The Urban Dyke

Presevering the Future by the increase of valuation

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Urban Dyke

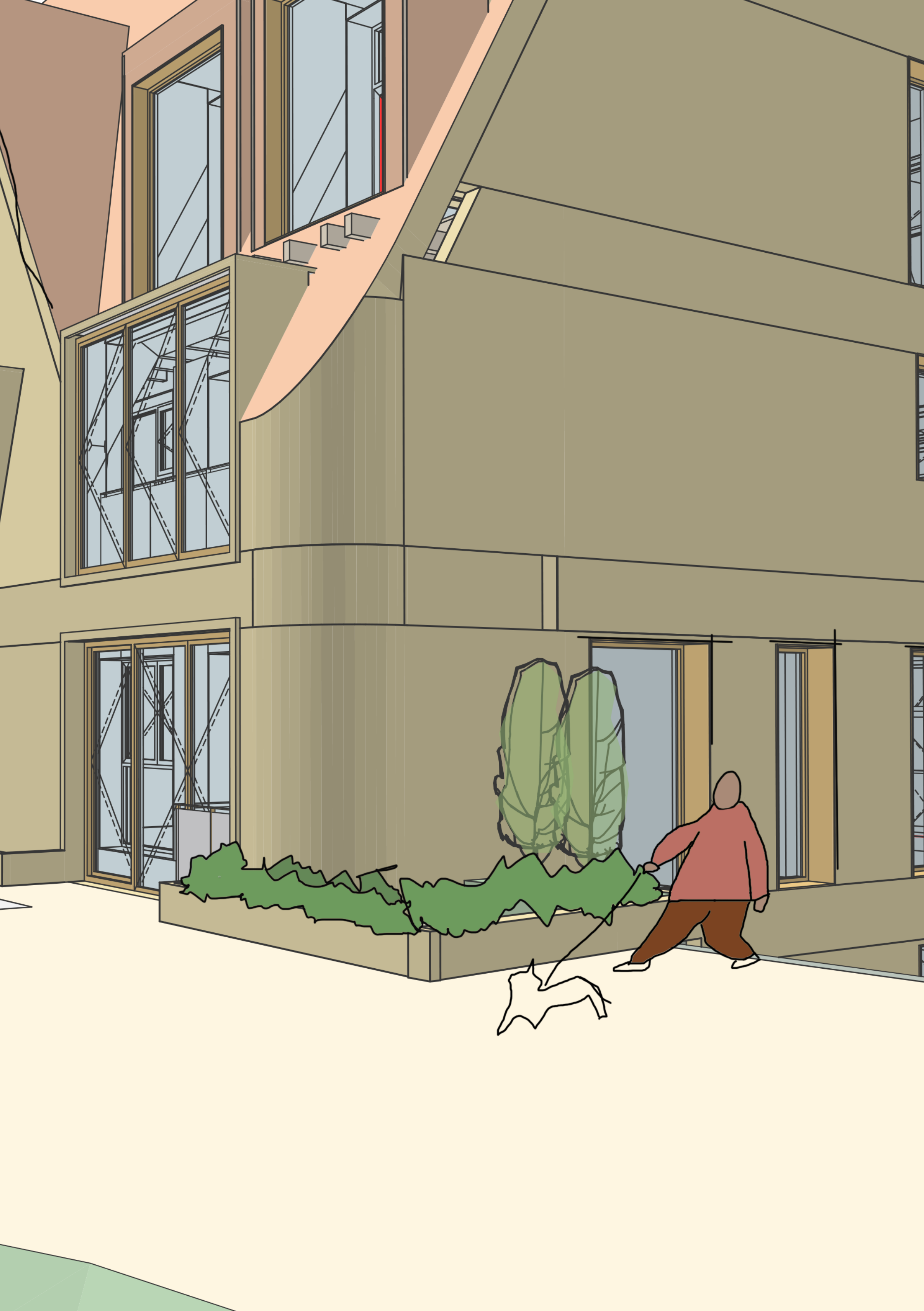
Preface

A design-based approach is essential to ensure the future safety and livability of the Dutch delta. As part of the Redesigning Deltas initiative, researchers, urban planners, landscape architects, and engineers have created innovative designs for five regions in the Netherlands. Their approach and designs aim to encourage bold long-term planning for our delta. This design task extends the long-term strategies for these five regions, including Midden-Delfland.

Team Rotterdam Delfland, comprising Zus, Flux, and Sweco, envisions Delfland as a National Productive Park. With the expectation of hotter summers exacerbating droughts in surrounding cities and a growing population necessitating densification and an increased demand for nature, water, and air in the surrounding areas, Midden-Delfland is seen as a crucial green lung and a sponge for the livability of adjacent cities. The design aims for a simplified water system with fewer dikes, pumps, and sluices while offering opportunities to promote biodiversity and provide valuable resources such as timber and food. Additionally, it presents solutions for waterlogging, land subsidence, and the threat of salinization. The urban fringes of Rotterdam and Delft are considered a highly urban framework for Midden-Delfland, preserving and protecting the area as a green lung within this boundary (source: Redesigning the Deltas).

How do you manage these urban fringes? This design research illustrates how the various challenges in the Midden-Delfland area can be transformed into advantages and potential through architecture.

The Urban Dyke is a contrast to a traditional dike. While a traditional dike is managed by the Rijkswaterstaat and operates separately from municipal disciplines, the Urban Dyke integrates function and design. The Urban Dyke protects Delft from water, shields Midden-Delfland from urban sprawl, and enhances the value of a mediocre neighborhood like Tanthof.



Foreword

Foreword

As my studies in Architecture proceeded, I became increasingly interested in the user. I realized that a building truly has value only when the user is satisfied. Moreover, I have always appreciated the atmosphere surrounding of old buildings, as if they become more beautiful with time. This fascination became the starting point for my thesis.

Today, construction is heavily influenced by environmental concerns, requiring more thoughtful approaches to building methods and ensuring they are environmentally friendly. Inspired by my fascination with existing buildings, I began to explore whether preserving, repurposing, or renovating buildings could be more environmentally friendly than new construction methods such as biobased or demountable building.

The second focus of my thesis is Tanthof. Initially, I approached this neighborhood and its archi-

tecture with a certain degree of reservation. However, as I delved deeper into my research and design work, I found Tanthof to be far more intriguing than I had initially anticipated. The complexity and potential of this neighborhood gradually revealed themselves, transforming my initial skepticism into hidden appreciation.
This unexpected journey has reinforced my goal of giving higher value to underappreciated places. Through thoughtful design and a nuanced understanding of social interactions within the built environment, I believe that even the most overlooked areas can gain greater recognition and value.
I hope that this thesis will not only contribute to academic discourse but also inspire other architects and designers to discover and enhance the hidden potential in similar, less-valued environments.

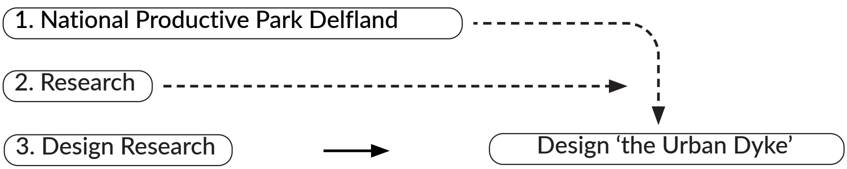
Bastiaan Vrij
June 21, 2024

Reading Guide

Reading Guide

"The Urban Dyke" book was developed from the graduation studio assignments in Advanced Housing. The assignment includes both research and design, building on the previous study "Redesigning the Deltas." "The Urban Dyke" is divided into the following three interconnected chapters:

1. National Productive Park Delfland
2. Research
3. Research by Design



Chapter 1: National Productive Park Delfland

This chapter summarizes casestudies from “Redesigning the Deltas.” It discusses the various factors that led to the design framework of the Urban Dyke.

Chapter 2: Research

The second chapter provides the foundational research that informs the design. It critically examines contemporary approaches to real estate concerning environmental impact. This chapter investigates whether architecture can play a significant role in minimizing the environmental footprint of the construction industry. The findings offer practical guidelines for architects, designers, and developers to achieve real estate projects with minimal environmental impact.

Chapter 3: Research by Design

The third chapter involves design-based research that led to the concept of the Urban Dyke. It explains how casestudies and existing architectural theories can lead to an integrated design. This design aims to enhance the valuation of post-war neighborhoods like Tanthof in Delft while also serving as a flood defense.

Each chapter is interconnected, providing a comprehensive understanding of how the Urban Dyke concept can address both environmental sustainability and urban development challenges.

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Glossary

Climate neutral

Climate neutral means not contributing to global warming. This means the greenhouse gases that are emitted are also removed from the air. Greenhouse gases are also called negative emissions.

Delta areas

A delta region is defined as the area belonging to a river delta. The river delta represents the section of a river characterized by a system of distributaries before it flows into a lake or sea. When referring to delta regions in the Netherlands, it pertains to those areas situated between South Holland, Zeeland, and the west part of Noord Brabant.

Demolition motives

Demolition motives are underlying reasons why the decision is taken to demolish.

Life Cyle Analysis

Environmentally oriented LCA (Life Cycle Analysis) is a method for mapping the impact of products and human activities on the environment. This involves the use of specialized calculation models. In LCA, the entire life cycle of a product or activity is examined, from the extraction of raw materials through production and (re)use to waste processing. In other words: from cradle to grave. Because this involves a chain of processes, LCA is considered a form of chain analysis (Wat Is LCA?, 2024).

Lifespan

Lifespan is the time from beginning to end of use. In general, the technical lifespan of a building ends when the lifespan of the main load-bearing structure ends. Long before that time, the economic life may have ended i.e. the building can no longer provide the required functional performance at acceptable sacrifices. A renovation initiative may then be taken. In that case, a new cycle of initiative with programme of requirements, design and construction follows, culminating in a new period of use. When a building has reached the end of its useful life, it will be demolished or become vacant. In other words, the use is ended (De Vree, n.d.).

Social inclusion

Social inclusion means an accessible, attractive, safe, affordable, and comfortable living environment for all types of users, regardless of their age, gender, health, income, or nationality. Implementing social inclusion in architecture is important for the appreciation of the built environment and for maximizing the lifespan of a building (Winston, 2010).

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National Productive Park Delfland

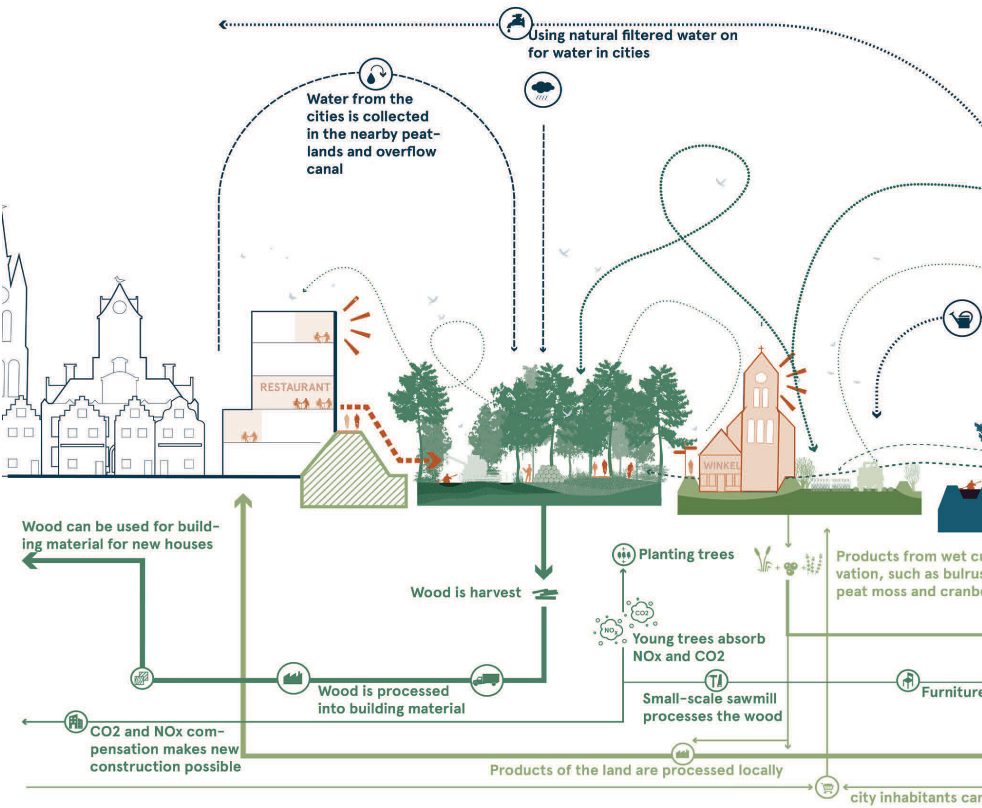
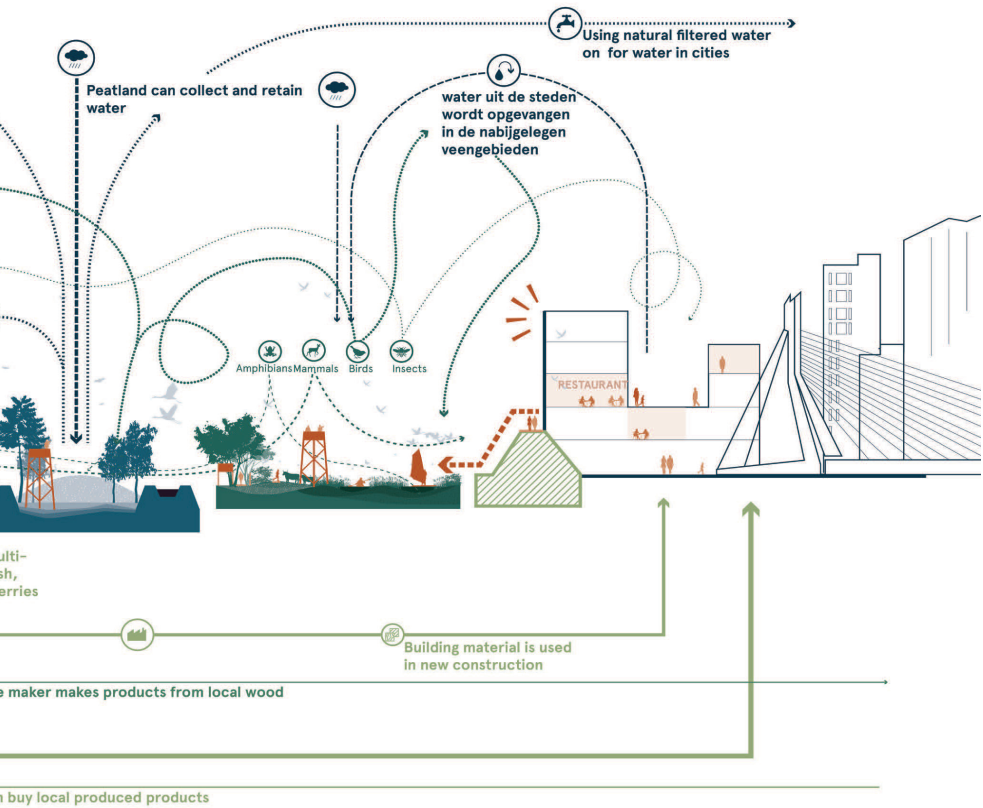


Fig. 1: *Section Vision National Productive (ZUS et al., 2022)*

1. Principals of the National Productive Park Delfland

Given the expectation that climate change will result in increasingly extreme weather conditions, it is crucial to store valuable water rather than discharge it, so it can be used during droughts. The boezem-system must be redesigned to allow more space for boezems, transforming them into



green-blue infrastructures that connect with surrounding urban areas. Hotter summers will exacerbate droughts in nearby cities, and population growth will increase urban density, heightening the need for surrounding nature, water, and clean air. Midden-Delfland should become a green lung and a sponge to enhance the livability of nearby cities.

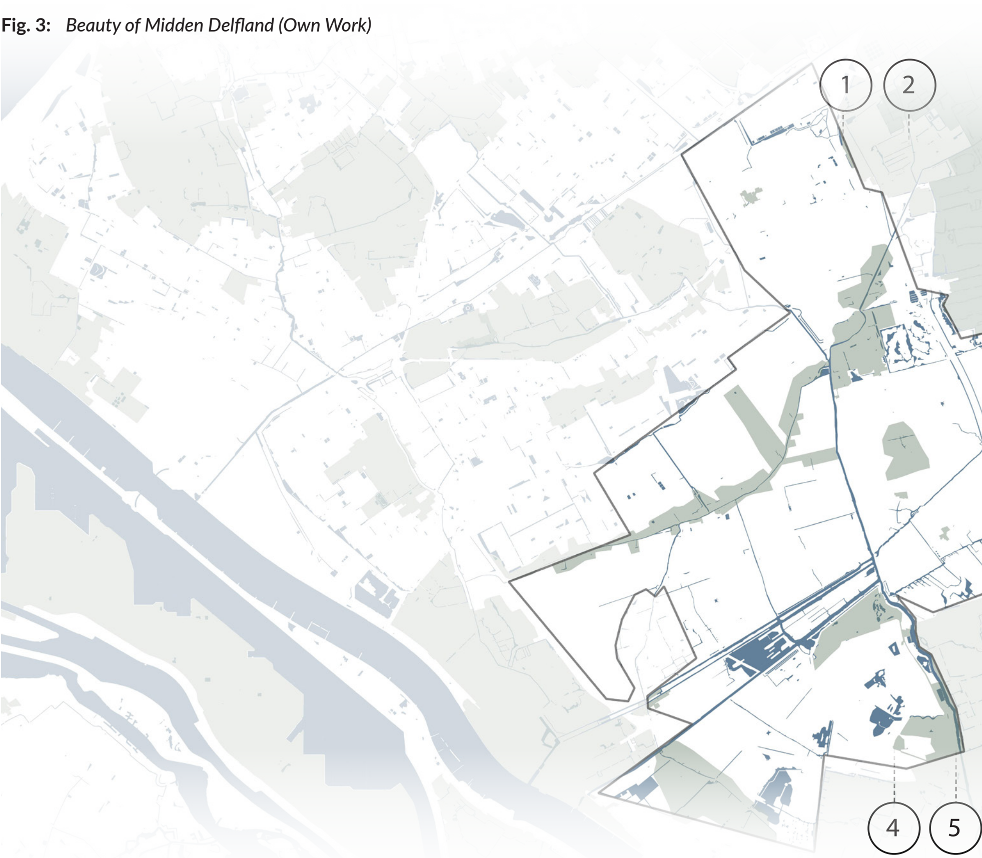
Fig. 2: *Vision National Productive (ZUS et al., 2022)*

- *Boezembuffer; mainly waterstorage and reeds*
- *Boezem*
- *Peetlands: new forms of natural farming, wet fields*
- *Peet+clay lands: natural reserves, wetlands for birds*
- *Claylands: woodproduction, fruitpicking forests*
- *Dike around lower parts of the existing urban areas*
- *Urban area's*
- *Public transport nodes*
- *Designated areas for urban densification and waterbuffer within the city*
- *Boezem as a green blue infrastructure in the city*

The new 'National Productive Park Delfland', shown in figure 2, will serve the surrounding urban areas in multiple ways. Based on the existing landscape morphology, various zones will be designated for different types of production and innovative land use. The landscape's diverse morphologies and typologies will guide land use, resulting in a water buffer and filter, new forms of agriculture, and nature preservation, while maintaining the area's recreational function.

The park's distinct form will influence the densification of city edges. Some borders will become more densely populated, especially near nature, the boezem-system, infrastructural nodes, and amenities. The Zestienhoven Airport area has significant potential for densification. The new highway connection between the A13 and A16 will act as an existing dike, protecting the lower-lying Zestienhoven polder from the dynamic system of the Midden-Delfland area.

Fig. 3: *Beauty of Midden Delfland (Own Work)*

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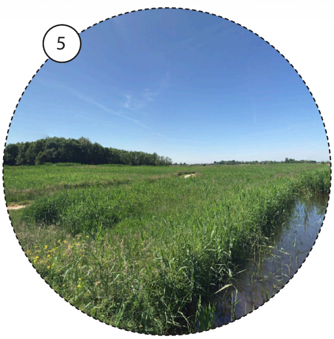
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Research

2.1 Research Introduction

This research chapter of ‘the Urban Dyke’ will focus on the environmental impact and lifespan of buildings. Global warming is a significant issue, and the construction industry is a major contributor. In 2019, the construction industry accounted for 38% of total emissions, making it the largest polluter.

Despite its substantial role as a polluter, several methods have been developed to reduce emissions within the industry. For instance, on paper, the Netherlands is a pioneer in emission reduction in the construction sector, particularly through innovative approaches to material usage. Statistics indicate that the Netherlands leads in circular construction practices, defined as the continual use of resources through reuse, refurbishment, and recycling to minimize waste and environmental impact. However, this circularity is not always reflected in practice. Consumed raw materials often end up as debris under endless miles of asphalt roads, while the influx of new materials continues to rise. Nevertheless, many countries within and outside the European Union are committed to circularity.

While efforts are being made towards sustainability and material reuse, demolition remains prevalent in the Netherlands. According to the Dutch Central Bureau of Statistics, nearly 20% of new buildings have been demolished on average over the past 20 years. Reusing materials is challenging in practice, especially when it is not economically viable. Prolonging the use of materials in their current form is a less discussed topic (Centraal Bureau voor de Statistiek, 2023).

Preserving existing buildings instead of unchecked new construction and considering maximum lifespan represents an alternative path to sustainability. A comprehensive assessment of the environmental impacts across the different phases of the construction cycle, studying premature demolition, and designing for maximum longevity is essential for forming a well-informed standpoint.

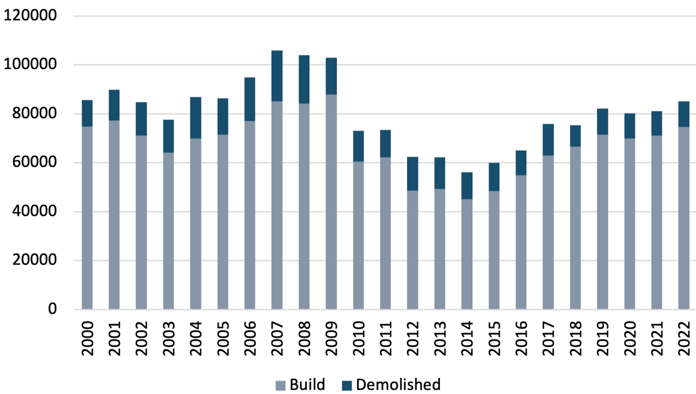

Fig. 4: *Dwellings built and demolished in the Netherlands(Centraal Bureau voor de Statistiek, 2023)*

Problem statement

The construction sector is recognized as one of the largest contributors to environmental impacts, ranging from resource extraction to construction waste. Within this context, this thesis aims to explore alternative approaches to reducing the environmental impact of the construction industry. Specifically, three key topics are highlighted:

1. Exploring the ecological footprint throughout the entire lifecycle: What environmental impact does each phase of the building-to-demolition process have?
2. Investigating the rationale behind demolishing residential structures in the Netherlands: What are the primary motives driving the decision to demolish Dutch dwellings?
3. Identifying elements that contribute to the preservation of buildings: What factors support the longevity and reuse of existing structures?

These sub-questions serve as a foundation for addressing the central research question of this research:

Can architecture play a significant role in minimizing the emissions and environmental burden caused by the construction industry?

2.2 Theoretical framework

The theme of the environment is unavoidable in today's context, and architecture plays a significant role in it. Various climate agreements determined by the European Union compel the Netherlands to become climate-neutral. The goal of the Netherlands is to achieve a circular economy by 2050 (Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer, 2022).

Circularity means that after use, products are used as are raw materials for new products, materials, or purposes. The aim of circularity is to strive towards a world without waste. In circularity, careful consideration is given during the production process to the next life of a product or its components.

A circular economy, and thus circular construction, is a way to eliminate emissions, with the goal of maintaining the world as a liveable place. This research points out that there are alternative ways to achieve minimal environmental impact.

Circularity is a commendable philosophy, but the question arises as to whether it aligns with reality. Thomas Rau acknowledges that while buildings can be easily disassembled and each material retains its value, no building is inherently circular; it merely has circular potential. "We can build buildings that are easily demountable and in which each material retains its value, but ultimately it is up to the next generations to do something with it and activate that potential. We can only facilitate it" (Thomas Rau: "The Circular Building Does Not Exist, There Are Only Buildings with Circular Potential," 2023).

Preserving a building essentially shares the same end goal as circularity: passing on potential to the new generation. The current generation faces the challenge of leaving the world in a way that preserves potential for the next generation.

Passing on a pleasant world involves leaving behind a world with a stable ecology and society. A stable society is (partially) sustained by social sustainability. Social sustainability stands for maintaining or improving the well-being of people in current and future generations. Architecture serves to maintain social sustainability and pass on potential material value.

2.2.1 Theoretical Framework of subtopics

The theories in this research chapter are divided into three subtopics, which together form an approach to address the central research question: Can architecture play a significant role in minimizing the emissions and environmental burden caused by the construction industry?

Environmental impact of the building industry

The first subtopic addresses the ecological footprint of construction. While there are various methods to measure the ecological footprint, this research focuses on the total environmental impact. Environmental impact refers to the (negative) effects of human actions on the natural environment and the earth's ecosystems. Studies mapping the environmental impact of buildings are conducted using the Eco-Quantum model. Eco-Quantum calculates the total environmental impact of a building over its lifecycle - from raw materials, through maintenance and modification/renovation, to the disposal of final demolition material. This is a forecast. The score is determined by factors such as the choice of materials, energy and water consumption throughout the building's life (including raw material extraction), production of building materials, and the use, maintenance, and demolition of the property. From this calculation, a weighted score for the building emerges in

the Eco-Quantum environmental indicator (Hoogers, 2004).
The Eco-Quantum model is combined with Stewart Brand's (1996) theory of 'the flow of buildings.' This combination of theories offers a new perspective on buildings and their changes over time from an environmental viewpoint. Throughout a building's lifecycle, the environmental impact can be divided into different phases. The phases referenced in this research are defined by Ng et al. (2012). These phases will be detailed later.

Motives for Demolition of Dutch Dwellings

The second subtopic examines the primary motives driving the decision to demolish Dutch dwellings. Professor Andre F. Thomsen of TU Delft has posed similar questions regarding the motives for demolishing housing in the Netherlands. Prior to Thomsen's research, there was little qualitative information available on demolition and demolition motives both in the Netherlands and the rest of Europe.
The reasons for demolition are often difficult to ascertain or may appear different than they seem. Potential influences of premature demolition include the type of housing, housing management, and 'Planners blight' (Thomsen, 2004).

Future-Proofing Energy Performance

The final subtopic is primarily based on the theory of Georgiadou et al. (2012). Georgiadou describes a conceptual framework for future-proofing the energy performance of buildings. This framework is expanded with theories on social inclusion and the theories from the first subtopic into a new framework: the 'Knowledge Map for Prolonging the Lifespan of Buildings.' This new framework integrates these theories to provide comprehensive insights into extending building lifespans.

Method

Chapter two consists of research divided into three subtopics that collectively aim to answer the main question.

The first part of the study focuses on emissions in the building industry. A literature review will identify the extent of emissions within the building sector. Currently, there is limited understanding of the emissions at each phase of construction. However, using the Eco-Quantum calculation model developed by IVAM Environmental Research and W/E Advisors, the total environmental impact over time can be calculated. This model considers factors such as material choice, energy and water consumption throughout the building's lifecycle (including raw material extraction), production of building materials, usage, maintenance, and demolition. The result is a weighted score for the dwelling, known as the Eco-Quantum environmental indicator (Hoogers, 2004). Furthermore, various studies, often in collaboration with the government, suggest that circular construction is key to climate-neutral building. However, there is limited discussion or testing to confirm whether circularity is actually implemented. The literature review and the Eco-Quantum calculation model aim to provide an overview of total emissions in construction and identify points of failure. This will help evaluate whether building in a way that minimizes demolition is more beneficial.

The second subtopic synthesizes literature reviews and case-studies. This part of the research focuses on the motives behind demolition. Existing literature will be used to outline the reasons for demolition in the Netherlands. Notably, research conducted by the Technical University of Delft, incorporating demolition surveys, has examined the life cycle of dwellings. These investigations identify factors such as corporate policies, biases, hidden agendas, and notably the influence of decision-makers as contributors to demolition (Thomsen, 2006). This collective evidence suggests a preference for economic motivations. The assumptions of the demolishers will be tested through a case study of a neighborhood consisting of social housing in 's-Hertogenbosch and Amersfoort.

The third subtopic also uses a literature review to form a theoretical foundation for understanding why buildings endure longer.

In the third chapter, "research by design" will investigate, through casestudies, implementing the results of chapter two and designs, how architecture can ultimately contribute to minimizing the environmental impact of the construction industry and increasing the value of Tanthof.

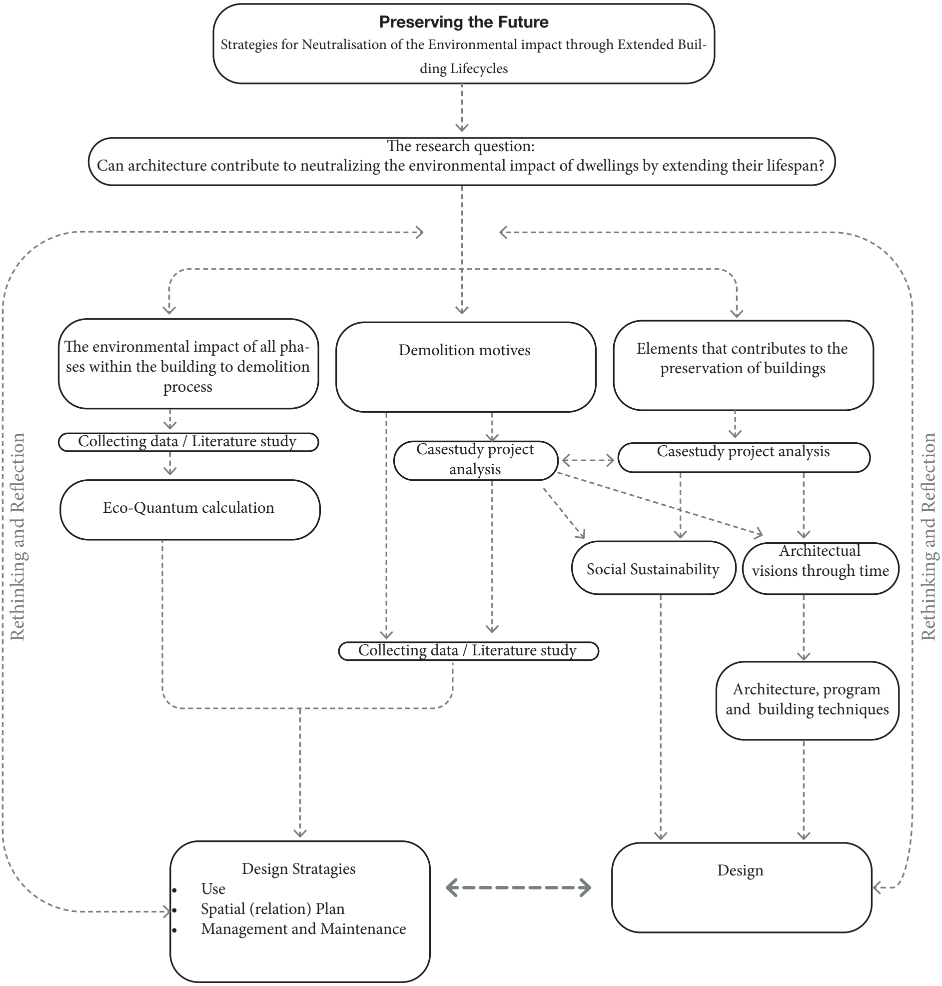

Fig. 5: *Research Schedule (Own Work)*

“We can build buildings that are easily demountable and in which each material retains its value, but ultimately it is up to the next generatons to do something with it and activate that potential. We can only facilitate it”

~ Thomas Rau

2.4.1 Exploring the Ecological Footprint Throughout the Entire Lifecycle

This chapter focuses on the sub-question: Exploring the ecological footprint throughout the entire lifecycle, what environmental impact does each phase of the building-to-demolition process have?

In an era where sustainability plays a crucial role in our society, questions about the ecological impact of the construction sector arise. Buildings and construction activities consume vast amounts of resources and have significant effects on society, the economy, and the environment. In 2019, the construction sector was responsible for 38% of global energy-related carbon dioxide emissions, with operational emissions accounting for approximately 10 gigatons of CO2, which corresponds to 28%, and emissions from the construction industry representing an additional 10%. In 2021, the energy demand of buildings increased by approximately 4% compared to 2020. Therefore, the construction and building sector has a substantial environmental impact (“2022 Global Status Report for Buildings and Construction,” 2022).

Preserving existing buildings instead of uncontrolled new construction is an alternative path to sustainability. An integrated assessment of the environmental impacts across the different phases of the building cycle is essential to form a well-informed standpoint. This cycle encompasses not only the visible construction phase but extends over the entire lifespan of a building. From material production to eventual recycling and reuse, each phase contributes to the overall ecological footprint. In this context, the focus will be on emissions during material production, construction, use, maintenance, deconstruction, and recycling of buildings (Ng et al., 2012).

Phases of a building

Firstly, it is important to define the phases within a building cycle. Ng et al. (2012) identify five different phases, which are divided into three categories:

Initial emissions:

1. Planning and design
2. Material production and construction

Operational emissions:

3. Operation

Maintenance and renovation:

4. Maintenance and renovation
5. Deconstruction and waste disposal

Relation of Duration and Repetition of Phases Impact on Environmental Impact

The environmental impact of a building is amplified by factors beyond initial environmental effects. The duration and repetition of construction phases, such as construction, maintenance, or use, can be significant.

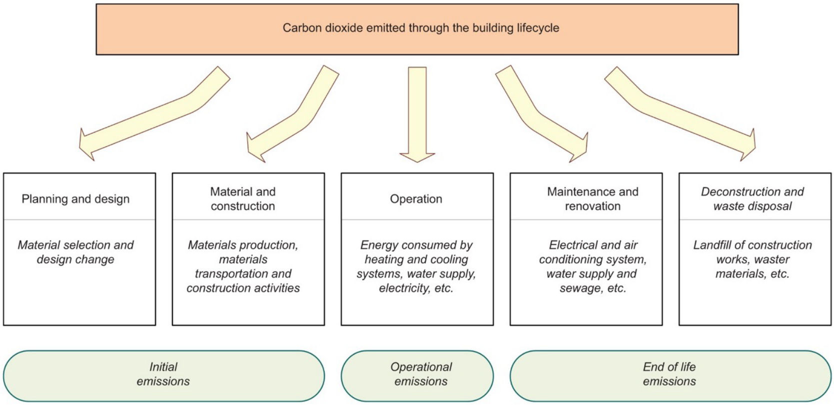

Fig. 6: *Carbon dioxide emissions in the building life cycle (Ng et al., 2012)*

When discussing bio-based or circular construction, the focus is often on the emissions from material production and construction. However, it is important to realize that the environmental impact extends beyond the construction phase. Emphasis is frequently placed on materials and processes during construction, but the impact of the building throughout its entire lifespan can be substantial. Consider energy consumption: during the building's lifespan, particularly if this lifespan is extended, the impact of the usage phase can play a leading role in the environmental impact of a building.

Life Cycle Analysis
The total environmental impact of a building can be calculated using a Life Cycle Analysis (LCA). The Eco-Quantum method is one way to calculate the total impact of a building, including all shadow costs related to the environment. The outcome is expressed in EQ points—the fewer EQ points, the better.

Figure 7 shows an Eco-Quantum calculation of a building with periodic maintenance and improvement. Figure 7 demonstrates that the environmental impact of the materials used at the beginning of construction becomes negligible after approximately 90 years (Hoogers, 2004).

Notably, the environmental burden is primarily determined by maintenance and energy consumption. The initial materials are negligible after 100 years. The best strategy for the building in this example, with a longer lifespan, is to maintain energy performance and use materials with low impact during renovations. Otherwise, a long lifespan can lead to high environmental burdens (Hoogers, 2004).

To theoretically achieve a perpetually usable building, the environmental impact of energy use and maintenance is the major culprit. Maintaining good energy performance of a building means regular maintenance and energy improvements.

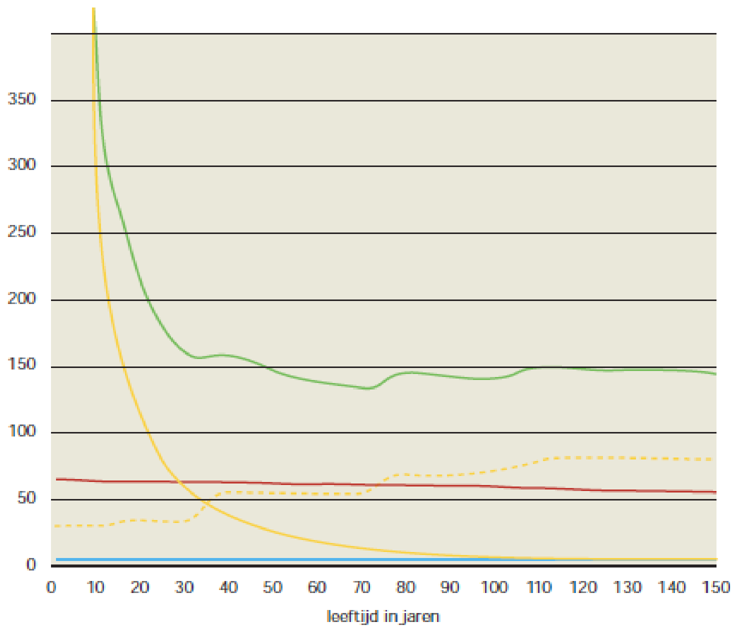

Fig. 7: *Environmental Impact over time (Hoogers, 2004)*

Total EQ points

Energy (reduction 1% per year)

Water (constant 5 EQ points per year)

Material maintenance/decay (variable)

Material initial (variable EQ points)

The Flow of Buildings

“Some buildings seem to flow with time, they flow with us,” says the American writer Stewart Brand (Cons Arch, 2016). According to Brand (1995), buildings change over time. He suggests that buildings are one of the few human artifacts that improve with time if they are allowed to adapt by their occupants or users. Change is influenced by three factors: technology, money, and fashion (Brand, 1995).

Based on the four S’s of architect Frank Duffy, Brand proposes that a building consists of six different layers. Each layer changes at a different rate. Building in a way that allows for adjustments over time extends the lifespan of buildings and leads to better buildings (Van Drenth, 2023; Brand, 1995).

Shearing Layers of Change and Environmental Impact

The shearing layers of change concept by Stewart Brand and Frank Duffy serve as an interesting starting point for addressing environmental impact in combination with time. By combining the environmental impact with the variability of time layers, an informed decision can be made for material usage. Materials in a fast-moving layer, such as partitions that are moved after 10 years, should have a low environmental impact. Conversely, materials that last a century prioritize robustness over a low environmental impact.

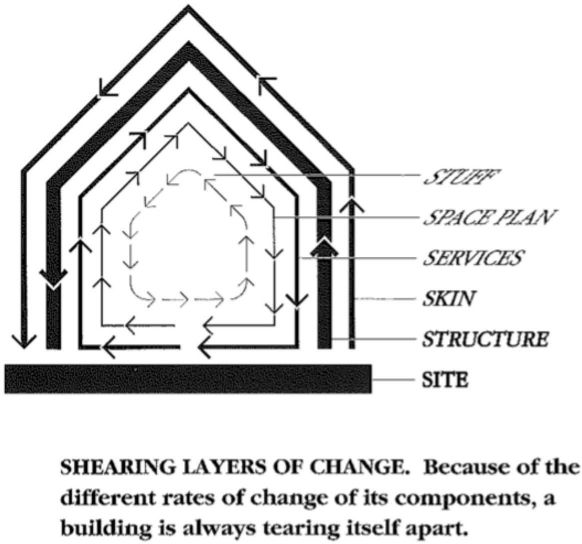

Fig. 8: *Shearing Layers of Change (Brand, 1995)*

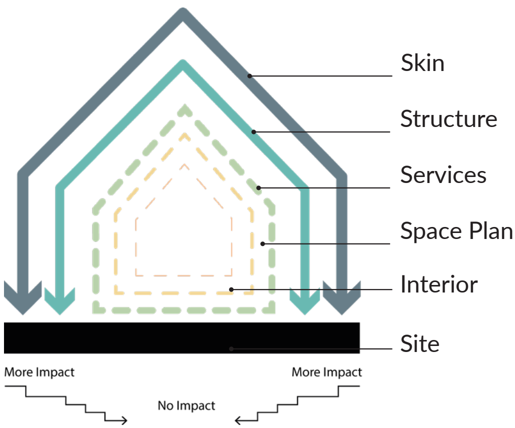

Fig. 9: *Shearing Layers of Change and Environmental Impact (Own Work)*

2.4.2 Demolition Motivations

Chapter two focuses on the premature demolition of residential structures. The sub-question addressed in this chapter is: Investigating the rationale behind demolishing residential structures in the Netherlands, what are the primary motives driving the decision to demolish Dutch dwellings?

The Netherlands has a distinctive demolition culture, as noted by Professor Thomsen from TU Delft (2004), who conducted research on the demolition of residential buildings. This is evident from the figures over the past 20 years, shown in Figure 4 (Central Bureau of Statistics, 2023), which indicate that over twenty thousand homes are demolished annually in the Netherlands, despite the severe housing shortage. To put this number in perspective, it represents about 20 percent of the new housing added to the Dutch housing stock each year. This chapter outlines various reasons that negatively affect the lifespan of houses.

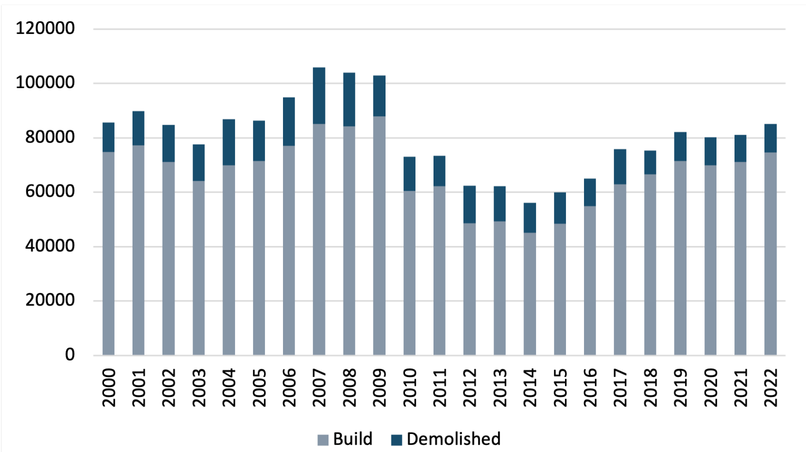

Fig. 4: *Dwellings built and demolished in the Netherlands(Centraal Bureau voor de Statistiek, 2023)*

Filtering Process

Demolition is not always negative. A certain filtering process ensures an improvement in housing quality in the Netherlands. Filtering processes in the form of demolition waves have occurred regularly since the 16th century. During a demolition wave or filtering process, the worst houses are removed from the housing stock, leaving a supply that adapts to the changing needs of the time. Statistics show that houses have a 97% chance of reaching a lifespan of 50 years, a 77% chance of lasting 75 years, and a 57% chance of reaching 100 years or older (Part 3, Building with Time).

The chances of preservation vary significantly by housing type. For example, 80% of single-family homes in the owner-occupied sector remain after 100 years, while only 30% of multi-family rental sector homes reach that age. In addition to the type of housing, the size of the house plays a significant role. The larger the house, the greater the chance it will last over 100 years (Thomsen, 2006).

To understand why so many homes are demolished in the Netherlands, the relationship between demolition rates and physical housing quality, combined with construction year, housing market conditions, management form, and portfolio policies, was examined. There is a strong correlation between demolition rates and management form. Social housing landlords demolish 0.6% of the total housing stock, compared to only 0.1% in the owner-occupied sector.

Moreover, construction quality and year of construction show a less strong correlation. Nonetheless, construction year does correlate with demolition within the social sector. Houses from the 1930s are less likely to be demolished than those from the 1960s (Thomsen, 2006). There is also a weak relationship between supply and demand in the housing market. High demolition rates are seen in Groningen, with a slightly relaxed housing market, as well as in the major cities in South Holland, with a moderately to highly tense market. Finally, there is no clear relationship with portfolio policy. One corporation may be more active in demolition than another, regardless of the corporation's size.

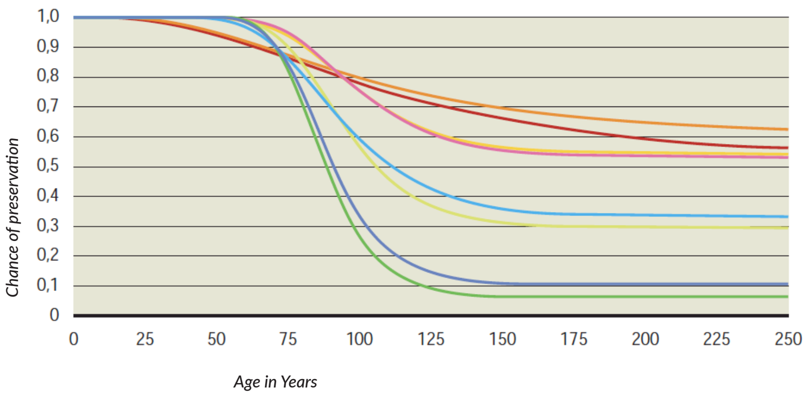

Fig. 10: *Chance preservation types of housing (Hoogers, 2004)*

- *Owner-occupied, Single Family up to 4 rooms*
- *Owner-occupied, Single Family up to 5+ rooms*
- *Owner-occupied, Multi Family up to 2 rooms*
- *Owner-occupied, Multi Family up to 3+ rooms*
- *Rental, Single Family up to 4 rooms*
- *Rental, Single Family up to 5+ rooms*
- *Rental, Multi Family up to 2 rooms*
- *Rental, Multi Family up to 3+ rooms*

The Sword of Damocles over Social Housing

An example where demolition results from the corporate culture and insights of housing associations is the Boschveld neighborhood in ‘s-Hertogenbosch. This neighborhood consists of social housing owned by three corporations. Residents who had enjoyed living in Boschveld for 30-40 years were informed that their social rental housing would be demolished to make way for new construction.

Fig. 11: *Copernicuslaan, during demolishion*

Fig. 12: *Copernicuslaan after rebuild*

Fig. 13: *Start of Demolishion at the Copernicuslaan*

In 2004, architect Cor Passchier was commissioned to investigate the homes in Boschveld. Despite Passchier concluding that the homes had the potential to be upgraded to energy-efficient and high-quality standards, the housing corporations deemed the homes to be worn out and irredeemable (Demolition, 2005). Residents saw “the sword of Damocles” hanging over them, suspecting their homes would be demolished when the neighborhood became too attractive for them to afford (Demolition, 2005).

Fig. 14: *Boschveld before Demolision (Own Work)*

Buildings
Neighborhood Boschveld
Demolished

Fig. 15: *Boschveld after Demolision (Own Work)*

Buildings
Neighborhood Boschveld
Demolished

The land owned by housing corporations, often prime locations due to less urban expansion in earlier times, makes neighborhoods like Boschveld close to city centers. Similar situations exist in almost every Dutch city where post-war neighborhoods face the threat of demolition. Examples include Sterrewijk in Utrecht and Jericho in Amersfoort. Contrary to expectations, the demolition of homes is not a thing of the past. All 124 homes in the Jericho neighborhood in Amersfoort are set to be demolished (source: AD), despite the neighborhood not being problematic. On the contrary, residents reportedly enjoy living there, and the area appears well-maintained.

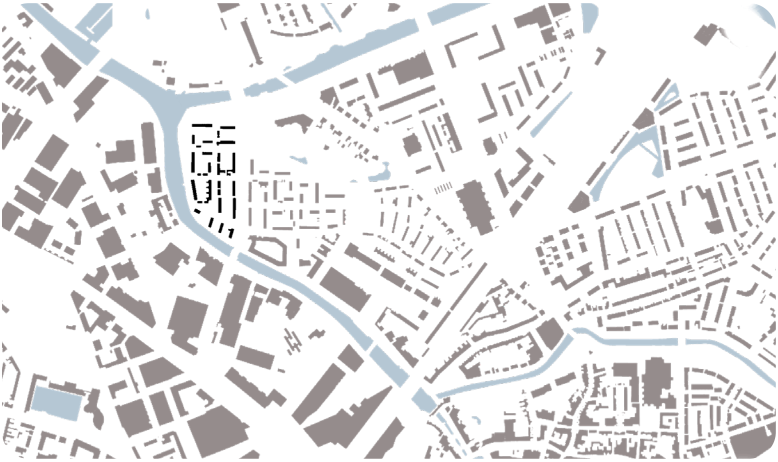

Fig. 16: *Jericho buurt before Demolision (Own Work)*

Buildings
Neighborhood Jericho buurt

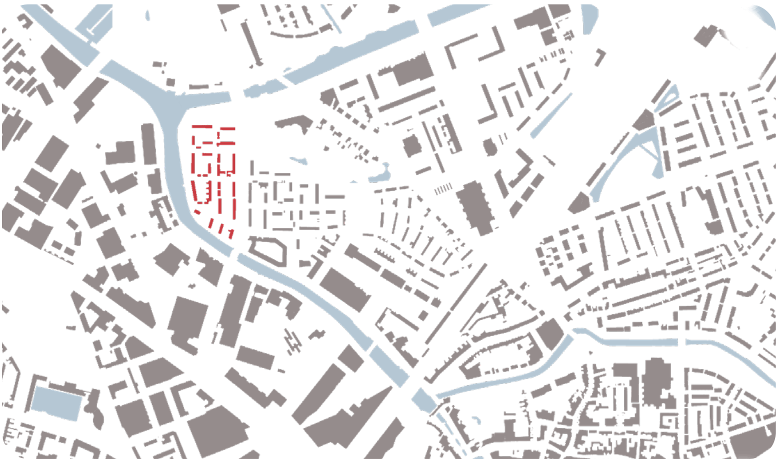

Fig. 17: *Jericho buurt after Demolision (Own Work)*

Buildings
Neighborhood Jericho buurt
Demolished

Real Estate as a Revenue Model

In the Dutch real estate industry, the lifespan of a building is typically estimated at fifty years (source). This is, in fact, the economic lifespan of houses, not their actual lifespan. Lifespan and decay models, such as those of Lönberg-Holm or the cradle-to-cradle model, are often used in the development of sustainable goods (Strum, 2012).

Economic models in real estate often rely on linear models focused on decay. A well-known example is Vroman's "sawtooth" model or Miles' model (Vroman, 1982; Miles et al., 1996). Vroman's model links the performance development to user requirements, with an acceptance threshold indicating the end of the lifespan. Thomsen notes that the sawtooth model is a good approach for understanding the fundamentals of technical management (source: Thomsen). Miles' model is based on economic performance as a derivative of the earning capacity of the building, which is a useful concept in the social rental sector.

However, buildings do not always fit within a linear model. Linear models assume decay, and the commonly accepted lifespan of 40 years for houses is incorrect.

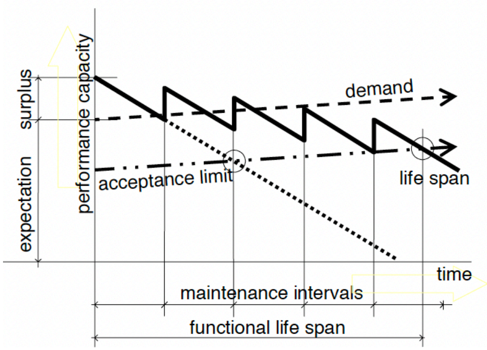

Fig. 18: *Decay Model (Vroman, 1982)*

Planners Blight

When the economic lifespan is reached or development plans are underway, planners' blight often occurs. Once a horizon is set for a building, the entire neighborhood may fall into decay. The anticipation of demolition discourages investment in the existing neighborhood.

An example of planners' blight is the Veemarkt area in Zwolle. For years, it has been speculated that the IJsselhallen, a large event complex, would relocate, making way for expensive housing. Despite no concrete plans in the early 21st century, houses near the IJsselhallen fell into disrepair. Images show neglected 1930s homes of good quality. Over time, buildings were demolished, possibly to prevent squatting (Thomsen, 2004).

Fig. 19: *Veemarkt 23 Zwolle (Google Maps, 2009)*

Fig. 20: *Veemarkt 23 Zwolle (Google Maps, 2017)*

Fig. 21: *Veemarkt 23 Zwolle (Google Maps, 2021)*

2.4.3 Preventing Demolition

This chapter aims to maximize the lifespan of buildings. The key question addressed here is:
Which elements contribute to the preservation of buildings?
The theoretical framework for this chapter is based on the research by Georgiadou et al. (2012), which developed a conceptual framework for future-proofing the energy performance of buildings.

According to Georgiadou et al. (2012), building longevity is influenced by three pillars: 'Accommodating risk and uncertainties,' 'Coverage of sustainability issues,' and 'Lifecycle thinking.' The 'knowledge map for future-proofed building design' serves as the foundational concept for prolonging the life of buildings. Although initially focused on energy-efficient design, this knowledge map provides a starting point for making buildings future-proof.

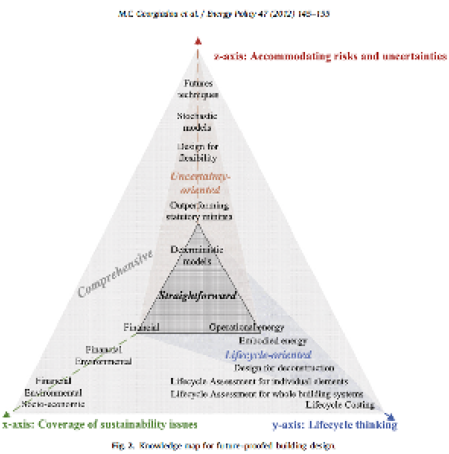

Fig. 22: *Knowledge map for future-proofed energy performance (Georgiadouetal et al., 2012)*

Long-term Impacts

To achieve a future-proof building, it is essential to consider the long-term impacts of buildings, which can be categorized into two main areas: the impact of buildings on the surrounding environment and the impact of the environment on buildings.

The impact of buildings on the surrounding environment involves lifecycle approaches to mitigate or prevent environmental impacts over the building's lifespan.
The environment's impact on buildings involves exploring the risks and uncertainties that can affect energy performance, including unforeseen events (Georgiadou et al., 2012).

Impact of Buildings on the Environment

Buildings should be designed from the outset to mitigate three types of impacts:

- Long-duration impacts are those that begin early in the building's lifecycle and continue into the future, such as the destruction of natural ecosystems during construction.
- Ongoing impacts occur during the lifecycle while the building is in use, particularly in the operational phase, such as the choice of heating and cooling systems or user behavior that affects total energy consumption.
- Far-future impacts arise long after construction, during decommissioning (refurbishment, deconstruction, or demolition).

Impacts of Environment on Buildings

The types of impacts classified as 'Long-Duration' and 'Far-Future' focus on the future, which is inherently uncertain and risky. While 'risk' involves situations where probabilities of outcomes can be assigned, 'uncertainty' exists when such probabilities are unknown. Forecasting can manage risks by predicting the most likely future based on existing trends or historical data. However, managing uncertainty requires exploring a range of plausible futures and not just relying on extrapolation (Abaza et al., 2004; Hacking and Guthrie, 2006; Stirling, 2007). Factors such as social attitudes, population patterns, economic changes, new materials and technologies, and environmental conditions shape building stock characteristics. 'Shifting goalposts,' caused by changes in policy frameworks, also modify building regulations, energy and environmental targets, design standards, fiscal measures, and financial incentives (Devuyst et al., 2001; Van Staden and Musco, 2010).

Accommodating Risks and Uncertainties

This pillar involves five design criteria of increasing complexity: using deterministic models, outperforming statutory minima, designing for flexibility, using stochastic models, and employing future techniques. Flexibility in design is crucial to accommodate risks and uncertainties by allowing the internal space to be reconfigured to adapt to significant changes in building layout and future user behavior.

Coverage of Sustainability Issues

Integrating sustainability considerations—financial, environmental, and socio-economic—is universally promoted in the literature on 'eco-design' and energy-efficient building design. Georgiadou et al. (2012) emphasize that the 'Coverage of Sustainability Issues' in the 'knowledge map for future-proofed building design' involves financial, environmental, and socio-economic steps. To transition to climate-neutral architecture and urban planning, numerous additional environmental and socio-economic issues, such as population growth, resource depletion, rising energy prices, and new regulatory requirements, must be addressed (Georgiadou et al., 2012).

Traditional building designs primarily based on financial considerations often lead to economic downturns and eventual demolition (Georgiadou et al., 2012). Therefore, financial and environmental aspects must be balanced by selecting building solutions that minimize greenhouse gas emissions and energy consumption. Socio-economic implications include fuel poverty, energy security, rising fuel prices, affordability, and the need for thermal comfort to enhance well-being and quality of life (Winston, 2010).

Design must also achieve social inclusion by ensuring accessible, attractive, safe, and comfortable buildings for all users, regardless of age, gender, health, income, and nationality (Been et al., 2010; Max Fordham, 2004).

Lifecycle Thinking

The 'Lifecycle Thinking' pillar focuses on considering the potential lifecycle impacts of selected building materials, construction techniques, and future use. It encompasses the broader 'philosophy' of addressing solutions throughout a building's entire lifecycle. This involves various design approaches and assessment methods, focusing on aspects such as the production and transport of raw materials, the construction phase (the initial 'cradle'), maintenance, renovation or redevelopment (the subsequent 'cradle'), and any necessary deconstruction or demolition (the 'grave') (Georgiadou et al., 2012; EC, 2010; Ness et al., 2007). The next step in lifecycle thinking involves using durable materials that are resistant to wear and tear, such as brick, concrete, ceramics, or wood. The approach in the 'knowledge map for future-proofed building design' (Georgiadou et al., 2012) advocates passing on buildings with spatial and material potential by reusing them without demolition. Spatial and material potential is best preserved when quality is maintained, with brick or concrete elements, combined with proper detailing, theoretically lasting indefinitely. As Georgiadou et al. (2012) note, from construction

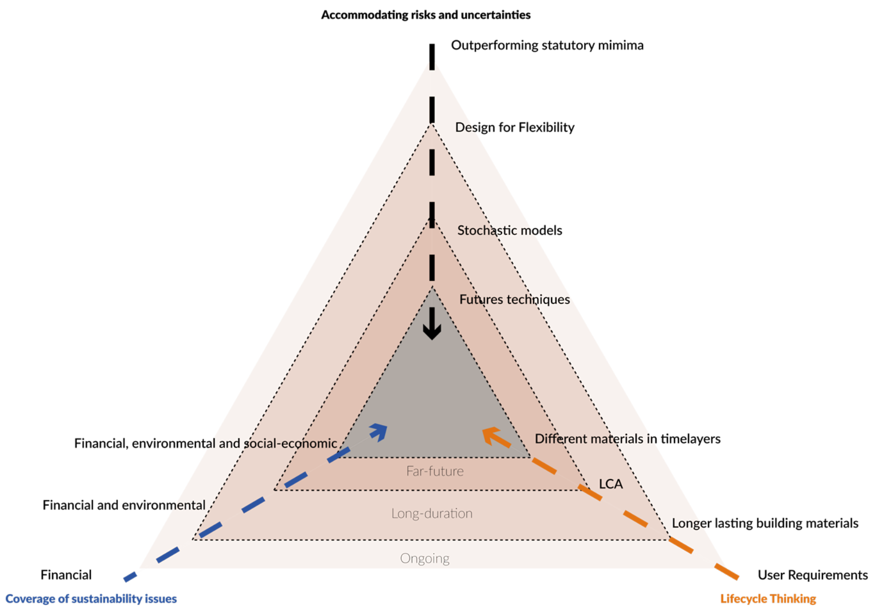

Fig. 23: *Knowledge map for prelonging the lifespan of buildings (Own Work)*

(the initial cradle) to redevelopment or renovation (the next cradle), buildings are metaphorically reused with different users and purposes over time, maintaining their fundamental structure.

Knowledge Map for Prolonging the Lifespan of Buildings

Based on the theory, a new knowledge map has emerged, forming the foundation for extending a building's lifespan. This knowledge map comprises three pillars with overarching restrictions to enhance building longevity: 'Future Techniques,' 'Financial, Environmental, and Socio-Economic Considerations,' and 'Different Materials in Timelayers.'

The best way to ensure a building's long-term preservation, according to the 'knowledge map for prolonging the lifespan of buildings,' is to incorporate 'Future Techniques,' 'Financial, Environmental, and Socio-Economic Considerations,' and 'Different Materials in Timelayers' into the design.

The ultimate step in the 'Coverage of Sustainability Issues' pillar is integrating 'Financial, Environmental, and Socio-Economic' considerations, with social inclusion being particularly crucial. Social inclusion focuses on the human aspect, emphasizing affordability, well-being, and quality of life. Designing accessible, attractive, safe, and comfortable buildings for all users, regardless of age, gender, health, income, and nationality, is essential for social inclusion (Winston, 2010). This topic is further explored in the chapter on Social Inclusion in relation to design.

The ultimate step in the 'Accommodating Risk and Uncertainties' pillar is using future techniques.
Although it may seem that three distinct problems need to be addressed in the design, this is incorrect. All three pillars are interconnected, and solutions for prolonging a building's lifespan often overlap.

Social Inclusion
Architecture and housing policy significantly influence social inclusion. This chapter delves into the goal within the 'Coverage of Sustainability Issues' pillar, which is social inclusion. Social inclusion means creating an accessible, attractive, safe, affordable, and comfortable living environment for all users, regardless of age, gender, health, income, and nationality. Since architecture and housing policy greatly impact social inclusion, this chapter focuses on the 'Coverage of Sustainability Issues' pillar. Architecture and housing policy determine where people can live, shaping neighborhoods and residents' living conditions.

Two current issues related to social inclusion are population di-

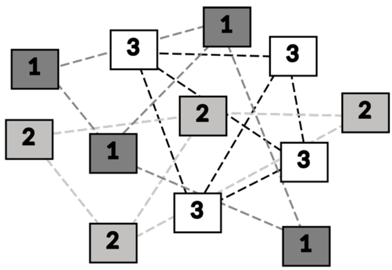

Fig. 24: *Fictional relations between different socio-economic groups (Own Work)*

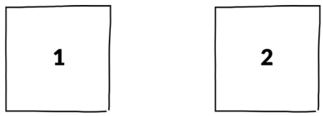

Fig. 25: *Different socio-economic groups (Own Work)*

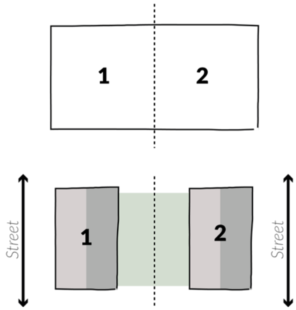

Fig. 26: *No bufferzone inbeween socio economic groups (Own Work)*

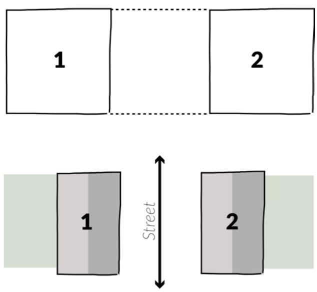

Fig. 27: *Space between different socio-economic groups (Own Work)*

versity and affordable housing. Diversity is increasing across Europe, and the shortage of affordable housing is problematic. The goal of social inclusion is to create pleasant living environments where demolition is unnecessary.

Increasing Diversity

A place that feels like home is where neighbors know each other. Urban growth brings diverse backgrounds, ages, and beliefs into neighborhoods, which can complicate social dynamics. Feelings of alienation and withdrawal can arise, leading to increased tensions. Promoting public familiarity, where neighbors occasionally meet and recognize each other, can help. Meeting places such as parks or libraries enhance public familiarity, although contact does not occur automatically.

Conditions for Diversity

Social inclusion involves diversity, which can present challenges. Mixing groups with significantly different lifestyles does not always work well (Kleinhans et al., 2014). A hidden yet critical mass of one's own group is needed to coexist among outsiders. Contacts between different resident groups can be challenging or non-existent. Too much difference on a small scale leads to problems, irritations, and conflicts. For example, placing groups with different socio-economic backgrounds next to each other without transitional space can cause issues, whereas separating them with a street can mitigate conflicts.

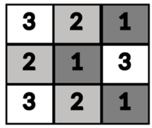

Fig. 28: *Checkerboard model (Own Work)*

Facilitating Connections Between Different Socio-Economic Groups

People with similar lifestyles or socio-economic backgrounds meet in the same places, forming bonds through unplanned encounters, such as parents meeting at a football club or dog owners in a park. These interactions foster a sense of community. Public spaces should facilitate such encounters.

Fig. 29: *Window Detailing (Photo by Museum het Schip)*

Fig. 30: *Facade of t' Schip (Photo by Museum het Schip)*

Increasing Economic Disparities Due to Housing Policy in The Netherlands

Everyone has the right to affordable housing. The constitution stipulates that no more than 30% of one's income should be spent on rent. Affordable housing is becoming increasingly scarce, causing the middle class to experience a so-called housing gap. Social housing, intended exclusively for individuals with very low incomes, is concentrated in specific neighborhoods (Hochstenbach 2022).

Historically, Dutch cities featured beautiful neighborhoods and housing complexes built by housing associations. Examples include the garden district in Utrecht, the Spangen neighborhood in Rotterdam, and the Vogelbuurt in Hilversum. 'Workers palaces' like Het Schip still symbolize the inspiring housing ideals of Dutch public housing. The ideal was that public housing should far exceed what the market offered, aiming for more than just the bare minimum (Hochstenbach 2022).

History of Housing Policy in the Netherlands

Post-World War I, housing construction in the Netherlands gradually recovered. The Housing Act of 1901 aimed to improve living conditions. Various housing associations were established, marking significant progress. Social housing construction surged, with notable projects across Europe during the 1920s and 1930s. The Karl Marx-Hof in Vienna, built between 1927 and 1930, is an impressive example, featuring 1,300 apartments with amenities and communal spaces. Other examples include the Siemensstadt complex in Berlin and the Weissenhofsiedlung in Stuttgart.

By the 1980s, about 40% of all Dutch households lived in social housing. However, both Prime Ministers Dries van Agt and Ruud Lubbers (CDA) argued that social housing expenditures were unsustainable. The state's budget was overly burdened by public housing costs. Consequently, public housing was decentralized under Lubbers' administration, transferring responsibilities from the national government to municipalities. In 1988, Secretary of State for Housing Enneus Heerma discontinued low-interest loans for housing associations.

Heerma advocated that social housing should be predominantly rented to lower-income groups, arguing that too many middle- and upper-income households occupied social housing, preventing access for lower-income individuals. This marked the birth of the "inefficient occupancy" myth. Heerma also suggested that social housing should be more modest and smaller. At that time, all rental housing in the Netherlands was regulated, with maximum rents calculated based on a points system considering the size, quality, and features of the dwelling. Larger homes with more amenities were worth more points and thus had higher rents. Heerma proposed a liberalization threshold, allowing homes with sufficient points to be freed from rent controls and subject to market forces .

European Examples and Marginalization of Public Housing

Examples from other European cities show different approaches. In Paris, families with incomes up to €70,000 can still access social housing, and in Vienna, this threshold is €80,000. The strict income limits currently in place in the Netherlands contrast sharply with the inclusive public housing heritage it once had.

The marginalization of public housing is evident.

The share of housing corporation dwellings has decreased from nearly 40% in the mid-1980s to less than 29% in 2021. Social renters are increasingly among the poorest in society. In 1990, only 12% of all housing corporation tenants had very low incomes, while an equal percentage had high incomes.The text aims to show that more of the poorest people are being concentrated in

Fig. 31: *Facade of t' Schip (Photo by Beispielsweise*

specific neighborhoods, leading to clusters of individuals with significant problems (Hochstenbach 2022).

People who previously qualified for social housing are now pushed into the private rental market, where rents have become unaffordable. Middle-income groups, earning around €40,000 or €50,000 annually, cannot afford the €750 monthly rent for social housing, let alone a modest workers' apartment in Amsterdam for €1,600. Even in mid-sized cities like Deventer, Maastricht, or Zwolle, rents exceed budgets. The stringent income limit threatens their financial stability. Middle-income earners also need affordable social housing (Hochstenbach 2022).

"Inefficient Occupants" and Subsidies

Middle- and higher-income earners remaining in social housing are often labeled as "inefficient occupants". These occupants are accused of occupying scarce social housing, leading to longer waiting lists and preventing those who truly need social housing from accessing it. Many "inefficient occupants" are trapped between their social housing and the private sector, where affordable options are scarce. Contrary to accusations, they do not benefit from state aid. They are not eligible for housing benefits, and housing corporations do not receive subsidies to house them. The notion that social housing is only for the poor is a persistent myth. Public housing was intended for a broad segment of the population (Hochstenbach 2022).

Subsidy Suspension and Market Orientation

In addition to addressing inefficient occupants, there was an emphasis on homeownership and creating more modest social housing. A fundamental reform known as the "Heerma operation" aimed to reduce the dependency of housing corporations on state subsidies. Despite already being private not-for-profit organizations, housing corporations were often discussed in terms of privatization. Direct subsidies from the state were substantial, as were outstanding loans, both around 30 billion guilders. This led to the "brutering" process, which aimed to disentangle the financial ties between the government and housing corporations. Since 1994, housing corporations had to become self-sufficient, relying on indirect subsidies like cheaper loans or land but no longer receiving direct support (Hochstenbach 2022).

Housing corporations began to behave more like market players, investing their portfolio value and selling large numbers of social homes to often foreign investors. This shift, exemplified by directors like Hubert Möllenkamp, led to a decrease in public housing stock due to the "sell-off."

Increasing Affordable Middle-Income Housing

Since the 1980s, the social housing stock has shrunk, reserved only for the lowest income bracket. Both homeownership and renting have become more expensive, and the gap between social housing and the free market is challenging to bridge. Private sector tenants often spend too much of their income on rent, risking financial ruin. Tenants with relatively low rents are squeezed into tiny luxury apartments.

In cities like Amsterdam or Utrecht, luxury apartment towers are rapidly emerging. These apartments, marketed as middle-income housing at €1,500 per month for 50m², do not address the housing shortage but are expected to lead to future vacancies, as noted by Hochstenbach (2022). Middle-income housing is the solution.

2.5 Conclusion

This thesis has explored how architecture can contribute to reducing the environmental impact of the construction industry by extending the lifespan of buildings. This issue has been systematically addressed through three sub-questions.

Sub-question 1: The ecological footprint throughout the entire lifecycle

The analysis of the ecological footprint throughout the lifecycle of buildings reveals that the environmental impact is significant when a building is in use for an extended period, such as 100 years. In such cases, the primary environmental impacts are associated with usage, renovations, and maintenance. By combining Brand's (1996) theory, which describes buildings as layers with different rates of change, with a lifecycle analysis, the environmental impact can be best measured and regulated.

Sub-question 2: Motives for demolishing residential structures in the Netherlands

Research into the motives for demolishing Dutch dwellings has shown that various factors promote premature demolition. There is a strong correlation between the likelihood of building preservation and the form of management. Rental properties have a higher demolition rate (0.6%) compared to owner-occupied properties (0.1%). The quality of the buildings also plays a role; there is a weak correlation between low quality and demolition for owner-occupied properties but a strong correlation for rental properties. Social housing from the 1930s has a lower demolition rate than housing from the 1960s. Economic decline models, such as Vroman's "sawtooth" model, can promote unnecessary demolition. Furthermore, demolition and renovation decisions vary significantly between housing corporations, indicating managerial differences. Finally, there is the phenomenon of "planners blight" (Thomsen, 2004), where the anticipation of demolition discourages investment in the neighborhood, leading to decay.

Sub-question 3: Elements that contribute to the preservation of buildings

According to the theory of Georgiadou et al. (2012), the longevity of buildings is determined by three pillars: social inclusion, recognizing time layers (Brand, 1996), and combining environmental impact with flexibility for unforeseen changes. By maximizing consideration of these factors, the likelihood of maximizing the lifespan of buildings is increased.

Main question: Can architecture play a significant role in minimizing the environmental impact caused by the construction industry by prelonging the lifespan of buildings?

Architecture can indeed play a significant role in minimizing the environmental impact caused by the construction industry. Applying the “Knowledge Map for Prolonging the Lifespan of Buildings” provides designers with both guidelines and design freedom to realize environmentally neutral buildings. However, it is crucial to handle materials carefully and for architects or designers to anticipate potential changes in a building.

In conclusion, by preserving, repurposing, or renovating buildings and applying careful design principles, architecture can significantly rol to a more in reducing the environmental impact.

2.6 Discussion

The thesis highlights the significant environmental impact of the construction industry, stating that it accounts for approximately 38% of the total environmental impact. This finding underscores two key nuances. Firstly, there is a wide variety of research that calculates the total environmental impact using different methodologies, leading to varying percentages. Despite these differences, the construction industry's share of the total environmental impact remains substantial.

To address the first sub-question, a simplified version of a life cycle analysis (LCA) was used to map the total environmental impact. The inputs for the user phases are based on assumptions. For example, constant values of 5 EQ points were used for water, and it was assumed that the annual energy demand decreases by 1%. This simplification highlights the challenge of accurately modeling the complex realities of the construction industry's environmental impact.

The second sub-question addresses the diversity of data and research on the causes of early demolition. Much of this research has been conducted by the same individual, which raises concerns about potential tunnel vision. The research exhibits a moderate level of negativity towards housing corporations, suggesting that their demolition behavior is primarily driven by corporate policies and board decisions. However, this perspective may oversimplify the issue, as the removal of subsidies and the push for the privatization of housing corporations have also likely contributed to increased demolition rates. This indicates that the motivations behind demolition are more nuanced than purely financial gain.

The third subtopic partially explores social inclusion and the mixing of diversity. Studies by Kleinhans et al. (2014) and Blom and Soomeren (2015) discuss “coarse mixing,” but they do not precisely define what this term means. In this context, “coarse mixing” has been interpreted as the granularity of apartment complexes. This lack of a clear definition highlights the need for more precise terminology and understanding in discussions about social inclusion in urban planning.

3

Research by Design

Introduction Research by Design

This chapter explains how elements from country houses, the Amsterdam School, social inclusion, and the integration of research findings from Chapters 1 and 2 have culminated in the creation of the Urban Dyke.

Fig. 32: *Transition between Tanthof and Midden-Delfland (Vrij et al., 2023)*

Tanthof

Tanthof

Tanthof is a residential neighborhood in Delft, developed primarily during the late 20th century to meet the demands of a growing urban population. The area is divided into Tanthof-East and Tanthof-West, each offering a range of amenities including schools, shops, and parks, which make it a practical and convenient place to live, especially for families.

The neighborhood is planned, with a focus on green spaces. Parks, playgrounds, and walking paths are integrated throughout, providing residents with plenty of opportunities for outdoor activities and fostering a sense of community. The presence of essential services and good public transport links further enhance the livability of Tanthof.

Fig. 33: *Tanthof (Own Photo)*

However, the valuation of Tanthof is limited. Architectural style and focus of users of Tanthof is fairly uniform. This lack of architectural variety means that many of the houses look quite similar, which can give the neighborhood a monotonous appearance. The buildings, primarily constructed in a functional style typical of the period, lack the distinctive features that might make the area more visually appealing.

As a result, despite its practical benefits and well-designed layout, the appreciation of Tanthof is somewhat limited. Residents and visitors alike often find the architecture less attractive compared to other parts of Delft, which can detract from the overall charm of the neighborhood. Nonetheless, Tanthof remains a solid choice for those looking for a family-friendly environment with convenient access to both urban amenities and green spaces.


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500 meter

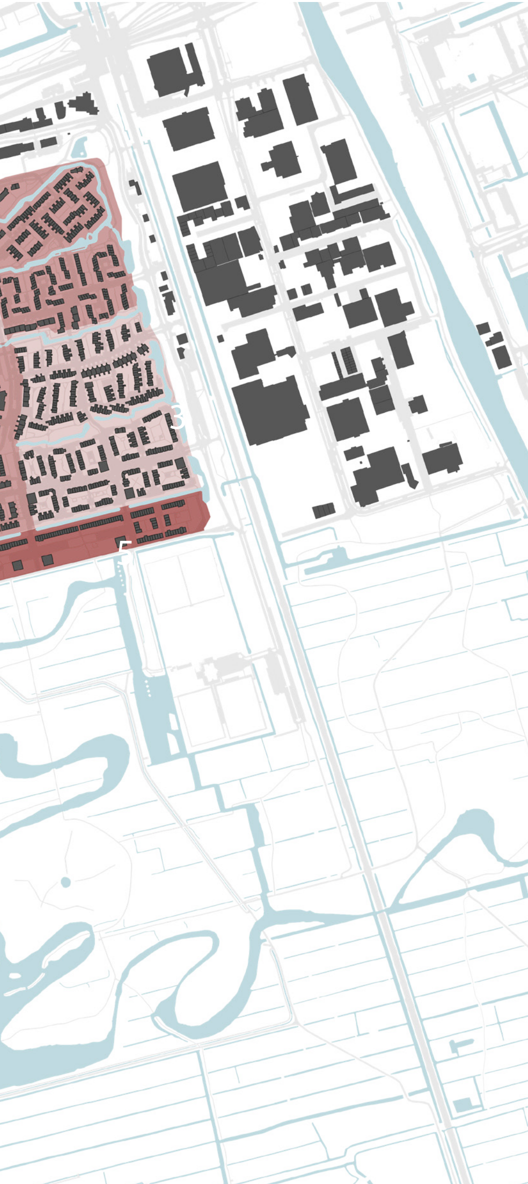


Fig. 34: *First Half of the 20th century (Vrij et al.,2023*

Tanthof East

1. Dierenbuurt (1977-1982)

2. Boerderijbuurt (1977-1979)

3. Vogelbuurt Oost (1978-1980)

4. Vogelbuurt West (1978-1981)

5. Bosrand (1987)

Tanthof West

6. Latijns Amerikabuurt (1981-1982)

7. Afrikabuurt West (1983-1985)

8. Aziëbuurt (1984-1992

9.

Underlaying history of Tanthof

Since the late 1970s, the construction of Tanthof began. However, the urban design barely took the existing land structures into account.
The road Abtswoude is one of the few remnants of the situation before the construction of Tanthof. This main road divides Tanthof East and Tan-

Fig. 35: *Second half of the 19th century (Own Work)*

Fig. 36: *First Half of the 20th century (Own Work)*

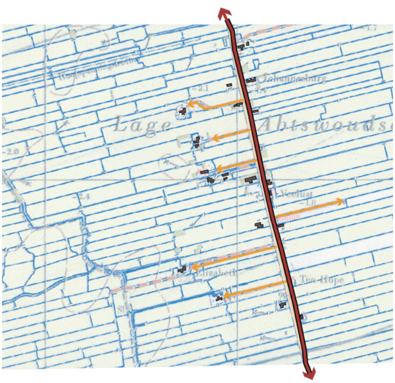


Fig. 37: *60's of the 20th century (Own Work)*

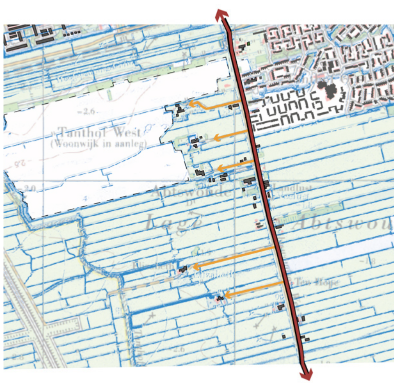


Fig. 38: *70's of the 20th century (Own Work)*

thof West. Along Abtswoude, there are still several farms that date back to previous centuries.
In the Abtswoudse Park, the original water structures and farms can still be found. Behind the limited valuation of the architecture of Tanthof, there are unique traces of the past are still visible for those who look beyond.

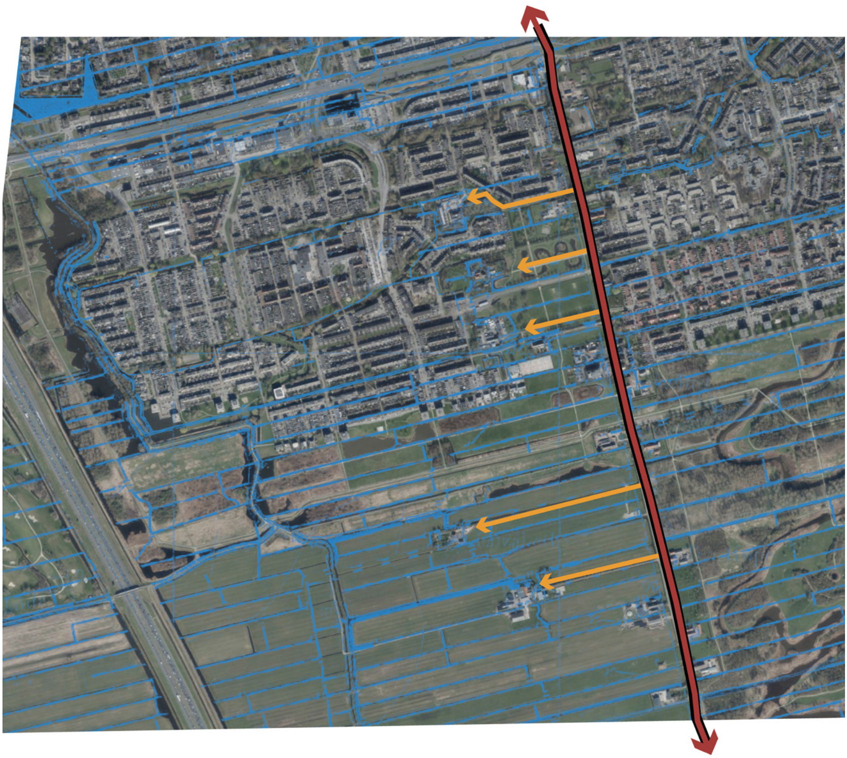


Fig. 39: *60's of the 20th century (Own Work)*

Fig. 40: *Masterplan Dyke between Tanthof and Midden Delfland(Own Work)*

- *Dyke*
- *Elevated Ground*
- *Same level Ground*
- *Deepened Ground*
- *Water*
- *Meeting Place*
- *Walking Route*
- *Tennis Court*

Dyke between Tanthof and Midden-Delfland

The dyke between Tanthof and Midden-Delfland provides an opportunity to enhance the contrast between the landscape and the city. This dyke will serve as a walking route along Tanthof, facilitating meeting places and encouraging outdoor activities.

The dyke will clearly delineate what is considered to be landscape and what is not. The Abtswoudse Park will be part of the new Midden-Delfland. The park is designed with varying elevations, allowing water to flow freely while ensuring other areas remain usable.

Figure 41 shows the current situation of the Abtswoudse Park. After rainfall, puddles tend to linger, rendering playfields unusable. By creating depressions and elevations with balanced soil, the water can be redirected away from the playfields, making them more functional.

Integration with Existing Tanthof
To maintain cohesion in Tanthof, the building lines of the existing structures are extended into the new development. The dyke, together with the urban plan, effectively marks the boundary of the city. This is shown in figure 42.

Fig. 41: *Abtswoudsepark after rainfall (Own Photo)*

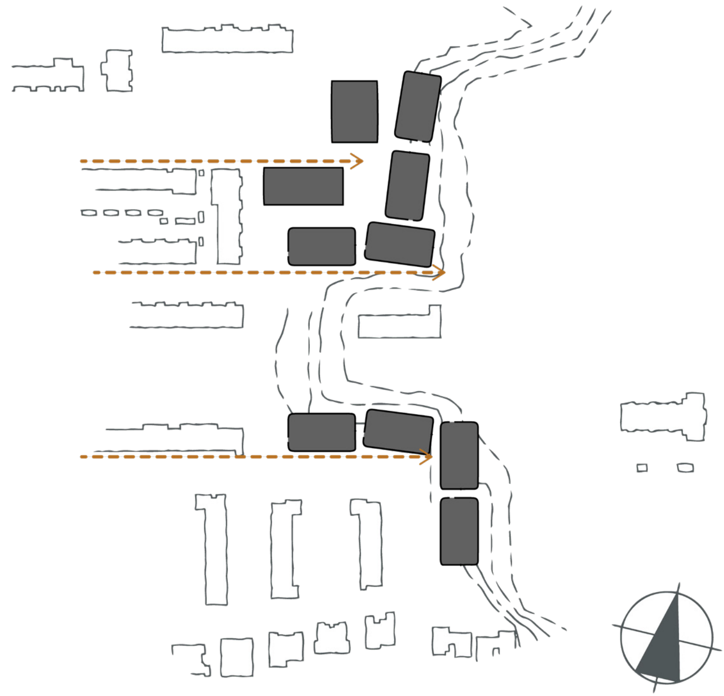
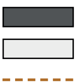


Fig. 42: *Cohesion with existing Urban Layout (Own Work)*



New building blocks

Existing buildings

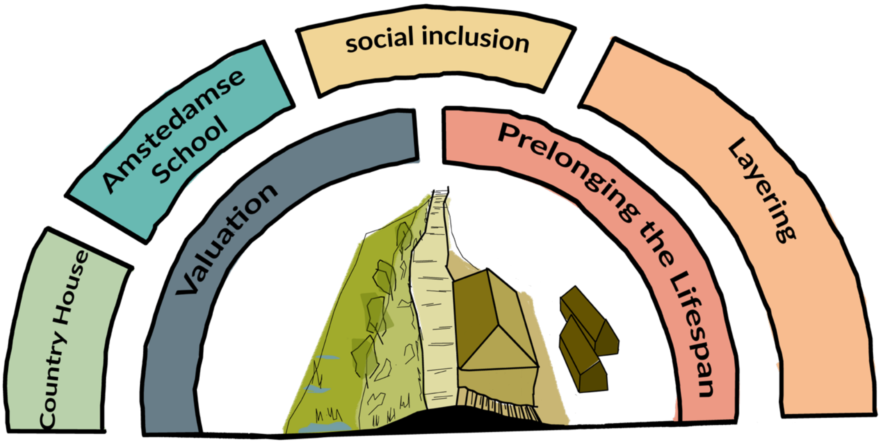
Building lines

Ambition of Urban Planning

Ambition of Urban Planning

Tanthof is a typical post-war neighborhood in the Netherlands. Such neighborhoods are widespread across the country, but despite their prevalence, they are often quickly labeled as unattractive. The buildings are monotonous and cater to a limited range of demographics.

The design ambition is twofold: to facilitate the development plans in Midden-Delfland and to prepare Tanthof for the future so that the existing buildings are not lost. These ambitions converge at the border between Midden-Delfland and Tanthof. The two areas should be separated by the Urban Dyke, which protects Delft from water, shields Midden-Delfland from the expanding city, and enhances the appreciation of the surrounding environment.



Urban Dyke

The Urban Dyke is intended to increase the appreciation of Tanthof while being designed for longevity. The underlying theories come from the research “Preserving the Future,” which discusses building with minimal environmental impact by designing for the long term and seeking architecture that harmonizes with the landscape.

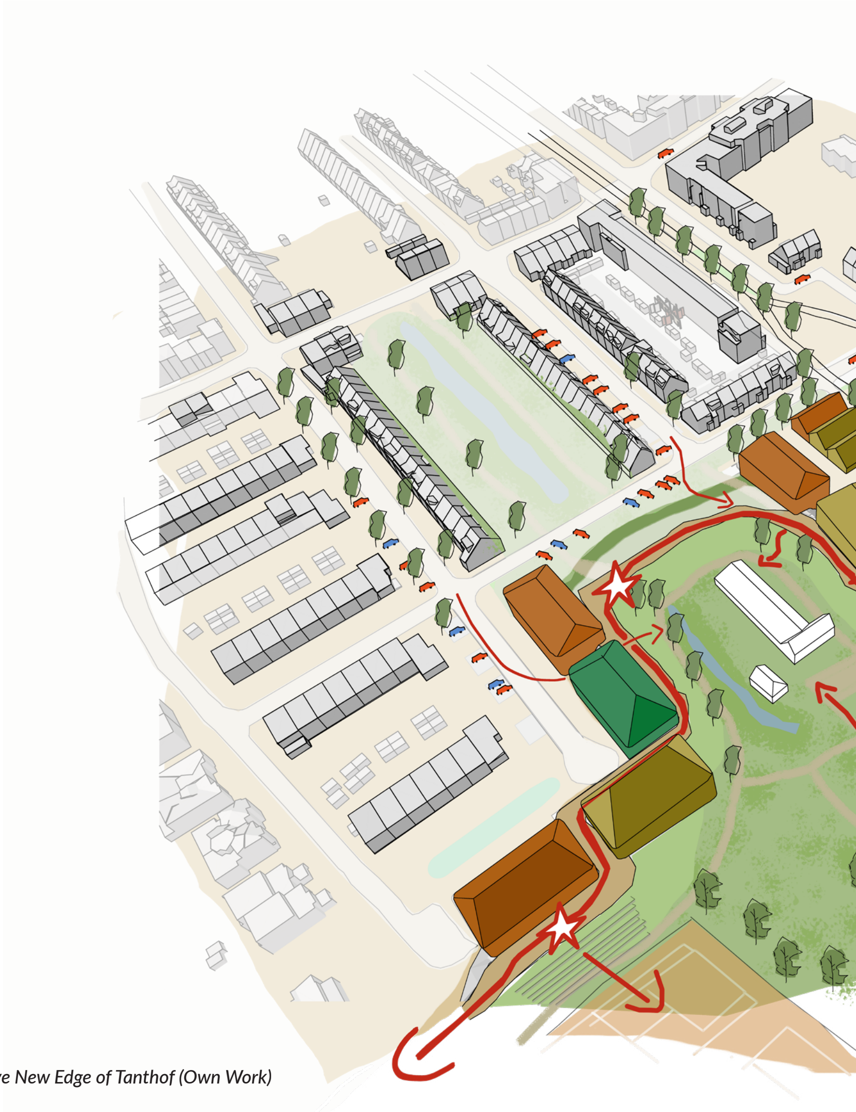
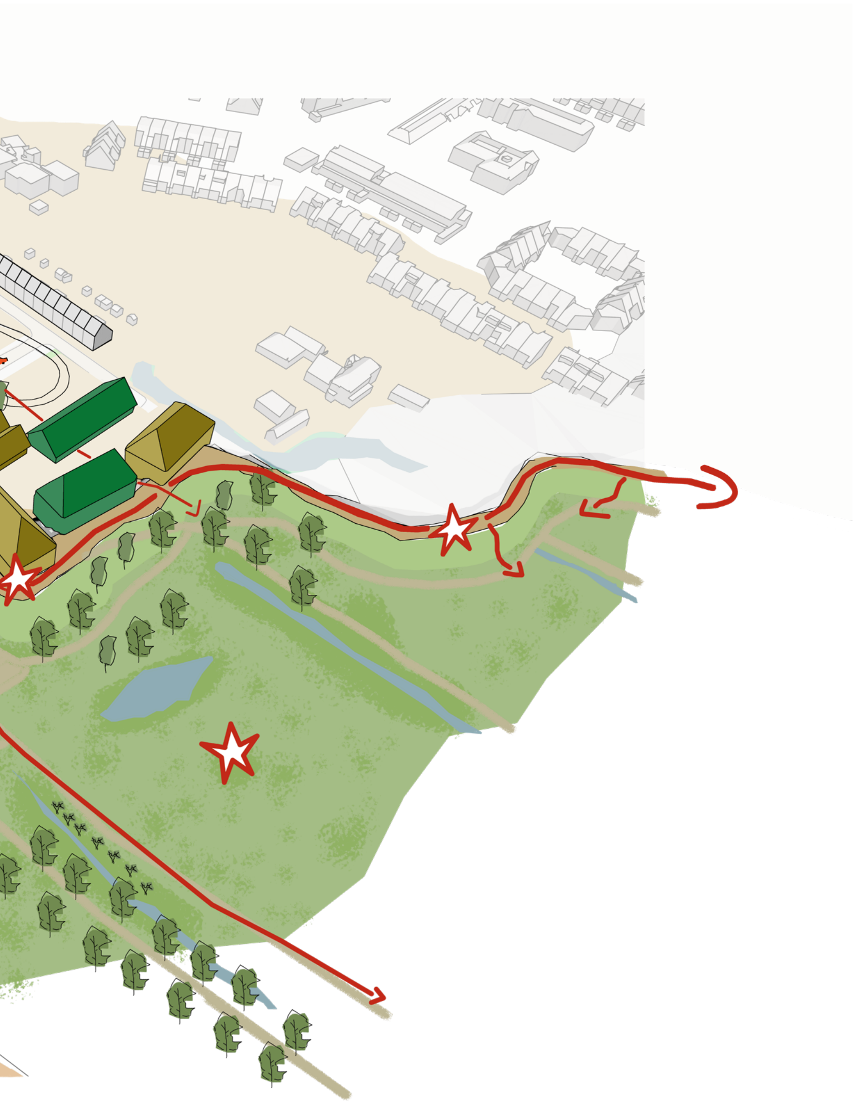


Fig. 43: *Birds Eye New Edge of Tanthof (Own Work)*



Valuation

Although some post-war neighborhoods in the Netherlands, like Tanthof, are often undervalued, they deserve recognition and preservation. Demolishing these neighborhoods would not only result in unnecessary emissions but also reduce the number of available homes, exacerbating the housing shortage.

Appreciation encompasses a combination of aesthetics, social impact, and historical value. Aesthetics refers to the visual appeal and beauty of a building, including the shapes, lines, colors, and materials that define its character. Social impact focuses on how a building contributes to the community, including aspects such as accessibility, inclusivity, and the promotion of social interaction. Historical value encompasses the cultural, historical, and architectural significance of a building, often assessed based on factors such as age, rarity, and any historical events associated with it. Emphasizing or enhancing these aspects can potentially increase appreciation.

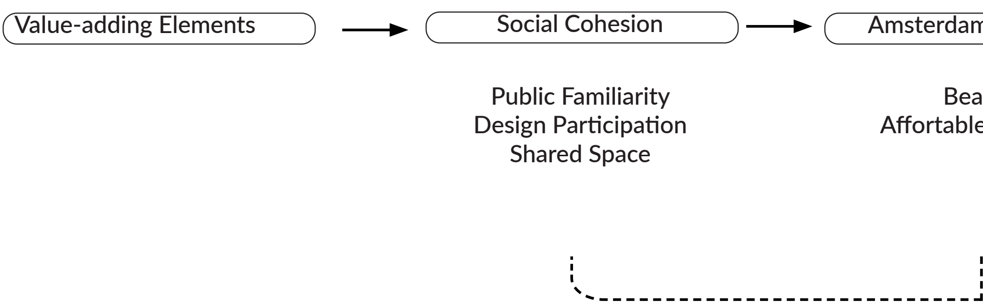
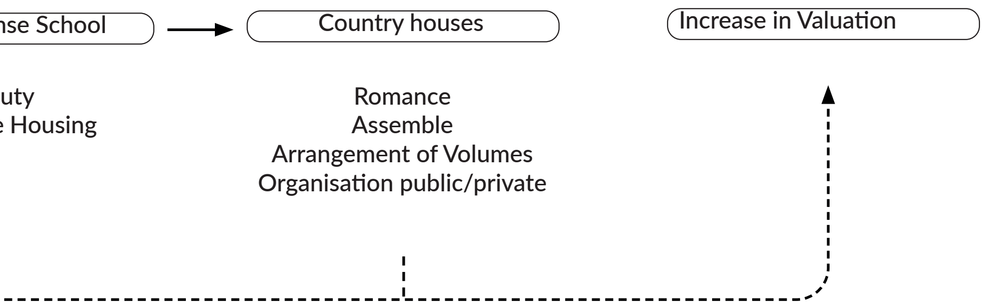
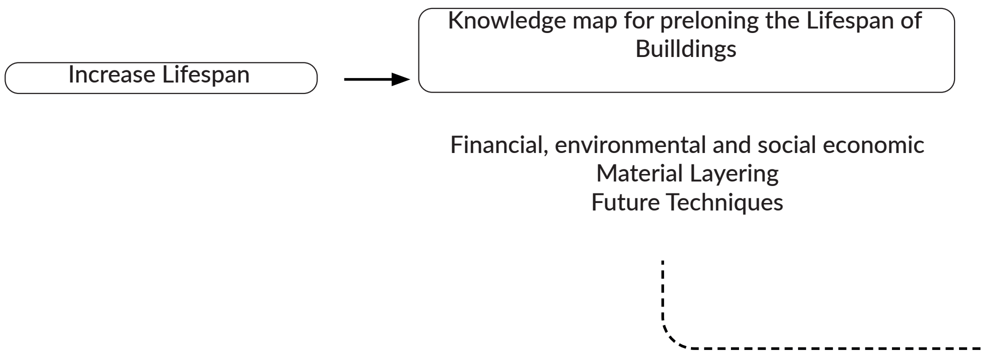


Fig. 44: *Impression Residental Blocks on Dyke (Own Work)*



Lifespan of Tanthof

Beyond appreciation, which can be challenging to quantify, a more pragmatic approach can be taken to extend Tanthof's existence. By implementing the "Knowledge Map for Prolonging the Lifespan of Buildings," the lifespan can be maximized (source). The knowledge map consists of three pillars: 'accommodating risks and uncertainties,' 'lifecycle thinking,' and 'coverage sustainability issue.'



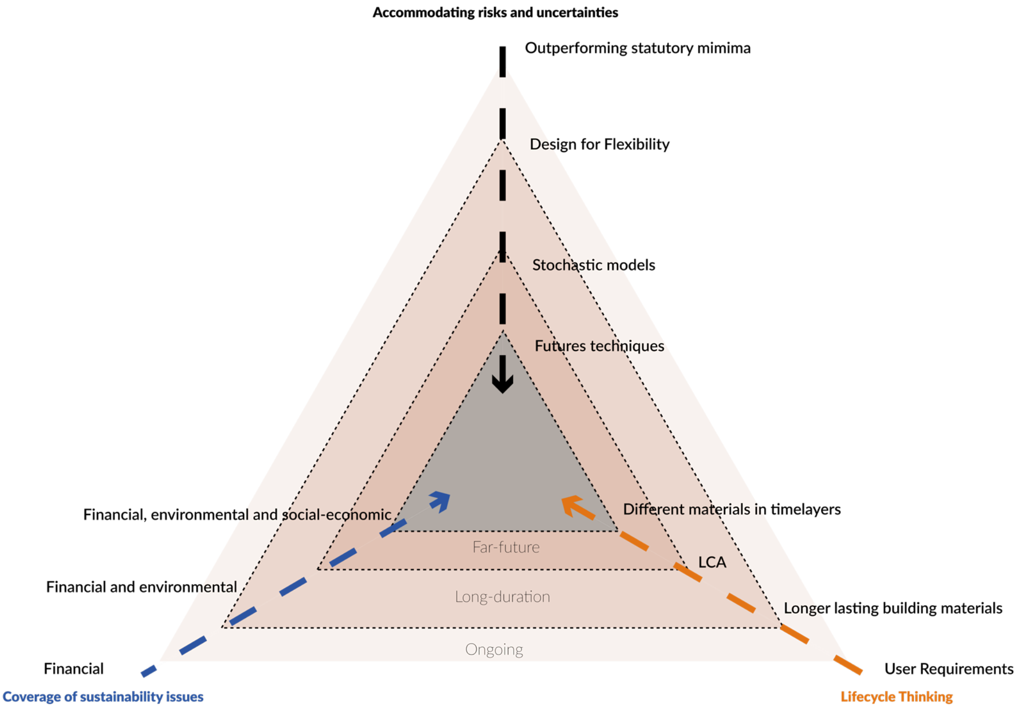
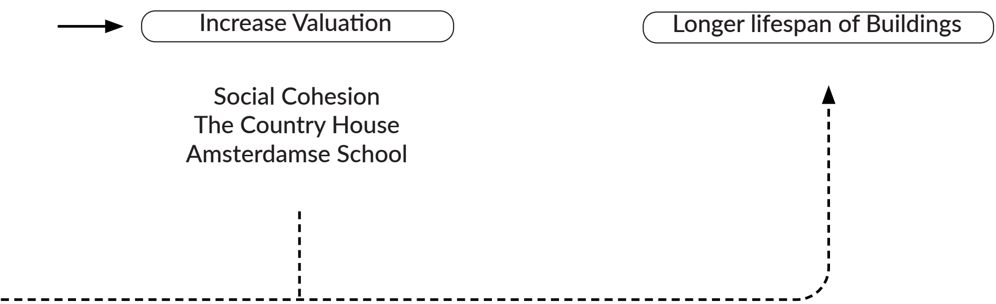
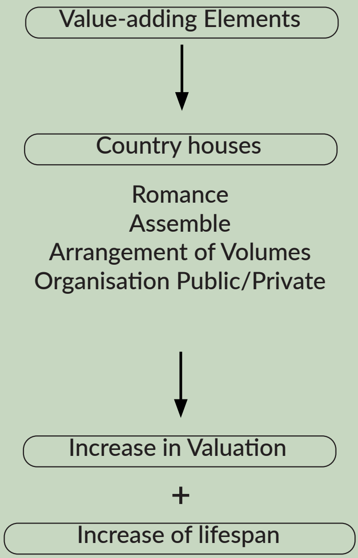


Fig. 23: *Knowledge map for preloning the Lifespan of Buildings (Own Work)*



The Country House



The Country House

Stately chimneys rise above the vegetation, with the roof and chimneys standing out prominently. However, there is a seamless transition between the landscape and the exterior walls of the villa.

Researching the country house is interesting because the Urban Dyke is intended to be a transition point between the city and the countryside, ultimately adding value to the environment. The country house has withstood the test of time, proving its value. Additionally, these types of residences are often situated at the edge of a city or village, literally forming the boundaries between building environment and the landscape.

Fig. 45: *Country House and Wild Garden, Design by Edwin Lutyens*

Fig. 45: *Portret of Sir Edwin Lutyens*

Edwin Lutyens

Sir Edwin Lutyens (1869 - 1944) was an English architect known for his versatility and inventiveness within traditional architectural lines. After studying at the Royal College of Art in London, he joined an architectural firm in 1887 but soon decided to go his own way. In his early works (1888-1895), he integrated the traditional forms of local Surrey buildings into his designs. Meeting landscape architect Gertrude Jekyll, whom he later married, marked a turning point for Lutyens. Jekyll taught him the principles of simplicity and purposefulness, inspired by John Ruskin. Munstead Wood in Godalming, Surrey (1896), marked Lutyens' debut as a designer with his own style. This house, characterized by a harmonious balance between curved roofs, tall chimneys with buttresses, and small doorways opposite long strips of windows, established his reputation (Lutyens, 1980).

The Arts and Crafts Movement (1870-1920)

Munstead Wood, designed by Lutyens, is considered one of the masterpieces of the Arts and Crafts Movement. This movement emerged as a reaction to industrialization. Both an artistic movement and a social force in the late 19th century, it brought together designers and craftsmen in a collective creative effort.

From about 1760, England underwent an industrial revolution, driven by innovations such as James Watt's steam engine, leading to significant industrialization. Mass production of cheap goods often resulted in inferior quality. Workers were mere executors, with no involvement in the design process. Workers lived and worked under appalling conditions.

Fig. 46: *Munstead Wood, Design by Edwin Lutyens*

In response to these developments and with an awareness of the negative effects of industrialization, designers and artists sought a return to craftsmanship and a redistribution of power and status. Often socialist in nature, they aimed for a reevaluation of craftsmanship, where each individual within the design and production process could find satisfaction and contribute to the well-being of society. Thus, the Arts and Crafts Movement was born, a fusion of art and craft (Arts-and-crafts, n.d.).

Fig. 47: *Ondertekst*

Fig. 48: *Ondertekst*

Ensemble

Typical of Arts and Crafts country houses is the ensemble of architecture and landscape. The landscape transitions gradually into the buildings. The pointed roof shapes and chimneys stand out against the surrounding vegetation. Yet the structure fits into the whole, forming a peaceful and romantic image.

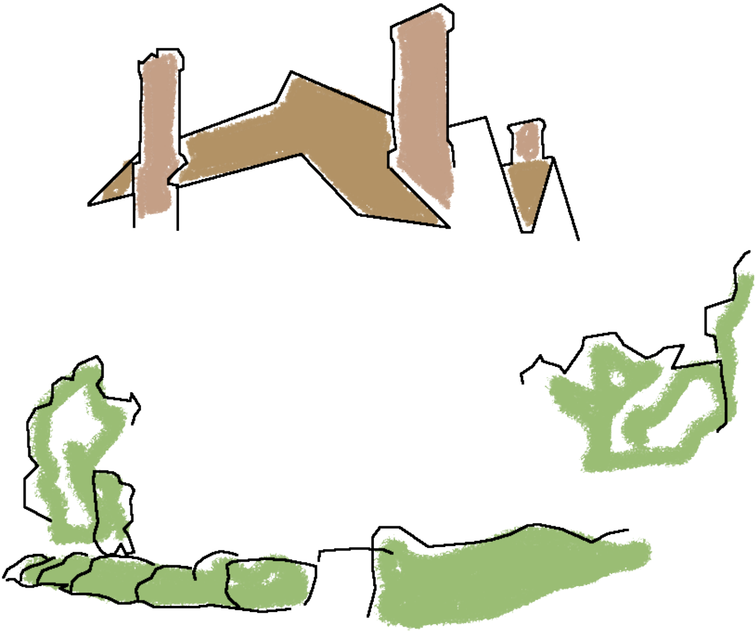


Fig. 49: *Ondertekst*

Fig. 50: *Downhill Park House Gardens by Edwin Lutyens*

Vestibule

Common space

Private Spaces

Beginning of the City and the End of the Landscape

In figure 50, a boundary is sought where the landscape ends, and the city begins. The existing farms belong to the landscape and the associated structures. The rest of the buildings belong to Tanthof.

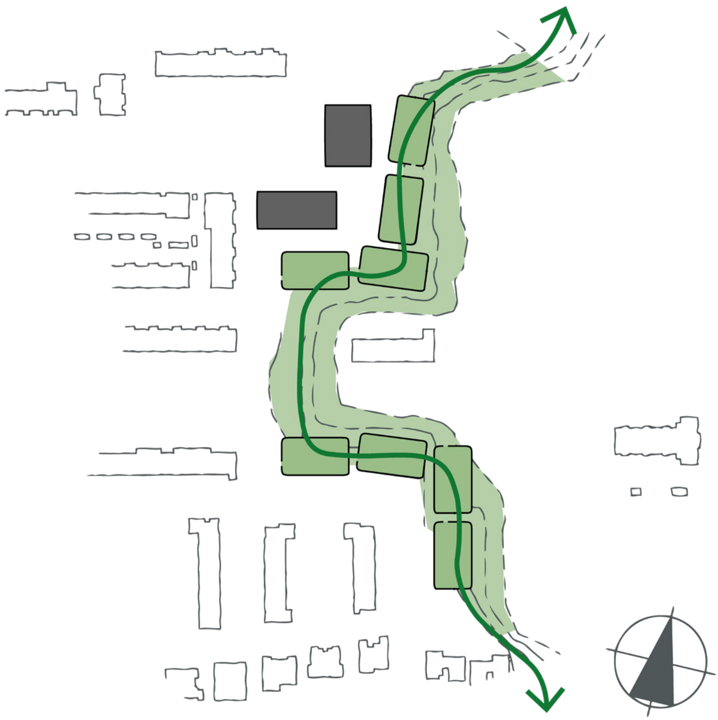
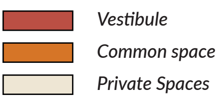


Fig. 51: *Downhill Park House Gardens by Edwin Lutyens*



Ensemble of Buildings and the Dyke

In figure 51, the ensemble of architecture and landscape is indicated. The buildings are part of the dyke and together form a whole with the landscape.

Arrangement Building Volumes

Typical of country houses and mansions is the arrangement of building volumes. The main house is the part that commands attention and houses the important functions. Surrounding the main house are smaller structures serving as, for example, the gardener's residence or storage.

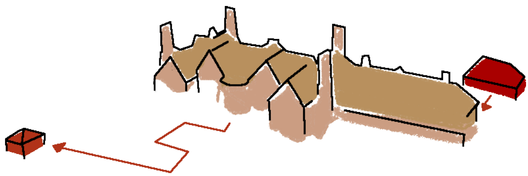


Fig. 52: *Ondertekst*

Building Volumes in Tanthof

In figure 52, the arrangement between prominent buildings and subordinate volumes is indicated. Derived from country houses: the main building and the associated outbuildings.

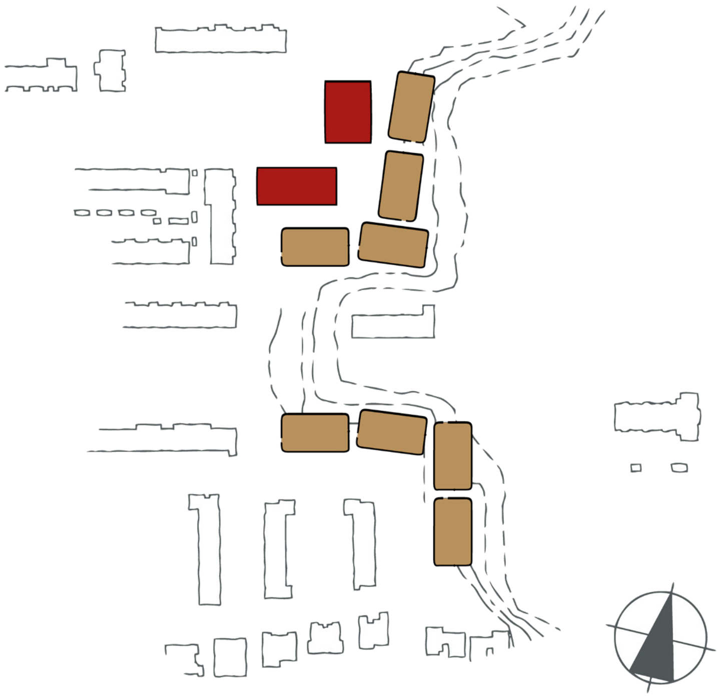


Fig. 53: *Downhill Park House Gardens by Edwin Lutyens*

Vestibule
Common space
Private Spaces

Organization of Private and Public

Like the transition from landscape to architecture, the transition from public to private is also gradual. Figure 55 shows how the transition from public to private is organized in the floor plans of the country house.

Fig. 54: *Downhill Park House Gardens by Edwin Lutyens*

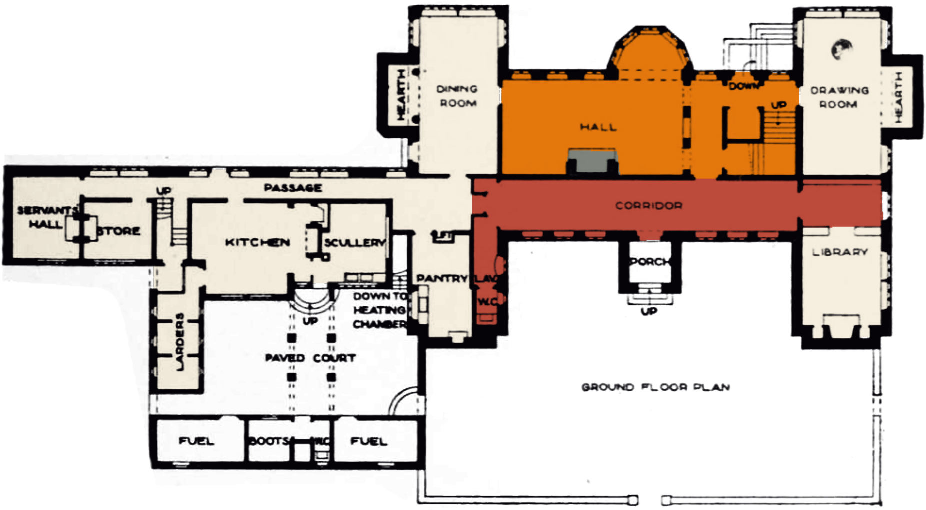


Fig. 55: *Downhill Park House Gardens by Edwin Lutyens*

Vestibule

Common space

Private Spaces

Fig. 56: *Ondertekst*

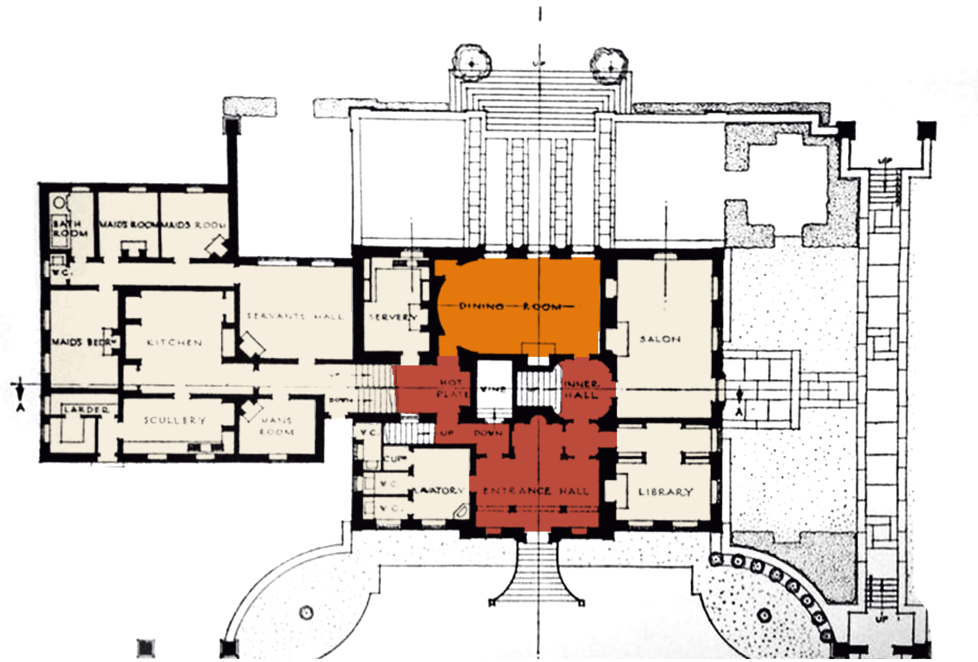


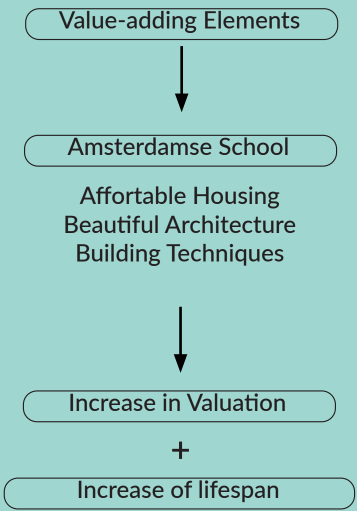
Fig. 57: *Downhill Park House Gardens by Edwin Lutyens*

Vestibule

Common space

Private Spaces

Amsterdamse School



Amsterdam School

Everyone has the right to housing! The Netherlands once had a beautiful public housing system. The pinnacle of social housing in the Netherlands was during the 1920s and 1930s, in the architectural style of the Amsterdam School.

The stunning expressionist facades of the Amsterdam School, such as those of Het Schip designed by Michel de Klerk, have made the Spaarndammerbuurt a high valued neighborhood. Researching the Amsterdam School is interesting because it exemplifies how architecture in the form of affordable housing can bring value and appreciation to the city.

Fig. 59: *The expressionist facade 'het Schip", designed by Michel de Klerk (Photo: C.H.V. Delorme)*

Right to a livable and affordable housing

The middle segment is under pressure. The Netherlands once had a splendid public housing system where people with low and middle incomes could find pleasant living spaces. Housing policy since the 1980s has put an end to this rich public housing. Only the lower echelons of society qualify for social rental housing, and due to the shortage of housing in the Netherlands, the gap between social rental and the free sector is widening (source: research booklet). Small apartments for €1500 per month are not a solution to housing shortages, as noted by Cody Hochstenbach (2022).

Similar to the dwellings in the Spaarndammerbuurt, where t' Schip is build is aswell, both low and middle-income households should have access to affordable housing. The philosophy associated with the Amsterdam School serves as an ideal model for creating a livable and higher valued city.

Fig. 60: *Hembrugstraat, Spaarndammerbuurt in Amsterdam (Google Maps, 2024)*

Fig. 61: *Hembrugstraat, Spaarndammerbuurt in Amsterdam (Jan T., 2023)*

Project	Spaarndammerhart
Achitect	Korthielens architecten Marcel Lok architect
Category	Dwelling
Date	2021
Location	Amsterdam, The Netherlands
Size	- m2

Spaarndammerhart

Spaarndammerhart indicates new architecture can still be can still be made with expressionist characteristics. In the early twentieth-century Spaarndammerbuurt consists of characteristic urban ensembles from the Amsterdam School period. The neighborhood is still largely intact but has incurred scars over time that are gradually being healed. The residential complex on the site of the former Spaarndammerschool, designed by Korthtielens Architects in collaboration with Marcel Lok Architects, serves as an example. The new construction is based on the richness of the Amsterdam School tradition, which integrates architecture, art, and nature (Korthtielens, 2021).

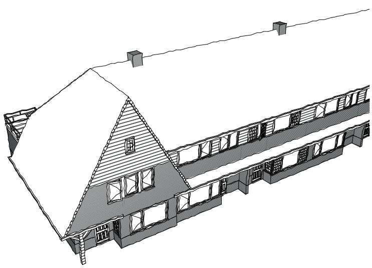
Spaarndammerhart epitomizes harmonious architecture. It is architecture that fits into the environment while simultaneously distinguishing itself from the surrounding area. Spaarndammerhart serves as a beautiful example of graceful new construction projects. The Spaarndammerbuurt is filled with (former) social housing projects, such as Het Schip designed by Michel de Klerk, who sought to elevate the ordinary worker and Dutch public housing.

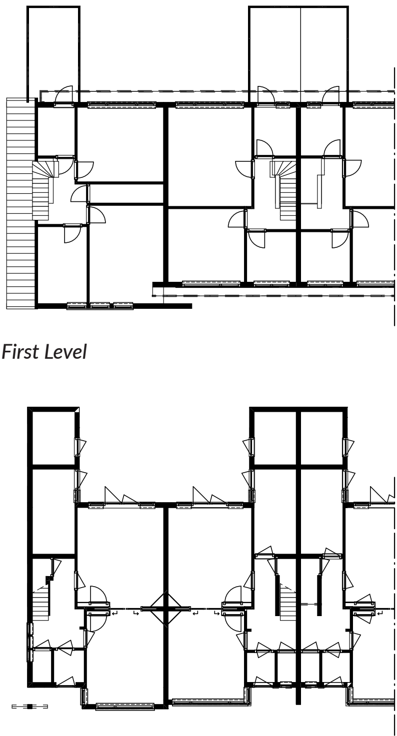
Fig. 62: *Spaarndammerhart (Photo by korthtielens architecten)*

Flexibility of Pre-War Homes

The fact that these homes have endured multiple generations and (energy)transitions speaks volumes about their flexibility. These pre-war homes typically feature masonry inner and outer walls, along with timber floor and roof structures.

A typical space plan, as shown in figure 63, has enabled these homes to adapt though time.





First Level

Ground Level

Fig. 63:*Typical 1930s floor plan (Own Work)*

Originally built without bathrooms, these homes later accommodated this feature as it became standard (figure 64).

The masonry construction also allows for relatively easy extensions at the back of the house (figure 65).

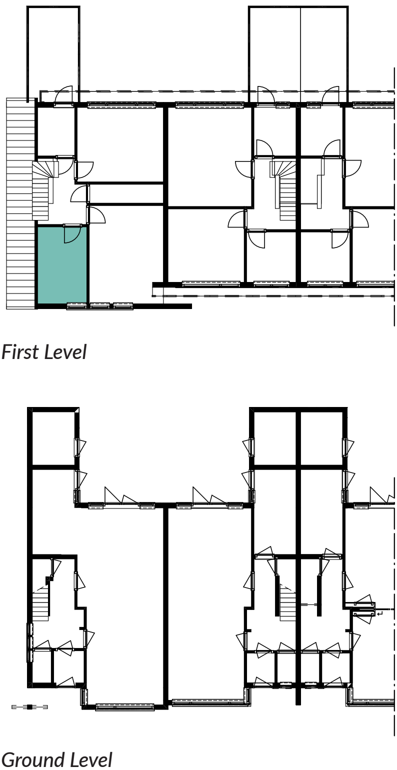


Fig. 64: *Introduction of bathrooms (Own Work)*

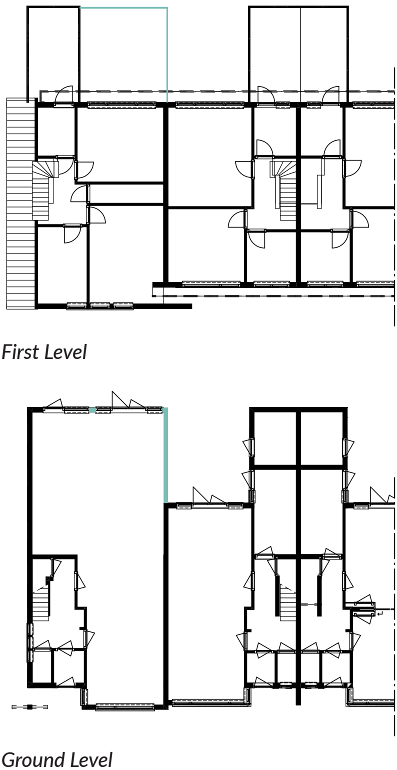


Fig. 65: *Extension (Own Work)*

Construction Technique Translated into a Renewed Design

Technical elements found in buildings from the 1930s are applied in a new way to the construction technique of the Urban Dyke buildings. Floor elements rest on supports, making them easy to remove if necessary. These floor elements also serve as ceiling finishes. Each floor incorporates a service space, simplifying the rerouting of pipes.

Thanks to the generous dimensions within the load-bearing structure, there are endless possibilities for future floor plan modifications.

The masonry facades are also equipped with steel overlays, allowing floors to be easily (de)attached to the facade. Details of the connection between the facade and the floor can be seen on pages 192 in figures 85-89.

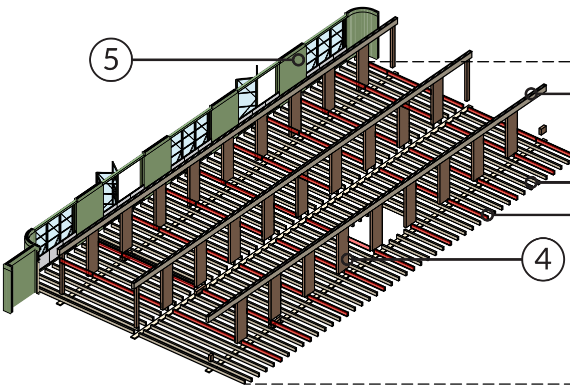


Fig. 66: *Axonometry demountable Timber Beam Construction (Own*

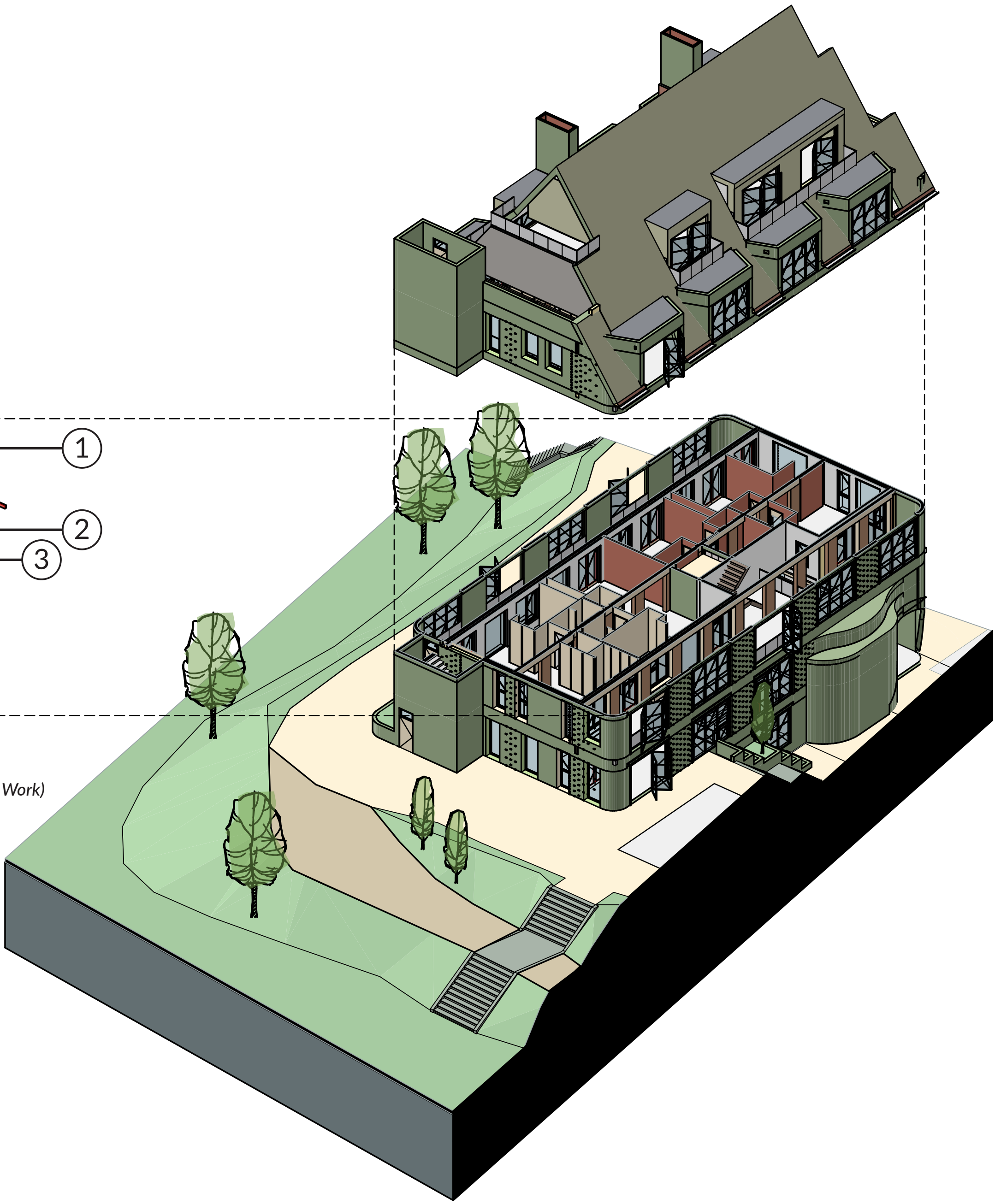
1: Oakwood Beam Construction

2: Demoutable Timber Beams

3: Non Demountable Beam (red)

4: Compressed Earth Brick Columns

5: Brick Façade with Steel Overlay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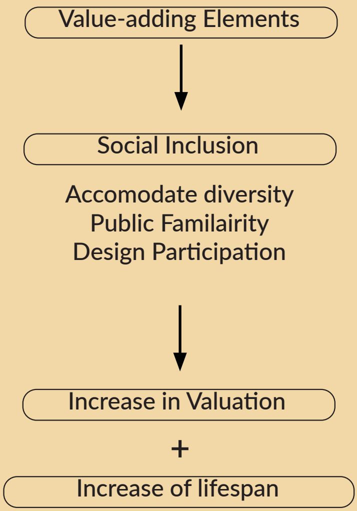
Social inclusion



Social Inclusion

Social inclusion means an accessible, attractive, safe, affordable, and comfortable living environment for all types of users, regardless of their age, gender, health, income, or nationality. Implementing social inclusion in architecture is important for the appreciation of the built environment and for maximizing the lifespan of a building.


BAR

Diversity in the City

Social inclusion is associated with diversity. With diversity sometimes comes conflict (source: research thesis). Mixing groups with very different lifestyles does not always work well together. One solution is to mix roughly by applying the checkerboard model (Blom & Soomeren, 2015). The checkerboard model schematizes a neighborhood where blocks consist of the same target groups. Within each block, people with the same lifestyle live together.

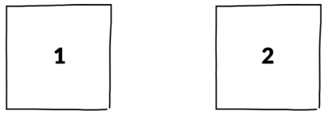


Fig. 67: *Different socio-economic groups (Own Work)*

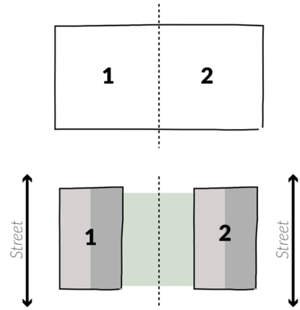


Fig. 68: *No bufferzone inbeween socio economic groups (Own Work)*

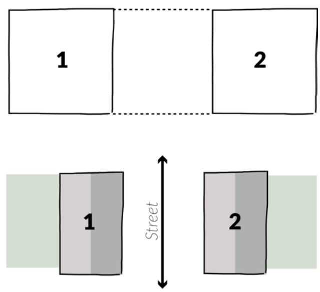


Fig. 69: *Space between different socio-economic groups (Own Work)*

Extended Checkerboard Model

The checkerboard model (Blom & Soomeren, 2015) is a schematic model for successfully implementing diversity at the neighborhood level. In the extended checkerboard model, a transition area is included between the different socio-economic groups. Each group must have the space to express its own identity. The public space between different economic groups is shaped by the users, from which an identity emerges. In figure 71, it is shown that the combination of group 1 and 2 results in a red-colored space, the combination between group 2 and 3 results in a purple space, and a combination of group 1, 2, and 3 results in a green-colored space.

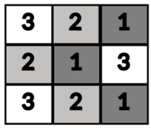


Fig. 70: *Checkerboard Model (Blom & Soomeren; Own Work)*

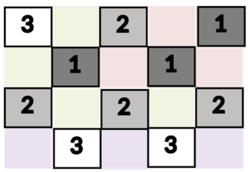


Fig.71: *Physical links between socio-economic groups (Own Work)*

Fig. 72: *Identity reflected in Architecture (Own Work)*

The following figure 72 shows how each building block has its own identity. Each building block has a different appearance. This is in stark contrast to the surrounding neighborhood, characterized by the same type of row houses.

In figure 73, the extended checkerboard model is applied to Tanthof. Each block has a specific type of user. Squares arise between the building volumes, belonging to the composition of building blocks.

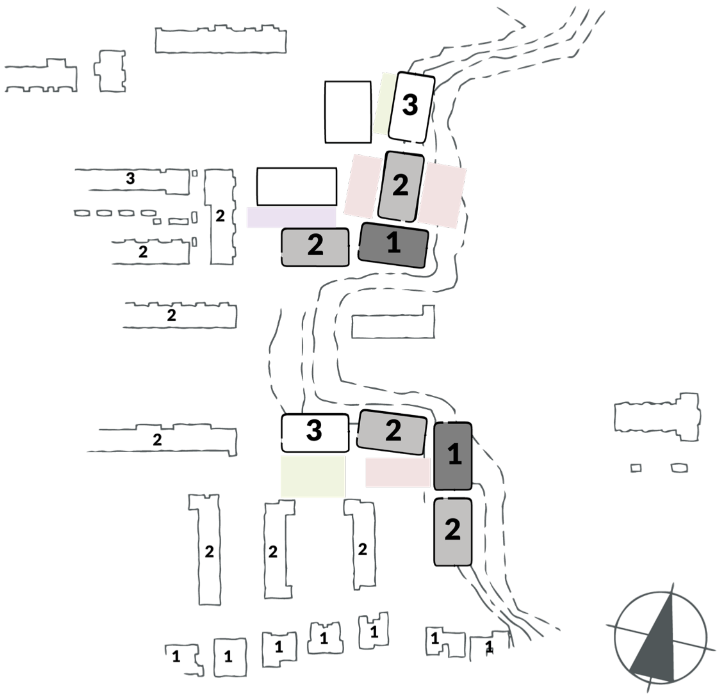


Fig. 73: *Advanced Checkerboard Model implemented in Urban Plan (Own Work)*

Social Economic Group 1
Social Economic Group 2
Social Economic Group 3
Group 1-2
Group 1-2-3
Group 2-3

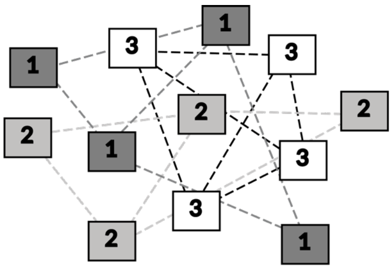


Fig. 74: *Fictional relations between different socio-economic groups (Own Work)*

Public Familiarity

A place that feels like home is a place where neighbors know each other. The growth of the city is accompanied by an influx of people from various backgrounds, ages, and beliefs. The diversity in the neighborhood can make community life complex. Feelings of alienation and withdrawal can arise, and tensions may escalate. What helps is that neighbors occasionally encounter each other, so they can recognize and place each other. This is also known as public familiarity. Meeting places like a park or library can promote public familiarity.

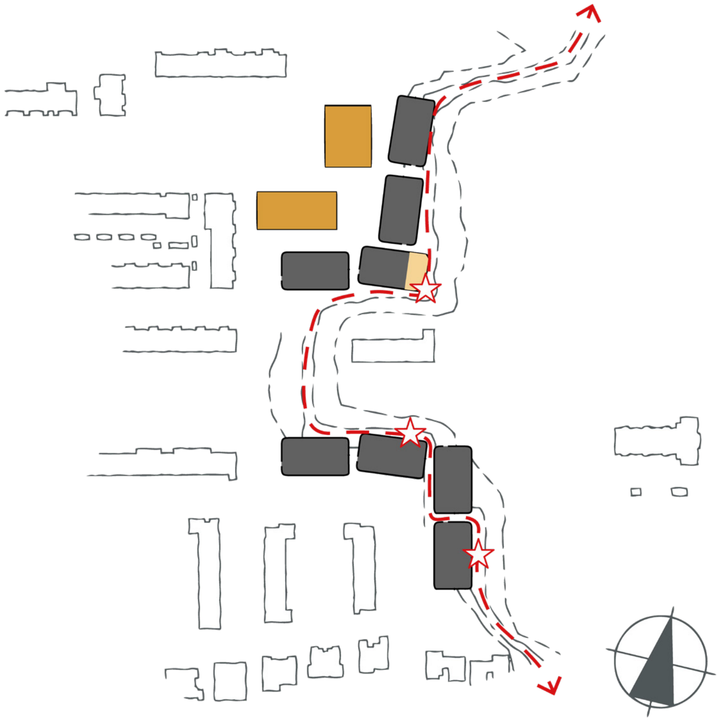
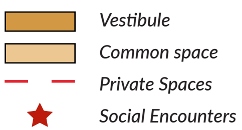


Fig. 75: *Implementing Public Familiarity*



Dyke as a Connecting Element

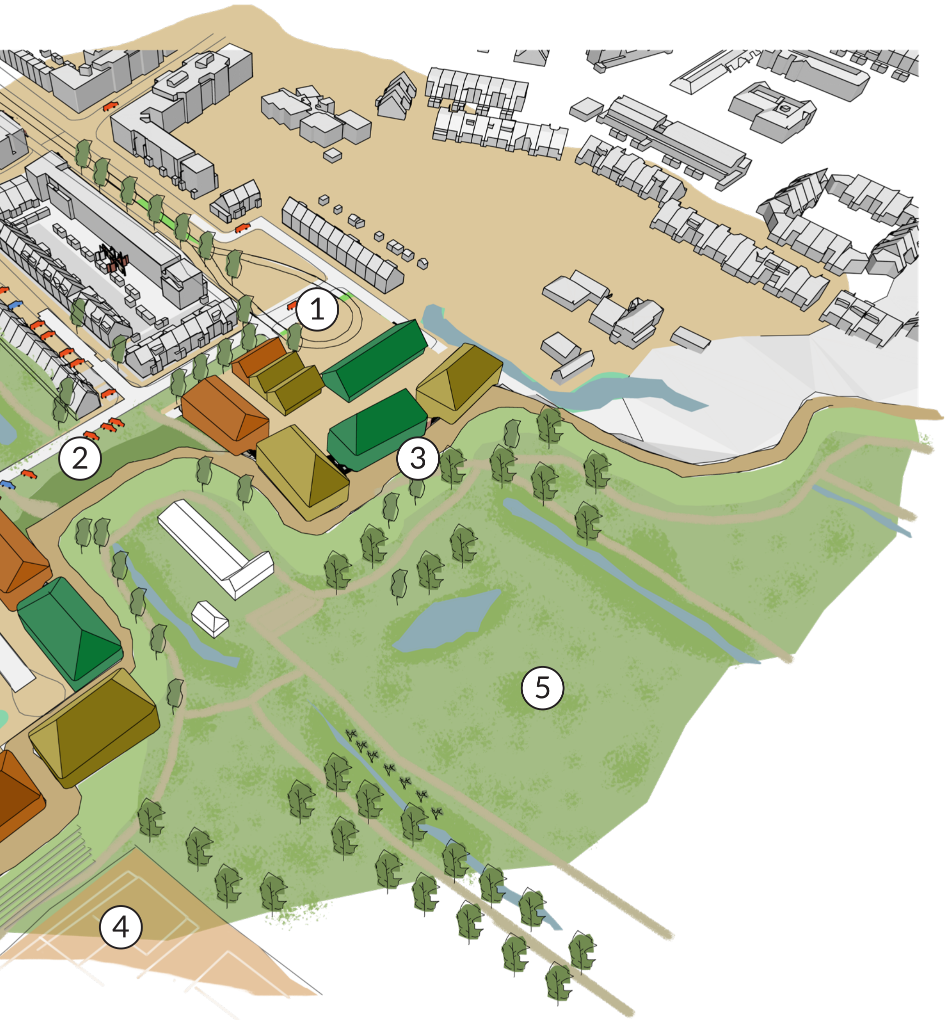
Integrating public familiarity and consciously designing with the eye on diversity has led to the Urban Dyke and enhancing the valuation for Tanthof. Along the dike, living, working, and recreating are pleasant experiences, with movement being encouraged. The people-centered design creates space for diversity in users, and the optimal connection with public transport ensures maximum accessibility for everyone.

The relationship between the park and the city is strengthened, improving the spatial quality of both the park and the city. Activities intersect around the dyke, thereby enhancing social cohesion in Tanthof.

LEGENDA

1 Tram Stop
2 Parking Space
3 Dyke
4 Tennis Court / Canteen
5 Outdoor Activities

Fig. 76: *Birds Eye of the Urban Dyke (Own Work)*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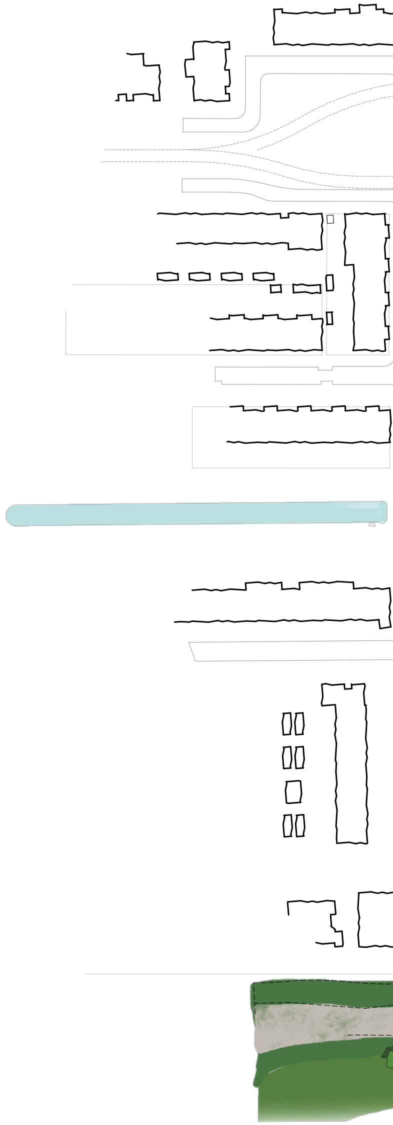
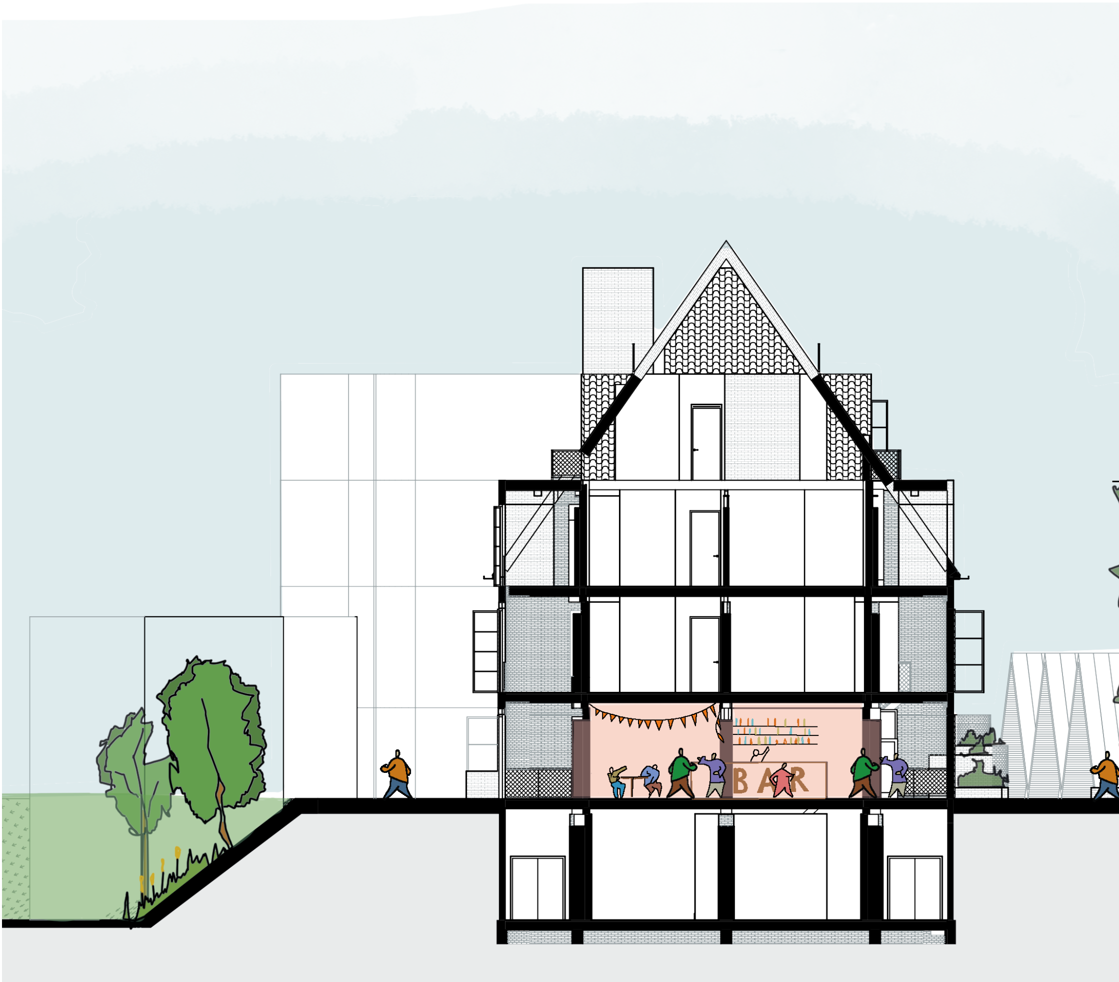


LEGENDA

1 Hallway / Winter Garden
2 Living Kitchen
3 Living Room
4 Bedroom
5 Toilet
6 Sanitary



LEGENDA | Section 1:200

1 Hallway / Winter Garden
2 Living Kitchen
3 Living Room
4 Bedroom


BAR

Communal Courtyard

The courtyard spatially ensures a sense of obscurity without the use of fences. The communal courtyard connects all the residental blocks. Maintaining the garden together on agreed days or engaging in other activities enhanced connections with neighbors. Through getting to know each other, relationships are built, leading to mutual support such as babysitting or other helping hands.

LEGENDA

1 Tram Stop
2 Shared Bike Parking
3 Shared Working Ateliers
4 Communal Garden
5 Dyke
6 Parking
7 Residential Block Starters
8 Residential Block Elderly
9 Residential Block Co-Parants


1
2
3
3
4
5
5
7
7
8
9

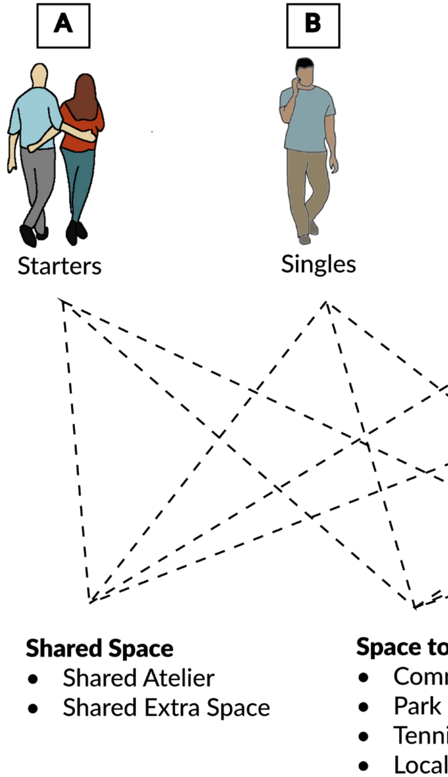
LEGENDA | Section 1:200

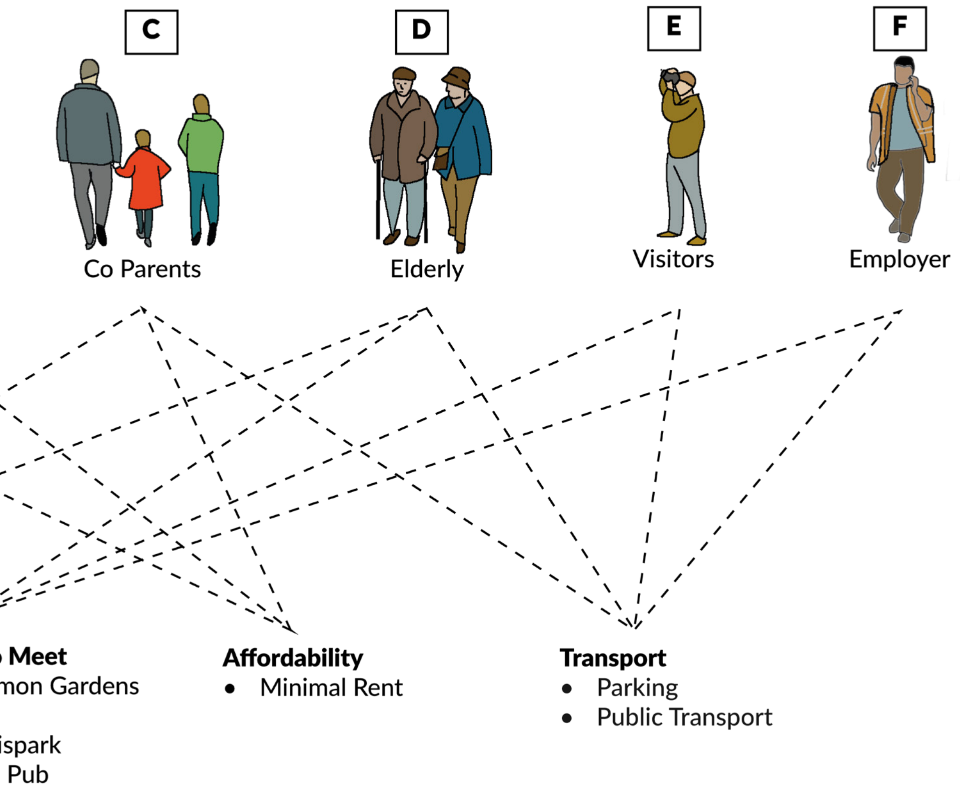
1 Hallway / Winter Garden
2 Living Kitchen
3 Living Room
4 Bedroom


1
1
1

Users of the Urban Dyke

The Urban Dyke fulfills functions that were previously lacking in Tanthof, a neighborhood predominantly made up of single-family homes. Starters, separated families, and the elderly find it difficult to find suitable housing and often remain in single-family homes, leading to a shortage of available housing for others.




C
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Co Parents
Elderly
Visitors
Employer
Meet
Gardens
Pub
Affordability
• Minimal Rent
Transport
• Parking
• Public Transport

Shared Workshops
Within the theme of affordability and sharing, shared Atlier workshops have been designed for enterprising craftsmen. These workshops consist of a small office and a atlier. A shared workspace allows for share the use and storage of expensive tools and materials, making entrepreneurship more affordable and thus more accessible.

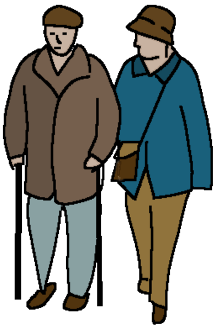
Fig. 77: *Birds Eye of Building Blocks (Own Work)*

LEGENDA

1 Appartments Elderly
2 Appartments Co-Parants
3 Appartments Starters
4 Shared Atelier Workshop
5 Shared Cycle Parking
6 Shared Garden


1
3
4
4

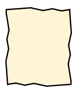
Ederly



Urban Veteran

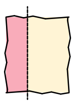
The ‘Urban Veterans’ are elderly people who are still full of energy and open to social interaction. The housing concept encourages spontaneous encounters to promote vitality. The residential complex features various common areas that maximize spontaneous meetings. This way, residents can enjoy their old age without loneliness.

120 m2 Average Row House



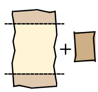
House is often too big for the elderly. A single-floor apartment is the next step

80 m2 Medium Apartment



Elderly people no longer want to live in a big house. A apartment is sufficient.

55m2 Communal Living

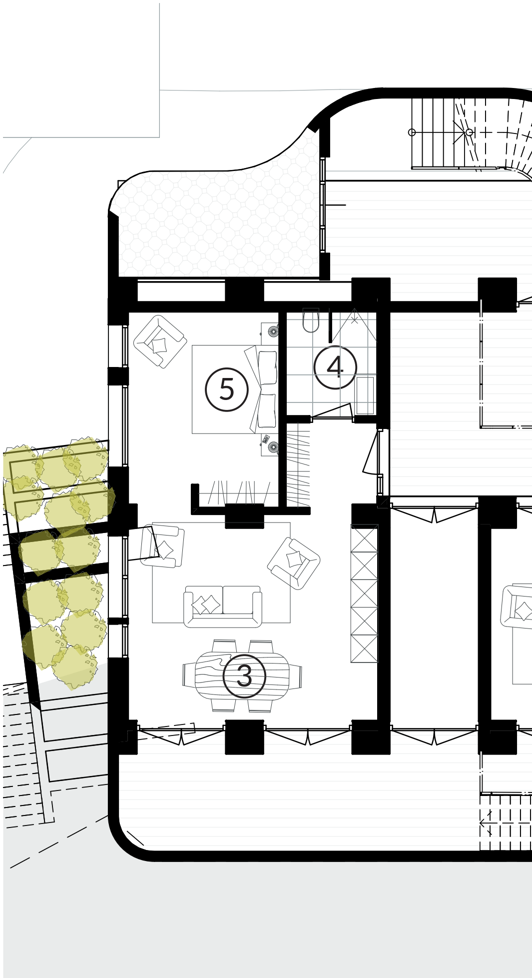


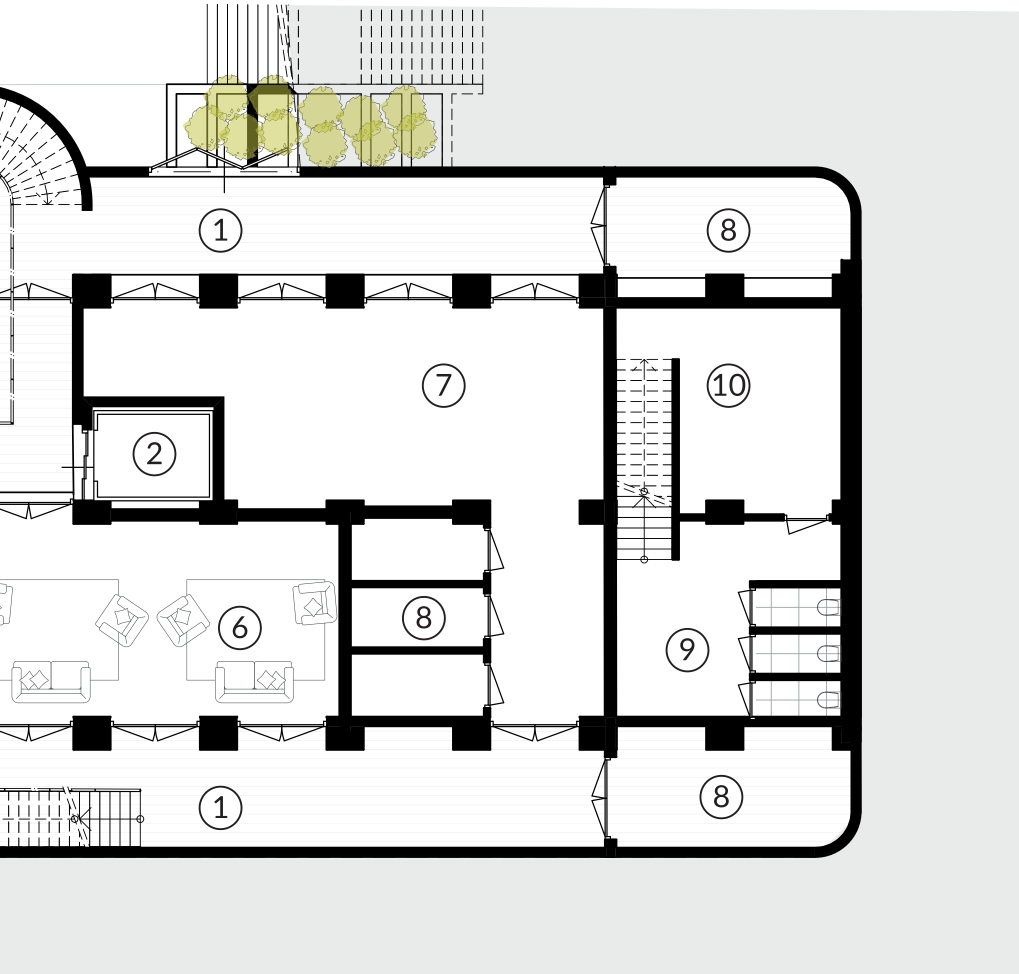
A part of the living area serves as communal space that provides connection with your neighbours!

Fig. 77: *Building Block Eldery (Own Work)*

LEGENDA | 1:150 0

1 Hallway / Winter Garden
2 Elevator
3 Kitchen and Living Room
4 Sanitary
5 Badroom
6 Home Cinema
7 Atelier /Workshop
8 Storage
9 Toilets Cafe
10 Storage Cafe




1
8
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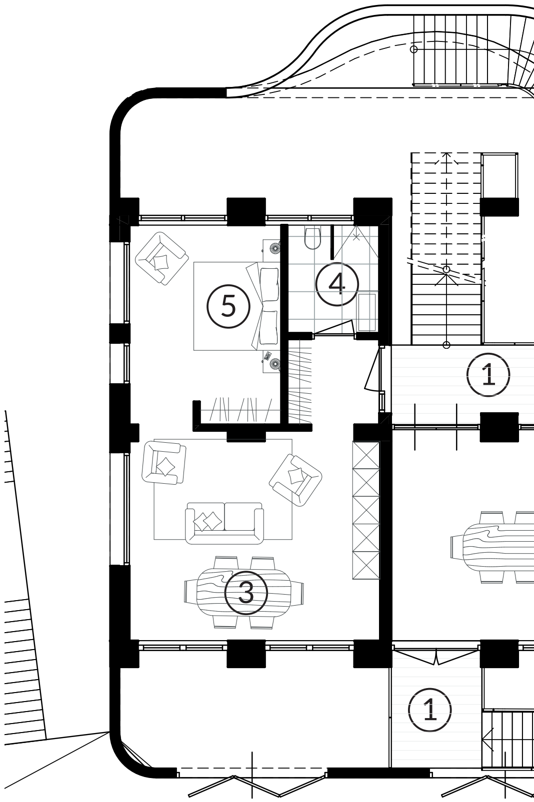
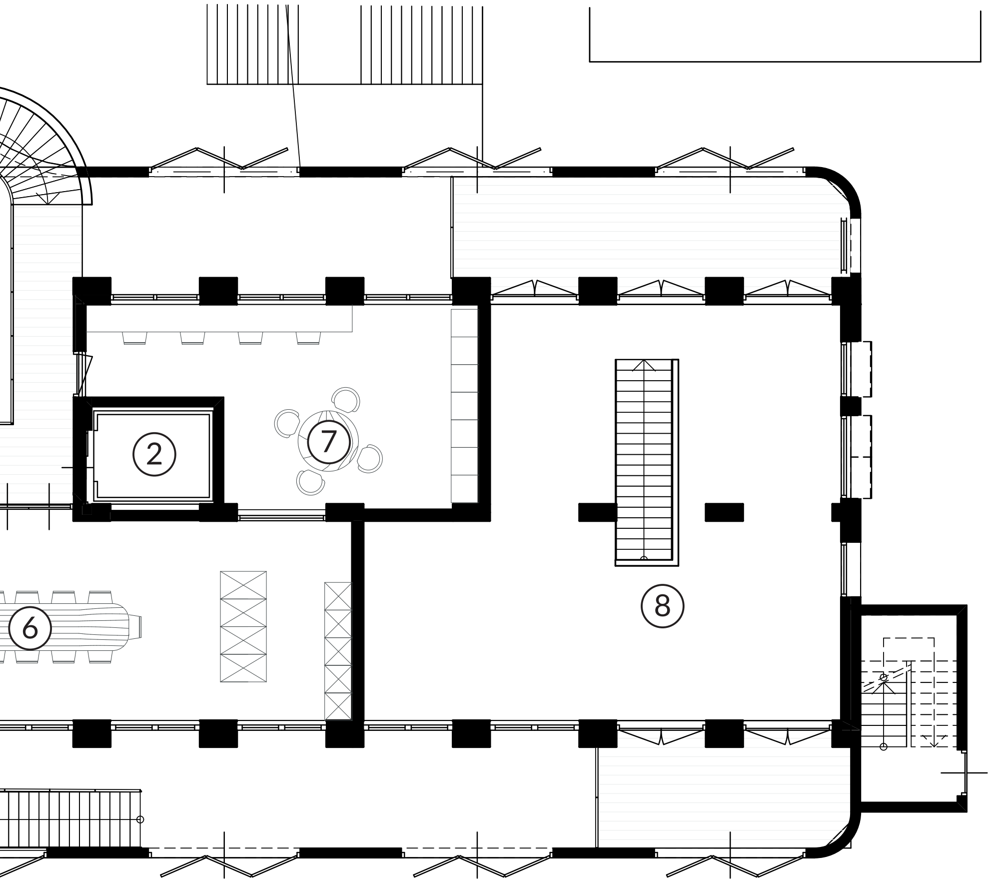
LEGENDA | 1:150 +1

1 Hallway / Winter Garden
2 Elevator
3 Kitchen and Living Room
4 Sanitary
5 Badroom
6 Cooking Studio
7 Coffee and Laundry
8 Cafe

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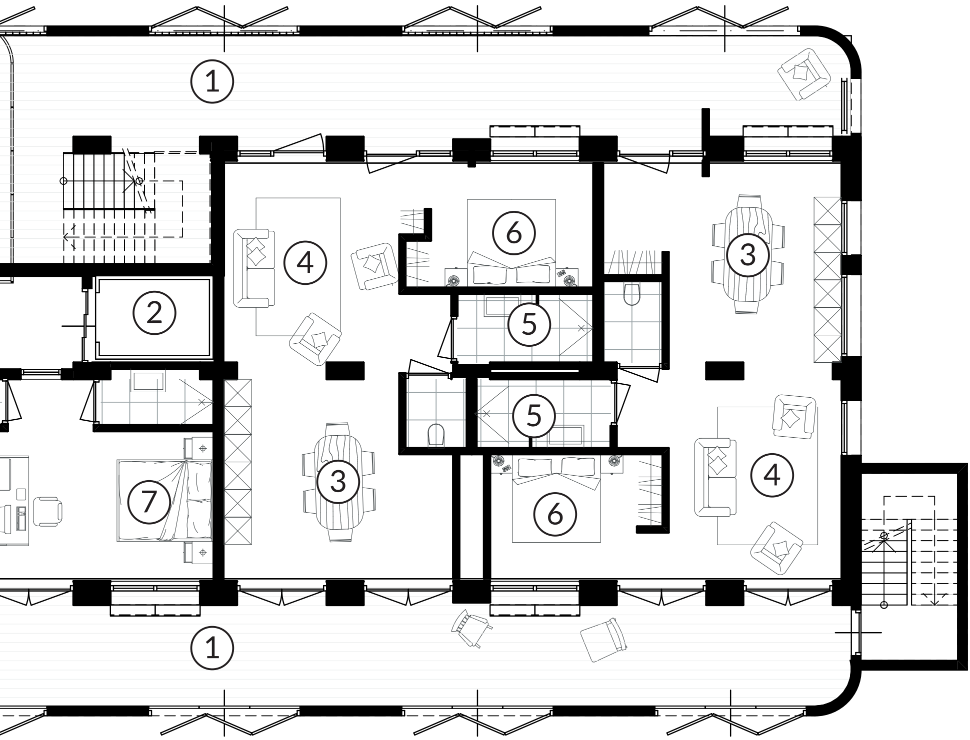
LEGENDA | 1:150 +2

1 Hallway / Winter Garden
2 Elevator
3 Living Kitchen
4 Living Room
5 Sanitary
6 Badroom
7 Guest suite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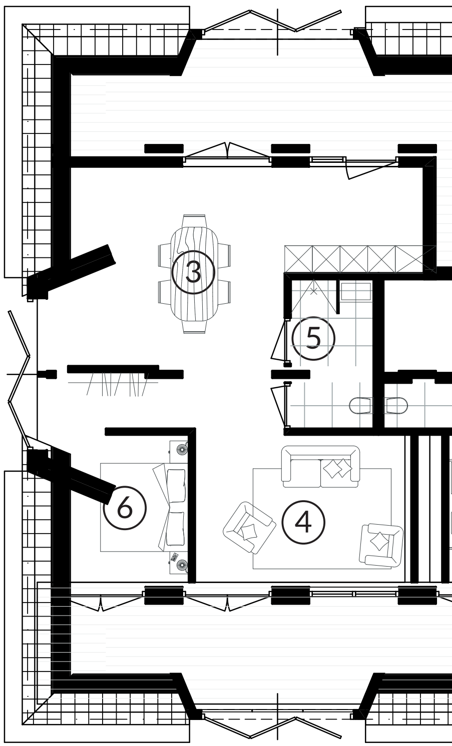
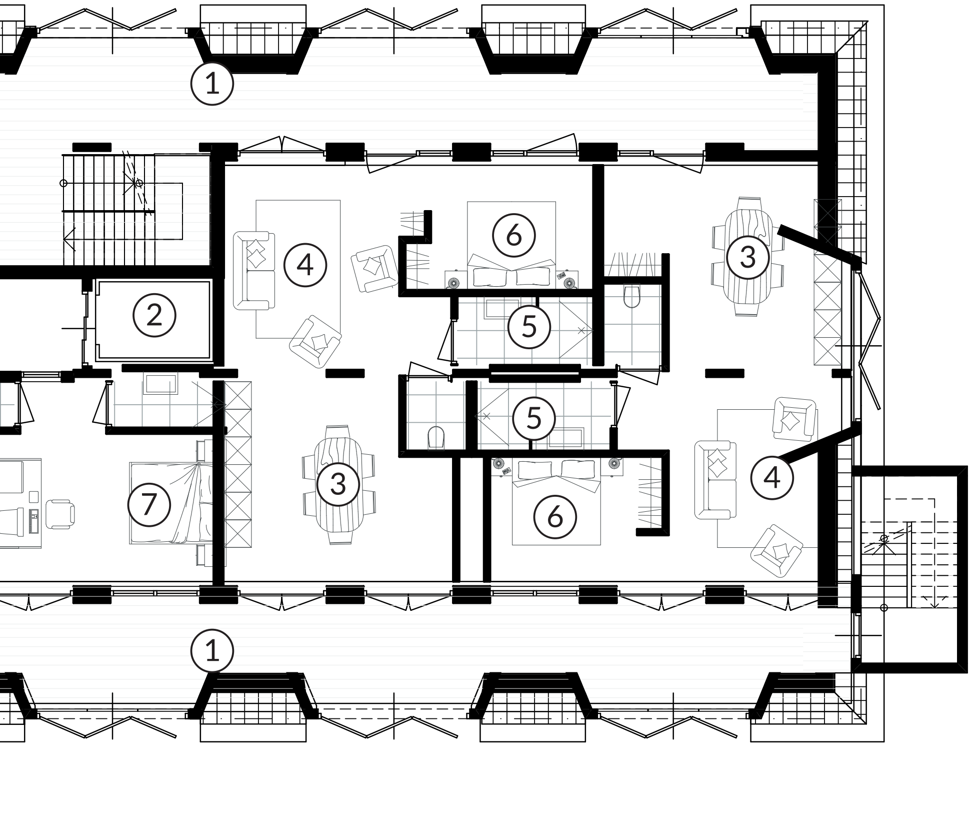
LEGENDA | 1:150 +3

1 Hallway / Winter Garden
2 Elevator
3 Living Kitchen
4 Living Room
5 Sanitary
6 Badroom
7 Guest suite

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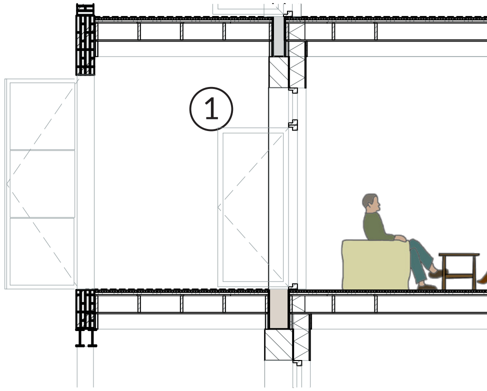
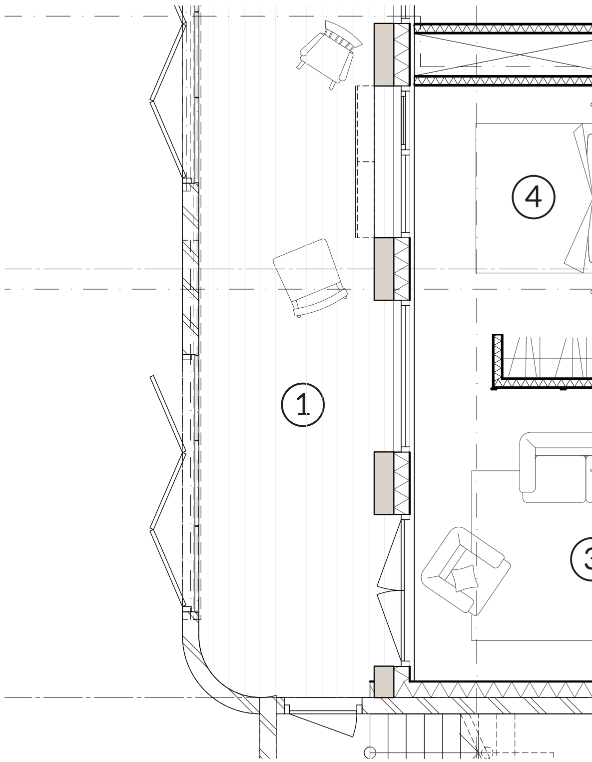
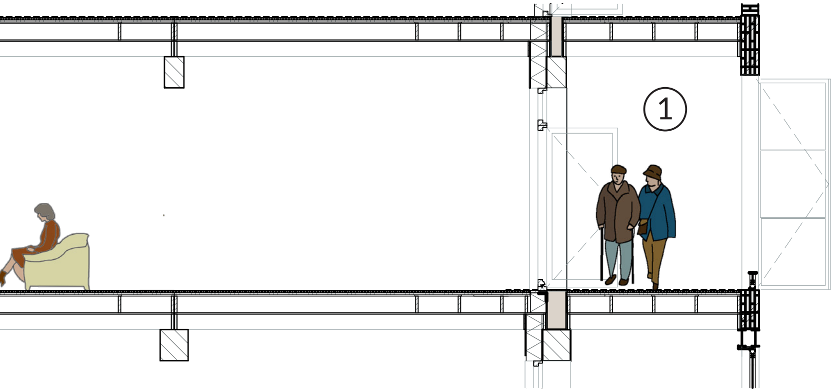
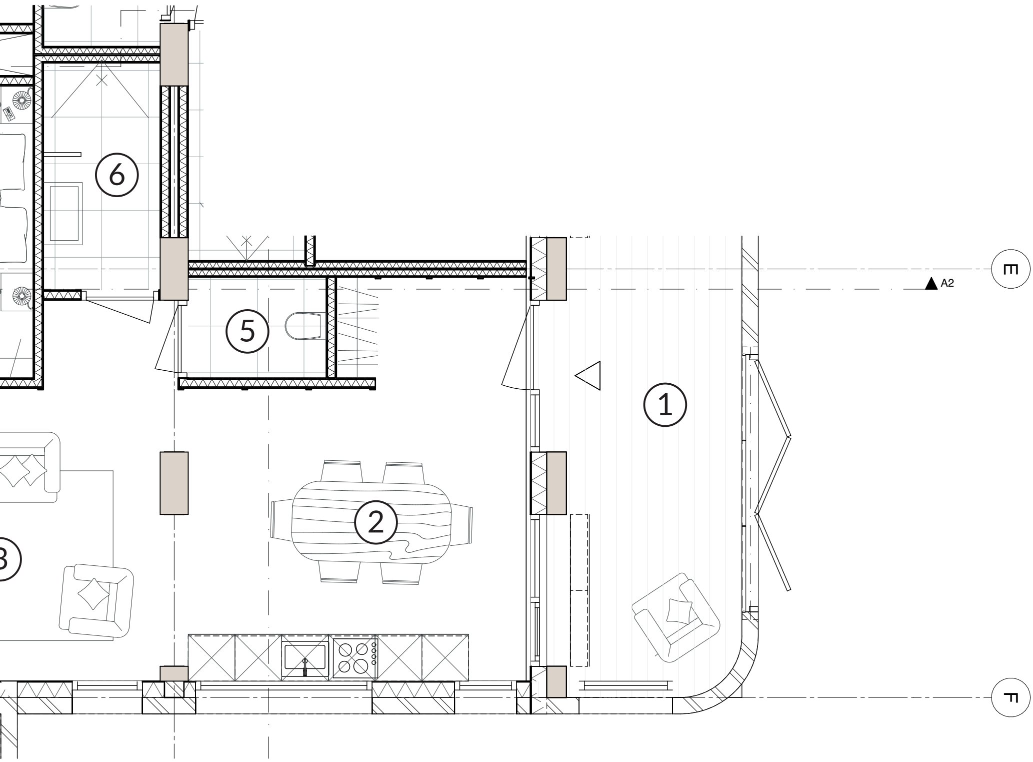




LEGENDA | 1:50

1 Hallway / Winter Garden
2 Living Kitchen
3 Living Room
4 Bedroom
5 Toilet
6 Sanitary


1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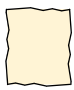
Separated Families

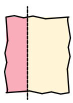
Co-Parent

Co-parents focus on maintaining their family and caring for their children. In their free time, they want to do something for themselves, which is why some privacy is appreciated. The housing concept offers sufficient privacy while also providing enough space for their children. Together with their neighbors, who have similar challenges and lifestyles, they can support each other, for example by babysitting each other's children.



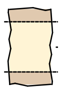
120 m2 Average Row House

House is often too big for the elderly. A single-floor apartment is the next step



80 m2 Medium Apartment

Elderly people no longer want to live in a big house. A apartment is sufficient.



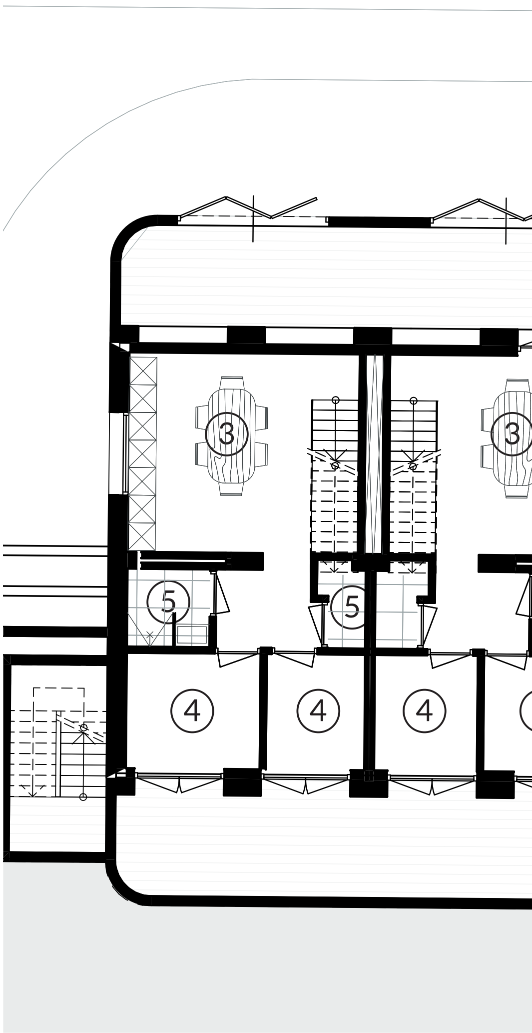
90 m2 Communal Living

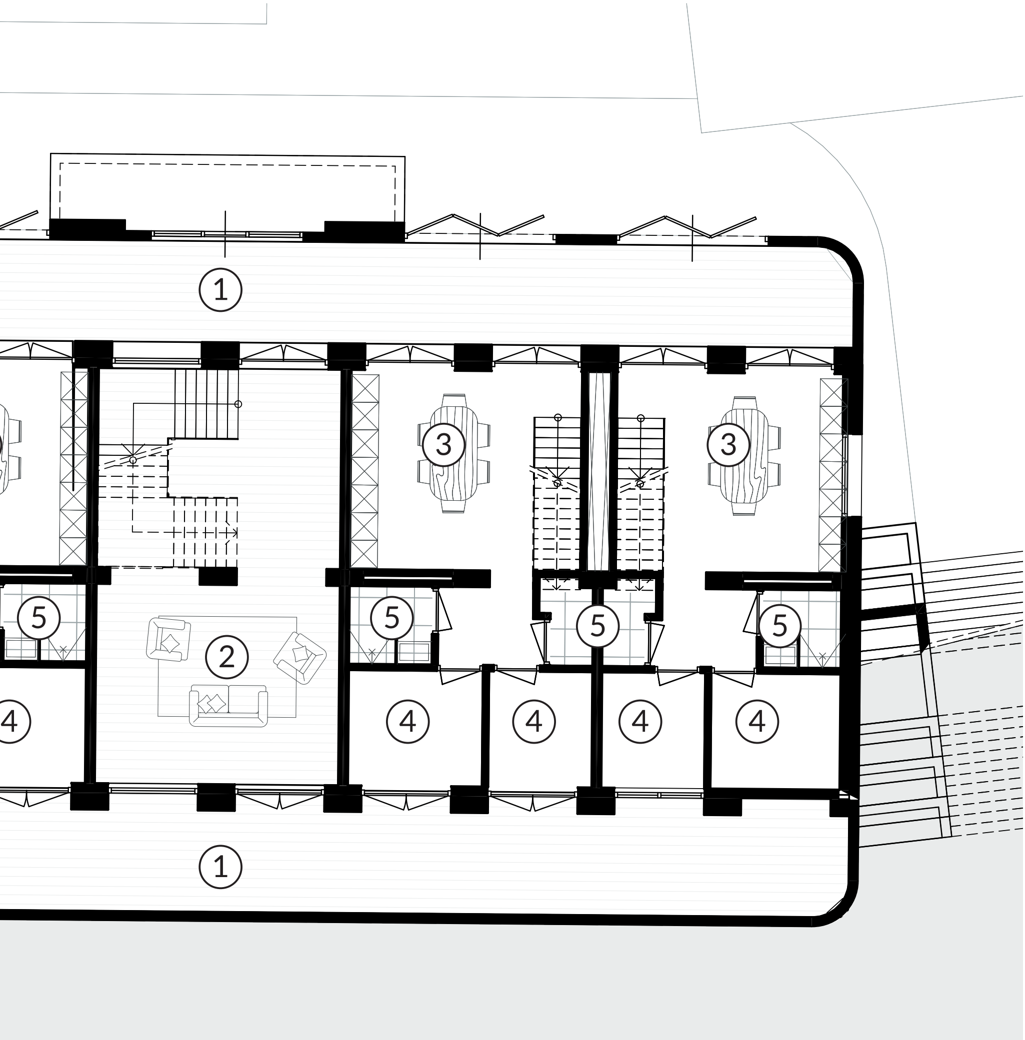
A part of the living area serves as communal space that provides connection with your neighbours!

Fig. 78: *Building Block Co-Parents (Own Work)*

LEGENDA | 1:150 0

1 Hallway / Winter Garden
2 Common Space
3 Living Kitchen
4 Childern Badroom
5 Sanitary

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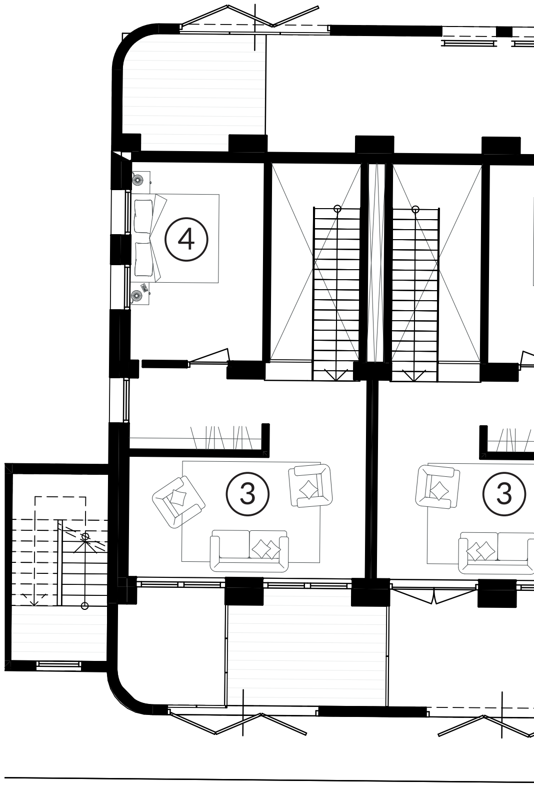
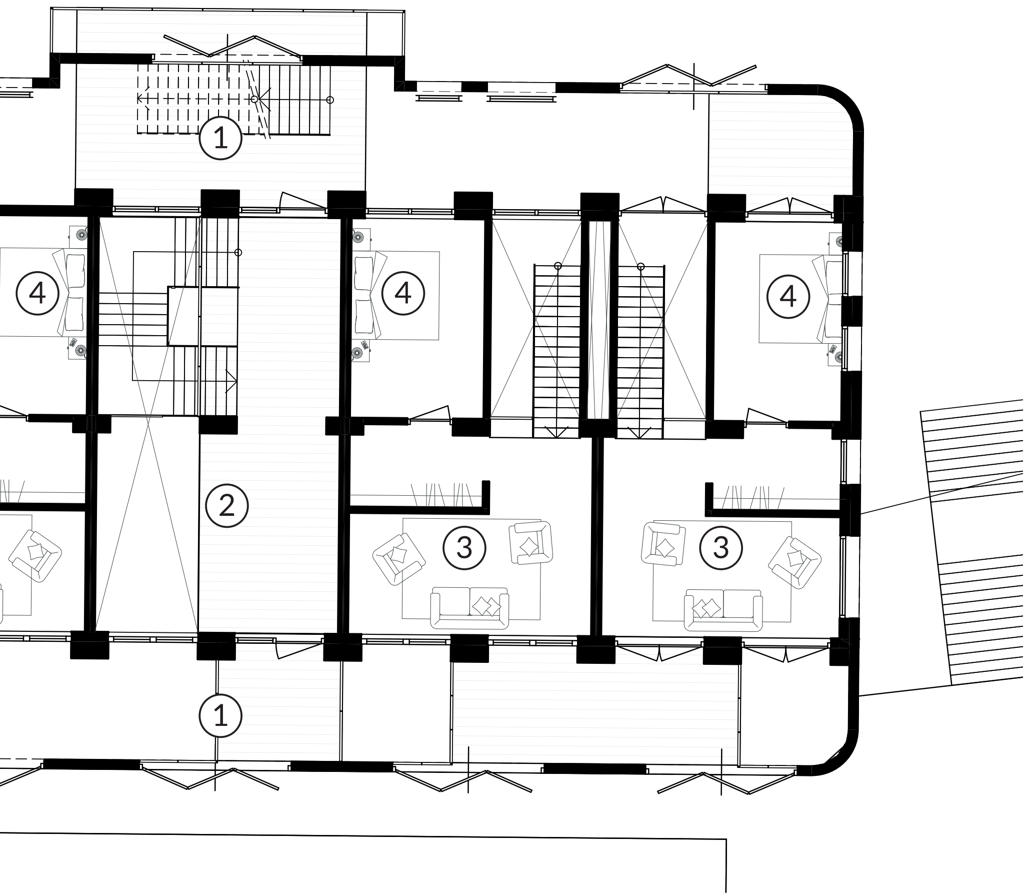
LEGENDA | 1:150 +1

1 Hallway / Winter Garden
2 Common Space
3 Living Room
4 Master Badroom

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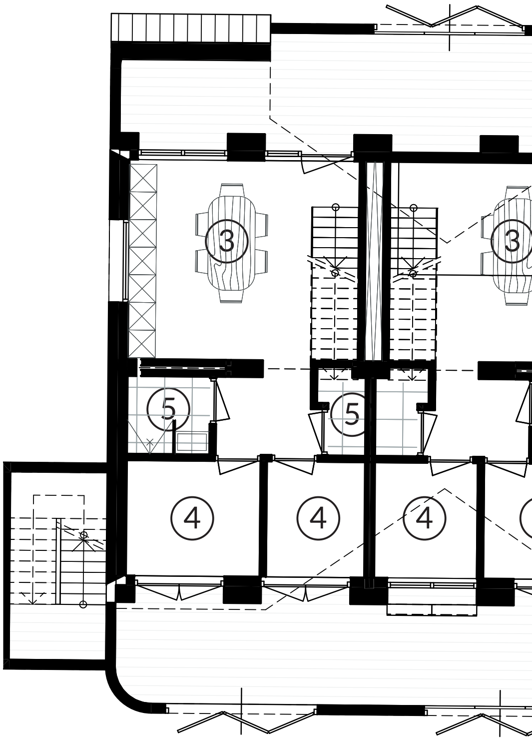
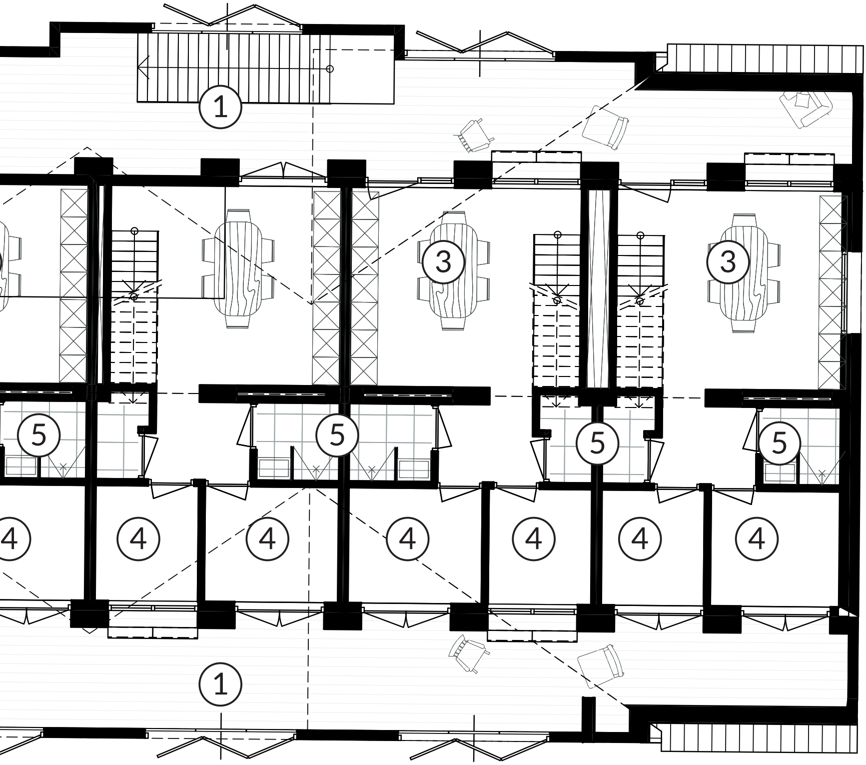
LEGENDA | 1:150 +2

1 Hallway / Winter Garden
2 Common Space
3 Living Kitchen
4 Childern Badroom
5 Sanitary

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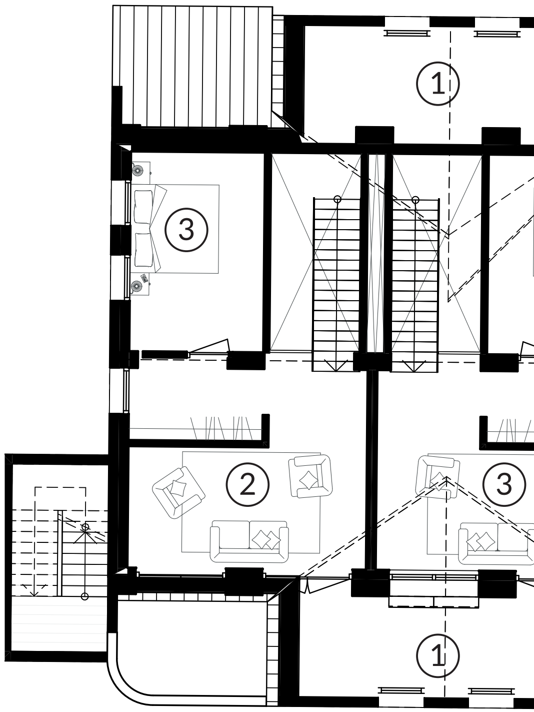
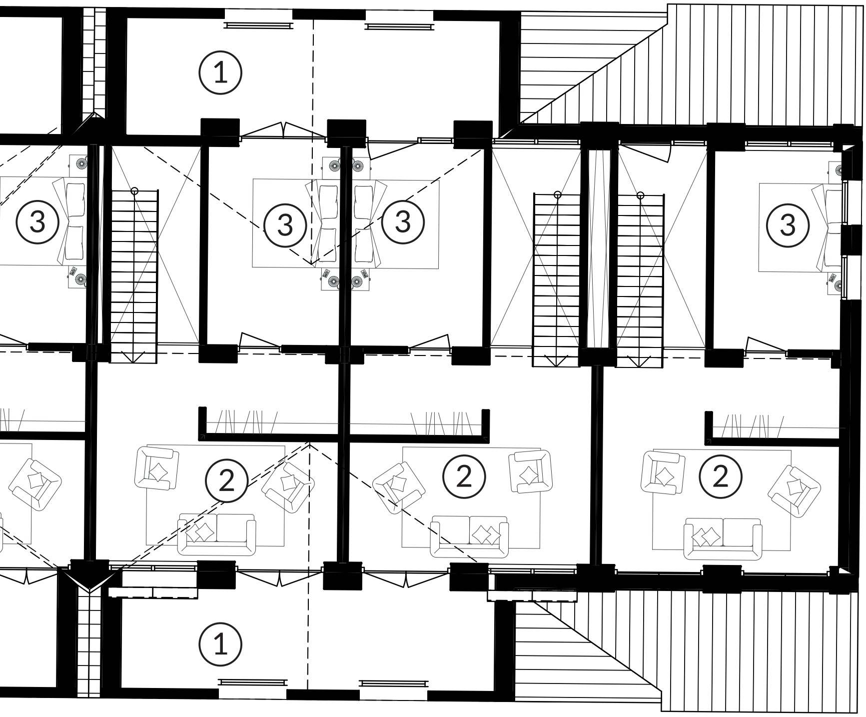
LEGENDA | 1:150 +3

1 Hallway / Winter Garden
2 Living Room
3 Master Badroom

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Layering

Layers

Recognizing different temporal layers is essential to realizing a building with low environmental impact and long lifespan. Studies have shown that buildings 100 years or older have minimal environmental impact concerning initial materials, with most impact arising from usage and renovations (Hoogers, 2004).

In the design process, it is important to consider which elements of a building have high potential for longevity and which have less. A composition of different temporal layers within the building, each moving at a different pace, optimizes the building's lifespan. Over time, functions and spaces will change. The design must ensure that these changes can be optimally facilitated.

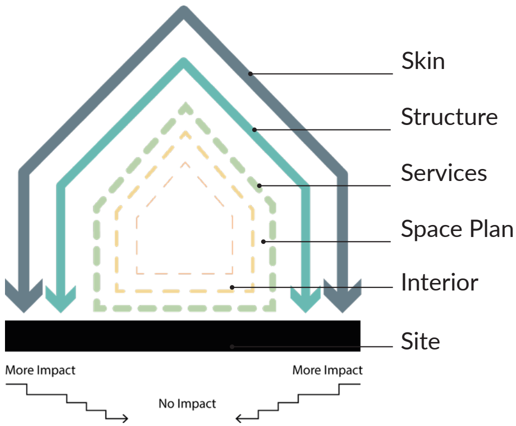
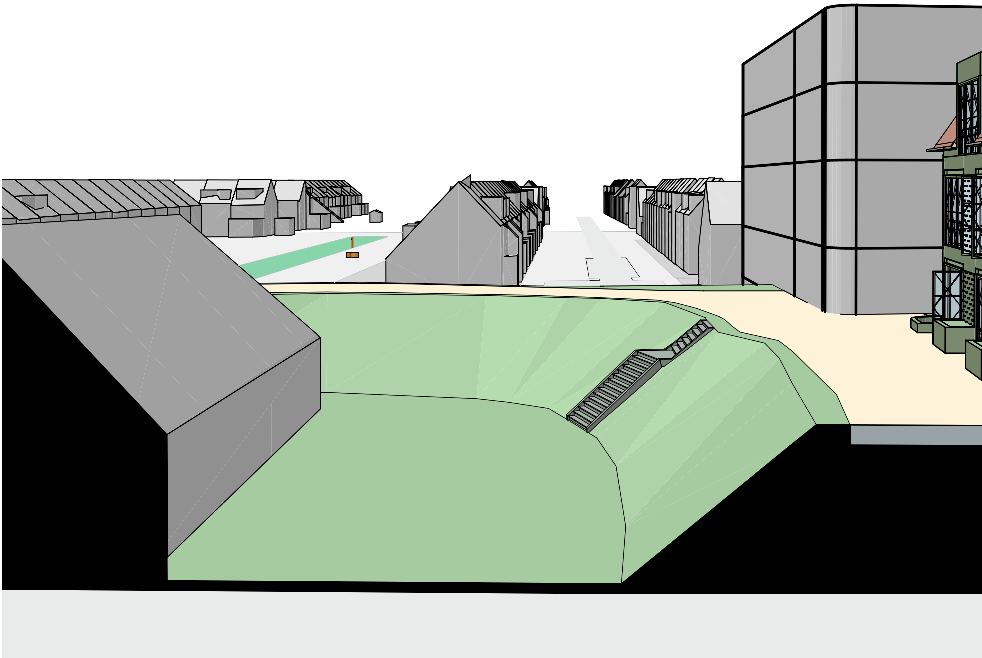


Fig. 13: *Shearing Layers of Change and Environmental Impact (Own Work)*

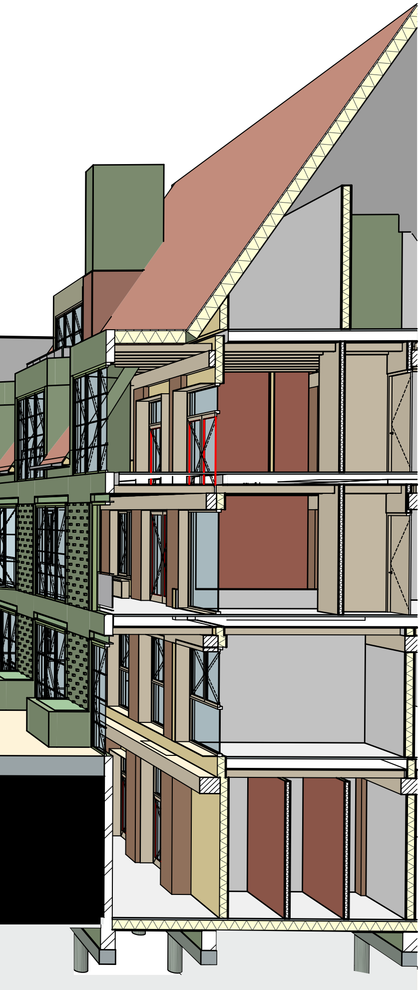
Temporal Layers

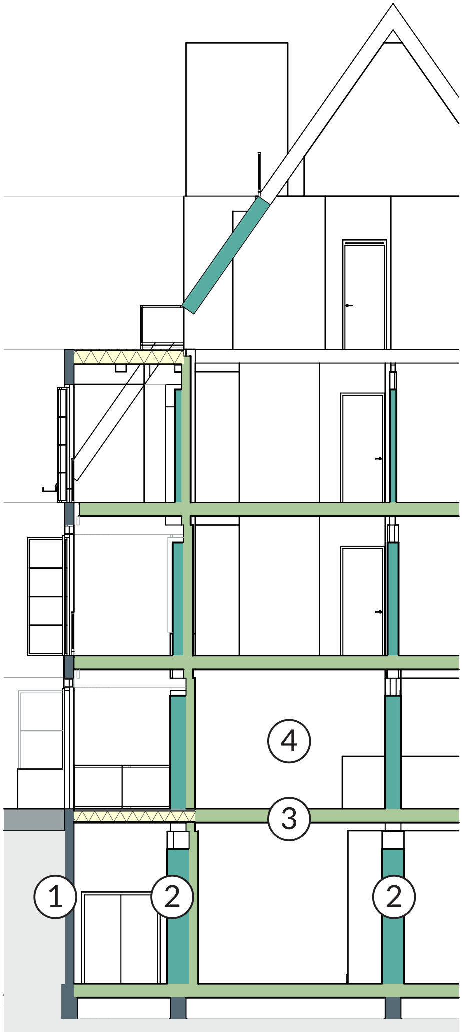
Thinking in temporal layers is the highest tier within the pillar of lifecycle thinking. This concept draws from the philosophy of Stewart Brand, who considered different layers of a building with varying lifespans. Within the overall framework of a building's emissions, which can be measured using a lifecycle analysis, time is a crucial concept. The same emissions spread over 100 years versus 10 years make a significant difference. Therefore, combining changes in temporal layers and material emissions is essential for designing a building with a long lifespan that remains sustainable in the future.



LEGENDA | Section 1:200

1 Hallway / Winter Garden
2 Living Kitchen
3 Living Room
4 Bedroom




4
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2

Layer 1: Skin

The building's facade is the slowest changing layer. Time has a positive effect on this layer, thanks to the artisanal processing of the applied materials, which enhances the appreciation of the built environment. This layer consists of robust materials such as masonry, which require little maintenance.

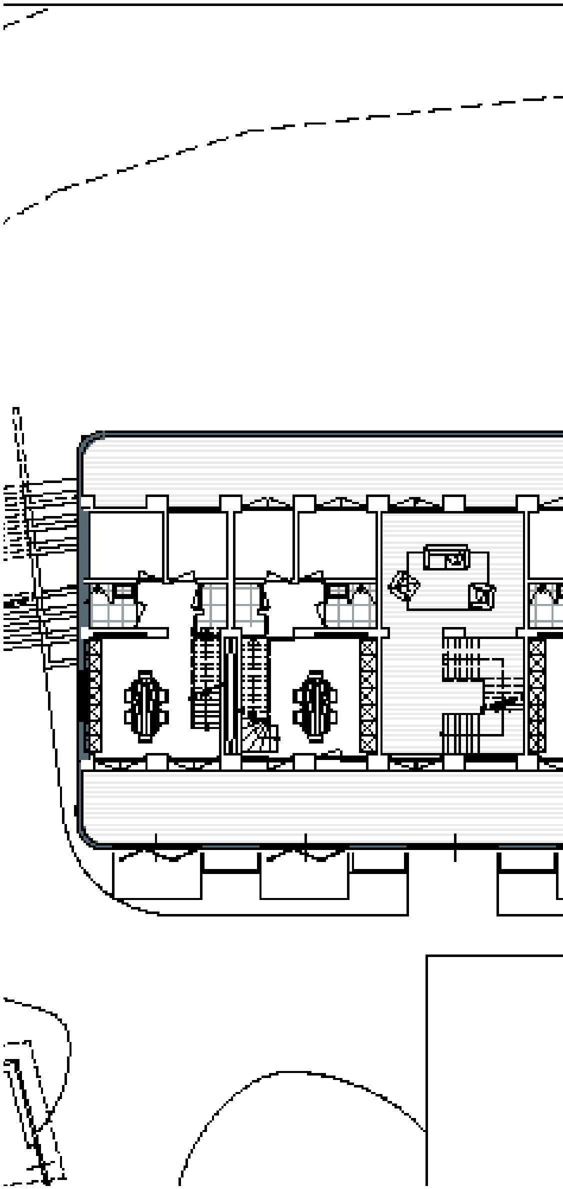
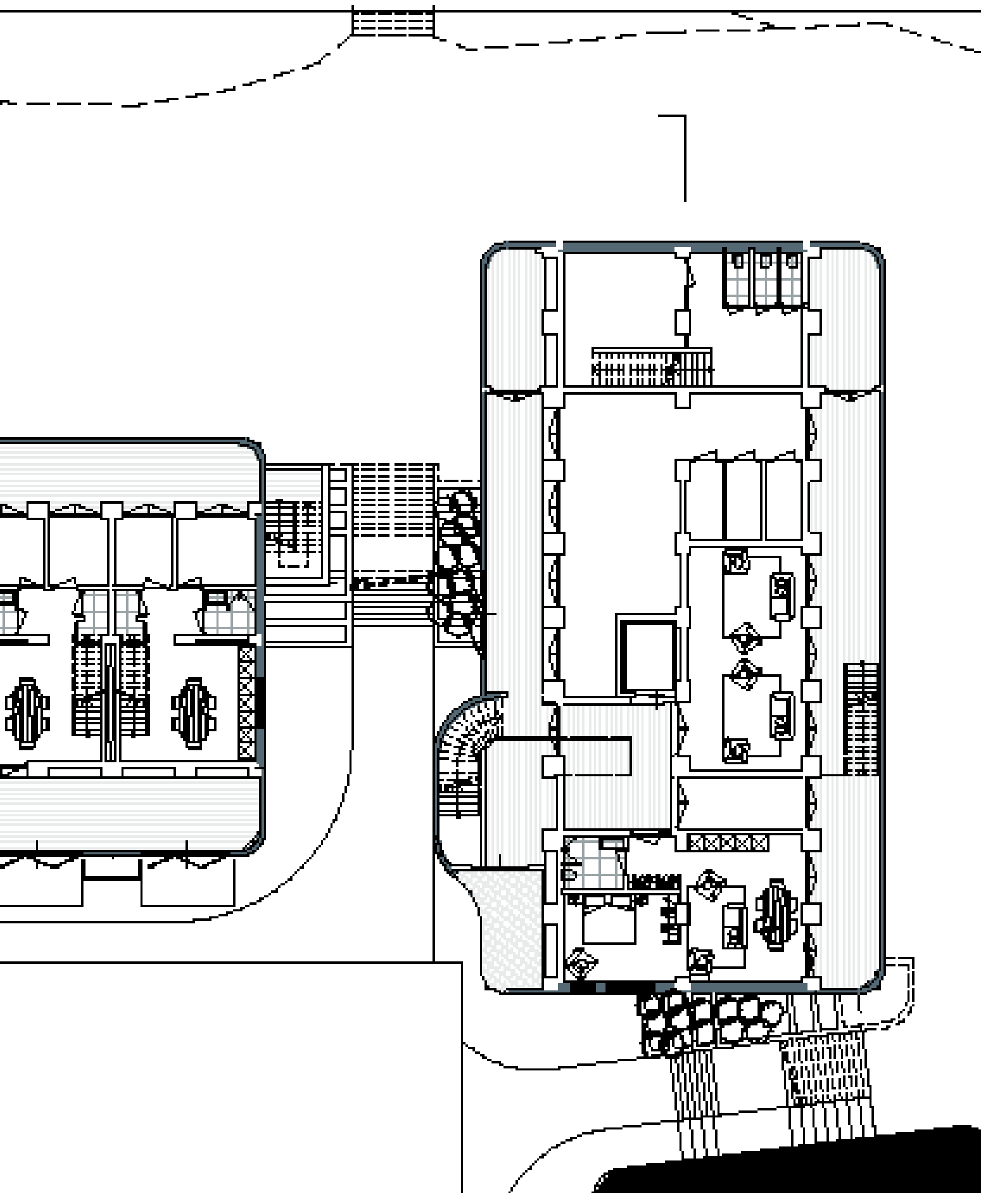


Fig. 79: *Layers of Change and Environmental Impact (Own Work)*

- *Skin*
- *Structure*
- *Services and Flooring*
- *Space Plan*



Layer 2: Structure

In this layer, the environmental impact of the materials used plays a larger role. The structural elements of the building do not change quickly and are designed with flexibility for future layouts. This makes the layer durable and future-proof.

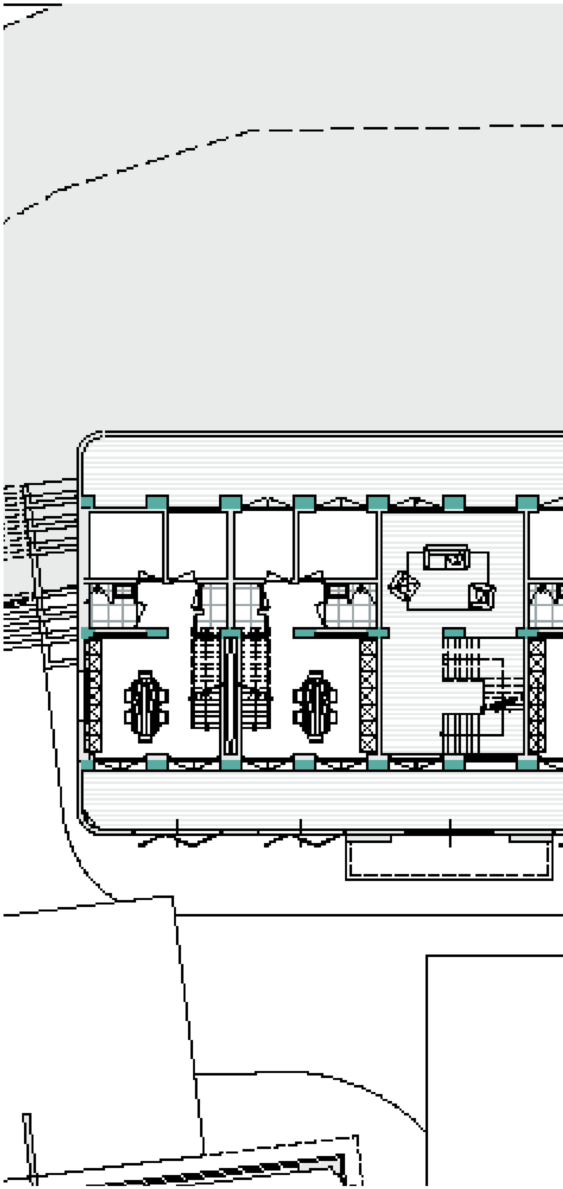
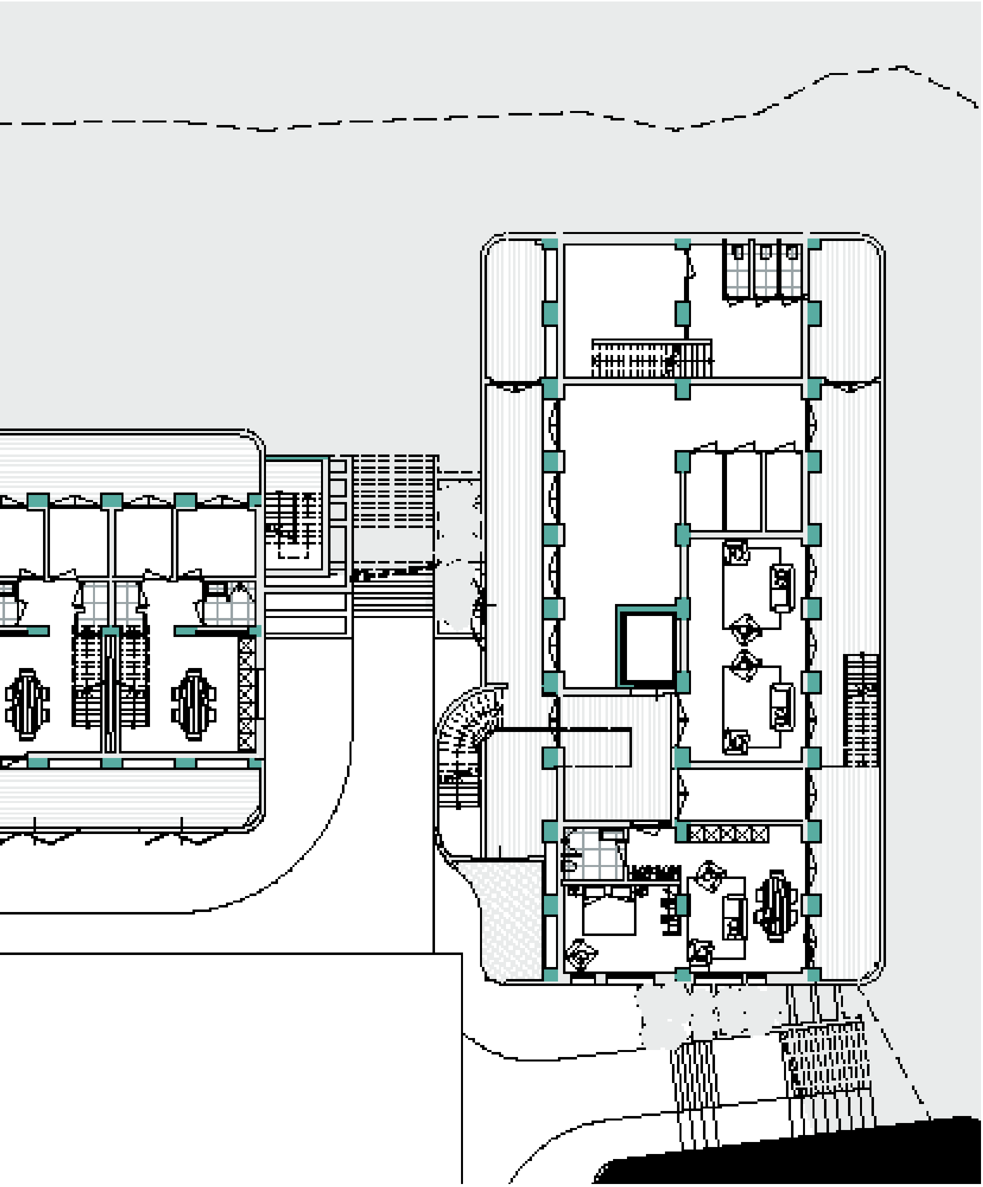


Fig. 80: *Layers of Change and Environmental Impact (Own Work)*

- *Skin*
- *Structure*
- *Services and Flooring*
- *Space Plan*

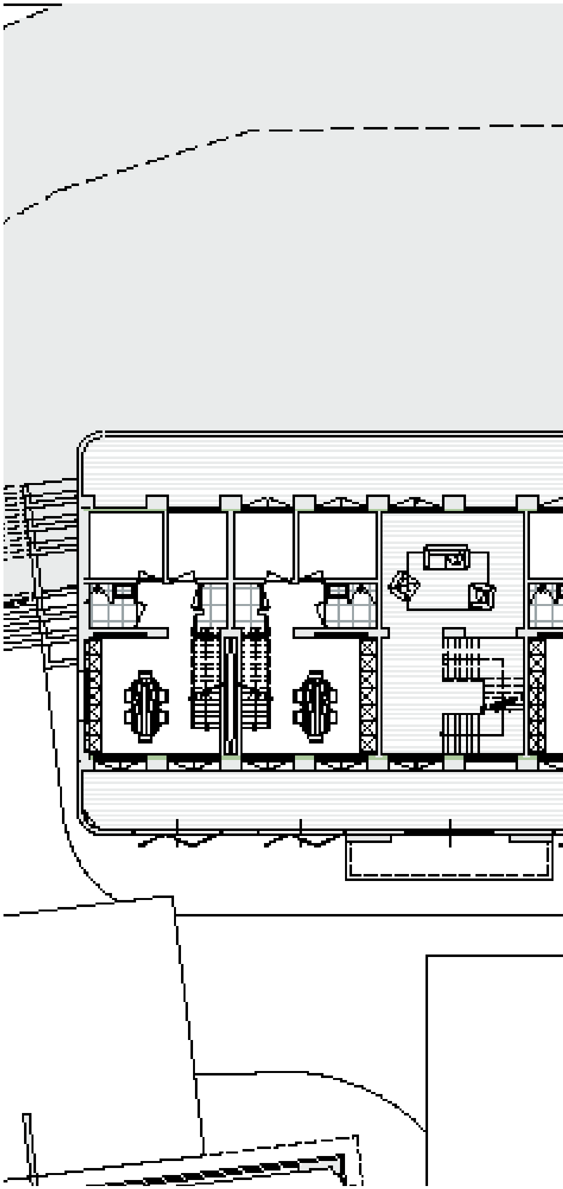


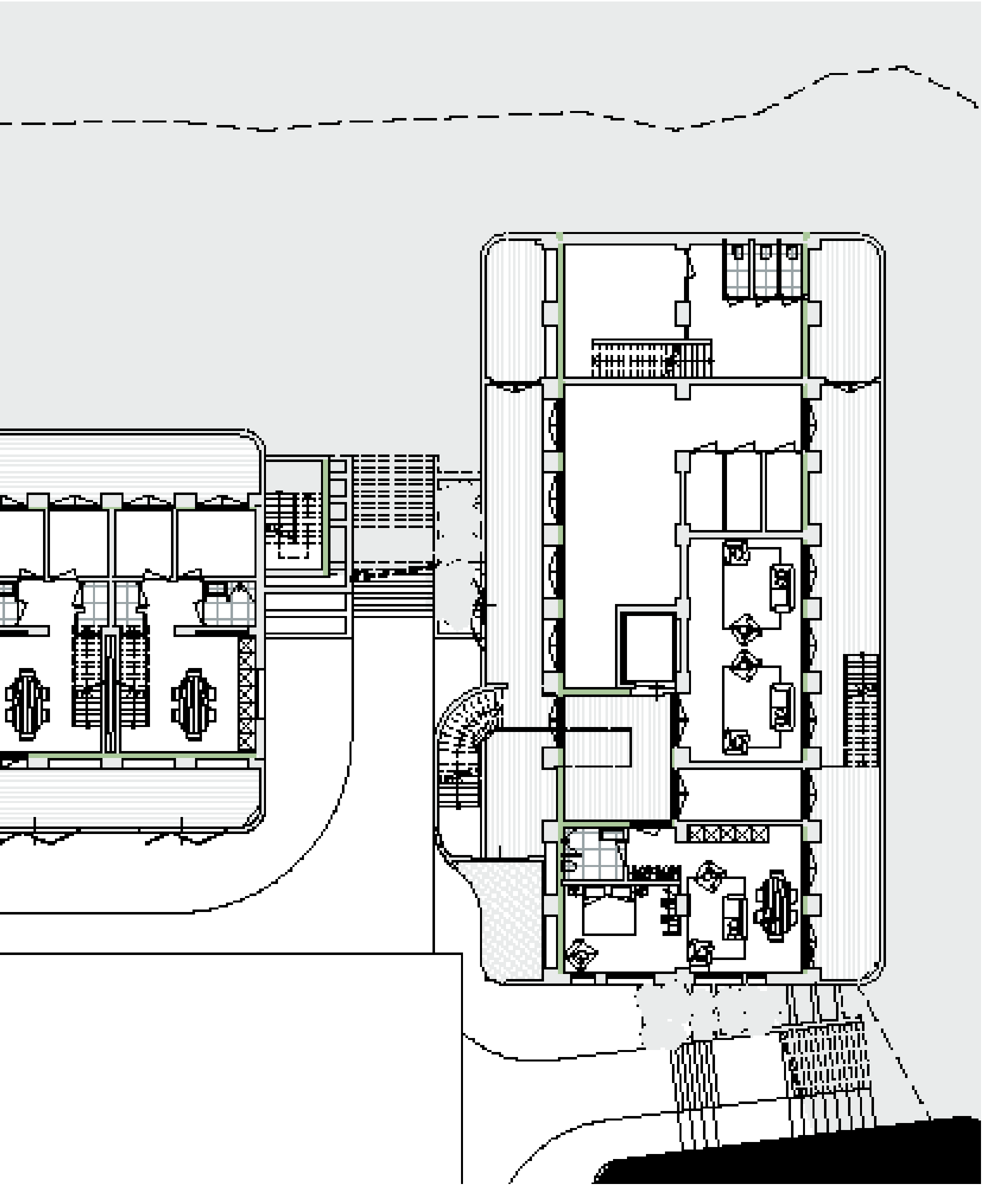
Layer 3: Services and Flooring

This layer can be adjusted without major structural interventions. Materials such as wood and flax hemp, which have a relatively low environmental impact, ensure that the layer remains environmentally friendly, even with a lifespan of 15 years.

Fig. 81: *Layers of Change and Environmental Impact (Own Work)*

- *Skin*
- *Structure*
- *Services and Flooring*
- *Space Plan*





Layer 4: Space Plan

This layer is easy to adjust and consists of materials with a low environmental impact. Compared to the rest of the building, this layer undergoes relatively rapid changes, allowing for flexibility and adaptability in the use of the space.

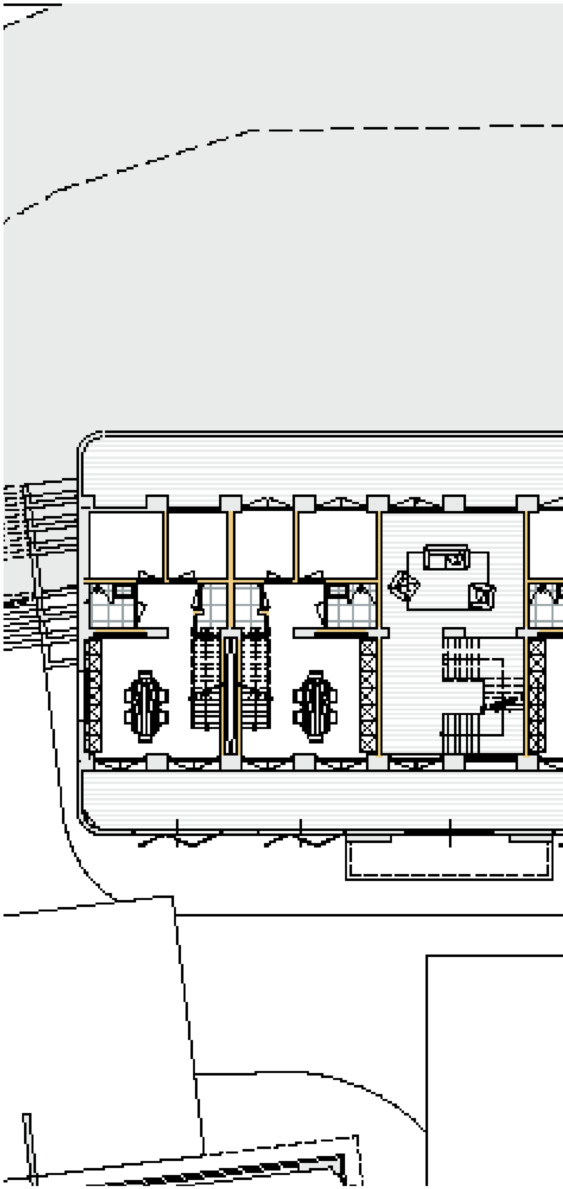
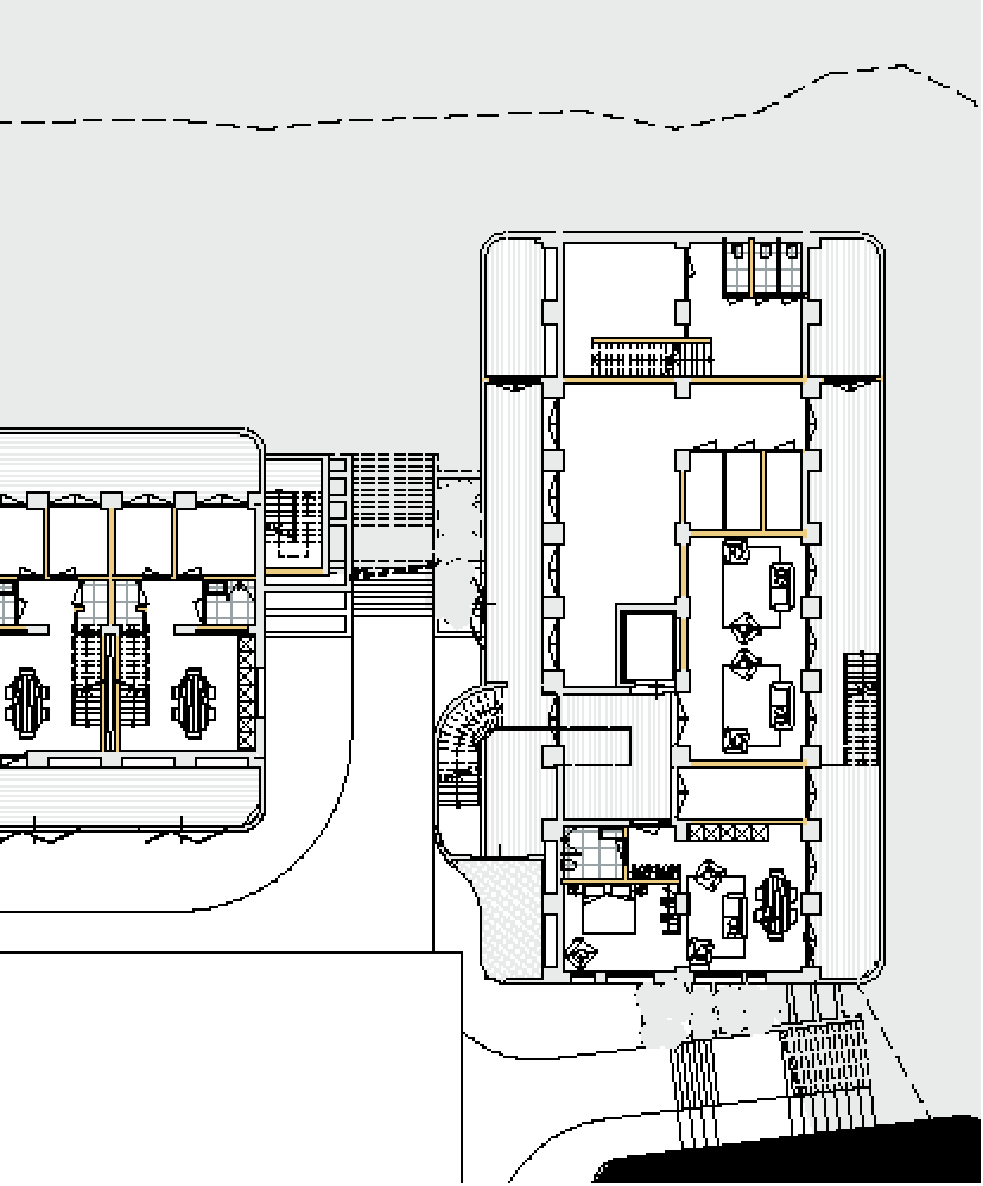


Fig. 82: *Layers of Change and Environmental Impact (Own Work)*

- *Skin*
- *Structure*
- *Services and Flooring*
- *Space Plan*



Winter Garden

The winter garden offers not only spatial advantages but also physical building benefits. The material use and detailing are evident in the winter garden. Different time layers come together, ensuring that the building no longer resembles an old-fashioned structure.

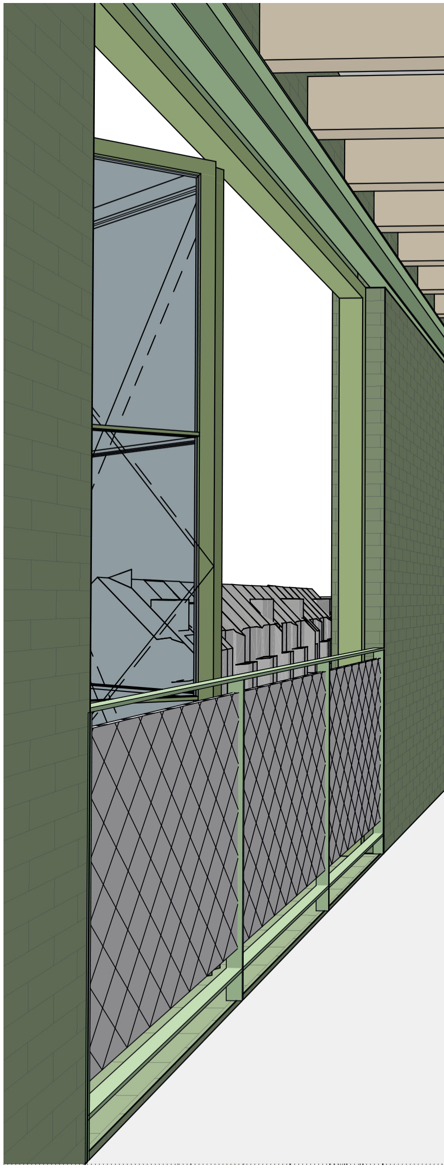


Fig. 83: *Impression Winter Garden (Own Work)*

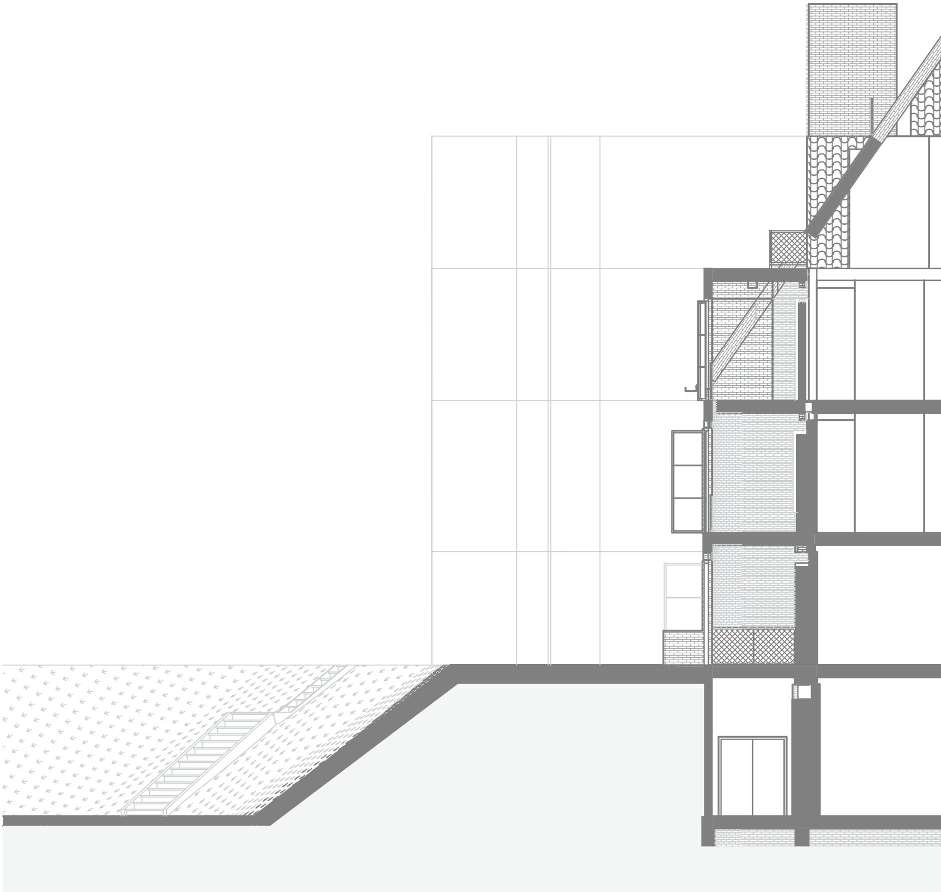
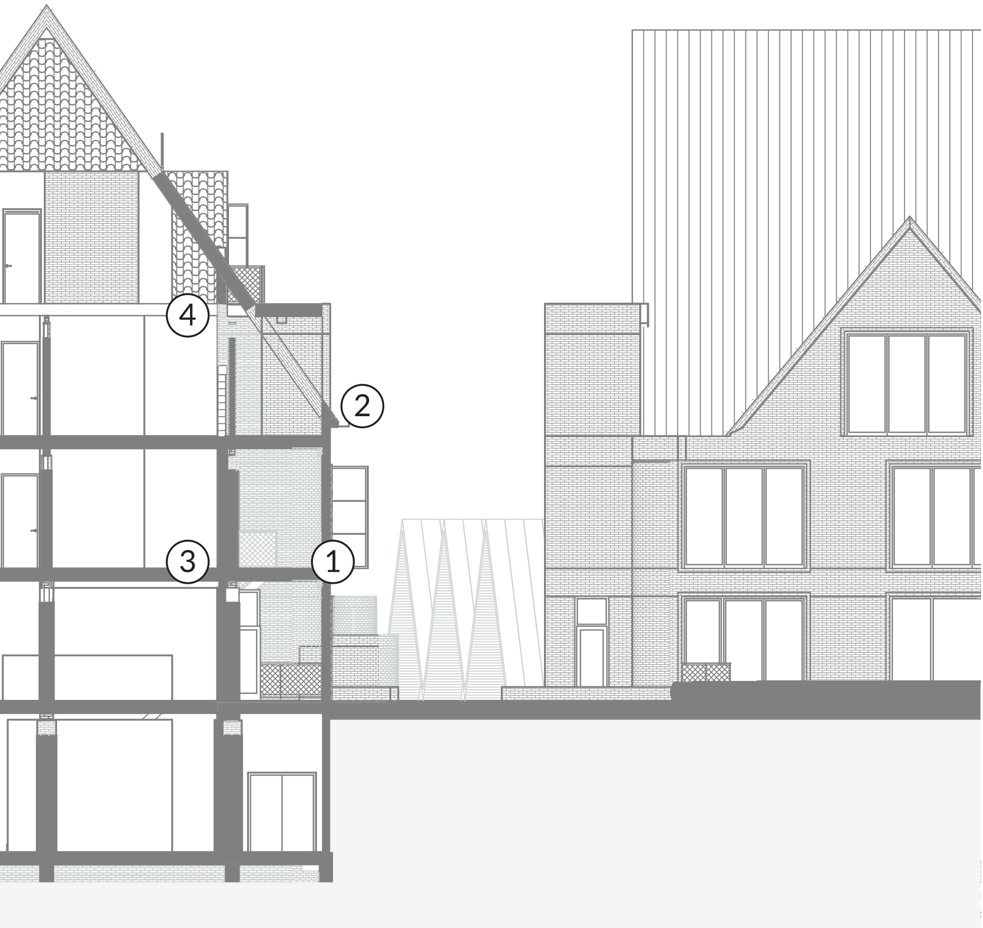


Fig. 84: *Location Details (Own Work)*


4
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1

LEGENDA | DETAIL 1a

1: Vloerafwerking, 12 mm
2: Gips-vezel composiet, 30mm
3: Kartonnen honinggraat met egalisatiekorrels, 30mm
4: Verhoogde vloer met systeemruimte
5: Prefab vloer element (LVL), 318mm
6: Rollaag 210mm
7: Nestkast
8: IPE 220 staalprofiel
9: Steensmetselwerk 210mm

1: Flooring 12mm
2: Gypsum fiber composite
3: Cardboard honeycomb with leveling granules
4: Raised floor with system space
6: Laminated veneer lumber flooring element (318mm)
7: Nesting box
8: IPE 220 steel profile
9: Masonry wall 210mm

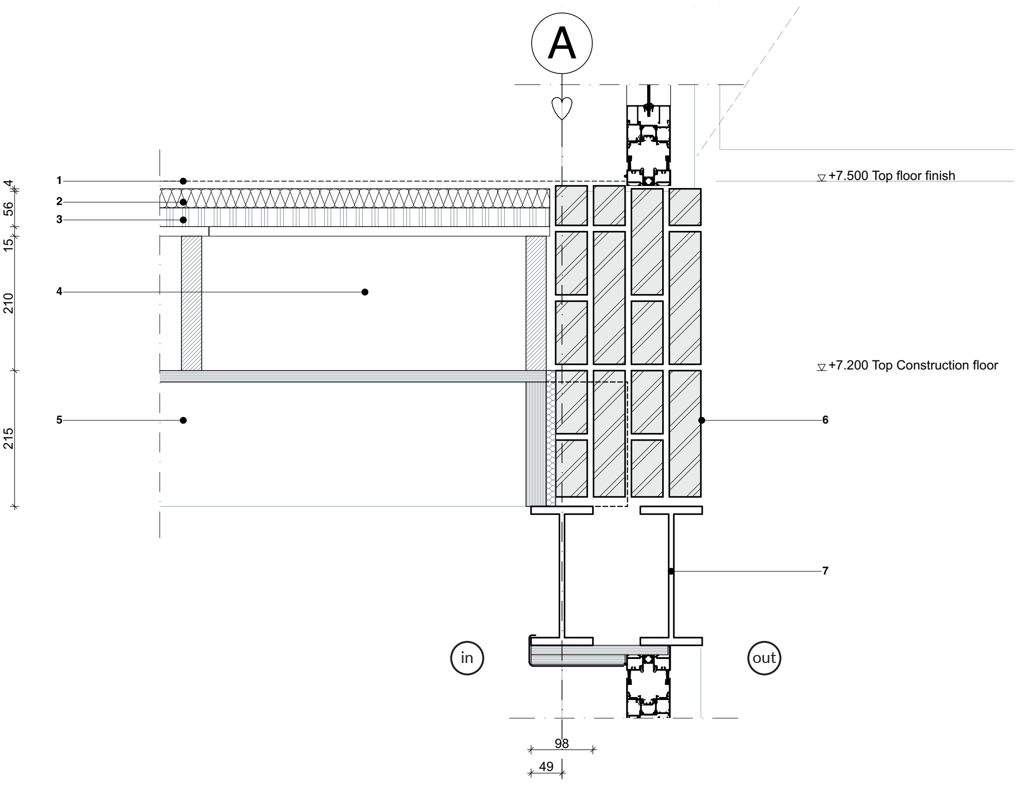


Fig. 85: *Detail 1a (Own Work)*

LEGENDA | DETAIL 1b

1: Vloerafwerking, 12 mm
2: Gips-vezel composiet, 30mm
3: Kartonnen honinggraat met egalisatiekorrels, 30mm
4: Verhoogde vloer met systeemruimte
5: Prefab vloer element (LVL), 318mm
6: Rollaag 210mm
7: Nestkast
8: IPE 220 staalprofiel
9: Steensmetselwerk 210mm

1: Flooring 12mm
2: Gypsum fiber composite
3: Cardboard honeycomb with leveling granules
4: Raised floor with system space
6: Laminated veneer lumber flooring element (318mm)
7: Nesting box
8: IPE 220 steel profile
9: Masonry wall 210mm

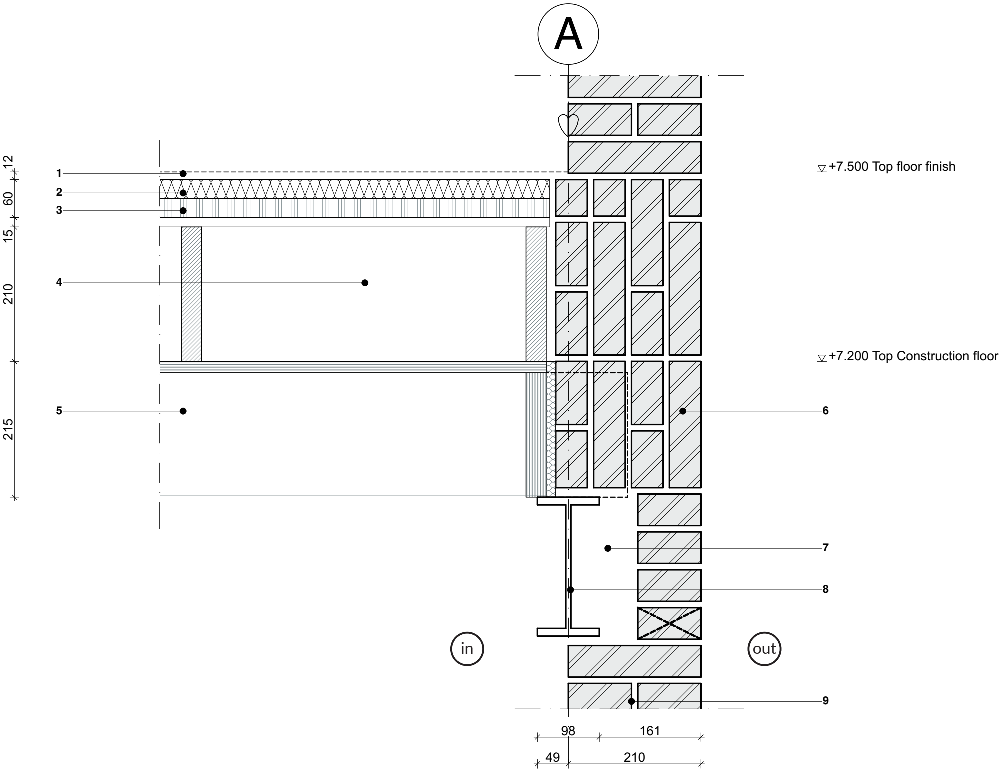


Fig. 86: *Detail 1b (Own Work)*

LEGENDA | DETAIL 2

1: Vloerafwerking, 12 mm
2: Gips-vezel composiet, 30mm
3: Kartonnen honinggraat met egalisatiekorrels, 30mm
4: Verhoogde vloer met systeemruimte
5: Prefab vloer element (LVL), 318mm
6: Rollaag 210mm
7: Nestkast
8: IPE 220 staalprofiel
9: Steensmetselwerk 210mm

1: Flooring 12mm
2: Gypsum fiber composite
3: Cardboard honeycomb with leveling granules
4: Raised floor with system space
6: Laminated veneer lumber flooring element (318mm)
7: Nesting box
8: IPE 220 steel profile
9: Masonry wall 210mm

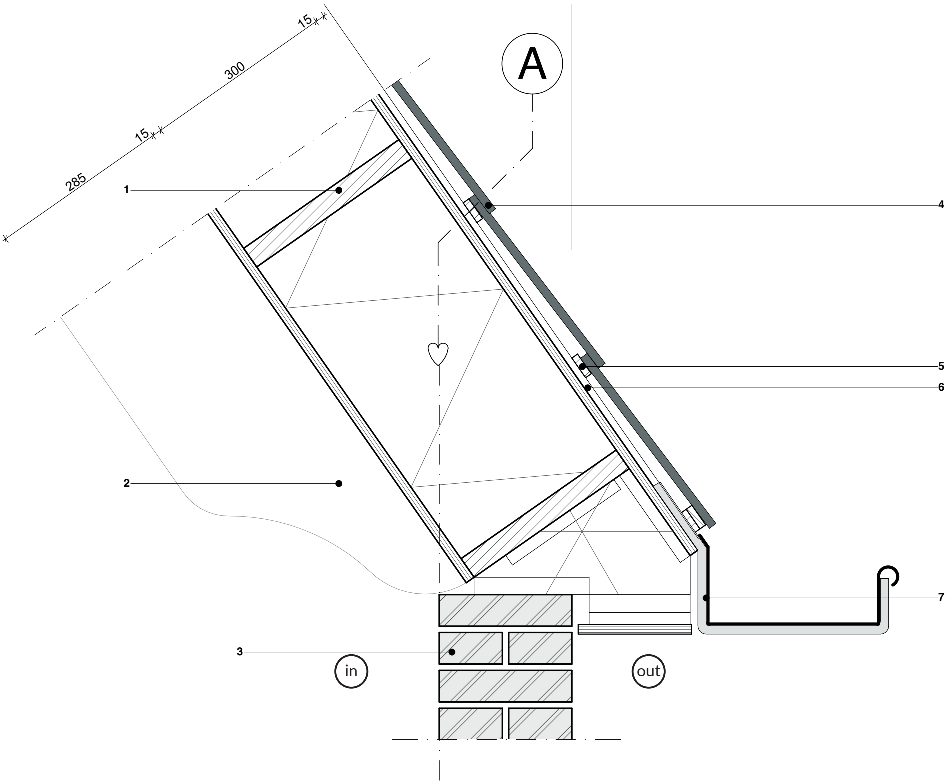


Fig. 87: *Detail 2 (Own Work)*

LEGENDA | DETAIL 3

1: Vloerafwerking, 12 mm
2: Gips-vezel composiet, 30mm
3: Kartonnen honinggraat met egalisatiekorrels, 30mm
4: Verhoogde vloer met systeemruimte
5: Kalkhennep blokken
6: Prefab vloer element (LVL), 318mm
7: Compressed earth bricks
8: Eikenhouten balk
9: Eikenhouten deur kozijn

1: Flooring 12mm
2: Gypsum fiber composite
3: Cardboard honeycomb with leveling granules
4: Raised floor with system space
5: Chalk hemp blocks
6: Laminated veneer lumber flooring element (318mm)
7: Compressed earth bricks
8: Oakwood beam
9: Oakwood doorframe

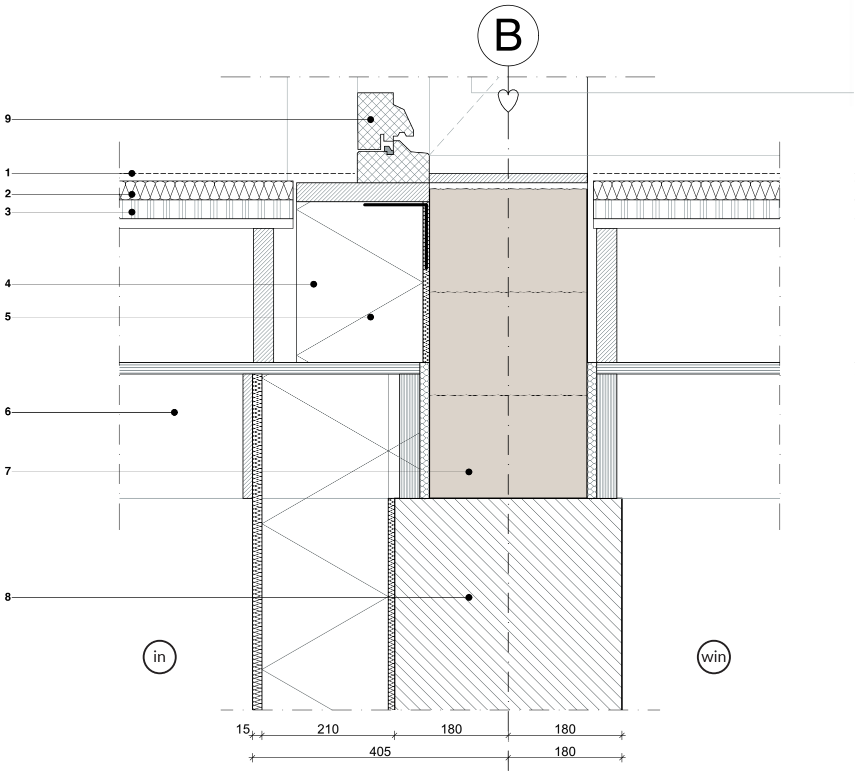


Fig. 88: *Detail 3 (Own Work)*

LEGENDA | DETAIL 4

1: Kalk hennep isolatie
2: Dakpan
3: Gording
4: Panlat
5: Spant
6: Tengel
7: Vloerafwerking, 12 mm
8: Gips-vezel composiet, 30mm
9: Kartonnen honinggraat met egalisatiekorrels, 30mm
10: Verhoogde vloer met systeemruimte
11: Muurplaat
12: Compressed earth bricks
13: Kalkhennep blokken
14: Prefab vloer element (LVL), 318mm

1: Chalk hemp blocks
2: Roof tile
3: Timber purlin
4: Batten
5: Timber truss
6: Tengel
7: Flooring 12mm
8: Gypsum fiber composite
9: Cardboard honeycomb with leveling granules
10: Raised floor with system space
11: Wall plate
12: Compressed earth bricks
13: Chalk hemp blocks
14: Laminated veneer lumber flooring element (318mm)

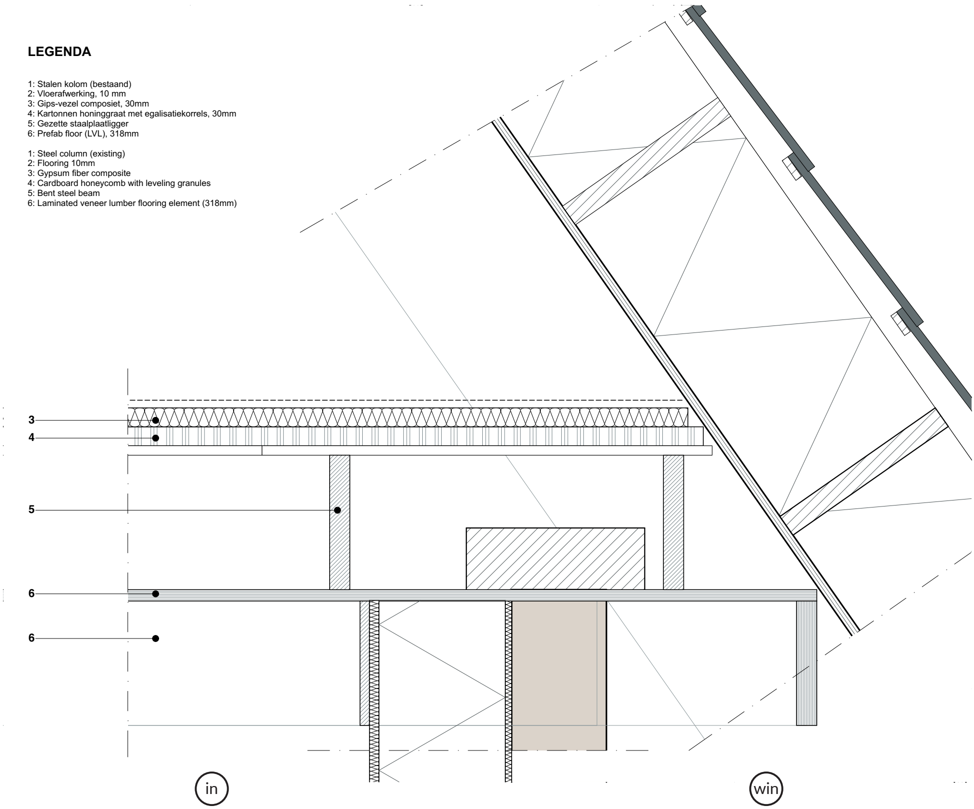


Fig. 89: *Detail 4 (Own Work)*

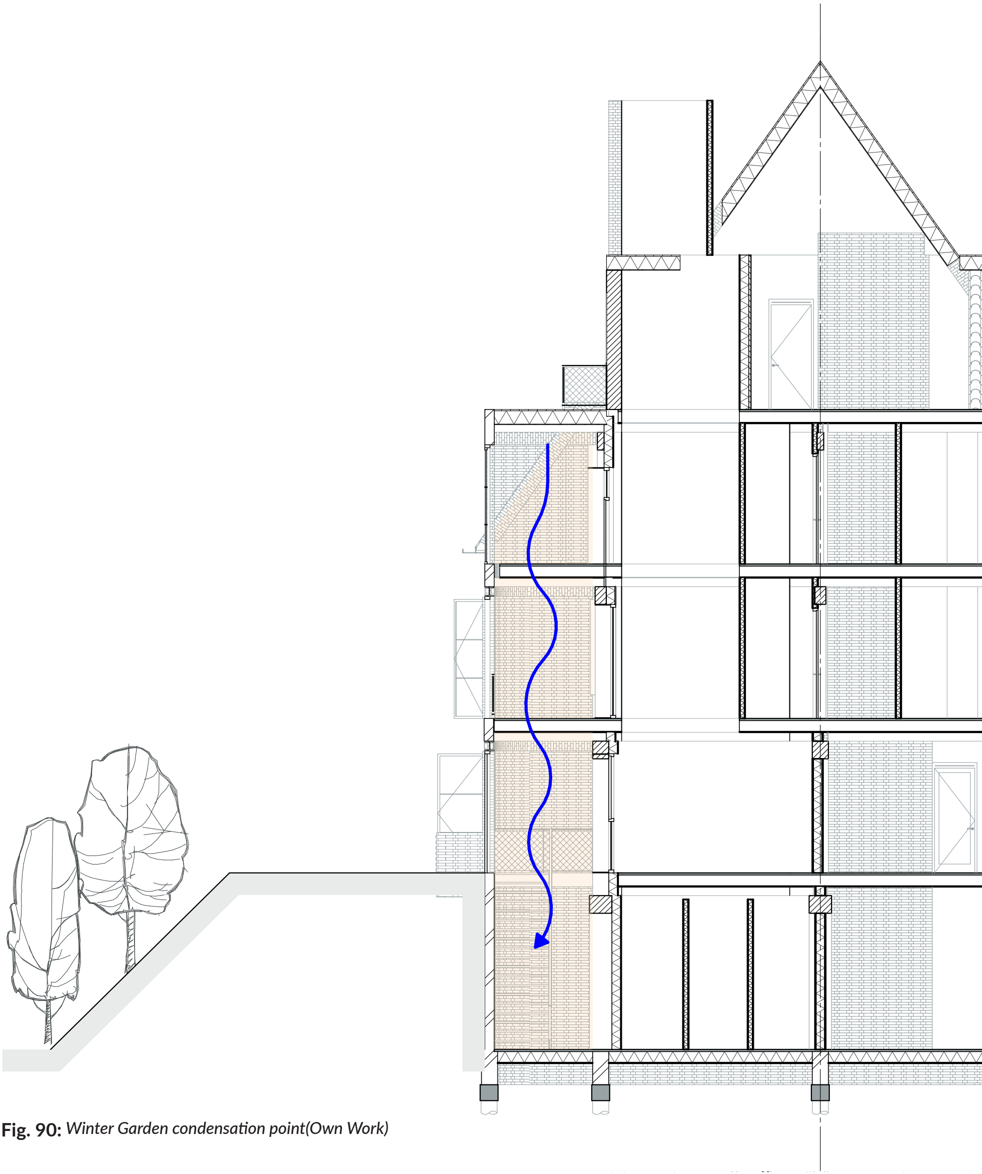
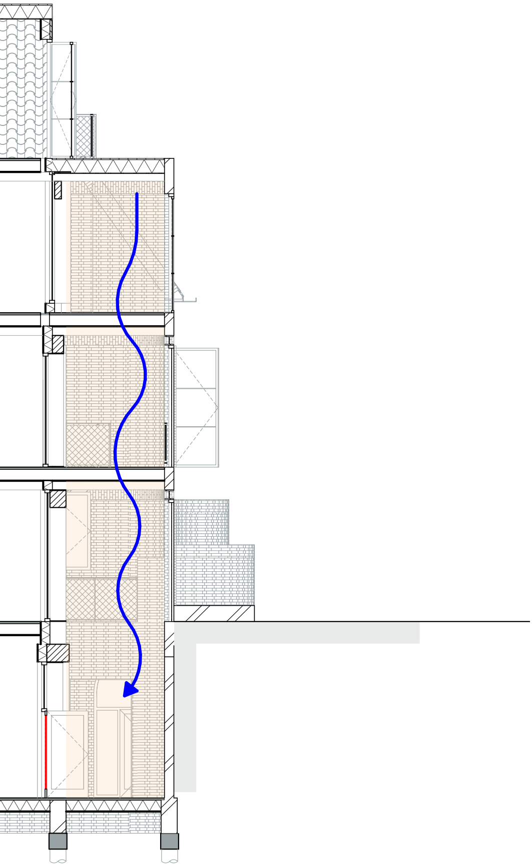


Fig. 90: *Winter Garden condensation point(Own Work)*



Condensation Point

The winter garden serves as a buffer between the interior and exterior, creating an intermediate climate. The meeting point of cold and warm air is in the winter garden rather than in the insulation, as is typically the case. This allows the use of wooden beams without the risk of wood rot. There is no need for insulation foils, which helps avoid construction errors. For materials like lime hemp, which can withstand moisture, the insulation value remains optimal. Since the condensation point is shifted to the winter garden, the lime hemp stays dry, maintaining its maximum insulation value.

LEGENDA | Section 1:200

1 Solar Chimney
2 Controlled ventilation
3 Pre-warmed in Winter Garden
4 WTW-unit

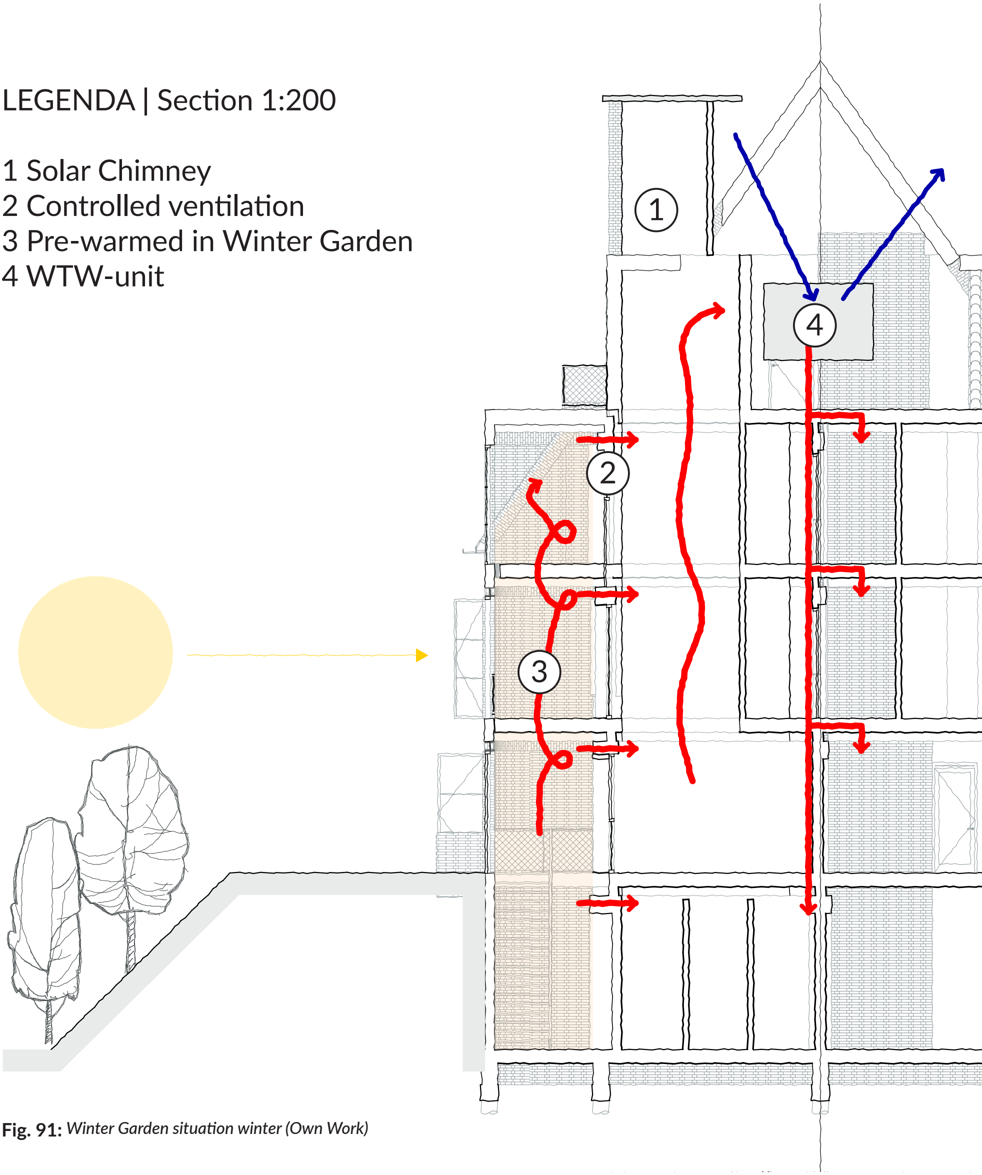
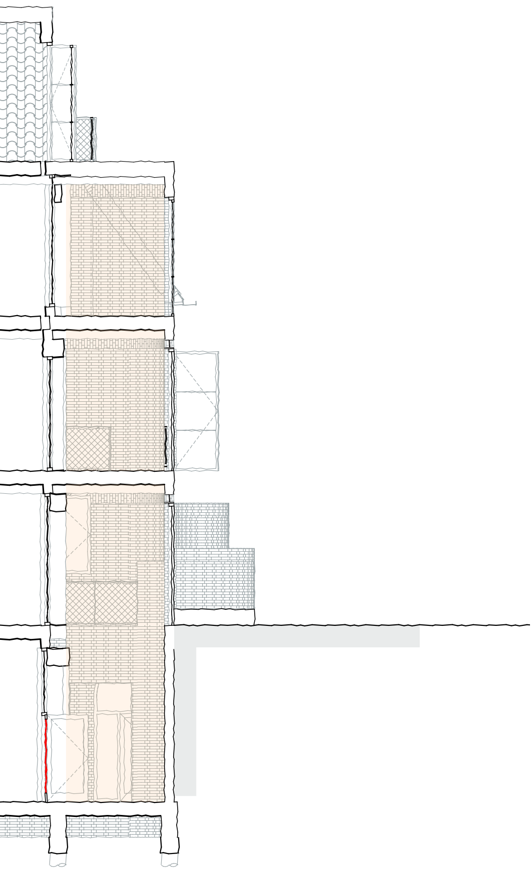


Fig. 91: *Winter Garden situation winter (Own Work)*



Winter Situation

Figure 85 shows the climate diagram for the winter situation. The warm facade heats the winter garden, making it a pleasant place to sit. The air in the winter garden is effectively warmed. This warmed air is drawn in by CO2-controlled ventilation. The polluted warm air is reused via a heat exchanger. Solar collectors, connected to a battery, then provide power to the heat exchanger.

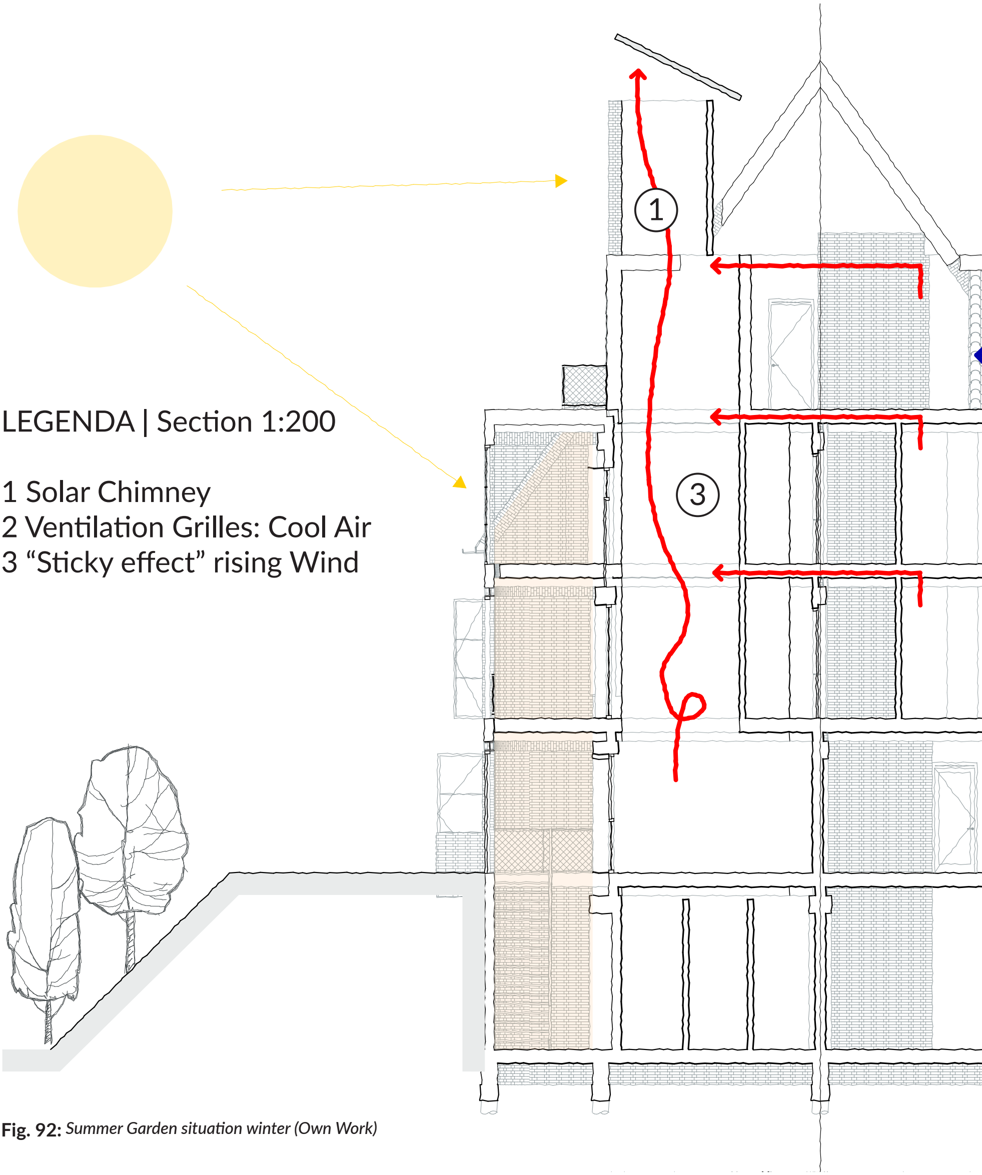
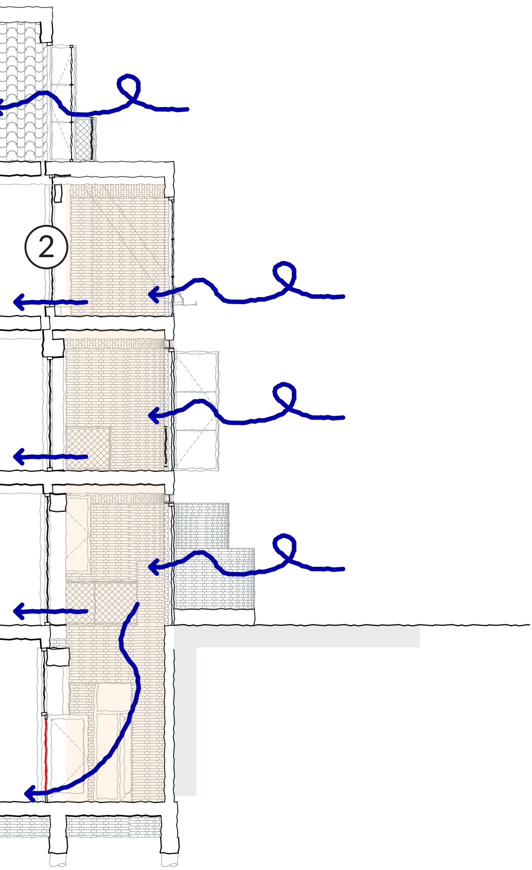


Fig. 92: *Summer Garden situation winter (Own Work)*



Summer Situation

Figure 86 shows the climate diagram for the summer situation. Here, the winter garden on the less sunny side serves as an air intake. By heating the solar chimneys on the sunny side of the building, the stack effect creates a draft, resulting in passive ventilation. The solar chimney opens with a moisture-sensitive sensor.

Reflection

Reflection

1. What is the relation between your graduation project topic, your master track (A, U, BT, LA, MBE), and your master programme (MSc AUBS)?

My fascination with heritage led me to pursue the MSc1 studio Heritage and Architecture within the master track of Architecture. As my studies progressed, I became increasingly convinced of the importance of the user aspect in architecture. For instance, a housing design is only truly successful if the occupants find it pleasant to live in.

The second master studio I joined was 'MSc2: Towards an Inclusive Living Environment,' where I explored how to integrate existing social structures in a neighborhood while addressing the future challenge of elderly individuals needing to care for themselves and to be more independently. Additionally, I learned about various housing forms and their associated financial structures, such as housing cooperatives, co-living arrangements, multi-generational homes, and lifetime homes.

The relationship between my graduation project topic and my master program revolves around social user aspects and the influence of time on architecture. These two subjects merged into the research question: Can architecture play a significant role in minimizing the environmental impact caused by the construction industry?

2. How did your research influence your design/recommendations and how did the design/recommendations influence your research?

My research significantly influenced my design. The findings highlighted specific factors that affect the lifespan of a building, which I incorporated into the design. Particularly, the aspect of managing diversity found substantial theoretical support, bridging the gap between theory and practice.

Conversely, the design had limited influence on the research. Since the design assignment required consideration of social inclusion, the research gained more depth in this aspect.

3. How do you assess the value of your way of working (your approach, your used methods, used methodology)?

The initial phase of the graduation process was heavily focused on research, which served as a foundation for the eventual design. The start of the design went well, in my opinion, because the research was complete enough that it did not stop the development of the design.

My research methods were systematically structured, providing the necessary framework for a prosperous design and research process. The first part of my research utilized a literature review method, generating sufficient knowledge to apply to my design. The chronological work method proved valuable, ensuring efficient progression.

Starting with a theoretical basis, I began the research and design phase. Analyzing precedents provided ingredients for my design. However, the overlap of research and design processes made the design process less prosperous. In hindsight, completing precedent analyses earlier would have been beneficial.

For example, analyzing Edwin Lutyens' country houses ensemble beforehand would have provided valuable input for the design. Implementing the detailed design language earlier would have streamlined the process.

Lastly, my approach to project phases could have been improved. Attempting to save time by pre-emptively solving layout issues led to delays. In the future, I will draft initial layouts to identify and resolve problems step by step, leading to a final design.

Fig. 1: *Essamble of architecture and landscape*

4. How do you assess the academic and societal value, scope, and implication of your graduation project, including ethical aspects?

I believe both my design and research contribute academically and societally. My literature review revealed that few discuss the changing temporal layers of a building in relation to environmental impact and longevity. This approach to architecture addresses housing shortages and environmental impacts in the construction sector. Moreover, I critically examined the circular or cradle-to-cradle concepts, proposing alternative solutions to reduce buildings' environmental impact.

The design serves as an example of addressing issues in the Midden Delfland area. It demonstrates how architecture can enhance the built environment's quality while preserving open spaces in the Netherlands. This example can inspire other designers, urban planners, and architects, fostering further societal value.

5. How do you assess the value of the transferability of your project results?

My project results illustrate how a dyke can encompass multiple values and how an integrated design can address various issues. A dyke's function extends beyond flood protection; it can control urban sprawl, protect open landscapes, enhance the quality of both the city and the countryside, and maintain livability in diverse neighborhoods.

6. Reflecting on the design process: What obstacles did you encounter?

During the urban design process, I faced the challenge of wanting to incorporate too many elements. I aimed to ensure the new buildings connected with the existing environment while transitioning between the city and the landscape. Setting numerous requirements and ambitions led to a lack of coherence in the overall design. Next time, I will prioritize and streamline my ideas earlier in the process to create a clear and cohesive plan.

7. Reflecting on the research process: What would you do differently next time?

Reflecting on my research, I realized that my desire to cover various interests resulted in a somewhat superficial exploration of each topic. While addressing social inclusion as one of the three pillars for extending a building's lifespan, the treatment remained relatively shallow. In future research, I would focus more deeply on a specific subject to provide a more thorough analysis.

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