

# *Stress Publica*

*Designing for stress-relief in vulnerable neighbourhoods,  
based on the case study of Overvecht, Utrecht*

# Colophon

## Stress Publica

*Designing for stress-relief in vulnerable neighbourhoods, based on the case study of Overvecht, Utrecht*

Graduation Thesis June 2025

Delft Faculty of Architecture and the Built Environment  
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All images are by the author, unless stated otherwise

# Abstract

Half of the people worldwide currently live in urban areas, which is expected to grow to two-thirds by 2050. Though relatively little is still known about the exact effects of urban living, in particular on our health, some patterns have been recognised: a higher likelihood of developing mental health issues, a high degree of car-dominance and -dependence, and strongly felt effects of climate change. These diverse issues have one overlapping factor, which is urban stress, the main topic of this thesis. People with a low socioeconomic status experience this especially severely, due to their higher likelihood of living in “problem areas” with many urban issues, in addition to other financial worries. This thesis aims to find out what the exact causes of urban stress are, and find out design solutions that can help lower this urban stress. The question at the centre of this thesis is “*What spatial design elements can improve the health of residents of vulnerable neighbourhoods with a low socioeconomic status through stress-relief, based on the case study of Overvecht, Utrecht?*”. Overvecht is chosen as a case study, as it has all of the aforementioned urban issues,

in addition to issues related to socioeconomics. Firstly, through literature review, sources of urban stress (“stressors”) are formulated and bundled in the so-called STRESS framework, which divides the stressors into five categories: Social, Activity, Economy, Nature, and Personal experience. Then, design solutions are presented in the form of the RELAX framework, which has the same categories, but seen from the perspective of stress-relief rather than stressors. Both of these frameworks are then applied in Overvecht, which shows how they work in practice. This same method could be used in other vulnerable neighbourhoods with similar issues related to urban stress. The main take away is that the different design solutions all depend on each other and to properly and effectively lower urban stress, the different perspectives should all be considered and formed into a synergetic vision/ design, which reacts to local circumstances and wants and needs of local residents.

*Key words: Urban stress, vulnerable neighbourhoods, socioeconomic status, health, restorative design*



## Preface

Dear reader,

If you read this, you are (presumably) about to read *Stress Publica*, my master thesis. For over nine months, I poured my blood, sweat, and tears into this document. As the title of it suggests, this thesis is about the topic of stress, something that is very personal to me. Ironically enough, the process of doing research and writing about the causes and possible preventions of stress, caused me immense amounts of stress at times. Luckily, there were some people who helped me along the way, whom I would like to thank for this.

Firstly, one of the main sources of input and inspiration was Maurice, my first mentor, who helped me with the overall process and could always offer a fresh view, even when I had lost inspiration and/or motivation. Secondly, my second mentor Deepti, who helped me sharpen my project further and kept me on my toes when necessary, while simultaneously offering support. In addition to the mentor team, I would like to thank Tess and Marco for organising Urban Fabric studio meetings throughout the year, which continuously offered an outside perspective on the graduation process and my own project, also due to the help and input of my fellow studio members.

There were also a few people outside of the faculty who helped me throughout this year. Firstly, Christophe, who must have heard my story (and every variation of it) for hundreds of times, and helped me think through everything. Lastly, my family members, whom offered emotional support whenever necessary.

Thank you to every one of these people and I hope you enjoy reading *Stress Publica*!

Laura Oosterhoff

# Res Publica

[rēs pūblica] *noun*

1) In a literal manner or sense: “the public thing, affair”, or “the people’s thing, affair”

2) Used to mean: “public affair”

(Lewis & Short, 1879)

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# 01

## *Introduction*

In this chapter, the theme and location (urban stress and Overvecht respectively) of this graduation thesis are introduced. A historical context of the relation between health and living environment is given, after which the current problems addressed in this thesis are presented in the problem field and statement. Then, the context is given, where the ways in which the problems manifest themselves in Overvecht are shown. Upon this, the research aim is based. Lastly, the societal and scientific relevance, and ethical considerations are discussed.

1.1 Problem field

Historical context health & living environment

Middle Ages and Renaissance

During the recent COVID-19 pandemic, we all experienced the impact our living environment had on our life, health, and habits, when many places proved insufficient to keep our distance from each other, our own houses drove us stir crazy, and vast green spaces offered a much welcome break. However, this era was far from the first time in history where the relation between living environment and health became clear: it begun as early as the Middle Ages. This time period is known for the rapid spread of disease, which started with the plague of 542 AD and ended with the Black Death, one of the biggest epidemics in history, in 1342 (Rhodes & Bryant, 2024). The main reason for the rapid spread of disease was the high density of the cities, combined with farm animals in close proximity, and the bad public hygiene within the cities, through open garbage collection, open sewage, and dirty food and water (Spraakmakers, 2022). At first, the solution for the spread of these diseases was isolating the infected, but later, the solutions were more structural, like pure water supplies, better rubbish and sewage disposal, and food inspections. This trend of wanting to improve public health continued until into the Renaissance, though many leaders still lacked the knowledge, so little advancement was actually achieved (Rhodes & Bryant, 2024).




Industrial Revolution

It was not until later, around the 18th Century, that major developments in public health were achieved. This started in England, which was the first county to enact several Public Health Acts. Other countries then started to follow their example. Many of these advancements were made out of necessity, as the population of Europe was growing rapidly, which led to a shortage of quality

housing. People had to live in dilapidated houses that impacted their health negatively in a major way, which led to wide-spread diseases and bad health. Another major factor was the factories built around and even in cities at the time. The air pollution and smell pollution that emanated from these factories had a major impact on the air quality in and around cities, which had a negative effect on the health of its residents. During the 19th Century, multiple Health Acts were enabled to combat these problems, which gradually led to better health overall (Rhodes & Bryant, 2024).

Modernism

Modernism attempted to break away from the aforementioned problems and create healthy living environments. The main goal of this movement, which started after the Second World War, was to break away from the dense, polluted, and busy city centres. Neighbourhoods were mainly constructed on the outskirts of the city, where there was still room to design and realise spacious, low-density neighbourhoods. Licht, lucht, ruimte (“Light, air, space”) was a guiding principle (IMOSS, 2019). After the turbulent war period, focus was on a comfortable and stable family-life. Neighbourhoods should include every facility you need within walking distance and be the breeding ground for tight-knit communities (Urban Fabric Development, 2006). However, while the intentions behind these post-war neighbourhoods were positive and actually reflect current urbanism concepts, like the 15-minute city (Moreno et al., 2021), these places have a fairly negative reputation. They are car-centric (Urban Fabric Development, 2006), mostly monofunctional, and the low density combined with high-rise buildings leads to a loss of the human scale (Koöperatieve Architecten Werkplaats, 2020).

Middle Ages	Industrialisation	Modernism
500-1500 AD	18th Century	1950s
		
<p>Figure 1.1.1, Painting of Medieval city (Pieter Brueghel the Elder, 1559)</p> <p>Density and lack of hygiene led to spread of disease</p>	<p>Figure 1.1.2, Painting of industrial city (Howe, 1909)</p> <p>Factories in and around cities led to air pollution and lack of quality housing</p>	<p>Figure 1.1.3, Photograph of Overvecht (DUIC, 2021)</p> <p>Lack of human scale and car-centric design led to lack of activity and disconnection</p>

## Current issues

### Urbanisation

For most of human history, the majority of people lived in smaller, rural communities. However, in the past few centuries and especially the past few decades, this has changed and more people now live in urban areas rather than rural areas: since around 2007, most people globally reside in cities, as estimated by the UN. This number is only expected to grow, as the UN expects more than two-thirds of global citizens to live in urban areas by 2050 (United Nations, 2018). This means that researching the influence of urban areas on our health is now more important than ever, and the importance will only get greater. For this reason, the focus within this thesis will be on problems (mostly) present in urban areas.

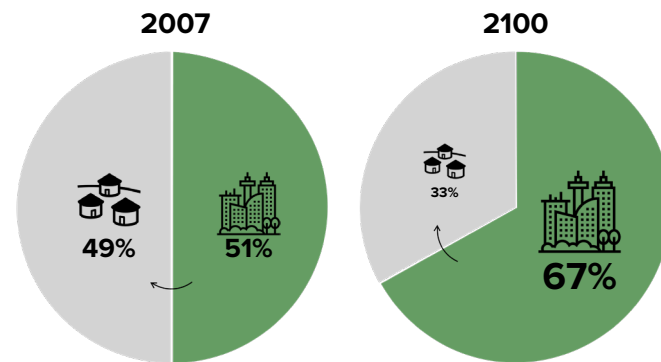


Figure 11.4, Graph of rural vs. urban residents (made by author, based on United Nations, 2018)

### Mental health problems

Cities have some typical characteristics that set them apart from rural areas: higher-density residential and commercial buildings, lack of access to green spaces, increased exposure to substance use, more stressful social conditions (Xu et al., 2023), higher population density, more traffic noise, and more pollution (Gruebner et al., 2017). While the direct impact of those circumstances has yet to be researched fully, as the

attention for mental health among researchers has only begun relatively recently, some patterns are already emerging. Adults living in cities are more likely to develop schizophrenia, depression, and anxiety. They also tend to experience more negative emotions, such as tiredness, unenthusiasm, depressive mood, feeling fed-up, and loneliness (Xu et al., 2023).

### Car-dominance

Another major issue now is car-dominance (Van den Berg & Schurink-Van 't Klooster, 2023). Much of the post-war reconstruction that took place in the Netherlands was centred around cars and infrastructure for cars was constructed throughout the country. Back then, cars were seen as a luxury product not everyone could afford. However, during this period, they slowly became more widely available and became a daily necessity (Urban Fabric Development, 2006). This, logically, led to car-dominance, which had its impact on our health. Firstly, car-dominance has led to a lack of physical movement, due to the practicality of cars leading to a preference for cars over active modes of transport, like walking and cycling (Van den Berg & Schurink-Van 't Klooster, 2023). Moreover, cars cause air pollution, elevated levels of stress and, consequently, several physical and mental health problems (Hahad et al., 2024).

### Climate change

According to the RIVM, the National Institute for Public Health and the Environment, climate change also has an impact on our health through our living environment. The most prevalent problem is centred around heat: the high number of hot days within cities - the Urban Heat Island effect - combined with a lack of places to cool off, impact our health negatively. This phenomenon is only expected to get stronger in the coming years (Betgen et al., 2024). In addition to the

negative effects of heat, climate change is associated with a higher chance of respiratory diseases, infectious diseases, and lack of healthy food (Patz et al., 2014). The quality of drinking water in the Netherlands is also under pressure, partially due to climate change (Limaheluw et al., 2021).



Figure 11.5, Illustration of the three main urban issues (made by author)



## Stress as overlapping issue

### Urban stress

The aforementioned trinity of urban issues is quite diverse, both in cause and in outcome. However, there is one overlapping theme between the three: stress. Stress is one of the biggest, if not the biggest mental health issue caused and worsened by the ways cities are designed. Urban circumstances, such as the high density of buildings (Xu et al., 2023) and people (Gruebner et al, 2017), can cause severe stress among residents. Moreover, this heightened level of stress can also be the cause of other mental health issues, namely developing mental health disorders. Lastly, suffering from these mental health disorders can cause additional stress in and of itself, further adding to the relation between living in urban areas and experiencing stress (Jalilisadrabad et al., 2023). Car dominance, the second issue mentioned, causes stress in several ways, such as the mechanical sound they produce (Hahad et al., 2024) and the air pollution they cause/add to (Gruebner et al., 2017). Moreover, they cause a lack of physical activity, namely walking and cycling (Van den Berg & Schurink-Van 't Klooster, 2023), which are actually ways to relieve stress (Roe & McCay, 2021). Therefore, while this is not a direct impact, cars do prevent stress-relief indirectly. Lastly, cities experience the effects of climate change quite severely, through phenomena such as the Urban Heat Island (Betgen et al., 2024) and a higher chance of developing certain diseases (Patz et al., 2014). Both of these are causes of additional stress (Jalilisadrabad et al., 2023).

### Health impact

Experiencing stress, especially chronic stress, affects our health in many different, negative ways (American Psychological Association, 2018). Because of that relation, the aforementioned urban issues negatively affect the health of urban residents through

the heightened levels of stress they cause. While this phenomenon has been observed by multiple researchers, it has only come to light relatively recently. This is because the attention for mental health in the scientific community is also a relatively recent phenomenon, that really only came to light since the COVID-19 pandemic (Van den Berg & Schurink-van 't Klooster, 2023). Therefore, much is still unknown and additional research is needed. All of these facts combined (stress being a result of some of the main urban issues, the strong relation between stress and health, and the relatively limited knowledge about this phenomenon) are the reason that urban stress is chosen as the main subject of this thesis, and why stress-relief is chosen as the main vessel towards better overall health.

## Impact of socioeconomic status

### Defintion

Some research has been conducted on the effect one's socioeconomic status (SES) has on their health. According to the CDC, the US Centers for Disease Control and Prevention, socioeconomic status refers to

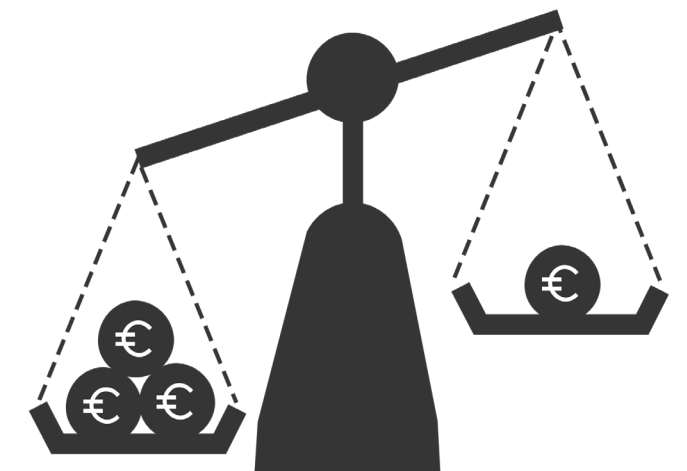
*“the absolute or relative levels of economic resources, power, and prestige closely associated with wealth of an individual, community, or country. Socioeconomic status is a multidimensional construct comprising multiple factors, such as income, education, employment status, and other factors”*

At an individual level, socioeconomic factors affect one's ability to engage in health activities, afford medical care and quality housing, and manage stress. On a community level, socioeconomic factors have an impact, too: low-income neighbourhoods are less likely to have access to good health care (US Centres for Disease Control and Prevention, n.d.).

### Health disparities

Socioeconomic status impacts stress and overall health in several ways. According to the American Psychological Association, those with a lower income and racial minorities experience more stress than affluent and/or white people, which impact their health negatively, both physically and mentally (American Psychological Association, APA Working Group on Stress and Health Disparities, 2017). Elevated levels of (chronic) stress can cause several health issues, such as anxiety, depression, digestive issues, headaches, muscle pain, heart problems, sleep problems, weight gain, and problems with memory and focus (Mayo

Clinic, 2023). Another issue is the higher likeliness of those with a lower SES to live in “problem areas”, which negatively affects their health. These are areas with low liveability due to lack of safety, noise pollution, and badly maintained housing and public space. Due to financial bounds, these areas also often lag behind in terms of climate mitigation. These different factors, combined with the financial problems, unemployment, and low literacy of many residents, directly and indirectly impact the health of those residents (Venderbos et al., 2023). These disparities even result in a difference in life expectancy, with highly educated men living 5,8 years longer than lower educated men, and highly educated women living 4,3 years longer than lower educated women. On average, the difference is life expectancy is 4,4 years. Highly educated men also live in good health for 14,6 years longer, and for highly educated women, the difference is up to 15 years (Ministerie van Volksgezondheid, Welzijn en Sport, n.d.).



Top: Figure 1.16, Economic disparity (made by author)

## 1.2 Problem statement

Our living environment has had an impact on our health and habits all throughout history and today is no exception. Whereas for most of history the majority of people worldwide lived in smaller communities, nowadays more than half of people live in urban areas, a number expected to grow even further. The influence of living in cities on our health is still being researched, but some patterns have emerged already: the higher likelihood of developing mental health problems, such as stress, car-dominance causing a lack of physical activity, pollution, and stress, and climate change causing the Urban Heat Island effect, a higher prevalence of several diseases, and a lowering drinking water quality, which in turn can also all cause stress. These diverse issues have one overlapping, underlying theme: stress. That makes stress one of the biggest challenges for cities today, and makes stress-relief a priority for urban areas. People with a lower socioeconomic status experience even more additional stress, due to disparities and the higher likelihood of living in a “problem area” with more possible sources of stress.



Figure 1.2.1, Visualisation of problem statement

### 1.3 Context

#### Vulnerable neighbourhoods

##### Urban issues in the Netherlands

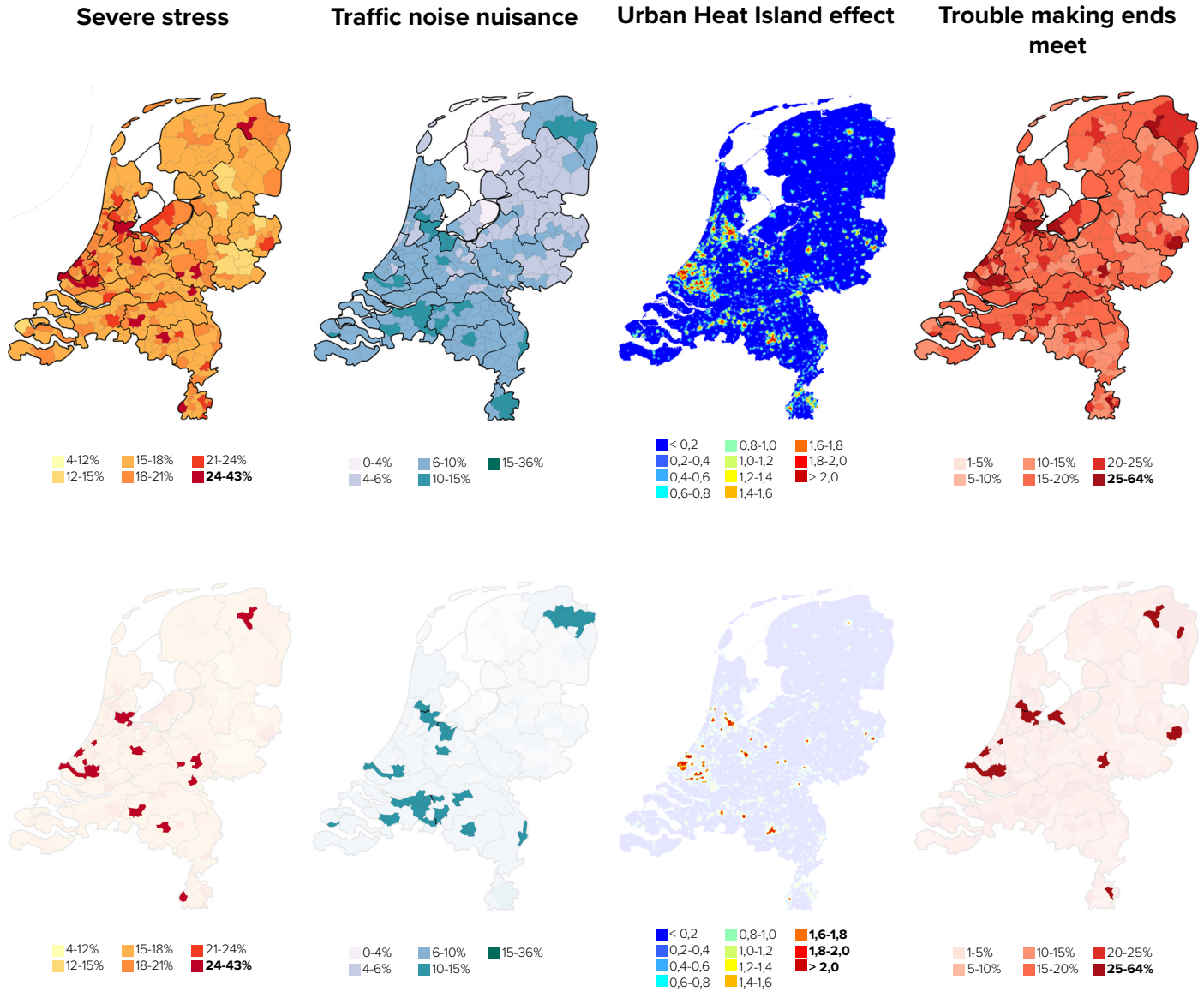
The problems mentioned in the problem field (mental health issues, car-dominance, climate change, and socioeconomic issues) happen all throughout the Netherlands and the problems are wide-spread. Figures 1.3.1 shows where these urban issues manifest themselves throughout the country. The map on the top left shows the places where people experienced severe stress during the last month, with stress being a major mental health threat in urban areas. The second map shows the areas where residents experience nuisance from the noise of traffic, which indicates a high car-dominance. The third map shows the effect of the Urban Heat island, where cities experience temperatures that are noticeably higher than their rural surroundings. Lastly, the fourth map shows the areas where people have trouble making ends meet, which represents socioeconomic struggles.

These four problems happen all throughout the country. However, when looking at the places where these problems are the most severe, an interesting phenomenon can be observed: there are a few places where most or even all of these problems happen all at once. This can be seen in Figure 1.3.2.

##### National policy underpinning

These areas, where many different problems occur at once, are especially vulnerable, and could, if left untreated, end up in a downward spiral. This phenomenon over overlapping issues in certain areas has not been left unnoticed by the Dutch government. In 2022, they launched the Nationaal Programma Leefbaarheid en Veiligheid (*National Program Liveability and Safety*), to combat this issue in a cohesive and synergetic manner. They designated twenty-two “vulnerable neighbourhoods” all throughout the

country, with many different problems on top of each other, which are related to unemployment, low income, education, housing, crime, safety, and health. For each of these neighbourhoods, a plan will be made to work on all of the different issues at hand (Ministerie van Binnenlandse Zaken en Koninkrijksrelaties, 2022b). Because these neighbourhoods have issues related to stress and overall health, and the socioeconomic status of their residents (education, income), these neighbourhoods are especially relevant for this thesis.

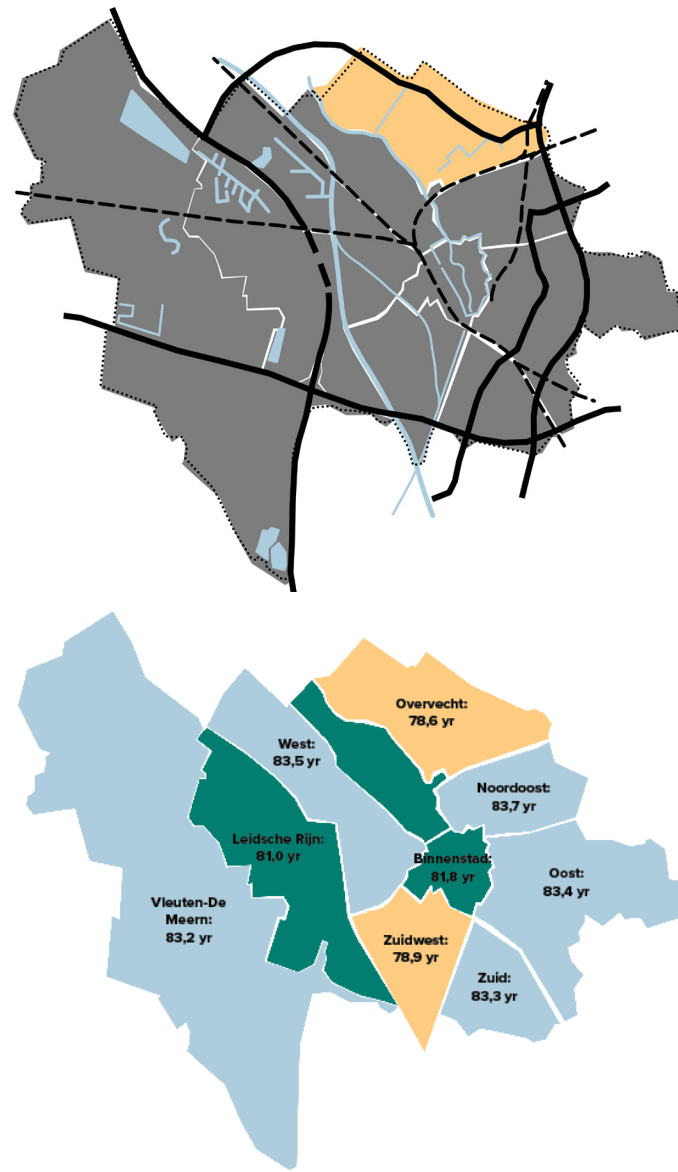


Top: Figure 1.3.1, National urban issues maps (made by author, based on Buurtatlas, 2022 and Atlas Leefomgeving, 2020)  
Bottom: Figure 1.3.2, Highlights of national urban issues maps (made by author, based on Buurtatlas, 2022 and Atlas Leefomgeving, 2020)



## Vulnerable Overvecht

One of the vulnerable neighbourhoods identified in the Nationaal Programma Leefbaarheid en Veiligheid, is Overvecht, in the city of Utrecht. It is located on the northern edge of the city and has all the characteristics of a vulnerable neighbourhood. This area has a relatively low liveability overall, especially when compared to the rest of the city (Ministerie van Binnenlandse Zaken en Koninkrijksrelaties, 2022a). It is the unhealthiest neighbourhood of the whole city, and its residents are unhealthier than the average Utrecht resident. In fact, the biggest national health disparity between two neighbouring districts is between Overvecht and Noordoost. The residents of Overvecht live 5 years shorter on average, and live in good health for almost 15 years less than the residents of Noordoost. The biggest reason is socio-economic circumstances: the people of Overvecht have a lower income and lower education than the people of Noordoost (Gordijn, 2022). This is reflected in the fact that a relatively high percentage of Overvecht residents have trouble making ends meet (Ministerie van Volksgezondheid, Welzijn en Sport, 2022).



Top: Figure 1.3.3, simplified map of Utrecht city  
Bottom: Figure 1.3.4, life expectancy per Utrecht district  
(made by author, based on Gordijn, 2022)

## Description of Overvecht

### Spatial aspects

Overvecht is on the northern edge of the city of Utrecht. It is a post-war neighbourhood and most of it was designed and built in the 1960s. The district is enclosed by multiple large infrastructural elements: the provincial road that is part of the ring of Utrecht, the train track, and the river Vecht. In line with post-modern design ideas, it is green, spacious, and open: the roads are broad, and there is a lot of greenery and open space. The district has its own train station, which connects it to the city centre on one side, and to cities north-east of Utrecht on the other (Echt Overvecht, n.d.)

### Administrative boundaries

The district of Overvecht consists of ten neighbourhoods. The borders of Overvecht are made up of city borders with De Bilt and Maarssen, the train track, and the river Vecht. The car roads divide the district into four main parts: Overvecht-Zuid, Overvecht-Noord, the industrial area (Bedrijfsgebied), and the polder area (Poldergebied). Overvecht-Zuid was designed and realised in the early 1960s. It consists of four neighbourhoods, and is bordered by the train track, two large roads, and the river Vecht. Zuid originally consisted of eight small neighbourhoods, but these were later gathered into four larger ones. Overvecht-Noord was designed and realised quickly after, in the mid to late 1960s. It also consists of four neighbourhoods. Vechtzoom-Noord & Klopvaart is the only neighbourhood that was not fully constructed in the 1960s, with the Klopvaart-area being a later addition, added in the 1980s. The industrial area was made in the 1960s/1970s and expanded in the 1990s. It consists of industrial buildings surrounded by sports fields, allotment gardens, and a cemetery on the outer edges. Lastly, the polder area is the oldest and the last area of Overvecht that still has the old polder structure. It is separated from the rest of Overvecht by

the provincial road that is part of the ring of Utrecht (Gemeente Utrecht, n.d.).

### Focus area

For the purposes of this thesis, the main focus area will be the inner part of Overvecht, consisting of Overvecht-Noord and Overvecht-Zuid. This part of the district was all part of the 1960s design process. It is enclosed by the train track, provincial road, large road next to the industrial area, and the river Vecht. Being enclosed by these borders makes this area function as an urban unity, whereas the industrial and polder area feel separate from this. The small part of Zuid that is officially not part of Zuid, on the crossing of the train track and river Vecht, will also be included, as it acts as part of the urban unity. As will be shown on the next pages, this inner area is also where the aforementioned urban issues present themselves the strongest.

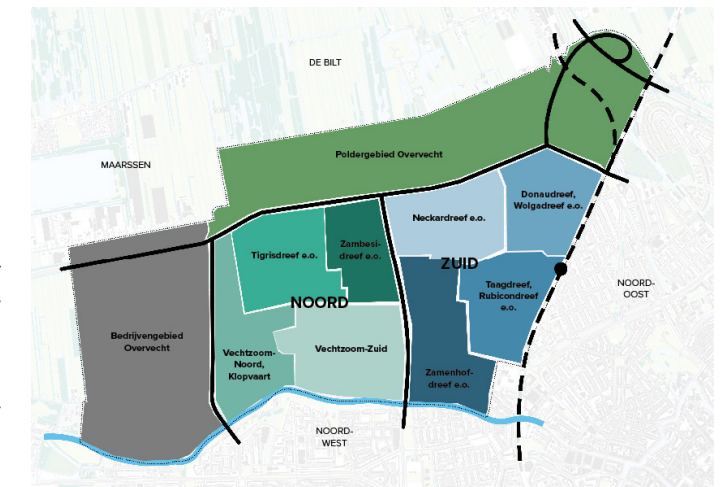
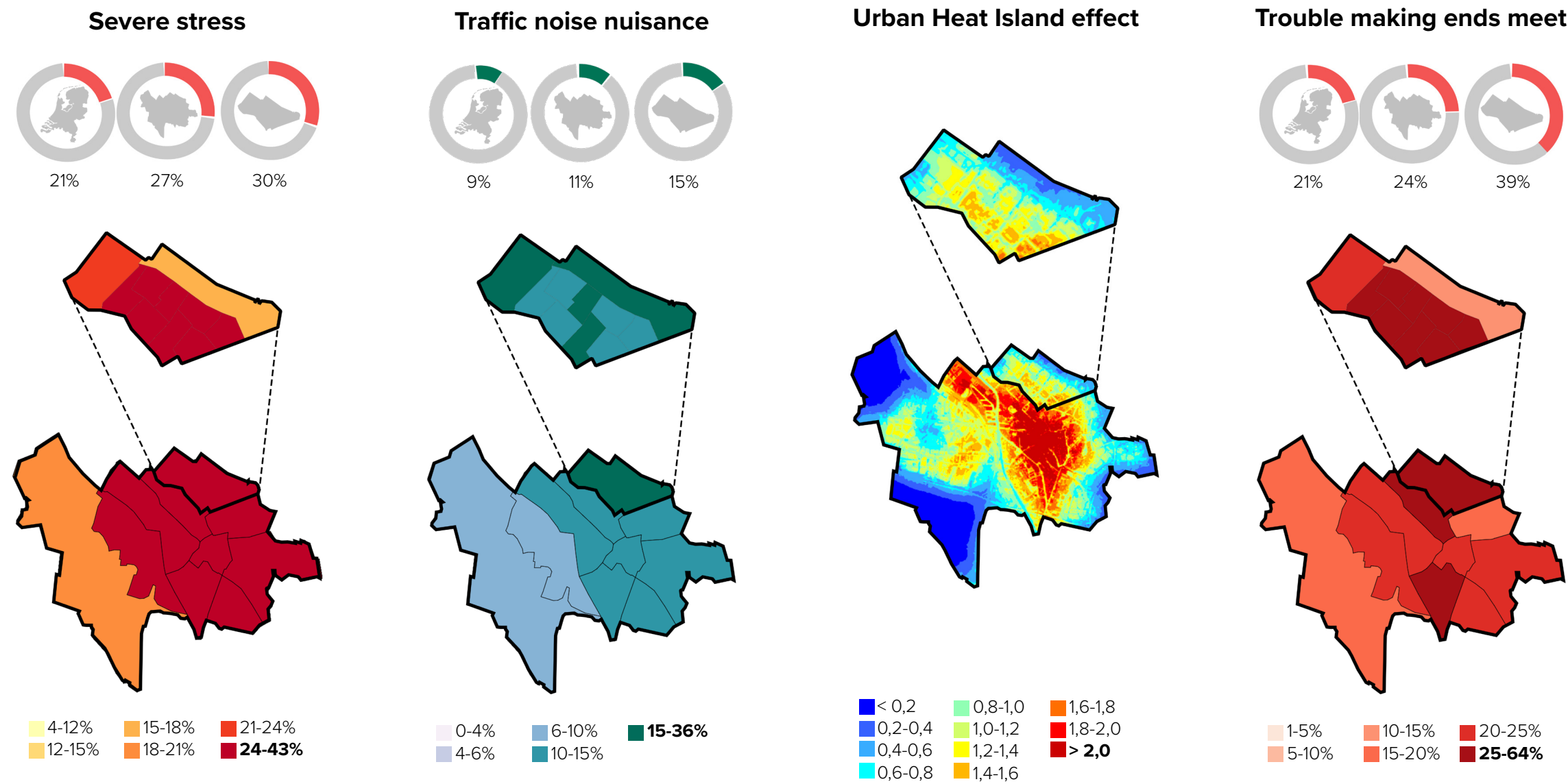


Figure 1.3.5, Administrative areas Overvecht  
(made by author, based on Gemeente Utrecht, n.d.)

Urban issues in Overvecht

Overvecht shows all of the four issues mentioned in the problem statement (mental health issues, car dominance, climate change, socioeconomic issues). The left map shows that there is a relatively high percentage of people that experience severe stress, especially when compared to the rest of the country. There is also more traffic noise nuisance than the rest of the country and rest of the city. The urban heat island effect is quite severe, especially in the part of Overvecht nearest to the city centre. Lastly, there is a big difference in the percentage of people living in Overvecht that have trouble making ends meet when compared to the rest of the country and city, with the percentage being nearly twice as high as the national average.



Socioeconomic statistics

As mentioned before, there are many socioeconomic problems in Overvecht. When compared to the rest of the country and city, there is a lower percentage of house ownership and higher percentage of renting, especially from housing cooperations. The vast majority of houses are apartments, more than twice the national average. Around two thirds of the residents have non-Dutch heritage, the majority of which have non-Western heritage. A higher percentage of people than nationally only have primary education, and the average income is only two thirds of national and Utrecht average, which means that the socioeconomic status in Overvecht is quite low (AlleCijfers, 2024).

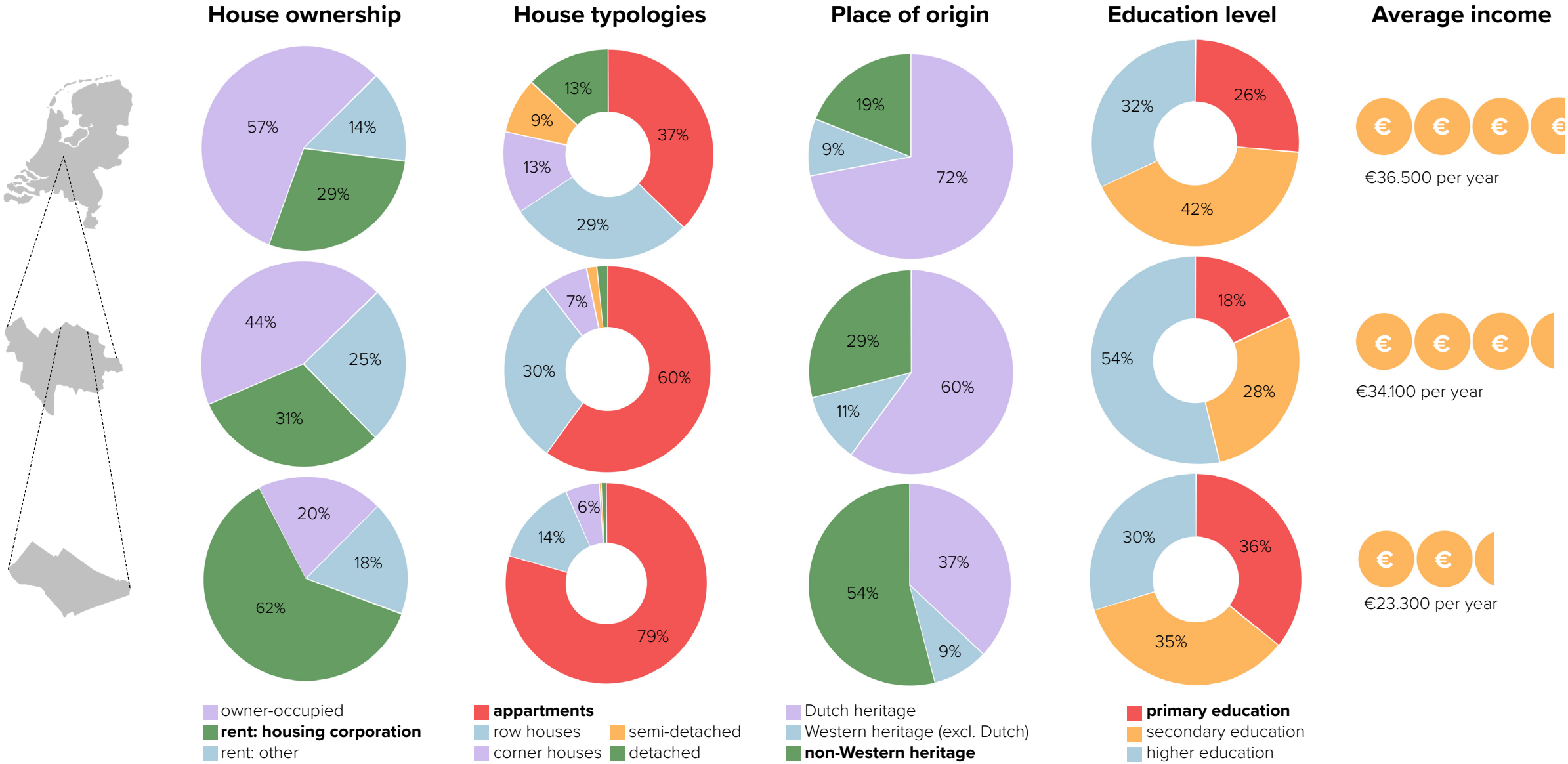


Figure 1.3.7, Socioeconomic circumstances in Overvecht, compared to national and city-wide circumstances (made by author, based on AlleCijfers, 2024)

## 1.4 Research aim

The aim of this thesis is to identify the relationship between health and the living environment, through identifying sources of urban stress, formulating design measures for possible stress-relief, and then applying these in a case study area, by creating an illustrative and representative design for a vulnerable neighbourhood: Overvecht. The main target group is those with a low socioeconomic status, as they tend to experience more stress than those with a high(er) socioeconomic status, partially caused by circumstances in their living environment. The end goal is to improve the health of the target group, which is achieved through stress-relief. The district of Overvecht is used as a case study due to the presence of several urban issues related to the topic. Through literature study, urban stressors (sources of urban stress) are formulated, which together form the STRESS framework. Then, design

measures that can facilitate stress-relief are formulated, which are bundled in the RELAX framework. Next, the stressors are located in the district of Overvecht. A neighbourhood is chosen to represent the full district of Overvecht and the accompanying stressors: part of the Taag- en Rubicondreef en omgeving, which is shown in figure 1.4.1. A neighbourhood design is made, using the stress-relief design measures from the RELAX framework, with a focus on functions, landscape, and mobility. Several zoom ins are made, to show how the design looks on a smaller and more human scale, based on the perspective of personas representing the target group. The design will be context-specific and -responsive, but elements of it are transferable to the rest of the district and through the usage of the STRESS and RELAX framework, parts are transferable to other vulnerable neighbourhoods, too.

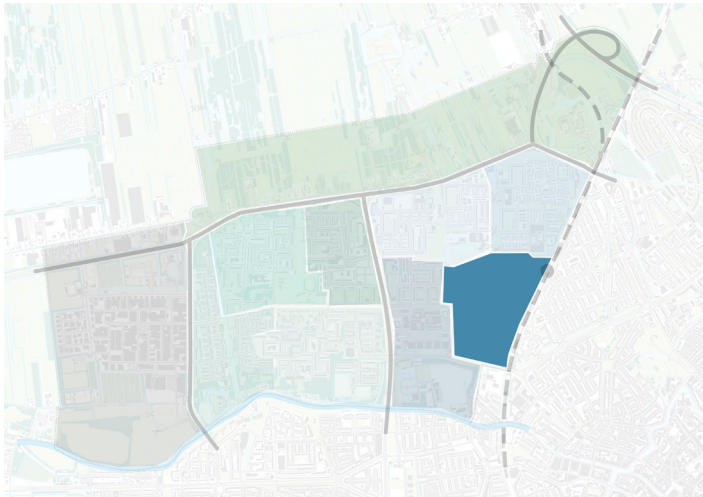


Figure 1.4.1, Location Rubicon- en Taagdreef e.o. neighbourhood  
(made by author, based on Gemeente Utrecht, n.d.)

## 1.5 Relevance and considerations

### Societal relevance

#### ***Lack of resources and knowledge***

As established, one of the major reasons that people with a lower socioeconomic status tend to have more health problems and less healthy habits is because of a lack of resources. Because they have a lower income, they have less money to invest in their health. This is both in the case of emergencies and need for medical help (US Centres for Disease Control and Prevention, n.d.), and in terms of generally healthy habits, like participation in sports (Van der Dool, 2022) and healthy diets (Friesland Campina Institute, 2022). Moreover, because they tend to have a lower education and less time to educate themselves about health, many people with a low socioeconomic status have less knowledge about health and healthy habits. The focus of this thesis is on designing public spaces and living environments in such a way that they promote healthy habits among the residents. By focusing on public space, a lack of resources becomes less of an issue because these spaces are accessible regardless of income. Moreover, because health becomes integrated into one's direct living environment, public awareness and knowledge about health is raised. This helps lessen health disparities and adds to health equality.

#### ***“Problem areas”***

Not all factors that contribute to health disparities are personal and individual. “Problem areas”, with many residents with low socioeconomic statuses, generally do not provide a healthy environment: low liveability, unhealthy and badly maintained housing and public space, and many issues related to crime (Venderbos et al., 2023). Moreover, these areas also generally have less access to good quality healthcare facilities (US Centers for Disease Control and Prevention, n.d.). These so-called “vulnerable neighbourhoods” (Ministerie van

Binnenlandse Zaken en Koninkrijksrelaties, 2022b) could end up in a downwards spiral, where problems only grow, because those with the means to improve often move away from the problem area, whereas those with less resources have no choice and stay behind. By focusing on one of these vulnerable neighbourhoods, steps towards escaping this downward spiral can be taken.



## Scientific relevance

### ***Growing body of knowledge***

While we have known for quite some time that there is a relation between our living environment and our health, researchers only started closely researching this topic in large numbers quite recently, mostly due to the effects of the COVID-19 pandemic. As mental health has also been taken more seriously as an important component of our overall health in recent years, part of this research has been done on the relation between our living environment and certain mental health problems. One of the major mental health issues in urban environments is “urban stress”, a concept that has existed for longer but came to light more recently. So-called “urban stressors”, sources of stress specifically linked to living in an urban environment, have already been researched, as have the effects they have on our health. However, as the phenomenon has been under-researched for many years, much is still unknown. This thesis helps to work towards increasing the knowledge about urban stress.

### ***Design-oriented***

As mentioned before, in the past few years quite a bit of research has already been done on the subject of “urban stress”. Most of these researches have been focused on diagnosing and describing this phenomenon. However, because the subject is still relatively new, possible solutions to this issue are still quite underexposed. Most of the research on this subject still lacks practical solutions to the problem(s) they describe. This thesis aims to add to closing this gap in knowledge, by developing a design that contributes to lessening (the effects of) urban stress. The design will be made for Overvecht, but will also (partially) be applicable to other comparable neighbourhoods/districts.

## Ethical considerations

### ***Other sources of stress***

The main subject of this thesis is stress among people with a low socioeconomic status. While the living environment is a contributing factor to this stress, there are many other factors that contribute to this stress that are not within the scope of this thesis. Many people with a low SES are in debt and experience financial difficulties due to their low income (Venderbos et al., 2023). Those difficulties also contribute heavily to the stress this group experiences, possibly more heavily than their living environment. Therefore, the goal of this thesis is not to eliminate all of the stress people with a low SES, as this is largely outside of its scope. The goal is to contribute to lowering the stress they experience due to their living environment and therefore lower the stress they experience overall.

### ***Differentiation within target group***

For the purposes of this thesis, the wants and needs of the target group (people with a low SES) will sometimes be generalised. In particular: in chapter 6, personas representing the target group are presented. Their wants and needs will be formulated to aid in the design process, but the personas cannot represent every single person in the target group, meaning generalisation are in order. These generalisations will be as limited as possible but some generalisations will still be necessary due to time constraints. I am aware that this target group is diverse in its wants and needs, as is every group of people. Therefore, I will limit the generalisation as much as possible, by collecting data from various sources to get a broad yet overarching idea of the wants and needs of the target group there.

### ***The personal aspect***

Stress is a very personal experience and largely depends on individual circumstances, preferences, and personality traits. However, like mentioned above,

some generalisations will have to be made to come to a complete design. The same methods mentioned there - collecting information from varied sources and bundling this information in the form of personas - will be utilised to get a grip on the specific wants and needs of the residents of Overvecht. Moreover, one of the main aspects of the thesis is creating a diverse urban environment. By providing different types of experiences and environments within the neighbourhood, this project will work towards making sure that as many different wants and needs are met.

# 02

## *Theory & methodology*

In this chapter, the theoretical and methodological elements of the thesis are explained. First, the main theory that is used as theoretical underpinning is discussed: Restorative Cities by Roe and McCay. Then, the overall set-up of the thesis and the research questions that will be answered are laid out, both the main research question and the sub-questions. Along with the research questions, the methods used to answer those questions will be explained. Lastly, the schedule according to which this has all been done is shown.

## 2.1 Theoretical framework

### Restorative Cities

Restorative Cities is written by Jenny Roe, an environmental psychologist, and Layla McCay, a psychiatrist and public health specialist. In this book, they coined the term “restorative urbanism”, which refers to the belief that the way our environment is designed can help restore our mental health and wellbeing. The book was published in 2021, during the COVID pandemic, where we all became increasingly aware of the direct relation between our health, and our living environment. In particular, the relation between mental health and living environment, about which little was known before, became more clear and increasingly difficult to ignore. In coining the term “restorative urbanism”, Roe and McCay brought more attention to this topic, and they provided practical tools for improving how our living environments impact our mental health, through their seven different “pillars” of restorative urbanism:

- 1. The green city:** Exposure to natural environments can improve mental health and wellbeing in many different ways, dependent on their quality, accessibility, and biodiversity.
- 2. The blue city:** Though evidence is limited, exposure to water elements is thought to benefit health and wellbeing, especially for children and elderly people.
- 3. The sensory city:** By harnessing sensory experiences in the city, mental health and wellbeing can be improved. Focussing on what people can and cannot hear, see, smell, taste, and feel in the city is at the core of this pillar.
- 4. The neighbourly city:** This pillar is centred around the idea of building strong networks of supportive social relationships, as people with a strong support network are less likely to develop mental health problems and recover faster if they do. Topics like

accessibility, the human scale, aesthetic values, engaging surroundings, comfort, and (perceived) safety are central.

- 5. The active city:** By integrating physical activity into everyday urban life and public spaces, mobility for all urban citizens is enabled. The way a city is designed and how stimulating and engaging it is, determines how easily and comfortably citizens can move through it, which in turn can impact their wellbeing. This can entail elements like mixed-use spaces, comfortable streets, connectivity, and green spaces.
- 6. The playable city:** Providing opportunities for play is essential for the wellbeing of children and adolescent people, though this pillar is also for adults. Everyone should be encouraged to interact with the city, both “pure” play contexts, like playgrounds, and other playable contexts, that are not exclusively designed for play.
- 7. The inclusive city:** All ages, genders, races, ethnicities, orientations, socioeconomic statuses, and physical and cognitive abilities should be considered, and everyone’s wants and needs should be met within the city.

By working with all of these seven pillars in parallel, cities can improve and restore mental health and wellbeing (Roe & McCay, 2021). The idea that a city or other living environment can be (re)designed in that way is a central starting point of this thesis.

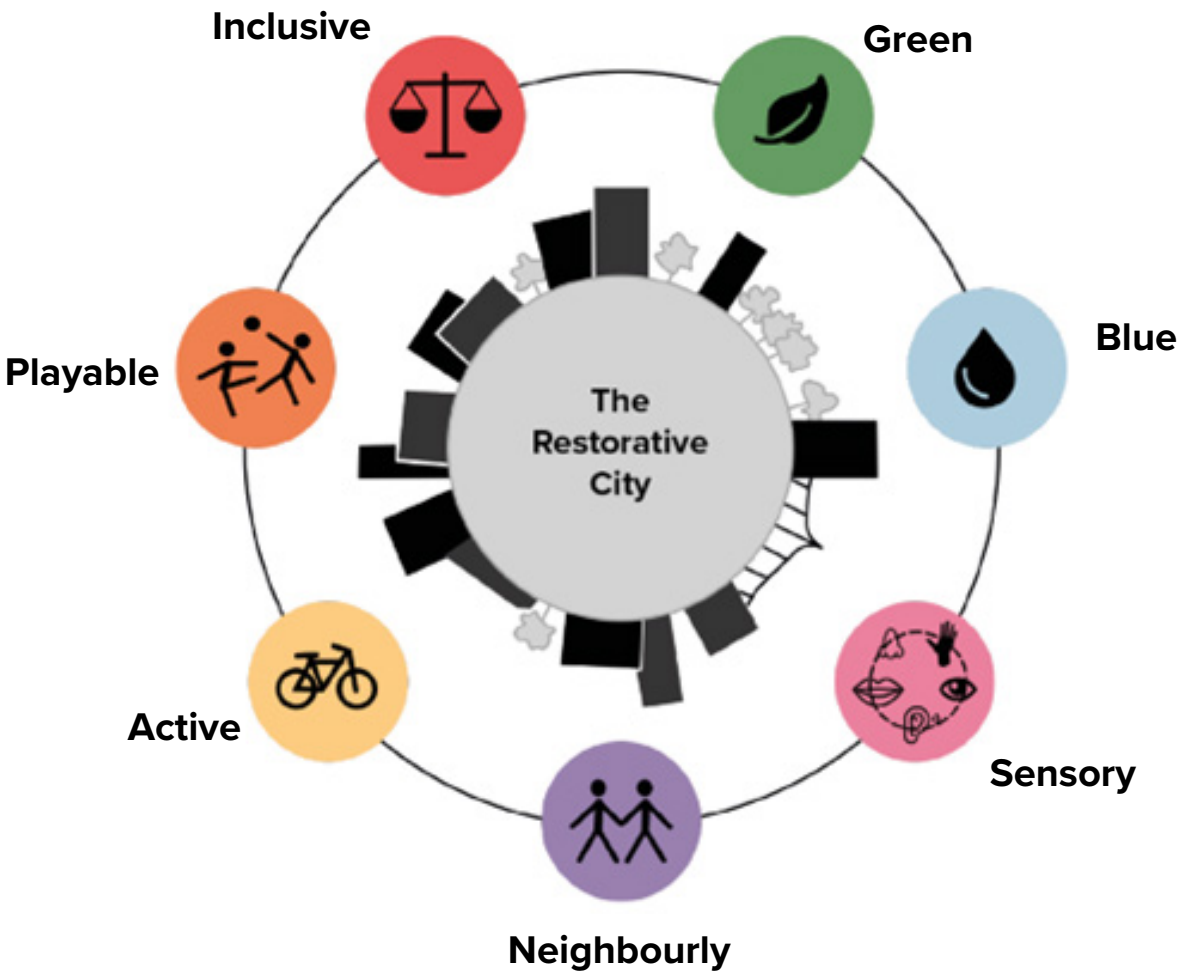


Figure 2.1.1, The Restorative City (made by author, based on Roe & McCay, 2021)

2.2 Conceptual framework/project visualisation

The figure on the right represents the project as a whole, visualising the overall process. By simultaneously decreasing existing urban stressors, and increasing restorative interventions (Roe & McCay, 2021), stress relief and restoration (Roe & McCay, 2021) can be achieved. This will, in turn, lead to less urban stress, which will result in better overall health: physical, social, and mental. For the purposes of this project, the direct context is Overvecht, but the end goal is for the same approach to be applicable in the broader context: vulnerable neighbourhoods.

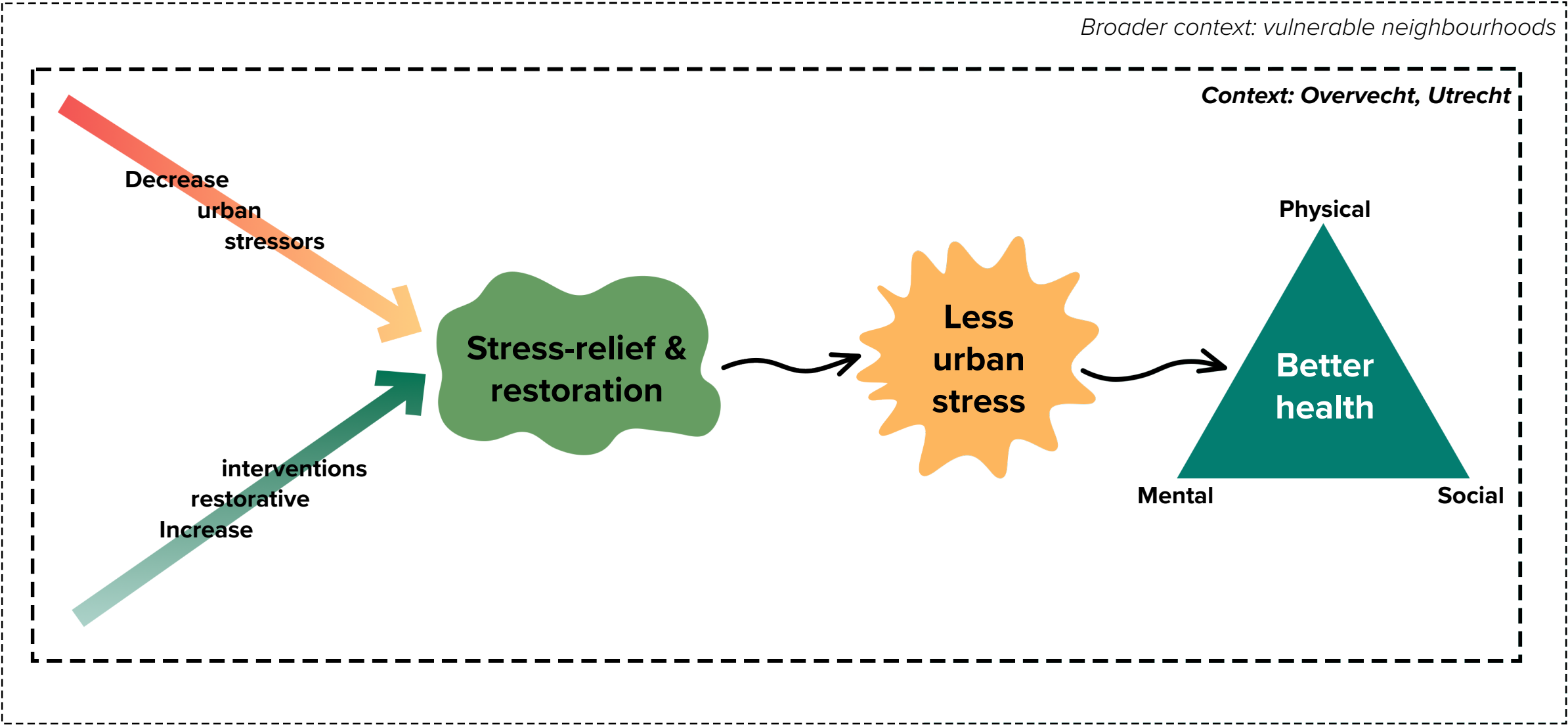


Figure 2.2.1, Conceptual framework



2.3 Research question

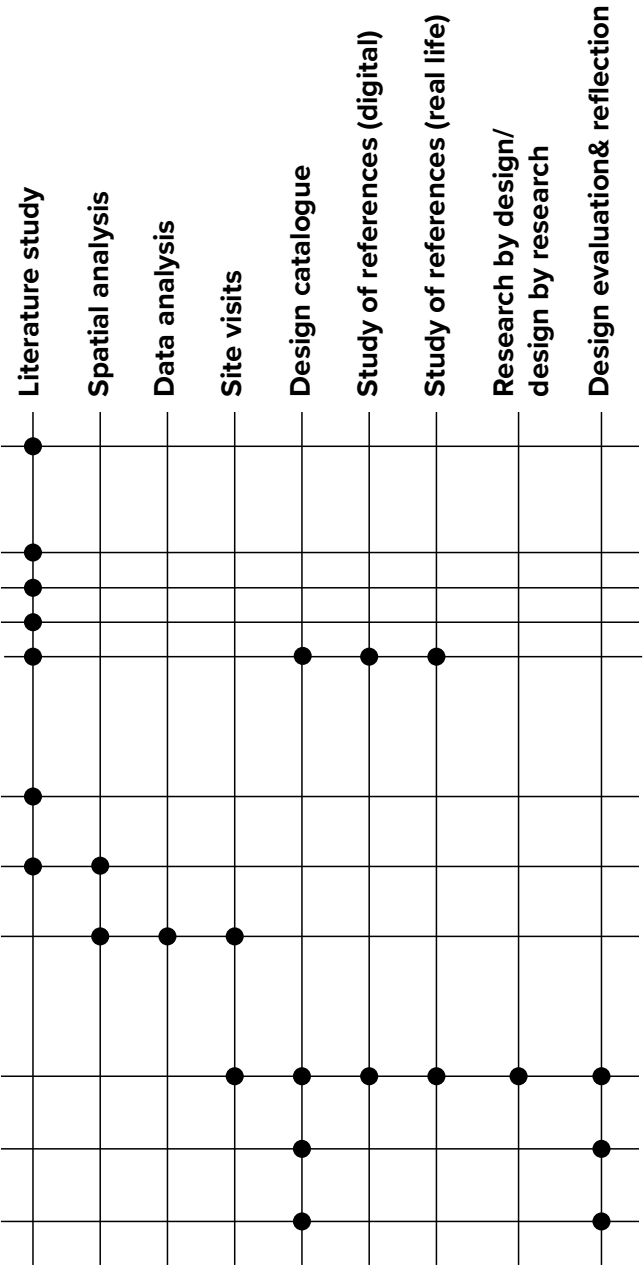
What **spatial design** elements can **improve the health** of residents of **vulnerable neighbourhoods** with a **low socioeconomic status** through **stress-relief**, based on the case study of **Overvecht, Utrecht**?

Approach

To answer the main research question, it is divided into themes, which are then divided into sub-questions. First, health is defined. Then, urban stress is defined, its health effects are discussed, as are sources of stress (stressors) and sources of stress-relief. Then, the location is researched, through its design background, its relation to health and stress, and the status quo in terms of stress. Lastly, a design is made for one of the neighbourhoods, and the application to the rest of the district and other vulnerable neighbourhoods is discussed.

Sub-questions

1. What is health?
- 1a. What is the definition of health?
2. What is urban stress?
- 2a. What is the definition of urban stress?
- 2b. What are the effects of (chronic) stress on health?
- 2c. What are sources of urban stress?
- 2d. How can urban stress be relieved?
3. To what extent are health and urban stress incorporated in Overvecht?
- 3a. What were the original design ideas behind Overvecht?
- 3b. How are those original design ideas related to health and urban stress?
- 3c. What are sources of urban stress in Overvecht?
4. What design interventions are needed for (additional) stress-relief in Overvecht?
- 4a. What design interventions are needed on the neighbourhood level?
- 4b. In what contexts is this approach applicable in the rest of the district?
- 4c. How is this approach applicable in other vulnerable neighbourhoods?



## 2.4 Methods

The previous pages showed an overview of the research questions and the methods used to work towards answering them. These two pages show a short explanation of each of these methods, by explaining the what (description) and the why (aim).

### 1. Literature study

- **Description:** Reading and reviewing different types of literature.
- **Aim:** Deepening the understanding of the theme and location, reading about different perspectives and comparing them to come to conclusions. Includes defining and describing certain terms, historical analyses.
- **Used for questions:** 1a, 2a, 2b, 2c, 2d, 3a, 3b

### 2. Spatial analysis

- **Description:** Analysing the location and visualising this in drawings, including maps, eyelevel drawing, birds eye view drawings.
- **Aim:** Understanding the workings of the location on different scales and also how those different scales interact and work together.
- **Used for questions:** 3b, 3c

### 3. Data analysis

- **Description:** Collecting and analysing data, visualising this data in maps and figures.
- **Aim:** Gathering concrete information about different subjects, quantifying them, getting a good understanding of these subjects.
- **Used for questions:** 3c

### 4. Site visits

- **Description:** Visiting Overvecht with a designated goal in mind.
- **Aim:** Experiencing Overvecht firsthand (as a visitor), getting an eye-level view.
- **Used for questions:** 3c, 4a

### 5. Design catalogue

- **Description:** Presenting possible design solutions in a cohesive and concise, yet complete way, through text and visualisation, including theoretical underpinning.
- **Aim:** Get and give a good view of the possible design solutions, both for the case study and other locations, which increases transferability.
- **Used for questions:** 2d, 4a, 4b, 4c

### 6. Study of references (digital)

- **Description:** Analysing reference cases related to the theme and/or location digitally.
- **Aim:** Gathering ideas for design solutions, research what design solutions work (or do not work) and if so, researching how and why they do.
- **Used for questions:** 2d, 4a

### 7. Study of references (real life)

- **Description:** Analysing reference cases related to the theme and/or location in real life.
- **Aim:** Gathering ideas for design solutions, seeing and experiencing first-hand what design solutions work (or do not work) in real life and if so, seeing how and why they work myself.
- **Used for questions:** 2d, 4a

### 8. Research by design/design by research

- **Description:** Trying several different design solutions based on the research done, and consequently doing more research based on the outcomes of the design process
- **Aim:** Come to a complete and fitting design solution through an iterative process, ensuring that the designs are informed by research, and the research is based on what is needed for the design of these subjects.
- **Used for questions:** 4a

### 9. Design evaluation

- **Description:** Comparing design solutions and weighing them against each other.
- **Aim:** Figuring out what design solutions meet the aim of the thesis best and optimising the design solution in the end.
- **Used for questions:** 4a, 4b, 4c

2.5 Schedule

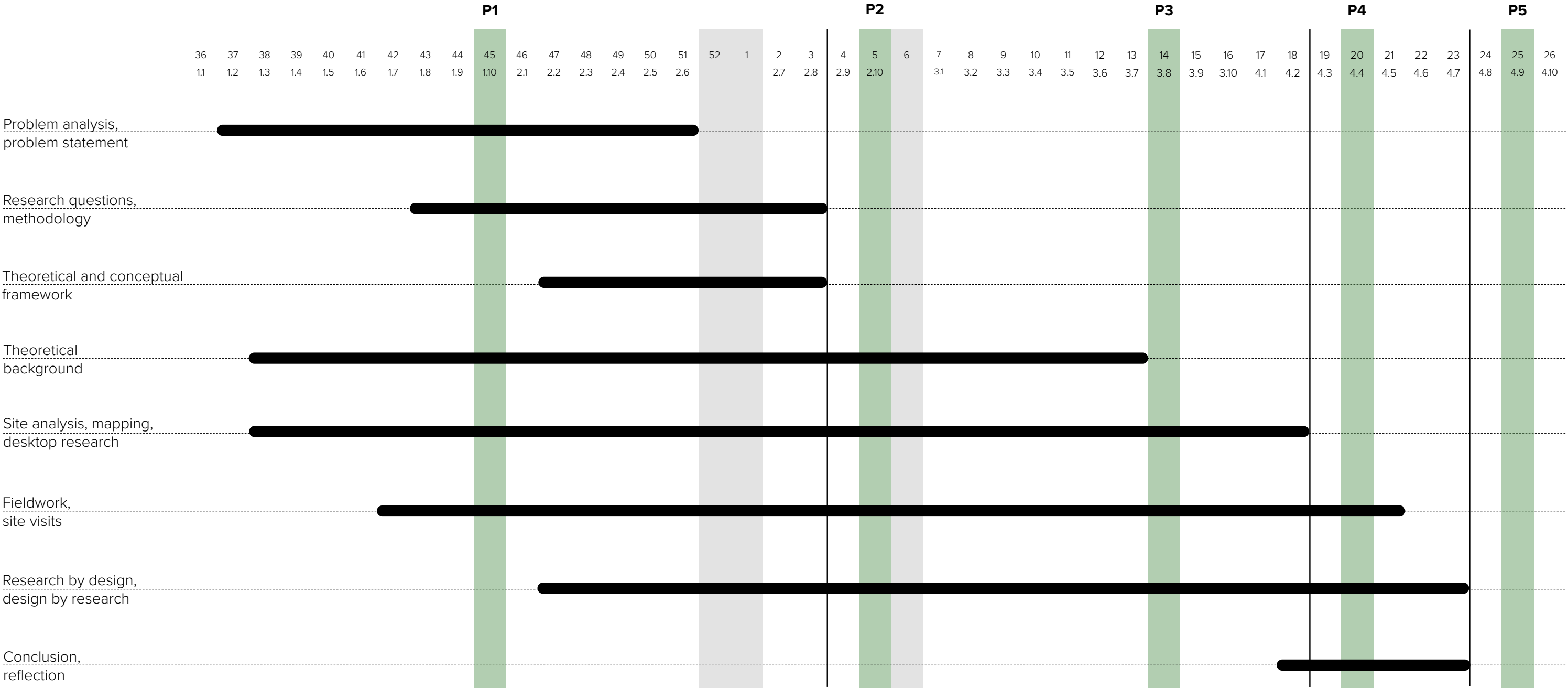


Figure 2.5.1, Graduation schedule

# 03

## *Health & stress*

In this chapter, some definitions and theoretical background and underpinning of the main themes are given. First, “health” is defined, including a short discussion of the associated controversies. This is followed by the definition of “urban stress” and some of the evolutionary background of the feeling of stress. Then, the possible health effects of chronic stress are discussed, to relate the themes health and stress to each other.

3.1 Definition of health

Controversies surrounding the definition

World Health Organisation

To be able to work with the theme of “health”, it is important to get a good idea of what exactly is meant with this term. According to the World Health Organisation, “health is a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity” (World Health Organization, 1948). While this definition was seen as groundbreaking at the time for how broad it is, it has garnered some criticism over time. Some researchers view the definition as too binary, as they feel it implies that people are either healthy or unhealthy, even though health is more of a spectrum. As this thesis wants to offer a nuanced perspective, careful (re)consideration is in order. In 2011, Huber et al. stated that they also consider the definition to be outdated. They offer the following alternative: health is “the ability to adapt and to self-manage” (Huber et al., 2011).

Maslow’s Hierarchy of Needs

A few years later, Misselbrook continued the redefinition of health. He defines health as “unimpaired flourishing” and “the ability to flourish without being unduly impeded by illness or disability or, if necessary, by overcoming illness or disability”. He based his use of the term flourishing on Maslow’s Hierarchy of Needs, see Figure 3.1.1. The bottom layer of the triangle (physiological needs) needs to be fulfilled in order to be able to fulfil the level above it. Fulfilling all levels of the triangle is considered “flourishing” (Misselbrook, 2016).

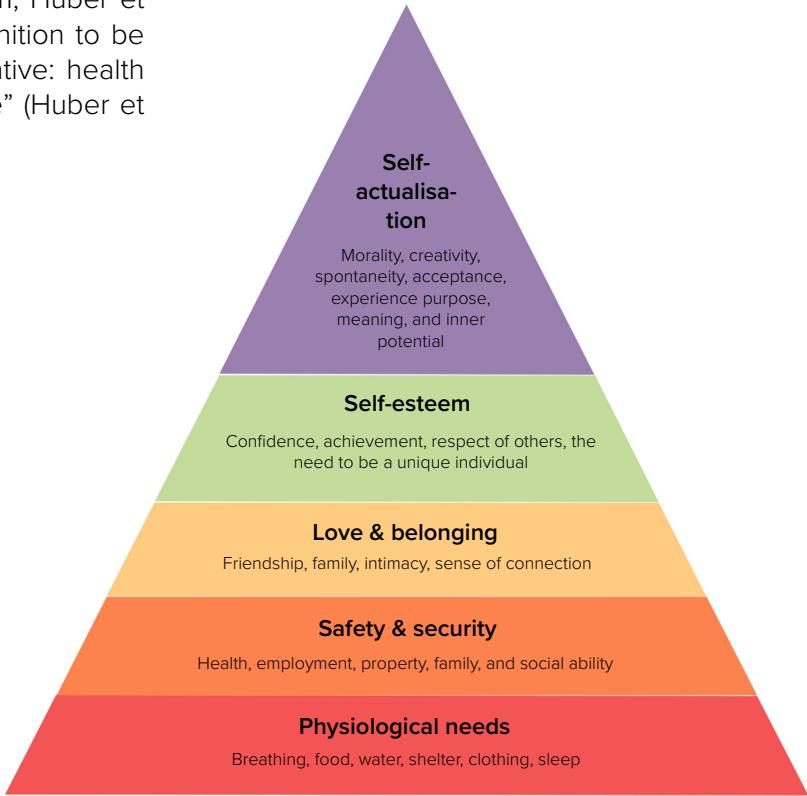


Figure 3.1.1, Maslow's Hierarchy of needs (made by author, based on Maslow, 1943)

Defining and redefining

Redefinition

While the criticism of the WHO definition of health are valid and important, they may not garner the definition completely useless. Thomas Schramme defends the definition and argues that most criticism is due to the use of “complete”, because it seems to imply that health is a utopian and unattainable thing, because no one has perfect wellbeing. It also ignores the fact that health is a spectrum and not a simple case of healthy versus unhealthy. Schramme does not consider the WHO definition useless, but suggest adding the word “perfect” in front of it: “PERFECT health is a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity”. The flourishing-aspect that seems to be missing from this definition, as stated by Misselbrook, is addressed indirectly through the use of “social wellbeing”, since there is an almost complete overlap between the notions of social wellbeing on one hand, and flourishing on the other. Schramme bases this on Martin Seligman’s PERMA model, which suggests five factors necessary for an individual to flourish: positive emotions, engagement, relationships, meaning, and accomplishments. According to Schramme, “Social wellbeing is widely regarded as the subjective evaluation of personal life circumstances and functioning in society, and is considered to involve developing and maintaining positive interaction with other people and with local and global communities” (Schramme, 2023). This, according to him, (almost) completely overlaps with what flourishing means. Therefore, while “flourishing” is not literally a part of the WHO definition of health, it is directly addressed through the use of the term “social wellbeing”.

Definition used in thesis

By slightly altering the WHO definition of health and by proving that the notion of flourishing is still addressed

in this new definition, Schramme addresses both of the aforementioned criticisms of the WHO definition, and shows that it is still applicable. Therefore, the definition of health developed by Schramme will be the definition applied within the context of this thesis, as it encompasses the relevant criticisms of the WHO definition, while still keeping its strengths:

*“Perfect health is a state of complete physical, mental, and social wellbeing and not merely an absence of disease or infirmity”.*

*(Schramme, 2023)*

The most important aspect for the purposes of this thesis, is the notion that health consists of three interdependent aspects: mental, social, and physical, as shown in figure 3.1.2. A mental health issue like urban stress also affects and is affected by other aspects of health, as will be shown on the next pages.

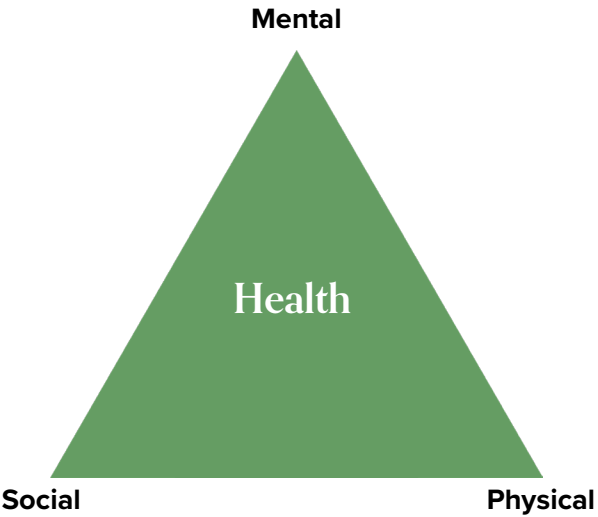


Figure 3.1.2, The three components of health

## 3.2 Definition of stress

### **Evolutionary background**

Similarly to the theme “health”, a precise definition and idea of what “stress” is, is also in order. According to the World Health Organisation, stress can be defined as “a state of worry or mental tension caused by a difficult situation”. It is a natural human reaction to a certain threat, that encourages us to address this threatening situation (World Health Organization, 2023). This reaction developed in our ancestors long ago, to protect them from immediate threats such as predators. It encouraged them to get into action by increasing the level of stress hormones, mainly cortisol and adrenaline, which speed up your heart rate, increase your blood pressure, and increase your energy level (American Psychological Association, 2013). This shows that stress in and of itself is not necessarily negative, and is simply a response to a threat, that encourages us to respond and act accordingly. However, when the threat persists, stress can turn into chronic stress, which has many more negative effects.

### **Chronic stress**

Nowadays, being attacked by a predator is not as common, but other types of “threats” trigger this same reaction. Situations such as an upcoming deadline, needing to pay bills, and dealing with family issues can make your body react the same way as being threatened by a predator, which can cause your body to become stuck in the “fight or flight” response (American Psychological Association, 2013). Whereas being threatened by a predator was a temporary threat and our ancestors could relieve their stress by getting away from the immediate danger, these newer causes of stress are not as temporary and can be present for days, weeks, months, or even years. This can lead to an elongated feeling of stress, which can have serious effects on one’s health. When stress starts to prevent you from living a normal life, it becomes

chronic stress. According to Yale Medicine, chronic stress is “a consistent sense of feeling pressured and overwhelmed over a long period of time” (Yale Medicine, n.d.). Exposure to stress for a longer period of time can have serious effects on your mind and body.

### **Urban stress**

The definition of urban stress, according to the European Environment Agency, is “a state of bodily or mental tension developed through city living, or the physical, chemical, or emotional factors that give rise to that tension” (European Environment Agency, 2020). Jalisadrabad et al. (2023) offer a similar, but slightly more broad definition. According to them, urban stress is cumulative stress caused by living in unfavourable urban conditions, like pollution, high population, extreme temperatures, crowding, noise, destroyed landscape, excessive waste, long commutes, etc. These events will trigger a reaction, and if they are seen as a threat, it can result in urban stress. This will only happen if the conditions are beyond the tolerance of someone living in this urban area (Jalilisadrabad et al., 2023).

### **Personal problem**

The last sentence, the fact that urban stress only happens once unfavourable urban circumstances are beyond one’s own tolerance, shows that urban stress is (in part) a personal problem. Not everyone has the same boundaries when it comes to factors like noise pollution, as one person can enjoy a lot of sound while others prefer complete silence, which means that the same environment can cause one person stress, while others will not experience (as much) urban stress.

## 3.3 Health effects of (chronic) stress

As explained, stress itself is little more than an evolutionary response of our body to something we perceive as a threat. Only when stress becomes chronic stress, by lasting for a long period of time, does it pose a threat to our health. The mental impact of stress is more self-explanatory, but the physical impact is less obvious. However, there are many systems and parts of our body that are impacted by urban stress, which will be explained here, to show that combating urban stress does not just positively impact mental health, it will prevent people from experiencing these negative physical health effects, too.

### **Musculoskeletal system**

Stress causes muscles to tense up, to protect against injury and pain. With sudden stress, muscles tense up at once and release this tension when the stress passes again, which is relatively quickly. With chronic stress, however, the tension lasts for a longer period of time, which can trigger other reactions and promote stress-related disorders, such as tension headaches and migraines.

### **Respiratory system**

The respiratory system provides oxygen and removes carbon dioxide from your body. Stress can have an effect on this system, like breathing fast and shallow. This is usually not a problem, but for people with a respiratory ailment, stress can worsen their pre-existing breathing problems. Acute stress can trigger asthma attacks, and rapid breathing caused by stress can induce a panic attack in someone prone to them.

### **Cardiovascular system**

Our heart and blood vessels provide oxygen to our organs. They are related to our body’s stress reaction. Acute stress raises our heart rate and our blood vessel dilate, increasing the blood pressure. This is a fight or

flight response, that fades away once the source of the stress disappears. Chronic stress can create long-term problems: the constant high heart rate and high blood pressure, combined with possible inflamed blood vessels, can increase risk for hypertension, a heart attack, or a stroke.

### **Endocrine system**

When we encounter a challenging situation, our brain starts a process that results in an increase of several hormones, including cortisol (the “stress hormone”). Cortisol is produced at different levels throughout the day, creating an energy cycle. In times of stress, more cortisol is produced, which increases the energy level in the body. Chronic stress can result in an impaired communication between the immune system and the stress-related hormones including cortisol. This has been linked to the development of several physical and mental health conditions, like fatigue, diabetes, obesity, depression, and immune disorders.

### **Gastrointestinal system**

The gut communicates constantly with the brain. Stress can affect this communication and can trigger pain, bloating, and other discomfort. The gut bacteria can, in turn, influence the health of the brain, which can affect the ability to think and express emotion. Stress early in life can change the development of the nervous system and thereby increase the risk for gut-related problems. Our intestines also have a thin barrier and stress can cause this barrier to become weaker, which allows bacteria from the gut to enter the rest of the body. This can result in chronic mild symptoms.

### **Nervous system**

When the body is stressed, the nervous system triggers the “fight or flight” response, which allows the body to combat whatever threat it perceives, through an

increase in energy levels. Once the threat disappears, the body returns to its neutral state. Chronic stress can result in long-term drain on the body, because physical reactions are constantly triggered. The nervous system itself is not necessarily affected by stress, but it does affect the other bodily systems.

**Reproductive system**

Stress causes the body to release cortisol, which is part of many different systems in the body, including the reproductive system. For men, chronic stress affect testosterone production, leading to decline in sex drive and lower production of sperm, which leads to a lower level of fertility. Because the immune systems is also affected by stress, the chance of disease rises. For women, stress can affect menstruation in negative ways. Stress may also reduce sexual desire for women, and lower their chance of conceiving and having a healthy pregnancy. It can increase the chance of pregnancy and postpartum depression and anxiety, which can also affect the baby. Premenstrual symptoms can become more severe, as can menopausal symptoms (American Psychological Association, 2018).

The image on the right, Figure 3.3.1, shows a summary of the physical effects of chronic stress on the body.

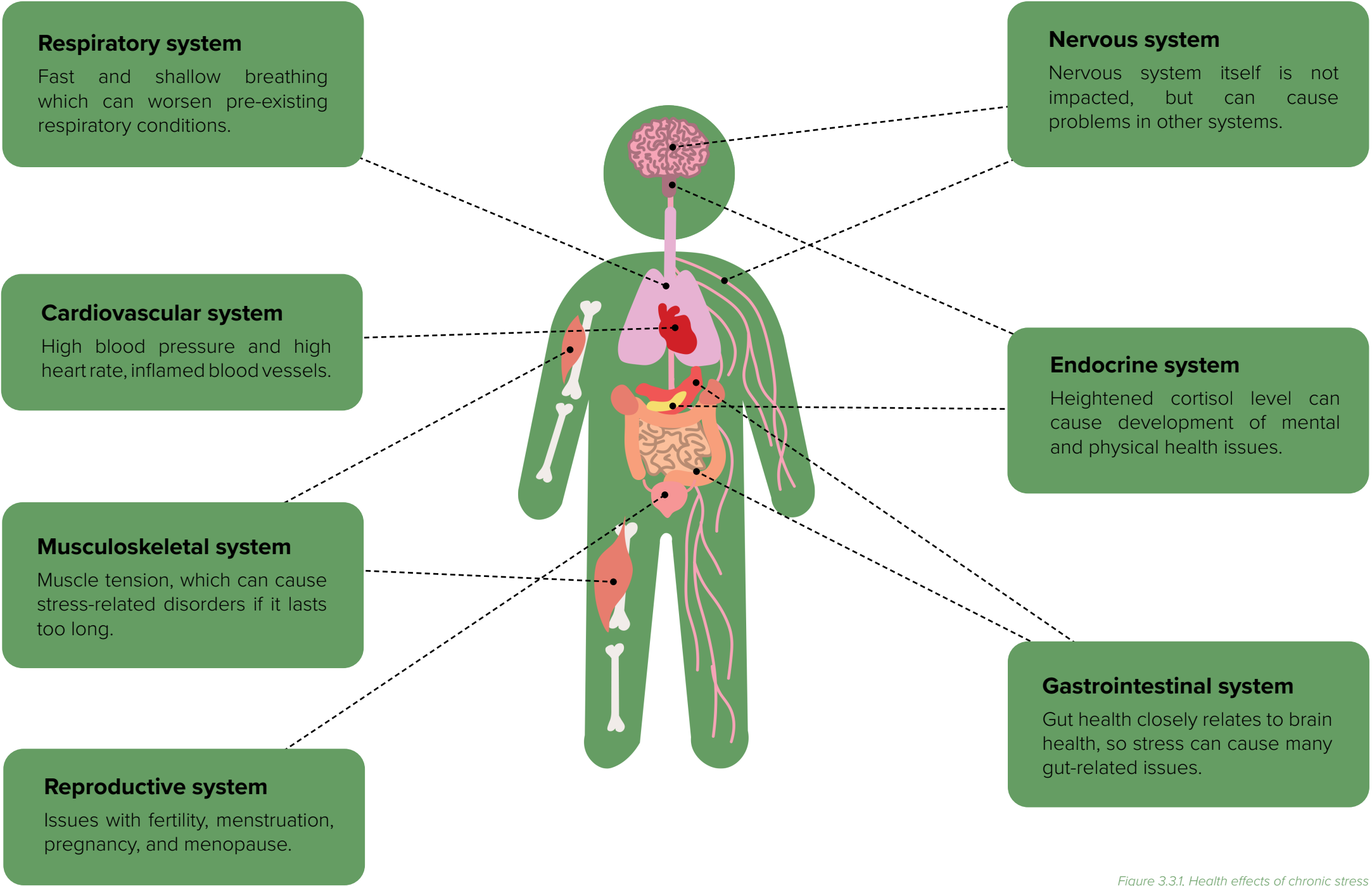


Figure 3.3.1, Health effects of chronic stress



# 04

## *STRESS & RELAX*

In this chapter, the theme “*urban stress*” is made more practical, as both the possible sources of stress and possible sources of stress-relief are discussed. First, the sources of stress, also called “stressors”, are outlined in the form of the STRESS framework. The full list of stressors is divided into five categories, with a focus on spatial elements. Afterwards, the possible sources of stress-relief are outlined, in the form of the RELAX framework, which consists of the same five categories as the STRESS framework. However, here they are approached from the perspective of what relieves stress rather than what causes stress.



4.1 Urban stressors: STRESS framework

Approach & input

Main source

Causes of stress are also called stressors, and stressors specific to the urban environment are called urban stressors. To research and analyse the current state of stress in Overvecht, a list of urban stressors was compiled. The main source was Stress Relief Urban Planning by Jalilisadrabad, Behzadfar, and Rahimi. It lists a number of urban stressors, which were used as input for the list seen below. Some additional sources were used for individual stressors.

Additional input

The thesis Urban stress by urban designer Marijke Koene was also used as a reference for the formulation of this list. I first compiled my own list of urban stressors. When this was mostly complete, Urban Stress was used to compare: almost the whole list of urban stressors overlapped. Because the focus of this thesis and Urban Stress is different, the lists do differ slightly. Koene had a focus on spatial aspects and based the stressors they addressed on their relation to the public space. Therefore, stressors like “air pollution”, “heat”, and most economic aspects were not part of their research (Koene, 2018). For the purposes of this thesis however, the decision was made to keep some stressors that have a less direct link to public space, as they could possibly be addressed in less direct ways. Moreover, since the main target group of this thesis is people with a low socioeconomic status, economic stressors were also kept. Urban Stress also served as a source of additional resources, which were then used to enrich the theoretical underpinning of the list of urban stressors.

STRESS framework

STRESS framework

The following list shows different urban stressors that will be addressed in this thesis. They have been bundled in categories partially based on the Mind the GAPS framework by The Centre for Urban Design and Mental Health, who propose four main ways in which urban design can positively impact mental health: Green places, Active places, Pro-Social places, and Safe places (The Centre for Urban Design and Mental Health, n.d.). Since this thesis focuses on those with a lower socioeconomic status, the economic element is also added, to form my own STRESS framework, which addresses: Social deprivation & overload (the social aspects), TRaffic & inactive modes of transport (the activity aspects), Economic deprivation & disparity (the economic aspects), Shortage of diverse greenery (the nature aspect), and Sensory overload & discomfort (the experiential aspect).

Stressor categories

Social deprivation & overload are related to one’s relation to others, both on a personal level and on a larger, more community-related level. TRaffic & inactive modes of transport mostly refers to how many cities are currently oriented towards cars, making physical movement more difficult, even though cars cause stress in multiple ways. Economic deprivation & disparity is especially relevant for this thesis, due to the target group being people with a lower income. Shortage of diverse greenery refers to a lack of natural elements of the living environment, including greenery, water, and animals. Lastly, Sensory overload & discomfort is the most personal category, as it refers to how people experience the city on a personal level. This is the largest category by far, due to the fact that stress is a very personal subject, as established before. Together, these five categories make up the stressors that will be addressed in this thesis.

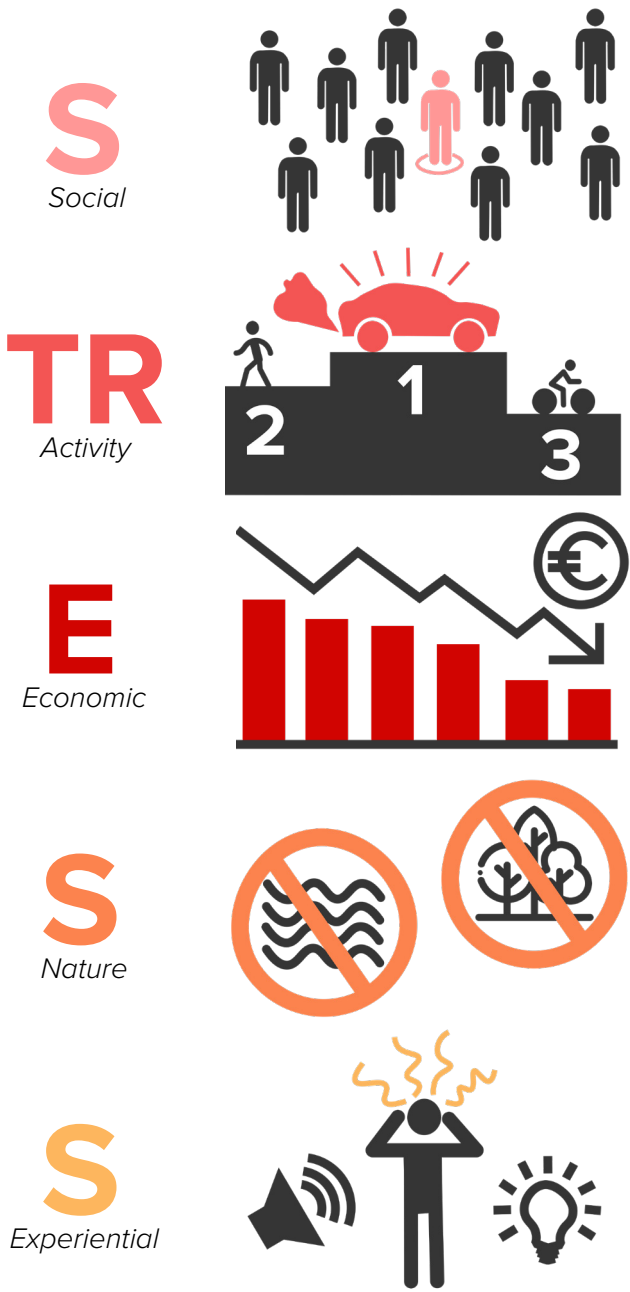


Figure 4.1.1, Illustrations of the STRESS framework categories



Figure 4.1.2, Benches turned away

### Social isolation and deprivation

Social isolation and deprivation are two of the most important social urban stressors (Jalilisadrabad, 2023). A lack of social connections can be as bad for you as smoking or drinking heavily, and social isolation is twice as harmful as obesity. Loneliness can heighten the feeling of stress and anxiety, and cause problems with sleep, which can have physical impact, too. If loneliness persists, it can cause a prolonged “fight or flight” stress response, which can negatively impact the functioning of the immune system (Novotney, 2019).



Figure 4.1.3, Facade closed/dead at eye-level

### Lack of eyes on the street

An important aspect of perceived safety is the noticeable presence of other people. A majority of closed facades and empty public spaces can make us feel unsafe, as there is a lack of eyes on the street. If we do not feel seen, we do not feel safe. Streets with open facades and a clearly defined distinction between public and private are seen as the most safe, whereas streets with a majority of closed facades, especially at eye-level, undefined spaces, and a lack of a (gradual) transition from public to private spaces generally feel more unsafe (Jacobs, 1961).



Figure 4.1.4, No public-private buffer

### Not enough space of your own

When we do not have enough space of our own, we can feel threatened, leading to a feeling of stress (Adli, 2011). There are two “types” of personal space. This first kind, the space around our body, acts as a sort of buffer zone: it is a personal and protective space present in most animals as a way to avoid predators. We prefer to only have people we have a close relation with within this space. The second kind of personal space refers to a physical space we can call “our own” (Graziano, 2018). When people impede on either of these spaces, we tend to feel stressed.



Figure 4.1.5, Crowding

### Crowding

(Over)crowding is a feeling that occurs when people feel that the density of people in a certain space does not allow them to achieve their goals, interrupts their desired behaviour, or makes them feel overwhelmed. People feel like they lack control of the situation (Schmidt & Keating, 1979). Therefore, living in areas that are often or always crowded can lead to social stress (Adli, 2011). A high density does not necessarily cause stress. Only when the density oversteps one’s boundaries does it become a source of stress (Jalilisadrabad et al., 2023). This is strongly related to the previous stressor: not enough space of your own.



Figure 4.1.6, Sign showing (perceived) injustice

### Injustice

Injustice based on factors like heritage, race, and socioeconomic status can lead to an increase in stress. It is one of the most prevalent social factors that lead to stress in cities (Jalilisadrabad et al., 2023). People with a lower socioeconomic status and racial minorities have been shown to experience more stress than their affluent white counterparts (American Psychological Association, APA Working Group on Stress and Health Disparities, 2017). This feeling can also have a spatial aspect, when people feel excluded from certain environments or unwelcome in other ways (Jalilisadrabad et al., 2023).





Figure 4.1.7, Abandoned playground

### Lack of physical activity

Physical activity mainly refers to walking and cycling, and for children also includes playing. Different circumstances and urban design elements can have an impact on the amount and quality of physical activity urban residents are encouraged to engage in. Lack of qualitative infrastructure for walking and cycling can discourage people from engaging in these active modes of transport, and a lack of qualitative playgrounds throughout the area can discourage children from playing outside.



Figure 4.1.8, Lack of safe pedestrian crossing

### Lack of traffic safety

In spaces shared by multiple people, especially areas where different modes of transport coincide, a (perceived) lack of safety can occur. This feeling is especially strong in participants that perceive themselves as the weakest, which is often cyclists and pedestrians. If they feel unsafe in these spaces, this can lead to a feeling of stress (Van der Burg, 2024), as their “fight or flight” reaction is triggered, in response to the (perceived) threat (Adli, 2011). Streets without bicycle lanes, for example, have been shown to result in higher amounts of stress (Jalilisadrabad et al., 2023).



Figure 4.1.9, Abundance of cars in the street

### Traffic

The car is everywhere in many urban environments, which can cause psychological distress. Streets that are shared with cars have been shown to lead to higher amounts of stress, and areas with a higher density of personal cars are also associated with higher amounts of stress. The main cause of this stress seems to be the chronic noise (Jalilisadrabad et al., 2023). Exposure to mechanical noises can negatively impact our nervous system, which can lead to mental health conditions, and negatively impact our brain tissue, leading to problems with physical health and mental health (Hahad et al., 2024).



Figure 4.1.10, Abundance of cars next to office

### Commuting

When there is little work opportunity nearby home, people will have to commute. Generally speaking, the longer people have to commute, the less satisfied they are with work and their overall life (Jung et al., 2024). Moreover, commuting over long distances is often inactive (by public transport or by car) which leads to a lack of physical activity (Han et al., 2022). Commuting is often associated with stress, anxiety, aggression, and poor sleep. This stress is highest when traveling by car, moderate when traveling with public transit, and lowest when traveling by cycling or walking (The Centre for Urban Design and Mental Health, n.d.).





Figure 4.1.11, Bad quality housing

### Bad quality housing

Bad quality housing can cause stress and other mental health problems in multiple ways (Jalilisadrabad et al., 2023). In terms of direct impact, exposure to environmental hazards can cause neurological damage, especially in children. Poor quality housing and the worries associated with it can also cause depression, anxiety, and depression, leading to a stress reaction (Miao & Zayas, 2023).



Figure 4.1.12, Abandoned parking garage

### Deterioration

Deterioration of buildings, infrastructure, and public spaces can make us feel unsafe, which can lead to a feeling of stress and decrease the quality of life in cities (European Environment Agency, 1995). It implies that the area is not well taken care of, which can make us feel stressed and uneasy, and negatively impact the feeling of safety (Jalilisadrabad et al., 2023). There is a link between dilapidated, deteriorated built environments and drug use, alcohol use, and crime (The Centre for Urban Design and Mental Health, n.d.). Examples of deterioration of the public space are rubbish, graffiti, disrepair (Montgomery, 2015), and lack of maintenance (Sadeghpour et al., 2023).



Figure 4.1.13, Badly maintained school building

### Poor educational opportunities

Cities generally offer better educational opportunities than rural areas, one of the prime examples of benefits urban areas offer. Therefore, when urban areas lack that benefit, it is seen as a major urban stressor. Quality of education is also the most important factor in the amount of social capital in an area. Therefore, a lack of good quality education will negatively impact general urban stress in a major way, as it can lead to social deprivation due to low social capital (Jalilisadrabad, 2023).



Figure 4.1.14, Vacant commercial building

### Unstable economic conditions

Economic factors have an influence on urban stress and are among the biggest categories of stressors. Especially job insecurity and unemployment impact the feeling of stress in a major way, as does having a low socioeconomic status (Jalilisadrabad, 2023). City living can be perceived as threatening when one lives under generally unstable economic conditions, which can result in feeling of stress (Adli, 2011).



Figure 4.1.15, Signal of frequent theft

### Violence/crime

The threat of violence and crime can, logically, make us feel fearful and unsafe, which can in turn cause stress (Jalilisadrabad, 2023). This stressor is mostly non-spatial, but can have spatial aspects. For example, when people do not feel responsible for the area they live in, because it does not have clear boundaries, they are less likely to take care of it and also less likely to feel connected to it, making crime and the feeling of unsafety more likely to occur (Van Dorst, 2012).





Figure 4.1.16, Lack of greenery

**Lack of (accessible) greenery**

Green spaces have many different health-related benefits, and can play a significant role in lowering stress (Roe & McCay, 2021). An environment with little to no greenery and/or other natural elements is therefore more stressful, as they lack these calming spaces that increase wellbeing (Jalilisadrabad, 2023). While looking at greenery already has its mental health benefits, being present within green spaces and activating the other senses strengthens the experienced health benefits (Zhang et al., 2023) (Roe & McCay, 2021). Therefore, making the greenery actually accessible for everyone is also important.



Figure 4.1.17, Low-biodiversity green space

**Low biodiversity**

Though natural elements in general have a positive effect on lowering stress, the strength of this effect is strongly impacted by the level of biodiversity. Environments with a larger range of natural features, including trees, other plants, and animals, specifically birds, have a larger benefit for mental wellbeing than environments with a smaller range of flora and fauna (Hamoud et al., 2024). Therefore, a high degree of biodiversity should be a priority, as a low level of biodiversity lowers the potential stress reduction. Moreover, noticeably loss of biodiversity, along with the effects of climate change, can actively cause mental distress and heighten feelings of stress (Cianconi et al., 2022).



Figure 4.1.18, Undefined green space

**Illegible/unclear design**

Legibility mostly refers to how recognisable elements of a public space are, and how easily we can categorise it mentally (Koseoglu & Onder, 2011). When a space is illegible, we do not know what space belongs to whom, which can lead to spatial tension and competition. This can induce stress (Van der Burg, 2024). Another element of legibility is the presence of recognisable elements that set areas apart. When urban areas are more uniform, they become less intuitive and navigable, which can make people feel lost (Koseoglu & Onder, 2011). However, environments that completely lack any complexity and mystery are also seen as stressors (Sadeghpour et al., 2023).



Figure 4.1.19, Facade without details

**Lack of detail & distinctions**

Visual aesthetics play an important role in how we perceive a space (Koohsari et al., 2024). A lack of detail can make a space boring and under-stimulating, leading to a negative perception. Endless repetition of certain elements can lead to a lack of distinction between different areas, and even negatively impact mental health over time (Jalilisadrabad, 2023). For example: long, featureless walls make people prone to negative thoughts and lower their interest in social interactions (The Centre for Urban Design and Mental Health, n.d.). Moreover, a feeling of boredom can lead to an increased release of the hormone cortisol, which can in turn can induce a feeling of stress (Weintraub, 2015).



Figure 4.1.20, Area with only sharp edges

**Sharp edges/straight lines**

Urban areas often consist of mostly straight lines and sharp edges. However, in natural contexts, the occurrence of straight lines is very rare. Because of this, many researchers believe that the abundance of straight lines and sharp edges in contemporary urban areas can cause a strain on our nervous system, therefore causing us stress (Olszewska-Guizzo et al., 2022). An additional reason for this stress is that sharp edges cause a feeling of fear, as sharp edges are often associated with danger and they trigger the fear centre of our brain, resulting in a stress reaction (Montgomery, 2015).





Figure 4.1.21, Environment without colour

### Unsuitable use of colour

Colours play a significant role in how people perceive a certain space, and how it makes them feel (Khalate, n.d.). Too many colours could be seen as overwhelming, whereas too little colour can be seen as under-stimulating and boring. When using colours for public spaces, pleasant and harmonious colour schemes make people feel comfortable and joyful, while obscure visual patterns and disharmonious colour schemes can make them feel disoriented, stressed, and unhappy (Premnath, n.d.). Colours and colour combinations should make sense in their context, like the functions of the space and its target audience. Otherwise, it is unclear and illegible (Khalate, n.d.).



Figure 4.1.22, Air pollution (Autovisie, 2018)

### Air pollution

Air pollution is one of the most prevalent urban stressors. While its negative impacts on physical health have been recognised for many years, research on its negative effect on mental health has only recently started. The exact mechanism is not fully understood yet (The Centre for Urban Design and Mental Health, n.d.), but some patterns do seem to emerge. Different particles in the air can result in neurological harm, and air pollution also negatively impacts mental health and stress levels in general, though the exact effects of air pollution on mental health have to be researched further (Jalilisadrabad et al., 2023).



Figure 4.1.23, Asphalted area that will heat up

### Heat

Heat is an environmental urban stressor (Jalilisadrabad et al., 2023). The physical impact of heat is well-known but with rising temperatures, the research on its psychological impact has increased recently, too. Consequences of heat exposure include irritability, impulsivity, and the inability to concentrate (Pappas, 2024). It can also result in discomfort and anxiety, and trigger stress responses such as increasing cortisol and adrenaline (Koohsari et al., 2024). Heat can worsen existing stress-related issues, among other mental health issues. The inability to cool off in case of hot days worsens the feeling of stress further (Pappas, 2024).



Figure 4.1.24, Light pollution (Straatbeeld, 2020)

### Bad urban lighting

Cities expose us to many sources of artificial light at nighttime, mostly street lights. Whereas exposure to natural light during the daytime makes us feel good, exposure to artificial light at night disrupts our sleep cycle and research shows that it can increase sleep problems by more than 20%. It essentially tricks us into thinking it is daytime, which prevents us from going to sleep. This can lead to stress. Moreover, exposure to artificial light at night can cause other health issues (Bonmati-Carrion, 2023). However, a lack of lighting in outside areas can make people feel unsafe, especially at night, so there should not be a complete lack of lighting, either.



Figure 4.1.25, Noise (Gemeente Amsterdam, n.d.)

### Noise pollution

Urban environments are often loud and it is seen as one of the most prevalent physical factors influencing stress levels in cities (Jalilisadrabad et al., 2023). People that experience more noise in their daily environment also experience more psychological distress, with young adults affected even stronger than older people. People in loud environments experience a feeling of threat and, consequently, a feeling of stress (Berkers et al., 2021). When the noise is (near) constant, this can result in chronic stress. Mechanical noises, like that of traffic, are associated with the most negative health impacts, both physical and mental (Hahad et al., 2024).



Figure 4.1.26, Rubbish causing smell pollution

### Smell pollution

Smell pollution, also called odour, in and of itself is not a strong indicator of a health risk, as some harmful chemicals have little to no smell whereas relatively harmless chemicals can smell very strong. However, regardless of this, strong odours can cause a variety of health issues, ranging from mild discomfort to more serious issues. When people are exposed to odours for a long period of time, they can affect mood, anxiety, and stress levels, in addition to physical symptoms such as nausea, dizziness, and a burning sensation (NY State Department of Health, n.d.).

4.2 Urban stress-relief: RELAX framework

Turning the tide

Decreasing urban stress can be done in two ways. The first is by minimising existing stressors, and the second is by adding restorative interventions. A fitting example is the role of noise. Noise pollution, especially mechanical noises, can cause severe stress (Hahad, 2024). Part of the solution therefore lies in limiting the existing noise pollution and its effects. However, in addition to this, adding positive sound that can help us restore from stress, like natural sounds (Zhang et al., 2023), can further increase the wellbeing. The approach that will be used for the design will rely upon both methods, so the list below consists of solutions that utilise both methods (limiting stress directly and enabling restoration).

The main focus of these design measures is spatial and tangible elements. This is because the intended end-product of this thesis is a design, rather than something like a policy proposal or strategy. However, I am aware that the implementation of measures such as proper maintenance and co-creation are also key to solving urban stress, as deterioration and the feeling of being unheard by authorities among residents can be causes of stress. As mentioned, since the end-product of the project is a design, the focus will not be on these kinds of measures, but they will be mentioned in some places and are still a part of the project. Essentially, they are part of the design process that will not be elaborated on too much, but are still regarded as important parts of said design process.

RELAX framework

From the research on stress-relief measures, a stress-relief framework was formed, partially based on an existing framework by The Centre for Urban Design and Mental Health, who propose four main ways in which urban design can positively impact mental health, in the form of their Mind the GAPS framework: Green places, Active places, Pro-Social places, and Safe places (The Centre for Urban Design and Mental Health, n.d.). Since this thesis focuses on those with a lower socioeconomic status, in addition to these elements, the economic element is also added to form the RELAX framework, which consists of Relationships & social connections (the social aspect), Economic opportunities & facilities (the economic aspect), Landscape (the natural aspect), Activity & mobility (the activity aspect), and Experience & comfort (the experiential and personal aspect, which The Centre for Urban Design and Mental Health mainly centred around the feeling of safety). It is a reworded version of the previously mentioned STRESS framework, with the same categories but from the perspective of stress-relief rather than stressors.

Per category, the significance of this particular category for stress-relief is explained, based on theoretical input. Then, examples of ways this category can be implemented in a design are presented. These practical design measures are mostly based on my own ideas and assumptions. Since the relation between urban stress and urban design is still under-researched, some assumptions had to be made. However, they are mostly based on the aforeme Once again, some of these design examples have been based on the work of Marijke Koene (Koene, 2018).

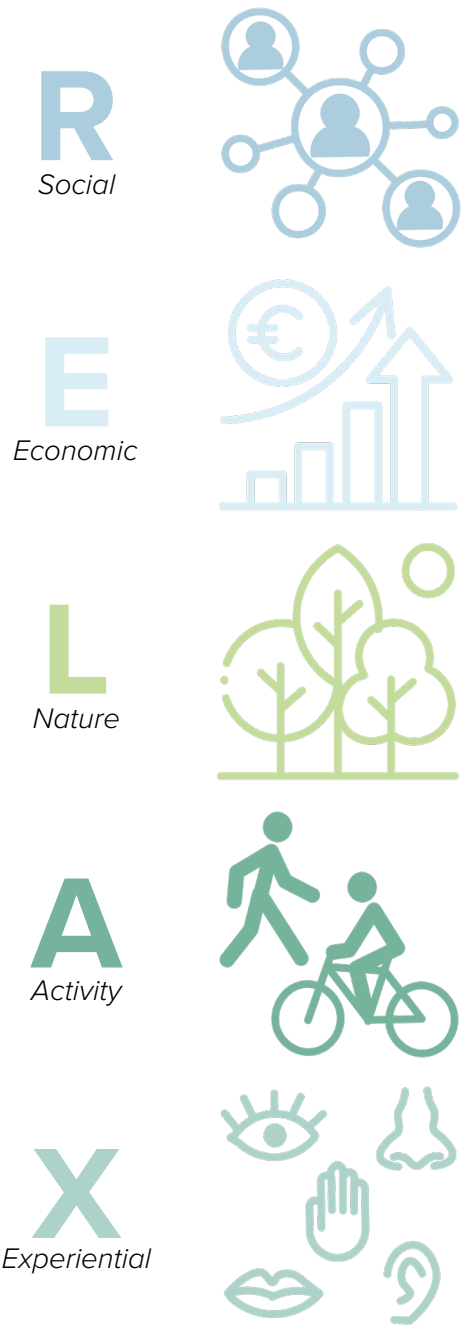


Figure 4.2.1, Illustrations of the RELAX framework categories



R

*Relationships & social connections*

## Relationships & social connections

### ***Social interactions & networks***

With social stress being one of the main forms of urban stress (Jalilisadrabad et al., 2023), creating and strengthening relationships between the residents of neighbourhoods is an important form of urban stress-relief. Increasing the amount of positive social interactions with other can have a big benefit for mental health and wellbeing (The Centre for Urban Design and Mental Health, n.d.). On an individual level, having positive social interactions has been shown to lower the feeling of stress by lowering the body's cortisol levels and also increase the body's ability to deal with stress and its' effects in the long term (Adli, 2011; Koohsari et al., 2024). It has been shown that the stronger one's social network is, the better their ability to deal with mental health problems and the lower the likelihood of developing those problems become (Roe & McCay, 2021). On a community level, frequent social interactions can increase the sense of social cohesion and feeling of community in a neighbourhood, which results in a better-perceived neighbourhood quality (Koohsari et al., 2024). Moreover, strong social networks within neighbourhoods increase the feeling of trust among residents and, therefore, the feeling of safety (Roe & McCay, 2021).

### ***Safety***

An important element of social stress relief is - as Jane Jacobs calls it - having "eyes on the street". This refers to a visual connection to other people. Seeing other people and being seen by other people yourself can add to social cohesion and increase safety, both actual safety and perceived safety. By replacing facades that are closed, especially at eye-level, with facades that are open and active, the feeling of having eyes on the street is heightened and, thereby, social cohesion increases (Jacobs, 1961). Open facades also add to visual complexity, which increases wellbeing,

in part by further increasing social cohesion. For example, fine-grain storefronts and detailed facades can increase social capital and cohesion (Roe & McCay, 2021). Moreover, the design of facades can also help to differentiate between public and private spaces, by opening up the facades of public spaces. As established, this also adds to public safety. Vibrant streets, with a clear demarcation between what is public and what is private, where you can see others and they can see you, are generally seen as the most safe (Jacobs, 1961). Another element of safety, is good maintenance. When an area is clearly well taken care of, people logically feel more safe (The Centre of Urban Design and Mental Health, n.d.).

### ***Sense of belonging***

The feeling of safety plays a big role in the so-called "sense of belonging". This refers to feeling safe, loved, and celebrated, and is found in the places where we feel at home. It can be achieved in many different ways, one of the most important of which is placemaking: the designing of spaces that centres around people and creating environments with real meaning. An important element is inclusivity, and making sure that everyone has a space where they feel at home (Sun Dela Cruz, 2023). Sense of belonging is partially achieved through physical design elements, such as urban lighting that is unique, meaningful, and encourages social interaction (De Frutos et al., 2024), and seats arranged in a circular way (Sun Dela Cruz, 2023). However, equally as important is establishing a participatory design process, to ensure that the wants and needs of residents are actually met, as this adds to a sense of belonging in your environment (De Frutos et al., 2024). Especially this last element is not exactly spatial, but can and should be a part of the design process regardless.



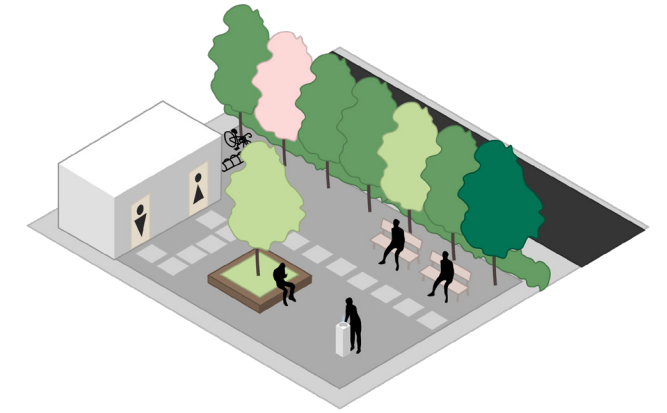
## Privacy

However, while increasing social interactions between residents greatly adds to lowering urban stress, there is a limit. Having a space of your own and enough space for yourself, where you have control over the amount of social interactions, is important and can help prevent and lower stress (Adli, 2011). The feeling of privacy can lower one's stress, as the feeling of (over) crowding is reduced (Sadeghpour et al., 2023). Having a space of your own can also heighten the feeling of having control, which can help lower stress further (Jalilisadrabad et al., 2023). Everyone's definition and idea of privacy is different and public spaces should reflect this. Providing both seating in groups and individual seats is one way this can be done, as is providing vegetation or built elements to enclose certain spaces (Roe & McCay, 2021). Ensuring a clear distinction between public and private areas, through a variety of design elements, can help lower stress, as people feel more safe (Jacobs, 1961).

## R1. Good quality public spaces

To encourage social interactions in public pedestrian spaces, they should be comfortable and pleasant spaces to be. This means eliminating or preventing nuisances like excess noise and bad air quality, by locating the spaces in a smart way and taking precautions like greenery and/or built elements to block unwanted sounds and air pollution. Proper facilities enhance the positive experience further.

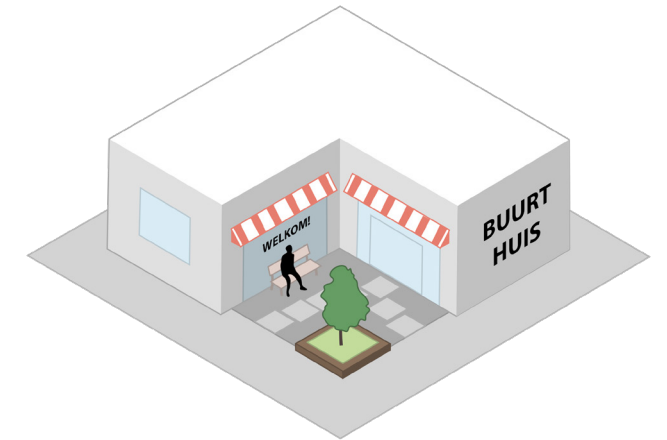
> Figure 4.2.2, Good quality public spaces



## R2. Indoor meeting spaces

Indoor meeting spaces are more formal and allow for different kinds of interactions. Moreover, they are less influenced by the direct environment, as they are more closed off. The façade should reflect the social character of the indoor space, by being open and allowing (visual) interaction with the outdoors.

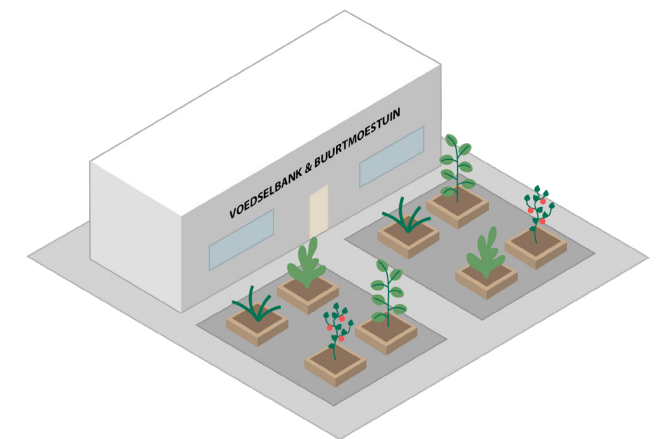
> Figure 4.2.3, Indoor meeting spaces



## R3. Spaces for volunteering

Volunteering can encourage social interaction, while also allowing residents to contribute to their own living environment, which can also help increase a sense of connection and a sense of belonging (Roe & McCay, 2021). They can be both outdoors and indoors, and include spaces like a repair shop, shared garden, and public services.

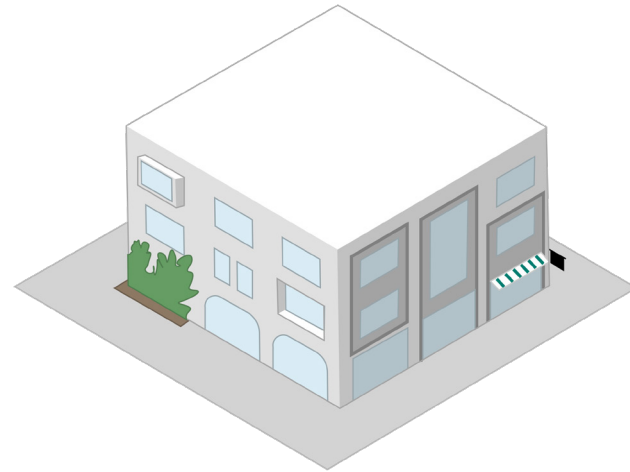
> Figure 4.2.4, Spaces for volunteering



#### R4. Active, open, and detailed facades

Having active and open facades, especially at eye level, can greatly improve the (perceived) quality of an environment. Fine-grain and detailed facades can help improve this quality further.

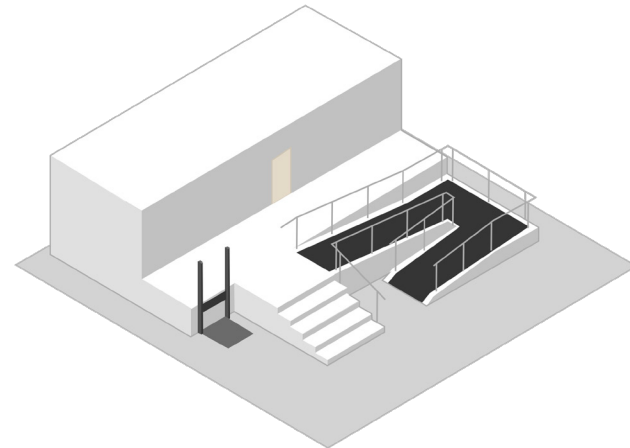
> Figure 4.2.5, Active, open, and detailed facades tile



#### R5. Accessibility and inclusivity

Allowing everyone to participate, feel at home, and feel welcome, can help lower the stress of being excluded. This includes physical elements like ample seating to rest, broad sidewalks, and accessible curbs, and also refers to a participatory planning process, which can even include allowing citizens complete control over the function and design of certain spaces.

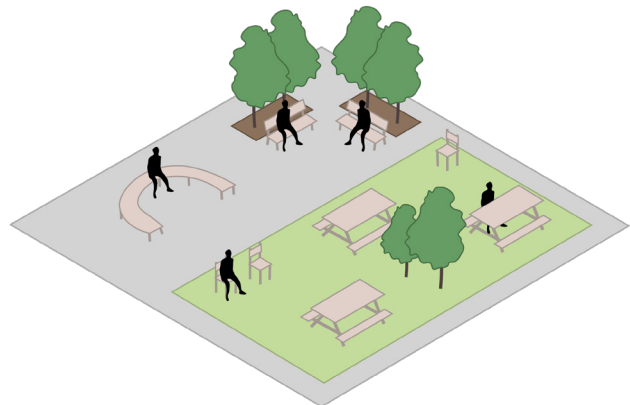
> Figure 4.2.6, Accessibility and inclusivity tile



#### R6. Social furniture

Social furniture like a bench and chairs can encourage social interactions with both strangers and acquaintances, especially when placed in a circular shape. This can in turn lower stress through creating a stronger sense of belonging and positive social interactions.

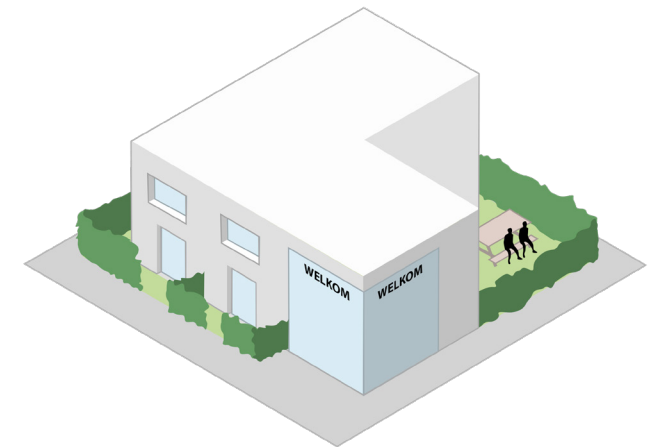
> Figure 4.2.7, Social furniture tile



#### R7. Private-public differentiation

Clearly defining the border between public and private spaces, preferably through the use of vegetation, allows for privacy in private or collective spaces. The use of enclosure also increases the feeling of comfort within the space itself (Sim, 2019).

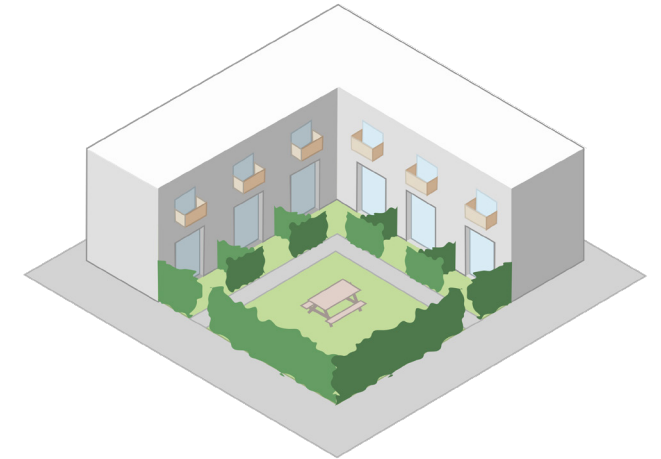
> Figure 4.2.8, Public-private differentiation tile



#### R8. Space of your own

This can be a private space, or a space shared with people you know and recognise. Apartment buildings should have some sort of buffer zone between the public domain and private/collective building. It should be enclosed in some way, like with vegetation or a built structure, to increase the clarity of the design and level of comfort within the space (Sim, 2019).

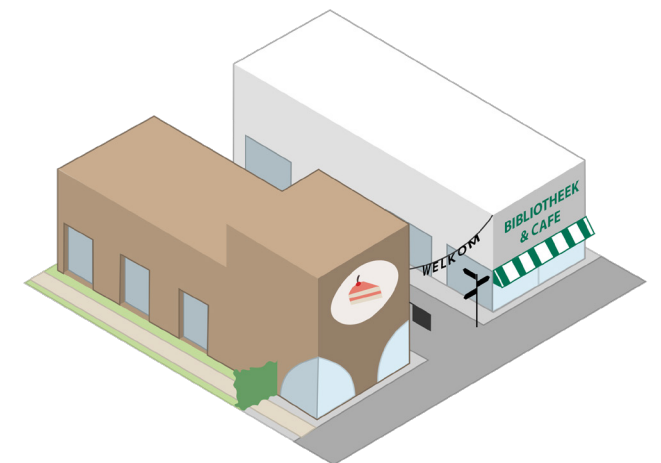
> Figure 4.2.9, Space of your own tile



#### R9. Clear design

Spaces should be designed in such a way, that it is clear to whom the space belongs and what the space is meant for, like ensuring that public spaces are clearly visible and accessible, while private spaces are more closed off. Clear design can also help with the recognisability of areas, which can in turn help with navigating through the neighbourhood and make it more intuitive. This can be done through reflecting the function of buildings in its appearance, and by making specifically the corners of buildings recognisable (Sim, 2019).

> Figure 4.2.10, Clear design tile





## *Economic facilities & opportunities*

### **Economic facilities & opportunities**

#### ***Economic opportunities***

The main target groups of this thesis is people with a low socioeconomic status. For this group of people, economic worries are a major cause of stress, in addition to more general causes of urban stress. Therefore, while economic causes of stress aren't always spatial, like having debt or having trouble making ends meet, some relief can be achieved by offering economic facilities and opportunities, as it can offer people the ability to limit the existing causes of economic stress. People with a lower income tend to live in neighbourhoods prone to crime, dilapidation, and poor management. These areas often have very little economic opportunity, making the people living there dependent on the rest of the city for work (The Centre for Urban Design and Mental Health, n.d.). This economic deprivation and disparity can lead to negative feelings like depression and stress. These can be alleviated by, among other things, increasing the amount of jobs nearby home, allowing those living in these neighbourhoods to increase their job security and lower unemployment. This can help alleviate economic urban stress (Jalilisadrabad et al., 2023). It can also help lower the stress and negative feelings associated with long commutes (The Centre for Urban Design and Mental Health, n.d.).

#### ***Housing***

While having economic opportunities and facilities is important, having affordable and good quality housing is at least equally as important, as you spend a lot of time there and for most people, it is their safe haven. Having access to good quality housing at a price you can afford is important for good mental health (The Centre for Urban Design and Mental Health, n.d.). Ensuring affordable and good quality housing can make the city more inclusive and lower stress by limiting worries about finding a house. Different wants and needs

across the full spectrum of socioeconomic statuses should be considered and met as much as possible. That makes an environment more diverse and inclusive (Roe & McCay, 2021), which is also beneficial for mental health, especially social health (Jalilisadrabad et al., 2023). Since the main target group of this thesis is those with a lower income, establishing ample houses at a relatively low price, is very important. Housing can also be designed in such a way that it promotes and encourages social interactions, leading to a stronger social network, which in turn lead to better mental health and wellbeing (Roe & McCay, 2021).

#### ***Facilities***

Having facilities within walking and/or cycling distance from one's house will encourage people to engage in physical activity, rather than use the car (The Centre for Urban Design and Mental Health, n.d.). Physical activity can become ingrained into daily life and the environment becomes more interesting and engaging, further encouraging walking and cycling (Roe & McCay, 2021). As described by Jane Jacobs, having facilities in an environment increases the amount of people on the street, which also increases the sense of "eyes on the street" and thereby creating a safer environment (Jacobs, 1961). Moreover, the practicality of having facilities nearby home can lower stress because its convenience makes running errands easier (Van der Burg, 2024).

#### ***Diversity & variety***

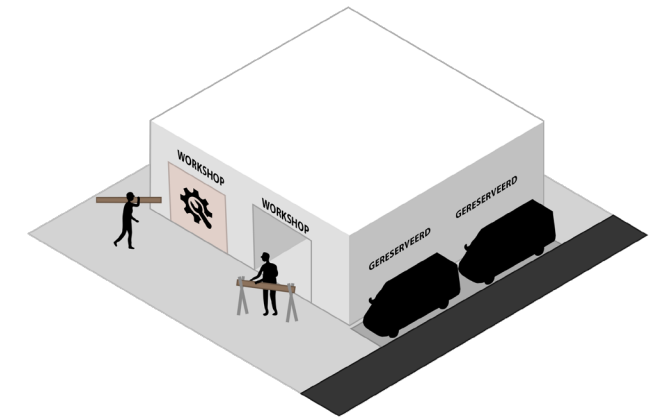
As established, having suitable facilities and opportunities in your direct environment is beneficial for mental health and lowering stress. However, a variety of different people live in cities, who each have a unique and different identity, and, therefore, different wants and needs, too. By offering a variety of different facilities and opportunities, we can create the

opportunity for everyone's wants and needs to be met, making the environment more inclusive (Roe & McCay, 2021). By offering a wide variety of affordable facilities in the neighbourhood, access to daily needs is improved, which can help lower urban stress associated with meeting one's daily needs. Also, by allowing users of a space to modify said space, you allow them to adapt it to their specific wants and needs (Sadeghpour et al., 2023; Jalilisadrabad et al., 2023). Moreover, it allows for different types of uses of the same space, making it more likely that the space will be used throughout the day. That will increase the sense of having "eyes on the street", making the area more safe and thereby lowering stress (Jacobs, 1961).

### E1. Workshop spaces

Having workshops within the neighbourhood allows for people with a maker's business to work near home, rather than having to travel outside of the neighbourhood, district, and sometimes even city for a workspace. This means shorter and less commuting, which can help lower stress, while still offering access by public transport and work vehicles for those who need it, like plumbers and carpenters. As these spaces can generate quite a bit of noise, they should be located smartly.

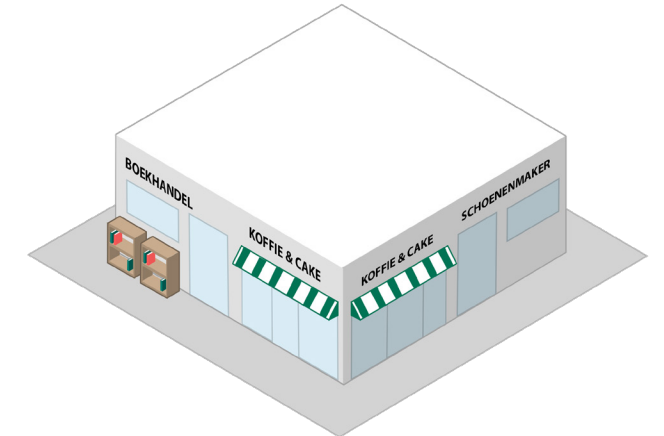
> Figure 4.2.11, Workshop spaces tile



### E2. Commercial spaces

Adding commercial spaces, where people can sell their product and/or offer their services locally, adds economic opportunity in the neighbourhood. It can also help increase the amount of affordable products and services within the neighbourhood.

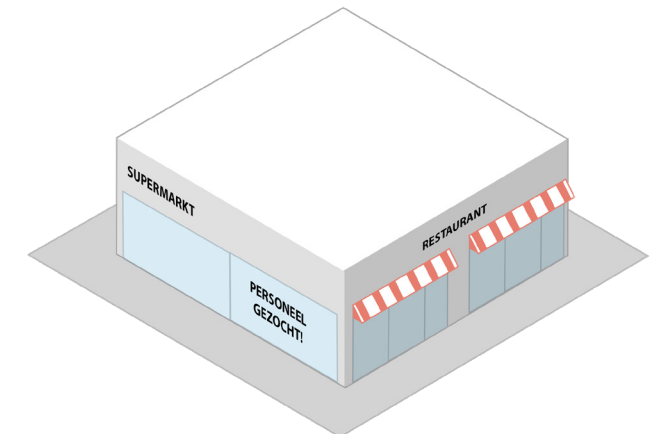
> Figure 4.2.12, Commercial spaces tile



### E3. Job opportunities

In addition to adding spaces for independent/other small scale businesses, other types of jobs are also important. Specifically, jobs suitable for people with a lower education and less specialised skills. This can be spaces like shops, cafes, restaurants, etc.

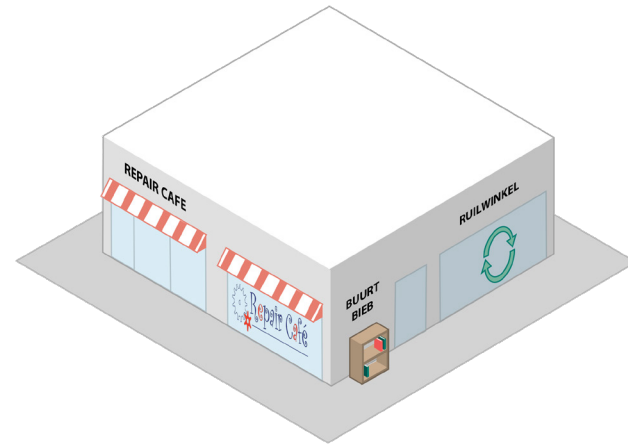
> Figure 4.2.13, Job opportunities tile



#### E4. Exchange of goods and/or services

This includes more formal instances, like repair shops, and exchange shops, but also less formal instances, like street libraries. Because the products or services are exchanged rather than bought, they are affordable for everyone, including the low income target group. It is also more sustainable than buying new items and/or throwing out old items.

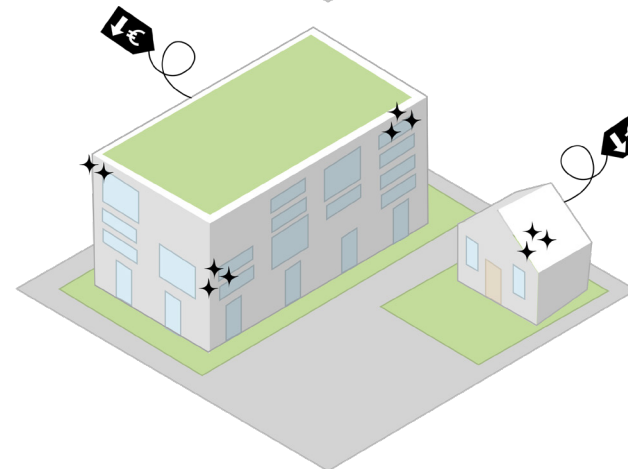
> Figure 4.2.14, Exchange of goods and/or services tile



#### E5. Affordable and good quality housing

With the main target group of this thesis being people with a lower income, ample affordable but also good quality housing should be offered. Existing houses and apartments with shortcoming should be improved. It also means that possibly demolished houses should be rebuilt in an affordable manner.

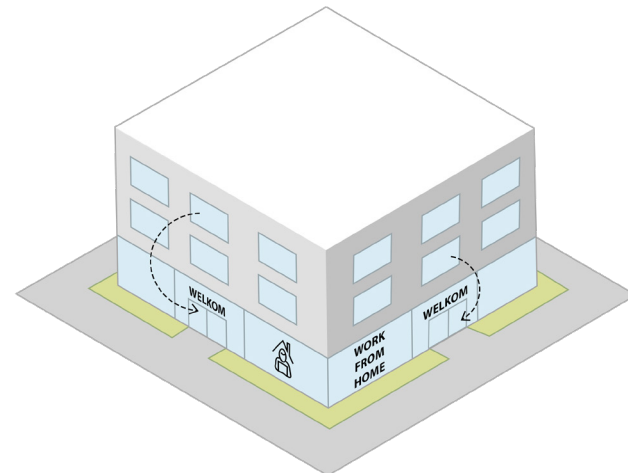
> Figure 4.2.15, Affordable and good quality housing tile



#### E6. Work-near-home

Since many people with a lower income presumably live in relatively small houses, most of their houses are not suited towards working from home. This means that most of them will be forced to commute, often for long distances, which can cause stress. By adding spaces suited towards working (and possibly studying) throughout the neighbourhood, people will be able to work near home, limiting the necessary commutes.

> Figure 4.2.16, Work-near-home tile



#### E7. Modifiable/multi-use spaces

By combining multiple functions in one space, we can increase the occupation of said space throughout the whole day, which in turn increases the “eyes on the street” and the amount of economic opportunity it offers. This can be things like temporary markets, temporarily incorporating the pavement into your own shop, and community activities.

> Figure 4.2.17, Modifiable/multi-use spaces tile







*Landscape*

## Landscape

### ***Green spaces***

Being in (view of) green spaces improves the functioning of our nervous system and can lower cortisol levels, thereby lowering stress, which in turn benefits the cardiovascular system. This is partially due to a lower exposure to air and noise pollution when compared to urban, non-green areas (Koohsari et al., 2024). Access to natural environments on a daily basis is beneficial for establishing and retaining good mental health and well-being in many different ways: promoting physical activity promoting social interactions, biophilia, stress reduction, and attention restoration. While seeing green spaces is already beneficial for mental health, the restorative effects are strongest when physically being inside of the space (The Centre for Urban Design and Mental Health, n.d.). The benefits depend on the quantity, quality, and accessibility of the green spaces, and generally speaking, the more biodiverse the green spaces are, the more beneficial they are for mental health (Hammoud et al., 2024; Roe & McCay, 2021). In addition, green spaces make us aware of the seasons and of the passing of time (Sim, 2019).

### ***Blue spaces***

Water features, both natural and mechanical, are seen as calming, can lower stress, and are good for mental wellbeing. Good maintenance is critical, though, as water that is not taken care of can become polluted, and look and smell bad, which limits the benefits it provides (Roe & McCay, 2021). Blue spaces bring benefits from multiple sensory experiences: hearing the sound of the water, and seeing the movements of and reflections within the water (Sim, 2019). In particular, hearing the sound of running water has been proven to be calming and lower stress (Franco et al., 2017). Water, especially moving water, can provide cooling off on hot days, which can also lower stress (Koohsari et al., 2024).

### ***Pleasant/natural sounds***

Hearing pleasant sounds can be restorative and lower stress. Designing positive soundscapes can play a positive role in mental health and wellbeing (Roe & McCay, 2021). Generally speaking, people experience natural sounds as positive and restorative. This includes animals, moving water, and wind blowing through leaves (Zhang et al., 2023), with water having the strongest restorative effect (Sadeghpour et al., 2023). Blue-green spaces, that combine both a variety of plants and some water elements, are especially suitable to offer these pleasant sounds, and the higher the degree of biodiversity, the broader the variety of sounds.

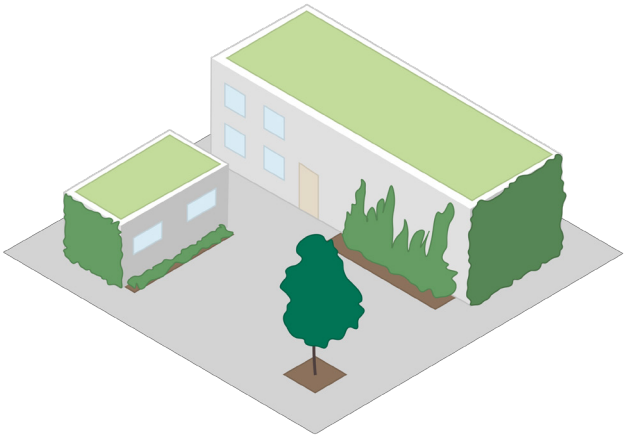
### ***Scenic environments***

The more we appreciate the aesthetic elements of an environment, the more likely we are to walk or cycle there, which has many health-related benefits. While beauty is subjective, some elements are (almost) universal (Roe & McCay, 2021). Organic shapes are most often preferred to straight and sharp shapes, as the latter category can add to a feeling of stress (Olszewska-Guizzo et al., 2022; Gu et al., 2024). A specific category of beauty that is regarded as one of the most restorative, is scenic environments. Scenic, once again, can mean different things to different people and within different context, but in the urban context often includes: green spaces, trees, beautiful buildings, leafy residential streets, and bridges (Seresinhe, 2016). Incorporating those elements, especially with curved and organic shapes, can make the environment more scenic and, therefore, more restorative.

**L1. Visual greenery**

These are green spaces only/mainly meant to view rather than visit, such as individual trees along the street and green roofs and facades. Though the restorative effects of these spaces are lower than larger green spaces people can visit, they still offer some restorative qualities, especially when compared to hard materials, like concrete and asphalt.

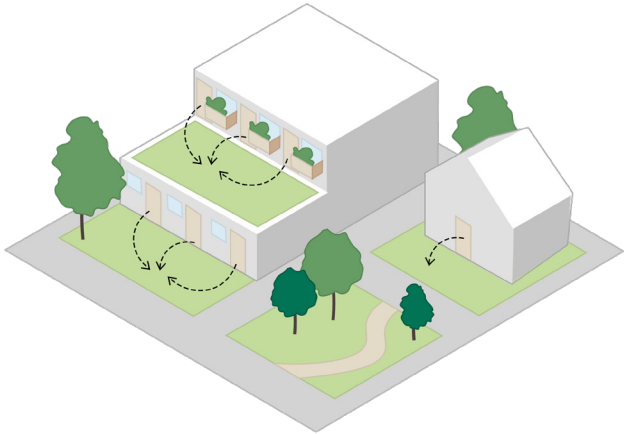
> Figure 4.2.18, Visual greenery tile



**L2. Small-scale greenery around home**

These are spaces like private or shared gardens around your home, and small-scale public parks nearby home. You should be able to see them from your home and visit them quickly. Because you can actually spend time in them, rather than just looking at them, the restorative effects are heightened.

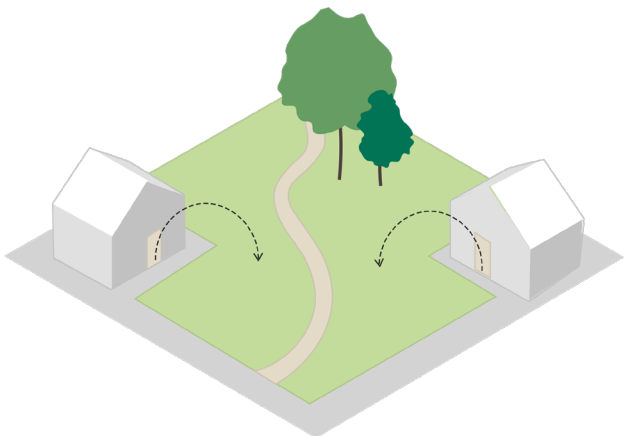
> Figure 4.2.19, Small-scale greenery around home tile



**L3. Larger-scale greenery in walkable distance**

This mainly refers to more large-scale, neighbourhood parks you can visit within a 15 minute walk from your home. Due to its larger size, it can include more biodiversity, more activities to do, and can serve more people.

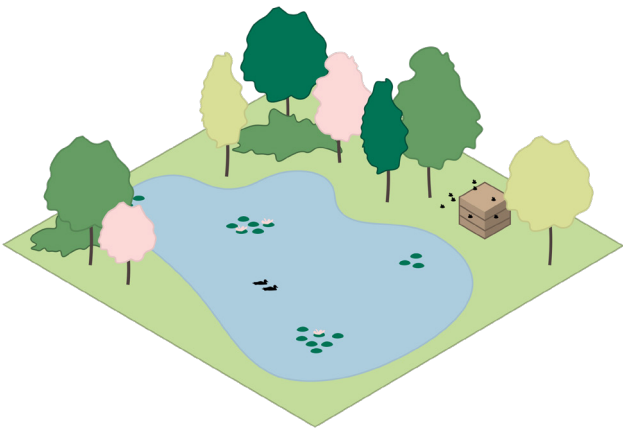
> Figure 4.2.20, Larger-scale greenery in walkable distance tile



**L4. Biodiversity**

Having more biodiversity has many benefits, such as heightened restorative benefits, and a richer experience due to more visual complexity and varied sensory experiences, like a wider variety of sounds (Hammoud et al., 2024; Roe & McCay, 2021). However, the biodiversity should be limited to species that are native to the area only, as the introduction of invasive species can imbalance or even wreck the local ecosystem.

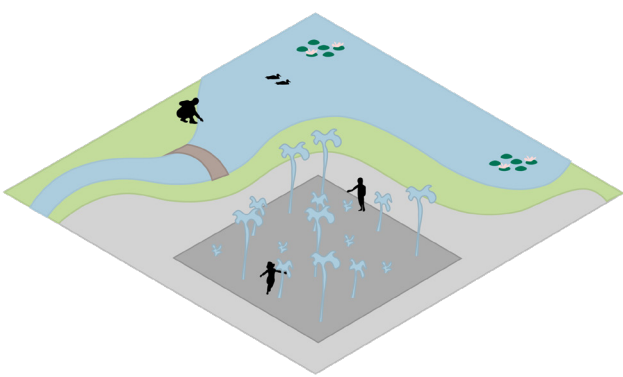
> Figure 4.2.21, Biodiversity tile



**L5. Water elements**

Since the presence of water has restorative benefits and can help with biodiversity, it should be included in the environment. As moving water produces sound, which is the main restorative part of water, and also helps to cool the environment, moving water is preferable to stationary water. The spaces can be either mechanical, which are easier to maintain and control, or natural, which have more benefits for biodiversity (Roe & McCay, 2021).

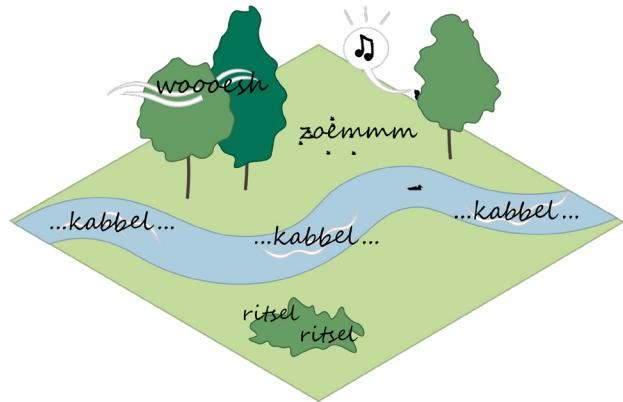
> Figure 4.2.22, Water elements tile



**L6. Natural sounds**

This refers to sounds that happen organically and without human intervention or interaction, like running water, leaves rustling in the wind, and the sounds of animals. These sounds cannot be made or produced, but can be facilitated by creating more and biodiverse green spaces.

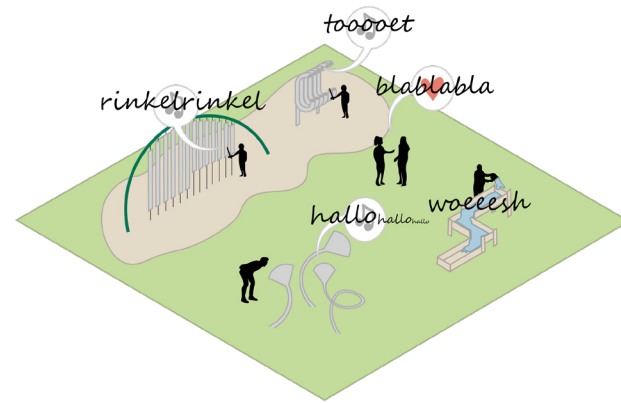
> Figure 4.2.23, Natural sounds tile



### L7. Other pleasant sounds

This refers to sounds that happen due to human interaction or interventions, like musical elements, physically moving water, other movable elements, and the chatter of other people. This offers, in addition to the sensory experience, a sense of control, which can also help lower stress.

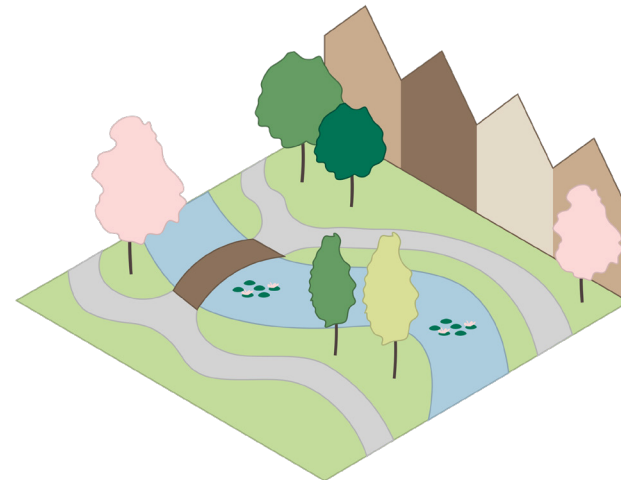
> Figure 4.2.24, Other pleasant sounds tile



### L8. Scenic environments

Though scenic is a somewhat ambiguous term, it generally refers to environments with mostly organic shapes, a variety of trees, beautiful buildings, and the presence of water and bridges (Seresinhe, 2016). Especially in Modernist environments, where these elements are not really present, adding more scenic spaces could be beneficial.

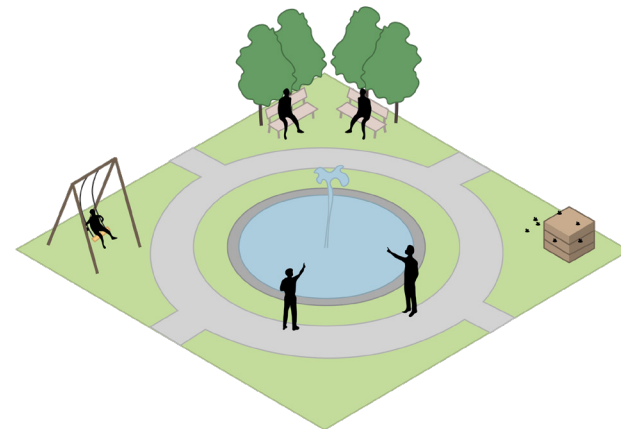
> Figure 4.2.25, Scenic environments tile



### L9. Points of interest within natural spaces

By adding points of interest in the green spaces, such as places to workout, play, explore, and meet others, the chance that people will want to visit, increases. Some sense of mystery should be ensured, since this will encourage people to explore, though everyone should still feel safe.

> Figure 4.2.26, Points of interest within natural spaces tile



# A

*Activity & mobility*



## Activity & mobility

### Active modes of transport networks

Both walking and cycling have a positive impact on mental health and wellbeing, and designing the environment with these activities in mind can help stress-relief. Establishing people-oriented transport networks, like those for walking and cycling, ensures that the most vulnerable participants of traffic feel safe, and actually are safe, too. Walking is one of the most easily accessible active modes of transport, that can be integrated into the existing environment. Walking can be made more attractive by providing wide sidewalks, public transport stops and facilities like shops and schools within walking distance, designated walking routes through green spaces (The Centre for Urban Design and Mental Health, n.d.), ample seating, attractive environments, and good public lighting (Koohsari et al., 2024). For encouraging cycling, many of the same aspects apply, in addition to cycle parking and safe cycling lanes/paths (The Centre for Urban Design and Mental Health, n.d.).

### Space for exercise/physical activity

In addition to encouraging walking and cycling, environments can promote further physical activity in other ways, too. Engaging in physical activity has been shown to lower the feeling of stress, by lowering cortisol levels, lowering blood pressure, and improving metabolism (Koohsari et al., 2024). Exercise can be encouraged by making stairs more attractive than escalators and lifts, making specific walking routes, making outdoor gyms, and providing sporting fields (The Centre for Urban Design and Mental Health, n.d.). Another element, specifically targeted at children, is providing ample opportunities for them to play in the city, both “pure” playgrounds and other public spaces that are not centred around play, but do have elements suitable for play (Roe & McCay, 2021).

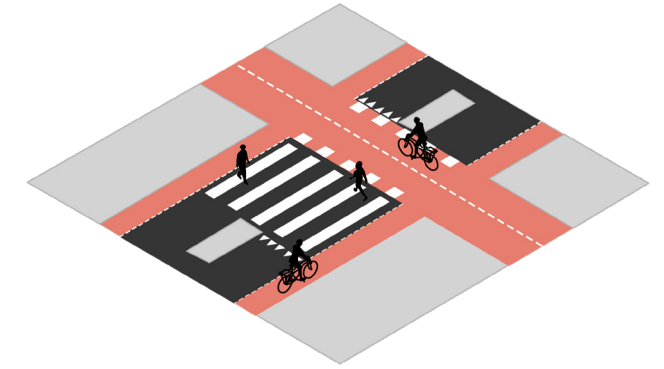
### Public transport

For larger distances and those who are less mobile, good public transport brings people around the city efficiently and ensures accessibility of different facilities that are good for mental health, like work, school, and recreational areas. Living near public transport has been shown to be good for mental health, especially for older people, who are often less mobile and have more trouble being physically active for longer periods of time. Moreover, public transport can help promote walking, by ensuring that there is a bus, tram, and/or train stop in a walkable distance throughout the whole neighbourhood (The Centre for Urban Design and Mental Health, n.d.). Therefore, while public transit itself often is not active, it can still promote active modes of transport by being well designed and placed strategically.

### A1. Safe active modes of transport networks

These are separate spaces/areas that are reserved for pedestrians and/or cyclists, where cars cannot go. The spaces should clearly be designed for them, shown through usage of specific materials and signage. Pedestrians should get the right of way wherever possible.

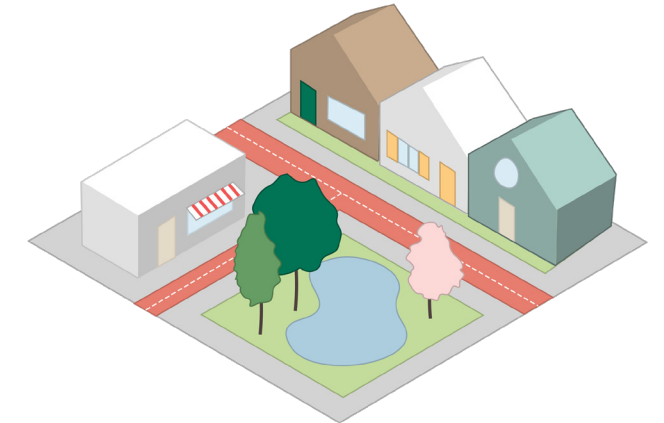
> Figure 4.2.27, Safe active modes of transport networks tile



### A2. Pleasant & interesting environments

If an environment is more pleasant and interesting, people are more willing to engage in active modes of transport there. This can be done through things like varied materials, natural elements, public functions, unique details, and comfortable walking and cycling networks.

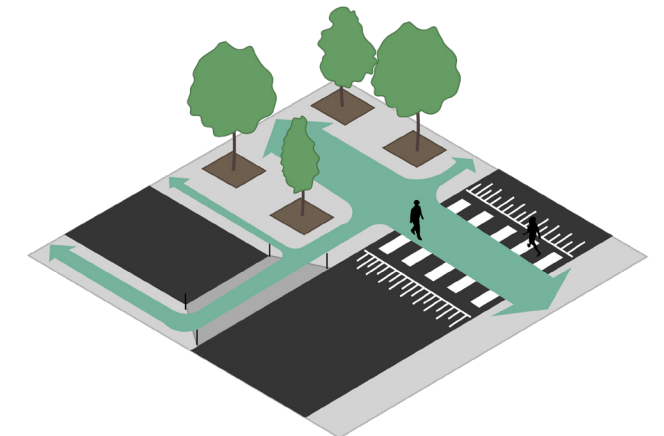
> Figure 4.2.28, Pleasant & interesting environments tile



### A3. Enough space for pedestrians

To prevent crowding, which could lead to stress, and to encourage walking, there should be enough space for pedestrians. Sidewalks should be broad, at least 2 meters of space to walk, free of furniture or other obstructions, to ensure that even the least mobile pedestrians can walk easily and comfortably (Cammelbeeck, 2013).

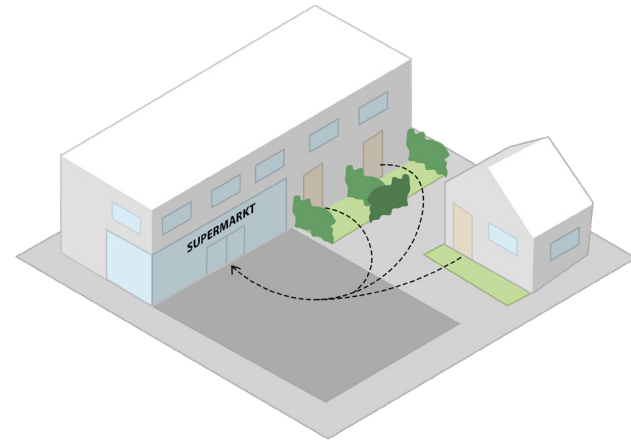
> Figure 4.2.29, Enough space for pedestrians tile



#### A4. Walkable distances to facilities

Necessary facilities, like healthcare, shops, parks, and meeting places, should be within a walking distance, preferably 15 minutes in accordance with the 15 minute city-model (Moreno et al., 2021). This includes elderly people and others who are less mobile, who cannot walk more than 400 meters in this time. Ideally, these facilities also include places to work, to prevent long, stress-inducing commutes.

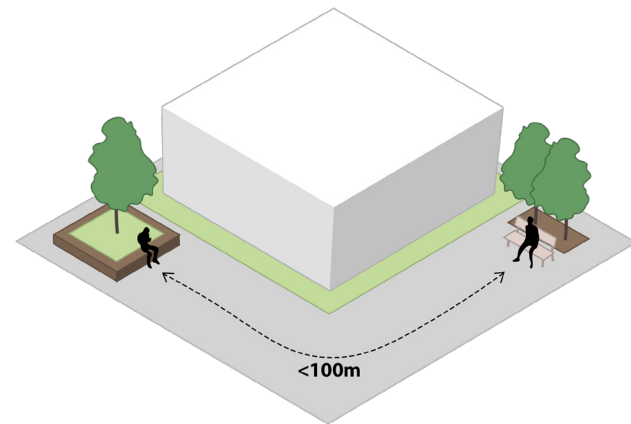
> Figure 4.2.30, Walkable distance to facilities tile



#### A5. Public seats/furniture

To make walking accessible for everyone, including the less mobile like elderly people and people with a physical liability, enough seats should be supplied. Ideally, there is no more than 100-200 meters between public seats (Cammelbeeck, 2013). This furniture also encourages meeting other people spontaneously.

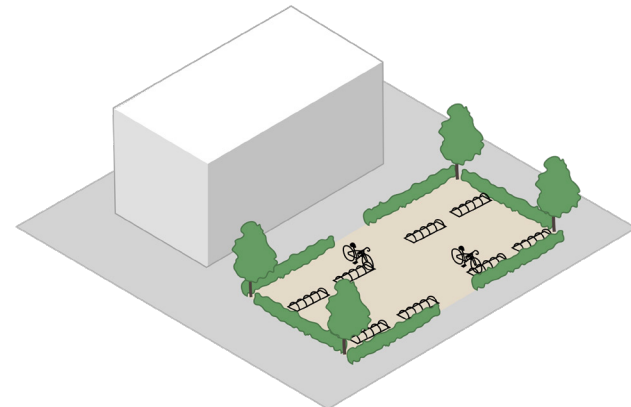
> Figure 4.2.31, Public seats/furniture tile



#### A6. Enough bike parking

To encourage people to cycle, there should also be enough places to park and secure their bike, both at home and at the necessary facilities. These parking spaces should be accessible from the slow traffic networks, without impeding on other flows of traffic, especially pedestrians.

> Figure 4.2.32, Enough bike parking tile



#### A7. Spaces for exercise/physical activity

In addition to active modes of transport, there should also be spaces to engage in further physical activity. This includes routes to run, public workout spots, playgrounds for kids, and activity routes.

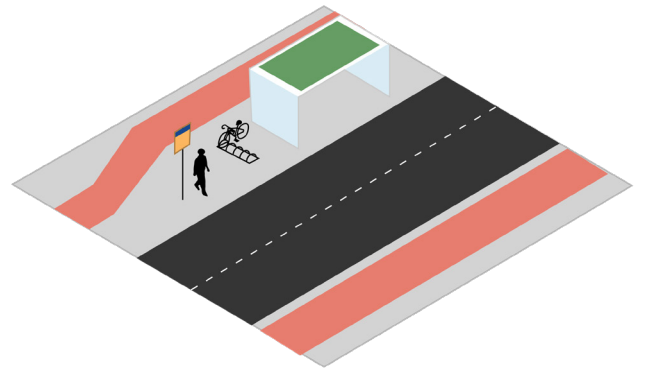
> Figure 4.2.33, Spaces for exercise/physical activity tile



#### A8. Good public transport

For distances that are too long to walk or cycle, or for whenever those modes of transport are otherwise undesirable, good public transport should be supplied, as this also help lower dependence on cars. The stops should be in a walkable distance, 200 meters ideally, and the route should be through a pleasant environment. The stops themselves should be comfortable to stay at, through supplying seats and shelter from rain and wind, and offer bike parking facilities.

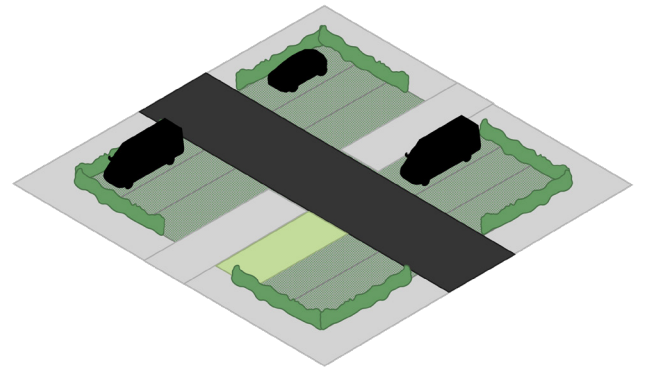
> Figure 4.2.34, Good public transport tile



#### A9. Better car parking spaces

Even though cars should be made less dominant to lower stress, they are still necessary sometimes, in particular for the less mobile, like those with a physical ailment and elderly people, and those who rely on a car for work, like plumbers and carpenters. Car parking should be rethought and redesigned to make the cars less dominant, especially visually, through usage of vegetation, for example. However, there should still be enough spaces, as not being able to find a parking spot can also cause stress.

> Figure 4.2.35, Better car parking spaces tile





*Xperience & comfort*

## Xperience & comfort

### Visual experience

Visual complexity can reduce feelings of depression and engaging the sense of sight in urban environments plays a part in better mental health and wellbeing. Moreover, place aesthetics play a part in stirring up curiosity and motivation to walk and cycle, as they make the place more engaging and interesting (Roe & McCay, 2021). Looking at artwork has been shown to lower stress, though the exact outcome depends on different factors, like personal preference and setting (Law et al., 2021). In terms of colours, cool colours have a stronger restorative effect than warm colours, and the restorative effect of white, black, and grey is negligible. The restorative effects of curved/organic patterns are stronger than those of rectangular patterns (Gu, 2024). Another visual element of experience and comfort, is lighting. Urban lighting is an essential part in making people feel safe, especially at night (Saad et al., 2020). However, it is also a source of stress through its impact on people's sleep cycle (The Centre for Urban Design and Mental Health, n.d.). Therefore, urban lighting should be carefully considered and designed well. White light leads to more light pollution but also to an increased feeling of safety (Peña-García et al., 2015). The brighter and more uniform the lighting, the safer it makes people feel (Kim et al., 2024). By orienting street lights downwards on residential streets, the sleep disturbance can be kept to a minimum, while also making people on the street more safe (The Centre for Urban Design and Mental Health, n.d.).

### Auditory experience

Noise pollution is one of the most prevalent urban stressors, especially mechanical noises like those produced by cars (Hahad et al., 2024). Therefore, providing spaces that offer relief from urban sounds can play a big role in lowering overall urban stress. In busy urban environments, people appreciate being

able to spend time in a more quiet place (Van der Burg, 2024). The effects of unpleasant noise can be reduced or restricted by offering sonic refuges (Roe & McCay, 2021). Built elements like sound barriers can be put up along especially loud spaces, like high speed roads, can be implemented to limit noise pollution (The Centre for Urban Design and Mental Health, n.d.). Parks and other green spaces can also play a role in creating sonic refuge, because vegetation can aid in the absorption of sound (Koohsari et al., 2024; Jalilisadrabad et al., 2023).

### Climate and pollution

While the exact effect air pollution has on mental health and stress has yet to be fully understood, there do seem to be patterns between air pollution and mental health problems. Certain urban design elements can be implemented to alleviate air pollution, like green spaces that can help filter pollutants from the air, carefully planning and designing for airflow through the urban canopy to help disperse pollutants from busy areas, and limiting exposure to sources of pollution like traffic and industry (The Centre for Urban Design and Mental Health, n.d.). Moreover, green spaces can help with increasing climatic comfort. Climatic comfort is one of the most effective ways to lower urban stress (Sadeghpour et al., 2023). Heat is a major urban stressor, so offering the ability to cool off, can offer climatic comfort, which in turn can lower stress. Cooling urban design features include green roofs, shaded pavements, and water elements (Koohsari et al., 2024). Another aspect of climatic comfort is wind. Specifically: offering refuge from strong winds, by vegetation and built elements, and designing the urban environment in such a way that they do not create vortexes or other strong winds (Sadeghpour et al., 2023).

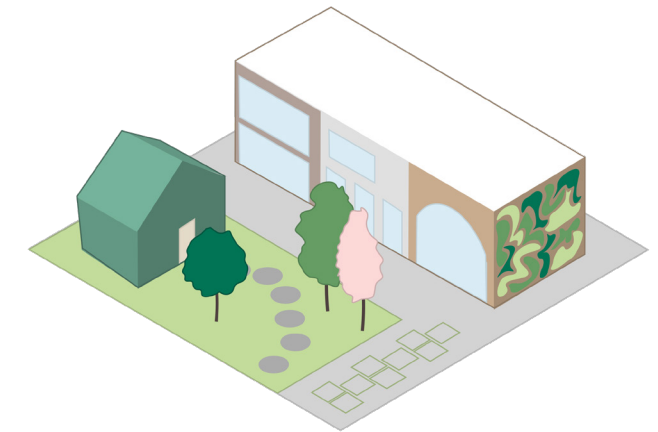
### Personal comfort

Most people tend to prefer to stay on the outer edges of big spaces, rather than staying right in the middle. This is because they feel more safe, as they have a better view of the full space. People also prefer the outer edges or outer walls when moving through a space, indoors or outdoors. Therefore, providing comfortable seating around the edges of big open public spaces and ensuring that the facades on the edge are interesting to walk by can make staying and moving through said space more comfortable (Hadley, 2019). However, while some preferences are (nearly) universal, everyone's wants and needs are different, as has been established before. Ideally, urban environments meet everyone's wants and needs, to create an inclusive and comfortable space. By offering a variety of different environments, the chance of one's needs being met increases, and by allowing people to modify the environments in one or several ways, the chances of their wants and needs being met increase further. Moreover, it adds to a sense of control, which can help lower stress and heighten the feeling of comfort (Roe & McCay, 2021; Sadeghpour et al., 2023; Jalilisadrabad et al., 2023).

### X1. Visual complexity/interest

There should be very little closed facades, especially at eye-level, and there should not be too much repetition. Artwork can further improve visual interest. Cool colours like green and blue are preferable, as these offer the most stress-relief.

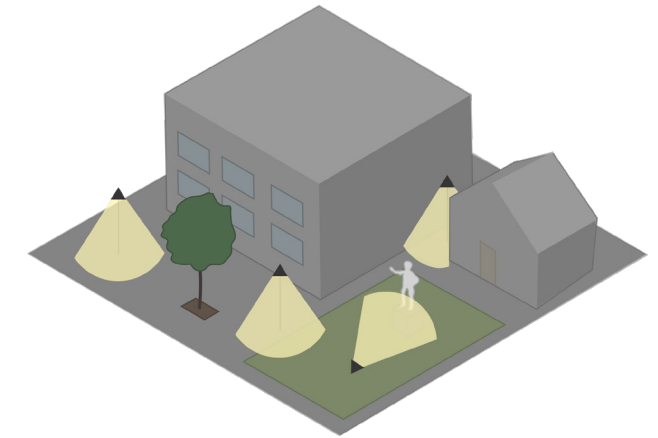
> Figure 4.2.36, Visual complexity/interest tile



### X2. Well-designed urban lighting

There should be enough lighting, so that there are no dark spaces in the necessary path system, and lanterns should be placed with regard for vegetation and built elements, so the light is not blocked. Lanterns should face down, to prevent nuisance for surrounding houses, and there should still be some dark spaces, outside of the path system, for nocturnal life. Lighting can also be used strategically, to emphasize certain elements and create visual interest.

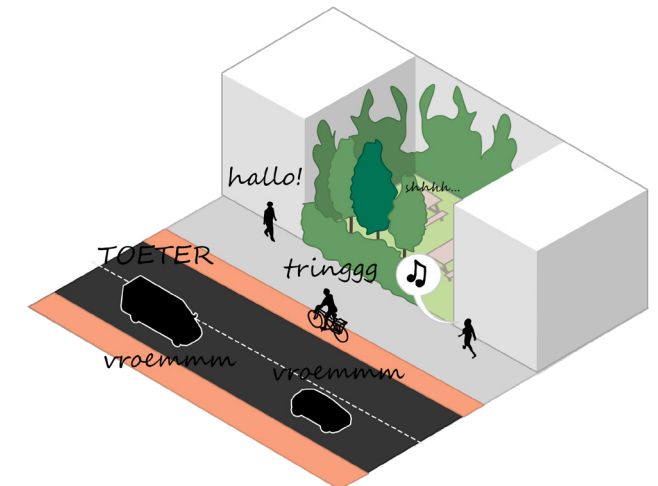
> Figure 4.2.37, Well-designed urban lighting tile



### X3. Quiet spaces

Within urban areas, especially busy and noisy urban areas, there should be areas of auditory refuge, where people can escape the constant noise, especially those produced by cars. These can be pocket parks, for example, that are physically away from the noise and/or have elements that help block and absorb the noise, such as vegetation.

> Figure 4.2.38, Quiet spaces tile

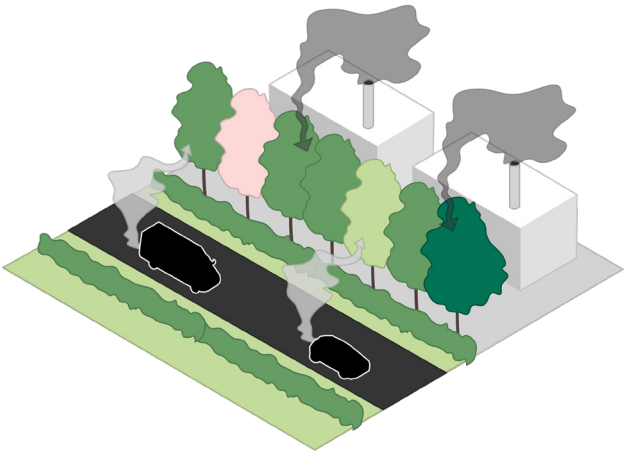




**X4. Good air quality**

This is partially achieved through lowering car dependence and thereby lowering car traffic. However, additional steps should be taken to clean the air, by implementing air-filtering vegetation, especially in busy areas and around heavily used roads.

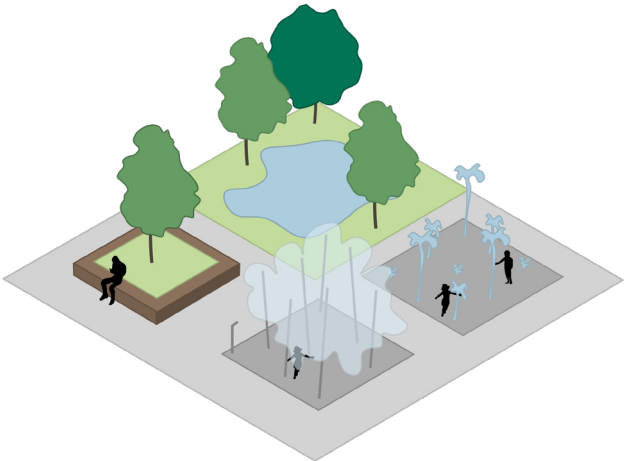
> Figure 4.2.39, Good air quality tile



**X5. Refuge from heat**

Places that currently have a strong Urban Heat Island-effect should be enriched by cooling elements, like moving water and plants, to lower the temperature, especially on hot summer days.

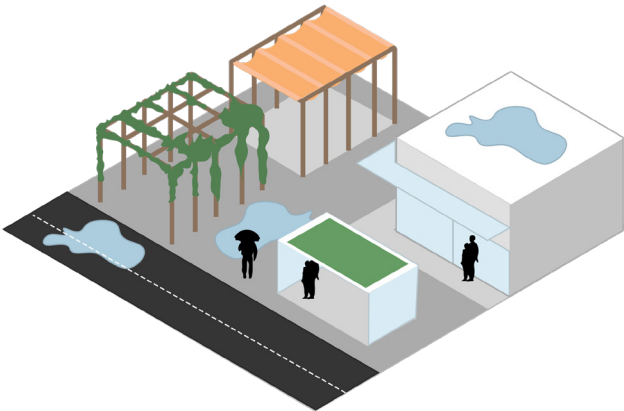
> Figure 4.2.40, Refuge from heat tile



**X6. Refuge from wind and rain**

This includes vertical elements, like walls and shrubbery, and can also include a roof, like pergolas, public transport stops, and roofed zones around shops.

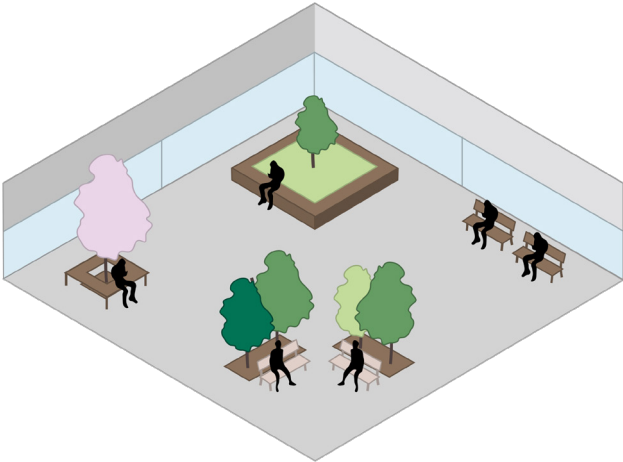
> Figure 4.2.41, Refuge from wind and rain tile



**X7. Comfortably placed furniture**

Generally, people prefer seating around the edges of open spaces, to get a view of the whole space, with shelter in the back. They can be oriented towards natural elements and/or in such a way that they encourage meeting others, like in a circle.

> Figure 4.2.42, Comfortably placed furniture tile



**X8. Diversity & variety**

Offering people multiple choices through variety, increases the chance of their needs being met and gives them a higher sense of control, which lowers stress. The different characteristics of different areas in the neighbourhood can be emphasised, to create distinction.

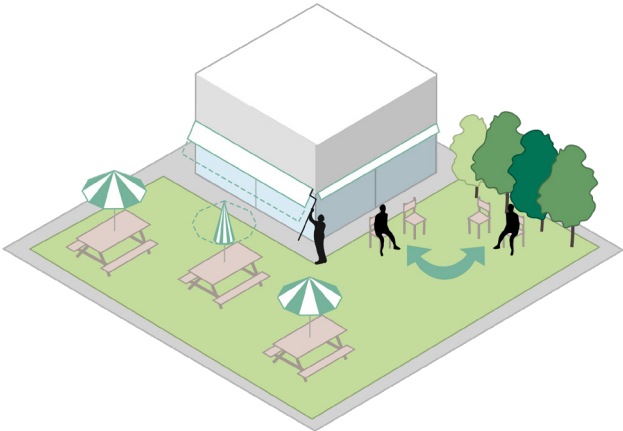
> Figure 4.2.43, Diversity & variety tile



**X9. Control over environments**

Through movable elements or allowing people to change things like lighting and sounds, people get a higher sense of control, which can help lower stress. It also increases the chance of their needs being met.

> Figure 4.2.44, Control over environments tile





# 05

## *Overvecht district*

In this chapter, the general location of this thesis (Overvecht, a district in the city of Utrecht) is introduced. First, a short historical context will be given, including the two main design influences and relevant social developments. The relation between these influences and health and stress in Overvecht are discussed after. Then, the spatial aspects of Overvecht are introduced and discussed shortly. The chapter ends with locating the different urban stressors discussed in chapter 04 in Overvecht.

5.1 Historical context

National scale

Post-war housing program

After the second World War, there was a large housing shortage in the Netherlands, due to damage caused by the war and population growth. The government took charge of this large housing program and divided the number of houses to build between municipalities. The focus was on building efficiently. Older building techniques proved insufficient, so new techniques and methods were developed around this time, such as prefabrication and standardisation (Urban Fabric Development, 2006). Instead of being differentiated and slightly different, most houses were designed in (almost) the same way, which made both the design process and the building process quicker (“Standardization”, n.d.). This also allowed for pre-fabrication, which is the process where buildings are already partially assembled off-site, which allows for a faster building process (“Prefabrication”, n.d.). Since most buildings consisted of the same parts, large-scale prefabrication was made possible. However, this also led to neighbourhoods with little distinction and a lot of repetition.



Figure 5.1.1, Post-war neighbourhoods in the Netherlands (made by author, based on Koöperatieve Architecten Werkplaats, 2020)

Utrecht scale

City expansion

Before the 1950s, Utrecht was a lot smaller than now. This meant that during the reconstruction period, Utrecht first had to realise its new neighbourhoods within the last few open spaces within these borders. Not much construction could take place and not much open space was left behind in the end. Finally, in 1954, the city borders were changed and the city of Utrecht became more than twice its previous size. This meant that there was room for bigger new districts. As the last structure plan for the city, made by Berlage and Holsboer in 1920, was made before the expansion, a new structure plan that included the new areas was needed. This plan stated that the city was to grow from 243.000 to 307.000 inhabitants by 1970, which meant that 37.000 new houses were needed. This plan also included big expansions of the infrastructure, to support these new built areas. Multiple large roads were added, going by and through these post-war neighbourhoods (Urban Fabric Development, 2006).

Post-war wreath

The city of Utrecht ended up developing ten post-war districts, all throughout the city, forming a “wreath”. There are two main categories: pre-expansion, which were developed before the borders of Utrecht were changed, and post-expansion, which were developed after the borders were changed. The pre-expansion districts are small-scale, with a clear mix of pre-war and post-war design ideas. The districts developed after the expansion of the city, including Overvecht, were much larger. They included more industrial building techniques, namely prefabrication, and there was a lot more repetition of typologies (Urban Fabric Development, 2006).

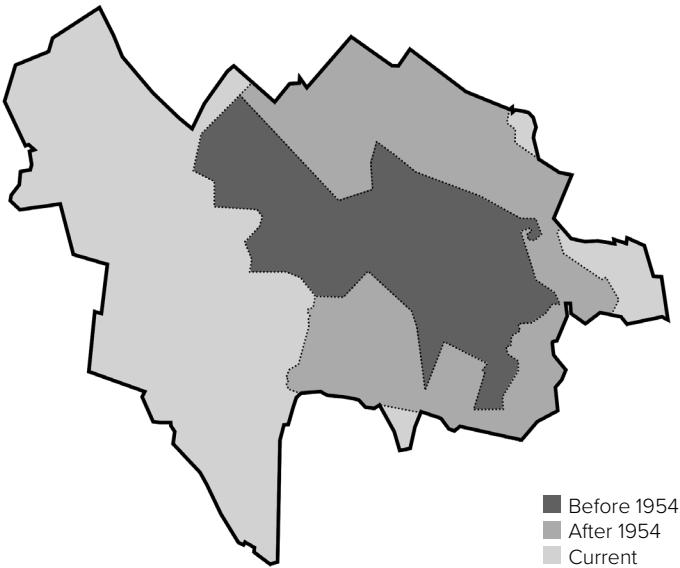
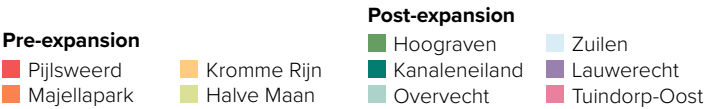


Figure 5.1.2, Two major expansions of Utrecht (made by author, based on Gemeentebestuur van Utrecht, n.d.)

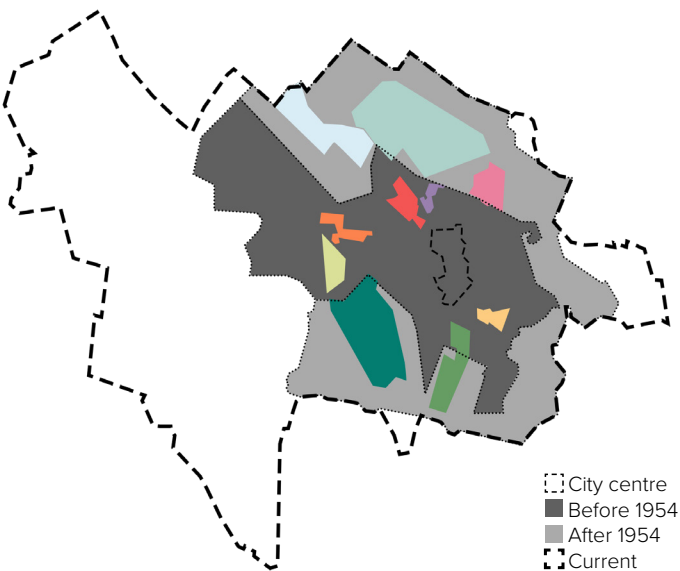


Figure 5.1.3, Post-war neighbourhoods in Utrecht (made by author, based on Urban Fabric Development, 2006)

## 5.2 Design influences

### Het Nieuwe Bouwen

#### CIAM

The Congrès Internationaux d'Architecture Moderne, which translates to the “International Congress for Modern Architecture”, was an association of Modern architects formed in 1928. Their goal was to prove to clients, the general public, and authorities that their style of architecture was “better than traditional architecture, from a technical, economic, hygienic, aesthetic, and ideological perspective”. The group believed that a rational and modern architecture was more important than the aesthetic value of traditional architecture. Buildings and designs were still supposed to be beautiful, but made in a modern way. In the Netherlands, these ideas were called “Het Nieuwe Bouwen” (“The New Way of Building”). The first congress of this group, CIAM 1, meant the formulation of “La Sarraz Declaration”, which consisted of four sections dedicated to the principles of CIAM (IMOSS, 2019):

- 1. Overall efficiency:** Through rationalisation and standardisation
- 2. Town and regional planning:** Urban design consists of all functions of public life, both urban

and rural. These functions are: living, working, and recreating. Decisions should never be based (only) on aesthetic values, but the priority should be on ordering those functions of public life. They can be ordered in different ways, such as land consolidation, traffic control, and different laws.

- 3. Architecture and public opinion:** Architects influence communities through the principles of CIAM. Educational institutions should educate the general public about those principles.
- 4. Architecture and its relation to the state:** Architectural education should be modernised. Modern architecture is centred around building rationally and economically responsible, which the architecture educational institutions did not accommodate at the time, as the focus was on traditional architecture which centred more around aesthetic values. The focus should be on the future rather than the past: new materials, such as concrete, metal, and glass, new types of constructions, such as skeletal constructions in concrete or steel, and new production methods, such as prefabrication.

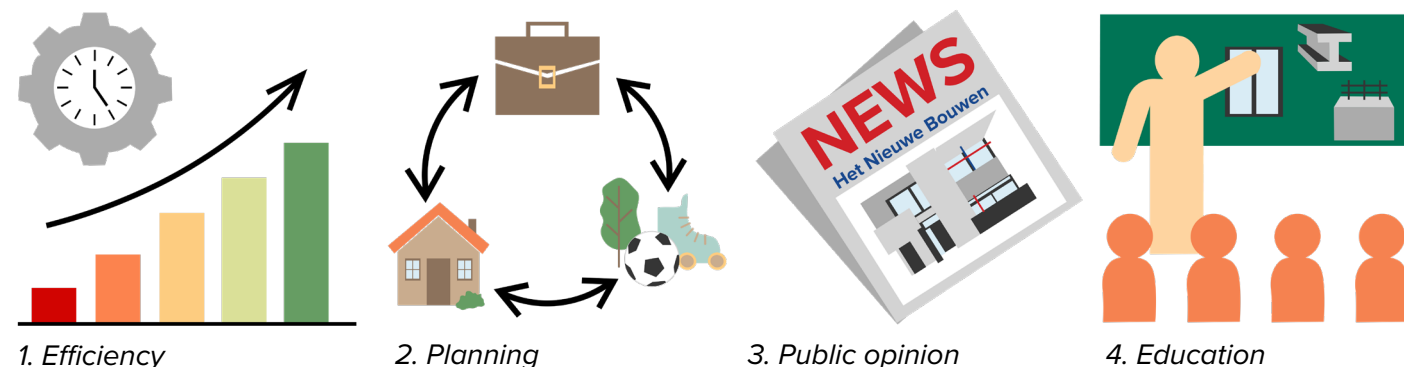


Figure 5.2.1, Four main principles of CIAM

#### Licht, Lucht, Ruimte

Practically, the designs made under the Het Nieuwe Bouwen/CIAM regime were centred around four themes: living, traffic, recreation, and working. This is informed by second CIAM principle (town and regional planning), which focused on the ordering of functions (IMOSS, 2019).

- 1. Living:** city centres and other 19th Century neighbourhoods were seen as too dense, unhealthy, overcrowded, and not in ideal locations. Neighbourhoods should be constructed in ideal locations in terms of climate and geography. Houses should be easily accessible via roads, and high-rise can be implemented to free up space for sports and play.
- 2. Traffic:** cars and other traffic is of nuisance to residents who live next to streets. There should be separate lanes for different modes of traffic. Roads should be differentiated on the base of their function and/or scale.
- 3. Recreation:** existing areas in the cities are lacking in nature/greenery, and the green spaces that do exist, are not well-distributed and are not accessible enough. There should be enough greenery and it should be well-distributed and differing in scale.
- 4. Working:** work places were not in ideal location at the time. There should be a short distance between

housing and working. Industrial areas should be separated from the rest of the city functions, ideally through the use of greenery. Residential areas need small-scale businesses that are of use to its residents.



Figure 5.2.2, Licht, Lucht, Ruimte (Light, Air, Space)

Most of the ideas of Het Nieuwe Bouwen were summarised in the concept **Licht, Lucht, Ruimte** (“Light, Air, Space”). Houses were supposed to be open and their orientation should be based on the sunlight, to maximise exposure to sunlight, which is why Light is mentioned. Air mostly refers to the importance of clean air, which is reflected in the belief that construction should take place outside of the city centres, where the air was polluted and there was little greenery to combat this through air filtration. Space refers to the belief that neighbourhood should have be spacious, and through the use of high-rise buildings, space could be freed up for other functions in addition to housing.

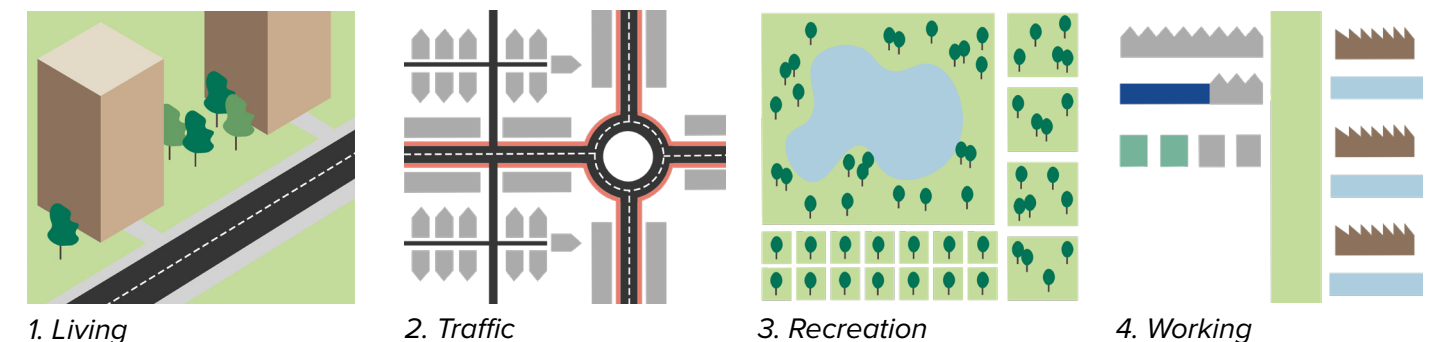


Figure 5.2.3, Four main themes of Het Nieuwe Bouwen

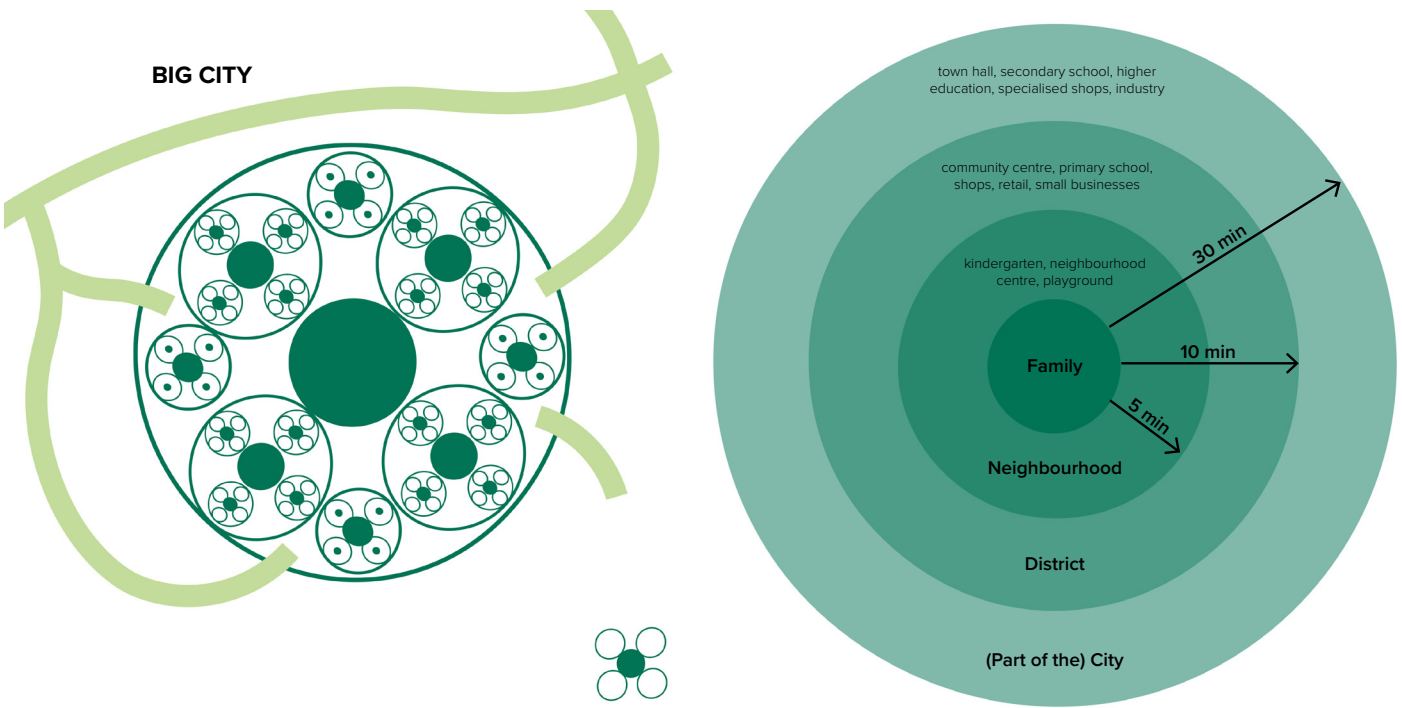


# Wijkgedachte

## Spatial aspects

During the second World War, many people developed ideas about their “ideal city”, which amounted into the concept of the wijkgedachte (“neighbourhood philosophy”). The core idea was to build up cities from recognisable neighbourhood units, where tight-knit communities would form and flourish. All necessary facilities, like shops, parks, playgrounds, schools, health care, community centres, and churches, were to be close to home. The designs were based on

the idea that good, liveable cities had a recognisable structure, from building block to neighbourhood to district to city. Per each of these levels, the designers decided what facilities were needed, with families at the centre. Essentially, these neighbourhoods were to function as small cities within themselves (Urban Fabric Development, 2006). This focus on functional design could be informed by the ideas of the aforementioned CIAM ideas.



Left: Figure 5.2.4, City made up of recognisable units (made by author, based on Geyl, 1949)  
Right: Figure 5.2.5, Urban design centred around family needs (made by author, based on Van der Wall, 2020)

## Social aspects

In addition to these practical ideas, wijkgedachte was also a social philosophy. In a world that was changing quickly, neighbourhoods had to be a stable and healthy place, where communities acted as protection from threats coming from the modern city, like increasing anonymity and depravation of morals. Moreover, within these neighbourhoods, everyone was to be equal, which was an act against pillarization (Van der Lans, 2007). Regardless of religion, social position, and age, these neighbourhoods were for everyone, and overarching community-building was the goal. The broad target audience of these neighbourhoods also meant a variety of housing typologies, so everyone could find a suitable home there (Canon van Nederland, n.d.). It seems like, after a turbulent and divisive time period during war, people longer for community, connection, and security above all.

This is a translation of the text on the right, which is the essence of the wijkgedachte:

*“Do your place of residence and your family offer you what you need for a good life? Are there safe spaces for your children to play, nearby your home? Can your children go to school without having to cross a busy street? Are the community gardens and sports fields near your home? Is there a building in your district for plays by amateur actors, performances by singers, workshops by the development club, and the St. Nicolaasfeest by the elderly community? “Wijkgedachte” points the way to improvements of your living environment.*

*Do you feel threatened by bureaucracies? Do you feel the need to participate in the regulation of community affairs? Do you think that the existing society shows defects, but that life is worth fighting for improving our living standards?*

*Then you too are interested in the “wijkgedachte”.*



Figure 5.2.6, Images from a book about the wijkgedachte (Geyl, 1949)

5.3 Societal influences

Social changes

The reconstruction of Utrecht took place during some big social changes. The basis for most of the reconstruction was a combination of Het Nieuwe Bouwen and wijkgedachte, as described before. At first, residents experienced living conditions within the areas developed around this time as positively. However, during the late 60s and early 70s, a shift occurred. The neighbourhoods became too large-scale, which led to a loss of the human scale, the neighbourhoods were monotonous, and dependence on technology (informed by the technical and rational aspects of Het Nieuwe Bouwen) overshadowed the ideology of healthy social communities behind wijkgedachte. Whereas families were supposed to be at the centre of these neighbourhoods, the human aspect got lost along the way (Urban Fabric Development, 2006). The means by which a perfect neighbourhood was supposed to be constructed (spacious layout, efficient building techniques, recognisable elements), became a goal themselves, essentially leading to the corruption of the wijkgedachte. The circumstances within the city of Utrecht itself also impacted the change in attitude towards post-war districts. The prosperity increased, and there was much social unrest, partially due to the demolition of old neighbourhood and the construction of high-rise buildings in large numbers throughout the city. Lastly, the car went from a luxury-product to a daily necessity, which meant that these post-war neighbourhoods, where the car had a relatively dominant position, were quickly overtaken by cars (Urban Fabric Development, 2006).

Impact on the housing market

These social changes impacted the housing market tremendously, in two major ways. Firstly, by the end of the 70s, there was an increase in the desire for a more varied and less monotonous living environment.

“Experimental housing” rose up, which offered more variation, flexibility, and freedom (Urban Fabric Development, 2006). An example can be found in Overvecht: there were apartments with movable walls, which allowed residents to (temporarily) change the layout of their house, and there were apartment buildings with large community spaces that a few residents shared. Within the context of the monotonous district of Overvecht, there was a desire for variation and experimentation, which took shape in these experimental buildings (Het Utrechts Archief, n.d.). Apartment buildings gained a negative reputation, as they were seen as unpersonal and too anonymous due to their large size. This meant that many plans for high-rise buildings were modified and changed into low-rise. At the same time, there was also an increased desire for privacy. This, paired with the individualisation of this period, meant that the existing communal spaces, of which there were many in these postwar neighbourhoods, often became dilapidated. The classic structure made up of levels that was at the centre of the wijkgedachte was bypassed and the woonerf was born (Urban Fabric Development, 2006).



Figure 5.3.1, Photograph of Overvecht apartments (Van der Linden, 1969)

5.4 Relation between context of Overvecht, STRESS, and RELAX

	STRESS	RELAX
National and city context	Rationalisation and prefabrication were efficient, but also led to <b>Lack of detail &amp; distinctions</b> , and <b>Illegible/unclear design</b> .	The benefit of the practical approach of the post-war reconstruction period, was the quick supply of relatively <b>Good quality, affordable housing</b> for many.
Het Nieuwe Bouwen	Similarly to the overall post-war period, the downfall of Het Nieuwe Bouwen was <b>Lack of detail &amp; distinctions</b> , and <b>Illegible/unclear design</b> , due to efficiency becoming a goal in its own right and too much focus being on rationality.	Greenery, both <b>Small scale greenery around home</b> and <b>Large scale greenery in walkable distance</b> were to be provided for everyone, also to ensure <b>Good air quality</b> . <b>Job opportunities</b> are also important, as are <b>Facilities within a walkable distance</b> .
Wijkgedachte	Shared spaces were eventually abandoned, due to an increase in the need for privacy resulting in a feeling of <b>Crowding</b> and <b>Not enough space of your own</b> . This possibly led to <b>Social isolation and deprivation</b> .	Central to Wijkgedachte was <b>Facilities within a walkable distance</b> . <b>Diversity and variation</b> in <b>Public spaces</b> and <b>Indoor meeting spaces</b> were meant to improve local communities. <b>Accessibility and inclusivity</b> was also important for community.
Societal influences	The overall <b>Lack of detail &amp; distinctions</b> and <b>Illegible/unclear design</b> led to dissatisfaction with new construction, and a feeling of <b>Injustice</b> in comparison to older, more pleasant districts. The rise of the car also led to more <b>Traffic</b> .	The need for a new type of housing and living led to the “experimental housing”, which was <b>Affordable, good quality housing</b> with <b>Space of your own</b> , a <b>Public-private differentiation</b> , <b>Exchange of goods and/or services</b> , and <b>Control over environments</b> .



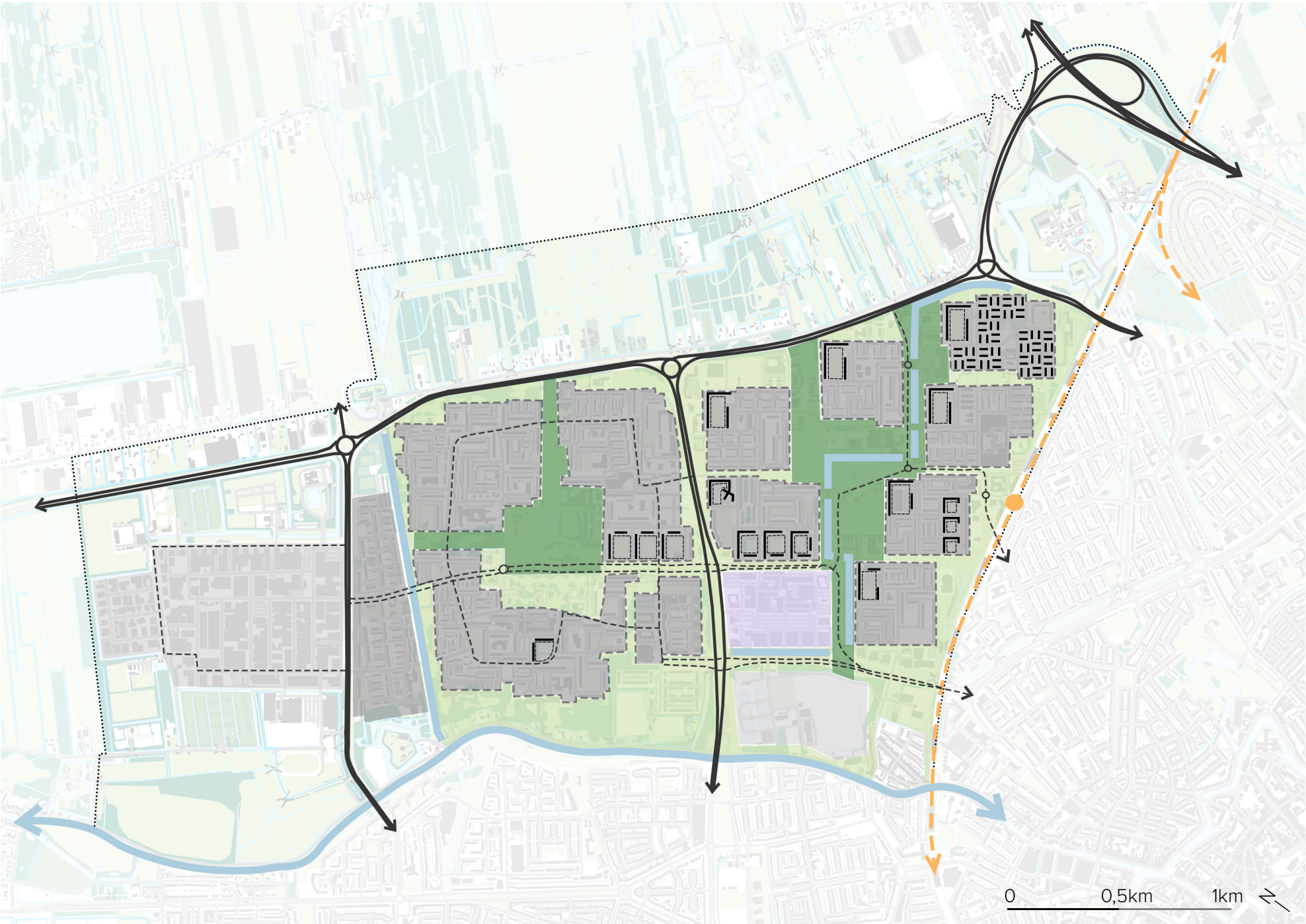
# 5.5 Introduction of Overvecht

## Essential & typical elements

The district Overvecht has some elements that typify it, shown in the map on the right. The overall structure consists of residential clusters, connected through a green framework inbetween. This green framework has two large parks, one in the middle of Overvecht-Noord and one in the middle of Overvecht-Zuid. Most of the current residential clusters were part of the original 60s design, except for the Klopvaart buurt. There is one large shopping centre, near the middle of the district, that serves inhabitants of the full district and was part of the original design. There is also an industrial area on the left, which was mostly constructed in the 70s. Within the residential clusters, as is typical for Het Nieuwe Bouwen, there are many repeating elements (IMOSS, 2019), especially the high rise, L-shaped apartment buildings. The barriers of Overvecht are made up of a large provincial road (north), the train track (east), the river Vecht (south), and another large road and the industrial area (west). There is one train station that serves the whole district, on the south-eastern side.

> Figure 5.5.1, Map of essential elements of Overvecht

- Repeating elements
- Residential clusters (original design)
- Residential clusters (other)
- Commercial cluster
- Industrial cluster
- Green framework
- Parks within green framework
- Water
- Main roads
- - - Other important roads
- - - Train track
- Train station

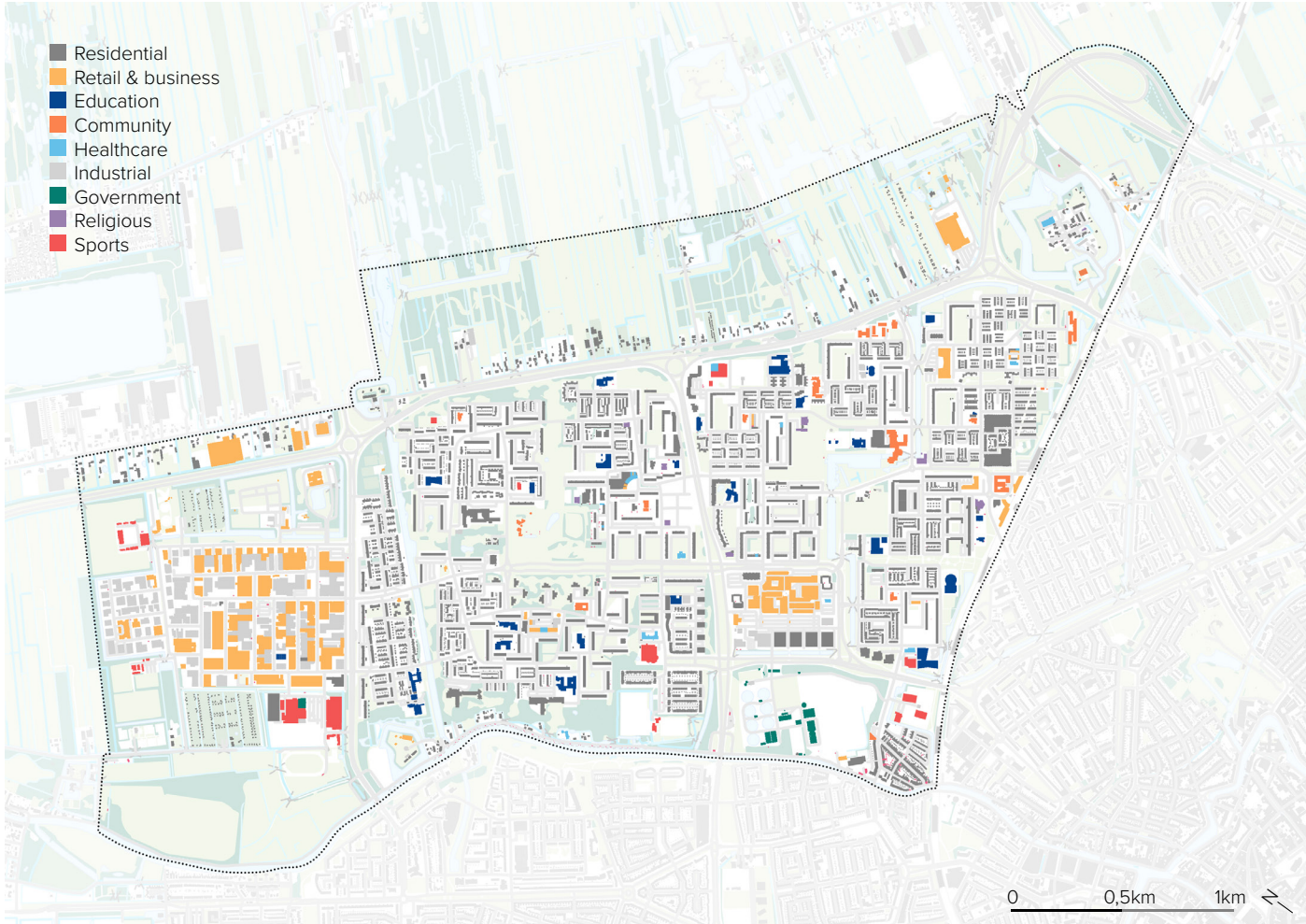




# 5.6 Spatial analyses

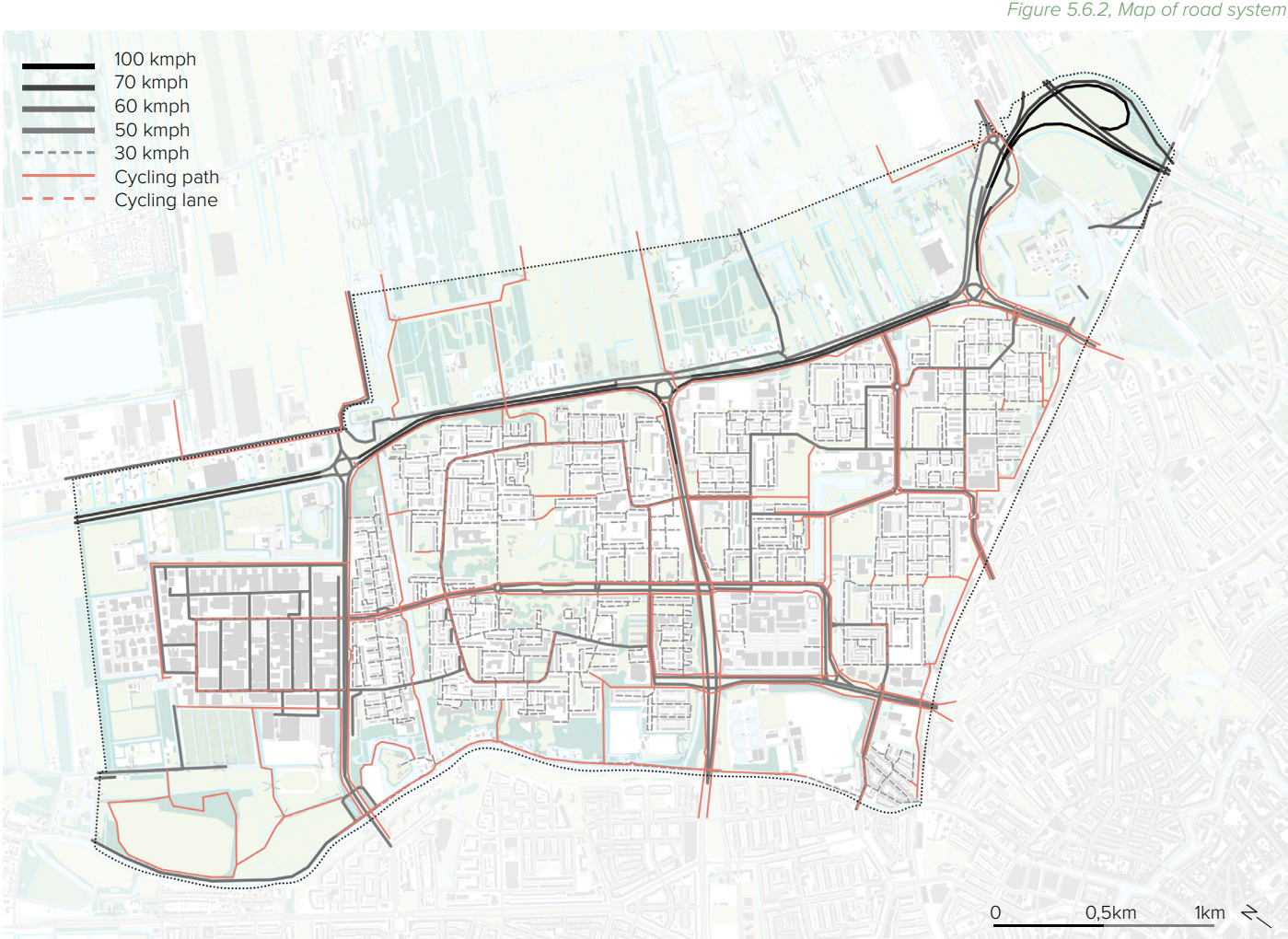
## Functions

Despite the fact that having a variety of functions near home is part of both Het Nieuwe Bouwen (IMOSS, 2019) and the Wijkgedachte (Urban Fabric Development, 2006), Overvecht currently consists of mostly monofunctional neighbourhoods. These clusters have (almost) no functions other than residential, with most non-residential functions being clustered and/or on the outer edges of the neighbourhoods and districts.



## Road system

When Overvecht was first designed, the main roads were the first elements that were on paper from the beginning. The usage of the car was seen as the road to autonomy, which is why it was a big part of the original design (Urban Fabric Development, 2006). The whole district is accessible by car. However, in the years between then and now, the car went from a luxury product to an everyday necessity, which has resulted in car dominance.

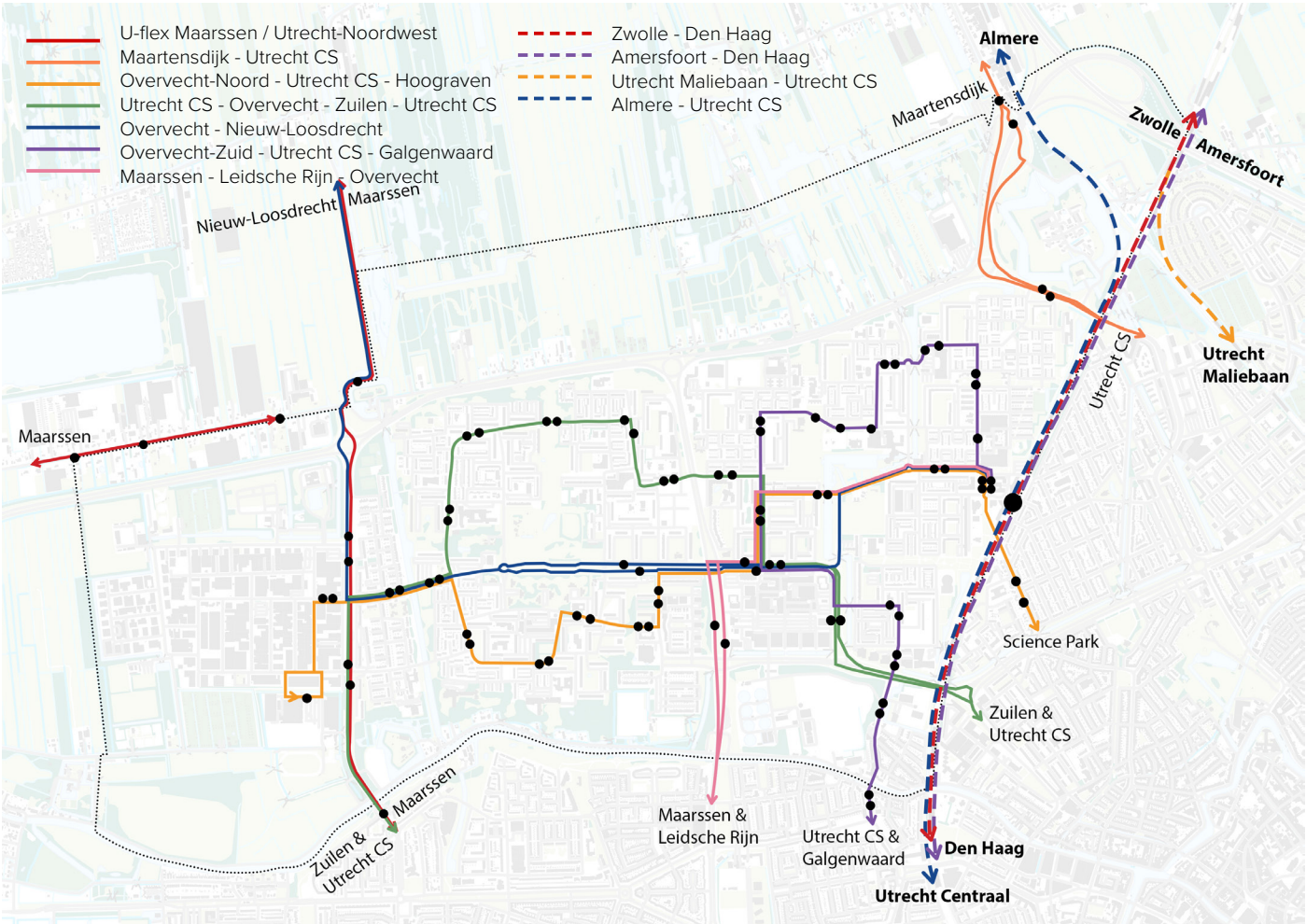




Public transport

There are two main modes of public transport: bus routes through the district, and the train track on the outer southern edge of the district. These connect the area to the rest of the city and surrounding cities.

Figure 5.6.3, Map of bus and train connections  
(Made by the author, based on University of Groningen Geodienst, 2022)



Natural elements

When Overvecht was first designed, the establishment of a “green framework” that both separated and connected the different areas, was an essential part of the design. This green framework is still visible today, and it is the reason the neighbourhood is overall quite green. However, the biodiversity in this framework is relatively low and the areas outside of the framework, the residential clusters, are largely non-green.

Figure 5.6.4, Map of natural elements, ordered by biodiversity  
(Made by author, based on OpenStreetMap, n.d.)





5.7 Urban stress in Overvecht

STRESS maps

On the next few pages, the urban stressors on the scale of the full district will be mapped, divided into the five aforementioned categories. Some of these stressors are difficult to map on a scale this large, especially those centred around individual perception (at eye level). The images in the STRESS framework in chapter 4 are all taken in Overvecht, so those show what those stressors look like on eye-level. They will also be adressed further in a later part of the thesis, namely in chapter 6, which is centred around the Rubicondreef neighbourhood.

Social deprivation & overload

Loneliness is a big problem in Overvecht, with most neighbourhoods experiencing high degrees of loneliness (between 39% and 68% of residents experience social loneliness, with most neighbourhoods scoring above 45%). In more spatial terms, there is a lot of repetition,

> Figure 5.71, Map of social deprivation and overload-related stressors (made by author, based on AlleCijfers, 2024, and Ministerie van Volksgezondheid, Welzijn en Sport, 2022)

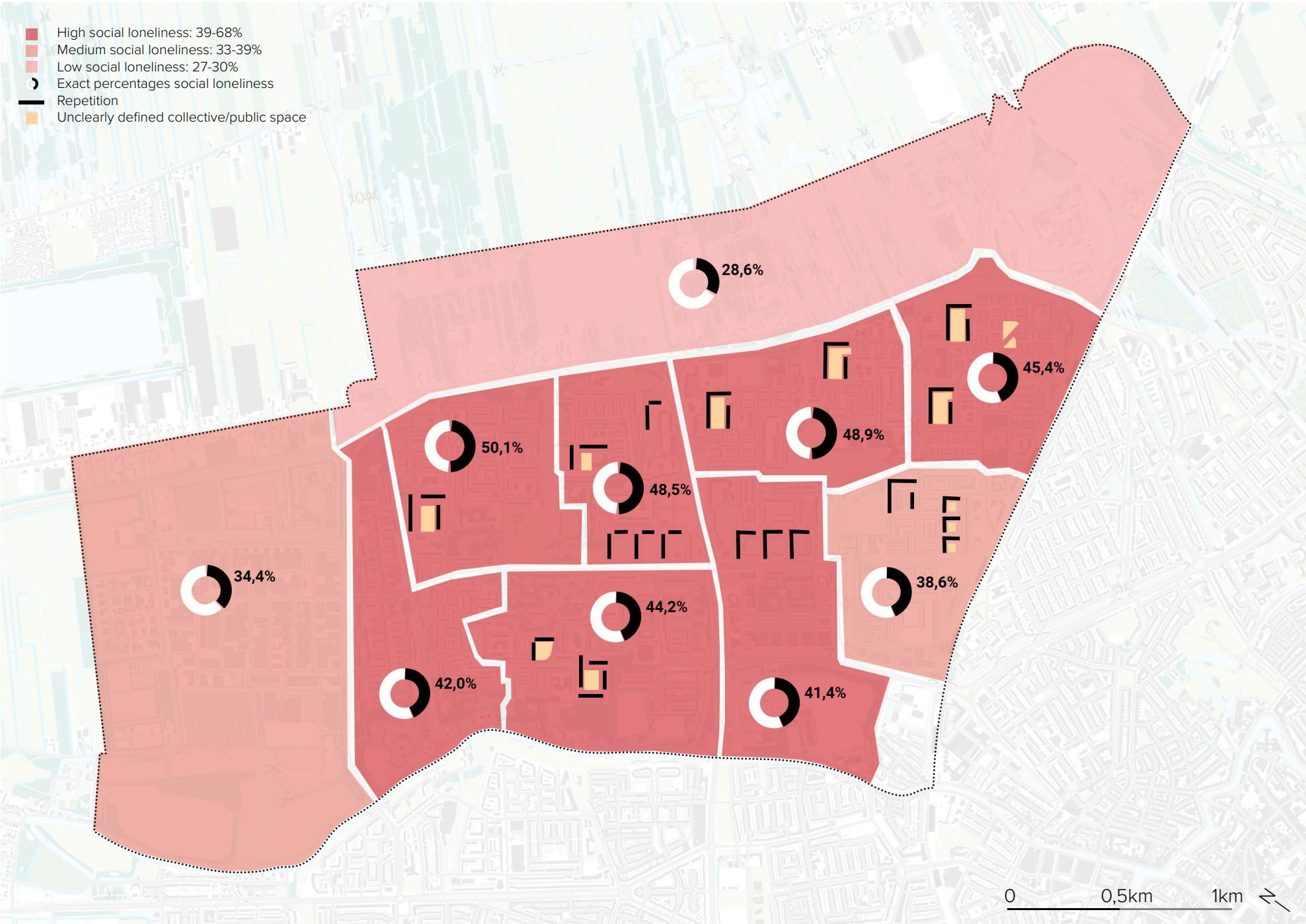
Overall social cohesion: **5/10**

Amount of neighbourly disputes per 1000 residents: **3,3**

Content with **cafés and restaurants:**  
34%

Content with **cultural facilities:**  
44%

Figure 5.72, Social statistics (made by author, based on Gemeente Utrecht, n.d.)





## Traffic & inactive modes of transport

There are many high speed roads (50 km/h or faster) that go through or by Overvecht. These, combined with the affinity for dangerous driving, can cause stress for both drivers and non-driver participants of traffic. Some of these high speed roads have insufficient cycling infrastructure: either only a lane rather than a path, or no separate infrastructure at all. Most big roads are noticeably busy during commuting hours (before 9AM and after 5PM).

> Figure 5.7.3, Map of traffic & inactive modes of transport-related stressors (made by author, based on Google, n.d.)

Nuisance due to **dangerous traffic**:  
52%

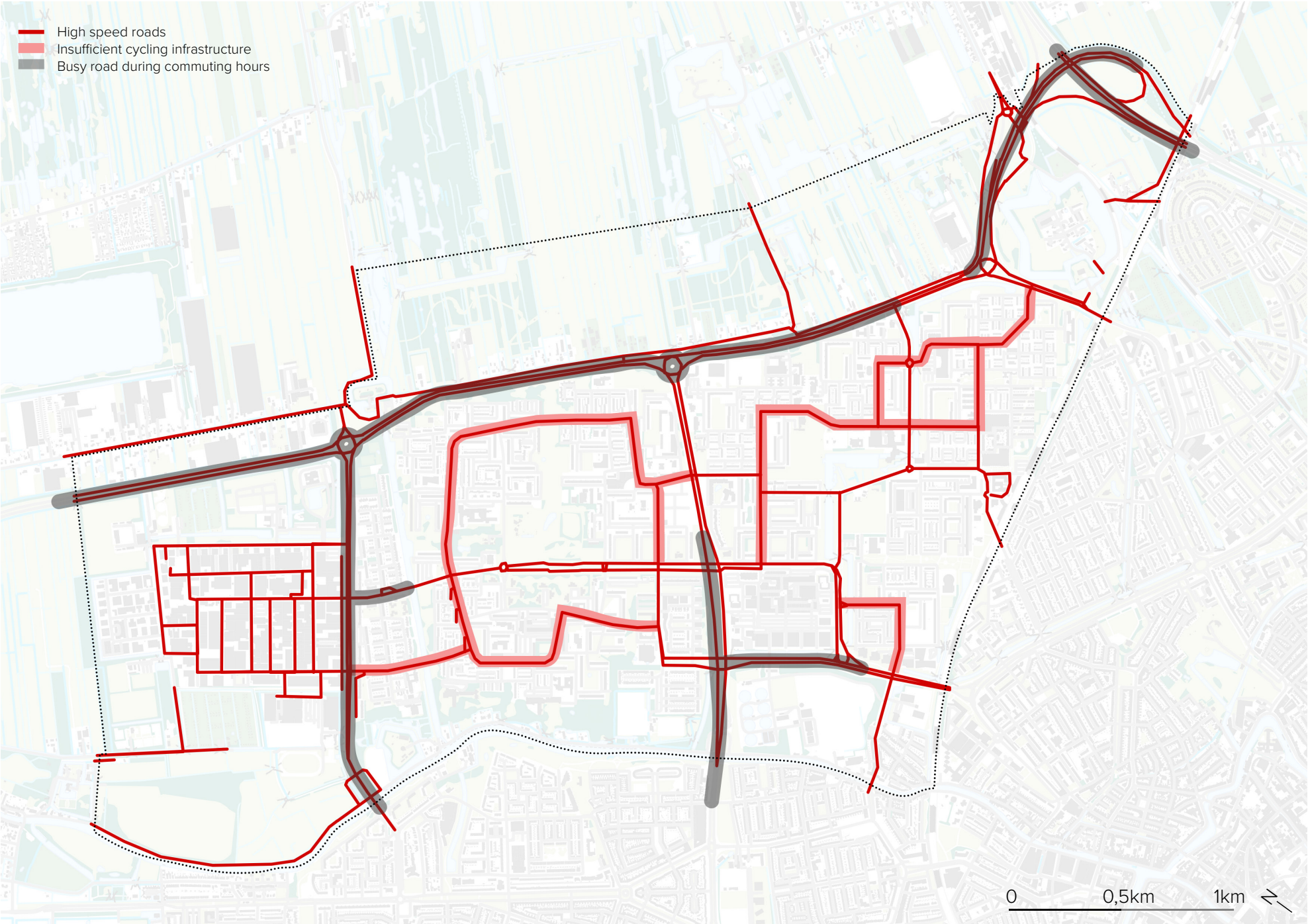
Content with **traffic safety**:  
47%

Content with **car parking**:  
65%

Content with **cycle parking**:  
37%

Content with **play facilities**:  
57%

Figure 5.7.4, Traffic-related statistics (made by author, based on Gemeente Utrecht, n.d.)





Economic deprivation & disparity

Throughout the district, there are some low-quality housing blocks, mostly due to low energy labels, signifying a lack of care. There are many neighbourhoods with a relatively high percentage of people with only a low education, which can contribute to a low(er) socioeconomic status. With the exception of the polder area, all neighbourhoods have an average income of well below the national average of €36.500 per year (AlleCijfers, 2024). This is also reflected in the fact that in nearly all neighbourhoods, close to half of the residents have trouble making ends meet. All neighbourhoods deal with some level of nuisance and unsafety, and the unemployment levels in all neighbourhoods are above the national average of around 4% (CBS, 2025).

> Figure 5.75, Map of economic deprivation & disparity-related stressors (made by author, based on AlleCijfers, 2024, and Gemeente Utrecht, n.d.)

Cleanliness public space: 5/10

Deterioration due to...

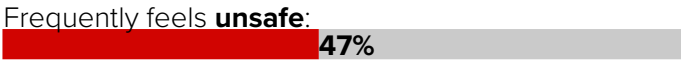
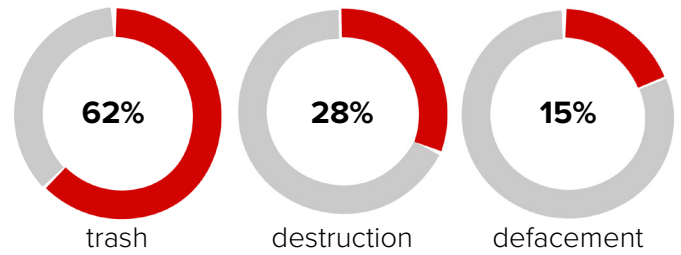
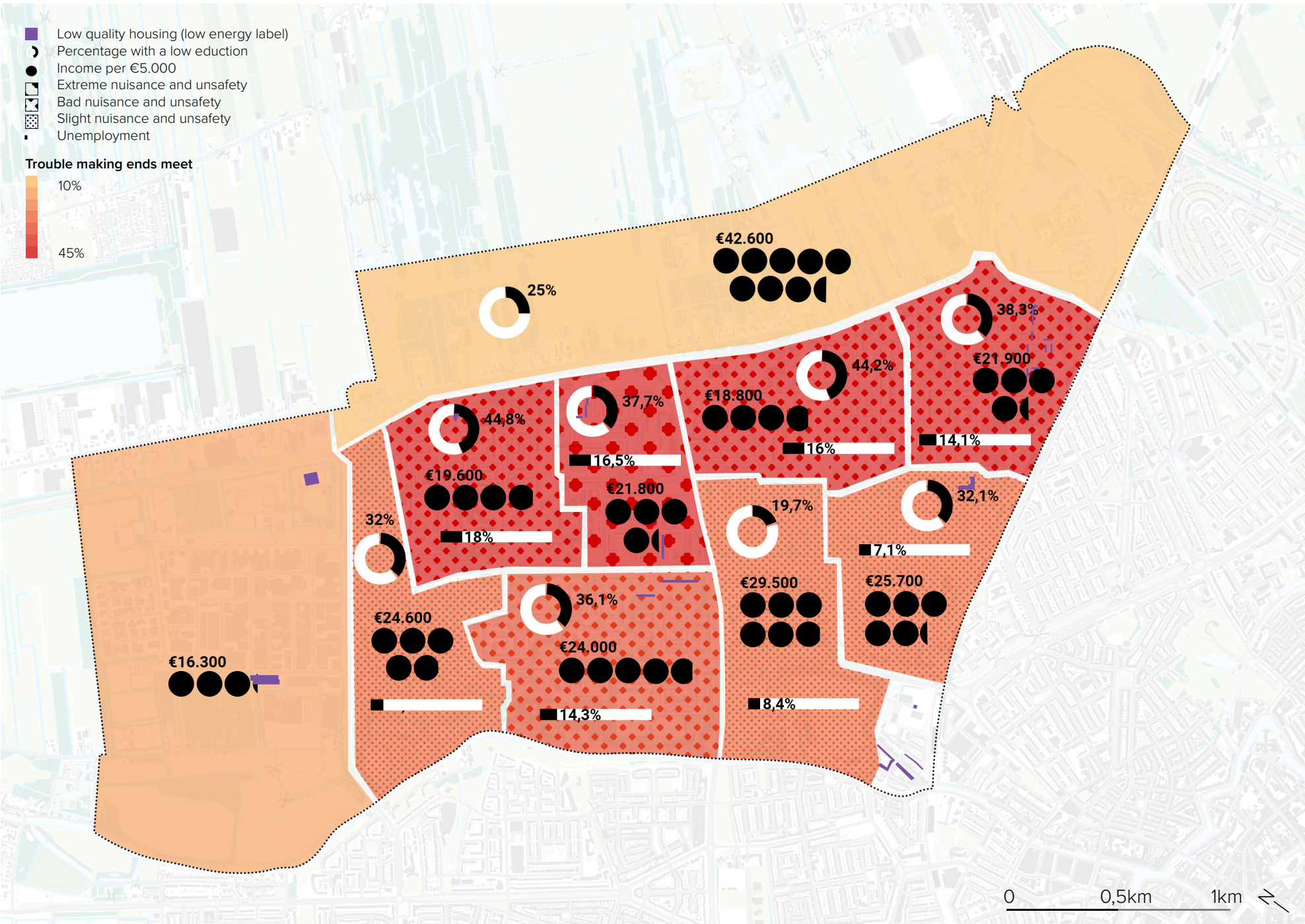


Figure 5.76, Economic statistics (made by author, based on Gemeente Utrecht, n.d.)





Shortage of diverse greenery

The map on the right shows all of the low-biodiversity green part of Overvecht (patches of grass, both real and fake). It is clear that most greenery in Overvecht is low in terms of biodiversity. It also shows that multiple of the more biodiverse parks are inaccessible from (a part of) Overvecht, due to a large, high-speed road being in the way, with little opportunities to cross safely. Regardless, most inhabitants of Overvecht are content with nearby greenery.

> Figure 5.7.7, Map of shortage of diverse greenery-related stressors



Figure 5.7.8, Nature-related statistics (made by author, based on Gemeente Utrecht, n.d.)



Sensory overload & discomfort

This last category is largely based on environmental factors. Most air pollution is centred around the larger high speed roads, and the light pollution in strongest in the industrial area on the north-west. Noise pollution is also strongest around the high speed roads, and the train track. The possible smell pollution is caused by a sewage treatment facility. There is a noticeable amount of urban areas with a lot of repetition, especially the L-shaped apartment building. Most of these also have an unclear collective space in the middle. Lastly, the heat island effect is strongest on the south and south-west part of the district, which is also partially caused by the urban fabric surrounding this area, outside of Overvecht. The parks in the middle of Overvecht-Noord and Overvecht-Zuid are noticeably exempt from the Urban Heat Island effect, which could point to the cooling effects of natural elements.

> Figure 5.7.9, Map of sensory overload & discomfort-related stressors (Made by author, based on Stichting Climate Adaptation Services, n.d.)

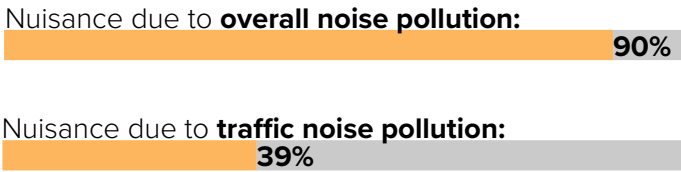
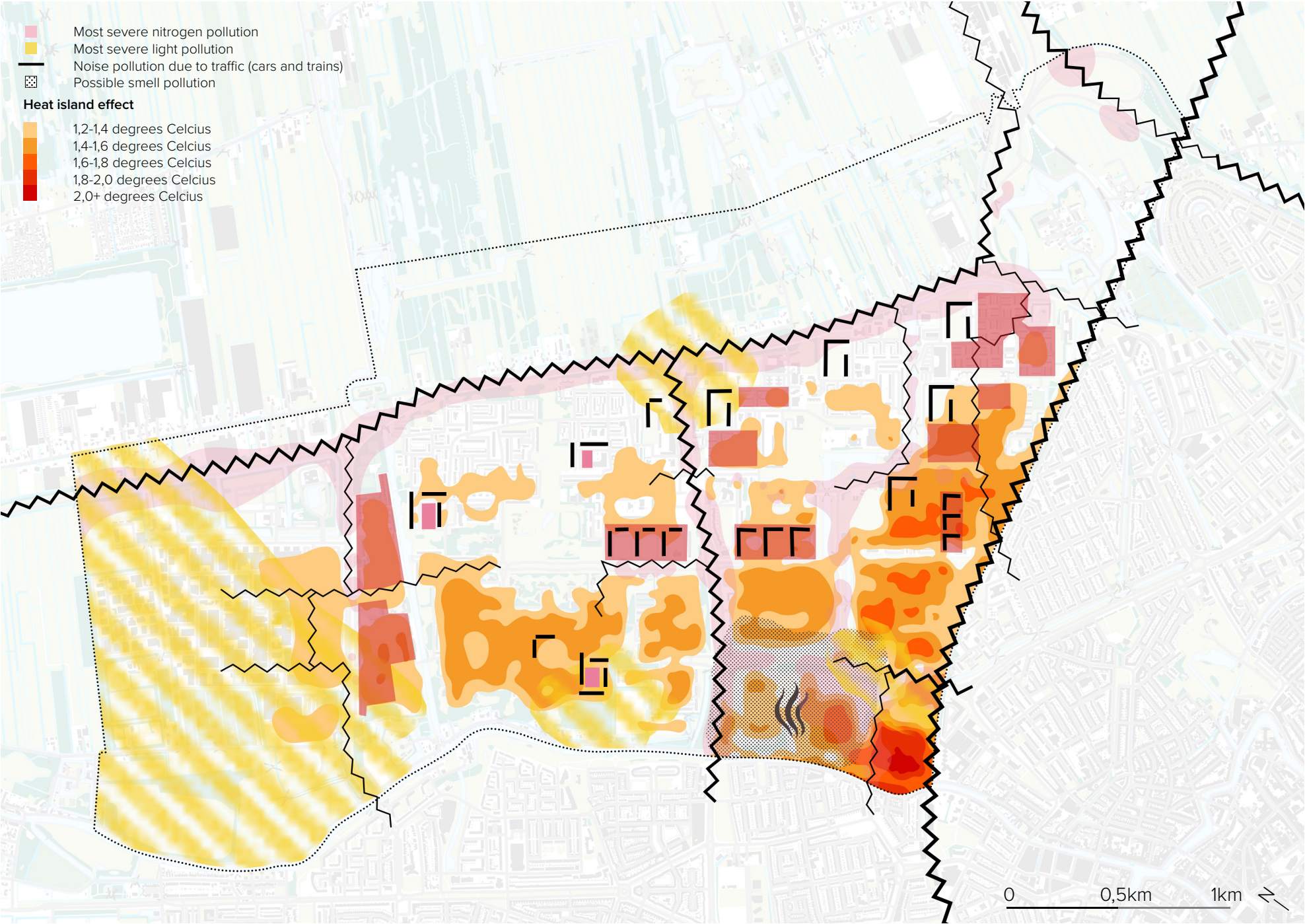


Figure 5.7.10, Experience-related statistics (made by author, based on Gemeente Utrecht, n.d.)



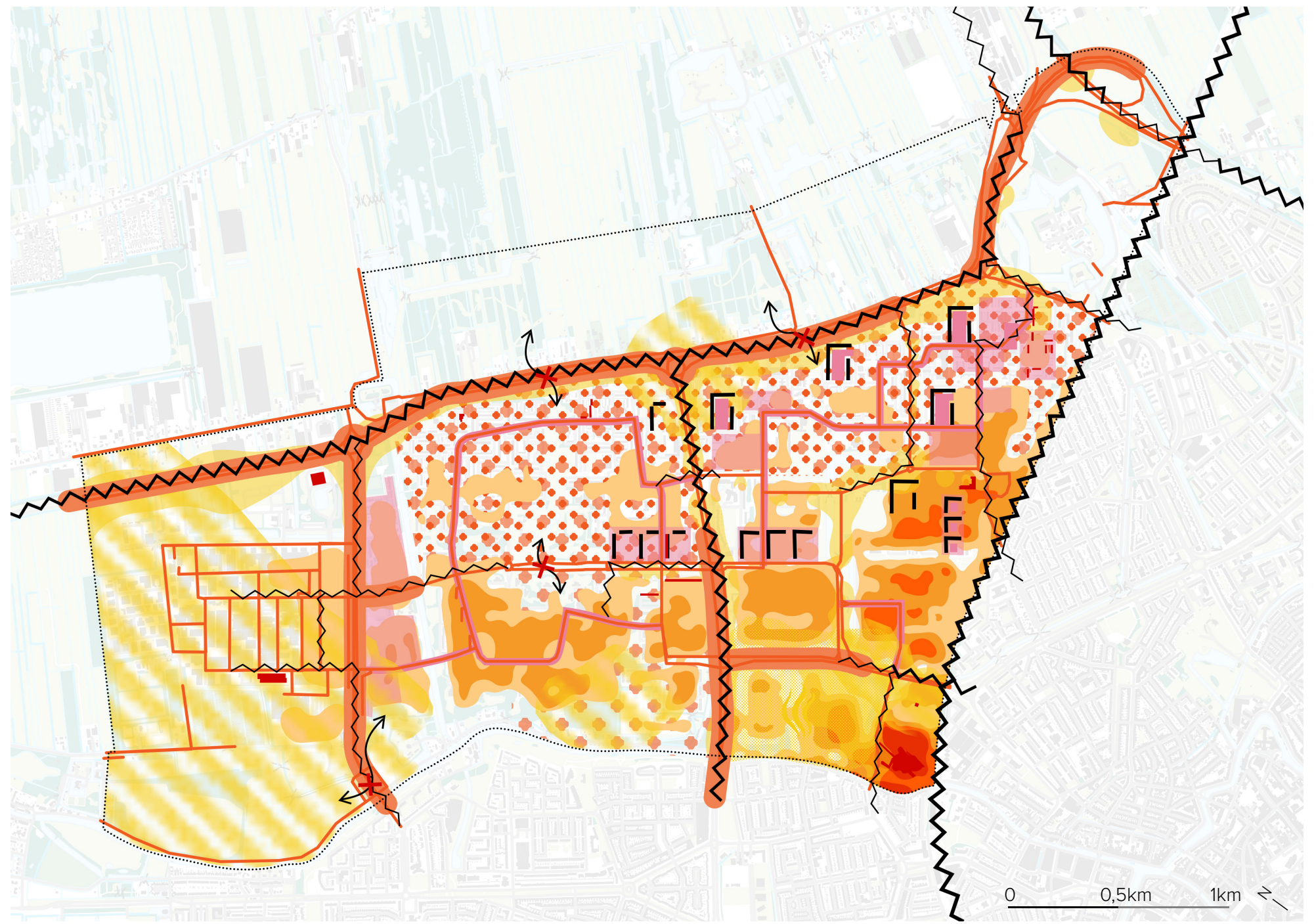
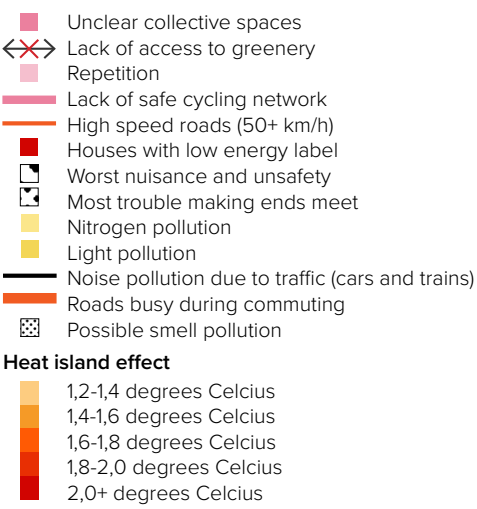


# Overall urban stress

When combining all of the STRESS categories, we see that the whole district of Overvecht experiences stress, though the main stressor differs slightly per area.

- Social deprivation & overload stressors are strongest in the north-east part of Overvecht, along the provincial road;
- TRaffic & inactive modes of transport stressors are felt along all of the high speed roads, that are spread equally across the full district;
- Economic deprivation & disparity stressors are also felt strongest in the north-east;
- Shortage of diverse greenery is especially visible in the parks along high speed roads, which happens in Overvecht-Noord and South, in the polder area and beneath the industrial area
- Sensory overload & discomfort manifests strongest in the south-west, probably due to the fact that this area is enclosed by urban area, whereas the rest of the district is surrounded by natural space, which helps lower the temperature and improve air quality.

> Figure 5.711, Map of overall urban stress



# 06

## *Rubicondreef neighbourhood*

In this chapter, the neighbourhood that is chosen as the design location of this thesis, the Rubicondreef neighbourhood, is introduced. First is a short introduction with a focus on spatial elements. Then, five personas that represent the target group of this thesis (people with a low socioeconomic status) are introduced. After this, for each of the aforementioned personas, a stress map is made, to show where the stressful and stress-relieving elements of the neighbourhood are. The chapter concludes with an overall SWOT analysis, mainly based on the stress maps shown before.







## 6.2 Spatial analyses

### Functions

As established and as is typical for Overvecht, the Rubicondreef neighbourhood is largely monofunctional, with mostly residential buildings and a few non-residential functions around the outer edge. There are also many big facades closed at eye-level, leading to a lack of eyes on the street.



1. Shopping centre

Figure 6.2.2, Shopping centre



2. Closed facade with garages at eye-level

Figure 6.2.3, Garages Tannhäuserdreef



3. Closed facade with storage at eye-level

Figure 6.2.4, Storage boxes Faustdreef



4. Storage at eye-level

Figure 6.2.5, Storage boxes Carmendreef



# Mobility

There are multiple public transport connections around the neighbourhood, but none that actually go through it. The emphasis is on car mobility, with many parking spaces, both “official”, which have one or more characteristics shown in the illustration on the right, and “unofficial”. A map with the exact amount of parking spaces in the appendix.

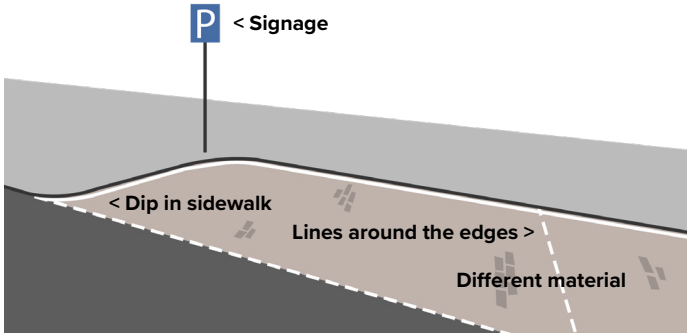
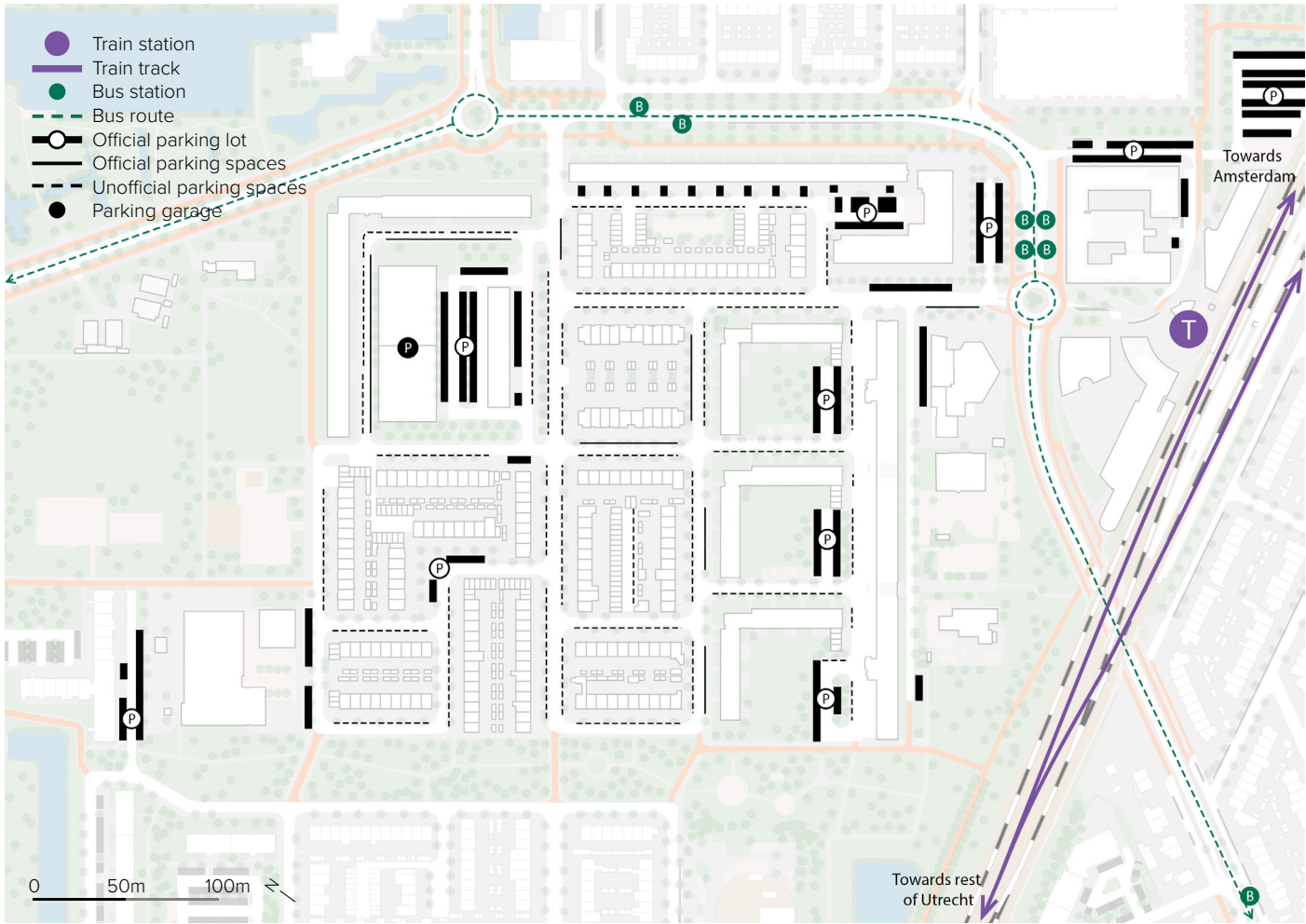


Figure 6.2.7, Illustration of “official” parking space

Figure 6.2.6, Map of mobility



1. Parking on the street (unofficial)

Figure 6.2.8, Parking on Arnodreef



2. Parking area (official)

Figure 6.2.9, Parking along Arabelladreef



3. Abandoned parking garage

Figure 6.2.10, Parking garage Faustdreef



4. Parking on private grounds, integrated in back garden (official)

Figure 6.2.11, Parking area Rubicondreef



# Natural elements

Like the rest of Overvecht, the neighbourhood is quite green. However, this mostly consists of grass fields and individual trees along roads. Overall biodiversity is low, except for Park de Watertoren, on the other side of the road.



1. Field with trees

Figure 6.2.13, Field with trees



2. Park de Watertoren

Figure 6.2.14, Benches along water in park



3. Trees along road

Figure 6.2.15, Trees along road



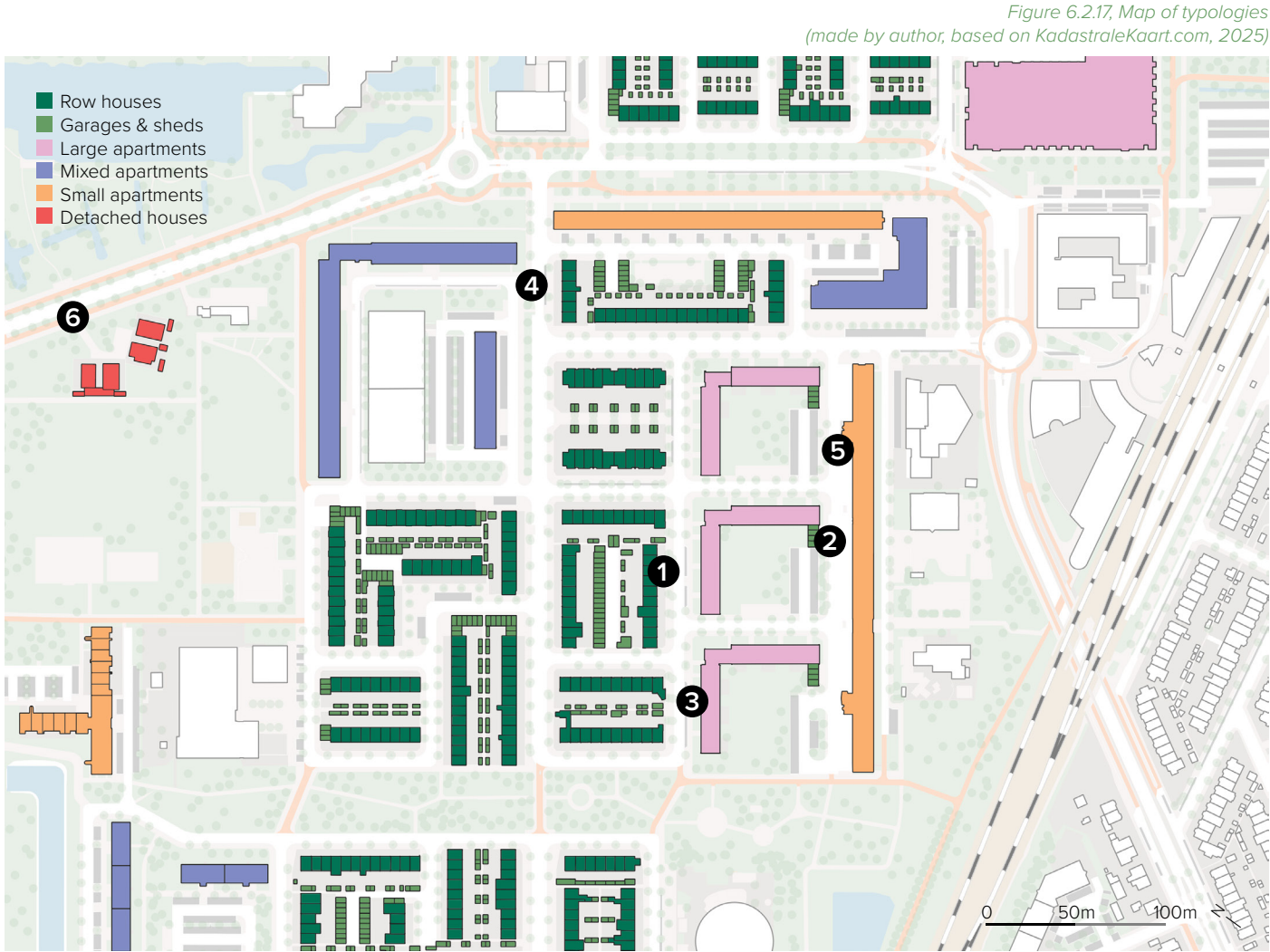
4. Mostly empty field

Figure 6.2.16, Empty field in Park de Watertoren



# Typologies

There is a variety of typologies throughout the neighbourhood, leading to quite a varied housing stock. The row houses already meet many criteria of the RELAX framework, like a proper public-private differentiation and offering clear space of your own. Many of the apartment buildings, however, have a lack of these elements, and a facade closed at eye level, too, which leads to lack of eyes on the street.



1. Row houses

Figure 6.2.18, Row houses



2. Garages

Figure 6.2.19, Garages (Google, 2020)



3. Large apartments

Figure 6.2.20, Large apartments (Google, 2021)



4. Mixed apartments

Figure 6.2.21, Mixed apartments



5. Small apartments

Figure 6.2.22, Small apartments



6. Detached houses

Figure 6.2.23, Detached houses (Google, 2023)



### 6.3 Introduction of the personas

#### Demographic statistics

These graphs show the most important demographic statistics of the neighbourhood. Compared to the rest of Overvecht (see page 24 & 25 for the demographics of Overvecht, Utrecht, and the Netherlands), the people are a bit higher educated, but the other statistics are similar, including half of the population having a non-European heritage and the group of 25 to 45 year olds being the largest demographic.

*"A society is made up of different people with different needs, different means, and different dreams" (Sim, 2019).*

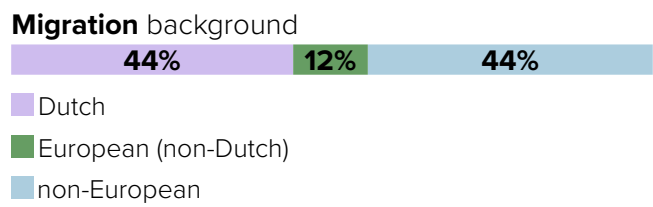
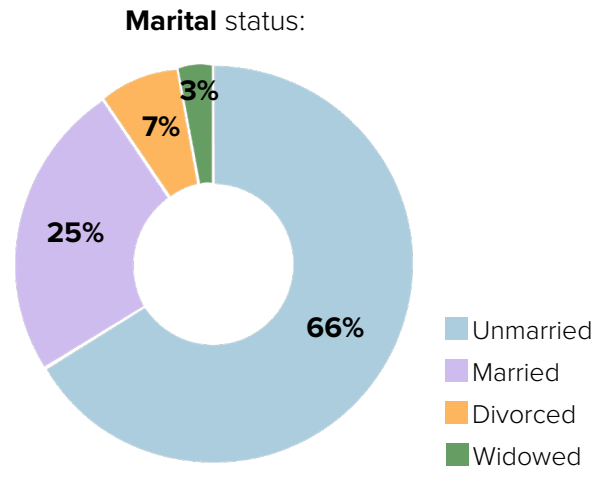
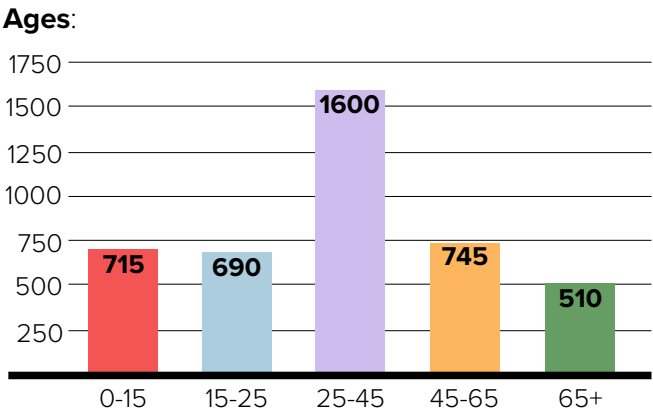
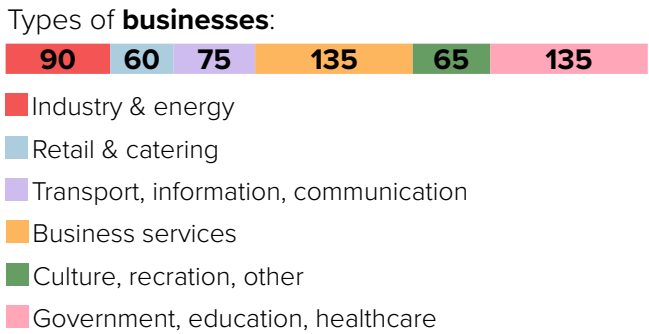
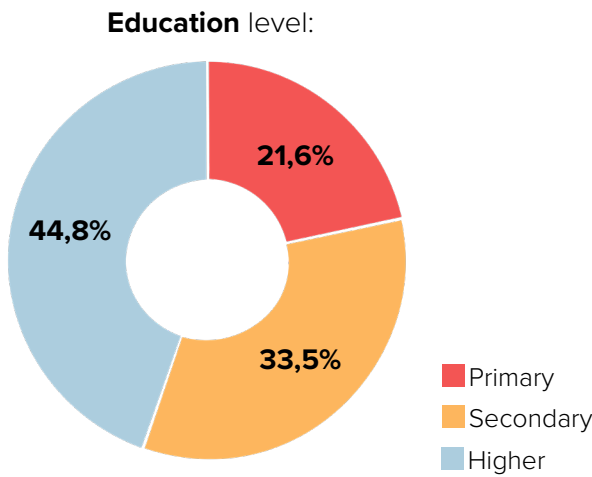


Figure 6.3.1, Demographic statistics (made by author, based on AlleCijfers, 2025)

#### The five personas

To represent the inhabitants of the Rubicondreef that fit the target group, people with a low socioeconomic status, the demographic statistics were translated into five personas. Their perspective on the neighbourhood will be used to develop a SWOT analysis, which is the final stepping stone for the neighbourhood design. Some of the characteristics are assumptions, like the typology of houses, but all exact numbers are sourced from AlleCijfers (2025).

#### Young family

- There are 715 children (between 0 and 15 years old) in Taag- en Rubicondreef
- A quarter of Taag- en Rubicondreef inhabitants are married
- Consists of young parent(s) + young children
- Lives in a small-, or large-sized apartment

#### Student/young adult

- There are 450 students in Taag- en Rubicondreef (MBO, HBO, WO)
- There are 690 people between 15 and 25 years old in this neighbourhood
- Lives in a large-sized apartment, shared with roommates of similar age, or a small (studio) apartment

#### Business owner

- There are 560 businesses in the Taag- en Rubicondreef, from a variety of different sectors
- Has a practical business, (handi)craft
- Lives in a row house, preferably with garage/storage as a workspace

#### (Recent) migrant

- 60% of inhabitants of Taag- en Rubicondreef are non-Dutch, of whom 78% are non-European (44% of the total inhabitants)
- Lives in a small apartment

#### Elderly

- There are 510 people older than 65 years old in Taag- en Rubicondreef
- Lives in a large apartment



### 6.4 STRESS maps

#### STRESS maps explanation

For each of the five personas, a map of their stress-related perspective of the neighbourhood is presented. It is essentially a type of SWOT analysis, where heavy stress-relief (strenghts) are green, heavy stressors (weaknesses) are red, light stress-relief (opportunities) are blue, and light stressors (threats) are orange. These are then also listed per category (social, economic, natural, activity, experience).

#### Young family

The young family has a very varied experience of the neighbourhood, scoring both very high and very low. The most negative category is social, with only negative experiences, including a strong negative, mostly due to a feeling of unsafety. The most positive is the natural category, scoring a strong positive twice.

**Social:** ●●●●●●●●

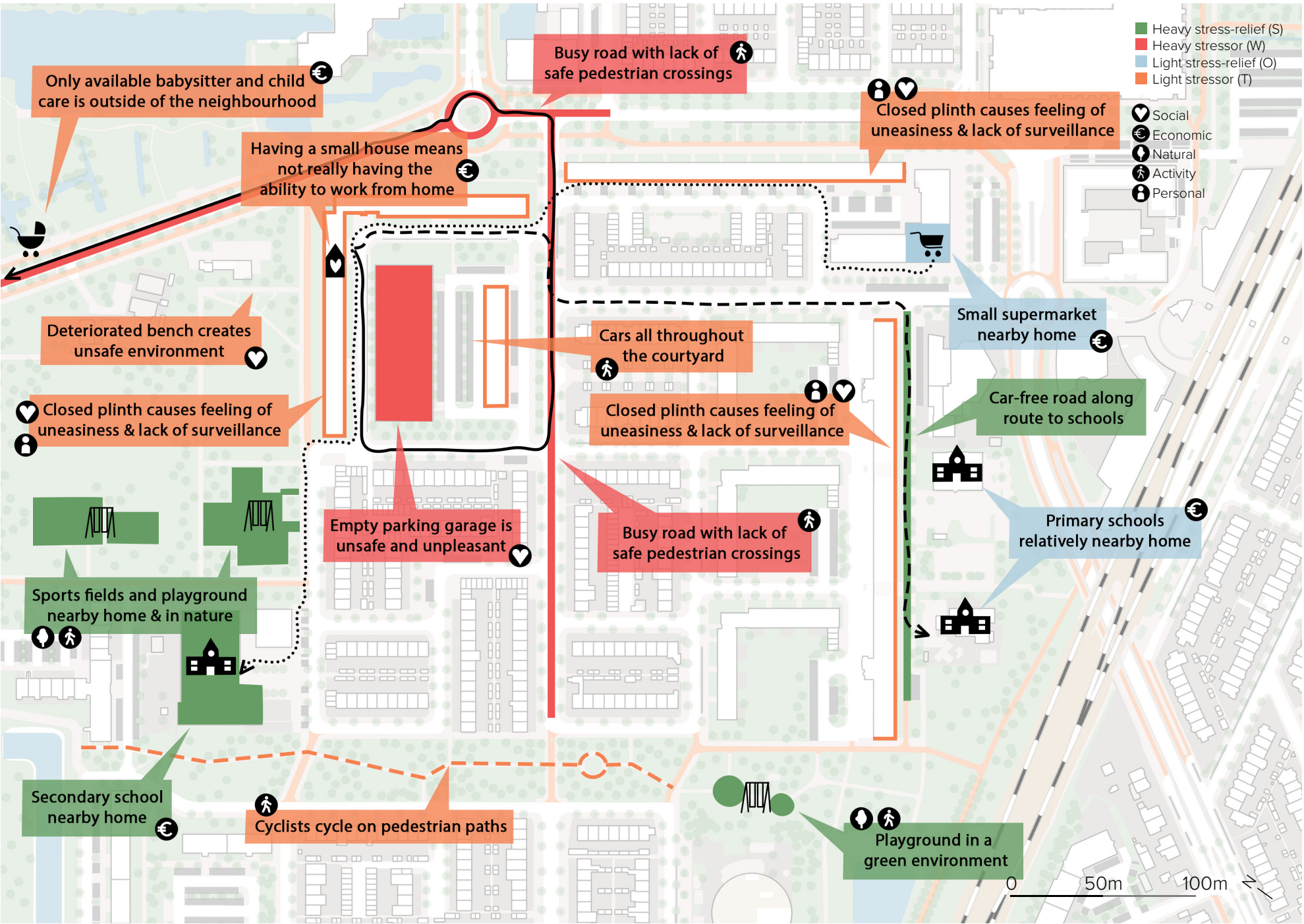
**Economic:** ●●●●●●●●

**Natural:** ●●

**Activity:** ●●●●●●●●

**Experience:** ●●●●●●

> Figure 6.4.1, STRESS map young family

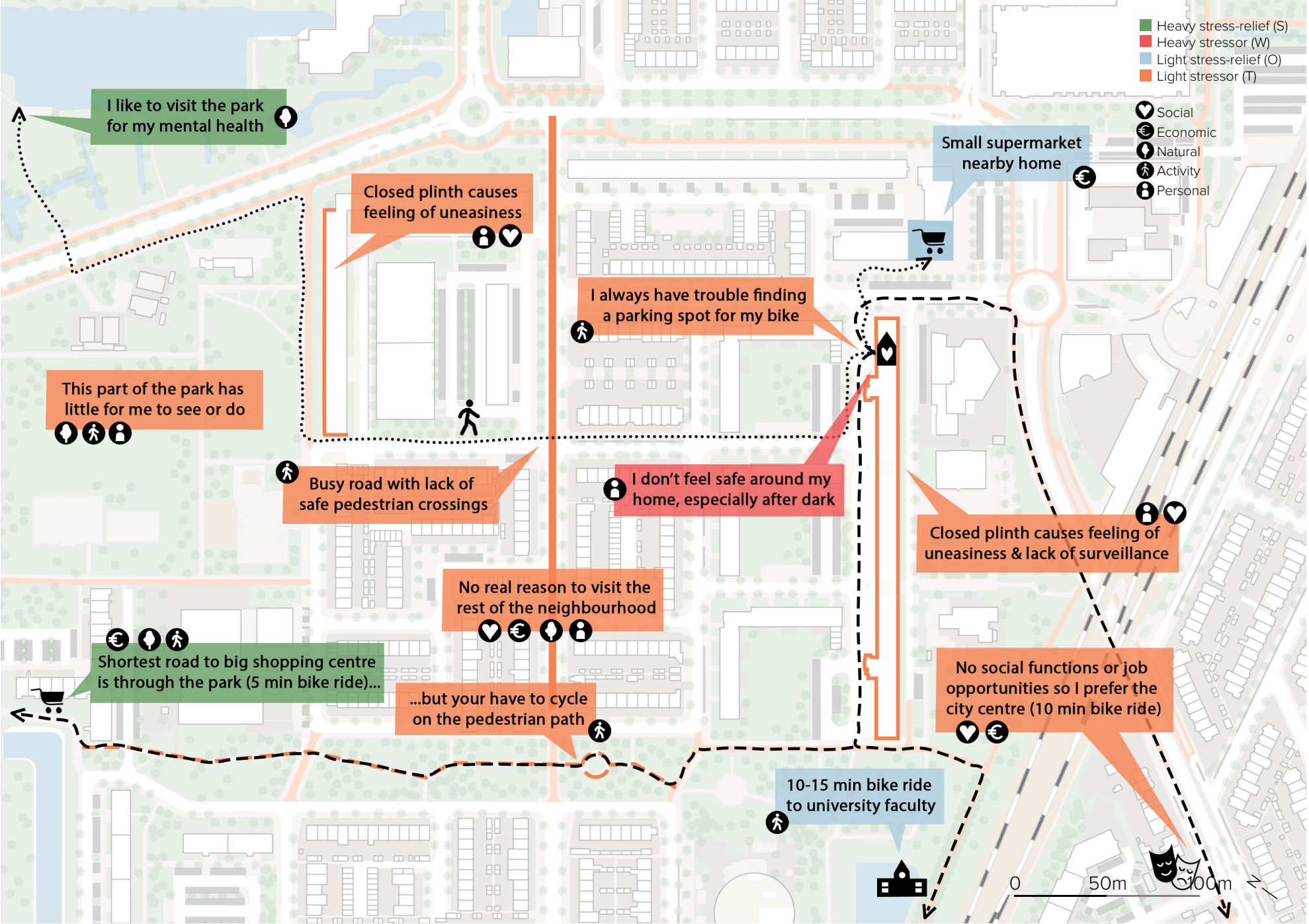


### Student/young adult

The student/young adult is relatively indifferent about the neighbourhood, with most thoughts falling into the “weak negative” category. The natural aspects are the most appreciated, in particular the two parks nearby, whereas the personal experience is the most negative.

- Social:** ●●●●●
- Economic:** ●●●●●
- Natural:** ●●●●●
- Activity:** ●●●●●
- Experience:** ●●●●●

> Figure 6.4.2, STRESS map student





## Business owner

For the business owner, the economic aspects are the most interesting, as having a business sets them apart from the other users. It is clear that there is very limited opportunity for having a business that requires a workspace, like a shop and/or some sort of handicraft. This means that commuting is required, making the activity category relevant, too. Other than that, the business owner is relatively indifferent.

**Social:** ●

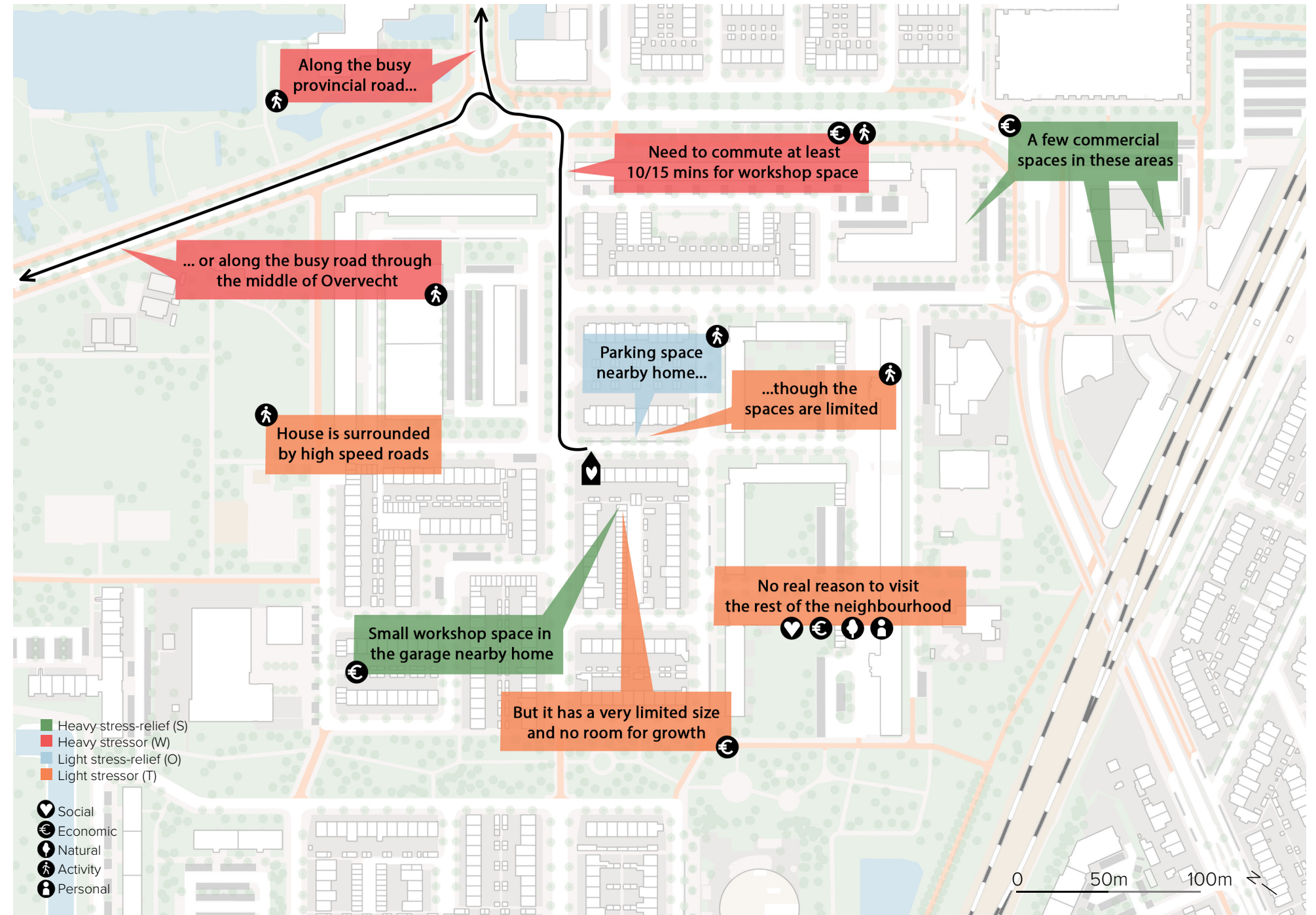
**Economic:** ●●●●●●●●

**Natural:** ●

**Activity:** ●●●●●●●●

**Experience:** ●

> Figure 6.4.3, STRESS map business owner



## (Recent) migrant

For someone with a (recent) migration background, the most influential aspect is the lack of facilities, since this makes it difficult for them to get to know the neighbourhood and the people living in it. Their socioeconomic status is also generally more vulnerable than that of native Dutch people, especially for non-Western migrants (De Regt, Fokkema & Das, 2022). That makes having suitable job opportunities especially important for this persona. Moreover, people with a migration background are less likely to be able to cycle, as it is not as engrained into their culture as it is in Dutch culture. This also means that they are more vulnerable when cycling, and tend to feel unsafe faster (Durand et al., 2023). This means that the lack of cycling infrastructure strongly impacts them and their ability and willingness to cycle.

**Social:** ● ●

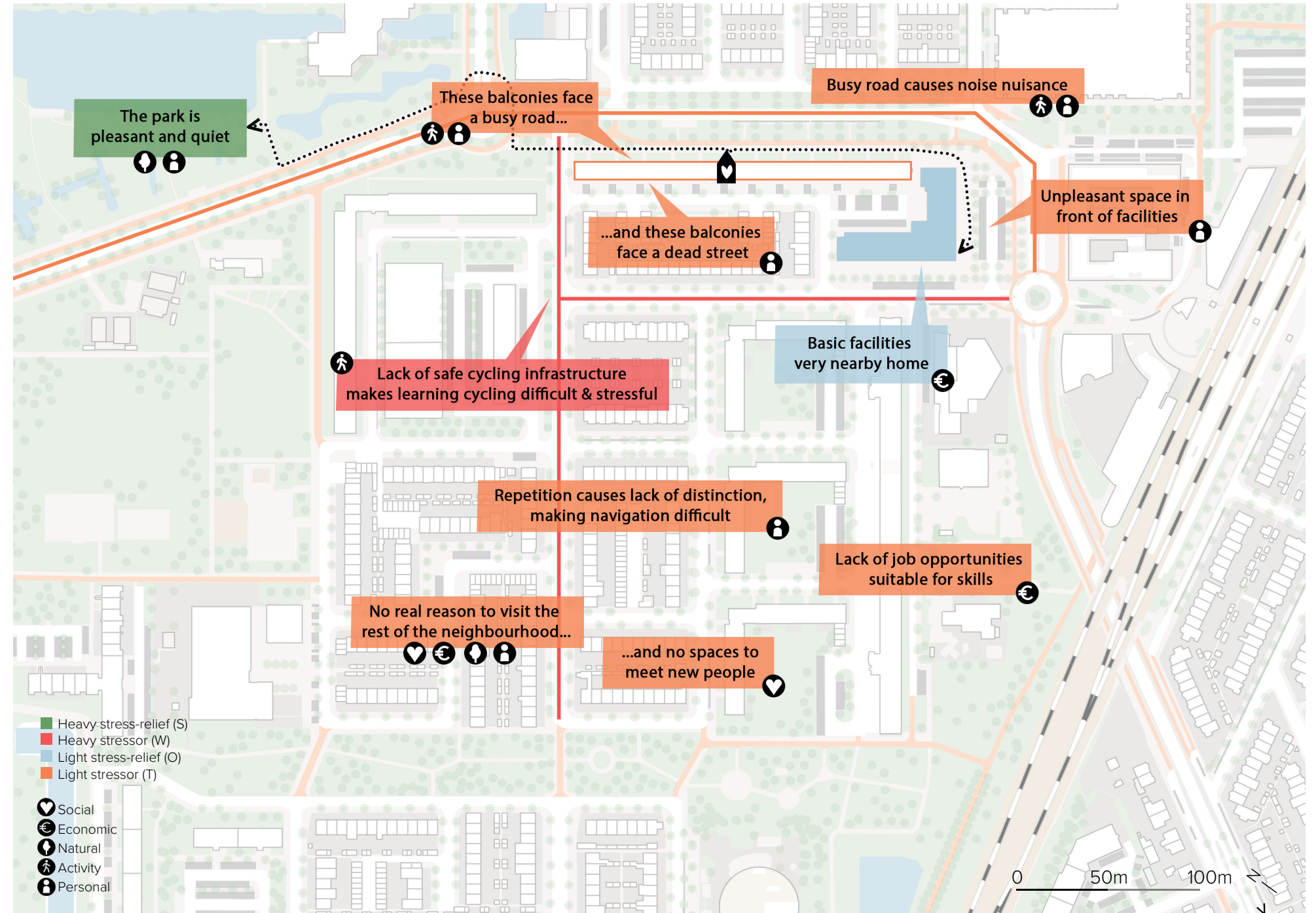
**Economic:** ● ● ● ●

**Natural:** ● ●

**Activity:** ● ● ● ●

**Experience:** ● ● ● ● ● ● ● ●

> Figure 6.4.4, STRESS map (recent) migrant





## Elderly

The elderly experience is a relatively negative one, with many categories scoring low. In particular, the activity category has many negative aspects, both strong and weak negatives. This is mostly due to the fact that elderly people generally are not very mobile, making them vulnerable in this aspect. For example, to be able to walk confidently and comfortably, elderly people need a seat at least every 200 meters, and for the least mobile elderly people, this distance needs to be as low as 100 meters. There are far too little seats in the neighbourhood to facilitate this. Even with ample seats, elderly people should not need to walk more than 500 meters to essential facilities such as a general practioner (Cammelbeeck, 2013), which is also not the case. In addition, both the social and experience category score only negative. The natural aspects are appreciated the most.

**Social:** ●●●

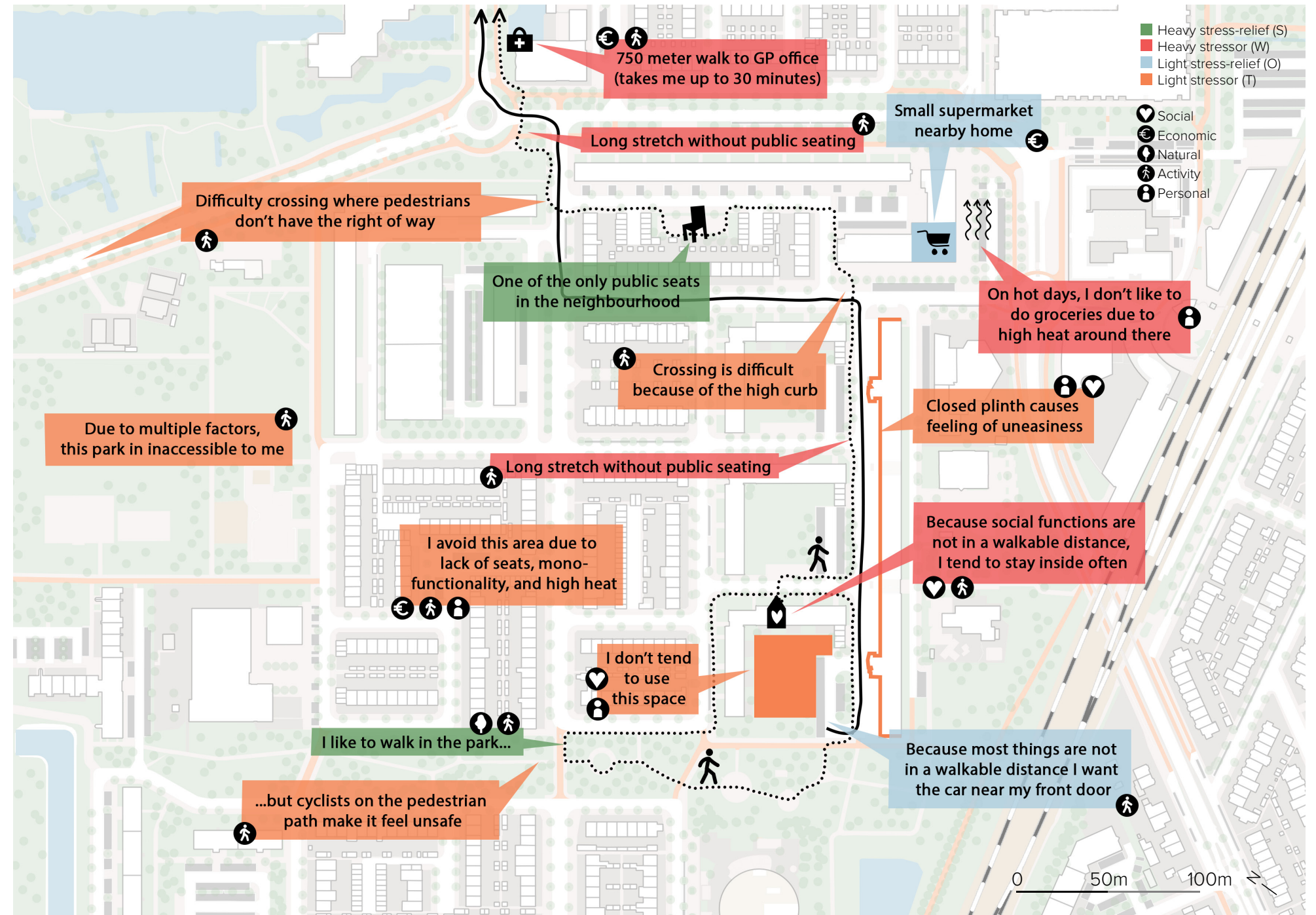
**Economic:** ●●●

**Natural:** ●●

**Activity:** ●●●●●●●●●●

**Experience:** ●●●●

> Figure 6.4.5, STRESS map elderly



## 6.5 Overall SWOT analysis

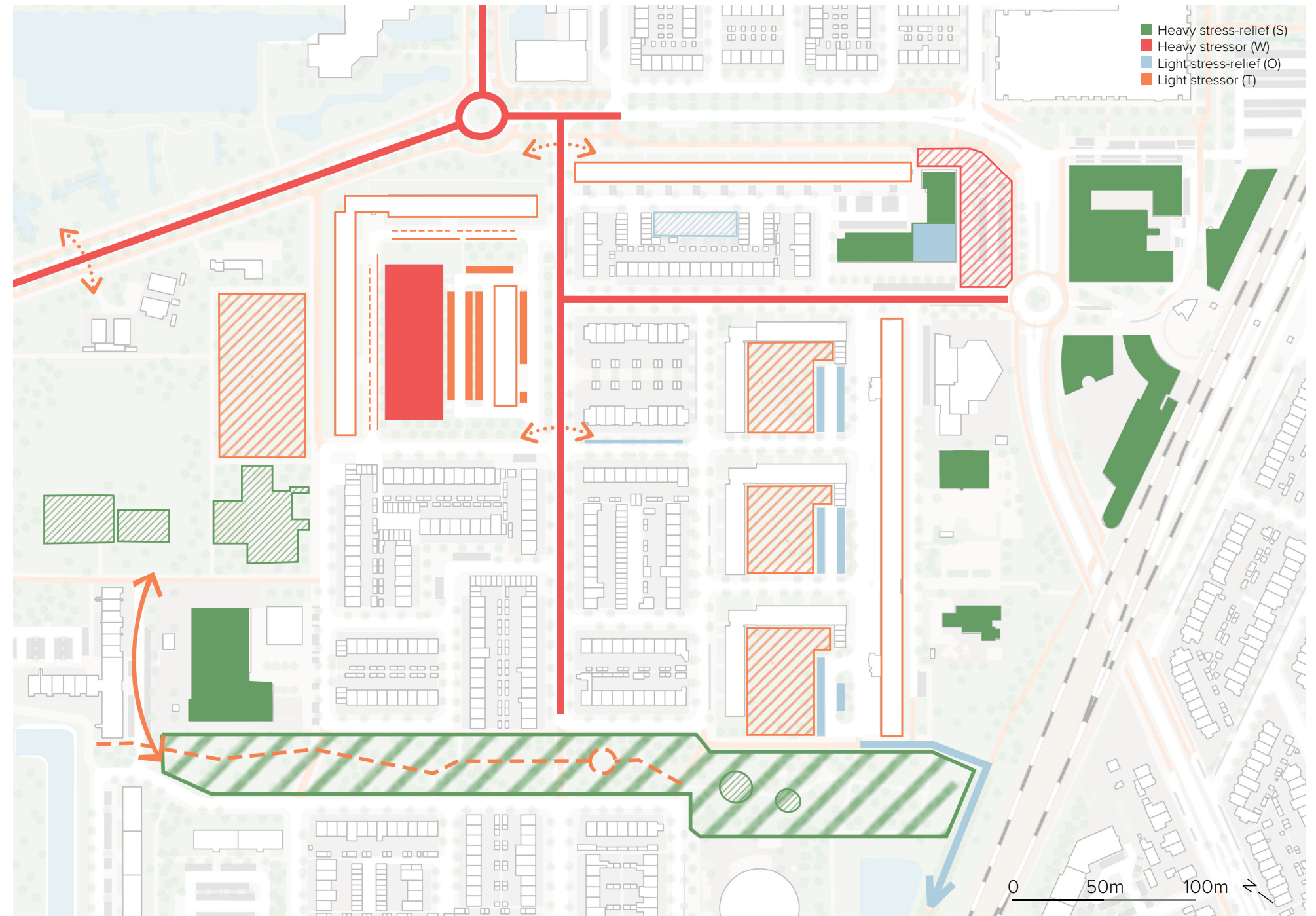
When all of the five perspectives are combined together, an overarching SWOT analysis can be made. Generally speaking, the natural elements and presence of some facilities are the most appreciated, whereas the unsafe roads, closed facades, and unclear design elements are the most negative.

### **Additional weaknesses & threats**

Something that is not present in the map, as it is difficult to show, is the disdain for the many **facilities that are lacking**. Therefore, these will be listed here, as they are important nonetheless:

- Job opportunities and workspace
- Social functions & cultural facilities
- Healthcare facilities
- Childcare facilities
- Public seats/social furniture

> Figure 6.5.1, Overall SWOT analysis map





# 07

## *Design*

In this chapter, the design for the Rubicondreef neighbourhood is presented. First, a full neighbourhood design is shown, which is then split into several themes: functions, which is focused on newly added public and collective functions, landscape, which is focused on natural elements and both green and blue spaces, and mobility, which is focused on changes to the car network and changes to the active modes of transport and public transport networks. Then, zoom ins into three key locations are shown, in a plan drawing and eye-level images from the perspectives of the aforementioned personas.

# 7.1 Neighbourhood design

The map on the right shows an overall view of the design for the neighbourhood, and this text explains the main elements of the design. Each of these themes will be explained further in this chapter.

## Functions (Relationships & social connections, Economic facilities & opportunities)

Apartment buildings with a blind and inactive plinth will gain new public or collective functions on the ground level, to increase the feeling of eyes on the street. The parking area in front of the shopping centre will be turned into a public square.

## Natural elements (Landscape)

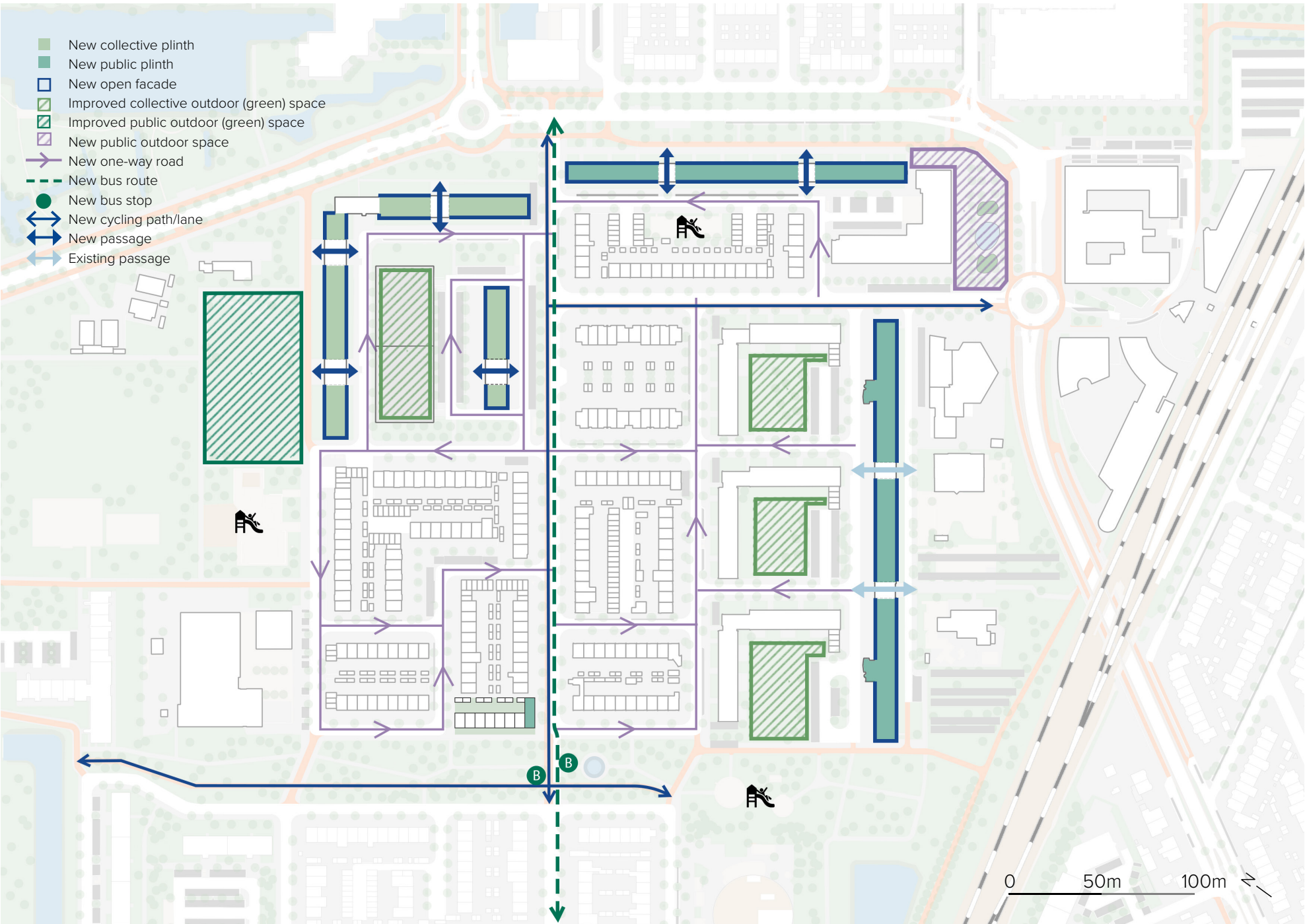
Biodiversity will be improved in existing green spaces, and more green elements will be added in areas that are currently lacking green spaces. Vegetation will be used strategically, such as to create a feeling of enclosure, to create a public-private barrier, and to lessen the visual dominance of cars.

## Mobility (Activity & mobility)

Most roads will be turned into one-way roads, to create more room for active modes of transport. An existing bus route will be re-routed to go through the neighbourhood, and a new bus stop will be created in the green framework. New cycling infrastructure will be added, to make cycling safer and more pleasant.

*Note: Xperience & comfort is not incorporated into the design themes as it is an inherent part of them all. It will be addressed more directly in the “zooming in” part following the design themes, as these zoomed in images will show the individual perception of the neighbourhood through the eyes of the personas.*

> Figure 7.1.1, Neighbourhood design map





## 7.2 Functions (Relationships & social connections, Economic facilities & opportunities)

### Collective plinth

The apartment buildings along the Faustdreef and Rubicondreef will gain collective functions on the ground floor, aimed at existing residents of these buildings. This includes places to work from home, childcare, and social spaces.

### Public plinth: health facilities

The apartment building along the Tannhäuserdreef will gain public facilities on the ground floor, with a focus on health. This includes functions such as a general practitioner, but also social spaces, a yoga studio, and healthy food shops. This location is accessible from the train station and existing shopping centre, but is also along a relatively quiet road, making it suitable for health-related functions.

### Public plinth: economic & commercial

Next to the existing shopping centre, the building along the Carmendreef/Moezeldreef will gain public, economy-related functions, such as workshop spaces and commercial spaces. The proximity to the existing shopping centre and busy road makes this location suitable for economic and commercial functions. A new cafe will be established next to the new bus stop, to increase interest in that area of the neighbourhood, while not intruding on the existing quiet character.

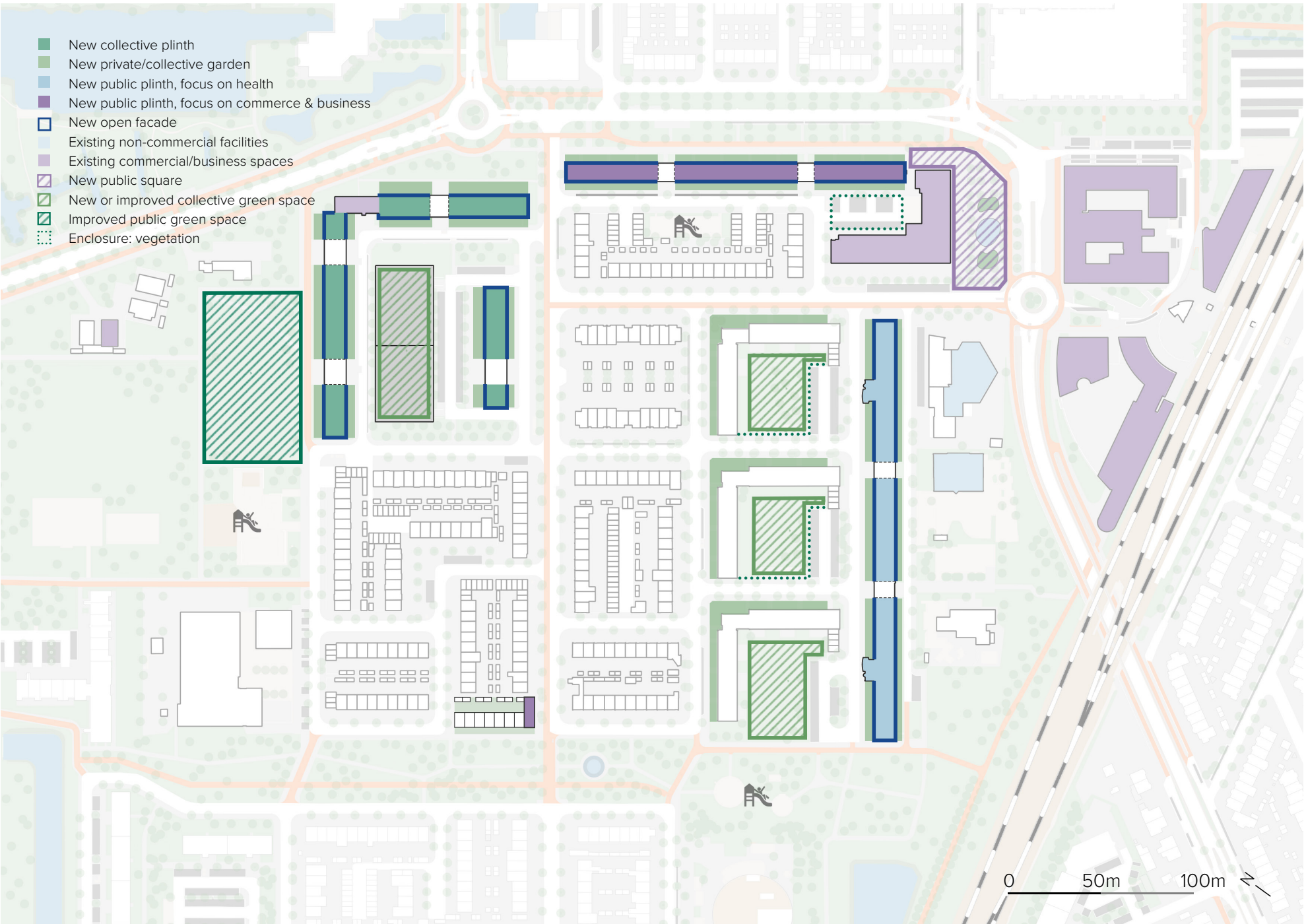
### Collective outdoor spaces

Existing collective gardens along the Tannhäuserdreef, will go from an empty field to being enclosed and having a function, to increase the chances of the space actually being used. There will also be a new collective garden on the roof of the parking garage along the Faustdreef.

### Public outdoor spaces

The park along the Don Carlosdreef will increase in biodiversity and gain functions and points of interest. The existing parking area in front of the shopping centre will be turned into a public square with meeting spaces.

> Figure 7.2.1, New functions map



### 7.3 Natural elements (Landscape)

### ***Public park, green framework***

The existing park is made more qualitative, through increasing biodiversity and adding points of interest. This increase in biodiversity is always limited to native species, to not disrupt the local ecosystem. A complete list of native plant species is included in the Appendix. The connectivity of the different zones is also increased, by creating a green corridor.

### Collective green spaces

Existing collective gardens are improved upon, by adding enclosure in the form of vegetation, increasing biodiversity, and adding program. This way, these spaces are more comfortable and interesting for residents to visit and use.

### *Public-private differentiation through vegetation*

For apartment buildings that currently have no public-private buffer, gardens and vegetation are used to establish a differentiation between the public and private, creating a buffer zone. This also offers residents a space of their own.

**Public square (blue and green)**

The space in front of the shopping centre is currently a parking lot. These parking spaces will be taken out and replaced by a public square, with seating along planters and a climate fountain. More explanation is given from page 168 and onwards.

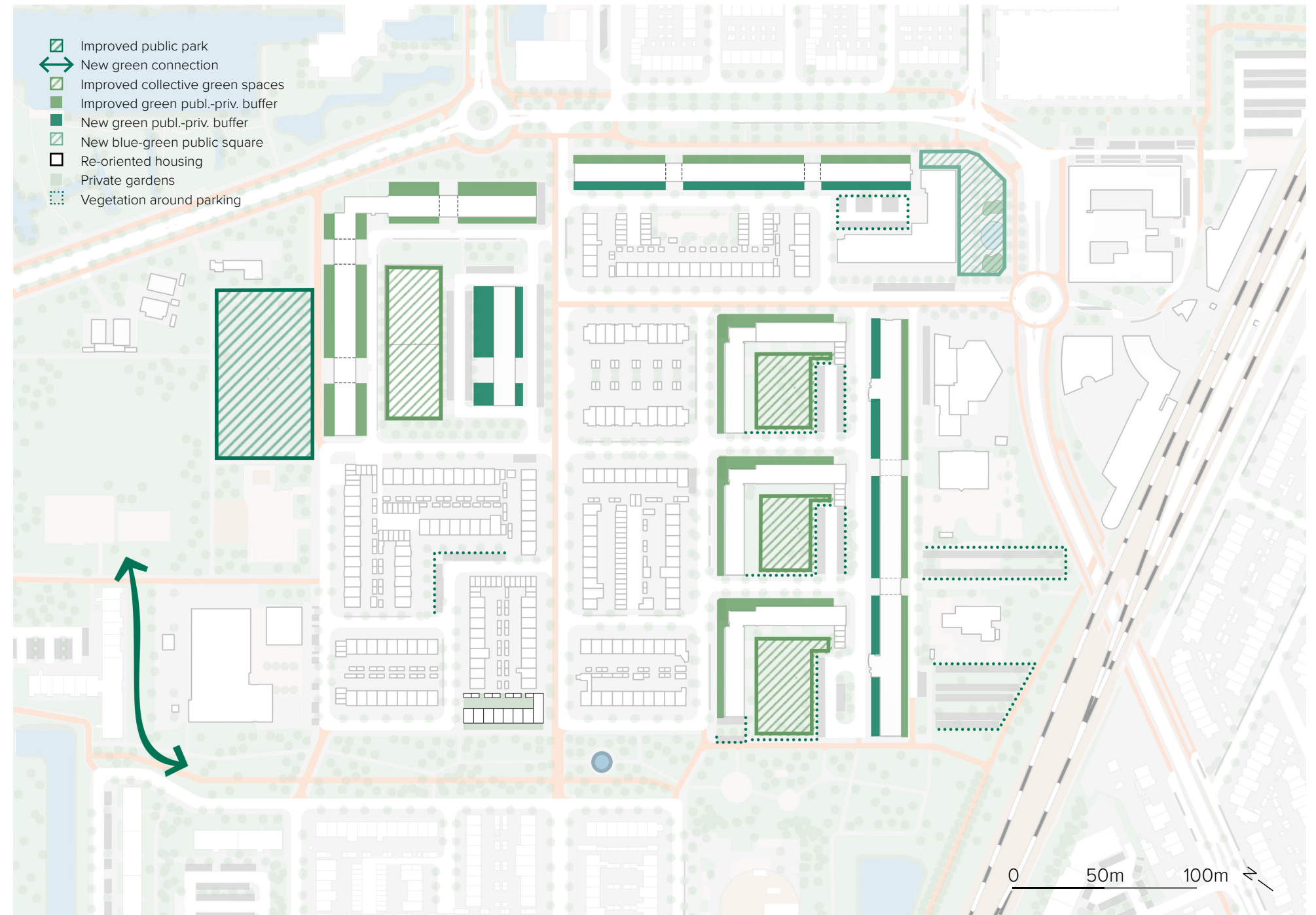
### ***Re-oriented housing***

The row houses next to the green framework that are currently not oriented towards the park and have a dead facade facing the park, are “re-oriented” in such a way that the residents have a view of the greenery next to their house. The amount of houses is kept the same.

### ***Parking***

Lastly, vegetation is used to “hide” parking areas, both existing and new, to make cars less visually dominant. This will be explained more on the next page.

> Figure 7.3.1, New natural elements map





# 7.4 Mobility (Activity & mobility)

## Car

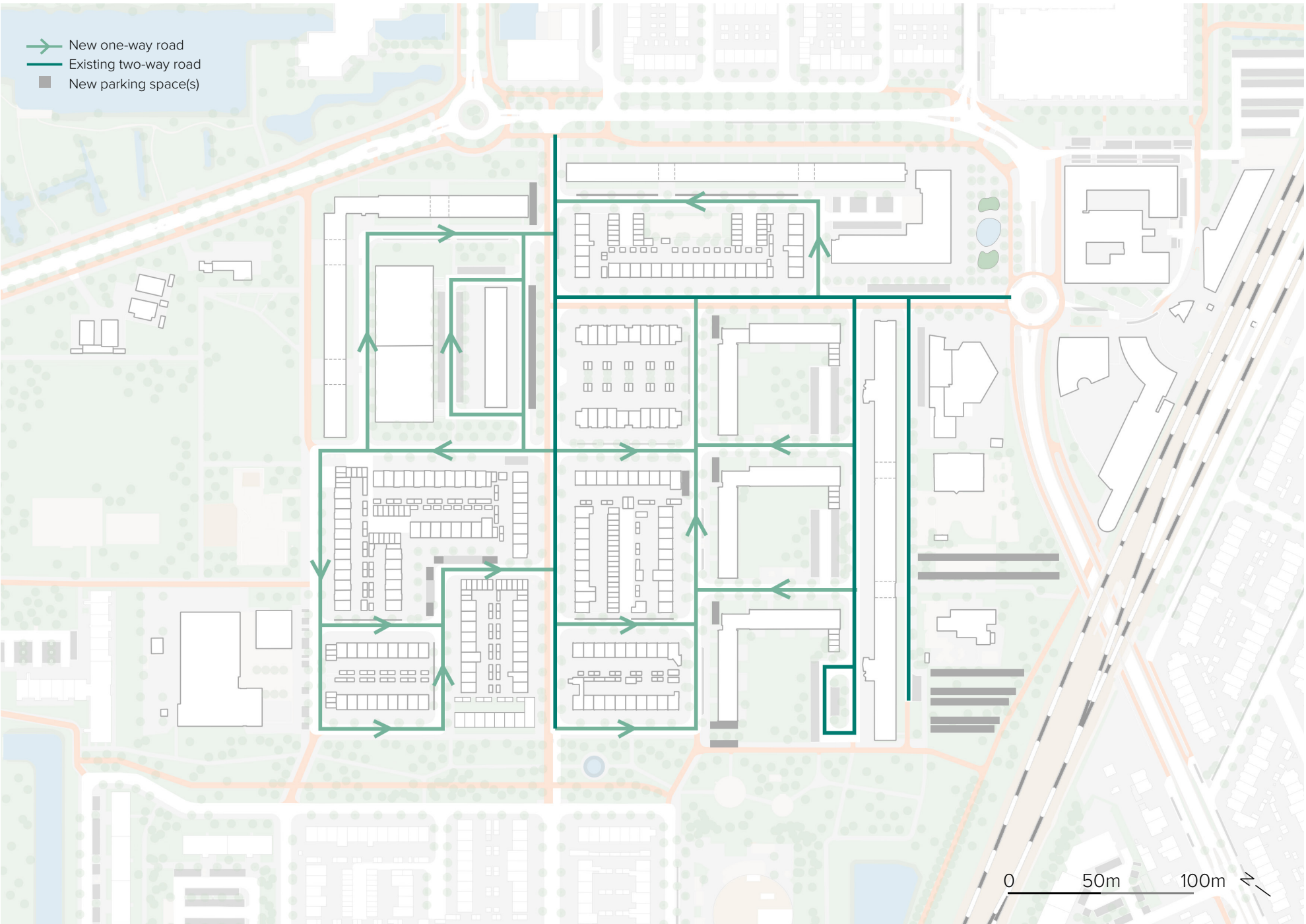
### Traffic direction

Roads will be made one-way wherever possible, to make more room for active modes of transport networks, while keeping the neighbourhood accessible by car, too. The two main roads and access points to the neighbourhood, the Rubicondreef and Arnodreef, are kept two-way for accessibility and traffic flow. More explanation is given on page 160 and 161.

### Parking

The parking spaces indication included in the Appendix shows that nearly every road has parking on both sides, meaning that the parking pressure on the neighbourhood is high and the car is very (visually) dominant. In order to relieve some of this pressure, additional parking spaces that are not along the sides of roads are supplied. The parking garage along the Faustdreef is opened up again, which offers over 100 new spaces. Parking pockets are made wherever possible, and some new larger parking lots are made on the outer edge of the neighbourhood. More exact numbers are included in the Appendix. To make these spaces and the existing spaces less visually dominant and stress-inducing, vegetation is used to “hide” the cars and half-open tiles are used to improve infiltration and lower heat stress.

> Figure 7.4.1, New car mobility map



## Car-alternatives

### Cycling network

As there is currently next to no cycling infrastructure in the neighbourhood, improvements are in order. There is a new cycling path through the green framework, to separate cyclists from pedestrians. Along the Rubicondreef and Arnodreef, new cycling lanes or paths are established. Other roads, that are turned into one-way roads, will give room for cycling lanes on either side. More details are shown on the next two pages.

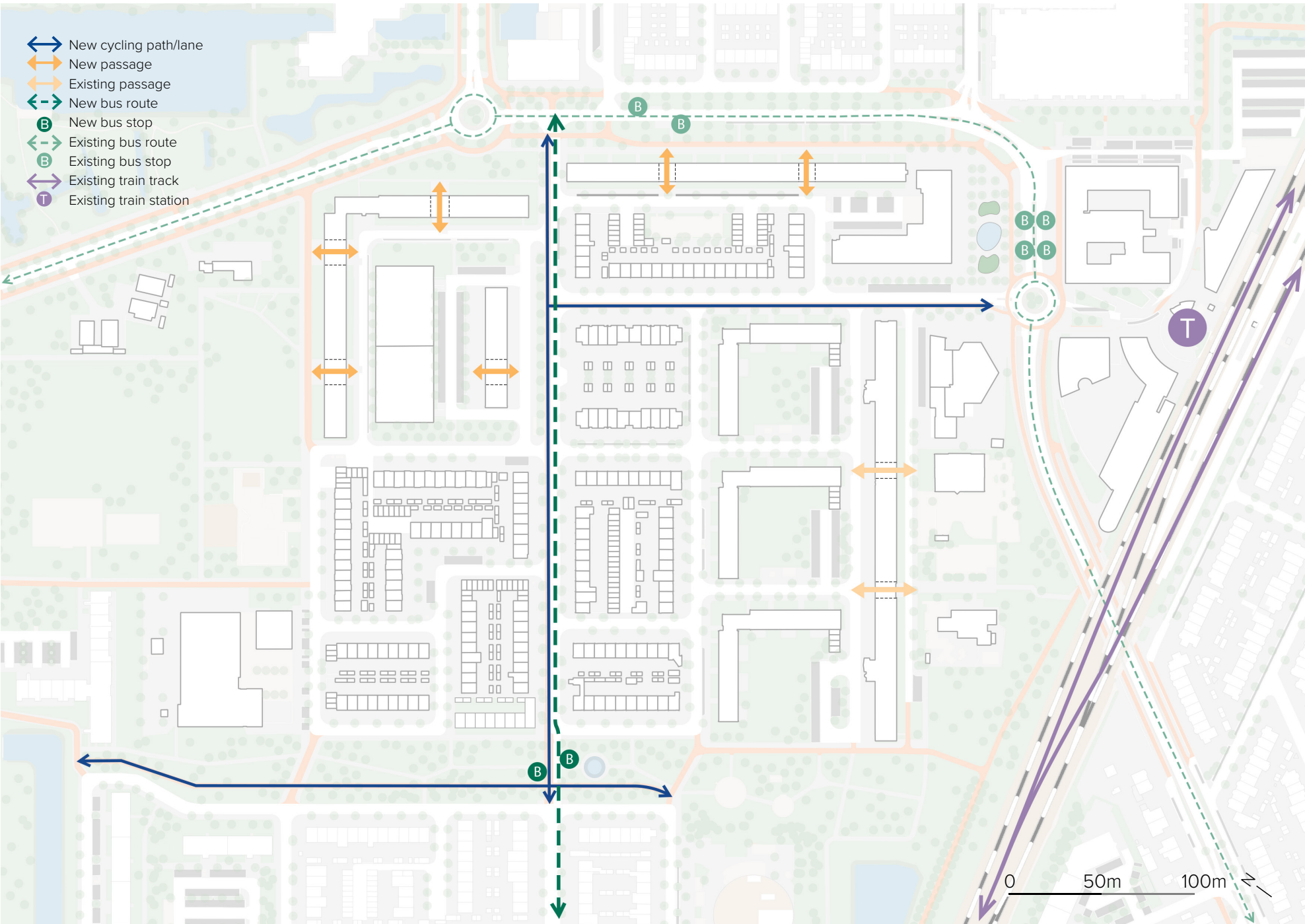
### Pedestrian network

To make navigating through the neighbourhood more pleasant, strategic passages are made through existing apartment buildings. Along the Carmendreef/Moezeldreef, these passages allow quicker access from inside the neighbourhood to the bus stop and vice versa. Along the Faustdreef, the new passages give quicker and easier access to the improved park area.

### Public transport connection

An existing bus route will be re-routed to go through the neighbourhood, rather than just pass it by. This bus route will go over the Rubicondreef, one of the main roads. To accommodate this new route, a new bus stop is added in the green framework. This includes a bus lock, to ensure that cars cannot pass through the park. This new bus stop allows for quick access to a bus stop from everywhere in the neighbourhood, with no household having to move further than 300 meters.

> Figure 7.4.2, New active modes of transport networks mobility map





# Changes to road system

Nearly all roads in the neighbourhood will be changed in one way or another in the design. Some of the choices that have been made, will be explained here. It could be useful to consult the road width-analysis included in the Appendix.

## Two-way, main roads

The neighbourhood has two main access points for cars: the Arnodreef and the Rubicondreef. These roads are also the widest, as both are around 8,5 meters. Currently, both roads are two-way streets with high speed traffic and without cycling infrastructure. In the design, both roads will be kept two-way, but will both gain cycling infrastructure, either as one cycling path on one side, or a cycling lane on both sides of the roads. According to the space requirements shown in figure ..., the road is wide enough for these infrastructure changes, given that the maximum speed is lowered from 50 km/h to 30 km/h (Fietzersbond, 2023).

## One-way roads

Most other roads throughout the neighbourhood will be made one-way roads, as they mainly carry destination traffic. Nearly all of these roads are around 6 meters wide, making them quite a lot smaller than the aforementioned main roads. According to the Fietzersbond, 6 meters is wide enough for low speed, one-way car traffic and a cycling lane on both sides of the road, while still offering cyclists a comfortable and safe cycling experience. Therefore, the roads that are 6 meters wide, will be modified to fit this model wherever possible.

Beschrijving	Breedte (cm)
fietser <sup>1</sup>	75
bromfietser <sup>2</sup>	100
vrachtfietser <sup>1</sup>	100
auto <sup>2</sup>	200
bestelauto <sup>2</sup>	230
auto-max <sup>2</sup>	260

1) excl. vetergang en op/afstapruimte  
2) incl. spiegels

Schuwafstand (cm)	
fietser - stoepband <sup>1</sup>	25
fietser – fietser <sup>2</sup>	50
fietser - P-plek	50
fietser – auto <sup>2</sup>	80
auto - auto	30
auto - stoepband	25

1) incl. goot met kolk  
2) in tegengestelde richting: +20

Figure 7.4.3, Space requirements of most common traffic participants (Fietzersbond, 2023)

## Main roads: Arnodreef:

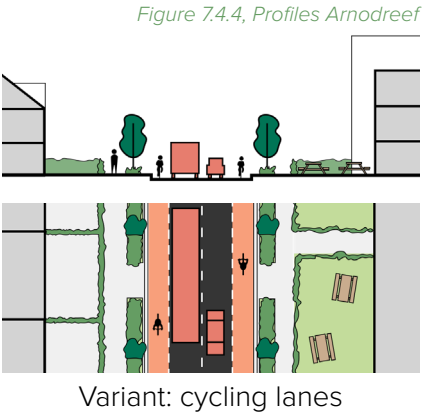
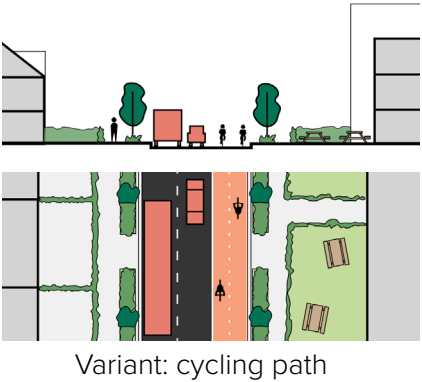
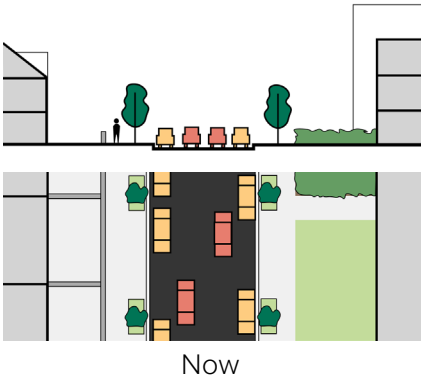


Figure 7.4.4, Profiles Arnodreef

## Rubicondreef:

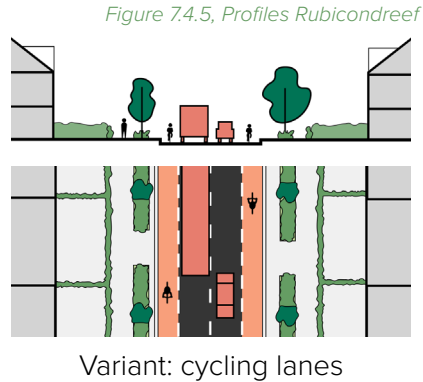
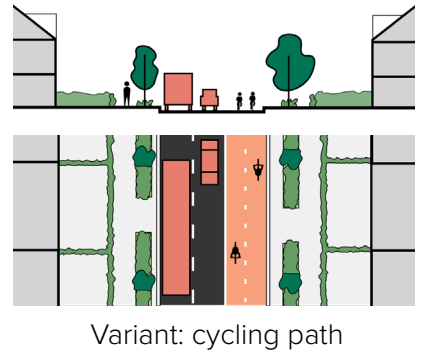
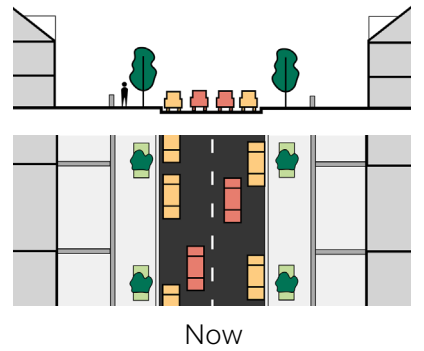


Figure 7.4.5, Profiles Rubicondreef

## Other roads: Othellodreef:

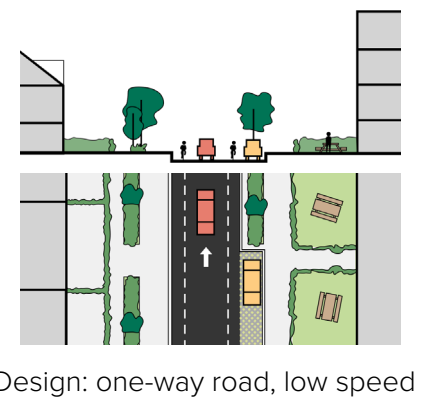
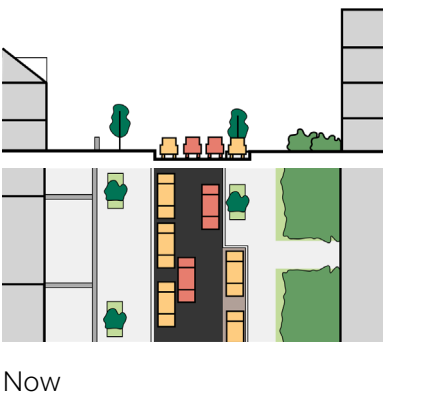


Figure 7.4.6, Profiles Othellodreef

7.5 Zooming in

Faustdreef: status quo

To show the design in more detail and show how the personas are incorporated, three zoom-in are made, the first of which is the apartment building along the Faustdreef. The map on the right shows the main stressors present here, which are also listed on the right. In addition, on pages 168 and 167, eye level impressions are shown. The location from where those perspectives were made, have also been indicated on the map on the right.

> Figure 7.5.1, Satellite image Faustdreef

- S2 Lack of eyes on the street
- S3 Not enough space of your own
- TR2 Lack of traffic safety
- TR3 Traffic
- E2 Deterioration
- E5 Violence/crime
- S1 Lack of (accessible) greenery
- S2 Low biodiversity
- S2 Lack of detail & distinctions
- S3 Sharp edges/straight lines

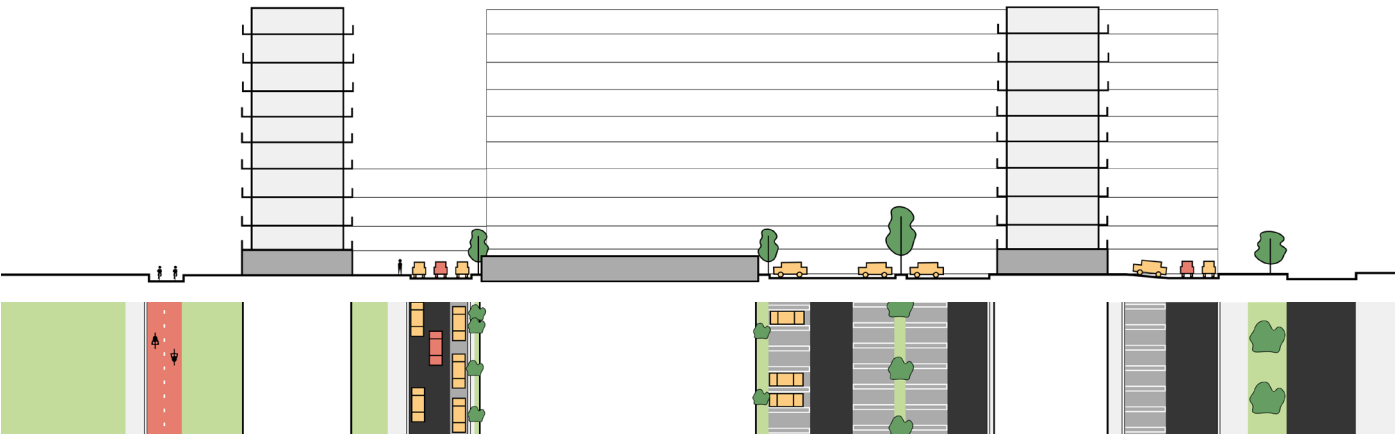


Figure 7.5.2, Schematic section Faustdreef current





# Faustdreef: design

The focus in this design zoom in is on opening up the ground floor: from storage spaces with a closed facade, to collective functions, like social spaces, work spaces, and childcare, and housing with an active and open facade, to improve (perceived) security. The existing green border around the building is transformed into gardens, to improve the public-private differentiation. The parking garage is back into use, which allows for the transformation of other, above-ground parking spaces into broader sidewalks and greenery. The roof of this parking garage is turned into a collective garden for residents, which can be seen more clearly in the section in figure 7.5.4 below. The Rubicondreef, that goes by the building, gains cycling infrastructure and safer pedestrian crossings, to improve the active modes of transport networks.

> Figure 7.5.3, Design map Faustdreef

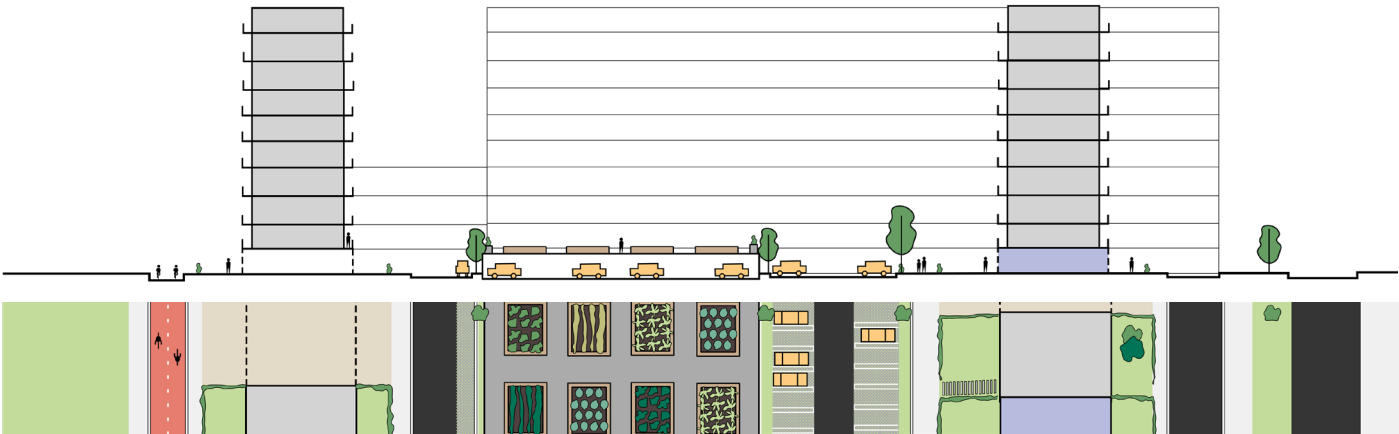
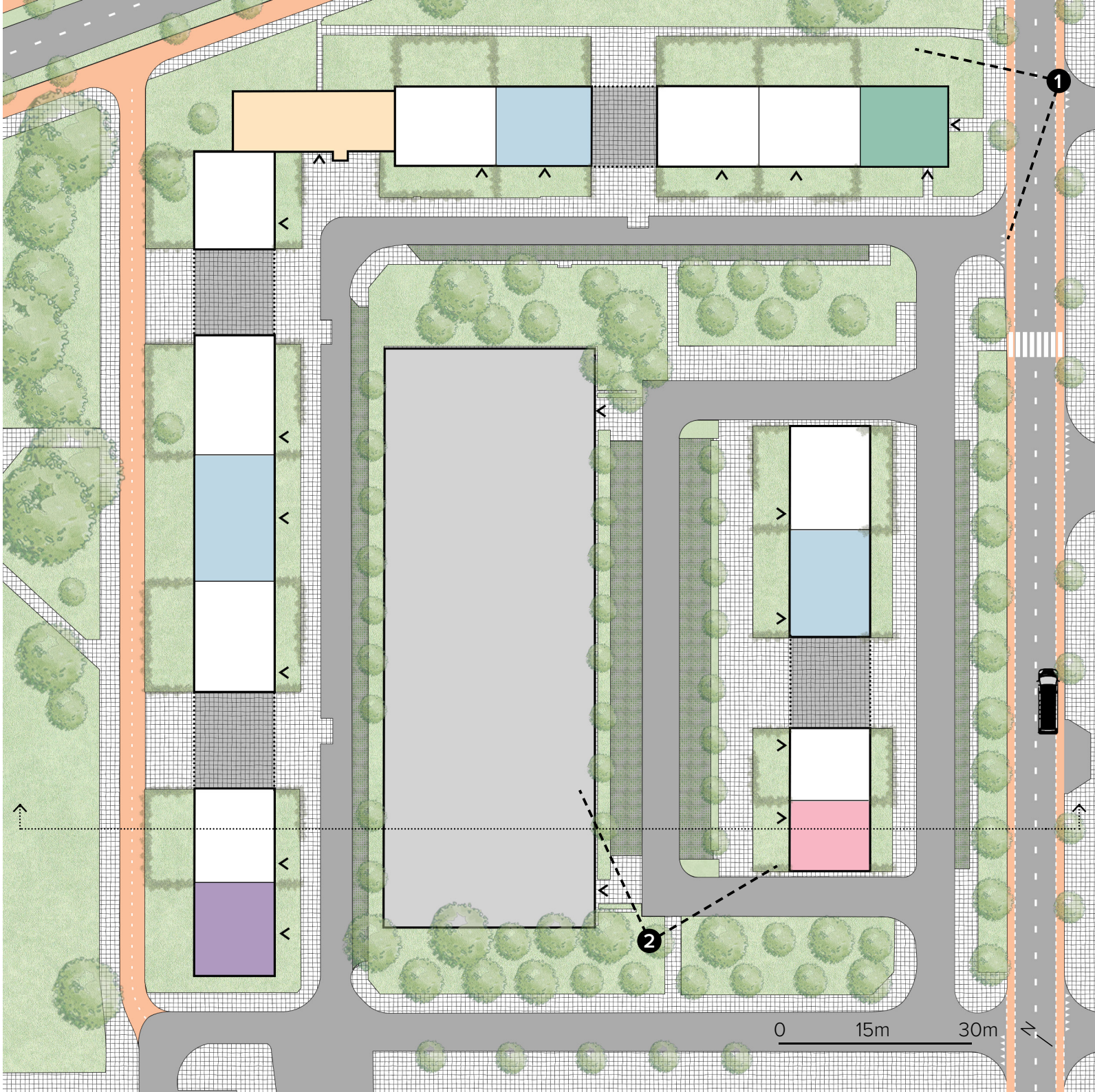


Figure 7.5.4, Schematic section Faustdreef design

- > Legend
- Work near home space (new)
  - Child care (new)
  - Neighbourhood cafe (new)
  - Repair shop (new)
  - Offices (existing)
  - Parking garage (back into use)
  - Apartment (new)





Faustdreef: design

On the right, all of the relevant design measures are listed, and the map on the right show the exact locations where most of these listed design measures are applied. Some design measures are not necessarily spatial or are difficult to pinpoint, so these are not shown in the map but are still listed on the right.

Important note: for the design measures, I only indicated the locations where said design measure is newly added. Wherever restorative design elements were already present, those elements have not been indicated. This also goes for the other zoom in locations.

> Figure 7.5.5, Design map Faustdreef

- R2 Indoor meeting spaces
- R4 Active, open, and detailed facades
- R7 Private-public differentiation
- R8 Space of your own
- R9 Clear design
- E4 Exchange of goods and/or services
- E6 Work-near-home
- L1 Visual greenery
- L2 Small-scale greenery around home
- L4 Biodiversity
- A1 Safe active modes of transport networks
- A3 Enough space for pedestrians
- A4 Walkable distance to facilities
- A8 Good public transport
- A9 Better car parking spaces

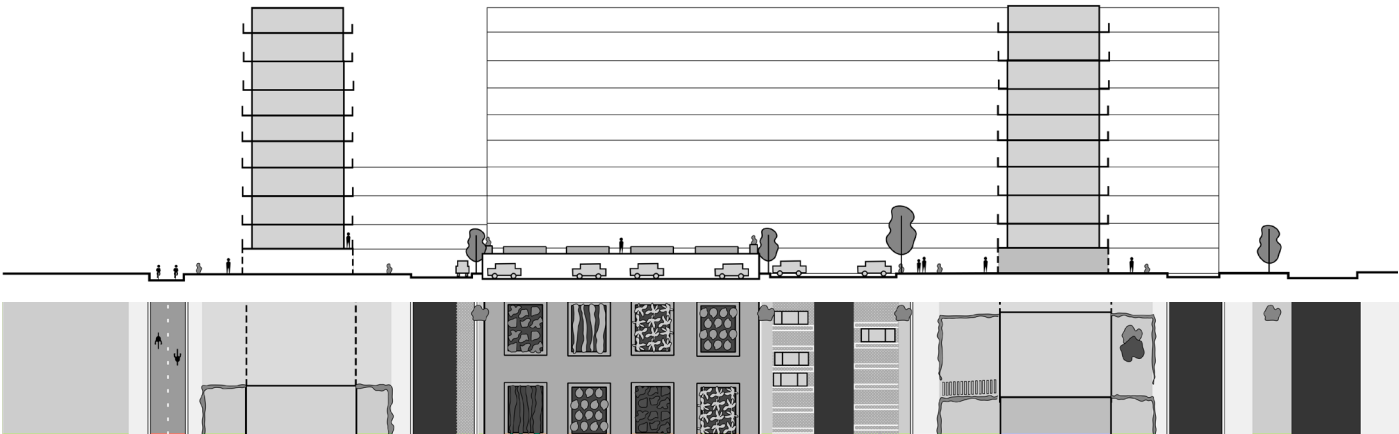
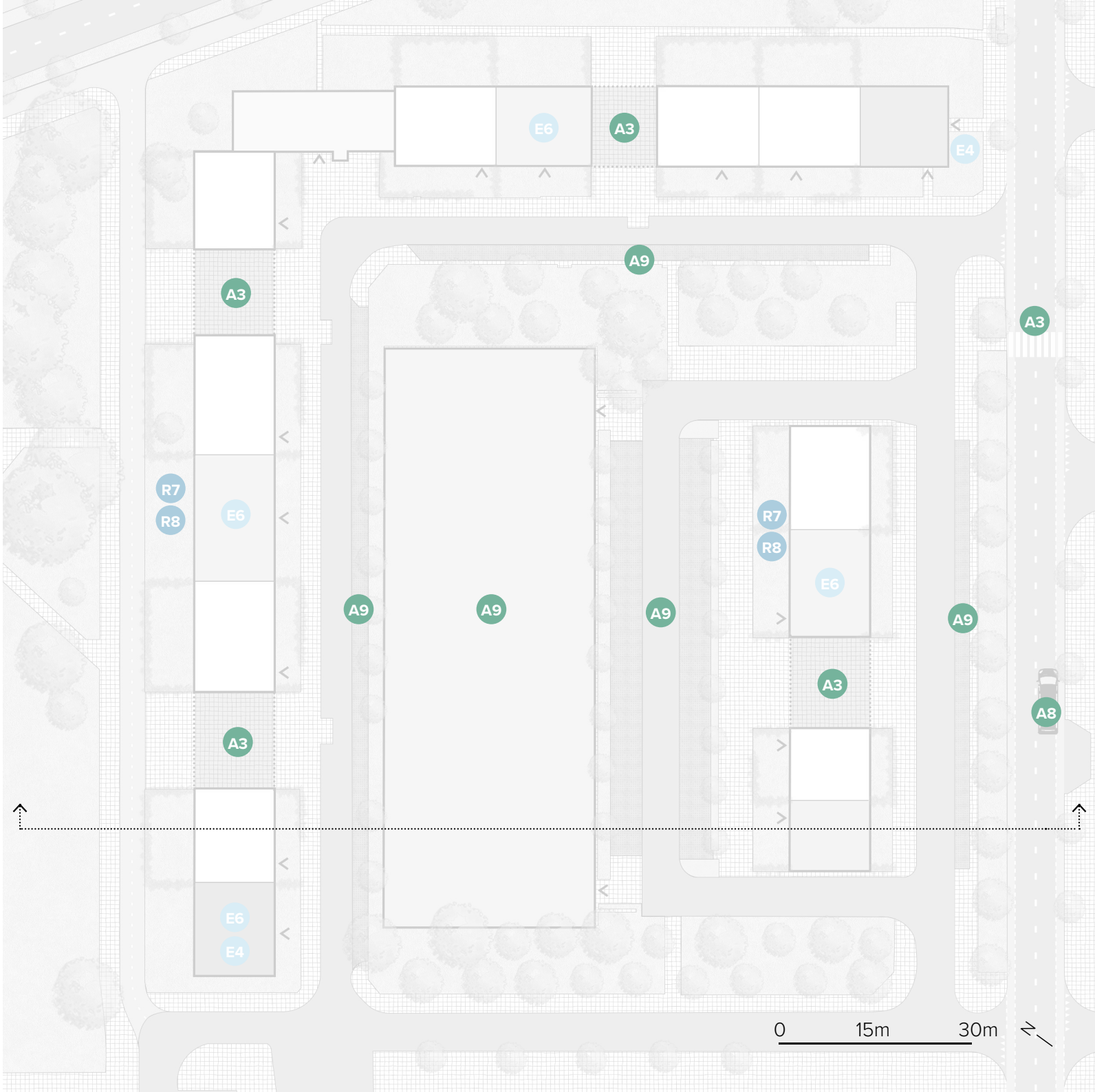


Figure 7.5.6, Schematic section Faustdreef design





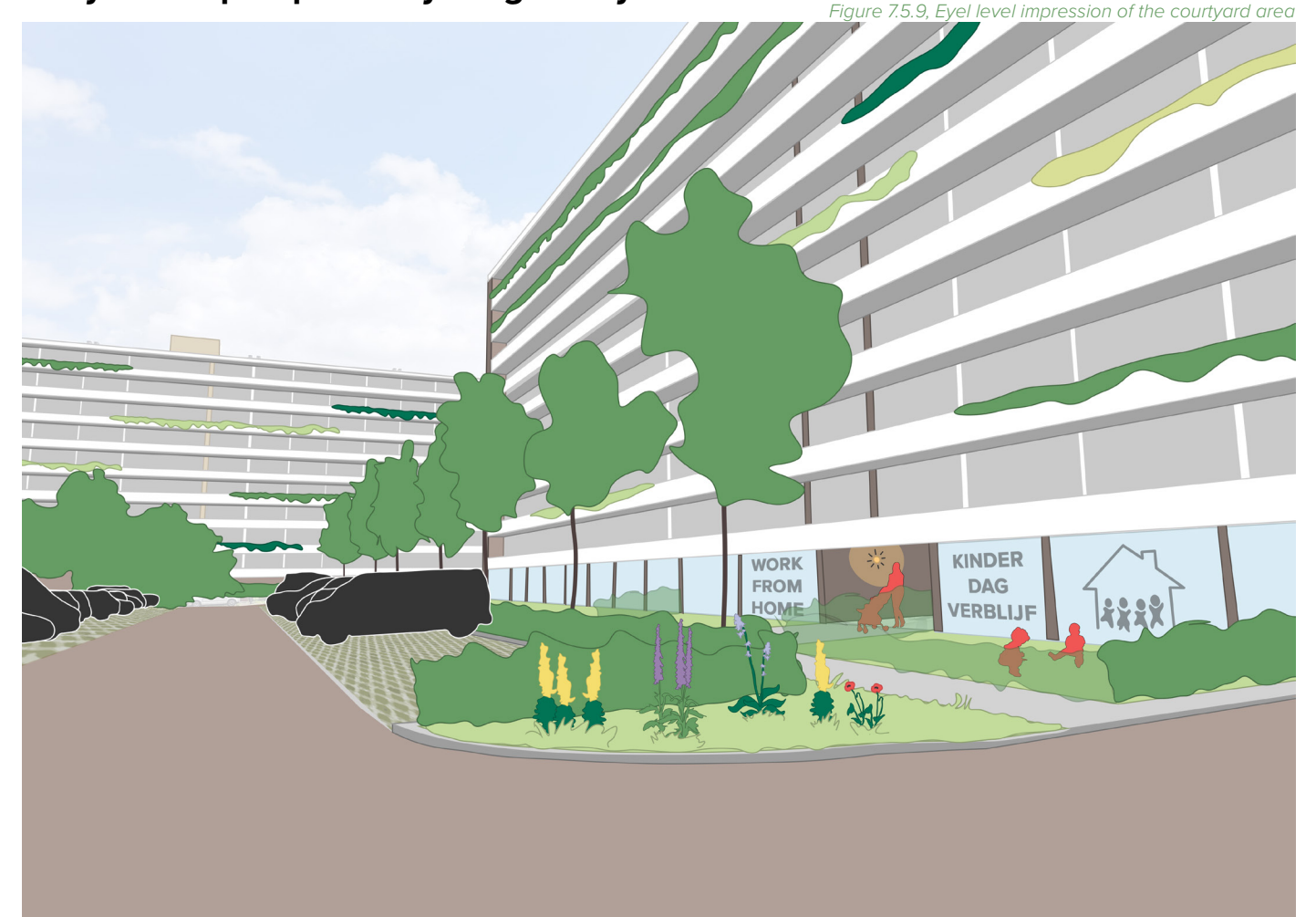
## 1. Eye level perspective young family



"Overall, the building and its surroundings have been made a lot more pleasant. Me and my children can cycle more safely due to the new lanes, and the safe crossings improve pedestrian safety. If we want to socialise, I can pop into the local neighbourhood cafe that has been opened on the corner of the building, whose produce comes from the new roof garden. The painting of the famous footballer from Overvecht inspires my children to achieve great things, and the painted breathing exercise reminds us to and helps us relax when we walk by."

< Figure 7.5.8, Photo of the current situation of the Rubicondreef

## 2. Eye level perspective young family



"Many of the existing parking spaces have made room for more greenery, and the new planters on the balconies add to this green character. The new passages through the ground level of the buildings have made the courtyard more accessible and it feels more open, while still feeling enclosed. When I want to work from home, I can go to the work spaces downstairs and I can leave my children at the daycare, right nextdoor."

< Figure 7.5.10, Photo of the current situation of the courtyard area



Tiberdreef: status quo

The second zoom in location, is the Tiberdreef. Specifically, the area in front of the shopping centre. This is currently a parking space, with a few bike parking spaces. The map on the right shows the stressors.

> Figure 7.5.11, Satelite image Tiberdreef

- S2 Lack of eyes on the street
- S3 Not enough space of your own
- TR1 Lack of physical activity
- TR2 Lack of traffic safety
- TR3 Traffic
- E1 Bad quality housing
- E4 Unstable economic conditions
- S1 Lack of (accessible) greenery
- S2 Low biodiversity
- S5 Air pollution
- S6 Heat
- S8 Noise pollution

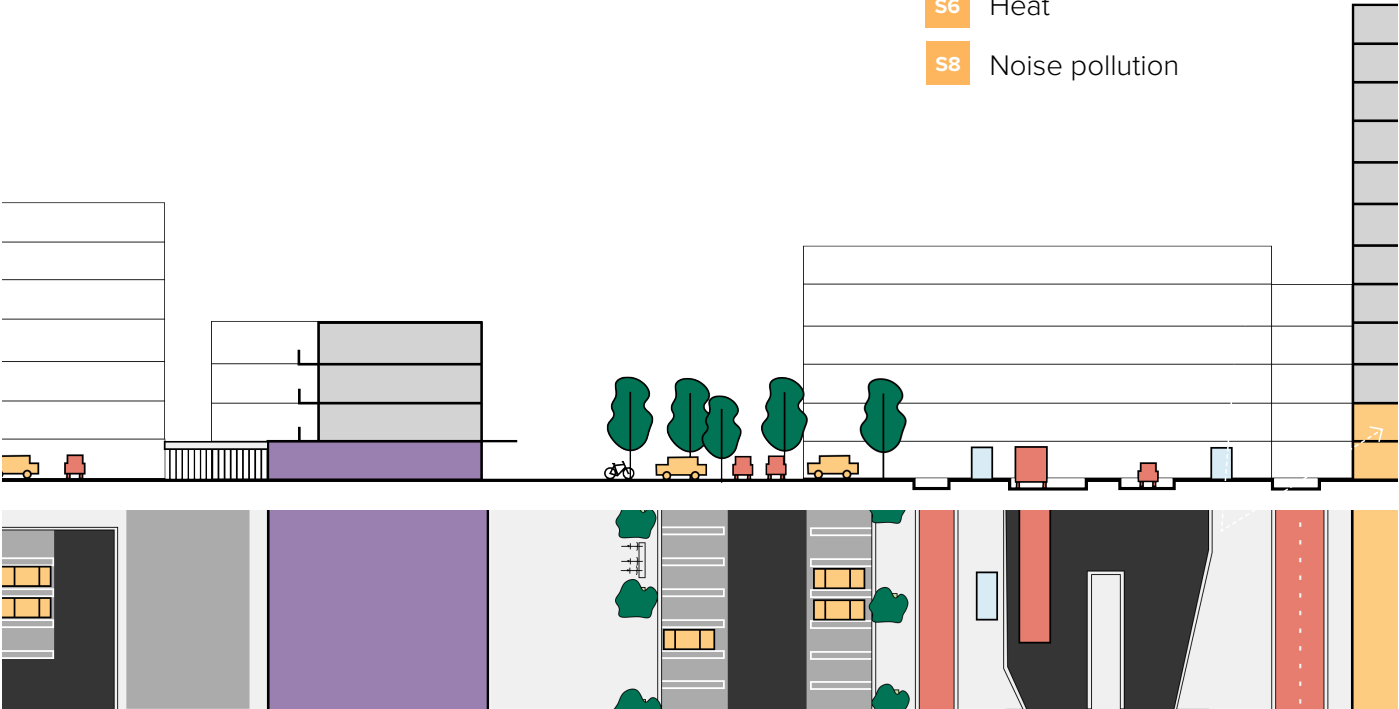
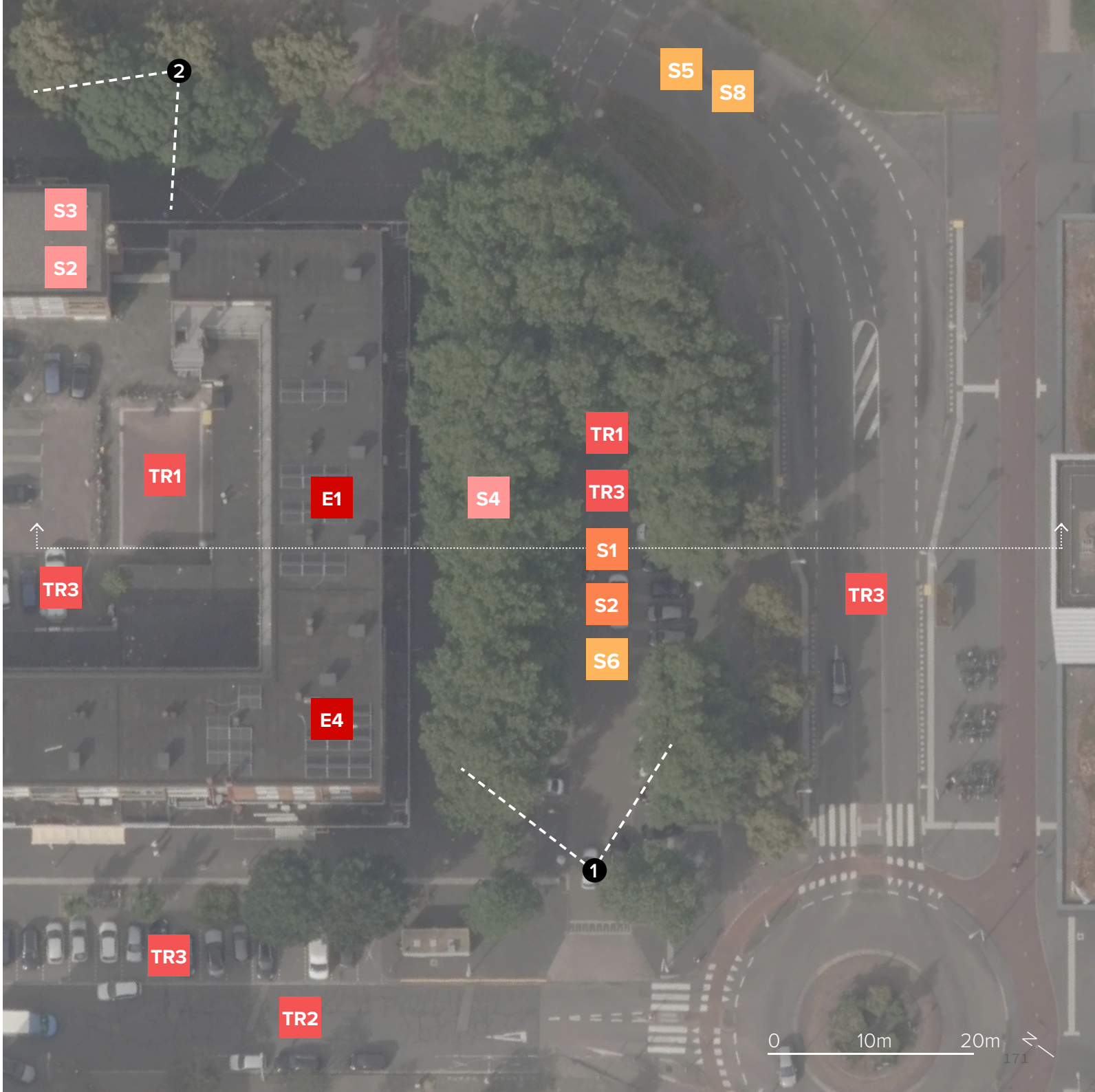


Figure 7.5.12, Schematic section Tiberdreef current





Tiberdreef: design

The parking area is turned into a new neighbourhood square, which can be used as a meeting space for residents for the neighbourhood and/or visitors to the shopping centre. New organically shaped planters with seats around the edge are added, to provide new and comfortable places to rest and meet others. In the middle, a so-called “climate fountain” is added, which is a water feature that provides an interactive place to play, and to sit and meet others, while also helping cool down the area on hot days and help with water retention. The climate fountain is inspired by the climate fountain in Kanaleneiland, which was designed and developed by design studio Rademacher de Vries (Rademacher de Vries, n.d.). As this area is also the first thing one sees when they exit the train station, it can also help improve the first impression of the neighbourhood and district.

> Figure 7.5.13, Design map Tiberdreef

- > Legend
- Workshop space (new)
  - Commercial space/shop (new)
  - Commercial space/shop (existing)
  - Offices (existing)
  - Apartment (new)

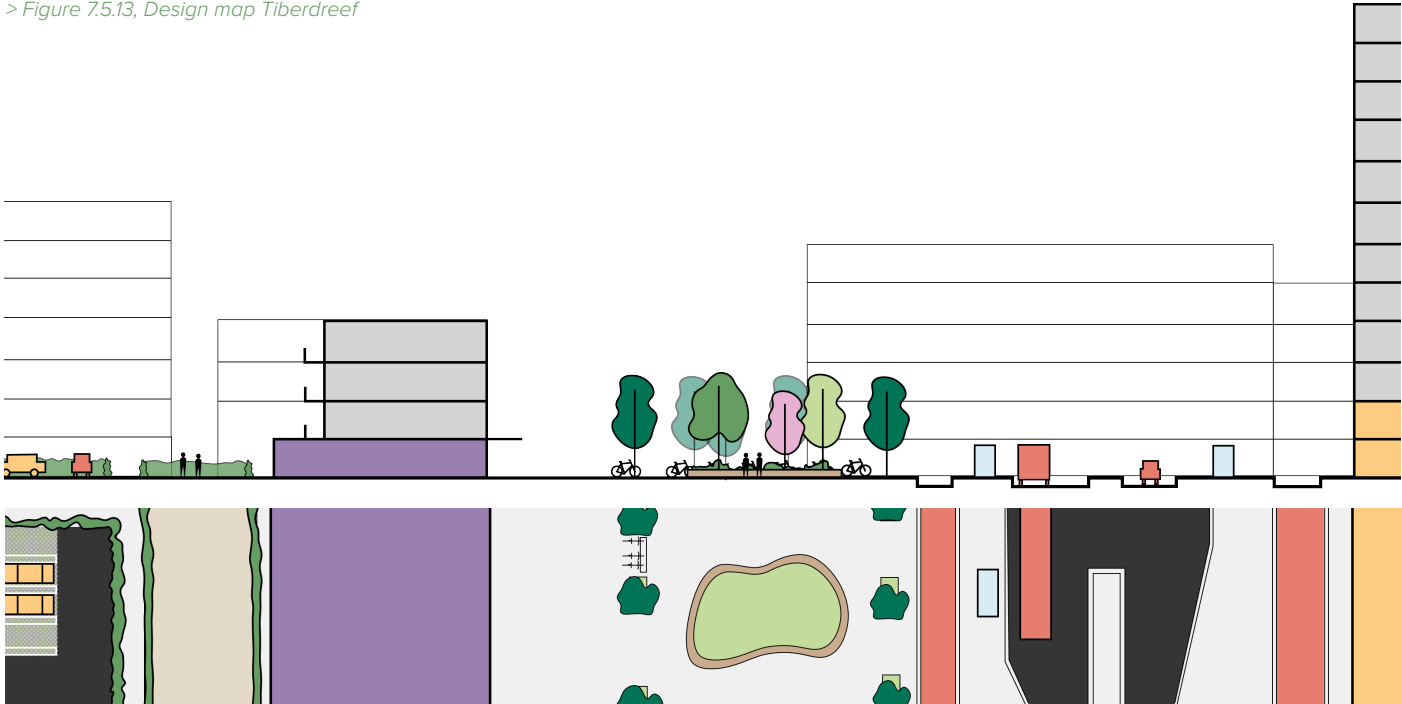
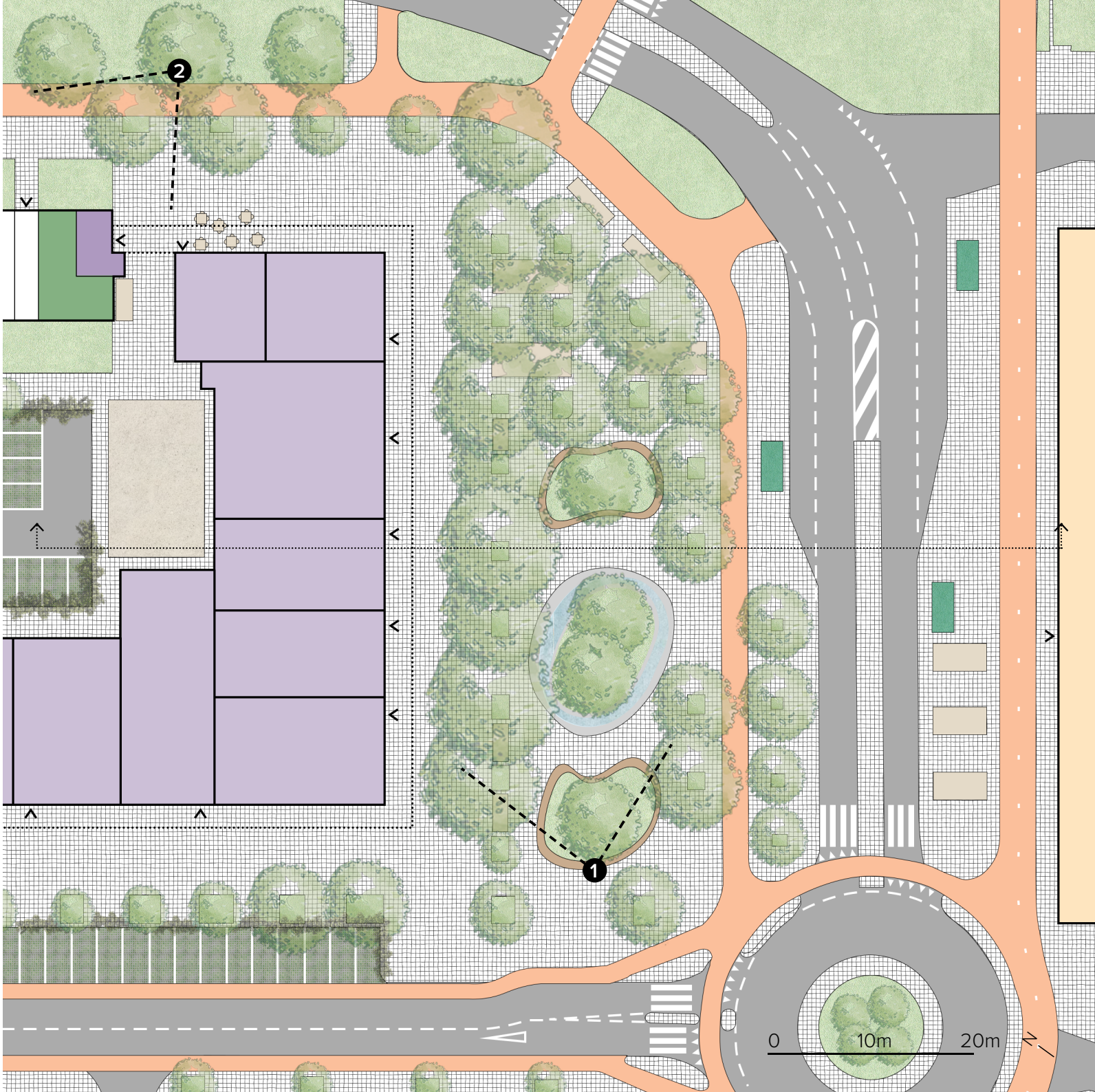


Figure 7.5.14, Schematic section Tiberdreef design





# Tiberdreef: design

The map on the right shows the exact locations of the design measures, wherever applicable.

> Figure 7.5.15, Design map Tiberdreef

- R1 Good quality public spaces
- R4 Active, open, and detailed facades
- R7 Private-public differentiation
- R8 Space of your own
- R9 Clear design
- E1 Workshop spaces
- E2 Commercial spaces
- E4 Exchange of goods and/or services
- L1 Visual greenery
- L4 Biodiversity
- L5 Water elements
- L6 Natural sounds
- A1 Safe active modes of transport networks
- A2 Pleasant & interesting environments
- A3 Enough space for pedestrians
- A5 Public seats/furniture
- A6 Enough bike parking
- A9 Better car parking spaces
- X1 Visual complexity/interest
- X5 Refuge from heat
- X7 Comfortably placed furniture
- X8 Diversity & variety

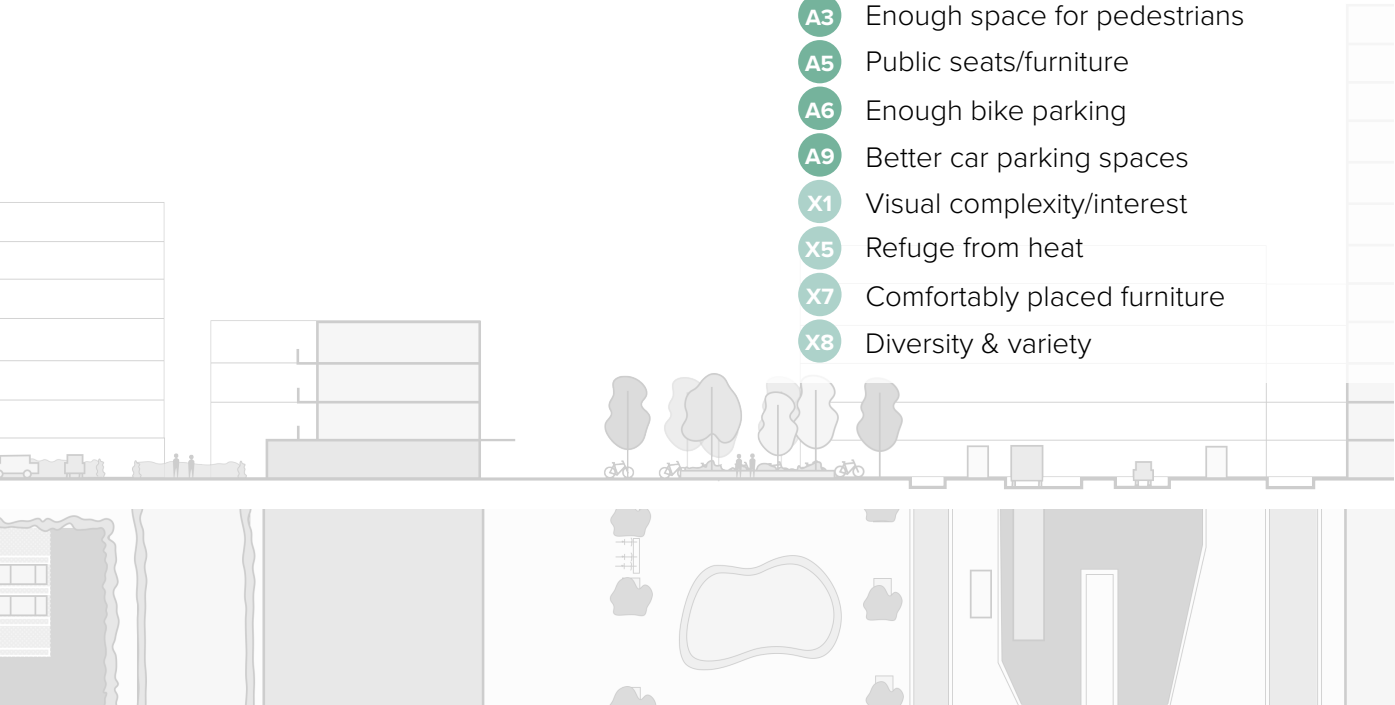
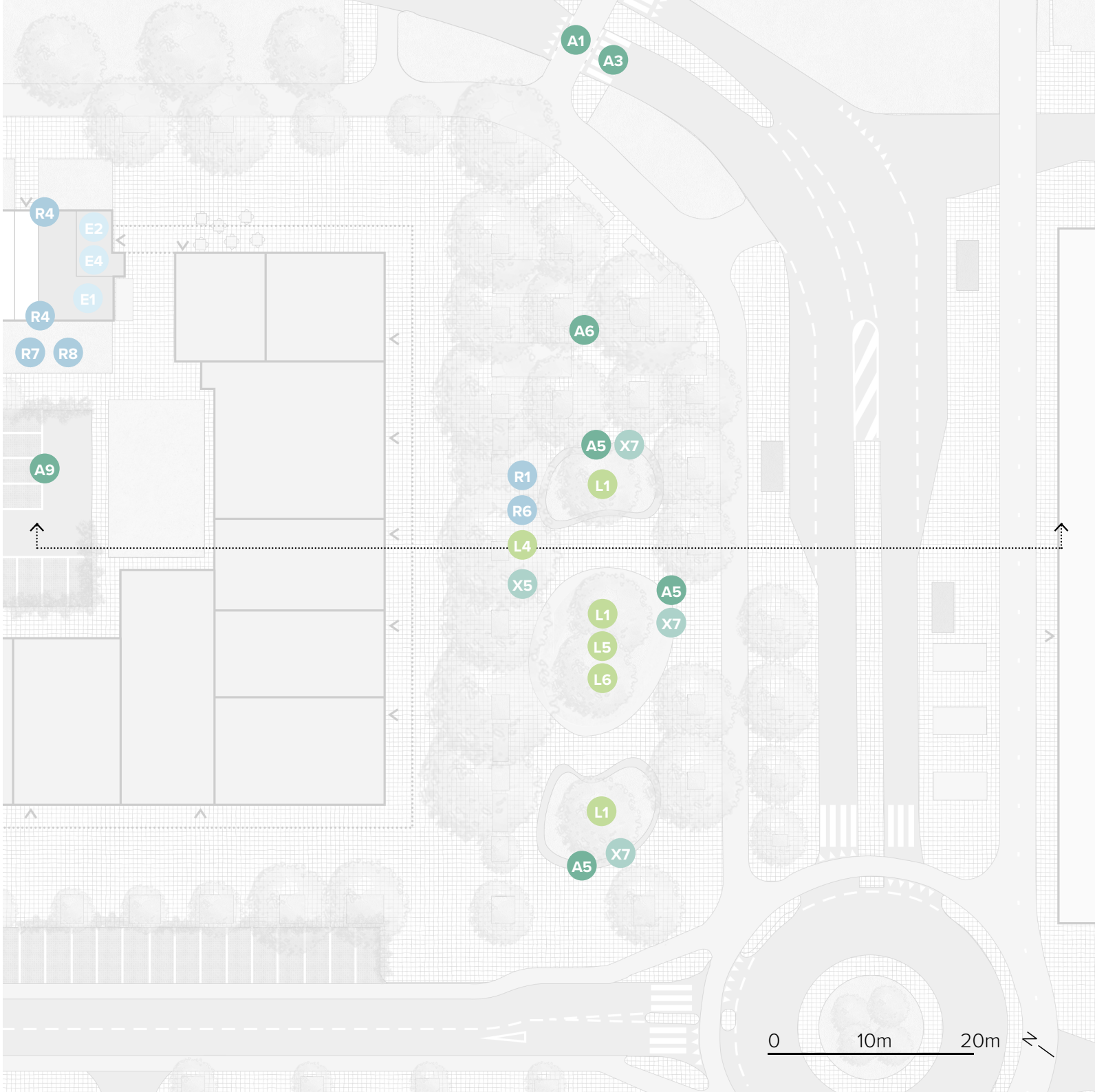


Figure 7.5.16, Schematic section Tiberdreef design





## 1. Eye level perspective (recent) migrant

Figure 7.5.17, Eyel level impression of the Tiberdreef



“The area in front of the shopping centre has gone from a parking area to a pleasant square where I can meet others. This nice public space has increased the time I want to spend outside, with or without others, increasing my sense of belonging here! On hot summer days, people gather around the fountain to cool off, and the different types of plants offer a varied experience, that also changes per season.”

< Figure 7.5.18, Photo of the current situation of the Tiberdreef

## 2. Eye level perspective business owner

Figure 7.5.19, Eyel level impression of the Moezeldreef



“In the newly added workshops, I can practice my craft without having to drive all the way to the industrial area, outside of the district. An in the newly added commercial area, I can sell my handmade products right nextdoor. The environment is made more pleasant, to attract more possible customers to my business.”

< Figure 7.5.20, Photo of the current situation of the Moezeldreef



Tannhäuserdreef: status quo

The third and last zoom in location is the Tannhäuserdreef, with a large apartment building and three small, L-shaped apartment buildings with collective green spaces.

> Figure 7.5.21, Satellite image Tannhäuserdreef

- S2 Lack of eyes on the street
- S3 Not enough space of your own
- TR1 Lack of physical activity
- TR2 Lack of traffic safety
- TR3 Traffic
- E2 Deterioration
- S2 Low biodiversity
- S1 Illegible/unclear design
- S2 Lack of detail & distinctions
- S3 Sharp edges/straight lines
- S4 Unsuitable use of colour

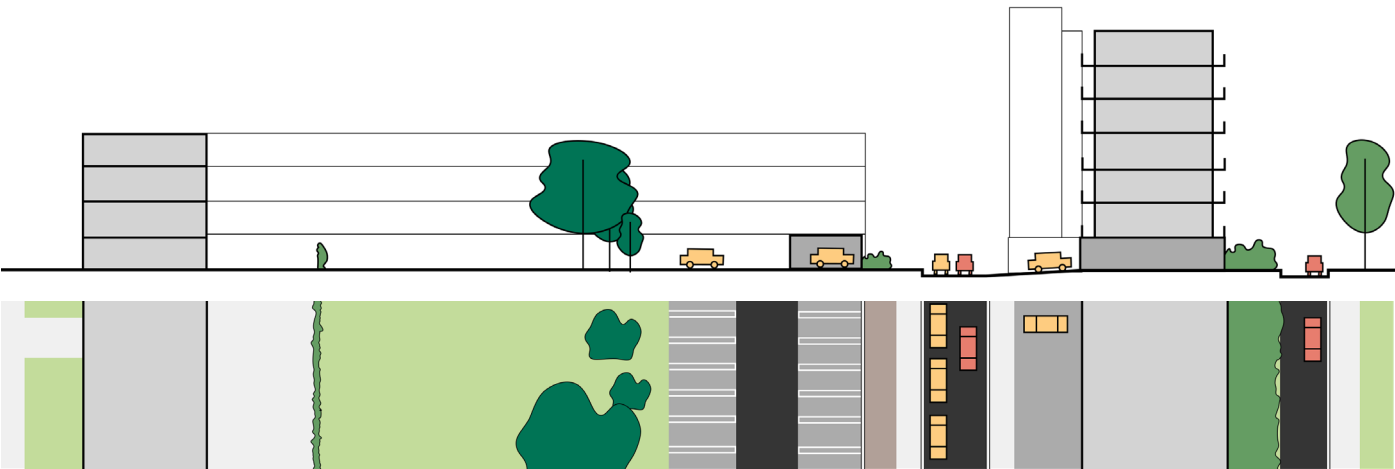
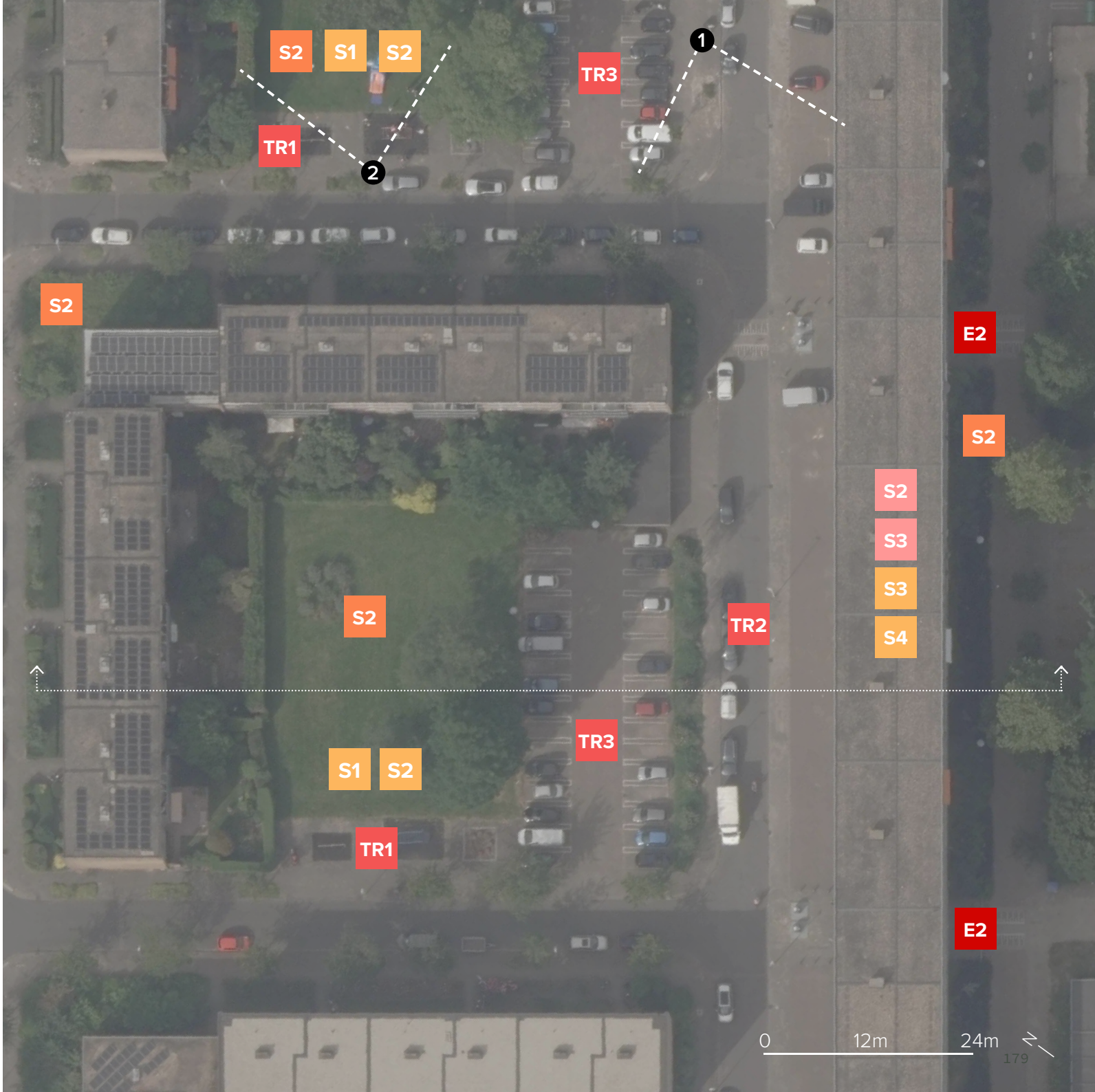


Figure 7.5.22, Schematic section Tannhäuserdreef current





# Tannhäuserdreef: design

For the large apartment building, the focus is on opening up the ground floor, which goes from garage spaces to public functions, with an overall theme of *health*. This includes a general practitioner, which the neighbourhood currently does not have within walking distance, and a variety of other functions.

For the small apartment building, the focus is on improving the existing collective green space. By adding enclosure, the ownership of the space is made more clear and the space feels more pleasant, to increase chances of it being used by residents. The parking spaces are “hidden” with hedges and other vegetation, to lower (visual) car dominance.

> Figure 7.5.23, Design map Tannhäuserdreef

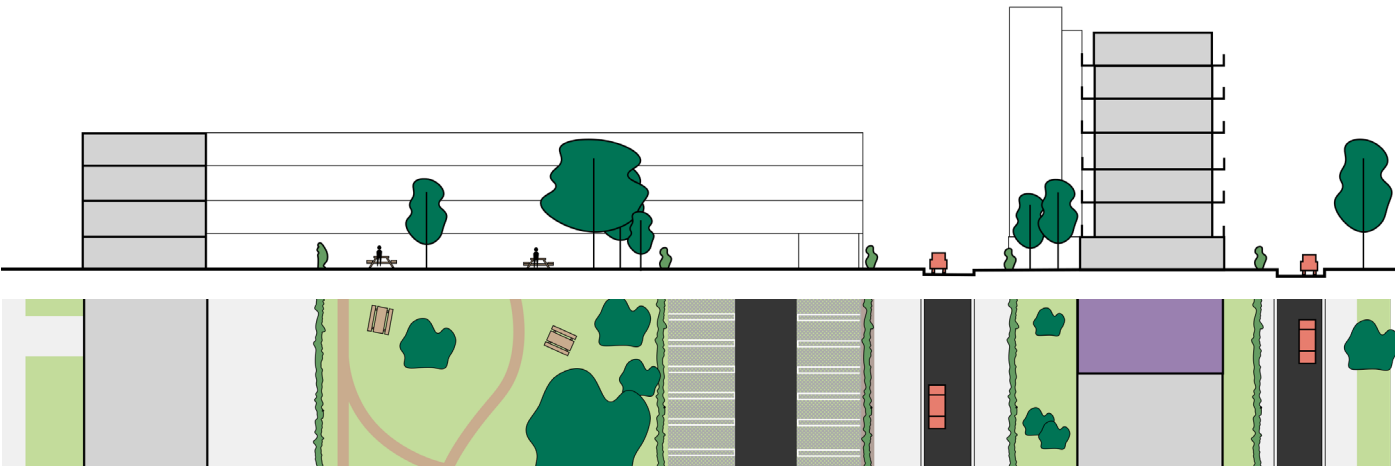


Figure 7.5.24, Schematic section Tannhäuserdreef design

- > Legend
- Neighbourhood cafe (new)
  - General practioner (new)
  - Yoga studio (new)
  - Work from home (new)
  - Garage (existing)
  - Apartment (existing and new)





# Tannhäuserdreef: design

The map on the right shows the exact locations of the design measures, wherever applicable.

> Figure 7.5.25, Design map Tannhäuserdreef

- R2 Indoor meeting spaces
- R4 Active, open, and detailed facades
- R7 Private-public differentiation
- R8 Space of your own
- R9 Clear design
- E6 Work-near-home
- E7 Modifiable/multi-use spaces
- L2 Small-scale greenery around home
- L4 Biodiversity
- L8 Scenic environments
- L9 Points of interest within natural spaces
- A2 Pleasant & interesting environments
- A3 Enough space for pedestrians
- A4 Walkable distance to facilities
- A9 Better car parking spaces
- X1 Visual complexity/interest
- X2 Well-designed urban lighting
- X3 Quiet spaces

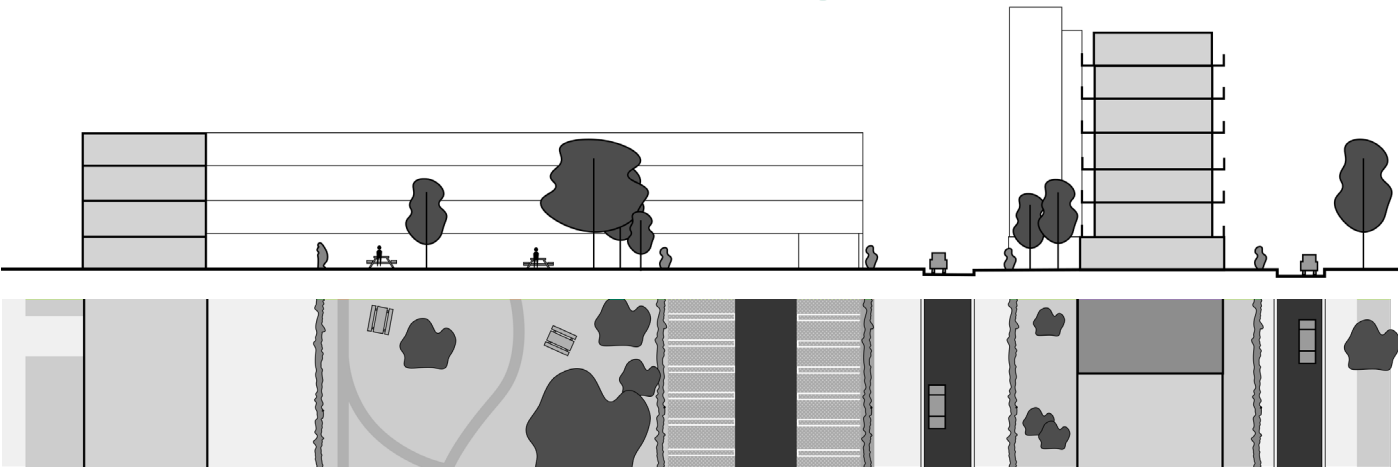
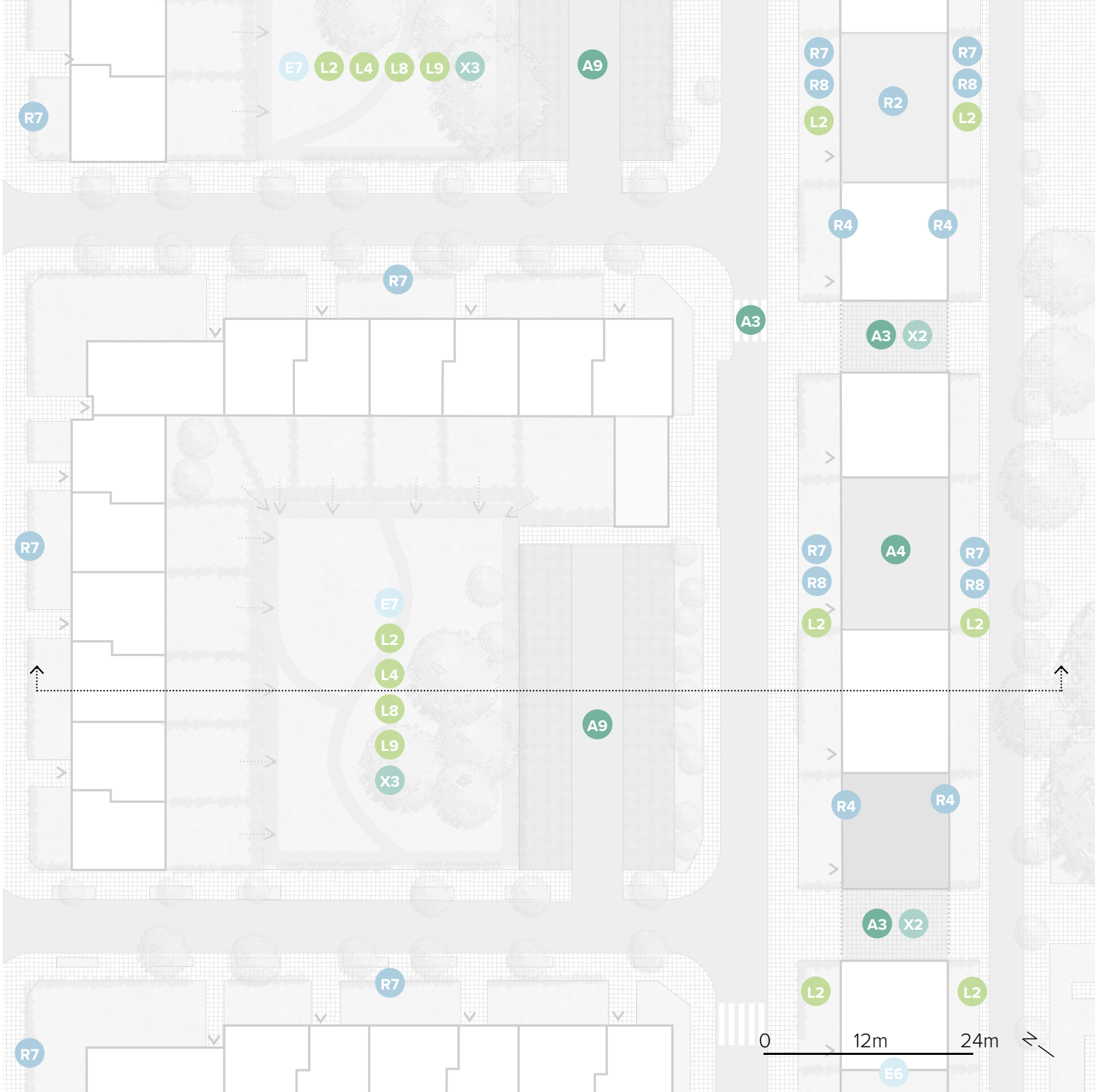


Figure 7.5.26, Schematic section Tannhäuserdreef design





## 1. Eye level perspective student/young adult

Figure 7.5.27, Eye level impression Tannhäuserdreef



"The neighbourhood used to have no social places to meet others, but now I can go downstairs to eat with others, do something active like yoga, or just sit and talk together. The new functions allow me to take care of my overall health: mental, social, and physical! All of the balconies have been painted in soothing colours, making the view of the building more cohesive and calming. The garages being replaced by open facades with public functions behind them make the street feel a lot more pleasant and safe."

< Figure 7.5.28, Photo of the current situation of the Tannhäuserdreef

## 2. Eye level perspective elderly

Figure 7.5.29, Eye level impression Toscadreef



"The empty grass field behind my house now finally has a purpose: it has become a meeting space for all of the apartment building residents. I enjoy meeting all of my neighbours in this shared garden, which is a nice outdoor space near home in addition to my small balcony. I cannot see my car from this space, even though it is parked right next to the garden. Though, to be honest, I don't need my car as often as I used to, because many facilities like a general practitioner and meeting spaces are in a walkable distance, right next door!"

< Figure 7.5.30, Photo of the current situation of the Toscadreef

# 08

## *Conclusions & Reflections*

In this chapter, the research question posed at the beginning of the thesis (*What spatial design elements can improve the health of residents of vulnerable neighbourhoods with a low socioeconomic status through stress-relief, based on the case study of Overvecht, Utrecht?*) is answered. This is done by answering each of the sub-questions based on the research and design done throughout the graduation process. These are then combined to answer to overarching research question. A discussion is had afterwards, discussing some of the limitation of this project and possible ways to build upon the thesis. Lastly, a reflection on the graduation process is given, based on both the overall process and the end results.



## 8.1 Conclusions

The main research question will be answered by answering the sub-questions first.

### 1. What is health?

#### 1a. What is the definition of health?

The definition of health used in this thesis, is: *“Perfect health is a state of complete physical, mental, and social wellbeing and not merely an absence of disease or infirmity”*. The definition is based largely on the 1948 definition coined by the World Health Organisation, with the addition of the word “perfect” in front, to reflect that health is a spectrum and one is not simply either “healthy” or “unhealthy”. Another important element is that health has multiple facets (physical, mental, and social) which are interdependent and affect one another.

### 2. What is urban stress?

#### 2a. What is the definition of urban stress?

The main definition of urban stress used in this thesis, is: *“a state of bodily or mental tension developed through city living, or the physical, chemical, or emotional factors that give rise to that tension”* (European Environment Agency, 2020). In addition to this general definition, the definition developed by Jalilisadrabad et al. was used to show that urban stress is a personal problem, that only occurs when the tension-caused factors are beyond one’s own boundaries (Jalilisadrabad et al., 2023), to reflect the personal nature of urban stress.

#### 2b. What are the effects of (chronic) stress on health?

Whereas a little bit of stress for a short period of time can be healthy, as it encourages us to take action in certain situations, too much stress and/or being stressed for too long can have severe negative effects on our health and it can heavily impact multiple of our important bodily functions: respiratory issues,

high blood pressure and heart rate, muscle tension, issues with fertility, menstruation, pregnancy, and menopause, development of several mental health issues, and gut-related issues. This also proves that the aforementioned facets of health affect each other, as a mental health issue like stress also affects one’s physical health.

#### 2c. What are sources of urban stress?

There are many sources of urban stress, which have all been presented in chapter 04 of this thesis. To summarise: the causes of urban stress addressed in this thesis, can be divided into five main categories, which together form the STRESS framework. The first is **Social deprivation and overload**, which is centred around a lack of social interactions on one hand, and a lack of privacy on the other. Secondly, **TRaffic & inactive modes of transport** shows that many cities are currently oriented towards stress-inducing cars and discourage physical activity, even though this could lower stress. **Economic deprivation & disparity** refers to a lack of economic opportunities and ample necessary facilities. **Shortage of diverse greenery** is about the lack of diverse natural elements, including greenery, water, and animals. Lastly, **Sensory overload & discomfort** refers to how people experience the city on a personal level.

#### 2d. How can urban stress be relieved?

Similarly to how there are many sources of urban stress, there are also many different solutions, which are also explained in chapter 04. Once again, a framework was presented, that showed the five main categories of urban stress-relief: the RELAX framework, which is essentially the antithesis of the STRESS framework. The first category is **Relationships & social connections**, which focuses on encouraging and facilitating interactions, and thereby strengthening

social networks, providing a sense of safety, a sense of belonging, and a sense of privacy. **Economic opportunities & facilities** is centred around offering ample opportunities to make a living, provide people with qualitative housing, and the necessary facilities within their direct living environment, all in a diverse and varied manner. **Landscape** is about biodiversity through supplying green and blue spaces, which results in pleasant and/or natural sounds, and using those elements to create scenic environments. **Activity & Mobility** centres around improving networks for active modes of transport and public transport, and offering additional spaces for exercise/physical activity. Lastly, **Xperience & comfort** is about creating a pleasant visual and auditory experience, limiting (the effects of) climate change and pollution, all to provide personal comfort.

### 3. To what extent are health and urban stress incorporated in Overvecht?

#### 3a. What were the original design ideas behind Overvecht?

Overvecht is a post-war neighbourhood, constructed in the 1960s, when there were two main design influences at large in the Netherlands. On the one hand, there is Het Nieuwe Bouwen, the Modernist movement, that focused on clear design, efficiency, and building quickly and pragmatically. On the other hand, there was the Wijkgedachte, which focused on creating community, and providing residents with all of their wants and needs nearby home, all within a clear and recognisable structure.

#### 3b. How are those original design ideas related to health and urban stress?

The focus on building quickly and efficiently in the post-war period resulted in monotonous neighbourhoods, with a lot of repetition and a lack of detail. However, it did result in providing a lot of people with a good and

affordable home in a relatively short period of time. In terms of Het Nieuwe Bouwen, similarly to post-war areas in general, there was much repetition and lack of detail, due to a focus on function rather than aesthetics. The Wijkgedachte focused on community-building, which is very beneficial for lowering urban stress, as loneliness is one of the most impactful and most prevalent stressors currently. However, the collective spaces designed to build this community now remain largely un(der)used, due to their unclear design leading to a feeling of discomfort.

#### 3c. What are sources of urban stress in Overvecht?

The second part of chapter 05 shows that all five categories of stressors manifest themselves in Overvecht in one way or another, and when looking at overall urban stress, it is shown that it is present everywhere in the district. However, the exact (main) source differs per location. This can all be seen in the STRESS map on page 120 and 121.

### 4. What design interventions are needed for (additional) stress-relief in Overvecht?

#### 4a. What design interventions are needed on the neighbourhood level?

On this scale, it becomes clear that many different design interventions are needed, which also depend on each other. There should be a focus on relieving tension related to car-dominance, and lessening the impact of the car on a street level, by centralising parking more, and improving existing parking areas, mainly through vegetation. The car alternatives should be made more attractive, by providing better and safer cycling infrastructure, more comfortable walking infrastructure, and better public transport wherever necessary. New functions should be added in the neighbourhood, so that they are in a walkable or cycleable distance for everyone. These functions should include job opportunities and workspaces, to

relieve economically induced urban stress. New and improved natural elements can help relieve stress further, through increased biodiversity on a larger and on a smaller scale, like better parks, collective gardens, and public spaces.

#### **4b. In what contexts is this approach applicable in the rest of the district?**

The chosen Rubicondreef neighbourhood represents Overvecht as a whole, with many of the local elements happening in other neighbourhoods, too. Therefore, most of the design measures applied there, can and should also be applied in the rest of the district. However, this should only be done through taking the local circumstances into consideration, and looking at the wants and needs of residents. Though the Rubicondreef has many elements that occur (nearly) everywhere in Overvecht, the district is still very large and diverse in many aspects, especially in the differences between Overvecht-Zuid, which was designed and constructed first, and Overvecht-Noord, which was designed and constructed after. The STRESS map on page 120 and 121 shows some of this diversity in stressors. Therefore, the exact local circumstances are important and should be used when choosing what design measures from the RELAX framework to apply.

#### **4c. How is this approach applicable in other vulnerable neighbourhoods?**

The STRESS and RELAX frameworks could be used as a starting point of lowering urban stress in other vulnerable neighbourhoods: first, by identifying what stressors occur, and then, by seeing what design measures could help combat these stressors, similarly to how this was done in the second part of this thesis for Overvecht and the Rubicondreef neighbourhood. It is important to remember that, while some elements of urban stress, both in terms of causes and solutions, are more general, many are context-dependent and differ

per location. This is mostly due to the wants and needs of local residents, because stress is something very personal and only happens when circumstances are beyond one's own individual boundaries. Therefore, what will cause the inhabitants of one neighbourhood stress, will not do the same for inhabitants of another neighbourhood with a different context. Therefore, a truly participatory process is preferable.

#### **Main research question**

Circling back to the overarching research question: “*What spatial design elements can improve the health of residents of vulnerable neighbourhoods with a low socioeconomic status through stress-relief, based on the case study of Overvecht, Utrecht?*”. The design made for the Rubicondreef shows that stress-relief can and should be realised in different sectors and different themes, that work together in a synergetic way: the functions, the natural elements, and the mobility aspects, all while keeping the personal experiences of residents at the forefront, too. The RELAX framework formulated in this thesis could be a great starting point for stress-relief in other vulnerable neighbourhoods, similarly to how it was done for Overvecht, as it shows that stress-relief can and should be achieved through combining many different small-scale solutions that work together. These solution should represent the full spectrum of the RELAX framework: Relationships & social connections, Economic opportunities & facilities, Landscape, Activity & mobility, and Xperience & comfort. For those with a low socioeconomic status in particular, the improvements will always include changes to the economic opportunities and facilities, as this is what typifies this target group. However, as said before, the overall design should always include elements from all five categories, combined into a synergetic and unified design, that reacts to the specific stressors that manifest themselves in the local context.

## 8.2 Discussion

Though every feasible attempt was made to make this thesis as rich as possible, some limitations had to be made and priorities had to be decided. Therefore, due to a limited scope, some elements remain un(der) researched, which will be listed here.

#### **Input from real inhabitants**

Qualitative and representative surveys and/or interviews take a lot of time to prepare, execute, and process. Because the focus of this thesis was on literature research and design, the decision was made to not do surveys and/or interviews, due to time constraints. However, as established many times before, stress is a personal subject that differs per person. Therefore, in future applications of the theory developed in this thesis, in particular the RELAX framework, a participatory process is preferable. One where inhabitants of design locations themselves are asked about what causes them stress in their direct environment and also what helps them unwind. This input could then be applied in a later design/vision.

#### **Future implications**

I see my design for the Rubicondreef neighbourhood as a starting point, that consists of the first steps towards a stress-free future for the neighbourhood, but not yet the final steps. For example: in the design presented at the end of the thesis, there are still many spaces for cars and most roads are accessible for cars. This is because the neighbourhood is currently very car-dominant and -reliant, making becoming car-free a very large step to make. However, once there are more facilities and functions, including work opportunities, in walking and cycling distance, the neighbourhood is less reliant on cars in their daily life. By that point, the step towards becoming fully or largely car-free is a lot more feasible, which could help in lowering car-related stress further, possibly fully. Future steps for this specific

neighbourhood could be taken later on, to build upon the design presented in this thesis. In addition, by that time, more will be known about designing efficient and pleasant car-free neighbourhoods, such as Merwede, which is being constructed in Utrecht currently. Lessons learned from that particular project and other similar projects, could be applied in other neighbourhoods, such as the Rubicondreef neighbourhood, to ensure a smooth transition into becoming car-free.

#### **Phasing & finances**

The more organisatory elements of urban design, such as phasing and finances, were not a part of this thesis, mostly due to time constraints. However, this elements are definitely important to test the feasibility of a design, especially for a neighbourhood with many socioeconomic challenges. Overvecht is eligible for multiple subsidies from the government, mostly due to its status as “vulnerable neighbourhood”, which could partially be used to realise the design outlined in this thesis. However, additional research is get a grip on the financial aspects of this project, and test whether it is feasible. In addition, were the project to be realised, more thought should be applied to the phasing, to figure out what developments should be done first, and how the different developments depend on each other.

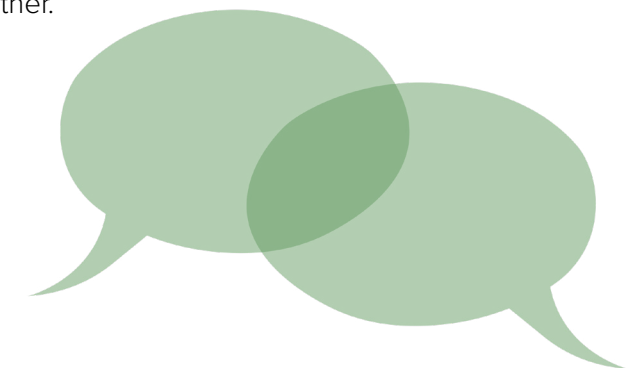


Figure 8.2.1, Discussion speech bubbles



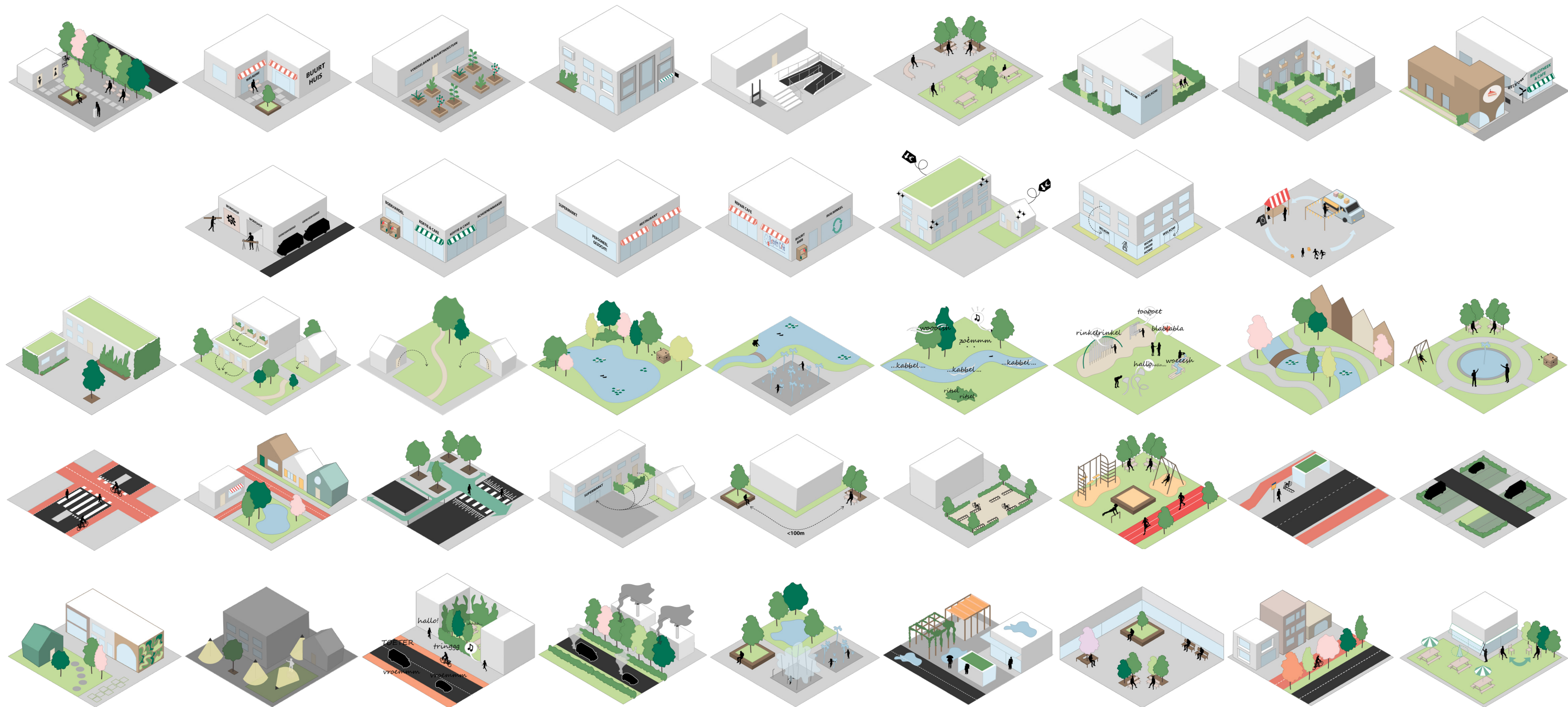


Figure 8.11, All tiles from the RELAX framework

## 8.3 Reflections

***How do you see the relation between your graduation project topic, the studio topic, your master's track (Urbanism), and your master's program (MSc Architecture, Urbanism and Building Sciences)?***

The **topic** of my graduation project, was urban stress. For this topic, different scales and different scopes are relevant, as urban stress is caused by both small and large stressors, and therefore the solution also lies in multiple scales. This is typical for the **Urbanism** approach, which also covers multiple scales and scopes. For example: having an abundance of car on and next to the street can cause stress for people in said street. However, the solution is more complicated than simple getting rid of the car. This also requires offering parking solutions on the neighbourhood-, district-, and city-level. Moreover, to lower car-dependence as a whole, the accessibility and proximity of facilities in the rest of the neighbourhood, district, and city should also be considered, to properly encourage walking and cycling. However, circling back the the street-level, to actually encourage walking and cycling, the design of the street should be considered, especially the level on which it keeps these participants of traffic safe, both on an absolute and a perceived level. This switching between scales and scopes is central to this project, and also to Urbanism as a whole. Due to my chosen **studio** being Design of the Urban Fabric, which is centred around the neighbourhood-scale, this scale became the layer where everything came together, the small and the large. It is also where the theory about urban stress became more tangible and where I could work on applying the theory. This scale was very useful in showing how the different design solutions work together, need each other, and strengthen each other. As established before, without good slow traffic infrastructure, people will not walk or cycle to their destination, no matter how near to them it is. However,

on the other hand, good slow traffic infrastructure will not be used if there are no desired destinations nearby. The small and large scale meeting in the middle, in the neighbourhood level, proved very useful during the graduation process. The multiscale and multiscope approach is also where the overall **AUBS master program** comes in. Urban stress is caused and therefore also lowered in not just the urban fabric, but the buildings and natural landscape elements within it, and the decision making process that leads to said design. Urbanism does not stand alone.

***How do you see the relation between research and design in your graduation project?***

The relation between research and design in this project is seen the most clearly in the RELAX framework, presented in chapter 04. There, the theory behind ways to relieve stress was made tangible and applicable in a spatial way, through developing a design catalogue with design tiles, that present ways in which the stress relief can be offered in a visual way, with theoretical underpinning. This framework then helped me when making the neighbourhood design, and offered direct inspiration for design measures. Although the process described now seems linear and to be going from theory to design only, it was actually more of a circular and iterative process, where questions about the application of the design led me back to theory more than once.

***What do you see as the value (and limitations) of your way of working: your approach, your used methods?***

As there is still a large knowledge gap in the world of urban stress, particularly when it comes to stress-relieving design, my main goal with this project was gaining knowledge and presenting this in a concise yet clear way. Developing several frameworks helped

me to understand the topic more clearly and also helped me in presenting said understanding in a clear way. Working with frameworks also helped increase the transferability. However, that being said, due to my main focus being on theory, the design was at some points lacking behind the theory, and more attention could have been paid to the design earlier into the graduation process. Moreover, due to the fact that doing research costs a lot of time, not enough time was left for doing substantial and representative interviews and/or surveys with actual inhabitants of Overvecht. Knowing and understanding more about how these people actually experience urban stress, would have been a useful addition.

***What are the academic and societal value, scope and implications of your graduation project, including ethical aspects?***

Urban stress is a relatively under-researched topic and not that much is known about it, even though it is becoming increasingly pressing due to urbanisation. Through my focus on theoretical research and literature review, I helped in lessening this existing knowledge gap. Moreover, most of the existing research on urban stress is centred around the stressors, and even less is known about possible solutions. Therefore, I believe the main value of my project lies in the two presented frameworks, in particular the RELAX framework. These two frameworks present the knowledge gained in a concise way, which is useful in an academic sense, but also in a societal sense, as they can make the knowledge more understandable for “the average Joe”, so to speak, and can help “regular” people inform themselves on this topic that affects their daily life. Moreover, since these frameworks are applicable in any urban environment, the scope of this project increased far beyond the case study location. Within the world of urban stress, there are severe disparities due to socioeconomic status, where people with a low

income often live in less favourable urban conditions, which in turn can cause them more stress. This thesis had people with a low socioeconomic status as its main target group, to help combat this existing disparity.

***How do you assess the transferability of your project results?***

This question has also been addressed in the conclusions part of this chapter, as the transferability was an important part of the project. While the eventual design was made for only one of the neighbourhoods of Overvecht, the overall approach could be applied to the rest of the district and also in other neighbourhoods with similar circumstances. As many of the circumstances in the Rubicondreef neighbourhood and the rest of Overvecht are typical for post-war neighbourhoods (such as the amount of repetition, high rise buildings, car dominance, low quality greenery, and unclear design), it can be assumed that many other post-war neighbourhoods could benefit from the approach described in this report. This is, in large, due to the usage of a design catalogue. Whereas the design presented in this thesis is made specifically for a particular neighbourhood, the design measures that were applied could be applied in other places, too, in a similar way to how I applied them in my design chapter.

***If you could redo (a part of) your project, is there something you would change in your approach and why?***

I would say that there is one main element that I would redo if I had the chance, which is related to the fact that my theme changed relatively late in the graduation process. At the beginning of the year, I chose “health” as my topic. At that time, some teachers, in particular my mentor Maurice, informed me that this topic might be too big to tackle in one year and advised me to specify my theme further. At the time, I did not do this,



because I was convinced that I wanted to approach health as a whole. However, after my P1, I realised that the teachers were in fact right and I decided to narrow down “health” to “urban stress”. Because this change came after P1, my research on urban stress also only started a few weeks after P1. As mentioned before, doing this research took up a lot of my time, which meant that I had to prioritise and choose what I wanted to work on outside of the research. Even though I think interviews and/or surveys could have offered useful insight into the way inhabitants of Overvecht actually experience stress, I chose not to do them, as there would not have been enough time to make them worthwhile and scientifically justified in addition to the other things I wanted to work on. I decided to base my STRESS maps of Overvecht and the Rubicondreef neighbourhood on a combination of literature and my own observations. Had I chosen stress as my main topic from the beginning, there probably would have been enough time to do interviews and/or surveys, which would have been a useful addition, and made the design more representative of the wants and needs of actual inhabitants.

***How did your graduation project impact how you view yourself as an urban designer?***

Before starting my graduation project, I was unsure about the career path I wanted to take. I knew that Urbanism was the general way I wanted to go, but even then, there are many different paths I could take. Even though I already knew that my main strength is doing research, I was unsure whether this was also where my main interest lies. For most projects last year, there were strict outlines in terms of location and/or theme, and this was the first time we could fully decide our own path. Even though at the beginning of the year, this made me incredibly nervous, I ended up really enjoying the full process of both outlining and then executing a project, and it made me more secure in my

organisatory and strategic skills.



# 09

## *References & appendices*

This final chapter will include the proper credits for all of the material used during the graduation process, both literature and other written material, and figures, images, and other visual material. After this, several appendices are included. These mainly consist of material that could be viewed to get a better understanding of Overvecht and the Rubicondreef neighbourhood, but that are not essential to understanding the thesis as a whole.



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9.2 Figures

Figure 1.1.1, Painting of Medieval city

Pieter Brueghel the Elder (1559). *Netherlandish Proverbs* [Painting]. Retrieved on October 25, 2024, from <https://www.sciencenorway.no/archaeology-history-medieval-history/how-dirty-and-stinky-were-medieval-cities/1729836>

Figure 1.1.2, Painting of industrial city

Howe, L. (1909). *Ville Industrielle* [Painting]. Retrieved on October 25, 2024, from <https://www.proantic.com/1050918-lauritz-howe-1869-1945-ville-industrielle-datee-1909.html>

Figure 1.1.3, Photograph of Overvecht

DUIC (2021). *Eén hoofdroute en veel kleine ommetjes, dat willen bewoners in Utrecht Overvecht* [Photograph]. Retrieved on October 25, 2024, from <https://www.duic.nl/algemeen/een-hoofdroute-en-veel-kleine-ommetjes-dat-willen-bewoners-in-utrecht-overvecht/>

Figure 1.1.4, Graph of rural vs. urban residents

Made by author, based on data from United Nations (2018). *68% of the world population projected to live in urban areas by 2050, says UN*. Retrieved on December 4, 2024, from <https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html>

Figure 1.3.1: National urban issues maps

FLTR:

- Made by author, based on Ministerie van Volksgezondheid, Welzijn en Sport (2022). *Buurtatlas: stress*. Retrieved on October 29, 2024, from [https://buurtatlas.vzinfo.nl/#heel\\_veel\\_stress\\_afgelopen\\_weken](https://buurtatlas.vzinfo.nl/#heel_veel_stress_afgelopen_weken)
- Made by author, based on Ministerie van Volksgezondheid, Welzijn en Sport (2022). *Buurtatlas: ernstige geluidshinder door wegverkeer*. Retrieved on October 29, 2024, from [https://buurtatlas.vzinfo.nl/#ernstige\\_geluidhinder\\_door\\_wegverkeer](https://buurtatlas.vzinfo.nl/#ernstige_geluidhinder_door_wegverkeer)
- Made by author, based on Rijksinstituut voor Volksgezondheid en Milieu (2020). *Atlas leefomgeving: Stedelijk hitte-eiland effect (UHI)*. Retrieved on January 15, 2025, from <https://www.atlasleefomgeving.nl/kaarten>
- Made by author, based on Ministerie van Volksgezondheid, Welzijn en Sport (2022). *Buurtatlas: moeite met rondkomen*. Retrieved on October 29, 2024, from [https://buurtatlas.vzinfo.nl/#moeite\\_met\\_rondkomen](https://buurtatlas.vzinfo.nl/#moeite_met_rondkomen)

Figure 1.3.2: Highlights of national urban issues maps

FLTR:

- Made by author, based on Ministerie van Volksgezondheid, Welzijn en Sport (2022). *Buurtatlas: stress*. Retrieved on October 29, 2024, from [https://buurtatlas.vzinfo.nl/#heel\\_veel\\_stress\\_afgelopen\\_weken](https://buurtatlas.vzinfo.nl/#heel_veel_stress_afgelopen_weken)
- Made by author, based on Ministerie van Volksgezondheid, Welzijn en Sport (2022). *Buurtatlas: ernstige geluidshinder door wegverkeer*. Retrieved on October 29, 2024, from [https://buurtatlas.vzinfo.nl/#ernstige\\_geluidhinder\\_door\\_wegverkeer](https://buurtatlas.vzinfo.nl/#ernstige_geluidhinder_door_wegverkeer)
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- Made by author, based on Ministerie van Volksgezondheid, Welzijn en Sport (2022). *Buurtatlas: moeite met rondkomen*. Retrieved on October 29, 2024, from [https://buurtatlas.vzinfo.nl/#moeite\\_met\\_rondkomen](https://buurtatlas.vzinfo.nl/#moeite_met_rondkomen)

Figure 1.3.4, Life expectancy per Utrecht district

Made by author, based on Gordijn, J. (2022). *Nergens in Nederland is de kloof tussen gezond en ongezond zo groot als bij deze spoorlijn*. Retrieved on November 25, 2024, from <https://www.ad.nl/gezond/nergens-in-nederland-is-de-kloof-tussen-gezond-en-ongezond-zo-groot-als-bij-deze-spoorlijn~a0fc022c/>

Figure 1.3.5 Administrative areas Overvecht

Made by author, based on Gemeente Utrecht (n.d.). *Beschrijving van wijk Overvecht*. Retrieved on November 25, 2024, from

<https://omgevingsvisie.utrecht.nl/gebiedsbeleid/gebiedsbeleid-wijk-overvecht/beschrijving-van-wijk-overvecht>

Figure 1.3.6, Socioeconomic circumstances in Overvecht, compared to national and city-wide circumstances

FTTB:

- Made by author, based on AlleCijfers (2024). *Regionale statistieken Nederland*. Retrieved on November 29, 2025, from <https://allecijfers.nl/nederland/>
- Made by author, based on AlleCijfers (2024). *Statistieken gemeente Utrecht*. Retrieved on November 29, 2025, from <https://allecijfers.nl/gemeente/utrecht/>
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Figure 1.4.1, Location Rubicon- en Taagdreef e.o. neighbourhood

Made by author, based on Gemeente Utrecht (n.d.). *Beschrijving van wijk Overvecht*. Retrieved on November 25, 2024, from <https://omgevingsvisie.utrecht.nl/gebiedsbeleid/gebiedsbeleid-wijk-overvecht/beschrijving-van-wijk-overvecht>

Figure 2.1.1, The Restorative City

Made by author, based on Roe, J., & McCay, L. (2021). *Restorative cities*. In Bloomsbury Publishing Plc eBooks. <https://doi.org/10.5040/9781350112919>

Figure 3.1.1, Maslow's Hierarchy of needs

Made by author, based on Maslow, A.H. (1943). *Maslow's hierarchy of needs*. Retrieved on November 13, 2024, from <https://www.simplypsychology.org/maslow.html>

Figure 4.1.22, Air pollution

Autovisie (2018). *Gezondheidsschade door uitlaatgassen is 4000 euro per auto* [Photograph]. Retrieved on May 13, 2025, from <https://www.autovisie.nl/nieuws/gezondheidsschade-uitlaatgassen-4000-euro-per-auto/>

Figure 4.1.24, Light pollution

Straatbeeld (2020). *Proefstraat brengt lichthinder ledarmaturen in kaart* [Photograph]. Retrieved on June 3, 2025, from <https://www.straatbeeld.nl/nieuws/proefstraat-brengt-lichthinder-ledarmaturen-in-kaart>

Figure 4.1.25, Noise

Gemeente Amsterdam (n.d.). *Proef digitale borden tegen lawaaierige voertuigen* [Photograph]. Retrieved on May 13, 2025, from <https://www.amsterdam.nl/leefomgeving/geluid/proef-geluidsoverlast-voertuigen/>

Figure 5.1.1, Post-war neighbourhoods in the Netherlands

Made by author, based on Koöperatieve Architecten Werkplaats (2020). *Ruimte zat in de stad*. Retrieved on October 9, 2024, from <https://www.kaw.nl/projecten/onderzoek-ruimte-zat-corporatievastgoed/>

Figure 5.1.2, Two major expansions of Utrecht

Made by author, based on Gemeentebestuur van Utrecht (n.d.). *Kaart van de grenzen van de gemeente Utrecht*. Retrieved on January 20, 2025, from <https://hetutrechtsarchief.nl/collectie/609C5B9E9FE64642E0534701000A17FD>

Figure 5.1.3, Post-war neighbourhoods in Utrecht

Made by author, based on Urban Fabric Development (2006). *Cultuurhistorisch onderzoek en ruimtelijke analyse Utrecht NaOorlogse wijken: Overvecht*. Retrieved on November 18, 2024, from <https://erfgoed.utrecht.nl/onderzoek-en-publicaties-over-erfgoed/rapporten-cultuurhistorie/cultuurhistorisch-onderzoek-en-ruimtelijke-analyse-van-10-naoorlogse-wijken>



**Figure 5.2.4, City made up of recognisable units**

Made by author, based on Geyl, W.F. (1949). *Wij en de Wijkgedachte* [Scheme]. Retrieved on November 19, 2024, from <https://www.canonsociaalwerk.eu/nl/details.php?cps=27>

**Figure 5.2.5, Urban design centred around family needs**

Made by author, based on Van der Wall, R. (2020). *Een eeuw tuinieren*. Retrieved on January 20, 2025, from <https://deltametropool.nl/nieuws/een-eeuw-tuinieren/>

**Fig 5.2.6, Images from a book about the wijkgedachte**

Geyl, W.F. (1949). *Wij en de Wijkgedachte* [Scheme]. Retrieved on November 19, 2024, from <https://www.canonsociaalwerk.eu/nl/details.php?cps=27>

**Figure 5.3.1, Photograph of Overvecht apartments**

Van der Linden, P. (1969). *Gezicht op enkele flatgebouwen in de wijk Overvecht te Utrecht* [Photograph]. Retrieved on June 3, 2025, from <https://hetutrechtsarchief.nl/beeld/89A56C8CB16B5827A649C46BC5FA0120>

**Figure 5.6.1, Map of functions**

Made by author, based on OpenStreetMap (n.d.). [Open map database]. Retrieved on January 22, 2025, from <https://www.openstreetmap.org/#map=15/52.11502/5.11323&layers=G>

**Figure 5.6.3, Map of bus and train connections**

Made by author, based on data from University of Groningen Geodienst (2022). *Openbaar Vervoer Nederland*. Retrieved on June 3, 2025, from <https://hub.arcgis.com/maps/9c7f791fb35e4eaab465e342fdf944e1/about>

**Figure 5.6.4, Map of natural elements, ordered by biodiversity**

Made by author, based on OpenStreetMap (n.d.). [Open map database]. Retrieved on January 22, 2025, from <https://www.openstreetmap.org/#map=15/52.11502/5.11323&layers=G>

**Figure 5.7.1, Map of social deprivation and overload-related stressors**

Made by author, based on data from

- AlleCijfers (2024). *Statistieken gemeente Utrecht*. Retrieved on January 27, 2025, from <https://allecijfers.nl/gemeente/utrecht/>
- Ministerie van Volksgezondheid, Welzijn en Sport (2022). *Buurtatlas: sociale eenzaamheid*. Retrieved on March 26, 2025, from [https://buurtatlas.vzinfo.nl/#sociale\\_eeenzaamheid](https://buurtatlas.vzinfo.nl/#sociale_eeenzaamheid)

**Figure 5.7.2, Social statistics**

Made by author, based on data from Gemeente Utrecht (n.d.). *Monitor Leefbaarheid*. Retrieved on January 27, 2025, from <https://utrecht.incijfers.nl/mosaic/monitor-leefbaarheid/>

**Figure 5.7.3, Map of traffic & inactive modes of transport-related stressors**

Made by author, based on data from Google (2025). [Typical traffic in Overvecht map]. Retrieved on January 27, 2025, from [https://www.google.com/maps/@52.1187287,5.1113866,15.45z/data=!5m1!1e1?entry=tту&g\\_ep=EgoyMDI1MDUyOC4wKlXMDSOASAFQAw%3D%3D](https://www.google.com/maps/@52.1187287,5.1113866,15.45z/data=!5m1!1e1?entry=tту&g_ep=EgoyMDI1MDUyOC4wKlXMDSOASAFQAw%3D%3D)

**Figure 5.7.4, Traffic-related statistics**

Made by author, based on data from Gemeente Utrecht (n.d.). *Monitor Leefbaarheid*. Retrieved on January 27, 2025, from <https://utrecht.incijfers.nl/mosaic/monitor-leefbaarheid/>

**Figure 5.7.5, Map of economic deprivation & disparity-related stressors**

Made by author, based on data from

- AlleCijfers (2024). *Statistieken gemeente Utrecht*. Retrieved on January 27, 2025, from <https://allecijfers.nl/gemeente/utrecht/>
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**Figure 5.7.6, Economic statistics**

Made by author, based on data from Gemeente Utrecht (n.d.). *Monitor Leefbaarheid*. Retrieved on January 27, 2025, from <https://utrecht.incijfers.nl/mosaic/monitor-leefbaarheid/>

**Figure 5.7.8, Nature-related statistics**

Made by author, based on data from Gemeente Utrecht (n.d.). *Monitor Leefbaarheid*. Retrieved on January 27, 2024, from <https://utrecht.incijfers.nl/mosaic/monitor-leefbaarheid/>

**Figure 5.7.9, Map of sensory overload & discomfort-related stressors**

Made by author, based on data from Stichting Climate Adaptation Services (n.d.). *Klimaateffectatlas*. Retrieved on December 16, 2024, from <https://www.klimaateffectatlas.nl/nl/kaartviewer>

**Figure 5.7.10, Experience-related statistics**

Made by author, based on data from Gemeente Utrecht (n.d.). *Monitor Leefbaarheid*. Retrieved on January 27, 2024, from <https://utrecht.incijfers.nl/mosaic/monitor-leefbaarheid/>

**Figure 6.2.17, Map of typologies**

Made by author, based on KadastraleKaart.com (2025). [Cadastral Map]. Retrieved on February 18, 2025, from <https://kadastralekaart.com/>

**Figure 6.2.19, Garages**

Google (2020). [Google Street View of garages along the Tannhäuserdreef]. Retrieved on May 7, 2025, from <https://maps.app.goo.gl/NzzxtNfNoQvwwAbf7>

**Figure 6.2.20, Large apartments**

Google (2021). [Google Street View of large apartments along the Othellodreef]. Retrieved on May 7, 2025, from <https://maps.app.goo.gl/Sg4YwA2BVMNtH9wZA>

**Figure 6.2.23, Detached houses**

Google (2023). [Google Street View of detached houses along the Moezeldreef]. Retrieved on May 7, 2025, from <https://maps.app.goo.gl/5CZzymGnzdxaiöYM9>

9.3 Appendices

1. Width of roads Rubicondreef

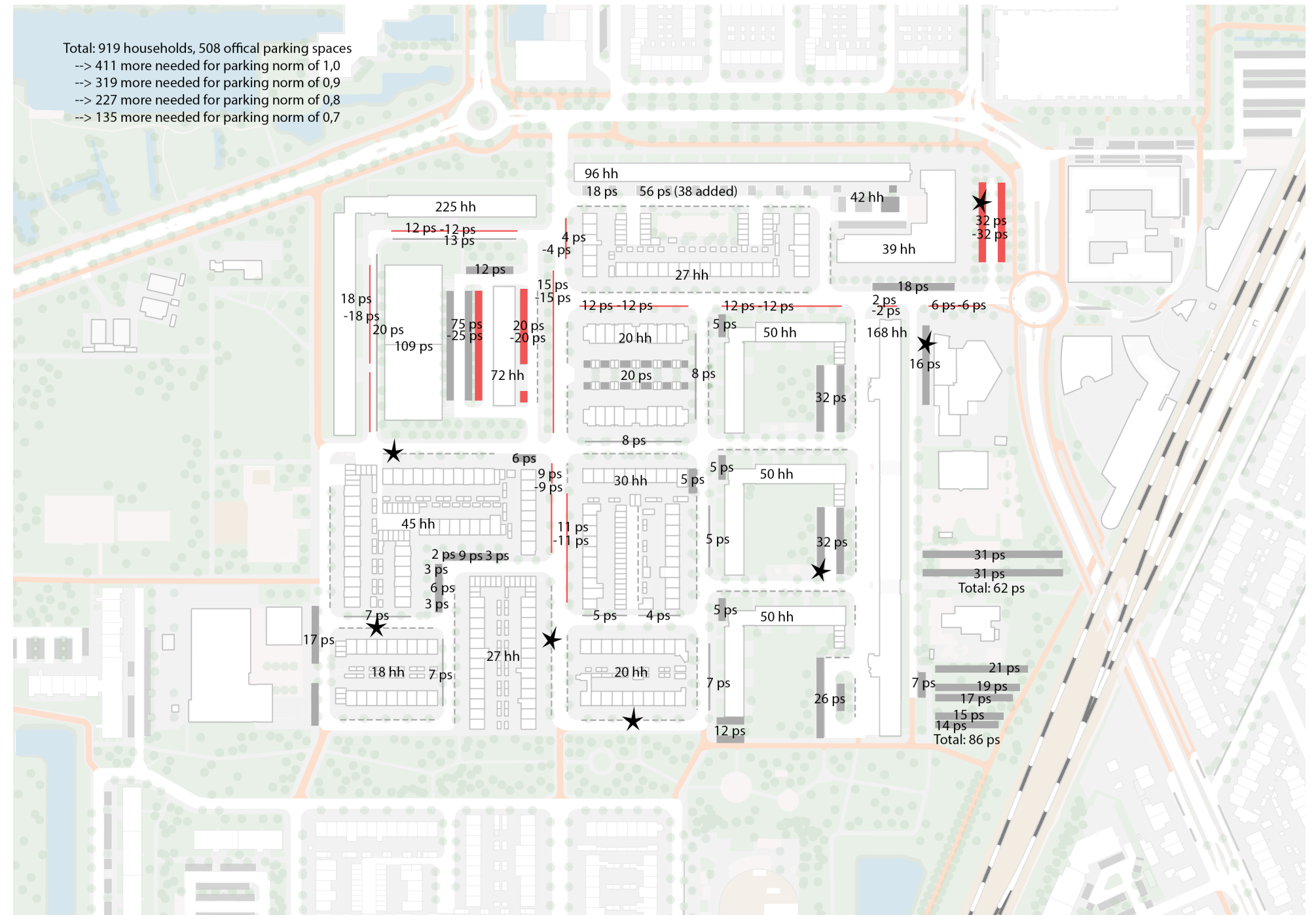




2. Current parking situation Rubicondreef



### 3. New parking situation Rubicondreef





4a. Native trees



**European hornbeam**  
*Carpinus betulus*  
(Dijkstra, n.d.)



**Field maple**  
*Acer campestre*  
(Dijkstra, n.d.)



**Bird cherry**  
*Prunus padus*  
(KU Leuven, n.d.)



**Goat willow**  
*Salix caprea*  
(Dijkstra, n.d.)



**Common alder**  
*Alnus glutinosa*  
(Dijkstra, n.d.)



**Silver birch**  
*Betula pendula*  
(KU Leuven, n.d.)



**Ash**  
*Fraxinus excelsior*  
(Dijkstra, n.d.)



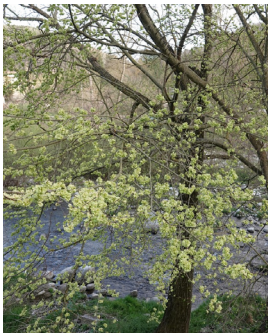
**Pedunculate oak**  
*Quercus robur*  
(Dijkstra, n.d.)



**Rowan**  
*Sorbus aucuparia*  
(Dijkstra, n.d.)



**Small-leaved lime**  
*Tilia cordata*  
(Dijkstra, n.d.)



**Wych elm**  
*Ulmus glabra*  
(Dijkstra, n.d.)

4b. Native shrubs



**Blackthorn**  
*Prunus spinosa*  
(Dijkstra, n.d.)



**Raspberry**  
*Rubus idaeus*  
(Dijkstra, n.d.)



**Spindle**  
*Euonymus europaeus*  
(Dijkstra, n.d.)



**Alder buckthorn**  
*Rhamnus frangula*  
(Dijkstra, n.d.)



**Holly**  
*Ilex aquifolium*  
(Dijkstra, n.d.)



**Dog rose**  
*Rosa canina*  
(Dijkstra, n.d.)



**Common dogwood**  
*Cornus sanguinea*  
(Dijkstra, n.d.)



**Guelder-rose**  
*Viburnum opulus*  
(Dijkstra, n.d.)



**Elder**  
*Sambucus nigra*  
(Dijkstra, n.d.)



**Common hazel**  
*Corylus avellana*  
(Dijkstra, n.d.)



**Sweet briar**  
*Rosa rubiginosa*  
(KU Leuven, n.d.)



**Midland hawthorn**  
*Crataegus laevigata*  
(KU Leuven, n.d.)



**Redcurrant**  
*Ribes rubrum*  
(Dijkstra, n.d.)



**Cornel**  
*Cornus mas*  
(Dijkstra, n.d.)



**European beech**  
*Fagus sylvatica*  
(Dijkstra, n.d.)



4c. Native flowers



**Bugle**  
*Ajuga reptans*  
(Dijkstra, n.d.)



**St John's wort**  
*Hypericum perforatum*  
(Dijkstra, n.d.)



**Wood anemone**  
*Anemone nemorosa*  
(Dijkstra, n.d.)



**Common dog-violet**  
*Viola riviniana*  
(Dijkstra, n.d.)



**May lily**  
*Maianthemum bifolium*  
(Dijkstra, n.d.)



**Wood violet**  
*Viola odorata*  
(Dijkstra, n.d.)



**Figwort**  
*Scrophularia nodosa*  
(Dijkstra, n.d.)



**Red dead-nettle**  
*Lamium purpureum*  
(Dijkstra, n.d.)



**Wood sage**  
*Teucrium scorodonia*  
(Dijkstra, n.d.)



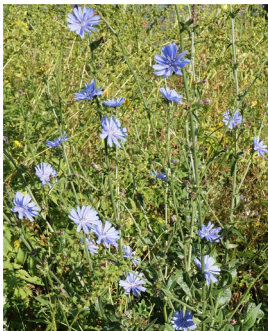
**Common harebell**  
*Campanula rotundifolia*  
(Dijkstra, n.d.)



**Heath**  
*Erica*  
(Dijkstra, n.d.)



**Greater burdock**  
*Arctium lappa*  
(Dijkstra, n.d.)



**Common chicory**  
*Cichorium intybus*  
(Dijkstra, n.d.)



**Wild basil**  
*Clinopodium vulgare*  
(Dijkstra, n.d.)



**Maiden pink**  
*Dianthus deltoides*  
(Dijkstra, n.d.)

4c. Native flowers



**Wild teasel**  
*Dipsacus fullonum*  
(Dijkstra, n.d.)



**Meadowsweet**  
*Filipendula ulmaria*  
(Dijkstra, n.d.)



**Ox-eye daisy**  
*Leucanthemum vulgare*  
(Dijkstra, n.d.)



**Common self-heal**  
*Prunella vulgaris*  
(Dijkstra, n.d.)



**Musk mallow**  
*Malva moschata*  
(Dijkstra, n.d.)



**Purple loosestrife**  
*Lythrum salicaria*  
(Dijkstra, n.d.)



**Meadow clary**  
*Salvia pratensis*  
(Dijkstra, n.d.)



**Common soapwort**  
*Saponaria officinalis*  
(Dijkstra, n.d.)



**Red campion**  
*Silene dioica*  
(Dijkstra, n.d.)



**Ragged-robin**  
*Silene flos-cuculi*  
(Dijkstra, n.d.)



**Black mullein**  
*Verbascum nigrum*  
(Dijkstra, n.d.)



**Yellow loosestrife**  
*Lysimachia vulgaris*  
(Dijkstra, n.d.)




**Comfrey**  
*Symphytum officinale*  
(Dijkstra, n.d.)




**Tansy**  
*Tanacetum vulgare*  
(Dijkstra, n.d.)




4d. Native seeds and bulbs




**Foxglove**  
*Digitalis purpurea*  
*(Dijkstra, n.d.)*




**Common bluebell**  
*Hyacinthoides non-scripta*  
*(Dijkstra, n.d.)*



**Cornflower**  
*Centaurea cyanus*  
*(Dijkstra, n.d.)*



**Long-headed poppy**  
*Papaver dubium*  
*(Dijkstra, n.d.)*



**Lathyrus tuberosus**  
*Tuberous pea*  
*(KU Leuven, n.d.)*

**Bibliography**  
The list of native species was accessed from: Nationaal Park Utrechtse Heuvelrug (n.d.). *De Heuvelrugtuin plantenlijst*. Retrieved on May 11, 2025, from <https://www.np-utrechtseheuvelrug.nl/heuvelrugtuinen/plantenlijst/>

**Figures**  
Nearly all images of native trees, shrubs, flowers, and seeds and bulbs have been taken by Klaas Dijkstra, and were accessed on May 11, 2025, from [wilde-planten.nl](http://wilde-planten.nl)

**Exceptions:**  
**Bird cherry (Prunus padus):** KU Leuven (n.d.). *Prunus padus* - *Amygdalaceae* [Photograph]. Retrieved on May 11, 2025, from <https://kulak.kuleuven.be/bioweb/>

**Silver birch (Betula pendula):** KU Leuven (n.d.). *Betula pendula* - *Betulaceae* [Photograph]. Retrieved on May 11, 2025, from <https://kulak.kuleuven.be/bioweb/>

**Sweet briar (Rosa rubiginosa):** KU Leuven (n.d.). *Rosa rubiginosa* - *Rosaceae* [Photograph]. Retrieved on May 11, 2025, from <https://kulak.kuleuven.be/bioweb/>

**Midland hawthorn (Crataegus laevigata):** KU Leuven (n.d.). *Crataegus laevigata* - *Malaceae* [Photograph]. Retrieved on May 11, 2025, from <https://kulak.kuleuven.be/bioweb/>

**Tuberous pea (Lathyrus tuberosus):** KU Leuven (n.d.). *Lathyrus tuberosus* - *Fabaceae* [Photograph]. Retrieved on May 11, 2025, from <https://kulak.kuleuven.be/bioweb/>