Attractive multi-scale public space in the densifying city of Eindhoven

Improving the quality of life with a toolbox for high-quality public space

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ATTRACTIVE MULTI-SCALE PUBLIC SPACE IN THE DENSIFYING CITY OF EINDHOVEN

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Here it is, my graduation thesis. An important chapter, within a large book, that I am about to finish. This graduation booklet means an end of an era, a period of educational years, and the end of my Master Urban Design and Planning at the Eindhoven University of Technology. The thesis has been written as part of the Graduation Studio "Density and Other Matters".

Since my fourth year of high school, I knew that I would like to study Architecture, little did I know I would develop into an urban designer, which is a beautiful result of that determined choice back then. During the past years, I learned an incredible amount of new things and I have been given many wonderful opportunities with great personal results.

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I hope you enjoy reading my thesis and please pause more often so you can admire the public spaces which are creating the base in our lives!

Content

Figure 0.1: Public space in Kaatsheuvel, made by author

Figure 0.2: Courtyard in Antwerpen, made by author

Abstract

The Netherlands faces a major housing challenge. A large number of housing units must be built, due to the predicted substantial housing shortage by 2025. One of these large-scale housing sites is the existing urban area of Eindhoven, which has to realize approximately 30.000 housing units. This residential densification causes rapid population growth, where urban (green) public spaces come at the expense of these urbanization processes. This growth leads to changes in the physical characteristics of cities to accommodate all these new residents and puts increasing pressure on public spaces. While public spaces function as the heart of a city and contribute to the urban image, the need for new buildings results in changes in the overall amount and use of public spaces. This paper investigates the relationship between the quality of public space, in the context of a densifying city, while stimulating positive individual reactions and quality of life. An overview of the possible urban interventions and their particular stimulation of an individual reaction is conducted through a systematic literature review and eventually translated into a guiding toolbox. A critical policy analysis is executed to gain insights into the current regulations and perspectives of the municipalities. Based on the spatial mapping a neighborhood is chosen that is suitable for designing a densified place with high-quality public spaces, while still preserving and improving the quality of life for inhabitants. The combination of research, analysis, and design illustrates how the toolbox can be implemented within design processes to create a high-quality (multi-scale) public space to stimulate positive individual reactions.

Keywords:
Densification, Public spaces, individual reactions, Quality of Life, physical environment

01
INTRODUCTION

In the coming years, the Netherlands faces major housing challenges. A large number of housing units must be built, due to the predicted substantial housing shortage by 2025 (approximately 400.000 housing units). Despite the rising demand for housing, it is expected that the construction of residential housing will decline. The housing pressure and all the accommodating changes and challenges mostly occur in large cities, including Eindhoven (VastgoedActueel, 2023).

Eindhoven is mainly known as one of the largest cities in the Netherlands (fifth place) (Promovendum, 2022) but is also widely known to many people from abroad. Due to the important role in the field of innovation and creation. Historically, Phillips shaped Eindhoven and it eventually became a city with a new identity. It has become a region with technology (TU Eindhoven), design (Dutch Design Week), innovation (High Tech Campus and Brainport Eindhoven), and multinationals such as ASML and DAF. This prominence and many opportunities within the city are one of the reasons Eindhoven needs to grow and is assigned to build a large number of housing units.

These housing units primarily need to be built in the seven different regions that make up the Urban Network of the Netherlands, as stated by NOVI (Nationale Omgevingsvisie) (RIVM, 2021). One of the large-scale housing sites is the existing urban area of Eindhoven, which has to realize approximately 30.000 housing units in its three development areas by 2030 (RIVM, 2021), of which half will be realized withtin the ring roads (flux, 2023).

At the moment Eindhoven is struggling to make this expected realization possible. Due to nitrogen regulation and other regulations and restrictions, the plans are at odds. Some plans have been approved, others are still awaiting for approval, while others are currently under construction.

Figure 1.1: Innovation statue at the TU Eindhoven (TU Eindhoven, 2022)

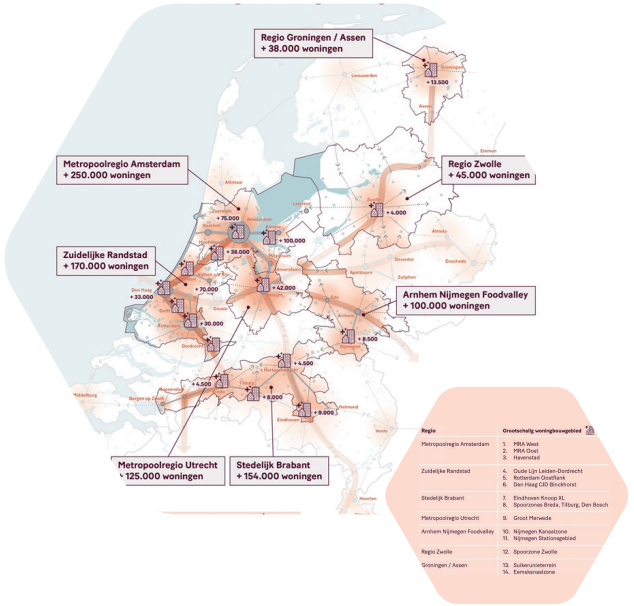


Figure 1.2: Housing numbers for the seven regions in the Netherlands (RIVM, 2021)

Prior to these new large-scale constructions in existing urban areas, from 2000-2017, approximately 500.000 new housing units have been built in these existing structures in the Netherlands. Of which 10% were built in green areas of inner-city locations (Claassens & Koomen, 2017). This residential/urban densification causes rapid population growth, where urban (green) public spaces come at the expense of these urbanization processes. This growth has led to changes in the physical characteristics of cities to accommodate all these new residents (Mouratidis, 2021) and puts increasing pressure on public spaces. While public spaces function as the heart of a city and contribute to the urban image (Paköz, Sözer & Doğan, 2021), the need for new buildings results in changes in the overall amount and use of public spaces.

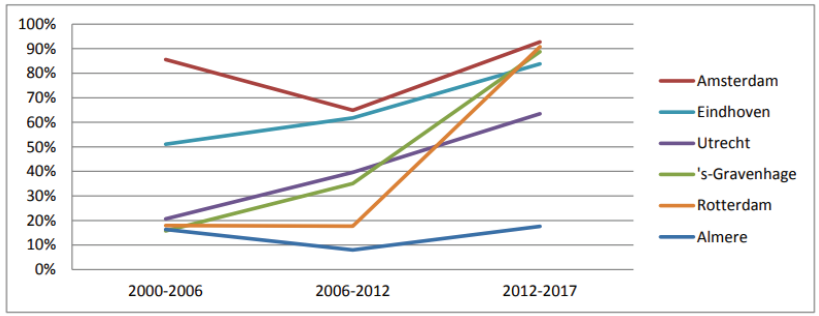


Figure 1.3: Percentage built in inner-city locations (Claassens & Koomen, 2017)

"Urban public spaces refer to those areas or places located in cities that are opened and accessible to all people regardless of gender, race, ethnicity, age or socio-economic status. They include different types of spaces such as plazas, squares, parks as well as connecting spaces such as sidewalks and streets. They are characterized by their different sizes and the diversity of individual features related to their spatial arrangement and functioning that are focused on public life, activities and events"

(Kimic & Karina, 2021)

Figure 1.4: Collage of new development in Eindhoven

Figure 1.5: Benefits of qualitative public spaces

Public spaces fulfill many different roles within the city. First of all, it adds value to the cultural, historical, and architectural aspects of the city (UN HABITAT, 2018). It provides room for the social aspect within the near environment (Garau, 2015). Public spaces stimulate public life, are a meeting place for different social groups. and are part of the communication system between urban activities (Zhou, 2019). This social aspect fosters a sense of belonging, and improves the community feeling of residents (Zhou, 2019). Well-defined, maintained and vibrant public spaces can enhance safety because it reduces insecurity and fear of crime (Garau, 2015). People's perceptions of insecurity can change if a large diversity of people is present throughout the day (Garau, 2015). Public spaces stimulate physical and mental health by offering opportunities for relaxation, physical activity, and close access to green environments. They can increase physical activity levels by improving neighborhood's walkability (making walking more attractive) (Garau, 2015), making active transportation more accessible and increase close destinations (Zhou, 2019), reduce stress, and provide a lively environment (Garau, 2015). Which eventually encourage people to walk more, to play or enjoy their near environment (Garau, 2015). It can influence people's mental health and social well-being (Zhou, 2019). Besides that, public spaces improve the surrounding environment, increase all types of (slow) mobility use and stimulate inclusion. However, on the other hand, they can also promote the local economy and political movements (Zhou, 2019).

As a physical structure and a place for passive experience, active engagement, and the social aspect (Metha, 2013) public spaces enhance the quality of life by meeting people's needs for health, recreation, social cohesion and a high-quality urban environment (Delianur Nasution & Zahrah, 2018). They are essential for individual and social well-being, serving as a gathering place for communities and expressing the diversity of their common identity (Sepe, 2021).

Public spaces are important places within cities and contribute to a healthy and social public life. Many articles prove that these effects exist, but these findings and possible solutions have a missing link to tools, urban planning strategies, and design targets to achieve effects on these outcomes. Research is done with statistical approaches and outcomes. However, there is a lack of ex-post studies which investigate if the applied design principles and guidelines have made a difference.

The municipality of Eindhoven has distinguished four different quality levels for public spaces in their "Handboek Openbare Ruimte 2021". In fact, the handbook addresses two extremes, on the one hand, the type of public spaces, and on the other hand, the specific infill of public space at a very detailed level (Gemeente Eindhoven, 2021). However the middle step, the urban design principles and guidelines of the public space are lacking. It is not clear how the public space will achieve a certain quality and stimulates individual reactions. Detailed analysis on policy analysis can be found in chapter 2 Policy analysis on page 18.

"Eindhoven is one of the greenest cities of the Netherlands. However, is not equally green everywhere. Across the entire city 44 % of the area consists of greenery. For the area within the Ring, this is only 18%. In combination with the densifcation challenge of upcoming years, this requires a substantial investmet in greening the center to improve liveability for current and future residents"

- Councilor Rik Thijs
(flux, 2023)

The health of individuals and cities in relation to public space is a high priority on the agenda of municipalities. Public spaces can contribute to achieving many Sustainable Development Goals, which are of great importance these days (United Nations, 2022). Such as, goal 3. Health and Well-being: public spaces promote access to healthy food through the support of local public markets and public spaces are the main places for physical activities. Goal 5. Gender Equality and goal 10. Reduce inequality: Strategies focus on creating safe public spaces for everyone, especially reducing violence against women and girls. 8. Decent Work for all: Public spaces function as "workplaces" for many informal workers. It is important to maximize the opportunities for these workers to use a safe public space. 11. Sustainable cities and communities: green and open spaces, play an important role in sustainable cities and communities. 13. Climate Change: (green) spaces can contribute to climate change mitigation and resilience (Daniel, 2016).

In the last few years, COVID-19 has increased the demand for public spaces (RIVM, 2020), but it also changed people's perception and use of urban spaces (Paköz, Sözer, Doğan, 2021). Changed patterns and behavior in public spaces emphasize the importance and the need for outdoor spaces (Khateeb & Shwaket, 2022). During the outbreak, people were missing and therefore longing for public spaces, especially open and green spaces (Paköz, Sözer, Doğan, 2021). There are positive and negative implications, how people react to one another in public spaces as well as interactions between people and places (Khateeb & Shwaket, 2022). Especially for green spaces, COVID-19 has forced to revise the existing green space typologies, where there will be more focus on local neighborhood parks, pocket parks and informal green spaces, while larger parks get other functions and become more essential for physical activity (Honey-Rosés, et al., 2021). RIVM stated that most squares and parks in cities of the Netherlands are designed for large groups, but also here the expectation is that there will be increased demand for smaller green spaces or neighborhood parks for relaxation in response to COVID-19 (RIVM, 2020).

The challenge is to create enough quality public spaces, with enough room for exercise, social interaction and playing in the immediate living environment. While combing densification with the creation of a living environment that is accessible, safe and attractive for everyone (RIVM, 2020). This leads to the following research question:

"How can urban design principles be applied to urban public spaces to stimulate positive individual reactions (and eventually increase the Quality of Life) in a densifying city?"

What is the relation between urban design principles and Quality of Life?

How can urban design principles contribute to high-quality urban public spaces and individual reactions?

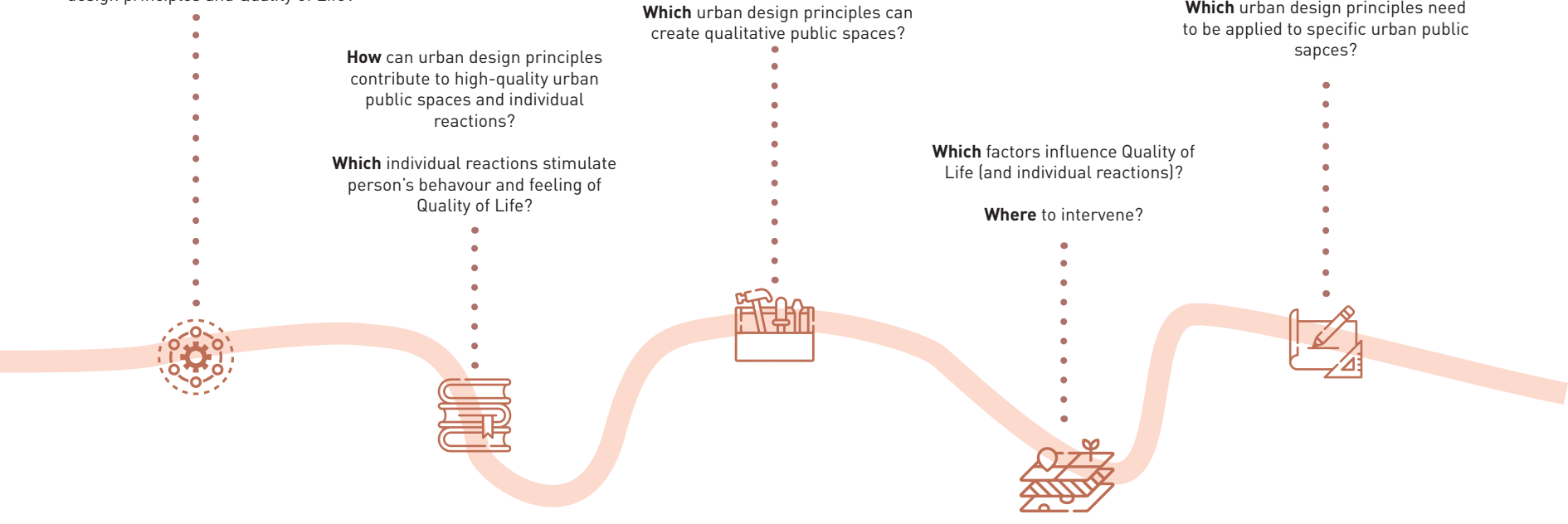
Which individual reactions stimulate person's behavour and feeling of Quality of Life?

Which urban design principles can create qualitative public spaces?

Which factors influence Quality of Life (and individual reactions)?

Where to intervene?

Which urban design principles need to be applied to specific urban public sapces?



The aim of this paper is to create a theoretical framework that examines the relationship between the quality of public spaces and their impact on behavior patterns and quality of life in the context of a densifying city. This study will identify the attributes (urban design principles) for improving the quality of public spaces in Eindhoven, to create a toolbox that can be utilized in Eindhoven. This toolbox can also be a guideline for other cities and can be used for future research. The aim is to improve and adapt urban places by urban design principles which will encourage individual reactions and enhance the overall quality of life in densifying cities.

To answer the research question, the paper is structured as follows: First, the theoretical framework is defined and elaborated, to identify how urban spaces and design principles relate to each other and how they can influence certain relations. After that, the methodology will outline the methods that are used during all processes. A systematic literature review is conducted to examine the relationship between urban public spaces, their design principles and their reaction to individual behavior. Policy analysis is performed to understand the importance of public space in different cities and at different levels. Based on the executed systematic literature review a toolbox is developed which can be used as a design guide for designing qualitative public spaces. After this, spatial analysis are conducted in Eindhoven, to determine the intervention zones, using open data and tools such as Qgis and Buurtkijker. Takeaways for design will be implemented in the intervention zones to improve the quality of public space and stimulate different individual reactions. Finally, the paper concludes with a discussion of the findings and overall conclusions of the project.

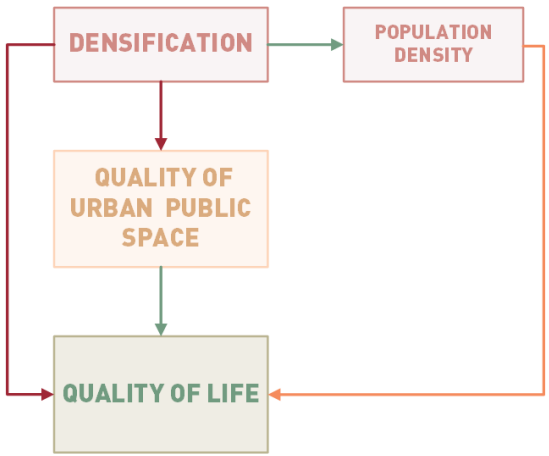


Figure 1.6: Relation between densification and public spaces

METHODOLOGY

Theoretical framework

The theoretical framework is the starting point of this paper and functions as the base of the whole research. It illustrates the relationship between urban public spaces, urban design principles, and individual reactions, quality of public space, quality of life, and behavior patterns.

Systematic literature review

The systematic literature review examines the relationships between urban public spaces, urban design principles and individual reactions as outlined within the theoretical framework (conceptual model arrows 1,2,3 (and 4,5,6)). The research string for the systematic literature review is conducted on 18 October 2022 and has the following topics:

(TITLE-ABS-KEY ((public OR shared OR community OR communal)) AND TITLE-ABS- KEY ((space OR realm OR domain)) AND TITLE-ABS-KEY ((densification OR density OR dense)) AND TITLE-ABS-KEY ((qol OR "quality of life" OR well-being OR wellbeing)) AND TITLE-ABS-KEY ((urban OR built AND environment OR city)))

The selection criteria process was based on the inclusion of titles and abstracts. First the titles where included that related to public spaces/ built environment, "Quality of Life" or well-being and case studies. After this first screening, the papers were screened on abstracts. Abstracts that are included are based on the relation with quality of public spaces, its effect on "Quality of Life" or well-being and effects on city/neighborhood or street level. The last screening was the exclusion of non-English and non-access articles, which resulted in a total of 59 articles that were include within this systematic literature review. The entire selection criteria process is shown in figure 1.7 and the selected articles can be seen in Appendix A on page 164.

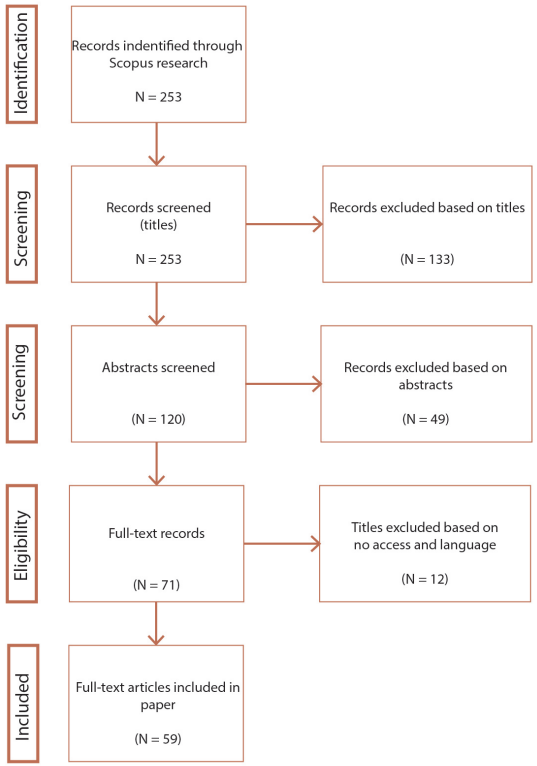


Figure 1.7: Selecting criteria systematic literature review

Creation of toolbox

The outcomes of the systematic literature review show the textual principles of urban design principles and their relation to individual reactions. These textual principles are translated into design guidelines. These design guidelines, executed and presented in 3D diagrams, will show potential solutions and directives for designing high-quality public spaces. This toolbox can serve as a starting point while designing new public spaces and can also be used to improve existing public spaces. When this toolbox is implemented in a specific location/public space shall be determined regarding the results of the spatial analysis of Quality of Life in Eindhoven.

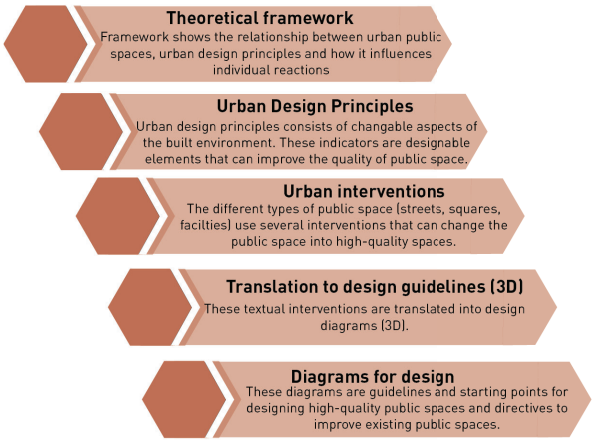


Figure 1.8: Creation and purpose of toolbox

Policy analysis

The policy analysis aims at providing a comprehensive understanding of the importance of public spaces and their effect on a healthy city. Within this analysis, information from various departments on different scale levels is reviewed critically. The national vision for public spaces in the Netherlands, the provincial perspective of Noord-Brabant and Eindhoven's policy documents. The analysis also examined visions of comparable cities to make an inventory of their approach to preserving the quality of public spaces. Finally, this policy analysis makes an inventory of the diverse approaches various departments have to improve or preserve the quality of public spaces.

Spatial analysis

The spatial analysis will identify the Quality of Life in different neighborhoods of Eindhoven. The analysis takes into account the Quality of Life factors that are indicated in the conceptual model (internal and external environments) and strengthened by the findings of the systematic literature review. The analysis will result in several theme plans, which identify the Quality of Life in different neighborhoods of Eindhoven. Neighborhoods that have the lowest scores on Quality of Life will be used to identify the intervention zones in the city. Within these zones improvements of the quality of public spaces will occur. The data for this analysis is obtained from various sources such as specific resident surveys (of Eindhoven) and the application "Buurtkijker" This data is processed in Qgis for graphic outcomes.

Complete methodology

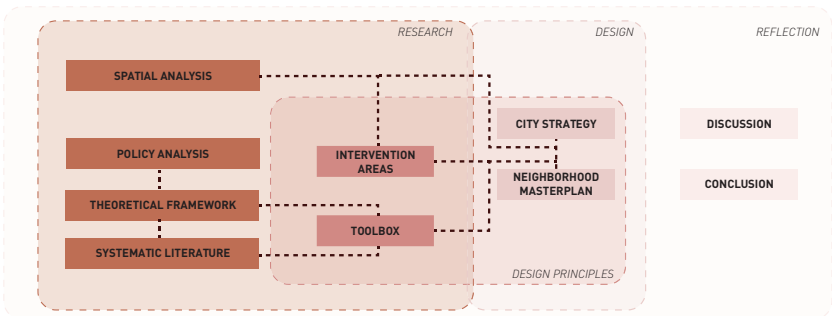


Figure 1.9: Research set-up

02
POLICY ANALYSIS

National level

The Netherlands is good at efficiently utilizing its limited territory, ensure that every hectare has a function. However, the intensive use of the living environment also has limits on the physical and social aspects. There is an increased tension between use value, experience value, and future value of the physical environment. This is due to the intensive use of space and the great pressure on the physical system, a maximization of use value. In addition, a policy which does not precisely represent the perspective of the citizen (experience value) (Hamers, et al., 2021).

One of the central objectives of the Omgevingswet and of national importance is the high-quality environment. It involves the importance of cultural heritage, architectural quality of buildings, urban planning quality, and quality of nature and landscape. It also involved the human experience of the physical environment the effects that the environment has on people and the intrinsic value that society attributes to the identity of areas, animals, and plant species (Nationale Omgevingsvisie, 2020).

Planbureau voor de Leefomgeving (PBL) concludes that it is a large assignment in a confined space and advises a recalibration of the relationship between use value, experience value and future values which are necessary to determine the physical and social boundaries in the Netherlands' living environment. Stretching a boundary within the short term can obstruct future use; future values limits use value. Sometimes the physical limits are reached before the social and the other way around. Besides the use value, experience value is an important driving force in spatial development. For example, the revival of interest in heritage in recent years is increasing and such identity and local history are more important (Hamers, etal., 2021).

In line with the Omgevingswet, the Nationale Omgevingsvisie (NOVI) has two objectives: development and protection. The government indicates that protection and development are not always correlated or even incompatible. So it is important to prioritize interests, which require political choices that are supported by society. Three design principles are used in the NOVI to guide this consideration process: 1. Combination of functions takes precedence over single functions, 2. Prevention of passing on, and 3. The characteristics and identity of an area are central. These principles establish a foundation for a new balance between use-, experience-, and future value. At this point it is important to actually apply these principles in further elaboration within the NOVI, but also in region- and area specific. This can be achieved through programs and agendas, but also good spatial design per region or area in which a concrete interpretation is given to efficient (new) function combinations, to a (re)design of space that considers social appreciation and ecological sustainability (Hamers, et al., 2021).

North-Brabant

The "Brabantse Omgevingvisie" states the scenic and cultural-historical importance of spaces. In which a good living and working environment are balanced with green areas, quietness, and a natural environment that facilitates biodiversity. According to this vision, these elements contribute to a high-quality environment that makes Brabant beautiful, attractive, and distinctive. A healthy environment is promoted by using "co-creation opportunities" in the (re)design of the environment and inviting movements through more greenery, or more facilities for outdoor recreation. A high-quality environment is an area-oriented approach where the city and country come together. New use open spaces involve value-added creation from "looking deep, round and broad" so that a development adds quality to the place. Local initiatives are supported to strengthen landscape and nature. By looking at developments and issues from a "deep, round and broad perspective", it is possible to achieve that preservation and development reinforce each other (Provincie Brabant, 2018).

In general public spaces might be cleaned and maintained, but little information is available on how valuable, well-used and active public spaces are (Beck, 2009). Overall, there is no single dataset or indicator that can measure the quality of public space (Beck, 2009). There is missing information on public spaces (in Eindhoven) and the quality of all open spaces within a city. Eindhoven itself, but also other major cities, have policy documents, but have missing links to design targets, strategies, and user experience.
Below the policy documents of the largest cities of the Netherlands are described.

Eindhoven

One of the programs and agendas for region-specific implementations is "Handboek Openbare ruimte 2021", the municipality of Eindhoven distinguishes four different quality levels for public spaces: standard, plus, special and exclusive. The distinction is mainly about the significance within a region. Standard public spaces are all user-friendly spaces. Quality level "plus" is a public space that has special meaning for a district or neighborhood, for example, cultural-historical value. "Special" is a public space that is supportive and has an important function or place within the city. The quality level "exclusive" distinguished public spaces that have an image-bearing function or are 'typical Eindhoven' places such as the Dommel. (Gemeente Eindhoven, 2021). After that, the handbook discusses, per quality level, for example, the type of paving, lamppost type, which street furniture can be used, thresholds, parking and suppliers of play equipment. In fact, the handbook addresses two extremes, on the one hand the type of public spaces, and on the other hand, the specific infill of public space at a very detailed level (Gemeente Eindhoven, 2021). The middle step, the urban design principles and guidelines of the public space are lacking. It is not clear how the public space will achieve a certain quality and stimulates individual reactions. But also in which way the public space fits within the environment and how that can be achieved. This also applies to other major cities within the Netherlands.

Figure 2.1: Quality levels of Eindhoven (Gemeente Eindhoven, 2021)

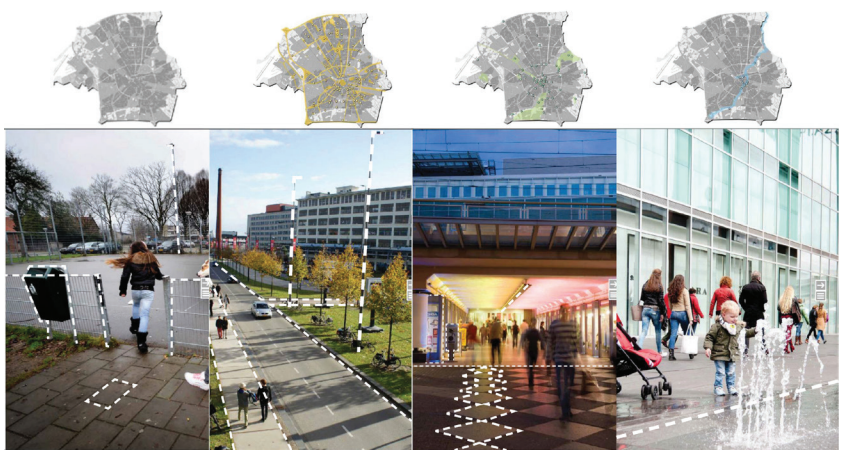


Figure 2.2: Focus within the publi space of Eindhoven (Gemeente Eindhoven, 2021)

Rotterdam

Rotterdam uses the "Handboek Openbare Ruimte Rotterdamse Stijl" with three pillars: 1. City by the river (making water experience able in the city), 2. Attractive network (developing characteristics of various lines) and 3. Recognizable areas (through the design of public spaces to respond to specific landscape and urban characteristics of an area). These pillars will be implemented with the three main themes: green city, balance in use through city-wide quality in the choice of materials. This manual provides guidelines for the design, use and, management of public spaces. The structure of public space is distinguished at three levels with the main structure, areas and lines and, special accents. And also in this handbook is a comprehensive list of material and furniture choices for achieving a high image quality within the city (Gemeente Rotterdam 2023).

Figure 2.3: Omgevingsvisie Rotterdam (Gemeente Rotterdam, 2021)

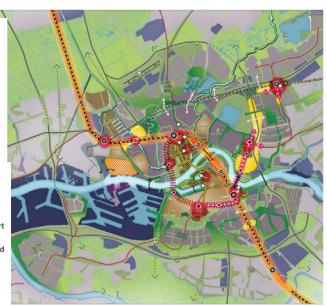


Figure 2.4: Omgevingsvisie Rotterdam (Gemeente Rotterdam, 2021)

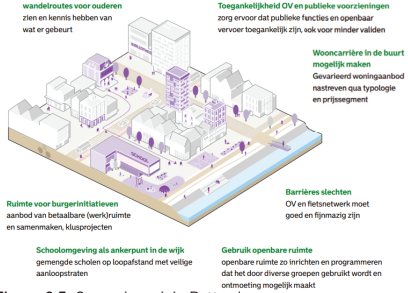


Figure 2.5: Omgevingsvisie Rotterdam (Gemeente Rotterdam, 2021)

Utrecht

Another program and agenda for implementation is "Handboek Openbare ruimte Utrecht 2021" which handles the principles of use, design, and management. The Handbook continues with design principles, about a healthy living environment, in which sustainability, accessibility and intensity are central. These general principles are followed by a very large list of building blocks, requirements and, technical details about for example, roads, street furniture, playground equipment, bollards, lighting, sewers, and structures (Gemeente Utrecht, 2021). Similar to Eindhoven, these basic principles are applied to different public levels. In this case, Domstad (the largest part of the city, with standard layout and basic distinctiveness), Domstad Bijzonder (special lines and places, other use than residential and working areas), and Utrechtse Allure (the Utrecht visitation cards, where public space with quality level requires customization) (Gemeente Utrecht, 2016).

Figure 2.6: Handboek Openbare Ruimte (Gemeente Utrecht, 2021)

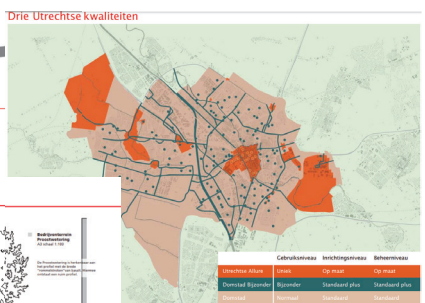


Figure 2.7: Handboek Openbare Ruimte (Gemeente Utrecht, 2016)

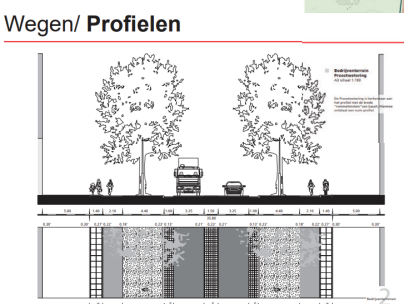


Figure 2.8: Handboek Openbare Ruimte (Gemeente Utrecht, 2021)

Amsterdam

The largest city in the Netherlands, Amsterdam, has created a program: "De huiskamer van álle Amsterdammers" (Visie Openbare Ruimte 2025), the public space in Amsterdam where urban life flourishes, day, evening and night. It must be a place that is designed and experienced as pleasant and safe. They set five ambitions to achieve this kind of urban public spaces. The space must be suitable for current and future use, supporting the dynamics within the city. In addition, it must be designed and managed sustainably and maintained at a proper level. Finally, the design and management is a shared task within the city. These new ambitions are created, because there is a changed use of public space. Within the city park visits are rising, because there is a combination of a central location, an attractive design, and many different facilities which is a guarantee for success. Amsterdam sees different challenges and tasks per zone because developments do not have the same meaning everywhere (Gemeente Amsterdam, 2017).

Figure 2.9: Visie openbare ruimte Amsterdam (Gemeente Amsterdam, 2017)

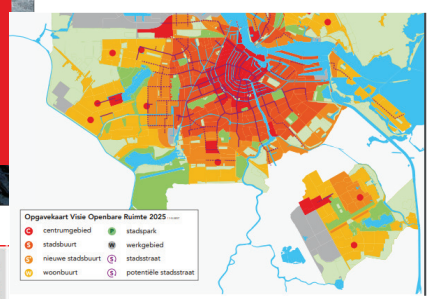


Figure 2.10: Visie openbare ruimte Amsterdam (Gemeente Amsterdam, 2017)

Figure 2.11: Visie openbare ruimte Amsterdam (Gemeente Amsterdam, 2017)

Overarching themes

The overarching themes within the policy analysis at different scales are contributions to the use, design, and management of spaces. In addition, all policies emphasize the future and how spaces can be made sustainable and future-oriented. And realize that each place or zone requires different developments. But in all documents, there is little to no consideration of experiences and user perspective.

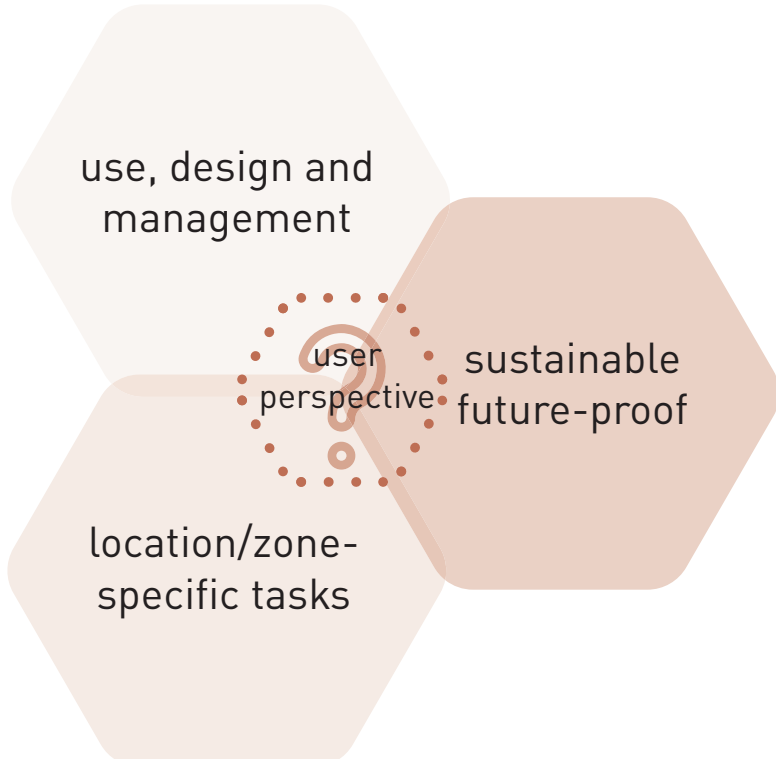


Figure 2.12: Overarching theme within policies

Figure 2.13: Public space within Eliasterrein - VonderKwartier

03
THEORETICAL FRAMEWORK

The conceptual framework of this study is based on a model by (Ewing & Handy, 2009), which presents the role of perceptions as they intervene between physical features of the environment and walking behavior. The framework has been modified to a model that presents the relationship between urban spaces, the quality of public spaces and their impact on behavior patterns and eventually on Quality of Life (see figure 3.1).

The theoretical framework of this study illustrates the relationship between urban public spaces, urban design principles, and individual reactions. A particular urban public space is designed with different urban design principles, which can positively or negatively influence individual reactions of people living in the near environment of these public spaces. All three elements form or contribute to the quality of public space. The quality exuded by a particular public space impacts the behavior patterns of people, which influences how people will behave in a certain public space and vice-versa. People's behavior in a certain public space also influences the quality a space receives. Eventually, all these elements will have consequences on the overall quality of life of citizens within a city. In summary, the framework demonstrates the important connections between the design and quality of public spaces and their impact on behavior and quality of life.

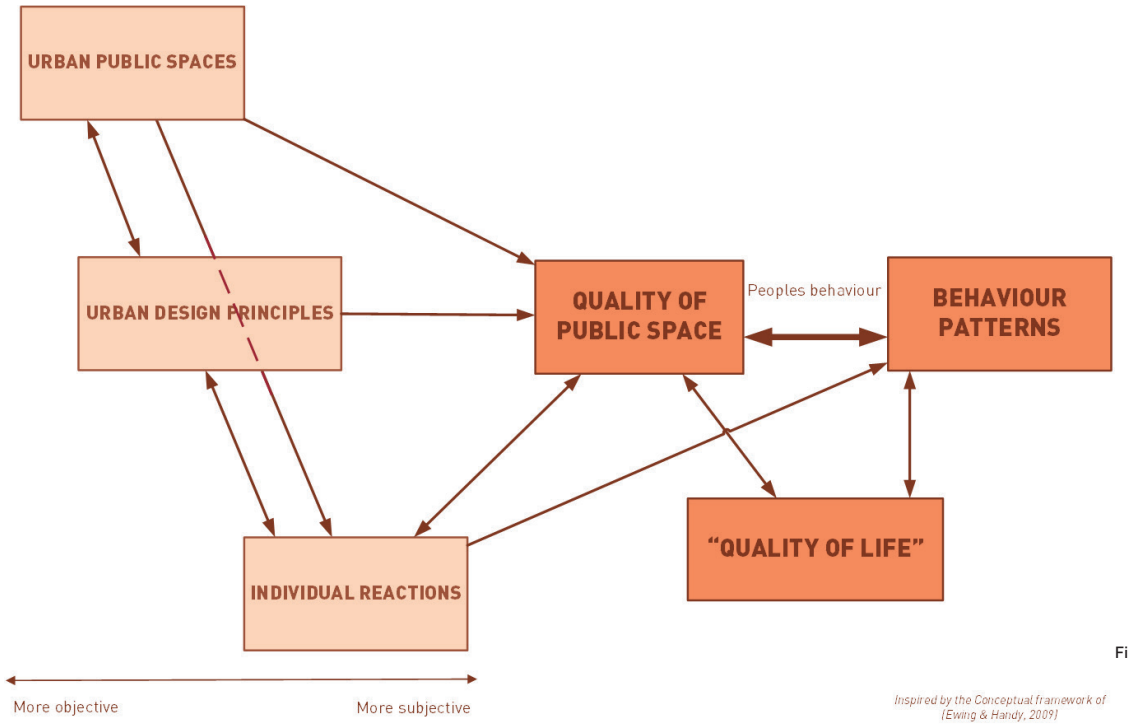


Figure 3.1: Theoretical framework

Inspired by the Conceptual framework of (Ewing & Handy, 2009)

To define and specify the terms used within the conceptual model an operationalization of the conceptual framework is conducted. The process outlines the specific characteristics of the urban public spaces, urban design principles, and individual reactions (later on also the Quality of Life). All these indicators have different influences on the elements of the framework. In the remainder of the report, the indicators will be used to clarify and specify certain influences and connections. The descriptions of the indicators are shown in tables 3.1 - 3.3 on the next page.

In Figure 3.2 the conceptual model is shown with the operationalization indicators. Besides that, all arrows (connections) are numbered. Within the literature review and the remainder of the report, these numbers will return to clearly show which connection is investigated at what point.

As an urban designer within the built environment sector, it is relevant to understand what you can change/adapt or influence. Within this study, it is possible to influence the indicators of urban public spaces (dedicate new public spaces). An urban designer can use urban design principles to stimulate and change public spaces into qualitative places, which will have changeable influences on the individual reaction of people and the quality of public spaces. These changeable elements will eventually change the quality of public spaces, and people's behavior and positively change the quality of life in cities and neighborhoods (see Figure 3.2).

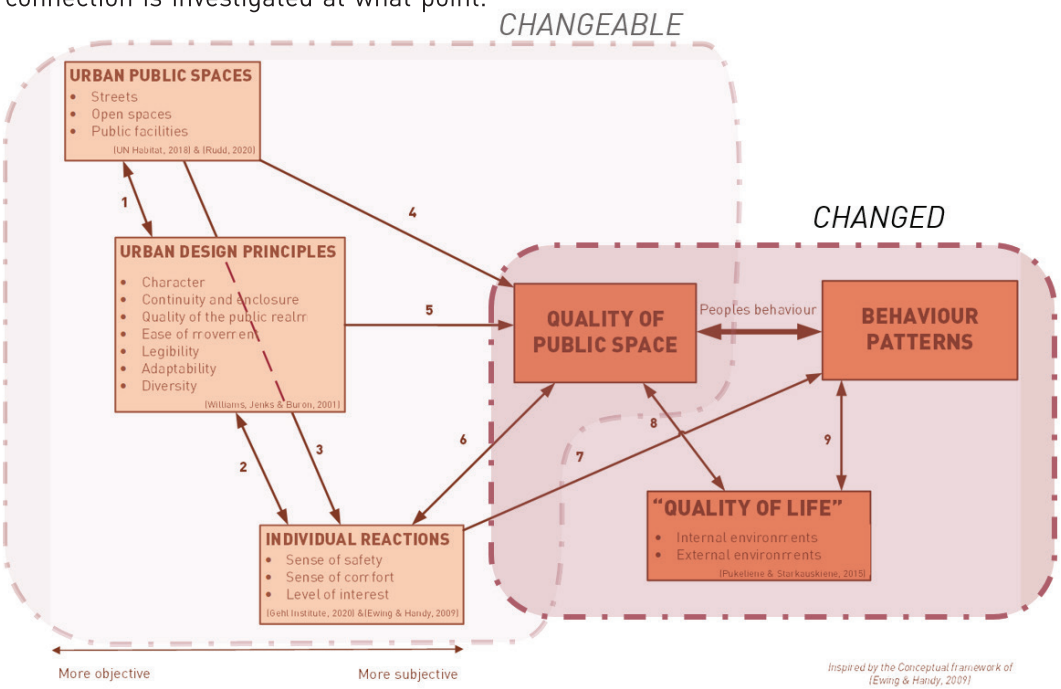


Figure 3.2: Theoretical framework + influences urban designer

Urban public spaces are indicated and categorized on their individual sizes and function, catchment (how far people might need to travel to visit the public space) and public or private appearance (Rudd, 2020).

Domain	Operationalization	Description	Literature
Urban public spaces			(Rudd, 2020)
	Streets	Publicly owned and maintained, accessible without charge and all hours	
	Open spaces:	Generally serve the function of recreation	
	Local/pocket open public spaces	0.03 -0.04 ha; 400 meters distance, 5 minute walk; small parklets that service, the recreational needs of the immediate residential population	
	Neighborhood open public spaces	0.04 -0.4 ha; 400 meters distance, recreational and social needs of a community, variety of activities	
	District/ city open spaces	0.4 -10 ha; 800 meters distance, 10 minute walk provide for organized formal sport	
	Regional open spaces/ Large city parks	10 – 50 ha; geographical or social regions attract visitors from outside	
	National/Metropolitan open public spaces	50 – 200 ha; support concurrent use services as recreational, sporting and basic amenities	
	Public facilities	Only accessible during operating hours	

Table 3.1: Indicators Public spaces

Urban design principles are indicated by seven objectives that make up the framework for good urban design and key aspects for 'good local environments'. The principles take into account the general public's view of what successful public spaces are (Williams, Jenks & Burton, 2001).

Urban design principles			(Williams, Jenks & Burton, 2001)
	Character	Places with own identity, responding to and reinforcing distinctive patterns of development and culture	
	Continuity and enclosure	Public and private space should be clearly distinguished, and the continuity of building frontage should be promoted	
	Quality of public realm	Places should have attractive and successful public spaces that work well for all users, including disabled and elderly people	
	Ease of movement	Places shoud be easy to get to and move through, should be inter-connected and put people before traffic	
	Legibility	Place should have a clear image, be easy to understand and easily to identify the purpose of the space	
	Adaptability	Places should be capable of changing in response to economic, social and technological conditions	
	Diversity	Places should have variety and choice, mix of appropriate developments and uses that meet the local needs of all sectors of society	

Table 3.2: Indicators urban design principles

Sense of comfort, sense of safety, and level of interest show how an individual reacts to a place. Different people have different reactions and can be assessed with an objective view (Ewing & Handy, 2019). Each category covers an aspect of the various human interaction and experiences within a public space (Hsueh, 2018).

Individual reactions			(Gehl Institute, 2020)
	Sense of safety:		
	Protection against traffic and accidents	Do people across groups and ability experience traffic safety, do they feel safe?	
	Protection against crime and violence	Do people feel secure in public spaces, perceive safety all hours of the day?	
	Protection against unpleasant sensory experience	Can the public space react to noise, dust, smells or other pollution?	
	Sense of comfort:		
	Opportunities to walk	Is the space accesible and easy to move through to enhance personal mobility?	
	Opportunities to stand/stay	Is the space equipped with features to stay and lean on?	
	Opportunities to sit	Is the space provided with primiary seating options (non commercial)?	
	Opportunities to see	Are seating options palce to look at intersting things?	
	Opportunities to talk and listen	Is it possible to have conversation together?	
	Opportunities to play and exercise	Is the space equipped with options to be active at multiple times of the day and year?	
	Enjoyment		
	Human scale	Is the space in relation with the building at human scale ?	
	Opportunities to enjoy the positive aspects of climate	Are climate aspects taking into account, e.g. seating options in the shadow or in sun?	
	Aesthetic quality and positive sensory experience	Is the space good designed in terms of shape and durability?	

Table 3.3: Indicators individual reactions

04
SYSTEMATIC LITERATURE REVIEW
(QUALITY OF PUBLIC SPACES)

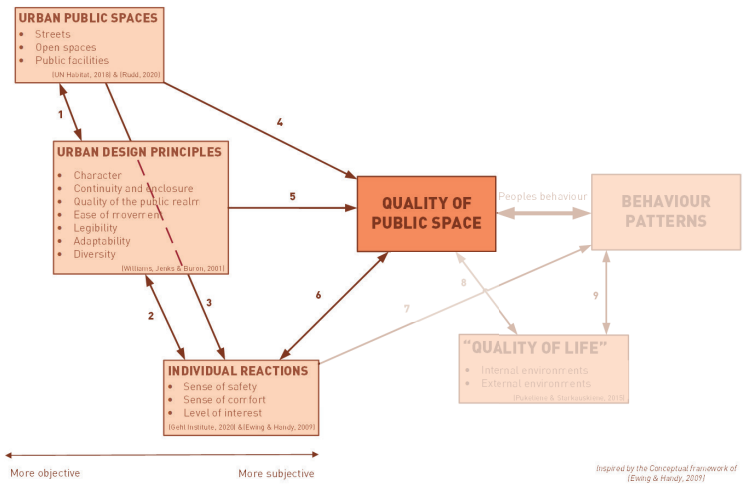


Figure 4.1:Theoretical framework with numbers and arrows

The systematic literature review examines the relationships between urban public spaces, urban design principles, and individual reactions as outlined within the theoretical framework (conceptual model arrows 1,2,3 (and 4,5,6)).

A particular urban public space is designed with different urban design principles, which can positively or negatively influence individual reactions of people living in the near environment of these public spaces. All three elements form or contribute to the quality of public space.

The literature outcomes are different specific interventions (spatial or non-spatial) of the urban design principles. These outcomes are exact guidelines for urban design and show the urban interventions that can place regarding the relations between urban design principles, public space and individual reactions. At the same time, they also outline suggestions about how to promote these relations.

To define and specify the specific interventions of the urban design principles. First, the literature outcomes explain the relationship between urban public spaces and urban design principles (arrow 1). Thereafter, the literature outcomes define the relationship between the urban public spaces and the three different individual reactions (arrow 2). The tables can always be consulted for the relations and function as background information that you always can rely on.

Promotion of urban design principles in relation to specific urban public spaces (arrow 1).

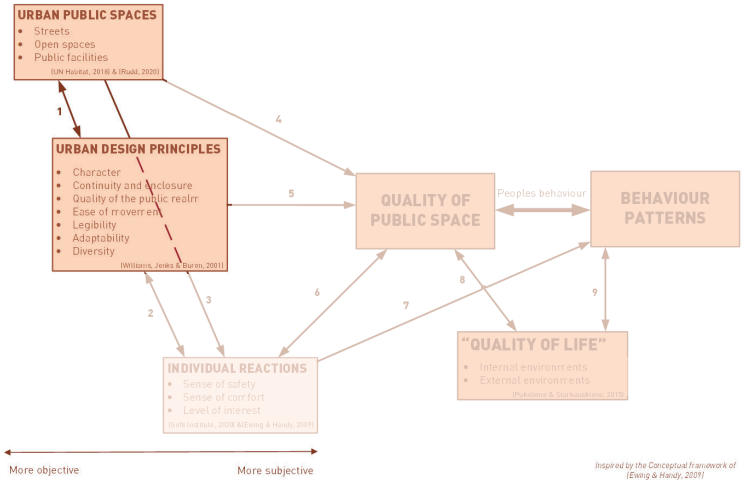


Figure 4.1:Theoretical framework with numbers and arrows

This chapter presents specific outcomes from the first link of the conceptual model, the relation between the type of urban public spaces and the urban design principles. These relationships and outcomes are shown in more detail in Table 4.1 and show that some outcomes occur in multiple design principles.

For each type of urban public space, different design principles are important. Streets prioritize ease of movement and character, while local open public spaces benefit more from principles such as quality of the public realm, diversity, and adaptability. On the other hand, regional open spaces gain more from the character, diversity, and quality of the public realm. Overall, the urban design principles of ease of movement, character, quality of the public realm, and adaptability are considered most important for all types of urban public spaces. In addition to these global outcomes, the relationships also show the quality of the public space but also highlight the behavior patterns of the inhabitants e.g. people's cognitive understanding of a place, which helps define personal identity. Another example is a selection of public spaces is always based on the free will of a person [51]. It is a choice based on their purpose for visiting, the examples show non-spatial interventions. So, the relationships not only demonstrate the quality of the public spaces, but also provide insight into the possible behavior patterns.

For the public space streets, the most important element is appearance. It is important that there are wide sidewalks [3;8], with enough trees [3], these wide places stimulate more recreational value [2;5] and where the duration of stay can be increased [18;40]. This can contribute to the important changes these days that streets are no longer only for vehicular traffic but for multiple uses, cars are no longer predominate [26], which creates better and easy accessibility that is safer for inhabitants, in particular for older adults and children [18;22].
In other words, the table clearly shows the relation between the various urban design principles. For example, wider sidewalks (ease of movement) stimulate more creational value (quality of public realm).

Green streets in relation to pavement detailing and striking marking improve the continuity, legibility and attractiveness of streets [13;34] (especially towards green areas) [2]. For example, the presence of trees on both sides visually extends the park [16], which stimulates the ease of movement toward public spaces. All in all, streets need to be pedestrian-friendly spaces [22], with good and easy accessibility [16;17;18;22;29;46], and enough presence of trees [4], to enhance social engagement and cohesion [28] so it stimulates the diversity within public spaces).

Urban design principles \ Urban public spaces	Street	Local/pocket open public spaces	Neighborhood public open spaces	District/ city open spaces	Regional open spaces/ Large city parks	National / Metropolitan open public spaces	Public facilities
Character	Density of users made the street more crowded, noisier, a better place to watch others [1;5], Green streets make routes leading to green areas more attractive [2], presence of trees [4] on opposite sides of the streets visually extend the park [16], site authenticity and specificity of its location [16;40;58]	site authenticity and specificity of its location[16;40;58], uniqueness with responsive to local context [16], positive sense of intimacy [16], spaces with a colorful, community-driven urban intervention [21], Smaller parks have less attraction than municpal parks and district parks [51], it is a comfortable place for it is surrounded by different walls that make people feel safe and, taking into account the small size of the walls, also isolated enough to feel well [58]		site authenticity and specificity of its location [16;40;58], Smaller parks have less attraction than municpal parks and district parks [51]	Smaller parks have less attraction than municpal parks and district parks [51], different zones allows engagement in different activities [58]		many destinations visually connect public open spaces [34], place are too small to add more facilities [38]
		Density of users in a public space [1] ,green areas improve learning [2], environmental design can increase positive emotional bonds [3], high-attractiveness and good ventilation [9], 'pleasant ambient noise' [13], cleanliness and maintenance [4;15;34;40;46;51;58], Tranquility [15], many destinations visually connect public open spaces [34], Improve shading and wind flow can lead to increased social activities [36], people prefere to stay on paved areas [40]					
Continuity and enclosure	Perceive this space as theirs, or as an extension of their home [1], pavement detailing used to continue the park in all directions [16]	Perceive this space as theirs, or as an extension of their home [1], well-defined green areas [3], pavement detailing used to continue the park in all directions [16]	well-defined green areas [3], pavement detailing used to continue the park in all directions [16]	well-defined green areas [3]		No more large open spaces, because inner cities are crammed with buildings [2]	
		Not clearly defined boundaries, many people are interested in being able to control places themselves directly by their expressions [13], separate surrounding by a low fence [29]					
Quality of public realm	More room on the streets increases recreational value [2;5], good air quality and acoustics [37], the duration of stay is influenced by the amount of shaded areas [13;18;40]	Greenery creates safety for childern [2], good air quality and acoustics [37], peripheral location in a neighborhood improve use [40]	good air quality and acoustics [37] peripheral location in a neighborhood improve use [40]	natural features, such as flowers, trees, fountains and fish ponds [34]			amount of local facilities [10][51]
		Sufficient places to sit improves child-friendliness [2], proximity to green areas [3;17;46;51], presence of all kind of services [4;5;6;11;28;29;47], sufficient places to sit [13] or need to be considered in relation to the environmental conditions and social interaction of the sites [36], good lighting [15;34], the duration of stay is influenced by the amount of shaded areas [13;18;40], Water features to improve air quality and natural ounds [29], unsafe pathways and long travel distance between facilities in parks reduce elderly to move around easy [34], protection facilities from bad wheater [47], The selection of a park is always based on the free will of a person, a choice based on his/her purpose for visiting, availability of facilities, and socio-physical accessibility [51]					
Ease of movement	wide sidewalks [3;8], presence of trees [3], more heavily trafficked streets curtailing the range of children's outdoor play more than those on less trafficked streets [5], good accessibility [16;17;18;22;29;46;51], plants and trees on opposite sides of the streets visually extend the park [16], Accessibility and safety are essential for older adults to make their travel behavior choices towards urban public spaces [18], high-quality network of open and green spaces which are connected by an appropriate pedestrian and cycling infrastructure [2][31]	More heavily trafficked streets curtailing the range of children's outdoor play more than those on less trafficked streets [5], Most commonly visited public spaces are within 5 min walking distance [18], good accessibility [26;29;46;51], flat terrain allows for easy pedestrian mobility [35;44]		Most commonly visited public spaces are within 5 min walking distance [18], flat terrain allows for easy pedestrian mobility [35;44]			easy acces (by transportation) [4;10;13;34], availability of recreational services in a 300-meter buffer [12], good accessibility [16;17;18;22;29;46;51]
		A park within walking distance of every home [2], proximity to green areas [3;17;46;51], Good transport conditions for elderly to access green areas [7], good accessibility [16;17;18;22;29;46;51], easy access (by transportation) [4;10;13;34], fully accessible for people with disabilities [16], Places are more frequently used if they are located within a 60 min walking distance [18], high-quality network of open and green spaces which are connected by an appropriate pedestrian and cycling infrastructure [2][31], barrier-free and circulation [34], people that need to walk through surrounding areas in order to access parks, such as street connectivity and slope of the terrain, influence the park use [44]					
Legibility	immediately striking and significant markings [13;34], the use of interstitial spaces as small parks, monuments or city landmarks [16]	the use of interstitial spaces as small parks, monuments or city landmarks [16], With its several staircases and different levels, the park, raised higher than the streets, arouses immediate interest [58]	the use of interstitial spaces as small parks, monuments or city landmarks [16], With its several staircases and different levels, the park, raised higher than the streets, arouses immediate interest [58]				
		immediately striking and significant markings [13;34], peoples cognitive understanding of a place, help define personal identity [22], people are more inclined to socialise in spaces with good visibility towards their surroundings [36]					
Adaptability	road space is no more meant only for vehicular traffic but for multiple uses, providing larger and safer public space [26], Repurpose abandoned infrastructure into linear parks [28]	adaptable and functional to surrouding area [16], the use of interstitial spaces as small parks, monuments or city landmarks [16]					
		meeting the needs and serving the community that use it, social interaction [8;17;18;28;29;34], improve mental and physical health [9], public places that allow interaction with other people through observation, communication or behaviour, become increasingly important for public and social interaction, as well as a leisure activity, in times of increasing individualization and legally protected privacy [13], moveable chairs gives users some influence on the appearance and functioning of their space [29], playground are most of the time not shaded, thus reducing its usability in summer [40]					
Diversity	Pedestrian-friendly spaces [22], Enhances social engagement and cohesion of those who live alone or are isloated [28] or elderly [34]	Different in form and use, generated in a well-connected network of green [2;3], A rest or conduct activities with one or more 'personal acquaintances' [13], uniqueness with responsive to local context [16]	Green areas as extension of school for a playful, social and educational role through natural elements, furnishings, structures and programs [2], A rest or conduct activities with one or more 'personal acquaintances' [13], uniqueness with responsive to local context [16]	support different ecosystem services [17]	support different ecosystem services [17], offer more amenities to attract people from further away [32]	support different ecosystem services [17], offer more amenities to attract people from further away [32]	community compactness, housing unit mix, and transportation improvement [5], different public facilities is the demands of different groups [50]
		Increasing contact with strangers [1], Child-friendliness with broad sidewalks and informal spaces for games, skate parks, and public sports [2], the variety in tree species creates more diversity [2], different sorts of activities causes more frequently visits to green areas [4;5], sit table space in the public realm, either on the sidewalk or elsewhere, facing the right way [5] and sheltered [34], meeting the needs and serving the community that use it, social interaction [8;17;18;28;29;34], Watching other people is a form of social inclusion [13], providing different activities the population wants [16;18], Pedestrian-friendly spaces [22], Enhances social engagement and cohesion of those who live alone or are isolated [28] or elderly [34]					

Table 4.1: Relations between urban public spaces and urban design principles

For the different types of open spaces, the element quality of the public realm is most important. Local/neighborhood or district open public spaces should be in proximity of people [3;17;46;51], this proximity can be promoted with interventions that focus on the quality of public spaces e.g. presence of all kind of services [4;5;611;27;29;47], including good lighting [15;34], and good air quality and acoustics [37] which focuses on the design principle character.

Sufficient places to sit [13], which improves child-friendliness [2], with protection from bad weather [47]. While moveable chairs encourage the adaptability of a space, giving people influence on the appearance of their space [29].

Besides that, the selection of a park is always based on the free will of a person, a choice based on his/her purpose for visiting, availability of facilities, and socio-physical accessibility [51]. Besides that the diversity within open spaces is necessary, which can be suggested with different sort of activities that causes frequent visits (behavior patterns) [4;5], and will increase contact with strangers [1]. But also the variety of tree species that create an attractive place for all kinds of insects [2]. Child-friendly places with informal spaces for games, skate parks, and public sports [2], but also places for social engagement and cohesion of those who live alone or isolated [28] or older adults [34]. In line with the streets, open public spaces need good accessibility [16;17;18;22;29;46], easy access (by transportation) [4;10;13;34], and need to be fully accessible for people with disabilities [16] or elderly [34]. But parks need to be within 5-minute walking distance of inhabitants [2;18], cause people will more frequently use parks. Specific to local and neighborhood open space is the site authenticity and specificity of its location [16;40;58]. It needs to be unique with responsive to the local context [16], while meeting the needs and serving the community that use it, to stimulate social interaction [8;17;18;28;29;34].

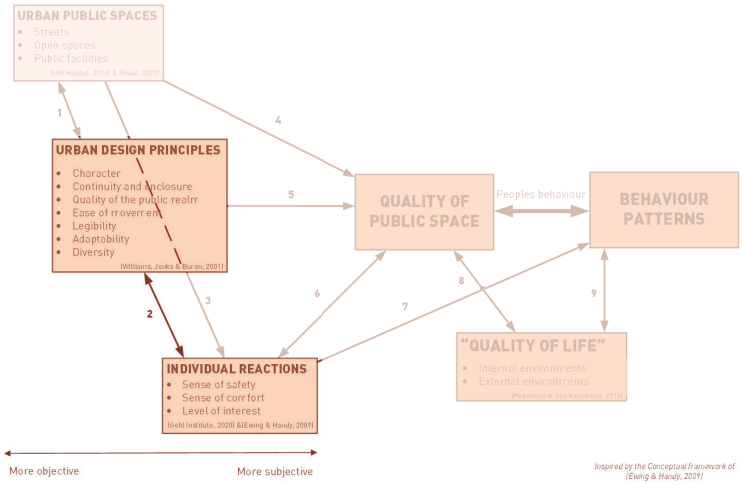


Figure 4.1:Theoretical framework with numbers and arrows

Promotion of urban design principles in relation to individual reactions

This chapter explores people's individual reactions to specific urban design principles. This relation (arrow 2 within the conceptual model) shows how certain interventions of the urban design principles will affect a particular individual reaction. For each category of individual reactions, a table is provided with a clear overview. The intervention shows which reaction is stimulated or suggested and how this relation can be promoted. The following sections elaborate on each category (sense of safety, sense of comfort and enjoyment) in detail.

SENSE OF SAFETY

The first category that influences individual reactions is the level of safety. People should feel protected against traffic, crime, and unpleasant sensory experiences.

The most important factor that creates a safe environment is the number of people in a public space [1]. The amount of people in a public space is encouraged by the diversity of uses and activities within a common street, or open space, which may contribute to better security throughout the day and better surveillance during nighttime [30], although women perceive public spaces less safe than men [1]. People feel more secure when there is clear legibility. People are more inclined to socialize in spaces with good visibility toward their surroundings [36]. It is a comfortable place for people if it is surrounded by different walls that make people feel safe [58], while immediately creating a character with it is a positive sense of intimacy [16]. More general outcomes that promote a secure feeling in open spaces are appearances such as cleanliness and maintenance [4;15;34;40;46;51;58], clear markings [13;34], 'pleasant ambient noise' [13] and a pedestrian-friendly environment [22].

Besides that, people feel safer when there is good lighting and it secures enjoying walking alone in the public open space during the day and night time [15;34]. Sense of safety is influenced by protection from accidents, which can be reduced by easy access [4;10;13;34] to open public spaces, where cars no longer are predominant on roads and spaces are for multiple uses [26]. In that situation, parents will be willing to let their children play outdoors more often [5]. Another important principle for feeling safe against traffic and accidents is the ease of movement, interventions such as wide sidewalks [3], and easy accessibility [4;10;13;34], with flat terrain allow for easy pedestrian mobility [35;44], in combination with plants and trees on both sides allow people to feel safe in public spaces [16]. Besides that, it is important for people with disabilities or the elderly that spaces are easily accessible to make their travel behavior choices toward urban public spaces and to be able to attend social activities.

The last element that influences the sense of safety is the protection against unpleasant sensory experiences. Therefore it is important to create a place that has enough shaded areas [13;18;40], which can influence the duration of stay. To counteract unpleasant sensory experiences it is valuable to stimulate natural features, such as flowers, trees, fountains and fish ponds [34] that can stimulate good air quality and acoustics [37]. In combination with improvements in shading and wind flow it can lead to increased social activities within public spaces [36].

Individual reactions / Urban design principles	Sense of Safety		
	Protection against traffic and accidents Feeling safe	Protection against crime and violence Feeling secure	Against unpleasant sensory experience
Character	Density of users in a public space [1], Greenery creates safety for childeren [2]	Density of users in a public space [1], Greenery creates safety for childeren [2], positive sense of intimacy [16], cleanliness and maintenance [4;15;34;40;46;51;58], many destinations visually connect public open spaces [34]	pleasant ambient noise' [13]
Continuity and enclosure		it is a comfortable place for it is surrounded by different walls that make people feel safe and, taking into account the small size of the walls, also isolated enough to feel well [58]	
Quality of the public realm	Greenery creates safety for childeren [2], Good lighting, people feel safe and secure, enjoying walking alone in the public open space during day and night time[15;34].	Women perceive public spaces less safe than men, and higher density more appealing and less stressful than men [1], More room on the streets increases recreational value [2;5], Good lighting, people feel safe and secure, enjoying walking alone in the public open space during day and night time[15;34].	the duration of stay is influenced by the amount of shaded areas [13;18;40], natural features, such as flowers, trees, fountains and fish ponds [34], Improve shading and wind flow can lead to increased social activities [36], good air quality and acoustics [37],
Ease of movement	wide sidewalks [3], easy acces (by transportation) [4;10;13;34], more heavily trafficked streets curtailing the range of children's outdoor play more than those on less trafficked streets [5], plants and trees on opposite sides of the streets visually extend the park [16], fully accessible for people with disabilities [16], Accessibility and safety are essential for older adults to make their travel behavior choices towards urban public spaces [18], high-quality network of open and green spaces which are connected by an appropriate pedestrian and cycling infrastructure [2][31], good accessibility [16;17;18;22;29;46;51], flat terrain allows for easy pedestrian mobility [35;44]	wide sidewalks [3], good accessibility [16;17;18;22;29;46;51]	
Legibility		immediately striking and significant markings [13;34], people are more inclined to socialise in spaces with good visibility towards their surroundings [36], it is a comfortable place for it is surrounded by different walls that make people feel safe and, taking into account the small size of the walls, also isolated enough to feel well [58],	
Adaptability	road space is no more meant only for vehicular traffic but for multiple uses, providing larger and safer public space [26], Repurpose abandoned infrastructure into linear parks [28]		playground are most of the time not shaded, thus reducing its usability in summer [40]
Diversity	Pedestrian-friendly spaces [22]	community compactness, housing unit mix, and transportation improvement [5], providing different activities the population wants [18], Diversity of uses, buildings and tenures accommodated within a common street pattern may contribute to greater security throughout the day due sufficient population in the street in the daytime and better surveillance during the night time [30]	

Table 4.2: Relations between urban design principles and individual reaction: sense of safety

SENSE OF COMFORT

The second category that influences individual reactions is the sense of comfort. One of the influential factors for people to feel comfortable is the character of the space. Also within this individual reaction density of users in a public space is crucial. More people within streets and public spaces make the places more crowded and a better place to watch others [1;5]. Walking, standing and staying are promoted by paved [40] greener streets that make routes leading to green areas more attractive [2], in combination with many destinations wit visually connect all the public spaces [34]. People feel comfortable sitting in a tranquil setting [15] and when they can experience nature [3]. Location and amount of places to sit also contribute to the design principle of diversity. It is essential that seatings in the public realm, either on the sidewalk or elsewhere, face the right way [5] and are (mostly) sheltered [34]. or need to be considered in relation to the environmental conditions and social interaction of the sites [36].. In combination with moveable chairs, it gives users some influence on the appearance and functioning of their space [29].

Another aspect of the principle of diversity is that public spaces are different in use and form [2;3]. People need to be able to participate in different sorts of activities [58], e.g. have enough places to sit [13;34], watch other people [13], and increase contact with strangers [1] and children need informal places to game, skate and sport [2]. When the open spaces meet the need and serve the community that uses them, people feel more comfortable which allows engagement in different activities, which stimulates social interaction [8;17;28;29;34;58]. People can adapt to the public space that allows interaction with other people through observation, communication or behavior, which become increasingly important for public and social interaction, as well as leisure activity [13].

Also in this case the ease of movement is influential on people's sense of comfort. If public spaces with the availability of recreational services are in a 300-meter buffer [12] people are more willing to walk, talk, play and exercise within these public spaces. Walking toward public spaces with flat terrain allows for easy pedestrian mobility [35;44], in well-defined areas [3] with full accessibility for people (including disabilities or elderly [16;34], in combination with safe [34] and wide [3] pathways. With a high-quality network of open and green spaces that are connected by these appropriate pedestrian and cycling infrastructure [2;31], which encourages walking, staying, and exercising. Proximity to green areas [3;17;46;51] stimulates these activities high create a sense of comfort.

Spaces should have a cleaned and maintained [4;15;34;40;46;51;58] appearance for people to feel comfortable, allowing different zones for stimulating engagement in different activities [58].

Individual reactions / Urban design principles	Sense of comfort					
	Walk	Stand and stay	Sit	See	Talk and listen	Play and exercise
Character	Green streets make routes leading to green areas more attractive [2], many destinations visually connect public open spaces [34], positive sense of intimacy [16], people prefere to stay on paved areas [40]		experience nature [3], Tranquility [15],	experience nature [3], Denisty of users made the street more crowded, noisier, a better place to watch others [1;5]	Density of users in a public space [1], positive sense of intimacy [16]	Green streets make routes leading to green areas more attractive [2], green areas improve learning [2]
	high-attractiveness and good ventilation [8], cleanliness and maintenance [4;15;34;40;46;51;58], site authenticity and specificity of its location [16;36;58], meeting the needs and serving the community that use it, social interaction [8;17;18;28;29;34], different zones allows engagement in different activities [58]					
Continuity and enclosure	well-defined green areas [3], wide sidewalks [3], pavement detailing used to continue the park in all directions [16], barrier-free and circulation [34]					
Quality of the public realm	unsafe pathways and long travel distance between facilities in parks reduce elderly to move around easy [34]	sufficient places to sit [13;34], the duration of stay is influenced by the amount of shaded areas [13;18;40], unsafe pathways and long travel distance between facilities in parks reduce elderly to move around easy [34]	Sufficient places to sit improves child-friendliness [2], sufficient places to sit [13;34], the duration of stay is influenced by the amount of shaded areas [13;18;40], natural features, such as flowers, trees, fountains and fish ponds [34]	natural features, such as flowers, trees, fountains and fish ponds [34]		the duration of stay is influenced by the amount of shaded areas [13;18;40], Need better opportunities for seniors [28]
	More room on the streets increases recreational value [2;5], Good lighting, people feel safe and secure, enjoying walking alone in the public open space during day and night time[15;34], presence of all kind of services [4;5;6;11;27;29;47], the duration of stay is influenced by the amount of shaded areas [18;40], protection facilities from bad weather [47].					
Ease of movement	availability of recreational services in a 300-meter buffer [12] Places are more frequently used if they are located wihtin a 60 min walking distance [18], flat terrain allows for easy pedestrian mobility [35;44], high-quality network of open and green spaces which are connected by an appropriate pedestrian and cycling infrastructure [2;31]	flat terrain allows for easy pedestrian mobility [35;44]	flat terrain allows for easy pedestrian mobility [35;44]		availability of recreational services in a 300-meter buffer [12]	high-quality network of open and green spaces which are connected by an appropriate pedestrian and cycling infrastructure [2][31], better access to parks, leads to more exercises [28]
	proximity to green areas [3;17;46;51], wide sidewalks [3], easy acces (by transportation) [4;10;13;34], Good transport conditions for elderly to access green areas [7], fully accessibility (for people with disabilities) [16] good accessibility [16;17;18;22;29;46;51], availability of recreational services in a 300-meter buffer [12], small distances [29]					
Legibility	immediately striking and significant markings [13;34], peoples cognitive understanding of a place, help define personal identity [22], with its several staircases and different levels, the park, raised higher than the streets, arouses immediate interest [58]				people are more inclined to socialise in spaces with good visibility towards their surroundings [36]	
Adaptability						Green areas as extension of school for a playful, social and educational role through natural elements, furnishings, structures and programs [2]
	meeting the needs and serving the community that use it, social interaction [8;17;18;28;29;34], public places that allow interaction with other people through observation, communication or behaviour, become increasingly important for public and social interaction, as well as a leisure activity, in times of increasing individualization and legally protected privacy [13], adaptable and functional to surrounding area [16], the use of interstitial spaces as small parks, monuments or city landmarks [16], Repurpose abandoned infrastructure into linear parks [28], Moveable chairs gives users some influence on the appearance and functioning of their space [29]					
Diversity	Child-friendliness with broad sidewalks and informal spaces for games, skate parks, and public sports [2], A rest or conduct activities with one or more 'personal acquaintances' [13]	A rest or conduct activities with one or more 'personal acquaintances' [13], Moveable chairs gives users some influence on the appearance and functioning of their space [29]	sittable space in the public realm, either on the sidewalk or elsewhere, facing the right way [5] and sheltered [34] or need to be considered in relation to the environmental conditions and social interaction of the sites [36], Moveable chairs gives users some influence on the appearance and functioning of their space [29]	Watching other people is a form of social inclusion [13]	Increasing contact with strangers [1]	Child-friendliness with broad sidewalks and informal spaces for games, skate parks, and public sports [2]
	Different in form and use, generated in a wel-connected network of green [2;3], different sorts of activities causes more frequently visits to green areas [4;5], providing different activities the population wants [16], Enhances social engagement and cohesion of those who live alone or are isloated [28] or elderly [34]					

Table 4.3: Relations between urban design principles and individual reaction: sense of comfort

ENJOYMENT

The third category that influences individual reactions is people's enjoyment. The most important element is the influence on the human scale. The human scale is influenced by the density of uses [1], well-defined areas [3], with wide sidewalks [3], the presence of lots of trees [3], and pavement detailing that continues in all directions [16]. It is a comfortable place when it is surrounded by different walls that into account the small size of the walls, which are isolated enough to feel well [58], and create a positive sense of intimacy [16].
Continuity and enclosure are important for the human scale, people need to perceive that space as their own or as an extension of their home [1]. Well-defined areas with no clearly defined boundaries, create a feeling that many people are interested in being able to control places themselves [12]. Besides that, the perceived spaces stimulate the feeling of the aesthetic quality of a positive sensory experience.

The human scale is strengthened by the ease of movement to visit these places. People most commonly visited public spaces that are within 5-minute walking distance [18], plants and trees on opposite sides of the street visually extend the park [16], while the biggest influence is the route people need to walk through surrounding areas in order to access the parks, this street connectivity influences the human scale and the park use of people in the surrounding areas [44]. Legibility can influence the human scale by immediately striking and significant markings [13;34], because people's cognitive understanding of a place, helps define personal identity [22]. When public spaces contain several staircases and different levels, the park is raised higher than the streets, it is arousing immediate interest [58].

The aesthetic quality of positive sensory experience is mostly promoted with protected facilities against bad weather [47]. Shaded areas not only influence the duration of stay but also prevent the reduction of usability in summer [40]. Besides that, the places need to meet and serve the community that uses it, which influences the quality and positive experiences [8;17;28;29;34] different public facilities and open spaces are the demands of different groups living in the surrounding areas [50].

For the enjoyment of the positive aspect of climate, it is essential that there are sufficient places to sit [13], in shaded areas, which influence the duration of stay [18;40]. If the seating options are located near water features (that improves air quality and natural sounds [29]. The positive aspect of climate can also be stimulated by natural features, such as flowers, trees, fountains and fish ponds [34], protection facilities from bad weather [47], amount of local facilities [10;51]. Lastly, the variety of tree species creates more biodiversity [2], which supports different ecosystem services [17] and positively influences the climate.

Individual reactions / Urban design principles	Enjoyment		
	Human scale	Enjoy positive aspects of climate	Aesthetic quality and positive sensory experience
Character	Density of users make the place more vibrant [1], positive sense of intimacy [16] site authenticity and specificity of its location [16;36;58], many destinations visually connect public open spaces [34], it is a comfortable place for it is surrounded by different walls that make people feel safe and, taking into account the small size of the walls, also isolated enough to feel well [58]	Green streets make routes leading to green areas more attractive [2], Tranquility [15], Improve shading and wind flow can lead to increased social activities [36]	environmental design can increase positive emotional bonds [3], spaces with a colorful, community-driven urban intervention [21], place are too small to add more facilities [38], different zones allows engagement in different activities [58]
Continuity and enclosure	Perceive this space as theirs, or as an extension of their home [1], no more large open spaces, because inner cities are crammed with buildings [2], well-defined green areas [3], wide sidewalks [3], presence of trees [3], pavement detailing used to continue the park in all directions [16], separate surrounding by a low fence [29], not clearly defined boundaries, many people are interested in being able to control places themselves directly by their expressions [12], barrier-free and circulation [34]		Perceive this space as theirs, or as an extension of their home [1]
Quality of the public realm	meeting the needs and serving the community that use it, social interaction [8;17;18;28;29;34], peripheral location in a neighborhood improve use [40]	sufficient places to sit [13], the duration of stay is influenced by the amount of shaded areas [18;40], Water features to improve air quality and natural sounds [29], natural features, such as flowers, trees, fountains and fish ponds [34], protection facilities from bad weather [47], amount of local facilities [10][51]	the duration of stay is influenced by the amount of shaded areas [13;18;40], protection facilities from bad wheater [47], the selection of a park is always based on the free will of a person, a choice based on his/her purpose for visiting, availability of facilities, and socio-physical accessibility [51],
Ease of movement	plants and trees on opposite sides of the streets visually extend the park [16], Most commonly visited public spaces are within 5 min walking distance [18], People that need to walk through surrounding areas in order to access parks, such as street connectivity and slope of the terrain, influence the park use [44], good accessibility [16;17;18;22;29;46;51]		Large parks offer more amenities to attract people from further away [32]
Legibility	immediately striking and significant markings [13;34], peoples cognitive understanding of a place, help define personal identity [22]With its several staircases and different levels, the park is raised higher than the streets, arouses immediate interest [58]		
Adaptability	adaptable and functional to surrounding area [16], Moveable chairs gives users some influence on the appearance and functioning of their space [29]	improve mental and physical health [9]	meeting the needs and serving the community that use it, social interaction [8;17;18;28;29;34], playground are most of the time not shaded, thus reducing its usability in summer [40]
Diversity	different public facilities is the demands of different groups [50]	The variety in tree species creates more diversity [2], support different ecosystem services [17]	Different in form and use, generated in a wel-connected network of green [2;3]

Table 4.4: Relations between urban design principles and individual reaction: sense of enjoyment

Improving Quality of Life by relations between urban design principles and individual reactions

Eventually, the explained relations between urban public spaces, urban design principles, and individual reactions have consequences for improving the Quality of Life. Below a short explanation of possible consequences is described.

The proximity of open spaces and facilities has a great impact on quality of life. Higher levels of perceived access to service were predictive of higher physical and social quality of life [4]. If green spaces are in proximity to people's home or workplace reduce the sense of mental condition and improves satisfaction and well-being [58]. Another article states that when green spaces are in a 300-meter buffer they were positively associated with subjective well-being and positively with mental health [11]. It would be ideal if the spaces could be connected to housing and available to all social classes in this study almost half of the responses explicated mentioned social or physiological benefits of urban (green) spaces and needs to be an essential space at the implementation of new development [17]. One study found that during COVID-19, residents with access to more green spaces experienced a smaller decline in satisfaction than during the pandemic because they have (green) public spaces within their proximity [10].

Urban public spaces also contribute to social and physical well-being. Residents with great exposure to green spaces can directly benefit from lower mental health distress, reduced stress, and refreshed mood, it can increase personal happiness by providing spaces for physical exercise and social interaction [28]. Urban parks are spaces that allow health-promoting activities and mental relaxation and have effects among all different groups, but the impact is much larger in groups of people with seniors compared to young adults [28].

Open spaces can help older residents to engage in physical and social activities to benefit their well-being [4], it is important when designing a public space or park to enhance social well-being and quality of life for every citizen, but also for our aging population, and try to strengthen integration and cohesion within districts where for example urban renewal is planned [34]. In addition, one study found evidence participants living alone reported higher environmental and social quality of life when type lived in a neighborhood with more parks and activities [4]. It is important to create a sense of security, peace, and belonging to the citizens and that contributes to helping to strengthen the components of improving the quality of life in cities [9].

The number of parks and activity types in parks will improve physical activity. If adults and children have more possibilities for physical activity, will lead to physical well-being [2]. One study found that participants who reported visiting (green) spaces once a week had a 2.4 higher subjective well-being score, than those visiting less frequently [5]. People are, subconsciously, see green as an important element for their quality of life and are not very satisfied with the condition of public open spaces in their neighborhoods. It is stated that the more green public open spaces there are in the neighborhood, the more satisfied people are with them, so people associate it as a quality to have public open spaces in their neighborhood [39]. Green spaces, facilities, playgrounds/ sports fields supported participation in leisure activities. There are opportunities for different activities that are important for children's health and well-being. It is important to have access to a variety of venues and affordances for different activities in the immediate neighborhood surroundings, as well as in the greater community [55].

Conclusion:
Implementation of the interventions of the urban design principle

The previously showcased outcomes of the systematic literature are all textual principles. The urban design principles are translated into design guidelines to ensure that they can be used during design strategies. These design guidelines, executed in 3D diagrams, will show potential solutions and directives for designing high-quality public spaces. This translation can be conducted and will result in a toolbox with urban (spatial) urban interventions for each urban design principle. This toolbox serves as a starting point while designing new public spaces and can also be used to improve existing public spaces (see Chapter X).

The summary tables of the systematic literature review (and the toolbox) are the guidelines for urban design. The following explanation demonstrates how these urban design principles can be implemented within urban design areas to create a high-quality public space.

1. First, it is assessed how an area scores based on the individual reactions to identify attention areas. Which eventually improves the Quality of Life in the city. This assessment can be found in Chapter 06: Spatial mapping (of Quality of Life).

2. Within these attention areas an investigation is applied to determine which urban design principles can be applied/improved within these areas to increase the positive individual reactions.

3. These urban design principles are applied and improved within the neighborhood through existing or new urban designs to create high-quality public spaces (which improve individual reactions and consequently the Quality of Life within cities).

4. At the end it is always possible to consult the summary table from the literature review for existing relations between urban design principles and individual reactions and how these can stimulate or promote certain reactions. It is background information that it is always possible to rely on.

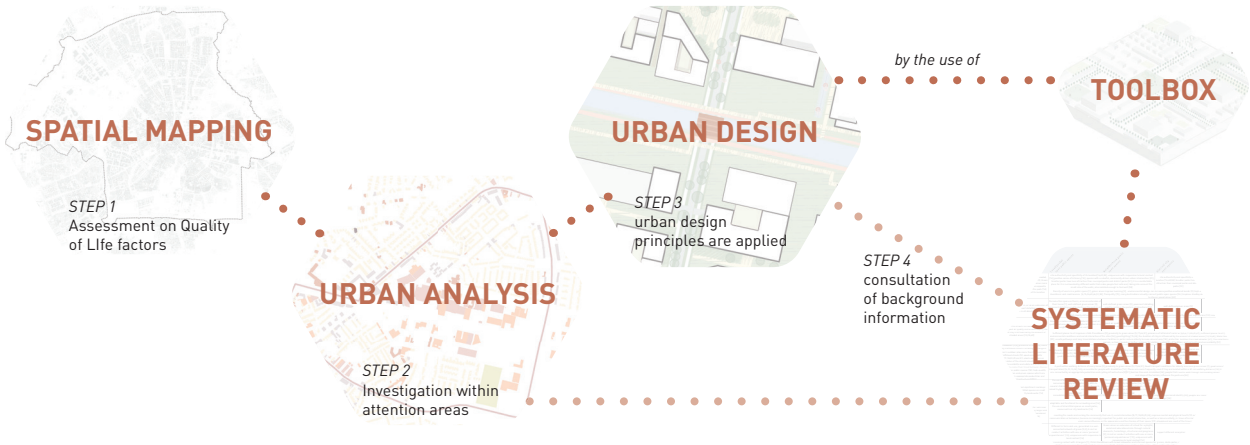


Figure 4.2: Implementation of urban design principles

05
TOOLBOX

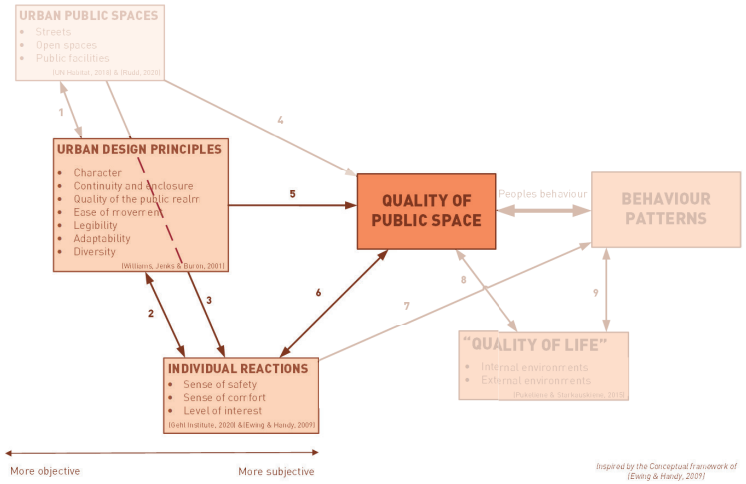


Figure 5.1:Theoretical framework with numbers and arrows

The comprehensive tables from the systematic literature review are exact guidelines for urban design and show the interventions (spatial and non-spatial) that can take place regarding urban design principles and individual reactions that occur or are stimulated. The tables can be consulted at any time during the design process to check which urban design principles stimulates certain individual reactions and vice versa. It is the extensive background information that you always can rely on.

With that taking in mind, also in this phase, it is identified which role an urban designer can have and highlighted all the interventions an urban designer can influence or can include and stimulate within the design process (see Appendix B for these highlights within the table).

So each design principle has certain interventions that can be applied or improved in a particular area, to increase the quality of the space and enhance a particular individual reaction.

These highlighted textual interventions are translated into design guidelines. Throughout this chapter, the design guidelines are executed and presented in 3D diagrams, which show potential solutions and directives for designing a high-quality public space. This toolbox can serve as a starting point while designing new public spaces or can be used to improve existing public spaces (arrows 2, 5, and 6). In addition, this toolbox also immediately shows which individual reactions are aroused.

Character	*density, greener streets, site authenticity, sense of intimacy, different walls, different zones, good ventilation, clean and maintained, many destinations.*
Quality of public realm	*more room on streets, good air quality and acoustics, amount of shaded areas, natural features, good lighting, presence of all kind of services, sufficient places to sit*
Continuity and enclosure	*Pavement detailing, well-defined areas, but no clearly defined boundaries*
Ease of movement	*wide sidewalks, presence of trees, (safe) accessibility, flat terrain and entrances, proximity to green*
Legibility	*striking significant marking, interstitial spaces, different levels with different staircases, good visibility towards surrounding*
Adaptability	*moveable chairs, public spaces that allow interaction by observation, communication and behavior, shaded playgrounds, reuse of abanded infrastructure*
Diversity	*different in form and use, pedestrian-friendly spaces, offer more amenities to attract different people, child-friendly spaces, variety in tree species*

Figure 5.2: Urban design principles with possible urban interventions

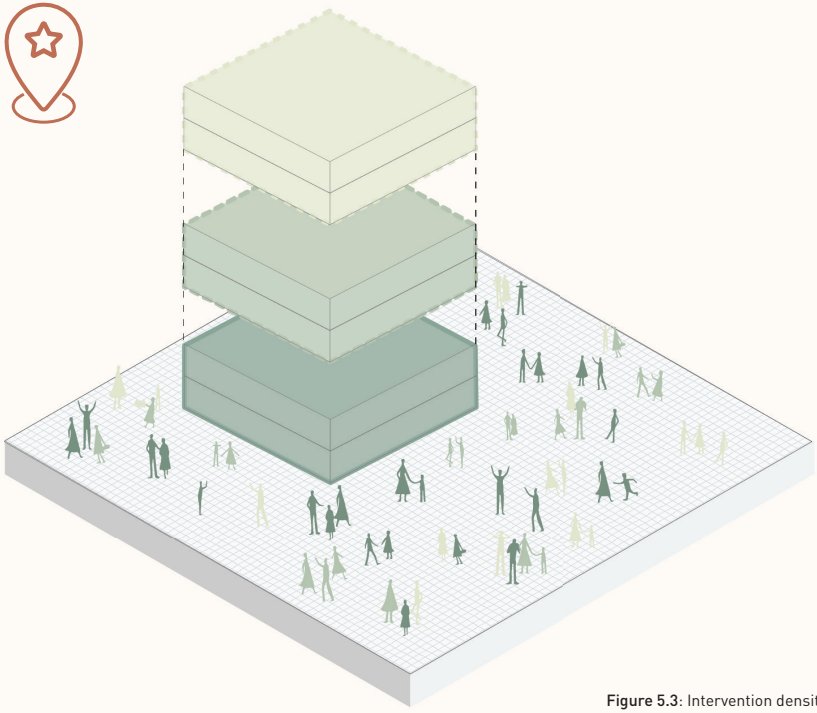


Figure 5.3: Intervention density

Density:

Density refers to the number of individuals in an area, the density of users in a public space can affect social interactions and will change the perceptions of safety. A change in the number of users can encourage others to join socialization, while contact with strangers can be overwhelming for others [1]. More users in public spaces can stimulate the social and community feeling in neighborhoods.

Influences the individual reactions

Ejoyment: human scale. Sense of comfort: talking and listening. Sense of safety: feeling safe and feeling secure

Greener streets:

Greener streets (and roads) are more inviting for people to walk and cycle. Green streets make routes leading to the (green) areas more attractive places. More green in streets is associated with better perceived well-being.

Influences the individual reactions

Enjoyment: Human scale and positive aspect of climate. Sense of comfort: walking, standing, staying, playing and exercise. Sense of safety: feeling safe and secure

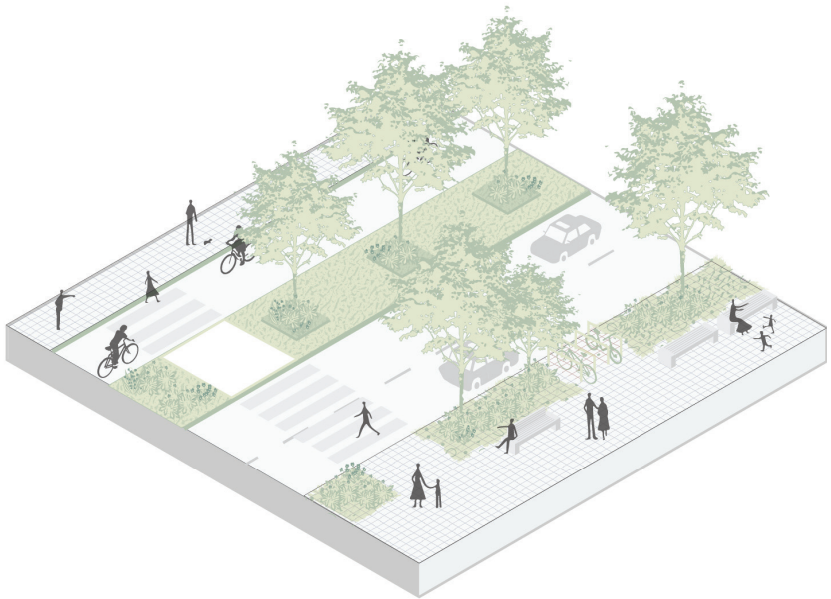


Figure 5.4: Intervention greener streets

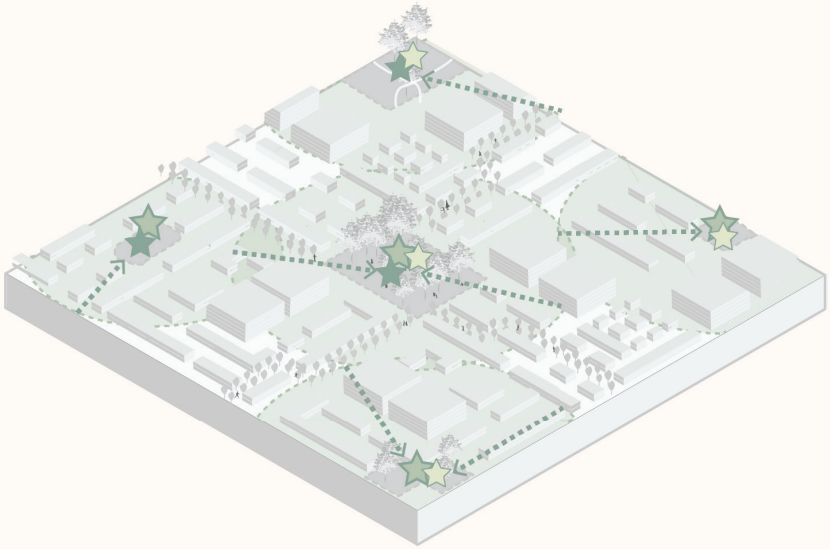


Figure 5.5: Intervention site authenticity

Site authenticity:

Authenticity (Genius Loci) of a public space is related to site-specificity [16]. A design of an open space needs to tell a unique story about the place [40]. It needs to be a public representation [16]. Public spaces need to feel unique and meaningful for the surrounding environment and feel like an extension of people's homes.

Influences the individual reactions

Enjoyment: Human scale. Sense of comfort: all.

Sense of intimacy:

A sense of intimacy is important for the perception of public spaces. In small parks or places, people are rarely far away, where people can easily talk to each other, they can see the general outlines of expression on another's faces. The smaller sizes (intimacy) with fences and/or buildings can make the public seem smaller and improve social interaction [16].

Influences the individual reactions

Enjoyment: Human scale and positive aspect of climate. Sense of comfort: walking, standing, staying, sitting, talking and listening. Sense of safety: feeling secure.

Figure 5.6: Intervention sense of intimacy

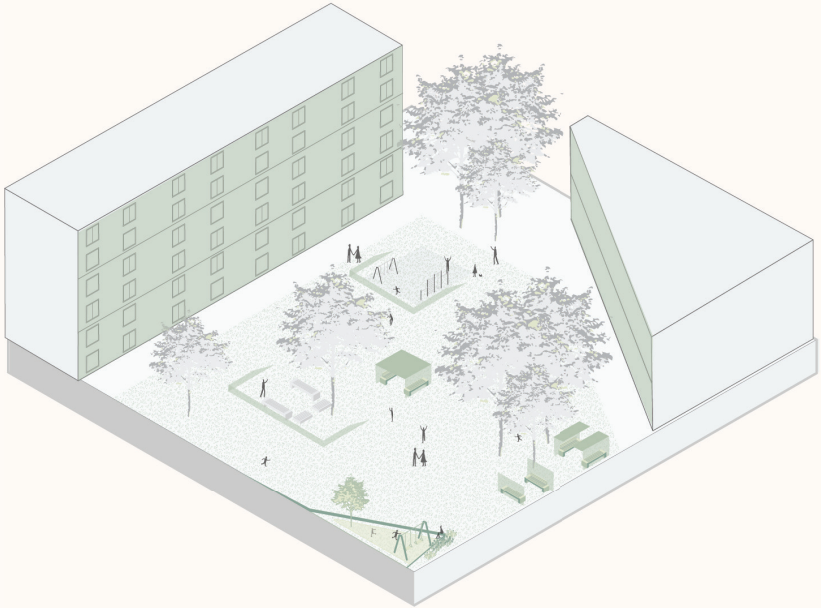


Figure 5.7: Intervention different small size walls

Different small size walls:

Comfortable places are places that are surrounded by different walls. These walls can be pillars, stairs, closed of sitting places. These areas make people feel safe, and taking into account the (small) size of the wall it can be isolated enough to feel well [58].

Influences the individual reactions
Sense of safety: feeling secure.

Different zones, different activities:

It is important that public spaces and parks contain different zones. These zones allow engagement in different activities without disturbing others. Different zones make it possible to use the area according to one's preferences [58]. If a public space is varied in activities, public space can be more attractive to a diverse range of people. If the number of active users increases different activities are stimulated and more social interaction takes place.

Influences the individual reactions
Enjoyment: Aesthetic quality. Sense of comfort: all.

Figure 5.8: Intervention different zones, different activities

Figure 5.9: Intervention good ventilation, shading and windflow

Good ventilation, shading and windflow:

It is important to have good ventilation to improve quality of life and promote high attractiveness [9]. Designing a public space it is important to take into account the shading and wind flows of a place. If placed furniture or elements are placed with shading and wind flow in mind, it can improve people's thermal comfort and social activities in places.

Influences the individual reactions
Sense of comfort: all.

Clean and maintained:

Well-maintained public spaces, including cleanliness are an important factor for people's feelings. It illustrates the quality of a place and has an impact on the attractiveness of a certain place [40].

Influences the individual reactions
Sense of comfort: all. Sense of safety: feeling secure.

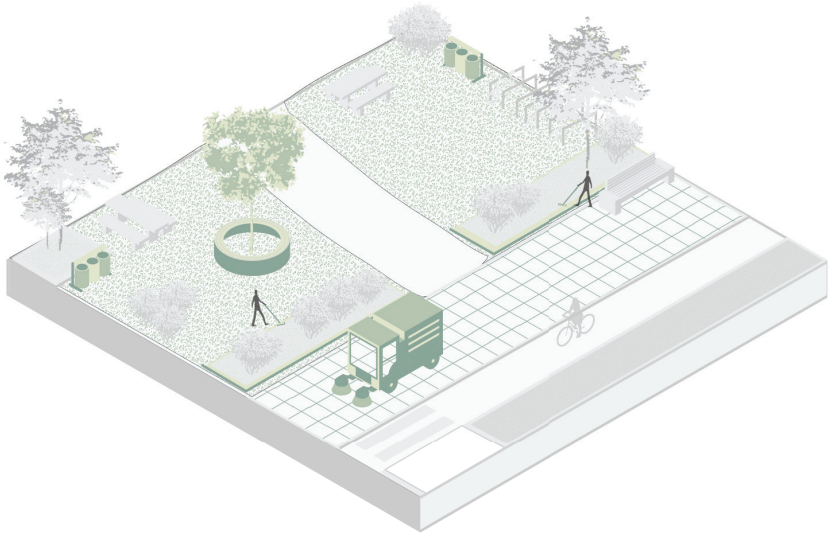


Figure 5.10: Intervention clean and maintained

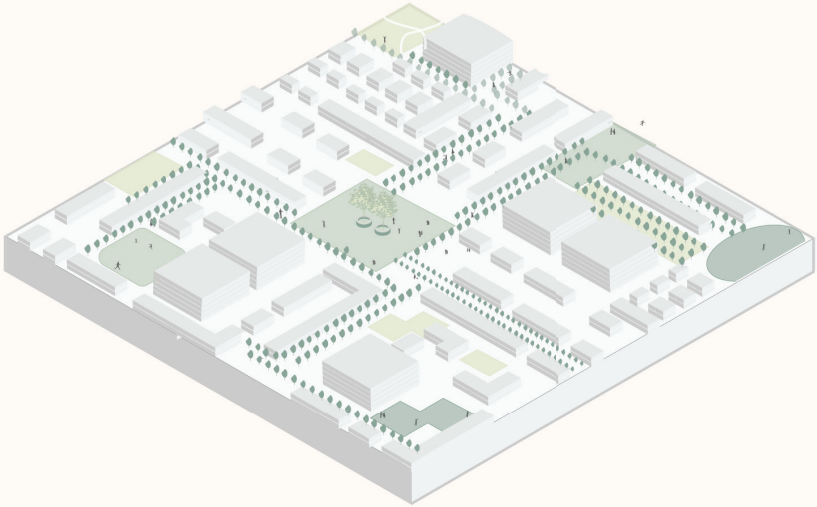


Figure 5.11: Intervention many destinations

Many destinations:

Many destinations within neighborhoods or public spaces visually connect open spaces with one another. A neighborhood with more destinations makes it more suitable to accomplish or complete everyday life activities. More destinations make people's sense of place and familiarity within the area better [34].

Influences the individual reactions

Enjoyment: Human scale. Sense of comfort: walking, standing and staying, sitting and seeing. Sense of safety: feeling secure

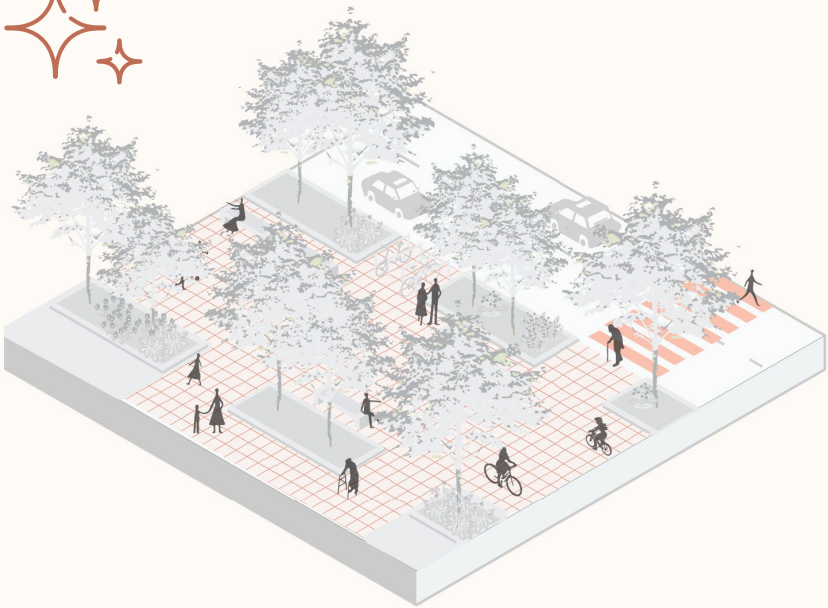


Figure 5.12: Intervention more room on the streets

More room on the streets:

Wider sidewalks (four meters wide or bigger) invite people to walk and cycle more often. It is a more attractive place and perceived greater well-being. As a result of a safe place, the recreational value of streets will continue to increase [2]. Besides that, the spaces that are previously used for vehicular traffic and parking are now larger and safer spaces to stimulate outdoor activities and social interaction [26].

Influences the individual reactions
Enjoyment: Human scale. Sense of comfort: all.

Good air quailty and acoustics:

Improve shading and wind flow can lead to increased social activities [37]. It stimulates the quality of public space and creates a safe and qualitative environment.

Influences the individual reactions
Enjoyment: Positive aspect of climate.

Figure 5.13: Intervention good air quality and acoustics

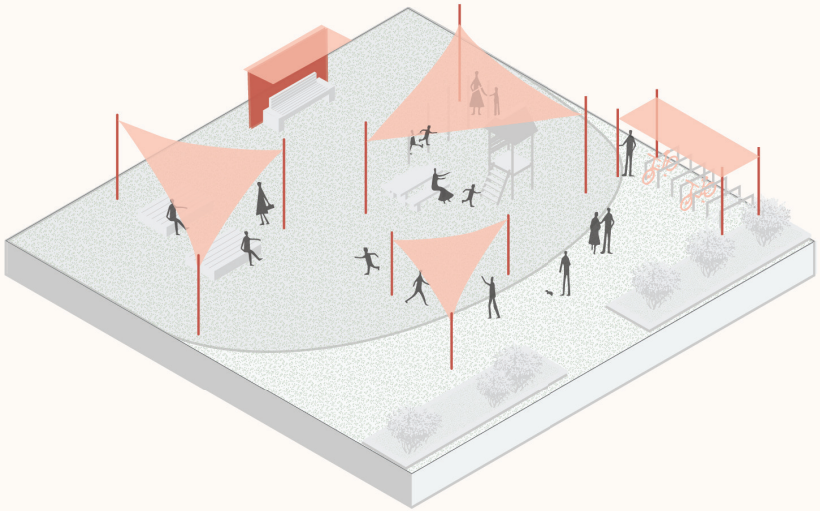


Figure 5.14: Intervention amount of shaded areas

Amount of shaded areas:

Shaded areas improve the quality of a public space. It affects people's duration of stay in public spaces and in summer shaded areas improve physical quality and people's sense of comfort. It can influence people's uses during the day or improve usability during summer [40].

Influences the individual reactions

Sense of comfort: walking, standing and staying, playing and exercising

Natural features:

Natural features in public spaces more people feel more in touch with nature.

Influences the individual reactions

Enjoyment: Positive aspect of climate.

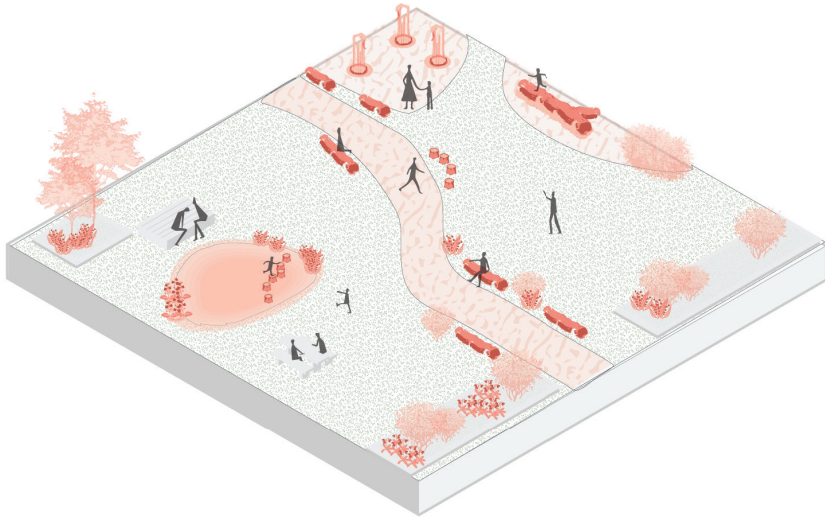


Figure 5.15: Intervention natural features

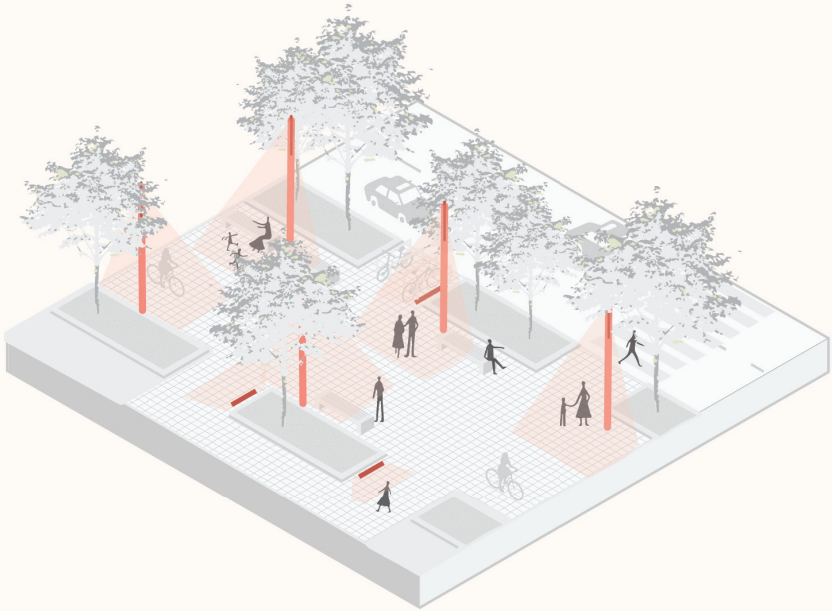


Figure 5.16: Intervention good lighting

Good lighting:

Good lighting is important for people to feel safe and secure and that they enjoy walking alone in public open spaces during the day and night time [34]. It is important that there is a consistent illumination of streets and public spaces and it is important to prevent the user from encountering intervals of darkness. In every situation, it is essential to configure the appropriate lighting.

Influences the individual reactions

Sense of comfort: all. Sense of safety: feeling safety and feeling secure.

Presence of all kind of services:

The presence of different kinds of services makes the spaces accessible to various social groups. Neighborhoods with a good mix of open spaces and services contribute to the social environment. If space can offer different services and amenities can increase the number of active users. Besides that, it increases the quality of a public space and increases the usability of spaces by people.

Influences the individual reactions

Enjoyment: Positive aspect of climate. Sense of comfort: all. Sense of safety: feeling secure.

Figure 5.17: Intervention presence of all kind of services

Figure 5.18: Intervention sufficient places to sit

Sufficient places to sit:

The quality of a public space can be improved by sufficient places to sit. Sitting places in shaded or isolated areas can stimulate social interaction. Child-friendliness of public spaces is improved by sufficient places to sit for adults to watch and observe the playground. Besides that, sitting places in the public realm need to be near the sidewalk (or elsewhere), sheltered and facing the right way for observation, communication and behavior [34].

Influences the individual reactions

Sense of comfort: sitting, standing and staying.

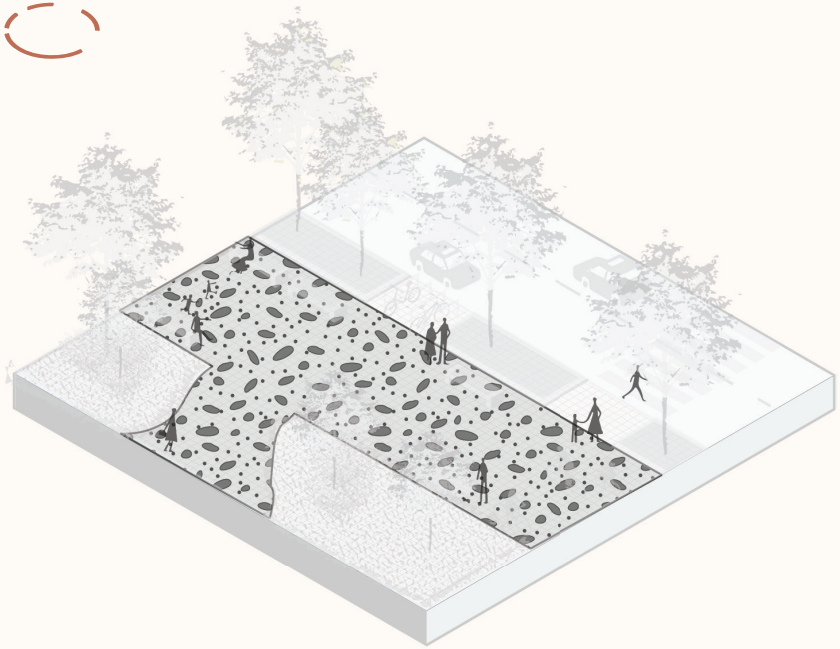


Figure 5.19: Intervention pavement detailing

Pavement detailing:

Pavement detailing is a crucial aspect for continuity of a park or public space [16]. If a street grid with pavement detailing is used to continue the space in all directions it visually extends these places. If the pavement is applied to a larger scale, the public space, park, streets, crosswalks ,etc., become all part of one larger space. It creates a recognizable place and makes relations between streets and public spaces more evident.

Influences the individual reactions

Enjoyment: Human scale. Sense of comfort: all. Sense of safety: feeling safe

Well-defined areas, but no clearly defined boundaries:

Many areas are defined with defined edges, which is important for people's orientation [1]. It is important the keep these defined areas, but not clearly define the boundaries. If the boundary between public and private can be (un)defined, people perceive spaces as theirs or as an extension of their homes. These spaces can be of great importance for social interaction and community feeling between neighbors and maybe even at larger scale.

Influences the individual reactions

Enjoyment: Human scale. Sense of comfort: all.

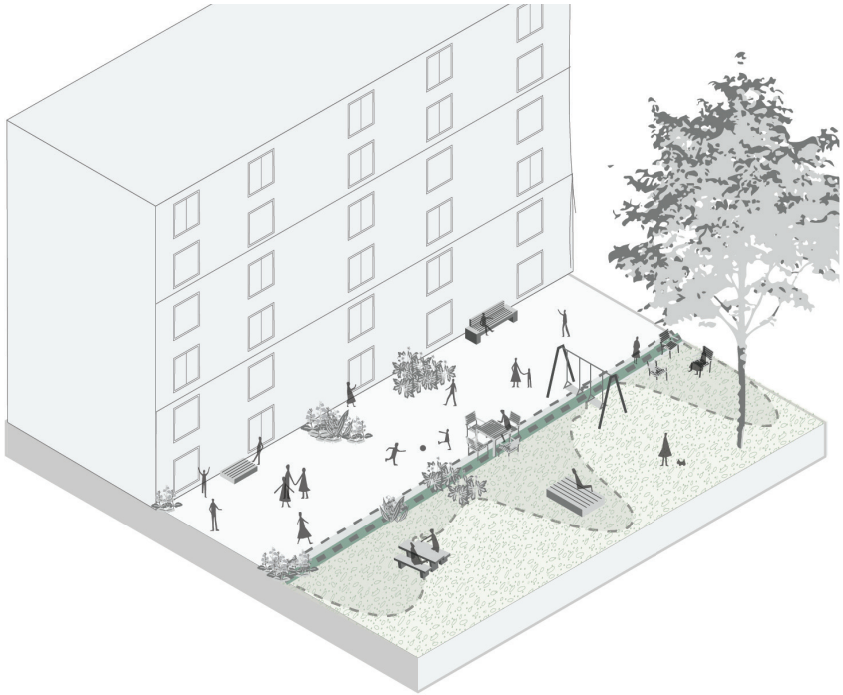


Figure 5.20: Intervention well-defined areas, but no clearly defined boundaries

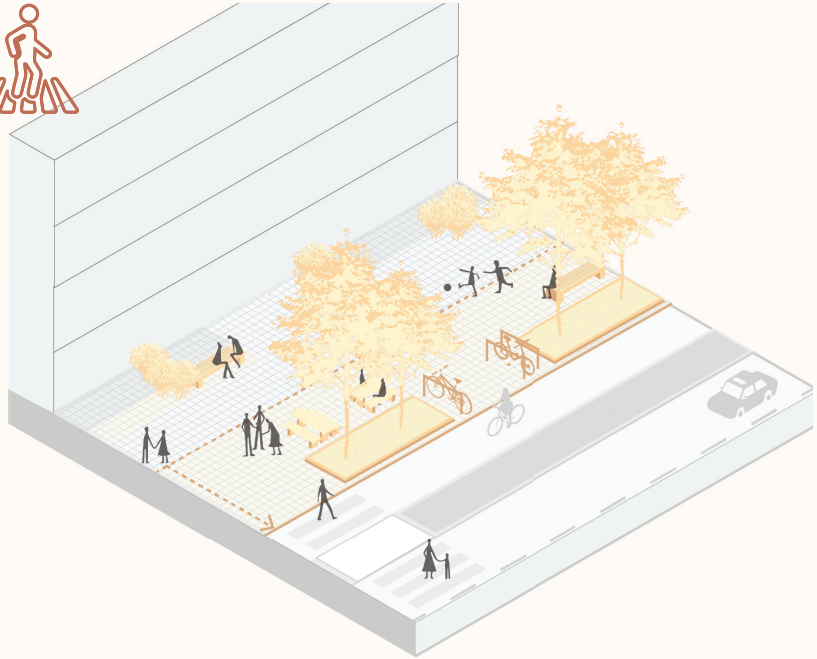


Figure 5.21: Intervention wide sidewalks

Wide sidewalks:

Wider sidewalks (four meters wide or bigger) invite people to walk and cycle more often. It is a more attractive place and perceived greater well-being. The spaces previously for vehicular traffic and parking are right now potentials for more larger and safe spaces to stimulate outdoor activities and social interaction [26]. As a result of a safe place, the recreational value of streets will continue to increase [2]. Besides that, wider sidewalks create safer places, with more room for social interaction.

Influences the individual reactions

Enjoyment; human scale. Sense of comfort: all. Sense of safety: feeling safe

Presence of trees:

Greener streets (and roads) are more inviting for people to walk and cycle. Green streets make routes leading to the (green) areas more attractive places. The presence of trees and greener streets in public spaces is associated with better-perceived well-being, it stimulates happiness and positive mental well-being. The presence of trees on opposite sides visually extends public spaces within the streets [16].

Influences the individual reactions

Enjoyment; human scale. Sense of comfort: all.

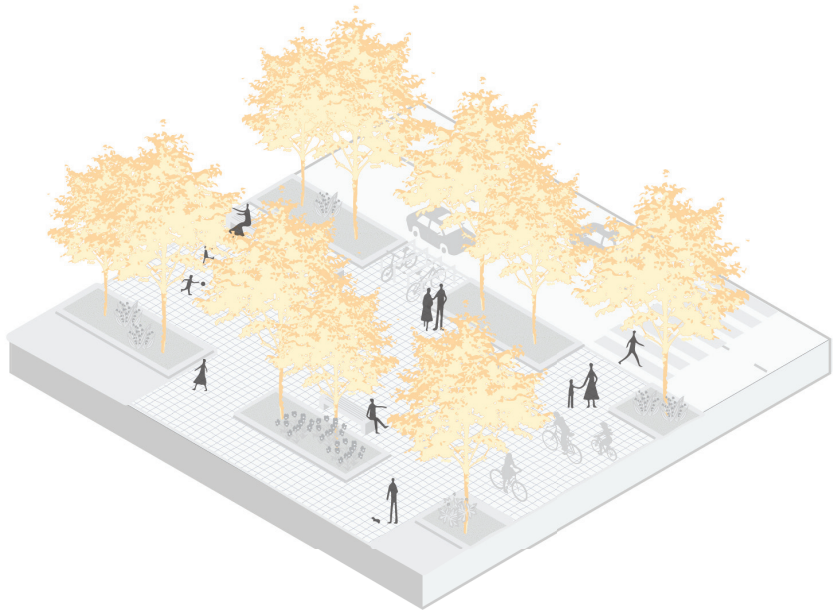


Figure 5.22: Intervention presence of trees

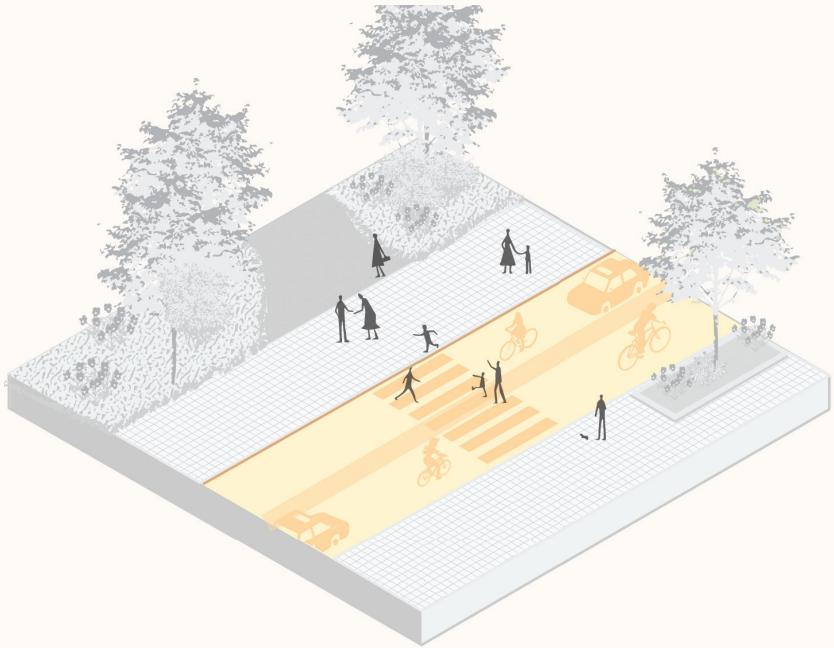


Figure 5.23: Intervention (safe) accessibility

(safe) Accessibility:

Accessibility refers to several elements [34]: location, a good walkable city where public spaces and services are within a 300-500 meter buffer, it offers opportunities to undertake physical and social activities [11]. Barrier-free, where wide roads with heavy traffic are no longer reducing accessibility [18]. Routing, where the wide roads are no longer only for vehicular traffic but for multiple uses, providing larger and safer public spaces to stimulate opportunities for outdoor activities [26]. Circulation, where public spaces are more often part of people's daily routine [16].

Influences the individual reactions

Enjoyment; human scale. Sense of comfort: all. Sense of safety: feeling safe, feeling secure

Flat terrain and entrances:

For easy pedestrian mobility, it is important to have relatively flat terrains and entrances. Where terrain characteristics such as terrain slopes are reduced to their minimum [35]. It is important to make necessary adjustments in the realm of traffic and pedestrian safety to improve the connectivity for older people and people who have difficulty with walking [44].

Influences the individual reactions

Sense of comfort: walking. Sense of safety: feeling safe

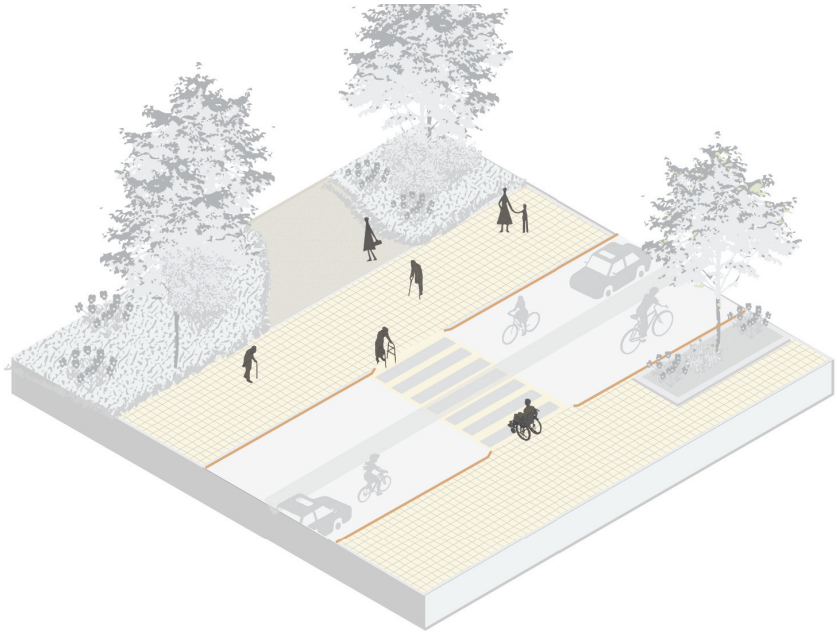


Figure 5.24: Intervention flat terrain

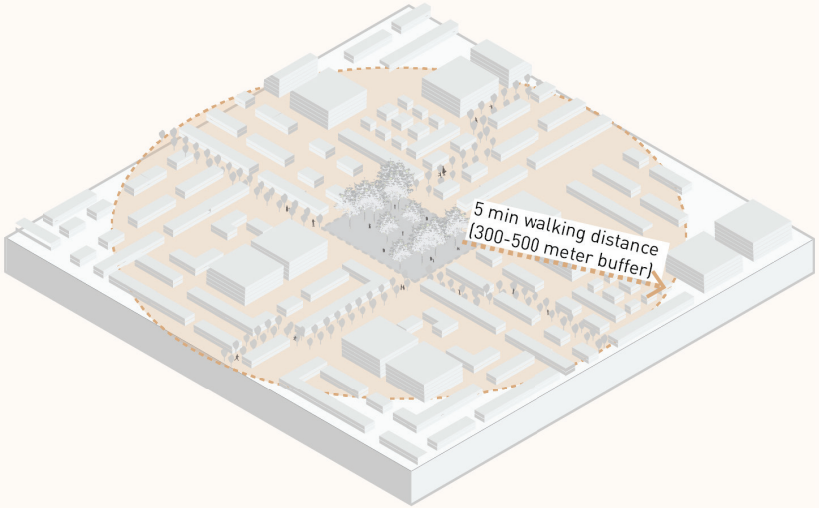


Figure 5.25: Intervention proximity to green

Proximity to green:

Proximity to public spaces and parks offer opportunities for social interaction, it provides easy destinations for people to walk to in their near environment and stimulate physical activity [3]. People living close to public spaces are more frequently using these spaces and encourage the social network existing within the neighborhood. Besides that, if public spaces are nearby, older adults are more likely to undertake physical activity and contribute to social activities [11].

Influences the individual reactions

Enjoyment; human scale. Sense of comfort: all. Sense of safety: feeling safe

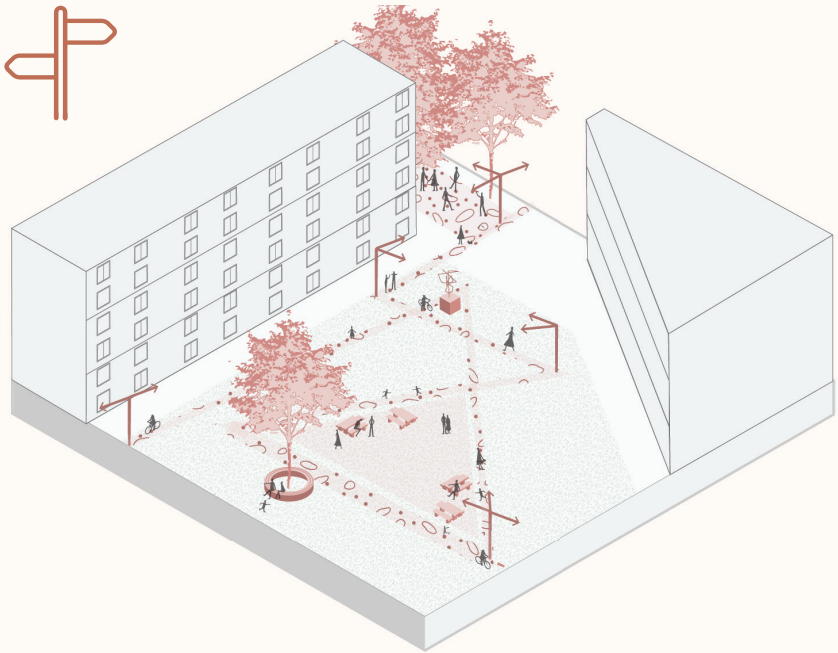


Figure 5.26: Intervention striking and significant marking

Striking and significant marking:

It is important that spaces have striking and significant marking which brings a sense of orientation for users [34]. The use of logical paths makes it easier for the user to perceive the place [58]. People are curious and prefer to be able to control places themselves and know where to go.

Influences the individual reactions

Enjoyment; human scale. Sense of comfort: all. Sense of safety: feeling secure

Interstitial spaces:

There are several types of public spaces, such as plazas, markets, green spaces or parks. The use of interstitial spaces such as small parks, monuments or city landmarks can increase the amount of public spaces but also can strengthen the orientation of users within certain places [16].

Influences the individual reactions

Sense of comfort: all.

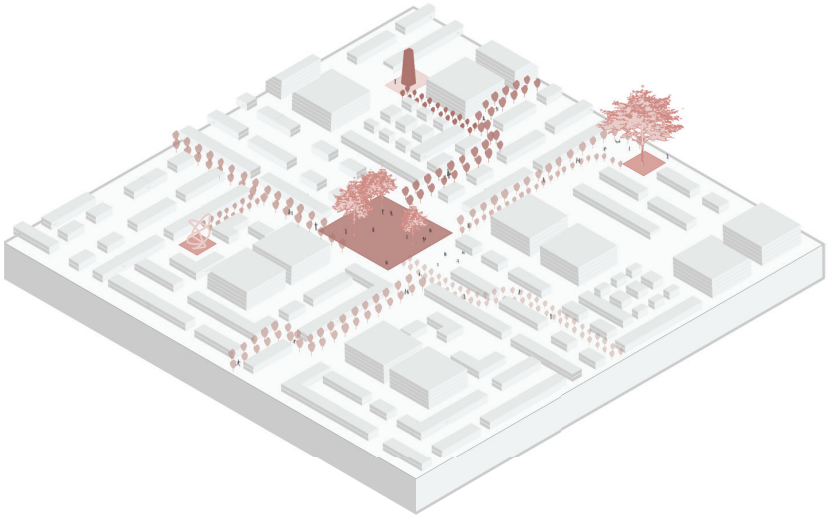


Figure 5.27: Intervention interstitial spaces

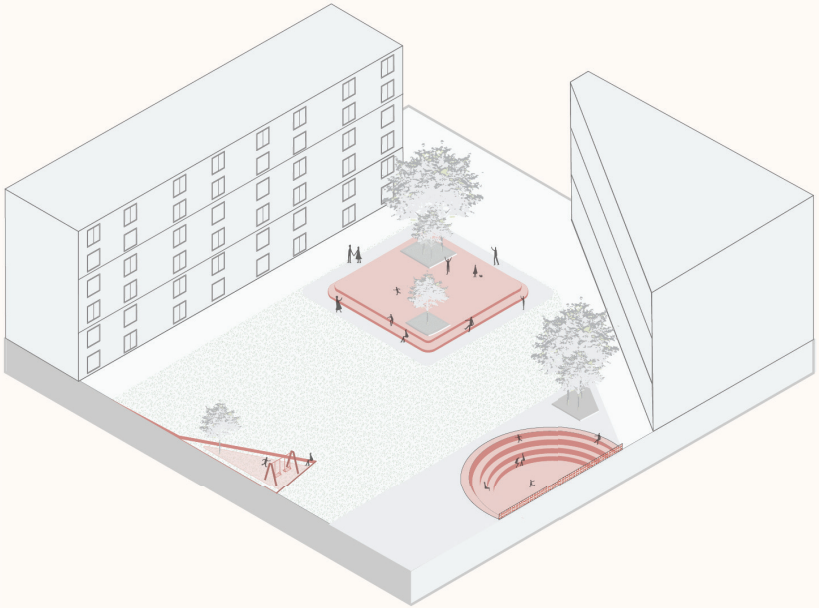


Figure 5.28: Intervention different levels, with different activities

Different levels, with different activties:

Public spaces that are raised high than the streets, caught immediately people'ss interest. A space with a varied relief of several staircases and different levels makes it possible to view an area from different levels and sides, which can help people to perceive the scope of the place [58].

Influences the individual reactions

Enjoyment; human scale. Sense of comfort: walking, standing, staying, sitting and seeing. Sense of safety: feeling secure

Good visibility towards surrounding:

Stimulation of social interaction and behavior can be stimulated by good visibility towards surrounding areas. Theories state that boundaries and visibility conditions can control or influence social behavior in environments. It is a combination of being seen (surveillance), seeing (visibility) and limited closedness that can influence the legibility and social behavior of people in a certain place.

Influences the individual reactions

Sense of comfort: seeing, talking and listening. Sense of safety: feeling secure.

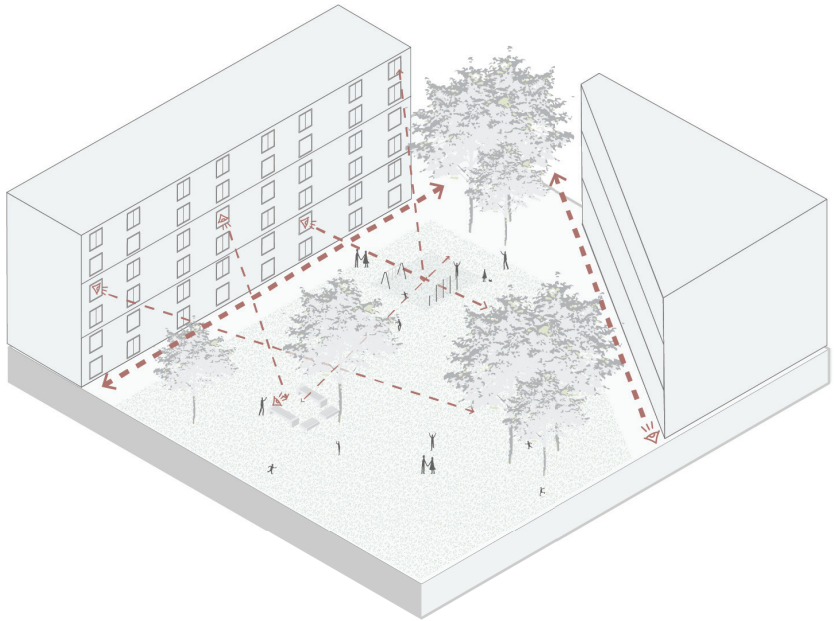


Figure 5.29: Intervention good visibility towards surrounding

Figure 5.30: Intervention moveable chairs

Moveable chairs:

An adaptive element within public spaces are moveable chairs. Besides sitting places that are permanently attached to the ground, it is also possible to provide moveable chairs in public spaces. These chairs offer people the possibility to place the chairs in the public space whatever they want. It creates a friendly environment and gives people influence on the appearance and function of a certain space. Besides that, people can arrange and control the place to their needs [29].

Influences the individual reactions
Enjoyment: human scale. Sense of comfort: all.

Interaction by observation, communication or behavior:

Due to adaptable spaces people can use a certain place as they want. Some people use space by observing and watching other people. Some people want to chat within a public space. The interaction between people by observation communication or a certain behavior stimulate the public and social interaction. It can stimulate leisure activities and other social initiatives, which attract all kinds of people and create a range of activities that can take place within a place [1].

Influences the individual reactions
Sense of comfort: all.

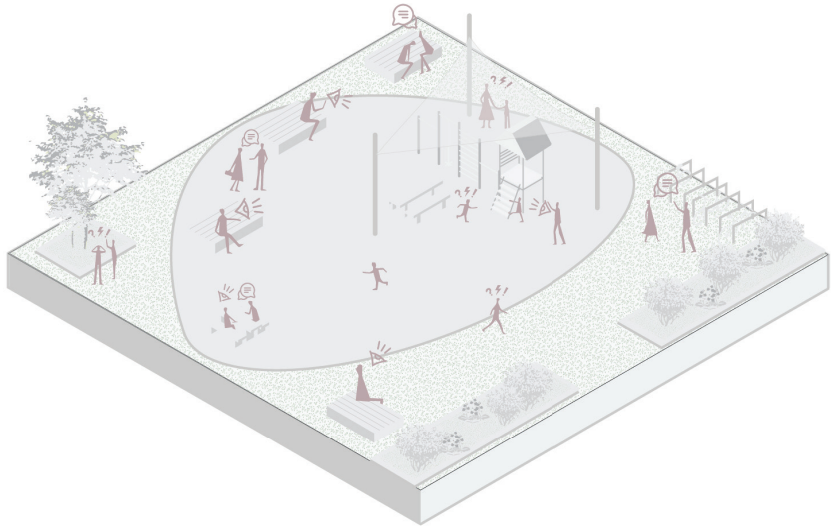


Figure 5.31: Intervention interaction by observation, communication or behavior

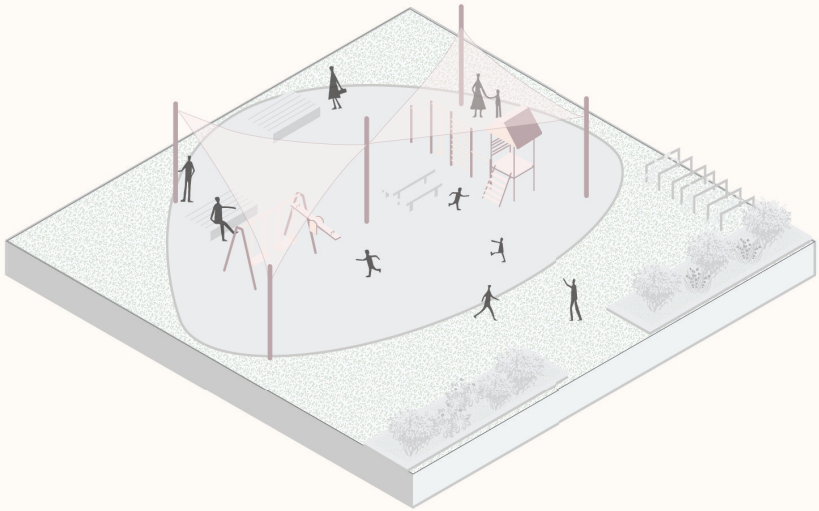


Figure 5.32: Intervention shaded playgrounds

Shaded playgrounds:

Due to reduced usability of playgrounds in summer and the increase natural wear of equipment when they are not shaded, it is important to encourage physical quality to public spaces and people's comfort. So for the use of equipment throughout the day despite the season it is important to shaded playgrounds [40].

Influences the individual reactions

Sense of comfort: play and exercising. Sense of safety: against unpleasant sensory experience

Reuse of abandoned spaces:

Adaptation of space is the reuse of abandoned places within a city. Previously used parking lots or abandoned infrastructure can be repurposed into parks or new public spaces [16]. In this way, neglected spaces can always regain a new place or function within the city.

Influences the individual reactions

Sense of comfort: all. Sense of safety: feeling safe

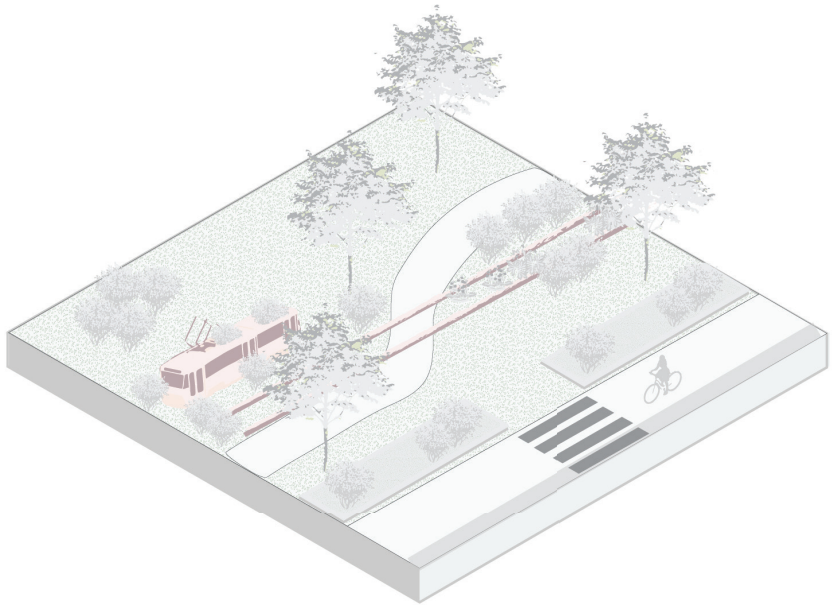


Figure 5.33: Intervention reuse of abandoned spaces

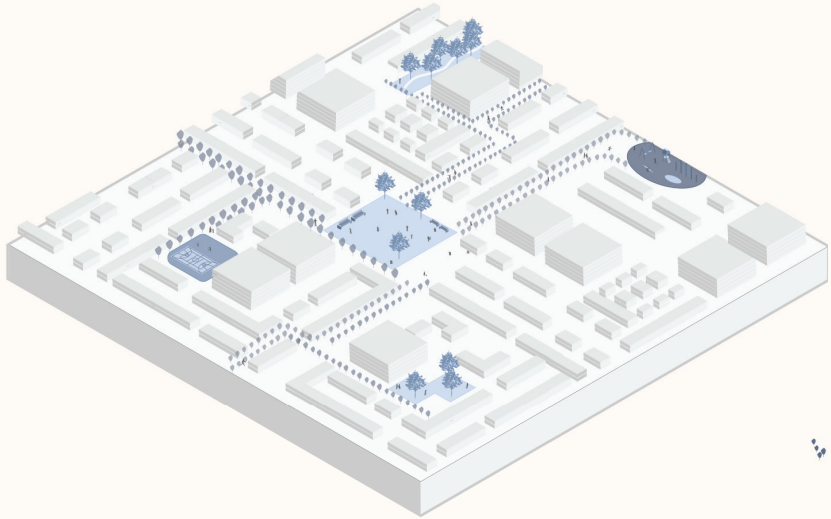


Figure 5.34: Intervention different in form and use

Different in form and use:

It is important that public spaces are within walking distance of every home. If public spaces differ from each other in form and use it creates a network of areas. Besides that, it also stimulates the perception of public spaces in the entire city [2].

Influences the individual reactions

Enjoyment: Aesthetic quality. Sense of comfort: all. Sense of safety: feeling secure

Pedestrian-firendly spaces:

The creation of pedestrian-friendly space stimulates a strong sense of place and community and these places directly affect people's sense of place [22]. The spaces that are used for vehicular traffic and parking are slowly transforming into spaces for slow mobility and focus on the cycling and walking infrastructure.

Influences the individual reactions

Sense of safety: feeling safe

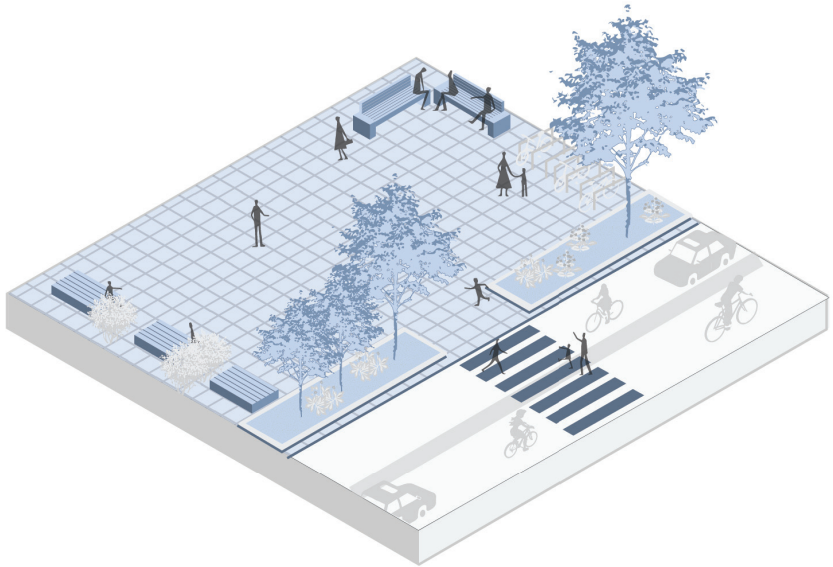


Figure 5.35: Intervention pedestrian-friendly spaces

Figure 5.36: Intervention more amenities to attract different people

More amenities to attract different people:

A public space that offers a mix of use, facilities and amenities affects the quantity and quality of public spaces and informal social activities [18]. It can stimulate people's sense of community. Public spaces are a common gathering place and with different activities that attract different people, which contributes to social interaction and social lives [29].

Influences the individual reactions
Enjoyment: Aesthetic quality.

Child-friendly spaces:

Child-friendly spaces are essential for an attractive living surrounding neighborhood. It is important to create enough playgrounds in the neighborhood, but it contains the entire design of public spaces so broad safe sidewalks, informal spaces for games, a skate park or sport grounds contribute also to child-friendly outdoor spaces. A protected environment for children with enough places to sit create the quality of the public spaces [2].

Influences the individual reactions
Sense of comfort: walking, playing and exercising. Sense of safety: feeling safe and feeling secure

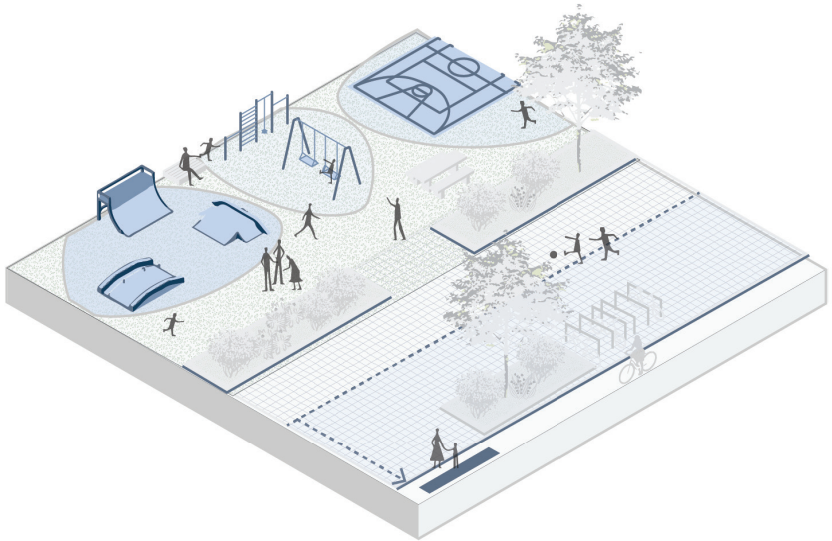


Figure 5.37: Intervention child-friendly spaces

Figure 5.38: Intervention variety in tree species

Variety in tree species:

Besides the variety of people, amenities, and spaces it is also very important to stimulate the variety of tree species. This variety of species creates more diversity and reduces the vulnerability of species. Trees, grass and plants make streets and places more attractive and improve the microclimate within a city [2]. Besides that, different green spaces and species contribute to the physical and mental health of citizens by stimulating different senses [29].

Influences the individual reactions

Enjoyment: Enjoy positive aspects of climate.

Implementation of the urban interventions:

First, an assessment is performed on how an area scores based on the individual reactions to identify where these urban interventions of the design principles can be applied to create a high-quality public space that improves Quality of Life. This assessment can be found in Chapter X: Spatial mapping on the next pages.

06
SPATIAL MAPPING

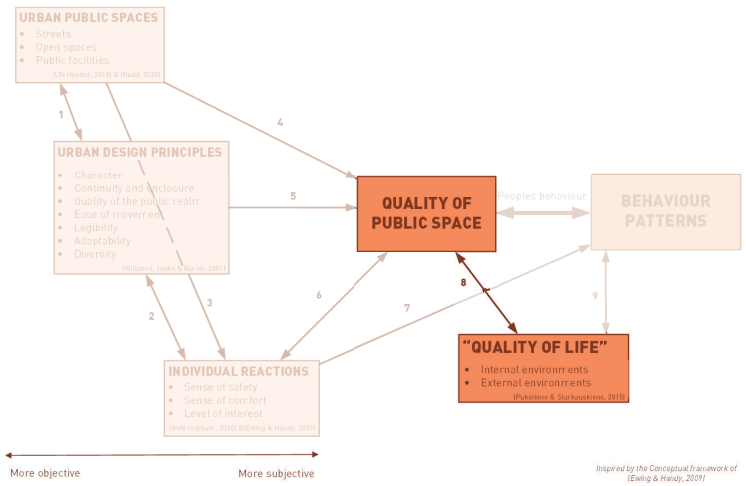


Figure 6.1:Theoretical framework with numbers and arrows

The relations between urban public spaces, urban design principles and individual reactions (results from Quality of public space) have consequences for improving Quality of Life (arrow 8).

To understand how the Quality of Life (and therefore individual reactions regarding public space and urban design principles) score in Eindhoven, a spatial mapping is applied. This analysis results in several indicator maps, which clearly show the Quality of Life in the different neighborhoods. Besides that, it creates a basis for the takeaways for the city strategy. In addition, it is possible to identify neighborhoods that can be used as intervention areas or need improvement on a particular factor. In these areas, the quality of public spaces can be improved to create opportunities for a better Quality of Life.

Within this spatial mapping, it is identified the overall Quality of Life in Eindhoven and which neighborhoods might score lower on these factors.

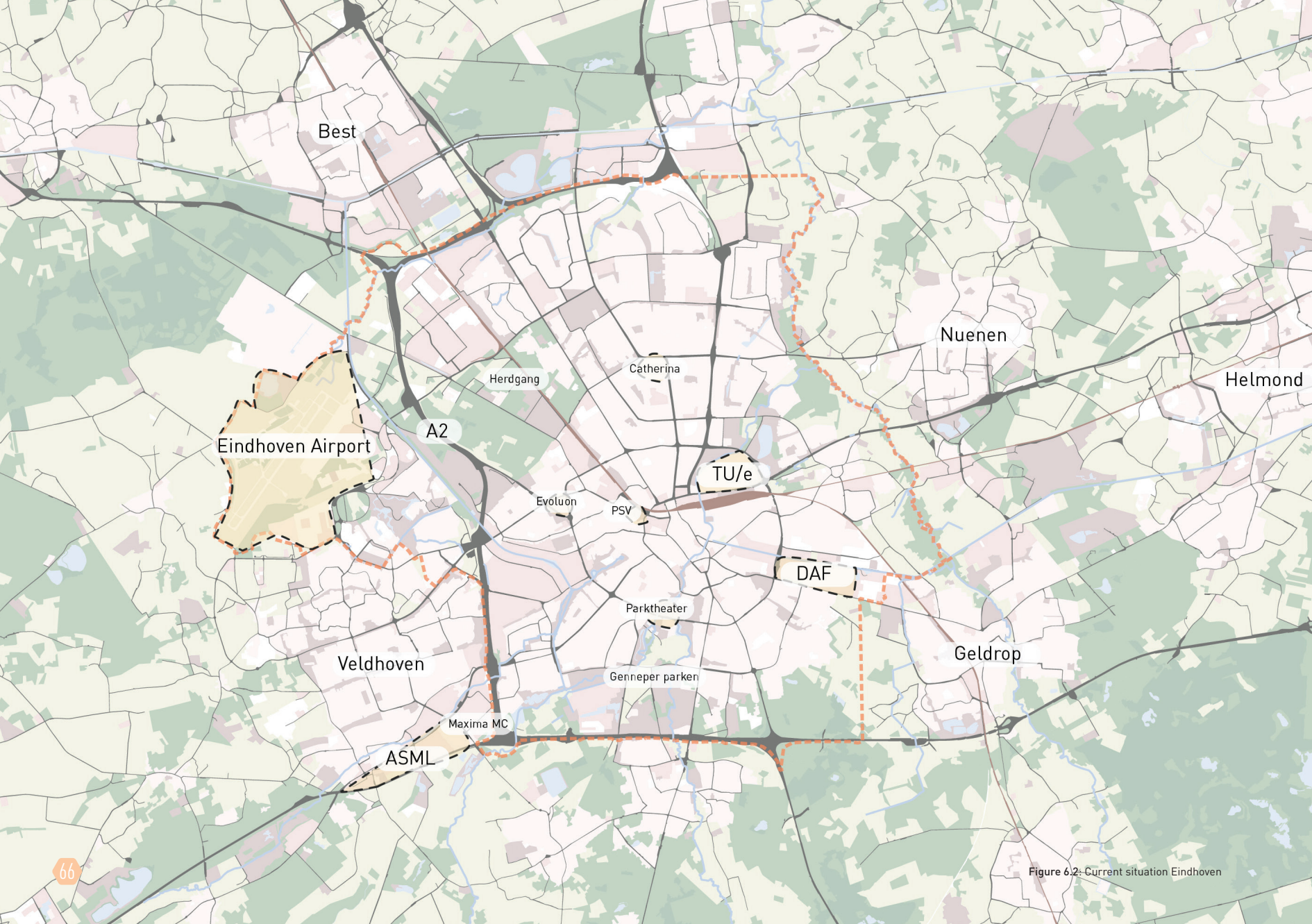


Figure 6.2: Current situation Eindhoven

As a basis for the spatial mapping of Quality of Life, the internal and external environments of (Pukelienė & Starkauskiene, 2015) were used. The external environment is underpinned by the factors natural environment and social environment. The internal environment includes physical and social well-being. These four factors were indicated with indicators that are applicable or occurring in public spaces. Each factor consists of a sum of indicators with a certain weight. This weight is assigned according to the number of mentions in the literature of the systematic literature review. For example, the highest weight of 4 is assigned to an indicator that is mentioned in the literature most.

On the following pages, each factor is described and all indicators leading to the final result are displayed. Each factor is categorized in the highest scoring 20%, middle scoring 20%, and lowest scoring 20 %.

1 Lowest weight mentioned in literature < 5

2 Middle weight mentioned in literature 5 < 10

3 Middle weight mentioned in litertature 10 < 15

4 Highest weight mentioned in litearture > 15

Quality of Life	Factors (Pukelienė & Starkauskiene, 2015)	Indicators	Mentioned in literature	Total	Weights	Source of data
External environments	**Natural environment:**					
	Climate	Climate risk in neighborhood (high wind chill heat stress and flooding after heavy rain)	(19), (Pukelienė & Starkauskiene, 2015)	2	1	(Atlas leefomgeving, 2023)
	Quality of the natural environment	Residents prefer fewer, more or enough trees within streets	(2)(3)(4)(8)(16)	5	2	(Gemeente Eindhoven, 2022c)
		Maintenance (satisfied with public spaces maintenance)	(4)(15)(34)(40)(46)(51)(58)	7	2	(Gemeente Eindhoven, 2022c)
		Furnishing (satisfied with furnishing within public spaces)	(2)(4)(5)(6)(11)(13)(15)(16)(18)(27) (29)(34)(37)(40)(47)(58)	16	4	(Gemeente Eindhoven, 2022c)
	Social environment:					
	Accessibility of public space	Distance to public spaces (within 10 minutes) + indicator recreational green	(3)(4)(10)(11)(12)(13)(16)(17)(18)(22) (26)(29)(34)(46)(51)(70)	16	4	(Gemeente Eindhoven, 2022c)
	Social security	Crime indicents in public spaces (sum of: threats, assaults, street robbery and pickpocketing)	(17)(35)(66)	3	1	(Buurtkijker, 2021)
	Social inequality	Amount/proximity of public space per person	(3)(7)(17)(19)(34)(39)(41) (43)(46)(51)	10	3	(Rijksinstittut voor Volksgezondheid en Milieu, 2020a)
Internal environments	**Physical well-being**					
	Health conditions	Healthy conditions (sum of: obesitas, comply with exercise guidelines, experience of health and loneliness)	(2)(3)(4)(6)(7)(8)(10)(11)(22)(23)(26) (28)(36)(37)(38)(46)(55)(56)	18	4	(Rijksinstittut voor Volksgezondheid en Milieu, 2020b,c,d,e)
	Personal security	Feeling safe in neighborhood	(1)(5)(13)(16)(58)	5	2	(Gemeente Eindhoven, 2022b; Buurtkijker, 2021)
	Social well-being:					
	Family	Child-friendly spaces	(2)(5)(16)(18)(22)(31)(40)(55)(58)	9	2	(Rijksinstittut voor Volksgezondheid en Milieu, 2020a)
	Leisure	Visiting parks	(2)(4)(10)(13)(18)(34)(51)(55)(56)	9	2	(Gemeente Eindhoven, 2022a)
	Community life	Social participation in neighborhood (sum of: feeling home, social cohesion, active to improve neighborhood and experience of socially limited network)	(8)(13)(17)(18)(22)(28)(29) (34)(36)(44)(55)(56)	12	3	(Gemeente Eindhoven, 2022a; Gemeente Eindhoven, 2022b)

Table 6.1: Quality of Life indicators

Natural environment

The natural environment is the combination of climate (high wind chill at heat stress and flooding after heavy rain) and quality of the natural environment. The quality of the natural environment is determined through the satisfaction of residents with the furnishing and maintenance of public space and satisfaction with enough trees in Eindhoven.

$$\text{Natural environment} = \frac{((1 * \text{Climate}) + (2 * \text{Enough trees within steets}) + (2 * \text{Matintaineance}) + (4 * \text{Furnishing}))}{9}$$

Climate

Climate risks in neighborhoods

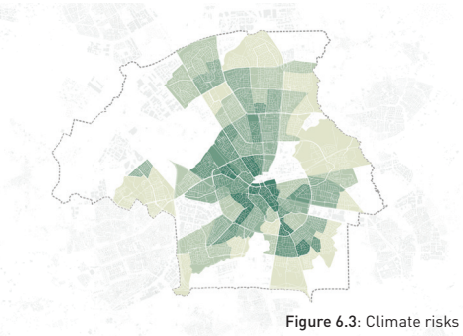


Figure 6.3: Climate risks

+

Enough trees within streets

Figure 6.4: Enough trees

Quality of the natural environment

+

Maintenance of public space

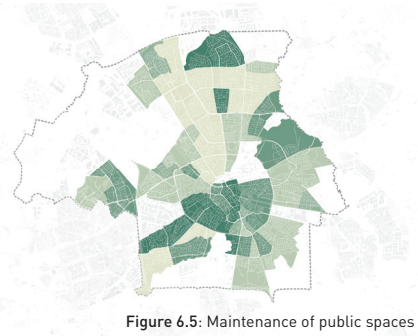


Figure 6.5: Maintenance of public spaces

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Furnishing of public space

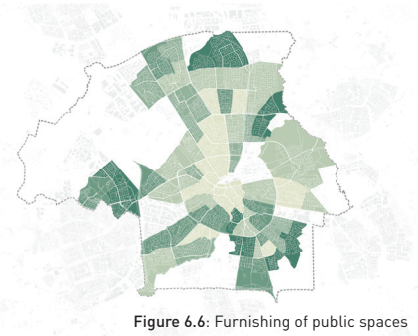

Figure 6.6: Furnishing of public spaces

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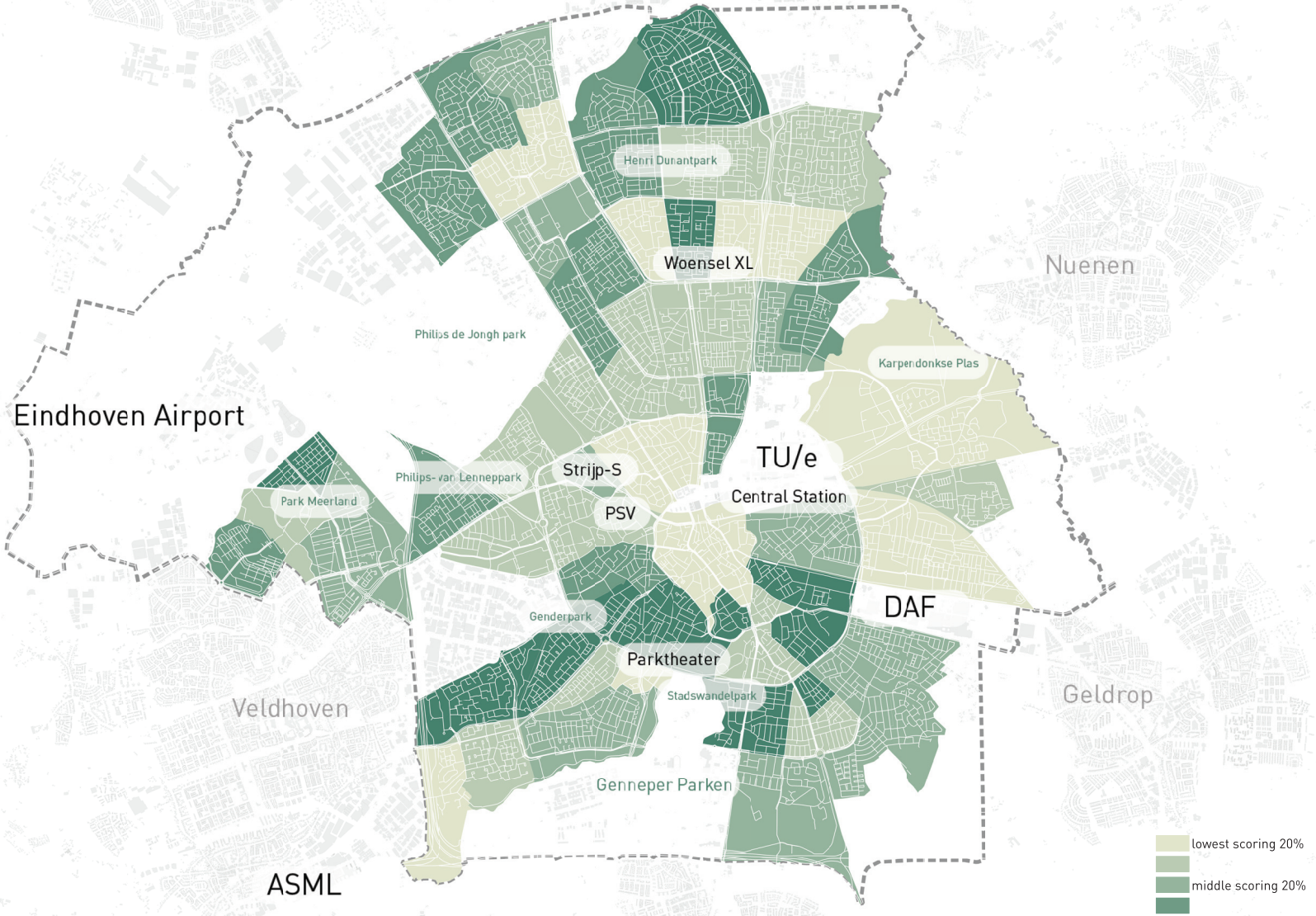

Figure 6.7: Overall natural environment

Social environment

The social environment is the factor that influences human behavior. In this case, it shows if people have sufficient access to public spaces in Eindhoven. As the distance to public space affects its use. In addition, it shows which neighborhoods have public space with good social safety which affects the attractiveness of public space. Social inequity shows the amount of public space per person.

$$\text{Social environment} = \frac{((4 * \text{accessibility}) + (1 * \text{social security}) + (3 * \text{social inequality}))}{8}$$

Accessibility of public space

Distance to public space (within 10 minutes)

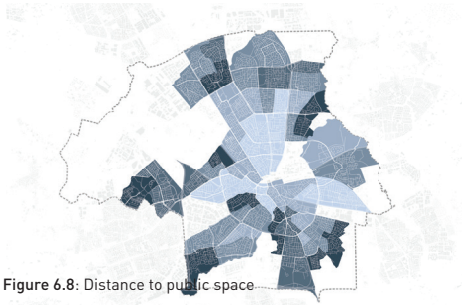

Figure 6.8: Distance to public space

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indicators of recreational green and blue space

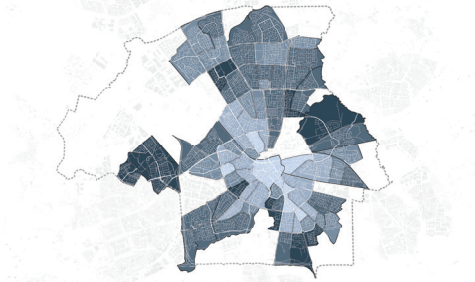

Figure 6.9: Indicators of recreational green and blue spaces

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Social security

Crime indicents in public space (sum of threats, asssaults, street robbery and pickpocketing)

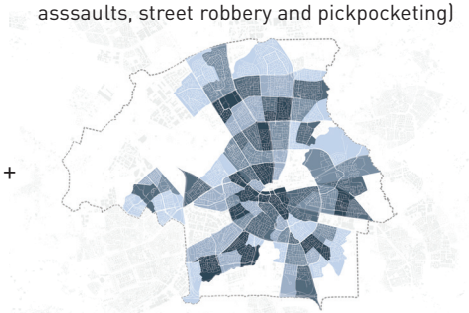

Figure 6.10: Crime incidents in public space

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Social inequality

Amount/proximity of public space per person

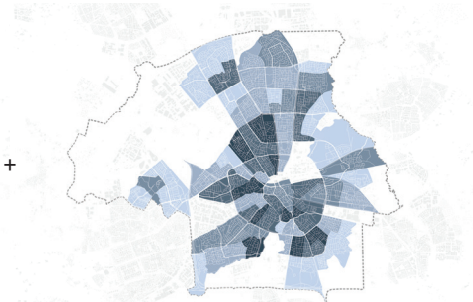

Figure 6.11: Proximity of public spaces per person

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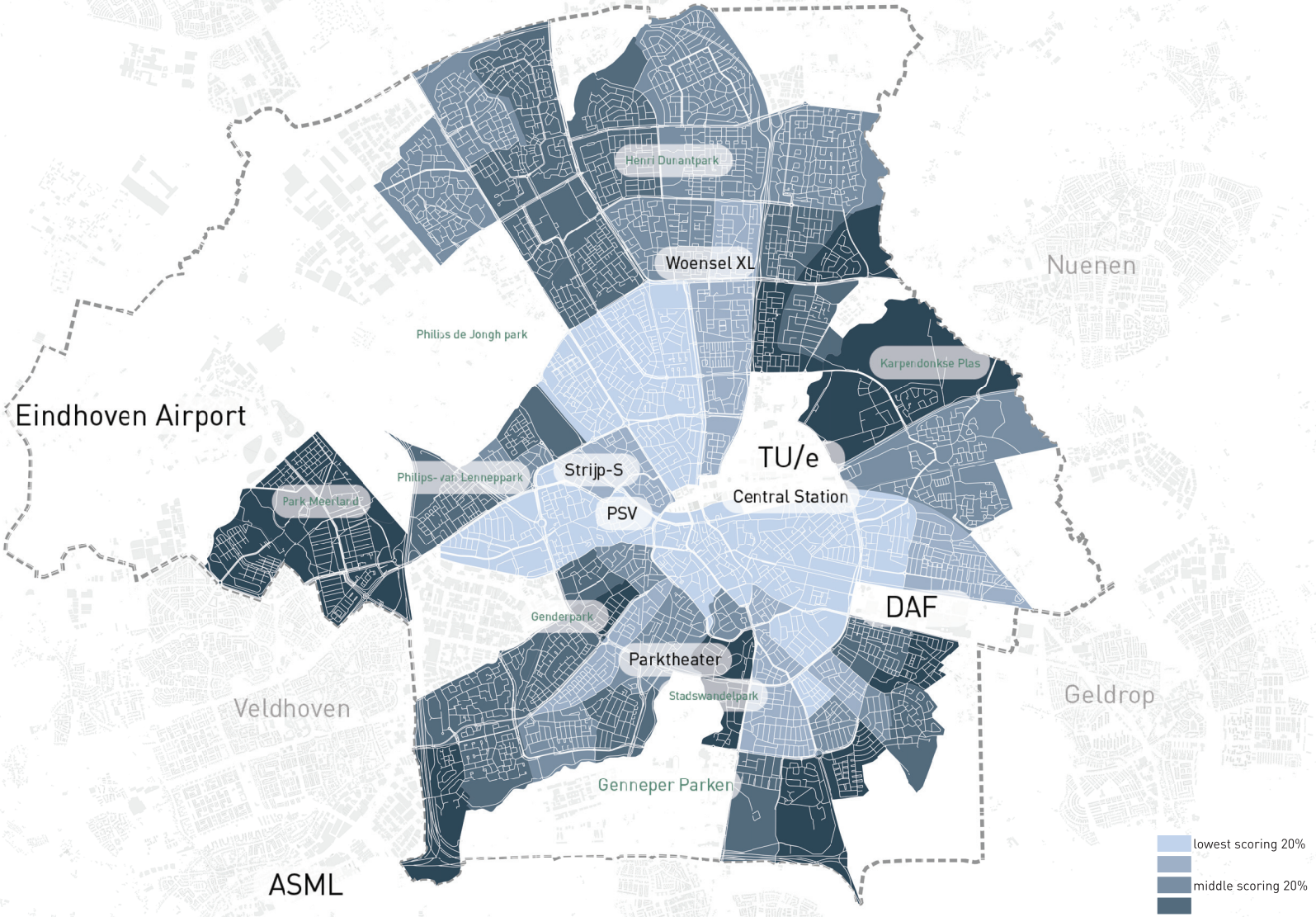


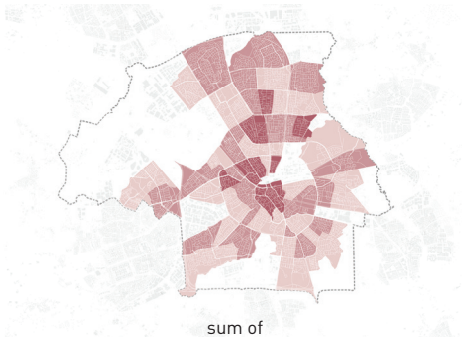
Figure 6.12: Overall social environment

Physical well-being

Physical well-being is the ability to maintain a healthy quality of life. The sum of health conditions shows if people can perform their daily habits in public spaces and take care of their bodies. It shows if people are able to complete their exercise guidelines within public spaces and if they experience an overall good health. Besides that, it is valuable that people feel safe in their neighborhood to stimulate personal security and well-being.

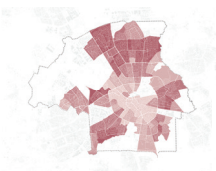
$$\text{Physical well-being} = \frac{((4 * \text{health conditions}) + (2 * \text{personal security}))}{6}$$

Health conditions



sum of

Obesitas



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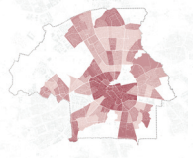
Comply with exercise guidelines



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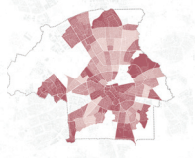
Experiencce of health



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Loneliness

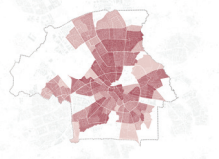

Figure 6.13: Health conditions

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Personal security

Feeling safe in neighorhood

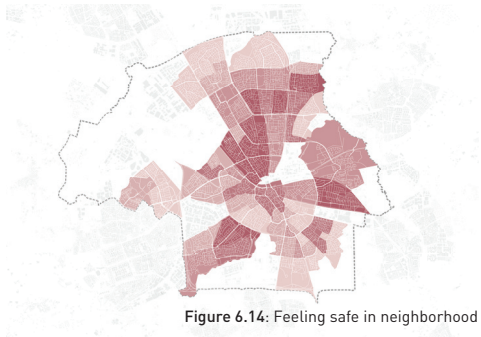

Figure 6.14: Feeling safe in neighborhood

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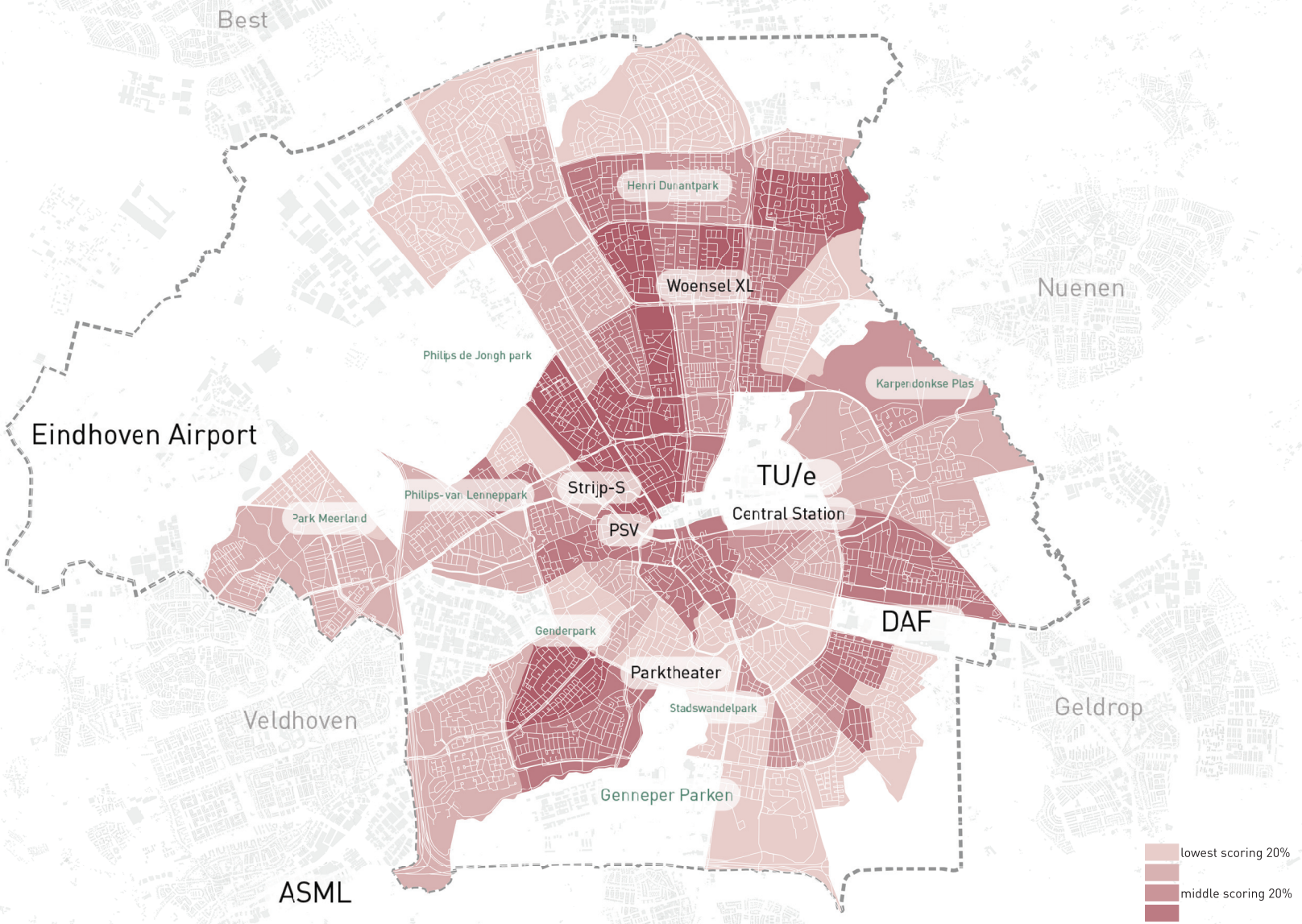

Figure 6.15: Overall physical well-being

Social well-being

Social well-being indicates if their are buildable and maintainable healthy relationships within the neighborhoods. It is about the connection with your surrounding area. Child-friendly spaces stimulate children and parents to go outside and interact in the playground. The amount of park visits shows if people use the public spaces for leisure. Community life shows if neighborhoods and people have meaningful interactions with people around them and feel at home.

$$\text{Social well-being} = \frac{((2 * \text{family}) + (2 * \text{leisure}) + (3 * \text{community life}))}{7}$$

Family

Child-friendly spaces

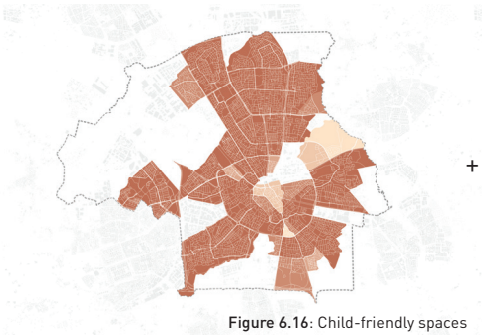

Figure 6.16: Child-friendly spaces

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Leisure

Visiting parks

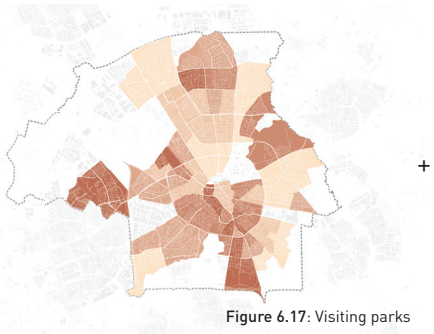

Figure 6.17: Visiting parks

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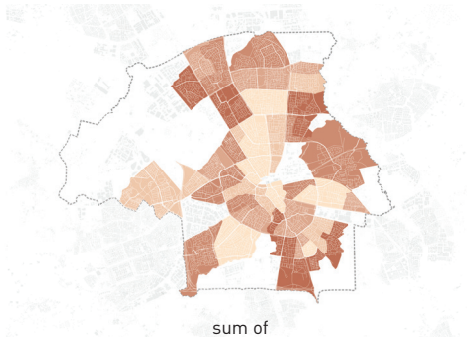
Community life



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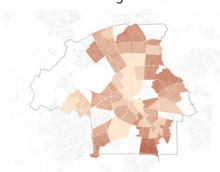
sum of

Feeling home



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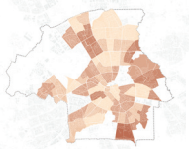
Social cohesion



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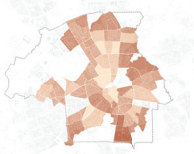
Active to improve neighborhood



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Socially limited network

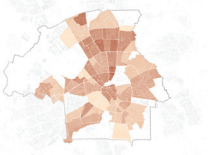


Figure 6.18: Community life

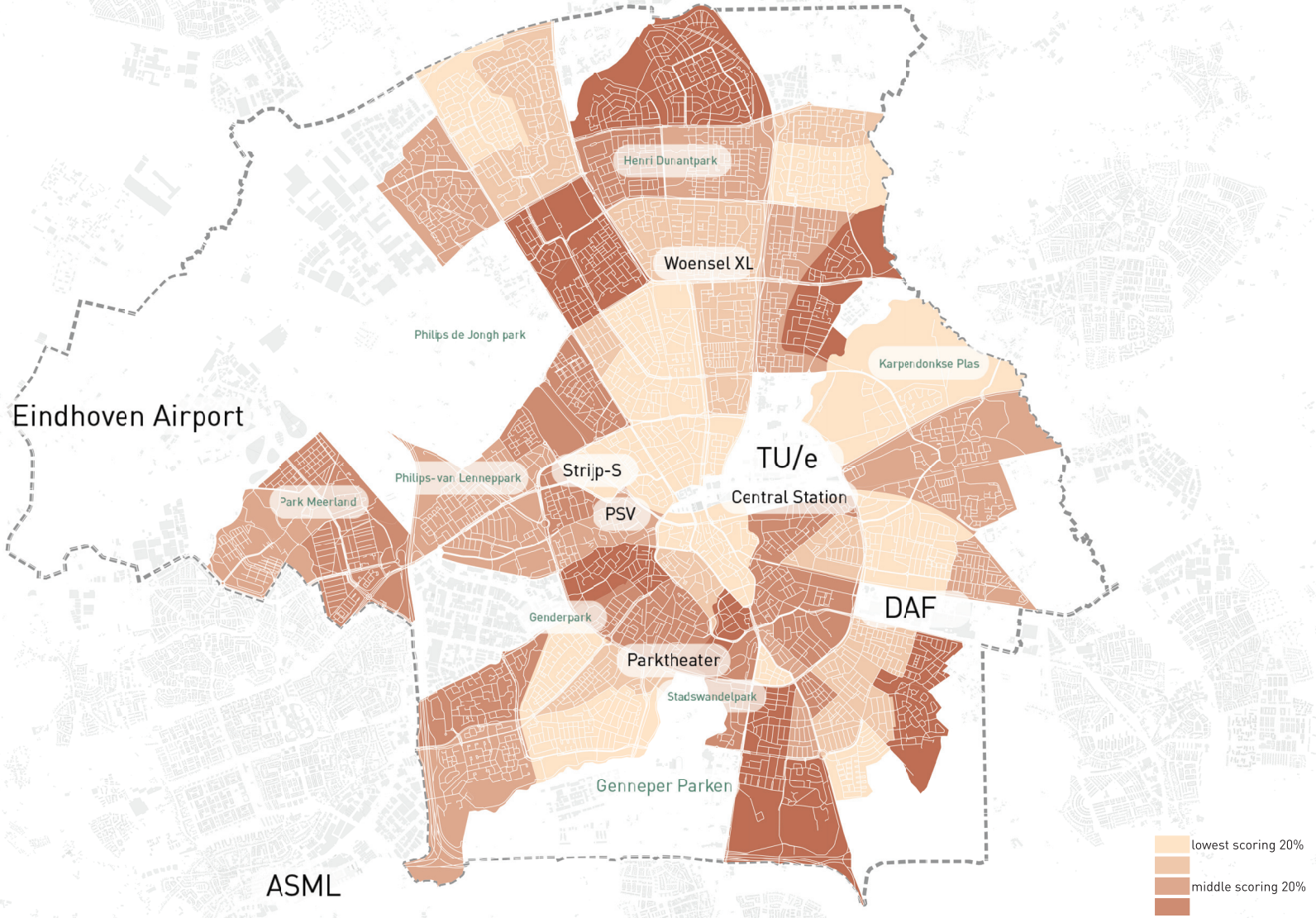
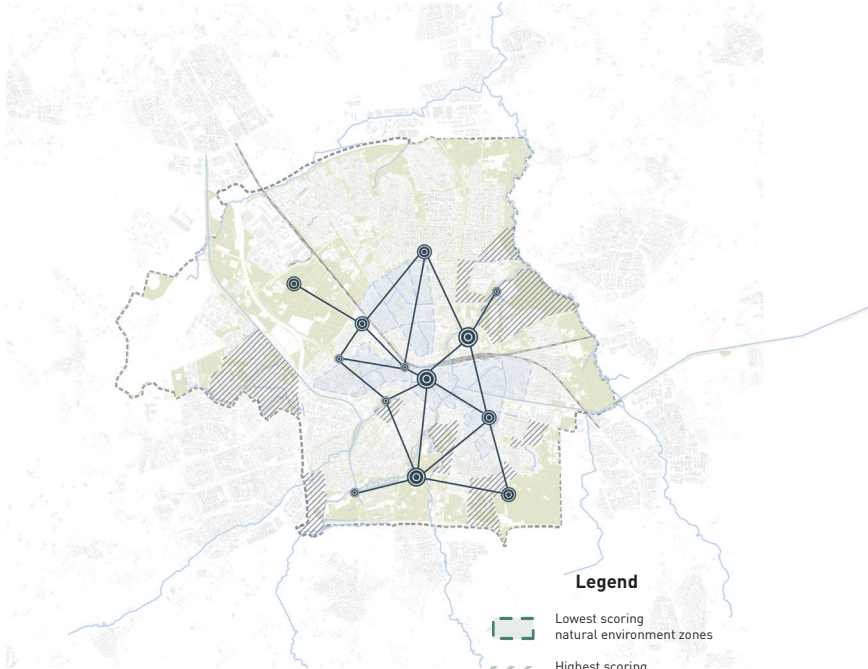


Figure 6.19: Overall social well-being

Takeaways for city strategy

NATURAL ENVIRONMENT

SOCIAL ENVIRONMENT

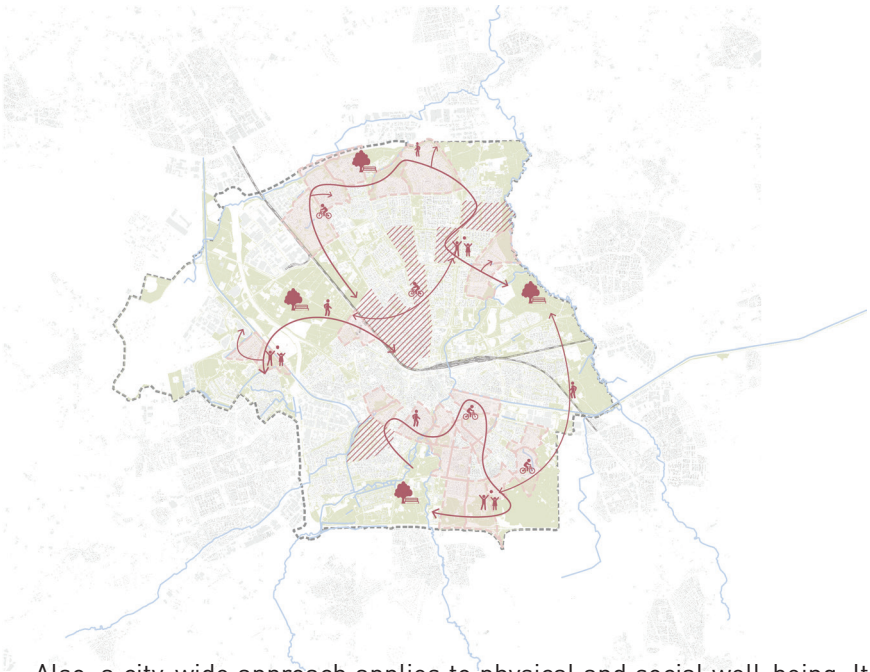


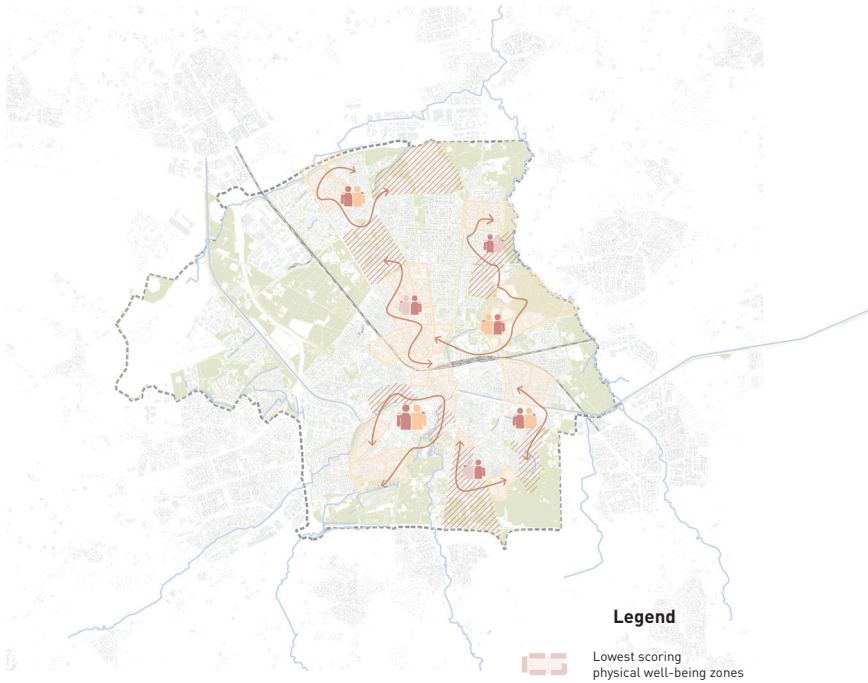
Both the natural environment and the social environment must be addressed citywide. For the natural environment, it is important that the low-scoring and high-scoring neighborhoods work together through the connection between the existing wedges and green main structures within the city. For the social environment, it is essential that both existing and new lively spots are accessible to everyone in the city. The combination of existing and new spots (around low-scoring areas) will create new places for social cohesion and will improve the overall social environment within acertain neighborhood or the whole city.

Figure 6.20: Takeaway natural and social environment

PHYSICAL WELL-BEING

SOCIAL WELL-BEING





Also, a city-wide approach applies to physical and social well-being. It is essential for physical well-being that there are safe and accessible streets and squares within the city for activities, such as walking, cycling, sports and visiting nature. These detours can enhance physical activities and make them more attractive within the city. For social well-being, it is relevant to improve social cohesion in neighborhoods. Again, it is vital that neighborhoods work together and that social factors within neighborhoods (or clusters) are strengthened and encouraged. This can be accomplished by supporting local existing and new initiatives.

Figure 6.21: Takeaway physical social well-being

07
CITY STRATEGY

The quality of public space affects the quality of life within a city (see arrow 8 in the theoretical framework on page X). First, it is important to identify on a larger scale how public space can contribute to this improvement and the current situation and contribution within the city. Through spatial mapping (chapter X), it has been identified which clusters within the city score lower on any of the factors of quality of life. The takeaways/conclusions from the chapter are the starting points for improving the quality of public space in Eindhoven. Besides that, it is essential to properly understand the current situation and combinate this with the new strategies. The overall strategy contains three sub-strategies: 1. Connect green wedges, 2. Customization of transit zones, 3. Define existing and new locations within the city. All sub-strategies are supported by the toolbox to improve the quality of public spaces through specific urban design principles.

The ambition of the city strategy is to form an overarching plan in which the different public spaces (streets, open spaces and facilities) cooperate. In order to ensure they are appropriate together and to reinform as well as stimulate each other.

For the public space streets, it is important to create a design that is conveniently located and gives a safe feeling so inhabitants feel pleasant to go outside. If this network of streets has an attractive character, it can contribute to the frequent use of open public spaces such as (green) squares or parks. These two types of public spaces work very closely together and can reinforce each other.

In the case of public open spaces such as squares or parks, the most important requirement is the location within the city. The location of a square or natural area should be easy to reach and serve a large audience. Also in this situation cooperation between streets and squares is essential. To further enhance the frequent use of public spaces, it is significant that these locations contain different types of facilities.

Public facilities contribute to the attractiveness of a certain place. It can make the place more attractive and entertaining. While it can also provide support to various activities. The facilities a place can offer increase attractiveness and encourage the variety in use of public spaces.

The cooperation between these three major elements within the public space ensures that residents experience a good living environment, with plenty of opportunities for physical and social activities. Whereby the natural and social environment is enhanced and residents experience a pleasant surrounding area. The following pages provide a detailed explanation of what way the various interventions of the seven urban design principles (toolbox) can be applied within the specific sub-strategy and in what manner they are related and shaped according to the current situation.

Resulting in a city strategy that strengthens the urban design principles of public spaces through the defined urban interventions (see toolbox). Ensuring the improvement of the overall and specific quality of public spaces within the city, which positively changes the Quality of Life within the city of Eindhoven.

Connect green wedges

The green wedges enter Eindhoven in three different locations which makes them accessible to nearly all residents of Eindhoven (and people from outside)

New green connections should provide better accessibility to green wedges and public spaces in the downtown area of Eindhoven

Green structures

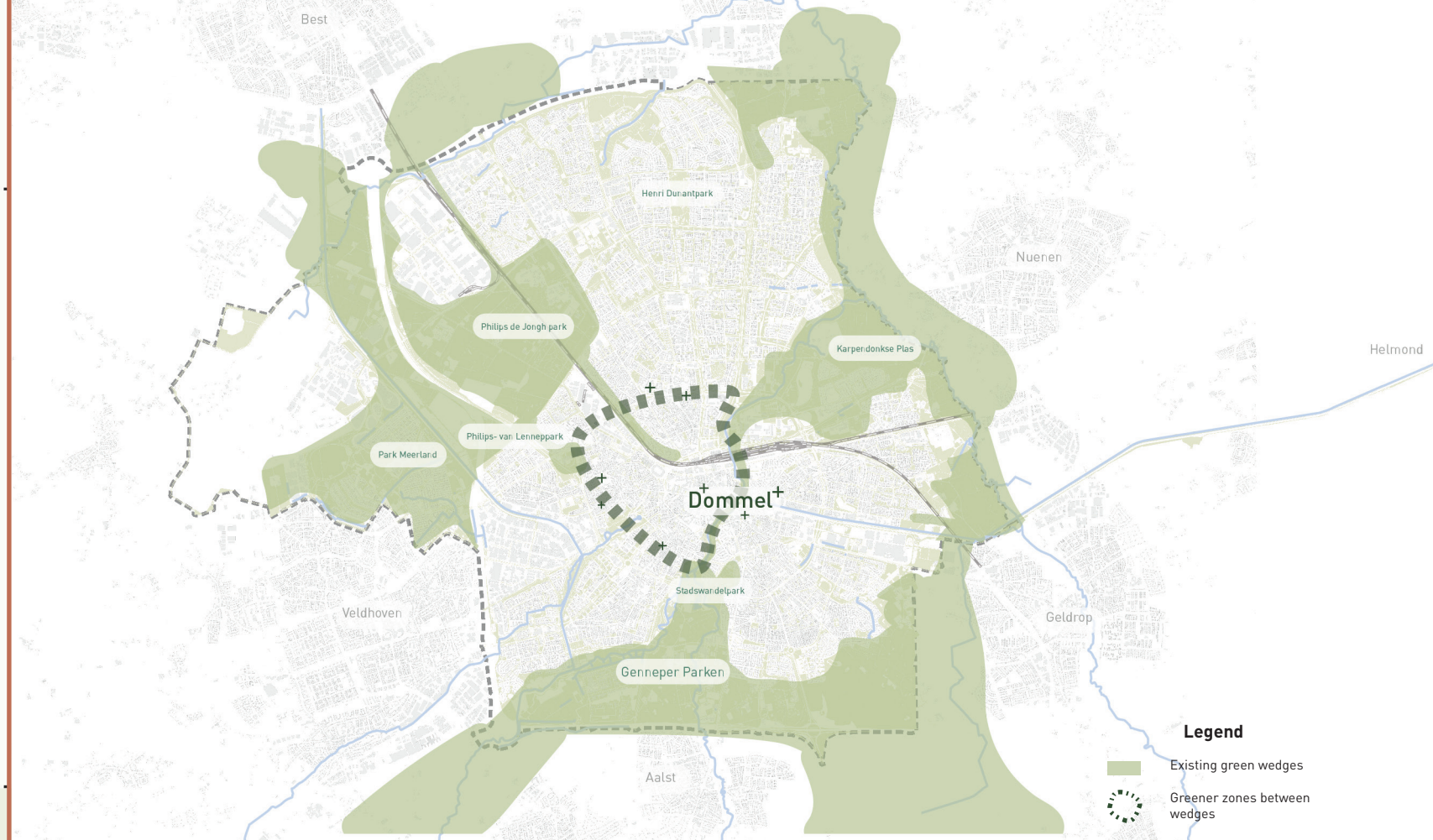


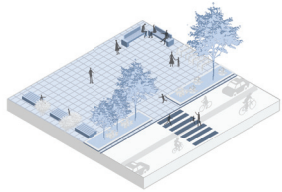
Figure 7.1: Connect green wedges

Substrategy 1: Connecting the green wedges is mainly focused on supporting the natural environment. The most important green structures for Eindhoven are the green wedges. These are contiguous green spaces that extend from the outlying area into the city center. These areas offer access to green spaces for all residents of the city. The main purpose of this sub-strategy is to connect these three wedges. In this way, accessibility to these green amenities is strengthened and the petrified center receives a greener presence. At the moment, the Dommel already offers a connection between two wedges, but there are several places along the Dommel with a closed character and in certain places a poor reticent connection to the city center (Gemeente Eindhoven, 2016).

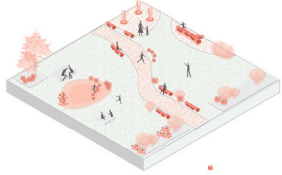
In order to strengthen the connections between the wedges, the area around the Dommel will be improved, through these adjustments the connection between Stadswandelpark and Karpendonske Plas will be encouraged. Besides that, the reinforcement ensures that the Dommel has a more central function within the city center, giving the place an open character and an inviting place to visit. In addition, part of the ring road will become greener, connecting the Karpendonkse Plas with the green wedge where the Philips de Jongh Park is located. Finally, streets within the neighborhoods Schouwbroek and Schrijversbuurt will be given a greener character to make to roads towards the Philips de Jongh park and the Stadswandelpark more attractive and inviting.

To realize these strategies and guarantee a qualitative public space several interventions from the toolbox are used. The four main interventions are shown on the right. For the area of the Dommel, it is essential to have striking significant markings with enough place to sit, so inhabitants can enjoy the natural feature of the Dommel. For the transformation of the streets, it is necessary to have the presence of trees on both sides to visually extend the park towards the residential neighborhoods and further ensure that the streets are pedestrian-friendly spaces so the roads have an inviting appearance.

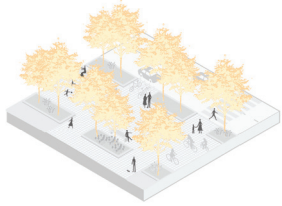
Pedestrain-friendly spaces



Sufficient places to sit



Presence of trees



Striking significant marking

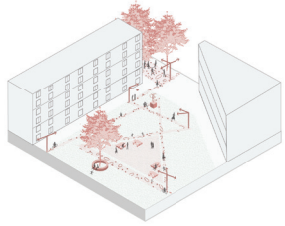


Figure 7.2: Greener streets

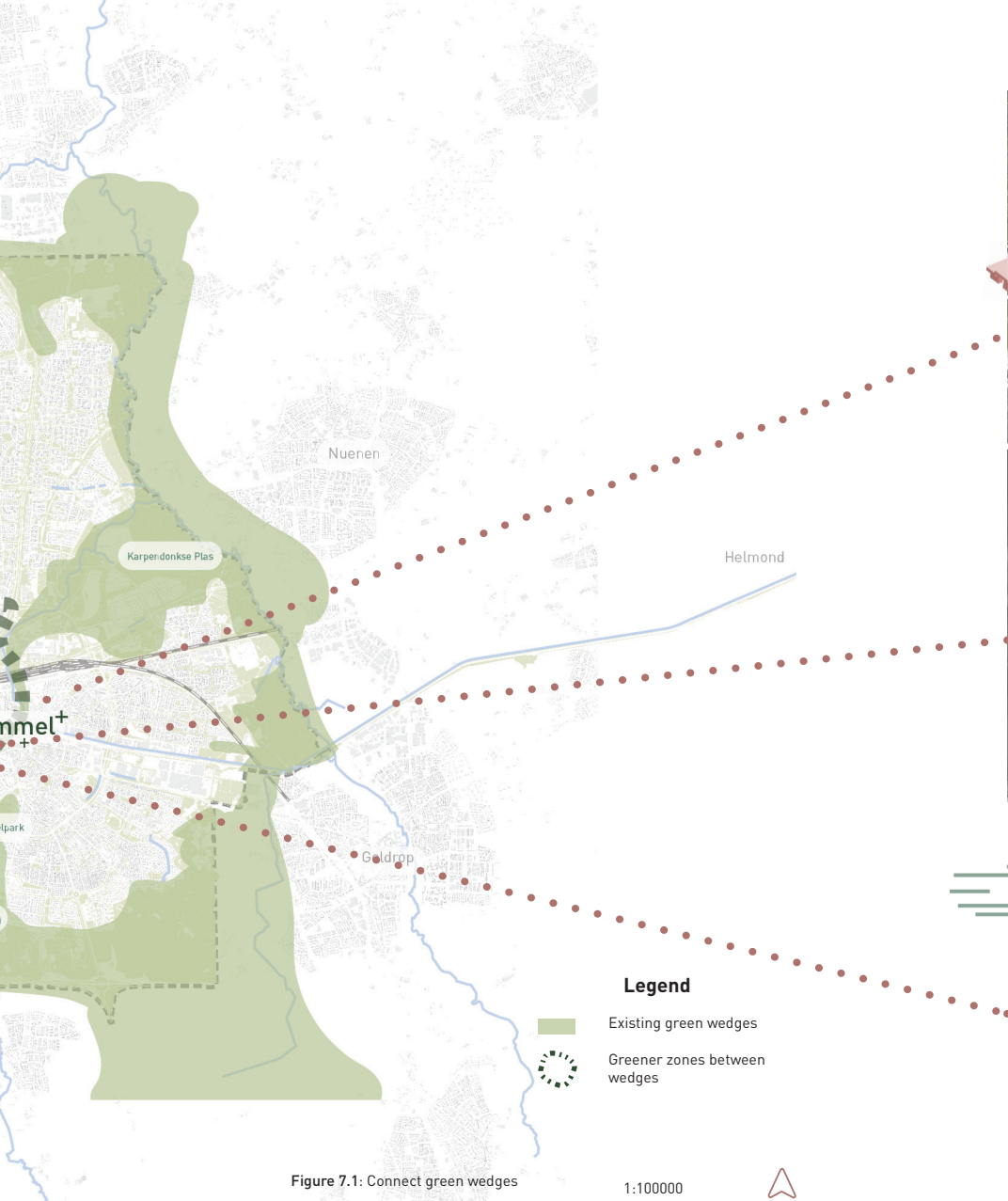


Figure 7.1: Connect green wedges

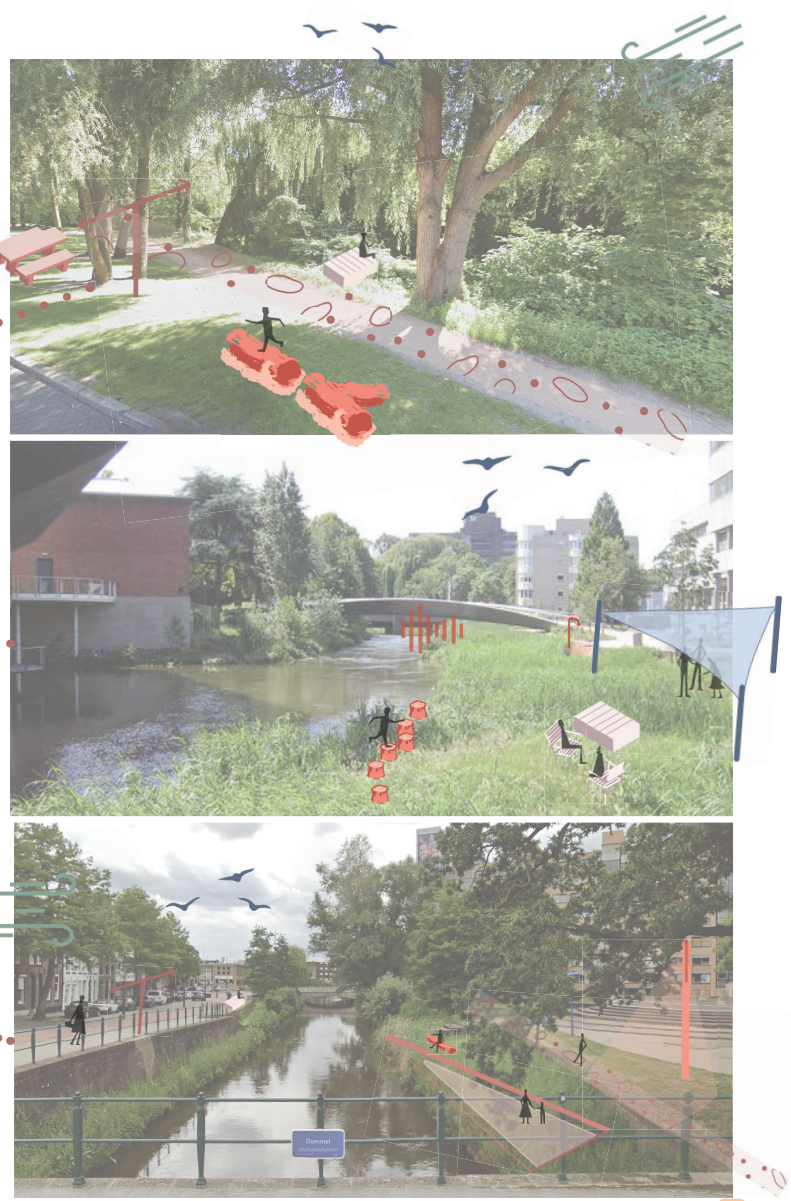


Figure 7.3: Strengthen area around the Dommel

Customization of transit zones

These green connections increase the amount of greenery in streets and public spaces. Green amenities make spaces more attractive and user-friendly and stimulate slow mobility

These connections improve accessibility and prioritize slow mobility, creating a safe transition zone in streets and public spaces. Which can encourage and promotes physical activity

New connections

Figure 7.4: Customization of transit zones

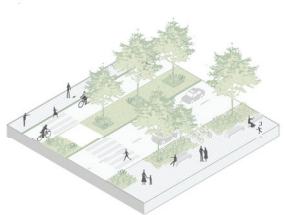
Substrategy 2: Customization of transit zones is mainly focused on supporting physical and social well-being. The green transit zones of the city provide a green and often recreational connection between the residential areas, green parks, and public gardens. Green connections are essential for the living environment within the city and give structure to the city. So these zones receive play an important role in the orientation, recognisability and identity of a place (Gemeente Eindhoven, 2016).

Within the strategy, the connecting structures are made location-specific by means of customization. The different structures are upgraded using two reinforcing elements:
1-> Transit zones are given a greener appearance and therefore strengthen the connection between the green wedges or
2 -> Transit zones are given a new appearance with a focus on stimulating physical activities within the neighborhoods.

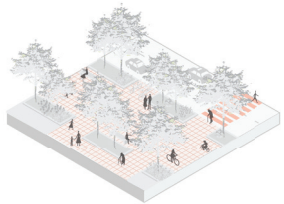
To realize these strategies and guarantee a qualitative public space several interventions from the toolbox are used. For each type of customization, the four main interventions are shown on the right. In the case of the greenification of streets it is essential to add more greenery, i.e. by means of more trees, shrubs, roadsides, flowerbeds etc. In addition, more space on the streets for cyclists and pedestrians is important to encourage people towards green wedges or other facilities.

In the case of the stimulation of physical activities, it is important that there are wide sidewalks, with good lighting to create a safe place. Furthermore, streets must be provided with facilities that encourage different activities, such as sports facilities for sports routes, a vegetable garden for gardening or informative routes for educational purposes. These interstitial spaces are essential places for interaction with observation, communication and behavior in order to improve the social aspect within the neighborhoods.

More green on streets

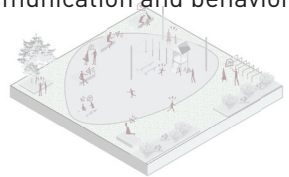


More room on streets

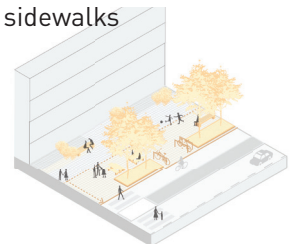


Natural features

Interaction with observation, communication and behavior

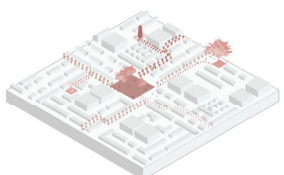


Wide sidewalks



Different activities

Use of interstital spaces



Good lighting

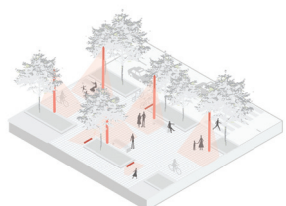


Figure 7.5: Greenification of streets

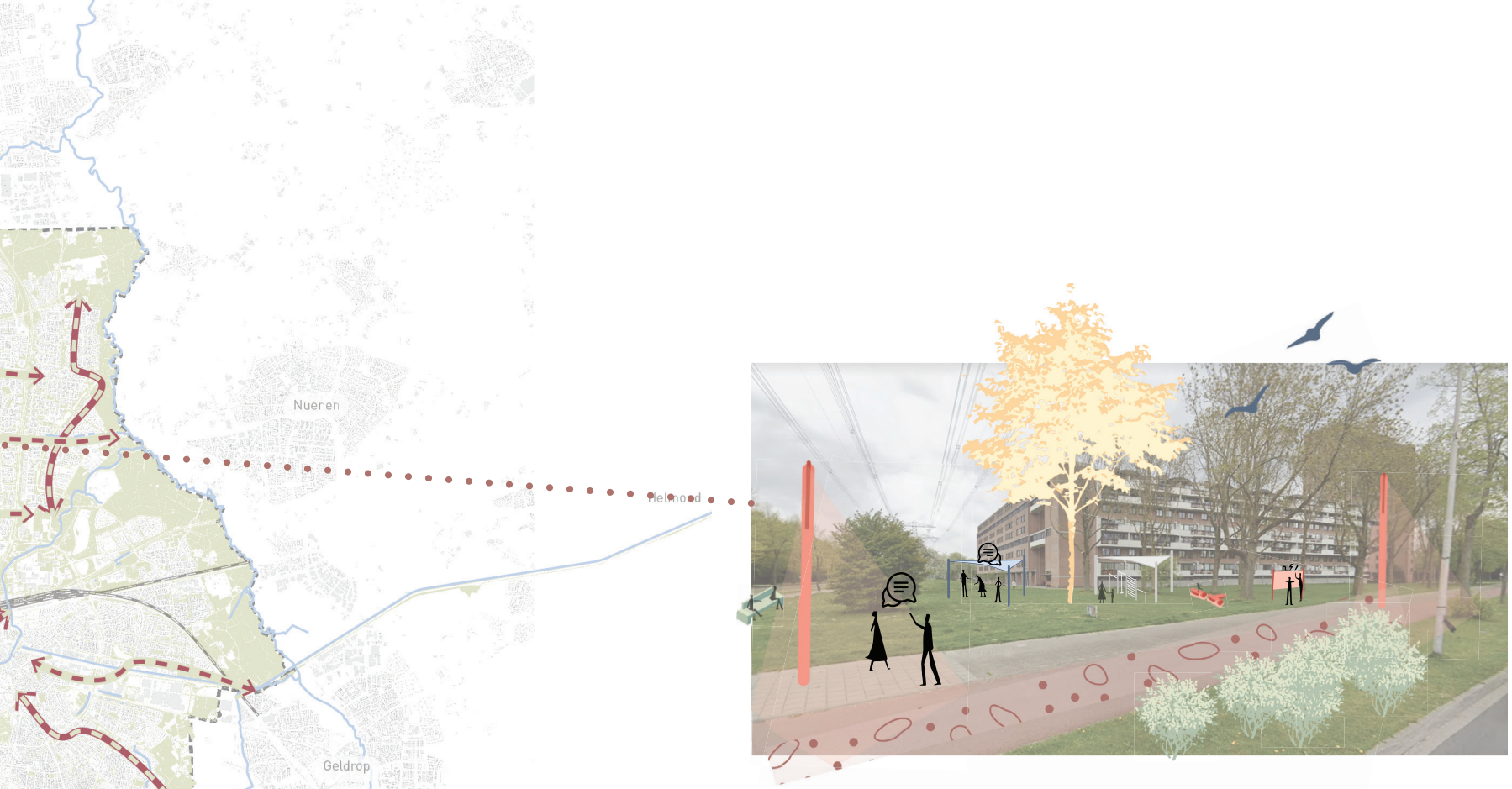


Figure 7.4: Customization of transit zones

Figure 7.6: Stimulation physical activity of streets

Define existing and new locations

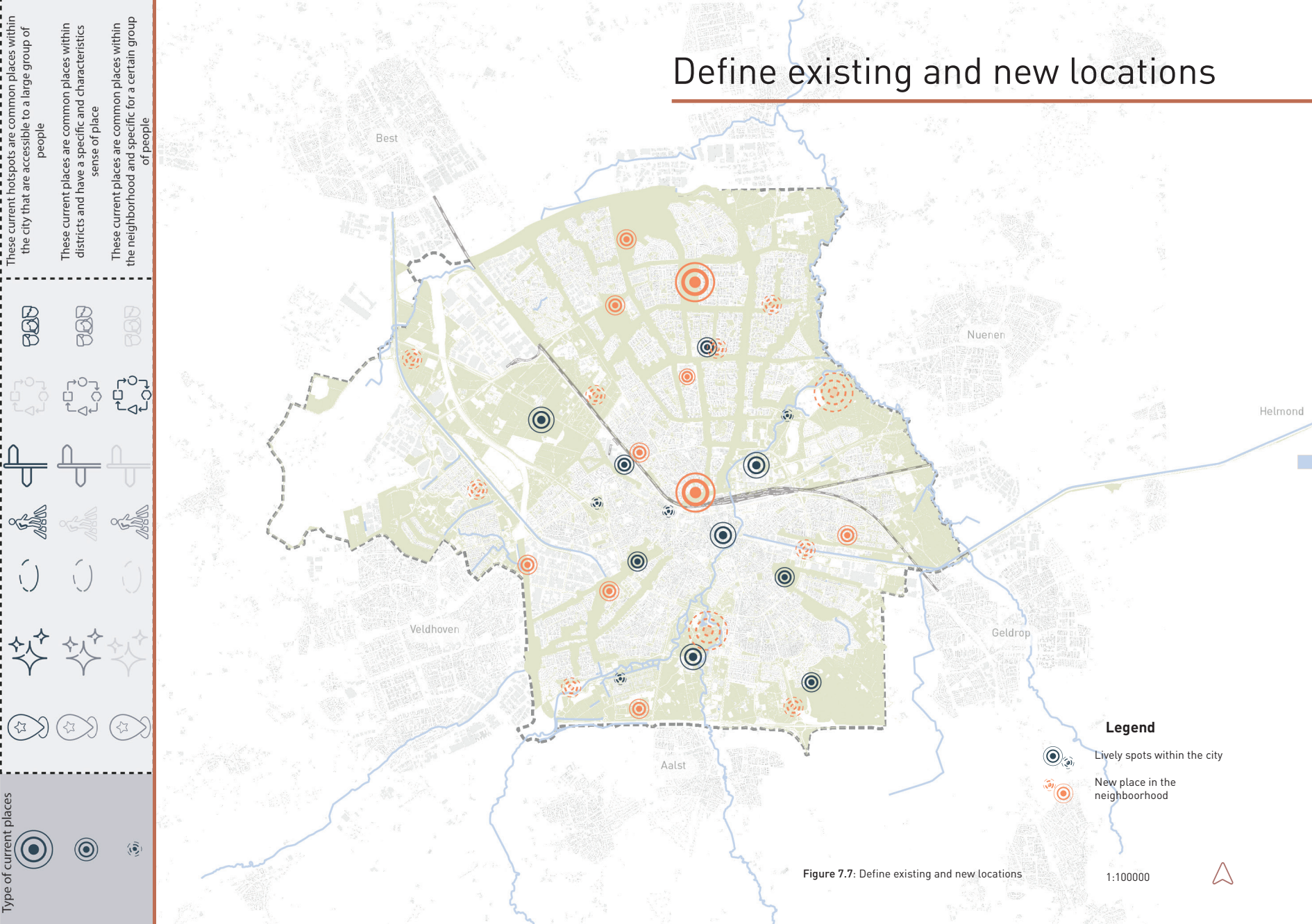
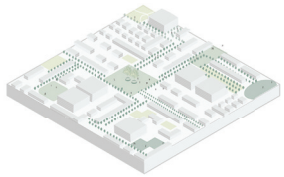


Figure 7.7: Define existing and new locations

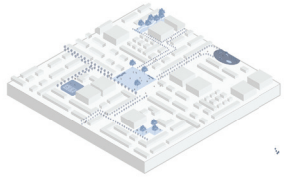
Substrategy 3: Define existing and new locations is mainly focused on the social environment and social well-being. For this strategy, it is important to capture the current lively spots within the city. These locations contribute to the social environment within the various neighborhoods. Some spots or locations are accessible to a large group, while others are more specific to a certain group of people. Besides that, the spots are also different in character. Spots can be a park, while the other is a provident square for activities. On the next page three lively spots in Eindhoven are highlighted, through the interventions of urban design principles (toolbox) it is shown why these spots are a current qualitative spot within the city.
To determine the location of new or improved squares or park, the locations of the lowest-scoring neighborhoods on social environment is considered. In this way, the location of new facilities can be created and positioned in those neighborhoods or in their near surrounding areas. In addition, the new places are nuanced and given an accessibility requirement (similar to the existing places). Some new places will become locations for a large group of people, while other new hotspots will be situated within current green structures for encouraging visits to parks. Besides these major interventions, there a smaller (green) squares or parks that will become central functions for local activities within one or more neighborhoods.

To realize these strategies and guarantee qualitative proportionally divided public spaces within the city several interventions from the toolbox are chosen. The four main interventions are shown to the right. For the new location, it is influential to create a place with authenticity or uniqueness for a neighborhood. So it feels like an extension of people's homes. In addition, the places need to differ in form and use to reinforce the diversity of public spaces, so it provides a place for everyone's preference. The proximity to green places should be between 300 and 500 meters (a 5-minute walk/detour) so it is accessible for all residents. Lastly, it is necessary that people can choose between different destinations to ensure diversity of choice.

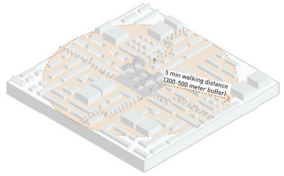
Site authenticity/ uniqueness



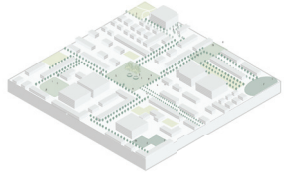
Different in form and use



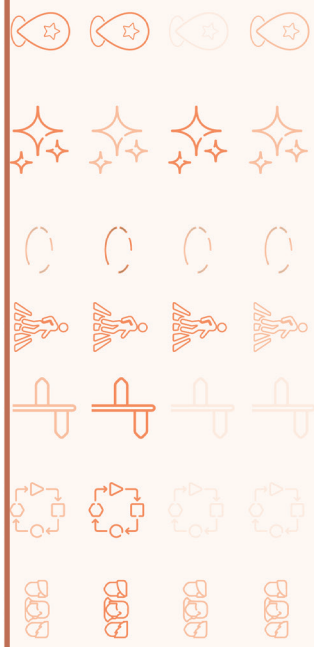
Proximity to green



Many destinations



Type of new places

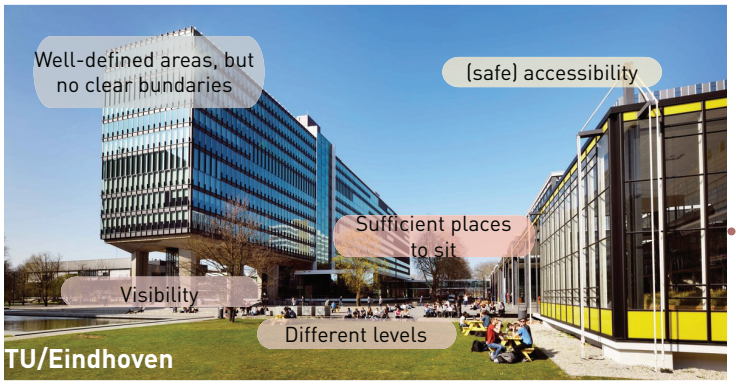


These new places will become common place within the city that are accessible to a large group of people

These places will be new qualitative hotspots in existing green wedges that stimulate people to visit parks

These new places will be new characteristic hotspots within neighborhoods, which are accessible, safe and attractive for a large group of people

These places will be new qualitative places within existing public spaces structures that stimulate accessibility and user-friendly activities



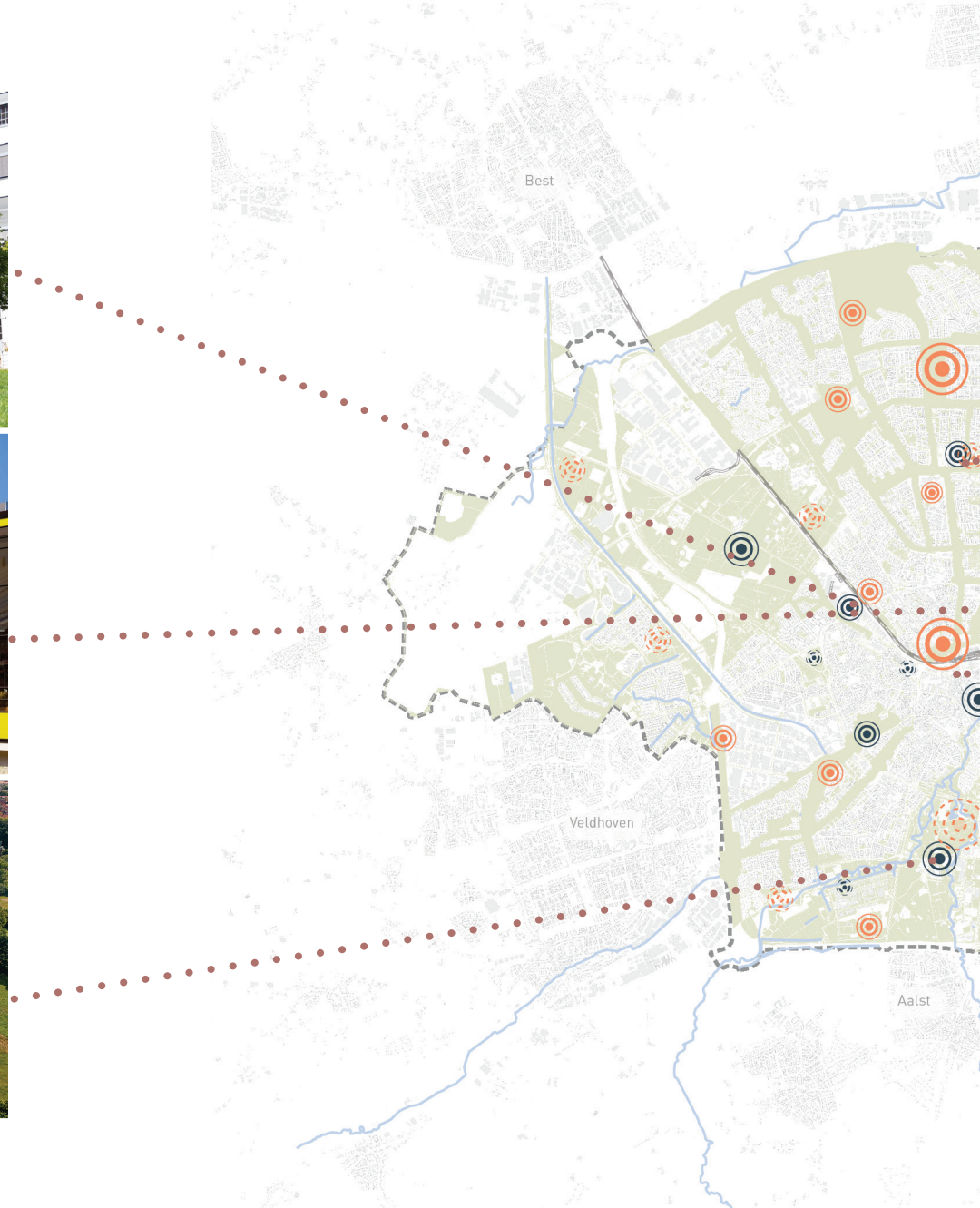


Figure 7.8: Define existing locations

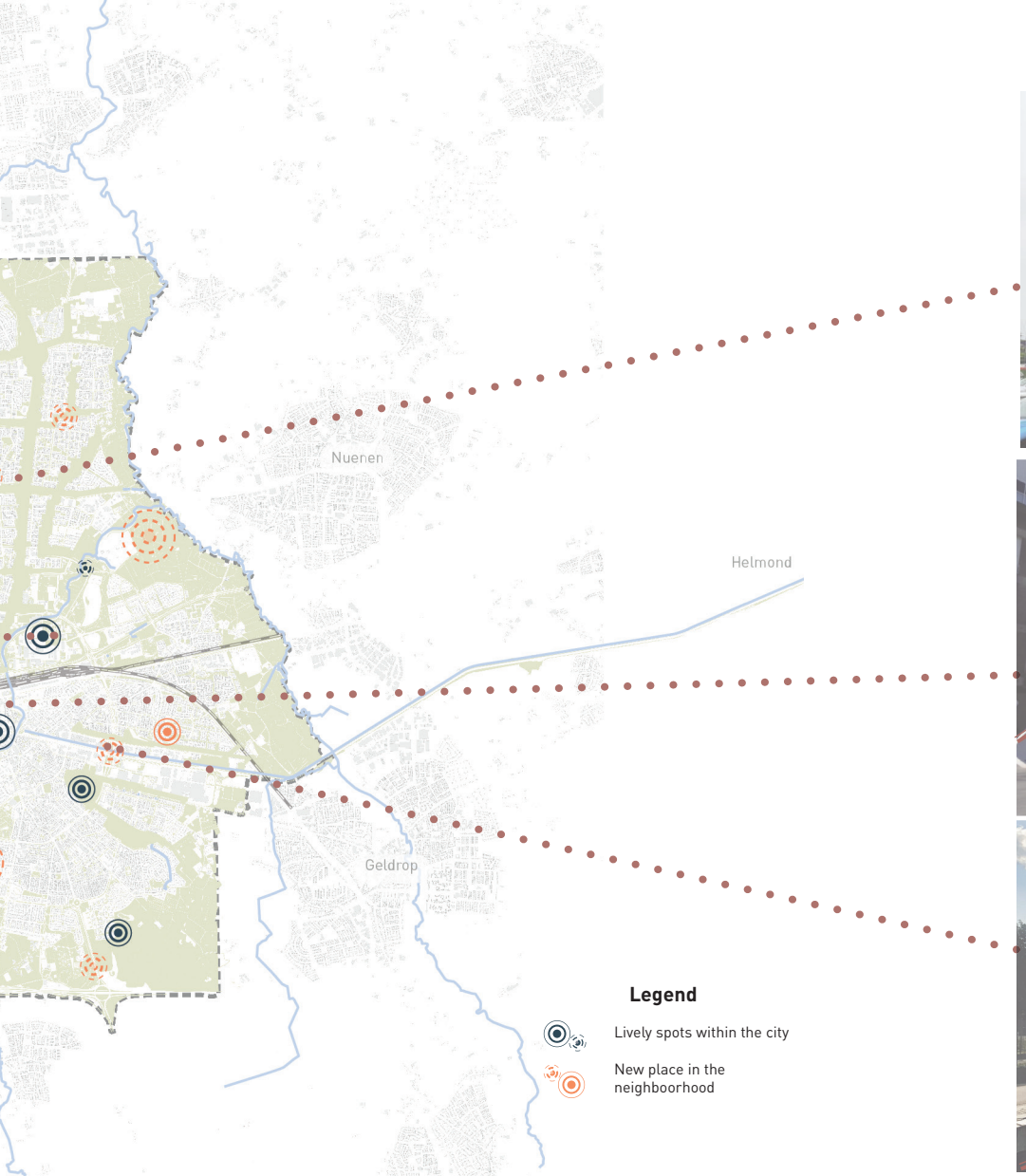


Figure 7.7: Define existing and new locations

Figure 7.9: Define new locations

City strategy

Figure 7.10: Total city strategy

In “Handboek Openbare ruimte 2021”, the municipality of Eindhoven distinguishes four different quality levels for public spaces: standard, plus, special and exclusive. The distinction is mainly about the significance within a region. Standard public spaces are all user-friendly spaces. Quality level “plus” is a public space that has special meaning for a district or neighborhood, for example, cultural-historical value. “Special” is a public space that is supportive and has an important function or place within the city. The quality level “exclusive” distinguished public spaces that have an image-bearing function or are ‘typical Eindhoven’ places such as the Dommel (Gemeente Eindhoven, 2021). The green wedges contain a combination of several quality levels, while the transit zones are qualified with level plus. The graphic on the right shows the distinguishment in Eindhoven and shows which approach the city strategy applies for a particular space.

In addition, Eindhoven has a densification challenge. Development and search locations have been inventoried, such as the current plans for Knoop XL, Emmasingelkwadrant and the Inner City. The character of several city districts has been examined and would transform with the addition of new housing. But in order to meet the ambition of new housing units and other programs, it has been concluded that several locations must be densified. This causes adjustments in different targets and planned sites need densification (Posad Maxwan; APPM, Tauw. Goudappel Coffeng, Gemeente Eindhoven, 2020). The densification vision shows the graduation between the high-urban and green-urban densification (with corresponding FSI) within the Inner City. In addition, it demonstrates which densification assignment different neighborhoods will face and how it relates to the city strategy

Lastly, the lowest-scoring neighborhoods in terms of Quality of Life are presented (how these outcomes have been established is shown in Chapter 06). With the help of the city strategy, it is possible to see how these neighborhoods/clusters are improved and receive a better quality of life.

Quality level for public space defined by Eindhoven

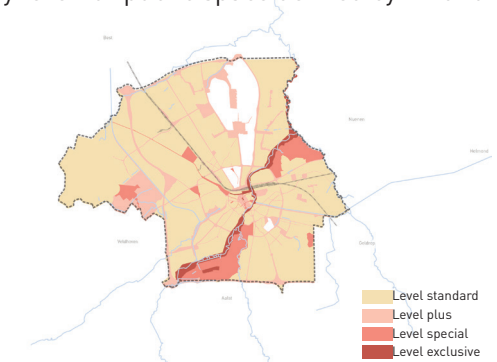


Figure 7.11: Quality level for public space defined by Eindhoven

Densification challegen towards 2040

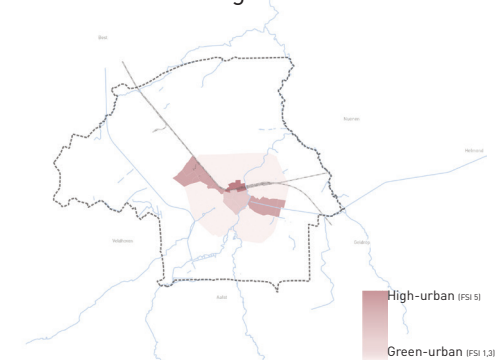


Figure 7.12: Densification challenge towards 2040

Lowest scoring neighborhoods
(results of spatial mapping)

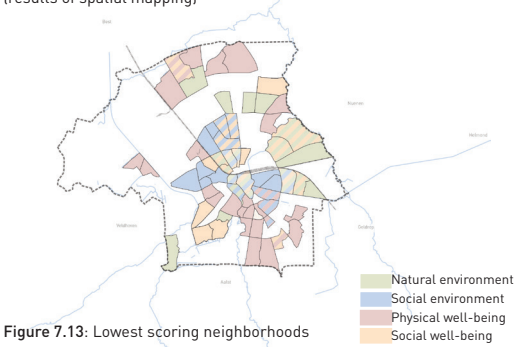


Figure 7.13: Lowest scoring neighborhoods

Intervention area

Figure 7.14:Intervention area

The two neighborhoods "Irisbuurt" and "Lakerlopen" are chosen as the intervention areas for the development of quality public spaces to improve the Quality of Life in their neighborhoods and surrounding areas. In Chapter 06 Spatial mapping of Quality of Life, the area belongs to the 20% lowest scoring neighborhoods on the factors of social environment and physical well-being, also several surrounding neighborhoods score low on these or other factors within the Quality of Life indicators.

In addition, the municipality of Eindhoven designated this neighborhood for middle high-urban density in the "Ontwikkelperspectief 2040 Centrum Eindhoven", which means the neighborhood has to realize many new housing units in a relatively short period of time. Within the neighborhood, the quality of public space is qualified with standard, where only the canal zone and access road are considered "Plus", which means these have a special meaning for the district.

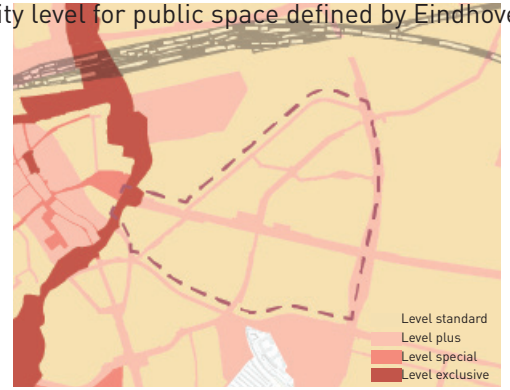


Figure 7.11: Quality level for public space defined by Eindhoven

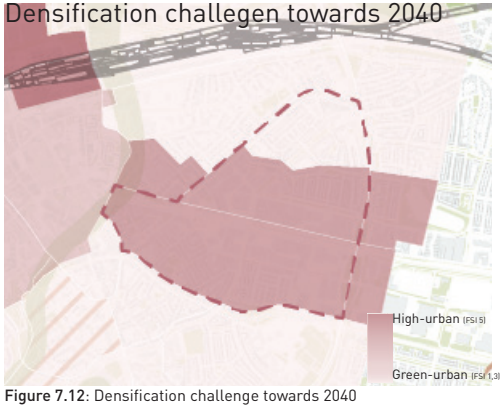


Figure 7.12: Densification challenge towards 2040

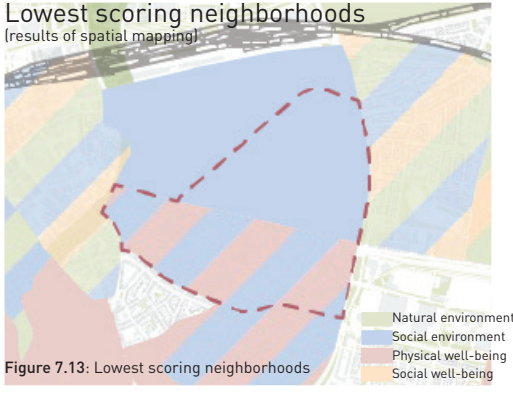


Figure 7.13: Lowest scoring neighborhoods

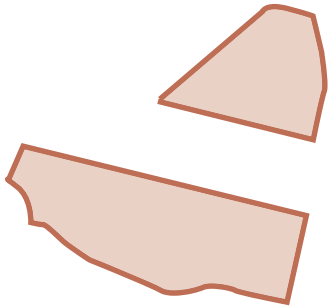
08
NEIGHBORHOOD ANALYSIS

The location area consists of two different neighborhoods separate by the Kanaaldijk (canal):

1. Lakerlopen on the north side

and

2. Irisbuurt on the south side



Both neighborhoods are located along the canal and are closely located near the inner city of Eindhoven. The neighborhoods contain a part of the industrial area "de Kade", one of the oldest industrial area which was created after 1845, when the municipality of Eindhoven had the Eindhoven Canal dug to connect it with the Dutch waterways (de Kade, 2023). During that time, the industry around the canal grew and many factories were situated near the canal. Because of weaknesses along the canal, it is not allowed to be navigated since 1971 (Wols, 2009). At this moment, the canal still fulfills a recreational function, with a bicycle path that runs along it, places for fishermen, and it is a practice course for rowing clubs.

Socio-demographics	Irisbuurt	Lakerlopen
Amount of inhabitants	2585	3245
Man/Women	1415/1170	1730/1515
0-15 years	300	380
15-25 years	370	490
25 - 45 years	1120	1300
45 -65 years	540	660
65 +	260	415
Single	1725	2075
Married	630	820
Native	1580	1605
Western migration background	475	630
Non-western migration backgroun	530	1010

Table 8.1: Sociodemographics Irisbuurt and Lakerlopen (AlleCijfers, 2022a) (AlleCijfers, 2022b)

Socio-economics	Irisbuurt	Lakerlopen
Income (average)	33.200	26.800
Housing characteristics	1332	1642
Property		
Home ownership	612	591
Housing corporation	466	739
Other rental options	253	312
Housing type		
Single-family house	653	936
Multi-family house	680	706
Year of construction		
Before 2000	1025	1067
After 2000	307	575
WOZ-value (average)	338.000	267.000

Table 8.2: Socioeconomics and housing characteristics Irisbuurt and Lakerlopen (AlleCijfers, 2022a) (AlleCijfers, 2022b)

Infrastructure

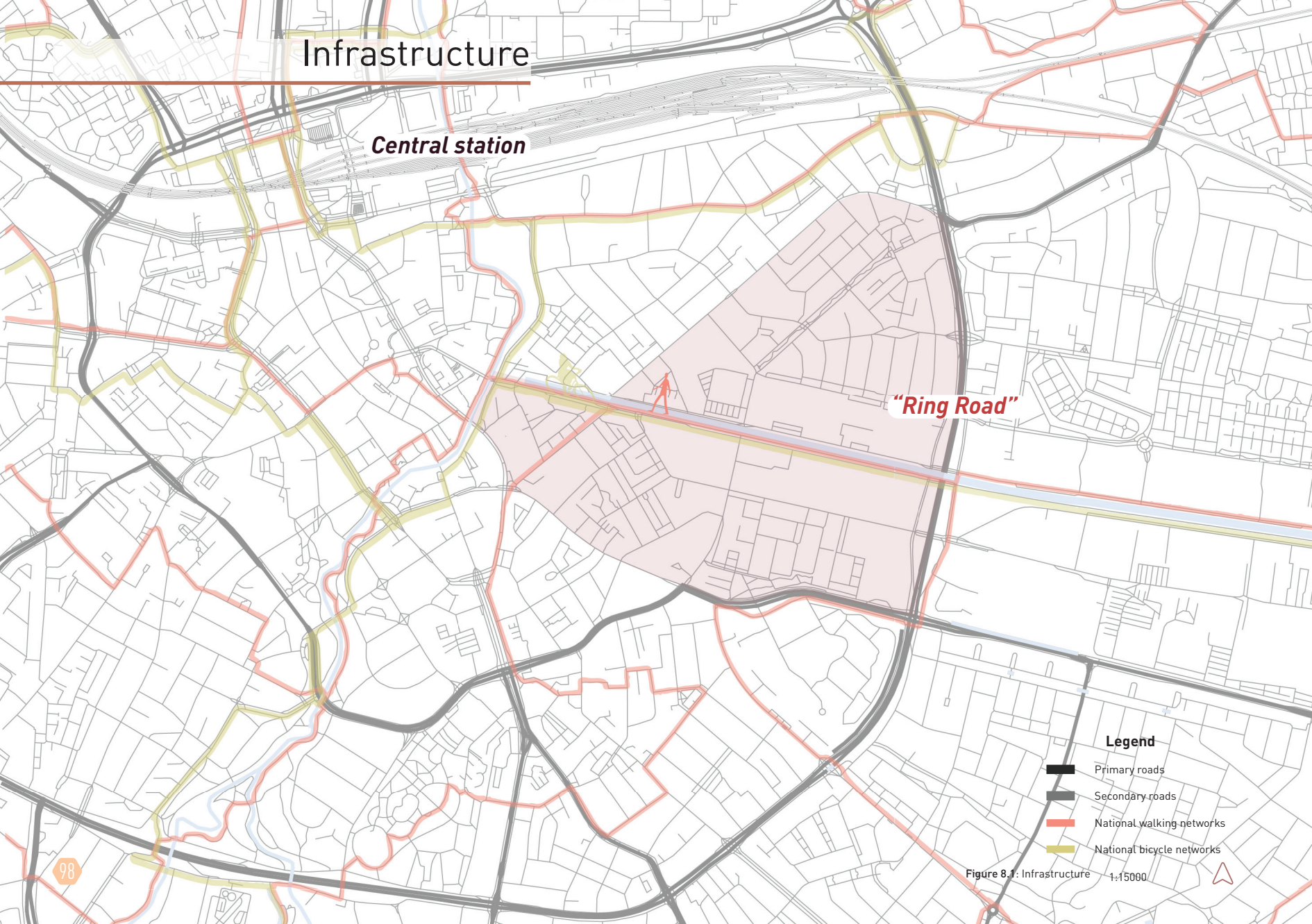


Figure 8.1: Infrastructure

Primary roads

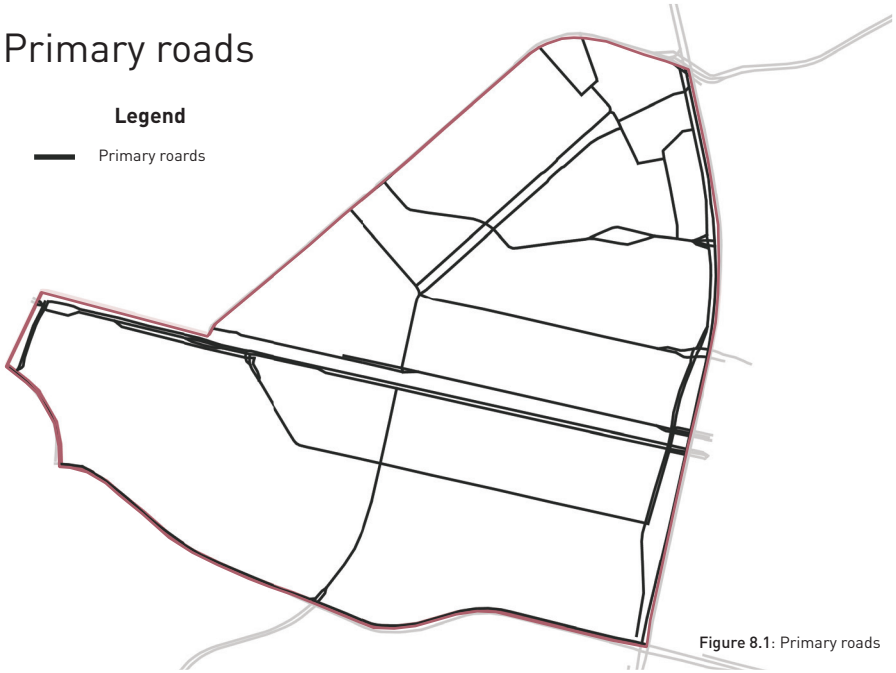


Figure 8.1: Primary roads

Secondary roads

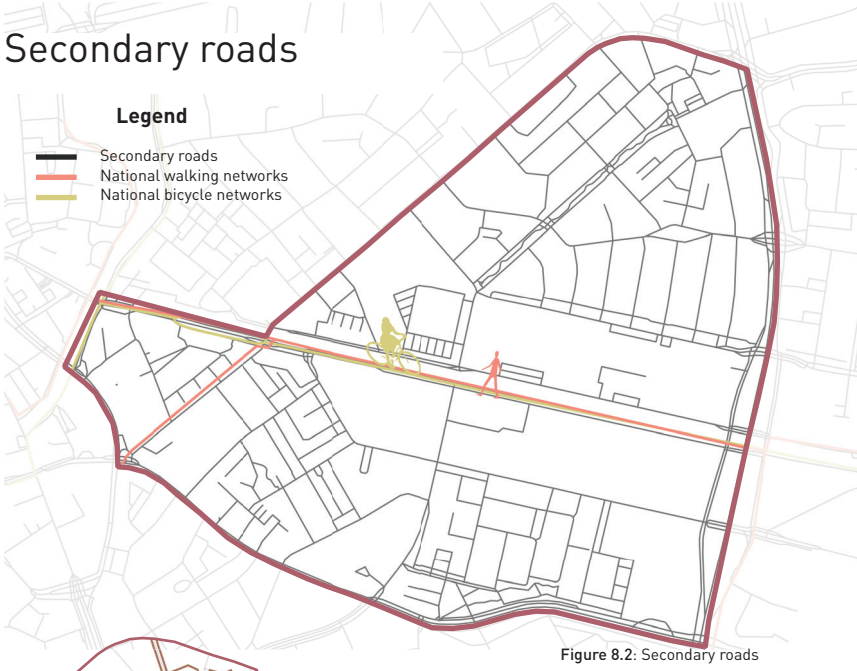


Figure 8.2: Secondary roads

The neighborhoods are enclosed by the "Ring Road" and one of the busiest roads towards the city center (located on the western edge of the area, "Geldropseweg"). Through the middle of the area, the neighborhoods are separated by the Kanaal. On both sides of the canal there are roads leading to Ringroad to enter the primary disclosure routes within the city. Also located along these roads are the national walking and bicycle network which connects the city center with Geldrop.

Parking

Figure 8.3: Parking

When taking a closer look there are two primary roads entering the neighborhood from the north side and one from the south side which both stop when they near the Kanaal. Furthermore, there are many roads that extend to the various clusters of homes. In addition, there are a lot of parking spaces (above ground) and they currently dominate the streetscape.

(green) Public spaces

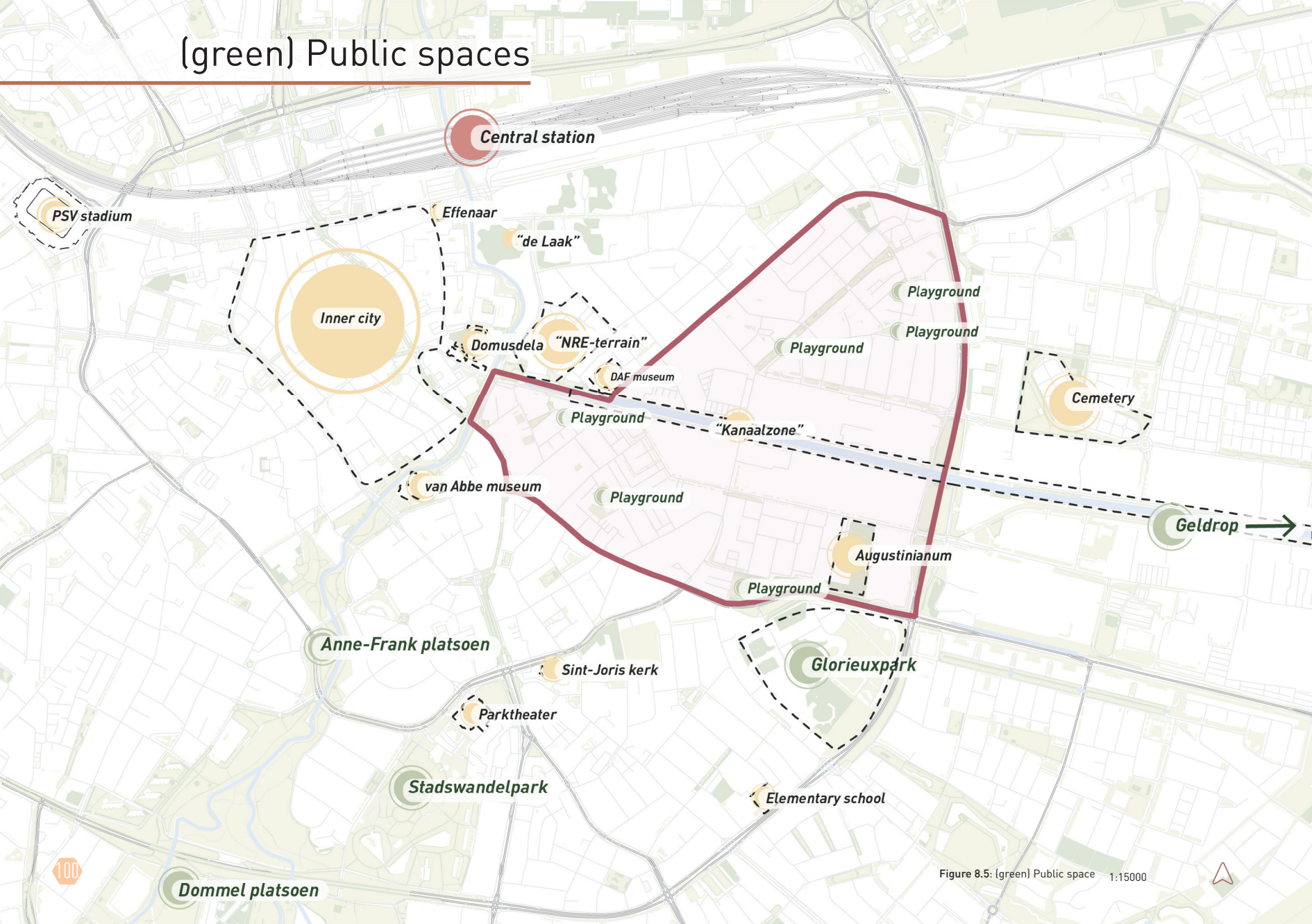


Figure 8.5: (green) Public space 1:15000

Location of trees

Figure 8.6: Location of trees

(green) public spaces

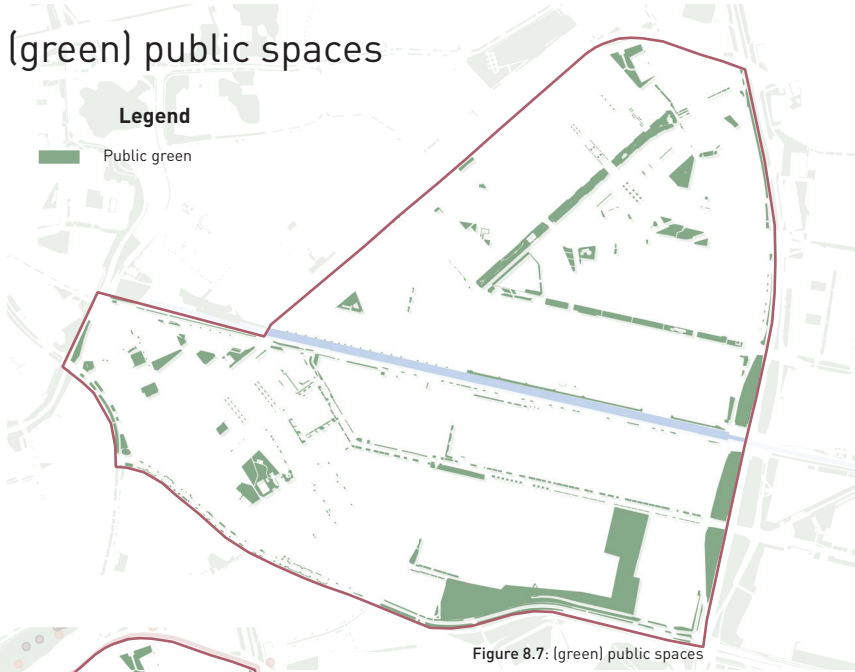


Figure 8.7: (green) public spaces

Near the neighborhoods, there are several (green) public spaces. The neighborhoods are closely located near the city center and with a sequence of relatively new public spaces near the canal it is possible to enter the neighborhoods. But also within both neighborhoods, there are a lot of green streets and public green areas. Several playgrounds are apportioned within the neighborhoods. Within these public spaces, several benches and playground equipment are facilitated. This means there are several locations to visit in and near the neighborhoods.

Facilities

Figure 8.8: Facilities within public space

Building characteristics

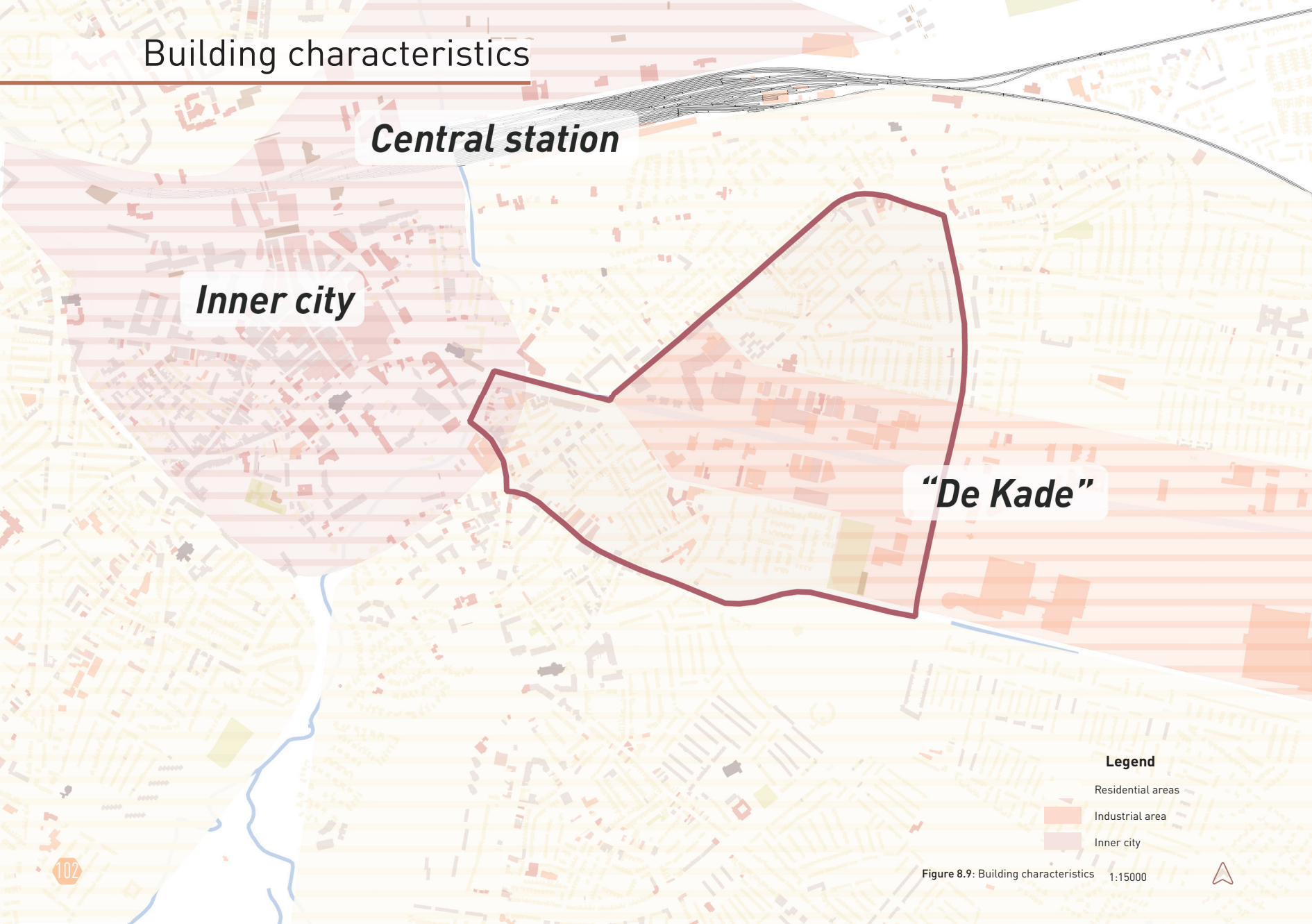


Figure 8.9: Building characteristics 1:15000

Building typology

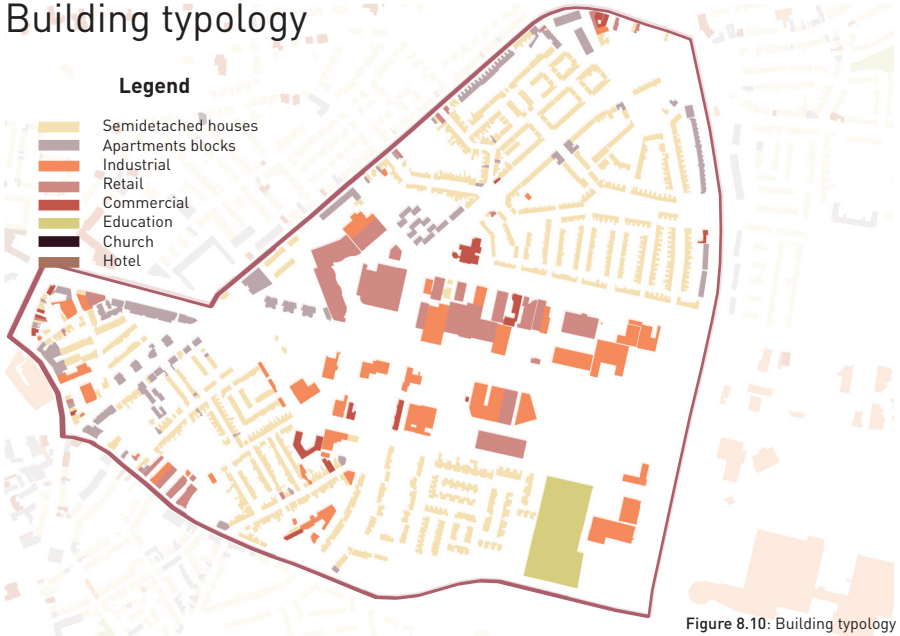


Figure 8.10: Building typology

Year of construction

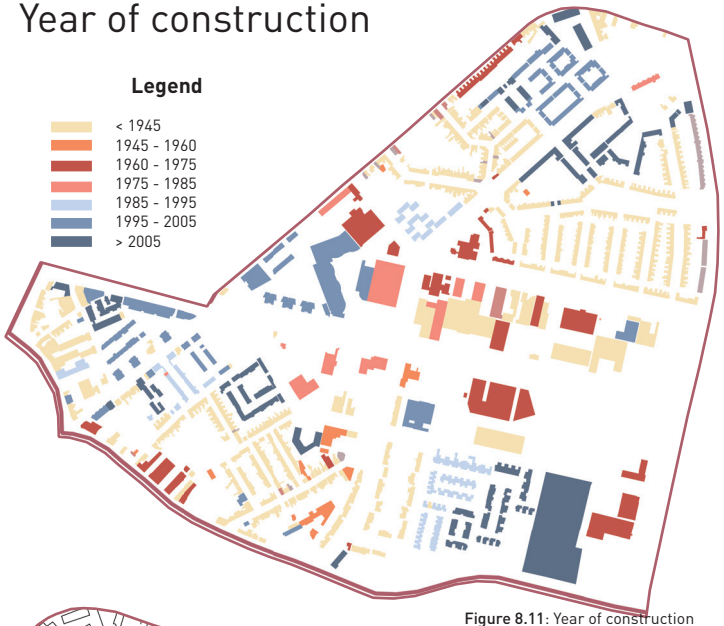


Figure 8.11: Year of construction

The area is located near the city center and facilitates one of the (oldest) industrial areas within the city "de Kade", of which a small part is extending towards the inner city and is in this manner located in the middle of this location area. The industrial area is located near the Kanaal.

Furthermore, the neighborhoods contain residential areas. Of which the majority of houses are built before 1945. Some of the industrial buildings are renovated after that period. While most of the renovated residential buildings are rebuild after 1995.

Peripheral

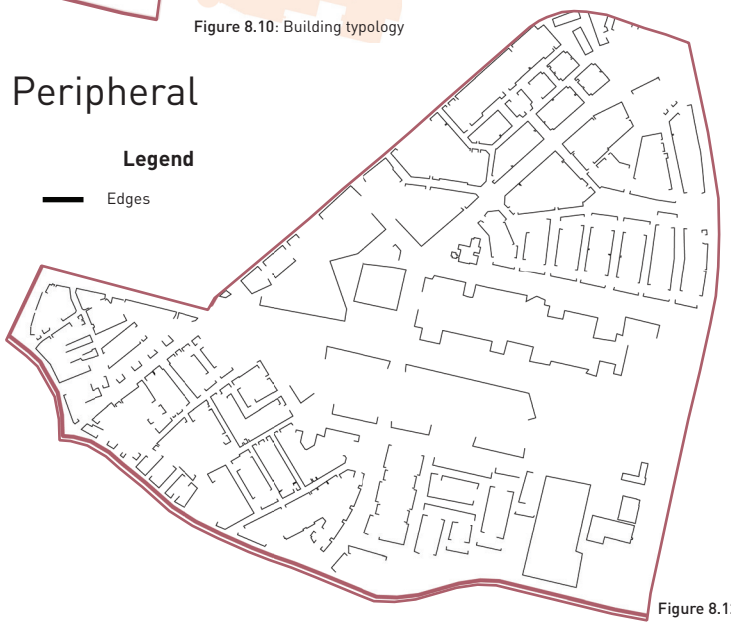


Figure 8.12: Peripheral

There are a couple of houses that are built a couple of years ago.

The distribution of residential areas related to the industrial area is also clearly visible in the peripheral. On either side of the canal, the buildings are large-scale blocks within the streetscape, while farther out, the blocks of houses are much smaller scale and focus more on the human scale.

Takeaways neighborhood analysis

Figure 8.13: Takeaway infrastructure

Infrastructure

The most important routes through the area are the roads on both sides of the Kanaaldijk. Currently, these function as the entrances to the industrial area, while they can also function as the connector between the city center and the green landscape towards Geldrop. It can become a leading route and connector for a large surrounding area. At this moment, the national walking and cycling network passes near the Kanaaldijk, which can be the starting point during the design phase.

Figure 8.14: Takeaway public space

Public spaces

There is an opportunity to connect the different public spaces through the route near the Kanaaldijk, in this way, the sequence of the nearby located public spaces is strengthened. The Canaalzone can be a new public space for a wide audience and an attractive place in the surrounding area. Besides that, the existing green north- and south connections towards the canal can be a perpendicularly connected route across the canal. So, these two existing entrances can strengthen the connection with existing public spaces.

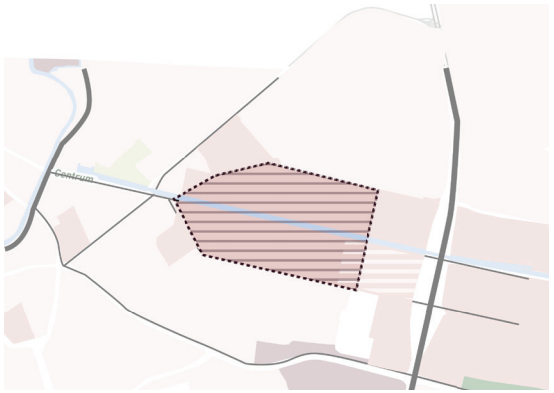


Figure 8.15: Takeaway density

Density

At this moment, the canal zone is surrounded by an industrial area from "de Kade". Over the years, these areas are slowly disappearing from the inner-city scene. Since the rest of the location is already a residential area and some housing blocks are recently renovated it makes at this moment sense to solve the densification challenge within these industrial areas. These are large spaces that are suitable for the current housing shortages in the city. In addition, the location near the canal offers a nice place for new residential constructions.

Figure 8.16: Kanaalzone in Eindhoven, made by author

09
NEIGHBORHOOD DESIGN

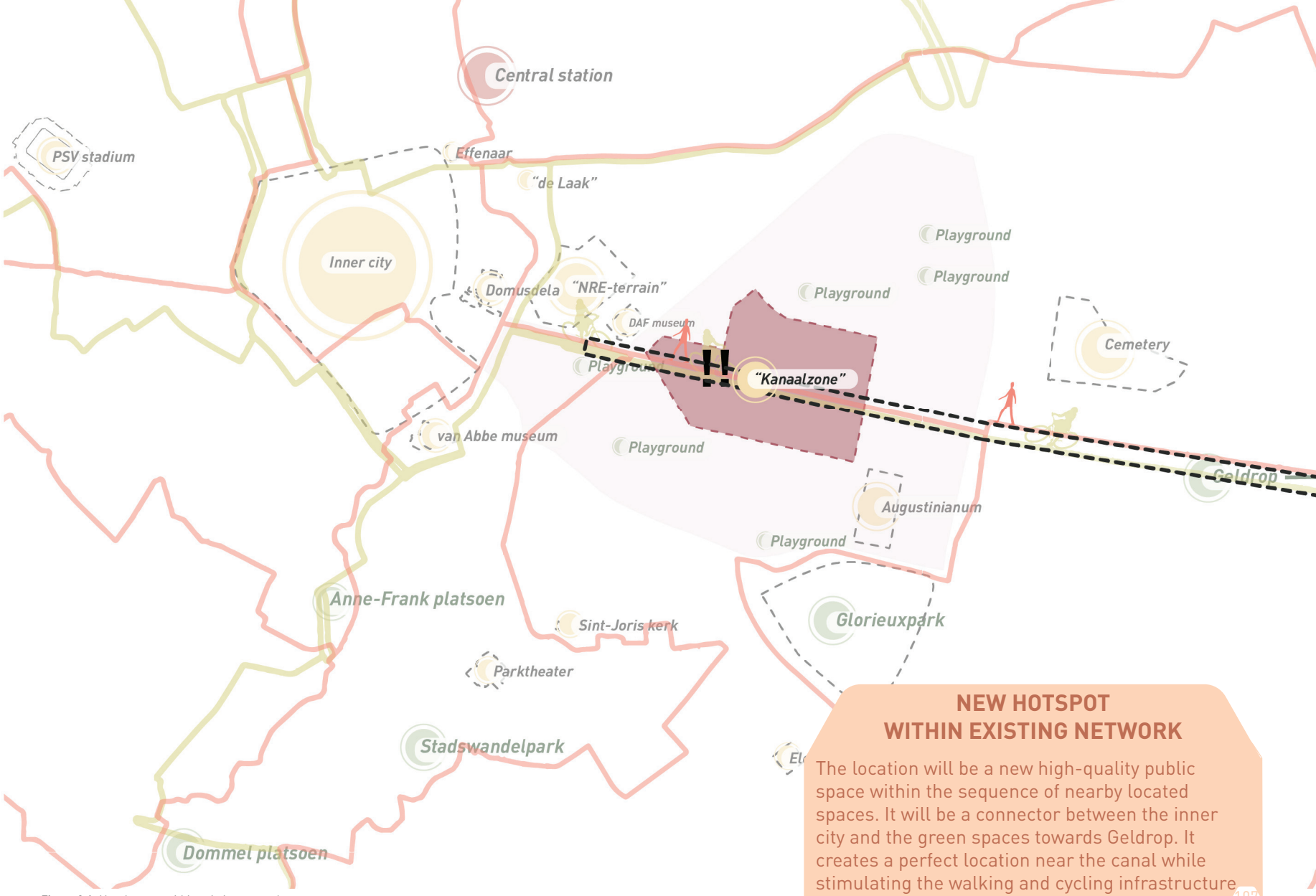
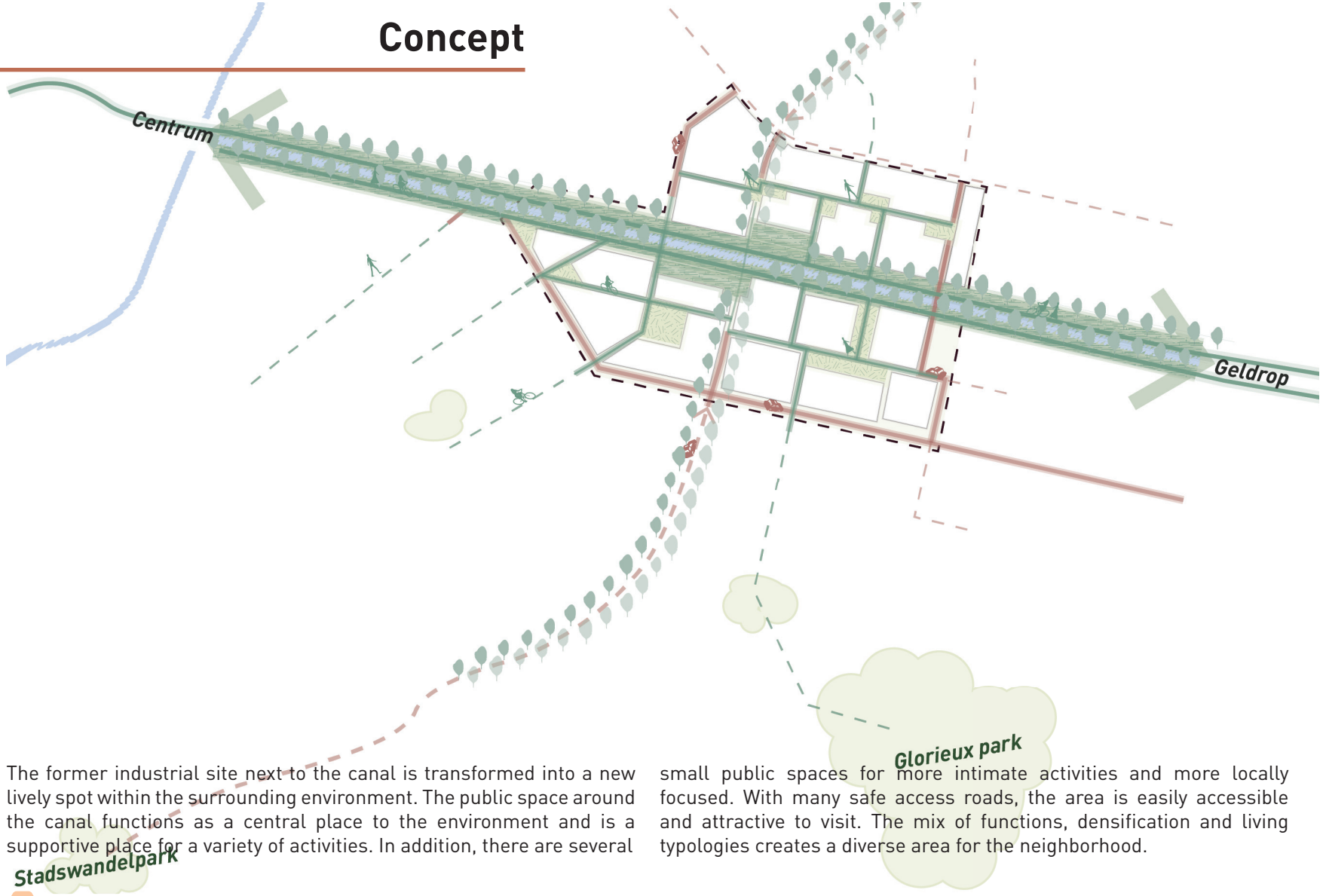


Figure 9.1: New hotspot within existing network

NEW HOTSPOT WITHIN EXISTING NETWORK

The location will be a new high-quality public space within the sequence of nearby located spaces. It will be a connector between the inner city and the green spaces towards Geldrop. It creates a perfect location near the canal while stimulating the walking and cycling infrastructure within the city.

Concept



The former industrial site next to the canal is transformed into a new lively spot within the surrounding environment. The public space around the canal functions as a central place to the environment and is a supportive place for a variety of activities. In addition, there are several small public spaces for more intimate activities and more locally focused. With many safe access roads, the area is easily accessible and attractive to visit. The mix of functions, densification and living typologies creates a diverse area for the neighborhood.

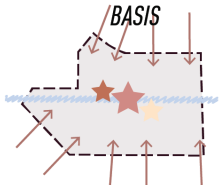
Figure 9.2: Concept for Irisbuurt and Lakerlopen 1:15000

PRINCIPLES OF PUBLIC SPACES

Site authenticity/ uniqueness

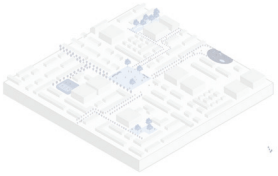
TOOLBOX PRINCIPLES TRANSLATED TO SPECIFIC LOCATION

BASIS

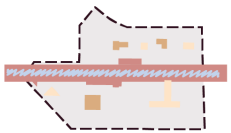


"Kanaaldijk" as base. It is site authentic to this neighborhood.

Different in form and use

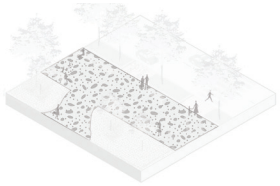


MIX OF PUBLIC SPACE

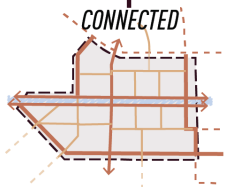


Mix of public space, which differ in form and use and adapt to the context.

Pavement detailing



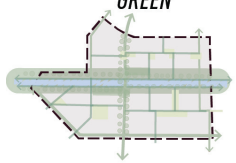
CONNECTED



Throughout the area the pavement detailing is the similar and connects different places and surrouding eares

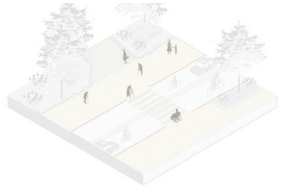
Presence of trees

GREEN

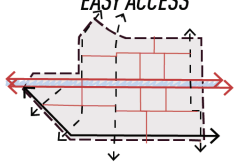


Greener streets with the presence of trees will visually extend and connect the public spaces.

Flatterrain and entrances



EASY ACCESS



Flat terrains and entrances with safe accessibility create an area reachable to everyone.

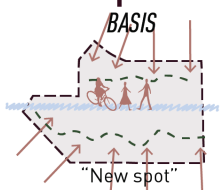
Figure 9.3: Principles used for public spaces

PRINCIPLES OF DENSIFICATION

Site authenticity/ uniqueness

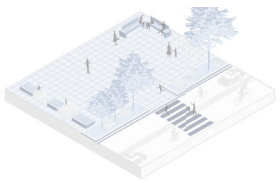
TOOLBOX PRINCIPLES TRANSLATED TO SPECIFIC LOCATION

BASIS

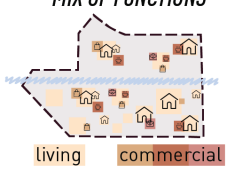


New unique spot within the surrounding environment.

Pedestrain-friendly spaces

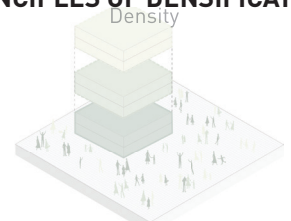


MIX OF FUNCTIONS

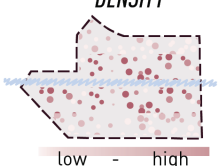


Mix-used development, which creates pedestrian-friendly spaces and sense of place.

Density

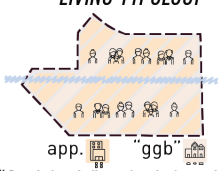


DENSITY



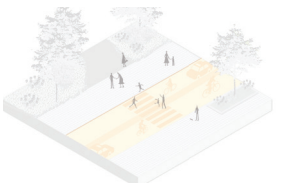
Different densities and housing types create diversity in the amount of people in public spaces.

LIVING-TYPOLOGY

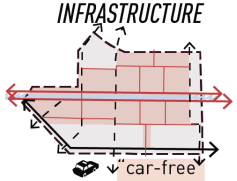


"Social mix" and mix housing typology promote social cohesion and sense of community.

(safe) accessibility



INFRASTRUCTURE



Separation of vehicular traffic and low mobility to create a safe and accessible neighborhood.

Figure 9.4: Principles used for densification

Important carriers

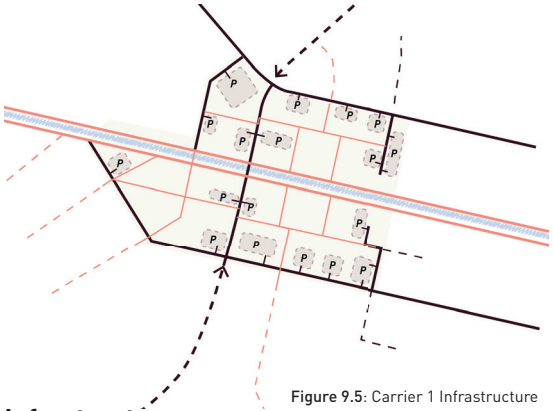


Figure 9.5: Carrier 1 Infrastructure

Infrastructure

The area has an attractive and accessible appearance because vehicular traffic has been minimized. There are three car access roads. The "main road" right through the middle of the area and two roads at the borders ensure that the area is accessible, but that the car is not dominating the area. In addition, on these access roads, the car is subservient to slow mobility, allowing cyclists and pedestrians to have priority (i.e. bicycle streets ("Fietsstraat")). Parking solutions are also located on these access roads. Through these roads, it is possible to reach the semi-underground parking garages. In this way, the car remains out of sight and the crated public spaces will be car-free.

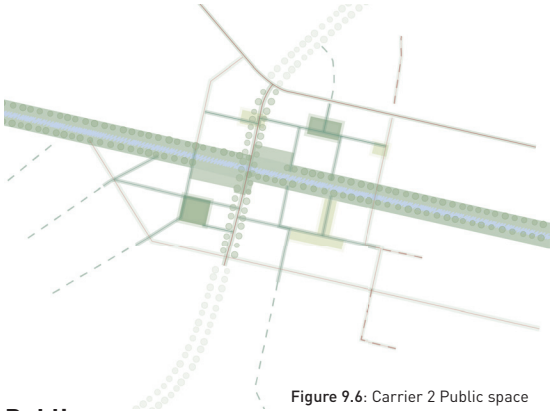


Figure 9.6: Carrier 2 Public space

Public spaces

Different types of public spaces have been created in the area. The canal zone, as a central axis and identity carrier, is on both sides provided with a green boulevard only accessible for pedestrians and cyclists with lots of spaces for public (city-wide) activities stimulating recreation and social cohesion, so provides a new (green) public space for the whole city. More specifically within the area and not directly adjacent to the canal zone are smaller public spaces that function as places for local residents who can use the public space for more intimate locally-oriented activities. These different places are linked by green connections and are located in car-free zones for accessible and safe access.

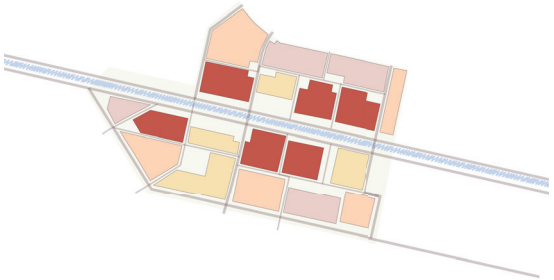
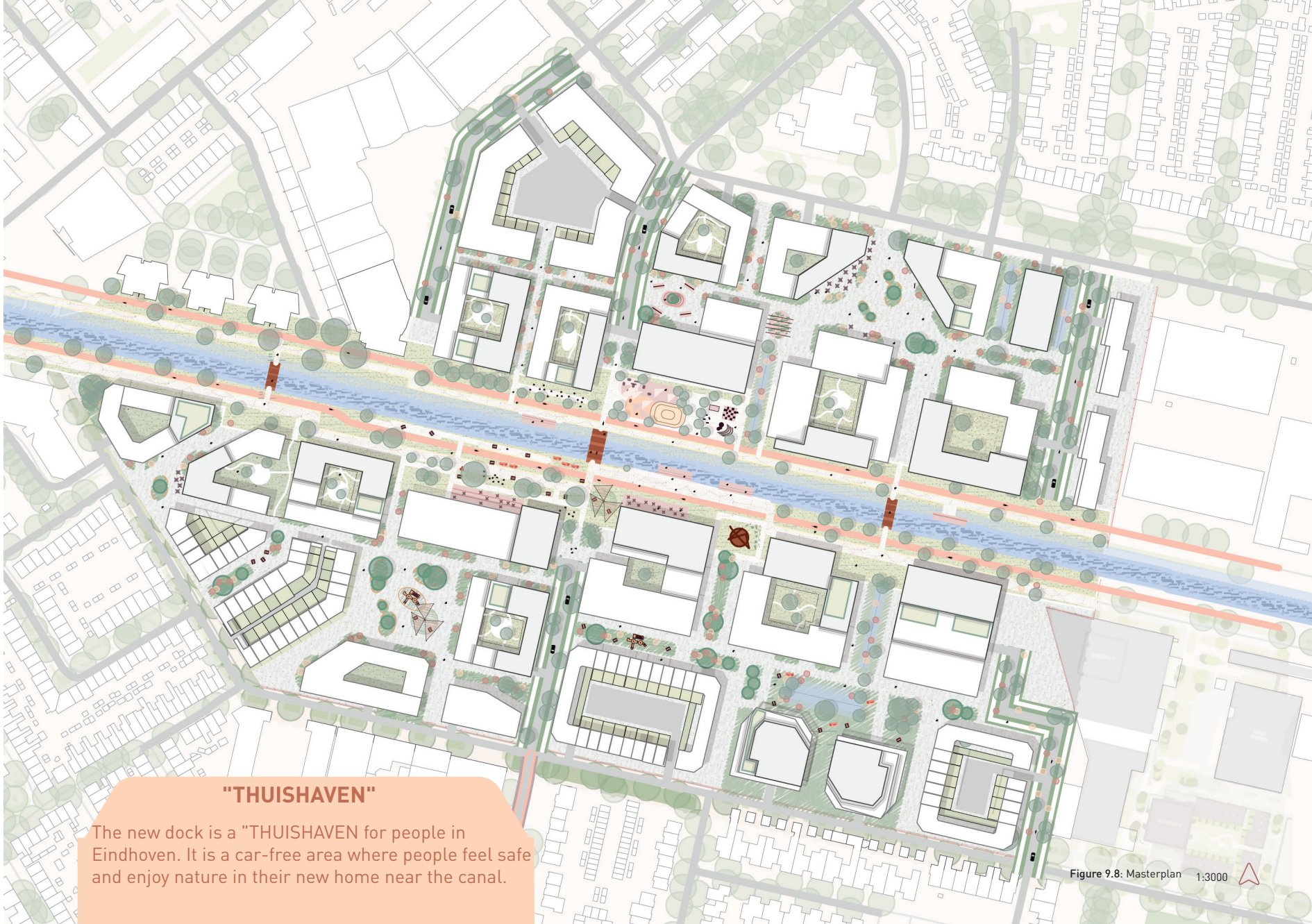


Figure 9.7: Carrier 3 Density

Density

In this area, large-scale housing development is applied, due to considerable density challenges within Eindhoven. Different densities have been realized within this area. On the central axis, the canal zone, high density has been applied to strengthen the character of the boulevards. This includes buildings with residential floors up to 6 or 8 layers with commercial functions in the plinth. Further away from the canal zone and more toward the edge of the area, low densification is applied. These buildings have residential layers up to 3 or 5 stories. This ensures that the relationship between the new area and the current residential areas interact.



"THUISHAVEN"

The new dock is a "THUISHAVEN for people in Eindhoven. It is a car-free area where people feel safe and enjoy nature in their new home near the canal.

Figure 9.8: Masterplan 1:3000

Density

Throughout the area, there is a mix of density.
At the edges of the location area (in relation to the existing surrounding neighborhoods the building blocks are up to 3 layers (slow-rise within this area). More toward the center of the area and slowly toward the canal, the floor layers rise as a gradient and reach their highest point at the building blocks along the canal up to 9 layers (high-rise within this area). In between the buildings have a mix of layers up to 6 layers (middle-rise within this area). This gradient toward the canal is clearly visible in Figure 9.10 (section A).

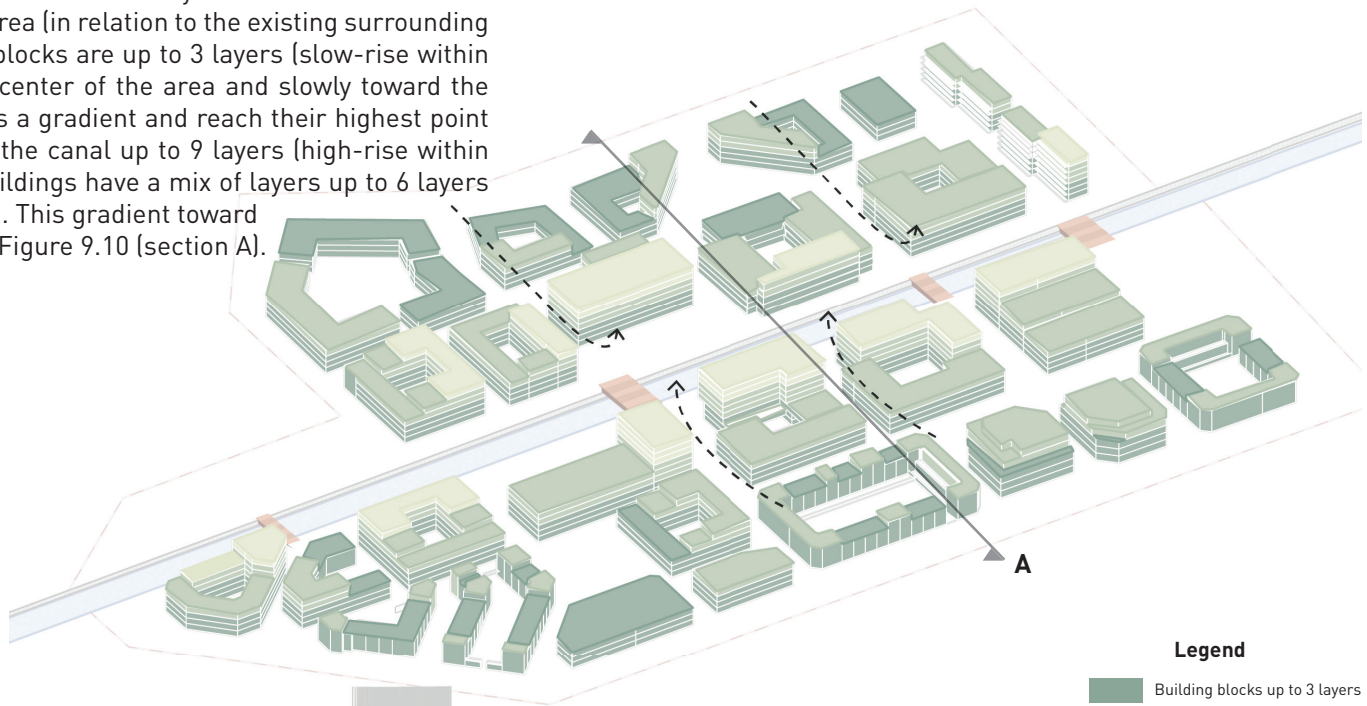


Figure 9.9: Density in new design area

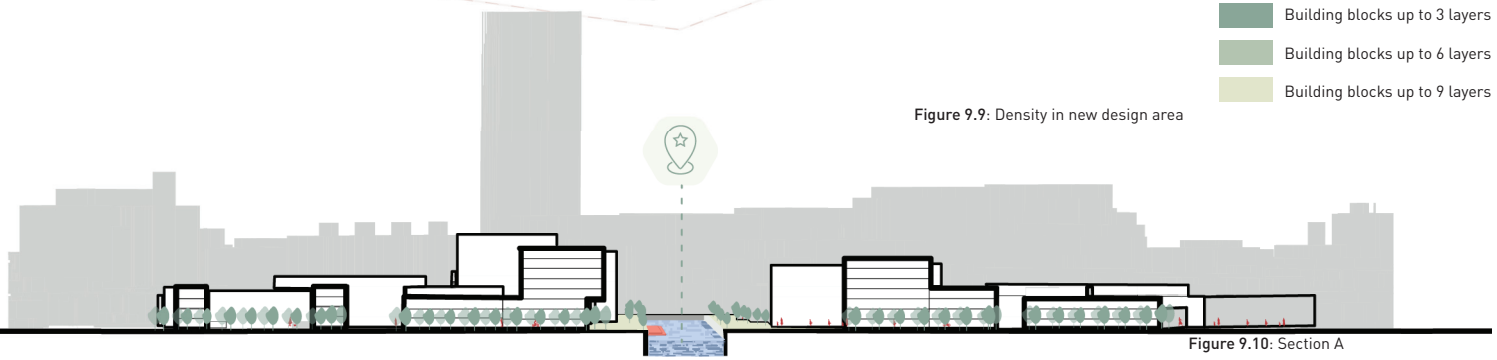


Figure 9.10: Section A

Accents

Different buildings provide accents within the area (mostly near the canal). The building blocks are the highest and provide direction and landmarks within the location and near the surrounding area. In addition, buildings have 1. the appearance to lead people toward a certain place, 2. accentuate certain directions or 3. define public spaces.

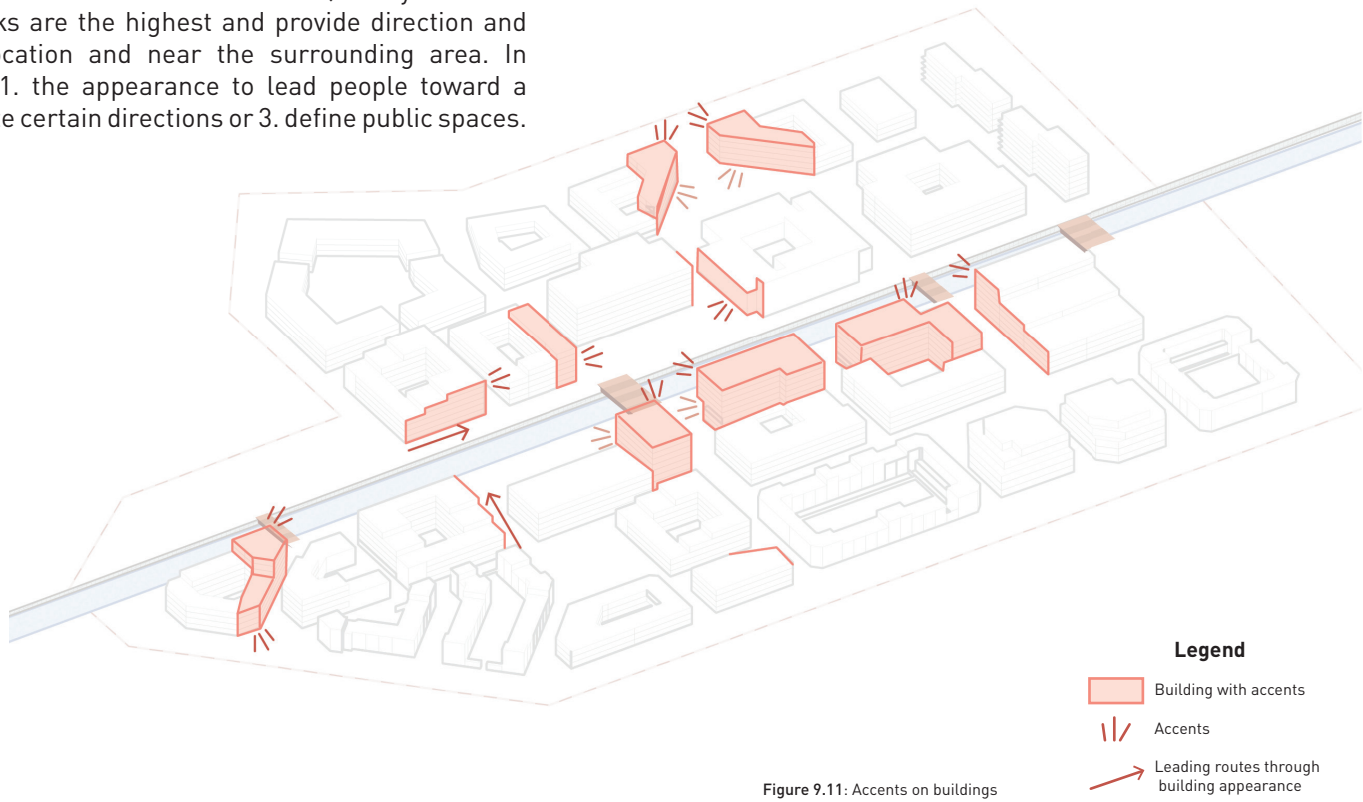


Figure 9.11: Accents on buildings

Infrastructure

The entire area is a car-free zone and is designed in a way that cyclists and pedestrians can move freely and easily. The are several options available for vehicular traffic primarily to enter the underground parking garages. In these streets, cars are allowed but must give priority to cyclists and pedestrians. In addition, the area is completely free to enter except for the private gardens and closed-off courtyards. A flat terrain with the same pavement makes it an organized and well-defined area.

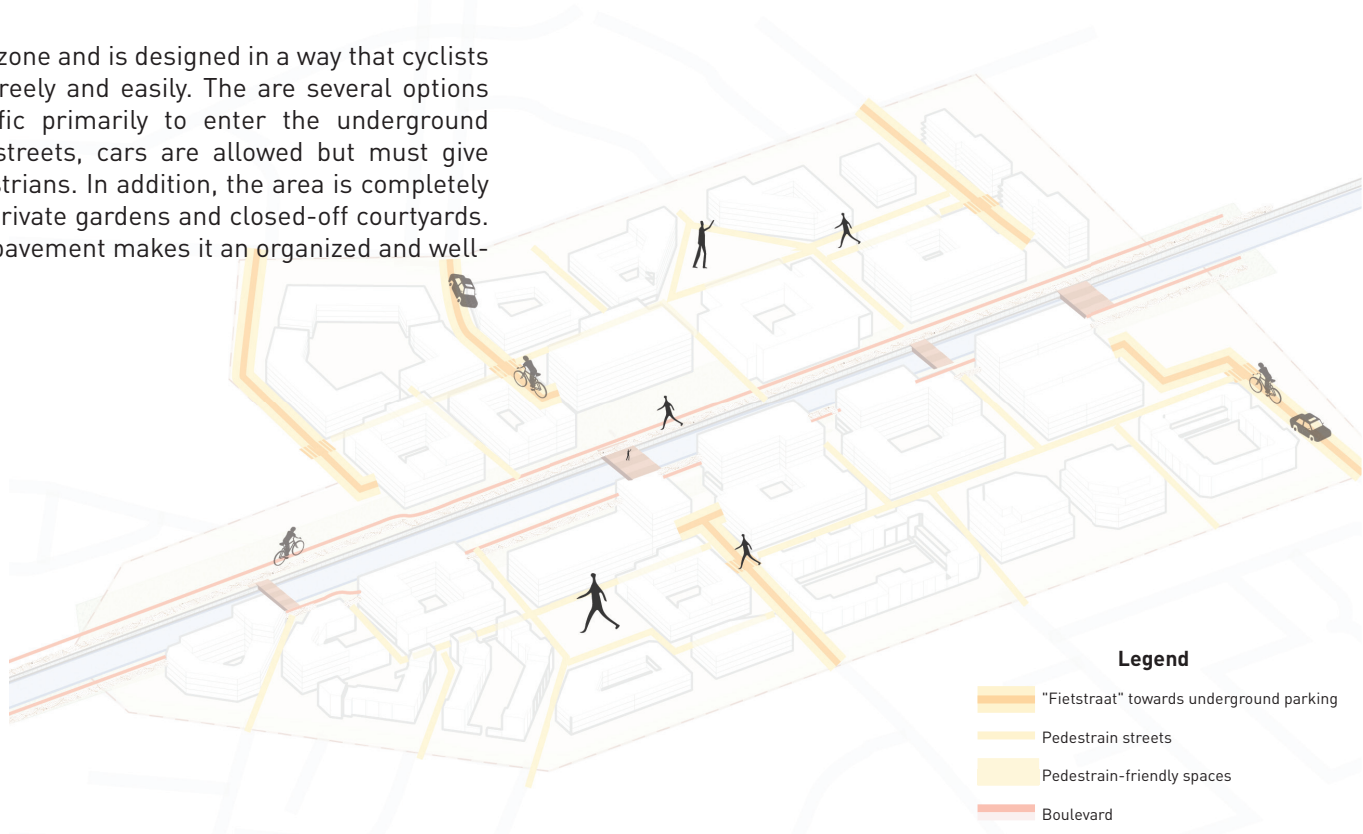


Figure 9.12: Infrastructure in new design area

Route and sightlines

Within the area, routes and sightlines are of great importance. The network of access roads is connected with the existing structure of the surrounding neighborhoods. In this way, it creates a coherent street pattern and creates connections between the different neighborhoods. In addition, all access roads lead towards the canal, which serves as the central point of the area, and the positioning of buildings influence the sightlines and steering towards the several public spaces.

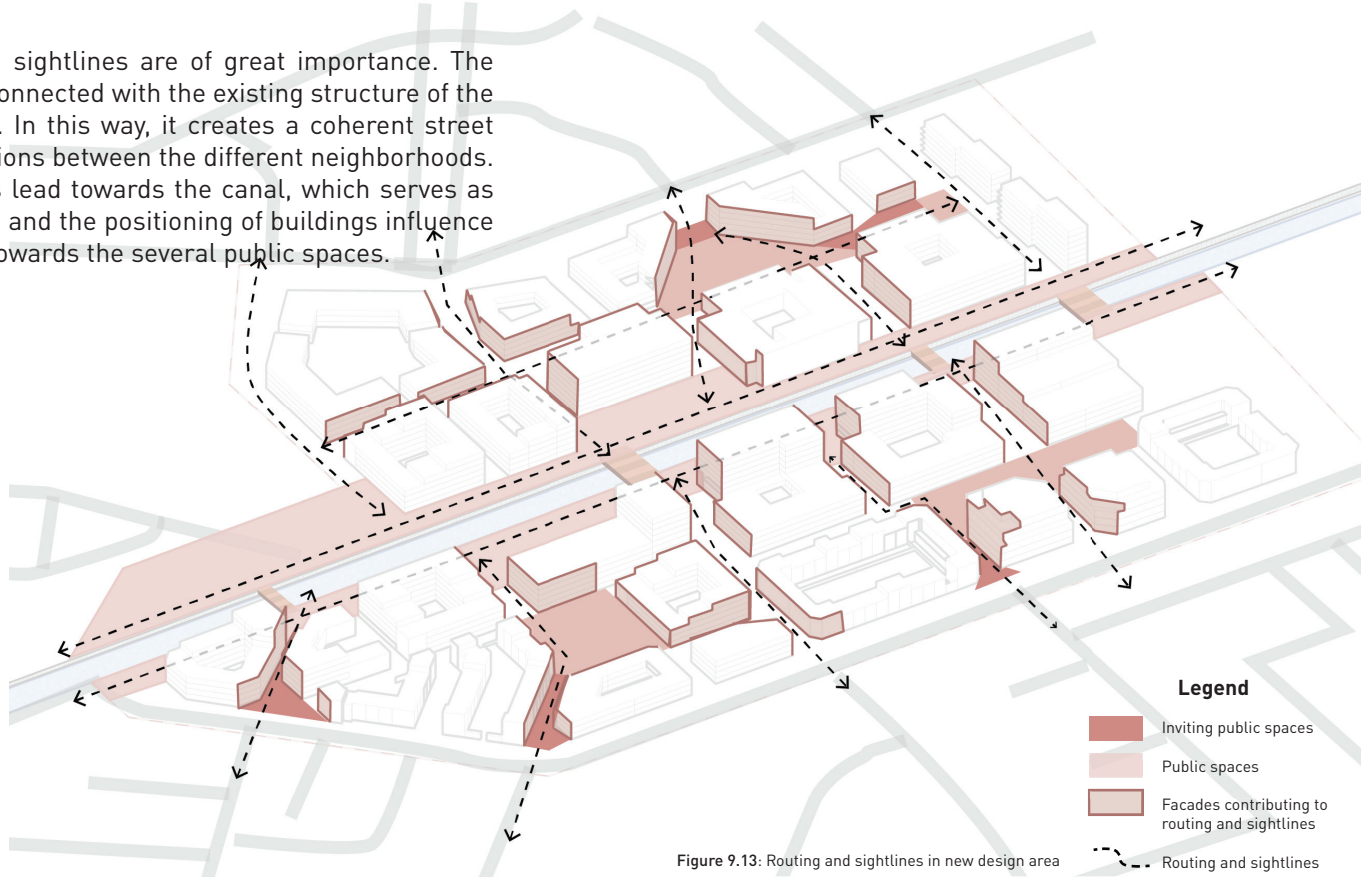


Figure 9.13: Routing and sightlines in new design area

Program

"With the construction of 3000 new housing units, 13,3% of the densification challenge can be solved"

Within the location area, a diverse program has been applied with an emphasis on residential units, with a supporting function of commercial functions such as restaurants, offices, and shops. Within the program optional, there is space kept available for functions that in due time prove to be a suitable place for the area. Figure 9.12 shows a few examples of functions within the area, including a gym to encourage physical activity, a post point, clothing stores, as well as stores to offer local products.

PROGRAM		m2
Housing	200.000	
Commercial	25.000	
Café and Restaurants		5.000
Shops and community facilities		10.000
Offices and companies		5.000
Optional		5.000

Table 9.1: Program

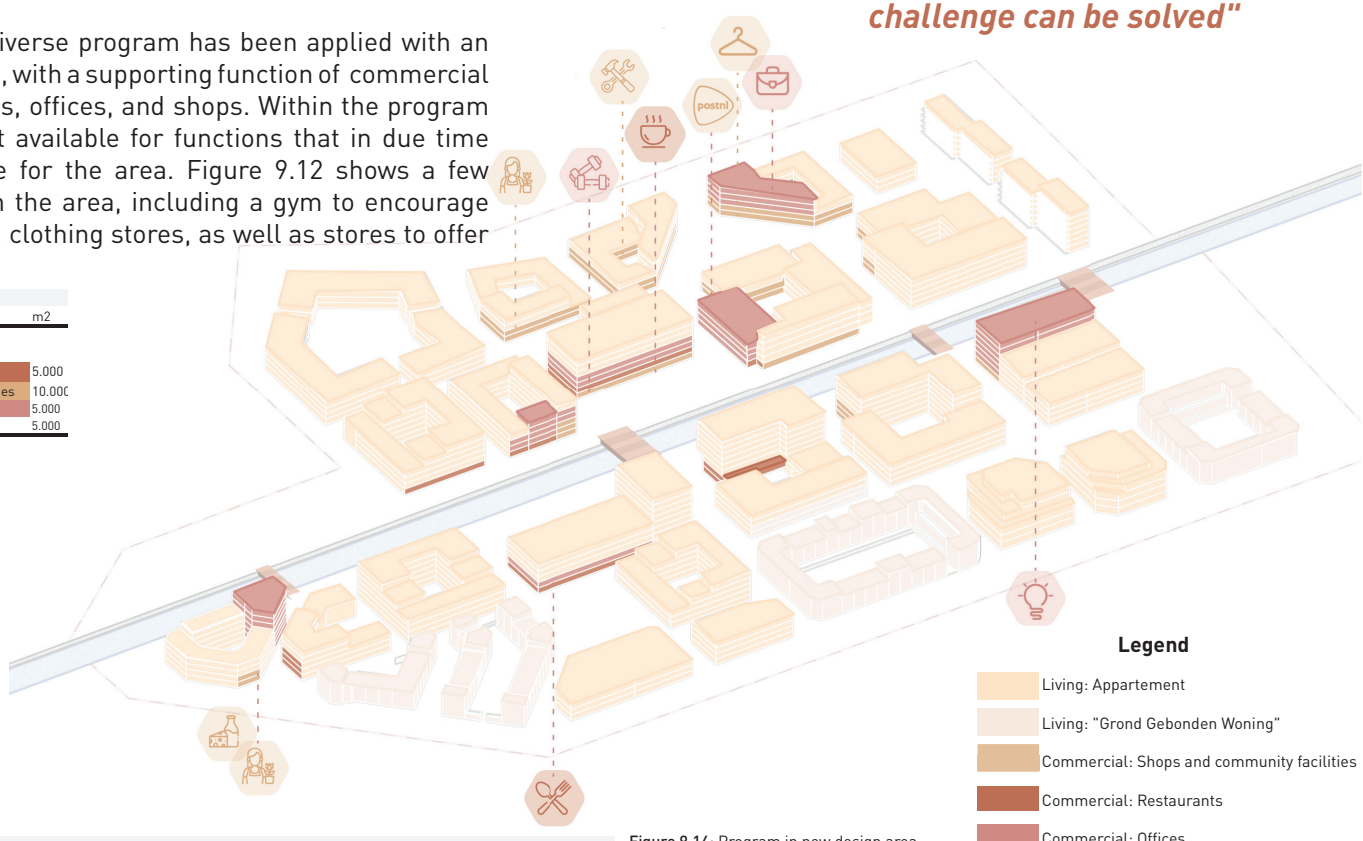


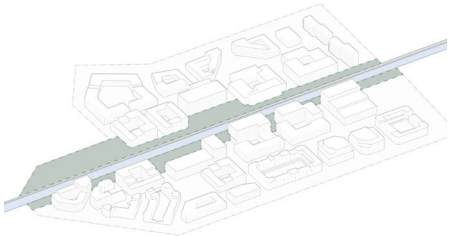
Figure 9.14: Program in new design area

LIVING	Typology	%	Amount
Single-family houses		30	1.000
Student houses	Studio/Maisonette	15	500
Single-family houses	(upper) appartements	15	500
Starters houses	apartments/terraced houses	40	1.200
Family housing	"GGW" and apartments	10	300
Elderly	(ground floor) apartments	20	500
Totaal			3.000

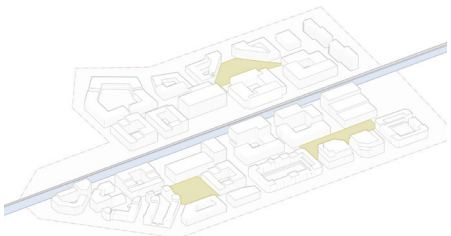
Table 9.2: Living typologies

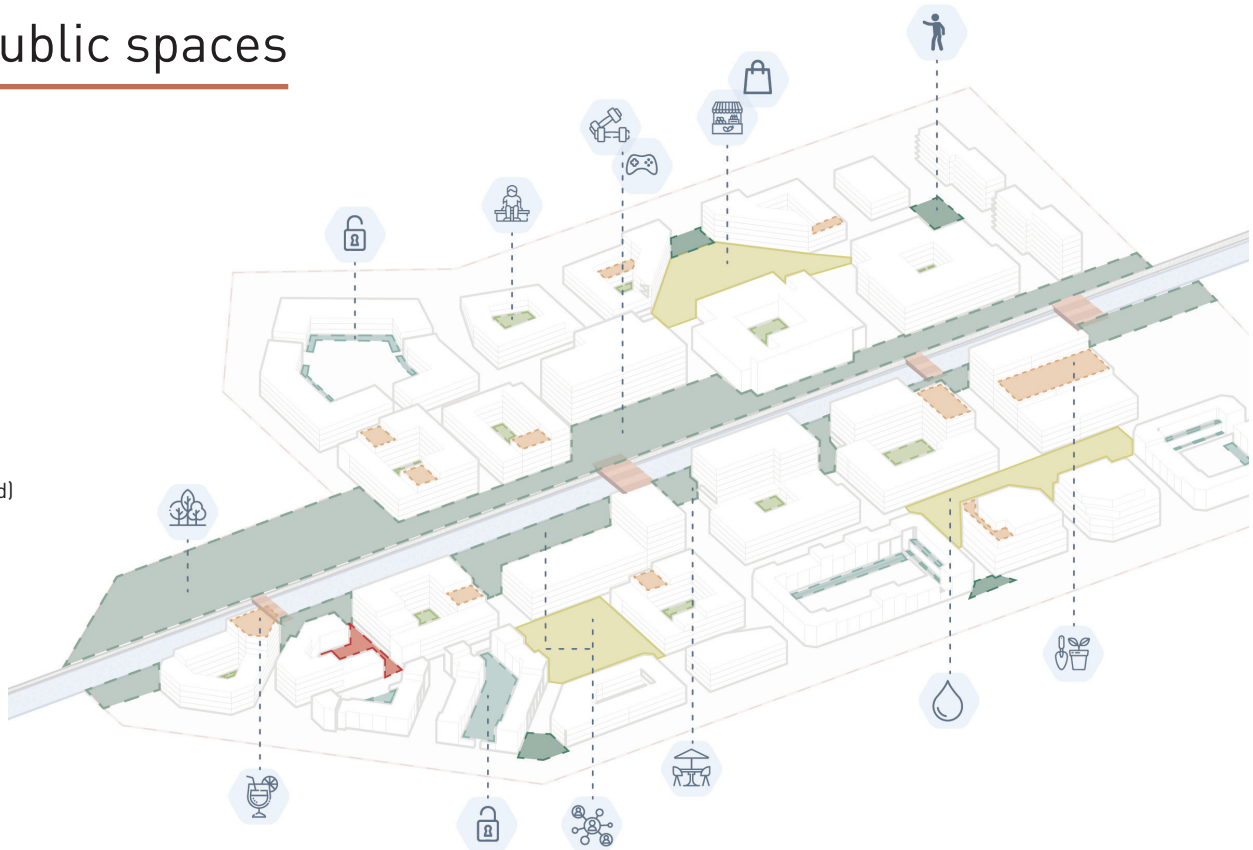
Diversity of public spaces

Boulevard (city-wide orientated)

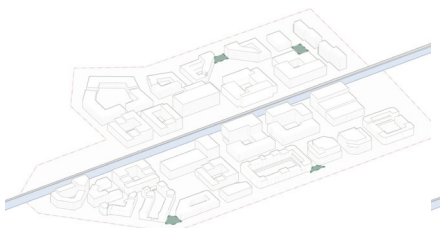


Neighborhood public spaces (neighborhood-orientated)

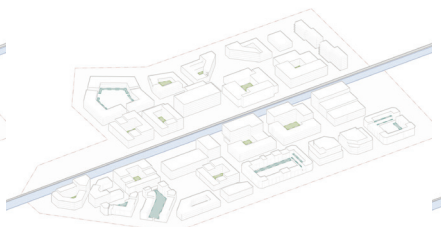




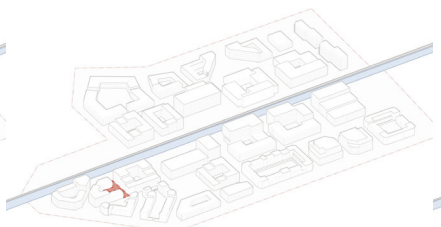
Small public spaces (inviting appearance)



Courtyards and privat gardens



Semi-private spaces



Roof terraces

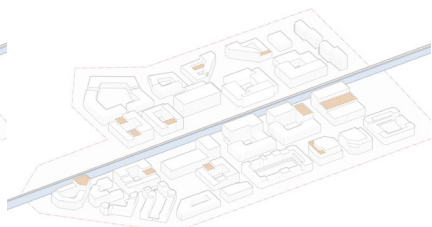
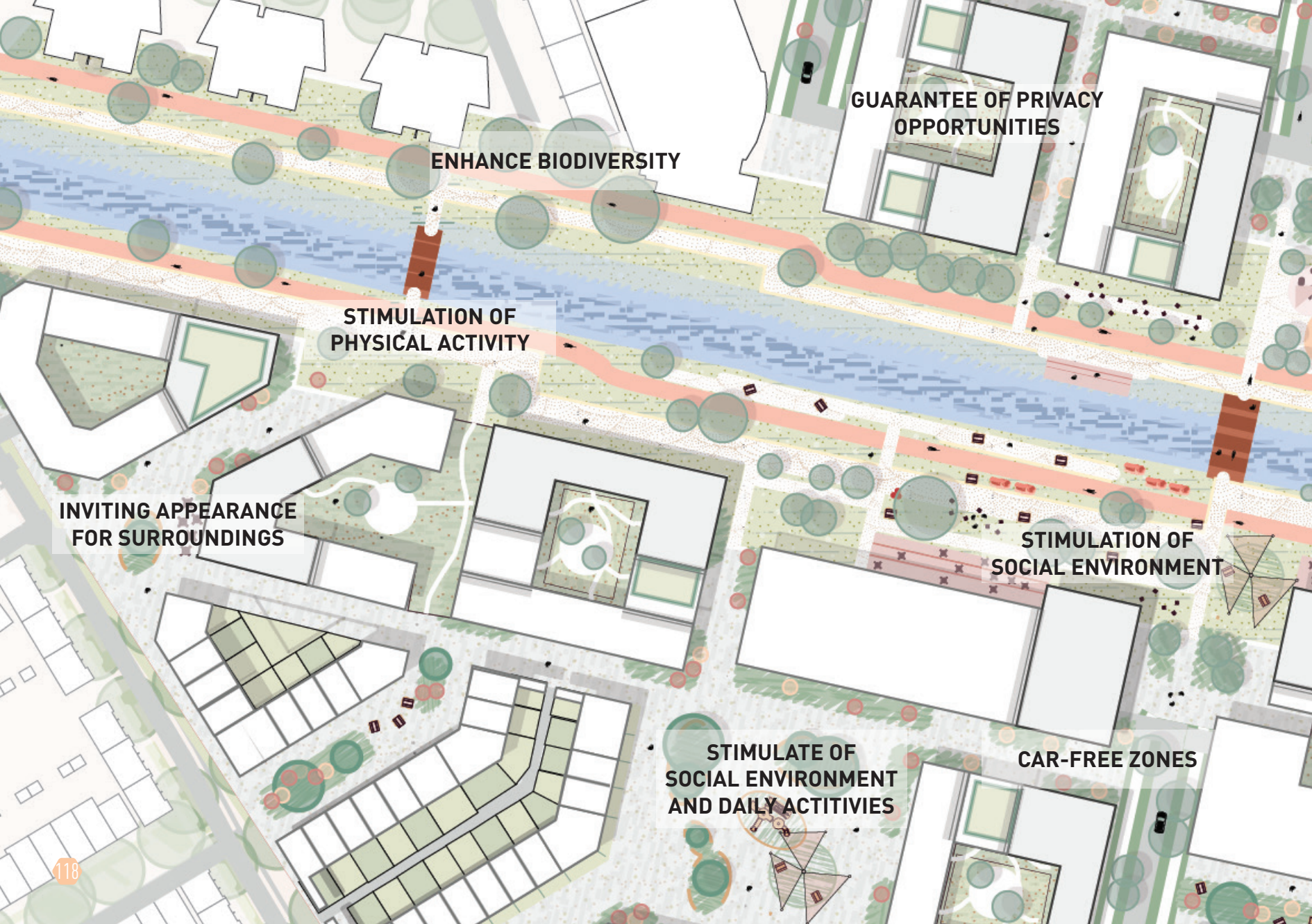


Figure 9.15: Diversity in public spaces


GUARANTEE OF PRIVACY OPPORTUNITIES
ENHANCE BIODIVERSITY
STIMULATION OF PHYSICAL ACTIVITY
INVITING APPEARANCE FOR SURROUNDINGS
STIMULATION OF SOCIAL ENVIRONMENT
STIMULATE OF SOCIAL ENVIRONMENT AND DAILY ACTITIVIES
CAR-FREE ZONES

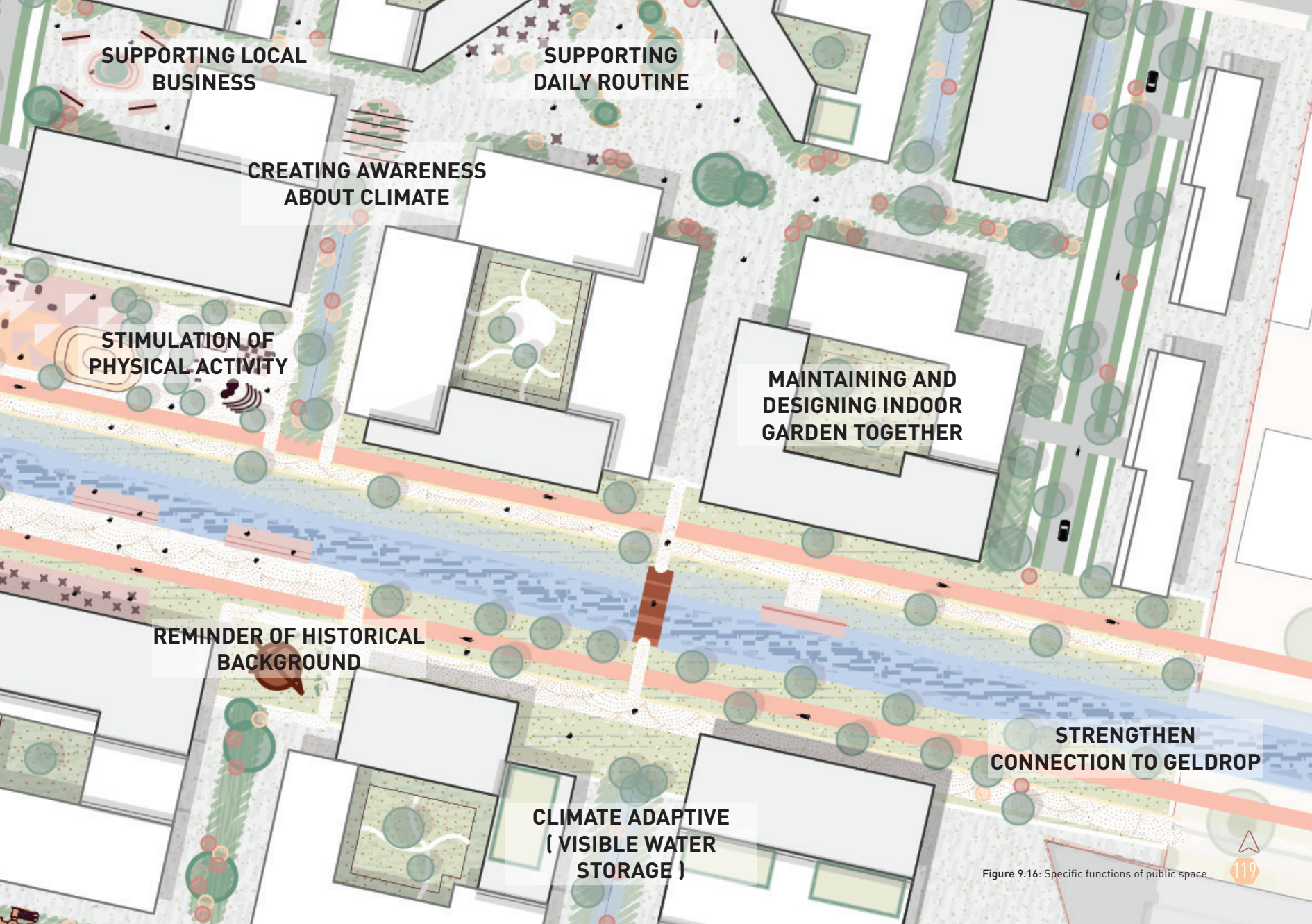
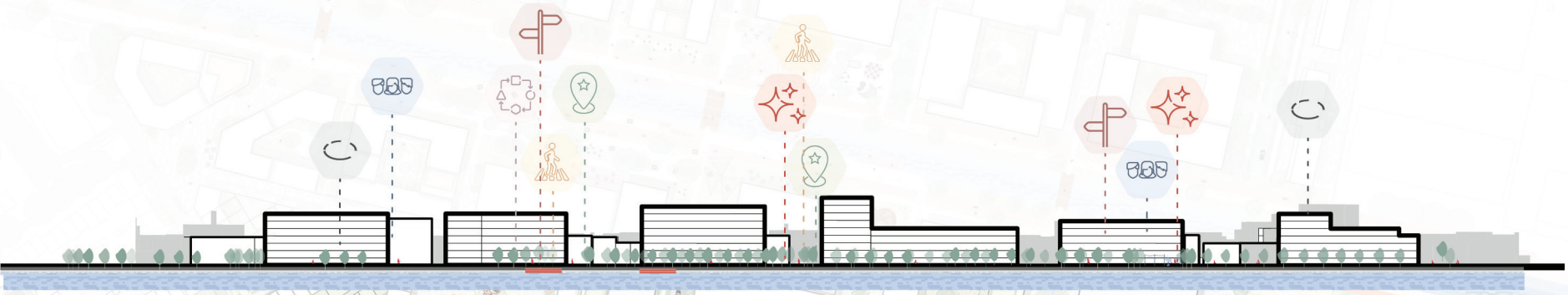


Figure 9.16: Specific functions of public space

Implementation of urban design principles



Section B

Figure 9.17: Implementation of urban design principles

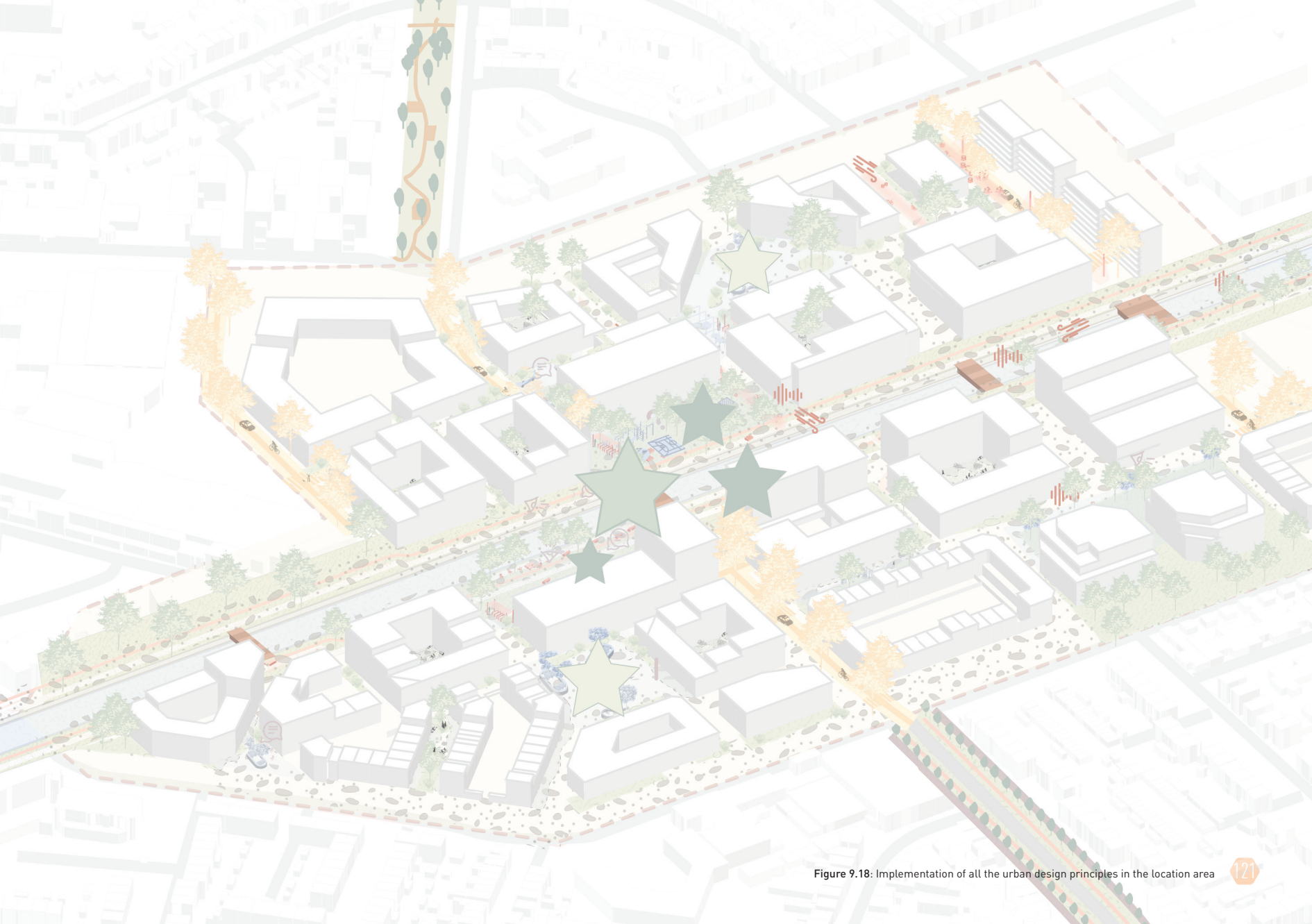


Figure 9.18: Implementation of all the urban design principles in the location area

Principle: Character

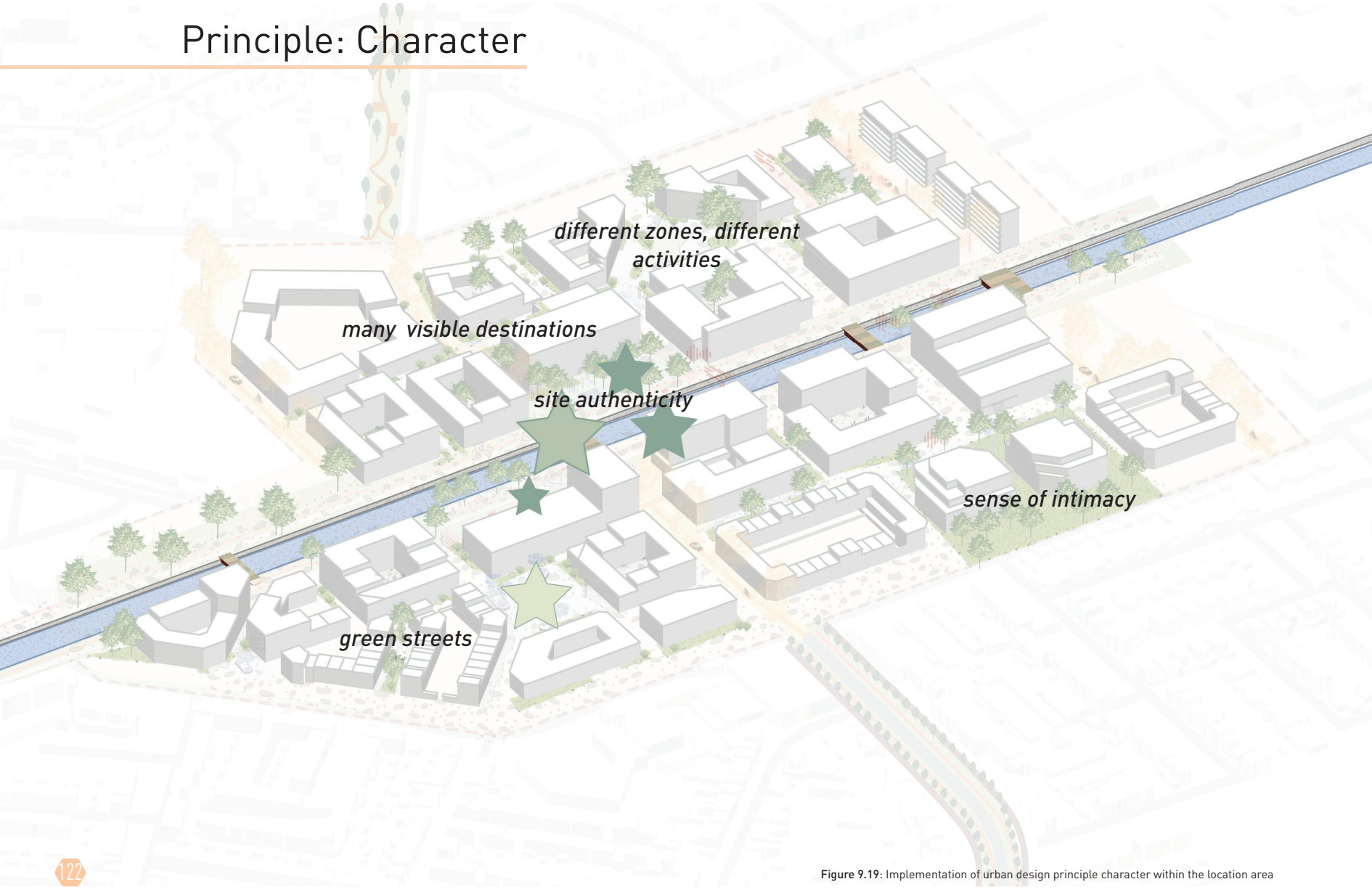


Figure 9.19: Implementation of urban design principle character within the location area

Principle: Quality of public realm

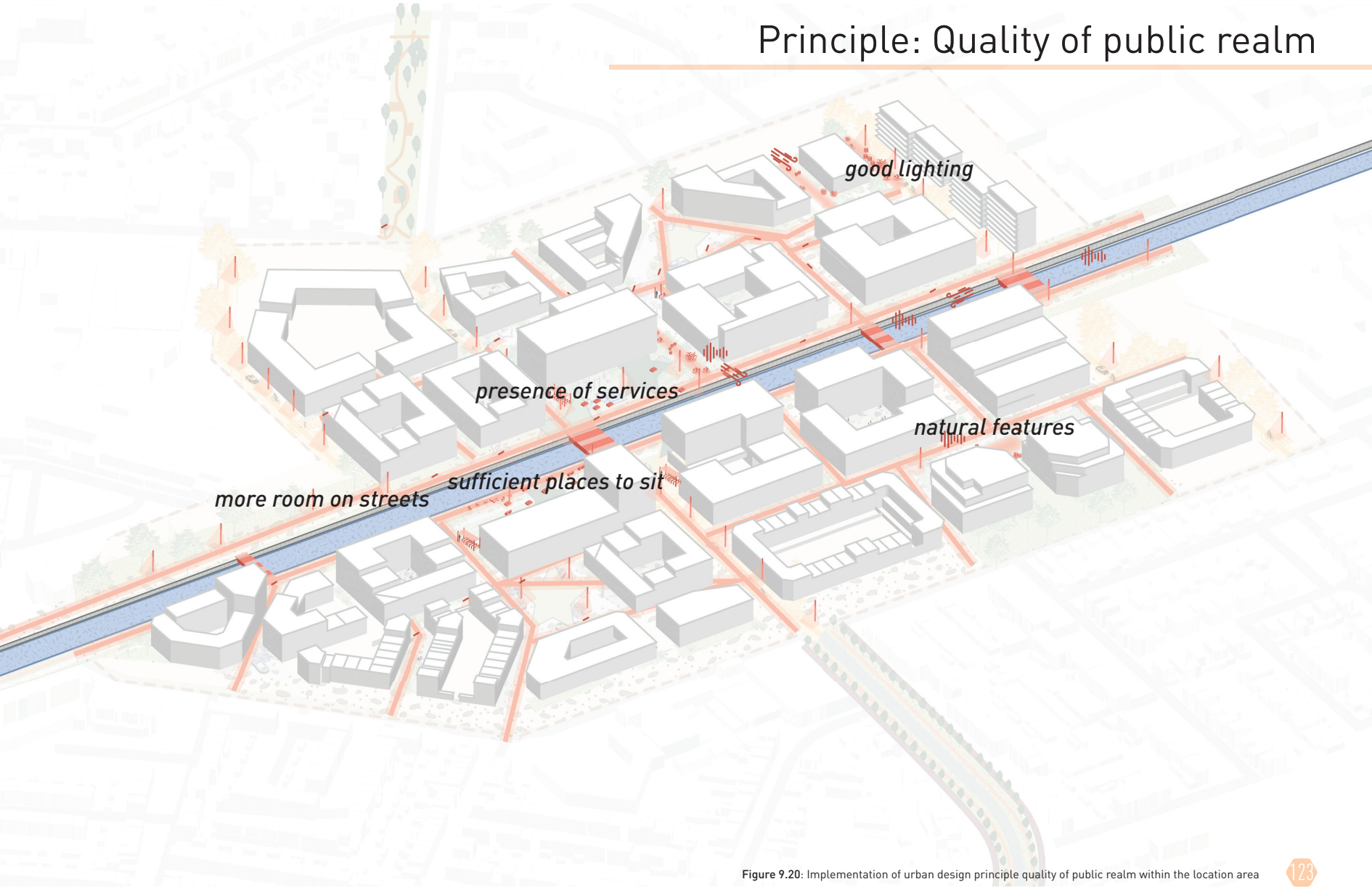


Figure 9.20: Implementation of urban design principle quality of public realm within the location area

Principle: Continuity and enclosure

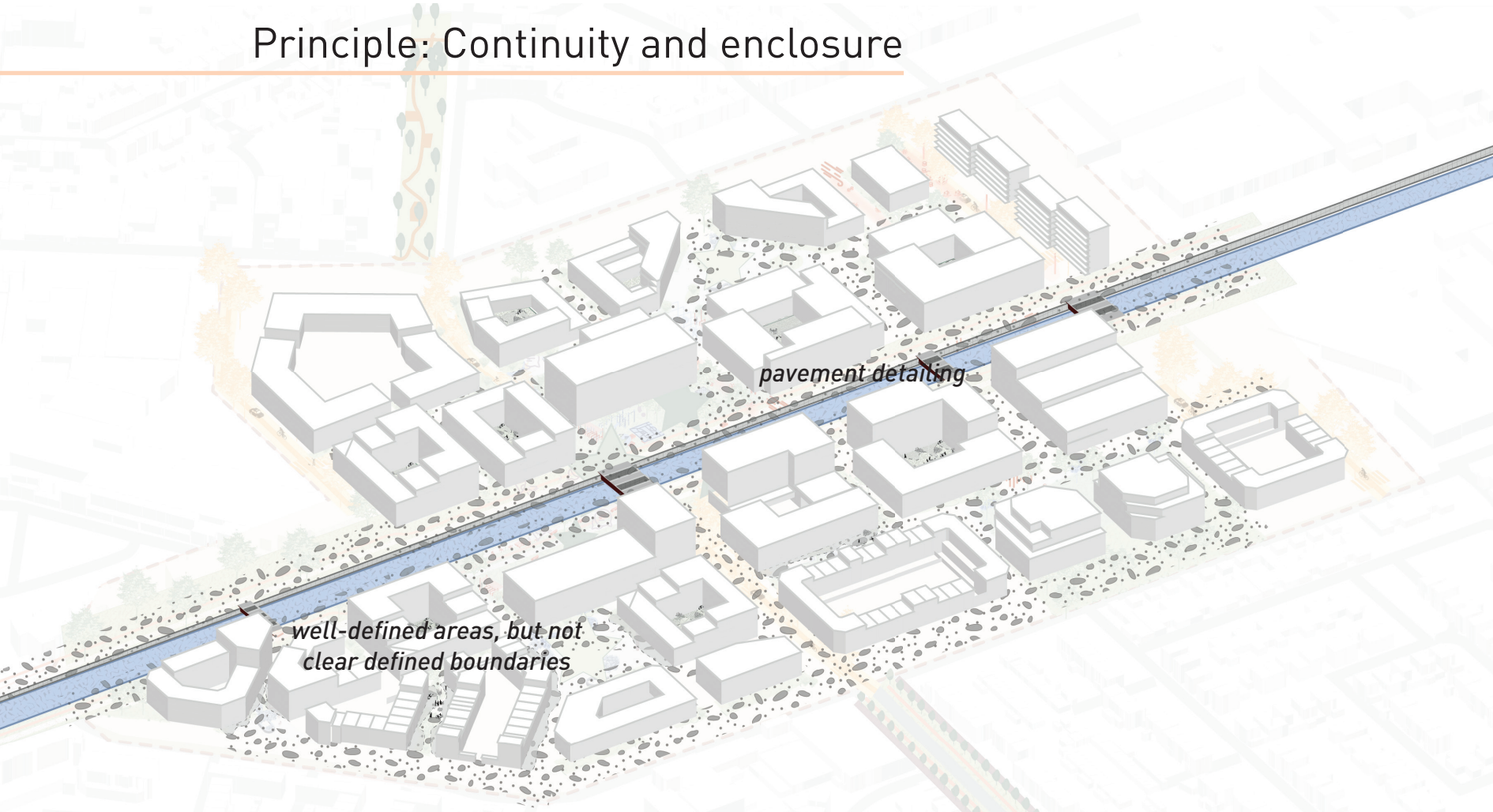


Figure 9.21: Implementation of urban design principle continuity and enclosure within the location area

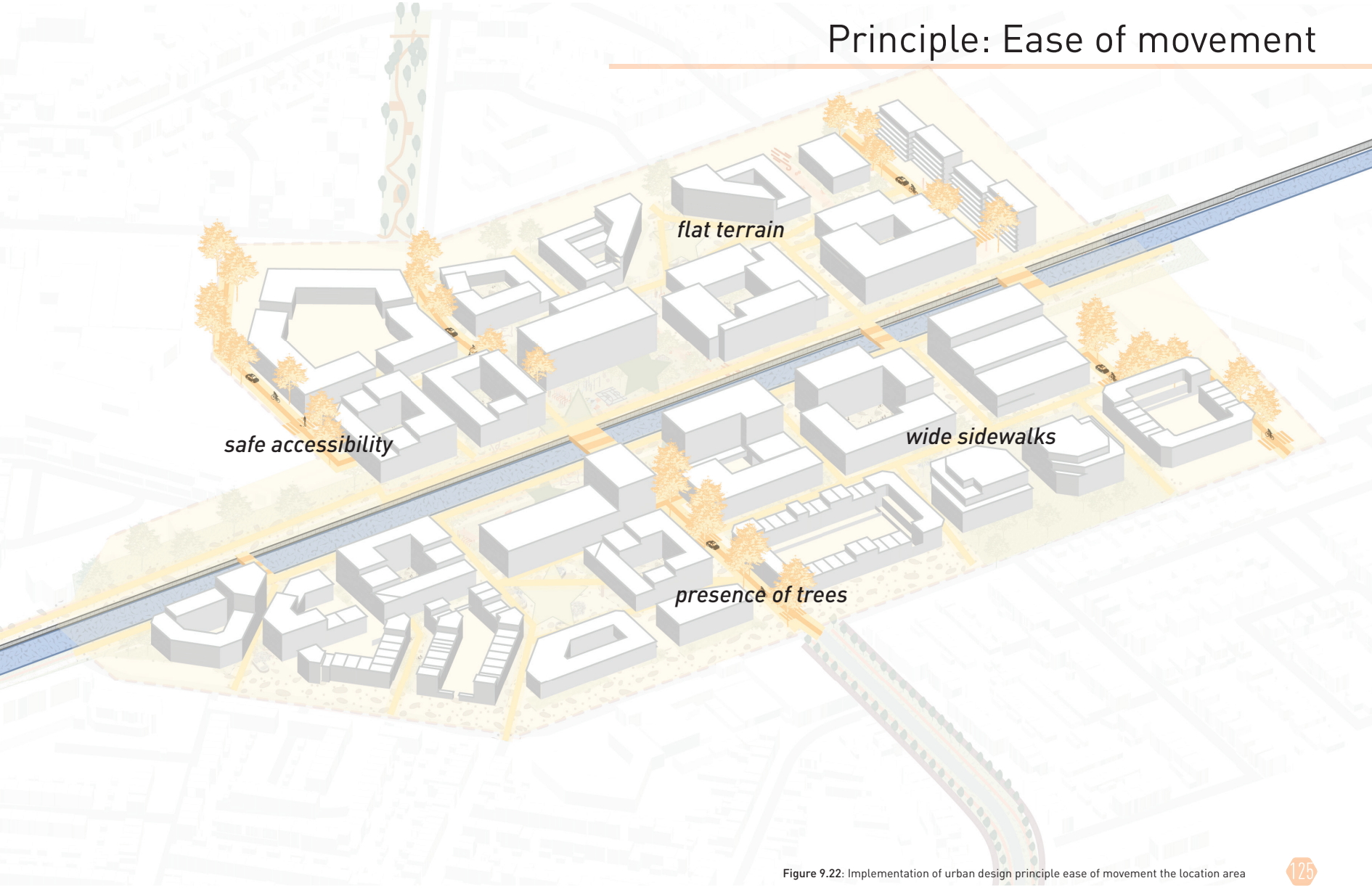


Figure 9.22: Implementation of urban design principle ease of movement the location area

Principle: Legibility

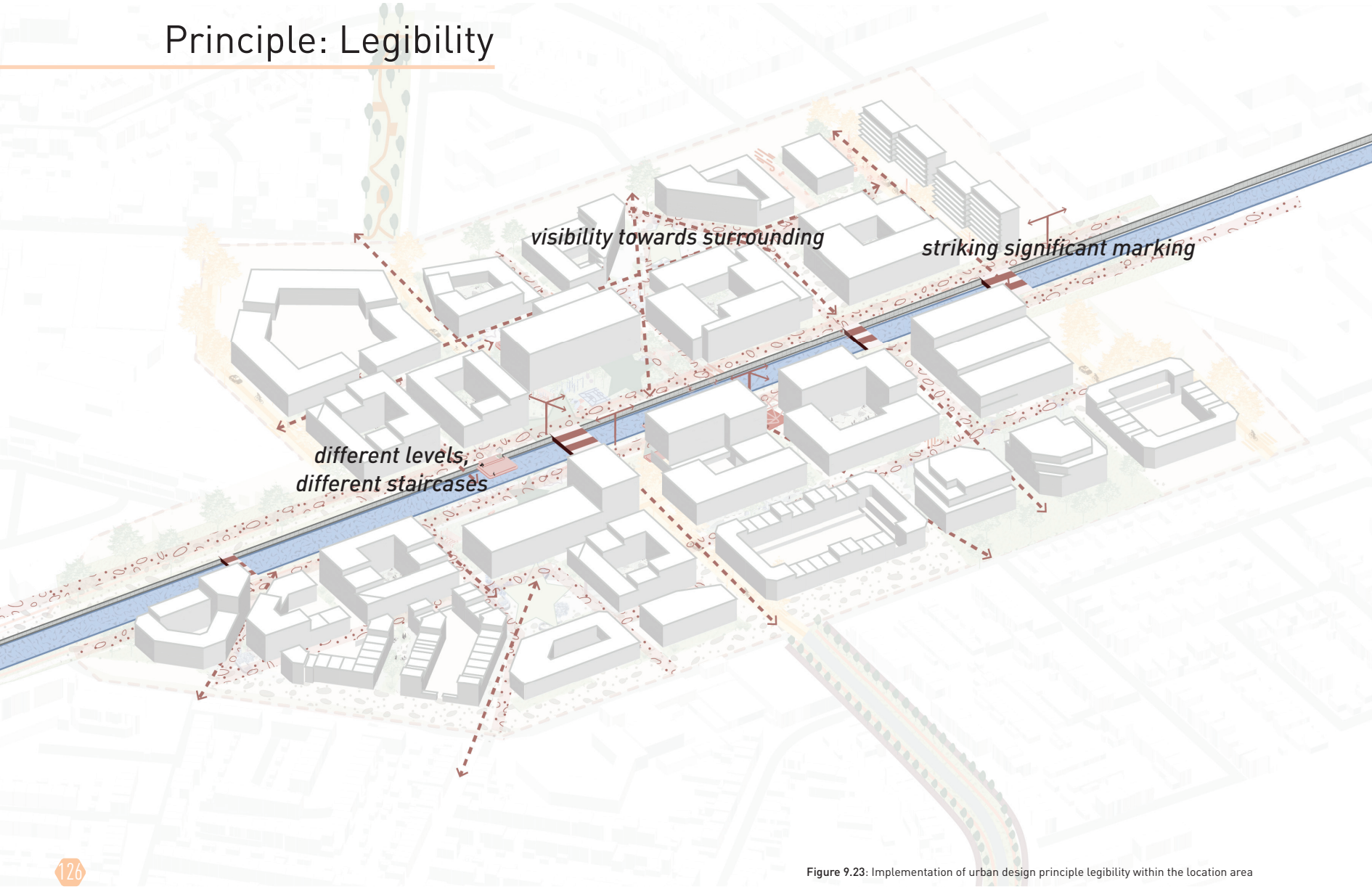


Figure 9.23: Implementation of urban design principle legibility within the location area

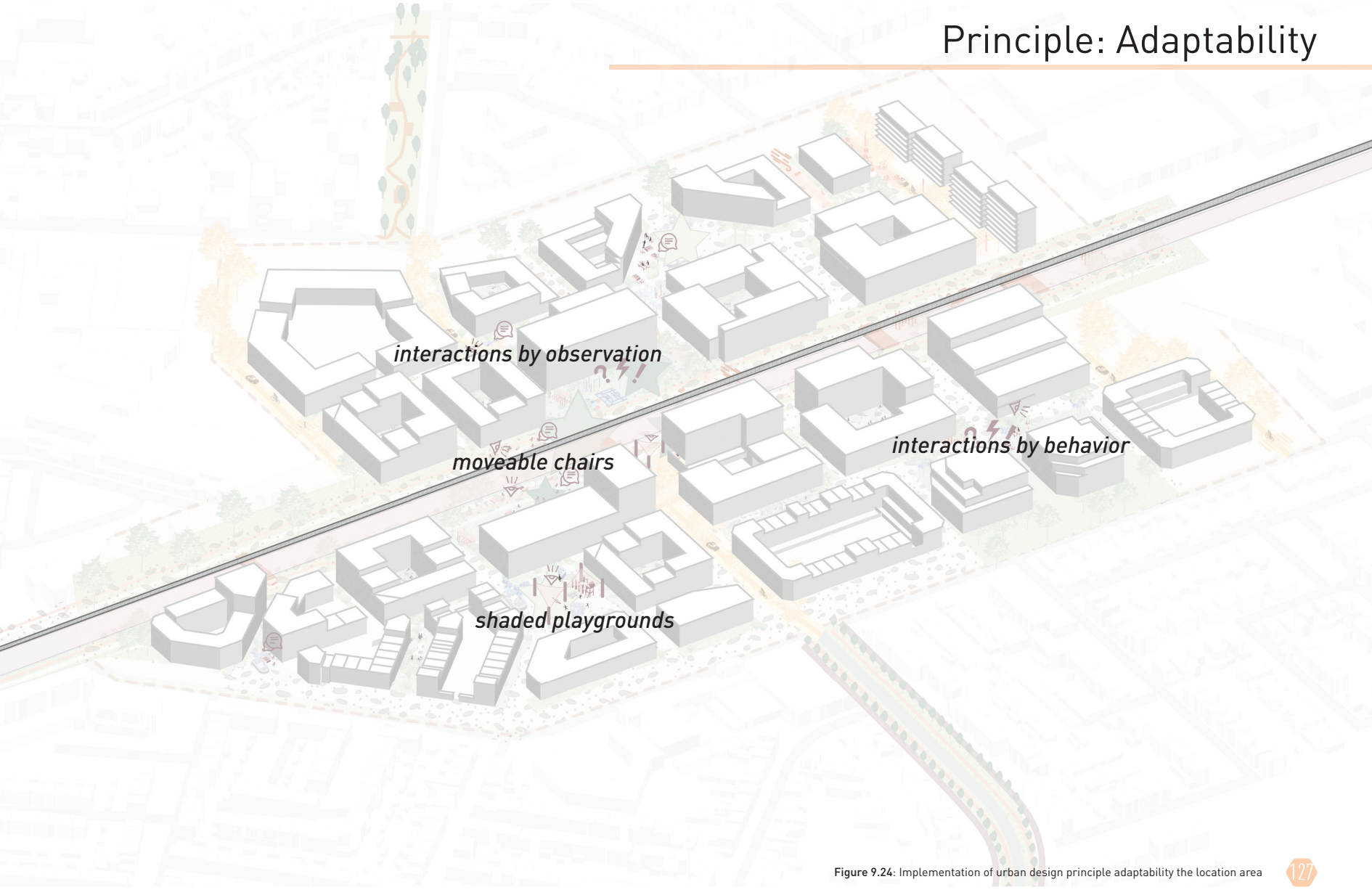


Figure 9.24: Implementation of urban design principle adaptability the location area

Principle: Diversity

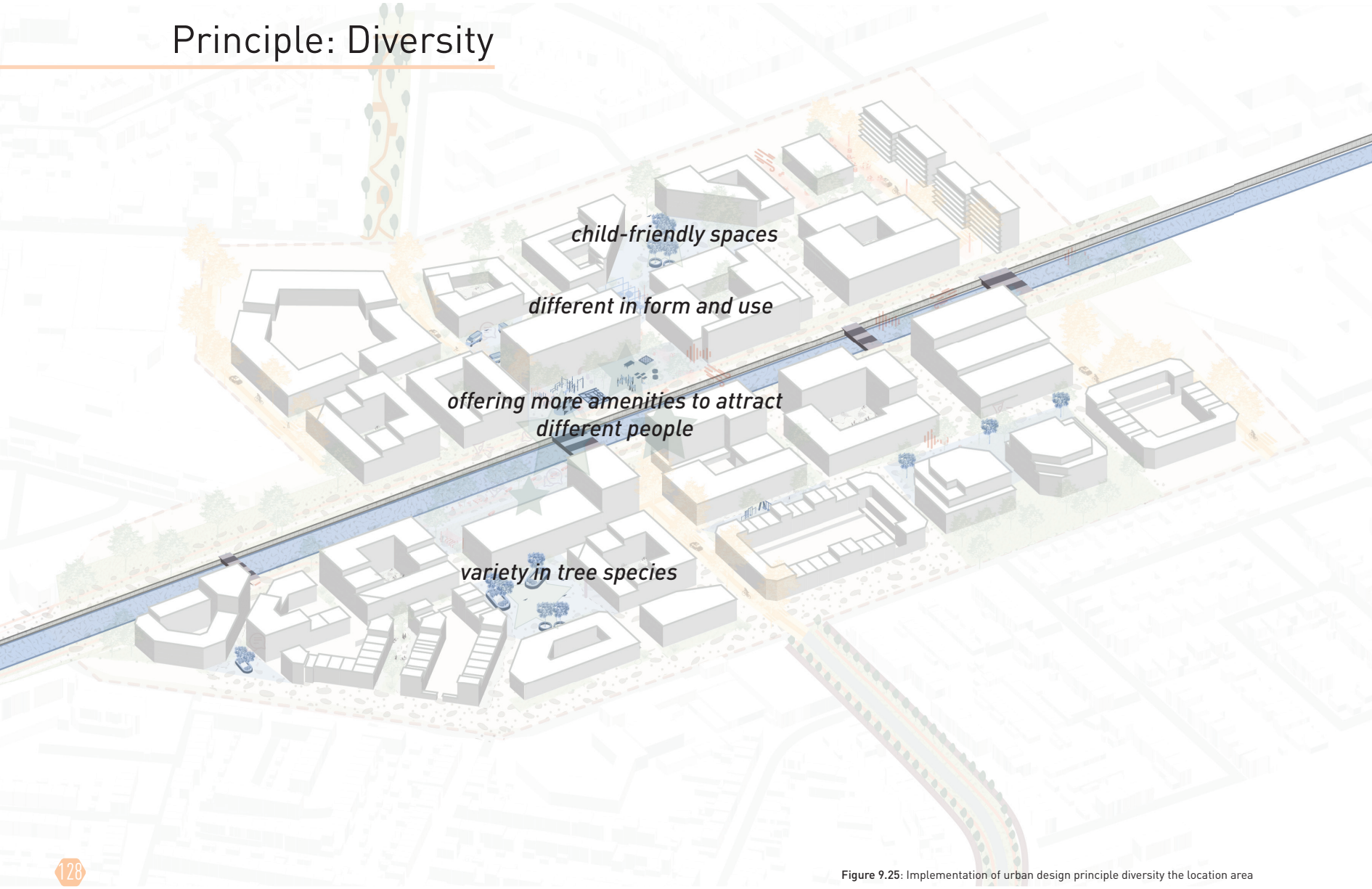


Figure 9.25: Implementation of urban design principle diversity the location area

Specific locations

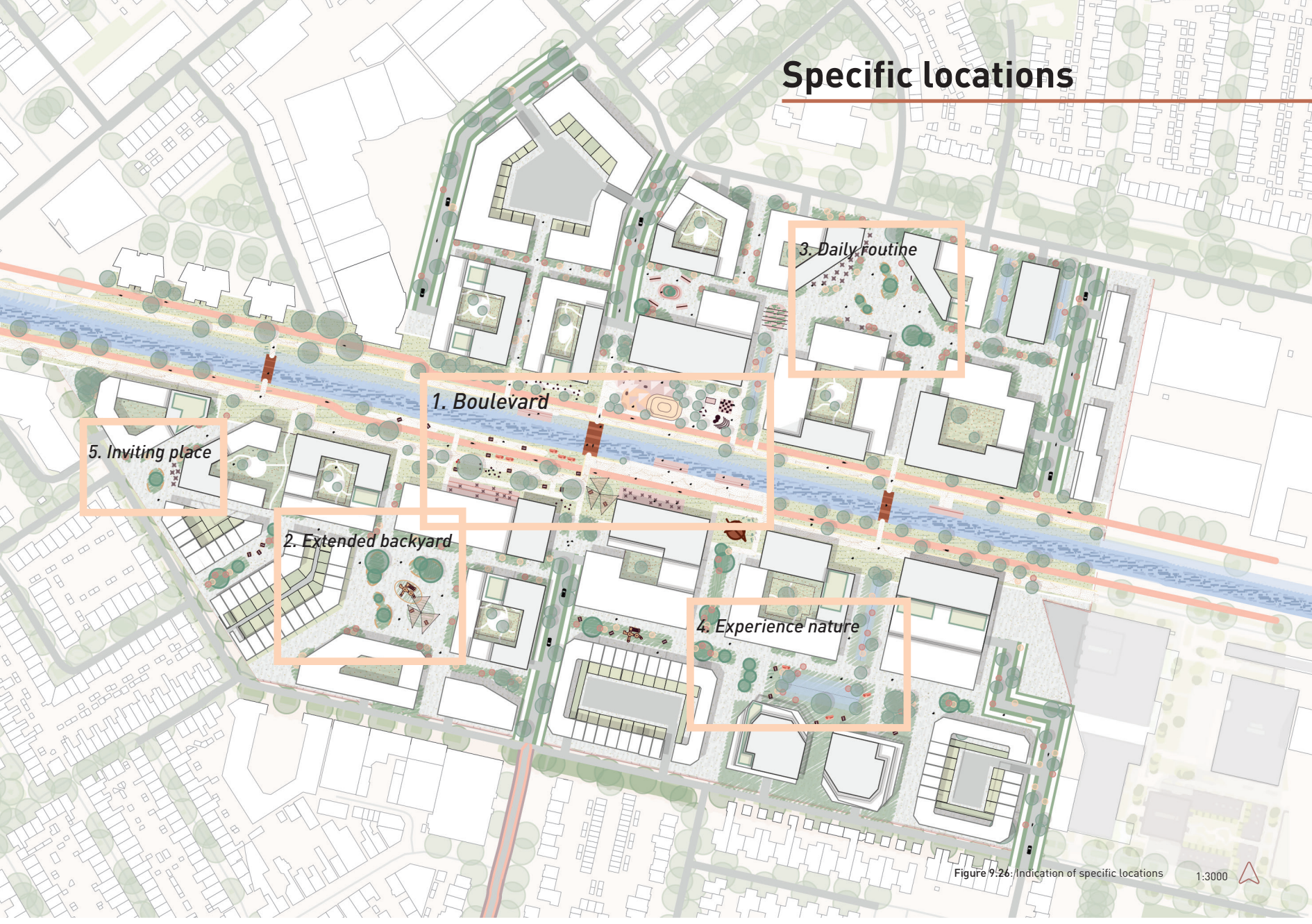


Figure 9.26: Indication of specific locations

1. Boulevard

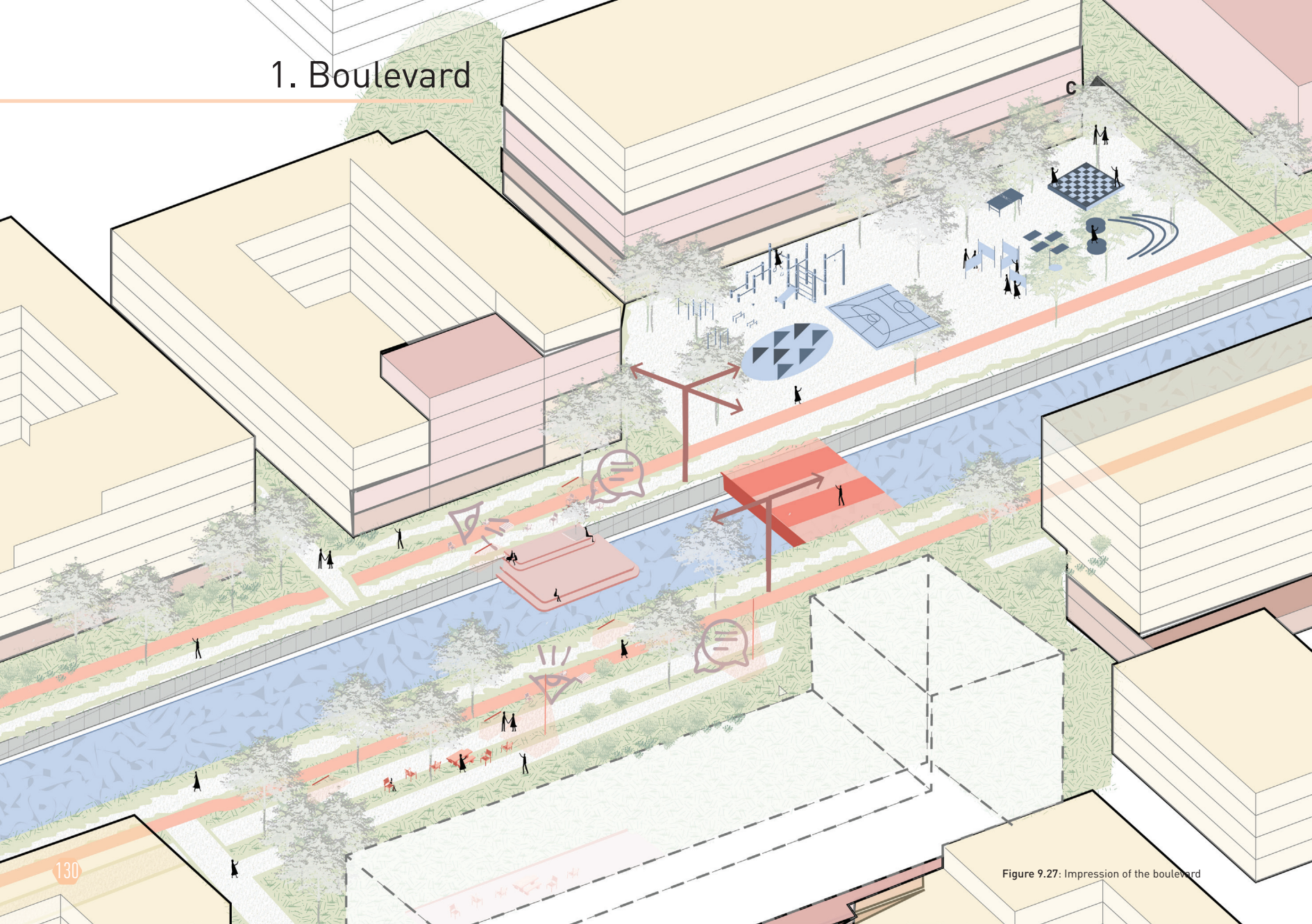


Figure 9.27: Impression of the boulevard

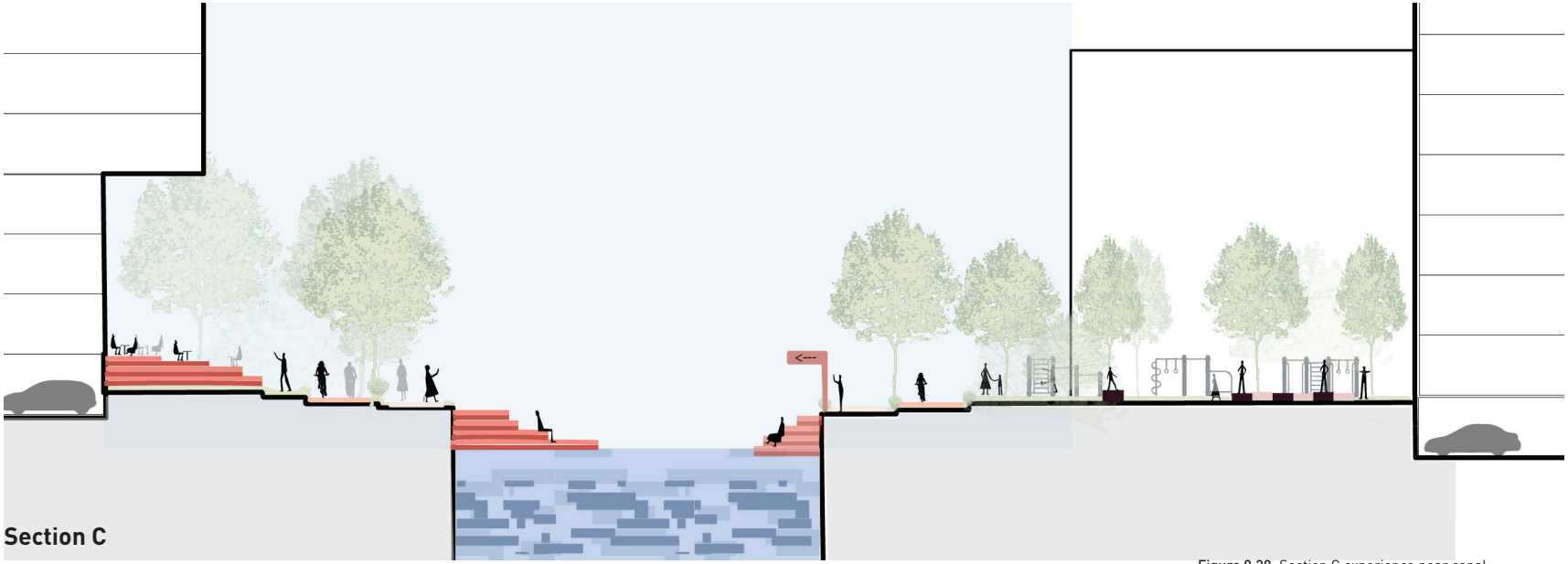


Figure 9.28: Section C experience near canal 1:500

The boulevard serves as a city-wide public space that spans across the entire location area. Through the situation near the canal and the existing national pedestrian- and cycling network it plays an crucial role as connector between the city centre and Geldrop. Adjacent to this boulevard, two large public spaces are located to enhance physical activity and social activities.

One of these places is designed to encourage physical activity furnished with an outdoor sport area in relation with informative, sport-related and playful elements. This place provides an location for inhabitants to engage in various physical activities and stimulate an activel lifestyle.

The other places is designed to promote social interactions among the inhabitants. With the moveable seatings, these space are flexibile to use and adaptable to the location. Resident can freely move the seatings to their own preferences.

Overall, the public spaces serves as a vibrant central axis within the new neighborhood. It functions as a place to move through, take a seat or actively participate in physical activities.

Figure 9.29: Experience near canal

2. Extended backyard

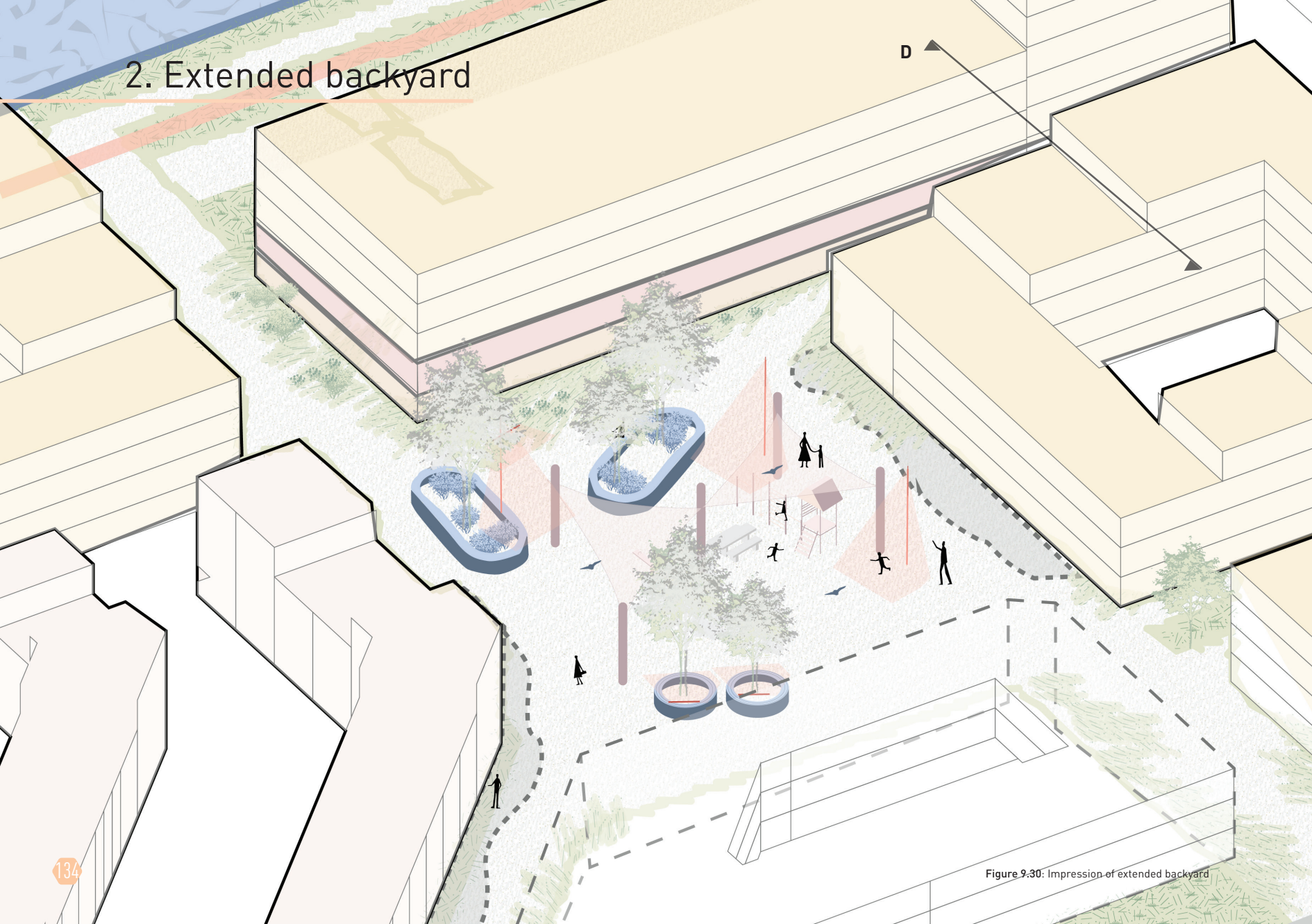


Figure 9.30: Impression of extended backyard

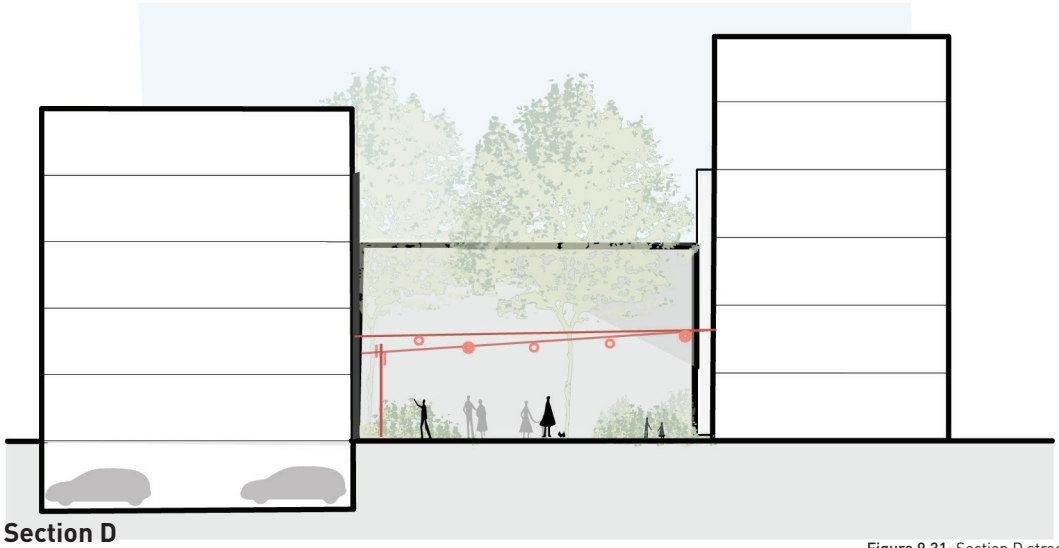


Figure 9.31: Section D streets leading to extended backyard 1:500

The extended backyard serves as a public space that is an extension of people's homes. It serves as a gathering place for the near inhabitants, where they can come together to socialize and where children can play in the shaded playgrounds. The car-free zone and the designed elements that create this area ensure a safe and enjoyable place for everybody. There is a minimum separation between private and public spaces, which allows for ease of movement throughout the area. The small areas in front of the houses are private, but gradients into the public spaces. This encourages people to use the public space and the not clearly defined boundaries stimulate the use of the public space. It feels like an extension of their homes.

3. Daily routine

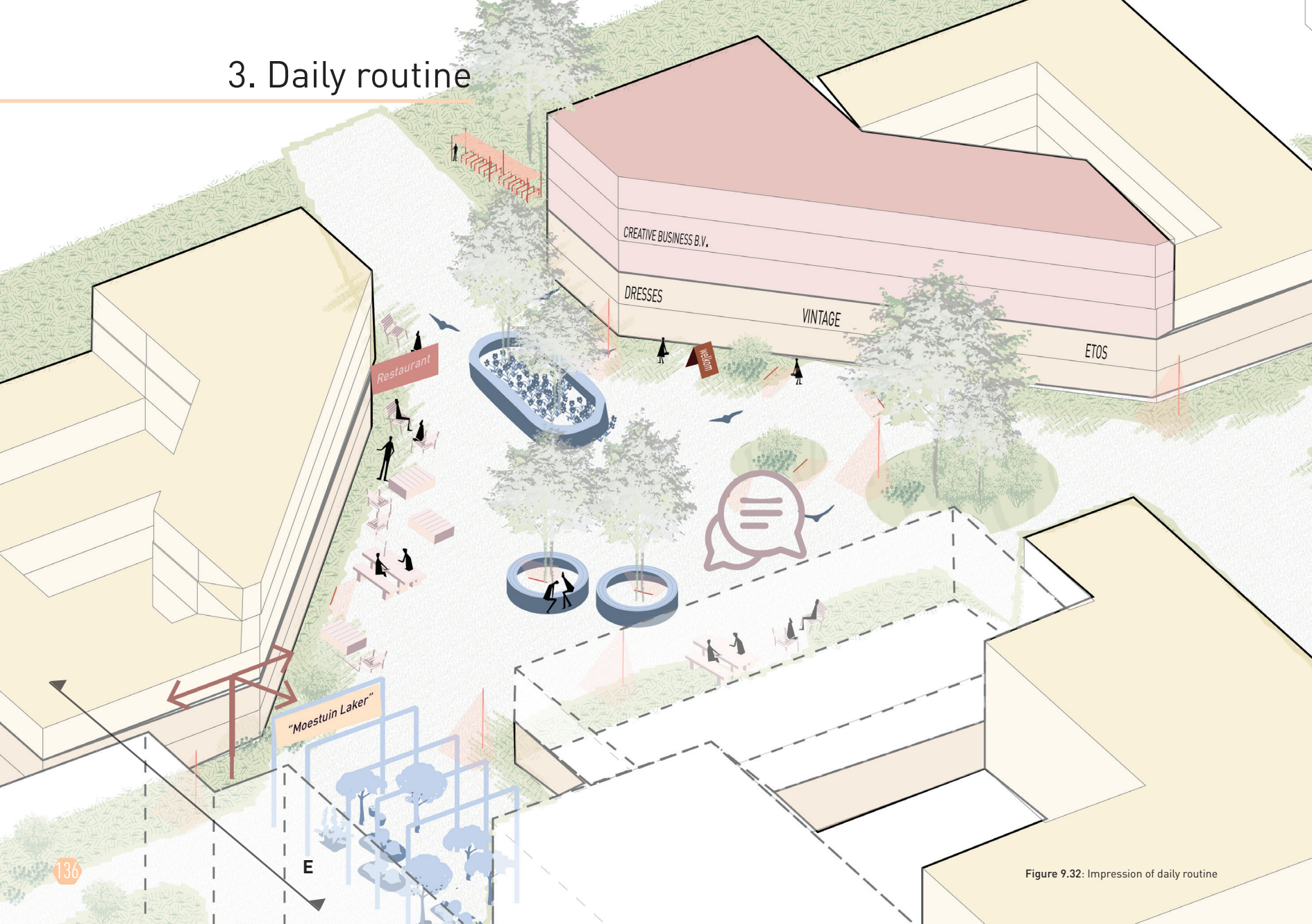


Figure 9.32: Impression of daily routine

Figure 9.33: Section E streets supporting daily routine 1:500

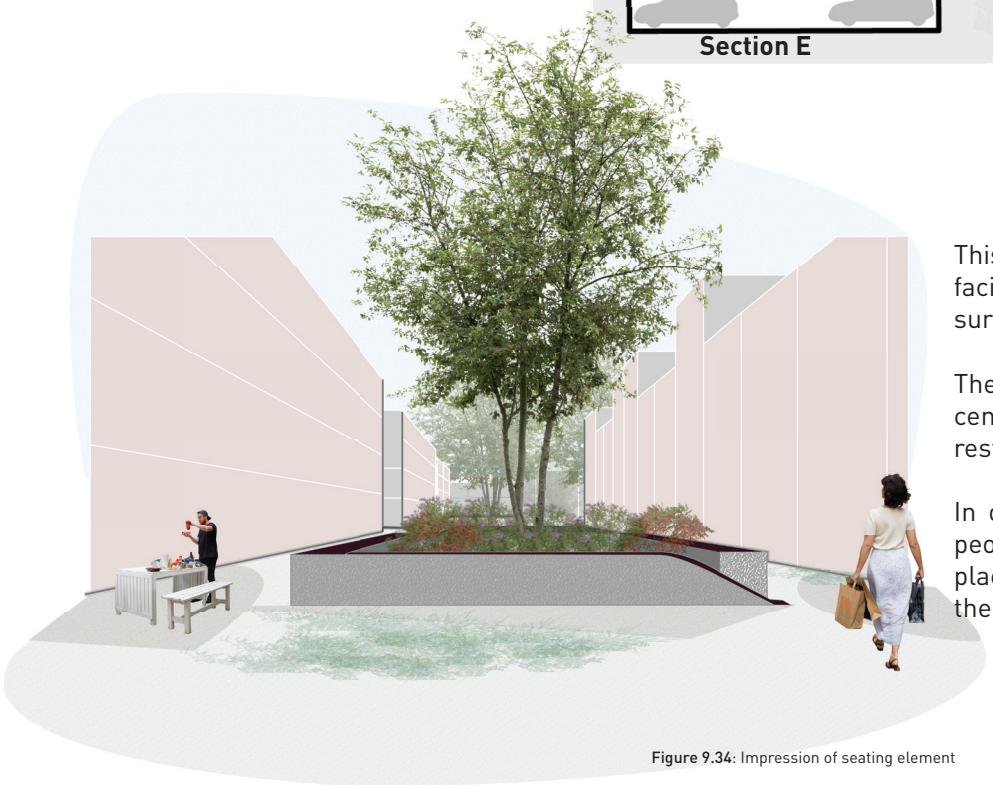


Figure 9.34: Impression of seating element

This neighborhood public space functions as a supportive place with facilities that stimulate the daily routine of inhabitants in the near surrounding.

The combination of located functions and facilities offers to create a central place within the neighborhood. It is a diverse place, with shops, restaurants, and enough seating.

In one of the adjacent streets an allotment is created, to stimulate people's awareness of food and sustainability. These several gathering places can stimulate social cohesion and a sense of community within the neighborhood.

4. Experience nature

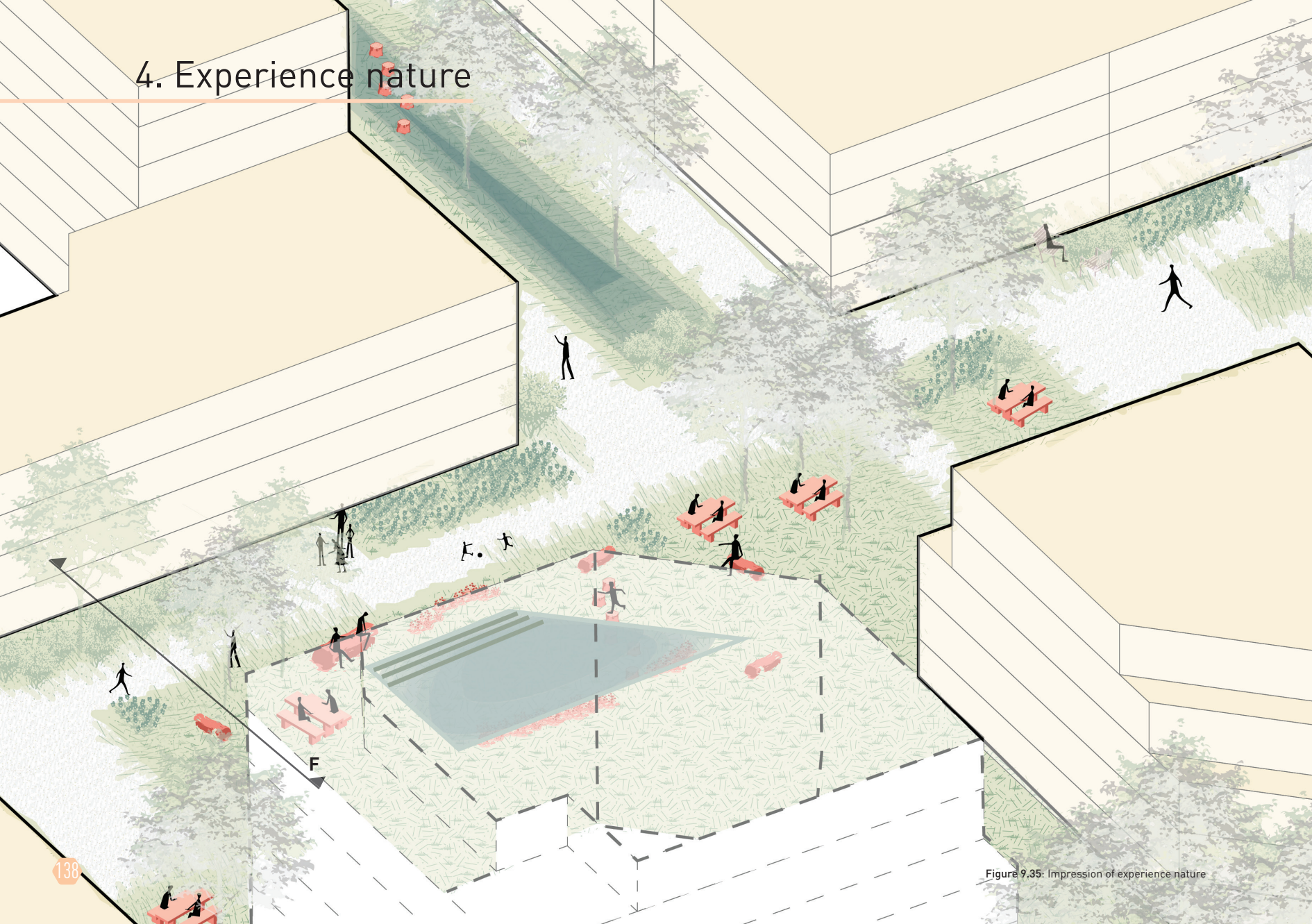


Figure 9.35: Impression of experience nature

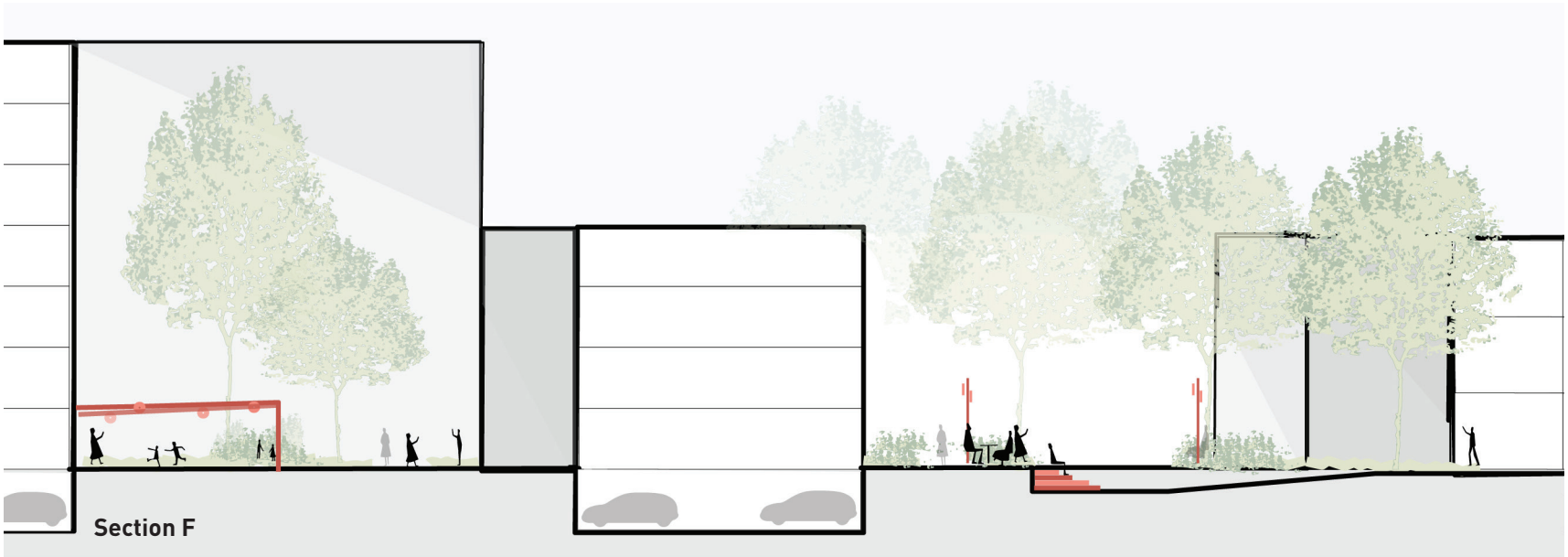


Figure 9.36: Section F experience of nature 1:500

This public space within the neighborhood serves as an intimate and tranquil place. It is a space to experience and connect with nature. The combination of natural features and seating provides a peaceful place within the neighborhood. One of the natural features are the several wadis to ensure water storage and create a visible water element in the area. Natural features such as tree trunks can be used as seating or as playful elements. The location is also a place for a variety of tree species to stimulate biodiversity and place for a all sorts of insects. In general, it provides a restful place within the neighborhood. Enough seating and greenery make this place a different area within the whole location area.

Figure 9.37: Impression of green streets

5. Inviting place

Figure 9.38: Impression of inviting place

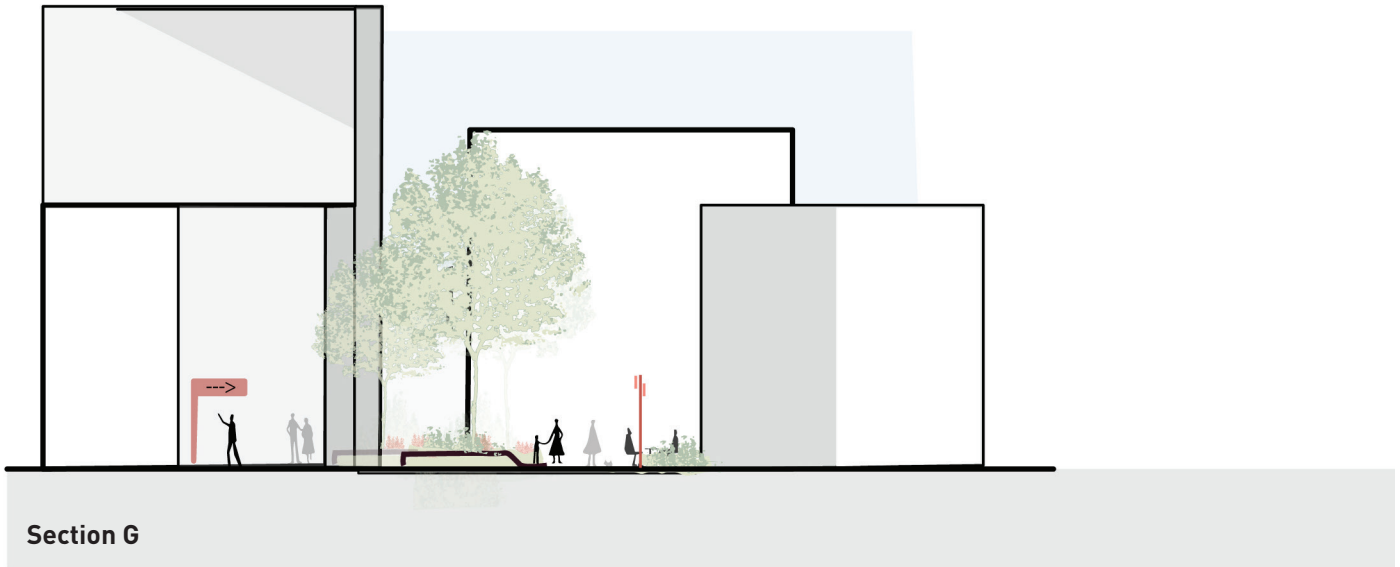
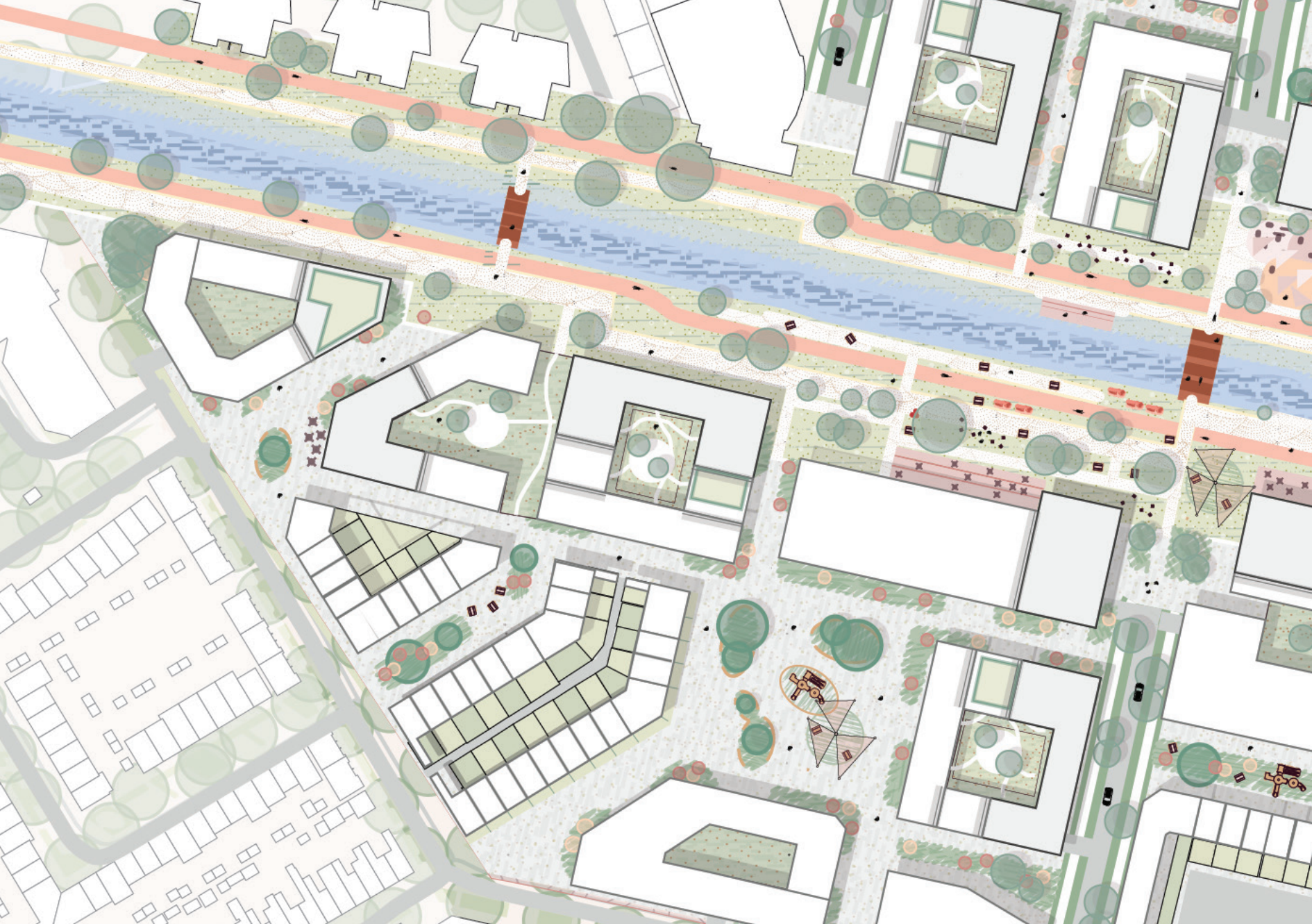


Figure 9.39: Section G experience of inviting place 1:500

This public space serves as an inviting entry point and an inviting place to explore the rest of the area. The situation of the buildings and functions in the plinth create an inviting appearance that encourages inhabitants to visit other places as well. Besides that, the positioning of the buildings stimulates several sightliness and attracts people to visit the canal. This triggers people to explore the surrounding area. It functions as a passage to enter and discover the rest.



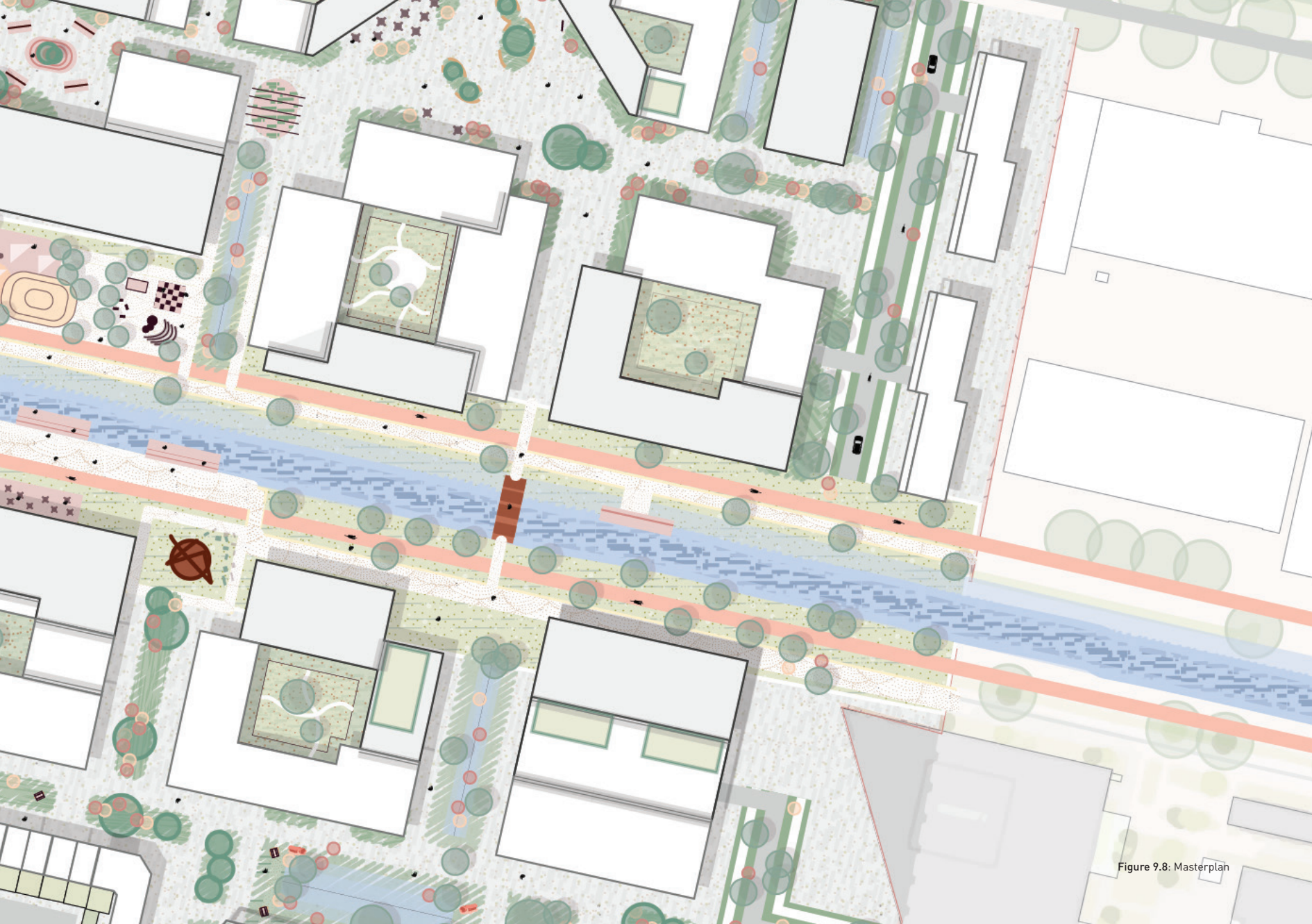


Figure 9.8: Masterplan

10
CONCLUSION

This thesis has explored the relationship between the quality of public space, in the context of a densifying city, while stimulating positive individual reactions and quality of life. This thesis tried to answer the research question: "How can urban design principles be applied to urban public spaces to stimulate positive individual reactions (and eventually increase the Quality of Life) in a densifying city?". This was accomplished through a systematic literature review, the creation of a toolbox, policy, and spatial analysis, and an implementation in a design. First, the theoretical framework defined the connection between urban design principles, urban public space, and individual reactions, which shape the elements of high-quality public space. The framework defined the type of urban public spaces, seven urban design principles that frame a good urban design and focus on good local environments, where they take into account the public view and use. The design principles are character, quality of the public realm, continuity and enclosure, ease of movement, legibility, adaptability, and diversity. These urban design principles are related to individual reactions based on the sense of safety, sense of comfort, and enjoyment. People have different reactions, uses and values in different public spaces, but each reaction should be guaranteed.

The gained information from the systematic literature review was used to define the interventions that a particular urban design principle stimulates and how it can influence a certain positive individual reaction. These interventions are categorized for each principle and particular spatial interventions are highlighted where an urban designer can have an influence. These spatial interventions are translated into a guiding toolbox, which was the starting point for the city strategy and the detailed design for a neighborhood.

The creation of the toolbox showed that it was possible to define urban interventions for particular urban design principles. The design process (on several scales and aspects) can be easier executed with the use of the toolbox. Which provides an extensive overview of the possible urban interventions categorized according to the different urban design principles. The application of the toolbox within different scales and strategies in the city showed that densification is possible while also ensuring the high quality of public spaces on city strategy, neighborhood scale, and with specific elements in the public space itself.

The cause of this graduation study "Density and Other Matters" is the major housing challenges in the Netherlands. One of the large-scale housing sites is the existing urban area of Eindhoven, which has to realize approximately 30.000 housing units, half of the total housing units, will be realized within the ring roads, of which half will be realized within the ring roads. Within Chapter 06 Spatial mapping, the quality of life in Eindhoven has been outlined to identify where the quality of life can be improved. With that information, a suitable location was chosen to densify within the ring roads, while still creating a high-quality public space and ensuring the quality of life within the city. The design process has been supported by the guiding toolbox to ensure that the quality of the public space is not at the expense of the densification challenge. The design for the chosen location provides 3000 new housing units, by which 13,3% of the densification challenge can be solved. Despite the densification, the guiding toolbox has provided guidelines for designing a high-quality public space. Each urban design principle contributes (in its own way) to the positive individual reactions of people and thereby to the quality of life of the new inhabitants, but also to the surrounding area.

Gemeente Eindhoven

11 april 2023 - 16:11 uur 11 april 2023 - 17:07 uur

Eindhoven wil ruim 10 miljoen uittrekken voor vergroening binnenstad

Gemeente Eindhoven is van plan zo'n 10,6 miljoen euro te besteden aan een vergroeningsslag van de binnenstad. Onder andere het Wilhelminaplein moet een flinke metamorfose krijgen.

June 2023 — Implementation strategy Groenplan Centrum

▲ Het Stadsforum in wording. „In één keer verandert het van een kaal ding in een beschaduwd plein, vooral als de kruinen nog verder naar elkaar toe groeien." © Jules van Iperen/Pix4Profs

Van betonnen treurplekken naar groenere binnenstad: dit zijn de plannen voor Tilburg

TILBURG – Het zijn grijze betonnen vlaktes, maar niet lang meer. De rigoureuze vergroening van de Tilburgse binnenstad gooit nu de Stationsstraat een jaar open. Straks komen ook het Koningsplein, Pieter Vreedeplein en zélfs de Heuvelstraat aan de beurt. Hoe die toekomst eruit ziet? Loop even mee.

Bas Vermeer 04-06-23, 10:21 Laatste update: 04-06-23, 11:31

Figure 10.1: Current developments
(Studio040, 2023), (flux,2023) and (Vemeer, 2023)

The thesis is framed within a theoretical framework and operationalization process with certain sources. The reviewed literature is based on these operationalization processes and limited by the seven urban design principles. The toolbox can still miss information and interventions and might not cover all the possible urban interventions that contribute to the quality of public space. The methods (systematic literature review) properly addressed a part of all the different urban interventions regarding the urban design principles that can take place, keeping in mind the individual reactions: the sense of safety, sense of comfort, and enjoyment.

Secondly, the thesis is missing observations from people using certain (high-quality or low-quality) public spaces. This implementation of observations and interviews would have strengthened the individual reactions and public perspective toward public spaces. It would have shown a clear relation and visibility of people's perspectives in relation to the use of public spaces. And in which way they think it would contribute to their quality of life within a city.

Although this thesis is limited to the location of Eindhoven, it could be implemented within every city. The guiding toolbox can contribute when defining a city strategy or designing a new neighborhood. Further research can expand this toolbox and create an even more coherent toolbox for designing a high-quality public space on different scales and use within different design processes. The focus of the seven urban principles can also limit the urban design progresses and have limited the design for the neighborhood to use these urban design principles.

In addition, it is a relevant subject to research, as you can see in Figure 10.1, it is currently a topical topic within cities and municipalities identify. They notice the importance of public space and the big central role they play within a city. So, they prioritize the quality of public space to make it a user-friendly place within their cities.

"I have always been aware of my surroundings and the experiences they offer. However, over the past year, especially with the subject of this thesis "qualitative space", I have caught myself becoming even more aware of my surrounding and their quality. During a walk, cycling tour, or participating in an activity, I often stop and observe with a keen eye what is happening around me. On this page, I have gathered a small selection of striking qualities that have caught my attention throughout this graduation year."

Amber

Figure 10.2: Selection of pictures

LIST OF FIGURES

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APPENDIX A

SYSTEMATIC LITERATURE REVIEW REFERENCES

Paper ID	Authors	Title	Year of Publication
1	Honey-Rosés J., Zapata O.	The Impact of Residential Densification on Perceptions of Public Space: A Field Experiment	2021
2	Cellucci C., Di Sivo M.	Green Densification Strategies in Inner City for Psycho-Physical-Social Wellbeing	2021
3	Zumelzu A., Herrmann-Lunecke M.G.	Mental well-being and the influence of place: conceptual approaches for the built environment for planning healthy and walkable cities	2021
4	Zhang C.J.P., Barnett A., Johnston J.M., Lai P.-C., Lee R.S.Y., Sit C.H.P., Cerin E.	Objectively-measured neighbourhood attributes as correlates and moderators of quality of life in older adults with different living arrangements: The alecs cross-sectional study	2019
5	Mavoa S., Davern M., Breed M., Hahs A.	Higher levels of greenness and biodiversity associate with greater subjective wellbeing in adults living in Melbourne, Australia	2019
6	Tang J.Y.M., Chui C.H.K., Lou V.W.Q., Chiu R.L.H., Kwok R., Tse M., Leung A.Y.M., Chau P.-H., Lum T.Y.S.	The Contribution of Sense of Community to the Association Between Age-Friendly Built Environment and Health in a High-Density City: A Cross-Sectional Study of Middle-Aged and Older Adults in Hong Kong	2021
7	Feng J., Tang S., Chuai X.	The impact of neighbourhood environments on quality of life of elderly people: Evidence from Nanjing, China	2018
8	Hassen N.	Leveraging built environment interventions to equitably promote health during and after COVID-19 in Toronto, Canada	2022
9	Safaee M.M., Nematipour N.	Development of urban public spaces using urban underground spaces: A new method to improve quality of life (QOL) in Tehran metropolis	2021
10	Mouratidis K.	COVID-19 and the compact city: Implications for well-being and sustainable urban planning	2022
11	Guo Y., Liu Y., Lu S., Chan O.F., Chui C.H.K., Lum T.Y.S.	Objective and perceived built environment, sense of community, and mental wellbeing in older adults in Hong Kong: A multilevel structural equation study	2021
12	Manzo L.C.	City Life and Well-Being	2018
13	Ioja C., Patroescu M., Nita M., Rozylowicz L., Vanau G., Ioja A., Onose D.	Categories of residential spaces by their accessibility to urban parks - indicator of sustainability in human settlements case study: Bucharest	2010
14	Mayen Huerta C., Utomo A.	Evaluating the association between urban green spaces and subjective well-being in Mexico city during the COVID-19 pandemic	2021
15	Völker S., Kistemann T.	Developing the urban blue: Comparative health responses to blue and green urban open spaces in Germany	2015
16	Currie M.A.	A design framework for small parks in ultra-urban, metropolitan, suburban and small town settings	2017
17	Littke H.	Planning the green walkable city: Conceptualizing values and conflicts for urban green space strategies in Stockholm	2015
18	Bu J., Yin J., Yu Y., Zhan Y.	Identifying the daily activity spaces of older adults living in a high-density urban area: A study using the smartphone-based global positioning system trajectory in shanghai	2021
19	Blancarte-Siqueiros R.H., Perez-Verdin G., Cortes-Ortiz A.	The relationship between quality of life, sense of belonging, and green spaces in urban environments in the city of Durango, Mexico [La relación entre la calidad de vida, sentido de pertenencia y áreas verdes en ambientes urbanos en la ciudad de Durango, México]	2019
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26	Staricco L., Vitale Brovarone E.	Livable neighborhoods for sustainable cities: Insights from Barcelona	2022
27	Arifwidodo S.D., Chandrasiri O.	Urban heat stress and human health in Bangkok, Thailand	2020
28	Kim D., Jin J.	Does happiness data say urban parks are worth it?	2018
29	Labuz R.	Pocket Park-A New Type of Green Public Space in Kraków (Poland)	2019
30	Bielinskas V., Staniūnas E., Beconytė G., Balčiūnas A., Vasiliauskas D.	Public safety in monofunctional zones of Vilnius city	2014
31	Gugerell K., Netsch S.	Reflection on the Austrian Newspaper Coverage of the Role and Relevance of Urban Open-and Green-Spaces in Vienna During the First COVID-19 Lockdown in 2020	2020
32	Li L., Du Q., Ren F., Ma X.	Assessing spatial accessibility to hierarchical urban parks by multi-types of travel distance in Shenzhen, China	2019
33	Milano V., Cortet J., Baldantoni D., Bellino A., Dubs F., Nahmani J., Strumia S., Maisto G.	Collembolan biodiversity in Mediterranean urban parks: impact of history, urbanization, management and soil characteristics	2017
34	Yung E.H.K., Winky K.O. H., Chan E.H.W.	Elderly satisfaction with planning and design of public parks in high density old districts: An ordered logit model	2017
35	Blečić I., Saiu V., Trunfio G.A.	Towards a High-Fidelity Assessment of Urban Green Spaces Walking Accessibility	2020
36	van Ameijde J., Ma C.Y., Goepel G., Kirsten C., Wong J.	Data-driven placemaking: Public space canopy design through multi-objective optimisation considering shading, structural and social performance	2022
37	Lau K.K.-L., Yung C.C.-Y., Tan Z.	Usage and perception of urban green space of older adults in the high-density city of Hong Kong	2021
38	Botticello A.L., Rohrbach T., Cobbold N.	Differences in the Community Built Environment Influence Poor Perceived Health among Persons with Spinal Cord Injury	2015
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40	Rofè Y., Feierstein G., Zarchin I.	Quantity and quality of public open spaces in Israel	2012
41	Dennis M., James P.	Evaluating the relative influence on population health of domestic gardens and green space along a rural-urban gradient	2017
42	Xu H., Fu F., Miao M.	What Is the Effect of Cultural Greenway Projects in High-Density Urban Municipalities? Assessing the Public Living Desire Near the Cultural Greenway in Central Beijing	2022
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44	Parra D.C., Gomez L.F., Fleischer N.L., David Pinzon J.	Built environment characteristics and perceived active park use among older adults: Results from a multilevel study in Bogotá	2010
45	Tsao T.-M., Tsai M.-J., Wang Y.-N., Lin H.-L., Wu C.-F., Hwang J.-S., Hsu S.-H.J., Chao H., Chuang K.-J., Chou C.-.C.K., Su T.-C.	The health effects of a forest environment on subclinical cardiovascular disease and heath-related quality of life	2014
46	Danilina N., Tsurenkova K., Berkovich V.	Evaluating urban green public spaces: The case study of krasnodar region cities, Russia	2021

47	Munyati C., Drummond J.H.	Loss of urban green spaces in Mafikeng, South Africa	2020
48	Qin B., Zhu W., Wang J., Peng Y.	Understanding the relationship between neighbourhood green space and mental wellbeing: A case study of Beijing, China	2021
49	Tan P.Y., Ismail M.R.B.	The effects of urban forms on photosynthetically active radiation and urban greenery in a compact city	2015
50	Li X., Ma X., Hu Z., Li S.	Investigation of urban green space equity at the city level and relevant strategies for improving the provisioning in China	2021
51	Ekanayake M., Sandamalee N., Rajapaksha U.	Lessons from the Distribution Pattern of Urban Parks and Factors that Contribute to Control COVID-19 Outbreak in Neighborhood Design	2021
52	Wang X., Liu K., Wang K., Gong J., Wang Y., Fan Y.	Spatiotemporal dynamics of Urban parks and their driving forces in Xi'an, China from 1949 to 2015	2017
53	Elsadek M., Liu B., Lian Z.	Green façades: Their contribution to stress recovery and well-being in high-density cities	2019
54	Jackson L.E.	The relationship of urban design to human health and condition	2003
55	Nordbø E.C.A., Raanaas R.K., Nordh H., Aamodt G.	Neighborhood green spaces, facilities and population density as predictors of activity participation among 8-year-olds: a cross-sectional GIS study based on the Norwegian mother and child cohort study	2019
56	Xiao C., Shi Q., Gu C.-J.	Assessing the spatial distribution pattern of street greenery and its relationship with socioeconomic status and the built environment in Shanghai, China	2021
57	Wheeler B.W., Lovell R., Higgins S.L., White M.P., Alcock I., Osborne N.J., Husk K., Sabel C.E., Depledge M.H.	Beyond greenspace: An ecological study of population general health and indicators of natural environment type and quality	2015
58	Rennit P., Maikov K.	Perceived restoration scale method turned into (used as the) evaluation tool for parks and open green spaces, using Tartu city parks as an example	2015
59	Murray M.H., Byers K.A., Buckley J., Magle S.B., Maffei D., Waite P., German D.	"I don't feel safe sitting in my own yard": Chicago resident experiences with urban rats during a COVID-19 stay-at-home order	2021

APPENDIX B

HIGHLIGHTED URBAN DESIGN PRINCIPLES

Urban design principles \ Urban public spaces	Street	Local/pocket open public spaces	Neighborhood public open spaces	District/ city open spaces	Regional open spaces/ Large city parks	National / Metropolitan open public spaces	Public facilities
Character	Density of users made the street more crowded, noisier, a better place to watch others [1;5], **Green streets make routes leading to green areas more attractive** [2], **presence of trees** [4] on opposite sides of the streets visually extend the park [16], **site authenticity and specificity of its location** [16;40;58]	**site authenticity and specificity of its location** [16;40;58], **uniqueness** with responsive to local context [16], **positive sense of intimacy** [16], spaces with a **colorful** , community-driven urban intervention [21], Smaller parks have less attraction than municpal parks and district parks [51], it is a comfortable place for it is surrounded by **different walls** that make people feel safe and, taking into account **the small size of the walls** , also isolated enough to feel well [58]		**site authenticity and specificity of its location** [16;40;58], Smaller parks have less attraction than municpal parks and district parks [51]	Smaller parks have less attraction than municpal parks and district parks [51], **different zones allows engagement in different activities** [58]		**many destinations visually connect public open spaces** [34], place are too small to add more facilities [38]
		Density of users in a public space [1] ,green areas improve learning [2], environmental design can increase positive emotional bonds [3], **high-attractiveness and good ventilation** [9], 'pleasant ambient noise' [13], **cleanliness and maintenance** [4;15;34;40;46;51;58], **Tranquility** [15], many destinations visually connect public open spaces [34], **Improve shading and wind flow** can lead to increased social activities [36], people prefere to stay on paved areas [40]					
Continuity and enclosure	Perceive this space as theirs, or as an extension of their home [1], **pavement detailing used to continue the park in all directions** [16]	**Perceive this space as theirs, or as an extension of their hom** e [1], **well-defined green areas** [3], **pavement detailing used to continue the park in all directions** [16]	**well-defined green areas** [3], **pavement detailing used to continue the park in all directions** [16]	**well-defined green areas** [3]		No more large open spaces, because inner cities are crammed with buildings [2]	
		Not clearly defined boundaries , many people are interested in being able to control places themselves directly by their expressions [13], **separate surrounding by a low fence** [29]					
Quality of public realm	**More room on the streets** increases recreational value [2;5], **good air quality and acoustics** [37], the duration of stay is influenced by the **amount of shaded areas** [13;18;40]	Greenery creates safety for childern [2], **good air quality and acoustics** [37], peripheral location in a neighborhood improve use [40]	**good air quality and acoustics** [37] peripheral location in a neighborhood improve use [40]	**natural features, such as flowers, trees, fountains and fish ponds** [34]			amount of local facilities [10][51]
		Sufficient places to sit improves child-friendliness [2], proximity to green areas [3;17;46;51], **presence of all kind of services** [4;5;6;11;28;29;47], **sufficient places to sit** [13] or need to be considered in relation to the environmental conditions and social interaction of the sites [36], **good lighting** [15;34], the duration of stay is influenced by the amount of shaded areas [13;18;40], **Water features to improve air quality and natural ounds** [29], unsafe pathways and long travel distance between facilities in parks reduce elderly to move around easy [34], **protection facilities from bad wheater** [47], The selection of a park is always based on the free will of a person, a choice based on his/her purpose for visiting, availability of facilities, and socio-physical accessibility [51]					
Ease of movement	**wide sidewalks** [3;8], **presence of trees** [3], more heavily trafficked streets curtailing the range of children's outdoor play more than those on less trafficked streets [5], good accessibility [16;17;18;22;29;46;51], plants and trees on opposite sides of the streets visually extend the park [16], **Accessibility and safety** are essential for older adults to make their travel behavior choices towards urban public spaces [18], high-quality network of open and green spaces which are connected by an appropriate pedestrian and cycling infrastructure [2][31]	More heavily trafficked streets curtailing the range of children's outdoor play more than those on less trafficked streets [5], **Most commonly visited public spaces are within 5 min walking distance** [18], good accessibility [26;29;46;51], flat terrain allows for easy pedestrian mobility [35;44]		Most commonly visited public spaces are within 5 min walking distance [18], **flat terrain allows for easy pedestrian mobility** [35;44]			easy acces (by transportation) [4;10;13;34], availability of recreational services in a 300-meter buffer [12], **good accessibility** [16;17;18;22;29;46;51]
		A park within walking distance of every home [2], proximity to green areas [3;17;46;51], Good transport conditions for elderly to access green areas [7], **good accessibility** [16;17;18;22;29;46;51], **easy access** (by transportation) [4;10;13;34], fully accessible for people with disabilities [16], Places are more frequently used if they are located within a 60 min walking distance [18], high-quality network of open and green spaces which are connected by an appropriate pedestrian and cycling infrastructure [2][31], barrier-free and circulation [34], people that need to walk through surrounding areas in order to access parks, such as street connectivity and slope of the terrain, influence the park use [44]					
Legibility	**immediately striking and significant markings** [13;34], the use of **interstitial spaces** as small parks, monuments or city landmarks [16]	the use of **interstitial spaces** as small parks, monuments or city landmarks [16], With its **several staircases and different levels** , the park, raised higher than the streets, arouses immediate interest [58]	the use of interstitial spaces as small parks, monuments or city landmarks [16], With its several staircases and different levels, the park, raised higher than the streets, arouses immediate interest [58]				
		immediately striking and significant markings [13;34], peoples cognitive understanding of a place, help define personal identity [22], people are more inclined to socialise in spaces with **good visibility towards their surroundings** [36]					
Adaptability	road space is no more meant only for vehicular traffic but for multiple uses, providing larger and safer public space [26], **Repurpose abandoned infrastructure into linear parks** [28]	adaptable and functional to surrouding area [16], the use of **interstitial spaces** as small parks, monuments or city landmarks [16]					
		meeting the needs and serving the community that use it, social interaction [8;17;18;28;29;34], improve mental and physical health [9], public places that allow **interaction** with other people through **observation, communication or behaviour** , become increasingly important for public and social interaction, as well as a leisure activity, in times of increasing individualization and legally protected privacy [13], **moveable chairs** gives users some influence on the appearance and functioning of their space [29], **playground are most of the time not shaded** , thus reducing its usability in summer [40]					
Diversity	**Pedestrian-friendly spaces** [22], Enhances social engagement and cohesion of those who live alone or are isloated [28] or elderly [34]	Different in form and use, generated in a well-connected network of green [2][3], A rest or conduct activities with one or more 'personal acquaintances' [13], **uniqueness with responsive to local context** [16]	**Green areas as extension** of school for a playful, social and educational role through natural elements, furnishings, structures and programs [2], A rest or conduct activities with one or more 'personal acquaintances' [13], uniqueness with responsive to local context [16]	**support different ecosystem services** [17]	support different ecosystem services [17], **offer more amenities to attract people from further away** [32]	support different ecosystem services [17], offer more amenities to attract people from further away [32]	community compactness, housing unit mix, and transportation improvement [5], **different public facilities is the demands of different groups** [50]
		Increasing contact with strangers [1], **Child-friendliness** with broad sidewalks and informal spaces for games, skate parks, and public sports [2], the **variety in tree species** creates more diversity [2], different sorts of activities causes more frequently visits to green areas [4;5], **sit table space in the public realm, either on the sidewalk or elsewhere, facing the right way** [5] and sheltered [34], **meeting the needs and serving the community that use it** , social interaction [8;17;18;28;29;34], Watching other people is a form of social inclusion [13], providing different activities the population wants [16;18], Pedestrian-friendly spaces [22], Enhances social engagement and cohesion of those who live alone or are isolated [28] or elderly [34]					

APPENDIX C

QGIS DATA FOR SPATIAL MAPPING

buurtcode	Buurtnaam	wijkcode	gemeentena	ONDHOPRUI	INGEROPRUI	Lie-bostra	VOLDOBOSTR	EHVGROESTA	lie+bostra	10minlogro	mins1parkb	-SOCINETWE	ONVEEIGBU	SPT+1PW	ACINBTVERB	SOCICOHESI	VEILIINBUU	Bewericlij	goeervagez	obesitas
BU07721110	Binnenstad	WK077211	Eindhoven	75	65	4	38	53	58	57	91	12	26	68	16	5.100	6.900	60.00	83.70	34.80
BU07721120	Bergen	WK077211	Eindhoven	73	58	6	30	42	64	54	98	12	27	75	26	5.600	7.300	59.90	84.70	35.40
BU07721130	Witte Dame	WK077211	Eindhoven	73	58	6	30	42	64	54	98	12	27	75	26	5.600	7.300	58.80	84.70	34.80
BU07722110	Irisbuurt	WK077221	Eindhoven	74	73	8	63	53	29	67	96	10	9	72	30	6.100	7.500	55.80	82.30	39.40
BU07722120	Rochusbuurt	WK077221	Eindhoven	71	69	2	46	47	51	85	98	8	11	72	31	6.100	7.200	58.30	83.90	33.60
BU07722130	Elzent-Noord	WK077221	Eindhoven	76	75	3	69	72	28	97	96	8	11	78	30	6.600	7.600	55.80	83.10	39.00
BU07722140	Tuindorp	WK077221	Eindhoven	74	73	8	63	53	29	67	96	10	9	72	30	6.100	7.500	52.00	79.40	38.50
BU07722150	Joriskwartier	WK077221	Eindhoven	71	69	2	46	47	51	85	98	8	11	72	31	6.100	7.200	55.00	81.80	37.30
BU07722160	Bloemenplein	WK077221	Eindhoven	68	68	10	55	54	35	86	95	11	19	73	29	6.000	6.900	54.30	77.20	42.50
BU07722170	Looiakkers	WK077221	Eindhoven	71	69	2	46	47	51	85	98	8	11	72	31	6.100	7.200	57.10	83.60	36.60
BU07722180	Elzent-Zuid	WK077221	Eindhoven	76	75	3	69	72	28	97	96	8	11	78	30	6.600	7.600	54.60	84.00	42.20
BU07722210	Kerstrooisplein	WK077222	Eindhoven	68	68	10	55	54	35	86	95	11	19	73	29	6.000	6.900	49.90	74.40	47.50
BU07722220	Gerardusplein	WK077222	Eindhoven	74	79	6	55	59	39	84	98	7	12	74	26	7.100	7.500	54.20	81.60	42.80
BU07722230	Gennepenzijde	WK077222	Eindhoven	76	79	3	69	72	28	97	96	8	11	78	30	6.600	7.600	47.00	77.10	42.10
BU07722240	Roosten	WK077222	Eindhoven	70	72	10	70	56	20	87	98	4	8	81	45	7.600	7.600	54.60	86.10	41.10
BU07722250	Eikenburg	WK077222	Eindhoven	70	72	10	70	56	20	87	98	4	8	81	45	7.600	7.600	53.80	83.00	42.80
BU07722300	Puttense Dreef	WK077223	Eindhoven	67	76	10	71	52	19	95	88	7	9	77	33	5.900	7.800	51.90	83.20	45.10
BU07722320	Burghplan	WK077223	Eindhoven	70	71	11	55	56	34	83	90	8	22	57	26	5.800	6.900	47.70	73.00	51.10
BU07722330	Sintenbuurt	WK077223	Eindhoven	70	71	11	55	56	34	83	90	8	22	57	26	5.800	6.900	51.40	77.20	45.50
BU07722340	Tivoli	WK077223	Eindhoven	70	71	11	55	56	34	83	90	8	22	57	26	5.800	6.900	44.30	65.00	56.50
BU07722350	Gijzenrooi	WK077223	Eindhoven	67	76	10	71	52	19	95	88	7	9	77	33	6.900	7.800	53.40	82.80	45.40
BU07722360	Nieuwe Erven	WK077223	Eindhoven	74	73	8	63	53	29	67	96	10	9	72	30	6.100	7.500	52.40	74.30	44.40
BU07722370	Kruidenbuurt	WK077223	Eindhoven	72	64	6	54	53	40	81	95	6	14	72	23	6.000	7.400	51.10	77.30	47.40
BU07722380	Schuttersbosch	WK077223	Eindhoven	67	76	10	71	52	19	95	88	7	9	77	33	5.900	7.800	45.00	76.10	49.10
BU07723110	Villapark	WK077231	Eindhoven	72	69	5	57	48	38	73	97	7	21	82	31	6.700	7.600	55.20	85.00	38.60
BU07723120	Lakerlopen	WK077231	Eindhoven	73	69	8	50	50	42	43	92	9	17	63	21	5.500	7.100	48.40	75.70	47.30
BU07723210	Doomakkers-West	WK077232	Eindhoven	70	64	14	49	49	37	56	87	9	30	63	21	5.800	7.000	49.20	75.10	48.70
BU07723220	Doomakkers-Oost	WK077232	Eindhoven	70	64	14	49	49	37	56	87	9	30	63	21	5.800	7.000	45.40	69.40	53.50
BU07723280	Tongelresche Akkers	WK077232	Eindhoven	71	66	5	54	58	41	51	95	9	34	63	35	5.800	7.000	50.10	83.60	45.60
BU07723330	Muschberg, Geestenberg	WK077233	Eindhoven	67	68	14	57	63	29	77	85	10	17	65	34	6.300	7.100	48.40	75.10	50.00
BU07723350	't Hofke	WK077233	Eindhoven	67	68	14	57	63	29	77	85	10	17	65	34	6.300	7.100	48.90	74.00	49.60
BU07723360	Karpen	WK077233	Eindhoven	72	69	5	57	48	38	73	97	7	21	82	31	6.700	7.600	51.90	84.40	41.10
BU07723370	Koudenhoven	WK077233	Eindhoven	72	69	5	57	48	38	73	97	7	21	82	31	6.700	7.600	52.40	83.60	44.60
BU07724100	Limbeek-Zuid	WK077241	Eindhoven	63	61	10	50	47	40	71	91	14	37	64	27	4.900	6.500	53.60	73.20	45.70
BU07724110	Limbeek-Noord	WK077241	Eindhoven	63	61	10	50	47	40	71	91	14	37	64	27	4.900	6.500	59.50	80.80	35.20
BU07724120	Hemelrijken	WK077241	Eindhoven	64	56	6	44	39	50	39	88	13	47	64	29	5.000	5.500	56.00	76.20	40.70
BU07724130	Giltebuurt	WK077241	Eindhoven	64	56	6	44	39	50	39	88	13	47	64	29	5.000	5.500	52.10	77.30	39.20
BU07724140	Woenselse Watermolen	WK077241	Eindhoven	69	71	8	65	62	27	48	86	19	21	60	28	5.600	7.100	53.00	80.80	42.00
BU07724210	Woensel-West	WK077242	Eindhoven	69	67	12	47	53	40	68	95	13	34	65	32	6.100	6.500	53.90	75.90	44.30
BU07724220	Kronehoef	WK077242	Eindhoven	64	63	13	61	56	26	40	88	9	36	61	25	4.800	6.200	47.50	71.70	44.50
BU07724230	Barrier	WK077242	Eindhoven	70	71	8	61	61	31	61	92	8	16	60	19	6.100	7.100	49.90	75.60	51.90
BU07724240	Mensfort	WK077242	Eindhoven	66	65	17	60	61	23	52	89	9	30	62	20	5.400	6.600	50.00	72.30	51.60
BU07724250	Rapenland	WK077242	Eindhoven	66	65	17	60	61	23	52	89	9	30	62	20	5.400	6.600	53.30	76.00	46.50
BU07724310	Generalenbuurt	WK077243	Eindhoven	67	68	19	57	63	23	44	92	15	17	57	21	5.700	7.000	50.00	74.00	50.90
BU07724320	Oude Toren	WK077243	Eindhoven	69	71	8	65	62	27	48	86	19	21	60	28	5.600	7.100	45.70	70.50	48.30
BU07724340	Oude Gracht-West	WK077243	Eindhoven	67	71	16	58	77	26	79	88	9	24	62	24	6.700	7.300	47.30	74.40	50.60
BU07724350	Oude Gracht-Oost	WK077243	Eindhoven	72	75	9	71	65	20	89	96	7	6	79	37	6.700	7.300	51.70	82.10	45.10
BU07725110	Driehoeksbos	WK077251	Eindhoven	65	71	13	65	70	22	70	92	12	17	68	36	6.200	7.400	49.10	80.80	50.70
BU07725120	Prinsejagt	WK077251	Eindhoven	65	71	13	65	70	22	70	92	12	17	68	36	6.200	7.400	47.90	73.80	52.20
BU07725130	Jagershoef	WK077251	Eindhoven	60	62	27	42	61	32	65	90	17	35	63	25	5.000	6.600	46.70	67.70	57.20
BU07725140	't Hool	WK077251	Eindhoven	75	73	6	69	64	25	78	94	14	29	59	21	5.600	6.700	51.40	72.40	51.40
BU07725150	Winkelcentrum	WK077251	Eindhoven	75	73	6	69	64	25	78	94	14	29	59	21	5.600	6.700	52.70	79.30	44.10
BU07725160	Vlokhoven	WK077251	Eindhoven	65	64	26	48	63	25	45	89	19	35	52	24	5.300	6.300	46.10	68.90	53.10
BU07725210	Kerkdorp Acht	WK077252	Eindhoven	68	70	19	67	56	14	76	88	5	8	73	32	6.800	7.800	50.80	81.10	50.00
BU07725220	Achtse Barrier-Gunterslaer	WK077252	Eindhoven	61	66	27	54	65	19	93	84	7	16	63	34	6.300	7.300	49.10	79.20	53.30
BU07725230	Achtse Barrier-Spaalhoef	WK077252	Eindhoven	71	73	21	60	58	20	80	80	7	8	65	19	6.400	7.200	50.20	80.40	53.70
BU07725240	Achtse Barrier-Hoeven	WK077252	Eindhoven	63	71	24	62	63	14	85	81	18	10	62	23	6.500	7.200	48.60	77.40	54.10
BU07725310	Woenselse Heide	WK077253	Eindhoven	68	69	17	68	64	15	81	98	14	21	58	21	5.900	7.000	46.90	73.00	54.90
BU07725320	Tempel	WK077253	Eindhoven	57	69	23	58	59	19	85	97	13	19	55	20	6.000	7.000	46.20	71.50	55.90
BU07725330	Blixembosch-West	WK077253	Eindhoven	76	76	12	69	63	19	81	94	7	9	76	20	6.800	7.700	52.40	83.70	49.20
BU07725340	Blixembosch-Oost	WK077253	Eindhoven	76	76	12	69	63	19	81	94	7	9	76	20	6.800	7.700	53.00	83.60	48.50
BU07725410	Eckart	WK077254	Eindhoven	60	68	28	53	64	19	75	85	13	24	56	26	6.500	7.200	44.50	69.40	55.80
BU07725420	Luytelaer	WK077254	Eindhoven	72	75	9	71	64	20	89	96	7	6	79	37	6.500	7.200	50.40	81.40	45.10
BU07725430	Vaartbroek	WK077254	Eindhoven	59	67	18	59	64	23	80	81	12	33	57	21	5.500	6.600	46.00	71.10	54.90
BU07725440	Heesterakker	WK077254	Eindhoven	70	68	26	54	58	20	85	85	4	14	62	19	6.500	7.200	52.00	81.80	53.10
BU07726110	Elisternein, Vonderkwartier	WK077261	Eindhoven	77	69	6	61	57	33	91	96	4	11	75	34	6.800	7.600	58.50	83.00	38.70
BU07726120	Philipsdorp	WK077261	Eindhoven	70	65	6	54	43	40	54	92	10	22	72	22	6.100	7.200	56.70	80.10	38.80
BU07726130	Engelsbergen	WK077261	Eindhoven	77	69	6	61	57	33	91	96	4	11	75	34	6.800	7.600	56.00	83.10	41.30
BU07726140	Schouwbroek	WK077261	Eindhoven	70	65	6	54	43	40	54	92	10	22	72	22	6.100	7.200	52.60	76.80	45.50
BU07726150	School	WK077261	Eindhoven	70	68	10	49	48	40	54	93	9	16	67	30	6.400	7.400	55.90	81.30	38.60
BU07726160	Strijp S	WK077261	Eindhoven	73	71	2	46	36	52	58	96	8	17	80	29	6.100	7.400	61.20	86.00	30.80
BU07726220	Het Ven	WK077262	Eindhoven	70	68	10	49	48	40	54	93	9	16	67	30	6.400	7.400	49.40	76.10	47.00
BU07726230	Lievendaal	WK077262	Eindhoven	69	72	15	67	57	18	87	95	10	16	60	17	5.600	7.100	46.90	74.10	52.90
BU07726240	Drents Dorp	WK077262	Eindhoven	71	68	19	45	55	36	78	91	13	24	62	23	6.400	7.200	47.80	70.90	52.10
BU07726250	Zwaanstraat	WK077262	Eindhoven	70	68	4	54	56	43	95	100	4	12	77	32	6.400	7.200	54.50	89.10	39.40
BU07726330	Grasrijk	WK077263	Eindhoven	73	79	10	59	51	31	87	99	8	10	80	25	6.100	7.800	51.90	83.30	47.00
BU07726340	Zandrijk	WK077263	Eindhoven	73	79	10	59	51	31	87	99	8	10	80	25	6.100	7.600	49.50	80.60	50.00
BU07726350	Waterrijk	WK077263	Eindhoven	70	74	5	61	56	35	93	100	9	14	75	32	5.600	7.400	52.30	87.60	43.20
BU07726390	Bosrijk	WK077263	Eindhoven	73	79	10	59	51	31	87	99	8	10	80	25	6.100	7.600	50.40	87.10	45.80
BU07726399	Meerrijk	WK077263	Eindhoven	70	74	5	61	56	35	93	100	9	14	75	32	5.600	7.400	47.70	82.50	47.20
BU07727110	Schrijversbuurt	WK077271	Eindhoven	79	74	7	60	56	33	83	97	5	10	74	22	6.800	7.500	56.00	81.70	39.80
BU07727120	Oude Spoorbaan	WK077271	Eindhoven	79	74	7	60	56	33	83	97	5	10	74	22	6.800	7.500	56.00	80.40	39.30
BU07727130	Hagenkamp	WK077271	Eindhoven	79	74	7	60	56	33	83	97	5	10	74	22	6.800	7.500	43.10	67.80	49.10
BU07727210	Genderdal	WK077272	Eindhoven	76	74	13	65	69	22	83	93	12	40	58	24	5.200	6.400	46.60	70.30	50.60
BU07727220	Blaarthem	WK077272	Eindhoven	66	65	9	51	52	39	74	95	7	32	71	24	5.500	6.500	48.90	72.30	49.90
BU07727230	Rapelenburg	WK077272	Eindhoven	66	65	9	51	52	39	74	95	7	32	71	24	5.500	6.600	55.00	84.40	39.40
BU07727240	Bennekel-Oost	WK077272	Eindhoven	72	71	18	57	66	24	81	93	10	28	53	16	5.500	6.600	48.90	75.00	48.80
BU07727250	Bennekel-West, Gagelbosc	WK077272	Eindhoven	72	71	18	57	66	24	81	93	10	28	53	16	5.500	6.600	45.10	70.50	54.00
BU07727310	Genderbeemd	WK077273	Eindhoven	76	72	9	62	66	29	83	93	6	13	67	29	6.400	7.200	50.70	79.30	49.50
BU07727320	Hanevoet	WK077273	Eindhoven	66	68	18	60	63	22	92	86	9	18	61	25	6.500	7.300	45.80	73.90	53.70
BU07727330	Ooievaarsnest	WK077273	Eindhoven	66	68	18	60	63	22	92	86	9	18	61	25	6.500	7.300	53.10	83.20	45.80

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23	56.70	42	4.400	34.000	74.000	11.000	51.000	69.000	11.300	28.600	1.500	28.300	69.700	30	59	54	48	48.571	44	58.80
11	53.70	54	4.200	92.000	81.000	9.000	56.000	73.000	1.100	2.900	0.000	1.100	5.100	37	58	49	48	70.143	42	58.43
11	58.30	54	4.300	46.000	74.000	1.000	56.000	73.000	10.800	9.400	0.000	2.700	22.900	37	59	49	48	57.000	43	59.15
10	50.10	59	4.000	100.000	78.000	22.000	61.000	75.000	2.100	3.700	0.000	0.000	5.800	40	57	63	41	73.143	40	56.90
10	51.30	54	4.200	100.000	93.000	0.000	61.000	72.000	0.600	0.000	0.000	0.000	0.600	39	57	57	42	73.286	42	56.78
2	47.50	71	3.800	100.000	85.000	34.000	66.000	76.000	0.000	2.900	0.000	0.000	2.900	44	56	66	41	74.857	38	56.35
10	48.20	59	3.800	100.000	78.000	17.000	61.000	75.000	1.000	1.400	0.000	0.000	2.400	40	55	63	40	73.143	38	54.53
10	48.90	54	4.300	91.000	78.000	1.000	61.000	72.000	0.000	2.300	0.000	0.000	2.300	39	56	57	41	70.714	43	55.75
19	54.50	53	4.400	9.000	67.000	11.000	60.000	69.000	2.500	3.300	0.000	0.000	5.800	38	57	58	44	46.000	44	57.13
10	48.10	54	3.600	100.000	70.000	77.000	61.000	72.000	0.000	1.500	1.500	1.500	4.500	39	56	57	41	73.286	36	56.35
2	39.20	71	3.600	100.000	59.000	100.000	66.000	76.000	0.000	0.000	0.000	3.400	3.400	44	55	66	40	74.857	36	55.00
19	54.40	53	4.200	100.000	81.000	16.000	60.000	69.000	1.100	3.200	0.000	0.000	4.300	38	57	58	44	72.000	42	56.55
9	45.60	81	4.100	100.000	85.000	18.000	71.000	75.000	1.200	2.100	0.000	0.600	3.900	46	56	64	41	76.286	41	56.05
2	47.50	71	3.700	93.000	67.000	82.000	66.000	76.000	0.700	1.500	0.000	0.000	2.200	44	53	68	39	72.857	37	53.43
8	35.90	93	0.000	92.000	48.000	92.000	76.000	76.000	1.400	2.700	1.400	0.000	5.500	55	54	63	39	77.857	0	54.43
8	39.90	93	0.000	91.000	59.000	59.000	76.000	76.000	2.700	0.000	0.000	0.000	2.700	55	55	63	39	77.571	0	54.88
5	42.60	75	0.000	100.000	48.000	64.000	69.000	78.000	1.600	0.000	0.000	0.000	1.600	46	56	64	40	73.429	0	55.70
18	54.20	53	3.900	100.000	70.000	72.000	58.000	69.000	1.700	2.700	0.000	0.000	4.400	36	57	60	45	69.714	39	56.50
18	48.30	53	4.000	100.000	89.000	26.000	58.000	69.000	2.200	1.700	0.600	1.700	6.200	36	56	60	45	69.714	40	55.60
18	58.20	53	4.200	100.000	59.000	35.000	58.000	69.000	3.900	4.600	0.000	0.000	8.500	36	56	60	45	69.714	42	56.00
5	39.90	75	0.000	99.000	37.000	48.000	69.000	78.000	0.600	0.600	0.000	0.000	1.200	46	55	64	40	73.143	0	55.38
10	54.90	59	3.900	100.000	85.000	1.000	61.000	75.000	3.700	4.700	0.000	1.900	10.300	40	57	63	41	73.143	39	56.50
12	50.80	49	4.300	100.000	78.000	41.000	60.000	74.000	1.600	1.300	0.000	0.000	2.900	35	57	57	43	70.714	43	56.65
5	41.80	75	0.000	77.000	37.000	82.000	69.000	78.000	0.000	1.600	0.000	0.000	1.600	46	53	64	38	66.857	0	53.00
7	43.80	68	3.700	94.000	78.000	7.000	67.000	76.000	0.400	4.100	0.400	0.400	5.300	43	56	60	44	73.000	37	55.65
14	54.80	52	4.100	100.000	74.000	22.000	55.000	71.000	1.200	1.900	0.000	0.600	3.700	34	57	58	44	69.429	41	56.55
22	53.40	50	3.900	100.000	74.000	19.000	58.000	70.000	2.800	1.700	0.000	0.000	4.500	35	57	55	48	68.429	39	56.60
22	57.40	50	3.900	100.000	67.000	48.000	58.000	70.000	2.800	4.200	0.000	0.000	7.000	35	56	55	47	68.429	39	56.43
22	42.10	50	0.000	100.000	63.000	59.000	58.000	70.000	2.300	3.500	0.000	0.000	5.800	38	55	57	48	72.000	0	55.35
10	52.30	63	3.800	100.000	59.000	48.000	63.000	71.000	1.500	2.800	0.500	0.300	5.100	43	56	58	43	71.286	38	56.45
10	54.00	63	0.000	99.000	74.000	60.000	63.000	71.000	2.400	1.100	0.000	0.000	3.500	43	57	58	44	71.000	0	56.63
7	40.20	68	0.000	29.000	33.000	100.000	67.000	76.000	0.000	0.000	0.000	0.000	4.400	43	54	59	43	54.429	0	54.40
7	39.20	68	0.000	4.000	33.000	98.000	67.000	76.000	0.000	0.000	0.000	0.000	4.400	43	55	59	44	47.286	0	54.95
28	58.10	34	4.100	100.000	63.000	43.000	49.000	65.000	1.400	1.400	0.000	0.000	2.800	31	58	53	51	67.857	41	57.65
28	59.50	34	4.100	100.000	78.000	23.000	49.000	65.000	2.500	2.900	0.000	0.400	5.800	31	59	53	52	67.857	41	58.75
51	60.30	39	4.300	100.000	81.000	6.000	50.000	55.000	3.300	4.100	0.500	1.300	9.200	33	58	49	54	67.857	43	58.30
51	56.70	39	4.200	100.000	85.000	20.000	50.000	55.000	6.600	7.200	0.000	0.600	14.400	33	56	49	53	67.857	42	56.33
12	59.80	41	4.000	84.000	67.000	72.000	56.000	71.000	1.500	1.500	0.000	0.000	3.000	36	59	62	46	64.000	40	58.90
38	55.50	57	4.100	100.000	89.000	16.000	61.000	65.000	1.800	2.300	0.700	0.000	4.800	41	57	56	49	73.286	41	57.40
36	57.10	30	4.000	100.000	78.000	16.000	48.000	62.000	2.100	2.300	0.000	0.000	4.400	28	55	56	49	65.714	40	55.20
13	51.50	57	4.200	100.000	81.000	13.000	61.000	71.000	3.400	2.400	0.000	0.000	5.800	36	57	61	43	70.286	42	57.22
23	56.30	46	4.000	100.000	85.000	41.000	54.000	66.000	3.300	1.300	0.000	0.300	4.900	32	58	57	49	67.714	40	57.55
23	56.60	46	4.100	100.000	85.000	37.000	54.000	66.000	3.000	4.700	0.000	0.000	7.700	32	58	57	49	67.714	41	58.10
10	53.70	52	4.000	100.000	70.000	65.000	57.000	70.000	1.300	2.200	0.000	0.000	3.500	36	57	58	44	70.286	40	57.15
12	55.40	41	3.900	100.000	63.000	62.000	56.000	71.000	1.200	1.200	0.000	0.600	3.000	36	55	62	44	68.571	39	54.98
5	53.70	68	3.700	100.000	81.000	96.000	67.000	73.000	0.700	1.100	0.000	0.000	1.800	42	57	60	46	71.714	37	56.50
5	53.60	68	0.000	100.000	56.000	58.000	67.000	73.000	3.000	3.000	0.000	0.000	6.000	45	58	65	41	75.286	0	58.13
2	42.50	65	3.600	100.000	41.000	89.000	62.000	74.000	4.200	6.200	2.100	0.000	12.500	44	56	61	43	73.714	36	55.78
2	52.10	65	3.700	100.000	67.000	77.000	62.000	74.000	0.600	1.900	0.400	0.400	3.300	44	56	61	43	73.714	37	56.50
21	56.80	46	4.000	100.000	70.000	66.000	50.000	66.000	0.600	2.000	0.000	0.000	2.600	35	57	51	50	69.286	40	57.10
24	56.50	45	3.800	100.000	56.000	60.000	56.000	67.000	1.800	3.100	0.000	0.000	4.900	34	58	65	48	70.000	38	57.93
24	55.90	45	4.100	100.000	74.000	40.000	56.000	67.000	7.400	17.800	0.000	5.900	31.100	34	58	65	48	70.000	41	58.00
23	57.10	42	3.900	100.000	74.000	64.000	53.000	63.000	3.700	2.300	0.000	0.600	6.600	35	56	54	49	69.000	39	56.30
2	41.50	79	3.700	87.000	41.000	50.000	68.000	78.000	0.000	0.600	0.000	0.300	0.900	46	56	62	40	69.714	37	55.85
3	45.20	59	3.900	100.000	78.000	53.000	63.000	73.000	1.300	2.400	0.300	0.300	4.300	41	57	55	43	70.143	39	56.70
2	43.60	65	3.700	100.000	59.000	48.000	64.000	72.000	0.900	0.700	0.000	0.000	1.600	39	57	62	41	68.143	37	56.98
7	46.90	55	3.800	100.000	52.000	65.000	65.000	72.000	1.800	1.800	0.000	0.000	3.600	40	57	60	41	68.857	38	56.75
14	51.50	59	4.000	100.000	67.000	62.000	59.000	70.000	2.100	2.500	0.200	0.600	5.400	38	57	61	45	72.857	40	56.58
13	51.90	59	3.800	100.000	70.000	50.000	60.000	70.000	0.600	2.400	0.200	0.200	3.400	38	56	57	44	72.571	38	56.38
6	41.10	78	0.000	100.000	67.000	66.000	68.000	77.000	0.000	0.000	0.000	0.000	0.000	43	57	66	41	73.857	0	56.60
6	42.50	78	3.600	100.000	74.000	56.000	68.000	77.000	0.400	0.000	0.000	0.000	0.400	43	57	66	41	73.857	36	56.90
13	55.70	71	3.700	100.000	81.000	72.000	65.000	72.000	1.600	1.900	0.000	0.200	3.700	44	56	56	45	71.714	37	56.35
13	42.30	71	0.000	94.000	56.000	73.000	65.000	72.000	0.000	0.000	0.000	0.000	0.000	45	55	65	39	73.571	0	54.80
27	55.60	51	3.600	99.000	74.000	56.000	55.000	66.000	3.300	1.400	0.200	0.000	4.900	35	57	56	49	66.429	36	56.90
18	41.90	67	3.700	98.000	59.000	48.000	65.000	72.000	0.800	0.400	0.000	0.000	1.200	39	57	58	43	69.000	37	57.23
7	46.90	66	4.400	100.000	67.000	28.000	68.000	76.000	1.600	0.600	0.000	0.300	2.500	43	57	62	42	74.429	44	56.78
10	51.40	57	4.200	100.000	85.000	20.000	61.000	72.000	3.300	3.600	0.000	0.300	7.200	38	57	57	45	71.143	42	56.75
7	43.50	66	3.700	100.000	70.000	47.000	68.000	76.000	3.200	7.900	0.000	0.000	11.100	43	56	62	41	74.429	37	55.97
10	50.60	57	4.000	100.000	89.000	6.000	61.000	72.000	1.300	2.000	0.000	0.700	4.000	38	56	57	45	71.143	40	56.37
13	55.40	64	4.200	100.000	78.000	22.000	64.000	74.000	0.900	1.400	0.300	0.300	2.900	42	58	57	44	73.143	42	57.80
10	48.50	63	4.400	77.000	63.000	35.000	61.000	74.000	1.700	8.400	0.000	0.600	10.700	40	57	58	44	66.571	44	56.63
13	51.70	64	4.000	97.000	78.000	34.000	64.000	74.000	1.300	1.300	0.500	0.300	3.400	42	56	57	43	72.286	40	56.05
5	53.30	60	3.800	100.000	70.000	63.000	56.000	71.000	2.900	2.200	0.300	0.000	5.400	36	57	63	43	71.143	38	56.80
12	55.80	58	4.100	100.000	70.000	57.000	64.000	72.000	0.800	0.400	0.400	0.000	1.600	40	57	56	46	71.714	41	56.65
12	38.20	58	4.200	97.000	52.000	60.000	64.000	72.000	1.600	0.800	0.000	0.000	2.400	40	55	58	41	73.429	42	55.30
3	47.30	56	0.000	100.000	19.000	91.000	61.000	78.000	1.400	1.000	0.000	0.000	2.400	38	57	64	41	73.143	0	57.38
3	45.60	56	3.900	100.000	37.000	94.000	61.000	76.000	2.100	1.000	0.000	0.300	3.400	38	56	65	41	73.143	39	56.43
12	42.80	43	3.600	100.000	22.000	92.000	56.000	74.000	0.400	2.000	0.000	0.000	2.400	35	56	62	42	72.143	36	56.47
3	40.30	56	0.000	100.000	26.000	100.000	61.000	76.000	0.000	2.400	2.400	0.000	4.800	38	56	64	41	73.143	0	56.90
12	48.40	43	0.000	100.000	74.000	100.000	56.000	74.000	0.000	2.500	0.000	2.500	5.000	35	56	62	42	72.143	0	56.45
7	45.40	61	3.900	100.000	78.000	29.000	68.000	75.000	2.200	3.600	0.000	0.300	6.100	39	56	64	41	73.000	39	55.73
7	53.70	61	4.300	100.000	85.000	17.000	68.000	75.000	1.900	2.800	0.500	0.500	5.700	39	57	64	41	73.000	43	57.35
7	58.30	61	3.800	100.000	78.000	86.000	68.000	75.000	2.600	1.700	0.000	0.000	4.300	39	55	64	40	73.000	38	54.58
24	57.50	37	3.900	100.000	74.000	76.000	52.000	64.000	1.000	1.400	0.300	0.000	2.700	31	56	65	51	68.429	39	56.25
25	56.10	41	4.200	100.000	74.000	27.000	55.000	65.000	2.500	4.100	0.000	0.000	6.600	32	57	55	49	69.429	42	56.80
25	47.80	41	3.900	100.000	74.000	53.000	55.000	66.000	0.900	0.000	0.000	0.000	0.900	32	57	55	49	69.429	39	56.65
23	55.80	45	3.600	100.000	85.000	56.000	55.000	66.000	3.600	4.500	0.600	0.300	9.000	32	57	61	47	68.857	36	57.13
23	54.70	45	3.800	100.000	70.000	55.000	55.000	66.000	1.500	1.500	0.000	0.000	3.000	32	56	61	47	68.857	38	56.08
6	47.50	64	3.700	100.000	73.000	55.000	64.000	72.000	1.100	2.200	0.000	0.000	3.300	41	57	63	42	72.714	37	56.75
4	51.20	70	3.700	100.000	70.000	57.000	65.000	73.000	2.200	3.300	0.300	1.100	6.900	42	56	59	43	71.143	37	56.15
4	40.00	70	0.000	98.000	48.000	71.000	65.000	73.000	0.000	1.100	0.000	0.000	1.100		56	58	43		0	55.53

!SOCICHOS!	!OVLCOMLIF	!!NATURENV	!!SOCIAENV	!!PHYWELLB	!!SOCWELLB	NASOENPHSW	NAOSENPHSW
51	30.25	59	41	48	46	49	49
56	37.00	53	31	48	66	50	50
56	37.00	53	30	48	55	47	47
61	40.00	67	42	41	69	55	55
61	38.50	61	43	42	69	54	54
66	43.75	70	62	41	71	61	61
61	40.00	67	40	39	69	54	54
61	38.50	61	43	41	67	53	53
60	38.25	62	48	44	45	50	50
61	38.50	61	72	41	69	61	61
66	43.75	70	86	40	71	67	67
60	38.25	62	50	44	68	56	56
71	46.25	68	49	41	73	58	58
66	43.75	71	80	39	69	65	65
76	54.50	63	79	39	75	64	64
76	54.50	63	66	39	75	61	61
69	46.00	64	72	40	70	62	62
58	36.25	64	69	45	66	61	61
58	36.25	64	52	44	66	57	57
58	36.25	64	56	45	66	58	58
69	46.00	64	66	40	70	60	60
61	40.00	67	35	41	69	53	53
60	34.50	61	56	42	66	56	56
69	46.00	64	78	38	64	61	61
67	43.25	63	40	44	69	54	54
55	34.25	63	30	43	65	50	50
58	34.50	59	36	48	64	52	52
58	34.50	59	47	48	64	55	55
58	38.00	57	48	48	68	55	55
63	42.50	62	57	43	68	58	58
63	42.50	58	61	43	67	57	57
67	43.25	59	75	43	53	58	58
67	43.25	59	73	44	47	56	56
49	31.00	57	52	51	63	56	56
49	31.00	57	45	52	63	54	54
50	32.75	54	23	55	63	49	49
50	32.75	54	29	53	63	50	50
56	36.00	66	51	46	61	56	56
61	40.75	60	41	50	69	55	55
48	28.00	60	27	49	61	49	49
61	36.25	65	36	43	66	53	53
54	32.25	61	42	48	63	54	54
54	32.25	61	41	49	63	54	54
57	36.25	62	47	44	66	55	55
56	36.00	66	48	44	65	56	56
67	42.00	63	76	46	68	63	63
67	44.75	65	67	41	71	61	61
62	43.75	64	70	43	70	62	62
62	43.75	65	64	43	70	61	61
50	34.50	55	58	50	65	57	57
56	34.00	69	62	48	66	61	61
56	34.00	69	58	48	66	60	60
53	34.50	58	47	49	65	55	55
68	46.00	65	57	40	67	57	57
63	40.75	59	67	43	66	59	59
64	38.75	66	58	41	64	57	57
65	40.25	64	67	41	65	59	59
59	38.25	65	64	45	69	61	61
60	38.00	60	62	44	68	59	59
68	43.25	66	65	41	70	61	61
68	43.25	70	62	41	70	61	61
65	43.75	59	65	46	68	60	60
65	45.00	65	72	39	70	62	62
55	34.75	60	62	49	62	58	58
65	38.75	62	61	43	65	58	58
68	43.00	66	56	42	71	59	59
61	37.50	61	35	45	67	52	52
68	43.00	65	65	41	71	61	61
61	37.50	61	30	45	67	51	51
64	41.75	61	36	44	69	53	53
61	40.25	63	43	43	63	53	53
64	41.75	61	40	43	68	53	53
56	35.75	66	68	43	67	61	61
64	39.50	61	61	46	68	59	59
64	39.50	62	70	41	69	61	61
61	37.50	64	78	42	69	63	63
61	37.50	69	79	41	69	65	65
56	35.00	66	81	42	68	64	64
61	37.50	64	82	41	69	64	64
56	35.00	62	85	42	68	64	64
68	39.00	68	53	40	69	58	58
68	39.00	69	49	42	69	57	57
68	39.00	68	74	40	69	63	63
52	31.25	69	70	51	64	64	64
55	31.75	60	48	49	65	56	56
55	31.75	59	57	48	65	57	57
55	31.50	64	63	47	64	60	60
55	31.50	64	62	47	64	59	59
64	40.75	67	63	42	69	60	60
65	42.25	62	68	43	68	60	60
65	42.25	58	73	43	67	60	60

Graduation project:
Title: Attractive multi-scale public space in the densifying city of Eindhoven
Subtitle: Improving the quality of life with a toolbox for high-quality public space

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Master Architecture, Building and Planning
Graduation Studio: 'Density and Other Matters' (2022-2023)

Chair:
Architectural Urban Design and Engineering (AUDE)

Gradutation committee:

Prof.dr.ir. P.J.V. (Pieter) van Wesemael	Chair AUDE
Dr.ir. D. (Dena) Kasraian	First supervisor
Dr. G.Z. (Gamze) Dane	Second supervisor

Date:
September 2022-June 2023