Interclusive Urban Green

Greening approach for the inner city of Schiedam

P5 Report

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Abstract

Most contemporary cities are currently unable to adapt fast enough to the constant change in demands. Rapid technological advances have significantly altered the way humanity interacts with its surroundings – with a sedentary lifestyle becoming more common – while climate change and ecological degradation threaten to do unrepairable damage to our urban ecosystems. These trends will – without drastic change – ultimately lead to increased social isolation, more people living an unhealthy lifestyle, an uncomfortable urban microclimate, and a lack of resilience regarding environmental shocks and stresses.

This study aims to determine how urban green – with its different qualities and attributes – can be applied to mitigate these potential future effects and develop a future city that is more liveable, resilient, and biodiverse. In this context, urban green can be defined as all urban land covered by vegetation of any kind – irrespectively of size, function, and ownership.

To effectively research the diverse benefits of urban green, a case study approach was applied, in which the city centre of Schiedam was selected. Additionally, the following research question was chosen: ''How can the implementation of urban green in the inner city of Schiedam contribute to resolving issues related to ecological degradation, climate adaptation, social isolation, and vacancy in an integrated and inclusive way?''

Literary research and case study reviews were conducted to assess the different ways urban green can be implemented, with their subsequent benefits. Furthermore, spatial analysis was conducted to gain a better understanding of how the aforementioned problems are manifested in the case of Schiedam, together with how the literary findings can be implemented in a real location.

The research showed that a multiscalar development strategy is required in order to utilise the concept of urban green to its full potential. On the scale of the inner city, five distinct types of pocket parks were developed that each focus on a specific target group. The goal of these park types is to minimise the barrier for people to come outside – giving them a high-quality social green space for whatever purpose they need within a five-minute radius. Furthermore, pocket parks contribute to creating a continuous ecological network, as well as provide environmental benefits.

On the street scale, an objective evaluation method was developed, which can be used to assess the current social, environmental and ecological quality of any street type. Additionally, an intervention toolbox was developed that provides the necessary tools to redevelop the street types accordingly.

By utilising the different potential qualities of urban green through a multiscalar development approach, the future inner city of Schiedam will become a rich, biodiverse urban territory that promotes social interaction and a healthy lifestyle – all while being resilient and climate adaptive.

Key words:
Urban green, Pocket parks, Greening approach, Climate adaptation, Healthy lifestyle, Schiedam

Figure 0.1. Image of inner city of Schiedam (t645556, 2019).

Personal motivation

Throughout my whole life, I have been living in Schiedam. It is the place I grew up and I still have a lot of fond memories here, thinking back to the times when I went with my parents to the city centre to grab a drink and just watch all kinds of people walk by. I used to love going to the inner city, but nowadays that former conviviality is gone and I barely visit anymore.

I used to think this simply boiled down to the high vacancy levels in Schiedam, however, throughout my study and especially the Urbanism master's, I have come to the realisation there are a lot more factors involved. With my thesis project, I would like to explore exactly what the current issues are in the inner city of Schiedam and develop a comprehensive development strategy that mitigates those effects. The main tool that will be used for this is urban green, as it is a fascination I have developed throughout my professional career and would like to explore more.

Figure 0.2. Image of inner city of Schiedam (t645556, 2019).

Acknowledgements

To my mentors, Claudiu Forgaci and Marjolein Pijpers-van Esch, I would like to express my deepest gratitude for supporting me throughout my thesis. The insightful discussions, continuous guidance, and helpful feedback have been essential for me to progress throughout my thesis, resulting in the rapport in front of you. Without their help, this project would not have been possible.

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Table of Contents

1 PROBLEM DEFINITION

1.1 Context
1.1.1 Era of change
1.1.2 Cities lack behind

1.2 Problem field
1.2.1 Climate change
1.2.2 Ecosystem health
1.2.3 Problematisation
1.2.4 Problem statement

1.3 Project location
1.3.1 Typology
1.3.2 Schiedam
1.3.3 Relevance of location
1.3.4 Specific problematisation

This chapter provides an overview of the main urgencies that drive the project. By delving into the problematisation and project location, chapter 1 aims to create a clear overview of the problem at hand. A general context is first introduced, followed by a more specific overview of the main urgencies that will be tackled within this project. Following this, the problematisation will summarise the main challenges, after which a project location will be characterised and selected.

1.1.1 Era of Change

Urbanisation

Currently, humanity finds itself in a time of unprecedented change, both politically, economically, and environmentally (Agarwal, 2021). Furthermore, as the world population continues to grow, the process of urbanisation has had a significant influence on how the world is shaped today. As can be seen in figures 1.1 and 1.2, the percentage of people living in an urban environment has rapidly increased throughout the past 50 years. In 1970, a total of 36,55% of the world population was living in urban areas, while this percentage has increased to a total of 56,16% in 2020 (UN Population Division, 2021b). Furthermore, current predictions state that this process is most likely to continue, with a projected 68% of the world population living in urban areas by 2050 (UN Department of Economic and Social Affairs, 2018).

A similar development can be seen in the Netherlands, with a 30,58% increase in people living in urban territories throughout the past 50 years, resulting in a total amount of 92,24% in 2020 (UN Population Division, 2021a).

As you would expect, this rapid increase of people living in urban areas creates new pressures and threats to these areas, such as increased pollution and environmental degradation (National Geographic, 2021).

Technological advances

Secondly, the world currently finds itself in a period of unprecedented technological advances (Business Insider, n.d.). For example, over 90% of the world's Big Data has been produced in only the past two years (Bulao, 2022). Technology has significantly changed the way people live their lives today – both positive and negative.

Figure 1.3. Illustration of technological advancements (Pequot Library, 2019).

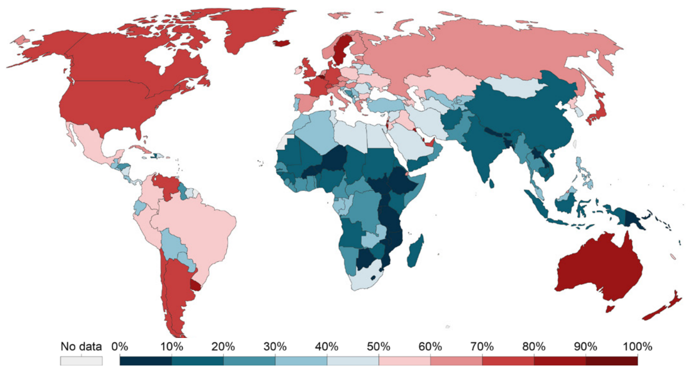


Figure 1.1. Percentage of people living urban areas (1970). Data from: (UN Population Division, 2021a)

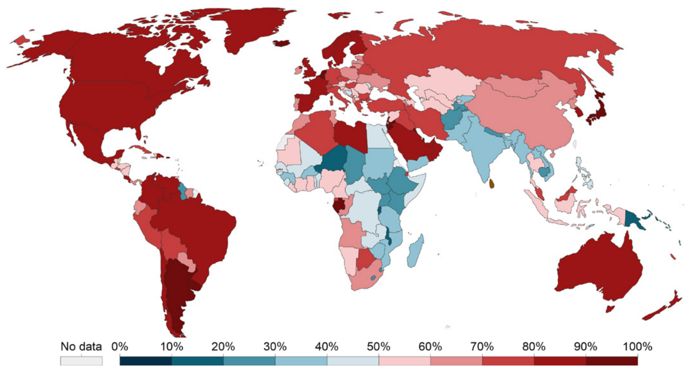


Figure 1.2. Percentage of people living urban areas (2020). Data from: (UN Population Division, 2021a)

Due to the introduction of the internet, people are more connected to each other than ever before. However, social isolation and loneliness are also at an all-time high (Digitalworld839, 2021). This is caused by people staying inside more often to connect with their online friends – never establishing friendships in the real world.

Other things have also become significantly easier and more convenient due to technology, such as shopping for groceries and clothes. While in the past you had to go to the store to get something, nowadays you are never more than just a few clicks away from whatever you might want (Aging In Place, 2022). However, this again severely limits the number of social interactions we get and the amount of physical exercise (Digitalworld839, 2021).

Overall, technology has made our lives way easier. If you do not know something, you look it up. If you do not have something, you buy it online. If you want to listen to some music, you just grab your phone. The list goes on. However, these technological advances have also significantly changed the way we use and interact with our surroundings.

1.1.2 Cities lack behind

While the world is changing at an unprecedented rate, cities worldwide are struggling to keep up. For example, many Dutch cities have been unable to adapt fast enough to the changing conditions. A clear example of this is the housing shortage, in which a total of 900.000 new houses are needed before 2030 (De Hypotheker, 2021).

Climate adaptation

However, the problem also touches other domains. For example, in terms of the climate, Stadszaken (2016) stated that the current climate adaptation measures are insufficient. They explain that the existing climate interventions are often small and focused only on the short term, while a concrete long-term development program is missing.

Changing behaviour

Furthermore, cities are failing to adapt to the changing way inhabitants use the city. Morgan (2019) describes it as an 'experience economy', in which citizens start to prioritise experiences over functionality. Fueled by the internet and social media, people are starting to see the public city landscape more as an experience than a necessity.

This results in drastic changes in how people use the city. A good example of this is shopping. People used to mostly go out shopping when they needed something, while nowadays all necessities can be purchased way faster on the internet. This means that a growing percentage of shoppers nowadays focus more on the experience of shopping, rather than the products. A recent study shows that this 'experience first' mentality has increased by 70% over the past 30 years to a current percentage of 78% of people (Morgan 2017). Cities, on the other hand, are still mostly focused on functionality and efficiency.

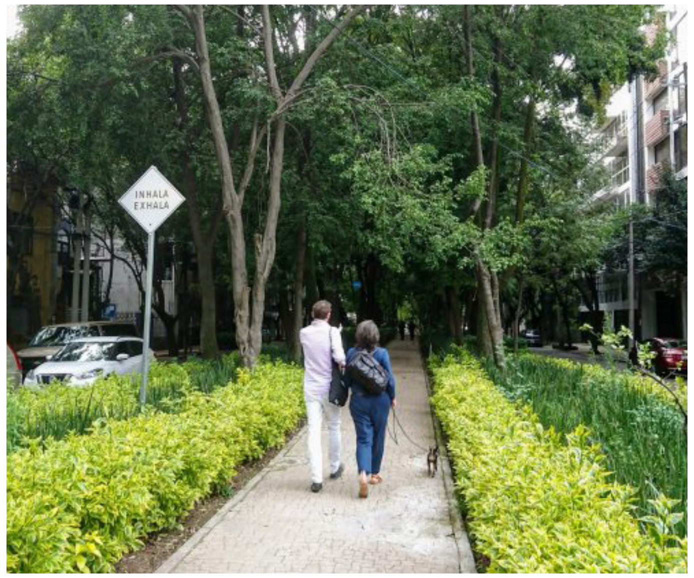


Figure 1.4. Experience based street design (Natural Walking Cities, 2019).

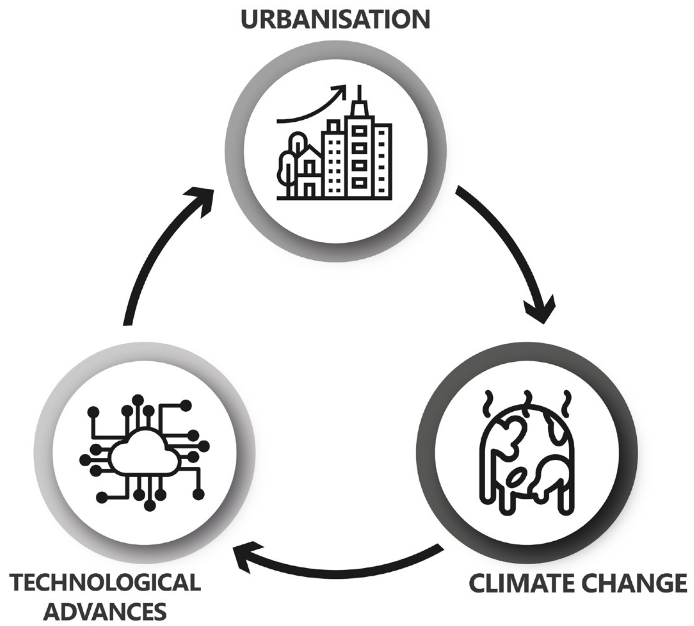


Figure 1.5. Diagram of relevant domains in which cities lack behind. Made by Author.

Development constraints

An important factor that keeps cities from developing faster is the number of constraints, as is illustrated in figure 1.6.

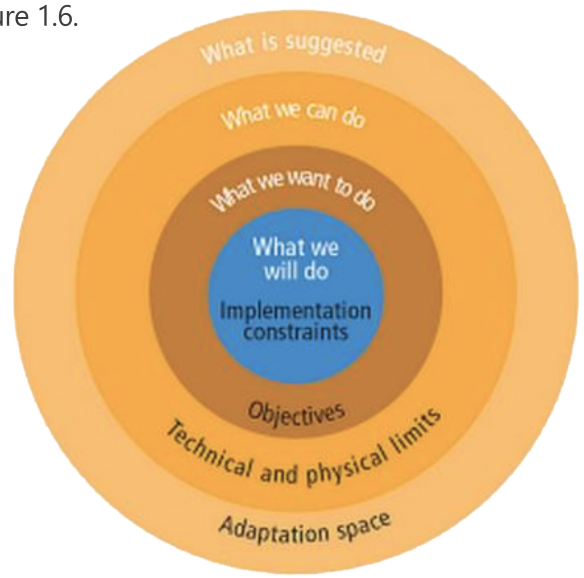


Figure 1.6. Diagram of development constraints (Climate Policy Info Hub, n.d.).

The diagram illustrates the four main types of constraints - available space, technical limitations, governance-related objectives, and implementation issues. These constraints result in only a small proportion of the possibilities being implemented.

However, this diagram does not paint the entire picture. Another important aspect hindering progress is the fact that the aforementioned types of development are (relatively) new. Especially the experience economy is a contemporary issue, resulting in less concrete knowledge on how to mitigate the negative effects and adapt to the changing conditions.

1.2.1 Climate change

The first urgency is related to the changing demand of cities in terms of the climate. Due to climate change, cities worldwide are starting to face an entirely new set of urgent problems. As stated by Tollefson (2020), the global average temperature on earth will increase by over 5°C by the end of the century if measures are not taken immediately. This would be an increase of over 600 percent in comparison to the 0,8°C that the global average temperature has risen over the past century (Bradford & Pappas, 2017).

Cities and their built environment are – for a large part – responsible for this, with around 75% of all CO2 emissions coming from urban territories (The Nation, 2018). As a result, cities should be an integral part of the global solution to combat climate change.

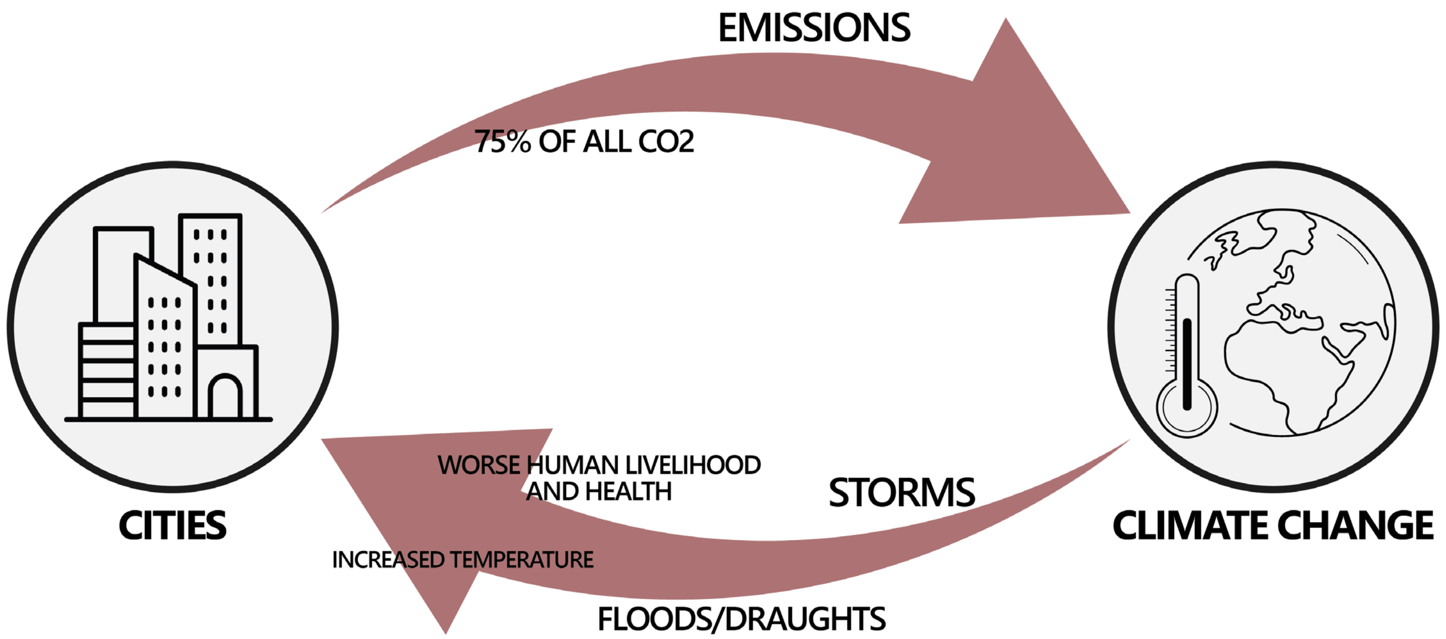


Figure 1.7. Downward spiral of effects of climate change and cities. Made by Author.

But what if nothing happens? First of all, extreme weather events will become a lot more frequent. Furthermore, extended heatwaves and droughts will become significantly more common, while storms and floods will also happen more frequently (Bradford & Pappas, 2017). As stated by Short (2021); ''The pace of climate change is accelerating much more rapidly than urban areas are taking steps to adapt to it.''. Ultimately, this will lead to massive economical damage. In the US for example, last year saw a record-breaking amount of climate disasters, resulting in tens of billions of dollars worth of damages (Short, 2021).

Another potentially catastrophic effect of climate change is the rising seawater levels. As stated by Mulhern (2020b), a sea-level rise of 1 to 2 metres is expected by 2100 if nothing is done. Especially for a country like the Netherlands, the effect of this will be immense, as can be seen in figure 1.8.

Furthermore, climate change will do irreparable damage to the natural world, with entire ecosystems that will be destroyed. Bradford and Pappas (2017) estimate that around half of earth's plant species and a third of earth's animal species will have become extinct by 2080.

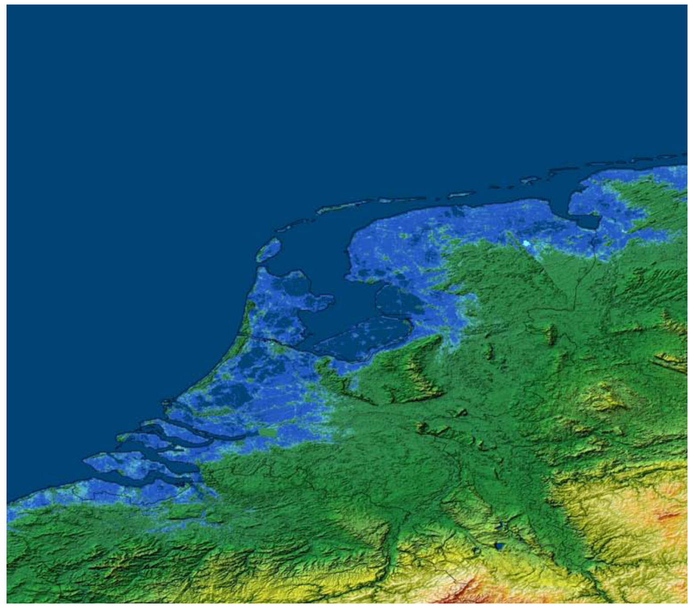


Figure 1.8. Visualisation of impact rising seawater levels (ESA, 2009).

Lastly, climate change will also significantly impact our society, as can be seen in figure 1.9. More heat-related deaths and life-threatening tropical disease outbreaks like the Zika virus will occur, while birth defects and chronic conditions like asthma will also become a lot more common (Bradford & Pappas, 2017).

Luckily, the point of no return has not yet been reached. If all countries worldwide come together and fight back against climate change, the global average temperature rise can still be reduced to 1,5°C by the end of the century (Tollefson, 2020). However, this would require a coordinated approach with action at the global, national, regional, and local levels (UNEP, n.d.). One important way cities can fight back is by investing in cooling techniques. Things like green roofs, more urban green and permeable surfaces, urban forestry, and rainwater harvesting can have a significant impact on cooling down the planet (Leighton, 2019).

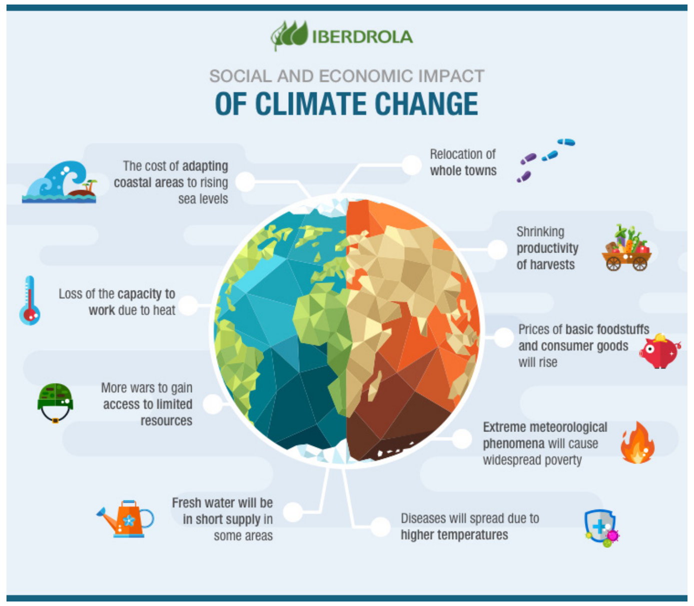


Figure 1.9. Societal impact of climate change (Iberdrola, n.d.).

Heat-island effect

Another effect that is amplified by climate change is the urban heat-island (UHI) effect. An urban heat-island is an urban territory that experiences higher average temperatures than the surrounding rural areas, as seen in figure 1.10. This difference can reach up to more than 10°C in the case of an extreme weather event (Tong et al., 2021), making the temperature within the city sometimes unbearable. In the future, these effects will become even more extreme due to climate change.

However, cities themselves also bear part of the blame. Most contemporary cities have an immense amount of dry paved surfaces, such as streets and buildings. These structures provide a lot less moisture than trees and other types of vegetation, making it harder for the area to cool off (EPA, 2021b). Furthermore, especially in wider paved areas, shading from buildings will be limited, resulting in even less cooling capacity.

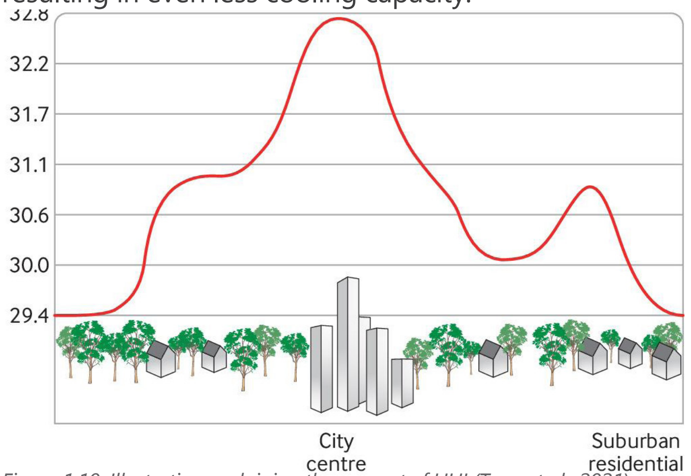


Figure 1.10. Illustration explaining the concept of UHI (Tong et al., 2021).

Furthermore, most conventionally used materials in cities absorb a lot more solar energy from the sun than trees and other vegetation types (EPA, 2021b).

As a result of the UHI, there is an annual increase in heat-related deaths, such as exhaustion and heat stroke (Tong et al., 2021). Furthermore, due to the heat, the general productivity of people goes down significantly (ILO News, 2019).

Another important effect of the UHI is the increased amount of air pollution (Appleton, 2020), which has another full list of potential negative effects of its own. Lastly, the UHI effect can also harm the water quality (Appleton, 2020).

The solution for reducing the UHI is quite simple - add more nature (EPA, 2021c). As said before, trees and other vegetation types reflect more energy coming from the sun, while simultaneously providing more shade and moisture for cooling. Even adding a limited amount of green can already have a significant impact on the microclimate (EPA, 2021c).

1.2.2 Ecosystem health

The second main urgency concerning the changing demand of cities is ecosystem health. An ecosystem can be defined as a biological community of interacting organisms and their physical environment (Oxford Languages, 2021). A city can therefore also be classified as an ecosystem – in which humans and all other organisms interact with each other and their surroundings.

The term ecosystem health encompasses issues related to the health and well-being of humanity, as well as biodiversity. Both will now be explained separately in more detail.

Human health & well-being

As stated in chapter 1.1.2, the way humanity is interacting with the city is changing. People have less of an urgency to leave their house as food, clothing and pretty much everything else can be brought to your doorstep with just a few clicks on your technological device.

However, while this makes life significantly easier, it has also resulted in society being considerably less active (Owen et al., 2010). Even before the pandemic, many people sit at home all day or only get up to travel from/to work – where they sit again. As a result, people's lifestyle becomes progressively less healthy. These developments have significantly increased lifestyle-related diseases.

First of all, cardiovascular diseases are on the rise, with the annual amount of deaths rising worldwide (Kauffman, 2020). Secondly, obesity rates are rising due to a lack of exercise (Bach, 2014). Furthermore, the likelihood of attracting other diseases like diabetes, a stroke, and certain cancers has seen a significant increase (Medline Plus, n.d.).

An inactive lifestyle also affects people's mental health, with depression and anxiety becoming more frequent. Ultimately, this all results in decreased mental well-being and a lower quality of life (Ellingson et al., 2018).

To combat this, cities should encourage people to go outside. Frequent interaction with nature has been proven to have a positive impact on people's mental health (Weir, 2020), while simultaneously promoting exercise.

Figure 1.11. An increasing amount of people leading an unhealthy lifestyle throughout the decades. Background images created by freepic.diller from freepik.com.

Biodiversity loss

In nature, the biodiversity of an area fluctuates with natural cycles (Rafferty, n.d.). This means that the biodiversity of an ecosystem is never stationary. Furthermore, natural ecological disturbances can significantly alter the biodiversity in an ecosystem. However, over time, ecosystems have been able to adapt to this challenge.

Biodiversity loss caused by humans, however, tends to be a lot more severe and long-lasting (Rafferty, n.d.). Outside of agriculture and deforestation, the built environment has an important role to play here.

The most obvious impact of urbanisation are the direct ones. To build a city you need space, which will be taken away from the natural world – disrupting the ecosystem that is colonised (McDonald, n.d.). Furthermore, most contemporary cities leave little nature in the 'final product', removing all chances for native species to survive.

But while native species often go extinct in urban territories, new species find their way into the built environment. A study showed that around 20 percent of bird species and 5 percent of plant species are found in urban areas (Levikov, 2014). This further amplifies the importance of providing sufficient facilities for the existing species to survive, as they are now also under continuous threat.

While the direct effects of cities on biodiversity are clear, the indirect effects of cities are arguably even greater. Urban territories consume a lot of resources and food from nature – resulting in them getting 'exhausted' (McDonald, n.d.). Furthermore, pollution plays a significant role in biodiversity loss. These effects are often seen on a larger scale and have a wider impact area.

However, while humanity is causing irreversible damage to the ecosystem, it also relies a lot on biodiversity. Humans rely on different types of plants and animals for food and resources (Rafferty, n.d.). In a way, humanity is destroying its future resources.

Figure 1.12 shows the current state of the biodiversity problem, together with three potential futures. Drastic change is needed to prevent the current trend of biodiversity loss to get out of control.

Within cities, the solution to preventing biodiversity loss lies in providing opportunities for wildlife to live in the built environment. Things like wildlife corridors, organic maintenance, and more variety of urban green can significantly contribute to improving the conditions for other species to survive in the city (Land8: Landscape Architects Network, 2015).

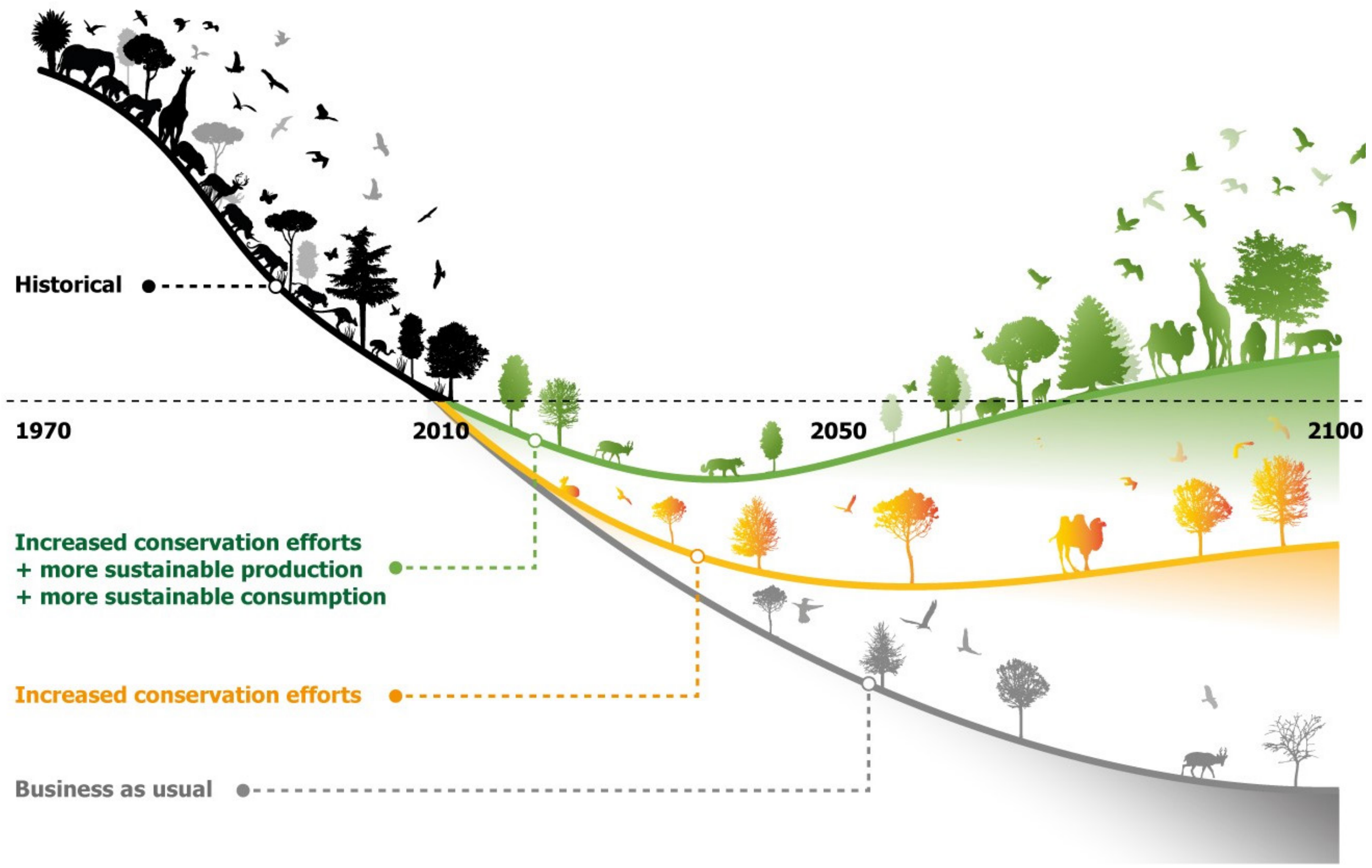


Figure 1.12. The biodiversity loss curve (WUR, n.d.).

1.2.3 Problematisation

The urgencies described in the previous sub-chapter are summarised in figure 1.13. The diagram consists of three main parts.

Climate
First of all, the top half contains the main problems related to the climate. It again focuses on climate change and the UHI effect, as well as the microclimate. In this, the worsening microclimate can be seen as the main way how citizens experience the other two concepts.

Ecosystem health
The bottom half contains the main problems related to ecosystem health. This half again contains the biodiversity and lifestyle aspects, combined with decreasing quality of life. The decreasing quality of life can be seen as the main way how citizens experience the other two concepts.

Lack of urban
Ultimately, all these problems can be related to a lack of urban green. As mentioned in the previous sub-chapter, one of the main potential solutions for resolving each issue is adding some type of vegetation/green. The lack of urban green will therefore be the main focus of this project.

1.2.4 Problem statement

The problem statement focuses on the current inability of cities to adapt fast enough to the rapid speed at which the world is changing. The statement is based on the problematisation diagram, in combination with all previously discussed material.

It is a known fact that the world is changing faster than ever before. Rapid technological advances and climate change have significantly altered the way humanity views and interacts with its surroundings.

However, most contemporary cities are unable to keep up with the rapid change in demand, leading to an imbalance between human needs and available facilities. Furthermore, cities are unable to adapt fast enough for the future.

Ultimately, if this same situation continues, this could lead to increased social isolation, a higher percentage of people living an unhealthy lifestyle, an uncomfortable microclimate, and a lack of resilience regarding environmental shocks and stresses.

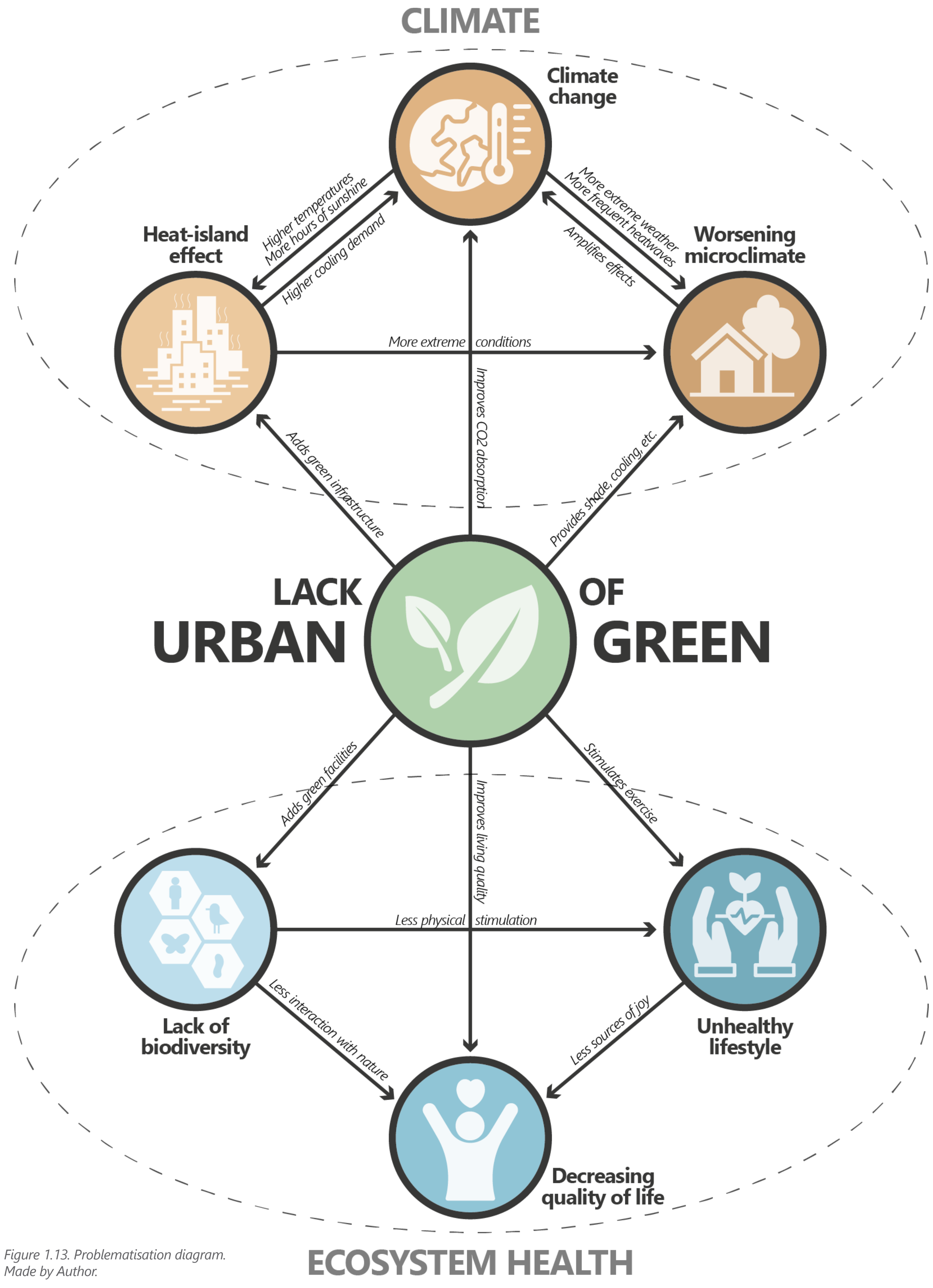


Figure 1.13. Problematisation diagram.
Made by Author.

1.3 Project location

1.3.1 Typology

To effectively research the impact of urban green on the aforementioned problem field, a case study approach will be applied, as it helps to translate potential (design) concepts into a real context. This research will apply a case study within the Netherlands, as this is the environment that I am most knowledgeable in, meaning less time will be spent on first trying to understand the context. Furthermore, the case study location should have similar concerns as the problem field, as well as be transferable to other cases (to a certain degree).

In the Netherlands, a very common typology is the traditional Dutch character, of which an example can be seen in figure 1.14. What is part of this 'traditional Dutch character' consists of four main parts.

Figure 1.14. Image of the traditional Dutch character. Example of the city of Sneek, Friesland (Funda, 2019).

Figure 1.15. Character component 1 - the buildings. Made by Author.

1. Buildings

The first main component of the Dutch character is the buildings. As can be seen in figure 1.15, buildings each have their unique appearance, but all within the same style – brick buildings with different roof designs that are 3 to 5 stories high. Together they create one coherent housing block that is interesting to look at due to all the little differences. Furthermore, as the character is mostly found in old city centres, the plinths often have an open character with some type of public facility inside. However, this is not always the case, as the buildings are also often used purely as residential buildings, which have a plinth that is significantly more closed in nature.

2. Streets

The second component is the type of streets. As seen in figure 1.16, the paving is almost always brick – varying from a bright red to a dark yellow colour. Furthermore, the patterns of the paving often provide a sense of direction, as for example the edges of the main road to the parking space are marked by a row of differently orientated bricks. Also, it is important to mention that the streets are (almost) entirely paved, leaving very few permeable surfaces. Lastly, the streets are generally pretty narrow, with street widths of 6-10 metres being the norm.

Figure 1.16. Character component 2 - the streets. Made by Author.

1.3 Project location

3. Nature

The third component is the natural quality, or rather the lack of nature. As said before, the streets are almost entirely paved, leaving little to no room for nature. Outside the occasional row of trees, no nature can be found in these areas. However, an important natural feature that is commonly present in these areas is the canal, as seen in figure 1.17. Throughout the Netherlands, many settlements formed alongside important rivers as a means of trade and travel, of which the remains can still be seen today.

Figure 1.17. Character component 3 - nature. Made by Author.

Figure 1.18. Character component 3 - furniture. Made by Author.

4. Furniture

Lastly, certain types of 'furniture' are commonly implemented within the Dutch character. First of all, public benches and other types of public furniture are lacking, with only the occasional bench and trash can here and there. Furthermore, the river edge is often used as a place to park cars and bicycles, making the river function as a 'back side' of the street. Lastly, the sides of bridges are always fenced off with an old-style iron fence, while the river edge does not have these protection rails.

Overview typology

Figure 1.19. Overview traditional Dutch character. Made by Author.

1.3.2 Schiedam

A city that falls perfectly into the previously described typology is Schiedam. Its inner city, seen in figure 1.20, is surrounded by canals and has a very similar type of streets and housing as seen in chapter 1.3.1. Furthermore, it has the same qualities, but also the same problems as other locations with this same typology.

Figure 1.22 shows an image within the inner city of Schiedam. All previously described characteristics can be seen here again. Traditional housing, completely paved, limited green, a historical canal, and narrow streets can all be observed.

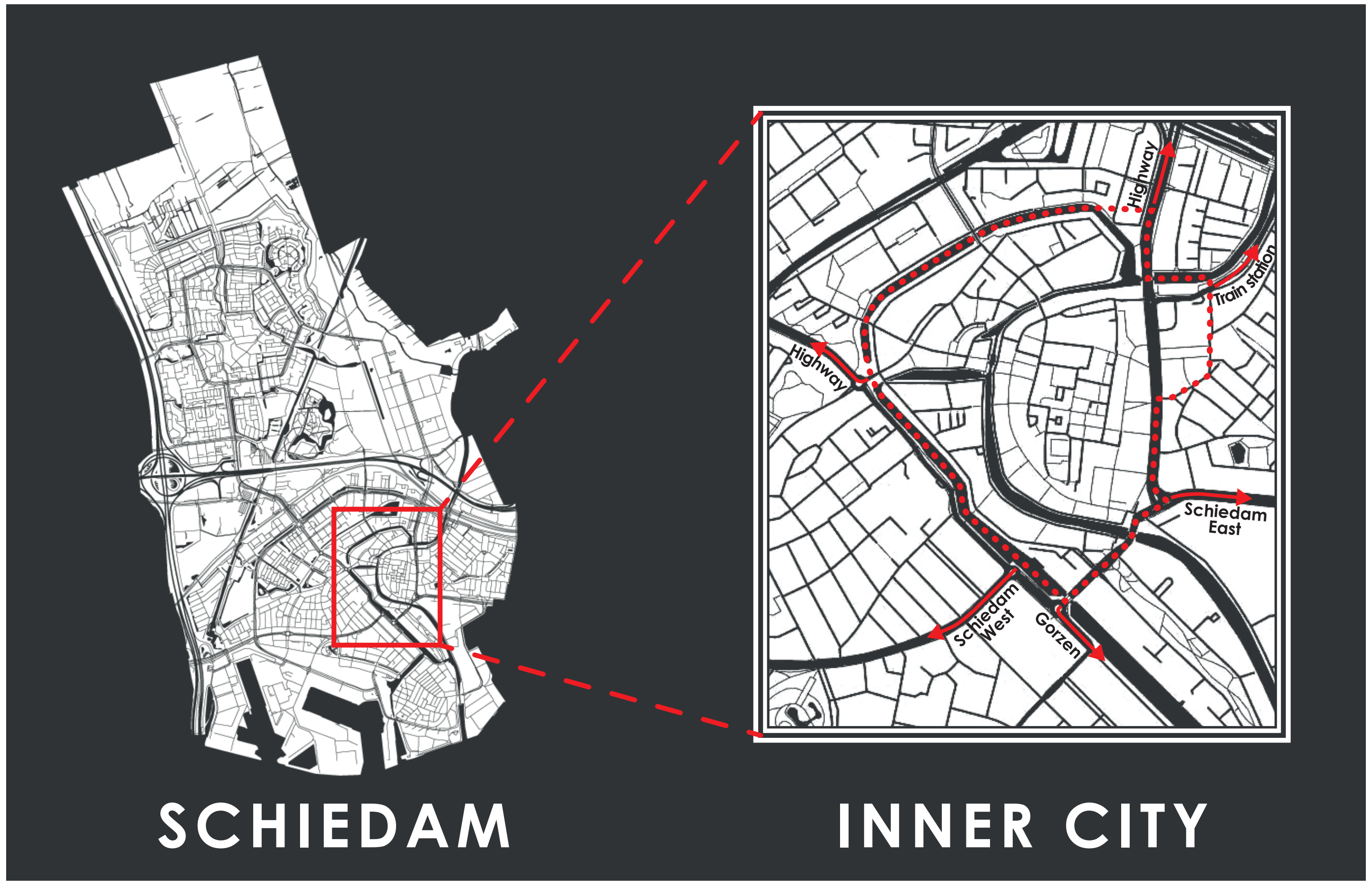


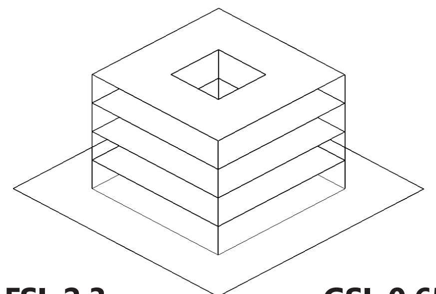
Figure 1.20. Project location. Made by Author.

The inner city of Schiedam has a total of 4.105 inhabitants, with a population density of 10.012 people per square kilometre. Furthermore, the inner city has a total surface area of 0,41 square kilometre. The inner city is located close to the only train station in Schiedam, as well as to the highways A4 and A20. As such, the inner city of Schiedam is well-connected to its surroundings.

Important to note is that the boundaries of the inner city do not form a 'strong edge' of the project location, as the inner city is merely selected as a starting point. For example, if new connections to areas outside the boundaries are beneficial, these edges will not prevent that. However, the focus will predominantly be within the boundaries of the inner city.

4.105 inhabitants

0,41	Total surface area (km^2)
10.012	Population density (p/km^2)
2,143	Annual population growth (%)
25.700	GDP per capita (€)
7,0	Highest elevation (m)



FSI: 2,3 **GSI: 0,65**

Figure 1.21. Practical information of the inner city of Schiedam. Data from: (Informatie wijk Centrum, 2021).

Figure 1.22. Picture of inner city of Schiedam. Made by Author.

1.3.3 Relevance of location

While the inner city of Schiedam is a place with diverse qualities, it also faces many of the contemporary issues found in the problem diagram of chapter 1.2.3. Figure 1.23 contains an image showing a typical streetscape within the inner city of Schiedam. The image highlights several ecological and environmental concerns and stresses.

Lack of urban green
First of all, the streetscape has an inherent lack of urban green. Only a few decades ago, urban design was still predominantly focused on functionality, while the importance of urban green was not yet established, which – as a result – led to a situation where urban green often was not integrated.

Limited shade/moisture
A major concern related to streets without vegetation is their inability to cool themselves down (EPA, 2021c). The moisture of vegetation can provide cooling, as well as shade. While this particular streetscape – seen in figure 1.23 – is relatively narrow and will therefore not have quite as much sunlight, several streets have similar characteristics but with a larger width.

Lack of permeability / Limited water storage
These types of streets also face several water-related issues. Its inherent lack of permeability puts pressure on the sewerage system and reduces the water quality (Upper Midwest Water Science Center, 2019). This will only get worse as climate change continues. Furthermore, there is insufficient capacity for water storage and natural water retention.

Car dominance
One important component that prevents more urban green from being integrated is the issue of car dominance. A large majority of the street width is dedicated to the car (driving and parked), leaving little room for both people and nature.

Urban heat-island
Lastly, there is the concern related to the UHI effect. Due to the limited shade/moisture, the UHI effect poses heightened health risks and lower water quality (Appleton, 2020). Outside of providing moisture and shade, adding vegetation would also help to reflect more energy coming from the sun.

Figure 1.23. Picture of typical streetscape in the inner city of Schiedam, combined with icons highlighting main concerns. Made by Author.

Figure 1.24. Picture of the Hoogstraat in Schiedam, combined with icons highlighting main concerns. Made by Author.

Outside of the ecological and environmental concerns, the inner city of Schiedam also faces issues of a more social nature. Figure 1.24 contains an image showing the main shopping street of the inner city of Schiedam, which has been plagued by vacancy throughout the past decade(s).

Decreasing liveliness / Not attractive anymore
Throughout the past decade, the amount of visitors to shopping streets has significantly decreased. Ultimately, this has resulted in a decreased liveliness, as the street now feels empty and is mostly used as a slow-traffic street. An important contributing factor to these changes is the changing behaviour of people, as described in chapter 1.1.2. People are starting to prioritise the experience over functionality, while the social spaces have seen little to no transition to counteract those changes.

Loss of social space
Another important concern is the loss of social space. Throughout the inner city, the are multiple social spaces – from playgrounds to the aforementioned shopping streets – that are not used (anymore). As a result, the choice of social space for people to visit becomes very limited, making them less likely to visit frequently.

Empty facades
In some regard, the issue of vacancy can be seen as a downwards spiral. Fewer people mean less business, leading to vacancies. And empty facades further decrease the liveliness and attractiveness of the area, leading to even fewer people (Gehl Architects, 2008). To get out of this vicious cycle, the focus therefore should not be on only attracting business, but on attracting people by making the area attractive again.

No 'uniqueness' / No urban green
Two components that can improve the attractiveness of an area are adding unique qualities and urban green. The unique qualities help to create a feeling of attachment, which stimulates people to come back, while nature is found to be generally more pleasant to look at than most building materials (Kerishnan & Maruthaveeran, 2021).

1.3.4 Specific problematisation

As said before, the problematisation found in chapter 1.2.3 has a significant amount of overlap with the specific problems found within the inner city of Schiedam, however, there are some slight differences. Furthermore, now that a case study has been selected, the problems are further specified. In figure 1.25, the specific problematisation diagram for the inner city of Schiedam can be found. It consists of four main themes – each further specified with some specific problems within that category.

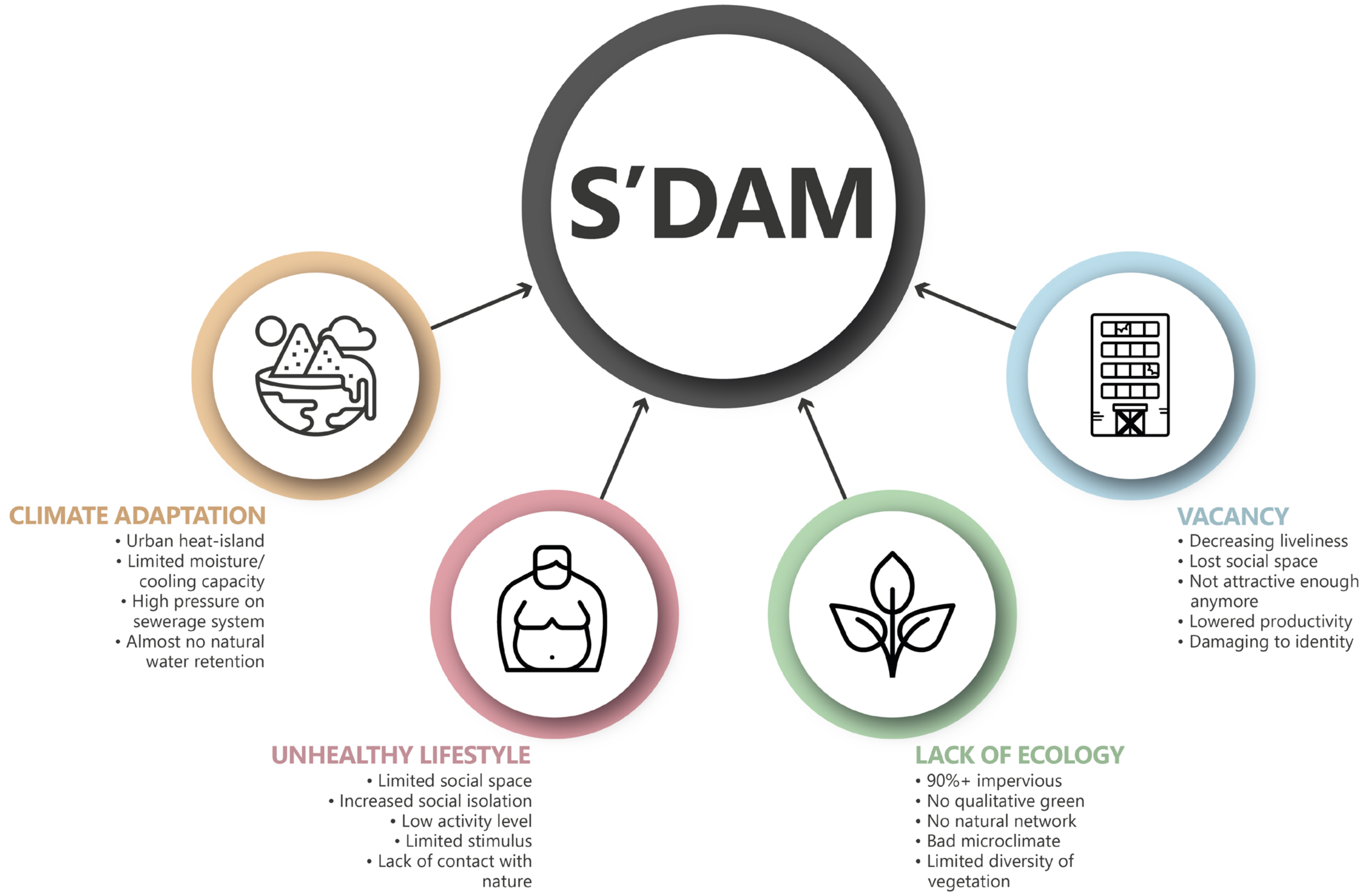


Figure 1.25. Specific problematisation diagram of Schiedam. Made by Author.

Climate adaptation
Present-day Schiedam is not yet prepared for the potential future effects of change climate. The inner city drastically lacks high-quality urban green and struggles with the urban heat-island effect due to its large amount of impervious surfaces.

Furthermore, the inner city is dominated by cars that produce air pollution and take up most of the available space. The high level of car dependency prevents other functions from being integrated, resulting in very monofunctional street patterns.

Further analysis on the climate adaptation status of the inner city of Schiedam, as well as the other main themes, can be found in chapter 4.

Unhealthy lifestyle
Schiedam also falls into the global trend of people staying inside more often, which contributes to an unhealthy lifestyle. This is partly due to the current way the inner city is shaped.

First of all, the inner city currently provides a limited amount of quality social spaces for people to interact. Furthermore, there is a lack of stimulus that encourages people to come outside – everything is pretty much the same.

Lastly, the inner city is unable to provide people with enough contact with nature, simply due to it not being there. Ultimately all these factors result in a decreasing liveliness within the inner city.

Lack of ecology
As mentioned before, the inner city of Schiedam also struggles with a lack of ecological value. Over 80% of the inner city is impervious, with most of the remaining <20% being from the canals. As a result, this puts high pressure on the existing sewerage system.

Furthermore, this lack of ecology means there is no continuous natural network within the inner city. This negatively impacts the microclimate and biodiversity within the inner city.

Vacancy
A problem that has not been thoroughly discussed before is that Schiedam is also facing issues related to the high amount of vacant buildings.

Only ten years ago, vacancy levels within the inner city of Schiedam were around 30 percent of all shops (Rijnmond, 2022). And while this number has significantly decreased, the problem is still there – as is reiterated by the news titles found below. Furthermore, many empty shops have been transformed into office spaces, which significantly alters the way the outside space will get used. However, no real changes have been made.

Schiedam is the champion of vacancy

– Rijnmond, 2017

Vacancy level has risen for the seventh year in a row

– Slob, 2014

2 METHODOLOGY

This chapter provides the main methodological structure the project will follow. By clarifying the main goals and expected outcome, chapter 2 aims to establish a clear direction in which the project will be heading. First, the main research aim is explained, followed by the leading research question and sub-questions. Next, the main research methods and expected outcomes are introduced, ending with a roadmap that roughly shows an estimation of time management.

2.1 Research focus

2.1.1 Urban green

As mentioned in the problematisation, urban green will be used as the main design concept within this graduation project. As explained by the WHO Regional Office for Europe (2017); ''urban green space is defined as all urban land covered by vegetation of any kind. This covers vegetation on private and public grounds, irrespective of size and function, and can also include small water bodies such as ponds, lakes or streams''. This means that every type of green space – from green facades to small patches of flowers – and all water bodies will be included when using the term ''urban green''.

So why urban green? Urban green has been found to have many different benefits, related to ecology and the evironmental, as well as socially and healthwise. It has a wide range of implications, however, it can also be used in various ways – each having different results. For example, a grass field will have no noise pollution-related benefits, while social networking might be perfect here.

Ecological/Environmental
- More biodiversity
- Improves climate adaptation
- Better circularity
- Less water and energy usage
- Provides cooling
- Water storage

Social
- Facilitates social networking
- Improves behaviour and cognitive functioning
- Reduces levels of crime, aggression and violence

Health
- Improves human health and well-being
- Less noise and air pollution
- Stimulates more exercise
- Aids in disease and pest control

Other
- Improves aesthetic value
- Increases property values

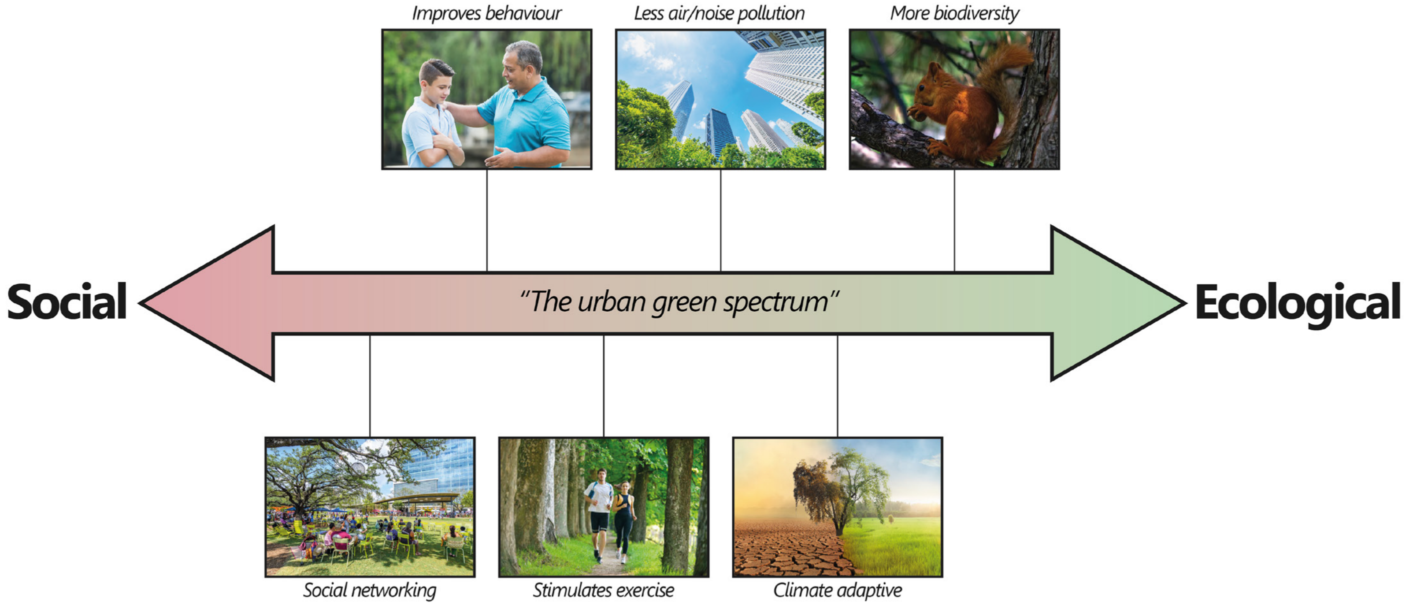


Figure 2.1. Spectrum of urban green benefits. Made by Author.

As seen in figure 2.1, the implications of urban green can be described as being on a spectrum. When urban planners and designers develop a new green facility, they will usually take a position within this spectrum. However, this way of designing does have its limitations and downsides.

The spectrum demonstrates a level of conflict within urban green development – do you go for a social or ecological type of green space? In many cases, the two do not go together that well. As said before, a grass field aimed to improve the local social facilities might not be that beneficial from an ecological perspective, while an ecologically focused project might lack in the social domain. The importance lies in finding the right balance of urban green spaces within a certain area to gain the most in all domains.

2.1 Research focus

2.1.2 Project aim

The project aims to explore the limits of urban green. While a lot is known about the potential benefits of adding urban green, the limits of its implications are yet unestablished. This project aims to bring together known implications and potential new ones in one coherent development strategy.

Another goal is to establish a way in which all inhabitants have equal access to the urban green-related benefits – leading to a situation in which all people can come in contact with nature whenever they want and for whatever purpose.

Furthermore, a balance should be found between the social and ecological sides of urban green, in which all are accounted for. The goal here is to use the different urban green implications to their full potential.

Lastly, the research will focus on how to implement this urban green approach in a context in which space is very limited – the inner city of Schiedam. Furthermore, this location currently has very few green facilities, meaning new and innovative ways are needed to facilitate sufficient urban green.

Figure 2.2. Different types of urban green interventions (WHO Regional Office for Europe, 2017).

2.1.3 Research question

The main research question focuses on the wide range of implications urban green has, in which potential new implications can also be explored.

The question is based on the concept of urban green in combination with the specific problematisation found in chapter 1.3.3.

> *''How can the implementation of **urban green** in the **inner city of Schiedam** contribute to resolving issues related to **ecological degradation**, **climate adaptation**, **social isolation**, and **vacancy** in an **integrated and inclusive** way?''*

2.2 Methodology

2.2.1 Research framework

To answer the main research question, a total of four sub-questions have been formulated - each aimed to tackle a specific part of the research project. In this, the sub-questions have a chronological order, meaning that conclusions of earlier sub-questions need to be (somewhat) clear before the next sub-question can be tackled.

Sub-question 1
The first sub-question aims to create a deeper understanding of the current performance of public spaces within the inner city of Schiedam. Public space can be defined as ''a place that is generally open and accessible to people. Roads (including the pavement, public squares, and parks are typically considered public space.'' (Definitions, n.d.). The goal is to create an overview of the main qualities and concerns within the context of Schiedam.

Sub-question 2
The second sub-question focuses on existing 'solutions' to the concerns found in sub-question 1. It aims to generate more knowledge on how the municipality currently deals with the issues at hand and how other cities have dealt with these similar concerns.

Sub-question 3
The third sub-question can be seen as bundling of the first two. It aims to further develop the previous findings and create an overview of where existing solutions might fall short. Following this, a development strategy will be outlined on how to tackle these limitations.

Sub-question 4
The final sub-question will focus on evaluating the development strategy and defining what components can be applied in other locations with similar characteristics.

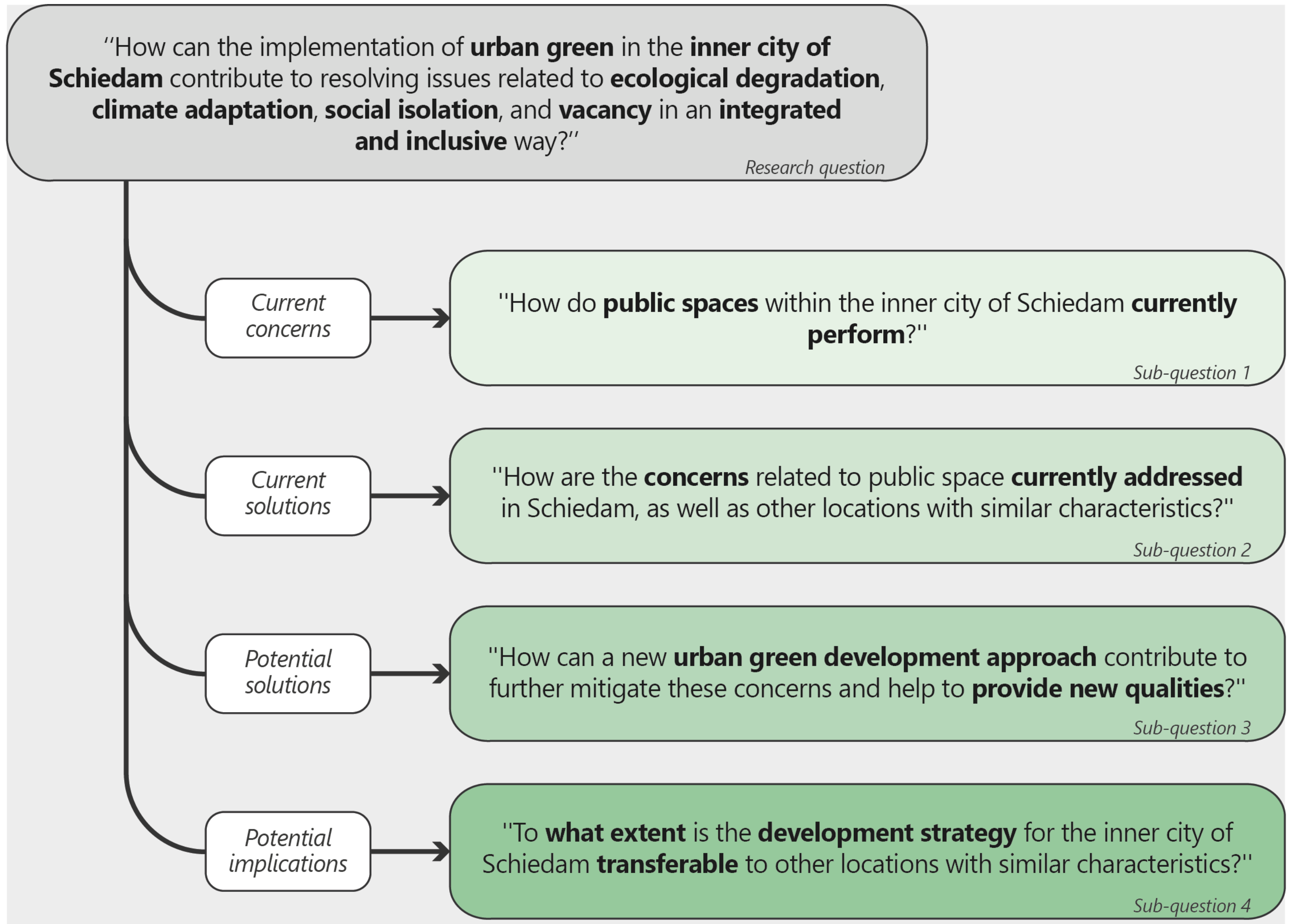


Figure 2.3. Diagram containing research and sub-questions. Made by Author.

2.2.2 Methods

''How do public spaces within the inner city of Schiedam currently perform?'' *Sub-question 1*				
Aim	Gain a better understanding of the main qualities and concerns of the public space within the inner city of Schiedam.			
Research methods	**Literature research** *''To provide theoretical background of the main research themes.''*	**Spatial analysis** *''To research main themes and draw conclusions.''*	**Sight observation** *''To gain an eye-level perspective on how the public space is used.''*	**Surveys/Interviews** *''To understand how potential problems are perceived by residents.''*
Expected outcome	Overview on theoretical concepts in relation to main themes.	Maps/diagrams showing existing conditions of public space.	Overview on how the area operates from an eye-level perspective.	Overview on how the area is perceived by the (local) people.

Figure 2.4. Diagram of sub-question 1 with methods and expected outcome. Made by Author.

''How are the concerns related to public space currently addressed in Schiedam, as well as other locations with similar characteristics?'' *Sub-question 2*			
Aim	Gain a better understanding of the existing measures taken by the municipality to resolve the issues, as well as how other cities around the world do it.		
Research methods	**Literature research** *''To provide theoretical background of the main research themes.''*	**Governance plan review** *''To research how the municipality currently deals with the issues.''*	**Case studies** *''To understand how other cities managed to deal with the issues.''*
Expected outcome	Overview on theoretical concepts in relation to case studies.	Overview of (dis)connects between governance plans and main issues.	Set of design principles and maps showing their potential implications

Figure 2.5. Diagram of sub-question 2 with methods and expected outcome. Made by Author.

"How can a new urban green development approach contribute to further mitigate these concerns and provide new qualities?" *Sub-question 3*			
Aim	Develop a well-underpinned development strategy for the inner city of Schiedam, containing both existing and new development solutions.		
Research methods	**Literature research** *"To provide theoretical background of the main research themes."*	**Synthetic mapping** *"To translate all previous findings into a coherent development strategy."*	**Iterative development** *"The process of going back and forth between research and design to become more specific each time."*
Expected outcome	Overview of what the greening approach is in combination with theoretical backing.	Maps/Diagrams/Impressions showing how the greening approach could work.	More specific research maps, as well as more concrete development proposals.

Figure 2.6. Diagram of sub-question 3 with methods and expected outcome. Made by Author.

"To what extent is the development strategy for the inner city of Schiedam transferable to other locations with similar characteristics?" *Sub-question 4*		
Aim	Develop a number of universal design concepts and tools that can be used by other cities that want to implement a similar approach.	
Research methods	**Evaluations** *"To evaluate the main development strategy components."*	**Reflective thinking** *"To reflect on the development strategy and set priorities, as well as discuss potential shortcomings."*
Expected outcome	Evaluation diagrams/rules that provide a way to test the development strategy and help with the potential implementation.	Diagrams/Text explaining the main components that are needed for the project to succeed, together with an explanation of potential pitfalls.

Figure 2.7. Diagram of sub-question 4 with methods and expected outcome. Made by Author.

2.2.3 Projected final outcome

The projected outcome of this graduation project consists of two main parts. First, the goal is to develop a comprehensive development strategy for the inner city of Schiedam. It will contain strategic guidelines across multiple scales and a few simulations with impressions to show how the development strategy could be implemented.

Secondly, the final product will contain several design principles that have been extracted from the case of Schiedam. These design principles will function as a guideline for other cities that are in the process of applying a similar urban green approach.

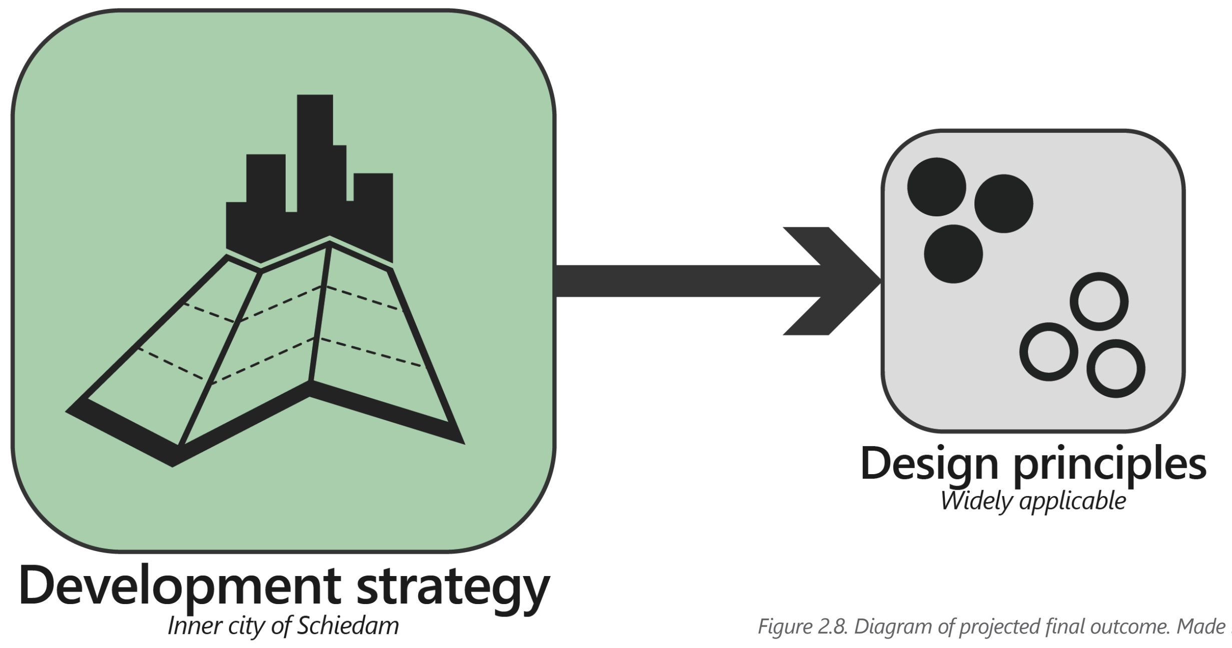


Figure 2.8. Diagram of projected final outcome. Made by Author.

2.2.4 Timeline

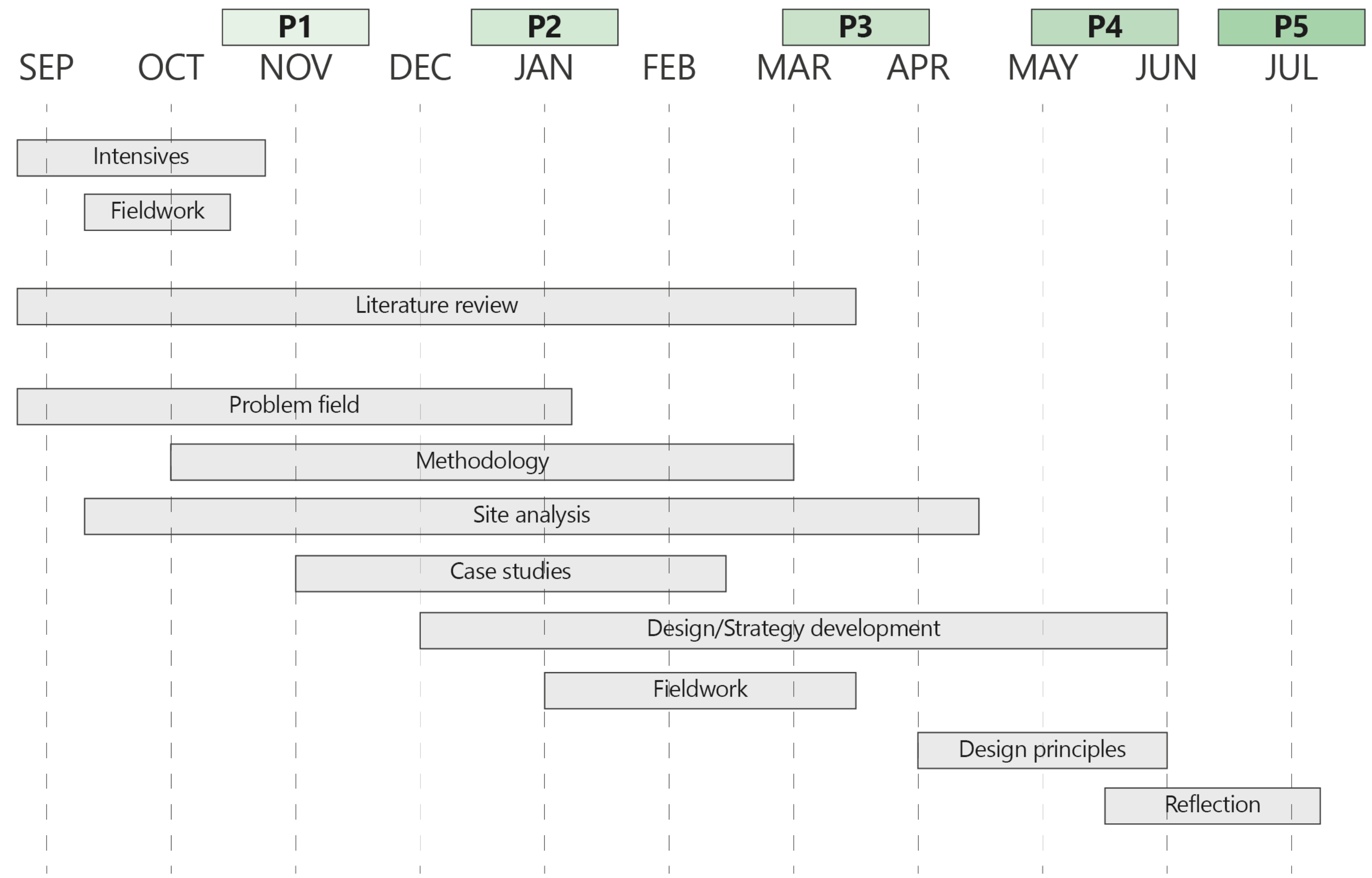


Figure 2.9. Rough outline of roadmap until the P5 presentations. Made by Author.

3 THEORETICAL UNDERPINNING

This chapter provides the theoretical foundation on which the project is built. By explaining the main theoretical concepts, chapter 3 aims to create a clear understanding of the key themes that characterise this project. The theoretical concepts will first be introduced, followed by the main concept and conceptual framework. Lastly, the relevance of the project will be discussed.

3.1.1 Theoretical framework

Figure 3.1 shows the theoretical framework of this research, containing the main research themes of Nature Inclusive Design and Human Health & Well-being. Furthermore, adjacent to each theme, a few sub-themes can be found that are related to that theoretical concept.

The theoretical framework shows how the concepts of Nature Inclusive Design and Human Health & Well-Being are starting to get used more and more in urban design, however, often on different parts of the spectrum – meaning both are not often used together as the leading theoretical theme(s).

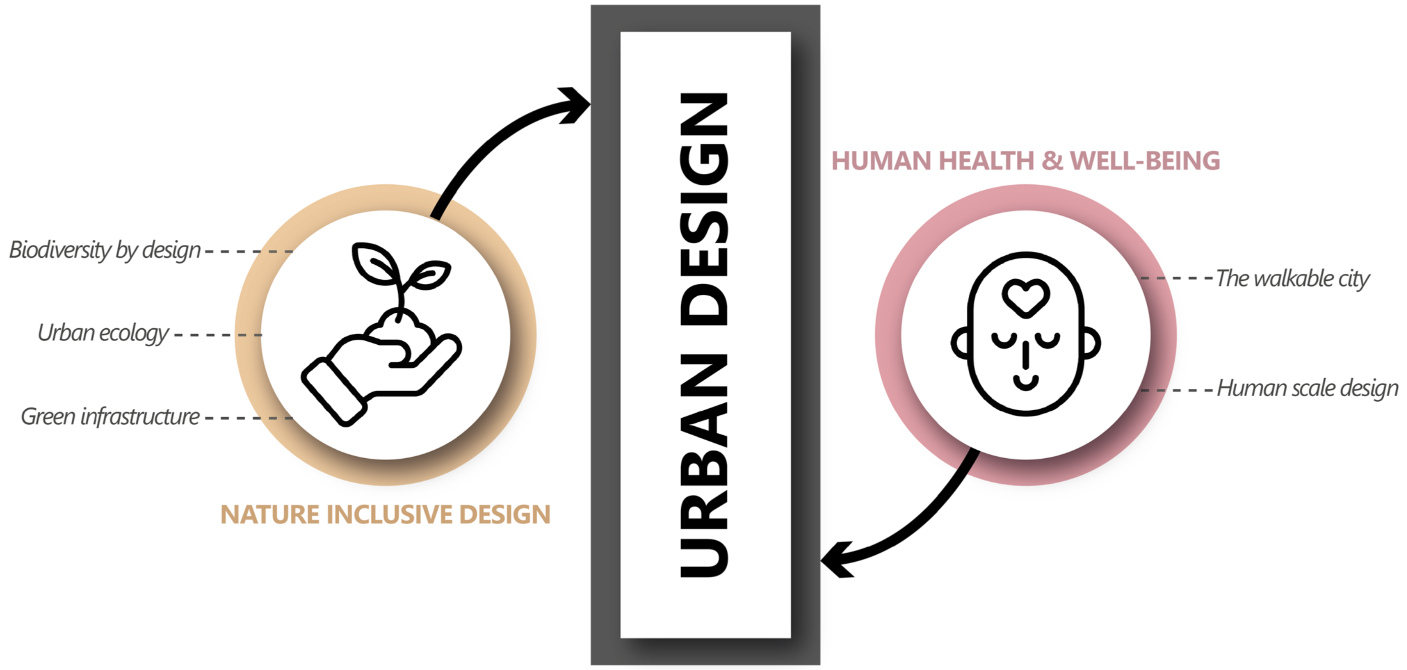


Figure 3.1. Main theoretical concepts used in this research. Made by Author.

3.1.2 Nature inclusive design

Nature inclusive design is ''a type of design that maintains and improves a rich and biodiverse urban ecosystem'' (van Stiphout, 2019). It combines ecological principles with urban design and aims to create a harmonious urban landscape where humans, animals, and plants can all flourish.

To design urban territories in a nature inclusive way, van Stiphout (2019) suggests looking through a biodiversity perspective. In this way, urban planners and designers will realise that a city is populated by a considerable amount of different life forms – each having its own specific needs. This implies that cities should no longer be designed only for humans, but all inhabitants. However, as ecology is a wide theoretical field, multiple different approaches to integrating ecology within urban territories have been established throughout the years.

Biodiversity by design
Biodiversity by design is such an approach, where the emphasis lies on facilitating the needs of each species present within a certain territory. As stated by the San Francisco Estuary Institute (2019), cities currently house a significant percentage of the world's biodiversity – a number that is increasingly under threat. The main cause of this threat is the lack of emphasis on biodiversity within existing planning practices (Weisser & Hauck, 2017). Furthermore, existing biodiversity in cities is often defined as a type of urban biodiversity that is created by humans for humans (Gómez-Baggethun et al., 2013). This means that currently, biodiversity within most cities is not optimised for all existing life forms, but only for humans.

However, as stated by Weisser and Hauck (2017), biodiversity functions as an underlying layer for many of the ecosystem services that humans demand, which suggests that a city will never be able to function optimally until a planning and development approach is used that focuses on biodiversity optimalisation. This is

corroborated by the World Economic Forum (WEF), which has placed ecological degradation as the number one long-term threat to the global economy (IISD, 2021). Lastly, by putting the focus on biodiversity, a city that is more liveable and resilient for people can be realised (San Francisco Estuary Institute, 2019).

Urban ecology
Urban ecology can be defined as the study of ecology within a built-up area (Forman, 2014). According to McIntyre et al. (2000), the terms urban and ecology are often seen as contrasting. However, McIntyre et al. (2000) argue this to be untrue, as this discrepancy was formed by a false assumption as to what urban ecology exactly is. Similar to the biodiversity by design concept, definitions of urban ecology are often very human-focused, making them incomplete. As stated by Forman (2014), urban ecology focuses on the parks and other green spaces within a certain area, but also the rich variety of built-up spaces. Urban ecology can therefore be defined as ''the relationship between the natural and all other systems, such as social and economic systems'' (Jorritsma, 2020).

As both humans and nature are part of the same ecosystem, they can both influence each other positively and negatively (Forman, 2014). In this, the goal of urban planners and designers is to find the right balance. For example, nature can positively influence people's behaviour, cognitive functioning, and well-being (Gaston, 2012), while it can simultaneously influence the housing prices in a negative way (Panduro & Veie, 2013).

3.1.3 Human health & Well-being

For the first time in history, more people are living in urban territories than in rural areas – a trend that will continue in the future (Pretty, 2007). As such, cities will be – and already are – the epicentres of human life, resulting in the vital importance of realising a high urban quality of life (van Stiphout, 2019). However, urban environments currently expose people to several different threats, such as noise and air pollution, fear of crime, and crowding – ultimately leading to mental fatigue (Gaston, 2012). Furthermore, Braubach et al. (2017) describe the current urban life as a lifestyle ''associated with chronic stress, insufficient physical activity and exposure to anthropogenic environmental hazards''.

The concept of human health & well-being focuses on improving people's physical and mental health by the means of urban design. Braubach et al. (2017) suggest that urban green is the key to success, as it provides psychological relaxation and stress alleviation. Furthermore, urban green has been found to significantly decrease risks related to many different diseases and illnesses, such as cardiovascular diseases and depression (Braubach et al., 2017). However, a discrepancy can be observed between the existing green accessibility between different population groups, with low-income areas generally having significantly less green space at their disposal (WHO Regional Office for Europe, 2012). Therefore it is of vital importance to focus on equal accessibility to all, as this is the only way to provide the best quality of life to all population groups.

The walkable city
The walkable city is a concept closely related to human health & well-being. As the name suggests, the walkable city focuses on the increasing value of designing cities with an excellent pedestrian network (Southworth, 2005). As stated by Speck (2018), there are a considerable amount of positive influences related to high walkability, such as economic growth and less pressure on the climate. Furthermore, Southworth (2005) states that frequent walking improves people's mental and physical health – ultimately leading to a better quality of life. For example, a study by LaCroix et al. (1996) shows that walking for at least 4 hours a week significantly decreases the likelihood of developing cardiovascular diseases. Furthermore, common illnesses like depression and obesity are considerably less likely in individuals who walk frequently. Lastly, developing walkable cities improves equity and creates stronger social communities.

Human scale design
While the walkable city predominantly focuses on aspects like safety, accessibility, and the quality of walking routes, human-scale design is more focused on the experience of the city at eye-level. This means that the walkable city facilitates pedestrian activity, while human-scale design encourages it (Jackson, 2003).

In terms of human scale, aspects like sightlines, street furniture, window proportions, building heights, and vegetation are of importance (Ewing & Handy, 2009). Furthermore, the article from Ewing & Handy (2009) states that imageability is an important aspect of encouraging pedestrian activity, as it creates a 'sense of space'. Imageability can be described as components of the physical environment that evokes a strong image, such as a landmark (Ewing & Handy, 2009). Lastly, the level of enclosure, transparency, and complexity are also of vital importance in creating a public landscape that encourages walking (Ewing & Handy, 2009).

3.2.1 Conceptual framework

Figure 3.2 shows the conceptual framework that will be central throughout this research project. It contains the main theoretical concepts, as seen in the theoretical framework, and aims to combine them by utilising a concept called 'Interclusive Urban Green'. With it, the project aims to use the qualities of both Nature Inclusive Design and Human Health & Well-being, while mitigating the potential conflicts between the two.

As stated before, this research will take a case study-based approach. This means that through the usage of the main concepts, a grounded development strategy for the inner city of Schiedam will be the main outcome, as seen in the figure. However – where applicable – the project simultaneously aims to derive several design principles related to the main concepts that are applicable in other cases with similar characteristics.

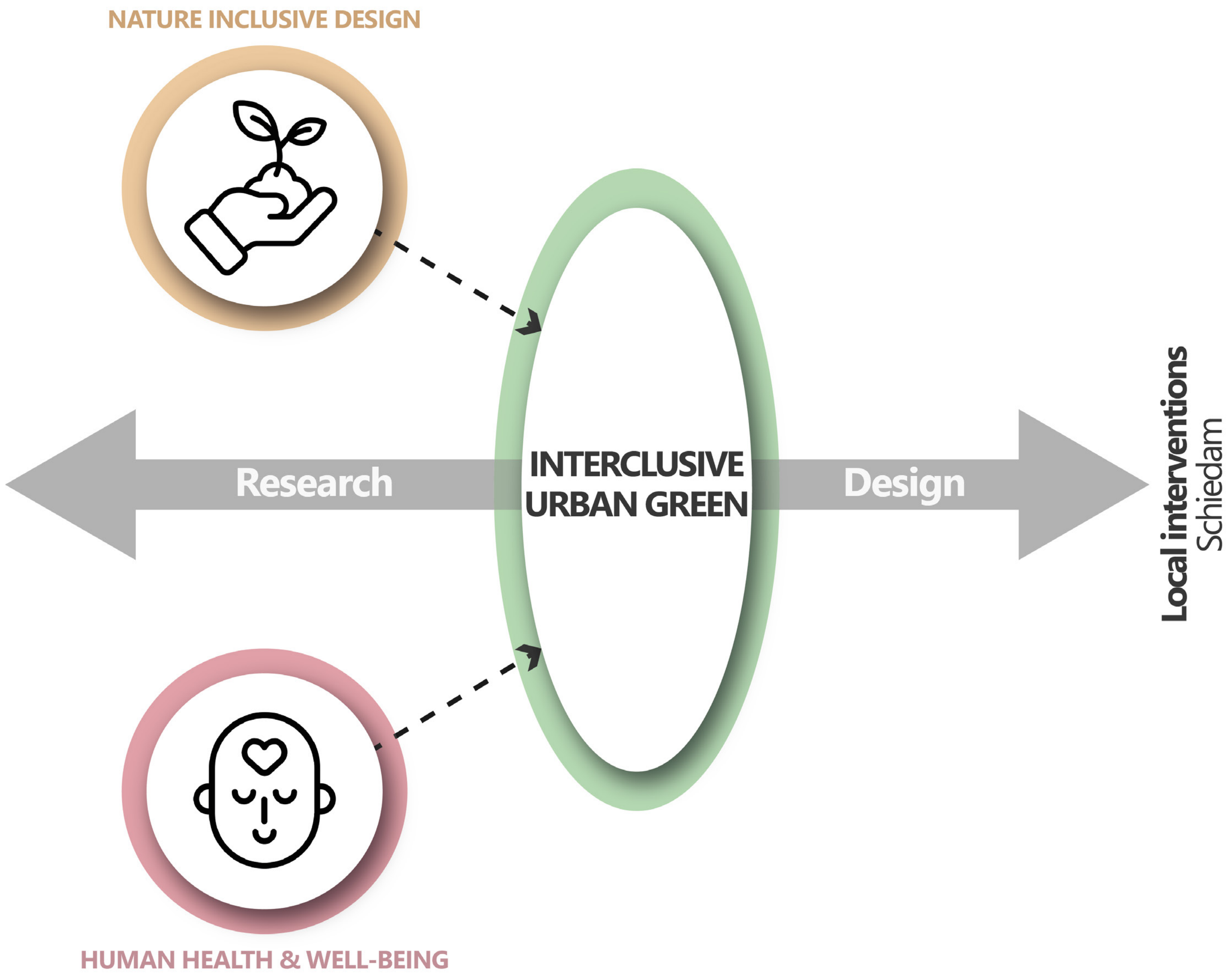


Figure 3.2. Conceptual framework. Made by Author.

3.2.2 Interclusive urban green

In the conceptual framework, the concept of 'Interclusive Urban Green' – also the title of this project – is first introduced. The term interclusive is used to further specify the type of urban green this project will focus on. As seen in figure 3.3, interclusive is a portmanteau of the words integrated and inclusive.

Integrated
The word integrated focuses on the relation between the natural and urban systems. In modern cities, the natural system often stops where the urban one starts – resulting in two separately working networks. The word integrated targets this division, aiming to create synergies between the different systems.

Inclusive
The word inclusive focuses on the social dimension of nature. As stated before, the accessibility of urban green is often unevenly distributed – resulting in social differences. Furthermore, urban green can provide space for social interactions, creating stronger communities.

Figure 3.3. Explanation of main concept. Made by Author.

3.3 Relevance

3.3.1 Scientific relevance

First of all, the concept of nature inclusive design is still relatively new. As van Stiphout (2019) stated, the amount of knowledge and examples are still (very) limited. The case study of Schiedam will add to this limited body of knowledge, deepening the understanding of how the concept can be translated to a real context. Furthermore, the projected design principles can add valuable practical knowledge on how other cities in the Netherlands – and potentially worldwide – can start to implement this nature-inclusive way of design.

The project also aims to explore potential synergies between the topics of nature inclusive design and human health & well-being. Currently, most scientific research focuses only on one end of the spectrum. By combining the existing bodies of knowledge within these two fields, potential new conclusions and synergies can be found that can be further explored in the future and implemented in other locations.

3.3.2 Societal relevance

The concept of interclusive urban green has a strong societal influence built into it. As mentioned before, the word interclusive is a portmanteau of the words integrated and inclusive. The inclusivity component aims to provide equal opportunity and benefit to all the different population groups. Furthermore, one of the goals is to provide sufficient social facilities for residents to create a strong sense of community. In this, the social dimension on the local scale is aimed to improve significantly.

The project also targets several relevant challenges society as a whole is currently facing. For example, the addition of urban green is aimed to combat the unhealthy lifestyle many people have nowadays by promoting an active lifestyle. Furthermore, this project will join the battle against common diseases such as obesity, cardiovascular diseases, diabetes, and mental illnesses such as depression. Ultimately, the project is centered around the experience of public space from an eye-level perspective, aimed to create the optimal conditions for people to maximise their quality of life.

3.3.3 Ethical considerations

As said before, inclusivity is an important component of this project, in which the aim is to create equal opportunities for all population groups. Accessibility to a sufficient amount of high-quality urban green and social spaces should become an integral part of any development project – regardless of the social status of that area. Furthermore, the concept of the walkable city is an important ethical component, as it is a free mode of transportation that is available to all. A study by LaCroix et al. (1996) corroborates this, stating that an excellent pedestrian network improves equity.

Another important goal of the project is to create a development strategy that is adaptive to future conditions. This will contribute to the (future) safety of all residents, making the inner city of Schiedam ready for the potential effects of climate change. Furthermore, future generations will be able to benefit from these developments – especially if the expected development strategy is implemented in multiple areas.

4 CURRENT CONTEXT

This chapter provides the analytical foundation on which the project is built. By introducing the analytical research, chapter 4 aims to create a clear understanding of the existing qualities and concerns of the inner city of Schiedam. First, historical analysis is conducted, followed by analytical research on the topics of ecology, environmental concerns, the social dimension, and public space use. Lastly, overall conclusions will be drawn from the findings.

4.1 Historical development

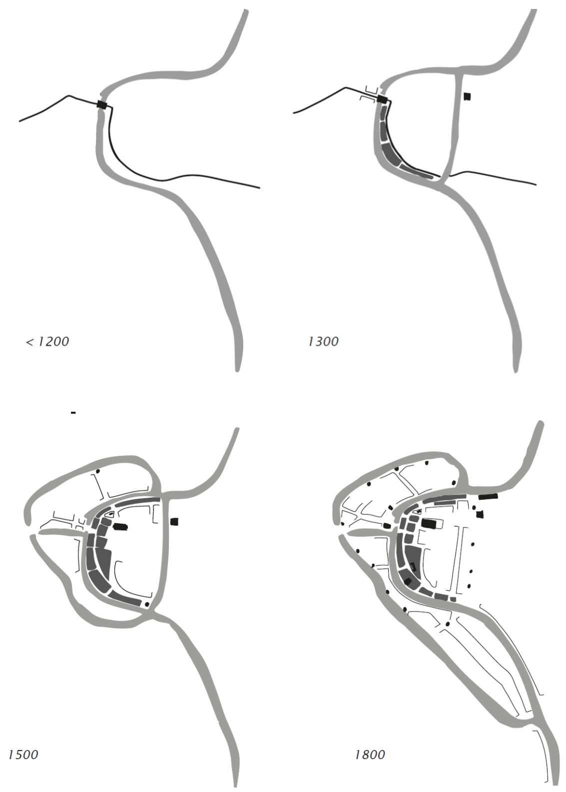


Figure 4.1. Historical development of Schiedam (Gemeente Schiedam, 2012).

Schiedam is a Dutch city with a history dating back to the 13th century. Most of the development started alongside the water – the Schie, which was an important route for travel and trade. This is reflected in figure 4.2, which shows the construction years of the buildings. Most of the oldest buildings follow the canal area, which is also the reason why the city centre follows a curved street pattern.

Furthermore, figure 4.2 shows a clear trend related to building sizes. Traditionally, building blocks were relatively small – each house was built separately. However, to accommodate the rapid urban expansion in the 20th century, building dimensions got bigger and entire blocks were built as one.

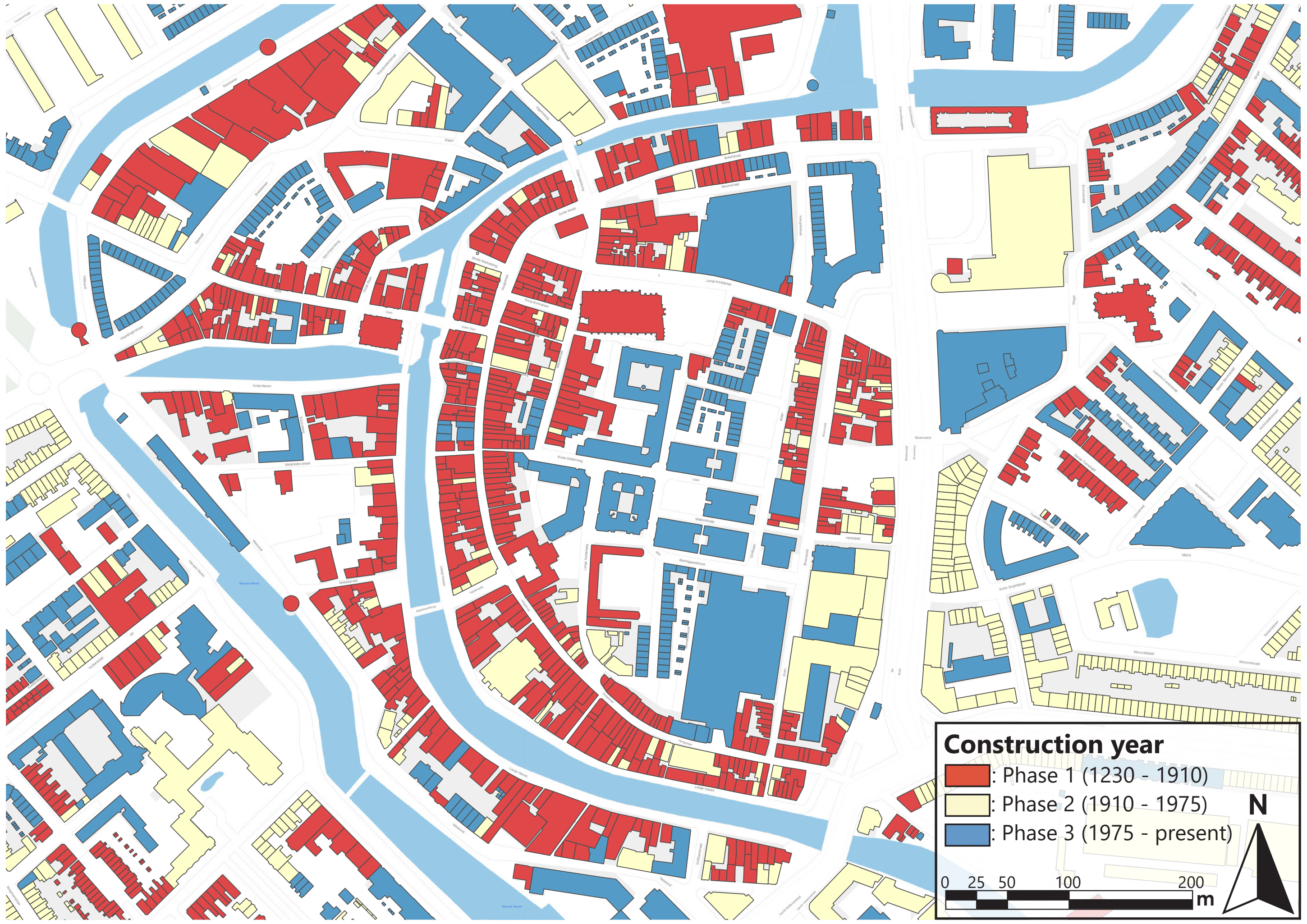


Figure 4.2. Map showing construction years. Made by Author.

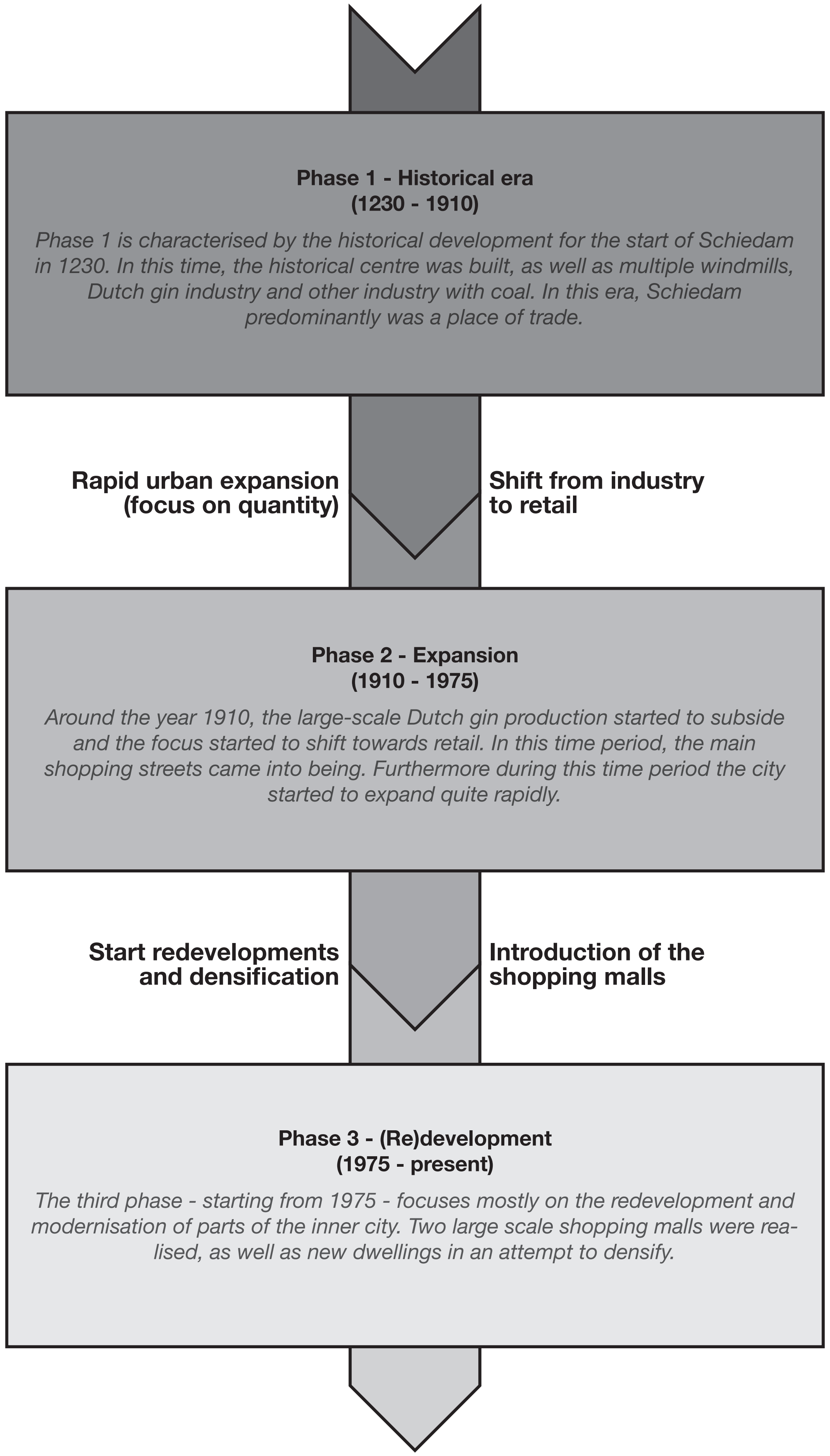


Figure 4.3. Diagram explaining main historical time periods of the inner city of Schiedam. Made by Author.

4.1.2 Identity - Longue Durée

Figure 4.4 shows the main areas of persistence within the inner city of Schiedam. In this, the area around the canal has seen the least amount of change, as it is filled with monuments and buildings from the 19th century or earlier. It is the main 'persistence zone', which can simultaneously be seen as the main area of historical identity in Schiedam.

However, not the entire inner city of Schiedam falls under this category. Throughout the past century, almost all cities in the Netherlands have started to 'modernise', in which old buildings are removed to make place for more space-efficient building blocks.

This trend can be seen in the middle of the inner city, where a new grid is used after all existing buildings were demolished. As such, this part took distance from its historical identity and transformed into a more modern appearance.

Furthermore, part of the old buildings has been removed to make place for the two shopping malls that are currently present in Schiedam. Outside the inner city, less transformation has taken place. Instead, most of the area was built in the 20th century as an expansion of the city centre, again in a more modern style.

Ultimately, it can be concluded that the 'main persistence zone' is also the main area where the historical identity of Schiedam can be best perceived.

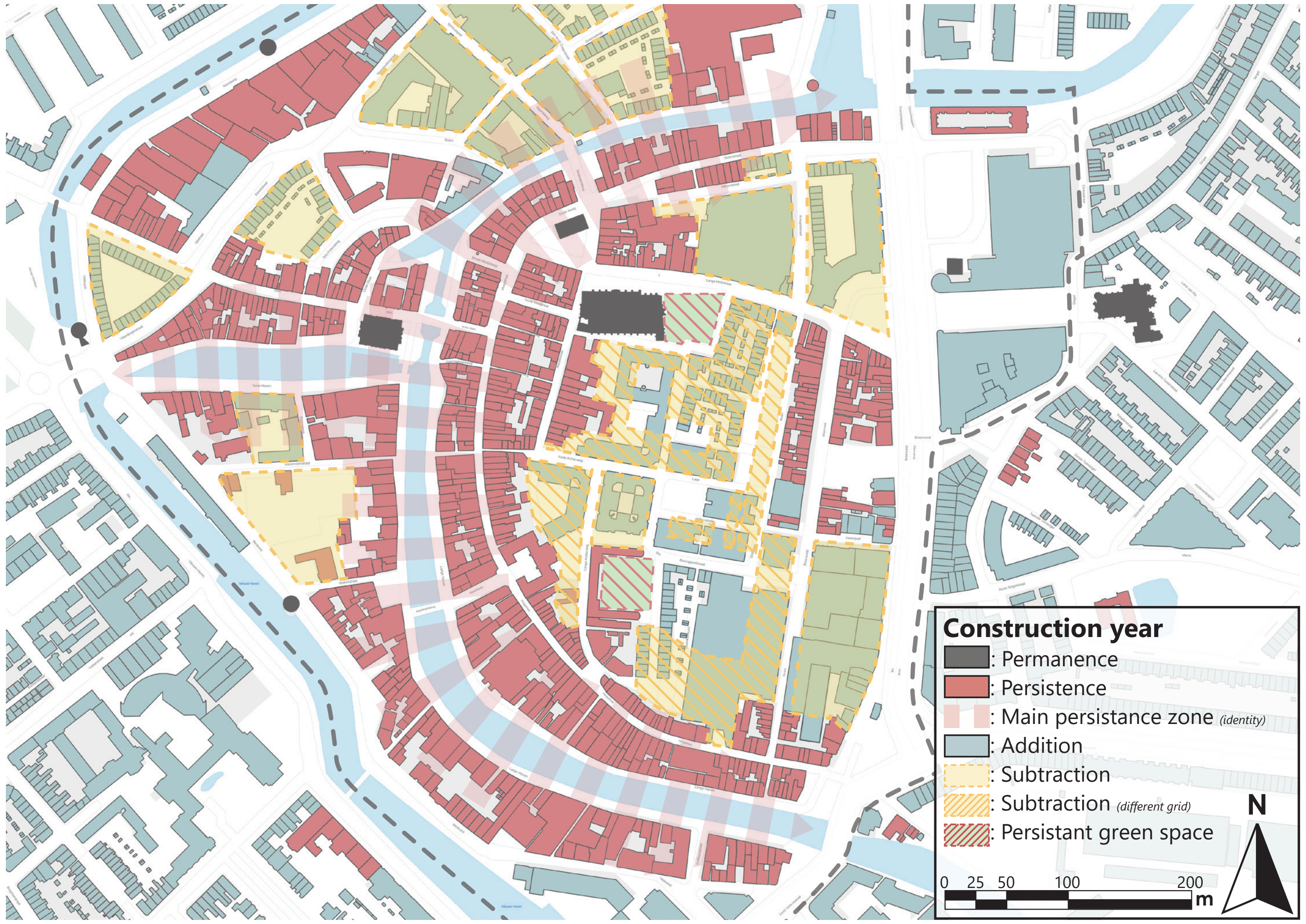


Figure 4.4. Places of the longue durée and identity. Made by Author.

Places of (no) change

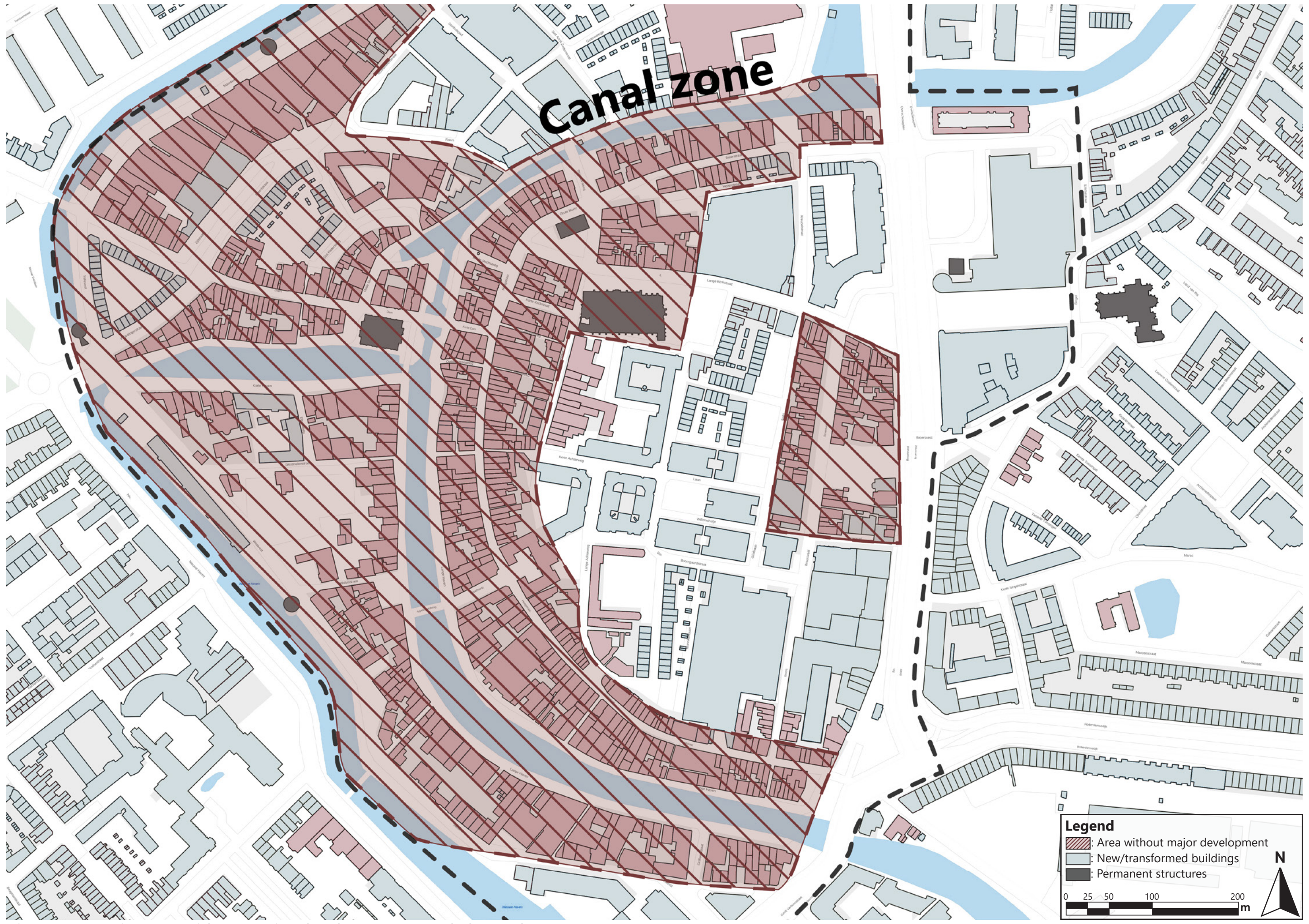


Figure 4.5. Main zone without major developments. Made by Author.

Due to the strong identity and a large number of monuments, the 'Canal zone' within the inner city of Schiedam has seen little to no transformation throughout the past century. An example of the lack of development is seen in figure 4.6. And while the historical identity is an important aspect of what makes Schiedam the city it is today, it has also held back in achieving the full potential of the area, with new problems arising as technology develops and the climate changes.

"It is important to acknowledge the past, but also important to not let it restrict future potential."

As such, it is important to start exploring opportunities to improve the local conditions whilst maintaining the main identity of Schiedam. In this, the importance lies in a gradual approach. As stated by Boussaa (2017), it is important to not make too many radical changes, as it can significantly alter or even destroy the identity of a place.

Figure 4.6. Comparison of the Hoogstraat between the year 1900 and now. Schiedam24 (2016) and made by Author.

Identity - Municipality

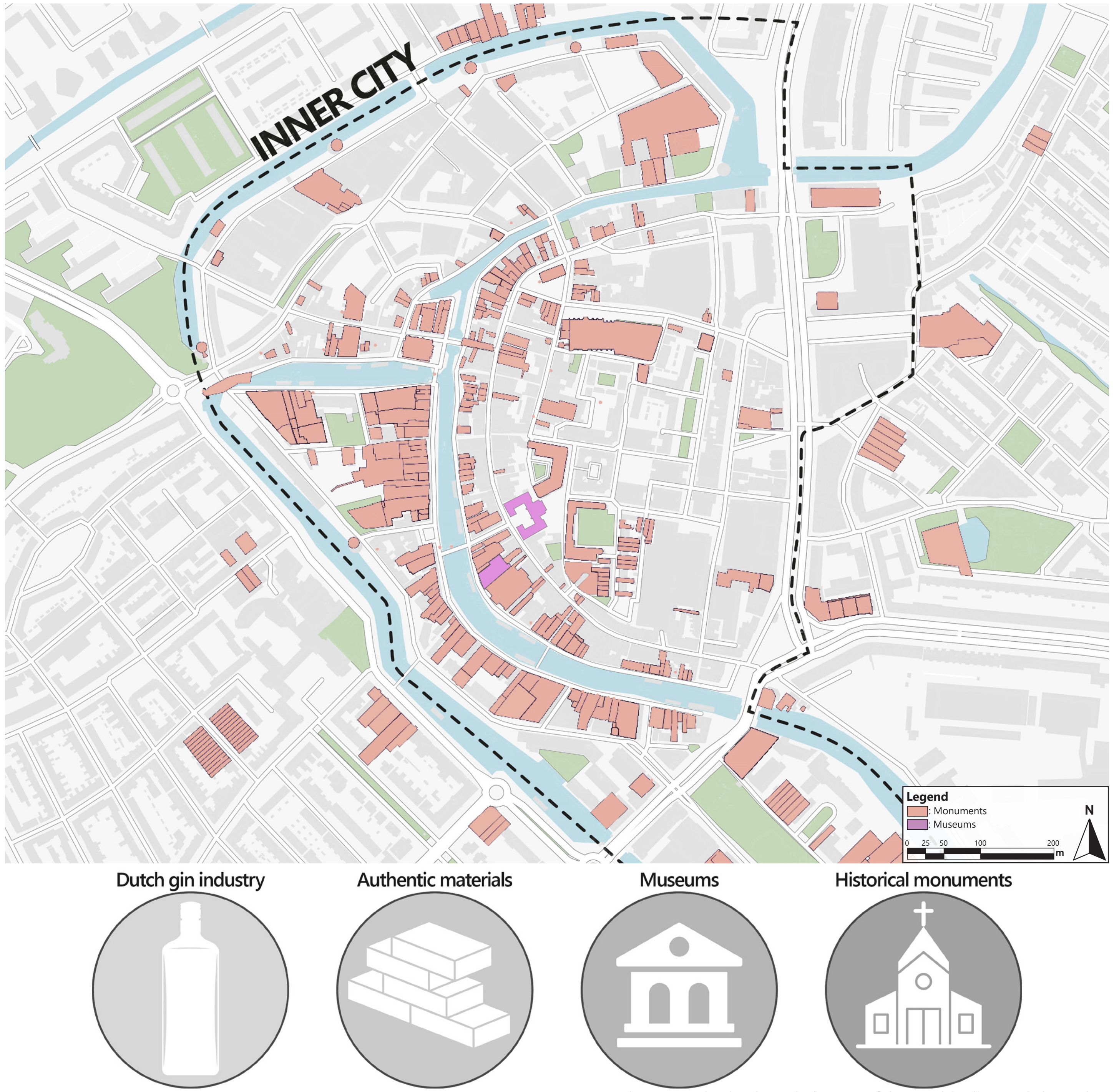


Figure 4.7. Identity through the eyes of the municipality. Made by Author.

In terms of identity, the municipality mainly focuses on tangible features. As seen in figure 4.7, there are a large number of buildings currently marked as a monument. Furthermore, Gemeente Schiedam (2012) focuses mostly on authentic (street) materials and buildings. Additionally, a strong focus is on the Dutch gin industry, as this is something the city of Schiedam got famous for.

The municipality seems to get stuck in potential redevelopment in the main identity zone, as it is filled with monuments. As a result, nothing has really happened here over the past decades – outside of some renovations.

Identity - Literature and personal view

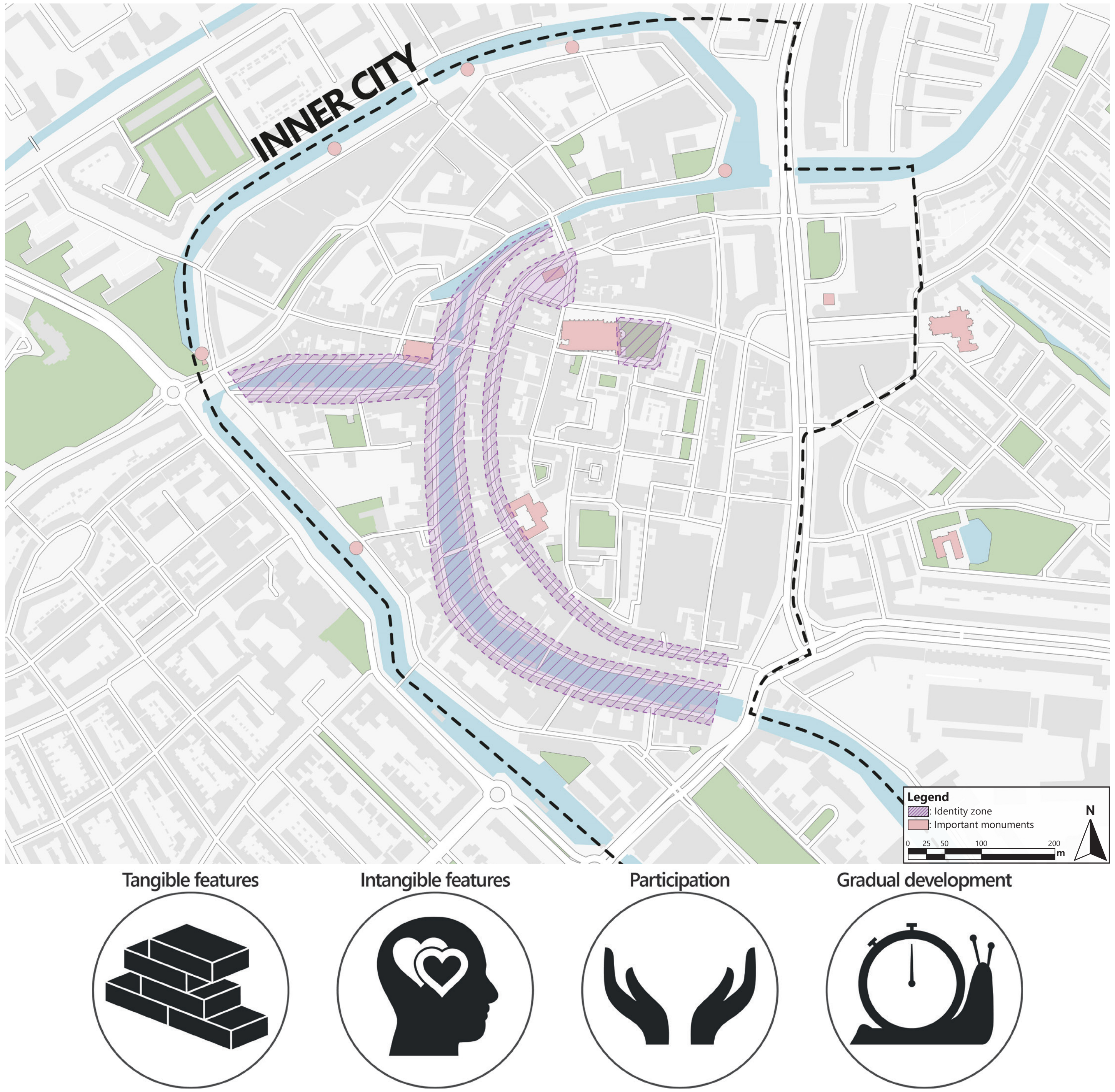


Figure 4.8. Identity through the eyes of literature. Made by Author.

Identity is based on tangible features such as authenticity and character, as well as intangible features like feelings, meanings, and memory (Rifaioglu & Güçhan, 2007). The spatial components are the unique spaces of the city – monuments and certain streets (Yaldız et al., 2014). Furthermore, visibility of the important buildings and the authentic materials is crucial. Not everything has to remain exactly the same – as long as the authentic components are still most prominent.

To fully assess what makes the identity, participation is crucial (Stepanchuk et al., 2021), as the identity of each city is different, and the essential components should therefore first be identified (Rifaioglu & Güçhan, 2007). In the case of Schiedam, these essential components are the streets highlighted in purple (mostly the buildings and canals) and the monuments marked in red.

Participation can also come in the form of festivalisation (eventification), which can promote further development and strengthen people's connection with the area (Stepanchuk et al., 2021). Lastly, it is crucial that changes to the street(s) with a strong identity are gradual and do not damage the essential components (Yaldız et al., 2014).

4.2 Ecological value

4.2.1 Ecological network

Figure 4.9. Main ecological structure of Schiedam and its direct surroundings. Made by Author.

In figure 4.9, the main ecological structure of Schiedam and its direct surroundings can be seen. The largest ecological zones are found to the west of the inner city – on the border between Schiedam and the neighbouring city of Vlaardingen. Furthermore, the network stretches towards Rotterdam, located to the east.

While the main ecological structure is not directly connected to the local green spaces within the inner city, two potential connections have been found. Especially the connection from the west provides a continuous route of green spaces without any major barriers. To improve the ecological quality on the scale of the inner city, (new) connections must be made to become connected to this main ecological structure.

4.2 Ecological value

4.2.2 Urban green

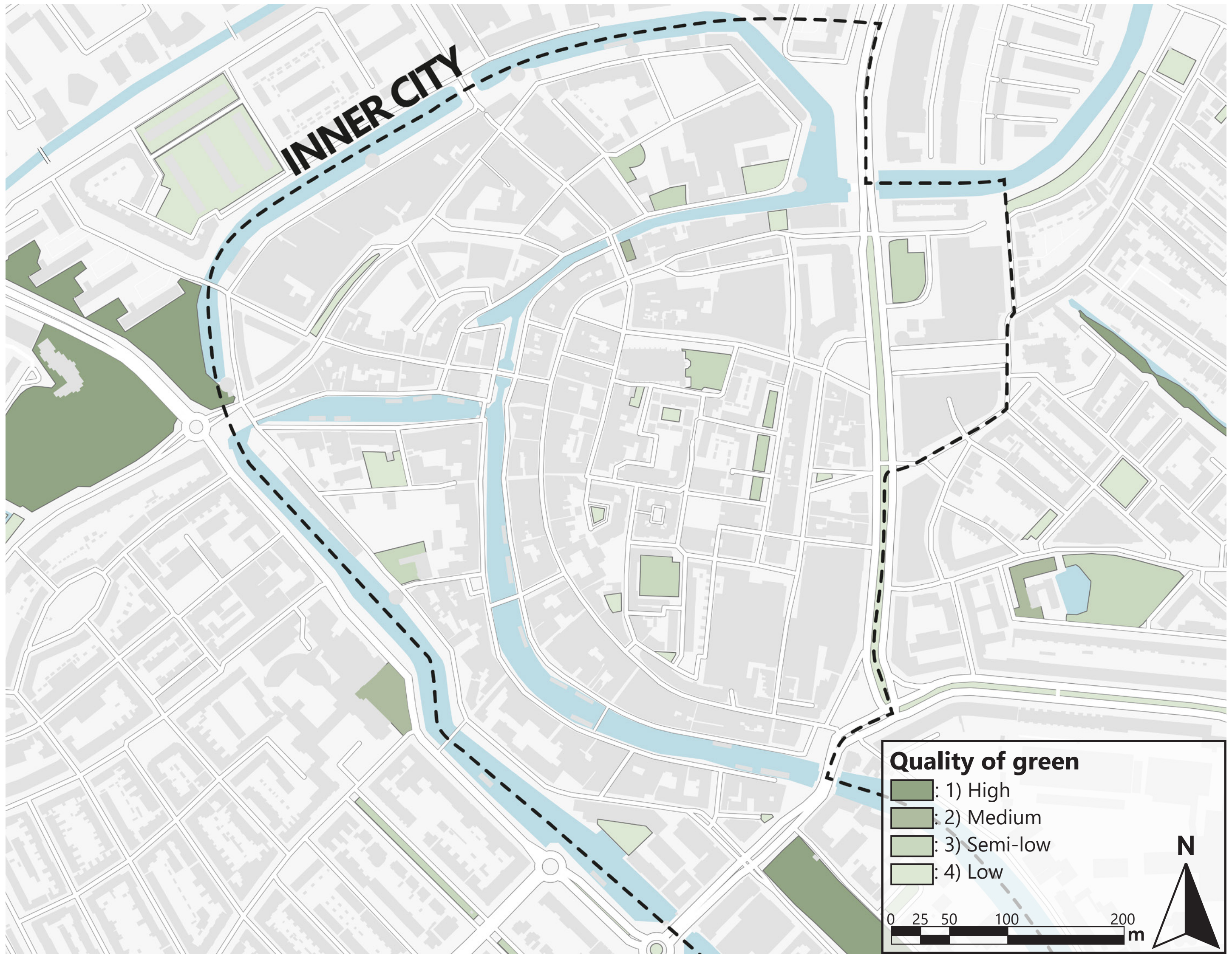


Figure 4.10. Green spaces with their ecological value. Made by Author.

Quality 1 - Low **Quality 2 - Semi-low** **Quality 3 - Medium** **Quality 4 - High**

Figure 4.11. Images of different green qualities within Schiedam (Google Maps).

Figure 4.10 shows all available green spaces within the inner city of Schiedam. In this, only urban green with green surface areas have been included, meaning trees in the street have not been taken into account. This is because, even though they do bring some ecological benefits, their influence is limited.

As seen from the map, the average size of the green facilities is small. This results in a relatively low capacity and fewer opportunities for biodiversity. Furthermore, certain areas have no green spaces at all within their direct surroundings.

The four qualities have been defined by assessing their capacity to facilitate biodiversity – done by evaluating the density and diversity of green.

Quality 1 only contains some green surface area without any other vegetation, while quality 2 also contains some well-kept bushes and/or a few trees. Quality 3 has more diverse vegetation and lastly, quality 4 is the highest – containing both high diversity and density of vegetation and providing sufficient parcel size for biodiversity to flourish.

4.2 Ecological value

Green accessibility (animals)

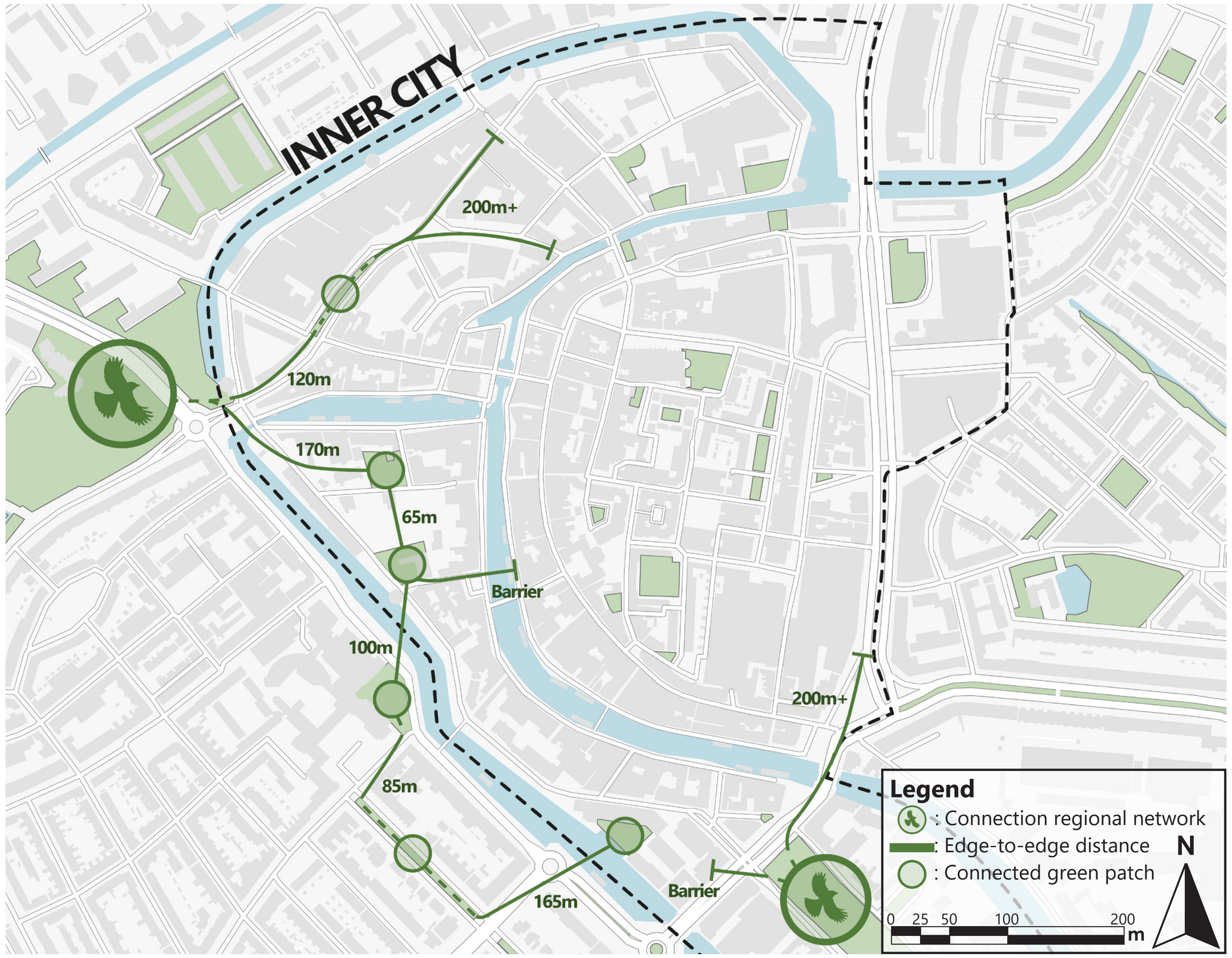


Figure 4.12. Accessibility of existing green spaces in relation to the regional ecological network. Made by Author.

To assess the accessibility of existing green spaces within the inner city of Schiedam, it is important to understand how animals travel between different green patches. Each species has a specific (estimated) maximum travel distance between patches, ranging from 0 to well over 300 metres (Andersson & Bodin, 2009). However, for a dense urban environment such as an inner city it is simply not viable to provide green corridors for every species, as there is already limited space available.

As a result, the focus will be on connecting the green patches within the inner city to the regional network for most bird species. As stated by Andersson and Bodin (2009), many bird species have a maximum edge-to-edge distance between green patches of around 200 metres. The distance of 200 metres will therefore be used as the main measurement for assessing the connectivity of green patches. Important to clarify is that this 200 metres should be unobstructed – meaning no houses or other buildings should be in the way.

As seen in figure 4.12, most patches are currently disconnected from the regional network. Either barriers or distances of >200m prevent bird species to successfully travel throughout the inner city. These patches must therefore get connected to facilitate more biodiversity. However, also patch quality, as described on the previous page, is important to facilitate this.

4.3 Environmental stresses

4.3.1 Heat-island effect

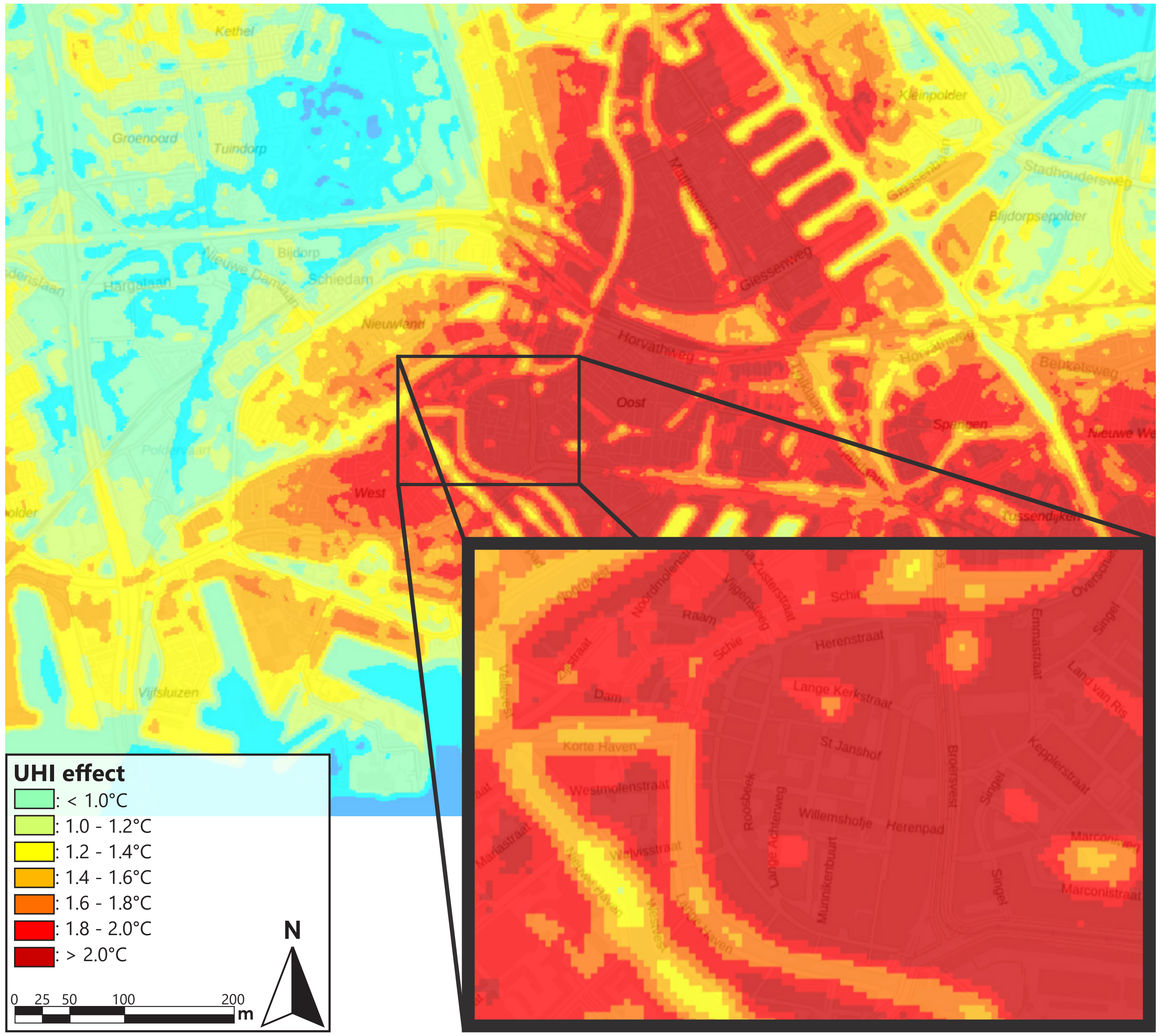


Figure 4.13. Urban heat-island (UHI) effect in Schiedam (RIVM, 2017).

Schiedam is currently suffering from the consequences related to the urban heat-island (UHI) effect. Currently, Schiedam is ranked the 8th worst city in the Netherlands in terms of its average UHI, even worse than cities like Amsterdam and Leiden (Klok et al., 2012). Over a 24-hour period, Schiedam has an average UHI of 4,1°C. However, this statistic is an average of the entire city, meaning this number will most likely be even higher for the inner city.

An important contributor to this bad statistic is the lack of permeable surfaces in Schiedam. Over 80% of its inner city is impervious, with the remaining 20% predominantly being the canals that flow through the area.

The zoom-in of figure 4.13 illustrates how the lack of urban green and permeable surfaces affects the capacity of the city to cool down. While looking at the map, the structure of the river is noticeable, as this is the main area that provides some cooling. Other than that, limited colour changes can be seen, meaning almost the entire inner city is affected.

4.3 Environmental stresses

4.3.2 Microclimate

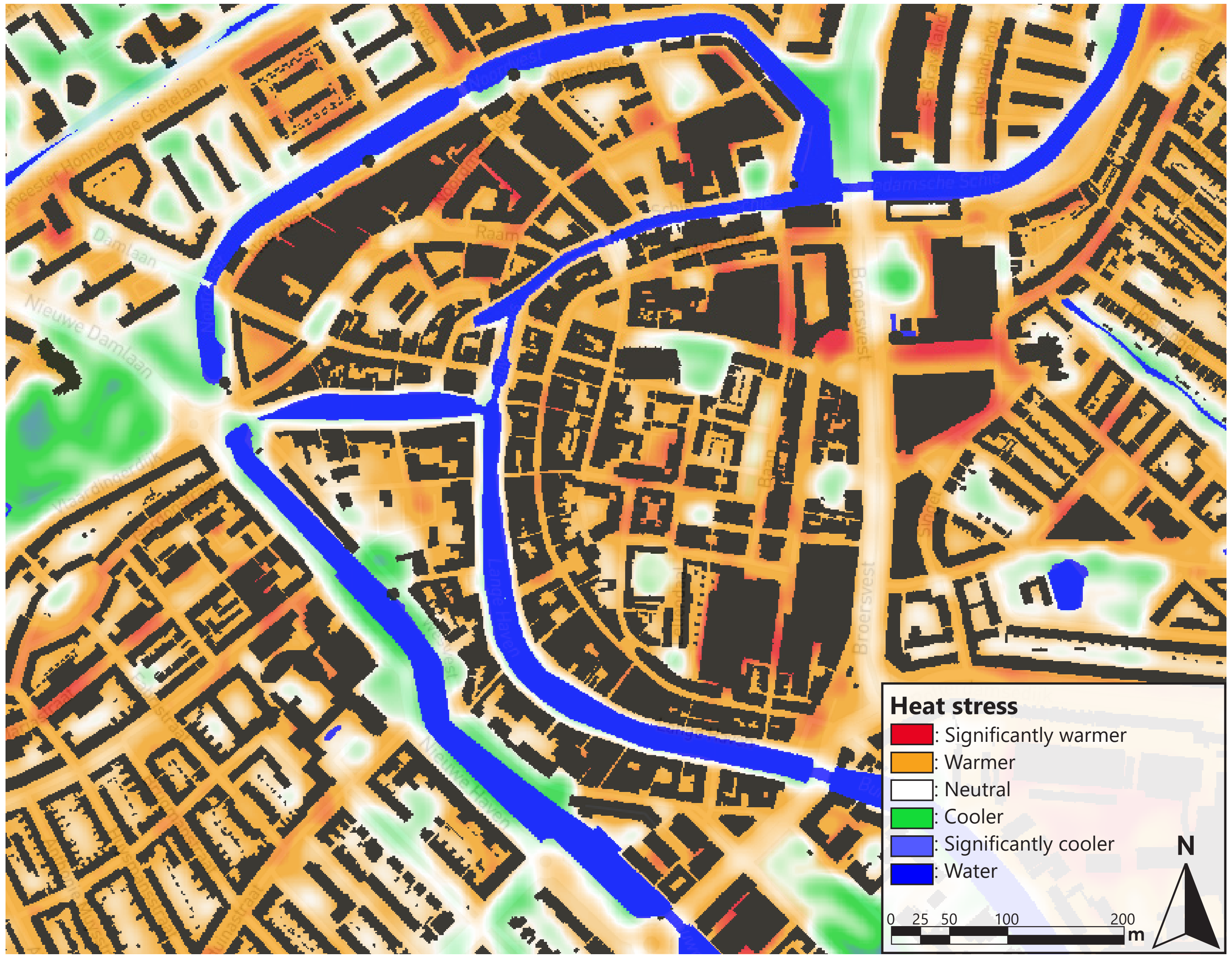


Figure 4.14. Physical comfort levels in Schiedam (Gemeente Schiedam, 2016a).

This lack of cooling is also noticeable when looking at a map of the physical comfort levels in the inner city of Schiedam. Here, a similar story is true.

The large majority of the inner city experiences the effects of heat stress. It creates an unpleasant microclimate and affects people's productivity (ILO News, 2019). Some areas are less affected and somewhat cooler than their direct surroundings, which is again following the location of the canal and the larger existing green facilities. However, overall the conditions are pretty concerning.

4.3 Environmental stresses

4.3.3 Water management

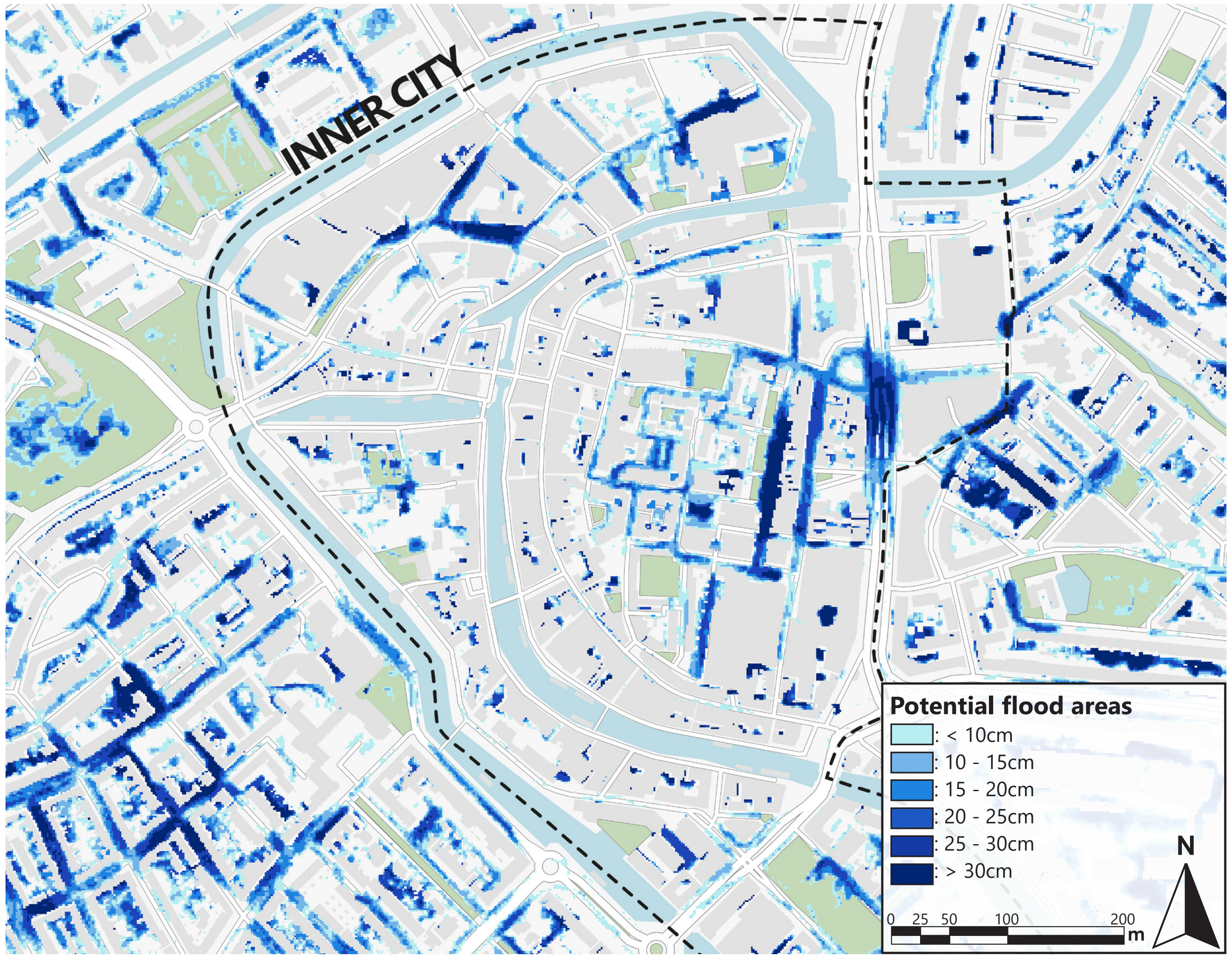


Figure 4.15. Potential flood areas in case of extreme weather (Gemeente Schiedam, 2016b).

Figure 4.15 shows the main problem areas concerning potential floodings in case of extreme weather events. As can be seen from the map, almost every street not directly connected to the canals faces potential flood risk due to extreme weather events.

For a large part, this is again due to the drastic lack of permeable surfaces. The sewerage system is simply unable to cope with the amount of rain an extreme weather event would bring along. Additionally, there are not nearly enough permeable surfaces where water can get naturally absorbed. Lastly, no green roofs or other facilities to slow down the water can be found within the inner city.

4.4 Social dimension

4.4.1 Demographics

The inner city currently houses 4.105 residents, resulting in a population density of 10.012 people per square kilometre. The majority of inhabitants fall into the category of 25 to 65-year-olds. The migration background is very mixed, with around 40% being western, while the remaining 60% is spread throughout the world (Informatie wijk Centrum, 2021).

On figure 4.17, the division of residents throughout the different parts of the inner city can be seen. It indicates that each area roughly has the same density of inhabitants.

Figure 4.16 shows some of the most critical health-related behaviours of residents in the inner city of Schiedam. Interestingly, over half the total population is considered obese, while a lower percentage practices some type of sport.

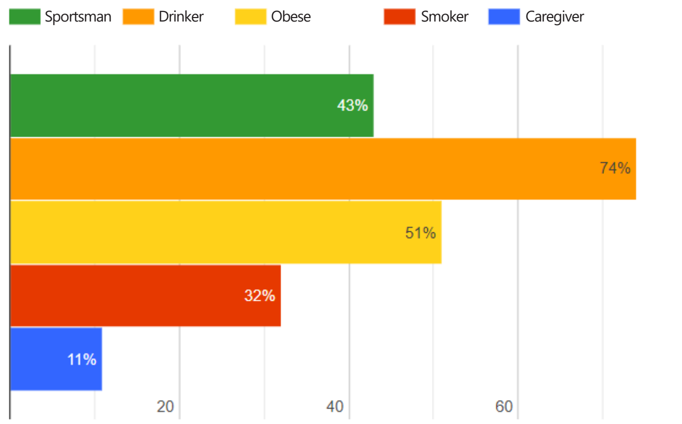


Figure 4.16. Health in relation to behaviour (Informatie wijk Centrum, 2021).

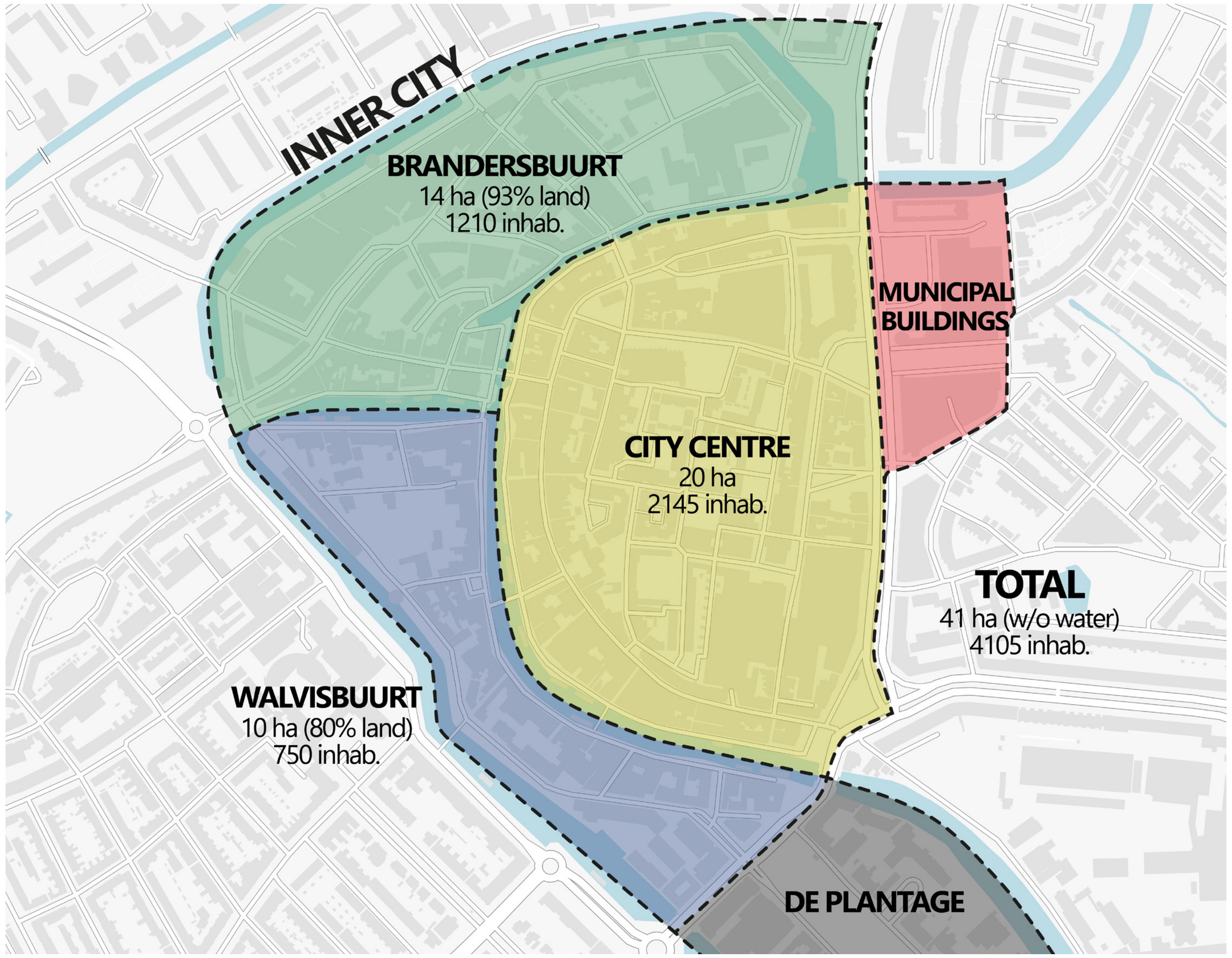


Figure 4.17. Size and inhabitants of each part of the inner city. Information from Kadastrale Kaart (n.d.), made by Author.

4.4 Social dimension

4.4.2 Accessibility network

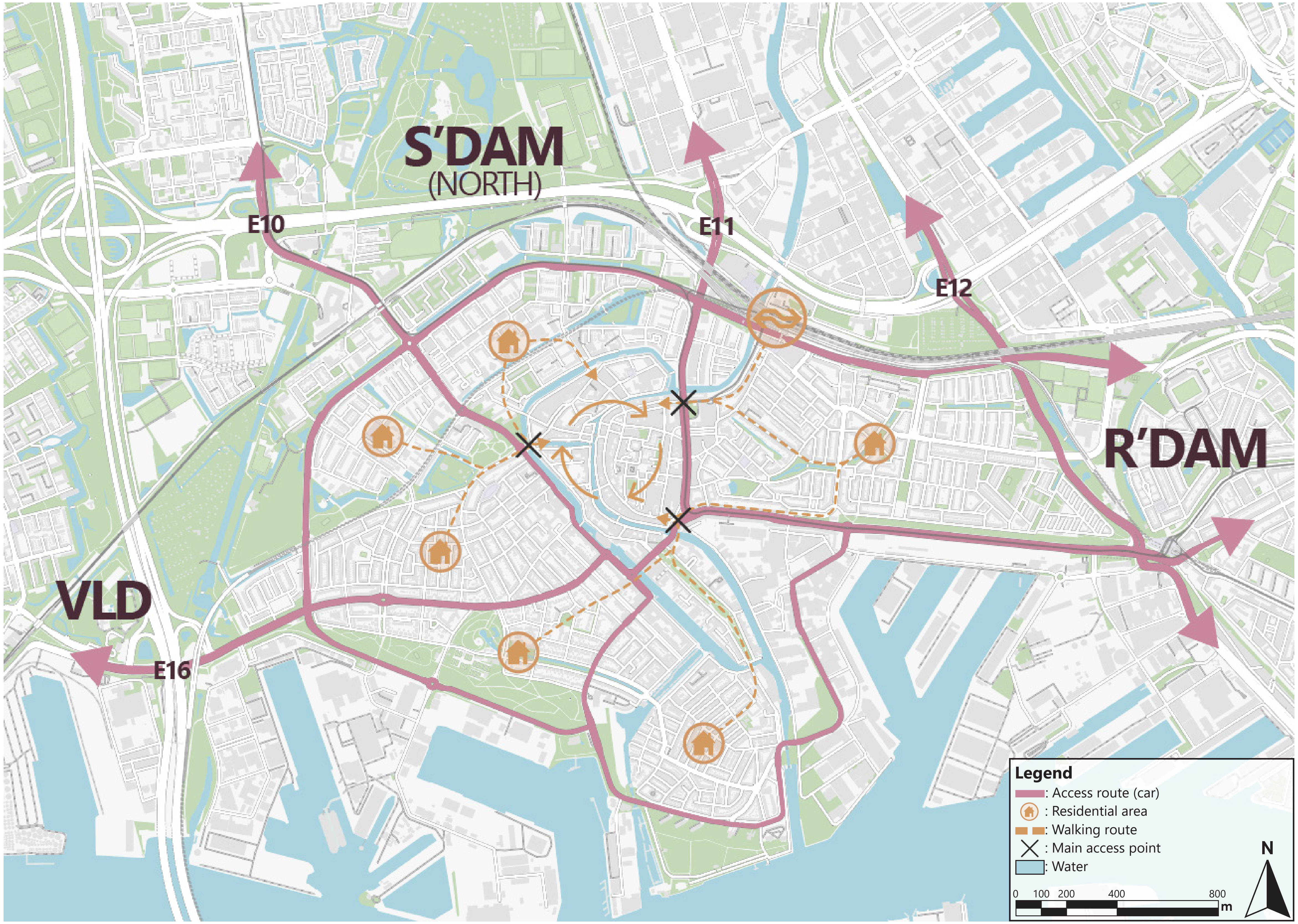


Figure 4.18. Main accessibility network of Schiedam and its direct surroundings, in relation to the inner city. Made by Author.

On figure 4.18, the transportation network surrounding the inner city of Schiedam is illustrated. By car, the inner city is pretty well connected – with two main access routes surrounding the city centre that connects it to a wider network.

For pedestrians, there are a couple of routes leading from the surrounding neighbourhoods into the inner city. These routes should feel safe and comfortable to minimise any extra 'barrier' for people to come and visit – meaning it should not be an annoyance for people to access the city centre.

By overlaying the pedestrian and car networks, three main entrances to the inner city have been identified. Both cars and pedestrians use the same three entrance points and they should therefore also accommodate both.

4.4.3 Social spaces

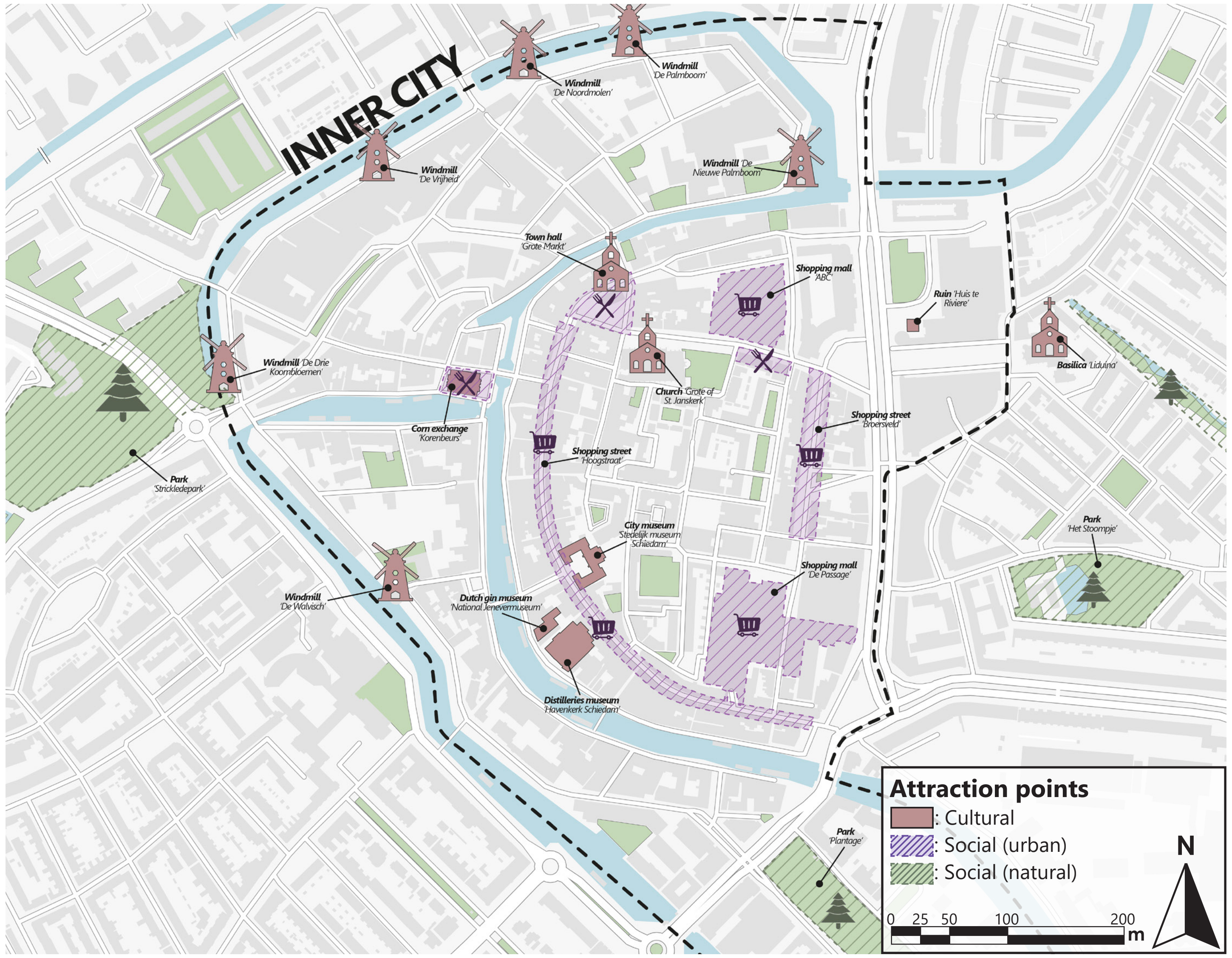


Figure 4.19. Cultural and social attraction points within the inner city of Schiedam. Made by Author.

Figure 4.19 shows the main attraction points within the inner city of Schiedam. It consists of several cultural and social locations, scattered throughout the inner city. While the cultural spaces are important for the identity of Schiedam, their influence on people's social life is limited.

An important finding is that there are quite some larger social spaces within the inner city, however, their functions are pretty monofunctional. This is because the shopping malls/streets and public squares are both economically driven – meaning spaces for people to relax and socialise without the need to spend money are almost completely absent. This results in a considerably lower frequency of each person visiting, as people are not always in the mood to spend money.

Additionally, most urban green spaces within the inner city are (semi-)inaccessible, resulting in almost no natural social spaces found within the inner city. This severely limits people's ease of access to different types of social spaces. Furthermore, many of the existing small social spaces that are not economically driven underperform due to them not being inviting enough and/or again only focussing on one target group – this time small children. Two examples can be seen in figures 4.21 & 4.22.


Figure 4.20. Grote of Sint Janskerk, Schiedam (Minderhoud, n.d.).


Figure 4.21. Largest natural social space (monofunctional). Made by Author.

Figure 4.22. Uninviting piece of playing equipment. Made by Author.

4.4 Social dimension

4.4.4 Green accessibility (people)

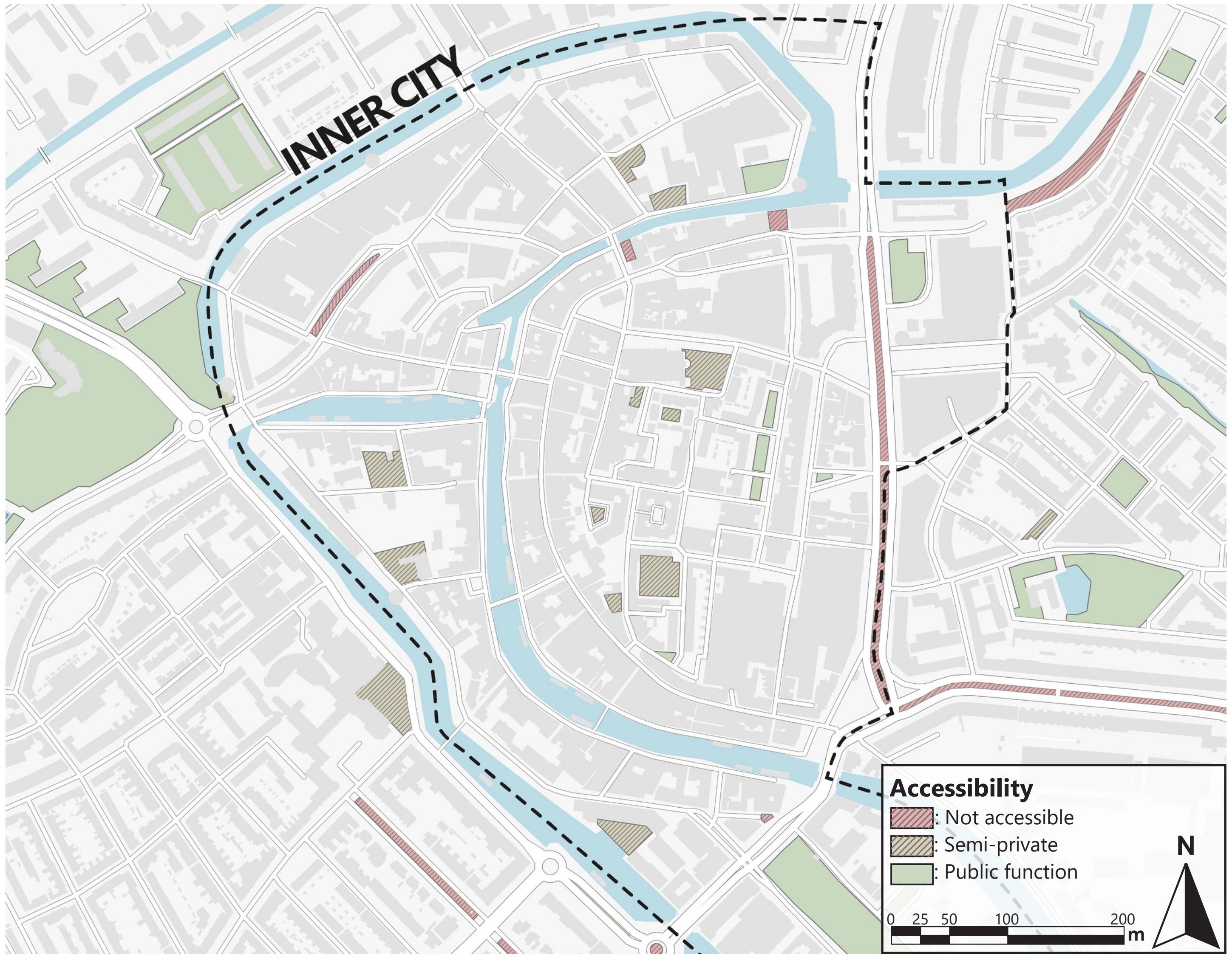


Figure 4.23. Accessibility of existing green spaces. Made by Author.

Figure 4.23 shows the accessibility of all existing green spaces for residents and visitors within the inner city of Schiedam. In this, not accessible implies that no one would – under normal circumstances – be able to reach the green facility, such as between tram tracks or blocked off completely. Next, semi-private entails that only certain groups can access it, such as within a building block or behind a fence at a church.

In total, there are 27 green spaces within the inner city ‘borders’, of which only 9 serve a public function. This means that two-thirds are either semi-accessible or not accessible at all, making it relatively hard to reach the nearest public green facility.

Furthermore, the top 5 largest green spaces all fall under the semi-accessible category, leaving only some small green spaces as actual public green.

4.4 Social dimension

Green walkability

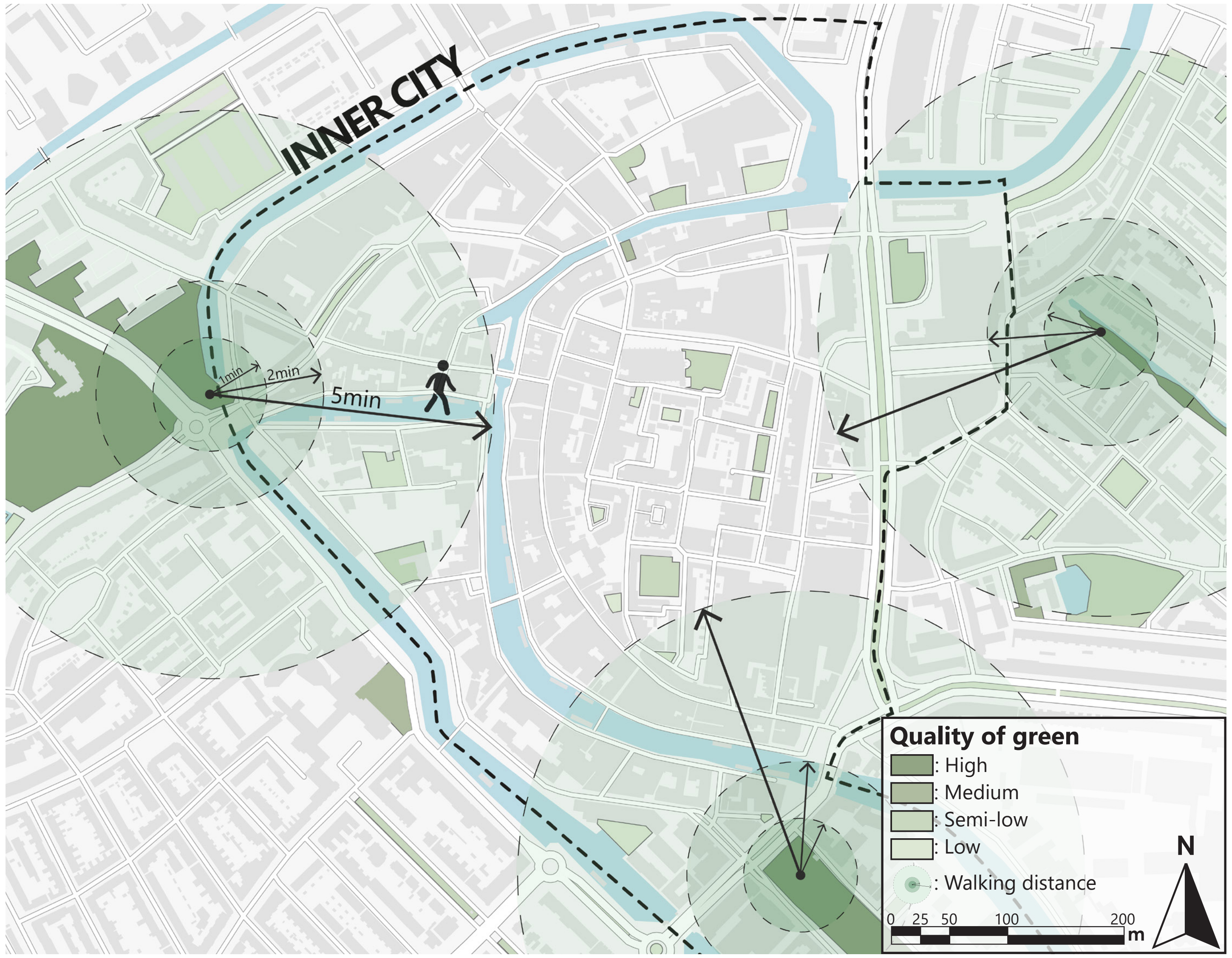


Figure 4.24. Walking distance to first high-quality green space. Made by Author.

The highest ecological quality of urban green within the inner city of Schiedam is quality 2 – semi-low. Meaning that to visit a medium or high-quality green space, people first have to leave the inner city.

In the direct surroundings of the inner city, however, there are a total of three parks with high-quality green. Figure 4.25 shows an image taken in one of these parks.

However, when assessing the accessibility of these high-quality parks, it becomes apparent that the large majority of the inner city does not have access to them within a five-minute walking distance. This means that for people that want to just pay a quick visit, the distance is too far to walk.

Furthermore, no clear routes are established that connect the inner city to the parks, making the actual 5 minutes radius even smaller.

Figure 4.25. Strickledepark - closest high-quality park to inner city of Schiedam. (Hryoma sakamoto, 2018).

4.5 Public space use

4.5.1 Vacancy

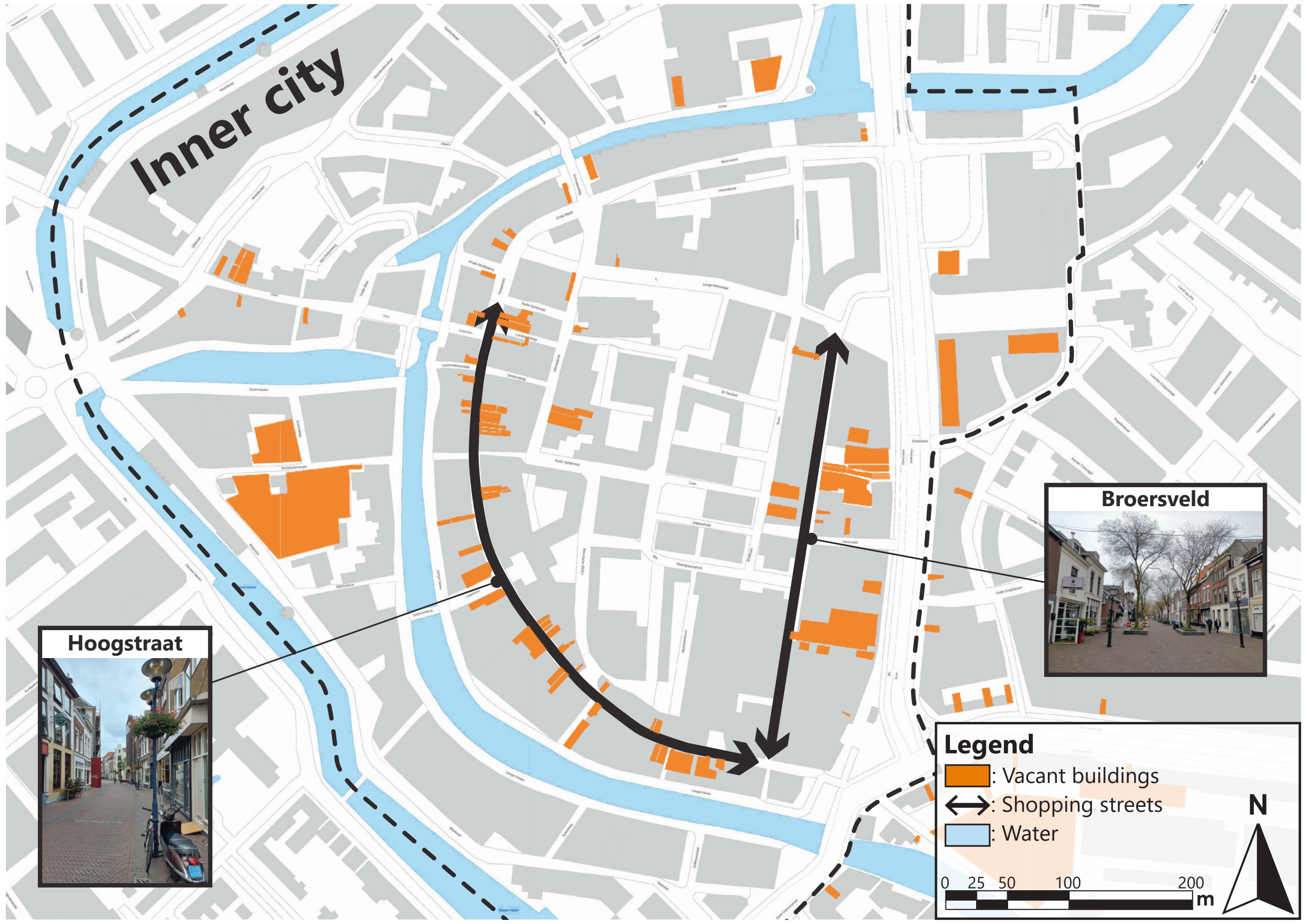


Figure 1.26. Map of vacant commercial buildings in Schiedam. Made by Author.

Figure 1.26 shows an overview of all commercial buildings that are currently vacant. As mentioned in chapter 1.3.4, vacancy levels have been high within the inner city throughout the past decade.

Most of the vacant buildings are around the two main shopping streets – the Hoogstraat and Broersveld. Both streets face a very similar issue, in which their appeal declines as people are transitioning to experience-based shoppers.

As stated in chapter 1.3.3, the focus should not only be on trying to attract business, as this will ultimately lead to high vacancy levels again. Instead, a strong focus should be on trying to improve the conditions of the area to attract more frequent visitors – the business will follow.

4.5 Public space use

4.5.2 Car use

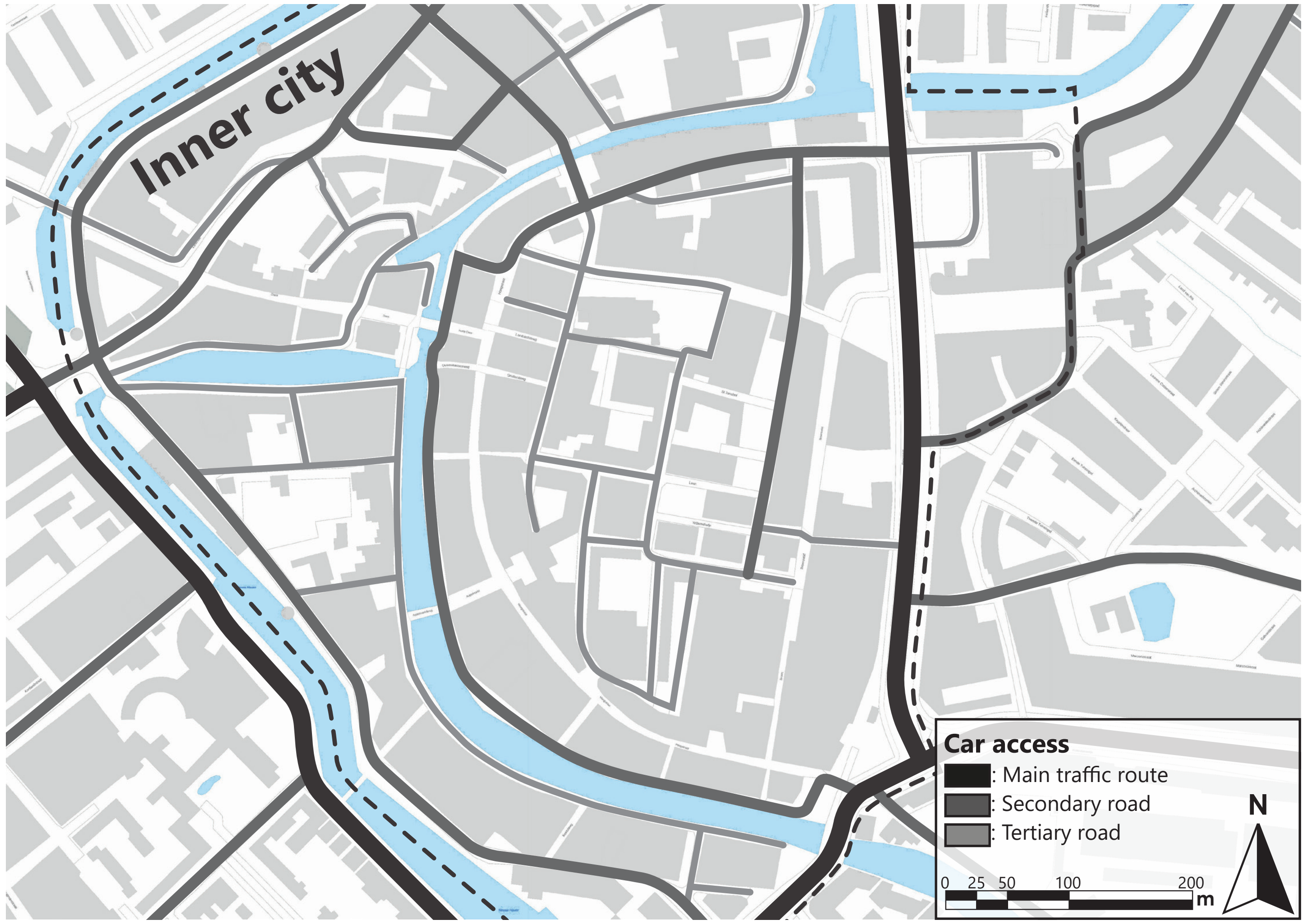


Figure 4.27. Car accessibility and hierarchy. Made by Author.

Figure 4.27 shows all existing streets where the car is allowed with their hierarchy. The first important finding is that no main access routes go through the oldest part of the inner city.

Next, two vertical (N-Z) streets have no car access, which are the two shopping streets, while the horizontal (E-W) dimension has no major streets without car access. As such, pedestrians are unable to access certain parts of the inner city without having to deal with car traffic.

Outside of these two car-free streets, almost all other streets without car access are small alleyways. Ultimately, this indicates that car accessibility is high within the inner city of Schiedam.

4.5.3 Pedestrian friendliness

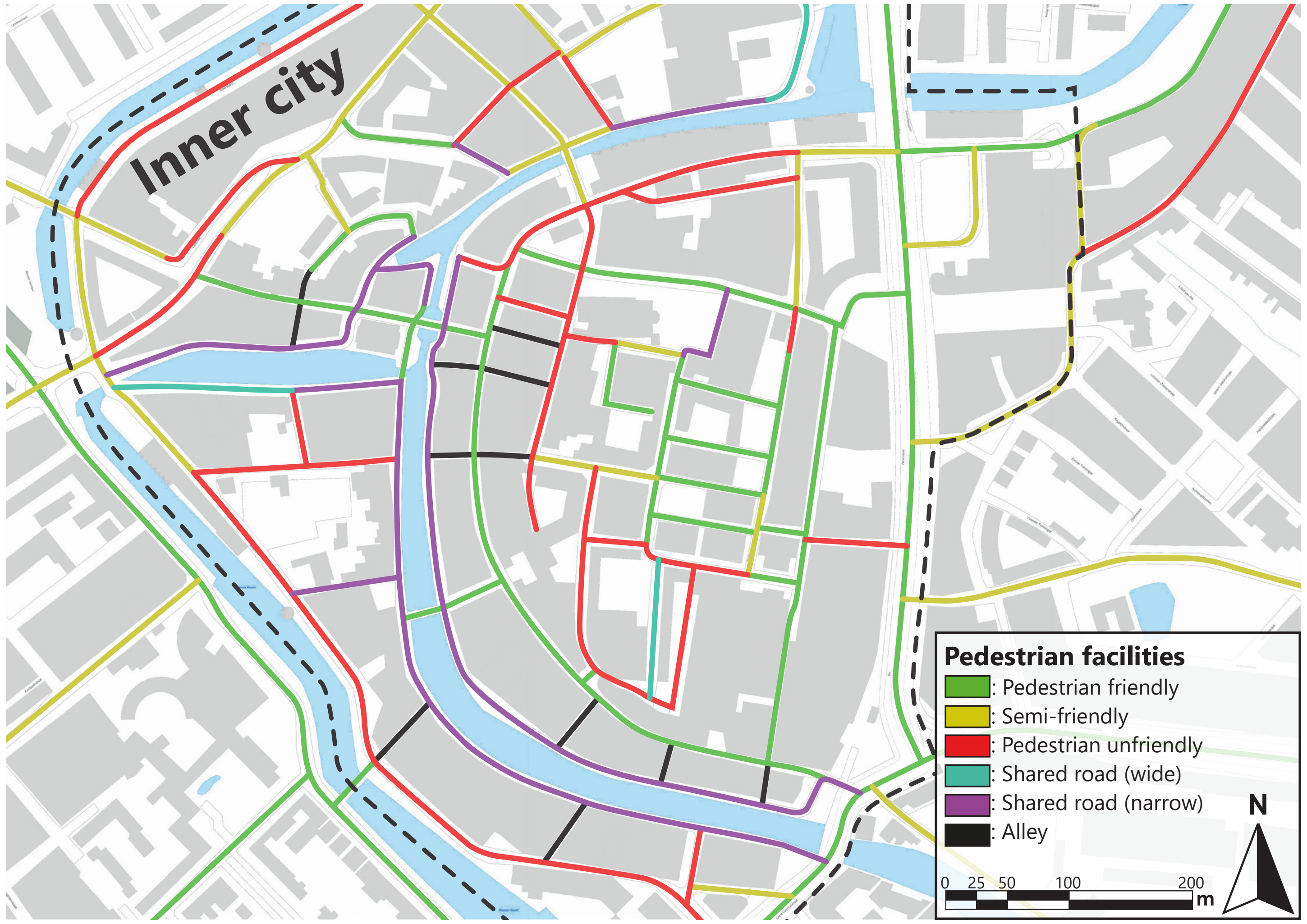


Figure 4.28. Pedestrian friendliness. Made by Author.

Figure 4.28 shows the pedestrian friendliness of each street within the inner city of Schiedam. First of all, it is important to note that being pedestrian-friendly does not mean being attractive, as many (semi-)friendly streets are completely paved and not that inviting. Pedestrian attractiveness will be analysed in chapter 6.5.2.

A street is deemed pedestrian-friendly if it has separated sidewalks with sufficient width, while semi-friendly is the same, but without a separative barrier. Pedestrian unfriendly is characterised by a streetscape without enough space for the pedestrian to comfortably walk. As stated by the Gemeente Leiden (2013), the minimum sidewalk width is 1,5 metres.

As can be seen from the map, the pedestrian-friendly streets do not form a complete network. As a result, people will have to cross streets that often pose unsafe situations for pedestrians.

Furthermore, several shared streets are located within the inner city. And while pedestrians technically have the entire road width to walk, they are often still pushed to the side by the car. As stated by Adams et al. (n.d.), speed limits are very often exceeded on shared streets, making relatively narrow shared spaces still feel unsafe.

4.5.4 Street typology

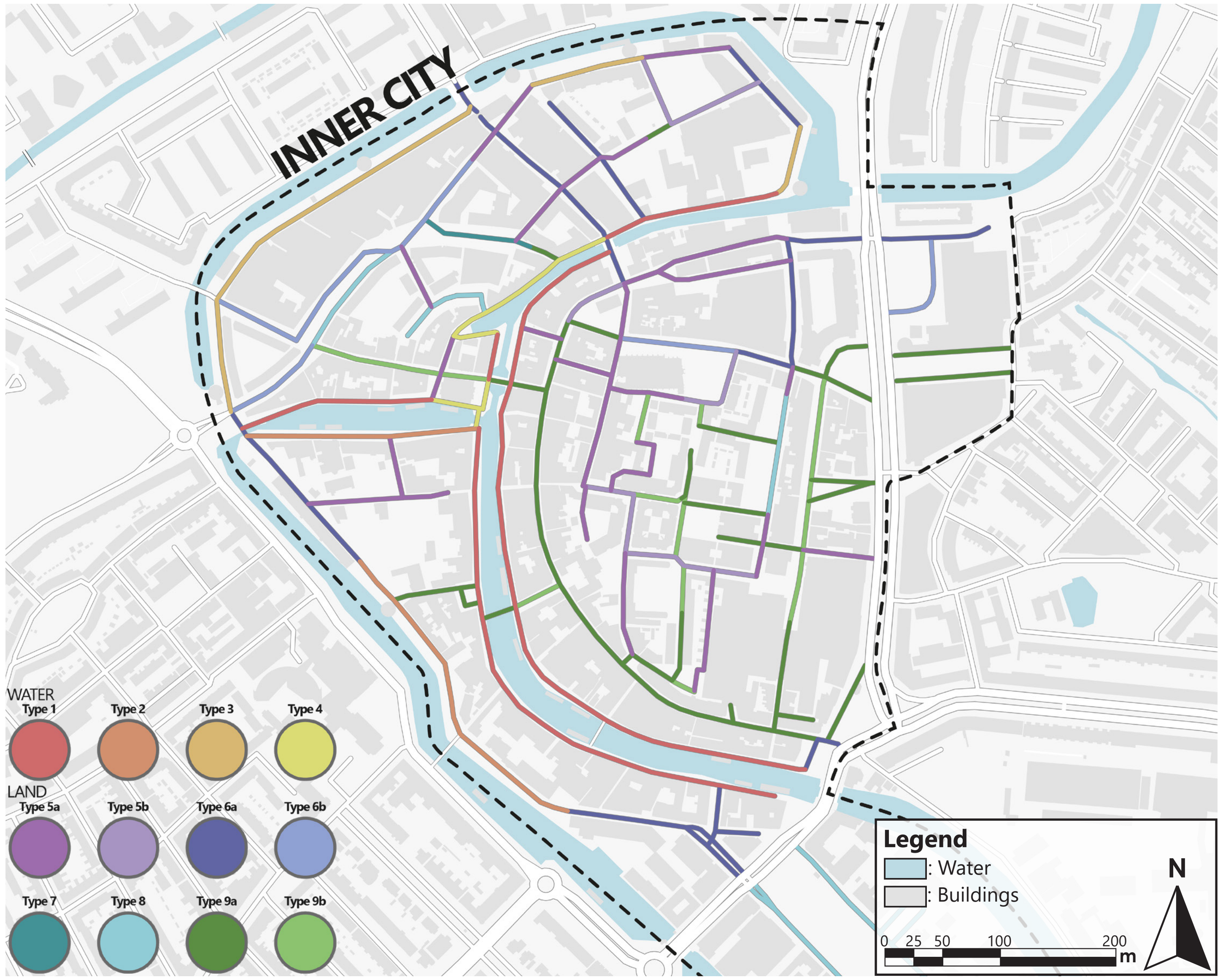


Figure 4.29. Street type distribution. Made by Author.

To better assess the current qualities and concerns related to the street typology within the inner city of Schiedam, an overview has been developed of all available street types. In total, 12 street types have been identified – four alongside the canals and eight others. Figure 4.29 shows the spatial distribution of these street types.

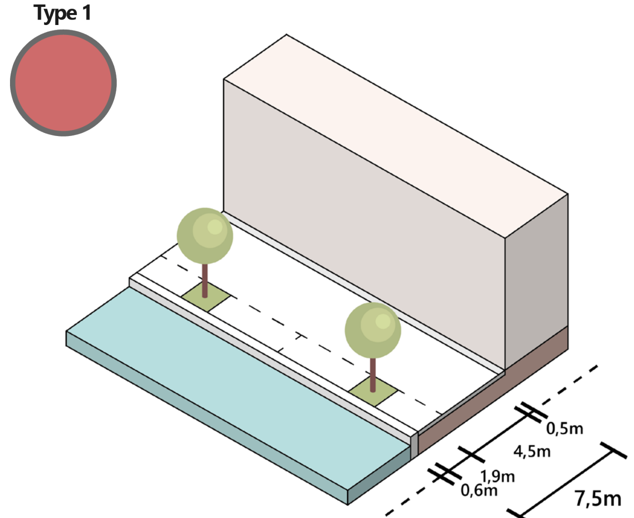
In figure 4.30, found on the following two pages, each street type has been visualised by its main characteristics and size. Important to clarify is that the exact measurements can slightly differ in the real context, however, to prevent having an abundance of very similar street types, multiple streets with similar characteristics have bundled into one type. Furthermore, variants with parking on zero, one, or two sides have been bundled under one street type – always shown in these visualisations as being on one side.

For each street type, some main characteristics have been summarised. These aim to create a first understanding of the potential qualities/concerns of each street type. However, it is important to note that each streetscape type will be further assessed and evaluated in chapter 6.5.4.

4.5 Public space use

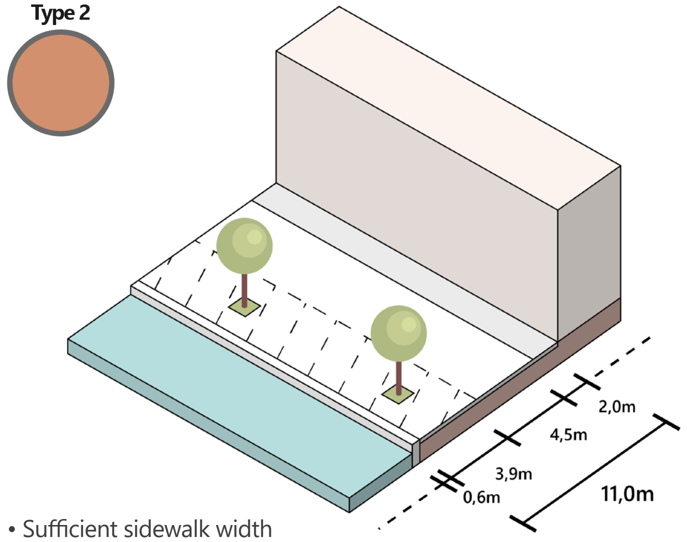
Streetscape types

Type 1



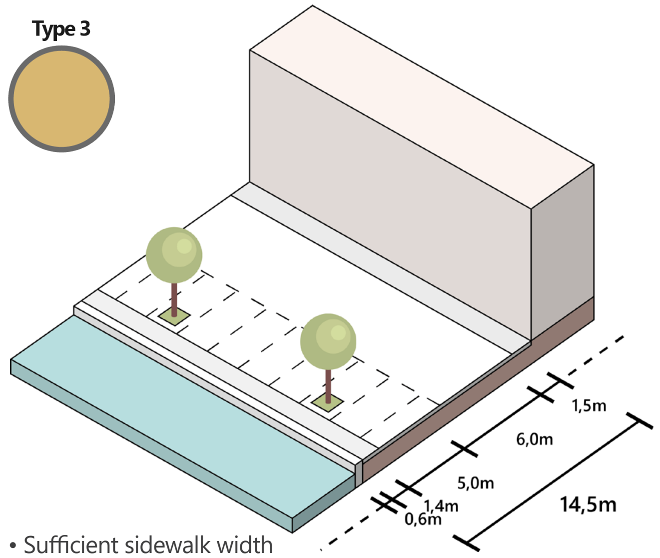
- No sidewalk and narrow road
- Cars between water and street
- Limited space for both car and pedestrians to pass each other

Type 2



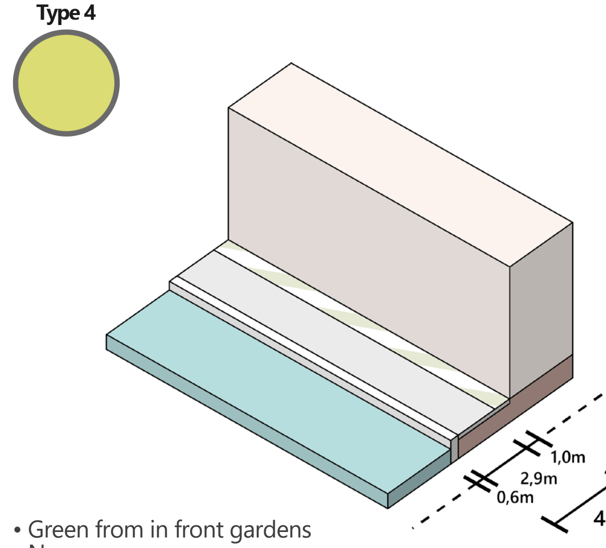
- Sufficient sidewalk width
- Cars between water and street
- Limited visibility of water from pedestrian route

Type 3



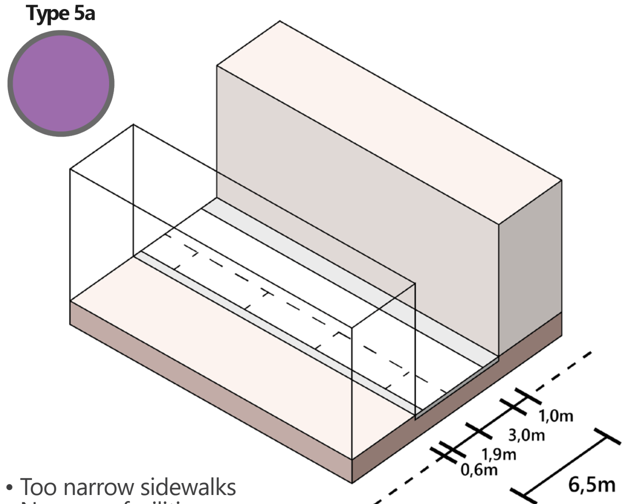
- Sufficient sidewalk width
- Pedestrian access to waterside, as well as at the buildings
- Wider street for cars

Type 4



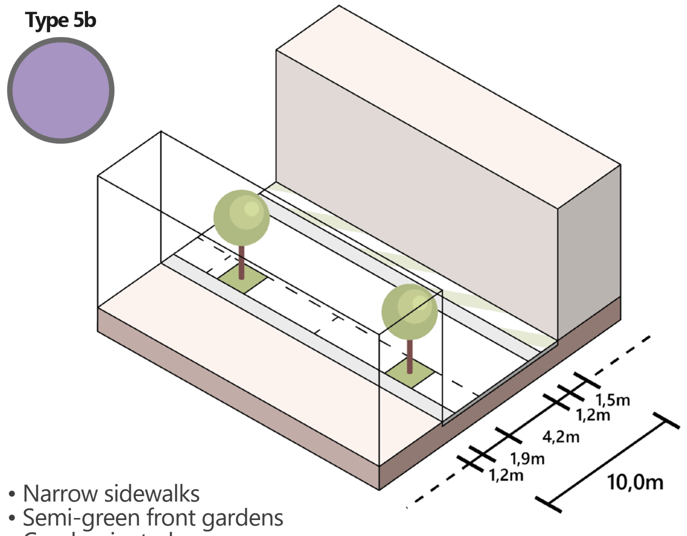
- Green from in front gardens
- No car access
- Varying street widths

Type 5a



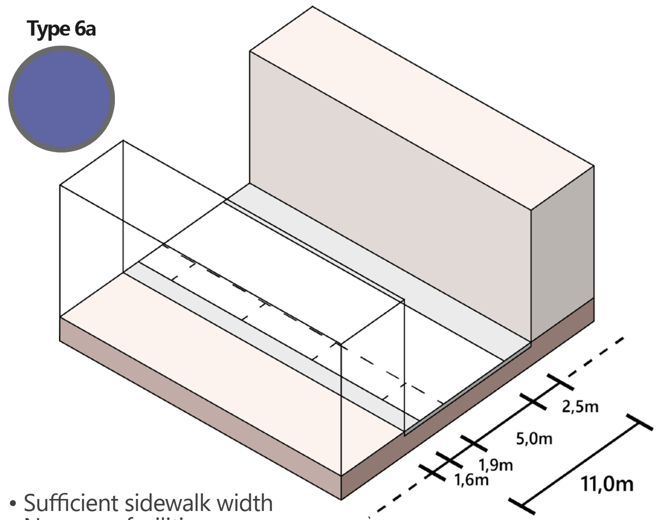
- Too narrow sidewalks
- No green facilities
- Unsafe feeling for slow traffic
- Car dominated

Type 5b



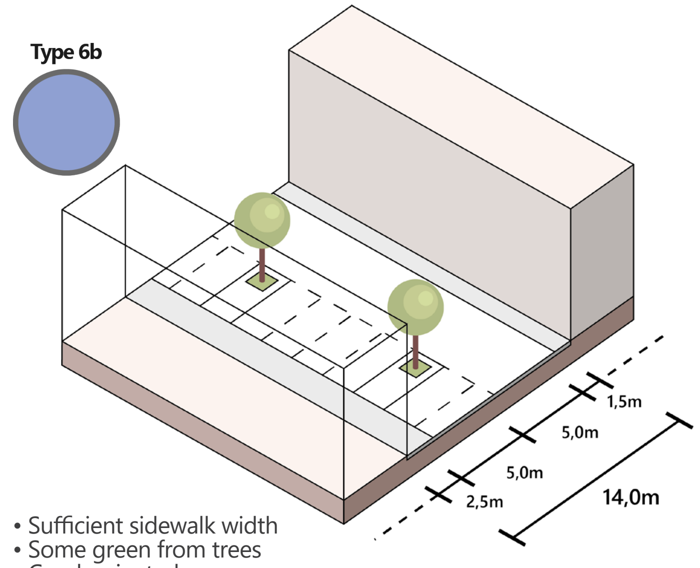
- Narrow sidewalks
- Semi-green front gardens
- Car dominated
- Common residential street

Type 6a



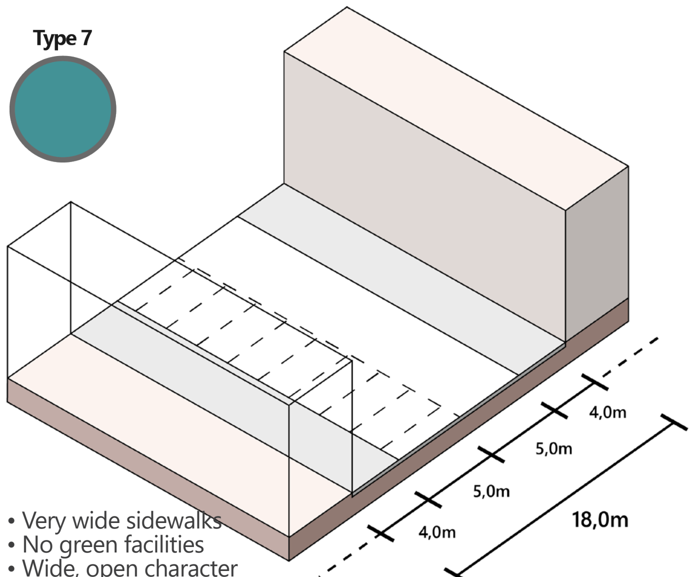
- Sufficient sidewalk width
- No green facilities
- Car dominated

Type 6b



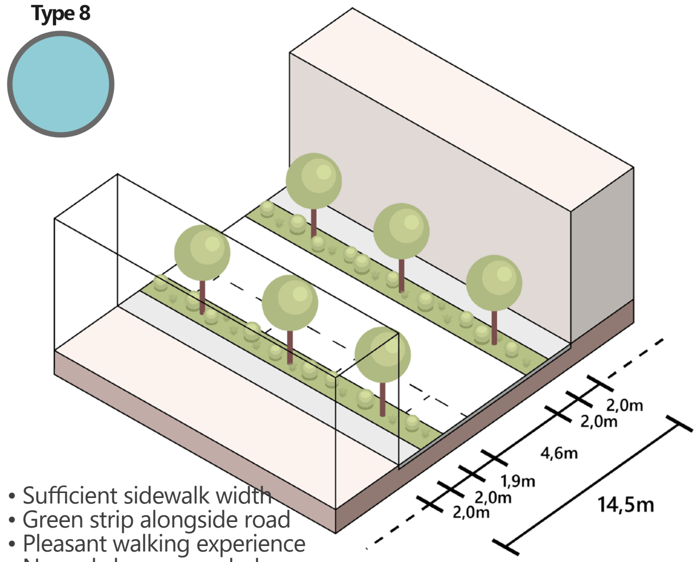
- Sufficient sidewalk width
- Some green from trees
- Car dominated

Type 7



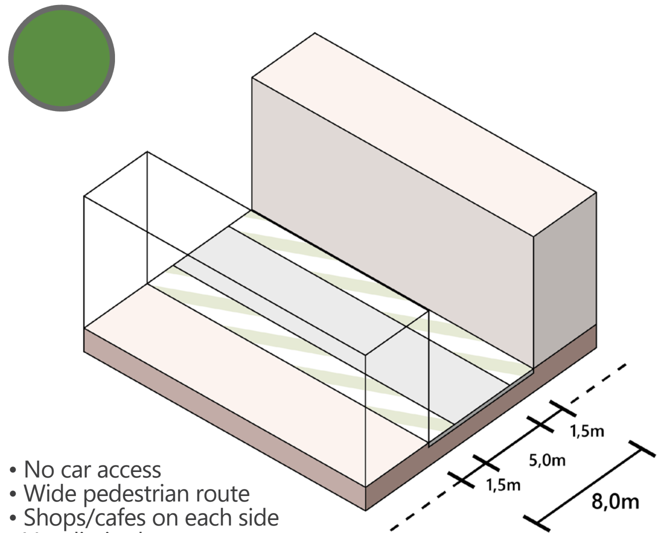
- Very wide sidewalks
- No green facilities
- Wide, open character
- Wide street for cars

Type 8



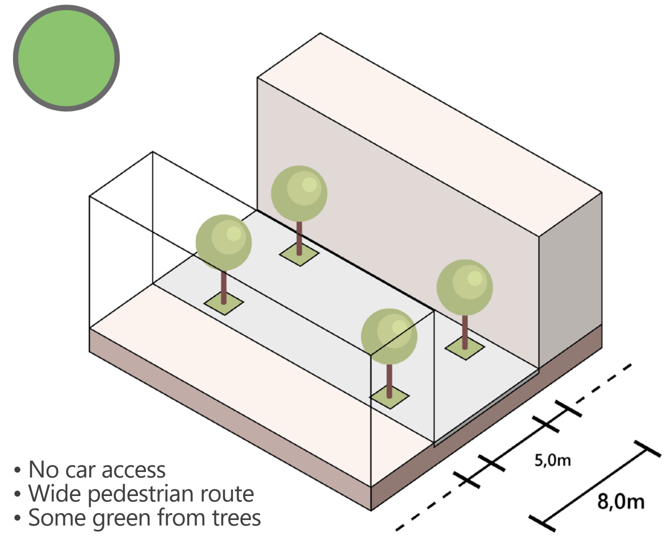
- Sufficient sidewalk width
- Green strip alongside road
- Pleasant walking experience
- No real change needed

Type 9a



- No car access
- Wide pedestrian route
- Shops/cafes on each side
- Very limited to no green

Type 9b



- No car access
- Wide pedestrian route
- Some green from trees

Figure 4.30. All street types of the inner city in Schiedam. Made by Author.

4.6 Conclusions

4.6.1 Ecological condition

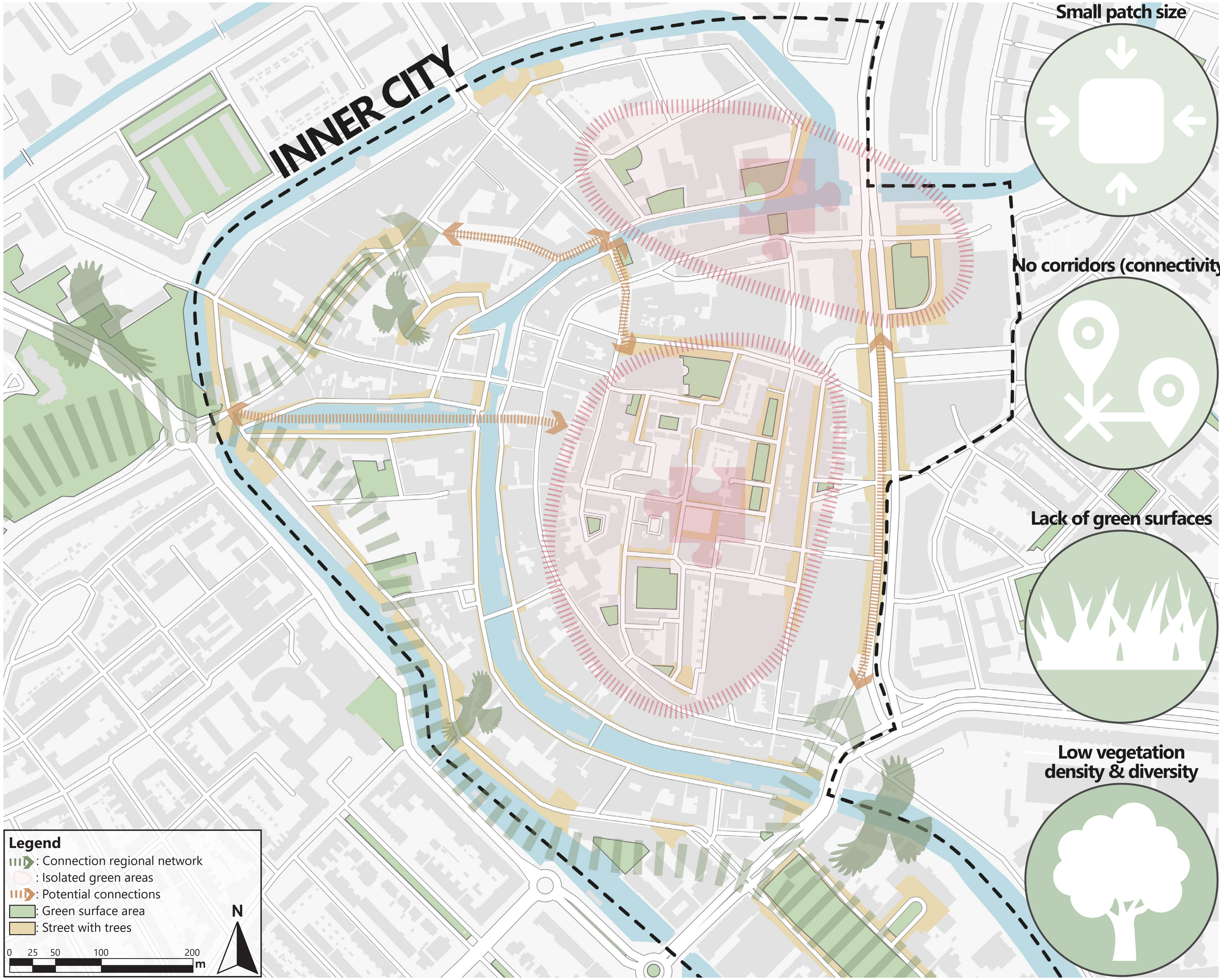


Figure 4.31. Map illustrating current ecological condition and potentials. Made by Author.

Overall, the current ecological condition of the inner city is low. Most existing green patches are small, unconnected to the regional network, and low in ecological quality. As a result, the inner city of Schiedam currently functions as a barrier for most species, also due to the very limited amount of green patches in general.

Figure 4.31 shows several potential new ecological connections that could improve the biodiversity within the inner city. New urban green patches should be implemented that contribute toward the goal of facilitating a rich, biodiverse urban ecosystem. However, to reach that goal, the vegetation density and diversity of existing (and new) green patches should go up, as this will also contribute to a more biodiverse area.

4.6 Conclusions

4.6.2 Environmental condition

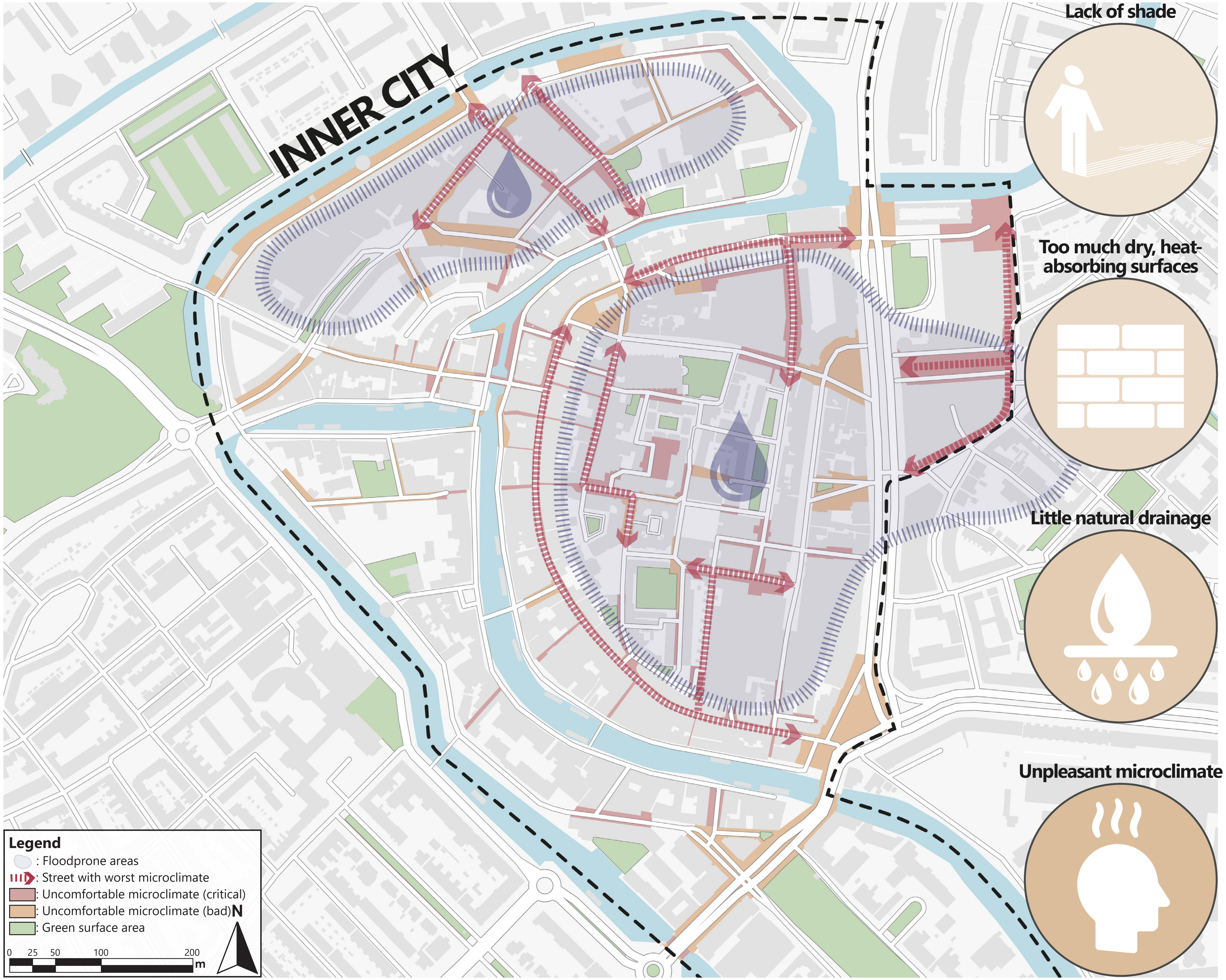


Figure 4.32. Map illustrating current environmental condition and potentials. Made by Author.

The current environmental condition of the inner city of Schiedam poses several concerns. A large majority of the surface area has heightened flood risk, due to its lack of permeability and natural water retention.

Quite some streets also face issues related to their microclimate. The lack of shade (excluding buildings), combined with limited wet surfaces and reflective capability results in a very low cooling capability. Especially on a warm day, the outside climate can quickly become uncomfortable. In figure 4.32, the most critical streets have been indicated.

Ultimately, the goal is to realise an inner city that is resilient and climate adaptive – meaning it will be able to deal with the potential future environmental shocks and stresses. Furthermore, the microclimate should be perceived as pleasant, whatever street you visit. In this, the solution lies in adding more permeability and cooling capacity.

4.6 Conclusions

4.6.3 Social condition

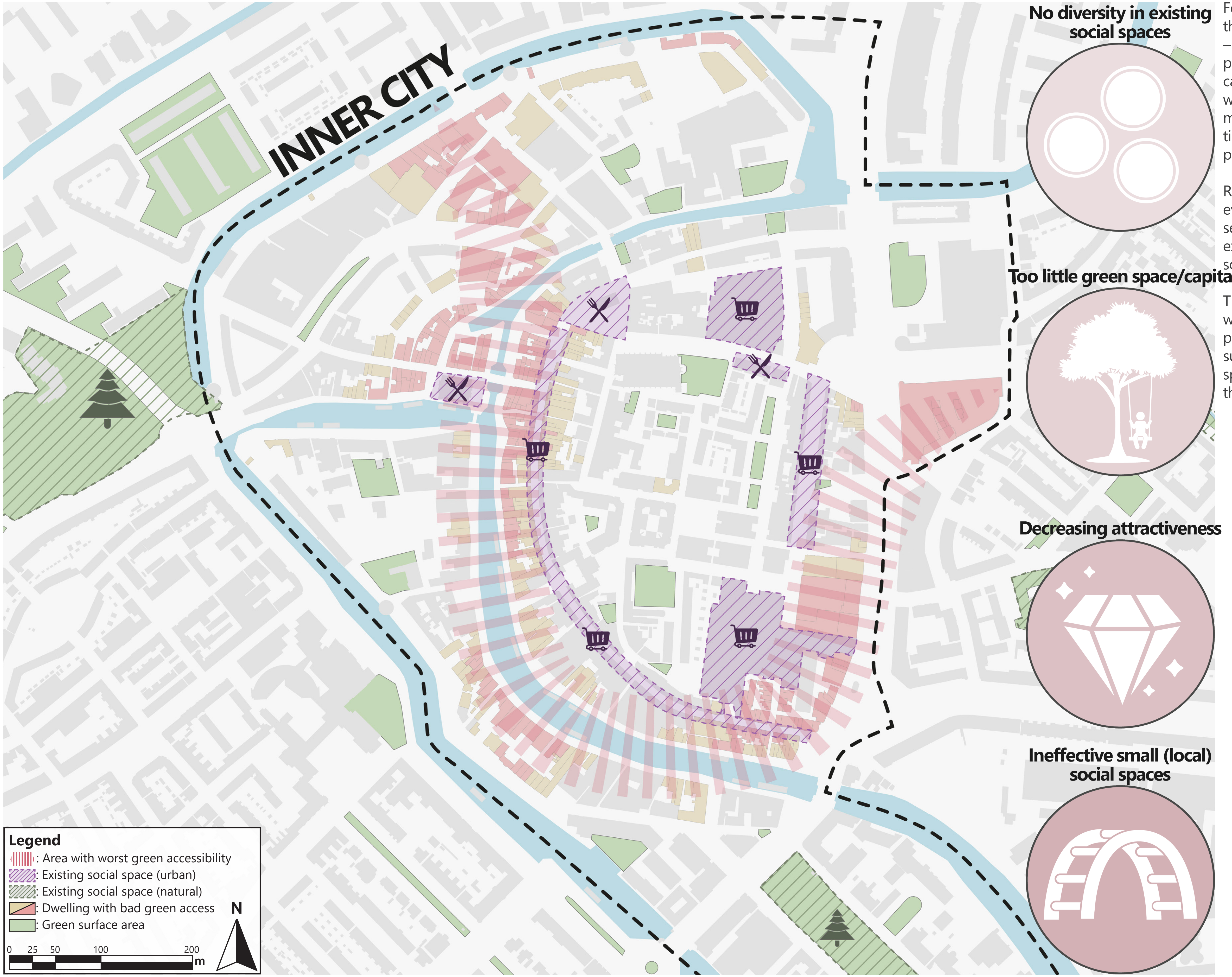


Figure 4.33. Map illustrating current social condition and potentials. Made by Author.

For the social condition, the results are varied. While there are quite a few high-quality large social spaces – as you would expect from an inner city – their use is pretty monofunctional. Almost all of them are economically driven, resulting in limited facilities for people that want to go outside for any other purpose. Furthermore, most small-scale spaces are either inaccessible, uninviting, or again monofunctional, leaving little incentive for people to frequently go outside.

Related to this, the green space/capita quote is not even close to being met, tying in with the lack of diverse social spaces. Lastly, as people are becoming more experience-driven, the attractiveness of some existing social areas is starting to decline.

The goal is to improve the diversity of social spaces, as well as their quality and accessibility. For whatever purpose people want to outside, the inner city – or its direct surroundings – should provide an appropriate public space to minimise the barrier for people to go enjoy the outdoors.

4.6 Conclusions

4.6.4 Synthesis

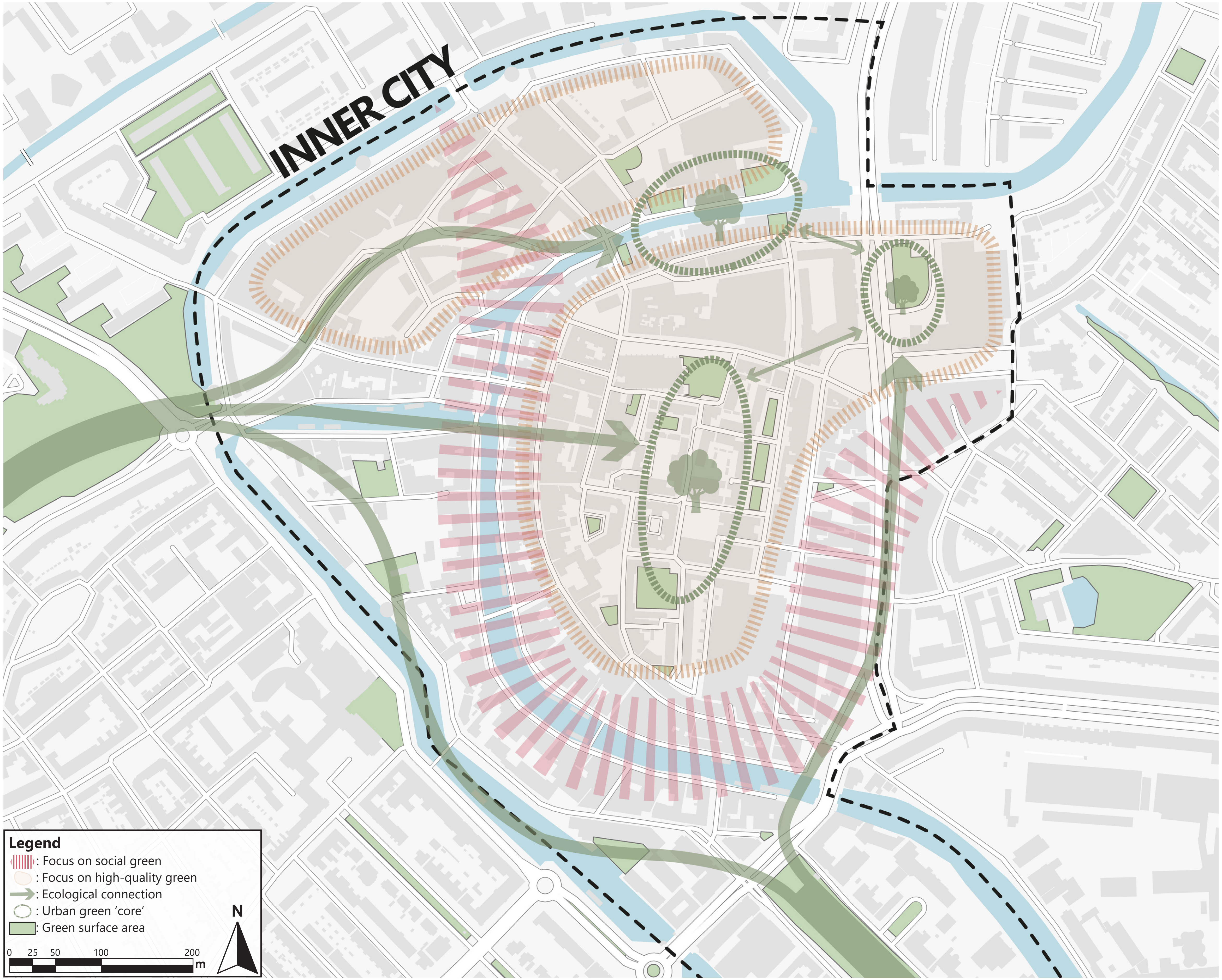


Figure 4.34. Focus area for each of the three domains, each by using urban green. Made by Author.

By overlaying the previous conclusion maps, a synthesis map has been developed, as seen in figure 4.34. The map shows the main focus areas for each domain – the ecological, environmental, and social domains. This, however, does not mean each domain is limited to its focus area, as an integrated approach will be most beneficial. Instead, the map illustrates the most critical areas within each domain.

Furthermore, all domains focus on the implementation of urban green, however, their appearance and configuration might differ. For the social dimension, for example, accessibility is crucial, while for the environmental domain, the focus is more on permeability and cooling capacity. Lastly, the ecological component focuses most on patch connectivity, as well as vegetation diversity and density.

5 CURRENT SOLUTIONS

This chapter provides an overview of the different ways Schiedam, as well as other cities worldwide, deal with the aforementioned concerns. By delving into all types of different solutions, chapter 5 aims to create a clear understanding of the quality shortcomings of existing development programs. After this, several potential design principles will be introduced.

5.1.1 National government

Figure 5.1 shows the number of times green-related topics have been mentioned by the National Government per major city. First of all, green-related topics have been mentioned far more often in the program of each political party in comparison to the coalition agreement. This is most likely to win more votes from that city. In Schiedam, however, the difference is one of the worst (1/35).

In 2014, the coalition - consisting of the D66, PvdA, SP, VVD, and CDA - did form a policy agreement named 'Samen Schiedam vernieuwen', however, it lacked any real attention to green. As stated by Visschedijk (2014), the document only contained a few hints related to potential new green, but nothing concrete.

When looking at the policy documents, it often starts with an enticing story about the rich history of Schiedam, however, it does not pose any specific ideas on how they want to renew this area without touching on this historical importance (Gemeente Schiedam, 2014).

In the rest of the documents, the focus is more geared towards the financial side, with, for example, the focus on a better business climate and more flexibility, again without any concrete examples (Gemeente Schiedam, 2014).

Lastly, the document does touch on some sustainability-related topics, however, the focus seems to be mostly on using every buzzword such as liveability, sustainability, better health, more sport, better safety, etc (Gemeente Schiedam, 2014). Without any examples of how they see to accomplish this, it seems to be more like empty words.

Visschedijk (2014), draws a similar conclusion, stating that no green-related topic in figure 5.1 has any clear plans yet.

	Amount of times		Subject					
Municipality	PPP	CA	UA	GH	LSM	MSM	TEG	CC
Amersfoort	22	5				√		
Amsterdam	25	1	√	√				
Arnhem	52	6					√	√
Den Haag	50	5					√	
Deventer	13	1						
Dordrecht	13	0						
Eindhoven	30	7				√		
Enschede	17	3	√			√		
Groningen	17	3				√		
Haarlem	36	1						
Heerlen	9	2				√		
Leeuwarden	?	1						
Maastricht	21	1			√			
Nijmegen	30	6	√			√		
Rotterdam	26	6				√		
Schiedam	35	1						
Utrecht	49	4				√		
Zaanstad	38	3				√	√	

PPP: Program of Politcal Party. CA: Coalition Agreement. UA: Urban Agriculture. GH: Green and Health. LSM: Less Self-Management. MSM: More Self-Management. TEG: Temporary use Empty Ground. CC: Climate Change.

Figure 5.1. Mentioning of green-related subjects by the National Government per city (Visschedijk, 2014).

5.1.2 Municipality

In figure 5.2, an overview of the main green-related topics is found. For each topic, a checkmark is placed if the Municipality of Schiedam has any plans in their policy/vision documents.

Add green surfaces
The Municipality of Schiedam acknowledges the importance of permeable surfaces and as a result, it aims to remove at least 5 percent of all paving throughout the city and replace it with green (Gemeente Schiedam, 2021). However, in terms of execution, only some small initiatives have been started. No complete, integrated green network has been proposed and these developments seem to stay away from altering the streetscapes.

Reduce impact of the car
A topic that the Municipality of Schiedam is pretty clear on is their car vision. Multiple projects have been realised over the past years that focus on removing some parking spaces or car access to focus on urban green or social functions (Gemeente Schiedam, 2017). However, no clear alternatives have been mentioned.

Variety of green
In terms of the variety of green, the Municipality of Schiedam does have a clear vision, however, it is currently incomplete. For example, biodiversity along the river edges is aimed to increase by 40% by placing different types of vegetation, but for other parts of the city, plans are still lacking (Gemeente Schiedam, 2021). Furthermore, the focus on biodiversity is mostly geared towards the major parks, not the smaller green facilities.

Green as social space
The Municipality of Schiedam has no clear vision of the social dimension that urban green can facilitate. The only program related to this topic is a project called 'Schiedam in Beweging' - translated to 'Schiedam in Movement'. It focuses on exercising in existing green facilities (Gemeente Schiedam, n.d.). But other than that, no clear plans have been put forward.

Main topics

Add green surfaces	**√ / X**
- *5% of all paving replaced by green*	√
- *Within streetscape*	X
- *Small initiatives*	√
- *Integrated green network*	X
Reduce impact of the car	**√**
- *Remove part of car parking*	√
- *Car away from water edge*	√
- *Provide alternatives*	X
- *Decrease car accessibility*	√ / X
Variety of green	**√ / X**
- *Improve biodiversity*	√
- *Variety in all sized green spaces*	X
- *Green as visual quality*	√
- *Variety throughout the city*	X
Green as social space	**X**
- *Promote exercise in green*	√
- *Improve social dimension of green*	X
- *Create experience based city green*	X

Figure 5.2. Mentioning of main green-related subjects by the Municipality of Schiedam. Made by Author & (Logo Schiedam WEB, 2017).

Case study selection

To gain a better understanding of how different cities worldwide (try to) deal with similar issues and threats the inner city of Schiedam faces, several case studies have been selected. As shown in figure 5.3, three case studies have been selected that each tackles a different type of green-related problem Schiedam currently faces.

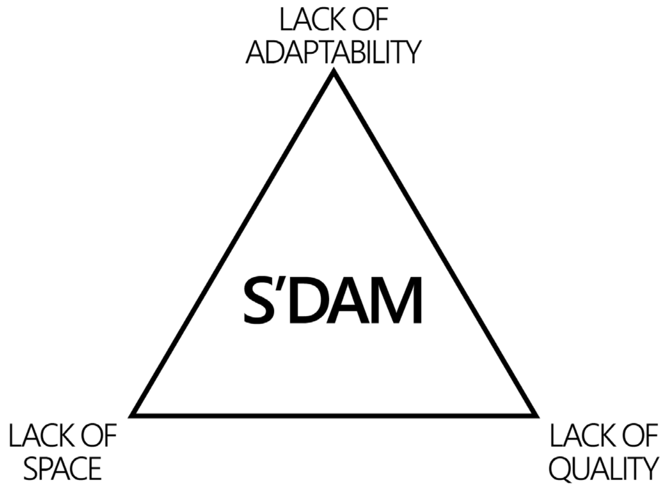


Figure 5.3. Main current green-related issues of Schiedam. Made by Author.

Lack of space

As seen in chapter 4, the inner city of Schiedam is characterised by narrow streets with very limited available space. This implies that – without any major redevelopments where entire building blocks are removed – the current dimensions are all that you will be able to work with. Therefore a similar inner city with a lack of space will be analysed – one that still has implemented some green qualities. The inner city of Venice has been selected, as it has similar space problems as Schiedam, but still manages to add green facilities for residents.

Figure 5.4. Streetscape impression of Venice (Storm, 2021).

Lack of adaptability

Partly due to this lack of free space, the current inner city of Schiedam is facing potential threats related to its lack of adaptability. The city centre currently cannot deal with potential future issues related to heavy rainfall, flooding, etc. Therefore a city that is far advanced in this regard will be selected. A central neighbourhood in Copenhagen has been selected, as Copenhagen has been elected as the most sustainable city in the world (Pardo, 2019). Furthermore, the government of Copenhagen has had both green accessibility and adaptability high on their agenda from an early stage (Wilmott, 2020).

Figure 5.5. Copenhagen as most sustainable city in the world (Oueslati, 2015).

Lack of quality

Lastly, the inner city of Schiedam currently lacks qualitative green facilities. As shown in chapter 4, most green spaces lack both visual, ecological, and environmental quality, which is detrimental to the slow-traffic experience and microclimate. For this aspect of the green-related concerns of Schiedam, a central neighbourhood in Singapore has been selected. Singapore has the nickname 'City in a Garden' and has one of the most diverse urban green landscapes (Natural Cool Air, 2020).

Figure 5.6. Streetscape impression of Singapore (Brears, 2017).

5.2.1 Venezia (Venice)

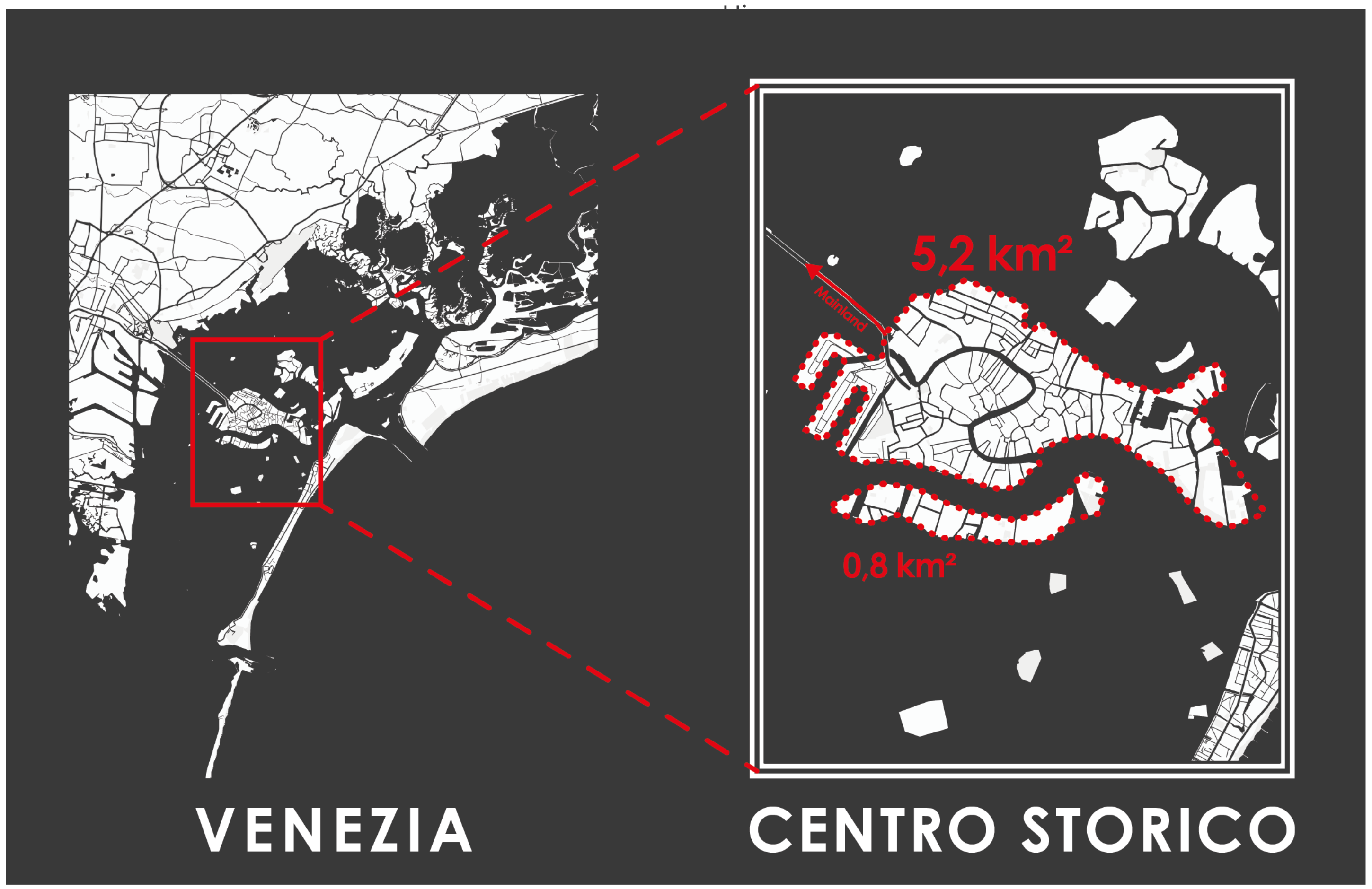


Figure 5.7. Location of Venice, as well as the case study location - the historical centre. Made by Author.

Venice (Venezia) is located on the East Coast of Italy. It consists of a group of islands located inside the Venetian Lagoon and an area on the mainland. While the mainland of Venice currently houses the most people and is larger in size, the main two islands will be analysed for this case study, as they house the historical centre.

In total, the Centro Storico (Historical Centre) houses 69.100 inhabitants, spread over an area of 6km². This results in a population density within the centre of 11.517 people per square kilometre. This is slightly higher than the 10.012 inhabitants per square kilometre the inner city of Schiedam currently houses (Informatie wijk Centrum, 2021), however, still comparable. Both the FSI and GSI are also very similar to Schiedam, as both use around the same amount of ground space, with buildings of similar height.

One important aspect that separates Venice from Schiedam is a large amount of tourism in Venice. Approximately 20 million tourists visit the city yearly – a number that is steadily growing (World Population Review, 2021). For the comparison, this means that pedestrian capacity will need to be significantly higher in Venice to cope with the tourists.

69.100 inhabitants

11.517	Population density (p/km²)
-3,354	Annual population growth (%)
31.066	GDP per capita (€)
1,0	Highest elevation (m)
Tourism	Dominant economic sector

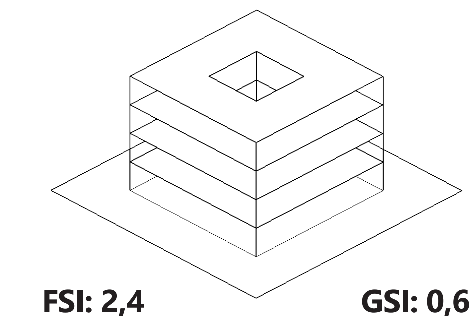


Figure 5.8. Practical information of the Centro Storico of Venice. Data from: (Venice Guide, n.d.) (Universität Hamburg, n.d.) (Patel, 2013).

Green/blue network

Venice is often regarded as 'the City of Water', mainly due to its large amount of canals that structure the landscape. Most building blocks are connected to the water. Furthermore, almost all canals are publicly accessible and create one continuous network.

For the green network, however, the story is different. As seen in figure 5.9, the urban green within Venice is very scattered. This is because – with exception of some larger green patches around the edges – almost all urban green is situated within building blocks. Most green patches are therefore not publicly accessible – only residents can visit them. For a city as busy as Venice, this makes the green courtyards a more secluded place to go for residents, however, as a non-resident, patches of green are hard to find.

Another side-effect of this way of distributing green is that residents have two distinct types of social spaces with each having unique qualities – the local social green space within each building block and the larger social space that are more urban and busy in nature, such as a large square.

Car accessibility

A relatively unique quality of the historical centre of Venice is the fact that cars are prohibited in most of the area. As seen in figure 5.10, only at the entrance of the island group is there some space reserved for car parking. While a city like Schiedam will never be able to be completely car-free like Venice – or at least not in the current climate – Venice does provide an interesting example of how to put pedestrians at the forefront (Williams, 2019).

Figure 5.10. Car accessibility Venice. Made by Author.

Figure 5.9. Green/Blue network of the Centro Storico of Venice. Made by Author.

Heat-island effect

The Centro Storico of Venice currently has to deal with the results of the urban heat-island (UHI) effect. While the city centre does provide green spaces for its residents, they are usually small in size and placed within building blocks – resulting in entirely paved surface areas outside the blocks. The main reason the UHI intensity of Venice is not higher than for example Milan, as seen in figure 5.11, is because of the large amount of flowing water that cools the area down slightly.

Floodrisk

As Venice is a city surrounded by water, it faces serious water-related threats. Currently, Venice is incapable to cope with a potential influx of extreme weather conditions. Similar to the heat-island effect, the green facilities of Venice do not help environmental concerns – they are mostly just for the residents. In case of extreme weather events, most rain will not reach the green courtyards, but stay on the streets and flow into the canals.

City	Methodology for UHI Intensity Estimation	Summer UHI Intensity (°C)	References
Milan	Remote sensing data (Moderate Resolution Imaging Spectroradiometer—MODIS sensor)	Maximum of 8–10 °C	Anniballe et al., 2014 [49]
Rome	Temperature data collected by meteorological stations/remote sensing data	2.5–7.5 °C	Guattari et al., 2018 [50] Fabrizi et al., 2010 [86]
Bologna-Modena	Temperature data collected by meteorological stations	4–8 °C	Zauli Sajani et al., 2016 [51]
Padua	Temperature data collected by meteorological stations	2–6 °C	Busato et al., 2014 [52]
Venice	Temperature data collected by meteorological stations	4–7 °C	Peron et al., 2015 [53]

Figure 5.11. Urban heat-island effect intensities of major cities in Italy (Barbieri et al., 2018).

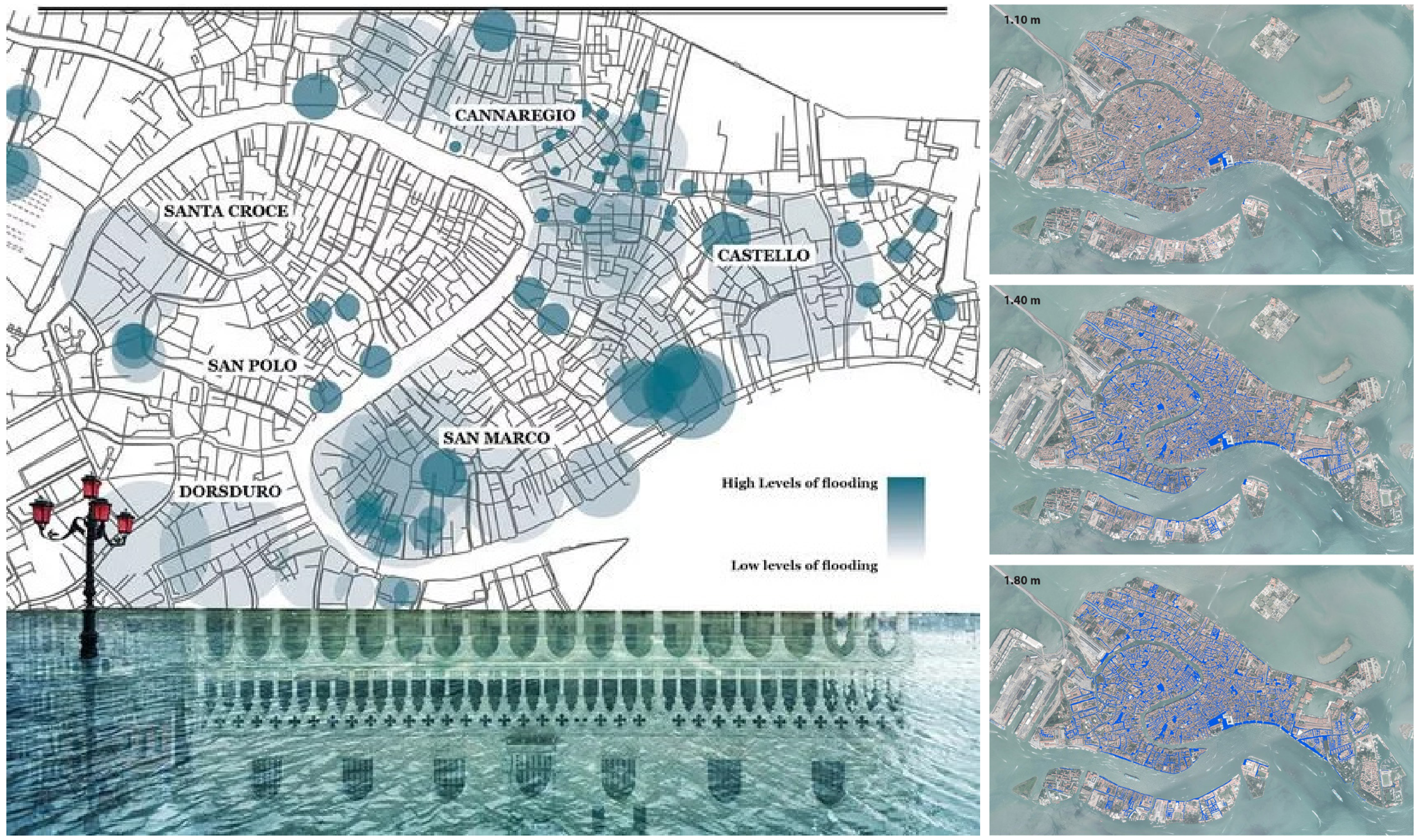


Figure 5.12. Maps showing the potential floodrisk in Venezia (GETTY, 2019) (Cavaleri et al., 2020).

Streetscape quality

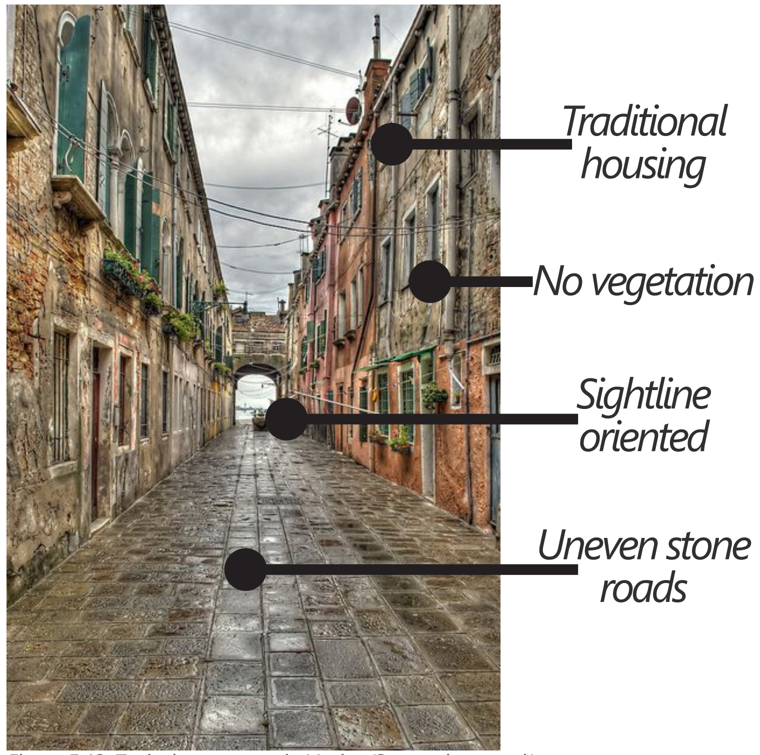


Figure 5.13. Typical streetscape in Venice (Santacoloma, n.d.).

The typical streets in Venice are relatively small in width. As no cars can enter, streets often opt for stone roads that fit the traditional style of housing found within Venice. Furthermore, for a large number of streets, a sightline towards the water or an important square is guiding.

Not surprisingly, the streets of Venice have no green – except for the occasional plants a homeowner might hang from their balcony. All space is used for pedestrians and no room is reserved for any green facility. Instead, the many canals often are the main natural feature. Furthermore, the streets next to a canal often appear a lot wider than they are, as seen if you compare figures 5.13 and 5.14. The actual width of the walkable streets is (nearly) the same, while the character and overall feel are completely different.

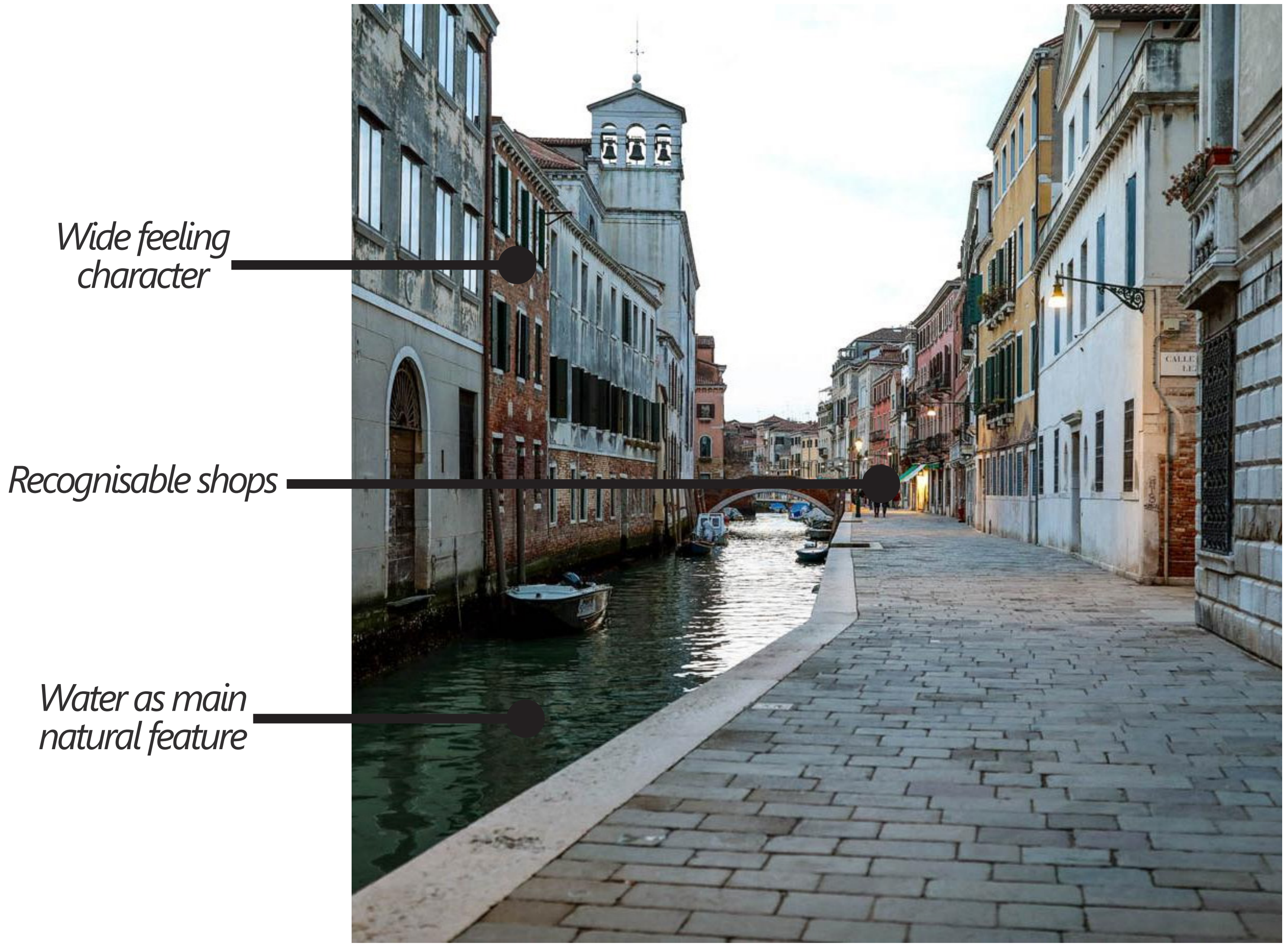


Figure 5.14. Typical streetscape with canal in Venice (di Lauro, 2020).

Strengths/Weaknesses

In figure 5.15, an overview of the main strengths and weaknesses of Venice in green-related aspects is found. A distinction has been made between aspects that are/are not applicable to the case of Schiedam – of which only the applicable side will be relevant.

Car accessibility
The main strength of Venice is related to its lack of cars. By removing the car, more space can be made available for other functions. And while in Venice all that space is taken up by tourists, other functions could be added in Schiedam. However, changing people's behaviour in terms of car use will require new qualities to counterbalance the lower mobility due to a lack of cars.

Social spaces
Another strength of Venice is its social spaces. Each resident has two distinct social spaces at their disposal, making them able to choose where they want to go depending on their mood. For example, the courtyard spaces offer green facilities and a more secluded location, while main squares and other public facilities offer more urban and lively spaces.

Streetscape & Microclimate
The streets of Venice are generally narrow, however, due to the lack of cars and regular canals, they feel safe and still quite pleasant. However, the drastic lack of green on the streets still results in an unpleasant microclimate – especially during the summer. In many ways, Schiedam faces the same problem, however, Schiedam has more opportunities to redevelop empty spaces.

Green accessibility & Biodiversity
While green accessibility is pretty good for residents, the same can not be said for visitors. In fact – outside a few parks around the edges of the island – no green facilities are found in the historical centre. This is detrimental to biodiversity, as the scattered courtyards are completely separated from any other natural area, making any form of interaction impossible.

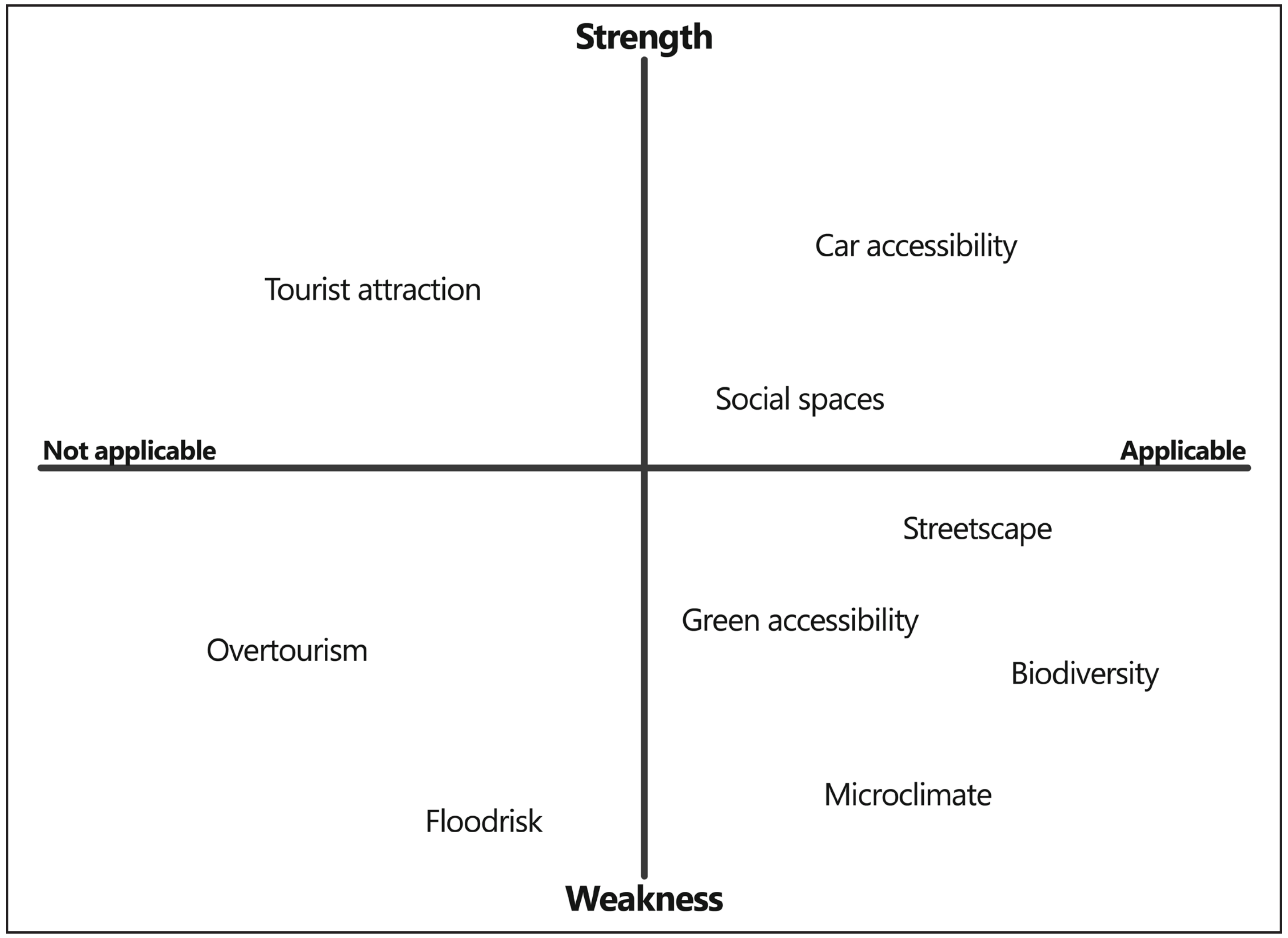


Figure 5.15. Main strengths and weaknesses of Venice in regards to green-related aspects. Made by Author.

5.2 Case studies

Design principles - Distinct social spaces

As said before, one of the main strengths of Venice is its two distinct social spaces. And while many cities have this – including Schiedam to a certain extent – the specific qualities that Venice includes within its social spaces is what makes them successful. In Schiedam, the local social spaces are often small playgrounds, with no more than a swing and one/two pieces of climbing equipment. This results in a very limited target group, meaning children older than 12 and adults do not have a local social space that is attractive to them. In Venice, the local social spaces are more diverse to attract people of all age groups.

For the large-scale facilities, Schiedam offers relatively similar social spaces in terms of its squares. However, it lacks some social spaces where people can also go without needing to spend money. Furthermore, this means that these spaces are again mostly geared towards one target group.

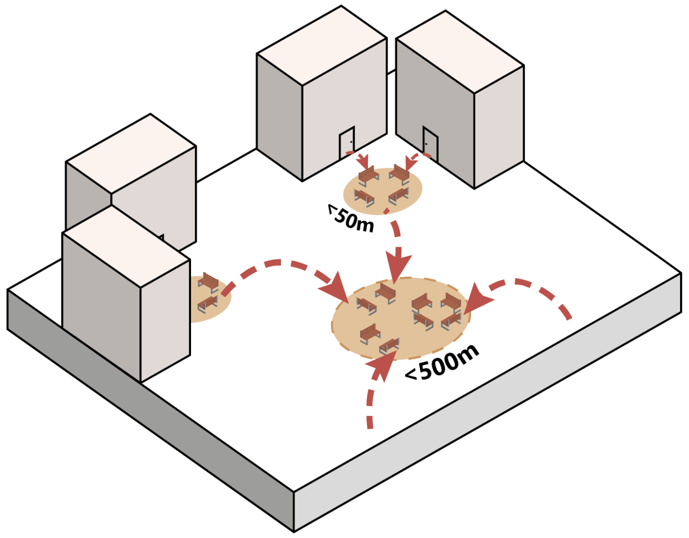


Figure 5.16. Distinct social spaces design principle. Made by Author.

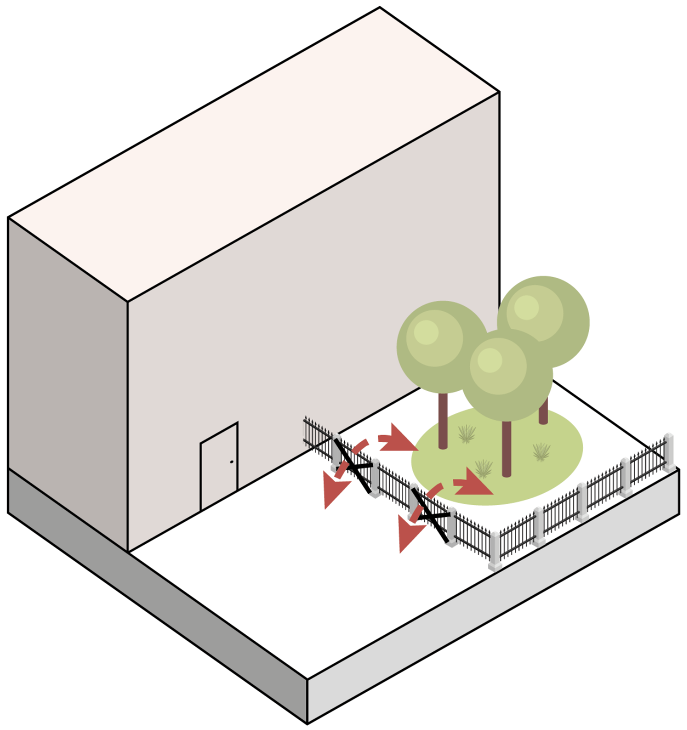


Figure 5.17. Urban green in public domain design principle. Made by Author.

Public vs Private

An aspect that is less positive in the case of Venice is its accessibility to green. While walking through Venice, it seems like it barely has any green facilities, however, most of it is actually within the building blocks. Due to them being inside building blocks, Venice does have very limited green in the public domain. This makes it near impossible for visitors to experience any green quality. Therefore enough urban green should be within the public domain.

Most higher quality green spaces within the inner city of Schiedam (which is already limited) are semi-private. This makes visiting your local green space extra difficult.

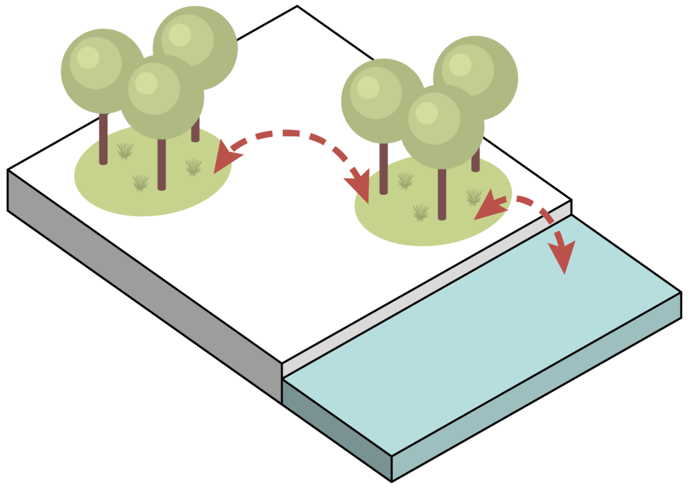


Figure 5.18. Avoid parcellation design principle. Made by Author.

Avoid parcellation

The third design principle focuses on how urban green is distributed throughout Venice. As most of the green is located within the boundaries of a building block, the potentiality of green connections is very limited, which is detrimental to the biodiversity. Parcellation should therefore be prevented where possible.

The inner city of Schiedam currently does not have much of a green network either – some small patches that are often hidden away behind fences.

Close proximity green

Lastly, a quality that Venice does very well is providing every inhabitant with some urban green nearby. People do not always have enough time to visit a larger park or they simply do not want to. By providing some high-quality urban green nearby, residents are encouraged to go outside and interact with (urban) nature.

Schiedam currently has large areas without any closeby green (except for a small row of trees). It is very unlikely for people to just go outside without any purpose, as long as there is almost no space for them to go.

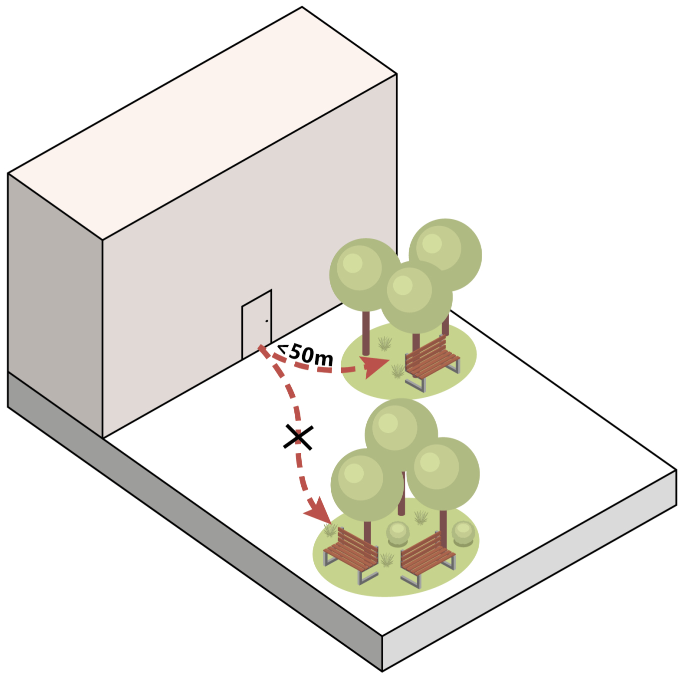


Figure 5.19. Close proximity green design principle. Made by Author.

5.2.2 København (Copenhagen)

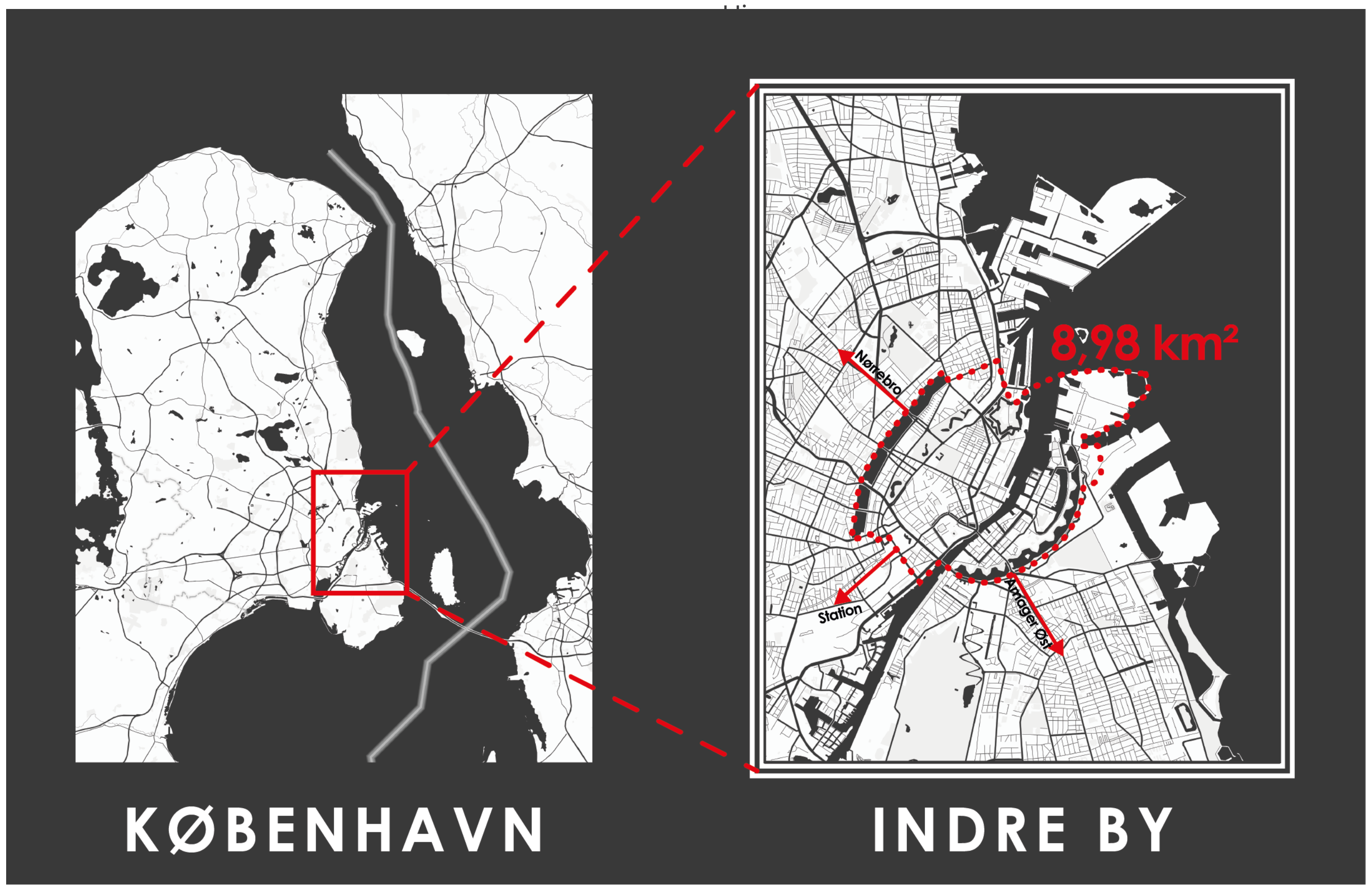


Figure 5.20. Location of Copenhagen, as well as the case study location - the neighbourhood Indre By. Made by Author.

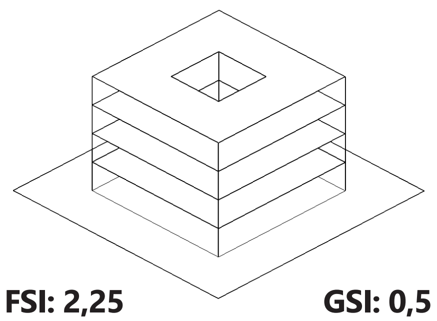
Copenhagen (København) is located on the East Coast of Denmark. It is the capital of Denmark, located next to the Øresund sea – a relatively small sea that separates Denmark and Sweden. For this case study, a central neighbourhood of Copenhagen will be analysed, as it houses the historical centre.

Indre By (which roughly translates to inner city) houses a total of 55.866 inhabitants, spread over an area of just under 9km². This results in a population density within the centre of 6.221 people per square kilometre. This is significantly lower than the 10.012 inhabitants per square kilometre the inner city of Schiedam currently houses. The GSI of Indre By is also lower, as the inner city of Copenhagen has more free ground space. However, the FSI is about the same, because the average building height in Copenhagen is slightly higher.

One important aspect that makes Copenhagen extra interesting is its excellent cycling network. Copenhagen currently has the title of the most bike-friendly city in the world (Copenhagenize Design Co., 2019). Both places two and three are taken by Dutch cities, however, Copenhagen is a good foreign example of how to implement slow-traffic routes within a city to encourage people to take sustainable modes of transport.

55.866 inhabitants

6.221	**Population density (p/km²)**
1,0	**Annual population growth (%)**
52.300	**GDP per capita (€)**
91,0	**Highest elevation (m)**
-	**Dominant economic sector**



FSI: 2,25 **GSI: 0,5**

Figure 5.21. Practical information of Indre By in Copenhagen. Data from: (City Population, n.d.-a).

Green/blue network

Copenhagen is often regarded as the ´Greenest City in Europe´, mainly due to its large amount of urban green spaces. Only in Indre By – a central neighbourhood of Copenhagen – there are already 10 large public parks. These ten parks total up to around 60 ha in size – approximately 7 percent of the total surface area. In comparison, the inner city of Schiedam would total less than 1 percent.

While Indre By contains several large parks, the average streetscape still contains limited green. There always is a larger green facility only a few hundred metres away and as a result, all the attention is focused on that. Direct routes towards each park make them highly accessible, however, this type of urban green is hard to implement in other cases where space is limited.

Indre By also houses a river and some canals. In comparison to Schiedam, the canals are significantly wider and they have a slightly different character. Furthermore, in contrast to Schiedam, people are enticed to visit the water. Cars are parked furthest away from the water, while a pedestrian route is established on the embankment. Furthermore, many different activities are located alongside the water.

European green capital

In 2014, Copenhagen was declared the green capital of Europe (European Commission, n.d.). And while this was already over 7 years ago, Copenhagen is still regarded as one of the greenest cities in Europe. A major contributor to this prize are the highly accessible green parks, however, Copenhagen also uses a lot of roofs for environmental purposes. Roof gardens, -parks, and more have been developed within Copenhagen, making it a green city on multiple levels.

Figure 5.23. Copenhagen as the European green capital (Malhotra, 2021) (European Commission, n.d.).

Figure 5.22. Green/Blue network of Copenhagen. Basemap from Snizek (2016).

Heat-island effect
The effects of the urban heat-island (UHI) effect are relatively mild in Copenhagen. As a large city, it is almost inevitable to be a few degrees hotter than the surrounding rural area, simply due to the large number of buildings and necessary paving. However, as seen in figure 5.24, the amount of dark red is limited. This is mainly due to a large amount of green surface area, however, in most streets, the microclimate can still be suboptimal due to the lack of green in the streetscape.

Floodrisk
As Copenhagen is directly connected to the sea, it faces water-related threats. Currently, however, most of the inner city is prepared for the potential influx of extreme weather conditions. A large number of natural areas and green rooftops relieve the pressure on the sewerage system and store water. Furthermore, as seen in figure 5.25, the city can handle part of the potential water-level rise, but the city does have its limits.

Figure 5.24. Map showing urban heat-island effect in Copenhagen (Dagens Byggeri, 2020).

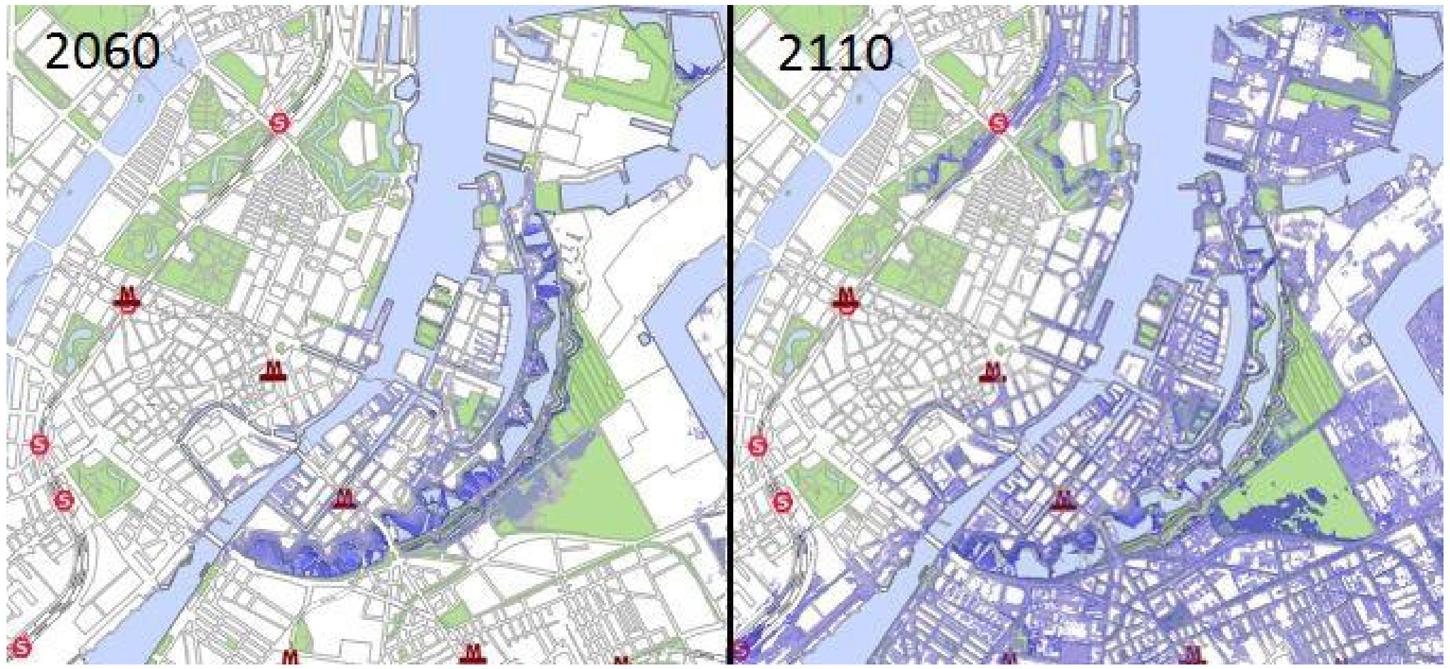


Figure 5.25. Maps showing the potential floodrisk in Indre By (Københavns Kommune, 2015).

Streetscape quality
The typical streets in Copenhagen are very paved, however, there are some streets with a wider profile that facilitate green. As seen in figure 5.26, a small park is located in the middle of the street. Furthermore, this street facilitates safe pedestrian routes with separated sidewalks and pedestrian crossings. However, less than 10 percent of all streets in Indre By have this streetscape.

Instead, most streets look more like figure 5.27. This typical streetscape has little to no vegetation and is very car-dominated. As a result, the pedestrian experience of walking alongside this road will not be that pleasant, even though it is a shopping street. Continuous loud car noises combined with no shade will make the microclimate not ideal.

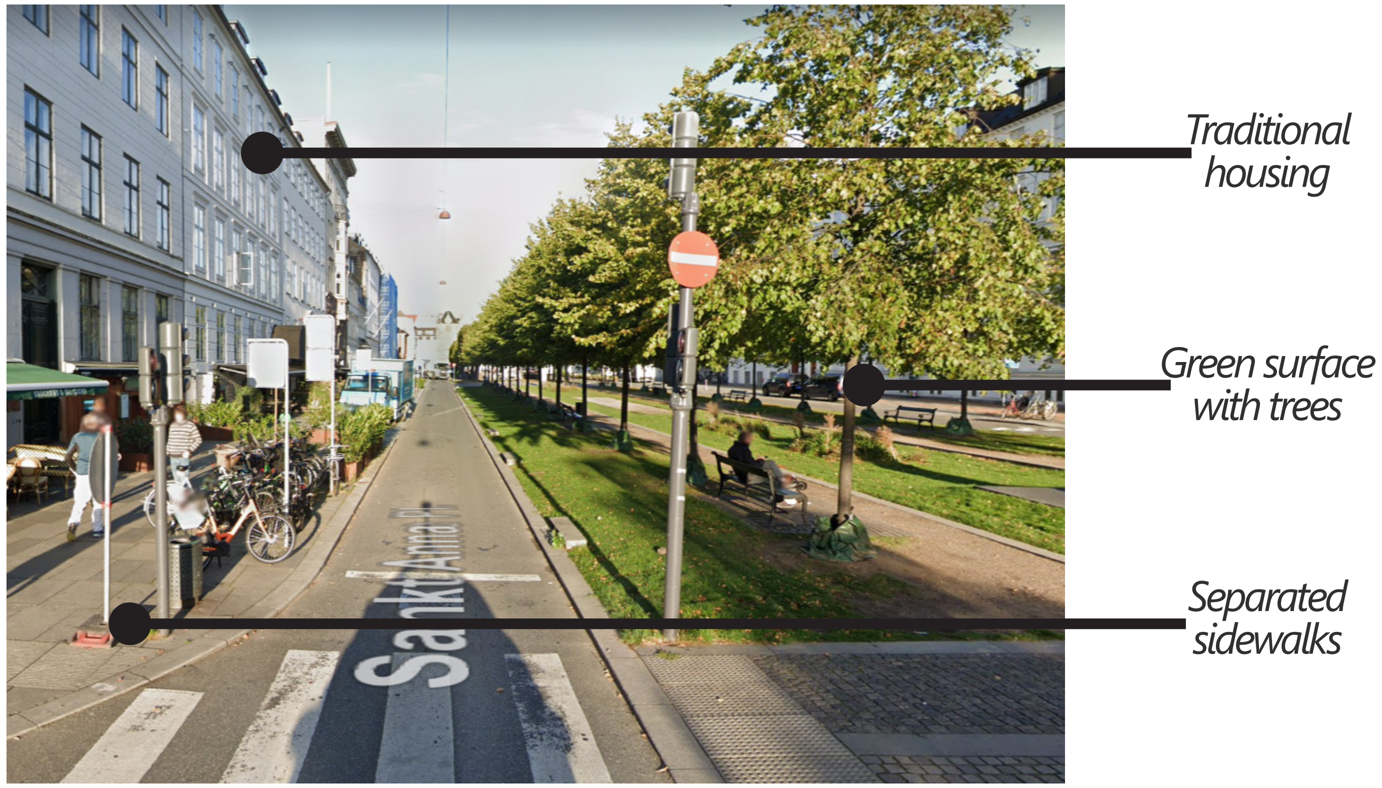


Figure 5.26. Wide streetscape with green in Indre By, Copenhagen (Google maps).

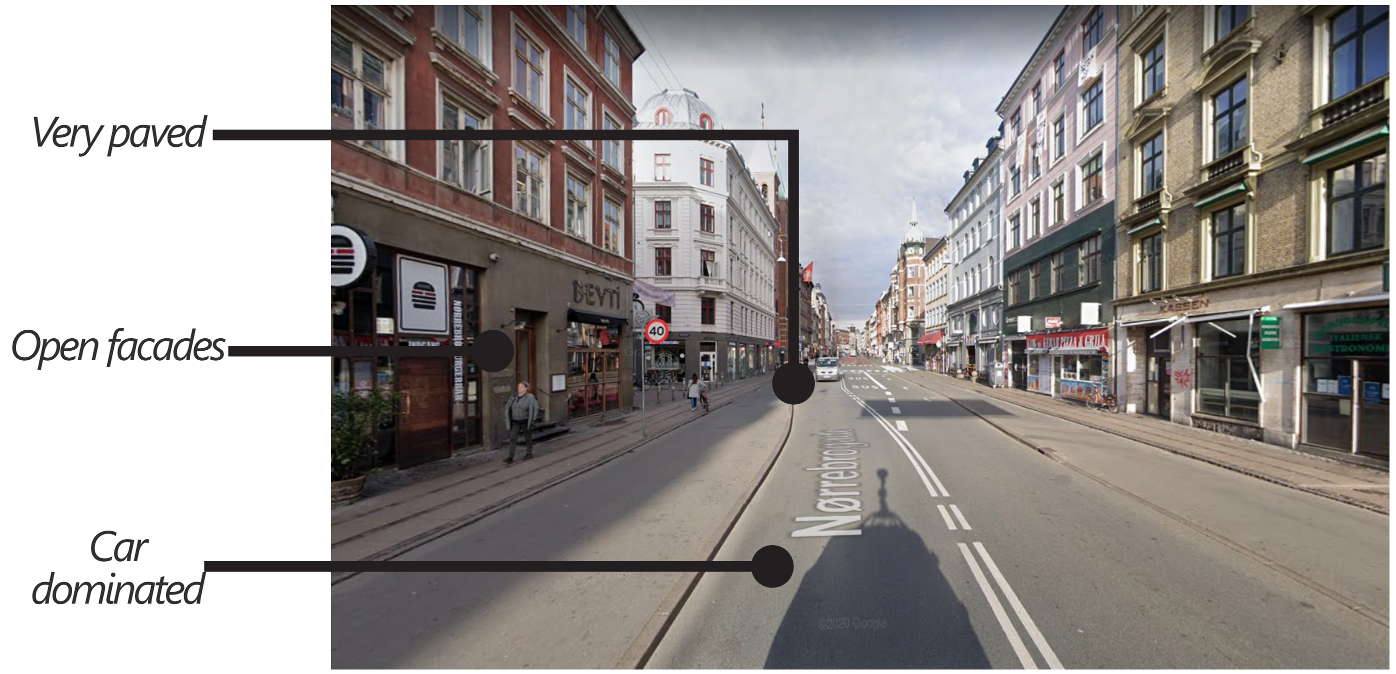


Figure 5.27. Typical streetscape of Indre By in Copenhagen (Google maps).

Strengths/Weaknesses

In figure 5.28, an overview of the main strengths and weaknesses of Copenhagen in green-related aspects is found. A distinction has again been made between aspects that are/are not applicable – of which only the applicable side will be relevant.

Pedestrian-friendly & Safety
One of the main strengths of Copenhagen is its high walkability. Most streets have separated sidewalks and there always is a green park within walking distance. In a way – even though a lot of streetscapes are suboptimal – pedestrians walk through the city from green park to green park, making it less of a problem that the spaces in between are more urban in nature.

Biodiversity
Another strength of Copenhagen is its high biodiversity. Again due to a large number of green parks, where a diverse selection of vegetation can be found. While Copenhagen has no integrated natural network, it does have enough green to still facilitate biodiversity.

Green accessibility & Social spaces
Probably the biggest strength of Copenhagen is its high green accessibility. However, this type of urban green accessibility is not applicable in already built-up areas like Schiedam. The main reason is that most green spaces in Copenhagen are parks, which cannot be integrated into an inner city like Schiedam, without removing entire building blocks. The same can be said about the social spaces, where the parks again play a major role.

Streetscape & Microclimate
While the green accessibility in Copenhagen is high, most streets still lack some quality urban green. Most streets function as connectors of different parks, however, when traveling over these streets, the environmental comfort is pretty low, due to there being no shade, no green, and no barrier from the cars.

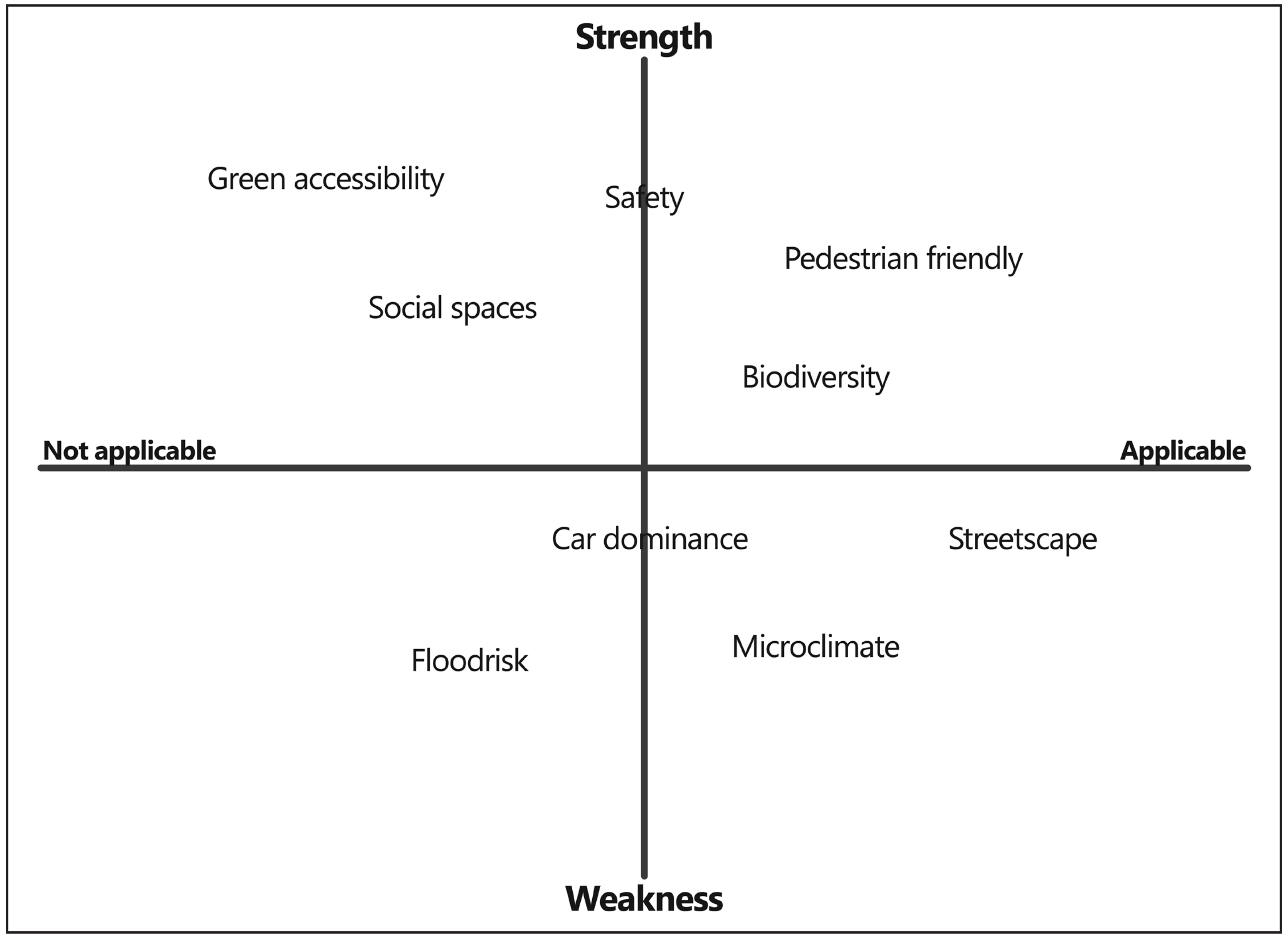


Figure 5.28. Main strengths and weaknesses of Copenhagen in regards to green-related aspects. Made by Author.

Design principles - Direct routing

One of the main strengths of Copenhagen is the way its parks are connected to the rest of the city. By creating direct routes towards each park, the walking distances are minimised. Furthermore, the straight connections create important sightlines toward the parks – making people aware of where they are walking to. This simultaneously decreases the green demand in the streetscapes themselves, as there already is green on the horizon.

In Schiedam, most major routes lead to a similar environment as they are themselves – not a real final purpose. In a way, even though each building is unique, it still feels like they are all quite similar. By adding a few specific 'green landmarks', the experience while traveling through the inner city of Schiedam could already significantly improve.

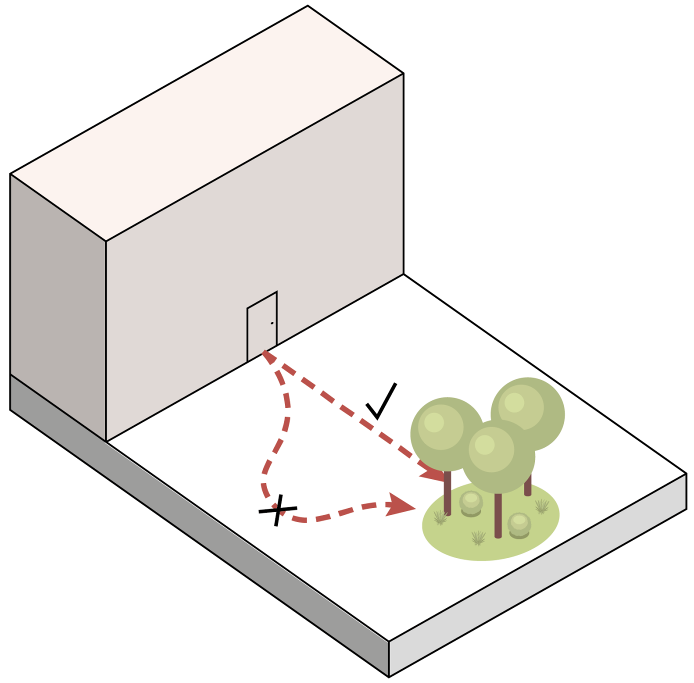


Figure 5.29. Importance of direct routing design principle. Made by Author.

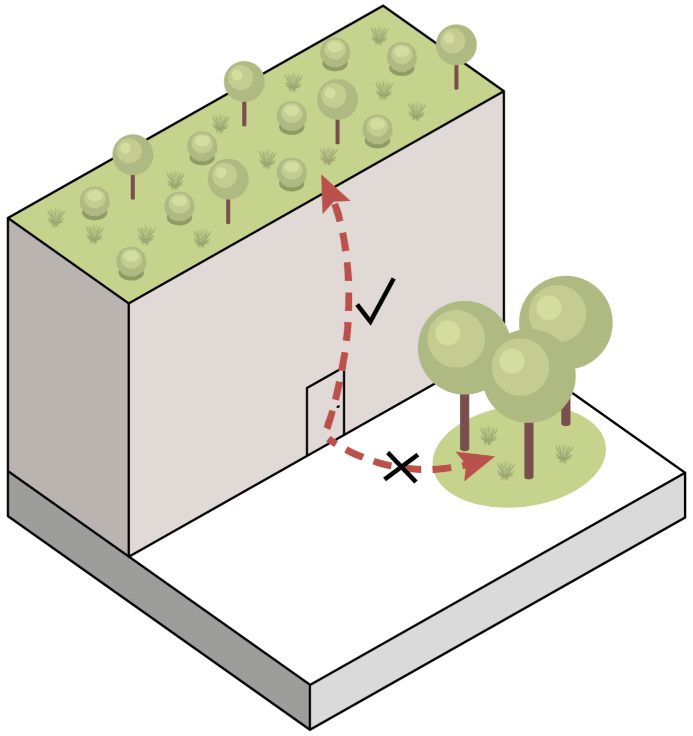


Figure 5.30. Green roofs as urban green extension design principle. Made by Author.

Green roofs

The second strength of Copenhagen is related to its use of roofscapes. While green roofs generally do not add to the pedestrian experience, they do provide major environmental benefits. Furthermore, the green roofs could also house social functions, such as a community garden or a small rooftop park. By having these rooftop spaces in addition to ground floor green space, a wide variety of green facilities are provided.

In Schiedam, no roofs currently house any green features. And while traditional Dutch housing is known for its iconic angled roofs, there are still a lot of buildings within the inner city that could be used as green roofs.

5.2.3 Singapore

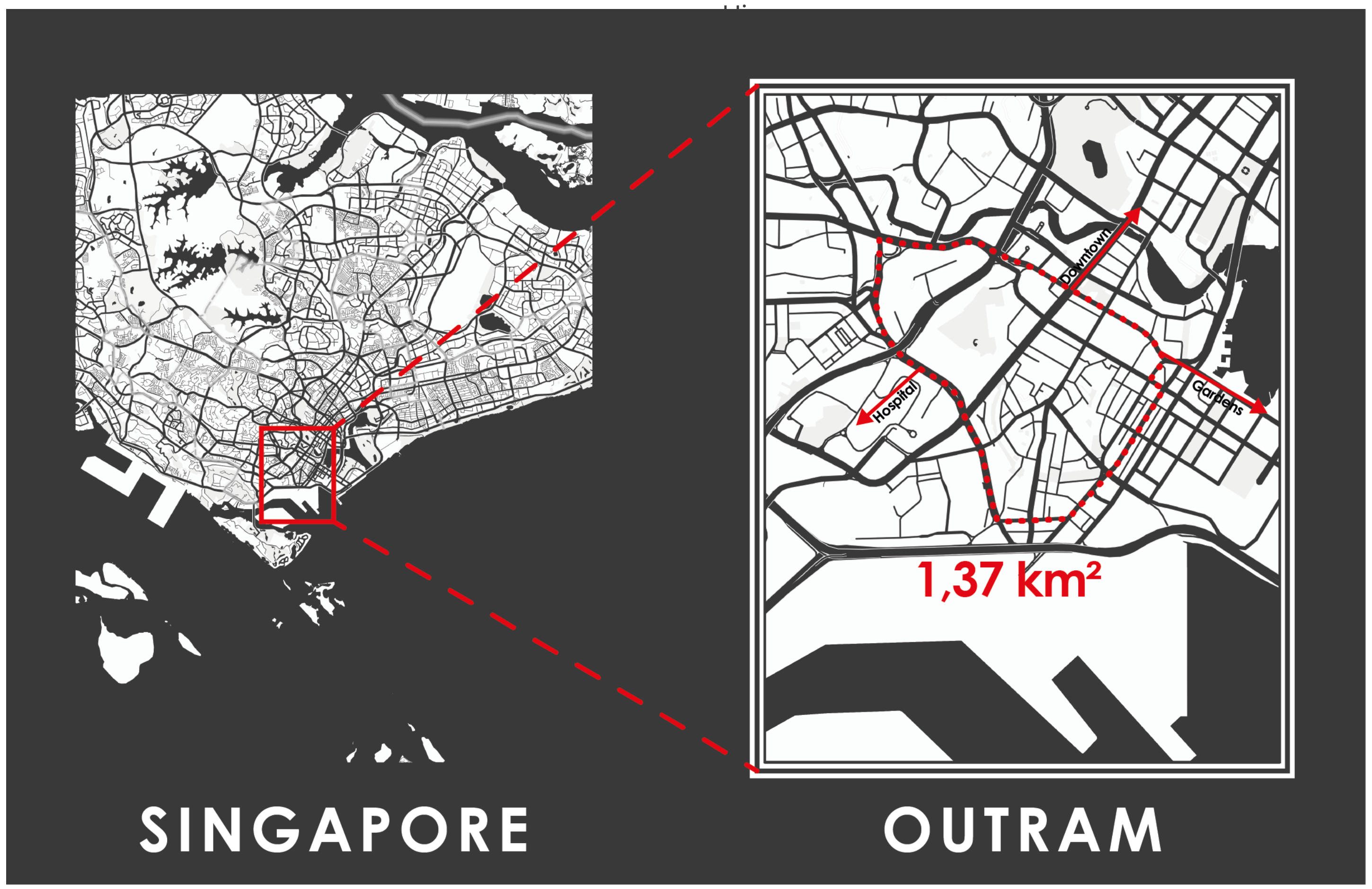


Figure 5.31. Location of Singapore, as well as the case study location - the neighbourhood Outram. Made by Author.

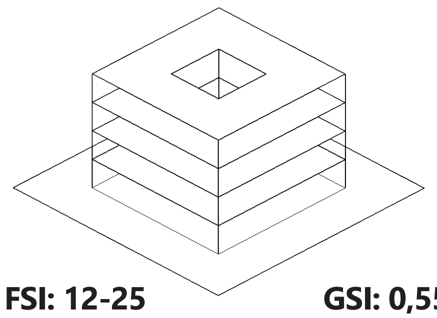
Singapore is a sovereign island city-state located directly South of Malaysia. It borders the South China Sea, which is connected to most Southeast Asian countries. For this case study, a central neighbourhood in Singapore will be analysed, as it best demonstrates how Singapore deals with its urban green issue in a high-density area.

The neighbourhood Outram houses 18.340 inhabitants, spread over an area of around 1.4km². This results in a population density within Outram of 13.358 people per square kilometre. This is already significantly higher than the 10.012 inhabitants per square kilometre the inner city of Schiedam currently houses, however, the difference in building density is a lot more extreme, mainly due to Outram also housing a lot of other functions that do not count towards its resident density, such as offices and municipal buildings. This is best reflected in the FSI, which can go up to 25. The GSI, however, is slightly lower than in Schiedam.

One important aspect that separates Singapore from Schiedam is the immense density Singapore has to deal with. The entire inner city is filled with skyscrapers, making it difficult to create a pleasant microclimate on ground-level. Therefore Singapore is a really interesting case to see how they have dealt with this lack of space.

18.340 inhabitants

13,358	Population density (p/km²)
-3,6	Annual population growth (%)
52.680	GDP per capita (€)
163,6	Highest elevation (m)
Manufacturing	Dominant economic sector



FSI: 12-25 **GSI: 0,55**

Figure 5.32. Practical information of Outram in Singapore. Data from: (City Population, n.d.-b) (Patel, 2013).

Green/blue network

Singapore has the nickname 'City in a Garden', mainly due to how green is integrated into the urban fabric. As seen in figure 5.33, Singapore has one nature reserve in the middle of the island, which is the centre point of its natural system. Furthermore, several green corridors connect the different parts of the island, creating one continuous natural network.

However, Singapore mainly got the title 'City in a Garden' due to the streetscapes. Similar to a garden, almost every street contains a multitude of small green facilities that together form a very green appearance. As such, green is never further than a couple of metres away. Furthermore, the city also contains several larger parks, which are connected by the green streets. In a way, the natural system on the lower scale is very similar to the system seen in figure 5.33 – one or a few larger green areas, connected by natural corridors.

Singapore also houses one river that has natural embankments. In comparison to the Schiedam canals, the river in Singapore has way more room. However, the natural embankments do show how a canal/river through the city can facilitate high-quality green space.

Most green efficient city in the world

Singapore is widely regarded as the most efficient user of urban green within a city. From alongside streets and in small empty spaces, to on top of buildings and inside them, pretty much everywhere you can look you will find green. The government had recognised that due to the high density, more mitigation was needed to still provide a relatively pleasant microclimate at ground level. As a result, the city invests heavily in improving the ground floor conditions to make the city liveable.

Figure 5.34. Singapore as the most efficient urban green city in the world (Nudge Sustainability Hub, 2015).

Figure 5.33. Green/Blue network of Singapore. Made by Author.

Heat-island effect

While the effects of the urban heat-island (UHI) effect are present in Singapore, they are significantly lower than in other locations with a similar density. The average UHI in Singapore is even lower than in Schiedam. This goes to show how the implementation of urban green within each streetscape can – when combined – make a great impact. As seen in figure 5.35, only in a certain area in the middle of the city the UHI effect reaches over 5°C warmer than in a rural area.

Floodrisk

Even though Singapore is located directly next to the South China Sea, the potential flood risk on the island is limited. Partly this is due to the hilly landscape, however, also the efforts of the government pay their dividends here. Again, since almost every streetscape has green space incorporated, Outram is well prepared to deal with a potential influx of extreme weather events. Furthermore, the large amount of green surfaces relieves the pressure on the sewerage system.

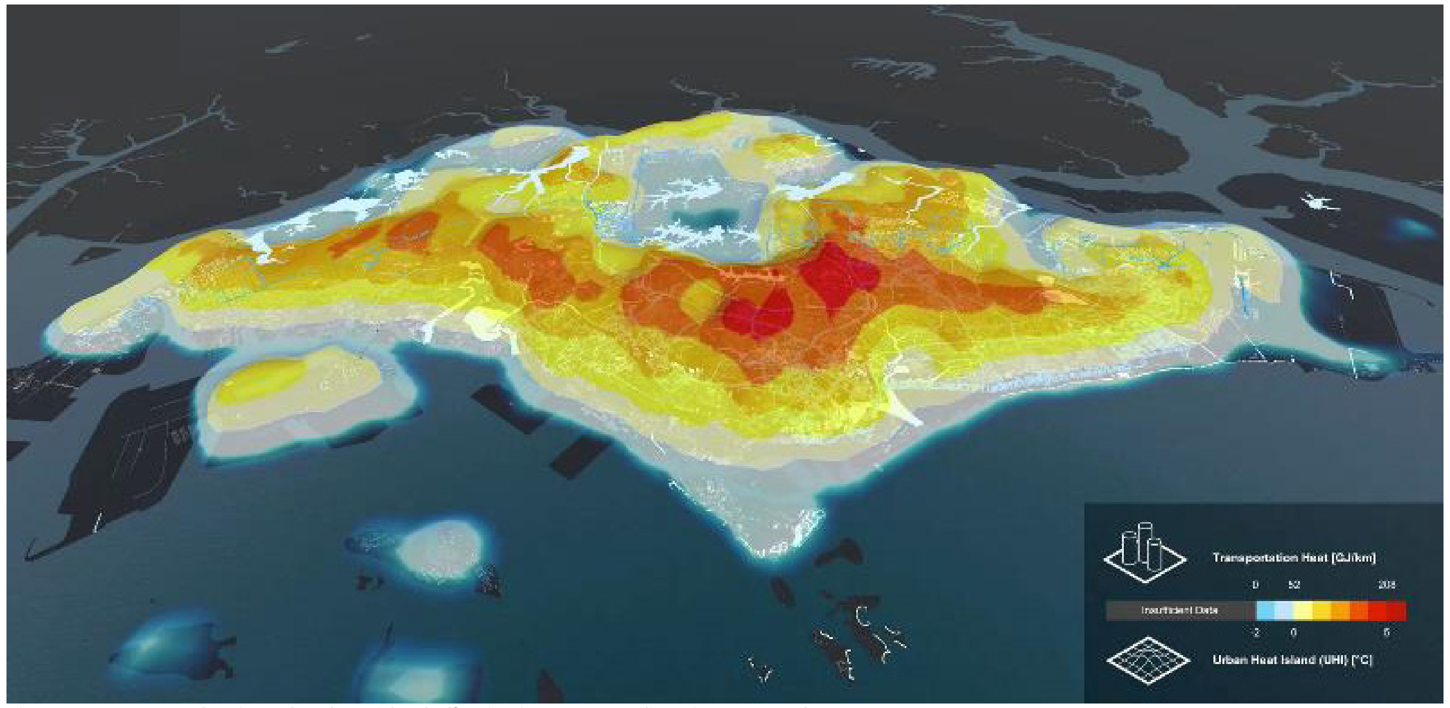


Figure 5.35. 3D map showing urban heat-island effect in Singapore (Cooling Singapore, n.d.).

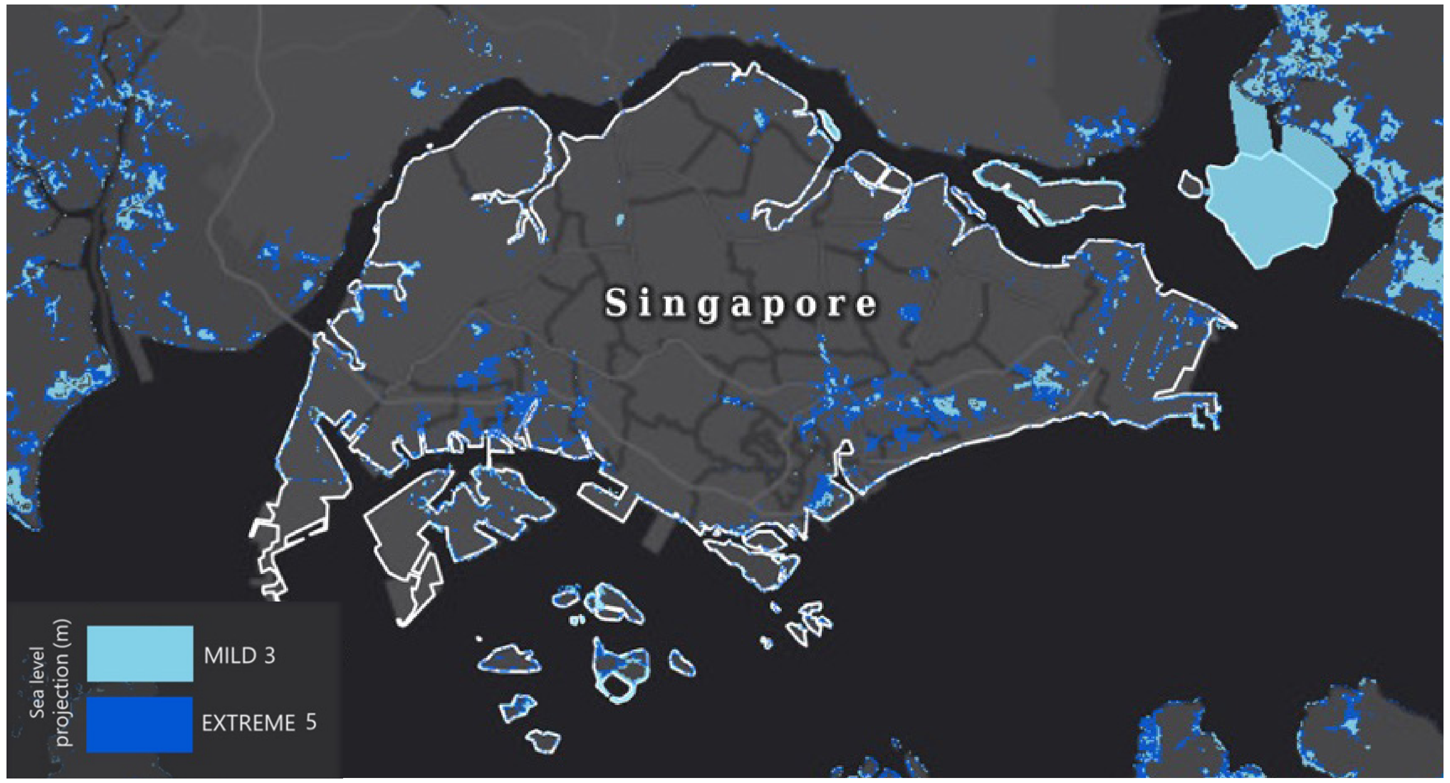


Figure 5.36. Maps showing the potential floodrisk in Singapore (Mulhern, 2020a).

Streetscape quality

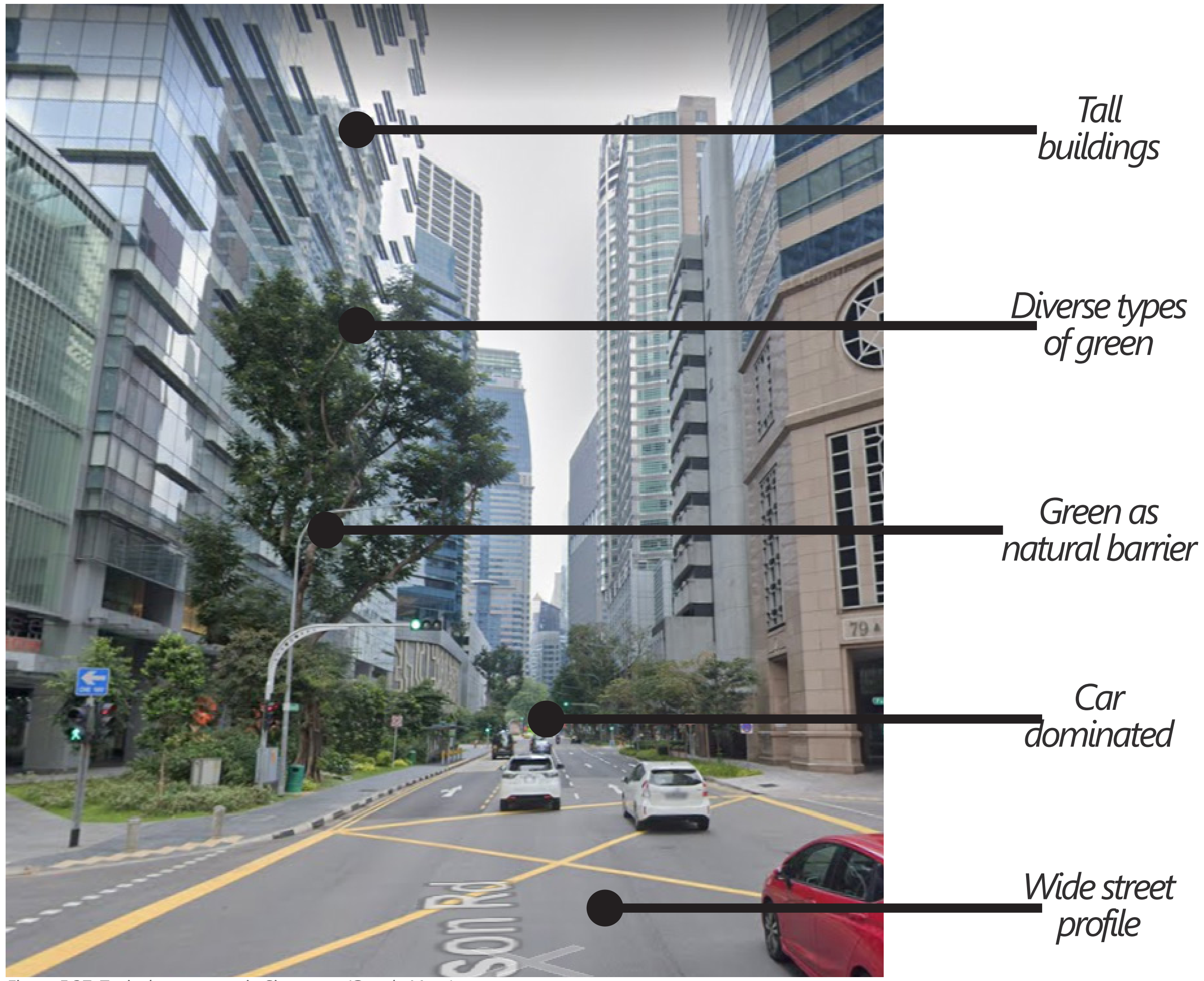


Figure 5.37. Typical streetscape in Singapore (Google Maps).

The typical streetscape in Singapore is relatively wide in nature. As seen in figure 5.37, a large percentage of the street is dominated by cars, however, due to the way urban green is used, pedestrians can still safely walk alongside the buildings. The vegetation often functions as a natural barrier between slow and fast traffic, made possible by the high diversity of green – each having a different height. As a result, a 'wall of green' is created alongside the roads that blocks the view of the cars.

Even in areas where available ground space is limited, Outram still manages to create a green atmosphere, as seen in figure 5.38. Here, the facade is part of the natural system. Furthermore, the focus is on making the green network continuous throughout the streetscapes, instead of only scattered pieces of green when there is room available.

Figure 5.38. Typical green appearance (Google Maps).

Strengths/Weaknesses

In figure 5.39, an overview is made of the main strengths and weaknesses of Singapore in green-related aspects, again with the distinction between applicable/not applicable.

Green accessibility & Biodiversity
The main strength in the situation of Singapore is its large amount of high-quality green facilities. Within Outram, pretty much every street has a strip of green on both sides, which – in combination with the larger parks – results in a very high green accessibility. Furthermore, these green strips create a continuous green network, in which they function like green corridors for biodiversity. Lastly, the green in Singapore generally is very diverse.

Safety & Pedestrian-friendly
Another strength of Singapore is its pedestrian safety. The green often fulfills multiple purposes, where it, for example, also functions as a barrier between slow and fast traffic. However, for this to work effectively, you do need sufficient street width, which in the case of Schiedam will not always be available.

Streetscape & Microclimate
The third green-related strength of Singapore is concerning its streetscape. While the majority of streets are car-dominated, they still are an attractive environment to walk in, mainly due to the large variety of green – each having different dimensions. By combining all types of green, a 'wall of green' is realised that shields pedestrians away from the car. Furthermore, green significantly improves the microclimate.

Housing prices
The main drawback of these green qualities is the effect it has on housing prices. As Outram is a central neighbourhood in Singapore, property prices are already relatively high. However, due to the large amount of high-quality green within the area, these prices have gone up even more.

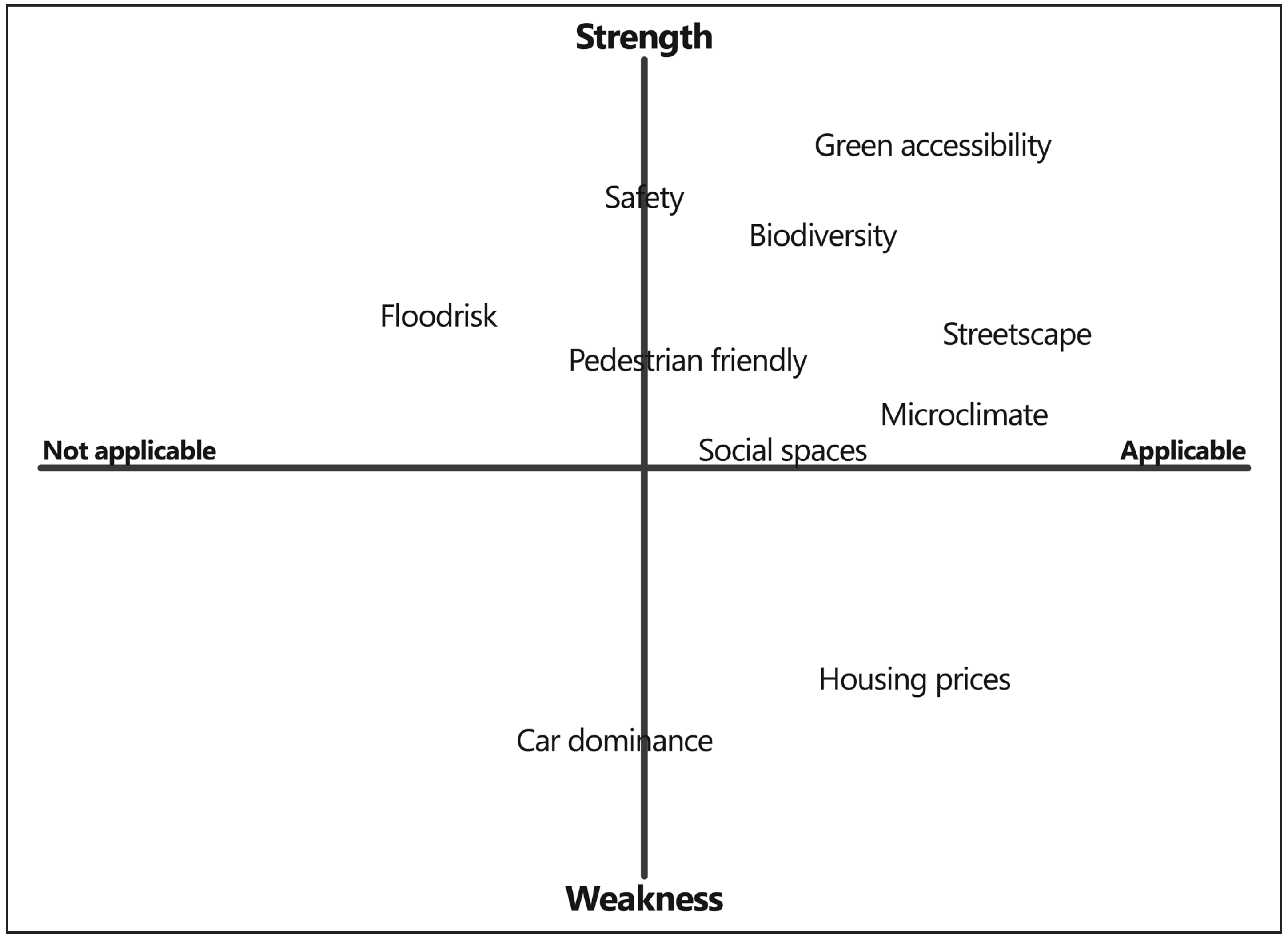


Figure 5.39. Main strengths and weaknesses of Copenhagen in regards to green-related aspects. Made by Author.

Design principles - No empty spaces

One of the main strengths of Singapore is its design philosophy when it comes to urban green. Almost every empty street corner, strip of land, etc. is filled with high-quality urban green. Generally, these urban green patches are not that large in size by themselves, however, by adding them all up, a very green appearance is achieved. It shows that you do not need massive open spaces to implement a lot of urban green.

In Schiedam, the space is even more limited, however, there often is some space available alongside roads, parking spaces, and sidewalks. The one main drawback of this approach – and something that needs to be taken into account – is that adding green everywhere can block sightlines and make a situation chaotic. Therefore each situation should be assessed separately to determine the right density and type of urban green for that location.

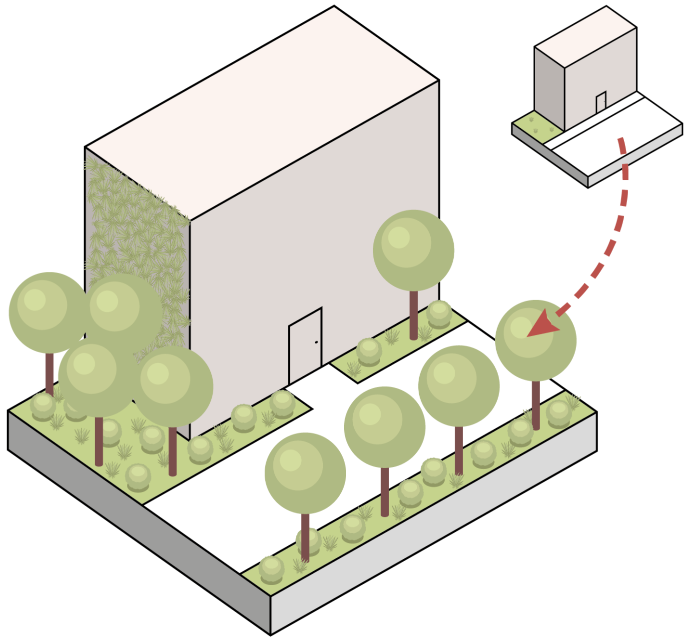


Figure 5.40. Fill up all empty space design principle. Made by Author.

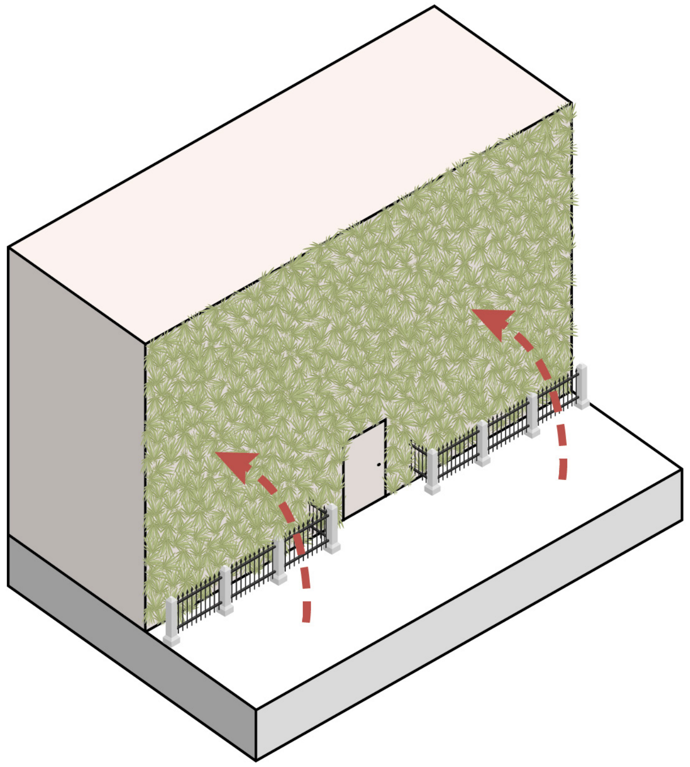


Figure 5.41. Green facades as visual green design principle. Made by Author.

No groundspace, no problem

Even in areas where limited to no ground space is available, Singapore still contains a certain level of green quality. Green facades are very common in Singapore. They add a high level of visual impact, since often entire facades are transformed into a natural surface. However, green facades do lack some of the environmental qualities green surface areas have. As such, green facades should only be prioritised when no other option of adding green is available.

In Schiedam, many streets only have a car lane and very narrow sidewalks. In these situations – without removing the car – (almost) no green can be implemented. Here, green facades could be a solution to still provide some green qualities and improve the microclimate.

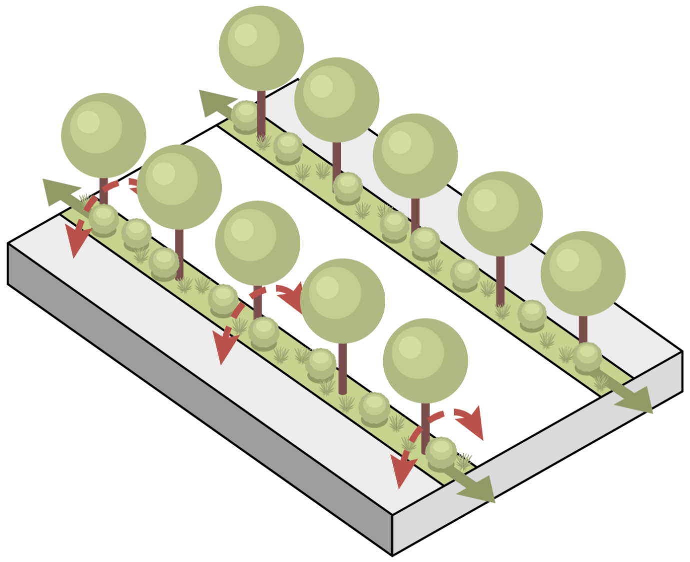


Figure 5.42. Multifunctional green design principle. Made by Author.

Multifunctional green

The third design principle focuses on the way green is implemented in Singapore. Often, the urban green in Outram serves multiple purposes. First of all, it has an environmental purpose, in which it provides cooling and facilitates biodiversity. Furthermore, it often has a safety purpose, shielding pedestrians from the cars (and their noise to a certain extent). Lastly, the green gives people a sense of direction. By adding a green strip – in combination with the buildings – a sightline is created over the sidewalk. In a way, the green facilitates a pedestrian-friendly environment.

In Schiedam, this sense of direction is sometimes seen in the form of a row of trees, however, these lack the some of the environmental and barrier functions. Furthermore, many streets do not have any green facilities. However, this type of urban green does require a certain street width again, so potentially one green strip instead of two might be more space effective.

Variety creates visual impact

Lastly, a quality that Singapore has invested a lot in is facilitating a large variety of green. As seen in figure 5.43, adding different types of urban green with different heights creates a larger visual impact. Especially grass and large trees often do not have that big of a visual impact, simply because they are too far away from eye level. By adding different sizes together, a 'wall of green' can be created that has significantly more visual impact.

In Schiedam, trees and patches of grass are the main two types of urban green that can be found. By adding more variety, not only will the environmental value go up, but also the green appearance. However, again it is important to make sure that sightlines are not blocked and situations do not get chaotic/unclear.

Figure 5.43. Visual impact of urban green design principle. Made by Author.

5.3 Design principles

Overview

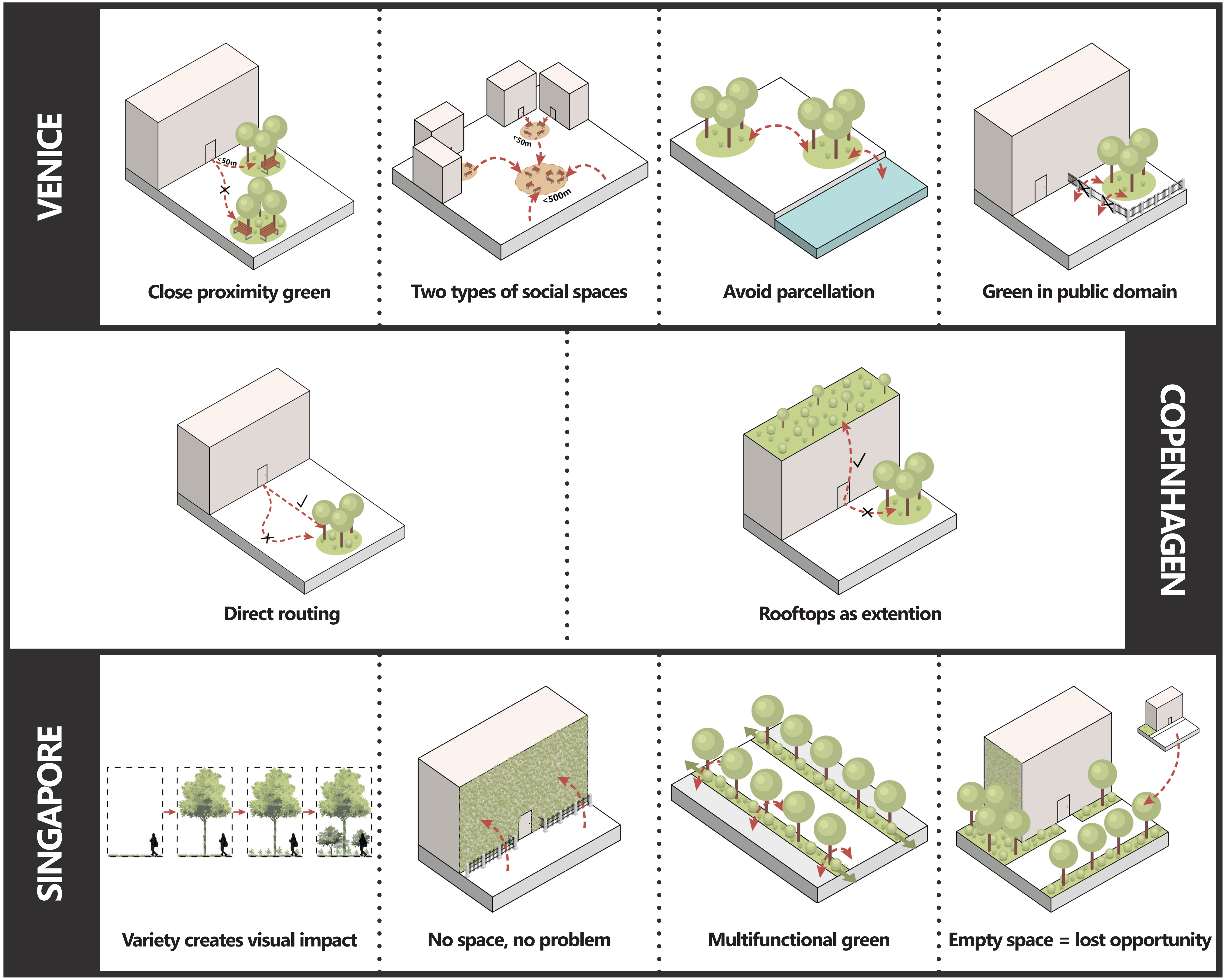


Figure 5.44. Overview of all design principles. Made by Author.

From the three case studies, a total of 10 design principles have been derived. Each principle focuses on a certain aspect concerning urban green.

To illustrate how these design principles could be translated to a real context, the different principles have been implemented onto a map of the inner city of Schiedam. In this, certain design principles have been bundled, as they either have some overlap or create a synergy together. The results of this research can be found in appendix 1.

6 DEVELOPMENT STRATEGY

This chapter will provide an overview of the greening approach, followed by an introduction of the development strategy. By separating the potential design interventions into a few key scales, chapter 6 aims to create a clear understanding of what the interclusive urban green approach entails exactly. Furthermore, a few simulations will be performed to illustrate how the proposed development strategy can be implemented in the real context.

6.1.1 Main components

Combining the conclusions of chapter 4 and the design principles of chapter 5, a clear foundation for the development strategy of the inner city of Schiedam has been realised. Next, it is important to start defining the main components on which the design strategy will be based. The 'interclusive urban green' development strategy will focus on three main domains – the ecological, environmental, and social dimensions. In this, the goal is to use urban green as the main resource for developers to tackle the different concerns found in chapter 4.

As seen in figure 6.1, the goal is to create a better living environment for all species – so not only humans. Furthermore, the goal is to create an inner city that is resilient and capable to deal with potential future stresses and concerns. Lastly, as space is very limited, the focus should be on building on the existing qualities and improve underperforming areas, rather than trying only adding new functions/qualities.

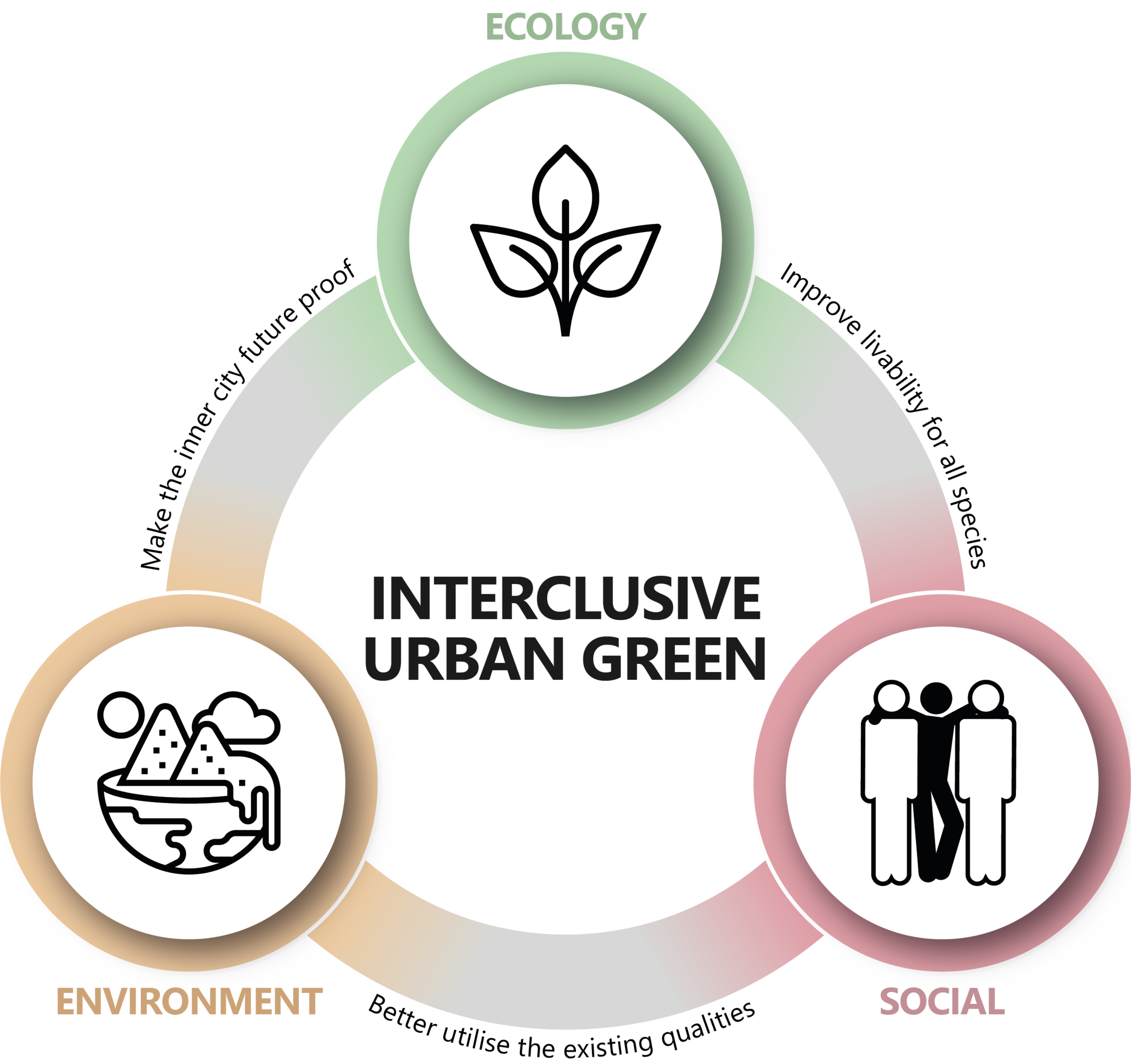


Figure 6.1. Diagram containing main components of interclusive urban green approach. Made by Author.

6.1.2 Scales

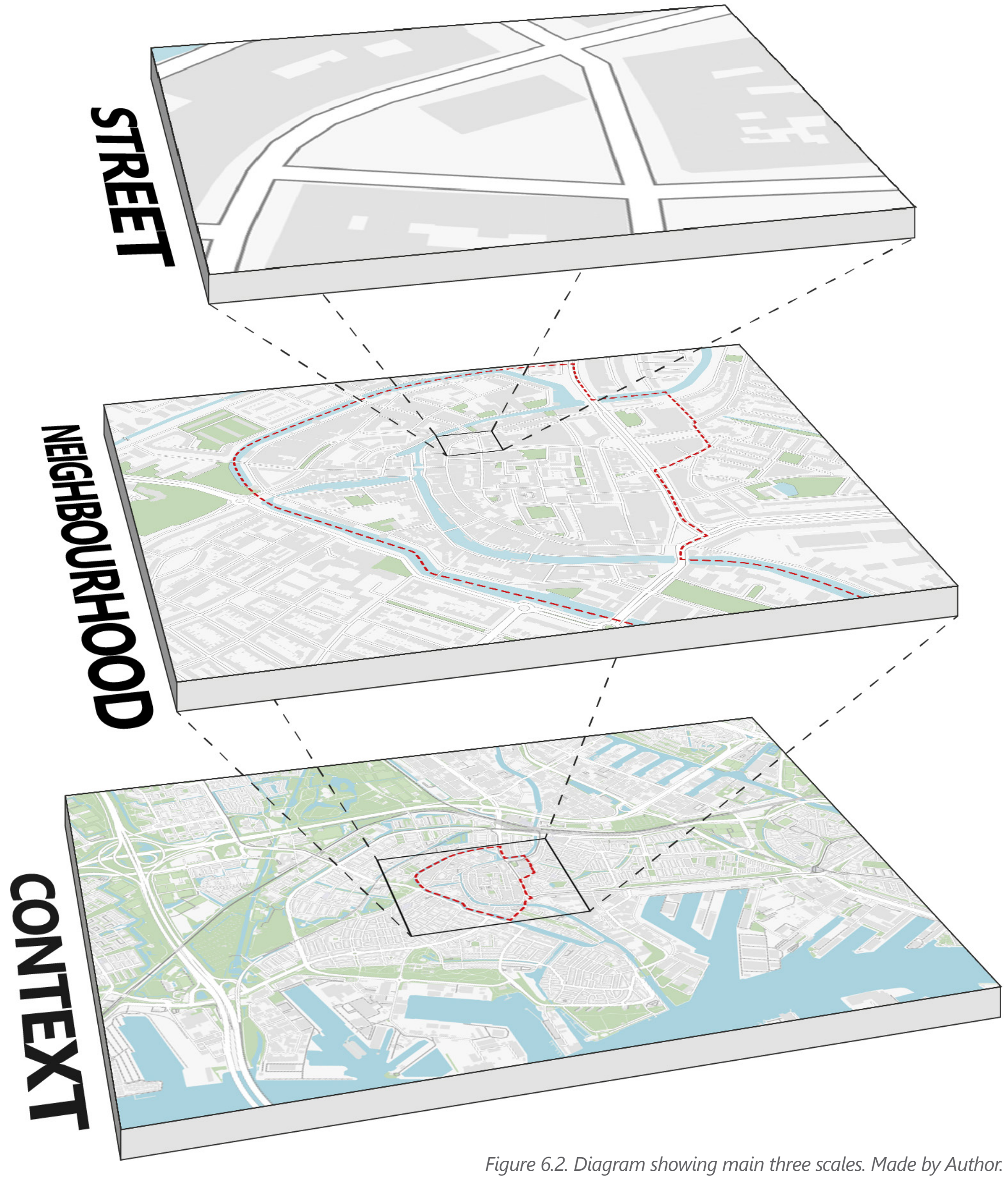


Figure 6.2. Diagram showing main three scales. Made by Author.

To effectively tackle a dense, complex area like the inner city of Schiedam, three main scales have been selected. Each scale tells a completely different story. Ultimately, those stories must come together again, however, to bring down the complexity, each scale will first be developed separately.

The context scale is significantly larger than the project area – reaching Rotterdam and Vlaardingen. This scale will focus on the connections between the inner city and its surroundings.

The neighbourhood scale is roughly the scale of the inner city. Here, the focus will be on spatial networks and the distribution of different interventions as a result of the analysis.

Lastly, there is the street scale. On this scale, the focus will be on how different interventions land in space. Furthermore, improving the quality of the different streetscapes found within the inner city is an important component here.

6.1 Greening approach

6.1.3 Network of interventions

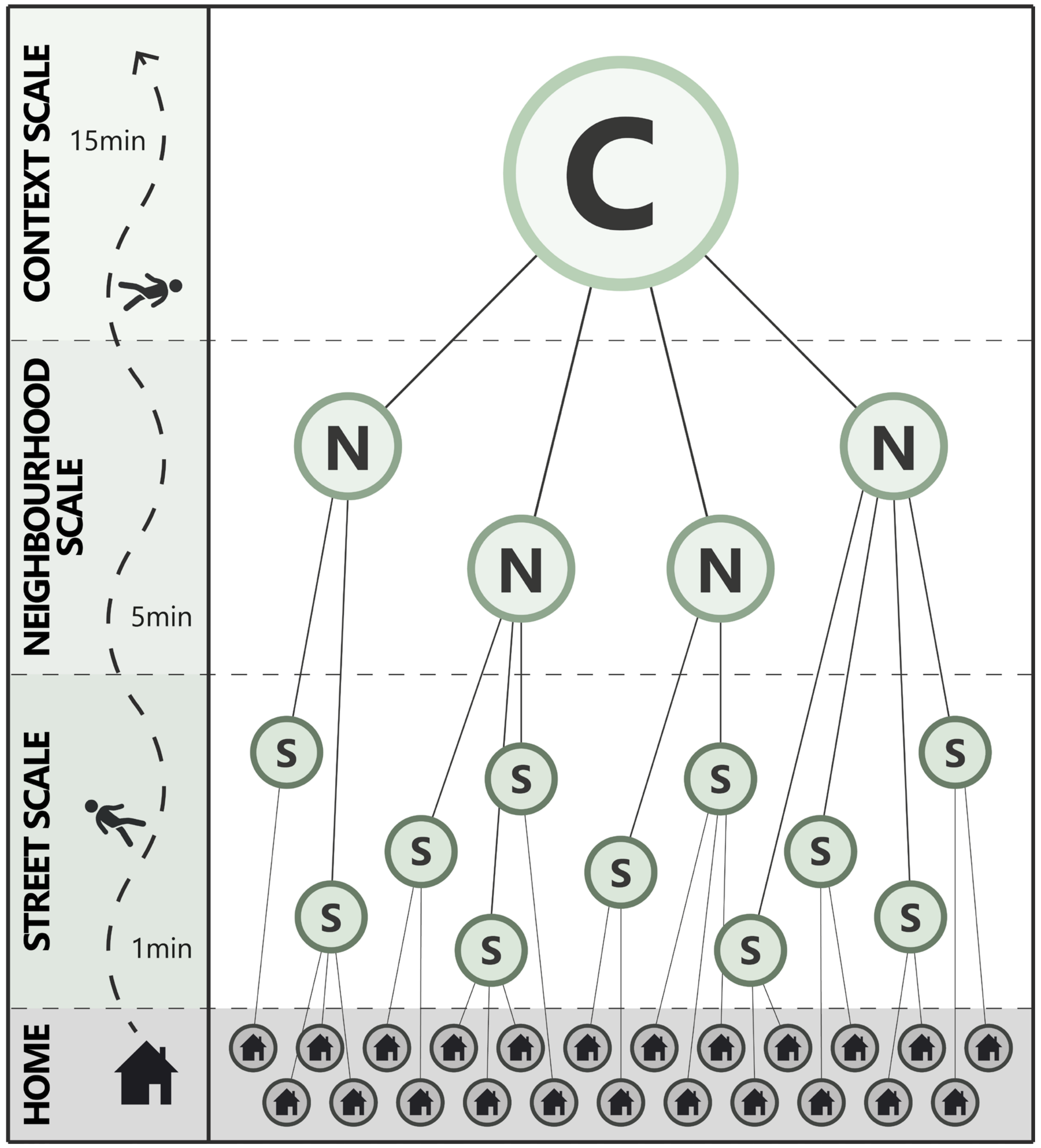


Figure 6.3. Diagram showing concept of the network of interventions. Made by Author.

The interventions on the different scales can be seen as being in a network. Starting at the bottom, the interventions will mostly be realised on the lower scales. These types of interventions will target a specific street or other local scale element and will generally be the least drastic/radical. Furthermore, their impact will be – in most cases – limited to the location and its direct surroundings.

Following this, the interventions on the neighbourhood scale will generally have a wider-reaching influence, but also be more drastic/radical. The idea here is that those small street-scale interventions are the connections between the people and the larger interventions. Lastly, the amount of context scale interventions will be very limited, as these will be very drastic/radical in nature.

The walking distances – indicated on the left of figure 6.3 – are mostly to give an order of magnitude to the interventions. The following few pages will go more in-depth into the multiscalar concepts of each main domain.

6.2 Main concepts

6.2.1 Ecological concept

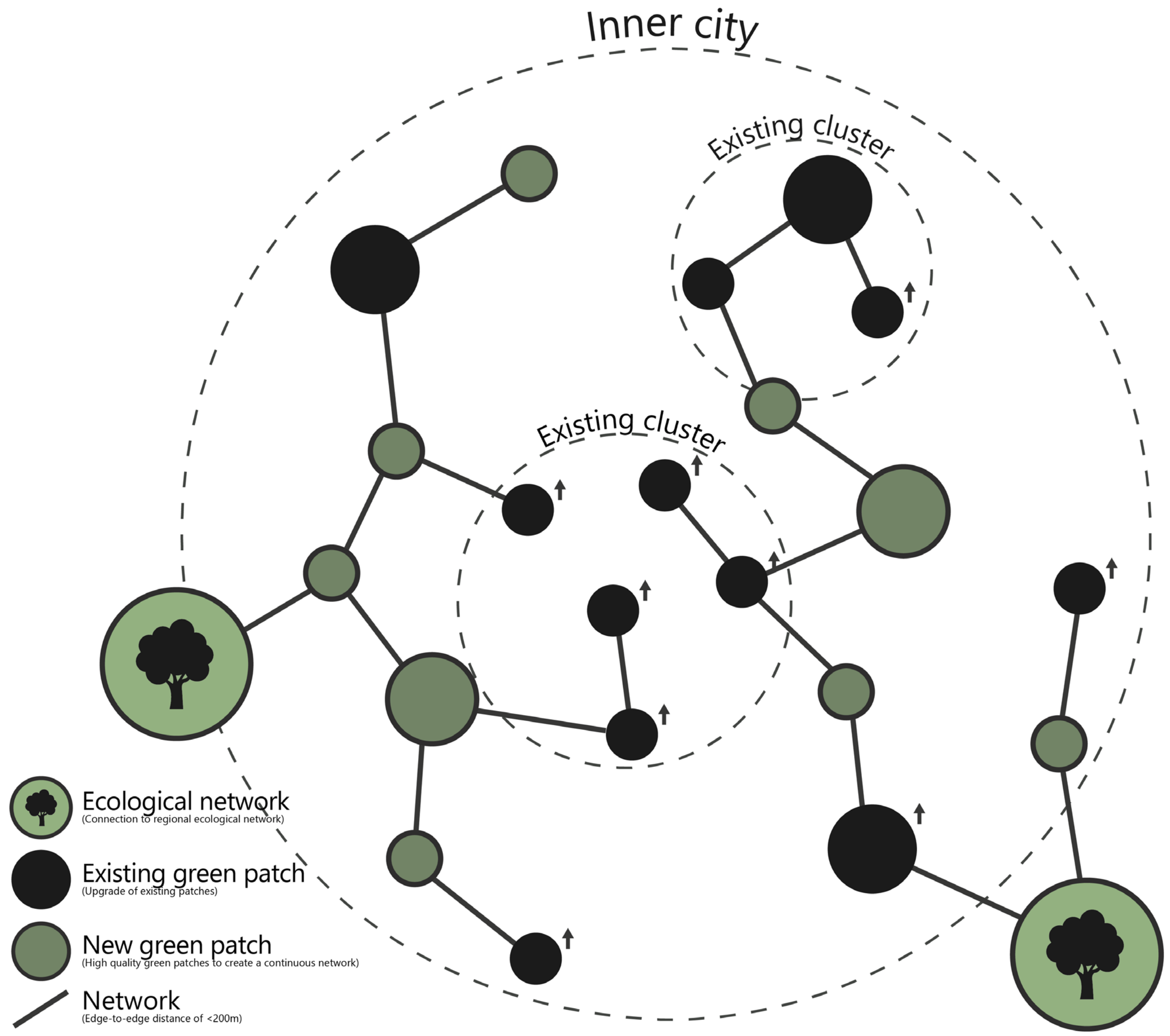


Figure 6.4. Main ecological concept. Made by Author.

The first main concept is related to improving the ecological condition of the inner city. Figure 6.4 shows an abstract vision of what the future ecological network of the inner city of Schiedam could/should look like. The main idea is that every green patch will be connected to the regional green network.

As was found in chapter 4.2.2, most green patches are currently disconnected – either by obstructions or simply by being too far apart. Therefore, new green patches should be added to connect these patches and create a continuous ecological network. As was also explained in chapter 4.2.2, the corridors between patches can be a maximum edge-to-edge length of 200m, so that most bird species can easily navigate from patch to patch. However, not every patch has to be interconnected in a circle – every patch should at least have one connection to the regional network.

Important to note is that a number of existing patches will have to be upgraded by the mains of diversifying and/or densifying the amount of vegetation. Otherwise, the patch will still not have the facilities to house a higher level of biodiversity. Furthermore, all potential new patches – including those that do not specifically focus on ecology – will have to be connected to this network.

6.2.2 Environmental concept

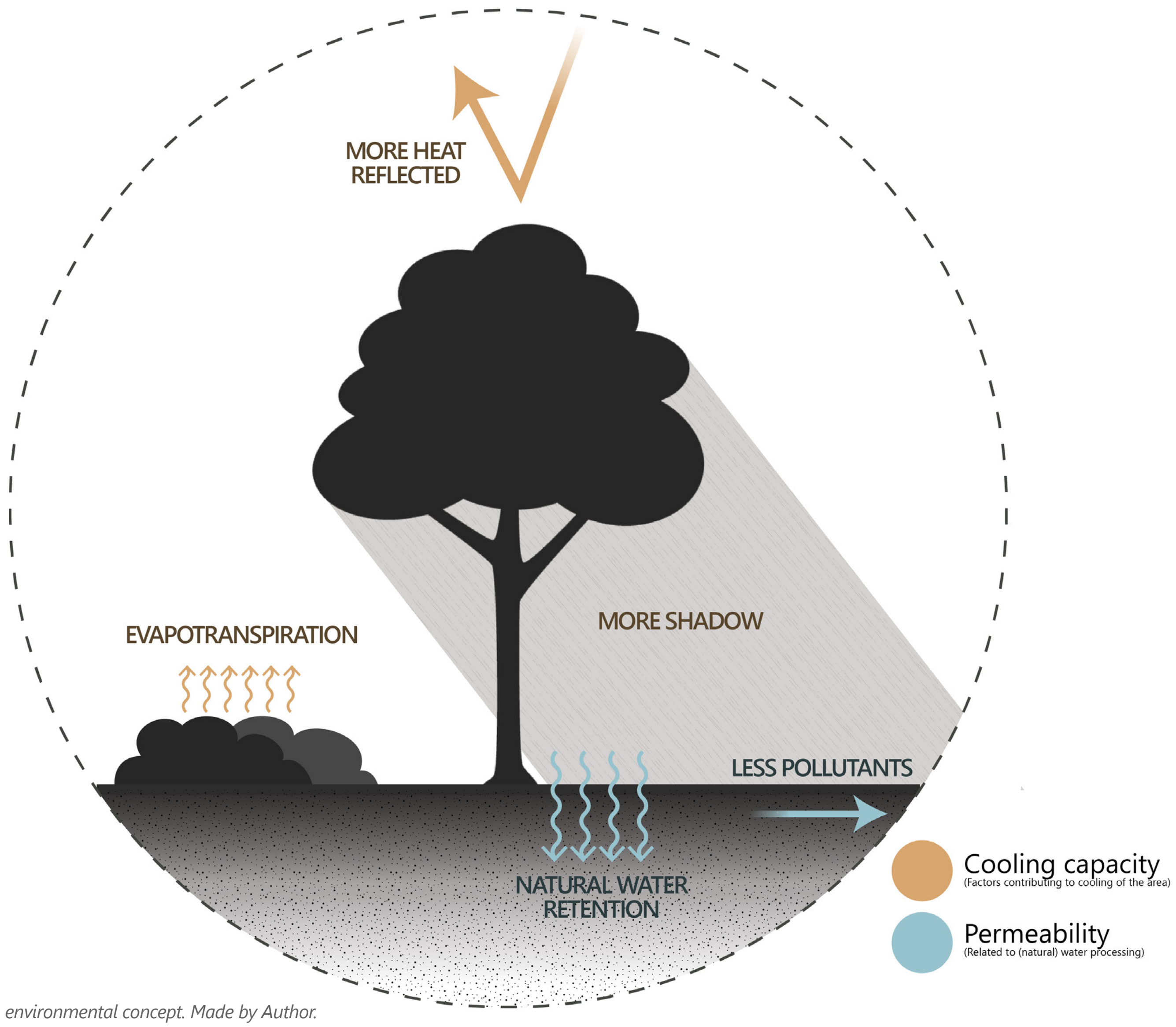


Figure 6.5. Main environmental concept. Made by Author.

The second main concept is about the environmental condition of the inner city. As seen in figure 6.5, this is more of a diagram than a network, mainly because interventions to improve the environmental condition are relatively 'flexible' – meaning it does not have to be realised on a certain scale or network.

The two main components that help to mitigate most environmental concerns within the inner city of Schiedam – through the lens of public space design and not of emissions, energy consumption, etc. – are the cooling capacity and permeability.

As was found in chapters 4.3.1 and 4.3.2, the current microclimate within the inner city is generally (very) bad. One of the main causes is that the area has limited capacity to cool itself down due to the lack of vegetation. Here, the goal is to increase the amount of vegetation, which will (mostly) be done on the street and neighbourhood scale.

In terms of water management, chapter 4.3.3 concluded that large areas of the inner city are incapable to deal with extreme weather events, with one of the main causes being the drastic lack of permeable surfaces and natural water retention that slows some of the water down. Improving the permeability will again mostly happen on the street and neighbourhood scale.

Both of these goals can be combined with either the ecological or social green concept, which was meant with the statement of it being 'flexible' at the beginning.

6.2.3 Social concept

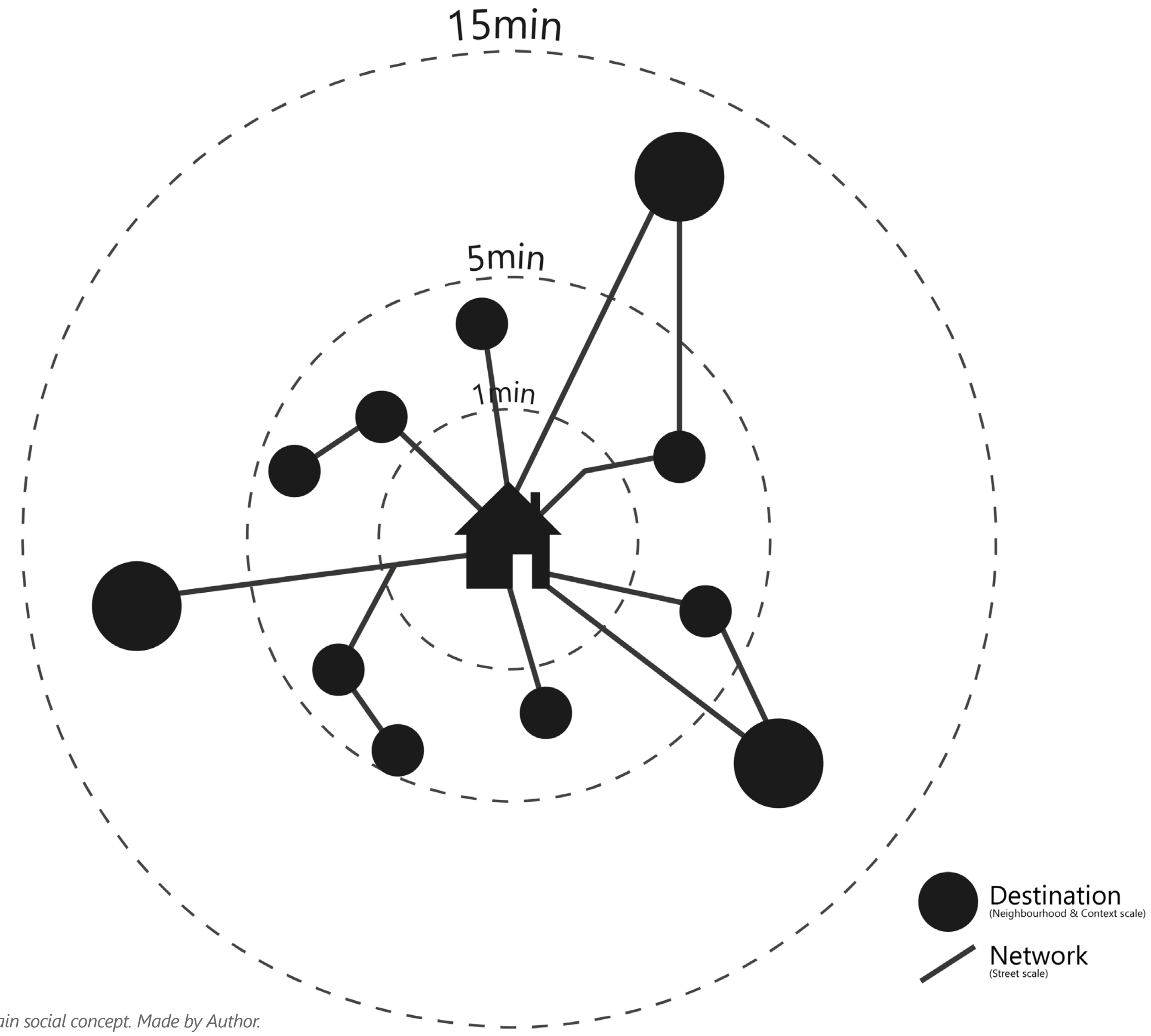


Figure 6.6. Main social concept. Made by Author.

The third main concept focuses on improving the social condition of the inner city. Figure 6.6 shows an abstract view of what the future could look like in terms of the social dimension. The social concept focuses on the experience of both inhabitants and visitors of the inner city. As was found in chapters 4.4.3 and 4.4.4, the current social spaces are often quite monofunctional and economically driven. As a result, people have very limited social spaces available if they want to go outside without spending money.

The social network aims to provide different types of social spaces at varying distances from people's houses. The street scale is the first component, serving as the connection between the people's dwellings and a destination – meaning a social space. However, each street must also be able to safely and comfortably provide this, which is not always the case.

The neighbourhood scale focuses on the smaller social spaces for people that have, for example, half an hour lunch break and quickly want to go outside. However, it is important that these spaces are still inviting, safe and comfortable for people to visit.

Lastly, the context scale contains the large parks present around the inner city. It will not be the main scale of the interventions, as adding large parks in a dense urban environment is not feasible.

The goal is to improve the ease of access and provide smaller social spaces for people that do not have the time (or energy) to visit the large parks – minimising the barrier for people to go outside.

6.3 Context scale

6.3.1 Interscalar relations

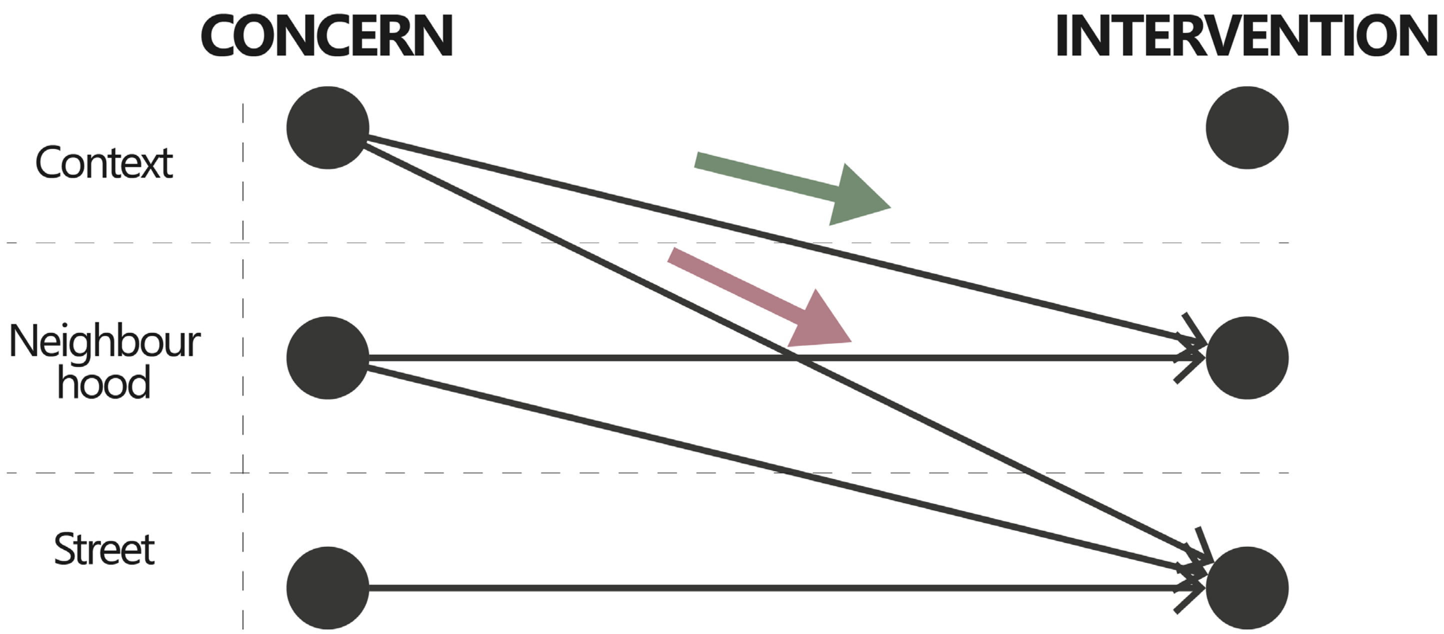


Figure 6.7. Relationship between the different scales. Made by Author.

As stated before, the development strategy will consist of three main scales. However, before delving into each scale, their interscalar relations should first be clarified.

For a development strategy of an existing densely built-up area, interventions on the context scale are not feasible without demolishing an entire part of the inner city.

Concerns found on a specific scale are generally only addressed on the same or a lower scale, because – for example – something that happens on a certain street cannot be directly addressed by an intervention on the neighbourhood scale. Important to note, however, is that this does not mean an intervention on a higher scale cannot influence lower scales.

As a result, the context scale can only shine a light on certain issues, while it has to be addressed on the lower scales. To further elaborate on what this means, two examples of interscalar relations will be explained.

The first focuses on an ecological context scale concern that will be addressed on the neighbourhood scale, while the second focuses on a social context scale concern that will be addressed on the street scale.

6.3 Context scale

6.3.2 Ecological concern

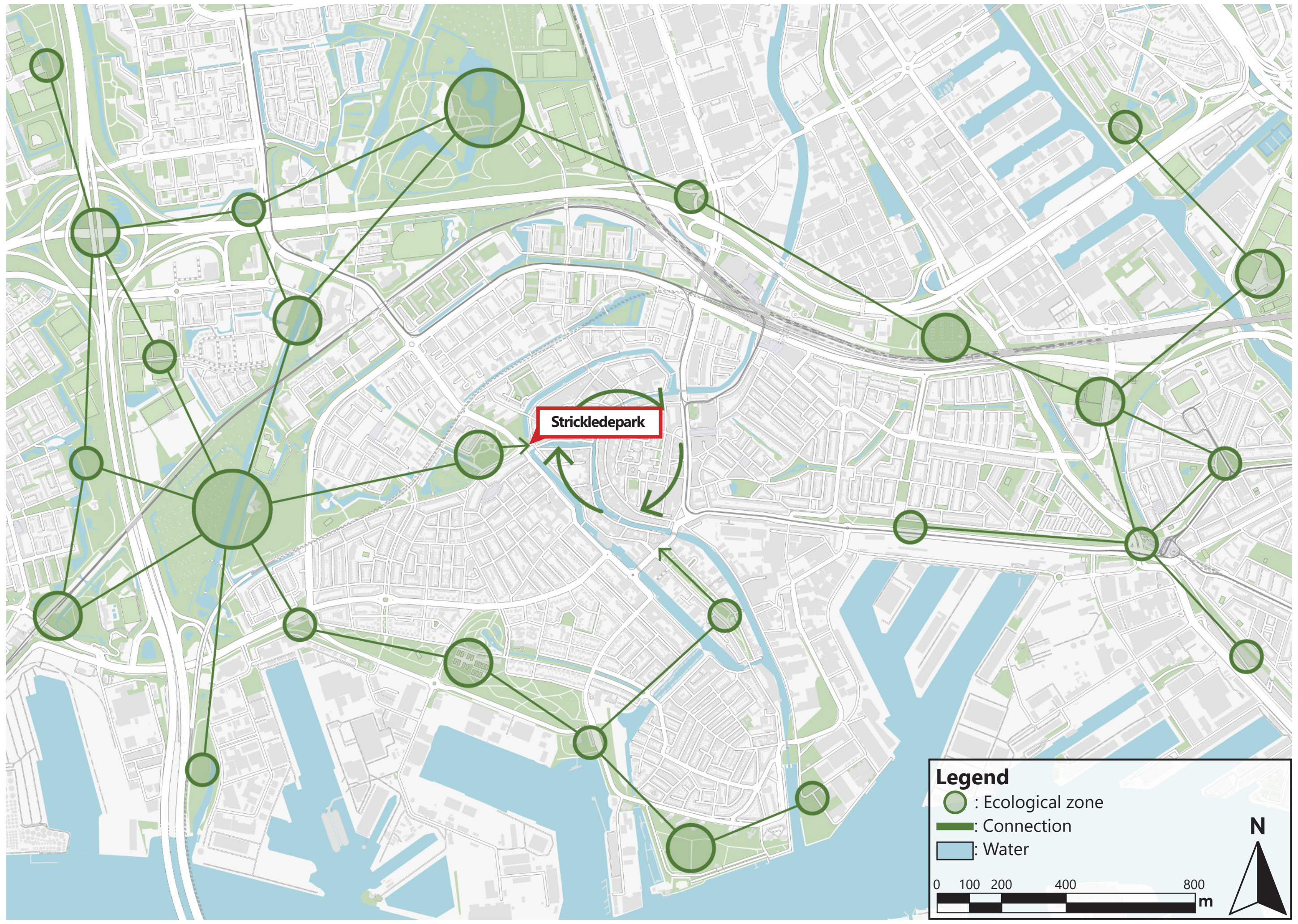


Figure 6.8. Main ecological structure of Schiedam and its direct surroundings. Made by Author.

As said before, the first example will focus on an ecological context scale concern that will be addressed on the neighbourhood scale. Figure 6.8 shows the regional ecological network, first shown in chapter 4.2.1. It highlights the issue that the inner city currently functions as a barrier, in which two ecological corridors stop just outside the inner city.

One of these corridors stops at the Stricklede park – a park just west of the inner city. However, on this scale, it is not clear how a solution can be found.

6.3 Context scale

Inner city as an ecological barrier

Figure 6.9. Ecological network with disconnect at inner city edge. Made by Author.

Figure 6.9 better illustrates the issue found on the context scale. The white arrows indicate multiple unobstructed corridors of less than 200 metres that connect the different green patches. However, this stops near the end of the inner city, due to the distance to the next green patch becomes too large and/or buildings that obstruct the connection.

The solution lies in creating a network of smaller green patches, as suggested in the ecological concept explained in chapter 6.2.1. This can be done on the neighbourhood scale, as an effective configuration of green patches within the neighbourhood needs to be realised to create this connected network.

A simulation that focuses on the neighbourhood scale green patch distribution and provides a possible solution to this issue can be found in chapter 6.4.4.

6.3.3 Social concern

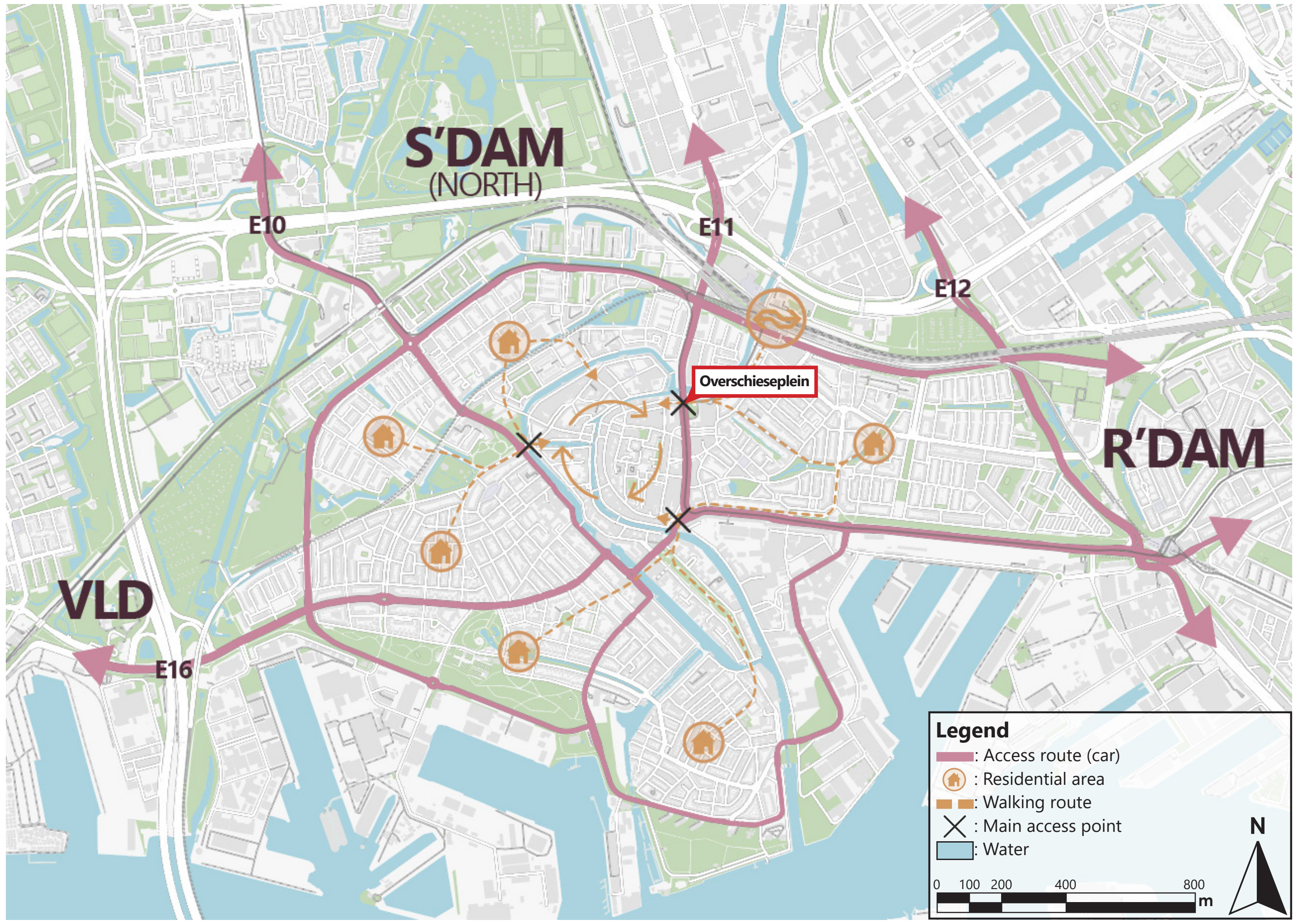


Figure 6.10. Main accessibility network of Schiedam and its direct surroundings, in relation to the inner city. Made by Author.

The second example focuses on a social context scale concern that will be addressed on the street scale. Figure 6.10 shows the social accessibility network, first shown in chapter 4.4.2. One of the main conclusions here was that most fast and slow traffic both use the same three main entrances to get into the inner city.

One of these entrances is at the Overschieseplein. It connects both the central station of Schiedam and the neighbourhoods of Schiedam-Oost to the inner city. An high ease of access is very important for people to visit more often (Kerishnan & Maruthaveeran, 2021). However, similar to the first example, it is not yet visible whether this is the case or not from just the context.

Access route from station

Figure 6.11. Eye-level view with main characteristics of route from Schiedam central station towards the inner city (Google Maps).

To assess this, the route from the central station to the main hospitality square within the inner city – Grote Markt – will be analysed. Starting from the central station, the route follows the water edge. It has a high ease of access, as it is a safe route, separated from fast traffic. Furthermore, there are some natural elements, a wide sidewalk, and an unobstructed view.

It is important to note that these conditions are not feasible everywhere, simply due to the large width and open nature of this streetscape. However, this is also not required to facilitate a safe and pleasant pedestrian environment.

6.3 Context scale

Access route inside inner city

However, directly after crossing the Overschieseplein, the conditions are completely different. Figure 6.12 shows an eye-level view from the area while entering the inner city. This car-dominated, completely paved street will generally feel uncomfortable and less safe, as pedestrians seem to be pushed to the side onto a narrow sidewalk.

The route continues straight ahead, where you enter a relatively narrow street where the conditions are even worse. Development alternatives to improve this streetscape will be provided in chapter 6.3.3.

Both examples aim to show the interscalar concept, in which some concerns can only be addressed on another scale. However, it is still important to analyse every scale, because certain issues will only be visible on those scales.

Figure 6.12. Eye-level view with main characteristics of route directly after entering the inner city (Google Maps).

6.4 Neighbourhood scale

6.4.1 Pocket park

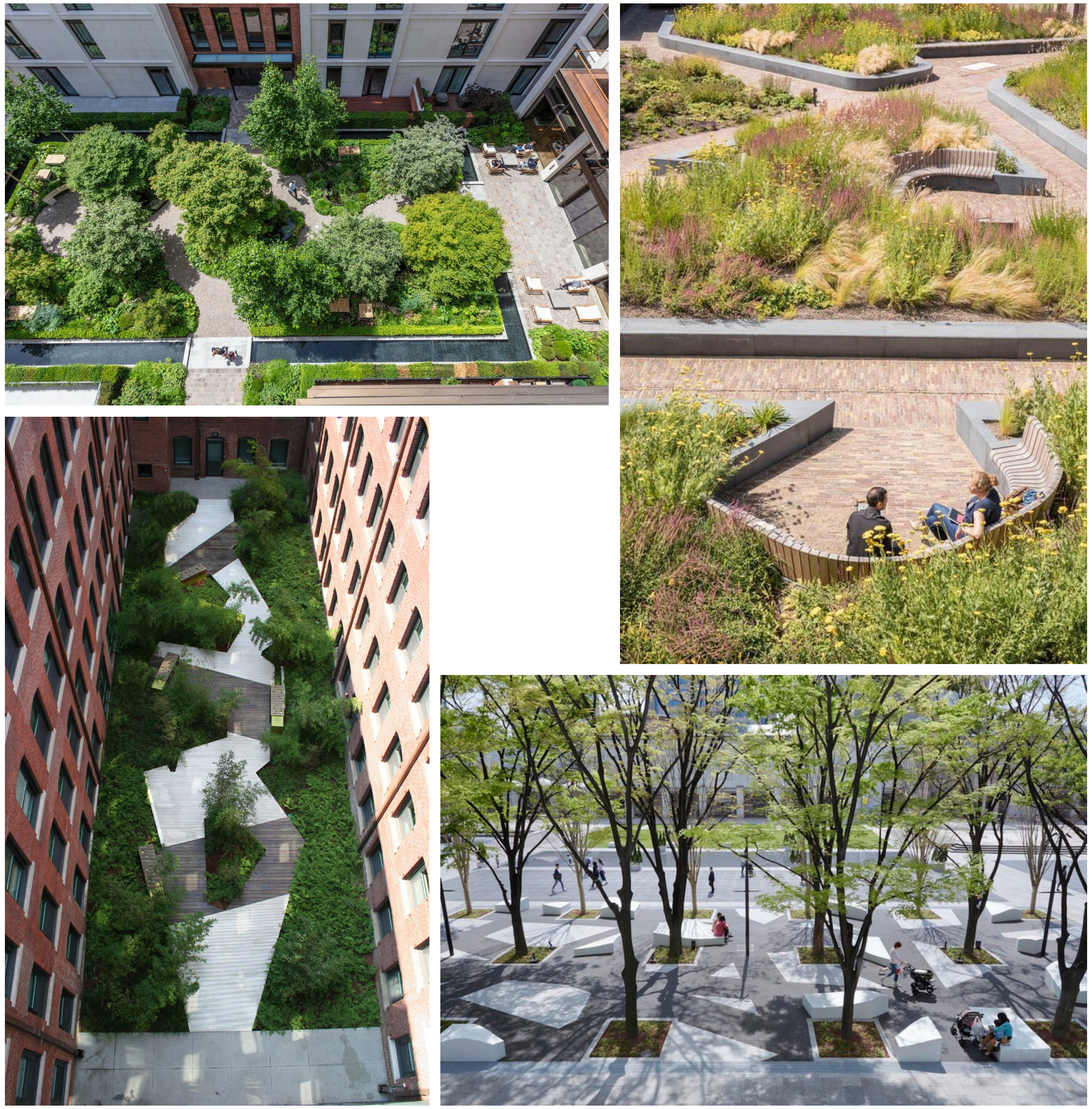


Figure 6.13. Collage of different types of pocket parks (Gillespies, n.d.; Mecanoo Architecten, n.d.; Okumura, n.d.; Landworks Studio, 2006)

The main tool used on the neighbourhood scale is a type of urban green space called a 'pocket park'. Pocket parks can be defined as public urban green spaces on a very small scale (Kerishnan & Maruthaveeran, 2021). Especially in areas where space is limited – such as the inner city of Schiedam – these types of urban green spaces can be very beneficial.

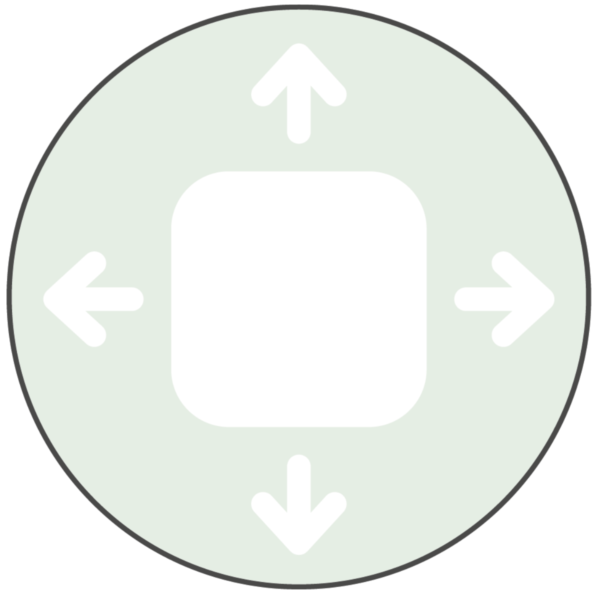
As pocket parks generally have a (semi-)high concentration of green surfaces and vegetation, they will positively influence all three main domains.

A synthesis article by Kerishnan & Maruthaveeran (2021) – containing the results of 83 articles related to pocket parks/small urban green spaces – concluded that ''pocket parks are highly potential to promote mental well-being, social benefits as well as physical health''. Furthermore, it promotes exercise.

The following pages will go into more detail regarding the specific characteristics of a successful pocket park, as well as the exact functions and qualities pocket parks can fulfill and provide.

6.4 Neighbourhood scale

Conditions for success



Sufficient size
The first important component for a pocket park to succeed is the size. As stated by Kerishnan & Maruthaveeran (2021), the size of a pocket park is ''usually only a few house lots in size or smaller''. As a result, the minimal size of a pocket park has been estimated to be around 80-100m². However, park design also plays a major role in this. Nordh et al. (2009) state that perceived park size can significantly differ from the actual park size.

A commonly found size for a pocket park is around 200m², with the largest size still falling under the title of the pocket park being around 4000m² (Ministry of Housing, Communities & Local Government, 2019), however, this maximum size will not be viable here. Lastly, different types of pocket parks require (slightly) different sizes, with social activities having more need for space than individual activities (Nordh & Østby, 2013).

Importance of nature
Secondly, the addition of nature and vegetation is essential. As stated by Kerishnan & Maruthaveeran (2021), a greener and more natural setting is generally perceived as more attractive. In this, Nordh et al. (2009) state that trees, bushes, lower ground vegetation (and grass), and water features are generally most preferred and most beneficial.

A high level of nature can positively influence people's physical health and mental well-being, as well as their psychological comfortability (Kerishnan & Maruthaveeran, 2021). Furthermore, Kerishnan & Maruthaveeran (2021) state that nature can significantly reduce the urban heat-island effect and significantly improve the ecological condition in the area – even with the park only being a small size.

Park facilities
The third influential component is related to the park facilities. Good (and enough) seating, as well as sufficient maintenance of these seating facilities, are crucial factors of success for pocket parks (Nordh & Ørstrum, 2013). Additionally, providing a certain level of the (natural) enclosure is important, as it can affect people's ability to relax and temporarily leave their busy life behind them (Nordh & Ørstrum, 2013).

Next, the integration of man-made elements with green facilities is essential in creating a pleasant atmosphere (Kerishnan & Maruthaveeran, 2021). Lastly, places for semi-stationary forms of exercise are advised, as it can stimulate people to exercise more (Kerishnan & Maruthaveeran, 2021).

6.4 Neighbourhood scale

Accessibility
Accessibility is one of the most important aspects for people deciding whether they will visit or not (Kerishnan & Maruthaveeran, 2021). For the walking distance, a max. distance of 5 minutes has been established. This distance ensures that people – even on a half-hour lunch break – can visit and do not have to leave straight after. For this, a walking speed of 3,96km/h has been selected (Mevius & Kievits, 2010), as this is the speed the elderly walk in – a frequent user of these types of parks (Kerishnan & Maruthaveeran, 2021). Furthermore, longer walking distances lead to less frequent use (Nordh & Ørstrum, 2013). Ultimately, this results in a max. distance of 330 metres for people's houses.

Next, the ease of getting there is crucial, as minimising barriers – physical or psychological – is influential for people to visit (Kerishnan & Maruthaveeran, 2021). Lastly, for ecological purposes, it is vital that the pocket parks connected - to both each other and the larger ecological network (Kerishnan & Maruthaveeran, 2021).

Safety
The fifth essential component is safety, which can be divided into two factors; social safety and physical safety. In terms of social safety, people generally prefer a few others to be there, instead of no people or too many, as no people can feel unsafe and too many can feel crowded (Kerishnan & Maruthaveeran, 2021).

For physical safety, people generally prefer at least a certain level of enclosure (Kerishnan & Maruthaveeran, 2021), as this prevents the feeling that everybody is looking at you when walking by. Furthermore, a well-maintained park (including park facilities) can improve the feeling of safety (Kerishnan & Maruthaveeran, 2021).

Feeling of attachment
Lastly, the feeling of attachment is a critical component that contributes to creating a positive outlook on the pocket park (Kerishnan & Maruthaveeran, 2021), as well as stimulating people to come back more often. First of all, some specific characteristics are essential, as they help to distinguish the pocket park from others. Furthermore, natural elements have been found to positively influence the attachment to a certain park (Kerishnan & Maruthaveeran, 2021). Lastly, organising small events – such as a movie night or an exercise group – can help to improve the feeling of connectedness towards a pocket park (Kerishnan & Maruthaveeran, 2021).

Figure 6.14. Main factors contributing to a successful pocket park. Made by Author.

6.4 Neighbourhood scale

Amount of parks

Outside of the general characteristics of a successful pocket park, it is crucial to establish the amount required for the inner city of Schiedam. In this, the green space/capita is most important. As stated by Robles et al. (2015), the minimal green space per capita is 9m².

As the inner city has 4.105 inhabitants, this would ultimately result in a minimum of 36.945m² of green space – around 9% of the total surface area. Figures 6.15 and 6.16 show a possible distribution of that green space.

Figure 6.15. 9m² green space/capita as one large park. Made by Author.

Figure 6.16. 9m² green space/capita as pocket parks of 100m². Made by Author.

In the inner city of Schiedam, this amount is not feasible (as well as not desirable). First of all, the previous calculation does not take into account the parks found outside the inner city. Furthermore – as the main potential new green spaces are pocket parks – this amount of green space will lead to a lot of 'competition' between the different pocket parks. As a result, a number of parks will be empty quite frequently, which is detrimental to the perceived safety.

Ultimately, figure 6.17 shows the new requirements. It still maintains the 9m², however, not per capita. Instead, at least 1% of the total surface area will be (pocket) park quality, while the remaining 8% can also be inaccessible, such as alongside roads or between tram tracks.

However, the accessibility of these parks should still remain within 5 minutes' walking distance. As a result, more than 1% might end up being necessary, however, that will depend on the distribution of the pocket parks.

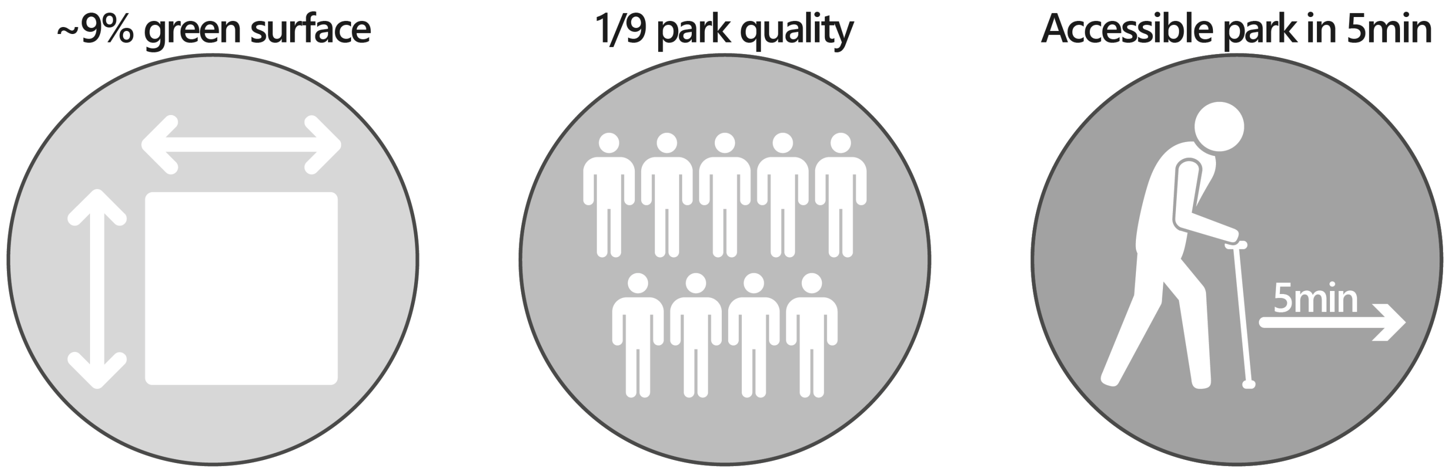


Figure 6.17. Requirements related to the amount of green space. Made by Author.

6.4 Neighbourhood scale

6.4.2 Specific park types

As stated before, pocket parks can have different benefits. However, to maximalise their potential benefits, it is necessary to understand that the required park characteristics can fluctuate, depending on what the main purpose is. As a result, a total of five pocket park types have been developed, as seen in figure 6.18.

The first two pocket park types – Restoration and Relaxation – have quite some overlap, as they both focus on creating a calm environment for people to escape their busy lives and destress/relax. Furthermore, these two have the highest level of nature.

Next, the Gathering and Playing pocket park types also have a certain amount of overlap. Both focus on creating a lively environment for people to come together and socialise. Furthermore, the level of nature is slightly lower here.

Lastly, the hospitality pocket park type is the most urban one and the only one that requires money to use. However, it does – similarly to the previous two – also aim to provide a lively environment for people to come together.

Each pocket park type will be discussed in more detail on the following pages.

Figure 6.18. Different types of pocket parks. Made by Author.

Pocket park type 1

RESTORATION

The restoration pocket park type focuses on providing (stressed) people a form of escape from the daily pressures and obligations of life by the means of a (nearby) place for restoration and stress relief. It focuses on providing a calm environment that people can visit to calm down and put their thoughts in order (Kerishnan & Marutha-veeran, 2021).

The restoration pocket park can be relatively small, as size has been found to not have a significant influence on the restorative value (Nordh et al., 2009). Instead, a lot of grass, trees/bushes, and a water feature are the most beneficial, while hard surfaces should be mostly avoided (Nordh & Østby, 2013).

Target audience
- People looking for a quiet space (Nordh & Østby, 2013)
- People that come alone (or with 1 person) (Kerishnan & Maruthaveeran, 2021)
- No playing children

Characteristics
- Enclosed space with 'small pockets' (Kerishnan & Maruthaveeran, 2021)
- Natural sounds (like a fountain) (Nordh & Østby, 2013)
- No playing equipment
- Calm environment (Nordh & Østby, 2013)
- Size of 80-100m² or larger (Nordh et al., 2009a)

Potential location
- Away from traffic and other noise sources (Nordh & Østby, 2013)
- Close to working/residential areas

Level of nature

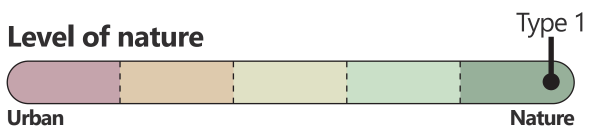


Figure 6.19. Impressions of a restoration type pocket park (Gillespies, n.d.; Nordh et al., 2009b).

Pocket park type 2

RELAXATION

The relaxation pocket park type aims to provide people with a (nearby) place to relax when they want to go outside (Kerishnan & Maruthaveeran, 2021). It aims to create a safe outside environment where people can read a book, have a chat, or simply enjoy the colourful nature these pocket parks have to offer.

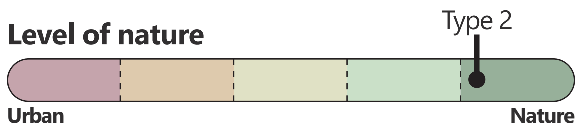
Similar to the restoration type, relaxation pocket parks can be relatively small (Nordh et al., 2009a). The elderly and women are found to use an urban park for relaxation the most (Kerishnan & Maruthaveeran, 2021), so these will be the main target groups. This means flowers and ornamental plants will be added, as both groups prefer this vegetation type (Kerishnan & Maruthaveeran, 2021).

Target audience
- People wanting to relax outside in nature (Kerishnan & Maruthaveeran, 2021)
- Elderly and women (Kerishnan & Maruthaveeran, 2021)
- No playing children

Characteristics
- Colourful vegetation (with flowers) (Kerishnan & Maruthaveeran, 2021)
- Enclosed space, but semi-open inside (Kerishnan & Maruthaveeran, 2021)
- No playing equipment
- Calm environment (Nordh & Østby, 2013)
- Size of 80-100m² or larger (Nordh et al., 2009a)

Potential location
- Away from traffic and other noise sources (Nordh & Østby, 2013)
- Close to residential areas

Level of nature



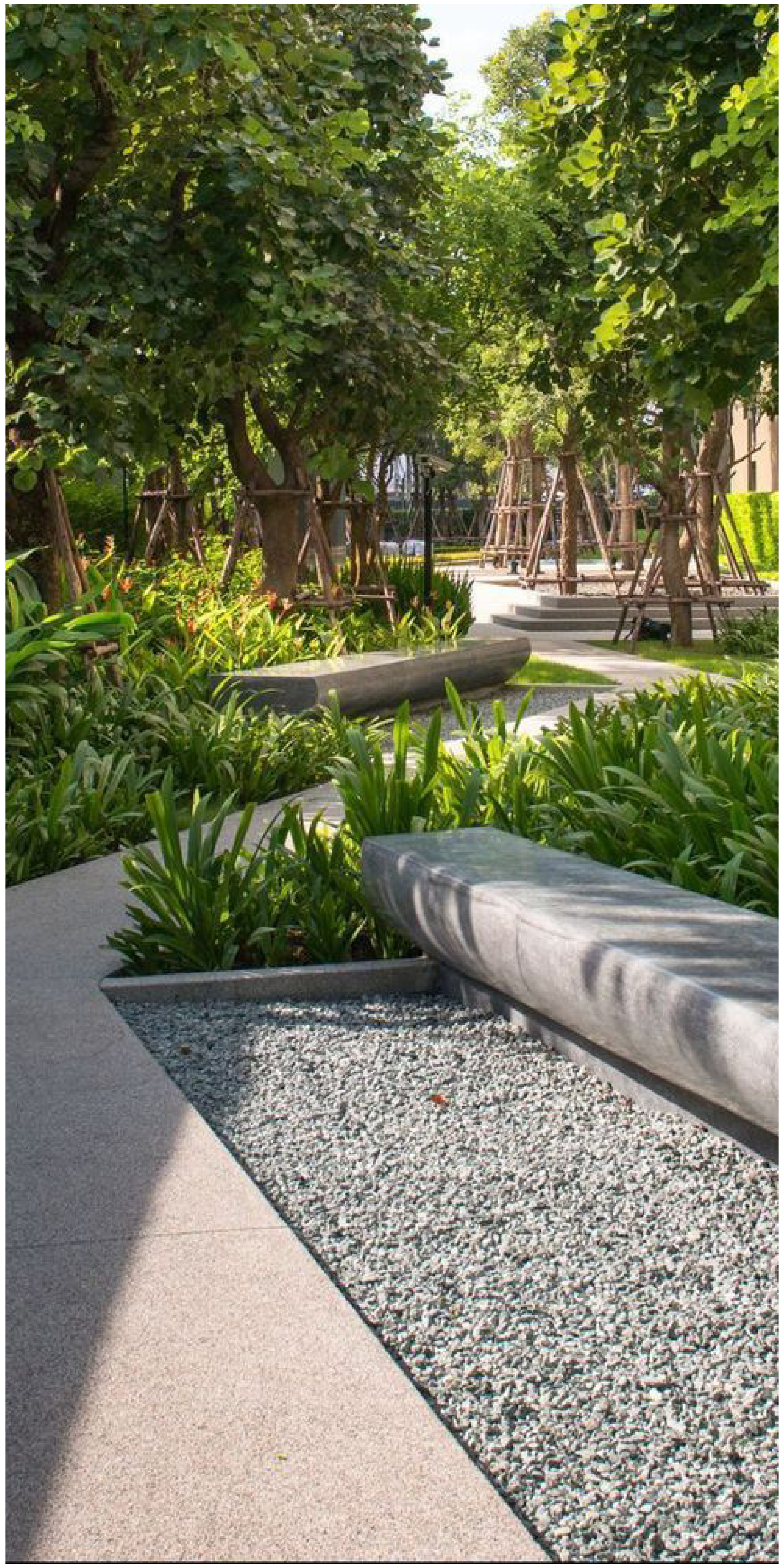


Figure 6.20. Impressions of a relaxation type pocket park (L+, 2019; T&G Groep, n.d.; Lim, 2017).

Pocket park type 3

GATHERING

The social/gathering pocket park type focuses on providing people with an outside space where they can get together with friends and family to socialise. It aims to provide people with a nearby outdoor semi-natural environment, ideal for people of all ages to come together and socialise.

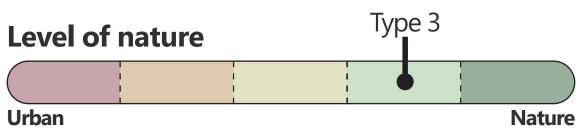
Compared to the previous two pocket park types, the social/gathering type should be slightly bigger (Nordh & Østby, 2013). Furthermore, the level of nature should be slightly lower, with a more open nature to better interact and create a lively environment (Kerishnan & Maruthaveeran, 2021).

Target audience
- People looking to socialise outside (Kerishnan & Maruthaveeran, 2021)
- All ages
- No playing children

Characteristics
- Semi-enclosed space, but open inside (Kerishnan & Maruthaveeran, 2021)
- No playing equipment
- Lively environment (Kerishnan & Maruthaveeran, 2021)
- Space for exercise/small events (Kerishnan & Maruthaveeran, 2021)
- Size of 200-250m^2 or larger (Nordh & Østby, 2013)

Potential location
- Close to busy pedestrian areas
- Close to café/food vendor (Kerishnan & Maruthaveeran, 2021)

Level of nature



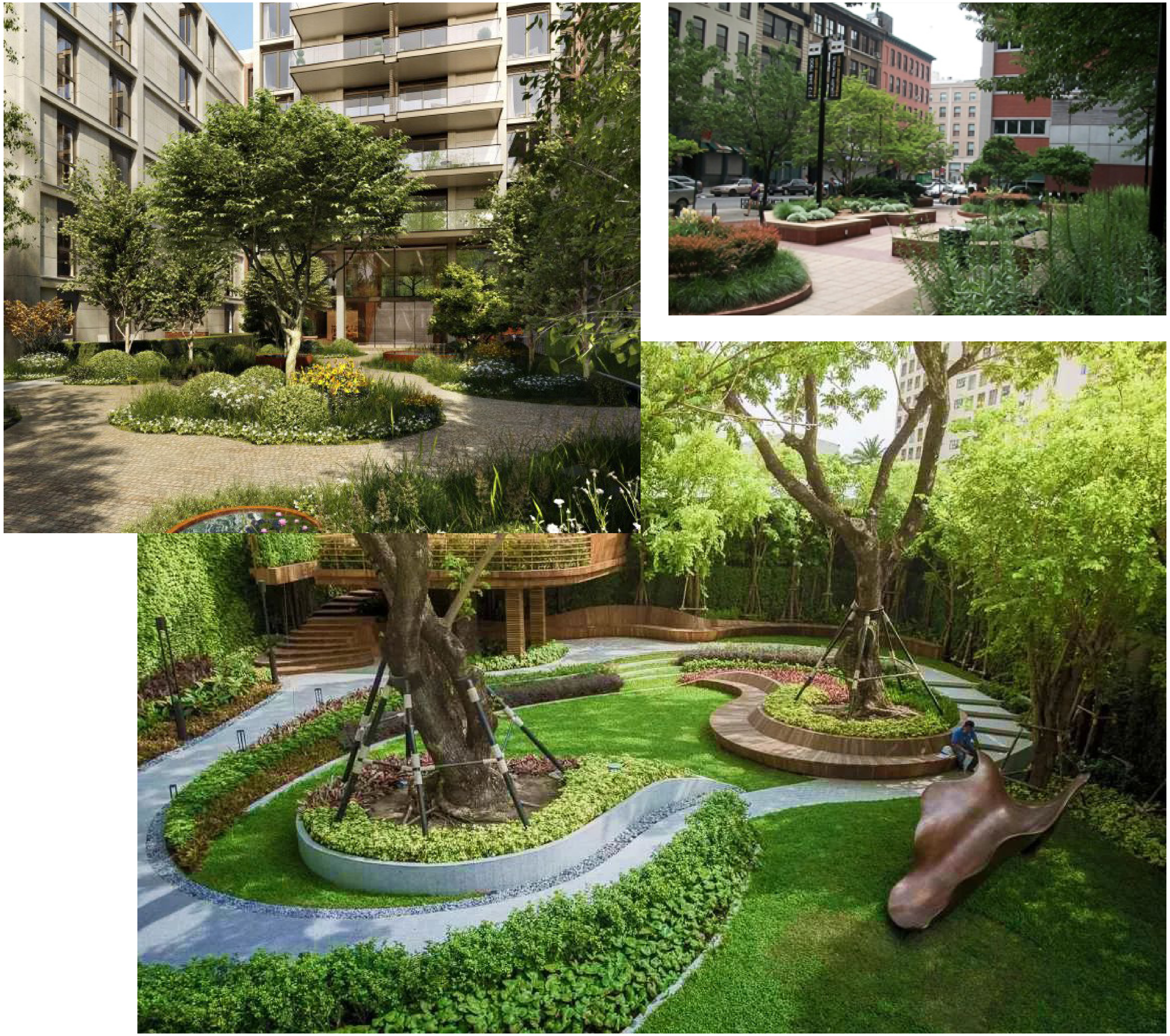


Figure 6.21. Impressions of a gathering type pocket park (Gillespies, n.d.; L+, 2019; Deegan, 2018).

Pocket park type 4

PLAYING

The playing pocket park type focuses on providing children (and their parents) a place to play together and enjoy the outdoors. It should provide a safe space for children to get together and a comfortable place for parents and other people to sit and socialise.

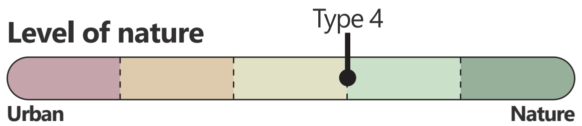
Similar to the gathering type, playing pocket parks should be slightly bigger (Nordh & Østby, 2013). Furthermore, these pocket parks demand a large diversity, but a lower density of vegetation to be most successful (Kerishnan & Maruthaveeran, 2021), as the diversity attracts people, but it still needs an open nature inside. Essential for this pocket park type is that the area is not only attractive for children to play, but also for parents and others to sit down and socialise.

Target audience
- Children that want to play/socialise outside
- Parents/other people that come along

Characteristics
- Semi-enclosed space, but open inside (Kerishnan & Maruthaveeran, 2021)
- Playing equipment
- Lively environment (Kerishnan & Maruthaveeran, 2021)
- Open space for different activities (Kerishnan & Maruthaveeran, 2021)
- Size of 200-250m² or larger (Nordh & Østby, 2013)

Potential location
- Close to busy pedestrian areas
- Close to residential areas with children

Level of nature



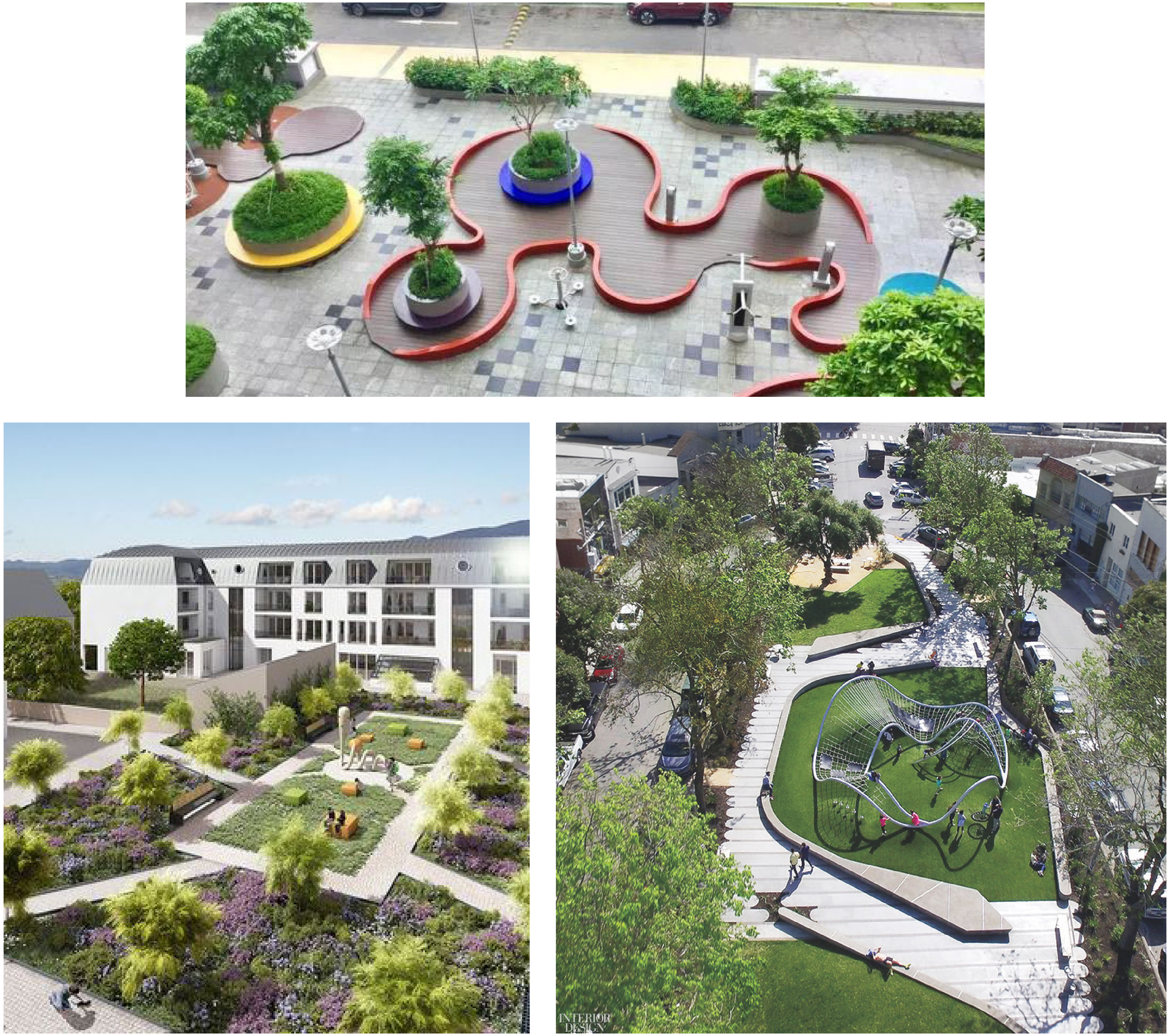


Figure 6.22. Impressions of a playing type pocket park (L+, 2019; Link3D, n.d.; Hegeman, 2018).

Pocket park type 5

HOSPITALITY

The hospitality pocket park type can be seen as the main existing 'pocket park' type within the inner city of Schiedam. While it provides little natural value, it aims to provide people with a lively outside area where they can eat/drink with friends and socialise. These often are the busiest social spaces within a city.

Especially in an area like an inner city, the hospitality business plays an important role. However, most people will not visit this type of social space on a daily basis, as it requires money to use these facilities. As a result, the focus will not be on expanding this pocket park type, however, it is meaningful to understand that these urban squares still fall under the term 'pocket park', as they still provide social space with (often) some green.

Target audience
- People looking to socialise
- People that are fine with spending money

Characteristics
- Open space with multiple access routes
- Large amount of furniture (terraces)
- Lively environment
- Size can vary significantly

Potential location
- Close to main pedestrian areas
- Close to landmark(s)

Level of nature

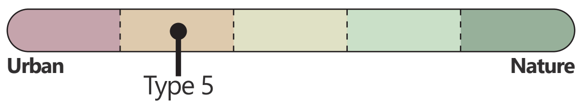


Figure 6.23. Impressions of a hospitality type pocket park (Biertapperij, n.d.; Beretto, 2019; Sluijter, 2017)

6.4 Neighbourhood scale

6.4.3 Park alternatives - Social

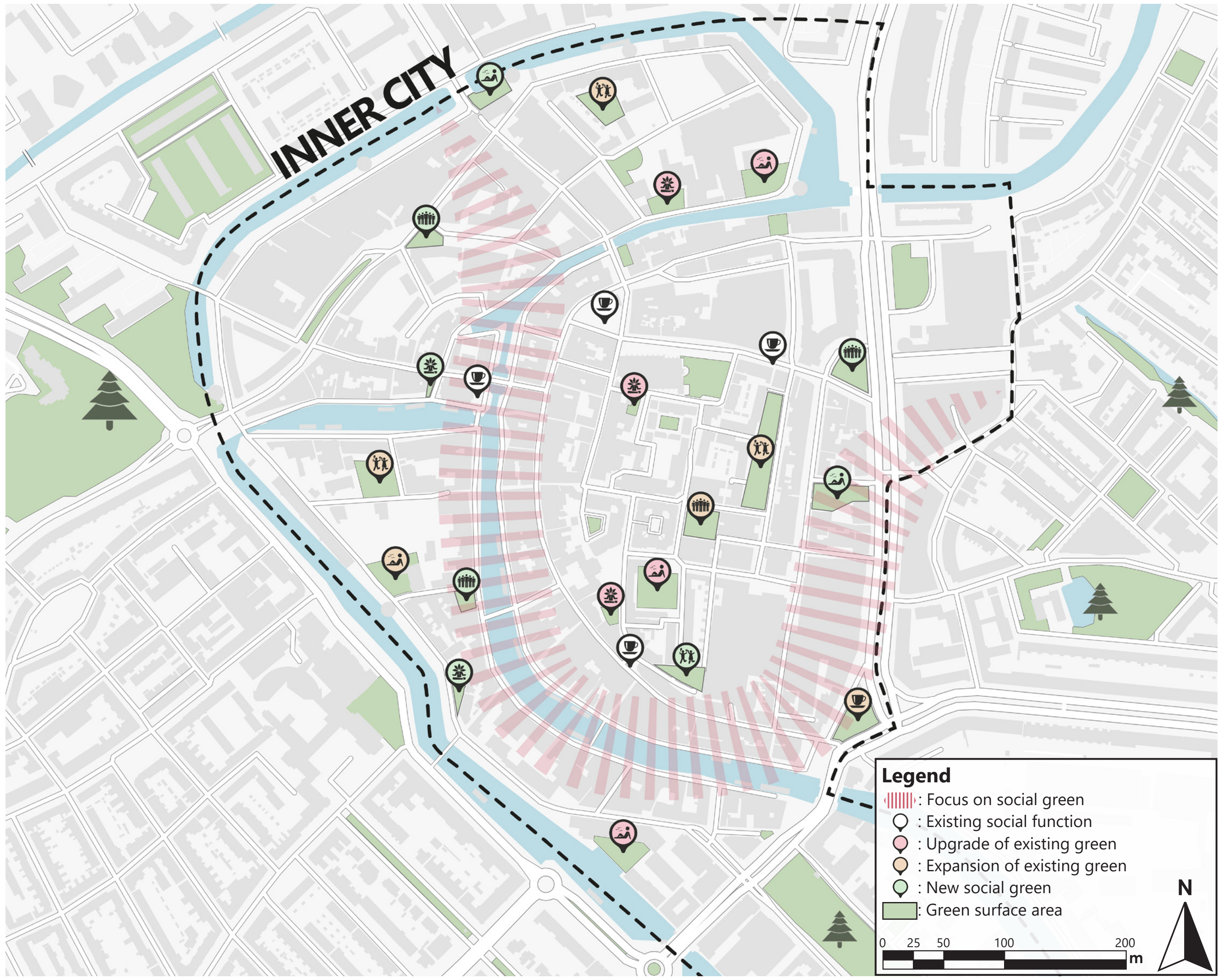


Figure 6.24. Social alternative of pocket park distribution. Made by Author.

While particular rules about the pocket park distribution are already established – such as a maximum of 5 minutes walking distance and at least 1% of total surface area – it is critical to test whether this would work. For this, two alternatives have been produced. Important to note is that no specific ecological alternative is developed, as the ecological network does not have to be accessible by humans. However, in the end, the pocket parks should all be connected to the regional network.

Figure 6.24 shows the social alternative of the pocket park distribution. As was concluded in chapter 4.6.4, the area – marked in red – currently has the lowest accessibility to any type of urban green. For the social alternative, this zone is the main area where new pocket parks have been placed, while the area outside focuses more on upgrading the existing spaces. An important finding is that limited new pocket parks have to be placed if existing green spaces/social areas are upgraded and/or expanded. Only 8 new pocket parks have been placed in this alternative, of which most are pretty small. This shows that most tools are already present, however, they are currently underperforming.

6.4 Neighbourhood scale

Park alternatives - Environmental

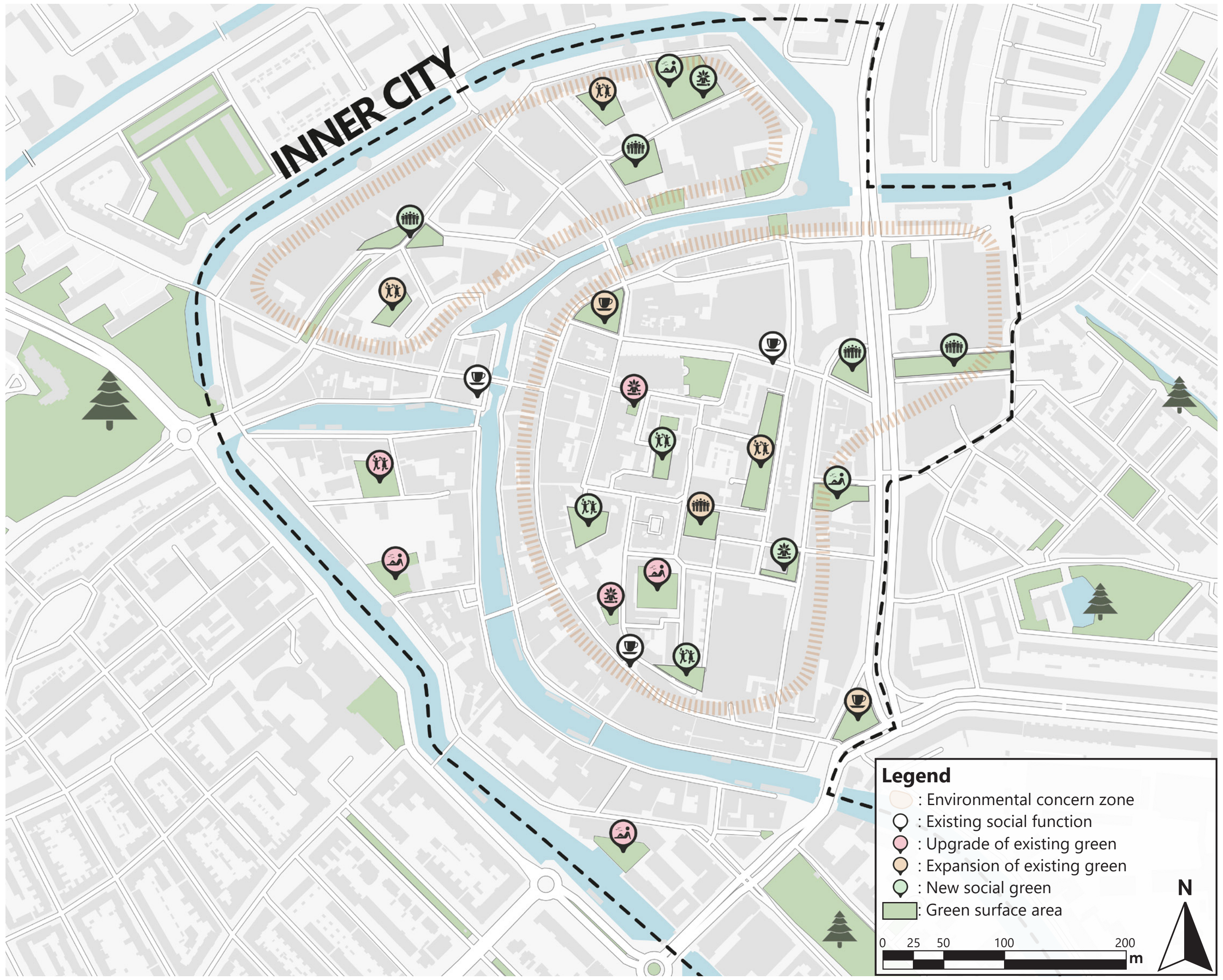


Figure 6.25. Environmental alternative of pocket park distribution. Made by Author.

The environmental alternative on the other hand focuses on maximising permeability by adding as much green space as possible – without demolishing any buildings or jeopardising any existing functions. While the number of new pocket parks has not been that dramatically increased – only 11 – the sizes have. Furthermore, a lot of existing social spaces have been expanded. Lastly, the pocket parks are significantly more scattered than in the social alternative.

An important issue with this alternative is the concept of 'pocket park overlapping'. In multiple areas, similar pocket park types are located relatively close together. This is either because no other type could be placed here due to the aforementioned potential locations/characteristics, or simply because a cluster of pocket parks was placed in which overlap is inevitable.

Pocket park distribution guidelines

>330m walking distance to similar park type

As stated before, too many pocket parks can cause competition, leading to empty pocket parks – especially true for the same type of pocket parks. For example, a Restoration and Playing pocket park can be relatively close together, as they have different purposes and target audiences. However, for similar types of parks, competition will be imminent. As a result, the 5 minutes (330m) walking distance has also been applied to the distance between two of the same type of pocket parks.

Upgrade to social or greenify existing

Something reiterated in the social alternative is the fact that there are several green/social spaces already present in the inner city, however, they are currently underperforming. As a result, it is crucial to investigate and upgrade them where possible, as this will – in most cases – be easier and less expensive than adding new ones. If they do not get a social function, adding high-quality inaccessible green on those patches is mandatory, as an underperforming/abandoned public space is a waste of valuable land.

Access for each dwelling

For accessibility, it is essential to understand that accessibility to one type of pocket park within 5 minutes still poses a certain psychological barrier. The whole idea of pocket parks is to provide people with high-quality public spaces for whatever purpose they need. As a result, it is vital that pocket park type 1/2 – Restoration or Relaxation – and type 3/4 – Gathering or Playing – are both available within 5 minutes of each dwelling. This ensures everyone will have both a calm and lively outside environment they can easily visit.

No empty areas

Lastly, the 'no empty areas' guideline is closely linked to the upgrading of existing. Currently, several small/medium sizes patches serve no real purpose. In this, the same applies as before. If no social purpose is necessary here, the addition of diverse vegetation is mandatory, as it helps to improve both the environmental and ecological conditions.

Figure 6.26. Spatial distribution guidelines for the pocket parks. Made by Author.

6.4.4 Pocket park simulation

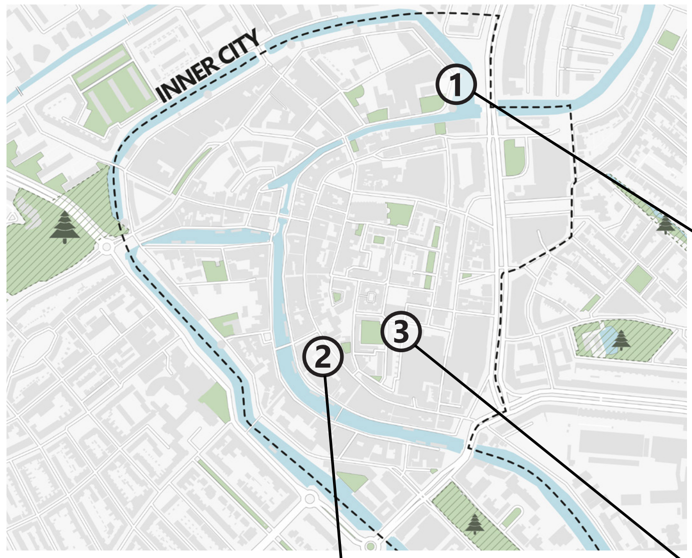


Figure 6.27. Current situation of green spaces. Made by Author.

Figure 6.28a. Potential pocket park location 1. Made by Author.

Figure 6.28b. Potential pocket park location 2. Made by Author.

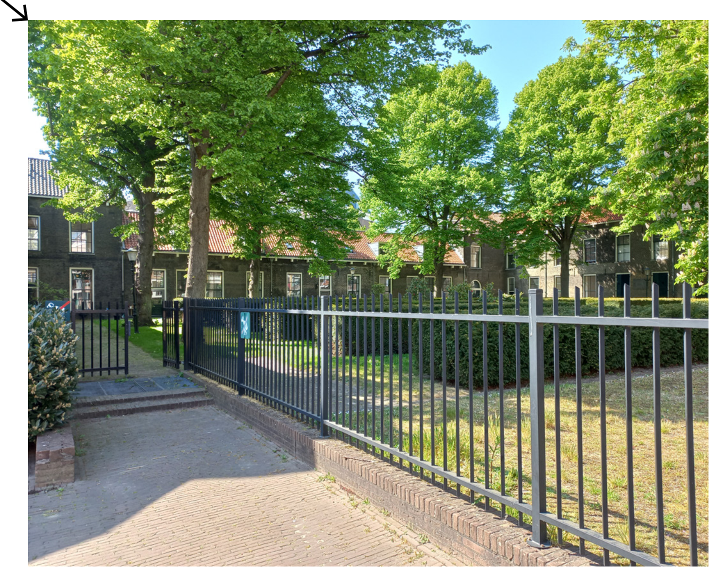


Figure 6.28c. Potential pocket park location 3. Made by Author.

To clarify how the pocket park concept could be realised in the future, a simulation is developed. The simulation aims to show the rough steps necessary to come from the concept, characteristics, and distribution guidelines previously described to an actual spatial design.

The first step is to assess the existing situation and identify potential locations where pocket parks can be realised. Improving the current is preferred over adding new, as it is more cost-effective and a less radical transformation. For this simulation, three examples of potential transformations are further explained.

The first potential location is in the north of the inner city. It has a view over the water and an access road going straight past it. Due to the noise the road will produce, the Restoration and Relaxation park types are ruled out. Furthermore, the view here is a big bonus, so realising a pocket park with a high level of enclosure would therefore be suboptimal. Between Gathering and Playing, the Gathering park type is best suited, because most residential buildings with children are a bit more west or south, as well as there is an access road right next to the potential location. With small playing children, this could lead to dangerous situations.

The second potential location is a small, low-quality park in the middle of the inner city. This area is a lot more secluded and calm, gearing more towards the Restoration and Relaxation park types. Furthermore, the size is quite small, while both Gathering and Playing function optimally with a slightly bigger size. Between Restoration and Relaxation, the Restoration park type is best suited, as the enclosure from the buildings can help to easily create small pockets for people to destress.

The third potential location is a slightly bigger semi-low to medium quality park. However, it is part of a building

Pocket park simulation (2)

complex, with people's windows from all sides watching the area. By adding any type of public park, either the view from the windows will be taken away or nuisance for residents will be imminent. Therefore, this location will not house a public function. Instead, the focus will be on improving the diversity and density of green in this area.

This type of analysis is done for each existing urban green space, ultimately leading to the map shown in figure 6.29. Certain green spaces have also been expanded, in cases where only a part of the existing available space was used as an urban green space, see figure 6.30a (1 on map) for an example. Here, fences are to be removed to create a continuous Playing pocket park. Additionally, the width can be increased.

Furthermore, certain expansion symbols indicate that the existing space only had a social function, but was still very urban. Expansion, in this case, indicates the expansion of functionality, see figure 6.30b (2 on map) for an example. Here, the hospitality business uses part of the square for terraces, however, there is also a part that still is not used for anything right now.

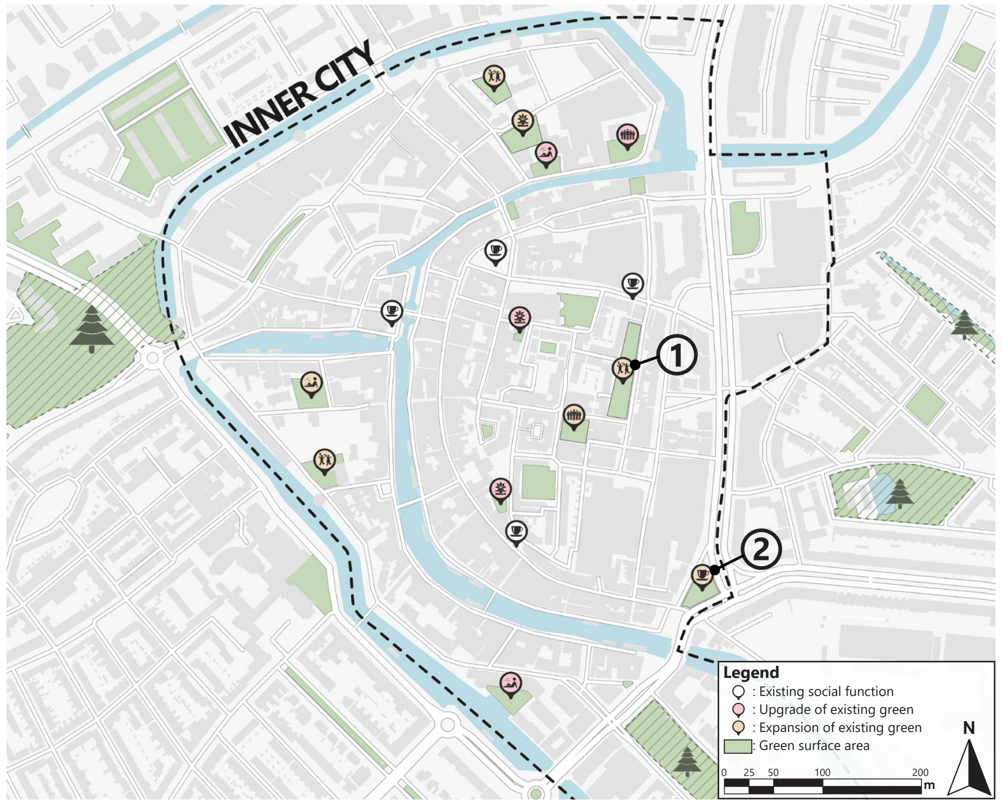


Figure 6.29. Map with all potential pocket park locations, focused on existing qualities. Made by Author.


Figure 6.30a. Example potential expansion by size. Made by Author.


Figure 6.30b. Example potential expansion by function. Made by Author.

Pocket park simulation (3)

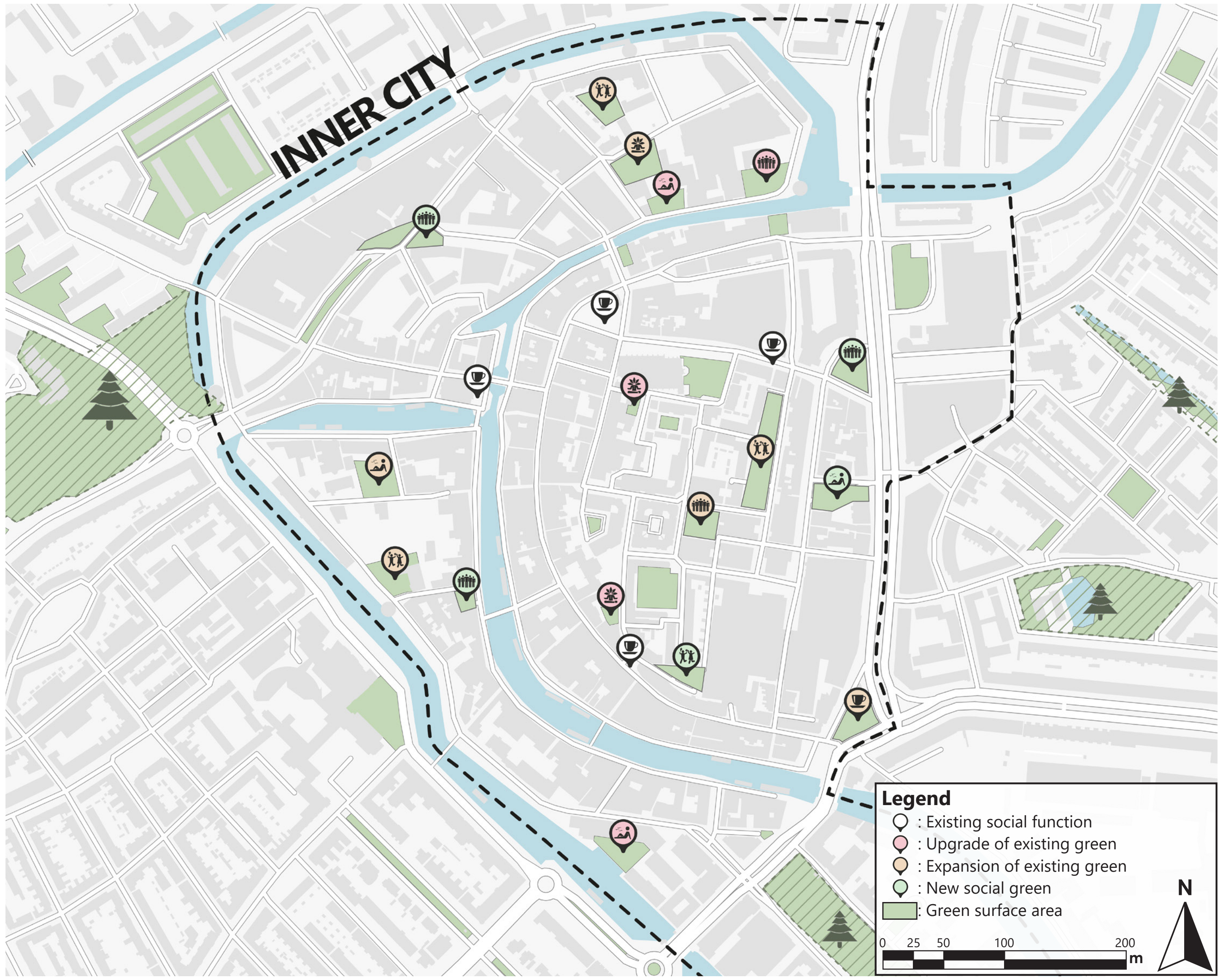


Figure 6.31. Map with all potential pocket parks. Made by Author.

The third step is to identify areas that do not meet the spatial distribution guidelines that have been set. So first, it is essential to look at the maximum walking distances to each category of a pocket park. This, for example, became a problem in the area marked with 1, resulting in a new pocket park being added. Furthermore, it is critical to assess the general distribution of each park type separately. For example, in the main area of the city centre, there was not a single relaxation pocket park, which resulted in one being added.

This stage does not have to be the final configuration of pocket parks – it should be an adaptive process. For example, when a number of these pocket parks are realised, one might be very crowded during certain parts of the day. At this stage, it is necessary to determine the cause and act accordingly. A potential reason could be that this pocket park facilitates a relatively large area compared to the others. This could lead to a further expansion of this pocket park or the addition of a new one.

Pocket park simulation (4)

Figure 6.32. Map showing new ecological network. Made by Author.

Lastly, it is crucial to assess the ecological condition. As stated in the first context scale example, the inner city currently functions as a barrier. Furthermore, analysis from chapter 4.2.2 has shown that most green patches within the inner city are disconnected. Figure 6.32 shows the new ecological network, in which all green patches have been connected to the regional network. Technically two small patches in the main part of the city centre are still disconnected, however, these are both inside building blocks and can therefore not facilitate a clear flying route.

Interestingly enough, only two new green patches had to be added to create a continuous network. However, this does not take into account the new green patches added due to the pocket parks – without them, the total would have been significantly higher.

An important assumption made in this network analysis is that each patch is upgraded with sufficiently diverse and dense vegetation to house more biodiversity. Meaning that if certain patches are not upgraded, necessary links in the network can be missing. In this case, a new connection needs to be found. The green patch marked with 1 is such an example. This patch will not house a pocket park, however, it is currently unable to house much biodiversity, as seen in figure 6.33.

In a way, a minimalist approach was taken in this simulation – meaning the aim was to reuse and upgrade the existing space as much as possible. Only in cases where this was impossible, new green spaces were added, mainly because space is very restricted, and often, adding any type of new green space would require the demolition of a building and/or parking lot, which would need further investigation. However, in the actual development of Schiedam, this could be done. It was not further investigated here to provide the least radical development strategy, from which can be deviated if deemed more beneficial.

Crucial link ecological network

Figure 6.33a+b. Image and illustration of crucial link in ecological network that needs an upgrade. Made by Author.

Figure 6.34. Illustration of potential future ecological situation of crucial link in ecological network. Made by Author.

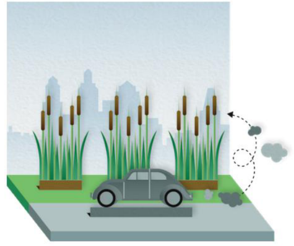
Pocket park impression

Figure 6.35. Impression of pocket park (Relaxation type). Made by Author.

Pocket park benefits

Plan: Interclusive Urban Green | **Scenario: Pocket parks** | **€ 37.135.283,-**

1. Health — € 1.383.262,-



Benefits:

- Less healthcare costs (general) due to a greener residential environment.
- Less absenteeism (generic) due to a greener residential environment.
- Reduced healthcare costs by the capture of particulate matter.
- Reduced healthcare costs by the capture of nitrogen dioxide.
- Reduced healthcare costs by the capture of sulphur dioxide.
- Reduced healthcare costs by the capture of ozone.
- Reduced healthcare costs due to noise reduction.

Beneficiaries:

- Residents
- Companies (absenteeism)
- Insurance
- Government

2. Climate adaptation — € 1.398.448,-

Benefits:

- Reduced energy consumption due to tree shade.
- Reduced energy consumption due to green roofs.
- Avoided purification costs due to an increased water storage capacity.
- Climate mitigation by storage of carbon.
- Climate mitigation saves energy.

Beneficiaries:

- Residents
- Companies
- Government
- Waterboard

3. Real estate — € 32.770.269,-

Benefits:

- Higher real estate value of existing dwellings due to a greener environment.
- Higher real estate value of new dwellings due to a greener environment.
- Higher real estate value existing dwellings through green quality improvement.

Beneficiaries:

- Property owners

4. Recreation & leisure — € 1.583.304,-

Benefits:

- More leisure opportunities through more or higher quality green.
- More profit for business owners due to the greener shopping streets.

Beneficiaries:

- Recreationists
- Business owners

Figure 6.36. Potential long-term benefits of the pocket parks. Calculations done through TEEBstad (RIVM, n.d.).

While urban green is often regarded as only having qualitative value, figure 6.36 aims to show the quantitative value urban green – in this case, the pocket parks – has. Figure 6.36 shows a rough estimate of the financial value the previous pocket park simulation has over a 30-year period. It focuses on the various cost reductions, in terms of healthcare and climate adaptation, as well as financial gain in terms of real estate and recreation.

While it does not contain all value of urban green, as a large component is still qualitative, it does provide an insight of the diverse monetary benefits the pocket parks can have.

6.5.1 Main focus

Figure 6.37. Collage of successful streetscapes. (Pricop, 2018; Gemeente Rotterdam, 2021; Street Moves, 2021; VT Community Forestry, n.d.)

The third and final main scale of focus is the street scale. As stated in chapter 6.2, streets form the vital links between the different neighbourhood and context scale destinations. For the social dimension, the concept of the one-minute city is key. This relatively new concept focuses on the idea of micro-mobility, where you enter the first social space as soon as you leave your house – the street (Dickson, 2021). Furthermore, the streets should provide a safe and comfortable environment for people to go to the 5-minute social spaces (pocket parks) and large scale destinations.

In terms of environmental concerns, the main focus is on facilitating a comfortable microclimate and providing sufficient permeable surfaces for natural water retention. Lastly, for the ecological quality, the focus will be on facilitating sufficient vegetation and urban green space to house a certain level of biodiversity. Furthermore, certain streets will function as corridors in the larger green network.

To better understand what qualities specific street types currently have and/or lack, it is essential to first establish a way to evaluate this. As a result, the following pages will focus on an evaluation method for each street type in the social, environmental, and ecological domains.

6.5.2 Evaluation matrix - Social

Social			
Component	**Constraint**	**Score**	**Explanation**
Sidewalk	<1,5m	Low	*Sidewalks are an essential component of any street. It promotes opportunities for citizens to connect with their community and creates safer pedestrian environments (Adams et al., n.d.). However, for these benefits to come to fruition, it does need a certain width. The minimum width of any sidewalk is 1,8 metres, of which 1,5 metres should be without any obstruction (Gemeente Leiden, 2013).* *However, this width does not provide the maximal benefit, because it is not that easy to pass each other on a sidewalk of 1,5 metres wide. As such, the optimal width of the sidewalk is at least 2,5 metres wide (Gemeente Leiden, 2013).*
	1,5-2,5m	Medium	
	>2,5m	High	
Separation (from fast traffic)	No separation	Low	*A buffer zone can be defined as a barrier between cars and pedestrians. It promotes pedestrian mobility by increasing comfort and safety (Adams et al., n.d.). It can be anything from vegetation to a row of parked cars. In this, the bigger the better, however, a minimum size of 0,6 meters has been established, as that will provide enough distance to improve safety. Streets without separation between the car and pedestrians on the other hand often feel significantly less safe, decreasing pedestrian mobility (Adams et al., n.d.).* *Streets without car access are much more enticing for people to visit, as they feel safer here. Furthermore, car-free streets "have the potential to promote socially inclusive streets' (Rainwater & Rivett, 2020). Streets where the pedestrian is the main user in terms of hierarchy also fall under this category.*
	Buffer of >0,6m	Medium	
	No car access	High	
Shared space*	<4,5m	Low	*While the low maximum speed (30km/h) of shared streets should make it possible for slow and fast traffic to coexist safely, the speed limit is very regularly exceeded (Verkade, 2021). This has even been rated as the number one 'public annoyance' in the Netherlands (Verkade, 2021). As a result, these shared streets are often perceived as less safe than intended.* *To establish an actual safe width for shared streets, the minimal width of a one-lane car street – which is 3 metres (Peeters, 1998) – is added to the sidewalk widths found at the top of this diagram. By adding the necessary space for both cars and pedestrians together, it can be assured that enough space is available for them to coexist.*
	4,5m-5,5m	Medium	
	>5,5m	High	
Extra facilities	No facilities	Low	*"On average, pedestrians choose to walk around 10% farther than their shortest path' (MIT Senseable City Lab, 2021). Outside of the aforementioned components, street facilities also play a crucial role here. People tend to prioritise streets that make the walk seem more enticing - i.e. something to look at. For example, walking alongside a canal or green strip is generally preferred over a street full of cars.* *Furthermore, street furniture provides pedestrians with the feeling that they are welcome, making the street a more comfortable place to be (SF Better Streets, 2019). Additionally, it adds vitality to the pedestrian realm.*
	View or Street furniture	Medium	
	View & Street furniture	High	

Figure 6.38. Matrix for grading the social condition of any streetscape. Made by Author.
** = Instead of components 1&2 and only applies to street type 1.*

To establish which street types are most critical for transformation and/or have the highest potential, an evaluation matrix has been developed. It aims to provide a better understanding of the current condition of all street types in the inner city of Schiedam, separated in social, environmental, and ecological conditions. Furthermore, it provides a tool to evaluate any future streetscape development.

For the social dimension, the components are focused around improving safety and comfort for pedestrians while using the street. Important to note is that the third component – Shared space – only applies to street type 1. Furthermore, street type 1 will not be graded on the first two components, as these are against the nature of a shared street. This means street type 1 has two gradable components, while all others have three.

The last component – extra facilities – is aimed to assess the extra components in a streetscape that make people more likely to use it – i.e. what makes people gravitate towards certain streets and/or what makes those streets be perceived as more pleasant.

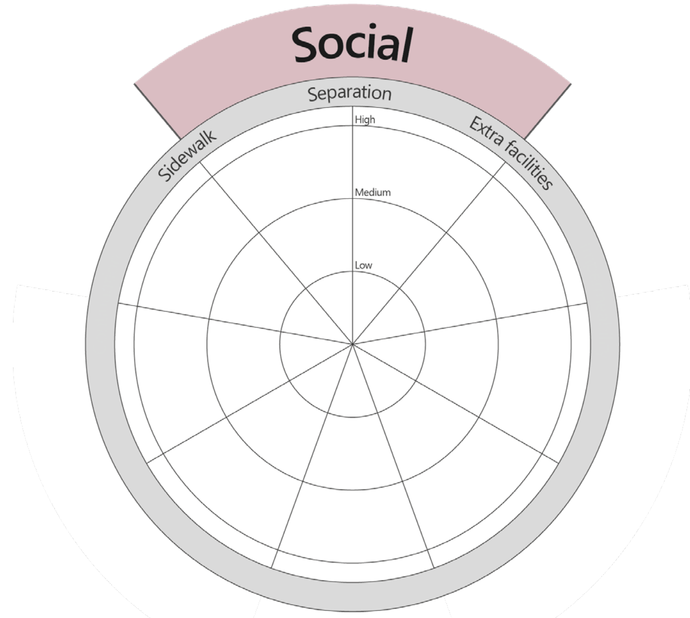


Figure 6.39. Grading diagram - social components. Made by Author.

Evaluation matrix - Environmental

Environmental			
Component	**Constraint**	**Score**	**Explanation**
Impermeability	100%	Low	*The increasing impermeability due to urbanisation has put significant pressure on the water management system in cities (Upper Midwest Water Science Center, 2019). It prevents natural water retention by the soil (and vegetation) and increases the amount of runoff water – ultimately reducing the water quality due to pollutants (Upper Midwest Water Science Center, 2019).* *In an ideal situation, every street would be 100% permeable, with only permeable pavement and unpaved areas in every streetscape. However, this is very expensive and unfeasible to do short-term. Instead, a goal of at least 15% has been set. This percentage will be explained in the text below the diagram.*
	85-100%	Medium	
	<85%	High	
Shade	Wide street, no trees	Low	*The amount of shade is an essential factor in assessing the comfortability of an area. Trees have been found to "cool an area by reducing the air temperature in summer by up to 30%" (SunSmart, 2011). However, also the buildings play an important role in providing shade. While the orientation of each street also plays a role in assessing shade conditions, a generalisation is made here to be able to assess each street type as a whole. In this, street width and the number of trees are most important (building heights are generally all around the same).* *A street is defined narrow when it has a frontage to frontage dimension of fewer than 10,5 metres, which is a number defined in an extensive manual for streets from the UK (Department for Transport, 2007). For the number of trees, the distance between their canopies will be analysed. 'Many trees' indicates that the area of no shade between the shade of two canopies is limited to non-existent.*
	Narrow street / Wide street, trees	Medium	
	Narrow street, trees / Wide street, many trees	High	
Cooling	No cooling	Low	*Outside of shade, vegetation also provides cooling by means of evapotranspiration. In this, evapotranspiration on its own can "help reduce peak summer temperatures by 1-5°C" (EPA, 2021a). The amount of evapotranspiration a plant can produce depends on the foliar surface area (Stan et al., 2014). As a result, trees and bushes are most effective, in which 'dense vegetation' is defined as being a combination of both.*
	Some vegetation / Canal	Medium	
	Dense vegetation / Some vegetation, canal	High	

Figure 6.40. Matrix for grading the environmental condition of any streetscape. Made by Author.

For the environmental dimension, the focus is on the concepts of water management and microclimate. The environmental matrix aims to assess the current environmental resilience and adaptability by looking at how the street deals with water and heat.

The 15% at impermeability is based on a study done by Holanda & Soares (2019), where the city of Recife, Brasil was analysed on the amount of natural infiltration related to permeability.

The study found that the 17% permeable soil of the location was able to cope with around 90% of the total precipitation. This would indicate that with approximately 20% – not taking into account runoff flows, placement of the permeable surfaces, etc. – most precipitation would have been able to naturally infiltrate. However, Recife has more than double the amount of precipitation in the peak months than Schiedam, resulting in around 10% permeability necessary in Schiedam to deal with all precipitation – again, not taking into account any external factors like soil infiltration capacity.

From this 10%, an additional 5% was added to deal with potential future environmental shocks and stresses, where a lot of precipitation falls in a short timespan.

While the 15% is not an exact science, this is also unnecessary, as it is solely used to indicate the current permeability situation in each streetscape.

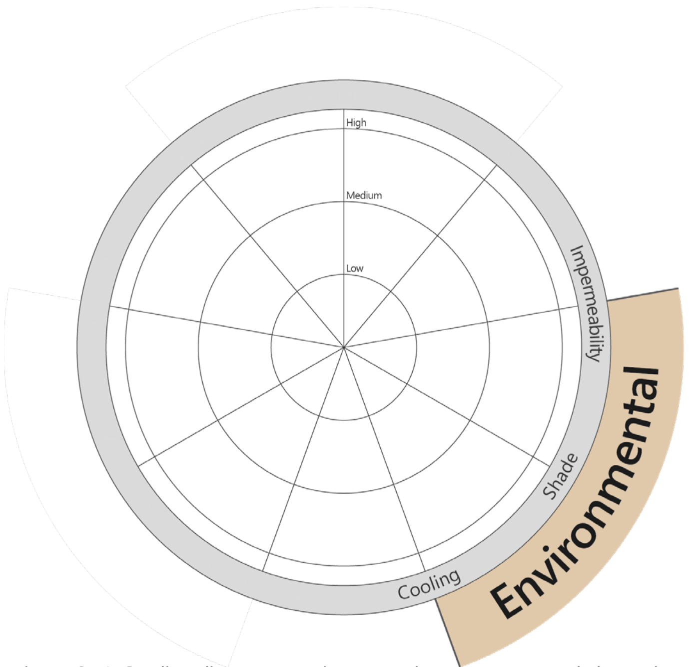


Figure 6.41. Grading diagram - environmental components. Made by Author.

Evaluation matrix - Ecological

Ecological			
Component	**Constraint**	**Score**	**Explanation**
Green surface	0%	Low	*Urban green spaces can be described as "critical habitats to support biodiversity" (Lepczyk et al., 2017). They form the foundation of urban ecology and provide life for countless plants and animals. SDSN (n.d.) states that around 15% of the entire surface area of a city should be green space – a percentage in which all building surfaces are also included. As a result, the percentage of the public domain that should be green is about 33% (SDSN, n.d.). However, most of this 33% will be provided by larger parks and other large-scale green spaces. To not overcomplicate things, the assumption is made that both roughly cancel each other out, leaving 15% green space within streets as the desired amount.*
	0-15%	Medium	
	>15%	High	
Vegetation	No vegetation	Low	*Outside of the urban green surfaces, vegetation also plays a crucial role in "biological conservation, including conservation of endangered species and native ecosystems" (Botkin & Beveridge, 1992). In this, the diversity of vegetation is crucial, as plants will each provide a (slightly) different habitat, sometimes geared towards other animal species. As a result, a situation with different types of vegetation (trees, different types of bushes, flowers, etc.) is preferred, as it is the most diverse and will be able to house the most biodiversity.*
	Some trees/plants	Medium	
	Diverse vegetation	High	
Continuation	No continuation	Low	*Improving the connectivity of urban green spaces is "widely seen as a key mechanism for reversing the effects of fragmentation on biodiversity" (Forest Research, n.d.). This is true on all scales, as different species have significantly different habitat sizes. As a result, streets – due to their 'corridor shaped' nature – can function as vital components in increasing habitat sizes and decreasing fragmentation. An (almost) continuous green strip is preferred, as this will also provide small animal species that have limited capabilities to travel from patch to patch with a larger habitat.*
	Semi-continued	Medium	
	Green strip	High	

Figure 6.42. Matrix for grading the ecological condition of any streetscape. Made by Author.

For the ecological dimension, the focus is on providing the streets with the right qualities to house a certain level of biodiversity. Cities are more important for biodiversity conservation than previously thought (Cutieru, 2022), however, these urban ecosystems are increasingly under threat (San Francisco Estuary Institute, 2019). As a result, it is vital to provide more room for these species and promote a rich and biodiverse ecosystem.

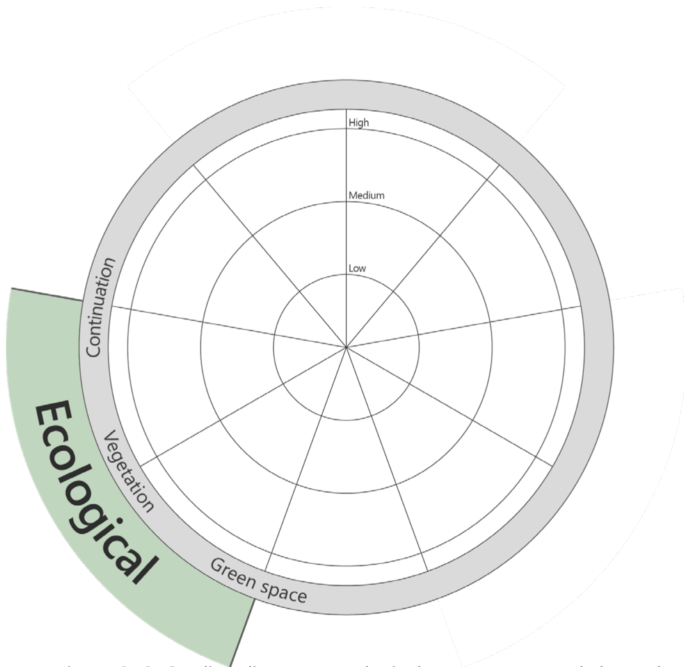


Figure 6.43. Grading diagram - ecological components. Made by Author.

6.5.3 Potential interventions

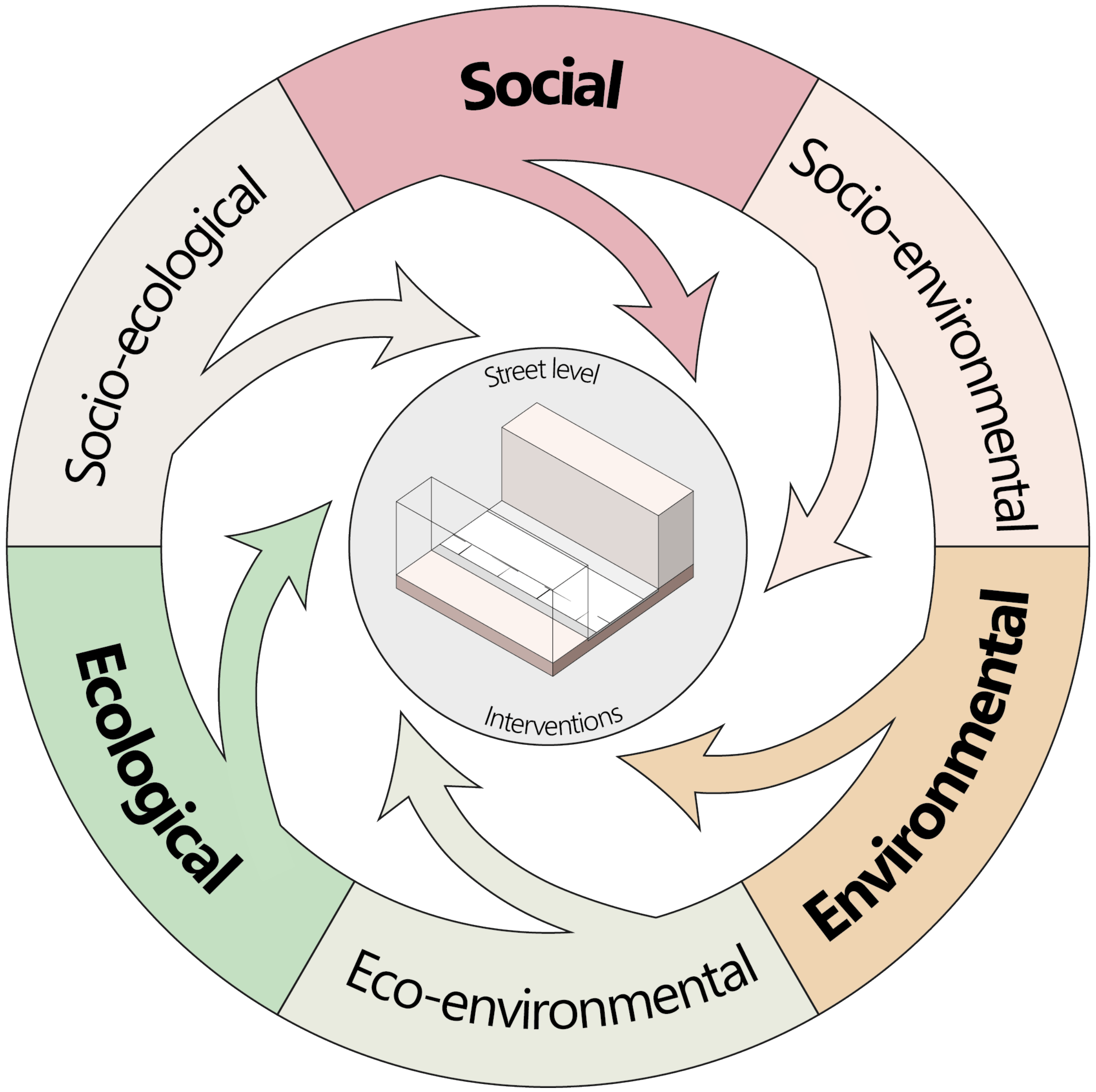


Figure 6.44. Diagram of different intervention domains. Made by Author.

Next to the evaluation matrix, it is crucial to understand which tools there are to redevelop the different street types. The various interventions have been categorised under the main domain they provide substantial benefits.

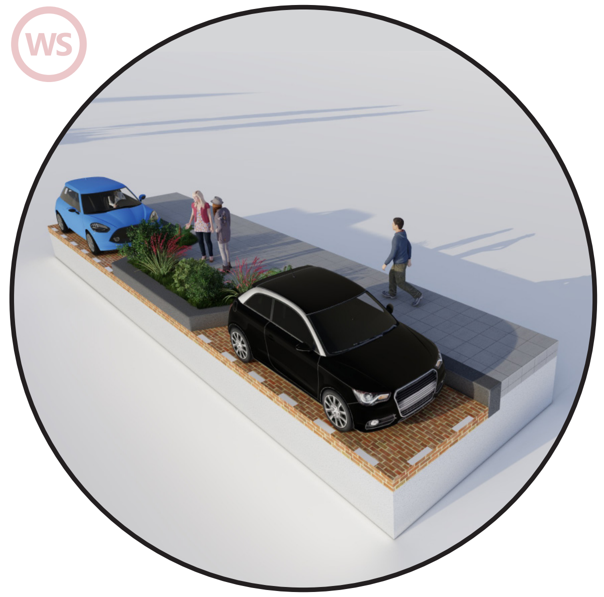
Interventions can also provide (almost) an equal level of benefits on two domains, in which case they have been placed in a different category. However, this does not imply that – for example – an intervention from the eco-environmental category has less potential ecological benefit than interventions from just the ecological category. It only implies that these interventions substantially influence two domains.

Lastly, (almost) all interventions will have a certain level of influence on all three domains, however, the interventions have all been categorised by their main influence(s), done to provide a better understanding of the main tools that can be used to improve a specific domain.

Potential interventions - Social

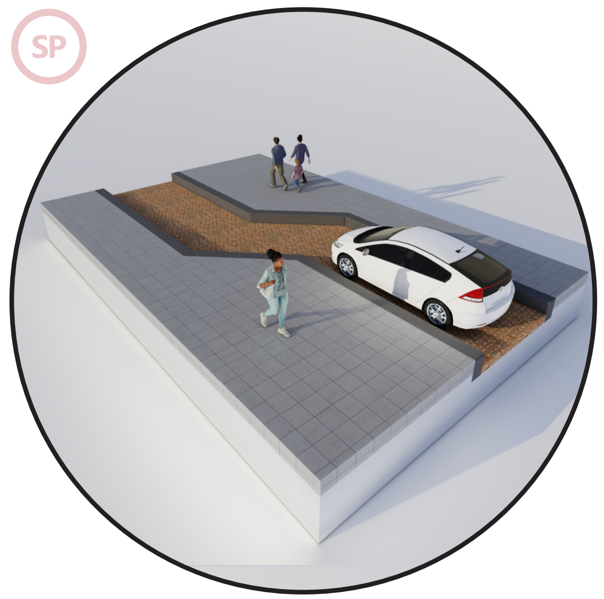
Public furniture (PF)
Starting with the social interventions, the first potential benefit can come from adding street furniture. As stated by SF Better Streets (2019), street furniture can provide pedestrians with the feeling that they are welcomed in the area, making the street a more comfortable place to be. Furthermore, it adds vitality to the public realm.

Street furniture can also add to the sense of identity and support social interaction (Furnitubes, 2019). Lastly, as stated before, humanity has started to transition from functionality first towards more experience-based, and street furniture can play an essential role in that transition (Furnitubes, 2019).



Widened sidewalk (WS)
The second potential benefit in the social realm comes from widening the sidewalk. As stated before, the optimal width of a sidewalk is at least 2,5 metres wide (Gemeente Leiden, 2013), as this provides people with enough space to easily pass each other. Furthermore, wide sidewalks increase mobility, improve perceived safety and promote healthier communities (FHWA, 2013). Lastly, wider sidewalks provide people who – for example – quickly want to have a chat with a neighbour the opportunity to do so without standing in the way of others.

The implementation of the widened sidewalk can be varied. In the example to the left, one parking space is removed to create a 'resting area' for people to have a chat – which can go paired with some green. However, widening the entire sidewalk is most beneficial (if possible).



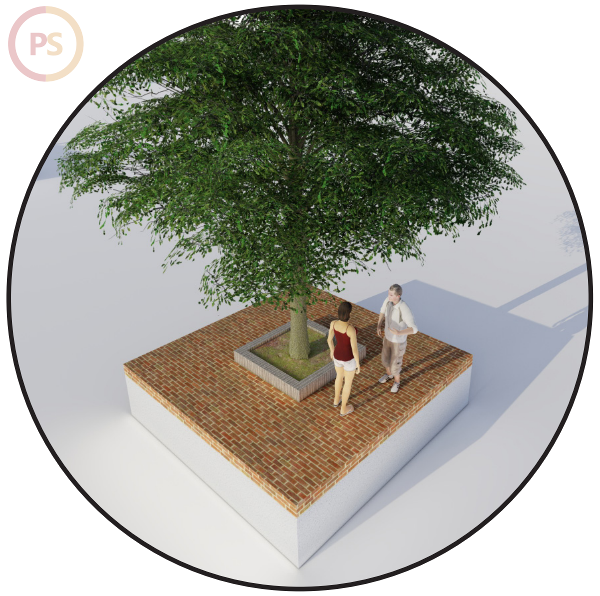
Change street priority (SP)
The third potential social benefit is by changing the street priority. By narrowing the street and adding chicanes – as shown in the example to the left – the average speed of cars is reduced by up to 50% (Distefano & Leonardi, 2019). Furthermore, a 50% reduction can also be seen in the number of accidents between cars and pedestrians (Distefano & Leonardi, 2019), drastically improving safety. Furthermore, (slightly) more space will become available for pedestrians if a road is narrowed.

The implementation of this intervention is again not fixed. Other types of slowing down the car are also viable. Additionally, removing the car completely also falls under this category.

Figure 6.45. Potential social interventions. Made by Author.

Potential interventions - Socio-environmental

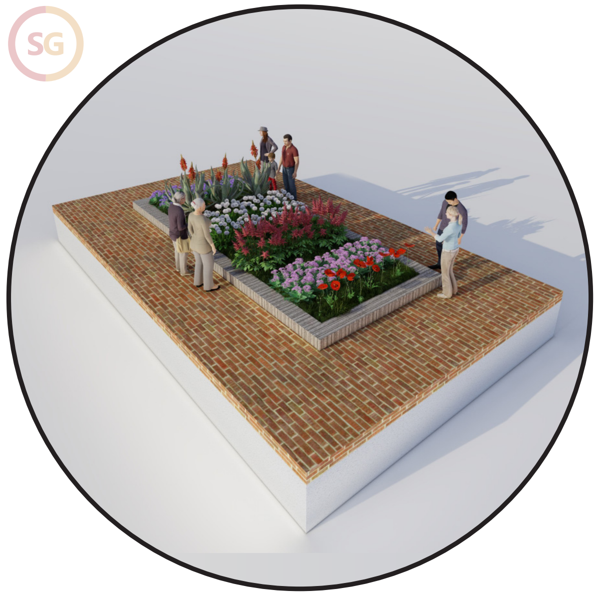
PS



Place with shade (PS)
For the socio-environmental interventions, the first potential benefit can come from adding places with shade. As stated by SunSmart (2011), ''carefully chosen trees can cool an area by reducing the air temperature in summer by up to 30%.'' This, combined with the cooling capacity of trees by the means of evapotranspiration, can have a significant positive impact on the microclimate. In terms of social benefit, the comfort level of being outside can go up significantly, as it provides relief from the heat of the sun on a summer day.

For the implementation, it is vital that the shade covers (part of) the pedestrian area, meaning a sun/shade analysis needs to be done for each specific street to determine where the trees are best placed.

SG



Shared garden (SG)
Shared gardens, or community gardens, are the second socio-environmental intervention that provides great benefits. As stated by DeMuro (2021), shared gardens ''allow for the creation of social ties and build a greater feeling of community.'' Furthermore, they can improve mental health. The shared gardens also provide the area with a permeable surface and a certain level of cooling – depending on the planted vegetation.

The implementation of shared gardens in a streetscape is limited, as it requires a certain amount of space. However, some wide street profiles can house the shared gardens if redevelopment takes place. Important to note is that this intervention can also be placed at the end of a street if more space is available there.

Figure 6.46. Potential socio-environmental interventions. Made by Author.

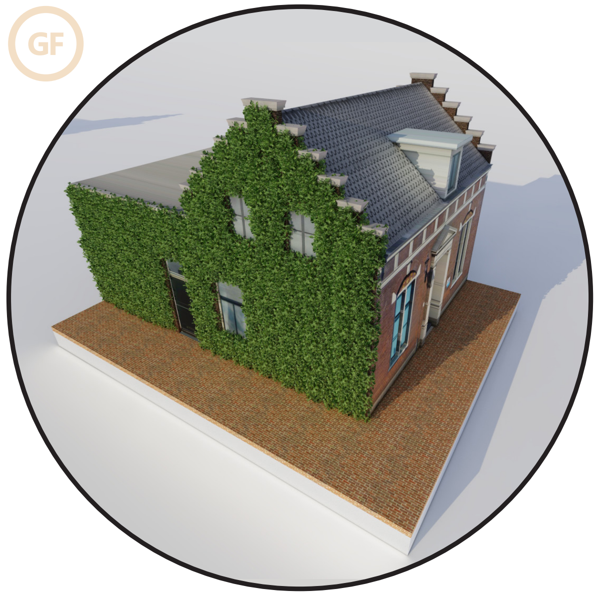
Potential interventions - Environmental

PP

Permeable pavement (PP)
The first environmental intervention with potential benefits is the permeable pavement. As stated by the Upper Midwest Water Science Center (2019), the permeable pavement has several hydrologic benefits, such as improved water quality, less pressure on the sewerage system, more natural water retention, and less runoff water.

For the implementation, the permeable pavement must be considered in pretty much any street redevelopment, as it can have a significant positive impact on the environmental condition. However, ideally, this intervention goes together with either renovations or other developments, as removing all the pavement just to replace it with the permeable pavement is not the most cost-effective.

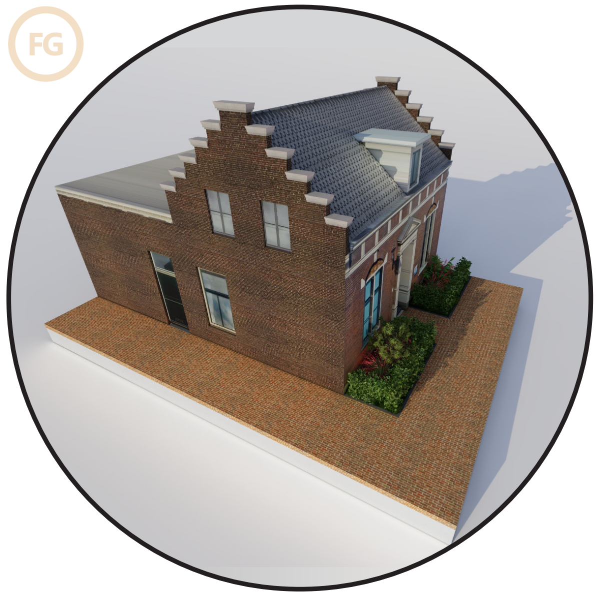
GF



Green facades (GF)
Secondly, green facades also provide a street with potential environmental benefits. As stated by Biotecture (2021), green facades provide thermal benefits for both the buildings themselves and the outside temperature. This is due to the ability of a green facade to evapotranspirate. Furthermore, green facades remove pollutants from the air.

For the implementation, it is essential to take into account the visual impact of such a development. Especially in streets with a strong character due to the buildings, covering them up might harm that. As a result, this intervention should be used in moderation. Furthermore, the green facades are most beneficial in narrow streets, where space is absent for green ground space.

FG



Front gardens (FG)
The third environmental benefit can come from the development of front gardens. Important to note is that this intervention is not that focused on adding new front gardens, however, the focus is more on improving the current. Most front gardens are often entirely urban. The goal is to provide the tools and/or incentives for residents to add green to their front gardens. This will again have positive benefits on the cooling capacity of the street.

Figure 6.47. Potential environmental interventions. Made by Author.

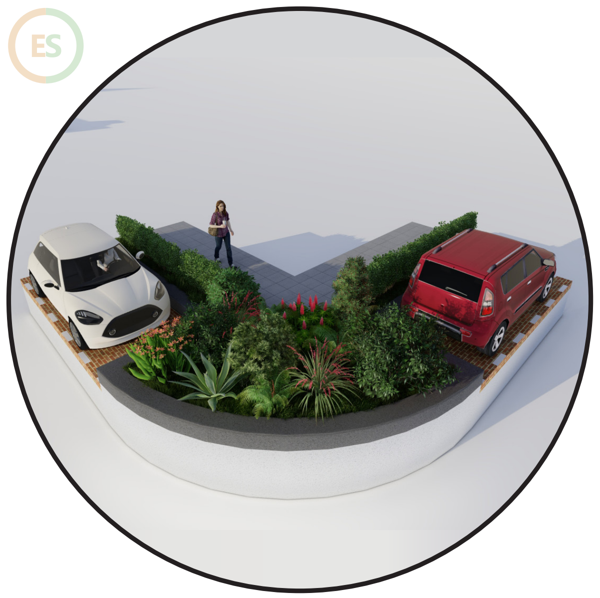
6.5 Street scale

Potential interventions - Eco-environmental

Maximise patches (MP)
The first eco-environmental intervention is focused on upgrading the existing patches of green. Often, trees are planted separately in a square hole in the paving with sometimes sand or some stones on top. And while the tree in itself already provides some benefits, more diverse vegetation on a larger patch will provide even more in terms of biodiversity, cooling ability, and green surface/permeability (Botkin & Beveridge, 1992).

A common example of missed potential is the tree between parking spaces. It is almost always only one tree, often using less than half of the available area between the two parking spots. An example of what can be done with this space is shown on the left.

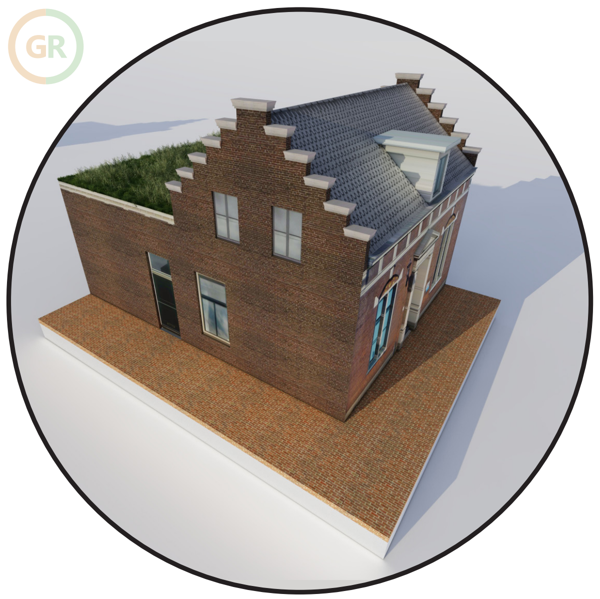
The implementation of this intervention can be very varied. As long as there is an existing area with some level of vegetation that can be enlarged/upgraded, this tool can be used.



Green in empty spaces (ES)
Next, the green in empty spaces intervention has quite similar characteristics and potential benefits as the previous one. The main difference is that the green in empty spaces intervention aims to add new green, while the previous one aims to upgrade existing.

While space is limited in most contemporary cities, there are often many (small) rest spaces that simply have no use. Street corners, areas between parked cars, between cars and pedestrians, etc. By adding new, diverse vegetation, similar benefits can be achieved as the maximise patches intervention.

In terms of implementation, it can be everywhere. Any type of space without purpose, or that comes free due to other developments is viable to be used. However, it is crucial to first analyse whether these areas actually have no purpose, as sightlines, unofficial crossing points, and more might not be that noticeable straight away.



Green roofs (GR)
The third eco-environmental intervention is the green roofs. As stated by SemperGreen (n.d.), green roofs have many potential environmental and ecological benefits, such as a rainwater buffer, less air pollution, increased biodiversity, and a reduced urban heat-island.

While green roofs can technically be installed on every flat roof, they will be most beneficial on buildings next to streets that have environmental and/or ecological concerns – similar to the green facades. However, in contrast to the green facades, the green roofs do not have to be used in moderation, as they do not influence the character of a street.

Figure 6.48. Potential eco-environmental interventions. Made by Author.

6.5 Street scale

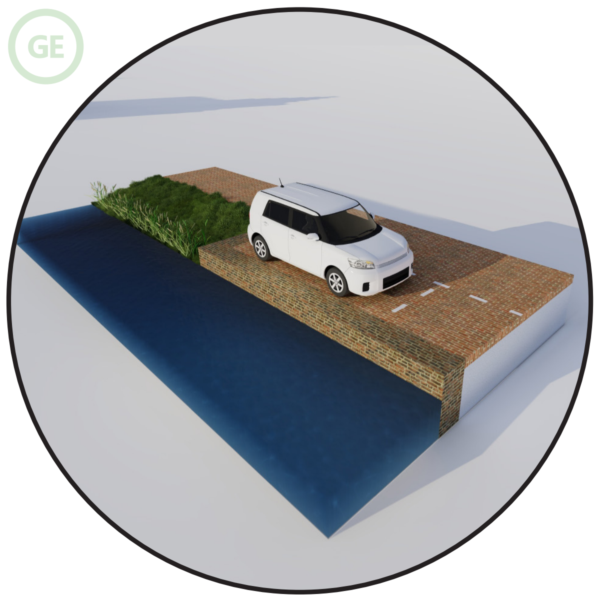
Row of trees (RT)
The fourth eco-environmental intervention with potential benefits is a row of trees. As stated before, trees can provide shade and cooling capacity due to evapotranspiration. Additionally, the trees – combined with the small green surface – can house a certain level of biodiversity.

The implementation of this intervention is limited to every street that currently does not have any trees – where possible. Furthermore, it can also be combined with other interventions that increase green surface area.

Potential interventions - Ecological

Diversity at tree (DT)
The first ecological intervention with potential benefit is adding diversity to the trees. This relatively small intervention focuses on the fact that little to no vegetation is currently present at the bottom of the trunk. This is a missed opportunity, as adding more diverse vegetation can play a crucial role in "biological conservation, including conservation of endangered species and native ecosystems" (Botkin & Beveridge, 1992). And while the area surrounding each tree might be small, it counts up if implemented consistently.

The implementation of this intervention is quite limited, as it only targets the area around the base of a tree. However, this type of vegetation – only a tree trunk on the ground – is very commonly found.

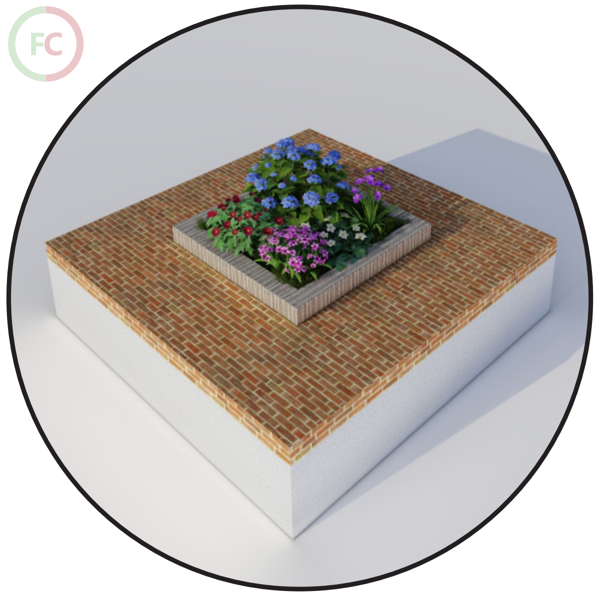


Green embankment (GE)
Unlike the first ecological intervention, the green embankment intervention is a lot more drastic. As stated by Koelewijn (2021), green river embankments provide a new habitat for a large number of different water plants and animals. However, it is necessary to realise that the impact of such a development will be massive, as the canal is an essential part of the identity of Schiedam. Furthermore, the embankment needs a certain amount of width to be effective.

As a result, the implementation of this intervention will be (very) limited. Mostly on the edges of the inner city it might be possible, however, it is vital to further investigate the full extent of consequences before implementing such an intervention tool.

Figure 6.49. Potential ecological interventions. Made by Author.

Potential interventions - Socio-ecological



Flowers (colourful) (FC)

Adding flowers – as well as ornamental plants – to a streetscape can have significant socio-ecological benefits. Flowers add colour to the streetscape and are generally perceived as an attractive feature (Kerishnan & Maruthaveeran, 2021). Furthermore, flowers can house a certain level of biodiversity, especially when placing a large diversity of flowers.

For the implementation to have its social effects it is critical that the flowers are well visible, and should not be hidden away under larger bushes.

Potential interventions - All three domains

Green strip (GS)

Lastly, the green strip is an intervention that substantially influences all three domains. The potential environmental and ecological benefits have already been mentioned several times, with more biodiversity, shade, cooling, and green surface area being some of the most impactful benefits. However, a green strip also has an important social purpose, as it provides a natural 'barrier' between the car and pedestrians. As stated by Adams et al. (n.d.), this will improve both the perceived safety and comfort levels of pedestrians.

The green strip intervention is widely applicable, as it only needs a limited amount of width to already have a significant impact.

Figure 6.50. Potential socio-ecological and all three domain interventions. Made by Author.

Intervention toolbox

Figure 6.51 shows an overview of all potential interventions across the three domains, together with a couple of key characteristics.

It is important to note that each tool in the toolbox has a certain level of abstraction/uncertainty, which is done on purpose to provide some room for interpretation and further development. In this way, the tools can be further fine-tuned for each specific street to gain the most benefits.

If the tools were all very strict, unusual street types might struggle to implement certain tools due to restrictions. Furthermore, some tools might get implemented suboptimally due to the different street qualities. Ultimately, the level of abstraction provides some creative freedom and adaptability for developers.

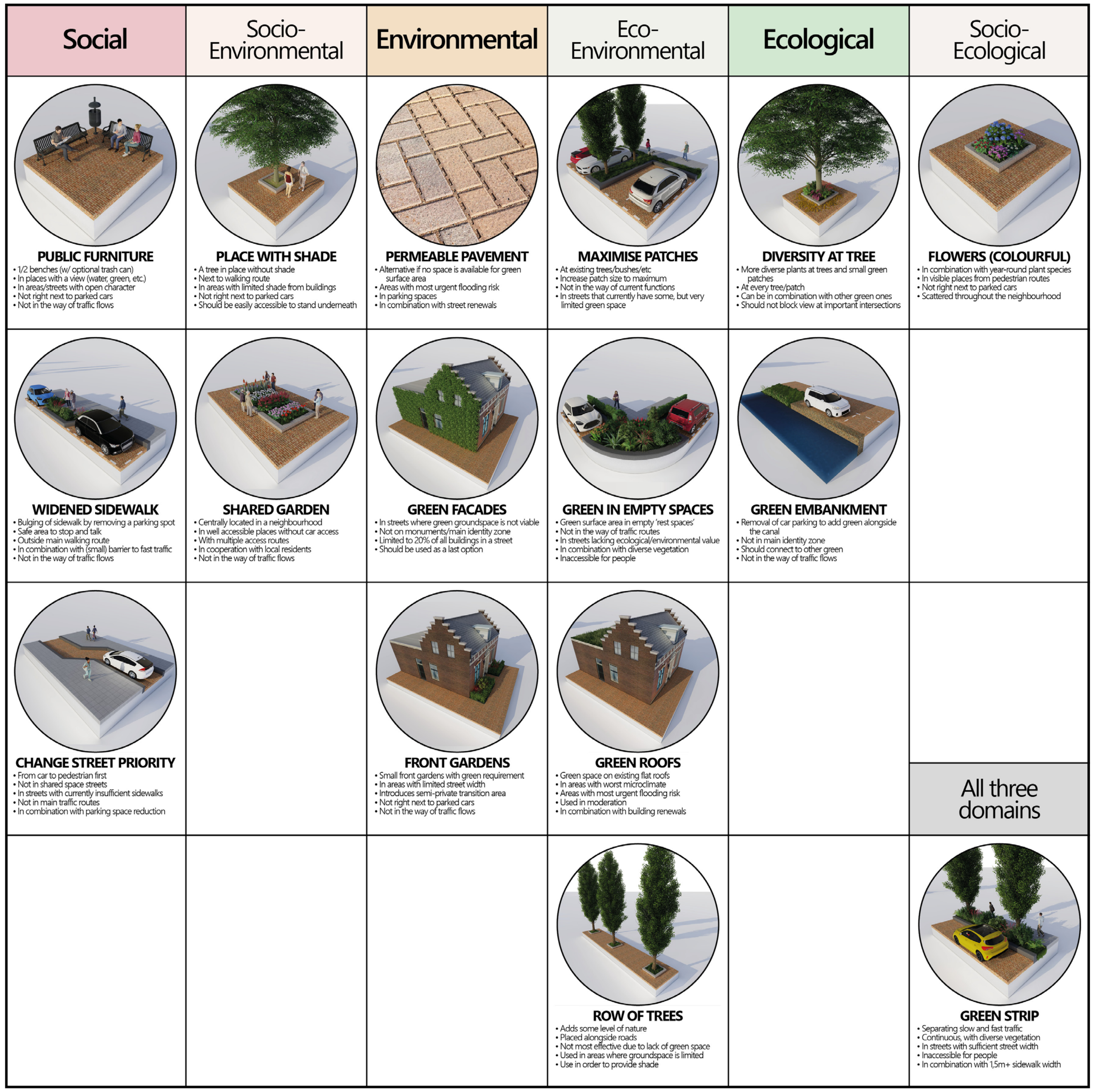


Figure 6.51. Intervention toolbox. Made by Author.

6.5 Street scale

6.5.4 Street type evaluation - Type 1

Figure 6.52. Image of a typical street with streetscape type 1. Made by Author.

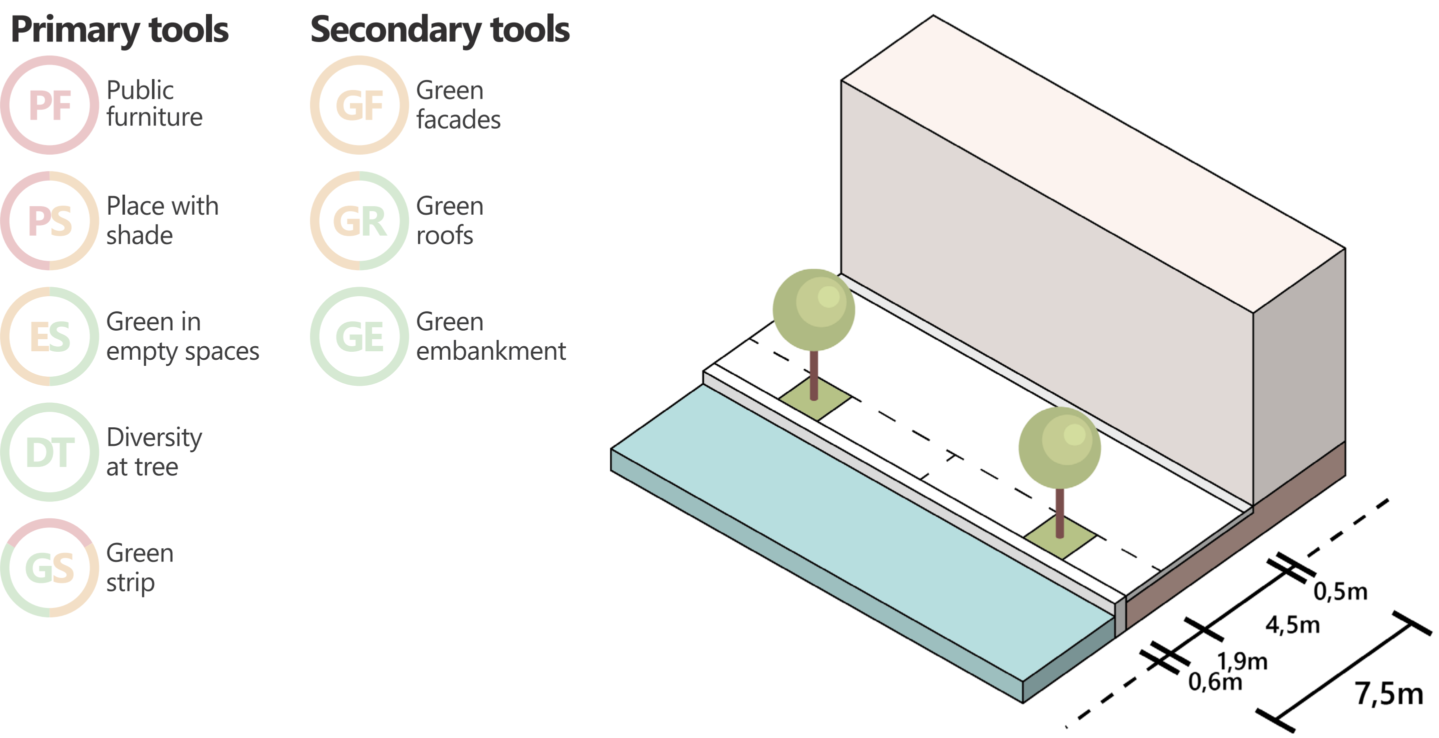


Figure 6.53. Axonometric street segment and potential interventions of type 1. Made by Author.

With both the evaluation matrix and intervention toolbox explained, it is essential to apply these tools to the different street types in the inner city of Schiedam to gain a better understanding of the current concerns and potentialities. For each street type, several primary and secondary intervention tools have been selected. In this, the primary tools are the least radical – such as diversity at a tree in this case – as well as the most beneficial ones – such as the green strip.

The secondary tools on the other hand focus on the quite general interventions that can technically be applied almost everywhere – such as green facades/roofs – as well as the most radical options, in this case, the green embankment.

For each of the 12 street types, all interventions have been assessed to whether they can be viable for that street type, resulting in several primary and secondary tools. Important to note is that for any redevelopment, the idea is not to use all given tools, as this would not be the most beneficial.

Instead, each individual street development will be able to use these tools and select the ones most suited for that specific location/condition. An example of the implications of these tools on a specific street development will be discussed in chapter 6.5.5.

As stated before, type 1 has different social evaluation criteria than all other streets, as it is a shared street. As seen in figure 6.54, street type 1 scores best on the environmental criteria, mostly due to the water and row of trees. On both the social and ecological criteria, this streetscape scored significantly lower.

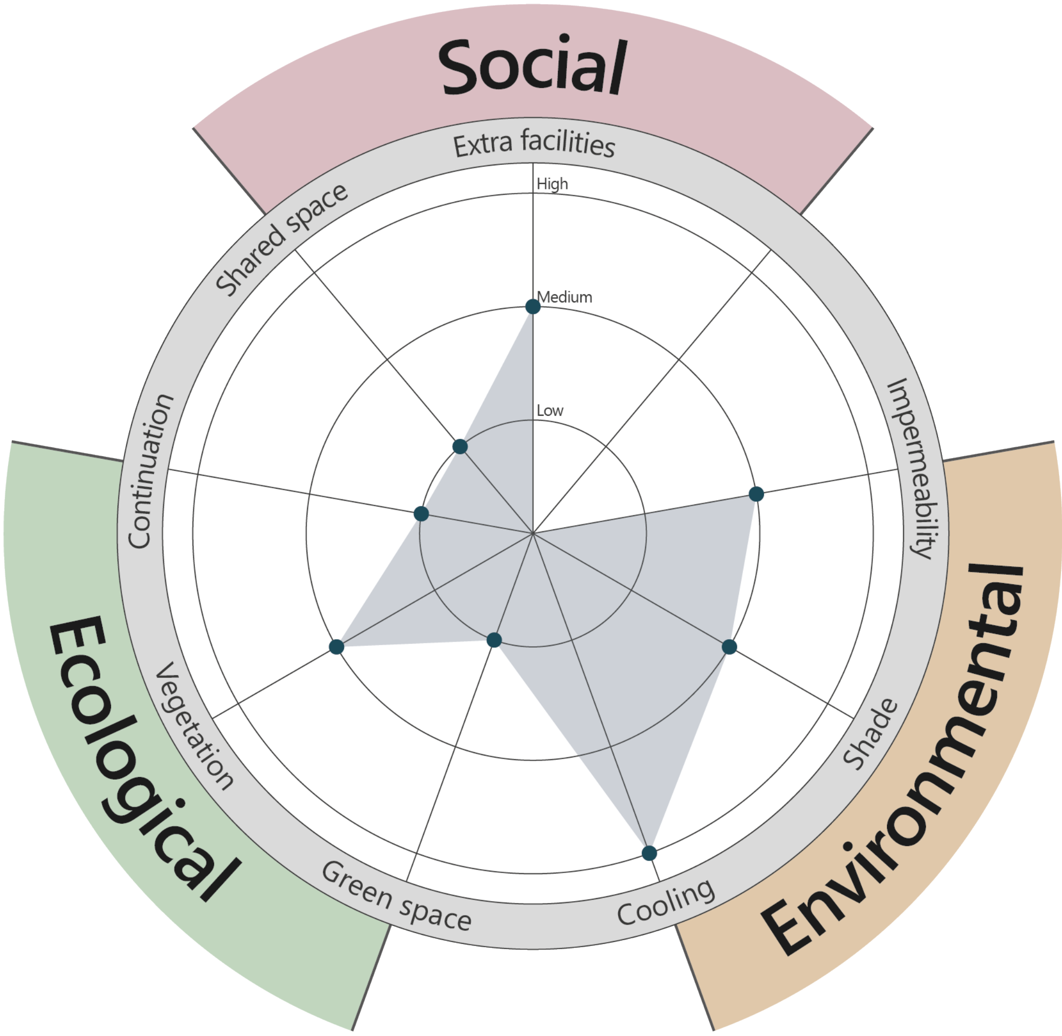


Figure 6.54. Grading diagram of street type 1. Made by Author.

Street type evaluation - Type 2

Figure 6.55. Image of a typical street with streetscape type 2. Made by Author.

Primary tools

- PF Public furniture
- PS Place with shade
- MP Maximise patch size
- DT Diversity at tree

Secondary tools

- GF Green facades
- ES Green in empty spaces
- GR Green roofs
- GE Green embankment
- GS Green strip

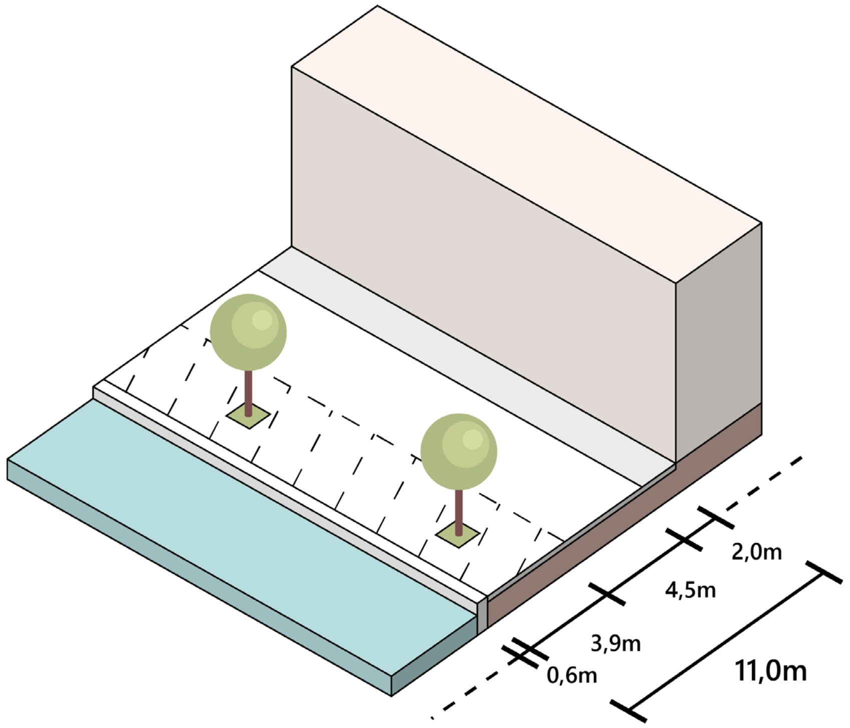


Figure 6.56. Axonometric street segment and potential interventions of type 2. Made by Author.

As seen in figure 6.55, street type 2 has quite some visual similarities to street type 1. However, there are two distinct differences – the street width and the sidewalk. As a result, type 2 scores slightly higher on the social criteria, while having similar scores on both the environmental and ecological criteria.

However, this street type does provide significantly more opportunity for redevelopment, mainly due to the extra available width. For example, adding a green strip in the area that can become available if the parked cars are turned to be parallel to the street is not that radical of an intervention, as it removes little to none of the existing functions. However, there are also other options available.

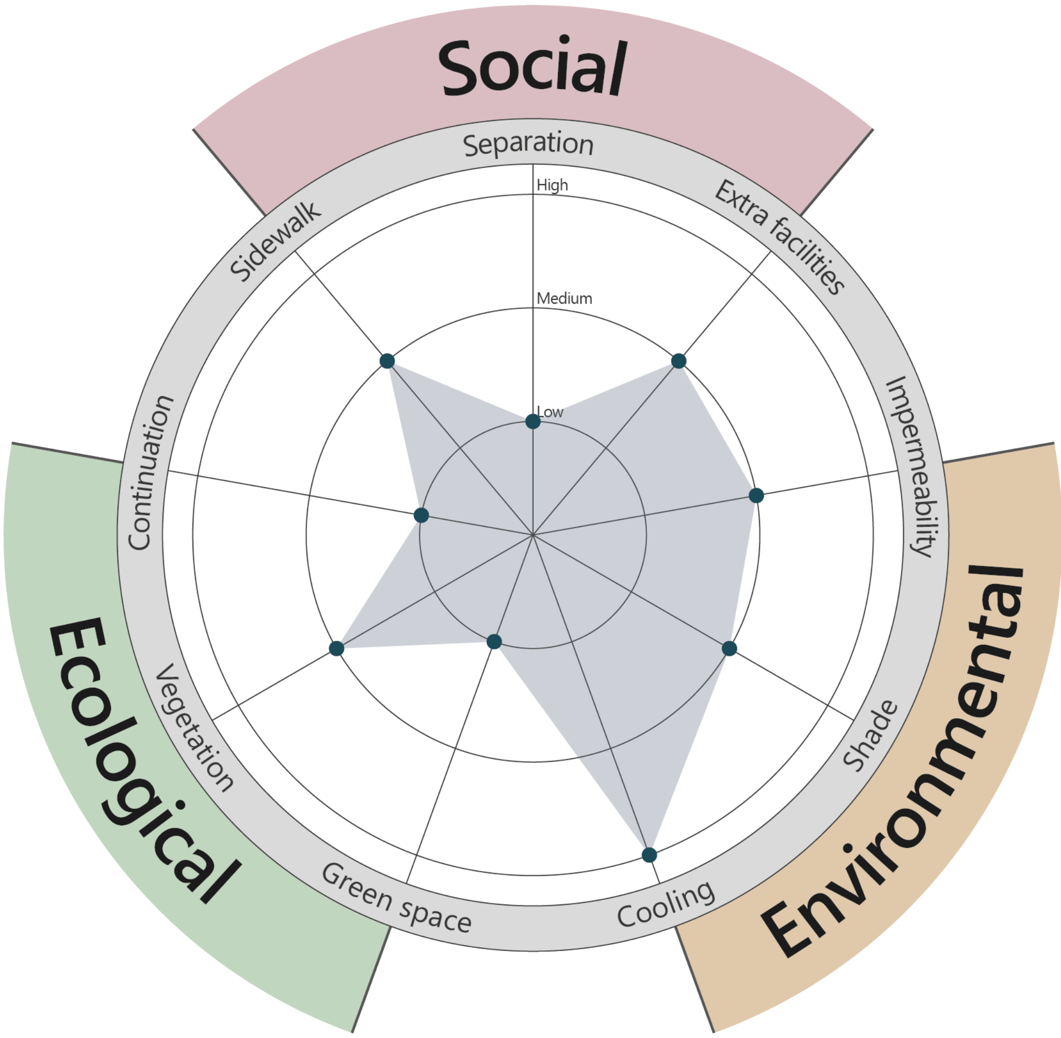


Figure 6.57. Grading diagram of street type 2. Made by Author.

Street type evaluation - Type 3

Figure 6.58. Image of a typical street with streetscape type 3. Made by Author.

Primary tools

- PS Place with shade
- MP Maximise patch size
- DT Diversity at tree
- GS Green strip

Secondary tools

- PF Public furniture
- GF Green facades
- ES Green in empty spaces
- GR Green roofs
- GE Green embankment

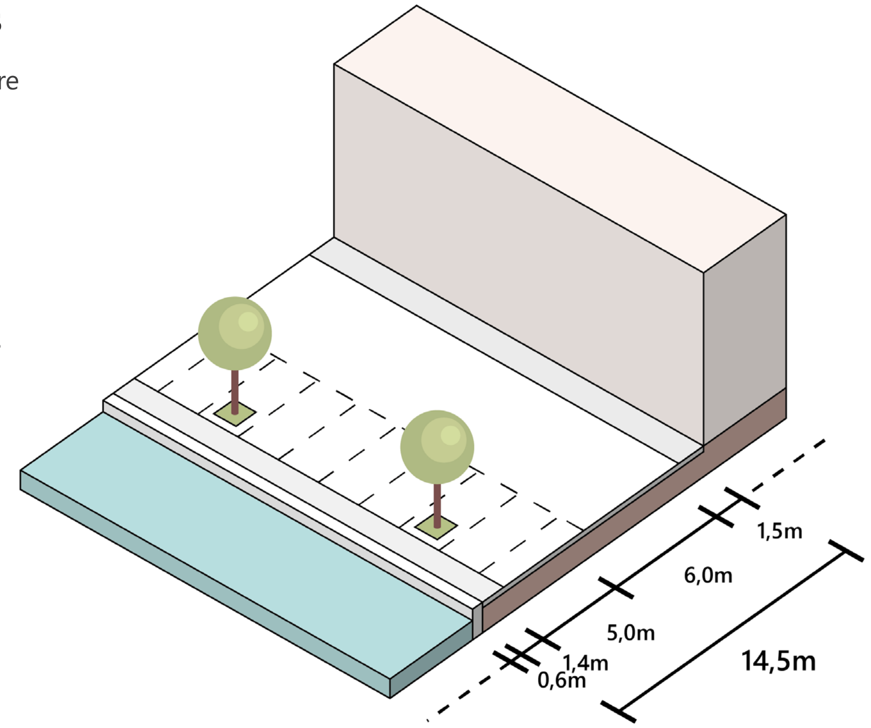


Figure 6.59. Axonometric street segment and potential interventions of type 3. Made by Author.

The third street type again has a certain level of similarities to the previous two. However, here the connection between people and the canal is more prevalent, as it provides both a walking route (in certain parts) and street furniture facing the water's edge. This is in contrast with the previous two street types, as both of those had a continuous row of cars blocking the view of pedestrians towards the water.

As a result, street type 3 again scores higher in the social criteria, while receiving similar scores on both the environmental and ecological domains. Important to note is that the waterside street types all score relatively high in terms of environmental concerns, which can be explained by the river providing cooling, as well as them all having a row of trees alongside the water.

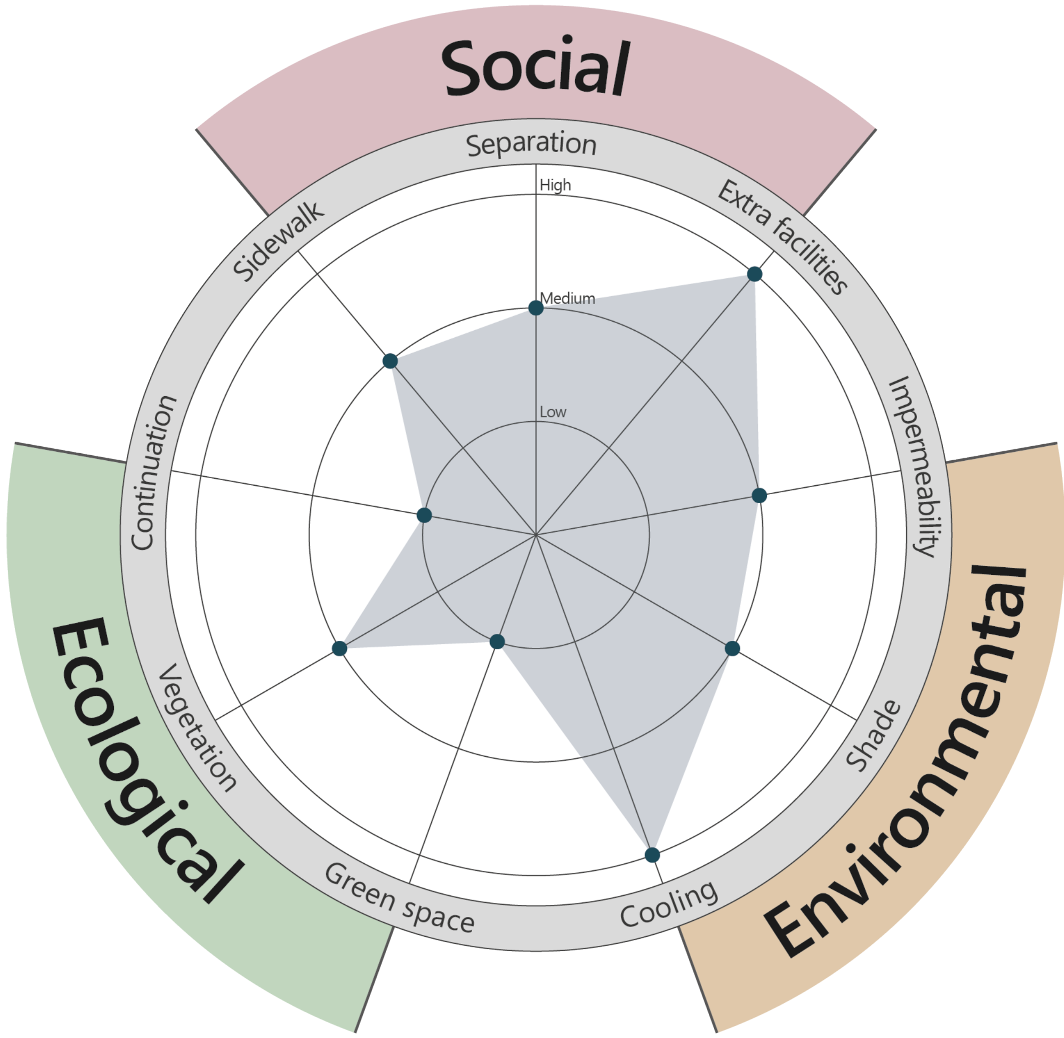


Figure 6.60. Grading diagram of street type 3. Made by Author.

Street type evaluation - Type 4

Figure 6.61. Image of a typical street with streetscape type 4. Made by Author.

Primary tools

PS Place with shade

FG Front gardens

Secondary tools

PF Public furniture

GF Green facades

ES Green in empty spaces

GR Green roofs

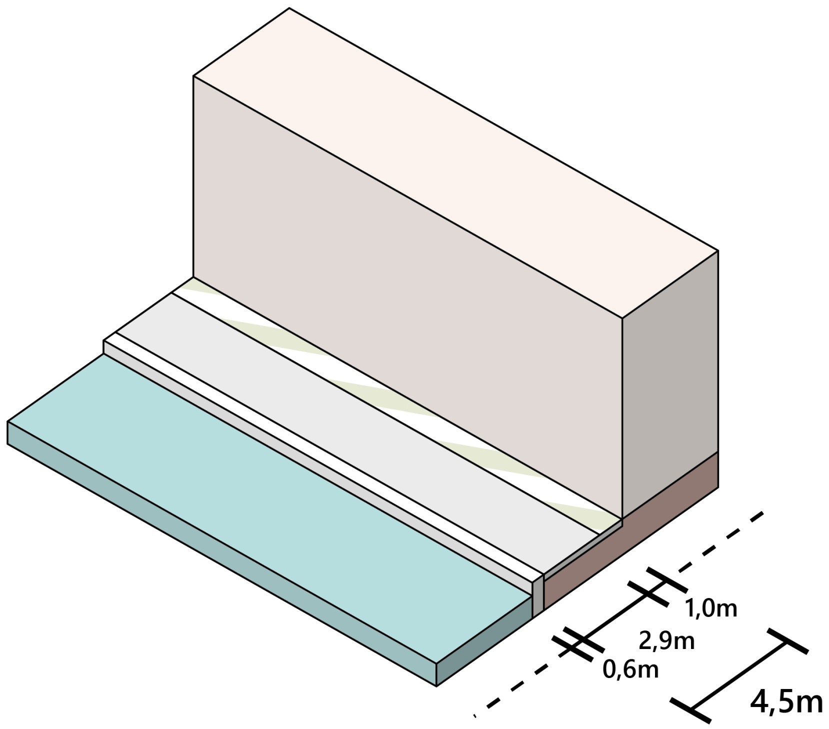


Figure 6.62. Axonometric street segment and potential interventions of type 4. Made by Author.

The final waterside street type is slightly different, as it is the only type that does not provide space for the car. Furthermore, the street width is significantly smaller than all other variants thus far – as well as it is the most narrow street type of all 12. As a result of the very limited street width, the potential development options are also limited.

Subsequently, most proposed interventions from the toolbox focus on improving the limited green quality that is already present. However, as these plants are privately owned, the interaction between the residents and developers is crucial to come to a successful redevelopment proposition.

As type 4 is a street without car access, it automatically scores relatively high in terms of the social criteria. However, the environmental score of this street type is significantly lower than all other street types that are next to the water's edge.

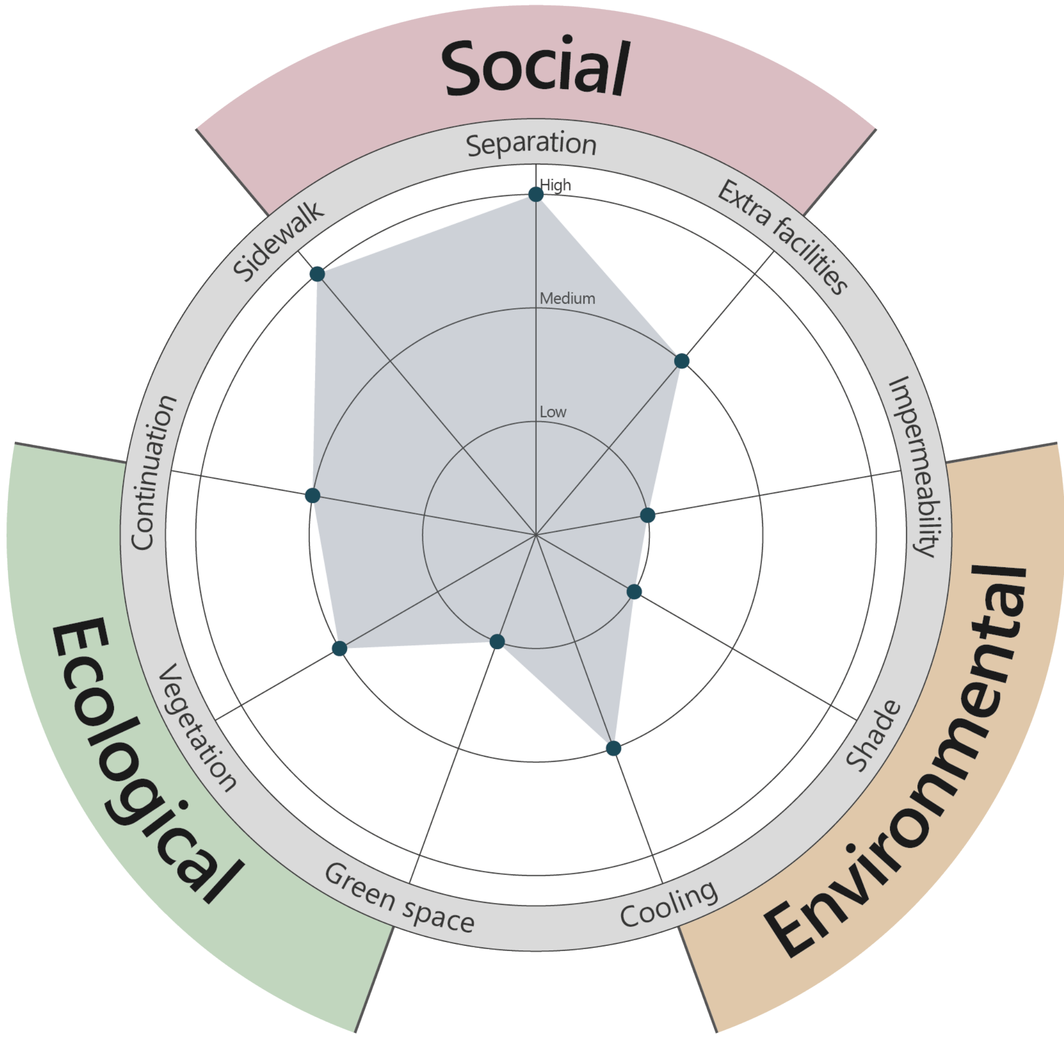


Figure 6.63. Grading diagram of street type 4. Made by Author.

Street type evaluation - Type 5a

Figure 6.64. Image of a typical street with streetscape type 5a. Made by Author.

Primary tools

- WS Widened sidewalk
- PP Permeable pavement
- GF Green facades
- ES Green in empty spaces
- GR Green roofs

Secondary tools

- SP Change street priority
- RT Row of trees
- FC Flowers (colourful)
- GS Green strip

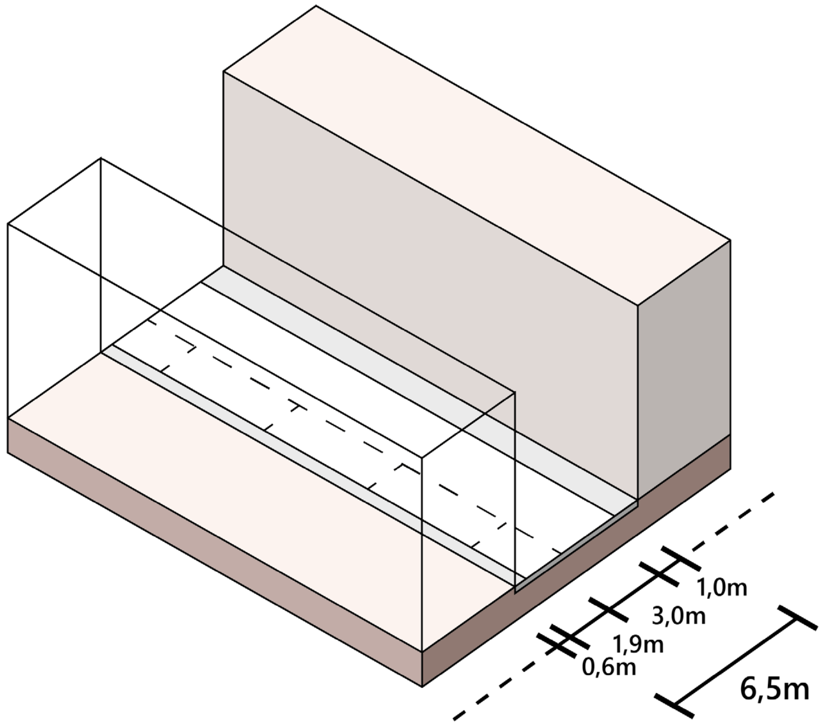


Figure 6.65. Axonometric street segment and potential interventions of type 5a. Made by Author.

6.5 Street scale

Street type 5a is the first of eight non-waterside street types in the inner city of Schiedam. As seen in figures 6.64 and 6.65, it is characterised by being completely paved with small sidewalks and no urban green. As a result, this street type scores quite low on all three domains. In fact, street type 5a has the worst overall score of all streets found within the inner city of Schiedam. As seen in figure 6.66, the only criteria where this streetscape does not score the minimal score possible is in shade, as it is quite a narrow street and therefore has some level of shade from the buildings.

As a result, this is a crucial street type to develop, as it functions as a social and ecological barrier. Furthermore, it faces several environmental concerns it currently is unable to deal with.

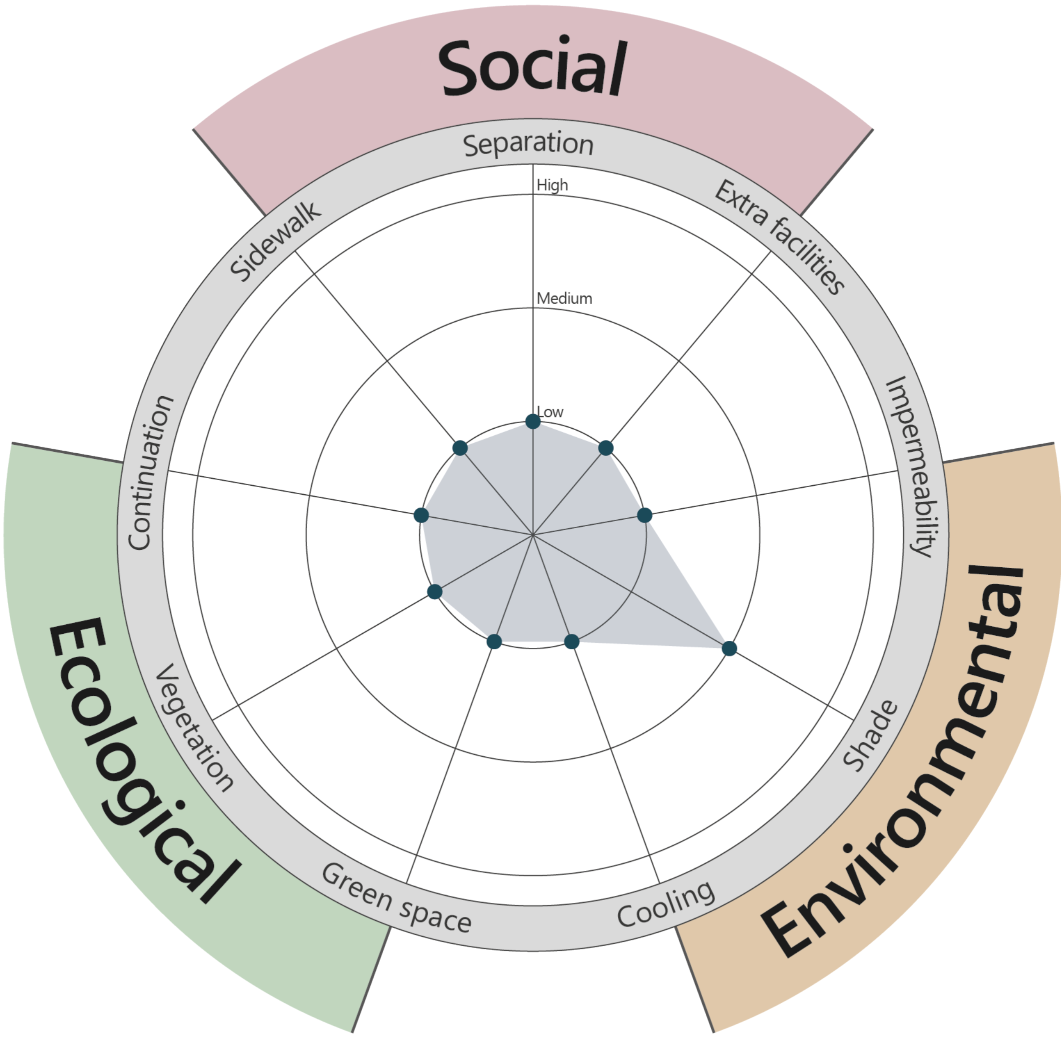


Figure 6.66. Grading diagram of street type 5a. Made by Author.

Street type evaluation - Type 5b

Figure 6.67. Image of a typical street with streetscape type 5b. Made by Author.

Primary tools

- WS Widened sidewalk
- PP Permeable pavement
- FG Front gardens
- ES Green in empty spaces
- DT Diversity at tree

Secondary tools

- SP Change street priority
- PS Place with shade
- GF Green facades
- GR Green roofs
- FC Flowers (colourful)
- GS Green strip

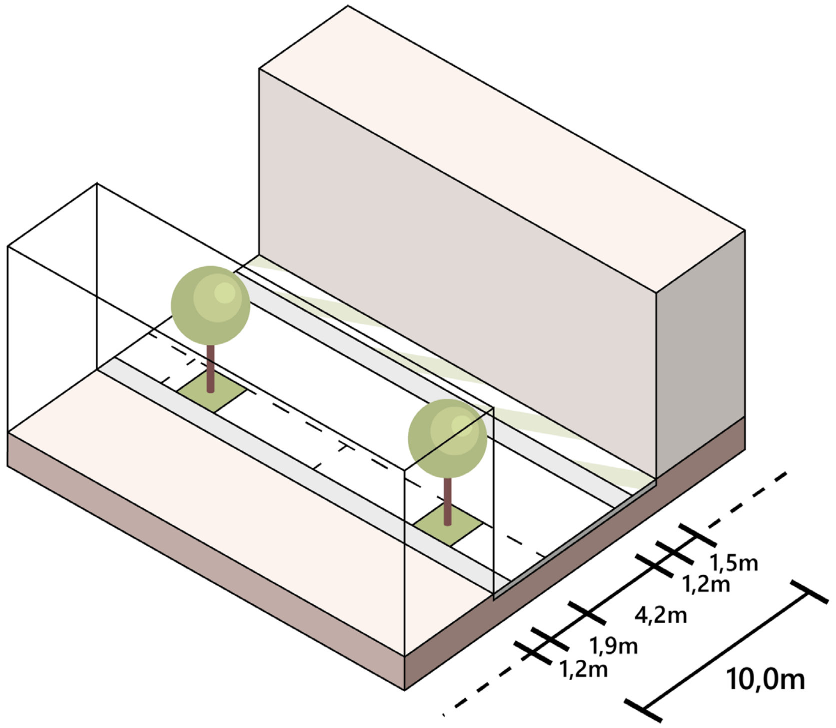


Figure 6.68. Axonometric street segment and potential interventions of type 5b. Made by Author.

Street type 5 is the first type that has the distinction a/b next to it, which is due to the similarities between the two in terms of character. However, type 5b does have some significant differences. First of all, type 5b has at least some level of vegetation in the means of a row of trees. Furthermore, there is a slight increase in both street and sidewalk width.

When looking at figure 6.69, it becomes clear that these slight changes already provide some significant improvements compared to type 5a. While the street scores relatively low in both the social and ecological domains, the environmental score is significantly higher.

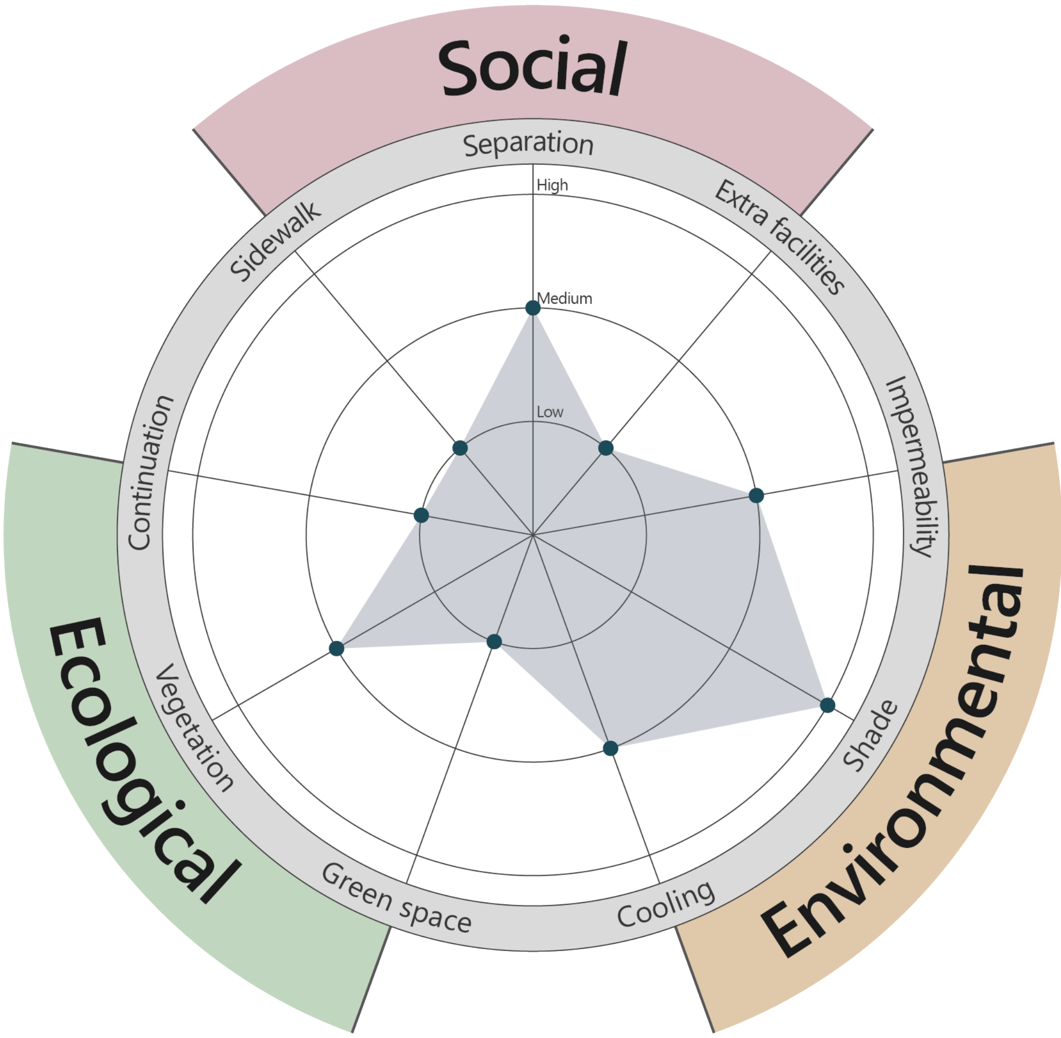


Figure 6.69. Grading diagram of street type 5b. Made by Author.

Street type evaluation - Type 6a

Figure 6.70. Image of a typical street with streetscape type 6a. Made by Author.

Primary tools

- PS Place with shade
- PP Permeable pavement
- ES Green in empty spaces
- GS Green strip

Secondary tools

- SP Change street priority
- SG Shared garden
- GF Green facades
- GR Green roofs
- RT Row of trees

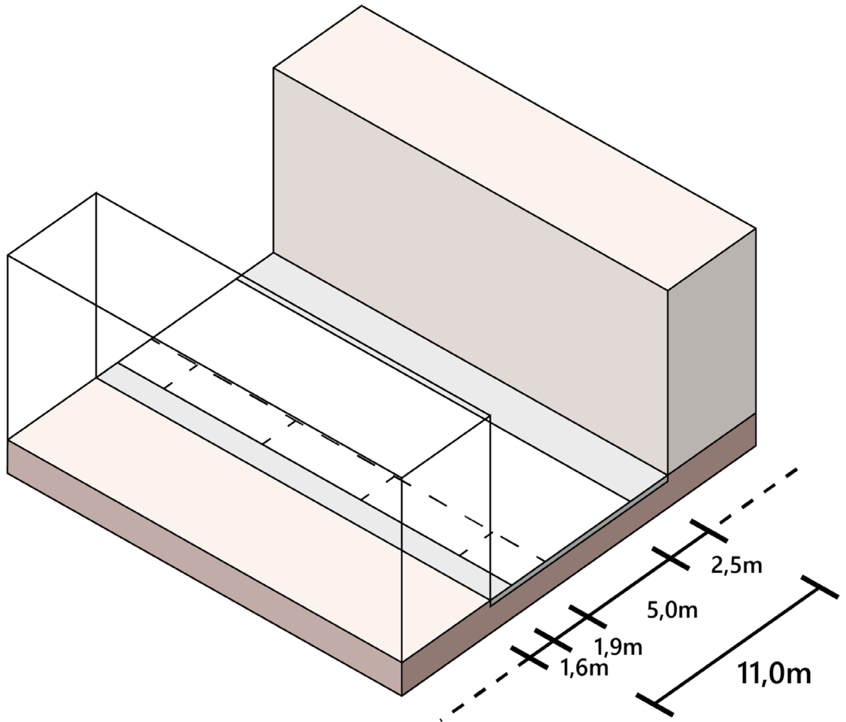


Figure 6.71. Axonometric street segment and potential interventions of type 6a. Made by Author.

Street type 6a can – in certain aspects – be seen as a wider version of type 5a. It again has little to no green facilities and permeability. However, an important distinction can be observed in the social dimension. Relatively wide sidewalks on both sides result in a more pleasant environment for pedestrians – even if it is still not ideal.

However, as type 6a contains no green or permeability, the scores of each environmental and ecological criteria are low, as seen in figure 6.72. Again, due to the better facilities for pedestrians, type 6a does score significantly higher here, but overall the score of this street type is still quite low.

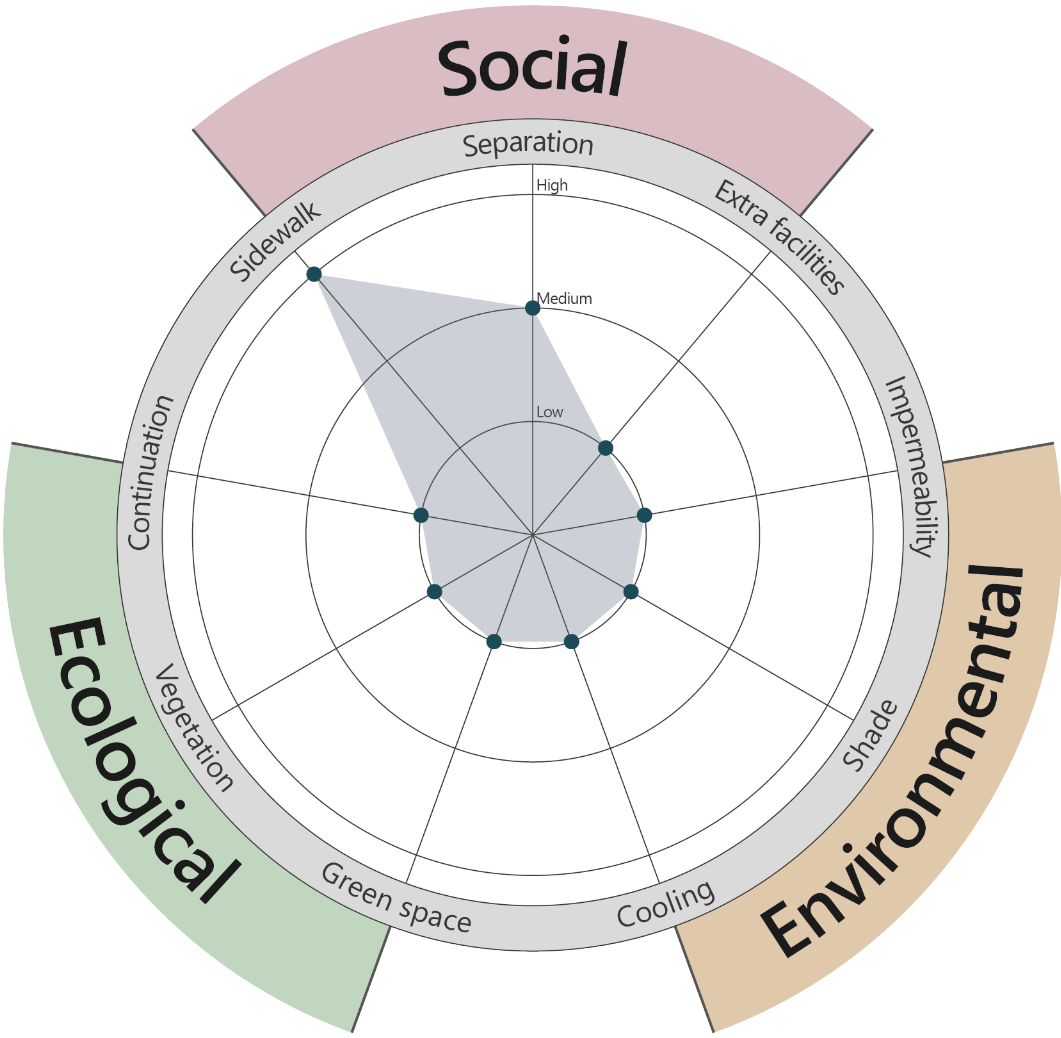


Figure 6.72. Grading diagram of street type 6a. Made by Author.

Street type evaluation - Type 6b

Figure 6.73. Image of a typical street with streetscape type 6b. Made by Author.

Primary tools

- PS Place with shade
- MP Maximise patch
- ES Green in empty spaces
- DT Diversity at tree
- GS Green strip

Secondary tools

- SG Shared garden
- PP Permeable pavement
- FG Front garden
- GR Green roofs

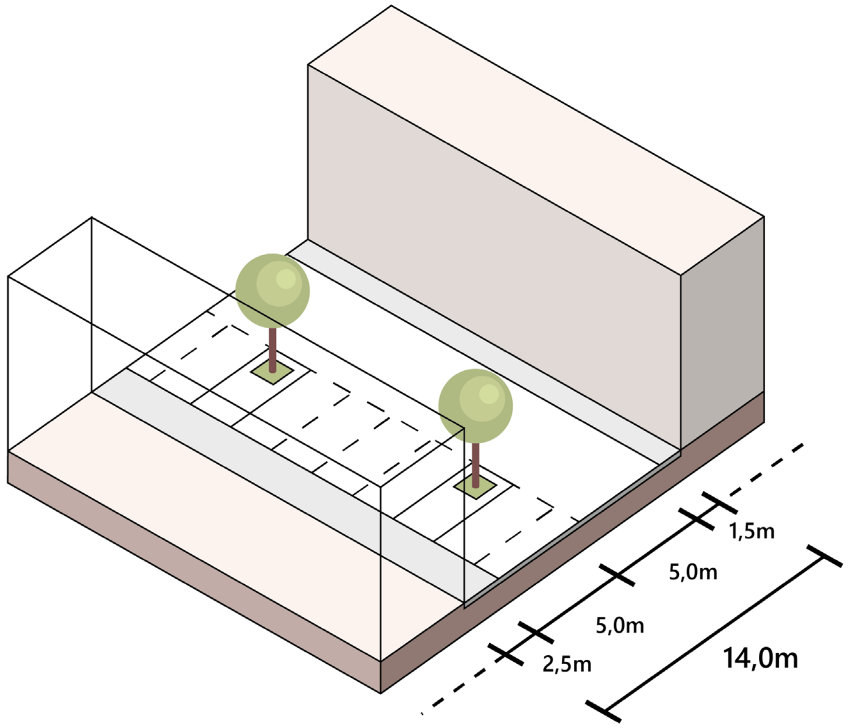


Figure 6.74. Axonometric street segment and potential interventions of type 6b. Made by Author.

Street type 6b again sees a lot of similarities with type 6a, however – similar to 5a/b – one of the critical distinctions between the two is the addition of trees. The addition of these trees provides some level of environmental and ecological quality, which is reflected in the grading diagram found in figure 6.75.

The street has seen significant improvements in both the environmental and ecological criteria, while the same social score was achieved. This again indicates how little changes can already have a certain level of impact. However, in terms of ecology, street type 6b still scores insufficiently overall.

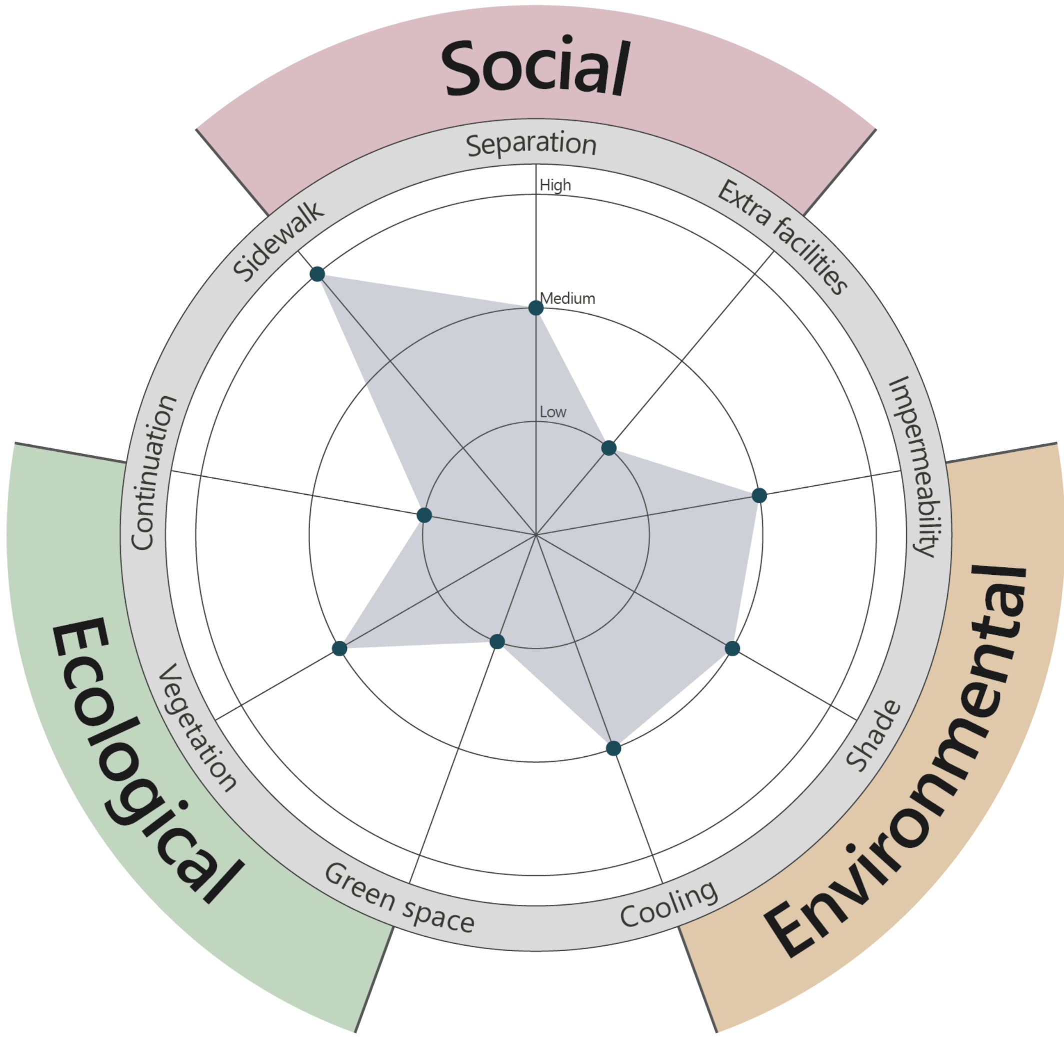


Figure 6.75. Grading diagram of street type 6b. Made by Author.

Street type evaluation - Type 7

Figure 6.76. Image of a typical street with streetscape type 7. Made by Author.

Primary tools

PF Public furniture

PS Place with shade

ES Green in empty spaces

RT Row of trees

GS Green strip

Secondary tools

SG Shared garden

PP Permeable pavement

GR Green roofs

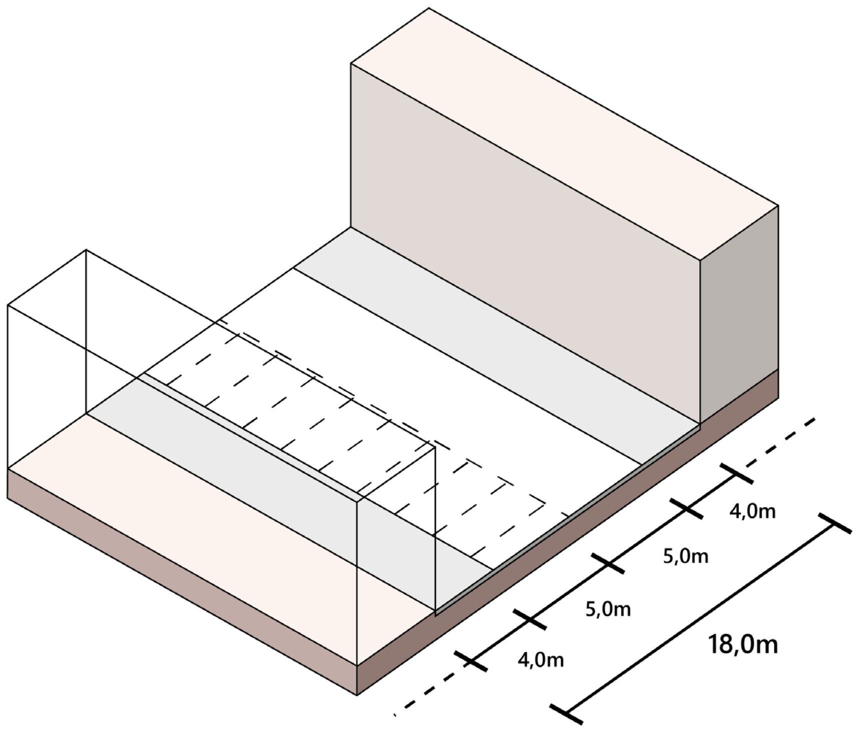


Figure 6.77. Axonometric street segment and potential interventions of type 7. Made by Author.

Street type 7 – together with type 8 – are the two least common street types in the inner city of Schiedam. For each, only one to a few streets have this specific street type. Street type 7 is characterised by having very wide sidewalks with some public furniture. Furthermore, some social functions are located here, namely a mosque. As a result, the social score of this street type is relatively high.

In terms of the environmental and ecological conditions, the scores are significantly lower, as this very wide street character has limited green. The trees have a significantly further distance away from each other, as well as them already have to 'cover' a significantly larger area due to the large street width. As a result, both environmental and ecological criteria score quite low.

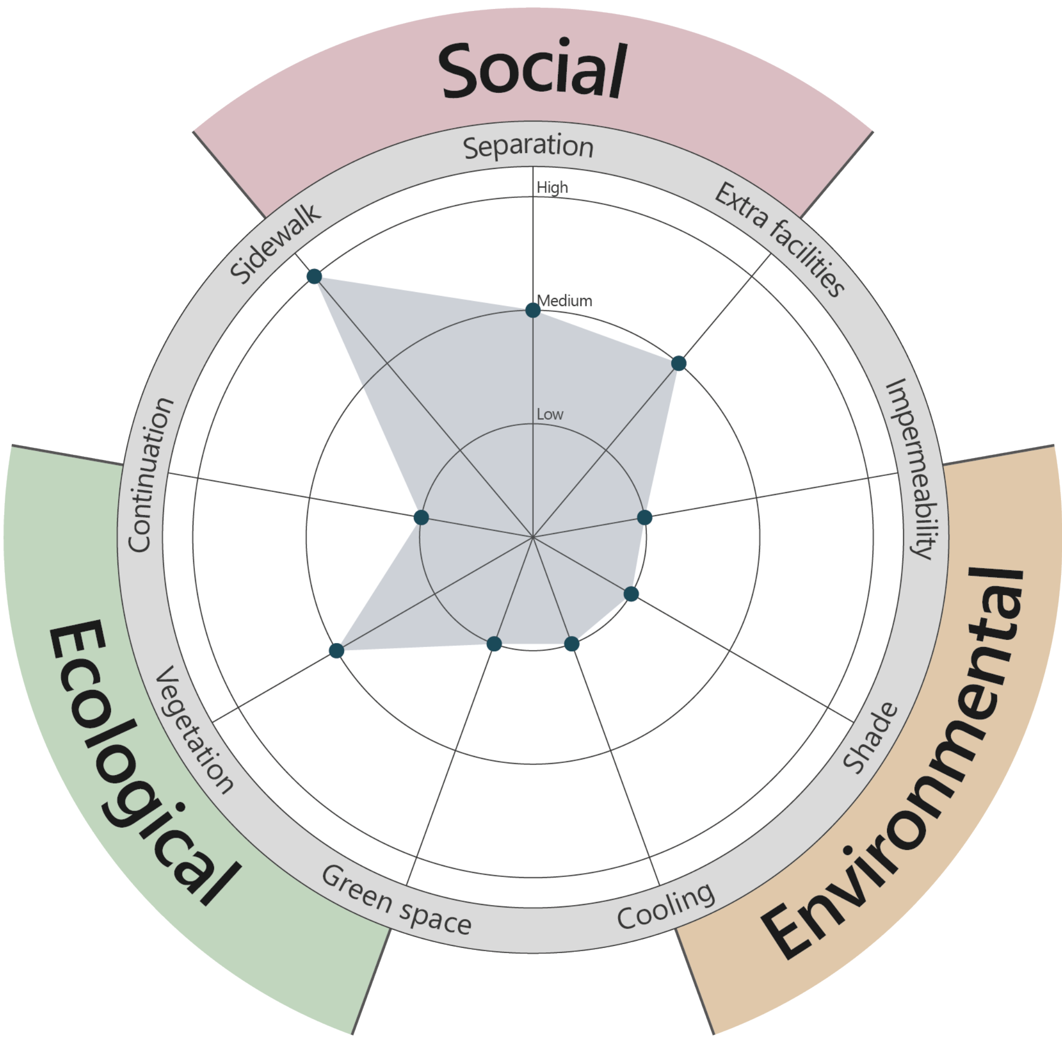


Figure 6.78. Grading diagram of street type 7. Made by Author.

Street type evaluation - Type 8

Figure 6.79. Image of a typical street with streetscape type 8. Made by Author.

Primary tools

Secondary tools

PF Public furniture

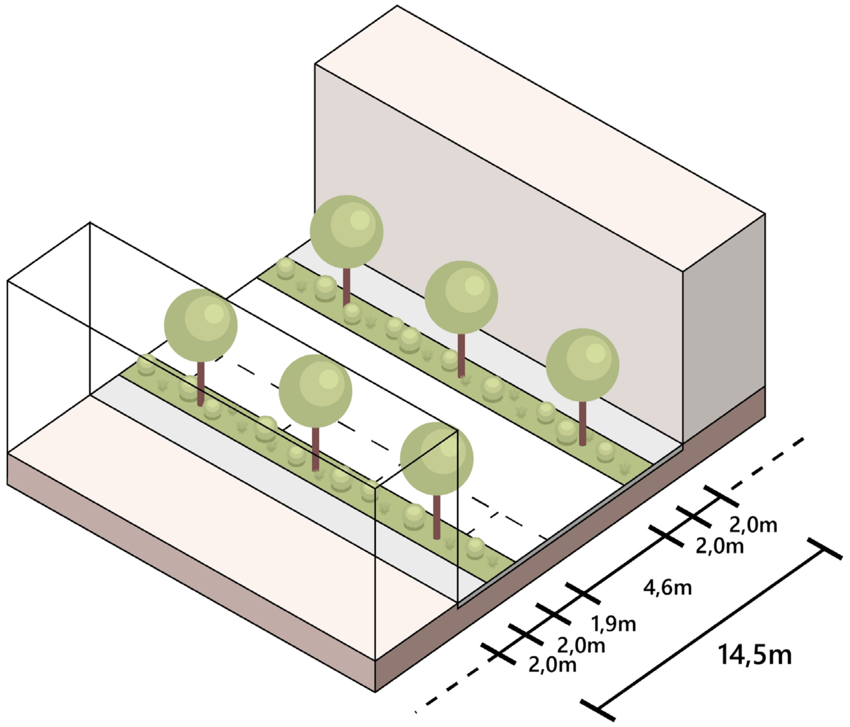


Figure 6.80. Axonometric street segment and potential interventions of type 8. Made by Author.

6.5 Street scale

As said before, street type 8 is also quite rare – there is only one street with these characteristics. However, this street also is the highest performing streetscape of all 12 street types. On both sides of the street a green strip can be found that, in combination with the trees, provides several environmental and ecological benefits – reflected in the grading diagram of figure 6.81.

As a result, this is the only street type that does not have such an urgency for streetscape redevelopment, as it already provides relatively good facilities in all three domains.

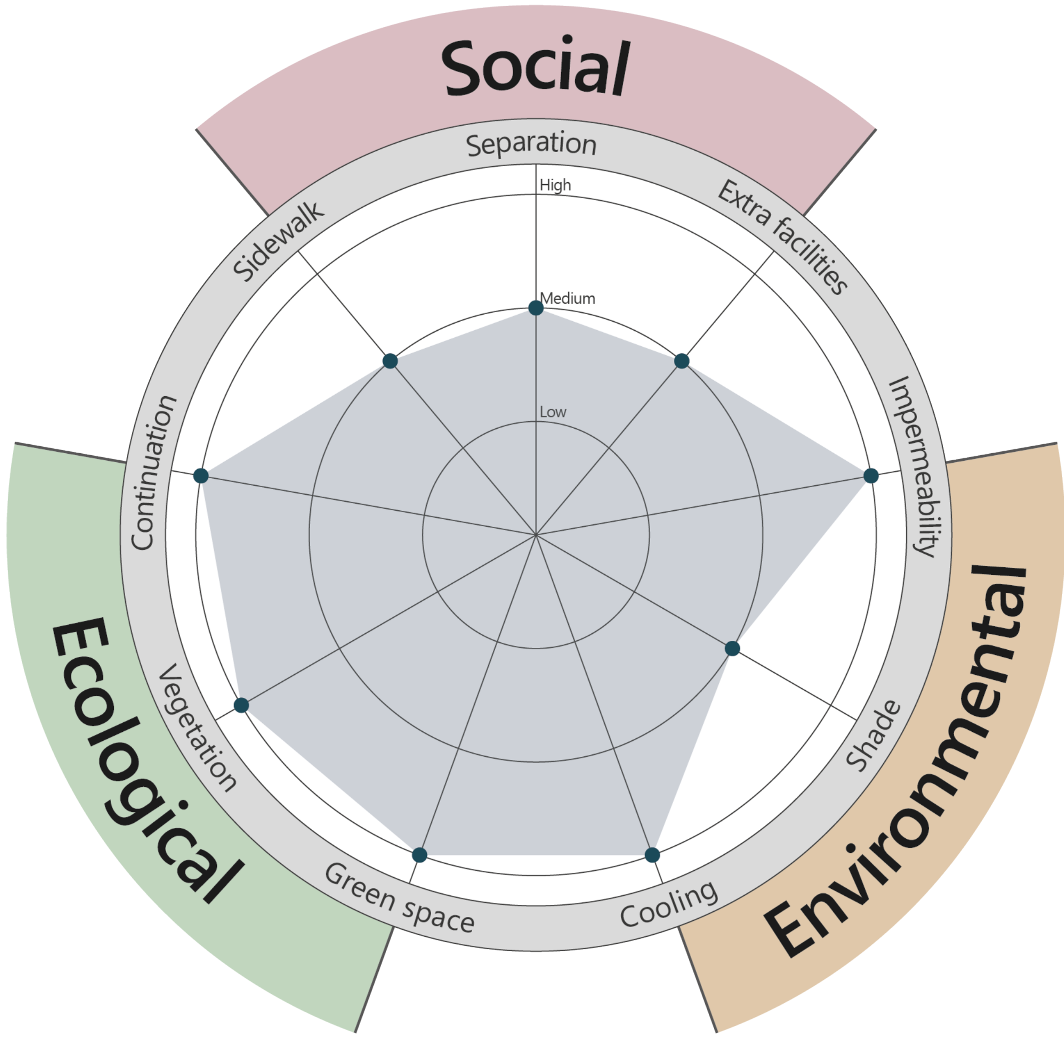


Figure 6.81. Grading diagram of street type 8. Made by Author.

Street type evaluation - Type 9a

Figure 6.82. Image of a typical street with streetscape type 9a. Made by Author.

Primary tools

- ES Green in empty spaces
- GR Green roofs
- RT Row of trees

Secondary tools

- PS Place with shade
- PP Permeable pavement
- GF Green facades
- FC Flowers (colourful)
- GS Green strip

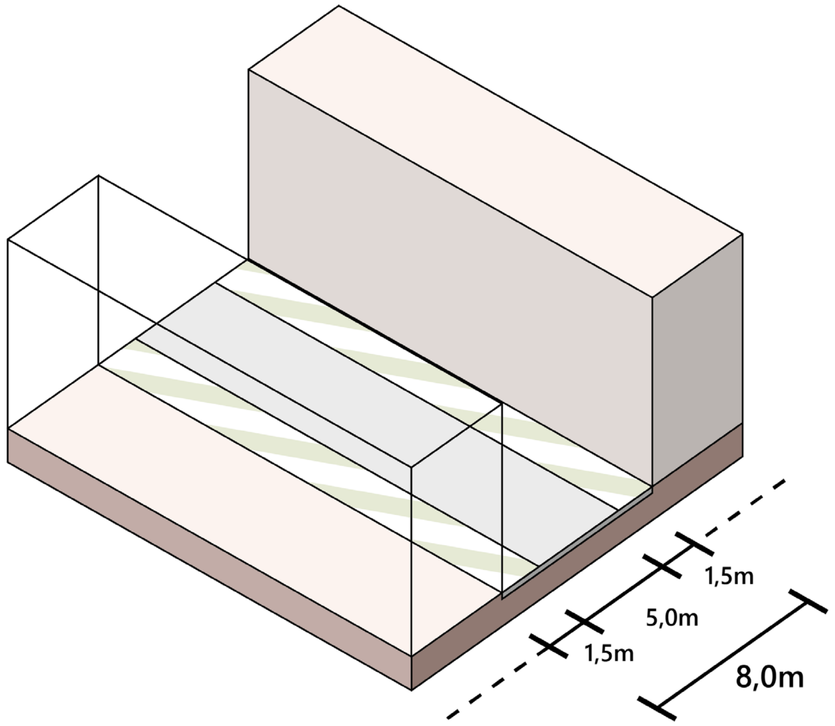


Figure 6.83. Axonometric street segment and potential interventions of type 9a. Made by Author.

Street type 9a, as well as 9b, are both streets without car access, as can be seen in figure 6.82. As a result, the social scores are generally quite high. Furthermore, this street type is characterised by having shops on both sides, which increases its social potential even further.

However, similar to type 7, the lack of urban green results in a low score in both the environmental and ecological domains.

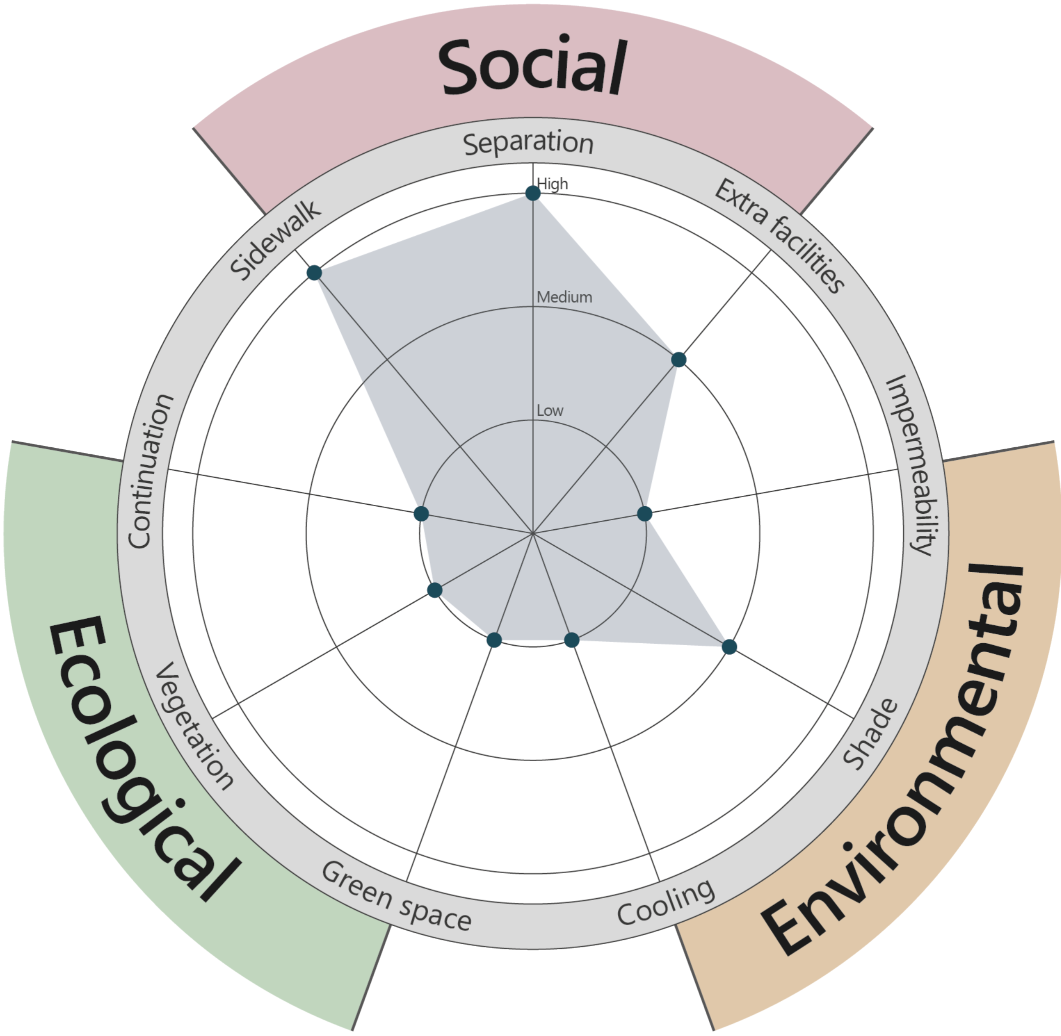


Figure 6.84. Grading diagram of street type 9a. Made by Author.

Street type evaluation - Type 9b

Figure 6.85. Image of a typical street with streetscape type 9b. Made by Author.

Primary tools

- PF Public furniture
- MP Maximise patches
- DT Diversity at tree
- GS Green strip

Secondary tools

- PP Permeable pavement
- GF Green facades
- GR Green roofs
- FC Flowers (colourful)

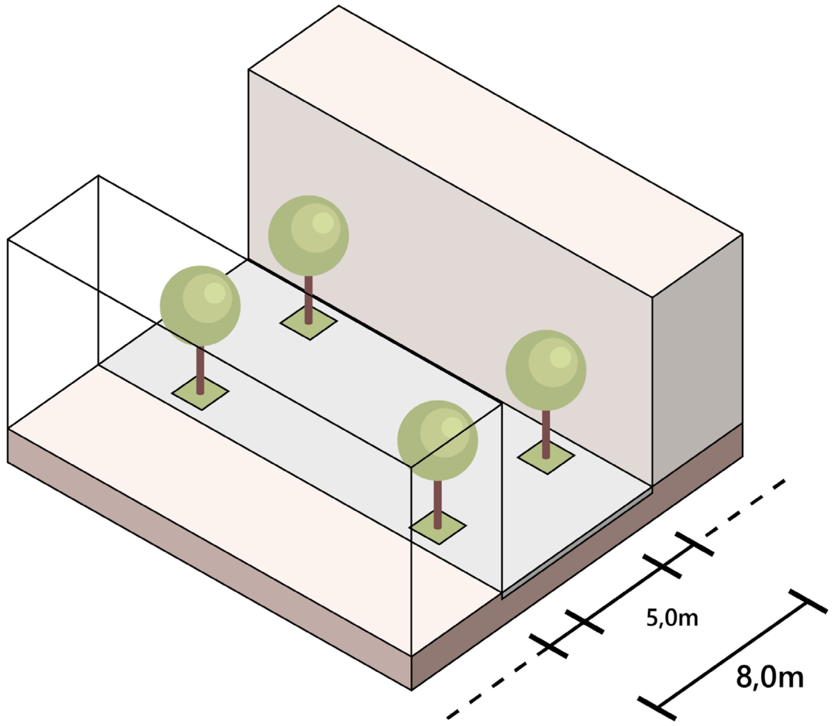


Figure 6.86. Axonometric street segment and potential interventions of type 9b. Made by Author.

Lastly, street type 9b is again a street without cars. Compared to type 9a, it scores significantly higher in both the environmental and ecological domains, mainly due to the addition of the trees. However, the street still scores relatively low in terms of ecological quality.

Furthermore, an important distinction between type 9a and 9b is the ground-level functions. While 9a mostly houses shops and cafes, type 9b has less of a commercially driven focus. As a result, the empty space on each side is used quite regularly for bicycle parking, as seen in figure 6.85.

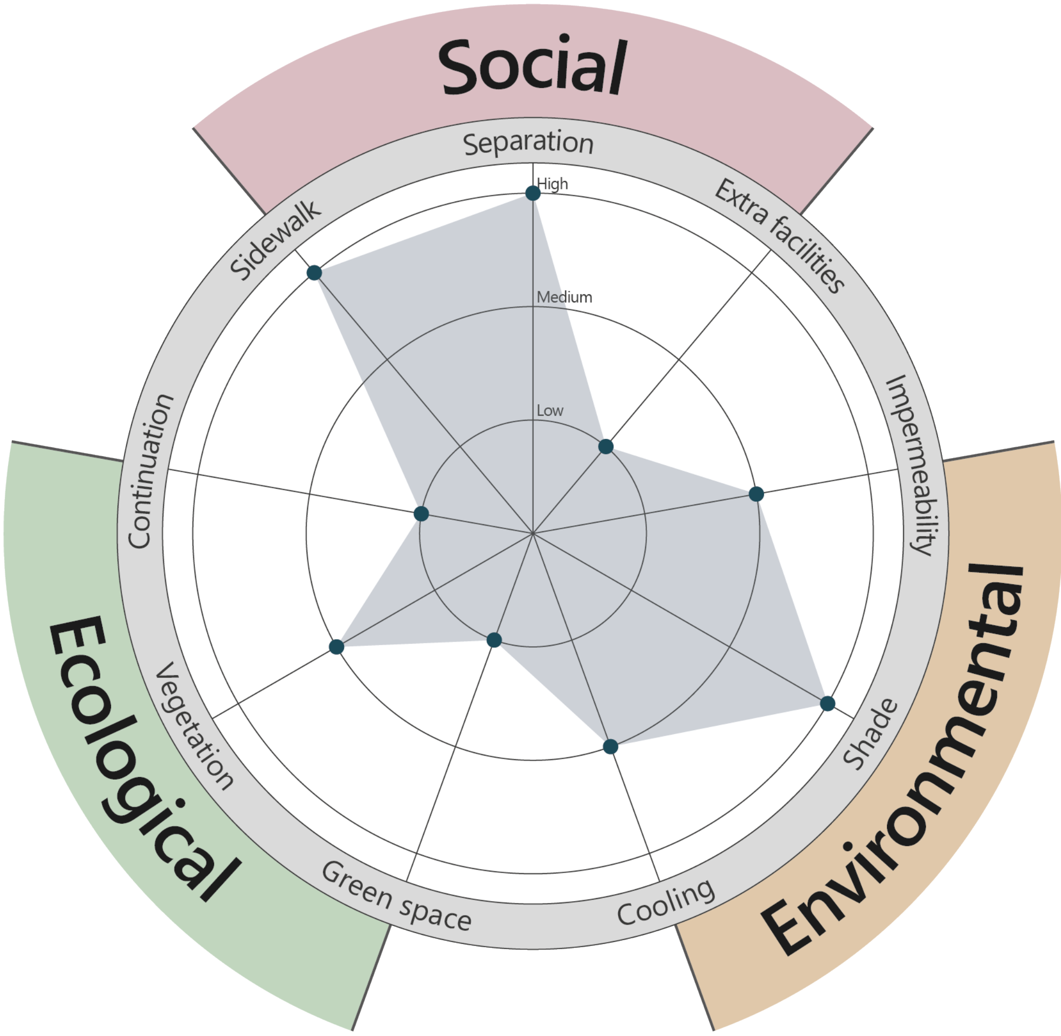


Figure 6.87. Grading diagram of street type 9b. Made by Author.

Combined evaluation

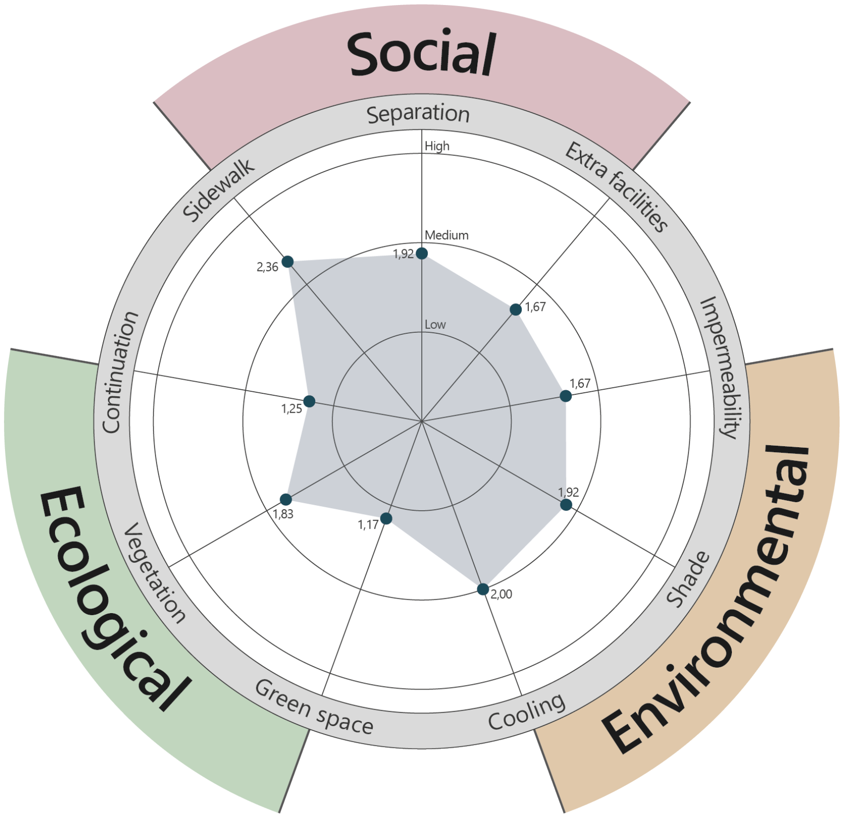


Figure 6.88. Combined grading diagram. Made by Author.

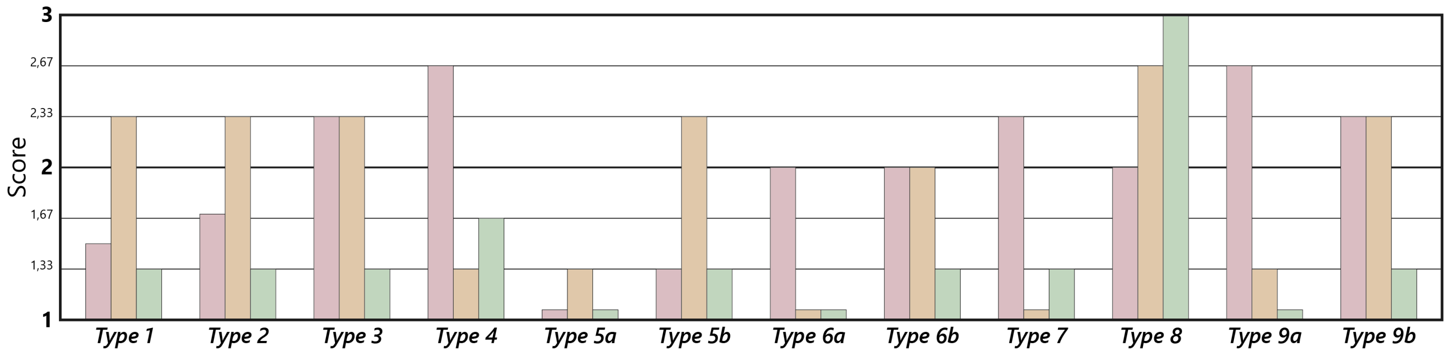


Figure 6.89. Graph showing final scores in each domain. Made by Author.

As seen in figure 6.88, the street types of the inner city scored the lowest on the criteria of green space, with a combined score of 1,17 – only 0,17 away from the minimum score of 1. Furthermore, ecology, in general, scored the lowest, as it contains both the worst and second-worst scores. The best-combined score was on the criteria of sidewalks, with a score of 2,36. Furthermore, the social domain also scored the highest in general.

However, the general scoring of all three domains is quite low. Only 2 of the 9 criteria have reached a score of 'Medium' or higher. All others fall in the category of 'Low' to 'Medium'. When looking at the specific scores of each type, as seen in figure 6.89, it becomes clear how the combined scores are quite low. Only 1 out of the 12 street types managed to score a 2 or higher in all three domains, which is type 8.

For the social and environmental domains, a lot of fluctuation can be seen between the different street types. For example, in the environmental domain, 6 street types have a score of 2 or higher, while the other 6 all have a score of 1,33 or 1. Lastly, the worst-performing street is type 5, as it is the only street type without any domain reaching a score of 2.

6.5.5 Street development simulation

Figure 6.90. Image of streetscape Houtstraat. Made by Author.

Figure 6.91. Location of Houtstraat in context example 2. Made by Author.

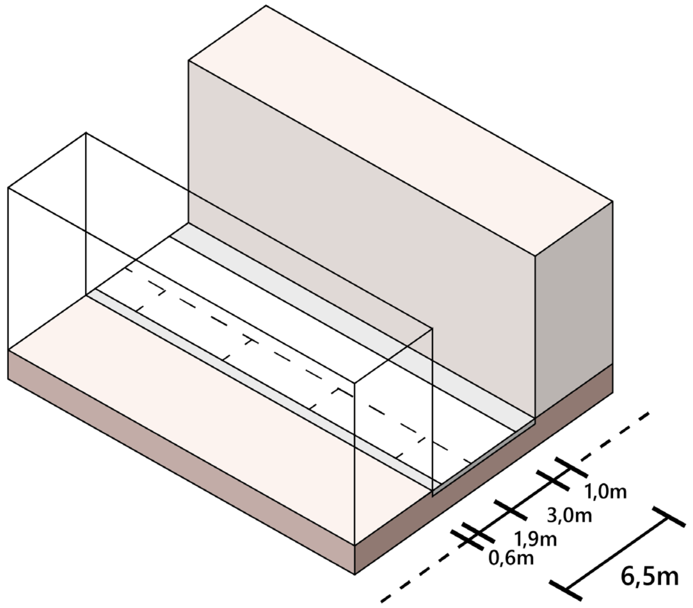


Figure 6.92. Axonometric street segment of type 5 (Houtstraat). Made by Author.

As stated on the previous page, type 5a currently is the worst performing street type in the inner city of Schiedam. An example of this street type is the Houtstraat, shown in figure 6.90. In fact, the Houtstraat might be the most restricted variant of type 5a, as it is the only street (5a) without any parking space to potentially work with during the redevelopment. As a result, very limited space is available to work with in an already pretty restricted street type. Therefore it is essential to demonstrate how such a street can still be redeveloped by using the toolbox provided in chapter 6.5.3.

As seen in figure 6.91, the Houtstraat is also the same street that connects the central station of Schiedam with the main square, as was explained in 6.3.3. As a result, this street must be redeveloped to facilitate this flow of people safely and comfortably. Furthermore, the street currently provides no space for biodiversity and severely underperforms in almost all environmental criteria.

Existing situation

Figure 6.93. Impression of streetscape existing situation. Made by Author.

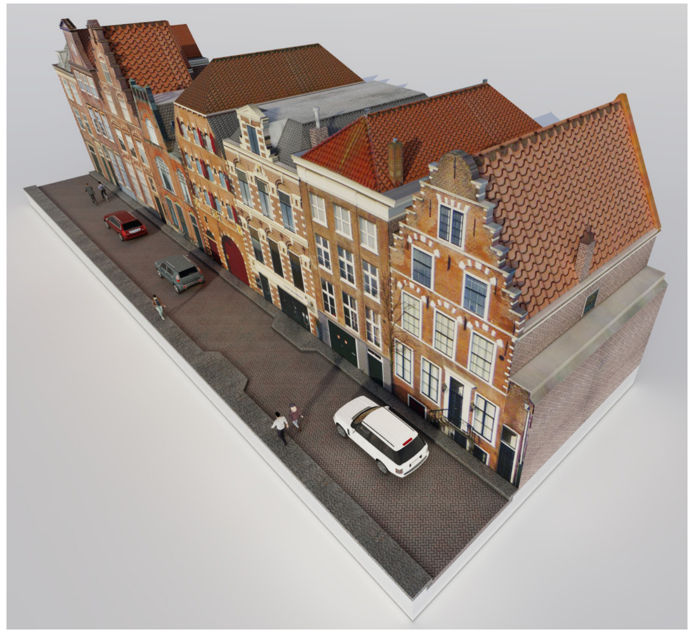


Figure 6.94. Axonometric street segment of existing situation. Made by Author.

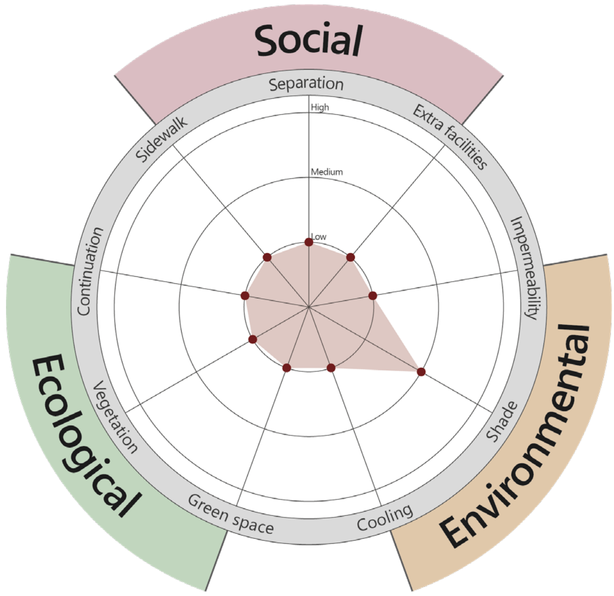


Figure 6.95. Evaluation of existing situation. Made by Author.

Figures 6.93 and 6.94 provide a better overview of the existing situation of the Houtstraat. As can be seen from both figures, the street is car-dominated and completely paved without any green. As a result, pedestrians have to walk partly on the road, leading to dangerous situations. Furthermore, some residential buildings are found on this street, with residents having to step straight onto the road when leaving their houses.

This, in combination with no vegetation, has led to the evaluation diagram shown in figure 6.95. The Houtstraat has the lowest score on every criterion except shade, as it is a narrow street in which the buildings can provide some shade.

In total, three development alternatives will be realised to show the potential implications of the intervention toolbox, each being more radical/drastic than the previous.

Alternative 1 - Minimalist

Figure 6.96. Impression of streetscape alternative 1. Made by Author.

Figure 6.97. Axonometric street segment of alternative 1. Made by Author.

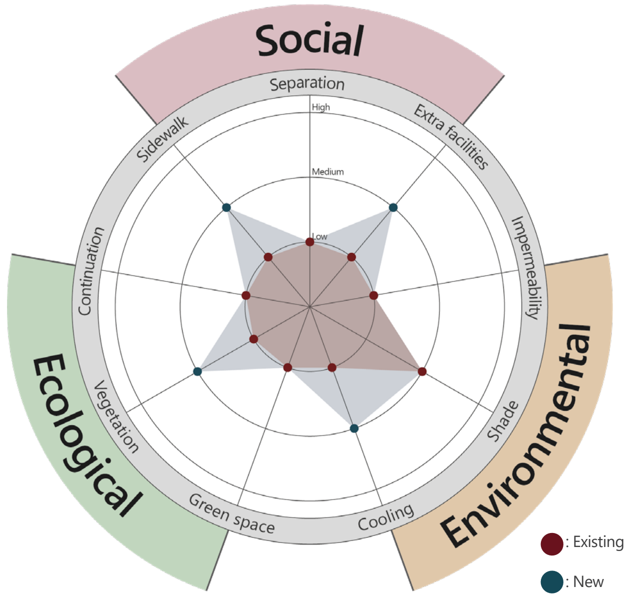


Figure 6.98. Evaluation of alternative 1. Made by Author.

The first alternative focuses on using tools from the intervention toolbox that are the least intrusive. As seen from figures 6.96 and 6.97, the changes are limited. In total, three tools have been used. First, the sidewalk is widened by reducing the width of the car lane to try and better accommodate the flow of people going through.

Next, two tools are used to provide some level of nature, (almost) without taking any ground space away. While these do not provide any permeable or green surfaces, they do provide some environmental and ecological quality, as seen in figure 6.98.

This minimalist redevelopment approach has already increased the scores of four criteria, with now over half being at a score of 2.

While the overall evaluation still is not that high, the goal of this alternative is to show how very little overall change can already have some significant impact. This could, for example, be the first step in a longer redevelopment process.

Alternative 2 - Street priority

Figure 6.99. Impression of streetscape alternative 2. Made by Author.

Figure 6.100. Axonometric street segment of alternative 2. Made by Author.

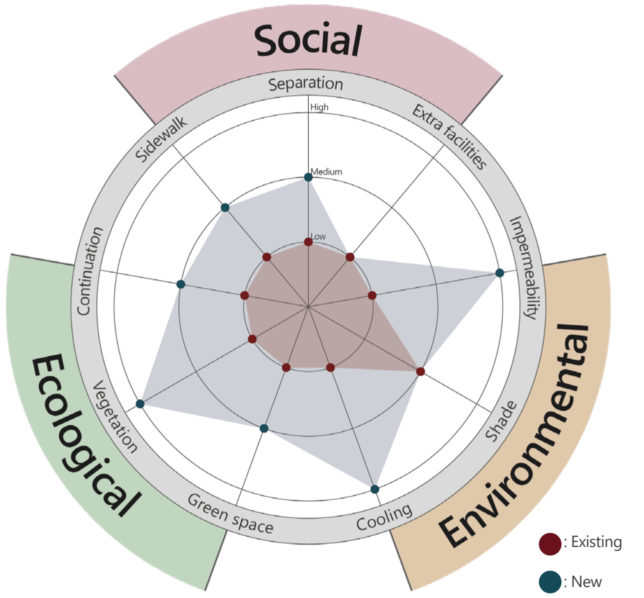


Figure 6.101. Evaluation of alternative 2. Made by Author.

The second alternative focuses on still providing accessibility to car users, however, this time while changing the street priority. As seen in figures 6.99 and 6.100, the car road now has multiple small bends, forcing car users to slow down. Furthermore, the width of the car road has again been reduced. Permeable pavement has also been implemented in the parts of the street that are changed.

Lastly, the space alongside certain portions of the sidewalk has been filled with a semi-continued green strip. This strip provides some green surface area to the streetscape, more diverse vegetation, and a level of separation between the car and pedestrians. Important to note is that the tools of alternative 1 – green facades and flowers – could have also been utilised in this alternative, however, to prevent repetition and better showcase the different tools, this has not been done.

Ultimately, the four tools used in alternative 2 have led to the new evaluation found in figure 6.101. Almost all criteria are now at a 'Medium' or higher, with only 1 'Low' criteria left. This indicates that car accessibility does not have to be removed here to improve the social, environmental, and ecological conditions.

Alternative 3 - Most radical

Figure 6.102. Impression of streetscape alternative 3. Made by Author.

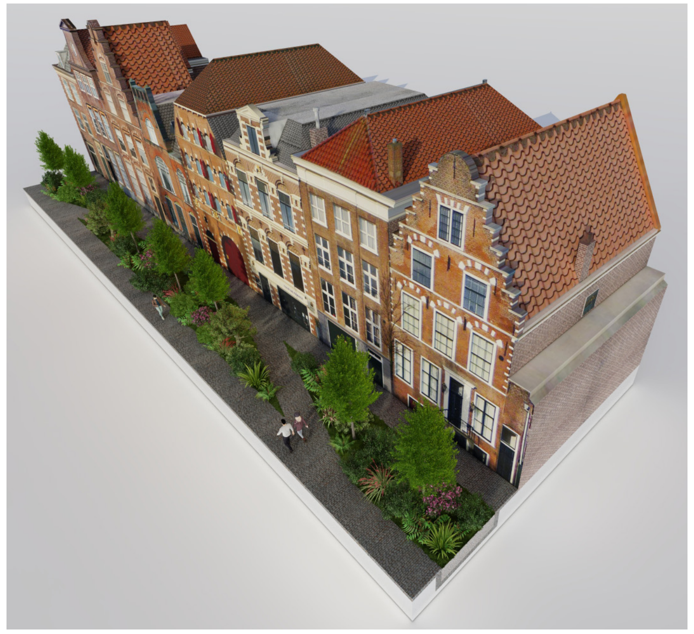


Figure 6.103. Axonometric street segment of alternative 3. Made by Author.

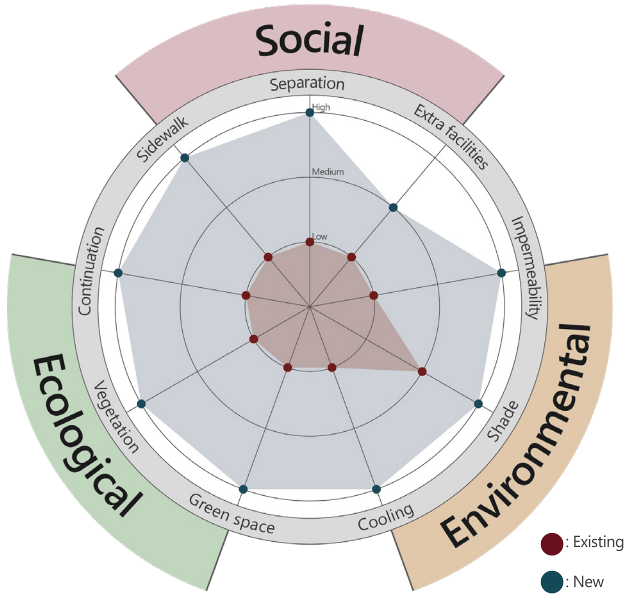


Figure 6.104. Evaluation of alternative 3. Made by Author.

Lastly, alternative three is the most radical. It completely removes the car and focuses on creating a green atmosphere that is beneficial for both humans and other species. The level of 'interpretation' embedded in the toolbox is best shown here. For example, the 'Change street priority' tool has been used significantly different here than in alternative two, done to showcase how tools can adaptively be used to fit the specific goals and restrictions of each development.

As can be seen in figure 6.104, this redevelopment scores higher than the original on every single criterion. Furthermore, it has reached the highest score on 8 out of 9 criteria. This illustrates that, while it is a radical approach, it also provides substantial benefits. In the actual development of streets, it is essential to establish what components of the existing situation – both function and spatial – need to be maintained to determine the level of radicality the development can have.

7 EVOLUTIONARY FRAMEWORK

This chapter will provide an overview of how the design proposal of chapter 6 can actually be operalised. By focusing on defining a few key development phases, chapter 7 aims to create a better understanding of the most - and less - urgent developments that will take place in the future. Furthermore the issue of vacancy will be further discussed here, as it will require an evolutionary approach. Lastly, the issue of finances will be briefly discussed.

7.1 Phasing

7.1.1 Initiation phase

PHASE 1

5 years

INITIATION

- Pocket park focused
- >50% of all realised
- Equal type distribution
- Fair spatial distribution
- Connect to regional network
- Plant nature on unused patches

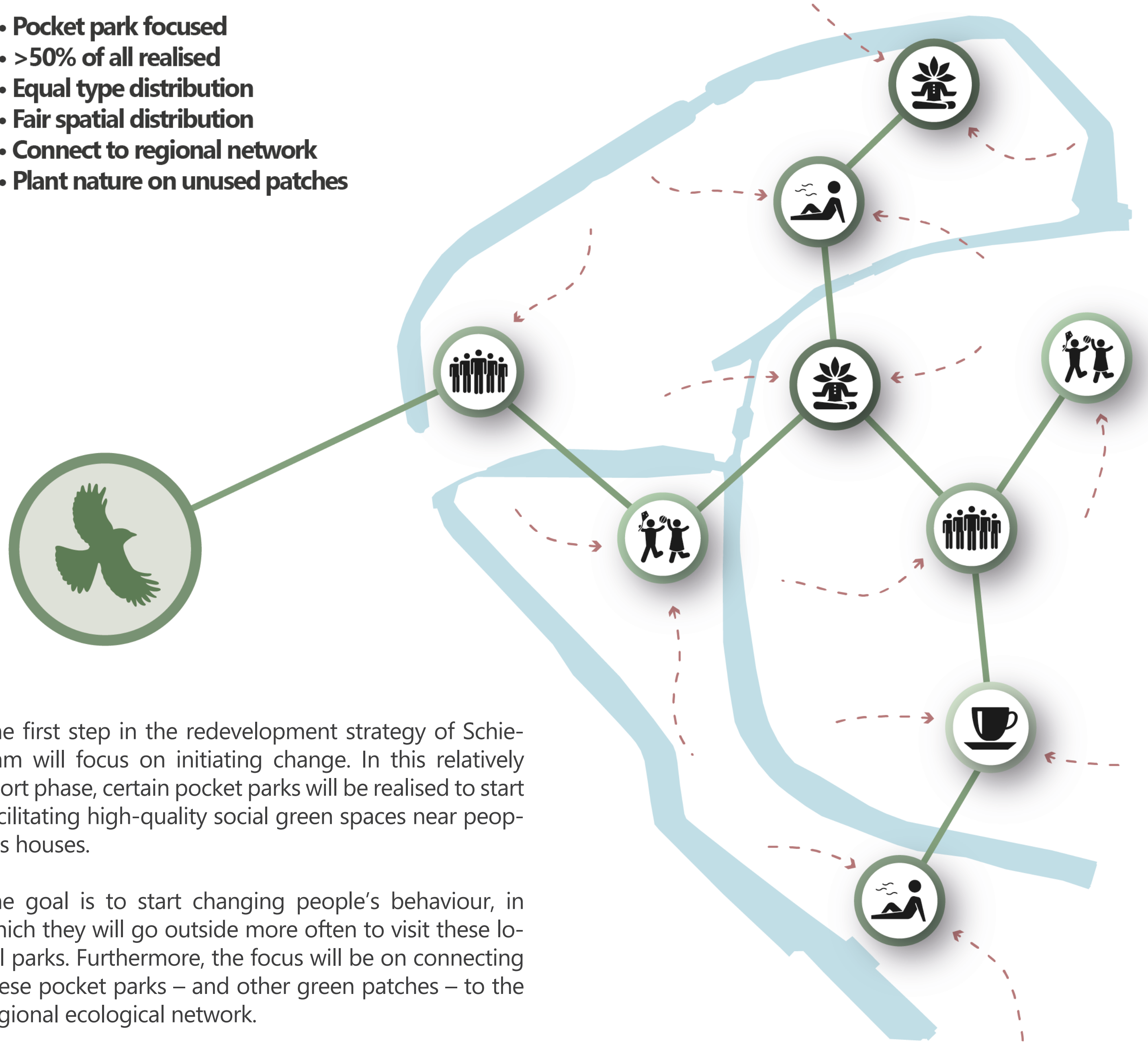


Figure 7.1. Abstract overview map of main goals of phase 1. Made by Author.

The first step in the redevelopment strategy of Schiedam will focus on initiating change. In this relatively short phase, certain pocket parks will be realised to start facilitating high-quality social green spaces near people's houses.

The goal is to start changing people's behaviour, in which they will go outside more often to visit these local parks. Furthermore, the focus will be on connecting these pocket parks – and other green patches – to the regional ecological network.

As nature needs a long time to grow, it is essential to start planting diverse green in specific areas to start creating this local ecological network. In this, the pocket parks will also play an important role.

Streetscape development has not yet started here, which is done for a reason. Without diverse social spaces to go to, people will still not use the streets that much more often, even with redevelopment. As a result, it is crucial to first realise 'the destination' in order for 'the connections' to have a clear purpose. This also clearly dictates the hierarchy – the pocket parks are the core of this development strategy and are most crucial for this project to succeed. Ultimately, a success criterion of this project is that every resident of the inner city has access to the pocket parks within a 5-minute radius.

7.1 Phasing

7.1.2 Pedestrianisation phase

PHASE 2

5 years

PEDESTRIANISATION

- Improve most critical/potential streetscapes
- Create pedestrian friendly network
- Connect pocket parks to this network
- Equal access to all
- Improve ecological connections (corridors)

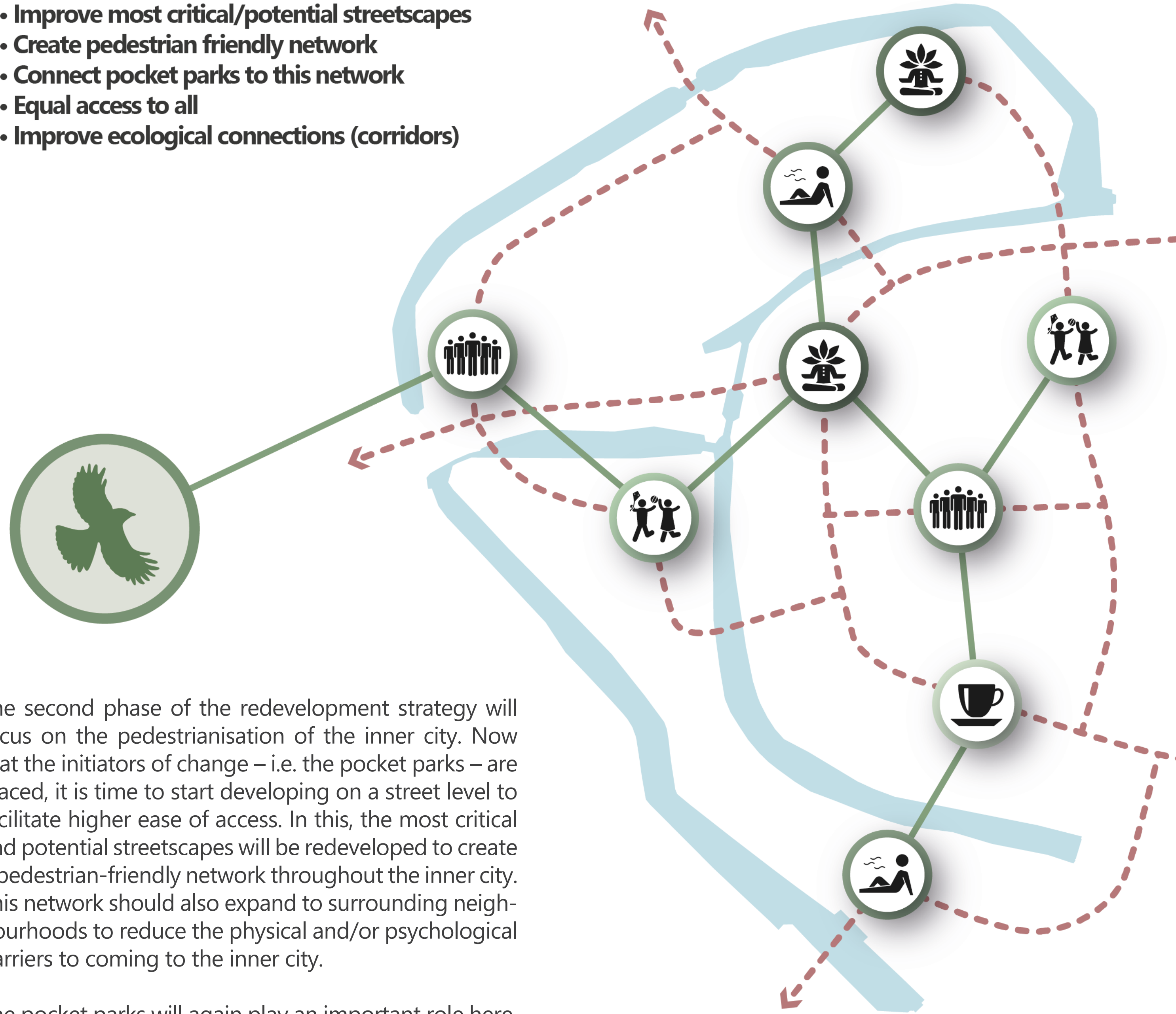


Figure 7.2. Abstract overview map of main goals of phase 2. Made by Author.

The second phase of the redevelopment strategy will focus on the pedestrianisation of the inner city. Now that the initiators of change – i.e. the pocket parks – are placed, it is time to start developing on a street level to facilitate higher ease of access. In this, the most critical and potential streetscapes will be redeveloped to create a pedestrian-friendly network throughout the inner city. This network should also expand to surrounding neighbourhoods to reduce the physical and/or psychological barriers to coming to the inner city.

The pocket parks will again play an important role here, as they will become the nodes of ecological and social connections. Careful considerations should be made though with the parks with a calm nature, meaning it should not get too busy there.

The streetscape development is less essential overall – meaning not each has to be fully redeveloped for this project to succeed. On the contrary, the focus should be on relieving the stress of the most critical cases and improving streets that are deemed most beneficial.

In terms of ecology, streets connecting two ecological patches are the priority to improve. For the social dimension, the aim is to create a social network – a continuous network of pedestrian-friendly streets connecting pocket parks and other important social locations. Lastly, the environmental quality aims to reach a situation where the microclimate and permeability are improved, which should be done concurrently with other developments – i.e. social/ecological and renovations.

7.1.3 Development phase

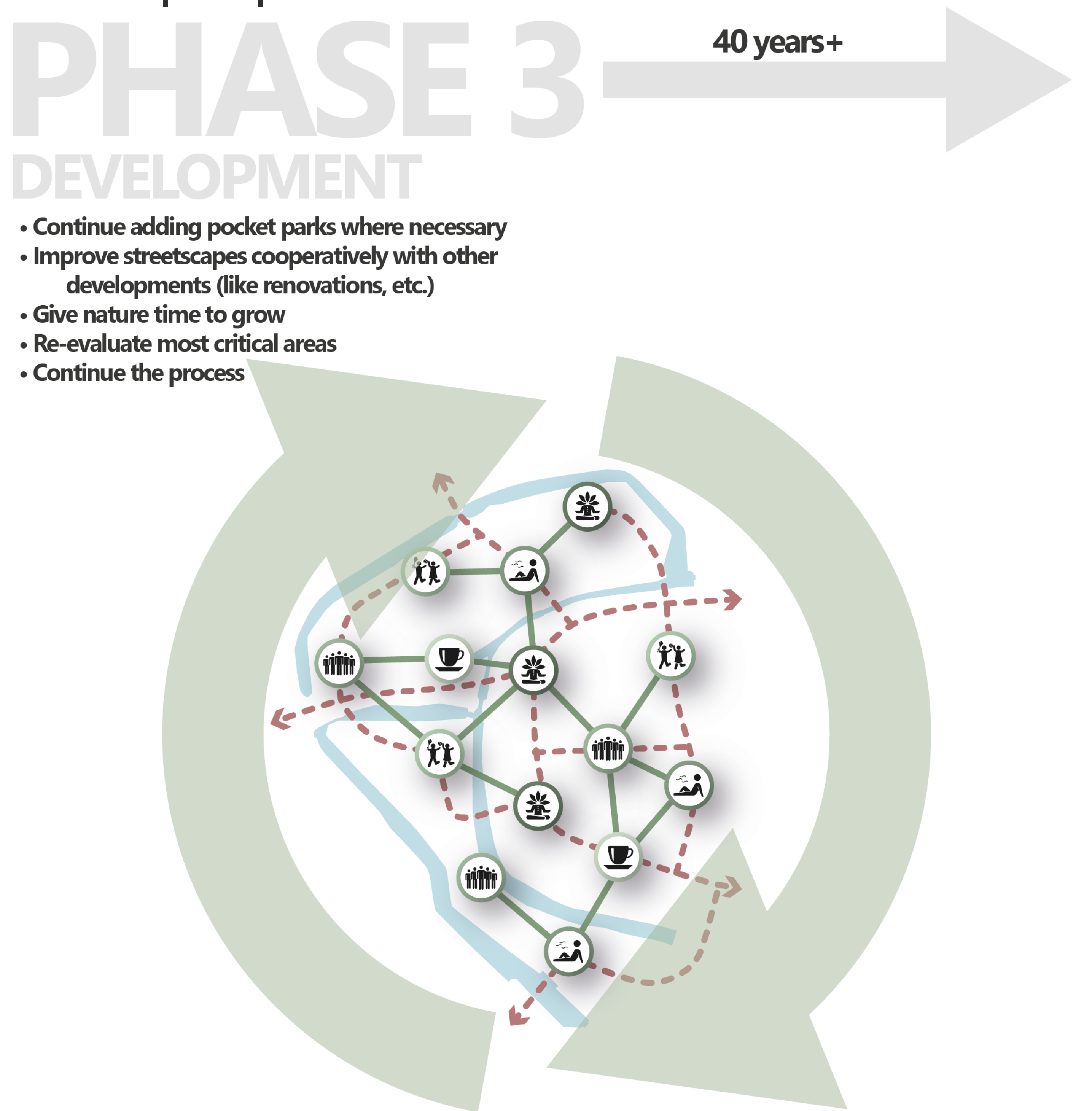


Figure 7.3. Abstract overview map of main goals of phase 3. Made by Author.

The final phase in the redevelopment strategy is called the development phase. This phase is significantly longer, but also less 'intense' than the previous two phases. The main goal here is to continue the development and re-evaluate what is most necessary.

For the pocket parks, this indicates that new ones can continuously be added if deemed necessary. For the streetscape, requirements will be set for any other development happening in the inner city, where the street should simultaneously be upgraded by using the intervention toolbox. However, the level of radicality in these upgrades should be assessed through the future purpose of the street. In this way, development on both the neighbourhood and street scale will continue, but at a slower pace, as the most critical areas have been developed in the first two phases. Furthermore, this phase gives nature the time to grow.

To summarise, this phase focuses on reflection and adaptation – continuously looking at how developments function after realisation and through an iterative process, evaluating potentially new problematic areas and acting accordingly.

7.1.4 Timeline

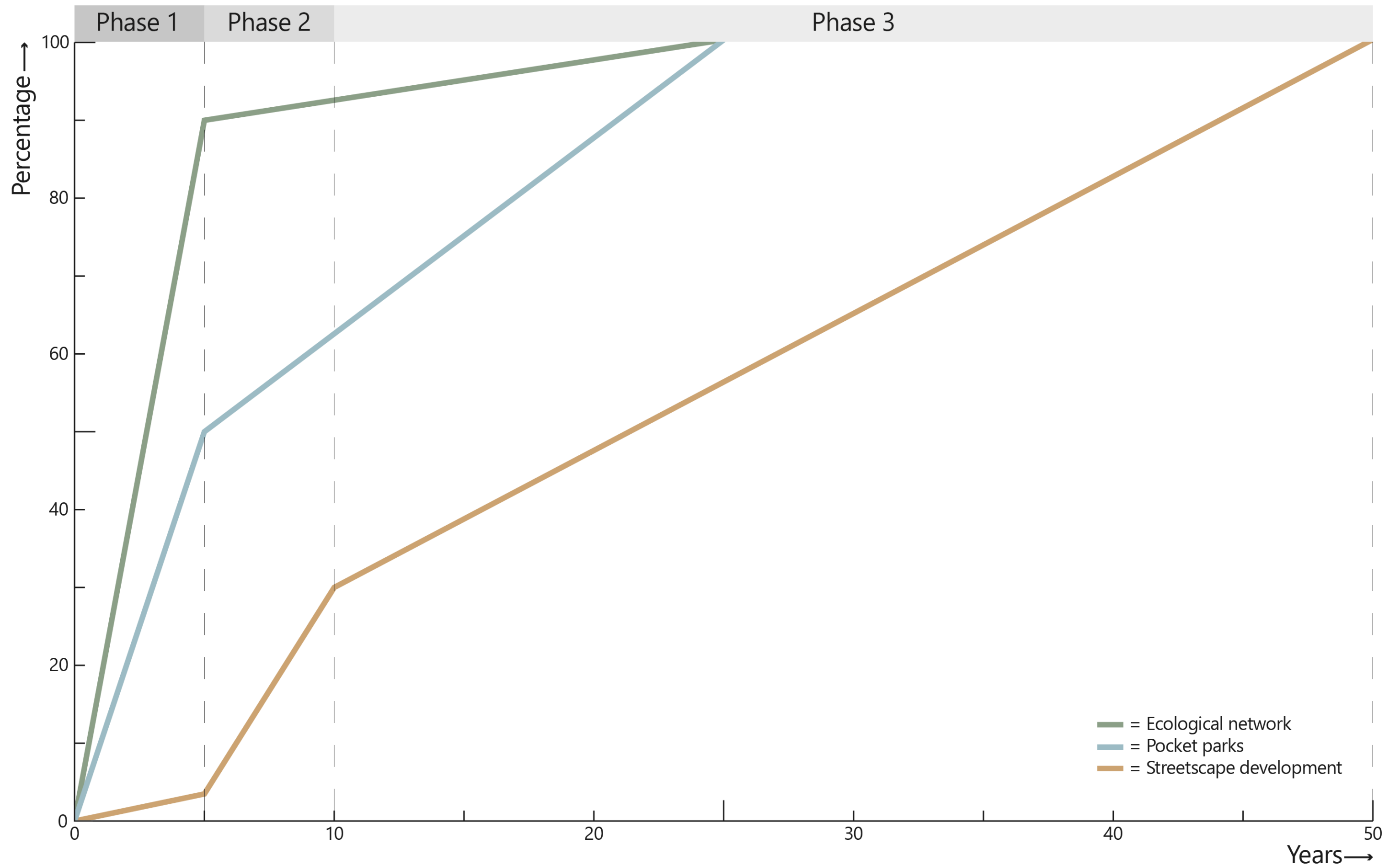


Figure 7.4. Rough timeline of the different developments. Made by Author.

The timeline shown in figure 7.4 illustrates a rough outline of the speed at which different developments will take place. While the percentages are not strict numbers, the timeline focuses mostly on providing a better understanding of the priorities in terms of development.

First of all, the ecological network. For the ecological network, most patches need to have a connection to the regional ecological network sooner rather than later. In the first five years, the pocket parks – in combination with potentially some other new green patches – will start forming the missing links in this ecological structure. Furthermore, each patch will need a long time to grow, so already defining which patches will need to be upgraded in an early stage helps to create a high-quality network as soon as possible.

Next – as stated in phase 1 – the pocket parks will start to develop straight away, as they are the top priority. In the first five years, around 50% of the pocket parks should be realised, as they can function as the catalysts of change. After these intense first five years, more pocket parks will gradually be added if/where necessary.

Lastly, the streetscape development will be most gradual. While phase 2 does have a slight spike to facilitate the start of a pedestrian network, the development will still go quite gradually, as it is very expensive (and inefficient) to develop all the streets as fast as possible.

Short interviews

To assess whether the project will be well-received by the residents, short interviews were held with several passersby that live there – each of a different target group. The idea here is to assess how different types of people can each benefit (or not) from the development strategy. Furthermore, the interviews were conducted to assess whether the proposed development strategy addresses actual issues residents are facing daily.

While the interviews were all very successful, the first few residents/interviewees did not have their picture taken – as it was forgotten. As a result, the decision was made to make a sketch of each person, which simultaneously keeps their anonymity.

After a general introduction and brief explanation of the project, each person was asked the following questions;

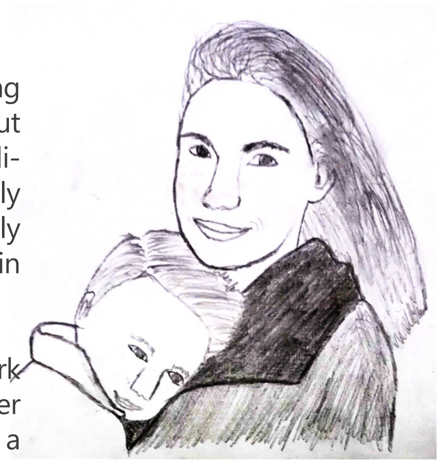
1. How often do you walk outside within the inner city? What is the main purpose and where do you most like to walk?
2. Are there areas of the inner city you avoid walking? If so, why?
3. How often do you come in contact with nature? And where?

After this, more specific questions were asked in response to their answers, to assess what is stopping them from going outside more often and/or what is missing to make the experience more pleasant.

Name: Karel
Age: 72
Story: Karel regularly goes to café Klein Thalia or café 't Anker – if possible – at least a couple of times a week. It is the main place he goes to socialise during the week. Other than that, he sits at home a lot or he walks through the Hoogstraat if he wants to get out, however, it is often a short walk without a clear destination. Lastly, his contact with nature is almost non-existent.

For Karel, the 'Gathering' pocket park will be most beneficial. His primary aim of going outside is to be among people, but there is not always a good place for him to go. Furthermore, he expressed the larger parks are quite far away and there are usually only some kids playing. Providing him with a well-accessible, lively pocket park relatively close to his house would significantly help him in keeping up his social life.

Name: Cynthia & Tobias
Age: 28 & 6
Story: Cynthia was on her way to the Passage to do some shopping, taking her son with her. She goes on a walk quite frequently with her husband, but almost always away from the inner city, either towards Strickledepark or Julianapark. She also expressed that for Tobias, the same applies, as they rarely go and play somewhere in the inner city – always in a park outside. She only really visits the shopping malls or seldom a terrace with her husband within the inner city.



For Cynthia, the pedestrian-friendly network, combined with a pocket park as the destination would provide new walking alternatives for her and her husband. Furthermore, the 'Playing' pocket park would provide them with a closeby park to go to with Tobias and play, especially on occasions when they have limited time.

Name: Jeffrey
Age: 31
Story: Jeffrey was walking his dog alongside the canal. He expressed that in the evenings, he takes his dog to a nearby park, but during the day he does not have the time for that. Instead, he just walks alongside the canal, because at least there are a couple of trees for the dog to go and pee. Outside of walking his dog, Jeffrey rarely goes on a walk or visits nature.

For Jeffrey, the streetscape development would be most beneficial, as certain streets will see significant improvements in terms of ecological quality – providing him and his dog with some vegetation to walk alongside. Furthermore, while the pocket parks are not specifically geared toward dogs, they could still visit one closeby and sit/walk/play there for a bit before heading back home.

Name: Maaike
Age: 26
Story: Maaike lives a very active lifestyle and goes out with friends quite often. She already cycles daily and visits nature regularly. Furthermore, she also walks quite often.

For Maaike, the benefits will be more indirect. While she probably will not go outside even more, the streetscape development and pocket parks could still enhance her experience. Most often, she now goes on her bicycle with friends toward a larger park – such as the Beatrixpark – to walk/picnic/sit there. Adding pocket parks and a pedestrian-friendly network could remove the necessity to first travel somewhere to enjoy nature (with friends).

Name: Esther
Age: 37
Story: Esther was walking outside during her lunch break, sandwich in hand. She expressed that since the beginning of Covid, she has been working from home a lot more, and she still works around half the time from home. During her lunch break, she likes the leave the house and go on a walk to get her mind off work, and she often takes her lunch with her. She regularly ends up sitting on a bench somewhere or she just eats while walking. Furthermore, she does aim to visit nature at least a couple of times a week.

For Esther, the pocket parks would provide a quality destination for her to eat her lunch. Almost all pocket park types are viable here – depending on her mood. Additionally, she seemed to value visiting nature quite high, but expressed she does not always have the time for it. Again, the pocket parks could help tremendously here.

Name: Mark
Age: 23
Story: Lastly, Mark – myself – used to visit the inner city quite often. He used to stroll the shopping streets with family or friends and regularly ended up just sitting somewhere, watching people walk by. Nowadays, he rarely visits anymore. An important reason is the lack of 'destination' – meaning there is nothing really to go to. He is not a 'shopper', but also does not like to go somewhere without a purpose.

For Mark, the pocket parks could provide a new reason to visit the inner city again. After a stroll through the inner city, enjoying the place he grew up in, he could end up in a pocket park to have a drink and snack from home. It reduces the barrier to visiting, as he does not like to go sit on a terrace when he is just visiting on his own – the only viable existing option to have a seat after a walk.

Figure 7.5. Sketches of six interviewees. Made by Author.

7.3.1 Successful shopping street

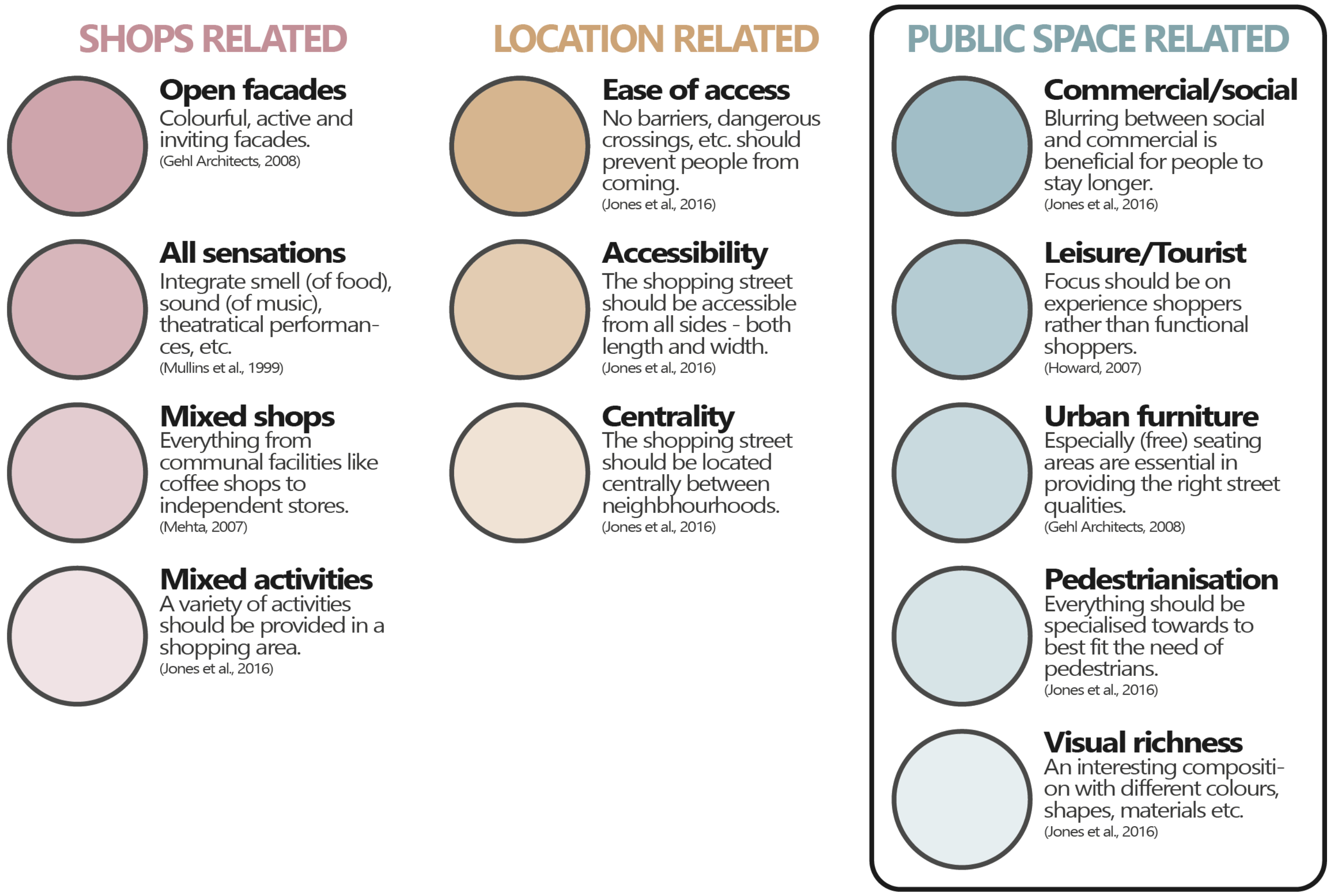


Figure 7.6. All important components that facilitate a shopping street to flourish. Made by Author.

The issue of vacancy has not been explicitly discussed after the analysis in chapter 4.5.1, which is done for a reason. The analysis concluded that the focus should be on attracting people by improving the conditions of the area instead of trying to attract business. In this, the entire development strategy will, directly and indirectly, play an essential role, as the main social goal is to minimise the barriers and get people to go outside again (and visit the inner city).

However, it is still necessary to assess what specific qualities the main shopping streets should provide to become more successful. Figure 7.6 shows all the critical components that should be present for a shopping street to flourish. The components have been categorised into three main categories; shops, location, and public space.

The shop components focus mostly on what shops themselves can do, for example, in terms of their facades or diversity. It is crucial to communicate with existing (and potentially new) shop owners about how they can improve the overall outlook of the shopping street, however, from a spatial development point of view, little can be done to influence this.

Second, the location-based components focus on the centrality and accessibility of the shopping street. Components like centrality are influenceable, but the accessibility and ease of access are. The second development phase – pedestrianisation – will play an important role here.

However, the most relevant components from a spatial development point of view are the public space-related ones. It contains five main components, most of which have been mentioned explicitly or implicitly before. All these have to be taken into account when redeveloping the shopping street itself and the area directly surrounding it.

7.3.2 Evolutionary approach

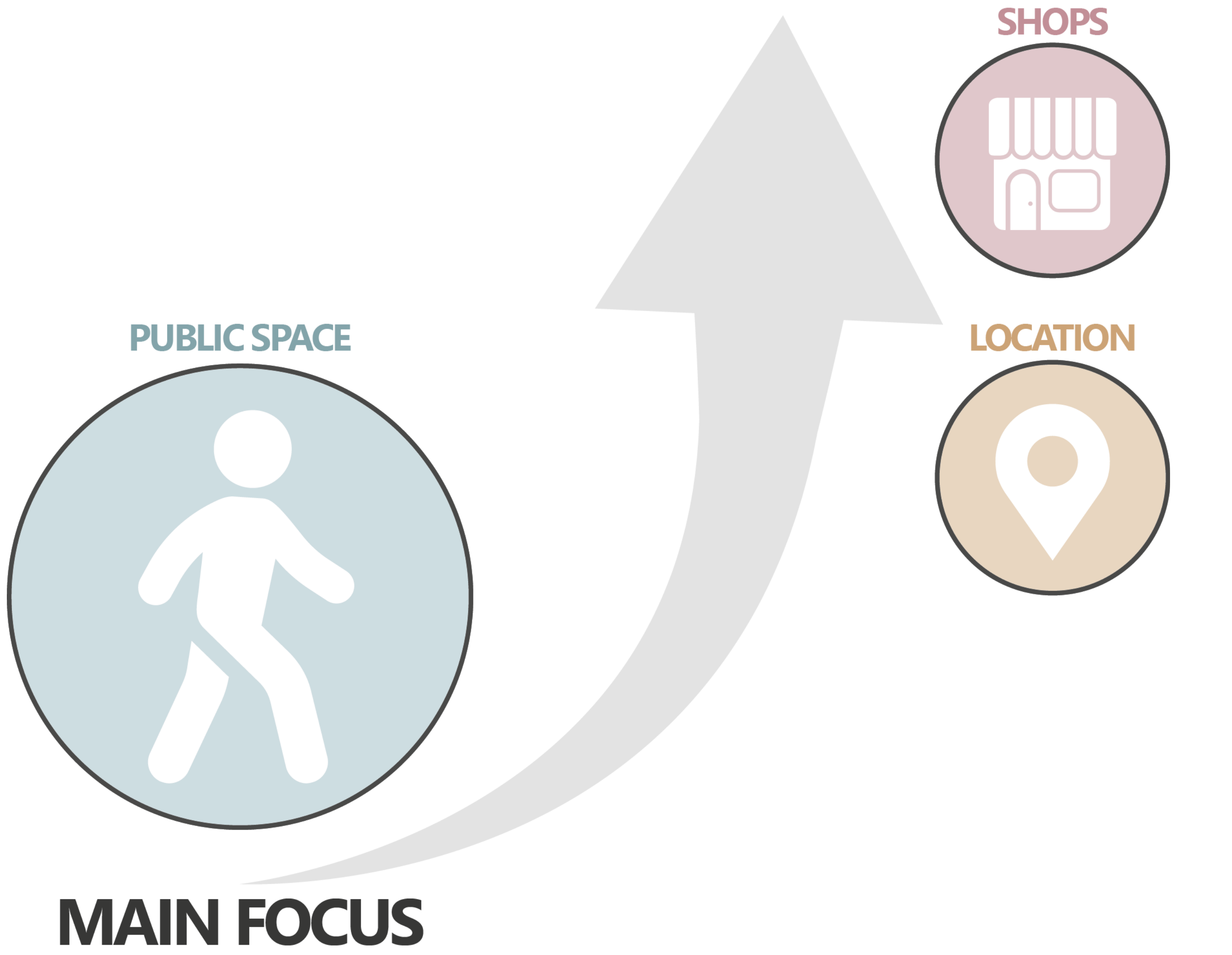


Figure 7.7. Main focus in relation to the issue of vacancy. Made by Author.

Figure 7.7 shows the main approach concerning the issue of vacancy. The focus will be on improving the public space conditions of the area to attract more frequent visitors – the business will follow. Furthermore, the improvement of the surrounding area will make the location more accessible.

The five components of public space – as shown in figure 7.6 – can be subcategorised into two categories. The first category – containing 'Commercial/Social', and 'Leisure/Tourist' – both have a strong focus on adding more to the shopping experience than just stores. To achieve this, pocket parks will be essential, as they add social green space to the area. However, they should be directly connected/visible from the shopping street, as only in this way a more diverse shopping experience can be realised with the pocket parks. Furthermore, these components are tightly related to the shop-related components, as a mix of functions should be encouraged.

The other three components – i.e. 'Urban furniture', 'Pedestrianisation' and 'Visual richness' – all focus on providing the most comfortable and interesting experience as possible. The intervention toolbox will be crucial here, as it can provide diversity and extra facilities to the streetscape. However, this does not mean the shopping streets should get 'greenified', but instead a real strong focus on all social aspects should be encouraged.

Ultimately, the goal is not to 'solve' vacancy, but instead to propose a development strategy that will attract people to the area, which – as a result – can help the vacancy levels to go down. However, this will have to be done via a gradual approach, as most 'fast solutions' are also temporary.

7.4 Finances

Financial situation

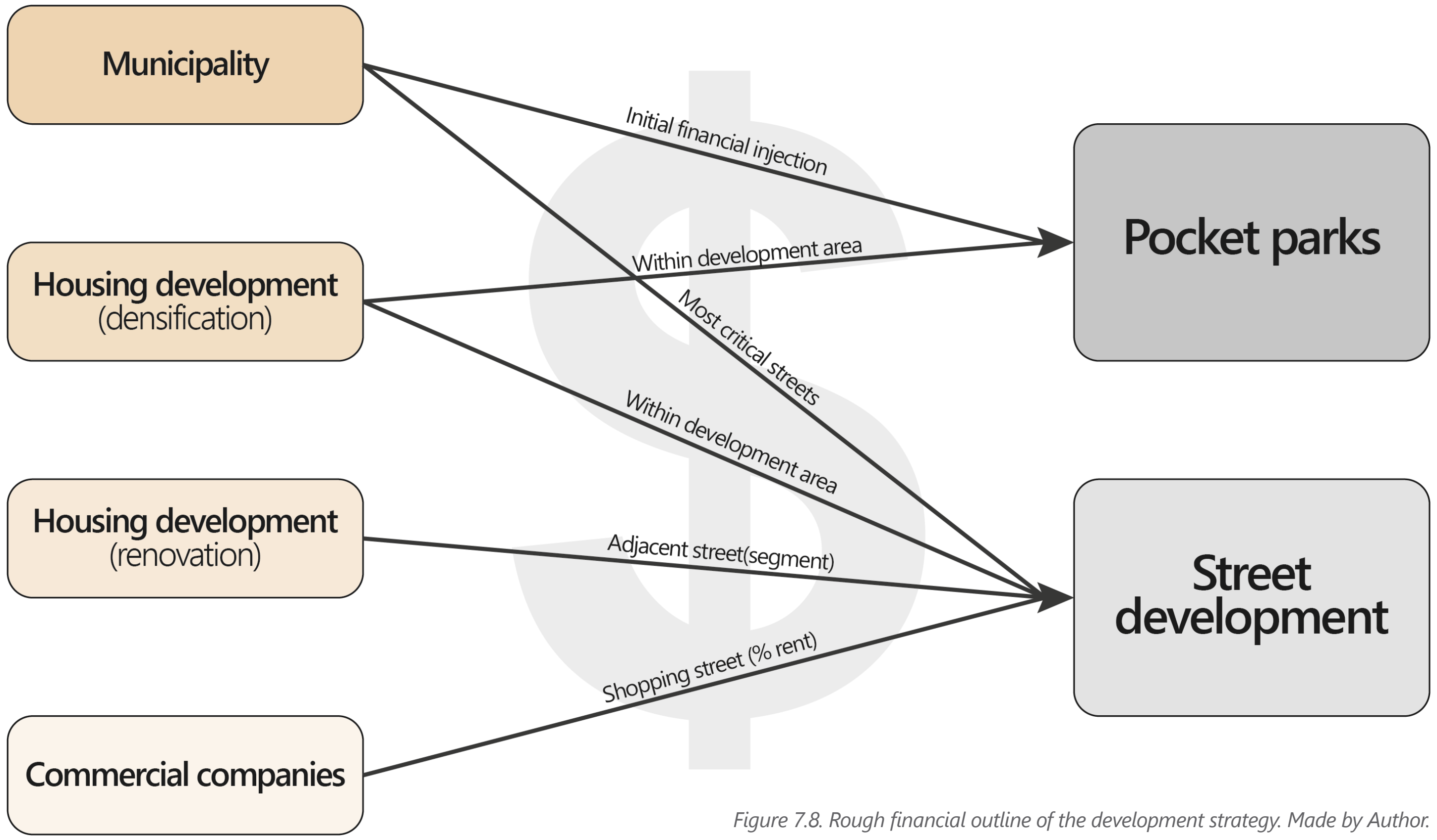


Figure 7.8. Rough financial outline of the development strategy. Made by Author.

Even though this project has not focused on the financial aspects, it is still essential to understand where the main sources of money should come from.

First, an initial injection should come from the municipality, mainly focused on developing several pocket parks in the first phase. As stated in chapter 6.4.4, these pocket parks will have significant long-term financial benefits, however, an initial investment is necessary to get 'the ball rolling'.

Next, as stated by Genesis Land (2017), developers should pay for any public space development within their development zone – meaning developers should be held 100% accountable for any pocket park and street development within their redevelopment area. For a densification project, this area will be bigger than in a renovation project.

Lastly, a payment scheme for shop owners could be developed, where a small percentage of the rent goes towards the development of that shopping street. Over time, a substantial sum of money will be collected that can subsequently fund (part of) the redevelopment.

8 STRATEGY TRANSFERABILITY

8.1 Universal concepts
8.1.1 Main concepts
8.1.2 Design principles

8.2 Pocket parks
8.2.1 Specific park types
8.2.2 Guidelines

8.3 Street development
8.3.1 Evaluation matrix
8.3.2 Intervention toolbox

This chapter will focus on the main components of the interclusive urban green approach that are transferable to other cities that want to implement a similar approach. The level of transferability for each transferable component in terms of scale and specific characteristics will be clarified here.

8.1.1 Main concepts

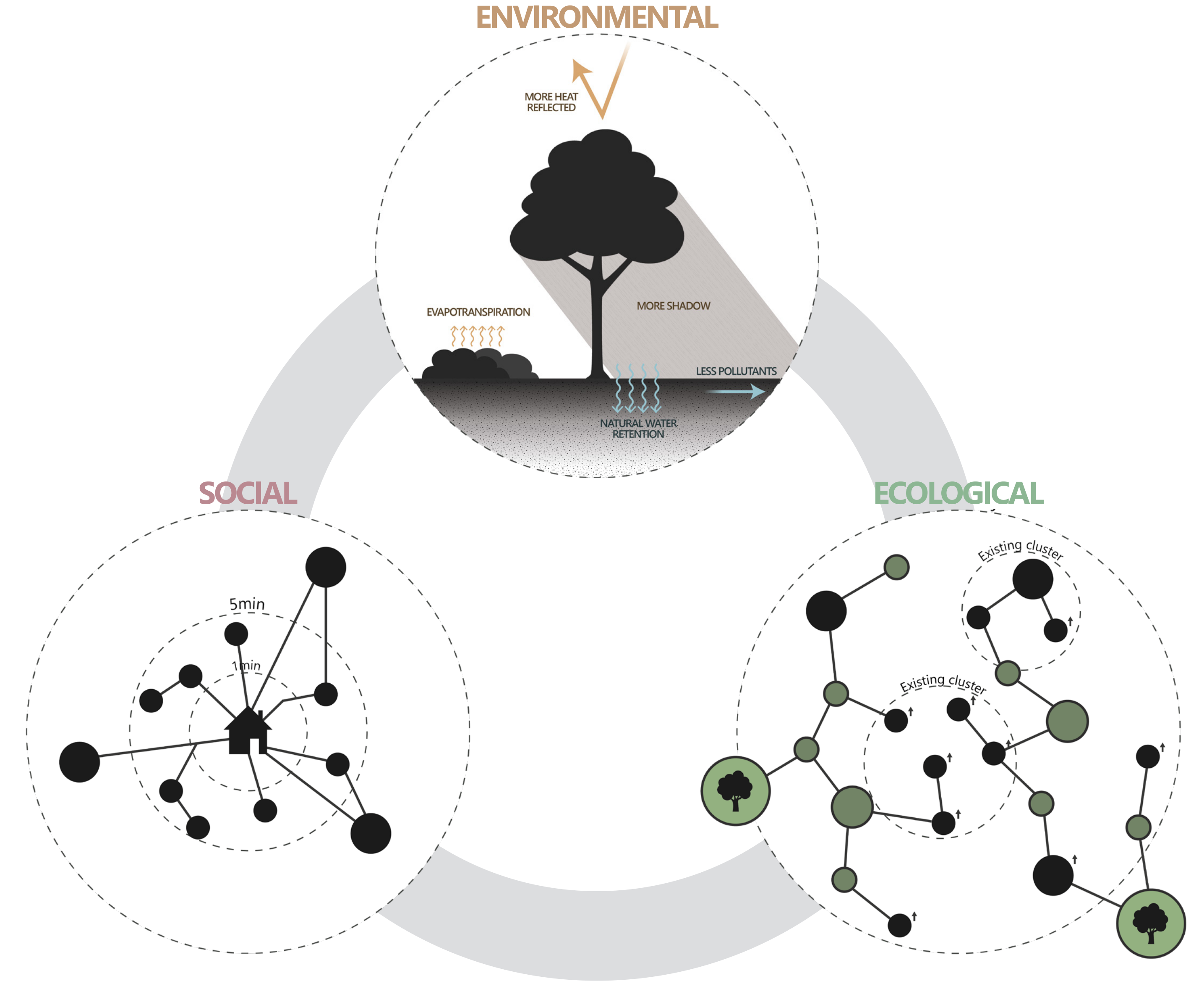


Figure 8.1. Diagram containing the three main development concepts. Made by Author.

Development strategies are generally specified to fit the needs of a specific location, however, in most cases, this strategy is built on several key concepts that are applicable in other locations. An essential ideology in the field of Urbanism – as well as many other fields – is to learn from each other and build upon the existing body of knowledge. This prevents the redoing of someone else's research. The Interclusive Urban Green strategy also has these key concepts that are – within limits – transferable to other locations.

First of all, the three main concepts, seen in figure 8.1, can be transferred to other locations. The environmental concept focuses on permeability and cooling capacity to improve water management and the microclimate. As this concept is quite broad, it can be applied on pretty much all scales and all locations.

Both the social and ecological concepts on the other hand do have certain scale limitations. The social concept focuses on providing a social network with different types of social spaces at different distances from people's houses. As a result, projects on a very high or low scale will have limited use of this concept.

Lastly, the ecological concept focuses on providing a continuous ecological network throughout the city that connects to the regional network. Again, with projects on a very low scale, this concept might have limited use – although this concept is scalable to a regional network. However, it also is not entirely new – mostly just reworked to fit the context of Schiedam.

8.1.2 Design principles

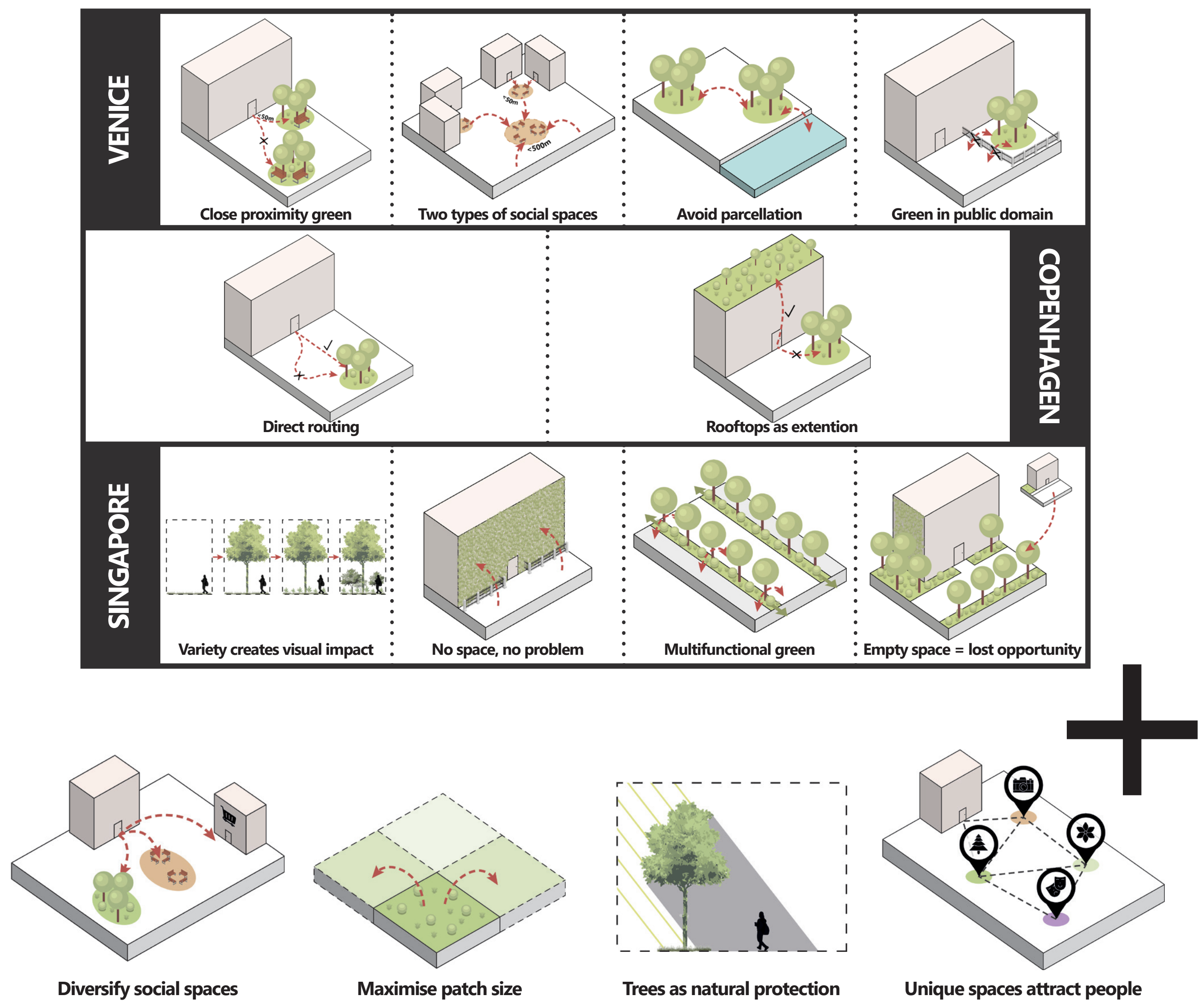


Figure 8.2. Overview of all design principles. Made by Author.

Another transferable concept is the design principles. The design principles have mostly been derived from the different case studies. While these design principles do have a certain level of genericism, they can still form the foundation for further specifications. In a way, these design principles can be used as evaluations of projects in other locations, as they all contribute to realising a more resilient, inclusive, and biodiverse urban territory.

Outside of the design principles derived from the case studies, four extra ones have also been added. These principles come from the research done in chapter 4 and add to the ones above.

8.2.1 Specific park types

Figure 8.3. The five main pocket park types. Made by Author.

While the universal concepts were all quite broad, they do provide a foundation from which to elaborate. The pocket park concept, however, is already a lot more specific. By combining different pieces of literature with analysis and own research, five distinctive types of pocket parks have been developed – each geared towards a (slightly) different target group. The main goal was to minimise the barrier for people to go outside by providing a high-quality green space for whatever purpose they want within a five-minute radius.

This concept of providing various types of social spaces for different purposes, as well as the five distinct pocket park types, are all transferable to other locations. However, these pocket parks will be most beneficial in urban territories where people currently have limited (to no) access to urban green and where space is (very) limited. So inner cities and dense neighbourhoods will be best suited.

Important to realise is that the pocket parks are not there to compete with larger city parks. Instead, the pocket parks aim to provide high-quality green spaces for people that do not have the time or energy to go to these larger parks. In saying that, areas with a large number of city parks will not see as much benefit from the pocket parks – it is all about providing high ease of access.

8.2.2 Guidelines

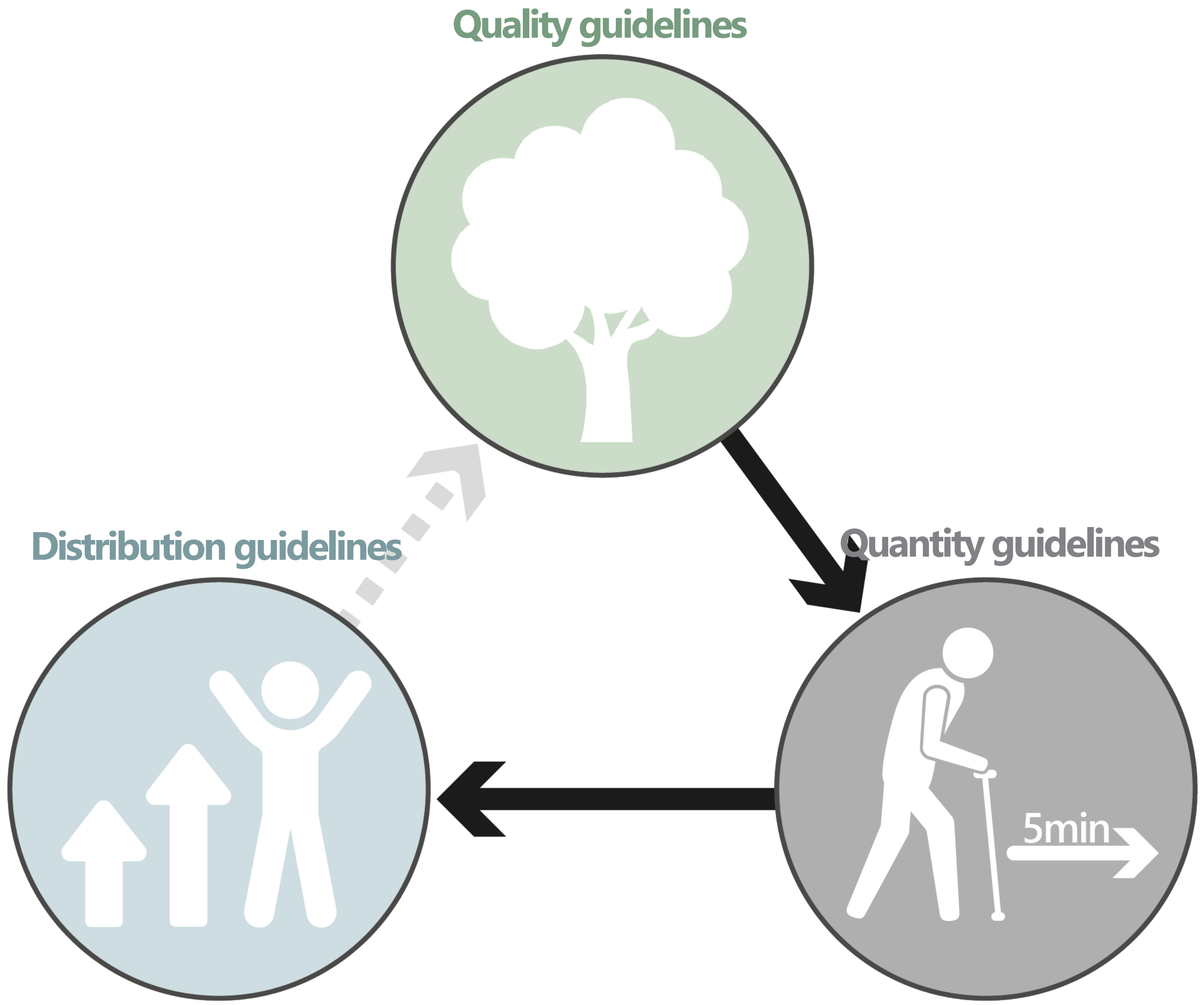


Figure 8.4. Diagram containing the different guideline types. Made by Author.

Related to the pocket parks, chapter 6.4 also provides many different guidelines for implementing the pocket parks most effectively. These guidelines can be summarised under three main categories, as seen in figure 8.4.

First of all, the quality guidelines focus on general qualities all pocket parks should have – regardless of what type. These guidelines should all be met at each pocket park to give it the best chance of being a beneficial addition to the public domain.

Next, the quantity guidelines focus on the amount of combined surface area the pocket parks should provide. These guidelines are a little less 'fixed', as they can fluctuate depending on the location. For example, a location with no parks surrounding the development area might opt for a higher amount. However, these guidelines do provide a good starting point.

Lastly, the distribution guidelines focus on the spatial configuration of the pocket parks. These again are of crucial importance in making the pocket parks most beneficial – as too many or an unbalanced distribution can lead to suboptimal results. The simulation found in chapter 6.4.4 provides further information on how these guidelines are applied.

As all the guidelines are related to pocket parks, they will all be transferable to similar locations as the pocket park types.

Lastly, all guidelines function for two purposes. First, it provides an overview of all the constraints the pocket park development needs to take into account. But secondly, the guidelines also function as 'checks', where you can go back at any stage of development and evaluate if all guidelines are still met.

8.3.1 Evaluation matrix

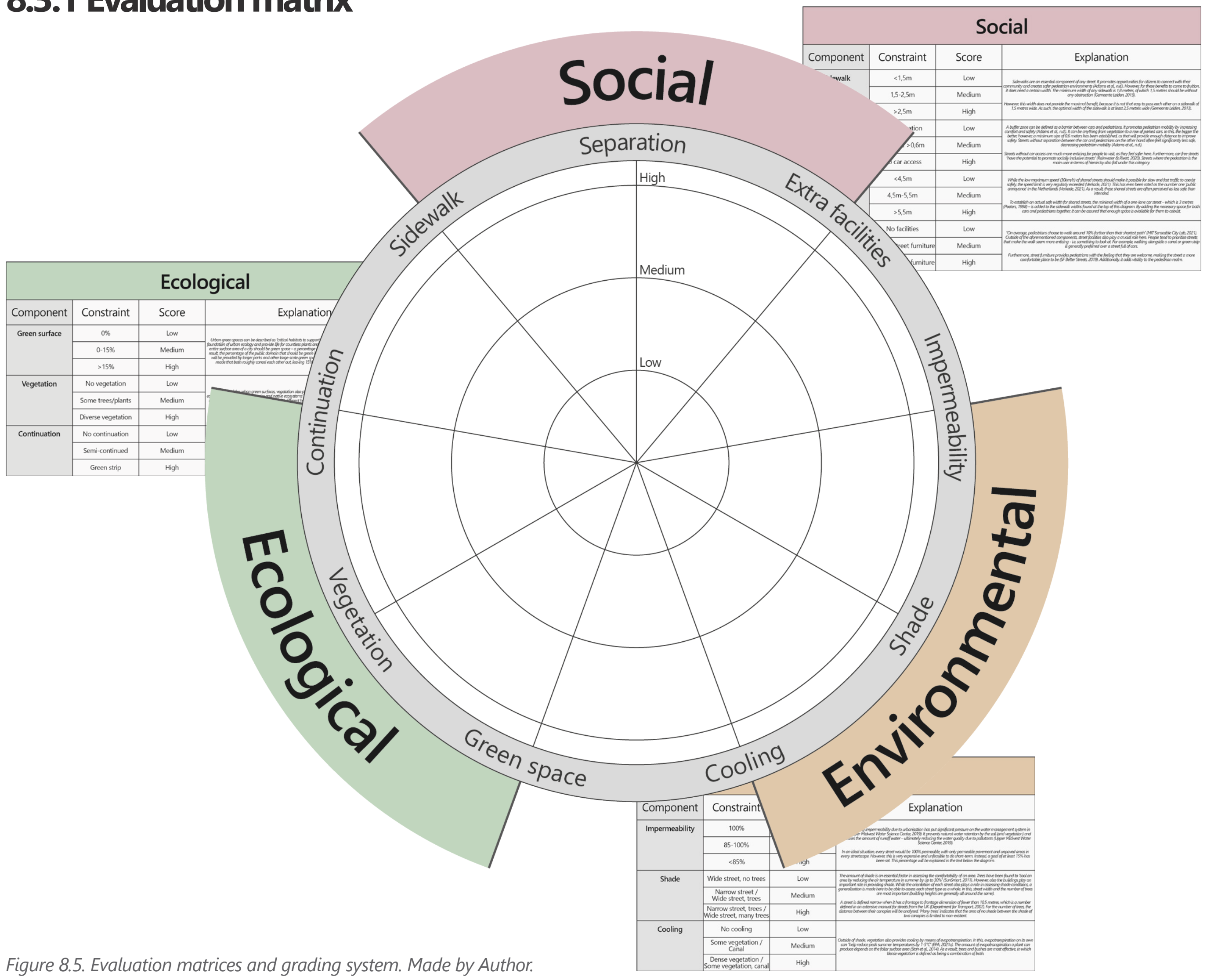


Figure 8.5. Evaluation matrices and grading system. Made by Author.

On the topic of streetscape development, the evaluation matrix is most widely transferable. Most streets within an urban context will be gradable by the means of this matrix. Evaluating the different street types within a specific area will provide a clear overview of the most critical areas in the domains of social, the environmental, and the ecological.

Furthermore, the grading system can be used throughout the design/development process to evaluate any intervention made on the streetscape. It goes without saying though that this evaluation matrix is limited to only the street level.

8.3.2 Intervention toolbox

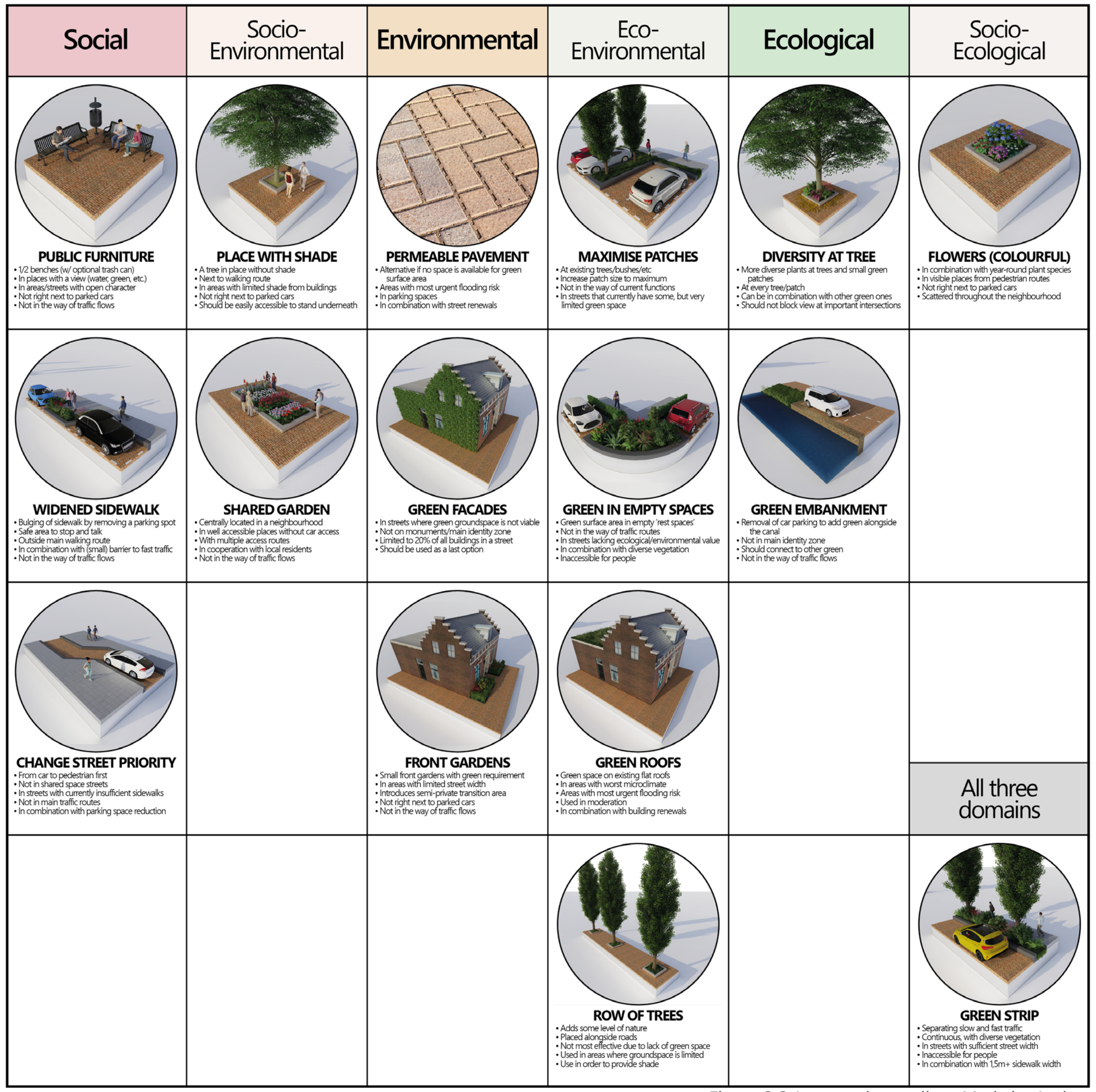


Figure 8.6. Intervention toolbox. Made by Author.

After evaluating the different street types, the intervention toolbox can be used to implement design solutions that focus on a specific domain (or more). Again, these tools are widely transferable to most streets in an urban context. However, potential interventions are not always limited to the ones found in the toolbox. Very specific interventions due to the specific character of a street might not be included in this toolbox.

Furthermore, the tools are generally geared towards the street types found within the inner city of Schiedam. This implies that – for example – large access roads with multiple car lanes and a very wide character might not find the ideal tools within this toolbox. As a result, this intervention toolbox will be most beneficial for urban territories with (somewhat) similar street characteristics as the streets found within the inner city of Schiedam.

Lastly, the simulation found in chapter 6.5.5 provides an example of how the intervention toolbox can be implemented on a real streetscape.

9 CONCLUSION

This chapter will focus on the conclusions of the thesis and discuss the current limitations and potential future research. Additionally, a reflection on the entire process is included here.

9.1 Final conclusion

Research question

"How can the implementation of urban green in the inner city of Schiedam contribute to resolving issues related to ecological degradation, climate adaptation, social isolation, and vacancy in an integrated and inclusive way?"

Research aim

"The main aim of this research project is to explore the limits of urban green implementation in the context of the inner city of Schiedam. The challenges of ecological degradation, climate adaptation, social isolation, and vacancy should all be examined from the perspective of urban green, from which an integrated and inclusive urban green approach can be realised."

Research goal

"The goal is to develop a coherent, integral development strategy for the inner city of Schiedam, in which the aforementioned challenges have been tackled by implementing various forms of urban green. Furthermore, the goal is to extract several key development concepts that can be applied in other locations."

9.1 Final conclusion

Urban green is a broad, but also versatile and very beneficial concept. It can have a positive influence on many different domains, however, to use the concept to its full potential, a thorough understanding is needed of the various implications. In this project, the concept of ´Interclusive Urban Green´ was developed to limit the scope and bring the benefits from different domains together.

The concept of Interclusive Urban Green focuses on three main domains – social, environmental, and ecological. By utilising the different attributes and qualities of urban green, a future city can be realised that is more liveable, resilient, and biodiverse. For the inner city of Schiedam, this was operationalised by looking through the lenses of three main scales – the context, neighbourhood, and street scale.

The context scale provided crucial insight into the way the inner city of Schiedam is embedded in its surroundings. While this scale was found to be too large for actual interventions, it still highlighted potential ecological connections to the regional network. Furthermore, it clarified the larger social network with its main access routes from the surrounding area towards the inner city.

On the neighbourhood scale, five distinct types of pocket parks were developed that each target a (slightly) different target group. Two park types focus on providing a calm, natural environment for restoration and relaxation, while the other types emphasize the social potential of the pocket parks. By providing residents – and visitors – with different types of social green spaces within a five-minute radius of their house, the barrier for people to go outside more frequently is minimised. For this project, the pocket parks function as the main catalysts of change.

Outside of their social benefits, the pocket parks also function as stepping stones to achieving a continuous ecological network that connects to the regional green structure. Furthermore, the pocket parks provide a comfortable microclimate and facilitate natural water retention.

On the street scale, an objective evaluation method is developed that can be used to assess the current social, environmental and ecological quality of any street type. Overall, the existing street types within the inner city of Schiedam score relatively low – with ecology having the worst overall result. To improve these conditions, an intervention toolbox is developed that provides all the necessary tools to redevelop any street type. The tools in this toolbox do have a certain level of abstraction, however, this is done to provide some room for interpretation and to prevent tools from being used sub-optimally.

For the issue of vacancy, the goal should not be to attract business, but instead to improve the conditions of the surrounding area to attract people – business will follow. In this, five components concerning public space have been defined that will help the shopping area to flourish – mixing social/commercial, focusing on the experience shoppers rather than functional shoppers, providing urban furniture, specialising towards pedestrians, and providing visual richness. All these components have a strong link to the pocket parks and/or intervention toolbox. However, the vacancy issue will still require a gradual approach with frequent meetings with shopowners, as most 'fast solutions' are also temporary.

Overall, the project provides an integrated and inclusive development strategy for the inner city of Schiedam. By utilising the different potential qualities of urban green through a multiscalar approach, the future inner city of Schiedam can become a rich, biodiverse urban territory that promotes social interaction and a healthy lifestyle – all while being resilient and climate adaptive.

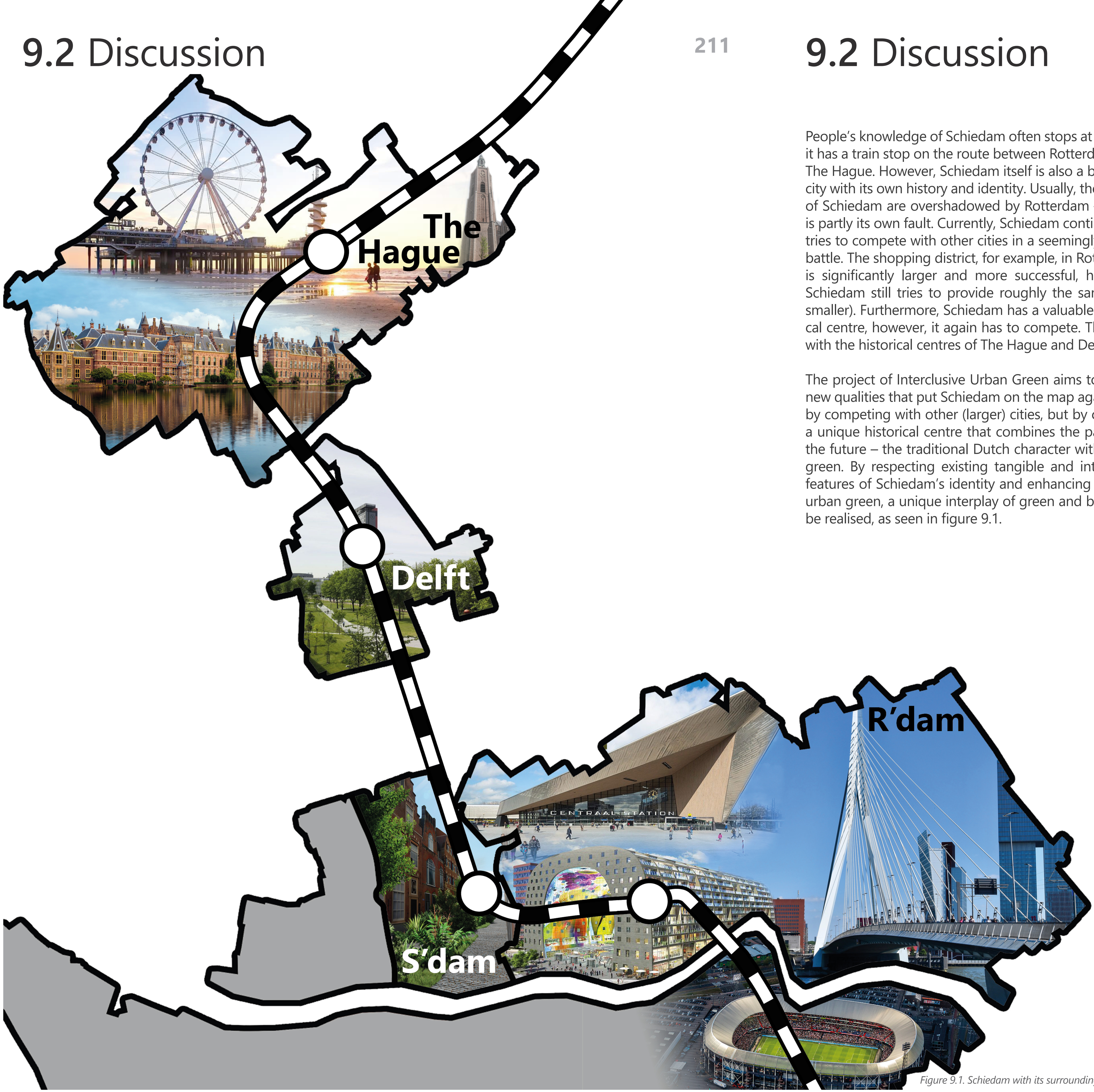


Figure 9.1. Schiedam with its surrounding cities. Made by Author.

People's knowledge of Schiedam often stops at the fact it has a train stop on the route between Rotterdam and The Hague. However, Schiedam itself is also a beautiful city with its own history and identity. Usually, the values of Schiedam are overshadowed by Rotterdam – which is partly its own fault. Currently, Schiedam continuously tries to compete with other cities in a seemingly losing battle. The shopping district, for example, in Rotterdam is significantly larger and more successful, however, Schiedam still tries to provide roughly the same (but smaller). Furthermore, Schiedam has a valuable historical centre, however, it again has to compete. This time with the historical centres of The Hague and Delft.

The project of Interclusive Urban Green aims to create new qualities that put Schiedam on the map again. Not by competing with other (larger) cities, but by creating a unique historical centre that combines the past with the future – the traditional Dutch character with urban green. By respecting existing tangible and intangible features of Schiedam's identity and enhancing it using urban green, a unique interplay of green and brick can be realised, as seen in figure 9.1.

However, while chapter 4.1 did provide an overview of the main components of the identity in Schiedam, further steps still need to be taken to realise this vision. More resident participation, as well as additional analysis on what the components of the identity exactly are, is necessary to prevent damaging it. Additionally, design alternatives are needed to assess the impact of various types of green on identity and how to best make them interact.

Next, further research regarding the financial aspects is necessary. While chapter 7.4 gave a first idea of the payment scheme, it is still extremely limited and does not include any actual costs. For example, an estimated cost per square metre of each pocket park could provide essential information on how much the development strategy will cost. Furthermore, these numbers are necessary to take the next steps for the development of Schiedam.

Related to this, maintenance of all the new urban green is an important topic that has not been explicitly mentioned before. The cost of maintaining all this high-quality urban green should therefore be assessed before operationalising the development strategy.

Lastly, the development strategy in general still needs further development before it can get implemented. Topics like the exact type of vegetation that can grow in each pocket park and street development, the exact streets that will form the pedestrian-friendly network, and exactly where the proposed ~9% permeable surfaces will be placed still need further research. This research project, in a way, forms a strong foundation on which the actual development of Schiedam can be built.

REFLECTION PERSONAL APPROACH
The graduation year, with its MSc3 and MSc4 studios, has been one big learning curve for me with many unexpected twists and turns. Additionally, it has been a real test of determination, as I am a person who has mastered the art of justifying an abnormal amount of procrastination in his head. And while there were a couple of times where my motivation was temporarily almost non-existent, I feel like I have proven to myself I can stick to a (rough) schedule, even in a lengthy project like a thesis.

Overall, I feel like most of my approach has worked. I am a strong advocate for frequent self-reflection – in which I usually reflect on my work first thing after the weekend. This, in combination with my structured approach to working, helped me change directions promptly before wasting too much time.

In terms of literary research, I feel like this project is the first project where I have actually used the theoretical concepts as a foundation for the final product. Most of the key concepts I propose in the development strategy – such as the pocket parks and intervention toolbox – all have a foundation of existing literature from which I have built.

For the analytical research, I used a more iterative process than normal, where I went back several times to further specify certain findings and edit older maps with new information. I think this worked a lot better in a project of this length, as I usually do not find myself doing this, which I expect is predominantly due to the lack of time to go back to analysis in shorter projects.

One analytical method I have used that does – looking back – feel a bit excessive is the case study reviews. While it felt very useful at the time, I have never really used the conclusion maps I made from that research – only the design principles. Looking back, it might have been better if less time was spent on that, although it did deepen my understanding of the project area. So in a way, the results were used indirectly as extra knowledge, however, that could have also been done with sketches instead of hours of mapping.

Lastly, I feel my approach regarding the development strategy was very effective. At first, I struggled a bit with the complexity, however, dividing the project area into three key scales helped me tremendously to first understand each scale separately, after which they could be combined again.

Both my mentors have played an essential role in my research process. While I probably have not met with them as often as I would have liked, their input has helped me over critical hurdles multiple times. Sometimes the feedback was on something I subconsciously already knew was missing, where hearing it made me realise that it was actually something more important than I thought. Other times the feedback helped me move forward, for example, setting out a plan for the next week(s). Lastly, the feedback gave me affirmation that I was still on the right track – something you start to become unsure of after a while.

Outside of my mentors, I also learned a lot from the research. My understanding of the implementations and limitations of urban green has tremendously increased. Additionally, the whole concept of a 'pocket park' was still foreign to me before this project started. But outside of the major components, there are also just a lot of small things I have learned about Schiedam – my hometown – about the issue of vacancy, social communities, ecological networks, and more. I think you pretty much always learn a lot while doing a project like this, however, usually most projects are in groups – in which everyone generally gets used to their strengths. While this might be best for the overall result, you kind of keep avoiding the subjects you know least about – something that is impossible in a graduation project like this.

REFLECTION PROJECT
I used to always believe that research precedes design, however, throughout my Master in Urbanism and especially throughout my graduation year I have found that it is more of a 'back and forth' relationship. As said before, I have gone back and updated my analytical and literary research at multiple stages of the project – usually after I discovered something during the development of the main development strategy. I think this is also reflected in my work, in which the analysis actually has concrete conclusions that have influenced the final development strategy. Furthermore, most components of the strategy are based on (iterative) literary research.

In terms of the relation between my topic and the studio, I do see a clear link. My graduation project focuses on exploring the limits of urban green implications, intending to create an urban environment that is more liveable, resilient, and biodiverse. As such, the project focuses on creating a better living environment, which is one of the core objectives of the Urbanism Master. Furthermore, my graduation project aims to address multiple domains, namely the social, environmental, and ecological domains. This is something the MSc

AUBS Master program also prides itself on – an integrated approach, instead of only focusing on one part of the problem at a time. Lastly, the Design of the Urban Fabric studio does not have a specific research topic.

SCIENTIFIC & TRANSFERABILITY
First of all, the concept of nature inclusive design is still relatively new. As van Stiphout (2019) stated, the amount of knowledge and examples are still (very) limited. The case study of Schiedam will add to this limited body of knowledge, deepening the understanding of how the concept can be translated into a real context. Furthermore, the pocket parks and intervention toolbox can add valuable practical knowledge on how other cities in the Netherlands – and potentially worldwide – can start to implement nature inclusive design.

The project also aims to explore potential synergies between the topics of nature inclusive design and human health & well-being. Currently, most scientific research focuses only on one end of the spectrum. This is best reflected in the proposed pocket parks, as they build on existing literature and propose five distinct types of parks that each focus on (slightly) different urban green qualities. Furthermore, these pocket park types are transferable to other locations and can be seen as a synergetic result of different types of literature research.

Lastly, the project also provided several universal concepts and an objective way to evaluate any street type – all based on literature – that is transferable to other locations.

SOCIETAL & ETHICAL
The concept of interclusive urban green has a strong societal influence built into it. The word interclusive is a portmanteau of the words integrated and inclusive. This inclusivity component aims to provide equal opportunity and benefit to all the different population groups. Additionally, one of the goals is to provide sufficient social facilities for residents to create a strong sense of community. In this, the social dimension on the local scale is aimed to improve significantly.

The project also targets several relevant challenges society as a whole is currently facing. For example, the addition of urban green is aimed to combat the sedentary lifestyle many people currently have by minimising the barrier to going outside. Furthermore, this project will join the battle against common diseases such as obesity, cardiovascular diseases, diabetes, and mental illnesses such as depression. Ultimately, the project is centred around the experience of public space from an eye-level perspective, aimed to create the optimal conditions for people to maximise their quality of life.

As said before, inclusivity is a crucial component of this project, where the aim is to create equal opportunities for all population groups. Accessibility to a sufficient amount of high-quality urban green and social spaces should become an integral part of any development project – regardless of the social status of that area. Furthermore, the concept of the walkable city is an important ethical component, as it is a free mode of transportation that is available to all.

Another crucial goal of the project is to create a design proposal that is resilient and adaptive to future changes. This will contribute to the (future) safety of all residents, making the inner city of Schiedam ready for the potential effects of climate change. Additionally, future generations will also be able to benefit from these developments – especially if the expected design principles will be implemented in multiple areas.

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Appendix 1: Design principles

Green roofs & facades

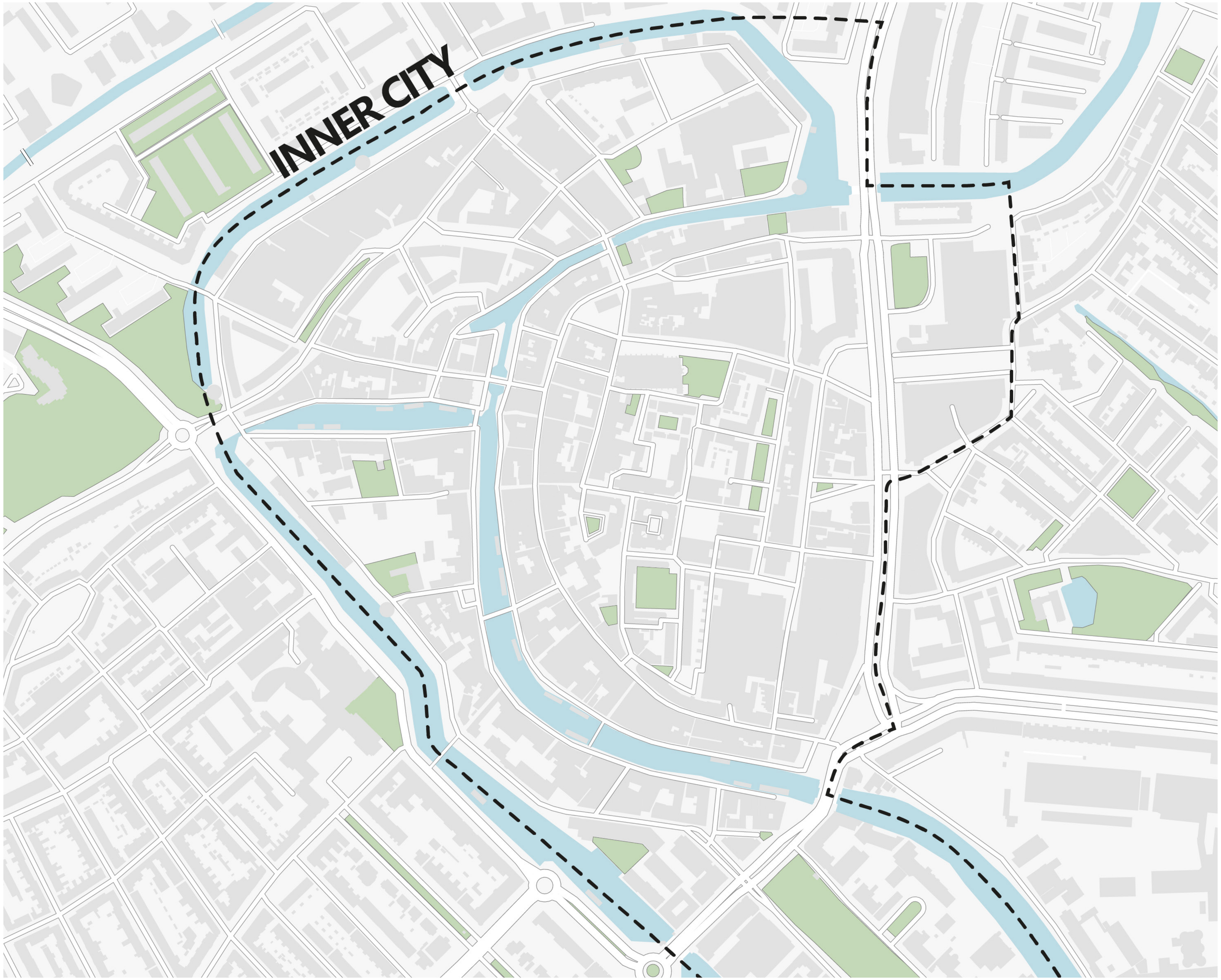


Figure 10.1. Map showing current situation of green roofs & facades. Made by Author.

Current condition

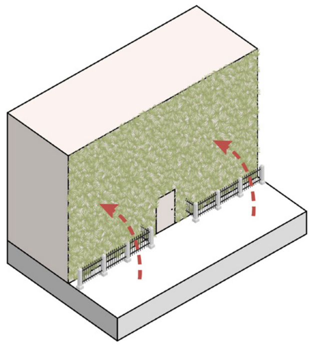
Currently, the inner city of Schiedam has (almost) no green roofs and facades. The only green surfaces are the few green parks/playgrounds/etc. that are located within and around the inner city.

As the inner city is characterised by its traditional housing typology with angled roofs, the potential implications of adding green roofs seem to be limited. However, there are a lot more flat roofs in the inner city than one might expect.

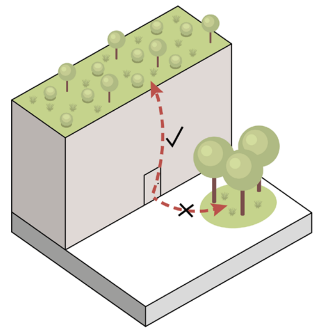
Adding green roofs does not help with ground-level experience, meaning other types of green will also be needed. However, this type of green does add a lot of environmental value in terms of the UHI and rainwater.

Adding green facades, on the other hand has less of an environmental impact, but way more in terms of ground-level experience. As a result, green surface areas should still be prioritised over green facades, however, in areas where the street width does not allow this, green facades are a good alternative.

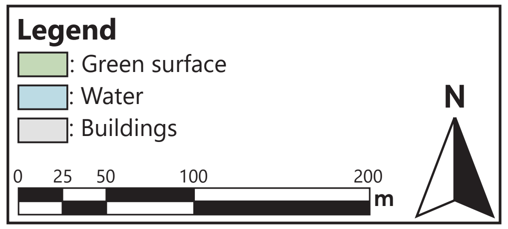
Relevant design principles



No space, no problem



Rooftops as extention



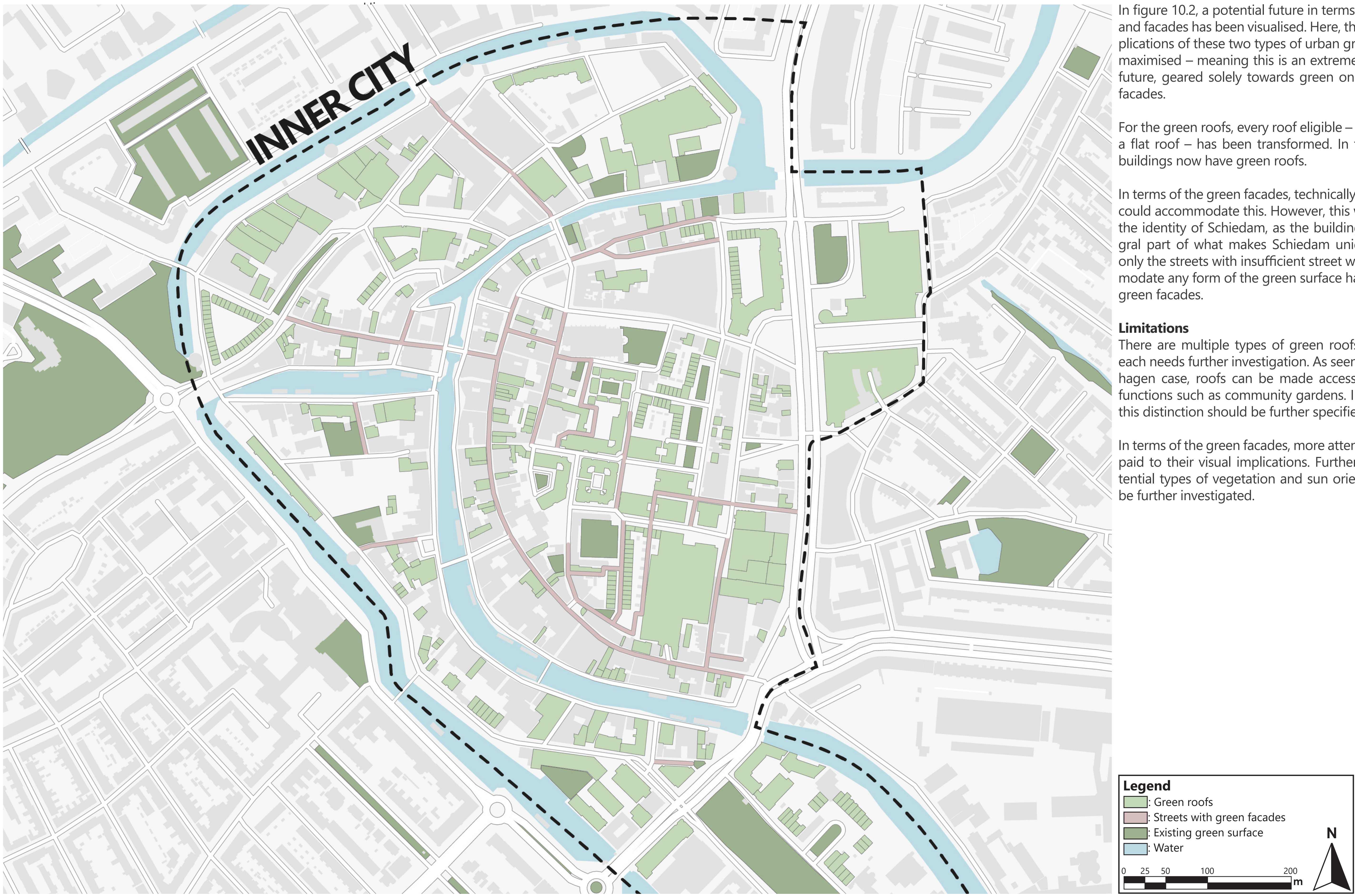


Figure 10.2. Map showing potential future situation of green roofs & facades. Made by Author.

Potential future situation

In figure 10.2, a potential future in terms of green roofs and facades has been visualised. Here, the potential implications of these two types of urban green have been maximised – meaning this is an extreme variant of the future, geared solely towards green on the roofs and facades.

For the green roofs, every roof eligible – meaning it has a flat roof – has been transformed. In total, over 100 buildings now have green roofs.

In terms of the green facades, technically every building could accommodate this. However, this would damage the identity of Schiedam, as the buildings are an integral part of what makes Schiedam unique. Therefore only the streets with insufficient street width to accommodate any form of the green surface have been given green facades.

Limitations

There are multiple types of green roofs possible that each needs further investigation. As seen in the Copenhagen case, roofs can be made accessible for public functions such as community gardens. In a later stage, this distinction should be further specified.

In terms of the green facades, more attention should be paid to their visual implications. Furthermore, the potential types of vegetation and sun orientation should be further investigated.

Appendix 1: Design principles

Green accessibility

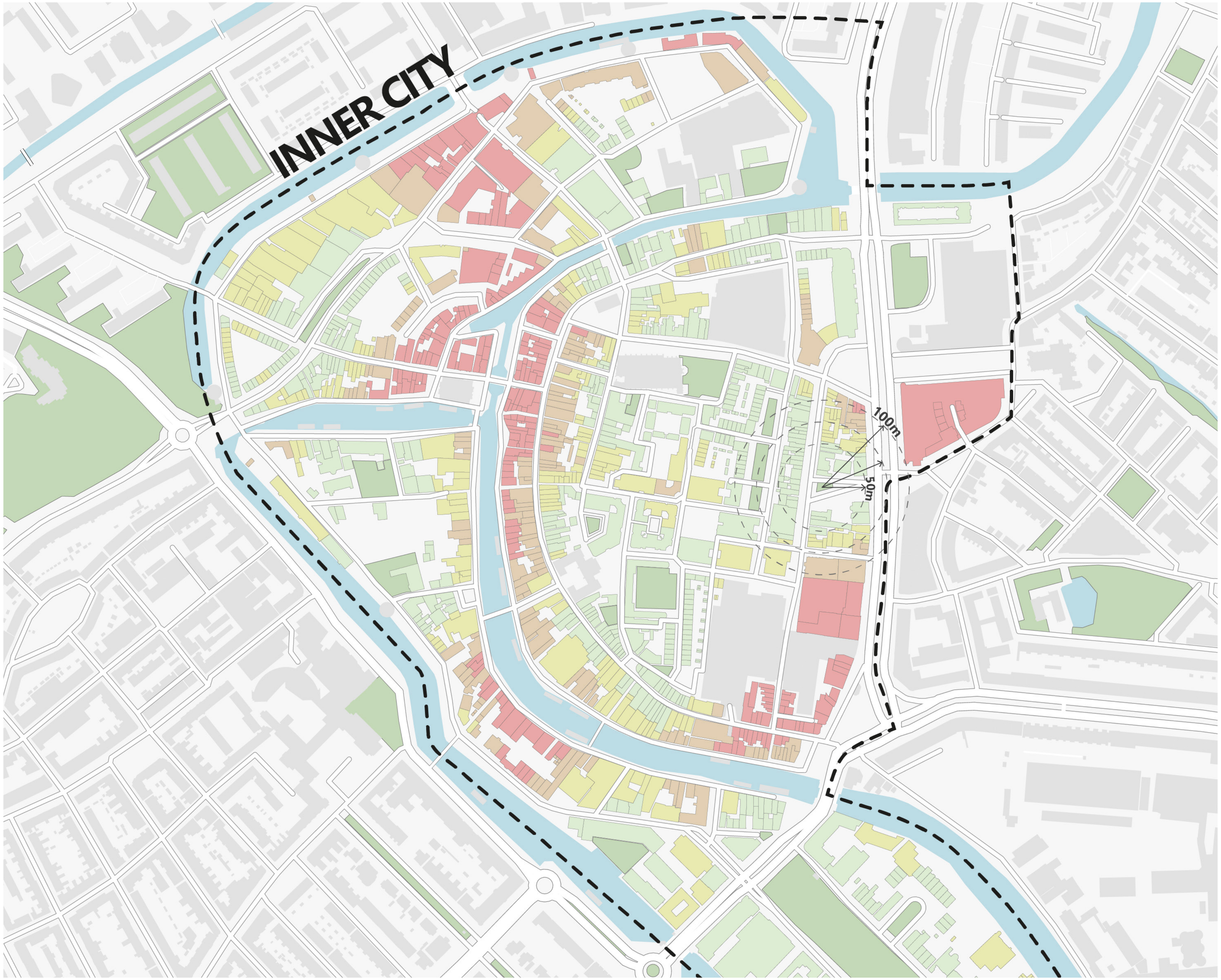


Figure 10.3. Map showing current situation of green accessibility. Made by Author.

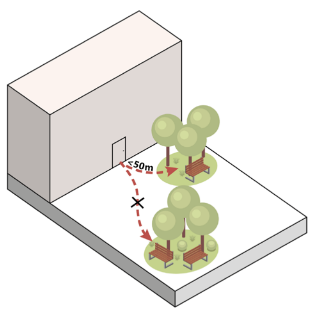
Current condition

Figure 10.3 shows the existing situation of green accessibility within the inner city of Schiedam. Relatively large areas alongside the water currently have no green facility within a 100m radius. Furthermore, the northern island has a large area of unconnected buildings.

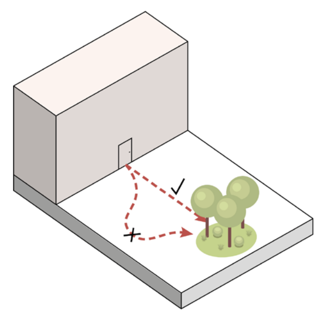
In the real context, however, the green accessibility will most likely be even worse. While assessing the green accessibility, only the variable of distance has been taken into account, meaning the quality and size of the green patches, have not been further looked at. Furthermore, many green facilities are not publicly accessible – only semi-public.

As such, this map is not completely accurate, however, it still illustrates general trends of where the most problematic areas are.

Relevant design principles



Close proximity green



Direct routing

Distance to green

- : >100m
- : 75-100m
- : 50-75m
- : <50m

- : Green surface
- : Water

N

0 25 50 100 200 m

Appendix 1: Design principles

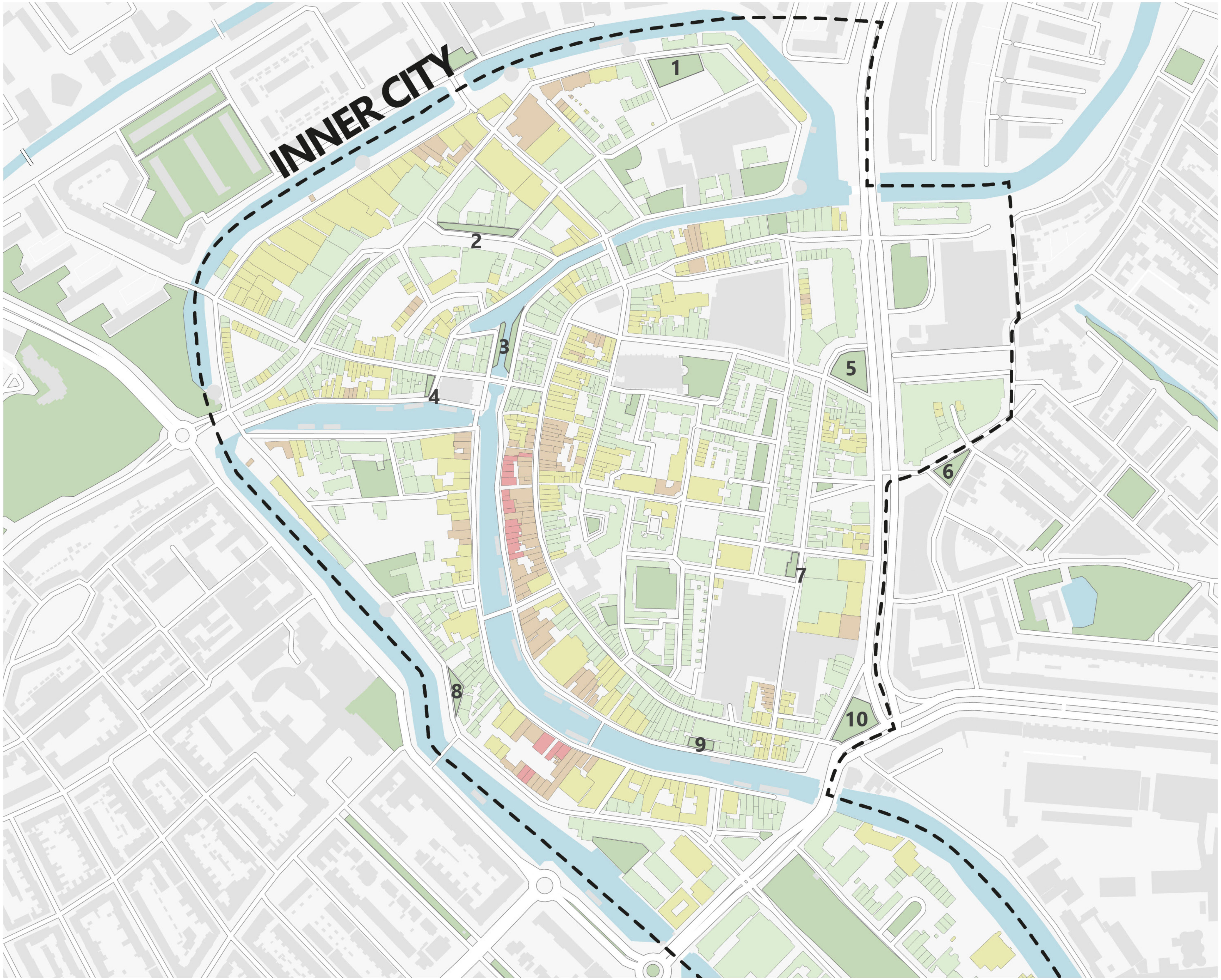


Figure 10.4. Map showing potential future situation of green roofs & facades. Made by Author.

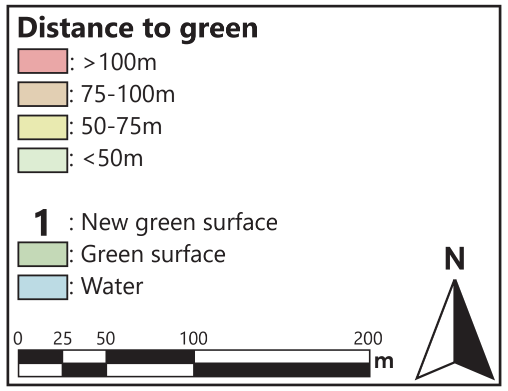
Potential future situation

Figure 10.4 shows the potential future situation of green accessibility within the inner city of Schiedam. Technically, every building could become well connected if you add enough green. As a result, a limit was placed on the number of green spaces that could be added. In total, 10 new green facilities were placed, making it important to choose the most beneficial locations. Multiple variations were examined, with figure 5.48 being the one with the most positive change.

There are still some small areas with low (red) green accessibility that need to be addressed. The chosen 10 new green spaces are therefore not final, it could also be 12/14. This is just meant to show how only a few new green spaces can already have such an impact.

Limitations

As said before, the size and quality of the urban green facilities have not yet been taken into account. Green facilities 8 and 9, for example, each cover quite a large area of buildings while being relatively small themselves. This could cause there not to be enough green space per capita – something that requires further investigation.



Appendix 1: Design principles

Green distribution

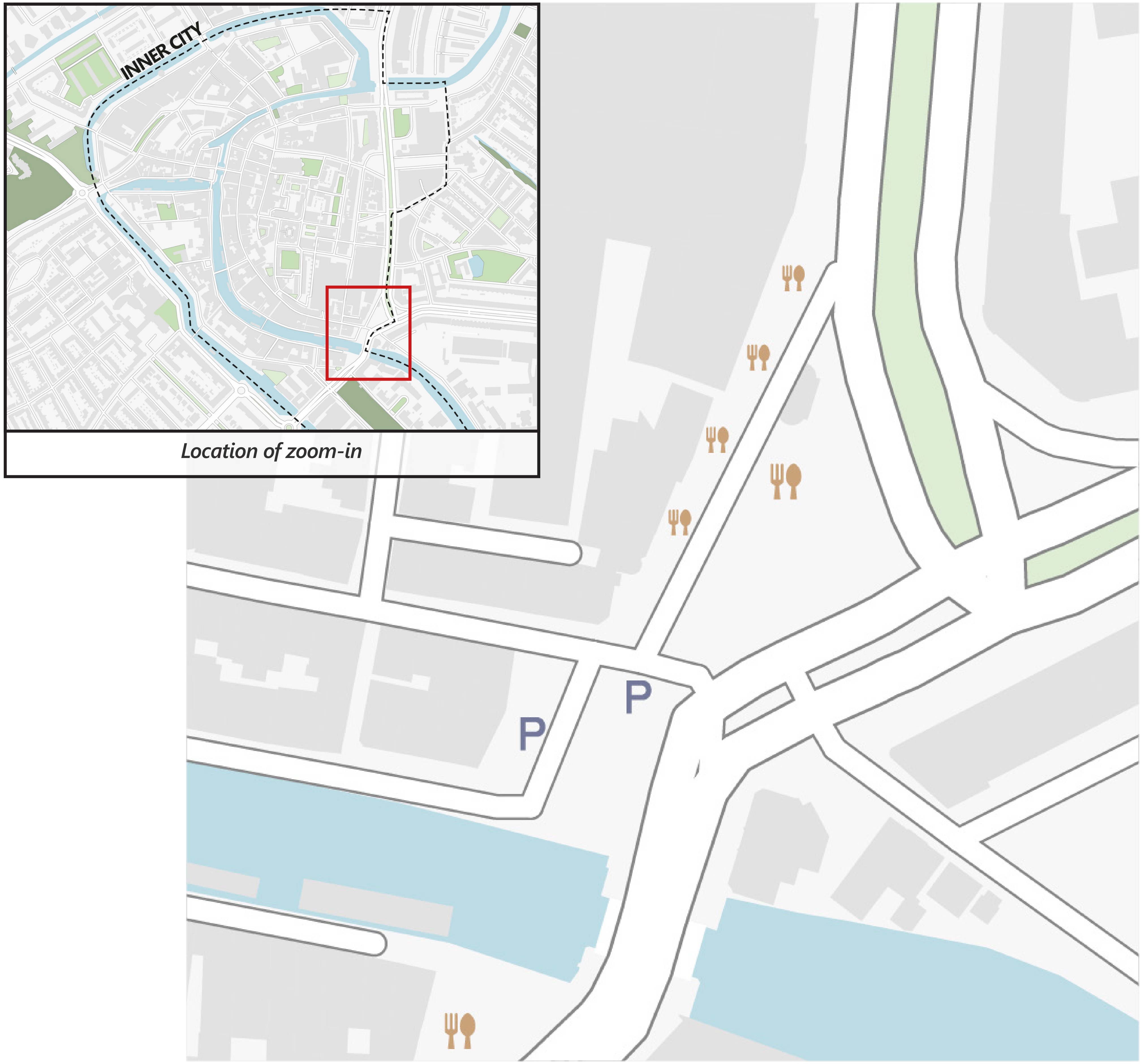


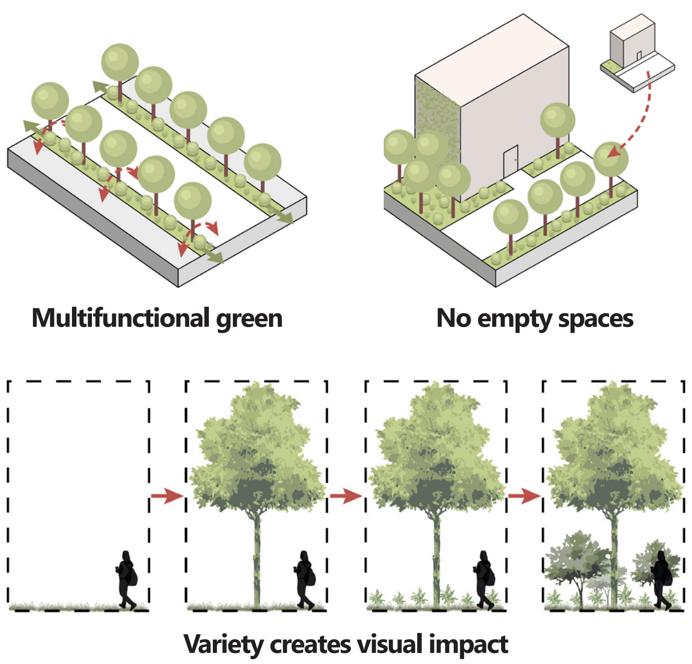
Figure 10.5. Map showing current situation of green distribution (zoom-in). Made by Author.

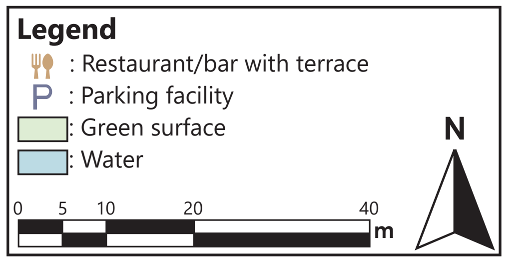
Current situation

Figure 10.5 shows the existing situation of green distribution within a zoom-in area of the inner city of Schiedam. As seen on the map, most of the area is paved, except for some green between the main roads and the canal.

However, in this area in particular – but also other areas around the inner city – there are a lot of empty 'rest spaces' that currently do not have a function. Around the parking spaces, next to the terraces, and alongside roads are just some examples of 'rest spaces' that currently have no function.

Relevant design principles





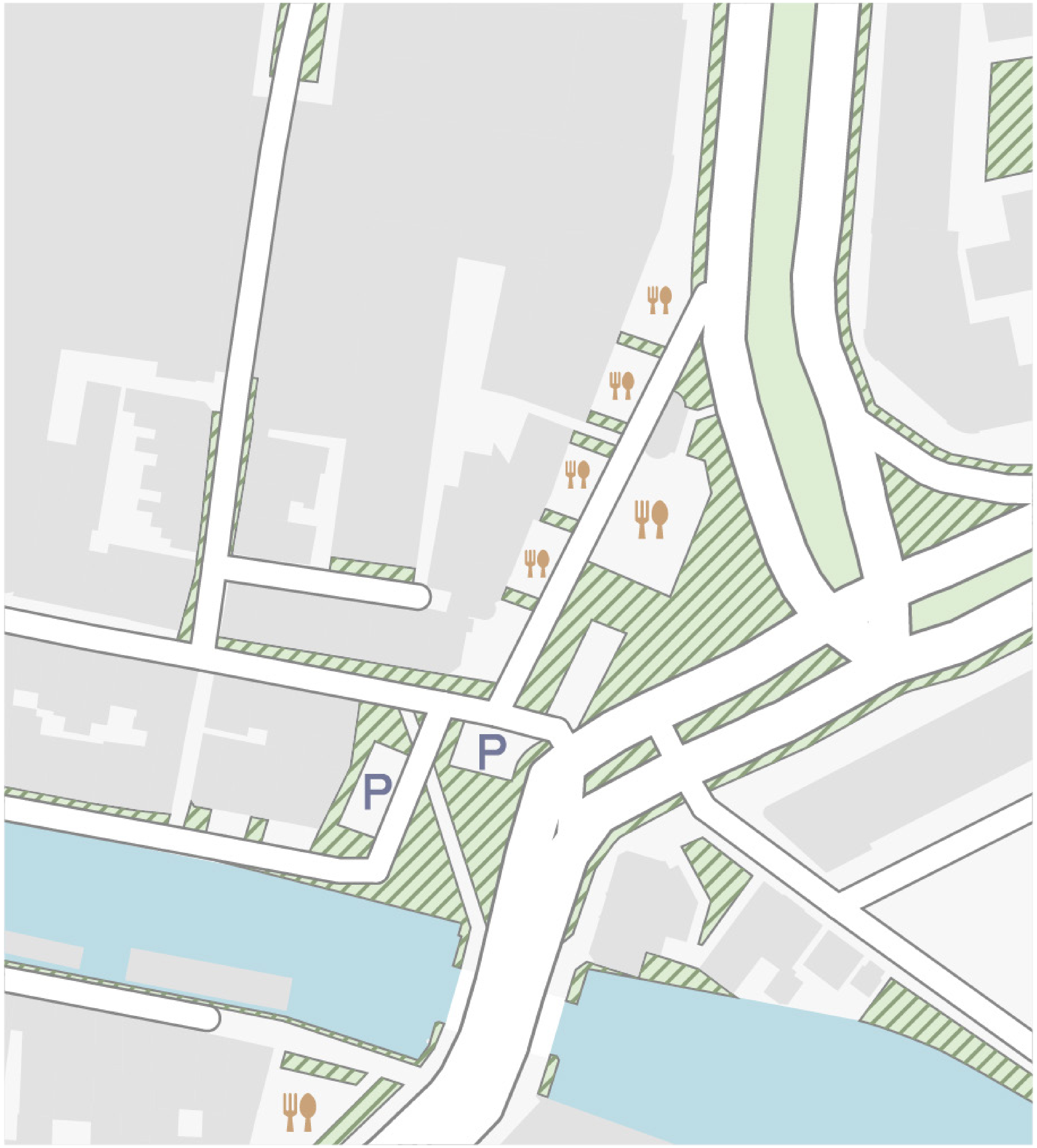


Figure 10.6. Map showing potential future situation of green distribution (zoom-in). Made by Author.

Potential future situation

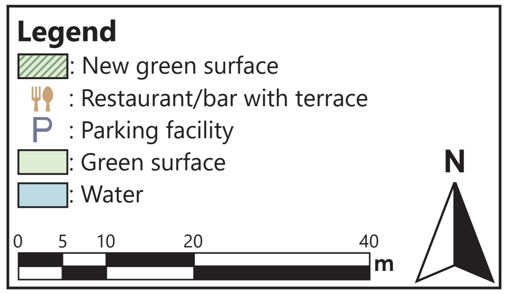
In figure 10.6, a potential future situation for the same zoom-in area can be seen. It focuses on maximalising the green surface area while maintaining all existing traffic routes and functions. For example, all terraces and parking spaces have been maintained, as well as all pedestrian routes.

The image clearly shows the concept of 'rest space' and how more ground space can be covered with permeable surfaces without losing any function. Important to note is that this is not a design proposal, but merely an illustration of the green potential.

A lot of green here functions for multiple purposes. First of all, it has an obvious environmental function, however, it also functions as a barrier between slow and fast traffic. Furthermore, the green can enhance the visual quality of the terraces and give direction to pedestrians.

Limitations

Figure 10.6 is only a first version of the green potentialities. Further investigation is needed to see what type of green could be added here (safety and sightlines are very important). Furthermore not all green might be necessary, while some parking might also be able to be removed.



Appendix 1: Design principles

Social spaces

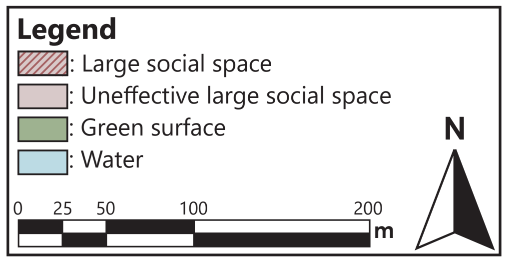


Figure 10.7. Map showing current situation of large social spaces. Made by Author.

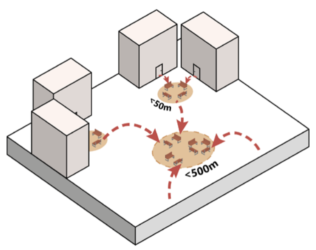
Current condition

Figure 10.7 shows the existing situation of the larger social spaces within the inner city of Schiedam. As seen on the map, several larger social spaces are already available. However, their purpose/target audience is quite similar, as two of them are shopping malls and the other 3 contain bars and restaurants with terraces, meaning each large-scale social space focuses on economic value. Furthermore, no green facility within the inner city currently contributes to the social dimension (outside the inner city this is another story).

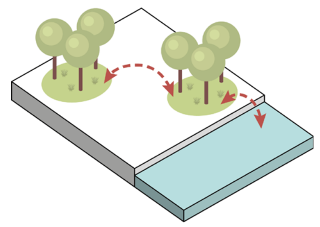
The maps also show two former social spaces that are currently ineffective. These two shopping streets are nowadays mostly used as a slow-traffic route between the other areas. These are also the areas with the highest vacancy levels.

The small-scale social spaces on the other hand – of which examples can be seen in the right two images – are relatively uninviting and only geared towards one age group. As such, it becomes difficult to have social security in these areas, because too few people visit them.

Relevant design principles



Distinct social spaces



Avoid parcellation

Figure 10.8. Map showing potential future situation of large social spaces. Made by Author.

Potential future situation

Figure 10.8 shows a potential future for the larger social spaces in the inner city of Schiedam. It focuses on providing different experiences in different areas, making it so there is a social space available for everyone – regardless of what type you are looking for.

In this, the current shopping streets will be the main areas of transformation. Currently, more and more shops are already leaving the shoppings streets, making place for offices and other businesses. This results in a change in the use of the outside space. The proposal embraces this transformation and aims to provide quality green facilities for offices, businesses, etc. to have their lunch break, while simultaneously providing new green facilities for residents.

The idea is to make a linear park with only a walking path and connections to the buildings, kind of like the New York High Line, but then on a street between buildings. Furthermore, due to the shape of the shopping streets, the first initiative of a natural network is taking shape.

As for the small green facilities, they should get an upgrade with diverse, quality green and more public furniture.

Limitations

One constraint that has not yet been investigated is how this linear park will look in the real context. The Hoogstraat and Broersveld are 9 and 16 metres wide respectively, meaning they might not be able to provide the same qualities as the New York High Line can. Additionally, there are multiple other options in terms of social space development that should also be explored before conclusions can be drawn.