GROWING HOMES

DESIGNING WITH NATURE

RESEARCH REPORT

EXPLORE LAB GRADUATION | TU DELFT | SUSANNE VAN DE VEN

PREFACE

This graduation project was developed within the Explore Lab studio of the Master's program in Architecture at Delft University of Technology. Within Explore Lab, students are given the freedom to set up their own design project based on personal interests, fascinations, and ambitions. The studio offers space for experimentation, research, and assembling a team of tutors that aligns with the chosen subject and design process.

For me, this formed the ideal environment to bring together my two greatest passions: architecture and nature. My connection to the outdoors originated in Scouting, where I have been active since I was six years old. There, I learned how important it is to treat nature with care and leave it as you found it; the principle of leave no trace. I have carried these values with me in my daily life ever since. Being outdoors plays a major role in my life, whether it involves traveling, running, hiking, or simply spending time in nature. For me, nature is a place of peace and freedom. By spending a lot of time outdoors and traveling minimalistic, my appreciation for minimalist living and a conscious approach to the environment grew.

At the same time, my passion lies in architecture: designing spaces, puzzling over structures and floor plans, and seeking smart and efficient solutions. From these interests arose the question of how architecture can contribute to a way of living that preserves the connection with the outdoors. This question formed the starting point of my graduation project within Explore Lab.

The project focuses on designing a modular housing system in which compact living, flexibility, and living with nature take center stage. In this process, not only did the architectural design play an important role, but also the research into sustainable materials, facade constructions, and building methods that minimize the impact on the environment.

ABSTRACT

The Netherlands is currently facing a major housing shortage while the construction sector continues to place increasing pressure on the environment through high CO_2 emissions, material consumption, and the loss of biodiversity. At the same time, existing housing often lacks flexibility, forcing people to relocate when their living situation changes. This graduation project explores how architecture can respond to these challenges through a modular, sustainable, and nature-inclusive housing system.

The project, Growing Homes, proposes a modular off-grid housing system that combines flexibility, circular construction, and living in harmony with nature. The system is based on compact timber modules that can be expanded or reduced over time according to changing household needs. By allowing homes to adapt instead of requiring relocation, the project aims to contribute to improved housing flow-through and reduce pressure on the housing market.

Central to the design is the principle of “designing with nature.” The homes are elevated above the ground to minimize disturbance to the landscape and create space for biodiversity underneath the buildings. The project integrates bio-based and circular materials to reduce environmental impact and create a healthy indoor climate. In addition, the homes function completely off-grid through integrated systems.

Besides the architectural and technical design, the project also investigates collective living as a sustainable social model. A test eco-community demonstrates how the modular system can support shared outdoor spaces, communal facilities, and stronger social connections while maintaining a close relationship with nature.

Through design research, this project demonstrates how modular and nature-inclusive architecture can contribute to a more flexible, circular, and environmentally responsible way of living.

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INTRODUCTION

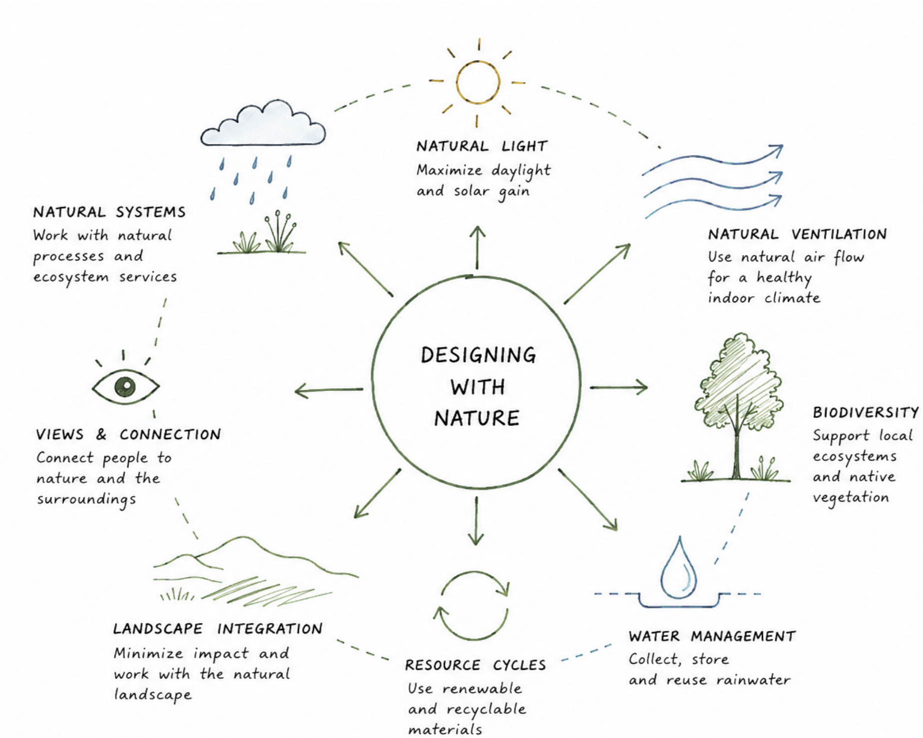
Nowadays, many new homes are being built in the Netherlands, but the realised numbers are still insufficient to catch up with the demand. According to the Centraal Bureau voor de Statistiek (CBS - Statistics Netherlands)(2025), 82 thousand homes were added to the housing stock in 2024. This building pace, however, is lower than in the five preceding years, a decline caused by various factors such as rising costs, the nitrogen crisis, and longer lead times for procedures. Meanwhile, the demand for housing is steadily increasing. For 2025, the shortage according to calculations by the Ministry of Housing and Spatial Planning (VRO) (2025) is estimated at 396 thousand homes, which corresponds to 4.8% of the total current housing stock in the Netherlands.

This increased pressure on the housing market is largely caused by stagnant flow-through (also known as 'chain mobility' or 'housing turnover'). 'Flow-through' is defined here as the process by which households move from one dwelling to another, thereby making their former dwelling available to others. This movement is primarily driven by demographic changes and significant life events, such as getting married, divorcing, or having children, which influence the demand for different types of housing (NAi Uitgevers & Planbureau voor de Leefomgeving, 2008). Because the current housing supply does not adequately match these changing demographic and personal life stages, people are forced to move to meet their current housing needs. This search often stagnates due to the lack of supply in the desired location or neighbourhood (Van Dongen et al., 2025).

This flow-through issue increases the demand for new homes, but this intensification of construction places a heavy burden on the environment and accelerates the depletion of resources, resulting in many new homes not being able to be built. According to 'The Global Status Report for Buildings and Construction 2024-2025' by the UN Environment Programme and the Global Alliance for Buildings and Construction (GlobalABC)(2025), the construction sector currently uses 32% of global energy and is responsible for 34% of global CO_2 emissions. Furthermore, the construction sector is one of the largest consumers of (heavy) raw materials. It consumes around 63% of all materials in the world and buildings are responsible for a large part of that (De Graaf et al., 2022). It is estimated that humanities' ecological footprint (a measure of consumption) is one and a half times the earth's capacity to sustainably provide the resources to meet that demand. The shortfall between the supply of resources and the demand for them is being met through the depletion of the natural capital (earth), things like fresh water, soil, forest land, wetlands and biodiversity. (Baker-Blocker, 2023)

DESIGNING WITH NATURE

Due to increasing urbanization and construction activities, much nature is being lost worldwide. The expansion of infrastructure and construction leads to the degradation of ecosystems, loss of biodiversity, and fragmentation of natural areas (United Nations Environment Programme, 2021). This is also the case in the Netherlands. According to the report ‘Balans van de Leefomgeving 2025’ by Planbureau voor de Leefomgeving (2025), urbanization is increasing, creating a lack of habitat for nature and biodiversity. Therefore, it is becoming increasingly important to design buildings and living environments ‘with’ nature, providing space for greenery, biodiversity, and natural processes. In this way, architecture and nature can better come together and reinforce each other.



SCHEME DESIGNING WITH NATURE (own work)

SUSTAINABLE HOUSING STRATEGIES

The Netherlands aims to become fully circular by 2050. To achieve this goal, the Netherlands Environmental Assessment Agency (Planbureau voor de Leefomgeving – PBL) identifies three key strategies in the report “Characteristics, Stock, and Material Chains of the Construction Sector”: circular construction, demountable construction, and the use of biobased materials (Van der Schuit, Van Hoorn, Sorel, & Rood, 2023). Modular construction is increasingly seen as a possible solution to both climate challenges and the housing shortage. The Dutch Ministry of Housing defines modular housing as easily relocatable, demountable, and adaptable dwellings (Ministerie van Volkshuisvesting, n.d.). This flexibility allows homes to better respond to changing household compositions and different stages of life, reducing the need for relocation and improving housing market flow-through. As a result, modular and flexible construction methods can both accelerate housing production and contribute to a more adaptive and efficient housing system (Ministerie van Binnenlandse Zaken en Koninkrijksrelaties, 2024)(PricewaterhouseCoopers, n.d)(Nagelbeheer, 2025).

In addition to modularity, the use of sustainable and circular materials plays an important role in reducing the environmental impact of construction. Biobased materials in particular offer strong potential for lowering the ecological footprint of buildings. Currently, around 38% of construction materials used in the Netherlands are secondary materials, while only 3% are renewable materials. Biobased construction can contribute significantly to the circular economy because these materials are renewable within a relatively short time compared to finite resources such as ore or petroleum. Furthermore, biobased materials absorb greenhouse gases during their growth process, instead of only generating additional emissions (De Graaf et al., 2022).

Furthermore, off-grid living is increasingly seen as a potential strategy to reduce pressure on the climate. According to the International Energy Agency (IEA, 2023), the operational phase of buildings is responsible for approximately 30% of global energy consumption and 26% of energy-related CO_2 emissions. With off-grid living, this dependence on central, often fossil, energy sources is reduced because homes generate their own energy using, for example, solar panels and storage, collect and reuse water locally, and process waste streams on a small scale. Because primarily renewable energy and reused materials and flows are utilized in this process, it leads to lower CO_2 emissions and a smaller ecological footprint.

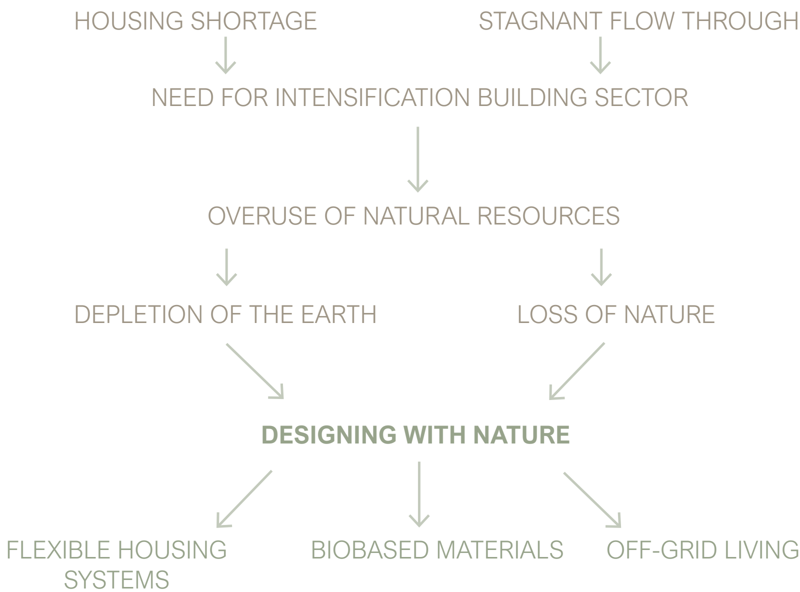
FROM PROBLEM TO DESIGN

Based on the challenges and strategies described above, this project focuses on the development of a modular housing system that contributes to reducing both the housing shortage and the environmental impact of the construction sector. The design challenge is to create sustainable, of the grid housing modules that minimizes the pressure on nature.

The modules combine to form a dwelling and can be easily connected to one another. This makes it possible to expand or reduce the size of homes depending on changing living needs. This reduces the need to move during changing life stages, contributing to better flow in the housing market and lowering the pressure on the current housing shortage.

The system must function completely off-grid, meaning it is self-sufficient in terms of energy, water, and waste processing and is not dependent on existing infrastructure. To achieve this, sustainable climate systems are integrated, such as local renewable energy generation, energy storage, rainwater harvesting, water reuse, and closed loops for waste streams. In this way, the system can be deployed in various locations without burdening or permanently disrupting the natural environment.

In addition, circular and bio-based materials are used to further reduce the ecological footprint and lessen the burden on the climate.



METHOD

This project is based on the methodology of the design process, in which designing is understood as a complex, iterative, and open-ended process in which knowledge is developed through action and reflection. Rather than being a purely linear process, design involves continuous exploration, testing, and decision-making. According to Van Dooren et al. (2014), learning and developing design knowledge is “a matter of doing and becoming aware how to do it,” in which learning and design are closely intertwined. In this approach, design serves as both a tool for exploring questions and a way of integrating knowledge.

This iterative approach is described by Van Dooren et al. (2014) using five generic elements: exploration and decision-making, guiding theme or qualities, domains, frame of reference (or library), and laboratory (or visual language). Within this project, exploration and decision-making, the guiding theme, and the frame of reference play a particularly central role in the design process.

During the process, various design experiments were conducted to investigate the possibilities of the system. These experiments focus on, among other things, the form, scale, and configuration of the modules, the materialization of the system, and the integration of sustainable climate and energy systems. By testing and analyzing variations, insights are gained into the performance and possibilities of the design, after which choices are refined and further developed.

During the decision-making process, the guiding theme served as an assessment framework that the choices had to meet. Central to the guiding theme is the principle that the design must not burden the natural environment and must have a minimal ecological impact.

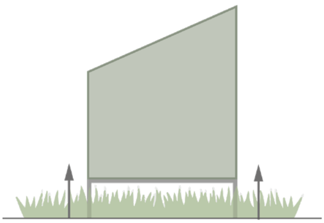
To substantiate these choices, an extensive frame of reference was used. Within this framework, knowledge was gathered from various domains, such as modular construction techniques, circular and bio-based material use, and off-grid residential and energy systems. These references not only provide technical and theoretical insights but also ensure the creation of a design that is not only experimental but also substantiated in terms of content and science.

A MODULAR AND NATURE-INCLUSIVE HOUSING SYSTEM

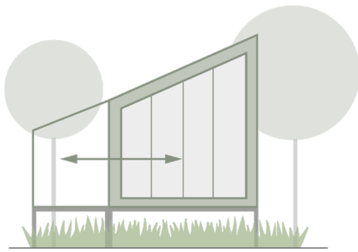
THE MODULAR SYSTEM

This project is based on four main principles: creating space for nature, connecting the indoors with outdoors and efficiency in transport and assembly.
All design decisions can be traced back to these principles, with sustainability functioning as an overarching theme.

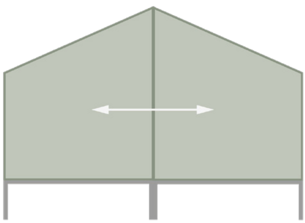
SUSTAINABLE
OFF THE GRID



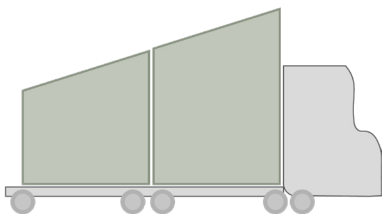
ELEVATED
SPACE FOR NATURE



CONNECTING
INDOOR + OUTDOOR



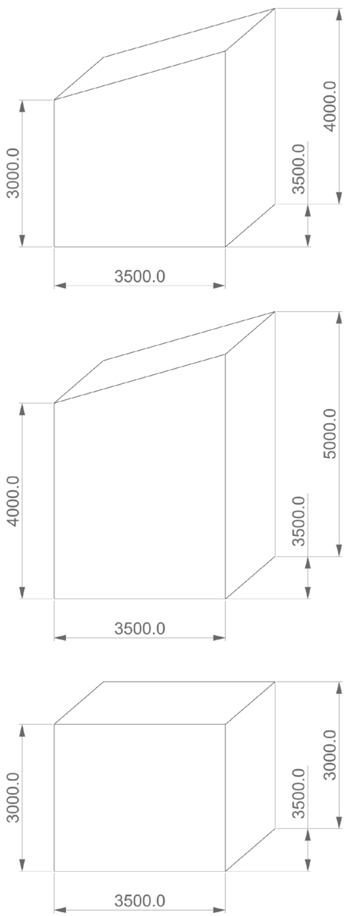
EFFICIENT BUIDLING
MODULES



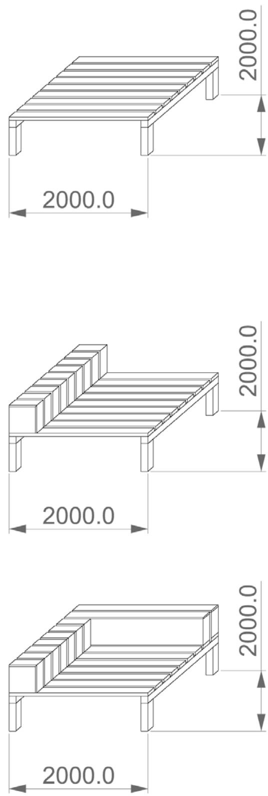
EFFICIENT TRANSPORT

The system consists of three different housing modules, three types of elevated substructures used to lift the modules from the ground, and a separate deck system composed of three modular elements.
Each module measures 3.5 × 3.5 meters, a dimension determined by transportation constraints. The modules are transported by low-loader trucks, which, according to the Dutch Ministry of Justice and Security (2024), may have a maximum width of 3.5 meters without requiring special escort.

HOUSING MODULES

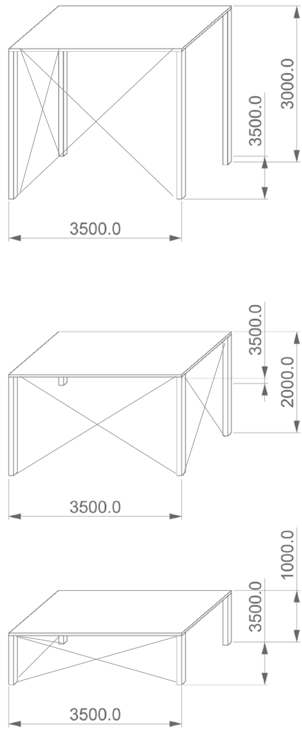


DECK MODULES



SUBSTRUCTURE MODULES

The houses are placed on substructures that elevate the housing modules above ground level. This allows nature to develop freely underneath the buildings and minimizes disturbance of the natural environment.The height of these substructures is based on the vegetation types typically found in shaded environments and their required clearance for growth. These include low grasses, mosses, ferns, and nettles. Grasses require approximately 20 cm of vertical space, while medium-height plants such as ferns and nettles thrive with around 80 cm of clearance (Ecopedia). Therefore, a minimum height of 100 cm is applied for the substructure.

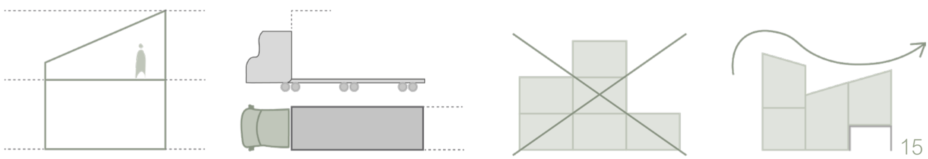


FORM

The form of the building arose from a combination of functional requirements and the desire to create a natural appearance. The maximum dimensions for transport and placement formed the starting point of the design and determined the basic shape of the volume.

Therefore, a sloping roof was chosen. This creates sufficient height on one side for a second floor, while the building remains compact and within a human scale on the other side. In this way, the home retains a warm and accessible appearance without feeling massive.

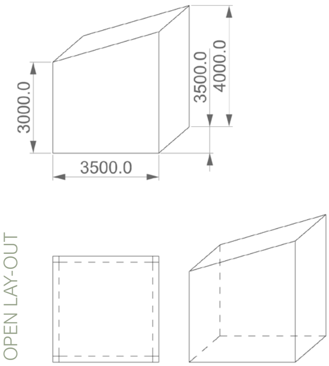
Additionally, a deliberate departure was made from a classic block shape. The flowing lines create a dynamic and organic design language that aligns better with the natural environment. The form thus combines functionality with a pleasant sense of space.



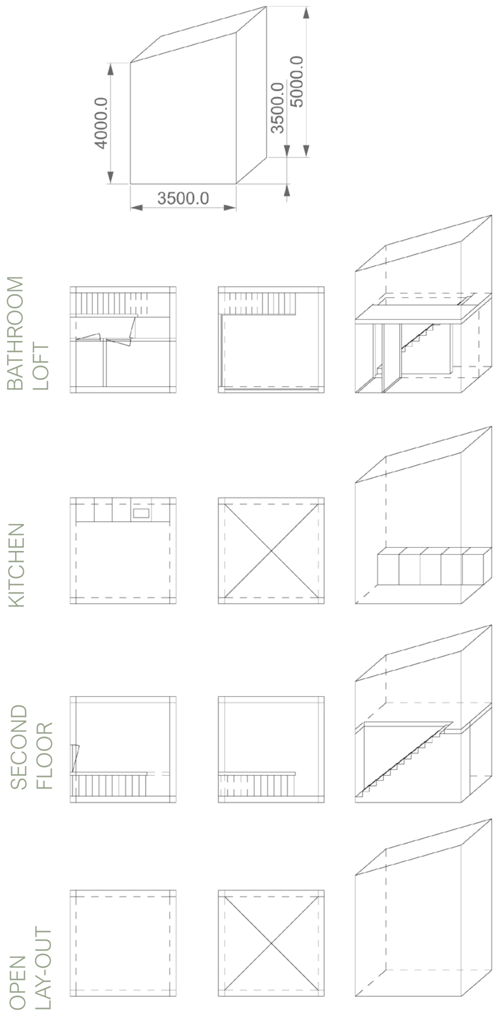
LAY-OUT

The three housing modules differ in their layout. In addition to modules with flexible layouts, the medium-to-high modules include predefined configurations such as a bathroom/loft-module, a kitchen-module, and a second-floor-module.

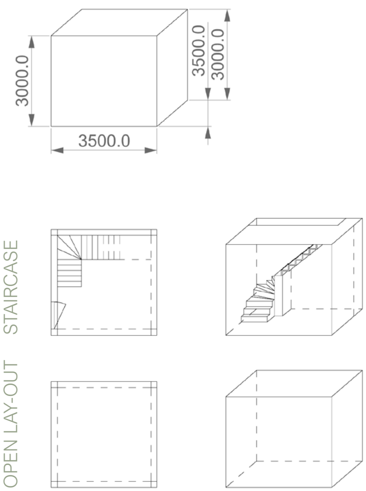
SMALL-MEDIUM



MEDIUM-HIGH



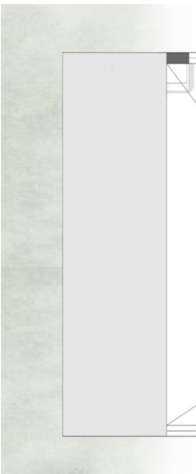
CUBE MODULE



SPATIAL CONFIGURATION

STARTER CONFIGURATION

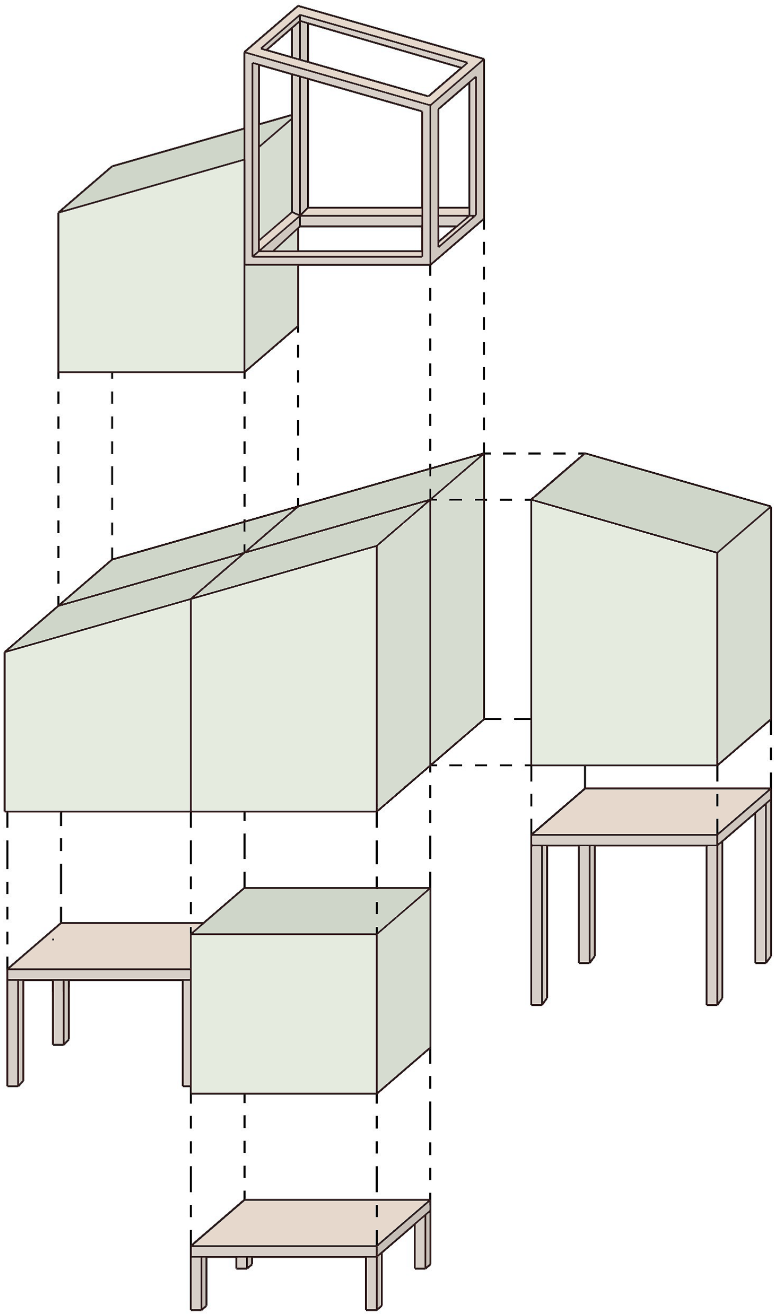
GROUND FLOOR



FIRST FLOOR | LOFT

The starter dwelling is composed of four modules: two free-height-to-medium modules, one medium/high kitchen-module, and one medium-to-high bathroom module. From this base configuration, additional modules can be connected both horizontally and vertically, resulting in a wide range of possible spacious configurations. To ensure efficiency in connecting modules, particularly with regard to water supply and drainage systems, the kitchen and bathroom modules are consistently positioned in relation to each other across configurations. This reduces complexity in installation, shortens construction time, and minimizes material use, contributing to a more sustainable system.

The development of different configurations, including floor plans and façades, can be found in the construction manual.



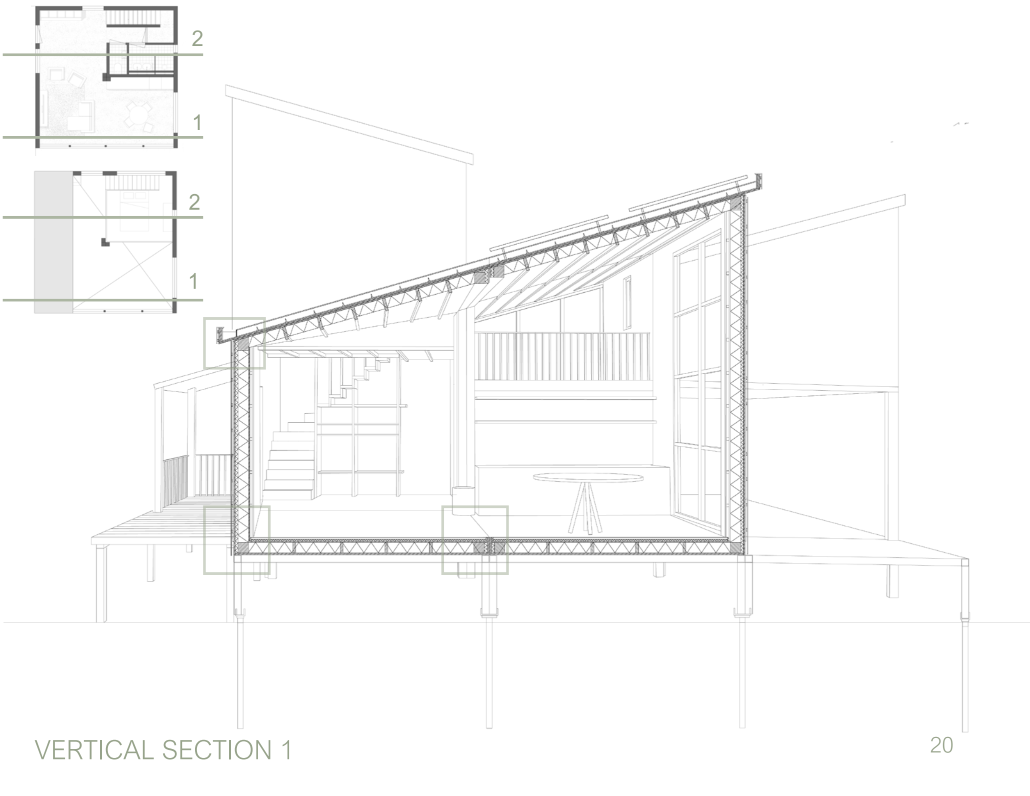
CONFIGURATION SCHEME

CONSTRUCTION

CONSTRUCTION

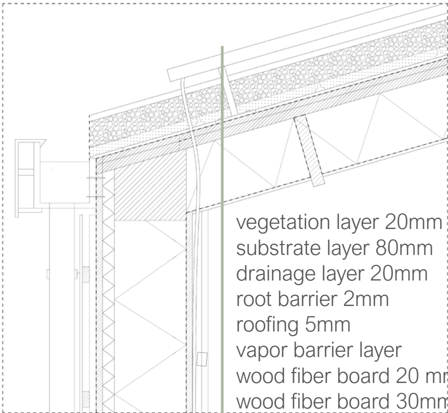
The modules are constructed using a timber structure with timber frame (HSB) elements. Timber is one of the lightest structural materials, which is beneficial for the transport and installation of modular units. Trucks can carry loads up to 50 tons, while a small telescopic crane, preferred for its mobility and flexibility, can lift up to 60 tons (Daniel, 2025). Timber is also easy to process both manually and mechanically, has low toxicity, is biodegradable, and can be easily reused or recycled. When properly protected from moisture, it also offers high durability (Timberlake & Smith, 2010).

Furthermore, HSB offers significant design flexibility. The structural system allows for adaptable layouts and easy integration of installations, making it well-suited for modular systems that need to evolve over time . This flexibility supports both horizontal and vertical expansion of modules. (Kampjes, 2024) (Pontmeyer,n.d.) To further improve efficiency in the assembly process the HSB construction is used for the walls, floors and roofs. All columns and beams of the main construction are standardized in size. This reduces production complexity and allows for faster and more flexible on-site assembly.

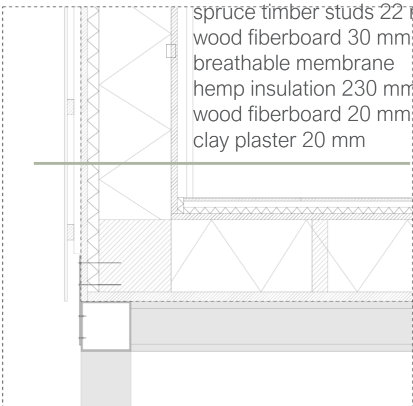


VERTICAL SECTION 1

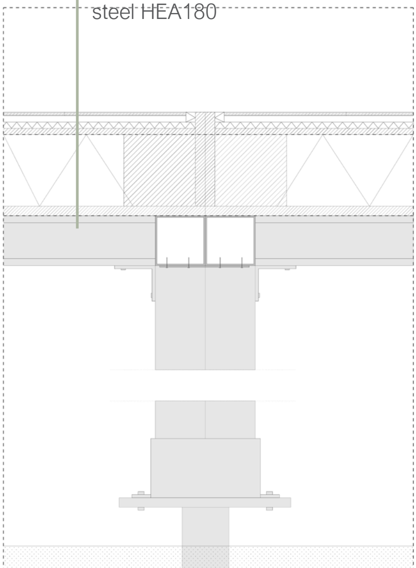
Each module is connected at two points. The substructures are connected at the base using steel plates. A similar connection method is applied at the exterior of the modules, beneath the façade finish, allowing modules to be connected either to the substructure or to adjacent modules. Bolted steel connections are widely used in modular construction due to their strength, speed of assembly, and reversibility, making them particularly suitable for flexible and circular building systems (Lawson, Ogden & Goodier, 2014; Smith, 2010).
More information about the construction and assembly of the system can be found in the ‘Building Manual’ booklet, which forms part of this project.



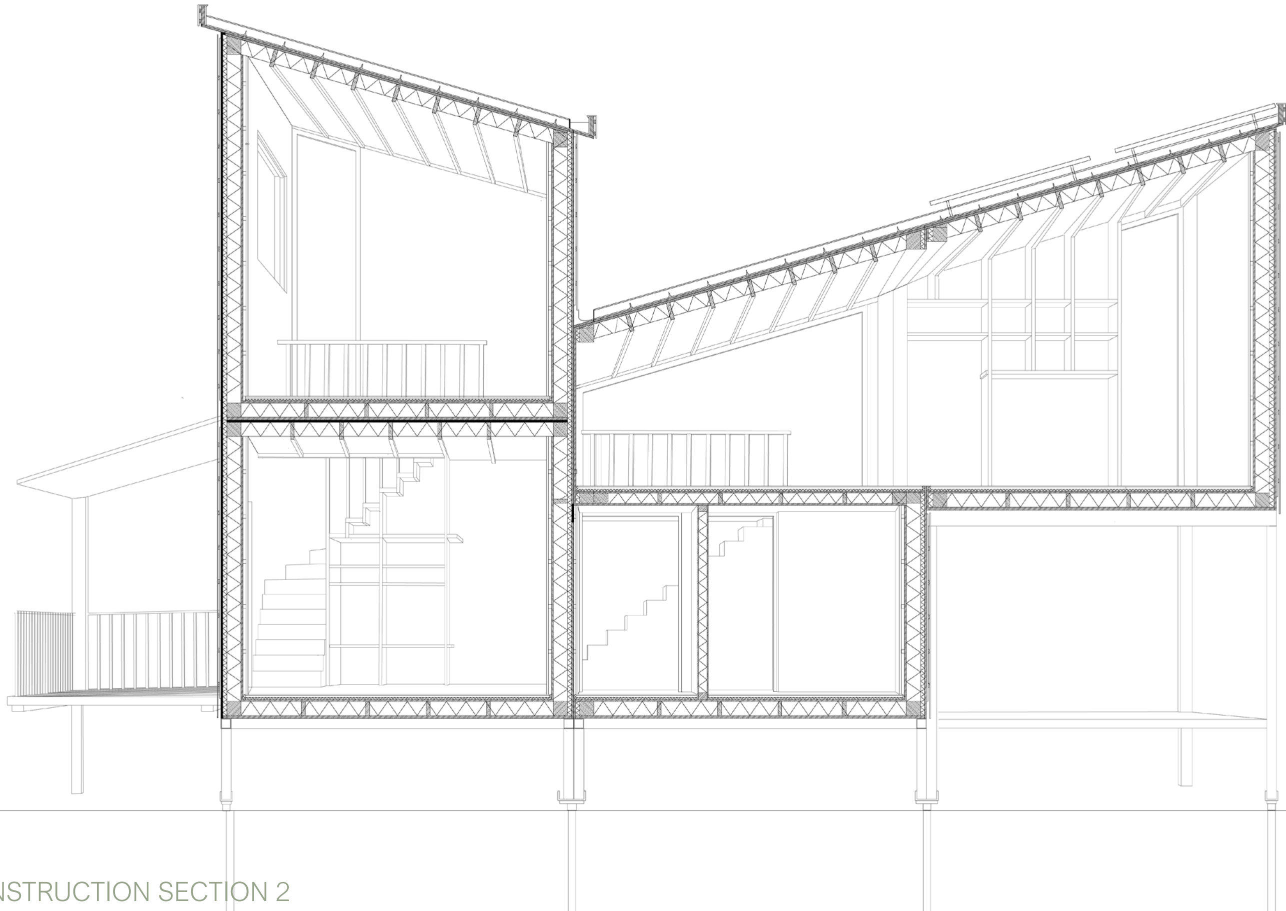
ROOF DETAIL



CORNER FLOOR | FACADE DETAIL



FLOOR DETAIL



CONSTRUCTION SECTION 2

MATERIAL

In this project, material choices play a key role in achieving a low-impact, circular and healthy building system. Since the design focuses on modularity and off-grid living, materials are selected not only for their structural performance, but also for their environmental impact, durability and ability to contribute to a comfortable indoor climate. The combination of construction, exterior and interior materials is therefore carefully chosen to support both technical performance and ecological responsibility.

CONSTRUCTION

As mentioned in the 'Construction' chapter, the structures of the housing modules and decks are made of wood. Wood is considered a natural and sustainable material, as it stores CO_2 and thereby contributes to reducing CO_2 levels in the atmosphere (Duurzame Materialen: Beste Keuzes Voor Milieu En Bouw, 2025). For optimal sustainability, it is important to ensure that the wood carries an FSC certification, meaning it originates from responsibly managed forests (WWF, n.d.). In this project, Accoya wood has been selected, a hardwood with durability class 1 and FSC certification.

EXTERIOR FINISHING

Residents can choose between two different options for the exterior finishing, allowing them to personalize their homes. The options include Rockpanel Wood and slate cladding. Rockpanel Wood is a façade material made from basalt, a naturally occurring and recyclable resource, with the appearance of wood (Rockpanel, 2025). Due to the use of basalt, the façade does not discolor, unlike traditional wooden facades, which is particularly important in a modular system where additional modules may be added later.

Additionally, there is the option to choose slate as a facade material. Slate is a natural material that requires little maintenance, is very strong, relatively lightweight for a type of stone, and highly resistant to various weather conditions. Moreover, slate is a sustainable material with the lowest carbon footprint throughout its life cycle (Pizarras, 2023). After use, the material can be reused in other construction projects or applied as aggregate in horticulture. Its eco-friendly production process, involving only raw material extraction and minimal processing, reduces CO_2 emissions, making it an ideal choice for sustainable architecture (Souza, 2024).

OPEN | TERRACE

CLOSED

SEMI CONNECTING

OPEN FACADE | WINDOW

SMALL WINDOWS

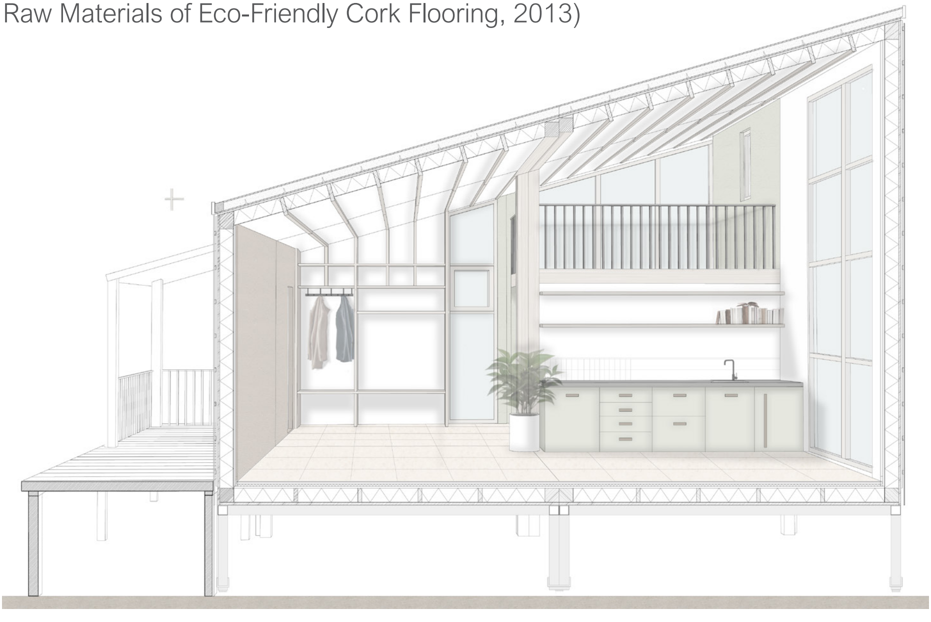
OPENING | DOOR

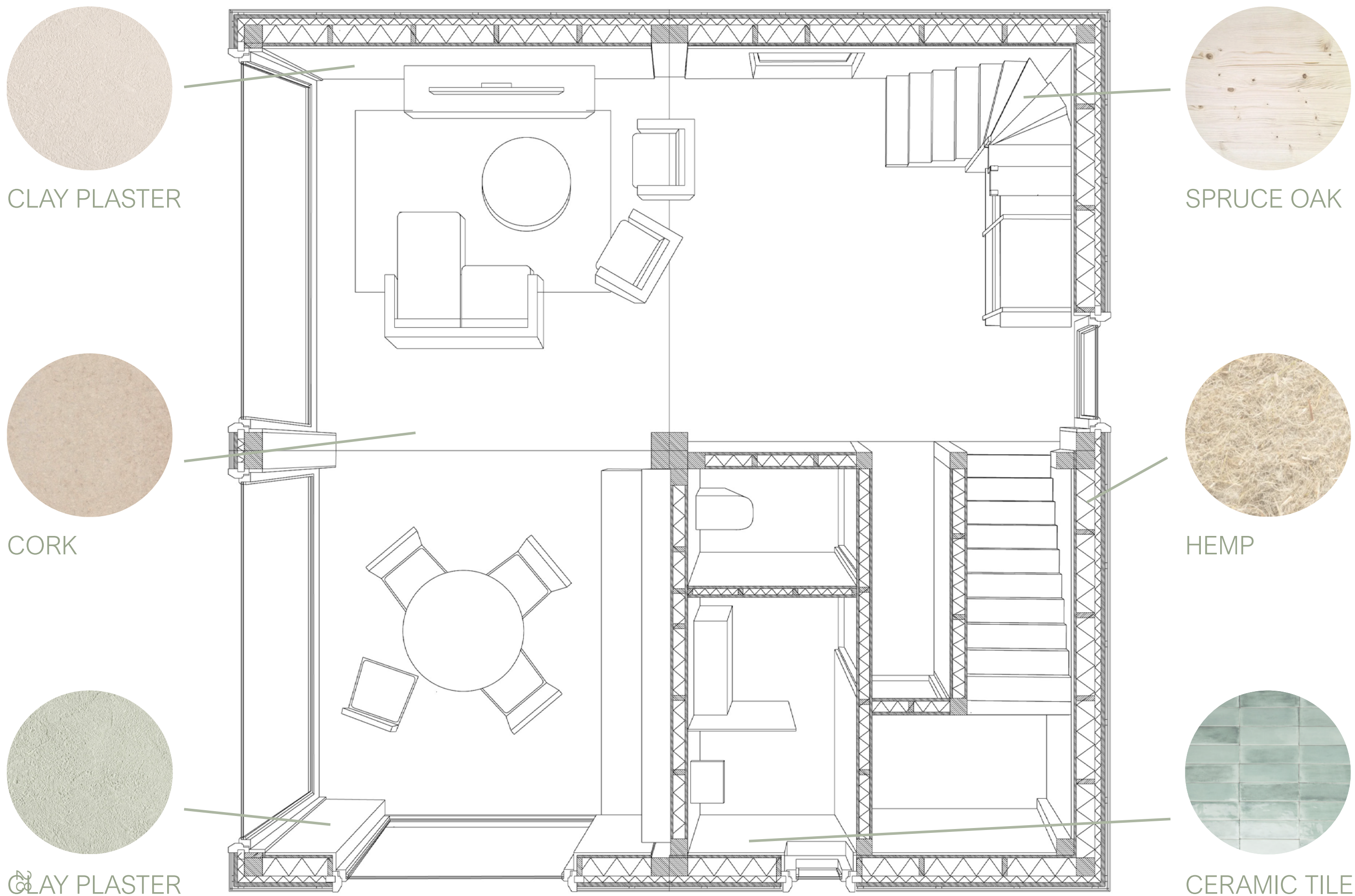
INTERIOR FINISHING

The timber frame (HSB) panels are filled with wood fiber insulation and finished on the interior with clay plaster. Wood fiber insulation is a highly sustainable material due to the use of certified wood. In addition to providing insulation in winter, it also has a cooling effect in summer and offers strong acoustic benefits. Furthermore, wood fiber insulation plays a crucial role in creating a healthy indoor climate thanks to its excellent moisture-regulating properties. During periods of high humidity, the wood fibers absorb excess moisture, which is then released when humidity levels drop. This natural process helps maintain a stable and comfortable indoor humidity level.

This effect can be enhanced by finishing the walls with clay plaster. This natural material reinforces the properties of wood fiber, allowing the entire building envelope to perform thermally, acoustically, and in terms of moisture regulation. This contributes to a more comfortable and healthier indoor climate (Green Building Materials, n.d.).

Cork is used as a floor finish due to its strong, durable, and functional properties. It is a 100% renewable material harvested from the bark of the cork oak, without felling the tree. During the regrowth process, the tree absorbs additional CO_2, contributing to a lower climate impact. In addition to sustainability, cork also offers great comfort. The material has good thermal and acoustic insulating properties, feels soft and resilient, and contributes to a pleasant indoor climate. It is also naturally mold- and allergy-resistant, water-resistant, and fire-retardant, making it a practical and healthy choice for flooring in sustainable homes. (The Raw Materials of Eco-Friendly Cork Flooring, 2013)



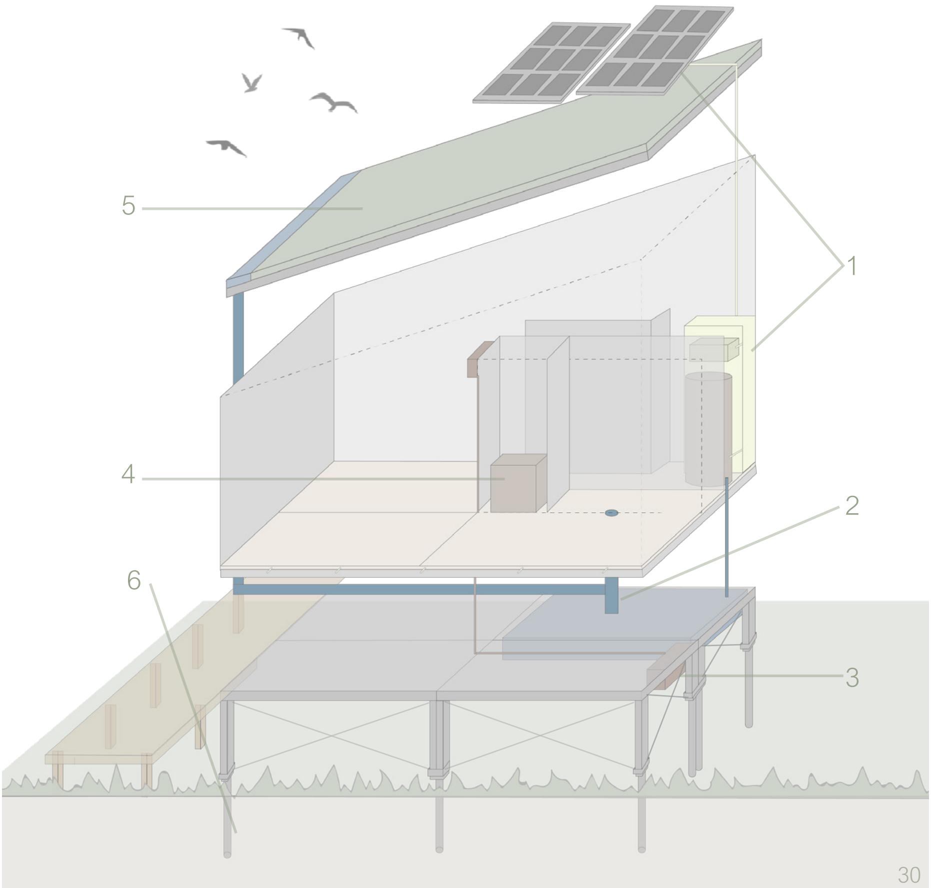

CLAY PLASTER
CORK
CLAY PLASTER
SPRUCE OAK
HEMP
CERAMIC TILE

SUSTAINABLE SYSTEMS

SUSTAINABLE SYSTEMS

This chapter describes the integrated off-grid systems of the Growing Homes project, including the energy supply, water management, heating system, composting toilet, and green roof strategy. Together, these systems enable the dwelling to operate independently from conventional utility networks while reducing environmental impact and supporting a more sustainable way of living.

In addition to explaining the functioning and sustainability principles of each system, the required dimensions and spatial integration of the installations are also considered. Detailed dimensions, placement, and technical integration of the different systems can be found in the chapter Sustainable Systems within the Construction Manual belonging to the Growing Homes project.



1 ENERGY SYSTEM

Solar panels were chosen as the primary energy source for the home's electricity supply. An average Dutch off-grid household of four people consumes approximately 3,000 kWh per year (Milieu Centraal, nd.). Depending on the location and the efficiency of the panels, this amounts to approximately 9 solar panels, with a total surface area of about 20 m², to fully meet their own energy needs (Verschoor, 2026).To bridge sunless days in winter, there is a battery with 50 kWh of storage, enough for three days of power.

The solar panels are integrated onto the roof of the modules and distributed across two roof planes within the overall system. This ensures that the available space is utilized efficiently for energy generation without additional land use. Furthermore, solar panels combine well with green roofs. Research at the Bronx Design and Construction Academy in New York shows that this combination can lead to a higher yield of the solar panels, while simultaneously improving the microclimate and growth conditions of the vegetation on the green roof (Perez et al., nd.).

2 WATER SYSTEM

For the water supply, rainwater is collected in a large storage tank (rainwater tank) with a capacity of approximately 4,000 liters. Rainwater is purified via a multi-stage filtration system consisting of a coarse filter (for leaf and debris capture), a fine filter for sediments, and an activated carbon filter to reduce odor, color, and micro-contaminants. After this pre-treatment, the water can be reused for applications such as showering and washing dishes.

For drinking water, an additional filtration step is applied at the tap, for example using a membrane filter (such as ultrafiltration or reverse osmosis), so that the water meets drinking water quality requirements. This makes the water safe and suitable for consumption. (Ross et al. 2025)The grey water generated during showering and washing dishes can, provided biodegradable cleaning agents are used, be collected again and returned to the storage tank via an additional filtration system or used for non-potable applications. In this way, a closed water cycle is created that significantly reduces drinking water consumption and limits dependence on external water supply.

The water tanks have a capacity of approximately 4,000 liters and are designed as flat storage tanks with dimensions of approximately 240 × 170 × 80 cm (l × w × h). This shape allows the tanks to be placed beneath the substructure of the modules. As a result, they are fully protected from direct sunlight and temperature fluctuations. This is functionally important, as algae only grow in the presence of light and heat. By keeping the tank dark and cool, algae growth is strongly inhibited, which improves water quality and storage stability.

3 HEATING SYSTEM

The home is heated using a heat pump. The outdoor unit is integrated beneath the substructure of the modules, where outside air is drawn in and thermally converted. The energy required for this process is supplied by the solar panels on the roof. The heated air is then blown evenly into the home via an indoor unit. In the summer, this system can be reversed, allowing the heat pump to function as active cooling in an energy-efficient and sustainable manner.

The hot water is heated using a solar water heater. In this system, water from the storage tank is heated in a storage vessel using solar energy. For this system, approximately three additional solar panels are added to the roof to ensure sufficient energy for the hot water supply.

4 COMPOSTTOILET

A composting toilet is used in the home because it is a sustainable alternative to the traditional flush toilet. No water is used for flushing, and it contributes to a lower environmental impact because no central infrastructure is used.

Additionally, the nutrient cycle is partially closed. The organic matter is broken down into compost, which can later be used as a soil conditioner. (Anand and Apul, 2013)

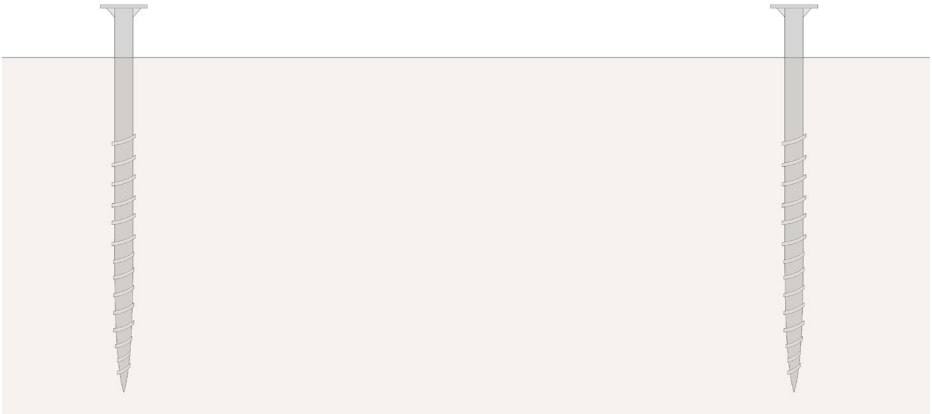
5 GREEN ROOF

Green roofs contribute to a more sustainable and climate-resilient living environment. According to the 2025 Environmental Balance, green roofs help increase biodiversity in urban areas, where nature and habitats are increasingly under pressure due to urbanization. In addition, green roofs provide water buffering during heavy rainfall, reduce heat stress by cooling buildings and the surrounding area, and improve air quality. As a result, green roofs make a significant contribution to climate adaptation and strengthening the ecological quality of the built environment. (PBL,2025)

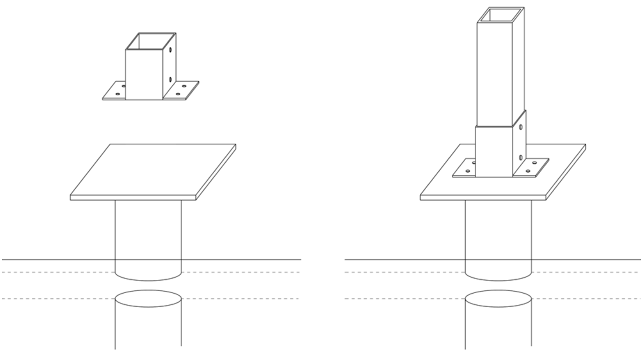
6 FOUNDATION

The foundation of the structure consists of a screw pile foundation. This system is chosen because it has minimal impact on the environment and leaves virtually no permanent traces in nature. The steel screw piles are screwed directly into the ground, eliminating the need for major excavation work or concrete pouring.

The screw pile foundations are prepared and installed on the construction site before the modules arrive. Depending on soil conditions, the screw piles are usually installed to a depth of approximately 2 to 4 meters to ensure sufficient load-bearing capacity and stability.



SCREW PILE FOUNDATION



ASSEMBLY FOUNDATION - CONSTRUCTION

TEST LOCATION

COMMUNITY LIVING

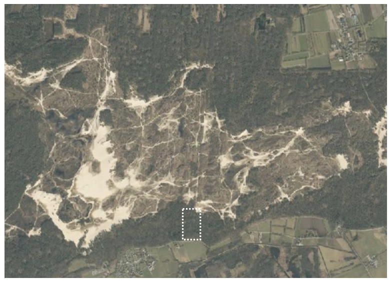
TEST LOCATION

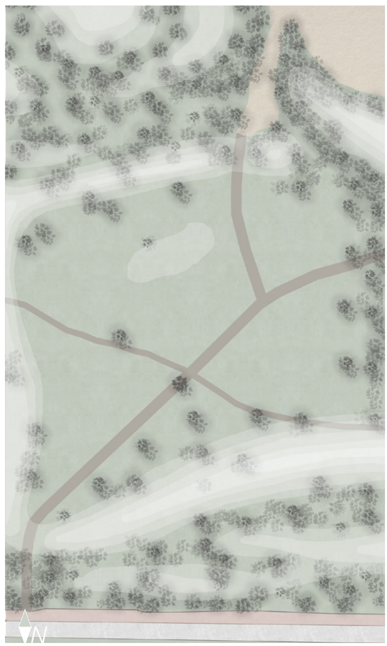
To test the modular system, various housing configurations have been designed for a test site in the middle of nature. The deck system of the modular concept is used to connect the homes, creating a collective living structure that aligns with the sustainable principles of the project.

Collective living is increasingly seen as a future-proof and sustainable form of housing because amenities, spaces, and materials can be shared. This reduces individual use of space and materials and results in a more efficient use of resources (Czischke et al., 2023).

As previously mentioned, the goal for this project is to build and live in harmony with nature. For the community, this means future residents will embrace the outdoors and take an active role in looking after the environment and each other. An eco-community is the ideal model for these values, as it places nature and sustainability at its heart.

The chosen site is located in the Loonse en Drunense Duinen, an area known for its high biodiversity and diverse landscape types. The specific location lies on the edge of the dunes near the beginning of the forest area, where the height differences of the dunes merge with the character of the old pine and oak forests.





COMMUNITY

In a separate study on collective living, it was investigated how an eco-community can be designed and which shared functions are important within collective living forms (the full study can be found in appendix 1 ‘collective living research’).

To gain insight into the needs and qualities of a community, various forms of collective living were studied. For this purpose, nine case studies were analyzed: Ecowijk Mandora in Houten, Ecodorp Boekel in Boekel, woongroep Harvest in The Hague, Het Groene Hof in Gouda, Cruquius 2Peer in Amsterdam, IEWAN in Nijmegen, Het Hallehuis in Amersfoort, Buitendelen in Lettele, and the Stadsboerderij in Delft. These projects differ in scale, target group, and living form, but all have a strong focus on collectivity, sustainability, and shared use of spaces and facilities.

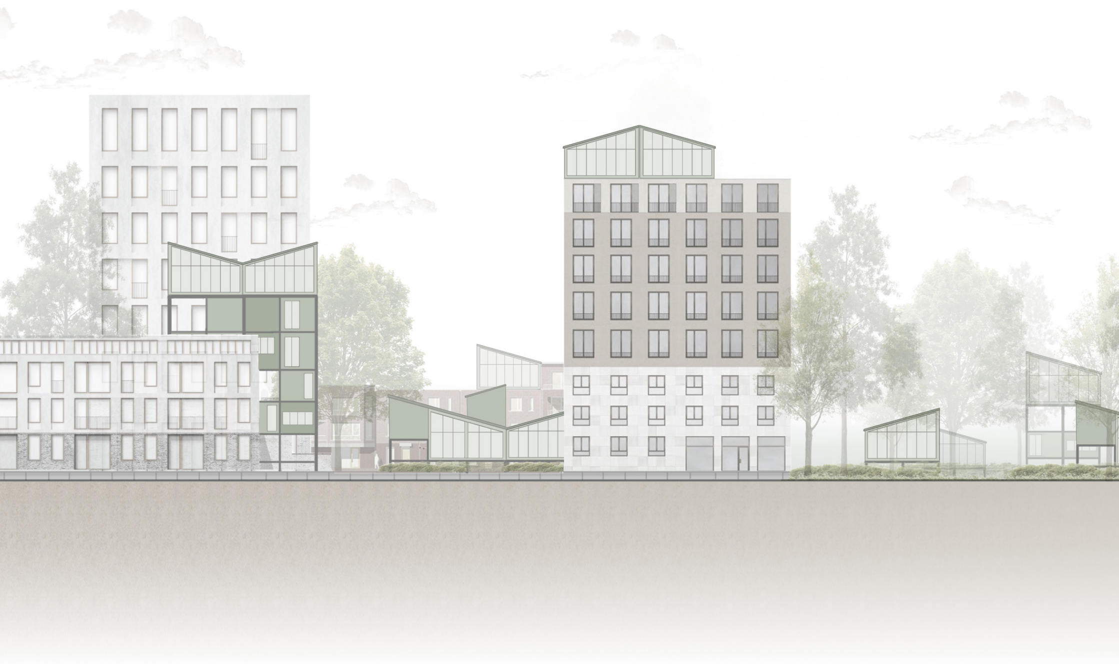
The case studies were analyzed for the ratio between private and shared functions to investigate which facilities are used collectively within an eco-community. All shared functions were subsequently assessed against three key criteria for an eco-community: social cohesion, outdoor living, and sustainability. This investigated the extent to which a function stimulates social interaction, activates residents to live and work outdoors, and contributes to a lower ecological impact. Based on this analysis, it has become clear that shared outdoor spaces, in particular, play an important role within an eco-community. Features such as communal gardens, vegetable gardens, orchards, and outdoor kitchens score highly on all three criteria. Shared facilities such as workshops, tools, laundry rooms, and mobility systems contribute to a more sustainable way of life by reducing individual ownership and space usage. The analysis shows that a future-proof eco-community revolves not only around shared living, but primarily around combining social connectedness, ecological systems, and the collective use of spaces and resources.

The results of this research have been incorporated into the design of an eco-community at the test site. The community consists of 10 homes for four different target groups: small families, large families, singles, and couples. These homes can be expanded or reduced in size using the modules. The homes are connected to each other using the deck modules. In addition to the private homes, there are collective functions including a fire pit, multiple vegetable gardens with vegetables, fruit, herbs, and flowers, shared means of transport, and a large community building. The detailed design, including the design of each home and the collective building, can be found in appendix 2 ‘designing an eco-community’.

INTO THE FUTURE

In the future, the modular system offers the possibility of being applied much more broadly than just within wooded areas. The design was developed based on the principle of “designing with nature,” which means not only that the modules can be situated in nature but also that they can restore or enhance nature at the site. The modules can adapt to various landscapes and are therefore not tied to one specific environment.

Thanks to the raised substructures, the homes can, for example, also be placed in polder areas or along the beach, where water levels and tides change continuously. The open structure allows water to flow freely beneath the homes without disturbing the natural landscape.



Additionally, the system offers opportunities for locations where nature has disappeared over time, such as vacant pastures due to declining livestock farming, or even within urban areas. It is precisely there that the modular system can contribute to restoring nature. By lifting the homes off the ground, space is created for new vegetation and ecosystems beneath the substructures. In this way, existing nature is not only preserved but is also given the chance to return to places where it was previously lost.

The system also offers possibilities for the future within the city. Thanks to the modular structure, the design can be expanded not only horizontally but also vertically. The ability to build upwards ensures that the system can contribute to urban densification, a theme that will become increasingly important in the future due to the growing housing shortage, while simultaneously leaving room for greenery and nature.

In doing so, the system focuses not only on designing with the nature of today, but also on strengthening the nature of the future.

CONCLUSION

This project demonstrates how modular, circular, and off-grid living can contribute to addressing both the housing shortage and the environmental impact of the construction sector. Research shows that the current housing crisis is caused not only by a shortage of homes but also by a lack of flexibility within the existing housing stock and the increasing pressure the construction sector exerts on natural resources, biodiversity, and the climate.

By combining modular construction with sustainable materials and off-grid systems, this project offers a housing model that is flexible, self-sufficient, and environmentally conscious. The modular system makes it possible to expand or reduce homes based on changing living needs. This reduces the need to move and improves flow in the housing market. At the same time, timber construction, bio-based and circular materials, and demountable connections ensure a lower ecological footprint.

The integration of off-grid systems, such as solar energy, rainwater harvesting, water reuse, composting toilets, and heat pump systems, enables the homes to function independently without being dependent on existing infrastructure. This allows the system to be placed at various locations without permanently disturbing the natural environment.

Furthermore, the project demonstrates that the modular system can function not only as an individual dwelling but also as part of a larger living community. By connecting homes via the deck system, collective functions can be created that stimulate social interaction and the shared use of facilities. In this way, the project also showcases the social aspect of sustainability, where living together, sharing facilities, and strengthening social connectedness contribute to a future-proof way of living.

In conclusion, the proposed modular system demonstrates how living can be designed in closer relation to nature, while simultaneously addressing current societal and ecological challenges.

RECOMMENDATIONS

It is recommended to perform further technical calculations of the design in a subsequent phase. In this project, this has currently been done based on rules of thumb per material, providing an initial indication of feasibility. Further structural and building physics research can determine whether the chosen assembly techniques are sufficient for the safe fastening and stacking of the modules within the system.

Additionally, follow-up research could be conducted into the ecological integration of the system. This could specifically investigate which plant species can develop beneath the substructures and what conditions are required for this vegetation to grow optimally. Furthermore, it could be investigated how the architecture itself can play an active role in enhancing biodiversity. This includes considering the influence of facade materials on flora and fauna, as well as integrating nature-inclusive elements such as insect hotels, nesting facilities, and other habitat-enhancing components into the design. In this way, the relationship between the building and nature can be further deepened and optimized.

Additionally, it is important to emphasize that the current design was primarily developed in response to the challenges of the Dutch housing market and the climate challenge currently at play here. For future research, it can be investigated in which other countries this system might also be relevant and applicable.

REFLECTION

Throughout the process of this project, I have been heavily involved in broadening and narrowing the project's focus. In the initial phase, the emphasis was on designing a tiny house that functions off-grid and is developed in harmony with nature. Subsequently, the focus broadened to the design of a modular system in which homes can be expanded, creating greater flexibility and giving the concept broader applicability and a unique character. As a result, the term “tiny house” became less appropriate and was replaced by the concept of a modular housing system.

This gave rise to the principle of future-proof living, with its associated environmental, technical, and social aspects. This led to an initial design for a community in which homes could be expanded horizontally using sustainable materials and fully off-grid systems. However, this three-way division made the project very broad, creating the risk that it would become three separate components without clear cohesion.

To create more focus and cohesion, the decision was made to delve deeper into one main aspect: the modular system as the technical starting point. Within this in-depth approach, the system was further developed by adding vertical expansions via substructures and additional modules. The sustainable aspect remains present here in material choices and climate systems, but no longer forms a standalone main component. The social aspect has been integrated into the development of a test site, where the functioning of an eco-community within the system is being investigated.

During the shift in focus, an essential aspect was pushed into the background: ‘designing with nature’. This was the main principle and guiding theme of my design and project. By re-examining the design, the elements associated with it have received extra attention in both the design and the research.

This process of broadening and focusing has taught me that it is not always necessary to immediately stick to one direction, but that it is valuable to leave room for change within a design process. Shifting perspective can lead to new insights and helps to better determine the core of the project. By focusing too strongly, I almost lost my original motivation: protecting nature, which is increasingly burdened by the construction sector. By continuing to switch between perspectives and remaining open to change, ‘designing with nature’ ultimately came to the forefront again and became the guiding theme of this project.

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APPENDIX

APPENDIX 1
COLLECTIVE LIVING RESEARCH

To gain insight into the functions required for such a community, research will be conducted. This chapter begins with an introduction to collective living, following by an examination of shared spaces in communities through the analysis of nine different case studies.

THE ORIGINS OF COLLECTIVE LIVING

The origins of collective living can be traced back to early communal living arrangements. Historically, extended families lived together in shared farmsteads or courtyard structures, where domestic and productive functions were naturally intertwined. In the 19th and early 20th centuries, collective living models reemerged in response to rapid urbanization and industrialization. Philanthropic housing initiatives, workers' housing, and the garden city movement introduced shared courtyards and communal amenities to improve living conditions in densely populated cities. (Startpunt Wooncoöperatie, 2024)

In the 1960s and 1970s, collective living received renewed attention in Western Europe and North America, influenced by social movements striving for equality, alternative lifestyles, and community-oriented living. Emancipatory and idealistic values, focused on increased neighborhood vibrancy and mutual involvement, led to the emergence of housing models such as co-housing and Centraal Wonen in the Netherlands. These models emphasize resident participation, joint decision-making, and the sharing of amenities, in addition to the preservation of private living spaces. (Van Dreth, 2025)

In recent decades, collective living has evolved from an ideological alternative to a more widely accepted and differentiated housing model. Today, it encompasses diverse typologies such as co-housing projects, eco-villages, multi-generational housing, senior cooperatives, and urban shared living concepts. The focus from purely social ideals shifted to themes like sustainability, spatial efficiency, and the circular use of resources. Also societal challenges get adressed such as housing shortages, social isolation, an aging population, and climate change.
(Stavenuiter et al.,2008)

MODELS OF COLLECTIVE LIVING | CASESTUDIES

Collective living is a multifaceted concept that ranges from small-scale residential groups and modern retirement homes to ecological neighborhoods and social housing projects. While the formats vary, these forms share a common core: residents consciously choose shared amenities and an active community, whether the focus is on sustainability, neighborliness, or social cohesion. To illustrate this broad spectrum, ten diverse case studies were selected: Ecowijk Mandora, Ecodorp Boekel, Het Groene Hof, Harvest, Cruquius 2Peer, IEWAN, Hallehuis, Buitendelen and Stadsboerderij Delft. These practical examples demonstrate how various ambitions of collective living are translated into practice. These case studies are explained in the following section.

ECOWIJK MANDORA

Ecowijk Mandora is located in Houten, directly adjacent to the outskirts of Schalkwijk Island. The neighborhood consists of 36 homes, ranging from apartments to detached houses, designed by ORIO Architects between 2013 and 2016. The architecture is characterized by an organic style with natural materials such as wood, flax insulation, and sand-lime brick, with the colors becoming increasingly vibrant as they approach the communal garden.

What makes Mandora truly special is its strong focus on community and ecology. The homes are compactly grouped around a shared garden of approximately 4,000 m², which is maintained by the residents themselves and designed to enhance biodiversity. At the heart of this garden is the shared community building, a central place for gatherings, meetings, and shared activities. (Mandora, n.d.)

ECODORP BOEKEL

Ecodorp Boekel is a community where people live in connection with each other and with nature. Daily life, work, learning, care, and relaxation are closely linked. The eco-village focuses on sustainability and self-sufficiency. Energy is produced in innovative, renewable ways, water is reused and cleaned naturally, and food is grown using permaculture to support biodiversity.

The village includes about 30 sustainable homes, shared facilities, and spaces for guests, artists, and children. The homes are designed by architect Huub van Laarhoven (Van Laarhoven Combinatie), using healing architecture that supports sustainability, community, and a strong connection with nature.

IEWAN
MULTI GENERATIONAL LIVING

IEWAN (Initiatief Ecologisch Wonen Nijmegen) is located in the sustainable Vossenpels residential area in Nijmegen-Noord. The site is part of the Waalsprong district and is close to the city centre of Nijmegen. Designed by Grietje van den Berg (ASAS), the complex comprises 24 social housing units, ranging from small studios to spacious family homes and communal living spaces. The architecture is striking: it is the first large-scale multi-family building in the Netherlands constructed entirely of straw, clay, and wood. These natural materials ensure an extremely low ecological footprint and a particularly healthy living environment in all units.
As a multigenerational project, IEWAN brings people of all ages together.
The heart of the project is the communal courtyard and the “Deel,” a publicly accessible multifunctional building for activities and social gatherings.
Furthermore, the neighborhood is fully self-managed, meaning that residents are

HET HALLEHUIS
CENTRAAL WONEN

The Hallehuis is a Central Living (Centraal Wonen) project in the Schothorst neighborhood in Amersfoort. About 45 people live together in a building designed by architect Dolf Floors together with the future residents, and is characterized by a pedestrian street running through the project. The residents are divided into six living groups with Each resident has their own private apartment and shares common spaces with others. The Hallehuis has 33 apartments of about 35 m². Most apartments can be divided into a living room and bedroom with a sliding door. Each apartment has a small kitchen, a private shower, and a toilet.
The community is based on a social and respectful way of living together. Residents do not follow one shared vision, but they value equality, openness, and helping each other when needed. Every resident contributes to the community in their own way.

WOONGROEP HARVEST
GESTIPPELD WONEN

Harvest is a modern housing complex in The Hague (Leyenburg / Moerwijk) with a special community group called the 'betrokken bewoners.' A group of engaged residents lives spread out across the building and works together with neighbors to care for the garden. The plan includes apartments (40–90 m²) and tiny houses arranged in a courtyard-style layout, inspired by traditional 'Haagse hofjes'. The building has 184 apartments, each with a balcony, terrace, or loggia. There is a large shared vegetable garden with a cozy shed, which forms the heart of the community. Gardening is the main activity, with occasional social drinks and group walks starting from the garden.

HET GROENE HOF
KNARRENHOF

The Groene Hof in Gouda is located on the historic site of the former Groen van Prinsterer School in the Korte Akkeren neighborhood. This central location offers seniors a peaceful, private living space within walking distance of Gouda's city center and all necessary amenities.

The courtyard houses 21 lifelong and future-proof homes, designed by INBO Architects. Thanks to close collaboration with the residents (CPO), a diverse range of homes has been created that seamlessly blend in with the neighborhood's architecture.

As part of the Knarrenhof concept, "nabuurigheid" is central here. Residents share a beautiful courtyard garden and a communal "Hofhuis" (community building) for socializing. It is a living environment where people look out for each other and combine independence with social security.

CRUQIUS 2-PEER
CO-LIVING

Cruquius 2Peer is located on the industrial Cruquius Island in Amsterdam East. This transformative neighborhood offers a unique mix of industry, history, and modern buildings, surrounded by water and just a short distance from Amsterdam's city center.

The building was designed by LEVS Architects. The architecture forms a hinge between the historic buildings and the new urban neighborhood, with a facade of robust brick and steel girders that evoke the city's industrial past. What makes 2Peer unique is the housing concept: the building contains 24 "friends apartments" (between 70 and 105 m²) specifically designed for home sharers. The overall design of 2Peer revolves entirely around community and sustainable living. The island is also designed to be car-free, creating a peaceful and pleasant environment.

BUITENDELEN
SHARED YARD

The project Buitendelen is a small living community in Lettele designed by 'Marten ontwerpt', with a focus on ecological building and living in harmony with nature. The site is 4 hectares in size and is transformed from farmland into nature. There is a growing orchard, hedgerows, a frog pond, and wetland areas that collect rainwater. All buildings are designed to look like a traditional farmyard from that region, so the community fits naturally into its rural surroundings.
Residents have their own homes and also share common spaces. The old farmhouse has been renovated into two homes, and six new eco-friendly houses have been built on the former stable area. A shared meeting place with a large kitchen is located in the renovated horse stable. There are also quiet seating areas, a fire pit, and a vegetable garden where people work and harvest together.

STADS-BOEDERIJ DELFT
HOFWONEN

The 'Stadsboerderij' is a collective housing project in the historic city center of Delft. A gate along one of the canals leads to a green inner courtyard, where the apartments are clearly visible and easy to reach. The community includes 33 apartments with a mix of social rent, private rent, and owner-occupied homes. Around 15 residents, including 7 children, live here, spread across four families around the courtyard
Each apartment has its own kitchen and bathroom, so residents are not dependent on shared facilities. The shared indoor and outdoor spaces are placed around the entrance, which encourages spontaneous meetings. In summer, residents often meet on the terrace, while the garden also offers quiet places to retreat and enjoy privacy.

CASESTUDIE ANALYSIS

In this chapter, the casestudies will be analysed on the degree of collectivity. To determine the level of collectivity in each case study, this section compares the allocation of shared and private spaces. The analysis focuses on the functional program of each model, highlighting the ratio of communal areas to private units to illustrate the intensity of collective living in each project.

ECOWIJK MANDORA

Each household within Ecowijk Mandora inhabits a private 94 m² home equipped with essential living function. The ground floor features a workspace, a spacious open-plan living area with a kitchen, and a restroom, while the first floor comprises two bedrooms, a bathroom, and laundry facilities. Each home includes its own front and back garden, yet is part of a larger community that shares several key facilities. These communal spaces include a large, resident-maintained garden and a community building for social activities, as well as a shared workshop equipped with tools for gardening and maintenance.

ECODORP BOEKEL

Each home in the ecodorp has all the basic amenities, such as a living room, kitchen, bedrooms, and bathroom, a laundry, and its own energy generation system.
In addition to the private homes, residents share various facilities. There is a community center with communal and work spaces, large workshops, and a large food garden with an orchard, vegetable gardens, and a swimming pond. Shared parking spaces for electric cars and bicycles are located at the edge of the village.
Sustainability plays a central role: residents share facilities such as an ecological water purification system, seasonal energy storage, a composting system, and an algae greenhouse for breaking down pharmaceutical residues.

IEWAN
MULTI GENERATIONAL LIVING

This residential community houses a diverse group of residents, ranging from families and singles to residential groups. While most units are fully self-contained with their own living room, kitchen, bathroom, and bedrooms, residential groups share the bathroom, kitchen, and living room internally. In addition to private outdoor spaces such as balconies or a gallery, residents have access to an extensive network of communal facilities. This includes functional spaces such as a laundry room and guest rooms, as well as workspaces and a multifunctional building called ‘de Wiel’ with a communal living room. The houses are compact and contain only basic amenities.

HET HALLEHUIS
CENTRAAL WONEN

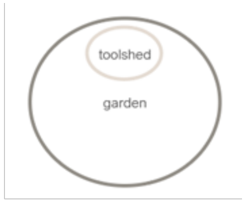
The Hallehuis is a central living project consisting of six residential groups. Each resident has their own rental apartment of approximately 35 m², with a living room and bedroom (separable by a sliding door) and a small kitchenette. The shower and toilet are located in the hallway, adjacent to the apartment.

In addition, each household belongs to one of the six residential groups. Within each group, a spacious kitchen, dining room, and living room are shared, fostering regular contact and communal activities while also allowing residents to maintain their own space.

All residential groups share additional facilities, such as a laundry room, a guest room, two large gardens, a balcony, and the “Deel” (shared living room). The Deel is the building’s central meeting space and is used for meetings, parties, drinks, and other communal activities.

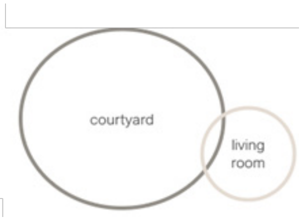
WOONGROEP HARVEST
GESTIPPELD WONEN

The Harvest residential group is spread out in a large apartment complex with units ranging from 40 to 90 m². Each apartment has its own living room, kitchen, bedrooms, bathroom, laundry room, and a balcony, terrace, or loggia.
The most important shared element is the vegetable garden, which is located right next to the complex. The garden includes a small tool shed. Drinks are occasionally held here, and communal walks depart from there.



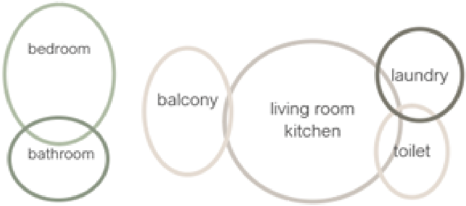
HET GROENE HOF
KNARRENHOF

The Knarrenhof consists of single-story apartments, with sizes varying between the corner units and those located in the wings of the U-shaped building. Each apartment is occupied by a single household and features a fully private program, including a living room with a kitchen, one or two bedrooms, a bathroom, and a separate toilet. The access gallery functions as a social transition zone thanks to the 'Delftse stoep', which adds a sense of privacy to the shared walkway. In this model, the degree of collectivity is expressed less through the sharing of functional spaces and more through communal facilities such as the inner courtyard and the 'Hofhuys' (community house)



CRUQIUS 2-PEER
CO-LIVING

In this model, apartments ranging from 70 m² to 105 m² are shared by multiple residents, with two people occupying the smaller units and three in the larger ones. Living behind a single front door, residents share both private and communal functions. Each individual has a private living/bedroom with an en-suite bathroom, totaling 20 m² to 25 m². The remaining space is used collectively, featuring a spacious kitchen-diner with an adjacent balcony. Additionally, the residents share a restroom in the hallway and a laundry room located next to the kitchen.

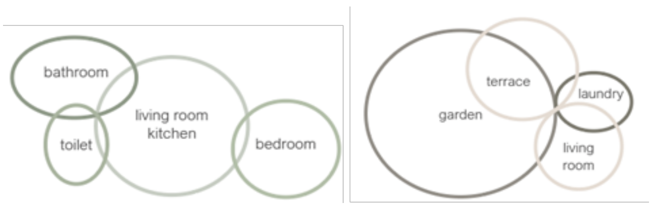


BUITENDELEN
SHARED YARD

The Buitendelen community consists of eight homes, ranging in size from approximately 300 to 415 m³, spread across three residential buildings. Each household has its own home with a spacious kitchen, living room, bathroom, laundry room, and several bedrooms.
There are also numerous communal spaces designed in collaboration with the residents. The old part of the farmhouse houses a shared kitchen-diner and two guest accommodations. The former haystack has been converted into a meeting space with hobby rooms and storage for garden tools and the technical equipment for the shared electric cars. There is also a shared shed for bicycles and for storing fruit and vegetables, which are grown in the communal vegetable garden. The grounds also include a large orchard, a flower garden, a wetland area, a frog pond, 'houtwallen', and herb-rich meadows, creating a strong connection between nature and living.

STADS-BOEDERIJ DELFT
HOFWONEN

The Stadsboerderij in Delft consists of several apartments organized around a courtyard. Each apartment has its own living room, bedroom, kitchen, and bathroom. Residents share a laundry room in the shed, a communal indoor spaces. similar to a shared living room, and various outdoor spaces such as a terrace and a garden. These shared spaces are located around the entrance, creating a great opportunity for spontaneous encounters.



ANALYSIS TABLE

The table below lists all collective functions resulting from the analysis of the case studies. These functions were not only inventoried but also systematically assessed against three core aspects of eco-communities: social cohesion, outdoor living, and sustainability. For each function, it is made clear to what extent and in what way it contributes to these aspects. Consequently, the table shows not only which collective facilities are present but also their significance within the functioning of the community.

Shared function/room	Social cohesion	Outdoor living	Sustainable
laundry	Informal encounters	Indoor	Fewer appliances, reduced energy and water use
indoor kitchen	Cooking and eating together	Indoor	Efficient space and energy use
outdoor kitchen	Cooking and eating together	Outdoor	Efficient space and energy use, less mechanical ventilation
living room	Daily interaction, community bonding	Indoor	Reduces m2 in private house
restroom	No social interaction	Indoor	Less material needed
communal room (parties)	Community building	Indoor but you can connect it to outdoor spaces	Mulitfuctional spaces use = sustabinable
tool shed	Sharing tools, cooperation	Supports gardening/outdoor activities	No need for a private toolshed in the private house
workspace	Possibility for Collaboration	Indoor	Reduces commuting
workshop	Collective repair and making	Indoor but could also be outdoors	Encourages recycling, repair over replacement
garden	Meeting space, joint feeling of care for the garden	Direct outdoor living	Biodiversity
courtyard	Space for spontaneous encounters	Semi outdoor	Less room in own houses needed for meeting spaces
vegetable garden	Collective food production, working together	Active outdoors engagement	Local food, reduced transport
fire pit	Informal social gathering	Outdoor	Less living room needed in own room

tree yard	Shared harvesting	Outdoor engagement	Local food, c02 storage
cars	Sharing trips to work or supermarket	-	Reducese private car ownership and car use
bikes	-	Encourgaes outdoor movement	More sustainable transport
terrace	Informal interaction	Outdoor	Reduces room for private terraces
compost	Shared maintainance, spontaneous encounters	Outdoor system	Closes nutrient cycle
ecological swimming pond	Recreational gathering	Outdoor activity	Natural water filtration
wastewater purification system	-	Outdoor	Water reuse, ecological treatment
animals (chickens)	Shared care	Outdoor activity	Local food production
guest rooms	-	Indoor	Reduces need for private guest rooms
meeting/conference rooms	Collaboration possible	Indoor	Efficient shared space use
wadi (plasdras zone)	-	Outdoor	Water retention, biodiversity
herb meadow	Educational, collective maintainance	Encourages outdoor engagement	Supports biodiversity, local food productions
flowergarden	Joint care	Outdoor	Ecological value
storage shed for vegetables and fruit	Functional coopereation	Connected to garden	Reduces food waste
energy storage	-	-	Grid reduction, enables self sufficiency

CONCLUSION

The evaluation of the shared functions demonstrates that outdoor-related collective spaces contribute most strongly to the core values of the eco-community: social cohesion, outdoor living, and sustainability. In particular, the vegetable garden, shared garden, courtyard, orchard, and outdoor kitchen score highly on all three parameters. These spaces stimulate daily interaction through collective maintenance and food production, actively encourage residents to spend time outdoors, and contribute to ecological value through biodiversity, water infiltration, and local food systems.

Functions such as the workshop, tool shed, compost system, shared mobility (cars and bikes), and energy storage contribute primarily to sustainability. They reduce individual ownership, stimulate circular use of materials, and lower environmental impact. Although their direct contribution to social cohesion may be less visible, they strengthen the collective structure through shared responsibility and management.

Indoor collective spaces, including the shared living room, indoor kitchen, and communal room, contribute strongly to social cohesion but have a more limited relationship with outdoor living. However, by reducing the need for large private living areas, they indirectly support spatial efficiency and sustainable land use.

Technical systems such as the wastewater purification system and energy storage are essential for environmental performance but have minimal influence on social cohesion or outdoor living. Their value lies primarily in enabling the eco-community to function as a low-impact and potentially self-sufficient system.

Overall, the analysis shows that the strongest contributors to the eco-community concept are those functions that combine ecological performance with everyday collective use. Spaces where food production, landscape, and social interaction overlap form the backbone of a future-proof eco-community, as they simultaneously address environmental responsibility and social resilience.

DESIGN

ECO-COMMUNITY

SITUATION

The community is situated in the open plain among the trees. The elevation differences of the surrounding dunes, together with the existing trees, form a natural boundary around the area.

The community consists of 10 homes for four different target groups: small and large families, singles, and couples. Thanks to the modular system, the homes can easily be expanded or reduced in size, allowing them to adapt to changing family compositions.

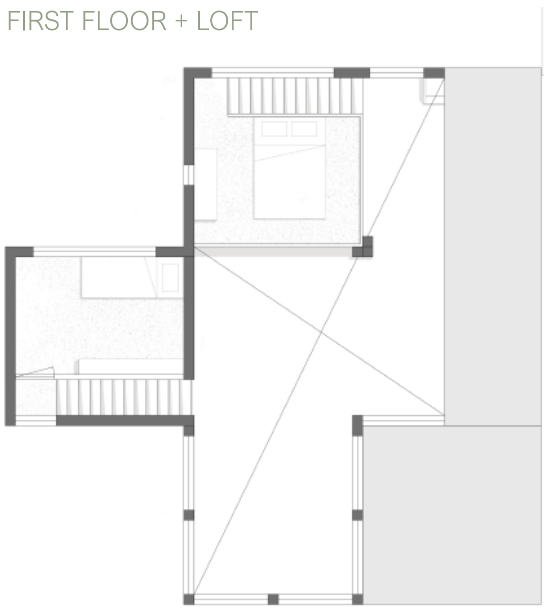
The community features multiple shared vegetable gardens, a large eco-pond, a central fire pit, shared vehicles and a community building with a terrace.

FAMILY HOME

LARGE FAMILY

GROUND FLOOR

FIRST FLOOR + LOFT



The home has an open and uncluttered layout. Through the entrance, you enter a central space with room for coats and shoes. Located beneath the loft are the bathroom, toilet, and additional storage space, ensuring these functions are compactly integrated into the heart of the home.

The ground floor further consists of an open kitchen with a dining area and a living room. Large windows provide plenty of natural light and a strong connection to the outdoor space and the surrounding landscape.

The loft is accessible via a staircase and offers space for a bedroom, study, or additional storage. Extending from the kitchen is an extra module with a built-in upper floor. Two bedrooms have been placed here, making the home suitable for a small family.

FRONT FACADE

SIDE FACADE (ENTRANCE)

SMALL FAMILY HOME

SMALL FAMILY

You enter the cube module, where the integrated stair cupboard provides space for coats and shoes. From the entrance, you walk directly into the open-plan kitchen and living room. French doors open onto the terrace adjacent to the dining area, extending beneath the elevated sleeping module.

Beneath the loft are the toilet, bathroom, and storage space. A staircase leads to the loft, which offers space for a workspace or an additional bedroom. Adjacent to this is an extra module that can be used as a bedroom. From the entrance, a second staircase leads to another bedroom on the first floor.

The living room and dining area feature large glass facades that provide ample daylight and a strong connection to the surrounding nature reserve. The elevated bedrooms also feature large windows with views of the landscape.

GROUND FLOOR

FIRST FLOOR + LOFT

FRONT FACADE

SIDE FACADE (ENTRANCE)

TREEHOUSE

TREEHOUSE

COUPLES AND SINGLES

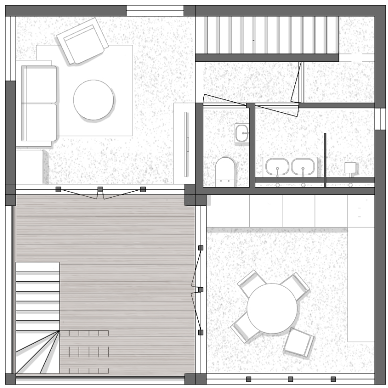
This home is inspired by the principle of a treehouse, where living is elevated above ground level. The entire structure rests on a high substructure, creating a sheltered terrace beneath the dwelling. From this ground level, a spacious staircase leads to the raised, covered terrace. This terrace forms the transition between indoors and outdoors and provides access to the living room as well as the dining room and kitchen via french doors.

Through these large facade openings, indoor and outdoor spaces flow seamlessly into one another, actively involving nature in the house. The living level is designed to be open and light, with direct connections between the various functions. Beneath the loft is a compactly organized core containing the toilet, bathroom, and storage space.

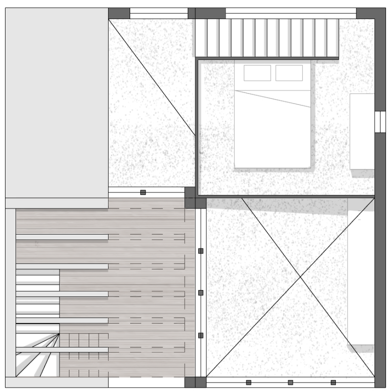
A staircase is also integrated into this core, providing access to the loft where the bedroom is located. The living room, kitchen, and bedroom all feature large windows. Thanks to the elevated position, these spaces offer sweeping views of the surrounding nature reserve, enhancing the feeling of living in a treehouse.

GROUND FLOOR

FIRST FLOOR



SECOND FLOOR + LOFT



FRONT FACADE

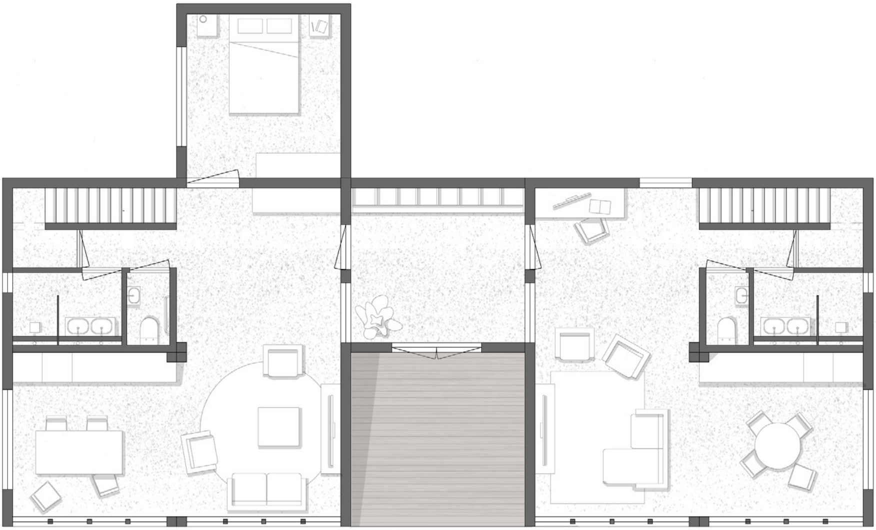
SIDE FACADE (ENTRANCE)

ASSISTED LIVING

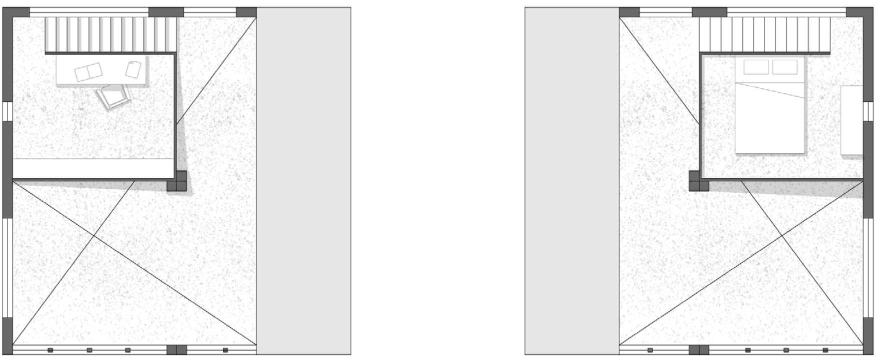
ASSISTED LIVING 2 FAMILIES OR COUPLES | SINGLES

By introducing a cube module, multiple dwellings can be linked together through a shared entrance space. This central module provides room for coats, shoes, and storage, while each home still has its own private front door connected to the shared entrance.

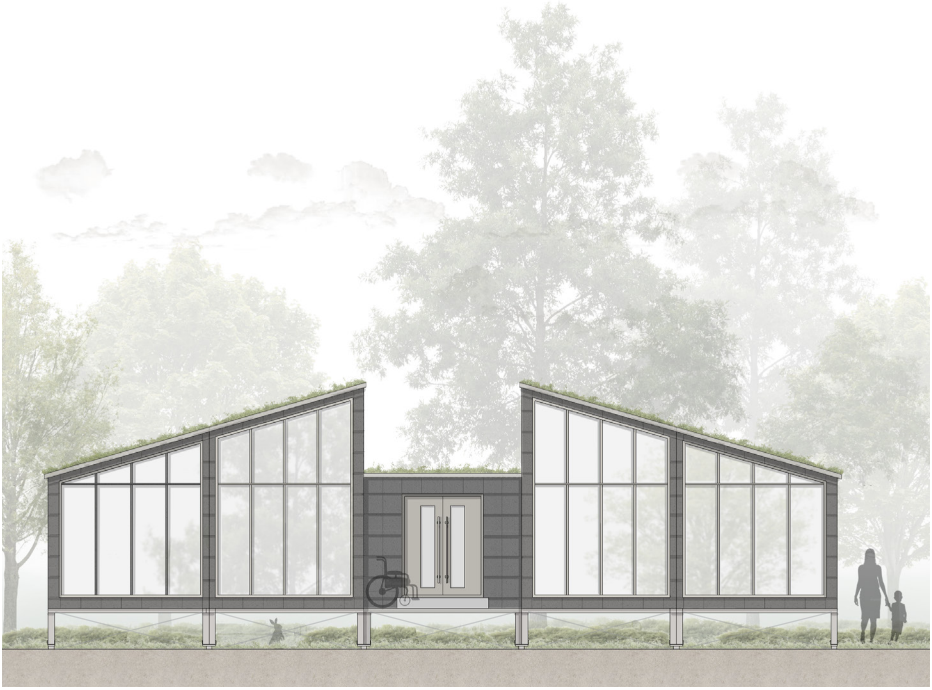
The configuration encourages communal living while maintaining privacy for each resident. It can accommodate different living situations, such as friends or couples living side by side, intergenerational households where elderly parents live independently next to their adult children, or supported living arrangements in which care and assistance are always close by.



GROUND FLOOR



FIRST FLOOR + LOFT



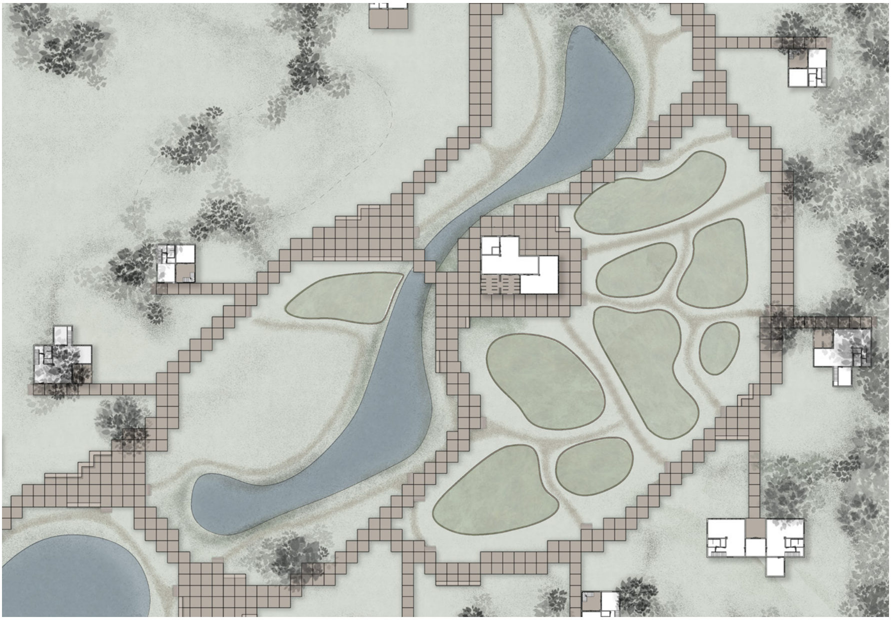
FRONT FACADE

SIDE FACADE

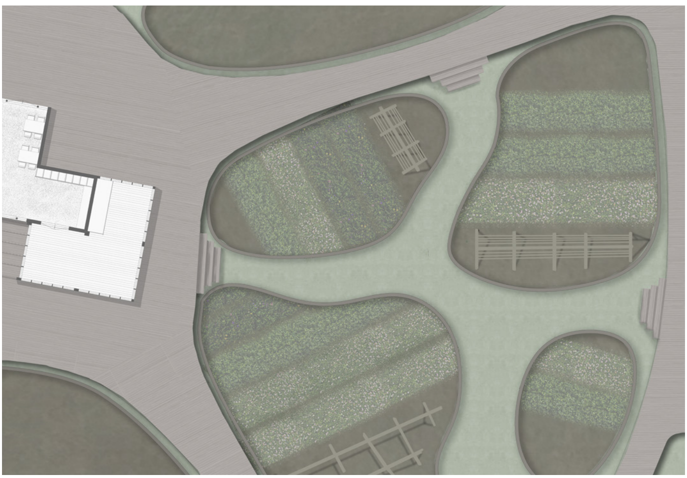
COMMUNITY

The community building with the adjacent spacious terrace forms the heart of the community. From this central location, raised paths made of deck modules lead towards the homes. Because the homes are set further outwards, a gradual transition from the collective to the private is created. Between the paths are gardens and an ecological swimming pond situated. In addition to the elevated main paths, smaller walking paths made of peach pits have also been laid out.

SITE PLAN COMMUNITY



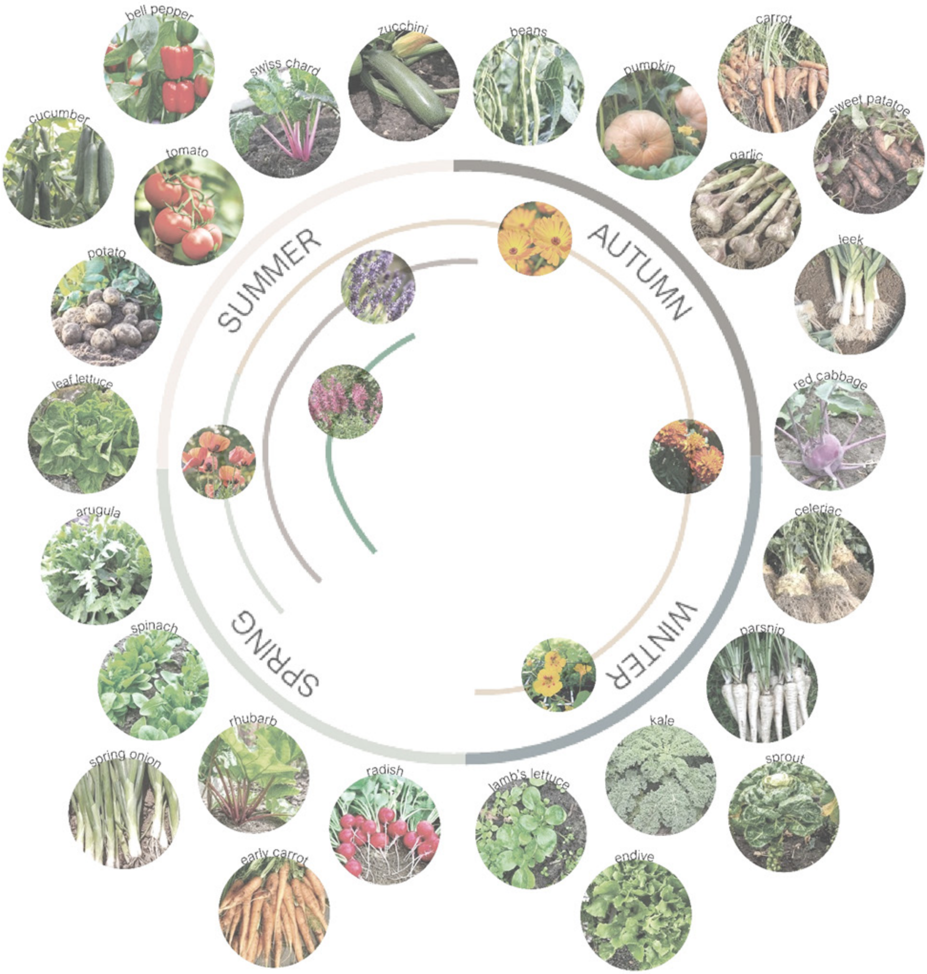
VEGETABLE, FLOWER, HERB GARDEN



In the gardens, vegetables, fruit, herbs, and flowers grow together. The planting is carefully composed whereby species support each other in growth. They attract beneficial insects that contribute to the balance in the garden.

VEGETABLE FLOWER HERB GARDEN

A selection of plants, vegetables, flowers, and herbs has been made for the vegetable garden. Due to this variety, in combination with the greenhouse, the garden remains productive year-round and largely self-sufficient. On average, approximately 40 m² per person is required for a self-sufficient vegetable garden. For the entire community, this amounts to about 1,200 m².



VEGETABLE GARDEN CALENDAR

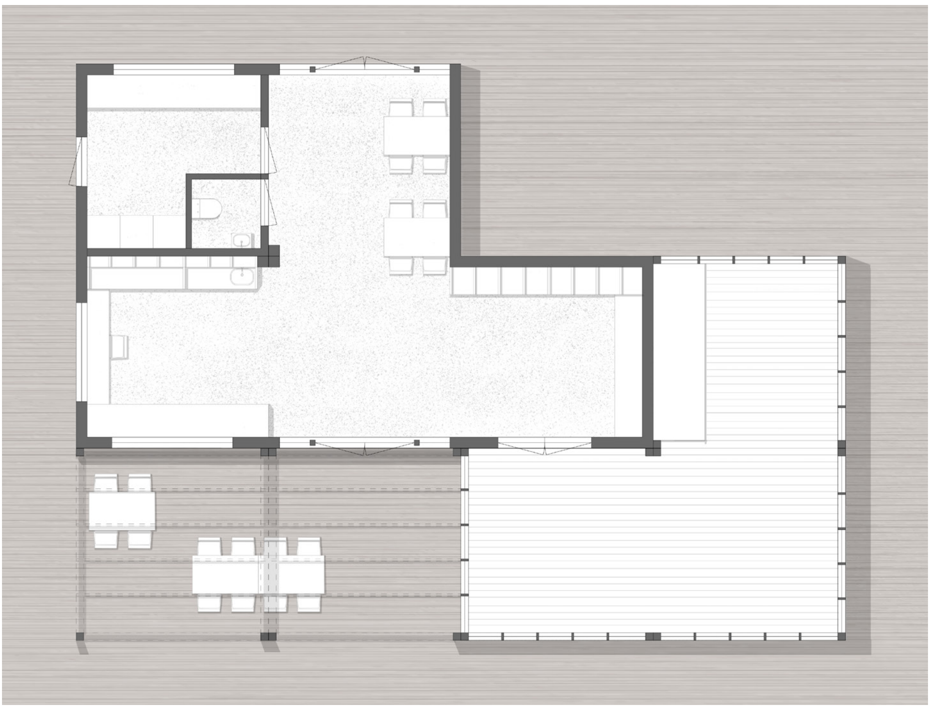
COMMUNITY BUILDING

The community building forms a central meeting place within the plan and is accessible via two distinct entrances: one on the terrace and one at the rear. Both entrances are recognizable by the large glass facades with French doors, which create a strong connection between the interior and exterior.

Inside, there is an open and flexible space with ample storage for tools and produce from the vegetable garden, such as vegetables, fruit, herbs, and flowers. Through a side window, these products can easily be sold to passersby in the nature reserve, allowing the building to play a connecting role with the surrounding area.

Additionally, there is a small pantry with seating areas both indoors and outdoors that invite socializing and lingering. At the rear, there is an enclosed space, accessible from the outside, containing a toilet and shared washing machines.

At the front, a spacious greenhouse virtually encloses the building. Due to the matching design and materials, this greenhouse forms a single entity with the main volume, causing the building to manifest itself as a coherent and recognizable element in the landscape.



FRONT FACADE

BACK FACADE

COMMUNITY BUILDING

EXPLORE LAB GRADUATION | ARCHITECTURE

MASTER’S IN ARCHITECTURE, URBANISM AND BUILDING SCIENCES 2025|2026

GRADUATION REPORT BY
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