SOCIAL ACTS AT HEIGHT

Liberated from the loneliness and social isolation in high-rise buildings

Graduation report

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July 2024

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Foreword

Dear Reader,

I am very excited to present my graduation project, which I began in September 2023 at Delft University of Technology as part of the Master's program in Architecture, in the City of the Future studio.

At the start of this research, I wanted to delve deeper into the growing popularity of high-rise typologies that are increasingly being realized in major cities. Especially in Rotterdam, a city very familiar to me, I observed how rapidly this typology was developing, which made me wonder about its impact on the social situation and livability. I was interested in how architectural and urban structures can contribute to ensuring the social well-being of high-rise residents. This research has led to various insights and findings.

Conducting this research has been a valuable experience for me, from which I have learned a lot. I had the opportunity to apply different research methods and to approach various people to obtain the necessary data and results.

This work would not have been possible without the guidance of my supervisors: Maurice Harteveld, Roberto Cavalho, and Piero Medici. Maurice helped me approach the research on a broader level, where I not only looked at architecture but also at the urban scale in which high-rise buildings exist and the sociological aspects of public and collective spaces. Roberto guided me purposefully and helped translate the research into an architectural design. Piero assisted me with the technical aspects of construction, enriching my research and design with sustainable and practical approaches.

I am grateful for the support and expertise of my mentors, and for the freedom I was given within the studio to express my own interests and approach in my master's thesis. It has been a true pleasure to inspire others with this topic.

Sincerely,
Linda Nguyen

27-06-2024, Spijkenisse

Colofon

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Version:	P5-Report
Date:	01-07-2024

Master thesis

Title:	Social acts at height
Sub-title:	Liberated from the social loneliness in high-rise buildings
Location:	The Netherlands, Rotterdam
Case studies:	Zalmhabentoren, Cooltower, Red Apple and New Orleans

Academy

University:	Technical University Delft
Faculty:	Architecture and the Built Environment
Mastertrack:	Architecture
Studio:	City of the future

TU Delft
Delft University of Technology
Faculty of Architecture
and the Built Environment

Abstract

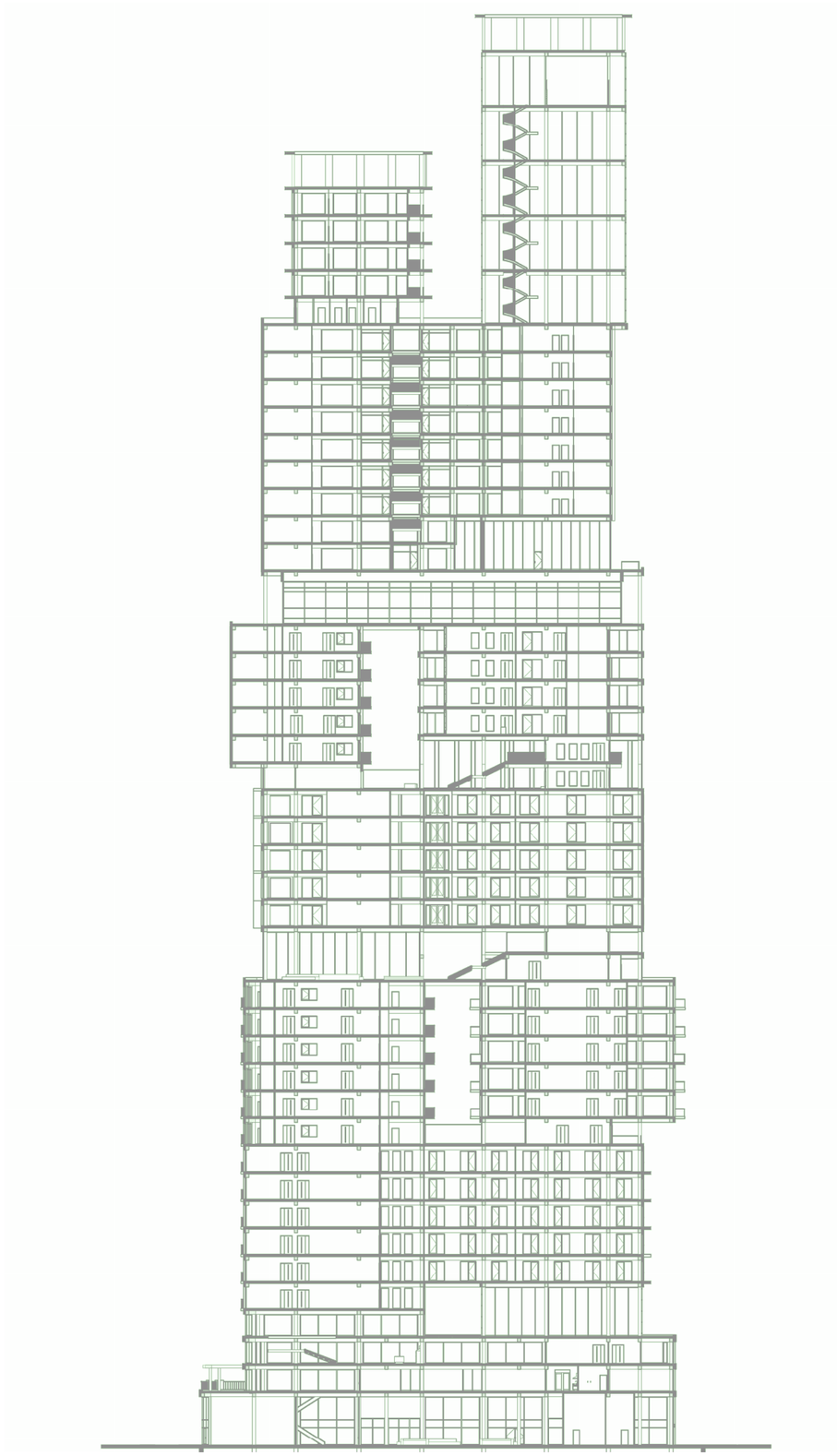
This graduation thesis, focused on high-rise typologies within large cities, with a critical look at the social aspects of high-rise structures. High-rise buildings are becoming increasingly popular as urban housing solutions due to the need for densification. Rotterdam is preparing for densification in the inner city in the coming years, including a master plan for the Rijnhaven area, where many high-rise buildings are planned. This raises the question of how liveability in high-rise typologies can be ensured, and which social aspects are important.

Various studies have shown that standard high-rise structures hinder the social interaction and making it difficult to create social relationships between residents and the city. This results in high-rise residents exhibiting more antisocial behaviour compared to residents of other housing types. High-rise buildings often lack collective spaces where residents can meet and build trusting communities in their own living environment. This lack of collective spaces contributes to social loneliness and isolation, which is detrimental to the mental and physical health of residents. Social loneliness and isolation are caused by factors such as social segregation, anonymity, a lack of sense of belonging, and the homogeneity of high-rise buildings. At the urban level, there are also problems; residential towers often function as individual blocks and do not integrate well with urban public spaces and network that promote spontaneous social interaction and urban community. The massive volume and repetition of identical layers of residential towers lead to a loss of human scale, making public and collective functions in and around high-rise buildings less optimally used.

This research is based on a theoretical framework and uses various research methods that align with both literature and practice. Through case studies, four prominent residential towers in Rotterdam were analysed on three levels: context, plinth, and public interior. This was done to identify which architectural and urban aspects within public and collective functions influence social loneliness and the lack of community feeling. Additionally, a survey was conducted among the residents of these four towers to understand their needs and shortcomings, to be considered in new approaches for social and sustainable high-rise buildings.

Ultimately, this research contributes to revisiting existing high-rise structures by introducing new public and collective spaces with the associated qualities that are needed to reduce the feeling of loneliness and stimulating the community feeling. This aims to improve the social relationships and mental health of residents and other city dwellers and make high-rise living more accessible to everyone within the densely populated city.

Keywords: Social interaction, Social loneliness, Community, High-rise, Public space, Communal space, Engagement



Glossary

Communal space:	Shared areas within a building complex that are accessible to all residents or a group of people.
Community infrastructure:	The buildings and spaces that provide services, activities, and opportunities for communal purposes.
Community network:	A network of social interactions and personal relationships.
Emotional loneliness:	The feeling of a lack of a meaningful relationship with a significant other or a close friend.
Engagement:	The active participation and involvement of individuals in social activities, interactions, and community life.
Familiarity:	The sense of comfort and ease that individuals experience due to their knowledge and recognition of their surroundings.
Housing satisfaction:	The feeling of contentment when one has or achieves what one needs or desires in a house or living environment.
Place attachment:	The bonding that occurs between individuals and their meaningful environments.
Public amenities:	Facilities and services provided by the government or other organizations for the benefit of the community, accessible to anyone in the area.
Public space:	All places of public use, accessible to all, comprising streets and public open spaces.
Sense of belonging:	The feeling of being accepted, valued, and connected within a group, community, or environment. It involves a sense of identification and emotional attachment to a place, group of people, or social setting.
Social experience:	The collective interactions, activities, and relationships that individuals engage in within a social context.
Social isolation:	A state in which the individual lacks a sense of social belonging, lacks engagement with others, has a minimal number of social contacts, and has deficient fulfilling and quality relationships.
Social loneliness:	A subjective feeling of being alone, separated, or apart from others, conceptualized as an imbalance between desired social contacts and actual social contacts.
Social support:	A network of family, friends, neighbours, and community members that is available in times of need to provide psychological, physical, and financial help.
Socio-demographics:	A combination of social and demographic factors that define individuals in a particular group or population.

"Despite the stunning panoramic views and the convenience of modern amenities, there are times when I feel like I'm living in a bubble, disconnected from the world below."

— *Maru Kim, inhabitant of a high-rise apartmant, 4 March 2023.*

Introduction

General

High-rise buildings as a housing type emerged in the United States around 1880, partly due to advancements in building materials such as steel structures and glasswork, enabling the creation of stacked urban housing. (Lepik,2008) Additionally, the inventions of elevators and escalators contributed to straightforward vertical transportation. This resulted in the rapid global spread of the high-rise typology. In the 20th century, high-rise buildings became highly popular, forming a distinctive element of the urban architectural landscape. Social changes made it increasingly convenient for people to move to large cities. (Bairoch, 1988) Urban dwellers could pursue their careers while simultaneously benefiting from the economic and social advantages of the city, including public transportation and other amenities. This led to a significant demand for urban housing. (Al-Kodmany, 2018)

Due to the growing urban population, an increasing number of cities face the challenge of a housing shortage, compelling them to seek options for urban densification. (Koelemaij, 2018) Additionally, rising land prices and limited space have led that horizontal expansion is no longer feasible, forcing urban environments to utilize the vertical space. (Al-Kodmany,2018) High-rise buildings are therefore employed as a solution to the urban housing problem. This architectural typology efficiently utilizes the vertical space within the city, providing an opportunity to optimize the use of the limited available land. Consequently, high-rise towers continue to be constructed even to this day to accommodate urban population growth.

While high-rise typology is capable of addressing economic challenges, it has long been associated with a negative impact on the mental health of residents.(Gifford, 2007) Various studies have demonstrated that high-rise buildings bring social and psychological challenges, both at the urban and individual levels. (Koelemaij, 2018) (Chile, 2014), (Nguyen, 2024)The concept of verticality in cities has become increasingly significant in recent years. Upon delving deeper into the living conditions and personal experiences of residents in high-rise buildings, it became apparent that this housing typology indeed has negative aspects on social matters.

It appears that there is a group of high-rise residents struggling with social isolation, as it even has lead to feelings of loneliness. (Korte and Huismans, 1983) While high-rise complexes allow numerous residents to live within the same walls, the paradoxical consequence is that many still experience a sense of isolation and anonymity. The dynamics of the city, despite the physical proximity of neighbours, do not automatically translate to a sense of community. Other studies have even indicated that promoting community and social connections in high-rise environments is a challenge, potentially resulting in negative consequences for the mental and physical health of residents. (Noordenbos, 2023)

Fascination

As a future architect aspiring to contribute to the development of the built environment, I consider it crucial that the built environment takes responsibility for the social health and well-being of its inhabitants. It should not only address economic and societal issues but also strive to create safe and healthy living environments that serve the residents' interests.

Therefore, this topic aligns perfectly with the 'City of the Future' studio. This studio focuses on the future city and explores how living environments can be designed to meet the needs of a growing urban population. The challenge lies not only in constructing cities that reach skyward but also in maintaining human connection and responding to the factors influencing this within the high-rise residential environment and the city.

Research relevance

High-rise construction is a prevalent occurrence in the built environment and has become an integral component of the urban landscape. (Abdelsalam, 2019) The future city is set to transform into a vertical city due to the need for densification. However, this does not mean that we should leave high-rise structures unchanged in their current form. Various studies have already shown that high-rise buildings limit social cohesion, and the living environment in high-rise structures also affects the loneliness and social isolation experienced by residents. (Kootsra, 2020), (Nguyen, 2020),(Chile, 2014), (Turner,2017) These problems, in turn, have a negative impact on the population's health. Therefore, social isolation is a current urban problem that needs serious consideration. (Harries, 2019)

Despite the fact that loneliness being influenced by numerous factors, including the living environment, specific research into the spatial factors and qualities in high-rise buildings that genuinely affect loneliness and social isolation has not been conducted yet. Architectural interventions are necessary to promote social interaction and a sense of belonging in high-rise buildings, thereby reducing loneliness and anonymity. It is crucial that the built environment responds by providing solutions and exploring new opportunities for vertical buildings. The metropolis must be dynamic and liveable, with a focus on the health and well-being of its residents.

What It's Like to Be Young and Extremely Lonely in a Big City (Ben Copeland, 2018)

"Most people look forward to the weekend, but for me, it's the other way around. I look forward to Monday so I can speak to people at work."

People feel lonier in crowded cities - but green spaces can help (Andrea Mechelli, 2021)

How do I not feel lonely living on my own in a studio apartment? (Connor Lishman, 2019)

Research

Problem statement

It is evident that cities need to prepare for urban housing and densification, considering the increasing population growth and limited available space. (Koelemaij, 2018) As a result, high-rise projects have become a necessity in urban development. Despite numerous high-rise projects being planned for the coming years, it is crucial to pay more attention to the social problems faced by current high-rise residents.

However, the horizontal street level, where vibrant community life has always taken place and where individuals have had the opportunity to appreciate the urban space, is not experienced at height. (de Certeau, 1988) High-rise residents lose social contact with the ground and feel disconnected from urban society. (Allemeersch, 2022) Even architects and developers acknowledge this problem and struggle with the challenge of integrating high-rise buildings into the vitality of street level and surroundings. (Monster, 2021) The thick 'shoe-sole,' referring to the ground floor and entrance of a residential tower, makes it challenging to create a lively street scene, making living in the high sky more anonymous among residents.

Furthermore, a considerable number of high-rise residents experience loneliness within apartment buildings and find themselves in social isolation. Various studies have shown that social loneliness occurs across all demographics, but is more pronounced in certain groups. (Chile, 2014) (Nguyen, 2024) (Gale, 2017) Older adults and young adults between the ages of 16 and 35 settling in high-rises are more likely to experience loneliness. High-rise residents report a lack or minimal social networks. Meaningful relationships between residents are missing, and there is a lack of social control due to the high density in high-rise buildings. (Nguyen, 2020), (Yau, 2018) For example, there are insufficient spaces to promote social interactions, encounters, and communal amenities. Residents may encounter each other in traffic spaces, but are not actively encouraged to engage in social interactions. This has resulted in a lack of community in residential towers. (Turner,2017) Many residents live more anonymously and isolated, unable to rely on the support of neighbours. It leads to a reduced sense of belonging to their living environment, creating a private atmosphere where residents tend to live more as individuals, contributing to segregation between neighbours and feelings of loneliness (Choenarom, 2005), (Klinenberg, 2016), (Haim-Litevsky, 2023)

Additionally, urban dwellers who feel lonely, and experience social isolation can suffer severe consequences. (House, 1988) Humans are inherently social beings, inclined to engage and build relationships. The absence of social relationships can have adverse effects on an individual's mental health. (Volksgezondheid en Zorg,2022) Loneliness can lead to anxious and depressive feelings, and prolonged signs of stress and depression can increase the risk of cardiovascular diseases. Moreover, loneliness also raises the risk of dementia and can negatively impact an individual's perception during social interactions. On a physical level, high-rise living has negative implications. Research has indicated that children growing up in high-rise buildings tend to spend most of their time playing alone, which limits their social interactions and physical well-being. (Gifford, 2007) As a result, children who were raised in high-rises developed more social problems and lower levels of motor ability compared to children who were raised in single-family homes.

Finally, the mental and physical health of urban residents also reflects the liveability of a neighbourhood or city. (Veenhoven, 2000) (Rijksinstutuut voor Volksgezondheid en Milieu, n.d) The liveability indicates the quality of life in a specific environment, taking into account various environmental factors including physical, social, economic, and cultural aspects. Therefore, the lack of social cohesion and participation is not just a personal issue for a small group of high-rise residents but also impacts the development of the future city's well-being.

Research questions

The social condition in high-rise buildings has been debated for a long time, questioning how the structure of high-rise buildings discourages social contact. This research primarily focuses on the architectural aspects present in high-rise buildings that may influence the loneliness of city residents. The aim of this research is to reduce loneliness and anonymity in high-rise living, allowing residents to reside in a better, healthier, and safer living environment within the densely populated city. Therefore, a main question has been formulated, supported by several sub-questions.

What are the spatial aspects and factors influencing loneliness and social isolation in high-rise buildings, and what design interventions are required to address this social issue?

1. Why do high-rise residents experiencing loneliness and social isolation in high-rise buildings?
2. What is the current social situation in high-rise buildings in Rotterdam, and how do high-rise residents interact socially with each other?
3. What are the psychological and physical ways to alleviate loneliness and social isolation in a residential environment?
4. Which characteristic spatial qualities contribute to social community among residents in the building environment, and what design elements can be applied in high-rise structures?

Theoretical framework

This research primarily focuses on human behaviour, how high-rise residents utilize spaces, and how they perceive things within high-rise buildings. The selected theoretical concepts serve as the foundation for the research structure which are: spatial qualities, design affects the human behaviour and social support.

Spatial qualities

The triad theory of Vitruvius indicates that the spatial quality can be divided into three different dimensions: future value (firmitas), utility value (utilitas), and experiential value (venustas), which together lead to high-qualirt communual spaces in high-rises, contributing to the sense of belonging and healhty relationships in a living environment. (figure 1) (Van der Voordt, 2009) (Wu and Ge, 2020)

Future value (firmitas):

This means that high-rise should be designed with an eye toward the future needs and changes of society Therefore, the high-rise structure should be flexible and adaptable to desired new functions, technology, and demographic patterns.

Utility value (utilitas):

This focuses on the functionality of public and communual spaces and how well it meets the needs of and uses of individuals. It tests the accessibility, usability, and suitability of a space for specific social activities.

Experiential value (venustas):

This pertains to the aesthetic and emotional value of a space. It mainly involves the subjective experiences and perceptions that people have within a space or environment in which they find themselves. It's mostly about the beauty, comfort, inspiration of a space, and whether the space provide satisfaction to the individual's experience. The decoration of communual spaces can intergrating diversity and enhance high-rise resident's indentity, creating a sense of belonging. (Lum, 2011) (Li, 2004)

The spatial quality of a residential environment is important for several reasons. (Khurram, 2023) It assesses whether the physical environment meets human perceptions and behaviours.(Wener and Carmalt, 2006) When the spatial quality of all three dimensions in high-rise buildings is ensured, a sense of belonging will also be present. It establishes a strong relationship between users and their surroundings, leading to better utilization of public spaces, higher satisfaction, and ultimately a sense of community. (Yazadanpour, 2014) This factor contributes to transforming a space into a place with specific behavioural characteristics for individuals. Certain spaces in high-rise buildings can meet certain qualities to encourage residents to use other spaces in the high-rise more often than their own homes. This provides more opportunities for social interaction within high-rise buildings, allowing for the development of a communitywith meaningful social relationships between neighbours. By ensuring this, the feelings of loneliness and social isolation will be reduced. (Resna, Wibawa, 2022)

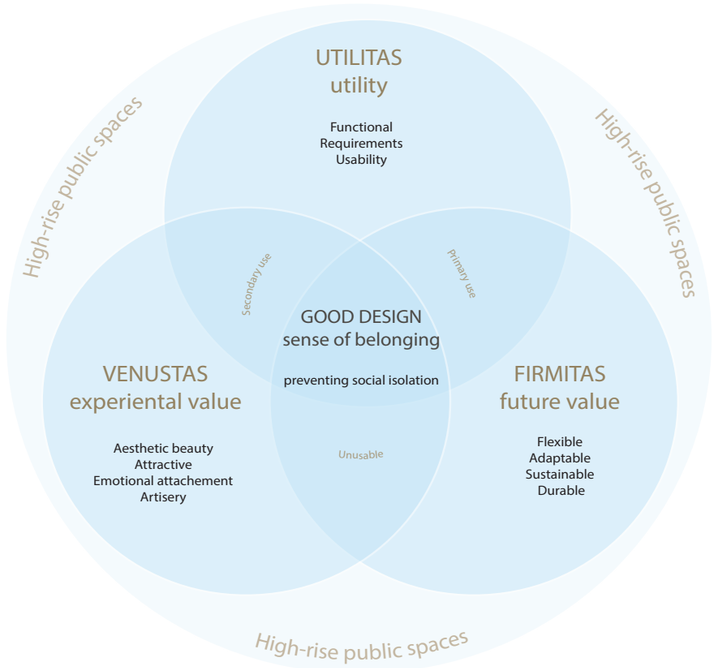


Figure 1. Diagram spatial aspects for sense of belonging, 2023, by author.

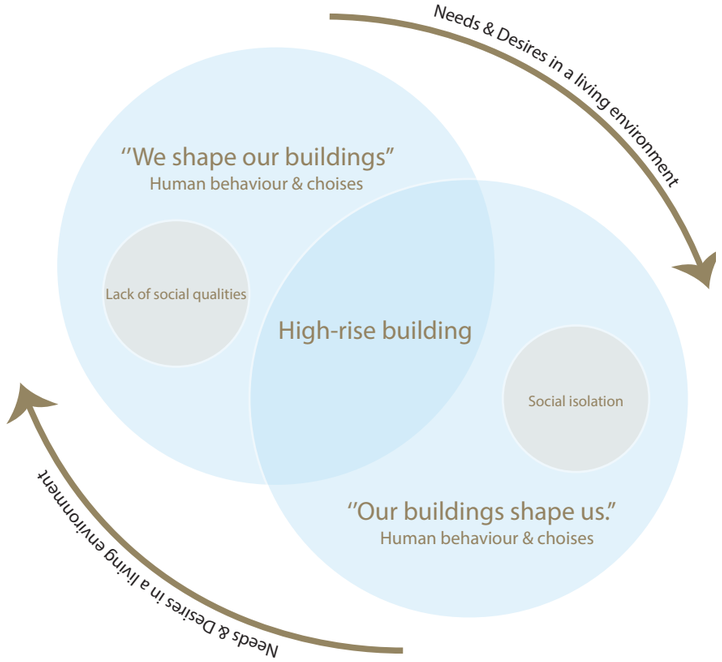


Figure 2. Diagram how space design can affects the human behaviour, 2023, by author

Design affects human behaviour

"We shape our buildings, and afterwards our buildings shape us." – Winston Churchill, 1924

This theory of Brand (1995) suggests that our physical environment, including buildings and architecture, is not only created by people but also influences the human behaviour, attitude, and interaction between users and their surroundings. The statement illustrates a mutual interaction where both elements continuously influence each other. (figure 2)

"We shape our buildings."

People design and shape the built environment in which they actively participate. They construct buildings and spaces that meet their needs and desires. (Kostourou, 2014). We shape our buildings and then they shape us. During this process, various aspects and priorities, such as culture and functions, are considered and applied. Therefore our buildings are constructed based on human decisions. Especially after the corona pandemic, human are

"Our buildings shape us."

This suggests that buildings influence people. The physical environment guides people and affects their behaviour, emotions, and interactions. (Feng, Nikolic and Ewart, 2021) The buildings we create ultimately determine how people feel, move, and engage in social relationships. An example of this is that a well-designed public space can encourage visitors to engage in social interaction, while a poorly designed space can discourage social interaction and even create social isolation. (Shah and Kesan, 2007)

In summary, the theory of "We shape our buildings and it shapes us" emphasizes that architects and designers must be aware of what they create in the built environment. Everything which is formed in the built environment should relate to the well-being and behaviour of the users. Therefore, it is necessary to reconsider the characteristic structure of high-rise buildings, as it can also influence antisocial behaviour and psychological discomfort. (Gillis, 1977)

Theoretical framework

Social support vs. loneliness

The theory of the American social psychologist James S. (1988) House emphasizes that strong and supportive social relationships among individuals can contribute to a person's health and well-being. Social connectivity serves as a buffer to reduce the health effects of stressful situations. Social connectivity can be ensured in various ways, both directly and indirectly, including emotional support, instrumental support, informational support, and appraisal support. (Barrera, 1983) Furthermore, the degree to which individuals are involved in a social network also determines an individual's health. (Umberson and Montez, 2011) The more someone is engaged within a social community, the better their health and well-being.

It is essential that individuals can form social relationships within their living environment, and local communities emerge. (Berkman and Kawachi, 2014) Social capital is part of the living environment, referring to strong social networks and support in a community. (Perkings and Long, 2002) It promotes resilience and the well-being of residents, preventing social isolation and loneliness, and enabling communities to be resilient and adapt to adverse situations. Maurice Harteveld's and Zarkhah theory (2021) indicates three conditions that public spaces must meet to ensure resilient communities in a living environment, which could promote meaningful relationships between high-rise residents: (figure 3)

1. Community Networks: Involving individuals who can be part of a community where strong social ties exist among these people. Public space is where people share activities and knowledge within the community. (Mcmillian and Chavis, 1986)

2. Place Attachment: The emotional and psychological connection that users have with a space. There is a sense of belonging and identity. Public space should be a place where people can meet to share experiences and developments.

3. Community Infrastructure: Providing the necessary services, amenities, and facilities in public space. This makes it easier for people to use the space in a certain way.

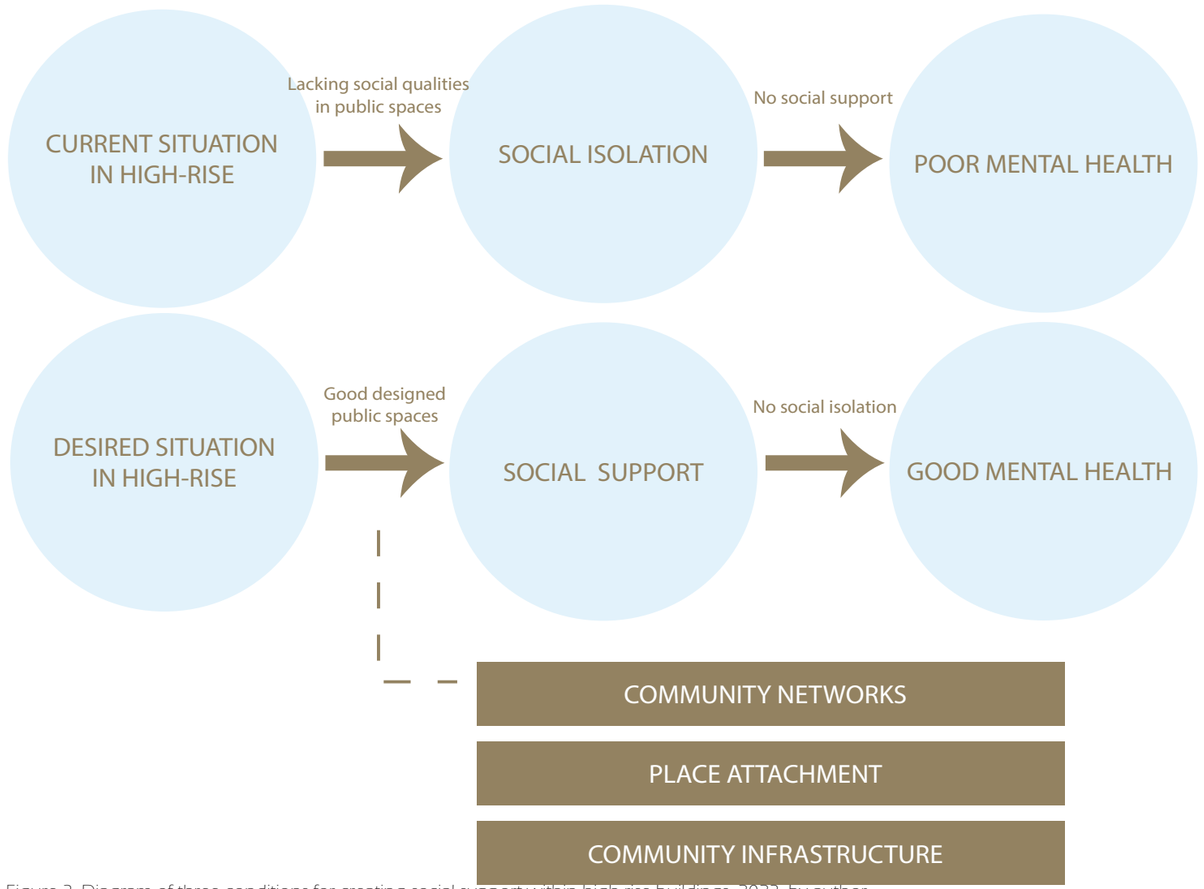


Figure 3. Diagram of three conditions for creating social support within high-rise buildings, 2023, by author.

Methods & Methodology

To investigate the spatial aspects and factors influencing loneliness and antisocial behaviour in high-rise buildings, various research methods are used to answer the main and sub-questions. (figure 4)

Quantitative research methods

Finding out the current situation of high-rise residents, including their sense of place attachment and the status of community network.

1. Survey: A questionnaire consisting of closed-ended questions to explore the subjective social experience in high-rise buildings. It provides insight into how residents rate their living environment in terms of social connectivity and the extent to which they feel socially engaged in their living environment. It also aims to identify the desires and shortcomings in high-rise living.

2. Data Analysis: Statistics and figures on the feelingof loneliness and housing satisfaction in high-rise buildings derived from previous ethnographic studies related to high-rise residents.

3. Literature Review: Existing studies and literature on social interactions and isolation in high-rise buildings are examined to gain insight into challenges related to maintaining social aspects in high-rise and to determine the spatial qualities needed to reduce loneliness. Additionally, other studies focusing on the causes, consequences, and prevention of loneliness are examined.

Qualitative research methods:

Discovering the urban integration of high-rise buildings and the community infrastructure within high-rise structures.

1. Observational Research: Observing residents and public spaces in different residential towers to gain insight into the social structures of individuals and groups. This method provides an overview of how high-rise residents make choices regarding their social behaviour, movements, and engagement.

2. Photography: Capturing and analysing the layout of public spaces such as the entrance, lobby's, garages, hallways and specific communal functions that influence social behaviour in high-rise buildings

3. Case Studies: Analysing four high-rise buildings and their surroundings to evaluate the public layout and spatial aspects for potential strengths, weaknesses, opportunities, and threats that impact loneliness and anti-social behaviour. The selected high-rises are among the top 10 tallest residential towers in Rotterdam, all constructed between 2009 and 2022.

The chosen research methods are selected to verify whether the theoretical framework (literature and data analysis) aligns with the practical framework (observation, survey, and photography). The goal is to identify spatial factors of architectural and urban design influencing social behaviour. The research is two-folded. It includes a theoretical framework in which various literature studies and data are examined. This framework provides insight into how public spaces and amenities as community infrastructures contribute to loneliness and how the built environment can respond to this problem. It also includes a practical framework, various residential towers are analysed, ranging from 'good' towers where attention has been paid to social connectivity and diversity to 'poor' towers where social isolation and loneliness occur. Various spaces and amenities within high-rise buildings are then assessed for strong and weak factors influencing social behaviour, thus community networks and feeling of belonging or place attachment. Additionally, the desires and subjective experiences of high-rise residents are considered to determine the necessary spatial quality in high-rise living. Also, other social and public spaces outside high-rise buildings are analysed. This provides insight into how people and groups are stimulated to engage in social interaction directly or indirectly and which spatial factors are crucial. This information can potentially be applied to high-rise living.

Methods & methodology diagram

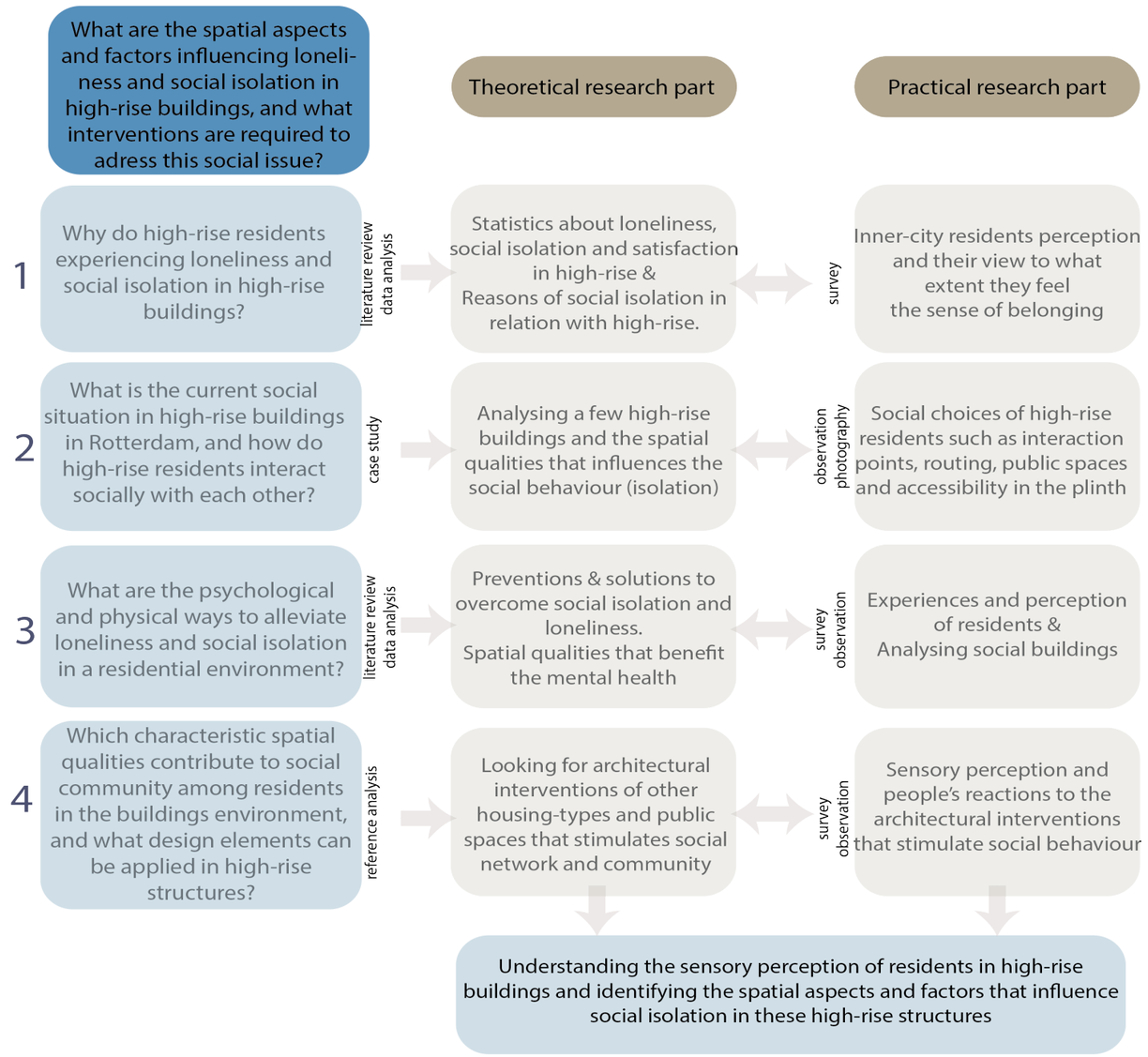


Figure 4. Researsch and methods diagram, 2023, by author.

Research

High-rise as a typology

High-rise in Europe

An early example of high-rise construction is the Tower of Babel, as described in biblical texts in Genesis 11. (Dupr, 2009) It was seen as the first tall structure built by humans in an attempt to reach heaven, driven by human pride and the desire to increase power and status through architecture. The story of the Tower of Babel is a typical example illustrating that the pursuit of higher constructions and architecture brings challenges and consequences.

The high-rise we know today is the skyscraper. This typology was first introduced in the United States, after which Europe quickly began to integrate high-rise buildings into the urban landscape. (Pietzark, 2014) However, Europe approached the construction of tall buildings cautiously due to concerns about potential negative influences on urban identity. It was not until around 1950 that Europe began to develop buildings over 100 meters tall. This led to a growing demand for such buildings, which serve as offices and residential. (figures 5 & 6) The typology became popular for urban developments because stacked housing could bridge the need for housing. (Koelemaij, 2018) Moreover, high-rise structures in cities became a symbol of power and prestige. (Ali and Al-Kodmany, 2012) Today, this typology is part of modern architecture and is included in the urban skyline of most European cities. Cities must continuously evolve and continue to develop high-rise structures to maintain their image as modern metropolises. (Pietzark, 2014)

High-rise in the Netherlands

The development of high-rise buildings in the Netherlands saw a significant leap after World War II (1945), with two major waves of high-rise construction, respectively between 1965 and 1975, and from 2000 onwards. (Wassenberg and Bugera, 2024) Immediately after the war, many high-rise projects were realized in a short period due to extreme population growth, leading to housing shortages. Particularly in the year 1969, 11 percent of all housing apartments were built in high-rise complexes. The significant development in high-rise construction was mainly due to large-scale modernist urban planning based on quantity and egalitarian ideas. This resulted in large neighbourhood projects with monotonous high-rise complexes on the outskirts of cities, aiming to accommodate as many people as possible. The popularity of this typology increased significantly due to the presence of luxury amenities such as elevators, showers, central heating, and the use of the latest construction technologies.

A new typology soon emerged in the suburbs of cities: ground-level houses with front and back gardens, which were more attractive to urban populations. This led to problems in renting out and vacancy rates of high-rise towers. The high-rise typology was then only used by people who had no other housing options, especially vulnerable groups with social, economic, or psychological problems. Moreover, the construction quality and satisfaction in high-rise buildings continued to decline, while the sense of insecurity increased. This led to a decrease in liveability in high-rise areas, and high-rise neighbourhoods such as the Bijlmer gained a poor reputation. The extensive high-rise developments in the Bijlmer resulted in high population density with a lack of communal spaces, leading to anonymity and social isolation. (Lotens, 2021) Furthermore, the absence of adequate amenities and public spaces such as schools, hospitals, and shops hindered the formation of close-knit communities, resulting in social issues such as flat syndrome, loneliness, depression, and increased crime. Such problems, akin to those in the Bijlmer, contributed to a negative perception of high-rise projects.

Only from 2000 onwards was there a steady increase in high-rise projects in the Netherlands. However, high-rise was applied differently. (Stichting Hoogbouw, 2008) The residential towers were no longer long high blocks but individual narrow towers. They were developed in attractive areas in the city centre that were easily accessible and based on market parties. There was also a shift towards high-rise being more focused on buyers and private renters. This resulted in high-rise in the city centre that differed from the social high-rise apartments from the 1960s and 1970's on the urban outskirts. (Wassenberg and Bugera, 2014)

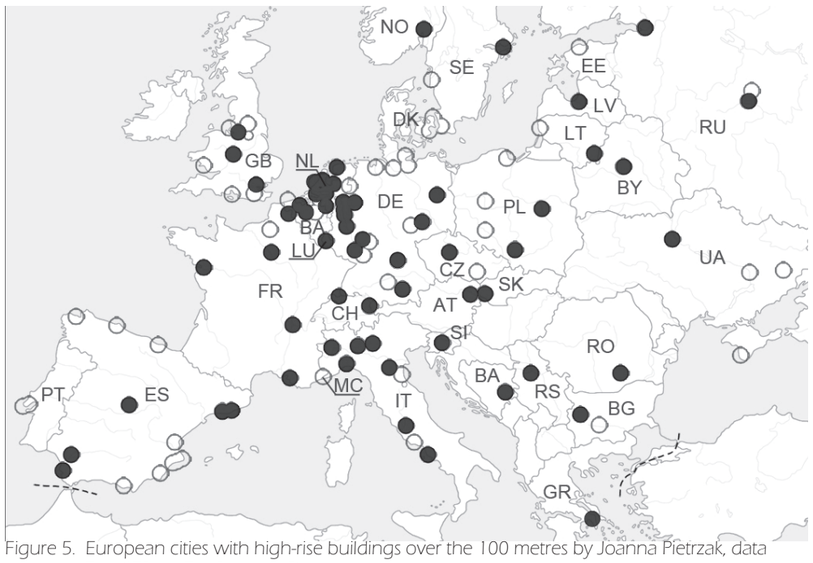


Figure 5. European cities with high-rise buildings over the 100 metres by Joanna Pietrzak, data based on The CTBUH Tall Building Database

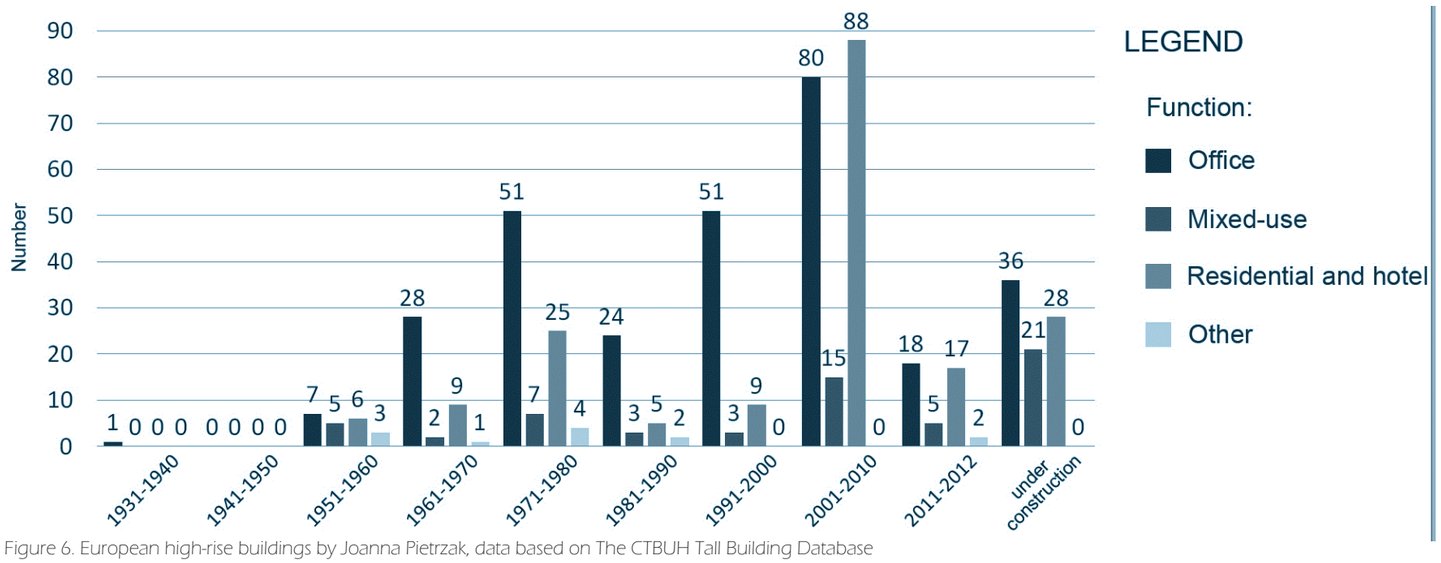


Figure 6. European high-rise buildings by Joanna Pietrzak, data based on The CTBUH Tall Building Database

High-rise as a typology

The social understanding of high-rise

Over the years, the definition of high-rise buildings has evolved and varies from country to country and region to region. In the Netherlands, buildings with stacked floors above 70 meters are generally considered high-rise according to building regulations. (Stichting Hoogbouw, 2018) Rotterdam remains a leader in high-rise development, with a minimum height of 70 meters and buildings from 150 meters considered as super high-rise. (figure 7) However, different municipalities apply varied standards for high-rise construction. Some municipalities consider buildings from 25 to 30 meters as high-rise, while others use tree lines as a benchmark.

The typology high-rise, such as the gallery flat, was originally intended to alleviate housing shortages. (Stichting Hoogbouw, 2018) The emphasis was mainly on efficiency and maximum housing, while little attention were given to the social well-being of the residents. It was not until the 1970s that this typology fell out of favour and was even banned from city centres.

From the 1980s, the typology of high-rise construction regained popularity, particularly for offices and hotels in city centres like Rotterdam. (Stichting Hoogbouw, 2018) Gradually, residences were reintegrated into high-rise construction. There was also increased attention to social aspects and efforts to better integrate high-rise construction into the urban environment. (Moor and Erysheva, 2017) Concepts such as mixed-use and hybrid developments, that replaced the precise city zoning in the urban environment such as industrial, business and recreation emerged. (Generalova, 2020) But also the value for liveable streetscapes and good accessible ground floors became important aspects to connect high-rise with the urban fabric. (De Nijs, 2015) Nowadays, high-rise construction is seen as a housing option, where traditional front and back gardens are exchanged for an urban view at height.

High-rise ambition

One increasingly encounters construction projects claiming the title of the "tallest" residential tower in the city. Not long after, a new residential tower emerges, surpassing the previous one. It appears that municipalities and developers are increasingly inclined to build higher, making it a goal in itself. This is not an entirely uncommon thought. The population growth in cities is significantly rising, and building higher means more residences on a relatively small land area. (Bevolkingsprognose Rotterdam, 2012) The continuous aspiration to build taller residential towers thus addresses housing shortages and the requirements of urban densification. (Monster, 2021) Moreover, designers and engineers see it as a challenge to continually build higher, in the Netherlands, surpassing existing heights. Innovating construction techniques and materialization to build higher which also contributes to the development of the built environment.

Nevertheless, it seems that not everyone appreciates these intensely tall residential towers. City residents and visitors feel overwhelmed by the massive volumes and heights. Both those living in high-rises and those at street level experience a disconnection from their surroundings and the city. Some high-rise residents even feel detached from the city, confined within their own residential building because of the lack of awareness street-level activities and social connections, which can lead to mental health problems. (Lacombre, van Etten and Horwitz, 2019) (Yao,2020)

Additionally, city visitors are increasingly overwhelmed by ever-taller high-rise buildings. This ambition to construct taller residential towers seems to come at the expense of the human scale (Gehl, 2010). Consequently, high-rise buildings and public spaces become more distant from what people perceive as meaningful and comfortable. The street, traditionally a place for public life and social engagement, is becoming increasingly detached from everyday experiences.

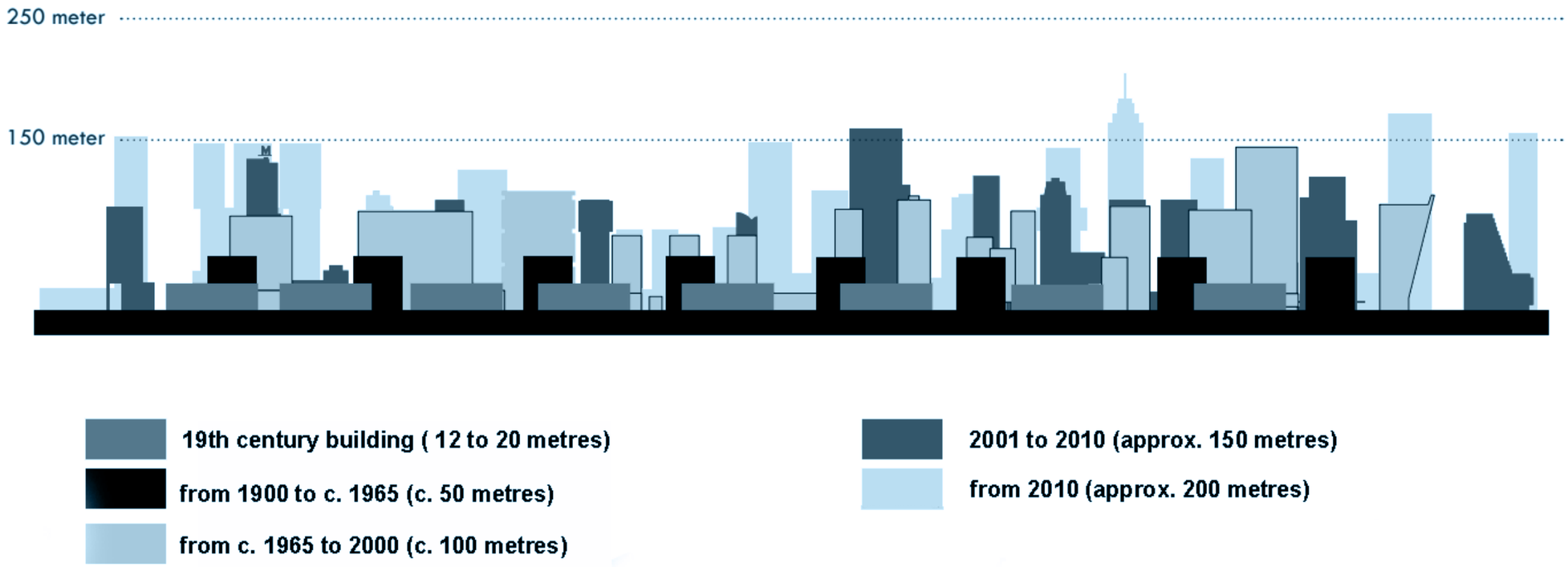


Figure 7. The shift in height for high-rise towers in Rotterdam by Stichting hoogbouw, Gemeente Rotterdam, 2019 (Edited by author)

Rotterdam high-rise vision

Rotterdam is famous in the Netherlands for its modern buildings and tall buildings. Unlike other major cities such as Amsterdam, Utrecht, and The Hague, Rotterdam does not have as much old architecture and historic buildings due to the bombing in 1940.(Weesies, 2023) When discussing the architectural and urban planning characteristics of Rotterdam, the emphasis is particularly on high-rise buildings. In recent decades, the city of Rotterdam has been active in constructing residential and office towers. Although the White House was once considered Rotterdam's first high-rise, and even Europe's, with a height of 45 meters, buildings exceeding 100 meters were soon realized. (Kooijman, 2023) The threshold for building higher shifted further over time. (Bergeijk, 2018) Currently, the city contains seven buildings that exceed 150 meters in height, with one building standing out, the Zalmhaventoren I with 215 meters. (Van Putten, 2023) Rotterdam is preparing for further densification in the coming years, making room for more high-rise buildings. Such plans and regulations are included in the 2019 high-rise vision. The city expects to realize 50,000 new homes by 2040, which also means that the city skyline will continue to evolve in the coming years.

The municipality of Rotterdam has published a new high-rise vision in 2019, making room for densification by allowing for more high-rise construction. (figure 8) The high-rise vision provides architects and developers with specific guidelines on where and to what height buildings can be constructed. The Rotterdam municipality prioritizes three points in the 2019 high-rise vision. (Stichting hoogbouw, 2019)

1) Increasing space and height in the city: Generally, buildings in the city centre are allowed to reach a maximum height of 250 meters. In surrounding areas such as Feyenoord City, Hart van Zuid, and the Alexanderknoop, the maximum height is limited to 150 meters.

2) Creating vibrant street scenes: The municipality values social functions. The surrounding area or neighbourhood should benefit from new amenities. The ground floor of buildings should be accessible.

3) Buildings must be safe and social: Measures should be taken to reduce anonymity in cities and high-rise buildings. Tall residential towers should promote social interaction by creating spaces that encourage encounters. One current requirement is that direct transportation from the car park (basement) to the respective residential floor is not permitted. There must be a transfer at the ground floor level, serving as a central lobby to promote social interactions and ensure safety.

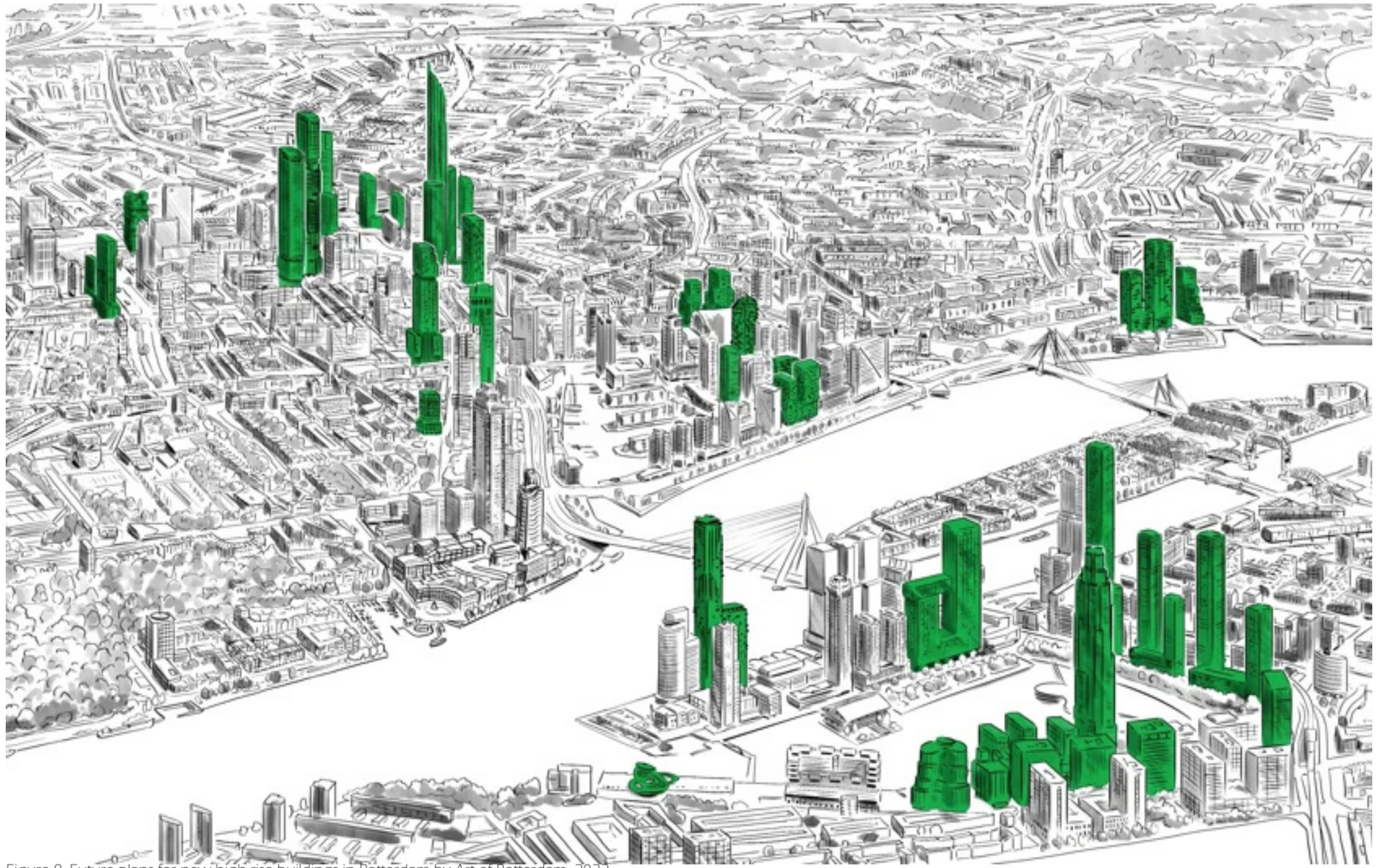


Figure 8. Future plans for new high-rise buildings in Rotterdam by Art of Rotterdam, 2022
https://www.dehavenloods.nl/nieuws/algemeen/44232/tegenslagen-bij-bouw-van-nieuwe-torens-maar-al-gaat-maar-de-hel#

"There is every reason to believe that high-rise apartment dwelling has adverse effects on mental and social health". - Cappon, 1971 p. 194

Loneliness and social isolation (Mansfield,2019)

Loneliness is a broad concept and manifests in various forms, such as:

1. Existential loneliness: A feeling that goes beyond from isolation and alienation stemming from the awareness of the own existence and the separation between individuals.
2. Emotional loneliness: The feeling of disconnection and dissatisfaction of deep meaningful relations with a person.
3. Social loneliness: The missing social network and contacts in daily life.

This research primarily focuses on social loneliness. But what exactly is social loneliness? Simply put, social loneliness is the lack of social relationships, where an individual cannot anchor themselves in society. (Fu, 2020) It is also referred to as collective loneliness. It is not only about the quantity of contact, but also about the quality of contact between individuals, and to what extent close relationships and bonds are formed. (Perlman & Peplau, 1981)

In general, when an individual is dissatisfied with their social situation and their perception does not align with reality, (Perlman & Peplau, 1981) this increases the likelihood of loneliness. Loneliness often accompanies social isolation, but the two concepts are not identical. (figure 9) Social isolation is the situation in which people are socially disconnected, meaning they have no contact or meaningful relationships with other people, while loneliness is a universal human emotion. It is a complex, multifaceted concept that can be described as the subjective experience of social isolation. This relates to the architectural and urban design in and of high-rise towers. Nevertheless, there is a strong correlation between the two concepts, where subjective isolation (the feeling of loneliness) can arise from objective isolation (social isolation). For example, a person may be socially isolated and have no contact but still be satisfied with their situation, whereas the feeling of loneliness is always perceived as negatively and therefore detrimental to individuals' mental health.

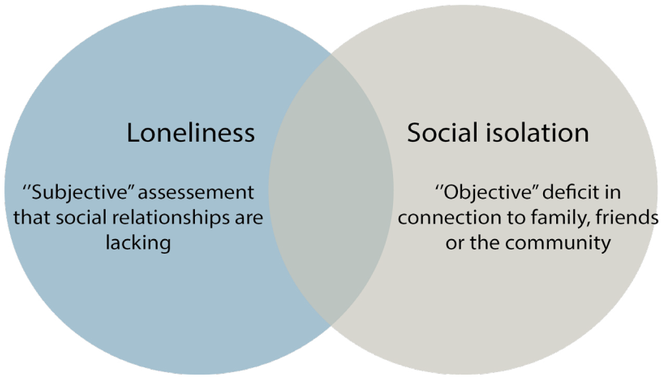


Figure 9. Differents between loneliness and social isolation by Ashwin A. Kotwal MD, 2021 (Edited by author) https://agsjournals.onlinelibrary.wiley.com/doi/10.1111/jgs.17366

Moreover, loneliness can arise from various factors and environments such as health, personal life, work, technologies, socio-economic, societal influences, geographical distances, and can occur in every age group. (figure 10) (VZinfo, 2022) Although certain demographic groups are more vulnerable to social loneliness, such as those aged over 65. (Fu, 2020) (Department for Culture, Media and Sport UK, 2023) Furthermore, according to figures from the RIVM (2002), an increasing number of young people between the ages of 15 and 25 feel socially very lonely, and this societal problem appears to be increasingly prevalent in big cities. (Gemeente Rotterdam, 2017)

This research exclusively focuses on the architectural and urban design aspects in and around high-rise buildings in cities, which affect loneliness and social isolation.

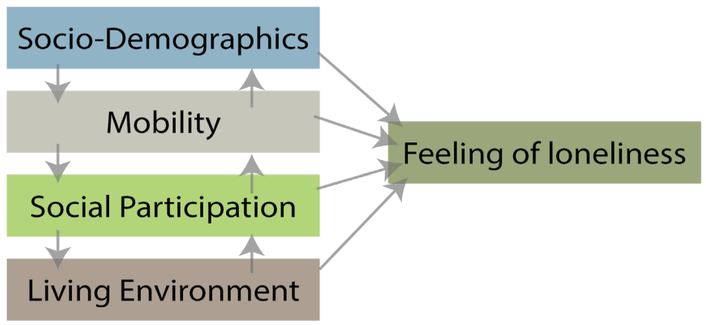


Figure 10. The causes of loneliness by Astrid Kemperman, 2019 (Edited by author) https://www.mdpi.com/1660-4601/16/3/406

Societal changes

The shift from high-rise buildings to the private sector, around 1995 has also led to societal changes. Previously, the groups living in high-rise buildings, mainly consisted of large families. (Wassenberg and Bugera, 2024) Nowadays, however, households in cities have become more diverse and smaller. They consist of small families, couples, and singles, as well as a diverse range of elderly people, (young) adults, and students from various demographic backgrounds. This is partly because the role of marriage is no longer central, and people have more freedom to shape their own lives based on career, personal interests, and socio-economic and political preferences. (Smith, 2023) Urbanization has led to cities becoming super-diverse, making individuals in the public domain increasingly independent and anonymous.

Moreover, traditional social bonds in the Netherlands are declining because religion and politics no longer play a significant role in daily life. (Centraal Bureau voor de Statistieken, 2023) Nearly a century ago, most people attended church, making church visits an important social activity. People could identify themselves based on religion, occupation, social class, or family.

Additionally, digitalization has changed the way people form social contacts. (Wassenberg and Bugera, 2024) People now communicate more often via the internet on social platforms than in physical settings, making relationships and social bonds less personal. As a result, people meet face-to-face less frequently, leading to a decrease in participation in genuine physical social activities.

Economic pressures have also contributed to this change. (Derek, 2024) An increase in working hours and economic uncertainties have led to people having less free time and energy to meet others and participate in social activities.

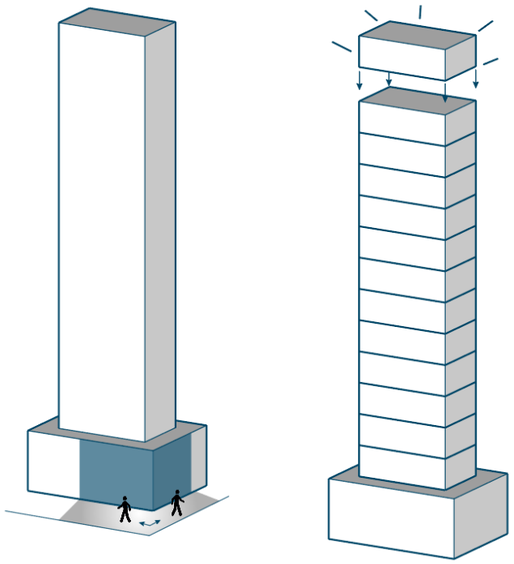
Finally, the advent of high-rise buildings and urban densification has brought changes to the urban structure. (de Nijs,2015) This has led to a decrease in communal spaces and disconnection of the lively citystreet, resulting in fewer spontaneous social interactions. These factors together are putting social cohesion in the Netherlands under pressure, causing individuals in the public domain to become increasingly independent and anonymous.

High-rise negative awe

Stress

Research about how high-rise structure affects the human body have shown that cities with a significant amount of high-rise buildings can be confronting for people. (Jackson,2017) (Peen, 2010) Exposing individuals to large and tall structures in urban areas can impact the mental health of city residents. (Mazumder, 2020) The study utilized Virtual Reality (VR) to measure the blood pressure and heart rate of participants exposed to different environments, including a forty-story high-rise and a two-story low-rise building. The results showed that, overall, a higher heart rate and increased stress were observed when participants were exposed to a high-rise environment compared to a low-rise environment. Participants reported that a high-rise environment was perceived as more oppressive, less open, and less friendly than a low-rise environment. (figure 11)

Even city residents who have lived in urban areas for an extended period or the majority of their lives may show signs of stress. Furthermore, prolonged stress can lead to additional health problems. Multiple studies have confirmed that city residents and individuals raised in large cities have an elevated risk of developing schizophrenia, a mental disorder characterized by psychosis. (Vassos, 2012) It's essential to note that city residents do not experience direct health problems, but rather, they are continually exposed to a stressful environment. This prolonged exposure to stress has a chronic nature and can result in psychological consequences. (Kalantari, 2020)



Homogenous form

Stacked layers

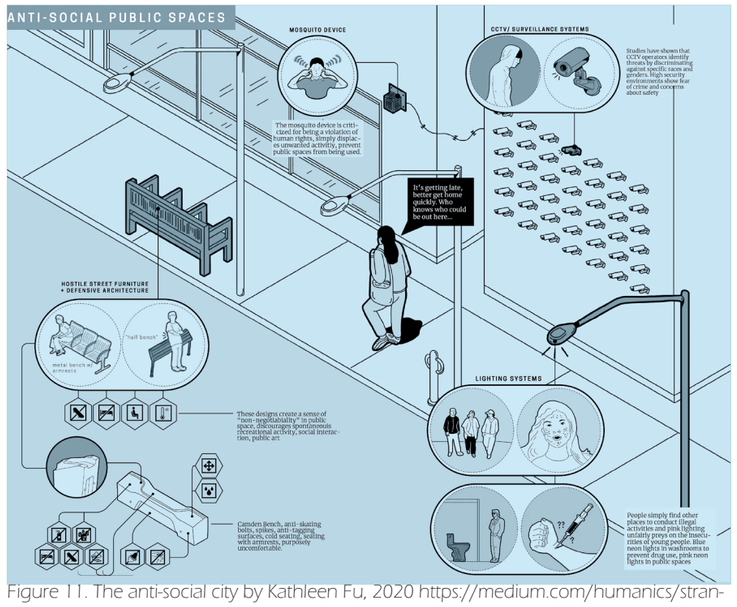


Figure 11. The anti-social city by Kathleen Fu, 2020 https://medium.com/humanics/strangers-in-the-sky-a-designers-guide-to-tackling-urban-loneliness-part-a-31991bd66e60

Losing the human scale

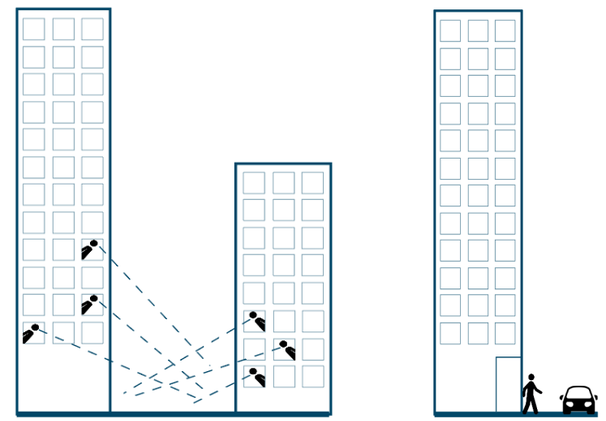
The height of residential towers plays a significant role because the interaction between humans and the urban environment depends on the human scale. (Gehl, 2010) (Zarghami, 2019) Urban dwellers are exposed daily to tall buildings in modern cities, experiencing various qualities of the urban environment. The scale between humans and high-rise structures is immense, leading to direct psychological and emotional effects. Research indicates that individuals exposed to tall buildings at street level had a reduced sense of self-control. (Madzumder, 2020) In contrast to low-rise structures, people felt more in control and reported feeling calmer and happier. This is attributed to the association of tall buildings with institutionalization. Additionally, large objects, including high-rise buildings, evoke a sense of sublimity, where massive structures are perceived as powerful and dominant. This creates feelings that the object is higher and stronger than the individual or human.

Another study suggests that individuals on the street navigate daily based on the scale of buildings relative to their own scale. (Ernest, 2007) The physical parameters of tall buildings, including spatial angles and configurational factors, are essential considerations in designing the exteriors of high-rise structures. Moreover, large buildings obstruct human vision. The permeability of the environment at eye level is disrupted by tall buildings, leading to a loss of overview of the surroundings, which can contribute to a more stressful experience. (Madzumder, 2020)

Losing the ground and dimensions

Within high-rise residential towers, the relationship and distance also play a significant role. (Gehl, 2010) Often, the view from a great height is highly valued, and the higher one resides, the more exclusive the view becomes. One could argue that this is one of the positive aspects of living higher in the sky. However, it turns out that the connection with the ground at street level is lost. According to the Danish urban designer and architect Jan Gehl, residents of high-rise buildings above the fifth floor lose contact with the city. Their focus becomes solely the view of the sky, and the dynamics and human movements visible on the street are hardly perceived at considerable heights. From a height of 13.5 meters, the top-down view is already severely limited, making it difficult to observe faces and emotions of people on the street. This results in a disconnection and lack of engagement between high-rise residents and the vibrant street or city. Moreover, the likelihood of social contact and relationships with neighbours decreases as one lives higher above the ground.

Conversely, contact from eye level on the street to high-rise structures is limited by human vision. (Gehl, 2010) Our vision is based on the horizontal plane, allowing people to walk on the street while simultaneously having an overview of obstacles on the road. Therefore, human vision is always directed 10 degrees downward while walking. Human vision is naturally not oriented upward, as the human neck has difficulty moving upward. The visual orientation of humans extends only up to 55 degrees above the horizontal plane. This is the visual plane through which spaces and environments are seen and experienced. In the case of high-rise buildings, it is challenging to establish a visual connection from street level. (De Nijs, 2015) Improper design of the base can result in an unwelcoming appearance of the tall building, causing a disconnection between humans and nature up to a certain height. (Larcombe, 2018)



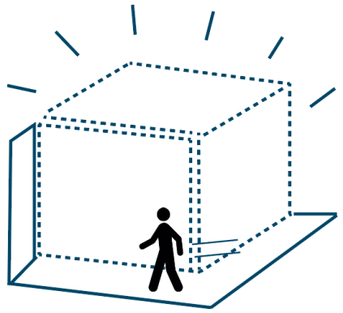
No visual connection of the ground

High mobility

High-rise negative awe

Missing social spaces

Extensive research has documented a lack of social engagement in European high-rise buildings. (Kalantari, 2020) This isolation was attributed to designs that promoted individualization and anonymity. Due to the absence of physical spaces defined as 'ours', it leads to a lack of direct informal social control. There is hardly any common connectivity among residents. (Kaur, 2017) It appears that creating a community in high-rise buildings is not easy. Another study confirmed the problem, demonstrating that high-rise apartments with central communal courtyards showed more social interaction among their residents compared to high-rises lacking such communal spaces. (Huang, 2006) According to Coleman (1985), this extends further, as the immediate environment is also responsible for the mental health of children growing up in high-rises. Additionally, children growing up in high-rises have fewer spaces to move and play, resulting in lower motor skills than children growing up in single-family homes. (Gifford, 2007) Furthermore, The absence of green spaces and natural elements such as daylight and good ventilation in the environment can also negatively impact on the mental health and social behaviour.



Missing communal spaces and program

Missing facilties promoting social activities

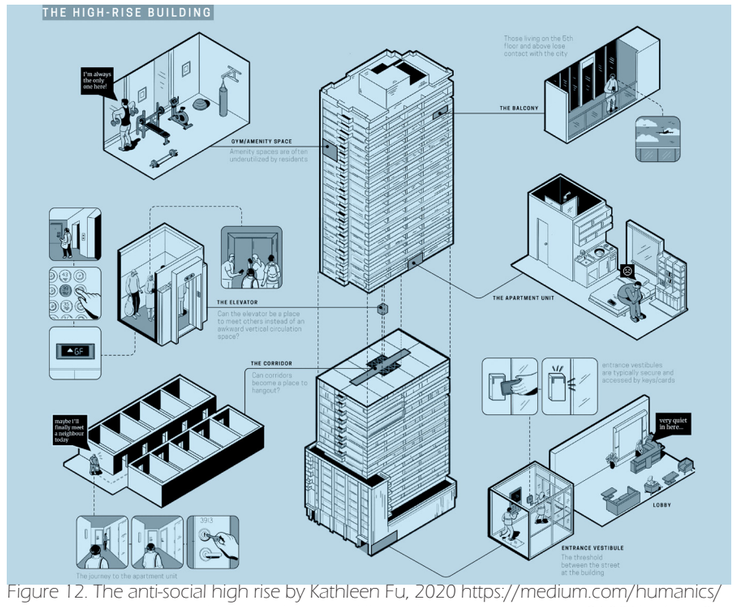


Figure 12. The anti-social high rise by Kathleen Fu, 2020 https://medium.com/humanics/strangers-in-the-sky-a-designers-guide-to-tackling-urban-loneliness-part-a-31991bd66e60

Public interior (figure 12)

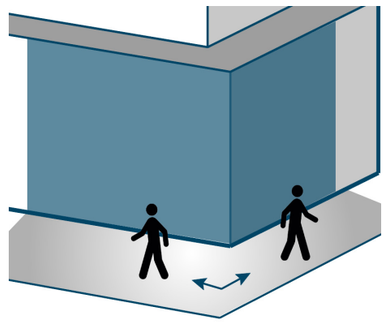
High-rise buildings often feature distinctive infrastructures that facilitate community networks, such as entrance halls, also known as lobbies. This is one of the most social and active parts of the building. (Nguyen,2020) The entrance hall is considered the building's main hub, acting as the nexus connecting the building (the object) with the dynamic street (the environment).(Kalantari, 2019) Furthermore, the lobby shapes the overall perception of the building for both visitors and residents. The desire for social interaction emerged as a crucial factor influencing residents' evaluations of the space. Lobbies with darker décor and insufficient lighting received lower ratings, and the lack of furniture, such as inadequate seating, was associated with poor socialization. The absence of specific elements in public spaces can hinder the stimulation of social interaction.

Additionally, elevators are indispensable in high-rise buildings. The study found that elevators were highly valued, with an emphasis on safety and efficiency. In many cases, elevators in residential towers are not seen as social elements and are associated with feelings such as confinement, fear, congestion, and claustrophobia. Although elevators provide opportunities for residents to meet and share the same space, social contact remains limited. (Kremer, 2012) Instead of promoting social interaction, elevators can even evoke feelings of discomfort. Residents waiting for the elevator for a minute or two upon entering the building may feel obliged to greet others or engage in conversation. This is because elevator spaces are often narrow, bringing individuals closer into each other's personal space. (Yao, 2020) (Fu, 2021) Moreover, these areas in and around the elevators are typically lacking in natural daylight and proper airflow, making residents less interested in staying in such spaces. (Kalantari, 2019) Additionally, the contact moment is quickly interrupted due to the speed of the elevator. Residents have barely initiated a conversation before they have to exit on their own floor.

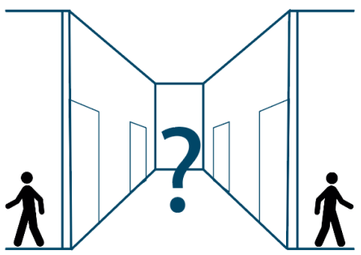
Anonimity

Personal identity also plays a role in reducing anonymity and distance between residents in high-rise buildings. (Ballard, 2012) Personal identity primarily arises in an individual's social life. (Szenfeld, 2017) Despite high-rise residents living, working, and having an extensive network outside their residential complex in a densely populated city, the immediate living environment is a crucial part of the personal identity. Key elements of a living environment that influence this include the type of housing and the immediate community, which contribute to the (reaffirmation) of personal identity. In this analysis, subjective interests must be taken into account, questioning how high-rise residents identify their own home, residential building, and living environment. (Tereszwski, 2019)

It is essential to recognize that a home and its design shape identities. In most high-rise buildings, especially in the social housing sector, homes are not designed according to residents' preferences or chosen by the residents themselves. The modern high-rise buildings known today often have uniform structures and standardized living spaces. (Tereszwski, 2019) High-rise residents do not have the freedom to personalize their homes and living spaces, leading to psychological pressure and a lack of variety and natural elements reflecting residents' personalities. (Nazif, 2024) This deficiency results in a sense of constraint and alienation, potentially impacting the mental health and identity of individuals.



No social engagement



High anonymous living environment

Fieldwork methods

Case studies

To investigate the current social situation in high-rise buildings, several residential towers have been selected as case studies. These case studies are primarily located in and around the centre of Rotterdam and are distributed across four different neighbourhoods, allowing for a better understanding of the social situation in high-rise buildings within Rotterdam. The four neighbourhoods are situated adjacent to each other and largely share the same urban environment and city facilities. This ensures that the findings are relatively comparable, minimizing significant variations between the neighbourhoods and their amenities.

The residential towers are analysed using the SWOT analysis, focusing on strengths, weaknesses, opportunities, and threats on three different scales: contextual level, plinth level, and public interior space. This approach enables the identification of various strengths and shortcomings within the neighbourhoods and in the towers themselves.

The aim of this analysis is to gain insight into the structures and spatial characteristics of Rotterdam's high-rise towers and how they influence social interaction and community within the city. This knowledge will help us better understand how the architecture and organization of these residential towers contribute to shaping social interactions and community spirit within the city.

Observations

The four case studies have been visited and, in the process, observed and photographed. Particularly, the public and collective spaces were investigated on three different scales. The aim of this observation is to identify how both visitors and residents socially behave in both the environment and the residential tower, and to determine the frequency of social interactions. Specific attention was also paid to the transitions between different spaces and how these spaces were used and accessed. At the plinth level, emphasis was placed on accessibility, openness, and the relationship with the street and surroundings. Subsequently, at the contextual level, particular attention was paid to the accessibility and available amenities in the neighbourhood, and whether these amenities meet the daily needs of residents and visitors.

(Un)structured interviews

To gain a better understanding of the social situation and living conditions of residents in high-rise buildings in Rotterdam, both structured and unstructured interviews were conducted. The unstructured interviews primarily took place during the initial visit, involving spontaneous conversations with residents, staff, and landlords. These informal discussions focused on various aspects of the social situation, such as residents' perceptions of the role of high-rise buildings in promoting or limiting social cohesion, the level of familiarity and interaction among residents, and satisfaction with spatial layout and organization.

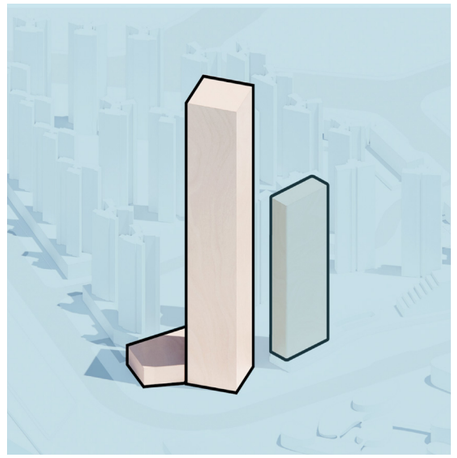
Additionally, a survey was conducted to residents of the four residential towers. This survey included both open-ended and closed-ended questions, examining the extent and nature of residents' social contacts. Residents were also asked to assess the suitability of public and communal spaces for social interaction and gatherings. Finally, residents were invited to share their opinions on potential improvements to features, amenities, and spatial characteristics they would like to see directly or indirectly in their own residential tower.

Residential buildings

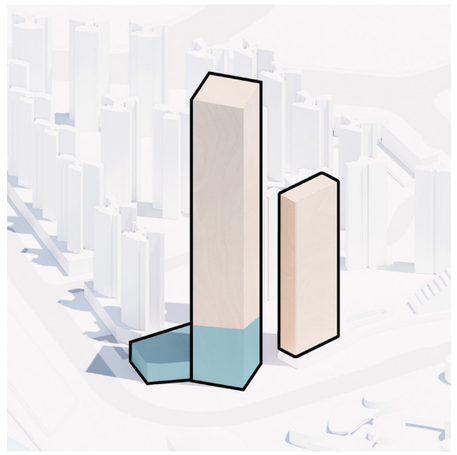
The residential towers selected as case studies are among the top 10 tallest residential towers in Rotterdam. These towers vary in construction year, providing a comprehensive overview of the general developments in high-rise construction in Rotterdam. Additionally, two out of the four residential towers, namely the Zalmhaventoren and the Cooltoren, are very recent, and there has been no extensive research conducted on the social environment within these towers. The other two residential towers date back to 2009, with one tower, The Red Apple, already having received attention regarding certain social aspects and mixed-use developments. The last tower, The New Orleans, was chosen due to suspicions that social issues, such as loneliness, may be prevalent.

Focus points

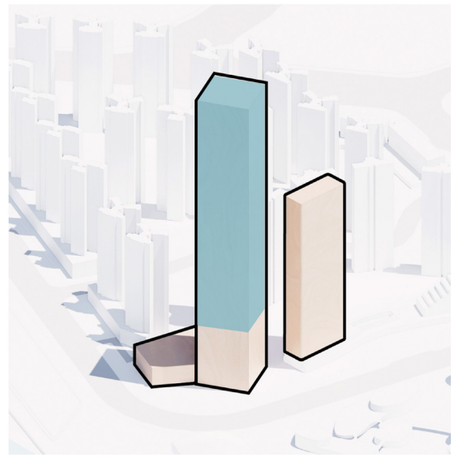
The residential towers are analysed on three levels: context, plinth, and the public interior space. In the context analysis, the focus is primarily on the relationship between the tower and its surroundings, and how it contributes to the surrounding environment. Aspects such as orientation, accessibility, and the availability of public amenities are evaluated. At the plinth level, attention is given to the accessibility and integration of the building with the street and surrounding buildings. Finally, on a smaller scale, the spatial layout of the collective/public spaces within the residential towers is examined. This includes assessing accessibility, spatial transitions, and the quality of the space, with the aim of promoting encounters and social interactions.



Context



Plinth



Public interrior

Fieldwork casestudies

1. Kop van Zuid (Feijenoord)

Kop van Zuid is situated opposite the centre of Rotterdam and is connected by the iconic city bridge, the Erasmus Bridge. (Wijkprofiel Gemeente 2022) Until the mid-'90s, Kop van Zuid was an unused harbour area in Rotterdam. Today, it is considered an extension of the city centre, partly due to the development of the Wilhelminapier. Over the past decades, the district has undergone significant development, featuring numerous new constructions and facilities that are essential for the physical growth of the city of Rotterdam.

The Kop van Zuid is home to a diverse population with various cultural backgrounds. In 2021, the district had approximately 11.000 residents, with relatively high income and education levels compared to other neighbourhoods in the city. Kop van Zuid is somewhat like an island, as it is largely surrounded by the waters of the Nieuwe Maas and the Rijnhaven. The total area of Kop van Zuid is 6.62 km², with 1.45 km² consisting of water.

The district has various public communal amenities, including the Five Continents building, which serves as a significant monument with hospitality and retail functions. Thanks to the construction of Laan op Zuid, the district features important buildings such as the tax office, courthouse, and applied science colleges. The Wilhelminakade has been transformed into a residential and commercial area with leisurements possibilities.

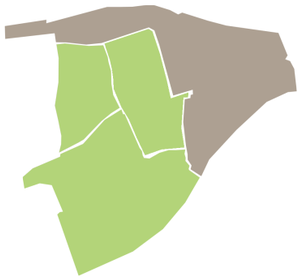
2. Stadsdriekhoek (Centre)

The Stadsdriehoek is located in the heart of Rotterdam and is connected to the shopping centre de Beurstraverse, also known as the Koopgoot, which is a significant component. (Wijkprofiel Gemeente 2024) This shopping centre features various shops and dining establishments that are visited daily by the residents and visitors of Rotterdam. Approximately a quarter of the homes in the Stadsdriehoek date back to the post-war reconstruction period. Nevertheless, a substantial 30% of the district consists of new construction developed from 2000 onwards. Key areas in the district include Grotekerkplein and Binnenrotte, with the iconic landmark the Markthal.

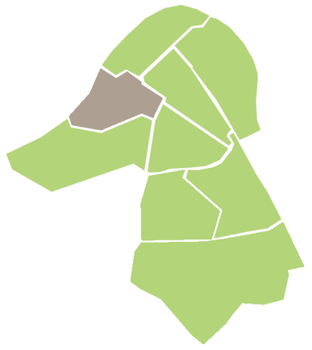
Around 19.000 residents live in the Stadsdriehoek, the majority of whom form households with singles or couples without children. Additionally, many students settle in this district, and approximately 31.000 people work in the Stadsdriehoek of Rotterdam.

In addition to the strong connection with the shopping centre, the district has other vibrant areas. Other public / community amenities are on a walking distance, such as: The Meent and the Pannekoekstraat. These streets contain various cafés, shops, and restaurants. On the Binnenrotte square, you can find the Beursmarkt every Tuesday and Saturday. Lastly, the Oude Haven is the well-known entertainment district, with numerous dining establishments and residences. This area has even received the Safety in Nightlife Quality Mark (Keurmerk Veilig Uitgaan, KVU) as the first entertainment area.

Map gemeente Rotterdam



Kop van Zuid



Stadsdriehoek

Fieldwork casestudies

3. Nieuwe werk/ Dijkzigt (Centre)

The district of Nieuwe Werk / Dijzigt is often referred to as the green lung of the city centre due to the medical cluster. (Wijkprofiel Gemeente 2024) the Erasmus MC/Dijkzigt hospital, and the various parks present in the area. One of the most well-known parks in the district is the Euromast Park, featuring the Euromast as a landmark. Additionally, there is the Museumpark, rich in greenery, art, and culture. Moreover, the southern part of the district is adjacent to the water, the Nieuwe Maas, resulting in a promenade with views of the city skyline. The area also features numerous public and communal facilities, such as the Kunsthal museum; Humanitas, a volunteer organization actively working in the field of welfare and care for residents; and De Machinist, a historic building in Rotterdam that has been transformed into a restaurant and café, as well as a venue for weddings and meetings.

The district has approximately 4.300 residents, many of whom are living alone. Furthermore, the area is attractive to students, partly due to the presence of two campuses of the Hogeschool Rotterdam, namely Academieplein and Museumpark. According to the neighbourhood profile provided by the municipality of Rotterdam, the incomes of residents in this district are relatively high. The area offers numerous employment opportunities, including the Erasmus MC/Dijkzigt hospital, various offices, and museums. On a daily basis, around 20.000 people commute to work, and the district attracts a significant number of daily visitors.

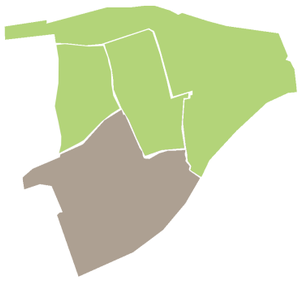
4. Cool (Centre)

The Cool can be subdivided into two parts, namely Cool-Noord and Cool-Zuid. Cool-Noord contains numerous shops, cultural institutions, residences, and employment opportunities. (Wijkprofiel Gemeente 2024) Examples of landmarks in Cool-Noord include the Doelen, the Lijnbaan, and distinctive buildings and streets such as the Calypso, the Pauluskerk, B-tower, the Kareldoormanstraat, and Kruisplein. Cool-Zuid also offers various shops and a mix of culture, housing, and healthcare facilities.

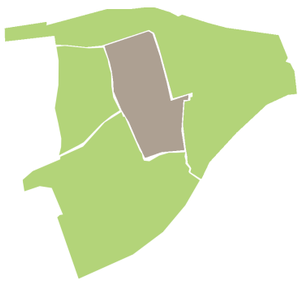
In 2024, the municipality counted approximately 6.600 residents in the district, predominantly consisting of singles and couples. Cool-Zuid is also home to many families with children, leading to the establishment of a primary school and a centrally located square called 'Het Landje,' situated between the Schiedamsesingel and the Schiedamse Vest. The square provides various play areas and sports fields. The district also contains housing, an eye hospital, the regional Public Health Service (GGD), Institution of art, the Schouwburgplein (cinema), de Doelen and TR25 Schouwburg (theatres).

Lastly, the Witte de Withstraat is renowned for its numerous restaurants, cafés, bars, shops, and art galleries in the district. This street connects with the city's art and cultural buildings, namely the Museumpark and the Maritime Museum. Nowadays, this street is heavily visited during the summer months, prompting the municipality to decide to make the street car-free for half of the year to accommodate bars and terraces.

Map gemeente Rotterdam



Nieuw werk/Dijkzigt

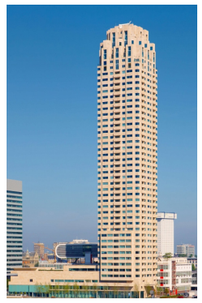


Cool

Fieldwork casestudies

New Orleans

Construction year:	2010
Height:	58 meter
Levels:	45
Apartments:	234 (64 m^2 - 212m^2)
Formats:	47 owned, 187 rented
Cluster:	No
Facilities:	Residential, cinema + terrace, fitness, offices, pool, rooftop terrace and parking



The New Orleans is a residential tower located in the Kop van Zuid area, offering not only residential units but also serving a public function with LantarenVenster, a cinema integrated into the plinth of the building.

In addition to the residential section, the building features a public cinema named Lantaarnvenster, with a terrace as a public amenity on the ground floor, along with small offices and practice spaces at the plinth level. The building is surrounded by broad pedestrian pathways, with one side being a promenade and the other side bordering a one-way road for cars.

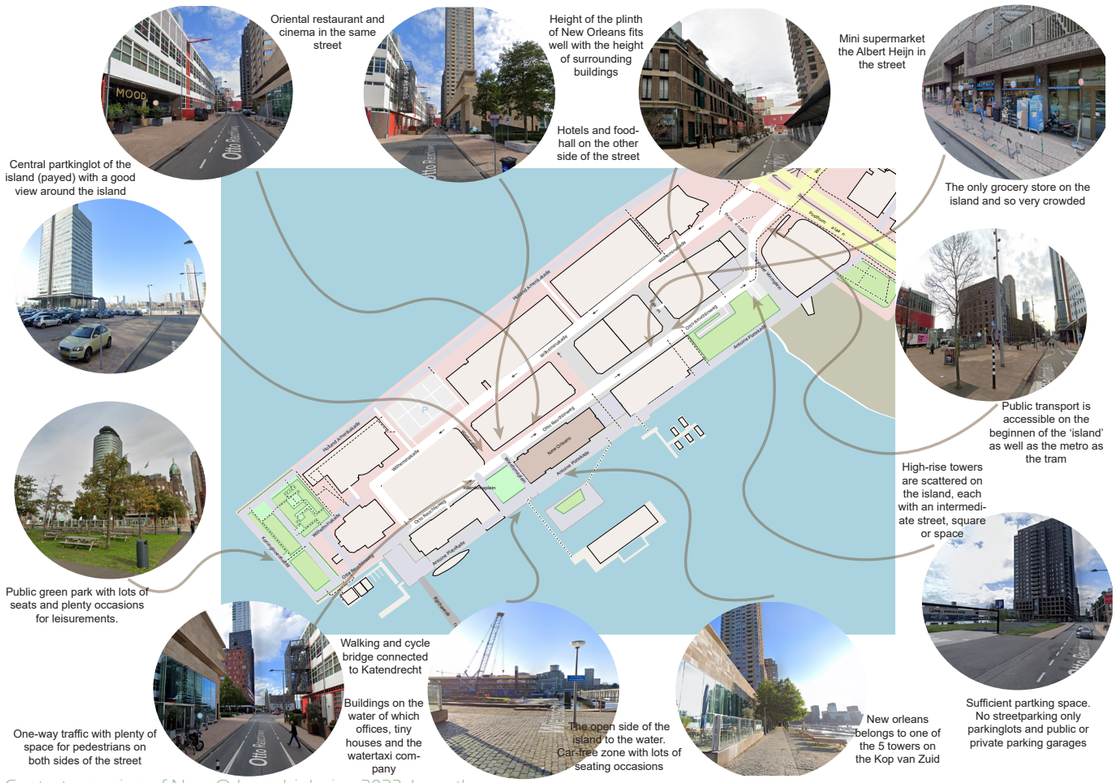
The buildings in this area are generously spaced apart and are frequently interrupted by small side streets or green spaces, allowing the water to be visible from the street. The residential tower has a distinct main entrance with a small green area in front of it. All communal spaces of the residential tower, such as the swimming pool, gym, and rooftop terrace, are located on the fourth floor and are accessible by elevator. Above the fourth floor, only residential units are found, including penthouses on the highest floors.

The Red Apple

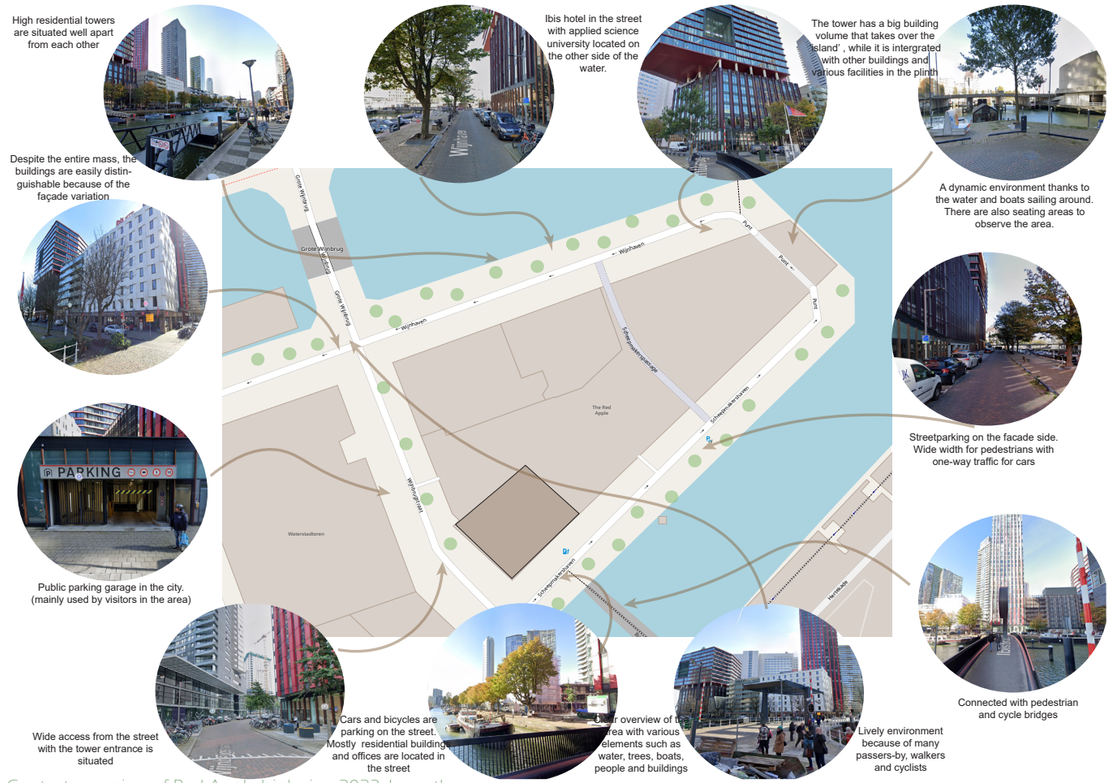
Construction year:	2009
Height:	127 meter
Levels:	40
Apartments:	231
Formats:	-
Cluster:	No
Facilities:	Residential, offices, parking and commercial

The Red Apple is a mixed-use development that includes residential units along with other functions. Situated at the junction of Wijnhaven and Scheepmakershaven, the complex comprises several blocks positioned along the waterfront. The ground floor features various entrances for different offices and businesses, as well as a walking passage and parking garages. Notably, the parking garage is not only underground but also located on the upper floors, with car lifts providing access.

The entrance to the residential tower is situated at the corner of a junction on Wijnbrugstraat. Along the street, parking is prevalent, and on the side walk in front of the main entrance, bicycles and scooters are often parked by visitors and residents. The residential tower has a small communal lobby that provides direct access to the elevators. Apart from the diverse functions on the ground floor, the residential tower itself does not have any other communal spaces. However, the other residential blocks are somewhat provided with shared courtyards or terraces.



Context mapping of New Orleans high-rise, 2023, by author.



Context mapping of Red-Apple high-rise, 2023, by author.

Fieldwork casestudies

Zalmhaventoren I

Construction year:	2022
Height:	215 meter
Levels:	62
Apartments:	452 apartments & penthouses
Formats:	200 owned, 33 herenhuizen, 33 family houses, 200 rented
Cluster:	Yes, belongs to Zalmhaven II and III.
Facilities:	Residential, offices, restaurant, gym, parking and rooftop garden

The Zalmhaventoren I, part of the Zalmhaven II and III complex, is a residential complex consisting primarily of apartments. With an impressive height of 215 meters, it is currently the tallest completed residential tower in Rotterdam. In addition to apartments, the tower offers various amenities and facilities, including offices, parking spaces, a rooftop park, a fitness centre, and a sky bar and restaurant at the top. Although Zalmhaven I is already inhabited, extensive renovations are still underway inside, and the collective and public amenities are not yet accessible to residents.

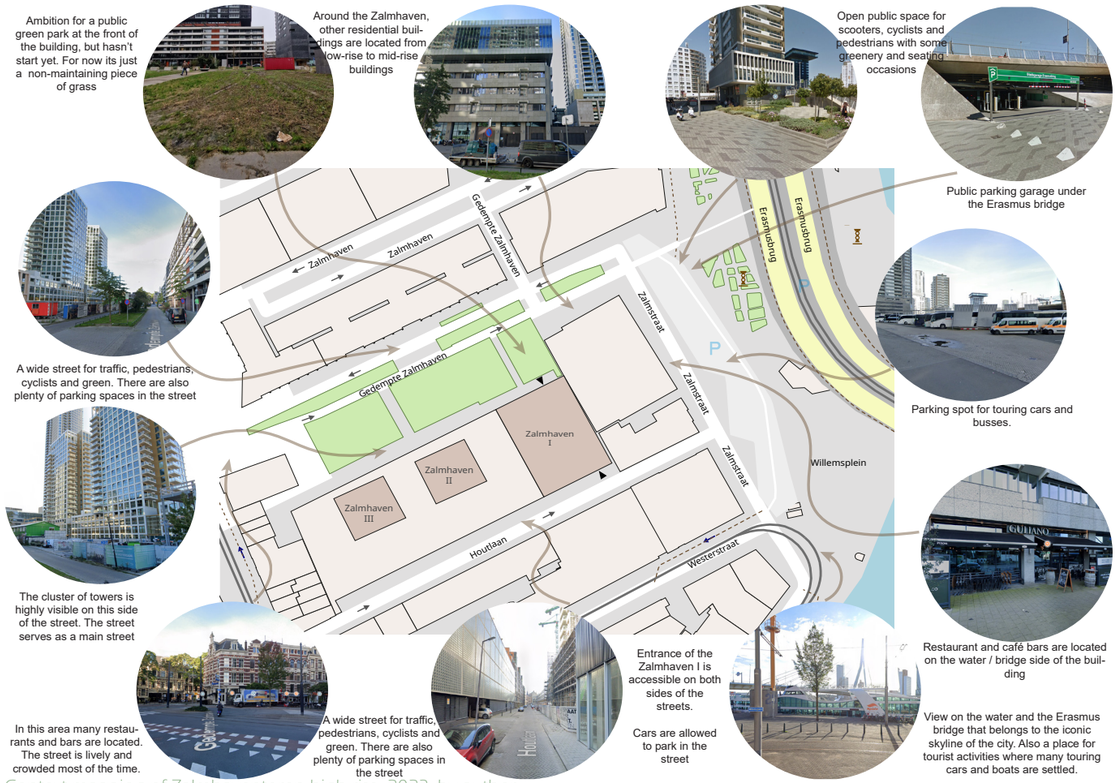
Access to the building is currently limited to those with a key, with entrances on both sides of the building. On the Gedempte Zalmhaven side, a green strip is reserved for plans for a park that will stretch along the entire length of the complex. The plinth of the tower is intended to be publicly accessible in the future and will provide space for offices and a lobby designed as a green oasis where people can meet and work. In the immediate vicinity of the tower, there are many other residences as well as restaurants and cafés, with many parked cars lining the streets.

Cooltoren

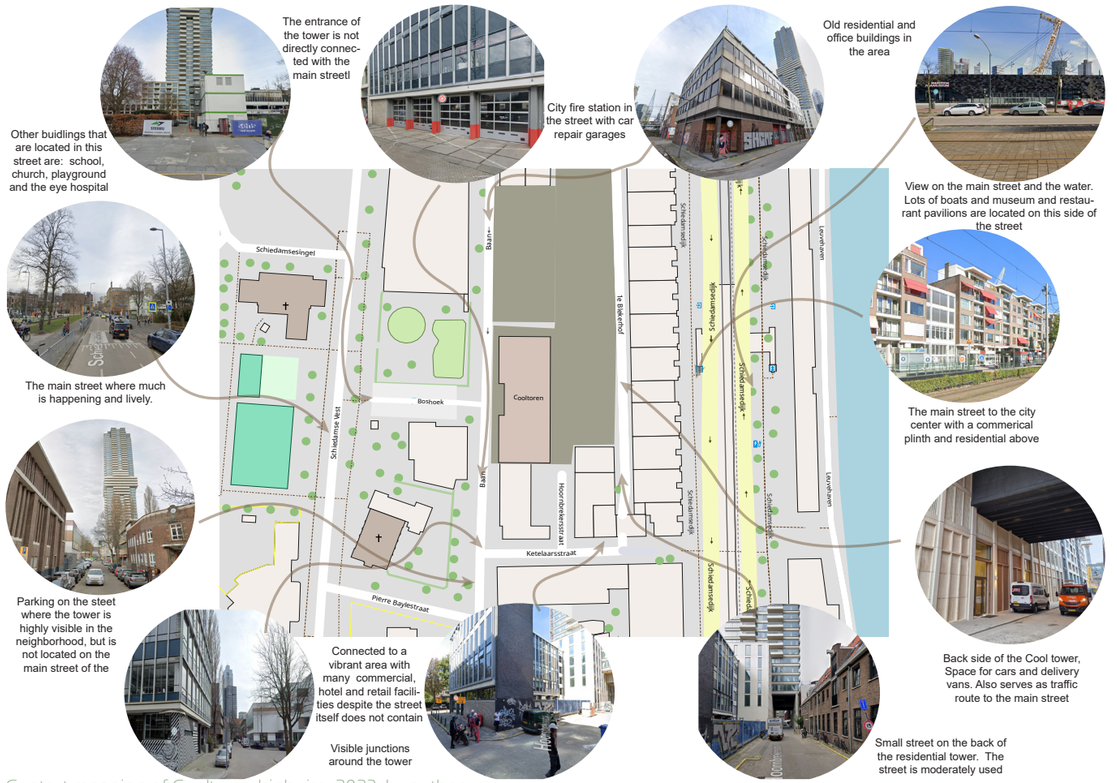
Construction year:	2022
Height:	154 meter
Levels:	50
Apartments:	282 (60m^2 - 400m^2)
Formats:	9 penthouses, 66 luxe apartments and 16 crown apartments.
Cluster:	No
Facilities:	Residential, commercial, parking, rooftop garden

The Cooltoren is a residential tower primarily consisting of apartments, with space reserved for public functions on the ground floor. Currently, the ground floor is not yet occupied, and only the entrance to the residential tower is accessible from the street. Since the tower has recently been completed, the rooftop terrace, the only communal space, is not yet available to residents. Furthermore, there are no other communal areas in the tower, so residents mainly utilize public amenities and facilities in the surrounding area, such as those in the Witte de Withstraat and the city centre itself.

The residential tower essentially has two access sides, but the main entrance is primarily located on Hoornbekerstraat. The tower integrates into the existing street profile, where many parked cars can be found. The street at the back of the tower, Hoornbekerstraat, is not heavily used or frequented due to its unattractive appearance and the ongoing construction activities taking place.



Context mapping of Zalmhaventoren high-rise, 2023, by author.



Context mapping of Cooltoren high-rise, 2023, by author.

Conclusions of analyses

The results of the field research are evaluated based on various aspects related to design principles. At the context level, factors such as human scale, mobility, and street interconnecting are considered. At the plinth level, accessibility, diversity, and functions are assessed. Lastly, the communal interior spaces are reviewed for their adaptability, opportunities for social engagement, and fostering a sense of belonging.

The human scale

Generally, the four residential towers have a very homogeneous design as residential high-rises, featuring a broad plinth. (figure 13) The plinth often comprises three stories, with its height usually aligned with de Rotterdamse laag. Atop the plinth sits the solid, rectangular residential tower occupying 50% of the plinth surface. (figure 14) (Hoogbouw visie 2019) These towers typically consist of a repetition of identical floors, resulting in minimal diversity. (figure 15) The towers are characterized by four flat walls, occasionally showing slight narrowing in the facade to reveal the crown, also known as the summit of the high-rise. An exception is the Cooltoren, which widens midway with balconies, creating an additional segment between the tower and the crown part. (figure 16)

In general, the residential towers are situated in areas with other tall buildings. They are often freestanding or seamlessly blend with surrounding buildings at plinth level. However, the Cooltoren is located in a residential neighbourhood, where the proportion between the tower and the surrounding structures is significant. Another approach can be seen in the Zalmhaventoren, which shares a plinth with two other Zalmhaventorens, creating a cluster where the three residential towers visually form an ascending staircase.

Figure 13. Homogenous vorm of towers, 2023, by author.

Figure 14. Three Zalmhaventowers sharing the same plinth, 2023, by author.

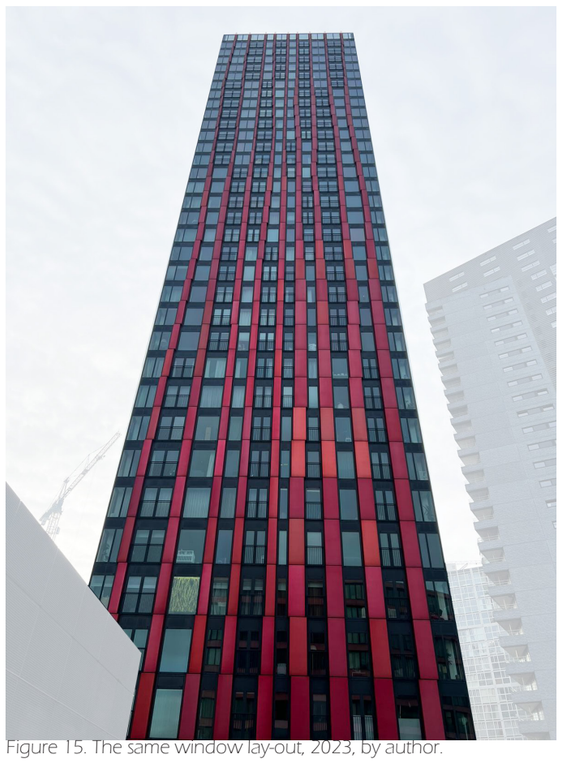


Figure 15. The same window lay-out, 2023, by author.

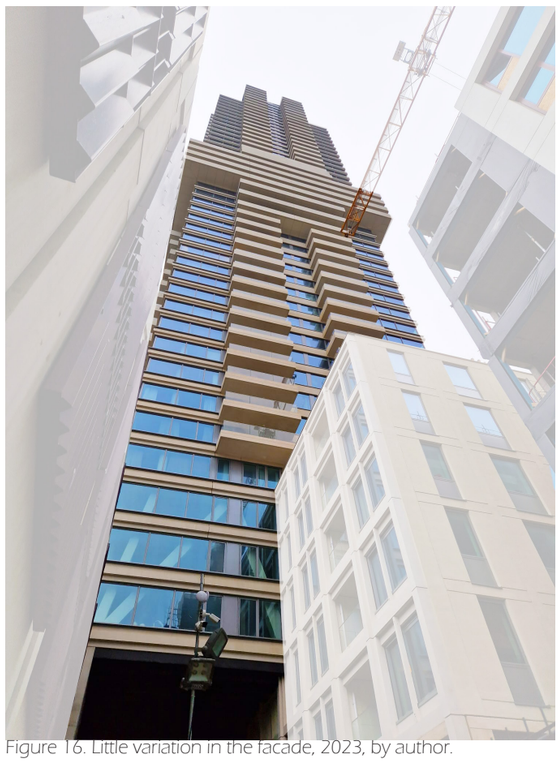


Figure 16. Little variation in the facade, 2023, by author.

Fieldwork casestudies

Mobility

The residential towers are often situated along major roads, with ample street parking available. The side walks are generally wide enough for two-way traffic but are primarily used for functional purposes. Often, the side walks surrounding the building and at the entrance are also utilized as bicycle parking or for waste containers, making the adjacent areas less inviting for leisure or social interaction. Occasionally, green strips and squares can be found in front of the building, but these are not yet equipped with street furniture that encourages social interaction. (figures 17 and 18) A prime example of this is the situation at the New Orleans, where streets on one side overlook the highway, while on the other side, a promenade runs along the waterfront. Pedestrians have the option to avoid the busy traffic and opt for a pleasant route with views of the urban landscape. (figure 19) Moreover, the promenade is spacious enough and furnished with benches and greenery, making it appealing for lingering and meeting up. (figure 20)

Interconnecting

All residential towers are easily accessible by public transport and are often within walking distance of metro or tram stops. They are located just outside the centre of Rotterdam, allowing various amenities to be found nearby. However, some neighbourhoods, such as the Kop van Zuid, are more focused on work and tourism, and the amenities in this area may not fully meet the daily needs of residents. For example, the neighbourhood only has one small supermarket, which can sometimes lead to crowding. (figure 21) Furthermore, various entertainment activities in the area can cause (noise) disturbances, which may reduce liveability. Another aspect is that the towers often have both a front and back side, with the back side often facing onto a grimy street that is not actively used and mainly serves for parking or as a thoroughfare. (figure 22) These streets can evoke an unsafe feeling because they do not connect well to the main road and there is little visibility from the surroundings for social control. (figure 23). Another example is the Red Apple, which is centrally located with a good visual connection to its surroundings. However, its physical accessibility is somewhat limited by several bridges, making the building more isolated from its surroundings. (figure 24)

Figure 17. Black and gray are the missing furniture stimulating social interaction on streetlevel,2023, by author.

Figure 18. Undivided green park in fron of the Zalmhaventoren currenty, 2023, by author.

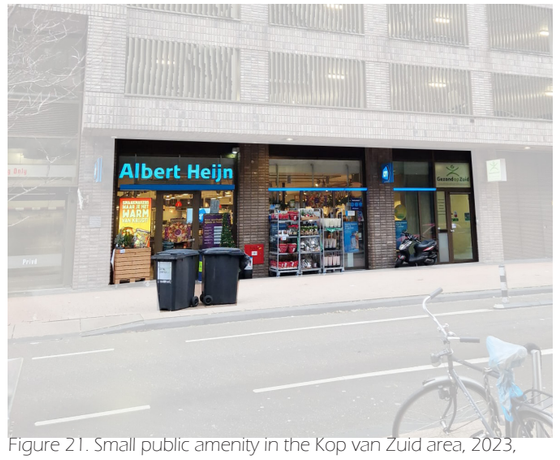


Figure 21. Small public amenity in the Kop van Zuid area, 2023, by author.

Figure 22. Unactive and dead end street on the backside of the tower, 2023 by author.

Figure 19. The promenade near the New Orleans tower, 2023, by author.

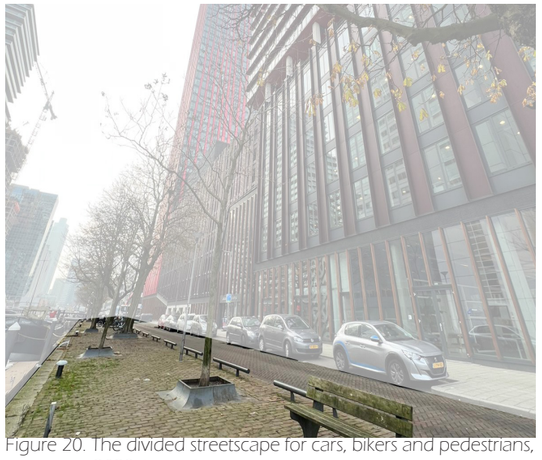


Figure 20. The divided streetscape for cars, bikers and pedestrians, 2023, by author.

Figure 23. Vacant spaces and disconnected functions, 2023, by author.

Figure 24. Unactive and dead end street on the backside of the tower, 2023 by author.

Fieldwork casestudies

Accessibility

In general, all four plinths are currently semi-publicly accessible, with only residents using the building. On the ground floor, all four towers have a raised ground floor with plenty of glass, making it open and providing good visibility inside. However, there are also certain facades that do not face the main street and are often closed, creating a harsh boundary between inside and outside. (figures 25 and 27) As a result, the adjacent outdoor spaces are also not attractive for staying. For example, at the New Orleans, this even gives the impression that waste containers or bicycles and scooters could be placed along the facades.

The residential towers that have multiple functions in the plinth have multiple entrances from the street to the respective functions, separating living from other functions. (figures 26 and 28) This leads to a reduced chance of encounters and interactions between residents and visitors. The entrance to the residential towers has a wider access used only by residents, leading to the lobby. The lobby is often the space with the most potential for encounters. However, these are not always designed for extended stays or social interactions. For example, there are minimal to no furniture present or the layout is tailored to short interactions, such as a TV screen displaying the weather forecast and a mailbox. (figures 29 and 30)

Moreover, the transitions between spaces are often abrupt and have many obstacles, prompting users to take a direct route. The transition between the street - public space - collective space and private space do have many borders. (figure 28) For example, from the entrance and the lobby, the doors to the elevator are already clearly visible and are central upon entering the entrance. This leads people to be more inclined to use the elevator directly. The space in front of the elevator is often closed off for fire safety reasons by a fireproof door, and then transitions into a more intimate space. (figure 31) The spaces in front of the elevator are narrower and serve as functional spaces where people wait for the elevator. Additionally, these spaces often lack good daylight access, have lower ceiling heights, and no seating options, which can create a feeling of discomfort because people are in each other personal space.

Figure 28. Entrance of the cinema Lantaarnvenster, 2023, by author.

Figure 29. Lobby consist of one seat and mailbox, 2023, by author.

Figure 30. Monotonous corridors with no variation, 2023, by author.

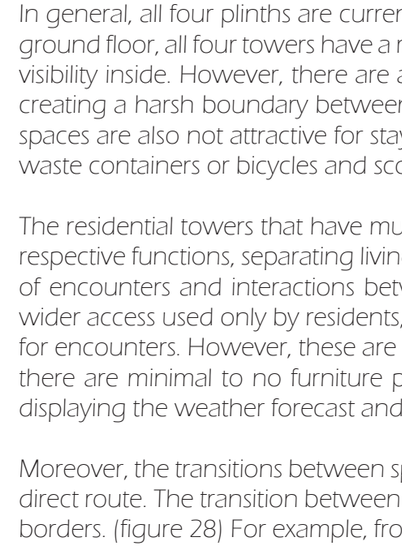


Figure 25. Closed facades creating hard borders between inside and outside, 2023, by author.

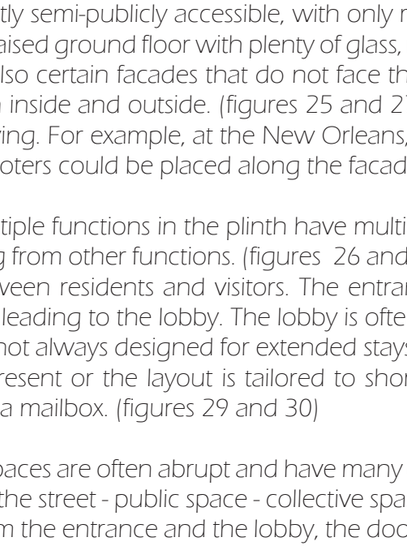


Figure 26. Multiple semi-public entrances, 2023, by author.

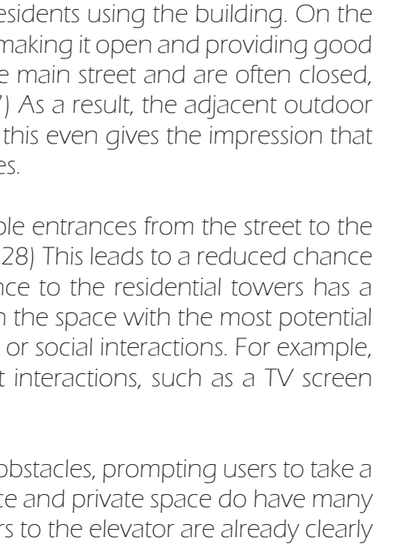


Figure 27. Closed facades at the back making the street unattractive, 2023, by author.

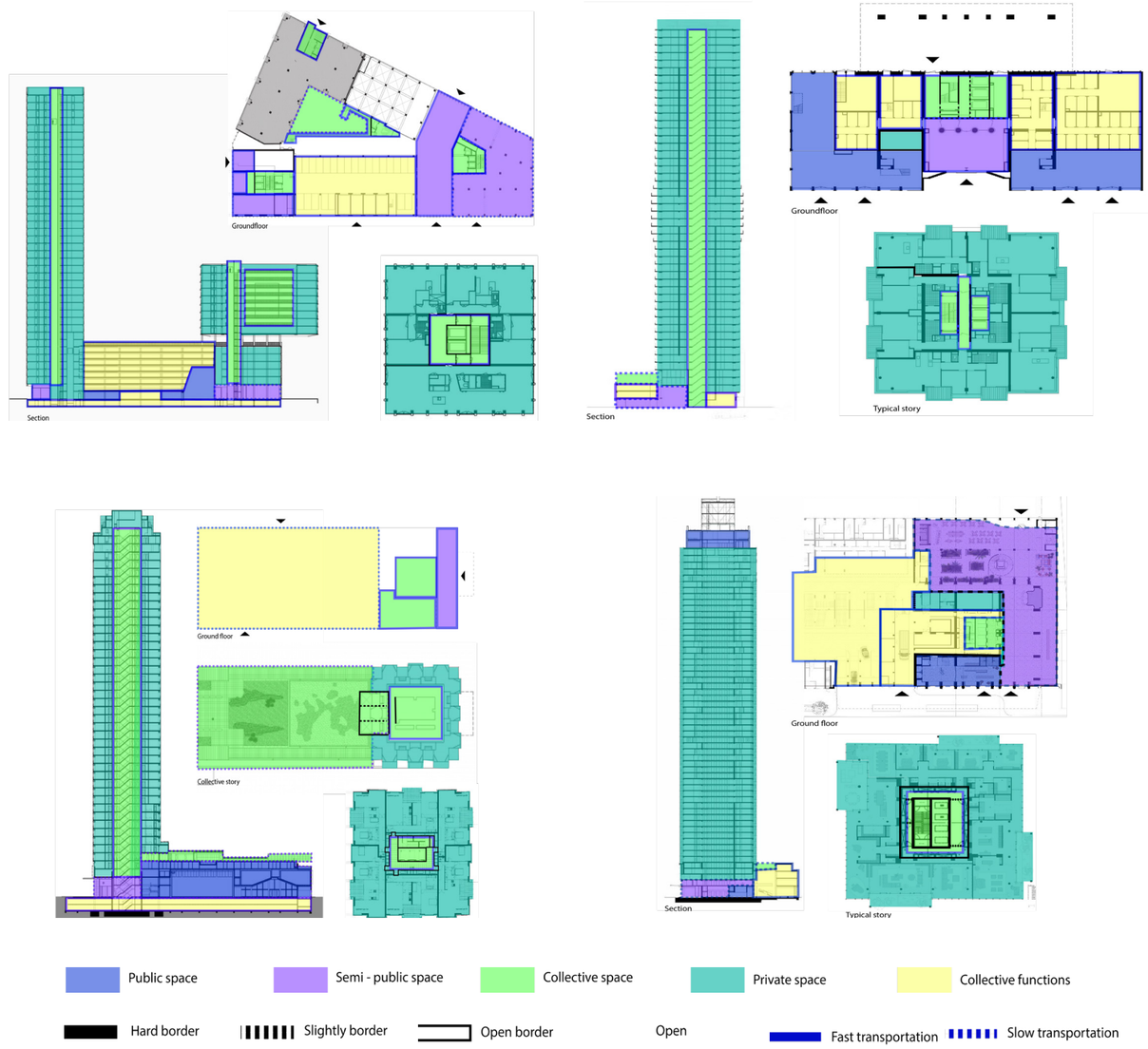


Figure 31. Analysis of spatial transtions in high-rise towers with different borders and accessibility, 2023, by author.

Diversity in materialisation and expression

The plinths of the residential towers often consist of blocks with homogeneous facades, usually made of one or two materials.These materials often do not appear soft and natural, but rather stony and hard, exuding robustness. (figure 37) The facades are generally flat and often contain glass panels, allowing it to be seen from the outside whether the space inside is public or private. (figure 38) For example, at The Red Apple, clear offsets with facade elements in both horizontal and vertical directions are visible, making different blocks of the complex well-visible and legible. (figures 35 and 36) Additionally, the complex includes a passage serving as an entrance to a residential block, a public parking garage, and various small offices and businesses. This space utilizes natural daylight, variations in height, and transparency, making the space diverse and more inviting for users.(figures 32 and 33).

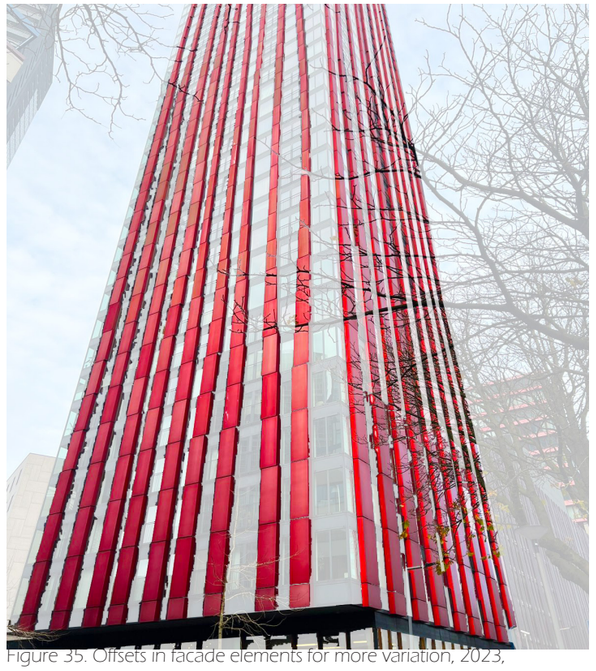


Figure 35. Offsets in facade elements for more variation, 2023, by author.

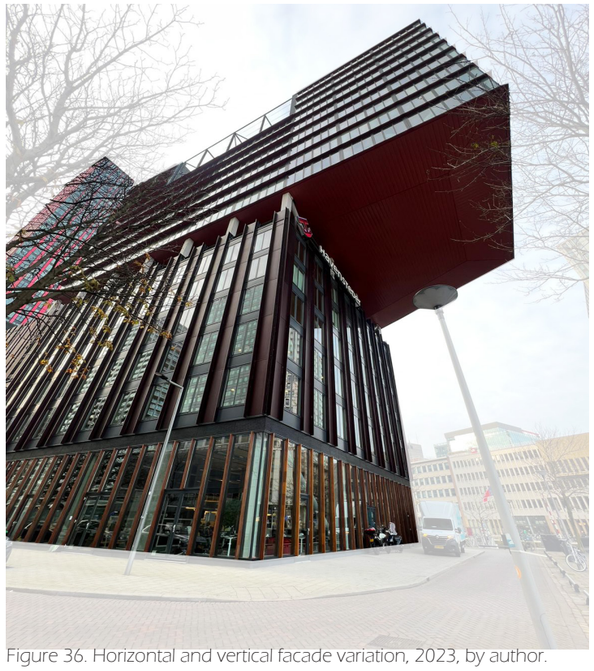


Figure 36. Horizontal and vertical facade variation, 2023, by author.

Figure 32. Semi-public space with diversiry in materialisation and height, 2023, by author.

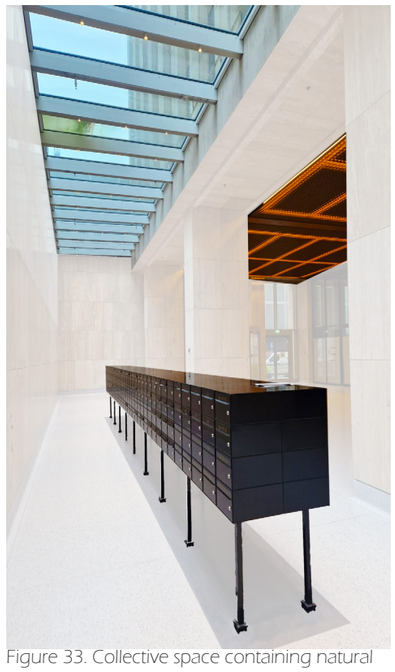


Figure 33. Collective space containing natural and artificial lightning, 2023, by author.

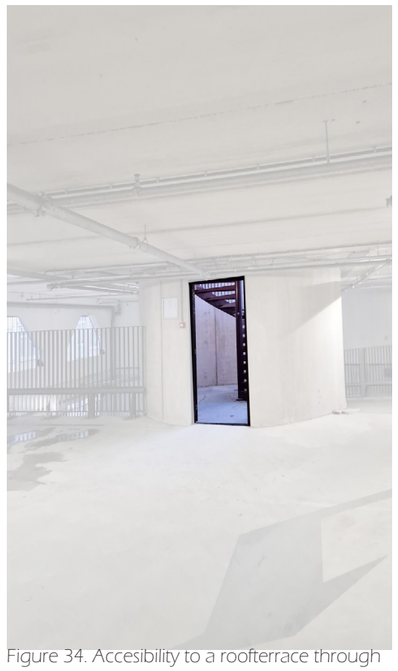


Figure 34. Accesibility to a roofterrace through the communual garage, 2023, by author.

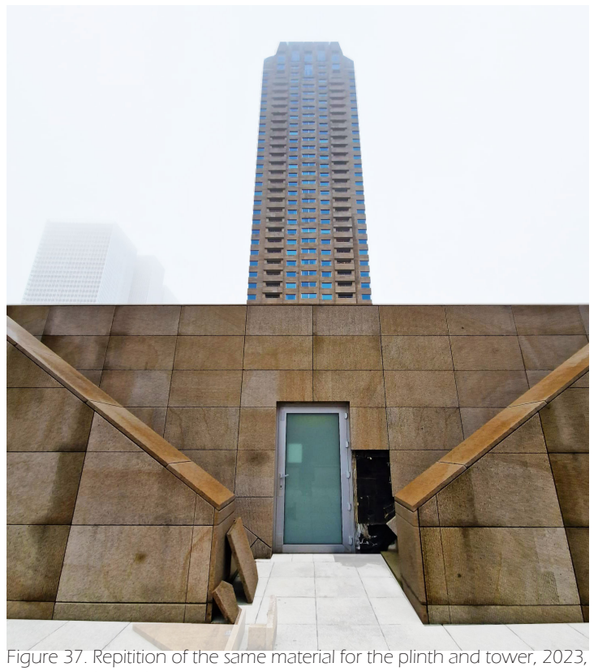


Figure 37. Repitition of the same material for the plinth and tower, 2023, by author,

Figure 38. Stacked layers of the same materials and facade layouts, 2023, by author.

Fieldwork casestudies

Figure 39. Communual roofterrace with no outside furniture (yet), 2023, by author.

Figure 40. Small (health) offices integrated in the residential plinth, 2023, by author.

Figure 41. An empty plinth, 2023, by author.

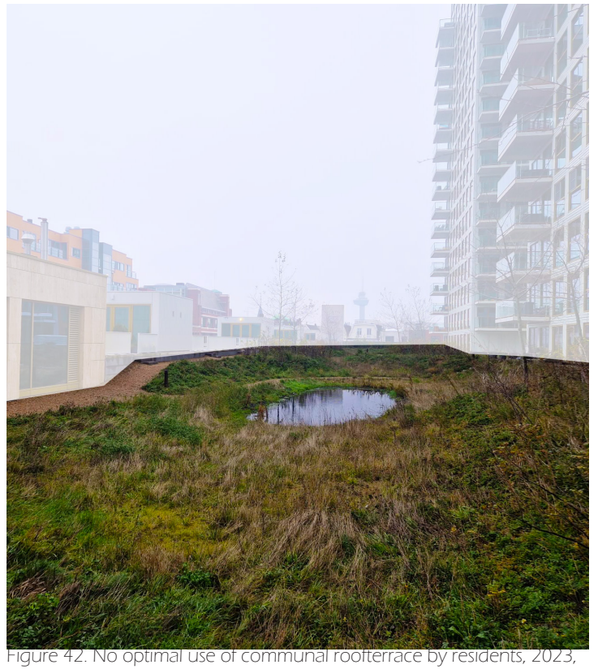


Figure 42. No optimal use of communal roofterrace by residents, 2023, by author.

Figure 43. A large space reserved for parking garage on street-level, 2023, by author.

Functions

Most residential towers follow a mixed-use concept, featuring not only residential units but also large public amenities such as a cinema and parking garage, as well as smaller functions like offices and practices. (figures 40, 41 and 43)Moreover, The New Orleans also offers collective facilities such as a swimming pool and fitness centre, and most towers have a rooftop terrace for residents' use (figures 39 and 42). However, the rooftop terraces of Zalmhaven and New Orleans are not yet completed, so they remain unused. Despite the presence of collective amenities, these spaces are often underutilized. They are typically located on one specific floor with limited access, making them less than optimally accessible. Additionally, other functions such as offices and practices may not align closely with the daily needs of residents. While the mixed functions within a building add diversity to the larger community, they may not necessarily cater to the daily social activities of residents and visitors. In addition to mixed functions, there are few green spaces around and within the building, and shared collective spaces for communal activities are lacking. (figures 44 and 45) The only functional spaces where residents may encounter each other are the parking garage, storage areas, lobby, elevators, and corridors.

Figure 44. An exhibition as A temporary infill on groundfloor, 2023, by author.

Figure 45. Reserved space for a future green oasis with sitting and meeting opportunities, 2023, by author.

Flexibility

The communal spaces on the floors often serve specific functions such as a fitness room or swimming pool and are not utilized for other purposes such as gatherings and social activities.(figure 46) Similarly, other semi-communal areas like the elevators, corridors, and lobbies are primarily used for circulation and as pathways to the apartments or to exit the building. (figure 47) The residential towers lack spaces designated for personal use or alternative functions, rendering the communal areas unsuitable for extended stays. (figure 48)

Furthermore, all the residential towers feature outdoor spaces, with some having larger rooftop terraces than others. However, these rooftop terraces are typically flat and sparsely furnished, primarily used during the summer months and in dry weather conditions. They are not subdivided into segments, with some lacking any form of covering. Additionally, the accessibility of these terraces may be suboptimal, as the communal space is often confined to one specific floor and does not serve as a central hub connecting all private spaces (apartments) together.

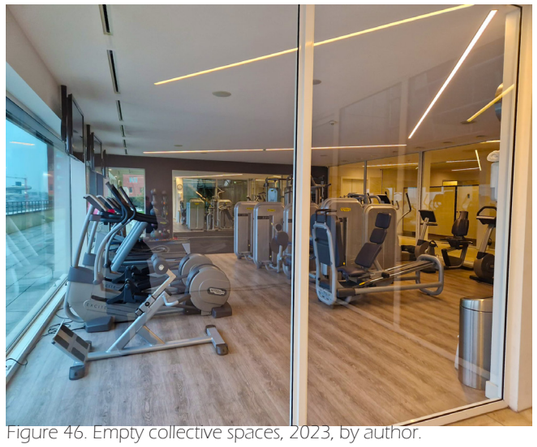


Figure 46. Empty collective spaces, 2023, by author.

Figure 47. Some greenery and sits in front of the elevator / lobby, 2023, by author.

Figure 48. Spacious lobby with minimal furnishing for social interactions, 2023, by author.

Social Interaction

The corridors in the residential towers are often narrow and dimly lit, lacking seating areas that encourage social activities and interaction. Due to their limited size, there is insufficient space to linger in these corridors for a conversation or activity without obstructing other pedestrians. Consequently, the corridors and inner courtyards are primarily used for circulation, indicating a shortage of appealing communal spaces. (figures 49 and 50) Residents often need to arrange meetings with neighbours outside the residential tower or remain in their own apartments.

The absence of specific communal spaces that can be shared by residents significantly reduces the likelihood of residents getting to know each other within the building. Those residing on the upper floors have minimal opportunities to spontaneously encounter someone from the lower floors in the corridors, thus limiting interactions to the elevators and lobbies. (figure 51)Furthermore, there are no other programs or activities available in the building that bring people together or that residents can participate in. The only option for residents to engage with one another is through the residents' association.

Figure 49. Minimal embellishment for social interaction, 2023, by author.

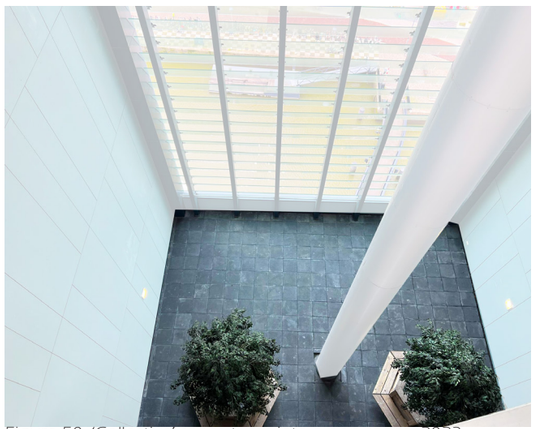


Figure 50. 'Collective' space turns into a non-space, 2023, by author.

Figure 51. Collective roof terrace with furniture, 2023, by author.

Sense of Belonging

In high-rise buildings, it is often the case that the floors and layout are highly uniform. Typically, the core, housing the stairwell and elevators, is centrally located within the building, while the apartments are arranged around it. (figure 52) The front doors and straight corridors have a consistent appearance, giving each apartment a similar look. (figures 53) At the top of the tower, you often find the more luxurious apartments and penthouses, which may have a slightly different aesthetic than those on the lower floors. However, the corridors on the floors are not personalized, turning these spaces into non-places where social control is minimal. (figure, 54) Residents are limited in personalizing their own units. In some apartments, such as those in The Red Apple and the Cooltoren, you may see that some front doors have their own doormat or flowerpot, but this occurs on a small scale.

Similarly, in communal spaces, the appearance and layout are often predetermined. (figure 55) Residents have no input or opportunity to customize the space according to their preferences to make it attractive or personal. In some cases, homeowners' associations (VVE) may have a say, as seen in the Zalmhaventoren, where residents collectively decided to set up a Christmas tree in the lobby and chose the colour and decorations themselves. This has led to residents feeling more connected to each other and to the Christmas tree in the lobby.

Figure 52. A few placemaking objects in the hallway, 2023, by author.

Figure 53. Monotonous frontdoor with a deep set back, 2023, by author.

Figure 54. Monotonous corridor with no daylight, 2023, by author.

Figure 55. Small waiting spaces in front of the elevators, 2023, by author.

Fieldwork (un)structured interviews

Survey participants

In total, 36 residents from the 4 residential towers participated in the survey. (figure 56) The participants were of different ages, ranging from 18 to 80 years old, and mainly resided in apartments. The majority of them have a household composition of cohabiting or single. Additionally, there was a variety of living situations on different floors, with most residents owning a freehold property. Due to the recent completions of the Cooltoren and the Zalmhaven, most participants have been living in their residential towers for about a year and expect to stay there longer.

Survey Results

The survey reveals that residents in the four residential towers often encounter their neighbours on the street, at the entrance, lobby, elevators, and corridors, but there is actually no specific communal space to truly meet up. Most residents indicate that this is the most common form of social interaction with their neighbours because it often happens spontaneously on their daily route. Some also prefer the entrance and lobby for social interaction, due to their size and the fact that other communal spaces serve more for circulation than for social interaction. Most people rate these spaces as adequate to dissatisfactory because these are the only spaces in the residential towers where these social interactions take place. The social interactions mainly consist of elevator conversations, greetings, and brief conversations.

However, there are also residents who know each other well and regularly meet up for social activities outside the residential towers, such as in cafés, restaurants, or at urban events. (figure 57) Overall, residents are reasonably satisfied with the amount of social contact but feel that the quality of interactions could be better. Residents of the Cooltoren especially hope that their rooftop garden becomes accessible soon so they can meet up there. Furthermore, most people miss proper furnishings and furniture for seating areas that make it inviting to stay longer for longer conversations.

The survey also reveals that people would like to have some sort of second living room where they can meet, drink coffee, read, and talk. Other amenities they would like to see in their residential tower include green indoor and outdoor spaces, leisure facilities, food and beverage outlets, a communal gym, local shops, supermarkets, and a postal point. (figure 58) These functions are often geared towards their daily needs and promoting social interactions.

Lastly, the survey asked about preferences for appearance and layout, with people opting for a streetscape with plenty of greenery, diversity, and natural materials. It was notable that the majority chose a scenario with little paving and car traffic, and a natural transition between indoor and outdoor spaces. Furthermore, residents prefer an open lobby designed for lingering or a lobby that is open and highly publicly accessible, with various public amenities and ample views of the space. Most also prefer wider corridors and front doors that can be personalized, with space for furniture and decorations, and with sufficient natural light and privacy so that people can also encounter in the corridors.

Survey results diagram

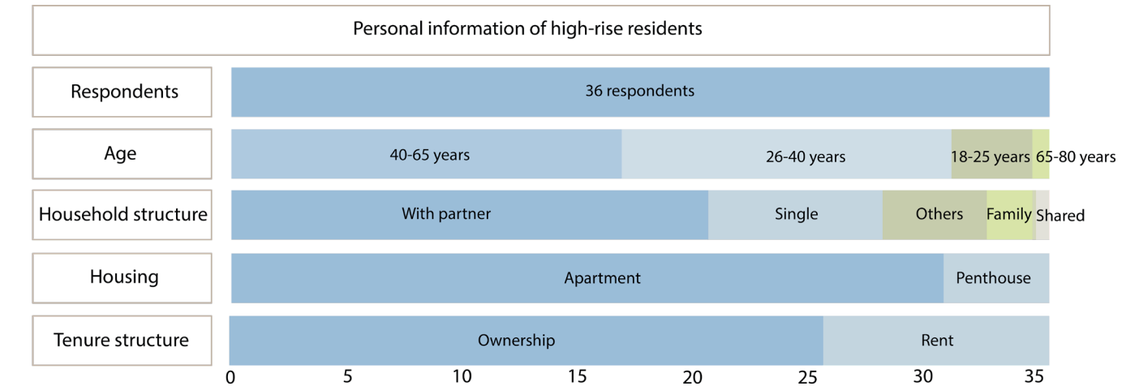


Figure 56. Survey results personal informatio, 2023, by author.

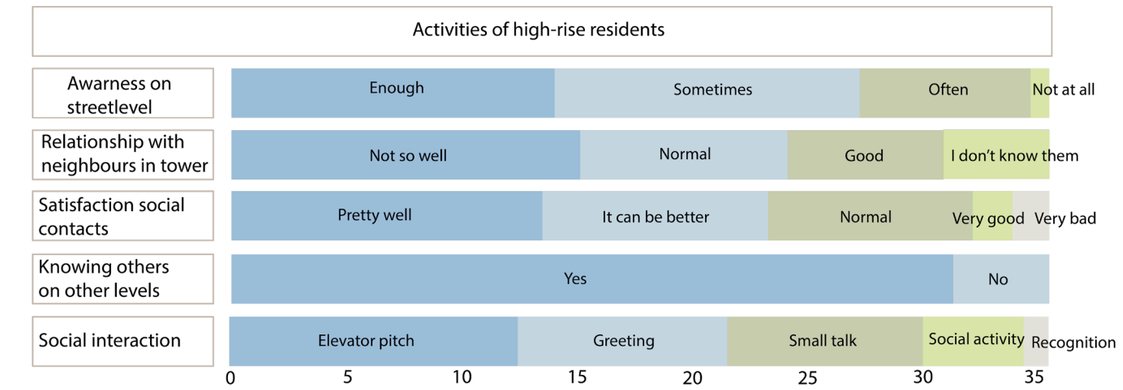


Figure 57. Survey results of social activitie, 2023, by author.

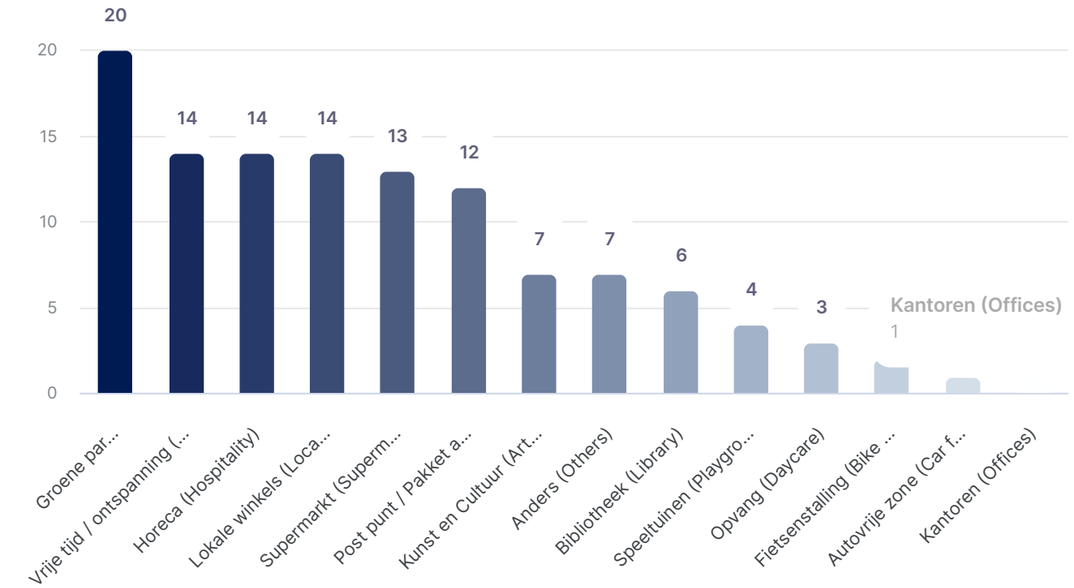


Figure 58. Survey results of missing facilities according to residents. 2023, by author.

Satisfaction

Social issues, such as loneliness, can stem from dissatisfaction with the social situation in the residential environment. (Kemperman, 2019) The municipality of Rotterdam conducted an online survey among high-rise residents to assess housing satisfaction and potentially make adjustments to the guidelines for high-rise construction in the city centre. (Gemeente Rotterdam, 2018) The survey also included the Red Apple and New Orleans residential towers.

The survey revealed that high-rise residents mainly come from one- and two-person households, with an increase in young adults between the age of 25 and 34. A third of these young residents indicate a residency expectation of two to four years, whereas it is longer for the older generation.

The results show that high-rise residents are particularly less satisfied with aspects such as indoor parking, sustainability, shared outdoor space, and the interior of communal areas. (figure 59) Additionally, they lack amenities for youth, green public spaces, parking, and sports facilities around the building. Although it is visible that these aspects has been improved according to the newest generation.

Furthermore, respondents were asked about social safety and interactions between residents. A significant number of people disagreed with statements like "I have frequent contact with my immediate neighbours" and "I have frequent contact with other residents in this building." (figure 60) Although a total of 69% indicate that they interact with each other in a pleasant manner, there is notably improved social contact among the new generation. Although a total of 69% indicate that they interact with each other pleasantly, there is notably improved social contact among the new generation.

The results highlight the needs and shortcomings of high-rise residents and underscore the necessity of interventions to enhance better social connections in high-rise living. (figure 61)

Valuation diagram of facilities in neigbourhood

Figure 59. Online survey results of satisfaction of public amenities by high-rise residents, by Gemeente Rotterdam, 2022.

Valuation diagram of social contacts in high-rise structure

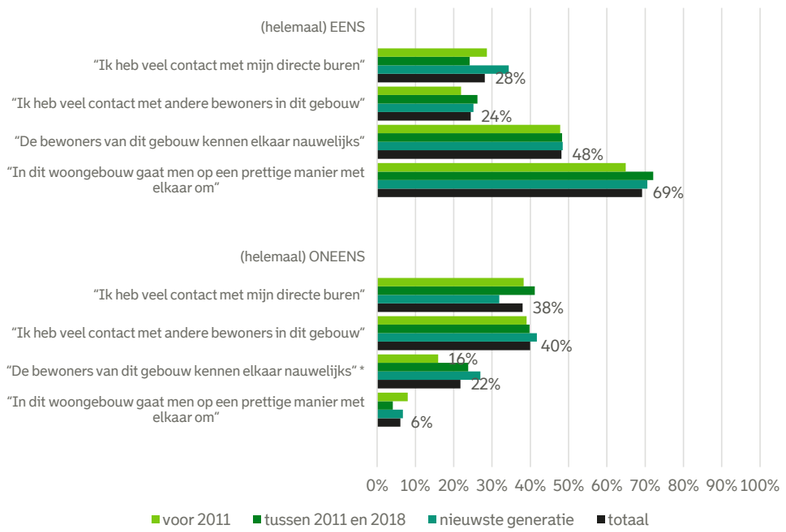


Figure 60. Online survey results of the social contacts of high-rise residents, by Gemeente Rotterdam, 2022.

Tabel B23. "Ik heb veel contact met mijn directe buren"

	vóór 2011	2011-2018	nieuwst	totaal
helemaal mee eens	2%	5%	8%	5%
mee eens	23%	15%	23%	19%
niet mee eens en niet mee oneens	32%	35%	33%	33%
mee oneens	27%	28%	26%	27%
helemaal mee oneens	16%	18%	11%	15%
totaal %	100%	100%	100%	100%
totaal #	1.179	1.519	938	3.636

Tabel B24. "Ik heb veel contact met andere bewoners in dit gebouw"

	vóór 2011	2011-2018	nieuwst	totaal
helemaal mee eens	4%	4%	2%	3%
mee eens	16%	17%	20%	18%
niet mee eens en niet mee oneens	37%	34%	30%	34%
mee oneens	28%	26%	35%	29%
helemaal mee oneens	15%	18%	13%	16%
totaal %	100%	100%	100%	100%
totaal #	1.179	1.519	938	3.636

Tabel B25. "De bewoners van dit gebouw kennen elkaar nauwelijks"

	vóór 2011	2011-2018	nieuwst	totaal
helemaal mee eens	14%	18%	12%	15%
mee eens	35%	35%	41%	36%
niet mee eens en niet mee oneens	35%	28%	24%	29%
mee oneens	15%	18%	19%	17%
helemaal mee oneens	0%	2%	3%	2%
totaal %	100%	100%	100%	100%
totaal #	1.179	1.519	938	3.636

Tabel B26. "In dit woongebouw gaat men op een prettige manier met elkaar om"

	vóór 2011	2011-2018	nieuwst	totaal
helemaal mee eens	10%	13%	17%	13%
mee eens	57%	61%	50%	57%
niet mee eens en niet mee oneens	25%	21%	26%	24%
mee oneens	7%	4%	6%	5%
helemaal mee oneens	1%	0%	1%	1%
totaal %	100%	100%	100%	100%
totaal #	1.179	1.519	938	3.636

Figure 61. Online survey results of high-rise residents in Rotterdam, by Gemeente Rotterdam.

The design of social high-rises

The physical environment cannot fully solve social loneliness and isolation, but can contribute to fostering social interactions for a healthy community to reduce feelings of loneliness for those susceptible to it. (Vrije Universiteit Amsterdam, 2020) This chapter examines psychological and physical interventions incorporated into the design.

Collective spaces

Introducing communal spaces, both indoor and outdoor, provides potential areas for social interaction (Abu-Ghazzeh, 1999). Making communal spaces available ensures that high-rise buildings not only consist of individual units but also offer areas within the building for more than just private residence. This can lead to increased satisfaction among residents of the tower, resulting in a stronger attachment to the place and longer stays. (Luitse, 2021) Therefore, it is important to have an adequate number of open communal spaces such as play areas, sports rooms, living rooms, and terraces that can promote social cohesion. These public spaces are crucial for improving quality of life, especially for those with lower incomes and the elderly, as they offer them the opportunity to escape the crowded city and connect on a smaller scale. (Beck, 2009) (Poon, 2017) (Robert Wood Johnson Foundation, n.d.)

Sense of belonging

Reducing feelings of loneliness does not always require engaging in social interaction with others. It can also be achieved by appropriating public spaces, creating a sense of connection between the individual and the physical environment. (Bergefurt and Kemperman, 2019) For this, it is important that public space is accessible and inviting. Additionally, people should be involved in shaping the space, giving them a greater sense of ownership over public areas. (place making) (Peavey, 2024) (Avery, 2023) (Al Hamzi, 2021) People can feel connected to a space when they are given the opportunity to partly fill it themselves. Examples include inviting people to help decorate the communal garden, hallway, or entrance, as well as organizing certain activities in public spaces or simply asking for people's ideas and desires. (participation) This is particularly about the individual experience of a person in a specific space where they spend time, move around, stay, and engage in activities. (Huang, Kam and Pong, 2005) Research about the feeling of loneliness in high-rises suggests that people feel less socially lonely in spaces with many natural elements and even feel indirectly connected to the community in the space, without actually having social contact with others. (Avery, 2023)(visual connection) (familiarity) Other public functions can also create feelings of connectedness by involving a third party to help people connect with each other and ensure they feel indirectly included (triangulation). Think of theatres, cinemas, lecture halls, etc. (Hue, 2022)

Flexibility

The living environment should provide space for flexible public areas, where people have the opportunity to meet but also to be alone. (Avery, 2023) Each individual deals with combating loneliness in their own way. Research shows that some people experiencing loneliness cope best by being alone occasionally. (Heu, 2022) They need moments of reflection and self-examination to understand their emotions and needs. Therefore, public spaces should accommodate these individuals, allowing them to withdraw without having to participate directly in the community, yet still enjoy the liveliness of the public space and feel visually connected to others in the surroundings. People who feel socially lonely often struggle with engaging in social interactions. (Perlman and Peplau, 1982) Direct exposure to others in a space that is crowded and focused on contact can make them feel obliged to communicate and create a sense of lack of control, making the space unpleasant and leading them to avoid such areas. (Heu and Brennecke, 2023) Thus, it is important that public areas in high-rise buildings should be designed in a way to reduce the social stigma.

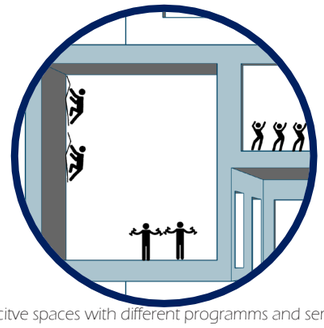
However, there are also people who experience loneliness and have a need for social contacts. For them, public spaces should provide opportunities to physically engage with the environment and engage in social interactions. (Avery, 2023) By building multiple relationships, individuals also feel like they belong to a community, reducing the feeling of social loneliness. Therefore, it is important that public spaces are not only designed for meetings, as this can have the opposite effect for some and increase their sense of loneliness. Public spaces should be designed to be flexible and diverse to meet the needs and different ways of social interaction of individuals. (Heu and Brennecke, 2023) Examples of flexible social spaces include: a central meeting place for activities with seating areas where individuals can sit on the sidelines and observe others while doing their own thing.

Human needs

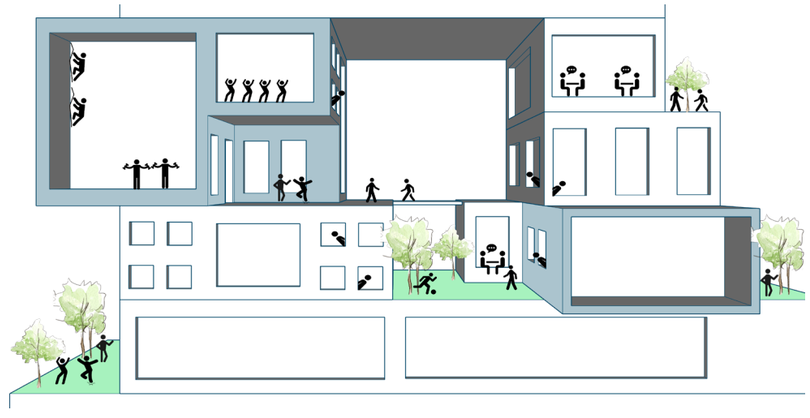
Providing various communal spaces and functions alone does not necessarily result in their actual usage. (Ashraf, 2023) Spatial qualities in the public or collective domain are required to make these spaces and functions appealing and influence human social behaviour. Communal spaces should have the necessary facilities and services to promote social interaction: (Kalantari, 2020) Good natural light combined with artificial lighting can make certain movements and activities pleasant; Adequate airflow and ventilation, along with sun shading, ensure a comfortable climate; (Weiss, 2019) Furnishing common areas with suitable furniture such as seating and tables encourages longer stays (Heu and Brennecke, 2023); Natural materials and green elements contribute to mental health and social behaviour. (Nazif, 2024) (Avery, 2023)

Flexibility and place making for better social control

Human scale and collective spaces for social interaction



Collecitve spaces with different programms and services



The design of social high-rises

Diversity in spaces and expression

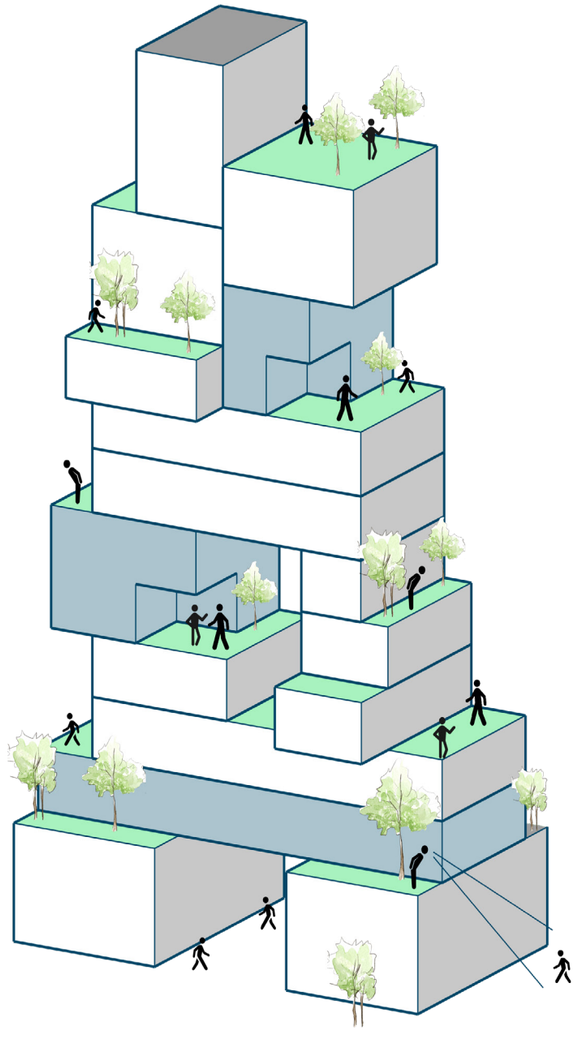
Offering various facilities and public amenities can contribute to social interactions between individuals, both within and outside the residential tower. This ensures that high-rise structures become multifunctional and offer more than just a living environment. (Kalantari, 2020) Mixed-use and hybrid developments can be applied for this purpose. An open plinth serving the neighbourhood and containing facilities that cater to daily needs and leisure activities contributes to a vibrant street and good urban flow. (De Nijs, 2015) Moreover, multifunctional high-rise buildings ensure that the building is used throughout the day and people can gather during the day.

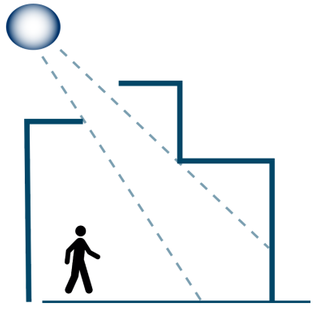
On all floors, there should be a diversity of apartments and communal spaces spread throughout the building, allowing different demographics to form a community and organize social activities. (De Decker, 1998) This breaks down social segregation and enhances the quality of social interaction. (Noordenbos, 2023) In addition to a mix of demographics on the floors, the floors themselves can also vary if space is provided to make the apartments more personalized. A small semi-private strip, such as a facade garden or a private front door, quickly adds diversity to a floor. Other communal spaces on the floors can include functions that are not always necessary but can be shared, such as workspaces, laundry rooms, rooftop terraces, playgrounds, or neutral communal areas. Sharing spaces encourages residents to communicate and collaborate with each other and creating a higher feeling of social control. (Wu and Ge, 2020) In addition to the diversity of programs and functions within public and collective spaces, variety in materialization and architectural expression can enhance the perception of a high-rise building and its spaces. (Khaleghimoghaddam, 2023) This makes the public or collective areas associated with the high-rise structure more pleasant to use and visit. Utilizing different materials and a variety of compositions, shades, patterns, and colours on the facade or interior can significantly improve the perception of these spaces.

Identity & Empowerment

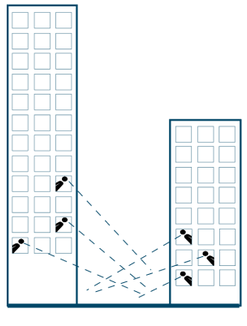
From the research conducted by the Vrije Universiteit Amsterdam (2020), it was also found that empowerment is an important aspect in reducing loneliness. It appears that self-esteem gives individuals the strength to increase their self-respect and create their social identity. With the help of community initiatives, people are encouraged to participate in a community and have a specific role in contributing to others. An individual thus gets the opportunity to use and express their own qualities, while receiving services from others in return. For example, one neighbour may give language courses to another, while the other can cook and occasionally provide dinner for the one giving language courses. This interaction then leads to greater empowerment for both parties and increases social cohesion within the community. It involves connecting individuals, strengthening the sense of belonging and self-esteem. Within the living environment, a network of connectedness is created, indirectly reducing loneliness.

The social identity of an individual is shaped by the living environment in which they find themselves (Uljas, 2001) (Szejnfeld, 2017). This social identity ensures that a person feels "at home" or part of a community, where trust is built between different people and shared norms and values are upheld within the collective domain.

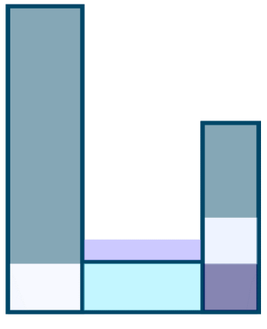




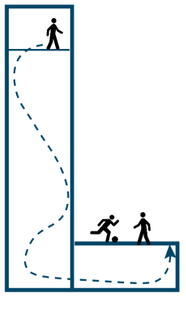
Natural daylight and good ventilation



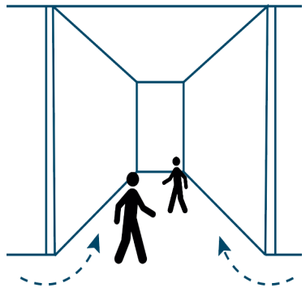
Visual connection and human scale



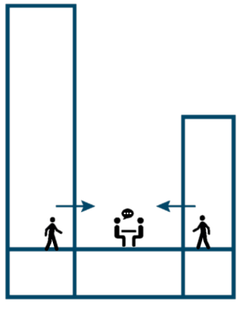
Diversity public and collective amenities



Long distance to collective spaces



Encounter points



Good accessible collective spaces

Accesibility

It is essential that various internal public spaces are open and accessible, both at street level and within the building. (Kanlantari, 2019) (de Nijs, 2015) (Li, 2004) By creating a gradual transition between the street façade and the street space, a symbiotic relationship between indoor and outdoor spaces is formed, seamlessly integrating internal spaces into the network of public areas. (figure 62)(Harteveld, 2014) Consequently, the public interior can also adopt the characteristic features of outdoor spaces. This softens hard boundaries and obstacles, fostering increased social interaction among people and spaces. Consequently, existing spaces such as lobbies, corridors, and other non-spaces can hold more significance for users. (Wu and Ge, 2020) They can serve not only their primary function but also function as streets, parks, and gardens that can be shared and used by various groups and individuals. (Noordenbos, 2023)

Making the ground floor publicly accessible provides the opportunity for other users in the city to utilize the public facilities within the building. (de Nijs, 2015) Therefore, the public interior must align with the urban context and connect to public pathways. This encourages different users to share the same space and network. (Poot, Van Acker and de Vos, 2016) To create good accessibility, openness and transparency are essential in design. People appreciate these aspects as they clarify where they stand between the (semi)public, (semi)collective, and (semi) private domains. (figure 63) (Moztarzadeh, 2019) It makes entering and staying in spaces easier.(Hadavi, Kaplan, 2015) Moreover, this openness offers a visual connection to the surroundings, enhancing people's sense of safety and strengthening social control.

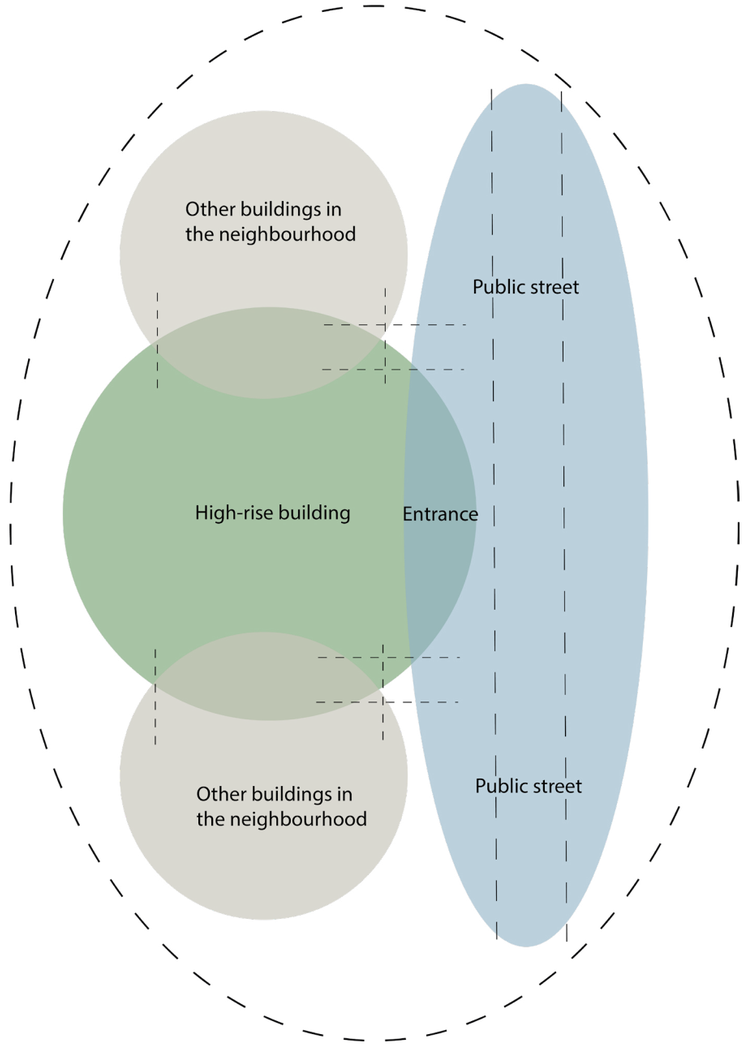


Figure 62. Spatial transition between private, collective and public space, 2023, by author.

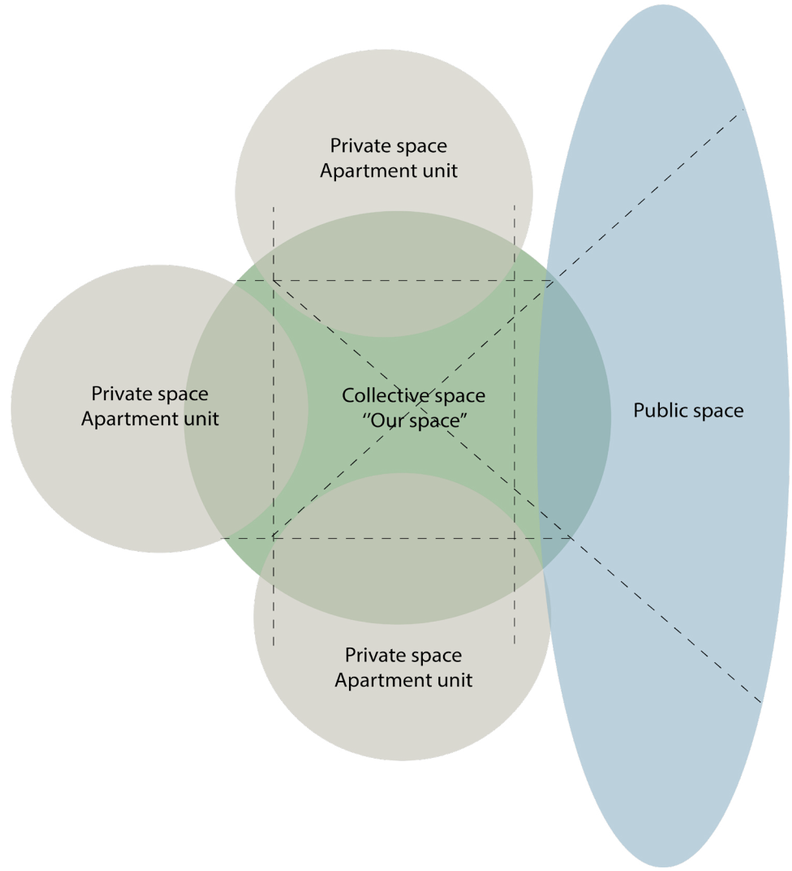


Figure 63. Spatial transition between private, collective and public space, 2023, by author.

Conclusion

This research shows that high-rise buildings play an indispensable role in urban development, particularly in addressing the need for increased density within cities. However, high-rise buildings also have significant drawbacks. The standard structures in high-rise buildings result in less frequent spontaneous encounters and social interactions, due to the considerable physical distance between residents. Furthermore, there is a significant lack of public and collective spaces, both inside and outside, that can bring residents together.

Standard collective spaces such as lobbies, elevators, stairwells, and corridors are primarily used for circulation rather than social activities and interactions. Additionally, the monotony and repetitive layout of apartments and collective spaces on the floors contribute to a sense of anonymity and impersonality. This hinders residents' ability to create their own sense of home and identify within the community, which can lead to feelings of loneliness. This loneliness can have long-term negative effects on residents' mental health, reducing the liveability of high-rise buildings.

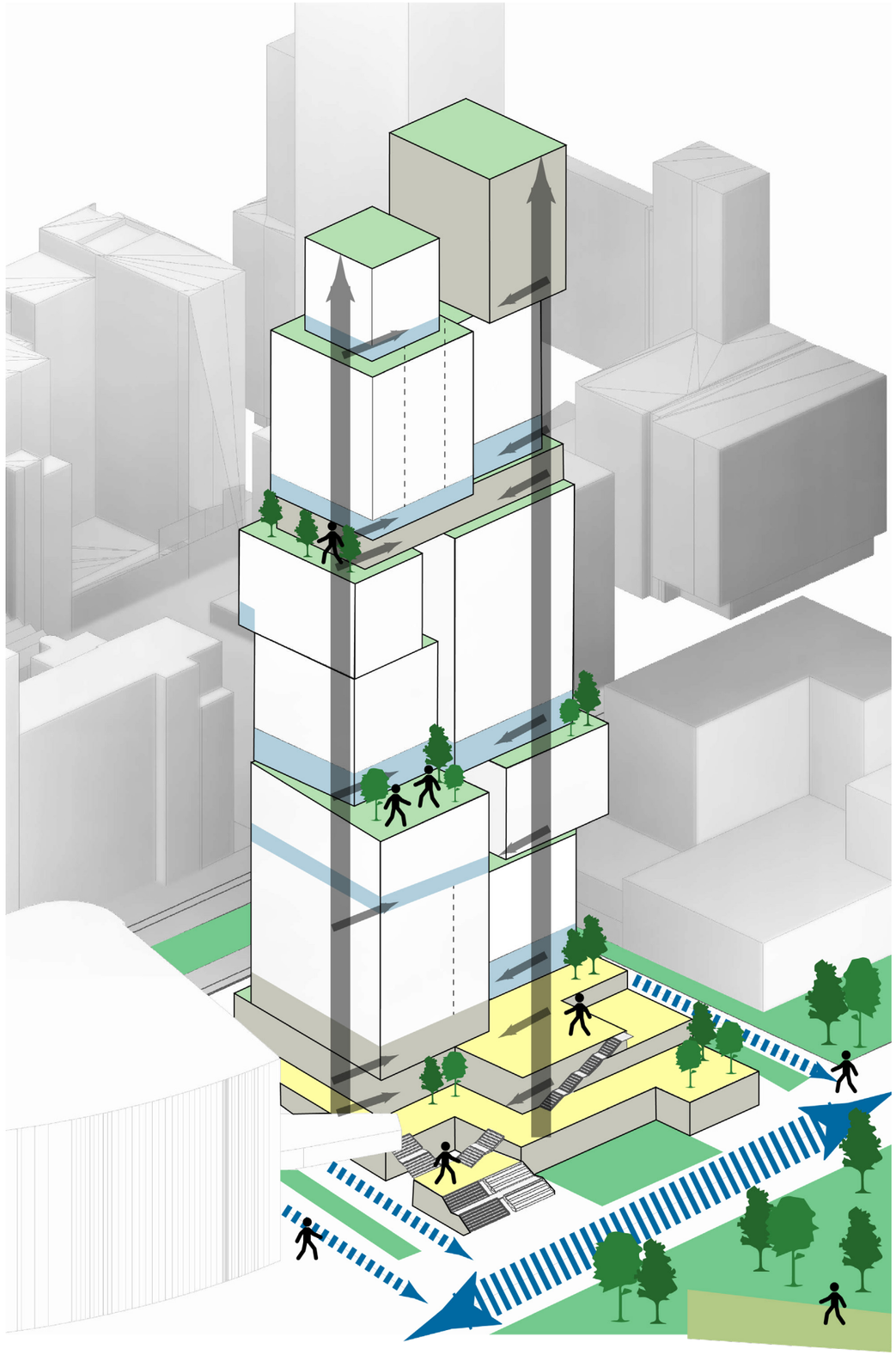
Moreover, high-rise buildings often function as individual structures that do not optimally integrate with the urban network. The homogeneity of high-rise buildings results in the loss of human scale at street level. The ground floors are often not easily accessible to city visitors, and the functions and programs do not meet the daily needs of city residents and visitors.

For the social well-being and mental health of high-rise residents, the current high-rise structure needs to be reconsidered to ensure that the social aspects and needs of city residents are also met. To reduce social loneliness and isolation in high-rise buildings, it is necessary to introduce good public and collective spaces and make them more accessible. Design aspects that can help with this include a good connection with the surroundings and an active ground floor that contributes to smaller communities and stimulates social interactions.

Additionally, more collective spaces need to be created on the floors to reduce the distance between the communal areas and residents. Integrating a good social program can optimize the use of these collective spaces. It is also important to ensure the spatial qualities within these collective spaces by using natural daylight, good ventilation, vegetation, furniture, and natural materials.

Surveys of high-rise residents reveal that different target groups live in high-rise buildings, and they acknowledge that there is a lack of communal spaces. Residents indicate that while there are sometimes communal spaces such as a rooftop terrace or fitness room, these are minimally used due to their location and distance from their own homes. Social interactions often consist of short elevator conversations or greetings in the lobby. There are virtually no public or collective amenities that encourage residents to stay longer in communal areas. The survey results indicate a great need for green outdoor spaces, a communal living room, gym, café, or other leisure facilities.

In conclusion, to address the negative aspects of high-rise buildings and improve the social well-being of residents, it is necessary to revise current high-rise structures, focusing on the creation of accessible and attractive public and collective space, that can stimulates the community feeling, sense of belonging for each individual.



Public interior

Flexibility
- Providing flexible and neutral spaces that are suitable for different social activities or user preferences to create the sense of belonging.

Collective spaces
- Spatial transition between public, collective and private spaces with as few obstacles as possible, to make it more accessible within walking/floor distance.
- Optimizing the transition between indoor and outdoor by introducing new ground levels.
- A good amount of collective spaces in the residential tower to maximize the social interaction and community feeling.

Identity and inclusiveness
- Mixing different cultural and socio-demographic groups on floors.
- Making the floors flexible for personal infill.

Human needs
- Public and communal spaces need natural daylight, good ventilation, social distancing and an open view to create social control and safety.

Plinth

Physical transition
- Human-scale proportion and plinth must be active on eye level.
- Stepped volumes for good vertical transition of the high-rise volume.

Multifunctional
- An all-inclusive living environment by facilitating programs, functions and services people need.
- The plinth must be active with a mix of public, collective and private spaces.

Diversity
- Variation in composition, patterns and architectural expression.
- Different functions that encourage social interaction and a sense of belonging.

Natural elements
- Using natural building materials and integrating natural elements such as greenery, water and fresh air into the public plinth.

Context

Interconnecting
- Ensuring a strong connection with the urban network and streets, including the establishment of car-free zones and the promotion of walking, bicycling, and community engagement.

Accessible
- Providing entrances from different directions by creating open and transparent transitions between the street and the building.

Overview
- Offering open views of the surroundings and installing attractive transit stops that can serve the surrounding neighborhoods.

Embedding
- Vertical extension of the urban landscape by integrating greenery and water features into buildings.

Social living environments

Reference projects in Rotterdam

In addition to high-rise buildings, there are also other building projects and typologies in the built environment that promote social interactions and neighbourhood communities. In this regard, some projects are being studied and analysed based on their qualities and architectural interventions. These may also be applied or introduced in high-rise buildings to reduce loneliness and social isolation.

Justus van Effenblok

Built in 1922, is popular for introducing a second ground level, also known as the elevated street. In addition to providing access to the apartments, the elevated street also offers space to transform the street into a front garden. (figure 64) Residents could personalize the gallery with garden furniture and decorations, leading to social activities at height: children could play there, and people could sit and enjoy the view of the neighbourhood.(sense of belonging & place making) The complex was clearly divided into segments with well-defined transitions between public, communal, and private spaces, resulting in a high level of social control.(spatial transition) Furthermore, there were communal facilities within the complex, such as a central courtyard, a laundry room, a library, and playgrounds, designed to promote social cohesion and provide residents with the opportunity to meet and engage in activities. (social engagement & facilities)

Figure 64. Lifted street of Justus van Effencomplex by Corina Popa, 2018, http://www.archi-re.com/architectural-ponderings/the-walkway-the-front-door-and the-justus

Le Medi

Figure 65. A typical street inside Le Medi complex by Nanda Sluijsmans (2023) https://stadszaken.nl/artikel/5172/lijstje-zeven-inspirerende-woonwijken

A well-known building block from 2006 inspired by Mediterranean influence, where the architecture demonstrates that the diversity of residents with different cultural backgrounds impacts both the public spaces and the architecture of the city. (sense of belonging) The houses were designed in a flexible way, allowing residents to expand and customize them over time according to their own preferences. (flexibility & adaptability) The building block is a densely populated enclave with narrow streets that connect to the semi-public central courtyard, which is only accessible during the day through large entrance gates.(safety & social control) The block features a variety of coloured facades, in between spaces, terraces, and covered parking garages. (figure 65)(diversity) It is a typical example of a smaller scale community that can be formed within the larger city.

The central library Rotterdam

The central library in Rotterdam is a public accessible to everyone. It provides a communal environment where people can come together, learn, read, study, work, and participate in cultural activities. The building serves as a hub for knowledge, education, and cultural exchange within Rotterdam, promoting social interaction and community well-being. (social exchange) The library has a main entrance that is prominently situated at the major intersection on the Binnenrotte (interconnection). In addition to the main entrance, the building offers other access points (accessibility). For example, the library is connected to multiple cafes, allowing the interior spaces to seamlessly merge into one large open area and fostering an exchange of activities (public amenities & spatial transition). Additionally, there are various flexible public spaces and facilities available. These include open areas for seating and socializing, quiet spots for reading, studying, or working, a children's play area, a bistro with an outdoor terrace for consumption, and meeting rooms that can be rented (diversity). Various actors can be part of the public space in different ways, encouraging social interaction and participation. (figure 66) (social engagement)

Figure 66. Semi-public place in the central library Rotterdam by Gerben Helleman, 2023 https://www.rooilijn.nl/artikelen/semi-publieke-ruimte-inleiding-op-een-themareeks/

Social living environments

Belvédère

Figure 67. Terrace in the front of the storytelling house Belvédère by monumenten portaal https://www.monumentenportaal.nl/locatieverhuur/verhalenhuis-belvedere.

"Where worlds meet in the city," A storytelling house in Rotterdam South is a physical venue that brings different groups of Rotterdammers together. (figure 67) It provides residents from surrounding neighbourhoods the opportunity to meet and sharing stories, with the aim of strengthening connections between different socio-geographic groups. (social interaction & diversity) The storytelling house offers a range of activities and programmes. These include storytelling from diverse perspectives, contributing to the cohesion and resilience of the city's community. (community resilient & social exchange) Visitors are free to use any space in the building for exhibitions, tours, and the public kitchen, where a guest chef prepares dishes daily for an affordable price. (affordable) Various cooking workshops are also offered, showcasing the different cultures of the city's residents. (participation & sense of belonging) In addition to the fixed programme, visitors can also hire various spaces and services tailored to their own events, ensuring the building is active at various times. (diversity)

Het Zuiderpark

A public city park in Rotterdam offers residents and visitors an oasis of nature and recreation amidst the crowded city. (greenery) The Zuiderpark is frequented visited by countless people, due to its good accessibility by public transport, bicycle, and on foot. (accesible) This contributes to the inclusivity of the park and encourages people to visit healthy green spaces.

The park is designed with diverse purposes, featuring various zones and paths suitable for a variety of social activities.(figure 68) You can find playgrounds, sports facilities, walking paths, sports fields, beaches, forests, allotment gardens, and hospitality establishments. (diversity & facilities) Furthermore, the park also provides space for hosting large events such as festivals, concerts, and markets. Notably, not all zones have fixed public interiors, allowing for flexibility for the user. Open grass fields, for example, offer opportunities for personal activities like picnics, barbecues, or group gatherings. (flexibility)

Additionally, the park is designed with various landscape elements, ensuring each zone offers a unique experience. Think of water features, sandy areas, diverse tree species, green lawns, asphalt, benches, lampposts, bridges, and artworks.

Figure 68. The layout of Het Zuiderpark consisting of various segments by Gemeente Rotterdam, https://www.planviewer.nl/imro/files/NL.IMRO.0599BP1071Zuiderpark-va02/t_NL.IMRO.0599.

The neighbourhood

Figure 69. 'Aktiegroep Het Oude Westen by Immaterieel erfgoed, February 2023 https://www.immaterieelerfgoed.nl/nl/aktiegroep-het-oude-westen-rotterdam

Residential neighbourhoods outside the major cities have features that promote social interaction and community feeling. Residents often have a good view of the public space from their homes, contributing to social control. (visualty) People are more familiar with their immediate neighbours or streets because there are spaces such as front yards and squares where they spend more time, increasing the chance of social interaction with their neighbours. (social interaction & place making) The fact that people also take ownership of the neighbourhood contributes to order and social security. (social control)

Additionally, there is often more space for social activities in a smaller community which make it easier to engage. (figure 69) (smaller communieties) Public amenities such as the hairdresser, supermarket, local snackbar, and shops are often centrally located and based on their daily needs. (public amenities) This leads to residents encountering each other more frequently. Although meaningful relationships may not immediately develop as a result, familiarity fosters a sense of security and comfort, making residents feel safer and more at ease within their living environment. (familiarity & sense of belonging)

In the Oude Westen, an initiative called 'Aktiegroep' has emerged, set up by and for residents, with the aim of uniting for urban renewal in the neighbourhood. Residents are actively engaged in improving the liveability of their environment. Everyone contributes: from distributing the neighbourhood newspaper to undergoing training to become an energy coach in the area, or maintaining the neighbourhood garden. (enpowerment & participation) The action group thus forms an essential part of the social infrastructure in the neighbourhood, providing a backdrop and context for social participation. (community resillient)

Design Location

The rise of social neighbourhoods

Rotterdam is a city with a great diversity of populations, originating from various cultural and ethnic backgrounds due to migration, economic changes, and urban developments. As a result, the city has had to find solutions to create safe neighbourhoods where different groups can live together. Each neighbourhood around the Rijnhaven has its own unique challenges and successes.

In recent years, the municipality of Rotterdam has worked on urban renewal and community initiatives to promote social cohesion among residents. At the same time, there has been an increase in residents who feel socially isolated. To address this, the municipality has undertaken various actions, established organizations, and improved public spaces in neighbourhoods. (figure 70)

Katendrecht

In the early 20th century, Katendrecht faced social problems such as poverty and crime due to its new port function. (De Nacht van de Kaap, 2024) This led to an increase in sailors and migrants settling in the neighbourhood (Municipality of Rotterdam, 2023). Consequently, the area became lively and vibrant, but sometimes also gritty due to the presence of numerous bars and brothels.(Altink,2015) Large-scale transformations and new construction projects have resulted in a restructuring of the neighbourhood, improving social cohesion through initiatives promoting community building and participation in local activities.(Gemeente Rotterdam, 2023)

On Katendrecht, a major redevelopment is currently underway, transforming the former port and industrial area into a modern residential neighbourhood with a maritime character. Until 2026, an annual construction plan of 3500 to 4000 new homes is scheduled.(Gemeente Rotterdam, n.d) Besides residences, the neighbourhood also offers a variety of recreational amenities and offices. Significant monumental buildings such as the Fenix warehouses, the SS Rotterdam, and De Walvis, a former warehouse, contribute to the architectural and historical context. Nevertheless, most of these monumental buildings have been repurposed for public and community amenitities. For instance, the SS Rotterdam is permanently moored and now operates as a hotel and restaurant; the Fenix warehouses have been converted into a multifunctional complex (Fenix Food Factory) featuring residences, shops, eateries, and cultural activities, while De Walvis serves as a cultural centre for Katendrecht, a hub for art and creative enterprises.

Afrikaanderwijk

The Afrikaanderwijk originated around 1900 due to the construction of ports in the southern part of Rotterdam. (Gemeente Rotterdam, 2016) It was one of the first multicultural neighbourhoods in the Netherlands, where more than half of the population had a non-Dutch background.
The initial residents were mainly portworkers from the South Holland islands, such as Zeeland and Brabant. (Bet and Meijel, 2007) It was not until later, between 1960 and 1970, that guest workers from various backgrounds settled in the area. This neighbourhood also faced social problems such as unemployment, crime, and poor housing conditions. From 2000 onwards, more attention was therefore paid to improving the liveability of the neighbourhood. (Gemeente Rotterdam, 2018) The community is highly multicultural, with many initiatives aimed at bringing together people from diverse backgrounds. This has led to a social structure where social interactions and communities have emerged, facilitated by various cultural festivals, neighbourhood organizations, and public spaces.

The neighbourhood has about 7.600 residents and is characterized by youthfulness and liveliness. (Gemeente Rotterdam, 2024) The municipality of Rotterdam sees potential in the neighbourhood, partly because many creative young people find the neighbourhood attractive. Moreover, besides many residences, the neighbourhood also has various cultural facilities for the community, such as the Afrikaandermarkt, a swimming pool, sports facilities, and numerous ethnic shops.

Kop van Zuid

Kop van Zuid is a relatively new district, developed on former port and industrial areas (Gemeente Rotterdam, 2022). The social cohesion in this neighbourhood is formed by a mix of old and new residents from various income groups. This neighbourhood also faces the challenge of promoting social cohesion, such as integrating new residents with existing communities and the communities in surrounding neighbourhoods. Urban renewal in the Kop van Zuid therefore includes more new common spaces and green amenities to stimulate interaction between residents. For example, city gardens have been created, making the neighbourhood attractive for young professionals and families to establish connections within a smaller community, also seen as a village (Link and Doucet, 2012).

During1994, the redevelopment of Kop van Zuid took place. (Stadsarchief Rotterdam, n.d.) Dutch Urban planner Riek Bakker took the initiative and had a clear vision for the Rotterdam area. Architect Teun Koolhaas was also involved in the development of the Kop van Zuid and designed the area to be 'tough' and 'specifically Rotterdam'. The area was developed while preserving its historical identity, consisting of ports, quays, a departure terminal, and the HAL. Nowadays, the area is home to many residences, offices, restaurants, and recreational facilities, making it a popular tourist destination both on land and on water. Other important public buildings and facilities in the area include the Rotterdam courthouse, the Maastoren, the Luxor Theatre, Lantaren Venster, Hotel New York, and the well-known building "De Rotterdam", designed by architect Rem Koolhaas.

Figure 70. Different neighbourhoods connected with the Rijnhaven, 2023, by author.

Design Location

The location

Due to its rich port history, the Rijnhaven has a strong connection with it's water. It is surrounded, by the five quays of the Rijnhaven, which connect different neighbourhoods and offer views of each other, such as the Kop van Zuid and Katendrecht. The construction of the Rijnhavenbrug, also known as the "Love Bridge" because of the tradition of couples attaching love locks to the bridge, has acquired special significance. The bridge is also known as the "Whore's Bridge" because of its role as a connection between Katendrecht (also known as De Kaap) and the Wilhelminapier (De Pier), especially during the time when Katendrecht was a well-known red-light district in the 20th century. The 160-meter-long bridge, designed in 2012 by Quist Wintermans, provides pedestrians and cyclists with a continuous route along the water of the Rijnhaven.

The Rijnhaven is accessible from three directions: via Laan op Zuid, the Erasmus Bridge (city centre), and the Maashaven, which are connected to Posthumalaan and Hillelaan. The area attracts many visitors and is well-served by public transportation. The tram line runs along the northern side of the area, while the Maashaven and Rijnhaven metro stops on the southern side are connected to the Wilhelminaplein stop. From there, there is a connection to the Beurs and Rotterdam Centraal stops on the north side of the city centre.

Despite its central location and rich port history, the Rijnhaven has not yet been given a specific designation. The surrounding neighbourhoods of Katendrecht, Kop van Zuid, and Afrikaanderwijk primarily play a role in shaping the Rijnhaven. The area has a mix of functions, with some aspects harking back to its old port days. (figure 71) Various significant buildings, functions, and facilities contribute to the identity of the Rijnhaven.

Nevertheless, the area now also exhibits spatial characteristics that align with the modern city and the urban densification task. The main qualities of the Rijnhaven are:

1) Connectivity with the city centre, with the area forming part of or an extension of the city axis (the Coolsingel) and the waterfront.

2) The water of the Rijnhaven acts as an open central point, connecting various surrounding neighbourhoods.

3: Various landscapes converge in the area, including the city, the port, and the river.

Figure 71. Masterplan Rijnhaven by Gemeente Rotterdam - Barcode architect, 2020.

Design Location

The history of a little port

The area of the Rijnhaven was constructed between 1890 and 1895 and is one of the oldest ports on the southern bank of the Nieuwe Maas. (figure 72) (Stadsarchief, n.d.) Originally, the Rijnhaven was built as a winter berth for Rhine ships. Nevertheless, during its construction, the port acquired a different ultimate function under the direction of G.J. De Jongh, a well-known director of Gemeentewerken. The port was ultimately transformed into a modern transit port of Rotterdam and was even considered one of the most beautiful ports in Europe.

In the 1880s, there was a great demand for transit handling on the Maas. (Contrei,2018) There were major concerns about the ships during the winter period because they were not resistant to the river ice. Furthermore, the Harbour Master and the Chamber of Commerce saw significant economic benefits in expanding transit activities around the Ruhr area. In doing so, the Rotterdam ports competed with those of Antwerp and Hamburg. Due to its favourable location near the mouth of the Rhine and access to the hinterland via waterways and railways, G.J. De Jongh considered the Rijnhaven as an important transit port of South Netherlands. (figures 73, 74 and 75)

According to the municipality of Rotterdam (2018), the Rijnhaven is an essential area for urban development with a recognizable and powerful identity. Additionally, the realization of the Rijnhaven and the construction of the Erasmus Bridge (De Zwaan) have contributed to the transformation of the Kop van Zuid into an extension of the city centre that extends over the water. The port is characterized by its distinctive and efficient five-sided quays: the Wilhelminapier, Hillelaan, Rijnhaven East Side, Rijnhaven South Side, and the Rijnhaven Southwest Side. Each of these sides has received a unique interpretation and function over the course of history, determined by various spatial configurations. Over the years, the Rijnhaven has undergone various expansions and improvements to meet the growing trade needs of Rotterdam. The area was mainly occupied by harbour businesses, but warehouses and cattle sheds were also common. Thanks to the favourable depth of the port, large ships could dock to load and unload goods.

During the 20th century, the Rijnhaven remained a significant centre for port activities, but changes in container transport and the emergence of modern facilities led to the evolution of its traditional role. (Stadsarchief, n.d.) Like many other ports, the Rijnhaven needed to be modernized to remain competitive. The focus shifted increasingly towards handling container ships and facilitating international trade, with efficiency, speed, and processing large quantities of containers becoming central. At the same time, other parts of the port and adjacent areas were redeveloped for various purposes. This had lead to more space for housing, offices, recreation, and culture in the area.

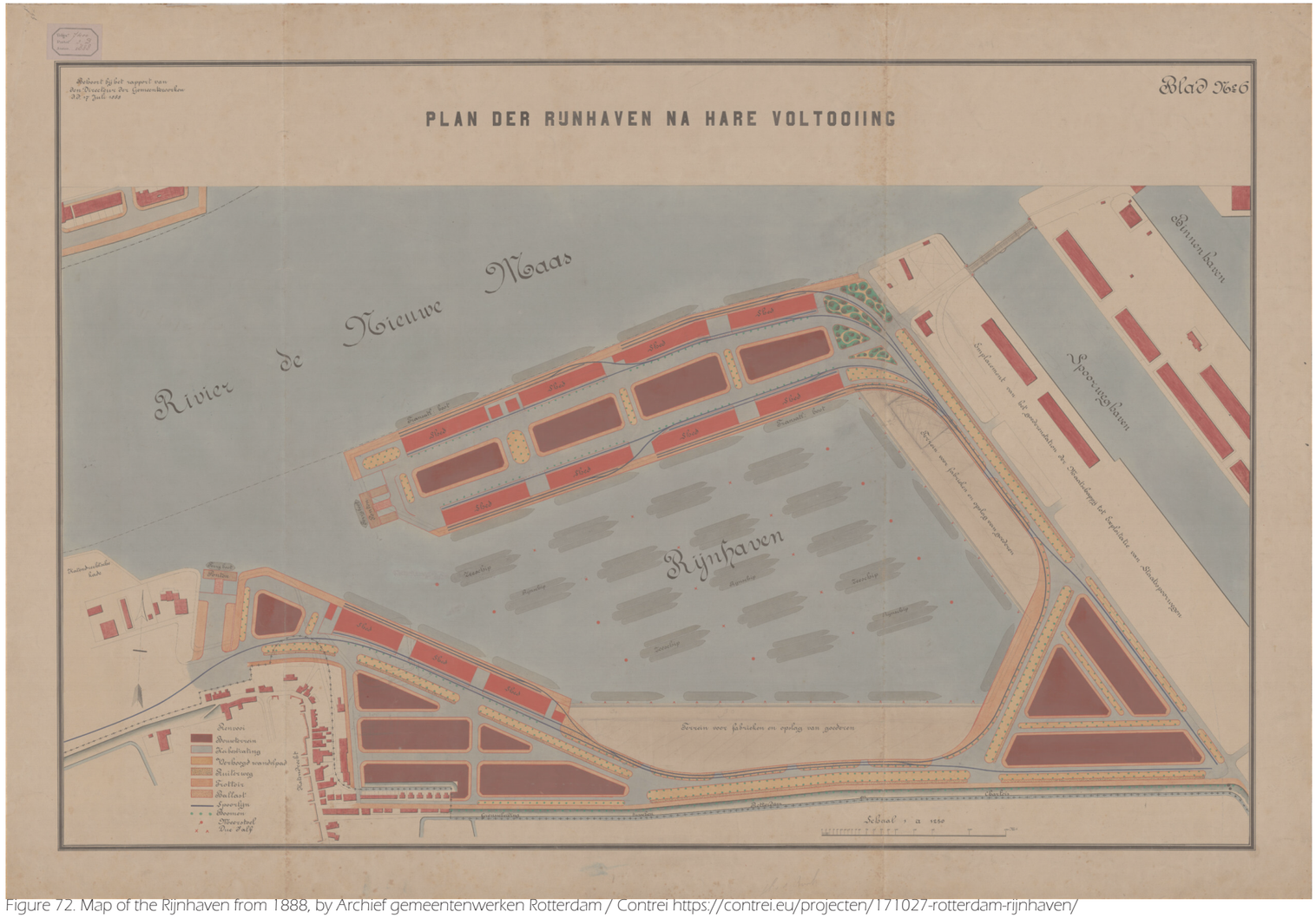


Figure 72. Map of the Rijnhaven from 1888, by Archief gemeentenwerken Rotterdam / Contrei https://contrei.eu/projecten/171027-rotterdam-rijnhaven/


Figure 73. Fenixloodsen in the interbellum by Bouwkundig weekblad, 1931 https://contrei.eu/projecten/171027-rotterdam-rijnhaven/

Figure 74. Rotterdam Katendrecht between 1980-1990 by KBO, March 2015. http://fotos.serc.nl zuid-holland/


Figure 75. Het schiereiland located between de Rijnhaven and Maashaven by H. Soesters, 1982. https:/ www.dehavenloods.nl/nieuws/algmeen/47012 /rotterdam-van-19toen-in-beeld.

Rijnhaven

A new area for Rotterdam

The Municipality of Rotterdam has had plans since 2018 to develop the strip of approximately 350,000 m^2 along the Posthumalaan into a city centre that acts as an extension of the current downtown area. (Barcode architects, 2019) This area is part of the city's densification task. The development of the Rijnhaven offers the opportunity to transform the area into a second city centre on the southern bank, which will form a strong connection between the north and south part of the city. (figure 76)

To realize this vision, part of the water will be filled in to make room for three blocks with approximately 3,000 residences, a new city park, and a 6.5-hectare beach. The area will include a diverse range of housing types, including social rental homes, mid-range rental homes, owner-occupied homes, and luxury homes, distributed across blocks of low, medium, and high-rise buildings. (figures 77 and 78)

In addition to housing, parks, and beaches, attention will also be given to the water. Plans include floating parks along the quays, making the water more accessible to pedestrians. (figure 79) Furthermore, the Municipality of Rotterdam plans to create a Maritime Centre in the middle of the Rijnhaven. (Gemeente Rotterdam, 2018)

This urban project aims to bring more greenery into the city and create space for green squares, parks, and car-free streets. The entire area will be designed around people and activities, with the ambition of making the Rijnhaven an inclusive and inviting place.

Figure 76. Masterplan for the Rijnhaven by Barcode architect https://barcodearchitects.com/projects/masterplan-rijnhaven-rotterdam/

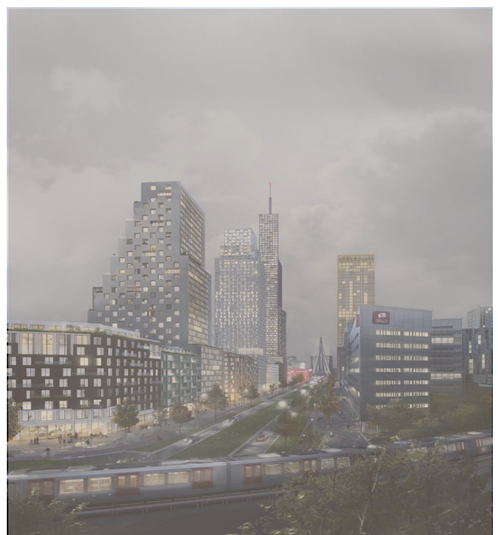


Figure 77. Masterplan for Posthumalaan side by Barocde architect. https://barcodearchitects.com/projects masterplan-rijnhaven-rotterdam/

Figure 78. Impression of public space on the Kop van Zuid by Barocde architect. https:/barcodearchitects.com/projects masterplan-rijnhaven-rotterdam/

Figure 79. Impression of high-rise buildings in the masterplan by Barocde architect. https://barcode architects.com/projects/masterplan-rijnhaven.

Rijnhaven

Focus points for the development

A Space for All Rotterdammers (Inclusivity)

The Rijnhaven area has potential to become a second city centre with the municipality's master plan, but it's important to carefully consider the programs introduced. Currently, there are many job opportunities and leisure activities like the Wilhelmina pier and Zuidkade, leaving the area empty at times. These don't always meet local residents' needs. Introducing functions aligned with the southern bank's population could strengthen connections between Rijnhaven, surrounding neighborhoods, and the local Rotterdammers. (Gemeente Rotterdam, 2018)

A Healthy and Sustainable City

Cities worldwide, including Rotterdam, are increasingly facing a rise in exhaust emissions within urban areas. (Dasgupta, 2022) (Gemeente Rotterdam, 2018) Aside from the harmful effects on the environment, this also leads to deteriorating air quality and noise levels in the city. To address these issues, the city needs to create more space for green areas and promote healthy mobility.

Promoting the use of public transportation over cars makes the urban environment more attractive for both visiting and living. The municipality of Rotterdam can prioritize pedestrians and cyclists while offering limited space for motorists. Additionally, the city should contribute to sustainable developments by efficiently allocating space for the generation of renewable energy and encouraging the use of circular building elements within the buildings. (Meyer and Zandbelt, 2012)

Mix-use & Hybrid

A diverse mix of urban functions and the clustering of various programs and activities can contribute to positive experiences for both visitors and residents alike. (figure 80) The Rijnhaven has the potential to offer not only complementary functions around the area, but also to provide functions that are currently limited or absent in the city centre. This would position the Rijnhaven not only as a second city centre but even as an extension of the downtown area. The focus here is on creating a pleasant living and staying environment, making it a place where people live, work, and gather. Certain programs and functions can enhance the experience in the Rijnhaven by integrating them with the urban landscape and the water of the Rijnhaven. (Potezica, 2022)

A Resilient City

Developments in the Rijnhaven must be resilient for changes. (Gemeente Rotterdam, 2018) Flexibility and adaptability to societal and climate changes are essential aspects of allowing the urban environment to adjust to evolving conditions. (Bridger-Lippe, 2024) With its direct connection to the water, it's crucial to consciously consider climate-adaptive developments for buildings and structures in the area. For instance, the park features many trees and plants that help cool the environment during hot days and provide shade to visitors. Furthermore, there is a focus on creating more space for nature, and enhancing underwater biodiversity in the Rijnhaven. Additionally, it's not just about exploring the relationship between nature and the Rijnhaven, but also about promoting nature-inclusive developments

A vibrant streetscape

In the master plan for the Rijnhaven, two main roads need special attention to create the most vibrant atmosphere possible. The high-rise building blocks constructed along the Rijnhaven are closely connected to the Posthumalaan and the Hillelaan. Currently, these blocks are designed as closed units, posing the risk of suboptimal street connectivity. This could lead to a significant divide between the buildings and the street, which may not be inviting to the public and could potentially lack accessibility for all. Therefore, it is crucial that the ground levels of the large buildings seamlessly integrate with the urban fabric. (De Nijs, 2015)

The two main roads primarily serve as traffic routes to the city centre and are currently not pedestrian and cyclist-friendly. (figure 81) Limited space for road users makes the area less appealing for lingering. However, by providing well-designed ground levels and functions, the transition between traffic, buildings, and even the waterfront can be softened. (figure 82) This has the potential to enhance the area's quality of stay, allowing the Rijnhaven to truly function as a second city centre.

Figure 80. Main and secondaire roads and direction on the Rijnhaven, 2023, by author.

Figure 81. Sun analysis and view on the Rijnhaven, 2023, by author.

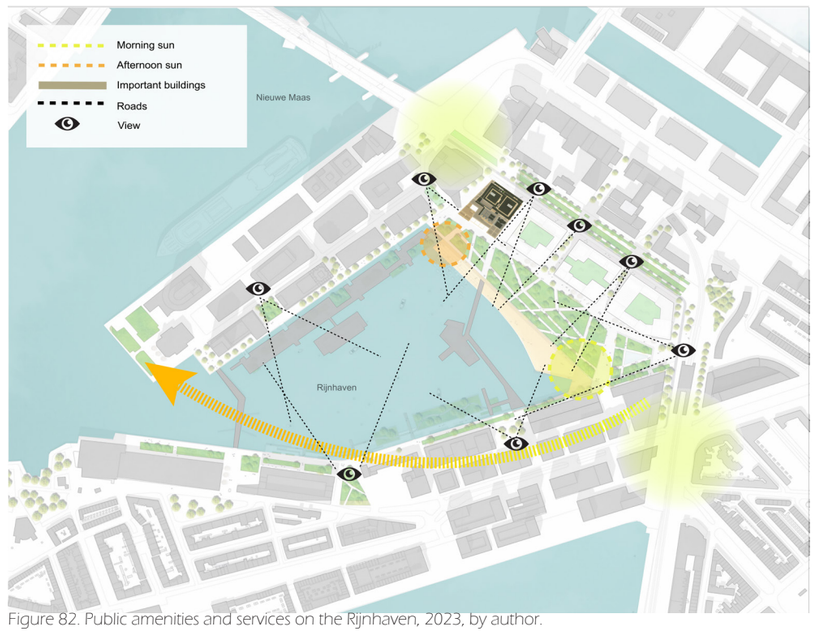
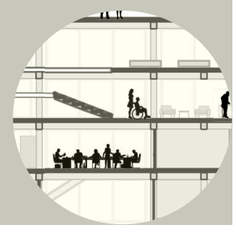


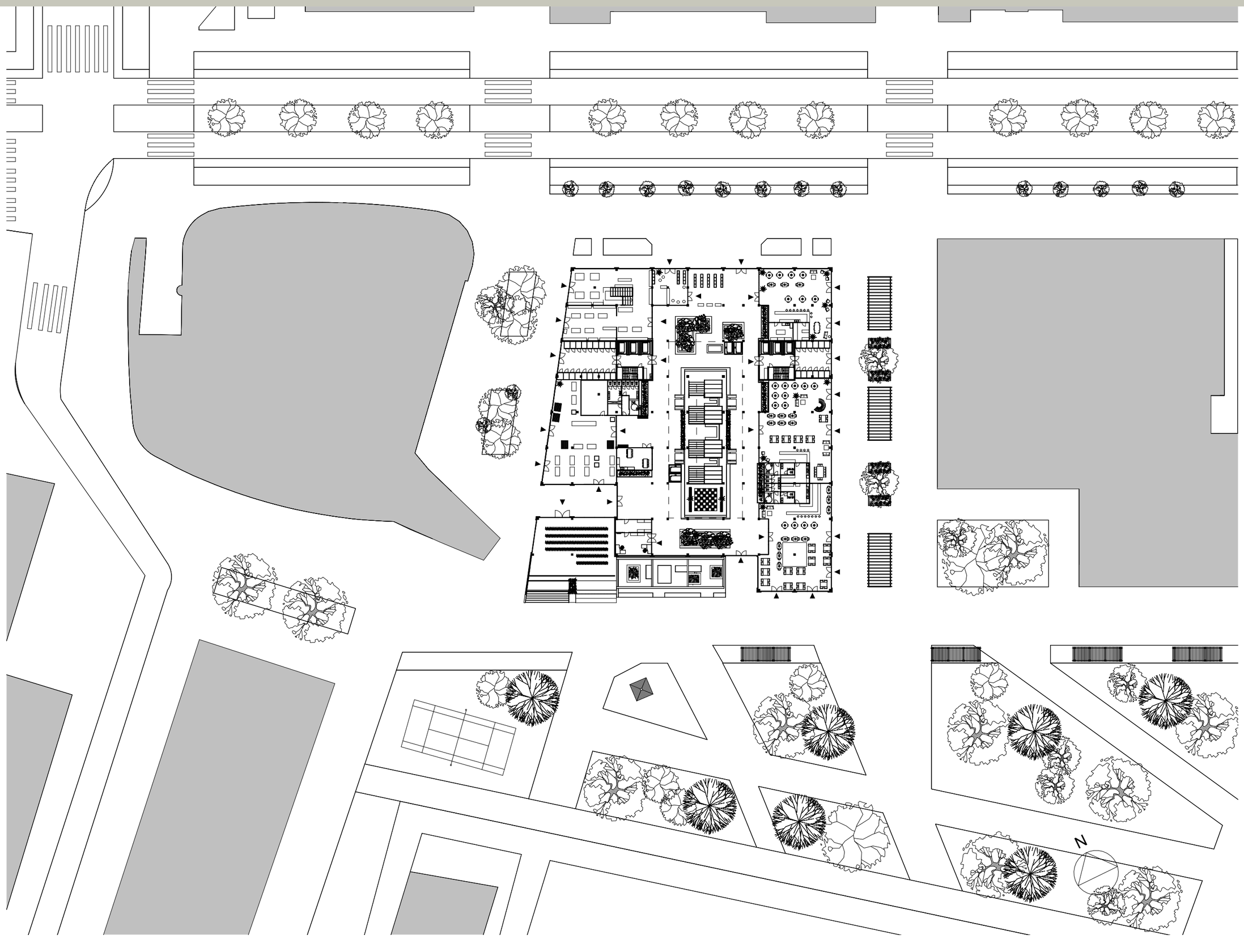
Figure 82. Public amenities and services on the Rijnhaven, 2023, by author.

Design



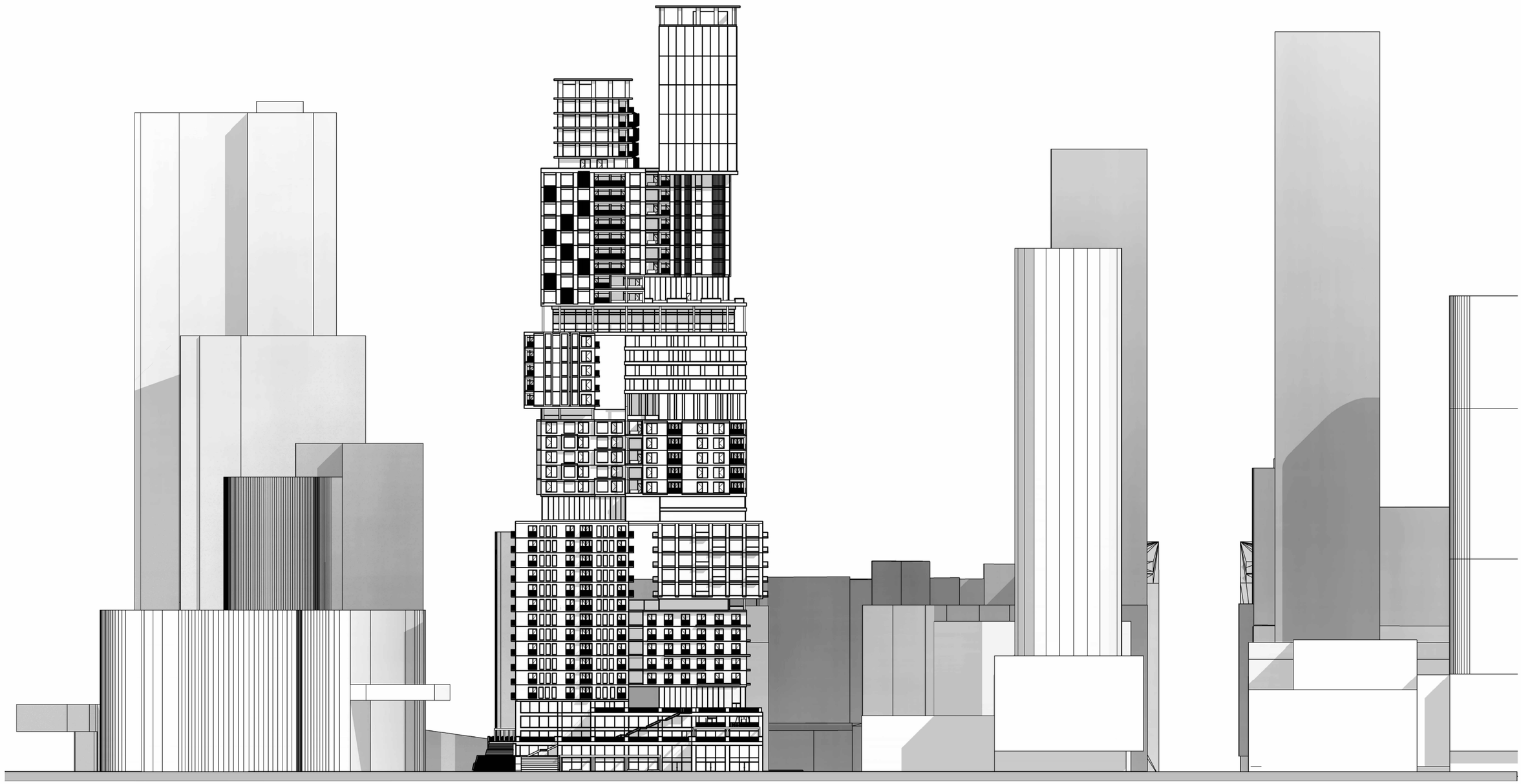
Masterplan Rijnhaven 1:1000

Situation plan 1:500

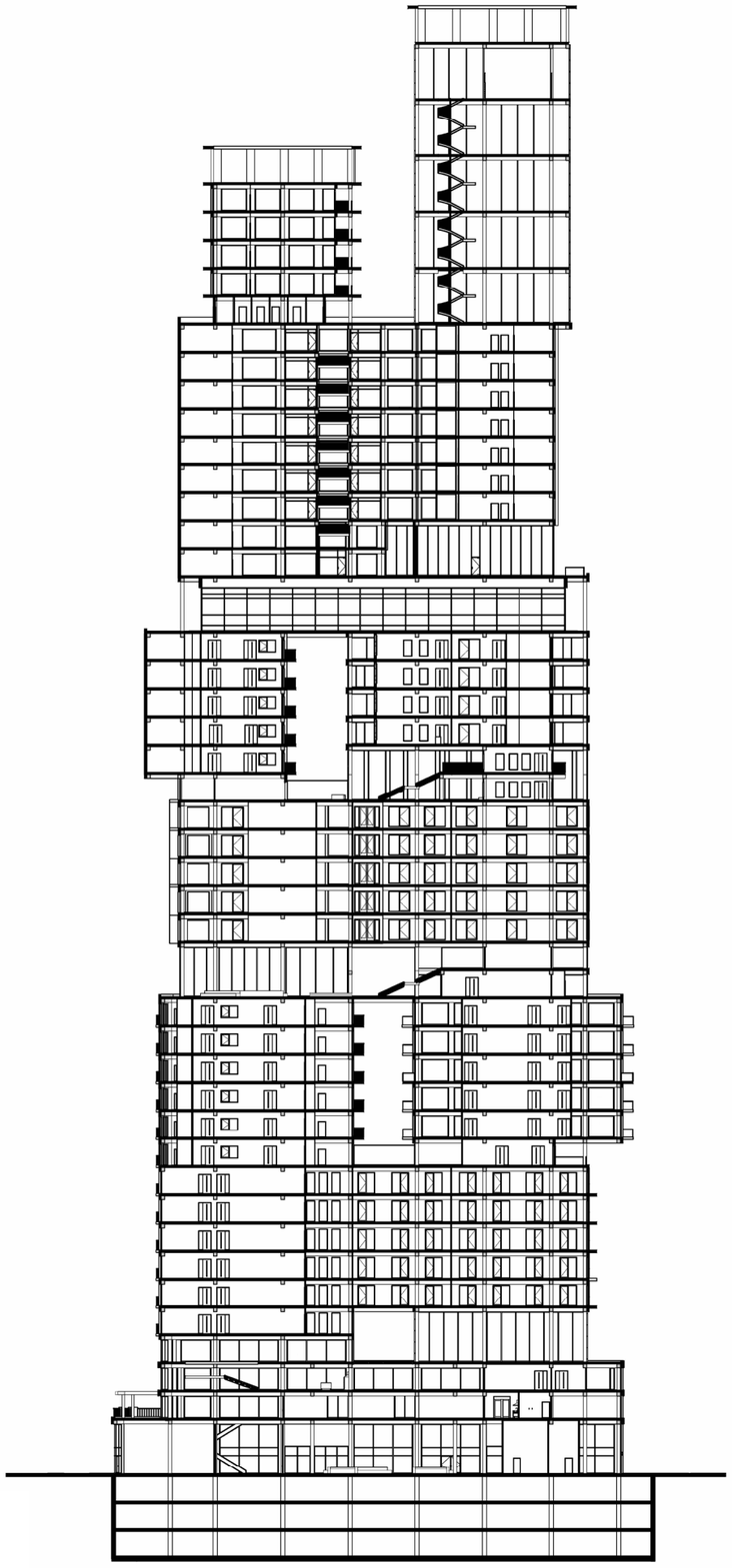


Street impression

South elevation 1:1000



Section AA 1:500



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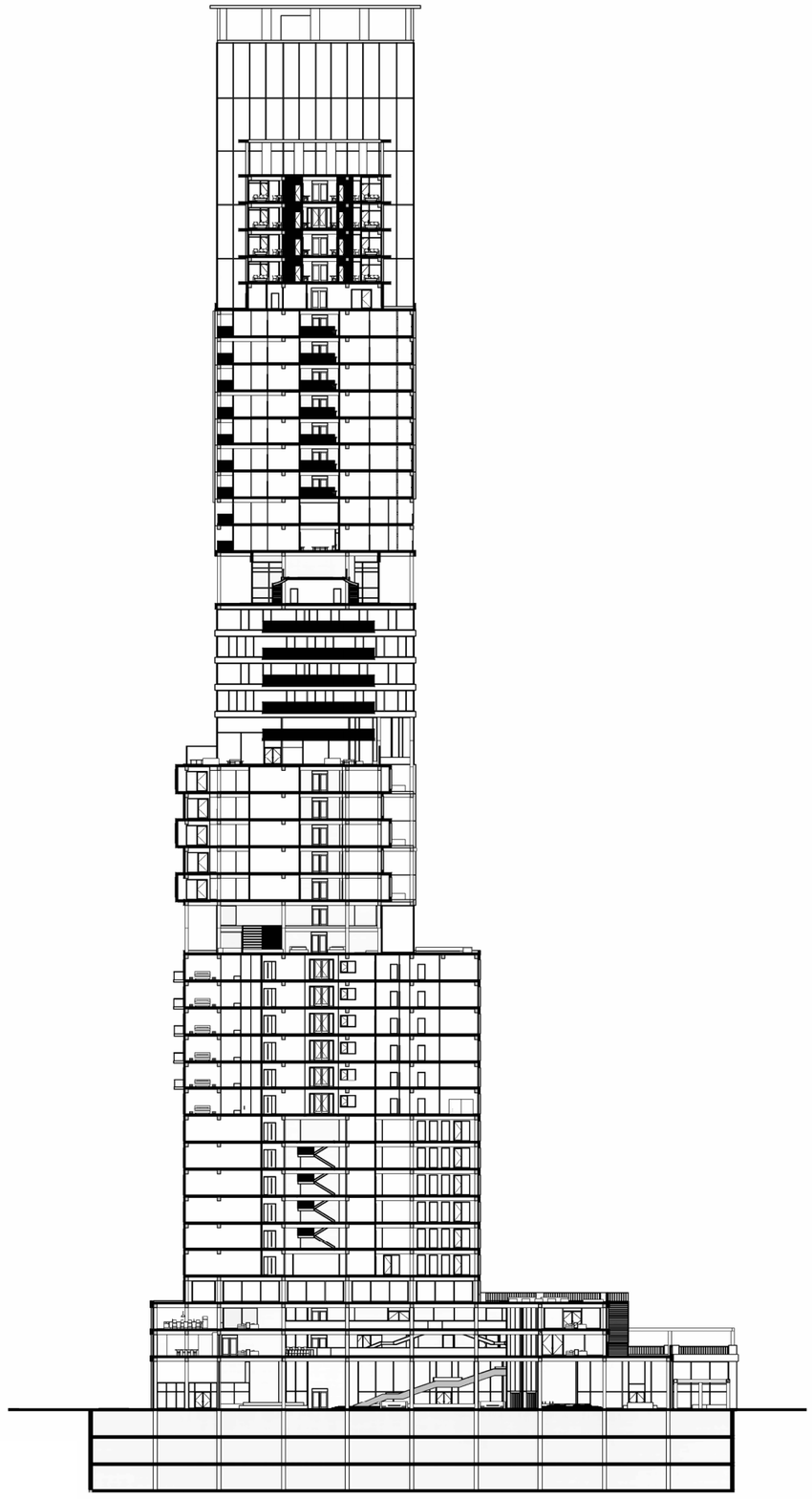


Construction scheme

TOP

- Concrete slab as roof for reinforcement

RESIDENTIAL LEVELS

- Timber glulam construction
- Timber column 400 x 400 mm
- Timber beam 400 x 450 mm
- Cross laminated timber floor 300 mm

PUBLIC LEVELS

- Double height stories
- Concrete slabs as diaphragm

RESIDENTIAL LEVELS

- Timber glulam construction
- Timber column 400 x 400 mm
- Timber beam 400 x 450 mm
- Cross laminated timber floor 300 mm

PUBLIC LEVELS

- Double height stories
- Concrete slabs as diaphragm

CONCRETE CORES

- 2 Massive concrete cores
- Stabilisation
- Emergency exit

PLINTH

- Mass and hybrid timber construction
- Timber column 450 x 450 mm
- Timber beam 450 x 500 mm
- Concrete slab 250 mm

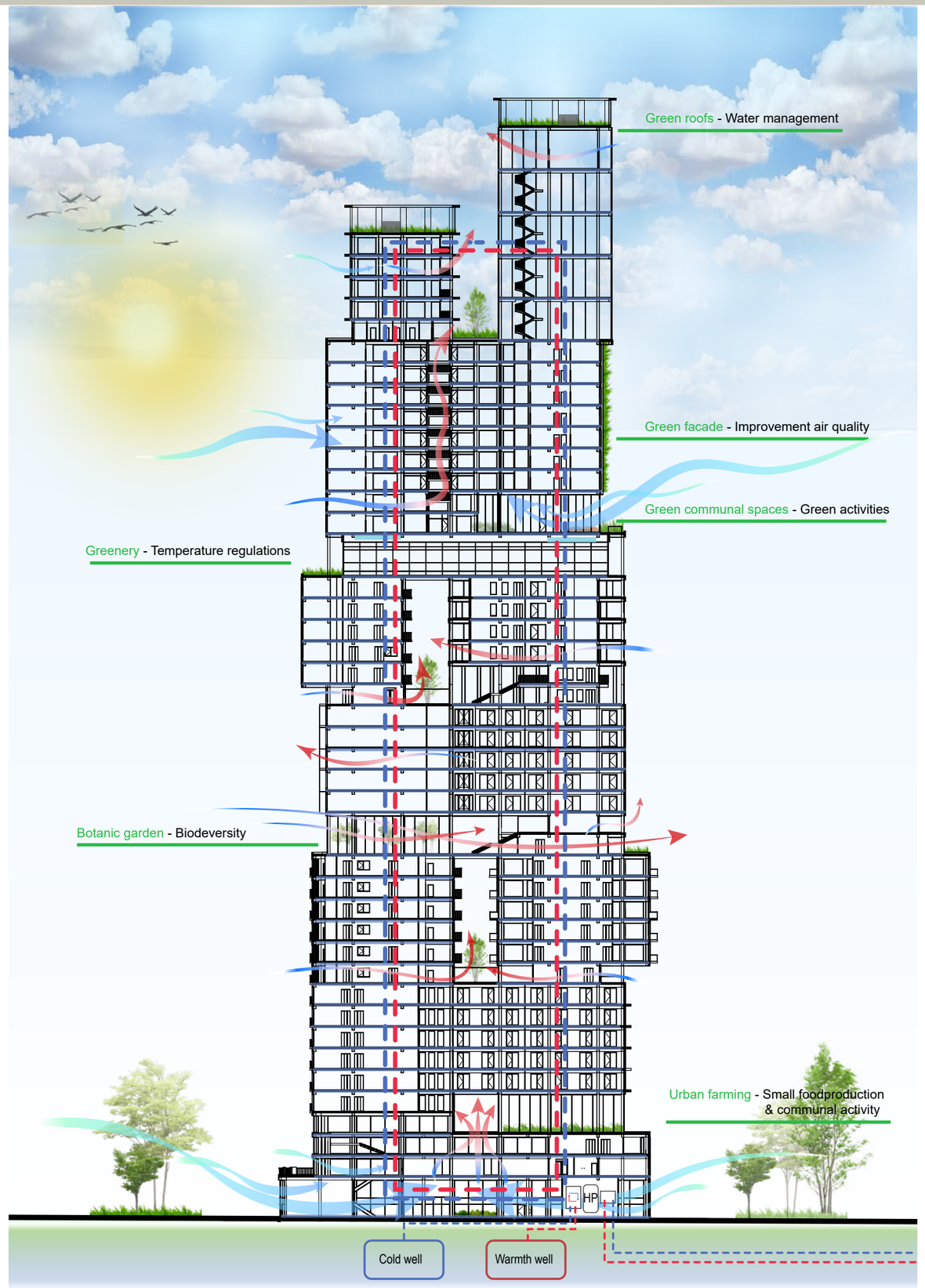
PARKING GARAGE

3 Stories parkinggarage (shared with other buildings)
Poured reinforced concrete walls and floors

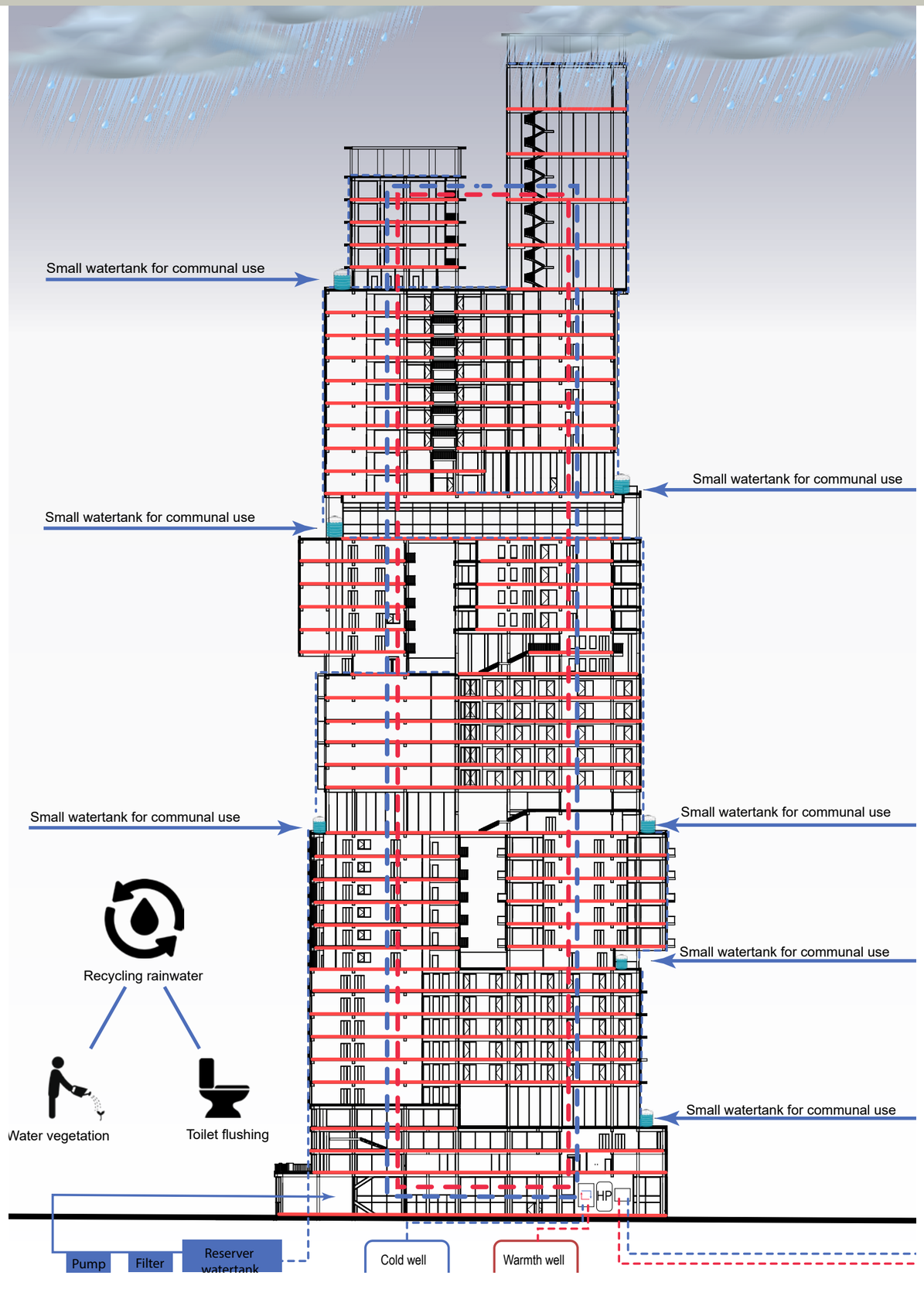
FOUNDATION

Foundation beams≈ 1500 x 2000 mm
Tubexpoles≈ Ø 850 mm x 70.000 m

Climate scheme - summer situation



Climate schema - winter situation



Community functions

Functions

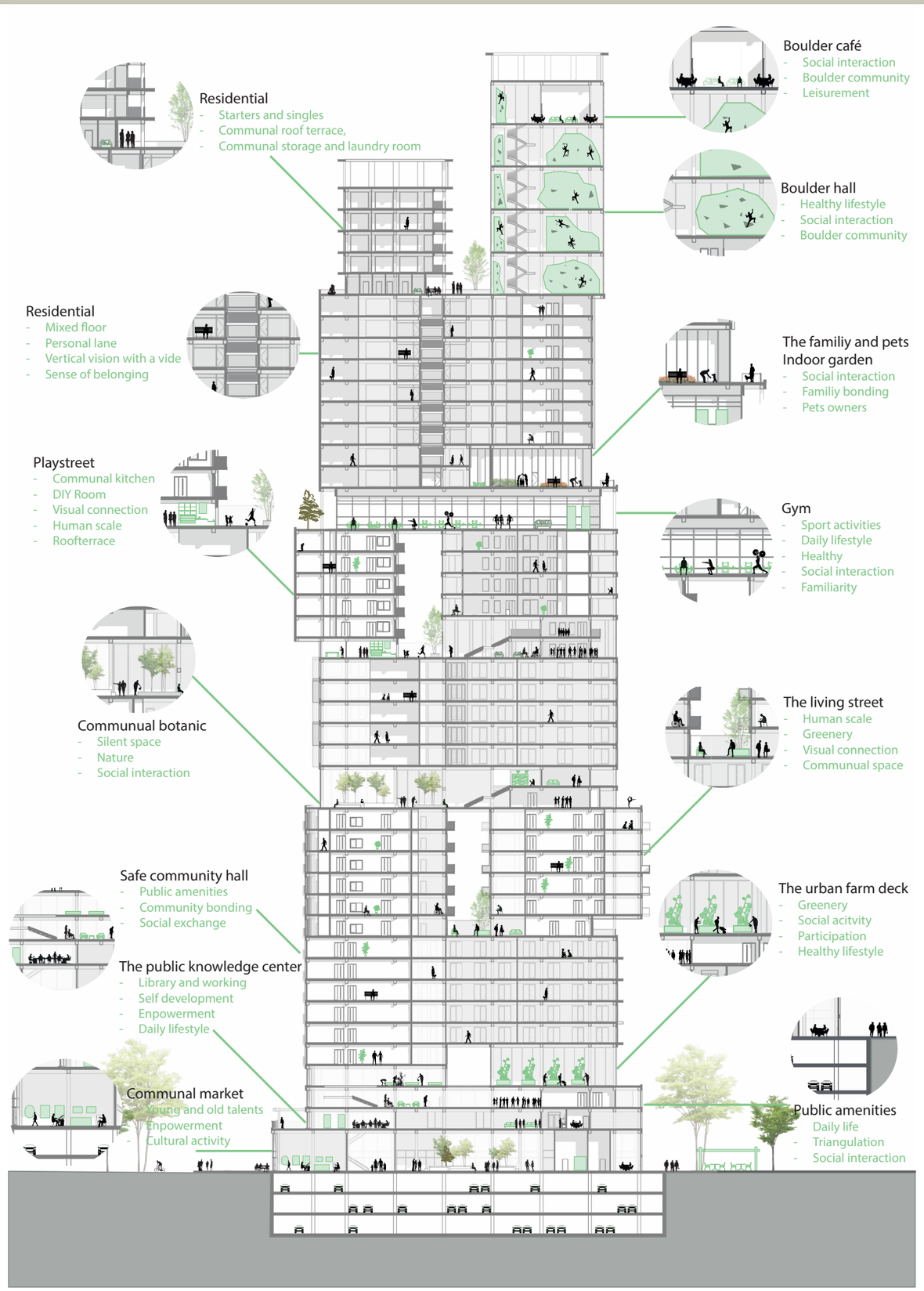
The functions within the building are primarily designed to stimulate social interactions and promote communities both inside and outside the tower.

Dining facilities are operated at a local level, making the kitchen and staff feel familiar to visitors. These facilities are combined with culture and entertainment, bringing together different target groups in the same space, which ensures optimal vibrancy in Rijnhaven (triangulation).

The public spaces offer diversity for everyone, with seating areas where people can directly or indirectly participate in activities and the liveliness inside and around the building, such as outdoor and indoor terraces.

Above the third public space, there is an urban farm deck where city residents and visitors become more aware of growing vegetables and flowers. This promotes participation and self-empowerment, as the harvested products can be used in the restaurant, bar, bakery, and during community cooking workshops.

Certain facilities in the tower are strategically placed near residential blocks where the target groups can benefit most, making collective and public spaces more accessible to users. For instance, residential blocks for the elderly are situated closer to the public plinth and floors with collective spaces, while floors with many starters and young students are located nearer to the gym and bouldering hall.



Public floorplan - Groundfloor

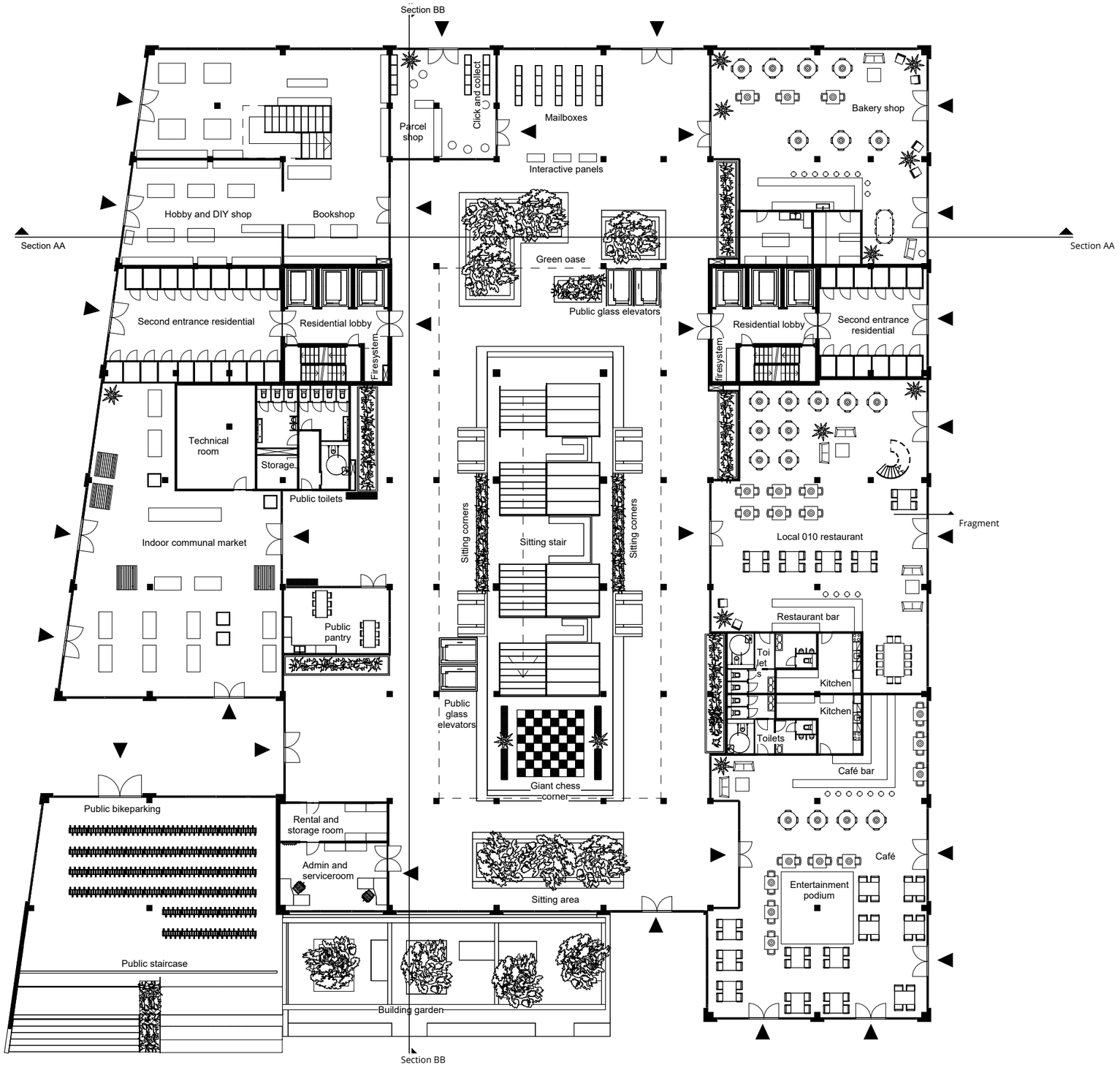
The public groundfloor

The ground floor features various functions and spaces accessible to everyone. The central hall provides openness and a clear overview of the activities and functions within the building, making it easy for visitors to navigate and be part of the lively atmosphere.

In addition to the central staircase, the two corridors function as covered streets, providing access to various functions from both inside the building and the street. During colder seasons, the inner street on the east side serves as a covered terrace for the dining facilities, ensuring the ground floor remains flexible and well-visited throughout the year. To foster a sense of familiarity, the functions are predominantly locally oriented. Think of a local restaurant, bar, and bakery where residents of the tower can contribute and get to know each other better.

The west side of the building focuses on personal development and education, a place where individuals can delve into personal interests and share them with the community. The communal market provides a platform for people of all ages to showcase their cultural talents. Within this space, people can come together, exchange knowledge and talents, and exhibit self-made art and music.

Furthermore, the ground floor is accessible from all sides and all spaces are interconnected. There's something for everyone, which is why the floor is divided into different segments with appropriate furnishings. Various seating areas offer direct or indirect contact with the surroundings.



The public central hall

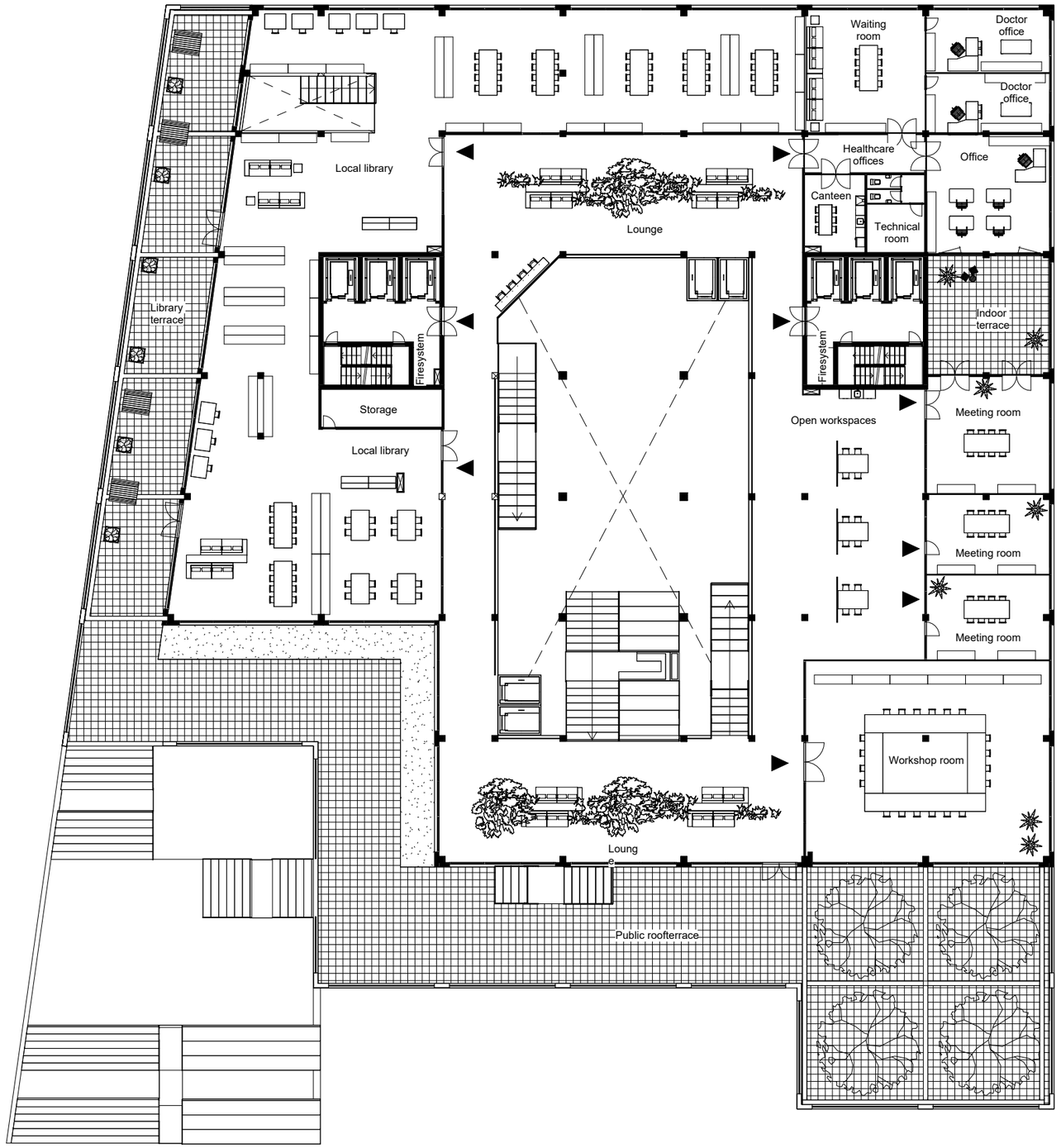
Public floorplan - Level 1

The public level 1

The first floor serves as an extension of the park via the public staircase. This play staircase is accessible to everyone and offers the opportunity to experience the park and the water of Rijnhaven from an elevated perspective. The staircase serves as an architectural feature that connects the surroundings with the building. The park provides space for various activities such as a tennis court or other play equipment, and has ample capacity for small-scale events, making the staircase publicly accessible.

Inside the building, there are various public facilities focused on education and social interaction, as well as essential services such as healthcare. Most spaces on these floors can be rented for meetings or workshops that cater to the working environment and educational needs.

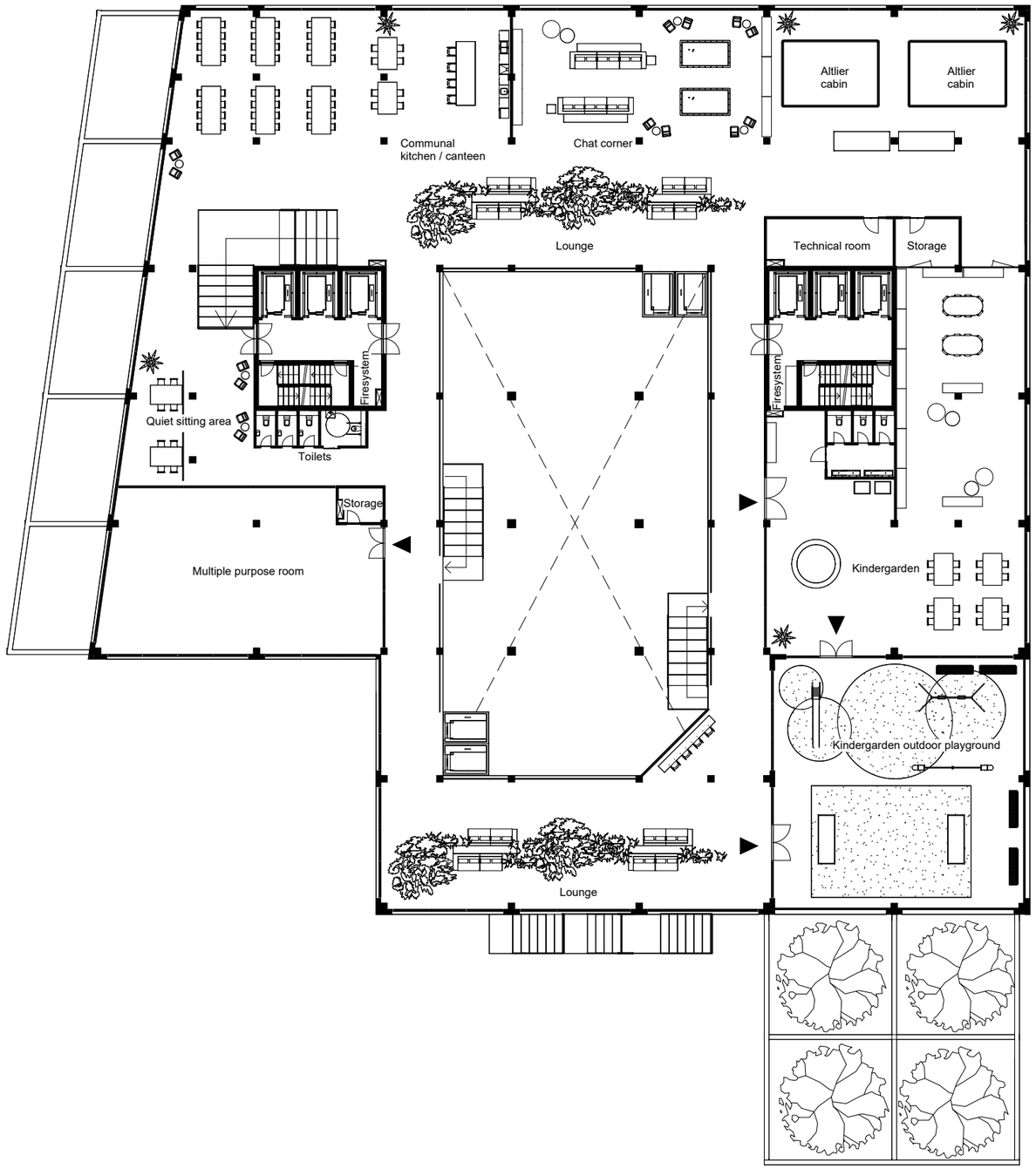
The local library serves not only as a book lending point, but also as a meeting place, both indoors and outdoors depending on the season.



Public floorplan - Level 2

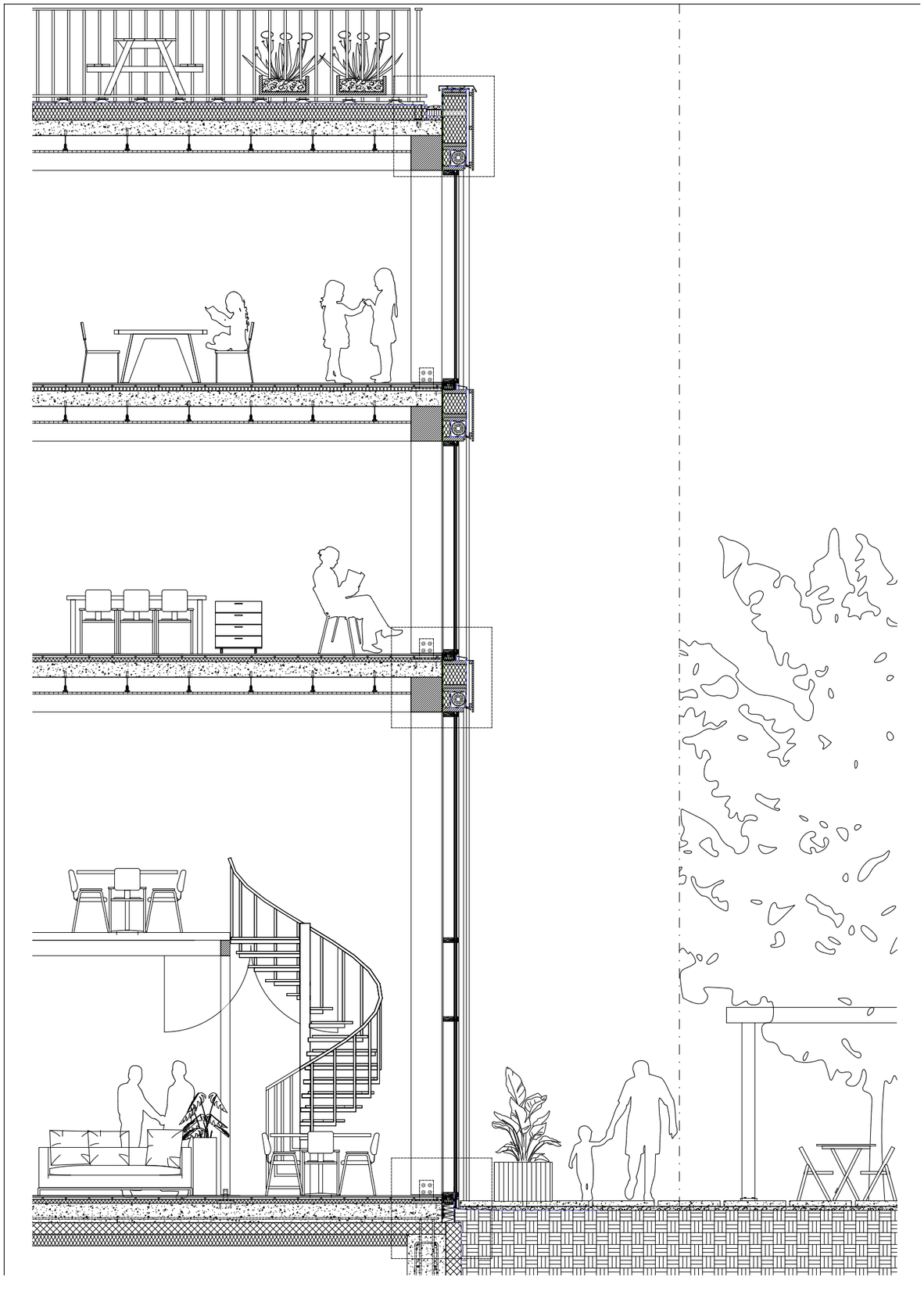
The public level 2

Additionally, it is expected that elderly and retirees will often use the community centre. The adjacent childcare facility ensures that elderly and retirees feel less lonely due to the presence of children. Despite the age difference between these two groups, the combination of elderly and children offers various benefits. Elderly individuals enjoy the company and liveliness of children, which can reduce their sense of isolation and enrich their daily lives. Simultaneously, children benefit from the wisdom and care provided by the elderly, enhancing their social skills and emotional development. This interaction promotes a sense of community and solidarity across generations.



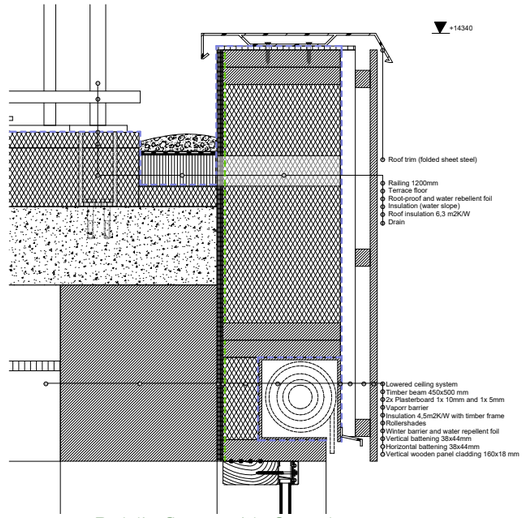
The walking street

Vertical fragment public levels 1:20

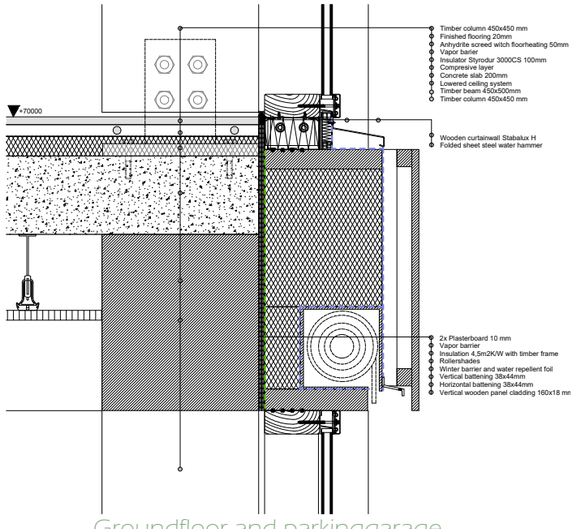


Vertical details 1:5

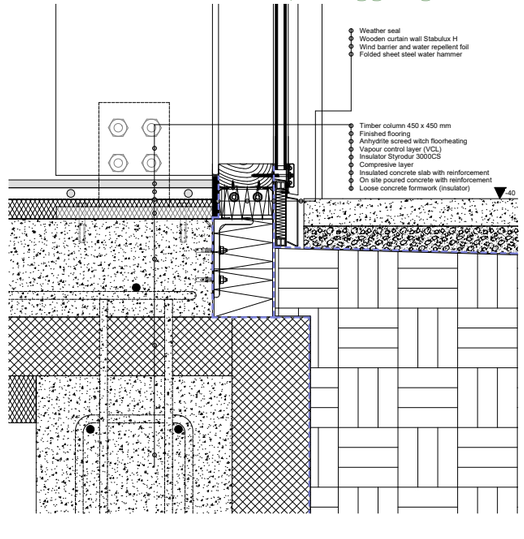
Public terrace with roof



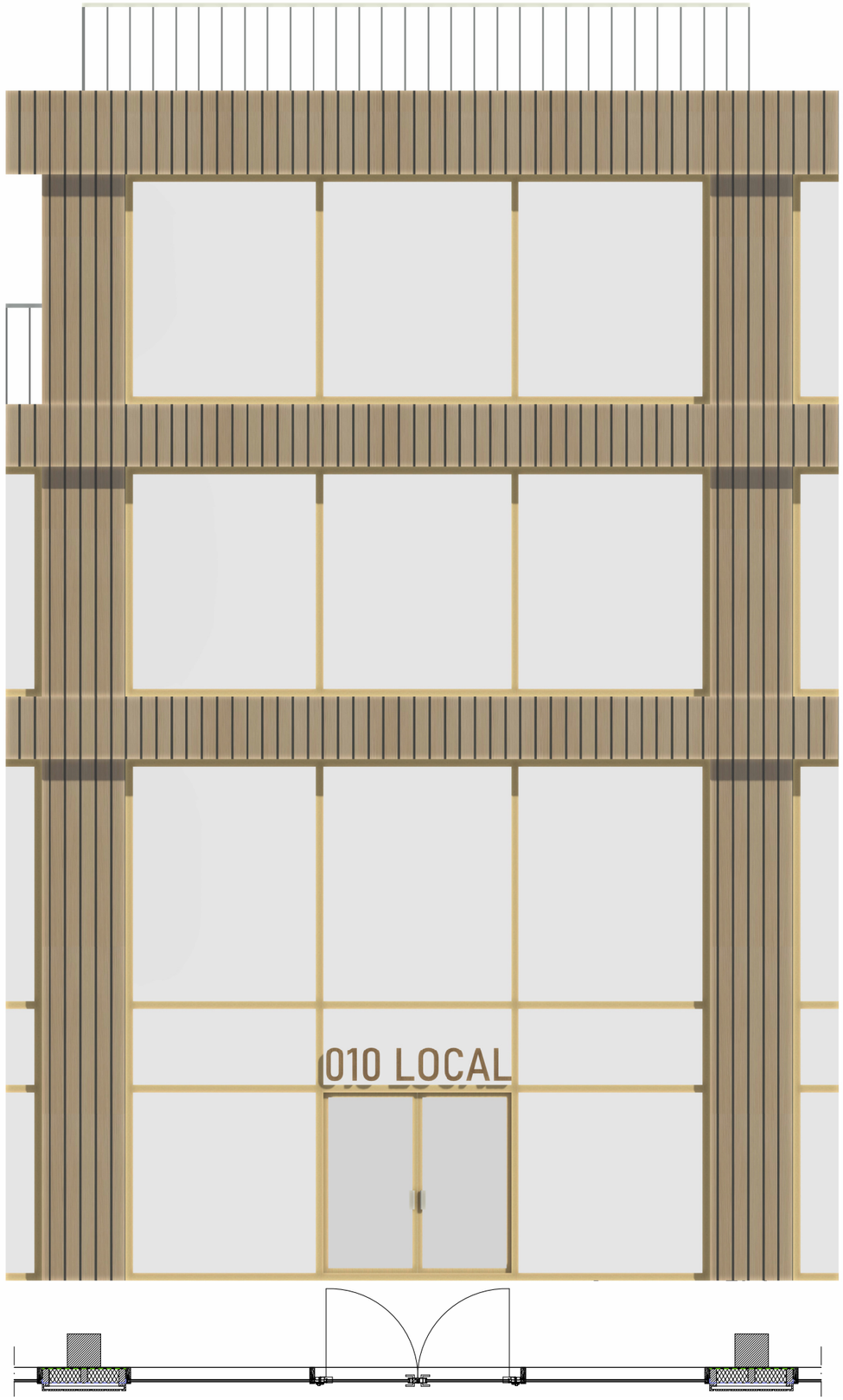
Public floor with facade



Groundfloor and parkinggarage

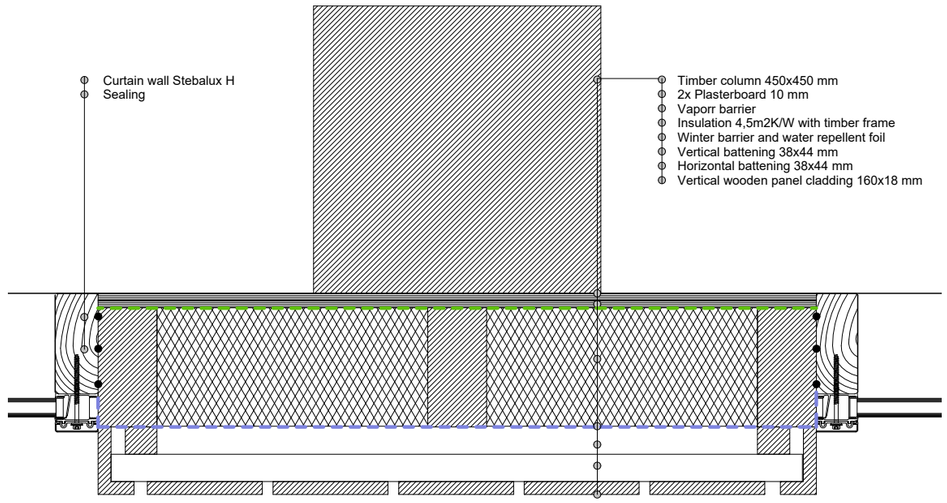


Horizontal facade fragment 1:20



Horizontal detail 1:5

Curtain wall detail with column



Materialisation

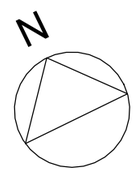
The facade is mostly transparent to convey the openness of the building, as it serves a public function for the area. Large glass panels will create a feeling of invitation, making it more accessible for visitors. The timber cladding is a natural and warm material that contributes to the building's sustainability while also providing a friendly and soft expression, making the building welcoming for various people. Additionally, timber is still rarely used in high-rise buildings in cities, adding more variety and diversity to the urban environment.

The public urban farm deck

Floorplan - Level 10

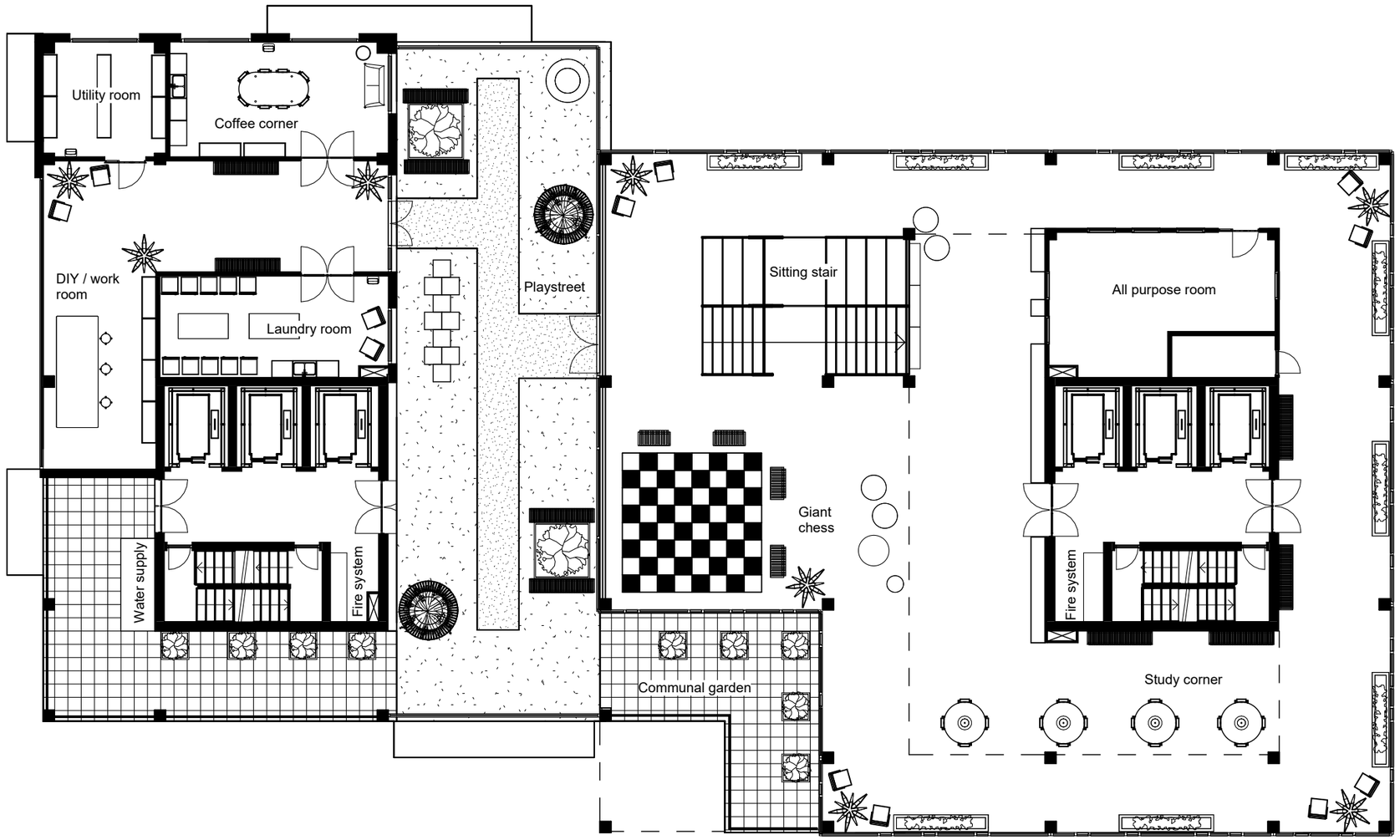
The residential block and communual space

The residential floor for the elderly and starters. These demographics are usually at a higher risk of feeling lonely. However, they can offer a lot to each other in daily life. Elderly individuals are often less mobile, so they should be placed closer to common areas to make it easier for them to participate in social activities. Additionally, starters can better utilize the essential facilities, thereby saving space in their own homes.



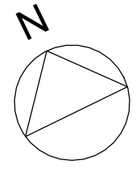
The commmunual livingroom

Floorplan - Level 23



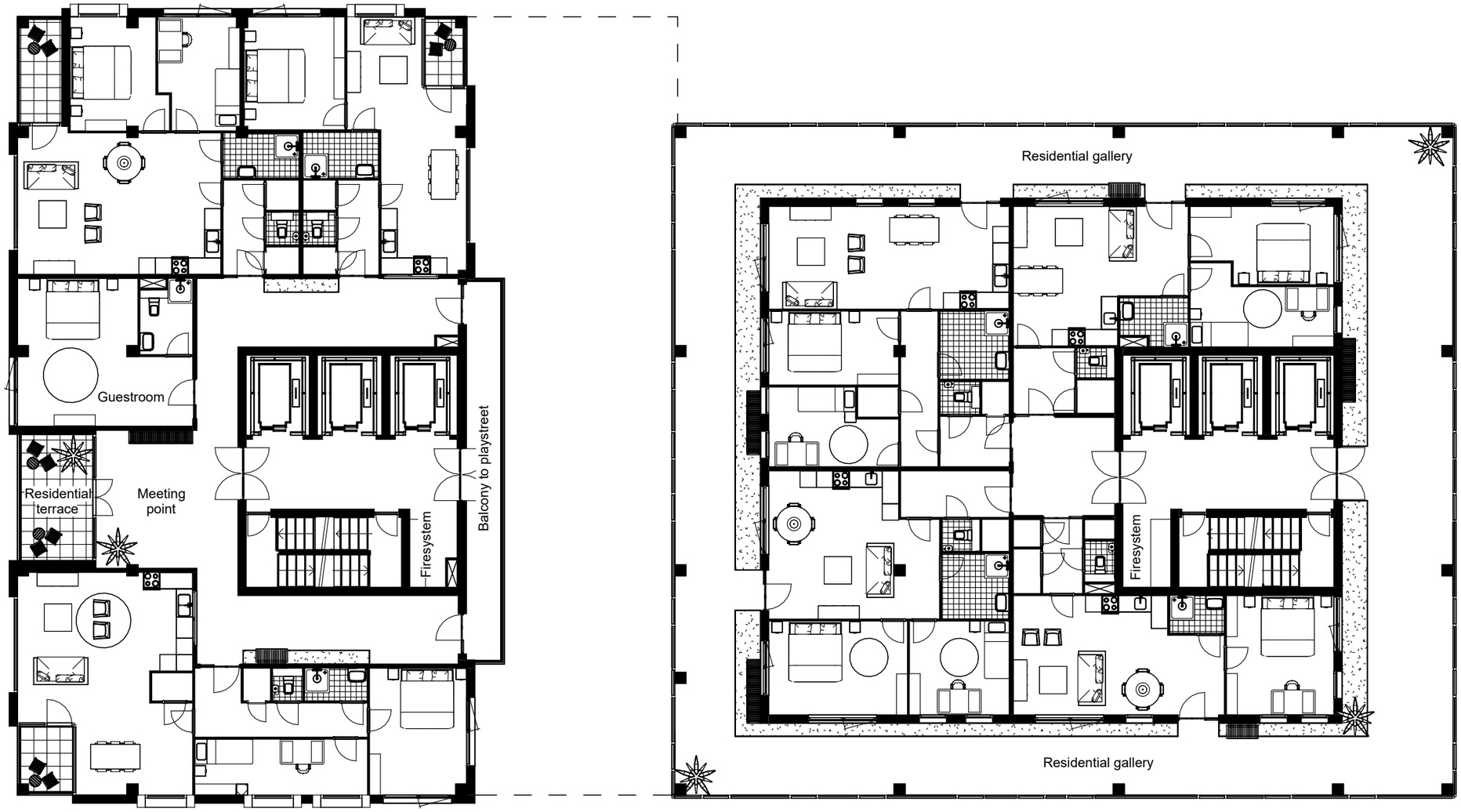
The communal playstreet

This floor is specially designed for larger communities in the tower, accommodating people from different groups and ages. The space includes facilities based on daily living needs, such as a laundry room, utility room, and a DIY room. Additionally, it features areas that facilitate social activities like gardening, a coffee corner, chess, and an outdoor communal terrace. This floor is particularly suitable for larger events, where the entire community can gather, such as Christmas, birthdays, or other special occasions.



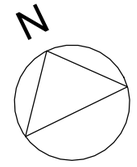
The communal street

Floorplan - Level 25

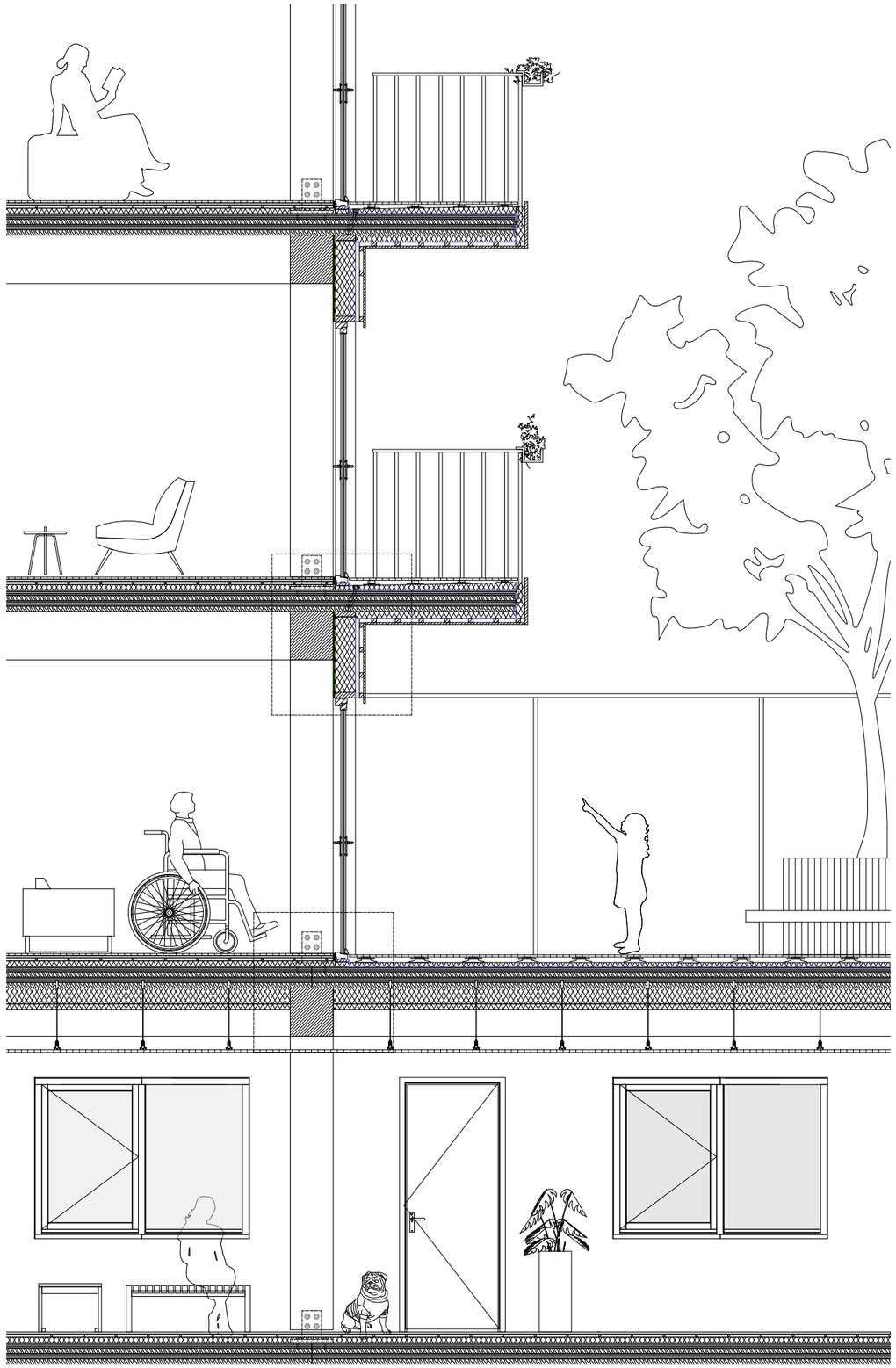


The residential blocks

The residential floor for families and students consists of two divided blocks that share the same view of the communal play street. In the family block, there is also a guest room for visitors. The student block includes a gallery where they can place their own seats and tables, allowing them to sit, study, exercise, and hang out without disturbing others.

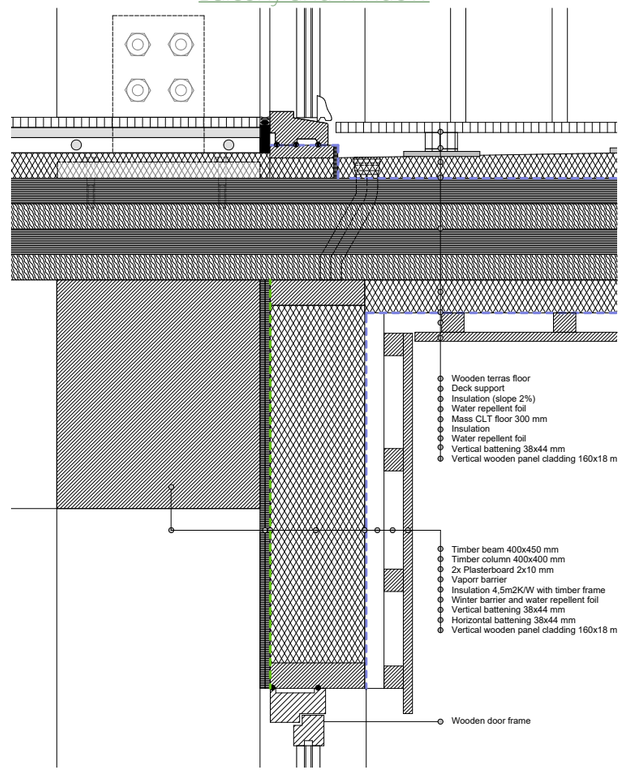


Vertical fragment public levels 1:20

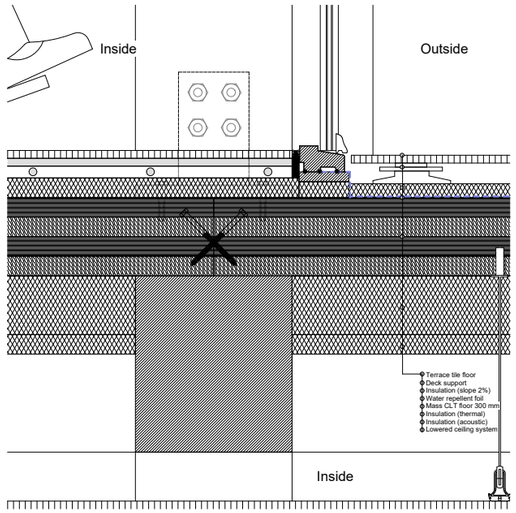


Vertical details 1:5

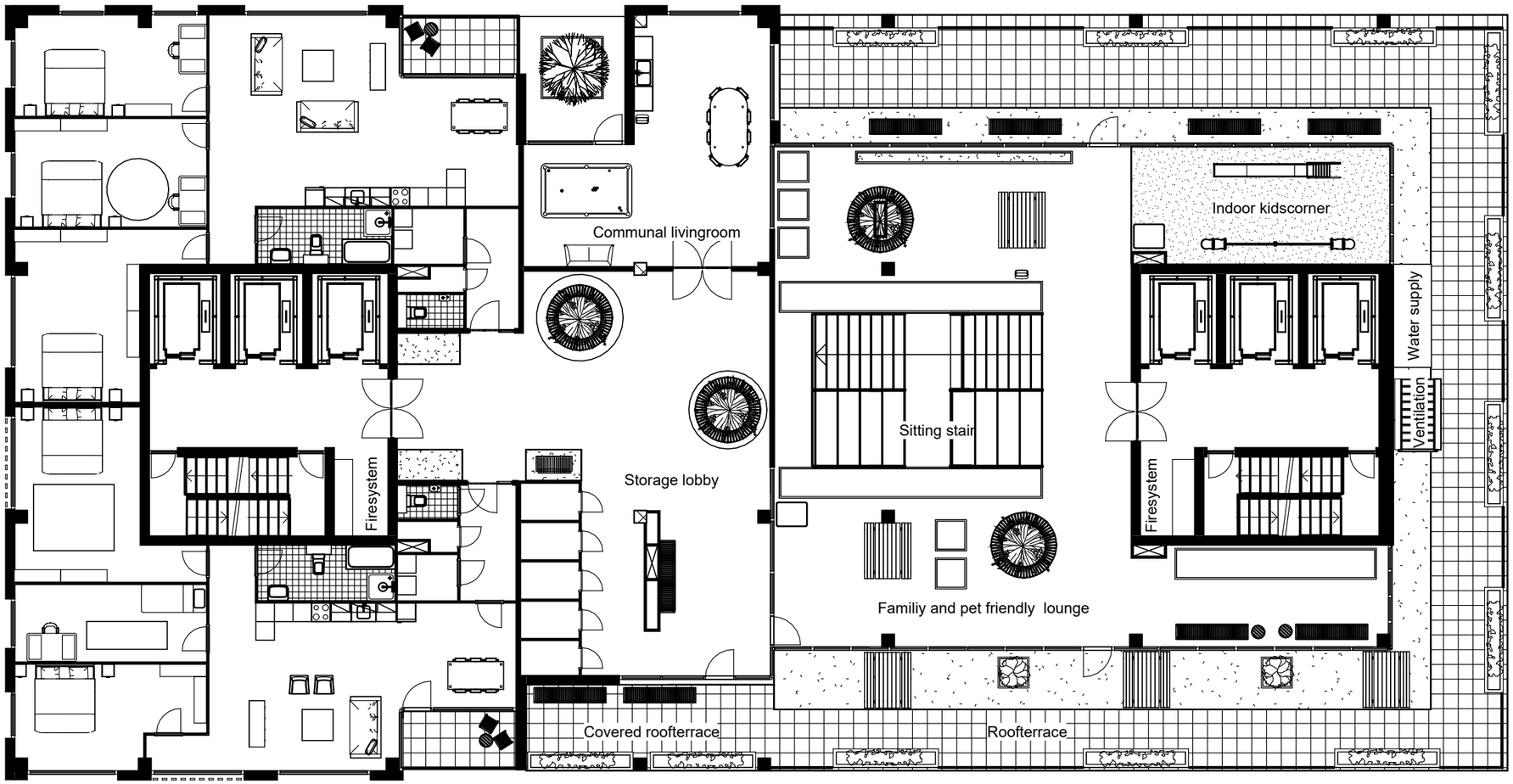
Balcony and window



Playstreet inside and outside



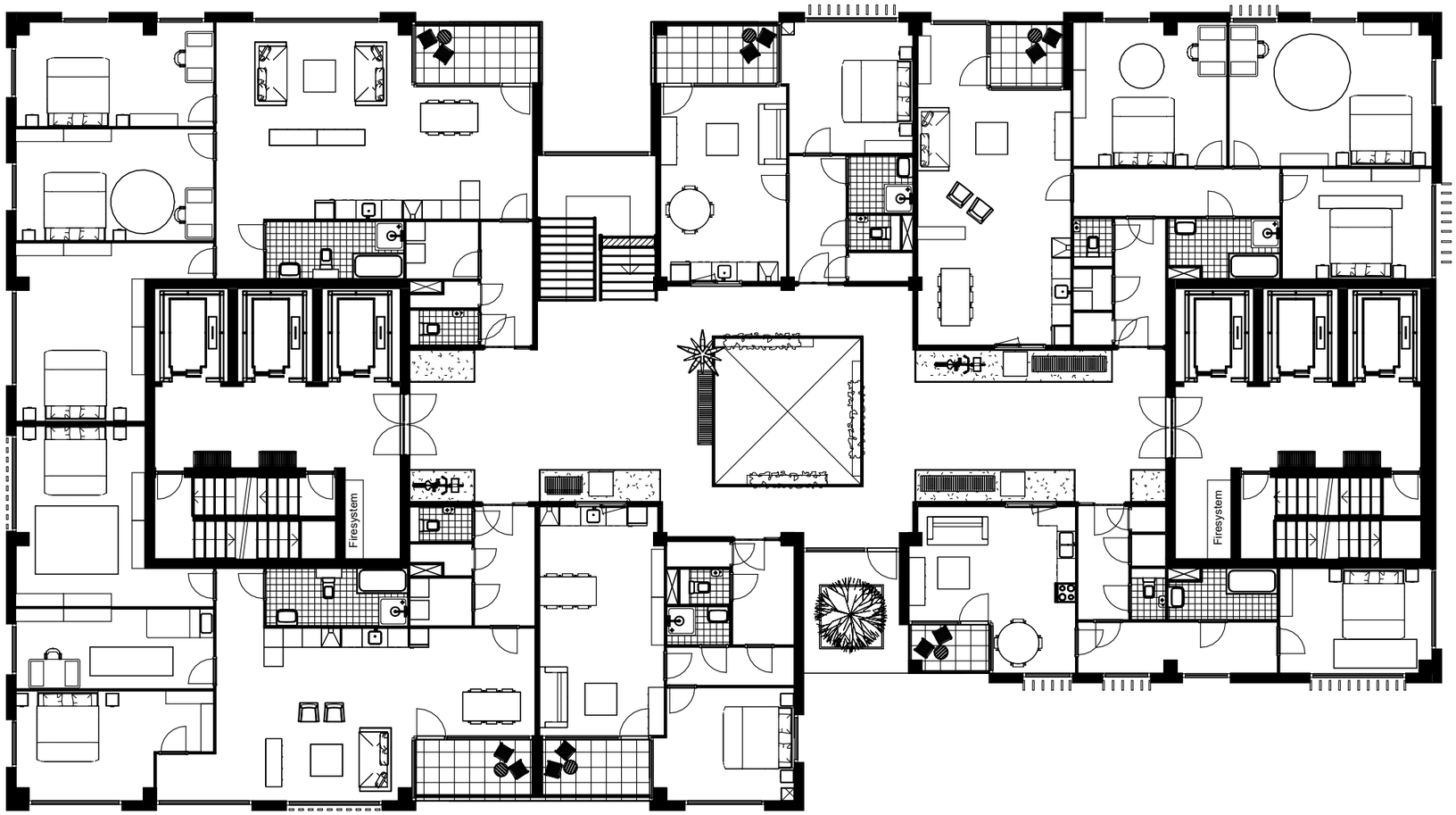
Floorplan - Level 31



The residential block and communual space

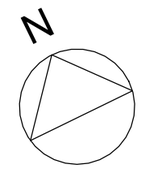
The residential floor for large families includes a communal space where families can invite friends and relatives to make use of the family indoor lounge. The common areas are designed according to the needs and wishes of big families. The lounge is a safe space for children and pets, allowing them to play and move around safely within the bustling city,

Floorplan - Level 37



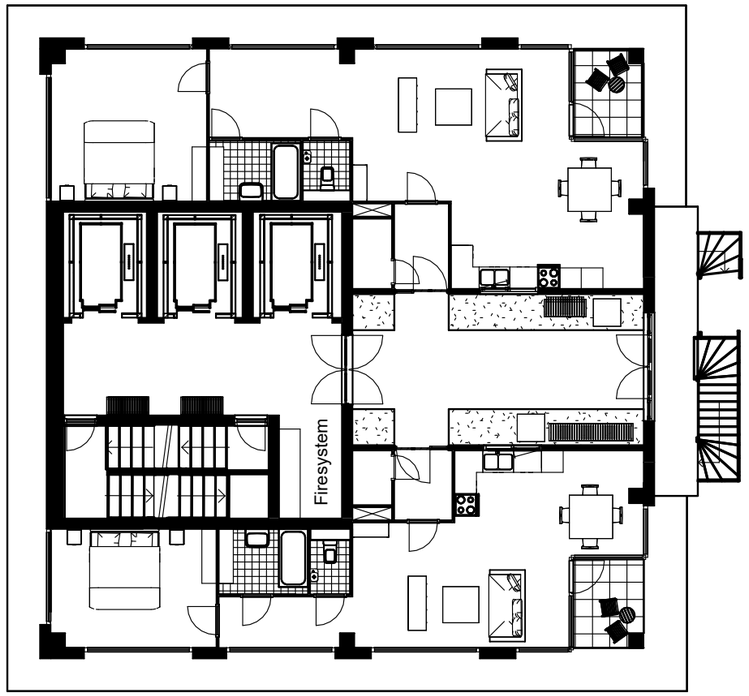
The residential block

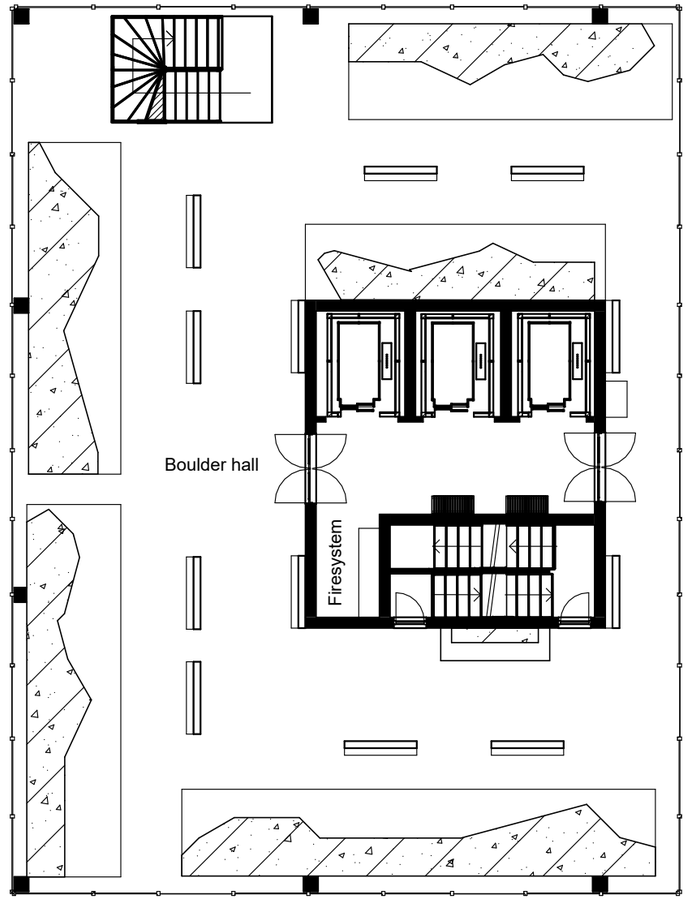
The residential floor for mixed communities is designed to help different target groups get to know each other better through various shared common areas. The central corridor, which the apartments overlook, fosters more social interactions. Additionally, all apartments have their own personal strip, allowing the homes and the hallway to be personalized, creating the sense of belonging and social control.



The living corridor as a meeting space

Floorplan - Level 43



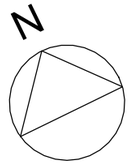


The residential block

The residential floor for singles and starters with one bedroom. This block shares a communal terrace and facilities such as a laundry room with an adjacent meeting space. The block faces the bouldering hall part of the tower.

Boulder hall with a café at the top

Bouldering is a rapidly growing indoor sport for young people and adults nowadays. It is a sport that can easily be accommodated in open spaces and is typically performed at height, as the sport revolves around climbing heights. At the top level of the bouldering hall, there is also a café, encouraging outsiders to visit the top of the tower and get to know the sport better.



South elevation

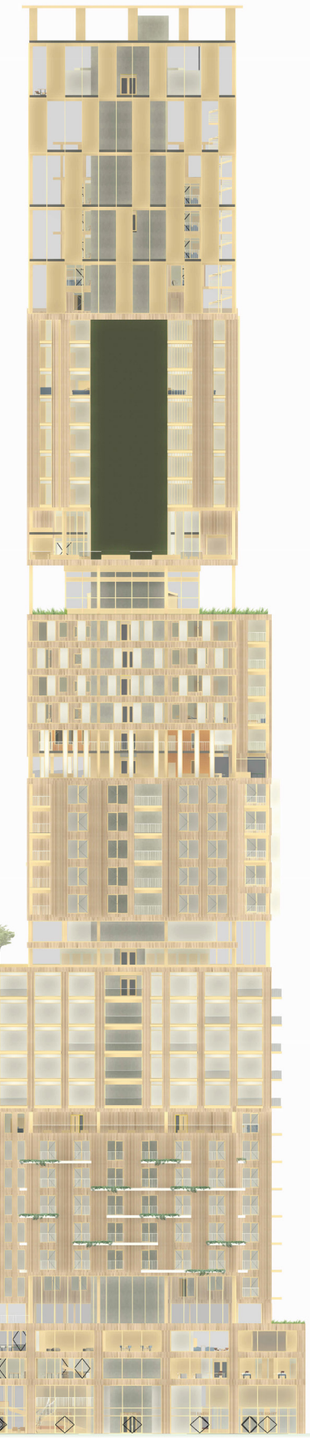
Facade layout

The facades are predominantly clad in wood and feature windows. The variation in layouts and proportions of the windows contributes to the diversity within the tower, making the different building volumes easily distinguishable. The level of transparency and openness also enhances the recognition of public, communal, and private spaces. This design allows residents to identify with their living environment and emphasises that the tower serves a multifaceted and dynamic role, accommodating various activities and communities.

Greenery

The greenery has been added sparingly to promote a healthy and sustainable appearance. Trees in large pots contribute to a natural environment that enhances the mental well-being of residents. Plants and trees are predominantly placed in communal areas, where they can contribute to social activities such as gardening and provide relaxation. Simultaneously, these spaces often feature large glass facades, allowing the greenery to serve a functional purpose as sun shading and aiding in cooling the environment.

East elevation

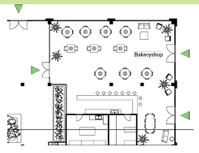


Design interventions

Accessibility


Multi-functional spaces


Transparancy



Multiple entrances


Spatial transition


Urban connection

Collective spaces


Encounter


Daily needs

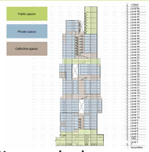

Social interaction


Knowledge


Triangulation

Diversity in space and expression


Hybrid development


Mix-use devlopment


Program


Different demographics


Facade lay-out

Identity and enpowerment


Social identity


Personal strip

Flexibility


Division of spaces


Diversity in lay-out (indoor/outdoor)


Sustainable

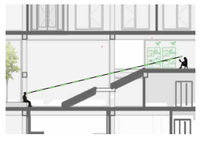
Sense of belonging


Inclusive


Participation


Personal infill

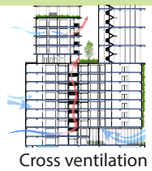

Placemaking objects


Visual connection

Human needs

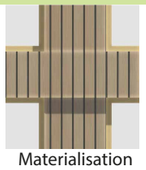

Daylight


Climate


Cross ventilation


Furniture


Human scale


Materialisation


Greenery

The hyper tower

Bibliography

Abdelsalam, Ahmed Ehab, red. A New Densification Approach for Upgrading the Vertical Public Realm and City Vitality. A New Paradigm Shifts Towards Sustainable Vertical Urbanism. 7th Annual International Conference on Architecture and Civil Engineering (ACE 2019), 2019. https://doi.org/10.5176/2301-394X_ACE19.532.

Abu-Ghazzeh, Tawfiq M. HOUSING LAYOUT, SOCIAL INTERACTION, AND THE PLACE OF CONTACT IN ABU-NUSEIR, JORDAN, Journal of Environmental Psychology, Volume 19, Issue 1, 1999, P. 41-73, https://doi.org/10.1006/jevp.1998.0106.

Al Hamzi, Ahmad Fariz. "Placemaking: A Solution For Urban Loneliness", 5 August 2022. https://issuu.com/shirvanoconsulting/docs/2021_intern_14_ahmad_fariz_al_hazmi_compressed.

Ali, Mir M., en Kheir Al-Kodmany. "Tall Buildings And Urban Habitat Of The 21st Century: A Global Perspective". Buildings 2, nr. 4 (28 September 2012): 384–423. https://doi.org/10.3390/buildings2040384.

Al-Kodmany, K. The Vertical City: A Sustainable Development Model. WIT Press, 2018.
Allemeersch, Simon. "The Inside And Outside Of High-Rise Social Housing: The Broken Institution". In The urban book series, 109–25, 2022. https://doi.org/10.1007/978-3-031-19748-2_8.

Altink, Sietske"Het Gecontroleerde Ontstaan van een Rosse Buurt: Bijnamenromantiek en Huisjesmelkers: Katendrecht | Sekswerkerfgoed",n.d.https://sekswerkerfgoed.nl/het-gecontroleerde-ontstaan-van-een-rosse-buurt-bijnamenromantiek-en-huisjesmelkers/.

Ashraf, Khurram, en Subhrajit Banerjee. "Spatial Quality Attribute for high Rise Buildings: Literature Review". ResearchGate, 2023. https://www.researchgate.net/publication/371013127_Spatial_Quality_Attribute_for_high_Rise_Buildings_Literature_Review.

Avery, Emma. "Should We Design Cities For Loneliness? — Happy Cities". Happy Cities, 22 March 2024. https://happycities.com/blog/should-we-design-cities-for-loneliness.

Bairoch, Paul. Cities and Economic Development: From the Dawn of History to the Present. University of Chicago Press, 1988.

Ballard, J.G. 2011. Concrete Island. London: Fourth Estate.

Ballard, J.G. 2012. High-Rise. New York: Liveright Pub.

Barcode. "MASTERPLAN RIJNHAVEN ROTTERDAM - Barcode", 15 May 2024. https://barcodearchitects.com/projects/masterplan-rijnhaven-rotterdam/.

Barrera, M., Jr, & Ainlay, S. L. (1983). The structure of social support: a conceptual and empirical analysis. Journal of community psychology, 11(2), 133–143. https://doi.org/10.1002/1520-6629(198304)11:2<133::aid-jcop2290110207>3.0.co;2-l

Beck, Helen. "Linking The Quality Of Public Spaces To Quality Of Life". Journal Of Place Management And Development 2, nr. 3 (9 October 2009): 240–48. https://doi.org/10.1108/17538330911013933.

Bergefurt, Lisanne, Astrid Kemperman, Pauline Van Den Berg, Aloys Borgers, Peter Van Der Waerden, Gert Oosterhuis, en Marco Hommel. "Loneliness And Life Satisfaction Explained By Public-Space Use And Mobility Patterns". International Journal Of Environmental Research And Public Health/International Journal Of Environmental Research And Public Health 16, nr. 21 (4 November2019): 4282. https://doi.org/10.3390/ijerph16214282.

Berkman, Lisa F., and Ichiro Kawachi. Social Epidemiology. Oxford University Press, 2000.

Bet, Els, Heide Hinterthür, en Leon Van Mayjel. "Afrikaanderwijk Cultuurhistorische en Ruimtelijke Karakteristiek", 2007. https://www.elsbet.nl/dl/vestia%20afrikaanderwijk.pdf.

Brand, Stewart. How Buildings Learn: What Happens After They're Built. Penguin Books, 1995.

Bridger-Lippe, Rosemary. "Regenerative High-Rise Reinvents The Tower - Ubm Magazine". Ubm Magazin., 9 March 2024. https://www.ubm-development.com/magazin/en/regenerative-high-rise/.

Cappon, Daniel. "Mental Health in The High-Rise On JSTOR" 1971. Www.Jstor.Org, n.d. https://www.jstor.org/stable/41986998.

Chile, Love M., Xavier M. Black, en Carol Neill. "Experience And Expression Of Social Isolation By Inner-city High-rise Residents". Housing, Care And Support 17, nr. 3 (9 September 2014): 151–66. https://doi.org/10.1108/hcs-11-2013-0021.

Choenarom, Chanokruthai, Reg Arthur Williams, en Bonnie M. Hagerty. "The Role Of Sense Of Belonging And Social Support On Stress And Depression in Individuals With Depression". Archives Of Psychiatric Nursing 19, nr. 1 (1 February 2005): 18–29. https://doi.org/10.1016/j.apnu.2004.11.003.

Contrei, "171027-Rijnhaven – Contrei", 2018. https://contrei.eu/projecten/171027-rotterdam-rijnhaven/.

Dasgupta, Susmita, Somik Lall, en David Wheeler. "Cutting global carbon emissions: where do cities stand?" WORLDBANK.ORG World Bank Blogs Logo (blog), 16 March 2024. https://blogs.worldbank.org/en/sustainablecities/cutting-global-carbon-emissions-where-do-cities-stand.

De Decker, Pascal en Kabinetsmedewerker bij de Vlaamse minister van huisvesting. "De woontorens worden gesloopt Utopia is veroordeeld. Over kind en badwater in de sociale huisvesting". Samenleving En Politiek 9 (1998). https://www.stichtinggerritkreveld.be/pdf/sampol_1998_09_p32_43_dedecker_pascal.pdf.

De Nijs, Marlies, Ir M. "High-rise op Ooghoogte: Een Onderzoek Naar Levendige Plinten Bij Hoogbouw". Thesis. Onder redactie van Erik Braun en Jeroen Van Haaren, July 2015. https://www.stichtinghoogbouw.nl/wp-content/uploads/2016/01/High-rise-op-ooghoogte.pdf.

Dupr É, J., s, D. Challinger, Wikipedia Encyclopedia, J.R. Hall Jr, M.E. Knoke, B. Sonder, J.R. Hall Jr, en W.D. Holmes PE. High-Rise Security And Fire Life Safety, 2009. https://booksite.elsevier.com/samplechapters/9781856175555/02~Chapter_1.pdf.

Feng, Jiajing & Nikolic, Dragana & Ewart, Ian. (2021). Understanding how the adaptations of building spaces shape or are shaped by human behaviour in disrupted use scenarios: a literature review.

Fu, Kathleen. "Strangers in The Sky: A Designer's Guide To Tackling Urban Loneliness, Part A". Medium, 16 December 2021. https://medium.com/humanics/strangers-in-the-sky-a-designers-guide-to-tackling-urban-loneliness-part-a-31991bd66e60.

Gale, Catharine R, Leo Westbury, en Cyrus Cooper. "Social Isolation And Loneliness As Risk Factors For The Progression Of Frailty: The English Longitudinal Study Of Ageing". Age And Ageing 47, nr. 3 (22 December 2017): 392–97. https://doi.org/10.1093/ageing/afx188.

Bibliography

Gebiedsontwikkeling.nu. "Hoogbouw Is de Ideale Oplossing in de Strijd Tegen Woningnood. Of Toch Niet?", n.d. https://www.gebiedsontwikkeling.nu/artikelen/hoogbouw-is-de-ideale-oplossing-in-de-strijd-tegen-woningnood-of-toch-niet/.

Gehl, Jan. Cities For People. Island Press, 2010. https://books.google.nl/books?hl=nl&lr=&id=IBNJoNILqQcC&oi=fnd&pg=PR3&dq=jan+gehl+human+scale&ots=hHnapU-3lj&sig=vL3HQR_CuSCYIlZ-NInVnrzVQ2g

Gemeente Rotterdam. "Nieuwbouw op Katendrecht", n.d. https://www.rotterdam.nl/nieuwbouw-op-katendrecht.

Gemeente Rotterdam. "Onderzoek", n.d. https://www.rotterdam.nl/onderzoek.

Generalova, E, en V Generalov. "Mixed-Use High-Rise Buildings: A Typology Of The Future". IOP Conference Series. Materials Science And Engineering 753, nr. 2 (1 February 2020): 022062. https://doi.org/10.1088/1757-899x/753/2/022062.

Geografie.nl. "Stadstuinen", n.d. https://geografie.nl/artikel/stadstuinen.

Gifford, R. (2007). The Consequences of Living in High-Rise Buildings. Architectural Science Review, 50(1), 2–17. https://doi-org.tudelft.idm.oclc.org/10.3763/asre.2007.5002

Gillis, A. R. 'High-Rise Housing and Psychological Strain'. Journal of Health and Social Behaviour 18,nr.4 (1977): 418–31. https://doi.org/10.2307/2955349. https://www.jstor.org/stable/2955349?casa_token=Um2QYTiD_mQAAAAA%3AyZzlGT7ZUMhVSJHN_nQABeT-XKdY9QydIfbqbsLWQC8X6IsxU3IZOAeWMSaK_hvE2I_YGffrpuHkJU20ReqLRREtYJLCgCQjckI6Ts39J_dh8kCUEzY&seq=1.

GOV.UK. "Tackling Loneliness Evidence Review: Executive Summary", 17 March 2023. https://www.gov.uk/government/publications/tackling-loneliness-evidence-review/tackling-loneliness-evidence-review-summary-report.

Haim-Litevsky, Dorit, Reut Komemi, en Lena Lipskaya-Velikovsky. "Sense Of Belonging, Meaningful Daily Life Participation, And Well-Being: Integrated Investigation". International Journal Of Environmental Research And Public Health/International Journal Of Environmental Research And Public Health 20, nr. 5 (25 February 2023): 4121. https://doi.org/10.3390/ijerph20054121.

Harries, Emma, Kim Samuel, Jitendra K. Trivedi, Himanshu Sareen, Mohan Dhyani, Kalpana Srivastava, R. P. Hortulanus, Anja Machielse, en Ludwien Meeuwesen. "Social Isolation and its Relationship to the Urban Environment". In Overcoming Social Isolation and Building Social Connectedness Through Policy and Program Development, door McGill University en Professor Kim Samuel, 2019. https://www.socialconnectedness.org/wp-content/uploads/2019/12/Emma-Harries-Social-Isolation-and-its-Relationship-to-the-Urban-Environment.pdf.

Harteveld, M. (2014). Interior public space: On the Mazes in the Network of an Urbanist. Delft University of Technology.

Harteveld, Maurice, and Sahar Asadollahi Asl Zarkhah. 'Public Spaces for Community Resilience: The 14th Conference of the International Forum on Urbanism (IFoU)'. The Evolving Scholar 1 (November2021). https://doi.org/10.24404/615ee7b5df40b600098d861d.

Heu, Luzia Cassis, en Tom Brennecke. "By Yourself, Yet Not Alone: Making Space For Loneliness". Urban Studies 60, nr. 16 (8 May 2023): 3187–97. https://doi.org/10.1177/00420980231169669.

Heu, Luzia. "Making Space for Loneliness in Our Cities". Next City, 2022. Accessed 10 March 2024. https://nextcity.org/urbanist-news/making-space-for-loneliness-in-our-cities-design-research.

Houben, Hans Schmeets Marieke. "Religieuze Betrokkenheid in Nederland". Centraal Bureau Voor de Statistiek, 6 April 2023. https://www.cbs.nl/nl-nl/longread/statistische-trends/2023/religieuze-betrokkenheid-in-nederland?onepage=true.

House, James S., Karl R. Landis, en Debra Umberson. "Social Relationships And Health". Science 241, nr. 4865 (29 July 1988): 540–45. https://doi.org/10.1126/science.3399889.
https://www.vzinfo.nl/eenzaamheid/oorzaken-gevolg#:~:text=Enerzijds%20kunnen%20genetische%20factoren%20meespelen,aan%20een%20ervaring%20van%20eenzaamheid.

Huang, Shu-Chun Lucy. "A Study Of Outdoor Interactional Spaces in High-rise Housing". Landscape And Urban Planning 78, nr. 3 (1 November2006): 193–204. https://doi.org/10.1016/j.landurbplan.2005.07.008.

Hung Sik Ng, Ping Kwong Kam, en Raymond W.M. Pong. "People Living in Ageing Buildings: Their Quality Of Life And Sense Of Belonging". Journal Of Environmental Psychology 25, nr. 3 (1 September 2005): 347–60. https://doi.org/10.1016/j.jenvp.2005.08.005.

Jackson, James. "This Scientist Is Using VR to Understand Why Skyscrapers Stress People Out". Vice, 6 December 2017. https://www.vice.com/en/article/43nnvb/this-scientist-is-using-vr-to-understand-why-skyscrapers-stress-people-out-stressweek2017.

Kalantari, Saleh, en Mardelle Shepley. "Psychological And Social Impacts Of High-rise Buildings: A Review Of The Post-occupancy Evaluation Literature". Housing Studies 36, nr. 8 (22 April 2020): 1147–76. https://doi.org/10.1080/02673037.2020.1752630.

Kaur, Jaskiran & Narayan, Neevita. (2017). Liveability in high rise apartments through open spaces. International Journal of Civil Engineering and Technology. 8. 1295-1301.

Kemperman, Astrid, Pauline Van Den Berg, Minou Weijs-Perrée, en Kevin Uijtdewillegen. "Loneliness Of Older Adults: Social Network And The Living Environment". International Journal Of Environmental Research And Public Health/International Journal Of Environmental Research And Public Health 16, nr. 3 (31 January 2019): 406. https://doi.org/10.3390/ijerph16030406.

Khaleghimoghaddam, Navid. "How Do High-Rise Buildings Affect The Mental Image Of Users? Case Study: Seljuk Tower in Konya". Deleted Journal 16, nr. 3 (1 September 2023): 21–30. https://doi.org/10.2478/acee-2023-0030.

Koelemaij, Jorn, Barend Wind, en Demi Van Weerdenburg. "Komt Hoogmoed Voor de Bouwval?" Agora 34, nr. 3 (1 September 2018): 4–7. https://doi.org/10.21825/agora.v34i3.11312.

Kooijman, Sander. "De Eerste 'Wolkenkrabber' van Europa Staat in Rotterdam en Is 125 Jaar: Vijf Dingen Die Je Moet Weten Over het Witte Huis". Rijnmond, 8 September 2023. https://www.rijnmond.nl/nieuws/1712938/de-eerste-wolkenkrabber-van-europa-staat-in-rotterdam-en-is-125-jaar-vijf-dingen-die-je-moet-weten-over-het-witte-huis.

Kootstra, Jorrit. "Socially-oriented High-rise Design in the Netherlands". Master thesis, Universiteit Groningen, 2020. https://research.tue.nl/files/275277813/Noordenbos_0806302_ABP_Kemperman_MSc_thesis.pdf.

Bibliography

Korte, Charles, en Sipke Huismans. "Sources Of Assistance Among Residents Of A Dutch High-rise Development". American Journal Of Community Psychology 11, nr. 6 (1 December 1983): 751–55. https://doi.org/10.1007/bf00896607.

Kostourou, Fani. (2014). We shape our buildings and then they shape us. https://www.researchgate.net/publication/282504794_We_shape_our_buildings_and_then_they_shape_us/citations

Kremer, William. "Why Do We Behave So Oddly in Lifts?" BBC News, 9 October 2012. https://www.bbc.com/news/magazine-19846214.

Kroon, Ilja, 2606733, Stella Pielage 2710931, Gabrielle De Vet 2591838, Heleen Vos 2579699, Jake Fernandes Orfao 2600263, Jens Lenferink 2681785, Kevin Boekhoudt 2599255, e.a. "TOGETHER AGAINST LONELINESS", Vrije Universiteit Amsterdam. 22 October 2020. https://www.movisie.nl/sites/movisie.nl/files/2020-11/FINAL%20RR_loneliness%20during%20COVID19_group1_20201022.pdf.

Langer, Beryl, en Michel De Certeau. "The Practice Of Everyday Life". Contemporary Sociology 17, nr. 1 (1 January 1988): 122. https://doi.org/10.2307/2069486.

Larcombe, Danica-Lea & Van Etten, Eddie & Logan, Alan & Prescott, Susan & Horwitz, Pierre. (2018). Disconnect from nature is apparent in high-rise apartment dwellers-how can we bring nature to apartment buildings?.

Larcombe, Danica-Lea, Eddie Van Etten, Alan Logan, Susan L. Prescott, en Pierre Horwitz. "High-Rise Apartments And Urban Mental Health—Historical And Contemporary Views". Challenges 10, nr. 2 (31 July 2019): 34. https://doi.org/10.3390/challe10020034.

Lepik, Andres. Skyscrapers. Prestel Publishing, 2008.

Li, L. (2004). Communality space constructionof aggregation inhabitation and high-risehousing inner public space. Huazhong Architecture, 22(5), 76-79.

Loketgezondleven.nl. "Integrale Aanpak Mentale Gezondheid", n.d. https://www.loketgezondleven.nl/gezondheidsthema/mentale-gezondheid/integrale-aanpak-mentale-gezondheid.

Lotens, Lotte. "Hoe Komt de Bijlmer Eigenlijk Aan Die Smet op Z'N Naam?" VPRO, 21 November2021. https://www.vpro.nl/lees/specials/2021/hoe-komt-de-bijlmer-eigenlijk-aan-die-smet-op-z-n-naam.html.

Luitse, Femke. "The Influence Of Place Attachment On Residential Satisfaction. A Study On A Sample From The Dutch Population". University of Groningen, 2021. https://frw.studenttheses.ub.rug.nl/3656/1/BSc%20project%20final%20version%20Femke%20Luitse.pdf.

Lum, S. W. M. (2011). Re-designing theapartment-high-rise through a child's perspective. (Doctor), University of Hawai'i at Mānoa.

Mansfield, Louise, Norma Daykin, Catherine Meads, Alan Tomlinson, Karen Gray, Jack Lane, en Christina Victor. "A Conceptual review of loneliness across the adult life course (16+ years): Synthesis of qualitative studies". What Works Well-Beings, 1 January 2019. https://researchportal.tuni.fi/en/publications/a-conceptual-review-of-loneliness-across-the-adult-life-course-16.

Mazumder, Robin", n.d. https://scholar.google.com/citations?user=JvKLnN0AAAAJ&hl=en.

McMillan, D. W. and Chavis, D. M. (1986) 'Sense of community: A definition and theory', Journal of community psychology, 14(1), pp. 6–23.

Meyer, Han, en Daan Zandbelt. High-rise And The Sustainable City, 2012.

Ministerie van Volksgezondheid, Welzijn en Sport. "Feiten en Cijfers Rond Eenzaamheid". Over Eenzaamheid | Alles Over Eenzaamheid, 9 October 2023. https://www.eenzaam.nl/over-eenzaamheid/feiten-en-cijfers-rond-eenzaamheid.

Moztarzadeh, Hamed & Sajjadi, Khatereh. (2019). Explaining The Effective Features of Open and Semi-Open Spaces In Availability and Increase of Social Interactions in Residential Complexes. 9. 67-76.

Nazif, Hasan & Yousefi, Niloofar. (2024). The Impact on People's Well-being of Utilizing Greenery in the Design of High-rise Residential Building Balconies. 10.32388/XZAMMG.2.

Nguyen, L. P., van den Berg, P. E., Kemperman, A. D., & Mohammadi, M. (2024). Social impacts of living in high-rise apartment buildings: The effects of buildings and neighborhoods. Journal of Urban Affairs, 1–22. https://doi-org.tudelft.idm.oclc.org/10.1080/07352166.2024.2311165

Noordenbos, Sara. Eindhoven University Of Technology Research Portal. "Social Cohesion And Interaction in High Rise Buildings", n.d. https://research.tue.nl/en/studentTheses/social-cohesion-and-interaction-in-high-rise-buildings.

Peavey, Erin. The Centre for Conscious Design. "Healing Loneliness: 6 Ways To Design For Social Connection And Community | The Centre For Conscious Design", 14 February 2024. https://theccd.org/blog-post/healing-loneliness-6-ways-to-design-for-social-connection-and-community/.

Peen, Jaap, Jack Dekker, Robert A. Schoevers, Margreet Ten Have, Ron De Graaf, en Aartjan T. Beekman. "Is The Prevalence Of Psychiatric Disorders Associated With Urbanization?" Social Psychiatry And Psychiatric Epidemiology 42, nr. 12 (25 September 2007): 984–89. https://doi.org/10.1007/s00127-007-0256-2.

Perkins, Douglas D., en D. Adam Long. "Neighborhood Sense Of Community And Social Capital". In The Plenum series in social/clinical psychology, 291–318, 2002. https://doi.org/10.1007/978-1-4615-0719-2_15.

Perlman, Daniel, University of British Columbia, Letitia Anne Peplau, en University of California, Los Angeles. "Loneliness". Loneliness, 1982, p. 38. https://peplau.psych.ucla.edu/wp-content/uploads/sites/141/2017/07/Perlman-Peplau-98.pdf.

Pietrzak, J. "Development Of High-rise Buildings in Europe in The 20th And 21st Centuries". Challenges Of Modern Technology - Tom Vol. 5, No. 4 (2014) - BazTech - Yadda, 2014. http://yadda.icm.edu.pl/baztech/element/bwmeta1.element.baztech-07ec0c2b-8817-4191-bde1-0e28e7a1361b.

Poon, Linda. "Bloomberg - Are You A Robot?", 31 March 2017. https://www.bloomberg.com/news/articles/2017-03-31/designing-productive-public-spaces-for-low-income-neighborhoods.

Poot, Tine & Van Acker, Marchen & Vos, Els. (2016). The Public Interior: The meeting place for the urban and the interior. IDEA. 15. 54-64. 10.37113/ideaj.vi0.52.

Potezica, Tanja 2022. "High-rises For Housing: The Integration Of High-rise Buildings Into The Housing Landscapes Of Amster", 28 April 2022. https://issuu.com/tanjapotezica/docs/master_thesis_tanja_potezica_digital.

Bibliography

Resna, Riksa Wibawa, Widianti Widianti, Wahyu Nofiantoro, Rachmayanti Iskandar, Dwi Maylina Ashbahna, Royani Royani, en Susi Susilawati. "Social Environment Support To Overcome Loneliness Among Older Adults: A Scoping Review". Belitung Nursing Journal 8, nr. 3 (28 June 2022): 197–203. https://doi.org/10.33546/bnj.2092.

RIVM. "Eenzaamheid", n.d. https://www.rivm.nl/mentale-gezondheid/monitor/algemene-bevolking/eenzaamheid.

RWJF. "Growing Demands For Healthy Public Spaces", n.d. https://www.rwjf.org/en/about-rwjf/how-we-work/learning-and-evaluation/learning-across-global-borders/six-global-trends-in-health-equity/growing-demands-for-healthy-public-spaces.html.

Shah, Rajiv & Kesan, Jay. (2007). How Architecture Regulates. Journal of Architectural and Planning Research. 24. https://www.researchgate.net/publication/228880819_How_Architecture_Regulates

Smith, A, Gregory. "Across U.S. Religious Groups, More See Decline Of Marriage As Negative Than Positive". Pew Research Center, 14 April 2024. https://www.pewresearch.org/short-reads/2023/09/14/across-us-religious-groups-more-see-decline-of-marriage-as-negative-than-positive/.

Stadsarchief Rotterdam. "Kop Van Zuid | Stadsarchief Rotterdam". Stadsarchief Rotterdam, n.d. https://stadsarchief.rotterdam.nl/zoek-en-ontdek/themas/kop-van-zuid/kop-van-zuid/.

Stadsarchief Rotterdam. "Kop Van Zuid | Stadsarchief Rotterdam". Stadsarchief Rotterdam, n.d. https://stadsarchief.rotterdam.nl/zoek-en-ontdek/themas/kop-van-zuid/kop-van-zuid/.

Stensberg, Ernest. "An Integrative Theory Of Urban Design". Journal Of The American Planning Association 66, nr. 3 (30 September 2000): 265–78. https://doi.org/10.1080/01944360008976106.

Stichting Hoogbouw. HOOG BOUW: Een Studie Naar Nederlandse Hoogbouwcultuur, 2008. https://www.stichtinghoogbouw.nl/download/hoogbouwbeleid.pdf.

Szejnfeld, Marta. (2017). City structure - the phenomenon of anonymity.

Tereszweski, Marcin. "Space And Identity in J. G. Ballard's Urban Disaster Fiction - ProQuest", n.d. https://www.proquest.com/openview/54896bc01eed770e8b1482081f6d2a0c/1?pq-origsite=gscholar&cbl=5377065.

Thompson, Derek. "Why Americans Suddenly Stopped Hanging Out". The Atlantic, 15 February 2024. https://www.theatlantic.com/ideas/archive/2024/02/america-decline-hanging-out/677451/.

Turner, Royce, en Andrea Wigfield. "It's Time To Recognise How Harmful High-rise Living Can Be For Residents". Clinical Psychology Forum 1, nr. 306 (1 June 2018): 11–13. https://doi.org/10.53841/bpscpf.2018.1.306.11.

UC Santa Barbara, CSISS Classics, en John Corbett. "Alice Coleman: Design Disadvantagement, 1985", 2003. https://escholarship.org/content/qt9sw3c9vf/qt9sw3c9vf.pdf?t=o0wun8.

Uljas, Jüri en Tallinn Pedagogical University. "SOCIAL IDENTITY INFLUENCES ON ENVIRONMENTAL ATTITUDES AND BEHAVIORS". TRAMES. Vol. 5, 2001. https://kirj.ee/wp-content/plugins/kirj/pub/Trames-3-2001-255-268_20221010155344.pdf.

Umberson, Debra, en Jennifer Karas Montez. "Social Relationships And Health: A Flashpoint For Health Policy". Journal Of Health And Social Behavior/Journal Of Health & Social Behavior 51, nr. 1_suppl (1 March 2010): S54–66. https://doi.org/10.1177/0022146510383501.

Van Bergeijk, Herman. "De Voortdurende Strijd Om Hoogbouw". Agora 34, nr. 3 (1 September 2018): 8–11. https://doi.org/10.21825/agora.v34i3.11314.

Van Putten, Bryan. "The 10 Tallest Buildings in Rotterdam". RotterdamStyle.com, 1 August 2023. https://rotterdamstyle.com/facts-stats/the-10-tallest-buildings-in-rotterdam.

Vassos, Evangelos, Carsten B Pedersen, Robin M Murray, David A Collier, en Cathryn M Lewis. "Meta-Analysis Of The Association Of Urbanicity With Schizophrenia". Schizophrenia Bulletin 38, nr. 6 (17 October 2012): 1118–23. https://doi.org/10.1093/schbul/sbs096.

Veenhoven, Ruut prof. dr. "LEEFBAARHEID", Erasmus Universiteit Rotterdam. https://personal.eur.nl/veenhoven/Pub2000s/2000i-abn.html.

Volksgezondheid en Zorg. "Eenzaamheid | Oorzaken en Gevolgen", n.d. https://www.vzinfo.nl/eenzaamheid/oorzaken-gevolg.

Wassenberg, Frank. and Bugera, Sara. "Oud Versus Nieuw: Hoogbouw in Nederland in Kaart Gebracht - Platform31 | Kennis en Netwerk Voor Stad en Regio", 17 April 2024. https://www.platform31.nl/artikelen/oud-versus-nieuw-hoogbouw-in-nederland-in-kaart-gebracht/.

Weessies, Ronnie. "Rotterdamse Hoogbouwgeschiedenis Centraal in 'Stad Zonder Hoogtevrees'". Architectenweb, n.d. https://architectenweb.nl/nieuws/artikel.aspx?id=55648.

Weiss, Sabrina. "The Psychological Tricks And Designs Hacks Used To Make Our Cities Happier". WIRED, 30 July 2019. https://www.wired.com/story/city-design-architecture-happiness-wellbeing/.

Wener, Richard, en Hannah Carmalt. "Environmental Psychology And Sustainability in High-rise Structures". Technology in Society 28, nr. 1–2 (1 January 2006): 157–67. https://doi.org/10.1016/j.techsoc.2005.10.016.

Wenyuan Wu en Xin Janet Ge, "Communal Space Design of High-Rise Apartments: A Literature Review" (thesis, University of Technology Sydney, 2020), https://doi.org/10.22452/jdbe.vol20no1.4.

Yao, Yao. "High – Rise Housing and Social Interaction Study Under Current Chinese High-rise Residential Situation". Master theses, ROCHESTER INSTITUTE OF TECHNOLOGY, 2020. https://repository.rit.edu/cgi/viewcontent.cgi?article=11512&context=theses.

Yau, Yung "Does High-rise Residential Building Design Shape Antisocial Behaviour?" Property Management 36, nr. 4 (24 July 2018): 483–503. https://doi.org/10.1108/pm-10-2017-0057.

Yazdanpour, Anahita & Moztarzadeh, Hamed. (2014). Sense of Belonging in Research Building. Advances in Environmental Biology. 8. 561-567. https://www.researchgate.net/publication/269695972_Sense_of_Belonging_in_Research_Building

Zarghami, Esmaeil, Mehrdad Karimimoshaver, Abdulhamid Ghanbaran, en Pooria SaadatiVaghar. "Assessing The Oppressive Impact Of The Form Of Tall Buildings On Citizens: Height, Width, And Height-to-width Ratio". Environmental Impact Assessment Review 79 (1 November2019): 106287. https://doi.org/10.1016/j.eiar.2019.106287.

Citizens: Height, Width, And Height-to-width Ratio". Environmental Impact Assessment Review 79 (1 November2019): 106287. https://doi.org/10.1016/j.eiar.2019.106287.

Bibliography

Citizens: Height, Width, And Height-to-width Ratio". Environmental Impact Assessment Review 79 (1 November2019): 106287. https://doi.org/10.1016/j.eiar.2019.106287.

"Mensen in Sociale Isolatie Als Gevolg van de Coronacrisis | RIVM", n.d. https://www.rivm.nl/documenten/mensen-in-sociale-isolatie-als-gevolg-van-coronacrisis.

"Wijkprofiel Rotterdam", n.d. https://wijkprofiel.rotterdam.nl/nl/2024/rotterdam/feijenoord/kop-van-zuid.

"Wijkprofiel Rotterdam", n.d. https://wijkprofiel.rotterdam.nl/nl/2024/rotterdam/rotterdam-centrum/stadsdriehoek.

"Wijkprofiel Rotterdam", n.d. https://wijkprofiel.rotterdam.nl/nl/2024/rotterdam/rotterdam-centrum/nieuwe-werkdijkzigt.

"Wijkprofiel Rotterdam", n.d. https://wijkprofiel.rotterdam.nl/nl/2024/rotterdam/rotterdam-centrum/cool?toon=alles.

"Wijkprofiel Rotterdam", n.d. https://wijkprofiel.rotterdam.nl/nl/2016/rotterdam/feijenoord/afrikaanderwijk.

"Woontevredenheid Bewoners Hoogbouw Binnenstad", 28 November2022. https://onderzoek010.nl/news/Woontevredenheid-bewoners-hoogbouw-Binnenstad/359.

Reference images

New Orleans: Rotterdam architectuurprijs. (2013) New Orleans,. https://www.rotterdamarchitectuurprijs.nl/vorige-edities/2012/new-orleans.html

The Red Apple: Blankestijn, Hester. (n.d.) The Red Apple Rotterdam. https://www.roodenburg.nl/projecten/the-red-apple-rotterdam/

Zalmhaven I: Sten. (2022) Picture of the Zalmhaventoren. https://commons.wikimedia.org/wiki/File:Zalmhaventoren_(cropped).jpg

Cooltoren: Rotterdam1904. (2022). De Cooltoren enkele maanden voor opleveing, 2022. https://commons.wikimedia.org/wiki/File:Cooltoren_-_september_2022.jpg

Figure 5. Pietrzark, Joanna. (2014) Project of European cities with buildings over 100 meters height by 2018. https://yadda.icm.edu.pl/baztech/element/bwmeta1.element.baztech-07ec0c2b-8817-4191-bde1-0e28e7a1361b/c/chmot54_07.pdf

Figure 6. Pietrzark, Joanna. (2014) European high-rise buildings, 100meters or taller, completed each decade and under construction: by function. https://yadda.icm.edu.pl/baztech/element/bwmeta1.element.baztech-07ec0c2b-8817-4191-bde1-0e28e7a1361b/c/chmot54_07.pdf

Figure 7. Gemeente Rotterdam. (2019) Hoogte kaart hoogbouw in Rottedam. https://www.stichtinghoogbouw.nl/wp-content/uploads/2019/10/Hoogbouwvisie-2019.pdf

Figure 8. Art of Rotterdam. (2022) De Rotterdamse hoogbouw-as loopt aan het einde van dit decennium nog veel meer dan nu heel duidelijk vanaf Rijnhaven, via Kop van Zuid, langs de Schiedamsedijk en Coolsingel naar Hofplein en Rotterdam Centraal. https://www.dehavenloods.nl/nieuws/algemeen/44232/tegenslagen-bij-bouw-van-nieuwe-torens-maar-al-gaat-maar-de-hel#

Figurelist

Figure 9. Ashwin A., Kotwal MD. And Irena S. (2021) Loneliness and social isolation. Are common at the end of life. https://x.com/agsjournal/status/1414714564575260678

Figure 10. Kemperman, Astrid. & van den Berg, Pauline. (2019) Conceptual model: Factors influencing loneliness in the aging population. https://www.mdpi.com/1660-4601/16/3/406

Figure 11. Fu, Kathleen. (2020) Anti-social public space. https://medium.com/humanics/strangers-in-the-sky-a-designers-guide-to-tackling-urban-loneliness-part-a-31991bd66e60

Figure 12. Fu, Kathleen. (2020) Anti-social high-rise. https://medium.com/humanics/strangers-in-the-sky-a-designers-guide-to-tackling-urban-loneliness-part-a-31991bd66e60

Figure 59. Gemeente Rotterdam. (2022) Waardering voor aspecten van het gebouw: totaalgemiddelde en (bij significantie voor het aspect): gemiddelde per groep hoogbouwappartementen. https://onderzoek010.nl/handlers/ballroom.ashx?function=download&id=786

Figure 60. Gemeente Rotterdam. (2022) Waardering voor aspecten van de directe omgeving: totaalgemiddelde en (bij significantie voor het aspect): gemiddelde per groep hoogbouwappartementen. https://onderzoek010.nl/handlers/ballroom.ashx?function=download&id=786

Figure 61. Gemeente Rotterdam. (2022) Overzicht uitkomsten vier stellingen sociale sfeer en veiligheid. https://onderzoek010.nl/handlers/ballroom.ashx?function=download&id=786

Figure 64. Popa, Corina. (2018) http://www.archi-re.com/architectural-ponderings/the-walkway-the-front-door-and-the-justus-van-effen-complex/

Figure 65. Sluijsman, Nanda. (2023) Le Medi in Rotterdam. https://stadszaken.nl/artikel/5172/lijstje-zeven-inspirerende-woonwijken

Figure 66. Helleman. Gerben. (2023) Schaken in de Centrale Bibliotheek Rotterdam. https://www.rooilijn.nl/artikelen/semi-publieke-ruimte-inleiding-op-een-themareeks/

Figure 67. Monumentenportaal. (n.d.) Verhalenhuis Belvedère – Rechthuislaan 1 – Rotterdam. https://www.monumentenportaal.nl/locatieverhuur/verhalenhuis-belvedere

Figure 68. Gemeente Rotterdam. (n.d) de bestaande structuren en belangrijkste functies van het Zuiderpark. https://www.planviewer.nl/imro/files/NL.IMRO.0599.BP1071Zuiderpark-va02/t_NL.IMRO.0599.BP1071Zuiderpark-va02.html

Figure 69. Immaterieel erfgoed. (2023) https://www.immaterieelerfgoed.nl/nl/aktiegroep-het-oude-west-en-rotterdam.

Figure 71. Barcode architect. (2020) Masteplan Rijnhaven. https://barcodearchitects.com/projects/master-plan-rijnhaven-rotterdam/

Figure 72. Archief gemeentenwerken Rotterdam. (1888) Plankaart van de Rijnhaven 1888. https://contrei.eu/projecten/171027-rotterdam-rijnhaven/

Figure 73. Bouwkundig weekblad. Jrg. (1931) De Fenixloodsen in het interbellum. https://contrei.eu/projecten/171027-rotterdam-rijnhaven/

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Figure 74. KBO. (2015) Rijnhaven Z.z. - zicht vanaf dak Codrico (destijds nog Latenstein) met links onder een deel van het dak van de graansilo - midden de loodsen van het havenbedrijf Klapwijk-Rapide en daarachter het Metrostation 1980. http://fotos.serc.nl/zuid-holland/rotterdam/rotterdam-28220/

Figure 75. Soesters, H. (1982) Katendrecht, het schiereiland gelegen tussen de Rijnhaven en Maashaven. De Kaap. Het woelige leven op het Rotterdamse schiereiland, 1982. https://www.dehavenloods.nl/nieuws/algemeen/47012/rotterdam-van-19toen-in-beeld-de-kaap-oh-ja-zo-was-het-

Figure 76. Barcode architects. (n.d.) Masterplan and impression Rijnhaven. https://barcodearchitects.com/projects/masterplan-rijnhaven-rotterdam/

Figure 77. Barcode architects. (n.d.) Masterplan and impression Rijnhaven. https://barcodearchitects.com/projects/masterplan-rijnhaven-rotterdam/

Figure 78. Barcode architects. (n.d.) Masterplan and impression Rijnhaven. https://barcodearchitects.com/projects/masterplan-rijnhaven-rotterdam/

Figure 79. Barcode architects. (n.d.) Masterplan and impression Rijnhaven. https://barcodearchitects.com/projects/masterplan-rijnhaven-rotterdam/

Survey January / February 2024

Beste meneer/mevrouw

Mijn naam is Linda Nguyen, en ik ben een student Architectuur aan de Technische Universiteit. Graag nodig ik u uit om deel te nemen aan een (online) enquête voor mijn masteronderzoek naar sociale interacties en contacten in hoogbouw. Dit onderzoek richt zich op de sociale dynamiek tussen bewoners in hoogbouw, waarbij ik de vier bekende woontorens in Rotterdam met elkaar vergelijk. Hierbij ligt de focus op de publieke/collectieve ruimtes die sociale interacties en contacten bevorderen. Ik hecht veel waarde aan uw ervaringen en wensen als bewoner van één van deze torens, omdat dit bijdraagt aan een beter begrip van hoe sociale binnenruimtes in hoogbouw kunnen worden ontworpen om de sociale cohesie in woontorens te bevorderen.

Het invullen van de enquête zal ongeveer 5 minuten van uw tijd in beslag nemen. Zoals bij elke online activiteit is er een risico op inbreuk, maar we zullen er alles aan doen om uw antwoorden vertrouwelijk te behandelen. De enquête zal volledig anoniem worden afgenomen, zonder het vragen van contactgegevens, en uw antwoorden en resultaten zullen op geen enkele manier persoonlijk worden gepubliceerd. Alle verzamelde gegevens worden bewaard tot het einde van het onderzoek (eind augustus 2024) en daarna verwijderd.

Uw deelname aan dit onderzoek is geheel vrijwillig, en u kunt op elk moment besluiten om niet verder deel te nemen. U heeft ook de vrijheid om vragen over te slaan. Door het aanvinken van 'ja' gaat u akkoord met deelname aan dit onderzoek en het gebruik van de verzamelde gegevens.

Mocht u nog verdere vragen hebben of interesse hebben in de publicatie van het onderzoek, dan kunt u mij bereiken via telefoon op 0642413171 of via e-mail op t.l.nguyen-2@student.tudelft.nl.

Met vriendelijke groet,
Linda Nguyen

Dear Sir/Madam,

My name is Linda Nguyen, and I am a student of Architecture at the Technical University. I would like to invite you to participate in an (online) survey for my master's research on social interactions and connections in high-rise buildings. This study focuses on the social dynamics among residents in high-rise buildings, comparing the four well-known residential towers in Rotterdam. The emphasis is on the public/collective spaces that promote social interactions and connections. Your experiences and preferences as a resident of one of these towers are highly valued, as they contribute to a better understanding of how social indoor spaces in high-rise buildings can be designed to enhance social cohesion within tower communities.

Completing the survey will take approximately 5 minutes of your time. As with any online activity, there is a risk of breach, but we will do our utmost to treat your responses confidentially. The survey will be conducted anonymously, without requesting contact information, and your answers and results will not be published in any personal way. All collected data will be retained until the end of the study (end of August 2024) and then deleted.

Your participation in this research is entirely voluntary, and you may choose to withdraw at any time. You also have the freedom to skip questions. By checking 'yes', you agree to participate in this study and the use of the collected data.

If you have any further questions or are interested in the publication of the research, please feel free to contact me by phone at 0642413171 or via email at t.l.nguyen-2@student.tudelft.nl.

Best regards,
Linda Nguyen

Survey January / February 2024

Personal information

Residential building _____

Age _____

Duration of residence _____

Household status Single / With friends or roommates / With partner(s) / With parents
With children / Residential group or other _____

Type of building

Level of dwelling _____

Type of dwelling _____

Tenure structure Ownership / Rent / Social housing / Other _____

Own experiences and social contacts

1. Can you describe your daily routing from the neighbourhood to your apartment?

_____

_____

_____

_____

_____

2. Are there any other public spaces you visit near your residential tower to meet your acquaintances or neighbours?

_____

_____

3. Are you aware of what happens daily on the street or in the neighbourhood from your own apartment?

Not at all	Sometimes	Enough	Often	All the time
1	2	3	4	5

4. How often do you meet or interact with your acquaintances or neighbours ?

Not at all	Monthly	Weekly	Daily	Multiple times daily
1	2	3	4	5

5. How well do you know your acquaintances or neighbours?

Don't know them	Not so well	Normal	Good	Very good
1	2	3	4	5

6. How satisfied are you with the amount of contacts in your living environment?

Not satisfied	It can be better	Normal	Pretty well	Very good
1	2	3	4	5

7. Do you know residents on other levels?_____ Yes / No On which level do they live? _____

8. What kind of interaction do you have with you your acquaintances or neighbours?

Recognition / Greeting / Elevator pitch / Small talk / Conversation / Activities >Type of activity _____

10. Where do you meet your acquaintances or neighbours often? Please write down all the spaces.

_____

_____

11. Do you think that this space is a suitable / comfortable space for people to interact and to know each other?

Not at all	It's something	Normal	Yes	Perfect space
1	2	3	4	5

12. Can you explain why you think that the space is (not) suitable? Please consider the following elements: Indoor/outdoor, crowded/quiet , restricted/accessible, big/small, furniture, lighting, air, view,

_____

_____

_____

13. Are there any collective or public spaces in the tower that you think are missing or can be improve for more interaction or social meetings and how?

_____

_____

Suggestions and preferences on spatial qualities for meetings

15. What kind of amenities would you like to have or add directly around or in your residential tower?

o Green parks o Playgrounds o Local shops o Offices o Supermarket

o Library o Street car / bike parking o Car free zone o Café's and Restaurants o Post office

o Leisure o Public Transport o Daycare o Art & Culture o Courtyard o Other_____

16. What kind of architectural aspects add value to the social contact in a collective / public spaces in a residential tower according to you?

o Daylight o Height o Noise o Variation o A common kitchen o Furniture o Accessibility

o Inviting o Variation of dwelling types on each level o Connection with surrounding and other buildings

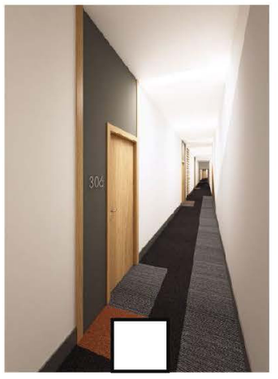
o Greenery o Human scale o Material and colour o View on neighbours o View on the city

o Open and transparent o Flexibility o Outdoor spaces o Play attributes o Active program

o Other_____

17. Cross in the desired living environment according to you

Apartment corridor

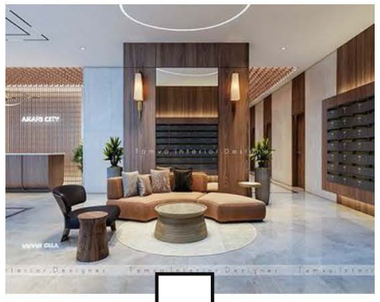


17.A Which spatial elements does attract you?

_____

_____

Collective spaces

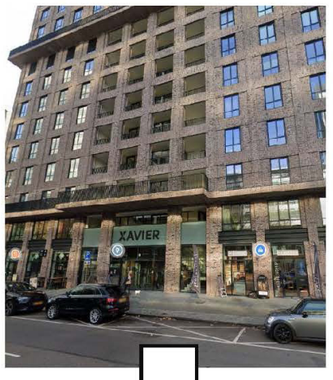


17. B Which spatial elements does attract you?

_____

_____

Entrance



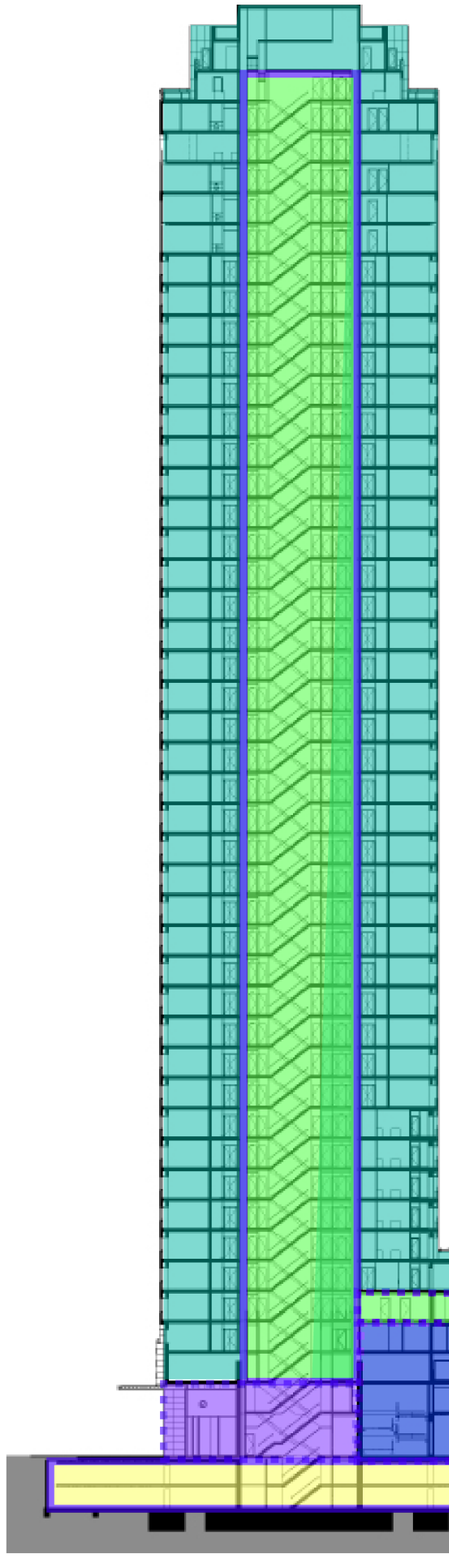
17.C Which spatial elements does attract you?

_____

_____

Thank you for your participation in this survey! Have a nice day

Apendix - Spatial analysis New Orleans



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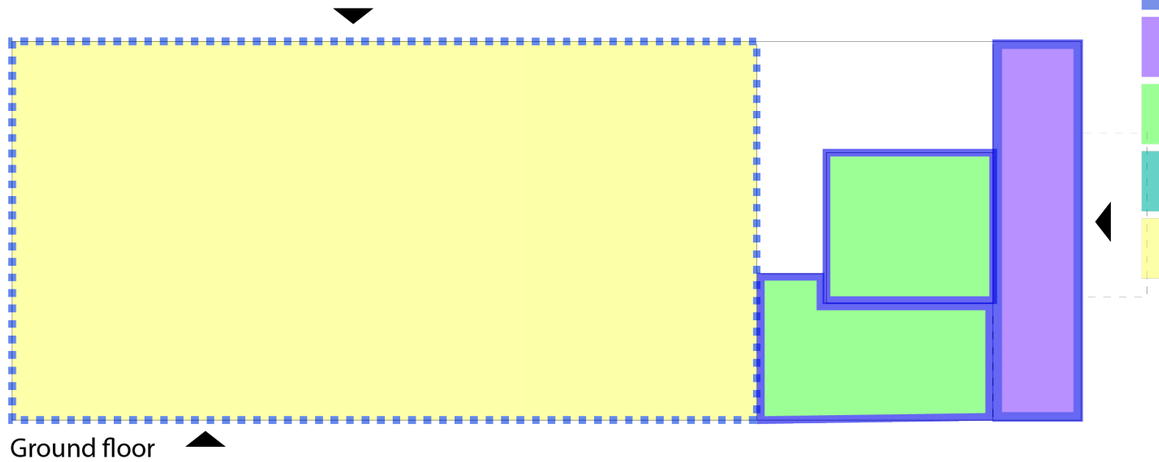
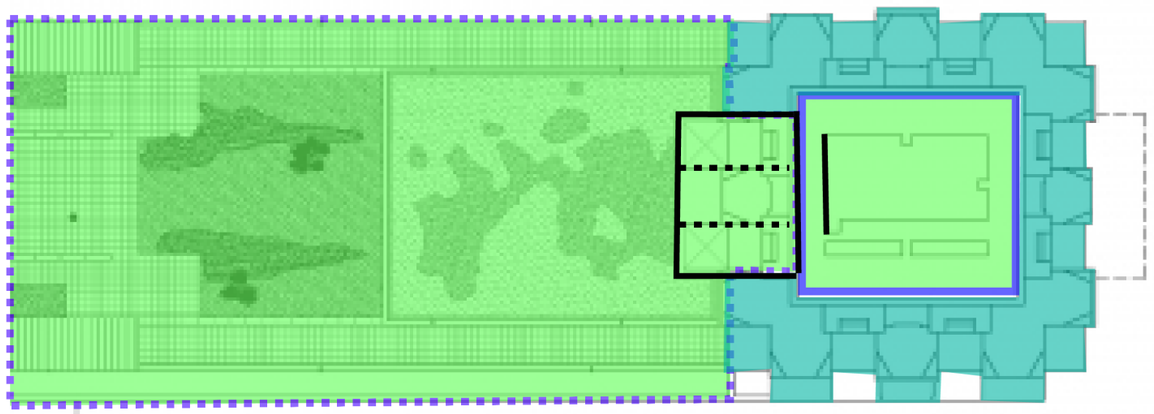
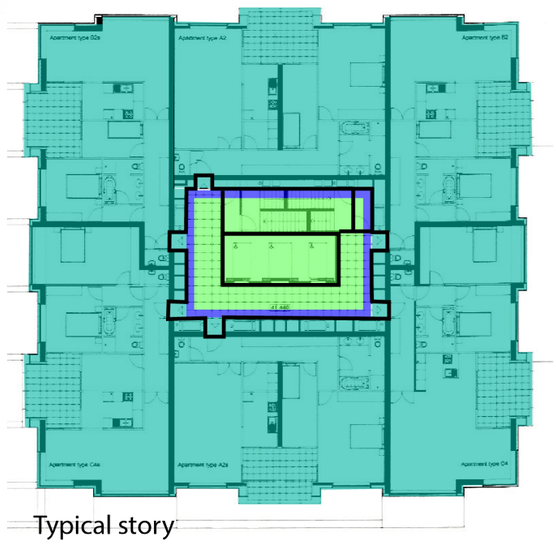
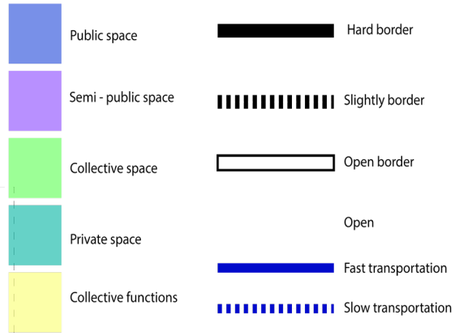
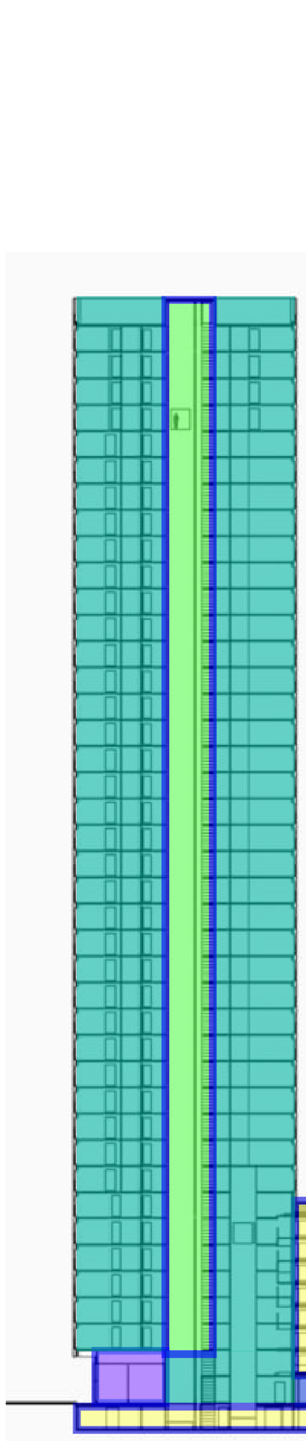








Apendix - Spatial analysis The Red Apple



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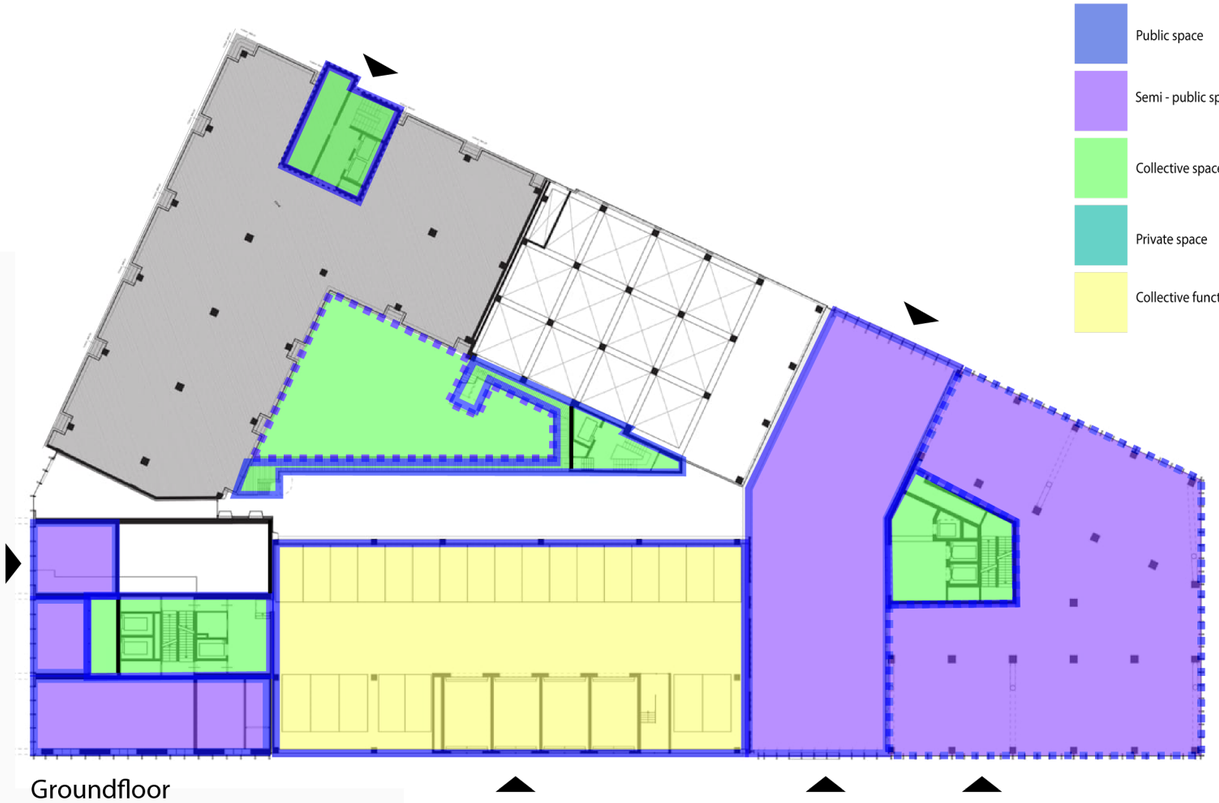
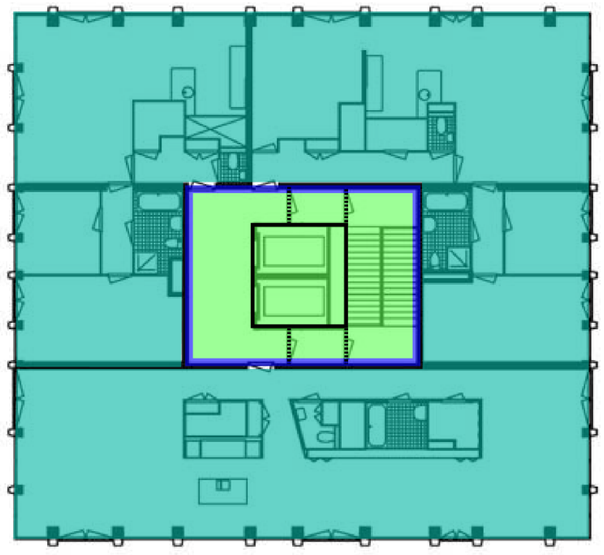
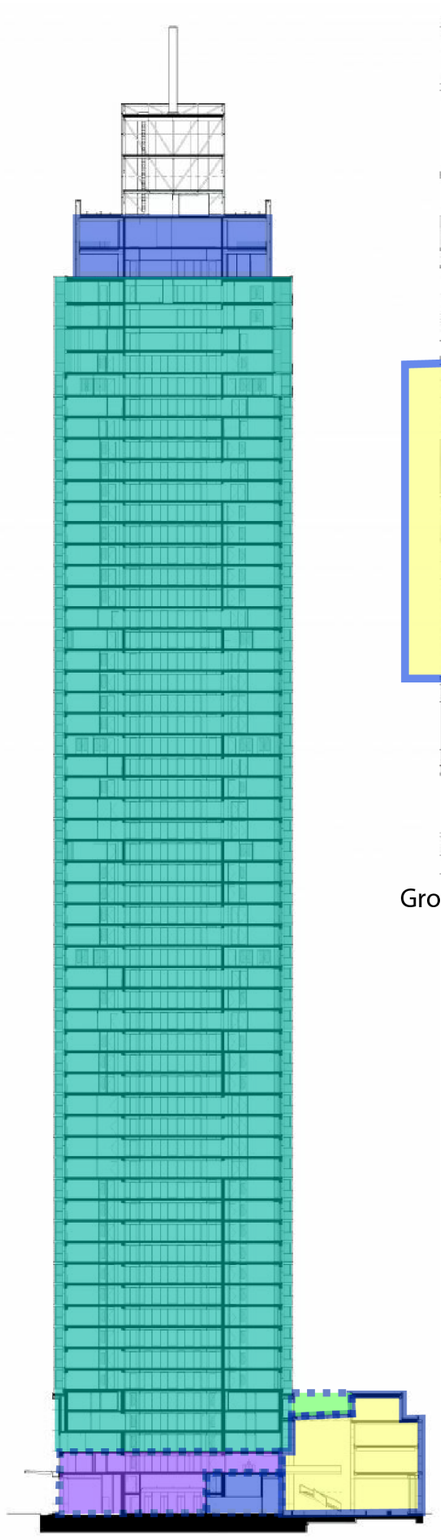


Groundfloor



Typical story

Apendix - Spatial analysis Zalmhaventower



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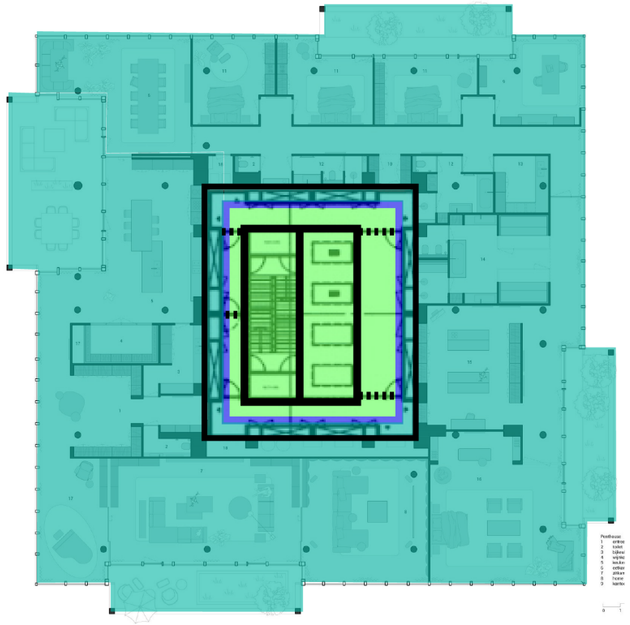
Ground floor



Typical story

Public space

Semi - public space

Collective space

Private space

Collective functions

Hard border

Slightly border

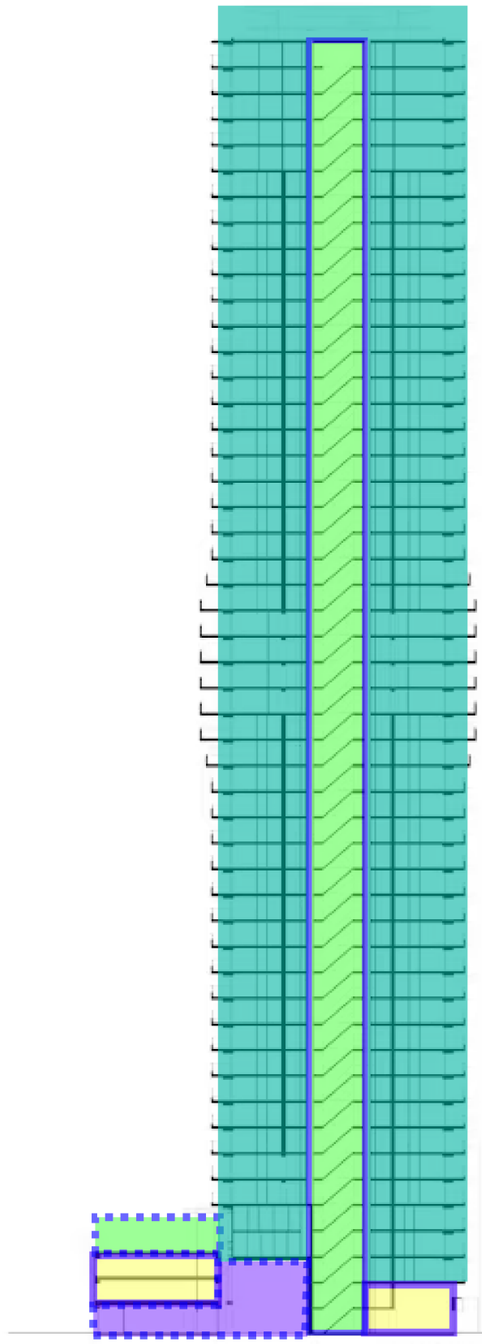
Open border

Open

Fast transportation

Slow transportation

Apendix - Spatial analysis Cooltower



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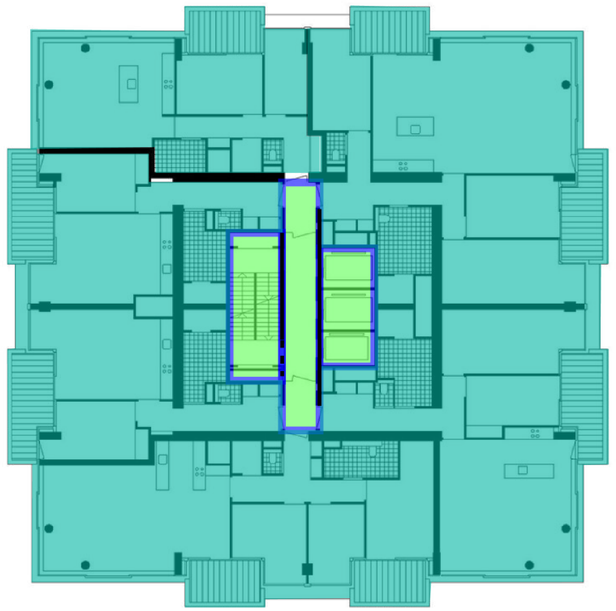
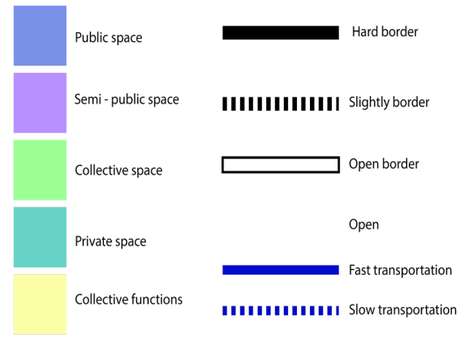
Groundfloor



Typical story



Apendix - New Orleans map

Apendix - Analysis New Orleans area

Oriental restaurant and cinema in the same street

Height of the plinth of New Orleans fits well with the height of surrounding buildings

Mini supermarket the Albert Heijn in the street

Hotels and food-hall on the other side of the street

Central partkinglot of the island (payed) with a good view around the island

The only grocery store on the island and so very crowded

Public transport is accessible on the beginnen of the ‘island’ as well as the metro as the tram

High-rise towers are scattered on the island, each with an intermediate street, square or space

Public green park with lots of seats and plenty occasions for leisurements.

Sufficient partking space. No streetparking only parkinglots and public or private parking garages

One-way traffic with plenty of space for pedestrians on both sides of the street

Walking and cycle bridge connected to Katendrecht

Buildings on the water of which offices, tiny houses and the watertaxi com-

The open side of the island to the water. Car-free zone with lots of seating occasions

New orleans belongs to one of the 5 towers on the Kop van Zuid

Apendix - The Red Apple map

Apendix - Analysis The Red Apple area

High residential towers are situated well apart from each other

Ibis hotel in the street with applied science university located on the other side of the water.

The tower has a big building volume that takes over the island' , while it is intergrated with other buildings and various facilities in the plinth

A dynamic environment thanks to the water and boats sailing around. There are also seating areas to observe the area.

Despite the entire mass, the buildings are easily distinguishable because of the façade variation

Streetparking on the facade side. Wide width for pedestrians with one-way traffic for cars

Public parking garage in the city. (mainly used by visitors in the area)

Connected with pedestrian and cycle bridges

Wide access from the street with the tower entrance is situated

Cars and bicycles are parking on the street. Mostly residential buildings and offices are located in the street

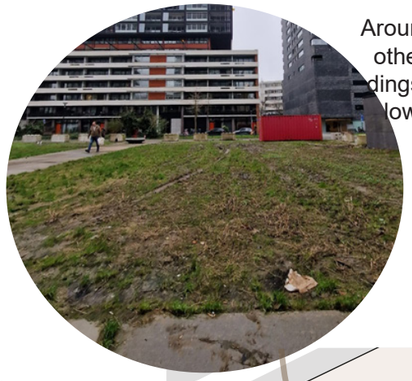
Clear overview of the area with various elements such as water, trees, boats, people and buildings

Lively environment because of many passers-by, walkers and cyclists

Apendix - Zalmhaventower map

Apendix - Analysis Zalmhaventower area

Ambition for a public green park at the front of the building, but hasn't start yet. For now its just a non-maintaining piece of grass

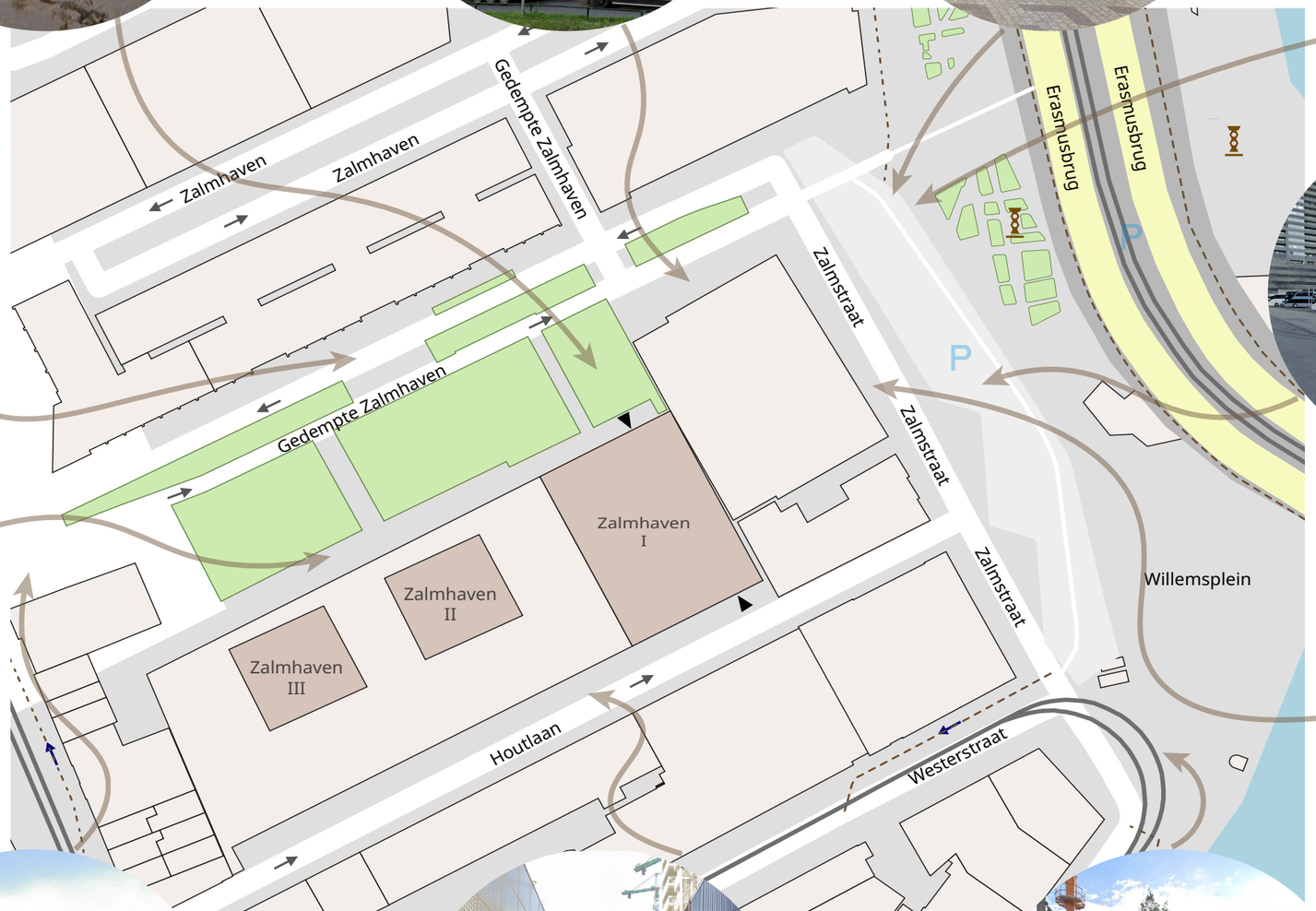


Around the Zalmhaven, other residential buildings are located from low-rise to mid-rise buildings

Open public space for scooters, cyclists and pedestrians with some greenery and seating occasions

Public parking garage under the Erasmus bridge

A wide street for traffic, pedestrians, cyclists and green. There are also plenty of parking spaces in the street



Parking spot for touring cars and busses.

The cluster of towers is highly visible on this side of the street. The street serves as a main street

Restaurant and café bars are located on the water / bridge side of the building

In this area many restaurants and bars are located. The street is lively and crowded most of the time

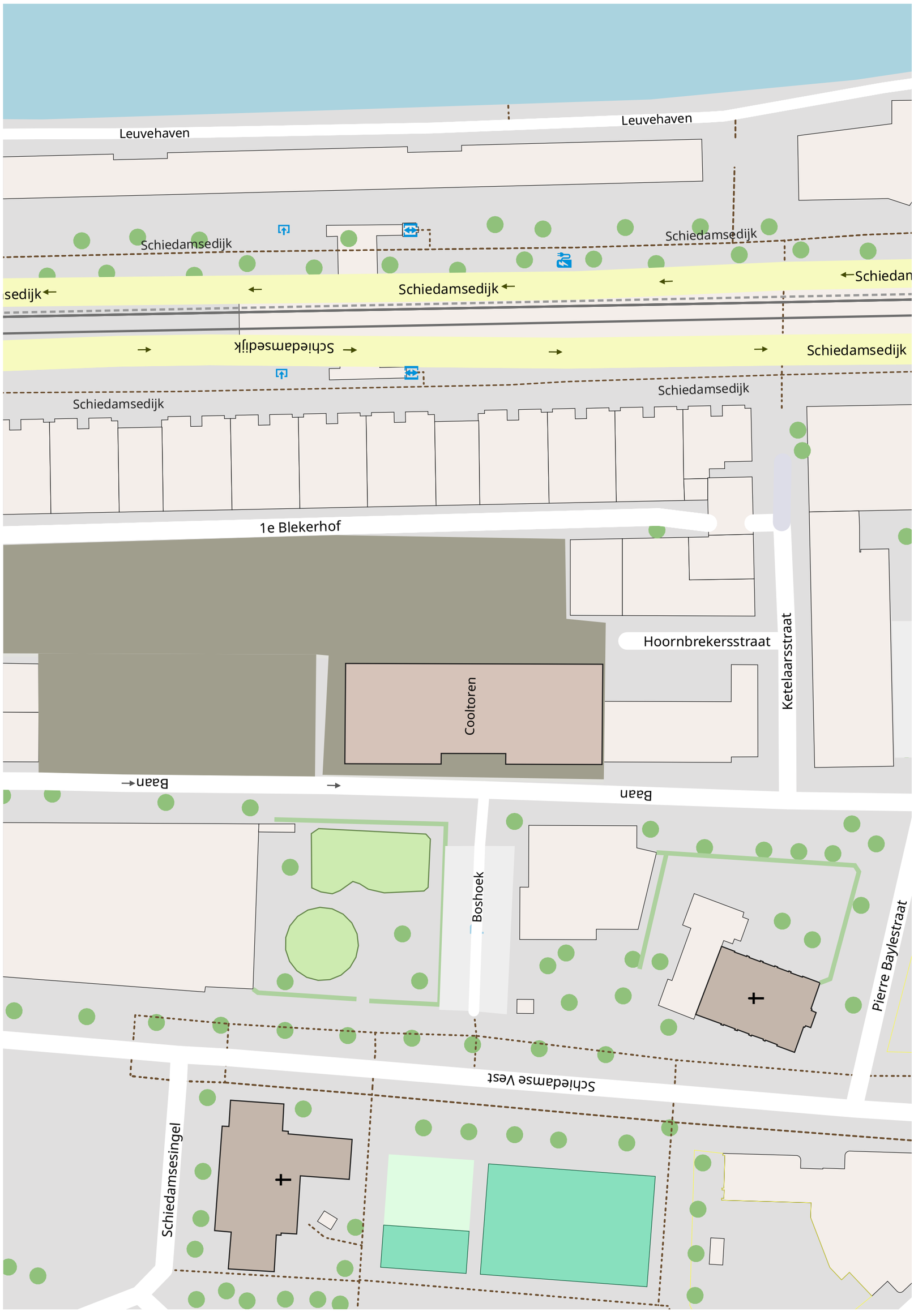
A wide street for traffic, pedestrians, cyclists and green. There are also plenty of parking spaces in

Entrance of the Zalmhaven I is accessible on both sides of the streets.

Cars are allowed to park in the street

View on the water and the Erasmus bridge that belongs to the iconic skyline of the city. Also a place for tourist activities where many touring

Apendix - Cooltower map



Apendix - Analysis Cooltower area

Other buidlings that are located in this street are: school, church, playground and the eye hospital

The entrance of the tower is not directly connected with the main streetl

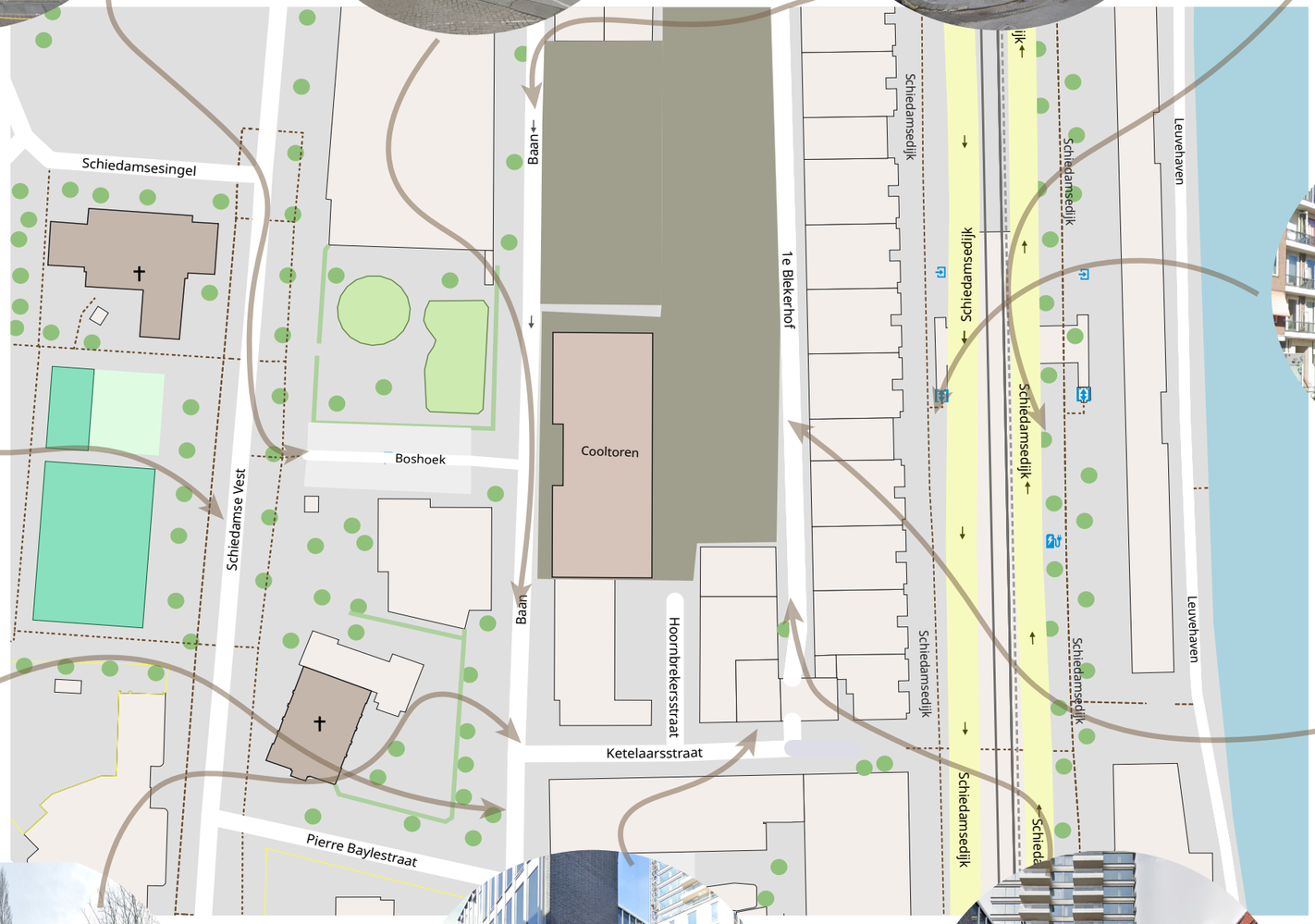
City fire station in the street with car repair garages

Old residential and office buildings in the area

View on the main street and the water. Lots of boats and museum and restaurant pavilions are located on this side of the street

The main street to the city center with a commerical plinth and residential above

The main street where much is happening and lively.



Parking on the steet where the tower is highly visible in the neighborhood, but is not located on the main street of the

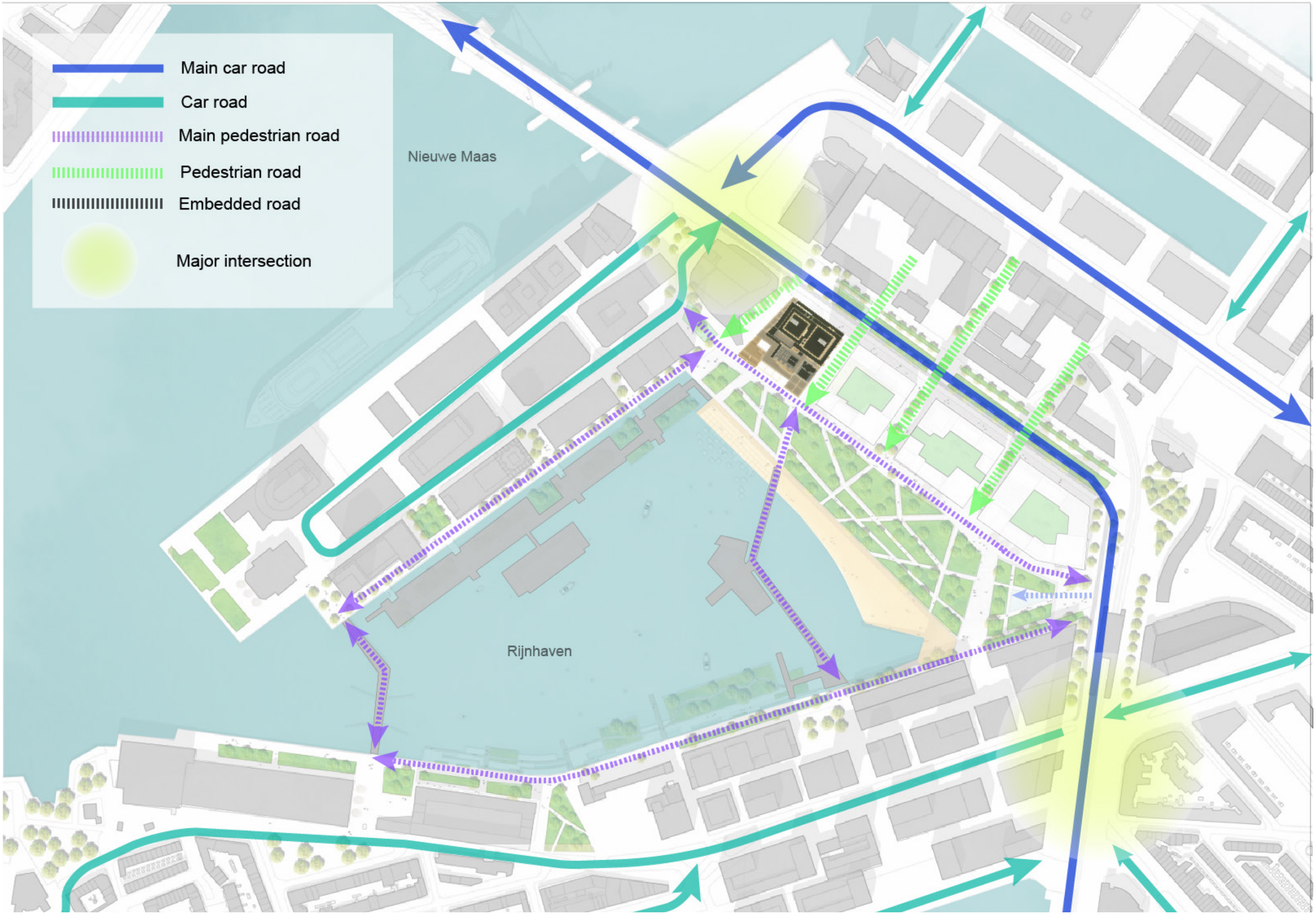
Connected to a vibrant area with many commercial, hotel and retail facilities despite the street itself does not contain

Visible junctions around the tower

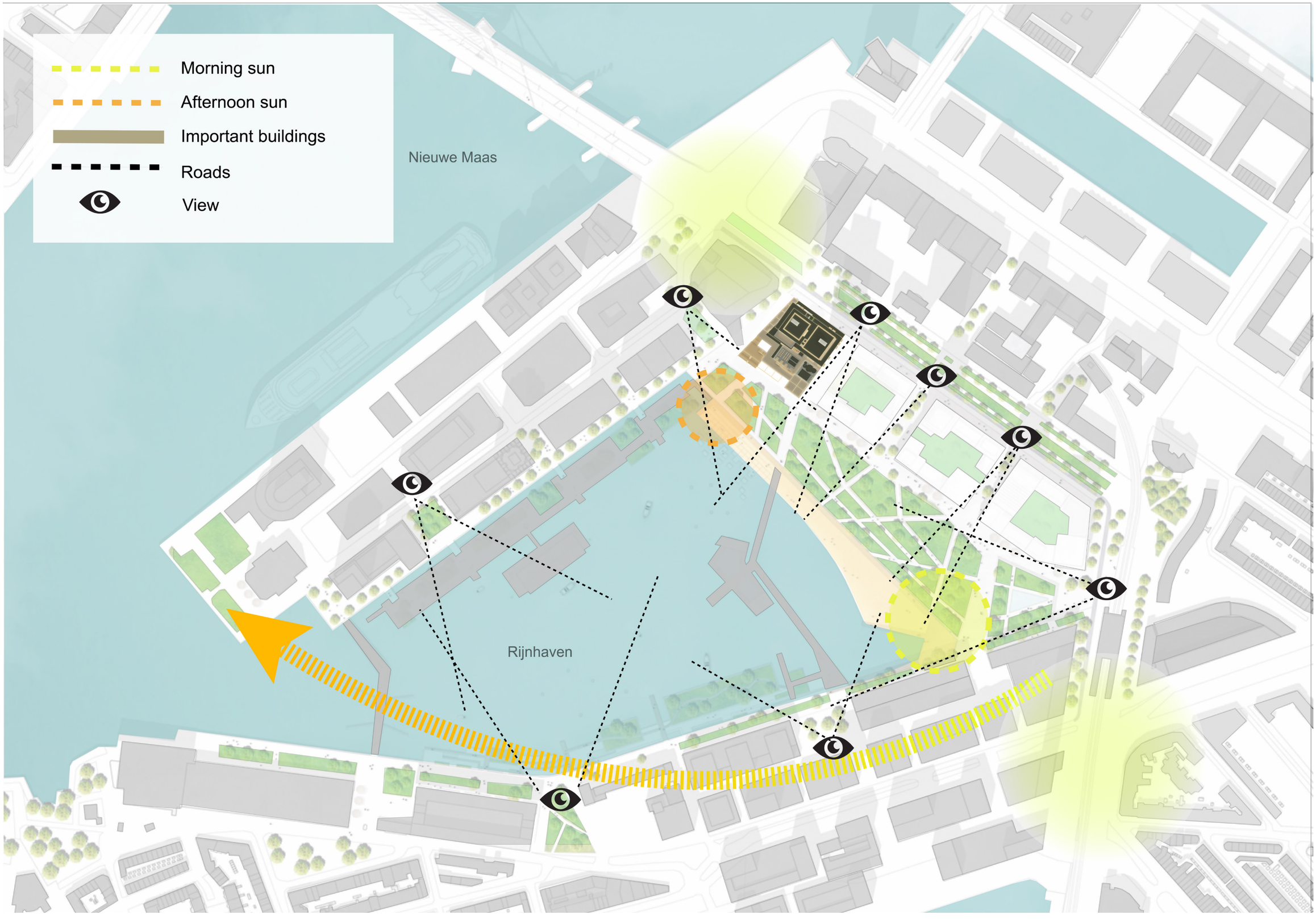
Small street on the back of the residential tower. The street is moderately used

Back side of the Cool tower, Space for cars and delivery vans. Also serves as traffic route to the main street

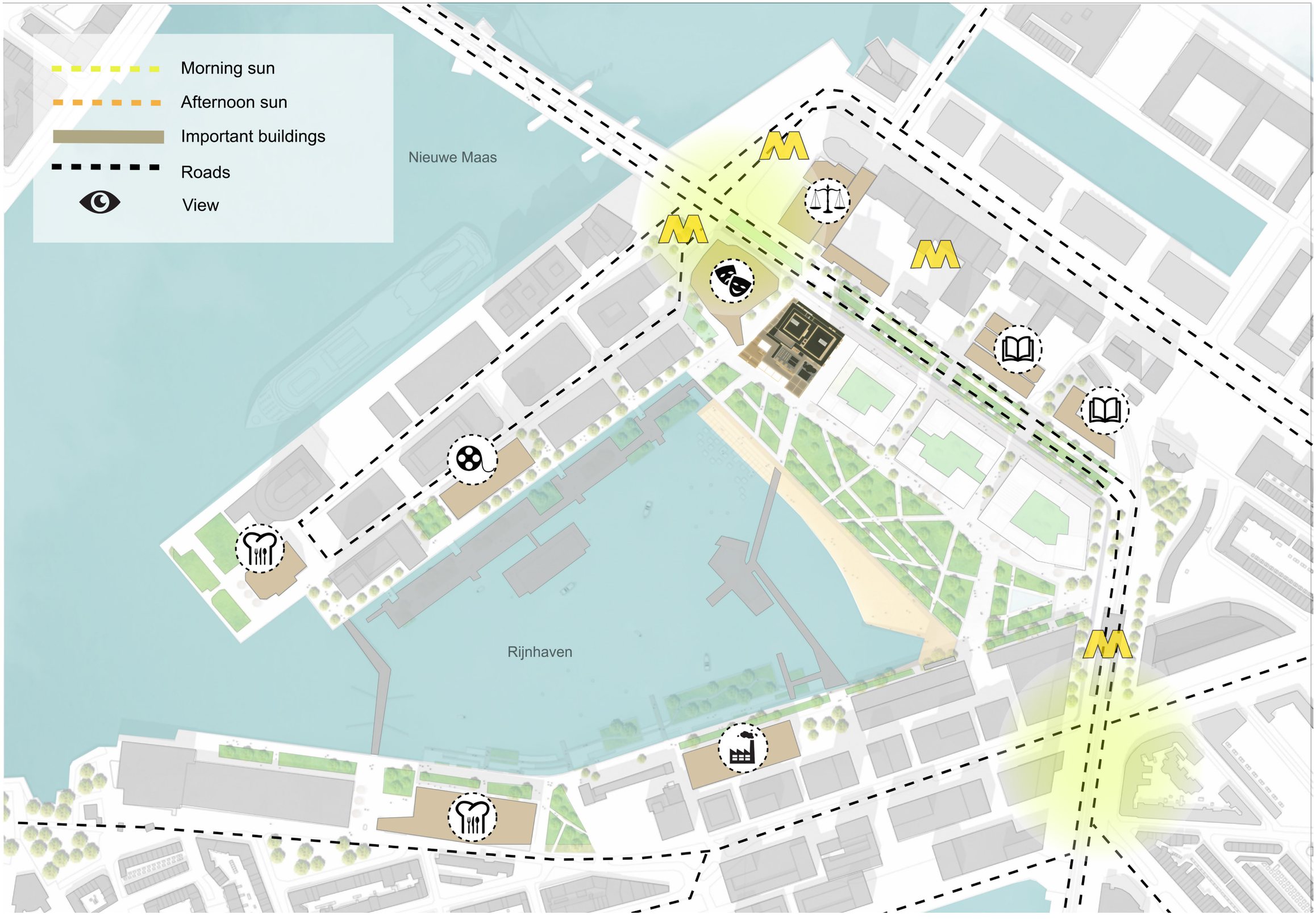
Apendix - Analysis traffic roads



Apendix - Analysis sunpath and view



Apendix - Area functions



Master thesis

Author:	Linda Tran Nguyen
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1st supervisor:	Roberto Cavallo
2nd supervisor:	Piero Medici
3rd supervisor:	Maurice Harteveld
Version:	P5-Report
Date:	01-07-2024

Title:	Social acts at height
Sub-title:	Liberated from the social loneliness in high-rise buildings
Location:	The Netherlands, Rotterdam
Case studies:	Zalmhaventower, Cooltower, Red Apple and New Orleans

University:	Technical University Delft
Faculty:	Architecture and the Built Environment
Mastertrack:	Architecture
Studio:	City of the future 2023/2024

Keywords: Social interaction, Social loneliness, Community, High-rise, Public space, Communal space, Engagement

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Faculty of Architecture
and the Built Environment