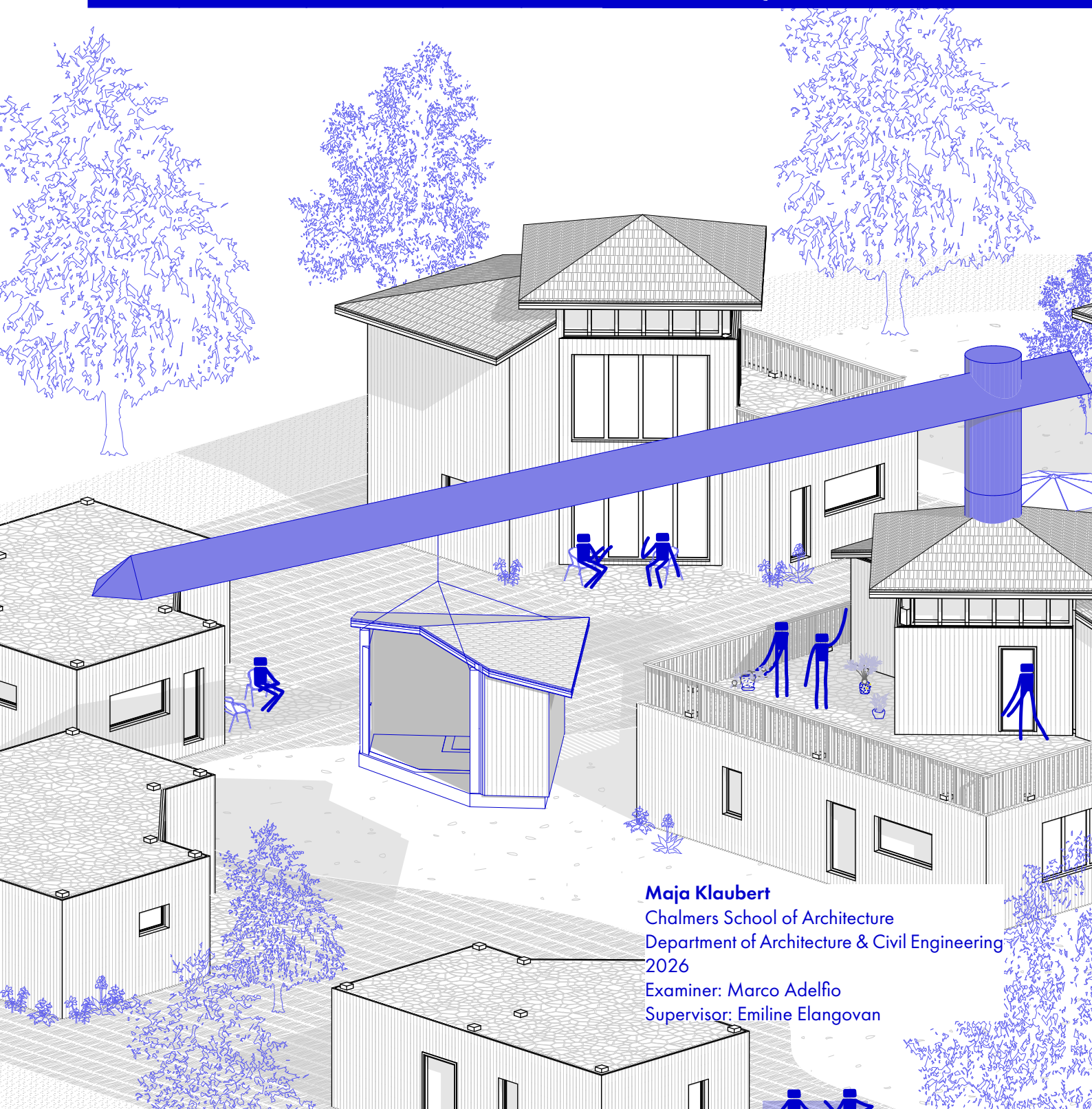
ELEMENTAL HOMES

HOW FLEXIBLE DESIGN CAN ADDRESS SPATIAL INEQUALITY



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Department of Architecture & Civil Engineering
2026
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Supervisor: Emiline Elangovan



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ELEMENTAL HOMES

- How Flexible Design can address Spatial Inequality

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Department of Architecture & Civil Engineering
Masters Programme: Architecture and Planning Beyond Sustainability
Society, Justice, Space
Examiner: Marco Adelfio
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ABSTRACT

Access to desirable urban and suburban areas is becoming more unequal across Northern Europe, where rising housing costs and a chronic misallocation of space limit spatial opportunities for many residents. Older generations occupy large, underused homes they cannot easily leave, while younger households lack access to the space they need. The housing crisis is not one of supply but of distribution.
This thesis investigates how adaptable housing structures can respond to these changing demand patterns while contributing to greater spatial justice. Rather than proposing densification or demolition, it asks whether an existing and widely desired typology, the suburban single family house, can be redesigned from the inside out to become more flexible, more equitable and more socially sustainable over time.

A set of Flexible Design Principles is developed, mapping relevant theories of architectural flexibility across three scales: micro, meso and macro. These principles do not prescribe a fixed solution but provide a framework that architects can apply and interpret depending on context.

The second half of the thesis tests these principles through a roleplaying suburban scenario set in the imaginary town of Grøsbärg. The design proposal, Elemental Homes, introduces a permanent core unit combined with detachable residential modules and a collectively owned community building. Inhabitants own their core unit and rent additional modules from the community, creating a financial and spatial incentive to rightsize as their needs change over time.

To evaluate the design, a scenario analysis game called the Sharing Game was developed and roleplayed with five volunteers. The game simulates 50 years of community life, stress testing the spatial system against the unpredictable life events of a multi-generational community.

Keywords: MODULAR HOUSING; RIGHTSIZING; SPATIAL EQUALITY; FLEXIBILITY

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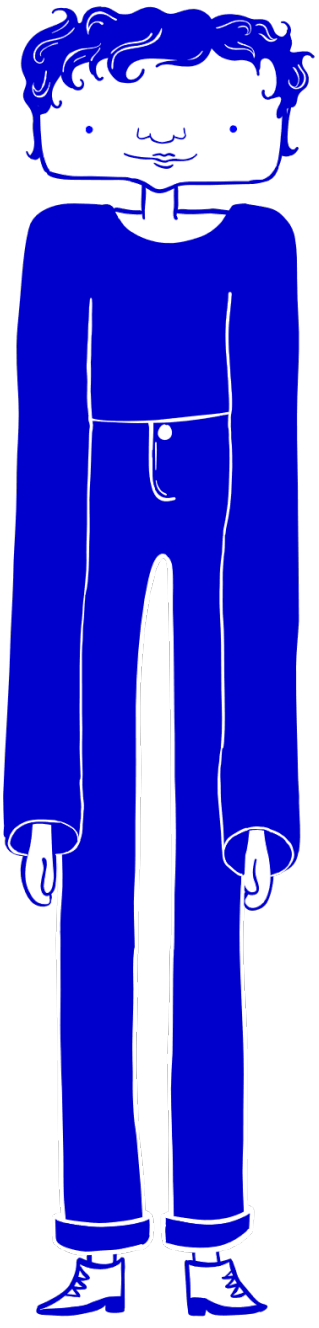


fig. I. Me as a character

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GLOSSARY

ADAPTABLE HOUSING	*Adjustable to needs over time. I. Multi-functionality (using space for different purposes without physical changes) II. Transformability (making physical modifications to the fabric).*
AGEING IN PLACE	*The ability to remain in one's home across the life course.*
HOUSING LADDER	„Trading up" through a sequence of house moves in size and equity as their income grows and their family expands. Until finally the top of the „family home" is reached.
MICRO SCALE	The materiality and elements of a building.
MESO SCALE	The spatial organization and function of a building.
MACRO SCALE	The relationship of the building to its neighbourhood and community.
MULTI-GENERATIONAL LIVING	Co-housing of different generations to encourage mutual support and social connection.
PLACE ATTACHMENT	An emotional bond to a place that shapes identity and belonging.
RIGHTSIZING	Aligning housing size with actual household needs to achieve spatial sufficiency.
SPATIAL INEQUALITY	Unequal distribution of living space per capita.

I. FRAMEWORK

The first part of this thesis consists of the formulation of a general set of rules, to which architects should abide to create socially sustainable housing. These rules will be stated as Flexible Design Principles, developed from different theories around flexible design. They should set a framework not just for my thesis, but also for my future profession as an architect.
They are build from a wider context than a specific location, since the unequal distribution of space seems to be a wider problem that we have throughout densely populated areas in Northern Europe. Also they are more varied in what "flexibility" means. Since each project depends on its context, stakeholders and budget, it will not be possible to formulate a "one size fits all solution". Instead attempted in this thesis is mapping out this set of principles into a logical matrix, from which can be read, which principles are applicable in which situation.

LACK OF SPACE?

- a problem with spatial distribution

Unequal spatial distribution

Often when speaking about the housing shortage, the phrase "lack of space" falls. While cities are more densified and have less space per person, there still is no crisis of supply. The housing crisis in sub-urban northern Europe is a crisis of distribution (Graham et al., 2024).

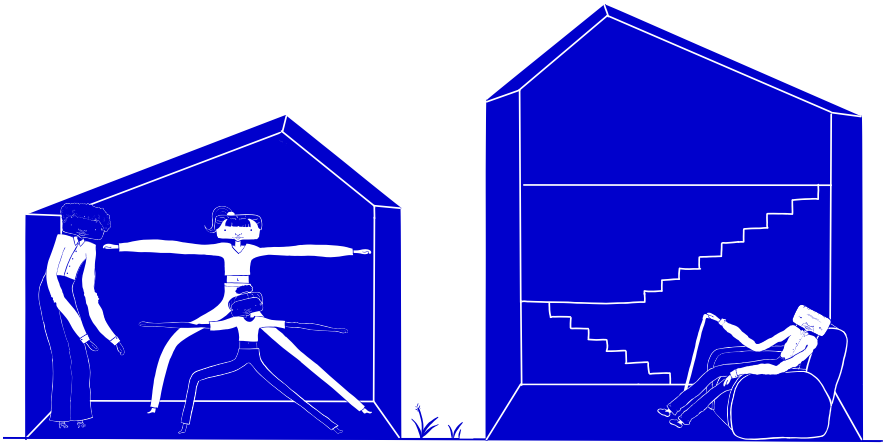


fig. II. Spatial inequality

The physical space that exists is allocated to the wrong people at wrong proportions, at the wrong life stage. For example, 69% of homes in the UK are under-occupied (Bruce et al., 2023, as cited in Graham et al., 2024). This misallocation is structural, not individual. It is built into how housing is developed and inhabited over time (Graham et al., 2024). Forming not a lack of space, but an unequal distribution.

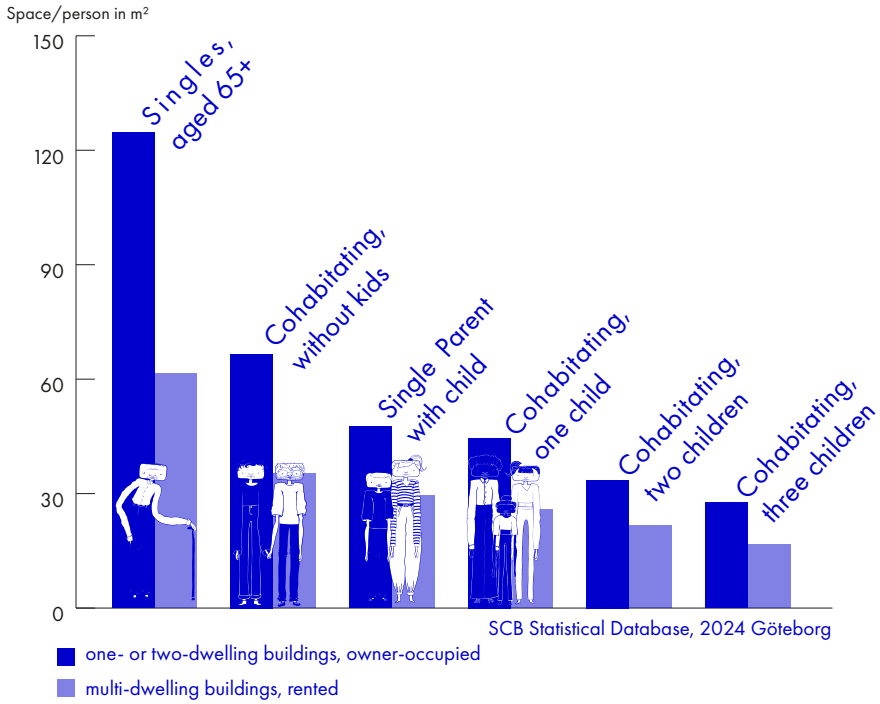


fig. III. Space per person in different lifestyles

Two scales

This housing inequality in the city, we have to differentiate between two different scales. The systemic scale, where housing is treated as an economic asset and the social scale, where space is differently distributed among different demographic groups.

The systemic inequality is mainly driven by property investors controlling large amounts of real estate, purposefully keeping units empty to drive up prices (zu Ermgassen et al., 2022). To solve this, political and regulatory changes are required. While architecture can try to set good examples of supporting alternative systems of private ownership, the main parts are outside the scope of architecture.

Instead architecture can address the social scale, which is about the misalignment between who occupies space and how much space a person actually needs (Graham et al., 2024).

The Neubaugebiet phenomenon

The unequal spatial distribution on the social scale is being fuelled by the "Neubaugebiet Phenomenon". Neubaugebiet is a German word for new development area. But in general understanding it also includes a certain connotation on the demographic and typology in these areas. It is usually young families moving into single family houses (Berndgen-Kaiser et al., 2014). This homogeneous group moves in with the same spatial need, ages together and then their spaatial need shrinks simultaneously (Berndgen-Kaiser et al., 2014). The need for new housing arises, is being filled with one "spatially needy" group of young families, and in 30 years time the problem arises again. Just that now the real estate prices have also risen, because there are fewer plots of land available for development, while the existing stock is getting less densely populated. The housing stock becomes frozen. Too large for its aging inhabitants, but unavailable to younger generations who need it (Berndgen-Kaiser et al., 2014).

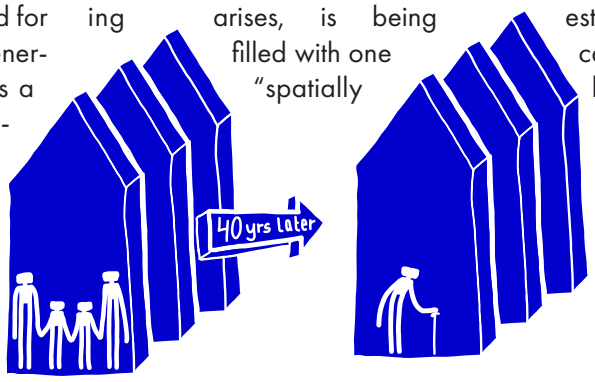


fig. IV. The "Neubaugebiet Phenomenon"

Why not move when you don´t need the space anymore?

When a house becomes too large for its inhabitants, the logical solution seems simple: move somewhere smaller. But this ignores the reality of why people stay. The financial system actively discourages downsizing. Stamp duty and transaction taxes mean that moving is expensive, making staying the most rational economic choice even when a home no longer fits (Graham, 2023). On top of that, older residents often find themselves as "missing movers" trapped not just by costs but by a lack of desirable alternatives (Hudson & Green, 2017, as cited in Graham et al., 2024). The options available rarely match what they already have.

But the deeper barrier is not financial. The home acts as a storehouse for identity and memory, decades of life lived within the same walls (Twigger-Ross & Uzzell, 1996). Being forced to leave does not feel like a practical decision, it feels like a loss. Those who do move, often into institutional care, find themselves in environments carrying what Schaff et al. (2022) describe as a "hygienist echo of the hospital". Spaces that conflict with their sense of self and dignity. So the house stays occupied, long after the spatial need has shrunk.

And when it is eventually vacated, through death or the move to a care facility, the building is typically already 30 to 50 years old. Given that the economic lifespan of a house is roughly 50 years, more than half of its lifecycle may have been spent underoccupied (Graham et al., 2024).

Loneliness in Old Age

So what happens to those who stay? The house that was once full of life gradually empties around them. Children move out, partners pass away, and the rooms that once had a purpose stand quiet. By 2050, more than a third of Europeans will be over 60, with increasingly complex and non-linear life courses and a growing number of them living alone (Schaff et al., 2022; Van Gasse & Wyninckx, 2024). Traditional family structures are fragmenting, leaving older adults with less informal social support than previous generations could rely on (Van Gasse & Wyninckx, 2024).

This is where the spatial and the social problem become one. Older adults are significantly more vulnerable to loneliness than other age groups, with serious consequences for both mental and physical health (Van Gasse & Wyninckx, 2024; Schaff et al., 2022). But this loneliness is not simply a personal condition, it is often an architectural one. Typical residential design encourages a "behind the front door" culture, where residents have little reason to engage with their surroundings (Graham, 2023a). In a large, under-occupied house at the end of a quiet suburban street, the opportunities for spontaneous social contact are almost zero.

The house itself makes things harder. Most current housing stock is physically unsuitable for the functional losses that come with ageing like decreased mobility, the need for home-based care, or simply the difficulty of navigating a building that was designed for a younger body (Andersson et al., 2021; Schaff et al., 2022). The home that was once perfectly suited to life becomes a source of restriction rather than freedom. Too big to manage, too isolating to live well in and as the previous section showed, too emotionally and financially costly to leave.

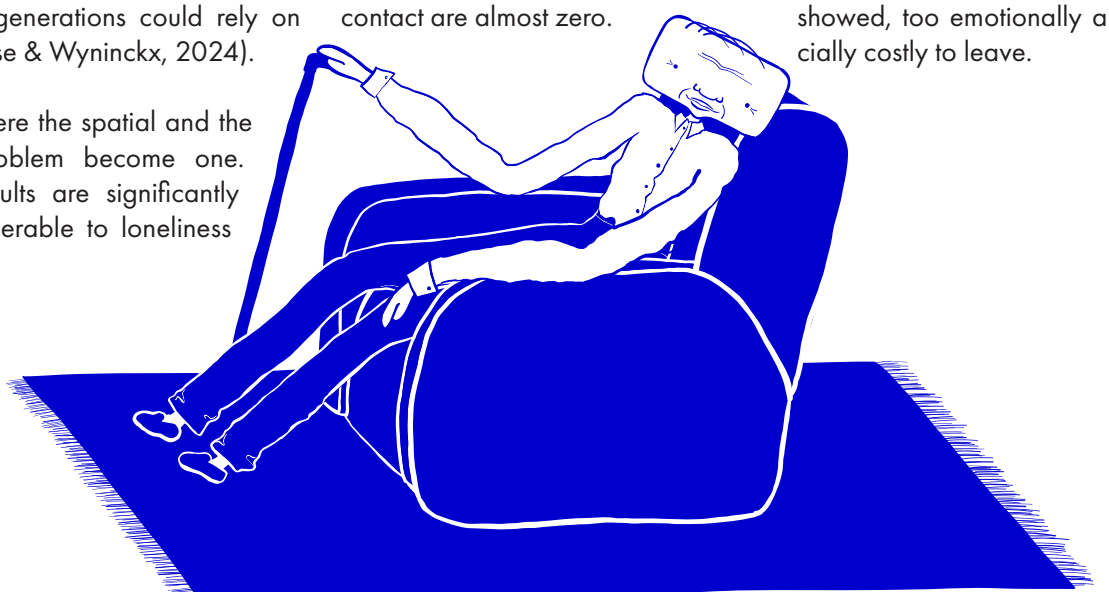


fig. V. Loneliness in old age

Lack of Flexibility

The previously collected problems are the direct consequence of how architecture has been practiced and how buildings have been built. Architects typically design for the moment of handover and rarely see how people actually live in their homes over the following decades (Graham, 2023a). The result is housing designed around a stereotyped occupant, usually the nuclear family, producing "tight-fit functionalist" layouts with rooms so specific they cannot be repurposed for anything other than their original intended function (Pelsmakers & Warwick, 2022; Rabeneck et al., 1973). Life, however, is not linear. Divorce, career changes, the sudden need for home-based care are all not exceptional circumstances, they are the normal texture of a life course (Graham, 2024). The architecture simply does not account for them.

The construction industry compounds this problem. Developers consistently choose cheap, standardized building systems because anything more considered costs more upfront, effectively deselecting any solution that deviates from standard practice (Tarpio et al., 2022; zu Ermgassen et al., 2022). Many modern building systems are optimized for energy performance but are nearly impossible to alter once built (Graham, 2023a). The only flexibility that does get built in tends to be one-directional like an unfinished loft, or an extra room with no determined use, meaning homes can grow in size and cost, but never shrink.

The regulatory system offers little help. Planning decisions fix density and typology at an early stage, long before anyone knows what future residents will actually need (Graham, 2023a). Even sustainability metrics work against adaptability. Energy performance is measured per square meter rather than carbon per person, making an under-occupied home invisible as a problem (Graham, 2024).

These are political and regulatory failures that architecture alone cannot solve, and they sit outside the scope of this thesis. But they point to something architecture can and must address: the buildings themselves.

If people are trapped in homes that no longer fit their lives, and if the buildings around them are too rigid to change, then the question this thesis has to explore is how architecture can be designed differently from the start. Not as a fixed product for a fixed moment, but as a flexible system for an unpredictable life.

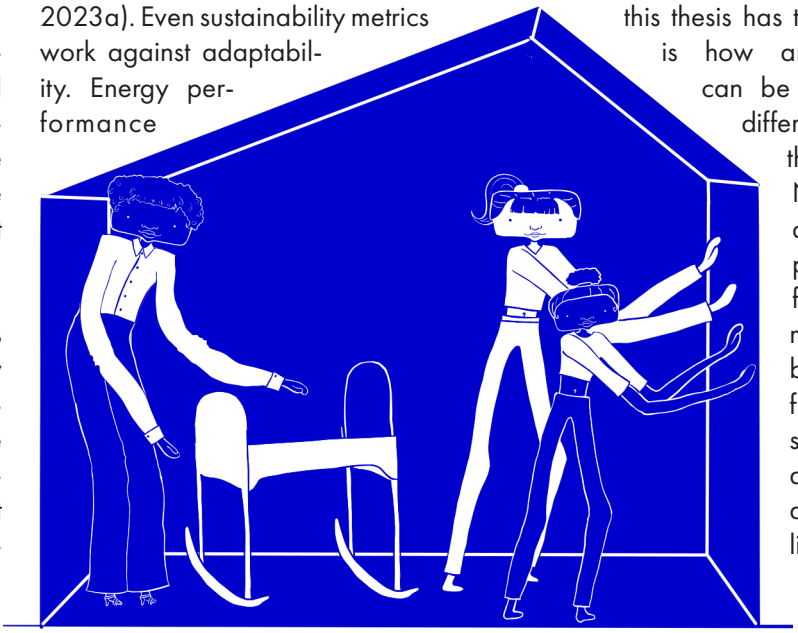


fig. VI. Lack of flexibility

THE SINGLE FAMILY HOUSE TYPOLOGY

The previous pages have outlined a problem of spatial distribution . Too much space in the wrong hands, at the wrong life stage, in the wrong type of building. But which building type deserves attention most?

Owner-occupied single family houses in suburban areas concentrate the problem more than any other typology. In Göteborg, the average space per person in owner-occupied single or two-dwelling buildings is 44 square metres, compared to 33 square metres in rented multi-dwelling buildings (SCB Statistical Database, 2024). The suburban house simply holds more space per person and as the previous sections have shown, that space is increasingly likely to be underused.

The obvious response might be densification. If single family houses use too much space, build apartments instead. But this misses something important. Across the EU, 57.4% of households live in houses rather than flats, reflecting a genuine and widespread preference for this way of living (Eurostat, 2018). Rather than dismissing what people actually want, this thesis asks whether the typology itself can be improved. Convincing people to abandon the suburban house is not a realistic strategy for addressing spatial inequality. Optimizing it is.

This thesis is therefore norm-critical rather than site-specific. It does not examine one particular place but instead takes aim at a typology, the suburban single family house, found across northern and western Europe. Suburbs, broadly understood as lower-density residential areas on the edges of cities characterized by owner-occupied single family homes and limited mixed use (Brasuell, 2021), are where this typology dominates and where the Neubaugebiet aging-in-parallel problem plays out most acutely. Cities continue building more housing, including social housing, but largely reproduce the same rigid structures that created the misallocation in the first place. The context of this thesis applies to any suburban new development area where these conditions are present.

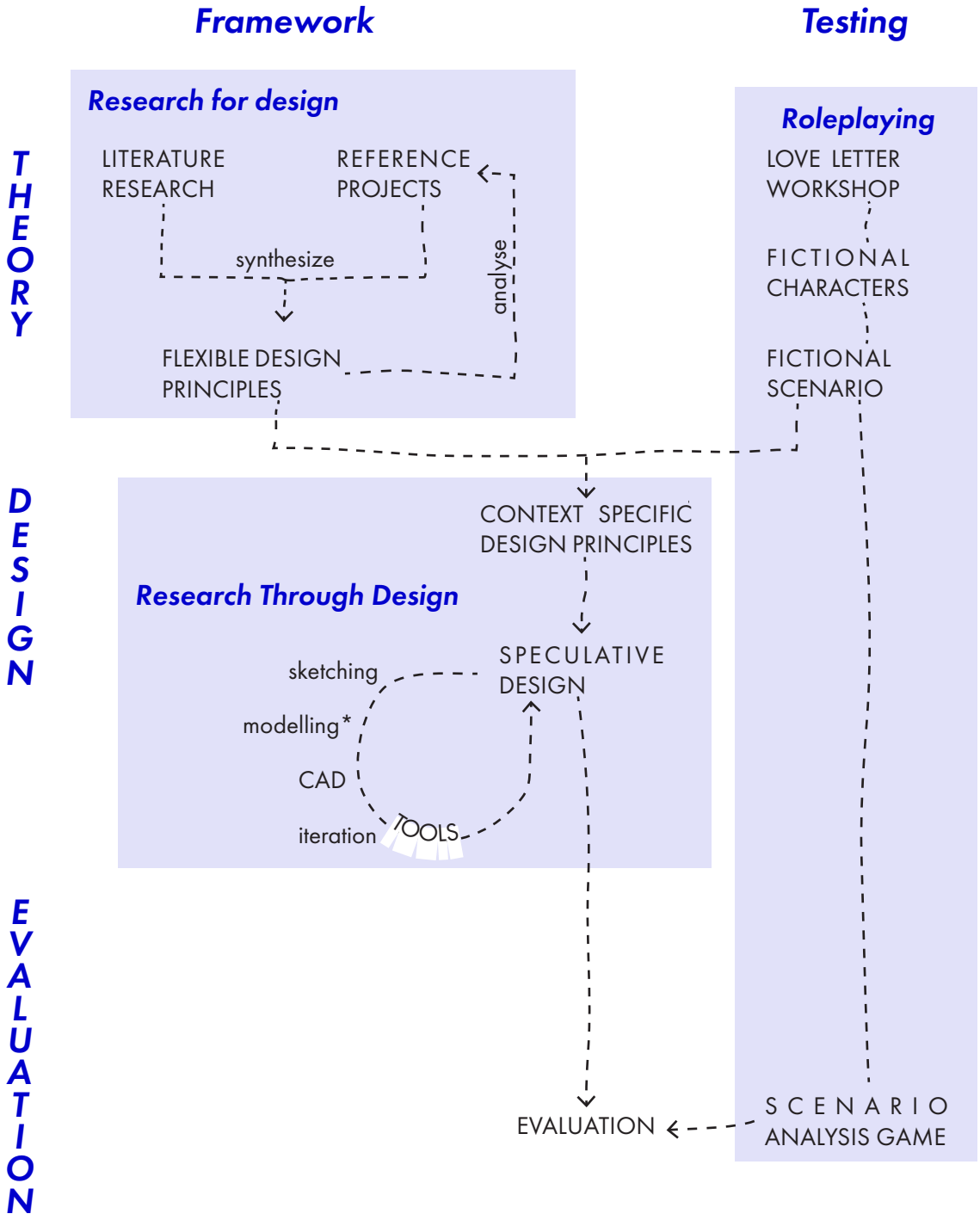
To address the problems in the previous paragraphs, this thesis aims to address unequally distributed space and formulate a set of principles to ensure the buildings of the future are more flexible and can accommodate eventual changes and avoid being under- or over-occupied, people being forced to move, or even buildings being torn down to build new ones.

I. **How can Flexible Design Principles function as a framework to contribute to long-term equal spatial distribution;**

II. **And how can these principles be operationalized through flexible, multi-generational housing in a role play scenario for the sub-urban room?**

The aim of this thesis is to develop Flexible Design Principles that act as guidelines to build more resilient to changes. These Principles should be a framework for designing and to rethink the way we build housing.

The underlying goal is to treat housing as a living system that has to be designed for transformation and not a static product heading for demolition at the end of its lifespan. To analyse the flexibility and to explore modular buildings from a communal and social standpoint.
The last aim of this thesis is to test the principles in a specific scenario. How flexible multi-generational housing can address spatial inequality and provide a different lens to sub-urban space distribution.



I have developed my own type of methodology for this thesis. By collecting Flexible Design Principles from different literature and then mapping it into a matrix, from which designs can be influenced. The second thesis question is also being answered through a self-developed method, of testing the collected design principle matrix through roleplaying. For that characters have been developed and their needs collected to develop the design. The final step was to have people roleplay these characters to stresstest the flexibility of the design.

The anticipated and established methods for this thesis are mapped out here. Not every method has brought the anticipated result. Further explanation for how each method was utilised, even when bringing unexpected results are referenced at the bottom of each text.

Roleplay

The thesis uses roleplaying as a method of examining a general setting without analysing site specific local problems, but instead to focus on grander challenges. The Scenario helps bring characters, challenges and situations to life and stress-tests the design (Hanington and Martin, 2017). Finally roleplaying is used as an evaluation method to test flexibility and sharing with the human factor.

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The Love Letter Workshop

According to Universal Methods of Design (Hanington, B. & Martin, B., 2017) the Love Letter Workshop is writing to express the emotional relationship with a product or a space. This helps to build our empathic knowledge base of how people experience and personify designs (Hanington and Martin, 2017). In this thesis it is used to understand the intimate connection, participants have with their home. And with that connection to design the characters for the roleplay.

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METHODS

Research through Design

The core idea of Research through Design is bridging theory and building knowledge (Hanington and Martin, 2017). Through sketching, building and documenting, the designer iterates small design steps, but also broadens the understanding for the research question.

**Modelling*

Modelling is quite common as a tool for Research through Design in architecture. It lets you understand spaces and connections in the 3-dimentional room. Modelling was also used as a design tool in this thesis, with contradictory results. The spatial results were not used for the design, but the consequential knowledge furthered the design idea.

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Scenario Analysis Game

The Scenario Analysis Game is a unique method, designed for this thesis. Connecting a statistical analysis of different scenario outcomes with the component of human interaction. It is used to produce observable patterns of spatial need, negotiation and community development over time.

-> more on page XX

I ONLY FOCUS ON...

...Architectural Impact

This thesis is geared towards architects to provide them with a collection of design principles for more flexibility. They are chosen as the recipients of this thesis, because they are mediators.
Architects can/should influence politics and users by setting examples. Users are usually aware of a problem that exists, but are not educated of sustainable solutions. Like politicians, they are influenced by popular opinions, advertising and the industry looking to profit. Most users want to be sustainable, it is the architects job to show which solutions are possible. So my thesis is a guide for this mediation.

...Social Impact

Policies and building laws are different in every country. The only thing they all have are restrictions to hinder sustainable and flexible designs. This thesis does not aim to change laws, but instead show an example how one possibility of flexible design would play out. The main focus are the social structures of a community and how they are impacted by a flexible design.

...Fictional scenario for testing

My thesis is about a problem that exceeds the local context of a specific site. Spatial inequality is a growing problem throughout the world. The project tested in the second half of this thesis is not an intervention for a specific site, but an exemplary solution to a bigger problem.

...Macro and meso scale

My design stands as a concept visualization. It is about the idea of communally sharing space and its impact on equal spatial distribution, not the actual implementation. Since modular buildings are possible and already marketable, I assume that the design could be implemented. That is why the focus is on the communal level and the functioning of sharing modules (Macro and Meso scale of building) and the specific details of construction (Micro scale) are for the most part assumed and not developed or tested.

...Sharing over Economics

Since the whole context is fictional (based on a mix of demands throughout Northern Europe), there is no reason for cost calculations or financial comparisons with conventional housing. The only proposition made is that there would be a financial incentive for a flexible housing system. That by sharing parts of the house, personal costs (like heating, rent etc.) would sink.

...Non Statistical Evaluation

In the end of the testing phase the design will be evaluated for its performance. This evaluation will not be perfect as a statistical analysis would be way to complex to run all eventualities of life happening. Instead the design will be evaluated in a game. This is set up to test randomized life events with different probabilities and the conversation these spark in a mock community.

I.I. FLEXIBLE DESIGN PRINCIPLES

While this thesis is about improving spatial inequality in one specific sub-urban context, small variations in contextual demands call for different design reactions. For this reason in the following pages a variety of different Flexible Design Principles are being collected, explained and mapped. The last step of the Framework chapter is then a case study analysis, of testing reference projects with the mapped Flexible Design Matrix.
Which of these principles are applied at the testing ground, will be determined in the second half of the thesis called "II. TESTING".

flexibility *noun (ABLE TO BEND):*
„the ability to bend or to be bent easily without breaking"

-Cambridge Dictionary (2026)

SUS-TAIN-ABILITY IS FLEX-IBILITY

In order to build sustainable, we have to look into the future. The United Nations Brundtland Commission (1987) defined sustainability as "meeting the needs of the present without compromising the ability of future generations to meet their own needs." This means to treat resources as finite and not to use them up in our lifetime. In architecture the notion of sparing resources and using regenerative materials is commonly accepted and more and more required. Space on the other hand is not treated as a finite resource and especially not used considering the future generations. Planing for the future when considering sustainable spatial use would mean considering all possible scenarios of needs that future generations might have. Predicting these needs is almost impossible, so it can be argued, that the only way to build truly sustainable would be to build flexible to different uses.

This flexibility is already considered in some sustainable building theories. These theories can be argued in three scales. Going from the most detailed scale of materials and elements in a building (the micro scale) over the functions and uses of the rooms (the meso scale) to the communal level of the building in its local context (the macro scale). In the following paragraphs I try to name a collection of flexible building theories and categorize them into the three scales.

THE MICRO SCALE

materials and elements

The first scale that has to be considered when looking at flexibility is the materials used, the construction of elements and how these elements are connected to each other. This scale is the most technical scale and is usually connected to other scales, facilitating theories that couldn´t be implemented without flexible elements.

Open Building / Support & Infill

Separates the permanent load-bearing structure (support) from the changeable interior (infill). The support is collective and long-lasting, the infill is individual and adaptable. This is the theoretical backbone of why walls, modules and elements can be changed without compromising the building (Habraken, 1972).

Modularity

Standardized, prefabricated components that can be assembled and disassembled. Making changes to the building easier.

Design for Disassembly (DfD)

Design for Disassembly (DfD) explores the possibility of taking apart a building at the end of its life time and reusing the parts. In this process reducing waste and resources. The elements (joints, parts and materials) are chosen to be reversible. This way of design allows most of the flexibility around the plot of land itself, because a building can simply be taken apart and a new one build, when the function or lifespan has run its course. (Various, developed through 1990s-2000s)

Ageing in Place

Originally understood as designing to allow older people to remain in their homes as they age (Andersson et al., 2021; Schaff et al., 2022).

In this thesis, the theory is reframed and expanded: ageing in place means designing for the entire life course, because all life events change your spatial needs (divorce, working from home, kids moving out, needing care etc.)not just becoming old.
However, if you try to accommodate all eventualities at once you need an impossibly large home. That is why this theory is a flexible design principle. The solution is not a bigger static home but a home that can grow and shrink with you over time. At the micro scale this means elements and materials must be accessible and adaptable for all ages and needs in life.

Universal Design

Spaces should be usable by all people regardless of age, ability or body (originally Mace, 1985). At the micro scale this means accessible dimensions, adaptable fixtures and inclusive detailing. In this thesis it supports the expanded ageing in place argument. If a space works for all bodies, it works across all life stages.

THE MESO SCALE

spatial organisation and use

The meso scale spans the spatial organization of rooms, up to the entire unit of apartments or the house. The flexibility here is about how rooms can be used, and if the entire unit could have an alternative function than initially anticipated.

Rightsizing

Aligning the size of a dwelling to the actual number and needs of its inhabitants. Not about minimizing space, but about ensuring a home is neither over- nor under-occupied. (Graham et al., 2024; Pelsmakers & Warwick, 2022).

Adaptability

Designing spaces that can change function without major structural intervention (Pelsmakers & Warwick, 2022; Estaji, 2017). Rooms are not defined by a single purpose but left open enough to serve multiple uses over time. It refers to changes in use rather than physical modifications to the shell of the building. This gives the home the adaptive capacity for resilience (Pelsmakers & Warwick, 2022) , making it capable of responding to unpredictability.

Convertibility

Flexibility can also be adaptive reuse and conversion of existing buildings or spaces to new uses. Then there was no initial flexibility planned into the design, but rather then demolition, the existing building can be changed.

Loose Fit Architecture

Designing spaces slightly larger and less prescriptive to allow multiple uses. This theory is similar to "Adaptability", except for their rate at which the rooms and units change functions. This author divides between "adapting a room to a different function to cater to short term needs", which changes furniture or simply the uses one has for a room during the day and "planning space to fit a different function for the future" that the entire unit can be easily changed to allow an alternative use.

THE MACRO SCALE

community and shared space

The Macro Scale refers to the neighbourhood and community in which the home is placed. Architecture engages with the community and aims to plan space for long-term resilience. By making sure that neighbourhoods and communities are resilient to societal changes, the longevity of houses also increases.

Spillover Spaces

Rather than designing every square metre for a fixed private use, buildings should include spaces that can spill between private and communal use depending on need and time. This avoids dead space — rooms used 1% of the time like guest rooms, laundry, large event spaces — by making them available to the community when not privately needed(called „pressure valves"; Graham, 2023, Graham 2024). Space is shared on a time axis rather than a space axis: it remains private but is temporarily released.

Cohousing

Co-housing involves individual private homes sharing common spaces and resources (Van Gasse & Wyninckx, 2024). Residents maintain full private dwellings but organize and manage communal resources collectively. This is called the "lot-model" which typically includes a common house, with a kitchen and living room, and sometimes guest rooms, playrooms, salons, or laundries (Van Gasse & Wyninckx, 2024). There is not necessarily a difference between Multi-generational Living and Co-housing. While the first one describes the demography of the community inhabitants, the second rather describes an ownership model.

Multigenerational Living

Intentionally mixing age groups within a housing community (Generations United, 2024) so that spatial needs, social capacities and life rhythms complement rather than duplicate each other (Van Gasse & Wyninckx, 2024). This model addresses loneliness in older adults (Generations United, 2024) and supports younger generations (Abdulmunem et al., 2024), creating a demographically varied community (Molinsky et al., 2023) that avoids the "aging-in-parallel" problem typically found in homogeneous developments (Molinsky et al., 2023). Consequently, spatial needs become complementary over time rather than simultaneously peaking and shrinking (Pelsmakers & Warwick, 2022; Molinsky et al., 2023).

Communal Sharing

Sharing at its most intimate means sharing almost all your space with another person. But in a collective living e.g. the shared space is only the kitchen and the bathroom. In Co-housing communities just a few amenities like gardens or a community house are shared. The definition of what is shared and what is private fluctuates heavily across these examples, but all of them operate on the same principle, sharing happens on a space axis — certain spaces are designated as shared and others as private, and that division is fixed.

Sharing over Time

This thesis proposes a second and different interpretation of sharing, developed here as a concept: sharing over time. Rather than dividing space into permanently shared and permanently private, parts of the home remain completely private but can be released and reattached as needs change. Through modularity, single compartments of a house can be detached when no longer needed and made available to another household. The space is never simultaneously shared — it simply moves. This shifts the meaning of sharing a home from communal spaces used together, to private space shared over time.

Logically implied in this principle is the connection to a form of multi-generationallity. Somehow the needs of the inhabitants have to be staggered, because if they were all at the same point in time, sharing would not work.

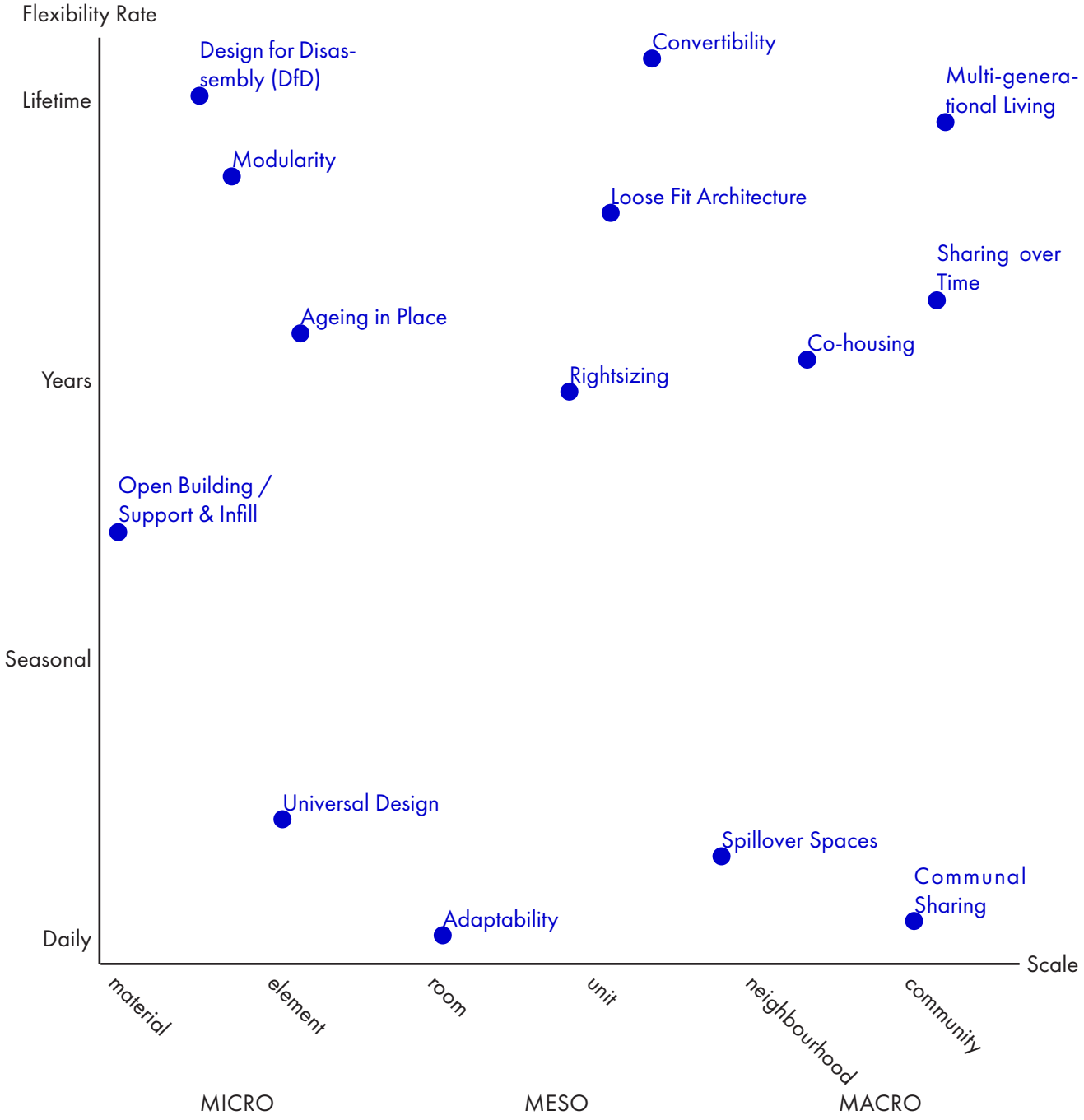
MAPPING FLEXIBLE DESIGN PRINCIPLES

After sorting the Flexible Design Principles to the scale upon which they act, they need to be mapped by Flexibility Rate. This rate describes how often a change is being done, because some theories have more frequent interventions than others. The Flexibility Rate is congruent with the Shearing Layer it acts upon. Based on the theory by Brand (1994), the home can be divided into six layers: Site, Structure, Skin, Services, Space Plan and Stuff. Each of these layers has a life expectancy for their permanence. While the site is almost eternal, "Stuff" (referencing furniture, possessions etc.) moves almost on the daily scale.

The Flexibility Rates devised from this theory are: daily (change that is easy to do and doesn´t need major intervention), Seasonal (changes being done at most a few times a year), Years (changes that require proper intervention, but are still easy enough to do, to allow flexibility), Lifetime (changes that are being done to the building after it has served one lifetime in one function).

Together with the Scale, the Flexible Design Theories can now be mapped out on a matrix, making it easier to determine, which theory can be applied at which intervention.

FLEXIBLE DESIGN MATRIX



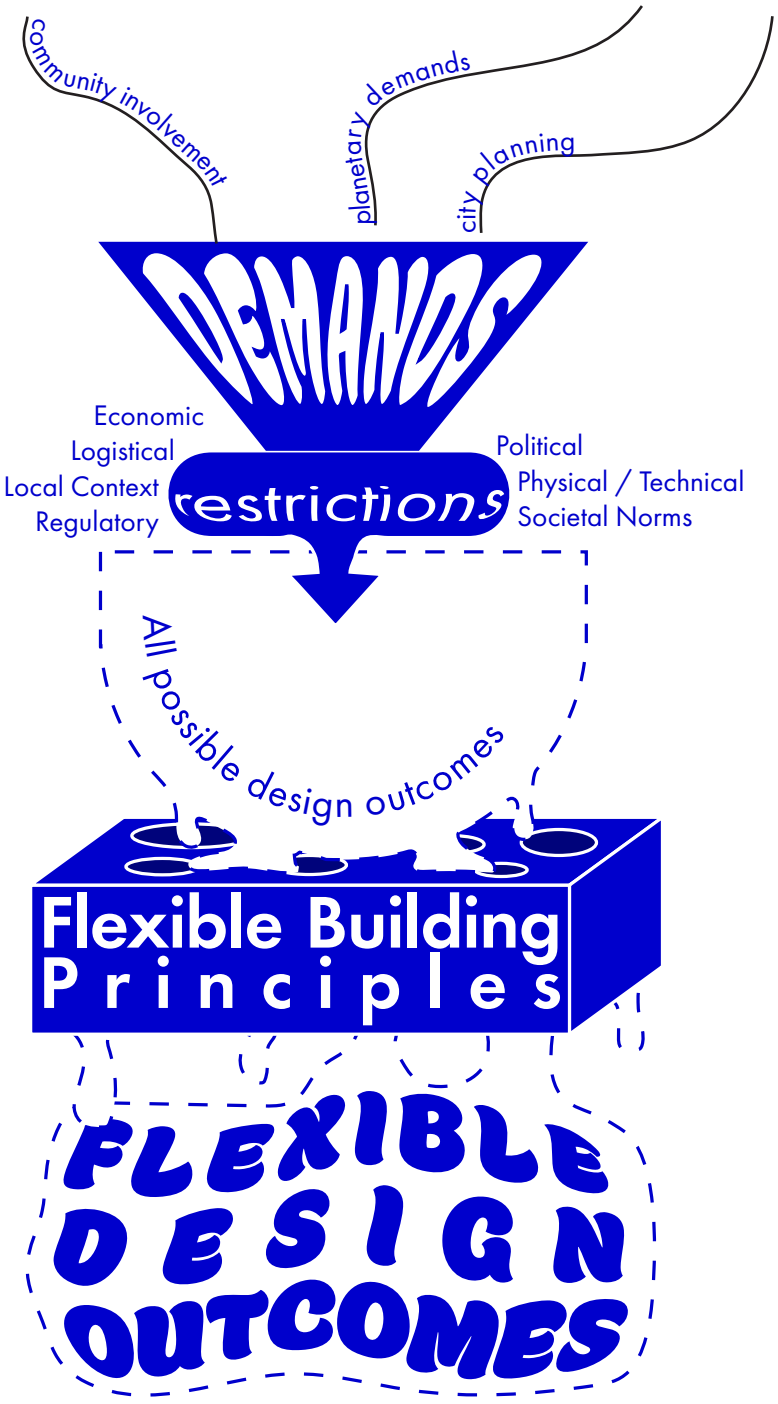
DEVELOPING A FLEXIBLE DESIGN

Three steps for the organisation of the building guide...

1. Demands need to be met (community involvement, planetary demands, city planning)

2. Restrictions need to be mapped (economic, logistical, local context, regulatory, political, physical/technical, societal, stakeholder opinions)

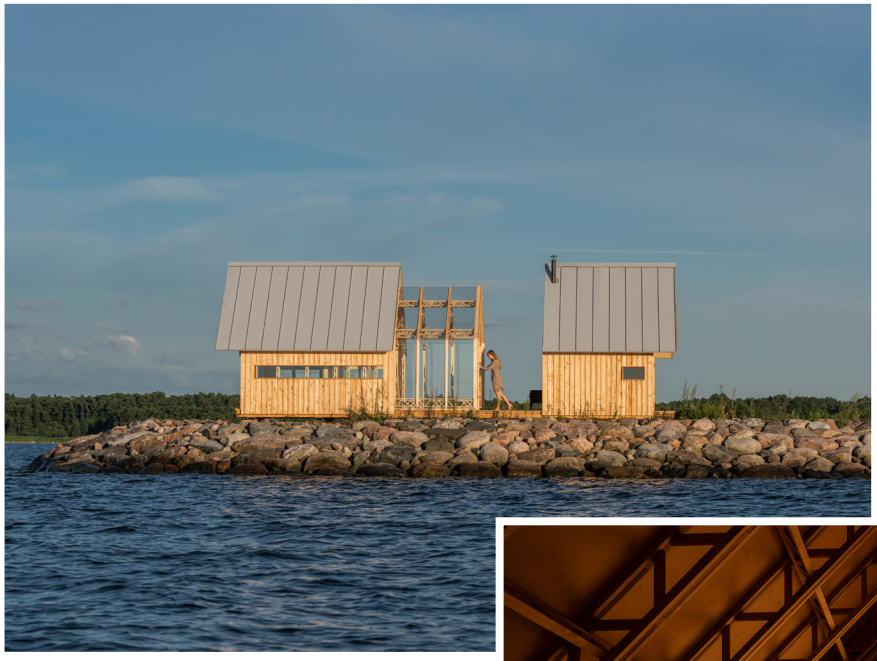
3. Flexibility principles applied (which scales need to be considered, and which rate of change is required)



I.II. CASE STUDY ANALYSIS

First, to test the resulting Flexible Design Matrix and evaluate flexibility in different contexts, I am doing a case study analysis. Here I analyse different reference projects that also centralise flexible design. I do not however compare them to what I am planning for my design, because the references have had different contexts and requirements, changing which theories could be applied. But even though they were not directly applied for my design, they were also used to collect the Flexible Design Principles.

CABIN ANNA



What was needed?

Cabin ANNA is designed as a small holiday home. The main focus is the contact to nature and the relation between inside and outside.

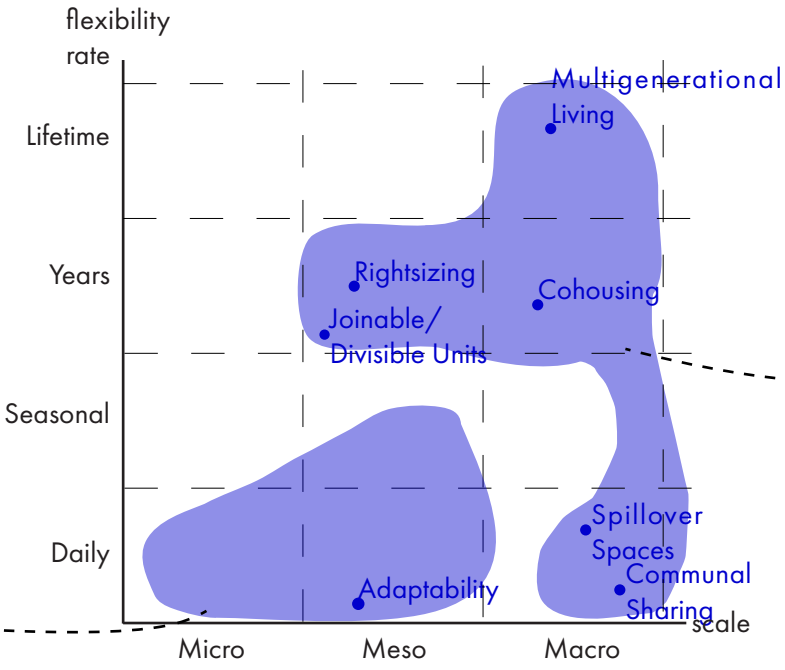
Flexible results:

- movable walls
- flexibility of elements and rooms on the daily scale
- connection between inside and outside
- adaptable space



fig. VII. Cabin ANNA outside
fig. VIII. Cabin ANNA inside
fig. IX. Cabin ANNA open
© Jorrit ´t Hoen





Cabin ANNA (2020)
Caspar Schols
Netherlands



ZOLLHAUS

What was needed?

Wohngenossenschaft Zollhaus is an experimental design for communal living. It is designed to optimize space in a tight-knit urban fabric and allowing social contacts and a community to form.

Flexible results:

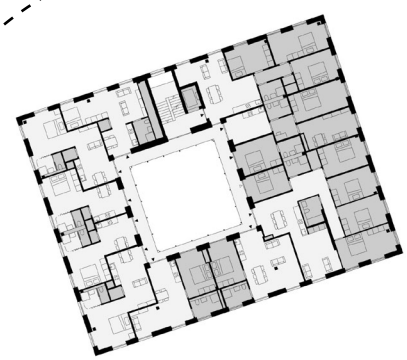
- shared common space
- adjustable apartment sizes depending on lifestage
- rightsizing and sharing living space for each user
- multigenerational living





fig. X. Zollhaus outside
fig. XI. Zollhaus private part
fig. XII. Zollhaus shared part
© Annett Landsmann

Zollhaus (2015 – 2021)
Enzmann Fischer Partner Architekten
Zurich, Switzerland





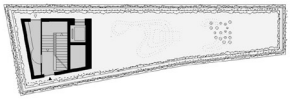


fig. XIII. Floorplans Zolllhaus, © Enzmann Fischer Partner Architekten, Zürich

STAMPFENBACHSTRASSE



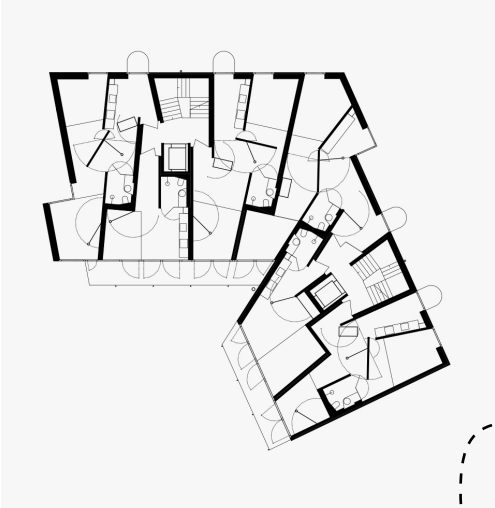


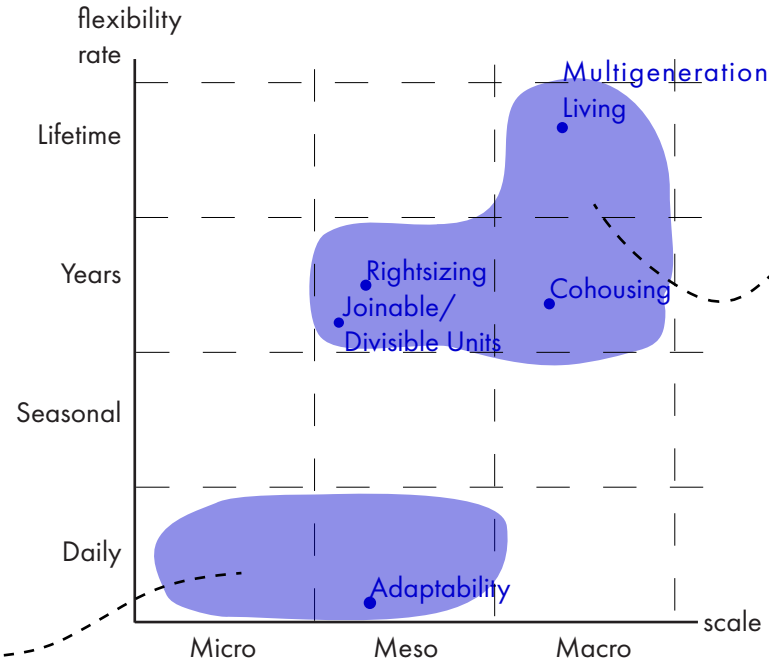
The design incentive

The apartments in Stampfenbachstraße by EMI Architects were designed to have movable partition walls. These elements change room configurations through rotating and cutting off different parts of the apartments.

Flexible results:

- movable walls
- flexibility of elements and rooms on the daily scale
- adaptable room sizes
- changeable private and public space





Stampfenbachstrasse,
EMI Architects
Swiss 2018

fig. XIV. Stampfenbachstrasse outside
fig. XV. Stampfenbachstrasse inside
fig. XVI. Stampfenbachstrasse Floorplans
© EMI Architekten

ÜBERBAUUNG HELLMUTSTRASSE



The design incentive

A.D.P. intended to relieve maximize living space on a small land plot of Zurich, while retaining comfort and reducing spatial waste. By designing apartments that can exchange rooms with the neighbours, the individual living space can be rightsized.

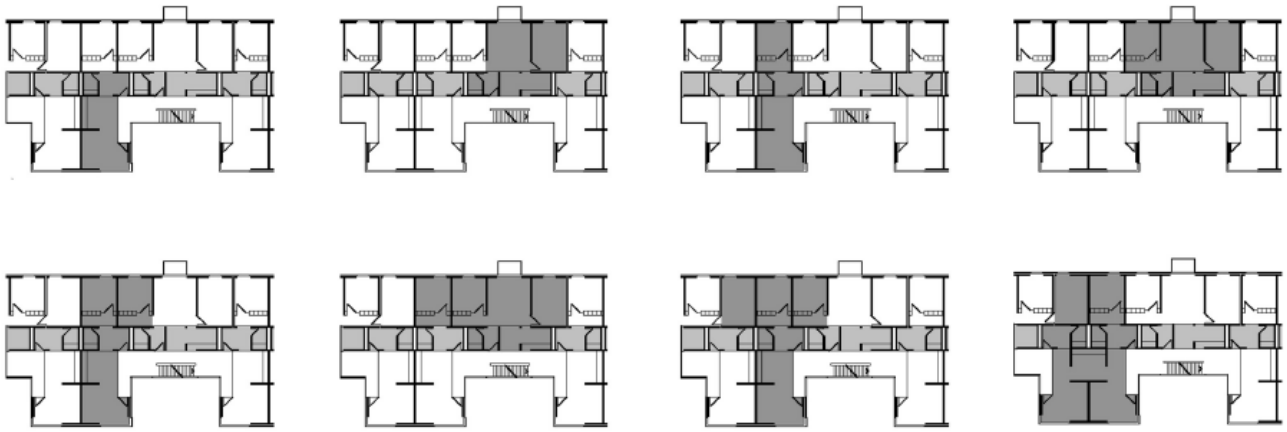


Flexible results:

- shared common space
- adjustable apartment sizes depending on life stage
- multi-generational living

Überbauung Hellmutstrasse,
A.D.P.
Zürich 1991

fig. XVII. Überbauung Hellmutstrass
fig. XVIII. Shared terrace space
fig. XIX. Transformable Floorplans
© A.D.P



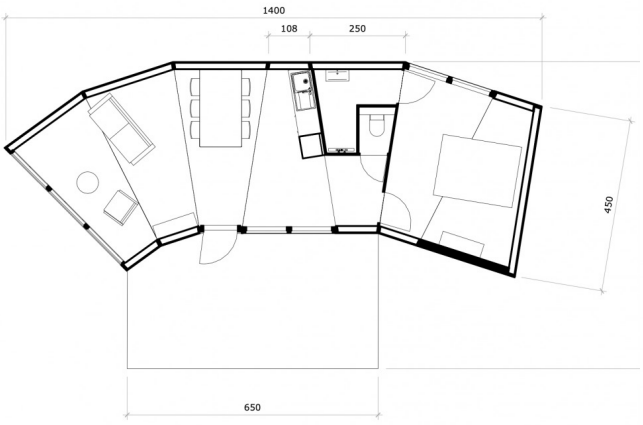
TINY MODULE



The design incentive

The design of the „Tiny Module“, by Marc van Vliet proposes a house out of small modules, that could be attached in different forms, and it that way supply housing space for different needs.

Tiny module,
Marc van Vliet
Landgoed de Appelhof n.d.



Flexible results:

- adjustable house depending on life stage
- modular rooms that can be configured
- flexibility of entire rooms on the life event stage

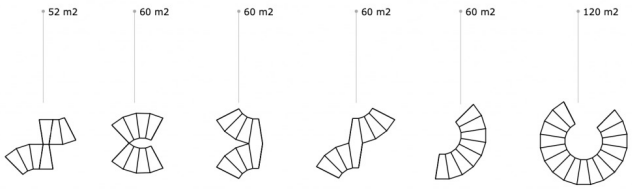


fig. XX. Tiny Modules
fig. XXI. Floorplans
© Casper de Vries

POD HOUSES

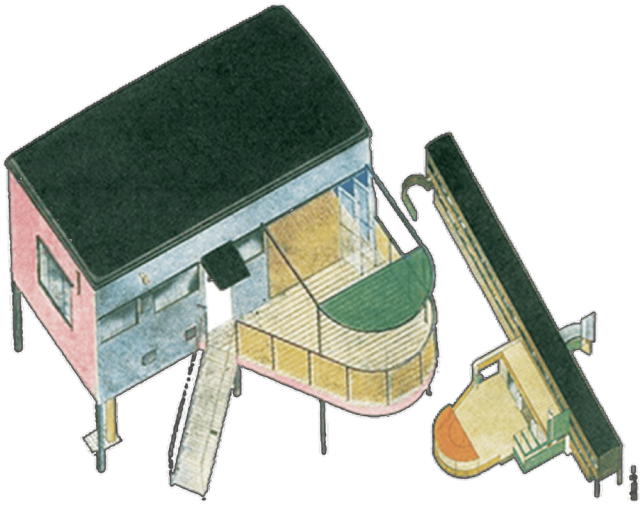


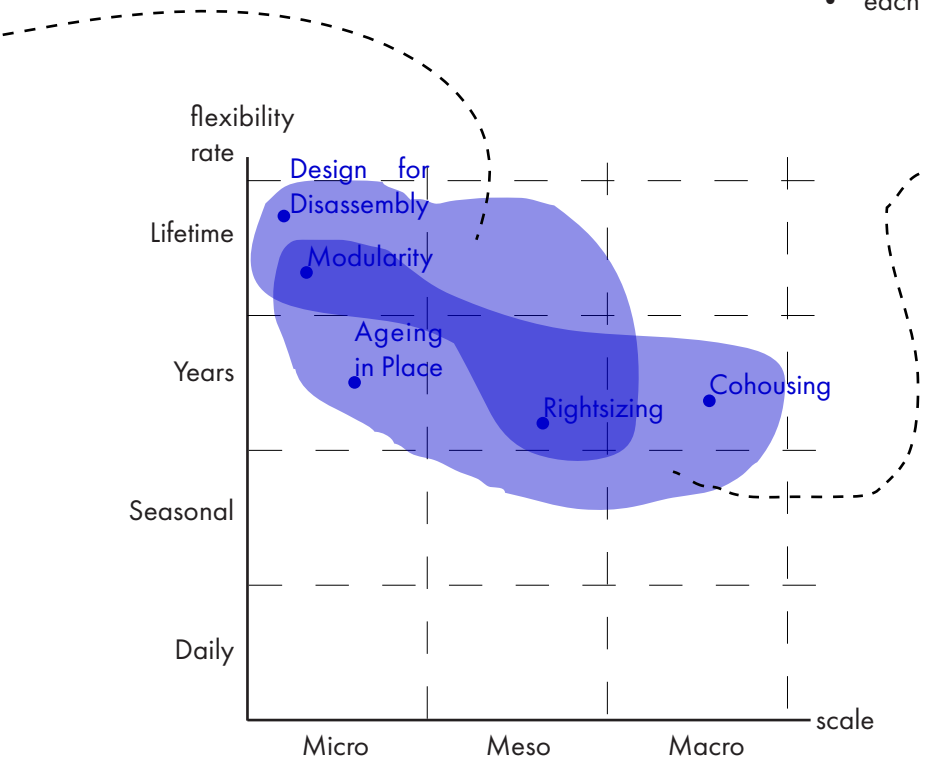
fig. XXII. Pod houses © unknown

The design incentive

The Pod Houses were part of the Soviet „Disurbanism" movement, opposing the traditional centralized city as a capitalist structure. Small individual units would be aligned along transportation highways, forming the Ribbon-city proposal for Magnitogorsk (1930). The pods embodied a socialist ideal of individual freedom — children, upon reaching maturity, would detach their own pod and live independently, connected to the state rather than the family unit.

Flexible results:

- joinable and detachable units accommodating marriage, kids and divorce
- multi-generational living
- mobile and collapsible
- each life event has a direct spatial response



Pod houses,
M. Ginzburg, M. Okhitovich,
A. Zelenko and A. Pasternak
USSR 1929/30
©unknown

II. TESTING

In this second part of the thesis the Flexible Design Principles are being tested in a specific scenario. The scenario is fictional on a anonymized context, because the evaluation of the scenario will be through a roleplay. To create an understandable context for the players/testers of the design, a introductional storyline was created.

First will be explained how the context was chosen and how the inhabitant´s personas were developed. After that the visual storytelling introduces us to the fictional city of Grøsbärg and how the need for a flexible design emerges.

"Perhaps home is not a place but simply an irrevocable condition."
— James Baldwin

II.I. STORYTELLING

EXPLORATION SITE



specific site as a testing ground

- The exact plot dimensions and orientation
- The specific zoning regulations of the municipality
- The specific 1960 building stock surrounding the site

SPATIAL --

Just another plot of land

The site chosen is a real site. Even though the testing of the building principles is done in a fictional scenario. But it stands anonymously and exemplary for all the sites like it. The decision was to test the building principles in a sub urban scenario, because the main goal is to eliminate spatial inequality. While the context is made up to be fictional, the requirements of the site are very real. The decision was to have a site with actual physical restrictions to have a more realistic test of the Flexible Building Principles. Also the site will feel more real or even familiar to the design test players.

The site we can see here is in a small suburban village in the periphery of a medium big city in Germany. It was chosen, because it represents the spatial inequality quite well. The houses around it were almost all build in the 1960-1990. While a few plots have already been recently densified and some of the older houses sold to younger families, is the city still growing and this peripheral village aging.

suburban context

- The suburban typology — low density, single family, owner occupied
- The demographic aging pattern — Neubaugebiet phenomenon happens across Northern Europe
- The spatial inequality argument — too much space per older person, not enough for younger households
- The plot size range — suburban plots of this scale are common across Northern Europe
- The fictional community and their needs — derived from Northern European statistics, not German ones specifically

INEQUALITY IS NOT A LOCAL PROBLEM

Next: How the inhabitants moving to the site were developed

LOVE LETTER WORKSHOP

For this thesis, characters and a fictional scenario were developed in order to test the collected building principles. This approach was chosen primarily because there is no perfect sustainable solution; each building depends on its stakeholders and local context. While building principles set rules or demands toward flexibility, they remain open to interpretation for each specific case.

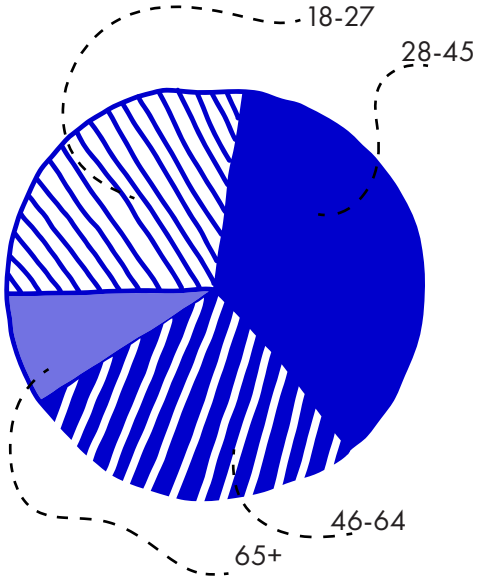
In order to be able to test the scenario of a community sharing a flexible house, there needed to be people interacting with each other. And to not make up wants and needs at random for characters that are not close to what real-life people would want, fictional characters needed to be „made real". Otherwise the results could be considered at the author´s whim. This type of role playing exercise lets you test scenarios, with the reactions and emotions of real people.

For that the fictional characters were developed based on the wants, needs, and dreams of real people. These demands were gathered in a workshop in which participants were asked to write a "love letter" to their home. This method was intended to capture the most intimate feelings and wishes someone has for their home. The results were then synthesized into the wishes and demands of fictional characters that then could be enacted by players to text the flexibility of the design in a role play.

The workshop participants were a mixture of people, 10 in total. They were diverse in gender, age, ranging from 23 to 83 years old and are predominantly people who live or grew up in the dwelling type of a single family home. A few of them even grew up at the chosen site or still live there. Some participants simply supplied a glimpse into individual values of home and their personal lens what they love about their home. A lot of their living situations have been directly translated into specific characters, for example divorcing, kids moving out, losing a partner in old age and being lonely.

All participants are known to the author, so a certain personal bias is upon these letters, but a relationship between workshop conductor and participant seemed to be necessary, because the Love Letter requires a certain honesty and intimacy. Strangers might have been hesitant.

Participants age



Participants living situation

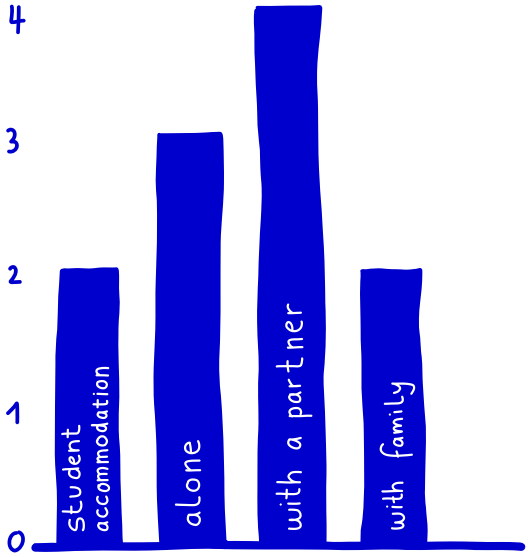


fig. XXIII. Evaluation of the Love Letter Workshop

Results

After reading each anonymous love letter with care they were sorted into age groups of the participants. Then the personal opinions and focussed topics of each participant were formulated into needs that each age group has to their home. While the sample size of the workshop was not very big, over arching feelings throughout the age groups transpired and could be tied to theories.

Young Adults

While the youngest participants were over 20, some have reminisced about their childhood home and what it meant to them. Home for them meant a room to grow, store memories and a safe place. Some participants have also reminisced about their childhood home, because afterwards their term of „home" had been diluted after moving around as a young adult. This notion is supported by **Place attachment** & self-identity (Twigger-Ross & Uzzell, 1996), a theory where the home is a storehouse for identity and memory during formative years, and being able to revisit it supports a healthy sense of self. However, that moving away from it is also an important part about self development. Tightly connected to this separation process as a way if identity forming is the feelings that the next age group had for their homes.

The next age group was 18-27 years old. Usually called „young adults". The most predominant feeling about home here was the uncertainty of where their home is. Often home was not even a place, but any place where you can feel safe, to relax and to have social security. Also often connected to the childhood home, are fond feelings of it being a place always to come back to, but also a place that lets you leave. Design theories that allow for a lot of changes in shorter time frames, so spaces that can change function without structural intervention, will match the transient nature of this life stage. The main theories would be **Adaptability**, **Loose Fit Architecture** and **Open Building / Habraken**. Another important theory to consider would be **Co-housing**, because it provides the necessary social backing and community connection to support the process of finding oneself outside the family home.

28-45 years old

After that the notion of home shifts in the age group 28-45 years. From childhood home to „my dream/forever home". It becomes a place to relax after work. A place to have a family in and a space to have guests. More present becomes the wish for a garden and some care practices towards the house. It is not anymore a means to an end, but part of your identity. Also more present is the financial aspect, of a home being both an investment and also a financial burden. Usually the spatial need for a house is the highest at this point, because relationships and families expand. Thinking about **Rightsizing** becomes all the more crucial, because the spatial need is only going to peak for around 20 years and then rapidly decline, while this is also the age where most people build a static house fitting their current needs. Another theory that is relevant then are **Spillover Spaces**, that can cater to less permanent or vital needs and absorb the overflow of a growing household without permanently increasing private space.

46-64 years old

In the age group after kids move out, leading up to retirement at 46-64 years old, two currents are predominant. First the urge to be able to grow old at some point, that the house will stay manageable as long as possible , suggesting that ageing in place becomes more and more relevant. And secondly the wish to take care of the home. Gardening and having social events, guests and family gatherings and also the wish for ownership of the house as a safety net and as part of ones identity. This is also the phase when people become "missing movers" (Graham, 2023), because their place attachment grows with collecting years of memories in their home. Rightsizing becomes vital and Ageing in Place is first thought about. While this age group still likes their home the way it is, they start thinking ahead about accessibility and future mobility needs. If the home is flexible enough to let an inhabitant Age in Place, they can live how they like and the home can gradually adapt to needs of old age.

Aged 65+

In the age group 65+, is being voiced that the house feels big and harder to manage with age. But also the strong opinion of not wanting to move or let somebody else move in. The place identity gets stronger with older age (Twigger-Ross, Uzzell 1996). This is the final stage of the Ageing in Place theory, requiring the home allowing old age.

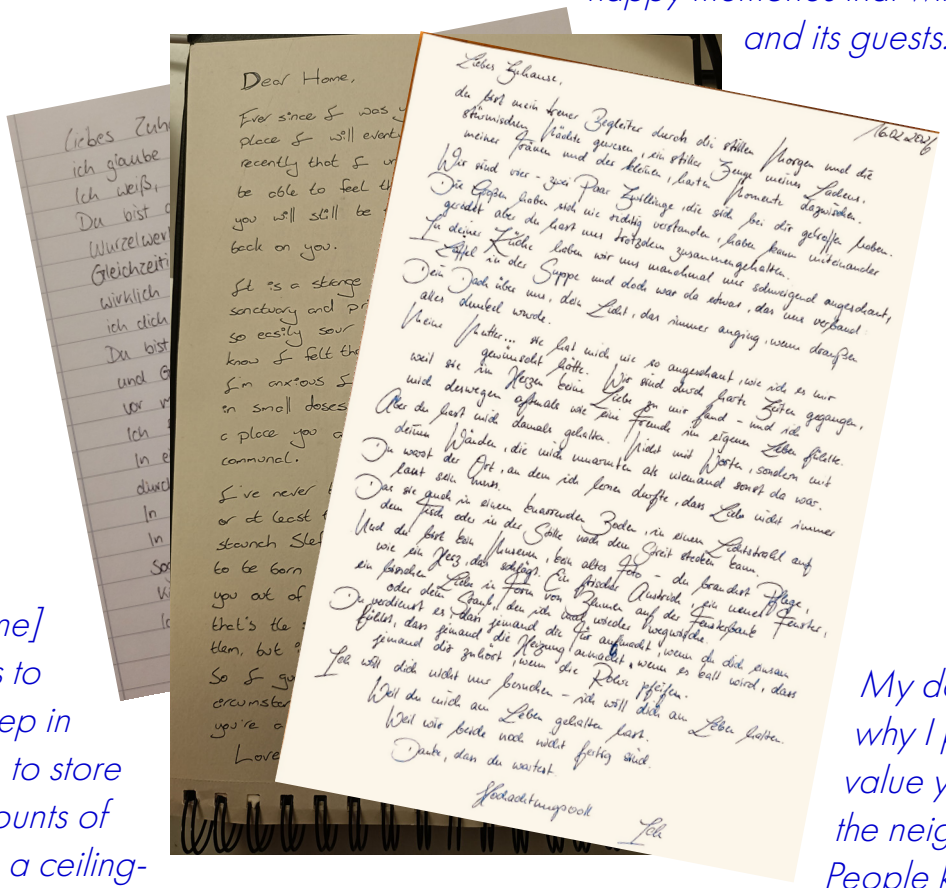
Also social bounds were stressed upon. Having the home as a place to have guests and socialize, but also the value of having neighbours, to rely on. Especially important are shared common spaces and a good community. To apply the theory of multi-generational communities is important so that neighbours are constant and of all age groups, that there is not a sudden break in old age of all known neighbours slowly dying and being replaced with young families with a different social binding.

Excerpts of the letters can be read on the following page, to see the direct translation from participants to fictional characters.

Dear home...

I am already happy that you have enough capacity for an additional guest room - and all happy memories that will come from it and its guests.

-female participant (age 28-45)



[You gave me] Air upwards to grow, to sleep in a bunk bed, to store endless amounts of memories in a ceiling-high wardrobe and for spider webs that nobody will ever reach. Thank you dear narrow room.
-female participant on her childhood bedroom (age 18-27)

My dear Home, why I particularly value you: that is the neighborhood. People know each other, people help each other.
- male participant (age 65+)

fig. XXIV. *Exemplary Letters, © Maja Klaubert*

Every time I enter, I look at some pieces of myself I left inside you. Sometimes things are in the right place, sometimes a mess, reminding me to take care of you.
-female participant (age 28-45)

And you are not a museum, not an old photograph — you need care, like a heart that beats. A fresh coat of paint, a new window, a little love in the form of flowers on the windowsill, or your dust that I wipe away too.
-female participant (age 28-45)

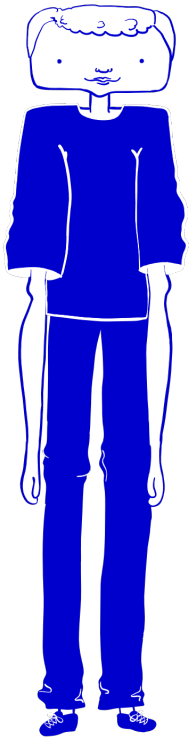
Personally I would rather live in a residential settlement where the residents are also the owners.
-female participant (age 46-64)

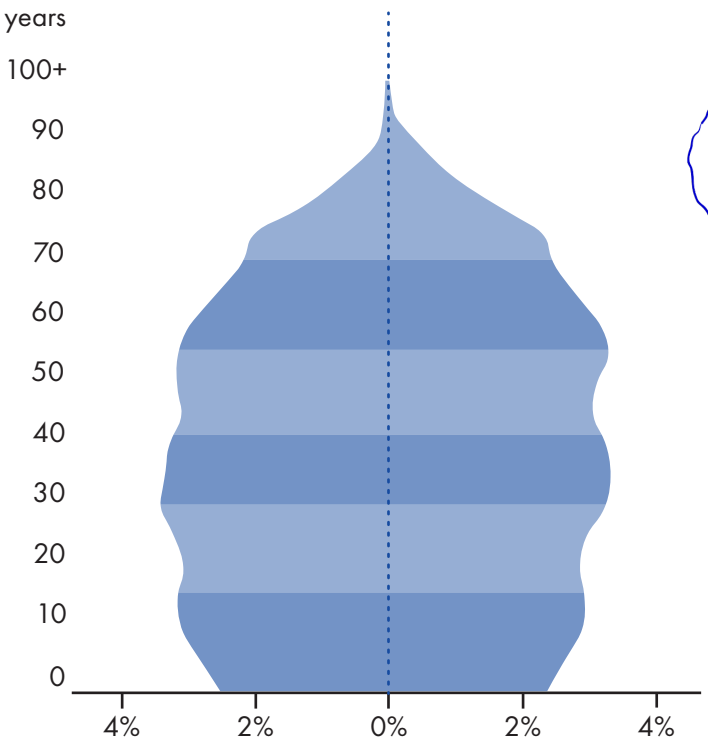
I want to still find my way around in you as an older person, even if I can see less, hear less or am already slightly becoming forgetful.
-female participant (age 46-64)

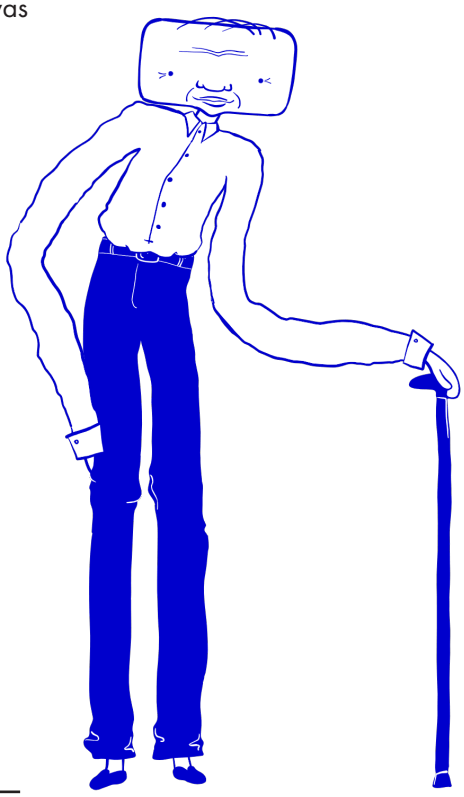
Dear Home, you are suddenly much too big for me alone. That is not really practical anymore, with keeping things clean for example.
A few times a year I still have overnight visitors, which I am happy about.
In theory I could rent out the upper flat. But I don't want to.
- male participant (age 65+)

Age

Typical in Northern Europe is a constrictive population pyramid. To determine the age of six evenly distributed characters, the pyramid was divided into sextiles and one character was placed into each age group.



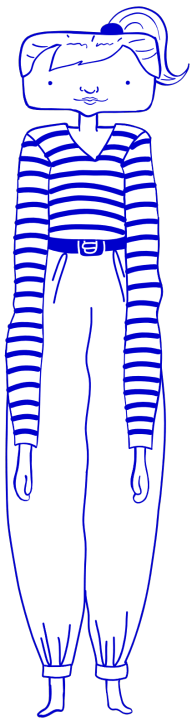




https://www.populationpyramid.net/northern-europe/2026/

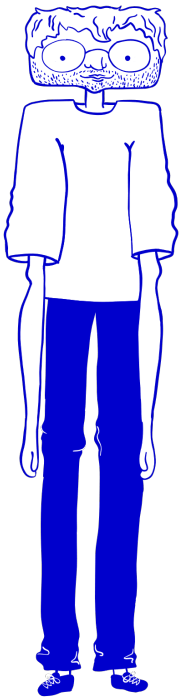
DEMOGRAPHIC SETUP

The diversity of these characters were very important to the Author, since the project is tied to a communal way of living, that it is important that not just one demographic is being tested. For that the statistical demography of Northern Europe were analysed and translated into six characters. Age, gender, origin, queerness and economic situation were considered.



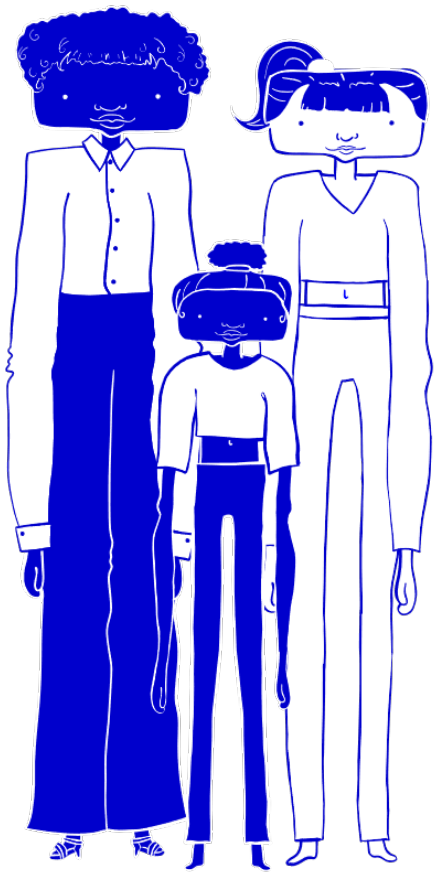
Gender

The gender distribution world wide is about fifty-fifty between male and female. Non-binary people would not be making up a big enough part statistically, to represent a sixth of the population. Further discussed in paragraph „queerness“. So the characters were split up in half between male and female identifying.



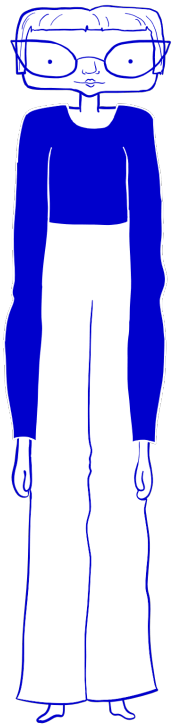
Origin

About 20-25% of the European population has migration background. So one character is a non EU-immigrant and one has immigrated from within the EU.



Queerness

If you follow European statistics, about one in ten people would be queer-identifying. While I am exploring the lives of six characters, demographically equally distributed, statistically none, or maximum one of them would be queer. So instead of writing a hetero-normative thesis, I will write a „homo-normative" thesis. Since my characters are fictional, they could all be gay. Love is love.



Economic situation

Two problems come up when comparing the populations average income and the demographic of home buyers. Firstly, that the housing market is developing continuous rising prices, so that the (lower) middle class can hardly afford home ownership. Since the project tests an alternative way of financing and affording a home, I propose a future where all people can afford to own a home. The second aspect when looking at „average" financial distribution across society are racial discrepancies. This is a problem of a racist economy and I do not wish to reproduce harmful statistics in an imaginary world, but instead skin colour not being a reason for discrimination.

fig. XXV. Developed Characters, © Maja Klaubert

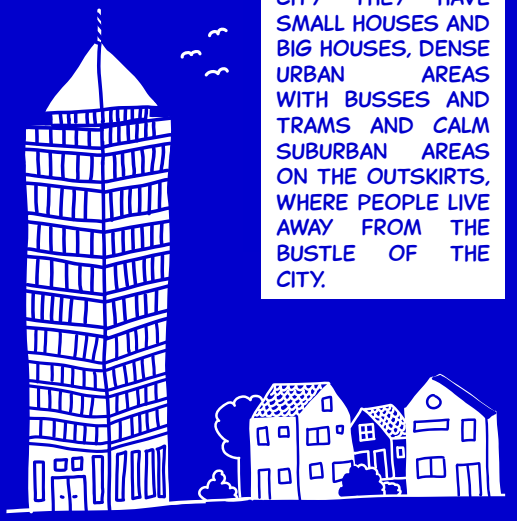
WELCOME TO GRØSBÄRG

OUR STORY STARTS IN A TOWN CALLED GRØSBÄRG.



IT IS A TOWN LIKE ANY OTHER. HOUSES AND STREETS AND PEOPLE. THE PEOPLE GO TO WORK, GO TO CAFÉS, DO THEIR HOBBIES AND IN THE EVENING THEY GO BACK TO THEIR HOMES.



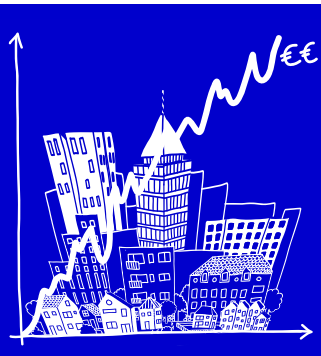


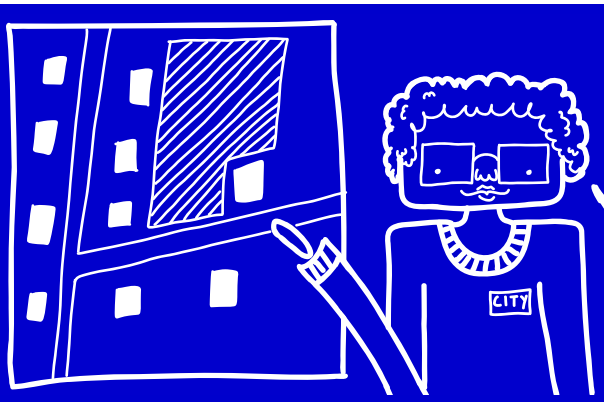
AND LIKE ANY OTHER CITY THEY HAVE SMALL HOUSES AND BIG HOUSES, DENSE URBAN AREAS WITH BUSSES AND TRAMS AND CALM SUBURBAN AREAS ON THE OUTSKIRTS, WHERE PEOPLE LIVE AWAY FROM THE BUSTLE OF THE CITY.



THE PEOPLE THAT LIVE HERE ARE LIVING THE SUB-URBAN DREAM. THEY HAVE THEIR PERFECT HOUSE, WITH PERFECT GARDENS AND NOSY NEIGHBOURS. JUST THE PLACE YOU WANT TO RAISE YOUR KIDS AND GROW OLD.

BUT THE PRICE FOR THIS LIFE IS RISING. THERE ARE JUST NOT ENOUGH HOUSES FOR EVERYBODY.





THANKFULLY THE MUNICIPALITY CARES. THEY DESIGNATE A NEW SPOT OF LAND FOR REAL ESTATE DEVELOPMENT. JUST BEFORE THEY SET THE PLOTS OF LAND FOR SALE THEY STOP FOR A MOMENT.



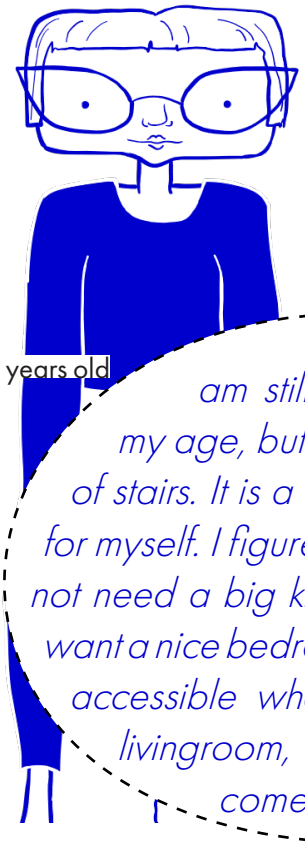
fig. XXVI. *Comic Storyline and the background for the role play, © Maja Klaubert*

The first step to develop a Flexible Design is to gather all demands that are set towards the project. For this the architect first started by mapping out the needs that each stakeholder has towards their home.

These are six neighbours that were willing to try a sustainable approach to their homes. While their needs are real and should be met as good as possible, the inhabitants can´t know the variety of solutions possible for them.
After that the demands towards the planet and the demands of the city toward the plot of land will be collected. It will be the architects job to mediate them.

1. DEMANDS

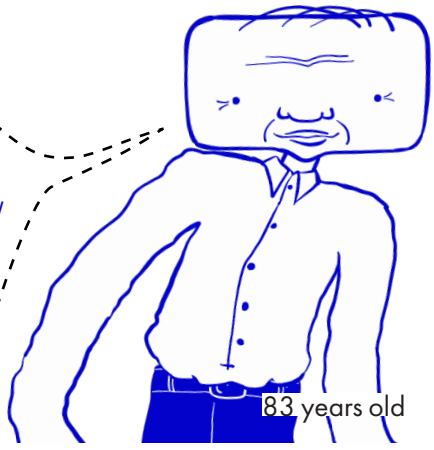
My boyfriend and I both work full time, so we wouldn´t need a lot of space at home. Just a homeoffice and a nice airy space to come home to. But we might want kids soon, so we need to build bigger. At least two extra bedrooms and another bathroom. We are just thinking ahead for the future. -inspired by participant 8



56 years old

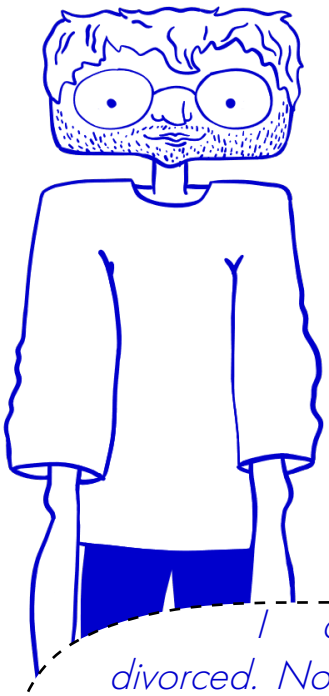
I want all my grand kids to be able to visit, but I don´t want to clean an entire house every week. I also want a big garden I can farm in, that´s why a small apartment isn´t suitable for me. I don´t know how this can be best combined. -inspired by participant 1

I am still quite fit for my age, but i live in a house full of stairs. It is a lot to clean and heat all for myself. I figured it is time to downsize. I do not need a big kitchen, because i don cook. I want a nice bedroom that could be wheelchair accessible when the time comes and a livingroom, so that my grandkids can come visit. -inspired by participant 11



83 years old

My wife and I are looking to settle down. We are planning to have a second child soon and need a bigger house now. We always dreamt of our forever home for our perfect family.
-inspired by participant 4

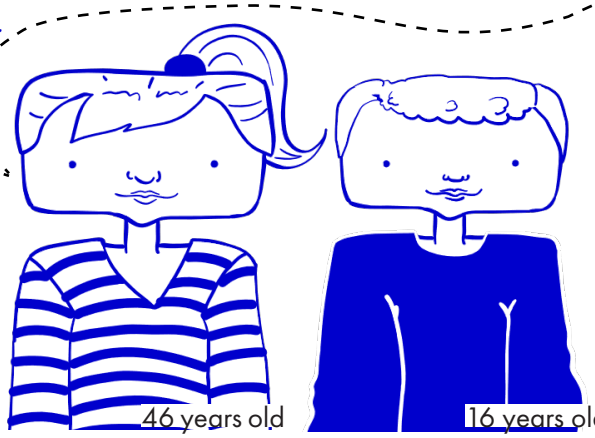


28 years old



34 years old

I am recently divorced. Now I am a single parent. Financially it makes sense for me to invest into a house right now, I just dont know what the future holds. My son will move out in a few years and I don´t know if i will remarry. But I don´t want to live alone in a big house. Maybe I could transform my son´s room into a yoga studio.



46 years old

16 years old

I need my own space. School is almost done and I want to travel – but I still want to be able to come back and visit my mum. I get it if she doesn't want to keep a spare room forever. But I don't want to sleep on the couch either. If we build smart now, that room can just become a guest room when I leave. There will be spare space either way, right? *-inspired by participants 5 and 6*

NEEDS TRANSLATION

Community Needs:

= collected through community involvement and stakeholder interviews

house

- privacy within the community
- sufficient space for family expansions
- having guests
- adapted to old age
- wheelchair accessible for old age

greenspace

- outdoor private space per unit (terrace/garden)
- parking or bike storage
- garden for farming
- child-friendly neighbourhood
- green space as a view

communal building

- guest rooms
- storage space
- home office
- space for socializing

Municipal Demands:

= what the municipality wants to achieve through this development

demographic diversity

- a sustainable neighbourhood that does not slowly age
- creating a socially mixed community

spatial distribution

- reducing individual spacial take-up
- increasing housing supply
- reducing vacancy and under-occupancy in the area

Planetary Boundaries:

footprint

- avoid demolition waste
- energy efficient construction
- minimize soil compaction through large foundations
- low embodied carbon materials

biodiversity

- avoiding monoculture gardens
- green space for non-human inhabitants
- rainwater management on site

Regulatory
- building size restrictions (height and floorspace)
- setback distances from plot boundaries (3m)
- minimum parking spaces per unit (one)
- minimum green coverage

Local Context
- plot size and shape
- orientation and sun angles
- character and scale of surrounding houses

Societal Norms
- preference for ownership over renting
- stigma around communal living
- expectation of private garden per household
- resistance to downsizing in old age

single family home with a parking space and a small garden

a big community garden

a community building in the centre providing shared spaces and spillover spaces

modularity for maintaining the home but reducing the space

modularity reduced to small rooms being moved with a crane in the centre

2. RESTRICTIONS

the rules and limits that constrain how you can build

Logistical
- access road width and construction vehicle access
- utility connection points (water, sewage, electricity, heating)
- modules limited by transport dimensions and weight

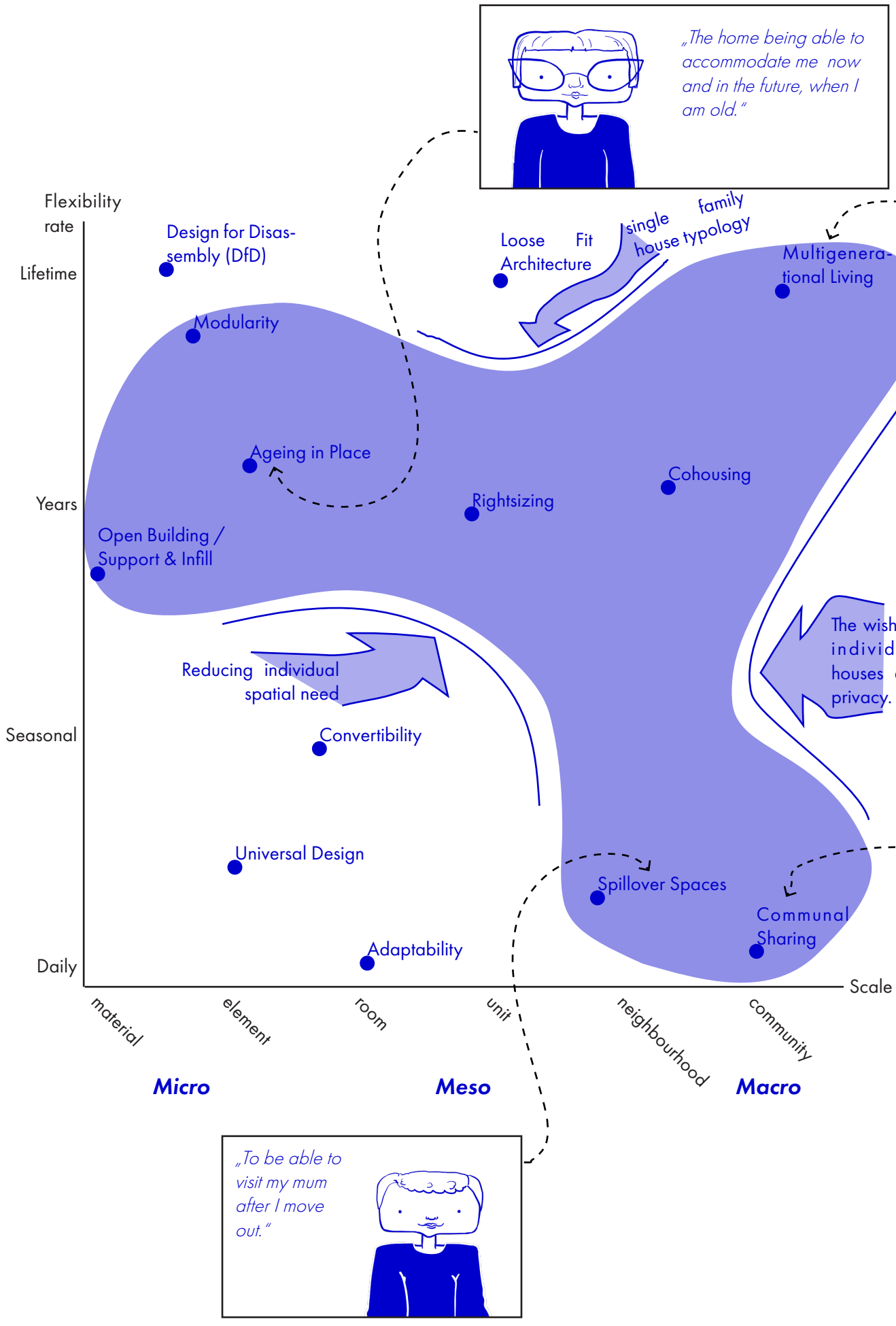
Physical/Technical
*detailed design is part of the delimitations
- accessibility requirements

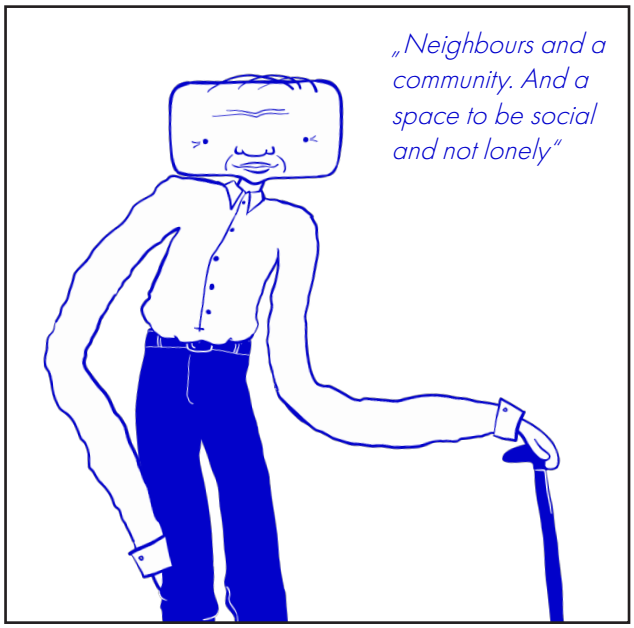
Political
- no regulatory framework for flexible/modular housing tenure*
- stamp duty discouraging resale of houses

Economic
*building economy is part of the delimitations

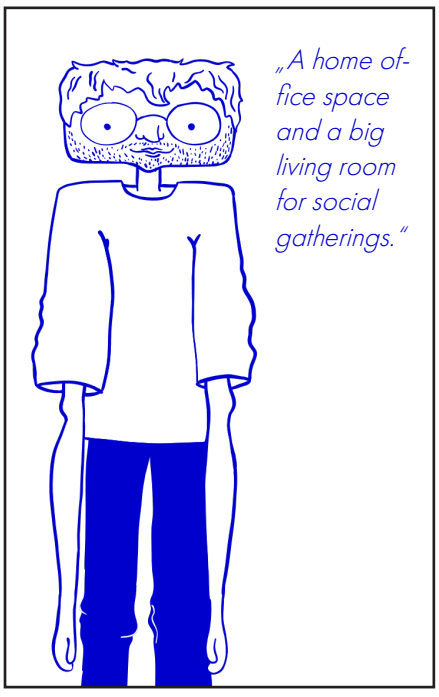
inclusivity
Wheelchair accessibility of a young couple e.g. has such a vast variety of design specifications that the case for old age immobility or a guest in a wheelchair is the design goal.

delimitations: the technical details, and economic situation are not in focus in this thesis, as the main goal is to optimize community sharing and spatial equality. Also it is assumed that the municipality is „willing to try a new way" that the political restrictions can be assumed supported.


„The home being able to accommodate me now and in the future, when I am old."
Flexibility rate
Lifetime
Years
Seasonal
Daily
Design for Disas-sembly (DfD)
Modularity
Loose Fit Architecture
single family house typology
Multigenera-tional Living
Ageing in Place
Cohousing
Rightsizing
Open Building / Support & Infill
Reducing individual spatial need
The wish for individual houses and privacy.
Convertibility
Universal Design
Spillover Spaces
Communal Sharing
Adaptability
Scale
material
element
room
unit
neighbourhood
community
Micro
Meso
Macro
„To be able to visit my mum after I move out."

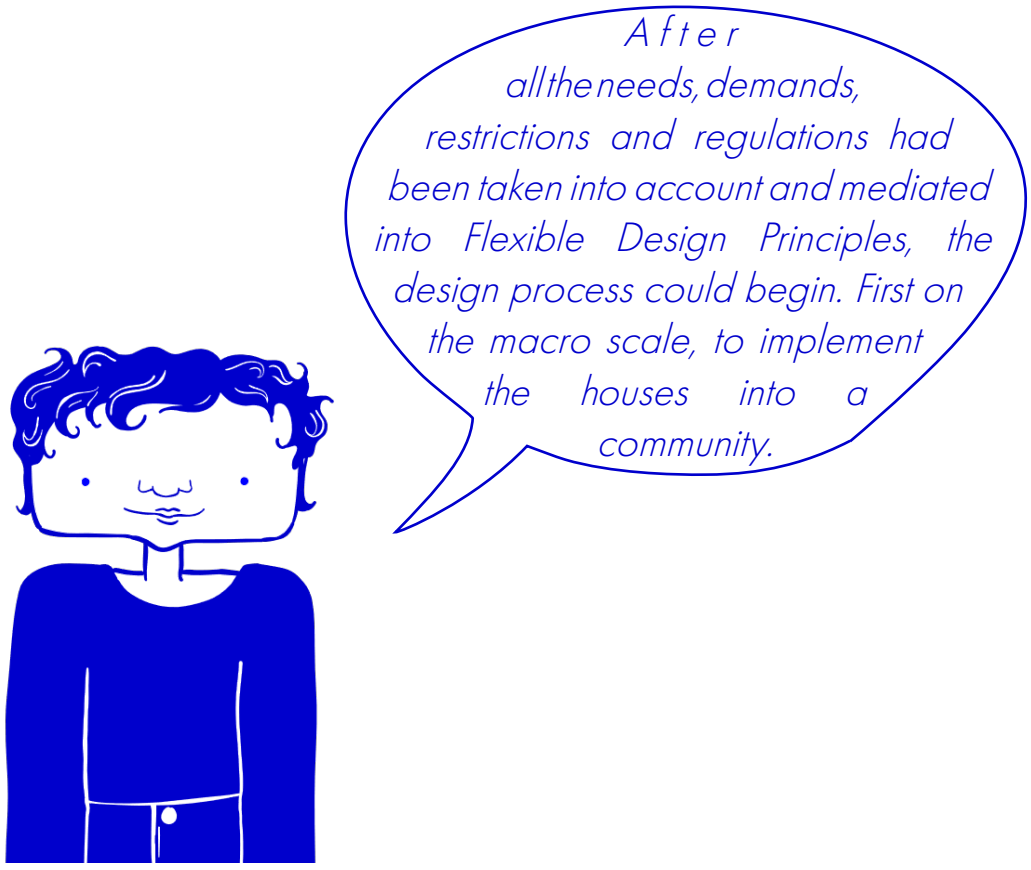


3. MAPPING FLEXIBILITY OPTIONS

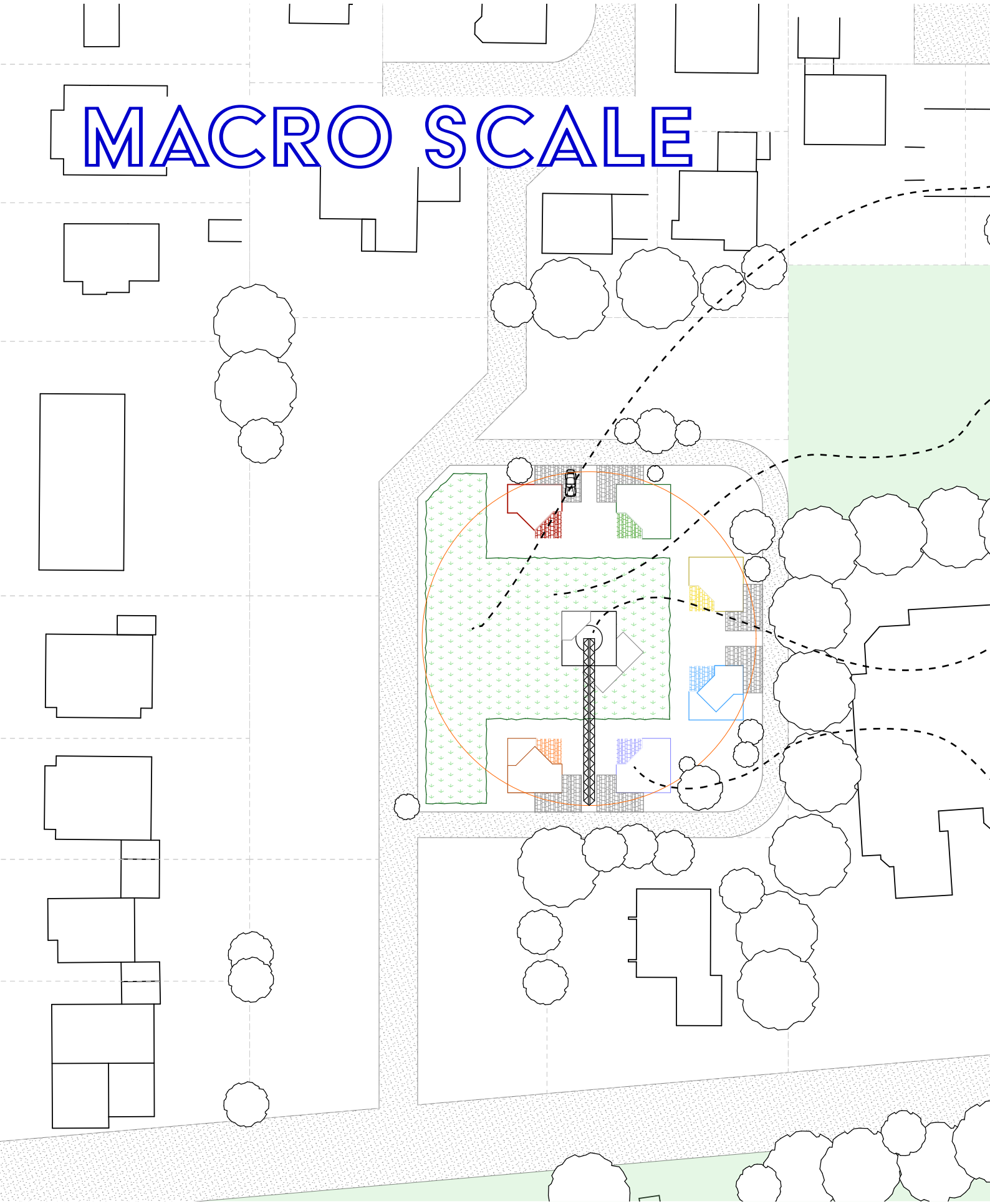


II.I. DESIGN

"In so far as something is designed for everyone, that is as a collective starting point, we must concern ourselves with all conceivable individual interpretations thereof - and not only at a specific moment in time, but as they change in time."
Herman Hertzberger (2005, p. 92)



MACRO SCALE



Community garden opening towards the public space to invite the neighbourhood in from the street.

Community garden to grow vegetables, have space for the kids of the neighbourhood to play and socialize with the community.

Community building that provides space for storage and semi used space. Guest rooms, office co-working space and places for bigger social gatherings.

Each home has an equal distance to the centre. They are also aligned that the living room and kitchen space look out to the public part. This way the spatial programme is linearly divided from private to public.

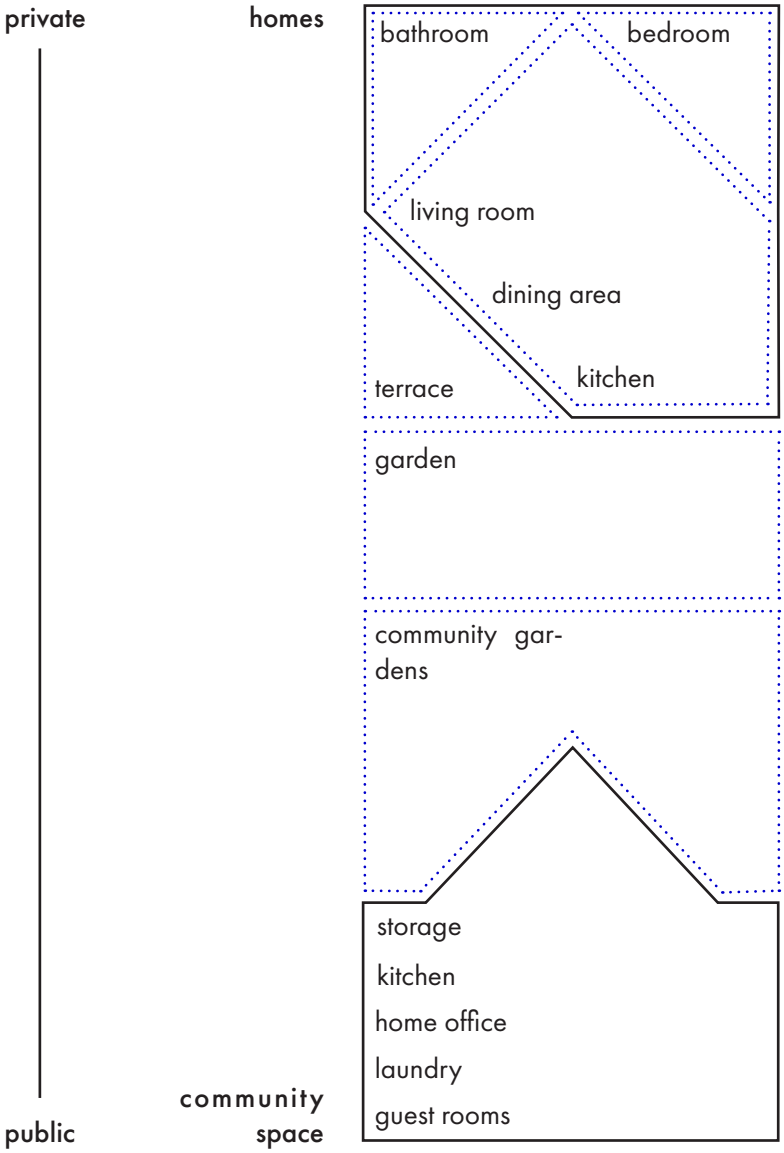
community management.

The ownership model of Elemental Homes is designed to resolve a tension that runs through the entire thesis: how can a community share space without asking its inhabitants to give up the security and identity that comes with owning a home?

The answer lies in a two-tier structure. Each inhabitant owns their core unit outright — a studio apartment consisting of a bathroom, living room and kitchen. This is their permanent, private space. It cannot be taken away, reassigned or lost. It is the architectural expression of place attachment, the part of the home that holds identity and memory across a lifetime. The private ownership of core units alongside shared communal spaces is a model known in co-housing literature as the "lot-model" (Van Gasse & Wyninckx, 2024).

The additional modules — extra bedrooms, work rooms, guest spaces — are rented from the community rather than owned individually. The community collectively owns both the module pool and the shared community building. This seemingly small distinction has significant consequences. Because modules cost rent, holding onto space you no longer need becomes a financial burden rather than a neutral default. Releasing a module back to the community is not a sacrifice — it is the rational choice. The system turns rightsizing from something people resist into something the structure quietly encourages.

Together, the two tiers create a home that can grow and shrink around a permanent core — flexible enough to respond to a lifetime of changing needs, stable enough to remain truly home.



Spatial Program

The spatial programme of Elemental Homes is organized along a single gradient from private to public. Each home follows the same sequence: bedroom and bathroom at the back, opening into the living room and kitchen, leading out to a private terrace and garden, then into the shared community garden and finally the community building at the centre.

Each house is set at an equal distance from the centre, forming a courtyard that belongs to everyone. The courtyard is closed on three sides by the homes themselves and open on the fourth, inviting the wider neighbourhood in.

This is communal sharing in its most straightforward form. Gardens, green space and social infrastructure that no single household owns but all can use (Van Gasse & Wyninckx, 2024). By designing shared amenities into the structure of the neighbourhood rather than leaving them to chance, the architecture actively creates the conditions for social contact and community belonging.

The crane

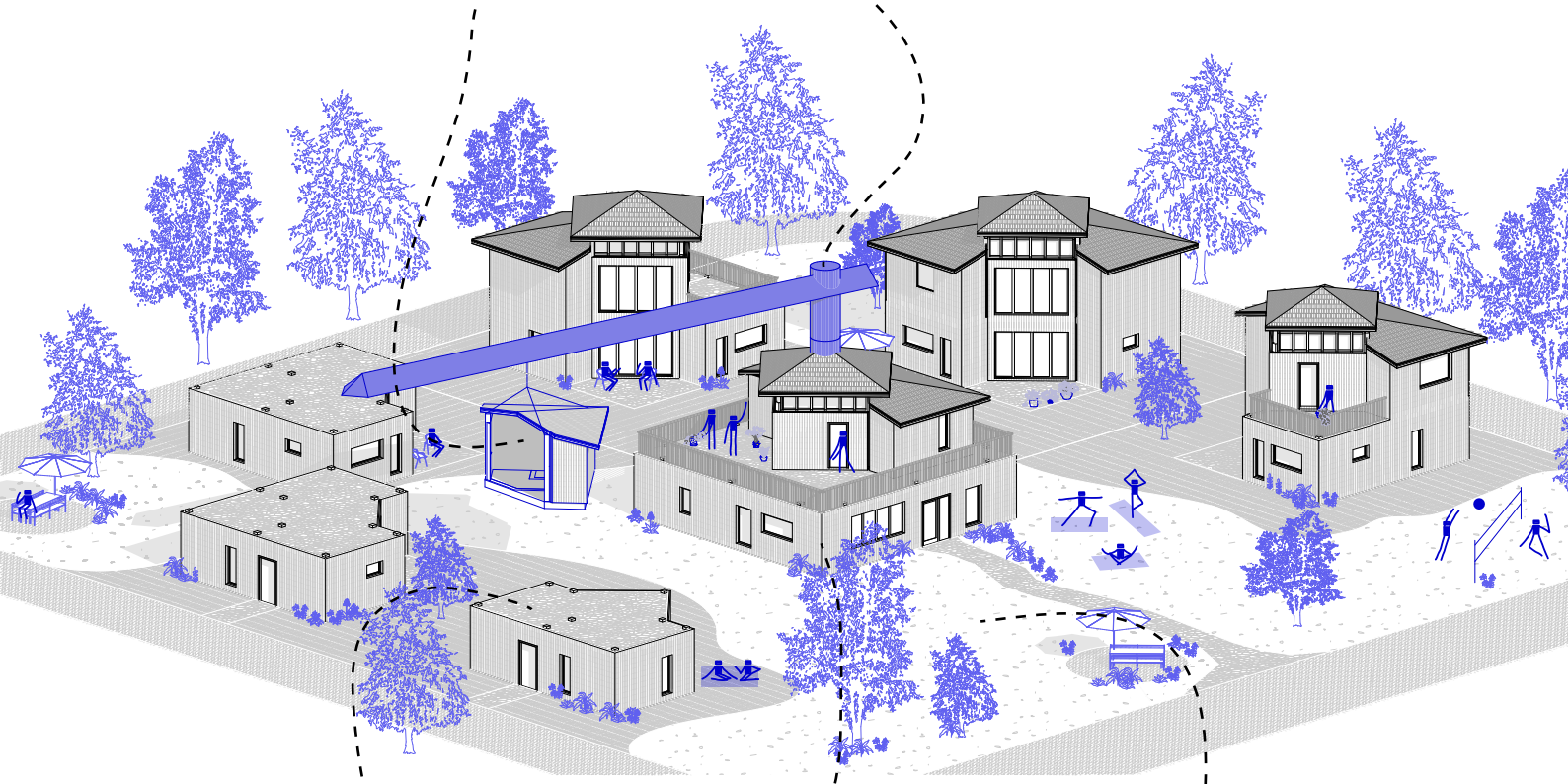
A crane sits at the centre of the community, making the movement of modules visible. Flexibility is not hidden, it is the defining image of the neighbourhood.

Modularity

Whole room-sized volumes are moved rather than individual walls. A grand gesture of flexibility rather than minor interior adjustment.

Orientation

Each home faces the community building at an equal distance, placing shared life at the centre.



Ageing in Place

The core unit itself has to be flexible. Not just the added modules, but the base layout must accommodate different bodies, ages and needs over time.

Green space

Suburban does not mean dense. Maximizing green space is not a luxury but part of the typology. For biodiversity, for the residents, and because it is what people choosing this way of living actually want.

Communal social space and isolation

The shared spaces are designed to create reasons to leave the front door. Spontaneous social contact is the architectural antidote to the isolation that under-occupied suburban housing produces in old age.

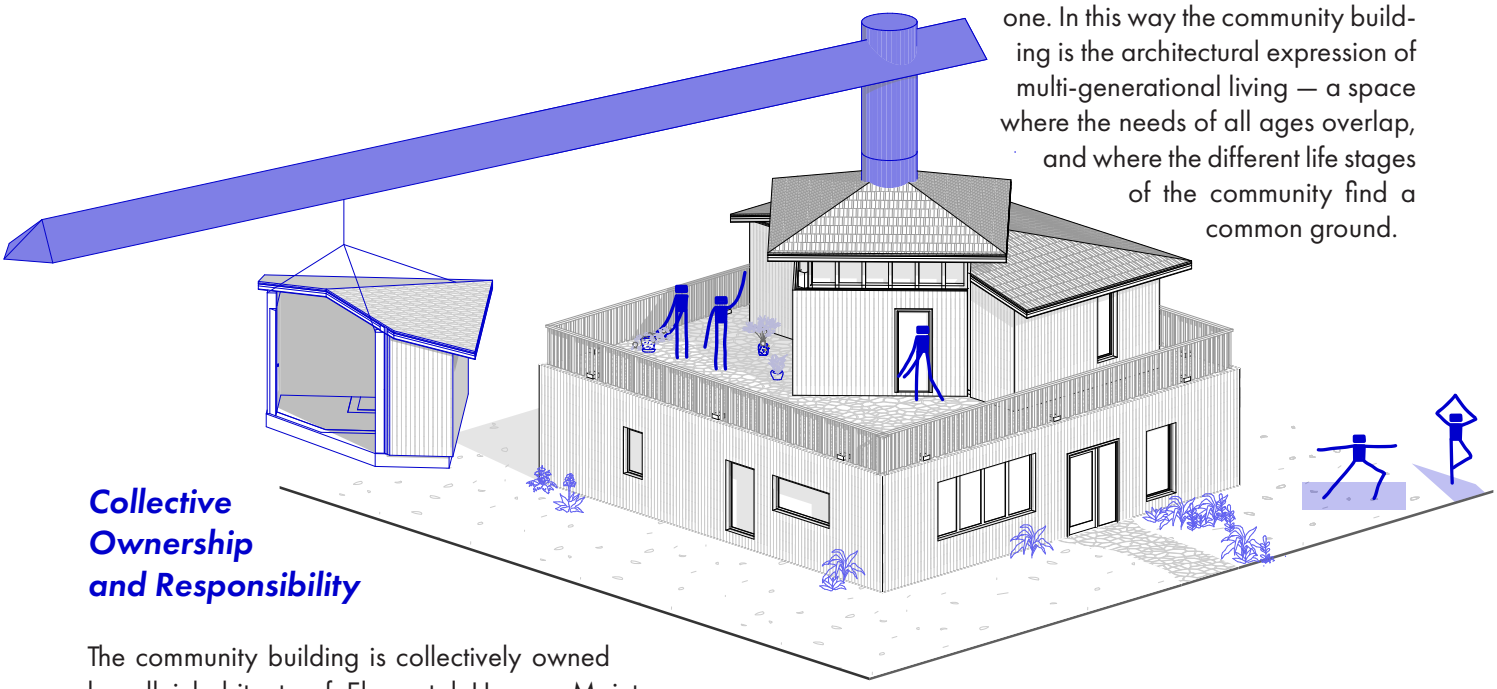
A crane moving modules between households only works if those households have different spatial needs at different times. This logically requires a multi-generational community, where one household grows while another shrinks

MESO SCALE

THE COMMUNITY BUILDING

A Building for Every Age

The functions of the community building are not designed for one demographic. Guest rooms serve the grandchildren visiting an older resident. The play space belongs to the young families. The co-working space serves those building careers. The large social room is for everyone. In this way the community building is the architectural expression of multi-generational living — a space where the needs of all ages overlap, and where the different life stages of the community find a common ground.

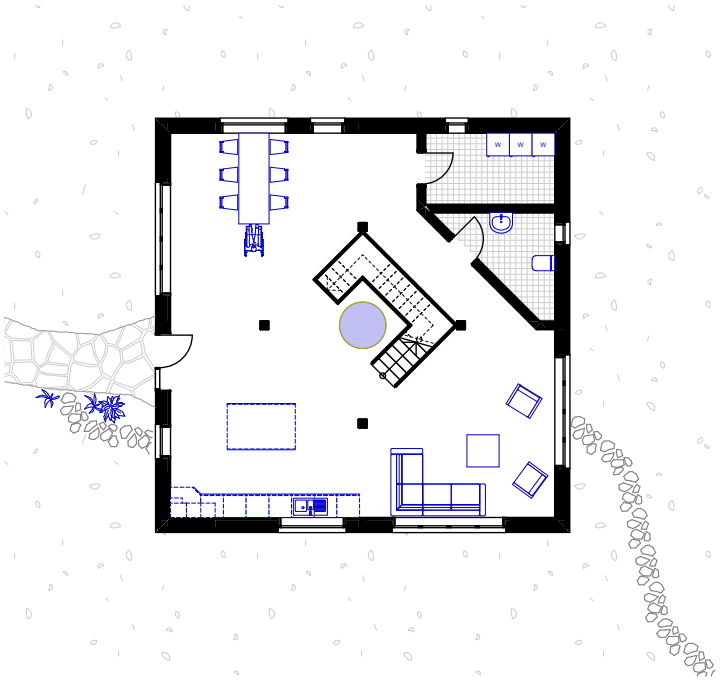


Collective Ownership and Responsibility

The community building is collectively owned by all inhabitants of Elemental Homes. Maintenance costs, decisions about use and the management of shared resources are handled communally. This ownership model is not incidental — it is the social glue that makes the spatial system work. A community that collectively owns and maintains its shared infrastructure has both the incentive and the responsibility to use it well. It also creates the regular contact and negotiation between neighbours that builds the kind of trust a module-sharing community depends on.

The community building sits at the centre of Elemental Homes, providing the shared infrastructure that individual homes cannot efficiently maintain alone. It houses:

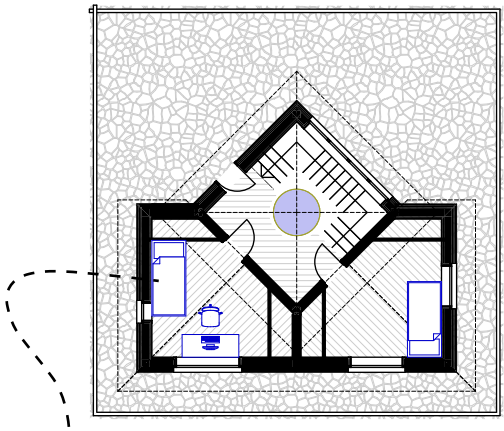
1. A large **social room** with kitchen and dining table — for gatherings, celebrations and shared meals
2. **Guest rooms** — for overnight visitors without requiring a permanent spare bedroom in each home
3. **Co-working** and home office space — for flexible working without dedicating a permanent room at home
4. **Laundry facilities** — shared and collectively maintained
5. **Storage** — for seasonal items, bikes and overflow from individual units
6. **Play space** — for children of the neighbourhood



1st Floor

Spillover Spaces

The community building functions as what Graham (2023, 2024) calls a "pressure valve" — but in two directions. When a household has more space than it needs, that excess can spill outward into the community building rather than sitting empty and costly. When a household needs more space than it has — for a party, a visiting family, a period of working from home — the community building absorbs that demand without requiring a permanent extension. Space moves in both directions, between the private and the communal, depending on where the need is at any given moment.



2nd Floor

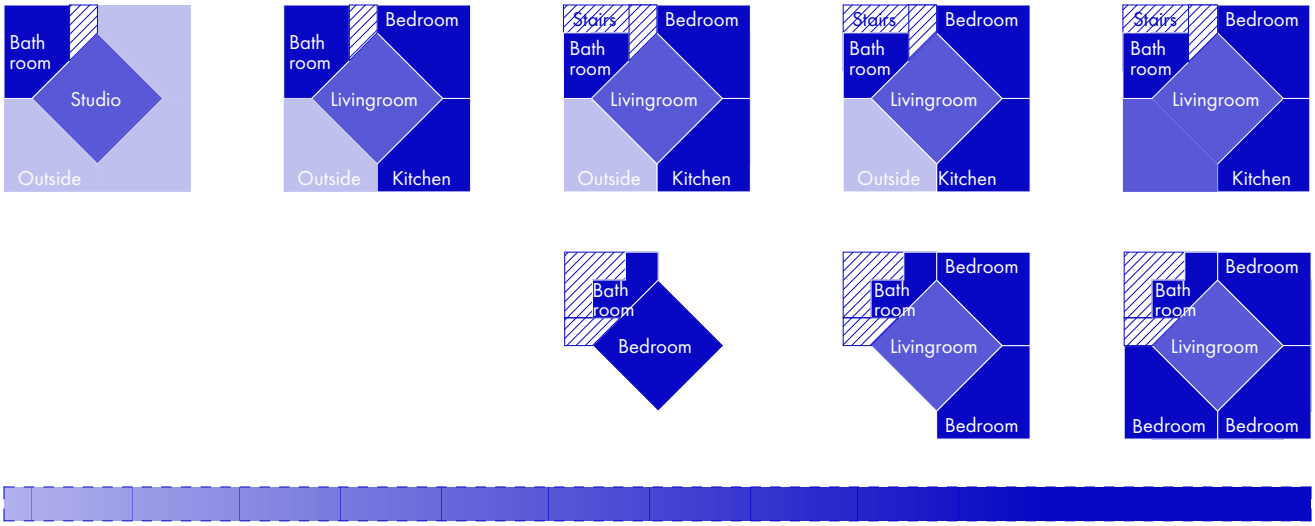
Storing Modules

When an inhabitant no longer needs an additional module, it does not disappear. The module physically reattaches to the community building, where it is held until another household needs it. This means the community building is not a fixed structure but a living one — growing and shrinking as the pool of available modules changes over time. Under-occupancy, which would otherwise mean wasted space and unnecessary cost for an individual, becomes a community resource instead.

THE BUILDING

How Much Space Does a Person Need?

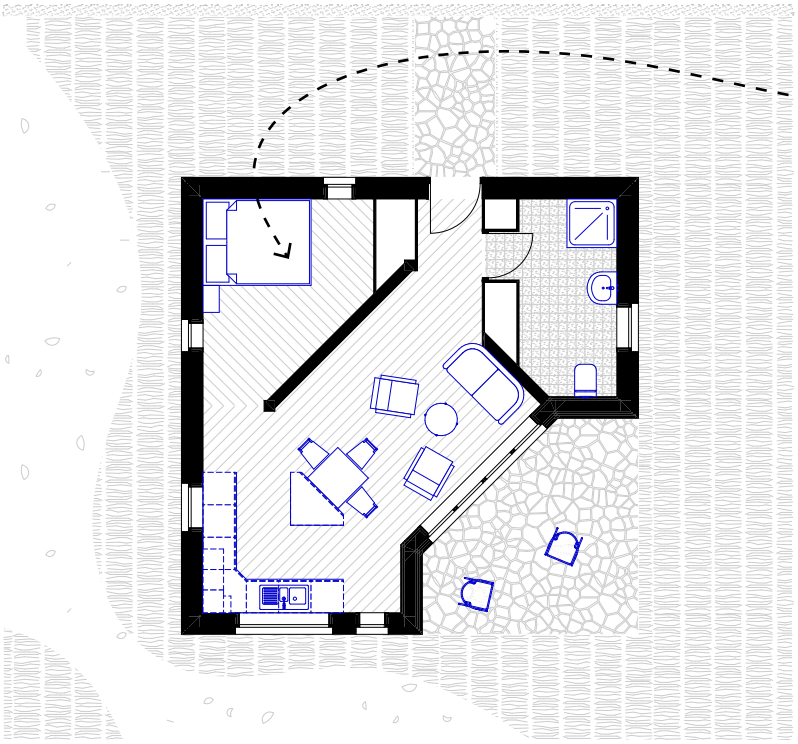
According to Gough et al. (2024), adequate living space can be calculated as 40 square metres for the first occupant, with an additional 10 square metres for each additional person (as cited in Graham et al., 2024). This thesis uses that formula as a starting point, but the design process revealed its limitations. Accessibility requirements, spatial comfort, flexibility for future needs and the minimum dimensions for furniture and circulation do not always fit neatly into the minimum area. Not everybody can live in a studio apartment — and not everybody should have to. The system therefore aims to encourage reduced spatial takeup while still accommodating what each inhabitant actually needs to live well.



The Grid

The structural system of Elemental Homes is a grid of load bearing pillars. This grid defines the dimensions of each module and ensures that units can be freely attached, detached and repositioned without compromising the structural integrity of the building. The grid is the silent enabler to maximize flexibility.

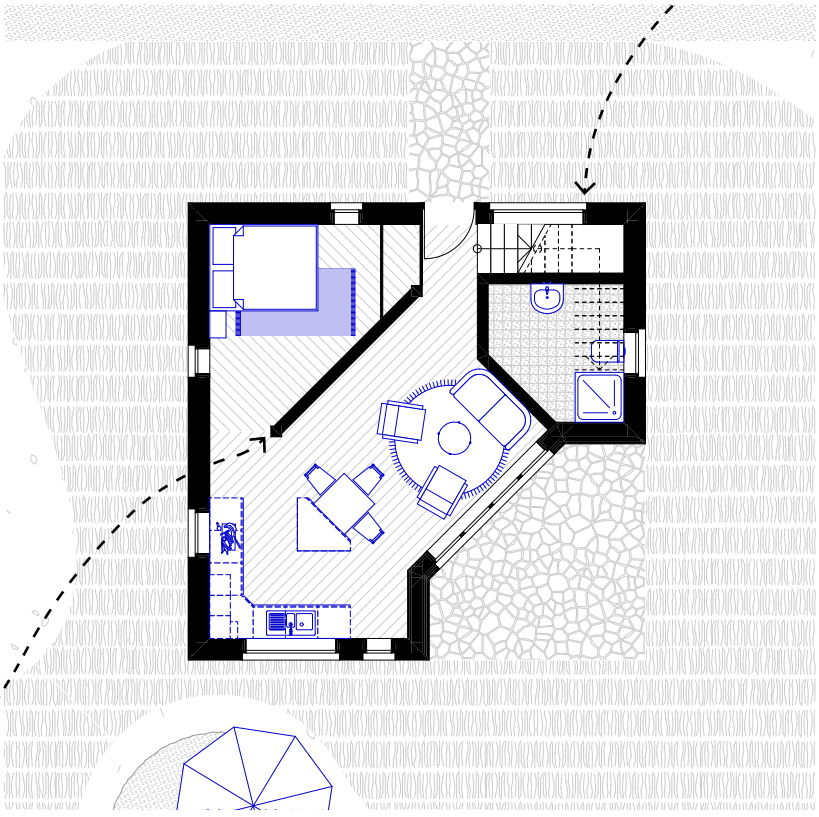
Couple configuration 50m²



1st Floor

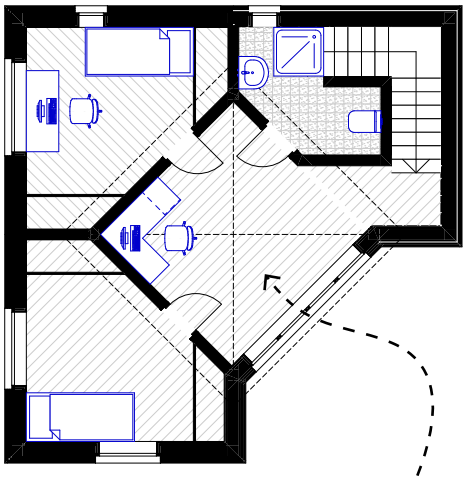
The small configuration adds one bedroom module to the core unit, reaching approximately 50 square metres. It contains bathroom, kitchen, living room, bedroom and integrated wall storage. This is the most common starting point for a household of one to two people.

Family configuration (4 people) 100m²



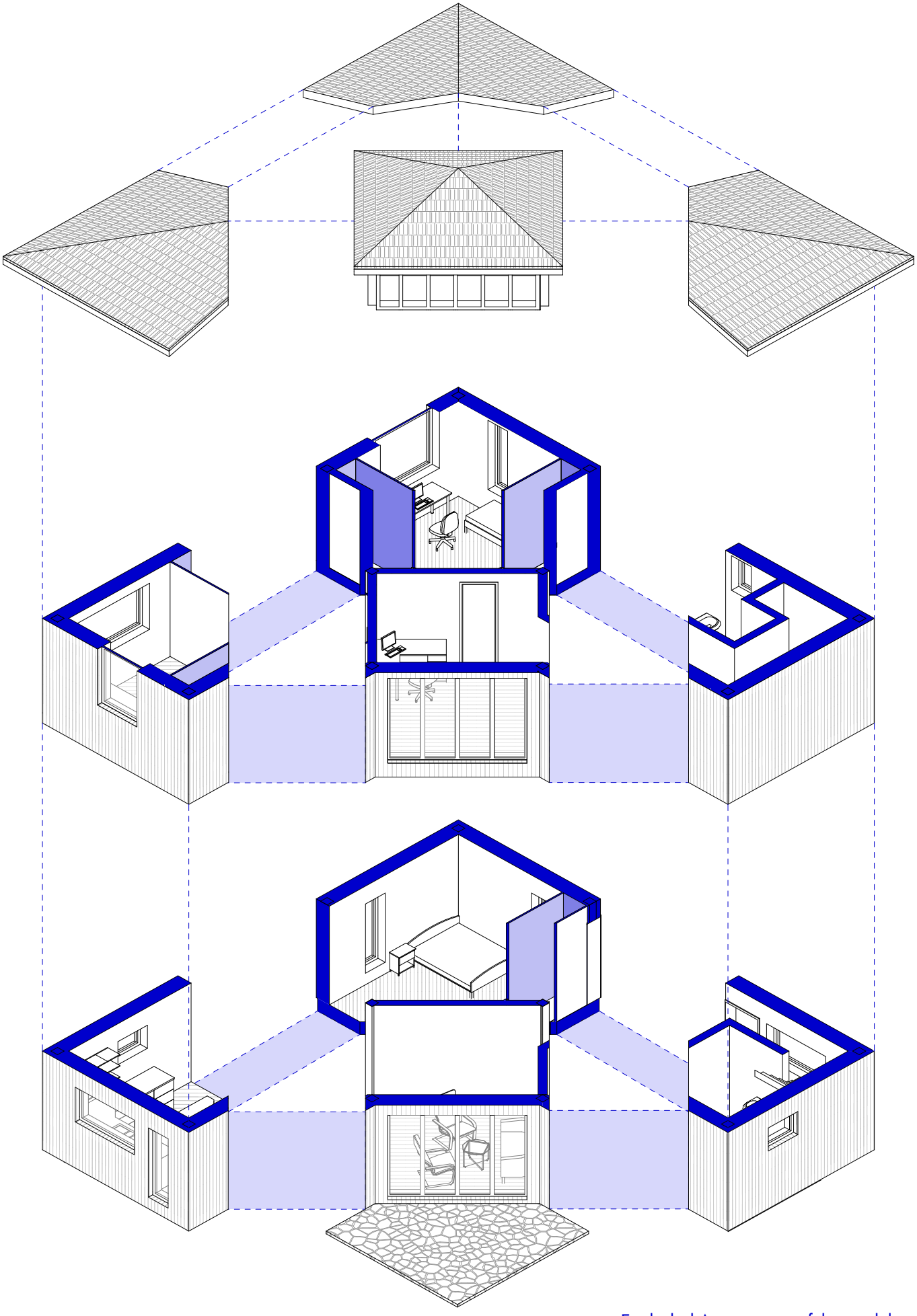
1st Floor

As the household grows to include children, the bathroom unit is replaced by a two storey module containing two smaller bathrooms and a connecting staircase. The ground floor spatial logic remains unchanged.



2nd Floor

On the upper floor, the transition space between staircase and bedrooms is designed as a semi-public room — functioning as a second living room, play room or home office depending on need. Space that would conventionally be wasted circulation becomes genuinely usable.



Exploded Axonometry of the modules

(MICRO SCALE)

As previously stated in my delimitations, this design does not include technical details on how the modules connect, how the facade is assembled to detach, how electrical and plumbing solutions run through the building and if the actual crane could even carry the modules.
This thesis is written in the profile "Society, Justice, Space" and focusses exactly on that; how flexibility and community work together for a more just allocation of space.

However, this author has put a great deal of thought into the logistics an assembly of the design, beyond the scope and detailing of the drawings, so I wish to quickly introduce these thoughts, that could be their own thesis and future research.

How does the plumbing work for the top-floor bathroom?

The staircase-bathroom module is a module that spans two stories, so once a top floor is attached, the initial bathroom module on the ground floor is detached and replaced by the two-story module.

How do the modules attach?

In the corners of the core and each modules there is a loadbearing structure, to which each module can be attached through reversible connectors. The exact design of the connection could be future research.

How do the insulation and facade layers work?

By designing for disassembly, the outer shell of the building could be detachable. That an outside wall could become an inside wall when the new module attaches. The outer layer could then be given up to the neighbour that gave up their module to reinsulate their building.

Could the crane actually carry the modules?

This is a bit unclear. I have done a rough calculation for the loadbearing. However the crane stands more as an architectual symbol for the modularity. For real implementation maybe a different mode of transport would be needed.

DESIGN ITERATIONS

Modelling

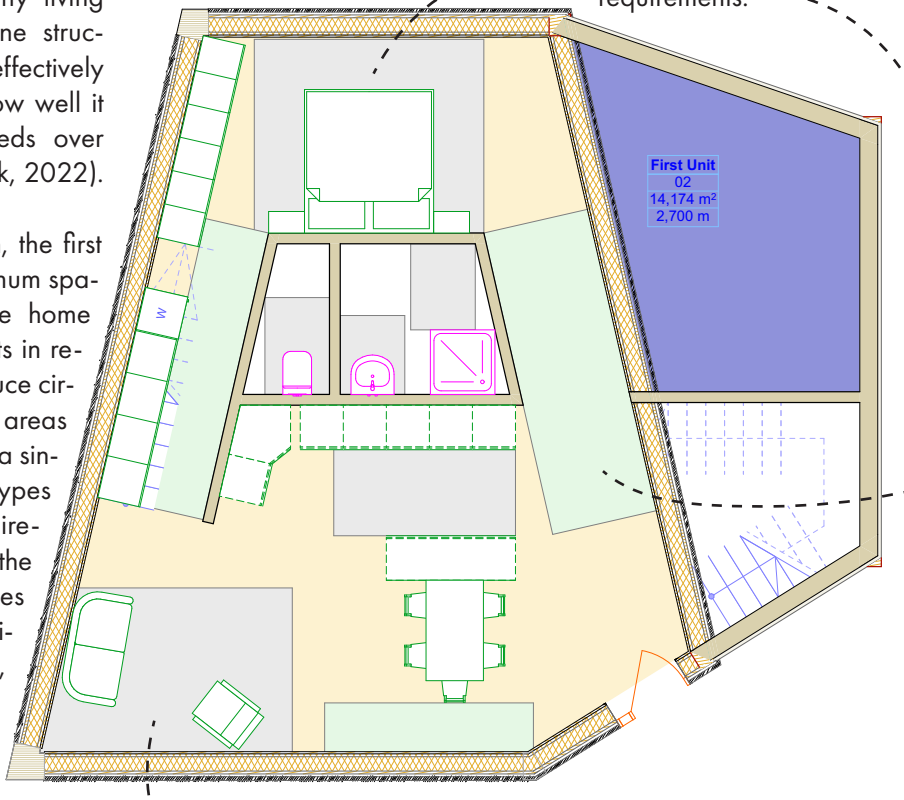
The first step of the design process was to optimize a living space for one person that could later be adapted for multiple occupants. The idea behind this design was to create a core unit containing all the necessary spaces for one person and then to add units for each additional person living there. An important aspect to consider is that shared space becomes more constrained as the number of inhabitants increases. While the design intention is to create efficient space, efficiency cannot be measured by how many living units can be fitted into one structure, but rather by how effectively space can be used and how well it adapts to inhabitants' needs over time (Pelsmakers & Warwick, 2022).

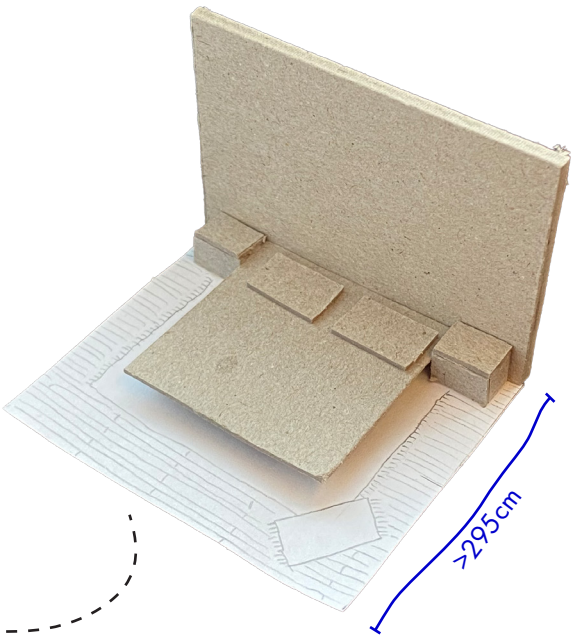
To translate this into design, the first step was to model the minimum spatial requirements within the home and then arrange these units in relation to one another to reduce circulation space and private areas that would only be used by a single person. There are two types of minimum spatial requirements. The first concerns the space around specific pieces of furniture to ensure accessibility and allow navigation, including for wheelchair users (Jocher & Loch, 2012).

The second relates to minimizing the overall apartment size. According to Gough et al. (2024), adequate living space can be calculated as 40 m² for the first occupant, with an additional 10 m² for each additional person (as cited in Graham, et al., 2024)

Here a main problem transpired. If all accessibilty laws were to be abided, then the minimum spatial requirements would not fit into the minimal overall apartment size. Applying the theory of the Shearing Layers and how flexible

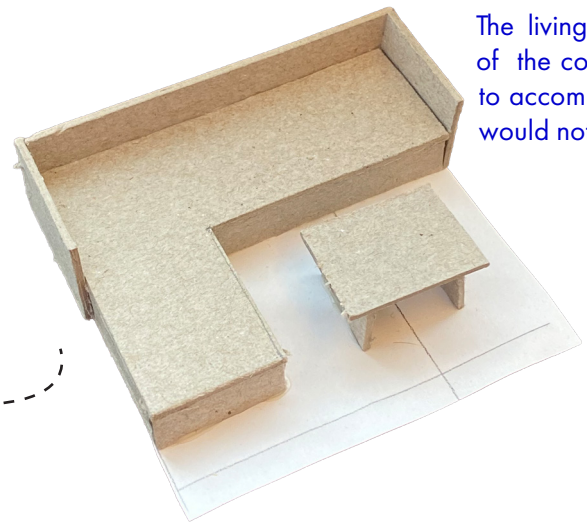
time something has to be, then no „core unit with all functionalities and all accessible" is needed. The core unit itself needs to be flexible and adaptable. Entire rooms might not be needed over the entire lifespan, and accessibility can be considered in different importances. All doors always have to be accessible, while a bedroom for example simply has to be adaptable to when it is needed. After that the modelling with single items was less important, that thinking of functions and their flexibility requirements.





Planning with the minimum space requirements of each interior space.

Planning with accessibility in the static core unit means to plan with more space while it needs the accessibility only later in life.



The living room space and "public space" of the core uni needs to be planned bigger to accommodate a growing family life... that would not be rightsizing, but convertibility.

III. EVALUATION

Welcome to the final part of my thesis. Here I evaluate the design according to its flexibility and ability to accommodate all the needs of the inhabitants. This is being done through a role playing game I designed and played with volunteers. The game is meant to stress test the design by simulating a fluctuating amount of occupants over time. Also tested should be the communal aspect of sharing. How willing participants will be to give up their modules to help a neighbour.
Finally the whole thesis is being evaluated. Limitations I have noticed while designing will be discussed, decisions reflected and then a hope for future research voiced.

THE SHARING GAME

To evaluate a thesis like this, which is proposing a lot of ideas on how life could look like in the future, if we planned things differently, some sort of scenario evaluation is needed. The design proposal includes a community sharing modules with each other over time. This could be run in a statistical program, checking averages of life expectancies, children moving in and out and relationships, but a real community is not made of averages. Life is unpredictable. Divorce happens, unexpected children get born, and even the average life expectancy gets often overshot or died early. A statistical evaluation would smooth out these alternative life paths and not actually stress test a design like this. Also missing from this mathematical simulation is the important factor of human negotiation. The community in Elemental Homes lives from conversations like: "Who gets the extra module? Who downsizes? Who moves in?". These are social decisions, not algorithmic ones.

So instead a game was devised, having the statistical averages of life events happening and then mixing them with the randomisation of a dice throw. The last ingredient are the players. Through roleplaying the developed characters, they bring the human factor of deciding, arguing, compromising and sometimes acting against their own spatial interest for the good of the community. Testing a rightsized design through a game is an idea by Dr. Philip Graham in his paper "Rightsizing" (Graham et al., 2024). In this game however a few more and differentiated life events have been added.

The game in the end is not just an evaluation tool but a small rehearsal of what living in the Elemental Homes could actually look like.

HOW THE GAME WAS DEVELOPED:

The Sharing Game was designed to simulate 50 years of community life, which is the theoretical lifecycle of a house. On a board of 80 tiles, each representing one year of life from age 21 to 100, players roll a dice to move forward in time. Each tile carries a life event that changes the size of a household like a new partner, a child, a divorce, a death.
The probability of these life events were simply statistics, for example the probability of having a child is 1,4 per person. This was now calculated with the probability of a dice throw landing on a specific tile. In the end the amount of kids each player gets should variate from none to maybe three, averaging out at 1,4.
Some events are only probable in a certain age bracket, so how many tiles were calculated, of an event happening, and then distributed within the age bracket of the event actually happening. For example having a child was only between 25 and 45. While death was only after 60 and then becoming more and more likely the higher the age.

After the board was built, test players needed to play the community. Players embody the fictional characters developed throughout this thesis, playing out their lives in a role-play that makes the spatial negotiations feel surprisingly real.

The game was simply a tool for evaluating this thesis. While the process of playing the game and the results are important, how this game was developed it not really in focus in this thesis. That is why I have for a lot of parts utilized AI (Claude Sonnet 4.6 and ChatGPT 5.5.). AI assistance was used specifically and transparently for one task: calculating the probability distribution of life events and determining how many tiles of each event type are needed per age bracket. A purely mathematical task that does not affect the design or intent of the game. The visual design, game logic, what to test and how to evaluate were devised entirely by myself.

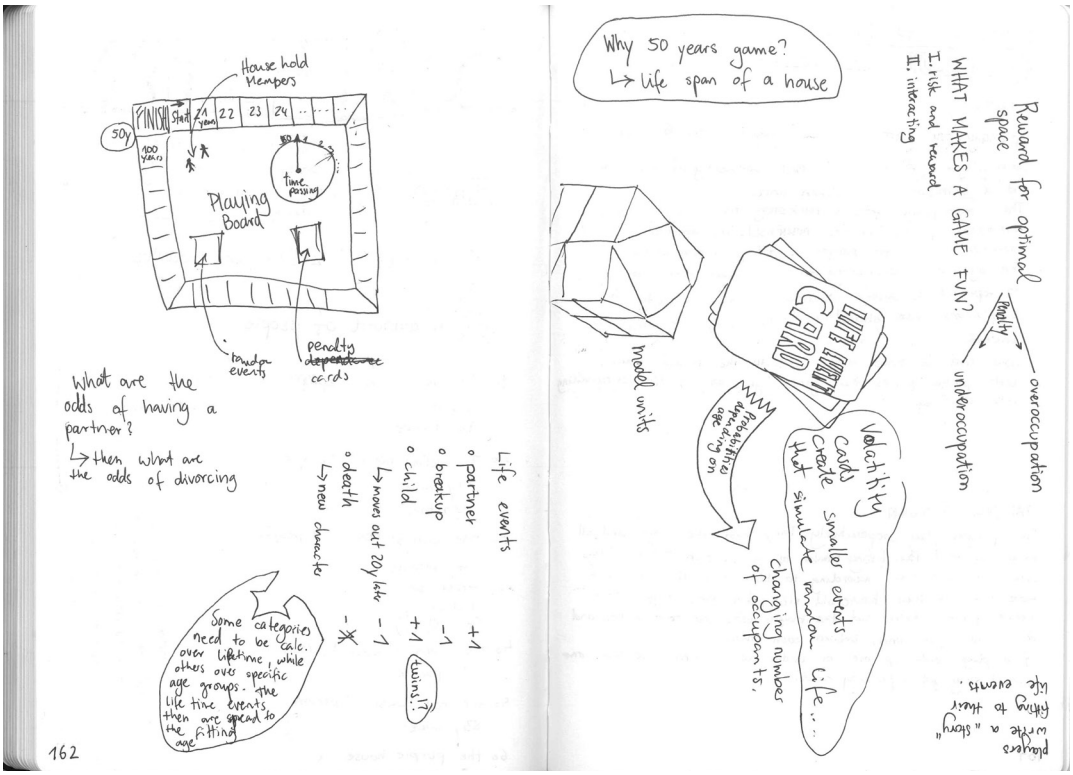


fig. XXVII. Notes of the game development process

RULES FOR THE GAME:

SETUP:

The game is played with 6 players. Each player receives a character card with a back story and starting household size. Each player begins with a model house consisting of one core unit including kitchen and bathroom (40m² — the spatial minimum for one person). For each additional person in the household, one extra unit of 10m² is added.

The total pool of units is fixed from the start — counted by the initial participants. Just like in real life, no new houses are built during the game. Units can be shared and redistributed between players, but the total never grows.

Each player places their game figure on the board tile corresponding to their starting age. The board should represent a diverse multi-generational community with players spread across age brackets.

There is one additional shared unit and a community centre. The players decide together at the start what the community centre contains and how the additional unit is used.

TAKING A TURN:

Players play cooperatively. All players cast the dice and move forward the corresponding number of years. Each player plays out the life event on their tile. If a household changes in size, the player adds or removes a person marker from their house accordingly.

After all life events are resolved, players discuss together whether any units should be redistributed between households. Nothing is forced — this game is also about community and human connection.

Each player logs their current occupancy status in the player log after each turn.

OCCUPANCY:

Spatial needs are calculated as follows:
- 1 person: 1 core unit (40m²)
- Each additional person: +1 unit (10m²)

Being ±1 unit over or under the ideal is acceptable. Being ±2 units or more counts as a proper under or over-occupancy and must be logged. The goal of the game is to finish 50 years with minimal logged under and over-occupancy across the whole community.

THE GAME ENDS AFTER 50 YEARS.
The theoretical lifecycle of a house. The community wins if it managed to keep under and over-occupancy to a minimum throughout.

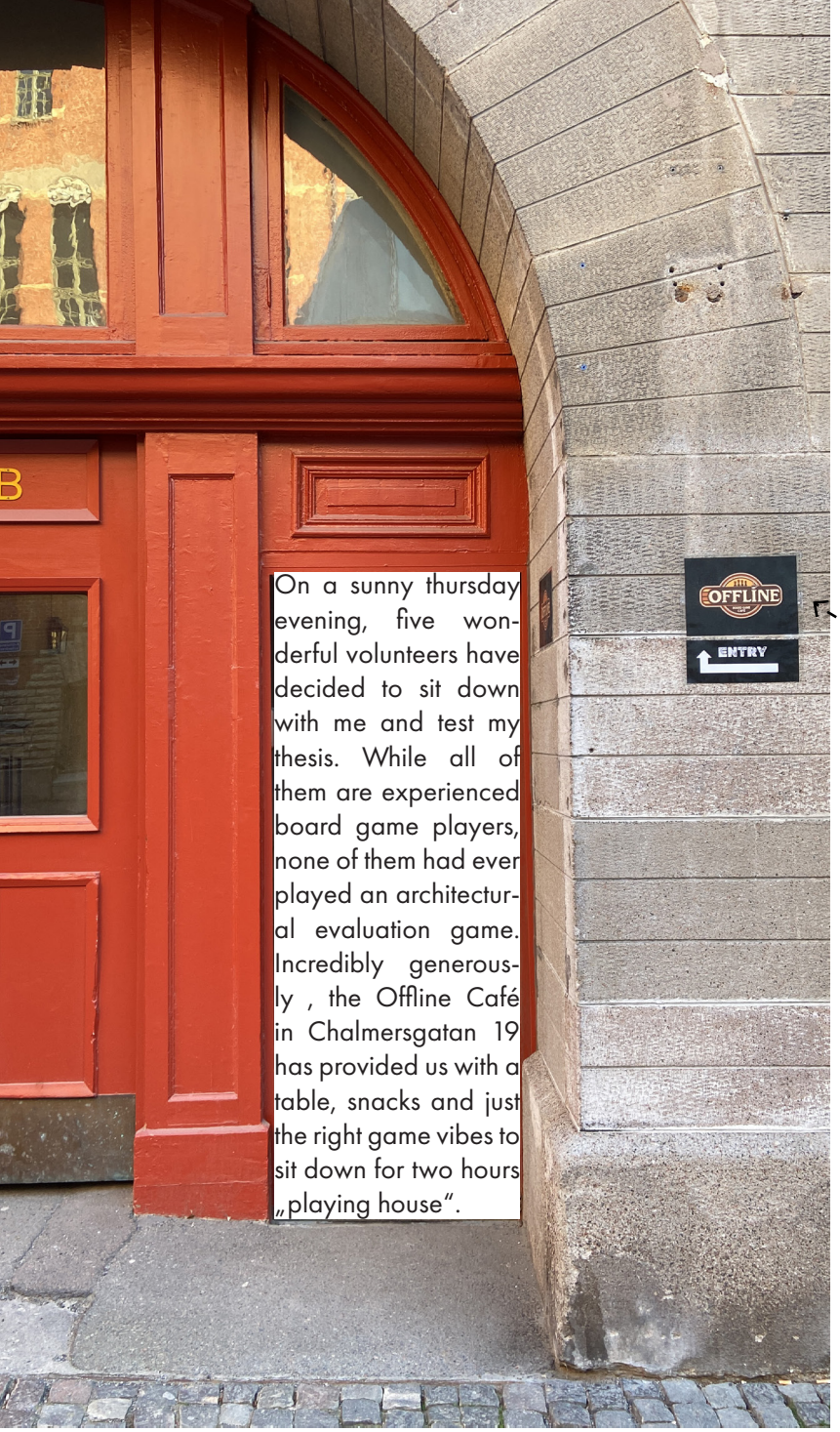
SPECIAL RULES:

Child Moving Out Rule:
A child automatically moves out at 18 years. When a child is added to a household, place a marker 18 years ahead on the board as a reminder.

Death Rule:
If a player dies and still has a partner, they continue playing as their partner. If they are single, the character resets and a new character card is drawn. The new inhabitant starts with whatever units were left by the previous character.

The Impossible Tile:
If a player lands on a tile that is impossible for their character — for example a breakup tile when they have no partner — the tile is played as „no event."

Over Capacity Rule:
If more than 2 inhabitants share a room for more than one turn, the overcrowded player must move out and a new inhabitant moves in.



On a sunny thursday evening, five wonderful volunteers have decided to sit down with me and test my thesis. While all of them are experienced board game players, none of them had ever played an architectural evaluation game. Incredibly generously , the Offline Café in Chalmersgatan 19 has provided us with a table, snacks and just the right game vibes to sit down for two hours „playing house".

A big „THANK YOU" to the Offline Café for providing us with a space to game the evaluation of this thesis and advertising the playtest to find more volunteers!

1. Set-up

After explaining what my thesis is about and why I have decided to build a game to test the statistics of real life, the five volunteers Erik, Ivar, Max, Nicolas and Srijan committed fully to play a "boring" version of DnD, without killing, but some dying. First the players picked a character they would play. The backstory on households and age was preset. As a first step to inhabit the characters, each player would give their character a name.

We set up the board and then the game already began, where all the players had to distribute the available unit between each other. You could notice the spirit of experienced gamers. They were negotiating passionately, trying to optimize individual needs, having a hard time accepting the communal aspect of sharing.

fig. XXVIII. The Offline Café, Chalmersgatan 19

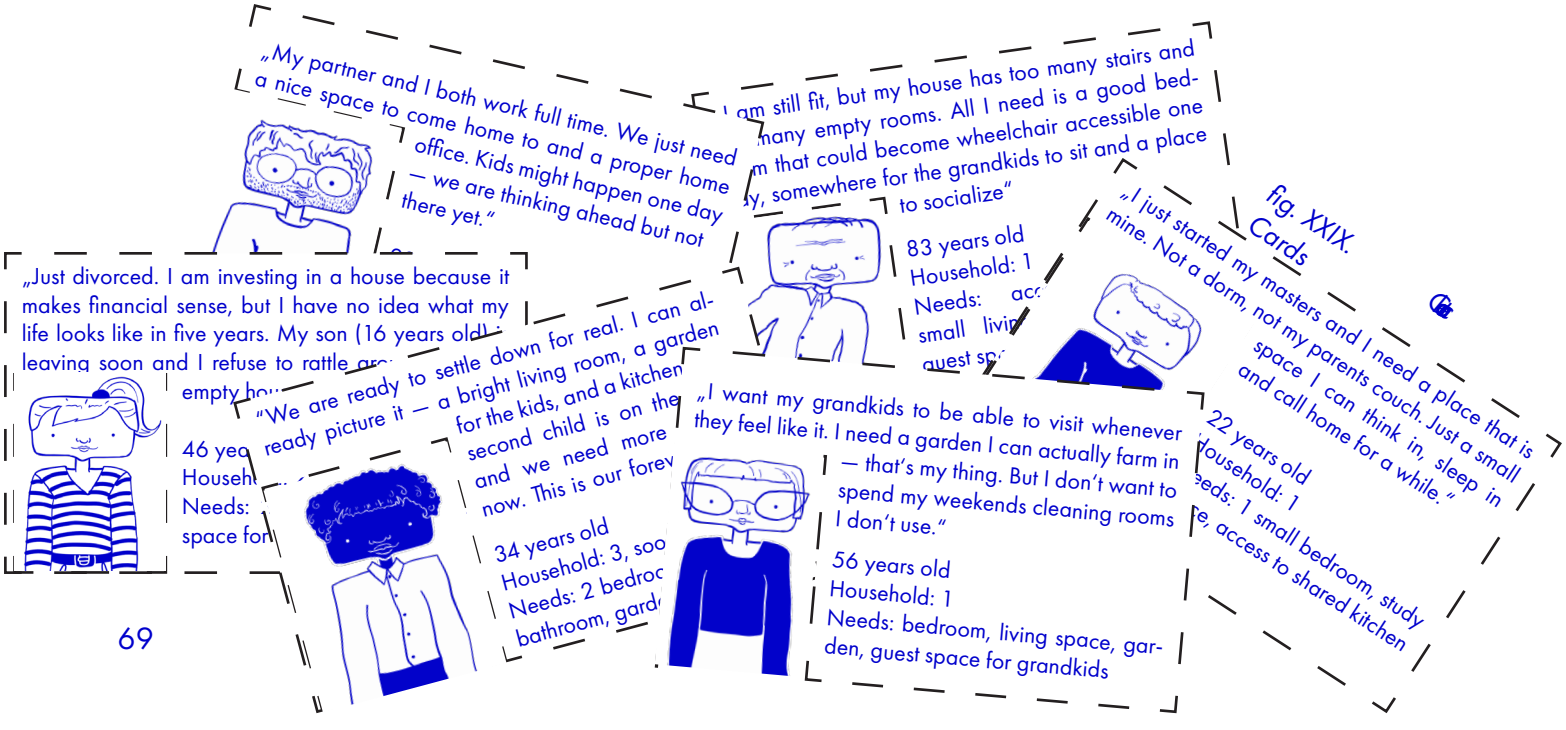


fig. XXIX. Cards

Sharing

While playing I kept a second log about when modules were moved. The players became more and more warm to the idea of sharing the modules throughout the game, so we ended up switching modules almost every turn.

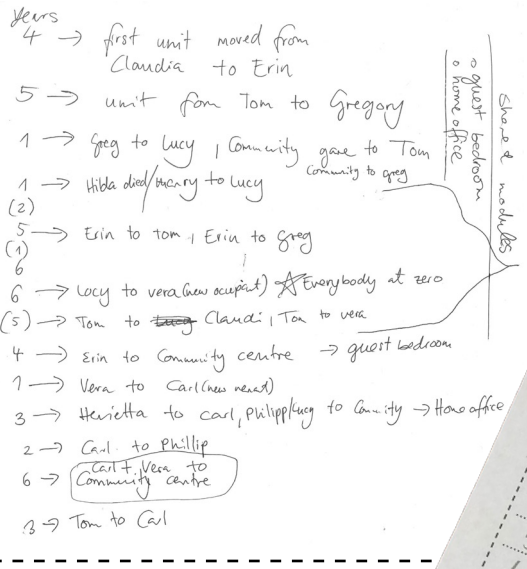


fig. XXX. One of the player logs after the game

2. The Game

During the game itself we hit a few bumps. By lucky dice or miscalculation of the tiles on my part, a lot of children were born. It led to a lot of fun conversations and a slight over-occupation throughout the community. This was also because the age gaps between the characters was not calculated perfectly. If the design would ever be implemented in the real world, there is no argument of building one or two more modules after a few years, if needed... So that is exactly what I have done. After Four rounds and the space being too little, I have introduced two more modules to the community. These modules after 10 turns then became vacant and the community slightly under-occupied.

3. Results

The results of the game were not perfect. The ages of the characters were not calculated correctly, the tiles on the game board led to too many children and the under-/over-occupation could not entirely be avoided.

Nonetheless this game counts as a great method of testing. It has tested the communal aspect of sharing and shown, the longer we played, the more "attached to the community" the players became and the more willing to share they became. It also makes it easier for people not in the subject of spatial equality, flexibility and sharing to approach this architectural topic.



fig. XXXI. The game board during the game, with different interpretations of assembling the modules.

EVALUATION OF THE GAME

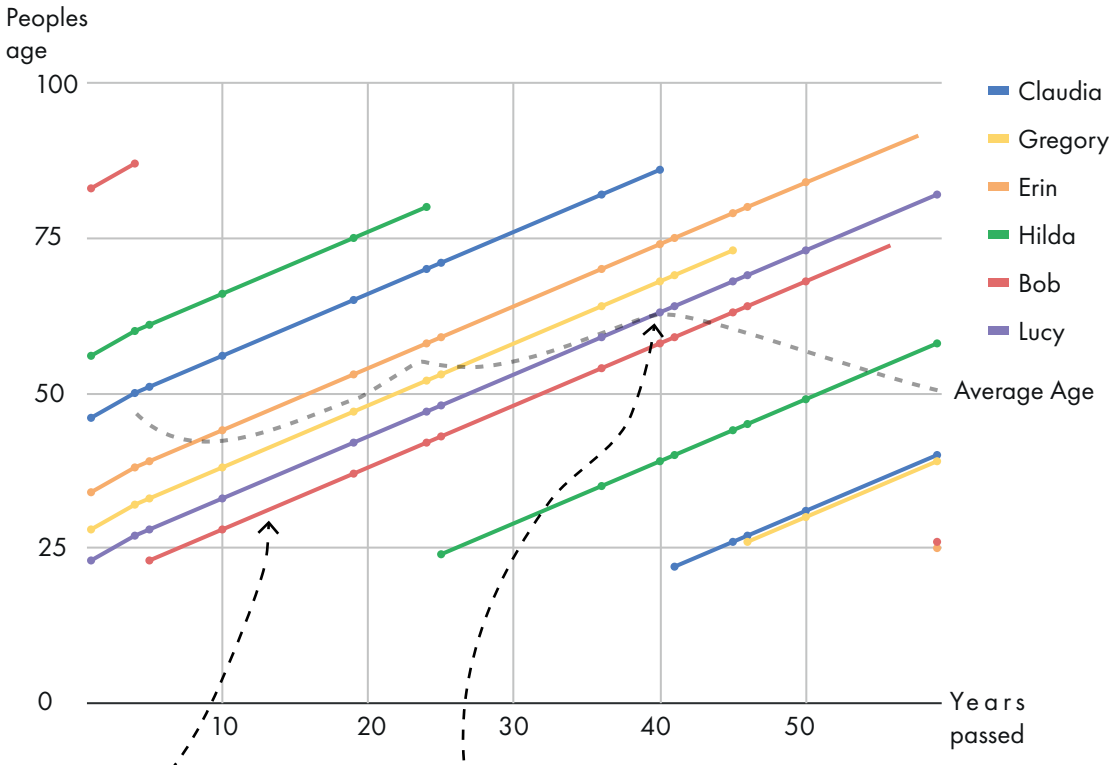


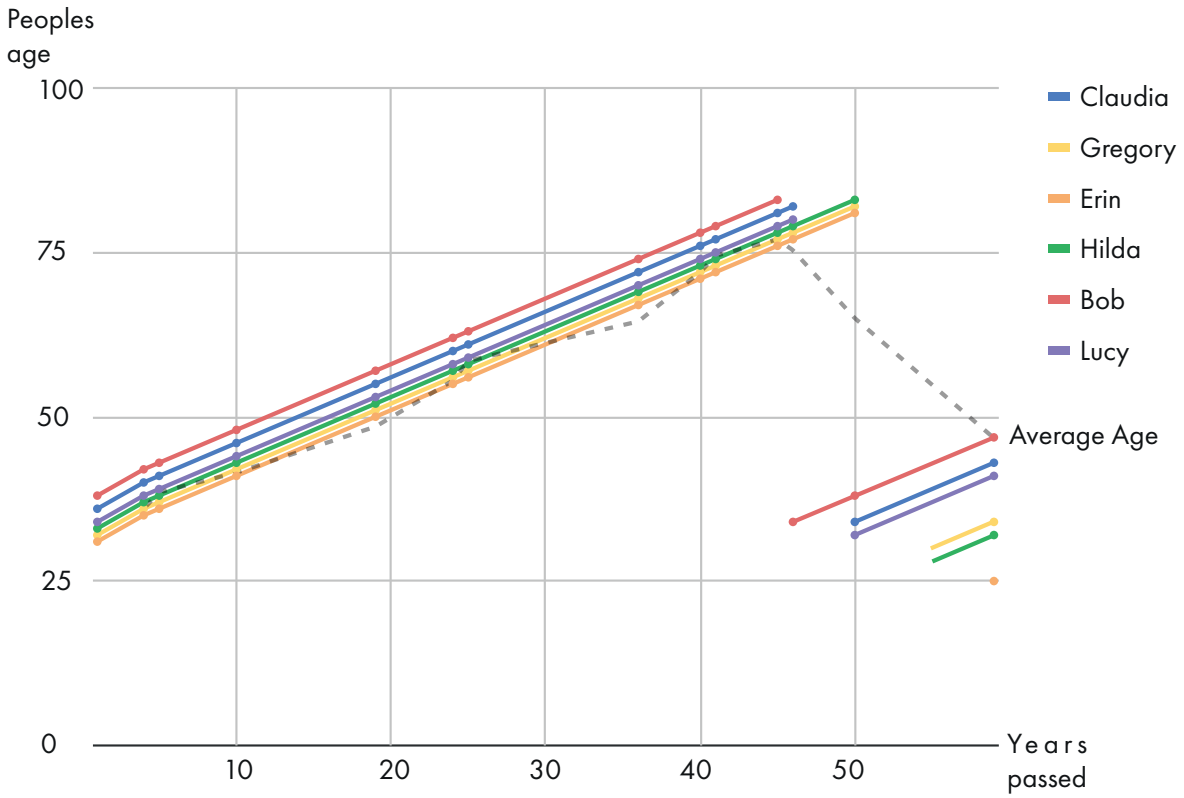
fig. XXXII. *Graph of the age of the players during the game*

After playing a few rounds it already became clear, that the oldest inhabitant (Bob) died too quickly and then there was a long period of 20 years of aging and the younger inhabitants having children. So the spatial need went up.

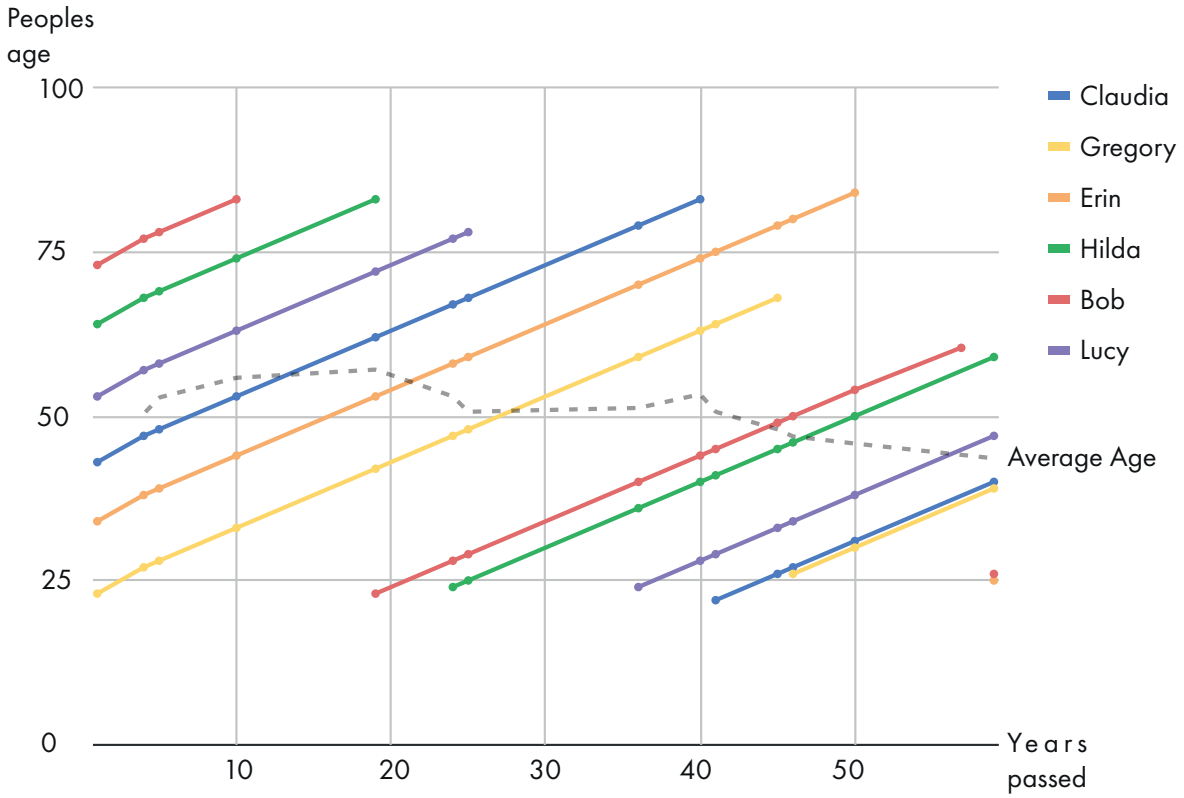
The average age kept slowly rising. It is a calibration issue of the initial starting characters age. While this means that the multi-generational generational community is not perfectly steady, It still stays around 52 years average.

Not perfectly figured out, this community is still performing better, than if a homogeneous young family demographic had moved in and aged in parallel.

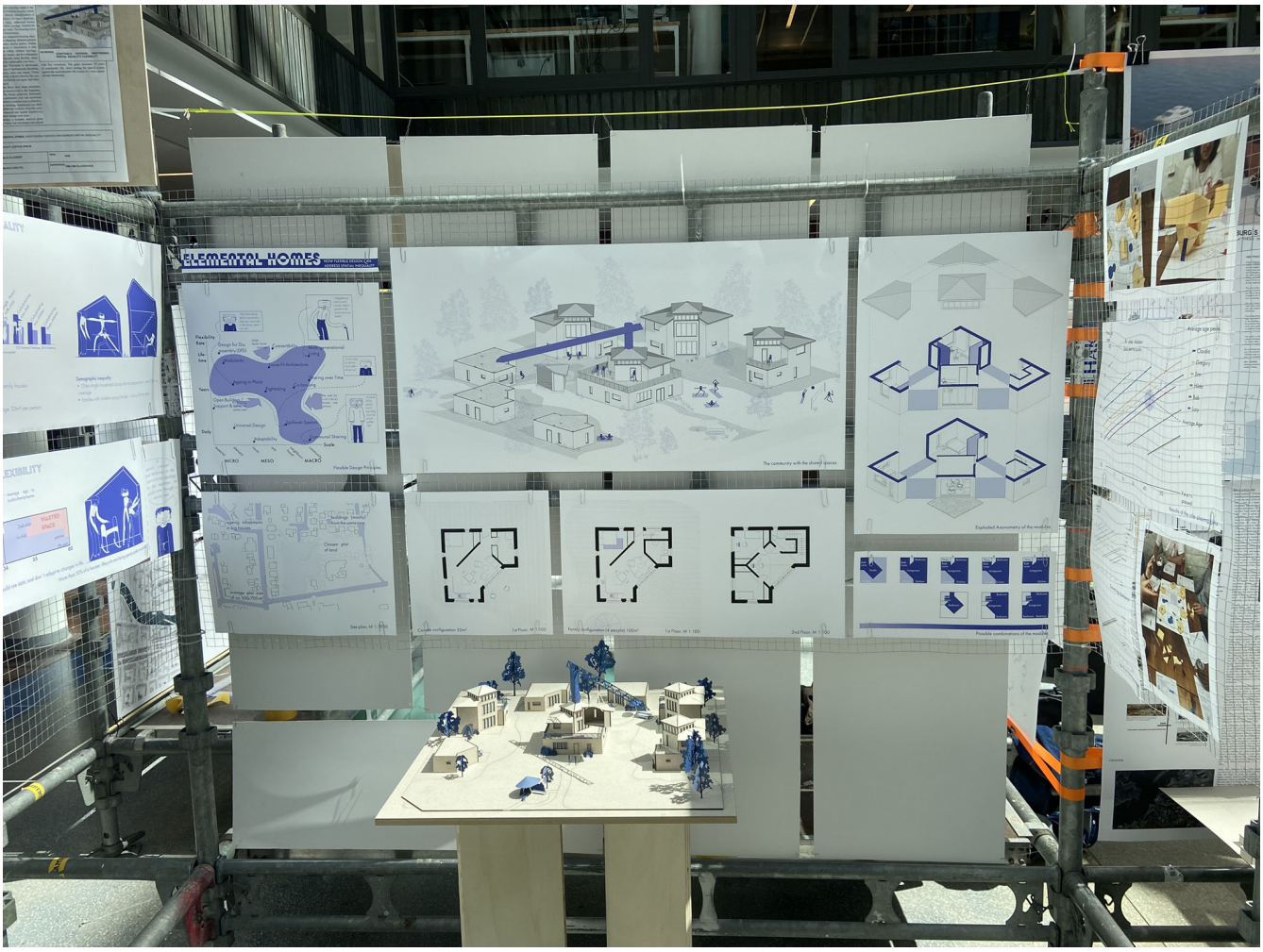
Classic age development in a new development area



Desired age development



THESIS EXHIBITION AND MODEL



EVALUATION OF THE THESIS

What did I do?

I have started this thesis with collecting problems that interest me and that are worth addressing. This collection was vast, stretched over many topics and partly could not be answered through architecture. I mindmapped, reduced and decided to a direction; spatial inequality. This field alone entailed multiple sub-topics that were more political or structural. But instead I found a framing of this problem that could be addressed by architecture. The lack of flexibility, responsible for the space being misallocated.

In my head I already had a rough outline of a design idea of a modular single family home, but I did not want to find a problem fitting my solution. So while keeping this design idea in mind, I started in the beginning; diagnosing the general problem, finding a general solution approach and then applying this approach to my specific context.
This "general solution" was the formulation of my Flexible Design Principles. It felt weird, only elaborating the principles that I actually needed, since my first thesis question is also for a more general frame. So i collected as many Flexible Design Principles I could find in the few months researching this thesis. I do not claim this to be a full list and also hope in my future as an Architect to find more and expand this research.

To test if the Matrix I have developed makes sense in its division, I have analysed my reference projects with this Matrix.

Then I went on to the second thesis question, of implementing these principles into a design. As already stated, I had an idea of the design for a while, to be frank, since my bachelors in architecture. However this design became more and more elaborate in its function and what parts would be needed. Especially studying in Sweden gave me more idea on what social, sharing and communal function means. The actual shape of the design and spatial layout of the modules has greatly changed during the master thesis, because the more intense my research got, the more problems for the layout arose.

Finally I evaluated everything through a game. While designing and researching I had in my mind, that this idea would be arbitrary, if I couldn´t back it up. Thanks to Dr. Philip Grahams "rightsizing" game I realized that a game is the perfect solution to test change and sharing all in one.

How did it answer my research questions?

Research Question I — How can Flexible Design Principles function as a framework to contribute to long-term spatial and social sustainability:

Neither the developers, nor the house owners actively want to build unsustainable or inflexible for future scenarios. It is usually a lack of information about which flexibility methods are a right fit and feasible in the context given. By mapping them out in a matrix they become readable and more easy to choose to which context they are suited. As previously stated, I hope these principles are a framework not just for my thesis but also other architects and my future profession.

Research Question II — And how can these principles be operationalized through flexible, multi-generational housing in a role play scenario for the sub-urban room?

Reimagining the single-family home typology was a needed step for a more sustainable and equitable future. The Sharing Game confirms that a community living by these principles can maintain reasonable spatial distribution over 50 years, even under the pressure of unpredictable life events. The answer is carefully positive. This is one exemplary test in a fictional scenario, not a universal proof, but as a proof of concept it holds up.
Also the principles only become meaningful when tested spatially, and the design only becomes defensible when grounded in theory.

Problems encountered

To talk about "problems encountered" would be an overstatement, since designing and architecture lives from iterations and adapting to circumstances. However after finishing the research into Flexible Design Principles and having a clear idea as to the direction of the design, the combination of both posed a challenge.

I had set it as a goal to avoid spatial inequality, additionally to providing flexibility, which to me meant reducing the used up space in general and making sure that excess space is detachable. However as a personal requirement and to accommodate Ageing in Place I wanted wheelchair accessibility, but to plan the entire home accessible exceeded the minimal spatial requirements. The solution I have found, was to decide which rooms should be accessible in the "family stage" of the house and which need to be accessible in the "old age stage". After deliberation, it became clear, that a family with a handicapped family member would not live in a house with stairs, so the "family stage" needed to be planned for a handicapped guest visiting, meaning the entrance, the living room area and the downstairs bathroom need to be accessible. For the "old age stage" the bedroom potentially needs to become accessible for a wheelchair, by removing the separating wall and turning the ground floor into a big studio apartment.

Connected to that issue was the question of ´How much space does one person "deserve"?´. Basing my work on the research of Gough et al. (2024) (adequate living space can be calculated as 40 m^2 for the first occupant, with an additional 10 m^2 for each additional person), I was wondering what other spatial needs need to be considered. As before with the accessibility, the solution at hand was maximizing the modularity.

That also seemed to be the right solution for the problem I encountered designing the staircase. In the beginning, I had planned a core unit to which only additional units would be attached. That would have the problem that the staircase would always permanently be built in and the overhead space wasted. Once again solution to this was modular. By having a two story high staircase module that can be exchanged when needed.

The last design challenge was privacy. Since my context was the sub-urban room, where people tend to live more to themselves and my concept of Sharing over Time needs a strong community, a solution was needed. The way I solved this, was having a clear spatial structure dividing between private and communal.

Limitations

During the evaluation of my thesis I have encountered unforeseeable limits, because while the role playing exercise is a good method for trying out new concepts, it is not a real "test" against real-world eventualities.

That started with my fictional characters being developed based on average demographic statistics from Sweden, Germany and the UK. Age, gender and marriage statistics are demographical. Their desires and „personality" are based on a small workshop of eleven people, all known to the author. Their diversity is represented in my workshop participants. However six characters can never be fully diverse. And eleven participants are only a qualitative study rather than a quantitative representation.

The second half of my thesis is an exemplary test of the design principles. It is just one specific, self chosen context including the assumption that all participants and stakeholders are willing to try a flexible solution. As outlined in the fictional storyline, the inhabitants "are willing to try something new". But this stands exemplary as a test. Also the comic/storyline does the work of justifying design decisions narratively rather than academically.

Finally I hit limits with the game as an evaluation itself.
The age distribution of starting characters was wrong in play test and would need adjusting. Which means the first results are partially based on a flawed setup and partly assumed from a prognosis of how a different age setup would perform. The problem is, that the Sharing Game was only played once. One play-through is not enough to draw conclusions on the age distribution. It was enough to evaluate the sharing and the function of the building.

Not just the characters age distribution was slightly miscalculated, also the game probability calibration was partially assisted by AI and only tested once. So the tile distribution may not accurately reflect real demographic patterns yet

This all comes down to this thesis sitting between a research thesis and a design thesis. As a research thesis however it was very far already carried out by Dr. Philip Graham, and if it was only a design thesis, the theoretical backbone would be lacking. So this thesis intentionally bridges research and design, which means it does not conform to the conventions of either in isolation.

Reflection

To admit, I left writing this reflection to my thesis to the very last point in time. After my final presentation and my defence. It was because I was curious as to the feedback of my teachers, friends and peers. I was reluctant to reflect upon this topic I had worked on for half a year, which was in my head for much longer, by myself. Especially because a part of it (the role playing part or even the idea) came from my own imagination. While I very much am capable of criticising it by myself, I personally still reflect on it as a very good and also much needed change in the way we see architecture.

For that exact reason I took my time with this text and waited for the views of others, which were very many and very positive. Nonetheless in that feedback one certain notion was audible: this being an optimistic and imaginary design. While seeing the project without construction details and exact planning, it is still a very real suggestion for the future of architecture. My opinion is adamant that we have to start building more flexible and the singe-family home typology needs an urgent makeover.

I see that challenging this typology is abstract and novel, since usually the criticism of the way we build single-family homes leads to building something different and more social. My opinion stands that "the dream of your own home" is still very real to the majority of the population and should not be cast aside, but instead formed into a more sustainable future.
I hope that by exploring this topic further in future research, looking into detailed construction solutions and rethinking other typologies to become more flexible, the entire topic becomes more approachable and realistic. Because it being taken seriously and seen as a feasible solution is the only was to implement this flexibility into everyday building.

APPENDIX



fig. XXXIII. *First Draft of the Game*

UN GOALS FOR SUSTAINABLE DEVELOPMENT

1. No Poverty
indirect positive influence

2. Zero Hunger
no influence

3. Good Health and Well-being
no influence

4. Quality Education
no influence

5. Gender Equality
indirect positive influence

6. Clean Water and Sanitation
no influence

7. Affordable and Clean Energy
no influence

8. Decent Work and Economic Growth
no influence

9. Industry, Innovation and Infrastructure
no influence

10. Reduced Inequalities
direct positive influence

11. Sustainable Cities and Communities
direct positive influence

12. Responsible Consumption and Production
direct positive influence

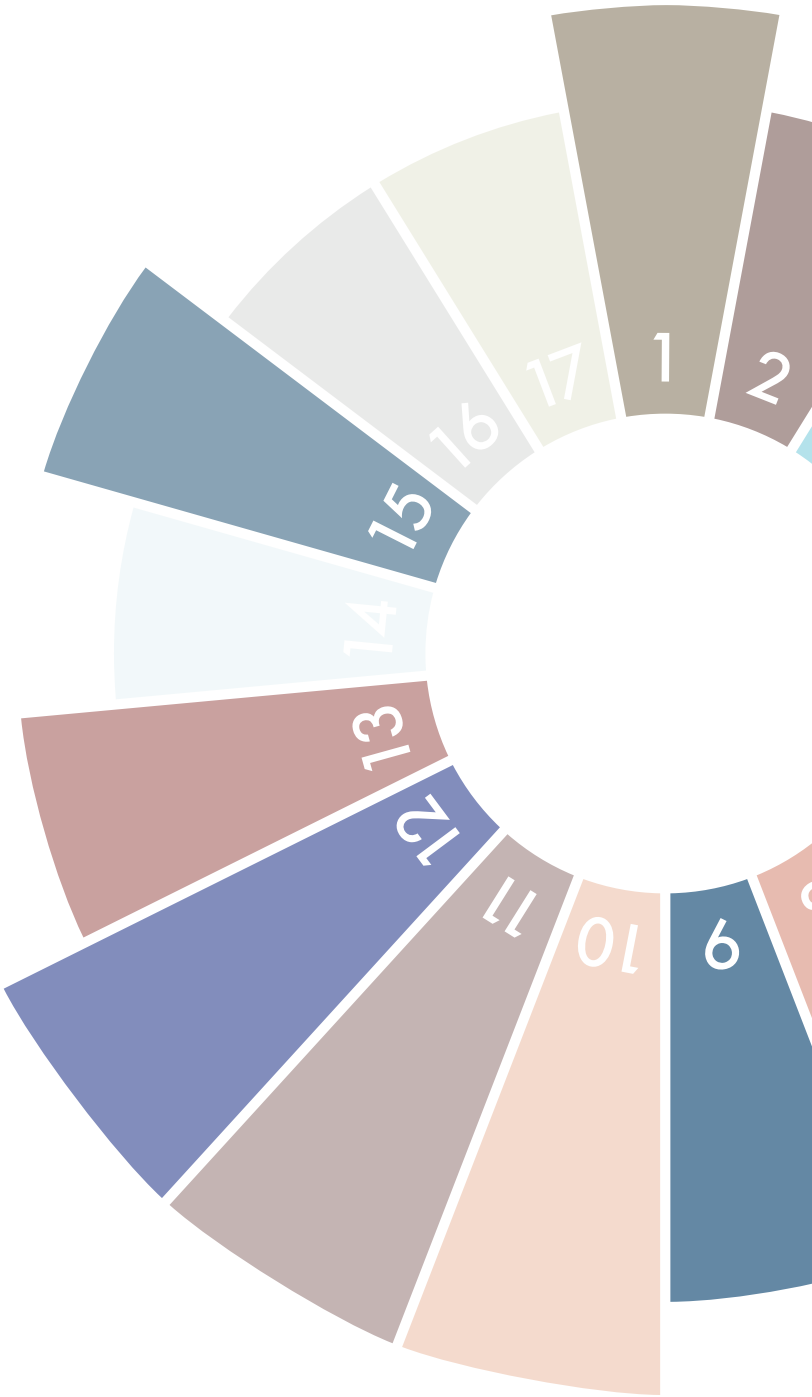
13. Climate Action
indirect positive influence

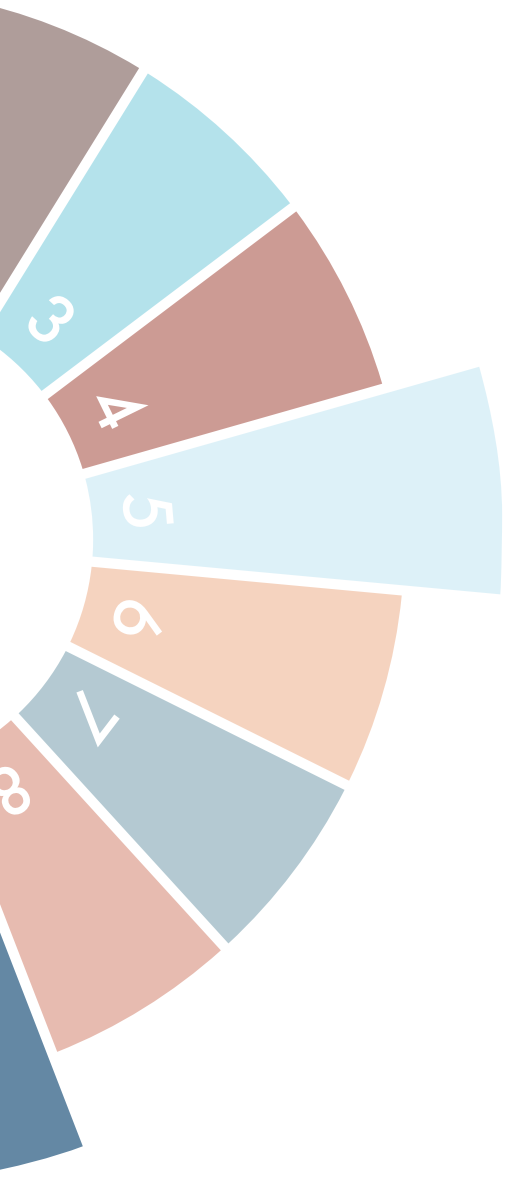
14. Life Below Water
no influence

15. Life on Land
indirect positive influence

16. Peace, Justice and Strong Institutions
no influence

17. Partnerships for the Goals
no influence





PROFILE CONNECTION

Society, Justice, Space is a master thesis profile in the course MPDSD at Chalmers University. MPDSD stands for Master in Architecture Beyond Sustainability. That means we go further than the standard definitions of „sustainable building practices". A sustainable choice of material is not just logic, but a requirement. The scope of going „beyond" sustainability means looking at social structures, ways of living and just spaces and improving those towards a more sustainable future.

The profile Society, Justice, Space holds the aspect of community and valuable social norms in architecture in highest regard. We focus on improving living situations for all of society and creating just spaces for all human beings, the planet and its non-human inhabitants.

My project seamlessly ties into the premise of promoting healthy social structures and a just space for all actors, by offering a fair space distribution inside the city, while maintaining greenspaces for a diverse urban biosystem.

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AI Appendix

The work of this thesis was done myself. AI was avoided as much as possible. As this Author is not a native speaker, AI was sometimes used for translation of academic texts or single words. All texts are written by myself.
AI was also sometimes used to organize notes into an understandable order. Here I used the prompt, instructing very directly and clearly to not „generate" ideas or other knowledge, since AI is not capable of original thinking.

The only part where AI was actively used was in the development of the evaluation game. This game is not part of my thesis, only the results. That´s why the workload of creating a fully functioning game by myself was not corresponding to its importance in my thesis.

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