

GRADUATION REPORT

Learn to Live with Less

AR4AD150 Advanced Housing Design
MSc Architecture, Delft University of Technology

Lisa van Dijk
5286026

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Responsible supervisor: **Olv Klijn**
Supervisor: **Robbert Guis**

Preface

This graduation report shows the process of my graduation project 'Learn to Live with Less'. This project is part of the MSc Architecture course 'Advanced Housing Design - Ecologies of Inclusion' at the Delft University of Technology.

The project explores a new housing system, in which the connection between people and nature is key. By designing houses with three different climate zones, the residents can choose how they want to relate themselves to their insulated home and to nature. The housing system is for everyone who wants to live closer to nature and to what the seasons have to offer. Every age and household type is welcome. This project provides a way of living where more conscious thought is given to climate, water, and energy use.

I would like to thank my supervisors, Olv Klijn and Robbert Guis, for their good and helpful guidance during this graduation process. Also, I would like to thank our sustainable environment expert, Fransje Hooimeijer, for her helpful insights. In addition, I would like to thank my fellow students for the good collaboration and the inspiration they gave me.

Finally, a big thank you to my family and friends. Their support has helped me a lot during this graduation process.

Lisa van Dijk
Delft, June 2026

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1. Introduction

1. Introduction

1.1 Problem statement

At this moment the Netherlands has two main key challenges: the housing crisis and the changing climate. In the upcoming years almost 400.000 new homes need to be built. Besides, the changing climate has more and more effect on our houses and nature; water levels rise, there are moments of drought or of extreme rain and even flooding in some places. These challenges not only affect the way we live, but also the way we should built. Right now most of the new developments focus on building new homes, homes that in some cases are at least a little climate adaptive. Although the topic of sustainability is important in most projects, this often reflects just by adding solar panels or reaching a certain insulation level. However, sustainability can mean so much more than that. A sustainable environment is for example also a healthy environment. This is a topic that needs to be considered more in new developments; it is not only creating new homes, but it is creating new healthy homes and living environments. A healthy living environment should help to improvement of both the physical and mental health of its resident. Nowadays people tend to live more unhealthy; they have a lot of stress, they eat unhealthy food, they are nonstop behind screens (phones, computers, etc.) and they don't go outside so often anymore. These unhealthy habits not only affects adult, but more importantly they affect children. Your childhood is the most important time in your life; it forms you as a human being. Were back in the days children learned and played outside, nowadays they are behind screens all day. The leak of being outside can not only affect them day to day, but also later in life. Besides the people around them, like their (grand)parents, are also more and more inside during the day. Due to the way we built, work and live we create a society that sits inside all day, which affects our health. This is a problem that needs to be solved. Everyone should be allowed to live in a (healthy) environment where being outside is stimulated.

1.2 Relevance

In order to create a healthy society it is important that we start as early as possible. A healthy society starts with growing up in a healthy

environment. Multiple health organizations alarm about the collective health of children. They have more health issues, like poorer vision, obesity and concentration problems. The main problem is that they don't go outside anymore. Society made it easier for kids to play on their phone than meet with friends outside. However, the generations above them are not a good example either. In The Netherlands people sit still about nine hours a day on average. That makes the country the 'European sit champion'. About three of these hours we sit still is in our free time, while this should be the time to go outside and be more active (TNO, 2024). Therefore, creating homes where being outside is valued just as much (or even more) as being inside is important. But, just being outside is not enough, being surrounded by nature really improves the health of humans. Nowadays we tend to think that homes close to nature are too expensive and just for certain people, but this has to change. It is important to create new healthy homes that are not only surrounded by nature but that are also accessible for most people. By doing so more people and children get the change to live and grow up in a healthy living environment.

1.3 Objective and motivation

Growing up and living in a healthy living environment should be possible for everyone; playing outside, go for a walk, enjoying nature. These are thing that should be basic right. The world has so much more to win by giving people the opportunity to live and grow up healthy, in nature. Therefore, for this graduation project creating a healthy living environment is the key theme, with a main focus on the outdoor life. The architecture in this project should stimulate the residents to be more outside. Being outside (in nature) becomes more the rule than the exception. The architecture and dwellings should serve, provide and stimulate the outdoors life. The vision is creating smaller homes with mainly the essential needs and easy access to the outside. There will be a part of the house that functions as a buffer zone between inside and outside. The use of the different zones in the house will change per season. During winter the residents might live in a smaller part of the

house with the essential functions. In spring and autumn they might use the buffer zone more and in summer they might only sleep and eat in their house, and the rest of the time they are outside in nature. The residents of this project will live more by nature, and the things nature has to offer. The outdoors become part of their home.

1.4 Research and/or design questions

The main design question for this graduation project will be:

'How can architectural design strategies create a healthy living environment that encourage being outdoors?'

In order to answer the main question the following questions need to be answered:

- Which architectural and spatial characteristics contribute to better inside-outside connection?
- How do architectural design elements influence residents' use of indoor and outdoor spaces?
- How can the design principles be translated into an architectural design that promotes being outdoors?

1.5 Scope

For this project the location is in Midden-Delfland, The Netherlands. This typical Dutch polder landscape will be the start for the new living standard: a healthy living environment. The specific location is the Foppenpolder/Vlietlanden near Maasland. Now this polder is used for agriculture and recreation. In a new masterplan developed by myself and my groupmates from the Advanced Housing Design studio, the polder will drastically change. In the new plan the water levels will be less regulated, which allows the water to find a new balance. By doing so new islands will appear. These island are divided in different zones: a housing zone, a nature buffer zone, and a nature only zone. By creating these zones, a part of the existing nature will be harmed as little as possible. That is also the goal for the housing zone: harm nature as minimal as possible. This goal will reflect in the way that the housing will land on the landscape and what materials will be used.

1.6 Masterplan

The design task for the Advanced Housing Design course began with the assignment of a group theme: sustainable environment. Within this framework, the Midden-Delfland area was analysed in relation to municipal ambitions and the future scenario developed by ZUS, SWECO and FLUX Landscape Architecture in 2022. This scenario, which explores the transformation of the landscape into a series of differentiated ecological systems, formed the foundation for the group's masterplan. Based on this analysis, the Vlietlanden was selected as the project site due to its ability to represent the full range of landscape conditions present within the broader regional vision.

The foundation laid by ZUS is further developed through a set of supporting ambitions. The project aims to define a new way of living that fosters a healthy and sustainable society, in which sustainability is approached not as a purely technological solution, but as a spatial and ecological condition. In this approach,

sustainability goes beyond interventions such as solar panels and instead actively contributes to the restoration of biodiversity, community and natural systems.

Human inhabitation is positioned in relation to ecological systems in a way that supports coexistence rather than dominance, allowing the landscape to function as a dynamic and evolving system while still accommodating living, working and recreation.

* The text and image are part of our group work

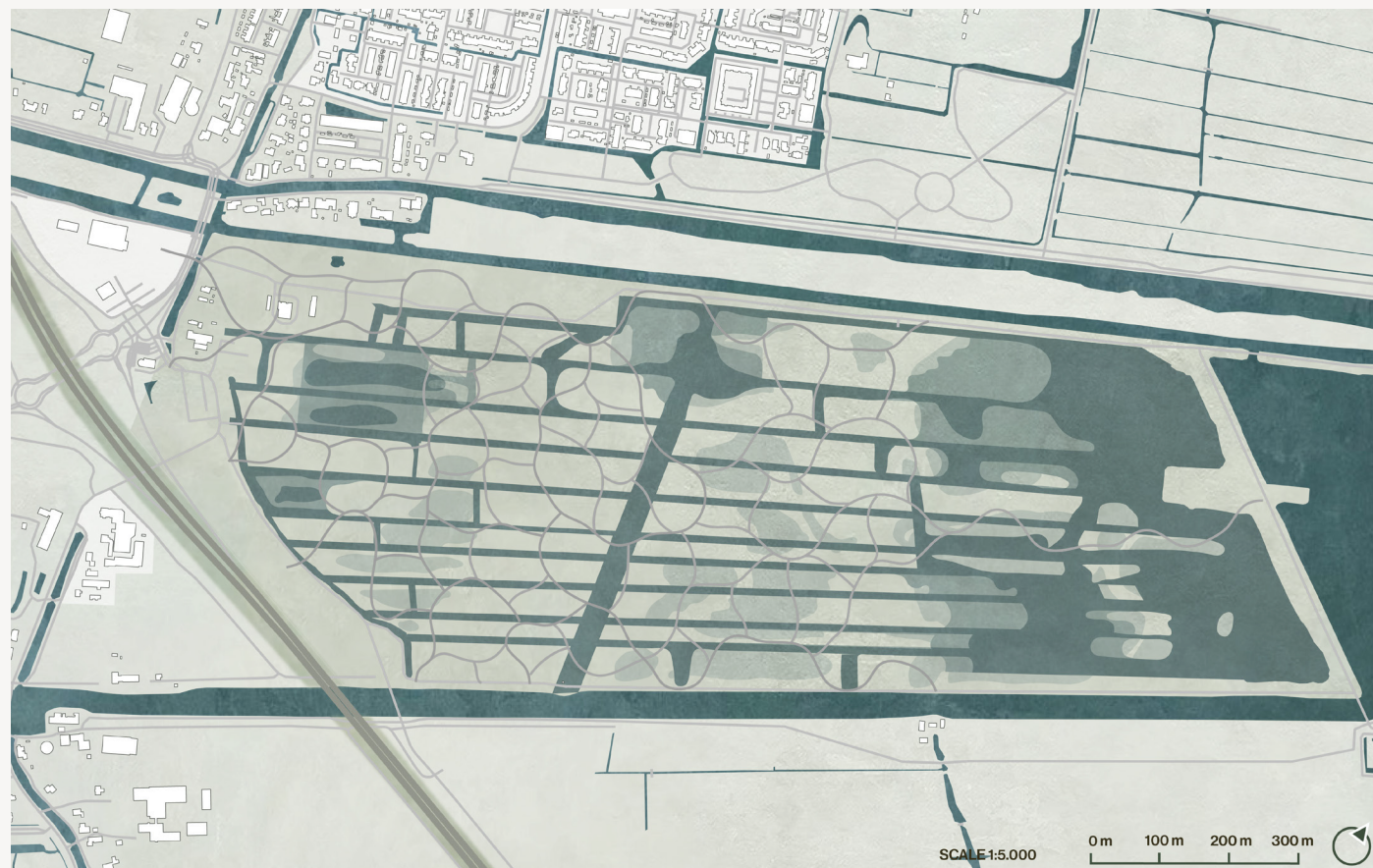


Figure 1: Masterplan
(Group work)

2. Approach

2. Approach

2.1 Methods

To develop a design that encourages people to spend more time outdoors, research is done. This research is mainly the analysis of case studies and relevant literature. The findings form the basis for the design development. In addition, the research-by-design method is used. This enabled ideas to be explored, tested and refined throughout the design process.

2.2 Theoretical framework

When people think about going outside, most of the time they think about some type of activity to do in their free time. Being outside becomes a form of recreation. Studies show the importance of these types of activities. Being (active) outside has multiple health benefits, both physically as mentally. People who live close to nature or spend time in nature have reduced risk of heart disease, diabetes type II, high blood pressure and sleep deprivation. It also reduces stress, depression and even anxiety disorders (Hoyng & De Zeeuw, 2020). For children outdoor activities can even promote their social skills, their creativity, give them more confidence and makes them better in collaborating, problem solving and making friends (Boer Play, n.d.). All the benefits being outside has on humans should not only be a result of recreation in nature, but should also be a part of their daily routine and lifestyle.

If you look at the division of the use of land in The Netherlands it becomes clear that recreational areas are not as big or even spread for it to become part of our daily lives. Already 54% of the country is designated for agricultural land. Of the remaining land 361.526 ha is built-up area and 105.418 ha recreational area (CBS, 2020). Which means that when we want to combine the recreational areas with our daily lives in the built-up area the ratio is now 23% recreational vs 77% built-up area. This balance should change if we want to bring more outdoor living and recreational activities into our daily lives. Perhaps a part of the agricultural land can be used to create this ratio shift.

A good example for a different inside-outside ratio are holiday parks. In these parks there is more room for nature than there is indoor

space. An interesting example of this type of park is the design of architect Jaap Bakema for Lommerbergen for Sporthuis Centrum (now known as CenterParcs). This bungalow park was built up with multiple volumes spread over a piece of forest land. These volumes were built up out of three to five cottages that were connected and staggered relative to each other. This created a private terrace for each cottage. A glass facade to the terrace created an unobstructed view of the forest. This allowed the interior and exterior to flow into one another (Rijksdienst voor Cultureel Erfgoed, n.d.). In the park plan (figure 2) it is clearly visible that nature got more space than the cottages. This balance is often experienced as pleasant and relaxing, because of the great contact with nature. Part of this contact is created by the way the cottages are designed. Like mentioned before, these cottages had good connection between inside and outside due to the amount of glass in the facade, while still keeping enough privacy (figure 3).

Another interesting element of these cottages is the compactness of the floorplan. All the necessary functions are placed in a one layer floorplan. The living room, kitchen and dining area are all in one room, with the bedrooms and bathroom directly adjacent to it. In some parts of the living area some extra height was added. The compact floor plan in combination with the inside-outside ratio creates a living environment where nature is directly accessible. When people visit these types of holiday parks they often feel better, partly because they went more outside and were more active in nature. This experience is often lacking at their own homes. Which might be a signal to create more housing projects that are like these holiday parks.

Unlike the compact cottages in holiday parks, Dutch people have on average quite a large amount of living area (m²) per person. In The Netherlands a person has around 53 m² living space, while the average European lives on 43 m² (Koops, 2024). There are some differences in m² per person per type of household. It also depends on the area where you live. In Midden-Delfland a single household has an average of 94 m² living area. For couples without children

that number is 68 m² per person. For couples with children the average amount of living space per person is 40 m² (CBS, 2022). If you multiply this by the amount of members of the different households, the numbers will add up. This leads to bigger houses. But is all that space needed? Maybe compacter houses are perfectly fine for Dutch people to live in. Besides, when houses get more compact, there will be more room for nature to surround the houses.

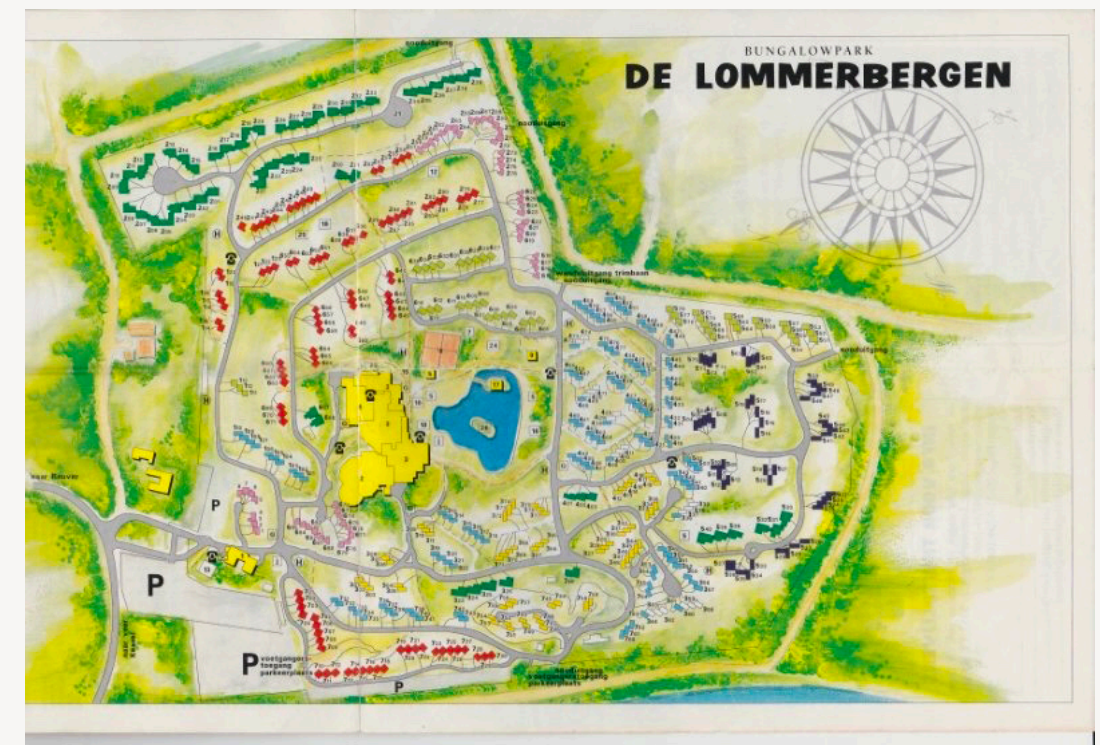


Figure 2: Park plan De Lommerbergen
(CenterParcs forum, n.d.)

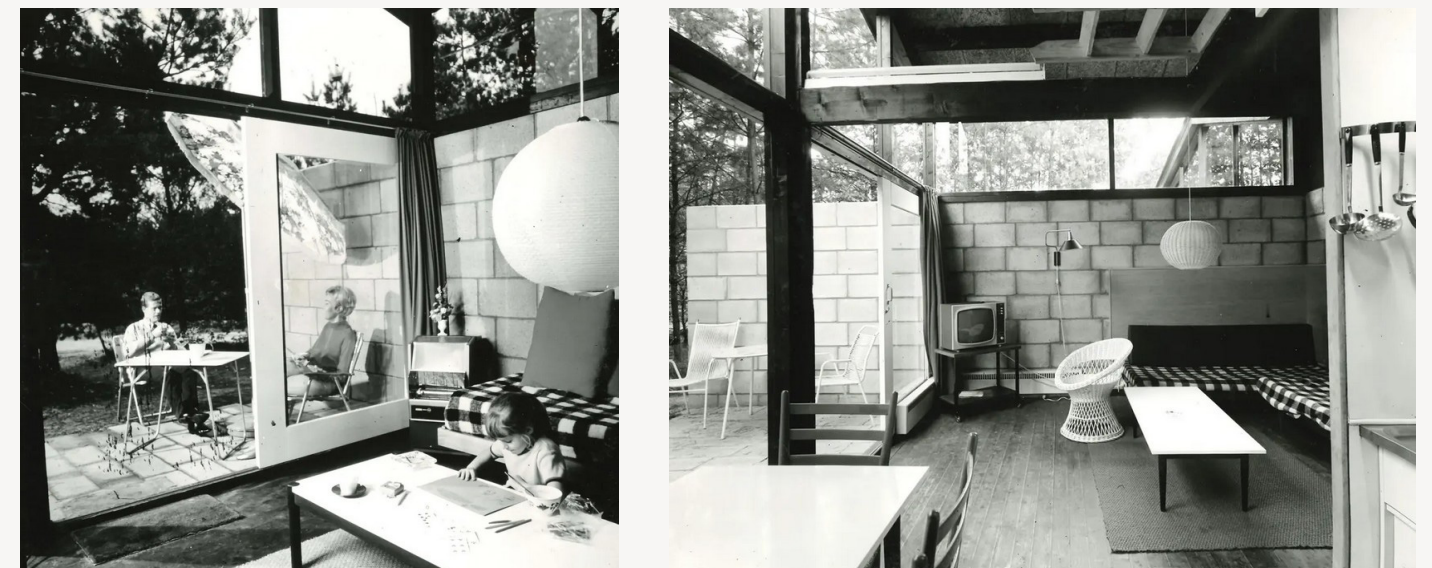


Figure 3: Interior cottage De Lommerbergen
(Nieuwe Instituut, 1968)

In a field study done by Common Practice (2023) they researched the usability of different floorplans. They looked at multiple apartments and how they were being used based on the lay-out of the floorplan. As a result they split up the total surface of the apartments into two categories: functional surface and traffic surface. Figure 4 shows the use of one of the apartments, with in grey the functional surface and in white the traffic surface. One of the things that stands out is, for example, the use of the bedroom space. In this case there is a lot of traffic surface, while the functional surface is mainly the bed and closet. Maybe, this can be an indication to change the way we organize the different rooms in a house.

An interesting example of a project that has a compact floorplan and a different approach on how to organize different rooms/spaces is Merry-Go-Round by Ira Koers. All the functions are placed as optimal as possible next to each other (figure 5). For example, there are no bedrooms, but two box beds. This leads to less walk paths next to furniture. Instead, there is a hall way that surrounds all the functions. By removing the unnecessary space, every function fully serves its purpose.

If houses are built more compact, more in contact with nature and with new inside-outside ratios, there will not only be more room for nature and for people to go outside, but also for more connection between neighbors. By constantly living inside people get more and more individualistic. This leads to more loneliness and loss of social cohesion. To counteract this, a sense of community is important. There are multiple ways to form a community, both in forms as function.

An interesting reference for forming a community are the projects of Knarrenhof. In these projects typical Dutch 'hofjes' are formed, where all the houses are surrounding a communal outdoor area (figure 6). The residents are mostly retired people who can still live by themselves. The goal is to look out for each other. Maybe one person needs help with grocery shopping and someone else needs help with a chore around the house, than they can get help from their neighbors. This way of looking out for each

other is something that might help reduce some of the loneliness.

In the project of Naturbyen by Effekt the houses are also based around a communal area. There are multiple sizes of housing clusters. Every cluster has its own identity and its own type of communal area (figure 7). Therefore, residents can choose which area fits them and their lifestyle best. Every house has its own terrace that is directly connected to the communal area and nature. This gives residents the opportunity to stay in their own space, while still being able to connect to others.

That the identity and type of lifestyle that can be provided by a housing project is important is also shown in 't Eemgoed in Almere (figure 8). In this project the connection with nature and people is key, with biodiversity and collaboration first. Every resident bears responsibilities for the care of their communal property, like the community center, the vegetables garden and the orchard. Together they form a close community where being outside is more the rule than the exception.

All these case studies show that it is possible to create communities where nature, being outside and care for each other are key. However, due to multiple causes it is still an exception. In order to create a healthy society this needs to change.

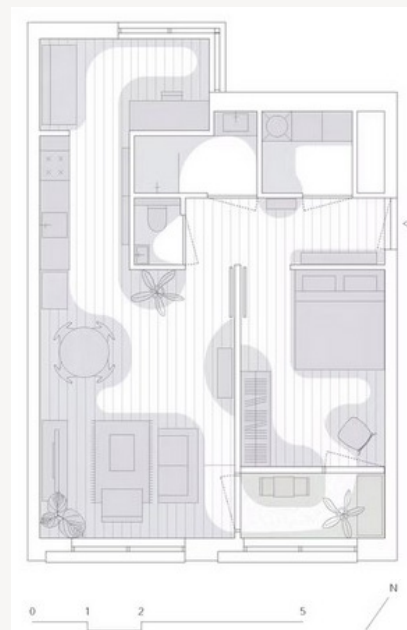


Figure 4: Floorplan usable surface
(Common Practice, 2023)

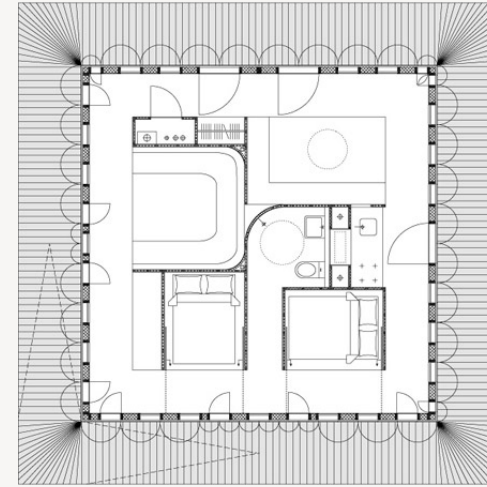


Figure 5: Merry-Go-Round by Ira Koers
(Dezeen, 2009)



Figure 6: Knarrenhof, Zwolle
(Stichting Knarrenhof, 2024)

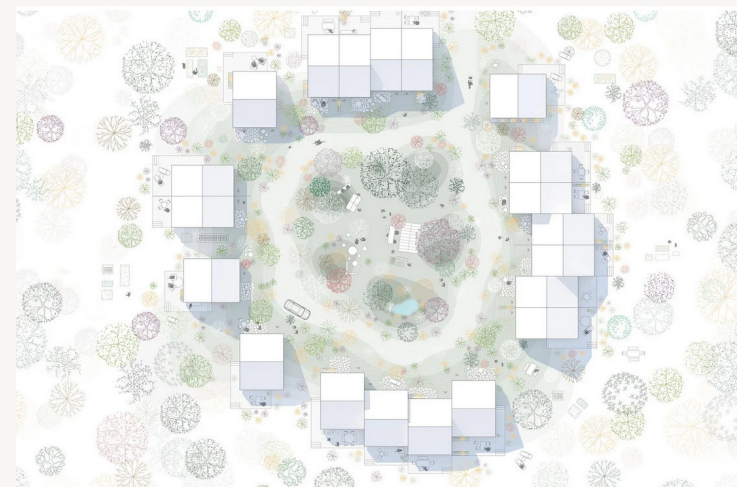


Figure 7: Naturbyen by EFFEKT
(EFFEKT, n.d.)



Figure 8: 't Eemgoed
(Trees for All, 2024)

3. Results

3. Results

Residents

The goal of this project is creating a healthy living environment where being outdoors is stimulated. Therefore, the target group is not a standard target group based on age range, but a target group based on lifestyle preferences. The people who are going to live in this project need to have a will to be more outside and more in contact with nature. The age range of these people can be 0 – 100 years (as long as you're still vital enough). In order to create a healthy society based from the start of life, there will be attention on making the project not only suitable for singles or couples, but also for families with children.

Project start

The project design started with the idea of creating a community that lives in smaller, biobased houses that are located around a collective outdoor area. In this outdoor area functions as a nature playground, a collective garden and a sports area could be located. These areas become a place to meet and enjoy nature. This community would be designed on one of the islands of the masterplan. On the island there would be three housing clusters, with each their own type of communal outdoor area. In between these clusters there would be various other outdoor functions, like meeting spots and a bird spotting place, but also two communal buildings. In one building there would be a collective living room and kitchen, where the residents of the project could come together and meet and eat. The other building would be more focused on collective activities. These activities could vary from a yoga class to a creative workshop. In this building would also be room to store collective outdoor equipment, like garden tools or canoes. Figure 10 shows the urban plan of this community as presented during the A2 presentation.

For the architecture of the project a new way of floorplan lay-out was studied. By focusing more on outdoor living, the surface of the houses and its functions could be designed smaller than we are used to. With the case studies as example, the choice was made to change the regular bedroom for box beds, since the bed is used every day and the space around

it mostly only gets used as traffic space. This led to the decision to make houses with a compact core in which the essential functions are located: box beds, bathroom, toilet and kitchen. The space of the box beds also could be filled in differently, based on the user's needs (figure 9). Around the core there would be a hallway with room for storage and a bay window that could be used as sitting area and gives a nice view into the landscape from the box bed. The rooftops of the houses were designed as green, pitched roofs to let them blend better into the landscape. These pitched roofs allowed the top of the core of the house to be extra living space. The resident could fill in this space however they wanted. With big windows on two sides of the house the residents would have a greater connection between inside and outside. For the A2 presentation five housing types were designed. Each housing type had a compact core as a starting point. The difference between the five types was mainly based on household size and the relation to the landscape. Type I was the big family home, type II was a family water house with a split level, type III was for smaller households, type IV was a family house with a winter garden attached to it and type V was a meant for smaller families.

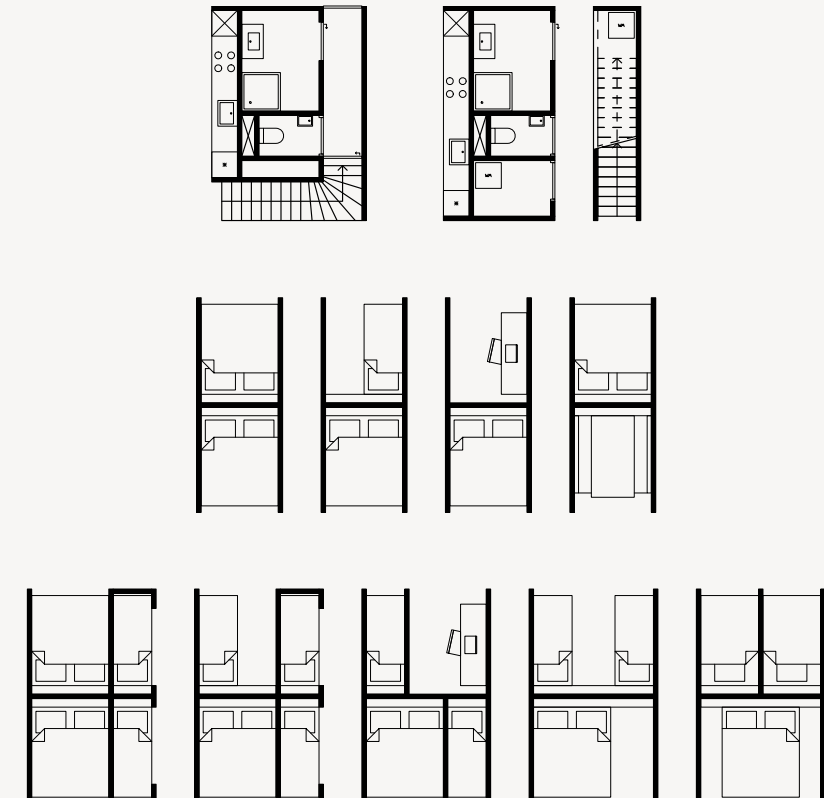


Figure 9: Essential functions in compact boxes
(Own work)



Figure 10: Site map A2 presentation
(Own work)

Het Groene Buitenleven

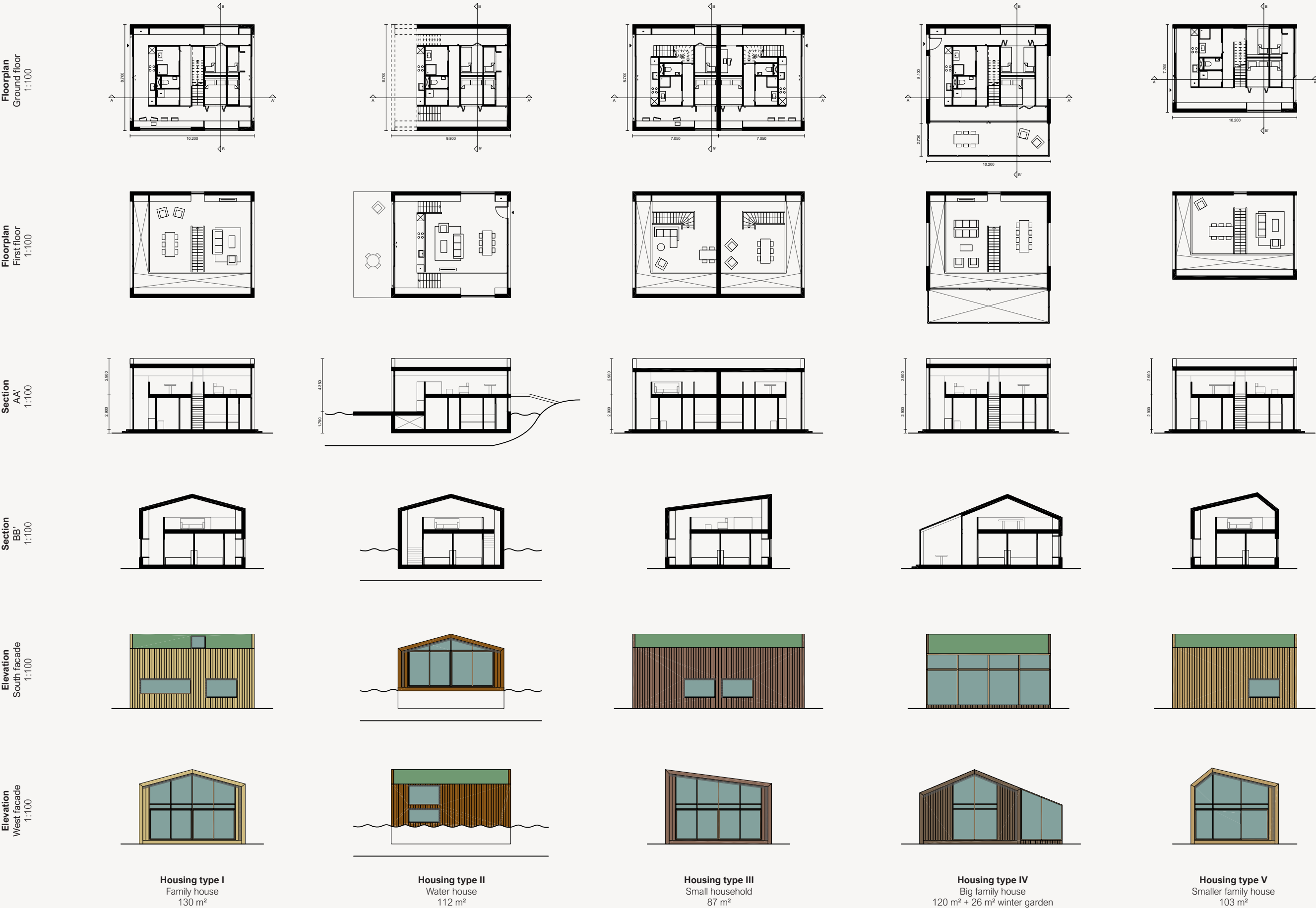


Figure 11: A2 presentation
(Own work)

Design shift

The work that was presented during the A2 presentation had some interesting aspects to it, like the compact core and the use of biobased building materials. However, the design did not yet align entirely well with the idea of making smaller houses that stimulate outdoors living. There was too little direct contact with outside and too much indoor surface to have a compact house. Therefore, after the A2 presentation some bigger changes were made.

Instead of designing a community, the focus got more to designing catalog housing that can be placed anywhere in or adjacent to nature, that can stand on its own or in small clusters. The houses should be compact, but also come in different sizes to accommodate different households. The idea of creating housing where outdoor life is stimulated remains. Eventually, this resulted in the design of a new housing system.

System & construction

The new housing system is built up out of a 3m by 3m grid. This 3m by 3m box can be layed out in multiple ways. For this project three ways were used: 3x3 system (9m by 9m), 3x4 system (9m by 12m), and 4x4 (12m by 12m). On this grid a timber construction is placed to support the roof.

Within this system there are three different climate zones: heated, insulated and rain & wind proof. The outer layer of the house forms the rain & wind proof shell. This shell is only rain & wind proof, so it is not insulated. The shell consists out of a timber floor (on stilts), folding doors with single glazing and a roof with sedum on top. The folding doors allow residents to open up the whole facade, which connects the inside to the outside. Within the rain & wind proof shell, or raincoat as you might call it, are the essential function of the house. These functions are designed in compact boxes, just like the design before the A2 presentation. These functions are all in an insulated part of the house. The bathroom and toilet are the only functions with heating. The insulated part of the house is placed as a box inside, or on the edge, of the raincoat. This box can be placed based on the residents needs and requirements.

Materials

The materials that are being used for this housing system are (mostly) biobased materials. This to bring as less harm to the nature, in which the houses are going to be placed, as possible and lower the carbon footprint of the project. Besides, due to the different climate zones and the compact layout of the insulated zone, there is less material needed. Figure 13 shows the built-up of the different construction packages.

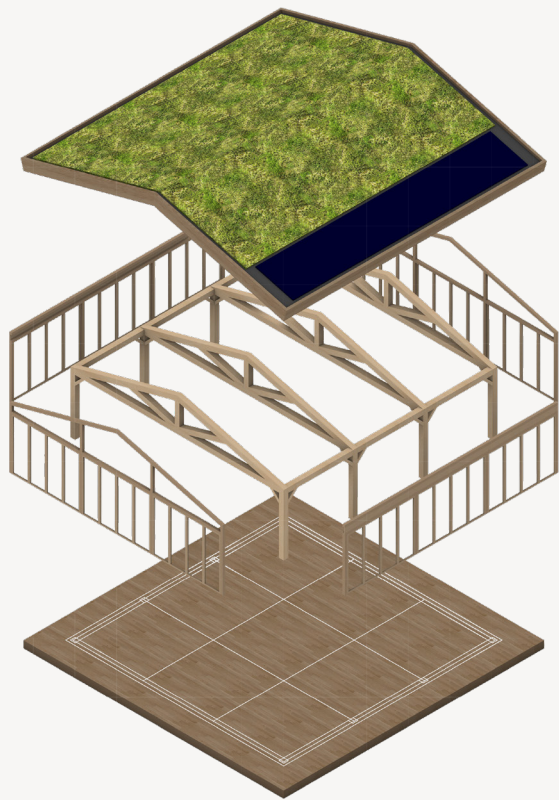


Figure 12: Building system (Raincoat)
(Own work)

Roof

- PVT-panel (40 mm), rails, framing (40 mm)
OR
Sedum (30 mm), substrate (60 mm),
Water drainage (10 mm)
- Eco EPDM
- Water retaining layer
- Timber frame construction with
Gutex thermoflex wood fiber insulation
244 mm ($R_d = 6,7 \text{ m}^2\text{K/W}$)
- Vapor barrier layer
- OSB board (18 mm)
- Birch plywood (12 mm)

Folding doors

- Timber frame
- Single glass with condensation profile
- Sliding rail

Floor

- Screed with low-temperature underfloor
heating (38 mm), wood fiber insulation
(22 mm), vapor barrier layer
OR
Timber floorboards (20 mm), timber
framing (30 mm), water retaining layer
- OSB board (18 mm)
- Timber frame construction with
Gutex thermoflex wood fiber insulation
160 mm ($R_d = 4,4 \text{ m}^2\text{K/W}$)
- OSB board (18 mm)

Insulated wall

- Timber cladding (18 mm)
- Timber framing (2x 28 mm)
- Water retaining layer
- Gutex thermoflex wood fiber insulation
180mm ($R_d = 5,0 \text{ m}^2\text{K/W}$)
- Vapor barrier layer
- Chipboard (18 mm)
- Birch plywood (12 mm)

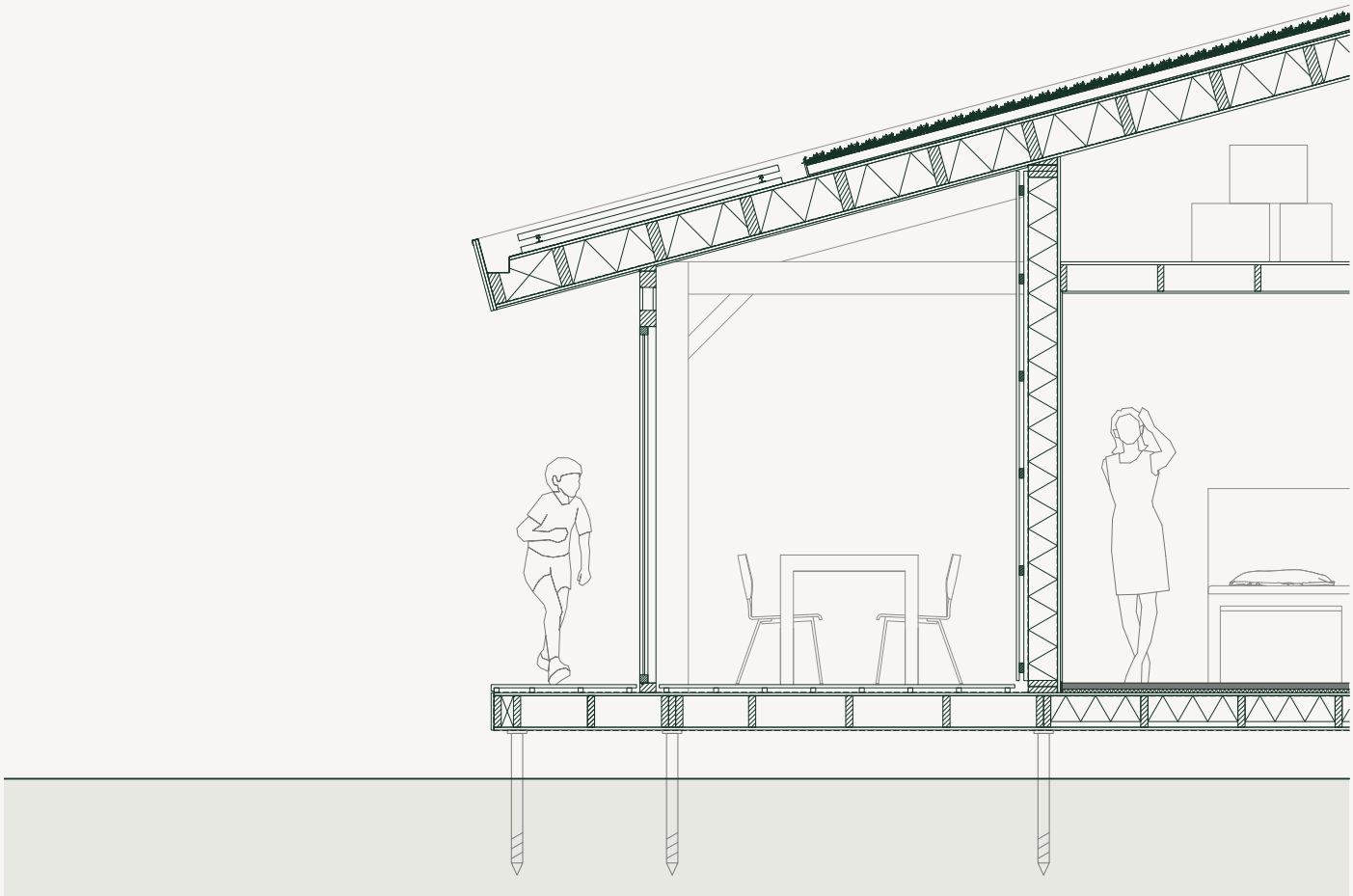


Figure 13: Facade section
(Own work)

Climate design

The three different climate zones lead to a different way of living. The intention of the project is that around half of the house is insulated and half of the house is rain & wind proof. That means that during colder times it might be more comfortable to live in the insulated part of the house. In this part are the box beds, bathroom, toilet, kitchen and storage. The residents live on a smaller surface. The temperature of this part of the house can only be regulated in the bathroom and toilet. The rest of the space is only insulated. When a resident feels to cold in this space, the intention is to first warm themself up, instead of the room. So, they put on a sweater or get a blanket. This to ensure that there is no unnecessary heating, it takes less energy to warm up yourself than an entire room.

When the outside temperatures are more comfortable the resident can use the rain & wind proof part of the house as an extra living space. The open floorplan allows residents to fill in this space tailored to their needs. By opening the folding doors they can bring outside to the inside and vice versa. This enlarges the connection of the resident to the outdoors (figure 14).

The goal of the project is, besides the better connection to the outdoors, creating a system in which residents live more consciously, with more attention to nature and the impact they have on it. Therefore, the use of energy and water in the houses need to be reduced when possible. It started already by the way the houses are heated (or not heated), but there are also some other tools that can help. The main energy source of the house will be PVT panels. This panel not only produces energy, but also works as a solar boiler. This means that all the energy and heat that is necessary in the house comes from these panels. In order to let them work properly, some installations are needed: a heat pump, a boiler, an inverter and a heating circuit distributor. All the energy that the panels produce can be used in the house, when needed the energy can be stored in the home battery. In order to be more conscious about the energy that they use, the residents get a smart home

system. In this system they can see exactly how much energy they can use and what they can do with it. This system also helps them to use the energy at the best possible moments.

Besides the energy use of the house, the water use of the house also needs some attention. The house will be connected to the regular tap water connection. For the shower and for cooking this water gets heated with the heat from the PVT panels. The grey water of the house is discharged into nature via helophyte filters. The toilet of the house is not a regular toilet. It is a vacuum toilet with a tank. This system can save up to 8000 liter of drinking water per person per year. The rain water from the roof gets collected in a rain barrel.

By using all these techniques a lot of energy and water can be saved. The systems themselves already provide savings, but by using a smart system that gives insights in the water and energy use, the residents get more aware of their use. This hopefully leads to even more savings.



Figure 14: Use in winter & summer
(Own work)

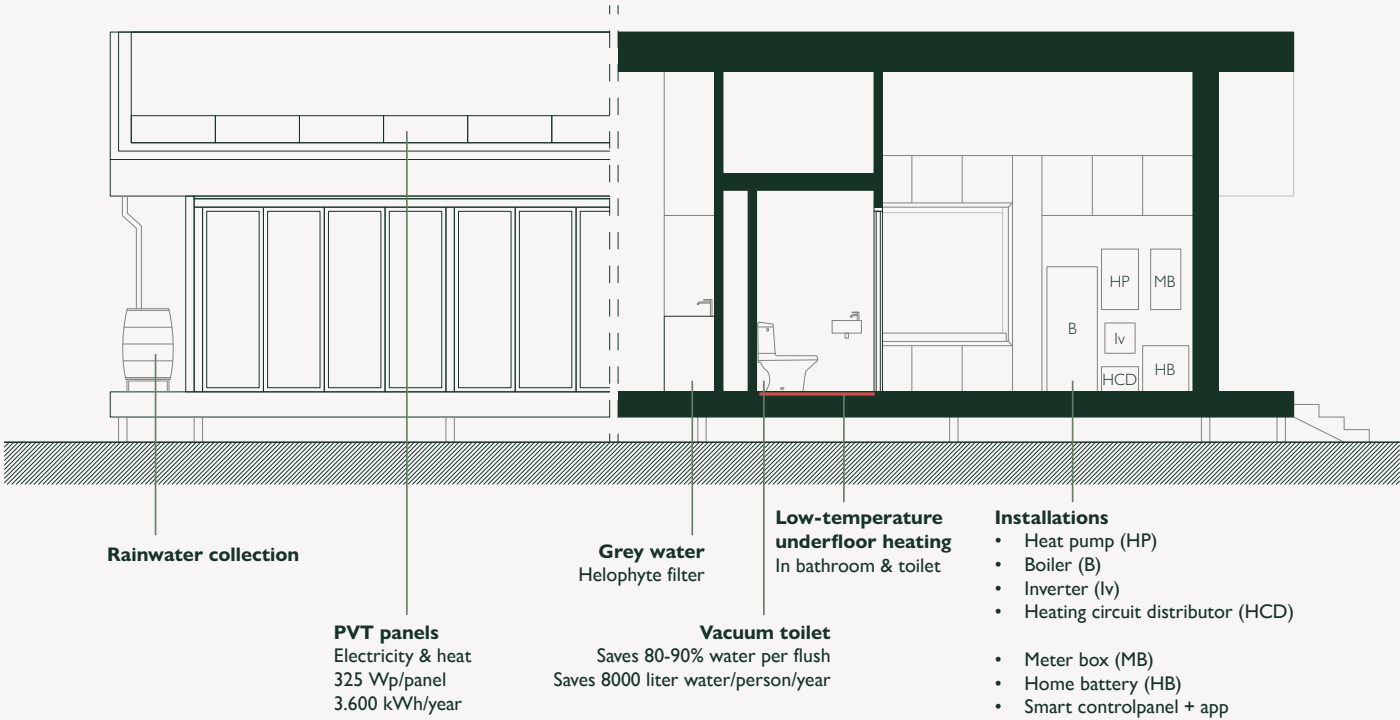


Figure 15: Energy & water system
(Own work)

Housing types

The housing system allows a great variation in floorplan possibilities. For this graduation project six different floorplans are made. These floorplans have a 3x3, 3x4 or 4x4 grid. The placement of the insulated part of the house also varies. This leads to different circulation types and different architectural appearances. Figure 16 shows the different combinations that are being used.

The first two housing types are the Blackbird and the Sparrow. In both types a 3x3 grid was used and they are both one-sided. The Blackbird is designed for a small household (1 - 2 persons). The placement of the bathroom, toilet and box bed result in an open part of the space, where the kitchen is placed. The Sparrow type has a similar division of the climate zones, but here are the essential functions placed in a hallway form. This gives room for one more box bed, but less insulated living space.

The next two housing types, Kingfisher and Godwit, both have a 3x4 grid and are for a 2 - 4 persons household. The insulated part of the Kingfisher house is located in the corner of the 'raincoat', which gives it two-sided outdoor access. The insulated part offers sitting space in the kitchen, but also in the storage wall, where a sitting window is placed. In the Godwit type the essential functions are all placed in the center

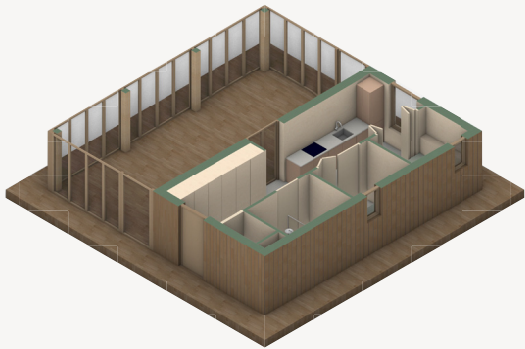
of the house. This gives the residents a 360° view of the landscape. However, this type of housing might need some more adaption from its residents. The kitchen can be part of the insulated area, by using thermal curtains, but also of the bigger house. In addition, the box beds are also directly located next to the rain & wind proof part of the house.

The last two housing types, Starling and Stork, have a 4x4 grid and are meant for bigger families. Just like the Kingfisher, the Starling type is two-sided. However, in this type there are two extra half box beds. This creates a 'sleeping island' in the middle of the insulated part of the house. In the Stork housing type the essential functions are more centered. Within the insulated part the functions are spread. This creates an open area that, when the folding doors are opened, can be part of the rain & wind proof part of the house.

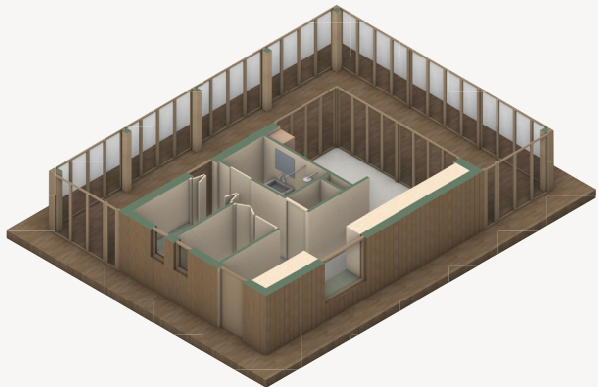
Each of these housing types has its own characteristics and lay-out. Within the system there are even more possibilities. This allows residents to create their own floorplan. Based on the location of the house and the residents needs, a nice fit can be found. However, every house has the same basic system, functions, climate zones and installation.



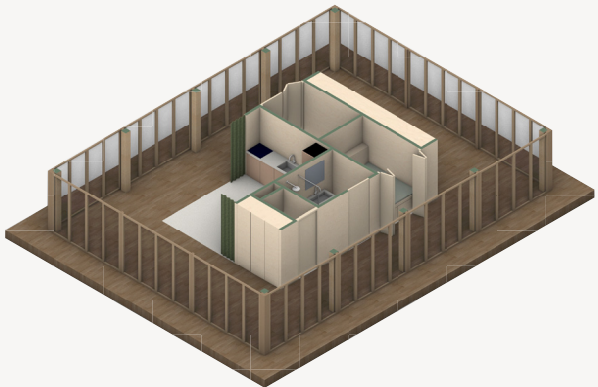
Blackbird



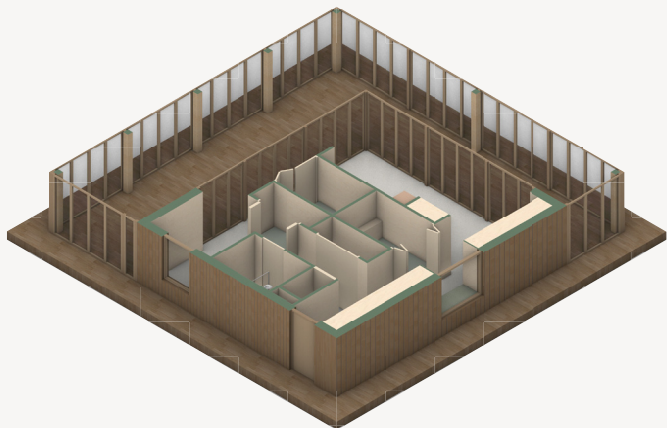
Sparrow



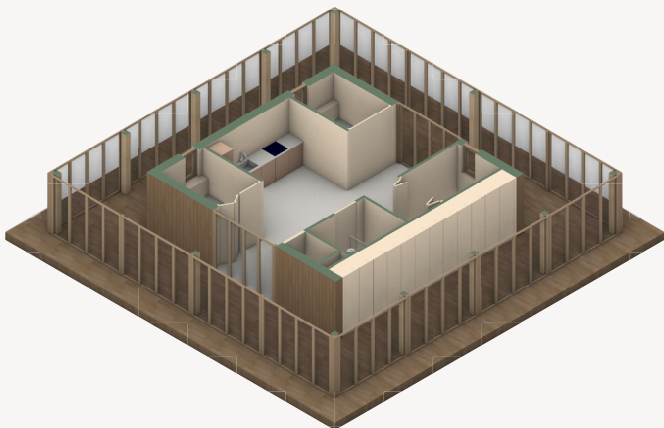
Kingfisher



Godwit



Starling



Stork

Size

- 3x3
- 3x4
- 4x4

Orientation

- One-sided
- Two-sided
- All-sided

Circulation

- Central
- Hallway
- Heart

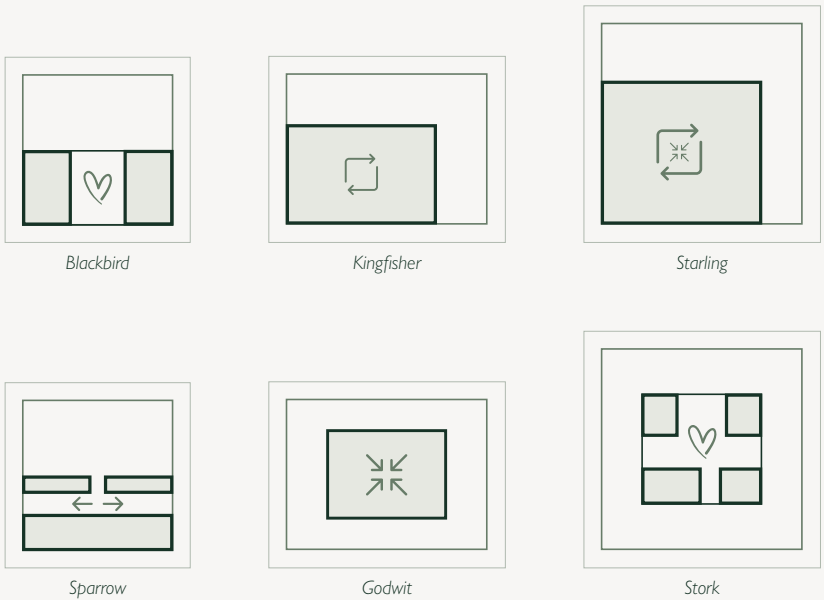


Figure 16: Housing type system
(Own work)

Figure 17: Six housing types
(Own work)

Housing type
Blackbird



Floor space 86,5 m²
5,9 m² heated
43,6 m² insulated
42,9 m² rain & wind proof



Household
Single - couple
1 - 2 persons



Architectural feature
One-sided
Heart

 Heated

 Insulated

 Rain & wind proof

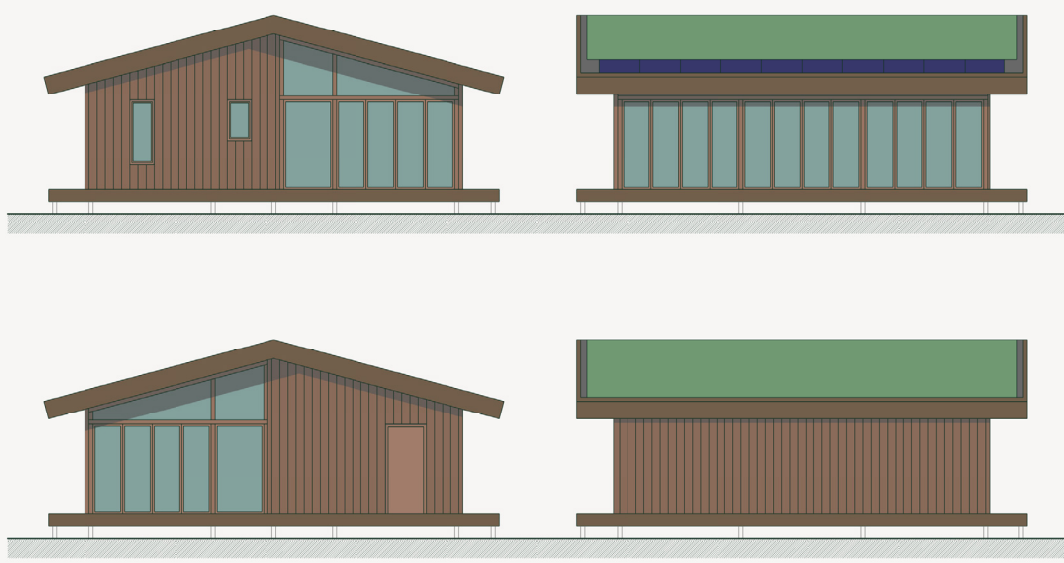


Figure 18: Facades housing type *Blackbird*
(Own work)



Figure 19: Floorplan housing type *Blackbird*
(Own work)

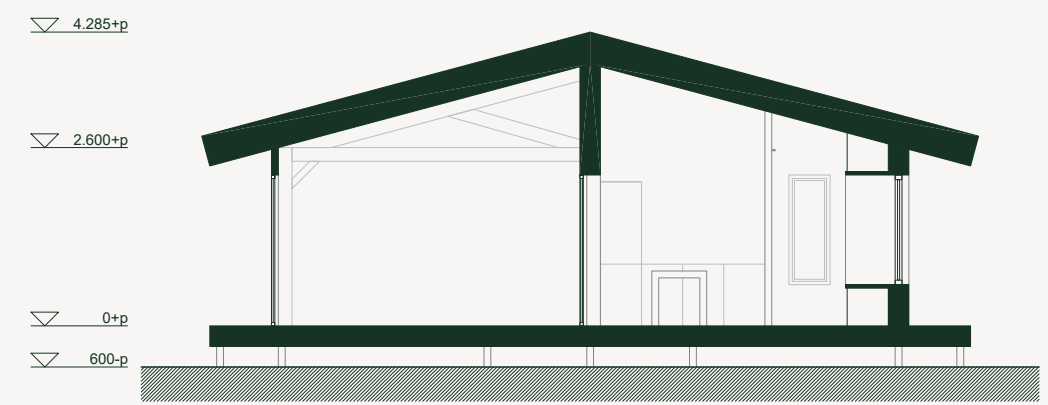


Figure 20: Section housing type *Blackbird*
(Own work)

Housing type
Sparrow



Floor space 86,5 m²
5,9 m² heated
44,6 m² insulated
41,9 m² rain & wind proof



Household
Single - couple - small family
1 - 3 persons



Architectural feature
One-sided
Hallway



Heated



Insulated



Rain & wind proof



Figure 22: Floorplan housing type Sparrow
(Own work)

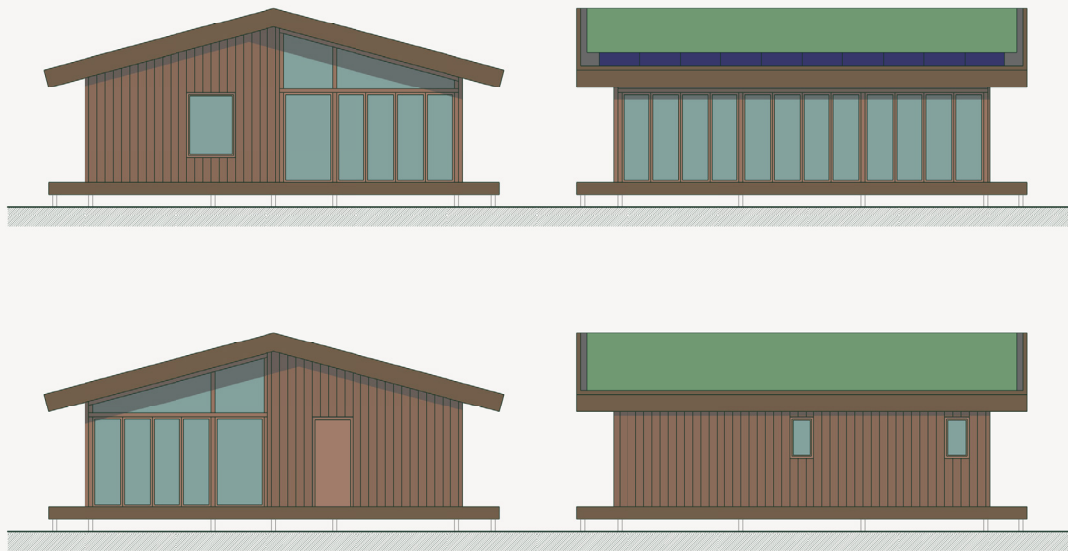


Figure 21: Facades housing type Sparrow
(Own work)

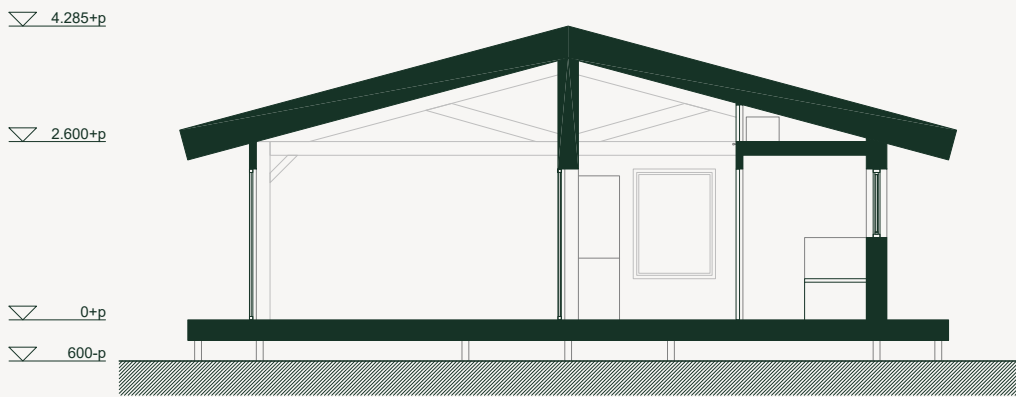


Figure 23: Section housing type Sparrow
(Own work)

Housing type
Kingfisher

 **Floor space** 114,4 m²
5,9 m² heated
58,6 m² insulated
55,8 m² rain & wind proof

 **Household**
Couple - family
2 - 4 persons

 **Architectural feature**
Two-sided
Hallway

 Heated
 Insulated
 Rain & wind proof

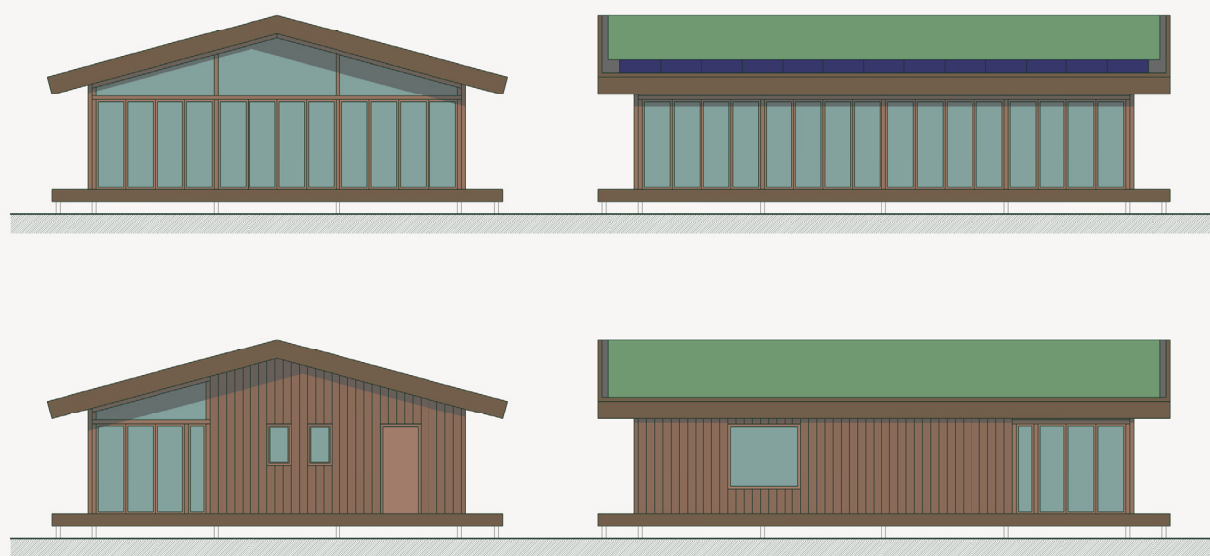


Figure 24: Facades housing type *Kingfisher*
(Own work)



Figure 25: Floorplan housing type *Kingfisher*
(Own work)



Figure 26: Section housing type *Kingfisher*
(Own work)

Housing type
Godwit

Floor space 114,4 m²
5,9 m² heated
34,2 m² insulated
80,2 m² rain & wind proof

Household
Couple - family
2 - 4 persons

Architectural feature
All-sided
Center

Heated

Insulated

Rain & wind proof



Figure 28: Floorplan housing type Godwit
(Own work)

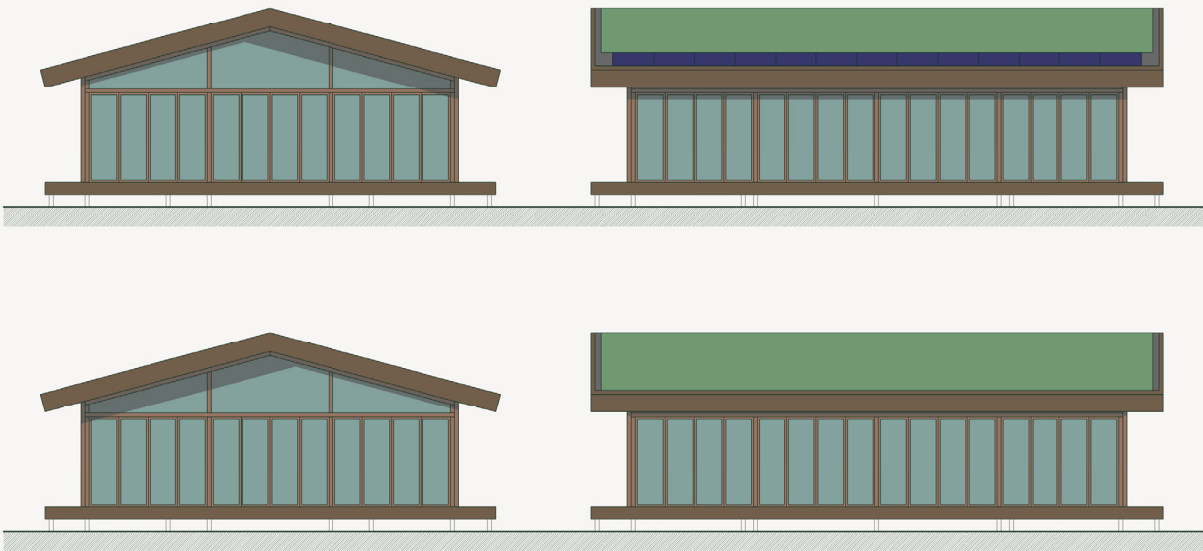


Figure 27: Facades housing type Godwit
(Own work)

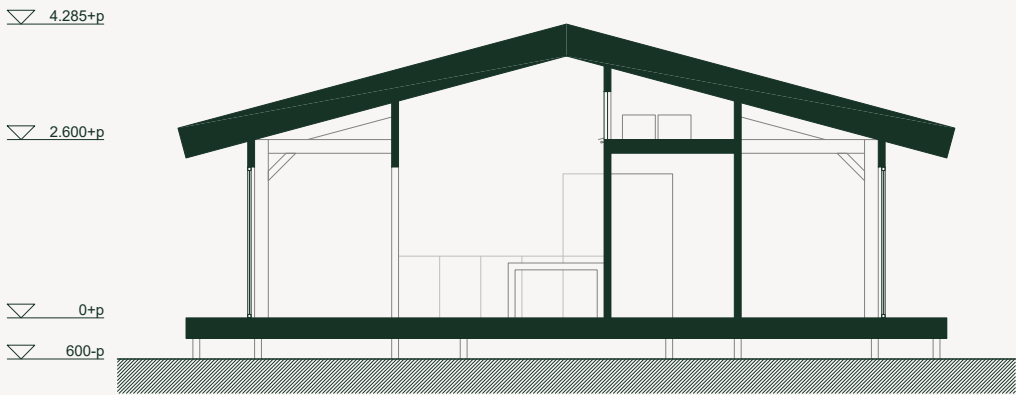


Figure 29: Section housing type Godwit
(Own work)

Housing type
Starling

Floor space 151,3 m²
5,9 m² heated
83,2 m² insulated
68,1 m² rain & wind proof

Household
Family
3 - 6 persons

Architectural feature
Two-sided
Hallway, center

Heated

Insulated

Rain & wind proof

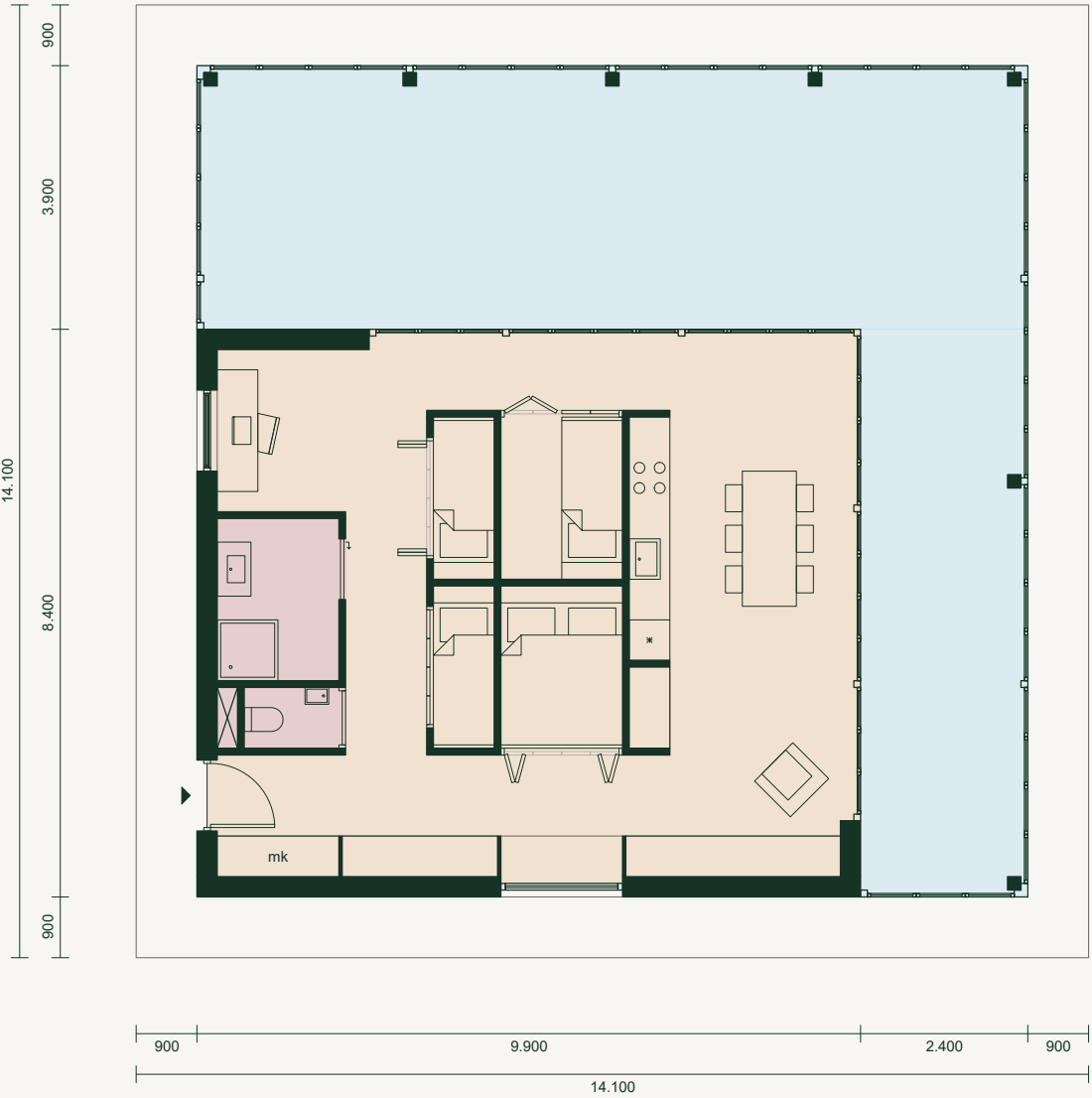


Figure 31: Floorplan housing type *Starling*
(Own work)

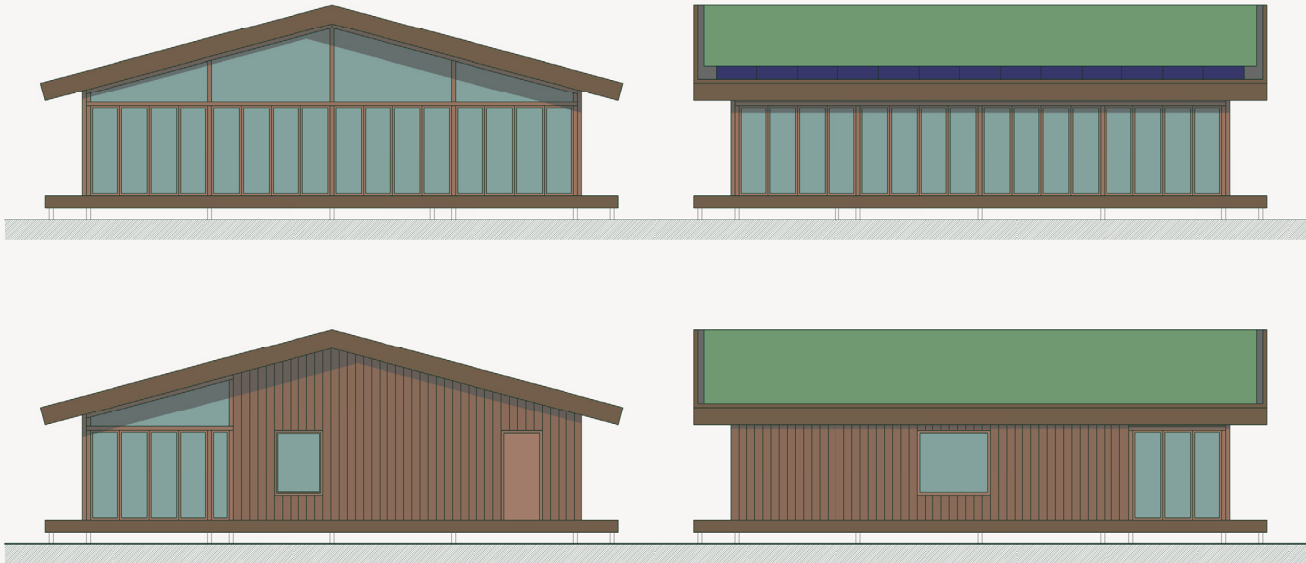


Figure 30: Facades housing type *Starling*
(Own work)



Figure 32: Section housing type *Starling*
(Own work)

Housing type
Stork



Floor space 151,3 m²
5,9 m² heated
64,8 m² insulated
86,5 m² rain & wind proof



Household
Family
3 - 6 persons



Architectural feature
All-sided
Heart

Heated

Insulated

Rain & wind proof

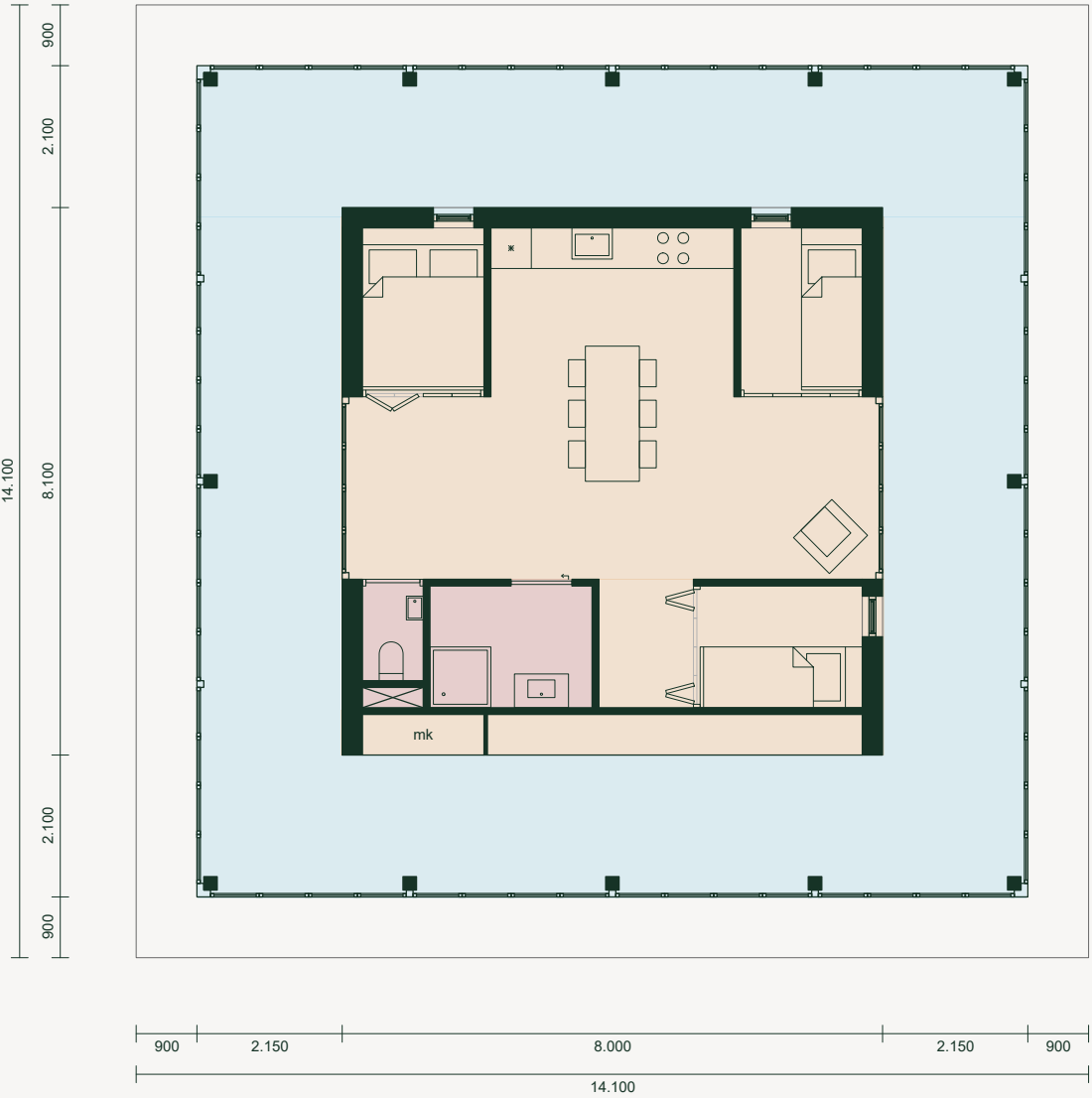


Figure 34: Floorplan housing type Stork
(Own work)

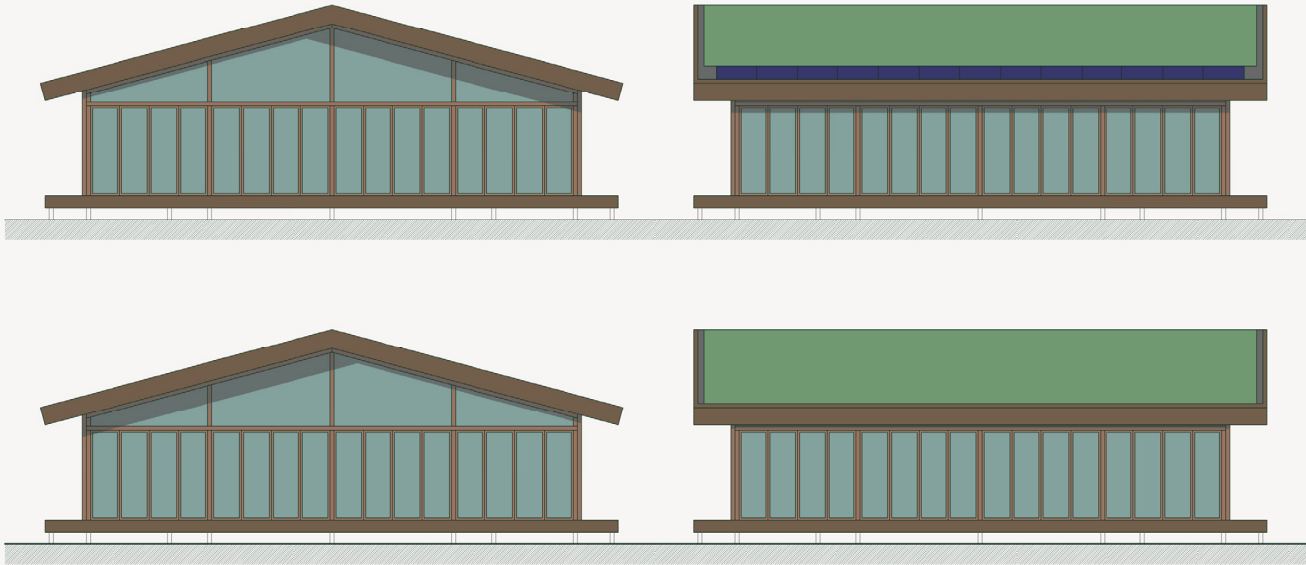


Figure 33: Facades housing type Stork
(Own work)

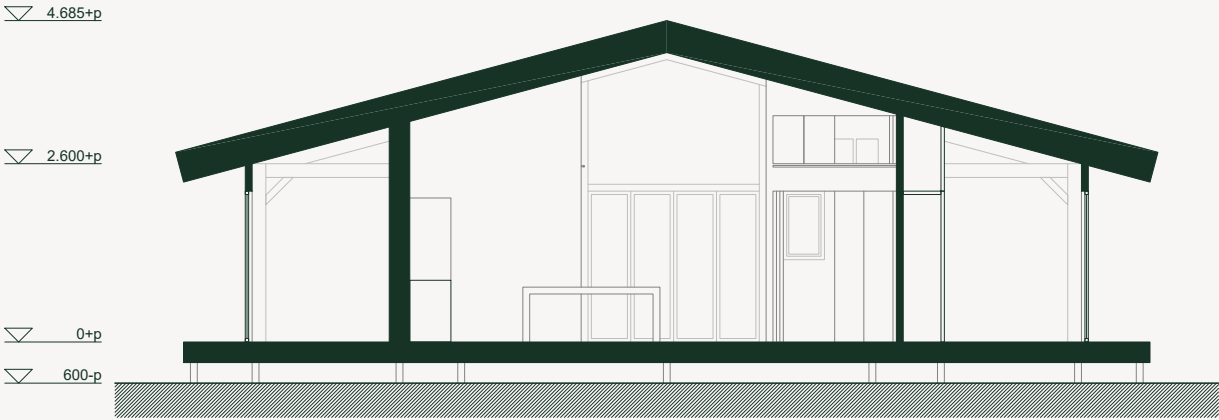


Figure 35: Section housing type Stork
(Own work)

4. Conclusion & discussion

4. Conclusion & discussion

4.1 Conclusion

Based on the analyzed case studies, literature research and the design that has been made, the main research question can be answered: *‘How can architectural design strategies create a healthy living environment that encourage being outdoors?’*. This question will be answered with the results of the three sub questions.

The first sub question got answered: *‘Which architectural and spatial characteristics contribute to better inside-outside connection?’*. In the case studies it emerged that the use of certain windows and their placement play an important part in the inside-outside connection. The cottages of Lommerbergen show that when big, openable windows are placed adjacent to the living area the contact with the outside is better. However, the surroundings also matter. The cottages of Lommerbergen were all placed in forest area. Projects like Knarrenhof, Naturbyen and ‘t Eemgoed also show that how housing is placed in connection to each other and to nature is important. Creating communities with likeminded people in a nature area can improve the inside-outside connection as well.

Also the second sub question got answered: *‘How do architectural design elements influence residents’ use of indoor and outdoor spaces?’*. The field study from Common Practice showed that the lay-out of a floorplan can influence how spaces are being used. This results in functional surface and traffic surface. The balance between those two is preferably more towards the functional side. Merry-Go-Round by Ira Koers shows that that is possible. By clustering all the functions in the center of the house, and by using box beds, a big part of the floorplan becomes functional surface. By making circulation around this block, the users have a view on the outside from (almost) every different function. So, the placement and sizes of the different housing functions do play an important part in the use of indoor and outdoor spaces.

Lastly, the third sub question got answered: *‘How can the design principles be translated into an architectural design that promotes being outdoors?’*. The design that has been made uses different principles that were recovered from the case studies. The

big, openable windows allow the residents to look and move directly from inside to outside. By placing the houses in or close to nature the inside-outside connection will improve as well. By using standard sizes for the essential functions, and switching to box beds, the usable surface becomes more functional. Even some traffic surfaces can also be used as functional surface. Clustering the essential functions into an insulated area, and having a rain & wind proof part of the house, allow the residents to still live on a bigger surface, while using less building materials and needing less energy to heat up the house. The rain & wind proof living area will form as a buffer zone between nature and the insulated home.

In conclusion, this project is one way to create a healthy living environment that encourage being outdoors. The used design strategies resulted in the final design. However, these design strategies can also be interpreted differently, which will result in a different architectural outcome. Though, the final design can be an inspiration to think differently about how we live and how we relate to the outdoors and nature.

4.2 Implications and/or recommendations

The design of ‘Learn to Live with Less’ can provide a stepping stone for a different way of living. At this moment the houses of the project might not be for everyone. However, like mentioned before, this project is for people who are willing to live closer to nature and with what the different seasons have to offer. The change of bedrooms to box beds, or the fact that your house is not fully heatable, or that you live on a smaller insulated surface, are all things that we are not used to nowadays. Though, when there is a small group of people, or pioneers, who can show that this new way of living is also comfortable, it might become more socially accepted. This will hopefully lead to more building systems with the same philosophy of connecting and caring more about nature, live more consciously and creating a healthy living environment.

However, the system can still be improved, especially the construction details. Combining three different zones into one system

asks for a very project specific approach and detailing. The current design provides a starting point for how the various structures might come together. Though, it still needs some more work to become actual functional.

When this day will come and people start actually living in this housing system, it will hopefully start a chain reaction. A reaction of more conscious living. People should start thinking about what space and resources they actually need, instead of just using it because it’s there. The earth and climate ask for a different lifestyle than were are used to nowadays. It is time to actually start listening, and if necessary people can be very adaptable.

References

Bibliography

Boer Play. (n.d.). *Blog: Het belang van buitenspelen voor de ontwikkeling en gezondheid van kinderen*. Boer Play. Retrieved on January 18, 2026, from <https://www.boerplay.com/blog/blog-het-belang-van-buitenspelen/>

CBS. (2020). *Hoe wordt de Nederlandse bodem gebruikt?*. CBS. Retrieved on April 14, 2026, from [https://longreads.cbs.nl/nederland-in-cijfers-2020/hoe-wordt-de-nederlandse-bodem-gebruikt/#::~:~:text=Van%20de%20totale%20oppervlakte%20van%20Nederland%20is,\(0%2C5%20miljoen%20hectare\)%20als%20bebouwing1%20en%20verkeersterrein](https://longreads.cbs.nl/nederland-in-cijfers-2020/hoe-wordt-de-nederlandse-bodem-gebruikt/#::~:~:text=Van%20de%20totale%20oppervlakte%20van%20Nederland%20is,(0%2C5%20miljoen%20hectare)%20als%20bebouwing1%20en%20verkeersterrein).

CBS. (2022). *Woonoppervlakte in Nederland*. CBS. Retrieved on April 14, 2026, from <https://www.cbs.nl/nl-nl/achtergrond/2018/22/woonoppervlakte-in-nederland>

Common Practice. (2023). *Medium Extra Ordinary*. Common Practice. Retrieved on May 16, 2026, from <https://www.commonpractice.nl/mediumextraordinary>

Hoyng, J., & De Zeeuw, J. (2020, January 6). *Groen als beweegvriendelijke omgeving: een overzicht*. Alles over Sport. Retrieved on April 14, 2026, from <https://www.allesoversport.nl/thema/beleid/groen-als-beweegvriendelijke-omgeving-een-overzicht/>

Koops, R. (2024, August 14). *Nieuwbouw steeds kleiner: 'Nederlanders ver paid qua woonruimte'*. RTL Z. Retrieved on April 14, 2026, from <https://www.rtl.nl/nieuws/economie/artikel/5465553/nieuwbouw-steeds-kleiner>

Rijksdienst voor Cultureel Erfgoed. (n.d.). *Vakantiepark de Lommerbergen*. Ministerie van Onderwijs, Cultuur en Wetenschap. Retrieved on April 14, 2026, from <https://www.cultureelerfgoed.nl/onderwerpen/p/post-65-erfgoed/verhalen-en-tijddlijnen/beschrijvingen-post-65-objecten/lommerbergen>

TNO. (2024, February 27). *Nederland Europees kampioen zitten*. TNO. Retrieved on April 14, 2026, from <https://www.tno.nl/nl/newsroom/2024/02/nederland-europees-kampioen-zitten/#:~:text=Van%20de%20Nederlandse%20bevolking%20van,bevolking%20zoveel%20uren%20per%20dag>.

Figures

Figure 2: CenterParcs forum. (n.d.). *Plattegrond De Lommerbergen*. CenterParcs forum. Retrieved on April 14, 2026, from <https://www.centerparcsforum.nl/forum/viewtopic.php?t=7504>

Figure 3: Nieuwe Instituut. (1968). *Het verlangen naar buiten*. Collectie Broekbakema. Nieuwe Instituut. Retrieved on April 14, 2026, from <https://nieuweinstituut.nl/articles/het-verlangen-naar-buiten>

Figure 4: Common Practice. (2023). *Appartement van Alexina*. Common Practice. Retrieved on May 16, 2026, from <https://www.commonpractice.nl/mediumextraordinary>

Figure 5: Dezeen. (2009). *Merry-Go-Round by Bureau Ira Koers*. Dezeen. Retrieved on March 6, 2026, from <https://www.dezeen.com/2009/10/13/merry-go-round-by-bureau-ira-koers/>

Figure 6: Stichting Knarrenhof. (2024). *Woonproject voor senioren: Knarrenhof komt er toch*. De Nieuwsbode. Retrieved on April 14, 2026, from <https://www.denieuwsbode.nl/lokaal/wonen/1065260/woonproject-voor-senioren-knarrenhof-komt-er-toch>

Figure 7: EFFEKT. (n.d.). *Naturbyen*. EFFEKT. Retrieved on February 20, 2026, from <https://www.ekkt.dk/naturbyen>

Figure 8: Trees for All. (2024). *Duurzaam en zelfvoorzienend leven? Zo doen de bewoners van dorpslandgoed 't Eemgoed het*. Trees for All. Retrieved on April 14, 2026, from <https://treesforall.nl/duurzaam-en-zelfvoorzienend-leven-op-dorpslandgoed-t-eemgoed/>

