HOW ARCHITECTURE SHAPES US

A pyschological approach for a healthy, social & active architecture

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03 April 2022

TU Delft

Advanced Housing Design (AR3AD100)

Master Thesis

April 2022

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ABSTRACT

Anonymity in cities and a lack of architectural identity are some of the social-architectural challenges of our time, with profound consequences for urban life. Not only does architecture have a major impact on how we experience cities and buildings, it also has an impact on our health, wellbeing and behavior. The aim of this research is to find out how residential architecture can create identity and positively influence the mental and physical health of its inhabitants. This involves architectural design principles that can respond to users' conscious and subconscious needs to their living environment. An extensive literature search in the main areas of architectural psychology and active architecture provides insights into these issues. In addition, an analysis of case studies illustrates these issues and how they can be implemented spatially. The results show the great influence that architecture has on large parts of our lives. Among other things, it influences emotions, behavior patterns, health or the way people interact with each other. On this scientific basis, residential architecture can be designed to exert a positive influence on social, private and public life.

DESIGN BRIEF

At the beginning of the studio, an extensive urban analysis was conducted by the students on the site of Walenurghof, as well as the larger context of the surroundings in Rotterdam Blijdorp. The result of eight thematic fields of this analysis is thereby the basis of the master plan and the individual design. Due to the complexity of these eight themes, I chose to focus on four of those themes. Starting with „healthy living" and „social context", which are aspects that I take into consideration as key factors and are intended to address important needs of Rotterdam's population. I want to address a healthy and social living environment that not only serves to increase the quality of life and satisfaction of the residents themselves, but in the larger picture also has a positive impact on Rotterdams society. By promoting mental and physical health, as well as fostering a community, the risk of stress and loneliness and an unhealthy lifestyle, which today represents a major cost for the health system and society, decreases. Also the inclusion of quality green spaces has a positive effect on health and social life on the whole environment. My project focuses towards a qualitative and detailed design to create a place that people can relate to. In addition, my project aims for a tenure mix between home ownership and housing cooperation to include a broad mix of different users and income levels to establish a healthy and balanced neighborhood with diverse interests and lifestyles, and to promote a framework for equality and acceptance among each other. This idea of political economy leads to the avoidance of homogeneous neighborhoods living in social segregation.

Finally, the theme of urban typologies plays an essential role of my design. The typological adaptation to the surrounding neighborhood of Blijdorp is not only harmoniously extended through low-rise, dense development, architectural diversity, and appropriate human scale, but at the same time should make street life attractive and vibrant. An attractive building and street design attracts people to this area to actively participate in urban life.

Especially the aspect of the human scale through low buildings, a small-scale urban layout and a mix of users and functions was the determining factor that shaped the group's master plan. A more traditional design of a public street and a private backside form a clear structure and come closest to the urban needs between private, collective and public. My project reflects this theme in its morphology and space program and discreetly fits as a part of the overall composition of the master plan. One of the main aspects of the

design concept are the three different building typologies, which differ in the size of the building, the housing typologies and the building set-up. These different types allow on the one hand different forms of ownership, more control of the individual parties and can better meet different requirements of different user groups. Solo dwellers in particular, but also couples, will find space in the numerous small to medium-sized apartments. In addition, there is a large number of ground floor apartments of different sizes, with two floors and with direct access to the collectively used and protected garden. These can be ideally used for families of different sizes or income range. Then there are different sized loft apartments, which also offer large space for different user groups for solo dwellers, couples or families in the higher income range.

Tenure

The three different building typologies are multiplied into a series of seven independent buildings, which allow for different tenures. One part of the buildings will be sold in ownership and the other part will be formed as housing cooperatives. In this way, various users are addressed, with different demands, income levels and community needs.

Collective Spaces

The two tenures of home-ownership and housing cooperative have different degrees of social spaces that they require. Housing cooperatives place great emphasis on collective spaces and should be accessible to all residents through the ground floor, the backyard, the stairways and the roof deck. The buildings in ownership could (partially) replace these collective spaces with private spaces. The exterior stairways of each building will be connected to the gallery entrances of the apartments to extend the living space to the outdoors and to encourage encounters among residents.

CONTENT

I. INTRODUCTION

The challenge of the Graduation Studio Advanced Housing Design (AR3AD100) is to design a livable, affordable and sustainable neighborhood at a central location in Rotterdam Blijdorp, which reduces the ecological footprint and provides social inclusion to its inhabitants. The emphasis is on a holistic approach to tackle the challenges of society and to not look at them in isolation from each other.

Theme of Investigation

The subject of this research, in short, addresses a Human Centered Design approach to residential architecture. It is a social approach that centers people in the design process to optimize positive interactions between people and buildings and can act as an improvement to the quality of life of the inhabitants. Physical and mental needs to our built environment are largely unconscious and are expressed in behaviors, emotions, health, and wellbeing (Voegeli, 2020). The primary method of the research is based on architectural psychology, which is a subcategory of environmental psychology and studies the interactions between people and architecture (Burke, 2016). The goal is to provide a scientific approach to designing buildings in a way that satisfies the psychological needs of the users. Some of these needs are, for example, connectedness to fellow citizens and neighbors, the sense of identity and belonging to a place, the relationships we shape in our homes or aesthetic and functional needs to the built environment. Investors and communities are mostly interested in commerce or cost-cutting while architects design based on their own intuition or aesthetic values without drawing on scientific basis (Keedwell, 2017). The second primary topic of this research addresses a healthy and active architecture. It comes with guidelines of improving the menal and physical wellbeing by design means, promotes physical movement through design solutions or helps to activate urban live through a human scale. The positive or negative effect of the built environment on our society is often underestimated. It can make us healthy or sick, smart or stupid, cheerful or depressed, motivated or apathetic (Goldhagen, 2020).

The user group I include in my thesis consists of solo dwellers and young families in the lower to middle income range, who on the one hand will make up the largest population of the city of Rotterdam in the future and on the other hand also have a difficult, financial position in the housing market. The user groups are analysed in more detail in chapter three.

Problem Statement

In the age of globalization, cities worldwide are experiencing rapid population growth, which is accompanied by high density and expensive housing prices. This acute housing crisis is forcing people into smaller dwellings and the balance between social life and private life is becoming more difficult (Sim & Gehl, 2019). In Rotterdam alone, 34,000 households are actively looking for a house to buy, but there are only 16,900 available homes for sale (as of Oct 2021) (Kooyman, 2021).

Due to the population increase together with the development of technologies and (social) media, a growing trend of anonymity in cities is emerging. While some people prefer the big city precisely because of its anonymity, which offers more privacy than suburbs, it can also have negative effects not only on social life but also on the urban city structure. People feel pushed away and alienated from their own city and often have a negative attitude towards modern residential architecture because of their anonymity and lack of identity.
(Gorski & Sredzińska, 2017).

Another critical issue is the health of city dwellers. Loneliness, stress and depression are widespread in almost all social groups, especially in large cities, with a negative impact on mental health. In Rotterdam alone, 15% of people report feeling seriously lonely (as of Sep 2020). According to the dutch National Institute of Health & Environment RIVM, this is a high number (de Vries, 2020).

Additionally to mental health, physical health also plays an important role. Due to constant technological progress, people now sit and work with computers far more often than they did 20 years ago. Another factor is the increasing comfort of our living environment. While barrier-free access, elevators or online deliveries of groceries, clothing and entertainment make life more comfortable, the consequence of these developments is that people move less actively and leave the house less often. A lack of movement promotes an unhealthy lifestyle and a decline in wellbeing (BETA office for architecture and the city, 2016).

Our built environment is not the sole cause of these problems, but it does play a significant role. Architects are challenged to solve many problems of our society architecturally and holistically. It is important that architects not only assess the needs of users, but also understand people's lives and their psychological connections to their living space. Architecture schools teach little to nothing about the psychology of people in relation to their environment. Yet this knowledge is essential to design appropriate living space (Wu & Zhang, 2015).

Research Question

Based on this Problem Statement, my Research Question is as follows:

How can architecture promote a healthy, active and social lifestyle and a sense of wellbeing among residents?
How can mid-rise residential architecture strengthen a sense of community and belonging among solo dwellers and young families by design means?

Personal Motivation

Due to the great impact architects have on the quality of people's lives, I see my biggest passion and responsibility in residential architecture. Therefore, the social character of this Advanced Housing Design studio was one of my main reasons for choosing it. I feel a strong interest in the built environment and how the people around me perceive it differently. As an architect, I feel it is my duty to respond to the problems and challenges of our cities and to have a sound knowledge not only about technical and aesthetic aspects, but also about people and their real needs. Moreover, the heated housing market concerns me personally as well. I am shortly about to finish my master's degree and would like to buy an apartment in the near future. However, the chances on the housing market are frustratingly low with a starter salary. In addition, I have lived in various apartments, cities and countries, some of which have made me feel very uncomfortable and lonely. From my own experience I know how difficult it can be to get out of such a housing situation and that especially loneliness is not only an issue for social fringe groups but can affect anyone. I want to convert my negative experiences by learning about psychology to understand how to architecturally influence the wellbeing of people.

Theoretical Framework

Through my initial research, I kept coming across the concept of the Human Scale city, initiated by architect and urban planner Jan Gehl. He advocates the concept of the human scale city through several publications and documentary films in relation to healthy urban spaces and how they affect people. He creates an interface in his research work between architecture and psychology and explores how urban spaces can work together with people to create suitable living space for the inhabitants. His research work is extensive specifically in this area.
Also Jan Gehl's office partner, David Sim published in 2019 with his book *Soft City* a research work how urban development can be more efficient, livable and better connected to its environment. Among other things, he describes how people can live better with climate change and how the Built City and architecture can adapt

and respond to the user.

The analytical research report *Active Design in Buildings* by Amsterdam-based architecture firm BETA, published in 2016, was commissioned by the city of Amsterdam and the GGD Amsterdam Public Health Service. It is about scientific connections between physical activity, happiness and general health. It explores how architecture influences our behavior and offers solutions to integrate physical activity into our lives in buildings.

Furthermore, I have consulted some environmental and architectural psychology sources. For example, the book *Headspace - The Psychology of City Living*, from the year 2017, by psychiatrist and author Dr Paul Keedwell. He covers topics about the latest findings in psychology and mental health and well-being in relation to architecture and design of our cities. In his book, he covers topics including how cities affect our well-being and satisfaction in our daily lives.

Furthermore, German psychologist, researcher and author Antje Flade also addresses the topic of residential psychology in her 2020 book *Kompendium der Architekturpsychologie*. She provides design-relevant information on architectural psychology concepts and empirical results on the effects of built environments on people and how they can be optimized.

The book *Welcome to Your World - How the built environment shapes our lives* from 2017 by U.S. American architecture critic Sarah W. Goldhagen writes about new discoveries of cognitive psychology in architecture. She describes how the built environment profoundly shapes our emotions, memories, and well-being, and argues that we must use this knowledge to adapt buildings to a human experience.

Lastly, I take anthropological research from British author Clare Cooper Marcus. She is a prominent educator in landscape design and architecture and a pioneer in the field of social issues in housing, open space design, and healing landscapes. With her book *Home as a mirror of self - Exploring the deeper meaning of home*, published in 2006, she addresses the psychology of housing and presents an exploration of our relationship to the place where we live.

Relevance

Due to the increasing density in cities and the growing challenges of our society, it is important to understand what people need to live with each other and not just next to each other. The health and wellbeing of our fellow citizens and ourselves is of concern to all of us and can be influenced through architecture and the built environment. A sound and broad knowledge of environmental psychology is crucial and with the help of my research I want to contribute to

an awareness of this subject, which is not only relevant today, but also in the coming decades. Of course, it is difficult to identify and react to future trends. However, I believe that simple principles in architecture and urban design can create resilient neighborhoods that will persist in the long run. I would like to explore these principles in detail and gain new insights. The issue of a healthy, social and people-friendly city is more relevant than ever and will continue to be an important issue for generations to come as our cities continue to grow. New challenges will continue to appear in the future, for which the city must form a flexible and resilient foundation.

Methodology

The research question is addressed using two approaches: An extensive literature research and a morphological examination based on case studies.
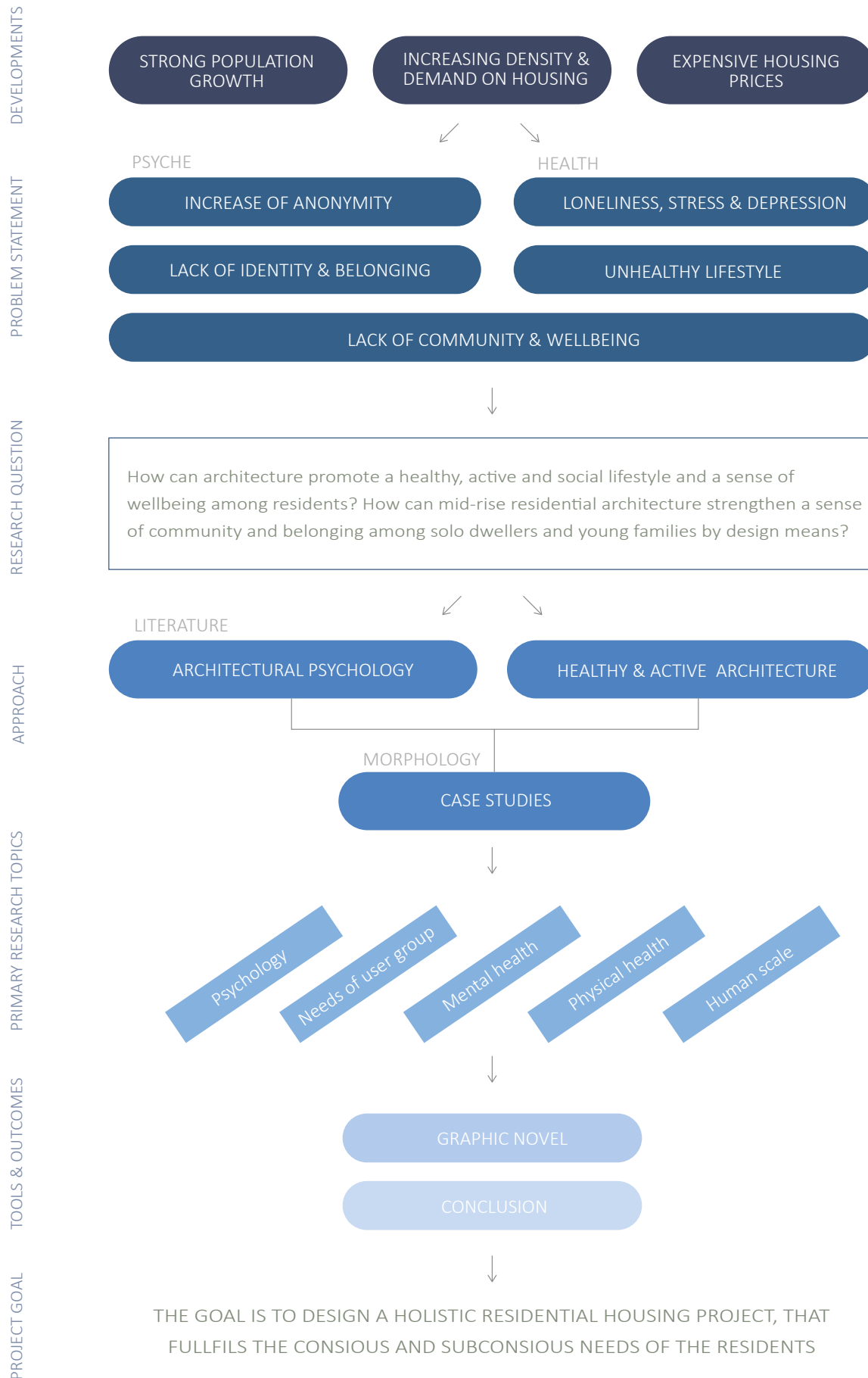
The literature research includes two core themes. The first is the architectural psychology to answer abstract issues of the research question, such as how architecture influences the sense of identity. It is largely concerned with the subconscious needs of people towards their built environment.

The second theme of the literature research deals with healthy and active architecture to answer more concrete aspects of health and wellbeing. This subject deals with the more conscious needs towards the built environment. Both themes are closely related and serve to complement each other. The morphological examination of case studies addresses the themes of the literature research. They are addressed in the last chapter to serve as a resume of the first chapters. More specifically, they serve to analyze spatial aspects such as the quality and role of their circulation space, the differentiation of private, public and collective spaces or the programmatic contribution of identity and belonging. This way they will respond to the issues mentioned in the chapters before. Ultimately, these two approaches address primary research topics of psychology, mental and physical health, and the human scale. The needs of the user groups of solo dwellers and young families also serve to project the applied themes onto specific groups of people.

In addition to the psychological and spatial analysis of their needs, both user groups serve as protagonists of the graphic novel in order to use it as a useful tool to concretely present their challenges in the housing context.

Finally, the conclusion in the last part of the thesis provides information on whether the research questions can be answered by the given topics, which aspects are useful and realistic, and if there are any discrepancies.

Research Plan

DEVELOPMENTS

| STRONG POPULATION GROWTH | INCREASING DENSITY & DEMAND ON HOUSING | EXPENSIVE HOUSING PRICES |

PROBLEM STATEMENT

PSYCHE   HEALTH

| INCREASE OF ANONYMITY | LONELINESS, STRESS & DEPRESSION |
| LACK OF IDENTITY & BELONGING | UNHEALTHY LIFESTYLE |

LACK OF COMMUNITY & WELLBEING

RESEARCH QUESTION

How can architecture promote a healthy, active and social lifestyle and a sense of wellbeing among residents? How can mid-rise residential architecture strengthen a sense of community and belonging among solo dwellers and young families by design means?

APPROACH

LITERATURE

| ARCHITECTURAL PSYCHOLOGY | HEALTHY & ACTIVE ARCHITECTURE |

MORPHOLOGY

CASE STUDIES

PRIMARY RESEARCH TOPICS

Psychology   Needs of user group   Mental health   Physical health   Human scale

TOOLS & OUTCOMES

GRAPHIC NOVEL

CONCLUSION

PROJECT GOAL

THE GOAL IS TO DESIGN A HOLISTIC RESIDENTIAL HOUSING PROJECT, THAT FULLFILS THE CONSIOUS AND SUBCONSIOUS NEEDS OF THE RESIDENTS

II. ISSUES IN CONTEMPORARY HOUSING

A holistic approach is needed today to address issues in a sustainable way, rather than dividing them into small pieces and addressing them separately. The built environment plays a significant factor in the way people behave and feel. As Winston Churchill once said, „We shape our buildings so that they can later shape us".

Cities around the world are experiencing rapid population growth, which poses challenges not only to planners, architects and communities, but to almost the entire urban population. Housing is in short supply. According to research by Rigo for Research & Advice, in Rotterdam alone, there is about 50% less housing available for purchase than households actively looking for a home to buy (as of Oct 2021). This mainly affects first-time buyers and young people with a starter salary who have little chance of getting a suitable and affordable apartment for sale in the housing market (Kooyman, 2021). But not only population growth plays a role in the housing shortage, investors do as well to some extent. As shown in the 2020 data of the land registry RTV Rijnmond, 38% of the freehold apartments are sold to investors. Due to low interest rates, buying and then renting is lucrative. This leads to rising real estate prices (Lalor, 2021).

The uncontrolled growth of the population in cities also brings a growing trend of anonymity. According to the World Youth Report, in the age of globalization, the crisis of the modern city is the uneven expansion of anonymity (Gorski & Sredzińska, 2017). But it should not be seen negatively in all aspects. Many people prefer the city precisely because of its anonymity. It offers more privacy, which they cannot find in suburbs. Most people also feel safer talking about things that might be unpopular, uncomfortable, or embarrassing. It can allow equality and free speech and encourages free personal expression (Bachmann et al., 2017). Anonymity arises in the human subconscious and is a consequence of the lack of relationships between people and space (Gorski & Sredzińska, 2017). But what are the negative effects of anonymity in cities? According to author and psychiatrist Dr Paul Keedwell, social interaction can be affected negatively as other people are perceived as irrelevant and the understanding and willingness to help towards different social groups diminishes. On the other hand, anonymity can negatively influence the perception of urban places. Undefined, random and uniform places function primarily for passing through and may deepen the sense of anonymity in the city. No human-to-human or human-to-space relationships take place in these spaces. Social bonds or a sense of identity cannot

develop, which can alter social relationships in the long term (Keedwell, 2017).

Furthermore, a lack of architectural identity can result in people not feeling connected to, caring for, or looking after their living environment. Architectural identity is a collection of values of various historical, cultural, economic or community aspects. They distinguish one place from another and give them meaning (Bahtiyar & Yaldiz, 2021). Buildings should reflect the identity of the community. According to PhD Author Martha Szejnfeld, identity describes the relationship between an individual and a space in different contexts. Architecture is about creating places that are friendly, close to people, and with which people can identify. If this is not successful, they become only passive observers instead of interacting with these places (Gorski & Sredzińska, 2017). This topic will be discussed in more detail in chapter three.

The issue of loneliness is playing an increasingly important role in mental health in our society. It does not only affect marginalized groups and the elderly, but the number of young people suffering from loneliness is increasing, too. Loneliness is the misalignment between perception and expectations of the relationship with the environment: an unhappy relationship between people and the city. Research from the Utrecht Public Health Monitor shows that certain factors contribute to a higher risk of loneliness. These are people with a lower level of education, being part of a single-parent family, living alone, having a migrant background, being unemployed, and being 80+ years old (de Vries, 2020). According to Dirk De Wachter, one of the most famous psychiatrists in the Netherlands says that there have rarely been so many people who have to walk alone in their lives. He sees the reason for this in the individualization, urbanization and the rise of social media (Berger, 2019). According to information from the Posad Maxwan loneliness map, there are 56% single person households in Rotterdam Blijdorp. Of these, 13% feel seriously lonely (as of Oct 2021). However, Jacko de With, health expert of the municipality of Utrecht says that numbers don't tell the whole story. The degree of loneliness differs by neighborhood and the time of measurement. New housing projects can combat (or increase) social loneliness. It is important that neighborhoods allow and encourage people to meet. In addition, it is important to understand that severe loneliness not only has mental, but also physical health effects, such as high blood pressure, diabetes, sleep problems, and a weakened immune system (de Vries, 2020). Ultimately, the built environment plays a part in our mental and physical health. One of the biggest health problems of our time is caused by overweight. Chronic diseases such as heart disease, strokes, cancer and diabetes are mainly caused by overweight,

which can be traced back to physical inactivity and poor nutrition. These are major costs to the health care system.
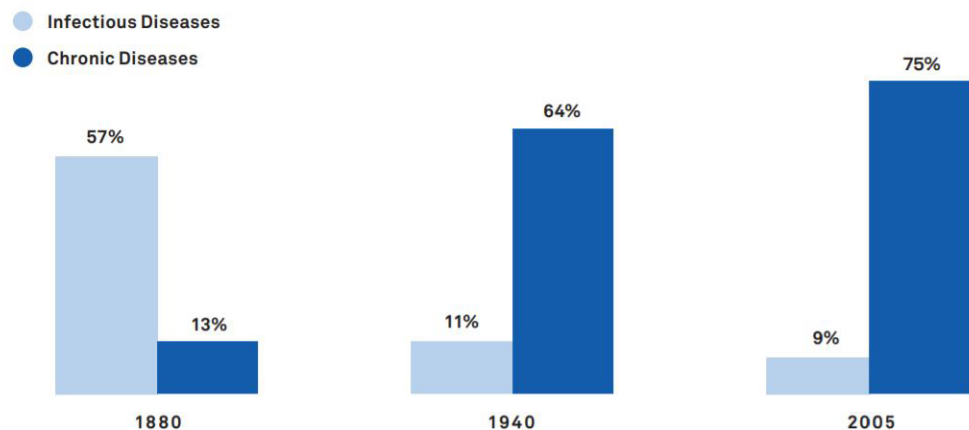

Figure 1: Development of Infectious & Chronic Diseases

Futhermore, the factor of comfort should not be overlooked. We have the possibility to have things like food, clothes or goods delivered to our doorstep. This saves a lot of time that we can use for our own leisure activities or personal relationships. However, this kind of convenience leads to significantly less physical activity (Department of Design and Construction et al., 2010). 90% of our lifetime is spent indoors. Cities and buildings can be designed to benefit our health through active design. The global pandemic has greatly impacted health in general and the way we live, work and communicate. It has raised awareness about designing cities and buildings to promote health and wellbeing (Hojniak & Hvid, 2021).

III. ARCHITECTURAL PSYCHOLOGY

A. Why a psychological approach is crucial in architecture
This section addresses the need for architectural psychology, what exactly it is, and why it can help to combat problems and challenges in architecture.

Especially in times of the pandemic, many have become aware that the spaces in which we live and work have a significant impact on personal wellbeing. Spaces influence our behavior, our relationships and our mood. They can encourage - or discourage - communication and togetherness. Architectural psychology is concerned with this interplay between spaces and emotions. Its findings can help to enhance the quality of life in our built environment (Püringer, 2021). Architecture influences the emotional life of every person who comes into contact with it, whether positively or negatively, says British neuroscientist

and author Collin Fischer (Margarete, 2018). Perceptual and thought processes, feelings, attitudes, reactions and behaviors are subjects of psychological research. Architectural psychology is the part of environmental psychology that deals with the relationships between people and the built environment. For example, why people feel a space is home or what drives people to spray graffiti on a blank wall or what makes public places worth visiting (Flade, 2020). Consequently, the appearance of buildings and neighborhoods is important not only to satisfy aesthetic needs, but to promote mental health and give places character and identity (Keedwell, 2017). According to aesthetics theory, too much simplicity promotes vandalism and can be attributed to under-complexity (Flade, 2020). Thus, architectural psychology is a scientific research that interrelates people with space. It aims to fulfill conscious and unconscious needs and can improve mental health and wellbeing.

Architecture is omnipresent; we spend almost our entire lives in it. Buildings and cities determine how we move, how we interact with each other, and how we live and withdraw. It determines public, social, professional, commercial and private life. It can harm and isolate us, or it can uplift us and keep us active.

Many architects know very little to nothing about the psychological impact of their buildings, as it is rarely taught in architecture schools. They usually design based on subjective perception. They are under pressure to consider not only social and aesthetic aspects, but also costs, time and quality demands (Margarete, 2018).

Figure 2: The illustration shows, how school children learn the difference between a „house" (left) and a „home" (right)

B. Solutions to contemporary housing issues

The following section addresses the architecture psychological approach with specific aspects of how architectural elements can enhance the wellbeing of residents. It explains the issues of identity and belonging to the home and how people respond to their built environment.

Psychiatrist and author Dr Paul Keedwell conducted a survey in 2009 with 1000 homeowners to find out how connected they felt to their home. The result was that one third of the respondents did not feel emotionally connected to their own home, even though they owned it themselves. Keedwell explains that attachment to one's home is not always possible due to stressful environments or psychological mismatch. This could be influenced by housing types, design, space, character or a stressful location.
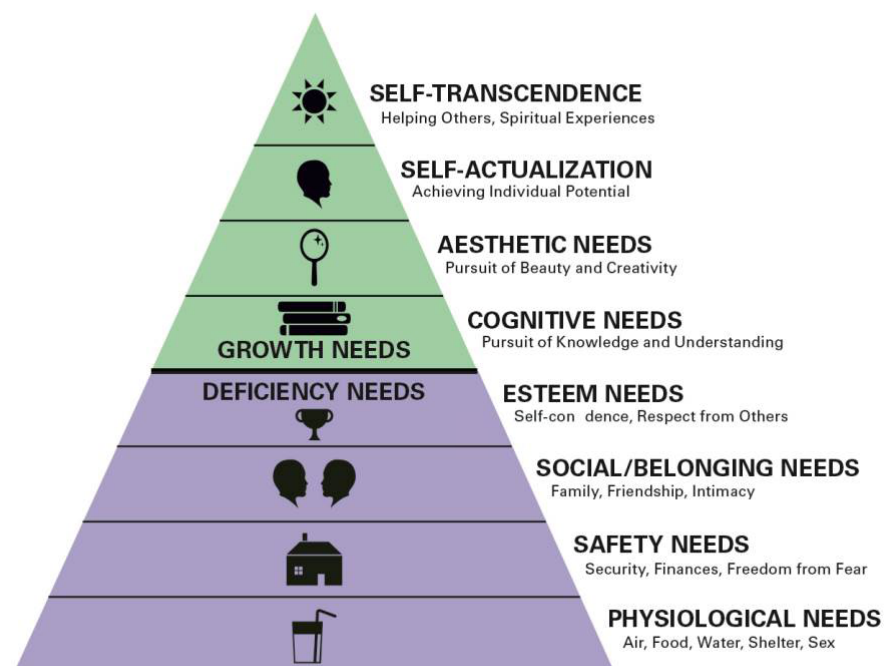
Figure 3: Maslow's hierarchy of needs- Design and Architecture impact

As mentioned in the previous chapter, the theme of identity, both urban and in the home, is an important factor in architecture. In an urban world that is subject to constant change and influence, the identity of the home environment becomes all the more important. It offers security, permanence, self-development and a sense of connection with the past and the future (Keedwell, 2017). People use their homes to consciously or unconsciously express something in them. On the conscious level we design our home to invite guests and to show what values we have. On an unconscious level, home becomes an expression from imprints of

life, childhood, a deceased relative or relationships (Marcus, 2006). An important factor in creating identity in the home lies in having maximum control of the own living space. This control is expressed in the design of the floor plan and the living space, the decoration, the furniture, with whom it is shared and personal objects.

An already imposed floor plan usually allows little room for structural adjustments to match individual living conditions. It involves high costs and effort that many residents are not comfortable with or can't afford. The result is living spaces that do not always meet the psychological needs or living circumstances of the residents. As a result, people may feel unconsciously limited in their lives and self-expression. Architects can respond to this by designing dwelling structures based on free, empty floor plans that can be individually designed and modified by residents before they move in. This type of design also allows future residents to easily reconfigure and customize the apartment structure and floor plan to meet future needs and living situations. Not only does this give a sense of maximum control, but it also leads to people feeling more comfortable in general and staying in their apartment longer. Author Olivier Marc describes in his book Psychology of the House that the most aesthetically pleasing and psychologically healthy living space is one that is organically designed from the own needs and with local materials. This is also confirmed by Mike Hardwick, project manager and self-build expert for the National Self Build & Renovation Centre. He says those who self-build are in control of planning their own current and future needs and lifestyle. This creates a much stronger sense of place. The own ideas in the design become an expression of the own personality and create identity. Self-building not only lowers construction costs, thereby creating more living space in cities where it is scarce, but also almost always leads to a stronger sense of belonging to the house and the neighborhood.
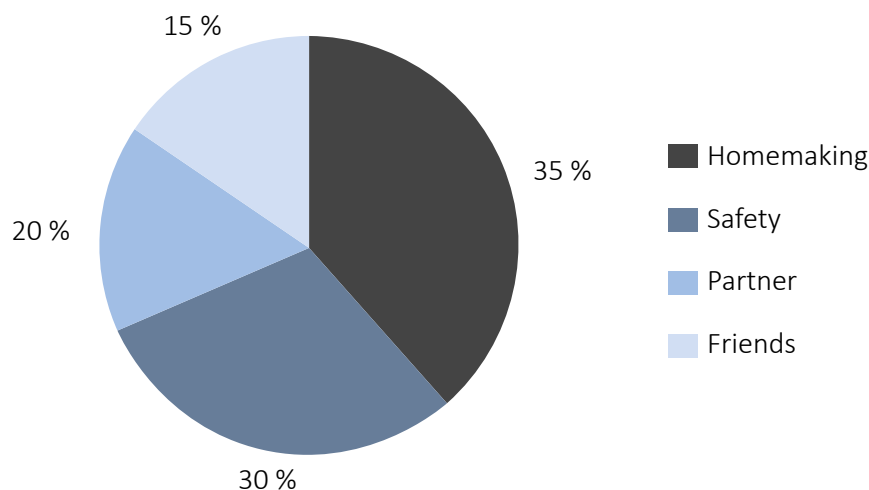
Figure 4: EVA Factors affecting the emotional value of your home

Keedwell, in his book Headspace, talks about the „Stamp of Personality"; how a person's personality determines the way we live and design our home. Being able to express the own personality is an important component of identity. For example, extroverts prefer busy and vibrant inner-city places to live, or prioritize social relationships over withdrawal and privacy. A study by Associate Professor Carl Matthews, of the School of Architecture at the University of Texas, dives deeper into this topic. Its findings indicate, in terms of interior design, that extroverts prefer direct access to spaces and less separation between public and private rooms. They also prioritize large window areas in the exterior façade to open the living space to the outside world. Bathrooms open to bedrooms and bedrooms open to living spaces. Introverts, on the other hand, tend to prefer enclosed spaces, more privacy and retreats. But his study differentiates even further between different character traits. Sensing, factual personalities, for instance, have a need for concrete information. They prefer order, symmetry and a grid-based layout. Free thinking, intuitive personalities, on the other hand, like design to be more nuanced through patterns and textures such as concrete or wood. Thinking, logical personalities prefer a more rational, symmetrical design based on a grid. They tend to avoid open interiors. Empathic, feeling personalities, on the other hand, prefer open layouts, direct access, and have a drive toward social spaces because of their strong empathy and emotional intelligence. However, Matthews also points out that this study should be taken with a grain of salt, as it is not sufficient as a single medium to determine the ideal living space. Nevertheless, it indicates how personality traits can influence the perception of spaces (Keedwell, 2017).

A room that we enter or a façade that we look at immediately evokes an emotional response, even before sensory impressions can be analyzed. Studies show that buildings made primarily of glass and steel, for instance, can affect our wellbeing and create a feeling of isolation (Nielsen, n.d.). Furthermore, room height plays an important factor in how a room is perceived. The minimum room height in Europe is 2.4 meters. However, people prefer more headroom, literally and figuratively. The psychologist and author John C. Baird published a study in the Journal of Applied Psychology about the ideal room height at home. According to this study, it is 3.04 meters, which is about 60 cm above the standard. However, rooms that are too high (for example, more than 2 stories) are perceived as rather negative, as they can make you feel exposed. In general, higher rooms are perceived as more beautiful, are more likely to be entered and appear more accessible. This can be particularly beneficial for ground floors, which are often considered the least attractive floor (Keedwell, 2017).

The premise that a space is perceived as beautiful is dependent on a positive emotional response. It is spaces that can be instantly grasped. Psychologist and author Antje Flade describes three characteristics of preferred and aesthetic environments. 1. Coherence: When individual parts make up a coherent whole, elements are related to each other and form a whole. 2. Readability: Environments are readable when it is easy to represent them cognitively. A spatially structured city is more readable than an unstructured one consisting only of uniform buildings. Readability fulfills the need for security and control. 3. Complexity: It is the number and variety of elements. The more numerous and diverse they are, the higher the complexity. However, the balance should be appropriate to not overwhelm the viewer. Elements can be different colors, columns, different facades, windows and doors, ornaments, roof and building shapes. Trees and plants also add complexity to the environment and are thus perceived as more beautiful. Plain, uniform blocks of houses with no decoration are not complex and should be avoided (Flade, 2020).

rather massive	less massive	
		horizontal or vertical devision
		row of windows
		refinement of vertical elements
		trees in the foreground
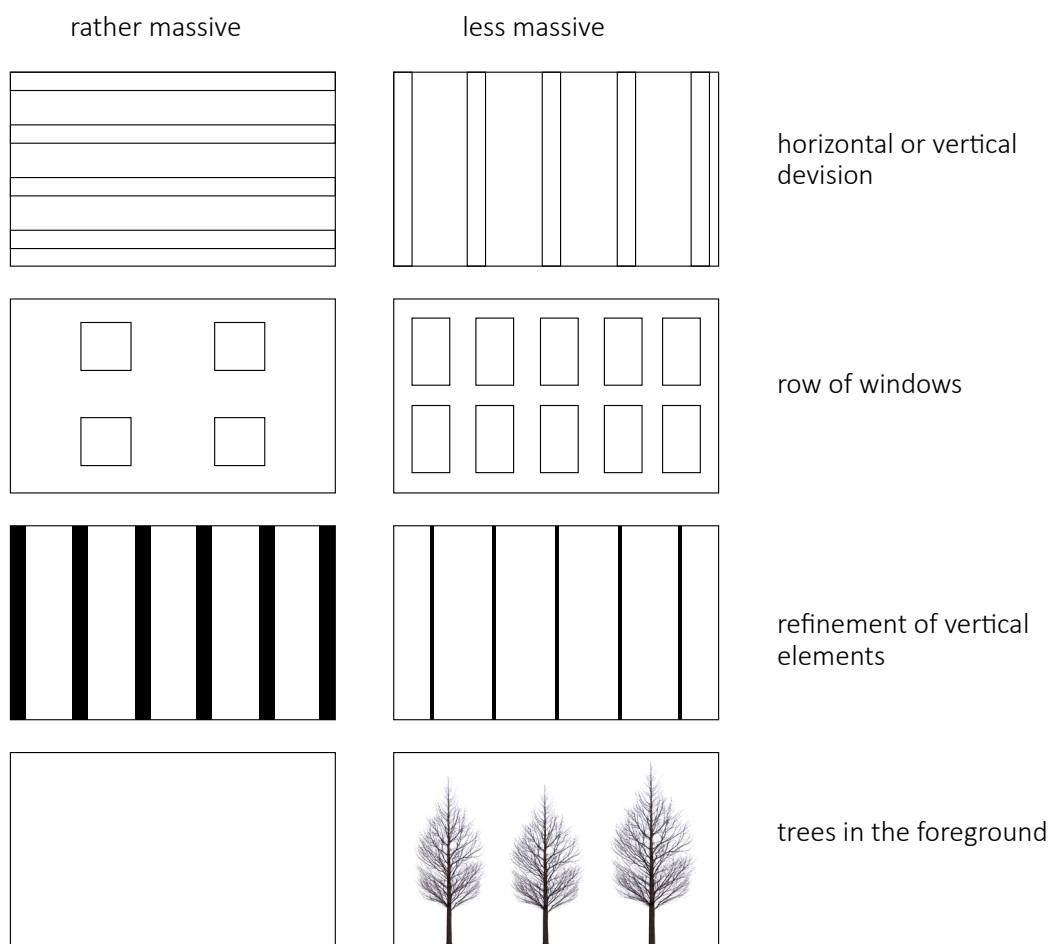
Figure 5: Reduction of the impression of massiveness

The point of readability and complexity is also addressed by author and architecture critic Sarah W. Goldhagen in her book Welcome to Your World.

She says that patterns and coherence support the readability of a building. Humans, because of their sensory cognitive system, are always on the search for repeating patterns in order to recognize a quick identification of basic shapes. This identification creates a sense of pleasure in the area of our brains associated with our „sympathy" system. Humans are naturally attracted to symmetry because it is satisfying, predictable, and navigable. The most important thing to humans is other humans, whose face and body shape are vertically symmetrical. It also describes that patterns without complexity are perceived as negative. Housing complexes with identical facades are therefore considered negative from a psychological point of view. Patterns must convey complexity. This can be derived from nature, which also conveys complexity and patterns.

In summary, architectural psychology can identify complex relationships that point a different perspective on the built environment and housing. How people respond to their living environment can provide an important design basis for architects to make buildings more engaging, aesthetically pleasing and to create a sense of identity to their residents, often without additional costs.

Figure 6: Gaudi's Casa Batlló, Barcelona

Regarding my own design project, these findings can help me to think about the effects that design solutions will have on the residents. The flexibility of floorplans and the complexity of the facade design can be a starting point for the design concept. Especially the findings on how to influence the identity of a home are valuable factors for my community driven design approach. However, it should be considered that the elements of flexibility react differently in the different tenures of owner-occupied houses and cooperative houses.

C. Psychological and spatial needs of Solo Dwellers and young Families

The type of users fundamentally determines the internal requirements of a dwelling and sets the framework for spatial design and floor planning. Despite the growing number of solo dwellers in cities, there has been little progress in research on their housing needs. In addition, they are still highly underrepresented in the housing market, as a majority of households are designed for other household types. Because of the lack of data, there is a risk that housing design is based on outdated concepts of living alone. (Breman, 2019). An opposite development can be seen among young families in cities. They have difficulty finding suitable apartments in the city and are moving to suburbs and smaller towns. There is a shortage of large family housing. One of the reasons they move out of the city is because they are looking for a house that better suits their living conditions (Booi et al., 2020). 28% of families in Rotterdam move out of the city within four years of the birth of their first child (Dutchnews, 2017). Nevertheless, there has been a counter-trend in the housing market that prioritizes family housing. There are also an increasing number of families who prefer city life over the suburbs (Gersonius, 2019).
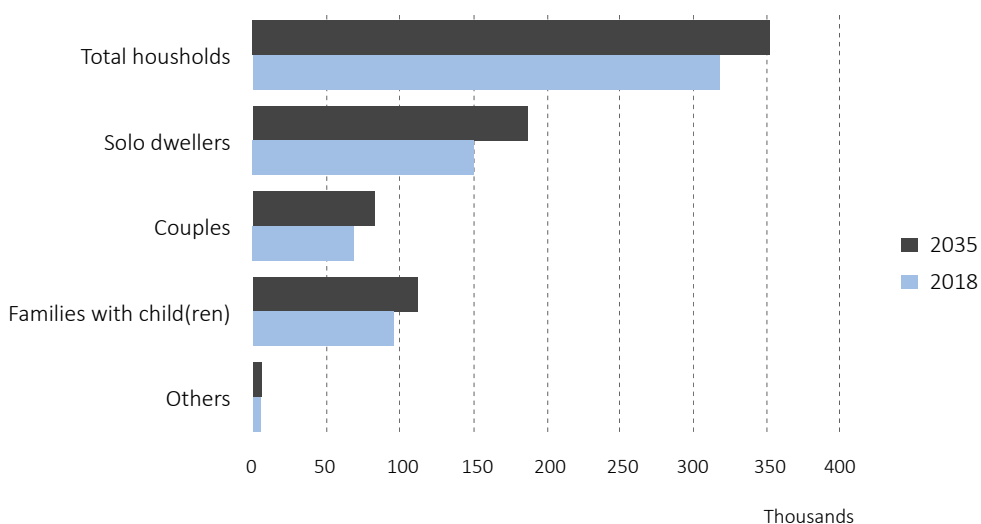
Figure 7: Numbers of households by type in Rotterdam in 2018 und 2035

Solo Dwellers

Nearly three million single-person households live in the Netherlands, according to figures from CBS, the Dutch statistics agency. That's 17.4% of the country's population. This growing trend is continuing. CBS estimates that by 2035, about 3.6 million people in the Netherlands will be living alone (Dutchnews, 2019). The housing market and the architecture should respond to this growing trend of people living alone not only quantitatively but also qualitatively. Eric Klinikenberg, author of the book Going Solo said, „No previous human society has supported large numbers of people living alone...we have no historical examples to learn from, no precedents to imitate or avoid." (Hocking, 2021).

The term „Solo Dwellers", which essentially means living alone, is very broad and needs to be defined in age groups to further analyse their housing needs. According to CBS, most people in the Netherlands that live alone are between the ages of 20 and 35 and over the age of 60 (Figure 8).
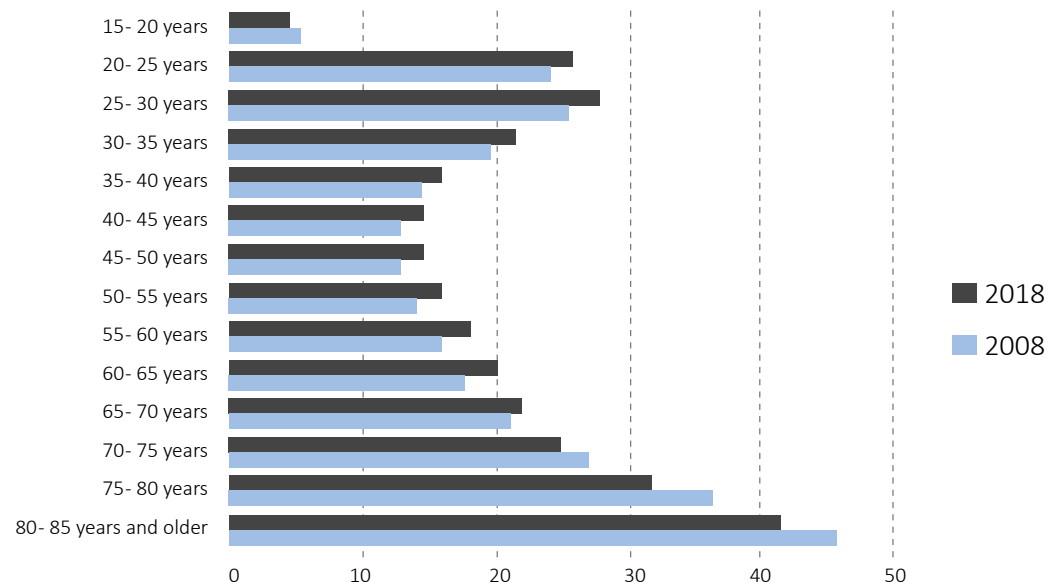
Figure 8: Number of people living alone in the netherlands by age group

Students make up a large portion of the 20 to 35 year olds, most of whom live in student apartments (Dutchnews, 2019). Those living alone over the age of 60 tend to have different needs than young solo dwellers and are less likely to live near the city center. Therefore, for consideration in regards to housing conditions in the regular housing market, young working professionals in the age between 20 to 35 are the focus of this analysis.

By living alone, social interactions become more important than for households living with multiple people. If you are part of a family, you come home to your family members, while Solo Dwellers come home alone. As a result, they go out more to meet other people. Centrally located homes near restaurants and bars tend to be more suitable neighborhoods for them compared to suburbs, which

are mostly designed for families. Bart Dopper and Ester Geurting of Stec Group research, consult and analyze live-work concepts in the city. They say that small housing is almost always a compromise. Solo Dwellers tend to have a limited budget, as they have to pay costs on their own, especially due to increased rental prices. However, they also strive for a flexible, diverse lifestyle and tend to put little focus on homeownership. Many choose to either maintain their residential identity, living in harmony with their urban identity and lifestyle, or move to a larger, less expensive apartment on the outskirts of the city (Breman, 2019). According to a comprehensive study by professor Anne Tervo at Aalto University, microapartments, however, are seen critically due to their immense lack of space. Microapartments are only habitable for a short period of time in life. According to her survey of Solo Dwellers, more than half perceive their current apartment as too small. 42% of Solo Dwellers live in one-bedroom apartments and 43% live in two-bedroom apartments. The ideal apartment size is on average 60 m² and the minimum size is 30 m². Here, the desired apartment size increases with age and income (Tervo & Hirvonen, 2019).
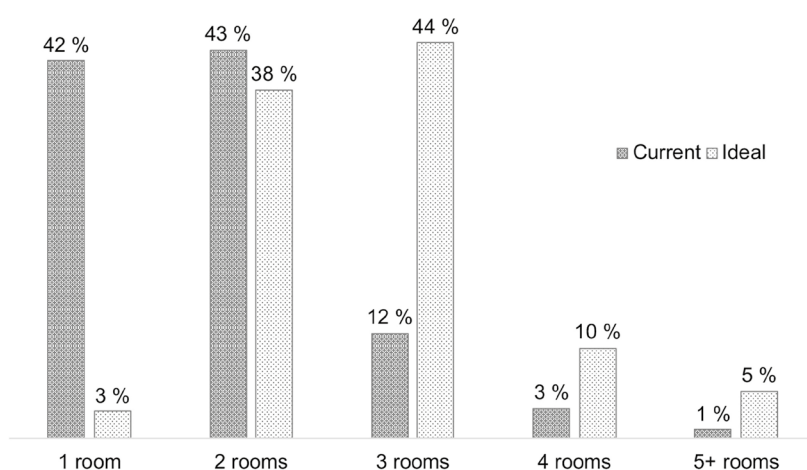
Figure 9: Solo dwellers current and ideal dwelling type (the number of rooms, kitchen excluded)
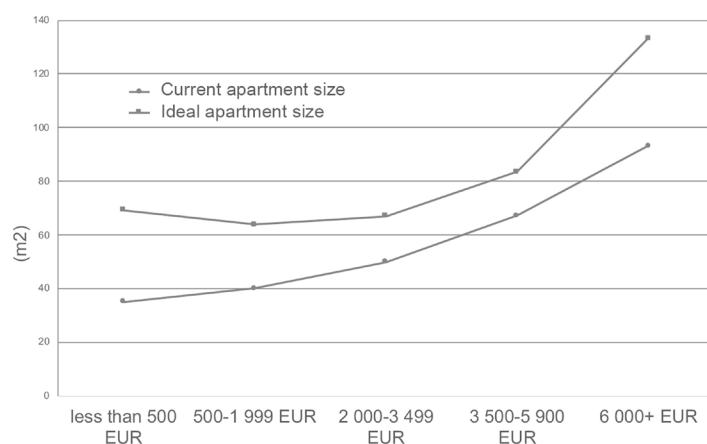
Figure 10: Solo dwellers current and ideal apartment size (m2) in relation to net income (EUR/month)

Young Families

Despite the many families leaving the city, there are rising numbers of dual-income and middle-class families who find the city and living close to the center attractive. Proximity to work, amenities, friends and family, and the diversity and vibrancy of the city are perceived as more important than a large house with a backyard. City families are less likely to prefer appropriately sized living spaces, and much more likely to prefer small, communal green and play spaces, as well as outdoor space or rooftop terraces that allow for a combination of play, care, work, socializing, and networking with neighbors. Family housing should be designed to accommodate the different life cycles of children (Gersonius, 2019). Environment and housing are a long-term influence on children's development and socialization. Restricted housing conditions often lead to stress, causing parents to practice an overly controlling educational style. Restrictions and an adverse family climate negatively affect children's development. Children need a „Free Range" where they can act and play unwatched. This „Free Range" expands with increasing age. Plants and trees are strongly beneficial to development by allowing children to learn through experiential learning (Flade, 2020). In this regard, the more people living in an apartment, the larger the apartment needs to be. An apartment size between 75 and 175 m² is sufficient, depending on the family size, with a private garden or a shared garden only for residents. In addition, there should be enough storage room and extra rooms for various escape possibilities. Ideally a car-free street and a large area for children to play (Gersonius, 2019). If there is no private garden, there should be a park or playground near the house. Parents place great importance on a safe and secure home and environment. For the home itself, this includes security of ownership and protection from eviction. Accordingly, owner-occupied apartments offer greater protection than rental apartments. (Mulder, 2013).

These are relevant findings for my design project which is ranging from different sized apartments for different user groups, including mainly small apartments for solo dwellers and large apartments for families. In particular the desired apartment sizes and requirements of solo dwellers in relation to the different tenures will be an interesting design task. Also, thinking of the different lifestages of families and their children requires careful attention to the program of the floorplan and its adaptability to future changes.

IV. HEALTHY & ACTIVE ARCHITECTURE

A. Stimulating physical and mental health

The following section addresses the health impact of buildings on people and explains concrete design principles on how active architecture can contribute to a healthy lifestyle.

To start with, there has to be a differentiation between mental health and physical health. Physical health can be promoted through physical activity and a healthy diet. Architecture and cities can help to encourage people to be physically active and to provide a healthy living environment. However, mental health can only be influenced to a limited extent by concrete architectural means. The human psyche is very complex and profound. Mental conditions such as loneliness and depression can have various causes and cannot be universally addressed. When people who feel lonely get into a room with other people, it can have a very helpful effect for some. For others, however, this situation can intensify feelings of loneliness. Contrary to what many think, communal areas or shared housing can have a counterproductive effect on social behavior. The „behavior setting" expresses that the willingness to behave socially and to help others decreases, when too many people are present. None of them feels responsible, the so-called „diffusion of responsibility". But not only the number of people is relevant, but also the type of people must be right in order to promote social interaction. People need control over social relationships. A loss of control, for example by too many unknown people, leads to social stress (Flade, 2020). That being said, architecture and cities may very well contribute to overall wellbeing. As explained in the previous section, cities, buildings, and spaces influence emotions, behaviors, and wellbeing. These psychological factors, along with active design and healthy lifestyles, can indirectly contribute to overall positive mental health.

To make peoples lives healthier and more active there are two aspects that play a key role: First, external factors such as incorporating nature, for instance, can be brought into and around buildings to improve quality of life and health. Second, specific design principles of active design, such as using stairs instead of elevators, can promote physical activity.

Healthy Environments

The World Health Organization recommends that cities provide 9 m² of green space per citizen. However, many cities in Europe have difficulty implementing this due to their density. Several studies show that there is a correlation between a person's proximity to nature and their physical health and wellbeing.

Furthermore, proximity to nature also promotes physical activity, social contacts and creates spaces for physical and mental recreation. Especially serious diseases such as heart disease, obesity and depression can be reduced.

The positive effects of nature on health and wellbeing are numerous and sufficiently proven. Plants incorporated into the living space bring many benefits. They improve air quality, concentration levels, general wellbeing and job satisfaction. They also reduce irritation and stress and have a positive effect on productivity and creativity. But plants are not only beneficial indoors. A view

CHRONIC DISEASE AND OVERWEIGHT
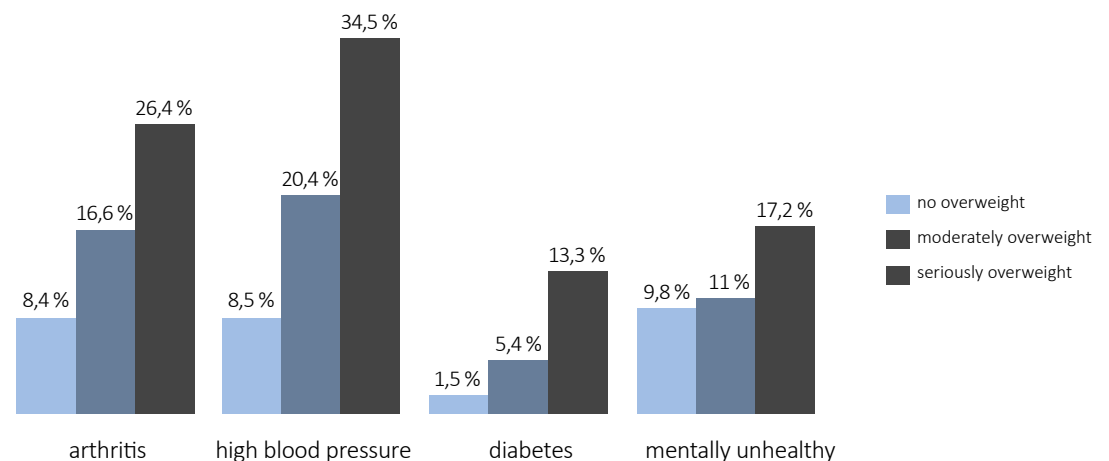
Figure 11: Chronic disease and overweight
no overweight, BMI < 25,0 kg/m2
moderately overweight, 25,0kgm2 < BMI < 30,0 kg/m2
seriously overweight (obesity), BMI > 30,0 kg/m2

of greenery also plays an important role in daily wellbeing. All these mentioned benefits are also attained by looking into the green from inside the building (Hojniak & Hvid, 2021). Not only real nature has a positive effect on people, but also the imitation of nature through, for example, photographs, organic ornaments or even the color green. Stephanie Lichtefeld from the University of Munich studies experiments on the „green effect". Green is associated with growth (physical and psyschological) and promotes vitality and concentration (Keedwell, 2017). Cecil van Konijnendik, Professor of Urban Forestry at UBC, suggests a 3-30-300 rule: Everyone should be able to see 3 trees from home, have at least 30% tree canopy (or vegetation) in a neighborhood, and be no more than 300 meters from the nearest green space. However, it is not only the quantity, but more importantly the quality of the green space that matters. It is not enough to plant only trees and green structures and elements. The quality is important and how the green space is perceived and experienced by the user. Care should be taken to use local and native species and plants with the best potential for the area. They can be stress reducing and provide a sense of
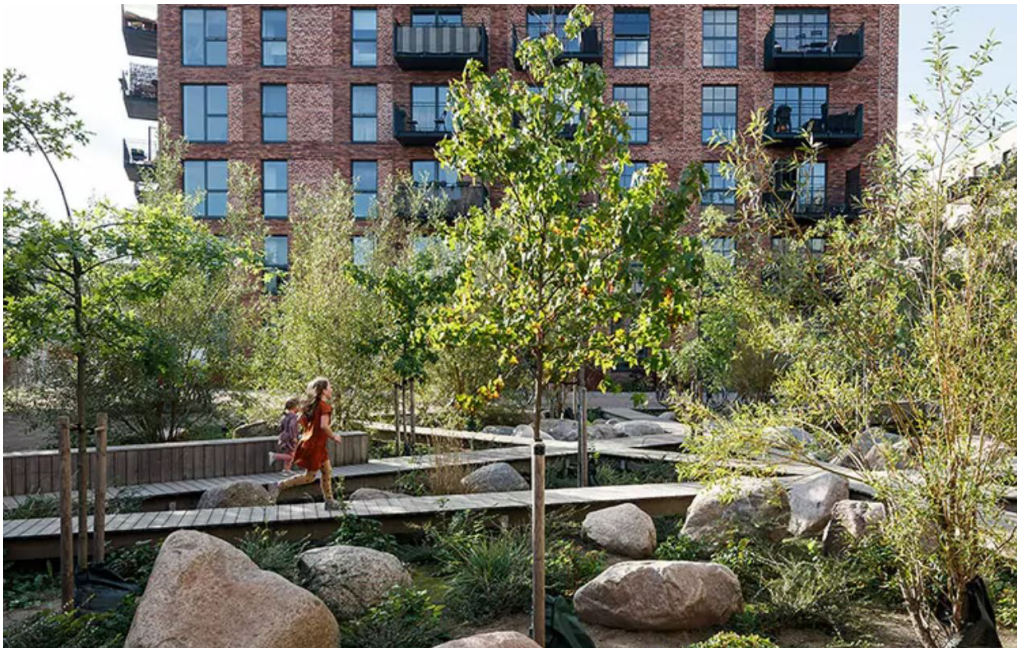
Figure 12: Gronttorvet, Copenhagen, Denmark. The green heart of the district, a park is created for the benefit of the residents. Location: Valby, Copenhagen

social cohesion. However, in addition to green spaces, air quality is also of great importance. Air pollution is the biggest environmental health risk in Europe. This can be addressed in two ways. By transforming streets into pedestrian zones and bike lanes, and considering better ventilation of indoor spaces during the planning phase. Indoor spaces suffer far too often from poor ventilation and high CO2 concentrations.

Light, whether natural or artificial, also contributes to overall health and affects people mentally and physically. From an evolutionary perspective, humans are biologically wired by the natural light cycle. Special attention should be paid to provide interior spaces with enough daylight. Lastly, noise is also a major health risk. 113 million people suffer from harmful noise exposure in Europe, leading
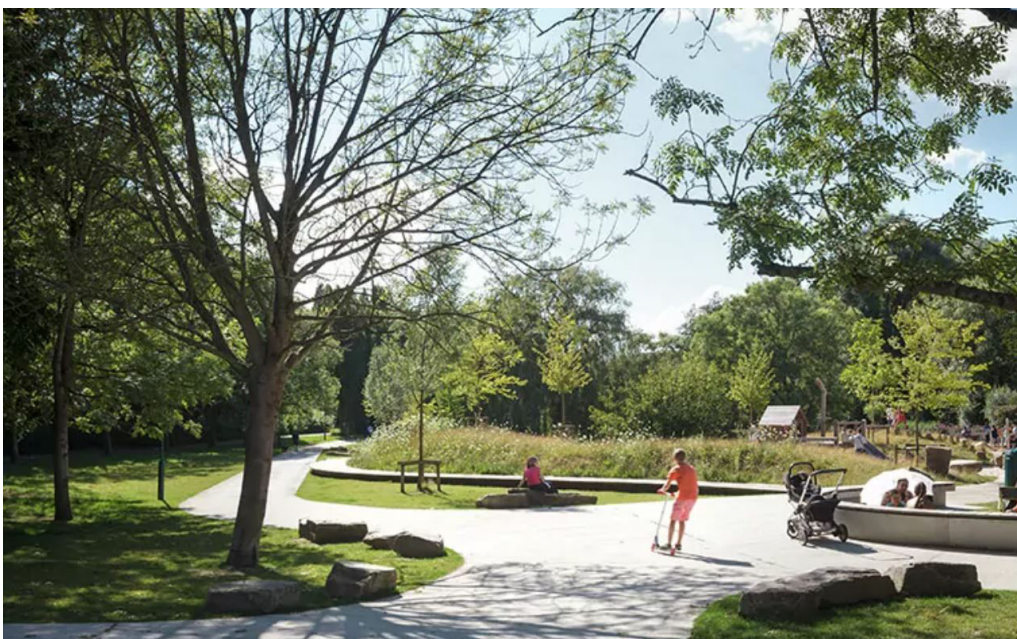
Figure 13: King Bouduin Park, provides a large variety of species and diverse habitats with many options for natural play and encounters. Location: Jette, Brussels

to 48,000 heart diseases and 12,000 premature deaths. 82 million citizens are exposed to road traffic noise of more than 55 decibels, which is the noise limit according to guidelines issued by the European Environment Agency EEA (Hojniak & Hvid, 2021). These basic aspects of healthy living are beneficial to both physical and mental health.

Active Design

The topic of active design focuses on concrete structural aspects to positively influence the physical movement of the inhabitants. Spatial conditions play a significant role in the degree to which people move through the city and buildings. Physical activity adds years to life, reduces overweight, helps combat school dropouts, and leads to overall better performance, lower health care costs and absenteeism from work. The spread of infectious diseases decreased significantly between 1890 and 1937 in the Netherlands due to better housing conditions brought about by the Housing Act of 1901. Today, chronic diseases are the leading cause of death in the Netherlands. While life expectancy has steadily increased in recent decades, so has the amount of chronic diseases. According to the Havard School of Public Health, the negative impact of this development is significant for the healthcare system. Yet chronic diseases can be prevented by a different lifestyle and daily exercise. The most common causes are comfort, stress, poor diet and alcohol. The Dutch Standard of Healthy Exercise recommends at least 30 minutes of moderate exercise per day. Physical activity can be found and encouraged in the most insignificant daily routines. Active design must be based on human biology and psychological needs. According to Patrick Whitney, Dean of the Illinois Institure of Technology, active building

Figure 14: Kindergarden Rymarksvej, Copenhagen. Light flooded rooms improve the quality of a space. Acoustic panels are elements that help reduce the indoor noise and create a comfortable acoustic environment.

Figure 15: Highlighted, open stairs in the entrance

Figure 16: Stairs with open void to give a more spacious feel

design can be divided into two directions. 1. discourage passive behavior by making decision unattractive or unfavorable. 2. encouraging active behavior by making decisions attractive and favorable. For example, elevators can be placed in a less visible area to emphasize the use of the stairs. People are constantly weighing effort against efficiency. Laundry or work spaces can also be placed outside the apartment in the building to increase movement through the house and promote interactions between neighbours.

Access and circulation spaces such as stairs, corridors, elevators or ramps determine how people move through the building. Stairs can be attractively designed as a central point in the entrance for vertical circulation, while the elevator is placed in the background. The staircase must have aesthetic, spatial, and comfort qualities. Stairs can be opened up to the outdoors, or be designed with attention to detail. Corridors are often dull and can also be designed so
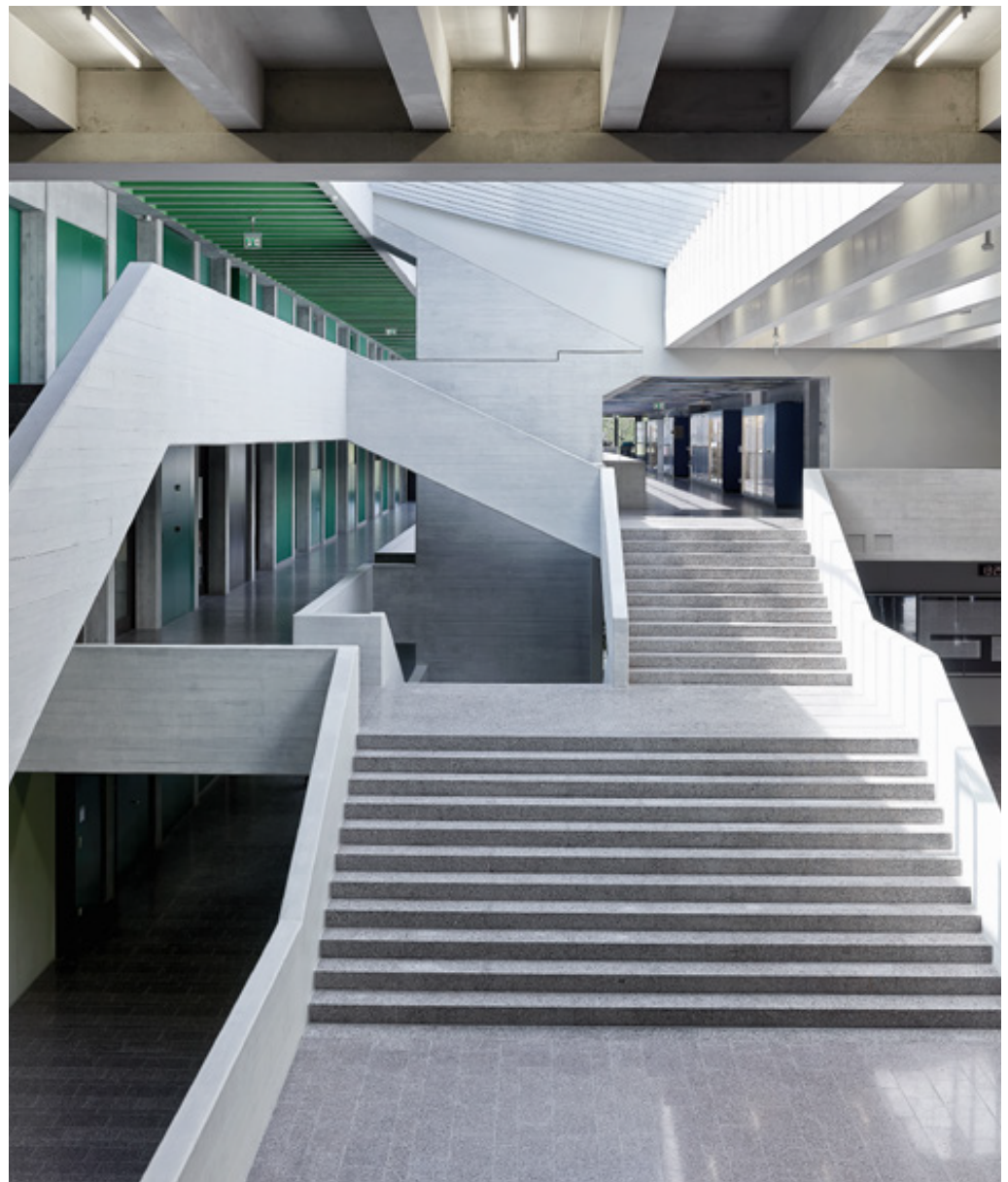
Figure 17: Spacious stairs with qualitative materials and daylighting

Figure 18: Designed hallway with colors, light and texture

Figure 19: Playful designed outdoor space invites for activity and play
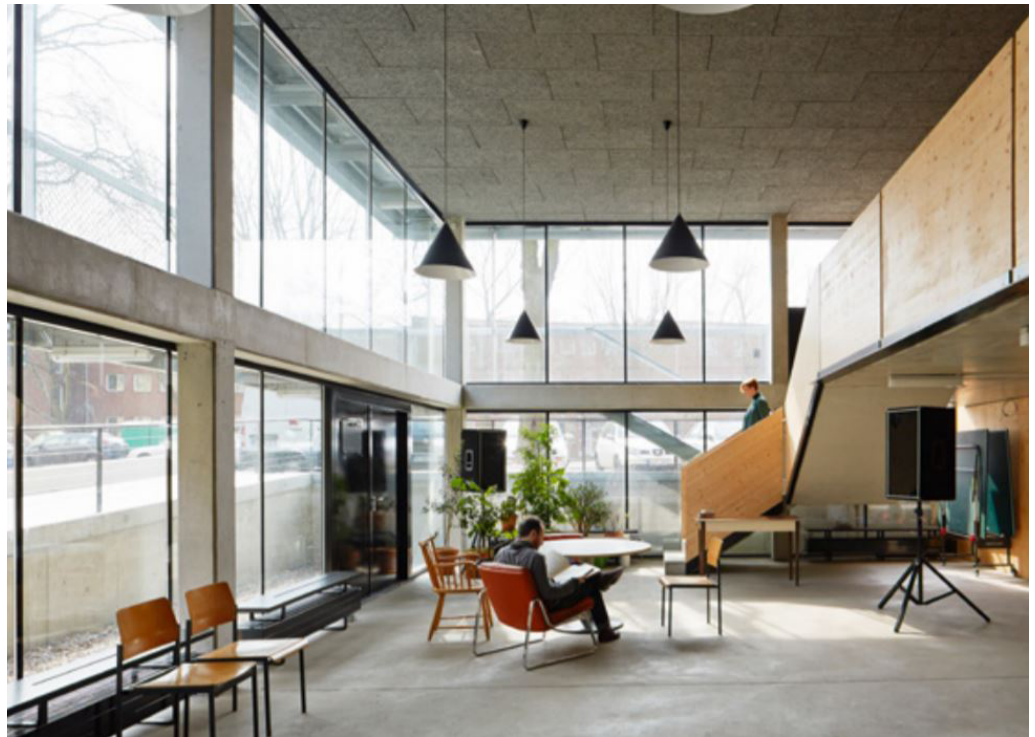
Figure 20: Apartment entrance hall, attractively designed with high ceiling and daylight. The stairs is present in the middle of the room.

that people have a positive experience when walking through them. This can be stimulated by a play of quality materials, transparency, (day) light, and spatial and programmatic differences. Split-level access points can also provide variety to increase movement (Department of Design and Construction et al., 2010).

In addition, strategic destination points within a building can be placed to encourage movement between these areas. Building features directly related to physical activity, such as fitness, bike storage, or active office furniture can be integrated into the building. When placed so that they are visible, this can encourage movement by combining facilites and comfort related to physical activity. Courtyards should be easily accessible not only from the ground floor, through multiple access points and active landscaping, but should also provide a gathering place for residents. If possible, they should be semi-public to increase liveliness and encounters. Sports facilities, seating, plantings, and trees are beneficial for an active courtyard.

Buildings influence the immediate environment through massing, materials, degree of transparency, and programming. Wide, windy and anonymous spaces, as well as monotonous facades, are examples of how the walkability of an area is hindered. Buildings should offer different functions, multiple, attractive entrances and a pleasant human scale. Great emphasis should be placed on unique detailing at eye level of ground floors, entrances, and facades. Ground floors should be designed according to the „Eyes on the Street" principle, that is, with a prevailing openness to enhance safety and security (BETA office for architecture and the city, 2016).

Figure 21: Collective courtyard with greenspaces and seating possibilities

Figure 23: Designed apartment entrances with attention to detail in the groundfloor area

B. The Human Scale

The following section discusses the topic of human scale in cities and in architecture. More specifically, it deals with morphological and social issues, how cities and buildings can be planned in times of densification so that people can live (together) in a pleasant, healthy and active way. The following is an introduction to what human scale means exactly, followed by concrete (design) principles and how they can improve people's quality of life.

To begin with, it is necessary to define the concept of the „Human Scale" in order to avoid misunderstandings and to be able to make a clear assertion. Human scale is an ambiguous term and it cannot be assumed that everyone understands the same by it. „Scale" is interpreted by many as „size." For example, door openings, window heights, or stair flights are designed to human scale and serve as a more technical indicator of spatial dimensions. In literature, however, human scale is defined in a different way. It includes many principles, which can be conceived differently depending on the author. For the social orientation of this thesis, the principles of architect and author Jan Gehl and David Sim are fundamental. They see the human scale in social issues and spatial forms in relation to the built environment and is strongly connected to environmental psychology. But also author Cliff Moughtin, Leon Krier or Jane Jacobs treat the issues of the human scale in their literatures mainly from social and spatial points of view (Mackesy-Buckley, 2012). To name an example of the human scale, public spaces are designed in a dimension, to allowing people to have visual contact with each other in order to see their faces and emotions and thus increase the likelihood of communication with each other (Gehl & Koch, 2011). There is a strong relation to environmental psychology and active design, which is relevant as a complementary part in the topic of this thesis.

Scale vs. size

Scale does not necessarily have to be considered in the size of a building. The Chrysler Building in New York, for example, is a large building in volume on the one hand, and is identified from afar by large, visual gestures such as the prominent roof peak. A distinctive detailing of the relatively small main entrance on the other hand, responds to the visual needs of pedestrians, and are only recognized in its immediate proximity (Figure 24). It is characterized from the small to the large scale. Similar to a tree, which forms a large whole with other trees. The closer you step, the more you recognize its shape, its crown, the large branches, the twigs, the texture of the bark and finally the leaves and its leaf structure. Many modern buildings look interesting in their outward form, but

Figure 24: Entrance of the Chrysler Building with detailing on eye-level

Figure 25: Chrysler Building, New York

Figure 26: Lack of detailing understimulates the human brain. Places are perceived as cold and distant

the closer you get to them, the less detail there is to engage with. A lack of detail and elements communicates a detachment between people and buildings. The human scale needs to be represented in different levels and should relate to the human form (Donnelly & Morales, 2016).

Building height

In relation to social aspects, and similar to Active Design in residential architecture, a building should respond to a person's biology. The human field of view is aligned horizontally, where we can see very little above and a little more below. This comes from an evolutionary perspective where we had to
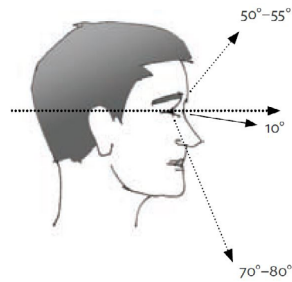
Figure 27: Sense of human sight

watch rather downwards than upwards. The field of view affects how we perceive the height of buildings. The closer you stand to a building, the less you can see what is happening on the upper floors; you have no connection to this area. Only when you step into the distance you can see what is happening on the upper floors. This increases the distance to the building, which means that there is no connection and communication happening. Communication from the street can perfectly take place up to the 1st and 2nd floors, and is still possible up to the 3rd, 4th and 5th floors, as the connection to the street is still strong and details such as faces and gestures can
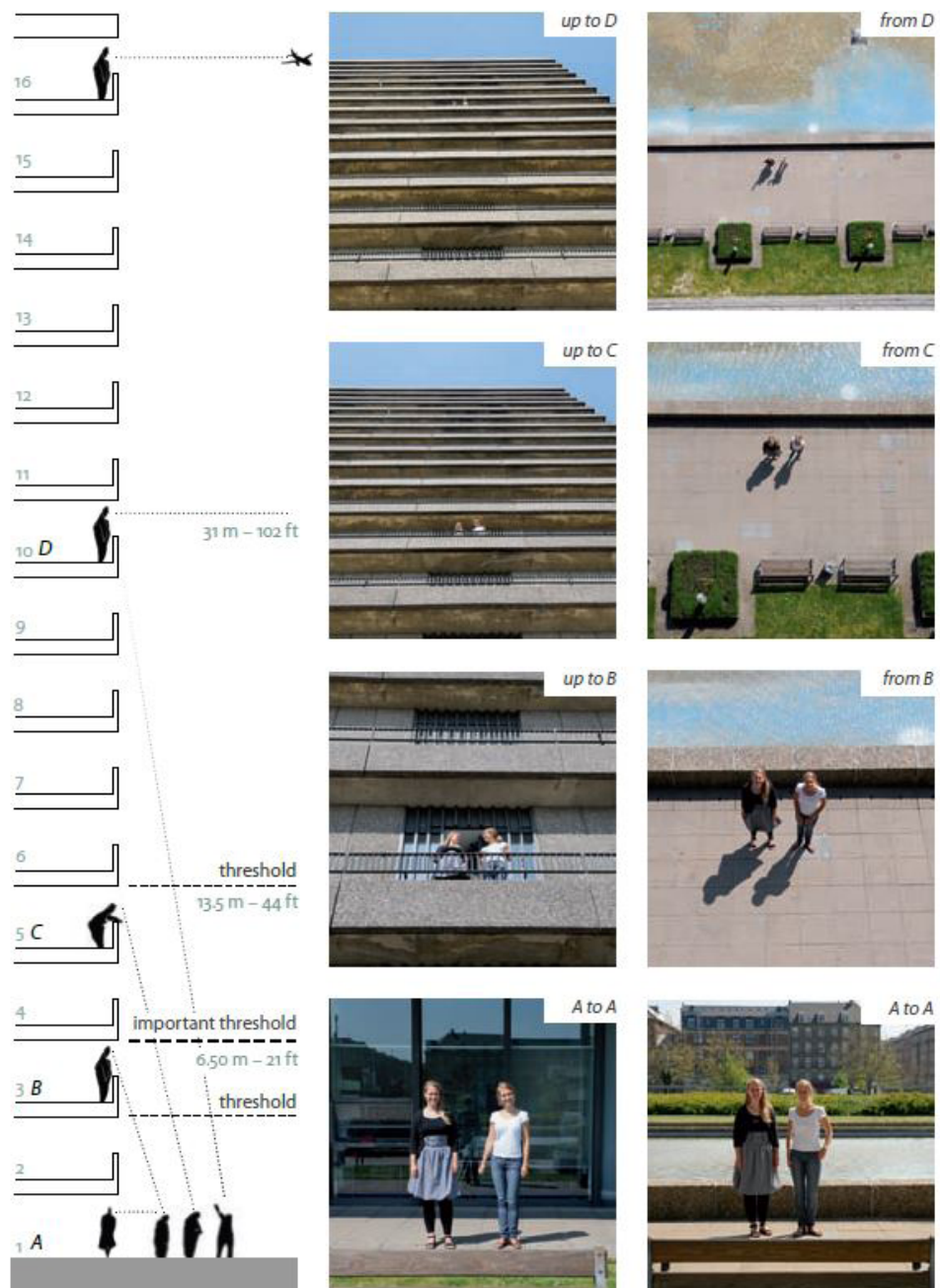
Figure 28: Visual connection between streetlevel and different floor heights

be recognized. Floors above that have little to no connection to the street (Gehl & Rogers, 2010). Up to the 5th floor, you can still participate in city life, calling out to children playing in the backyard or calling out to someone you know. In addition, most people can walk up 3 to 4 stories without effort. In addition to physical activity, stairwells can also function as social forums where neighbors can meet. Low-rise buildings reduce the number of apartments and households, giving residents more social control and making it easier for intimate situations to arise. As learned from chapter three Solutions to contemporary housing issues, social control in the home is essential in getting to meet your neighbours. The likelihood of knowing your neighbors increases when you live in a low-rise building, rather than a high-rise. The staircase is a valuable buffer zone between the outside world and private living space and functions similarly to a gated community, with the advantage that this space is not isolated from the city (Sim & Gehl, 2019).

Walkability

To encourage active and social street life, buildings and neighborhoods must be designed to promote walkability. The likelihood that people will communicate and engage in social activity increases with the frequency with which they go outside (Figure 29).
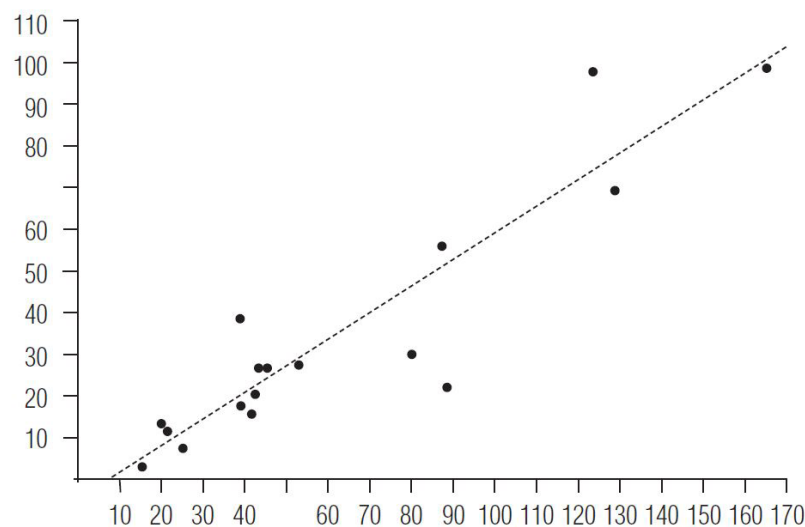
Figure 29: Chart plotting the relationship between the number of outdoor activities and frequency of interactions. (Street life sudies in Melbourne)

Walkability is the starting point from which many other activities emerge: Street trading, window shopping, short stops, longer stays, conversations and meetings, sports, recreation, children playing and so on (Gehl & Rogers, 2010). Social activities require the presence of other people. In this regard, the space should not be solely for foot traffic, but must appeal to people's senses to encourage

Figure 30: Dinan, France. Active groundfloors and narrow streets make places seem more lively

Figure 31: Residential street in Haarlem with active street life and a small dimension. Emotions and details can be easily recognized

them to walk and communicate with their surroundings. This can be done in a variety of ways. Following the principle of Sven-Ingvar Andersson, professor of landscaping at the school of Architecture, Royal Danish Academy of Art, „Make spaces smaller than necessary" will make public spaces and streets appear more alive. This way, building details and other people in the environment and their facial expressions can be recognized. Experiences become more intense. The environment is perceived as warm, personal and welcoming. In urban areas with large buildings, wide streets and squares, there is little to experience. These places often seem empty, impersonal, formal and detached.

Mix of users and functions

However, density alone does not simultaneously lead to a vibrant city. A city becomes vibrant when there is quality urban space and a critical mass of people who want to use that space. Attention to the smallest scale at eye level is most important to promote active street life (Gehl & Rogers, 2010). Density, different building types and the uses from the same places creates good urban qualities. Architectural diversity provides constant stimulus and information and conveys a pleasantly complex environment. Different, even opposing users and uses can very well coexist as long as the neighborhood provides a suitable space. The example of the Cross Section of Parisian houses around 1850 was meant to express the miseries of society and to represent the economic segregation of classes (Figure 32). However, it can be seen in another way: It is impressive
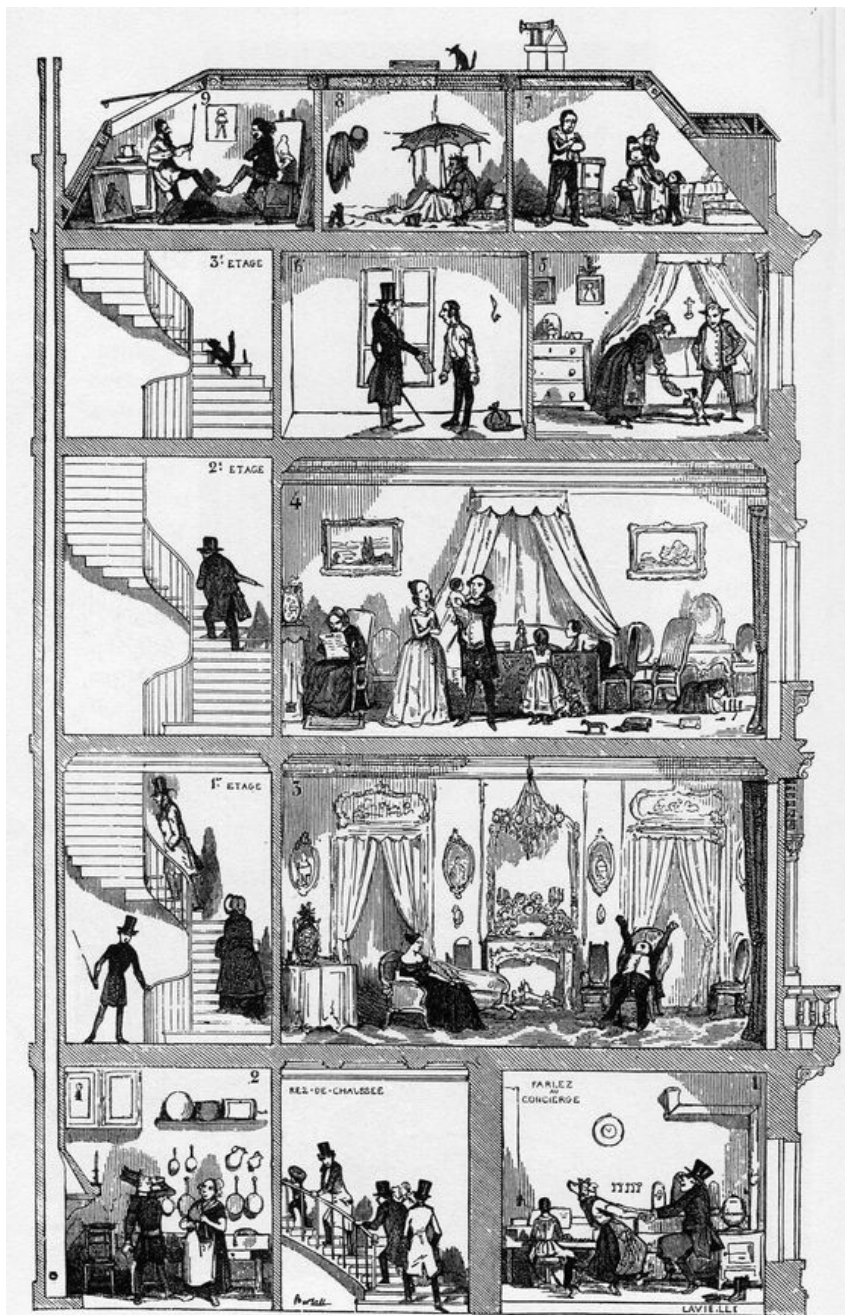
Figure 32 : Cross section of a Parisian house about 1850 showing the economic status of tenants varying by floors

41

that all these people share the same address, they are neighbors, and once they enter the street they are all part of the same community and have equal access to the commons of the city. Comparing this heterogeneous mix of different classes of society to a forest, a broad mix of different plants and trees leads to a biodiverse complexity at different levels, which makes the forest healthy and resistant to diseases, storms or fires. A shared identity with a community comes from sharing the same places and resources. Local identity is often stronger and more important than national, cultural, or ethical identity and is a healthy form of collective identity (Gehl & Koch, 2011).
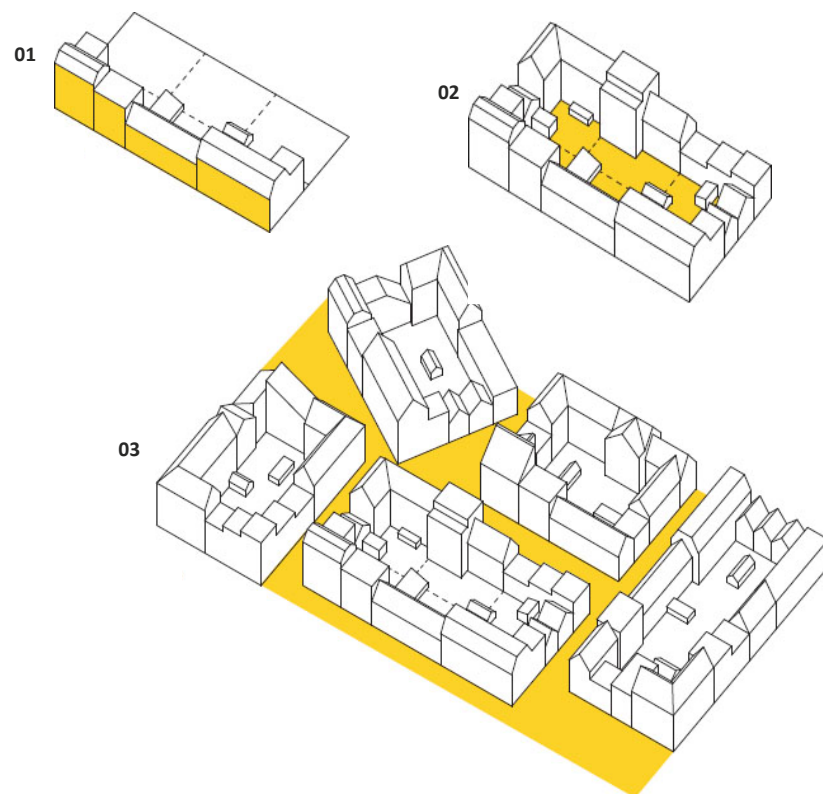
Figure 33: Buildings lined up along the street (01), forming building blocks (02) and public streets and squares (03)

Parcelling & control

Different parcels in a building block can be developed and managed independently, offering greater flexibility in building design, typology, construction, tenure, use, and development over time. But this independence is not just a matter of form or design. Individual owners can make their own decisions about the development of the building in terms of ownership, rental, commercial use, subletting and so on.
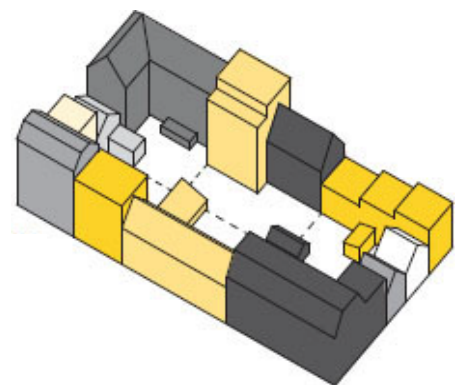
Figure 34: The system of joining up and juxtaposing allows diversity in each block.

Figure 35: Individualised building block creates diversity in architecture, function and users and increases the level of control with individuals

Layering

Furthermore, buildings can be designed in layers to place different functions and typologies on top of each other. The difference between layering and stacking is that in stacking, mainly the same functions and types are placed on top of each other. Ideally, urban buildings should be differentiated into layers to characterize the functions and emphasize the advantages of each floor. The ground floor has direct visual contact with the street and can have a positive impact on function and promote street life. They are very flexible in their use, can be extended to the outside and are easily

Figure 36: Stacking vs Layering

accessible. An open groundfloor with visual connection to the outside enhances the „eyes on the street" principle and increases security. Next to stores, ground floors can also contain apartments, workspaces or other service functions. The upper floors have close contact with the street, yet privacy and security. They differentiate themselves in how they are accessed by stairwells and more daylight. The top floor is often seen as attractive because it gets more daylight from all sides, has better views, and the floor plan can vary greatly because there

Figure 37: Layering to work out the differences of each floor

are no load-bearing walls. Often the prices are higher, making them popular for penthouses. This increases the social-economic diversity and dynamism of the building. Medium height buildings have a greater advantage in layering than tall buildings because the first floor and attic have proportionally more floor area. Together they often make up half of the volume, increasing the economic value of the building (Sim & Gehl, 2019).

Figure 38: Principle of layering, Nya Hovås, Gothenburg, Sweden

Conclusion

In conclusion, the principles of the Human Scale is comprehensive and can essentially build on the findings of previous chapters such as Architectural Psychology and Active & Healthy Design in a complementary way.

Especially the detailed and spatial dimensions and the small scale are one of the main factors of my design concept which contribute to an active life and thus create a socially equitable design proposal. The built environment responds to the biological needs of people by stimulating their senses. This can be translated into the smaller dimensions of my design and a visual diversity in the facades, where other people or building details are more visible in order to trigger familiar and positive impulses.

V. ARCHITECTURAL SOLUTIONS ON THE EXAMPLE OF CASE STUDIES

Case Study 1: Lokdepot, Berlin

Project Name: Lokdepot

Location: Berlin- Schöneberg

Architect: Robertneun

Year of realization: 2012- 2016

Client: UTB GmbH

Plot size: 21.000 m²

Abstract

The Lokdepot is an urban development and includes high quality freehold apartments. The project includes different building typologies for a wide range of different users. The main concept of these buildings is the open layout of the apartments, which can be freely and individually designed by the residents (Kleilein, 2014). The reason for choosing this project is precisely this aspect, which offers a collective urban living, with the concept of individualization of the own living space. The advantages of self-control, free expression in the own living space and the mixture of different users have been studied in this research. These themes will be exemplified by the Lokdepot as to how such concepts can be implemented architecturally. Another aspect for the choice of this project is the morphology, together with the individual typologies and the proximity to the train tracks, which has strong similarities with my individual design project and thus creates a link between research and design.

Figure 39: Street front of the Lokdepot

Figure 40: Areal view

Urban morphology

The building complex was created as a completion of the building block on a formerly derelict plot of land. The incomplete block was closed with a series of building volumes lining up lengthwise the block and the traintracks (Kleilein, 2014). The typical Berlin back houses were omitted in order to obtain a collectively usable backyard, which is assigned to the individual buildings parcels. The challenge was to develop an inner-city residential concept along the busy train tracks as a reconfiguration of the site while retaining its atmospheric charm

of the historic lokdepot. The project thus acts as an urban edge, differentiating private space from public space. Due to the sloping topography of the site, which varies in height, the ground floor is used as a kind of „urban plinth" for commercial use (Figure 42). The living space is located above. A coherence of the different looking typologies is attained through the materialization of red colored concrete and red metal panels. The red color is a reference to the rust-red tracks that characterize the landscape along the building (BauNetz, 2019).
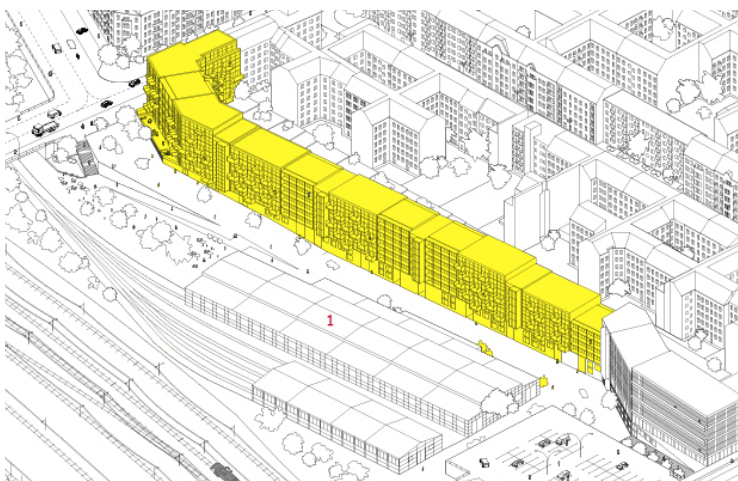
Figure 41: Axonometric view (graphic by architect)

1:1000
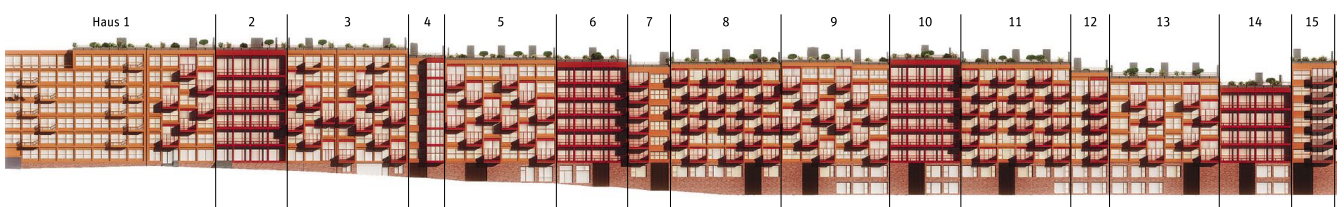
Figure 42: Street elevation of the different building types and the

Dwelling Typologies

„Factory Living" was chosen as a contemporary solution and as a response to the general demand for housing. As a result, the dwellings offer many advantages due to flexible, robust and adaptable floor plan options. The design is based on the concept of communal urban living, which at the same time allows freedom for the individual. Thus, the plot has been divided into 15 plots to allow flexibility and different typologies and designs. For this purpose, there are three different building typologies: Type S (7 m wide), Type M (14 m wide), and Type L (21 m wide). Each apartment is designed individually and based on an open floor plan, on a grid of 3.50 meters, which can be designed by the residents themselves (BauNetz, 2019).

House L: Large cantilevered balconies on each side along with a „greenhouse" with a room height of 4.30 meters. Around this space, depending on the apartment layout, further rooms are grouped on two levels, partly separated by glass, wood, brickwork or plaster walls. A modular construction method results in apartment sizes ranging between 52 and 162 m² with different floor plans.

House M: Principle of loft with continuous loggias on both sides and a core zone with elevator and junction for bathroom and kitchen. The raw construction feeling is intended to be preserved in all apartments.

House S: The living space is extended by a cantilevered bay window on one side of the building to maximize the use of the living space. The floor plan is divided in the middle to generate an open, continuous living and dining area open to both sides on the one hand, and a functional layer with access, sleeping and bathroom on the other (Die rote Wohnfabrik | BDA | der architekt, 2016).
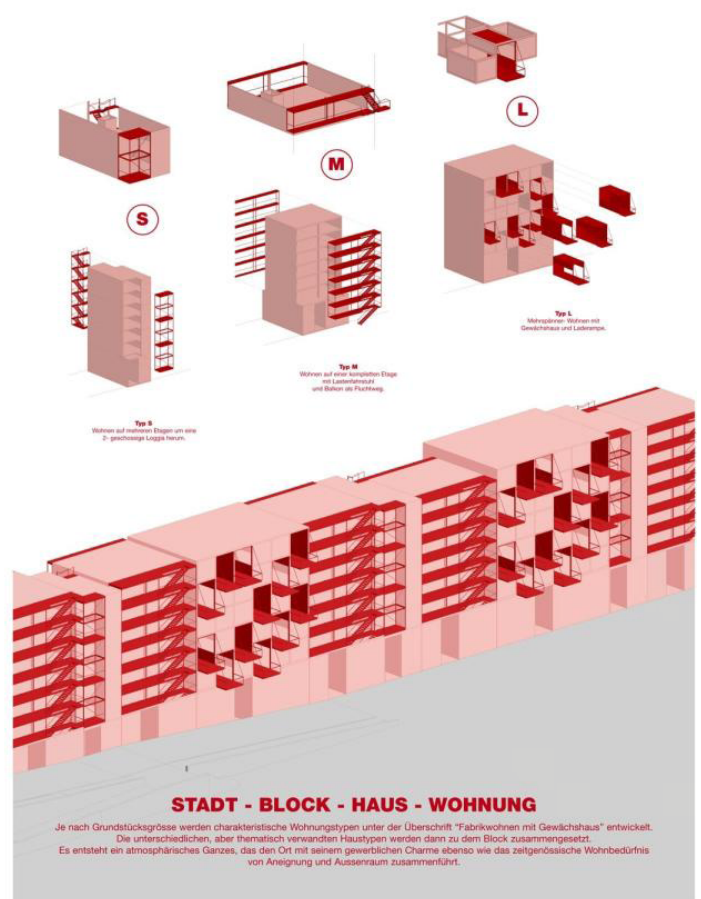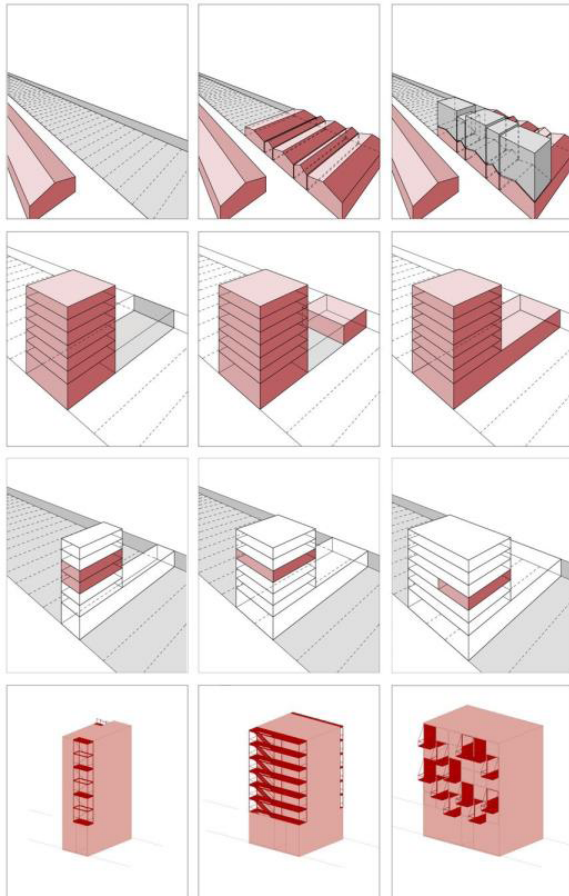
Figure 43: Concept & building typologies (Haus S, M & L)
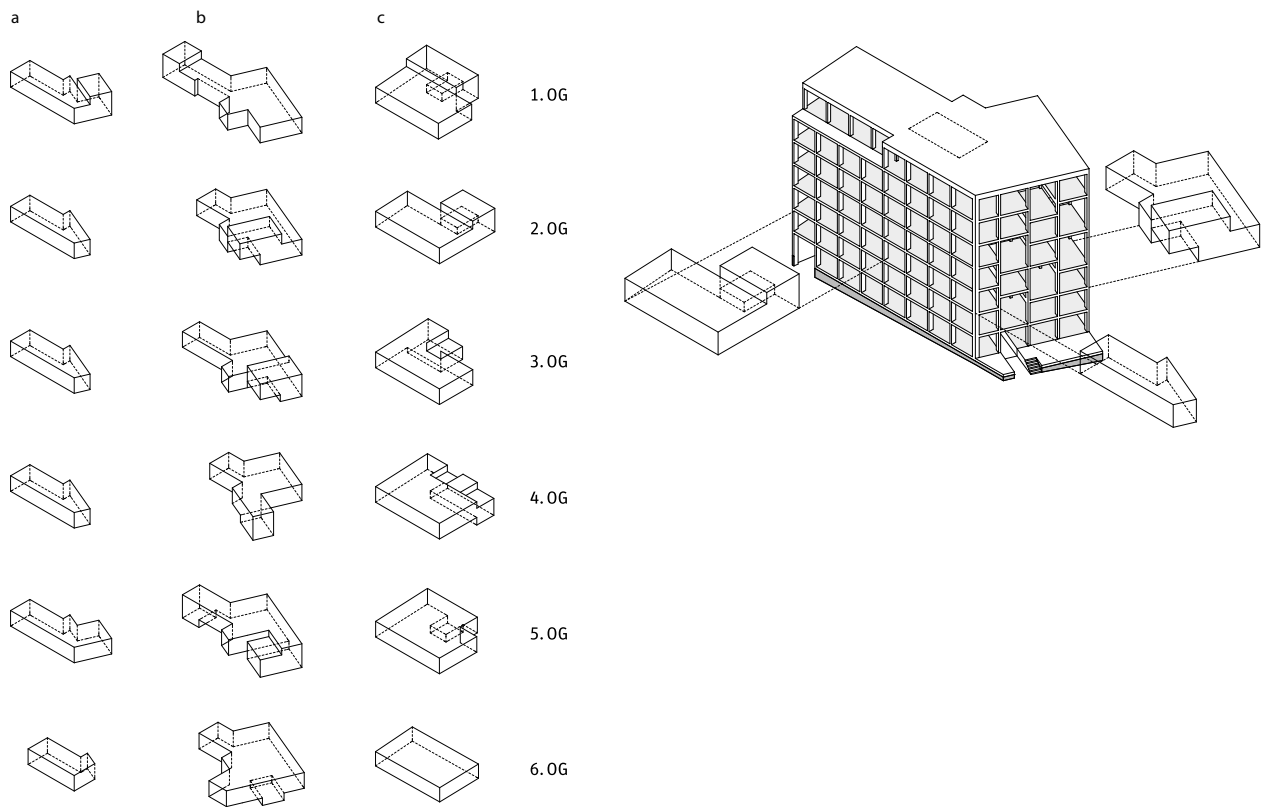
Figure 44: Dwelling Typologies of House L. Each apartment has a different layout with different hight rooms

Figure 45: Example of an apartment before it is sold (Haus L)
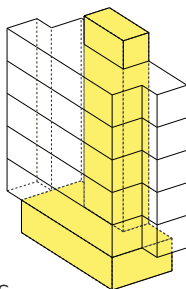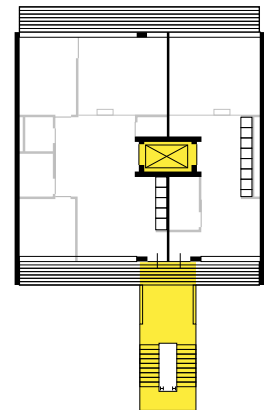
Circulation

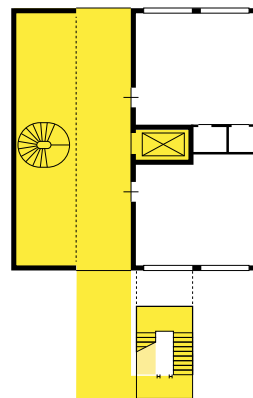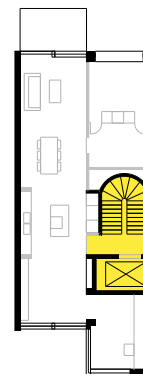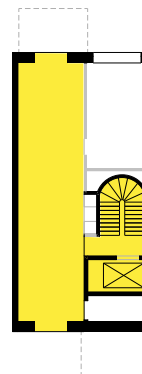House L
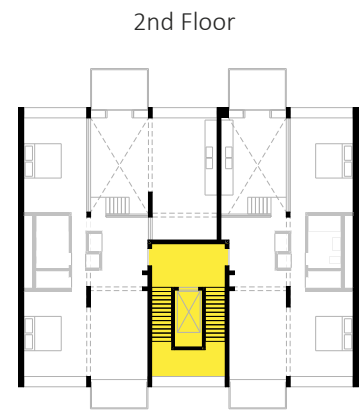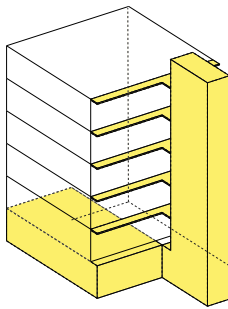
House M

House S

Circulation space

1:400　　N

The circulation space is the space within a building that serves the movement of people and from which access is provided to apartments and other spaces. Since the circulation space is mainly used by residents, encounters between residents often occur there. In the Lokdepot, great attention was paid to the entrances, as they not only provide access to the apartments, but also connect the public outdoor space with the collective backyard.

Entrance spaces are sized in a dimension to provide space for activities such as neighborhood gatherings, children playing, or simply a short conversation to neighbors. The exterior staircase of House M increases the floorspace of the apartments and is specifically intended to function as a communication space between residents and to the courtyard (Die rote Wohnfabrik | BDA | der architekt, 2016).

Figure 46: Outdoor stairs of House M

Figure 47: Entrance hall of House L
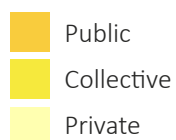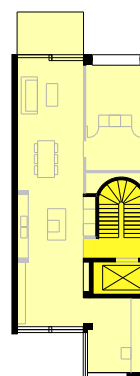

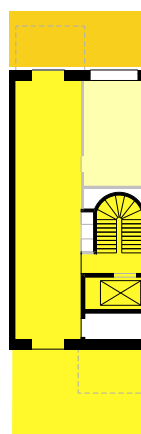Figure 48: Entrance hall of House L
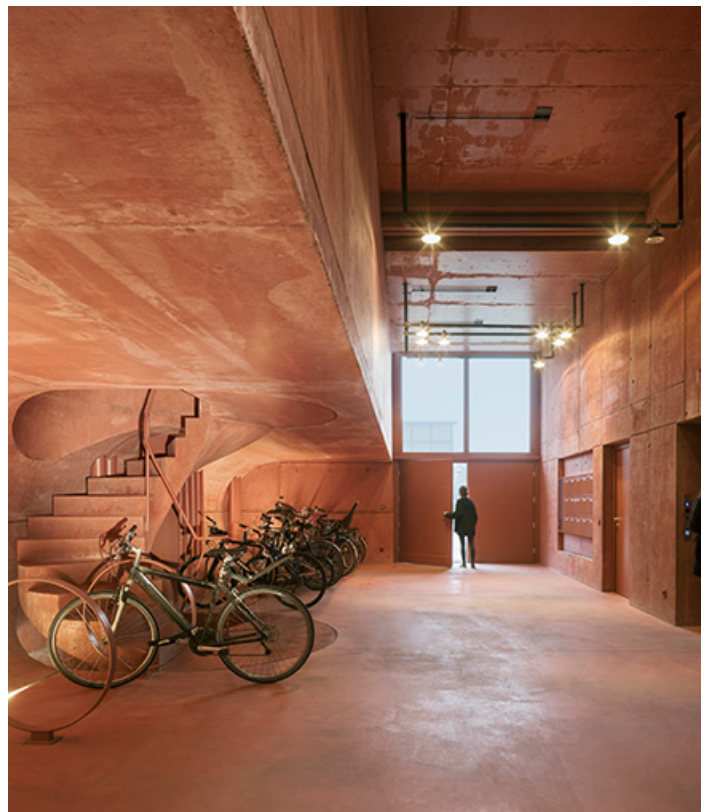
Figure 49: Entrance hall of House M

Private, Public, Collective

Groundfloor 2nd Floor

House L

House M

House S

Public

Collective

Private

1:400　N
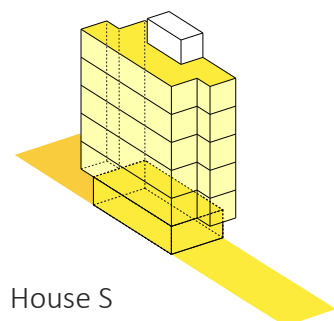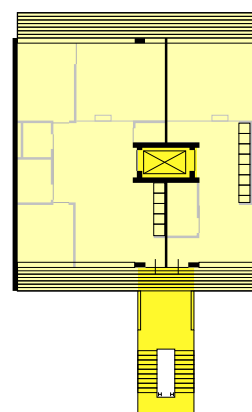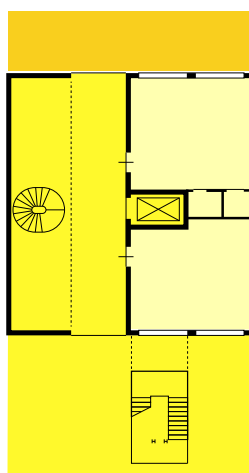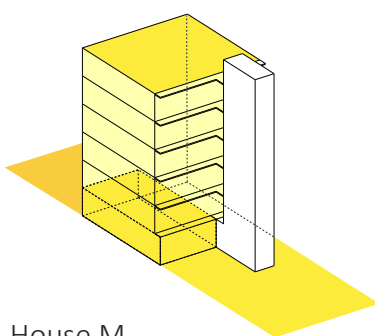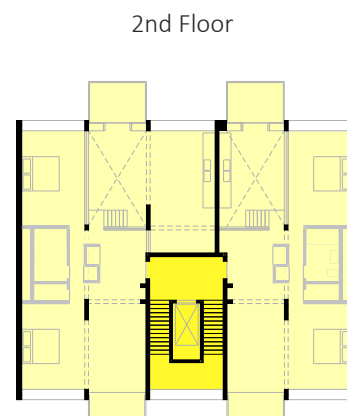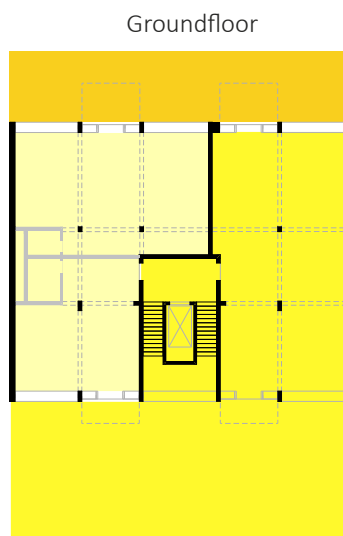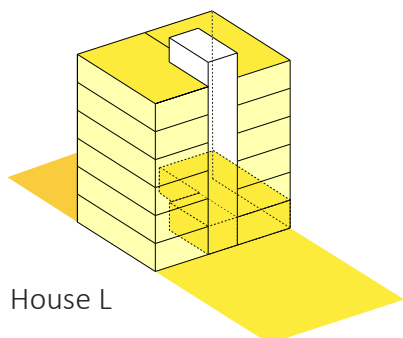
A distinction between private, public and collective spaces is important for a clear differentiation and design of spaces and to meet the urban needs of public and community life, as well as for withdrawal. The Lokdepot forms a clear division between the public street space and the collective area, which is available to the residents through the shared backyard, the large entrance areas, as well as the collective roof gardens. The apartment buildings have collective gardens and are referred to as „courtyard gardens". It provides an appropriate frame for building a community within the building.(Die rote Wohnfabrik | BDA | der architekt, 2016). Commercial and restaurant spaces are located on the ground floor and are partially accessible from the public street space, and from the collective access space. The private living area is located above the ground floor and as such is visually and spatially separated from the semi-public ground floor (Buschmann, n.d.). The need of the private refuge for the residents which serves as a space of personal development and control, is achieved well at the Lokdepot through the clear distinction between private and public.

Figure 50: Collective rooftop garden

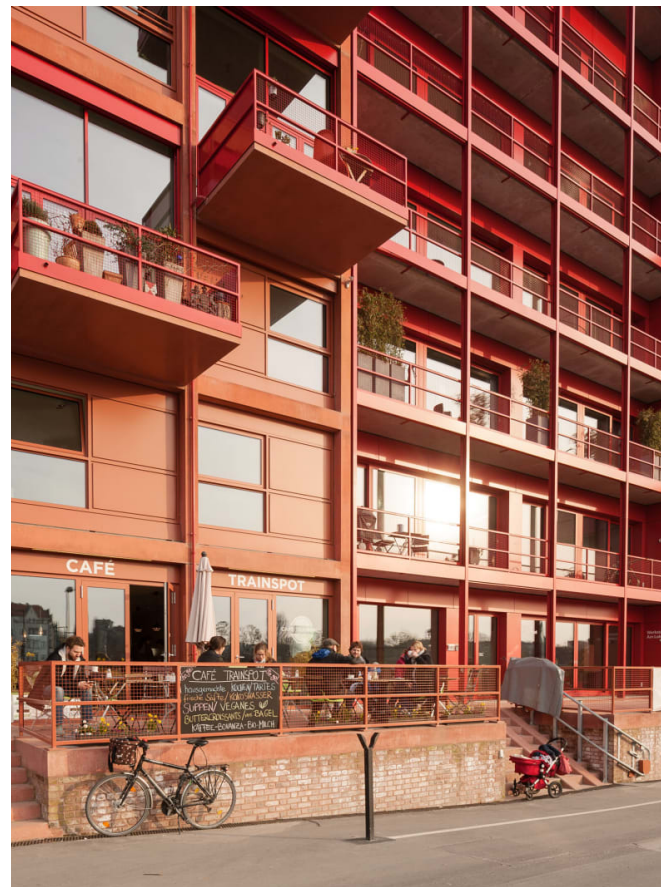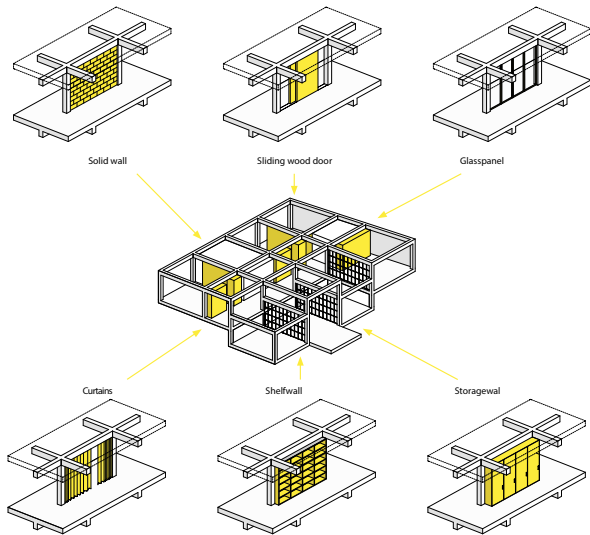Figure 52: Collective backyard split into different

Figure 51: Public street front with a Cafe in the

Figure 53: Collective backyard

Contribution to identity and belonging

Different infill variations

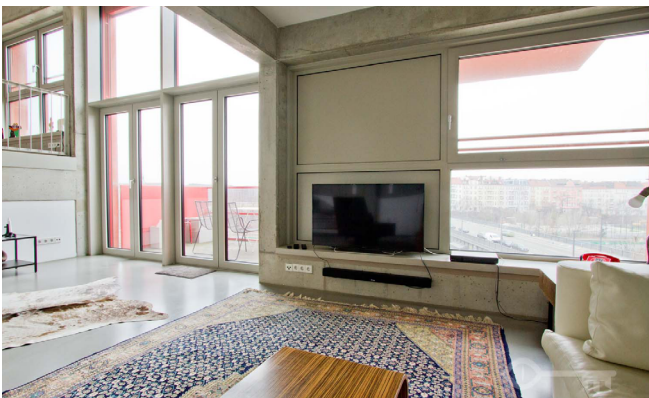Figure 54: Living space of House M

Figure 55: Living space of House M

Figure 56: Living space of House L

The exposed concrete and the open column structure are designed to emphasize this character of the „factory living" (Buschmann, n.d.). The open design allows the various sized apartments to be individually designed by the owners. Walls can be drawn with different materials as desired to customize the living space to fit the own living situation. (Kleilein, 2014). From this, it emerged that the sense of identity can be formed through personal design of the living space. This includes the design through furniture and personal objects, but also the design of the own apartment layout, the materials, the degree of openness and the way residents live together. Personal traits or (future) living situations can thus be expressed, which reinforces the own identity to the living environment. Furthermore, the Lokdepot offers its residents the possibility of interaction with their neighbors through collective spaces, which form the framework for a community and thus strengthen the sense of belonging to the place of residence. Especially the large and attractively designed entrance areas are an important part of the daily encounter and are beneficial for the collective feeling and the resulting sense of belonging.
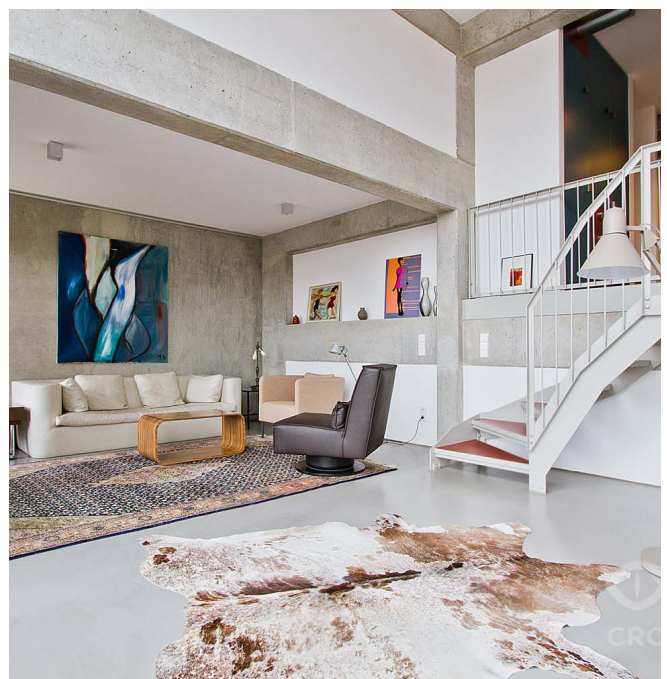

Figure 57: Living space of House L

Healthy & active architecture features

Some nature elements can be found in the Lokdepot, such as the green roof areas and the planted backyard, which can attract and influence residents through qualitative plantings and small trees. However, these areas, especially the rooftop gardens must be actively accessed to enjoy their benefits. The design also placed little emphasis on natural planting, especially in the public streetscape, where green spaces are scarce and too small. In terms of active architecture, there are some elements that can encourage physical movement. For example, the exterior stairways of House M or the open stairwells of House L are positive indicators as they connect access to outdoor space. However, the use of these stairwells can tend to be secondary to the elevators, which are placed rather in the foreground. Stair use encourages social interactions with neighbors because, unlike elevators, social interaction can be better controlled. The attractively designed, and partially light entrances are therefore positive, as is the detailed design of the ground floor to stimulate the senses and encourage walking. The plinth is kept rather closed in parts and thus can only react poorly to the street space.

Figure 58: Planted backyard

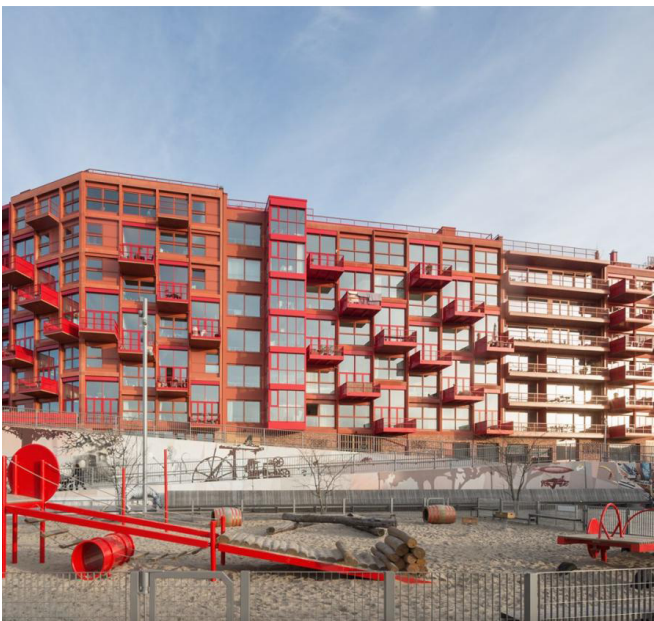Figure 59: Public street front with closed off

Figure 60: Public street front with playground

Figure 61: Outside stairs of House M

Case Study 2: Superlofts, Amsterdam

Project Name: Superlofts
Location: Amsterdam,
                           Houthavens
Architect: Marc Koehler
Year of realization: 2016
Client: Era Contour BV
Plot size: 18.000 m²

Abstract

Superlofts is an architectural development where the residents are involved in the design project from the very beginning. It is a co-housing project that is financed by the residents and the architects association itself. Thus, there is no developer aiming for profits. This allows the residents to co-design the concept, the living space and the facade, creating a strong community and a sense of belonging (arqa.editorial, 2019). Designed like an „urban village", the issue of loneliness and isolation is addressed through communal and hybrid spaces (N.S. Program, 2018). The project targets a community of people with creative and entrepreneurial mindsets who live hybrid lifestyles with specific spatial requirements. The apartments are based on an open floor plan principle, with multiple shafts to ensure maximum freedom of the dwelling design. The architects have designed each apartment together with the residents and can be developed gradually (MKA, n.d.). For this reason, I chose the Superlofts as a case study. Similar to the Lokdepot, the Superlofts concept emphasizes free development and freedom for the residents. They have control over finances, design, community, and hybrid living functions, which can build a strong identity to the place they live.

Figure 62: Street front of the Superlofts

Figure 63: Areal view

Urban morphology

Three building volumes (Plot 1, 2 & 4) form a segment of the building series and are part of a large urban development in Amsterdam Houthavens. The building volumes each consist of an apartment building of 30 meters height, and opposite townhouses of 12 meters height. Between them on the first floor is a courtyard situation, which is used by the adjacent buildings as collective gardens. Below the gardens on the groundfloor are parking garages and storage space, and are also used collectively (MKA, n.d.). The morphology of the project resembles a typical Dutch narrow building block, which is permeable on one side through lower buildings and openings, providing the courtyard with sufficient daylight. This increases the quality of this space as a place to stay and can efficiently function as a private refuge.
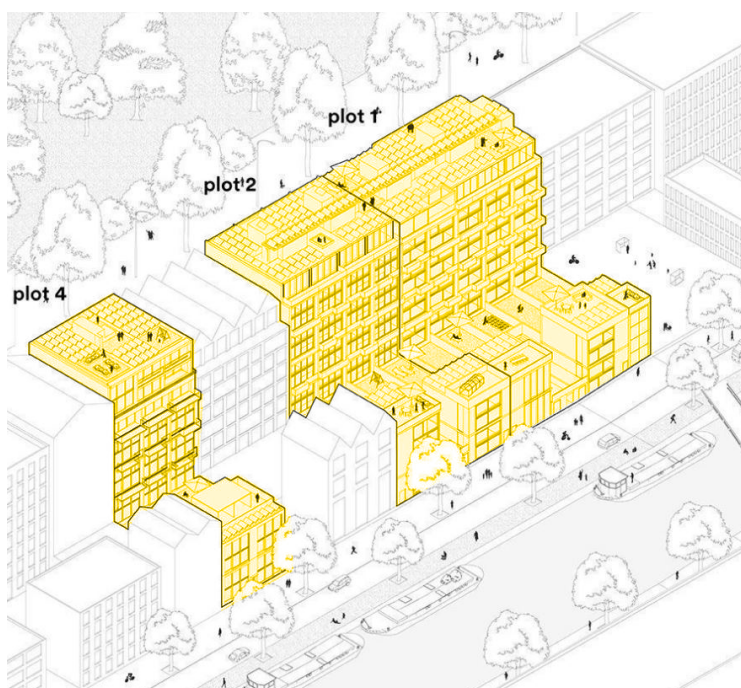

Figure 64: Axonometric view (graphic by architect)

1:1000

Dwelling Typologies

The architects worked together with the residents to design each apartment. As self-financing is more affordable than the market price, the residents can gradually develop their living space and thereby grow organically into their own apartment. The apartments are on average 18 meters deep, 5.7 meters wide and 5 meters high. This allows residents to extend up to 70% of the floor space as a second level. There are two lofts of 75 m² per floor, which can be divided into two smaller units of 35 m². The houses range from very small (35 m²) for young professionals to very large (200 m²) houses for large families (MKA, n.d.). Together, the three buildings comprise 70 apartments, each with individual floor plans and designs. Since a large part of the apartments are maisonettes, the elevator stops only on every second level. By placing the circulation core on the

façade, a diverse and modular combination of loft types is created, varying from one to five lofts per floor. The open superloft framework stimulates new hybrid residences such as an artist's studio, a cooking studio, a brewery, and various home offices all blended throughout the building. The diverse housing brings a vibrant mix of residents that create a dynamic community (Melvin, 2020).

Raw space Interior infill
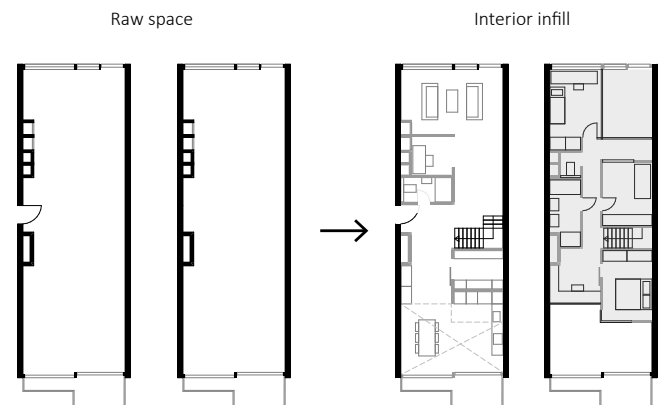
Figure 65: Superloft concept from a raw space to a custom made interior design

Figure 66: The raw apartment before it is being adapted

apartment loft
80 - 155 m²
A1   A2   A3

double sided loft
83 - 195 m²
DS1   DS2

H1
one sided loft
35 - 185 m²
OS1   OS2

loft house
80 - 240 m²
H1   H2

3/4 house
65 - 130 m²

Figure 67: Various different apartment sizes and typologies (graphic by architect)

Figure 68: Each apartment is an individual and unique design suited to the residents' needs (graphic by architect)

Circulation

1st floor

Circulation Space

1:400   N

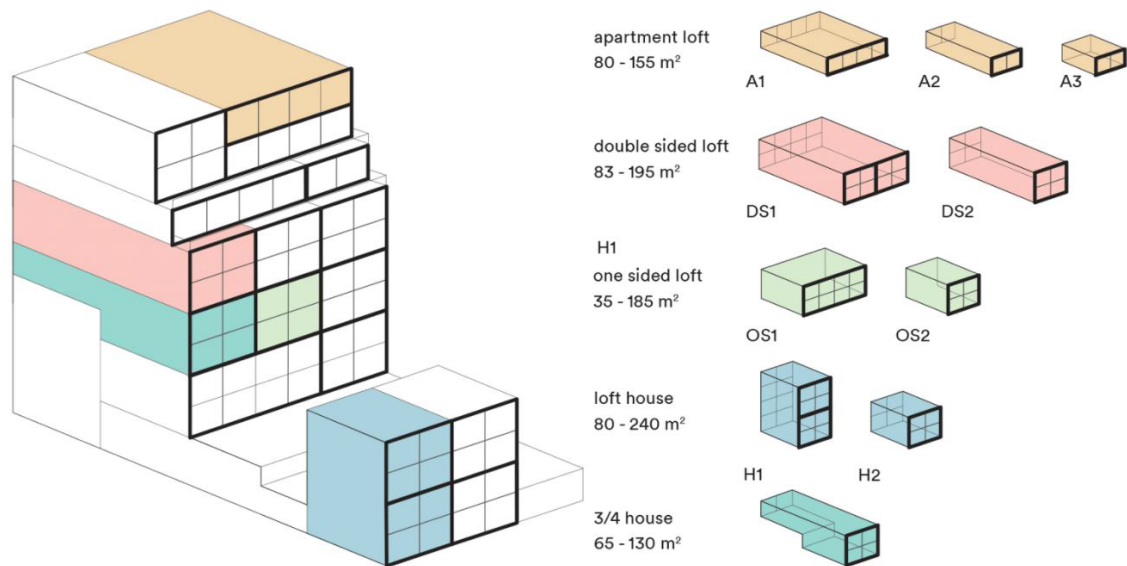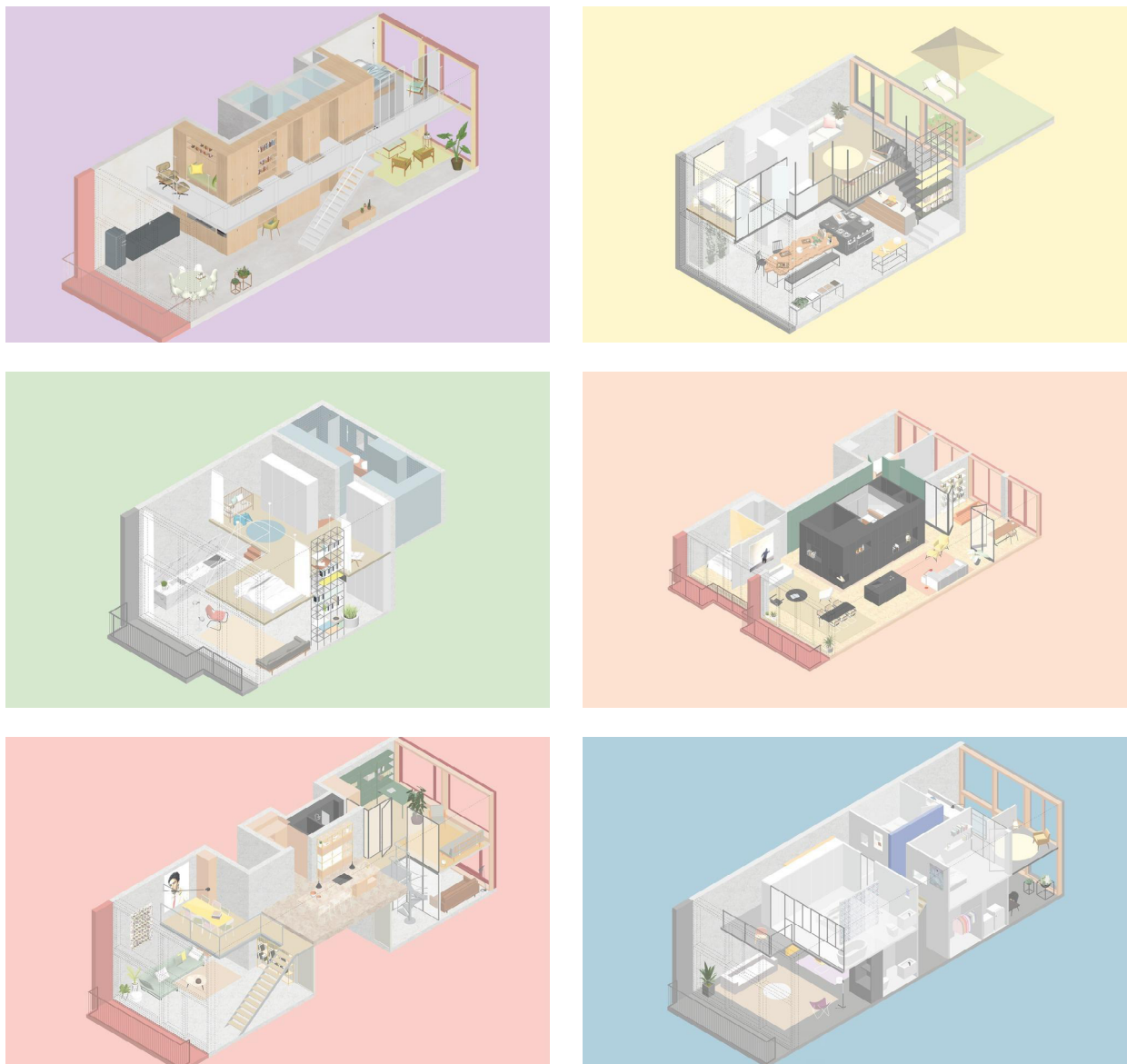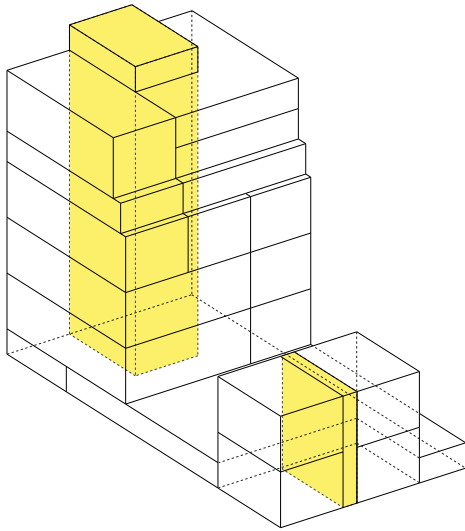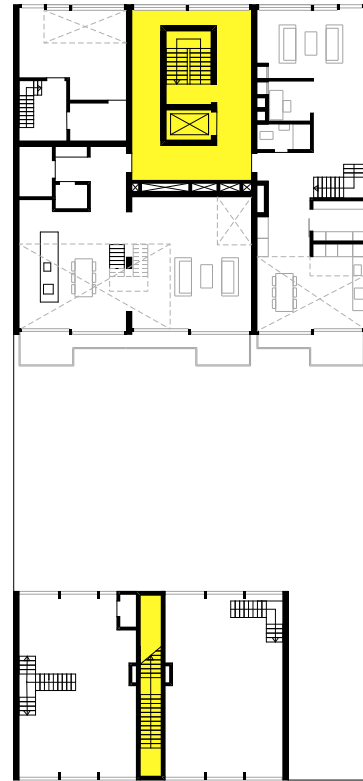As such, the circulation space in the Superloft is designed to be very efficient and simple. The stair core, as mentioned earlier, is located at the exterior facade to create an efficient apartment layout and provide natural daylight to the circulation space. Due to the apartment building's height of 30 meters and 10 floors, the access is mainly provided by the elevator (MKA, n.d.). The stairwell itself is closed off from natural daylight and serves purely functional purposes. Casual encounters take place mostly in the elevator, or on the floor level to its direct neighbors in the hallway. The access to the townhouses is also purely functional. Due to the low height of the townhouses, access is provided solely via the staircase and connects to two additional apartments on the upper floor. From personal observation from a field visit, the potential to use the stair space as a potential collective space by emphasizing encounters was hardly used. This aspect is different from the circulation spaces in the Lokdepot, which connects the access with collective spaces.
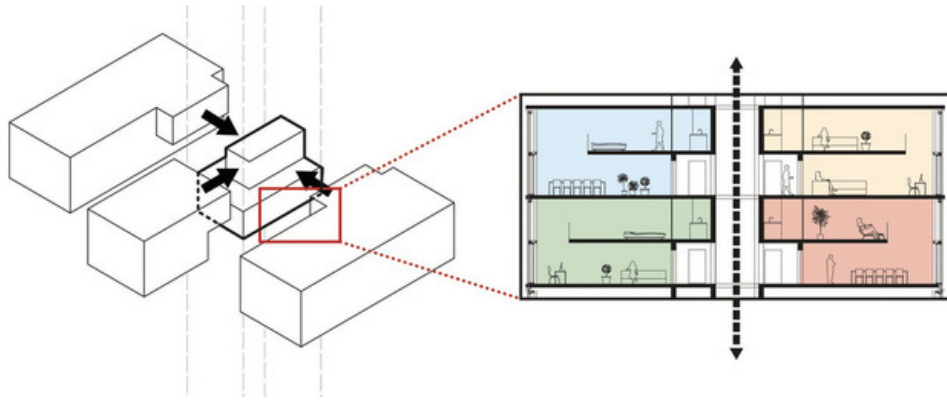
Figure 69: Maisonette apartments allow for an efficient use of the stairwell. The elevator stops only on every second floor

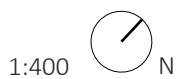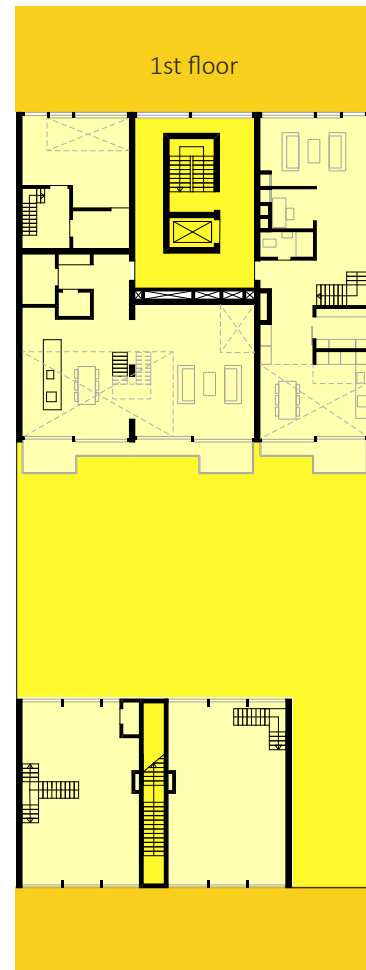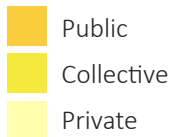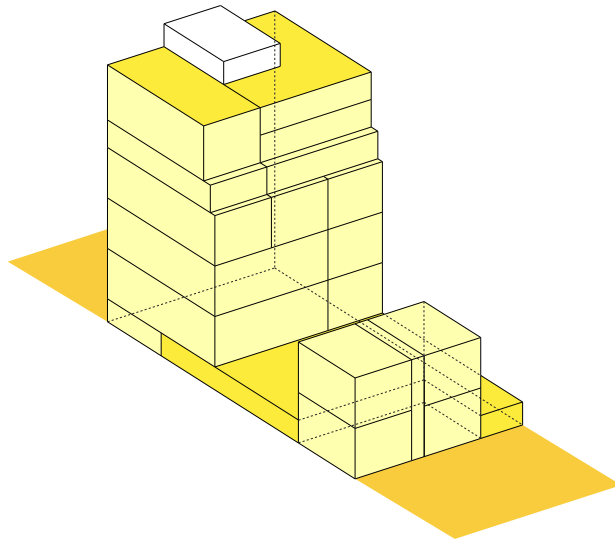Figure 70: The Townhouses are accessed directly from the public street

Figure 71: Access of the groundfloor of the apartment building

Figure 72: Streetfront elevation

Figure 73: Maisonette floors are accessed within apartment stairs

Private, Public, Collective

Public
Collective
Private

1st floor

1:400   N

The concept of the „urban village" is largely obtained through the co-housing concept, as the residents organize themselves collectively and design concepts together. This provides a framework for residents to get to know each other and to network and come together (Melvin, 2020). An urban village in a dense development as in the example of the Superloft can only spread little in width, and much more in height. Some collective spaces are present in the project and offer the possibility of networking and coming together. Collective spaces include the rooftop terrace and the elevated courtyard, which according to the architect is intended as a space for all residents. However, from my research, floor plans and diagrams, and from my site visit, it was not apparent to me how the courtyard is collectively used and can be accessed from different floors. The roof terrace provides a space for gatherings. However, this space has to be actively entered and as such is hardly attractive architecturally or through planting. It offers little incentive to be used permanently. The quality focus of the superlofts is clearly on the private living areas and the free and qualitative design possibilities of the residents. Likewise, the public street space is seen as an extension of the living space by the ground floor apartments especially by the townhouses and its southern orientation. This became apparent during the site visit in the lush planting and furniture along the facade, and the way the living space and the public street space are interchanged.

Figure 74: Transition between the private inside and the balcony

Figure 75: Apartment in the making. Transition between the private inside and the collective terrace

Figure 76: Collective rooftop for collective

Figure 77: Public street in front of the townhouses
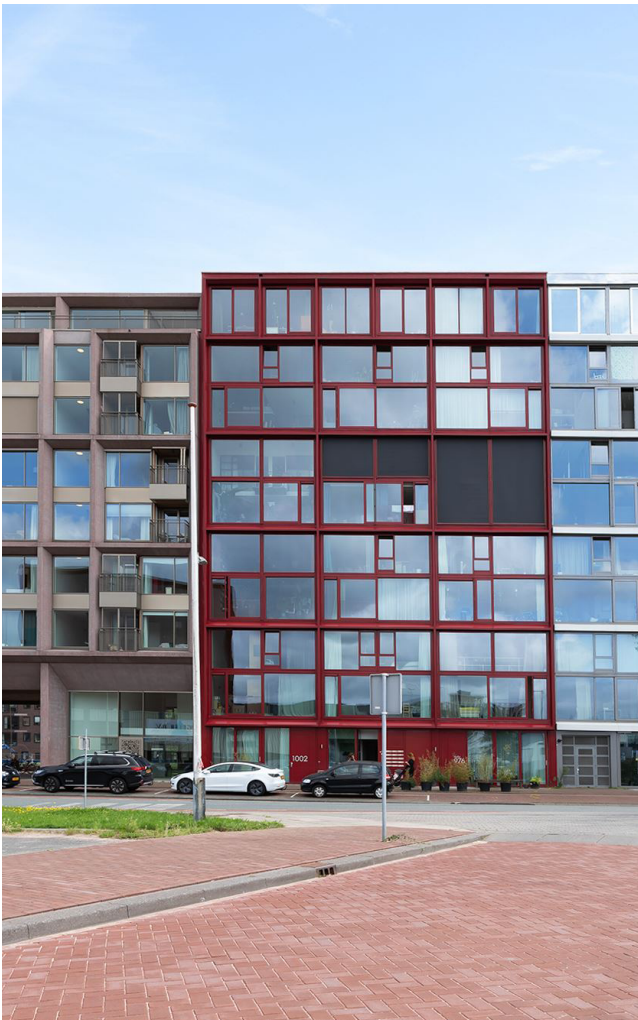
Figure 78: Public street in front of the apartmenthouses

Figure 79: Collective courtyard

Contribution to identity and belonging

Figure 80: Transition between the private and public space

Figure 81: Uniquely designed apartments reflecting the residents personal traits

Figure 82: Uniquely designed apartments reflecting the residents personal traits

The Superlofts contribute significantly to the fulfillment of the individual resident's living desires and, through the dynamic concept, create the potential for residents to identify closely with their living environment (N.S. Program, 2018). The living space must be adaptable to individual living situations and should provide the opportunity to express the own personality through personal objects and decoration. The open structure of adaptable super lofts corresponds to the factor of homemaking and is positive in terms of forging identity. Furthermore, people feel attached to a place, building or environment when they have qualitative social contacts that enrich private life and satisfy the need for social interaction with other people. The co-housing concept of the Superlofts aims at a collectivity between the residents, as they collaborate in part to create the concept and design of the building. However, collective spaces or spaces that encourage encounters could be a stronger focus of the design to further strengthen a sense of community.

Figure 83: Uniquely designed apartments reflecting the residents personal traits

Healthy & active architecture features
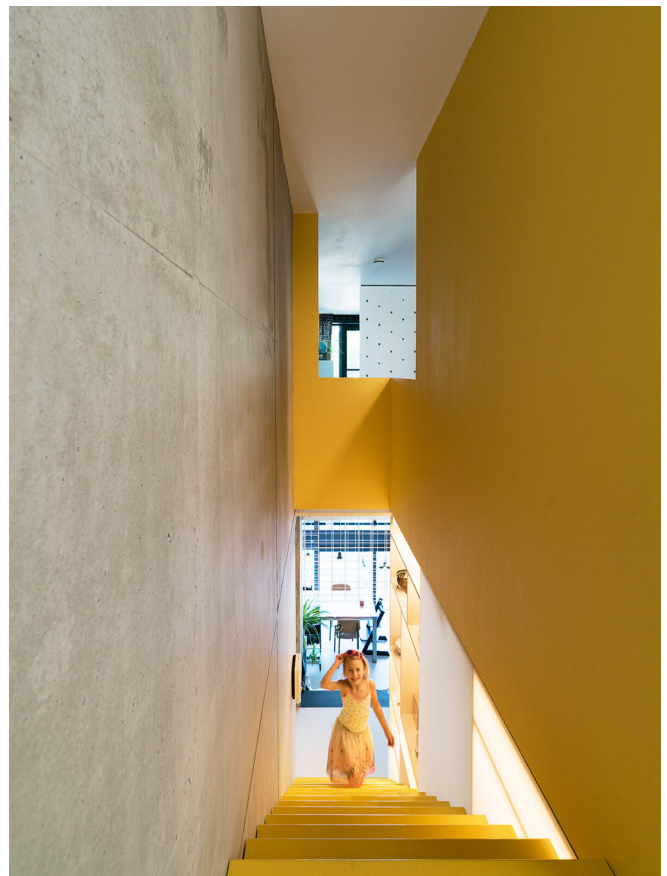
The inclusion of natural vegetation and trees is not an essential part of the design of the Superlofts. The rooftop, as a communal space, is barely planted and offers little amenity. Proximity to quality green space in close proximity to the apartment is crucial for a healthy and calming living environment. Based on personal observations, planting occurs largely by residents themselves. However, water areas, such as those found in close proximity to the superlofts, can also have a positive impact on residents' wellbeing, have a stress-reducing effect, and can encourage physical activity. The large window areas of the ground floors open up the interior space to the quiet street, which increases safety through the „eyes on the street" principle and encourage interactions and encounters. As indicated in the Active & Healthy Architecture chapter, people are more likely to walk if they can establish visual contact with neighbors to create a sense of community. You feel like a part of the neighborhood. Personal observations showed that residents of most ground floor apartments at the Superlofts left their curtains open even in the late evenings. There appears to be only a limited sense of a lack of privacy from the public street space. This could be due to the quiet character of the residential street and a feeling of safety.

Figure 84: Large window fronts allow maximum amount of daylight to the inside

Figure 85: Planted courtyard

Figure 86: Large window fronts in the groundfloor increase the safety on the street

Figure 87: Public street with little green space

Case Study 3: Spreefeld, Berlin

Project Name:	Spreefeld
Location:	Berlin- Kreuzberg
Architect:	Fatkoehl Architekten,
	BARArchitekten &
	Carpaneto Schöningh
Year of realization:	2011-2013
Client:	Genossenschaft
	Spreefeld
Plot size:	7.400 m²

Abstract

The Spreefeld project in the inner-city of Berlin is a cooperative housing development with the main focus on the community. Similar to the Superloft, the Spreefeld does not have a developer, but is financed by a community of future residents and the housing cooperative and was designed together with three architecture firms. The focus was less on the individual residential units, but much more on how a community can be architecturally designed (Bau- und Wohngenossenschaft Spreefeld Berlin eG, n.d.). Different types of apartments such as the cluster housing and the standard private apartments are designed to accommodate a broad mix of different users with different financial resources. Through the cooperative concept even people with low income can live in the Spreefeld. Furthermore, the focus was on the public and collective ground floor, which can be used for commercial and especially for collective purposes (Balhausen & Kleilein, 2014). The choice to include the Spreefeld in my case study analysis is motivated by the focus on building a community, which can be implemented through architectural means. The residents themselves have control over the design of the architecture and the collective principles, thus forming a strong sense of unity and identity. Moreover, the emphasis in this project was placed on the incorporation of nature in the form of collective spaces, which offers a great contribution to a healthy and social life.

Figure 88: Areal view

Figure 89: Waterfront

Urban morphology

The project consists of three building volumes that are arranged offset to each other and form a central space between the buildings. The architects paid attention to an open structure in order to leave the site and the riverbank of the Spree accessible to the public and to allow almost every resident a view of the river. As a result, there is no clearly defined front and back, but instead forms a flowing urban space. In addition, the riverbank is to the north and the sun is to the south. So it's not entirely clear which side is the more attractive one. The architects and the cooperative saw the project as an urban extension, which meant that the public should not be excluded. The buildings consist of six stories, each with a community roof terrace and private vertical gardens. The roof terraces were seen as a compensation for the residents, as the inner area and the waterfront remain open to the public (Balhausen & Kleilein, 2014).
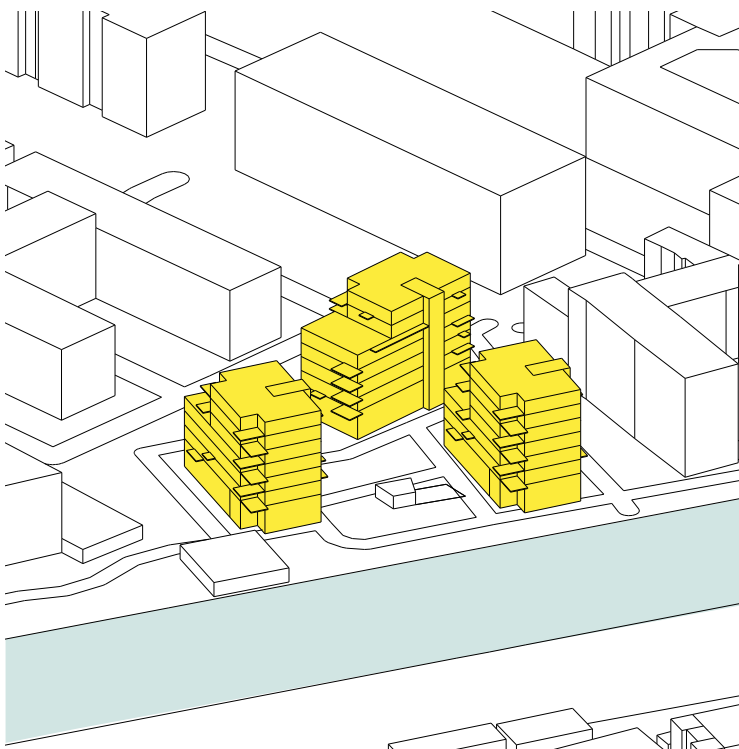

Figure 90: Axonometric view

1:1000

Dwelling Typologies

The apartment typologies consist of cluster apartments and standard apartments of different sizes, from mini-apartments of 25 m² to 400 m² of shared apartments (Balhausen & Kleilein, 2014). The cluster apartments are grouped, smaller apartment units each with a private bathroom and a kitchenette, and a large common space with a large collective kitchen and a living room. In this type of housing, the primary focus is on the community, with the private apartments serving as refuge. The idea is to extend the encounter among neighbors not only to the casual encounters in the stairwell, but to create a kind of tiny neighborhood that lives together collectively and that interacts with each other. There are different sized cluster units ranging from 4 to 20 grouped apartments. The standard apartments consist of individual floor plans and were designed and laid out by the residents themselves. A column grid construction of reinforced concrete and wood was chosen to enable flexible and individual layout design and possible rearrangements in the future.The apartments were kept cost-effective and handed over to the residents in their raw state to allow for individual adaptations (Sánchez, 2021).

Figure 91: Apartment interior and the large balconies
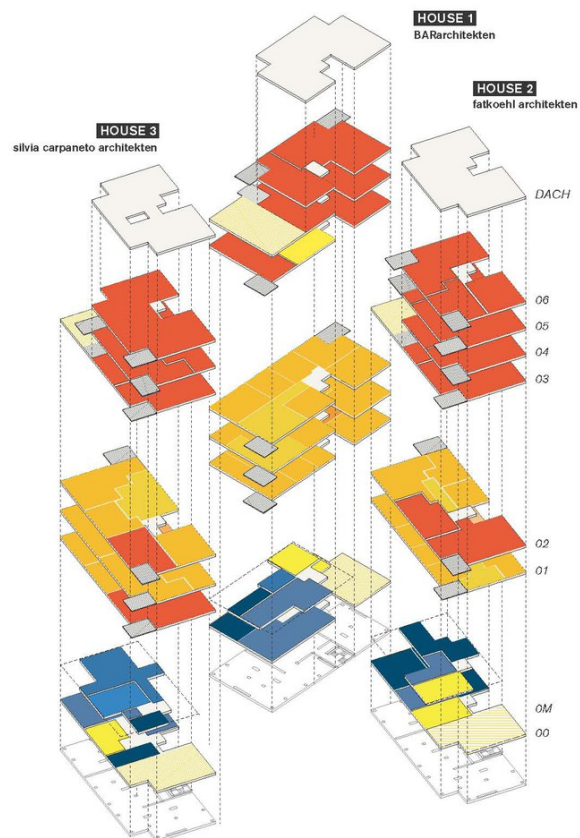
Figure 92: Interior programm

Figure 93: Cluster units on two floors, connected with interior stairs

Circulation

1st floor
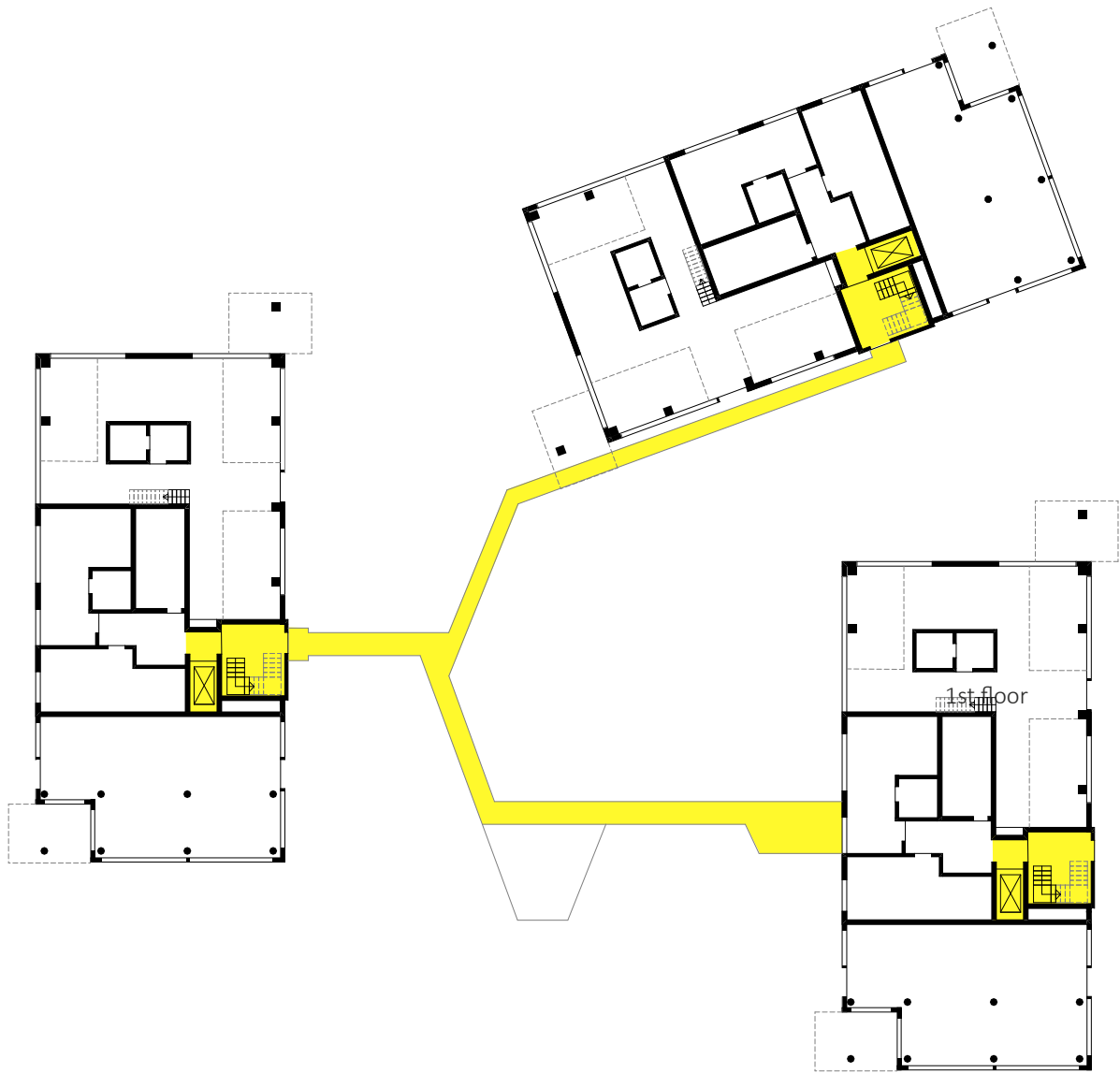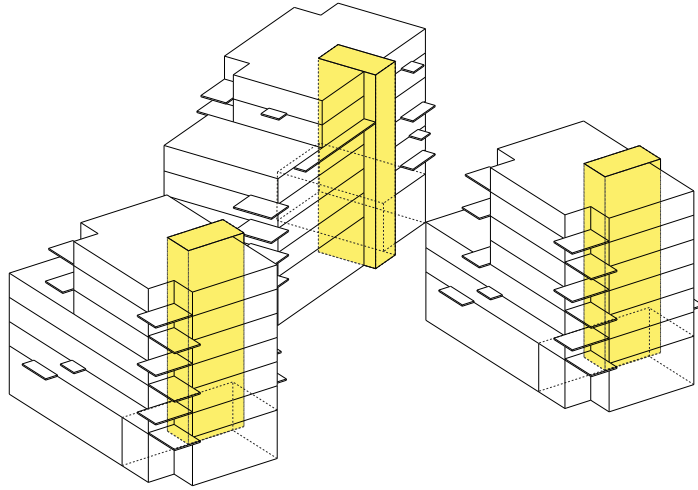
Circulation space

ground floor   1:400   N

The circulation space in the Spreefeld is efficiently designed and serves the main function of the access. The stairwells are opened up to the outdoors and partly extend outside the building. The reason for this is, on the one hand, the fire safety regulations, as the open strucutre counts as an outside staircase (Balhausen & Kleilein, 2014). On the other hand, the staircase is designed to be of high quality and to connect the staircase with the surrounding nature. Thereby the spatial quality should be increased to promote encounters among residents. Furthermore, the stairs are connected to the roof gardens and can be reached via a gallery access. A walkway spans between the three building volumes and connects the central winter garden.

Figure 94: Stairswell opened up to the outside

Figure 95: Public river bank of the Spree

Figure 96: View into the collective courtyard

Figure 97: Facade front with balconies and the open

Private, Public, Collective
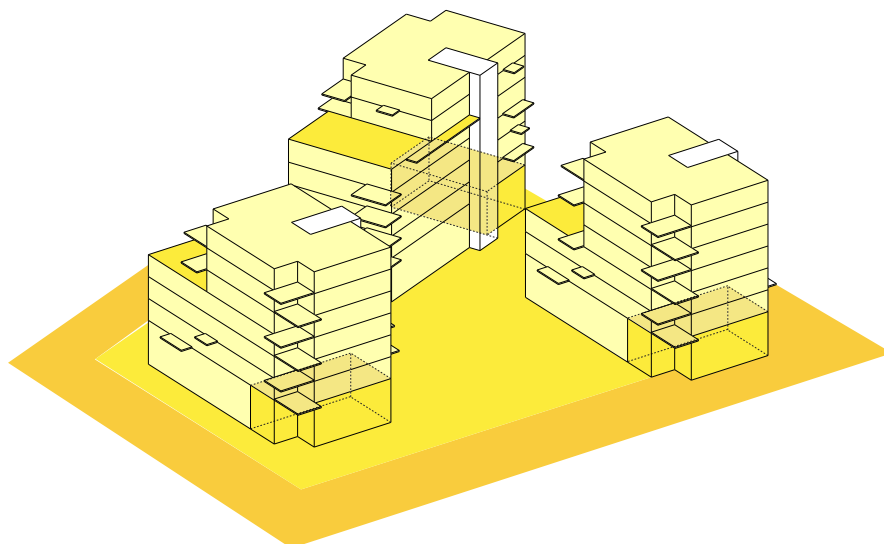
	Public
	Collective
	Private

ground floor   1:400   N

The focus of the cooperative was on the inclusion of the public to the river bank, as well as the permeability and accessibility of the property. Accordingly, the collective areas are very large compared to the Lokdepot and the Superloft. The central courtyard mainly serves the residents and functions as a multifunctional space for various activities such as playing, gathering, gardening or relaxing. In addition, each of the three buildings has so-called „option rooms" in the groundfloors and were deliberately not assigned to any specific function. The architects left these spaces largely un-designed to allow spontaneous adaptations by the residents to organically happen. They are used collectively by the residents or can be rented by outside parties as long as they are not used exclusively for profits and retail space. The entire ground floor does not include a residential function, but remain open to the collective and the public. Thus, there are office spaces, a carpentry and workshops, which can be used by the residents, or studios and commercial spaces. The private living spaces are located above the ground floor. The three roof gardens are exclusively accessible to the residents and can be freely cultivated and utilized by them (Sánchez, 2021).

Figure 98: One of the three option rooms

Figure 99: Collective carpentry and workshop

Figure 100: Residents gathering in the option room

Contribution to identity and belonging

Figure 101: Residents gathering in the option room

Figure 102: Apartment interior

Figure 103: Apartment gardens

The design of the Spreefeld was created and conceptualized by the future residents themselves in a collaborative effort. In an interview with the architecture magazine Bauwelt, the architects report that the collaboration has bonded the residents together, allowing them to form a community even before they moved into the buildings. Because Spreefeld residents have control over their own living environment and have the opportunity to participate in a collective and design the living space as they see appropriate, there is a strong sense of belonging and identity developing to their own home. This concept is particularly suitable for young families who like to live in the city but want a safe environment for their children with familiar people. But other groups of people who like to live in a community are also well suited for a cooperative. The position of the buildings, which together form a sort of courtyard, create a central point that can be used as a kind of „village square." Nevertheless, the concept of cooperative housing does not seem to be suitable for every person and requires a will to contribute to the community.

Figure 104: Communal kitchen of the cluster unit

Healthy & active architecture features

The many trees and plants and the proximity to the water stand out directly when analyzing the Spreefeld. The central courtyard features a variety of large trees and plants and offers an ideal opportunity for residents to meet and be active. Children in particular can benefit from a richly planted living environment, as it positively influences development and encourages physical activity. The richly planted rooftop gardens and large balconies are also positive features, providing an intimate and calming atmosphere, which is very important in a dense, urban environment. The open stairwells convey a closeness to the green outdoor space and can encourage people to choose the stairs over the elevator, integrating physical activity into their daily lives. The open, glazed ground floors can animate the immediate environment and encourage interaction. Outsiders are encouraged to interact with the neighborhood. Encounters can easily occur due to the open courtyard in conjunction with the public waterfront and appear inviting to external people. In conclusion, the Spreefeld has a number of positive features that provide a healthy living environment for its residents, as well as its immediate surroundings, and represents a piece of attractive urban extension that can be used as a positive case study.

Figure 105: Large trees in the green courtyard

Figure 106: Collective courtyard

Figure 107: Collective roofdeck

Figure 108: Every resident has a view into the green

VI. GRAPHIC NOVEL
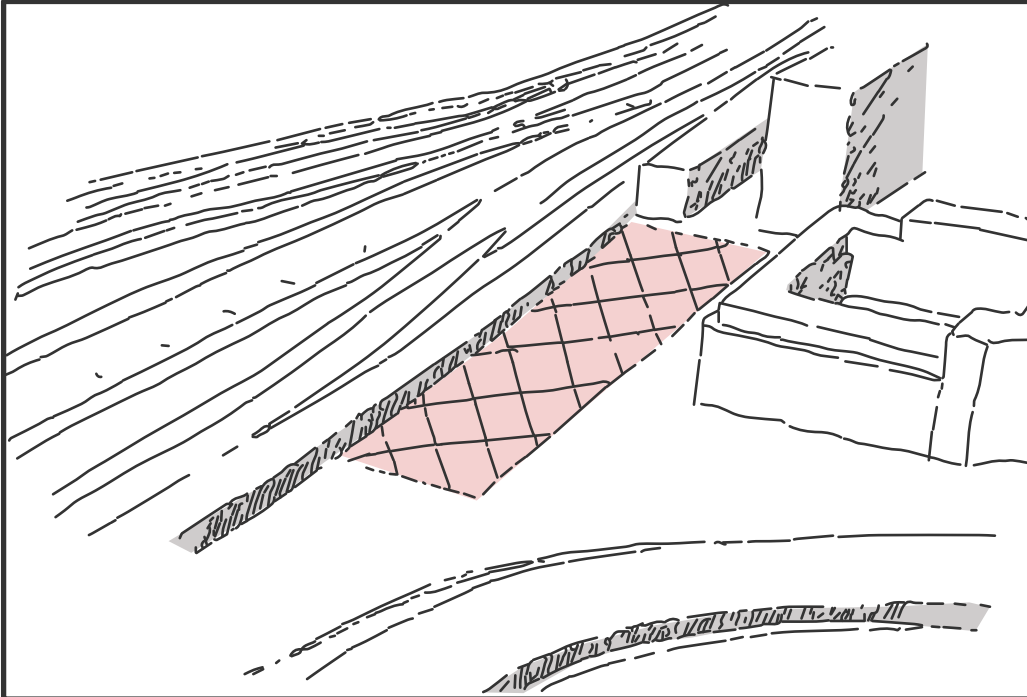
The city of Rotterdam has initiated a redevelopment of the site in the inner-city Walenburghof. Due to the acute housing shortage in Rotterdam, a redensification of the site with a large number of new flats and tenures is to be created, which will qualitatively enhance the neighbourhood of Blijdorp.

Representatives of various housing cooperatives discuss the new development in Blijdorp together with the architects. As the concept of a housing cooperative is still quite young in the Netherlands and still to be explored, the developers came to a conclusion:

...what if we design a part of the houses as housing cooperatives, and the other part as regular ownership homes. As a comparison, so to speak, to see a direct relation for the development of the Rotterdam housing market in the long run.

That's an interesting idea... In this way, we can build a diverse and healthy mix of users and income levels.

Meanwhile, Single father Henri sits in his small studio apartment in Rotterdam, which he had to rent on short notice.

Since the break-up with Dalma, I only see my little Maya far too little. Somehow my life has become quite dull and boring. I don't really want to show anyone how I live now, it just doesn't fit me.

Can I sleep at your place tonight, Dad?

No Maya, I will have to bring you back to mum tonight. You know how small my new apartment is. And besides, I have to work tomorrow morning, so I can't look after you.

You never have time for me...
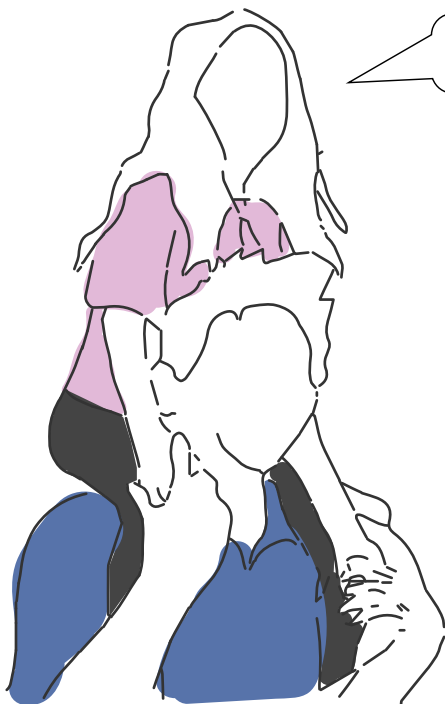
The young parents Valerie and Niels and son Elias live in a central flat in Rotterdam. Since the birth of Elias, their flat has become too small. Both parents work alternately from home. However, they find it difficult to manage their stressful daily schedules and at the same time lead a balanced and healthy family life. Valerie and Niels wish to own a large family apartment with a garden where Elias can grow up one day.

MAMA...

Elias, I am not going to repeat myself!...

Niels, we can't go on like this, we really need a bigger place. We absolutely need a bit more space for ourselves and Elias also needs more room to play. He can't grow up in this small appartment. You know, maybe I would also like to have a little brother or sister for him to grow up...

I get it, but there are hardly any suitable family homes in Rotterdam if we want to stay central. But maybe we should start getting serious about it and inform ourselfs at the bank for a mortgage.

Valerie and Niels have come together for an appointment at their bank for a mortgage. As they both can credit their independent salaries together, as a couple they have a high credit score for a loan.

...then the last thing I need from you is a signature here and here.

Henri has applied for a share at the Blijdorp housing cooperative and introduces himself to the cooperative. Together they try to find out whether Henri fits into the cooperative and what conditions there are in community life.

I find the idea of living in a community really interesting! I have a little daughter who I would like to live with me every now and then. So I am looking for a flat that gives me the flexibility to have my daughter occasionally live with me.

One of the advantages of our cooperative is the great flexibility we can offer our residents. It may also be possible to exchange apartments if life situations change in the future.

We have a number of single parents with young children who are well connected to each other. Many parents also occasionally look after each others' children.

Ultimately, Henri was accepted by the housing cooperative and moved into his new home a short time later.

What a nice apartment, I love the view!

Let me show you guys the rest of the apartment

Also Valerie and Niels were able to buy their ideal duplex apartment on the groundfloor with extra space for Elias and possibly a second child.

...what I like the most is the communal garden. It gives me a bit of a village feeling because you really get to meet your neighbours. And Elias has a lot of space to play with other children.

... I am Henri, by the way, and this is my daughter Maya. I recently moved into the housing cooperative next door.

I'm Niels and this is Valerie and we bought this ground floor apartment. What is it like to live in a cooperative? We looked at the concept but were not sure if we really wanted to live in a cooperative. It was important for us to be in control of our own four walls and to be able to make structural adjustments.

Yes, that makes sense. I like the community very much, I know all my neighbours in the house and now also some from the neighbouring houses. We are now like one big family. I can often leave Maya with the neighbours when I have to go out and cook dinner for them in return. I find that very pleasant.

VII. CONCLUSION

The goal of this research was first to find out how architecture creates the framework for healthy and active living and how residents can better interact with each other through design principles. Second, it was to find out how to create and strengthen a community and a sense of belonging in mid-rise residential architecture. Based on extensive literature research on the main topics of psychology and healthy living, and analysis of case studies, a clear conclusion can be drawn.

The result of the first point is that physical health in particular can be influenced by architectural and spatial design aspects. An increase in physical activity can be achieved in simple daily movement patterns, and has a positive effect not only on general health, but also on the overall wellbeing. This can be achieved, among other things, through attractive and strategic design of circulation space and common areas, and the implementation of nature, healthy materials and a strong connection between inside and outside. The aspect that active design has on mental health can only be answered to a limited extent. Due to the complexity of factors influencing mental health, a universal, architectural solution is not feasible. Promoting health and general wellbeing, as well as a healthy and friendly living environment and creating a sense of community, can have a positive effect on the psyche for many. However, social issues such as loneliness or stress cannot be counteracted across the board for everyone through positive influences of the living environment, which means that the effect of active design on mental health is only indirect. The creation and design of collective spaces within a housing complex can provide the framework for residents to interact with each other and form a sense of cohesion. However, quality and lasting interaction requires the willingness of residents, making spatial influence on social interactions also indirect.

The result of the second point shows that the formation of a community within a housing complex is not only influenced by spatial structures, but largely by the housing tenure. Thus, especially through the analysis of the case studies in the comparison between owner-occupied apartments and housing cooperatives, it becomes apparent that a strong sense of community among residents and the prevention of loneliness must be actively organized and should go beyond random encounters in collective areas. However, regardless of the housing tenure, a qualitative spatial design of the collective areas can help to promote encounters between residents and invite them to linger. That people can identify with their living environment and develop a sense of belonging is strongly favored by a sense of community. However, residents also need control over their living space, which can be provided through adaptive design and making

spatial adjustments possible for the residents. The design and appearance of a building can be identity-building if it reflects the psychological and biological needs of the occupant.

My key takeaway from this research is the psychological impact that architecture has on the user, mainly subconsciously, and what profound effects take place on the psyche, behavior, emotions, or wellbeing. Buildings not only define the appearance of a city and a neighbourhood, but also influence us in many different ways. Creating architecture with a strong identity has a positive impact on social coexistence and an active urban life and is not only based on aesthetic or subjective views, but can be scientifically-psychologically substantiated. The findings of this thesis will greatly shape my attitude towards residential architecture and my own design projects, and make me even more aware of my responsibility as an architect.

Based on these findings, urban and architectural designers should consider that their designs do not merely have a superficial effect on urban and private life, but have a profound impact on the quality of life and on the development of users and neighborhoods. From the learned insights of this thesis, it can be assumed that architects have not only the opportunity but also the responsibility to design buildings that can sustainably satisfy the needs of users and promote active, urban living. This research is aimed to provide insight into the interrelationships of architectural psychology, which is little known in today's building industry. Ultimately, the Scientific Psychology approach to residential architecture can lead to a better understanding of how people respond to their environment and can explain behavioral patterns that can be considered in the design process.

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