Reverting social atomization

Learning from cohousing to combat loneliness

Master thesis
Research and design report
Joaquim Boendermaker
2024-2025

TUDelft

Publication
Research and design report

Date
June 18th, 2025

Master Programme
Architecture, Urbanism and Building Sciences | Architecture Track

Graduation Studio
Advanced Housing Design | AR3AD100

Student
Joaquim Boendermaker

Student number
4611497

Tutors
ir. Olv Klijn
Ruurd Kuijlenburg
dr. ir. Alejandro Campos Uribe
dr. ir. Brook Haileselassie

Table of Contents

Introduction

Abtswoudepark, Delft (Own image)

'The Advanced Housing Design Graduation Studio (AR3AD100) explores how **housing design** can successfully address the challenge of reducing the ecological footprint of its residents and **assure social inclusion**.'

'The students will work on the **area between Delft and Rotterdam (Midden-Delfland)** and will need to develop an urban (micro)-system that facilitates the **coexistence of working, learning, and living**, re-assessing dwelling design from the lenses of contemporary critique.'

'[...] the studio goal: to **overcome social polarization and increasing loneliness** by sharing resources and social infrastructures within an **affordable housing program**.'

Taken from the Advanced Housing Design (AR3AD100) Graduation Studio Syllabus

Motivation

The past few years have sadly emphasized the fragility of our society. The COVID-19 pandemic has undeniably been the largest disruptor we have witnessed in recent times. We may also not ignore the influence of national politics, geopolitics and war, and isolation through the digital age. All of these have seem to be contributing to the further hardening and polarization of society, in turn further isolating many individuals.

My interests, like many of my peers, concern improving lives and living environments through architecture. I certainly hope that architecture will, surely for a long time, remain a discipline that aims and succeeds to positively affect the ways we live.

For this reason, I have been interested in researching how architecture can influence (mental) health in a positive way. As a result of the aforementioned societal developments a very pronounced mental health issue, loneliness, has become increasingly evident. The specific aim within my graduation project, inspired by the research and design objectives that have been formulated within the graduation studio syllabus, is to understand what loneliness entails exactly, how it is related to the built environment, and how, through architecture, we may be able to mitigate loneliness and its corresponding negative health effects.

“Architecture is about people”
- Francis Kère

Societal urgencies

Loneliness

In November of 2023, the World Health Organization declared loneliness to be a pressing global threat. According to the WHO, loneliness affects people of all ages and backgrounds, and has the potential to pose 'serious consequences for health and well-being' (WHO, 2023).

In the Dutch context, in 2022 an estimated 49% of Dutch adults endured feelings of loneliness, as surveyed by the Dutch bureau of statistics (CBS, 2023). Additionally, in the last half decade, the amount of people that have experienced loneliness or severe loneliness has been increasing among different age groups - perhaps as a result of the COVID-19 pandemic - undeniably showing the relevance of loneliness as a demographical statistic, if not issue.

In the meantime, recognition of the – potentially negative – role of loneliness in Dutch society is growing: 'loneliness is a persistent issue, without a clear solution' (Scholten, 2024). Professor Erik Borgman calls the issue 'not in particular a problem of the lonely person, but a problem of society' (Scholten, 2024). The Dutch ministry of Health, Welfare and Sport, that has developed a program of action to combat loneliness, has noted that Dutch society is 'on the brink of a major change', suggesting that large demographic shifts will lead to increased loneliness in the near future – in particular within the elderly demographic (Ministerie van Volksgezondheid, Welzijn en Sport, 2018). More recently, the same ministry published an addition to their program of action. In this, they stress that in light of the developments during and after the COVID pandemic, loneliness is shown to affect people of all demographics and backgrounds (and not neccessarily just the elderly), calling loneliness a 'societal issue of unprecedented size' (Ministerie van Volksgezondheid, Welzijn en Sport, 2022). Additionally in this piece, state secretary Maarten van Ooijen hints at the role of the built environment as one of the major aspects that is connected to loneliness.

WHO launches commission to foster social connection

Figure 1. WHO addresses loneliness (WHO, 2023)

1 op de 10 mensen sterk eenzaam in 2023

26-9-2024 06:30

Figure 2. Dutch statistics bureau CBS releases poignant stats on loneliness (CBS, 2024)

Ministerie van Volksgezondheid, Welzijn en Sport

Actieprogramma

Eén tegen eenzaamheid

Eén tegen eenzaamheid

Actieprogramma 2022-2025

Figure 3. The Dutch ministry of Health, Welfare and Sport has released two programs of action to reduce loneliness in the past 5 years (Ministerie van Volksgezondheid, Welzijn en Sport, 2018; 2022)

Housing

The Dutch housing market is stressed. There is a clear deficit in available dwellings compared to the required amount of dwellings to fit the country's inhabitants, and this deficit is increasing each year (Ministerie van Volkshuisvesting en Ruimtelijke Ordening, 2025). In 2024, around 82 thousand dwellings have been built in the Netherlands, marking the smallest addition of dwellings in six years (Nu.nl, 2025).

Additionally, a fifth of dwellers is not living fittingly in relation to their stage of life and/or financial situation (Hilhorst & Kellij, 2023). Those wanting to relocate often experience financial struggles that are caused by the stress that has been placed upon the housing market. A growing number of dwellings is becoming unobtainable, evidently, because most dwellings that have been constructed in the last decade have either been owner-occupied or have fallen in middle rent segments - as opposed to social housing. The net number of dwellings within the segment of social housing has only grown marginally (Centraal Bureau voor de Statistiek, 2024), further skewing the 'available' housing stock to become increasingly unobtainable, in particular for those who have limited financial means.

The potential of cohousing within the Dutch housing crisis

Operatie Wooncoöperatie was written partly in response to this current state of Dutch Housing. In this publciation, Lengkeek & Kuenzli (2022, p. 13) mention three streams of dwelling manufacturing. Of these, two have already become widespread within Dutch housing manufacturing. These are public housing (through government) and private housing (through free market parties). They now opt for a third option to get a more prominent role: housing within the so called 'economy of the commons'. They see these forms of housing, 'cohousing', as 'enterprises that do not need subsidies, yet harbor **affordability** and **inclusivity** on the long term' (Lengkeek & Kuenzli, 2022, p. 18). While cohousing is still very much underexplored and underrepresented within the Dutch housing market, they suggest that cohousing may play a role in remedying the Dutch housing crisis.

Figure 4. Number of newly constructed dwellings is decreasing annually (Nu.nl, 2024)

Figure 5. The crisis in housing is felt strongly within the Dutch population (Kellij & Hilhorst, 2023)

Figure 6. Affordable housing in particular is facing deficits (BNNVARA, 2024)

Some evidence to support the claim to this potential can be found in the ambitions of governmental bodies and other parties to increase the percentage of cohousing developments. The municipality of Amsterdam (figure 7) for example aims for ten percent of its housing stock to consist of housing cooperations by 2040 (Open Research Amsterdam, 2025).

In Rotterdam (figure 8), a coalition has recently been formed to bundle and operationalize initiatives for new housing cooperations. This coalition, called the Rotterdam Coalition for Housing Cooperations, is already working on test cases that may show how to incorporate these kinds of projects in to new mixed urban development zones (Coöperatief Wonen, 2025)

De kracht van het collec-tief - Wooncoöperaties in Amsterdam

Figure 7. Housing cooperation ambitions for Amsterdam (Open Research Amsterdam, 2025)

coöperatief wonen

menu
nl | fr

Stad Rotterdam blaast coöperatief wonen nieuw leven in

Figure 8. Initiation of Rotterdam coaltion for housing cooperations (Coöperatief Wonen, 2025)

Problem statement

Taking into account these aforementioned urgencies, a preliminary problem statement has been formulated that has functioned as the departure point for further research in this project.

The problem statement specifically tries to link these discovered societal urgencies of loneliness and housing, hinting at cohousing as an underexplored potential remedy to both. The statement reads:

The Netherlands is facing a double crisis: a shortage of affordable housing and rising levels of loneliness. Traditional housing at the moment does not seem to help mitigate loneliness and isolation. Cohousing – an approach that combines private living with the sharing of space, amenities and ideologies – offers a potential solution. The graduation project explores if and in what ways cohousing could effectively address both housing affordability and social isolation, and will impose this on the context of the graduation studio; Midden-Delfland.

Research approach

Scope of research

The studio syllabus of the Advanced Housing Design Graduation Studio states several objectives for the eventual design project. The following objective has served as inspiration for the research:

'[…] the studio goal: to overcome social polarization and increasing loneliness by sharing resources and social infrastructures within an affordable housing program.'

Two main themes to research from this studio goal have been formulated: loneliness and cohousing (the 'affordable housing program with shared resources and social infrastructures'). Reviewed briefly on the previous pages, there now already is an idea of the urgency behind loneliness as a societal issue. The literature review will cover loneliness in more depth, and investigate what loneliness entails, what kind of negative health effects are related to loneliness, what the societal impact of loneliness is, who is affected, and how loneliness is related to the built environment.

The second theme is that of cohousing: (affordable) housing on a basis of sharing resources and social infrastructures. Continued within the literature review, the different forms of cohousing that exist will be explained, along with what kind of role they play in the Dutch housing market. Furthermore, this chapter will use theory on the designing for interaction to explain how to categorize and analyze these kinds of projects in order to discover how these projects relate to and impact loneliness.

This report will show that, although there is evidence that suggests certain links between loneliness and architecture, it is difficult to link specific aspects of the built environment to loneliness. The goal of the research is not to discover these links, as finding statistically valid evidence for connecting loneliness and architecture is far out of the possible scope that could be obtained within this graduation project. However, the third chapter of this report - containing the

case study analysis - will seek to investigate how certain realized projects may contribute to reducing loneliness. The projects that are chosen for this case study analysis are all some sort of cohousing development, and the reason for this is that cohousing projects all have a common focus: sharing - whether it be sharing ideology, investment, or space. Through this, the aim is to find good practices that will give inspiration to designing in a way that may reduce loneliness.

To situate this research into an eventual design project, the last research theme concerns the graduation studio departure point: the region of Midden-Delfland as it is envisioned within the Redesigning Deltas design study. All these research themes will eventually feed into a design for a housing project in Midden-Delfland that helps to reduce loneliness.
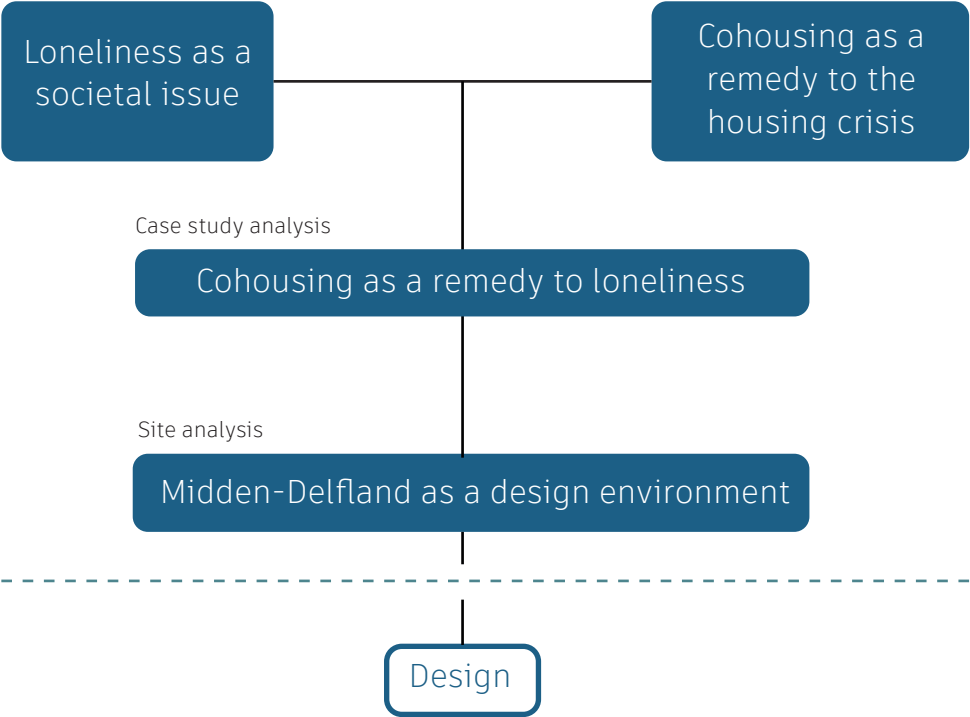
Literature review

Loneliness as a societal issue

Cohousing as a remedy to the housing crisis

Case study analysis

Cohousing as a remedy to loneliness

Site analysis

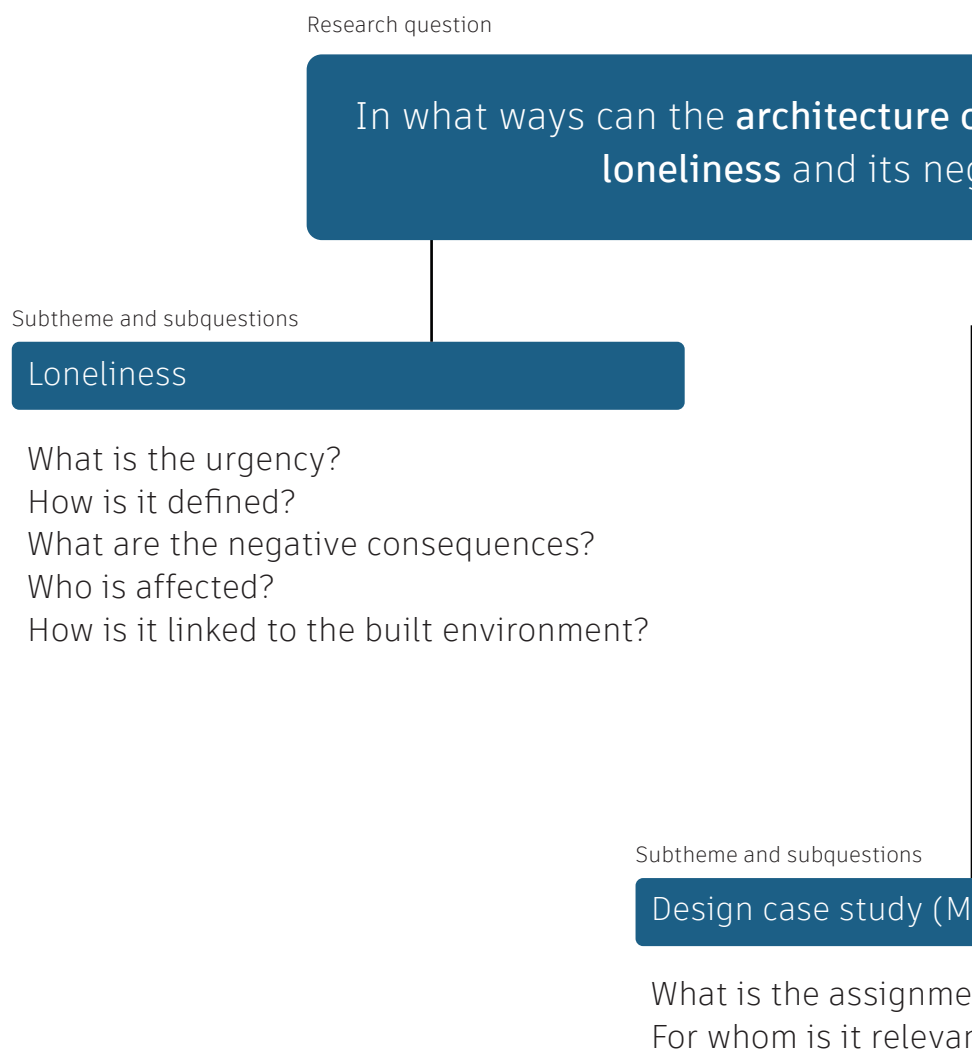Midden-Delfland as a design environment

Design

Figure 9. Research scope divided into different themes

Research questions

This page shows the main research questions along with the research subthemes and (some of the) subquestions that have been formulated to answer the main research question.

In what ways can the **architecture c** **loneliness** and its neg

Loneliness

What is the urgency?
How is it defined?
What are the negative consequences?
Who is affected?
How is it linked to the built environment?

Design case study (M

What is the assignme
For whom is it relevar

of cohousing contribute to reducing gative health effects?

Cohousing

What is the urgency?
How is it defined?
What forms are there?
How can we analyze them?
Which examples are relevant?

idden - Delfland)

nt?
nt?

Methodology

In the next chapter of this research report, a literature review will be given on two themes: loneliness, and cohousing. The following chapter will give an elaborate case-study review of cohousing projects, and extracts the good practices that are found from these projects to incorporate into the design project. For the case study analysis, there will also be research through fieldwork, including site visits and on-site interviews. The discussion of the results will follow after this chapter, and before heading into the chapter on design. That chapter will firstly give an overview of the design study, reviewing the Redesigning Deltas Design study along with other literature, reports and data, and will end with showing the actual design proposal. The methodological framework on the following page shows how the research methods will be carried out through the graduation project.
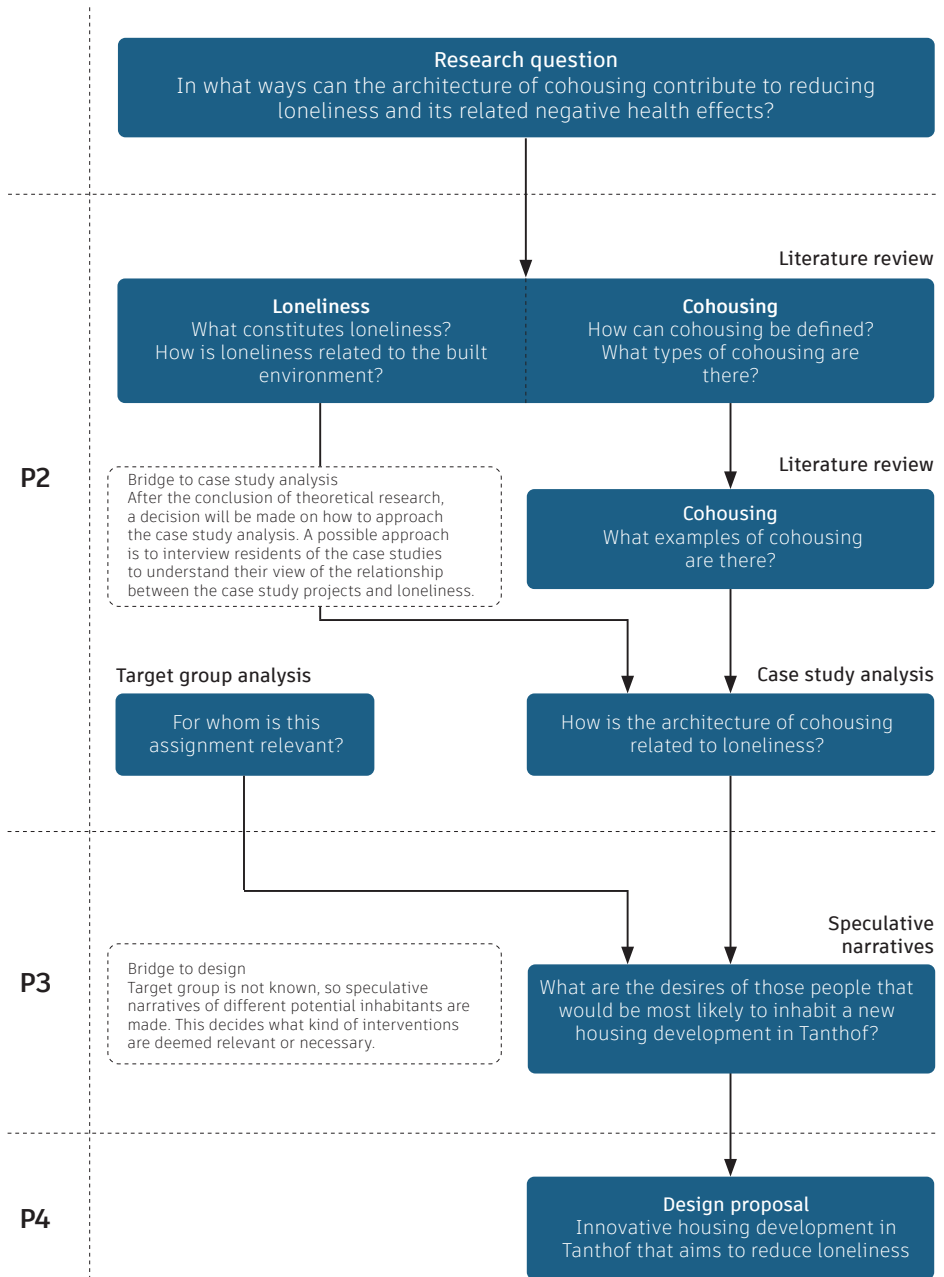
Research question
In what ways can the architecture of cohousing contribute to reducing loneliness and its related negative health effects?

Literature review

Loneliness
What constitutes loneliness?
How is loneliness related to the built environment?

Cohousing
How can cohousing be defined?
What types of cohousing are there?

P2

Bridge to case study analysis
After the conclusion of theoretical research, a decision will be made on how to approach the case study analysis. A possible approach is to interview residents of the case studies to understand their view of the relationship between the case study projects and loneliness.

Literature review

Cohousing
What examples of cohousing are there?

Target group analysis

For whom is this assignment relevant?

Case study analysis

How is the architecture of cohousing related to loneliness?

P3

Bridge to design
Target group is not known, so speculative narratives of different potential inhabitants are made. This decides what kind of interventions are deemed relevant or necessary.

Speculative narratives

What are the desires of those people that would be most likely to inhabit a new housing development in Tanthof?

P4

Design proposal
Innovative housing development in Tanthof that aims to reduce loneliness

Figure 10. Methodological framework

Literature Review

Loneliness

What is loneliness?

Loneliness as a concept has been popularized in the last half of the 20th century, initially by psychologists like Frieda Fromm-Reichmann, who devoted an article to loneliness in a journal on Psychiatry (Fromm-Reichmann, 1959) and Robert S. Weiss, who wrote a book on social and emotional loneliness (Weiss, 1973). Since then, many theories and definitions have been defined for loneliness. As a result of this, loneliness is measured differently throughout different scientific sources. Additionally, we may not fairly speak of a single definition for the subject. The following pages however try to give an overview of multiple theories behind loneliness that may help to give an understanding of what loneliness is considered to mean in a general sense.

Social and emotional loneliness

Robert S. Weiss, who published a book on loneliness in 1973, made a clear distinction between two kinds of loneliness: social and emotional loneliness. According to Weiss (1973), social loneliness or isolation would relate to the amount of (or in fact, lack of) connections a person would have in their social network. Emotional loneliness or isolation would relate to the absence of a strong emotional connection with for example a single person (e.g. romantic relationship).

Additionally, Weiss attributed a number of provisions to different kinds of relationships: attachment, social integration, reliable alliance, guidance, reassurance of worth, and opportunity for nurturance. These were later operationalized and used in studies that examined loneliness in certain demographics (DiTomasso & Spinner, 1997).

Loneliness vs. being alone

According to Bekhet (2014), loneliness is an experience that is recognized by every individual, and is also unique to each of us. It may simply be defined to mean 'a state of solitude or being alone' (Tiwari, 2013). However, to understand why loneliness may pose a health issue,

we must understand that there is a crucial distinction between **loneliness** and simply **being alone**. Copel defines loneliness as 'an emotional state in which an individual is aware of the feeling of being apart from another or others, along with the experience of a vague need for individuals' (Copel, 1988, p. 14), indicating that loneliness is not only related to a physical state of being - being alone - but also to an emotional response to this state of being: feeling lonely.

Generally speaking, each individual has their own preferences in regards to the amount of social interaction they desire, and, in accordance with this, the amount of relationships they develop as well as the depth of these relationships (Russel et al., 2012). Therefore, one individual could have very few relationships with others and remain socially isolated, but still be happy with their situation – and through this not necessarily feel lonely. At the same time, another individual could have lots of social interaction with many people, but still be discontented with the amount of relationships they have or the quality of these relationships.

Cognitive discrepancy theory

As a result of this characteristic of loneliness, the theory of **cognitive discrepancy** related to loneliness has been developed and tested in numerous studies in the past. The theory suggests that each individual, indeed, has their own perceived desires related to the amount and quality of their interpersonal relationships. More importantly, it suggests that when an individual has higher expectations of these relationships than what they are experiencing, they are more likely to feel lonely (Archibald et al., 1995). However, it is important to note that, although tested through several studies, literature is not yet fully decisive on the scientific validity of this correlation (Peplau & Perlman, 1982; Perlman & Peplau, 1998). Some data suggests that there is indeed a correlation between the amount of loneliness an individual may experience and their lack of desired relationships (Garber, 1989). Other data suggests only a minimal correlation (Archibald et al., 1995), or specifies it to only be valid when considering closer social circles, like close friendships (Russel et al., 2012). Furthermore, this approach

to the definition of loneliness makes it unidimensional: looking only at an individual's perception of loneliness based on one aspect, and places it in one point in time (De Jong Gierveld, 1998).

## Loneliness according to De Jong Gierveld

To situate the definition of loneliness in a more specific social context, De Jong Gierveld (1998) defines loneliness as the following:

> Loneliness is a situation experienced by the individual as one where there is an unpleasant or inadmissible lack of (quality of) certain relationships. This includes situations in which the number of existing relationships is smaller than is considered desirable or admissible, as well as situations where the intimacy one wishes for has not been realized. Thus loneliness is seen to involve the manner in which the person perceives, experiences, and evaluates his or her isolation and lack of communication with other people.

This definitions consists of three components. Firstly, it indicates that because of this lack of (meaningful) relationships, there may be feelings of emptiness and abandonment. Secondly, because this is not an issue related to a single point in time, there may be feelings of hopelessness, particularly when an individual feels that their situation is not getting better or is even getting worse. Thirdly, there may be additional emotional complications as a result of these previous two components, including feelings of shame and frustration (De Jong Gierveld, 1998).

The aforementioned components indicate a number of negative emotional connotations related to loneliness like feelings of emptiness, hopelessness and frustration. These can lead to several health issues, and this is what makes loneliness an issue that even goes beyond the individual. These health issues will be covered in the next subsection.

Overview
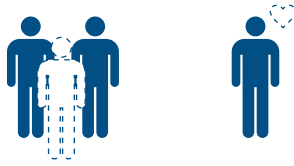
Social and emotional loneliness (Weiss, 1973)

A person will feel socially isolated when there is an absence of desired social relationships. A person will feel emotionally isolated if there is an absence of desired close attachment relationship.
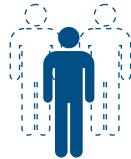
Loneliness vs. being alone (Copel, 1988)

Loneliness and being alone are not the same. A person may be alone, but not feel lonely. A person may also be surrounded by people, but still feel lonely.

Cognitive discrepancy theory (Archibald et al., 1995)

When an individual has higher expectations of their relationships than what they are experiencing, they are more likely to feel lonely.

Loneliness according to De Jong Gierveld (1998)

Loneliness is experienced through a lack of relationships and/or a lack of quality of relationships, which may induce feelings of hopelessness through time, and, as a result, feelings of shame and frustration.

What are the negative health effects and their consequences?

The WHO (2023) has stated that loneliness has the potential to pose 'serious consequences for health and well-being' (see quote). Studies show that loneliness can have negative effects on both mental and physical health. Induced stress levels as a result of loneliness can increase the risk for heart disease (Paul et al., 2021). Evidence suggests that may be a relationship between loneliness and dementia, where a higher degree of loneliness is associated with poorer cognitive function (Lara er al., 2019; Yin et al., 2019). Loneliness may also pose additional risk to distress in the form of anxiety or depression, and it may even lead to ideation of suicide (Beutel et al., 2017). According to state secretary Maarten van Ooijen, these issues are also complemented by societal issues, making loneliness a societal problem on top of it being a personal one.

The health risks associated to loneliness also further strain the Dutch healthcare system, which is already under pressure currently (Wetenschappelijke Raad voor het Regeringsbeleid, 2021). Because of rising costs, limited personnel and the ageing demographic, healthcare is currently a major topic in Dutch politics, and as result, in 2024, a new governmental agreement has been made to restructure parts of the healthcare system (Rijksoverheid, 2024). However, the current pressure on the system, like Rob Leensen stresses, asks not only for adjustments to the system itself, but also asks to alleviate the system through prevention (Leensen, 2023; Möhlmann, 2022; Rijksoverheid, 2024). Hence, preventing health issues related to loneliness – or loneliness itself – will contribute to alleviating the Dutch health system.

Lastly, although loneliness can affect all people, it disproportionally affects those with a lower socioeconomic status in Dutch society, including those with a lower level of education or income, the elderly, and people with a migratory background (Beutel et al., 2017; CBS, 2022; Volksgezondheid en Zorg, 2024). The next subsection will cover in detail how statistics on loneliness are dispersed through the Dutch population.

World Health Organization

"Anyone, anywhere, can be lonely or socially isolated. Across all ages and regions, loneliness and social isolation have **serious impacts on our physical and mental health,** and the well-being of our communities and society."

Maarten van Ooijen

State Secretary of Health, Welfare and Sport
"[…] we are dealing with a societal problem of unprecedented proportions. You do not solve this quickly. Loneliness is connected to numerous societal issues, like a strong social base, improving mental health, combatting poverty, the **setup of the physical living environment**, working on **health prevention**, and stimulating volunteer work"

Rob Leensen

Sector lead Health and Life Sciences, EY Partner Assurance
"It's clear that the Dutch Healthcare sector is dealing with serious issues. High costs, too little investment, too much focus on production, and **too little attention towards prevention** and health are leading to a vicious circle in which patients, staff and healthcare providers suffer."

Who is affected?

Everyone *can* be affected by loneliness. However, this subsection will examine further which subgroups are, in the Dutch context, affected more than others. This will give insights into those subgroups in Dutch society that may be more vulnerable to this health issue. Offering ways to mitigate loneliness in these groups specifically may prove to be valuable.

The data in this subsection is taken directly from research from VZinfo: the Dutch Governmental website on data and statistics within the domain of healthcare (VZinfo, 2024). Data this organisation gathered on loneliness was extracted by surveying Dutch citizens using the loneliness scale that was devised by Van Tilburg and De Jong Gierveld (2007). This scale contains eleven statements on loneliness, divided into questions on social and emotional loneliness (VZinfo, 2024).

First and foremost, figure 11 shows how the percentage of people that experience loneliness, either moderately or severely, has generally been rising for the last decade.

Loneliness in the Netherlands
Progression through time
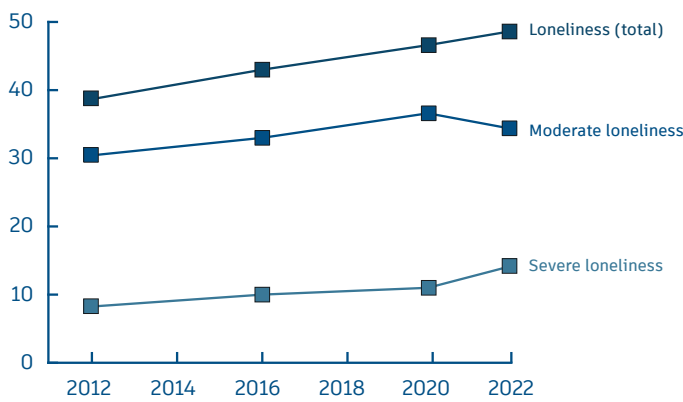
Figure 11. Progression of loneliness through time period 2012-2022. Adapted from VZinfo (2024).

Loneliness in 2022
Per income group
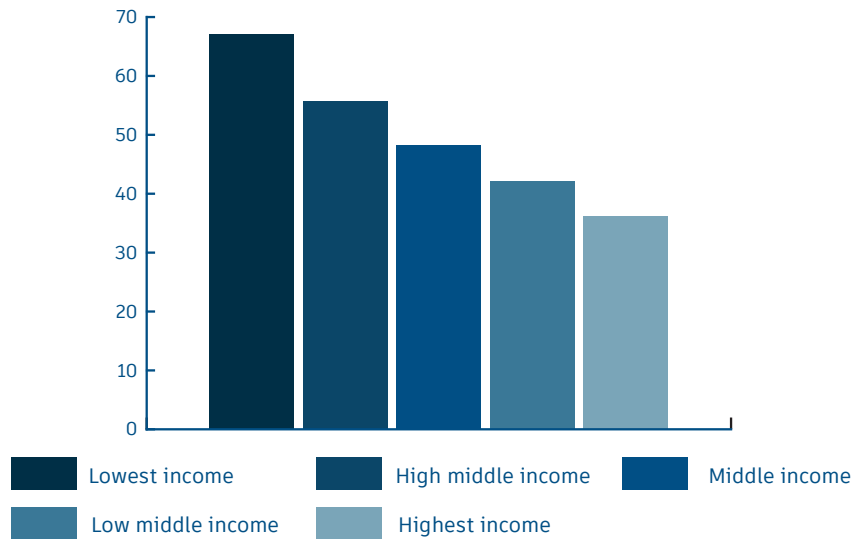
Figure 12. Loneliness per quantile (1/5th) income group. Adapted from VZinfo (2024).
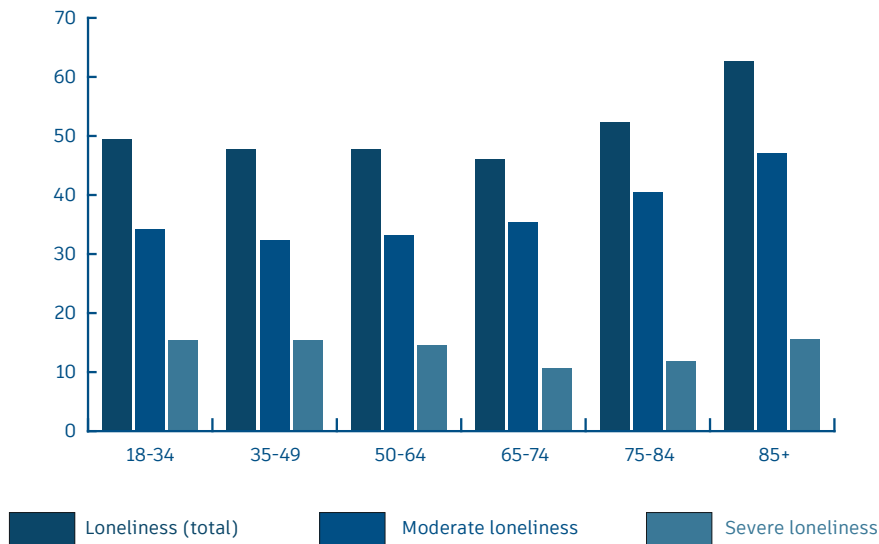
Per age group

Figure 13. Loneliness per age group. Adapted from VZinfo (2024).
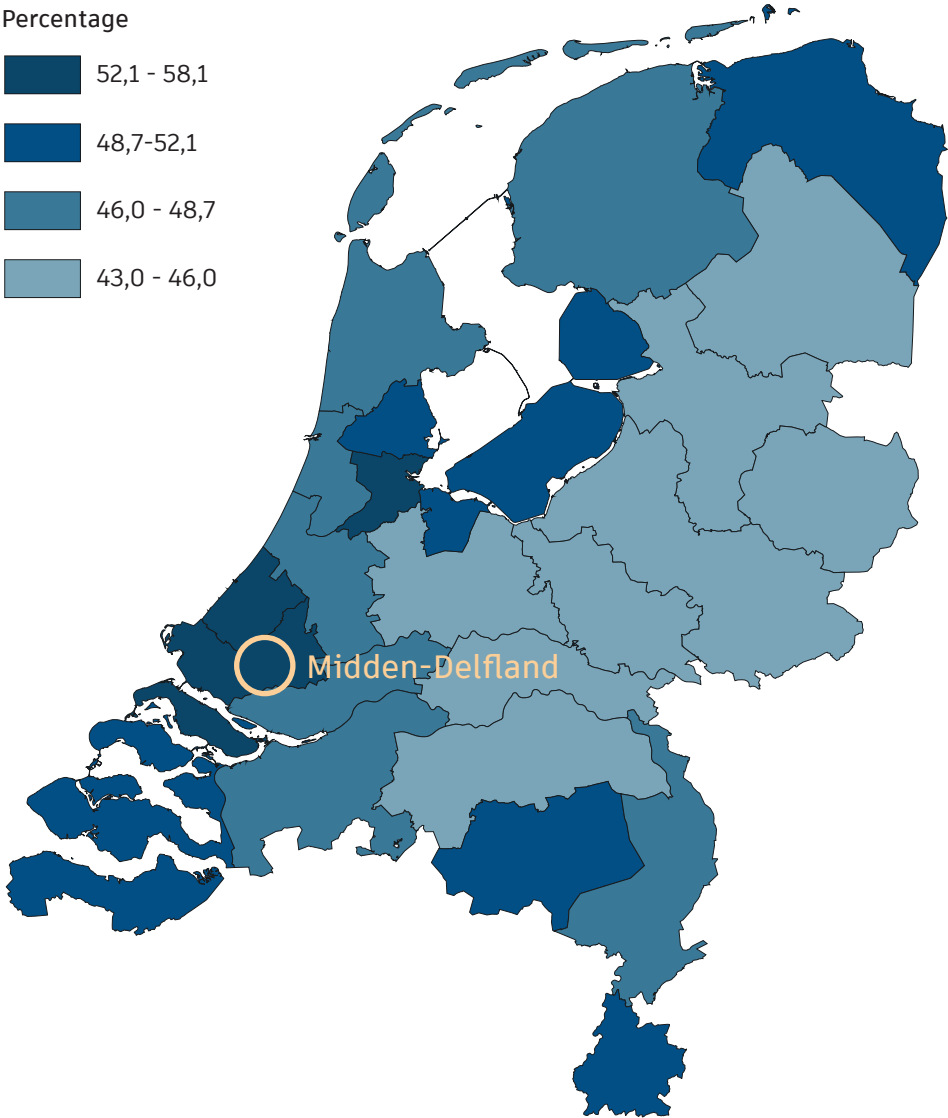
Loneliness in 2022
Amongst adults, per MHS region

Percentage

- 52,1 - 58,1
- 48,7-52,1
- 46,0 - 48,7
- 43,0 - 46,0

Midden-Delfland

Figure 14. Loneliness amongst adults per Municipal Health Service (GGD) district. Adapted from VZinfo (2024).
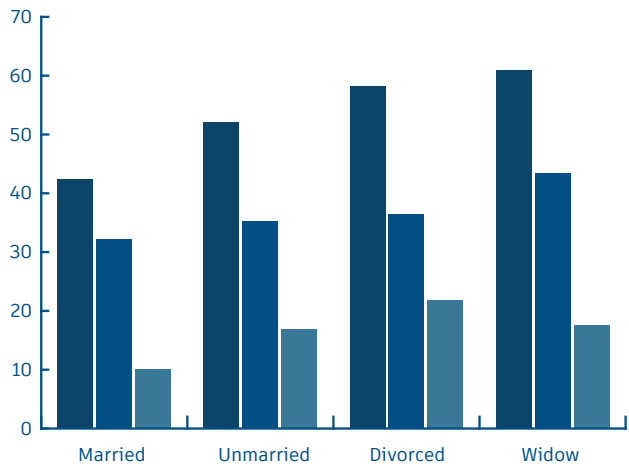
Loneliness in 2022
Based on civil status

Figure 15. Loneliness based on civil status. Adapted from VZinfo (2024).

Additionally, figures 12-15 demonstrate how loneliness is both apparant through all layers of Dutch society *and* also more prevalant in specific demographics.

First of all, there is a clear correlation in regards to income groups: lower income levels have a higher percentage of experienced loneliness. In terms of age groups, loneliness is most apparant within young adults and, at the other end of the table, senior citizens. Loneliness is also more apparant in more urbanized regions like Amsterdam and the Rotterdam - The Hague metropolitan area. Lastly, in regards to civil status, there is more experienced loneliness within those that are not married, divorced or widowed as opposed to those that are married.

Summary
Statistics on loneliness show that experienced loneliness is visible through all layers of Dutch society, and that this has been growing for the last decade. Furthermore, loneliness is experienced more often in demographic groups that can be considered to be more vulnerable, like those with a lower income, the divorced and widowed, and young adults and the elderly.

How are loneliness and architecture related?

The previous subsections have shown the societal relevance and urgencies behind loneliness, at least in the Dutch context. This final subsection will look into how, according to literature, loneliness may be related to architecture and the built environment. To do this, we may firstly establish the role of architecture and the built environment in our lives in general.

Built environment and architecture

The built environment can be widely defined to be 'all human-made surroundings that provide the setting for human activity' (Kaklauskas & Gudauskas, 2016), or somewhat more concretely, 'the human-made space in which people live, work, and recreate on a day-to-day basis' (Kong et al., 2020). The built environment therefore undeniably encompasses large parts of most people's daily lives. Architecture, as the art or science of constructing elements within the built environment, then does this as well - albeit by proxy: with the average person probably spending between 85 to 90 percent of their time indoors (Atlas Leefomgeving, 2024; UK Parliament, 2023; Roberts, 2016), human-made (building) structures are designed to help shape the (daily) lives of most people. For now, we will consider the built environment to be synonomous with architecture in regards to its relationship with health, as we may consider architecture to involve the way we have constructed and shaped the built environment.

The influence of the built environment on health

Most of our daily lives are not only shaped, but also influenced by the built environment. The relationship between health and the built environment for example has been suggested in numerous studies. According to Roof and Oleru (2008), the way we use land and build our environment has 'significant impacts on individual and population health, safety and well-being'. Rice and Drane (2020) state that since we spend so much time indoors, 'the design of buildings can greatly impact on human health'. Sallis et. al (2012) mention that, especially in

developed countries where the amount of physical activity is below par, modifications in environments are necessary in a response to the fact that 'characteristics of the built environment […] have been related to rates of chronic disease and mental health'. These statements were based on studies by numerous researchers: Green (2004) has for example stated that our modern urban environment 'discourages people from undertaking physical activity', and as a result, many North Americans living in city centers have become overweight, leading to diseases like diabetes and heart disease. Sturm and Cohen (2004) identified these same complications, but from suburban sprawl instead of living in city centers. Papas et al. (2007) report a 'statistically significant positive association between some aspects of the built environment and obesity'.

We can conclude from this that there seems to be quite some evidence that links health factors like obesity and heart disease to the built environment (often through the absence of physical activity). Additionally, there seem to be some links between mental health and the built environment as well. However, the connection between the built environment and loneliness remains unclear.

The influence of architecture on loneliness

The built environment and architecture shape most people's day to day lives: 'Architecture creates the setting in which life is led' (Forty, 1995). According to Larkin, urban space and its socio-technical infrastructures 'generate the ambient environment of everyday life' (2013: 328). Nieto and Eubio do not go as far as to say that there is a direct correlation between loneliness and the built environment, but do state that 'given the multifaceted characteristics of the causes and consequences of loneliness, from psychological to political aspects, it seems evident that it has a tangible reflection on spatial arrangements.' (Nieto & Rubio, 2021). Imrie suggests that elements in the built environment serve not only their technical infrastructural purpose, but that they are vital in 'people's life opportunities, to meet, to mix, and be part of a broader polity of

shared interests' (2017), further stipulating on the connection that Nieto and Rubio have posed, but still not yet suggesting a direct correlation.

Bower et al. (2023) suggest that practices in the built environment may influence loneliness, but that further research is required to determine the relationship between specific aspects. A more targeted study performed in the Netherlands has suggested some factors in the built environment that may negatively influence loneliness, like living in an apartment, or satisfaction with the amount of amenities in one's neighborhood (van den Berg et al., 2016). They also suggest that the use of transport modes - and therefore, increased mobility, reduces loneliness significantly, which has also been supported by research from Domènech-Abellaet et al. (2019). According to Lyu and Forsyth (2021), a 'supportive built environment can potentially help reduce loneliness'. They elaborate on this statement by posing that a better availability of amenities and better walkability both have the potential to reduce loneliness, as well as better access

to green space (although they also state that more research may be required to conclude this). The availability of proper public transport was also an indicator of reduced loneliness. Gijsbers et al., who specifically studied loneliness in young adults, found that aspects of the built environment were able to significantly impact loneliness, and recommend that public spaces be made highly accessible - especially by foot - and that housing is provided with shared facilities, rather than being single person studios (Gijsbers et al., 2024).

Returning to Imrie, the necessity for affirmative infrastructure may be considered. Imrie (2017) defines this as infrastructure that has the potential to shape spaces that enable people to be present and interact. This may refer to elements in public space that would lower the threshold for social interaction, like wider sidewalks to walk side by side on or benches along certain paths. Imrie notes that this will not neccessarily solve loneliness from itself, stating 'none of this can guarantee that particular socio-psychological and emotional conditions will be alleviated'.

This may, along with the other evidence given, be the most important takeaway from this literary review. As a social and personal issue, loneliness may or even can not simply be resolved by interventions within the realm of the built environment. However, by implementing interventions that offer the instruments for increased social interaction, feelings of loneliness may be reduced or limited for a larger portion of a specific population.

Publications on designing for social interaction

The specific ambition to lower thresholds and increase social interaction within housing projects has been gaining attention within the Dutch context. In recent times, numerous publications, theories, and visions on how to accomplish this have been released. Examples are the guidebook for designing for interaction by WoonIn (2025), a different publication on desiging for interaction by Platform31 (2022), and a bundle of visions for the living environments of tomorrow (Ministry of Housing and Social Planning, 2025), highlighting the increasing relevance of the subject.

Figure 16. Different Dutch publications on designing for interaction.

Summary

Although literature has proven that there is *some* evidence that suggests a correlation between the built environment and loneliness, several studies also suggest that more research is required to establish more conclusive evidence. Through this part of the literature review, **no conclusive evidence** will link the built environment to loneliness. However, the following has at least been discovered from the research on loneliness.

First of all, it has become clear that loneliness is indeed a societal urgency, at least in the Dutch context: it affects people through all layers of society, and in particular has the ability to affect those with a more vulnerable position in society, like young adults, the elderly, and in general, low income groups.

Secondly, the research has shown the negative consequences that may be a result of loneliness. These may bring about more physical and mental diseases and complications, ultimately putting stress on the Dutch healthcare system.

Thirdly, it can be concluded that loneliness can not be solved for everyone, and certainly not through simple design interventions that do not take into account local contexts. However, implicating solutions and interventions that offer more opportunities for interaction may in fact prove to be helpful to remedy loneliness.

Where to go from here?

The following section will focus on a new theme: cohousing. Cohousing as a form of dwelling is focused on sharing - whether it to be sharing ideologies, investments or space - and may therefore prove to be a favorable type of housing to learn from in regards to lowering thresholds to sharing and social interaction. A case study analysis in chapter three will categorize the good practices that come from these projects. Along with the knowledge that has been acquired in regards to loneliness, this information, along with the takeaways and strategies on the next page, will be tapped into to support decision making in the eventual design project.

Takeaways and strategies

1. Focusing on reducing loneliness through housing
Loneliness is a societal problem. Focusing on housing design that tries to reduce loneliness can help mitigate this societal issue.

2. Offering a thought out variation of typologies
Different types of people have different desires in terms of preferred social interaction. Therefore, developing a variety of housing typologies that fit people with different personality types may prove to be a more inclusive solution to remedying loneliness.
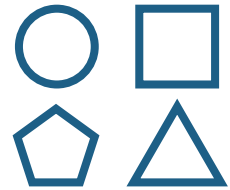
3. Lowering thresholds for interaction
Loneliness can not be solved through architecture alone, but architecture may help within the right context. Designing with the intention of lowering thresholds for social interaction is the most straightforward instrument to achieve this.

4. Designing with consideration of the future.
Loneliness is multidimensional, with the element of time playing an important role. Designing housing that offers people the chance to live in one area for a longer time will reduce the chance of people feeling more lonely in the future.

Cohousing

What is cohousing, and what types are there?

Cohousing exists in many forms. Even the spelling of the term itself is disputed, as 'co-housing' and 'cohousing' are both common in literature and dictionaries. In this report, the spelling of 'cohousing' is used, as it seems to be most common within literature and sources from practice, like the Canadian *Cohousing* Network, the *Cohousing* Association of America, the UK *Cohousing* Network, and *Cohousing* Australia (Canadian Cohousing Network, 2025).

Cohousing may refer to several types of housing and living. There are numerous (slightly differing) definitions. Most, like Cambridge Dictionary and Merriam-Webster, define cohousing as a way of living that includes some form of **physical sharing** - like sharing facilities, space, and items (almost always along with also allowing for personal space). This is the basis for cohousing. In addition to the sharing of tangible aspects like sharing facilities, space, and items, some types of cohousing

have an additional focus on the sharing of intangible aspects, like **sharing ideas or investments.** This for example refers to cohousing projects that are developed within the framework of certain ideologies or financed by a group of people beforehand. Within this report, the following four subdivisions have been made within the umbrella term of cohousing: the management and housing cooperative, the CPO, and the community land trust. Figure 17 shows how these types of cohousing are positioned in terms of power and responsibility for civilians, government and the market.

Cooperatives

In the Netherlands, cooperative housing is a relatively uncommon practice, but not a new one: the first forms of cooperation originate from the 1860s (Time To Access, 2024). Cooperatives in general can be seen as initiatives that focus on collective living with some degree of ownership or control of a collective's living environment

Figure 17. Types of cohousing, and their relative power position in terms of civilians, government and market. Adapted from Lengkeek & Kuenzli (2022)

(Volkshuisvesting Nederland, 2024). In this, there is a distinction between the management cooperative and the housing cooperative.

The management cooperative

Management cooperatives are set up mainly to transfer a significant amount of control and management over from a housing corporation to a living collective – the renters (Lengkeek & Kuenzli, 2022, p. 92). This means that ownership still lies within the corporation, but inhabitants – the renters – have the chance to take control of living aspects that they are interested in through their management cooperative (which is often officially an association in legal terms). Now, they may have a say in what their living environment should look like (in the case of a newly built development), they may decide upon the division of rent and they may even decide upon who may inhabit their project.

An example of a management cooperative in the Dutch context is the *Woningbouw Vereniging Gelderland*. Their ambition is to

offer high degrees of involvement, liveability, sustainability and social engagement within their projects (WBVG, 2024). Because they work within the realm of social housing, these ambitions should be obtainable within affordable living environments.

These ambitions are honorable, and objectively do have a chance in succeeding. After all, allowing for renters – who would usually have no say or power – to take control and appropriate their living environments may increase feelings of responsibility and social cohesion (Platform 31, 2019). There are however also risks and downsides. First of all, costs may not necessarily be reduced when responsibilities are transferred to residents, as this takes some work and may result in lest cost effective solutions (Platform 31, 2019). Furthermore, placing responsibilities like awarding residences into the hands of the current residents may result into more closed, exclusive communities.

The housing cooperative
Whereas management cooperatives focus on control without actual ownership, housing cooperatives strictly distinguishes itself because *all rights* fall to the collective For this reason, the right of ownership and all financial aspects related to ownership fall into the responsibilities of the cooperative. Effectively there is no more working of the market and no more speculation, as projects are set up without the intention of turning a profit or even selling real estate at all once the project has been completed (Lengkeek & Kuenzli, 2022, p. 93). As a result, housing cooperatives symbolize a form of housing that does not see housing as a commodity but as a human right, offering financially equitable possibilities to resolve housing demand (Delz et al., 2020, p. 5).

One of the few examples of completely independent housing cooperatives in the Netherlands is the *Amsterdamse Coöperatieve Woningvereeniging 'Samenwerking'*. This cooperative is focused on improving the living situation in Amsterdam for its 4000 thousand members, of which a quarter rents within their stock of real estate (Samenwerking, 2024). Housing cooperatives have a

clear disassociation with the workings of the market, and this non commercial identity makes the housing cooperative in theory a very favorable alternative for offering affordable housing. There is however a remark to be made about why the cooperative may actually be a less inclusive housing solution. The reason for this that - usually - a personal investment is required to start or be a part of a cooperative, which then seeks additional investments from banks and other institutions to finance a cooperative housing project (Lengkeek & Kuenzli, 2022, p. 14). The housing cooperative therefore often only offers an affordable housing solution for those that have the time and at least some private equity to invest into a housing project. Since in 2024, almost two of the eight million households in the Netherlands for example had private equity worth less than €5000 (CBS, 2024), this would immediately disqualify a significant portion of Dutch households to participate in such a project.

CPO
CPO - *Collectief Particulier Opdrachtgeverschap* - is the Dutch term for Collective private commissioning, which is a type of housing project development in which future residents function as a collective commissioner for the housing project itself (Bouwen in eigen beheer, 2024). In the Netherlands, the CPO is relatively common, and a growing number of housing projects is developed through this method. Because the CPO allows for a significant amount of collobaration between future residents and developers, CPO projects have a lot of potential in terms of increasing the quality of living aspects like sustainability and social cohesion (Lengkeek & Kuenzli, 2022, p. 14, p. 94). However, CPO's are organized in such a way that participants arrange their investments for the project independently - like financing individual homes with individual mortgages. Because of this, ownership remains on a private commercial level, and does not evade the principles of the market - making this form of cohousing not necessarily more affordable than contemporary housing solutions. Additionally, the costs of those facilities that are shared often come on top of the costs of mortgages.

Community land trust

The community land trust, or CLT, is not strictly a form of cohousing, as it focuses on developing plots of land for both housing *and* other purposes (Community Land Trust Nederland, 2024). However, housing with a focus on collectivity can definitely often be considered to be one of the goals of the CLT. The CLT namely focuses on forming a **community** of involved residents, users, developers and local government to collectively take control and have a say in a plot of land. The **land** will be extracted and removed from the market, which takes market speculation from the equation and prevents surges in land values, offering opportunities to develop on this land in an affordable fashion. The **trust** is based on the expressed ideologies for the land use, like sustainable and affordable developments, which is recorded in the *statuten*: the articles of association (Lengkeek & Kuenzli, 2022, p. 96). Although this type of co-development is still in its preliminary stages in the Dutch context, it may allow for a more inclusive approach to cohousing than projects with own investments, like CPO's (Jansen, 2021).

Takeaways

Most definitions for cohousing only address the sharing of *tangible*, physical elements. However, in legal terms, we have seen that we can define four types of cohousing that are subdivided through the way *intangible* aspects, like sharing ideas or investment, are organized. In this, there are some critical differences that can be distinguished. These mainly concern the degree of ownership, and as a result of this, the necessity for individual investment.

In terms of loneliness, those most affected are those from vulnerable demographics - among others: people from lower income groups, lower levels of education, young adults, and the elderly. Cohousing that is meant for these groups *must* be financially inclusive in order for it to be viable.

Where to go from here?

This subsection has defined cohousing projects based on their legal make up. The following subsection will assess cohousing as a spatial concept, showing how cohousing projects may be analyzed in a spatial sense.

Overview

Management cooperative

Ownership and control
Management cooperatives usually work in collaboration with housing corporations. The corporations maintain ownership of the project, while the cooperative takes over management.

Advantages
No investment is needed from residents to participate.

Disadvantages
Is not necessarily more affordable than conventional social housing as this is usually less cost efficient.

Housing cooperative

Ownership and control
The cooperative takes full control of all rights and decision making.

Advantages
Projects become non-speculative, increasing affordability.

Disadvantages
Investment of private equity is almost always required, making these projects less inclusive.

CPO

Ownership and control
The buyers association takes full control with collective rights and decision making. Financial contributions occur independently, e.g. through private mortgaging for an individual's home.

Advantages
Participation occurs during design process, improving design quality.

Disadvantages
Investments and ownership is maintained per individual dwelling, which keeps it speculative.

Community land trust

Ownership and control
Residents, developers and government take joint control.

Advantages
Land is extracted from the market and made more affordable.

Disadvantages
Many parties are at play, making it harder to come to decisions that suit all and don't exclude some.

The spatial side of cohousing

Cohousing projects exist not only in different legal terms, but also in different spatial shapes and sizes.

The smallest may consist out of a single shared living unit, like the 'Shared micro living' apartment that Miel Arquitectos & Studio P10 have designed in Barcelona (figure 18). This apartment hosts two live-work spaces and a central communal kitchen whilst only being 65 m² in size (Howarth, D., 2014).

On the other end of the spectrum, some cohousing projects form entire communities. These can exist in different typologies. There are so-called ecovillages for example. The Ecovillage in Ithaca (US, New York State, figure 19) is one of the largest cohousing communities in the world, spanning 175 acres and inhabited by over 200 people (Ecovillage Ithaca, 2024).

Urban oriented typologies of this scale also exist. Take for example the cohousing block of Kalkbreite in Zürich (figure 20), which houses almost 250 people within 82 apartments (Kalkbreite, 2024).

It is clear that cohousing projects may vary strongly in size. Still, there is one particular thing that cohousing projects all have in common: the focus on sharing - whether it to be sharing space, objects or amenities. This is something that happens throughout all scale levels, but also has strongly differing characteristics on different scale levels. Within the apartment in Barcelona for example, two 'households', most likely consisting of 1 or 2 people, share a central kitchen. In Kalkbreite however, one of the apartments consists of a cluster of up to fifty residents, who all share a number of kitchen units within this unconventionally large group of people (Kalkbreite, 2024). Undoubtedly, the scale level on which sharing (certain) spaces, objects and amenities occur, greatly influences how sharing happens, and what kind of sociospatial effects it may yield. Understanding how sharing works on different scale levels may therefore give interesting insights.
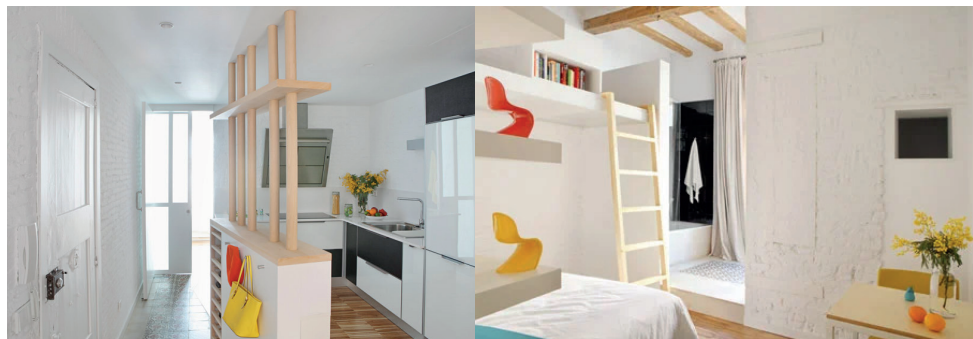
Figure 18. 'Shared micro living'. Miel Arquitectos & Studio P10. Barcelona, Spain.

Figure 19. Eco village Ithaca. New York State, USA.

Figure 20. Kalkbreite housing cooperative. Müller Sigrist Architekten AG. Zürich, Switzerland.

How can we analyze cohousing case studies?

Cohousing projects have been shown to vary strongly in organisational and spatial configuration. Three indicative methods have been selected to analyze these projects in terms of their ability to stimulate social interaction. These three methods are related to:

· Planned versus unplanned social interaction, based on a publication on designing for interaction (WoonIn, 2025)

· Interaction on different scale levels, based on another publication on designing for interaction (Platform31, 2022)

· Sharing and collectivity on different scale levels, based on the principles of the Wijkgedachte (Doevendans & Stolzenburgh, 1988)

·

Planned versus unplanned social interaction

Theory on 'planned versus unplanned interaction' comes from the *Handboek Ontwerpen voor Ontmoeting*: a publication that investigates how to stimulate social interaction within housing developments (WoonIn, 2025).

Unplanned social interaction within this context relates to moments in which residents of a housing complex meet each other without the intention of doing so. This usually occurs within the circulation spaces of a housing development, like the staircases that lead to different dwelling floor levels. It could potentially also occur within parts of the private dwelling; for example from one private balcony to another, or perhaps from inside a dwelling towards a circulation space: for example, from a gallery that looks into a dwelling.

Planned social interaction relates to moments in which residents (and others) purposefully intend to meet others. This then usually occurs within spaces that have a collective function, like a collective courtyard.

The publication suggests that different parts of (the routing through) a complex have differing importance for the type of interaction. In terms of lowering the thresholds to social interaction, it is often the unplanned social interaction that may have a

hidden role in this. Spaces where this interaction happens, like the entrance of a complex or the circulation space (figure 21, are therefore definitely relevant to investigate - in addition to dedicated spaces for social interaction.

Figure 21. Unplanned versus unplanned interaction. WoonIn, 2025

Interaction on different scale levels

A different publication on designing for social interaction comes from Platform31 (2022). This publication includes a large number of reference projects and studies that showcase the potential and possibilities of enhancing social interaction,

organized within different spatial scales. These range from the neighborhood to the size of the individual dwelling (figure 22).

Figure 22. Interaction on different scale levels. Platform31, 2022

The aim of the publication is to showcase how the design of housing and living environments can positively contribute to making neighborhoods more self-reliant, as it suggests that everyday interactions and brief meetings between residents are very important for increasing sociale network.

The principles of the Wijkgedachte

The *Wijkgedachte* is an urban design principle which originally found its roots in 1920's United States, and moved to the Dutch context after the second world war (Doevendans & Stolzenburg, 1988, p. 9).

During the post-war period, architects among others started focusing on creating a world in which spatial and social division as a result of religion, societal position or stage of life would cease to exist (Canon van Nederland, 2024). To achieve this, the focus was shifted towards creating new types of communities that were focused on spatial organisation and hierarchy based on different scale levels: from the individual, to family (esentially the dwelling, when considering the nuclear family), block, neighborhood, all the way up to the city (figure 24). A dedicated number of people and dwellings would be linked to these different scale levels. Amenities would then be linked based on these numbers and their relevance to each scale level.

W.F. Geyl, who was a major propositioner of the *Wijkgedachte*, described some of the spatial properties that would ideally occur as a result of implementing the principle as folllows (W.F. Geyl, 1946, p. 17):

> The neighborhood has certain functions that support daily life, and is in particular for younger children the first environment outside of the family that is important for their development. At the core is a kindergarten with a group of stores nearby, so that the mother of the house could bring their child to school and, without a loss of time, run her errands. [...] Moving from the

Figure 23. Advertisement for the idea of the Wijkgedachte, from W.F. Geyl's report (Geyl, 1946).

home to the neighborhood core will never exceed a five minute walk. There could be other amenities if needed, like a café, washing house, day car or garage. Through central grouping, the clarity of the neighborhood organisation remains, whilst also becoming more purposeful.
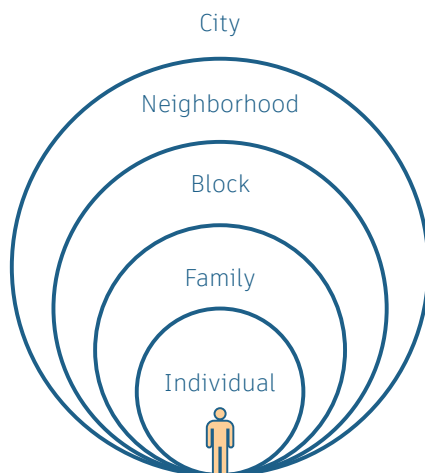
Although this description has a rather rational and organisation oriented perspective, Geyl also underlined the positive social

Figure 24. Spatial hierarchy based on different scale levels. Adapted from Doevendans & Stolzenburgh (1988)

consequences that would follow from this, which were also definitely at the core of the principle:

> Socially, the neighborhood is a unity in which people can get to know each other relatively well, where people visit and talk to neighbors, where people borrow things from each other or watch eachothers children. This might sound rather ordinary, but still, these types of personal contacts […] have great importance for the emotional side of life; for raising youth it is definitely important to not grow up in an atmosphere of isolation, but in a community.' (Doevendans & Stolzenburgh, 1988, p. 21)

The principles of the Wijkgedachte as envisioned by Geyl and others were not undisputed, as opposers rather quickly suggested that the neighborhood could not be seen as an isolated part of society - in particular as the post-war increase of general wealth allowed people to access more than just their neighborhood (Van der Lans, 2007).

However, the basic concept of social and spatial hierarchy, and their importance in attempting to create a stronger sense of community, is still an interesting approach that may be transferred to modern day design principles.

Takeaways and strategies

1. Determining the form of cohousing early on
Cohousing exists in a number of different legal terms, that each have their own implication on affordability and inclusivity. Within design, it is important to consider early on which form of cohousing a project is expected to be, as this will influence the target group(s) envisioned for the project.

2. Considering the size and typology, and its impliciations
Cohousing exists in a range of sizes and typologies. These factors will greatly influence in what ways people interact with each other, how people share spaces and amenities, and in turn influence in what ways these projects may help to reduce loneliness.

3. Analyzing sharing and interaction in cohousing projects
Social interaction may take place in different parts of a housing project, and may be planned or unplanned. On different scale levels, different interventions may incite interaction - especially seeing that space, amenities, and objects in cohousing projects are shared on strongly differing scale levels. The scale level, or amount of people you share something with, influences the way someone uses or experiences sharing and the coinciding degrees of interaction.

Case study analysis

Aardehuizen in Olst (Own image)

Case study selection

For the case study analysis, nine housing developments have been selected that all fall under one of the four types of cohousing that have been described within the cohousing segment of the literature review. Some of these projects have also been visited, others have been investigated through desk research. The projects vary in size and context, but stay within the following paramters. In terms of size, each projects varies between the size of a housing cluster and a

Aardehuizen
Olst

IEWAN

Boschgaard

Centraal Wonen
Bagijnhof 13
Oude Nieuwelaan

Within the Netherlands

housing block. In terms of context, each project has been developed within the western European context. In this, three projects in Delft have been chosen, as the design location will also be in Delft. Three projects in the Netherlands have been chosen, to showcase innovations in cohousing that have worked in the Dutch context. Lastly, three projects in a broader European context have been chosen because of their placement in countries that are further developed in terms of the number of *and* innovation in cohousing projects.

Structure of analysis

The main research question of the research is: 'In what ways can the **architecture of cohousing** contribute to reducing **loneliness** and its negative health effects?'. The literature review showed that a definitive answer to this question will not be found within this research alone. Some conclusions could however be made from this research. For example, that housing that offers diversified living typologies, lowers thresholds for social interaction, and is focused on long term habitation, may work favorably for reducing loneliness. For now, the research will focus on how to learn from cohousing case studies as good practices of housing that fulfills (some of) these goals. The case study analysis is meant to understand a number of aspects. More general aspects like context and type of cohousing, but more importantly, spatial aspects like circulation principles and the degree of collectivity. The methodology for the analysis can be found on the right.

What?

Basic project information
Location, year of completion, legal form of cohousing, number of dwellings, number of residents, urban context

Circulation principles
Entry from public space, horizontal circulation, vertical circulation, visual connection between circulation and dwelling

Collectivity
Shared spaces, amenities, objects

Degrees of collectivity
Relationship between shared spaces, amenities and objects and scale on which these are or are not shared (neighborhood, block, cluster, household, individual level)

Why?	How?
To get an understanding of the basic properties of a cohousing project. As mentioned before, context is key: the legal form, location and size of cohousing strongly determines what kinds of demographics a project is targeted for.	Gathering project data through the architect, websites, news sources, etc.
Unplanned social interaction is largely influenced by circulation, and therefore, understanding how circulation is organized will give a better understanding on the potential of unplanned interaction.	Analyzing floor plans, sections and other data
How much collective space there is - and on which scale level - will strongly determine the amount of planned social interaction in a project.	Analyzing floor plans, sections, imagery and other data
Understanding the overall organisation of a project, and how different spaces are linked and have differing degrees of collectivity (based on scale levels) will help give a complete overview of the workings of a project in terms of sharing.	Redrawing floor plans and sections and determining key spaces within the project that showcase (innovative) ways of interaction and sharing on different scale levels (based on principles of the Wijkgedachte)

Definitions

Some definitions that will be used within the case study analysis, like that of 'planned versus unplanned interaction' and sharing based on the principles of the wijkgedachte have been covered in the literature review (within the section on analyzing case studies). On this last definition some further elaboration is warranted, as the principles behind spatial hierarchy stemming from the Wijkgedachte have been altered somewhat to better fit this particular case study analysis. Figure 25 shows the difference between the two.

The social unit versus the household

The Wijkgedachte showed principles behind spatial hierarchy (figure 25.1) that fit the Dutch post-war housing zeitgeist. In this, in particular the household composition may have been fairly monotypical, consisting of a single family living together in one dwelling. Within cohousing, the definition of 'household' to mean a family living together in a dwelling (Cambridge Dictionary & Merriam-Webster, 2025) does not always make sense. Many cohousing projects consist of dwelling typologies that house groups of people that are not necessarily related to each other: like Merriam-Webster's second definition, the household can also represent 'a social unit composed of those living together in the same dwelling'. It becomes hard to then define what 'living together' actually means, when certain aspects that are related to living - like sleeping, eating, washing and socializing - are shared with different amounts of people: for example, in a form of cohousing where you share a bathroom with less people than you share a kitchen with. For this reason, the 'social unit' within figure 25.2 will be determined by the *maximum* amount of people a person shares the following with:

- a bedroom (sleeping);
- a toilet/bathroom (washing);
- a kitchen (eating);
- if appliccable - some sort of living room (socializing, relaxing etc.).

This means that if a person shares a bathroom with one other person, but a kitchen + living room combination with 7 others, the social unit will be considered to be 8 people.

The 'household' in this example relates to the amount of people a person lives and may have a conventional relationship with, be it a romantic relationship or a genetic relationship. Therefore, in the previous example, if a couple lives together in a housing unit, where they share a kitchen + living room combination with 6 others, the 'social unit' will be considered to be 8 people, while the 'household' will be considered to be two people.
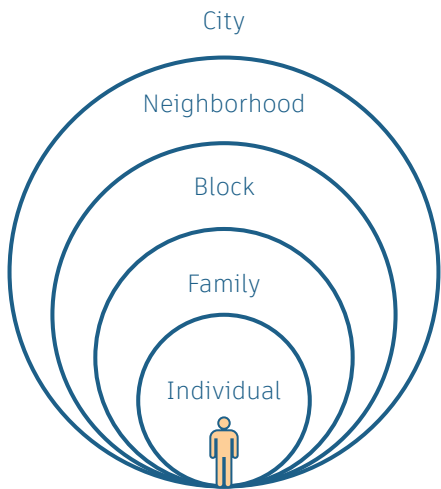
1. Spatial hierarchy based on the principles of the Wijkgedachte
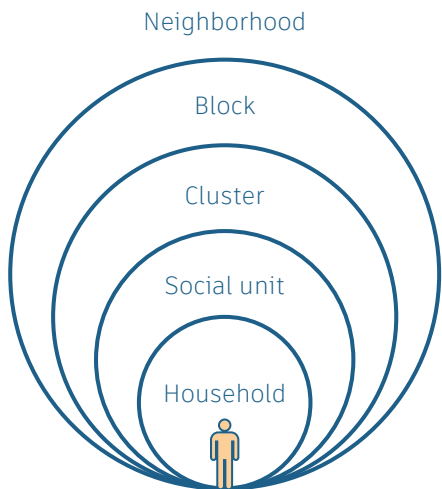
2. Spatial hierarchy that will be used to analyze case study projects

Figure 25. Spatial hierarchies. Adapted from Doevendans & Stolzenburgh (1988)

Centraal Wonen

Location	Delft, Zuid-Holland, the Netherlands
Year of completion	1981
Type of cohousing	Management cooperative
Number of dwellings	175 rooms
Number of inhabitants	~100

Description

Centraal Wonen Delft Tanthof started as an innovative, corporation driven, experiment to rethink the way people live together and share amenities on different scale levels, countering the traditional organisation of the nuclear family. According to architect Flip Krabbendam: '[...] in the 70s, the concept of living within the nuclear family was up for debate. The nuclear family is too much like a prison, and we ought to give people a broader form of living environment' (from his interview with Open Rotterdam, 2021). Krabbendam worked with the idea of a tree structure, where each scale level has its own context, users, amenities, etc.

'Public square' of Centraal Wonen (Own image)
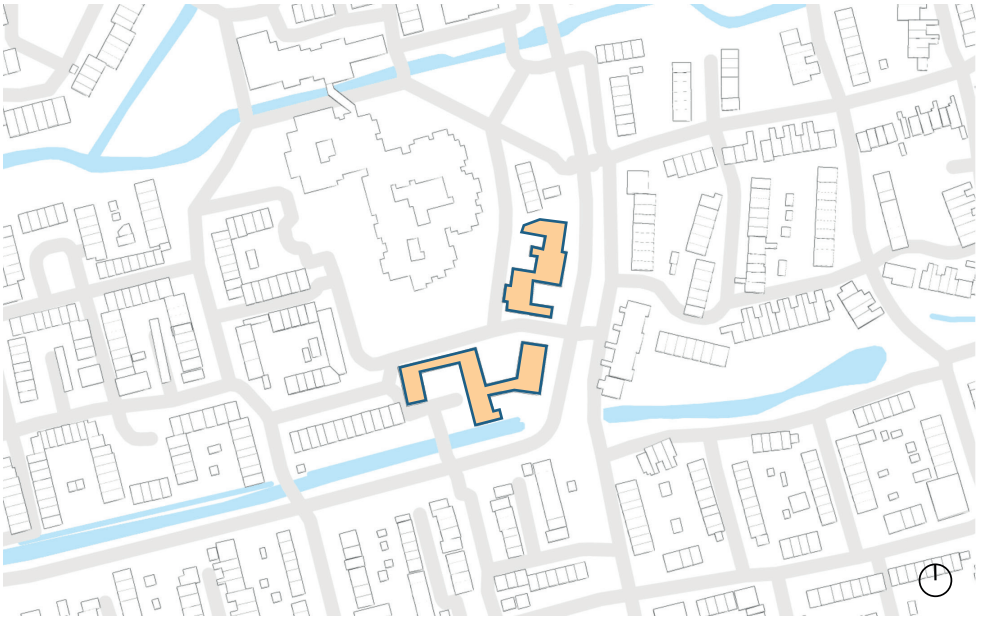
Circulation

The complex consists of 4 different clusters with their own entrances. There are central corridors running through each ground floor of each cluster. Residents rent one or multiple rooms, which do not necessarily have to be placed next to each other, which may mean that a shared hallway is part of one's route from bedroom to home office. On a larger scale, there is a pedestrian path that extends from a bridge south of the complex. Through this, the complex becomes part of a pedestrian route through the neighborhood of Tanthof.

Collectivity

There is a large focus on sharing amenities on a range of specific scale levels. Many residents share a pantry (including a bathroom) with one or two others. Within a group of about eight, residents share a living room and kitchen combination. Within the cluster of thirty, residents share storage spaces and a garden, as well as a laundry room. Some amenities, like the public square, the communal gardens and the café, are shared by the entire complex. It is clear that there's an intricate dispersion of sharing through different scales.

Degrees of collectivity

	Neighborhood	Complex square (1)
	Block	Meeting room / café (2)
		Communal garden (3)
		Workshop (4)
	Cluster	Laundry room
		Garden (G)
		Bicycle storage
	Social unit	Kitchen (K)
		Living room (L)
		Pantry (P)
	Household	Bedroom (B)

Complex square

Garden

Communal garden

Kitchen

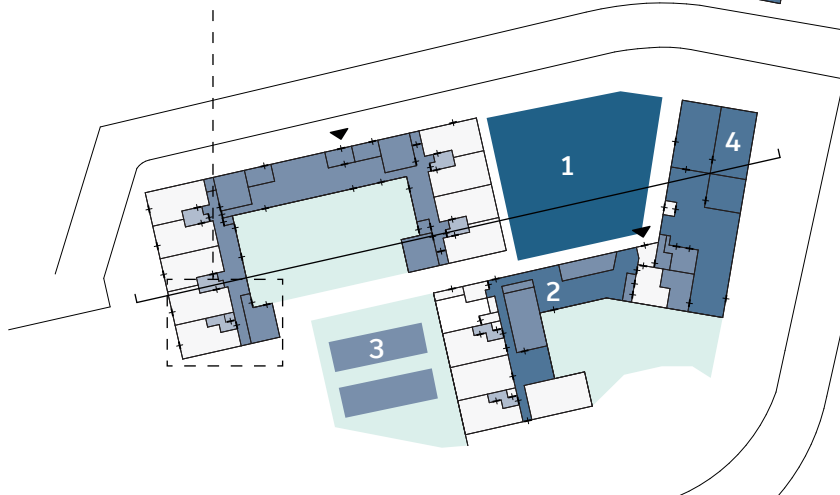(Centraalwonendelft.nl, n.d.)
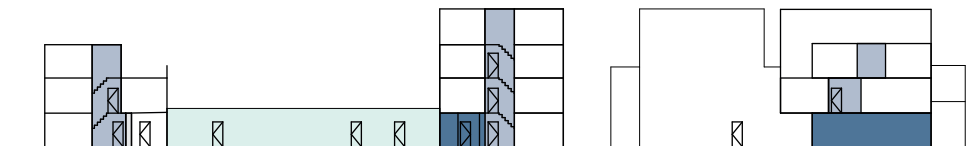
Bundle of pantry, stairs and
toilet is shared by 2-3 people
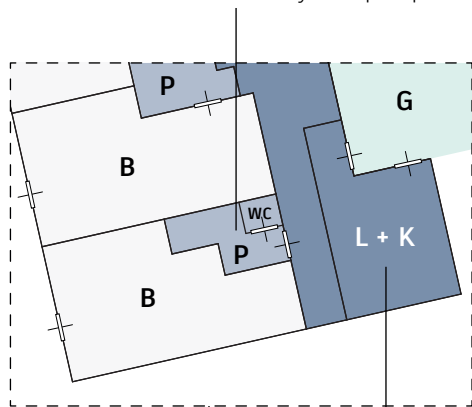
Communal storage spaces

P

B

WC

P

B

G

L + K

Living kitchen is used
by group of ~8 people

1

4

2

3

0   10   20   30   40   50 m

Adapted from centraalwonendelft.nl

Oude Nieuwelaan

Location	Delft, Zuid-Holland, the Netherlands
Year of completion	2005 (year of purchase of dwellings)
Type of cohousing	Housing cooperative
Number of dwellings	4
Number of inhabitants	~30

Description

The dwellings on the Nieuwelaan in Delft are over 100 years old, stemming from 1912 (BAG Viewer, 2025). In 2005, a collective decided to purchase six properties on this street (picture below) through mortgaging. The collective renovated the properties primarily through self-building. The ~30 residents now rent within one of four living groups as a means of paying back the mortgage loan. Each living group has its own ideas on living together, sharing and other aspects, Collectively, residents manage the complex all by themselves, essentially making this project a housing cooperative. In the beginning of the project, each resident was mandated to work at least 8 hours per month on the restauration and renovation of the project (Nieuwelaan.nl, 2024). Much is allowed, but children are not allowed to live in the Nieuwelaan.

Historical (1990) image of the Oude Nieuwelaan (nieuwelaan.nl, 2024)
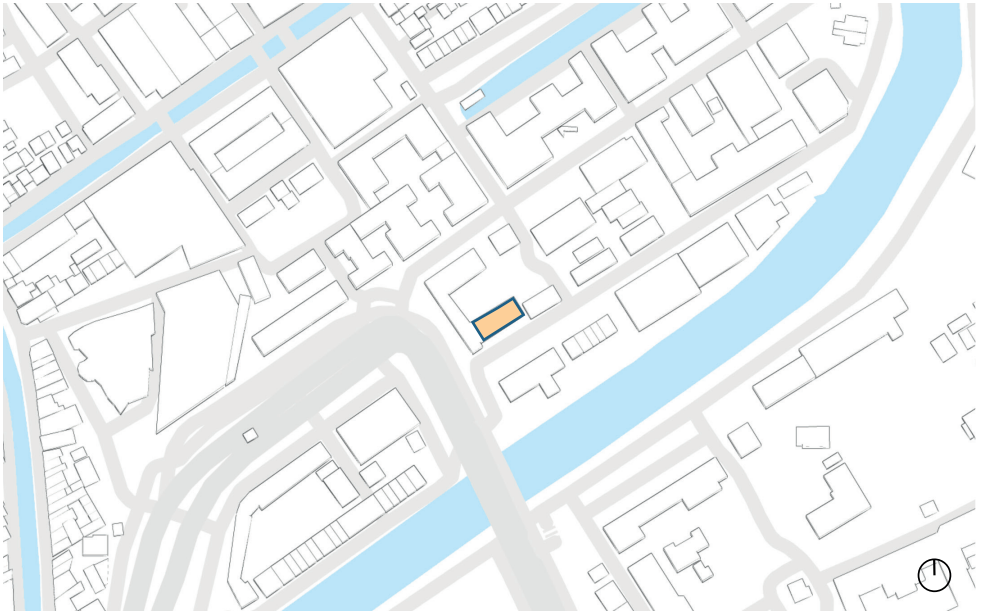
Circulation

Within the Oude Nieuwelaan there are four living groups with their own names and traditions. These have their own private entrances on the street side. Towards the back there is a central access to the collective garden
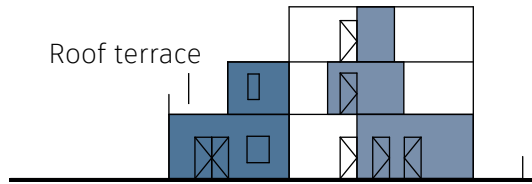
Collectivity

Most is shared within one living group, where there are toilets, bathrooms, a kitchen and living room, and even a roof terrace build upon additions that were completed after renovation. A few exceptions lie in amenities that are shared with the entire complex instead of just the living group. In the western most property, the collective kitchen is also used as meeting space for the entire complex - which may for example be utilized for a members meeting. Here, there also is a home cinema room. Lastly, the garden is open for the entire complex.
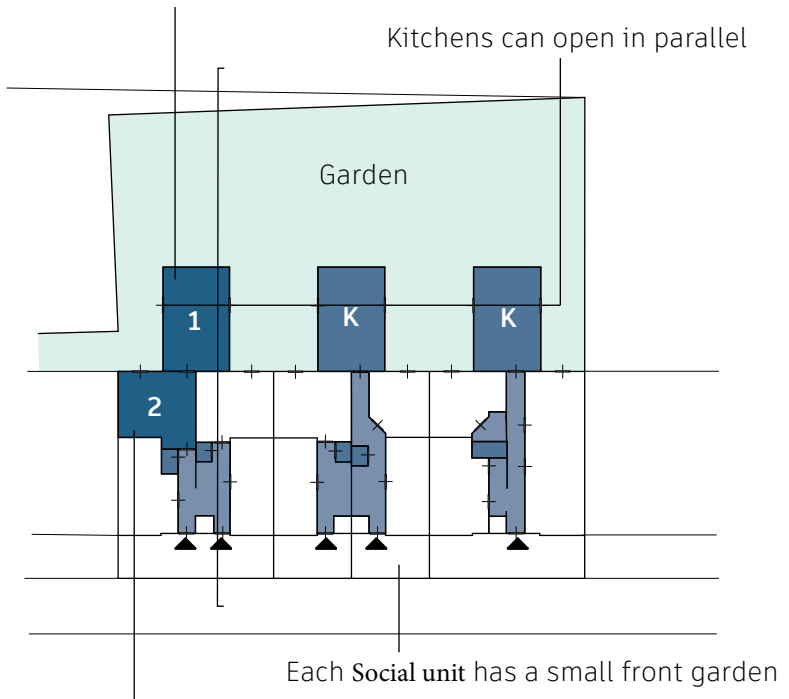
Degrees of collectivity

Neighborhood	-
Block	Garden
Cluster	Communal Kitchen (1)
	Home cinema (2)
Social unit	Roof terrace
	Kitchen
	Living room
	Bathroom
	Toilets
Household	Bedroom

The communal gardens (Rufus de Vries)

Roof terrace

Collective kitchen is
also used for meetings

Kitchens can open in parallel

Garden

1

K

K

2

Each **Social unit** has a small front garden

One room has a film projector and is used
as a home cinema for all

0   5   10   15   20   25 m
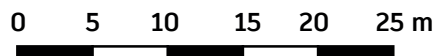
Bagijnhof 13

Location	Delft, Zuid-Holland, the Netherlands
Year of completion	1955
Type of cohousing	Management cooperative
Number of dwellings	1 (40 rooms)
Number of inhabitants	~40

Description

The Bagijnhof 13 in Delft used to be a nurses monastery for the nearby hospital (Collectief Wonen Delft, 2024). Now, it houses around fourty residents within the social rent domain. Additionally, seven rooms have been rented out as workspaces, making this complex a combination of a living and working environment.

Central staircase in Bagijnhof 13 (Collectief Wonen Delft, 2024)
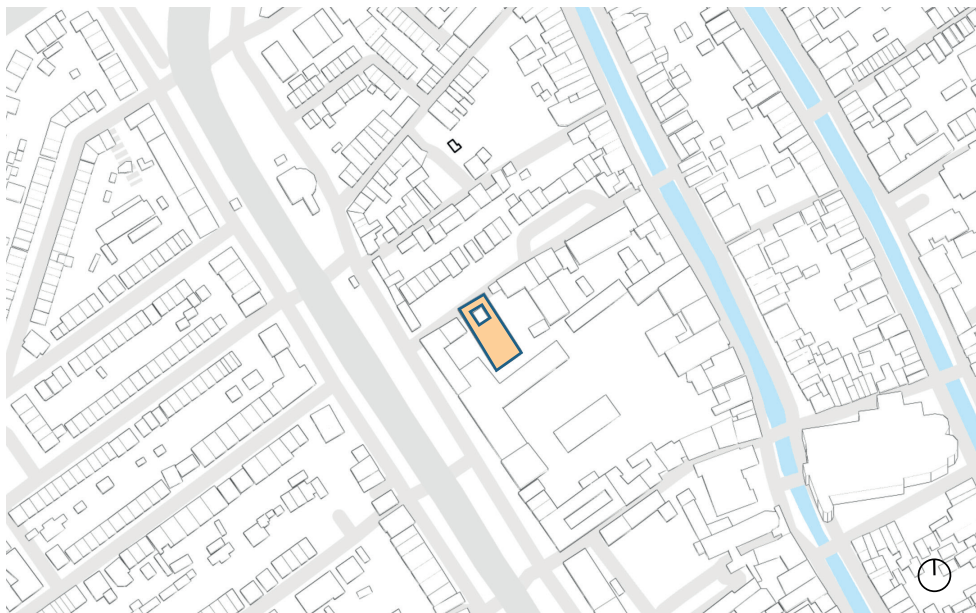
Circulation

The former monastery is characterized by a long central corridor that forms the connecting element between virtually all rooms. This corridor is positioned in line with the central entry on the street side in the north. The main vertical circulation consists of a centrally located staircase (see picture to the left).
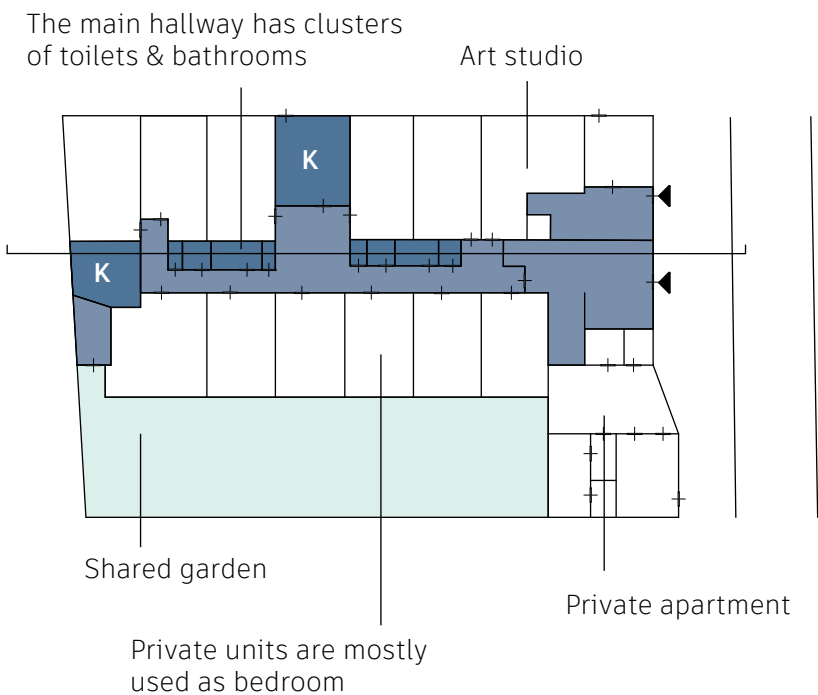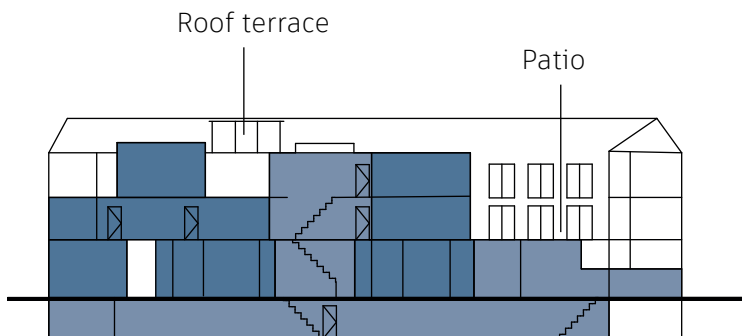
Collectivity

The floor plan organisation is very open, with kitchens, living rooms, toilets and bathrooms all situated along the central corridors. The seven kitchens help to determine the 'subgroups' that live together (Collectief Wonen Delft, 2024). Besides this smaller scaled level of sharing there are also several spaces that are specifically allocated to all residents, like storages, the patio and atrium space, and the roof terrace.

Degrees of collectivity

Neighborhood	-
Block	-
Cluster	Main hallway
	Garden
	Roof terrace
	Offices
Social unit	Kitchen (K)
	Bathrooms
	Toilets
Household	Bedroom (B)
	Apartment

The roof terrace (Centraalwonendelft.nl, n.d.)

Roof terrace

Patio

The main hallway has clusters
of toilets & bathrooms

Art studio

K

K

Shared garden

Private units are mostly
used as bedroom

Private apartment

0   5   10   15   20   25 m

Aardehuizen Olst

Location	Olst, Overijssel, the Netherlands
Year of completion	2015
Type of cohousing	CPO
Number of dwellings	23
Number of inhabitants	~75

Description

The Aardehuizen in Olst started as an idea from two people who had obtained knowledge about the low-tech development of earthships in Sweden, and wanted a similar project in the Netherlands (aardehuis.nl, 2024) After deliberation, a CPO project was set up and 23 earthships and a collective facility were developed, with a lot of help of and management by the future residents.

One of the earthship residences of the Aardehuizen (own image)
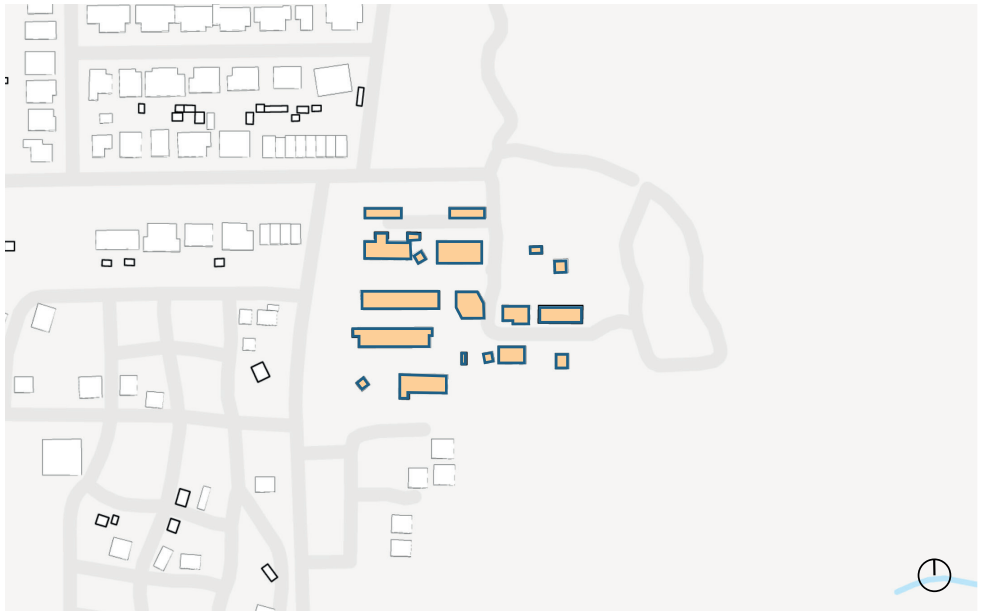
Circulation

There is a central entry to the plot situated on the north. The plot consists of 23 residences that are joined in groups of two, three or four, and the central 'Middenhuis' stands alone. Pathways meander through and along the grouped houses here, with dedicated front doors all situated on the south side.

Collectivity

The seperation between collective and individual is very strong in a spatial sense. Simply put, the dwellings are housed by typical households (families and couples mainly), and the 'Middenhuis' is the one central communal building. Furthermore, there is a carport that is primarily meant for car sharing, and a communal garden. During a visit to the earthships, an additional shared function came to light: a nearby former pear orchard that was being transformed into a fruit garden for the entire neighborhood.
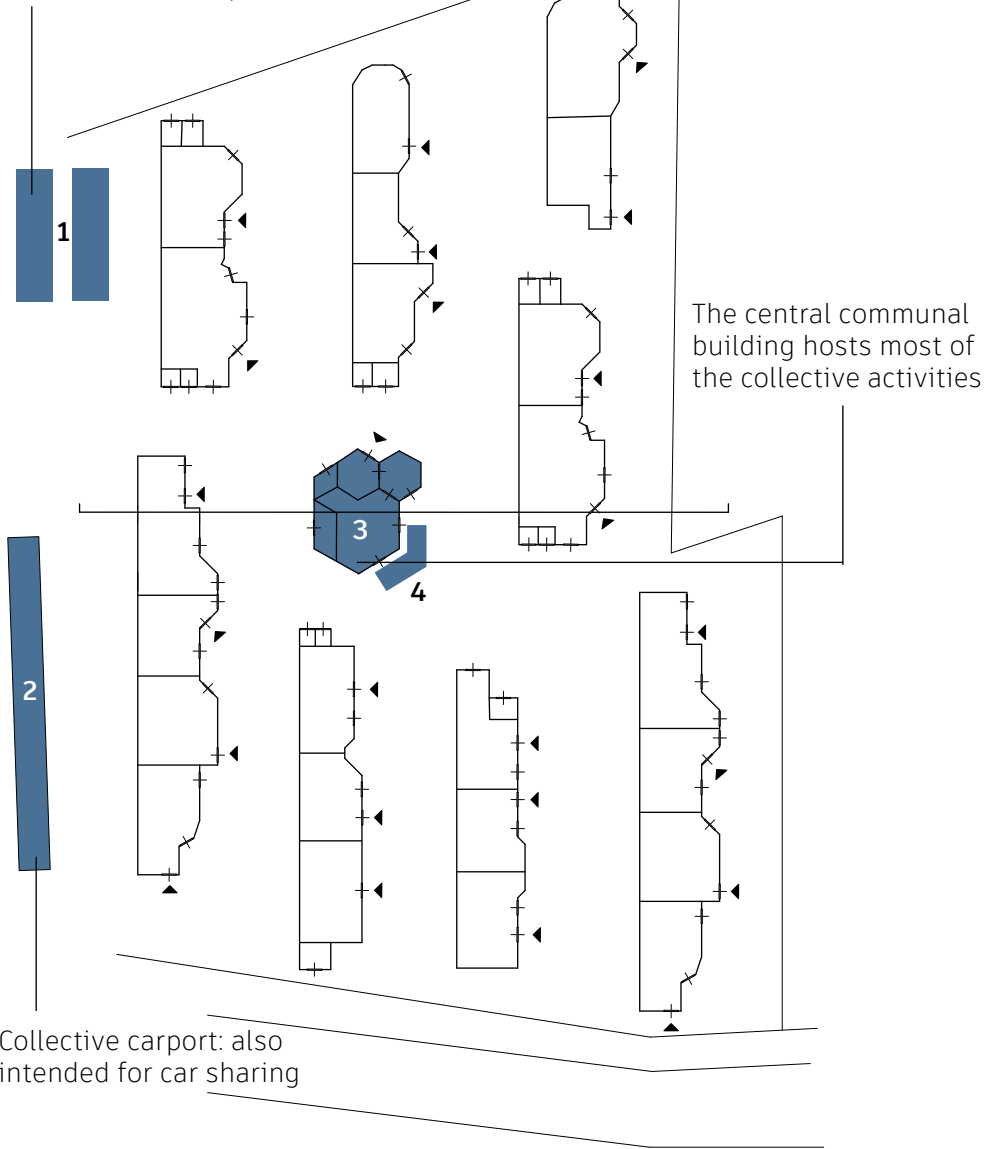
Degrees of collectivity

|		
Neighborhood	-	
Block	Allotment garden (1)	
	Carport (2)	
	Communal house (3)	
	Communal terrace (4)	
Cluster	-	
Social unit	-	
Household	Dwelling	

Collective meeting space 'Het Middenhuis' (Own image)

Small allotment garden with
greenhouse as supplement
to private gardens

1

The central communal
building hosts most of
the collective activities

2

3

4

Collective carport: also
intended for car sharing

0   10   20   30   40   50 m
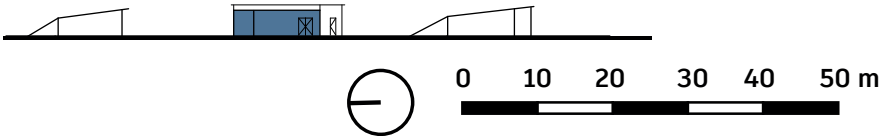
Boschgaard

Location	Den Bosch, Noord-Brabant, Netherlands
Year of completion	2024
Type of cohousing	Management cooperative
Number of dwellings	19
Number of inhabitants	~30

Description

Boschgaard is a pionering project in self-building and sustainability, completely led by citizen initiative in cooperation with a housing corporation (Boschgaard, 2024). 19 residences were developed, all within the domain of social housing, at the location of a former community center. Many residents *to be* helped work on the construction of the complex, and the focus was put on re-using as much material as possible - eventually resulting in a 85% re-use of all building materials. Organisationally, there is little hierarchy within the residents, as these are all involved within the construction and management of the project equally and with equal say.

Boschgaard from the southern street side (The Plan, 2024)
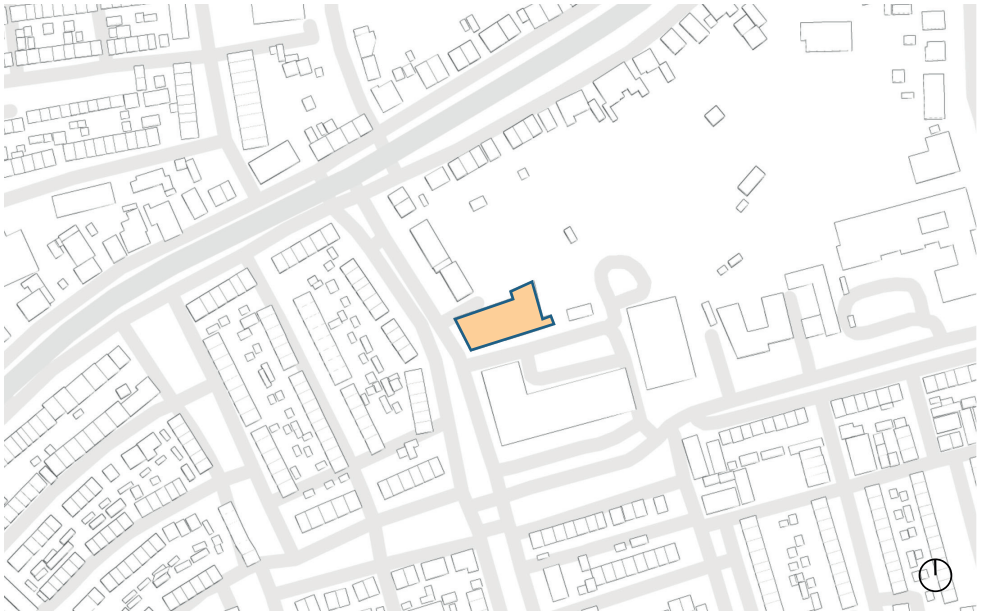
Circulation

The project consists of three 'houses' that each host a number of individual dwellings, as well as a number of dwellings that are positioned along the street side. All dwellings can only be reached from 'inside' the complex, meaning that there is always some door that needs to be opened before reaching one's front door.
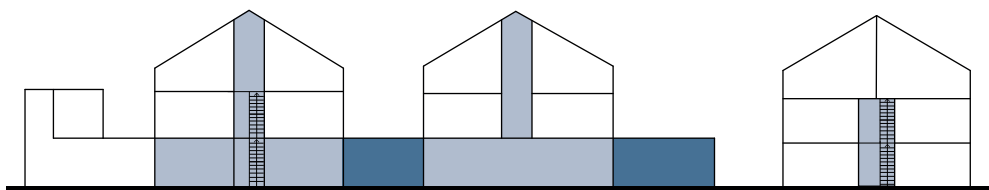
Collectivity

The organisation of the project is quite complicated, and many spaces are shared on different levels and found spread out through the complex. Some storages are for example shared by multiple residences, while others are not. There are communal combinations of living room and kitchens, but one of the 'houses' only has access to one through the open garden. Lastly, there is the central meeting space, 'Het Sociale Gebeuren', which may also be utilized by the rest of the neighborhood.

Degrees of collectivity

|		
	Neighborhood	Meeting space (1)
	Block	Workshop (2)
		Garden (3)
		Office (4)
		Patio (5)
		Roofed 'out-door' space (6)
	Cluster	Living room and Kitchen (L + K)
		Shared storage (S)
	Social unit	-
	Household	Dwelling
		Apartment

Collective meeting space 'Het Sociale Gebeueren' (Boschgaard.nl, n.d.)

One of three 'houses' is not attached
to the indoor collective spaces

Some storages are shared by
multiple residences, some are not

There are two sets of collective
living room + kitchen

s

s   s s

L + K   L + K

3

5   6

4   1   2
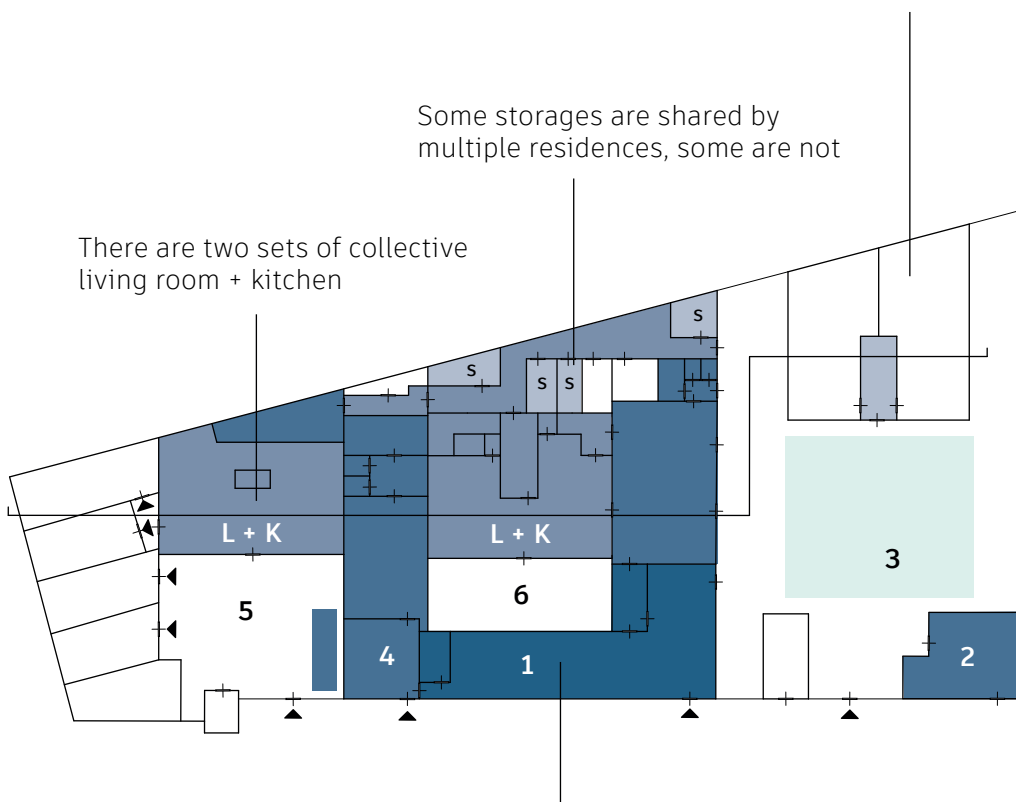
This collective space also
functions as meeting space for
the neighborhood

0   5   10   15   20   25 m

Strowijk IEWAN

Location	Lent, Gelderland, Netherlands
Year of completion	2015
Type of cohousing	CPO
Number of dwellings	24
Number of inhabitants	~50

Description

Strowijk IEWAN is the largest 'straw' building of the Netherlands, housing 24 dwellings in the social domain (iewan.nl, 2024). In its original design, construction and ideologies there has been a strong focus on sustainability, and thus the building has been constructed predominantly with sustainable building materials like wood, straw, and loam. Rent is kept low because residents take care of maintenance in the complex. There is a strong focus on sharing which follows from the focus on sustainability, as sharing spaces and amenities reduces footprints related to carbon emissions.

Entry to IEWAN from the street side (VIBA Vereniging, 2024)
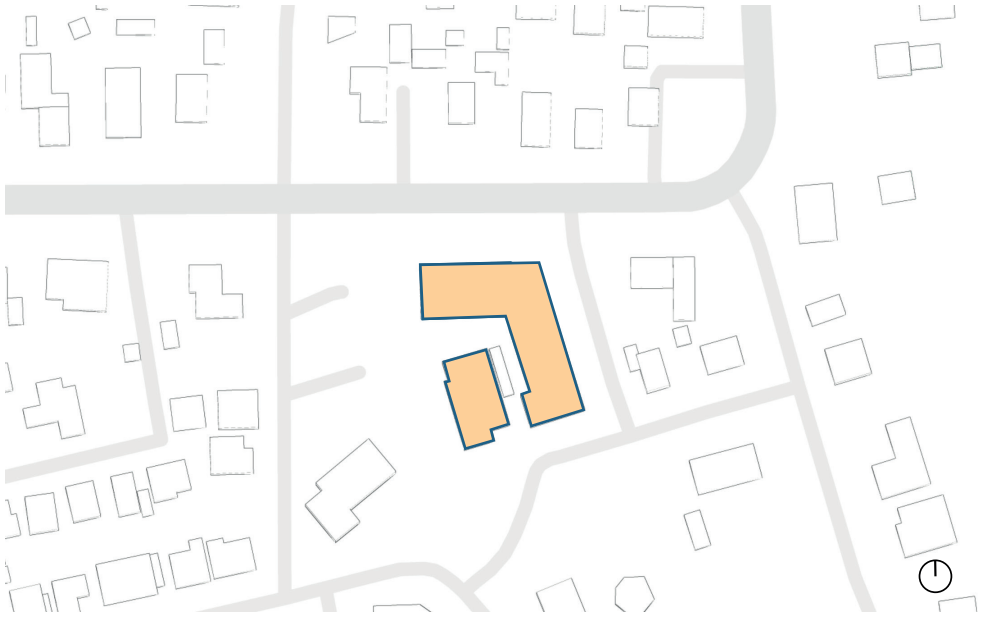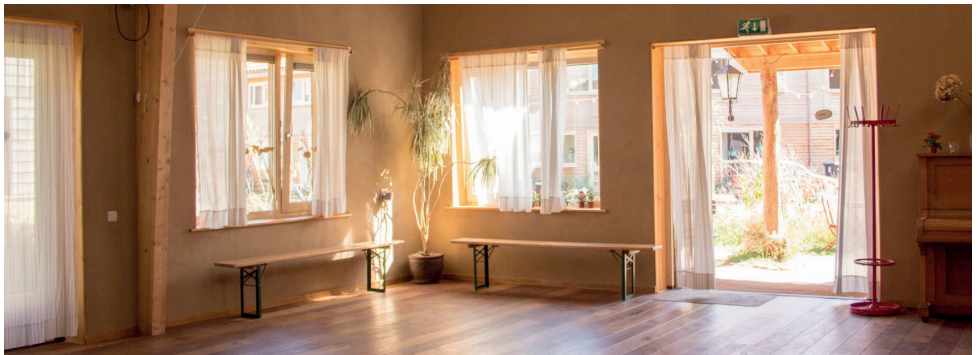
Circulation

The project consists of a main building that contains all the dwellings. They either have an access from the street level (for the groundbound duplexes) or through the main staircase and galleries. The other smaller building hosts many of the collective functions.
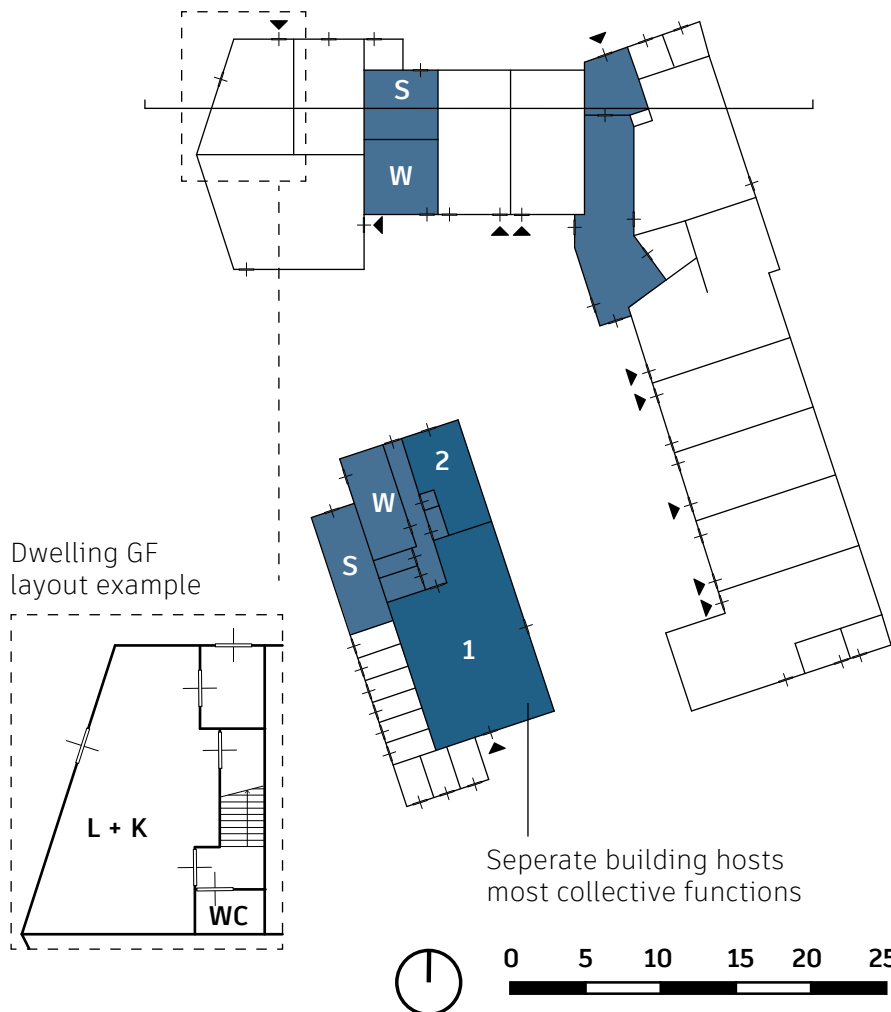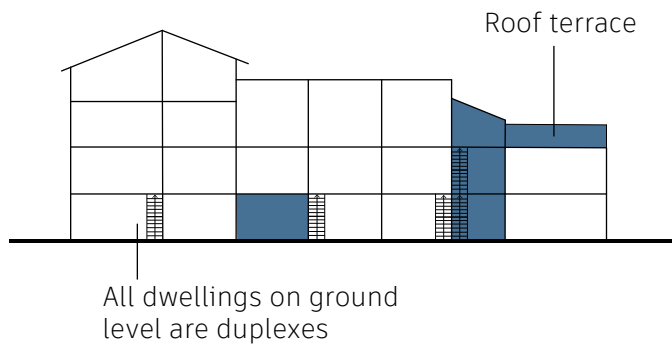
Collectivity

Although there is a strong focus on collectivity, the organisation between individual and collective is quite conventional and straightforward. The dwellings are all fully functional. Several amenities and even items (like vacuums and washing machines) are shared. What stands out is the 'Kleine Wiel' – the collective meeting space that may also be rented from outside of the complex. Furthermore, there is also a food cooperative that focuses on the purchase of sustainable food items for the collective.

Degrees of collectivity

	Neighborhood	Meeting space (1)
		Food cooperation (2)
	Block	-
	Cluster	Workshop (W)
		Storage (S)
	Social unit	-
	Household	Dwelling
		Apartment

Collective meeting space 'De Kleine Wiel' (IEWAN, n.d.)

Roof terrace

All dwellings on ground level are duplexes

S

W

Dwelling GF layout example

2

W

S

1

L + K

WC

Seperate building hosts most collective functions

0   5   10   15   20   25 m

Spreefeld

Location	Berlin, Germany
Year of completion	2013
Type of cohousing	Housing cooperative
Number of dwellings	64
Number of inhabitants	~140

Description

Spreefeld consists of three residential buildings and an old boathouse and is located right next to the Spree river in Berlin. With the intent to remain very open, the entire ground floor public space is open to the public, connecting the neighborhood with the waterside (instead of privatizing it). Additionally, there are 'option rooms' on the ground floor that are also open. Above the ground floor, there is a range of collective and individual spaces and dwellings, signifying the demographic variation that Spreefeld offers. Through collateral funding of the project, even those with little capital have had the ability to move into Spreefeld (ArchDaily, 2024)

Spreefeld from across the Spree river (own image)

Circulation

Three apartment buildings are spread out dynamically on the plot. Due to its location on the waterside, its main approach is from one direction: the southwest. The entire ground floor is open. Vertically, there are staircases that are directly connected to all apartments and other spaces on the upper floors
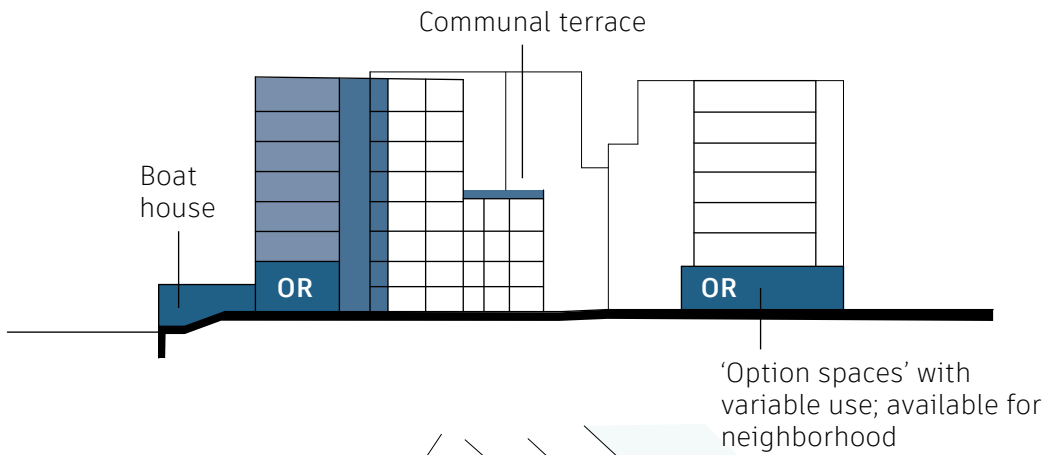
Collectivity

The ground floor is extremely open: this is the location of the option rooms, but also of a carpentry workshop, a daycare and a co-working space. Just for residents is the space on the upper levels, like the roof terraces. Additionally, collectivity is strongly related to the type of dwelling: many dwellings are mostly aimed at traditional households like singles, couples or families. However, there are also cluster apartments aimed at groups from 4 to even 21 people, highlighting the variety of possible living arangements.

Degrees of collectivity

	Neighborhood	Public space (1)
		Option rooms (OR)
		Boat house (2)
	Block	-
	Cluster	Laundry rooms
		Fitness
		Communal terrace
	Social unit	Living room
		Kitchen
		Balcony
	Household	Apartment
		Bedroom

Communal living room and kitchen (ArchDaily, n.d.)

Communal terrace

Boat house

OR

OR

'Option spaces' with variable use; available for neighborhood

Spree river

Mix of apartment types: single 'family' and cluster

1

2

Ground floor and river are open to the public

This is a schematic plan of the third floor with ground floor surroundings

0   10   20   30   40   50 m

Hunziker Areal, Haus A

Location	Zürich, Switzerland
Year of completion	2015
Type of cohousing	Housing cooperative
Number of dwellings	12 cluster apartments
Number of inhabitants	~80

Description

Hunziker Areal, or 'Mehr als Wonen' is an urban densification project consisting of 13 buildings and many public and/or collective functions in Zürich, Switzerland. 'Haus A' is one of these buildings, and functions as a prominent innovative example of modern or even futuristic forms of living, housing a range of cluster apartments.

Haus A seen from the central square (Roger Frei, 2024)
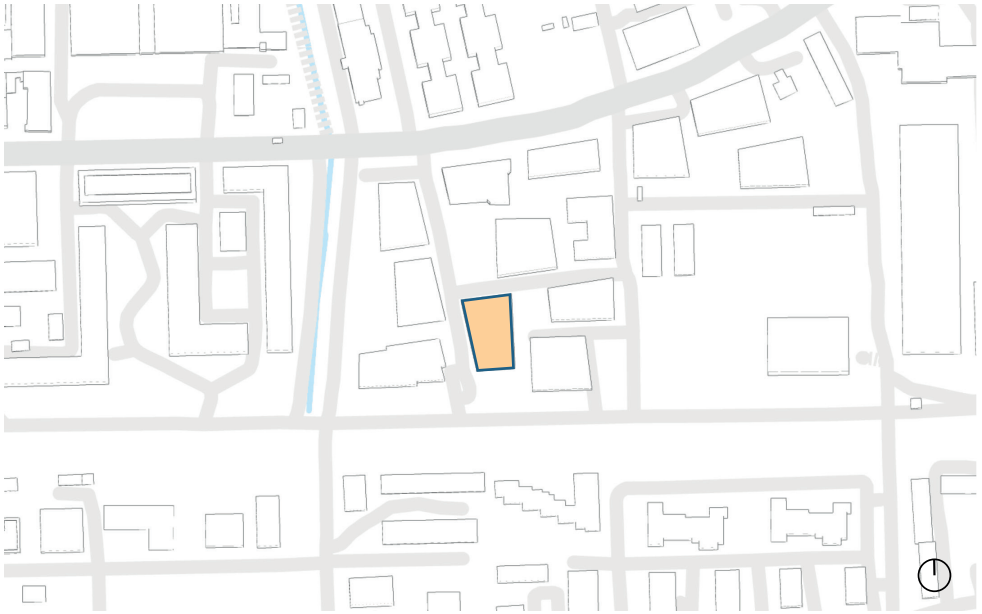
Circulation

The main circulation is organized vertically through a large staircase (with neighbouring elevator). From here, there is a cluster apartment located on each side.

Collectivity

For the neighborhood scale there is some commercial space located in the plinth. Within the building itself, each floor hosts some minor shared space that is available to the entire floor, like a laundry room. The set-up of the cluster apartments may be the most intriguing. Each cluster apartment consists of ~6 smaller private spaces, always containing a bathroom and a pantry. In the negative space between these private spaces there is ample collective space, containing a living room, kitchen, bathroom and terrace.

Degrees of collectivity

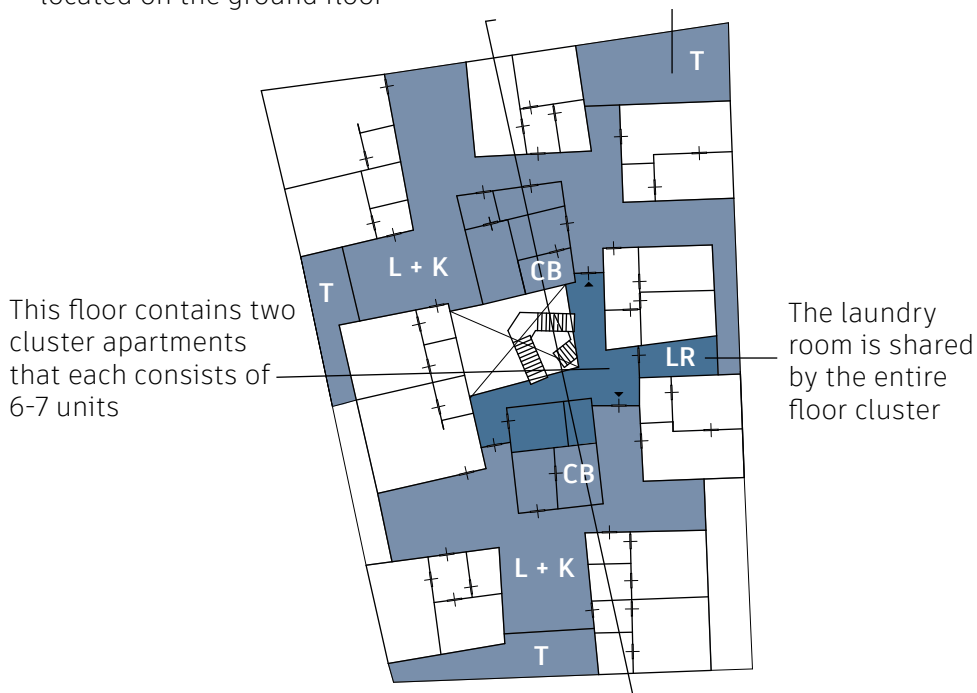|		
	Neighborhood	Commercial space (1)
	Block	-
	Cluster	Laundry room (LR)
	Social unit	Living room + Kitchen (L + K)
		Workspace
		Terrace (T)
		Collective bathroom (CB)
	Household	Bathroom
		Pantry
		Bedroom
		Balcony

Central staircase (Architectuurwijzer, n.d.)
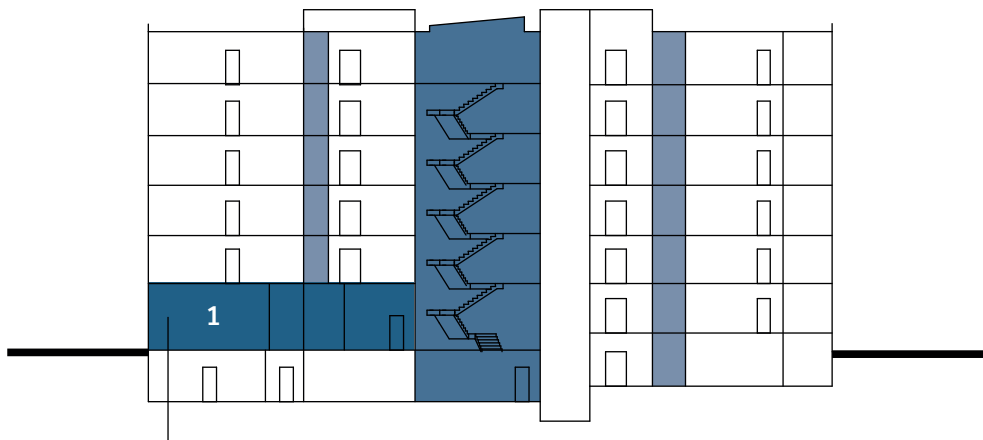
Some commercial space is located on the ground floor

Communal terracees on corners

This floor contains two cluster apartments that each consists of 6-7 units

The laundry room is shared by the entire floor cluster

T

L + K

CB

T

LR

CB

L + K

T

This is a schematic plan of a dwelling floor (2nd floor and up)

0   5   10   15   20   25 m

Rigaud Cooperative Housing

|	
Location	Geneva, Switzerland
Year of completion	2024
Type of cohousing	Housing cooperative
Number of dwellings	49
Number of inhabitants	~100

Description

This project consists of 49 apartments divided in six connected volumes, along with some commercial space and a nursery. It is designed to fit in with neighbouring building developments in terms of size and height. It opens up to the nearby square (picture below), offering connections to the neighborhood.

Rigaud Cooperative Housing seen from central square (Bonhôte-Zapata, 2024)
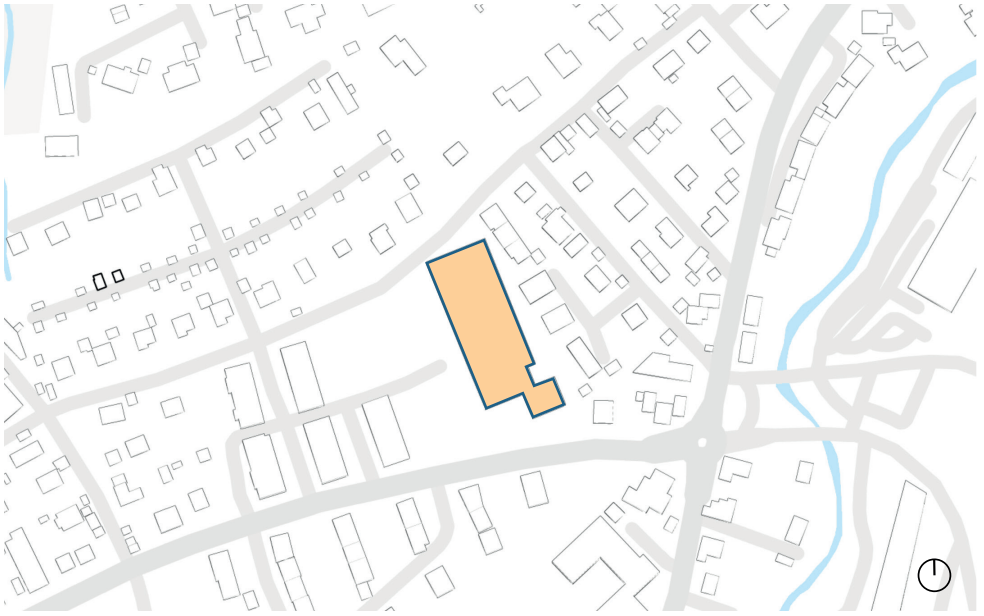
Circulation

The complex can be seen as a collection of six volumes that each have their own vertical circulation system, consisting of widened staircases with excessively dimensioned landings.
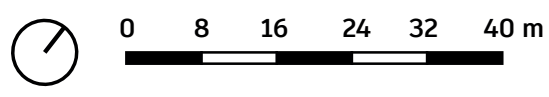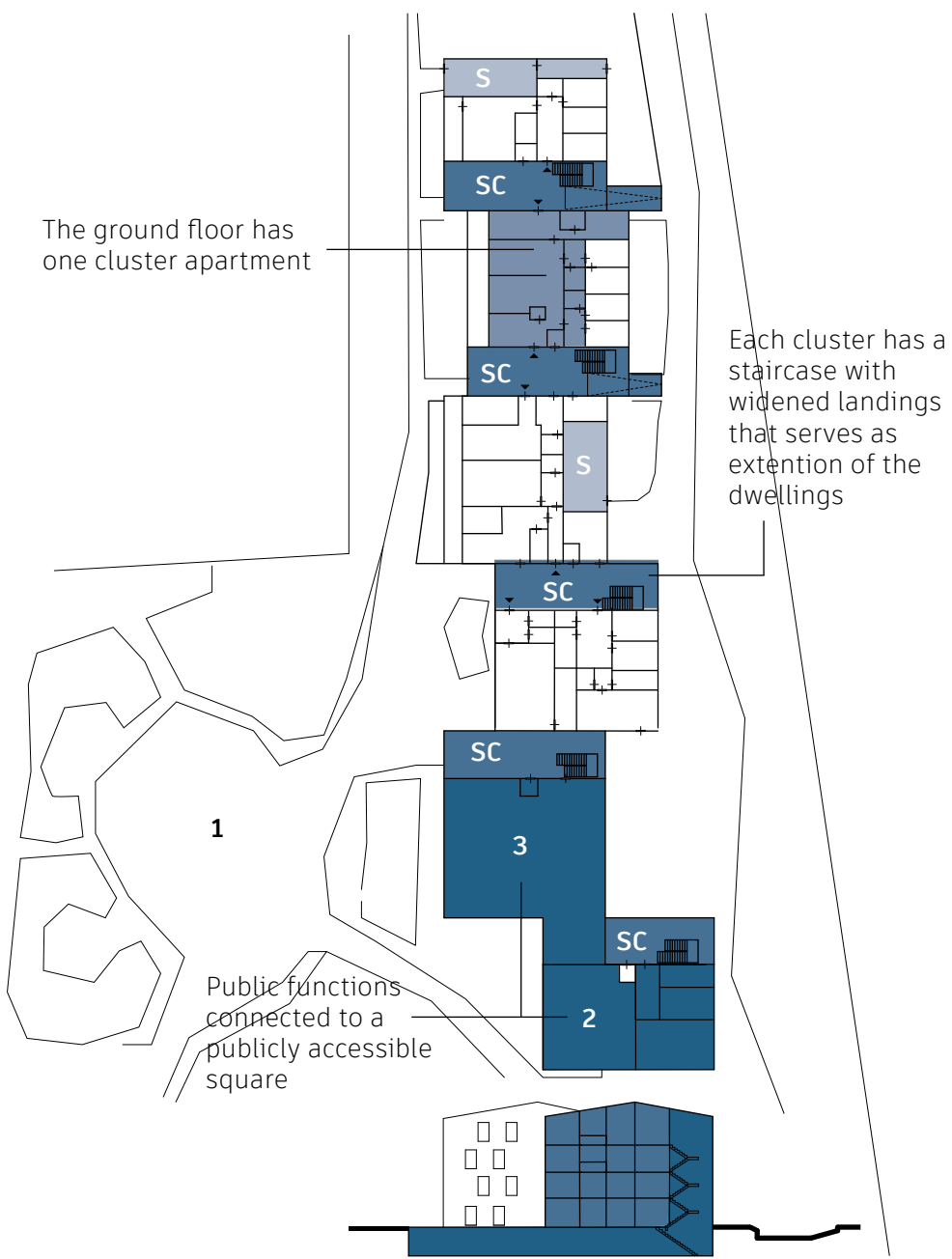
Collectivity

Besides the space allocated for the nursery, co-working spaces, and shop, there is one aspect to this project that really stands out in terms of collectivity: the staircases. These have been designed in such a way that allows for a easy and strong appropriation of this particular circulation space. Because of this, it becomes much more than just circulation space, allowing for use as (temporary) storage, but also recreation and social encounters.

Degrees of collectivity

	Neighborhood	Public space (1)
		Café (2)
		Nursery (3)
	Block	(Bicycle) storage (S)
	Cluster	Widened staircases (SC)
	Social unit	Living room
		Kitchen
		Bathroom
	Household	Apartment
		Bedroom

Staircases with widened landings (Bonhôte-Zapata, n.d.)

The ground floor has
one cluster apartment

Each cluster has a
staircase with
widened landings
that serves as
extention of the
dwellings

Public functions
connected to a
publicly accessible
square

S

SC

SC

S

SC

SC

SC

1

3

2

0   8   16   24   32   40 m

Discussion

Indiastraat, Tanthof (Own image)

IV

Findings from literature

The main research question posed is: 'In what ways can the architecture of cohousing contribute to reducing loneliness and its negative health effects?'.

To be able to answer this question, the question has firstly been split up into two main research themes: loneliness, and cohousing. The initial goal was to get an extensive understanding of these two themes through a literature review, before finding a way to connect the two.

Loneliness

Loneliness is a persistent societal issue, becoming increasingly evident in the Dutch context. This has been the initial motivation behind the choice to investigate loneliness as part of the research. Additionally, it has become clear that loneliness exists in several forms - emotional and social, that it is not one dimensional, as the perspective on one's future also influences degrees of loneliness, and that loneliness may lead to significant emotional and physical health risks. These risks may also further stress healthcare systems.

Different types of people have different desires in regards to social and emotional connections, which means that the threshold for a person feeling lonely is related to a discrepancy between there current situation and their desired situation in terms of social and emtional connections. Either way, loneliness can target anyone, and it is shown to target in particular the most vulnerable groups in our society: young adults, the elderly, and in general, those with a lower economic status.

Since the built environment - and thus, architecture - argumentatively is an extremely important part of people's everyday lives (most of our time is spent within buildings and the built environment), it may seem helpful to see how architecture can work as an instrument to mitigate these issues with loneliness. However, research shows that it is still rather hard to find conclusive relationships between architecture and loneliness. Nonetheless, a multitude of sources hint at architectural elements that aim to lower the thresholds to social

interaction as instruments to help reduce loneliness. Examples of these are increased walkability, better mobility, more greenery in public space, an increase of shared facilities, and better access to amenities.

Cohousing

Cohousing is an umbrella term with multiple definitions, however, for all intents and purposes, it generally refers to a way of living that includes some form of physical sharing (like sharing spaces, facilities and/or items). Along with this, there sometimes also is a focus on the sharing of intangible aspects like sharing ideas (ideologies) or investments. In legal terms, four subdivisions of cohousing are most common in the Dutch context: the housing and management cooperative, the CPO, and the Community Land Trust. Differences between the four lie in the way ownership and control is are arranged. Where in all four control (and management) of a project is given to residents in some degree, only in housing cooperatives take ownership of their share of a housing project, and in CPO's residents take ownership

of only their own house.

Cohousing projects not only exist in these different legal forms, but also in many different shapes, sizes and typologies, making it hard to effectively categorize them. However, recent ideas on the influence of housing and architecture on social interaction offers some methods.

Firstly, the difference between planned and unplanned interaction can be considered. In this, it is important to look at different aspects of a (housing) development, like the entrance, circulation space, and the collective spaces.

As cohousing is focused on sharing, the most important way to categorize these projects is by determining how the sharing of spaces, amenities and object is organized in these projects in a spatial sense. The principles of the Wijkgedachte, which focused on spatial hierarchy and the coinciding dispersion of spaces and amenities based upon certain scale levels, can be used to create this categorization.

Findings from case study analysis

A case study analysis (chapter III) was carried out after the literature review, to better understand how cohousing projects may form good practices in creating living environments that help to reduce loneliness. 9 projects were chosen in three distinct contexts: 3 in Delft (the location of the eventual design location), 3 in the Netherlands (in an attempt to understand projects that work within the Dutch context), and 3 in the broader European context (within countries that have been further developed in terms of cohousing as a housing domain). These case studies were analyzed based on general characteristics, but also on spatial properties like circulation principles, types of collective space and degrees of collectivity (similar to the workings of the Wijkgedachte). The analysis showed the diversity that characterizes cohousing projects - in typology, size, demographic make-up and much more. The three most relevant conclusions to draw from the analysis are related to the legal form, circulation and the focus on sharing sharing through different scale levels.

1. The relevance of the organisational form of cohousing

Within the 9 projects that have been analyzed, in legal terms, 4 are housing cooperatives, 3 are management cooperatives, and 2 are CPO's. Of the three, the CPO is the only type of cohousing where the exclusive ownership rights of a dwelling go to those living in that specific dwelling: within a housing cooperative, ownership falls on the entire complex, within the management cooperative, there is no ownership (only renting). As a result it seems, the two CPO projects, Aardehuizen Olst (figure 26) and Strowijk IEWAN, show a large focus on the individual - conventional - house. Within these projects, there is no real innovation in terms of household composition. Both do contain innovative ideas on sharing through e.g. their collective spaces, but this almost comes more as a bonus - an addition to the quality of this housing - than as a inherent identity of the way of living. Cooperatives on the contrary seem to give more freedom and innovations in dwelling types as there is no direct ownership of

one house; in those projects, there is often a lot more variation in typologies, making the projects more inclusive. Additionally, these are the projects that harbor more innovative ways of social interaction in day to day live, like the sharing on different scale levels in Centraal Wonen Delft (figure 27).

Figure 26. Aardehuizen Olst. Olst, Netherlands

Figure 27. Centraal wonen. Delft, Netherlands

2. The importance of circulation

Both planned and unplanned social interaction and appropriation of space are very much reliant on the way the circulation space, including the entrance, of a housing project is organized. The circulation space is after all the space that is used by residents to reach their homes, and thus is used actively.

In conventional housing projects however, this space is most often designed with simplicity and modesty (figure 28). Of course, this is mainly due to financial considerations, which makes sense, but it strongly diminishes the potential to make this space more than just space to travel through.

Interestingly, most of the case study projects contain spatial elements that do give more meaning to their circulation space, whether it to be on purpose or not. In the Aardehuizen for example, the positioning of all entrances and gardens on the south sides creates a strong front-back orientation. Because the facades here are extremely open (often fully glazed) and the garden hedges may not exceed a certain height (according to their association rules), there is always a chance of seeing your neighbor(s) when walking past.

The Rigaud case study (figure 29) may show the strongest example of the added benefits of clever architectural design of circulation systems. There, the carefully constructed vertical circulation system with large landings, openings, and semi-closed facades has shaped the perfect environment for appropriation of space. The landings incite unplanned *and* planned interaction, but also function as space for storage, adding to the multifunctionality of this space.

Figure 28. A typically Dutch gallery circulation

Figure 29. Circulation within the Rigaud Cooperative Housing. Geneva, Switzerland

3. The focus on sharing through different scale levels

The most important observation to take out of these analyses stems from the premise that collectivity is not a unidimensional property of cohousing projects, but that collectivity is incorporated in different forms, types *and* on different scale levels.

Projects like Centraal Wonen Delft have been very strongly designed around the basis of sharing (and thus, interacting) on different scale levels. The reason for this is that different scale levels *warrant* different types of sharing, and forms of interaction. There is a significant contrast between sharing a micro-apartment with one or two others (figure 30) and sharing an apartment with up to twenty people, like in Spreefeld (figure 31). Through all these case studies, it is also impossible to establish definitively what people want to share on what level. Of course, this make sense, as people indeed have differing desires, and there are no definitive answers to these questions. What is important is that case studies (in particular Centraal Wonen Delft, Boschgaard, Spreefeld and Hunziker Areal) each show their own specific organization of collective space, and that it must be understood that all of these work - in their own way.

Figure 30. Shared Micro-living. Barcelona, Spain

Figure 31. Spreefeld. Berlin, Germany

Interpretations

The relevance of loneliness as a societal issue in the Dutch context can not be understated. It is something that is becoming increasingly persistent. As a result, the need to find ways to mitigate loneliness is growing as well. Because loneliness is an extremely difficult social concept to grasp however, it is not very easily made spatial in a way that we can find direct answers to solving loneliness one-on-one. Loneliness as a concept is simply too complicated, as it varies per person and context. However, evidence suggests that the built environment and architecture may very well be able to contribute to solving loneliness in some way. For this reason, one specific housing domain was isolated and investigated: that of cohousing. Cohousing was chosen based on the premise that this constitutes a form of housing that focuses on those aspects that may contribute to reducing loneliness: namely aspects like walkability, access to amenities, and sharing space. Although the initial intention was to limit the research scope and look into specifically the domain of cohousing, the research has made clear that cohousing is housing that can still be of a wide range of typologies, forms, and sizes. The case study that followed has given a lot of insights into the workings of those individual projects, but obviously fail to tell the story of the whole. The analyses and coinciding strategies should not be seen as exclusive evidence of how cohousing projects work, but rather as guidelines based on a limited portion of projects within a greater realm of cohousing projects.

Implications

Although the results from the literature review and case study analyses are far from conclusive, they still might add to a better understanding of the workings of the research themes of loneliness and cohousing, and their relationship. Results from the case study analysis may give more insights into how cohousing projects contribute to creating housing that is more inclusive and fosters more and elaborated degrees of social interaction. These results may help inform design in projects aimed at reducing loneliness.

Limitations

The results in this research report do not simply answer the main research question conclusively. The literature review has even questioned if the main research question can be answered at all. Loneliness is such a complicated social concept that spatializing it would require intricate and detailed investigation of the context: for whom are we reducing loneliness, and in what environment? We can only discover this when doing research into this context. This is perhaps what has been lacking most within this research report: as there has been less focus on ethnographic research. Although several case study projects have been visited, including two projects (Aardehuizen Olst and Boschgaard) of which some residents have been interviewed, there has not been much elaborate evaluation of the experiences of residents of cohousing projects in terms of satisfaction with social interaction and other factors that could link to loneliness. More extensive ethnographic results of each case study could have given more insights into these projects. However, this too would have its own limitations, since ethnographic field research could also skew results and interpretations if only a small group of residents would have beeb interviewed or consulted.

Recommendations

Investigating other promising cohousing case studies would definitely be recommended in general, as this research has been limited to nine projects. Furthermore, it would certainly be valuable to investigate not only the spatial, but also the ethnographic perspective of these projects. Within cohousing projects, what helps is that future inhabitants actually are often a part of the design process. Because of this, the housing project has often been tuned to their desires - also in regards to social interaction for example. Therefore, inhabitants may help to give an extensive range of insights into the workings of the cohousing project. Nonetheless, one must be careful when taking this approach, as a few residents alone may not be able to convey the total story of the working of a (co) housing project.

Conclusions

Design site in Tanthof (Own image)

The research in this graduation project has focused on two societal urgencies in the Dutch context: loneliness and housing.

Loneliness is a growing problem as a result of several societal changes and events in the Netherlands in recent times, like the hardening of society, the rise of the digital age, polarization through politics, and isolation events like the COVID-19 pandemic. A graying society, with an increasing amount of elderly, further accelerates the issues with loneliness in the Netherlands.

Additionally, the Netherlands is facing a housing crisis, with high demand and low supply driving up housing prices and limiting availability of (affordable) housing. Several other Western European countries have a reasonable amount of cohousing, which is a relatively affordable housing typology that can be seen as an alternative to social housing and free market housing. This type of housing however is rather underexplored in the Dutch context. As cohousing is not only considered to be a possible affordable alternative to regular housing, but also inherently focuses on sharing - and thus, social interaction, cohousing can be considered a form of housing that could potentially mitigate issues with both housing *and* loneliness. To investigate this, the following research question has been formulated:

'In what ways can the architecture of cohousing contribute to reducing loneliness and its negative health effects?'.

To answer this research question, a literature review has been performed to cover the bases of what loneliness and cohousing entail exactly. After this, a case study analysis has been performed to understand how different cohousing projects may contribute, through their organisational and spatial configurations, to increasing social interaction and reducing loneliness.

Loneliness
Loneliness as a topic is complex, and does not have a single definition. There is social loneliness, which is related to the amount of relationships we have, and emotional loneliness,

which is related to the depth of our relationships. Loneliness is a subjective feeling, experienced differently by different people, and influenced by the amount of interaction and relationship a specific person desires. Time also plays a role, making loneliness multidimensional: if a person does not think their situation will change in the future, they may feel more lonely.

Loneliness may target anyone, lead to mental and physical health risks, and through this further stress healthcare systems. In the Netherlands, those most likely to feel lonely are often part of vulnerable demographics, like young adults or the elderly, or those with low incomes.

Research suggests that loneliness and the built environment are related in some ways. In principle, this comes as a result of the fact that people spend a lot of their lives within buildings and the built environment. Although not a lot of evidence is fully conclusive, there has become more and more awareness for this topic in recent times, and more publications have looked into the overlap between loneliness, (housing) architecture and the built environment.

Cohousing

Cohousing generally refers to a way of living that includes some form of physical sharing (like spaces and facilities) and sharing of intangible aspects (like ideologies or investment). There are four common types of cohousing in the Netherlands: the housing cooperative, management cooperative, the CPO, and the Community Land Trust. The differences between these lie in the way ownership and control are arranged. Spatially, cohousing can take on a range of different forms, with considerable freedom in shape, size and typology.

To categorize cohousing projects in terms of their ability to increase social interaction and reduce loneliness, several different approaches can be taken. It can be valuable to look at the difference between areas designated for planned and for unplanned interaction. Additionally, it is important to understand on what scale level interaction takes place.

Lastly, it is important to understand what kinds of sharing take place and how this sharing works on different scale levels.

Case study analysis

Nine projects have been analyzed in order to better understand how cohousing projects may form good practices in creating living environments that help to reduce loneliness. Three projects were chosen in Delft (the location of the eventual design location), 3 in the Netherlands (in an attempt to understand projects that work within the Dutch context), and 3 in the broader European context (within countries that have been further developed in terms of cohousing as a housing domain). These projects were analyzed based on general characteristics, but also on spatial properties like circulation principles, types of collective space and degrees of collectivity. As a result of the analyses, three main conclusions were drawn.

The first conclusion was focused on the influence of the organisational form of the cohousing project on the degree of sharing and interaction. It became clear that cohousing projects that have private ownership, like the CPO, still have a large focus on the conventional household: often the nuclear family. Sharing comes as a bonus, for example the sharing of a joint common house. Within projects with more shared ownership, the 'social units' in which residents live varied more strongly and sharing occurred in significantly more ways and on more scale levels.

Secondly, there is the importance of the circulation space. Both planned and unplanned social interaction, as well as appropriation of space, are very much reliant on the way the circulation space of a housing project is organized. In conventional housing, circulation space is kept modest and simple due to financial constraints. However, many of the cohousing case studies show how small interventions strongly improve the multifunctionality and appropriation opportunities of circulation space.

Lastly, it has become clear that collectivity and sharing is arranged in many different forms, types *and* on different scale levels within these cohousing projects.

Because of this, it is important to understand that different scale levels *warrant* different types of sharing and interaction. One could share a kitchen for example with 2 other people, but also with twenty others, and this drastically impacts the amount of interaction that takes place, but also the way interaction occurs. In general, this varies strongly per case study and therefore is extremely project specific.

Future research

Although extensive research has been performed to achieve an understanding on two socially relevant topics in the Netherlands, loneliness and housing, this research has been far from conclusive. Instead, it has tried to firstly explain why these topics can indeed be considered to be societal urgencies, and secondly tried to convey how cohousing projects are projects that could be learned from in terms of remedying both these issues. The case study analysis however only tells the story of those specific nine projects that have been selected, and even within those analyses, there may be more potential. For the future, it would be recommended to look into more of these cohousing projects. Through this, one could find more potential good practices for housing that is focused strongly on sharing and social interaction. Looking more in depth into certain projects, for example through ethnographic fieldwork, may also prove inciteful, although one must consider that the story of cohousing projects may be skewed if it only comes from only a couple of the residents of a project.

Design

Design site in Tanthof (Own image)

VI

Masterplan

Redesigning Deltas Design Study

In 2022, the Delta Urbanism Interdisciplenary Research Programme, led by the TU Delft, published the Redesigning Deltas Design study. The RDD was assisted by 15 practice partners that were divided into 5 research groups. One of these research groups, consisting of the offices of ZUS, Flux and Sweco, worked on and produced a plan for the future of Midden-Delfland (figure 33), which has formed the


Figure 32. Location of Midden-Delfland within the Netherlands

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

Vision National Productive
Park Delfland

Figure 33. Vision map for the Reproductive Park Midden Delfland from the Redesign Deltas D

point of departure for the Advanced Housing Design Graduation Studio. The plan is meant to respond to contemporary urgencies surrounding climate change, and seeks to show an envisioned future situation: Midden-Delfland in 2122. Its main response is towards the natural conditions of the area, as cultivation of land in the previous centuries has not taken into account soil types and elevations among other aspects. In the new plan, the water system of the area is simplified, water buffers are added to counteract periods of droughts, and new ways of cultivation arise.
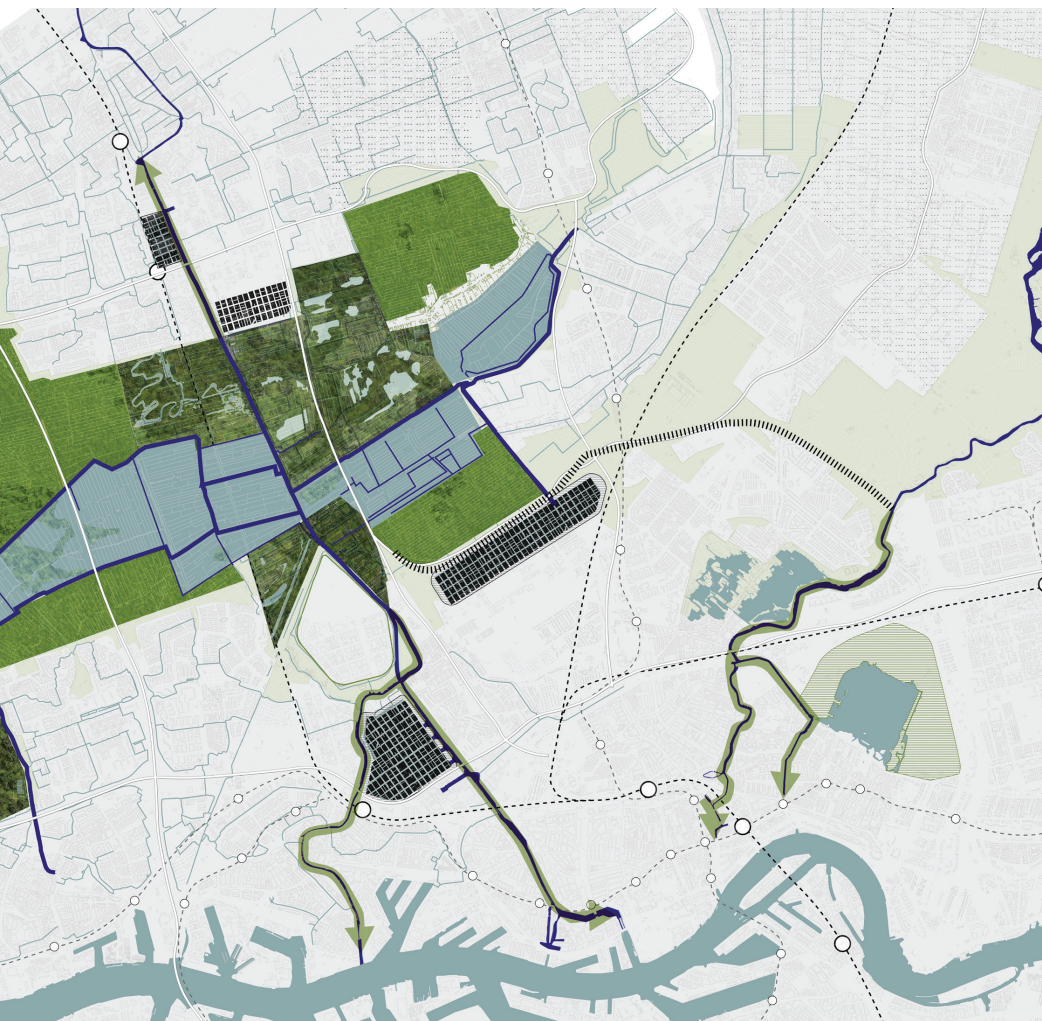
Within this simplified system, Midden-Delfland is envisioned to become a 'Natural Productive Park'. In this, each plot of land has its own productive function. The section in figure 34 shows how this would work. The lowest laying levels of land, mainly consisting out of subsided peat soils, could serve as water storage in periods of drought or water buffers in periods of extended precipitation. Through this, existing settlements in the area would stay protected from flooding. New kinds of food and material production could take place in areas that have been designated for forestry or new

Using natural filtered water on for water in cities

Water from the cities is collected in the nearby peat-lands and overflow canal

RESTAURANT

WINKEL

Wood can be used for build-ing material for new houses

Planting trees

Products from vation, such a peat moss and

Wood is harvest

Young trees absorb NOx and CO2

Small-scale sawmill processes the wood

F

Wood is processed into building material

CO2 and NOx com-pensation makes new construction possible

Products of the land are processed locally

city inhabita

National productive park Delfland; a green lung for the city

Figure 34. Section displaying envisioned system of flows for the Reproductive Park Midden D

forms of agriculture. These could serve the surrounding urban areas. The surrounding urban areas would also profit from new water storage and purification opportunities within Midden-Delfland.

The densification of several areas surrounding Midden-Delfland, like Rotterdam - The Hague Airport in Rotterdam North and the southern part of the campus in Delft would support the redevelopment of Midden-Delfland financially in exchange for these benefits.

Using natural filtered water on for water in cities

Peatland can collect and retain water

water uit de steden wordt opgevangen in de nabijgelegen veengebieden

Amphibians Mammals Birds Insects

RESTAURANT

n wet culti-
s bulrush,
d cranberries

Building material is used in new construction

urniture maker makes products from local wood

ants can buy local produced products

elfland from the Redesign Deltas Design Study (2022)

Masterplan design

We may argue that the envisioned plan within the RDD study strongly focuses on connecting streams and flows on the regional scale of Delfland: the urban and rural serve each other. However, whilst the connection between urban and rural on the regional scale is clear, on the local scale, segregation of functions increases. The intention of the RDD study is to bind the rural region of Midden-Delfland to its urban surroundings, but this will be lost when the borders and edge

Figure 35. Location of Tanthof in relation to the extents of the Redesigning Deltas Design Study.

Figure 36. Satellite image of Tanthof, lo

Assimilation of (regional) flows ⟷ Separation of functions

conditions are too hard.

For this reason, a masterplan has been devised that builds upon the RDD study, but tries to counteract this characteristic of a strong separation of functions – instead focussing on a location where flows and functions could be integrated and intertwined holistically. For this, the neighborhood of Tanthof (Figure 36) has been chosen.

Tanthof Masterplan

Assimilation of (regional) flows ⟷ Combination of functions

0   50 100 150 200 250 m

...ocated in the southwest of Delft (Google Earth, 2024)

Tanthof is located in the southwest side of Delft, and actually consists of two neighborhoods: Tanthof-West and Tanthof-East. The divide between the two can be seen from the satellite imagery in figure 36, which also highlights the Abtswoude road: the main throughway running between Delft and Schiedam here.

The vision for this area based on the RDD study (figure 37, 2) does not go any further than implying that Tanthof-West and Tanthof-East will remain the populated urban cores in this area, that the Abtswoude Bos, which is located in the southeast of this quadrant, will remain an area for forestry and that

1

Current configuration

2

Patchwork, as proposed by RDD study

3

Group proposal: creating a common ground
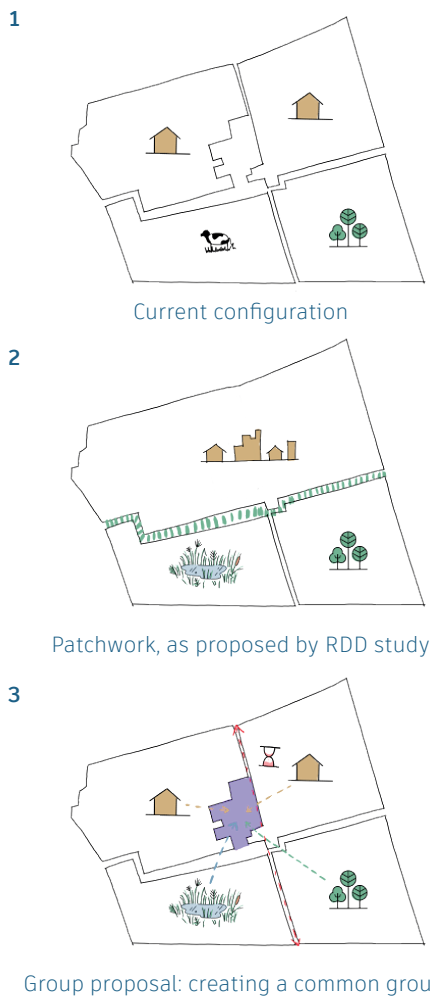
Figure 37. Masterplan design principle (Group work)

Figure 38. Group masterplan for the fu

the current southwestern farmland will transform into wetfields.

The envisioned group masterplan proposal for this area however tries to assimilate all these different functions (figure 37, 3). Within this plan (figures 38, 39), a natural, biodiverse and recreational dike park creates an inlet into the area between Tanthof-West and Tanthof-East, and serves as a transitional zone between wet fields and Tanthof. Here, the urban meets the rural, offering ample opportunity for new forms of housing and recreation to arise.

...ture of Tanthof (By Diya Sharma)

The dike park may serve as a new space for recreation and forms new connections between Tanthof-West and Tanthof-East. There is a slight elevation difference envisioned between the far south - where the park meets the rural Midden-Delfland - and the far north. Because of this, different conditions occur through different parts of the park, as well as different parts of the year.

In drier periods, the expectation is that the dike park will be used more actively and intensively. At these times water levels will be lower on average, offering the opportunity for wetfield agriculture to take place,

Dry periods
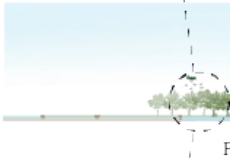
Wet periods

Figure 39. Schematic section of proposed group masterplan (Own work)

or to recreate on public squares. In wetter periods, this area will be used less. For these times, the area may serve other useful purposes: for instance, a water square may be used to form a water buffer.

Several of the guiding principles of the RDD study have been used to create this masterplan. However, as opposed to the RDD study, in this masterplan the principle of assimilating flows has been thought out on the scale of essentially the neighborhood, in an attempt to show how flows and functions can be assimilated on smaller scale levels.

Pond for swimming and fishing   Water retention square   Paludiculture
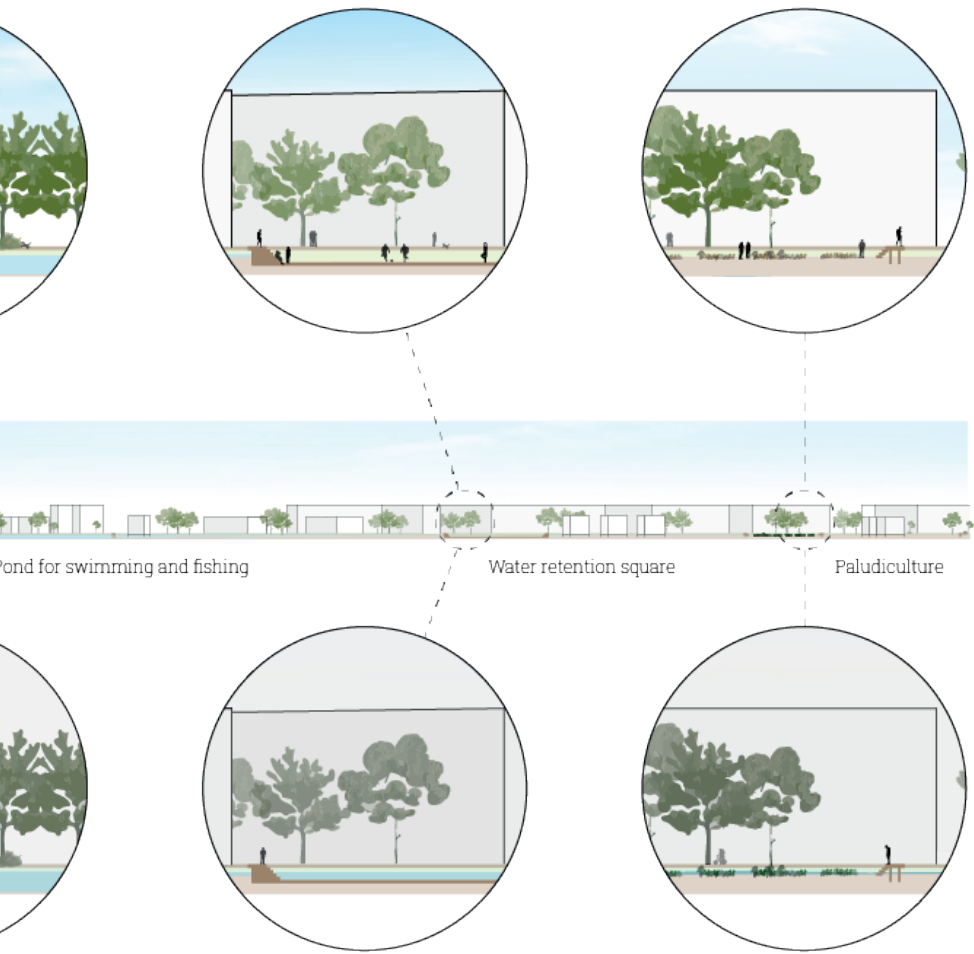
Urban Design

This subsection will show the individual research that has been developed to create a smaller urban design within the masterplan, as well as the urban design strategy and design that has come as a result of this research.

Elevations

Figure 40 shows the minor elevation differences within the masterplan area. Near most water bodies, the ground levels lower towards 2.3 meters below NAP, but on average elevation stays on 2.0 meters below NAP throughout the masterplan area.

Soil types

Figure 41 shows the dispersion of soil types in this area. The most favorable soil for urban development can be considered the green soil type, which denotes a clay soil with a calcium rich clay underlayment: a heavy and sturdy soil that does not subside like peat soils do. This type of soil is found in most parts of the masterplan developments. The most southern part of the masterplan (light blue), which does not see much densification, consists of more light weight, peat based plass grounds.

-2.3m NAP ▬▬▬▬▬▬▬▬▬▬ -1.8m NAP
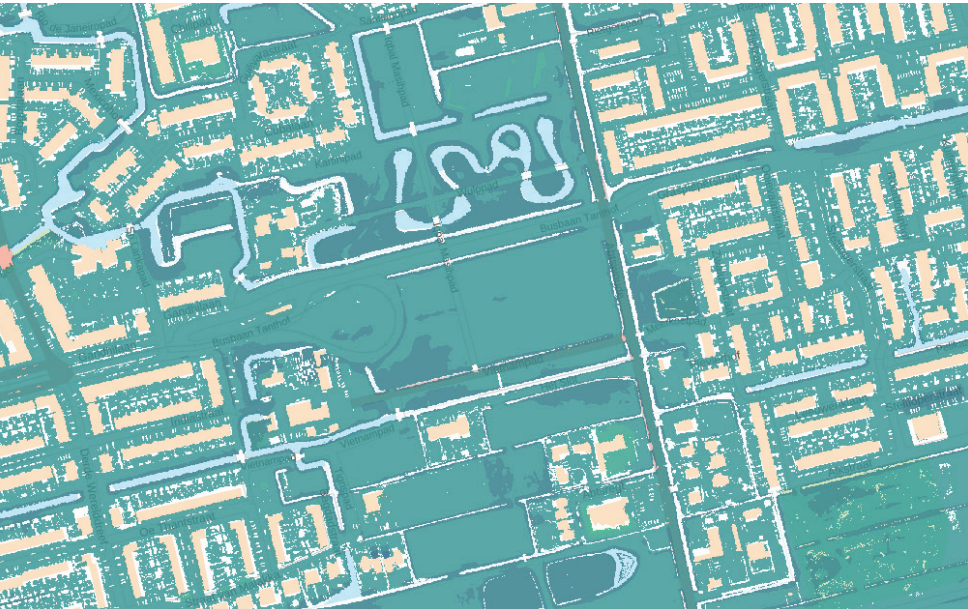
Figure 40. Map with elevations (AHN, 2025)

| Peat | Clay, on peat underlayment | Clay, heavy underlayment | Plass ground |
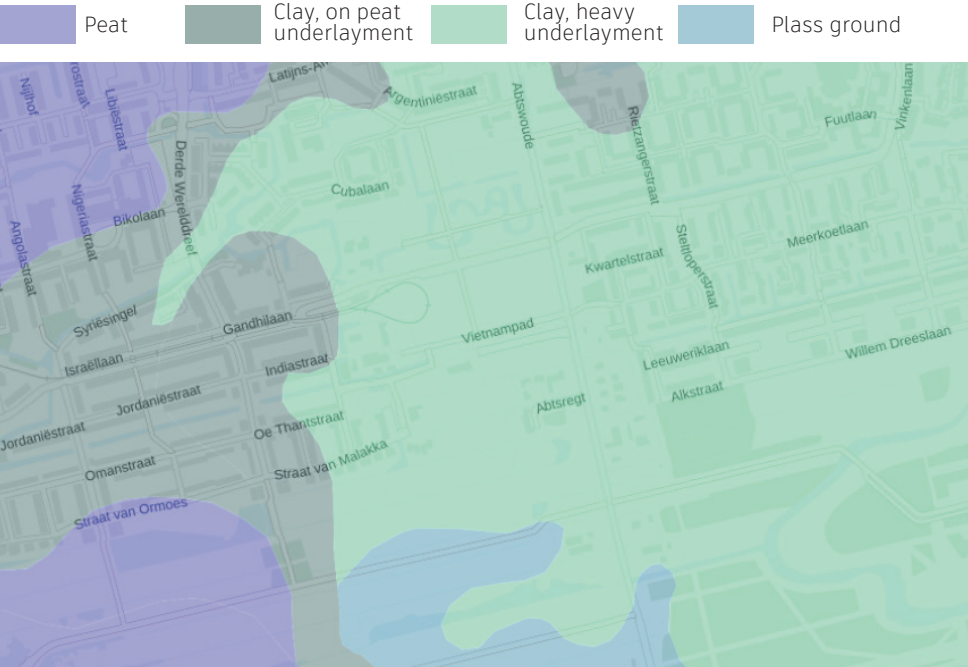
Figure 41. Map with soil types (Bodemkaart, 2025)

Historical development

1925

One century ago this area was characterized by the main axis of the Abtswoude road (going from north to south). In extension to the Abtswoude, there were numerous roads leading to farms, and all land is used for farming.

1990

Construction of Tanthof-East is completed first while Tanthof-West is still in development.

Figure 42. Historical development of Abtswoude and Tanthof (Topotijdreis, 2025)

1985

It takes until the 1980s for the first work to start on the neighborhoods of Tanthof-West and Tanthof-East. In the plans, the Abtswoude remains a main axis. However, some farms lose their farmland.

2025

With the completion of both neighborhoods, this area is now surrounded by urban developments and recreational greenery. Farms are repurposed.

Evaluation of policies

There is a significant demand for housing in Delft. The municipality of Delft has stressed this further in their *Woonvisie* (Vision on living), which mentions the ambition to build 15 thousand new homes by 2040 (Gemeente Delft, 2023). This report also covers 5 themes - with 5 corresponding ambitions - in which the vision on living is executed:

1. Growth of the housing supply: 'offering everyone a spot to live'
2. Keeping rent and sale prices low: 'affordable living'
3. Harboring special target groups: 'fitted living to diverse demands'
4. Making the current stock more sustainable: 'naturally sustainable'
5. Looking into the quality of living environment: 'targeted work on resilient neighborhoods'

The municipality also strongly conveys that Delft is a city for everyone. According to the report, Delft should be a city for 'starters, young adults and students, singles, families, elderlies, refugees and other vulnerable groups'. This ambition is considerate, however, the municipality itself is aware of the fact that it is simply not possible to provide everyone with a home on the short term. Nevertheless, the municipality has set out to try to mitigate the local housing crisis as best as they can. Figure 43 shows the proposed number of homes added based on location in Delft. The first thing that may be noticed from this map is that there are no specific plans for development in Tanthof yet, which means that there may be opportunities to explore further how to incorporate Tanthof in these densification ambitions.

Karin Schrederhof
Delft alderman for Living, Health, Education and Sport

"Delft knows a number of substantial housing challenges. The need for housing is high. There are shortages in all segments. [..] The coming years we will not, as a municipality, be able to solve the demand for housing"
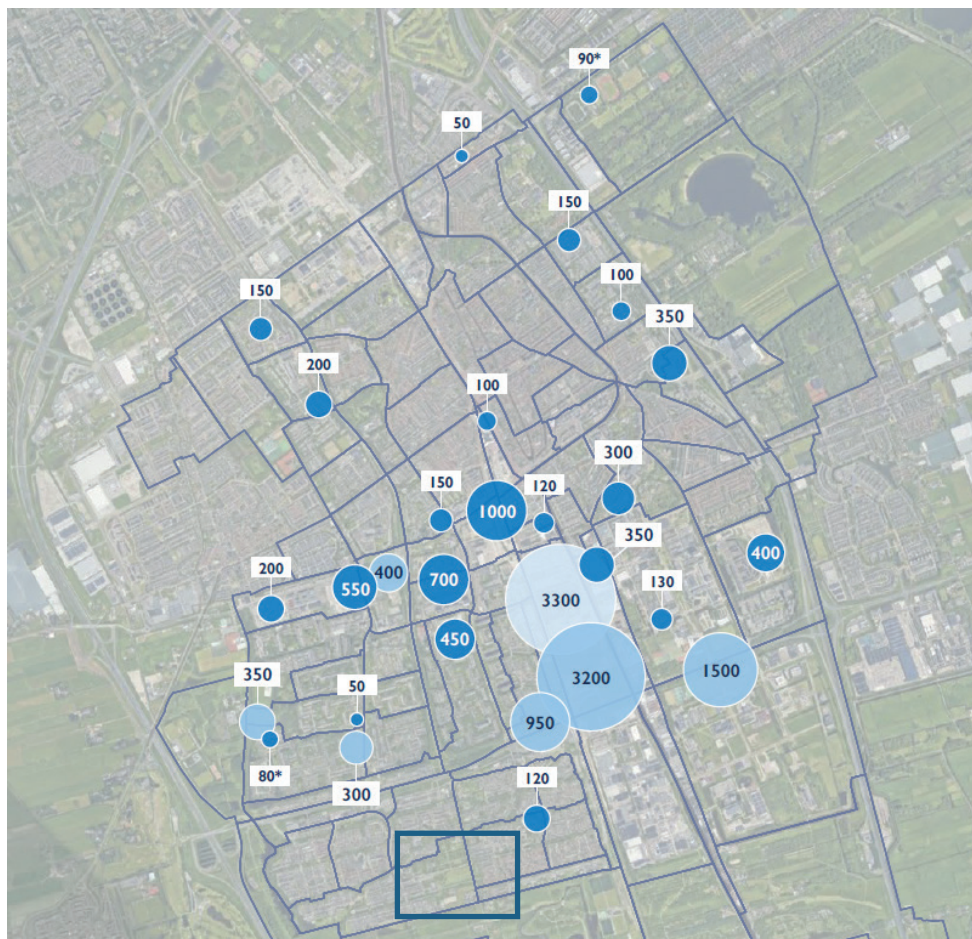
Figure 43. Densification plans for Delft according to the vision on living, showing an absence of densification plans in Tanthof-West (Woonvisie Delft 2023-2028, 2023)

Martina Huijsmans
Delft alderman for Spatial Planning

From the *Omgevingsvisie*, on what the citizens of Delft find important in their own environment:
"It's not just about stones and asphalt: the hard side of the physical environment. It's also about the soft side: safety, health, greenery and meeting each other"

Quality of living

The Woonvisie Delft also discusses the resilience of neighborhoods and communities in Delft. The map below shows a general overview of the degree of resilience per area. This focuses primarily on the ability of a neighborhood to handle a rise in vulnerable inhabitants: if a neighborhood can not handle new influxes of vulnerable people and nuisance and safety issues grow as result of this, then that may be an indicator the lack of resilience in a neighborhood (Gemeente Delft, 2023). Within the Tanthof focus area the indication is that the problem level has stayed the same. This is a more favorable evaluation than in some other neighborhoods, however, it does warrant caution when considering target groups for new developments in the neighborhood.
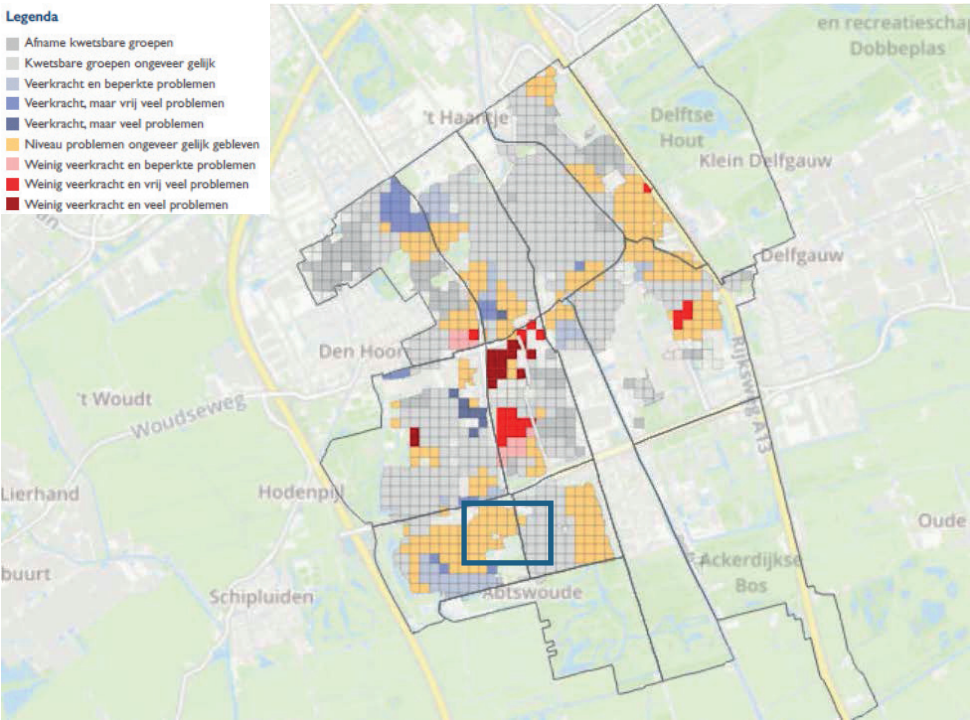
Figure 44. Map showing the suggested resilience of neighborhoods in Delft (Woonvisie Delft 2023-2028, 2023)

Building ages

The map below shows the building ages of all built developments in the focus area of Tanthof. As the historical development showed, the neighborhoods of Tanthof-West and Tanthof-Oost were developed consecutively in a short period at the end of the 20th century. Most buildings therefore stem from this period. Before this, the Abtswoude road formed the main infrastructure and along this road several buildings - mainly meant for farming or farm habitation - have been developed that are still standing today. These buildings in particular are often several hundreds of years old already. Because of their age, some of these might not be in great condition. On the other hand, these buildings may also have some historical value.

< 1800		1960 - 1975	
1800 - 1850		1975 - 1985	
1850 - 1900		1985 - 1995	
1900 - 1930		1995 - 2005	
1930 - 1945		> 2005	
1945 - 1960			

Figure 45. Age of buildings in Tanthof (Waag, 2025)

Focus area

The previous analyses have shown the potential of Tanthof as an area for (re)development: demand for housing is high in Delft, and Tanthof is underexplored as a viable location for densification. The area has a lot of history, but there definitely is space to densify, whilst taking into consideration historical building values. The soil structure lends itself for development and developing here may contribute to improving the quality of living in the neighborhood. These reasons further support the masterplan that had already been envisioned earlier on, which can be seen in figure 46. Figure 46 also shows an annotation of the area that has been further investigated and developed within the individual design. Several interesting aspects of this area, which can be seen on the satellite image of figures 47 and 48, are:
· The nearby public transport hub
· Existing urban tissue
· Valuable sightlines
· The surrounding water system
· Developments with historical value
· Other existing building structures.

The next pages highlight these points of interest.

Figure 46. Focus area annotated on group masterplan

Figure 47. Satellite imagery of focus area (Google Earth, 2025)

Figure 48. Bird's eye view of plan area, with points of interest (Google Earth, 2025)

Public transport hub

Just a minute's walk to the north of the focus area is a public transport hub with a direct bus and tram connection to the centre of Delft.

Existing urban tissue

With its position on the e
of Tanthof-West, there is a
tissue in the form of low to

Water system

This area harbors an extensive grid of canals that already contribute to considerable water buffering opportunities.

Historical barn

Central in the focus area lie
Constructed in the 17th ce
historical value in the area

Sightlines

The focus area forms both an infrastructural and visual extension of several streets, like the Indiastraat as pictured above.

edge of the neighborhood
a variety of existing urban
mid rise dwellings.

Other structures on plan site

Several other building structures can be found on this site as well, but these are more recently developed and hold no historical value.

s a traditional farm house.
ntury, this building holds

Urban design strategy

After evaluating all of the points of interest within this focus area, a plan has been made to carefully redesign this part of Tanthof. Currently, this area hosts a car garage and most of the area is used for the storage of vehicles. However, the intention of the new plan is to repurpose this area through a housing densification strategy. An additional ambition is to make sure that the new plan functions as an extension of the existing neighborhood of Tanthof. To achieve this, routing has been added to and through the focus area, creating stronger sightlines that reach from the focus area in to the neighborhood (to be specific, the Indiastraat). The historical barn may be repurposed as a community centre for Tanthof-West. Around the barn, three plots have been assigned that could each host a different building typology, offering new living environments and diversifying the neighborhood. Additional interventions, like the creation of additional canals, create extra water buffering capacities and make this area flood proof.

Current situation
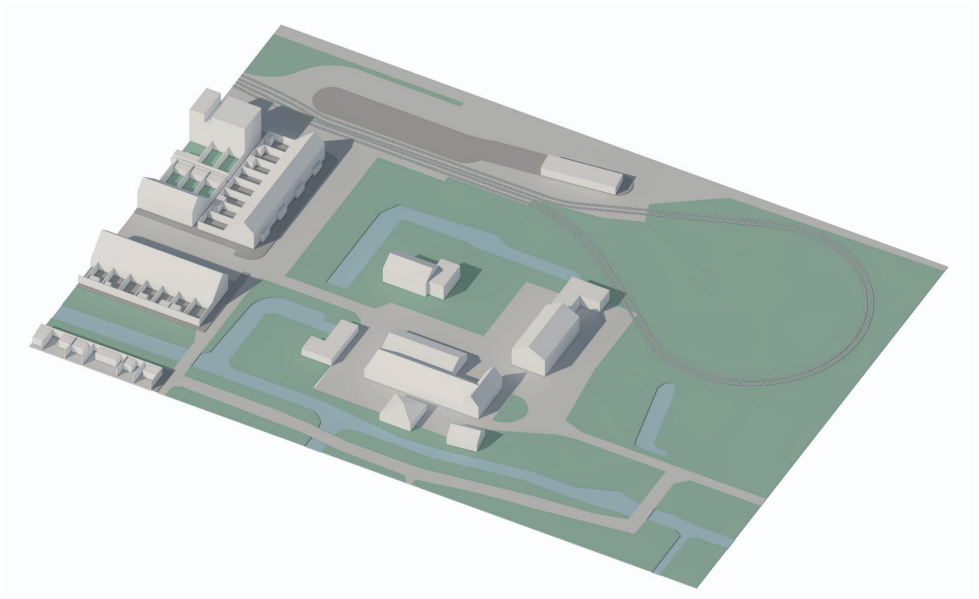
1. Reroute tram according to group masterplan
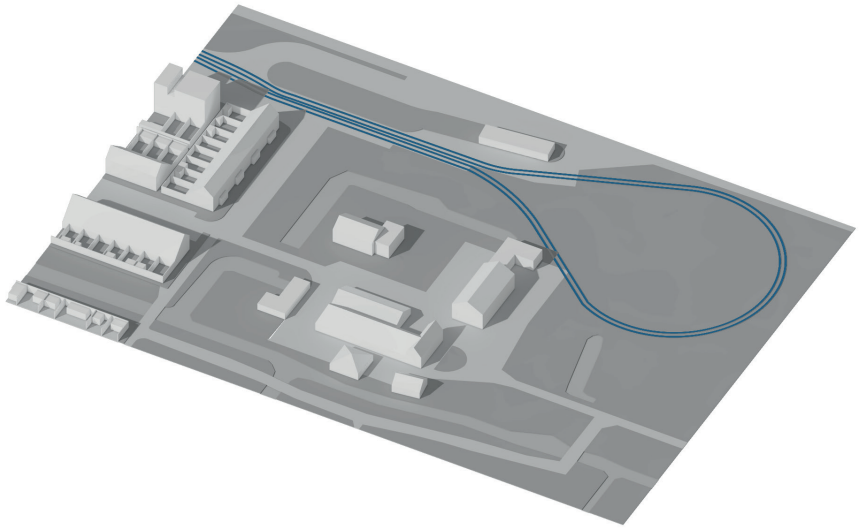
2. Enhance water buffering capacities
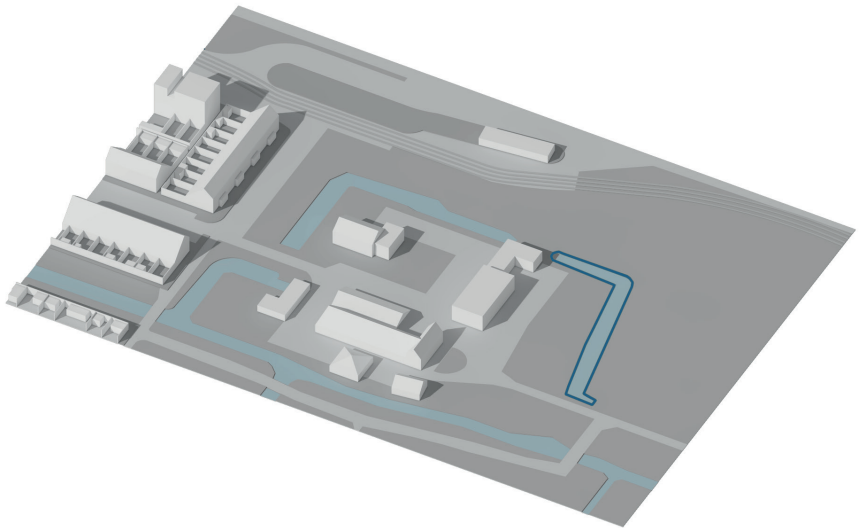
3. Make room by phasing out buildings with minor value
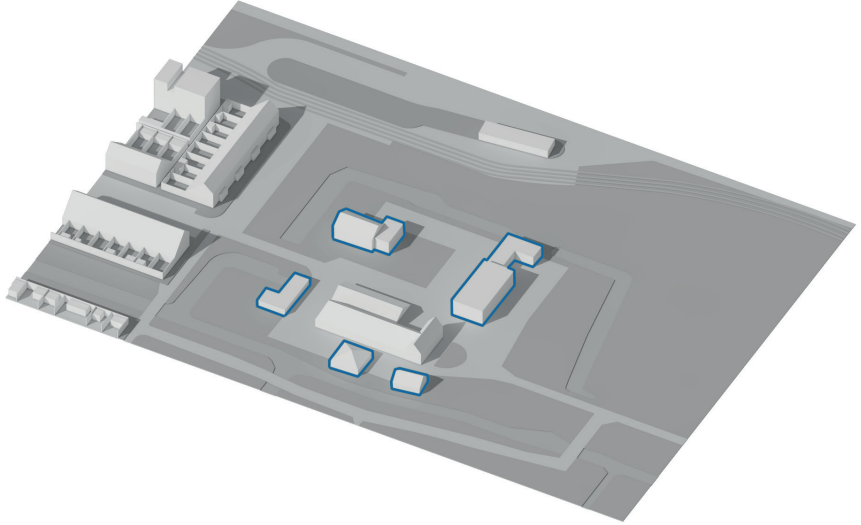
4. Create access from all directions
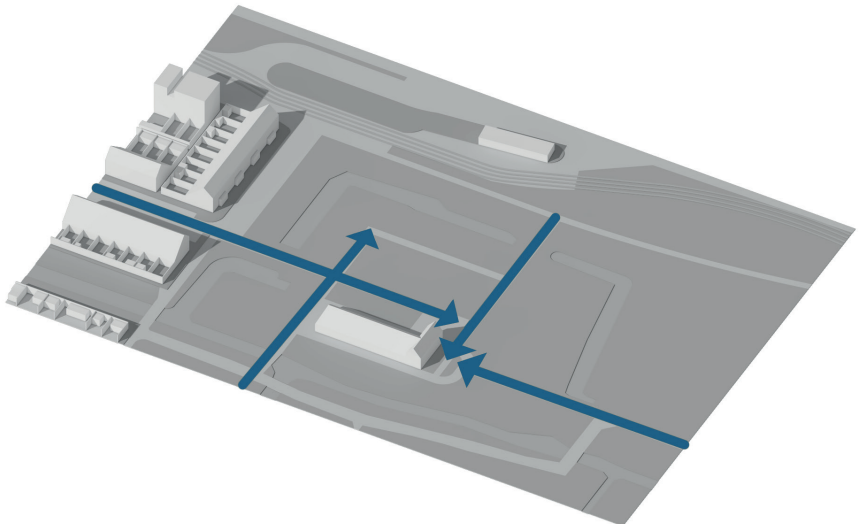
5. Maintain barn with historical value, and turn it into community centre
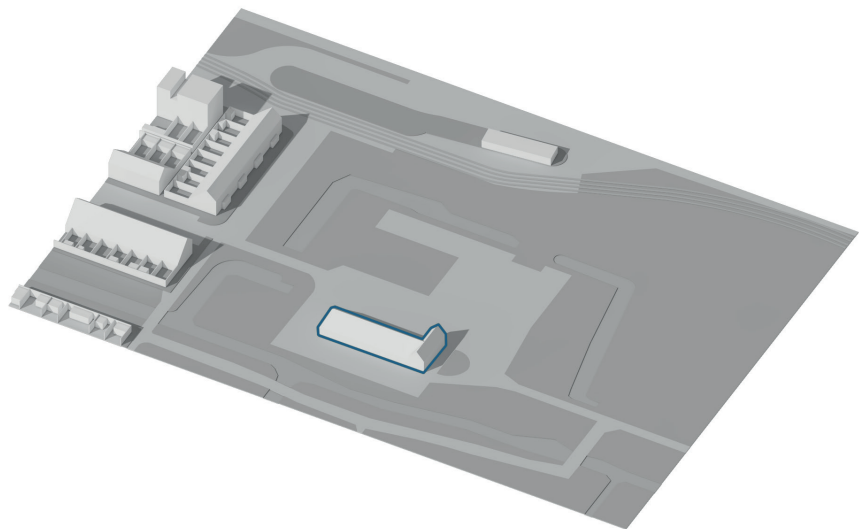
6. Densify around community centre
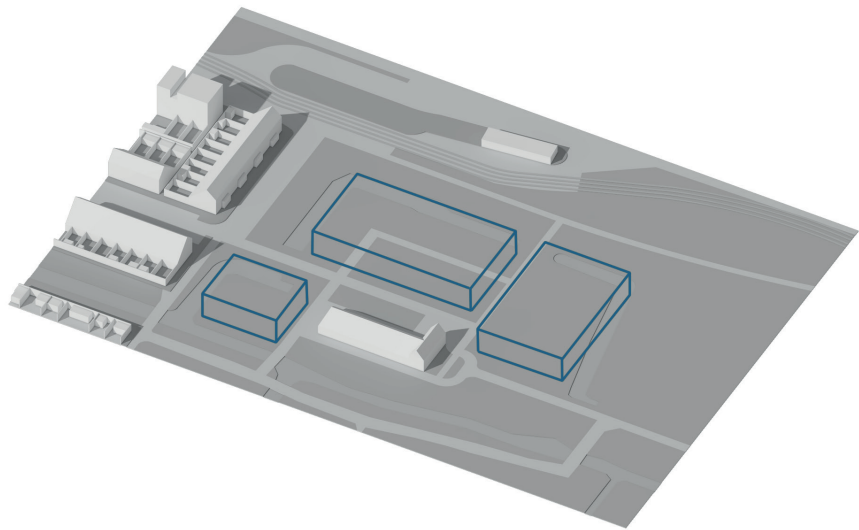
This page shows the urban design as proposed at the time of the P2, or midterm. As mentioned before, three different typologies would be placed on three plots surrounding the existing barn. The three envisioned typologies will be explained further on the next pages.
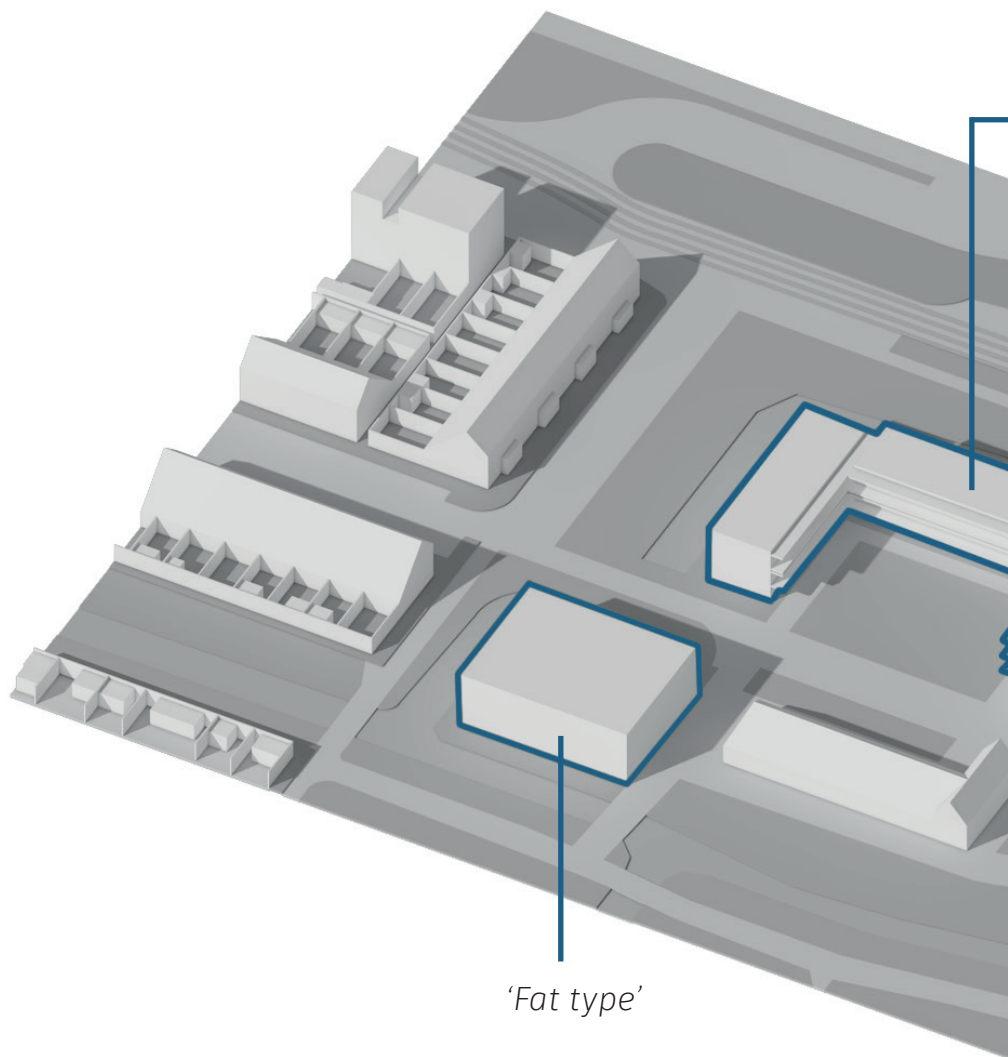
'Fat type'

Courtyard community
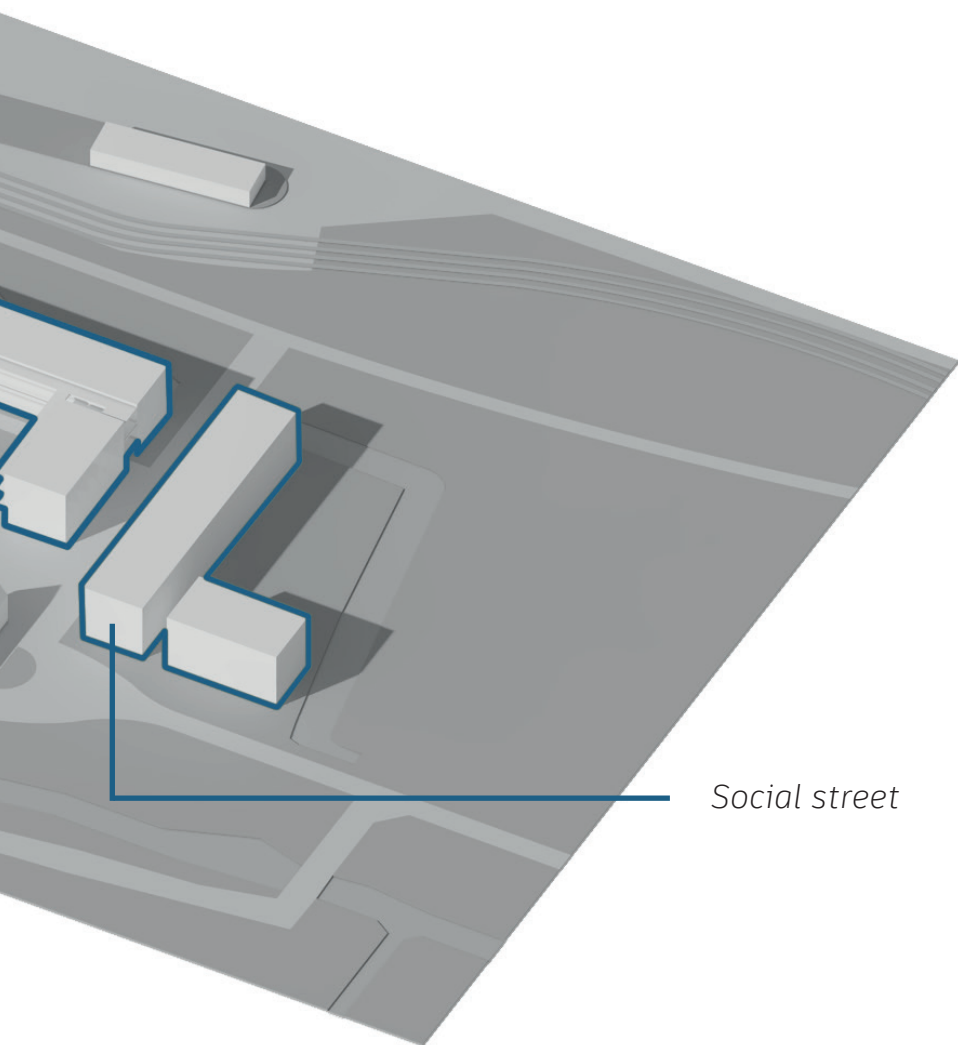
Social street

Mehr als Wonen / Hunziker Areal, Zürich

Marmelade Lane, Cambridg

'Fat type'

The 'fat type' can be considered to a form of housing in which dwellings are (considerably) larger than conventional arrangements. This essentially always means that these are inhabited by a group op people that do not necessarily have a romantic or genetic relationship, and thus this is almost always a form of cohousing. The example shown above from Switzerland has also been investigated within the case study analysis. The project consists of an apartment building with two social units per storey. Each social unit can house at least 6 people, with each having their own wet cell whilst sharing living rooms, kitchens and terraces with the entire group. This typology would be most suited for individuals (or perhaps even couples) that wish to intensively share elements within their direct living environment and are in search of high potentials to social interaction.

Social street

Marmelade Lane is an
conventional looking hou
quietly fosters a number
The essence of housing
typology remains the indi
of the dwelling, meaning t
would inhabit one stand
there is also room for the
through a 'common hou
and a car free street that
between residents. This
suited for couples and far
a conventional household
having the potential to soc

Aahof, Zwolle

example of a relatively
sing project that actually
of cohousing elements.
within this project and
ividual ownership and use
hat a 'conventional' family
d alone house. However,
collective: in this example,
e', a communal garden,
is focused on interaction
typology would be most
milies that value living as
, but with the benefits of
cial interaction nearby.

Courtyard community

This typology is focused on countering the linearity of the street, and instead creating housing that is centered around a central form of public (meeting) space. Again, the essence of this typology is based on the conventional household, as each dwelling is most likely inhabited individually or by a couple. However, outside of this conventional living there is also focus on collectivity. In the example above, there is not only room for interaction within the public courtyard, but also within the centrally placed common house. This example is specifically focused on the elderly, but in general is suited for a range of singles and/or couples that wish to individually inhabit a residence whilst also having the ability to find social connections nearby.

Preliminary building design

At the time of the P2

The 'courtyard community' was the typology that was worked out up until building scale level at the time of the midterm of this graduation project. A standardized dwelling floor plan (figure 49) was created, which included an internal stair case that could link different stories, but would not *necessarily* be in use. The idea behind this was the potential in flexibility and diversity of the units, as these could now be merged into two or three story dwellings. Besides these standardized dwellings, there would also be space for storage, mobility sharing and there would be a common room for the complex. The project would be considered a management cooperative, which would warrant the implementation these shared functions.

Design flaws

This initial design did not yet tap into the results from the case study analysis, and in general remained a relatively mainstream example of a courtyard typology with gallery circulation. As a result, the circulation space remained quite anonymous, and the public space - the courtyard - was still too large to have a human scale. Additionally, the dwelling floor plans were organized inefficiently, with too much space going to circulation and the staircase, and with the wet bathroom cell being positioned against the facade.
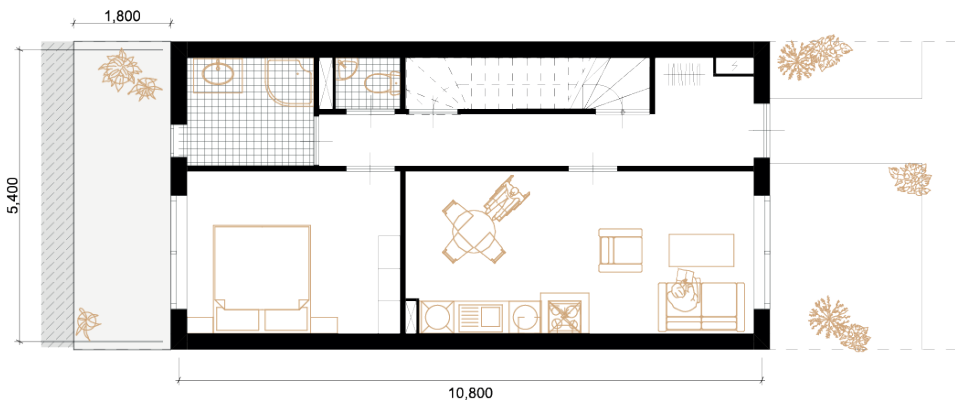
Figure 49. Standardized dwelling floor plan of building at the time of the P2/midterm

Storages tucked away
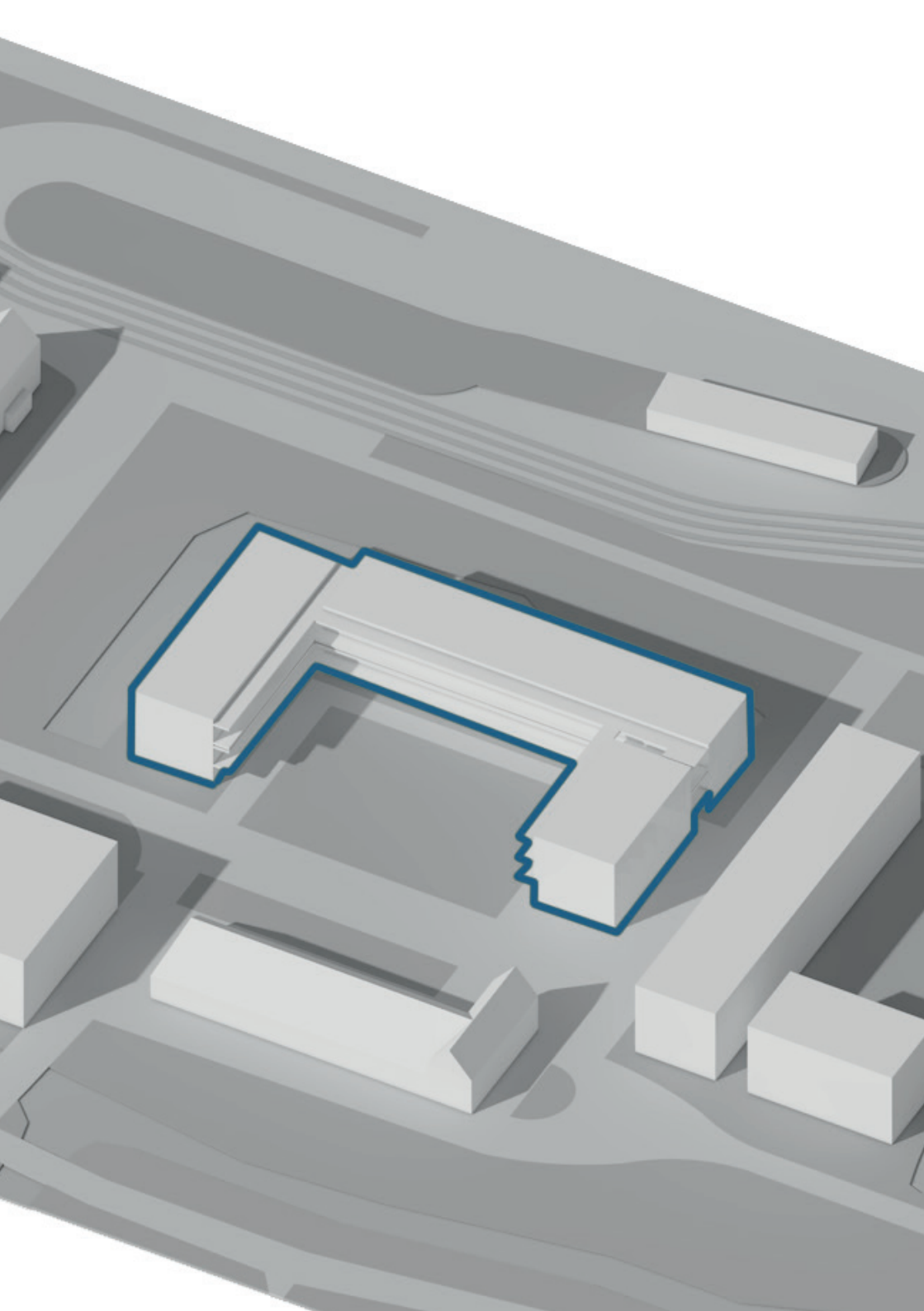
Wide 'living' galleries

Courtyard design at the time of the P2/midterm

Complex common room

Shared bike and mobility scooter storage

0　2　4　6　8　10 m

Sliding doors open up to gallery

151
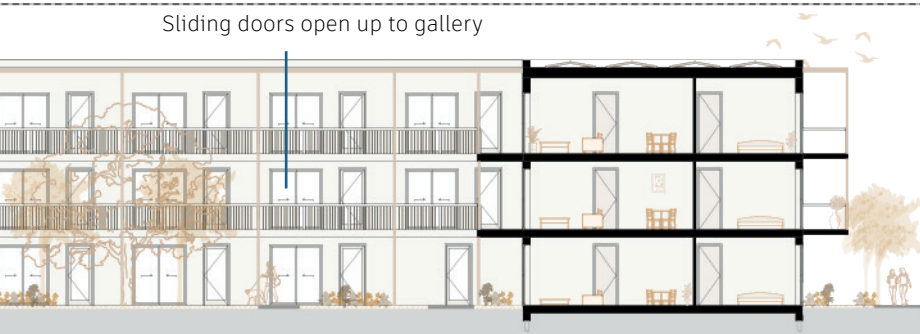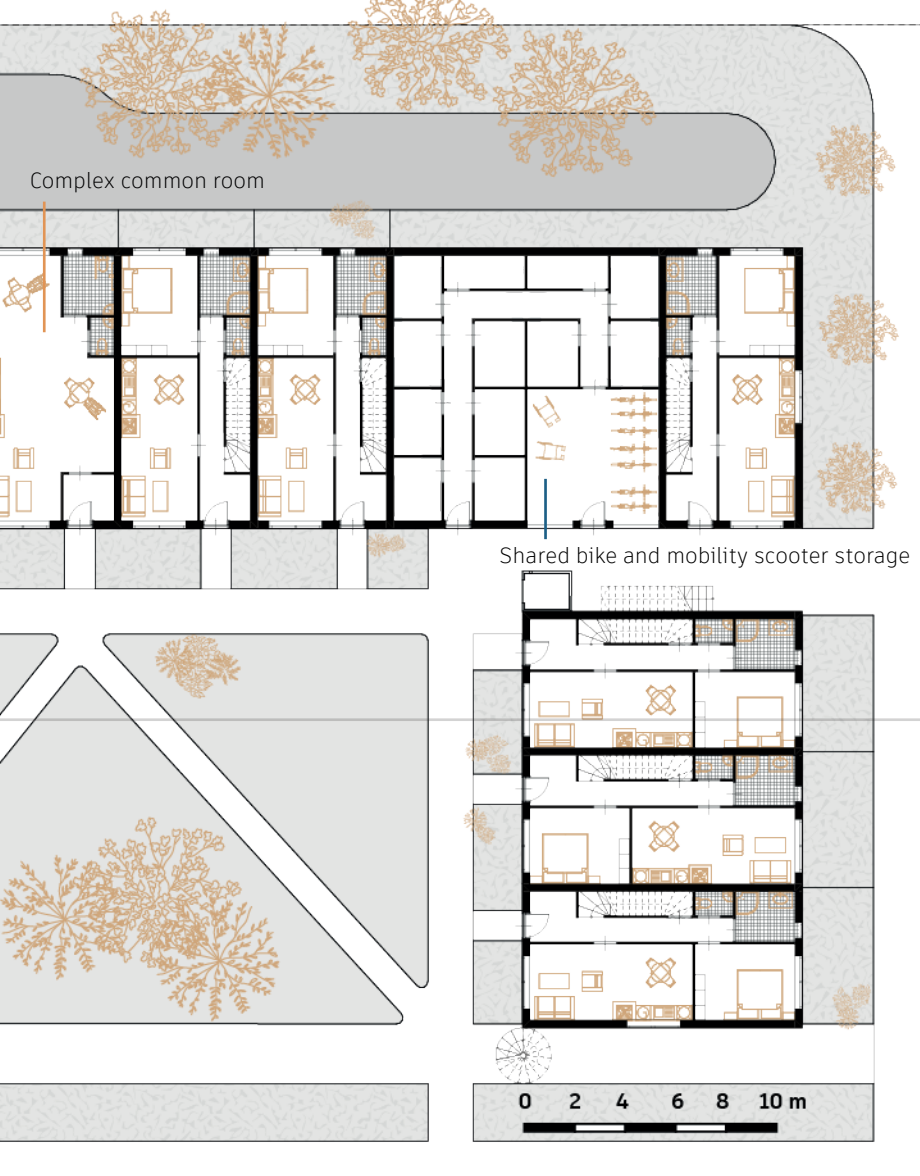
Definitive building design

Concept

Working towards a definitive building design, the preliminary building design at the time of the midterm was reimagined, supported by a period of intensive work on in particular the case study analyses, which gave many new insights that could be implemented into the definitive building design.

1. The new concept still focuses on the same plot size that was used initially, but now reimagines the configuration of the building here. A projected height of nine meters was chosen as a starting point to relate the building to nearby housing developments – which typically ranged between 8-12 meters in height.

2. One conceptual idea from the time of the midterm was to create a courtyard typology, with the goal of creating a spatially bounded community. This idea still remains, and therefore the courtyard typology is the departure point for the building design.

3. The plot has a slightly skewed geographical orientation. As a result, opening the 'left' side, positioned towards the southwest, will allow for additional access to sunlight during the end of the afternoon and beginning of the evening during warmer months.

4. The complex is envisioned to not be fully enclosed, but also function as a throughway, so that it becomes an integral part of the surrounding neighborhood. For this reason it is made accessible from multiple directions.

5. The volume is 'broken up' to give it a more human scale, and heightened at the central entrance to signify the entrance zone.

6. Instead of galleries, circulation happens through portico's, as the portico resembles a more human scaled circulation space: now there are four distinct circulation zones instead of a single one with long and anonymous galleries attached to it.
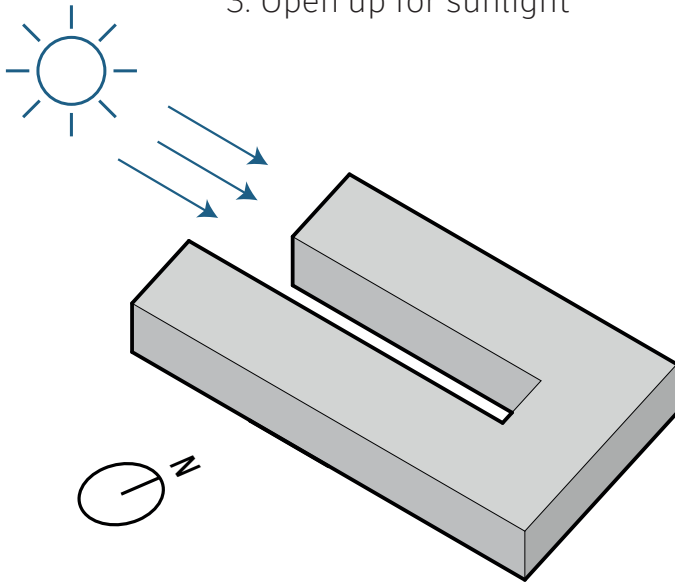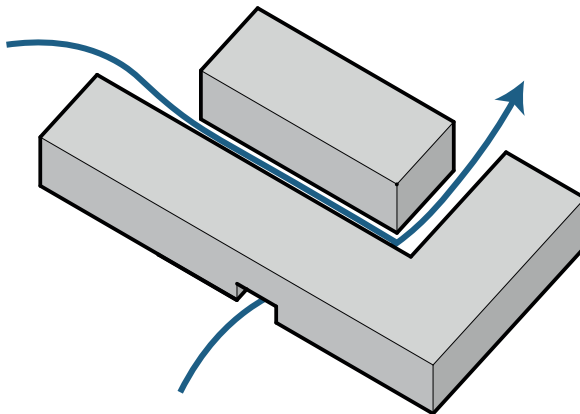
1. Starting volume

9 m

55 m

30 m
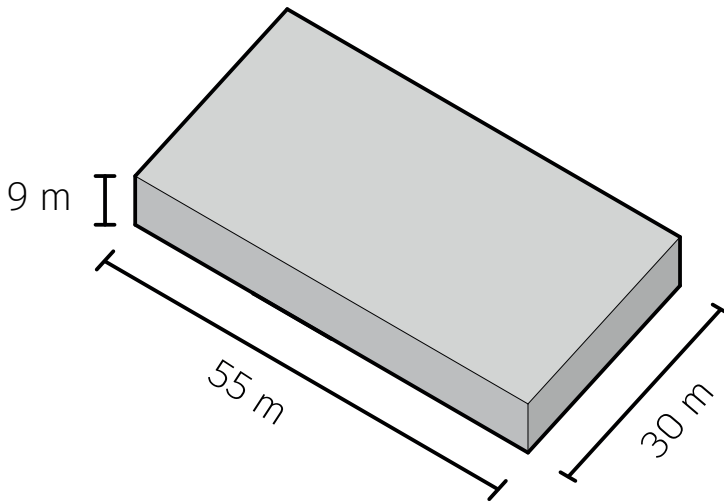
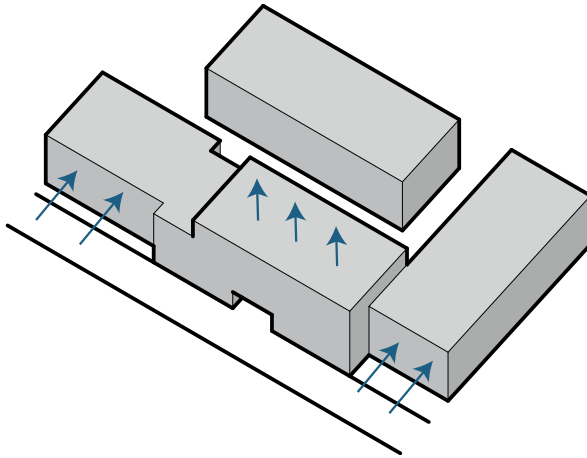## 2. Courtyard typology as departure point
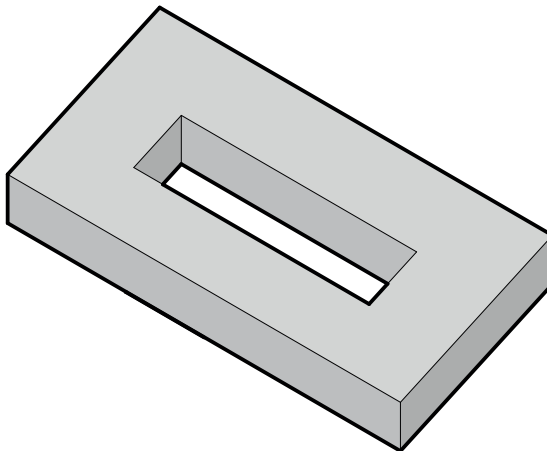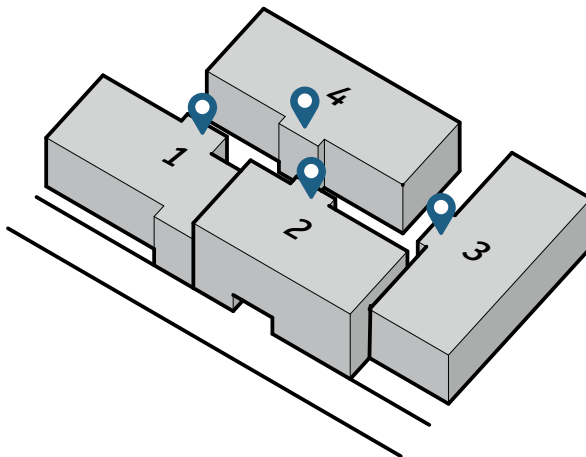
3. Open up for sunlight

4. Allow for options in routing, to and through the complex

5. Push and pull to create formal entrance zone on street side

6. Create 4 portico style entrances for more humanly scaled circulation space

Axonometry

Ground floor plan

The ground floor plan shows the building design in its context on the plot of the urban plan. On the west and north hand side, the complex is locked by a water body. The west side is positioned opposite to a new development, while the south borders a square and a barn with historical value that, within the plans of the urban design, may be repurposed as a community centre.

Courtyard
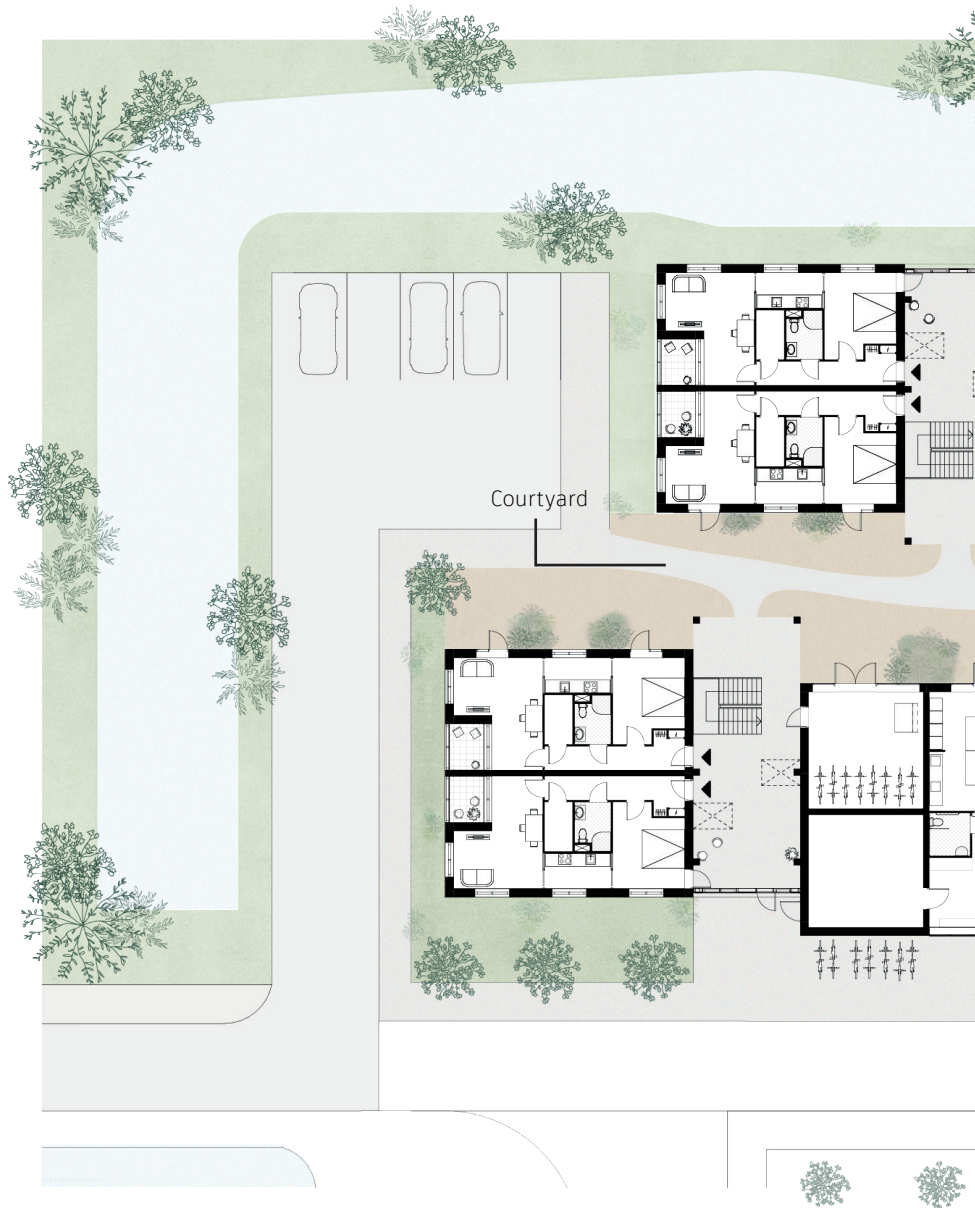
The south side sees the formal entrance to the complex, with an actual entrance with mailboxes, which also borders the complex laundromat.

The four portico's are also visible. Neighboring each portico is a bicycle and garbage storage. Centrally in the complex is an informal 'courtyard' that can be used as circulation, but also for leisure and perhaps even gardening.

Pedestrian bridge

Central entrance

Square

159

Impression of the inner 'courtyard'

Elevations

The elevations highlight the degrees of repetition and disruption of patterns within the facade composition. Although the west-east elevation at first hand seems to be rather wide, it is broken up into three parts through setbacks and height differences. Additionally, the focus is drawn to two of the entries of the portico, which have been

West - East

Sections

The west-east section shows the differences between dwellings and circulation space. The circulation space is a centrally placed portico, materialized extremely lightly with a wooden skeleton carrying structure, wooden flooring and polycarbonate facade elements. On both sides of the portico, there are front entrances to the dwellings.

West - East

materialized with polycarbonate facade cladding, instead of the wooden open facade cladding that has been used for the dwellings. Nevertheless, the systematic use of window openings create repetition and bind all these different parts together. These interventions have tried to create a composition for the complex that makes it feel both as one whole, but also instigate a more humanly scaled feeling.

South - North

Each dwelling also has an additional door that borders the portico for easy acces. The north-south section shows these entrances. What this section also shows, is the formal entrance and complex laundromat (bottom left), and the central narrow street that runs through the complex.

North - South

163

Dispersion of dwelling units

The complex contains a total of 40 dwellings that can be placed into three dwelling types. All dwellings are situated around a portico (in yellow within the axonometric). Three of the four portico's have dwellings of all types connected to them, as a means of diversifying the housing supply within each floor and each portico.
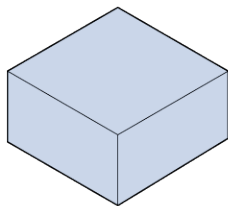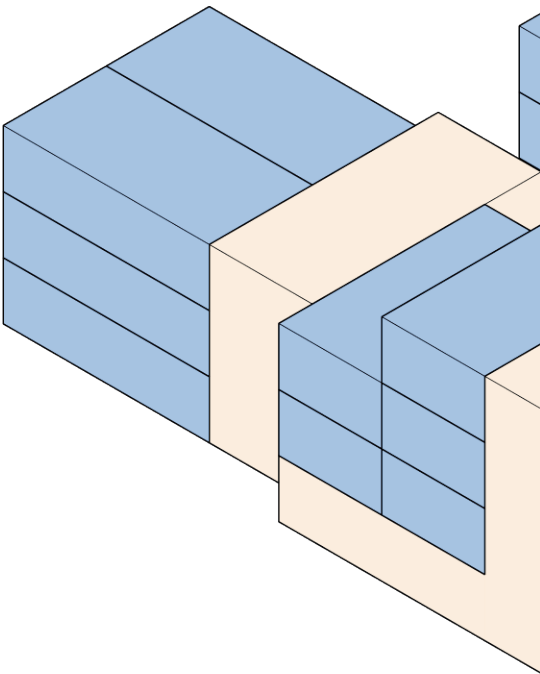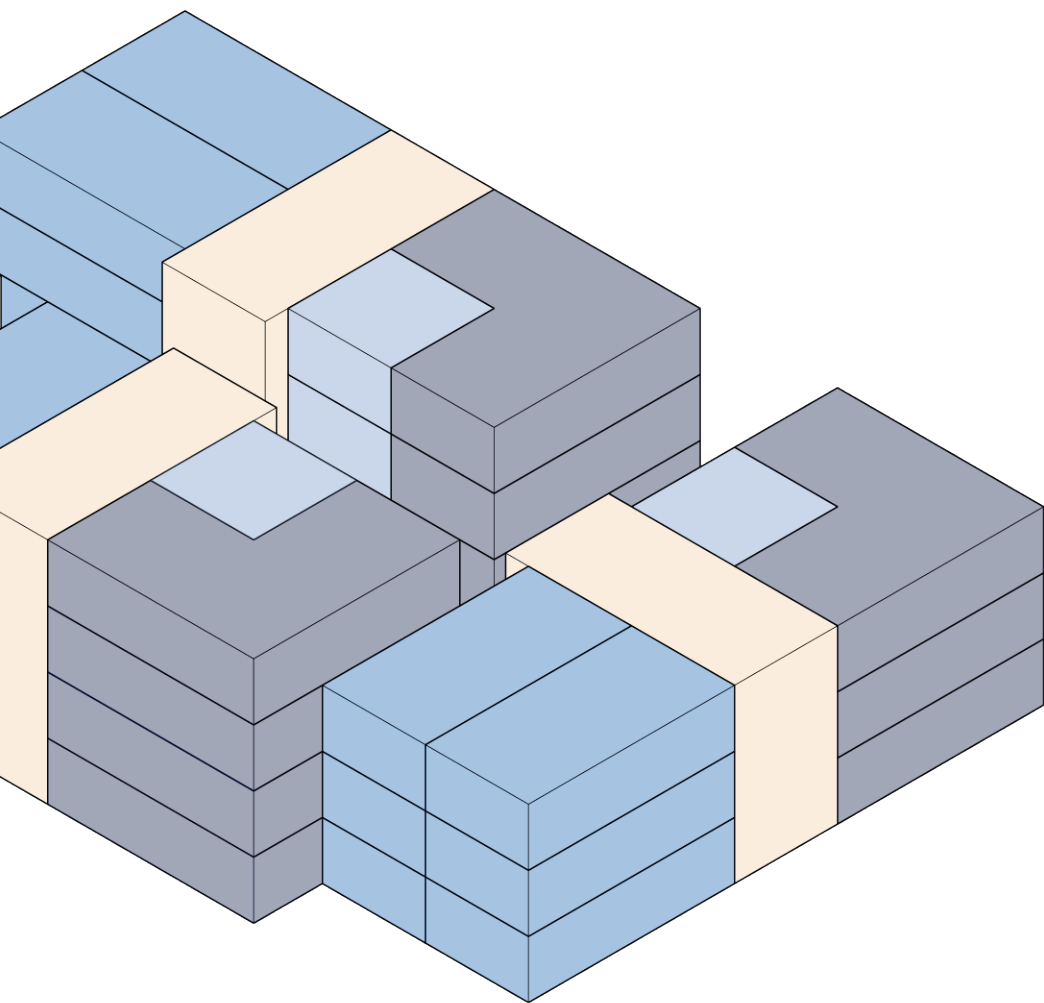

Type A | 7x
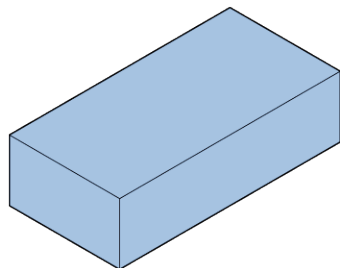
Type B (B1+B2) | 23x

Type C | 10x

Dispersion of housing units (circulation and shared space in yellow)
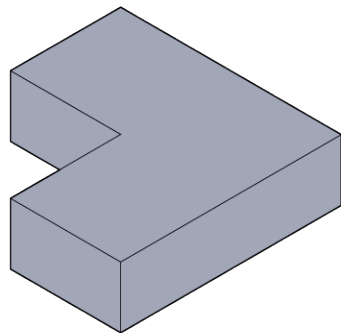
Dwelling types

Type A

The first dwelling type is the smallest of the three, with a 29 m² gross floor area. This unit is a studio apartment, containing an open space living room and kitchen combinatiomn and an additional wet cell. There is flexibility in configuration, multiple windows account for sunlight and there is a double connection to the portico, offering some complementary outdoor space for this unit.
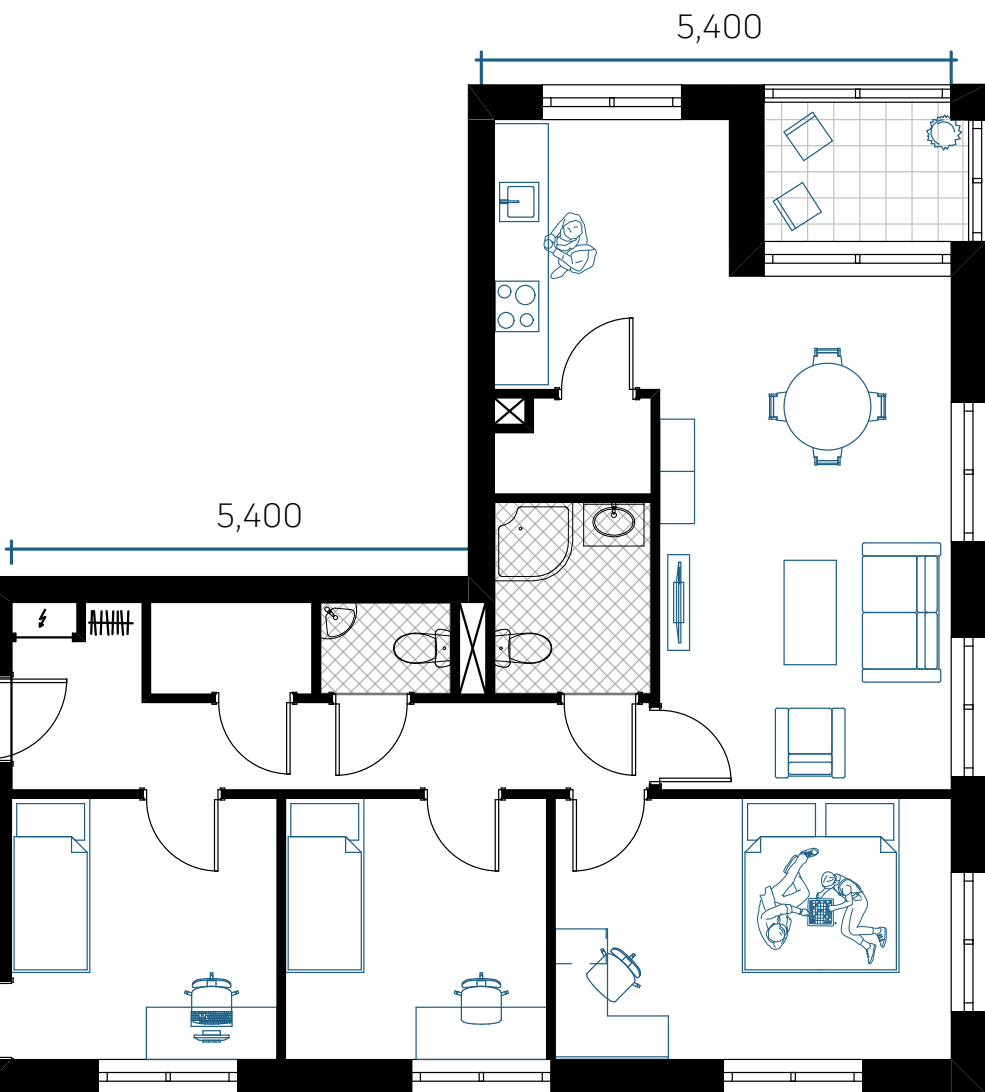
Type C

This is the largest type with 87 m² GFA. This apartment may host two to three bedroom in addition to the living room and kitchen combination. As a result it is feasible for families or living groups. The apartment has private outdoor space through a loggia, but there is also one room connecting directly to the portico for some complementary outdoor space.

5,400

5,400

5,400

Type A

5,400

5,400
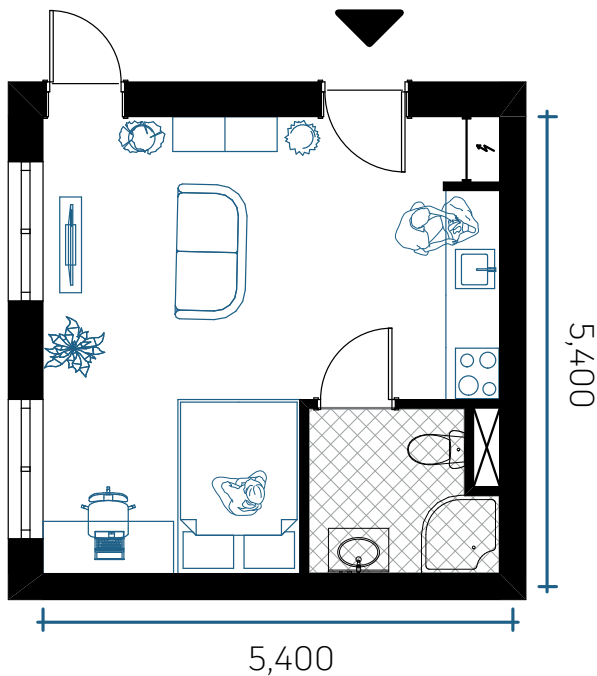
Type B1 + B2

The last type is the type B dwelling. This type contains 58 m² GFA and is organized in such a way that the dwelling can be navigated in a loop, by placing the wet cell in the middle and allowing for circulation around this. This also gives liberty in deciding where to place either the bedroom or living room, as the kitchen can easily be reached from both sides of the apartment.

5,400

10,800
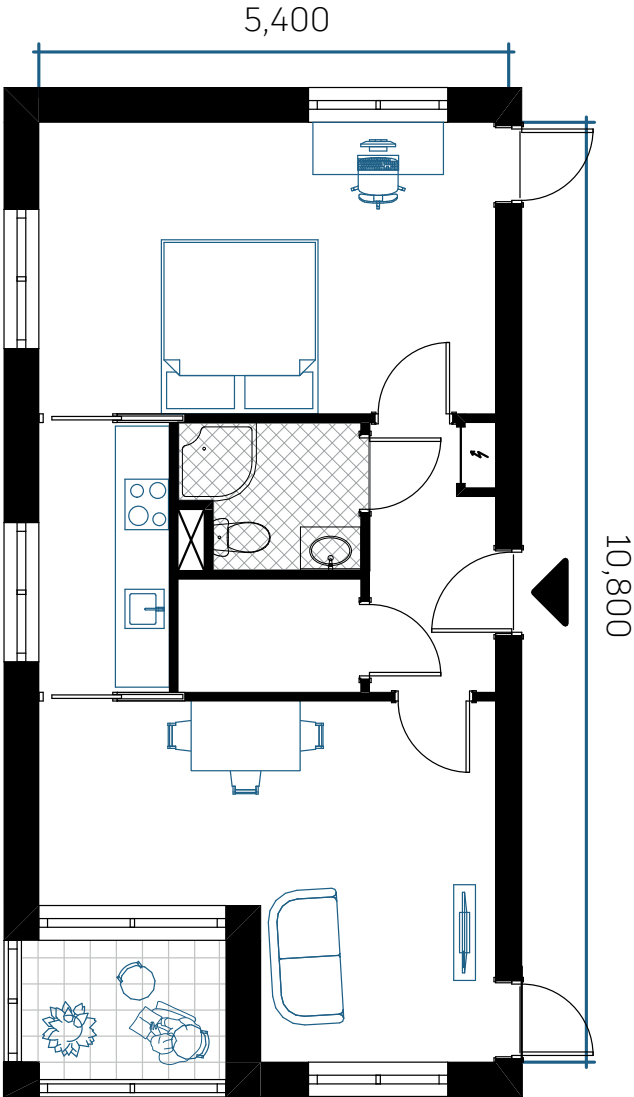
Type B1

The difference between types B1 and B2 lies in the positioning of the doors connecting to the circulation space. Type B1 has a central entrance on the long si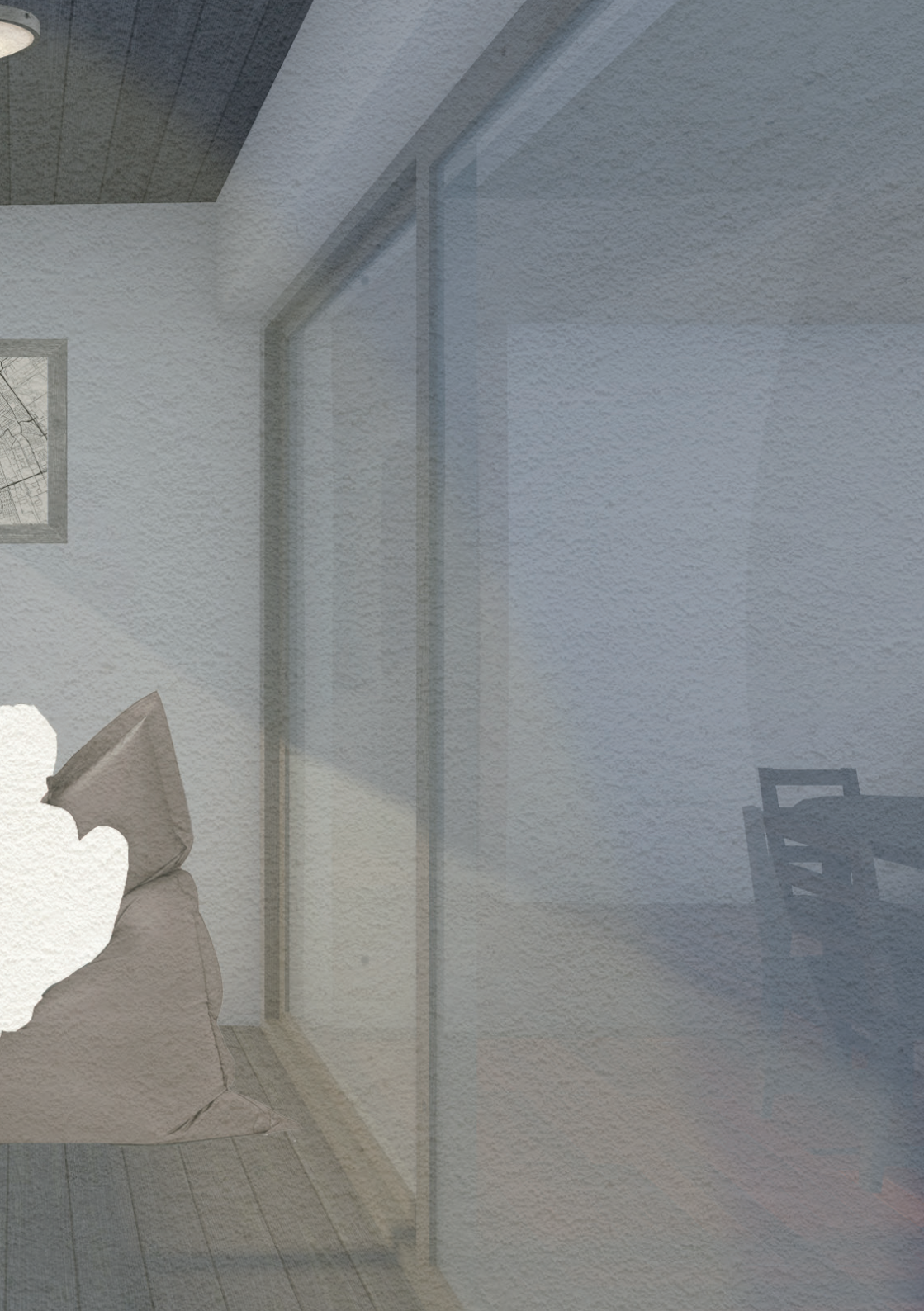de of the dwelling, while type B2 has its entrance on the short side. Still, both types have additional connections to the portico. Both types lastly also have their own private space through a loggia.
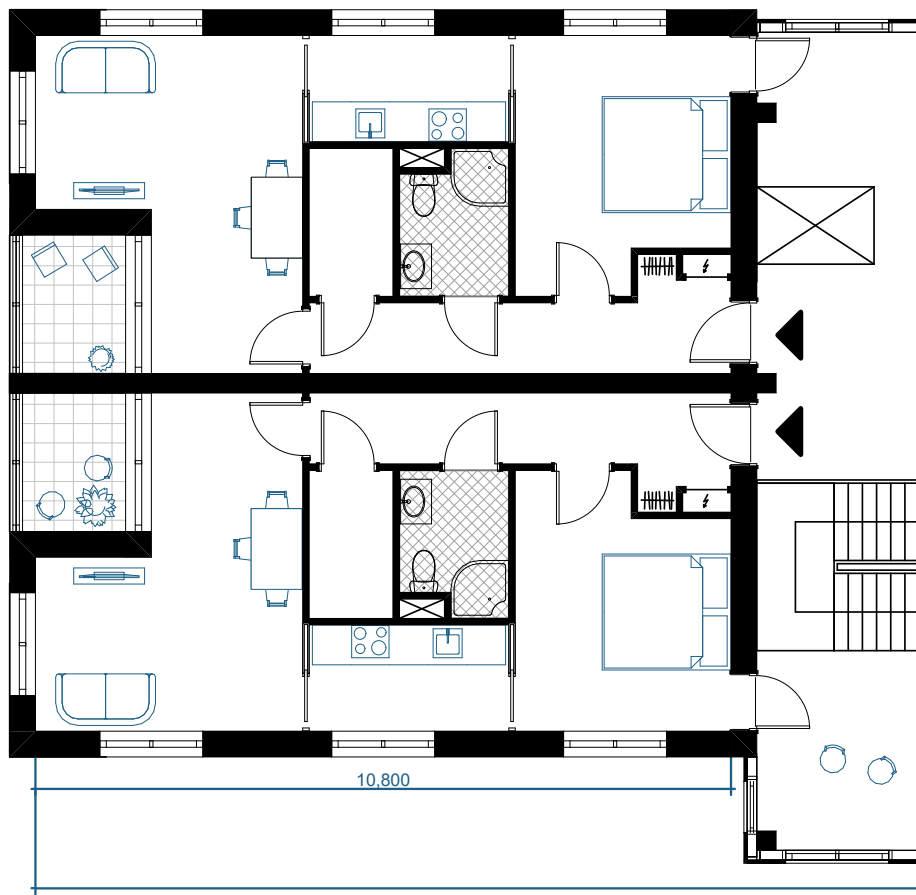

5,400

10,800
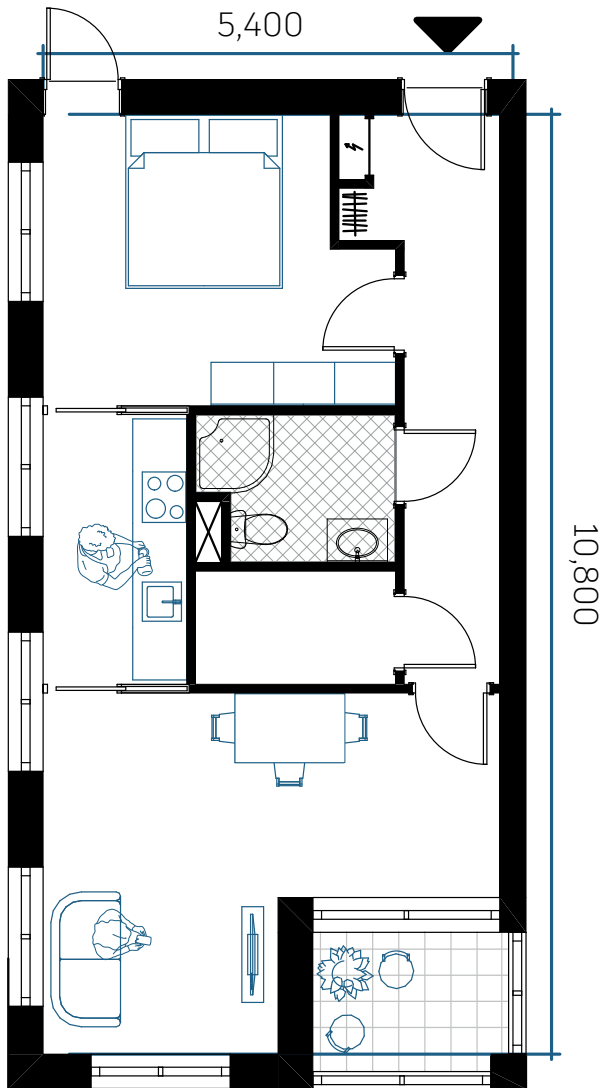
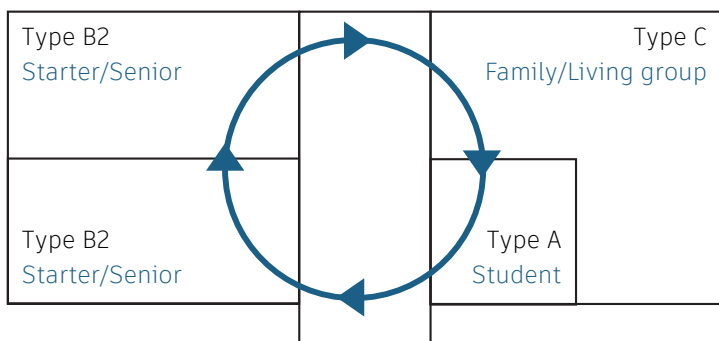Impression of a loggia in a type C dwelling

Portico floor plan

Grouped together, the different dwelling types may be organized like this within one floor of the portico. Because of the differentiation of dwelling types, one floor may host a range of different residents. This opens up the opportunity to move from dwelling to dwelling on the same floor when a change in one's life occurs; for example when expanding a family, or when a child moves out. This option is also important to reducing the risk of loneliness, as it allows for dwellers to live longer within (virtually) the same space.

10,800

27,

| Type B2 Starter/Senior		Type C Family/Living group
Type B2 Starter/Senior		Type A Student

Envisioned possibilities for moving house within the same portico

0,400

10,800

400
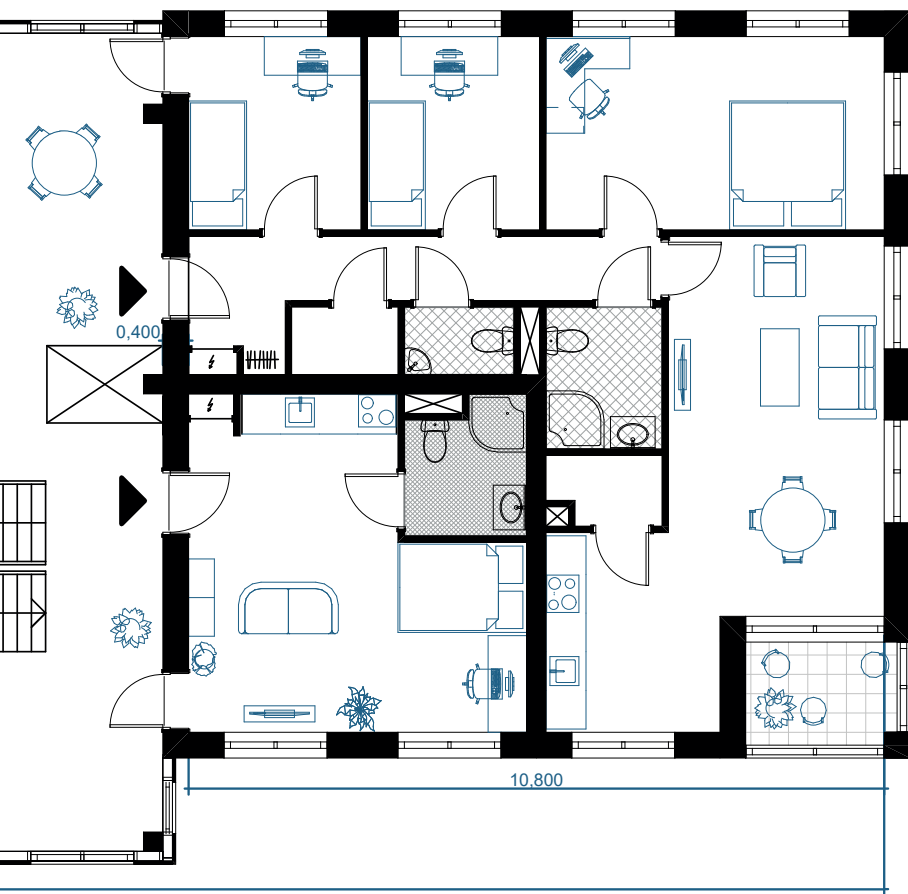
(Dis)engaging on the portico

More design decisions have been made to increase the quality of living along with the opportunities for social interaction on the scale of the portico, allowing for dwellers to engage with others or retreat.

Naturally, privacy remains an important point. The portico itself helps because there is a limited amount of dwellers that move along your front door within this configuration, as most front doors can be reached immediately from the staircase. Additionally, there
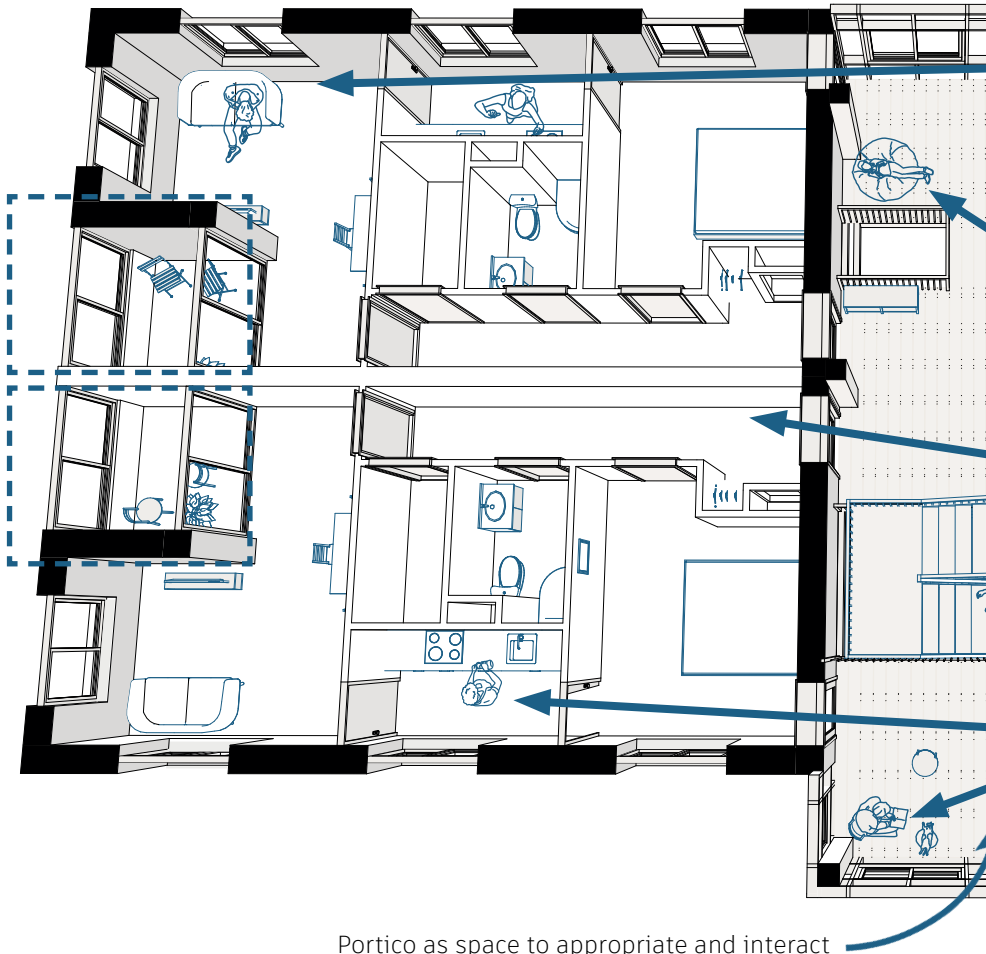
Portico as space to appropriate and interact

is still room for private outdoor space, through the positioning of private loggias on the ends of the apartments.

However, to also give ample opportunity to interact socially, the portico has been designed in such a way that space is created that can be appropriated by residents of this floor. By oversizing the landings and adding some gaps, the space becomes split up and ownership remains undefined, leaving it up to the residents to make it their own.

Loggias offer private outdoor space
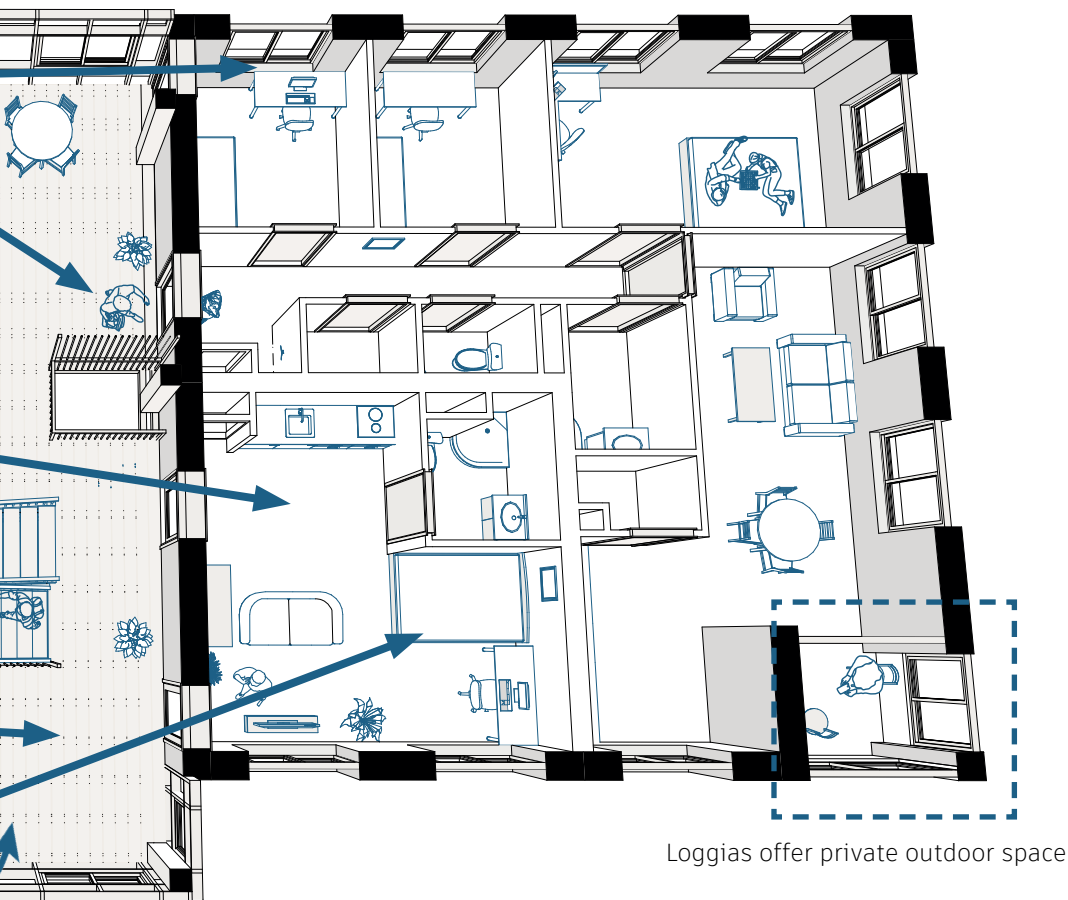
Impression of the portico

Building technology

Building structure

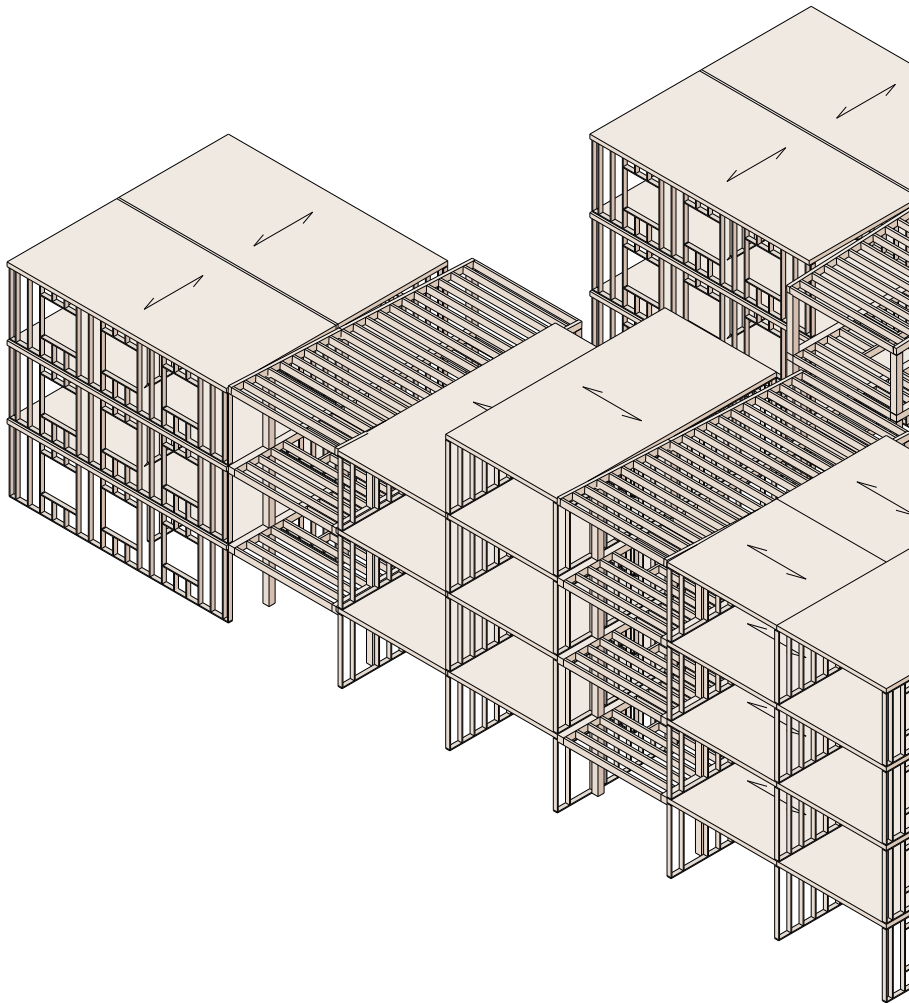The departure point for the building structure design has been the use of wood as sustainable construction material. A maximum floor span of 5400 mm has been chosen to optimize material use. With the building configuration of max. 4 floors, a hybrid system of

Axonometric of carrying building structure

CLT (Cross Laminated Timber) floors and wooden frame walls has been chosen to construct the dwellings, as this lends itself to optimally limit the thickness of floors and walls (for example, because of the ability to insulate within the wooden frame structure). The circulation space of the building is constructed by a wooden skeleton structure of columns and beams, with the goal of keeping this spacy open and light.

Building structure

10800 mm

5400 mm

CLT floor

Stability wall

Wooden frame walls

Dwelling (type B example)
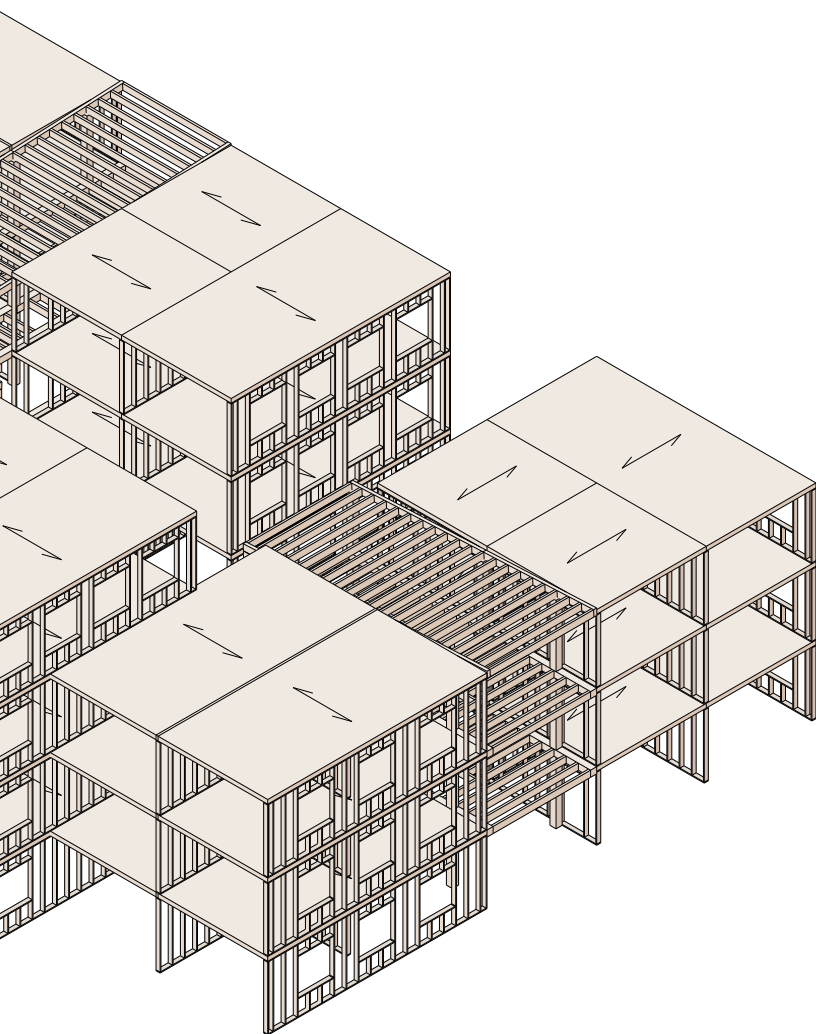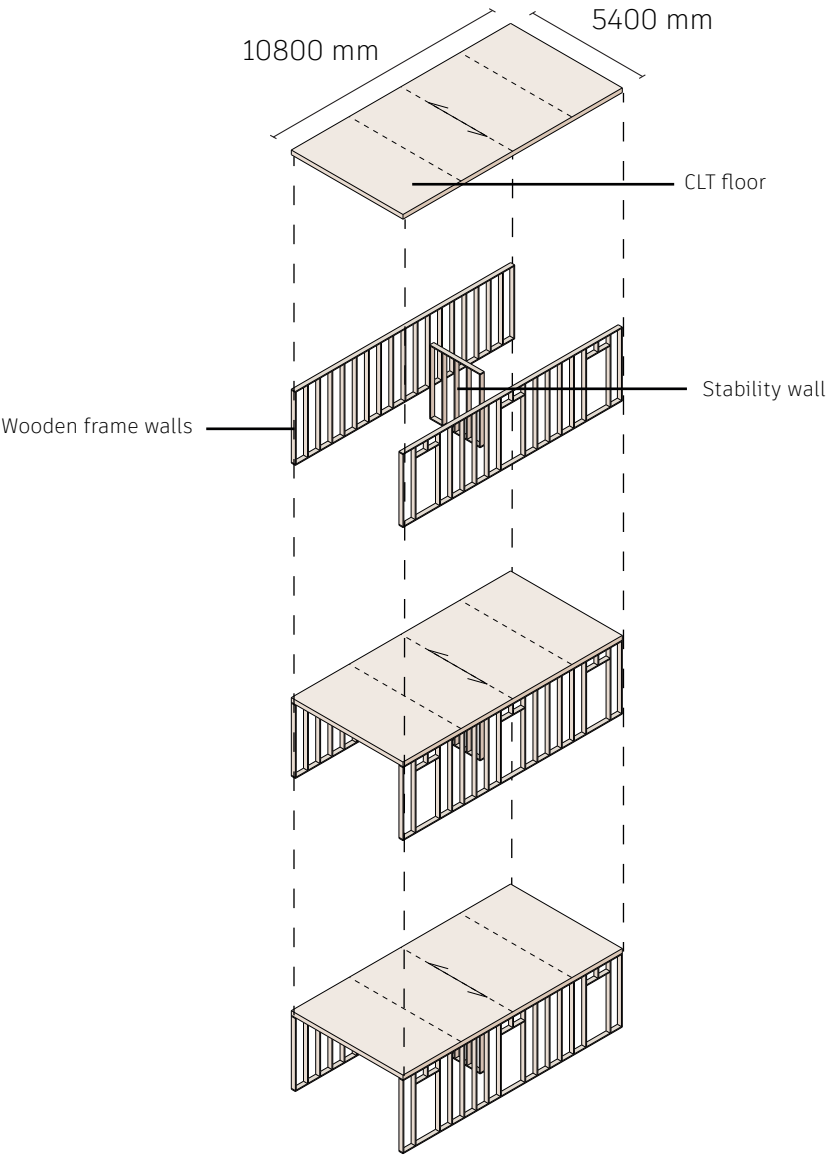
Axonometric of structure of typical dwelling and circulation space

CLT Flooring

Wooden frame walls
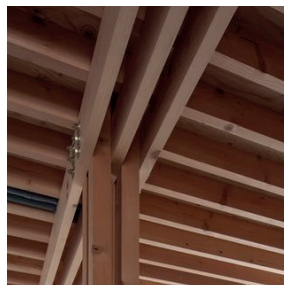
Skeleton structure in circulation space

Primary girder

Secondary girder
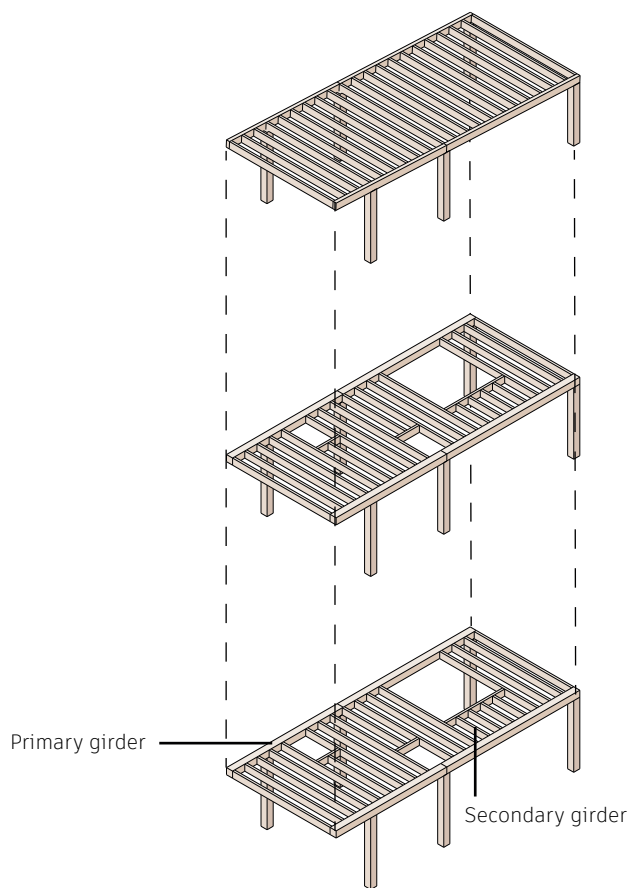
Circulation space

Climate concept | Summer

Climate considerations have been widely user oriented, hoping to offer a healthy living environment, low energy use and optimal use of space.

Walls, foundations and roofs have been adequately insulated. Window openings are limited and all windows contain external sunscreens to keep out heat.

Loggia's and circulation space are not insulated but can both be closed of through single glazing features, effectively creating winter gardens that stay warm in winter periods. PV in combination with heat pumps facilitate low energy floor heating and cooling. Mechanical ventilation further limits heat loss. Lastly, sedum roofing allows for water retention and evaporative cooling, while dampopen wall packages regulate moisture within dwellings.

Evaporative cooling through sedum

Circulation
functions as h

Loggia's function as heat buffer

West

Energy generation
through photovoltaic +
added efficiency
through sedum

space
eat buffer

External sunscreens
block excess sun
infiltration

East

Floor cooling

Climate concept | Winter

Roof
Sedum finish
Wood fibre insulation
between battens
CLT carrying structure in sig
Rc > 6,6

Lowered
ceiling zone

Circulation spa
and forms buff

Glazed loggias as
winter garden

V

V

V

West

Mechanical ventilation
prevents heat loss

Floor
Lithotherm finish
Geopolymer concrete in situ
Underlying insulation
Rc > 4

ht

Water retention in
sedum roof

ce sheltered -
er for the cold
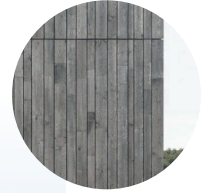
Facade
Damp open
Wood fibre and straw
insulation
Wooden cladding
Rc > 4,9

Buffer

HP

Damp open facade for
moisture regulation

Buffer

HP

Buffer

HP

East

Floor
heating

Heat pump for
floor heating

Facade fragment

Facade fragment
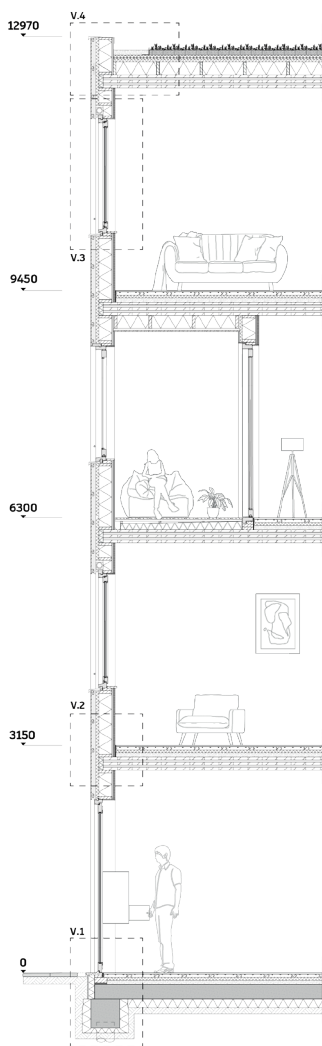
The focus has been put on sustainable materialization with consideration of affordability. Pre-greyed wooden facade cladding is durable, relatively light weight and limits the thickness of the facade package. Straw, as an excess product in abundance in the Netherlands, is used as insulation together with wood fibre plating – which further limits the thickness of the facade.

Low-cost, durable and light weight polycarbonate is used to clad the circulation space, with openable windows placed within this grid to allow for ventilation in warmer periods.

Lithotherm flooring is used as a sustainable, dismountable flooring system that works with floor heating. Because of underlying sound insulation on this floor, the CLT carrying structure can remain in sight for a natural look of dwelling ceilings.

Within the vertical and horizontal section of the fragment, 5 details have been highlighted, which can be seen on the following pages.

Detail V.1
Facade - Foundation

Double glaz[ing]

Holonite door sill

Grate for rain disposal

Edge strip

Air ti[ght]

0

Gravel

Concrete band

Water barrier

Insulated side board

Water barrier

Insulated foundation beam

Foundation pile

Foundation floor | Rc = 4
- 20 mm floor finish
- 45 mm Lithotherm floor system with integrated heating
- 40 mm wood fiber insulation plate
- 60 mm CEMWood levelling layer
- 200 mm Geopolymer concrete (poured in situ)
- 80 mm rigid insulation

ghtening

20

45

40

60

200

484

120

Detail V.2

Facade - Dwelling dividing floor

340

18 28 28 40 180 18 28

Double plasterboard for fireproo

Facade | Damp open, Rc = 4,9
- Open wooden facade, pre-grey
- Vertical and horizontal battens
- Water barrier, damp open
- 40 mm rigid wood fiber insulat
- 180 mm straw insulation betw
- 18 mm open strawboard platin
vapour barrier
- 2 x 12,5 mm gypsum board fini

Additional wood fibre insulation
to reduce thermal bridge

ved
s

tion
een battens
g, acting as

sh

Dwelling dividing floor
- 20 mm floor finish
- 45 mm Lithotherm floor system with integrated heating
- 40 mm wood fiber insulation plate
- 60 mm CEMWood levelling layer
- 180 mm 5-ply CLT

20

45

40

60

344

180

Edge insulation for sound proofing

Detail V.3

Facade - Window

External sunscreen

Seam sealing, window frame

Fall protection,
distance to floor = 1000 mm

Aluminium window sill

18   28 28   40   180

340
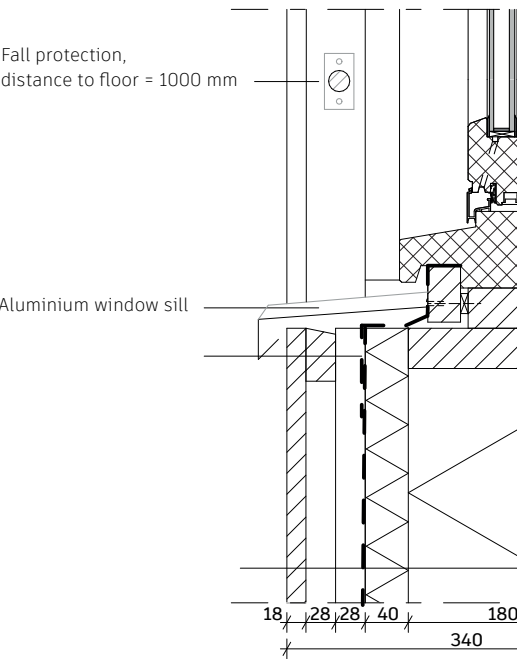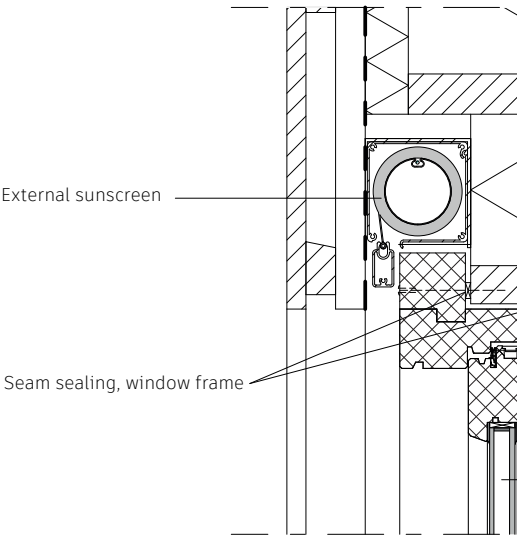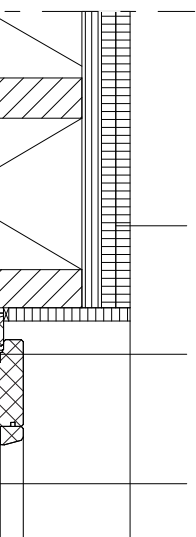
Double plasterboard for fireproofing of construction

Window sealing

Double glazing, insulated
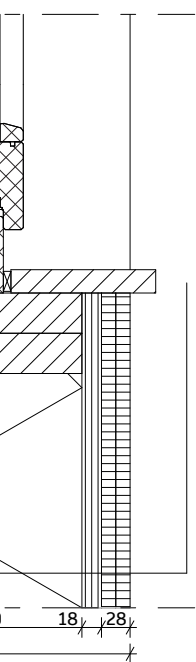
Facade | Damp open, Rc = 4,9
- Open wooden facade, pre-greyed
- Vertical and horizontal battens
- Water barrier, damp open
- 40 mm rigid wood fiber insulation
- 180 mm straw insulation between battens
- 18 mm open strawboard plating, acting as vapour barrier
- 2 x 12,5 mm gypsum board finish

18   28

Detail H.1

Facade - Window

Seam sealing, window frame

External sunscreen, guiding rails

Facade | Damp open, Rc = 4,9
- Open wooden facade, pre-greyed
- Vertical and horizontal battens
- Water barrier, damp open
- 40 mm rigid wood fiber insulation
- 180 mm straw insulation between battens
- 18 mm open strawboard plating, acting as vapour barrier
- 2 x 12,5 mm gypsum board finish

Double glazing, insulated

indow sealing

Fall protection,
distance to floor = 1000 mm

27
18
180
340
40
28 28
19

Detail V.4
Facade - Roof

Slope ⟶

Gravel infill, min. 50

Additional wood fibre insulation
to reduce thermal bridge

18 28 28 40   180   18 28

340

Facade | Damp ope
- Open wooden fac
- Vertical and horiz
- Water barrier, dam
- 40 mm rigid woo
- 180 mm straw ins
- 18 mm open straw
- 2 x 12,5 mm gypsu

Roof | Rc = 6,6
- 70 mm substrate
- 35 mm storage mat
- 20 mm protective mat
- Water and vapour barrier, EPDM
- 40 mm rigid wood fibre insulation
- Wood fibre insulation between 38/180 mm beams
- Damp barrier
- 180 mm 5-ply CLT

00 mm from edge

70

35

20

40

180

527

180

en, Rc = 4,9
ade, pre-greyed
 contal battens
mp open
d fiber insulation
sulation between battens
wboard plating, acting as vapour barrier
um board finish

Reflection

1. What is the relation between your graduation project topic, your master track and your master programme?

I have been wanting to look into a social theme for my graduation project since I am strongly interested in the connection between the social and spatial. Loneliness is something that caught my eye because it is becoming increasingly linked to architecture in contemporary housing design for example. As a sociospatial aspect, it also very much exceeds the realms of architecture alone, as we can link it to more elements in the built environment, like landscape architecture and urbanism.

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

Within my graduation project research and design have followed each other continuously. Understanding what loneliness constitutes helped me make more intricate design decisions. Still, I found myself often searching to make certain decisions once the design process evolved. For this, I often needed to circle back to more and more case studies that I thought were inspiring. As a result, the total number of case studies I decided to investigate grew from 4 to 9, and I even dismissed a few projects that I had come to find to be less interesting in the process.

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

In the end, I do not feel like the research within the graduation project has supplied enough useful results to draw meaningful conclusions. This may be partly because the main research question that has been posed was too broad to be answered within the project, but also very much due to chosen methods - or perhaps lack thereof. Within this research scope, I believe more ethnographic fieldwork would have been warranted to understand better how a social aspect like loneliness operates within the realm of architectural design. Nonetheless, the time and means available might have never made it possible to execute this fieldwork - unless perhaps the choice had been made to look into less case studies but to examine those more vehemently.

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

Like has been stated, loneliness is a huge societal issue. Not only is it something that may affect an entire population negatively, it is also an issue that disproportionally targets those that have a more vulnerable position in society. As a result, there is significant value in finding ways to effectively reduce loneliness through architecture and the built environment. My graduation project has been an attempt to show how we may contribute to this. If my research has not yielded the results that prove the academic value of this graduation project, then I hope that it has at least contributed to the awareness of this topic, and may inspire further research.

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

There are definitively things to learn from the literary research and case study analyses I have done. In particular within the case study analyses, I have tried to show my evaluation of the workings of cohousing projects in terms of sharing and collectivity. I do think these evaluations can be used and transferred to other (co)housing projects, and that through this, we may build upon an increasing amount of knowledge on examples of good practices in cohousing.

Bibliography

Loneliness

Archibald, F. S., Bartholomew, K., & Marx, R. (1995). Loneliness in Early Adolescence: A test of the cognitive discrepancy model of loneliness. Personality and Social Psychology Bulletin, 21(3), 296–301. https://doi.org/10.1177/0146167295213010

Atlas Leefomgeving (2024). Indoor environment. https://www.atlasleefomgeving.nl/en/node/661

Bekhet, A. K., Zauszniewski, J. A., & Nakhla, W. E. (2008). Loneliness: A Concept Analysis. Nursing Forum, 43(4), 207–213. https://doi.org/10.1111/j.1744-6198.2008.00114.x

Bower, M., Kent, J., Patulny, R., Green, O., McGrath, L., Teesson, L., Jamalishahni, T., Sandison, H., & Rugel, E. (2023). The impact of the built environment on loneliness: A systematic review and narrative synthesis. Health & Place, 79, 102962. https://doi.org/10.1016/j.healthplace.2022.102962

Cacioppo, J. T., & Patrick, W. (2008). Loneliness: Human nature and the need for social connection. W W Norton & Co.

CBS (2022). Vooral jongeren emotioneel eenzaam in 2021. https://www.cbs.nl/nl-nl/nieuws/2022/39/vooral-jongeren-emotioneel-eenzaam-in-2021

CBS (2023). 1 op de 10 mensen sterk eenzaam in 2023. https://www.cbs.nl/nl-nl/nieuws/2024/39/1-op-de-10-mensen-sterk-eenzaam-in-2023

Copel, L. C. (1988). A conceptual model. Journal of Psychosocial Nursing and Mental Health Services, 26(1), 14–19. https://doi.org/10.3928/0279-3695-19880101-08

DiTommaso, E., & Spinner, B. (1997). Social and emotional loneliness: A re-examination of weiss' typology of loneliness. Personality and Individual Differences, 22(3), 417–427. https://doi.org/10.1016/s0191-8869(96)00204-8

Domènech-Abella, J., Mundó, J., Leonardi, M., Chatterji, S., Tobiasz-Adamczyk, B., Koskinen, S., Ayuso-Mateos, J. L., Haro, J. M., & Olaya, B. (2019). Loneliness and depression among older European adults: The role of perceived neighborhood built environment. Health & Place, 62, 102280. https://doi.org/10.1016/j.healthplace.2019.102280

Forty, A., (1995). Bring and Nothingness: Private Experience and Public Architecture in Post-War Britain, Architectural History, 38, 25-35.

Francis, G. M. (1976). Loneliness: Measuring the abstract. International Journal of Nursing Studies, 13(3), 153–160. https://doi.org/10.1016/0020-7489(76)90010-9

Fromm-Reichmann, F. (1959). Loneliness. Psychiatry, 22(1), 1–15. https://doi.org/10.1080/00332747.1959.11023153

Garber, M.M. (1989). Loneliness: a study in cognitive discrepancy. https://scholarworks.lib.csusb.edu/etd-project/455

Gijsbers, D., Van Den Berg, P., & Kemperman, A. (2024). Built Environment Influences on Emotional State Loneliness among Young Adults during Daily Activities: An Experience Sampling Approach. Buildings, 14(10), 3199. https://doi.org/10.3390/buildings14103199

Green, C. (2004). Health And Community Design: The Impact Of The Built Environment On Physical Activity. Canadian Journal of Urban Research, 13(2), 390.

Imrie, R. (2017). Narratives of loneliness. https://doi.org/10.4324/9781315645582

Kaklauskas, A., & Gudauskas, R. (2016). Intelligent decision-support systems and the Internet of Things for the smart built environment. In Elsevier eBooks (pp. 413–449). https://doi.org/10.1016/b978-0-08-100546-0.00017-0

Kong, L., Liu, Z., & Wu, J. (2020). A systematic review of big data-based

urban sustainability research: State-of-the-science and future directions. Journal of Cleaner Production, 273, 123142. https://doi.org/10.1016/j.jclepro.2020.123142

Larkin, B., (2013). The Politics and Poetics of Infrastructure, Annual Review of Anthropology,
42, 327-343.

Lyu, Y., & Forsyth, A. (2021). Planning, Aging, and Loneliness: Reviewing Evidence about built Environment Effects. Journal of Planning Literature, 37(1), 28–48. https://doi.org/10.1177/08854122211035131

Masi, C. M., Chen, H., Hawkley, L. C., & Cacioppo, J. T. (2010). A Meta-Analysis of Interventions to Reduce Loneliness. Personality and Social Psychology Review, 15(3), 219–266. https://doi.org/10.1177/1088868310377394

Ministerie van Volksgezondheid, Welzijn en Sport (2018). Actieprogramma Eén tegen eenzaamheid.

Ministerie van Volksgezondheid, Welzijn en Sport (2022). Actieprogramma Eén tegen eenzaamheid.

Nieto Fernandez, F., & Rubio Hernandez, R. (2021). Loneliness in Place.

Papas, M. A., Alberg, A. J., Ewing, R., Helzlsouer, K. J., Gary, T. L., & Klassen, A. C. (2007). The built environment and obesity. Epidemiologic Reviews, 29(1), 129–143. https://doi.org/10.1093/epirev/mxm009

Rice, L., & Drane, M. (2020). Indicators of Healthy Architecture—A Systematic Literature review. Journal of Urban Health, 97(6), 899–911. https://doi.org/10.1007/s11524-020-00469-z

Rijksoverheid (2024). Eén tegen eenzaamheid. Actieprogramma 2022-2025 https://www.rijksoverheid.nl/onderwerpen/eenzaamheid/aanpak-eenzaamheid

Roberts, T. (2016). We Spend 90% of Our Time Indoors. Says Who? https://www.buildinggreen.com/blog/we-spend-90-our-time-indoors-says-who

Roof, K., & Oleru, N. (2008). Public Health: Seattle and King County's Push for the Built Environment. Journal of Environmental Health, 71(1), 24–27. http://www.jstor.org/stable/26327656

Russell, D. W., Cutrona, C. E., McRae, C., & Gomez, M. (2011). Is loneliness the same as being alone? The Journal of Psychology, 146(1–2), 7–22. https://doi.org/10.1080/00223980.2011.589414

Sallis, J. F., Floyd, M. F., Rodríguez, D. A., & Saelens, B. E. (2012). Role of built environments in physical activity, obesity, and cardiovascular disease. Circulation, 125(5), 729–737. https://doi.org/10.1161/circulationaha.110.969022

Scholten, W. (2024). Wat de Amsterdamse pinkstergemeente ons leert over eenzaamheid bestrijden https://www.trouw.nl/religie-filosofie/wat-de-amsterdamse-pinkstergemeente-ons-leert-over-eenzaamheid-bestrijden~b541a29c/

Sturm, R., & Cohen, D. (2004). Suburban sprawl and physical and mental health. Public Health, 118(7), 488–496. https://doi.org/10.1016/j.puhe.2004.02.007

Tiwari, S. (2013). Loneliness: A disease? Indian Journal of Psychiatry, 55(4), 320. https://doi.org/10.4103/0019-5545.120536

UK Parliament (2023). Indoor Air Quality. https://post.parliament.uk/research-briefings/post-pb-0054/

Van Den Berg, P., Kemperman, A., De Kleijn, B., & Borgers, A. (2015). Ageing and loneliness: The role of mobility and the built environment. Travel Behaviour and Society, 5, 48–55. https://doi.org/10.1016/j.tbs.2015.03.001

VZinfo (2024). Eenzaamheid. https://www.vzinfo.nl/eenzaamheid/leeftijd-en-geslacht

VZinfo (2024). Eenzaamheid | Verantwoording | Methoden https://www.vzinfo.nl/eenzaamheid/verantwoording/methoden

Weiss, R. (1973). Loneliness. The Experience of Emotional and Social Isolation. MIT Press

Wolters, N. E., Mobach, L., Wuthrich, V. M., Vonk, P., Van Der Heijde, C. M., Wiers, R. W., Rapee, R. M., & Klein, A. M. (2023). Emotional and social loneliness and their unique links with social isolation, depression and anxiety. Journal of Affective Disorders, 329, 207–217. https://doi.org/10.1016/j.jad.2023.02.096

World Health Organization (2023). WHO launches commission to foster social connection. https://www.who.int/news/item/15-11-2023-who-launches-commission-to-foster-social-connection

Yanguas, J., Pinazo-Henandis, S., & Tarazona-Santabalbina, F. J. (2018). The complexity of loneliness. PubMed, 89(2), 302–314. https://doi.org/10.23750/abm.v89i2.7404

Cohousing

ArchDaily (2024). Coop Housing at River Spreefeld / Carpaneto Architekten + Fatkoehl Architekten + BARarchitekten. https://www.archdaily.com/587590/coop-housing-project-at-the-river-spreefeld-carpaneto-architekten-fatkoehl-architekten-bararchitekten

BAG Viewer (2024). https://bagviewer.kadaster.nl/

Betsky, A. (2024). "Boschgaard" Residential Complex. Former Squatters Buy into Circular Construction. https://www.theplan.it/eng/magazine/2024/the-plan-159-12-2024/boschgaard-residential-complex

Bonhôte Zapata (2025). Rigaud Cooperative Housing and Nursery. https://bonhotezapata.ch/en/projects/rigaud-cooperative-housing-and-nursery

Boschgaard (2024). Wat is Boschgaard? https://boschgaard.nl/wat-is-boschgaard/

Bouwen in eigen beheer (2024). Collectief Particulier Opdrachtgeverschap. https://bouwenineigenbeheer.nl/cpo/

BNNVARA (2024). Ontluisterende CBS-cijfers laten zien waarom er werkelijk een gebrek aan betaalbare woonruimte is. https://www.bnnvara.nl/joop/artikelen/ontluisterende-cbs-cijfers-laten-zien-waarom-er-werkelijk-een-gebrek-aan-betaalbare-woonruimte-is

Building Social Ecology (2024). Hunziker Areal: captivates with new forms of housing and the range of leisure facilities. It is committed to the vision of the 2000-watt society. https://www.buildingsocialecology.org/projects/hunziker-areal-zurich/

Canadian Cohousing Network (2025). What is cohousing? https://cohousing.ca/what-is-cohousing/

Cambridge Dictionary (2025). Co-housing. https://dictionary.cambridge.org/dictionary/english/co-housing

Cambridge Dictionary (2025). Household. https://dictionary.cambridge.org/dictionary/english/household

Centraal Bureau voor de Statistiek (2024). Voorraad woningen; eigendom, type verhuurder, bewoning, regio. https://opendata.cbs.nl/statline/#/CBS/nl/dataset/82900NED/table?dl=AE331

Centraal Bureau voor de Statistiek (2024). Vermogen van huishoudens. https://longreads.cbs.nl/materiele-welvaart-in-nederland-2024/vermogen-van-huishoudens/

Collectief Wonen Delft (2024). https://collectiefwonendelft.nl/

Community Land Trust Nederland (2024) https://www.communitylandtrust.nl/

Delz, S., Hehl, R., & Ventura, P. (2020). Housing the Co-op - A Micro-political Manifesto. Ruby-Press

Doevendans, K., & Stolzenburg, R. (1988). De wijkgedachte in Nederland. Gemeenschapsstreven in een stedebouwkundige context. Eindhoven: Technische Universiteit Eindhoven, Faculteit Bouwkunde.(Bouwstenen: 14).

Ecovillage Ithaca (2024). 175 Acres, 100 Homes, 210 Residents https://ecovillageithaca.org/live/

Geyl, W.F. (1949), Wij en de Wijkgedachte. V. en S., Utrecht.

Hilhorst, E. & Kellij, S., (2023). Negen op tien Nederlanders: sprake van 'wooncrisis' https://www.ipsos-publiek.nl/actueel/negen-op-tien-

nederlanders-sprake-van-wooncrisis/

Howarth, D. (2014). Miel Arquitectos and Studio P10 design Barcelona apartment for "shared micro living". https://www.dezeen.com/2014/08/04/salva46-apartment-barcelona-shared-micro-living-miel-arquitectos-studio-p10/

IEWAN (2024). Duurzaam en sociaal bouwen en wonen – Het kan wél! https://www.iewan.nl/

Jansen, C. (2021). Gimmick of geniaal: lukt dat, sociale duurzaamheid via de Community Land Trust? https://www.gebiedsontwikkeling.nu/artikelen/gimmick-of-geniaal-lukt-dat-sociale-duurzaamheid-via-de-community-land-trust/

Kalkbreite (2024). A new part of town. https://www.kalkbreite.net/en/kalkbreite/

Lengkeek, A., & Kuenzli, P. (2022). Operatie Wooncoöperatie. Trancity*valiz

McCammant, K. & Durrett, C. (1994). Cohousing: A Contemporary Approach to Housing Ourselves. California, Ten Speed Press

Meier, S. (2006). Tussen leefstijl en wijkgedachte. Moderne en postmoderne denkbeelden over wonen en de herstructurering van naoorlogse wijken. Amsterdam, Stichting de Driehoek.

Merriam Webster (2025). Cohousing. https://www.merriam-webster.com/dictionary/cohousing

Merriam Webster (2025). Household. https://www.merriam-webster.com/dictionary/household

Ministerie van Volkshuisvesting en Ruimtelijke Ordening (2025). Staat van de

Volkshuisvesting 2024.

Nieuwelaan (2024). Het plan. https://www.nieuwelaan.nl/hetplan.php

Nu.nl (2025). Verwachte bouwdip begonnen met slechts 82.000 nieuwe woningen. https://www.nu.nl/economie/6342977/verwachte-bouwdip-begonnen-met-slechts-82000-nieuwe-woningen.html

Platform 31 (2019). Aan de slag met beheercoöperaties.

Samenwerking (2024). Statutair doel. https://www.samenwerking.org/over-ons/doel-en-ambities/organisatiedoel

Time to Access (2024). Housing Cooperatives. https://timetoaccess.com/research/housing-cooperatives

UK Cohousing (2024) UK's largest and most innovative cohousing scheme opens! https://cohousing.org.uk/news/uks-largest-and-most-innovative-cohousing-scheme-opens/

Vereniging Aardehuis (2024). Het concept. https://www.aardehuis.nl/index.php/nl/

Vereniging Integrale Bio-Logische Architectuur (2024). Iewan – Strowijk Nijmegen https://www.vibavereniging.nl/iewan-strowijk-nijmegen/

Volkshuisvesting Nederland (2024). Wooncoöperaties. https://www.volkshuisvestingnederland.nl/onderwerpen/wooncooperatie

Woningbouw Vereniging Gelderland (2024). https://www.wbvg.nl/

Wooninfo (2024). Wat is een wooncoöperatie? https://www.wooninfo.nl/vraagbaak/wooncooperatie/wat-is-een-wooncooperatie/