

Young Carnisse

Enhancing mental wellbeing of adolescents in
Carnisse through urban design



Abstract

This graduation project investigates the relationship between public space and the mental wellbeing of adolescents in Carnisse, a post-war neighbourhood in Rotterdam. The project addresses the research question: *To what extent does public space influence the mental wellbeing of adolescents and how can its design be adapted to improve the wellbeing of adolescents in Carnisse?* It focuses on the context of post-war neighbourhoods, where spatial structure that were originally designed for housing efficiency, often mismatch with the contemporary social and developmental needs of adolescents.

Through a combination of literature review, historical analysis, spatial analysis and observations based on informed empathy, the research explores how adolescents use and experience public space. These findings show that mental wellbeing is primarily influenced by personal and societal factors, but that public space plays an important supporting role in relation to safety, social interaction, autonomy and connectedness to the neighbourhood. Public space can therefore contribute to creating environments in which adolescents feel comfortable, included, and welcome.

Based on these insights, a transformation strategy was developed that consists of three interconnected layers: connect, activate and intensify. By improving soft mobility routes, activating underutilized public spaces, and introducing new functions and youth housing, the project proposes a more inclusive and future-proof neighbourhood where the daily lives and experiences of adolescents are placed at the centre of urban development.

Keywords: mental wellbeing, adolescents, public space, post-war neighbourhood, urban design

Disclaimer

Generative AI (ChatGPT & DeepL) has been used in the project and report for spell checking, report structure and translation of texts.

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The problem statement

The urban environment plays an increasingly important role in supporting adolescent wellbeing, as young people have become more dependent on public space for social interaction, identity formation and daily activities (Oosterlynck & Beeckmans, 2022). At the same time, research shows that overall happiness of young people is declining, which, according to Dutch psychologist and psychiatrist Damiaan Denys, reflects the growing pressure on their mental wellbeing (Fikse & Denys, 2025; Blanchflower et al., 2024).

Although the Netherlands ranks relatively high in terms of national wellbeing, these averages often hide significant differences between regions and population groups (Centraal Bureau voor de Statistiek, 2024b). This shows that mental wellbeing is not only influenced by psychological wellbeing, but also by the daily living environment.

This becomes particularly relevant in urban contexts such as Rotterdam, where broad prosperity scores relatively low in both current and future projections (Centraal Bureau voor de Statistiek, 2024b). This suggests that in the upcoming years, people growing up in the city may face increasing challenges related to their quality of life, including mental wellbeing, social cohesion and access to healthy and safe living environments.

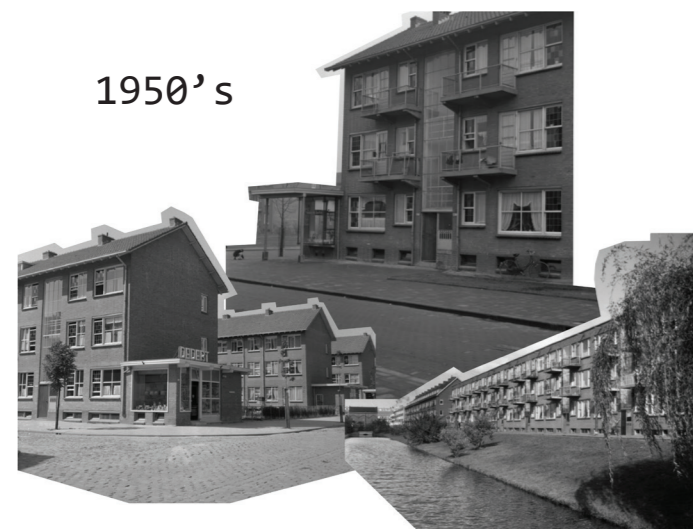


Fig. 1: Urban elements of Carnisse in the 1950's.
Note. Collage created by the author using images by Fototechnische Dienst Rotterdam (images have been cropped and assembled). Full source references have been provided in the reference list.

Within this context, Carnisse represents a typical post-war neighbourhood that is characterized by high density housing and limited private outdoor space. As a result, adolescents are strongly dependent on their immediate environment and public space for leisure and personal development (Tilstra, 2011). However, despite this dependence, their needs are often underrepresented in public space design (Middendorp et al., 2023; Emmelkamp, 1998). Instead, adolescents are frequently perceived as a problematic user group, which limits their inclusion in spatial design processes and reduces the potential supportive role of the built environment on their wellbeing.

Consequently, the general problem is that the spatial structures of post-war neighbourhoods, such as Carnisse, which were originally designed to address housing shortages, no longer align with the contemporary social and developmental needs of adolescents. This is illustrated in Figures 1 and 2, that show that while those needs of adolescents have changed significantly, the spatial configuration of Carnisse has mostly remained unchanged. This results in a mismatch between use and design, contributing to limited spatial inclusion, reduced perceived safety and a negative influence on mental wellbeing.



Fig. 2: Urban elements in Carnisse in 2025, showing that the spatial layout is still the same.
Note. Collage created by author using images from Google Street View.

& its relevance

As increasing density results in fewer people having access to private outdoor space, public space becomes more important in everyday life, and makes adolescents more dependent on their direct surroundings for social interaction, personal development and mental wellbeing (Oosterlynck & Beeckmans, 2022; Van Hecke et al., 2018).

At the same time, the mental wellbeing of young people is decreasing, strengthening the need for inclusive and supportive urban environment. This is especially relevant in post-war neighbourhoods, as those were originally designed for a different societal context and often do not represent contemporary ways of living.

Although extensive research has already been conducted on mental health, urban environments and overall wellbeing, there remains a gap in available data regarding concrete design interventions that targets the mental wellbeing of adolescents in public space design. This emphasizes the need to bridge the gap between theoretical understanding and spatial interventions.

Because Carnisse is representative of many post-war neighbourhoods, the insights from this project can also be applied to similar neighbourhoods. This increases the relevance of the project for municipalities, designers and policymakers, who can improve to incorporate adolescents into urban design processes and promote mental wellbeing through public space design.

The focus on adolescents does not imply exclusivity, rather, it addresses a group that is often underrepresented in urban design processes. Improving the inclusiveness and quality of public spaces can ultimately benefit all users of the urban environment.

The project scope

This project explores how the design and experience of public space in the urban context of Carnisse can support the mental wellbeing of adolescents. To make this project feasible, it will focus on a limited scope in terms of location, target group, spatial scale and thematic focus.

Case study location

Carnisse was selected as a case study for this project because it reflects many of the spatial and social conditions that are common in post-war neighbourhood in the Netherlands. According to statistics from CBS (Centraal Bureau voor de Statistiek, 2024b), Rotterdam scores relatively low on indicators of wellbeing compared to other Dutch municipalities. Within the municipality, significant differences exist between neighbourhoods on environmental, social and economic levels.

Located in Rotterdam Zuid (Figure 3), Carnisse is characterized by high urban density (Figure 4), relatively low average income levels, limited private outdoor space, and low liveability indicators compared to the national average (Figure 5). These conditions make the neighbourhood a relevant case study for investigating how the urban environment can better support everyday wellbeing.

The neighbourhood also experiences relatively high levels of nuisance involving adolescents, which can partly be understood as a result of adolescents informally claiming spaces that were not originally designed to accommodate their needs (Emmelkamp, 1998; Tilstra, 2011). Carnisse therefore provides a suitable context to investigate the spatial mismatch between post-war neighbourhood structures and the contemporary needs of adolescents.

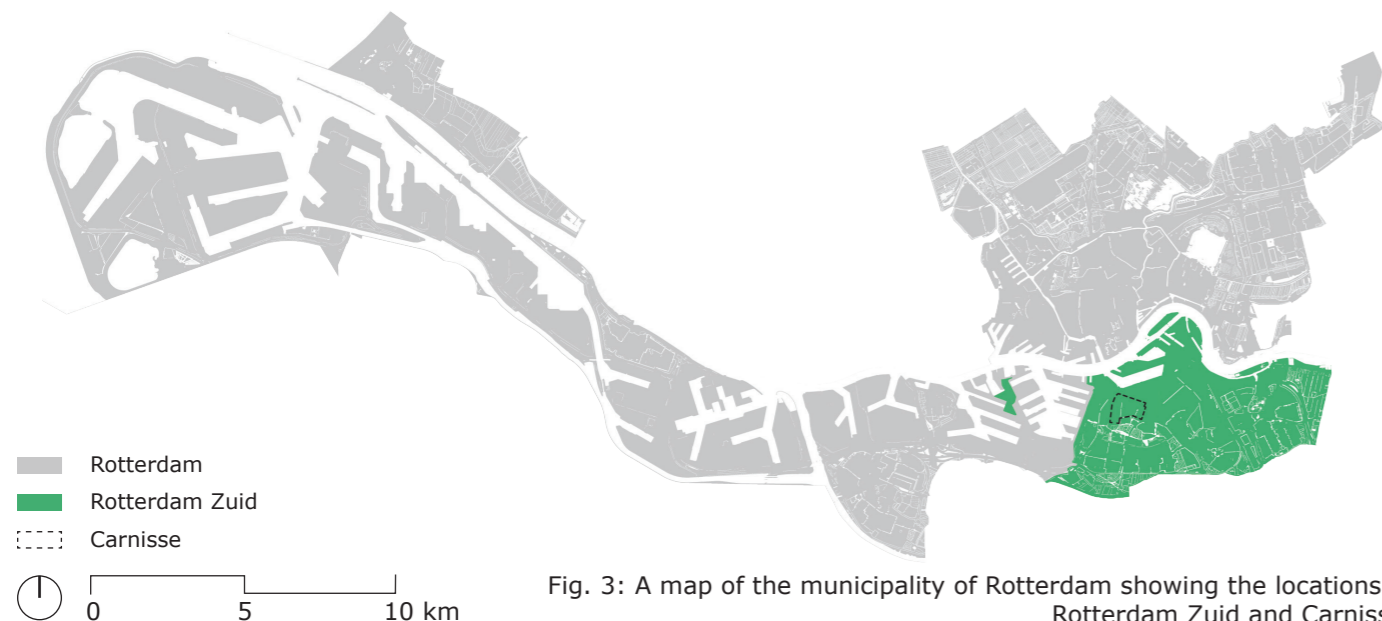


Fig. 3: A map of the municipality of Rotterdam showing the locations of Rotterdam Zuid and Carnisse. (Sources used: PDOK & OpenStreetMap)

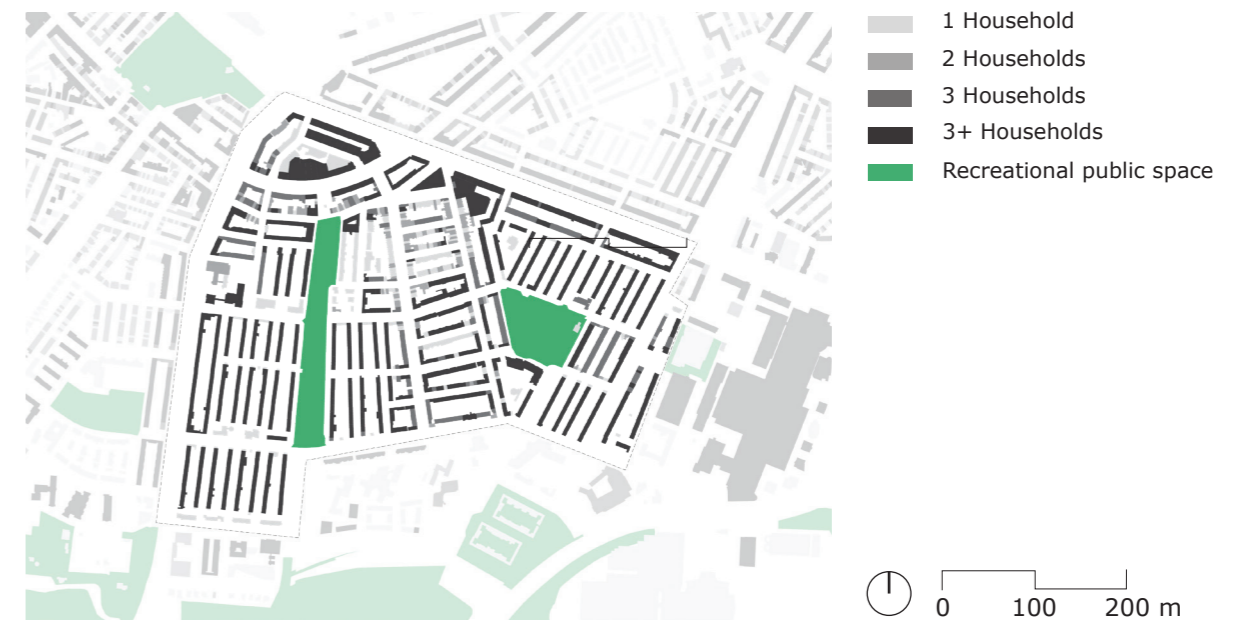


Fig. 4: A map of Carnisse, showing the amount of accommodations per building block. (Sources used: PDOK & OpenStreetMap)

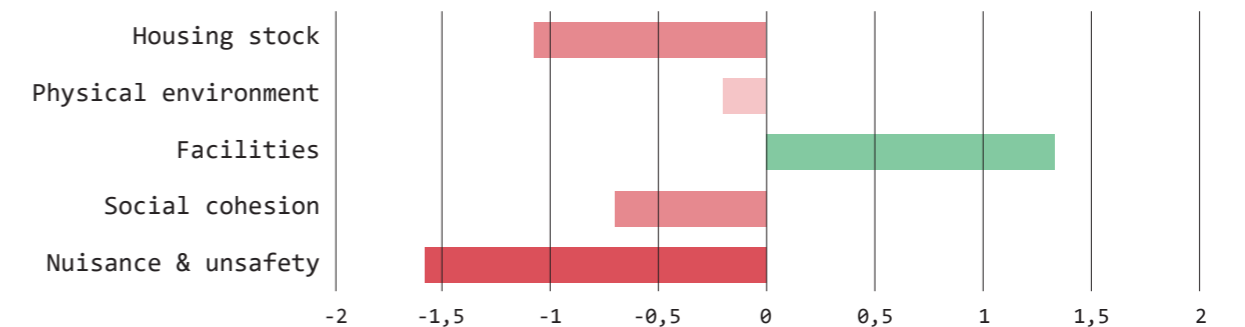


Fig. 5: A graph showing how Carnisse scores on several liveability aspects compared to the average Dutch neighbourhood. (Source: Leefbaarometer. (n.d.). *Leefbaarometerklasse Carnisse*. <https://leefbaarometer.nl/kaart/>)

Research focus

To better understand this spatial mismatch, the project examines the relationship between public space and the mental wellbeing of adolescents. The spatial experience of adolescents plays a major role in this, as this influences their feelings of wellbeing, and both their use and influence of the space.

Based on this use, experience and influence, the project examines how existing neighbourhood structures either support or limit adolescents' mental wellbeing, and how this could be improved. The focus is not only on individual public spaces, but also on their connections, networks and street structures. Thus, the focus is on their daily living environment, daily routes they take and the quality of the spaces that they move in or through.

Target group

The target group for the project is therefore adolescents between twelve and eighteen years old. According to researchers at Fontys University of Applied Sciences (Middendorp et al., 2023) and Ghent University (Van Hecke et al., 2018), public spaces offer adolescents opportunities to spend time freely, develop social relationships and explore independence without adult supervision. As a result, adolescents are intensive users of public space.

Compared to adults, adolescents are generally more dependent on their direct surroundings because of their limited mobility options and stronger reliance on local social networks (Provincie Noord-Holland, 2025). This increases the importance of creating accessible and supportive public spaces where they can develop socially and personally, and feel safe and accepted (Van Der Meulen & Van Melik, 2019).

Despite this strong dependence on public space, urban design processes often fail to include the needs and wishes of adolescents in urban design processes (Middendorp et al., 2023; Thijssen, 2020). This becomes increasingly relevant as the mental wellbeing of adolescents in the Netherlands has been deteriorating in recent years (Blanchflower et al., 2024; Volksgezondheid Toekomst Verkenning, 2018; RIVM, 2025; Polak, 2025).

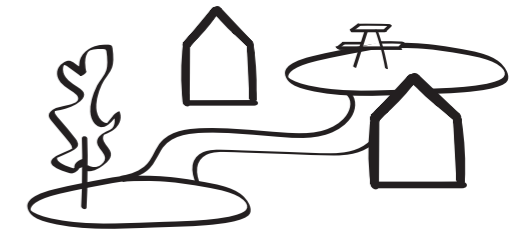
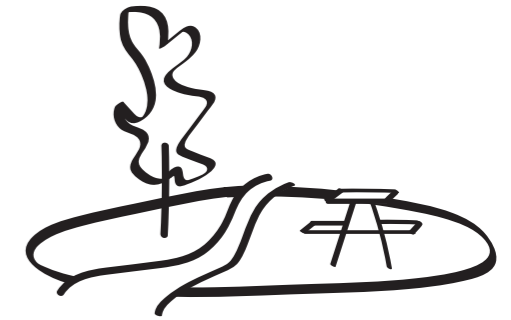
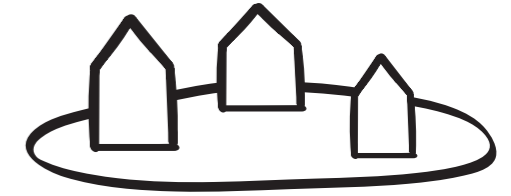
Design scope

The final goal for the project is to develop an urban design for the neighbourhood that is built up of three different interconnected scale levels.

The largest scale is on neighbourhood level and is presented through a strategic vision for Carnisse as a whole. Within this vision, the focus is on optimizing spatial connections and networks between amenities, public spaces and surrounding areas that are frequently used by adolescents.

The functions and improvements of these new routes are then explained using street level interventions and designs, which demonstrate how the connections are made safer and how certain places and routes are made more attractive to promote social control and safety. The focus here is on daily routes, traffic safety, the legibility of the streets and on implementation of human scales.

In addition to the connecting routes, the project also zooms in on three different public spaces, each of which different types and functions of locations and program. Within these more detailed designs, there is a focus on the relationship between in- and outside, to create an integrated design.



Limitations

As the project focuses on environmental and spatial interventions, it does not address clinical, physiological or medical treatment. It does not propose a full neighbourhood transformation, nor does it include policy making or detailed economic feasibility studies. However, policies and economic feasibility are considered based on accumulated knowledge.

In summary, this project focuses on creating spatial interventions in the urban context of Carnisse, that will help to improve the mental wellbeing of adolescents. This is done through implementations on neighbourhood, streetscape and public space level. By focusing on the specific context of Carnisse, it can be examined how the redesign of a post-war neighbourhood can contribute to broader social themes, such as liveability, social inclusion and equity, after which the insights may be applicable to similar neighbourhoods.

The objective & motivation

The ambition of this project is to acknowledge adolescents as legitimate users of public space, whose needs and experiences deserve to be considered within urban design, rather than being treated as a problem factor. By doing so, the project aims to explore how the mental wellbeing of adolescents can be better supported by the built environment.

To achieve this, the project develops a research-based and location-specific urban design proposal for Carnisse, investigating how spatial interventions can contribute to the mental wellbeing of adolescents. The design outcome consists of an integrated design strategy across three spatial scales, each addressing different aspects of daily experiences and making impact on different criteria.

At neighbourhood scale, the design focuses on connections within Carnisse and between the neighbourhood and its surrounding. This scale addresses accessibility, cohesion and perceived safety, by improving movement through the area for residents while strengthening connections to surrounding neighbourhoods.

On the scale of public space design, three locations are redesigned (1:250 – 1:1000), with each a different function and programming. These interventions aim to strengthen the attractiveness, usability and safety of the public spaces, while creating opportunities for social interaction and community engagement. The impact on this scale is most directly experienced by adolescents and other daily users, through increased social safety, vibrancy, quality of the space, and a stronger sense of belonging.

To complement the connections between the public spaces and the rest of the neighbourhood, several street profiles are redesigned to show how the everyday street environment can contribute to safety, autonomy and accessibility. These profiles focus on the balance between pedestrians, cyclists and cars, improving walkability and reducing stress in daily movement, affecting physical health. At the same time, variation in street character can contribute to a stronger sense of identity and belonging, by avoiding identical layouts that are often linked to social isolation and stigma among residents (Duhl & Sanchez, 1999).

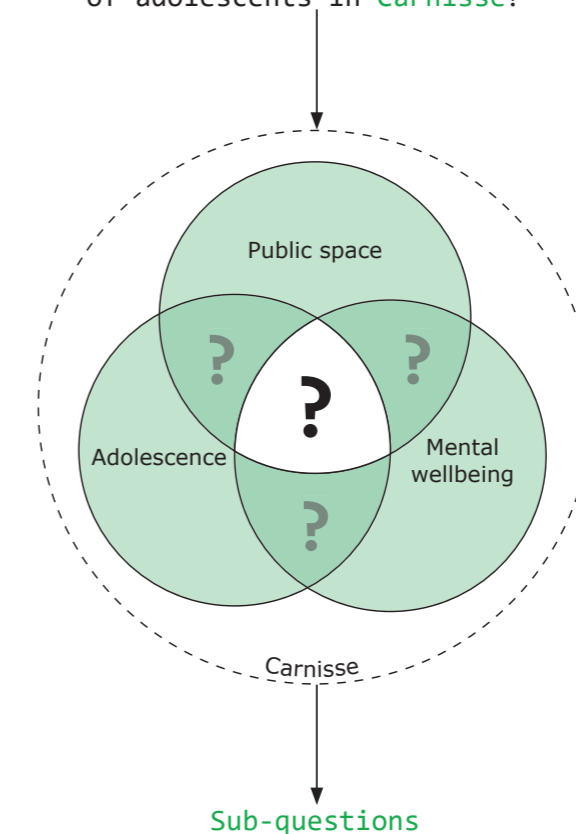
Together, these outputs will demonstrate how spatial design can operate across multiple scales to support safety, social inclusion and mental wellbeing. Through visual representations like maps, sections, and mood images, the project illustrates how public space can become more supportive for adolescents while contributing to a more inclusive and socially resilient environment for a wider range of users.

& Resulting research questions

To answer the main research question that guides this project, it is broken down into the three core themes: public space, mental wellbeing and adolescence. These themes are integrated into sub-questions that systematically address the overlap between them, in order to fill the knowledge gap.

The questions are addressed within the context of the case study in Carnisse, however, the scope gradually expanded if local data was unavailable. In such case, the research scaled up from Carnisse to Chalrois, to Rotterdam Zuid, to Rotterdam.

‘To what extent does public space influence the mental wellbeing of adolescents and how can its design be adapted to improve the wellbeing of adolescents in Carnisse?’



1. What influences the mental wellbeing of adolescents in Carnisse?
2. How do adolescents use, experience and influence public space in Carnisse?
3. How does public space influence mental wellbeing in Carnisse?

The research process

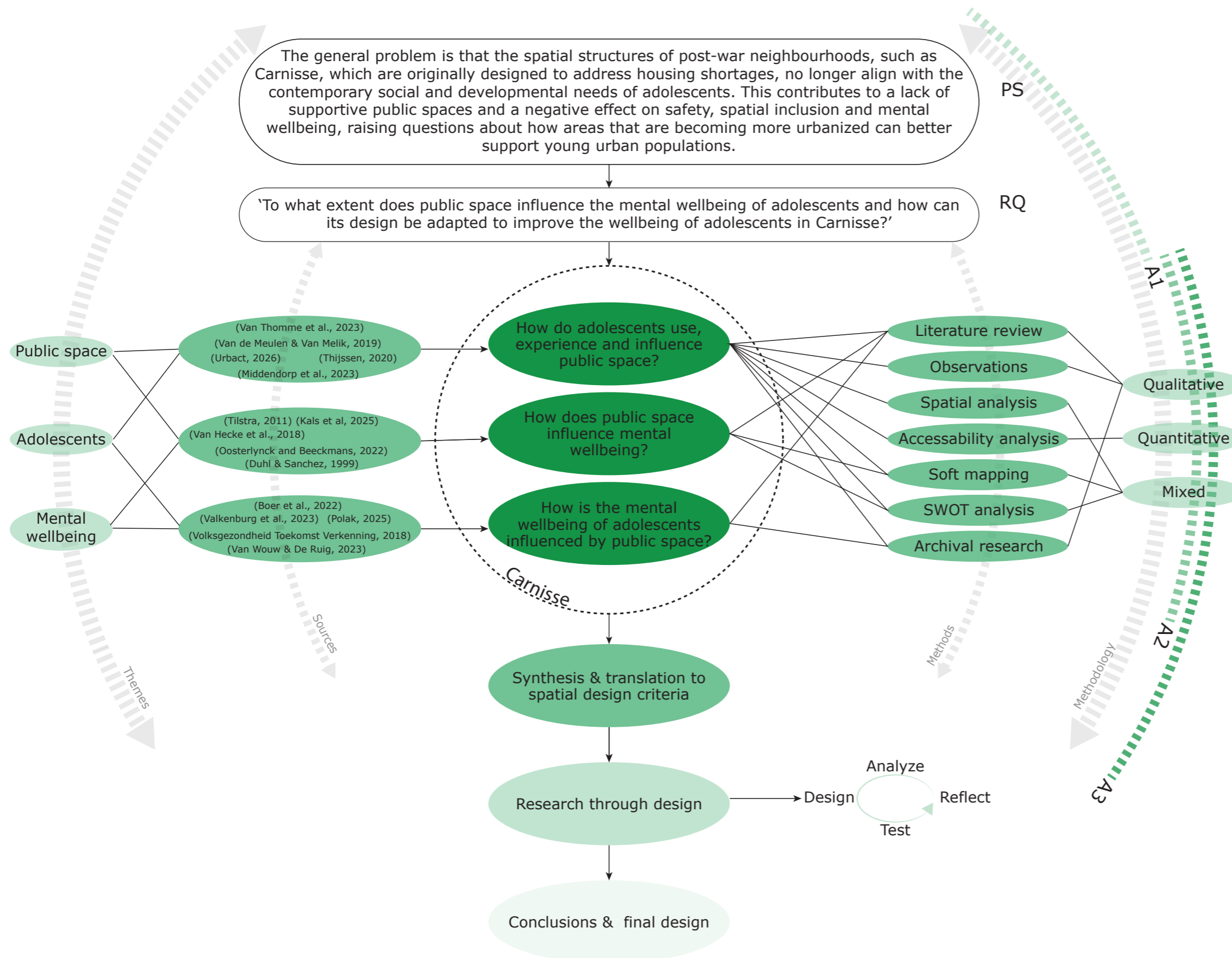


Fig. 7: The research diagram of the project, including the themes, applied sources, research questions, methodology and planning.

The research for the project is based on a combination of qualitative, quantitative and mixed-methods approaches. The process starts with the development of a theoretical framework to determine which theories and principles are relevant for answering the research questions.

As the three research questions each require different types of information, a mixed-methods approach is used, allowing the different methods to complement and reinforce each other (Dawadi et al., 2021). The research process is iterative rather than linear, meaning that the different research methods, data sources, and findings continuously inform and strengthen each other throughout the project.

Several research methods were applied, including a literature review, observations, soft mapping, spatial analysis, accessibility analysis, archival analysis, and a SWOT analysis that brings everything together. Each method contributes to different types of insights related to the use, experience and spatial qualities of public spaces in Carnisse.

The applied methods can be divided into on-site and off-site approaches. Off-site methods, such as the literature review and spatial GIS analysis formed the basis for understanding the broader context of Carnisse and its existing spatial and social issues, primarily utilizing secondary data sources. The subsequent on-site visits, observations and spatial analysis provided primary, detailed data on how the public spaces are actually used and experienced within the neighbourhood itself.

The gathered data does not directly translate into final design solutions. Rather, the research outcomes are synthesized and translated into design criteria that form the basis for the design interventions. In the final stage, these interventions were further explored, tested and evaluated through a research-through-design approach.

Figure 7 illustrates the research diagram, showing how the different research questions correspond to specific methods and data sources. Additionally, it shows the overall timeline of the project, showing how the steps connect to supporting the final design proposal.

The theoretical framework

To understand the relationship between public space and the mental wellbeing of adolescents, this chapter delves deeper into various theoretical concepts. Concepts from environmental psychology and urban planning help to underpin the research and justify the spatial interventions that are aimed at contributing to the wellbeing of adolescents.

Defining public space, wellbeing and adolescence

According to the United Nations Human Settlements Programme (UN-Habitat), "streets, sidewalks and cycling lanes, squares, parks and waterfronts, gardens and community courtyards are all of what we define as public space" (United Nations Human Settlements Programme (UN-Habitat) et al., 2022, p. 6). These spaces have primary functions, such as providing shelter or mobility, as well as secondary functions, such as fulfilling psychological and social needs (Kals et al., 2025). Urban design therefore influences not only what people do, but also how they feel.

The definition of mental wellbeing is interpreted in various ways, depending on setting and context. In this project, it is understood through the definition that is established by the Dutch National Institute for Public Health and the Environment (RIVM), which describes mental wellbeing as "the way you relate to yourself and others, and how you deal with the challenges of daily life" (RIVM, n.d.). Within the context of this research, this translates to adolescents feeling comfortable with themselves and being able to navigate their social and physical surroundings. Wellbeing is namely largely influenced by personal factors, but also by the physical and social environment in which people live (Felce & Perry, 1995).

Healthy urban planning

According to Barton and Tsourou (2000), who wrote a book on Healthy Urban Planning, commissioned by the WHO, the quality and experiences of public space can contribute to positive feelings and stress reduction through its influences on safety, inclusivity, and emotional comfort. Conversely, poorly designed or unsafe spaces can lead to increased stress, exclusion or a lack of connection.

Environmental psychology and place attachment

To better understand this dynamic, theories from environmental psychology are utilized. As noted in Kals et al. (2025), Bell et al. (2005) and Graumann & Kruse (2008) describe environmental psychology as "a subdiscipline of psychology that deals with the interactions between humans and their physical and sociocultural environments". According to this theory, the built environment directly influences both human behaviour and emotional experiences.

Furthermore, environmental psychology shows that people develop 'place attachment', which is an emotional bond with places where they live and feel comfortable (Fuhrer, 2008 as cited in Kals et al., 2025). This attachment influences the way that people experience and use the place, as it fosters a sense of responsibility.

By integrating insights from urban planning, environmental psychology, and youth studies, these theories provide the foundation for analysing the current situation in Carnisse, as shown in Figure 8. It demonstrates that public space is not merely a physical setting but also provides a social and psychological environment that directly impacts wellbeing.

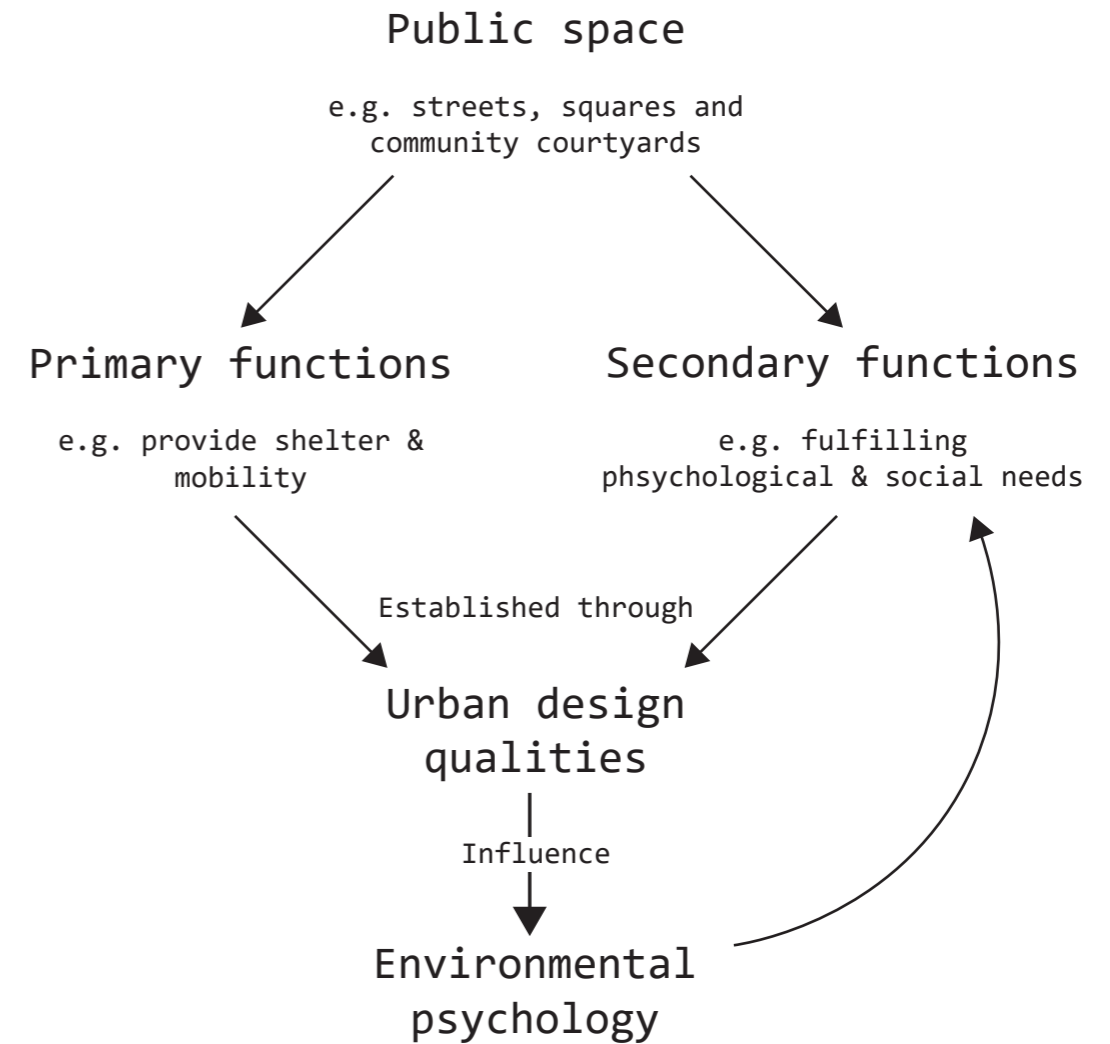


Fig. 8: A schematic diagram showing the relation between public space, urban design and environmental psychology.

Literature review

The research process started with a literature review to establish a theoretical foundation for the project and to identify the main themes related to public space, adolescence, and mental wellbeing. This review mainly utilized sources such as scientific articles, reports, academic theses, policy documents and newspaper articles.

To gain a better understanding of the relationship between public space and adolescent wellbeing, the review synthesized findings from both qualitative and quantitative studies. Comparing these diverse sources helped to identify recurring themes, similarities, differences, and specific knowledge gaps.

Where possible, recent Dutch sources published within the last five years were prioritized to ensure that the information reflects current societal developments. This was particularly relevant following the COVID-19 pandemic and its impact on mental wellbeing (Valkenburg et al., 2023). Older and international literature was also included, after they were critically evaluated for its relevance. These sources were utilized when they provided fundamental theoretical frameworks or critical insights that are relevant to urban design and public space.

Sources were mainly collected through Google Scholar and the TU Delft Library, using combinations of keywords related to public space, adolescents, and mental wellbeing. The search terms and their synonyms or related terms, such as, jongeren, tieners and adolescenten, were arranged per theme, as illustrated in Figure 9. Additionally, a snowball search strategy was applied by tracing references and citations within relevant publications to discover further relevant sources (Cranfield University, n.d.).

In addition to establishing this theoretical basis, the literature review also served to determine which additional research methods were necessary to fully address the research questions. Based on the identified themes, methods such as on-site observations, soft mapping, spatial analysis, and archival research were selected to further investigate the spatial and social dynamics within the context of Carnisse.

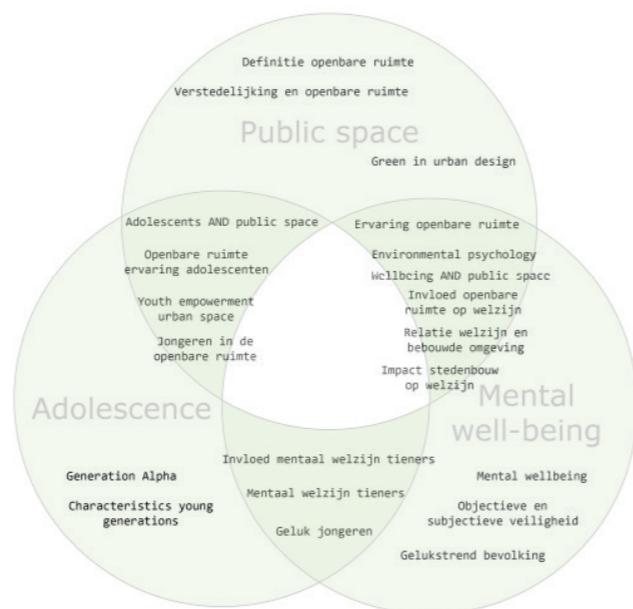


Fig. 9: Search terms used to find sources for the literature review.

To structure all the findings, the collected information was categorized according to the specific sub-research questions (Figure 10). The semi-structured approach resulted in a clear overview to compare insights, formulate coherent answers, and pinpoint the gaps that required additional field research.

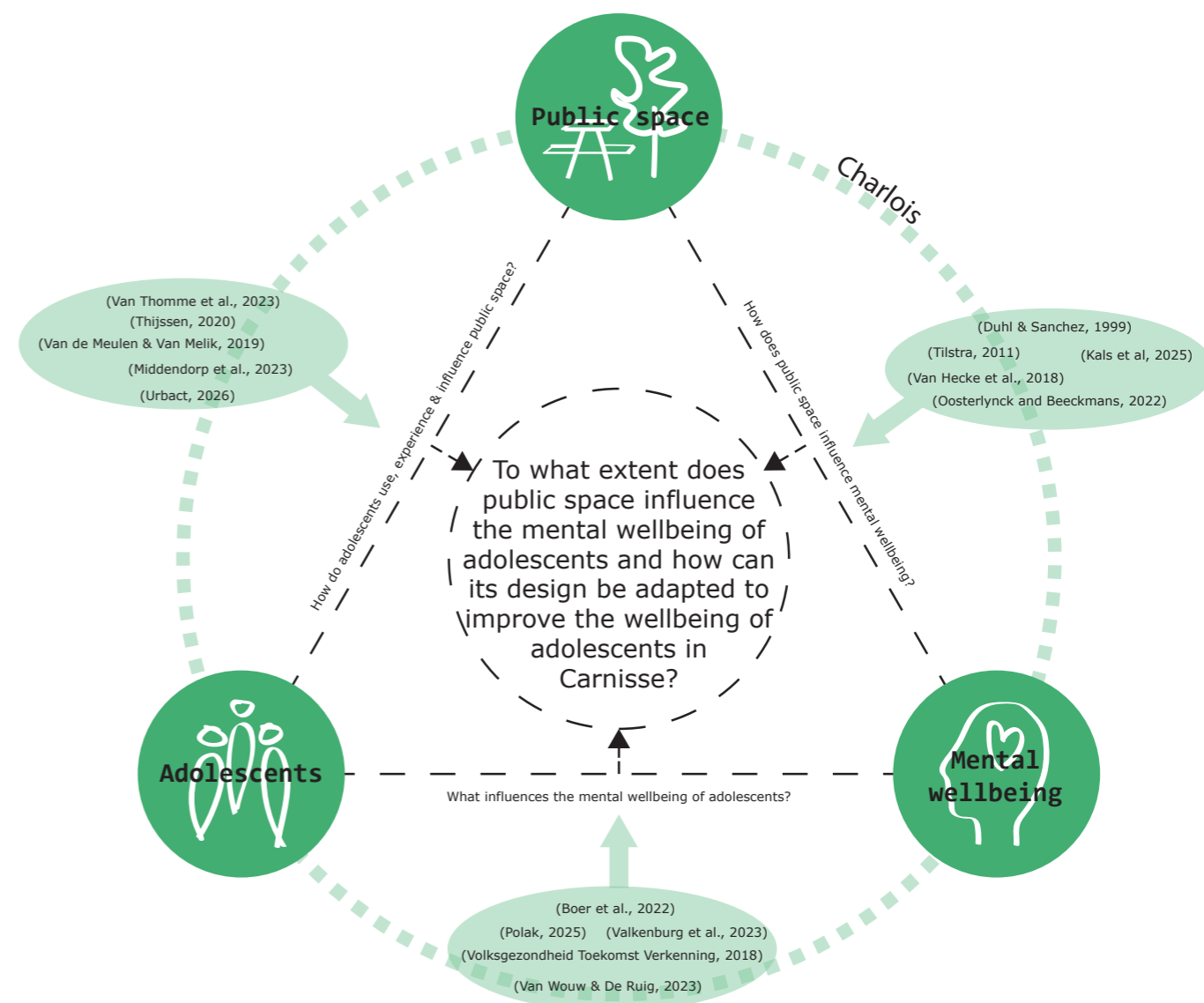


Fig. 10: A diagram showing the three themes, the research questions, and the theories used to answer the sub-research questions.

Archival research



Fig. 11: An emergency residence at the Dorpsweg in 1950.
(Fototechnische Dienst Rotterdam, 1950)



Fig. 13: Traffic on Pleinweg towards the Maastunnel, showing the crossover with Wolvaertsbocht.
(Fototechnische Dienst Rotterdam, 1953)



Fig. 12: Construction on the Pleinweg, with the Maastunnelplein in the background on the right. Across the street is the Esders clothing building.
(Fototechnische Dienst Rotterdam, 1951)



Fig. 14: Playing children on the Dorpsweg.
(Fototechnische Dienst Rotterdam, 1956)

To better understand the current situation in Carnisse and the relationship between adolescents and public space, it was necessary to examine the historical developments of both the neighbourhood and its youth culture.

Initial background information on the development of Rotterdam South was obtained through online publications by the Municipality of Rotterdam. However, these sources contained limited information that was directly related to adolescents and youth culture within the neighbourhood.

To gain more specific insight into the historical development of adolescents in the neighbourhood, archival research was conducted. More than fifty newspaper articles published by *Het vrije volk*, a national democratic socialist newspaper, were examined. The selected articles all included references to both the words 'Carnisse' and either 'tieners' or 'jongeren'. This helped to identify recurring social themes, neighbourhood dynamics and the changing role of youth within the area.

In addition, visual archival research was conducted using the archives of the Municipality of Rotterdam, with the aim of illustrating both its urban and social developments (Figures 11-14). The photographs were accessed through the City Archives of Rotterdam via Archieven.nl and were used to support the development of a visual understanding for the timeline of Carnisse.

Ultimately, by comparing and analysing all sources, a broader understanding was developed on the historical evolution of the neighbourhood, its spatial structure and the role of adolescents in it. These insights contributed to understanding how historical developments continue to influence the current social and spatial conditions in Carnisse.

Spatial and accessibility analysis

To develop a better understanding of the spatial structure of Carnisse and its relationship to the wider context of Rotterdam Zuid, spatial and accessibility analyses were conducted using QGIS with data gathered from PDOK OpenStreetMap, and TopoTijdReis. These analyses focused primarily on gathering quantitative spatial data to understand the physical layout, accessibility, and functionality of the neighbourhood, that bridges the theoretical framework to the local context (Figure 15).

Carnisse is used as a case study in the project because of its social and demographic characteristics that are identified prior in the research. However, statistical data alone does not elaborate on the way that the neighbourhood functions spatially. Therefore, spatial analyses were necessary.

Various spatial layers were collected and analysed, including infrastructural elements, public transport routes and stops, housing typologies, green spaces, amenities, public spaces and public facilities. These layers were first analysed on the scale of Rotterdam Zuid, to gain insight into the broader context and the positioning of Carnisse in this context.

After the broader urban context was mapped, the analysis focused on Carnisse itself. By overlaying different spatial layers, patterns could be identified regarding movement, accessibility, public life and the spatial layout of the neighbourhood. Special attention was paid to connections between public spaces, routes for soft mobility, green structures and public facilities, to gain better insight into the way that adolescents can move through the neighbourhood on a daily basis.

The spatial and accessibility analyses formed the foundation for developing spatial awareness of the neighbourhood and to identify both spatial qualities and challenges. These outcomes were later combined with more qualitative research methods, such as observations to research the experienced influences.

In addition, the spatial data collected formed the basis for a SWOT analysis, which was used to identify the neighbourhood's spatial strengths, weaknesses, opportunities and threats, and to support the development of design criteria for the final design proposal.

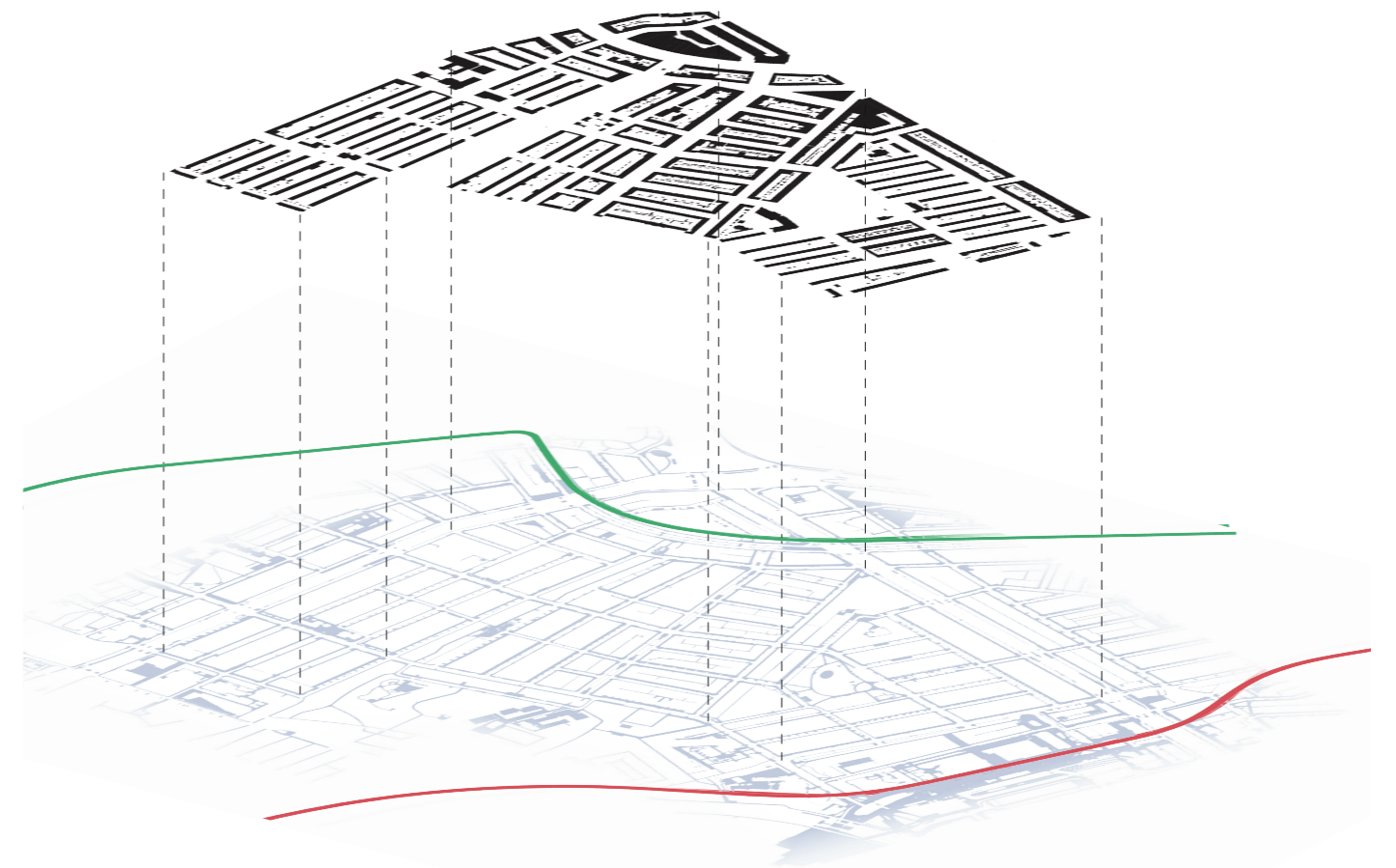


Fig. 15: Overlaid GIS layers showing that combining data layers can give better spatial insight.
(Sources used: PDOK & OpenStreetMap)

Observations

While spatial analyses provide structural data, they do not capture human experience. Therefore, on-site observations were conducted, that were informed by the insights from the literature review and spatial analysis, to gain a deeper understanding of how public spaces in Carnisse are actually used and experienced by adolescents. This qualitative method aimed to identify key locations for adolescents, while mapping their spatial experiences, frequently used routes, and connections between those spaces.

The method relied on repetitive walking observations throughout the neighbourhood, while approaching the public spaces from a different perspective each session. This process involved the application of informed empathy, a technique where theoretical insights and prior observations are used to observe the environment through the lens of adolescents, considering their potential needs, experiences, and circumstances (Kouprie & Visser, 2009).

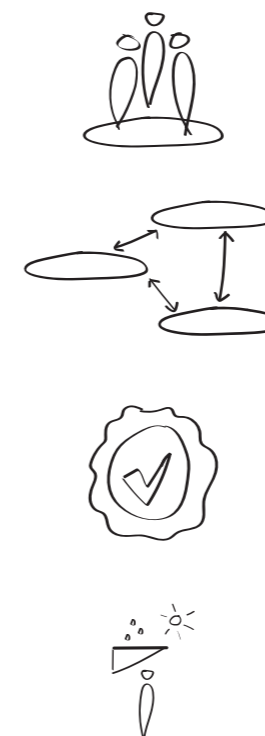
The observations focused on several distinct conditions and spatial uses:

- The use of public space after dark;
- The impact of varying weather conditions (sunny, rainy and cold);
- Dedicated spaces for meeting and lingering;
- Areas utilized for sports and physical activities;
- Routes and connections between key locations.

Throughout the multiple observations, close attention was paid to spatial elements such as visibility, shelter, social presence, accessibility, quality of stay, and connectivity. While the initial routes were planned based on the prior spatial analysis and insights from the literature, they were dynamically adjusted on-site, in response to the experiences and observations within the neighbourhood.



Fig. 16: Image of binoculars. (Feng Yu, n.d.)



The data collected during these walks were subsequently translated into 'soft maps', which not only show physical locations, but also visualize subjective experiences, qualities and connections of public spaces. Consequently, the developed maps highlight:

- Important places for adolescents;
- Routes and connections between those places;
- Specific spatial qualities and bottlenecks;
- Variations in use and experience under different environmental circumstances.

By comparing these soft maps, a better understanding of spatial patterns, qualities, and missing connections within Carnisse emerged. Together with the literature review and spatial analysis, these insights formed the basis for formulating design criteria and spatial interventions.

RESULTS

How Carnisse changed, but didn't

To understand how public space can contribute to the mental wellbeing of adolescents, it is important to understand the historical developments within youth culture and the spatial developments of postwar neighbourhoods, such as Carnisse in Rotterdam South.

Before the 20th century, adolescents were largely part of the working population and had to contribute financially to their families. This, however, started to change with the introduction of the Compulsory Education Act in 1901, which required children aged six to twelve to attend school to help reduce child labour (Centraal Bureau voor de Statistiek, 2024c). Nevertheless, young people still had very little free time and there was limited oversight of the compulsory education system.

After World War II, compulsory education got extended, creating more opportunities for young people to develop outside of work, leading to more recognition of adolescence as a distinct phase of life (Centraal Bureau voor de Statistiek, 2024c). At the same time, neighbourhoods, such as Carnisse, were built during the reconstruction period after the war (see Figure 18). Due to severe housing shortages that were caused by war destruction and rapid population growth, there was a need for large-scale, affordable and practical housing construction, with Rotterdam Zuid identified as a prime expansion area for the city (Stadsarchief Rotterdam, n.d.; Programmabureau Nationaal Programma Rotterdam Zuid, 2023). This resulted in a large-scale functionally designed neighbourhood consisting of identical apartment blocks, wide streets and strict separation between residential areas, traffic and public amenities.

At the time of its construction, Carnisse represented a major improvement compared to the overcrowded and unhealthy inner city, as the neighbourhood aligned well with the collective society of the time and the shared work rhythms of its residents (Programmabureau Nationaal Programma Rotterdam Zuid, 2023). However, the neighbourhood was designed in a period when adolescents still spent much of their time within structured systems such as school, work and family life, leaving little consideration for informal youth spaces in the urban environment.

From the 1960s onwards, societal changes increasingly altered the everyday lives of adolescents. The automation of the port reduced employment opportunities in Rotterdam Zuid, while labour migrations simultaneously increased the cultural diversity within the area (Programmabureau Nationaal Programma Rotterdam Zuid, 2023). As traditional work structures declined and adolescents gained more free time, public space became increasingly important for social interaction, identity formation and recreation (Filius & Van Melik, 2011).

In the 1970s, school attendance began to be monitored more closely, creating greater insight into how adolescents spent their time outside of institutional structures (Centraal Bureau voor de Statistiek, 2024c). In response, more facilities and activities were organized to both entertain and supervise them, which contributed to the emergence of a distinct youth culture on Zuid. A pivotal moment within this development was the handover of the youth centre on Amelandseplein to the *Jong Charlois* action group in 1973, which functioned as a meeting place and drop-in centre for adolescents (Meijer, 1973). At the same time, other youth and community centres were established through the area, although, the demand quickly exceeded the available facilities for the growing and increasingly diverse group of youth ("Noodsituatie bij jongeren in Charlois," 1978).

As a result of the lack of space for adolescents and the urban renewal in the 1980s, where neglected housing blocks were renovated, adolescents began claiming public spaces for themselves, which led to complaints about nuisance and vandalism (Emmelkamp, 1998; Programmabureau Nationaal Programma Rotterdam Zuid, 2023; "Noodsituatie bij jongeren in Charlois," 1978). This negative image associated with adolescents subsequently contributed to their exclusion from public spaces. In response, urban planning initiatives during the 1980s increasingly focused on participation processes that involved young people in improving their living environment (Wolters, 1986). These initiatives, however, mainly targeted children, rather than adolescents.

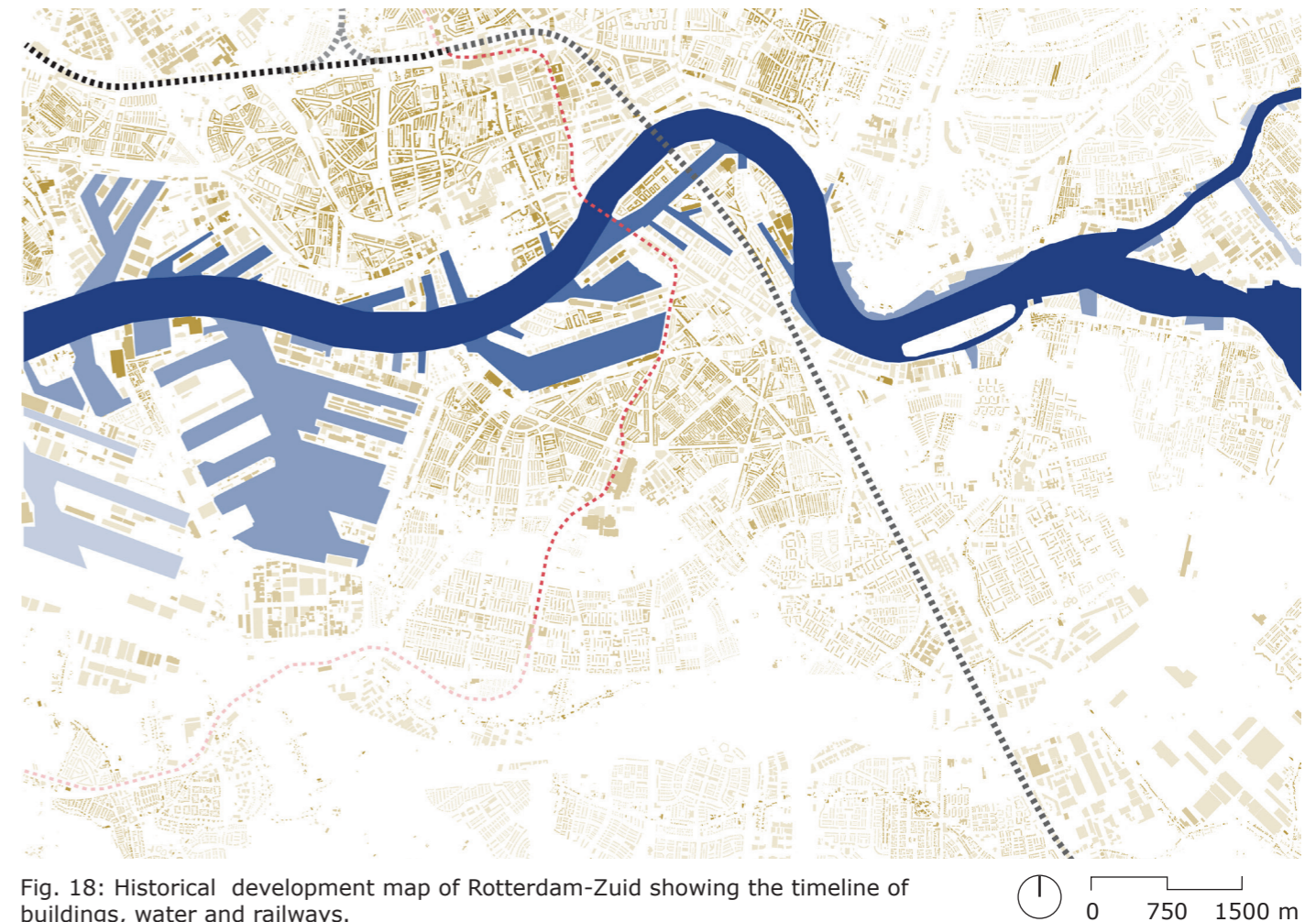
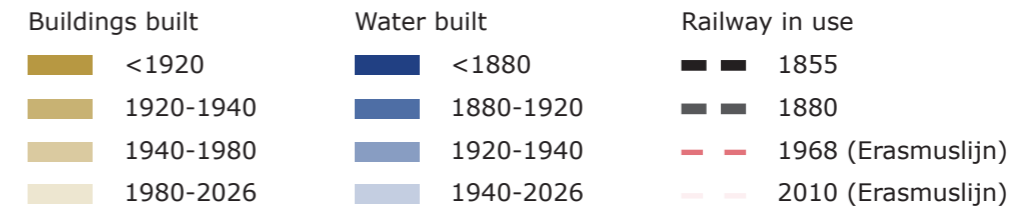


Fig. 18: Historical development map of Rotterdam-Zuid showing the timeline of buildings, water and railways. Sources used: OpenStreetMap, PDOK & TopoTijdreis.

While the social position and daily rhythms of adolescents changed significantly over time, the spatial structure of Carnisse remained largely the same. Public spaces within the neighbourhood are still primarily functional and dominated by concrete surfaces, with streets mainly serving transportation and car parking purposes. Streets previously accommodated slower traffic, social interaction and informal recreation. However, as work in the port shifted to other sectors, residents began commuting farther to work, making cars indispensable, fundamentally shifting the use of public space (Barton & Tsourou, 2000; Ministerie van Volkshuisvesting en Ruimtelijke Ordening, 2024).

At the same time, contemporary adolescents spend their time differently than previous generations, partly due to digitalization and the shift of social interaction towards online environments, increasing the importance of meaningful physical places as a counteract to online interaction (Polak, 2025; Urbact, 2026).

As a result, a mismatch has emerged between Carnisse's spatial layout and the contemporary needs of adolescents. The neighbourhood is still organized according to post-war spatial principles, which no longer align with the current social dynamics and everyday rhythms of youth.

The decline in adolescent wellbeing

Although the Dutch are among the happiest in the world, adolescents have been feeling increasingly unhappy in recent years, as they are more likely to feel anxious, stressed and unhappy (Van Wouw & De Ruig, 2023; Ten Have et al., 2023). According to Valkenburg et al. (2023), who wrote a UNICEF commissioned essay on the mental wellbeing of adolescents in the Netherlands, this is not surprising, as the gap between expectations and reality in affluent countries is often bigger. According to them, the decline in mental wellbeing of adolescents has been occurring since the 1960s, when youth culture in Carnisse was just beginning to be recognized.

Adolescents have always felt pressure to perform, as this is a stage of life when things become more serious (Volksgezondheid Toekomst Verkenning, 2018). However, this pressure has been increasing in recent years, with result that only half of Dutch young adults rate their own mental wellbeing as good (RIVM, 2025).

This is partly a result of the lockdowns during the COVID-19 pandemic that caused a decline in overall mental wellbeing, which was far from recovered several years later (Valkenburg et al., 2023). Negative feelings partly stem from the uncertainty about the complex world of the future and distrust in government decisions, that stem from events such as the pandemic, housing shortage, climate crisis and ongoing wars (Van Wouw & De Ruig, 2023; Polak, 2025; Boer et al., 2022).

According to Polak (2025), who wrote an article on the mental health of young people, adolescents that experience pressure due to school has also tripled over the past twenty years, from 16% to 45% (Polak, 2025; Boer et al., 2022). As cited by Högberg (2021) in Boer et al. (2022), this is because adolescents' life opportunities have become increasingly dependent on their educational performance. Adolescents are therefore placing greater importance on achieving high grades and levels of education, with more stress as result (Boer et al., 2022).

An aspect that has also changed significantly in recent years is the social world that adolescents immerse themselves in, which, thanks to social media, they carry with them at most times (Polak, 2025). According to Polak, anxiety, depression and self-harm have increased globally since 2012, which was a turning point in the rise of smartphone use among young people. While some research claims that social media has a major impact on the mental wellbeing of adolescents, others argue that there is no proven evidence (Valkenburg et al., 2023). In addition to social media, gaming is also strongly linked to unauthorized school absenteeism, sleep deprivation, social isolation and self-neglect, especially for boys (Volksgezondheid Toekomst Verkenning, 2018). Thus, self-control and being able to deal with temptation and risks is necessary for personal resilience.

Spending time outdoors subsequently helps young people to develop skills that enable them to adjust and overcome fears, and it teaches them how to form friendships, to give and take, and to be assertive (Polak, 2025; Gray, 2011 as cited in Valkenburg et al., 2023). However, according to children's organization Jantje Beton, the number of children who play outside daily has decreased significantly over the past two years, resulting in less resilience (Verian, 2024; (Gray, 2011) as cited in Valkenburg et al., 2023).

In addition, adolescents with limited social networks appear to be more vulnerable in regards of social safety nets (Van Wouw & De Ruig, 2023). As Carnisse is characterized by lower social cohesion and higher vandalism and nuisance compared to the Rotterdam average (Appendix I), this may indicate that adolescents in the neighbourhood have less access to strong social networks and a lower life satisfaction, emotional difficulties and feelings of loneliness (Boer et al., 2022).

According to Boer et al. (2022), home environments are also strongly linked to school performance and overall wellbeing of adolescents, as they need their parents to help them build resilience. Due to a general increase in mental health issues, this can also have an increasingly negative effect on home environments (Ten Have et al., 2023).

In summary, it is hard to define what exactly causes the decline in the mental wellbeing of adolescents, as it is very subjective. However, what can be concluded, is that it does not depend on just one component, but on a combination of factors (Figure 19).



Fig. 19: Collage of aspects influencing the mental wellbeing of adolescents.
Note. Collage created by the author using images from Adobe Stock. Full source references are provided in the reference list.

Adolescents in public space

According to Middendorp et al. (2023) and Van Hecke et al. (2018), public spaces play an important role in the social and personal development of adolescents, by providing free, obligation-free environments that foster independence and identity discovery. During this transitional phase from childhood to young adulthood, they learn to navigate freedom and responsibility, with public space serving as their practice ground (Van der Meulen & Van Melik, 2019; Filius & van Melik, 2011). Despite this importance, the needs and wishes of adolescents are often overlooked during urban design processes (Middendorp et al., 2023; Thijssen, 2020; Van der Meulen & van Melik, 2019).

The use of public space

In recent years, digital media has increasingly shaped how adolescents navigate and interact with public space (Urbact, 2026). Physical use is further influenced by environmental factors, such as accessibility, seating, functionality, lighting, and social safety, with time and weather conditions also playing a role (Thijssen, 2020; Van Thomme et al., 2023). Popular gathering spaces include squares, shopping centres, public transport stops, and parks with sport facilities such as football fields, skate parks and basketball courts (Filius & van Melik, 2011; Van der Meulen & van Melik, 2019; Urbact, 2026). The most important requirement for these spaces is that they can be used flexibly and in varied ways. It is also crucial that adolescents can both be seen and withdrawn from parental or school supervision, allowing them to experience greater sense of autonomy (Middendorp et al., 2023; Filius, & van Melik, 2011; Thijssen, 2020).

Therefore, the use of public space depends on the physical factors such as lighting and weather, combined with the adolescent's need for flexible and unsupervised spaces.

The experience of public space

How users experience a public space is subjective and therefore depends on personal needs, memories and social context (Tilstra, 2011). However, the social context is influenced by what is perceived to be present and happening in the space (Duhl & Sanchez, 1999). For adolescents, their experience is strongly determined by the bustle and liveliness of the place (Van Thomme et al., 2023; Schram et al., 2024; Filius & Van Melik, 2011).

The sense of safety is also a major aspect of the experience, which is influenced by visibility, social presence and, conversely, the absence of dominant groups (Schram et al., 2024; Van Thomme et al., 2023). This perception of safety influences how freely adolescents move through and use public space (Eelderink, 2025).

Research conducted by Schram et al. (2024) in Rotterdam Zuid shows that feelings of unsafety influence how girls move through the city, often avoiding interaction and preferring busy routes that feel socially safer (Van Thomme et al., 2023). In contrast, other research shows that adolescents are attracted to spaces that allow forms of expression and controlled tension, such as skate parks, climbing spots or places for street art (Urbact, 2026).

The experience of public space thus differs per adolescent, but generally depends on the balance between social safety, local liveliness, and the subjective need for autonomy and expression.

The influence of adolescents

Because adolescents make extensive use of public spaces, they also play an active role in shaping them (Urbact, 2026). Because adolescents often lack dedicated spaces, they appropriate existing spaces to fit their social needs. This can create tension with other users and contribute to a negative image of adolescents in the neighbourhood (Filius & van Melik, 2011; Tilstra, 2011; Van Thomme et al., 2023).

Adolescents like to go to places where others are present, so that they can see and be seen (Middendorp et al., 2023). At the same time, the formation of too large a group can lead to a spatial claim on a place, making other users no longer feel safe and causing them to avoid the place (Van Thomme et al., 2023; Filius & Van Melik, 2011).

Adolescents therefore both directly and indirectly influence how public spaces are experienced, both by adolescents themselves and other user groups, through their presence, activities and appropriation of space.

In short, adolescents' experience of public space directly influences how they use it, which, in turn, shapes the influence they have on the environment. This relationship is however mutual, as the use of a space alters their ongoing experience. This creates a continuous cycle of mutual reinforcement (Figure 20).

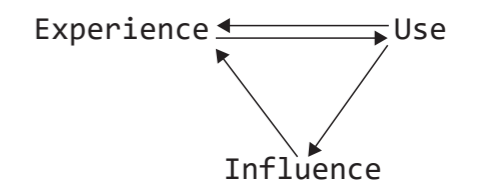


Fig. 20: The continuous cycle of mutual reinforcement of the experience, use and influence of adolescents on public space.

The relation between public space & wellbeing

To understand how the cycle of experience and use of public space translates into adolescent wellbeing, it is important to analyse the relationship between mental wellbeing and the physical environment.

Environmental psychology focuses on the relationship between people and their environment (Kals et al., 2025). According to this field, both the physical and social environment influence the behaviour, experience and wellbeing of the user. Because nature, physical activity, safety and social inclusion all have a positive impact on health, public space is crucial to daily mental and physical wellbeing (Van Hecke et al., 2018). As a result, public space not only functions as space for movement, but also as social infrastructure that supports interaction, relaxation and everyday life (Tilstra, 2011).

Research shows that the quality, accessibility and useability of public spaces prove to be more important than their quantity (Tilstra, 2011). Greenery, accessibility, visibility and a clear spatial function contribute to a more positive experience of the neighbourhood, as natural elements such as trees and green spaces promote both health and social interaction (Sullivan et al., 2004). Additionally, the physical environment directly influences the extent to which users move, meet and relax through its effect on mobility, play and gathering, contributing to health and social cohesion (Eelderink, 2025; Barton & Tsourou, 2000).

Perceived safety is another important factor influencing public space use and wellbeing. According to Eelderink (2025), safety contributes to feelings of freedom and influences the extent to which adolescents dare to express themselves freely. Clear routes, social visibility and accessible outdoor spaces therefore support independence, social interaction and a healthy lifestyle.

For adolescents and residents experiencing spatial poverty, public space can function as an extension of the living room, offering access to green and open spaces, and thus improving their wellbeing (Oosterlynck & Beeckmans, 2022). This emphasizes the importance of accessible, inclusive and well-designed public space in supporting everyday wellbeing.

In conclusion, a well-designed, safe and inclusive urban environment is essential for the social infrastructure of adolescents, while it directly impacts their physical and mental wellbeing (Figure 21).

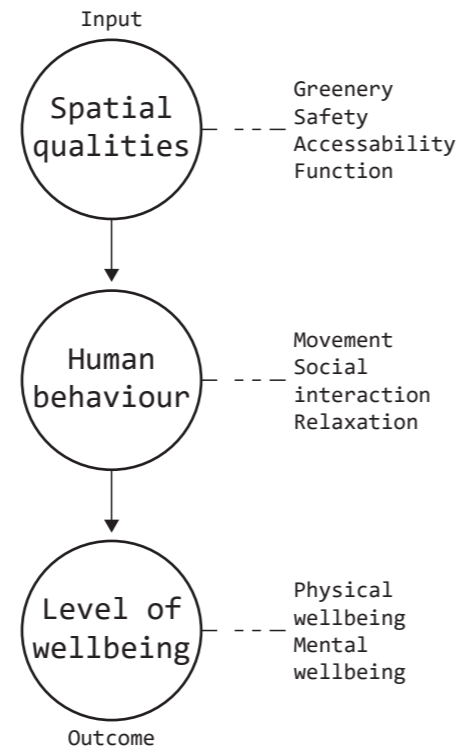


Fig. 21: A conceptual framework on the relationship between the physical environment and wellbeing.

To apply these theoretical insights to the context of the project, the following sections analyse the neighbourhood Carnisse. By examining its urban network, spatial qualities, and amenities, the case study explores how the physical environment of Carnisse impacts the daily lives and wellbeing of local adolescents.

Main modes of mobility

In Carnisse, accessibility and safe connections play an important role in promoting independence, health, and social interaction (Eelderink, 2025). Because adolescents are usually not yet allowed to drive, public transport plays a major role in providing access to facilities, education, employment, and social networks outside the neighbourhood. This mobility does not only contribute to their physical movement but also enhance their social and economic wellbeing.

Research from the CBS OdiN study shows that adolescents in urban areas, such as Rotterdam, are highly dependent on cycling and public transport, as these modes of transport grant them autonomy within both the neighbourhood and the wider region (Centraal Bureau voor de Statistiek, 2024a). Within Rotterdam, the metro forms the backbone of this accessibility, with Zuidplein serving as an important hub between Carnisse and the rest of the city, as shown in Figure 22 (Gemeente Rotterdam, 2020). Consequently, Carnisse is strongly connected to the rest of the city and the national network through integrated walking, cycling and public transport networks (Figure 23).

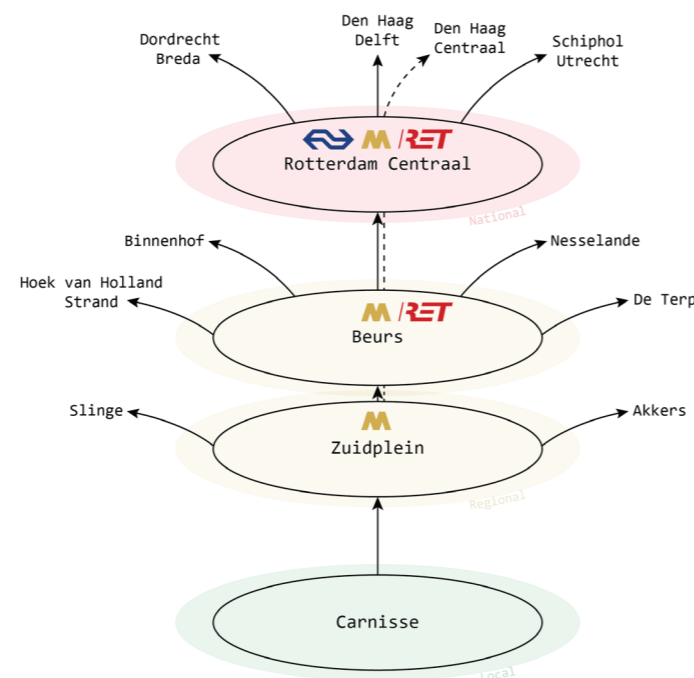


Fig. 22: A diagram showing the options of public transport from Zuidplein, for Carnisse.

& Places to be

While the regional connectivity from Zuidplein is strong, the limited independent mobility of adolescents also emphasizes the importance of public space at the local level. Consequently, the quality, safety and accessibility of local streets and squares heavily influence how the neighbourhood is experienced on a daily basis.

To map the daily movement patterns of adolescents in Carnisse, Figure 24 illustrates the spatial distribution of key amenities, including high schools, attractive retail areas, public and green spaces, community centres, sports facilities, and public transport stops. Notably, these amenities are almost exclusively located at the periphery of the neighbourhood, leaving the central residential area largely vacant of youth-oriented infrastructure, despite the presence of a central green axis.

This peripheral concentration suggests that adolescents must travel to the edges of Carnisse for social interaction and recreational activities. The public transport stops at these edges do not only provide external autonomy, as discussed previously, but also function as a primary access point where youth amenities cluster. As a result, the central green axis underperforms as an active youth space, likely due to a lack of accessibility, visibility or specific programming. This forces adolescents to cover longer distances within their daily environment, ultimately limiting spontaneous and informal use of central public space.

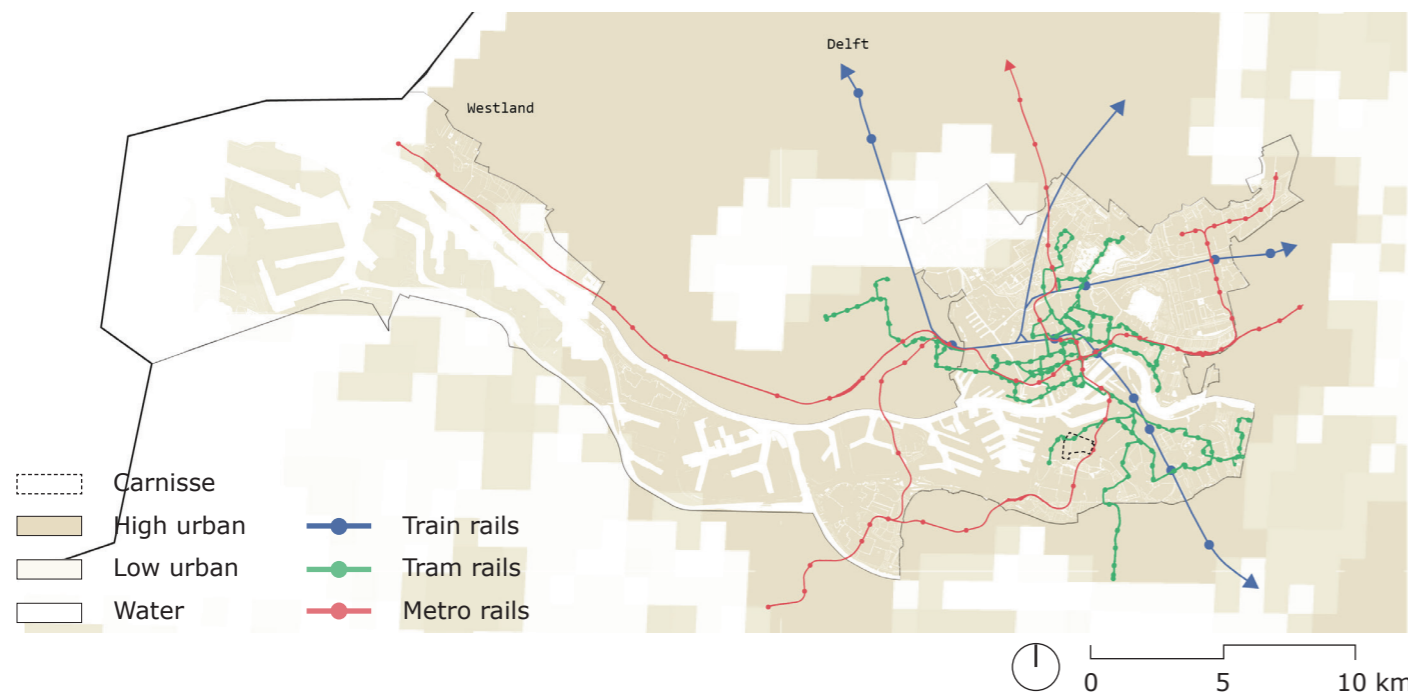


Fig. 23: A map on regional scale of the public transport networks. Sources used: OpenStreetMap & PDOK

- High school
 - Sport facility
 - Community building
 - Public transport stop
 - Retail area
 - Public squares
- 1 Karel de Stouteplein
 - 2 Lepelaarsingel
 - 3 Zuiderpark
 - 4 Amelandsplein
 - 5 Zuidplein

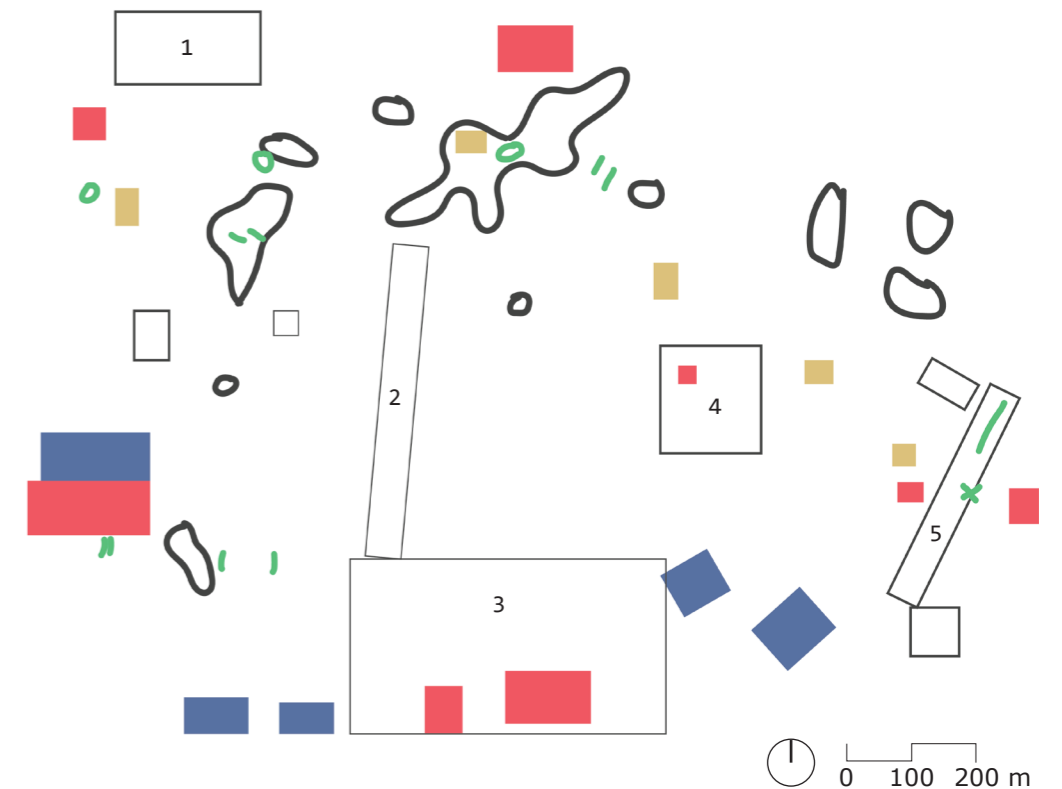


Fig. 24: Abstract spatial map of youth infrastructure in, showing high schools, public sport facilities, community buildings, public transport stops, retail areas and public squares.

The post-war neighbourhood layout

In addition to the peripheral location of amenities, the internal physical structure of Carnisse further influences how adolescents move through the neighbourhood. The following section examines the spatial layout and housing typologies within the neighbourhood.

Carnisse features a post-war urban layout that is characterized by a highly repetitive streetscape, where residential blocks, street profiles, and public spaces have a uniform layout, as shown in Figure 25. The residential buildings blocks also adhere to identical building heights, building lines, and use of materials, resulting in a strictly monofunctional environment (Figure 26). The plinths of those building blocks remain closed and the boundaries between private and public space are very rigid. This lack of transition zones eliminates the opportunities for informal encounters and social interaction.

In addition, as shown in the schematic layout and cross-section of the identical street networks (Figure 26 & 27), the public realm is dominated by car parking and suffers from a lack of street lighting, which collectively increases feelings of unsafety. As a result, place attachment is limited and social distance is created, resulting in a negative impact on the wellbeing of local adolescents (Kals et al., 2025; Duhl & Sanchez, 1999).

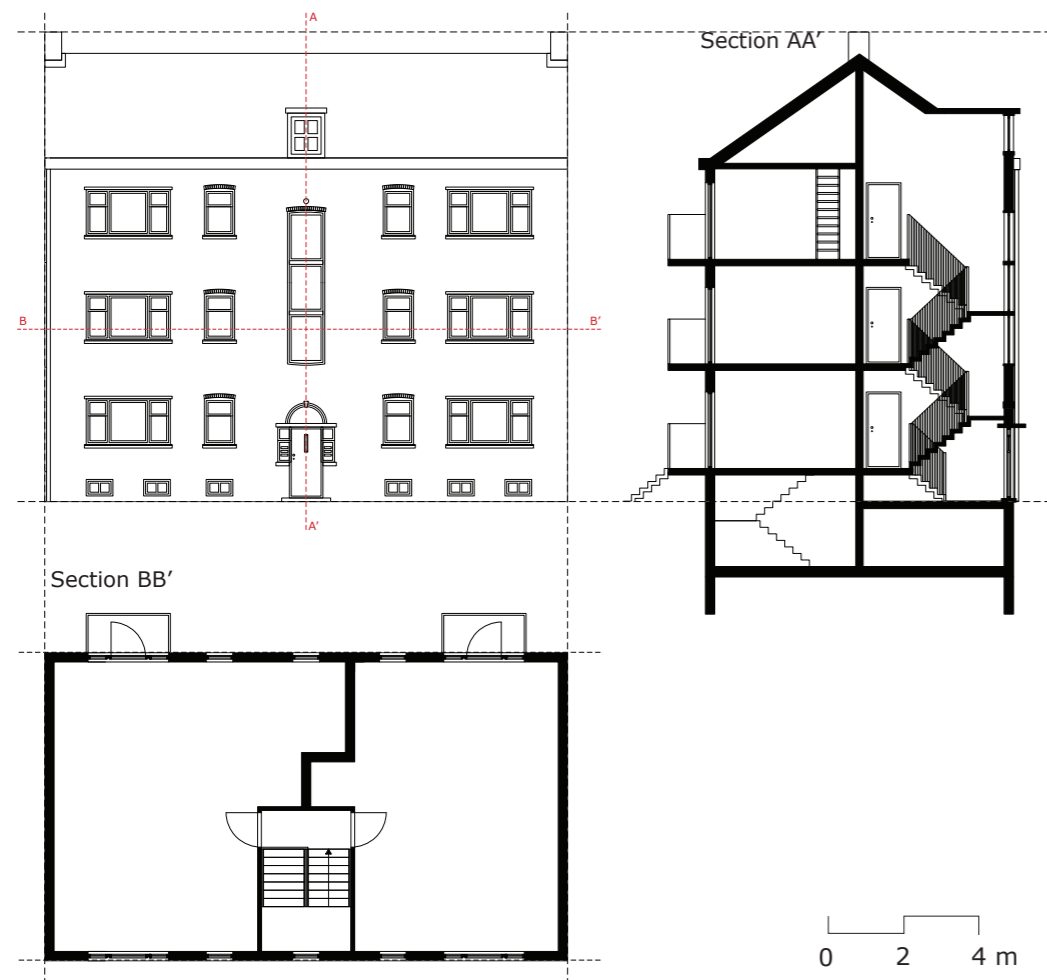


Fig. 26: Architectural layout of a typical post-war apartment complex in Carnisse, showing the uniform elevation, floor plan and closed plinth design.

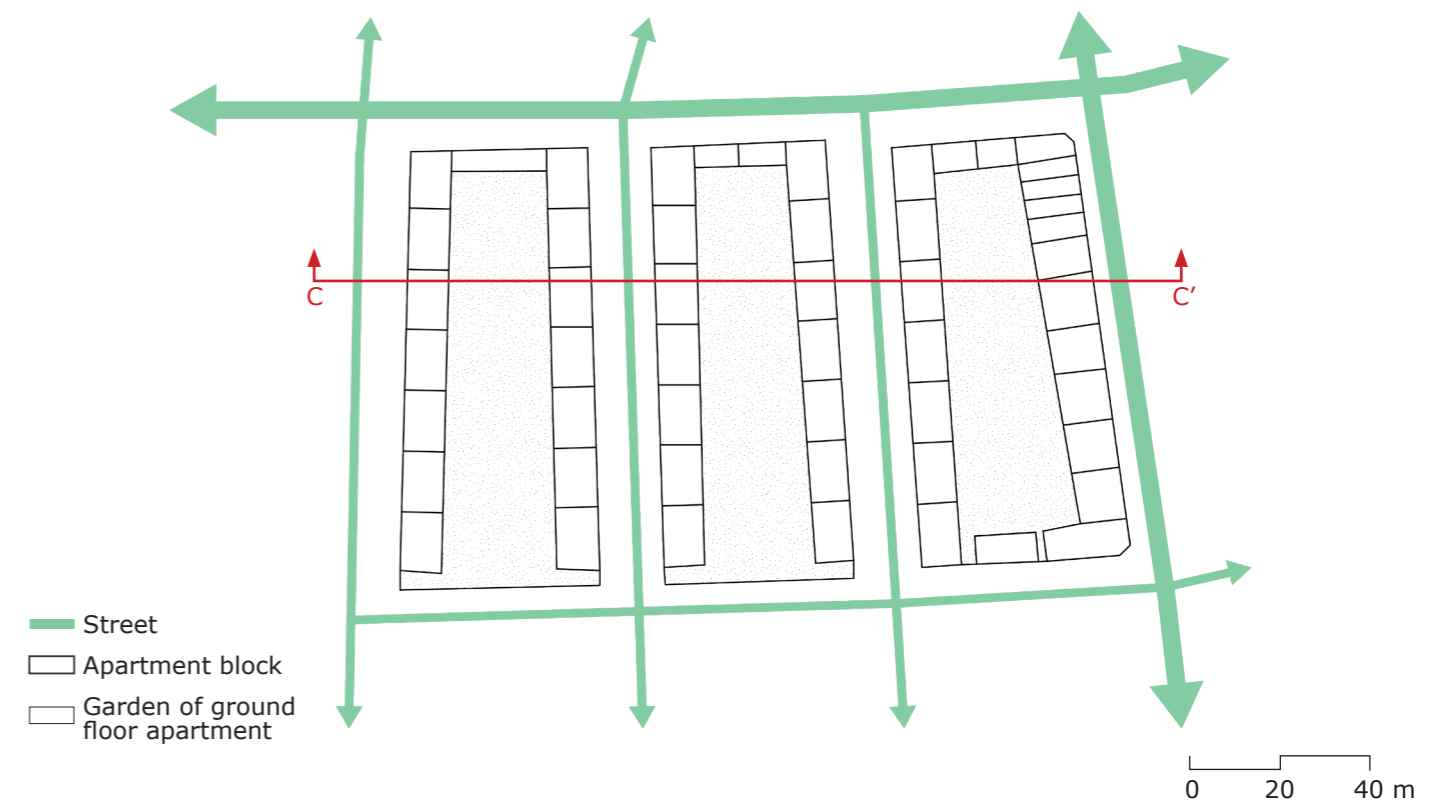


Fig. 26: Schematic plan of three identical residential blocks in Carnisse, highlighting the repetitive layout.

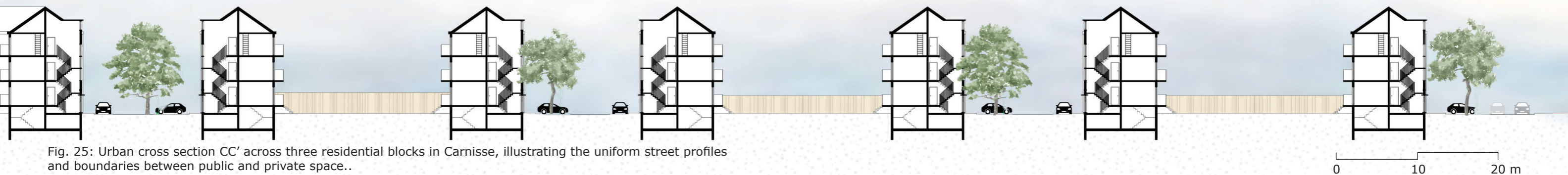


Fig. 25: Urban cross section CC' across three residential blocks in Carnisse, illustrating the uniform street profiles and boundaries between public and private space..

Adolescents in Carnisse

The consequences of this rigid and anonymous spatial layout became clearly visible during field observations. Based on these observations, soft maps were developed that helped to identify the spatial preferences of adolescents in the neighbourhood under varying conditions, such as different weather conditions and activity preference (see Appendix II).

These observations revealed a contrast between the neighbourhood's edges and its interior. Adolescents heavily concentrate around a few public spaces, namely Zuidplein, Amelandseplein, and Nachtegaalplein. Several routes connecting these squares to peripheral amenities are much used, because they offer strong social control, clear spatial organization, and adequate lighting, which collectively enhance perceived safety. This actively used network of places and routes is visualized in Figure 28. The inside of the neighbourhood, however, away from the squares, remains largely inactive. Despite the spatial potential of its wide sidewalks and spacious layout, the residential core attracts very little youth activity.

Prior theories about not many spaces being designed for adolescents can be confirmed through observations, it's striking how few adolescents are present in the spaces. There are places for sports, but adolescents tend to avoid highly exposed spaces such as the calisthenics area on Amelandseplein, suggesting that lack of privacy reduces the attractiveness of the space. In contrast, the adjacent sports field is used intensively, because it not only allows them to play both basketball and football, but also to observe, meet and be visible to peers from surrounding fences (Figure 29). Due to the lack of dedicated adolescent space, they gravitate toward children's playgrounds in the evenings, demonstrating how they adapt spaces to their social needs.

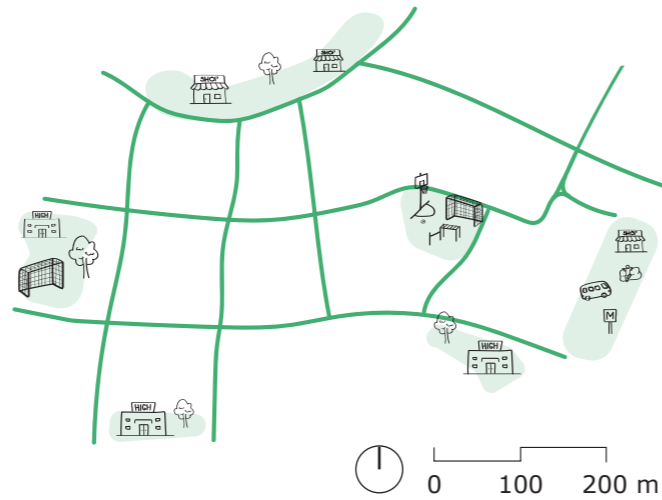


Fig. 28: Map showing the key places for adolescents in Carnisse, and the main routes used between them.



Fig. 29: Sports field on Amelandseplein. Adapted by author, background image from Google Street View (Google, 2022a)

Large and undefined open spaces, such as the field around the sports field, show little public activity when the weather is not great. This suggests that openness alone does not create a successful public space without a program, as the absence of shelter, shade and lighting limits the usability of the spaces during wet, dark or hot weather conditions, reducing their accessibility throughout the day and year.

Zuidplein is almost the only publicly accessible place with shelter and it provides a lot of well-used seating spaces (Figure 30). This shows that access to places without consumption pressure and flexible seating are more used than fixed sitting space.

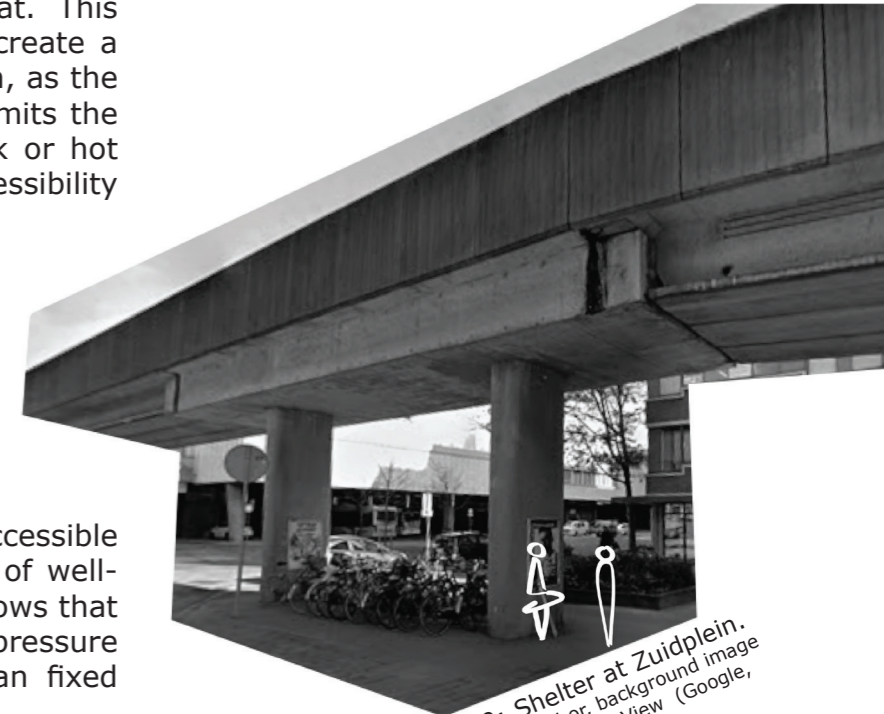


Fig. 30: Shelter at Zuidplein. Adapted by author, background image from Google Street View (Google, 2022b)



Fig. 31: Open field along Lepelaarsingel. Adapted by author, background image from Google Street View (Google, 2025)

Sports activities mainly take place in designated areas, but sometimes also emerge in undefined open spaces such as the grassy area along the Lepelaarsingel. The overlap of various activities in these areas can, however, lead to tensions between users, showing that a lack of spatial definition and clear programming can lead to conflicts in public space use (Figure 31). This implies that there is a need for areas that accommodate various uses while maintaining spatial clarity and separation between activities.

Finally, many public spaces in Carnisse lack privacy, reducing the attractiveness of public space for longer stays and informal social gathering for adolescents. The observations demonstrate that adolescents value spaces that combine visibility, flexibility and opportunities for spontaneous social interaction.

Spatial conclusions

Based on the spatial analysis and observations, a comprehensive SWOT map was made for Carnisse (Figure 32). This analysis identifies the strengths, weaknesses, opportunities and threats within the neighbourhood in relation to public space and mental wellbeing, forming the basis for the spatial design strategy.

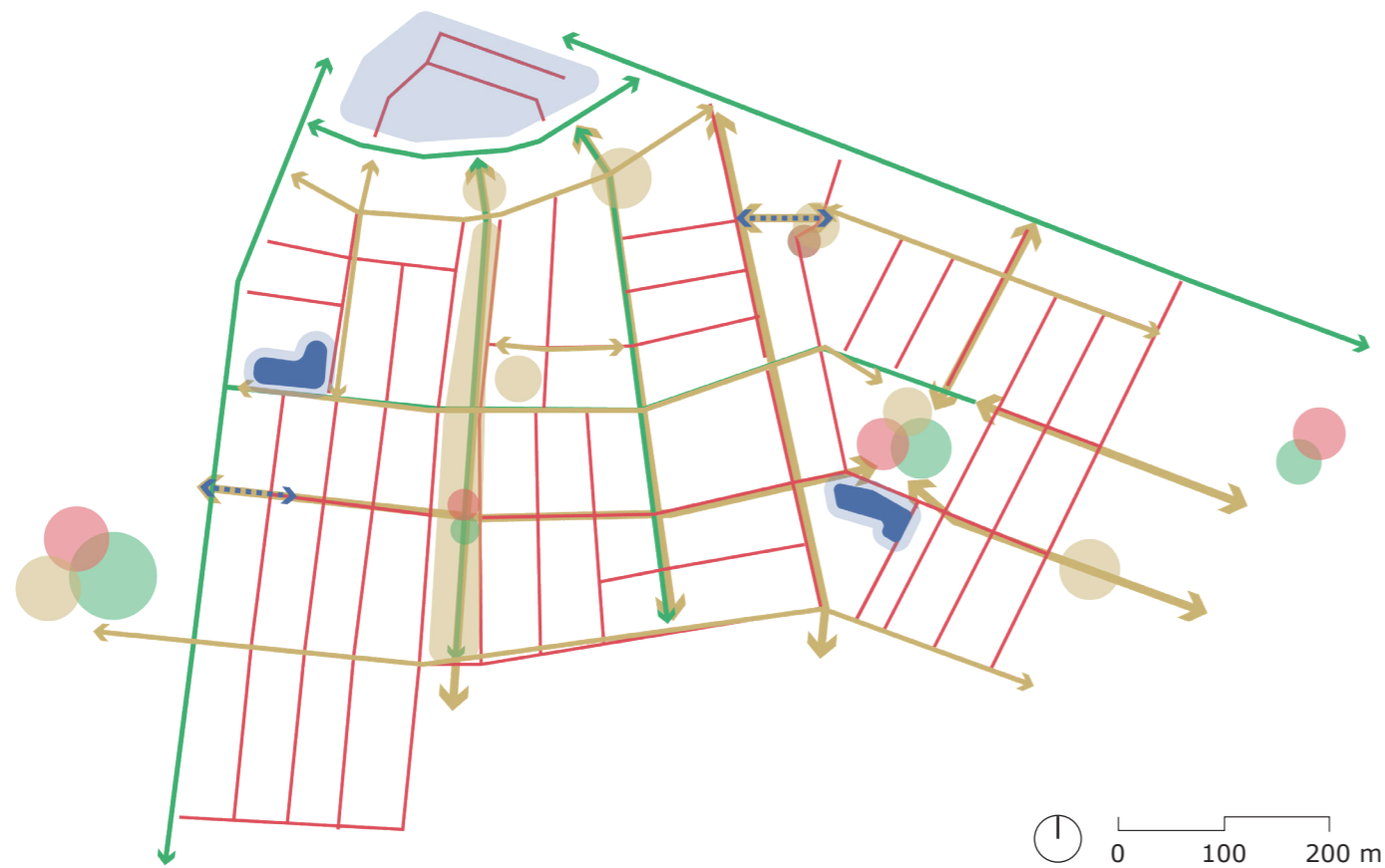


Fig. 32: An abstract map of Carnisse showing the spatial strengths, weaknesses, opportunities and threats.

Strengths

The neighbourhood's greatest strength is its clear spatial structure, featuring wide, well-organized streets and existing green spaces in the centre. Figure 33 shows where adolescents currently like to gather and the networks they use to move between those spaces.

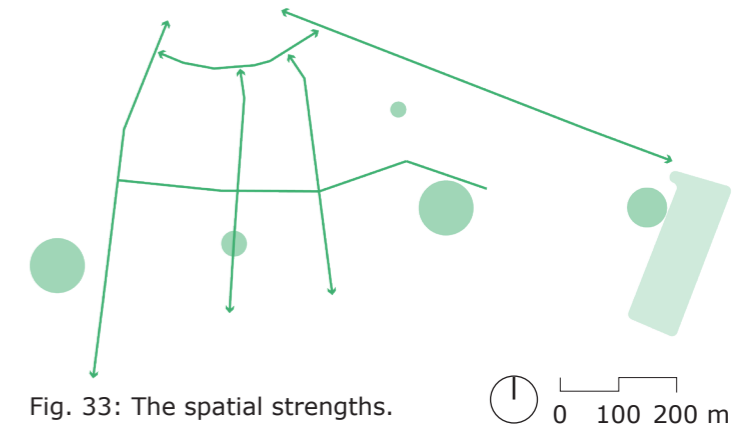


Fig. 33: The spatial strengths.

Weaknesses

A major drawback is that most streets are dominated by cars. This results in a very stony, monofunctional and anonymous environment, creating little sense of place. This is exacerbated by a lack of inclusive spaces and informal gathering spots, which lowers social safety. Figure 34 highlights areas with low social safety due to parked cars blocking visibility, poor lighting or overdue maintenance.

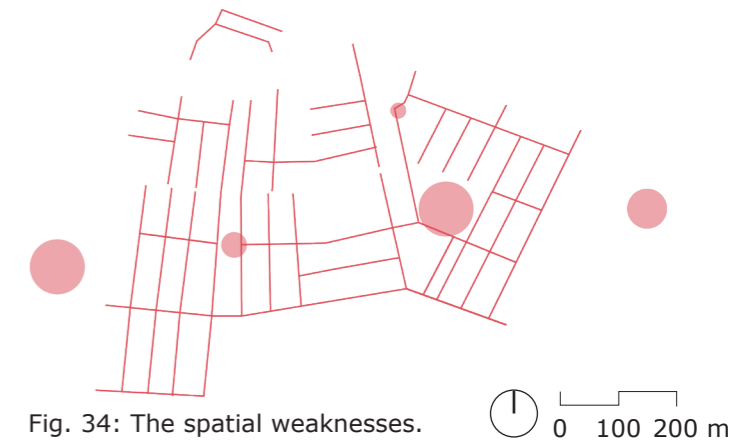


Fig. 34: The spatial weaknesses.

Opportunities

There is, however, great potential in the streets if less space is allocated to car parking and more space is freed up for public gathering areas. Because the streets are wide and clearly laid out, adding more youth activities can improve both the public space and social control. Figure 35 shows these areas with potential to foster greater inclusion and cohesion.

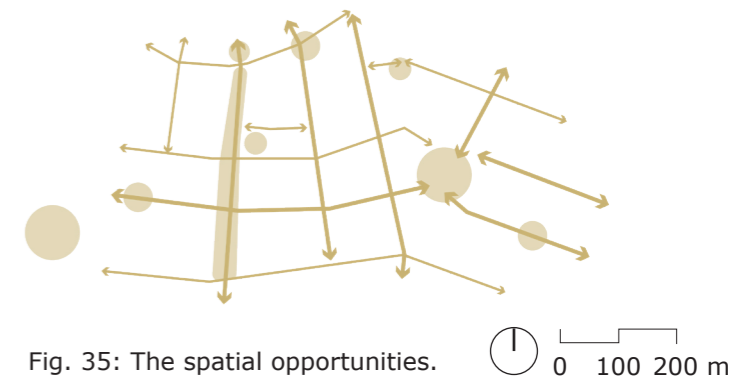


Fig. 35: The spatial opportunities.

Threats

Due to urban densification and the national housing shortage, public spaces are coming under greater pressure. A growing number of cars will take up more space, reducing safety and spatial quality. Furthermore, increasing digitalization reduces the need for physical interaction to keep social lives on track. Lastly, local nuisance by adolescents can cause conflict with residents due to low noise tolerance, as shown in Figure 36.



Fig. 36: The spatial threats.

From analysis,

The next section synthesizes the findings and results into sub-conclusions to the sub-research questions, which are translated into a design challenge and criteria to tackle this challenge. By bridging the gap between theory, observations, and the SWOT analysis, these insights form the foundation for the design strategy for Carnisse.

The mental wellbeing of adolescents

The mental wellbeing of adolescents in Carnisse is influenced by social, societal, individual and spatial factors, including school stress, housing shortages, and broader uncertainties. At neighbourhood level, public space has an important role in this, as a lack of safe and accessible places limits social interaction, physical activity, and autonomy. Additionally, low social cohesion and a fragmented urban structure contribute to social isolation and reduced place attachment.

Adolescents in public space

Adolescents use public space in Carnisse in a flexible and adaptive manner, often appropriating places themselves due to a lack of specifically designed facilities. Their use differs a lot per person, but in general is highly dependent on visibility, accessibility, flexibility of use, and the presence of others. Frequently used spots in Carnisse include Amelandseplein, Lepelaarsingel and Zuidplein, where dedicated functions exist, but personal interpretation remains possible, allowing youth to meet, spend time and be seen. Their experience of public space is influenced by safety, social control, and liveliness. At the same time, adolescents influence the space themselves through their presence and behaviour, occasionally creating friction with other users. The use, experience and influence form a continuous cycle of mutual reinforcement.

Wellbeing through public space

The extent to which public space influences mental wellbeing differs among individuals, as wellbeing is highly dependent on personal and social factors. However, by offering good spatial qualities that improve its accessibility, safety, functionality, and impact on physical health, public space can significantly contribute to more social inclusion, physical health, and overall wellbeing. In Carnisse, these positive effects are currently limited by a lack of high quality and diverse public spaces, a fragmented network, low social safety and a monotonous neighbourhood structure. As a result, there are currently few opportunities for meaningful use within the neighbourhood.

To a design strategy

The synthesis between the three themes reveals a mismatch between the current spatial layout of Carnisse and the contemporary needs of adolescents. The results namely show that the current layout limits their autonomy and wellbeing by forcing them to the edges of the neighbourhood, while the public space does have the potential to function as supportive system for their wellbeing. This mismatch highlights the need for spatial interventions and leads to the design challenge to transform Carnisse from a fragmented and underactive neighbourhood into a more cohesive urban system that better aligns with the needs of adolescents in terms of program, network and urban quality (Figure 37). To achieve this, the focus is divided into three interconnected layers:

1. Programming
2. Network
3. Densification

To guide the design within these three layers, several design criteria are applied that derive from the analysis and the literature. These criteria ensure that the interventions directly align with the needs of adolescents in Carnisse:

1. **Improve accessibility:** ensuring easy and open access to everyone.
2. **Stimulate social interaction:** designing physical spaces that invite informal encounters and gathering.
3. **Enhance perceived safety:** improving visibility, lighting, and social control to make spaces feel safer.
4. **Support autonomy:** providing safe connections that allow adolescents to move independently through the area.
5. **Promote healthy lifestyle:** encouraging physical activity and contact with nature.
6. **Create high quality of stay:** designing comfortable public environments that invite spontaneous interaction and longer stays.
7. **Strengthen identity:** creating sense of place and local attachment.

Together, these layers and criteria form the basis for the redesign of Carnisse into a coherent, liveable, and future-proof urban system, where the daily life of adolescents takes centre stage.

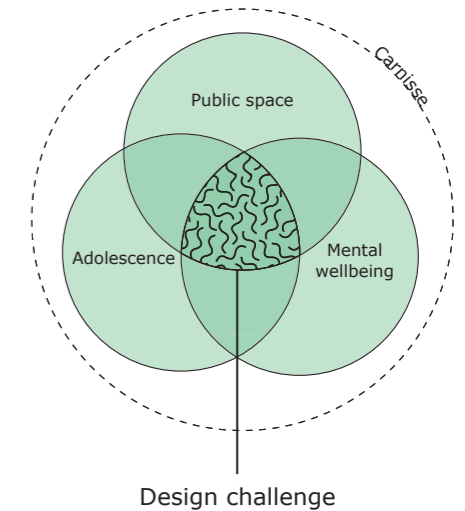


Fig. 37: A diagram showing that the results to the sub-research questions led to the central design challenge.



Programmatic zoning

The results show that adolescents in Carnisse have highly diverse needs, while the neighbourhood is currently uniform and lacks variation. To address this mismatch and improve their wellbeing, four different programmatic zones are introduced. These zones create varied levels of activity, privacy, and social integration, allowing every type of adolescent to find a suitable place in the neighbourhood. By distributing these zones throughout Carnisse, underutilized spaces are transformed into a multifunctional and accessible network that supports autonomy and social inclusion. The zones are divided into:

Active

The active zones focus on movement, social interaction and high visibility. These spaces include sports fields, calisthenics areas, and skate parks (Figure 38). In Carnisse, locating these active zones along busy and open spaces enhances local liveliness and uses existing social control to improve perceived safety.

Calm

The calm zones provide low stimulus environments that support relaxation and mental recovery from daily stress. Located in quieter areas, these spots include natural greenery, walking paths, and small, comfortable seating areas (Figure 39). In Carnisse, these zones are designed as quiet, green pockets in corners along routes and squares, offering adolescents safe and accessible spots to retreat from the busy and stony environments.

Chill

The chill zones function as informal extensions of the living room, where adolescents can relax and linger (Figure 40). Flexible seating and sheltered areas near functions such as cafés or libraries create comfortable spaces for longer stays without consumption pressure. As private outdoor space in Carnisse is often limited, these zones offer crucial informal hangout spots that foster everyday social belonging.

Creative

The creative zones provide space for self-expression, youth culture and informal learning. These areas include community ateliers, repair spaces, outdoor music and dance spaces, and legal graffiti walls where youth can express themselves freely (Figure 41). By integrating these zones near community hubs in Carnisse, they provide visible spaces for youth culture, strengthening their sense of identity and ownership in the area.

Together, these four zones transform Carnisse from a monotonous environment into a balanced urban environment that supports the different emotional and social needs of adolescents throughout the day.



Fig. 38: Impression of functions in active zoning.

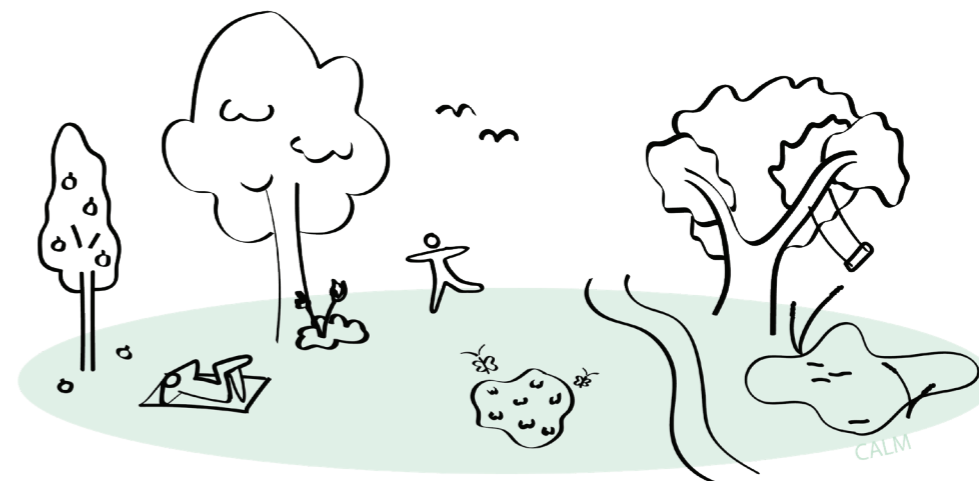


Fig. 39: Impression of ambiance in calm zoning.

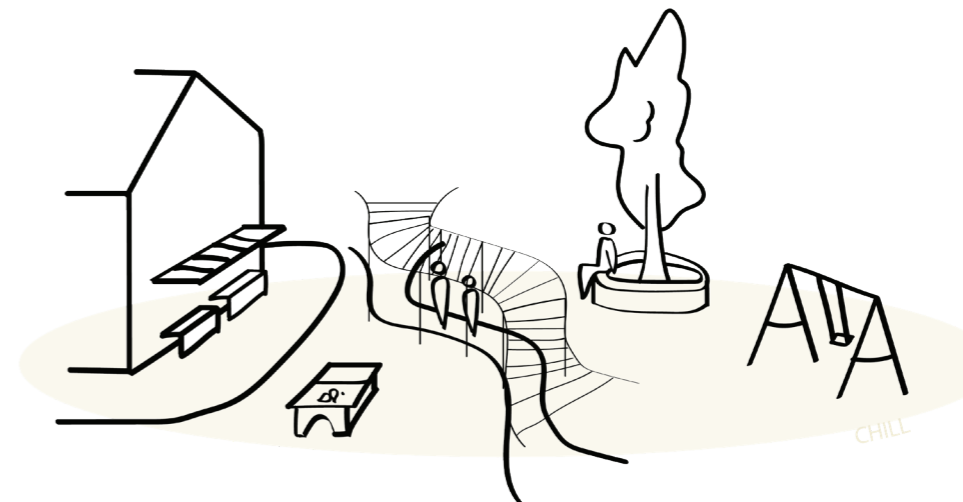


Fig. 40: Impression of ambiance in chill zoning.

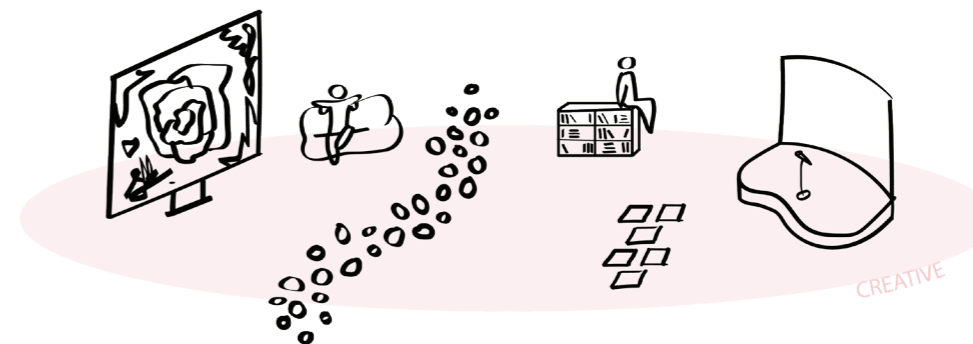


Fig. 41: Impression of functions in creative zoning.

DESIGN

The transformation strategy

PHASE 1 - ACTIVATE

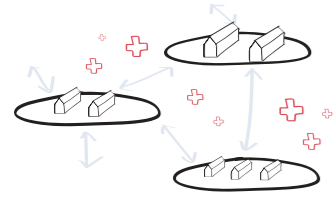


Fig. 42: Birdseye of Carnisse showing building blocks and the spaces for the activation of public space in phase 1.

PHASE 2 -CONNECT

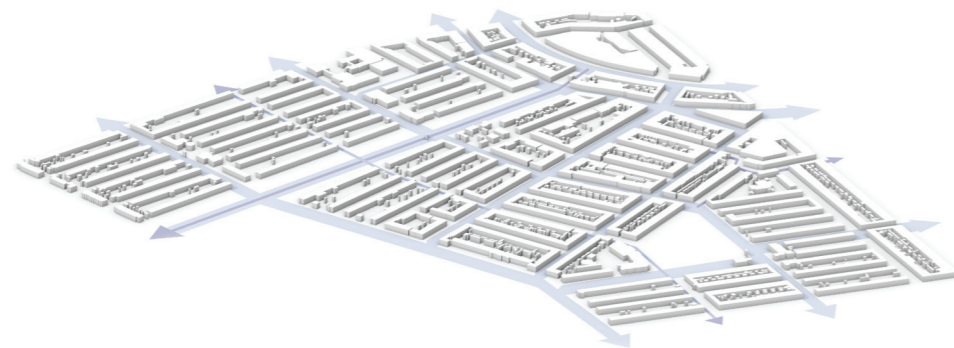
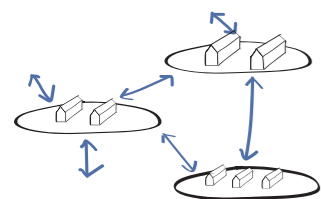


Fig. 43: Birdseye of Carnisse showing building blocks and the new network that is established during phase 2.

PHASE 3 - INTENSIFY

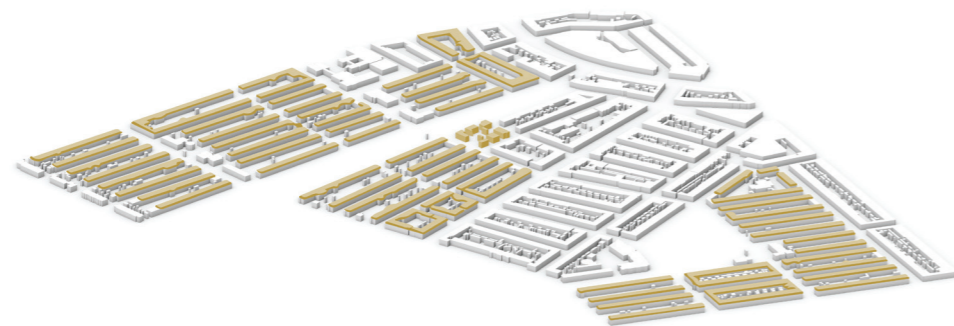
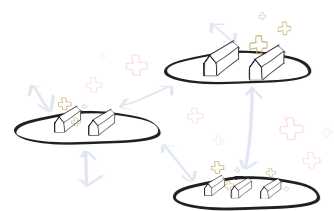


Fig. 44: Birdseye of Carnisse showing building blocks, the rooftop extensions and buildings with new functions that are added during phase 3.

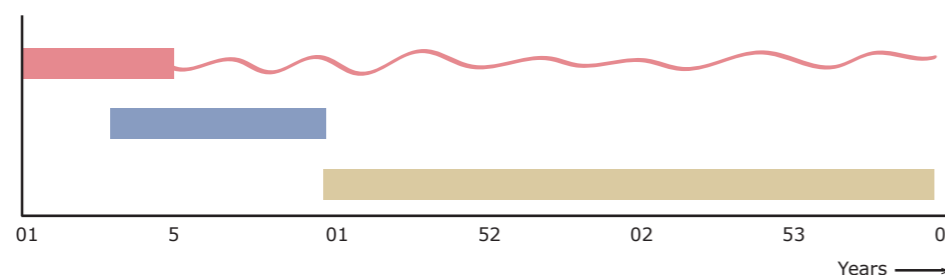


Fig. 45: Gantt chart for the global schedule of the phases.

The transformation strategy for Carnisse consists of three layers: programming, network and densification. These layers gradually transform the neighbourhood from a fragmented residential area into a more activated and cohesive urban system. The layers operate on different timescales (phases), allowing Carnisse to develop through both more flexible and permanent spatial interventions.

Phase 1 - Activate public spaces

The first phase focuses on quick, flexible, low-cost interventions to create a more diverse and inclusive environment for adolescents. This is achieved by identifying public spaces for activation and within those spaces implementing the four programmatic zones (active, calm, chill and creative) using flexible seating, lighting, greenery, and functional program (Figure 42). Due to the adaptability of public space, these interventions can be realized quickly to stimulate immediate social interaction and inclusion. By testing what works and adapting the public spaces to the changing needs of adolescents, it is a future proof component of the strategy.

Phase 2 - Connect the new network

Building upon the newly activated spaces, the second phase creates a coherent and safe network for soft mobility (Figure 43). This phase focuses on connecting the permanent inner structures of Carnisse by constructing bicycle streets and residential courtyards, opening specific residential blocks for better connections, and transforming the central green axis into a central soft mobility route. These infrastructural changes require more time, but provide a stable, long-term foundation that connects the activated zones with peripheral amenities.

Phase 3 - Intensify and mix the neighbourhood

The final phase focuses on urban intensification to strengthen social cohesion and density. By adding youth housing in rooftop extensions, and active functions in plinths, a livelier and more inclusive urban environment is created (Figure 44). This new density directly benefits from the activated public spaces and improved networks established in the previous phases, making Carnisse a more attractive and inclusive living environment for various residential groups.

This phased approach improves the financial and practical feasibility of the project, as the first phase requires low initial investments, and achieves results quickly. The resulting spatial and social improvements create a stronger justification for the more expensive and drastic infrastructural investments in phase 2. Eventually, the third phase is a long-term investment that is highly dependent on the housing market, municipal policies, and housing corporations, ensuring a permanent and future-proof transformation for Carnisse.

This phased approach ensures that Carnisse develops gradually, combining immediate public space activation with long-term urban interventions. The global schedule and the overlap of the three design layers are visualized in Figure 45 and 46.

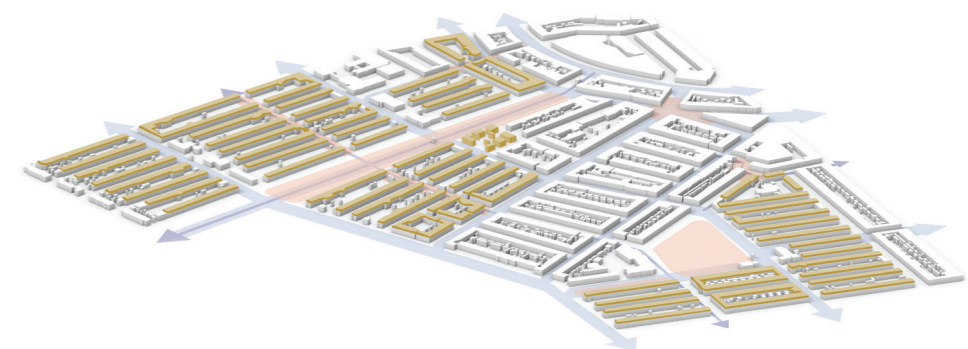


Fig. 46: Birdseye of Carnisse showing building blocks and the three layers of the transformation strategy: programming, network and densification.

Activate

On neighbourhood level



Fig. 47: Map of Carnisse showing the spaces for public space activation in phase 1.
(Sources used: PDOK)

The activation layer focuses on adding functional, youth-oriented programmes to existing public spaces in Carnisse. By distributing new activities across squares and streets, underutilized spaces become more active and functional. The strategy does not only focus on more opportunities for relaxation and activities but also targets specific streets that are currently underused and considered unsafe (Figure 47). Introducing new functions to these vulnerable areas will increase the social activity and control, and turn anonymous routes into lively, safe environments.

Central in this strategy is the Lepelaarsingel, which functions as the social and spatial backbone of the neighbourhood. Due to its green character and central position, the singel has great potential to become a highly valued and recognizable public space. By activating the Lepelaarsingel with different programmes and connecting it to the broader network, it becomes a continuous and safe route that links various routes, amenities and public spaces to one another.

Activating public spaces along these routes directly targets the accessibility of the amenities and supports autonomy, by making it easier and safer for adolescents to move independently through the area.

The four programmatic zones (active, creative, chill and calm) are introduced within these activated public spaces to encourage functional mixing and interaction between different user groups. This avoids mono-functional areas and creates a comfortable environment that guarantees a high quality of stay for everyone. By offering a variety of atmospheres, the strategy acknowledges that adolescents have diverse social and emotional needs within public space. Some places invite them to exercise, walk and bike, thereby promoting a healthy lifestyle, while others are designed to stimulate creative expression or social interaction. Ultimately, by transforming the public spaces into functional and inclusive places, the strategy aims to develop a sense of belonging for everybody.



Connect

On neighbourhood level

- One way residential area
- One way bicycle street
- Two way street
- City road



Fig. 48: Map of Carnisse showing the new street network, established in phase 2.



Fig. 49: Main current network.

Fig. 50: Opened buildings.

Fig. 51: Network after interventions.



The network layer of the strategy focuses on rebalancing Carnisse’s mobility structure by prioritizing walking, cycling and public transportation over private car use (Figure 48). To support the activation of public spaces from the previous layer, several existing building blocks are selectively opened to create direct connections between these public spaces, Zuidplein and surrounding amenities (Figure 50). This creates a more continuous and legible network, improving accessibility and reducing fragmentation within the neighbourhood. By distributing movement more evenly throughout Carnisse, isolated areas become better connected and activated, contributing to a greater sense of safety and social control, as shown in Figures 49-51.

To improve the quality of the residential environment, inner streets are reorganized into a one-way traffic system that directs through traffic towards the major surrounding roads. While residential areas all remain fully accessible, unnecessary car movement within these streets is reduced. This allows space to be allocated from traffic and parking towards shared and welcoming environments that promote more informal social interaction and a higher quality of stay.

Although car access remains important, the new network is designed to encourage walking, cycling and the use of public transportation, particularly in relation to Zuidplein. Safe and direct soft mobility routes support adolescents in moving independently through the neighbourhood, while promoting a healthier and more active lifestyle. At the same time, stronger connections within Carnisse and to the rest of the city through Zuidplein reduce dependence on the car and strengthen the neighbourhood’s overall connection.

Overall, the connectivity strategy transforms Carnisse from a fragmented and car-oriented structure into a safer, healthier and more connected neighbourhood that supports inclusive mobility, social interaction and everyday autonomy.

Intensify

On neighbourhood level



Fig. 52: Map of Carnisse showing the buildings with rooftop extensions and the extra programming added in phase 3. (Sources used: PDOK)

By adding rooftop extensions on existing apartment buildings, that specifically target housing for adolescents and young adults, Carnisse can accommodate population growth without consuming open spaces. This allows valuable space to remain available for public functions and green spaces, while providing young residents with opportunities to live independently within their own neighbourhood. As a result, their future perspective in Carnisse is strengthened, increasing the likelihood that they remain in the area and invest in social networks and the physical environment. This contributes to stronger place attachment, social stability, and long-term engagement with the neighbourhood.

In addition to providing housing, the strategy aims to increase the resilience of Carnisse through programmatic intensification and functional mixing (Figure 52). By distributing community-oriented functions throughout the neighbourhood, daily destinations for adolescents become more evenly distributed and accessible. This enables adolescents to move themselves easier between activities by foot or bicycle, supporting autonomy and reducing dependency on others for everyday mobility.

Adding ground floor functions such as a library, repair shops, and other community and youth-oriented facilities, increases street-level activity and contributes to perceived safety through more social control. At the same time, these functions create opportunities for informal encounters and social interaction, strengthening a sense of belonging. This more balanced distribution of amenities also contributes to more equity across the neighbourhood.



Redesign of Lepelaarsingel

On public space level

Within the strategy, the Lepelaarsingel serves as a green, functional axis that acts as the backbone of the new mobility and public space network, as can be seen in Figure 53 and 54. The goal is to extend the green and peaceful atmosphere from Zuiderpark into the urban area of Carnisse, creating a healthy and tranquil environment that accommodates a variety of functions.

By extending the green structure from Zuiderpark in the southern part of space and creating a stronger connection between the public spaces and the water, a calm and attractive environment is created. This is reinforced through the installation of intimate spaces, such as decked platforms that provide contact with nature, improving both mental wellbeing and a quality of stay (Figure 55).

In contrast, the open area next to it is intentionally left without a fixed function, leaving it for flexible use and activities. This creates opportunities for adolescents, and other users, to appropriate the space according to their own needs.

Towards the north, the existing playground will be upgraded and an adjacent skatepark with legal graffiti spots will be built for older children and adolescents, resulting in a stronger sense of ownership and belonging among the youth (Figure 56).

As shown in figure 54, there are pedestrian paths on both sides of the Lepelaarsingel. The surrounding environment on the western side is designed for faster moving traffic and car parking, while the eastern side focuses on recreation and leisure. On both sides, soft mobility is prioritized, reducing through traffic and creating a safer environment for pedestrians and cyclists, while ensuring accessibility for everyone.

To strengthen the role of the singel as an active public space, new functions are programmed in the park and are integrated with surrounding buildings. A yoga studio is, for example, positioned next to a quiet green corner where they can practice outside (Figure 57). Parents are more likely to use this than adolescents themselves, which could contribute to a more calm home situation. Additionally, a library and culture hub are introduced, serving as safe indoor spaces that offer study facilities, educational support, skill development and opportunities for social interaction. Together, these functions contribute to a more vibrant and inclusive public axis that strengthens physical and social inclusion.

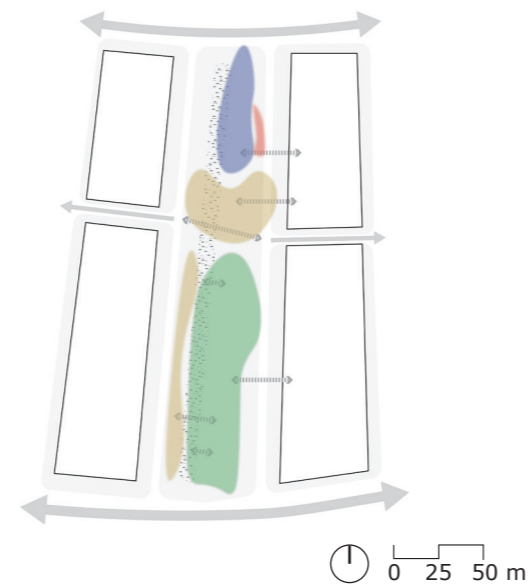
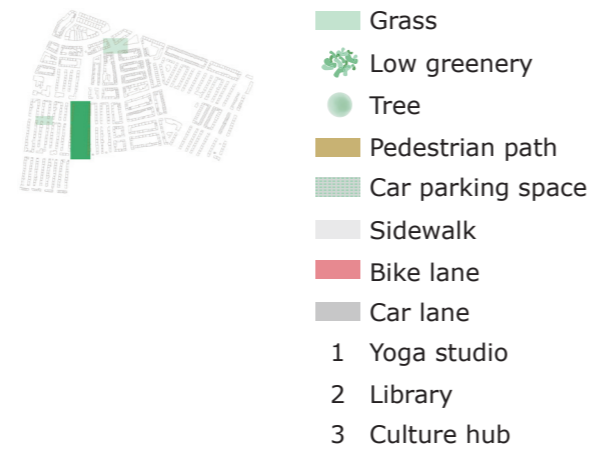


Fig. 53: Zoning and connections for Lepelaarsingel.

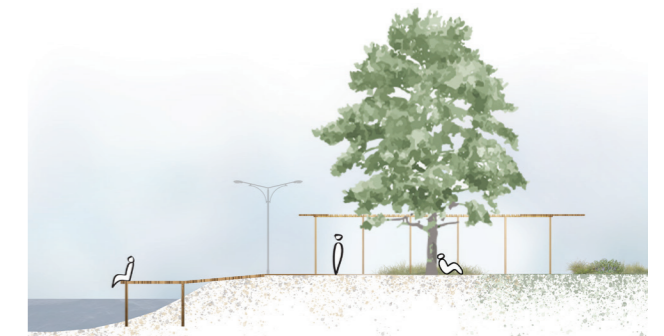
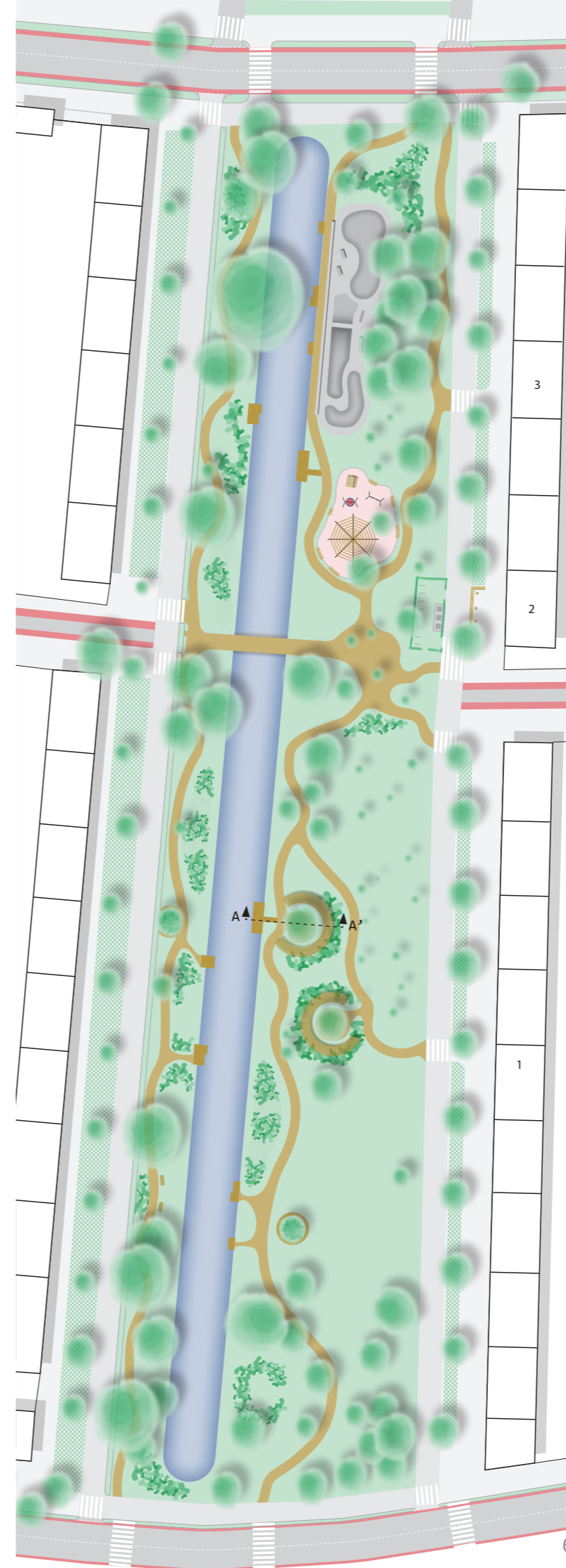


Fig. 55 : Section AA' on the deck and urban chamber, showing the calmth of the southern area.



Fig. 56: A mood image of the skatepark.



Fig. 57: A mood image of the yoga space in the park.

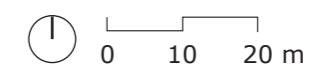


Fig. 54: Map of the design for the Lepelaarsingel.

Redesign of the intersection

On public space level

Located at the intersection of the Katendrechtse Lagedijk, Zandblokstraat, Carnisselaan and Buijserlaan, this site forms an important transition point within Carnisse. Although many residents pass through the area daily, to reach the Wolphaertsbocht or the tram stop, the space is largely underused. By introducing one-way traffic, space becomes available for functional public use to transform the intersection into a neighbourhood hub (Figure 58 & 59).

A new public square and urban park are envisioned that combine existing greenery with low vegetation that maintains visibility and social control. While the square provides an active meeting space, the mini park on the east offers a quieter environment for relaxation and contact with nature and art, creating a balance between activity and retreat.

Adjacent to the park, a new community centre focused on art and culture is introduced that offers space for legal graffiti. This offers adolescents creative expression and strengthens their sense of ownership and connection to the neighbourhood. Together with the multifunctional plaza and stage, that interact with the community centre, these functions contribute to spontaneous social interaction and create a recognizable destination within Carnisse.

New safe pedestrian crossings, bicycle parking and improved connection to public transport stops encourage independent mobility, while shelters and parklets provide comfortable places to wait, meet and linger, contributing to a safer, more accessible and higher quality public space (Figure 60).



- Grass
- Low greenery
- Tree
- Pedestrian path
- Car parking space
- Sidewalk
- Bike lane
- Car lane
- Building
- Bicycle parking



Fig. 59: Map of the design for the crossing point.

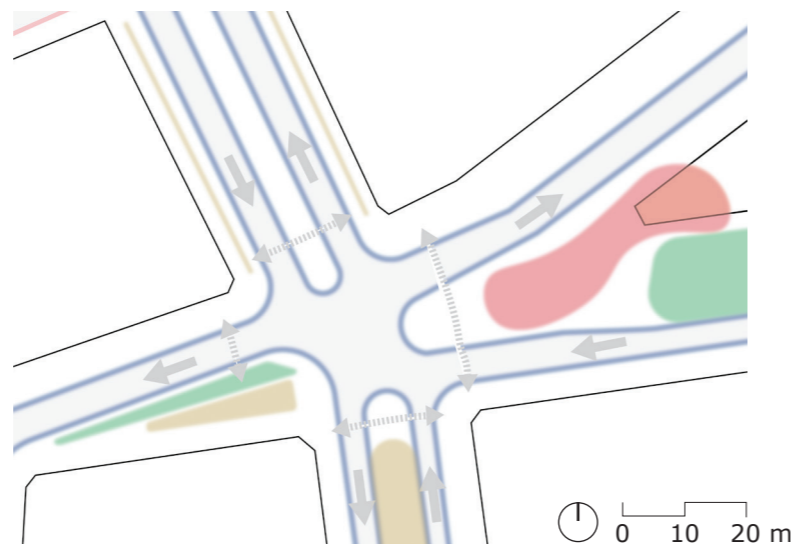
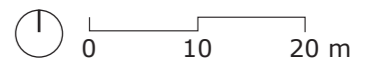


Fig. 58: Zoning and connections for the crossing point.

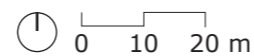


Fig. 60: Cross section AA' on a parklet between the streets.



Redesign of the intersection

On public space level

The circular semi sunken plaza, which is in the middle of the square, is designed as a flexible gathering space for performances, open mic nights, dance events, workshops, neighbourhood meetings and informal use (Figure 60). By providing a platform for participation and creative expression, the stage encourages social interaction and quality of stay, while allowing adolescents to strengthen their identity and connection to the neighbourhood.

Flexible seating arrangements support both organized events and spontaneous use, creating an inclusive environment where anyone is welcome. As observed during the research, adolescents are particularly attracted to informal and adaptable seating environments.

Lowering the plaza by approximately one metre creates an intimate atmosphere while maintaining visible from the surrounding space (Figure 61). This balance between enclosure and openness contributes to both comfort and perceived safety.

The lowered design of the plaza also functions for climate adaptation, as it can temporarily store rainwater to slow down the local runoff to the sewer, preventing flooding during peak rainfall. Together with surrounding greenery, this improves environmental comfort and contributes to a public space with a strong local identity.



Fig. 60: Mood impression for the activated square at the intersection.



Fig. 61: A cross-section over the community centre and water square.

Redesign of urban corners

On public space level

Currently, the Roodborststraat (bicycle street in image 63) is a dead-end street, while the spaces surrounding are underused, creating anonymous and inactive building corners. By extending the street and introducing new functions on the corners, the streets become destinations rather than leftover areas, transforming a previously fragmented area into an active part of the neighbourhood (Figure 62 & 63). The corners are designed as safe and accessible outdoor living rooms where people can meet and linger without pressure to consume (Figure 64).

New community functions, such as a repair shop, community canteen and flexible gathering spaces are introduced to support social interaction, skill development, and community engagement. The repair shop in the southern courtyard offers opportunities to gain practical skills and is located at a parking free courtyard that functions as a square for gathering and flexible programming, while the sheds provide accessible space for everyday encounters and organized activities.

The street itself is transformed into a bicycle street, prioritizing soft mobility over car traffic, while the sidewalks are divided into two sections, where the top one focuses on movement and the lower one on lingering and socializing. Trees, low greenery, permeable surfaces, and use of wooden material contribute to climate adaptation and create healthier and more comfortable streetscapes. Together, the interventions transform the Roodborststraat into a recognizable and active corridor that supports autonomy, social interactions, and a better sense of place.

Activating the street by extending it and adding functions improve visibility, accessibility and social control, transforming a previously fragmented area into an active part of the neighbourhood.

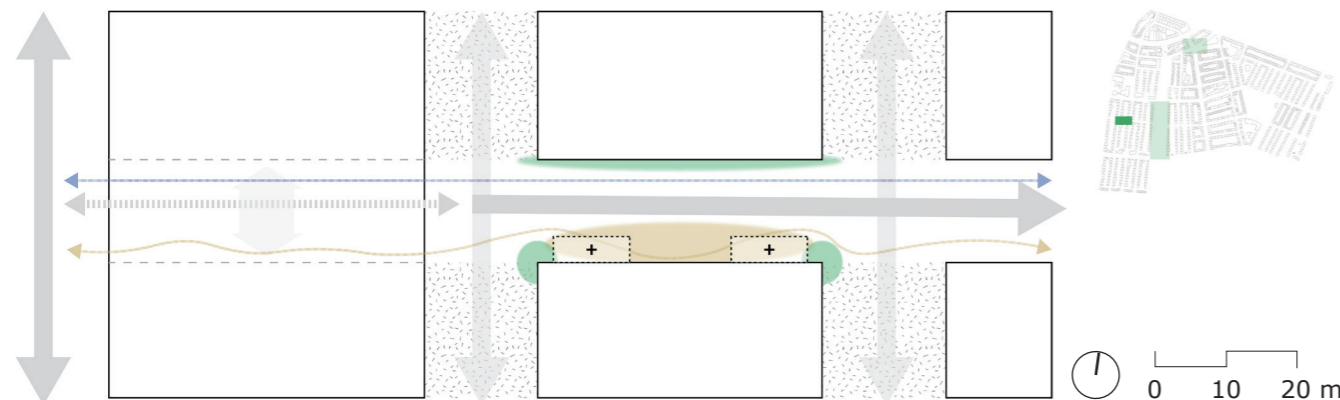


Fig. 62: Zoning and connections for one of the corners.



- Hedge
- Grass
- Low greenery
- Tree
- Pedestrian path
- Car parking space
- Sidewalk
- Bike lane
- Car lane
- Building
- Bicycle parking
- 1 Repair shop

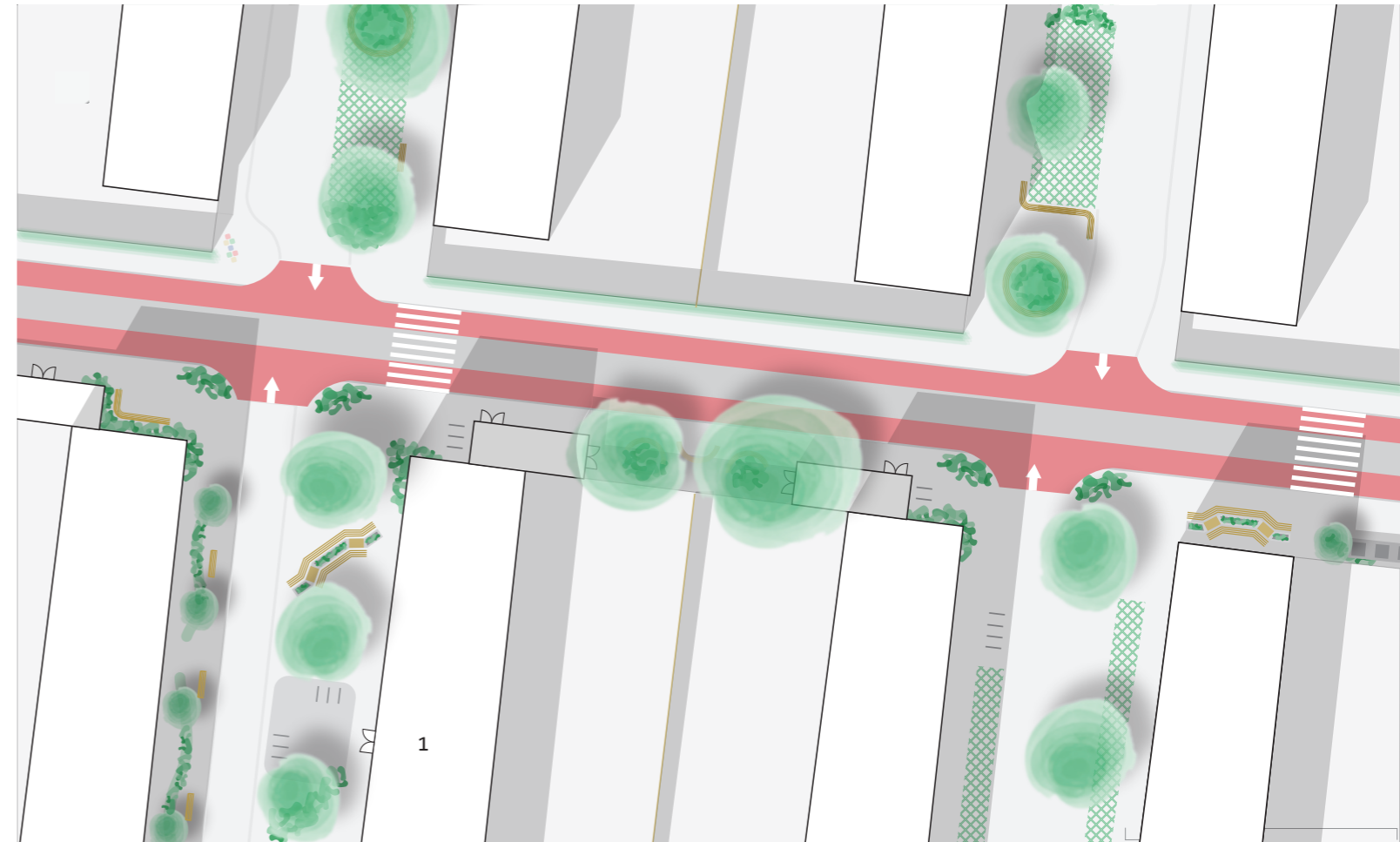


Fig. 63: Design for a corner.



Fig. 64: A mood image of the street corner with the community canteen.

Redesign of urban corners

On public space level

In this specific corner design, two sheds are placed on the end of the residential building. These sheds and the space between them form a shared outdoor living space that is publicly accessible, but well-organized and socially safe, as visualised in Figure 65 and 66. Each shed serves a different purpose: one accommodates an informal neighbourhood canteen with a bar and a cabinet containing games and tableware, allowing visitors without any pressure to consume. The other provides a flexible community space, where workshops, meetings, homework support, dinners and movie nights can be organized. The planning for this is displayed on the bulletin board hanging outside, to keep people without social media informed.

Because both sheds have doors to both the street and garden side, they can function independently or be used together during larger activities, where the space in between functions as connector, creating a flexible setting that can adapt to different community needs.

The garden is accessible from both the street and the sheds, which feature large glass panels in their facades, allowing for better visibility. In the evening, the sheds are closed, but the garden remains subtly lit so that it stays visible and safe.

Along the street edges, seating elements create a gentle transition between movement and gathering, creating more intimate spaces without creating barriers.

By attracting a variety of users throughout the day, the space supports social diversity and community engagement, helping to create a shared sense of ownership and responsibility for the space.

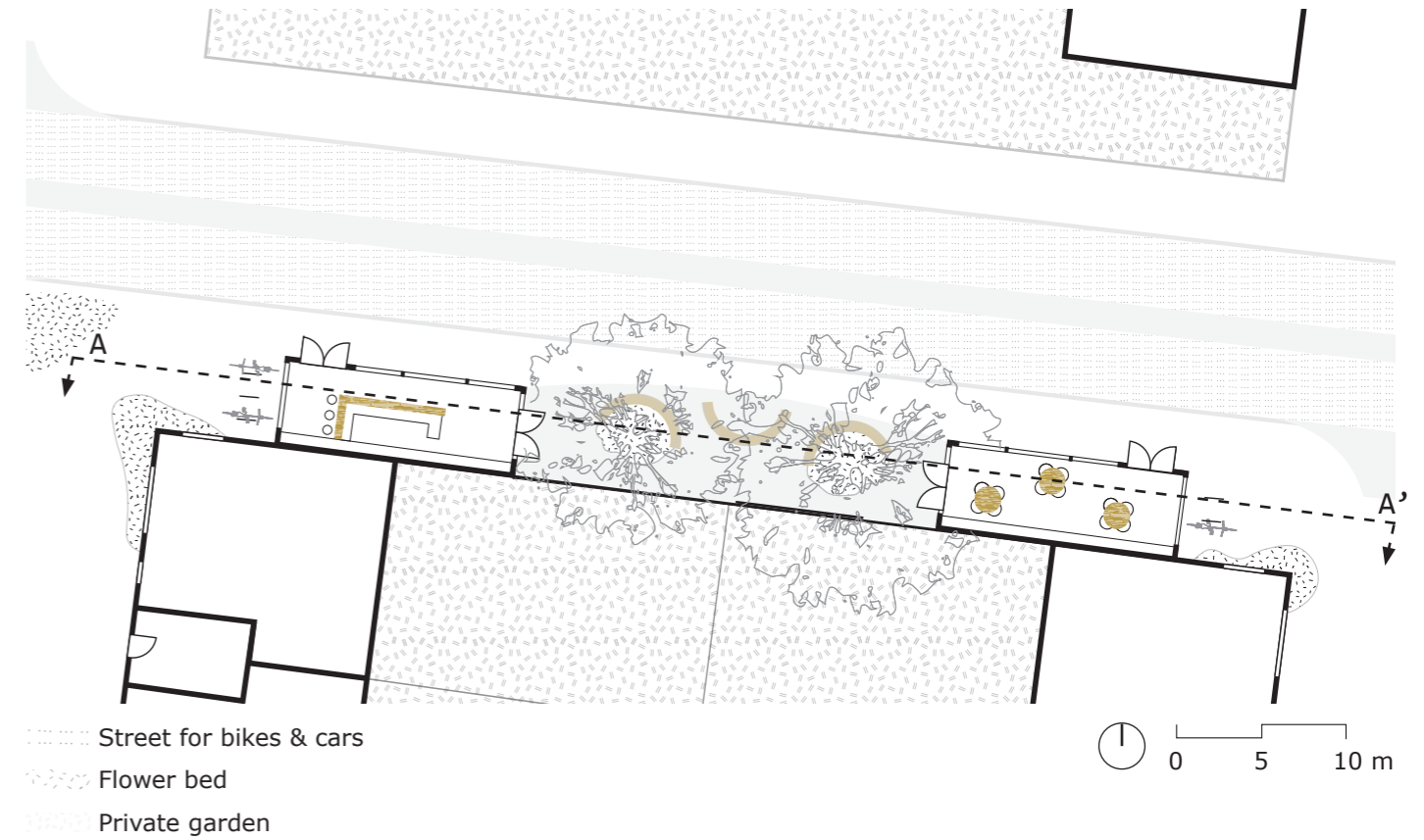


Fig. 65: Architectural floor map of the new functions on the edge of the corner.



Fig. 66: Cross section AA' over the sheds to show the relationship between the in- and outside of the activated corner.

Improving the network

Via streetscape interventions

Within the neighbourhood, the streets between the apartment buildings are redesigned as residential courtyards, where walking and cycling are prioritized over car traffic (Figure 66). By redirecting unnecessary vehicle movement towards the peripheral streets, traffic within the residential areas is significantly reduced, creating a safer and more comfortable living environment, while freeing up space for greenery, social interaction and recreation.

This mobility shift is reflected in three street typologies. The primary streets that accommodate most vehicular traffic will get dedicated cycling space (Figure 67). From these streets, bicycle streets provide access to the residential areas, giving priority to cyclists and other forms of soft mobility (Figure 68.). And at the centre of the neighbourhood, the courtyards function as shared living environments where cars are guests and speeds are limited (Figure 69).

Each courtyard receives a unique combination of greenery, parking solutions and gathering spaces, as can be seen in the section in Figure 69, creating greater spatial variation and more local identity. The courtyards are constructed on slightly raised surfaces, clearly indicating the transition from traffic space to residential space (Figure 68).

While parking remains important to ensure accessibility and inclusivity, it is more carefully organized. Parking spaces are positioned further away from buildings or are positioned more parallel, to improve safety (Figure 70). At the same time, additional bicycle parking spaces and meeting places are introduced, transforming the courtyards into urban environments that prioritize safety, physical wellbeing and quality of stay.

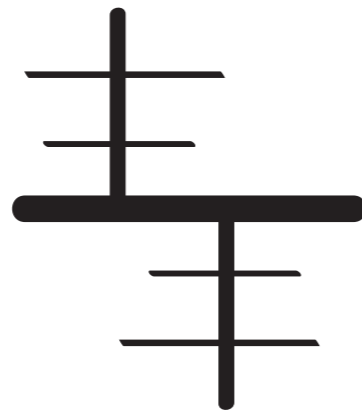


Fig. 66: Diagram showing the system of primary streets, bicycle streets and courtyards.

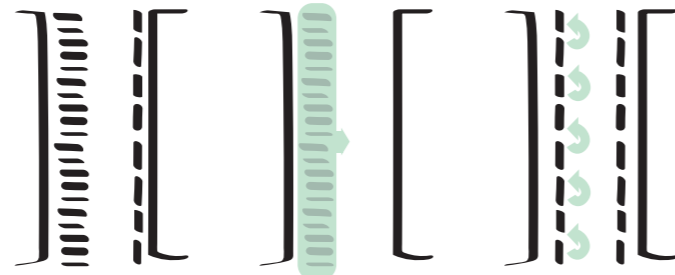


Fig. 70: System diagram that shows interventions for the parking systems to improve perceived safety.

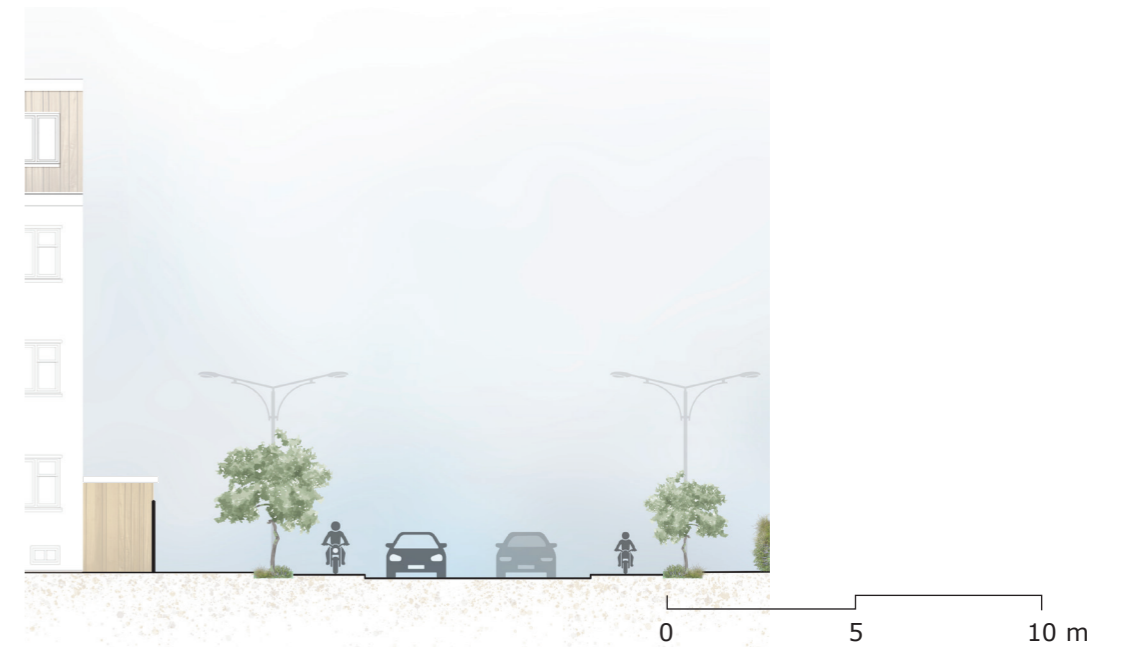


Fig. 67: Cross section over new street typology for primary roads, showing the new traffic distribution and green implementation for safety and health.



Fig. 68: Cross section over new bicycle street typology, showing the traffic distribution and heightened courtyards.

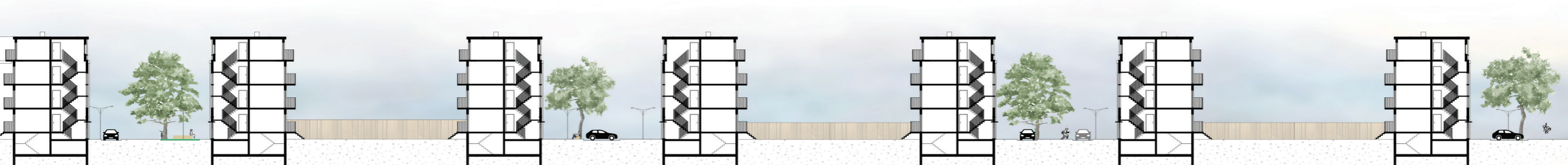


Fig. 69: Improved cross section over Figure 25, showing the differences between the courtyards.

0 10 20 m

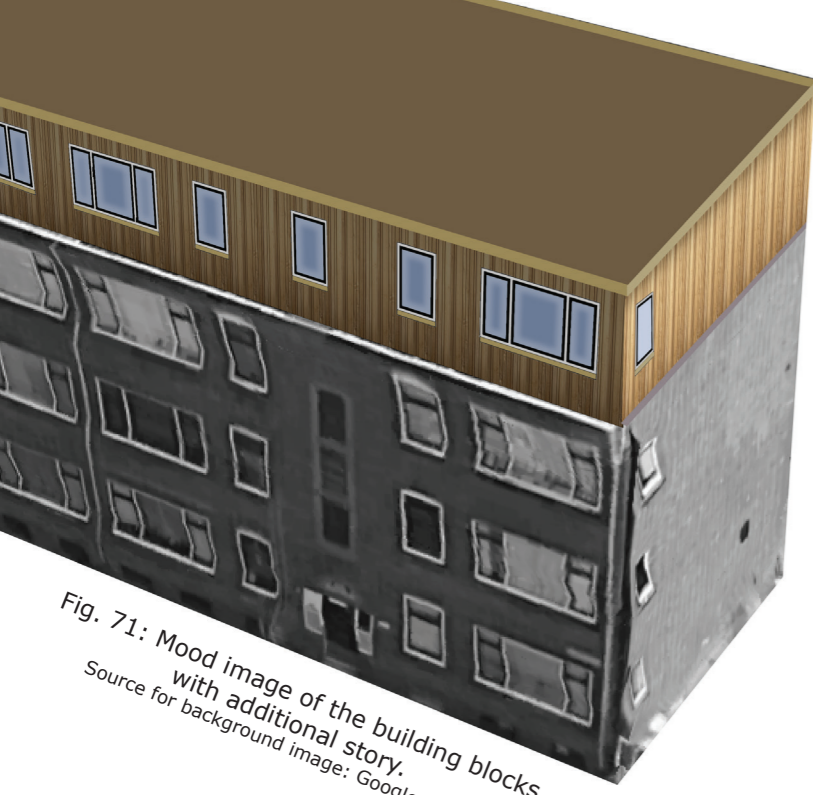


Fig. 71: Mood image of the building blocks with additional story.
Source for background image: Google Earth.

Intensifying the neighbourhood

Through rooftop extensions

The additional homes in the neighborhood will not be built on new land but will be added on top of existing apartment blocks (Figure 71). As shown in the floor plan in Figure 72, the housing concept combines private living units with kitchen, dining space and balcony as collective spaces. This collective living lowers the threshold to move out, making it more accessible for adolescents and young adults, while stimulating collaboration and interaction.

At the same time, the design maintains sufficient privacy and perceived safety through individual studio units, each containing a private bathroom and personal living space, contributing to independence. This balance between collective and private spaces supports independent living while maintaining social proximity.

The architectural design integrates carefully into the existing streetscape of Carnisse, by using the same timber in the façade as used in surrounding community buildings, strengthening visual continuity and creating a recognizable identity within the urban fabric. In addition, the warm texture and human scale of wood contribute to a softer and more inviting residential appearance.

Its compact layout allows for more efficient use of space, without occupying additional land or altering the existing urban structure. The timber frame constructions enable a lightweight, sustainable and cost-effective building method, using renewable materials that reduce environmental impact (Sleiderink, 2026). Furthermore, the funds generated from adding additional stories can be invested in making the existing homes more sustainable to improve the quality of life for other residents.

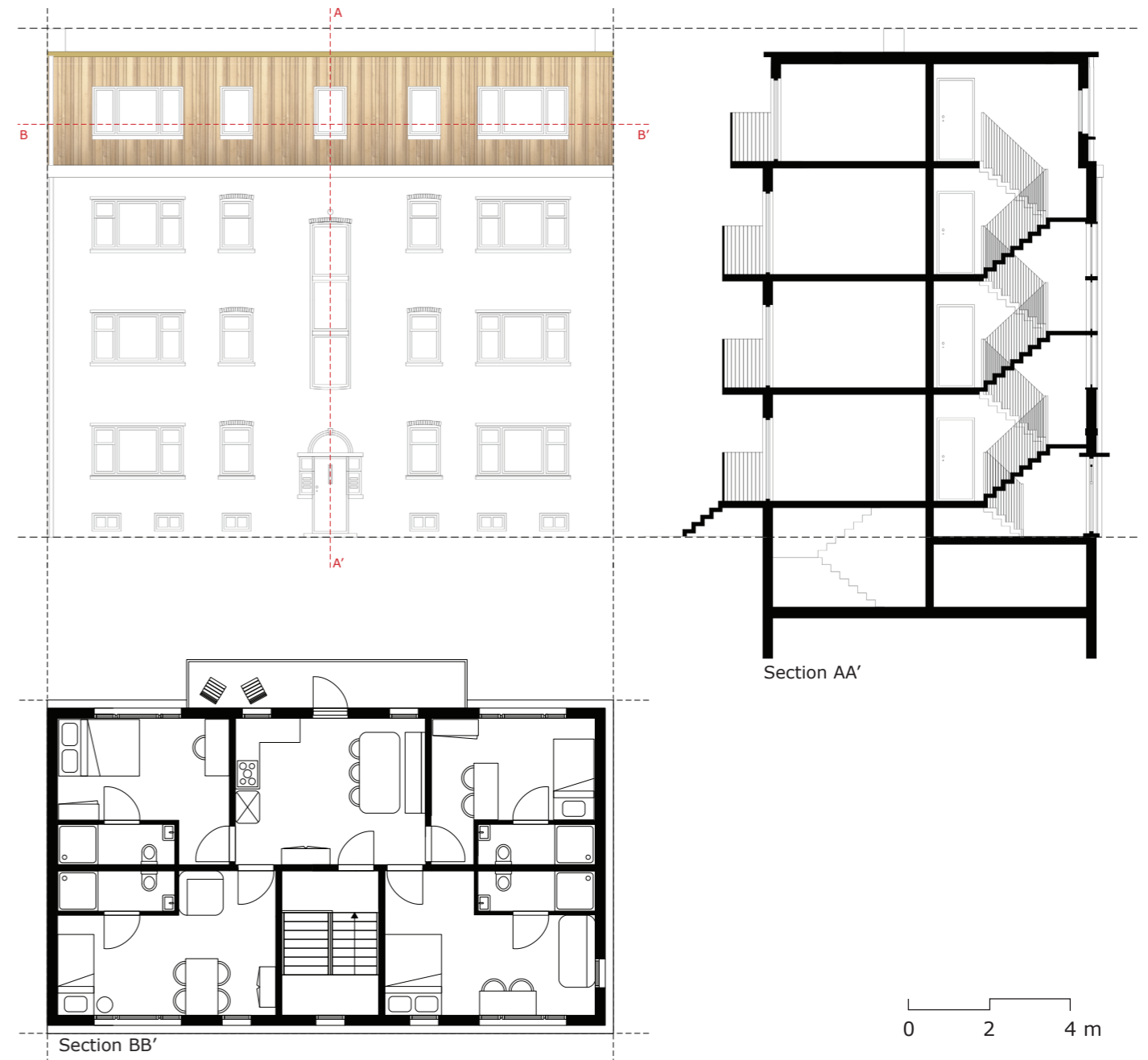


Fig. 72: Elevation and cross-sections of the apartment buildings with an additional stories.



The strategic vision for Carnisse

On neighbourhood level

The strategic vision map for Carnisse in Figure 73 brings together all proposed interventions and design layers into one integrated framework. It illustrates how existing structures are strengthened and connected through activated public spaces, an improved soft mobility network, and newly introduced functions.

The main objective of the strategy is to create equal opportunities across Carnisse by distributing youth-oriented amenities throughout the neighbourhood, activating public spaces and connecting these destinations through an accessible soft mobility network. By combining a diversity of functional zones with attractive and accessible public spaces, the strategy encourages social interaction and everyday use throughout the neighbourhood. This improved distribution also increases perceived safety, as previously isolated areas become more active and thus socially controlled. As a result, these places develop a stronger identity and offer a higher quality of stay.

The network is designed to support greater autonomy among adolescents by enabling safe and independent movement between key destinations within the neighbourhood. While improved connections to Zuidplein strengthen Carnisse's integration with the rest of the city.

The strategy primarily focuses on opportunities within the neighbourhood itself. This is because the surrounding roads around Carnisse form a physical barrier around the neighborhood, which makes movement to surrounding places more difficult, leading to a higher threshold for use. Therefore, it is important that adolescents can access essential amenities, social spaces and recreational facilities within walking or cycling distance. This reduces dependence on external destinations and supports independent participation in urban life.

Overall, the strategy transforms Carnisse into a more connected, inclusive and resilient neighbourhood where public space, amenities and mobility work together to support adolescent wellbeing, social cohesion and long-term neighbourhood attachment.

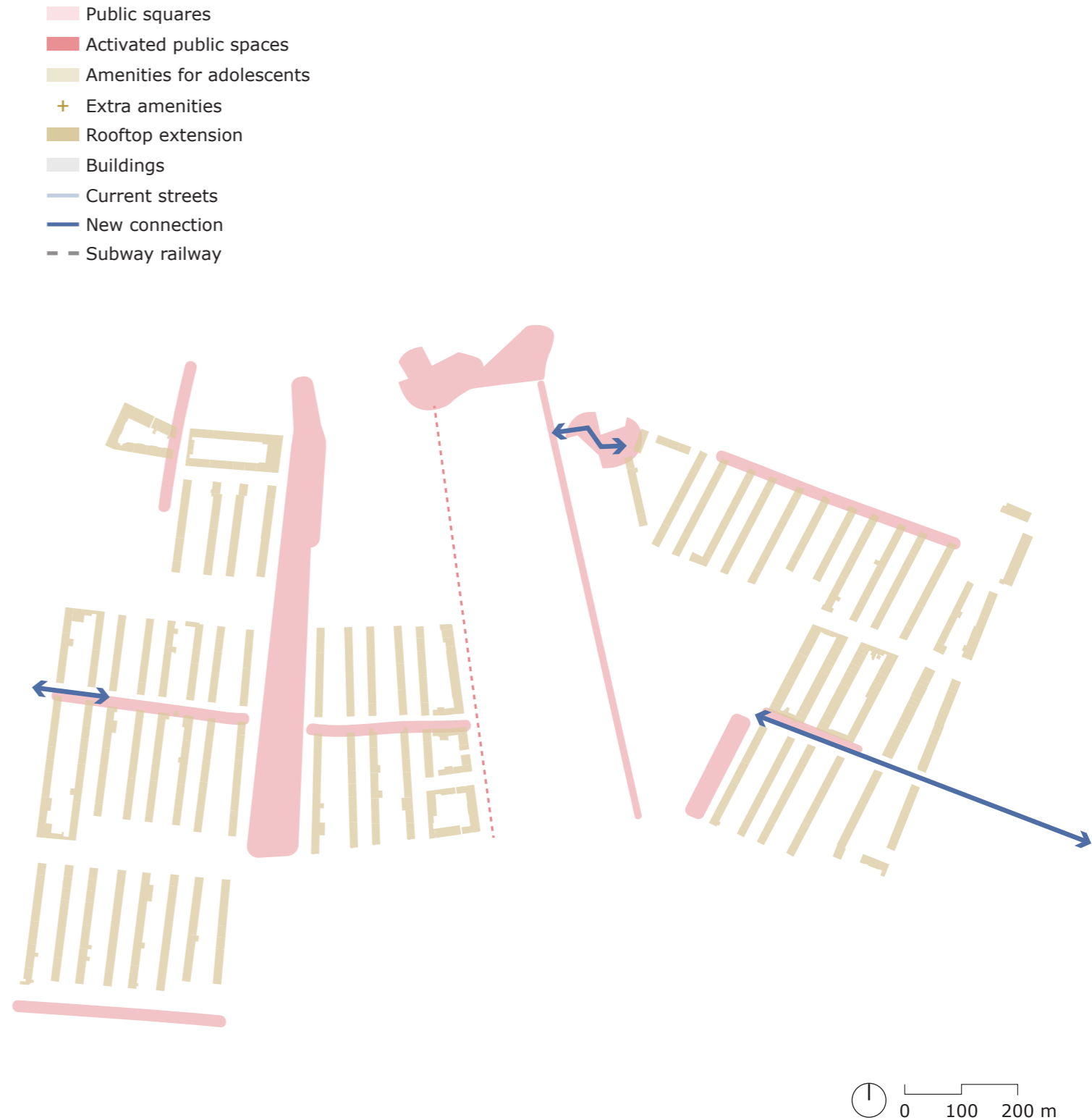


Fig. 73: The strategic vision map for Carnisse, based on the three layers (activate, connect and intensify) and on the design criteria, showing what is currently present and what is intervened.

The detailed vision for Carnisse

On neighbourhood level

This strategic vision translates into the following vision map for *Young Carnisse* (Figure 74).

- Bicycle street
- Primary street
- Activated space
- Water
- Green space
- Tree
- Sidewalk
- Pedestrian path
- Building
- Building with additional story
- Playground

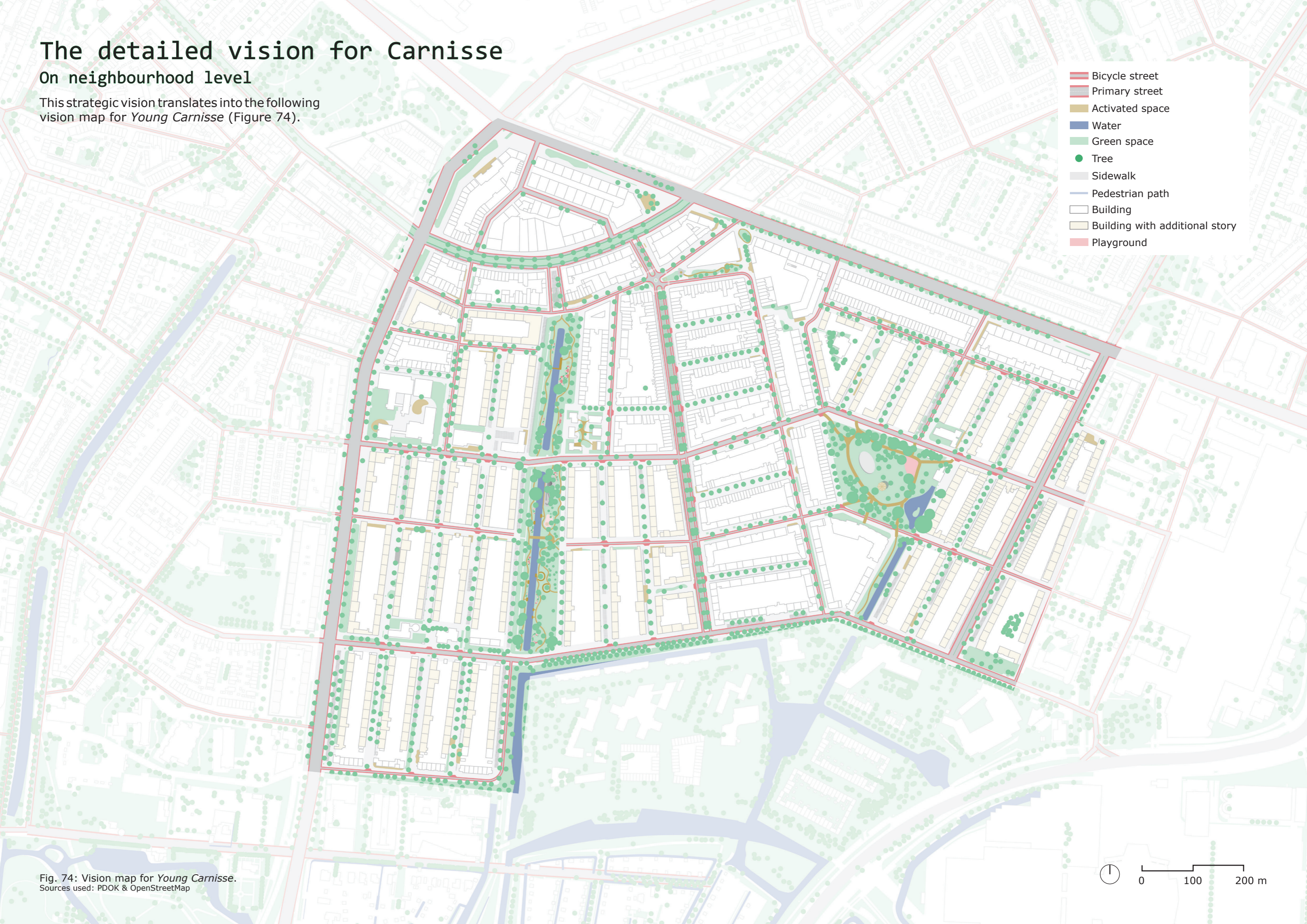
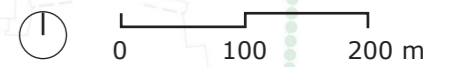


Fig. 74: Vision map for *Young Carnisse*.
Sources used: PDOK & OpenStreetMap



CONCLUSION & DISCUSSION

Conclusions

This master thesis explored the relationship between public space and the mental wellbeing of adolescents in Carnisse through focusing on the question: *To what extent does public space influence the mental wellbeing of adolescents and how can its design be adapted to improve the wellbeing of adolescents in Carnisse?*

The research that has been conducted shows that public space influences the mental wellbeing of adolescents in Carnisse, but that this influence remains relatively limited compared to personal and societal factors. The mental wellbeing of adolescents is namely largely determined by individual circumstances, such as home situation, social relationships, financial insecurity and concerns about the future, including housing shortages. Public space can't solve these problems, but it can contribute to how adolescents feel within their daily environment.

Within this context, public space plays a supporting role. A well-designed public space can contribute to feelings of safety, social inclusion, autonomy, and a sense of being accepted. At the same time, a poorly designed public space can reinforce feelings of exclusion, insecurity and social isolation. Consequently, the quality of public space primarily influences how adolescents experience their neighbourhood and the extent to which they feel comfortable in participating in public life.

The results show that the current spatial structure of Carnisse does not adequately meet the contemporary needs of adolescents. The neighbourhood was originally designed as a post-war residential area that aimed at solving housing shortages and being functional, resulting in little attention being paid to high quality public space and the stimulation of social interaction. This has led to a fragmented neighbourhood structure, limited social safety, and a lack of attractive places for adolescents to live their daily lives.

Both the literature review and the observations show that adolescents use public space in a flexible way. Due to the lack of specifically designed facilities, they appropriate places for themselves. Locations in Carnisse, such as Amelandsplein, Lepelaarsingel and Zuidplein are frequently used because they offer space for meeting, visibility, movement and personal interpretation of the space. This aligns with existing literature, which describes that adolescents have a need for public spaces that support freedom of use, social interaction and identity formation.

In addition, the research shows that factors such as accessibility, social safety, vibrancy and quality of stay determine how adolescents experience a public space. When these qualities are lacking, feelings of unwelcomeness and unreliability arise. The literature confirms that inclusive and high-quality public spaces can contribute to mental wellbeing and social development, especially in increasingly dense urban areas where qualitative public spaces are scarce.

Based on the link between literature, historical analysis, and the experiences of adolescents, a transformation strategy for Carnisse has been developed. This strategy consists of three phased and interconnected layers:

Connect
Activate
Intensify

Within these layers, interventions are done to improve connections for soft mobility, by adding more safe and accessible routes for cyclists and pedestrians and connecting those to public transportation, activating public spaces through adding new functions and program, and strengthening social cohesion through mixed-use development and densification.

Eventually this strategy formed the basis for a redesign on three currently underutilized public spaces, that focuses on improving the wellbeing of adolescents in Carnisse. Currently, these places often function as residual or transitional spaces and offer little quality for spending time or meeting. Within the design, these spaces have been transformed into places that actively contribute to the wellbeing of adolescents by adding new functions, greenery, places to linger, lighting, and safe routes for soft mobility. The seven design criteria that have been applied in this process are:

1. Improve accessibility;
2. Stimulate social interaction;
3. Enhance perceived safety;
4. Support autonomy;
5. Promote a healthy lifestyle;
6. Create a high quality of stay;
7. Strengthen identity.

In addition to these design criteria, the design of public spaces took into account the diverse needs of adolescents. To achieve this, four distinct zones were developed and implemented into the spaces: active, calm, chill and creative. Rather than making boundaries between them, they flow and complement each other to prevent spatial and social divisions.

This application of differentiation creates space for various forms of use and different personalities, allowing more adolescents, but also other users, to feel at home in the neighbourhood. The spaces offer flexible opportunities for meeting, relaxation, physical activity and personal expression.

Additionally, the inclusion of youth housing contributes to future prospects, social ties with the neighbourhood, and the reduction of uncertainty about housing shortage.

The conclusion of this project, therefore, is that public spaces do not directly determine the mental wellbeing of adolescents, but that they can indirectly support, or conversely, hinder it. When public space is designed to be safe, accessible, diverse, and inclusive, this can contribute to social interaction, identity formation, and stronger sense of belonging to the neighbourhood. In Carnisse, therefore, the opportunity lies not only in physical improvements, but above all, in creating a living environment where adolescents feel seen, welcome and involved within the neighbourhood. This research shows that future proof cities revolve not only around densification and spatial efficiency, but also around designing inclusive public spaces that accommodate the social and mental development of future generations.

Urban planning can't solve mental health problems independently, but it can shape the future by creating safe and inclusive urban environments.



Implications

The outcomes of this research and design project in Carnisse extend beyond the specific context of the neighbourhood and offer broader implications for urban design, particularly in post-war residential areas and currently urbanizing areas. The research shows that public space, while not a main factor influencing the mental wellbeing of adolescents, does play an important role in how adolescents experience their living environment and thereby forming an essential component of daily wellbeing.

Impact

On public space level, the project demonstrates how underutilized spaces can be transformed into high quality, inclusive and meaningful spaces for adolescents. By adding functions, improving social and spatial safety, and mixing different functions, public spaces are created that can contribute to social inclusion, relaxation, and identity formation. Adolescents are flexible users of public spaces and improving public spaces with a focus on them thus not only improves the space for them, but also for other residents and users. As a result, the daily experience of adolescents and other users is directly influenced, and more space is created for social wellbeing in everyday life.

At neighbourhood level, the project has an impact by restructuring Carnisse from a fragmented residential area into a more cohesive urban environment. The strategy of connect, activate and intensify ensures that physical connections, program and density are better aligned. Resulting in a more legible, safer, and more accessible neighbourhood for soft mobility, while simultaneously stimulating more social interaction. This strengthens the liveability of the neighbourhood as a whole and increases the degree to which residents feel connected to their environment.

On a larger scale, the project primarily impacts the positioning of Carnisse within the urban network. Through improved connections for slow mobility towards Zuidplein and surrounding areas, the public spaces in the neighbourhood are better integrated into existing daily routes, resulting in better interaction with other neighbourhoods. Strengthening the connections between neighbourhoods can thereby contribute to an improved urban fabric in Rotterdam-Zuid, where mobility, amenities and public spaces are more strongly interconnected.

& Recommendations

Transferability

Many post-war neighbourhoods share similar spatial characteristics with Carnisse, such as strong functional separation, monofunctional use, and limited qualitative public spaces. As a result, these areas often fail to meet the contemporary needs of adolescents. The issues identified for this case are therefore not unique, but rather representative for a broader urban challenge in comparable Dutch contexts.

The developed strategy offers transferrable frameworks for this, as activating underutilized public spaces, improving connections for soft mobility, and eventually intensifying the neighbourhood through mixed use development, together form an approach that is also applicable in other neighbourhoods. Due to its phased structure, the strategy is flexible and transferrable at various scale levels and within different contexts.

A key recommendation to urban design processes is the structural involvement of adolescents and all other users. Adolescents are intensive users of public space but are often insufficiently included in spatial decision making, while their input is essential for achieving inclusive and future proof urban environments.

The typologies of public spaces that are developed in this project and the design criteria are also widely transferrable, as they offer a concrete framework for assessing and improving the quality of public space with a focus on wellbeing.

In short, the project contributes at various scale levels to more qualitative public spaces in Carnisse, a more cohesive neighbourhood structure, and stronger connections within Rotterdam-Zuid, thereby better embedding the neighbourhood in the urban network of the city. In addition, the approach in Carnisse is transferrable to neighbourhoods with similar spatial mismatches, to contribute to the development of inclusive, future-proof cities where adolescents are actively involved in shaping the city.

Reflection

This reflection evaluates the research and design process of Young Carnisse, which investigated how the design of public space influences adolescents' mental wellbeing through daily experiences of safety, stress and social inclusion in Carnisse.

Process

The project evolved differently than initially planned in one key aspect: direct participation with adolescents was not possible. Due to ethical restrictions related to conducting research with minors and limited time within the graduation process, co-designing with adolescents could not be realized. This created a methodological challenge, as the project focuses on adolescents' experiences of public space, which are subjective difficult to capture without direct user involvement.

To gather user-centred insights without direct adolescent participation, informed empathy was used as a methodological alternative to co-design. Insight from literature, behavioural observation and spatial analysis were combined to reconstruct daily routines, emotions and spatial behaviours of adolescents, which formed the foundation for the design criteria (Figure 75). These interpretations were constantly cross-checked against scientific literature and spatial evidence to constrain subjectivity and strengthen its reliability.

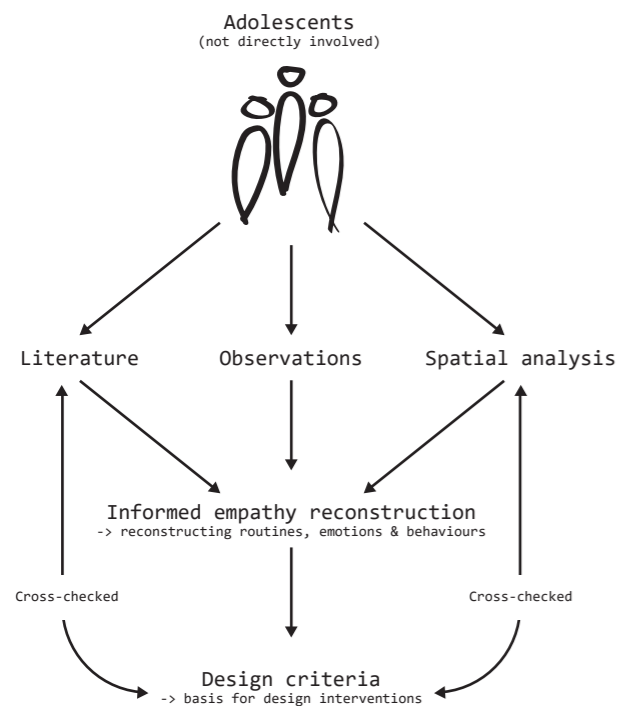


Fig. 75: Diagram showing how literature, observations and spatial analysis helped to reconstruct informed empathy, and formulate design criteria.

Methodology

In this project, research and design worked together in a continuous loop. The mixed methods approach combined on-site and off-site research to map spatial experiences in Carnisse. This allowed research findings to guide design decisions, while design explorations helped to understand spatial behaviour and test research outcomes in a spatial context. The value of this mixed-methods approach lies in its ability to combine historical, spatial and behavioural insights.

Research outcomes directly informed spatial design criteria, such as the perception of safety, visibility and social inclusion. Observations, for instance, showed that adolescents tend to avoid certain routes and open spaces due to limited social control and liveliness. This insight led to design interventions that improved sightlines and creating more clearly defined public spaces. In turn, testing these design interventions through drawings and sections revealed how social control and defining public spaces could clash, helping to refine those concepts into tangible spatial proposals. This iterative research through design approach was valuable for addressing abstract topics, such as mental wellbeing, where spatial, social and personal factors are strongly interconnected.

A major methodological challenge was the difficulty of measuring mental wellbeing through spatial interventions alone, as adolescents experience public space in a highly subjective ways and wellbeing is influenced by external social and personal factors. Because of this, the direct impact of the design can't be measured within the scope of the project but rather remains interpretative. Furthermore, the use of 3D modelling could have further enhanced the understanding of scale and experience.

Relation to discipline & studio

This project addresses the relation between adolescent mental wellbeing, public space design, and the MSc AUBS program by embracing the crossover between Urbanism and Architecture within the City of the Future studio. As an Urbanism graduation project, it focuses on analysing urban structures and understanding social dynamics within them. However, to translate these urban findings into human scale interventions that shape everyday experiences, an architectural approach was integrated (Figure 76). Because traditional urban plans proved to be too abstract to capture the subjectivity of mental wellbeing, architectural representation methods, such as cross-sections, mood images and detailed floor plans, were essential to test and visualize the human scale. By combining these disciplines, the project demonstrates how the interdisciplinarity of the AUBS program is vital to address complex spatial challenges and design supportive, inclusive environments for the city of the future.

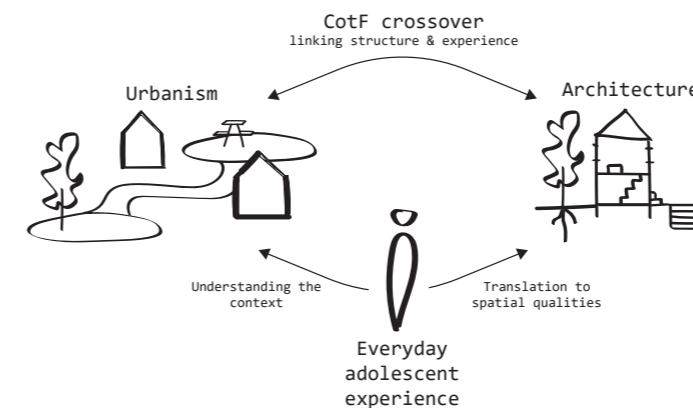


Fig. 76: Diagram showing the value of the crossover between urbanism and architecture in the project.

Transfereability

Although the project focuses on the specific context of Carnisse, its methodological approach and design principles can be transferred to other post-war neighbourhoods with similar spatial characteristics and challenges related to safety, social inclusion and underutilized spaces.

The project therefore shows how spatial design can support inclusive and future proof urban environments, while encouraging active participation of adolescents in the city's development. However, the specific social, cultural and spatial circumstances of a context should always be taken into consideration when the findings are applied elsewhere.

Value and limitations

The main value of this project lies in understanding how spatial design can influence experiences of wellbeing in public space and translating abstract concepts such as stress, safety and inclusion into concrete design principles. Academically, the project contributes to insight into the relationship between spatial design and mental wellbeing, while exploring how research through design can be used to address these subjective experiences in urban environments.

Societally, the project places the youth perspective central in urban development, and it highlights the importance of involving adolescents in urban design processes. The open attitude and cooperation of the local community centre proved that there is already strong societal recognition for youth wellbeing in Carnisse.

However, the project also has several limitations. The biggest limitation was that the relationship between public space and mental wellbeing is often indirectly influenced by social and personal factors, which are beyond the scope of this project. Furthermore, the lack of practical validation, as result of limited time and ethical procedures, means that the design remains an interpretative. From an ethical perspective, the inability to directly involve adolescents in the process was both a limitation but also showed the necessity of vulnerability when working with minors.

Therefore, future research could further investigate how adolescents experience implemented interventions over a longer period and how participatory urban design processes with adolescents can become structurally embedded in neighbourhood development.

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Figure 19: Collage by author, photographs from:

- Lund, J. (n.d.). *Group of cute kids playing in the forest* [Photograph]. Adobe Stock. <https://stock.adobe.com/nl/images/group-of-cute-kids-playing-in-forest/265163729>
- Tsuguliev. (n.d.). *Process of express fast coronavirus covid Antigen AG PCR testing examination at home, COVID-19 swab collection kit, test tube for taking OP NP patient specimen sample, testing carried out* [Photograph]. Adobe Stock. <https://stock.adobe.com/nl/images/process-of-express-fast-coronavirus-covid-antigen-ag-pcr-testing-examination-at-home-covid-19-swab-collection-kit-test-tube-for-taking-op-np-patient-specimen-sample-testing-carried-out/494073807>
- Pormezz. (n.d.). *young asian woman cover her head after stressed with monthly bill expenses and credit card debt*. [Photograph]. <https://stock.adobe.com/nl/images/young-asian-woman-cover-her-head-after-stressed-with-monthly-bill-expenses-and-credit-card-debt/485862684>
- FOTO_STOCKER. (n.d.). *kids hands with joystick, child playing video game console while sitting at home, real people, leisure concept*. [Photograph]. <https://stock.adobe.com/nl/images/kids-hands-with-joystick-child-playing-video-game-console-while-sitting-at-home-real-people-leisure-concept/566041388>
- SAKCHAI. (n.d.). *hand using smartphone traveling*. [Photograph]. <https://stock.adobe.com/nl/images/hand-using-smartphone-traveling/295007207>
- Azarneshin, M. (n.d.). *Two homeless little girl walking in destroyed city, soldiers and helicopters and tanks are still attacking the city* [Photograph]. <https://stock.adobe.com/nl/images/two-homeless-little-girl-walking-in-destroyed-city-soldiers-and-helicopters-and-tanks-are-still-attacking-the-city/269676816>

Figure 29: Google. (2022a). *Amelandseplein, Rotterdam* [Google Street View]. Google Maps. <https://maps.app.goo.gl/eRJke9mfosA3irM67>

Figure 30: Google (2022b). *Metroplein, Rotterdam* [Google Street View]. Google Maps. <https://maps.app.goo.gl/BShpbG8hqz2TqkNM9>

Figure 31: Google. (2025). *Lepelaarsingel, Rotterdam* [Google Street View]. Google Maps. <https://maps.app.goo.gl/jXmRoRxiTzc44k9t5>

Figure 77: Wijkprofiel Rotterdam. (2026). Carnisse - Wijkprofiel Rotterdam [Infographic]. Gemeente Rotterdam. <https://wijkprofiel.rotterdam.nl/nl/2026/rotterdam/charlois/carnisse>

Appendix I

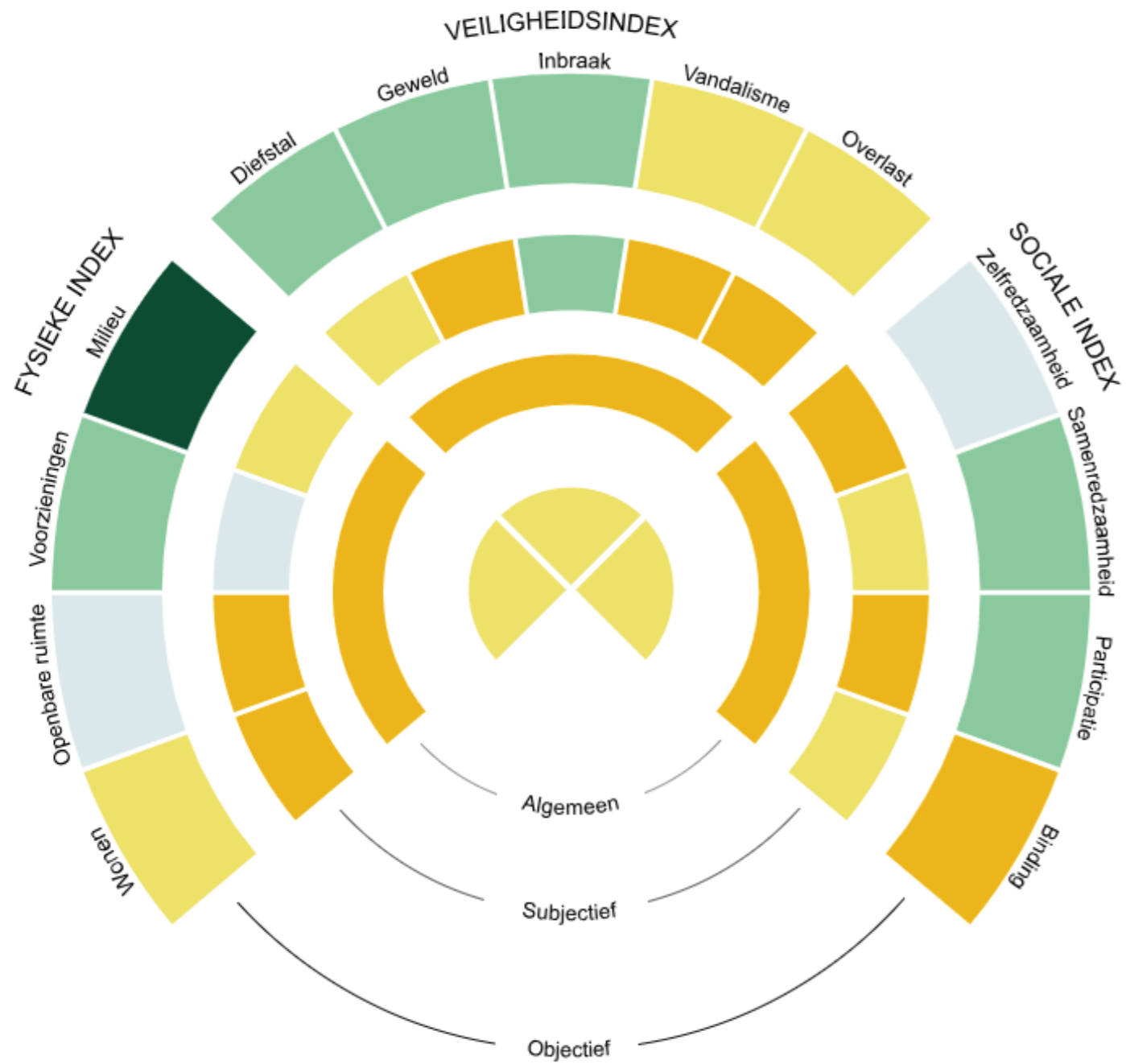
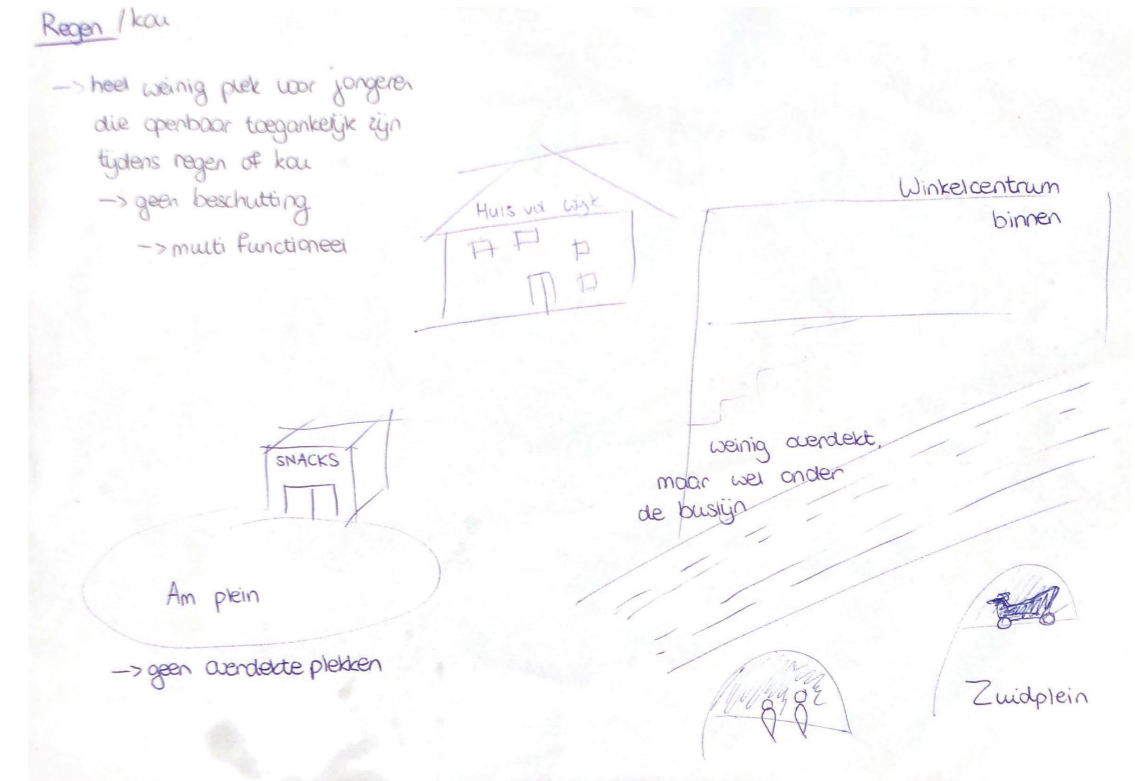


Figure 77: The physical index, safety index and social index of Carnisse in 2026, compared to the average of Rotterdam.

Source: Wijkprofiel Rotterdam. (2026). Hoefijzer van de wijk Carnisse [Infographic]. Gemeente Rotterdam. <https://wijkprofiel.rotterdam.nl/2026/rotterdam/charlois/carnisse>

Appendix II - The soft maps

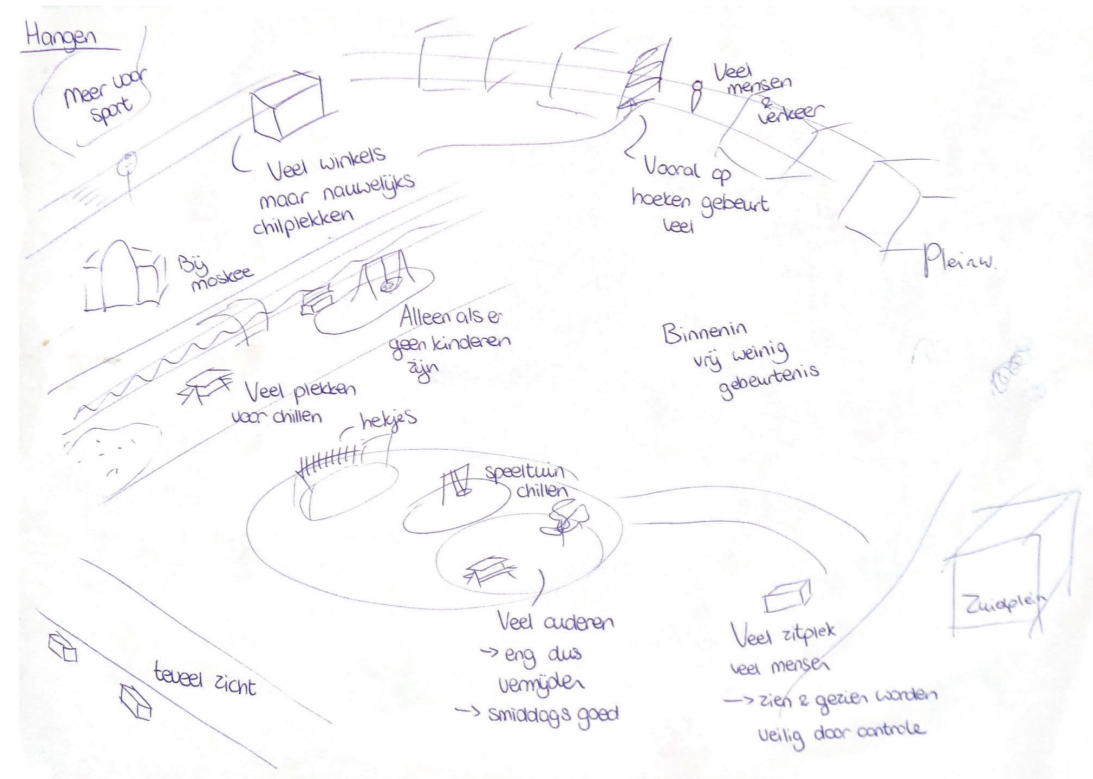
The soft map of Carnisse during rainy / cold weather.



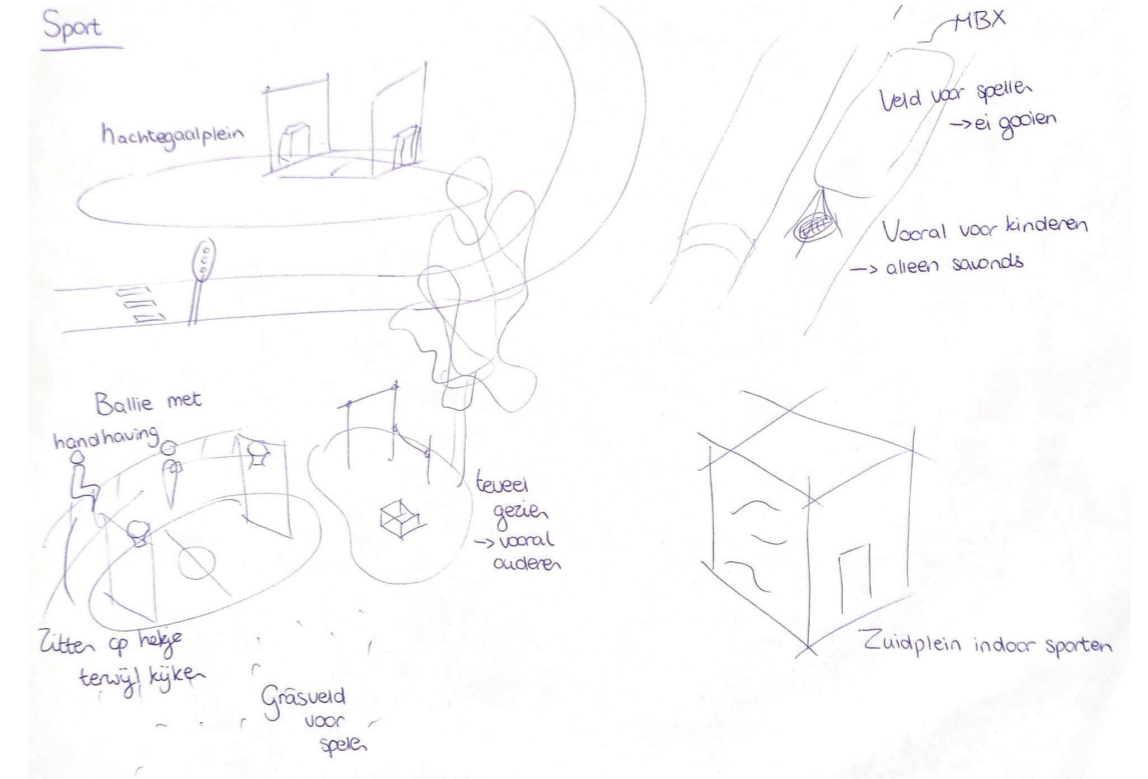
The soft map of Carnisse during sunny weather.



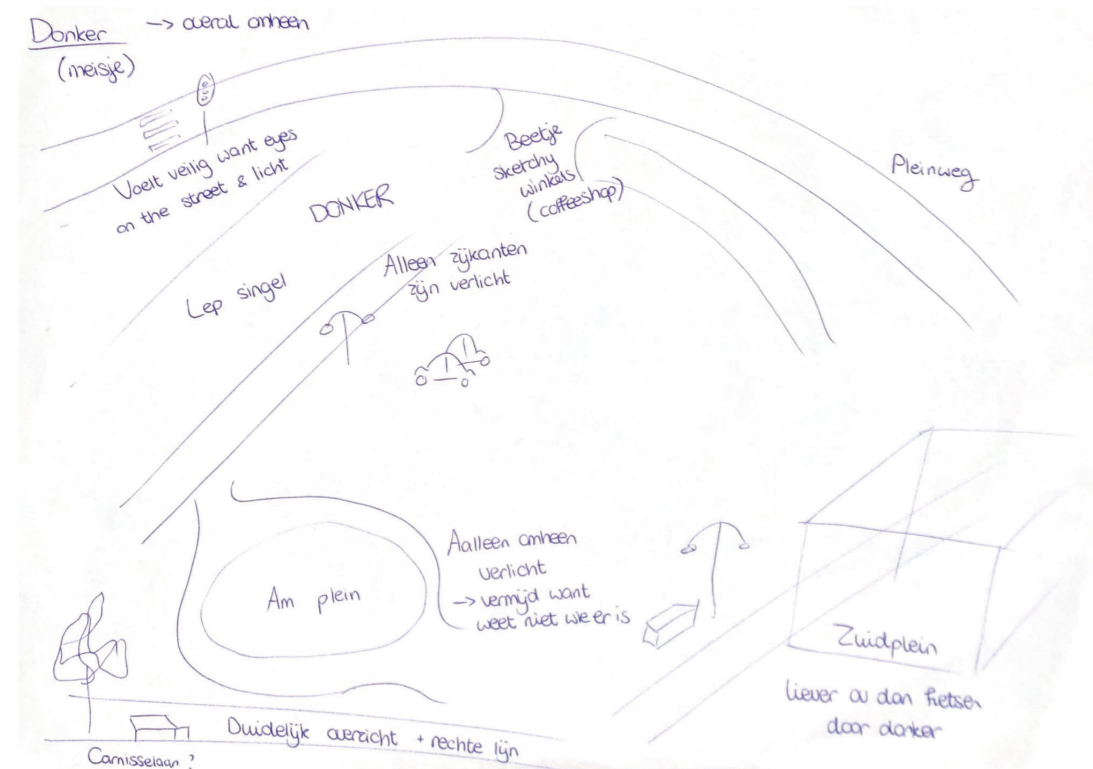
The soft map of Carnisse for lingering.



The soft map of Carnisse for sports.



The soft map of Carnisse during the dark (focus on safety).



Appendix III - Data Management Checklist

DATA MANAGEMENT CHECKLIST

Instruction

This checklist is relevant for all graduation projects of the Master AUBS. The form is intended to highlight common aspects of graduation projects that require particular attention with regard to planning the research and data management. Relevant information and supplementary sources regarding each question are provided below each question.

With this checklist, the faculty wants to avoid that students unexpectedly find themselves in complex and stressful situations, in which ethical or privacy matters and/or other laws and regulations become an issue. In projects involving humans, certain types of data processing increase the risks to the human participants: planning such projects requires additional evaluations and advice from university staff before ethical approval can be received and the project can begin. In the case of a graduation project, obtaining additional advice or permits may delay the project with an extra education period or semester. To avoid this, it is recommended that students set up a graduation project with a low level of risk. Therefore, all students have to check their risk, by completing this checklist before their A1.

The first section of the checklist (A) should be completed by all students, together with their supervisor, during the planning of the graduation project, before the A1. It does not need to be submitted to anyone for review or approval. Please consider questions 1 to 3 carefully in relation to the intended graduation project, and answer with 'yes' or 'no'.

The second section of the checklist (B) should only be completed if the graduation project involves working with data from human participants. In that case, the student and their supervisor must apply for and receive ethical approval from the [Human Research Ethics Committee](#) (HREC) before the project can begin (see the paragraph 'Explanation and follow-up' after the questions). The student can submit the application to the HREC, but the supervisor is responsible for making sure that the project is compliant with relevant privacy regulations and ethical policies.

Section A. General considerations	yes	no
<p>1. Is the graduation project conducted as part of an internship (at a company), or as part of a research project at TU Delft?</p> <p>If a student's graduation project is conducted at a company or as part of a research project at the university, questions of data ownership and intellectual property rights need to be addressed in a written graduation or internship agreement before the project begins. Students and their supervisor should consult the Intellectual Property Rights of Students webpage. Additional information can also be found in the Extended Personal Research Data Workflow.</p>		✓
<p>2. Does the project involve conducting (part of) the research outside the Netherlands?</p> <p>Students who intend to travel abroad (even to other EU countries) for study, exchange, research, internship, or graduation project purposes need to follow the Travel Safety Protocol. This includes attending a mandatory Travel Safety Training Session: see the Disclaimer.</p>		✓
<p>3. Will the research involve processing data from humans, such as running a survey, conducting interviews or workshops, collecting data through social media or internet forums, or re-using existing datasets about humans provided by a third party? (If 'yes', see follow-up questions 4 to 13 in Checklist B.)</p> <p>Students who work with data from human participants must complete the next section and apply for and receive ethical approval from the Human Research Ethics Committee (HREC) before conducting the research.</p>		✓

Section B. Extended risk factors (only if question 3 has been answered with 'yes'.)	yes	no
<p>4. Will the project involve participants who may be considered vulnerable, such as the elderly, refugees or asylum seekers, ethnic minorities, patients, or people with disabilities?</p> <p>Participants who may suffer very adverse consequences (for instance, due to discrimination) if their personal data became publicly available can be considered vulnerable.</p>		✓
<p>5. Will the project involve participants who cannot themselves give informed consent for taking part in the project, but for whom consent must be obtained from a legal guardian?</p> <p>Participants who cannot give informed consent can include, for instance, children or participants with intellectual disabilities, mental disorders, or dementia. Such participants are also considered vulnerable in the context of the General Data Protection Regulation (GDPR).</p>		✓
<p>6. Will the project involve processing any of the special categories of personal data below?</p> <ul style="list-style-type: none"> - Race - Ethnicity - Criminal offence data - Political opinion - Union membership - Religious or philosophical beliefs - Sex life and/or sexual orientation - Health data (including measurements such as heart rate) - Biometric or genetic data (including fingerprints, iris scanning, facial recognition) <p>The General Data Protection Regulation (GDPR) defines a stricter rules for processing special categories of personal data. If it is necessary to process these data in a project, it is important to provide additional safeguards.</p>		✓
<p>7. Will the project involve processing personal data that could be considered sensitive, such as the ones listed below?</p> <ul style="list-style-type: none"> - Information about a person's income, debts, or other payments - Information about a person's (un-)employment status - Information about a person's performance at school or work - Information about relationship problems or (gambling) addiction - Information about poverty, domestic violence, or youth welfare/social work involvement <p>Some types of personal data are considered sensitive, because they can have a high impact on the privacy of the data subject if other persons gain access to these data. Sensitive personal data should only be processed if necessary: in such cases, additional safeguards need to be put in place.</p>		✓
<p>8. Will the project involve processing video-recordings, or photographs of participants?</p> <p>TU Delft considers photographic and video-materials of research participants to be sensitive personal data. If such data need to be processed, additional safeguards must be put in place.</p>		✓

Section B. Extended risk factors (only if question 3 has been answered with 'yes'.)	yes	no
<p>9. Will the project involve sharing or transferring personal data between multiple partners or collaborating organisations involved, such as between TU Delft and an internship company?</p> <p>According to privacy law, sharing personal data between organisations requires a privacy agreement to be in place: setting this up takes time, and requires support from additional university staff. Furthermore, personal data sharing can potentially expose research participants to different types of risks: these risks must be considered in the ethical application.</p>		✓
<p>10. Will the project involve deception, or covert observation of participants?</p> <p>In some types of research, obtaining informed consent for processing participants' personal data is not an option: for instance, if the research involves deception, or the research is covert (conducted without participants knowing about it). In such situations, the steps to mitigate risks to participants are important, and an alternative legal basis for processing the participant's data needs to be established with the help of additional support staff.</p>		✓
<p>11. Will the project involve working with social media data?</p> <p>Social media data are personal data, but since it is usually not possible to ask for informed consent for processing social media data, another legal basis for processing the participant's data needs to be established. Processing of social media data also involves legal considerations related to terms of use of data from third-party platforms: therefore, research with social media data requires expert support on privacy, ethics, and legal matters.</p>		✓
<p>12. Will the project involve using learning algorithms or other AI to analyse, combine, or otherwise process data from participants?</p> <p>The use of AI in research involves many considerations in terms of data protection, ethics, security, and intellectual property: for more information, see TU Delft's Instructions for use of Generative AI.</p>		✓
<p>13. Will the project involve participants who are based in a country or countries outside of the EU?</p> <p>Students affiliated with TU Delft must comply with Dutch and EU regulations of personal data processing (GDPR). Furthermore, the student and their supervisor must make sure that the research complies with local (privacy) legislations of any foreign destinations. Additional support from an external (local) expert may be required.</p>		✓

Explanation and follow-up

If you have answered 'no' to all questions 4 to 13, your project is likely to be considered low or minimal-risk: see the paragraph 'Projects with minimal or low-risk' on the next page.

If you have answered 'yes' to one or more of the questions 4 to 13, your research likely involves extended or high risks to participants, according to the [General Data Protection Regulation](#) (GDPR) and TU Delft's privacy and ethical policies: for information regarding such projects, see the paragraph 'Projects with extended or high-risk' on the next pages.