Togetherness

How can a community of multi-generational solo dwellers and non-human species coexist near Rotterdam station today? The project “Togetherness” offers loft homes for starters, cluster apartments for middle and senior citizens, maisonettes for solo parents and habitats for bats. Considering different sharing capacities for each target group leads to the articulation of different layers of shared spaces, thus promoting various forms of cohabitation. The public spaces and collective facilities on the ground floor are open to residents and visitors. The co-living apartments contain shared living rooms and kitchens. Bats live in the interstices of the facade, resembling the mountain landscape.

TOTAL RESEARCH TARGET GROUPS CASE STUDY DESIGN

Savanne van Harrewijen
Studentnumber: 4460146
Msc3: Advanced Housing - The Ecology of Inclusion
Tutors: Anne Kockelkorn, Olv Klein, Ferry Adema
P5: 23 juni 2022

Togetherness

solo species sharing space in central Rotterdam

Savanne van Harrewijen

Togetherness

solo species sharing space in central Rotterdam

Personal Introduction – *What will the future bring?*

How do you become nature-inclusive in the built environment? The realization is slowly sinking in that we must make an effort to make our current society future-proof. But we cannot do this as individuals, we all have to work together to create a sustainable world to live in. And it's better to start today than tomorrow.

Because this has always been an intriguing subject for me, it naturally became my starting point for the graduation project in the Advanced Housing studio 'Ecology of Inclusion'. By telling stories from different solo residents and bat species and investigating how their habitats come together, I was able to design a cooperative housing complex at the project location Walenburghof in Rotterdam. With this project, I hope to contribute to the discussion about our future, to change the perspective of designing a new *Togetherness*.

QUESTION

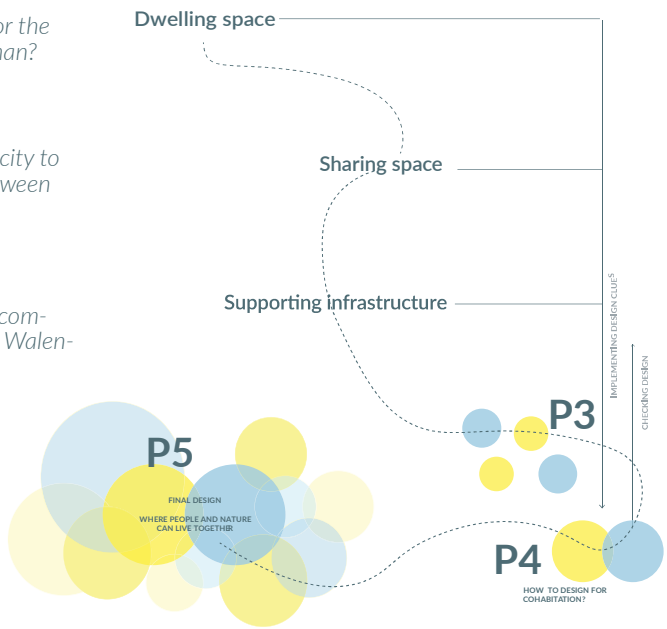
How can a community of multigenerational solo-dwellers and non-human species cohabit near Rotterdam station today – considering each species' specific dwelling needs and capacity for sharing?

SUB QUESTIONS

HOW TO INVESTIGATE FOR FUTURE DESIGN?

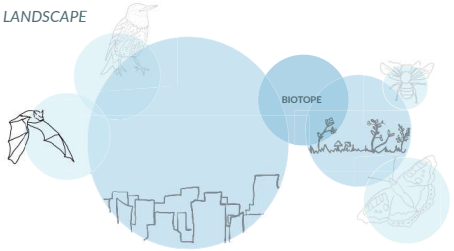
1. *What makes a space suitable for the individual – human or non-human?*
2. *How do you stimulate the capacity to share - among humans and between humans and non-humans?*
3. *How do you connect a sharing community with their context – the Walenburgerhof?*

RESEARCH FRAMEWORK



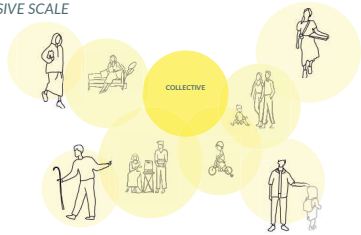
DWELLERS

THE CITY AS MOUNTAIN LANDSCAPE



1. **common pipistrelle** *bat*

GOING SOLO ON A MASSIVE SCALE

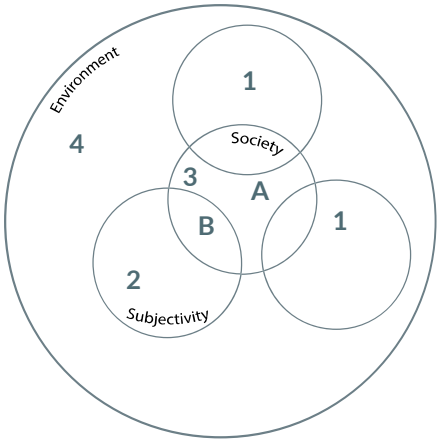


1. **starter**
2. **solo-parents**
3. **middle aged adults**
4. **(vital) elderly**

multigenerational mix

THE THREE ECOLOGIES

CHAPTER STRUCTURE BASED ON GUITTARI



DWELLING SPACE

LEFEBVRES NOTION OF SPACE

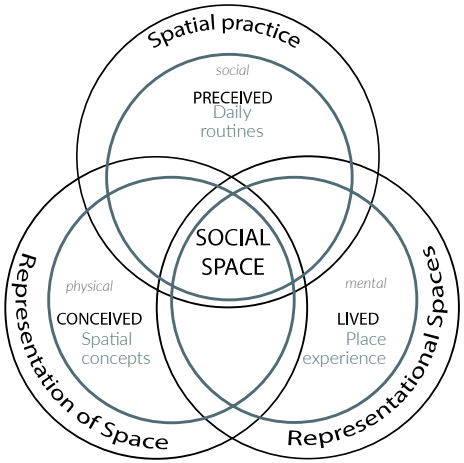


Table of contents

Chapters of the research report

I Introduction

Introduction
Problem statement
Target groups
Research questions
Sub-questions

M Methods and methodology

Research Framework
The Three Ecologies

1. Dwelling spaces for the solos and bats

Triad of Space – The production of space (Lefebvre)
Representation of the Triad of Space in architecture
Storytelling

2. Sharing space

3. Environmental

1 Solo dwellers

Introduction
The solo-dwellers: The rise of the solo dweller
Need in Rotterdam: Rotterdam housing needs for solo dwellers
Popularity: Solo on a massive scale
The solo dweller types: A multigenerational approach
The solo-parent: Adding a nuance

The Starter
Solo-parent
Middle-aged
Elderly

Treehouse
Miss Sargfabrik
Haus A
A

2 Species

A balanced ecosystem – The decline of biodiversity
Biodiversity of Rotterdam – What will the future bring?
Future of Rotterdam – How to reach the goals?
Species in focus – Whom to include?

Bats – Common pipistrelle

3 Sharing

Cohousing

Alone together
Between Private and Public
Living alone together:
Conclusion: the layers of sharing

Treehouse
Miss Sargfabrik
Haus A
B

Cohabitation

Ecosystems
Sharing ‘our space’ with nature
Co-existence
Symbiosis and/or cohabitation
Conflicts for humans
Conflicts for species
Taking care
Solo-dweller and common pipistrelles encounters

Groenmarkt
Vertical
C

4 Environmental

Environmental or ecological
Ecology thinking in Architecture
Social-sustainable lifestyle
Sustainable housing – Focus on four layers
The biotic layers in focus

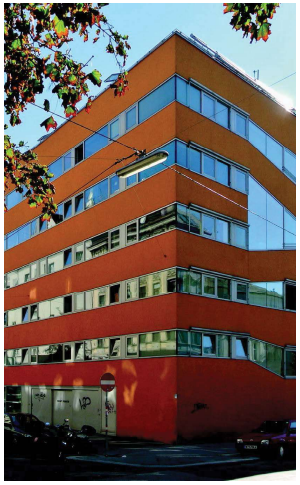
R Reflection

B Bibliography

Interviews
Literature Research
Literature Case studies

Case studies

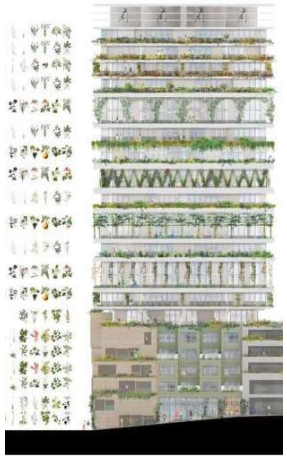
Chosen case studies



MISS SARGFABRIK,
BKK-3 ARCHITECTS,
2000,
VIENNA

TREEHOUSE,
BO-DAA,
2018,
DOGOK-DONG,
GANGNAM-GU, SEOUL

HAUS A
MEHR ALS WONEN
DUPLEX ARCHITECTS,
2015
ZURICH



VERTICAL,
NL ARCHITECTS,
-
AMSTERDAM

GROENMARKT
RONALD JANSSEN,
BASTIAAN JONGERIUS,
HARRO DE JONG
2021
AMSTERDAM

A

SOLO DWELLERS

1. Circulation - in the building
2. Dwelling units layout - daily rythm

B

SHARING

1. Shared facilities - position in building and users
2. Levels of privacy - private vs public facilities

C

SPECIES

1. Targeted species in habitats
2. Architectural details

COHABITATION

1. Position species in building
2. Dwelling connection

Introduction

Project introduction and research questions

Introduction –*What will the future bring?*

The urban areas continue to grow, but the available space on Earth does not. As a result, the human presence in the world is increasing. Paul Crutzen, among other scientists, even proposes the term *Anthropocene*, to describe this era of man (Steffen et al., 2007). In the post-war period of the twentieth century, with the arrival of the suburbs as the dominant urban form, large areas of agriculture and nature reserves were urbanized. The boundaries of the cities were shifted, and even today there is an increasing demand for space to densify the cities.

The results of human actions are having an increasingly clear impact on the Earth's ecosystem. The urgent need to make the world sustainable for the future becomes visible through the effects of loss of biodiversity and climate changes. As Gibson describes it in her essay: *'Planetary and social systems are under stress and there is an urgent need to shift gear and usher in a more caring way of surviving together (Gibson, 2020, p.*

Fig. 1.
We can no longer keep nature out.
Photo of 'Stadsnatuur Maken', Jacques Vink, Piet Vollaard, Niels de Zwarte (Rotterdam: nai010 uitgevers, 2017).

Fig. 2.
We should see the city as an mountain landscape.
Picture is part of the book Hiryczuk / Van Oevelen – Landfall, source Fassbinder (2021).

111).' We, as architects, need to change the current perception of continuing growth and start thinking of more sustainable ways of creating an inclusive economy. This means that new framework conditions arise for architecture and urban planning (Biotope City, 2021).

Making a strict distinction between urban and natural areas is therefore no longer a good approach. Both ecological systems are intertwined – we have to see humans as part of nature. We can no longer keep natural processes outside the urban environment; we have to overcome the alienation of (urban) man from nature. This new way of designing raises questions such as what is the balance between the city and natural environment, and when and how do they overlap? And how can these systems connect to create a future-proof system? To show in designs that nature and the built environment are inextricably linked and can support each other.

Problem statement - *Where will we live tomorrow?*

The future city asks for a nature inclusive design approach– *'a design that purposefully accommodates man, flora in an adequate way in order to maximize and popularize ecosystem services and the synergy evolving between them.'* (Stiphout, 2019). Nature inclusive design is only successful when people, plants, and animals are included from the start, and relate to their context.

The boundaries between the two opposites of human and non-human lives and the duality between natural and urban environments have lost equilibrium. This asks - as Vandkunsten said in 1973 - *".. for a rejection of post-war housing blocks and private detached housing, challenging the rationalist mindset that put the system before people"* (Dove, 2020, p. 70). It stimulates a form of co-existence of all species, it is a way of striving towards a Togetherness.

This graduation studio focuses on alternative economical structures, to stimulate a 'what if' scenario, while forming scenarios for Rotterdam's future. In this research, the site Walenburghof and its surroundings act as one of those potential contexts for high-dense urban development. The location is on the north side of Rotterdam Central, along the train track. It is centrally located in the centre of Blijdorp, but the place feels like a closed island in the city. The Walenburghof needs a rethinking of its first function. Partly situated in a highly urban character, it has the potential to become a prime example in the city for a multi-species encounter.

This is a difficult task that requires a new approach to urban development. Rotterdam has an intensive history of rebuilding the city after its demolition during the war. Not only were suburbs developed. The city centre was also completely reconstructed after the bombing. The urban perimeter of Rotterdam has grown enormously during this period. Nevertheless, the municipality of Rotterdam is still working hard to meet the shortages in the housing stock by (re)developing areas into densely populated spaces. Architects have the potential to develop new ways of sharing this space so that not only humans but also nature can benefit.

Target groups - *Who will be present?*

To narrow down the possibilities of design options for this broad question, I will base my design on creating a togetherness between a selected group of individuals. This resembles a biotope, the conditions providing a living space for a specific assemblage of species (including humans). Or, as Oxford Languages defines a biotope as "*the region of a habitat associated with a particular ecological community*". Within this biotope, I use the perspective of five carefully selected dwellers to create a research scope.

What are potential groups of species in the inner city?
We can start by seeing the city as a possible natural habitat for species (Fassbinder, 2011; Stiphout, 2019). The city of Rotterdam consists of buildings, paving and infrastructure. From the perspective of nature, this looks like a rock biotope, with cracks and holes. When these buildings become planted, they create a covered hill biotope. On the garden level, more hiding spots are a base for a variety of species, continuing the mountain landscape. Species are adapting to these conditions, and are thriving well within the city (Schilthuizen, 2018) The selected species need to be balanced in such a way that they create a symbiotic system.

Inspired by the multispecies storytelling of Haraway (2016), I intend to use key figures in the design to propose a new network of sharing. This network can be seen as string figures, as she mentions: "*String figures are like stories; they propose and enact patterns for participants to inhabit, somehow, on a vulnerable and wounded earth.*" (Haraway, 2016, p. 10). In conversation with the urban ecologist André de Baerdemaeker, a specific species for the location can be chosen. The selected species of the urban rock landscape are the common pipistrelle. I use the perspective of bats as dwellers within the Walenburghof.

Which types of households are needed in this new urban environment?
Based upon the notion of a biotope, humans in their respect also share space, creating together a community to live in. To create an inclusive community, housing must be made for upcoming household types in the cities, and need to be in a good ratio to the current building stock.

Our species has about 200,000 years of experience in collective life, but only since about fifty or sixty years has there been a visible tendency on a large scale to go solo (Klinenberg, 2012). The current supply of housing does not match the housing needs of this group, as it mainly consists of large apartments for families in post-war construction. This is also the case in Rotterdam, as small, lonely studios are being built for this group (Dove, 2020). In this research, I will look for new forms of living for the solo-dweller to break through this trend.

Creating a cooperative housing model with shared facilities for solo dwellers may prove to be a successful model. The solo-dwellers are potential residents for sharing common resources, due to their limited income and the potential interest in social interaction. They can use the supportive network of neighbours, to improve their living conditions.

Several groups have value in going solo; young people often see this as a chance to form their autonomy in the process to become an adult. Middle-aged adults want to regain the same self-control, often after a divorce. For the (vital) elderly, living solo means maintaining their integrity. Introducing variations of age into the dwelling environment result in a layering approach, that is more resilient to change (Gehl & Sim, 2019). Therefore, I would like to add solo parents to these target groups.

Research questions - *How will we live together?*
The main goal of this research plan is to create a systematic understanding of how to connect the natural and human systems within a dwelling design. The aim for Walenburghof is to find a new balance for a more inclusive city where people and nature can live together in a relationship of cohabitation. By including nature from the start, this new cooperative living can supply sustainable new ways of residential housing.

With the five chosen target groups in mind, the research is limited to a selected group of species that is suitable for dense cities and the sharing potentials between solo dwellers. This is an opportunity to create a new type of residential housing. The research question is, therefore;

How can a community of multigenerational solo-dwellers and non-human species cohabit near Rotterdam station today – considering each species' specific dwelling needs and capacity for sharing?

Sub-questions
What makes a space suitable for the individual – human or non-human?
The first question is about determining the schedule of requirements for the living environment (compact homes and shelter) to establish the basis for personal living quality. This question will be applied to all five selected target groups, using Lefebvre's notion of space.

How do you stimulate the capacity to share - among humans and between humans and non-humans?
Nowadays, the shared spaces are often written down in the project design brief with an indication of percentages or square meters. However, the first step is neglected to argue how many common spaces we *actually* need. This also indirectly raises the question of what motivates sharing and when regenerates sharing added value? Thus, overlaps will

be searched within the target group's needs, to reflect on their capacity to share spaces.

This asks for an investigation into the distribution of and interaction (relationships, networks) between humans and non-humans. First, we can have a look at possible forms of co-housing, among humans. Then the same can be done in the search for cohabitation between humans and non-humans, by looking at how humans can connect to the eco-systems of the species.

How do you connect a sharing community with their context – the Walen-burgerhof?

The third question is how these communities can create an ecosystem together, and what supporting foundations bind them together. By looking at its context, the buildings can develop a strategy to reduce the impact on their environment.

Methods and Methodology

Research approach

Research Framework

Architects can design and shape the surroundings of the world we live in. They position themselves in the particular position between science and the humanities (Cross, 2007). This also comes with the complex challenge of combining different disciplines, to form an architectural answer to societal issues. To answer the question of how to create a sustainable ecosystem, we first look for a theory to divide this complicated question into smaller issues. This chapter explains the methods and methodology used in this research report.

The Three Ecologies

Felix Guattari, a psychoanalyst, philosopher and social theorist, is one of the essential thinkers on how we should extend the definition of ecology. He pleads that the earth is undergoing a period of change, threatening the continuation of life on the planet's surface. Human modes of life, individual as well as collective are deteriorating, compromising the relationship between subjectivity and its exteriority. These issues that arise due to the new form of capitalism are no longer valuable in a sustainable future.

In his book, *The three ecologies (1974)*, he proposes a new fundamental approach that respects the differences between all living systems; *'only an ethio-political articulation, which I call ecosophy – between the three ecological registers (the environment, social relations and human subjectivity) would be likely to clarify these questions* (Guattari, 2000, p. 17)' The three ecologies are therefore described as the mental -, social - and environmental ecology.

The principle underlying the three ecologies is that these 'Territories' are not given as an *in-itself*, but should be seen as *transversal* to each other (Guattari, 2000, p. 36). This means that they can be addressed one at a time – thus redesigned or reinvent, but also changed simulta-

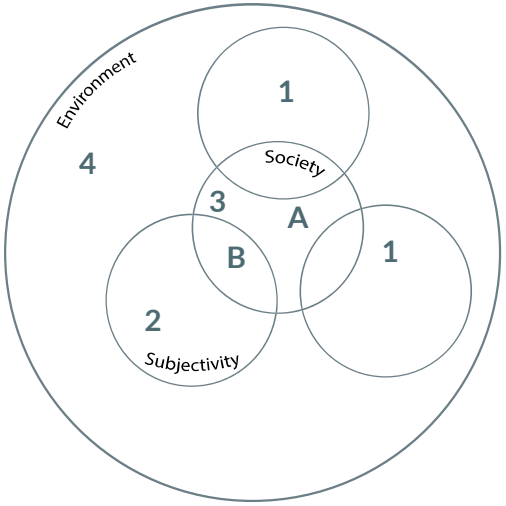


Fig. 3.
Guattari's Three Ecologies translated into the three research frameworks.

1. Solo dwellers
2. Species
3. Sharing
A. Cohousing
B. Cohabitation
4. Environmental

neously affecting each other, since *'a degree of creative autonomy in one particular domain encourages conquest in other domains'*. (Guattari, 2000, p. 47).

Chapter structure

I will use the framework of Guattari's ecologies to construct the foundations of a new system, striving towards a situation where humans among each other and humans and non-humans share the city. *The Three Ecologies* are therefore the base for the chapters in this research report. By breaking down the complex systems of ecology into three sub-topics, we then can contribute more specifically to these fields. While at the same time we keep considering the whole picture, creating a *Togetherness*.

The first two chapters address the mental ecology; the pre-objectal and pre-personal logic of the individual. The first chapter explores this by looking at the distinct types of solo dwellers and their needs. The second chapter considers the non-human individuals, exploring the spatial needs of the bat species the common pipistrelle.

The third chapter describes the social ecology; the reorganization of individuals into groups of varied sizes. These groups can be bound together by different cathexis, or some 'groupEros', such as 'city inhabitants', 'fathers' (more personological) or 'solo-dwellers' (into subject-groups). Here the subdivision is made between the groups of 'cohousing' among humans and the 'cohabitation' among humans and non-humans.

The last chapter dives into the principle of environmental ecology, searching for a new story to contribute to the world. Here I show how I articulate the project in the urban context, and how it should react to its surroundings. The research contributes to different epistemologies, based upon the distinct levels of the research. On one hand, the research is based on praxeology knowledge on how people use and perceive space. On the other hand, the research is about the construction of ecology, the relationship between living organisms and their interaction with their environment.

1. Dwelling spaces *for the solos and bats*

The first two chapters dive into the individuals of the solo-dwellers and the chosen species. If we would like to understand the mental ecology of the selected target groups in architecture, we need a way to define space through the lenses of the users. The technique used is Lefebvre's triad of space, adapted to the circumstances of architecture.

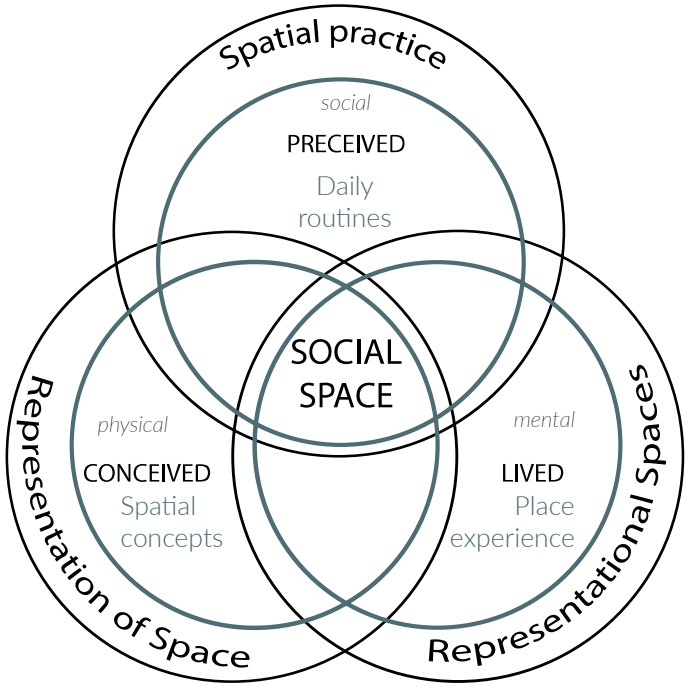
Triad of Space – The production of space (Lefebvre)

The French sociologist and philosopher Lefebvre argues that space should not be described as an *abstract space*, created, and used within the capitalist circuit. Instead, in his work *Production of Space* (1974), he argues that space is an interplay between the abstract physical relation to space, and the two subjective elements of mental experience and social relation to space. These three realms result in the *social space*.

These 'lived, conceived and perceived' realms are - same as we saw by the three ecologies of Guattari - interconnected. While the 'subject' may move from one realm to another without confusion, they do not necessarily need to make up a coherent whole (Lefebvre, 1974, p. 40). To explain his new idea of ***social space*** Lefebvre developed a triad that constructs space; consisting of spatial practice, representations of space, and representational space.

1. *Spatial practice (perceived);*
   describes the cohesive patterns and places of everyday social activity. It is about the daily routines that align with routes between places. Thus, it includes both daily routines on an individual level and networks as the result of collective movements.

Fig. 4.
Interpretation own layers of dwelling space projected into Henri Lefebvre's triad of space production.



2. *Representations of space (conceived);*
   are about how space is conceptualized by engineers, cartographers, architects, and others, guiding and shaping the space through plans, designs, drawings, and maps. It is a system of abstract signs and codes that are used to organize and direct spatial relations.

3. *Representational Space (lived space);*
   are those spaces that the imagination seeks to change and appropriate as the unconscious, non-verbal direct relation of inhabitants and users to space. It is about the symbolic value that the individual imposes on the place; *"It overlaps physical space, making symbolic use of its objects* (Lefebvre, 1974, p. 39)."

Representation of the Triad of Space in architecture

There are diverse ways to work with the Lefebvrian Triad in several fields of study, however, in this report, it is used as a tool for design and research in the field of architecture. One possible adaptation of the Lefebvrian Triad in architecture is seen in the work of Leupen and Mooij (2011) on the level of dwelling design: they distinguish the notions of activity, space and place. *"The spatial organization of dwelling, therefore, consists of organizing the various places in which these activities occur and defining the spaces in which they can best unfold* (Leupen & Moij, 2011, p. 63)."

In this report, I use my own interpretation, working with the terms; daily routines (close to perceived space), spatial concept (close to conceived space) and place experience (lived space).

1. *Daily routines:*
   The daily routines are used to describe the everyday rhythms of the selected target groups, both human and non-human. Leupen and Mooij (2011) analyze that within the use of dwellings, several recurring activities happen. The habitants have a place in the home for the basic activities in the categories of gathering, sleeping, cooking, eating, washing and working.

   The research will start with a literature study to determine the difficulties and social issues in the rhythm of the individual target groups. These stories are additionally supported by drawings from the graphic novel. Based on research on solo dwellers (Klinenberg, 2012), supplemented with specific literature on (single-parent) families (Keesom, 2013) and lively older people (Heren 5 Architecten, 2016). The spatial needs of the residents and the order of the daily routine can be analyzed in the case studies. This same principle will also be applied to the rhythm of the selected species; the common pipistrelle (Vink et al., 2017).

   *Methods: Literature study, **Storytelling**, **Spatial** sequences analysis*
   Case studies: Haus A, Treehouse, Miss Sargfabrik

2. *Spatial concept:*
   If a person would furnish a simple square room, he or she will most likely divide the room into a sleeping zone, work zone, laundry zone (etc) deconstructing the room in multiple places. These places can form the basis of space. This also involves the connections among these places, moving 'from place to place'.

   The architect has a crucial role in the construction of these spaces, influencing the lifestyle of its residents. Spatial needs

of the residents, such as an accessible bathroom for the elderly, are therefore searched in literature and investigations. The spatial system of the case studies can be expressed using a topological diagram – a graph of the sequence of spaces. The intentions of the architects can be found in literature, interviews and publications.

***Methods**: Literature study, Topological Analysis*
***Case studies:** Haus A, Treehouse, Miss Sargfabrik*

3. *Place experience:*
One could argue that this is about what 'makes a place', undefined areas that we see as home. The sketch "Small Pleasures of Life," by Alison and Peter Smithson, is a good example of exposing uses that create pleasure for the inhabitant. These are based upon experiences, they enrich the dwelling, and do not define the space where these need to happen (Hechmann & Schneider, 2018).

***Methods**: Literature study, Storytelling*

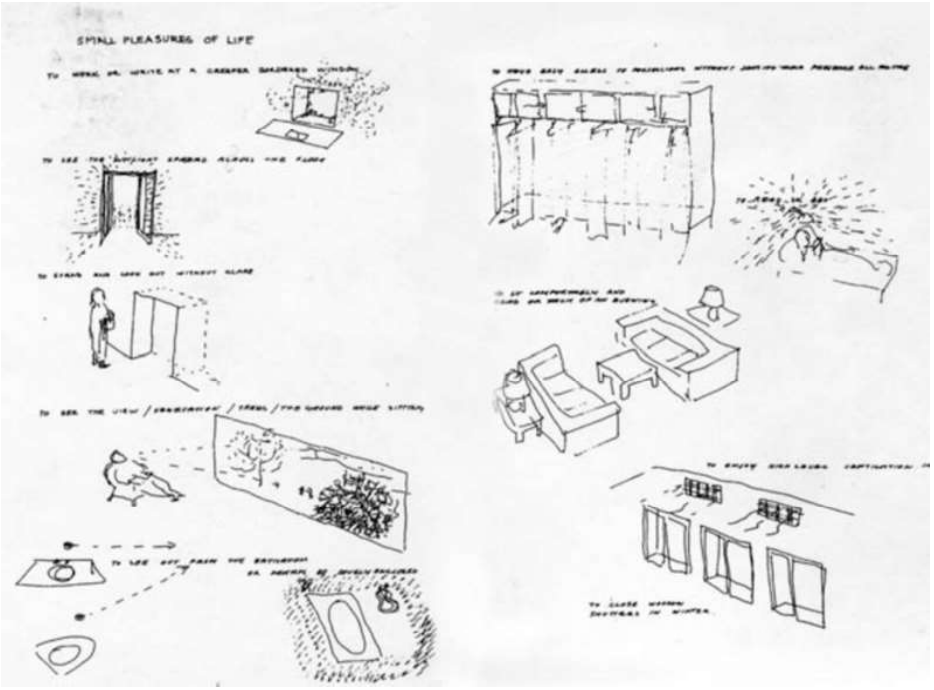


Fig. 5.
Small pleasures of life.
Drawing of A.+ P. Smithson, in Changing the Art of Inhabitation, London, Munich, 1994. Source: Hechman and Schneider (2018). p. 12

Storytelling

In this research, I use storytelling as a method to describe these three perceptions. Important is that the only way you can access this lived space (while not being one of the users or inhabitants) is through the stories told. *"... also of some artists and perhaps of those, such as a few writers and philosophers, who describe and aspire to do no more than describe* (Lefebvre, 1974, p. 39)." These stories have no rules of consistency or cohesiveness, as *"Representational space is alive, it speaks* (Lefebvre, 1974, p. 42)**."** and are qualified in various ways, since it is qualitative, fluid and dynamic. The intervention is the architecture, not as a structure, but as a project in a spatial context and a texture that calls for representations.

Although the intention is to avoid inappropriate stereotypes during the research, the chapters of the graphic novel will tell a story about the different solo-dweller groups. This story is based on my own first-hand experiences and observations, stories read in literature such as Klinenberg and Jamieson and Simson and supplemented with target-group specific literature. Hopefully, it has become clear that there is never just one story to tell about living alone. Life experiences vary with means and by age and stage of life, but a glimpse into this world is possible thanks to storytelling.

2. Sharing space *Praexeology*

From the notion of ecology that resources are limited, we must seek new ways of sharing to reduce our footprints. This asks for new social structures in housing models in which sharing becomes a bonus, not

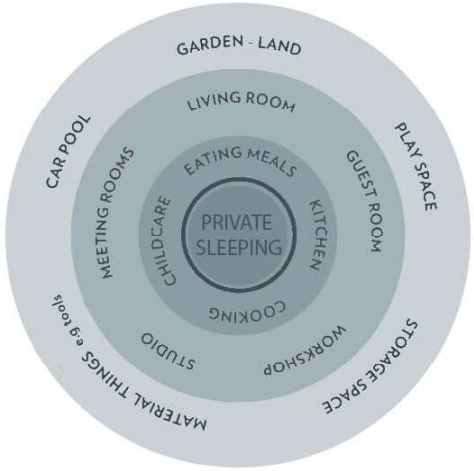


Fig. 6.*Spheres of sharing*
Edited diagram from Ahn et al. (2018).

a burden. This research focuses on the social aspects of sharing since this contributes more to the stimulation of a community-oriented design.

Different cohousing communities show different approaches to sharing. These can result in physical spaces to share as well as social activities or supportive networks. These distinctions will be researched within forms of alternative housing models and case studies on co-operative and collective buildings for solo-dwellers. In this analysis, the ratio between public collective and private spaces will be analysed, as well as the function of shared spaces. With the outcome of this research conclusions, an ideal combination of sharing suited to the target groups can be designed.

Methods: *Topological Analysis, Case studies*
Case studies: *Haus A, Treehouse, Miss Sargfabrik*

The next step will be combining the world of human and non-human species, looking for forms of cohabitation. Same as with human connections, species also need a range of other species and environments to thrive in. Therefore the needed habitat for the bat species will be investigated.

By looking at literature on how animals can live together, we can learn whether these forms of coexistence can also be applicable between humans and non-humans. In two case studies, references in habitats and the possible integration of species in a design will be examined. The chosen case studies integrate both more animal species than in an average construction project.

Methods: *Literature study, Case studies, Interview*
Case studies: *Groenmarkt, Vertical*

3. Environmental *Ecology*

The last level of the design brief is how to create conditions to reach a total inclusive design, that has a positive effect on its surroundings. A sustainable building should close loops on the abiotic, biotic, technical and atmospheric layers (Kristinsson, 2012). Analysing these layers and the exchange of flows between them will influence the living conditions of the chosen target groups. The aim is to investigate possibilities in closing cycles and make a sustainable building ecosystem.

Methods: *Urban Analysis, Literature study*

1

Solo dwellers

Introduction

Let us start to zoom into the residents and explore the housing needs and preferences of solo dwellers. This chapter introduces the rise of the solo-dwellers in the Netherlands and Rotterdam, followed by a description of the distinct types of solo dwellers. The sub-chapters that follow, then delve deeper into the challenges in their daily routines, their spatial needs and experiences of what makes a 'place'. This research is based on the conceptual framework of Lefebvre's notion of perceived, conceived and lived space, as discussed in the methodology chapter. The following chapters on the case study analyses show different approaches to designing dwelling spaces for solo dwellers.

The solo-dwellers: *The rise of the solo dweller*

The prognosis foresees that the size of multi-person households will not change much in the coming years, but that household thinning will continue because more and more people will live alone (Duin et al., 2018). This has two main reasons: first, the declining family sizes and increasing childlessness and second, the biggest factor of the last 20 years, the rise of the single-person household.

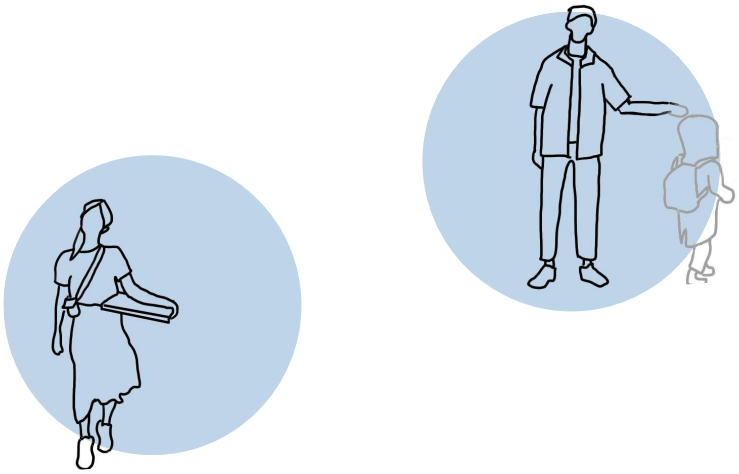
In the early 70s, the proportion of single people in the Netherlands was much smaller than it is today. It was less common among young people to live on their own, divorce was less usual, and a larger proportion of the elderly lived in a care or nursing home at that time, so they did not fall into the single category (Duin et al., 2018). The total number of single people households in the Netherlands has grown from 685 thousand in 1971 to almost 3 million at the beginning of 2018. According to the same population trend prognosis, the number of single people households will increase to 3.8 million by 2060. (Duin et al., 2018)

Need in Rotterdam: *Rotterdam housing needs for solo dwellers*

The Rotterdam household prognosis expects the same increase of solo dwellers as the rest of the Netherlands. Although the group is already a large part of the population, the percentage of single-person households in Rotterdam was 46% in 2021. There is therefore already a high demand for homes for this group in Rotterdam, and this will only increase.

The increase in single-person households in recent years is mainly caused by people in the age group 55-74 years. In the coming years, this group will continue to grow. In the long term, when the age of 75 is reached, they will also ensure an increase in the number of single over-75s (Hoppesteyn, 2016). But there is also a new influx of the new generations, as the city is popular among young adults (PBL, 2015).

So there is a need for single-person houses in the city of Rotterdam. The central location of the Walenburghof, close to Rotterdam Central, makes the place suitable for solo dwellers who like to use the facilities in the city. However, inviting solo dwellers to this region takes some time. Most solo-dwellers do not like to be the new 'adventurers' in a neighbourhood, because it is not nice to live alone in a difficult neighbourhood. Only when the location is right, they are more likely to become pioneers (BPD, 2015).



Popularity: *Solo on a massive scale*

The reason people choose to live alone can have several causes. Some people experience pride in living alone, but for other people, 'being alone' is not at all what they imagined (BPD, 2015). According to the study by Klinenberg (2012), for some people, living alone is seen as a *temporary* stage in life, where ultimately the goal is to settle for the right partner. Although he also argues, that having a partner is no guarantee of avoiding loneliness, as *"one should depend on itself"* (2012, p. 61).

Klinenberg continues that to others, living alone is a well-considered *choice*, driven by the modern values of individual freedom, personal control or self-realization (Klinenberg, 2012). He gives four main driving factors for the spread of individual housing; the rising status of women, the communications revolution, mass urbanisation and de the longevity revolution – as they all created conditions for the flourishing of the solo dweller. (Klinenberg, 2012, p. 18)

The question is why is it so attractive to live alone? Living alone provides various advantages, but also comes with its challenges. Different age groups have different values for this. Often driven by modern values in society as individual freedom, personal control and self-realization.

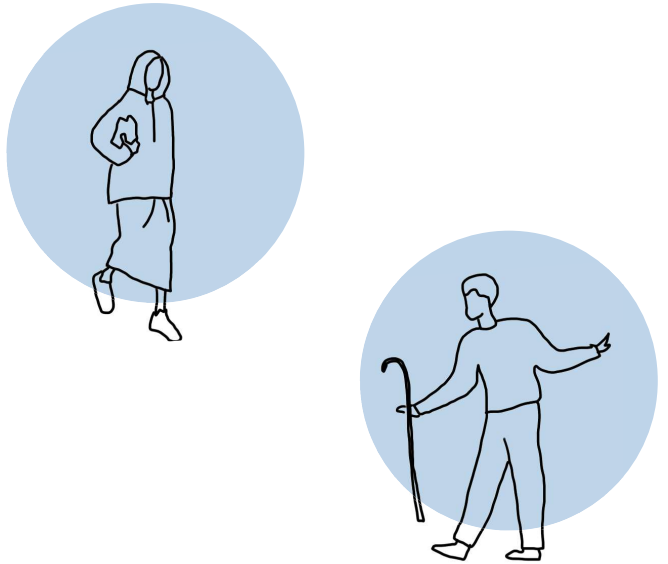


Fig. 7.
Different types of solo-dwellers

The solo dweller types: *A multigenerational approach*

Within the target group of the solo dweller, still diverse types of dwellers can be distinguished at various stages across the life course. Relatively many people in their twenties and over 65s are single people. After leaving the parental home, the young singles run a one-person household for a while until they find a partner with whom they will live together. From the age of 45, the share of singles increases because couples break up, as the amount of divorces rises. At an older age, the risk of losing a partner increases, and therefore that the share of single-person households will grow further.

In this report, the target groups are categorized according to these life stages, as the starter, the middle-aged adult and the (vital) elderly. The design, therefore, gets a multigenerational approach. To show that *Togetherness* can be enriched within a healthy mix of different life stages.

The solo-parent: *Adding a nuance*

In addition to the above groups of solo dwellers, there is another chosen target group that I have not discussed yet; the solo-parents. In the solo-dwellers discussed above, are proportionately more men among single people aged 25 to 65. This is mainly because after divorce the custody of the children goes to one of the two parents, usually the mother. As a result, the woman becomes the head of a single-parent household (Duin et al., 2018).

On the flip side of this phenomenon, the parent *without* custody becomes a one-person household when moving out. Although this group (thus consisting of more men than women) technically lives solo, they could better be classified as 'part-time' single-parents. I refer to them in this report as the '*solo-parents*'.

Since the 70s, the number of single-parent households has grown, due to an increasing number of divorces. The prognosis predicts that this group will continue to grow, from 570 thousand in 2018 to 640 thousand in 2040 and 660 thousand in 2060 (BPD, 2015). This means that there will also be more solo parents. The average age of this the share of single parents peaks will slowly move to 49 years in 2060, due to the trend that women are having children at increasingly later ages (Duin et al., 2018).

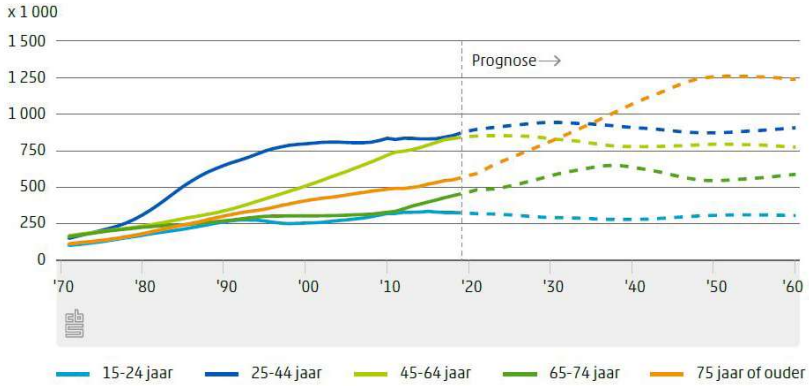


Fig. 8.
Prognosis solo-dwellers
(Fig 4.1.1 Duin et al., 2018, p. 19)

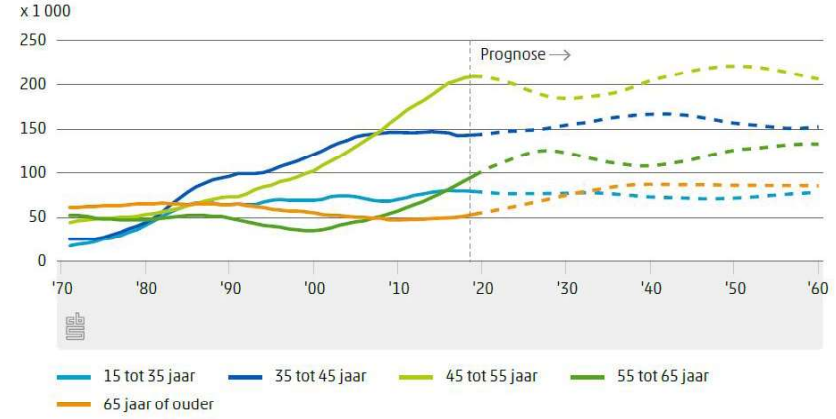
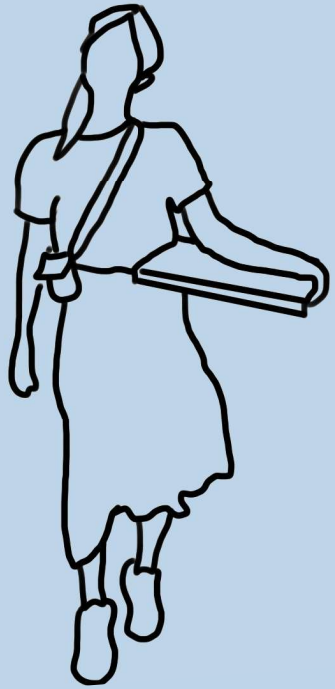


Fig. 9.
Prognosis single-parents households categorized by parent's age.
(Fig 4.3.2 Duin et al., 2018, p. 24)



Starter

Solo dweller

Introduction

20-35 Years

Second adolescence

Starters are solo residents who 'start' their adult lives and want to gain control over their living situation. Among the younger solo residents is a small surplus of women between the age of 15 and 25, as on average, they tend to leave the parental home earlier than men (Duin et al., 2018). This transitional phase for women and men, this upgrade from the family home or student room to the first home of their own, is described by Klinenberg (2012) as the *'second adolescence, finding the way as an important transition to adulthood.'*

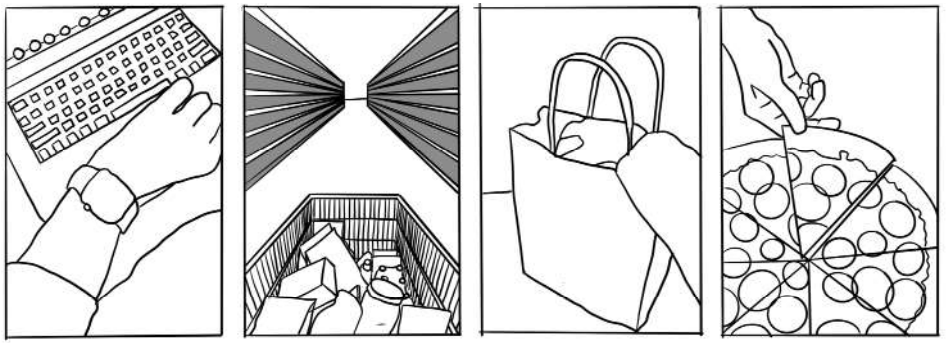
Solve the puzzle

This transition highlights the importance of safe living space for the starter. They still need to learn what it takes to live on their own; 'They must not only solve the puzzle of how to live alone, but also of how to live well.' (Klinenberg, 2012, p. 30) For the starter, it is difficult to learn how to take care of themself. They are struggling to find a balance between being alone and enjoying contact moments with other people. Often, the starter sees this life stage as an inferior in-between period before settling with a partner, but that's a pity. It could mean much more than that.

GATHERING

They Benefit from buzzing environment with small interactions and a network of friends and family, balancing social and solitude life.

COOKING

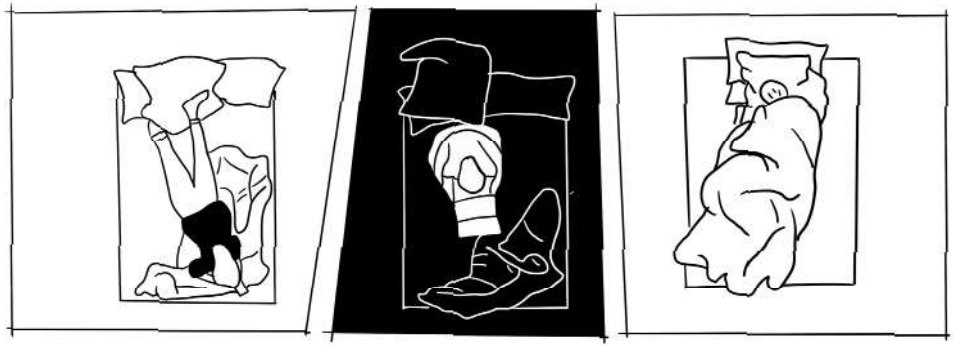


New challenges arise on learning how to cook, plan and shop. Putting effort and creativeness into a meal just for one ask for a lot of energy.

EATING

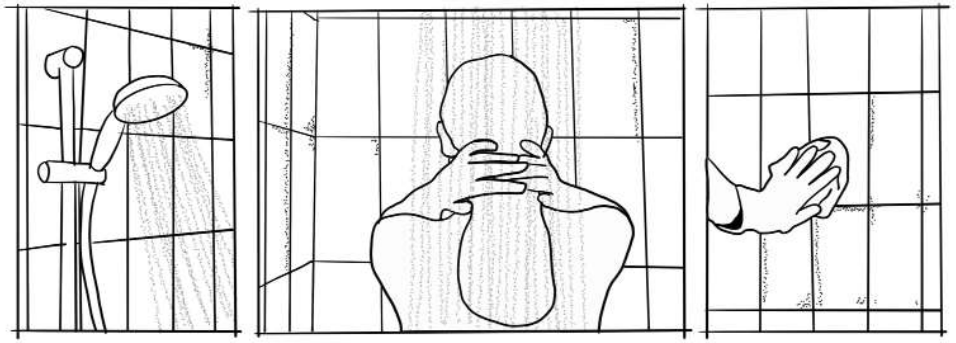
Eating alone can feel strange and is still seen as a social failure or sad.

SLEEPING



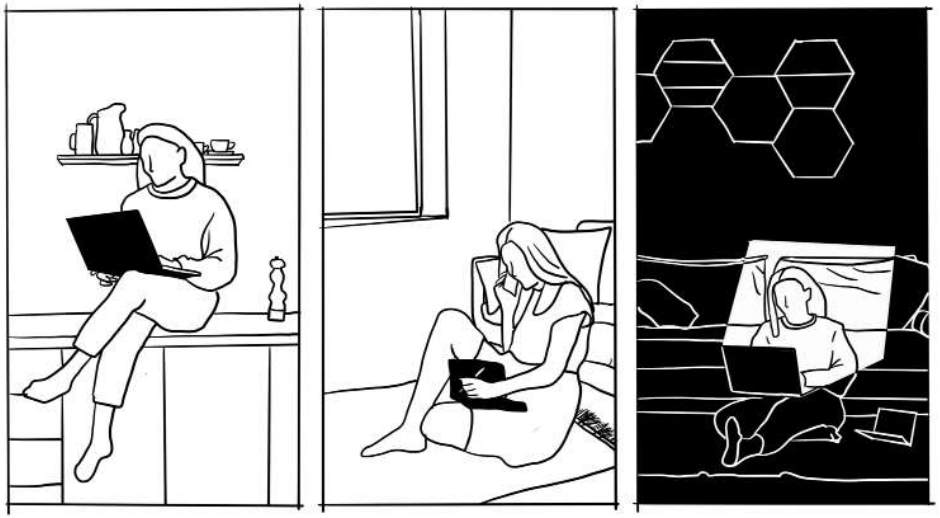
The media askes for an new view on the evening, being online late at night, it cuts into their sleep.

WASHING



Learning how to take care of yourself, balance between rest and duties. The responsibility of domestic tasks is easier when shared with others.

WORKING



The free times goes into working, investing in the career path.They often have more workload than their colleagues on deadlines, because they have less obligations at home

Spatial concept

Because the starter's first home marks an important transition in life, they are proud residents of their first living space. Their enthusiasm defines the space as chosen and especially belonging to them (Jamieson & Simpson, 2013). Instead of seeing themselves as part of a bigger community, they tend to see themselves as 'electively belonging', colouring a blank canvas with their own life projects (Jamieson & Simpson, 2013).

This fight for freedom can be supported by architectural concepts. For example, the entrance zone can articulate the feeling of ownership. The temporality and flexibility can literary be supplied by blank boxes, or lofts, where the dwellers can create their needed space.

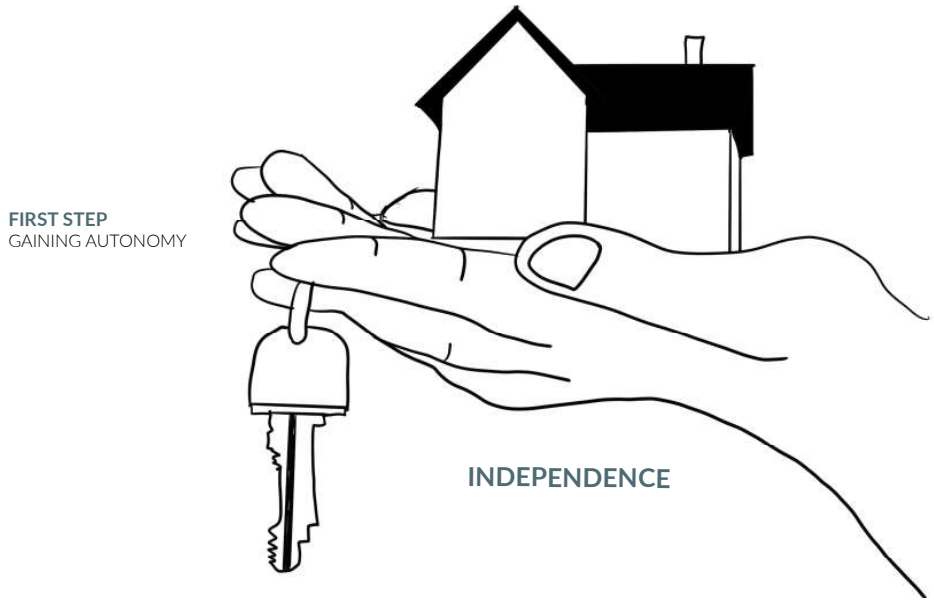
The housing market is experiencing shortages due to low supply and high demand for houses (CBS, 2018a). The additional effects of rising housing prices make it difficult for first-time buyers to buy a home (Duin et al., 2018). As a response, there is a trend to reduce the size of the dwelling space, to make it affordable for this starter group. ANA Architects (2019) investigated different tactics to make more use of these small spaces. In the design study *"K–woning"*, they define 4 starting points to make better use of a small home:

1. Grid size: The small houses are often oriented on one side with corridor access at the rear. By considering a wider size, more daylight will enter the house. Also, by making apartments that are not too wide, the spaces become more usable for the residents.

2. M3 vs. M2: A little extra height allows spaces to be placed on top of each other. As a result, the other living spaces feel more spacious due to the extra height. From 4.7 meters, even a double headroom can be made, with a light floor construction.

3. Indoor vs. outdoor: Often a small home does not need to make an outdoor space, but this adds extra quality to a small space. The outdoor space can be an extension of the interior space.

4. Private vs collective: By reducing the personal surface, it is possible to give back to collective spaces. Here, birthdays and or other activities can take place if more space is needed.



Place experience

The place experience in a dwelling for the starter could be described as a playground for adulthood. As the home should be a safe space to explore and liberate themselves, from former roommates and family (Klinenberg, 2012).

Keep on learning

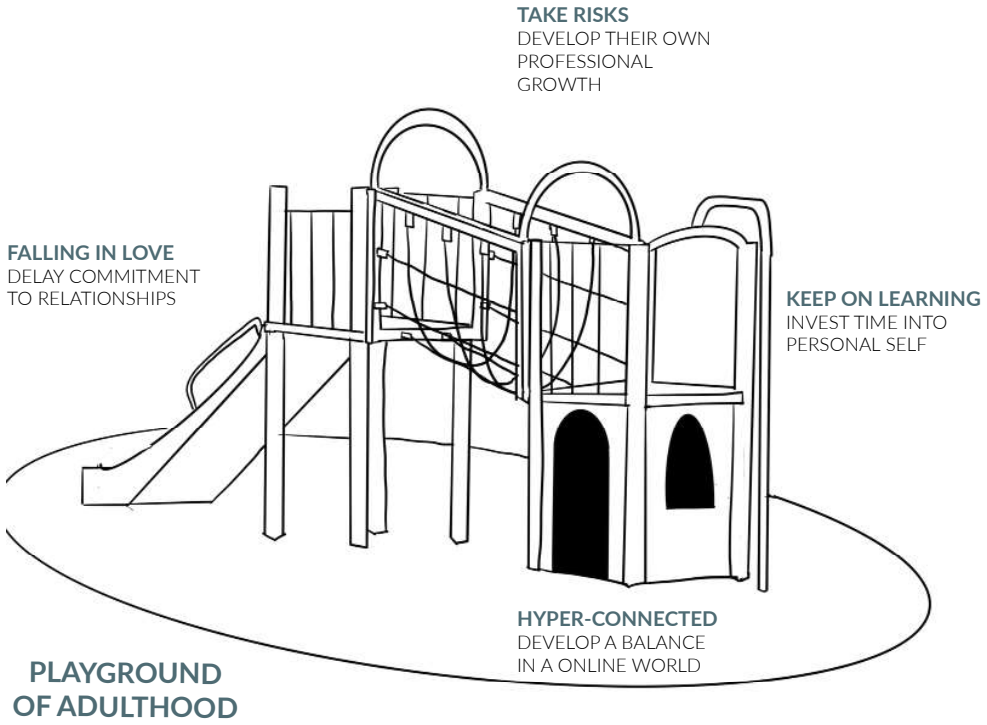
The starters are still eager to learn and continue to do so. They often see living alone as a temporary situation, to explore the true self. They use their free time for self-cultivation, and above else, career development. Despite improving economic changes, the group of young adults with flexible contracts remains large, which creates uncertainty in income (CBS, 2018a). As they often are well dressed and seem to have an active social life, they often do not get the same benefits as other colleagues, like leaving early to pick up the kids.

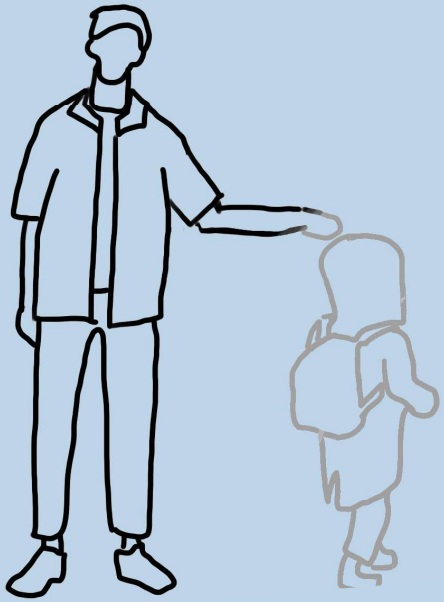
Delay commitment

It is more common for starters to live alone first and not yet cohabit with a partner or roommates, as this comes with some great benefits (Duin et al., 2018). They seem to have more sexual freedom, trying to develop true romantic love, and willingly delay any commitments to relationships (Klinenberg, 2012, p. 57). When turning into their 30s, the question of trying to find a partner is becoming an increasingly pressing issue. For single men in the city, life comes with a certain luxury and postponing this issue is not such a big deal. Women, on the other hand, have to deal with more stigma when living alone. Questions from their surroundings, medical advice about their biological clock and ideals formed in the media, put pressure on the choice to stay longer.

Hyperconnected

Finally, starters have more difficulties with society's demands. They grew up with the idea of always having all the information at hand. To share their lives through the internet. They are used to a hybrid world; are hyper-connected, performing personal, professional, and even social activities online. This manifests itself in being constant 'online' even when they are alone (Klinenberg, 2012, p. 60).





Solo-parents

Solo dweller

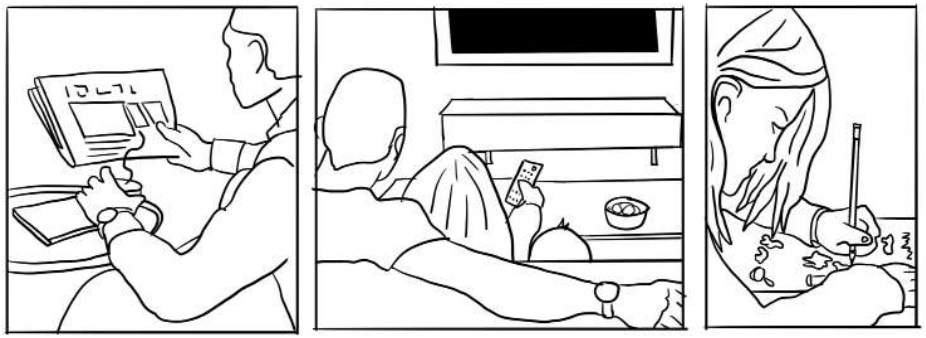
Introduction

35-55

Part-time responsibilities

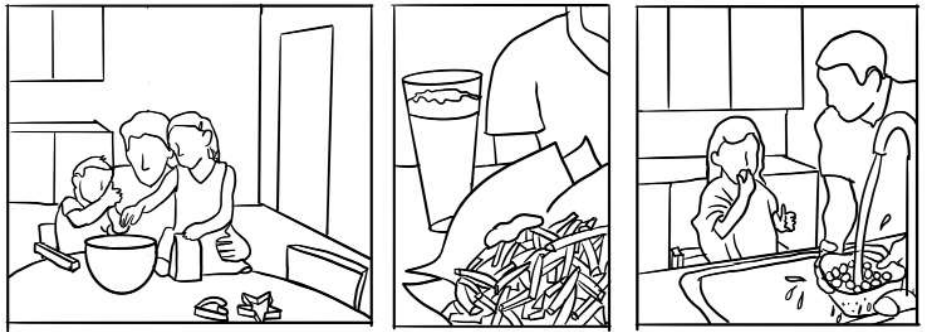
The solo parent is a dweller that primarily lives alone but occasionally needs to take care of his/her children. After a divorce, the custody of the children is mutual distributed between the two parents. As discussed in the previous chapter, the custody goes often to one parent, creating an official single-parent household. Therefore, a weird situation occurs, where the other parent in theory becomes a solo dweller. However, these solo dwellers see their children come to live with them every other week, on weekends, or during holidays, depending on the visitation rules. Thus, we better could describe this group as *solo-parents*. This target group is facing the same challenges as any other single-parent but is living alone a larger part of their days. Single parenting comes with its challenges, as Klinenberg (2012) describes: *"Whether is it becoming a single parent on your own or after breaking up, it's hard not to share the duties of care between two people."*

GATHERING



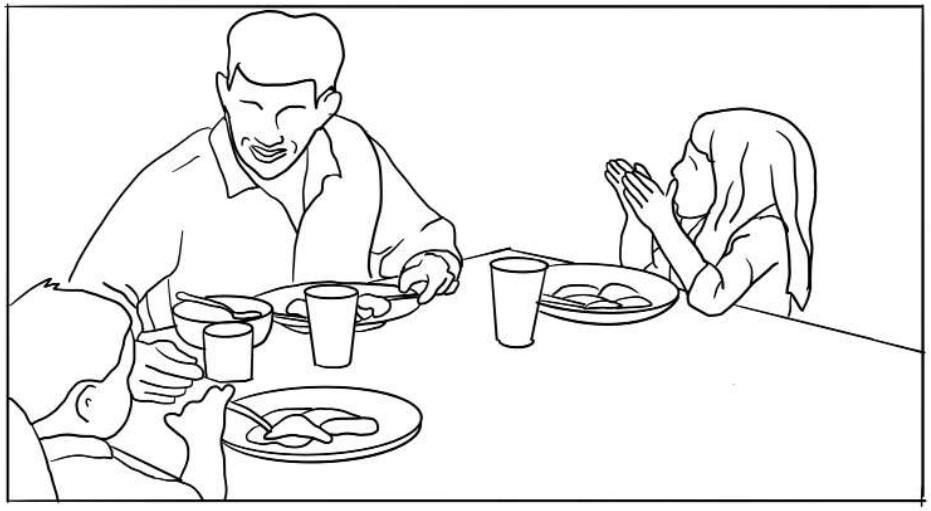
People tend to be together at home, but also need private space to be alone.

COOKING

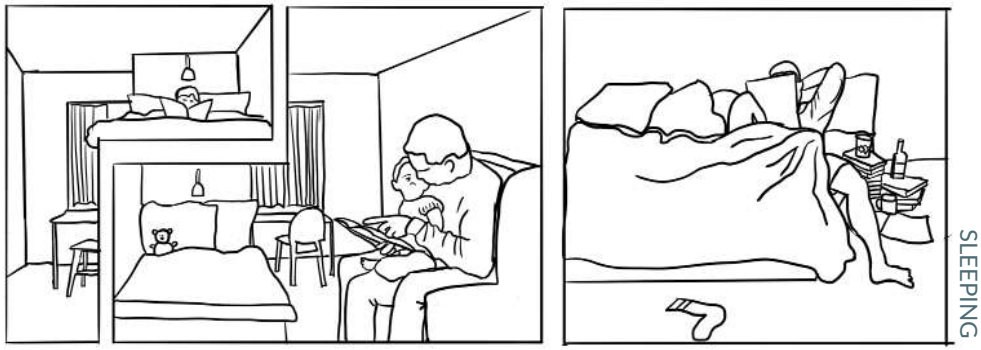


Parents need to cook not only for themselves but also to take care of the needs of their children. Differentiation arises between preparing a meal alone and for others.

EATING

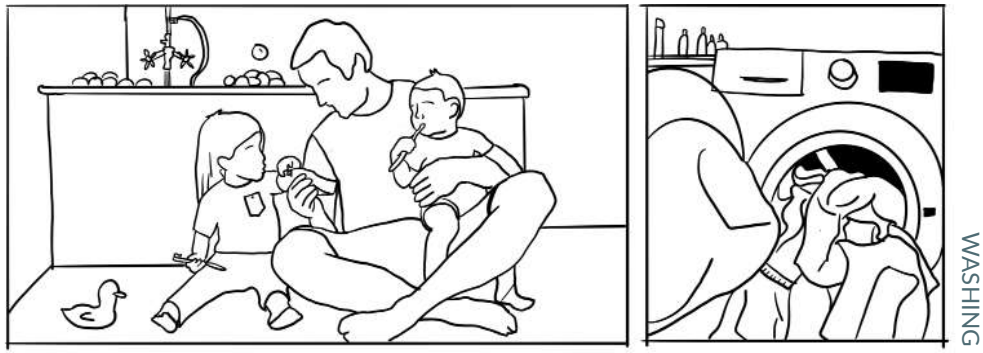


The dining table is the central place to be together, where the families share meals and discuss events of the day



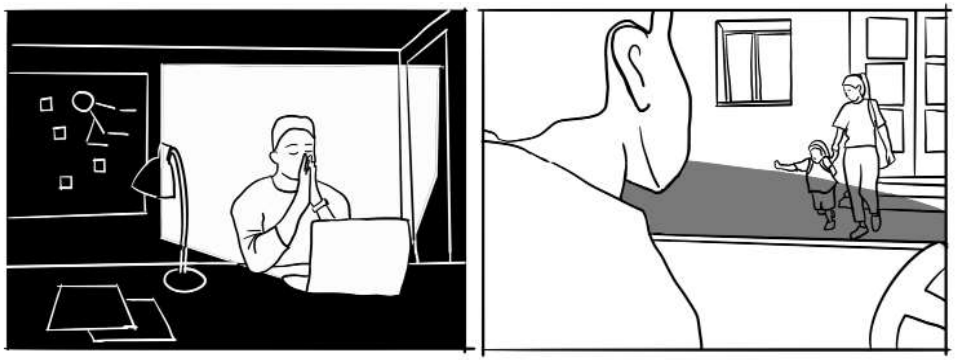
SLEEPING

Having a private bedroom when visiting, ensures the individuality of the child's feeling at home. It also acts as a private space to retreat.



WASHING

Not only taking care of themselves but also learning the children their self-care routines at earlier ages. Domestic tasks increase, as the pile of dirty laundry just keeps coming,



WORKING

Working harder during the kid-less periods to ensure that they have enough quality time with their children when visiting.

Spatial concept

It can be a challenge to find a decent place in the city to live as a family, let alone for the solo-parents. The solo parent requires a small affordable living space, but preferably with the same requirements as any other family home. Urban families often develop enormous creativity to adapt the dwelling to the right conditions. The book *'Nestelen in de stad'* challenges different architects to come up with innovative solutions for six themes to make a dwelling family-friendly (Keesom, 2013).

1. Storage spaces; The larger the family, the more space is needed for the storage of temporary items. Smart storage spaces under stairs or built-in wardrobes can help solve these issues.
2. Smart floor plans; Small homes require spaces that can handle multiple functions. Rooms can quickly be given multiple functions, such as a hall or annex. The separation between private and representative rooms is an important starting point for the dwelling layout.
3. Flexible use; the right dimensions ensure that a room can be used in multiple ways. This could be facilitated by a good grid size, rethinking the façade layout and smart positioning of the central cores.
4. On the growth: Possibility to grow with the family, individual space is needed to guarantee a private place for the children.
5. Between inside and outside; kids like to play outside in front of the entrance. Not only the entrance of the dwelling but sometimes also that of the complex. Making in and out flight paths help to keep them safe.
6. Living environment; making an urban environment family-friendly. A city can be improved by designing car-free zones and playgrounds, but also by making wider sidewalks.

Place experience

City-network

The proximity to a wide range of employment opportunities and education in the city, ensures that more and more families are staying in the city (Karsten, 2013). Solo parents can also benefit from the closeness of amenities. If work cannot be avoided during visitation days, solo parents with younger children are more dependent on a network around them or family to look after the children. Like in a conventional family, teenagers tend to be more on their own during the day, as it is more common for both parents to work (Klinenberg, 2012).

Quality time

At the time of the visits, solo-parents prioritize their children over other activities, even to a degree that potential relationships are kept at a distance to ensure building a parent-child relationship (Jamieson & Simpson, 2013). The life of solo parents is more focused on the needs of the children, stimulating the individual hobbies of each child (Klinenberg, 2012). The time spent together is often seen as quality time.

Family time

On the other hand, this being together for limited periods calls for extra attention to find a balance between individual freedom and being together as a family. Besides the times when they share meals, parents and children are rarely together in the same room (Klinenberg, 2012). Historically, it was more common for parents to sleep together with their children, but cultural changes separated the child from the bedroom (Klinenberg, 2012). Nowadays, it became the norm to have an individual bedroom for each child (Klinenberg, 2012).

Middle aged

Solo dweller

Introduction

35-65 years old

At some point in the life of a solo dweller, one reaches a moment when they realize they live alone for a longer period than initially thought. In the group of solo dwellers of middle age, two types of dwellers can be distinguished here; since it makes a difference whether living alone is a choice or is caused by the ending of a relationship.

Still single

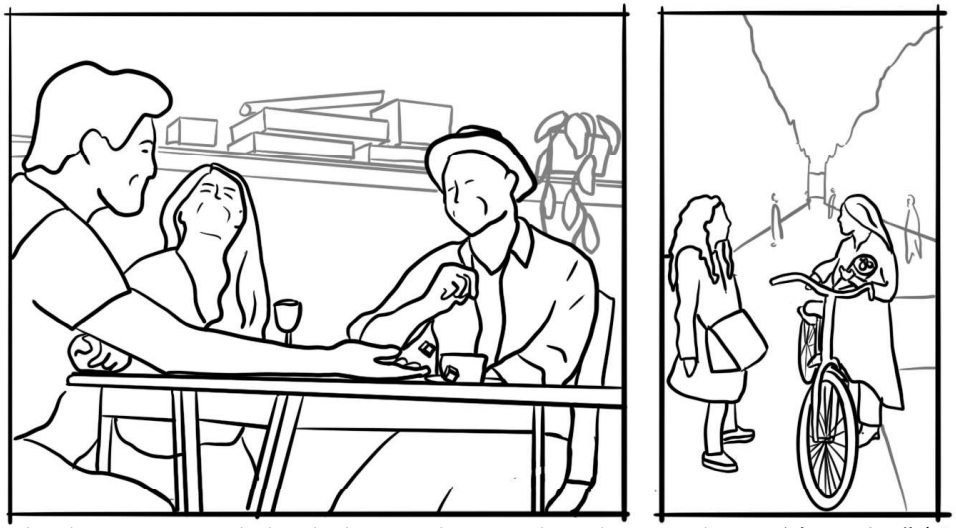
The first group consist of solo dwellers for which living together with a partner just did not happen, or they consciously chose to remain single. However, being alone or choosing to live alone, can still feel lonely, even if there is a group of people surrounding you. These solo dwellers have become attached to their lifestyle, and this reflects in how they continue to build connections. They give up the myth of finding the ideal life partner but are still quite picky as they don't want to give up their freedom in a new relationship (Klinenberg, 2012).

Single again

In addition, there is the group that chooses to be single again, those who decide to live independently after a divorce. As Klinenberg (2012) argues the difficulties of solo-living tend to outweigh feeling lonely in a convectional - but unhappy - marriage. These adjustments to life after separation can be difficult, but also bring great benefits. Living alone is a tempting way to (re)discover personal control, cherish freedom and search for self-realization, and by doing this in a booming singleton society in the city, they keep socially engaged and personally stimulated (Klinenberg, 2012).

Daily routines

GATHERING



They have contact with their built network of friends, and refer to them as '***chosen family***', but also have more distant contacts as neighbours, informal group activities and members of secular social groups.

COOKING

Taking care only of yourself is one of the toughest challenges after separation, although it can also be a liberation from the unrewarded responsibilities.

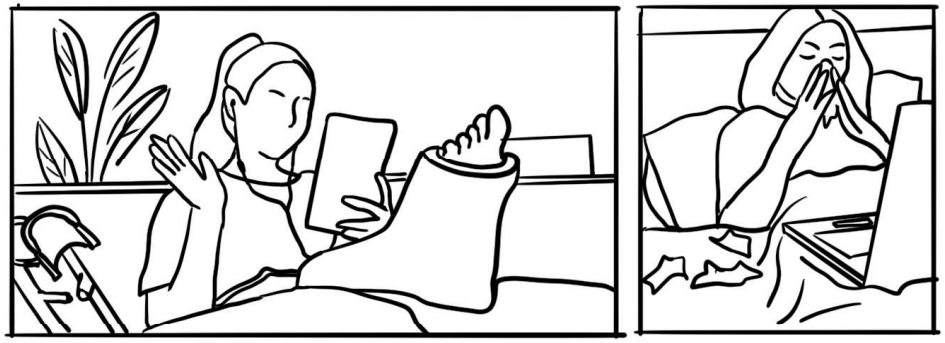
EATING

Being able to eat whatever you want, even if it will be the fourth day in a row, there is no one to complain about.

SLEEPING

Enjoying the freedom of expressing weird habits such as reading in the middle of the night, but at the same time they need to re-learn to sleep alone in an empty bed.

WASHING



Washing: When ill, the solo dweller is confronted with the need for social security, often relying on the network of family members to visit and help.

WORKING

Working: Often they have a buzzy, even stressful, work-life. Living alone does allow for more flexible working hours, or making quicker career choices that involve moving.

Spatial concept

As for spatial measures for this target group, there are fewer requirements on the spatial aspects of a dwelling, other than standard qualities. There are only a few considerations on spatial needs when living alone in this age group.

Financial burden

The middle-aged solo dwellers do not have the financial benefits of splitting expenses as a couple. Finding a place on your means also dealing with economic burden alone. This often comes with a substantial decline in the standard of living (Klinenberg, 2012). The same situation occurs if the solo dwellers had kids, they could choose to start downsizing to an apartment that suits their domestic responsibilities (Klinenberg, 2012). These small living spaces need careful consideration to still function as if they are spatial. Middle-aged solo dwellers may also have higher demands on the home than a starter.

Halving the inventory

The second group of divorced people not only have to deal with economic adjustments but also need to rebuild their household inventory. Moving means you have to deal with splitting things up; junk, cooking utensils; books, CDs, but also the bed and the sofa. It takes time and money to put everything back together. On the other hand, if you have to downgrade in space, you can have too much stuff. They benefit from sufficient storage space for furniture that does not fit in their new home or in their new shared living space where many household items are already present.

Place experience

Accepting big issues

The most difficult part of living alone as a middle-aged adult is the acceptance of the situation. Especially women in their fifties and early sixties struggle with the idea of ageing alone. This does not mean solo middle-aged men and women don't have a network of social contacts; they just tend to be lonelier than couples (Klinenberg, 2012).

Oasis

Living alone can create more stability to form a joyful home - facilitating the pursuit of solitaire and self-discovery. As a time to recharge and decompress, *'living alone for the successful professionals means creating a balance between the busy city life and the home as a sanctuary'* (Klinenberg, 2012, p. 101). The home can be an oasis to buffer themselves against the busy stressful work lives.

Avoidance

Living alone seems like heaven, but not everyone is capable of a successful life alone. Living alone for this vulnerable group can also become a dangerous state that fosters distrust and antisocial behaviour, ultimately towards the self as well. As Klinenberg (2012) argues, they like to isolate themselves from friends and family to avoid problems, regain their footing and take some time. However, this can lead to a vicious circle. Without the needed care and support, they risk increasing stress and endangering their own health, leading to even greater detachment and suffering.

Elderly

Solo dweller

Introduction

65-85 years

The last group of solo dwellers yet to discuss, is the group of older age. Of course, the category of elderly is quite big, so in this report, I refer to the group that is retired but can still live (essentially) independently at home. The future growth in the number of single-person households will be almost entirely attributable to the elderly of the age group of 75+ (Duin et al., 2018). This strong growth in the number of older single people can almost entirely be attributed to the increase in the number of older people due to the ageing of the population.

Independent

Among the group of elderly solo dwellers, again there are minor differences in how they became solo. Same as with the middle-aged solo dwellers, there is the group that lived solo consciously for a longer period. Even when they form a new relationship at this age, it is normal to remain living apart together, as these elder solo dwellers are too attached to their own space. They are more interested in someone to go out with than someone to come home to, keeping the hitches at a distance (Klinenberg, 2012).

Loss of a spouse

The other group are those who lost a spouse and therefore became widows. Due to the higher mortality rates of men, women are in the majority among solo dwellers at a higher age (Duin et al., 2018). The rising life expectancy of men does lead to a slightly less skewed sex ratio in the highest age groups. At the turn of the century, there were only 23 men per 100 women among single people over 75. By 2060, this will more than double (Duin et al., 2018).

Daily routines

GATHERING

Elderly are likely to socialize with friends and neighbours in their daily lives, as they need a supportive network which most seniors need to make peace with their conditions.

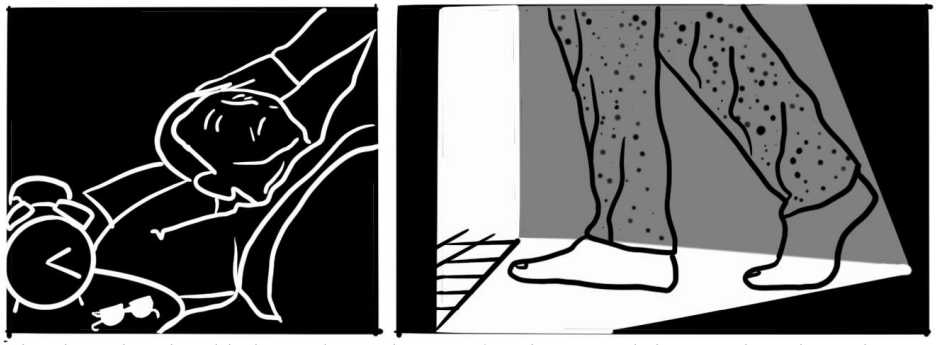
COOKING

As their range becomes smaller, nearby groceries become necessary. Due to physical limitations, they become more dependent on cooking services, not only for a daily warm meal but also for face-to-face interaction.

EATING

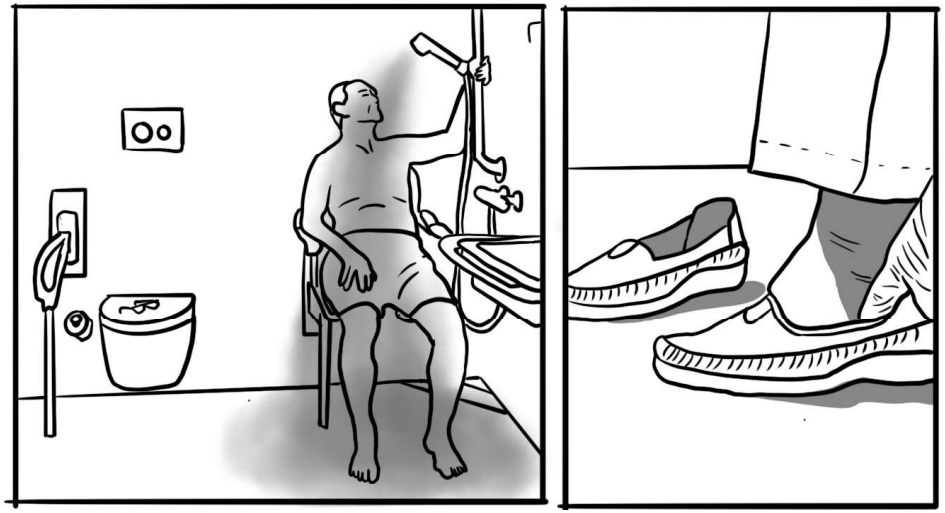
It is important to continue to eat a balanced meal, and not to become dependent on unhealthy ready-made meals.

SLEEPING



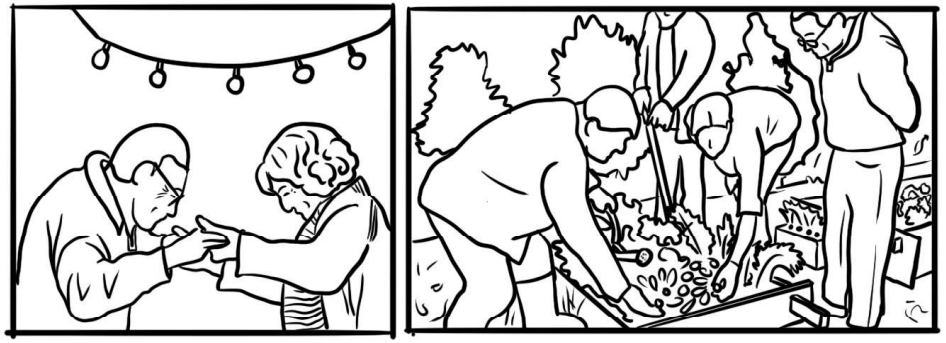
The sleep that the elderly need at night is getting shorter and shorter. They also wake up more often, as they are visiting the toilet more often.

WASHING



One of the biggest challenges is taking care of yourself, and the idea of needing special assistance feels like losing control.

WORKING



Filling up free time is one of the hardest parts; needs something to keep you going. Volunteer works, social groups and taking exercises are of importance to maintain their mental but also physical health.

Spatial concept

Living solo for as long as possible beats the alternative options as going to live with their kids or in a nursing home. The relationship with their children is one of the most important parts of their life – if they have any. Although the family is also kept at a distance to keep avoid too much intimacy. Moving in with them often recalls them on duties such as childcare, cleaning and cooking (Klinenberg, 2012), They would rather stay in their homes. but this asks for some adjustments, to make the dwelling suitable for ageing.

1. Outside space: Maintaining a large house with a garden does not work for the elderly, which is often seen as a burden (ANA Architecten, 2020) However, they do would like to have an outside space (ANA Architecten & Gemeente Amsterdam, 2018).
2. Mobility range Mobility problems increase with ageing, which reduces their range. Their action radius shrinks reduce to 250 meters to 500 meters. (ANA Architecten, 2020)
3. Physical limitations The house becomes unsuitable due to physical limitations, such as not being able to take stairs or steps. So adjustments are needed in the house. A scooter, walker or walking stick can help but requires a lift and even floors. These fittings again require space to move around, store and charge them (ANA Architecten & Gemeente Amsterdam, 2018).
4. Adjustments of the home; Moving is difficult to adapt to new surroundings (Klinenberg, 2012). They prefer to adjust to the current home, instead of moving to a new home (ANA Architecten, 2020).
5. Room for stuff: when ageing, one collects more valuable items, there has to be enough space to store them in the dwelling
6. Extra room for family and hobbies Elderly would like an extra room; for example for guests, a caretaker, hobbies or storage. This can also be facilitated by flexible spaces in a collective (ANA Architecten, 2020)

Place experience

Self-control

The biggest issue among the elderly is wanting to remain their self-control, to oversee their lives. As Klinenberg mentioned: *"Aging alone is not easy: adjusting to retirement, managing illness, enduring frailty, and watching friends and family die – harsh for someone alone. (Klinenberg, 2012, p. 21)"*. This means they value the importance of independence. Being able to stay as long as possible in their own place, symbolizes keeping their autonomy and staying positive for as long as they can (Klinenberg, 2012).

Ageing in time

As they are ageing in time, the solo elderlies are slowly in need of more care. Not all can manage to maintain a quality of life high, and every day they are facing these qualities can decrease quickly. They need a greater support network, which they build over the years of neighbours, close friends, and family. This network of daily interactions, including the informal social contacts, is of immense importance to be able to continue living independently. Common (traffic) areas can help with stimulating these small interactions (ANA Architecten & Gemeente Amsterdam, 2018).

Isolation

Not everyone is able to build a large network around them. The less fortunate are in danger to become more isolated. Older men are more vulnerable to becoming isolated since they are less skilled in maintaining a social network (Klinenberg, 2012). Most of the day elderly spend their time alone. They sometimes see their kids, call a friend or go outside, but most of the day they spend reading and watching television (Klinenberg, 2012).

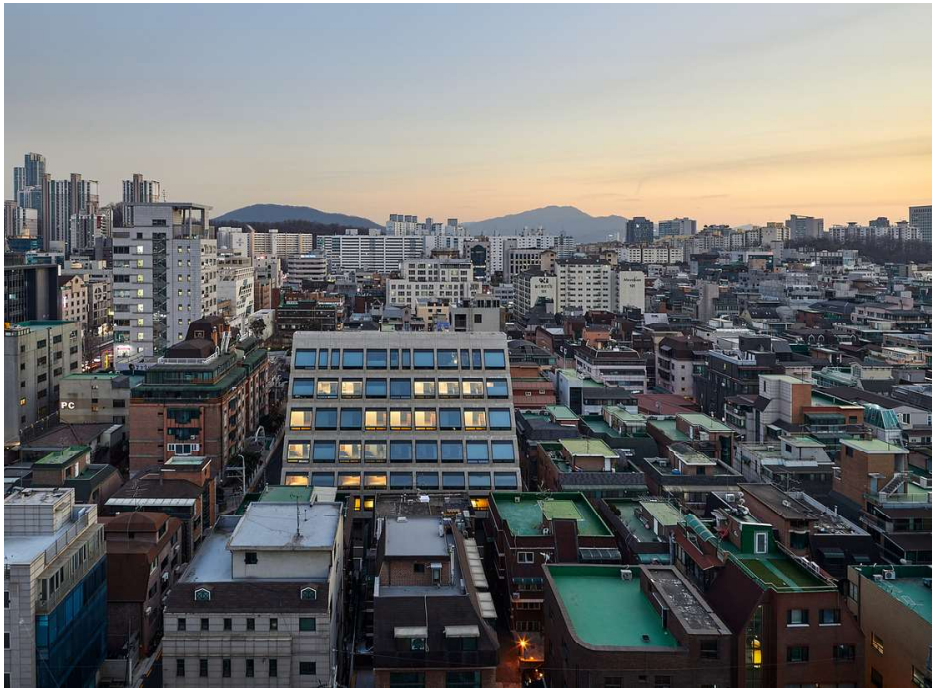
Sharing

According to a study by ANA architects (2020), some elderlies are interested in a form of housing where there are independent facilities, but also shared spaces. Some of them prefer a mix of young and old. A small home in combination with a large common area stimulates encounters and helps to prevent loneliness (ANA Architecten & Gemeente Amsterdam, 2018).

Fig. 10. *Site plan*
Scale 1:500

Treehouse *Dwelling units*

Bo-DAA



Project Name:	Threehouse
Site:	Gangnam-gu, South Korea
Address:	33 Dogok-ro 23-gil, Seoul
Client:	Kolon Global
Architect:	Bo-Daa
Year of realization:	2018
Number of units:	72 studios
Square meters:	4810 m²

Fig. 11. *Slanterd windows give appartments great vriews, while maintaining privacy.*
(c) Rohspace
(Archdaily, 2021)

Circulation

Placement of circulation space in the building

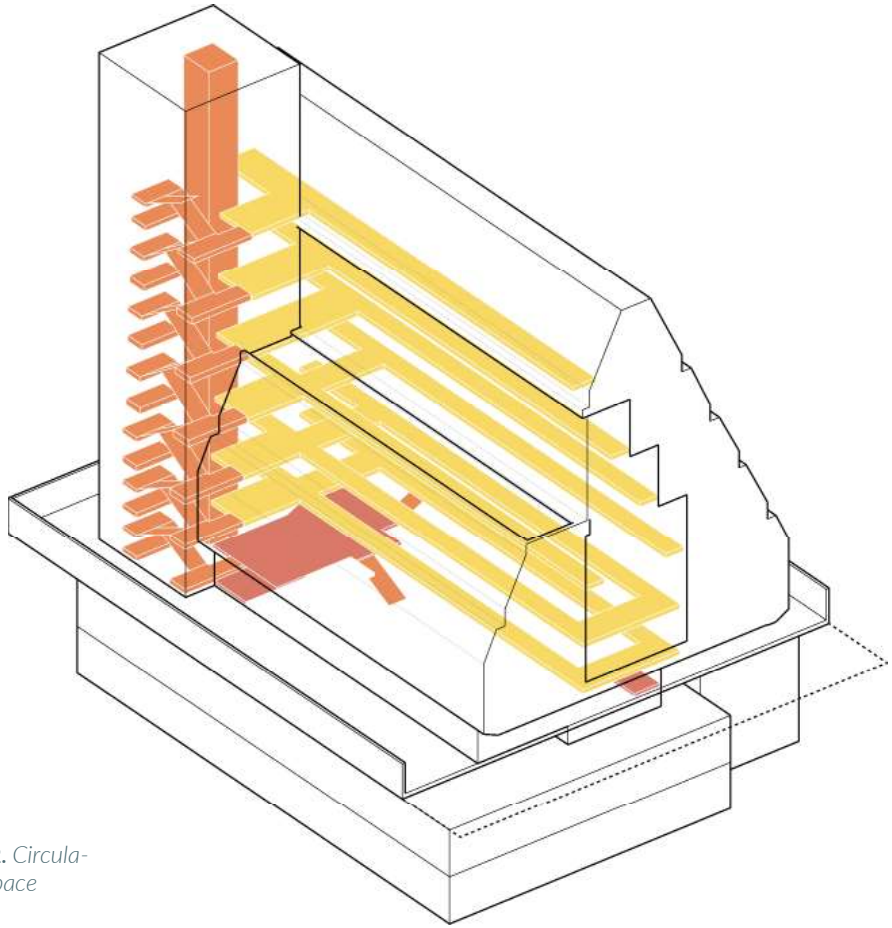


Fig. 12. *Circulation space*

Fig. 13. *Gallery*
(c) Rohspace (Bo-Daa, 2021)

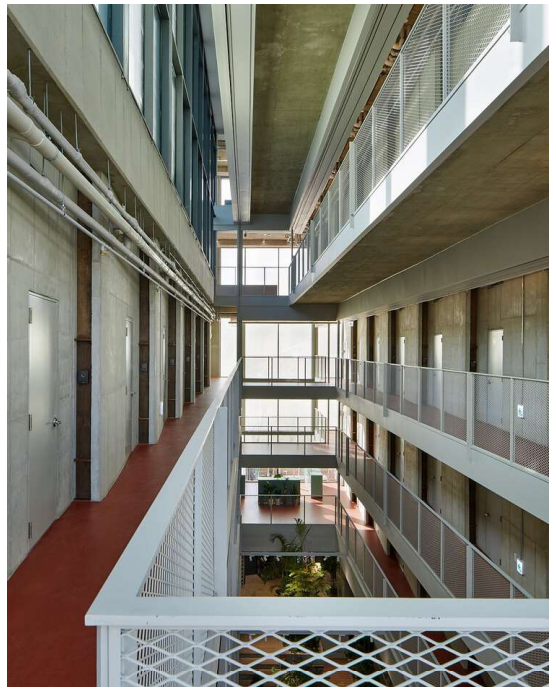


Fig. 14. *Green atrium*
(c) Rohspace (Archdaily, 2021)

Circulation

Placement of circulation space in the building

Main routes
Entree

Entree routes
Outside

Vertical routes

Horizontal routes

Communal routes

External routes
Restaurant

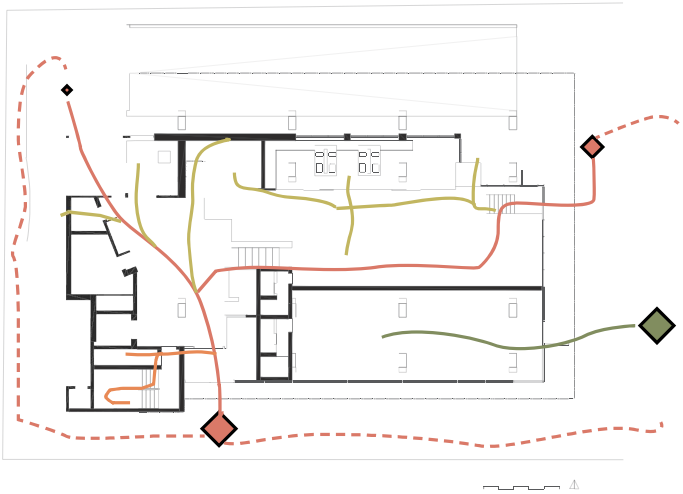


Fig. 15.
Circulation
Ground floor
Scale 1:500

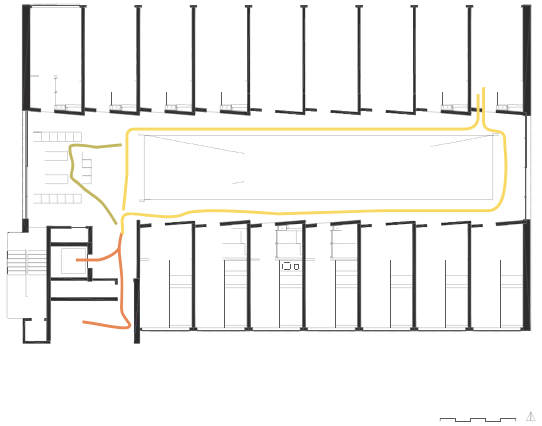
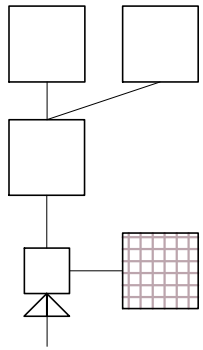


Fig. 16.
Circulation
First floor
Scale 1:500

Type *Femme*
Number *16*



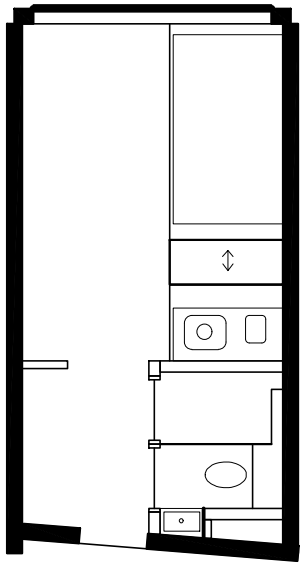
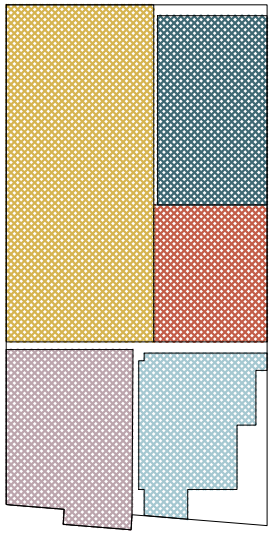


Fig. 17. *Floor plan*
Scale 1:100

Fig. 18. *Moving side table from kitchen to bed-office.*
(c) Rohspace (Bo-Daa, 2021)

Fig. 19. *Spatial analysis in daily routines*
Scale 1:100



First Floor

Gathering
Area 8.7m2

Cooking
Area 2.7m2

Eating
Area 5.4m2

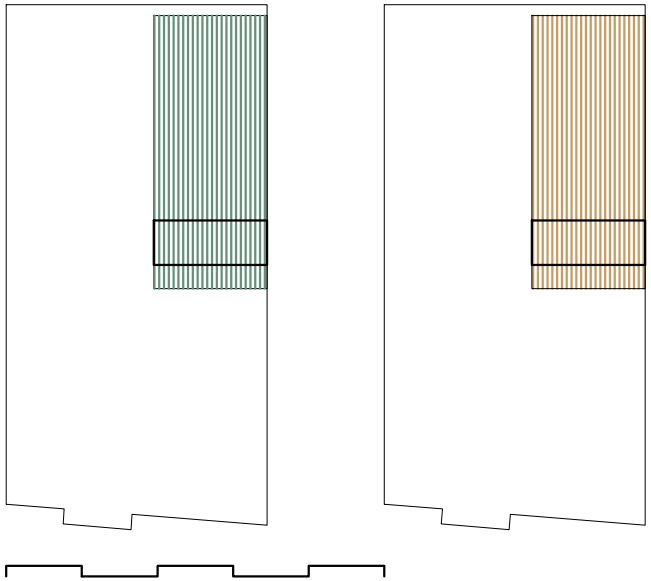
Working
Area 5.4m2

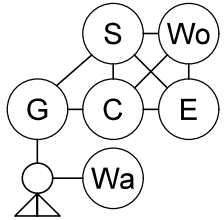
Sleeping
Area 3.6m2

Washing
Area 2.8m2

Other:
Area 3.7m2

Extra functions
in/on top of space





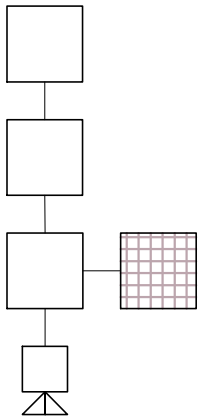
Dedicated area

Undedicated area

Movable direction

Dwelling typology

Type *Nomad*
Number *16*



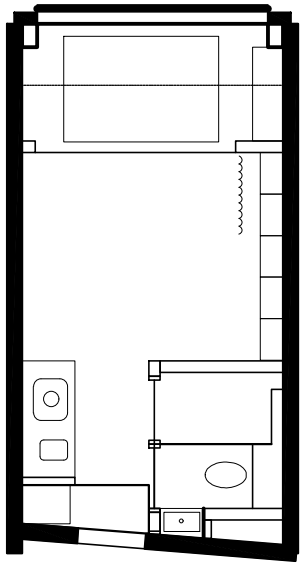
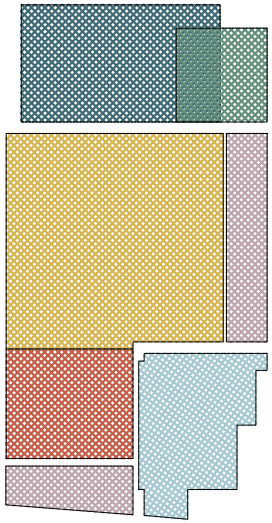


Fig. 20. *Floor plan*
Scale 1:100

Fig. 21. *Bed on platform near window.*
(c) Lee Jieung (NESS, 2021)



First Floor

Extra functions
in/on top of space

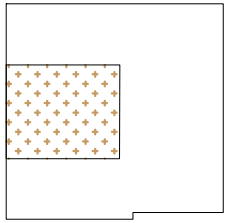


Fig. 22. *Analysis space in daily routines*
Scale 1:100

Gathering
Area 8.1m2

Cooking
Area 2.4m2

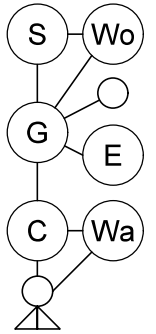
Eating
Area 1.9m2

Working
Area 1.5m2

Sleeping
Area 4.1m2

Washing
Area 2.8m2

Other:
Storage
Area 1.5m2
Entrance
Area 1.0m2



Dedicated area

Undedicated area

Movable direction

Dwelling typology

Type *Cat*
Number *16*

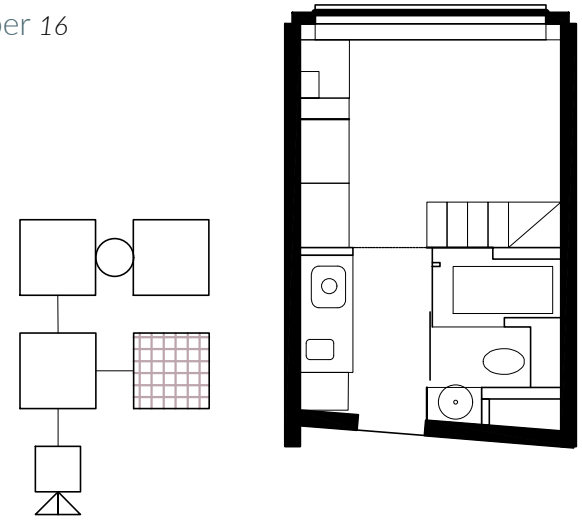
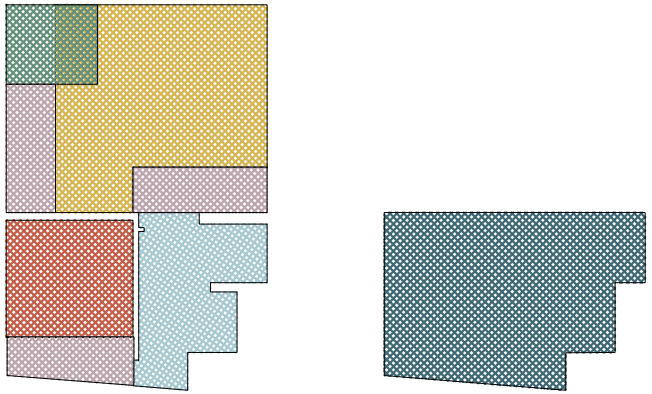


Fig. 23. *Floor plan*
Scale 1:100

Fig. 24. *A climbing course has been set up in the interior especially for the cat.*
(c) Rohspace (Bo-Daa, 2021)

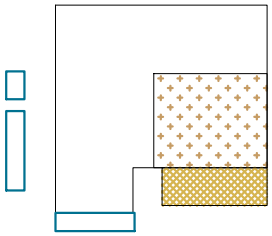
Fig. 25. *Analysis space in daily routines*
Scale 1:100



First Floor

Second floor

Extra functions
in/on top of space



Gathering
Area 6.6m2+0.7m2

Cooking
Area 2.6m2

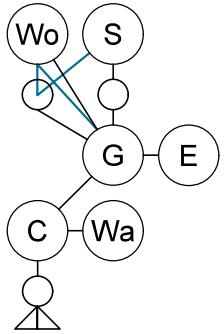
Eating
Area 1.9m2

Working
Area 1.3m2

Sleeping
Area 7.0m2

Washing
Area 2.9m2

Other:
Storage
Area 1.1m2
Stair:
Area 1.1m2
Entrance:
Area 1.0m2



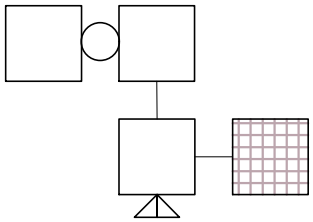
Dedicated area

Undedicated area

Movable direction

Dwelling typology

Type *Terrace*
Number *9*



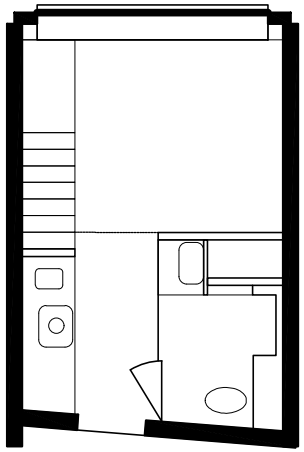


Fig. 26. *Floor plan*
Scale 1:100

Fig. 27. *Bed on platform with storage under stairs.*
(c) Rohspace (Archdaily, 2021)

Fig. 28. *Analysis space in daily routines*
Scale 1:100

Dwelling typology

Type *Minimal*
Number *9*

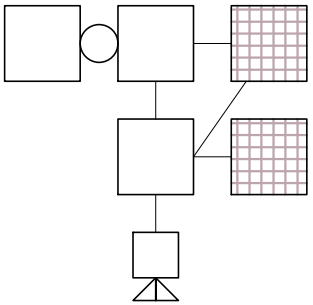


Fig. 29. *Floor plan*
Scale 1:100

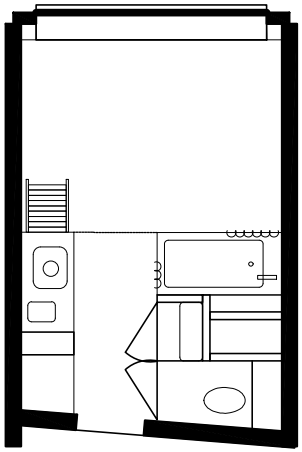
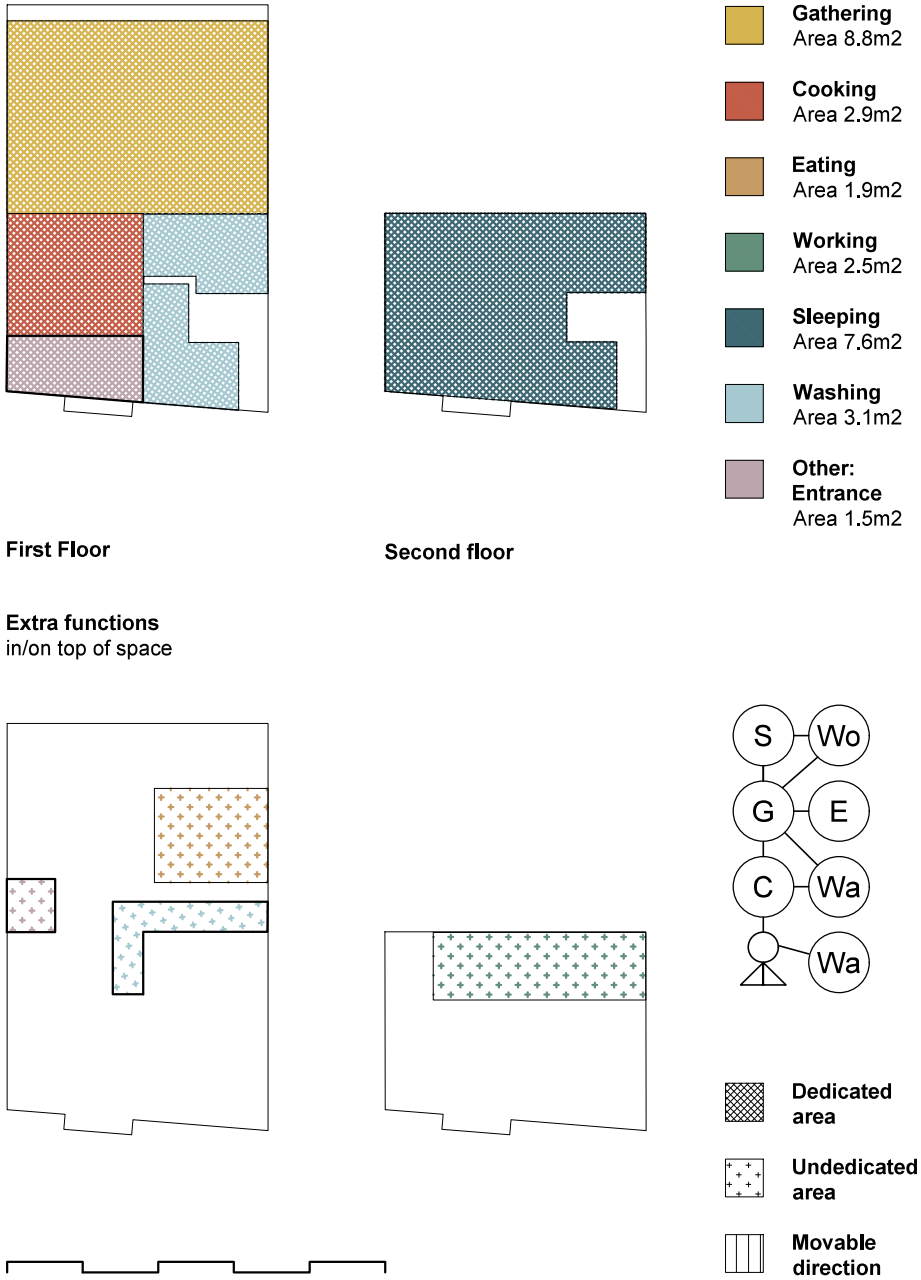


Fig. 30. *Open bath (luxury in Seoul appartments) in living room*
(c) Rohspace (Bo-Daa, 2021)

Fig. 31. *Analysis space in daily routines*
Scale 1:100



Dwelling typology

Type *Peak*
Number *6*

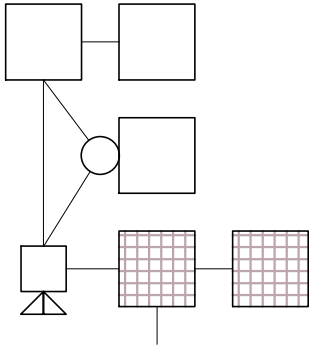
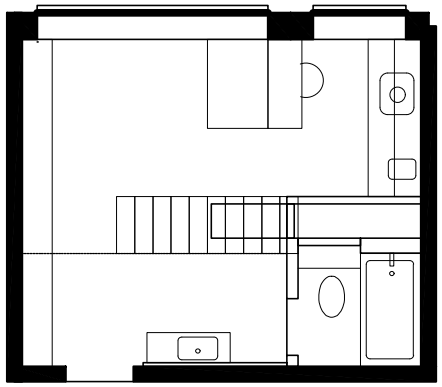


Fig. 32. *Floor plan*
Scale 1:100



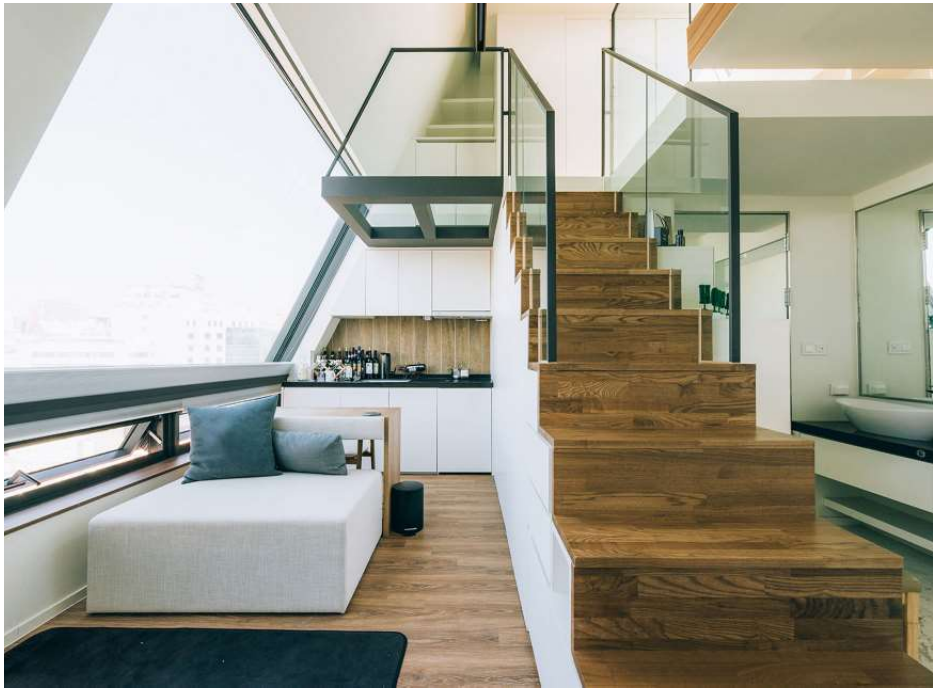
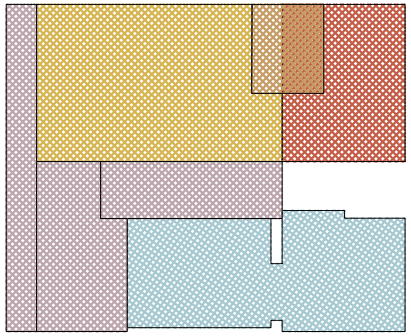
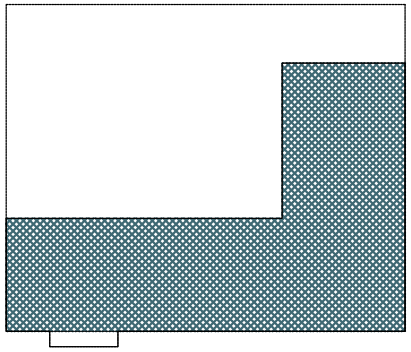


Fig. 33. *Stair separates the room.*
(c) Lee Jieung (NESS, 2021)

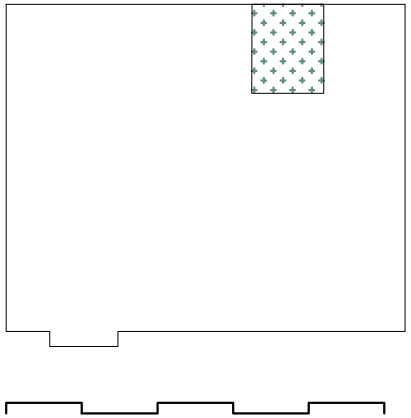
Fig. 34. *Analysis space in daily routines*
Scale 1:100



First Floor



Second floor



Extra functions
in/on top of space

Gathering
Area 6.3m2

Cooking
Area 3.4m2

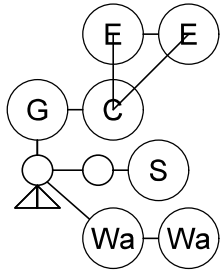
Eating
Area 1.1m2

Working
Area 1.1m2

Sleeping
Area 11.2m2

Washing
Area 5.4m2

Second floor
Other:
Stairs:
Area 1.8m2
Storage:
Area 1.7m2
Hall:
Area 2.4m2



Dedicated area

Undedicated area

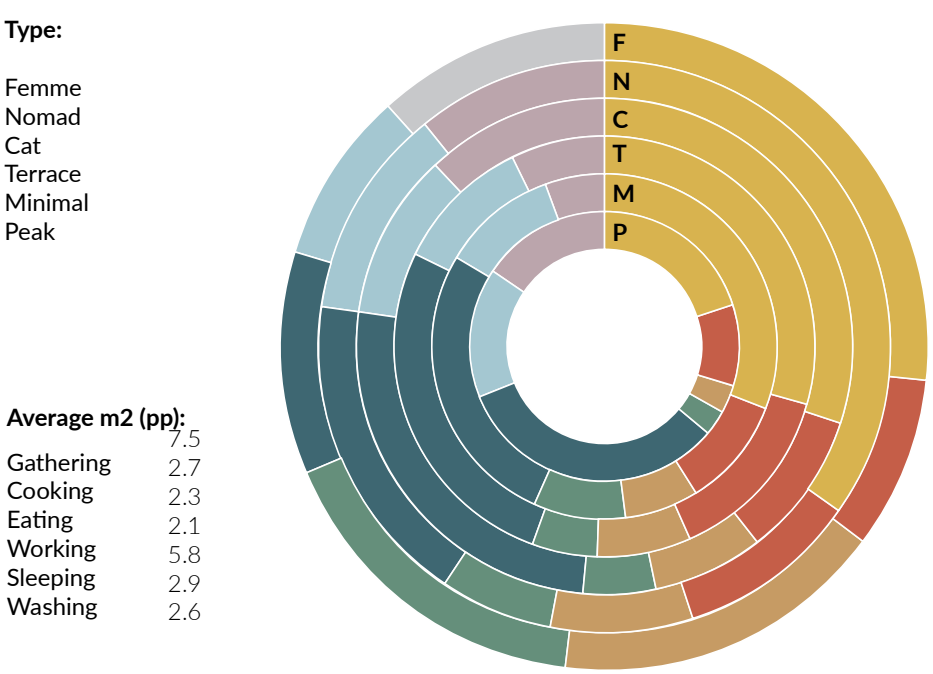
Movable direction

Daily routines

The individual units in Treehouse are designed for single professionals and their pets (NESS, 2020), and have all the needed equipment to cover their daily activities. All units have private facilities, including a kitchen, bathroom and sleeping area with a double-sized bed, centred around a large open space which can be used freely for multiple functions.

On each floor, there is a different apartment type, that has a name referring to their 'special' feature. These features affect how the daily routines within the type are performed. The Female type is the only type with a kitchen in the living space and has a movable table; that functions from an extended kitchen counter to a workspace above the bed. Nomad has a low built-in bed on a platform, with a workspace in front of the window. Cat has shelves and obstacles, allowing the cat to climb from one place to another in multiple ways. The Terrace itself does not have an extra function, but the floor offers an extension to the communal roof terrace. Minimal has an overlapping bathtub that opens into the living room, a bath is a great luxury by Korean standards. Peak is the only type that can accommodate a couple, and therefore offers twice as much space to sleep as the average room.

Fig. 35. *Daily routines in percentages*

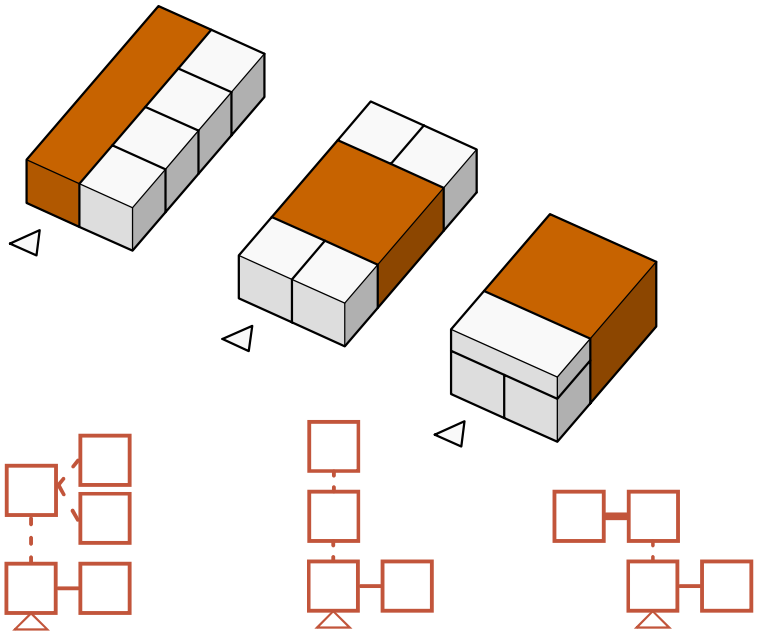


Spatial concept

The concept of the Treehouse building is the accumulation of the various residential units. The slanted façade makes the building look like a tree from the outside. Key in all the apartments is the full-width slanted window, that creates a spatial view of the sky while maintaining privacy with the blinds that rise bottom-up (NESS, 2020). Most of the units are face North for the view, more consistent light and cooler temperatures (Astbury, 2019).

The spaces of the treehouse can be divided into three principles. The first is a flat box with a linear layout. The largest room runs completely over the length of the apartment, where the additional functions are

Fig. 36. *Conclusion diagram space*



placed on the side. The second is a sequence of different zones. The largest space is in the middle, where the additional spaces are placed at the beginning and end. The latter is a loft typology, where the facilities are stacked on one side of the space, connected by a double-height spacious room.

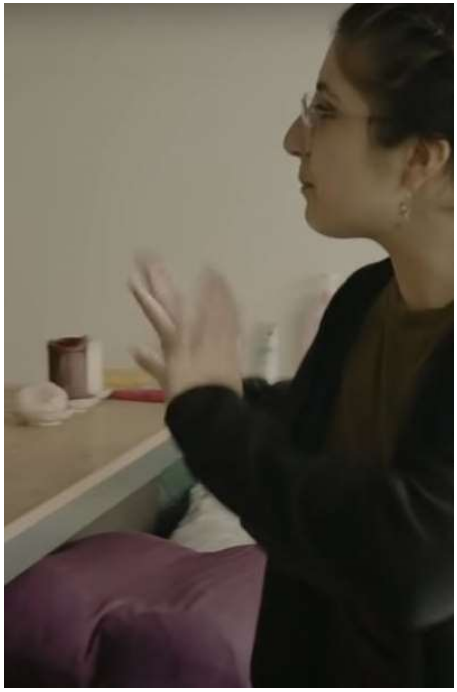
As the one-person boom has stimulated the housing demand in Seoul, the compact apartments are spatial (between 16.5 and 33 m2) for Korean understanding. As the average floor space per person was 13.8 m2 in 1990 to 24.9 m2 in 2010 (Ronald, 2017). To make maximum use of the still small area, functions are combined; stairs function often as a bench, workspace or storage.

Place experience

Yet something stands out in the photos of the apartments. The largest room is often undefined in spatial use, often staged and photographed with one chair, as if there never will be any company in the room. This gives the feeling of a lot of space but also radiates a lonely situation. It would be interesting to see how the apartments would work with inhabitants.

All the dwelling types have some sort of aggressively overlapped spaces, condensing the living space to the best minimum. These special features seem to not only give identity to the space but also to its residents. It is as if the person living in the Type Femme never leaves the table; working, eating, cooking, and even 'sleeping' are all connected by a multi-purpose table. The name makes me wonder if the types are only suitable for women, or is it stereotyping because the kitchen is so prominent in the room.

Also striking are the workplaces that are connected to the bedrooms; almost in all types. Types of Terrace and Minimal have a side table above the bed on the railing of the platform. This could be very suitable for lazy people (Rita, 2021), but maybe its explanation lies more fundamental in the culture. As Ronald (2017) argues the rise of solo dwellers in Seoul is connected to the economic opportunities for young people. The tendency is that regular - or even irregular - work is difficult to find, making it hard to strike a balance between employment, family, and housing careers. The transitions between them are blurring, just like in the apartments.



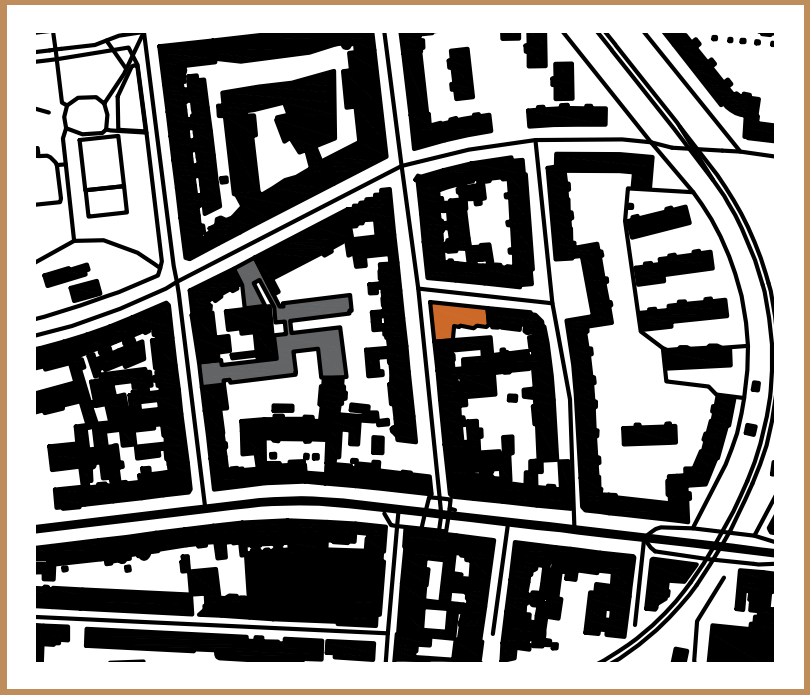


Fig. 37. *Site plan in grey is the project Sargfabrik indicated*
Scale 1:500

Miss Sargfabrik *Dwelling units*

BKK-3

Project Name:	Miss Sargfabrik
Site:	Vienna, Austria
Address:	Missindorfstrasse/Fenzlgasse
Client:	Verein für integrative Lebensgestaltung
Architect:	BKK-3
Year of realization:	2000
Number of units:	43
Square meters:	3.000 m²

Fig. 38. *Miss Sargfabrick seen from corner Fenzigasse/ Missindorfst-rasse*
(c) unknown (DASH, 2012)

Circulation

Circulation space in the building

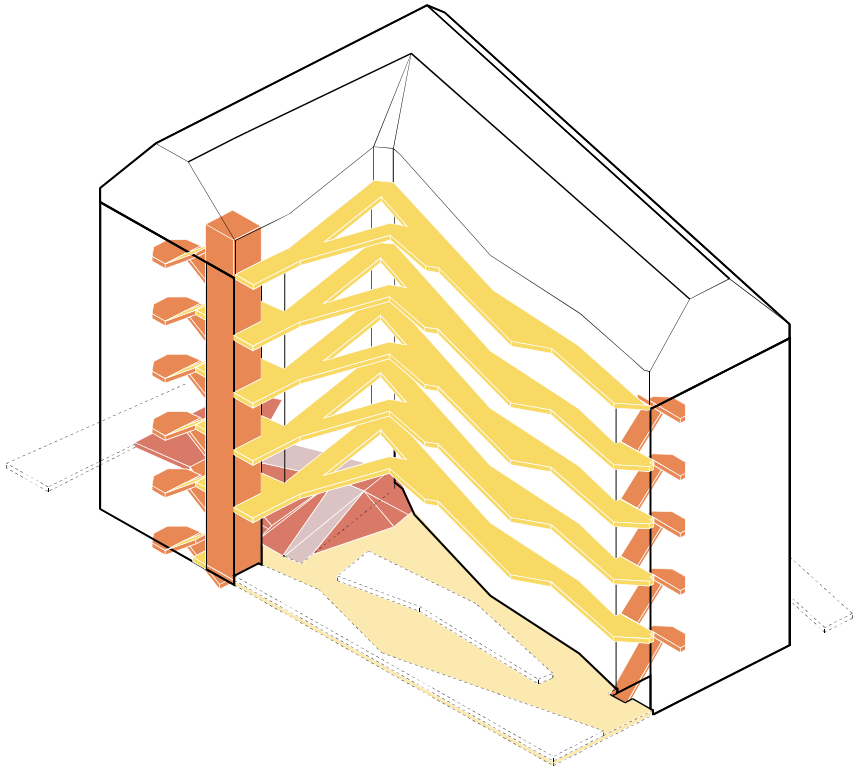


Fig. 39. *Circulation space*

Entrance
Street level

Slope
Outside slope

Vertical
Elevator + Stairs

Horizontal
Gallery + Courtyard

Escape
Fire staircase

Fig. 40. *Entace ramp from the courtyard*
(c) Felix Vollmann (Sargfabrik, 2021)

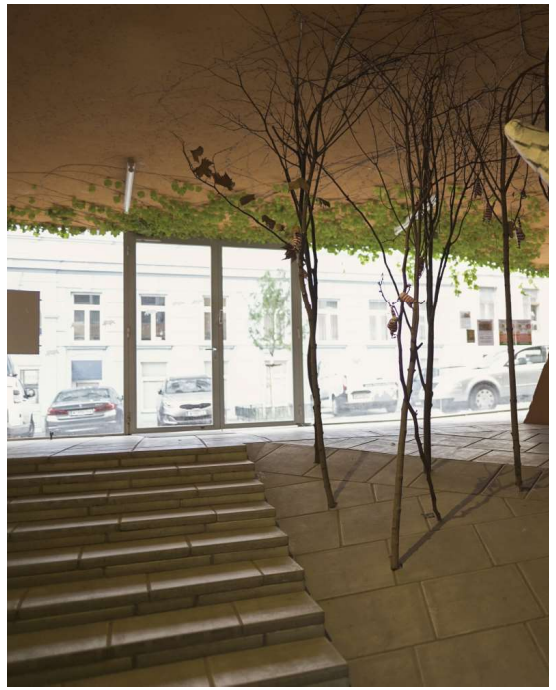


Fig. 41. *Wide balconies*
(c) Felix Vollmann (Sargfabrik, 2021)

Circulation

Placement of circulation space in the building

Main routes
Entree

Entree routes
Outside

Vertical routes

Horizontal routes

Communal routes

External routes
Club

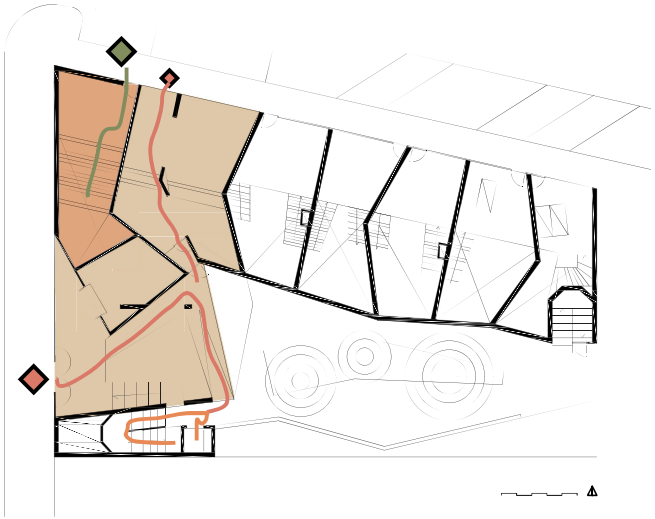


Fig. 42.
Circulation
Ground floor
Scale 1:500

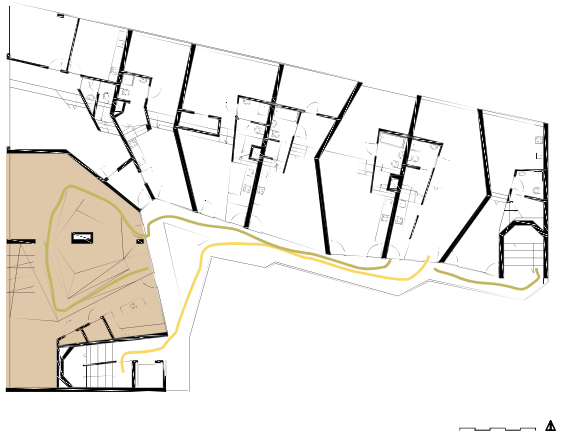


Fig. 43.
Circulation
First floor
Scale 1:500

Dwelling typology

Type *Working-living-ateliers*
Number *5*

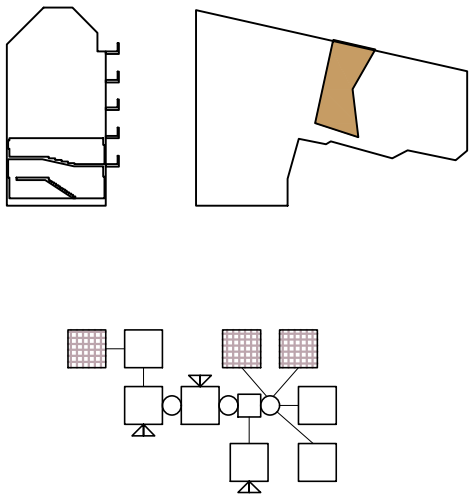


Fig. 44. *Floor plan*
Scale 1:200

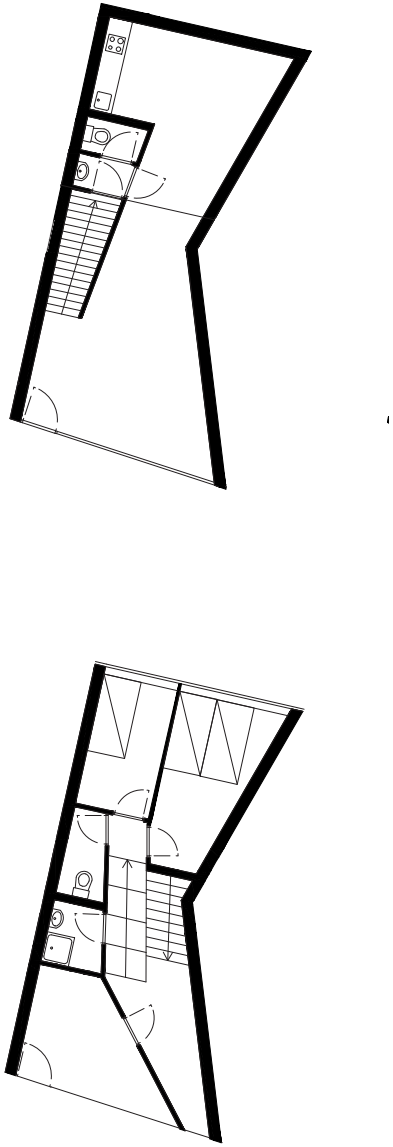
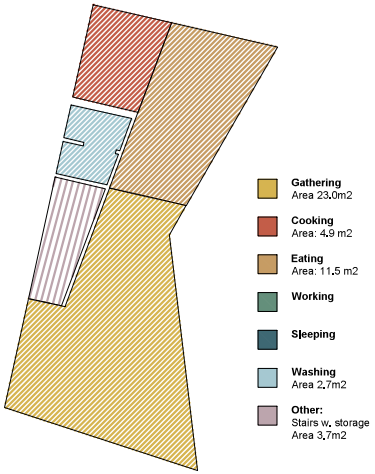
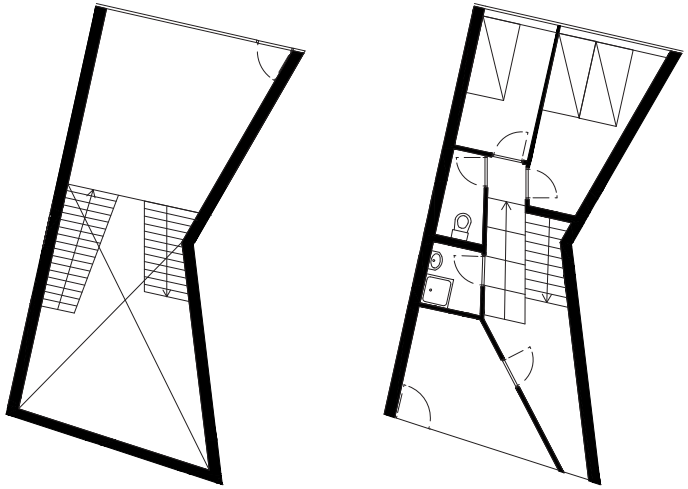


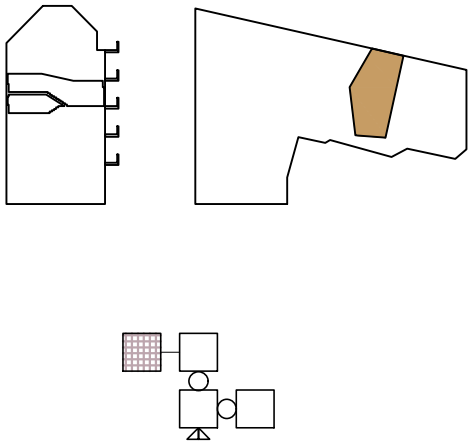
Fig. 45. *Analysis space in daily routines*
Scale 1:200





Dwelling typology

Type *Split level*
Number *17 (similair to this plan: 6)*



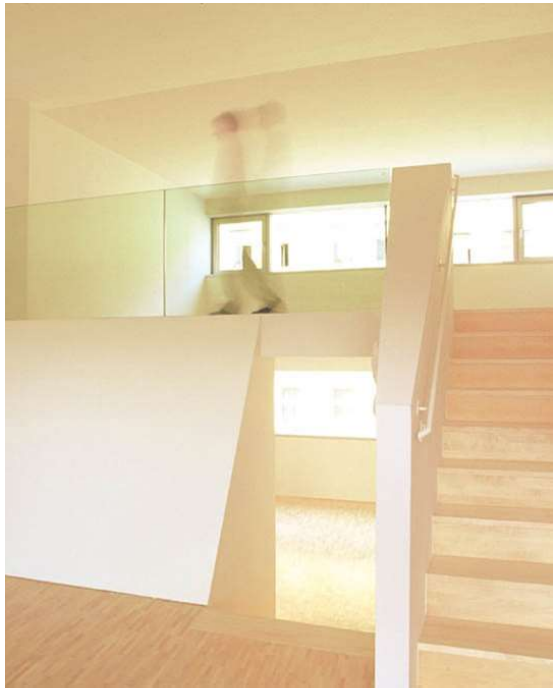
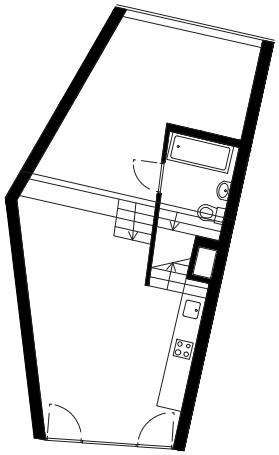


Fig. 46. *The split level dwelling has interesting spaces due to the sloping walls and ceilings* (c) BBK-3 (BBK-3 2022)

Fig. 47. *Floor plan*
Scale 1:200



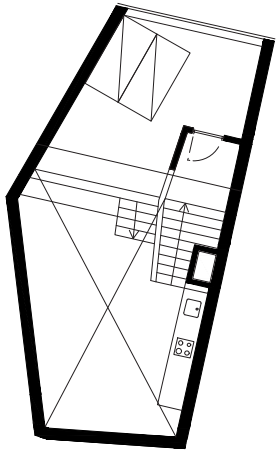
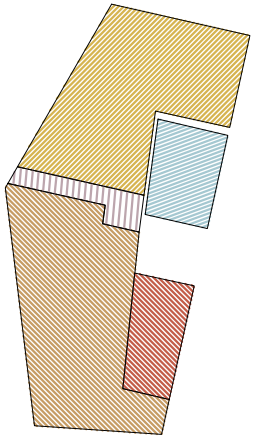
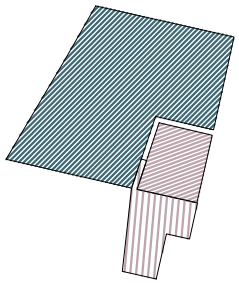


Fig. 48. *Analysis space in daily routines*
Scale 1:200





Gathering
Area: 17.0 m2

Cooking
Area: 4.4 m2

Eating
Area: 18.5 m2

Working

Sleeping
Area: 16.7 m2

Washing
Area: 4.5 m2

Other:
Hall
Area: 2.8 m2
Stairs/ramp
Area 5.2 m2

Lower Floor

Higher Floor

Stairs

Undedicated

Dwelling typology

Type *Apartment*
Number *17 (incl 3 wheelchair friendly)*

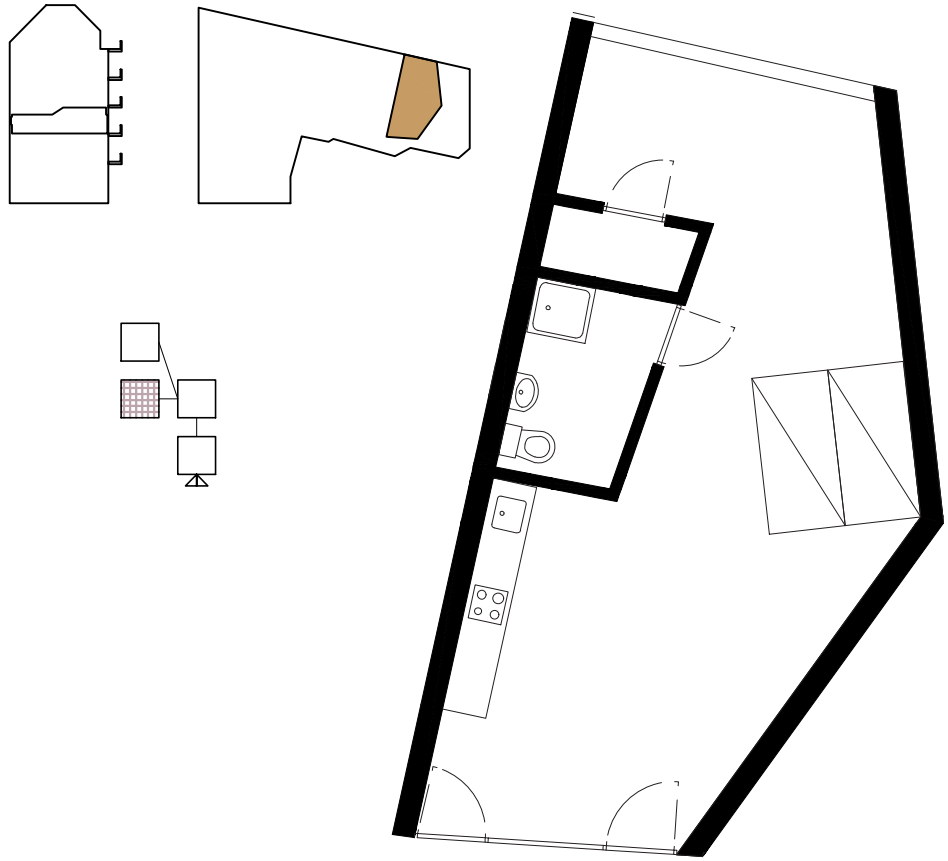


Fig. 49. *Floor plan*
Scale 1:100

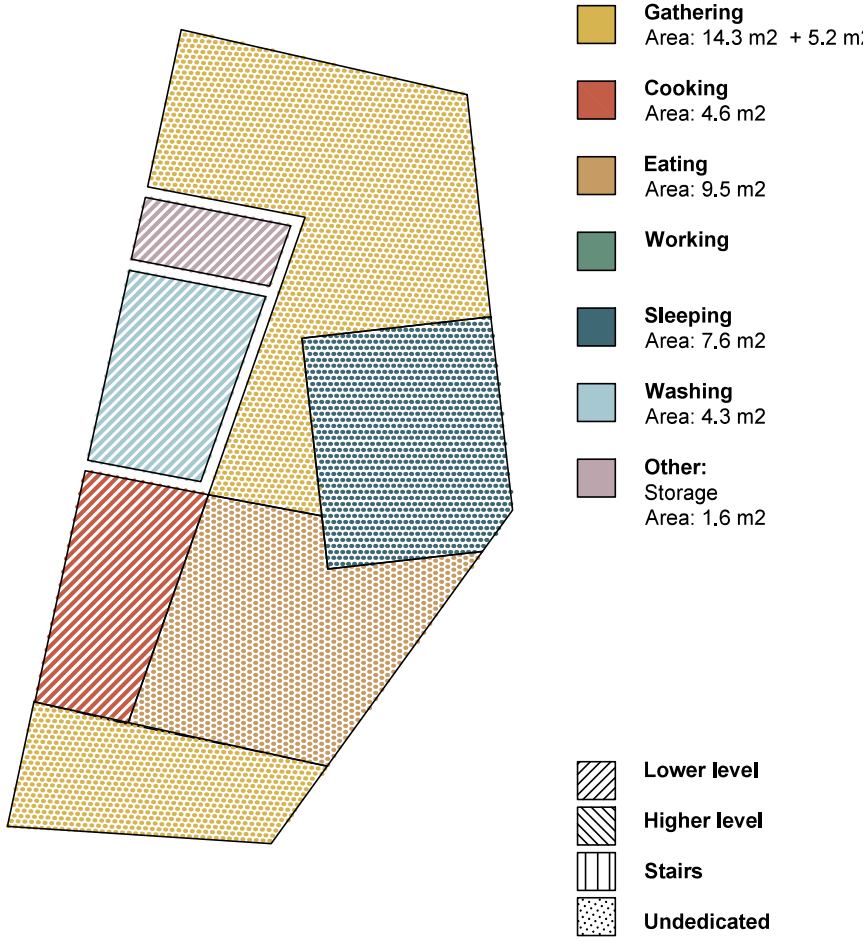


Fig. 50. *Analysis space in daily routines*
Scale 1:100

Dwelling typology

Type *Apartment (leveled)*
Number *17 (incl 3 wheelchair friendly)*

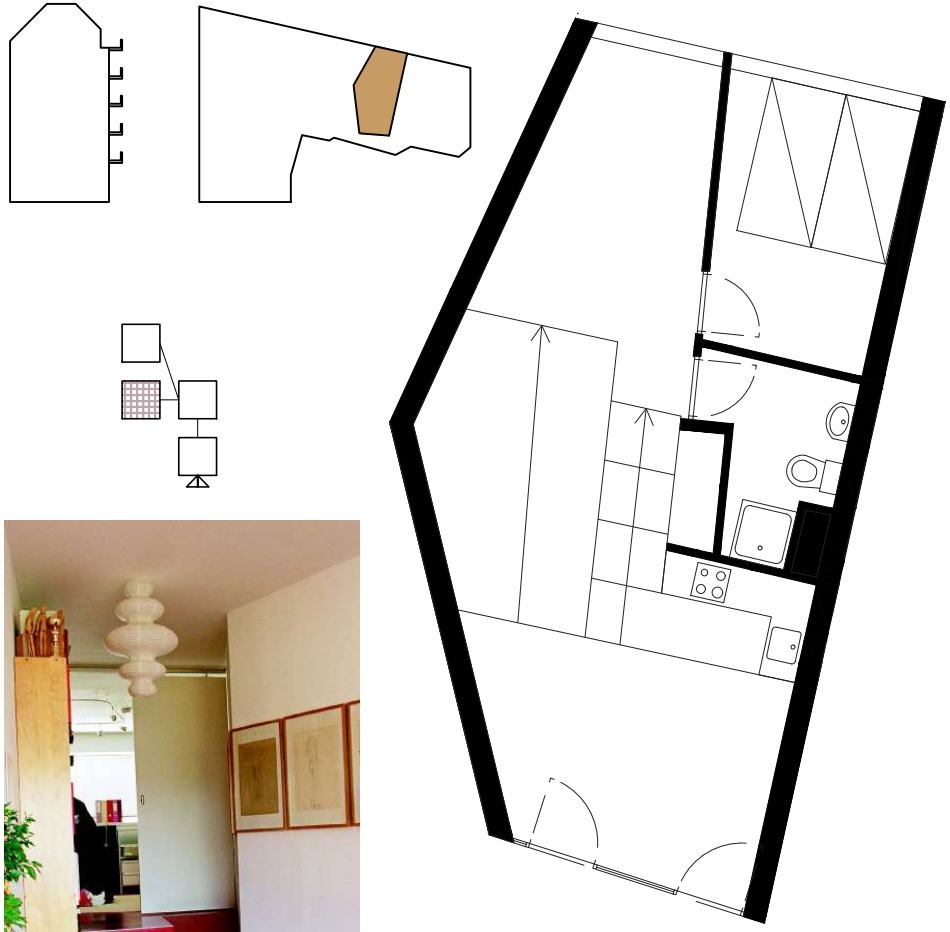


Fig. 51. *Floor plan*
Scale 1:100

Fig. 52. *All the apartments differ due to the angled walls and the inclined ceilings, sometimes there is a little step necessary.*
(c) unknown (DASH, 2012)

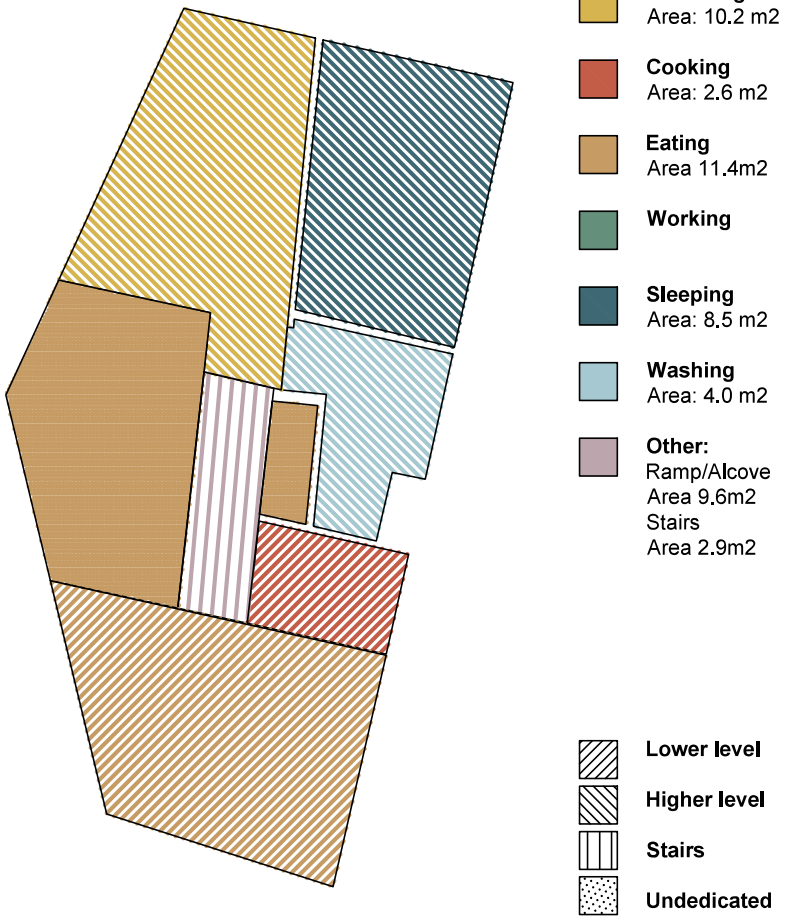


Fig. 53. *Analysis space in daily routines*
Scale 1:100

Daily routines

The small apartments in the Miss Sargfabrik are less suitable for families, most of the residents are therefore single or single-parent families. Although small, each home is fully equipped with the necessary facilities of a bathroom and kitchen. The division of functions of the rooms is less implied upon the residents than in typical housing projects. Since it requires a lot of imagination where one room ends, and another begins. This is done to not produce minimal housing cells, but to accommodate individual needs within the project (Putt & Klijn, 2012). Although furnishing the apartment can cause some headaches.

For example, in the split-level dwelling the residents can position the bedroom above and a living room below, or vice versa. The corners in the rooms ensure that all homes can be used as desired, around the pattern of sleeping, working and living (Brombach & Holl, 2009). Visible in Miss Sargfabrik is the possibility to combine working and living inside affordable housing, keeping in mind the future changes in employment (Beck & Cooper, 2000). De Work types all have a spacious workspace at street level.

Spatial concept

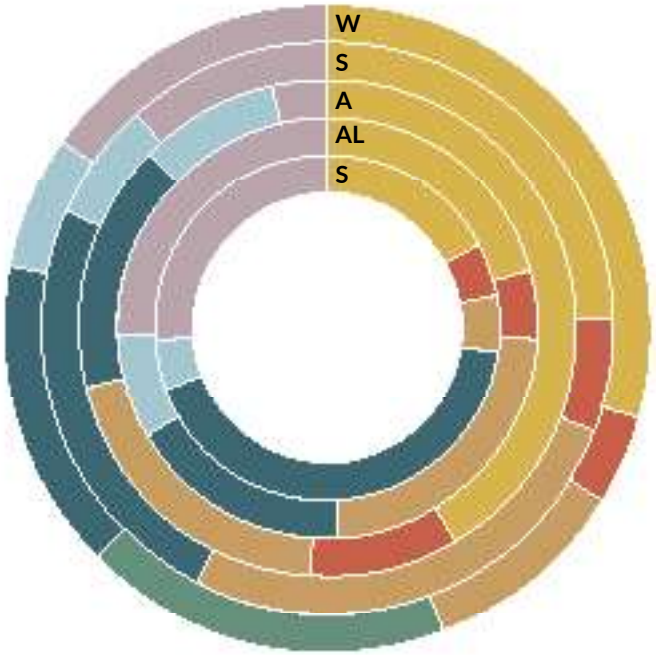
The concept of the energizing apartments arose from the Sargfabrik, where the ceiling height of 'boxes' has been lowered to 2.26m. This concept was acceptable if the living areas were sufficient voluminous with double height and light. In the Miss this concept is even densified, living rooms do not have complete double heights, but one and a half stories.

These different floor heights are resulting in odd, inclined floors with ramps and stairs. The disturbed floor is not new in Viennese architecture, inspired by the architecture of Hundertwasser (Beck & Cooper, 2000). The building, therefore, consists of an accumulation of different types of houses. The first is an apartment with a spacious room and two equal floors on a split level. The second is a high and a low room

Fig. 54. *Daily routines in percentages*

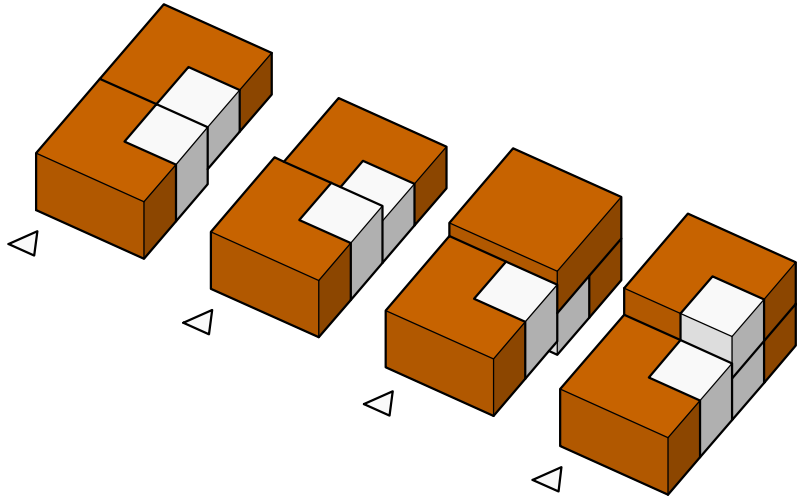
Type:

Workspace
Split level
Apartment
Apartment (leveled)
Shared



Average m2 (pp):	7.9
Gathering	2.0
Cooking	6.7
Eating	1.1
Working	6.6
Sleeping	2.4
Washing	4.9

Fig. 55. *Conclusion diagram space*



connected, either with a continuous floor level or with a smooth ceiling and a ramp in the middle. In such small apartments of an average of 56 m2, this is also a waste of space, resulting in people building constructions above the ramps or building extra storage spaces (Beck & Cooper, 2000; Lootsma et al., 2005).

There are not only horizontal steps in levels, but the vertical constructive walls also do not run straight through the building. By adding the angular walls, new spatial experiences arise in the apartments. Each home type has its typical floor plan, and as a result, each unit is unique.

Place experience

When looking at the density of the houses and the crazy angles in the spaces, this requires serious creative input from the residents of the Miss Sargfabrik. This also makes the building popular with a certain group of people. It connects like-minded people who have the necessary imagination to handle the housing layout.

The various residences have no outdoor spaces, but instead, the large gallery is placed on the south side of the building. This triangled space serves as an extension of the home and serves as a meeting place between neighbours (Schittich, 2013). Large windows act as the front door, stepping directly into the dwelling. Lots of glass on the inside ensures that nothing will go unnoticed, while the slightly closed exterior closes off the community from the outside world. By walking past the open gallery, the residents of the same floor are closer than the people in the rest of the building (Putt & Klijn, 2012).

Fig. 56. *Site plan in grey is the project Merh als Wohnen indicated*
Scale 1:500

Haus A *Dwelling units*

Duplex architects

Fig. 57. *Facade of Haus A in the Mehr als Wohnen project in Zürich*
©Johannes Marburg (Duplex architects, 2021)

Project Name:	Haus A
Site:	Zürich, Switzerland
Address:	Dialogweg 6
Client:	Baugenossenschaft mehr als wohnen
Architect:	Duplex Architecten
Year of realization:	2015
Number of units:	60
Square meters:	6.883 m2

Circulation

Placement of circulation space in the building

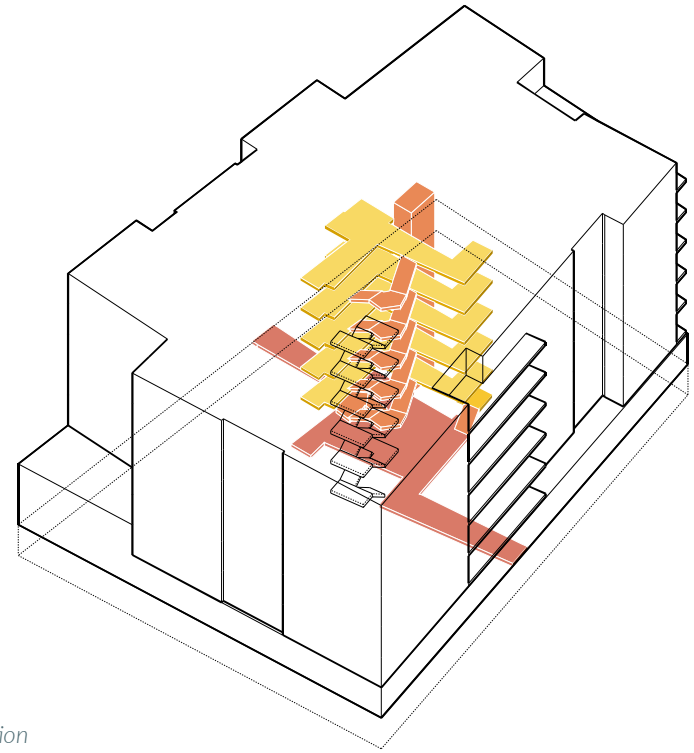


Fig. 58. *Circulation space*

Entrance
Street level

Slope
Outside slope

Vertical
Elevator + Stairs

Horizontal
Gallery + Courtyard

Escape
Fire staircase

Fig. 59. *From the gallery one can easily look into the clusterapartments* (c) Johannes Marburg (Archilovers, 2022)

Fig. 60. *Staircase Haus A in the atrium*
(c) Johannes Marburg (Käpplinger, 2022)

Circulation

Routes through the building

Fig. 61.
Circulation
Ground floor
Scale 1:500

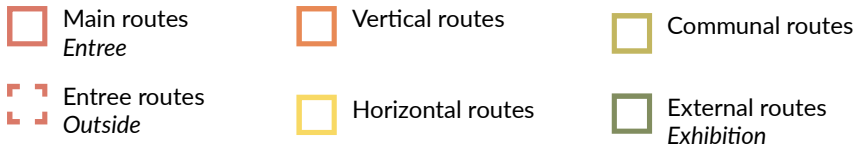


Fig. 62.
Circulation
First floor
Scale 1:500

Cluster Ground Floor *Personal units*

Fig. 63. *Floor plan*
Scale 1:200

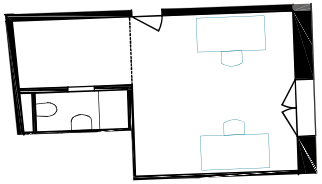


Fig. 64. *Analysis space in daily rhythm*
Scale 1:200

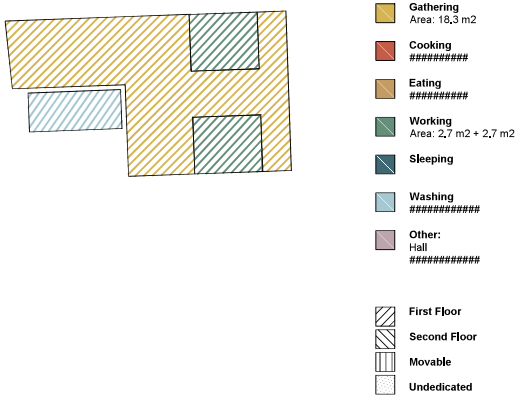
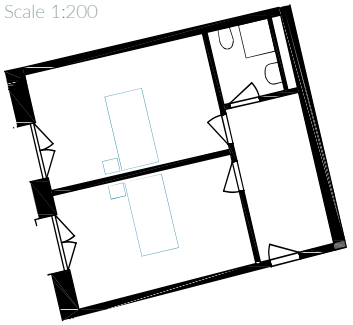
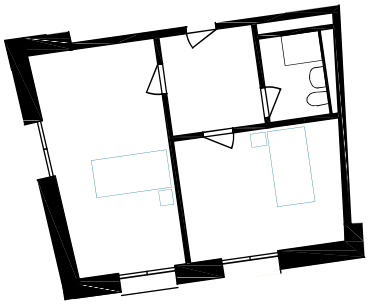


Fig. 65. *Floor plan*
Scale 1:200





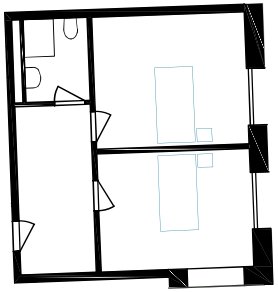
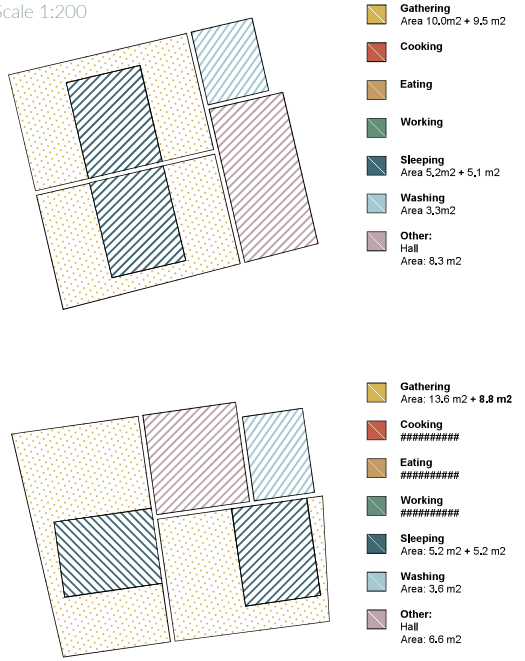


Fig. 66. *Analysis space in daily routines*
Scale 1:200



Cluster A - Typical Floor *Personal units*

Fig. 67. *Floor plan*
Scale 1:100

Fig. 68. *Analysis space in daily rhythm*
Scale 1:100

Fig. 69. *Floor plan*
Scale 1:100

Fig. 70. *Analysis space in daily rhythm*
Scale 1:100

Cluster B - Typical Floor *Personal units*

Fig. 71. *Floor plan*
Scale 1:100

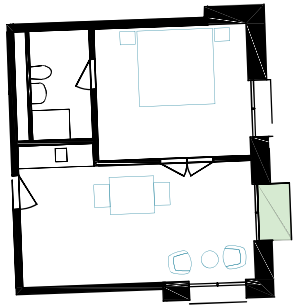
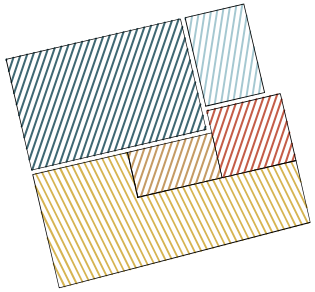
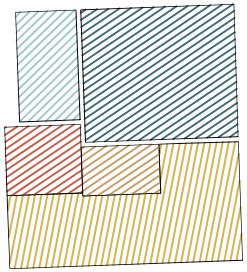
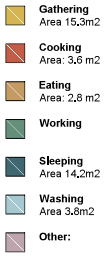
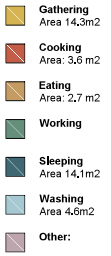


Fig. 72. *Analysis space in daily rhythm*
Scale 1:100









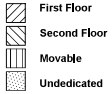


Fig. 73. *Floor plan*
Scale 1:100

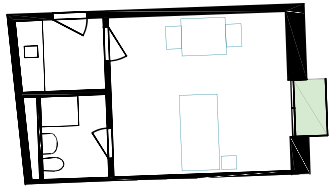
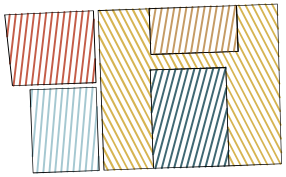
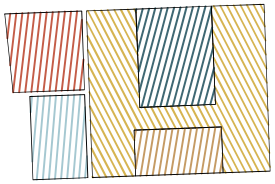
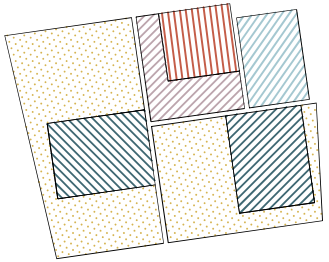


Fig. 74. *Analysis space in daily rhythm*
Scale 1:100







Daily routines

The 4-5 small independent residential sub-units in Haus A form a cluster (or 'satellite') apartment, two per floor. Although the sub-units look small at first sight, they are spacious enough to keep your privacy within the cluster. Basic facilities are shared in the common space (see chapter 3), which runs as a common ground between the units. But this is not at the expense of the possibilities within the private units, it is an addition.

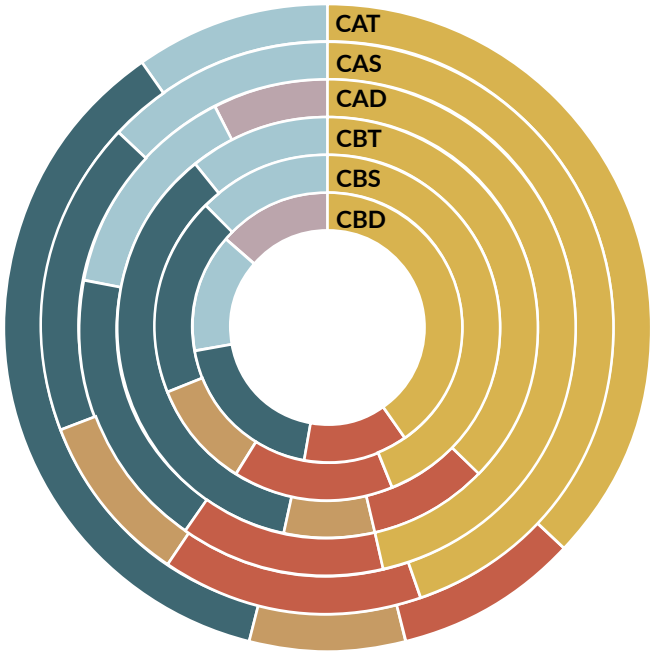
Most private units are also spacious enough to facilitate all daily activities. The different units offer the residents sufficient living space to retreat in private. The units consist of one or two rooms with a bathroom, a small tea kitchenette and often a balcony. The two-room units have an extra space that serves as a bedroom. The other two types combine gathering and sleeping in one room. Places to work or eat are not explicitly marked out but are free to be filled in by the residents.

Fig. 75. *Daily routines in percentages*

Type:

Cluster A (CA)
Cluster B (CB)

Average of the:
Two room (T)
Double room (D)
Single room (S)



Average m2 (pp):	13.2
Gathering	3.8
Cooking	1.9
Eating	0.0
Working	8.3
Sleeping	3.9
Washing	1.0

Spatial concept

The spaces each have one door that connects to the rest of the cluster apartment. All units have a small transition zone between the collective and the private part. The kitchen functions often as the entry zone and is sometimes connected directly and sometimes with a door to the rest of the rooms.

There are three different variations of the private units in a cluster. The smallest is a single room apartment, where you enter in a hall with a kitchen zone that is connected to the largest room, from where you can enter the bathroom. This option is also available with a double room, where you enter again in a small hall (with or without a kitchen) and chose to enter one of the two private bedrooms. However, the bathroom can only be reached here from the hall and not the rooms themselves. The last is a big two-room apartment, separating the bedroom and bathroom from the large space. Here you enter directly into the living space including the kitchen, as the whole room functions as a buffer between the more intimate zones.

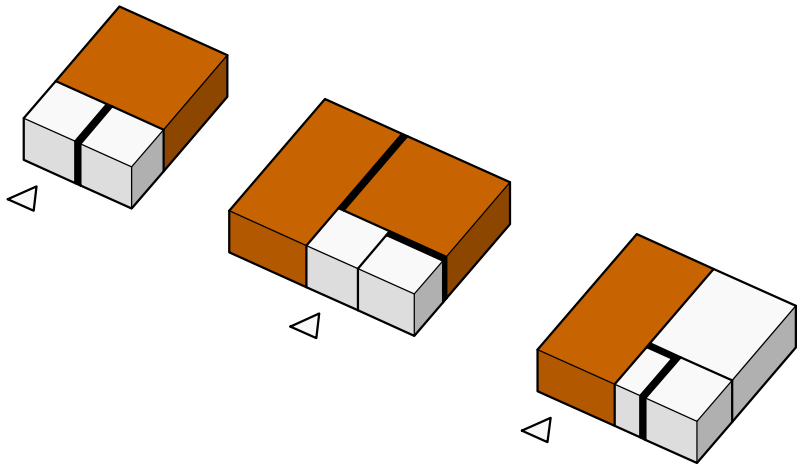


Fig. 76. *Conclusion diagram space*

Place experience

The design of the houses in the whole complex is typical of all Zurich cooperatives: a range of different typologies adapted to the different life stages of a resident. For example, when a child leaves a family, that family has to move to a smaller apartment. (Brussels Dossier, 2020). These cluster apartments are ideal for solo-dwellers and young couples, who consciously choose to live together with a larger group of people.

There is a difference though whether your cluster supplies individual kitchens or not. On the ground floor, there is a cluster for mentally disabled young people, that has no personal kitchenettes in the units (Brussels Dossier, 2020). This stimulates a different type of communal involvement since cooking and eating are becoming a social activity in the cluster, creating more connections between residents. The dwelling spaces on the ground floor are oriented toward the park side and placed on a mezzanine to guarantee privacy (Arbeitsgemeinschaft Futurafrosch & Duplex Architekten, 2010)

Entrances of the building are placed on both sides, cutting the plan of the building in half. Although initially only one entrance zone on the right was indicated at the small alley in between buildings, as this is an intimate place for access and not for lingering (Arbeitsgemeinschaft Futurafrosch & Duplex Architekten, 2010). The stairwell has a light and open character and a spacious gallery. Meeting neighbours is stimu-

Fig. 77. *Entrance of a private unit (haus C, idea of the principle, not Haus A)*
(c) Johannes Marburg (DAC, 2022)

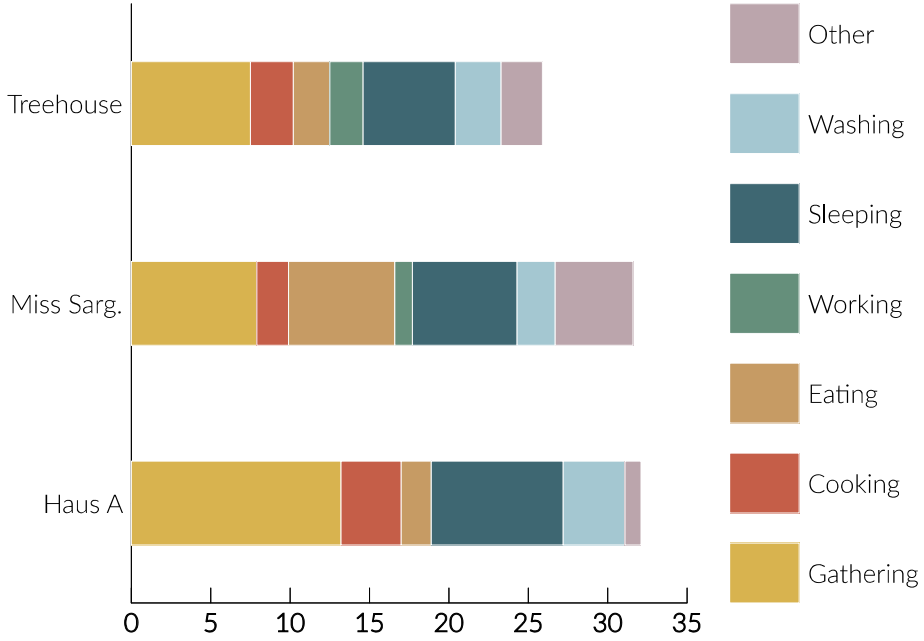
Fig. 78. *Private unit from the inside (cluster undefined)*
(c) Marvin Zilm, (Dossier, 2020)

C

Conclusion

Dwelling space for the solo-dweller

The average room size of the rooms for solo dwellers in the examined case studies is between 25 and 35 square meters. Treehouse clearly has the smallest rooms, where the Miss Sargfabrik and Haus A have roughly equal areas of just over 30 square metres. The largest room is always a room that can be freely divided, a kind of living room between 8 and 14 square meters. What is striking about the Miss Sargfabrik is that the space of the largest room has been surrendered in order to create a second room. The sleeping areas are the same size throughout and offer slightly more space than just a bed. The amenities of the kitchen and washrooms have been made as small as possible.



2

Species

Introduction to the city species in Rotterdam

Humans – or *Homo sapiens* - are not the only species that live in the city. Different groups of living organisms thrive in the structure of the big city or even adapt their skills to their urban surroundings (Schilthuizen, 2018). This chapter describes that unfortunately yet many species are lost due to habitat change and climate change, leading to a loss of biodiversity. The same issues can be seen in Rotterdam, after which we can start looking for solutions on how we can improve the future city by focusing on more biodiversity. I am therefore interviewing André de Beardemeaker, an urban ecologist, to include a specific species in the design project. The choice was made for the common pipistrelle. His accommodation is further explained in the next subchapter, based on Lefebvre's notion of space.

A balanced ecosystem – *The decline of biodiversity*

In a proper working ecosystem, species are in balance in their specific habitat. These ecosystems have not only an intrinsic value but are vital for the continuation of the existence of humans. We – people - are dependent on the ecosystem service productions in our daily life, such as water and food. To create a sustainable ecosystem; it is fundamental to look at biodiversity. Biodiversity is a merge between the term 'biological' and 'diversity' and refers to all the variety in life; from plants, animals, fungi, and micro-organisms as well as the communities that they form and the habitats that they live in (PBL, 2022). Therefore we must try to restore, preserve and improve conditions for biodiversity.

Biodiversity of Rotterdam – *What will the future bring?*

The city of Rotterdam is facing a decline in biodiversity. Multiple factors influence this process, mostly caused by increasing urbanization, due to the densification of the city and building constructions (Gemeente Rotterdam, 2020). Green structures are not divers. Light-, air and noise pollution impact the living quality of the species. This is all visible in rural areas, as in the urban areas in Rotterdam

Fig. 79. *Ecology cycle* (own image)

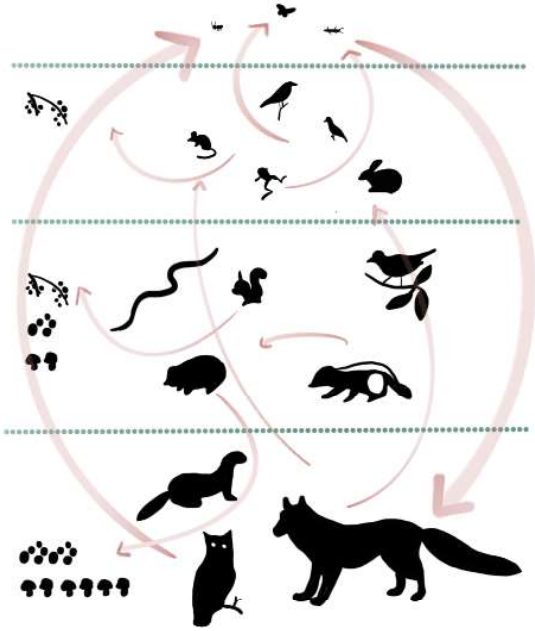


Fig. 80. *Forest species* (own collage)

The municipality of Rotterdam created in December 2020 a document called 'Uitvoeringsagenda Biodiversiteit' to contribute to the city nature of Rotterdam. The ambition formulated in this document is: *"Rotterdam restores, preserves and where possible strengthens the biodiversity in all biotopes. People, plants and animals are in balance with each other and with the economy. Species are connected with each other and the surrounding area."* (Gemeente Rotterdam, 2020, p. 18)

Two important steps to reach this ambition are suggested. First to improve settlement conditions for plants and animals. Second strengthening green and blue networks at the different scale levels in the city. This allows plants and animals to move and expand. Meanwhile, Rotterdam faces the challenge to build 50.000 homes by 2040, an opportunity to include biodiversity in this development (Gemeente Rotterdam, 2020).

Future of Rotterdam – *How to reach the goals?*

To ultimately strive for a nature-inclusive city, the municipality of Rotterdam has drawn up an implementation agenda with three steps to get started with increasing biodiversity. The first step is to create awareness and spread information among residents. This is a quick fix, by implementing simple things you can do now.

One of these examples is the campaign of '10 in 010'. It consists of ten selected species that are highlighted by the municipality. These 'ambassadors' are indicator species resembling the different biotopes in the city. If one of these species can settle in the area, it means that the ecosystem is in good balance. Together they tell the story of the balance and cohesion between people and nature, and the importance of a (bio) diverse environment (Gemeente Rotterdam, 2021).

The second step concerns the necessary transitions that must be made, to create a future that includes biodiversity. To properly target the transition, a new image is needed for the future city and the associated desired biotopes. As a starting point, it is important to distinguish the current biodiversity in the Rotterdam biotopes, as a baseline for further development. The specific location in Rotterdam Noord, Walenburghof, will be discussed in the last chapter of this report.

The final step is to safeguard the measures, which involves stimulating biodiverse initiatives and disseminating knowledge. This also involves establishing criteria for design principles and developing tools at the urban level in collaboration with partners.

Species in focus – *Whom to include?*

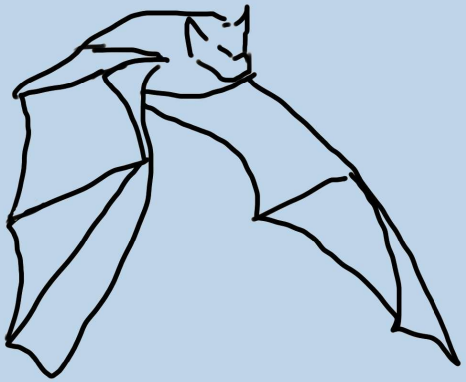
To properly consider which species is suitable for the design location, I interviewed André de Beardemaeker, a city ecologist in Rotterdam. André has been an urban ecologist at Bureau Stadsnatuur for 13 years, who are involved in social projects about informing urban nature to the general public and giving ecological advice. In addition to the help in selecting a target species, I ask him questions about human and non-human encounters (Chapter 3) and the ecology of the city (Chapter 4).

He points out to me that the potential success rate of involving an animal species in the design is important for the feasibility of the project. You may want to include a certain species in your project, but if the chances of the animal staying on-site are slim, it may be a waste of investment. It is, therefore, better to look at species that have a high potential to settle, to have a higher chance of success to connect the project with its context.

Together we looked at a map of reported observations of species in the area around the design site in Rotterdam (Gemeente Rotterdam, 2022). As a possible potential resident, Andre highlights one of the few populations of starlings that settle at Rotterdam Central Station (observation B). They benefit from the many crumbs of the croissants and these settle in the old houses of the Agniesewijk. In the past, these species could be found throughout Rotterdam, but today they are very much declining in urban areas.

Another observation that stands out is a mention of a bat flying inside a home (observation A) Often houses are nature-inclusive by nature, without this being the original intention. The drive to become sustainable increased the need for isolation of buildings while pushing the current bat inhabitants out (Gunnell et al., 2013). Therefore, the choice was made to create new living spaces for a specific bat species in the city; to contribute to the population of common pipistrelles.

Fig. 81. *Observations around the location*



Common pipistrelle

Bats

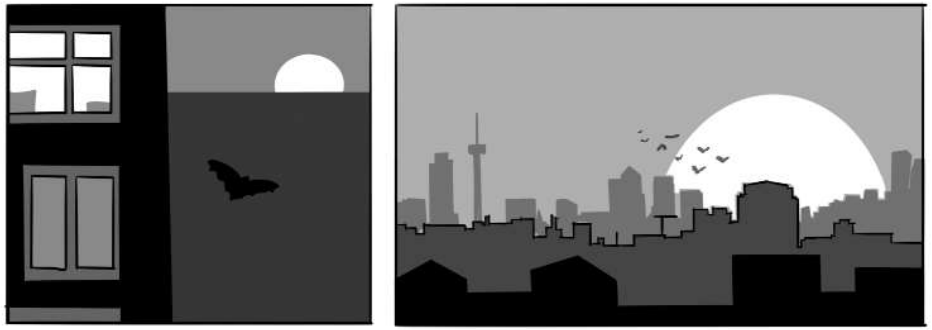
Introduction

Bats have a bad reputation when it comes to propagating viruses. Recently, most people have associated the animals with the spreader of the coronavirus, but this is not exactly the case (Korsten, 2020). When you get to know them better, there is a fascinating way of life behind these little creatures. This chapter gains insight into the lifecycle of this species, investigating their needed living space based on the Lefebvrian spatial triad; their daily routines, the spatial concepts and place experience.

We often talk about 'the' bat, but there are about 18 species of bats in the Netherlands. All of them are protected as endangered species by the EU habitats Directive. Each species specializes in a specific habitat, adapting hunting methods and sleeping places to their environment. The common pipistrelle is the most common urban bat species.

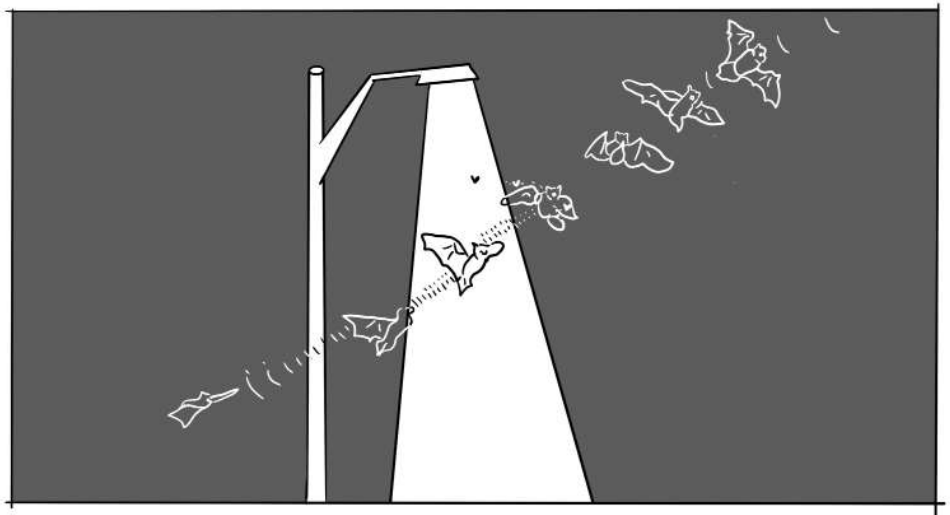
The common pipistrelle (Pipistrellus pipistrellus) is a small bat, weighing 3.5 – 8 gr and has relatively long, narrow wings, with a wingspan of 18 to 24 cm (De Zoogdiervereniging, 2022). This bat species usually live to be four years old but can age up to 16 years.

GATHERING



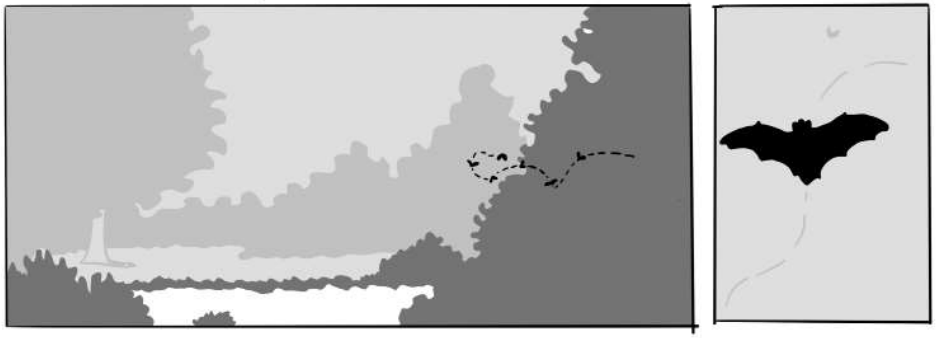
They sometimes live in colonies or harems and sometimes as individuals. They become active at night. At dusk, they wake up and fly out to go hunting and return to their roosts at dawn.

COOKING



They fly making sonar sounds, using the returning echo to locate the insects. To stay alive, bats need to catch a quarter to a half of their body weight in insects.

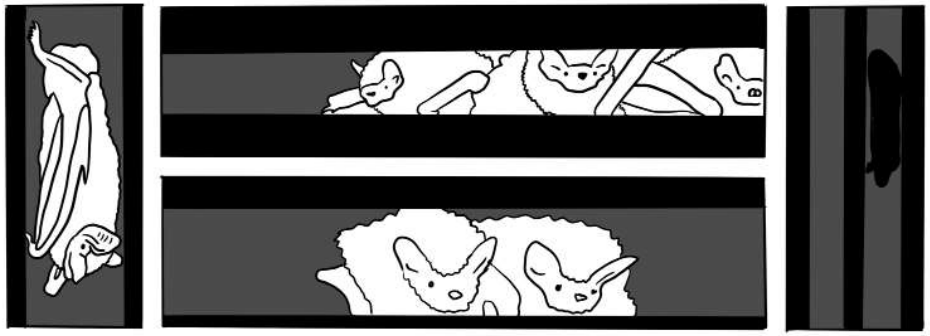
EATING



They hunt insects in an erratic flight, turning and looping alongside vegetation (1-8 m distance) at a height of 2-5 meters, sometimes up to 15 meters.

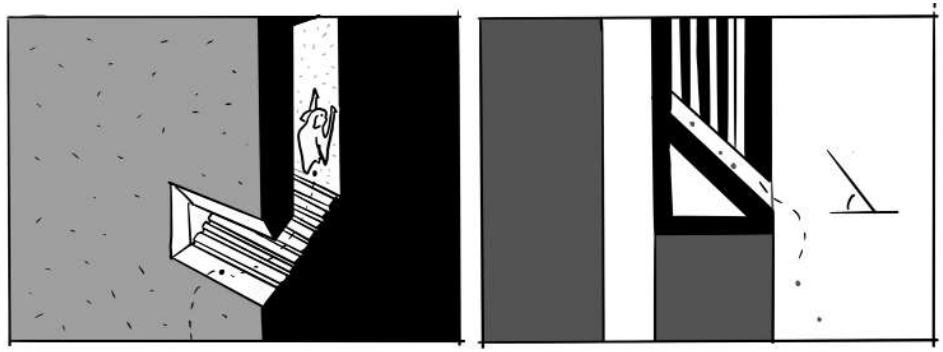
Daily routines
Common pipistrelle

SLEEPING



During the day, every bat needs a roost to sleep and find shelter from predators. When they hang their head down, their body weight pulls on a tendon so that their legs are pulled shut, saving energy.

WASHING



Although they are known for carrying pesticides, they are quite clean animals. They often change habitats for possible illnesses and turn to defecate. The slope at the bottom of the cavity should be more than 45 degrees for the slightly sticky bat droppings to roll out of the openings.

WORKING

Their main instincts are to reproduce themselves and find enough food to survive. Bats potentially keep plagues of mosquitoes and others in track, flight pats between roosts and foraging areas are important, using linear tree lanes.

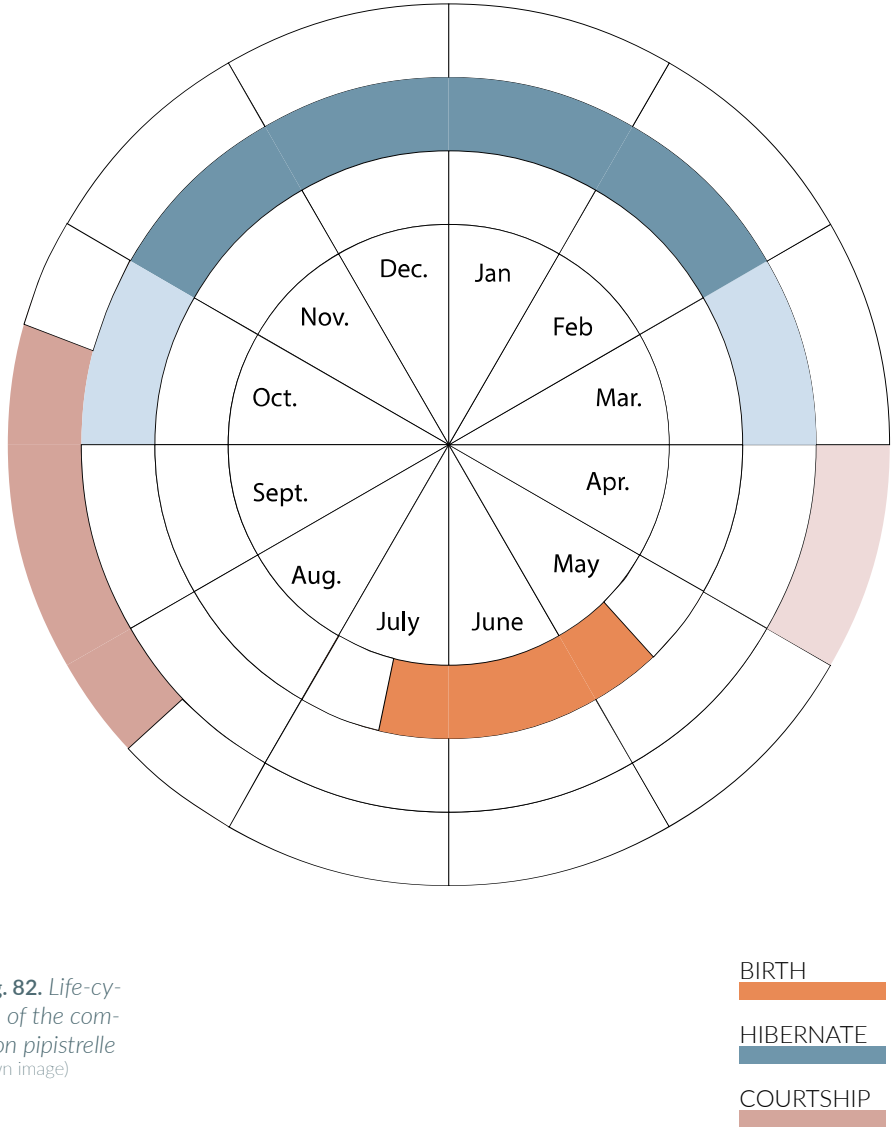


Fig. 82. *Life-cycle of the common pipistrelle*
(own image)

Lifecycle

The daily activities of bats do not differ much from that of humans, as they also gather, sleep, cook, eat, wash and work. But as we have seen from the different groups of solo dwellers, our daily routines inside the home change slightly during human life stages. These transitions come subtly as we age, or have to do with big life events such as moving in with a partner or having a child. On an annual basis, little changes in human lives. Whether it's winter or summer, life within the four walls of the house continues. Bats, on the other hand, are more dependent on the changing seasons, their life goals repeat in one-year cycles.

It is therefore important to also identify the annual changes in the life of the common pipistrelle. To identify those elements that are indispensable for the animal in their native habitat, we analyse the species' life-cycle based on the Animal Aided Design (AAD) approach (Wolfgang & Hauck, 2017). The AAD method describes the life of a bat according to the yearly cycles in the topics of birth, courtship and mating, and hibernation.

Birth

A colony of bats grows slowly, as female bats have one offspring at a time (Vink et al., 2017). The pregnancy starts in spring, as soon as the females have regained sufficient strength after hibernation (Korsten, 2019). The females then gather in maternity roosts in groups of diverse group sizes. In the meantime, the males find individual shelter spaces to rest. In summer, the pups are born and need warmth in the evenings when left alone. After feeding the babies for six weeks, the colony falls apart when the young can eat independently (Gunnell et al., 2013) (Vink et al., 2017).

Courtship and mating

In autumn, the mating begins for the next season. The peculiarity of this process is that the bats already mate in the fall, but the egg is only fertilized the next year. In built-up areas, the courtship dance of the calling males in their territory is often visible in the air (De Zoogdierv-ereniging, 2022). However, the mating enclosures in crevices in and around buildings are difficult to find (De Zoogdiervereniging, 2022).

Hibernation

After the mating period, the preparation starts to survive the winter. The bats feed themselves each evening as much as possible to prepare, putting on some weight (Gunnell et al., 2013). When temperatures drop, they go into solitary hibernation. To protect themselves from

frost, they often look for heated houses (De Zoogdiervereniging, 2022).

Often, the common pipistrelle is also observed to form larger groups, in which up to several hundred animals hang together. In the mild Dutch winters, they sometimes wake up and go hunting for an evening, before returning to rest. Due to sustainability measures in old buildings, currently used hibernation spaces disappear, and new buildings often don't integrate them into the design (Vink et al., 2017).

Spatial concepts

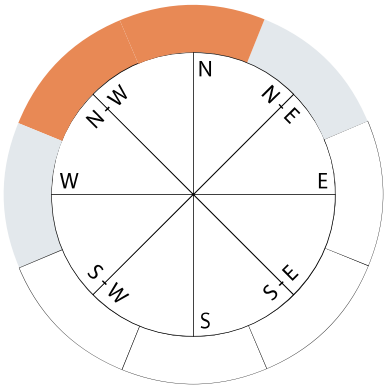
The common pipistrelle is one of the twelve crevice-dwelling bats, that select their roosts as crevices or narrow gaps (Gunnell et al., 2013). This specific bat does not need open spaces to fly inside its roosts. In general, bats do not build their own nest but make use of existing structures (Vink et al., 2017). The common pipistrelle is therefore often seen in the city, nesting in small gaps in building constructions. From the lifecycle analysis, we learned that four different spaces are needed on an annual basis: individual roosts, maternity roosts, mating roosts and hibernation roosts.

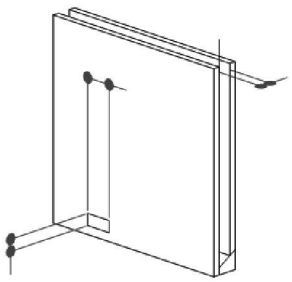
Male roosts/ Interim roosts

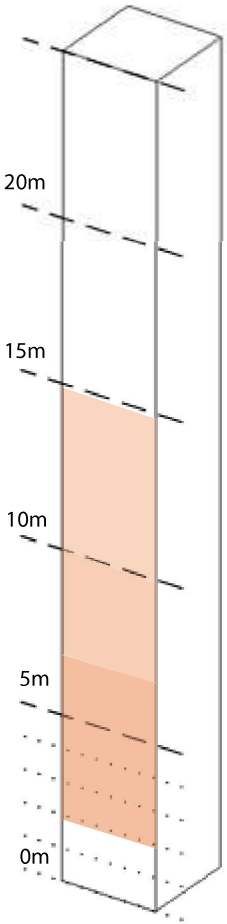
First, the common pipistrelle needs spaces to shelter during the day. Females use these crevices between seasons and males also during the summer. The males then try to find individual shelter spaces in cooler places to rest during the day. They like cool places, where they can heat up at the end of the day under the influence of an external heat source, usually the sun (Korsten, 2012). They seem to have a small preference for buildings where multiple spaces can be used, depending on the weather conditions (BIJ12, 2017).

DIMENTIONS

scale: 1:10





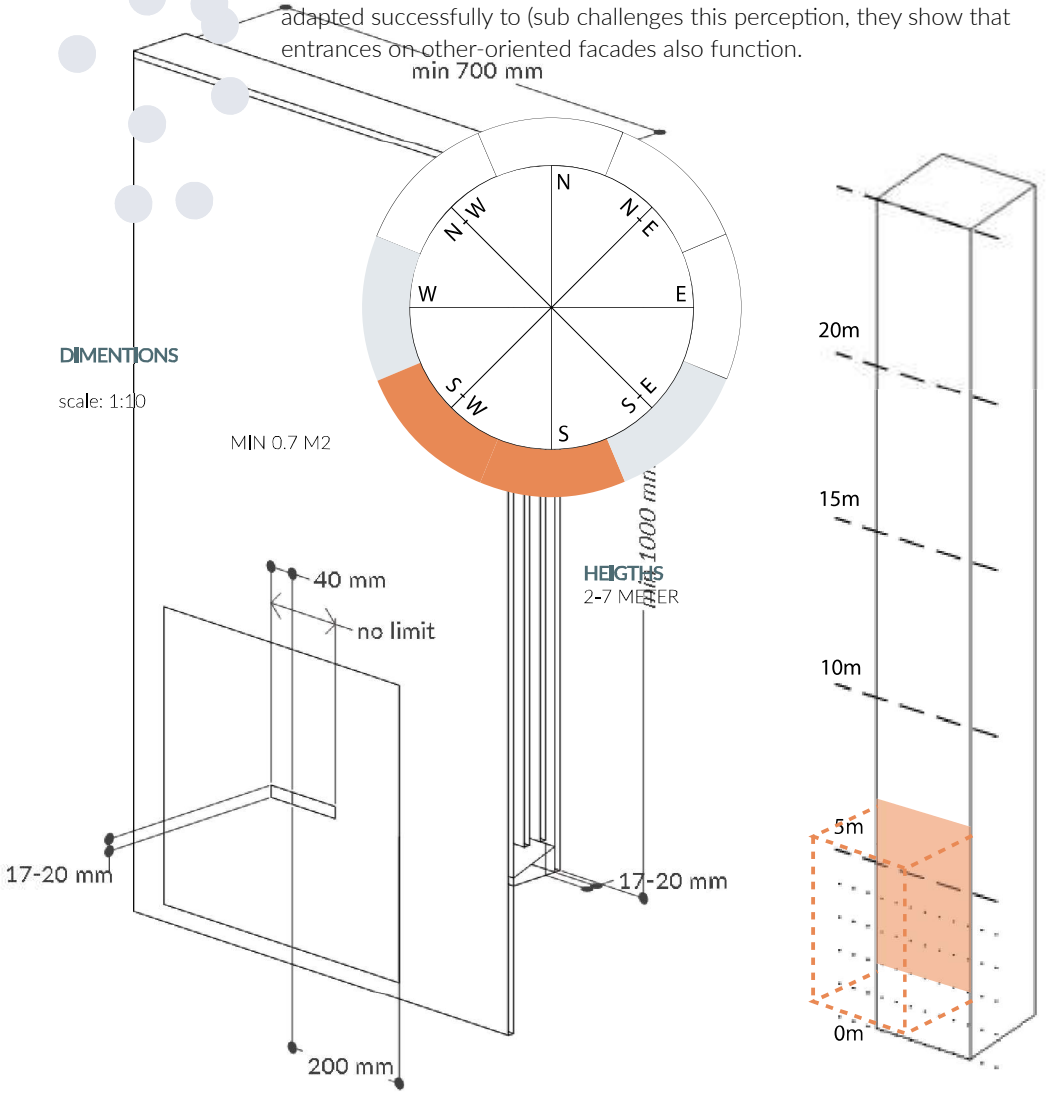


Maternity roosts

In summer, the pregnant female bats gather in a maternity roost in groups of 20 to 120 individuals (BIJ12, 2017). This space is preferably as big as possible but needs a minimum area of 0.7m2 (Vink et al., 2017). Important are the thermal properties, with the pipistrelles looking for summer habitats with maximum thermal gain and reduction of 24-hour fluctuations (Gunnell et al., 2013). Positioning these roosts on a south-facing façade keeps the pups warm at night. Although a recent study by Voortman and Bakker (2020)but affects organisms in a species-specific way. Common pipistrelles Pipistrellus pipistrellus have adapted successfully to (sub challenges this perception, they show that entrances on other-oriented facades also function.

DIMENTIONS

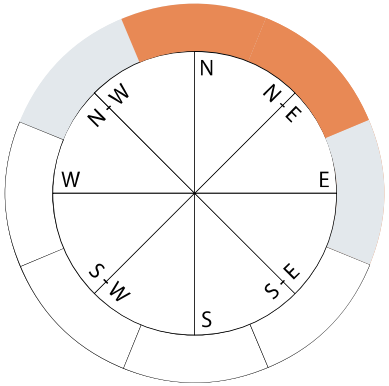
scale: 1:10

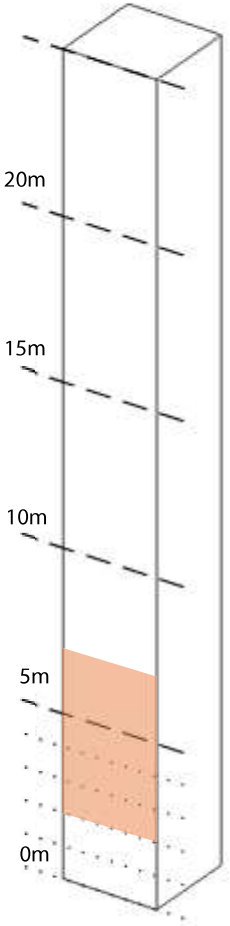


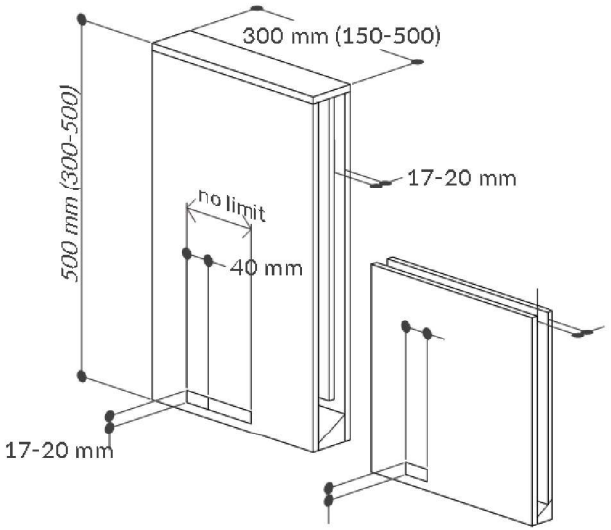
Hibernation

Hibernation spaces are used to rest during the cold winter months, therefore they search for temperature-sensitive places, out of the sun. Thermal insulation can be of value as common pipistrelle bats seem to have a preference for buildings that react slowly to the outside temperature (BIJ12, 2017). Two distinctions can be made here, some bats go in search of a place individually, for which the summer roosts of males are often used. The others gather in larger groups in mating roosts or maternity roosts.

DIMENTIONS
MULTIPLE LAYERS
scale: 1:10





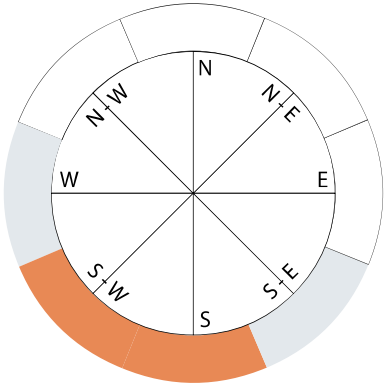


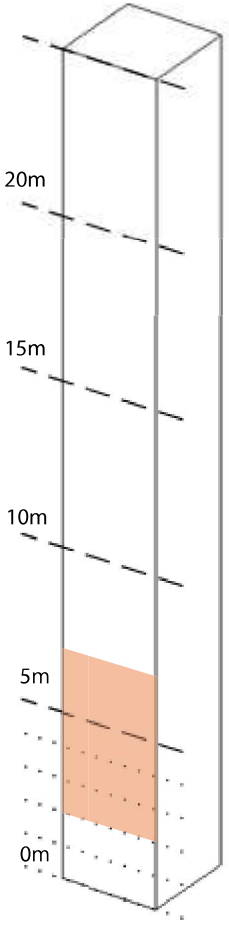
Mating roosts

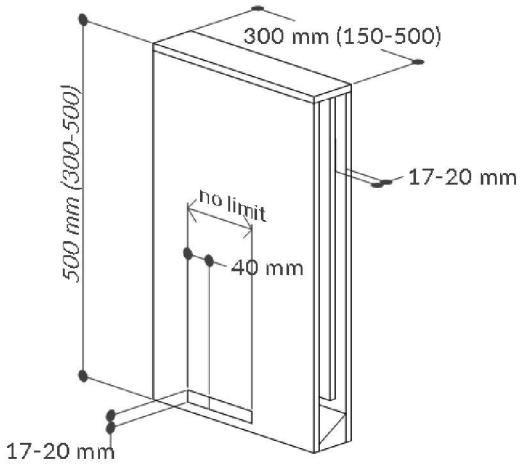
The buildings need a mating space for the male to lure in females, these small crevices and openings are often difficult for people to find (Vink et al., 2017) (De Zoogdiervereniging, 2022). One roost can serve 1-10 pipistrelles, usually one male and some females.

DIMENTIONS

scale: 1:10

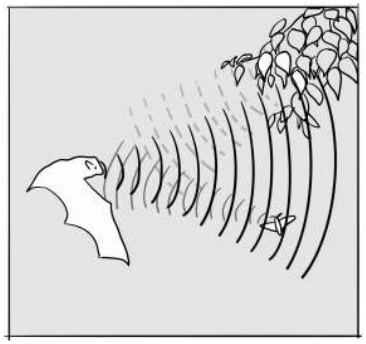






Place experience

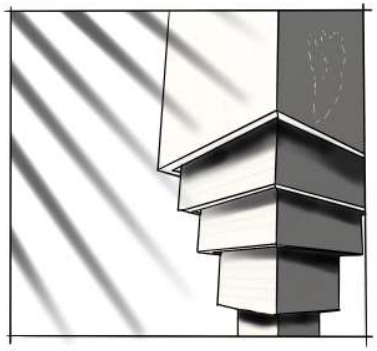
The mental world of a bat would be difficult to understand for us humans. As the philosopher, Nagel (2020, p. 324) asks himself *'We must consider whether any method will permit us to extrapolate to the inner life of the bat from our own case, and if not, what alternative methods there may be for understanding the notion.'* Let us try to use our imagination, to discover the place experience for a bat.



Sonar perception

While the common pipistrelle is a mammal, just like humans, they operate a range of activities and have a sensory apparatus so different from ours. Most of the species in the NL can see, but they are more dependent on their ears. They perceive the world primarily by echolocation, using the returning echoes to determine their location (Gunnell et al., 2013). The action radius for the common pipistrelles is not that big: a maximum of 2-5 km from the residence (De Zoogdiervereniging, 2022)(Vink et al., 2017).

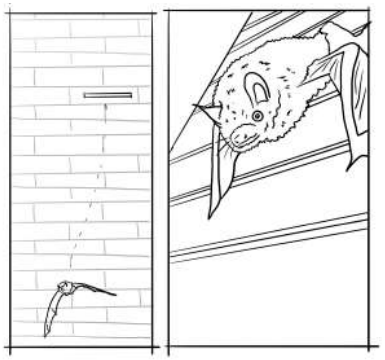
Their brains are trained to process the reflected information to determine the exact position of insects during their hunt. Essentially, what they see with their sonar is similar to our vision; discriminations of distance, size, shape, motion, and texture (Nagel, 2020). While hunting, they make higher sonar sounds in short FM-qcf pulses from 45 to 50 Hz, but in areas with open vegetation, lower and longer sounds between 42-45 Hz (De Zoogdiervereniging, 2022).



Microclimate

Bats can adjust their body temperature to the ambient temperature, to save energy, also called topor or lethargy (Korsten, 2012). This is why the climate in the roosts is of great importance to lose as little energy as possible. Therefore, they need to have the possibility to shift within the construction to search for ideal microclimate circumstances (BIJ12, 2017).

As seen, bats also choose their habitat according to the different microclimates. The climate within the roosts can differ due to the following properties: the buffer value of the material (the heat that the material can store), the temperature gradients (different zones in the residence) and the exposure to heat sources (both sun and installations) (Korsten, 2012). Ventilation of the roosts is therefore also important. The ventilation gap should not be wider than 12 mm. The ventilation slots are best placed 15 cm from the bottom of the roost or 1/3 of the way from the bottom (Korsten, 2012).



Grip and flight paths

Bats are very agile fliers, but the process of landing and taking off often comes with some challenges. It is therefore necessary to provide some free space around the roost and choose materiality with enough grip. They need at least 3 meters of free space to fall, without any obstacles blocking the entrance of the roost.

Wood and wood-concrete are the most commonly used materials for bat boxes. Wood-concrete consists of up to 75% wood fibres and can store heat. This material also provides enough grip, without necessary post-processing. The wood used in roosts is often made from solid wood, but there are examples of plywood to be found. When treating the wood against weather conditions, non-chemical resistances must be taken into account to not harm any bat species. For example, in Vivera's bat poles, the waterproof glued plywood is treated on one side with spray cork for maximum grip. Horizontal grooves (10-12 mm apart, and min 1 mm deep) can also help, especially for young animals (Korsten, 2012).

3

Sharing

The capacity to share - cohousing and cohabitation

As we saw in the previous two chapters, each solo resident *and* bat species has individual space requirements to live well. In this chapter, we take our systematic approach to a new level, that of social interactions. In this, we bring the individuals together and we investigate how people and non-humans can share space. We will see how these individuals come together and what they need to find a harmonious living situation.

We first start with the more architecturally explored theme of sharing among humans**, *co-housing*.** There will be an introduction to the notion of sharing in the theoretical field. The case study analysis shows different examples of designing for sharing within communities of a co-operative. Second, the level of sharing becomes even more difficult when inviting animals into our surroundings. The difficulties and benefits of ***co-habitation*** are explored and illustrated by two case studies on housing that integrates species.

Cohousing
Sharing among humans

This chapter dives into the capacity for sharing among solo-dwellers. We learn that the success of a sharing community depends on clear zoning between private, shared and public spaces, where each zone fits the desired level of interaction.

Alone together - *Solo dwellers participating in society*

When I started living alone myself, I remember the challenges I ran into those first weeks. We saw that for all types of solo dwellers it takes some time to master 'the art of living alone' and to find the right conditions. Still, it is an important skill to develop as independent living forms the basis for participating in society. It ensures that someone with his own values can participate in the bigger picture; *"Paradoxically, living alone helps us to reconnect, cyclical condition, not a permanent one. Anchored only by the self, we go through different conditions"* (Klinenberg, 2012, p. 22).

Living by yourself is extra challenging due to the way our society is shaped. As Klinenberg (2012) points out, most social activities are not 'made' to do alone: *"most people learned the conventional setting that sharing a life with others is the norm"* (Klinenberg, 2012, p55). Think of a restaurant, where the setup of two chairs at a table suggests the place to be a place for sharing. Going out by yourself in such an environment feels awkward. Joining strangers at their tables is also inappropriate. Joining strangers on the train, on the other hand, is perfectly normal. To understand these situations, it is important to understand the duality of the public and the private domain concerning the capacity for sharing.

Between Private and Public
– The intermediate zones of sharing

When different people share space, there is a need to negotiate a balance between openness and privacy. The public can be described as an area accessible to everyone. Only by excluding from the public, one can create a living environment, acting as a refuge for individuality: the private domain. Thus the private sphere is always embedded in the bigger domain of the public. The basic principle of a shared social life lies between this duality of the public and the private (Schmid, 2019).

As a basic condition for a healthy sharing community, there must be a good ratio between private spaces – with the need for security and privacy - and opportunities to share common areas (Kaestle, 2016). These domains relate to the essential human needs of individuality (privacy) and identity (belonging). Collective spaces fluctuate between these two poles. Collective spaces are areas used by a settlement, housing development or residential community (Schmid, 2019). These intermediate zones allow for daily interaction and thus are crucial for co-existence between humans – or in other words - for a' sharing' life.

Boundaries constantly need to be redrawn and renegotiated, due to changing social developments. Gradations are therefore shaped in this in-between. One study that tries to make these different layers of sharing explicit, can be seen in the spheres of sharing by Ahn et all. (2018) (see figure: 89). They distinguish four levels of activities/spaces that can be shared with others, based on the required intimacy.

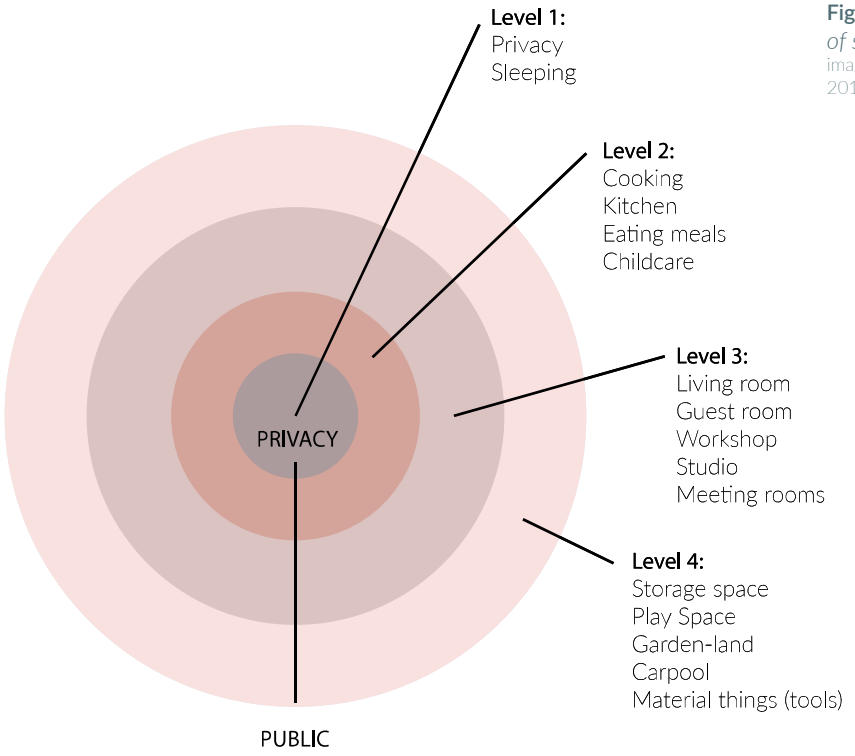


Fig. 83. *Layers of sharing* (own image of Ahn et al, 2018)

Collective spaces

As the Cambridge Oxford Dictionary states, there is more to 'sharing' as it is not only a physical act but also occurs on a social level. One can share emotions on a deeper level, by telling feelings and thoughts to another or by experiencing activities together. Sharing can also be based on different intentions: political, economic or social (Asani et al., 2021).

The success of a shared space relates strongly to social relationships: as the character of a space is defined by the daily routines within. The publicness of the activity changes the perception of the space, while the room itself remains natural. Collective spaces are therefore complex and defined by their spatial structures, uses and the residents' populations. The boundaries need to be permeable and flexible to be able to keep up with the strong interplay of intimacy and open access lifestyle (Schmid, 2019). Architecture can act as a mediator of the access - where thresholds serve as filters of this in-between.

Living alone together

- Cooperatives and co-living motivation for new co-housing models

New spatial models, focused on different levels in the collective rather than the duality between private and public, are more fit for solo dwellers to interact. Solo dwellers also like to seek each other's company. It is what Klinenberg calls the result of 'mass urbanization, leading to a subculture of singles who share similar values, orientations and ways of urban life (Klinenberg, 2012, p. 20). In these settings, the individual tends to find others like themselves and could help each other living alone.

A society based on more solo dwellers means an increasing need for these collective spaces. This has resulted in new spatial experiments, which reduce the individual living space and encourage sharing and community-oriented connections: co-housing. (Asani et al., 2021; Jamieson & Simpson, 2013; Kaestle, 2016) Jamieson & Simpson describe these new structures as environmentally friendly one-person dwellings, within a social structure that could be described as 'living-alone-together' (2013, p.222).

These forms of cohabitation each have their approach to distinguishing layers between public and private spaces. It might be good to first explain the definition of 'co' termination, as this term is used to describe different sharing housing models. Co-housing is an all-encompassing term that indicates a '***type of housing with shared characteristics***', including sharing spaces, activities, creation and tenure (Babos et al., 2020, p. 6). Cooperatives and co-living are two forms of cohousing, wherein participating and partaking are essential.

Cooperatives

The first model of co-housing is cooperative housing. Cooperative housing consists of living spaces for individual households with additional shared infrastructure (Schmid, 2019, p. 20), in both the collective and public domain. Individual members own shares in the cooperative and pay rent as if they were owners and have equal access to the common areas. (Babos et al., 2020, p. 8) It is a model that offers advantages of living alone, fostering opportunities for building companionship and support. In the Netherlands, this model is still uncommon.

Coliving

The second model is collective living, co-living in short. Co-living is more based on social motivations and is a newer form of collective housing as a response to changing households. The individual can live with reduced space while benefitting from the connectedness within the whole community (Kaestle, 2016). Sharing collective living space within a community is preferred over private ownership.

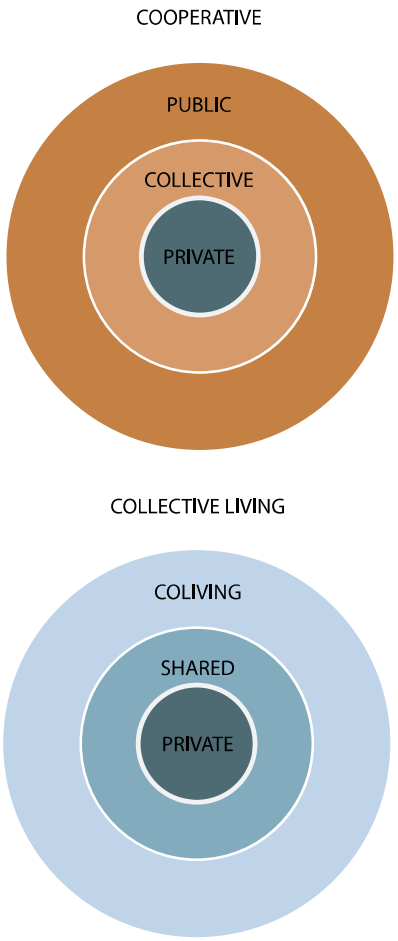


Fig. 84. *Layers of sharing in different housing models*

Conclusion: the layers of sharing

Based on the different types of sharing, I constructed a new methodology to distinguish the layers of sharing. These are categorized from public to private, and function as described below.

1. Public: Run by the members of the cooperative, these spaces function as a connection between the neighbourhood and the building. They can serve as a space for activities of the residents, as well as being an extension of the public sphere.
2. Collective: These are shared spaces available to all the residents in the building, to organize both common activities and private events. They act as an extension of the private dwelling.
3. Coliving: These spaces facilitate coliving, as the collective living spaces bind a fixed group of individuals together. Daily, they share these spaces as complementary spaces to their private zones.
4. Shared: This layer contains amenities that you can share with a selectively chosen housemate. It contains spaces that do not necessarily need to be facilitated per person, such as bathrooms or kitchens. It can also host collections of items that can be easily shared, such as games. Better thought should be given to suitable sharing candidates, as this layer comes pretty close to the intimate circle.
5. Private: This layer is based on the need to ensure an intimate individual zone. Here someone can withdraw, without having to share anything with others. Only close-knit family members could be present. Guests will only enter this space by invitation.

Different cohousing projects illustrate that shared housing can adopt multiple variations and combinations of these layers, suiting their residents. The case studies show that several ways of cohabitation are possible within these layers.

A small side note can be made here; circulation space can act both functional and collective, as it can help to enhance the social connections within a building. In this analysis, because of the scope of the research, I have chosen not to elaborate on this.

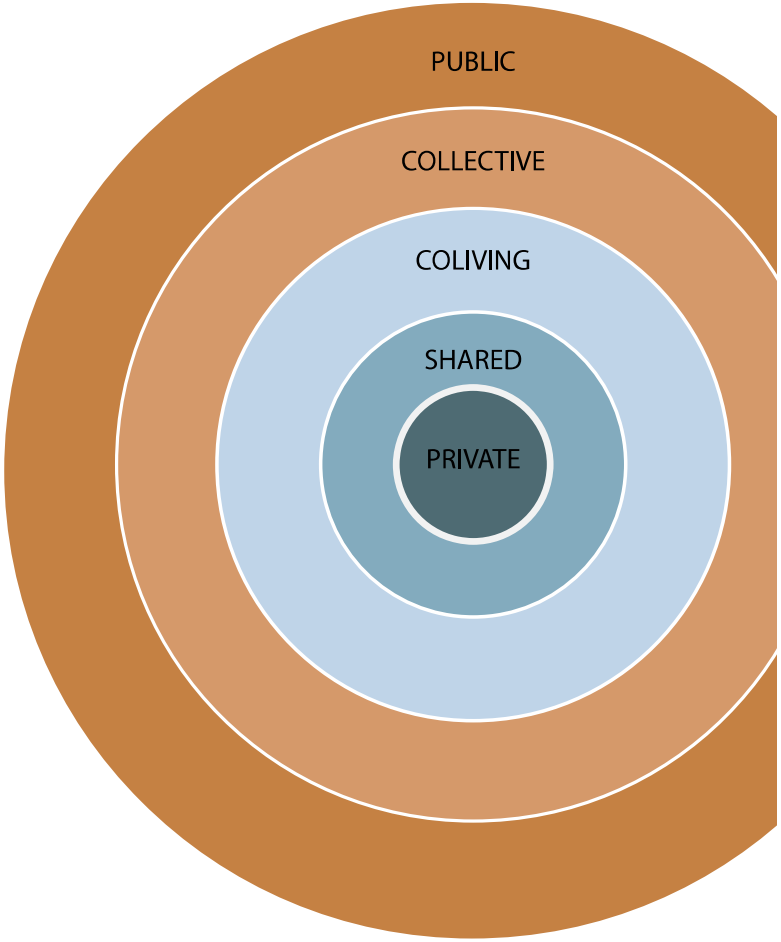


Fig. 85. *The layers of sharing*

Fig. 86. *Green atrium looking onto the lounge and event space*
(c) Rohspace (Archdaily, 2021)

Treehouse *Coliving*

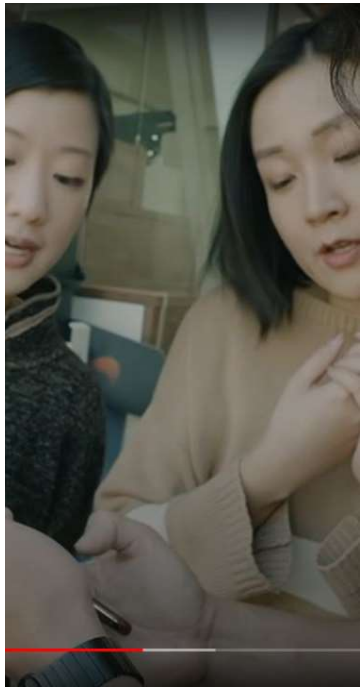
Bo-DAA

Luxurious coliving

The residents of Treehouse can choose if they would like to take part in the community, or whether they would like to retreat in their individual units. The architect Bo-DAA describes the community as not a forced one, but coaxed (Bo-DAA, 2022). Communal spaces can easily be booked through the app, which also notifies of communal activities (Liu, n.d.-a). Residents only share amenities when a larger scale and community make for a better experience (Bo-DAA, 2022).

However, one does not enter the building anonymous, through this central interior garden in the atrium everyone still is visible. The residents connect twice, on their arrival. Once when they enter the building, as the lobby is connected to the atrium. . And again when they look down on the gallery when entering or leaving their unit (Abdel, 2020). So they only have to step out their door and they are part of the community. The central collective spaces persuade the residents to connect, this spatial composition, therefore, reflects upon the communal lifestyle (NESS, 2020).

These design principles were developed by the architect from market surveys, precedent research, and feasibility studies (NESS, 2020). The functions that people were willing to share have therefore been removed from the homes. The marketing is aimed at millennials, as they don't pay a year-long rent in advance, as is usual, but two months' worth of deposit (Dionysus, n.d.). Resulting in a co-living brand, complete with its signs and logos, featuring a Meerkat – a communal driven animal (Liu, n.d.-b).



Garden-centred

A striking recurring theme in the building is the invitation of animals into the building. The elevator even has a pet button, unfortunately, I couldn't find what happens when you press it, but it does paint a picture of the measures taken. This building is equipped with extra facilities such as gardens and pet washing or even furnishing for cats. The building not only contributes to the community but also the desire to live close to non-human beings, such as plants and animals (Bo-DAA, 2021). Even the interior is made out of brick to enhance this garden feeling (Astbury, 2019).

Sharing

Types of collective spaces in the building

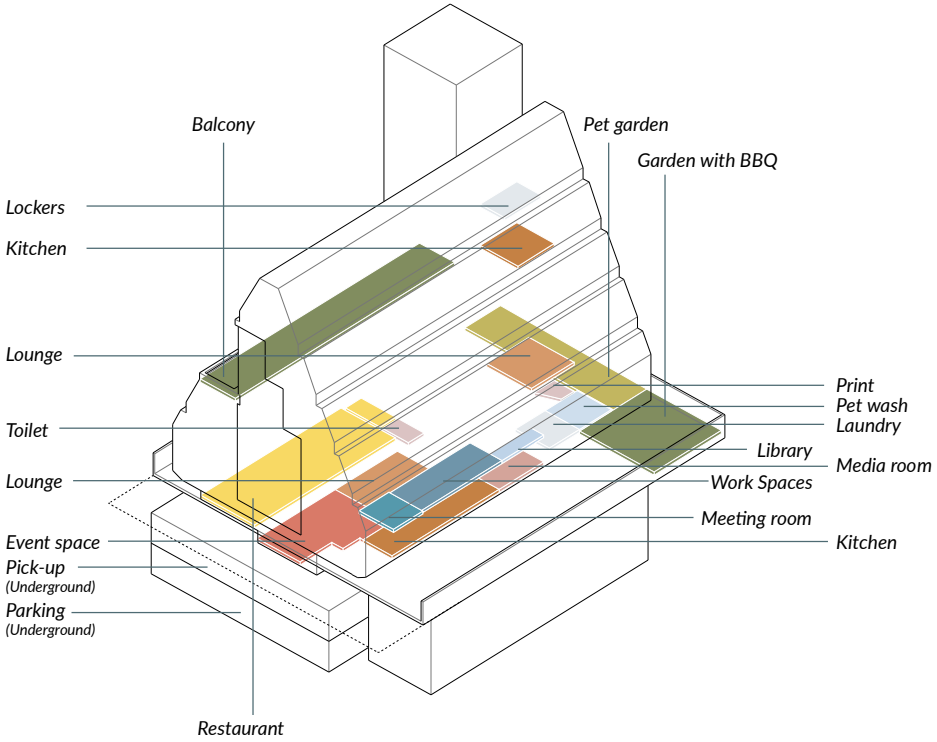
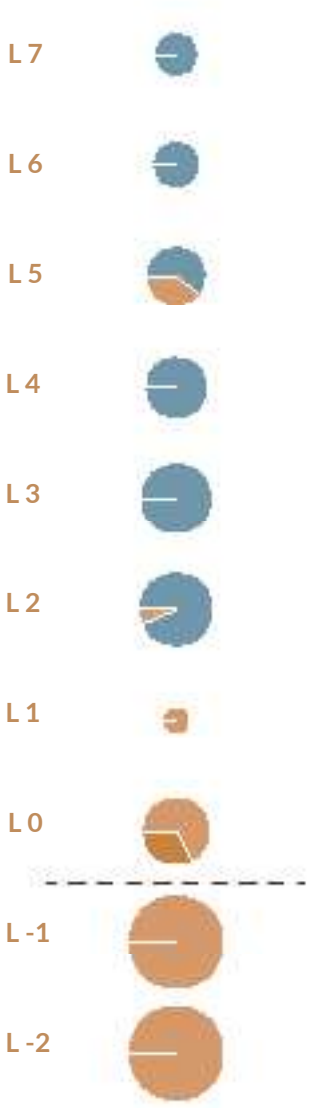


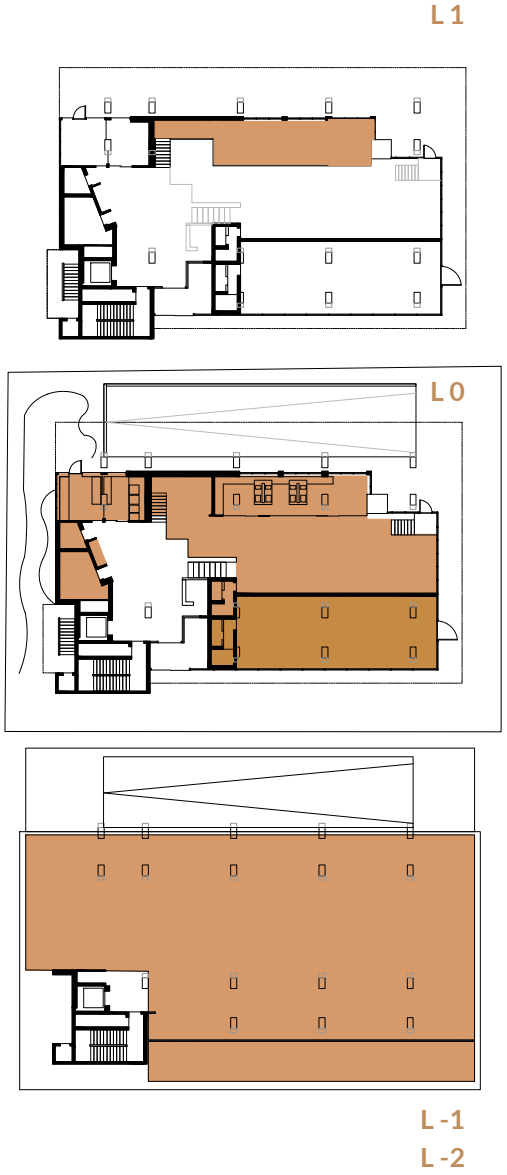
Fig. 87. *Collective space in Treehouse*

Fig. 89. *Pet wash with acces to the pet garden*
(c) Lee Jieung (van Es, 2019)

Fig. 88. *Communal kitchen*
(c) Rohspace (Bo-Daa, 2021)



'ding



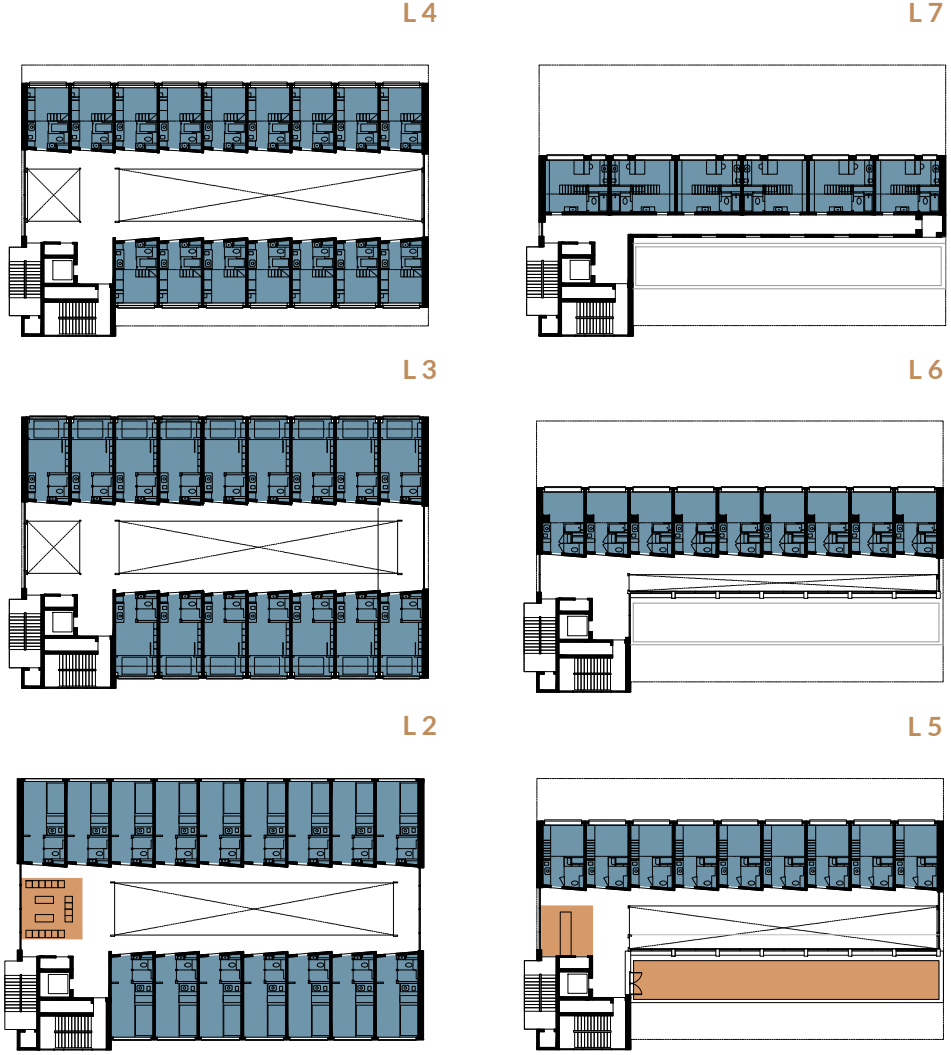


Fig. 91.
Circulation
First floor
Scale 1:500

Layers of sharing

Layers of shared space in percentages

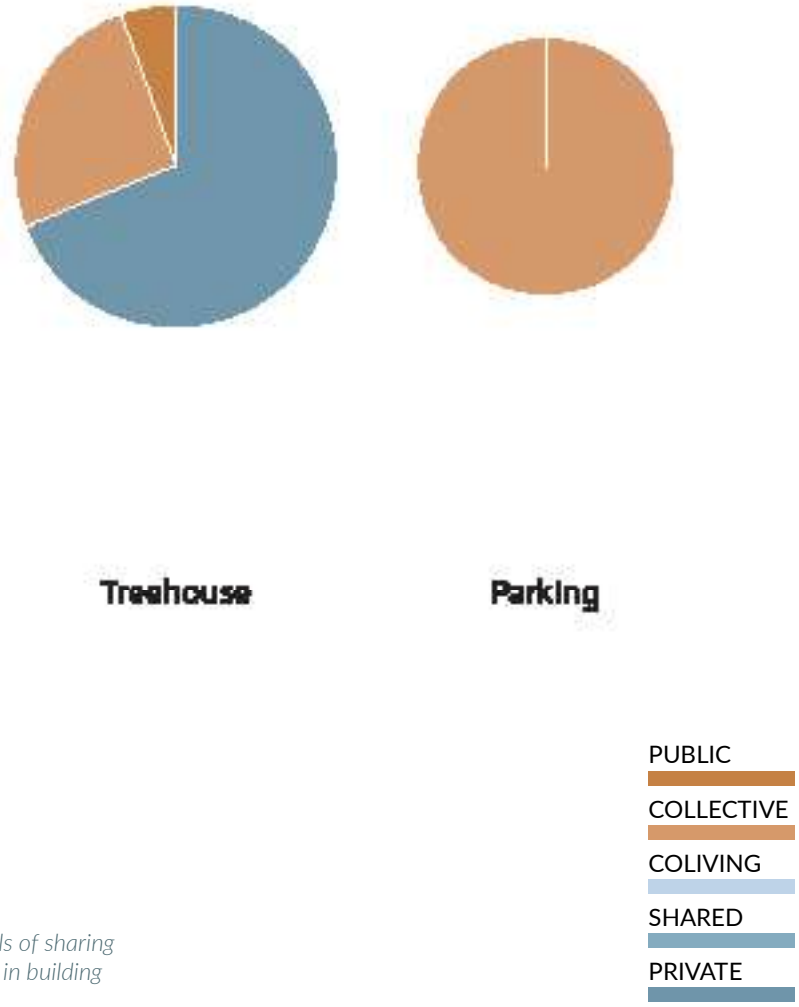


Fig. 92. *Levels of sharing*
Percentages in building

Sharing in Threehouse

The atrium is created by the stacking of the private units, both the individual and the community, therefore, it shaped the building (NESS, 2020). The architects explained; '***The community cannot exist without the individual, and the individual is anchored by the community***' (Abdel, 2020)**.** There is an opportunity to completely withdraw from the community, but you can't escape the possible connections. This is especially visible in how they positioned the door numbers, hidden in the concrete folds; '***serving to melt indicators of private space into the collective***' (Astbury, 2019).

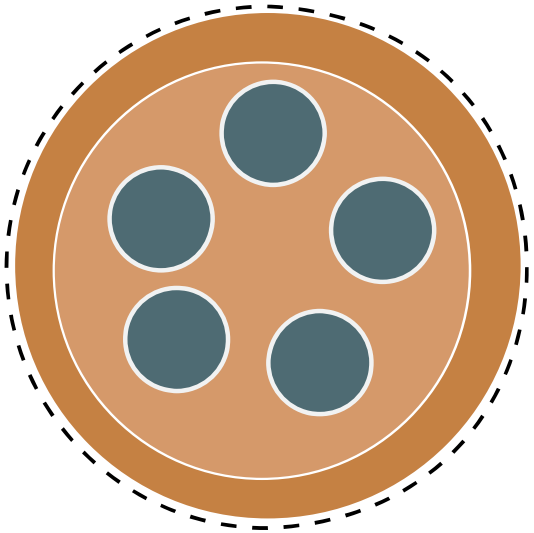


Fig. 93. *Diagram levels of sharing*
(c) Own image

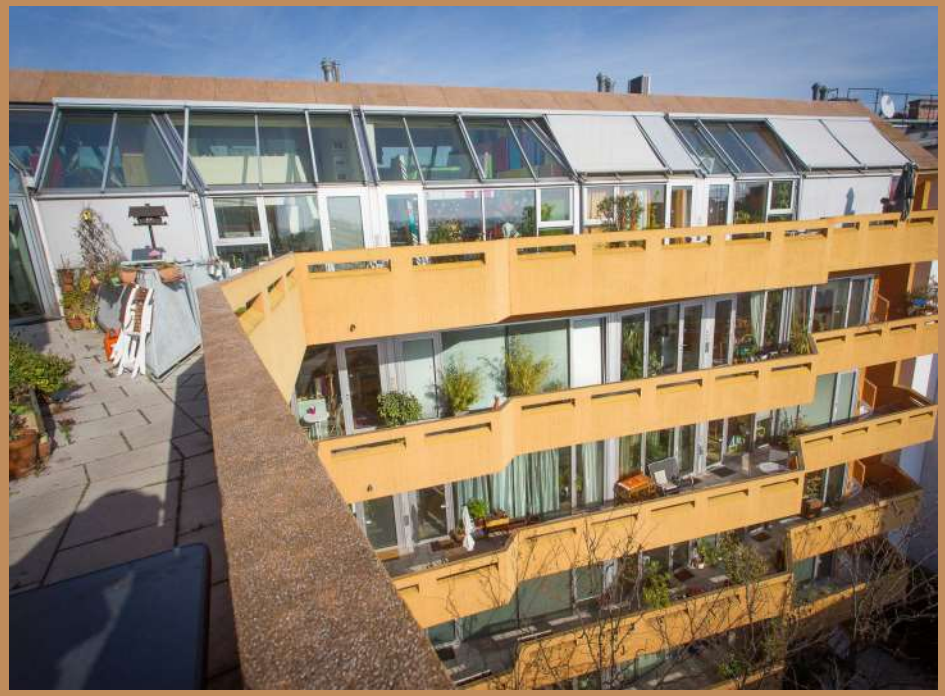


Fig. 94. *Open gallery inside*(c) Cole Norgaarden (source unknown)

Miss Sargfabrik *Coliving*

BKK3

The factory of individuals

Miss Sargfabrik is the little 'child' of the first experimental project of The Sargfabrik. Residents become members of the same Verein für integrative Lebensgestaltung (Association for Integrated Living). The values and social meanings of the community continue to exist in this building (Lootsma et al., 2005) Elke Krasny (2008) writes about these values: ***"The Sargfabrik is a village within the city. But it is not a place of retreat. It is about individual power, one's own identity."*** (Angela Fitz & Krasny, 2008).

The community spaces in the Miss Sargfabrik serve to complement The Sargfabrik facilities. In other words, these places were 'missed' by the former residents (Lootsma et al., 2005). The shared, semi-public space in the Sargfabrik cultivates the informal contacts between residents and deepens neighbourly relationships in the area (Brombach & Holl, 2009). However, the communal spaces in the Miss are only for the residents available, and domestic in nature: a community kitchen, library, laundry room, multipurpose room, and a -not so domestic- club room (managed by the teenagers). Among the residents, smaller sub-groups arose that use these spaces for their hobbies (Lootsma et al., 2005). Initially, the architect designed a workspace, but the target groups preferably worked from home, so the room transformed into multipurpose use, such as yoga and choir practice.

Both projects have an experimental way of looking at the spatial frequencies of communal spaces. While in the Sargfabrik the communal facilities are placed upon the entrance in a linear sequence, in Miss the spaces function as a huge core in the building. The short side of the building shows this spatial complexity in the façade, by merging two strips of fenestration (Putt & Klijn, 2012). The spaces are 'emotionalized' and interwoven by ramps and inclined glass, creating a ***Bergskulp-***

Fig. 95.*Gallery also serves as an outdoor space* (c) Harald Huscava, 2008

Fig. 96.*Residents meeting in the courtyard* (Lootsma et al, 2005)

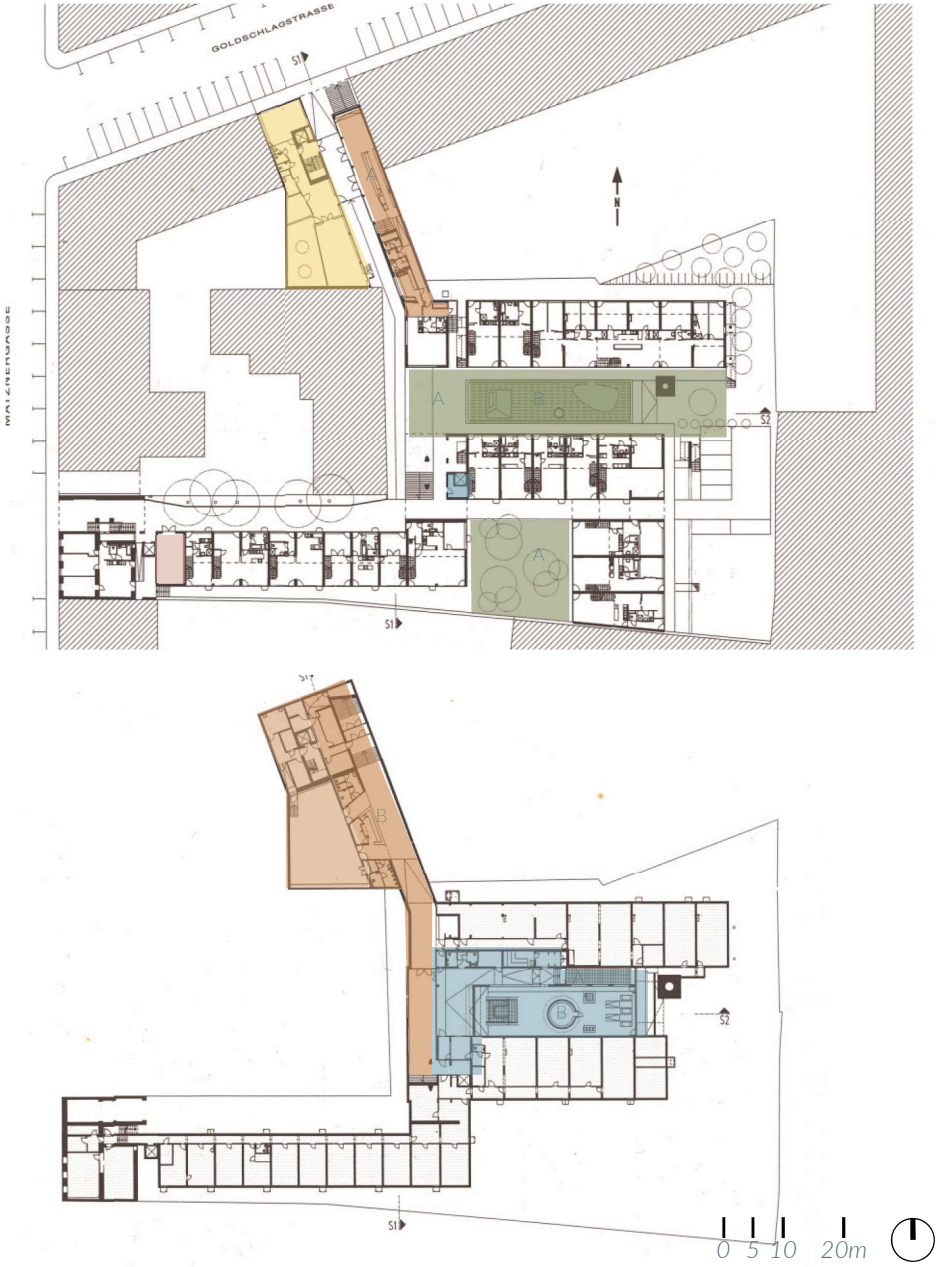
tur 'mountain sculpture' (Beck & Cooper, 2000). This artistic approach not only dodged regulations, but the space almost became art. However, the ramp is not practical, takes up much space and does not even serve for wheelchair use.

Social inclusive spaces

Besides, there is a political sphere in the project, reserving spaces for 'marginal groups'. In Miss Sargfabrik, three studios for disabled people are integrated and there is an apartment for a socio-pedagogic residential community. This was the first non-authority project that incorporates such a group, ***'If not here with us then where else?*** '(Lootsma et al., 2005, p. 117). The residents were afraid of the negative consequences of the presence of such a group in the building, especially of the noise. The shared flat, therefore, situates between the entrance and the communal spaces. The living room faces the gallery, serving as a buffer between the bedrooms. However, in practice, the complaints turned out to be the other way around. The group now regularly complains about parties of the residents (Lootsma et al., 2005).

Most residents never would like to leave the project, thus multiple generations are living together. When divorcing or when children move out, apartments can be exchanged within the building if the living situation changes (Brombach & Holl, 2009). Miss Sargfabrik even had some 'flex'-apartments, for these kinds of situations. They made a list of 17 cases when these apartments can be put to use, for example taking care of your parents, Although in practice these often tend to be transformed into semi-permanent living spaces, due to the high demand for apartments (Lootsma et al., 2005).

Placement of collective spaces in the Sargfabrik project



Sargfabrik

Cultural centre

Seminar rooms

Restaurant

A Coffeebar

B Foyer with small bar

Events hall

Grant meeting hall

Flexible

Baths

A Swimming channel

B Sauna tubs

C Turkish bath

Outdoor

A Courtyard

B Water basin

Spaces not shown

Restaurant (2nd level)

Workshops

Kindergarten

Acces balcony

Rooftop terrace

Music room

Guest room

Fig. 97. *Cooperative facilities*
Own analysis on plans BKK-3
(c) Lootsma et al. (2005) p. 16-17

Types of collective spaces in the building

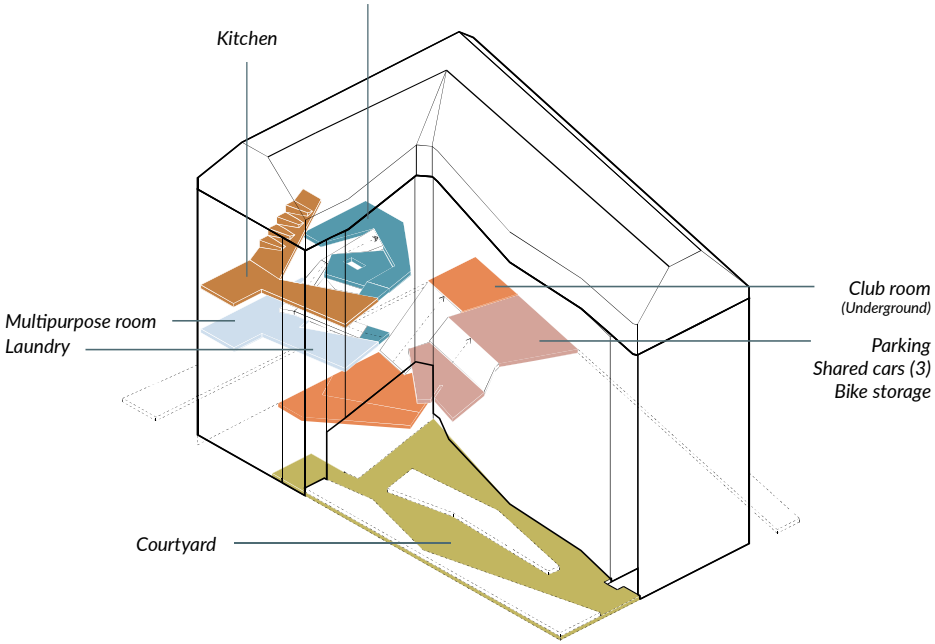


Fig. 98. *Collective spaces in Miss Sargfabrik*

Fig. 99. *Club room*
(c) Felix Vollmann (Sargfabrik, 2021)

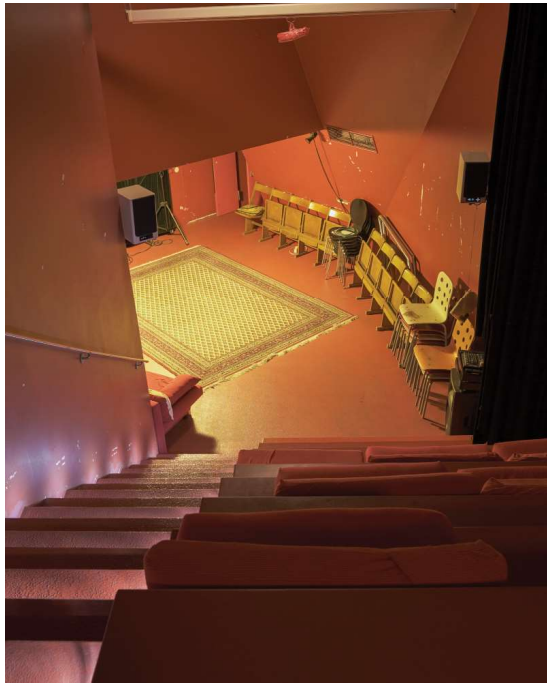


Fig. 100. *Bergsculptur in the library seen from laundry*
(c) Wolfgang Zeiner

Sharing - Dwelling typology

Type *Shared accommodation for young people*
Number *1*

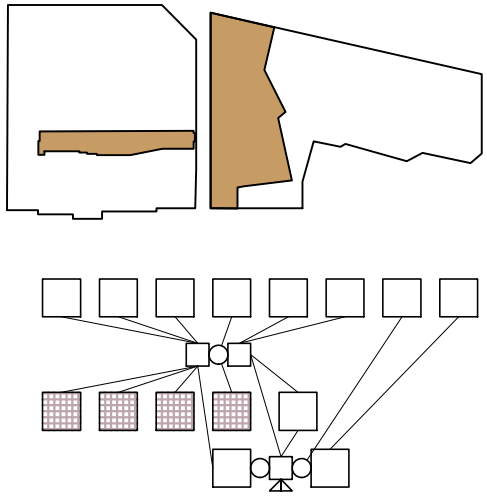


Fig. 101. *Floor plan*
Scale 1:200

Floorplan
Total: 214.5m2

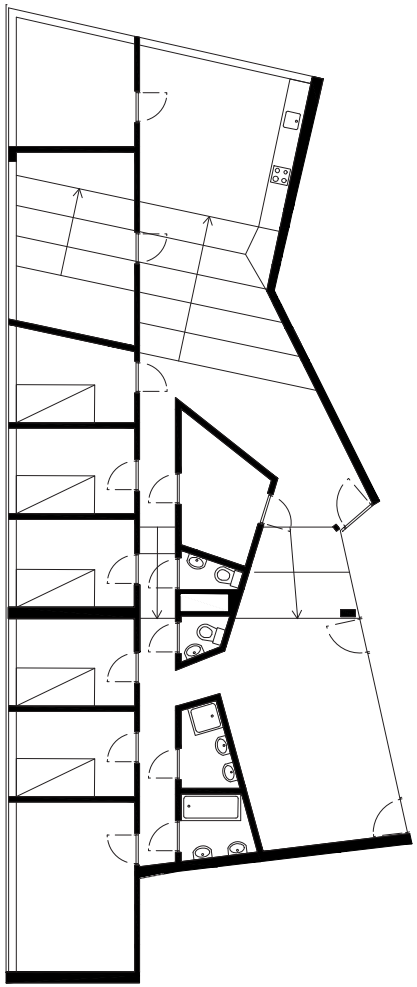
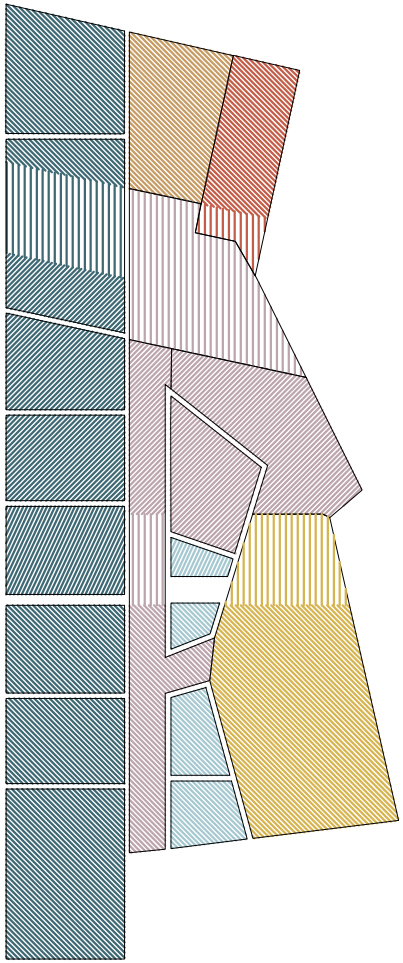


Fig. 102. *Analysis space in daily routines*
Scale 1:200

Analysis
Daily routines



Gathering
Area: 29.9 m2

Cooking
Area: 8.9 m2

Eating
Area: 9.6 m2

Working

Sleeping
Rooms: 9.6 m2 + 15.0 m2
+ 6.9 m2 + 7.1 m2
+ 7.1 m2 + 7.1 m2
+ 7.1 m2 + 14.1 m2

Washing
Area 1.2m2 **+ 1.2m2**
+2.8 m2 +3.0 m2

Other:
Entrance
Area: 11.6 m2
Storage
Area: 6.4 m2
Stairs
Area 13.5 m2
Hall
Area 14.2m2

Lower level

Higher level

Stairs

Undedicated

Layers of sharing

Layers of shared space in the building

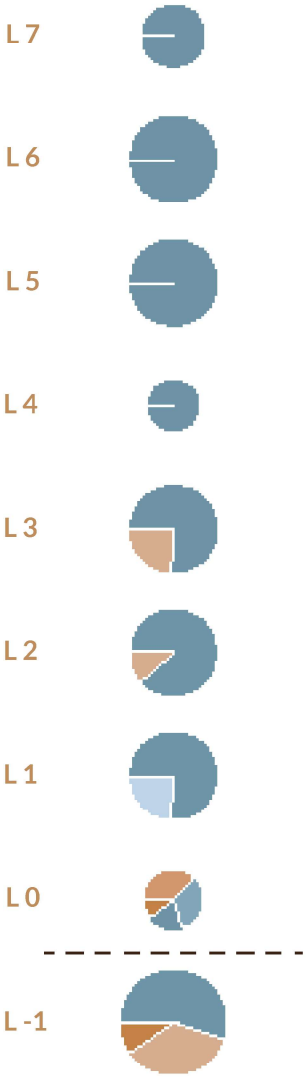
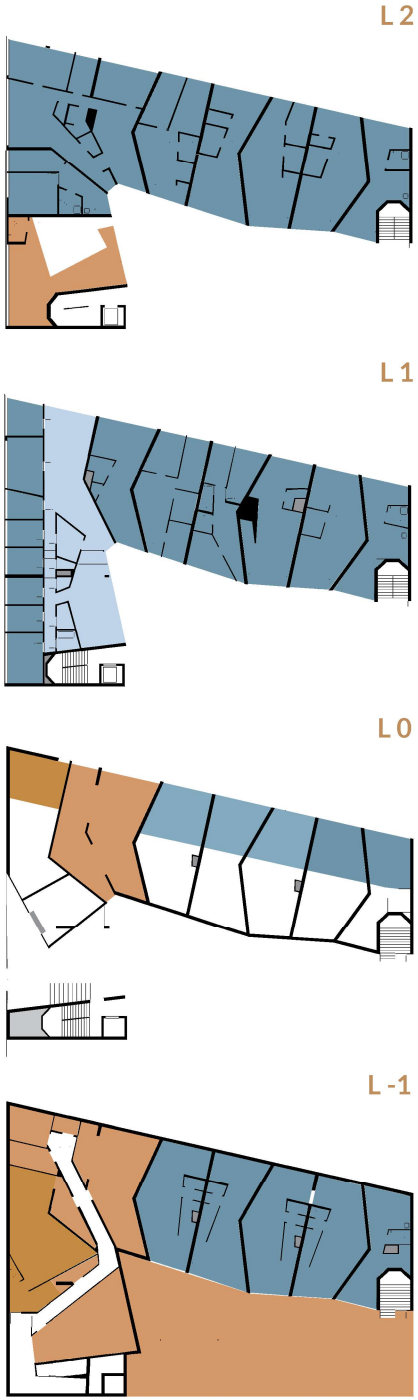


Fig. 103.
Percentages per level



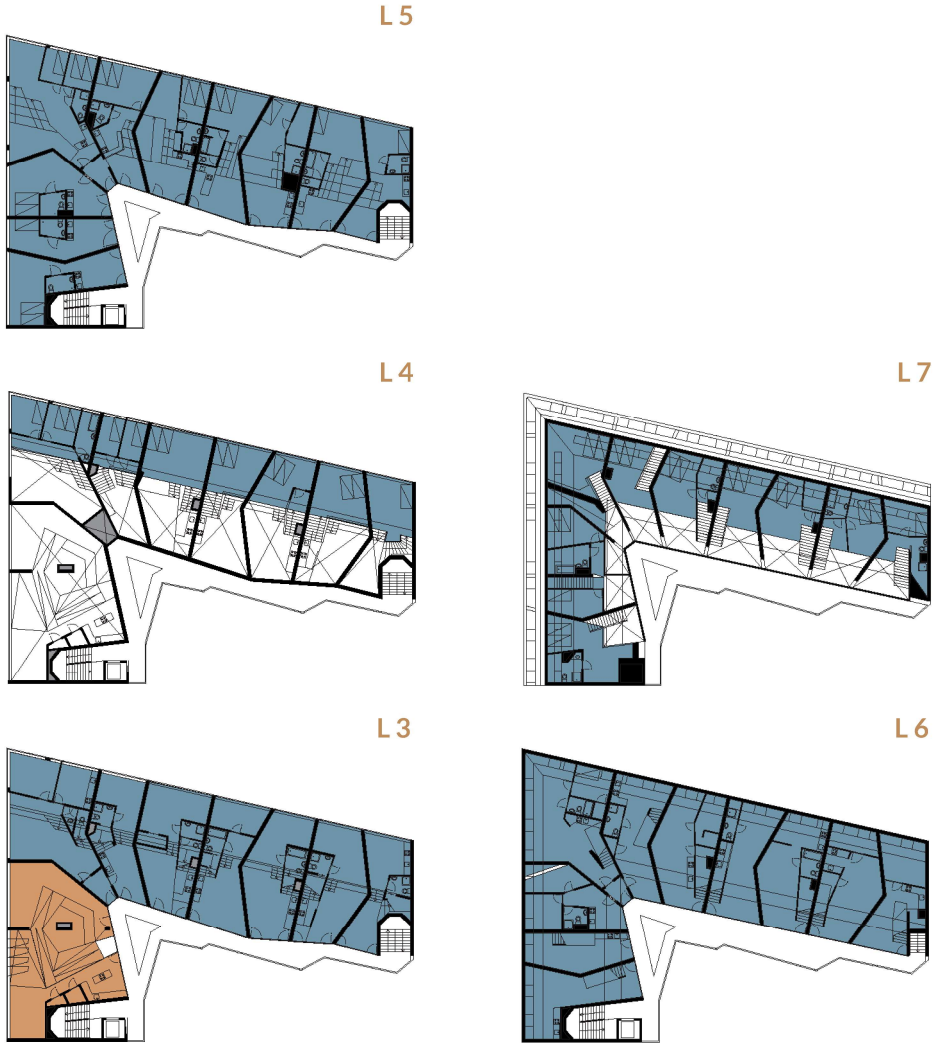


Fig. 104.
Layers of shared spaces
Analysis per floor
Scale 1:500 (75%)

Layers of sharing

Layers of shared space in percentages

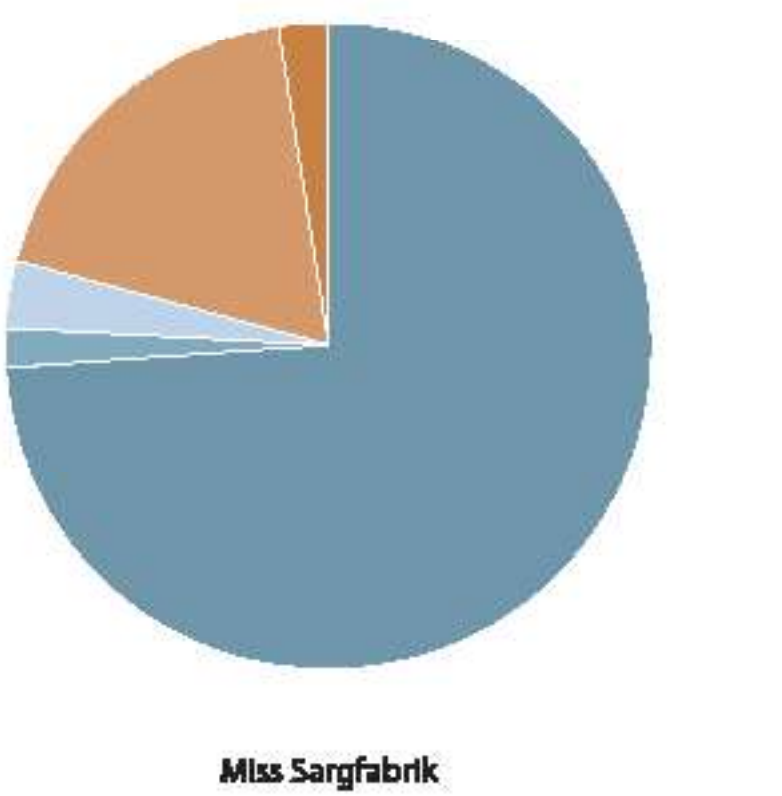


Fig. 105. *Levels of sharing*
Percentages in building

Sharing in Miss Sargfabrik

The community in Miss Sargfabrik enhances an incredibly open way of living. The residents can find their privacy and retreat from the city, within the 'village' of the project. Living so close together is not for everyone, although the residents choose to live here. The sphere of informal communication within these closed walls (Brombach & Holl, 2009), can be best described by a quote from Alexander, one of the residents '***But we all know each other, and we meet each other naked in the bathhouse. And if you want to be left alone, you simply close the blinds*** (Lootsma et al., 2005, p. 133)'. The architecture, therefore, facilitates this community; it is easier to close this transparency than open a closed façade (Lootsma et al., 2005)– or even a closed-minded individual.

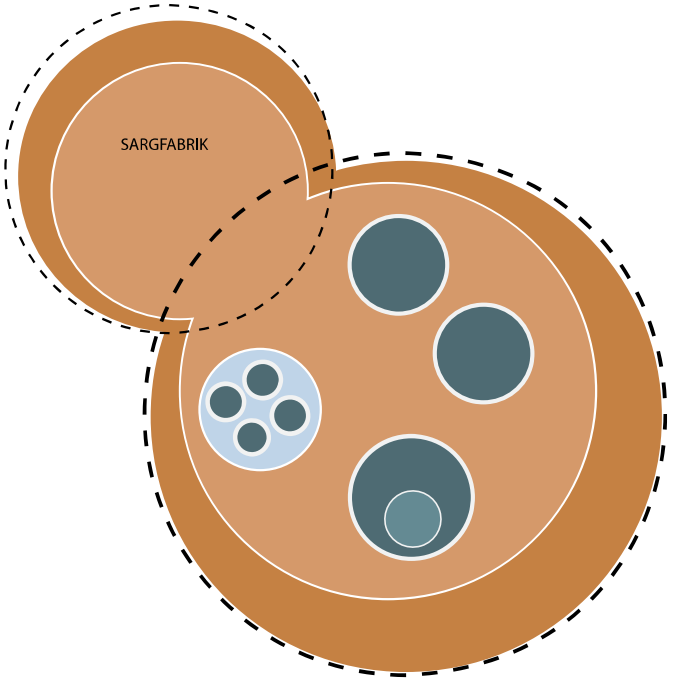


Fig. 106. *Diagram levels of sharing* (c) Own image

Fig. 107.
Haus A

Haus A *Coliving*

Duplex Architects

Haus A

The living concept of Haus A is quite a unique experiment. Compared to other communities, the clusters share a generous amount of living space with each other, you cannot escape your roommates in the house. This new way of inclusive living marked quite latterly the moment in reinventing the concept of 'family' (Gina Rauschtenberger & Alexia Zeller, 2021). Residents consciously choose to live together in the cluster apartments. From the private units, step straight into the collective space. It runs like a landscape between the units, there are no corridors to be found.

To approve this concept of satelittenwohnungen or cluster apartments, existing regulations had to be revised by the government (Gina Rauschtenberger & Alexia Zeller, 2021). In essence, the community also takes on an obligation to take care of each other, by forming their own association. This means that the official housing fire safety measures apply, instead of within a 'hotel situation' (The Essential Housing Campaign, 2021). Not only are they a family from a social point of view, but they also legally carry the duties to take care of each other in need.

Fig. 108. *The reception serves as a communication point for the residents* (c) Unknown (Dossier, 2020)

Fig. 109. *Organization of activities by the residents (for children in the picture)* (c) Ursula Meisser (Dossier, 2020)

Mehr als Wohnen

Mehr als Wohnen

The project originated from only six principles in the master plan. One of these was about how the functions should be distributed over the area. All common spaces should be allocated on the ground floor. This was binding for the character of the urban planning. As a result, all the common and public-oriented spaces are facing the squares, with extra high ceilings where possible (Arbeitsgemeinschaft Futurafrosch & Duplex Architekten, 2010).

There are three types of spaces on the ground floor of the complexes. On the north side, close to the main road and the entrances of the complex, are commercial areas. These spaces facilitate the basic necessities such as a bakery, which are needed at the neighbourhood level. These spaces are rented out to independent parties and companies at a market value (Anne Malliet, 2015).

The second type of space on the ground floor is the 'Allmendräume' - community and meeting places for residents and visitors. In Haus A, workplaces and an exhibition space are available. Residents can rent these collective spaces for private use - or external parties for a higher rent. The spaces are free to use if the events are open to the public (Hunziker Areal, 2018).

The last type of space that we come across in the area, has an organizational character. The Genossenschaft 'Mehr als Wohnen' has an office where reservations for the complex are managed by ten employees Anne Malliet, 2015). Residents can come here for all their questions, and also for dropping off packages. Neighbourhood committees can use the collective spaces for free to organize meetings (Hunziker Areal, 2018).

Placement of collective spaces in the Mehr als Wohnen project

Mehr als Wohnen

Commons
A 'The commons'
B Gallery space

Organization
A More then housing cooperative office
B Reception
C Hunziker Guest house
D Janitor

Washing
Laundry rooms

Flexible

Children
A Kindergarten
B Remedial teaching school

Play
A Boules field
B Playground

Outdoor
A Seedling nursery
B Activity area

Werkstatt
Occupational therapy workshop

Buisness
A Mobility station
B Violin makers studio
C Offices
D Mastering studio Music room
E Children's clothing exchange
F Editorial office
G Graphic art studio
H Psychology practice
I Meditation studio

FLEX
A Buinessspace
B Art therapy practice

Retail space / restaurant
A Bakery
B Cultural Salon
C Restaurant
D Hair dressing salon
E Make-up academy
F Printers shop
G Take away
H Hedgehog center
I Psychology practice
J Nail studio
K Dance/Yoga studio

Fig. 110. *Cooperative facilities*
Own analysis on plans Duplex Architects
(c) XXX

Dwelling typology

Cluster C
Ground Floor

Fig. 111. *Living space before residents moving in*
(c) Duplex Architects (Duplex Architects, 2022)

Fig. 112. *Kitchenspace in clusterapartment*
(c) Johannes Marburg (Käpplinger, 2022)

Fig. 113. *Analysis cluster space in daily rhythm*
Scale 1:200

Cluster A and B
Clusterspaces

Fig. 114. *Analysis cluster space in daily rhythm*
Scale 1:200

Sharing

Types of collective spaces in the building

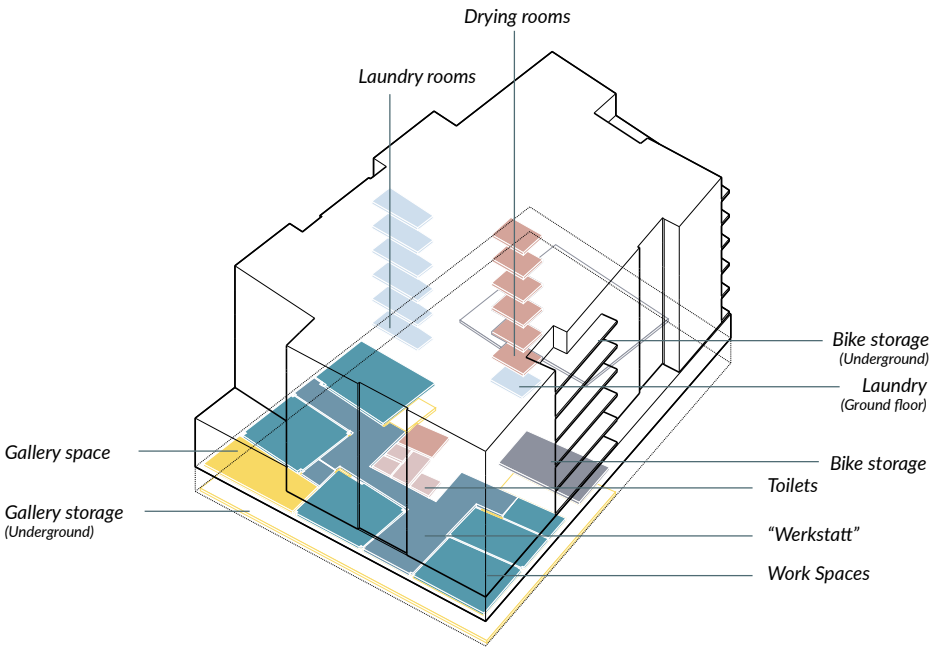


Fig. 115. *Collective space in Haus A*

Fig. 116. *Laundry rooms on the gallery*
(c) Anna Derriks (Asani et al, 2021)

Fig. 117. *Workspaces on the ground floor, with double height gallery space* (c) Myriam Hilgers (Dossier, 2020)

Layers of sharing

Layers of shared space in the building

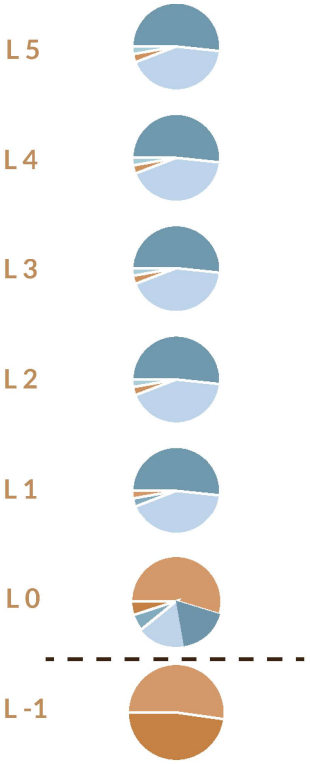


Fig. 118.
Circulation
Ground floor
Scale 1:500

Fig. 119.
Circulation
First floor
Scale 1:500

Layers of sharing

Layers of shared space in percentages

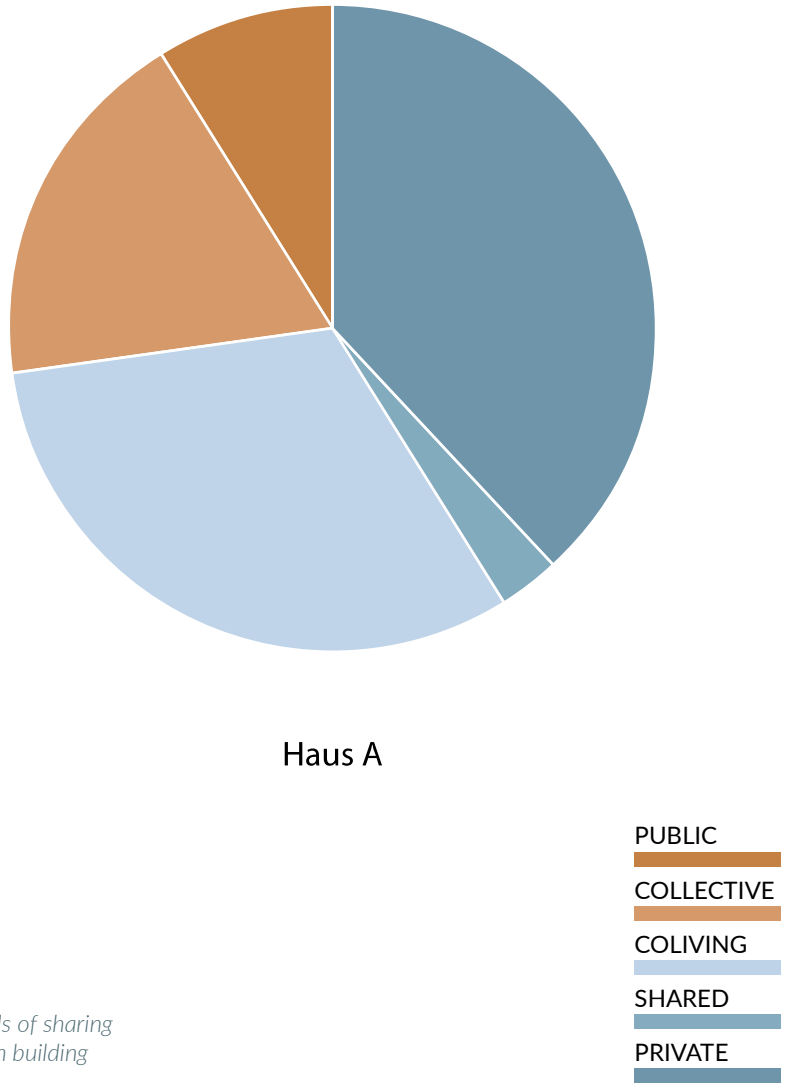


Fig. 120. *Levels of sharing*
Percentages in building

Sharing in Haus A

Every building in the Mehr als Wohnen project looks like a test case for a particular housing concept. It takes a lot of courage to implement new social observations in a new housing model. Design is always speculation and not every experiment can succeed, to make future visions you have to see how residents will experience it (Kaestle, 2016). There is a great similarity between the floor plan of each floor in Haus A and the footprint of the masterplan ***(Brussels Dossier, 2020),*** The common space flows as a connection between the individual buildings or private units**.** The result is a vibrant environment in which residents can meet and reinforce each other.

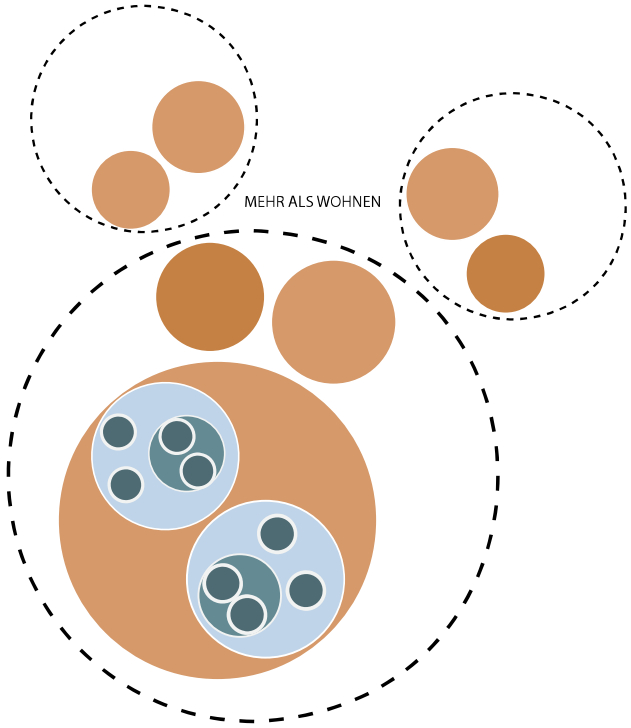


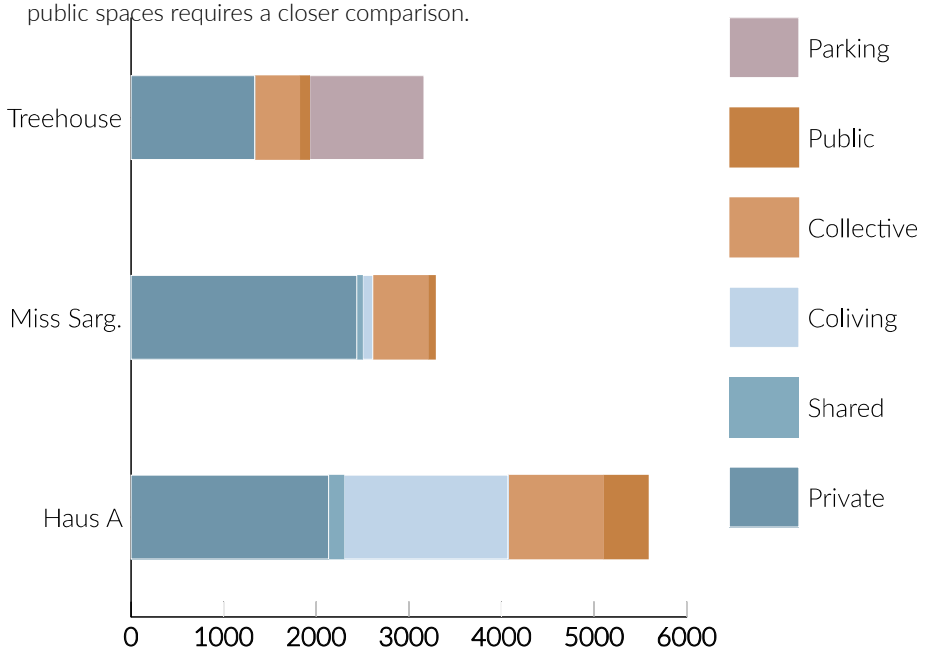
Fig. 121. *Diagram levels of sharing*
(c) Own image

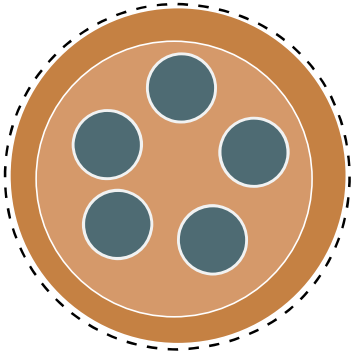
C

Conclusion

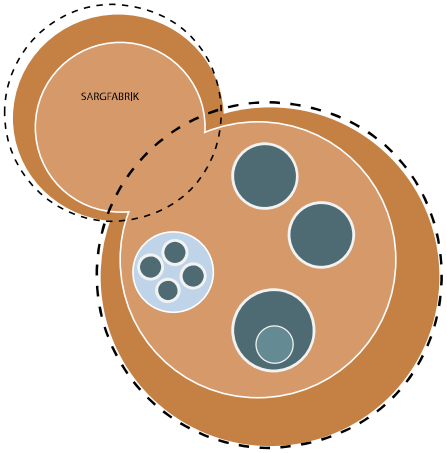
Sharing space among the solo-dwellers

The first thing that pops out from the comparison is that the three projects are very different in size. Not counting the parking garage, Treehouse is the smallest of the three. Haus A is the largest with an area of more than 5000m2. All three projects also include a space that is open to the public. The collective spaces are present in all three projects but are located in different positions in the building. The surface of the public and collective spaces together amounts to approximately 45% of the building. The rest consists of living spaces for the residents. In Haus A we see that the balance between private and collective in the cluster apartments is approximately equal. The organization of the public spaces requires a closer comparison.

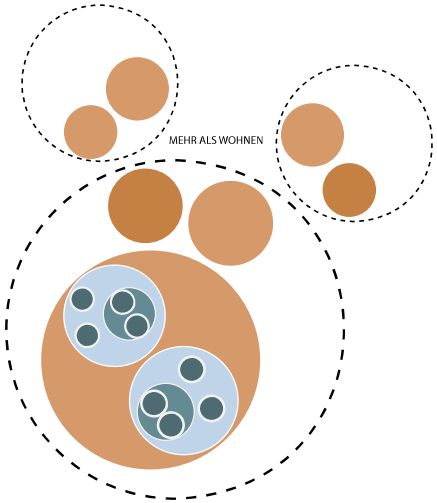




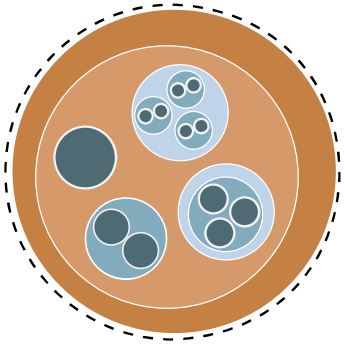
Treehouse



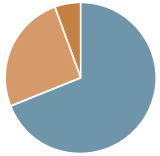
Miss Sargfabrik

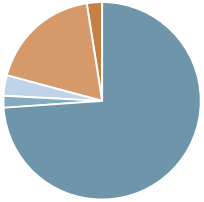


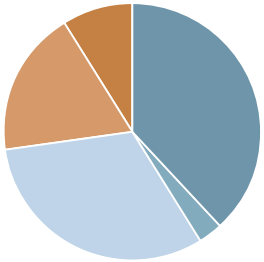
Haus A

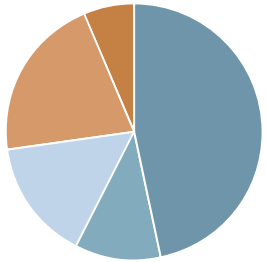


Togetherness aim









Cohabitation

Sharing between humans and non-humans

When reading the paper full of new year's resolutions, one article struck my attention. Philosopher Eva Meijer (2021) wrote an essay about how we should start to '*verwerelden*' [Re-worlding]. Re-worlding, learning an attitude that is more focused on others, is necessary within existing 'life worlds' as a basis for new ones. Meijer encourages us to be curious about other perspectives, to look at the way of life of animals, and thereby broaden our own world view. She explains she borrows the thought of Donna Haraway in the concept of 'worlds', as *"It matters what stories make worlds, what worlds make stories"* (Haraway, 2016, p. 16). This caring for others, Meijer argues, leads to a lasting relationship with everything we share the planet with, from humans to mice.

Now we have seen how humans can share their resources in the earlier section, we can continue to explore the relations between humans and non-humans. To better understand and make explicit these encounters between humans and other species, this chapter first explains how we share 'our space'. From these ways of co-existence, we learn how co-habitation is a state worth striving for. By anticipating conflicts through design, we can create a togetherness within the city.

Ecosystems

For starters, bats cannot just survive alone, they also depend on other species to eat and reproduce. Bats thrive better in an insect-rich environment. Insects themselves play a key role in supporting the 'ecosystem services, such as pollinating our flowers. The different hierarchies between animals contribute to ecosystem conservation cycles.

It takes several stages to reach the balance in a new cycle in an area. After the first few years, the first animals will start to inhabit the area. When they are settled, the next hierarchy of species comes in after 10 years. The cycle will be balanced in a timeframe of 16 years. When designing a new building, it is therefore also worthwhile to consider how not only bats but also other insects can be involved in the project.

Butterflies are one of the indicators of an insect-rich environment. Butterflies are very precise about their habitat; therefore, a butterfly-rich environment indicates a good environment for other species to settle. Of these, the small tortoiseshell is an interesting species because it hibernates in the Netherlands and is therefore specifically looking for warm cracks and crevices.

Bees, on the other hand, are important pollinators, which are necessary for maintaining a healthy flower-rich environment. Certain bees also benefit from human interventions. Mason bees settle in small cavities. There are several mason bees, where one settles, and usually follows the other. Often the red mason bee is therefore taken as a target species, yet it is interesting to see which others tell a story; the wallpaper mason bee for example.

To not create any conflicts to share our buildings with building-reliant species, we need to take a closer look at possible interactions. The current state of information about species relies mostly on animals that already are established in buildings (Gunnell et al., 2013). But it could be so much more, to provide people with the chance to see interesting and attractive species (Gunnell et al., 2013).

Sharing 'our space' with nature

De Baerdemaeker describes the human-animal connection within the basic principle of ecology; you must see the life histories of varied species in relation to others. Therefore, the encounters between humans and non-humans vary; *'It is never unambiguous - just like any relationship - only happy. You have your confrontations, your beautiful moments, sometimes it bites each other, sometimes it goes together.'*

Wildlife meanwhile is also adapting to our urban conditions, improving their survival skills in new surroundings. Would we for example choose to ignore weeds, they would slowly take over our pathways and buildings - not creating ideal situations. Humans like to keep their environment under control but can also choose to offer more space for these kinds of phenomena to run more freely. Building more explicit for co-habitation could help us avoid these kinds of conflict zones.

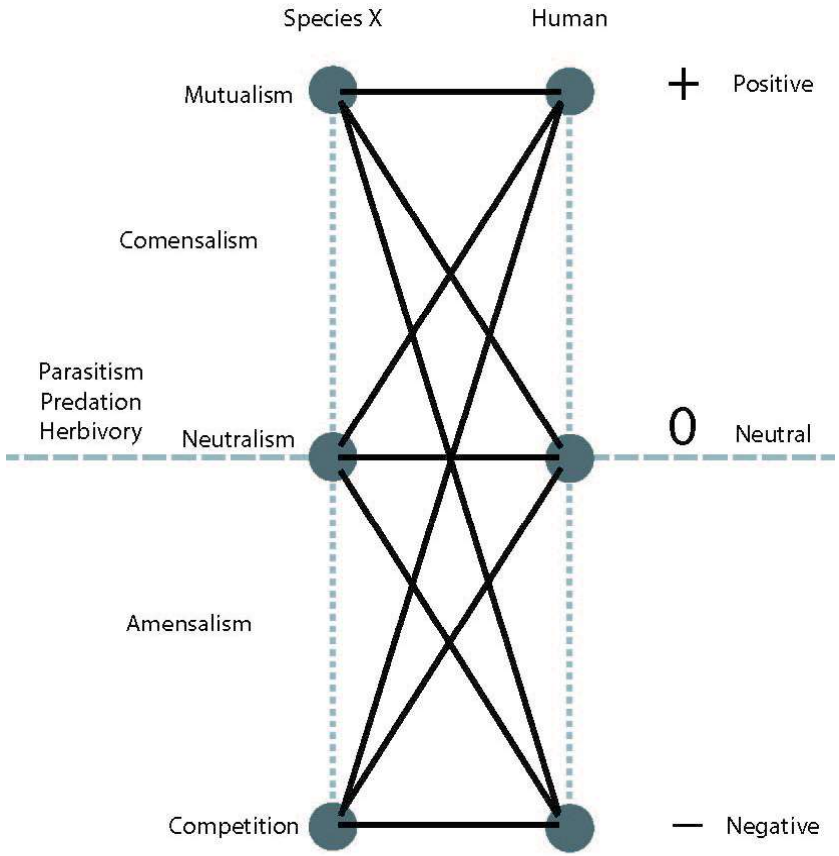


Fig. 122.
Classic categories of direct effects in ecological communities
(c) Own image

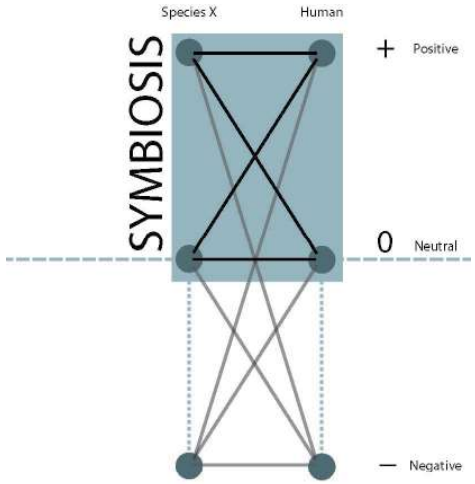


Fig. 123.
Symbiosis

In a Manifesto for an Architecture of Cohabitation, one of the basic principles is that "*The architecture of cohabitation is human-built architecture that includes non-human animals as users and residents of the architecture and actively invites them to use the architecture.*" (Marc Frohn & Thomas E. Hauck, 2021) This means that actual space needs to be given to – and thus designed for - these 'other' species.

Co-existence

To map out possible encounters, we look at different forms of coexisting between species described in the field of biology. To start, encounters between humans and species can cause different effects of one species on the other, either positive (+), negative (-) or neutral (0) (Moon et al., 2010). Mutualism (+,+) is when both species benefit from each other's existence, this is an optimal situation. The opposite situation is competition (-,-), here conflicts arise since species compete for the same resources.

However, there are also some situations in-between (figure XXX). Commensalism for example (+, 0) is when species benefit from one's existence, while the other species – humans in this case – are not affected. Here the relationship between species and humans becomes interesting and more complex, and most conflicts arise.

Symbiosis and/or cohabitation

To create the wanted state of ***togetherness***, species and humans within the city should live in a state that doesn't have negative consequences for each other. This positive state is called *symbiosis*, be it mutualism, commensalism, or parasitism, and originates from the original Greek word for 'living together'. Cohabitation is when this state of harmonious living together takes place in the same space.

Here the introduction of a context is implied, and therefore the concept of architecture can have an impact. Cohabitation therefore should be stimulated through architecture. Or formulated otherwise; "***The architecture of cohabitation anticipates possible conflicts and enables them to be resolved. It offers contact spaces for encounters between non-human animals and humans.***" (Marc Frohn & Thomas E. Hauck, 2021)

How then to continue resolving these conflicts? There are two kinds of lenses possible to look at this diagram: either we are endangering the living situation of species by human actions or vice versa. Therefore,

two types of conflicts arise in this diagram: on the one hand, the negative consequences affect the human being, and on the other hand, the negative consequences for the animal.

Conflicts for humans

One could argue humans are the strongest species within a city, therefore it is most important humans tolerate the other species. Species that cause negative on humans are often called pests. Pigeons, rats and other animals have adapted their skills to benefit from the existence of humans, while often spreading illnesses and nuisance.

What is being perceived as a negative consequence may not always be the case. "***A rat in your kitchen is a different conflict, then seeing a rat in your garden. This situation is quite harmless, but often seen as a problem.***" Changing this negative view of the situation to a neutral one, in which both parties can live together acceptably, can be done in two ways.

The first is restricting the freedom of movement for the species concerned, by taking active measures to close off areas or diverting flows. Mapping these encounters between species, and gathering data about their individual needs could help to steer these conflicts. However, this information will always be embedded within its social and political context. The human power relations and biases are always 'above' the living world of animals.

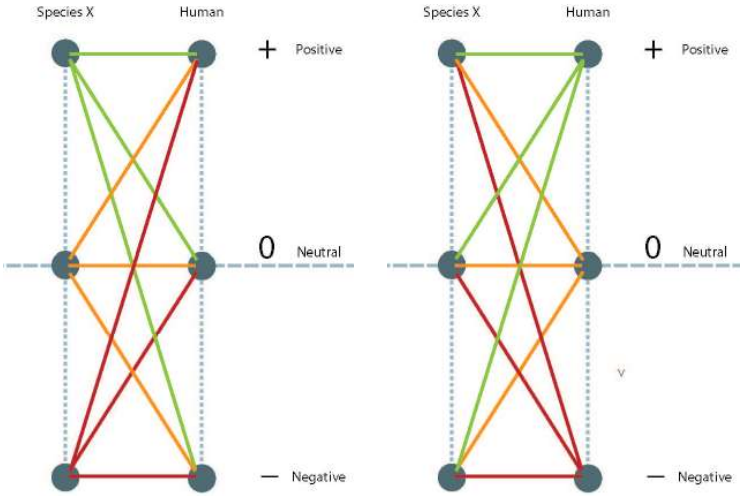


Fig. 124.
Species centred conflics vs. Human centerd conflics

The second is therefore cultivating understanding and information so that people are a little less inclined to complain. They accept the species and are more likely to come to a neutral state. It is therefore also a matter of education that man is part of nature. As De Beardemeaker gives an example; ***"If you sit in the sun for a long time you can burn yourself, if you walk in the forest you can be stung by a mosquito or a wasp, that's possible. Those are the risks in life. You walk out and you walk right into the food chain [...]."*** One's view on nature conservation therefore also has to do with what someone has been given in his youth (Prominski, 2019).

Conflicts for species

If we want to increase biodiversity in the city, we must start by looking at the animals that have been endangered thanks to us humans. Many of these species are directly or indirectly positive for humans, although people are often unaware. Think of bats that eat pesky mosquitoes or of bees and butterflies that pollinate our food. A tactic could be showing the positive effects species can bring to humans. This does not always have to be financial or visible, abstract ways – such as beauty - are also sufficient. As a result, people are more inclined to participate in enhancing the biodiversity in their environment.

Some of these species have the potential to be incorporated into the city without potential conflict with humans. Some animals can already be helped with small interventions, but it is then up to humans to take action. It is therefore important to choose species that can share their habitat with humans and tolerate contact with them (Hauck & Weisser, 2015).

Often the species that have a neutral effect on humans will soon follow, when a larger habitat is created that offers space for nature. People do not necessarily need to notice the effect of these measures in their daily lives, but they will help biodiversity.

Taking care

Especially if you want to get something done in a practical sense, it is important to increase support for the measures among people involved in the project. The Baerdemaeker gave some advice on a successful project. "***We often look at those plants and animals as annoying and irritating because they take up space. When you see that they are actually your neighbours, your fellow citizens, you create some understanding and people are perhaps a little more willing to offer space. Which also gives a little more support for nature, including design, and its protection, but also especially for the municipality to take those measures. Quite deliberately a promotion campaign for ecology in the city"*** Education is, therefore, one of the most important steps to take.

There are a few other tactics that can be used to manage relations between humans and non-humans. Designs are needed which take care of plants and animals as well as human users and allow them to relate to one another. Prominski (2019) tries to illustrate some of those strategies:

1. Positive control
   Access to natural areas is a delicate issue, while often plants and animals are sensitive to humans entering their habitat. Therefore there is a distinction between using an area and protecting it. (Prominski, 2019). This can be done by separating the two worlds positively, to create a balance between using and protecting them. Hans Loidl calls this phenomenon positive control: connecting the two by making visual links and path signs, but no encounters.

2. Include in engineering
   This black and white distinction can also be overcome to integrate human aspects into the engineering process of green infrastructures. Or vice versa; including the needs of animals in the engineered world of humans.

3. Tell a story
   Artists can help to bring the distinction between culture and nature together, they can link phenomena together by telling stories. The imagination and sentimental connection can help to create empathy for non-human species in the city.

4. Use time
   Make use of the succession; use time in the design strategy. As a visual metaphor, gradual transitions in time can change a neat park zone in a wildly grown strip of forest, where space is offered to other city dwellers. This transition is gradual and takes time.

5. Care
   The use of charismatic species can help to create interest in nature conservation. The connection can be a visual attraction while stimulating nature conservation. By consciously involving and educating people, giving them an insight into the experiences of a common pipistrelle and perhaps even making them proud of what they can contribute.

Solo-dweller and common pipistrelles encounters

To anticipate any conflicts, let us have a look at possible encounters between the common pipistrelle and solo dwellers. One of the most commonly used equations to explain the pipistrelle to humans is that it is the smallest Dutch bat, fits in a matchbox and weighs as much as a sugar cube. A vivid representation to indicate size, hence they can often hide in small crevices and hide from human view.

When people go to bed, bats wake up, our their daily rhythms do not run parallel. Possible times of interaction are when pipistrelles are flying in and out of their roosts, at sunset and sunrise. Before going into their roosts at dawn, they fly around for a while right in front of the entrance. That 'swarming' is very nice to see, although you have to be up early.

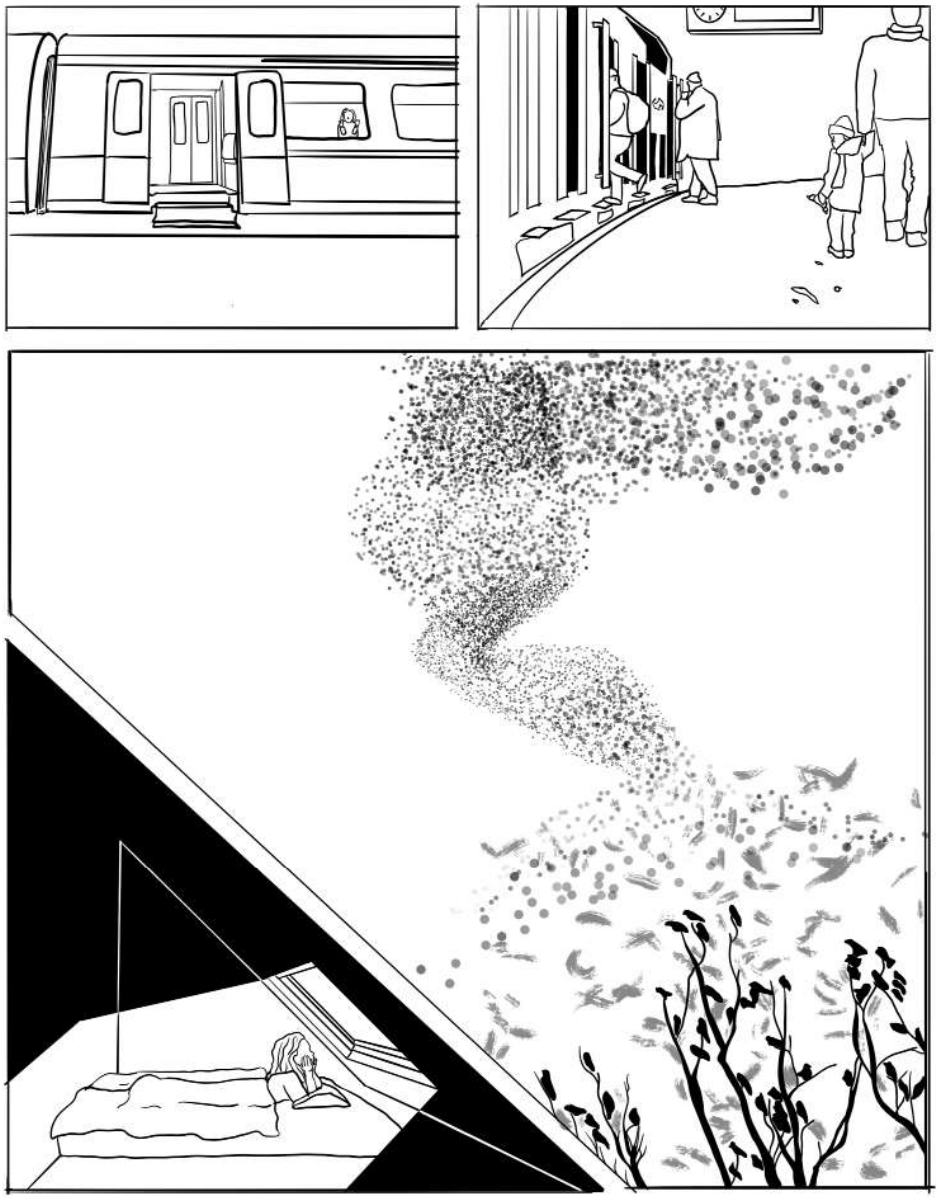
The perception of the bat species by humans is even more difficult since bats make almost no noise. They use echolocation to see, by producing sonar sounds. Although bats also can make loud social noises. The courtship call of the pipistrelle can partly be heard by young people (Herman Limpens, 2016).

The possible interaction moments in the morning and evening are also the most critical moments of conflict. Those are the times of the day when people turn on their lights but don't always close their curtains. Too many lights can be disadvantageous for bats. However, it is possible to use amber-coloured UV-free light, that is less disturbing to bats or it can be sufficient to dim the lights in the evening (Vink et al., 2017). The common pipistrelles, however, have a higher tolerance to light, and they even like to use street lanterns to hunt around (Spoelstra et al., 2015).

Bats have a protected status in the Netherlands, so moving their habitats must be done carefully. In the Netherlands, the Minister of Economic Affairs specifies species that (are becoming) endangered or extinct on the ‘Red List. The Minister stimulates research and activities to protect and manage them (MvLNV, 2022). |This often causes some conflicts in the construction sector, as projects are delayed. It could help explain the provisioning function of bats in ecosystem services. Bats are needed in the ecosystem as seed dispersers, and pollinators and help reduce pest controls (Gunnell et al., 2013).

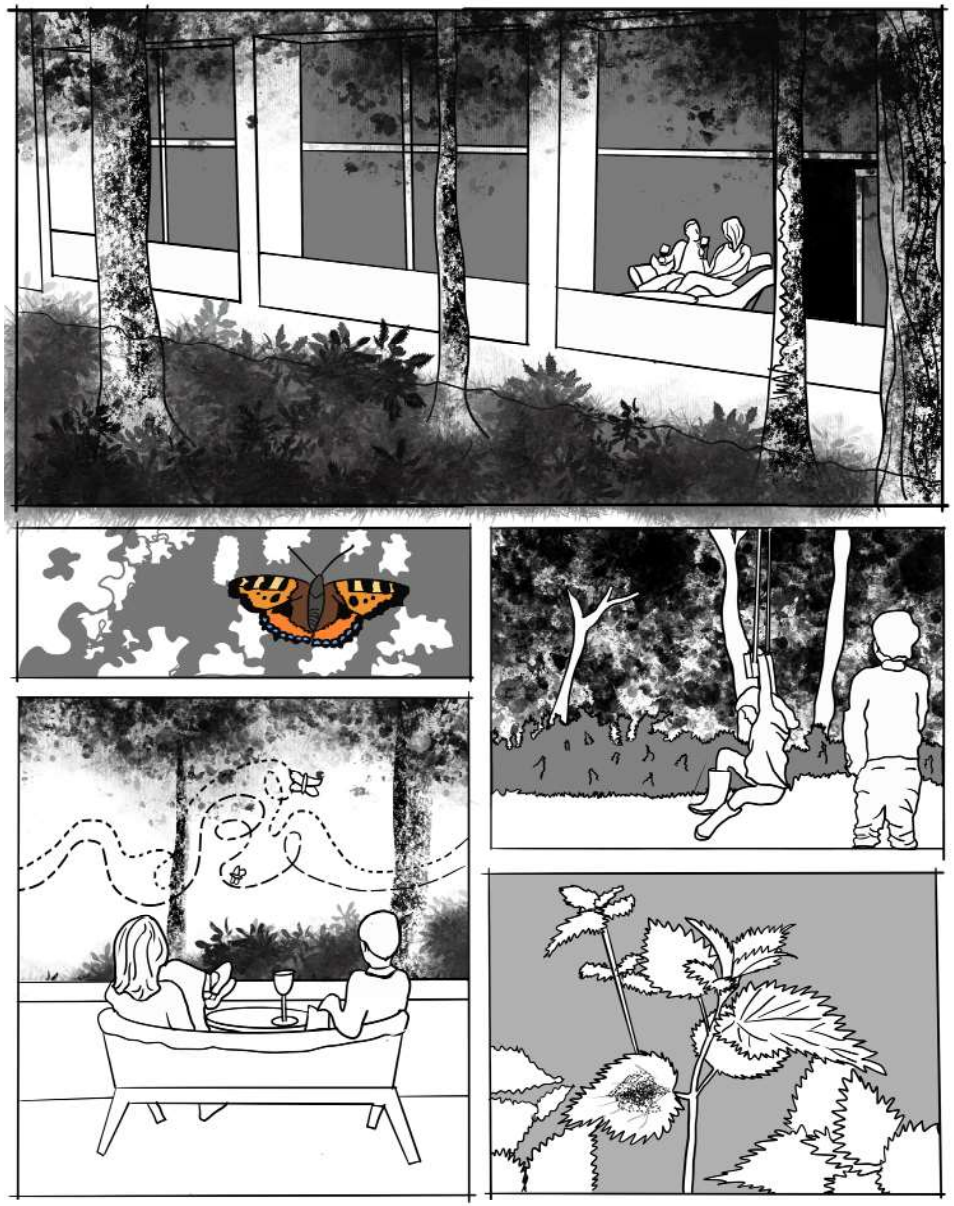
Tell a story

Starlings in Rotterdam cental station immitate the sound of a leaving train.



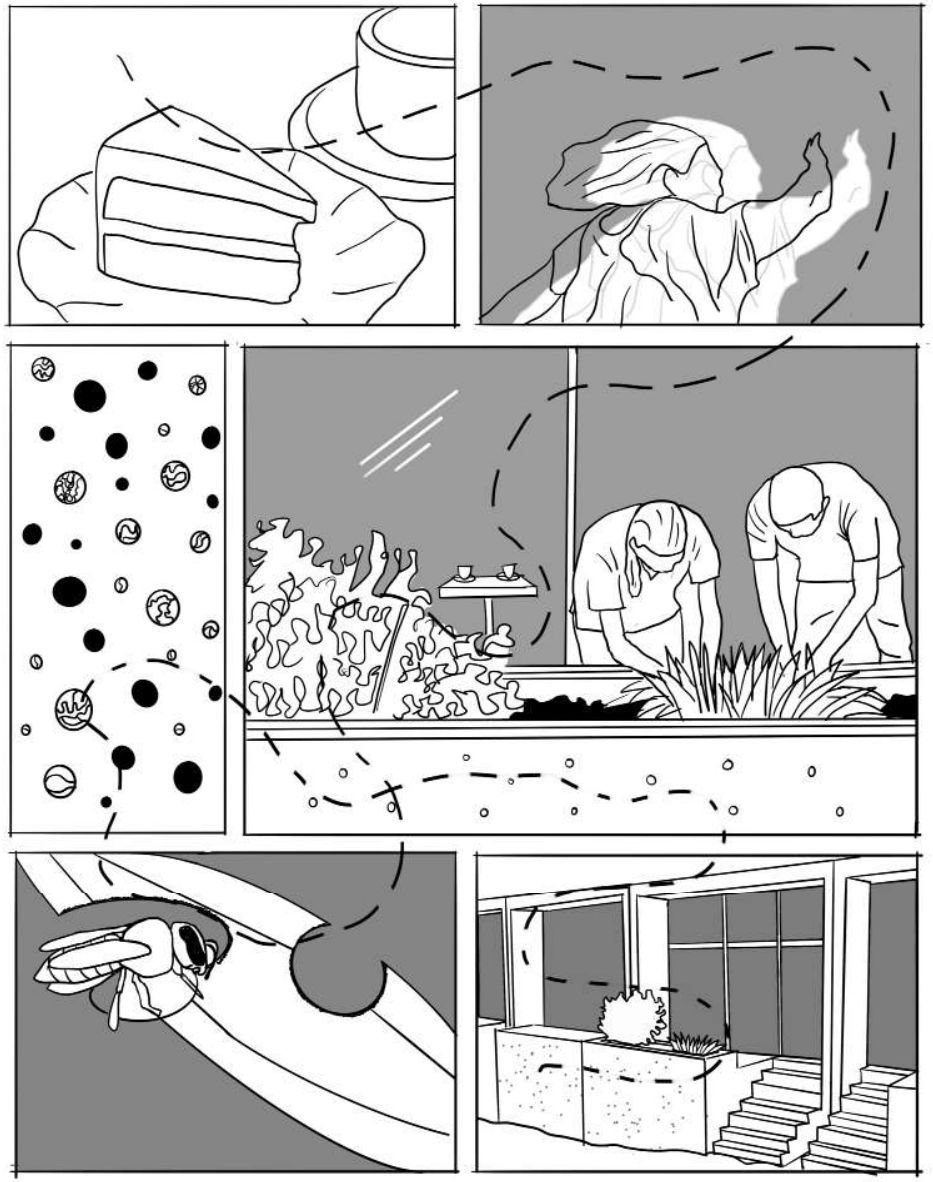
Positive control

The host plant of a mall tortoiseshell is a nettle, not a pretty one, but an advantage is that people are kept at a distance.



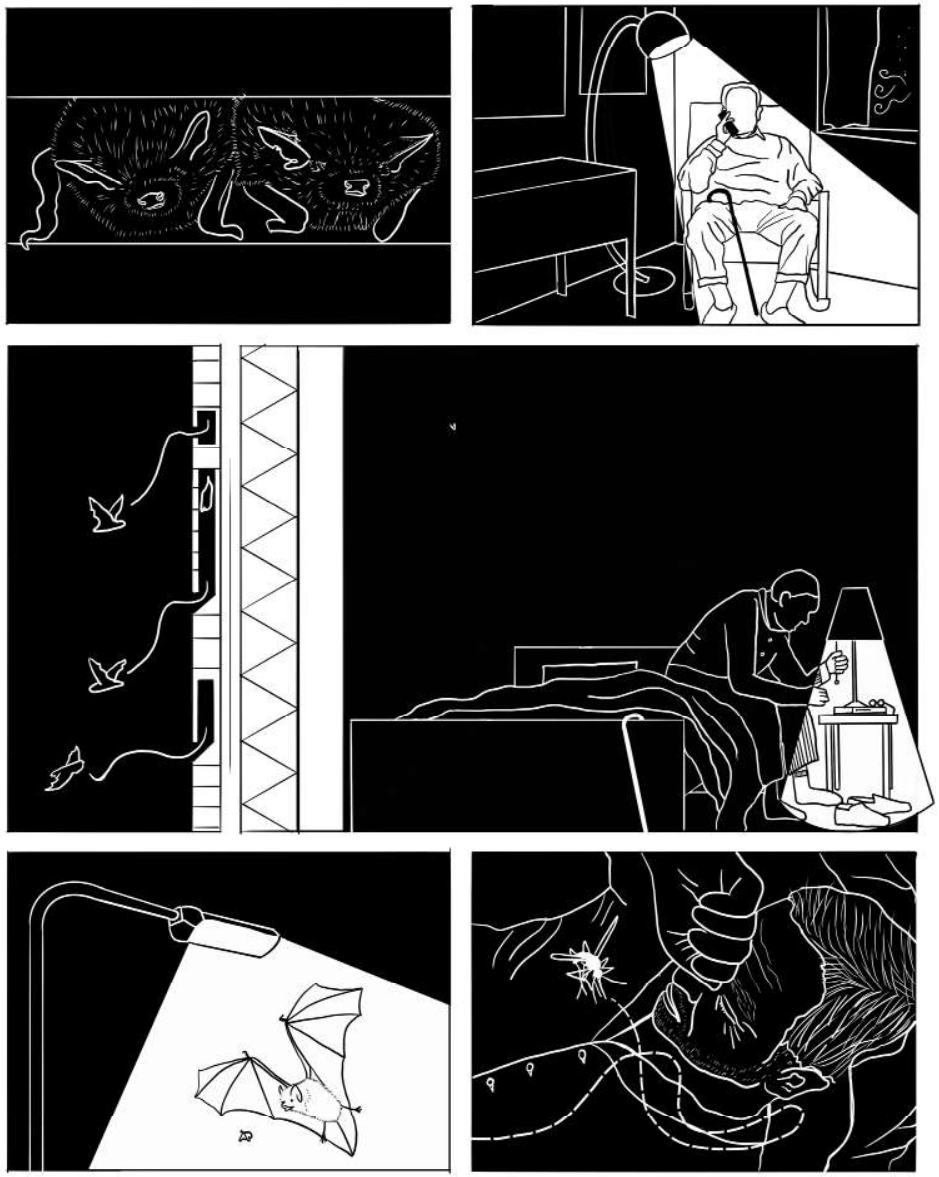
Connect

Patchwork leafcutter bees are harmless and good for biodiversity. They decorate their home with leaves.



Engineering

Bats contribute to the maintenance of a good ecosystem, they live in the crevices in the walls of houses.



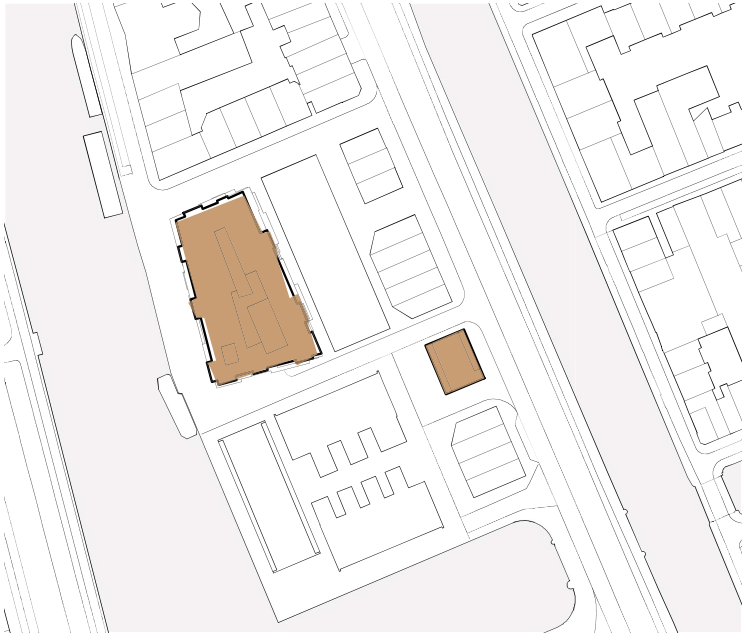


Fig. 125. *Site plan One green block on the singelgracht and one classic blok on the Marnixstraat.*
Scale 1:500
(c) Bastiaan Architecten

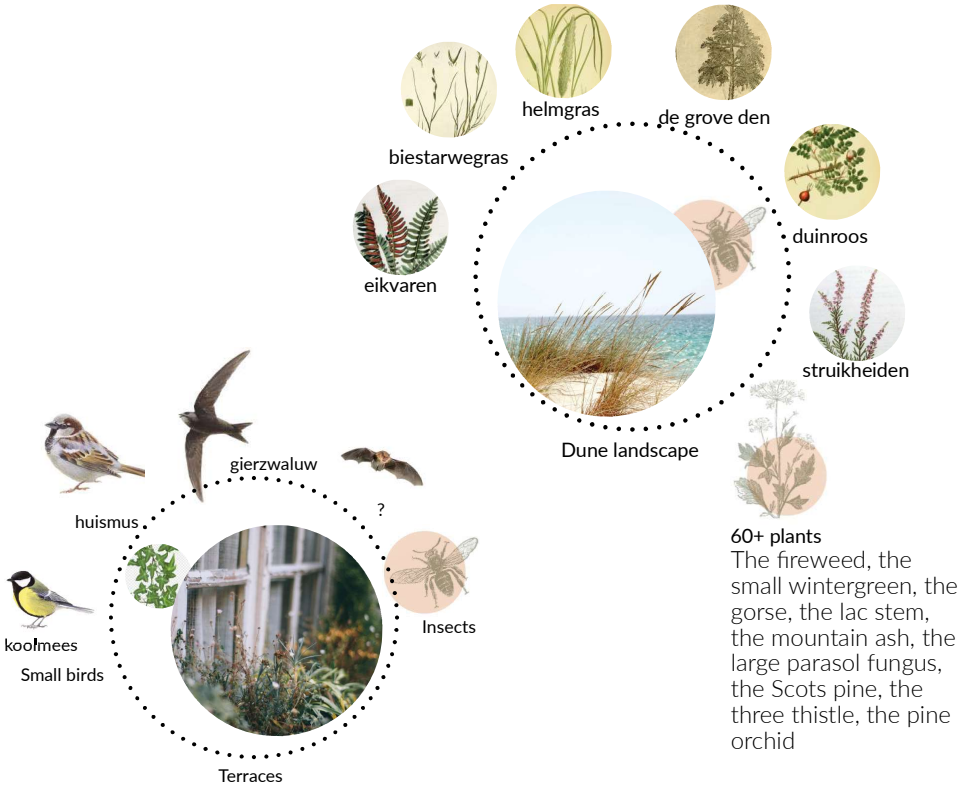
Groenmarkt *Cohabitation*

Bastiaan Jongerius en Ronald Janssen

Fig. 126. *Groenmarkt project in Amsterdam*
(c) Bastiaan Architecten

Project Name:	Groenmarkt
Site:	Amsterdam, Netherlands
Address:	Marnixstraat (building 1) Singelgracht (building 2)
Client:	HBB Ontwikkeling en Edwin Oostmeijer Projectontwikkeling
Architect:	Bastiaan Jongerius en Ronald Janssen
Landscape architect:	Harro de Jong
Year of realization:	2021
Number of units:	40
Square meters:	7450 m²

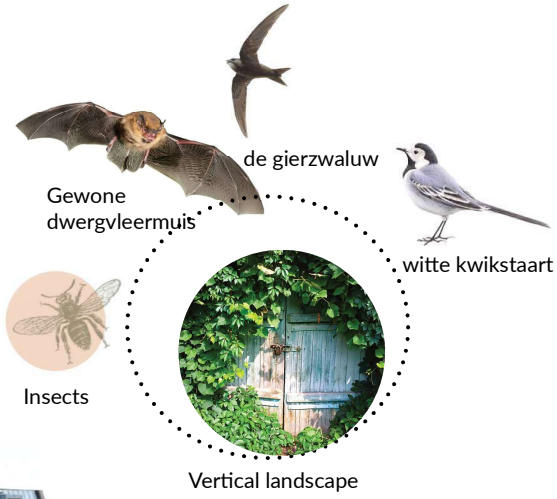
Singelgracht



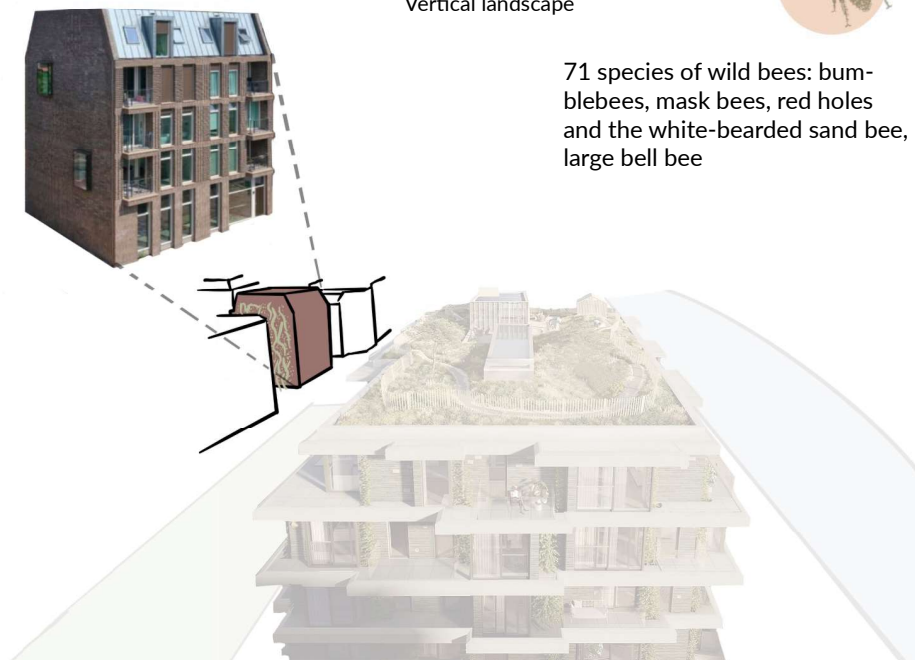
60+ plants
The fireweed, the small wintergreen, the gorse, the lac stem, the mountain ash, the large parasol fungus, the Scots pine, the three thistle, the pine orchid

Fig. 127. *Habitats in Groenmarkt project*
Collage own illustration:
birds: vogelbescherming.nl
plants: wilde-planten.nl
bat: Cristian Giesen
Groenmarkt: architects
Marnixblock: Jeroen Musch

Marnixstraat



71 species of wild bees: bumblebees, mask bees, red holes and the white-bearded sand bee, large bell bee



Terraces

Dwelling

Less outdoor spaces

More outdoor space

Outdoor space

Accessible

Inaccessible

Fig. 128. *Floor plan*
Scale 1:500

Nesting boxes

Vogelkasten:

1. Gierzwaluw

2. Kleine vogels

3. Huismussen

? Vleermuiskasten

Fig. 129. *Construction picture of the facade*

Boxes included in the construction, emerging from the facade, like small apartments.

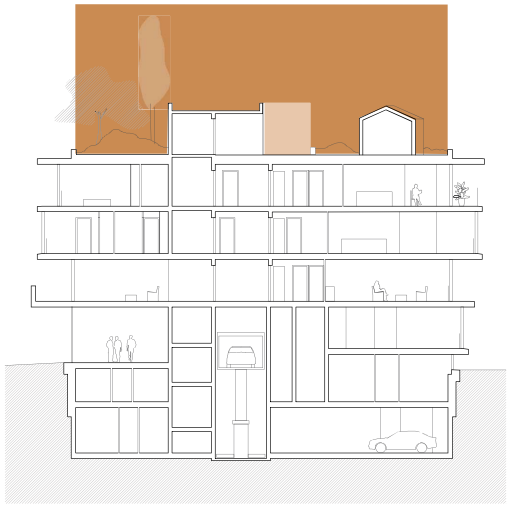
Young growing climbing plants that can continue to grow from ground level through holes in the prefab terrace elements in various places

Fig. 130. *Render of the facade*

Dune landscape

Landing site

Various butterflies, birds and insects are attracted to the flowery rooftop landscape



Outdoor space

Accessible

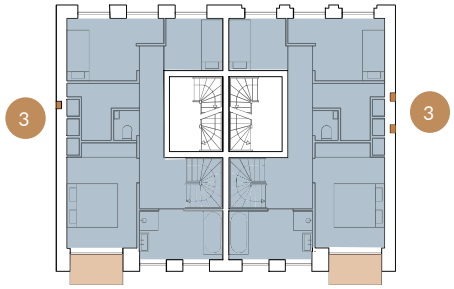
Inaccessible

Fig. 131. *Section*
Scale 1:500

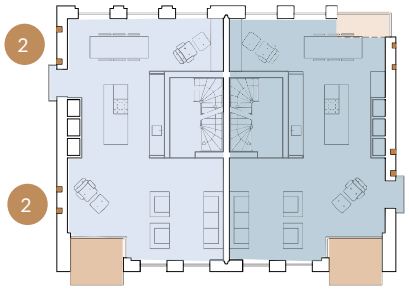
Fig. 132.
Dune landsacpe on rooftop with collective pool

Cohabitation - *Position vs dwelling*

Vertical landscape



2



3

Dwelling

Less outdoor spaces

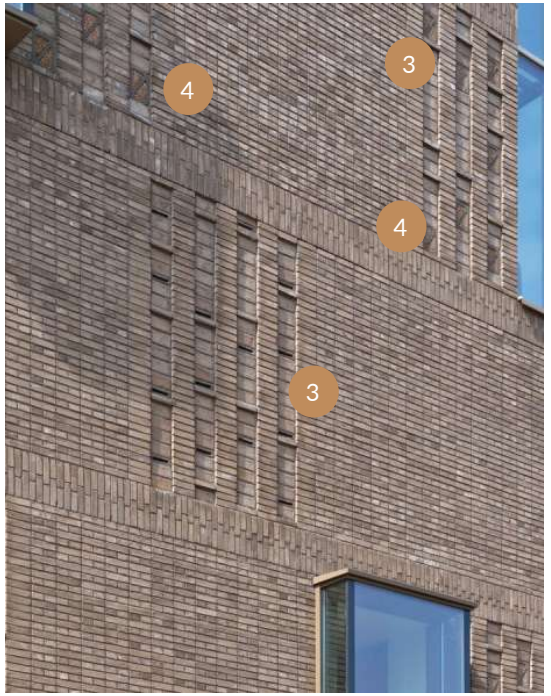
More outdoor space

Outdoor space

Accessible

Inaccessible

Fig. 133. *Floor plan*
Scale 1:200



Nesting boxes

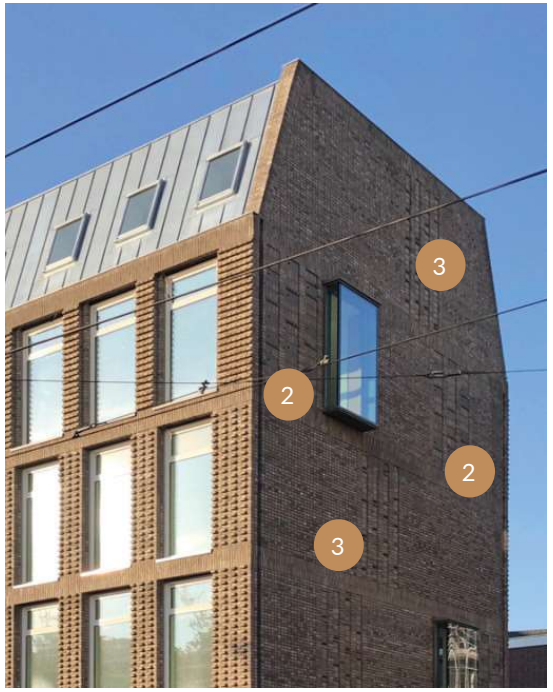
Bird:
1. Swift
2. White Wagtail

bat boxes
3. Common Pipistrelle

Insect boxes:
4. Wild Bee

Installed between the masonry of the facade

Fig. 135. *Detailed picture of the facade*



When an area is suitable for butterflies, it is usually also suitable for all kinds of other animals such as bees, bumblebees, hoverflies, amphibians, birds, and hedgehogs

Fig. 134. *Picture of the facade*

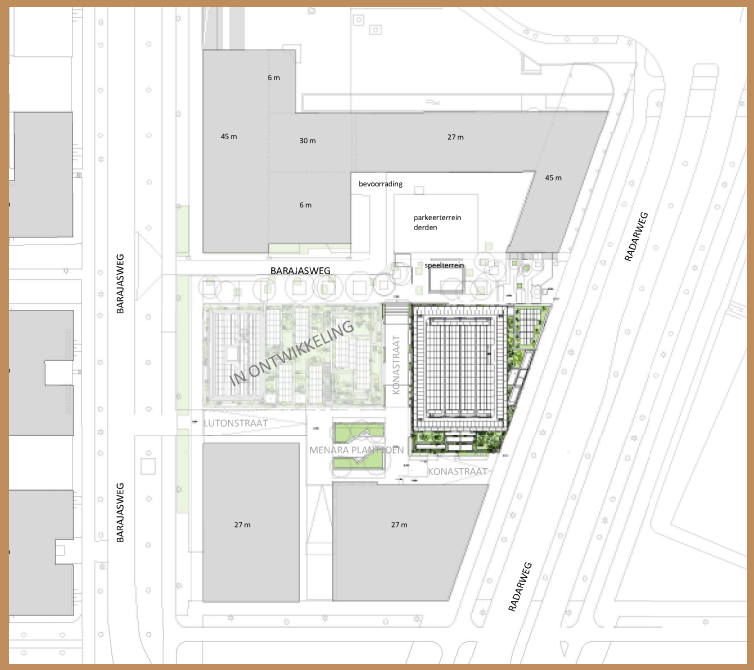


Fig. 136. *Site plan*
Scale 1:5000

Vertical *Cohabitation*

NL Architects, Chris Collaris Architects, studio Donna van Milligen Bielke, Space Encounters en DS Landschapsarchitecten

Fig. 137. *Render of the project*

Project Name:	VERTICAL
Site:	Amsterdam, Netherlands
Address:	Sloterdijk, Kavel N1 + N3
Client:	Heijmans Vastgoed B.V.
Architect:	NL Architects, Chris Collaris Architects, studio Donna van Milligen Bieke, Space Encounters, DS Landschapsarchitecten
Year of realization:	in construction
Number of units:	168 dwellings
Square meters:	-

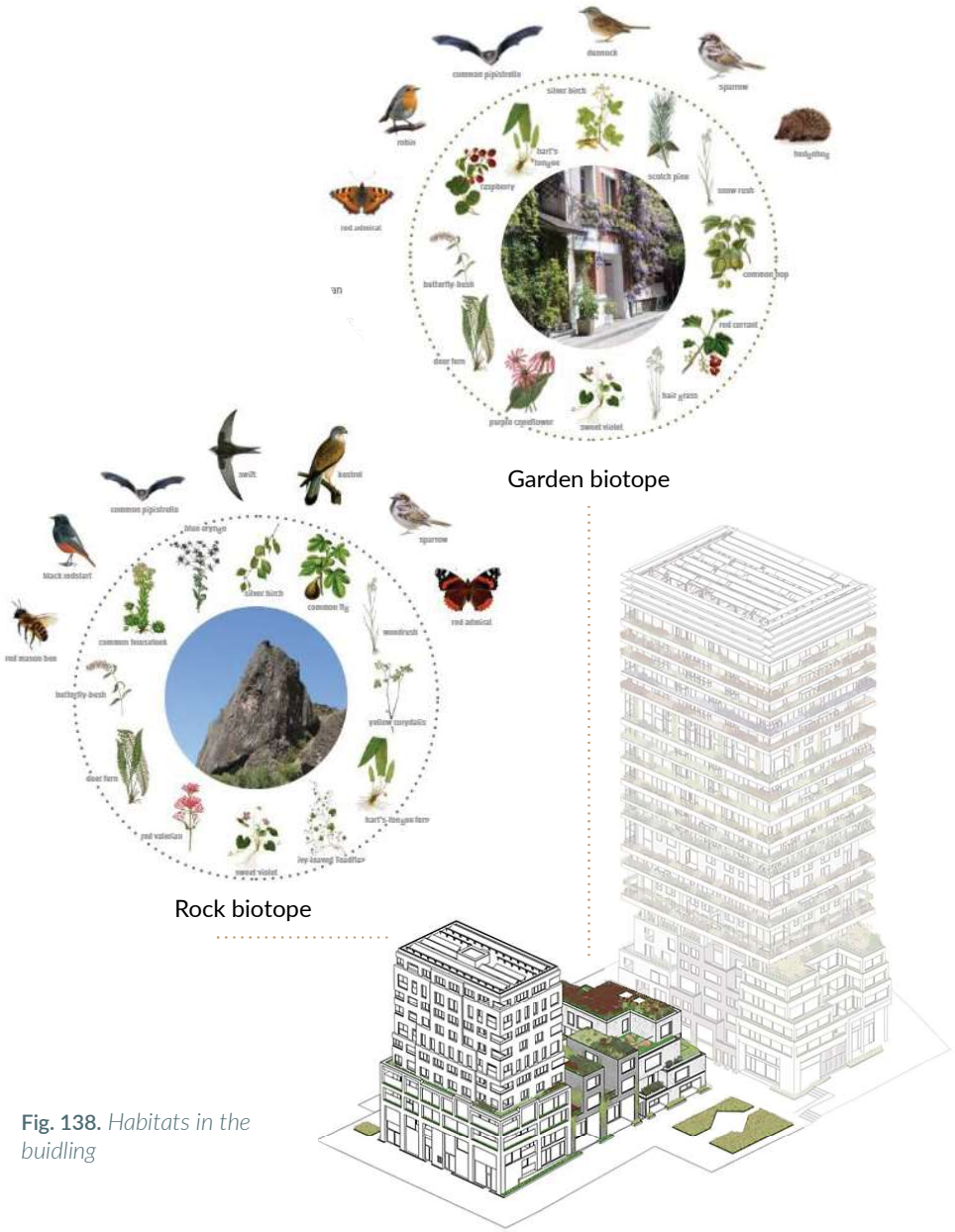
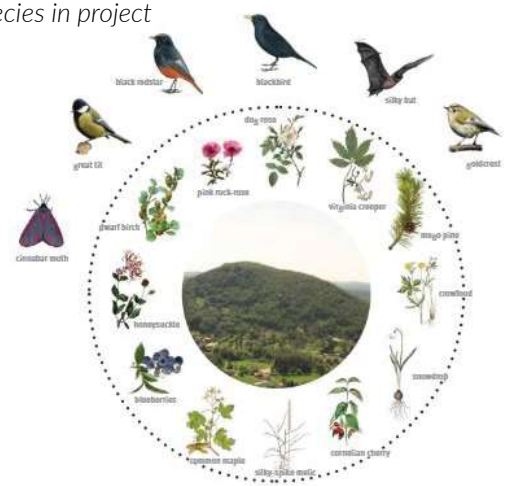
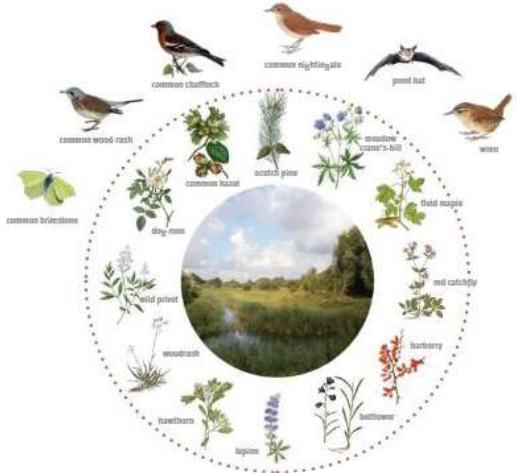


Fig. 138. *Habitats in the buidling*

Fig. 139. *Selected plants and species in landscapes*



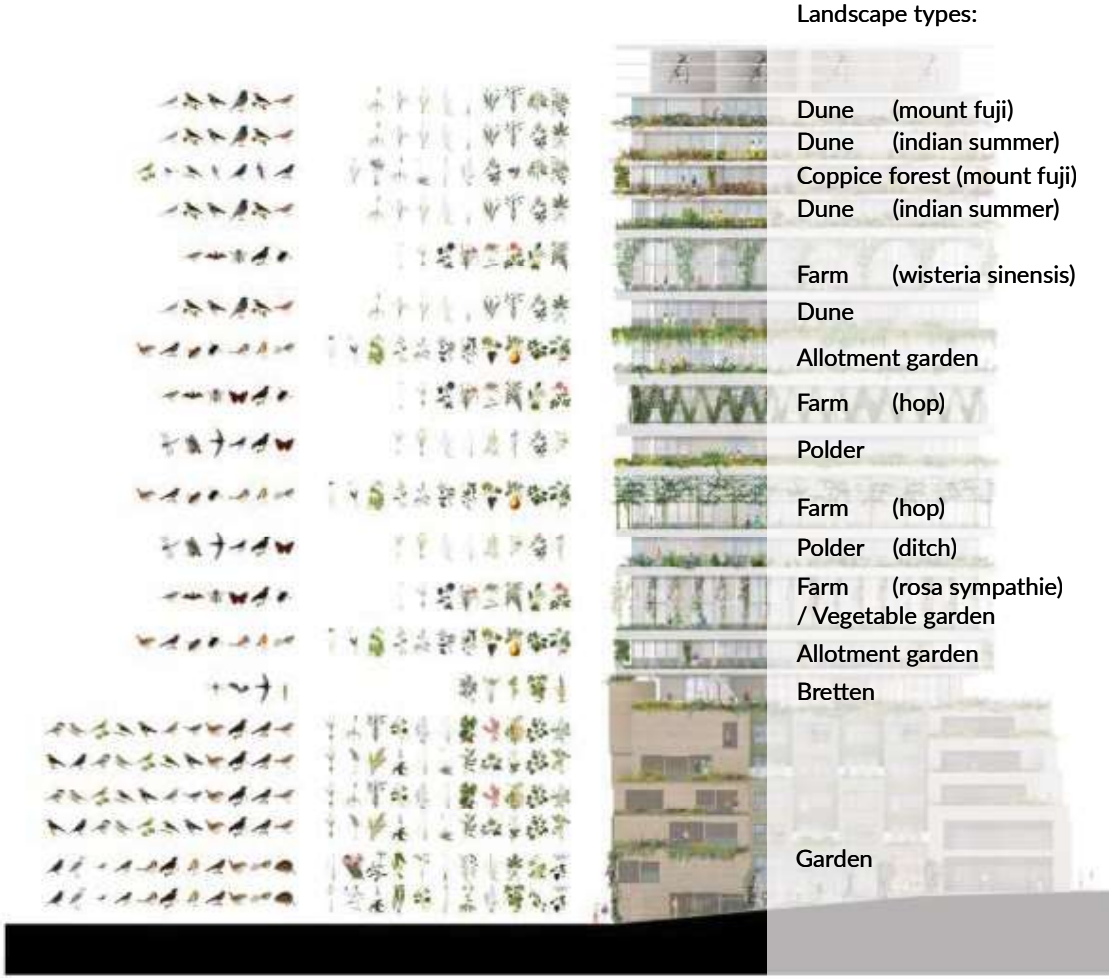
Covered hill biotope



Bretten biotope

Fig. 140. *Habitats in the buidling*

Fig. 141. *Selected plants and species in landscapes*



Cohabitation - *Position vs dwelling*

Rock biotope

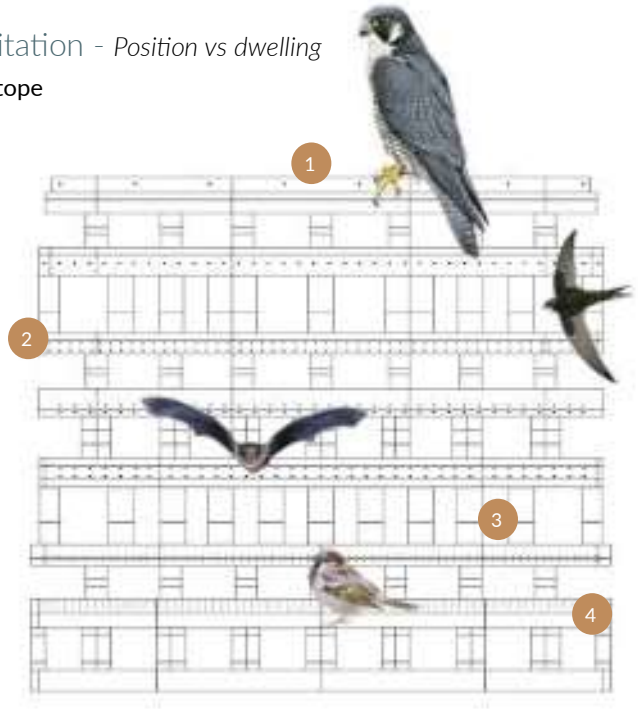
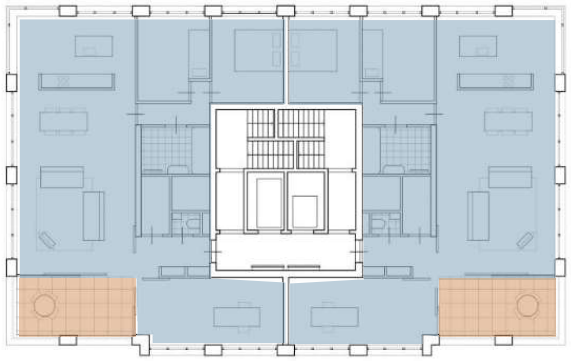


Fig. 142. *Nestboxes in the facade*



Dwelling

Less outdoor spaces

More outdoor space

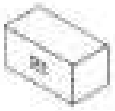
Outdoor space

Accessible

Inaccessible

Fig. 143. *Dwelling plan*

Nesting boxes



Birds of prey

1 box - East

Swifts

60 boxes - East
35 boxes - West

Bats

24 boxes
14 boxes - West

Small birds

72 boxes - East

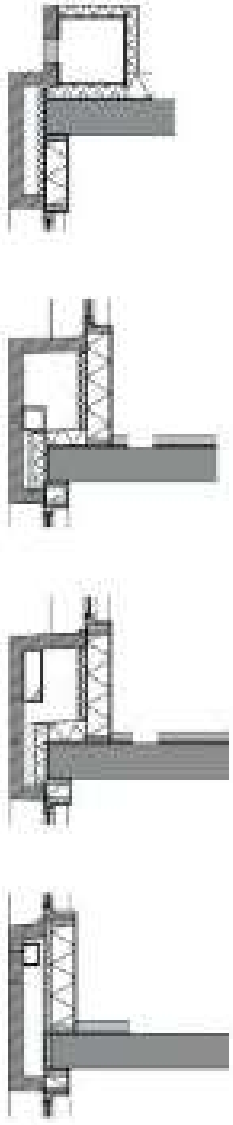
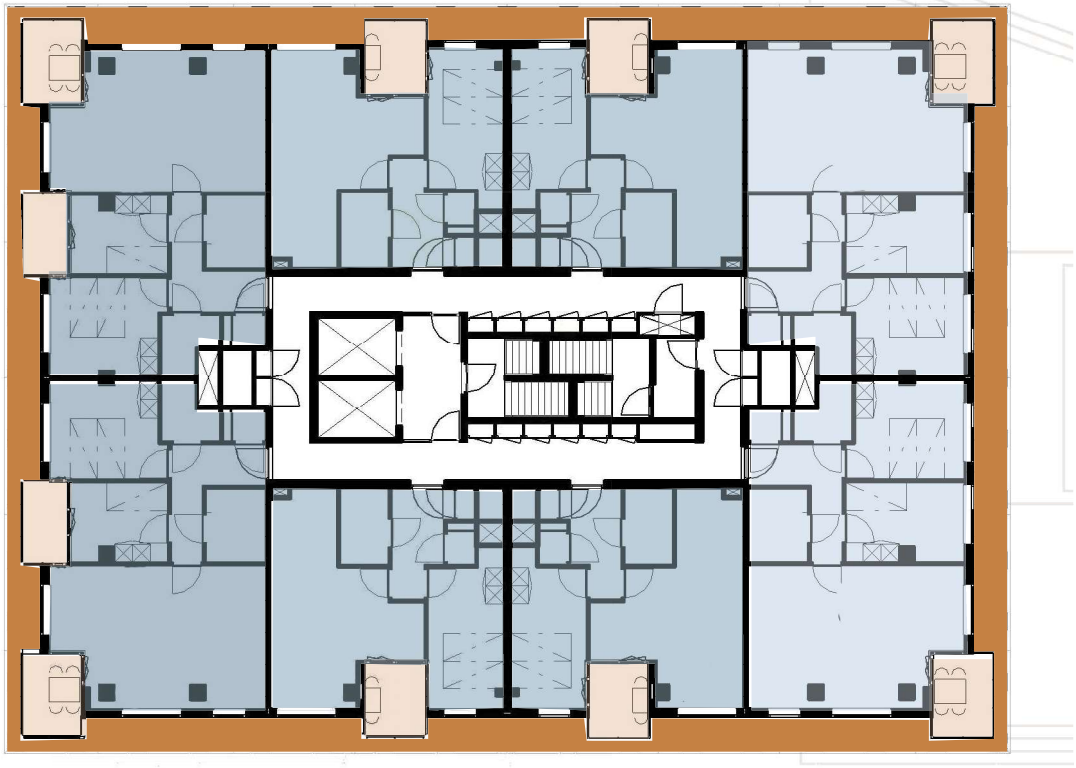


Fig. 144. *Details facade section*

Cohabitation - *Position vs dwelling*

Covered hill biotope



Dwelling

Less outdoor spaces

More outdoor space

Outdoor space

Accessible

Inaccessible

Fig. 145. *Floor plan*
Scale 1:200 - 80%

Landscape types:

Fig. 146. *Render with landscapes impressions*

C

Conclusion

Sharing space between humans and non-humans

Today, more nature inclusive buildings are popping up. By looking at two case studies, we learn how they applied strategies and how they connected the human and non-human world.

Strong storytelling is visible in both buildings. The Singelgracht-block sketches a world in which it is possible to relax on a beach in one moment and be able to eat a sandwich at your own kitchen table within a minute. The tower of Vertical tells us that it is possible to superimpose nature on different layers. These extreme gestures make nature implicit in the buildings and give them their character.

While on the beach in Groenmarkt people are still invited to play and swim in the pool that collects rainwater, a different strategy is used in the Vertical tower. The connection is a visual one, the landscape can be seen behind the windows. The rainwater collection system of the building makes self-maintenance of the plants possible. This leaves nature to rest while enjoying it at a safe distance from your living room.

Both projects also show examples of taking measures for species within the engineering process of the normal construction method. Nest places are concealed in the facade and become one with the building, both in the Marnixblock and the building with a Rock landscape.

A fourth strategy is reflected in Groenmarkt; integrating the inhabitants by attracting charismatic species. In the Singelgrachtblock, the nest boxes protrude slightly from the façade. Placed in the same playful manner as the terraces, the nest boxes appear to be 'small apartments'. As a result, residents share their balconies with 'the other residents'.

4

Environmental

Introduction to the city species in Rotterdam

No matter how well architects want to fit our designs in their environment, the best solution to help nature is to 'do nothing'. As true nature conservation would always be 'leaving nature as is' and thus design and human interference will always downgrade the wilderness of nature (Wolfgang & Hauck, 2017). This fundamental difference between conservation and landscape interventions is one of the biggest challenges among designers. "*Perhaps that is of course the pre-eminent criticism on architects because they are the designers of that world. But that goes for all people. Since prehistoric times we have been busy bending things to our will, we have proven to be good at that.*" (André de Beardemaeker).

On the other hand, it *is* possible to leave a positive impact on the environment through our intervention. In the previous chapter we saw how humans and non-humans can share and become a community, but this all happens in a bigger context. Namely, both groups are dependent on the thriving ecosystems on Earth.

This chapter explores how we can react to our surroundings and how to connect the building with the ecosystems. First, a history of ecology thinking in architecture is summarized and then is discussed how you can involve residents in an ecological lifestyle. Last, we learn a strategy to explore the environmental layers on the site in Rotterdam and use them as a base to start implementing the design on the plot.

Environmental or ecological

There is a fundamental difference in thinking environmental and ecological. The technical layers of environmental care are about closing loops, avoiding pollution, and re-using finite resources. Ecological residents often continue these ideals, where taking care of the environment becomes a lifestyle, a holistic way of living. Passive housing, self-sufficient housing and other, more experimental ecovillages are housing concepts that reflect a lifestyle that rigorously minimizes the

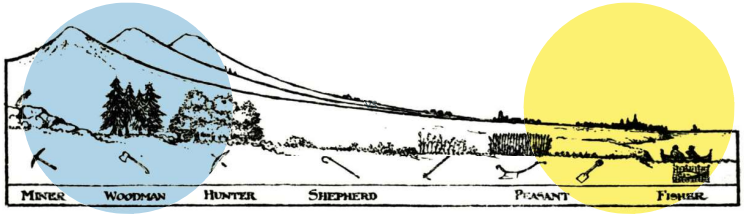


Fig. 147.
Peter Geddes c. 1909 The Valley Section

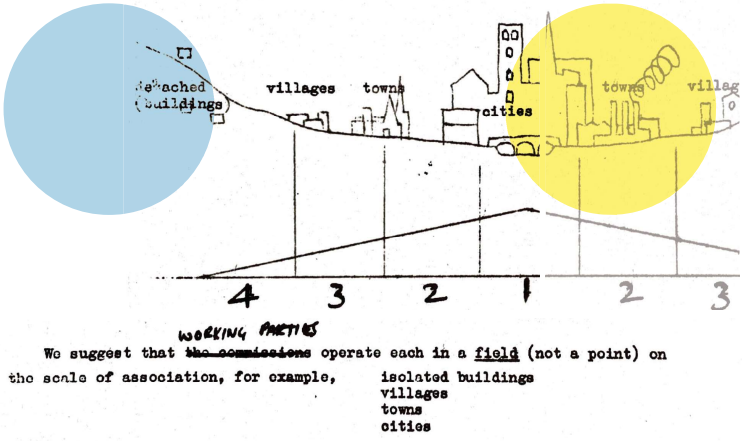


Fig. 148.
Alison and Peter Smithson, for Team 10, CrossSection through the Valley Region Doorn, Manifesto, 1954.

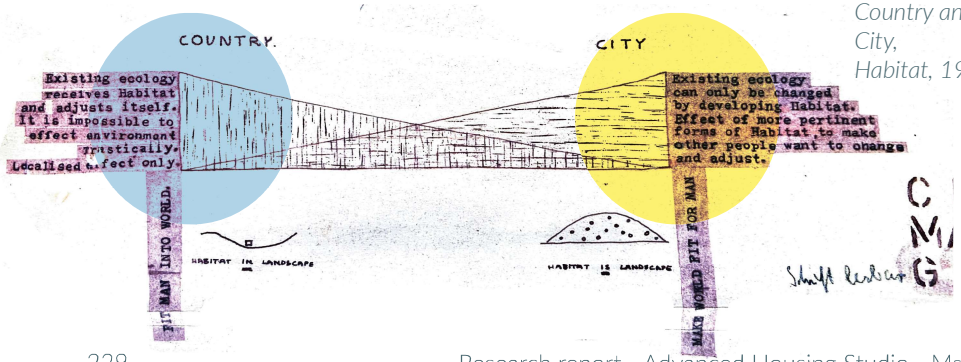


Fig. 149.
Alison and Peter Smithson, Country and City, Habitat, 1956

environmental space. These housing styles tend to be recognized and appreciated by people with a similar lifestyle.

Ecology thinking in Architecture

The dualism between city and nature is a more frequent phenomenon in literature. This is certainly a sensitive subject for architects since they are the designers of the world in which 'humans' flourish. "*That dualism is contrived, it has been classified by people themselves to validate their own behaviour, namely clearing everything that gets in the way without looking back, so that you can fulfil the function you want to fulfil. That is, after all, designing your city*." (André de Beardemaeker)

Wolfgang and Hauck (2017) describe in their research how this separation between the two - the urban realm and wilderness - came to be. The idea evolved from 'landscape' compositions during the 15th century in Dutch painting workshops. This principle - a pictorial understanding of nature - translated into the garden designs of the bureaucracy in the 16th century. As framing of picturesque views on walks became more popular, these views started to include their typical inventory of species. Here lies the origin of the symbolic value of specific animals that are only belonging to their natural habitat.

Ecology thinking, reconceptualizing architecture and the way of being in the world, has become popular among key thinkers such as Felix Guattari and Donna Haraway. It reshapes the recognition of this interrelationship between 'men and things'. Various interpretations of 'the city in its landscape' can be found in architectural discussions; in the book, '*Habitat; ecology thinking in architecture*' by Heuvel et al., (2020) three fundamental turning points in the discussions are explained.

Habitat is a concept borrowed from biology and is now used in multiple disciplines, such as anthropology and architecture. It originally comes from the Latin word *habitare*, meaning 'to dwell'. Around the 1950's it became a popular topic of discussion among architects in CIAM, advocated by Le Corbusier. The sketch of 'the Valley' by the biologist Gebbes lays the foundation for placing the city in its context. The notion of seeing the city as a habitat – thus relational, embedded, conditional and above all contextual, thinks of architecture as part of a larger whole. This concept was new and different, as opposed to the earlier 'functional city' in which only functions within the city are strictly divided into zones. This has resulted in a new scale of association, instead of division into functions.

However, the landscape itself is little further included in the various notions in the following CIAM discussions. Except by Alison and Peter Smithson in 1956, as they briefly aim to theorize landscape in relation to habitat and ecology. They describe the relationship between habitat and landscape (country). On one side they situate a habitat in the landscape, 'make man fit for world' and on the other side they distinguish habitat as a landscape 'make world fit for men'. As they sketch a gradual transition in the diagram between the two worlds, the question arises of what happens in the zone in-between.

A shift arises in 1972 when the Club of Rome presented the 1972 – limits to the growth – report. People are starting to feel the urge to take care of the environment. Driven by emerging issues such as climate change and species extinctions, the question is no longer whether we want to change architecture, but how. An ecological approach would increase the potential for a harmonious man-nature relationship, even in densely populated areas.

Social-sustainable lifestyle

Building sustainable architecture doesn't mean that the residents will also live sustainably, this asks for a behaviour change, that without understanding the problems at first, sustainable housing is meaningless (Dorst, 2012). Ecological housing often is associated with hippy communes that would like to live off-grid, one with nature and almost spiritual. But these communes are rare, as the Dutch governance does not allow zones like that, besides, water and infrastructure are always close (Dorst, 2012).

Cohousing projects are often associated with environmental or ecological concerns, or as advocacies of lower-carbon lives. However, this is not always the case, although they do seem to have reoccurring sustainability themes in member organizations (Jamieson & Simpson, 2013, p. 223). Cohousing does open up the possibilities of collective technical innovations on sustainability measures in the building, that are more difficult to implement by individual households.

Sustainable housing – *Focus on four layers*

How then create conditions to reach a sustainable, environmentally friendly design. The design should therefore fit in with its environment, in line with the various components of the ecosystem. The levels that Kristinsson determined were the abiotic, biotic, technical and atmospheric layers (Kristinsson, 2012). These distinctions in layers can be used to step-by-step connect the building loops in the context. Analysing these layers and the exchange of flows between them will influence the living conditions of the chosen target groups.

1. The a-biotic layer contains inanimate components such as water, soil and raw materials. Groundwater and foundations play an important role in the design. Raising the site with the soil creates a hilly landscape so that the parking garage can be placed at the current ground level.
2. The biotic layer consists of living organisms, and also contains the flora and fauna. This will be discussed in more detail in the next section.
3. The third layer is the anthropogenic component, the technical one encompasses everything man-made. By applying innovative techniques, when using resources, we can reduce the impact of this layer.
4. Finally, the fourth primary component is that of the physical shell of the Earth. This includes, among other things, the air, light, sound and heat. By properly analyzing these components, we can initially make the building co-operate with these components.

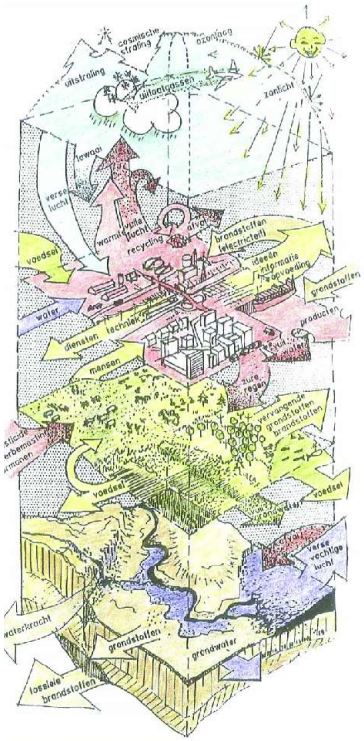


Fig. 150.
The four layers of Kristinsson
Kristinsson, 2012

Fig. 151. *Forest landscape*
(own image)

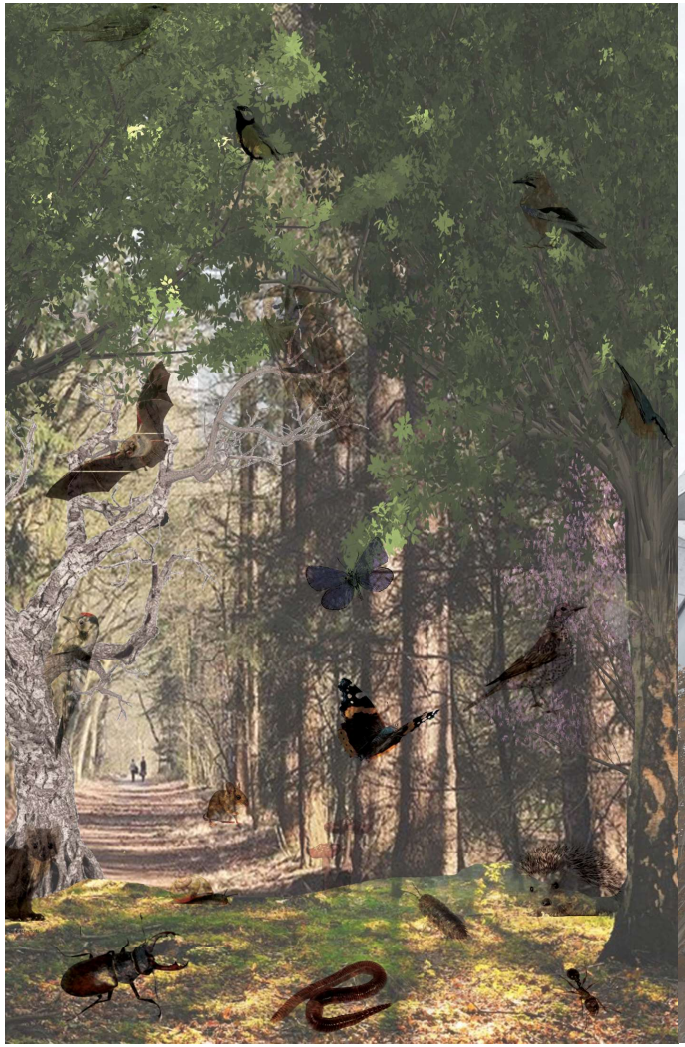


Fig. 152. *Rock landscape*
(own image)

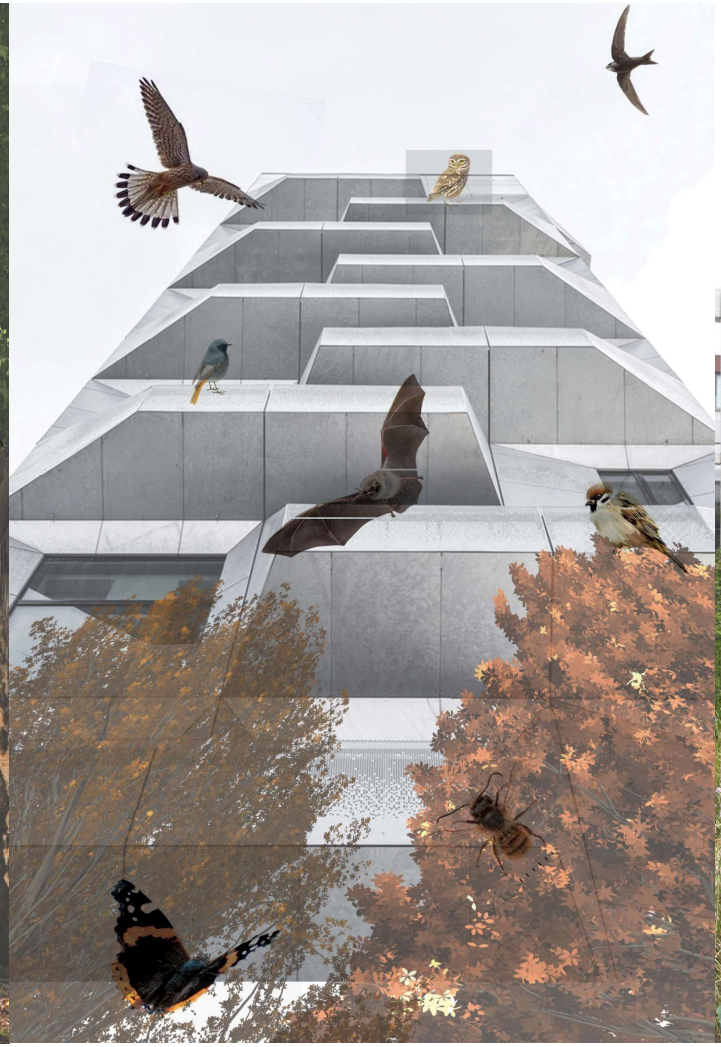


Fig. 153. *Garden landscape*
(own image)

The biotic layers in focus – *Which biotopes can we find on the site?*

Of all possible biotopes in Rotterdam, three of them are distinguishable within the direct context of the site in Walenburghof, as proposed by the master plan. The project building stands on the border between two worlds. On one side is the courtyard, which we could compare most to a large garden. As the site is situated in Blijdorp, this space fits in with the surrounding historical city typology. On the other side is a thin zone, between the building and the rail tracks, where the vegetation is designed somewhat rougher and more impenetrable. These extreme new urban conditions are created within the masterplan, to act as an artificial forest edge. Moreover, the building itself also acts as a biotope in its environment, resembling that of a rock. Since the walls of the new building will shape the boundaries on the chosen site.

Urban Forestry

Urban forestry included scrubs and secondary woodlands, as well as trees in streets, parks, gardens, woodland and industrial areas (Wheater, 1999). Within the master plan, we create the new biotope of a forest edge, a representation of a rich and diverse environment with lots of nutrients. The trees are important for the number of insects on the site, leading to a wide range of invertebrates. Trees whether dead or alive, provide food for many bigger birds, such as woodpeckers and finches.

This forest-like edge, has a great impact on its surroundings, reducing the impact of the train tracks on the south side. The zone helps to reduce the local climate conditions, provide shading in the summer and acts as a watershed for soil erosion. Also, atmospheric pollution is ameliorated. Deciduous trees can reduce dust fall by 27% and 9% of suspended particles, and even better, coniferous trees reduce dust fall by 38% and intercept 13% of particles (Wheater, 1999). They can also reduce noise pollution; here a dense row of evergreen species is more effective than deciduous trees.

Rock

When you think of biotic layers, the impact of rock-rich environments is often forgotten. Walls, buildings and paved areas do contribute to nature in the city. These elements can be seen as analogues of cliffs and bare rocks, inhospitable areas but with their corresponding flora and fauna (Fassbinder, 2011; Stiphout, 2019). The building can therefore be seen as a biotope in itself, a place where species come together.

City buildings provide great opportunities for nesting, roosting and perching sites for birds and bats, together with habitats for lichens, mosses, ferns, flowering plants and invertebrates (Wheater, 1999, p. 55). Roof gardens (if not used aesthetic and recreational) create opportunities to provide more greenery in the city and can contribute to cooling the city by retaining water.

Garden and courtyards

Today many houses have a form of a garden on the ground floor, that provides food and shelter for wild plants and animals. These individual plots form a continuous track in (sub)urban areas This asks for awareness and participation among private owners in the city, as only 40% of the public area is part of the Municipality of Rotterdam (Gemeente Rotterdam, 2020). This system needs to be connected, as the animals and plants do not distinguish borders, and do not notice the owner.

Often chosen for their flowers and fruit, plants in gardens provide a diversity of habitats. While many chosen plants are not native, there is a wild diversity of plant species; trees, shrubs, herbaceous plants and grasses. Less attractive aspects of gardens also contribute to this, such as a compost heap or a pile of firewood.

Reflection

Project situation within the TU Delft

The title of my graduation project is *Togetherness;* it ensures housing for both solo-dwellers and bats in Rotterdam, while at the same time creating a stimulating environment for sharing space (*graduation topic*). The design contributes to the broader question of how to create an 'Ecology of inclusion' (*studio topic*). The Dwelling studio focuses specifically on housing that sustains such a holistic and long-standing design approach; thus, architects need an understanding of dwelling as a social practice and of the city as an ecology. This is an important challenge in the architectural field (master track: architecture). By designing a building based on extended research, this graduation project will contribute to the larger discussion at the faculty of Architecture of TU Delft (*master programme*).

Relation research and design

Zoom in and out

The starting point of my research was the creation of a sustainable future-proof building, which not only invites people but also natural elements into the design at a central location in the city of Rotterdam. The project aims to create a *Togetherness*, among humans, but also between humans and non-humans, in the context of their environment. To set up the research, I used the philosophy of Guitarri's *The Three Ecologies*. In his work, he states that to create a fully-fledged ecology, it must work on the three scales independently first if it is to work well together on all levels. This framework helped me to divide the design assignment into smaller issues. This way I could always zoom in specifically on a part of the design. With the knowledge gained in researching that subject, I was then able to zoom into specific parts of the design and while zooming out again, it would all make sense in the bigger picture.

Balance human and non-human aspects

The first layer in the ecologies consisted of making homes for the solo dwellers and making suitable habitats for bats. Based on Lefebvre's work *Representations of Space*, I was able to subdivide the residents' wishes for dwelling space into their daily routines, spatial concepts, and place experience. By approaching the life of humans and bats in the same way, I was able to maintain a better balance between the wishes of humans and those of non-human creatures in the design.

Solo dwellers and typologies

I learned that different solo-dwellers have different demands on their homes, and this quickly resulted in different dwelling typologies of ground-bound houses, cluster apartments and top-up dwellings among a street. These typologies happened to be quite easy to process in the classic three-level division of a building. The development of the cluster homes was the biggest challenge, which is why the focus after the P2 was on these dwelling types. The same issues appeared with the design of the ground-bound houses, since they shaped the ground floor accessibility and landed the building in its context. The design of the last typology started after the P3 and became easier as the research progressed. With the knowledge gained from the research about the solo-dwellers housing wishes, I was then able to design housing plans more quickly.

Translating non-human needs into guidelines

Researching the housing needs of bats was one of the most difficult subjects. Since this information was less written for the purpose I was looking for, namely telling stories. The trickiest thing was to adapt the information found to the same requirements that people have for their living environment. This had to work to eventually tell a coherent story throughout my research. The insights obtained were then quite easy to use to defend choices in the design.

Telling a story of Togetherness

The second layer of the ecologies was about sharing between people, and between people and non-humans. In this chapter, the different characters come together in the design. By looking at other projects about living together, I was able to create different forms of living that fit the needs of the solo dwellers. This has had a profound influence on the choice of collective functions in the building and their position.

The lessons I learned from cohabiting with bats also ensured that priority was given to their necessities. For example, this process is very

Fig. 154. *Iterations on the facade design*

visible in the design process of the facade. The facade of the building clearly shows which part is reserved for the bats, thus telling a story of living together in the city.

Context

Finally, the building is placed in its context. Sustainable interventions in the circularity of the building ensure that the building has a smaller impact on its environment. Involving residents and creating a green core also contribute to increasing support. The urban plan, which was drawn up with the group in the first weeks, ensured that my building stood on a tension between a green park zone and a busier courtyard, on top of a green slope to make the centre of Blijdorp greener.

Relation research methods and insights

Most of the insights in the report come from reading literature and doing an interview. Drawing a graphic novel was a nice tool to capture knowledge that was more difficult to formulate in words. I also made use of typological analysis in different case studies.

Literature

Literature about solo dwellers specifically in the Netherlands was difficult to find. As a result, I have made extensive use of international studies, which in turn make use of sources from several countries. In the research, the chapter on solo dwellers is mainly based on the work of Klinenberg. His book *'Going solo on a massive scale'* gave me a foothold to fathom and understand the way of life of the solo-dwellers.

In retrospect, I would have liked to spend more time fully reading and understanding multiple sources about solo dwellers in the same way. Now the research seems to be based a bit too much on Klinenberg. To fix this issue a little bit, I did consult multiple sources per type of solo dweller and supplemented the missing information with other sources. This way, a more nuanced picture would arise. Moreover, I contacted ANA Architects to consult their publications on target group investigations. Their works helped me to translate my knowledge into architectural elements. I do believe this method helped to contribute to the discussion on solo-dwellers in the architectural field.

For the chapters about sharing, I looked at sources that described the co-living and cooperative models. Since this topic is not yet quite prevalent in the Netherlands, these sources are mostly from other countries as well. In contrast to all the above, I did look up literature about bats in Dutch as much as possible, so that the rules and standards would correspond most closely with the Dutch regulations.

Interview

The interview with an urban ecologist allowed me to ask specific questions about the site and urban nature in Rotterdam in general. It was a remarkably interesting conversation to help me well on my way at the beginning of the design. During the conversation, I mainly learned about the role of the designer in contributing to the development of urban nature.

Graphic novel

The graphic novel helped to tell a story about the target group. The drawings stimulated me to empathize with the daily life of the dwellers and the life of a bat and increased my empathy as a designer.

Case studies

In terms of case studies, next time I would look even more specifically for projects built for one person. Now the case studies also had to meet the requirements that they included shared areas within the project. As a result, it was sometimes possible that a house in a case study could accommodate several people. I learned more from the research on sharing than the research meant for the solo dwellers. To better answer the question of how best to set up the space for a solo dweller, another selection could be made in a follow-up study.

The same was visible in the choice of the case studies on the topic of cohabitation. This study resulted more in an investigation of possible design solutions, and technical aspects of incorporating animals into the building. Afterwards, it would have been more interesting to look at historical examples of cohabitation between humans and non-humans, to learn more about the less graspable social aspects of sharing.

Contemporary societal issues and challenges

The graduation work contributes to the larger challenges of future housing projects in the Netherlands. This future will not only be about the quantity of housing but qualitative housing projects that will sustain. Therefore, challenges on how to create an ecology in the city and how to include the political debate of inclusive systems need to be discussed to create sustainable housing.

The graduation project contributes especially to the notions of nature inclusive design – by searching for a more fundamental understanding of the impact of architecture on the species while creating a community based on sharing principles between humans and nonhumans. The question is whether there will be room within the Netherlands to experiment with new forms of housing and whether the cooperatives will gain more support.

Ethical issues and dilemmas

In my design, I try to grasp the way of life of a bat in the same approach as to how we define spaces for humans, based on Lefebvre's notions of space. The question is, of course, whether this approach is ethically correct. Can we humanize the life of a bat or is this something we - as human beings- should not do?

This approach was chosen to be able to apply the gained research insights into the design. By doing this, I tried to make the insights of the daily struggles of a bat explicit, to be able to respond better to their needs. This choice was made for this project since, in the end, the question was seen from the role of the architect.

Of course, the applied 'houses' for the bats are placed in a fictional project. Whether they would eventually be put in use by the bats, if the project would have been built, is something that lies outside the boundary of the architect's hand. The only thing architects can do is make the habitation possibilities as optimal as possible, based on the available insights. Time will eventually have to show if the initiated measures would have worked the way they were intended. At least I – an architect to be - did everything I could.

B

Biblograhpy
Research report

Interviews:

André de Baerdemaeker – Bureau Stadsnauur Rotterdam. Online interview (Delft-Rotterdam) via zoom on 21 januari 2022 om 14.00. Duration: 1,5 hour.

Literatuur:

Ahn, J., Tusinski, O., & Treger, C. (2018). *Living Closer: The many faces of co-housing*. Studio Weave. https://issuu.com/studioweave/docs/living_closer_for_online_sharing_re

ANA architecten. (2019). *K woning*.

ANA Architecten. (2020). *Grijstinten - De leefwereld van ouderen*.

ANA Architecten, & Gemeente Amsterdam. (2018). *Ouderen wonen in de stad*.

Archive Themerson. (1999). *Stefan Themerson - Bibliography*. Collected Poems. http://www.themersonarchive.com/pageDmed.htm

Asani, K., Fuchs, A., & Mansouri, A. (2021). *An Idea of Sharing*. Cooperative Conditions. https://cooperativeconditions.net/home/1-an-idea-of-sharing

Babos, A., Szabó, J., Orbán, A., & Benkő, M. (2020). Sharing-based co-housing categorization: A structural overview of the terms and characteristics used in urban co-housing. *Epites-Epiteszettudomany*, *48*(3–4), 331–355. https://doi.org/10.1556/096.2020.009

BIJ12. (2017). *Kennisdocument Gewone dwergvleermuis Pipistrellus pipistrellus Versie 1.0, juli 2017*. 30. https://www.bij12.nl/assets/BIJ12-2017-004-Kennisdocument-Gewone-dwergvleermuis-1.0.pdf

Biotope City. (2021). *Concept*. https://biotope-city.net/

BPD. (2015). *Woonwensen van eenpersoonshuishoudens*. https://corpweb.bpd.nl/media/87025/bpd_publicatie_eenpersoonshuishoudens_lr-web.pdf

Cross, N. (2007). *Designerly ways of knowing* (Research P).

De Zoogdiervereniging. (2022). *Gewone dwergvleermuis* . De Zoogdiervereniging. https://www.zoogdiervereniging.nl/zoogdiersoorten/gewone-dwergvleermuis

Dorst, M. van. (2012). Duurzaam wonen, duurzaam leven. In D. van Gameren, D. van Den Heuvel, F. van Andel, P. Vollaard, & J. Vink (Eds.), *DASH: The Eco House* (07 ed., pp. 48–55).

Dove, C. (2020). *Radical Housing; Designing Multigenerational + Co-Living Housing for All*. RIBA Publishing.

Duin, van C., te Riele, S., & Stoeldraijer, L. (2018). *Huishoudensprognose 2018-2060: opmars eenpersoonshuishoudens zet door* (Issue December).

Fassbinder, H. (2011). *The City As A Rocky Landscape*. Biotope City Journal. https://biotope-city.net/the-city-as-a-rocky-landscape/

Gehl, J., & Sim, D. (2019). *Soft city - Building density for everyday life*. Island Press.

Gemeente Rotterdam. (2020). *Samen werken aan rijke Rotterdamse stadsnatuur - Uitvoeringsagenda Biodiversiteit*. https://rotterdam.raadsinformatie.nl/document/9563301/2#search=%22uitvoeringsagenda

Gemeente Rotterdam. (2021). *De 10 van 010 | Rotterdam.nl*. Gemeente Rotterdam. https://www.rotterdam.nl/wonen-leven/10-van-010/

Gemeente Rotterdam. (2022). *Natuurwaarnemingen - GisWeb*. https://www.gis.rotterdam.nl/Gisweb2/Default.aspx?context=MIJN-PROJECT.1403

Gibson, K. (2020). Speculations on Architecting Care Beyond the Anthropocene. *Critical Care*, *August*. https://doi.org/10.7551/mitpress/12273.003.0015

Guattari, F. (2000). *The Three Ecologies* (I. Pindar & P. Sutton (eds.)). The Athlone Press. http://books.google.com/books?id=ZqcYtjGsanQC&pgis=1

Gunnell, K., Murphy, B., & Williams, C. (2013). *Designing for biodiversity: A technical guide for new and existing buildings* (Second). RIBA Publishing. https://doi.org/10.4324/9780429347658

Haraway, D. J. (2016). *Staying with the trouble; Making Kin in the Chthulucene*. Duke University Press.

Hauck, T. E., & Weisser, W. W. (2015). *AAD - Animal Aided Design*. http://bln-berlin.de/wp-content/uploads/2016/04/Animal-Aided-Design-Broschuere.pdf

Hechmann, O., & Schneider, F. (2018). *Floor plan manual housing* (E. Zapel (ed.); Fifth). Brikhäuser.

Heren 5 Architecten. (2016). *Stadsveteranen - een onderzoek naar verhalen over gelukkig oud worden in de stad*. Lulu. https://issuu.com/heren5architecten/docs/160616-stadsveteranen-definitiefboe

Herman Limpens. (2016, August 2). *Gewone dwergvleermuizen op de vuist* . De Zoogdiervereniging. https://www.zoogdiervereniging.nl/nieuws/2016/gewone-dwergvleermuizen-op-de-vuist

Heuvel, D. van den, Martens, J., & Muños Sanz, V. (2020). *Habitat: Ecology Thinking in Architecture*. Nai010 publishers.

Hoppesteyn, M. (2016). *Bevolkings- en huishoudensprognose Rotterdam 2015-2035*.

Jamieson, L., & Simpson, R. (2013). *Living Alone; Globalization, Identity and Belonging*. Palgrave Macmilla. https://doi.org/10.1057/9781137318527

Kaestle, A. (2016). Wer teilt, hat mehr. In O. Bahner & M. Böttger (Eds.), *Neue Standards. Zehn Thesen zum Wohnen.* (pp. 124–134). jovis Verslag GmbH.

Karsten, L. (2013). Op zoek naar stedelijkheid in de luwte. In *Nestelen in de stad* (pp. 18–25). BNA.

Keesom, J. (2013). *Nestelen in de stad : appartementen voor gezinnen*. BNA.

Klinenberg, E. (2012). *Going Solo.The Extraordinary Rise and Surprising Appeal of Living Alone*. Penguin Press.

Korsten, E. (2012). *Vleermuiskasten: Overzicht van toepassing, gebruik en succesfactoren*.

Korsten, E. (2019). *Beschuit met vleermuisjes*. De Zoogdiervereniging. https://www.zoogdiervereniging.nl/nieuws/2019/beschuit-met-vleermuisjes

Korsten, E. (2020, April 16). *COVID-19 en vleermuizen: de feiten op een rij*. De Zoogdiervereniging. https://www.zoogdiervereniging.nl/nieuws/2020/covid-19-en-vleermuizen-de-feiten-op-een-rij

Kristinsson, J. (2012). *Integrated suistainable design*. Delft Digital Press.

Lefebvre, H. (1974). *The Production of Space* (D. Nicholson-Smith (ed.)). Blackwell.

Leupen, B., & Moiij, H. (2011). *Housing Design: A Manual*. Nai010 publishers. http://books.google.es/books?id=7Kj8ygAACAAJ

Marc Frohn, & Thomas E. Hauck. (2021, June 5). *Manifest für eine Architektur der Cohabitation*. Modellverfahren Mäusebunker. https://www.modellverfahren-maeusebunker.de/diskurs/manifest-fuer-eine-architektur-der-cohabitation

Meijer, E. (2021, December 31). Inleven is de sleutel tot beter samenleven. *De Volkskrant*, 20–21.

Moon, D. C., Moon, J., & Keagy, A. (2010). Direct and Indirect Interactions. *Nature Education Knowledge*, *10*(3), 5p. https://www.nature.com/scitable/knowledge/library/direct-and-indirect-interactions-15650000/

MvLNV. (2022). *Rode lijsten | Beschermde natuur in Nederland*. Ministerie van Landbouw, Natuur En Voedselkwaliteit. https://minlnv.nederlandsesoorten.nl/content/rode-lijsten

Nagel, T. (2020). What Is It Like to Be a Bat. In *The View from Nowhere* (Issue 6, pp. 49–63). https://doi.org/10.7146/lev.v0i6.118860

PBL. (2015). *De stad: magneet, roltrap en spons*. https://www.pbl.nl/sites/default/files/downloads/PBL_2015_De_stad_magneet_roltrap_en_spons_1610_1.pdf

PBL. (2022). *Introduction to biodiversity*. PBL - Netherlands Environmental Assessment Agency . https://www.pbl.nl/en/en/topics/biodiversity/introduction-biodiversity

Prominski, M. (2019). Come Together. Enhancing Biodiversity in High-Density Cities by Giving Space to Humans and Non-Humans. In B. M. Rinaldi & P. Y. Tan (Eds.), *Urban Landscapes in High-Density Citites* (p. 290). Brikhäuser.

Schilthuizen, M. (2018). *Darwin Comes to Town - How the urban jungle drives evolution*. Picador.

Schmid, S. (2019). A history of collective living : Forms of shared housing. In S. Schmid, D. Eberle, & M. Hugentobler (Eds.), *Eidgenössische Technische Hochschule (ETH) - Wohnforum*. Birkhauser.

Spoelstra, K., Van Grunsven, R. H. A., Donners, M., Gienapp, P., Huigens, M. E., Slaterus, R., Berendse, F., Visser, M. E., & Veenendaal, E. (2015). Experimental illumination of natural habitat—an experimental set-up to assess the direct and indirect ecological consequences of artificial light of different spectral composition. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *370*(1667). https://doi.org/10.1098/rstb.2014.0129

Steffen, W., Crutzen, P. J., & McNeill, J. R. (2007). The anthropocene: Are humans now overwhelming the great forces of nature? *Ambio*, *36*(8), 614–621. https://doi.org/10.1579/0044-7447(2007)36[614:TAAHNO]2.0.CO;2

Stiphout, M. van. (2019). *First guide to nature inclusive design* (G. Havik & M. Lehner (eds.)). nextcity.nl. https://issuu.com/ds_landscape_architects/docs/firstguide

Vink, J., Vollaard, P., Zwarte, N. de, Tee, J., & Vink, J. (2017). *Stads natuur maken = Making urban nature*. Nai010 publishers.

Voortman, T., & Bakker, G. (2020). Spatial and temporal variation in maternity roost site use of common pipistrelles Pipistrellus pipistrellus (Mammalia: Chiroptera) in Rotterdam. *Deinsea*, *19*, 1–16.

Wheater, C. P. (1999). Urban habitats. In *Urban Habitats*. Routledge. http://ebookcentral.proquest.com/lib/delft/detail.action?docID=179898

Wolfgang, W. W., & Hauck, T. E. (2017). Animal-Aided Design – using a species' life-cycle to improve open space planning and conservation in cities and elsewhere. *BioRxiv*, 14. https://doi.org/https://doi.org/10.1101/150359

Biblograhpy
Case studies

Abdel, H. (2020, January 29). *Treehouse Coliving Apartments / Bo-DAA*. ArchDaily. https://www.archdaily.com/932735/treehouse-apartment-building-bo-daa

Angela Fitz, & Krasny, E. (2008). *Housing Models. Experimentation and Everyday Life: Miss Sargfabrik*. http://www.wohnmodelle.at/index.php?id=88,79,0,0,1,0

Anne Malliet. (2015). Zürich Pilootproject 'Meer dan wonen.' *A+ Architectuur in België*, *256*, 75–78.

Arbeitsgemeinschaft Futurafrosch, & Duplex Architekten. (2010). *Häuser im Dialog: Ein Quartier entsteht*.

Asani, K., Fuchs, A., & Mansouri, A. (2021). *An Idea of Sharing*. Cooperative Conditions. https://cooperativeconditions.net/home/1-an-idea-of-sharing

Astbury, J. (2019, August 12). *Treehouse is a sloping block of co-living apartments with a tree-filled atrium*. Dezeen. https://www.dezeen.com/2019/08/12/treehouse-co-living-bo-daa-seoul-concrete/

Beck, H., & Cooper, J. (2000). *Miss Sargfabrik Housing Collective - Architects' statement*. 20–28. https://janjiraruk013.files.wordpress.com/2010/12/bkk-3-architects-miss-sargfabrik-housing-collective-vienna-austria.pdf

Bo-DAA. (2021). Treehouse. *ARQ*, *107*(2020/21), 70–81. https://www.scielo.cl/pdf/arq/n107/en_0717-6996-arq-107-70.pdf

Bo-DAA. (2022). *Residential - Treehouse, Seoul*. Bo-DAA. https://www.bo-daa.com/en/residential

Brombach, K., & Holl, C. (2009). Sargfabrik und Miss Sargfabrik, Wien (A) - Integratives Wohnen mit Quartiersbezug. In BMVBS/BBSR (Ed.), *Werkstatt: Praxis Heft 63 - Stadtquartiere für Jung und Alt - Europäische Fallstudien* (pp. 86–95). Druckdienstleistungen GmbH.

Brussels Dossier. (2020). *Projectfiche Duurzame wijken - Hunziker Areal , Zürich*.

Dionysus. (n.d.). *TREEHOUSE Design & Build* . Retrieved May 16, 2022, from https://dionysus.works/project/treehouse/

Gina Rauschtenberger, & Alexia Zeller. (2021). *Public Opinion*. Cooperative Conditions. https://www.cooperativeconditions.net/home/2-public-opinion

Hunziker Areal. (2018). *Konzept zu Allmendflächen des Hunziker Areals* (pp. 1–3).

Kaestle, A. (2016). Wer teilt, hat mehr. In O. Bahner & M. Böttger (Eds.), *Neue Standards. Zehn Thesen zum Wohnen.* (pp. 124–134). jovis Verslag GmbH.

Liu, S. (n.d.-a). *Treehouse App Design*. Retrieved January 13, 2022, from https://www.shirley.works/portfolio/treehouse-app/

Liu, S. (n.d.-b). *Treehouse Brand Illustration*. Retrieved January 13, 2022, from https://www.shirley.works/portfolio/treehouse_illustration/

Lootsma, B., Ruby, A., & Ruby, I. (2005). Bkk-3. 2G. In *Revista internacional de arquitectura*, *1136-9647 ; 36-2005/IV*. Gili.

NESS. (2020). *Composing Community: Treehouse by Bo-DAA*. NESS. https://nessmagazine.com/composing-community-treehouse-by-bo-daa/

Putt, P. van der, & Klijn, O. (2012). Miss Sargfabrik. *DASH*, *#08*(Building Together), 116–123. https://doi.org/10.1515/9783034610667.92

Rita. (2021, February 14). *Want to get divorced? Asia's ultra-luxury shared apartment is here! 72 unfamiliar men and women live together, with an average of 20 square meters per person, and they will be fixed as soon as they are rented out! Bo Daa*. Sohu. https://www.sohu.com/a/450821389_200550

Ronald, R. (2017). The Remarkable Rise and Particular Context of Younger One-Person Households in Seoul and Tokyo. *City and Community*, *16*(1), 25–46. https://doi.org/10.1111/cico.12221

The Essential Housing Campaign. (2021, October 22). *Ep. 15: Tour of "Mehr Als Wohnen" (in Zurich)*. YouTube. https://www.youtube.com/watch?v=QuVGbZjQFc8&t=85s