

THE COMMONS



Graduation report

STUDIO - ADVANCED HOUSING
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THE COMMONS

A community where living and landscape dissolve into one another

ABSTRACT

This graduation project proposes a new form of community living within the rewetting peat landscape of the Vlietlanden, Midden-Delfland — a territory undergoing fundamental ecological transformation under the ZUS, SWECO, & FLUX Landscape Architecture masterplan for 2122 (2022). As conventional agriculture becomes untenable and water levels rise, the project asks : what comes next, and who lives there ?

The project develops a woonlandschap — a living productive landscape — for approximately 55 dwellings and 150 inhabitants, organised around three dimensions of productivity : ecological, material, and social. The landscape is treated not as a backdrop but as the generative foundation of every spatial decision. Water and soil gradients dictate land use, which dictates the position and form of the settlement.

Three new social actors inhabit this landscape : the new farmer as landscape guardian and educator, the seasonal worker as full community member, and the hybrid resident seeking an active relationship with nature. Together they form a mixed community organised around shared productive infrastructure — workshop, community kitchen, educational space, and restaurant — at the heart of a circular ring of dwellings.

The architectural typology combines hexagonal CLT dwelling units with a rectangular greenhouse

envelope. The hexagon responds to the organic, non-orthogonal conditions of the rewetting soil, breaks the rigid geometry of the polder grid, and opens six sightlines onto the productive landscape. The greenhouse provides a spatial and environmental threshold between interior and landscape — generating three new biotopes, producing energy through BIPV panels, and filtering water through rooftop helophyte systems. The settlement is energy positive, materially circular, and ecologically generative. The project demonstrates that architecture in a fragile, transitional landscape don't need to choose between human comfort and ecological integrity. When the ground leads, both become possible.

Key words:

peat landscape, regenerative production, community housing, woonlandschap, paludiculture, hexagonal typology, ecological threshold, climate-adaptive design

**This report is designed to be read as a double-page spread. For the best reading experience, please open this PDF in two-page view.*

ACKNOWLEDGEMENT

This graduation project marks the end of six and a half years of studying in the Netherlands — a journey filled with challenges, growth, beautiful encounters, and memories I will carry with me for the rest of my life. These acknowledgements go to everyone who has been part of that journey, in one way or another.

First and foremost, I would like to thank my supervisors for their guidance, patience, and support throughout this graduation process. Their feedback pushed me to think further about what this project could be, and helped me to believe in myself along the way. I would also like to thank my teammates Floor and Meike — thank you for keeping each other laughing and for the support we shared throughout this process.

To my parents — I may not say it often enough, but I am endlessly grateful that you gave me the opportunity to study here. It was not always easy, but I have learned so much, met extraordinary people, and lived through experiences I would not trade for anything. I do not regret a single second of it.

To everyone who has been part of this journey — my housemate Elise, DSBV Punch, my boards, my teams, my family, the ones that were there and took a different route and all the people I have shared so many moments with — thank you for making these years what they were.

And a very special thank you to Jasper, Eliah, Noor, Ilona, and Jesse. You have been there through the hardest moments and the best ones. Thank you for your support, for all our laughs and long nights talking, your patience, checking in on me and for believing in me when I struggled to believe in myself. It has meant more to me than words can say.

As we say in French : “À tous les beaux lendemains.”

Amélie L.W. Niemeijer
Delft, June 2026

PREFACE

I did not choose this landscape. Midden-Delfland was assigned to us as a studio. But when our group chose the Vlietlanden as our specific site — pushing ourselves as far into the landscape as possible, as far from the city as the masterplan would allow — something shifted. I started cycling there almost every week. Not always for the project. Sometimes just to breathe.

The Vlietlanden is a remarkably simple place. Flat, open, quiet. Rabbits at dusk. It has a way of emptying your head. In the middle of a graduation process that was often difficult, that landscape became something I relied on.

The theme of production came to me more naturally than I expected. I grew up with it, without quite knowing it. My Dutch family lives near the Noordoostpolder — a landscape shaped entirely by the ambition to make land productive. My grandfather spoke with love and pride about his father, who worked the peat for many years. Every time he took me to his plot of land ‘De Pollen’ near Almelo, he told me stories about how it used to be — the work, the soil, the seasons. He passed away during this graduation process, and I think he would have loved to see what I made of it all. This project carries something of him.

I grew up in a house in the south of France with a garden large enough to get properly lost in

: climbing cherry trees, playing in mud, riding on my father’s tractors. I also had the incredible chance to spend every summer in the Alps, surrounded by farms, forests, and mountain air — nature that always gave me a sense of peace and simple beauty. But that beauty has another side too. I witnessed floods at home in the South that taught me, young, that water is not something you can ignore. You can manage it, or you can live with it. But you cannot pretend it is not there.

In recent years, through periods of real difficulty, I have understood more clearly how much I need nature — not as a view from a window, but as a place to actually be. The simplicity it offers. The calm. The sense that things grow and change at their own pace, regardless of deadlines or doubts.

This project is, in some ways, an answer to that need. It asks what it would mean to live somewhere that gives you that — not as a luxury, but as a way of life. And it asks what you would have to give back in return. Because nature does not ask nothing of you. It asks that you pay attention. That you take care. That you show up.

That, to me, is what productive living means.

Delft, June 2026



With my grandfather . J. Niemeijer (2006).

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PART I. INTRODUCTION

I.A PROBLEM STATEMENT

Low-lying peat landscapes in the Netherlands are under severe pressure due to climate change, water level fluctuations, soil subsidence, and salinisation. Traditional agricultural practices like dairy farming, which rely on drained peat soils, contribute significantly to peat oxidation, land subsidence, biodiversity loss, and greenhouse gas emissions, while becoming increasingly unviable under changing hydrological conditions (Reidsma et al., 2015; Temmink et al., 2025). At the same time, climate change intensifies challenges related to water management — flooding, drought, and salinity — further limiting the suitability of conventional large-scale production in peat polder landscapes (Bonte & Zwolsman, 2010; Schuetze & Chelleri, 2011).

In response, Studio ZUS's Polderlab initiative designated the Midden-Delfland polder as a test laboratory for a long-term 100-year transformation. This plan transforms the core of the polder from an area historically drained for agriculture into a landscape

designed to give back to nature and explore new forms of coexistence with water and ecological systems (ZUS, SWECO, & FLUX Landscape Architecture, 2022). Due to the radical transformation of the landscape, current activities will no longer be possible in their present form. New modes of production and habitation must be developed.

Alternative production systems such as paludiculture, horticulture, and agroforestry offer promising strategies to work with natural water and soil dynamics rather than against them — reducing peat degradation, enhancing biodiversity, and contributing to climate adaptation (Temmink et al., 2025; Ziegler et al., 2021). However, most research focuses on environmental performance or economic feasibility and rarely translates these systems into spatial or architectural models that integrate living, working, and community life.

Simultaneously, the role of the farmer is shifting

from a solely production-oriented actor towards a multifunctional landscape guardian who manages ecological services, biodiversity, and water systems (Zasada, 2011; Grashof-Bokdam et al., 2016). Recent studies emphasise that nature-inclusive agriculture can provide substantial environmental benefits, yet its success strongly depends on social organisation, governance, and community involvement (Gies et al., 2025; Verkuil et al., 2024). Despite this, spatial frameworks that support this evolving role remain underexplored, as do community-based living models embedded within vulnerable peat landscapes where natural dynamics such as fluctuating water levels play a dominant role (Petit-Boix & Apul, 2018; Hassan et al., 2021; Chou et al., 2017).

The broader context for this project is the group investigation into sustainable environment, which revealed a fundamental principle : sustainability cannot be achieved through isolated technological interventions applied to an unchanged system. As Haraway (2016) argues, sustainable futures demand a rethinking of the relationship between humans and non-human systems — not one of dominance, but of symbiosis and mutual dependency. Rees

(2009) similarly demonstrates that the ecological crisis is rooted in a collective self-delusion about the separability of human systems from natural ones. Rather than placing human needs above ecological ones, the challenge is to design conditions in which both coexist and mutually reinforce each other — functioning as a single integrated system in which the landscape is not a resource to be managed, but a living system to be participated in. This project takes that principle as its starting point.

As a result, a clear gap exists between environmental research on regenerative production in peat landscapes and architectural design approaches that explore how housing, regenerative production, and landscape stewardship can be spatially integrated to strengthen biodiversity and enable climate-adaptive living. Addressing this gap is particularly urgent in the Dutch context, where low-lying peat polders demand new ways of inhabiting and caring for the landscape that prioritise ecological regeneration and collective responsibility.

Masterplan Midden-Delfland 2124. Adapted from ZUS, SWECO, & FLUX Landscape Architecture (2022).



I.B RELEVANCE

This project contributes to a growing intersection between architectural practice and landscape transformation at a moment when the Dutch polder is undergoing one of its most fundamental reorganisations since the Golden Age. While regenerative agriculture, nature-based solutions, and multifunctional land use are increasingly discussed in policy and research contexts, their implications for housing typology and community form remain largely unexplored (Keesstra et al., 2023; Zasada, 2011). Architects and urban designers currently lack spatial strategies and built typologies for engaging with agricultural transitions in vulnerable landscapes such as peat polders.

This project responds to that gap by positioning regenerative production not as background infrastructure, but as the organising principle of a new spatial and social model. In doing so, it extends the conceptual territory of what Studio Marco Vermeulen (2023) calls the *woonlandschap*, a housing landscape

in which nature, food production, and dwelling are not competing but mutually constituting forces. Where the *Woonlandschappen* prototype proposes this model as a general alternative to suburban development, this project anchors the concept in the specific ecological and hydrological logic of a rewetting peat polder, developing an architectural typology specific to that condition.

The project is also relevant to broader debates about social sustainability in the context of rural transition. Multifunctional and nature-inclusive agriculture has been shown to provide substantial environmental benefits, but its success depends critically on social organisation, governance, and community involvement (Gies et al., 2025; Verkuil et al., 2024). By designing for a mixed community of landscape guardian, seasonal workers, and hybrid residents and by giving spatial form to their shared life, this project contributes an architectural framework for community cohesion in landscapes undergoing

regenerative transition.

Finally, the project contributes to architectural knowledge by developing new housing typologies suited to a wet, productive, and ecologically sensitive context. The integration of the greenhouse as both spatial threshold and productive infrastructure, blurring the boundary between interior and landscape, offers a new architectural language for inhabiting marginal landscapes that is grounded in both local material culture and ecological logic.

I.C OBJECTIVES AND MOTIVATION

This graduation project aims to develop a spatial and architectural model for a new form of community living within the rewetting peat landscape of Midden-Delfland. The project explores how a woonlandschap, a living landscape that integrates housing, food production, and ecological stewardship (Vermeulen, 2023), can be designed for the specific conditions of a low-lying peat polder and for the three new social actors this transition brings into being: the new farmer as landscape guardian, the seasonal worker as temporary inhabitant, and the hybrid resident as someone who seeks a deeper relationship with nature while maintaining urban connectivity.

At the core of the project is a new dwelling typology organised around the hexagon, a form drawn from the logic of productive nature (the beehive as symbol of collective productivity) and the geometry of Dutch polder farmsteads (the compactness and efficiency of the traditional farm

structure). Each hexagonal unit constitutes a single spatial function (a room, a kitchen, a living space) and units are combined differently depending on the inhabitant's role and needs, creating a modular and adaptable community of approximately 50 to 60 dwellings. Each dwelling is sheltered beneath a rectangular greenhouse structure that extends the habitable space, creates a productive half-season threshold between inside and outside, and generates energy while blurring the boundaries between the domestic interior and the productive landscape.

Community life is organised around shared productive infrastructure at the heart of the settlement: a collective food production, a workshop and light processing space, a community kitchen, and educational spaces where the farmer-as-educator can transfer ecological knowledge to residents and visitors. These shared spaces are conceived not as amenities but as the social engine of the community — places where the

three target groups meet, collaborate, and develop a collective relationship to the landscape they inhabit and steward.

The motivation for this project is rooted in the conviction that architecture has a meaningful role to play in ecological transition, not by accommodating it from a distance, but by designing spatial conditions that make a new way of life possible. The polder's transformation under the ZUS masterplan is radical enough that it demands equally radical thinking about what it means to live, work, and belong in a landscape being handed back to water and ecology. This project is an attempt to give that transition a liveable, collective, and architecturally grounded spatial form.

Vlietlanden, oorsponkelijk rietland (n.d.). Cultuurhistorie van Midden Delfland



I.D DESIGN QUESTIONS

In response to the challenges described above, this graduation project is guided by the following main research question:

How can a new community living model, rooted in a productive peat landscape, create spatial and architectural conditions for collective life between three new social actors: the new farmer, the seasonal worker, and the hybrid resident; while enabling ecological regeneration and climate-adaptive inhabitation?

In order to answer the main research question, three key themes are defined to structure and guide the research and design process.

1. The productive landscape

- How can the productive landscape be understood as a system of ecological, material, and social productivity — and how can these three dimensions be spatially integrated into the settlement design?
- Which regenerative production systems are compatible with the rewetting conditions of the Vlietlanden peat landscape, and how do they generate spatial and programmatic opportunities for community life?

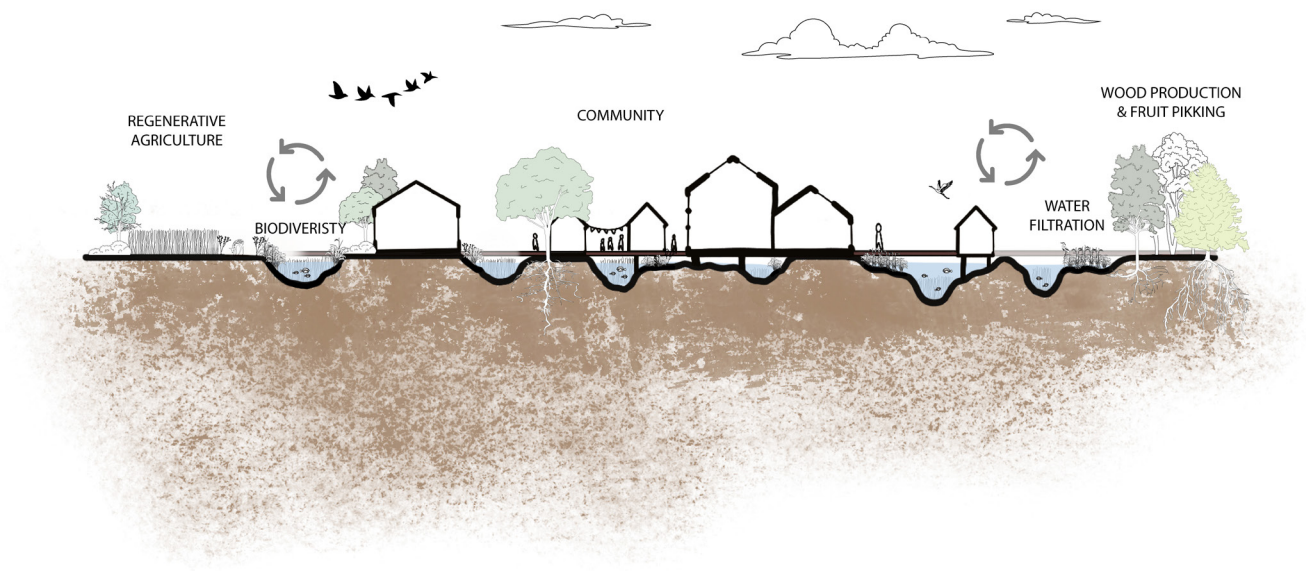
2. The Community

- What are the specific spatial needs and daily rhythms of the new farmer, the seasonal worker, and the hybrid resident — and how can a shared built environment accommodate their differences while fostering collective life?
- How can shared spaces and shared productive infrastructure function as the social glue of a community organised around landscape stewardship rather than neighbourhood proximity?

3. The Architecture

- What dwelling typology can create an architecture that is modular, adaptable, and ecologically embedded — blurring the boundary between domestic interior and productive landscape?
- What architectural principles can structure the relationship between individual dwelling, shared community space, and the productive landscape at the scale of a new settlement in a rewetting peat landscape?

Concept section A1 . A.L.W. Niemeijer (2026)



I.E SCOPE

This graduation project focuses on the design of a new community settlement of approximately 50 to 60 dwellings within the Vlietlanden area of Midden-Delfland, using the ZUS Polderlab masterplan (2022) and the group's own translation of that vision into a urban masterplan as the territorial framework. The settlement is conceived as a woonlandschap — a living productive landscape — in which housing, food production, ecological stewardship, and community life are spatially integrated. The project takes production as its specific thematic lens, exploring how this new form of community living can be given architectural and spatial form across four interconnected scales: the landscape, the settlement, the community programme, and the individual dwelling.

The scope includes the development of a modular hexagonal dwelling typology with three variants corresponding to the three target groups, the new farmer as landscape guardian, the seasonal

worker, and the hybrid resident; the design of shared community spaces and productive infrastructure. But also the articulation of the greenhouse as a spatial and ecological threshold; and the integration of water dynamics, seasonal change, and landscape succession as generative design conditions rather than constraints.

The project does not aim to provide a technical engineering solution for water management, to optimise agricultural yields, or to develop a detailed economic business model. The focus is on the spatial, typological, and communal dimensions of the new settlement, and on the architectural language through which a new relationship between inhabitation, production, and ecological stewardship can be given form.

Vlietlanden in Midden Delfland (n.d.). Natuurmonumenten

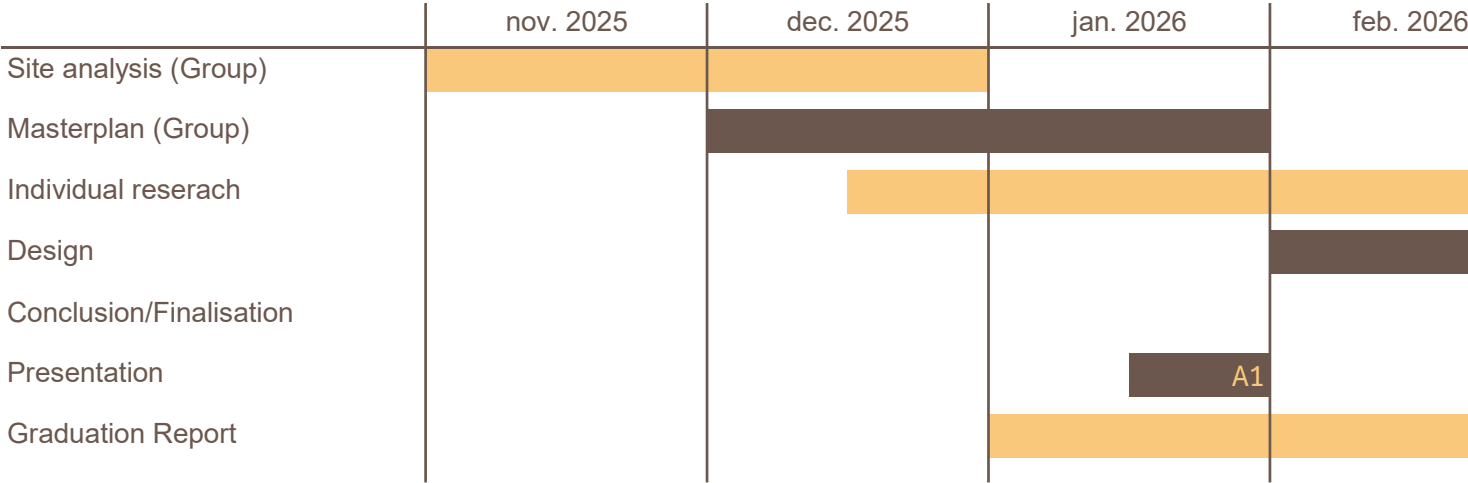


PART II. APPROACH

II.A METHODS

The project employs a research-by-design methodology in which analysis, precedent study, and design exploration are conducted iteratively and simultaneously. The following methods structure the process:

Literature study grounds the project in current knowledge on peat landscape ecology, regenerative production systems, community housing models, and the sociology of rural transition. Key sources include research on multifunctional agriculture (Zasada, 2011; Grashof-Bokdam et al., 2016), and community-based



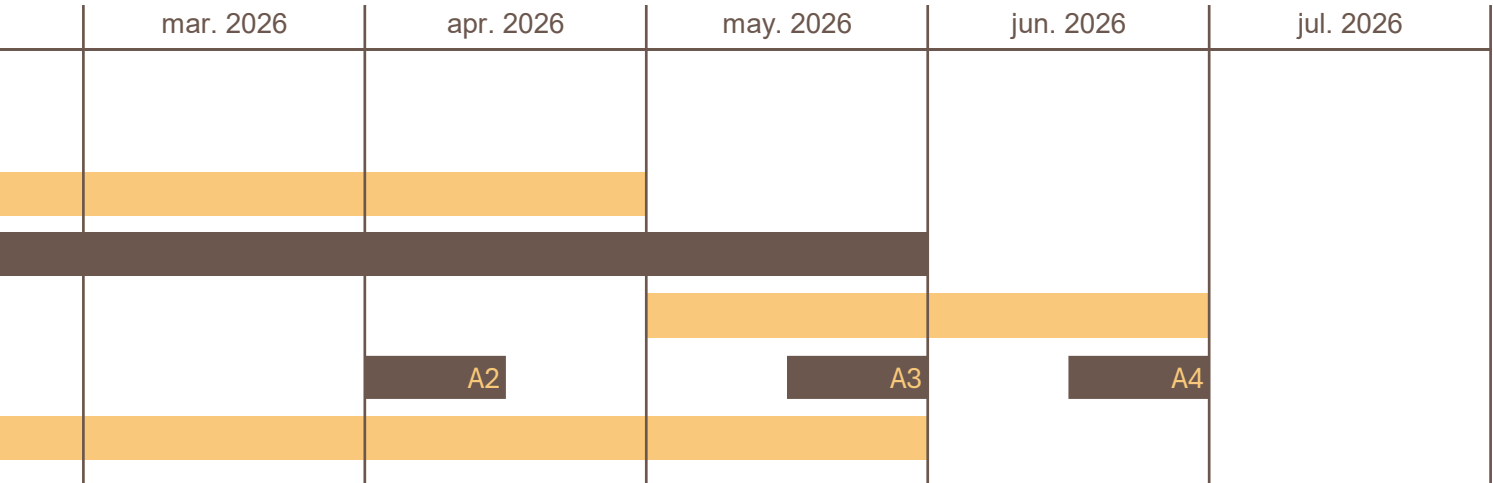
food production (Petit-Boix & Apul, 2018; Hassan et al., 2021), as well as design-oriented studies such as Van Eijk et al.'s Regenerative Food Landscape (2020) and Studio Marco Vermeulen's Woonlandschappen (2023).

Precedent and case study analysis examines existing projects and settlements at the intersection of housing, productive landscape, and community organisation. Each analysed for their spatial organisation, community structure, and degree of integration between dwelling and production. From these precedents, design principles are extracted and tested in the Midden-Delfland context.

Site analysis (conducted partly as group work) maps the ecological, hydrological, and spatial conditions of the Vlietlanden area, with particular attention to water level dynamics, soil types, existing land use, and landscape succession potential under the ZUS rewetting scenario. This analysis directly informs decisions about land use, programme placement, and housing orientation.

Research by design forms the core of the method: iterative design exploration at multiple scales (from the settlement plan to the individual dwelling unit) generates, tests, and refines spatial hypotheses. The hexagonal typology, the greenhouse threshold, and the organisation of shared space have all emerged through this iterative process and continue to be developed through drawing, model-making, and diagrammatic analysis.

Graduation planning . A.L.W. Niemeijer (2026)



II.B THEORETICAL FRAMEWORK

The project is grounded in three intersecting theoretical fields:

Productive landscapes and agricultural urbanism

The concept of the productive landscape in which food production, ecological function, and habitation are spatially integrated provides the foundational framework. Van Eijk et al. (2020) map this concept onto South Holland's peat, clay, and horticultural landscapes, arguing for a regenerative spatial strategy that reconciles culture and landscape. Studio Marco Vermeulen's *Woonlandschappen* (2023) extends this into housing typology, proposing the *woonlandschap* as an alternative urbanisation model in which residents collectively steward their food, energy, and water systems. This project adapts and develops the *woonlandschap* concept for the specific ecological conditions of a rewetting peat polder, where the productive systems are water-based and the landscape is in active ecological transition.

Community and social cohesion

The social dimension of the project draws on research into community-based food production and its effects on social cohesion, wellbeing, and collective responsibility (Petit-Boix & Apul, 2018; Hassan et al., 2021; Chou et al., 2017). Dunbar's number (the cognitive limit of approximately 150 stable social relationships) informs the scale of the community (SMV, 2023; Lindenfors et al., 2021), though the project works at a smaller scale of 50 to 60 units, reflecting the specific spatial and programmatic constraints of the polder context. The three-actor social structure (new farmer, seasonal worker, hybrid resident) is informed by research on multifunctional agriculture and the evolving role of the farmer as landscape guardian and community educator (Zasada, 2011; Grashof-Bokdam et al., 2016; Gies et al., 2025).

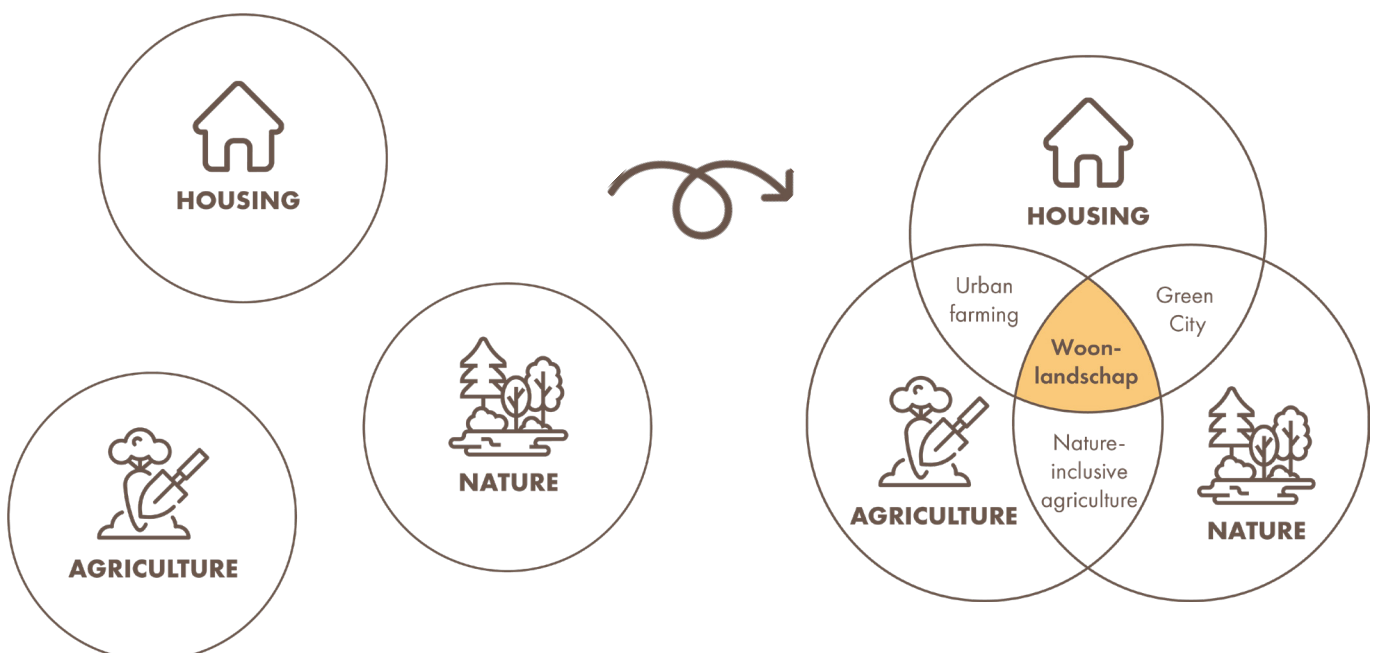
Architecture and ecological threshold.

The relationship between interior and landscape as a site of ecological and social intensity is a recurring preoccupation in architecture working with productive environments. This project draws on three layers of precedent research. First, historical Dutch settlement typologies including dyke villages and farm settlements in which the form of habitation is directly generated by water, soil, and productive land use, demonstrating that architecture and landscape have historically been in direct dialogue in the Dutch context. Second, villages embedded in productive landscapes, where the consistent spatial principle is the immediate proximity of cultivation to dwelling: stepping outside means stepping into production. Third, garden villages, which demonstrate the importance of the relationship between inside and outside, the space left for nature to develop between and around buildings, and the centrality of community as a spatial and social organising principle. Together these layers inform a typological ambition in which the dwelling is not isolated from its ecological context but acts as an active participant in it a position further supported by biobased and climate-adaptive design thinking.

The Group Masterplan

Finally, the group masterplan for Midden-Delfland (see appendix VII) forms an essential layer of the theoretical framework. Developed from the ZUS future scenario for the Vlietlanden, the masterplan establishes a set of spatial principles that directly inform this project: the natural landscape is leading, water dynamics structure spatial organisation, and built interventions remain minor and adaptable within the landscape. An organic cellular structure organises development zones while protecting ecological integrity, and slow mobility is prioritised throughout. This individual project situates itself within that framework, taking the theme of production as its specific lens : exploring how a new form of community living organised around regenerative production can translate these territorial principles into an architectural and spatial form at the scale of a single settlement.

Alternative urbanisation model, adapted from Vermeulen (2023).



II.B THEORETICAL FRAMEWORK

GROUP MASTERPLAN

Sustainable environment

The starting point for this group was the theme of sustainable environment. Within this framework, the Midden-Delfland area was analysed, including the municipality's ambitions and the future scenario developed by ZUS, SWECO and FLUX Landscape Architecture in 2022. This scenario, which explores a transformation towards diverse landscape typologies, formed the basis for the development of the masterplan. The Vlietlanden was selected as the project location, as it contains the full range of landscape conditions described in the ZUS proposal. This creates an interesting setting for the project, as traditional building methods will no longer suffice. Therefore, new ways of living, coexisting and community building must be explored.

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.

Masterplan

The masterplan is guided by a set of spatial principles: the natural landscape is leading, water dynamics structure spatial organisation, ecological zones define accessibility and development, and built interventions remain minor to and adaptable within the landscape.

The masterplan is based on a fundamental principle:

the natural landscape forms the foundation of all spatial interventions. Elevation differences within the area are used to create overflow zones that respond to extreme weather conditions, such as heavy rainfall, and function as water buffers that can be utilised during periods of drought. Rather than controlling water, the design embraces seasonal fluctuations, allowing lower areas of the Vlietlanden to flood more frequently and operate as dynamic ecological systems. In doing so, the pressure on existing water pumping infrastructure is reduced.

The ecological structure is further informed by the existing nesting locations of the black-tailed godwit. These birds return to the same nesting sites annually and are highly sensitive to spatial disturbance. This has led to the designation of inaccessible nature zones, particularly towards the eastern edge of the site where ecological value is already high. These areas are strategically aligned with key sightlines to preserve the identity and visual openness of the landscape, in accordance with ambitions of the municipality.

Surrounding these protected areas, buffer zones are introduced where limited recreational use is permitted. These zones mediate between strictly protected nature and areas where development is allowed. All spatial interventions are carefully positioned to maintain existing sightlines and landscape continuity. An organic cellular structure is overlaid onto the landscape, functioning as a spatial framework that organises development zones, accessibility, and ecological areas. This structure enables a flexible approach in which areas can expand or contract over time in response to environmental conditions

and social needs, while ensuring that development remains confined within clearly defined boundaries. In this way, urban expansion is controlled and the ecological integrity of the landscape is protected.

Mobility within the masterplan prioritises slow movement. Cars are treated as guests, only a limited number of routes accommodate vehicle access, while parking is concentrated at the edges of the site. The existing mobility hub is reinforced and expanded to support public transport and cycling infrastructure, encouraging alternative modes of transport.

Together, these strategies establish a spatial framework in which ecological performance is prioritised, while enabling new forms of inhabitation that are embedded within the dynamics of the landscape.

Themes

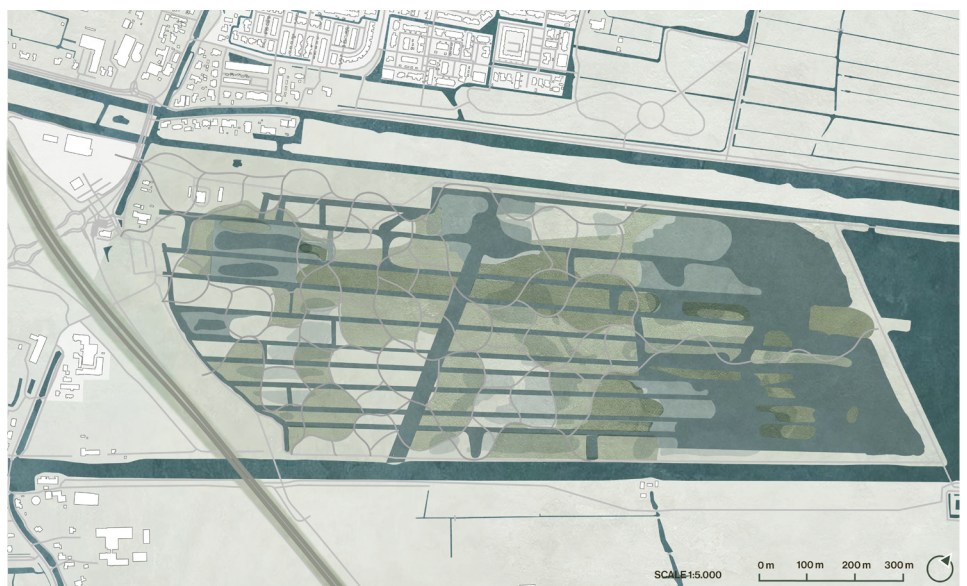
Each group member uses the masterplan as a foundation to explore a specific aspect of living within this landscape through one of the following themes: biodiversity, healthcare, work, education, recreation, or production. These thematic explorations act as repeating layers on top of the masterplan. While small adjustments to the spatial configuration are possible, they must remain consistent with the core principles of the masterplan.

The objective is to develop a comprehensive understanding of how different societal functions can be integrated within this framework, ultimately contributing to a refined and cohesive vision for a new way of living in which ecological, social, and spatial systems are in balance.

Group Masterplan . A. Niemeijer, A. Watan, F. van Hoorn, F. de Bruijne, L. van Dijk, M. Traa (2026)



Creating a healthy environment
combining the six themes



PART III. RESULT

III.A SETTLEMENT ANALYSIS

HOW DO COMMUNITIES FORM ?

Before designing a new settlement, it was necessary to understand how settlements have historically come into being — particularly those that emerged in direct response to landscape conditions. A study of approximately ten historical and contemporary settlement types was conducted, organised around three categories: settlements shaped by terrain and water, villages embedded in productive landscapes, and garden villages that prioritise the relationship between dwelling and nature.

Settlements shaped by water and relief.

The first category reveals two distinct survival logics. Some villages are organised along the natural relief of the land — built on higher ground, following ridges and mounds as protection against flooding. Others take the opposite approach: rather than adapting to the terrain, they attempt to control water through constructed infrastructure, positioning dwellings behind dykes and using the dyke itself as

the organising spine of the settlement. Both strategies share a fundamental principle: the form of the village is a direct spatial response to water. This is directly relevant to the Vlietlanden context, where rewetting will fundamentally alter which parts of the landscape can be built upon and how.

Villages in productive landscapes.

The second category — settlements organised around agricultural production — consistently reveals one recurring spatial principle: production happens adjacent to the dwelling, not at a distance from it. Whether in traditional farm settlements, kibbutzim, or cooperative agricultural communities, the proximity of cultivation to living space is not incidental but structural. Stepping outside the front door means stepping into the productive landscape. This intimacy between living and working generates both practical efficiency and a fundamentally different relationship between inhabitant and land — one that is daily, embodied, and responsible rather than abstract or distant. It is worth

noting, however, that the positioning of productive settlements is not always driven by landscape logic. The villages of the Noordoostpolder, for example, were spaced approximately seven kilometres apart based on cycling efficiency — a human and economic logic rather than an ecological one. The landscape was engineered to serve production, not the other way around. This is precisely the model this project moves away from.

Garden villages.

The third category, which comes closest to the ambitions of this project, demonstrates the importance of the relationship between inside and outside, and of giving nature the space to develop around and between dwellings. What these examples consistently show is that the ecological quality of a place depends not only on what is built, but on what is left — the interstitial spaces between buildings, the unmanaged edges, the thresholds where the domestic and the wild meet. Building positioning in garden villages is often governed by solar orientation and the desire to maximise views onto natural surroundings rather than by strict geometric order. What also returns consistently across all three categories is the centrality of community: shared spaces, shared rhythms, and shared responsibility for the environment are inseparable from the success of these settlements.

Conclusion.

These three categories reveal different but complementary lessons. Water-responsive villages show how the form of a community can grow directly from the conditions of the ground, following the water's edge or rising above it. Garden villages show the importance of leaving space for nature and of community as a spatial organising principle. Productive settlements show what happens when efficiency drives form — and why that approach fails in a landscape as fragile and dynamic as the Vlietlanden.

This stands in sharp contrast to how most contemporary settlements are built today — a layer of sand is placed on top of the existing ground, erasing its specific conditions and creating a flat, uniform surface on which a generic layout can be applied. The result is a settlement that could be anywhere, because it has been deliberately disconnected from

where it is.

In the Vlietlanden, this approach is simply not possible. The ground here is not stable — it is sinking, rewetting, and changing over time. Understanding this landscape means understanding not just where the water is today, but how it fluctuates with the seasons, how it will rise under the ZUS, SWECO, & FLUX Landscape Architecture (2022) rewetting scenario, and how the ecology of the site will evolve over decades. The settlement must be designed with that change in mind, not against it.

These lessons, taken together, inform the three organising principles of this project : water and soil generate form, production and dwelling must be close to each other, and the spaces left between buildings matter as much as the buildings themselves. They also connect directly to the group masterplan, which rejects the layer-of-sand logic in favour of a system that works with water dynamics and allows the settlement to adapt as the landscape continues to transform.

LAND & WATER

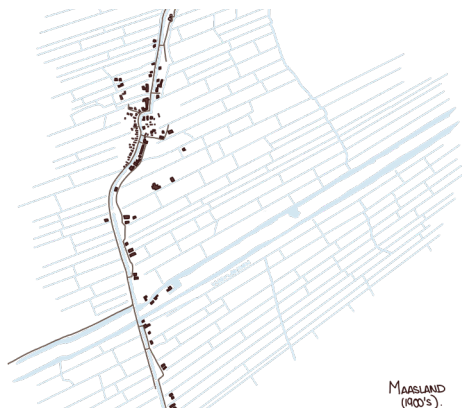


Ezinge, NL

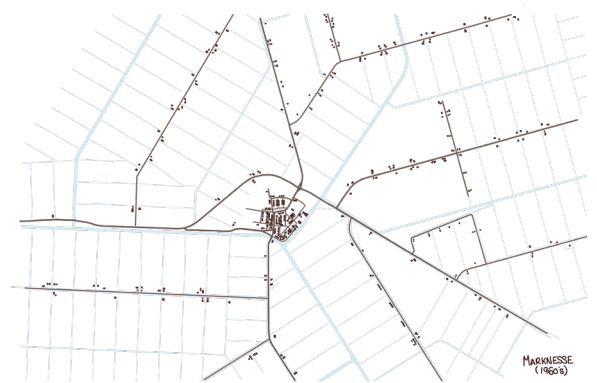


Nieuwendammer, NL

PRODUCTIVE



Maasland, NL



Marknesse, NL

GARDEN VILLAGE



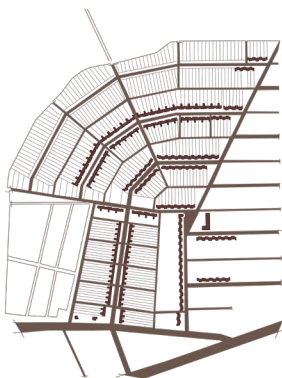
Eco-village Findhorn, GB



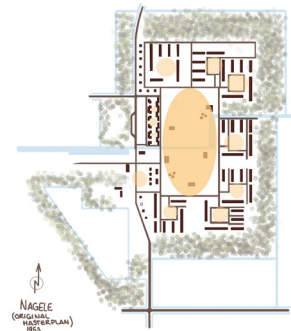
Helsingør Haverby, DK



Bastide Monpazier, FR



Siedlung Dessau, DE



Nagele, NL



Serembe, USA

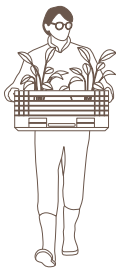


Eva Lanxmeer, NL

III.B WHO LIVES THERE ?

THE THREE TARGET GROUPS

The transformation of the Vlietlanden landscape demands not only new forms of production but new forms of inhabitation — and new social actors to carry them. Three target groups are identified, each bringing a different relationship to the landscape, a different spatial need, and a different contribution to the collective life of the settlement. Together they form a deliberately mixed community in which ecological stewardship, daily life, and productive labour are shared across different lifestyles and rhythms.



NEW FARMER

*As guardian of the new
landscape and educator to the
community*

The New Farmer is conceived as a figure of reconversion: a person (or family) who transitions from conventional agricultural practice towards the role of landscape guardian. Permanently resident in the settlement, the new farmer is responsible for the management of the productive landscape throughout the year — coordinating paludiculture, horticulture, and agroforestry cycles, and acting as the ecological and educational anchor of the community. One farmer per settlement is envisaged, supported during peak productive seasons by residents and seasonal workers. The dwelling reflects this role: compact (45–65 m²) but directly connected to the landscape and equipped with a work module. Storage for tools and materials is not required within the dwelling itself but is provided in the shared workshop facilities at the heart of the settlement.

The Hybrid Resident is a middle-to-higher

income family — typically with one to three children — who chooses this settlement not as an escape from urban life but as an active alternative to it. They maintain a professional connection to the city, commuting two or three times per week while working remotely for the remainder. What distinguishes them from the suburban family is motivation: they are drawn not merely by proximity to nature but by the ambition to actively participate in its regeneration. The community here is not an amenity but a commitment — a shared responsibility for the landscape they inhabit. The dwelling (70–90 m², modular) accommodates remote work, family life, and the possibility of spatial adaptation as the family evolves — adding units when children arrive, reconfiguring them as they grow up and leave.



HYBRID RESIDENT

Urban professional that are seeking a new way of life in respect to the nature

The Workers, seasonal or permanent, provide the physical labour essential to maintaining the productive landscape. They come from varied backgrounds and origins, and their presence may fluctuate with the rhythm of the seasons. Crucially, they are not conceived as a separate or subordinate population: they share the same community spaces, participate in the same collective life, and contribute equally to the stewardship of the landscape. Their dwelling is compact and flexible (30–40 m², one or two rooms), designed for easy access to the productive areas and adaptable to both individual and shared occupation.



WORKERS

Supporting the farmer's activities through regenerative production and daily care of the landscape

What unites these three groups is not a shared lifestyle but a shared spatial and ecological commitment: the choice to live in active relationship with a landscape in transition, and to take collective responsibility for its regeneration. The community functions — the communal greenhouse, shared workshop, community kitchen, educational space, and shared facilities — are designed to serve all three groups equally, and to function as the daily meeting ground across their different rhythms and roles.

III.C RESEARCH INTO PRODUCTIVE LANDSCAPE

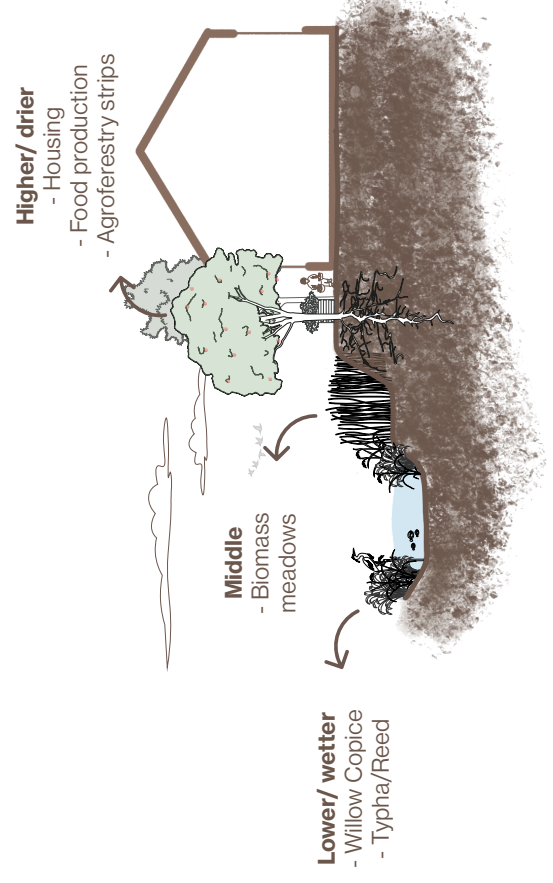
WHAT IS POSSIBLE HERE?

Research was also conducted into which forms of regenerative production are compatible with the rewetting conditions of the Vlietlanden peat landscape. Under the ZUS masterplan scenario, water levels will rise significantly, making conventional agriculture impossible but opening the landscape to water-based and wet-tolerant production systems. Three production systems emerge as relevant and complementary. Paludiculture — wet farming of species such as Typha, reed, and sphagnum moss — is directly compatible with rewetted peat soils and contributes actively to peat restoration, carbon storage, and biodiversity (Temmink et al., 2025). It also produces building materials (reed for thatching, Typha for insulation panels) that can be used locally, creating a circular material loop between landscape and architecture. Horticulture, conducted on the drier elevated areas of the site and within greenhouse structures, offers year-round food production close to the dwellings. Agroforestry and wood-based production on the transitional zones between wet

and dry land contribute biomass, structural material, and habitat value. Together these systems define a productive landscape structured by the gradient between wet and dry: deep water zones for paludiculture, transitional zones for agroforestry, elevated areas for horticulture and dwelling. This gradient becomes the primary organising principle of the urban plan. Additionally, the wood production forest designated in the ZUS masterplan in the area next to the Vlietlanden represents a further productive resource that can be integrated into the material and spatial logic of the settlement : contributing timber for construction, biomass for energy or fruitpicking as indicated in the plan.

Production Type	Material Output	Project Goal	Soil Type	Water Level	Approx. Surface (for 80 residents)	Spatial Position
Wet agriculture (Typha / Reed)	Insulation panels, fibers, thatching, biomass	Water buffering, peat preservation, water purification	Moerige eergronden, natte poldervaaggronden	High groundwater / seasonal flooding	1 – 1.5 ha	Lowest zones, near ditches, water corridors
Cranberry / Wet berries	Food (local niche product)	Economic diversity + wet soil use	Acidic wet soils	High groundwater	0.3 – 0.5 ha	Transition wet-dry edges
Agroforestry strips (Alder, Willow, Fruit trees)	Wood, fruit, biomass	Soil structure improvement, wind buffering, biodiversity	Leek-/woudegronden	Medium groundwater	0.8 – 1.2 ha	Linear strips across site
Food production (market gardening regenerative)	Vegetables, herbs	Community food + social cohesion	Slightly raised, well-drained zones	Controlled, not flooded	0.6 – 1 ha	Directly adjacent to housing
Biomass meadow (wet grassland mix)	Compost, mulch, grazing	Nutrient cycling, habitat creation	Poldervaaggronden	Fluctuating	0.5 – 0.8 ha	Between agroforestry and wet zones
Willow coppice (short rotation)	Flexible wood, weaving, small construction	Local material loop	Wet but not permanently flooded	Seasonal wet	0.5 – 0.8 ha	Along water edges
Wood production (Plan from ZUS)	Wood production, fruit picking forest	Local community + local job creation	Clailands		See plan from Zus	Plan from Zus

Overview production possibilities. Own work (2026)



Production zoning: section principle. . A.L.W. Niemeijer (2026)

III.C RESEARCH INTO PRODUCTIVE LANDSCAPE

FOOD PRODUCTION

A key question in designing a self-sufficient productive settlement is how much land is actually needed to feed its inhabitants. Drawing on research by Vermeulen (2023) and the underlying WUR/LEI autarky study (Terluin et al., 2013), a food production framework is established for a community of approximately 150 inhabitants.

The current average Dutch diet requires approximately 1,800 m² of productive land per person — the majority of which is dedicated to animal products. By shifting towards a predominantly plant-based diet, this footprint can be reduced dramatically: a biological autarky scenario requires approximately 447 m² per person without grassland. For this settlement, a plant-based biological diet is taken as the working assumption — not because residents are required to eat that way, but because that is what this landscape can sustainably support. This is part of a broader ambition to promote a new way of living, one that is more conscious and more

connected to the land. The production system invites awareness: what you eat is connected to how much land you need, and how much land you have. Some residents will embrace that fully. Others less so. But the landscape makes the relationship visible — and that, in itself, changes things.

Production is organised around the distinction between grove teelten (large-scale crops: grains, potatoes, legumes, oilseed) and fijne teelten (fine crops: leafy vegetables, herbs, tomatoes, courgettes, beans). The ratio between the two is approximately 4:1. Grove teelten are cultivated in the open productive landscape surrounding the settlement, where machinery can be used and crop rotation managed at scale. Fijne teelten are produced closer to the dwelling — on the rooftops of the hexagonal units beneath the greenhouse envelope, where light and temperature conditions are most favourable — at approximately 5 to 7 m² per person, or 750 to 1,050 m² for the whole community. This two-layer production

system — field-scale crops in the landscape, fine crops within the dwelling — reinforces the central principle of the project: that production is not separated from daily life but woven into it, visible from every threshold and accessible from every door.

The settlement is designed to produce beyond its own needs. Surplus production from the rooftop gardens — vegetables, herbs, and seasonal crops — is channelled directly to the restaurant and the local kiosk at the heart of the community. The restaurant offers visitors a direct experience of the productive landscape, using what grows here to tell the story of this new way of living. The local kiosk makes surplus available to the wider region. Together they transform excess production from a logistical question into a social and economic opportunity — generating additional income for the community, creating new connections with the surrounding area, and demonstrating that a productive settlement can be open rather than closed.

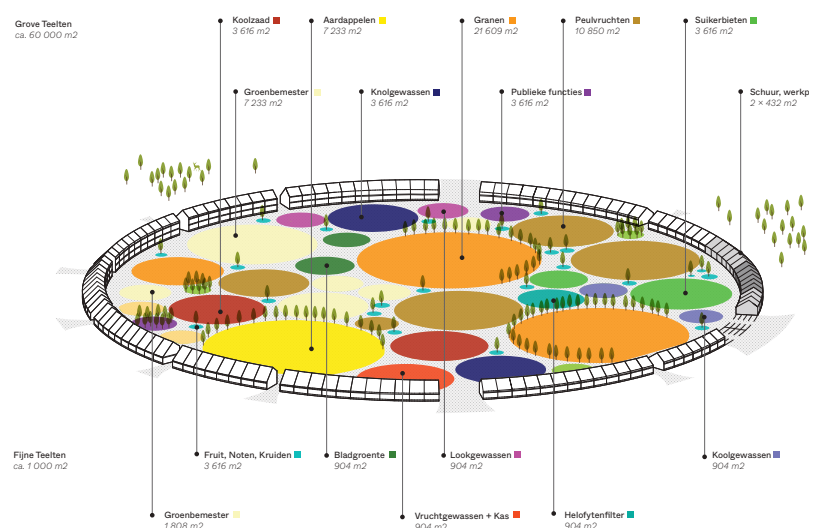
The productive landscape is managed according to a crop rotation plan (teeltplan) in which different crop families — brassicas, legumes, root vegetables, grains, and green manures — rotate across the cultivated beds on an annual cycle. This rotation is essential to maintaining long-term soil fertility without external chemical inputs: each crop family conditions the soil differently, and the regular inclusion of a green manure crop (groenbemester) actively restores nitrogen levels, improves soil structure, and creates new layers of biodiversity — attracting different insects, birds, and microorganisms

at each stage of the cycle. In this way, crop rotation is not only an agricultural technique but an ecological one: it continuously renews and enriches the living soil beneath the settlement. The teeltplan is managed by the new farmer, with seasonal variation in crops providing both ecological diversity and a constantly changing productive landscape that marks the rhythm of the year for the whole community.

The wood production and fruit-picking forest designated in the ZUS, SWECO, & FLUX Landscape Architecture (2022) masterplan in the area adjacent to the Vlietlanden represents a further productive resource integrated into the logic of the settlement. Beyond contributing timber for construction and biomass for energy, the forest also produces fruit and nuts — extending the food production system beyond the settlement boundary and adding an additional layer of ecological connectivity between the settlement and the wider polder landscape.

The paludiculture systems — particularly Typha and reed — contribute not only to ecological restoration but directly to the material construction of the settlement itself. Typha harvested from the rewetted fields is processed into insulation panels used in the walls of the dwellings. Reed is used for roofing and thatching. This circular material loop — in which the landscape produces both the ecological conditions for habitation and the building materials of the dwellings themselves — is one of the most fundamental arguments of the project. The settlement is not built on the landscape. It is, in part, built from it.

Food production zoning. Vermeulen (2023, p. 55)



III.D URBAN AND ARCHITECTURAL CONCEPT

The conceptual framework for the settlement is built around five principles, each translating a research insight into a spatial position.

1. Water and soil dictate land use, which dictates the space for habitation.

The settlement does not impose a geometry onto the landscape but reads the existing gradients of soil type and water level as the primary design input. Where the soil is most elevated and stable, dwellings are positioned. Where it transitions to wet peat, productive systems take over. The boundary between these conditions is not a sharp line but a gradient — and it is within this gradient that the most interesting spatial conditions emerge.

2. Integration in the landscape.

The settlement does not sit in the landscape as a foreign object but seeks to become part of it. This is



achieved through the use of local and natural building materials (reed, timber, transparantie), through the low horizontal profile of the buildings, and through the deliberate management of the spaces between buildings as ecological zones that connect the settlement to the wider rewetted polder.

3. The experience of the landscape is multiple and directional.

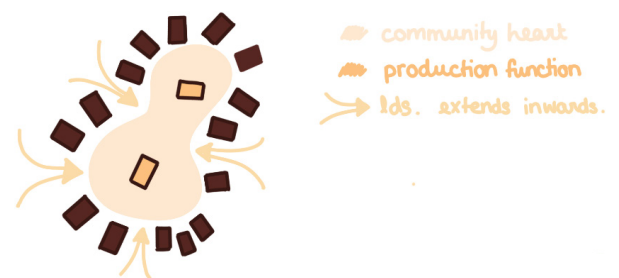
Rather than offering a single panoramic view, the settlement is designed so that from any given point, inside a dwelling, in a shared space, in the productive garden, different sightlines open to different parts of the landscape. At multiple levels within a dwelling, views shift in direction and character: the productive garden to one side, the open water or reed bed to another, the community at the centre. This multiplicity of landscape experience is not decorative but functional, it maintains a constant spatial and sensory dialogue between inhabitant and environment.



Experience of the landscape in multiple directions . A.L.W. Niemeijer (2026)

4. Community functions occupy the centre; dwellings organise around them.

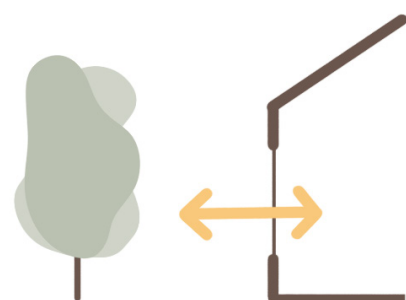
The shared spaces — workshop, community kitchen, educational space, local selling point — are placed at the heart of the settlement. Dwellings are organised in relation to this centre, ensuring that every inhabitant's daily path passes through or alongside the shared productive infrastructure. This spatial logic reinforces collective life not through obligation but through proximity.



Urban principle. A.L.W. Niemeijer(2026)

5. A strong relationship between inside and outside.

The greenhouse as threshold — the defining architectural element of the individual dwelling — dissolves the boundary between interior and landscape. It is neither fully inside nor fully outside: a conditioned but porous space in which cultivation, living, and working can coexist. This principle operates at every scale: from the individual room that opens onto a productive terrace.



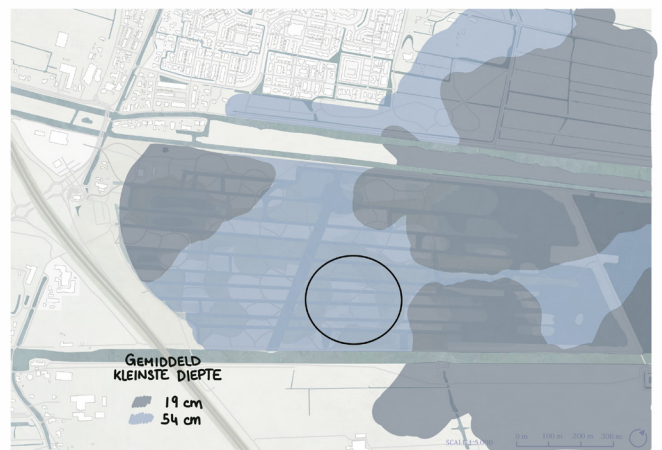
Strong relation between inside and outside. A.L.W. Niemeijer(2026)

III.D URBAN DESIGN EXPLORATION

SITE ANALYSIS : SOIL AND WATER AS GENERATOR

A detailed mapping of the Vlietlanden site was undertaken, analysing soil composition, current and projected water levels under the ZUS rewetting scenario, existing landscape structures (ditches, embankments, field patterns), and ecological succession potential. This analysis identifies the areas of the site most suitable for each productive system and defines the elevated zones where permanent habitation is feasible.

The analysis confirms the central design principle: the productive landscape is not a backdrop for the settlement but its generator. The form of the community emerges from reading what the land can sustain.

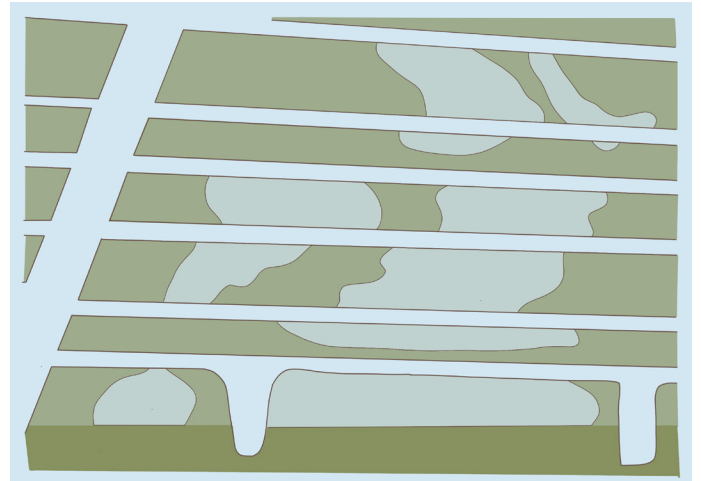


Mean groundwater table depth. From Basis Registratie Ondergrond (BRO)



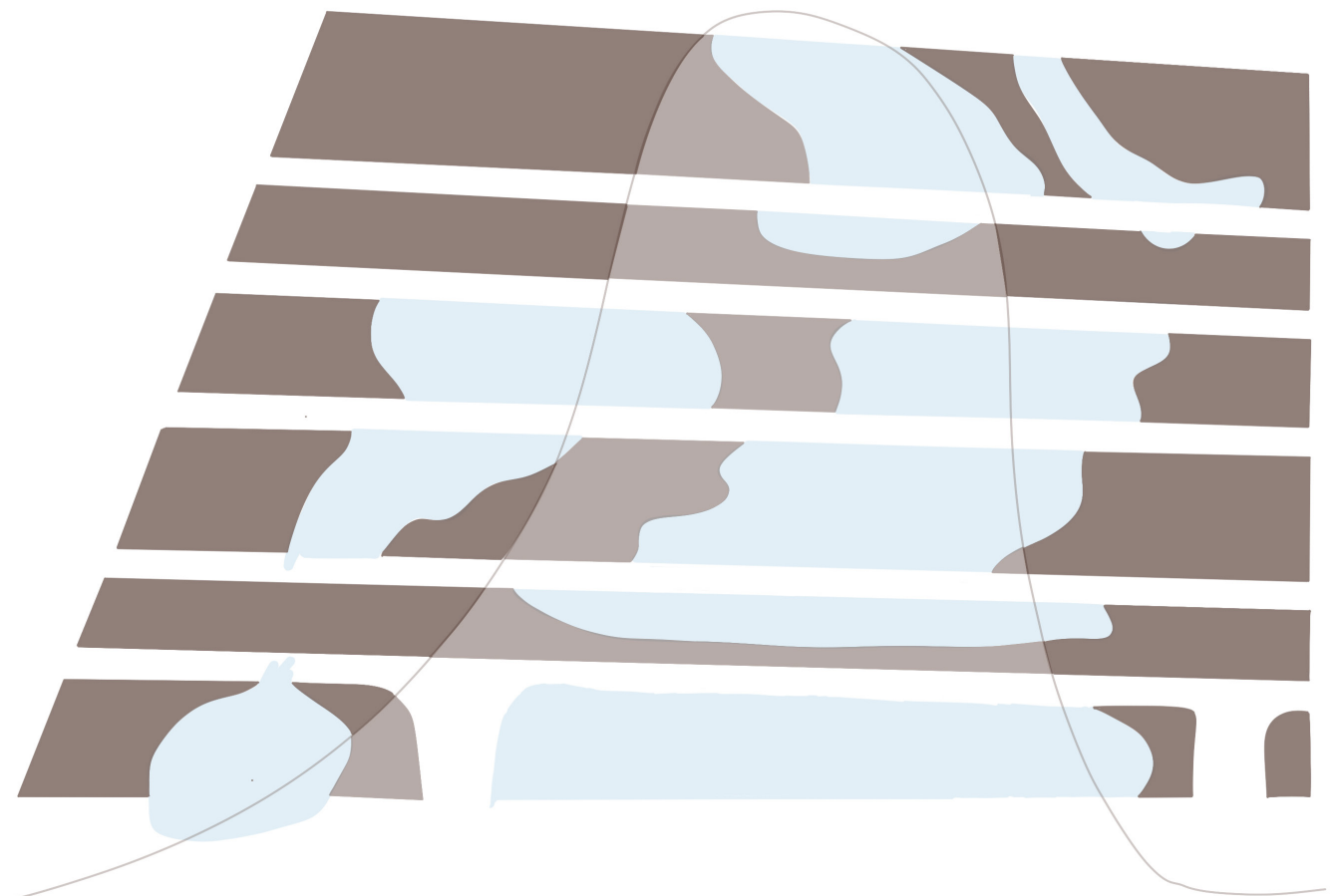
Soilt type. From Basis Registratie Ondergrond (BRO)

 Seasonal flood zone



Wetter situation on location. A.L.W. Niemeijer (2026)

-  Preferred location
-  Feasible location
-  Permeable zone



Conclusion on where to build on location. A.L.W. Niemeijer (2026)

III.D URBAN DESIGN EXPLORATION

DESIGN ITERATION

18 urban design variants (see Appendix 1) were developed and tested against the principles established through case study analysis and site research. This exploration did not follow a linear trajectory. An initial series of variants was developed early in the process as a starting point, testing different geometric logics for organising the settlement: linear arrangements along existing landscape structures, clustered groupings around productive fields, and circular or ring-based configurations that surround a shared productive core. However, none of these early variants succeeded in resolving the relationship between settlement form and dwelling typology satisfactorily. It was only once the hexagonal housing concept and its greenhouse envelope were developed that the urban design was revisited. A second series of variants was then drawn, this time informed by the specific spatial logic of the dwelling unit itself, its orientation, its relationship to the productive landscape, and the way units cluster and relate to one another. This second phase produced

configurations that felt more organically connected to both the landscape conditions and the architectural concept.

From this iterative process, several lessons emerge. Linear arrangements, while efficient, tend to produce a hierarchy of dwellings with privileged and less-privileged positions relative to the landscape and the community core. Clustered groupings create strong internal community zones but can produce a fragmented relationship to the wider productive landscape. The circular or ring configuration — in which dwellings are arranged around a central productive garden, with wild or managed nature surrounding the outer edge — shows the strongest alignment with the design principles: every dwelling has an equal relationship to the shared centre, the productive landscape is immediately proximate to every door, and the outer edge dissolves into the rewetted polder.

The preferred direction is a settlement organised around a circular or near-circular arrangement, with the form adjusted to follow the specific contours of soil elevation identified in the site analysis. This is not a perfect geometric circle imposed on the landscape, but a ring-form that bends and adapts to the terrain — more closely related to the logic of the historical dyke village, which follows the water's edge, than to the idealised circles of Ebenezer Howard or the SMV prototype.

This layout is site-specific. At another location within the masterplan, the settlement configuration would shift to adapt to the local soil, water, and landscape conditions.

Settlement. A.L.W. Niemeijer (2026)



III.D URBAN DESIGN EXPLORATION

COMMUNITY SPACE

The community functions at the heart of the settlement are developed based on the needs of the three target groups and on the productive logic of the landscape. The programme includes:

Workshop and light processing space for handling, preserving, and processing the harvest; shared tools and materials

Community kitchen and dining space for collective meals and food culture events

Educational workshop space where the farmer-as-educator can transfer ecological and agricultural knowledge to residents, school groups, and visitors.

Local kiosk / selling point where surplus production is offered to the wider community and passing visitors

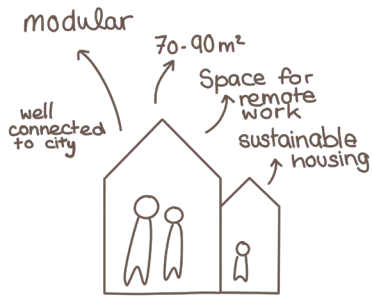
Co-working spaces for hybrid residents who maintain professional activity within the settlement

Shared laundry, storage, and maintenance facilities shared across all three target groups

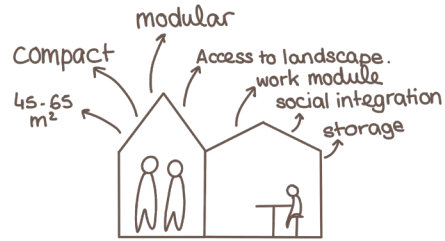
These spaces are conceived not as a service layer added onto the settlement but as its productive and social core — the reason the community exists and the daily infrastructure of its collective life.



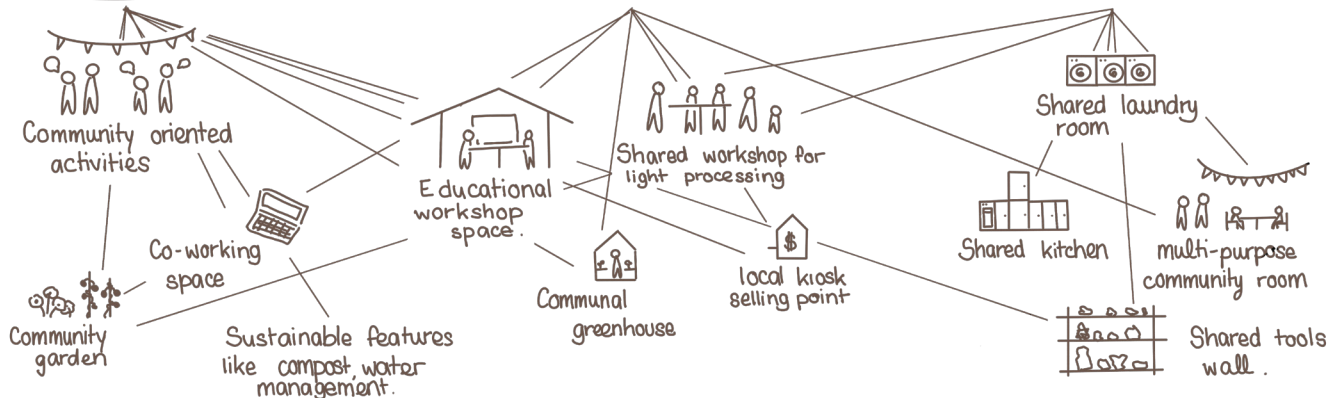
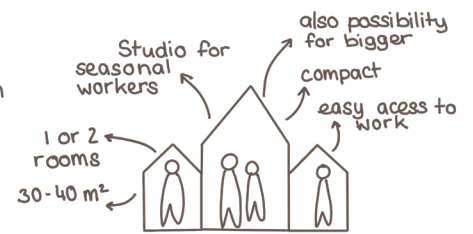
HYBRID RESIDENT



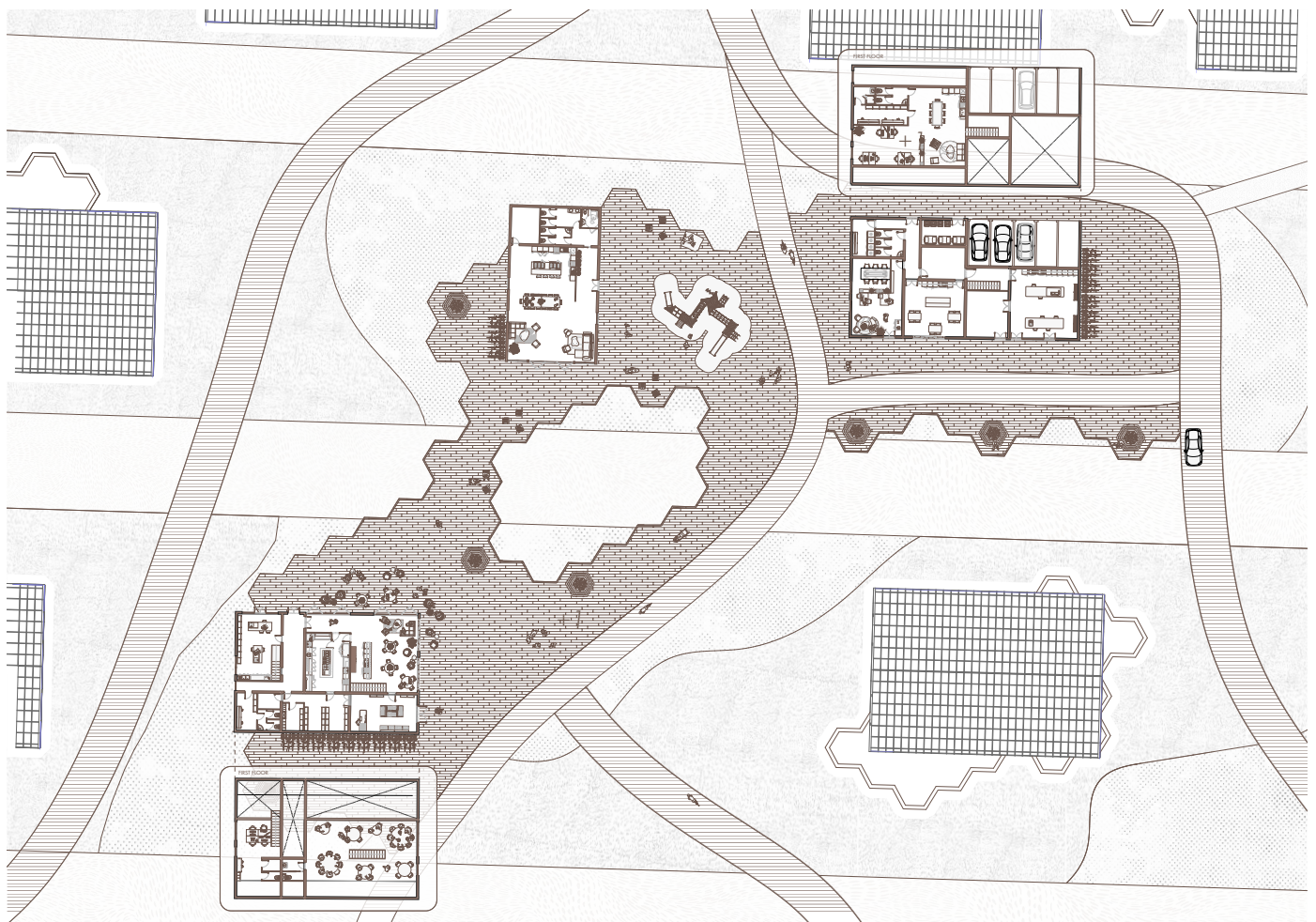
NEW FARMER



WORKERS



Target group overview: spatial needs and wishes. A.L.W. Niemeijer (2026)



Floorplan: community functions. A.L.W. Niemeijer (2026)

III.E HOUSING TYPOLOGY

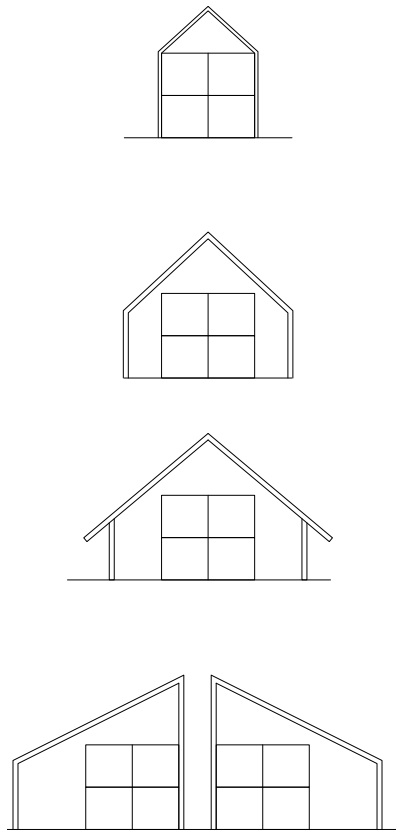
FROM CONTAINER TO HEXAGON: THE SEARCH FOR A DWELLING FORM

The search for a housing typology began with the logic of modular unit combination — exemplified by container housing, in which identical units are assembled dry, stacked, and configured into larger wholes. What is compelling about this approach is not the container itself but the principle: a dwelling is not a fixed object but an assembly of spatial units that can be configured differently depending on the inhabitant's needs, expanded over time, or reconfigured as those needs change. This modularity also carries practical advantages in terms of prefabrication and construction efficiency.

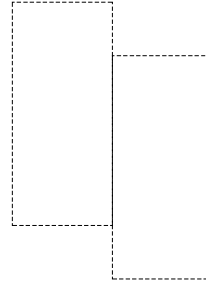
The second source of inspiration was the Dutch farm tradition. In the flat polder landscape, the pitched-roof farm typology is not only historically rooted but spatially logical: it maximises habitable volume within a compact footprint, orients itself to the productive landscape immediately surrounding it, and integrates living, working, and storage within a single envelope. Maintaining this typological reference felt

important — it connects the new settlement to the long history of productive inhabitation in this landscape, and it offers a formal reference for the greenhouse envelope: a single pitched roof form that is legible within the flat horizon of the polder.

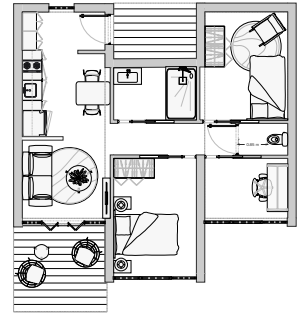
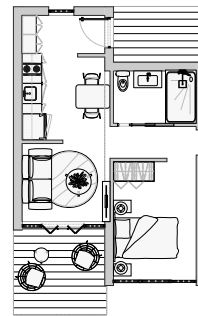
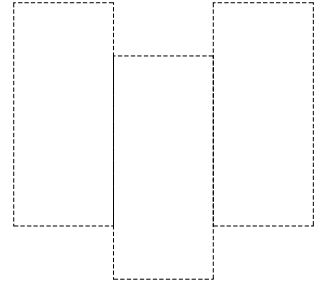
Before arriving at the final typology, a series of precedent projects were studied to understand how the greenhouse has been used architecturally — not as a technical agricultural structure, but as a spatial threshold between interior and landscape. Lacaton & Vassal's *Maison Latapie* (1993) and their *14 Dwellings in Cité Manifeste* (2005) demonstrate how a greenhouse envelope can dramatically expand the habitable space of a dwelling at low cost, creating a generous intermediate zone that is neither fully inside nor outside. Restaurant *De Kas* in Amsterdam shows how a productive greenhouse can become a social space, where the act of growing and the act of eating happen within the same envelope. *Woon-Werkhuis Hoogland* by DAAD Architecten



2 DRY 20 Peds
High cube
= 29,7 m²



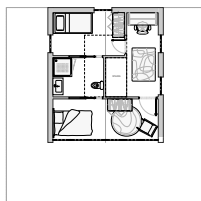
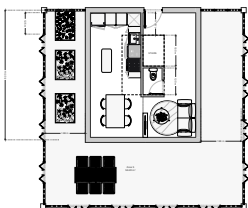
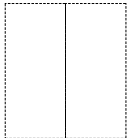
2 DRY 20 Peds High cube
+ 1 for extension
= 44,6 m²



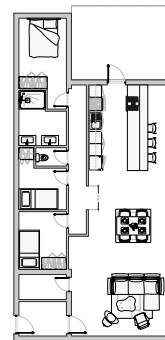
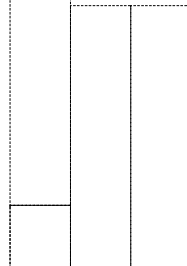
Section studies: modular unit combinations.
A.L.W. Niemeijer (2026)

Floorplan studies: modular unit combinations.
A.L.W. Niemeijer (2026)

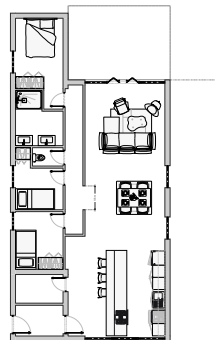
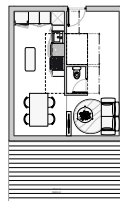
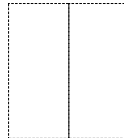
4 DRY 20 Peds High cube
= 59,4 m²



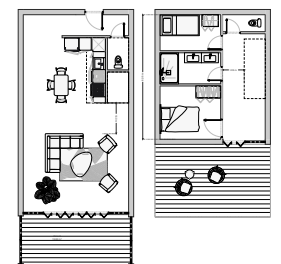
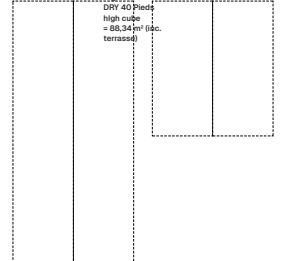
3 DRY 40 Peds High cube +
1 DRY 10 peds
= 94,71 m²



4 DRY 20 Peds High cube
= 59,4 m²



2 DRY 20 Peds
High cube + 2
DRY 40 Peds
High cube
= 88,34 m² (incl.
terrace)



and Eric de Leeuw integrates living and working within a greenhouse structure, demonstrating how the typology can accommodate multiple programmes within a single transparent envelope. The Naturhuset project in Sweden takes this logic to its extreme – an entire house enclosed within a greenhouse, creating a year-round temperate microclimate that extends the growing season and dramatically reduces heating energy. What these precedents share is the understanding that the greenhouse is not simply a productive structure – it is a spatial one. It creates conditions: warmth, light, humidity, porosity. It blurs the boundary between inside and outside in a way that no conventional wall can.

However, combining these three sources of inspiration – the modular container, the farm typology, and the greenhouse envelope – produced an architecture that remained entirely orthogonal: rectangular units, perpendicular arrangements, straight lines. In a landscape already heavily shaped by human intervention into right angles – the straight ditches, the rectilinear field patterns, the rigid geometry of the polder grid – this felt insufficient. The design needed something that could break this orthogonality and introduce a more organic spatial logic.

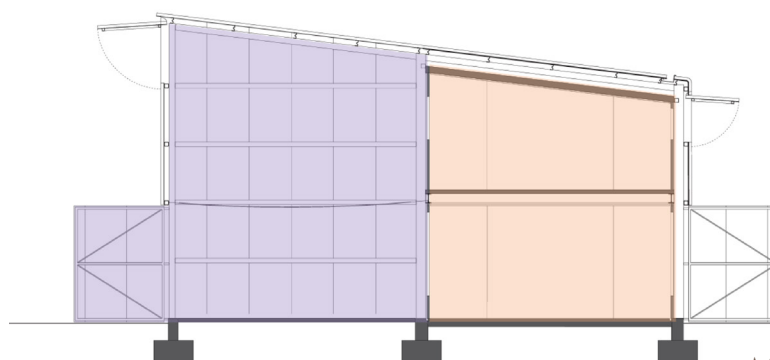
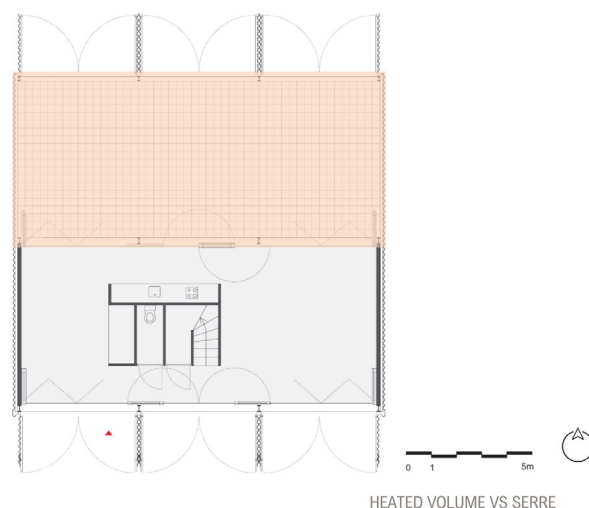


14 dwellings interior. Philip Ruault (2006)

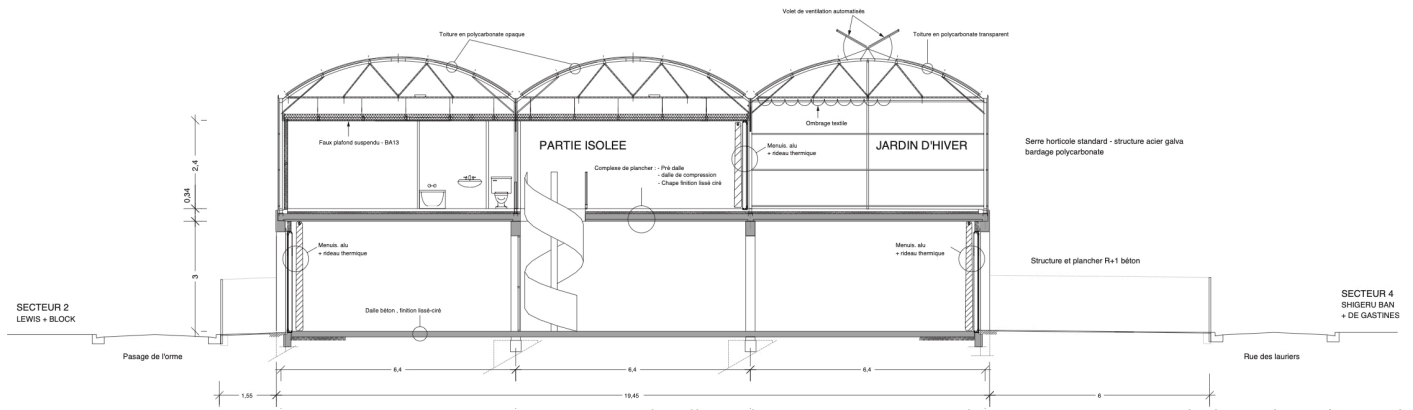
Maison Latapie. Philip Ruault (2006)



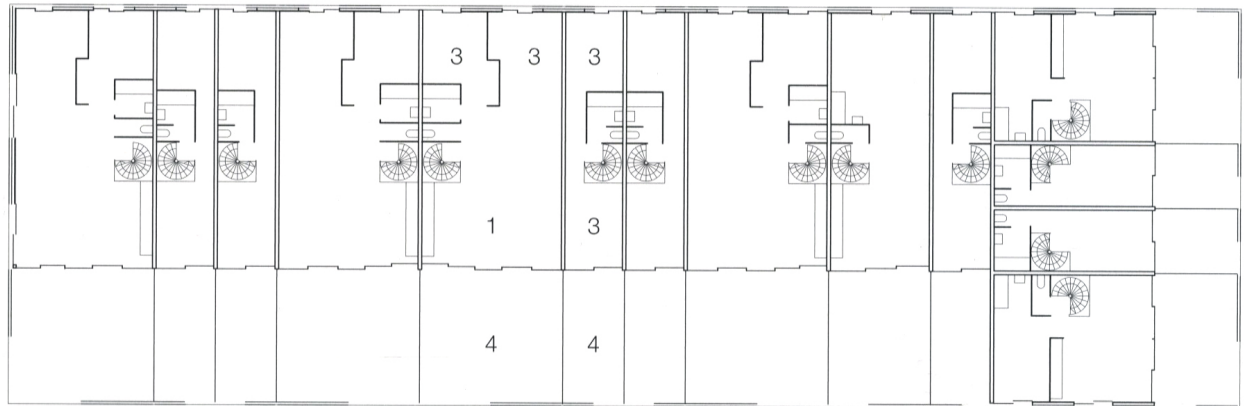
Maison Latapie Floorplan. Philip Ruault (2006)



Maison Latapie Section. Philip Ruault (2006)



14 dwellings by Lacaton & Vassal's section. Jean-Michel Landecy (2006)



14 dwellings by Lacaton & Vassal's first floor floorplan. Jean-Michel Landecy (2006)

Concept description From "Naturhus," by Greenhouseliving.se (n.d.)

Naturhus a short description

Greenhouse terrace:

The rooftop terrace on top of the Core House becomes a fantastic space protected from wind and rain. The warm air rises up and the rooftop terrace has a warmer climate that can be enjoyed sunny days in winter, in spring and in autumn.

Core House:

The insulated and heated part of the house. Built with an energy efficient climate-shell in CO2-smart and eco-friendly materials. The heated m² are reduced and efficiently planned to reduce the use of material and the m² to heat up. Facades and roof are protected and can be built with more ease.

Eco-cycle system + Plantbeds:

The greenhouse creates a warmer climate with longer growing-season. It also secures a controlled environment for the plantbeds, which are a vital part of the eco-cycle system. Plants in the plantbed re-use the water and take up nutrients from the wastewater. A Naturhus does not need a connection to a municipal sewer system.

The plantbeds can be placed down in the ground on groundfloor, or in raised beds on the greenhouse terrace.

Solarcells:

Integrated solarcells in glass-roof. Produce energy and shadows the sun. In combination with battery-storage.

Ventilation:

Ventilation lids along the ridge. Air out overhead. Automatic regulation by temperature, wind and rain.

Greenhouse:

Single glass, insulated double glass or some kind of recirculated plastic. Frame of laminated wood. Inclination of roof 30-45 deg. Important to have a generous volume of air, above the house to secure a nice climate. This is where the hot air goes in the high-summer.

Shadow

The sun can be to hot parts of the year. The sunrays can be framed by greenery climbing along the walls and roof of the greenhouse and/or by textile sun-curtains

Openings:

Generous openings towards the outside in many directions is important to create cross-ventilation and a great contact to the surroundings.

Greenhouse garden

The wind, rain and snow protected greenhouse garden is an extension of the house for a long period of the year. The greenhouse (heated only by the sun) creates a mediterranean climate even in scandinavian countries.

Food production:

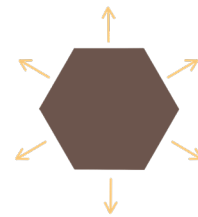
Plantbeds in a greenhouse climate boosted with nutrient water from the eco-cycle system can produce large amounts of vegetables and fruit every year.

Looking to nature for an alternative geometry, the hexagon emerged as the answer. The honeycomb — the most efficient tiling structure in nature — is simultaneously a symbol of collective productivity, a form that generates a remarkable variety of spatial conditions from a single repeated element, and a shape that naturally produces multiple sightlines and orientations. Where a rectangular room offers essentially two axes of view, a hexagonal space opens onto six directions. This multiplicity of orientation is not incidental: in a settlement where the experience of the productive landscape from within the dwelling is central, the hexagon becomes an instrument of spatial and ecological engagement. Beyond its symbolic and experiential qualities, the hexagon also offers a practical advantage over the rectangle : it adapts far more naturally to organic, non-orthogonal ground conditions. Where rectangular plots require straight boundaries and right angles, hexagonal units can be grouped and rotated to follow the irregular contours of the soil — making the hexagon not just a design choice but a more intelligent response to the specific conditions of this rewetting peat landscape.

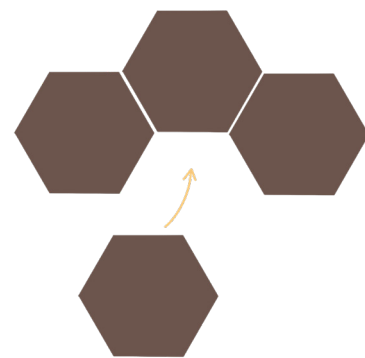
Each hexagonal unit of approximately 14 m² corresponds to a single spatial function — a bedroom, a living space, a kitchen, a workspace. Units are combined to form dwellings of different sizes and configurations depending on the target group, covered and extended by a rectangular greenhouse envelope whose pitched form echoes the Dutch farm tradition.

In all of the greenhouse precedents studied, the envelope remains a rectangular, orthogonal structure. What none of them explore is the combination of a greenhouse envelope with a non-orthogonal dwelling typology. This is where this project departs from its references. By introducing hexagonal units that extend beyond the greenhouse perimeter — some enclosed within it, others reaching outside into the open landscape — the project generates in-between spaces that blur the boundaries between interior and exterior. Rather than a clear line between the dwelling and the landscape, there is a sequence of conditions that dissolve into one another, creating a fundamentally different experience of being at home.

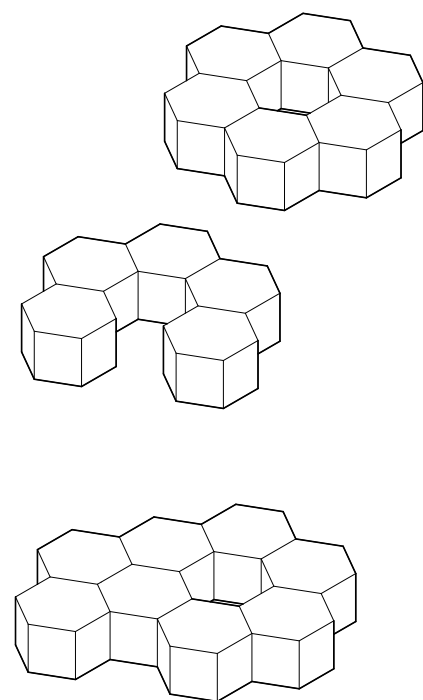
The greenhouse provides structure and productive climate. The hexagon introduces fluidity and organic form. Their tension is the project's most original spatial contribution.



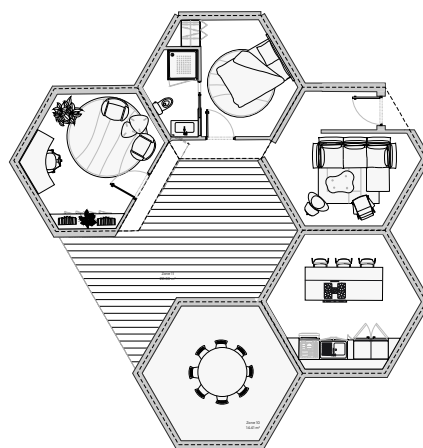
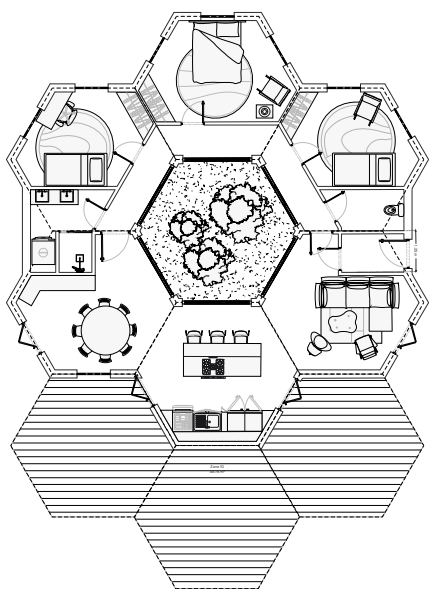
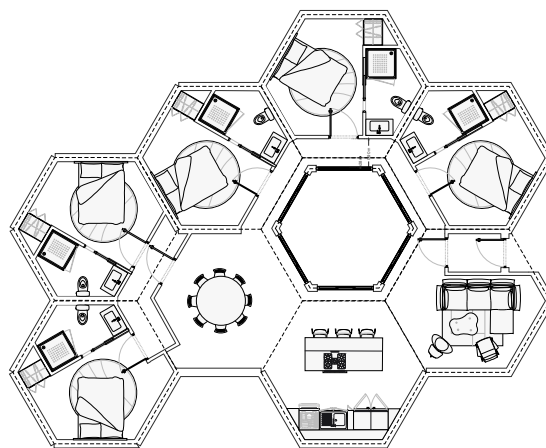
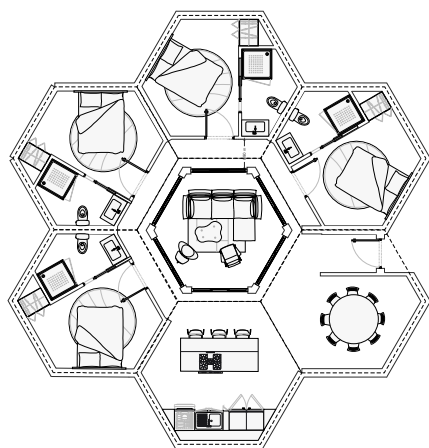
*Principle : Hexagonal space opens onto six directions.
A.L.W. Niemeijer (2026)*



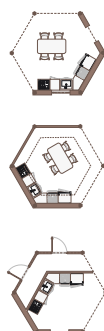
Modular. A.L.W. Niemeijer (2026)



Mass studies: Honeycomb. A.L.W. Niemeijer(2026)



Floorplan studies: Honeycomb. A.L.W.Niemeijer(2026)



Example honeycomb modules. A.L.W. Niemeijer(2026)

III.E HOUSING TYPOLOGY

DISSOLVING THE BOUNDARIES

Each dwelling consists of a combination of hexagonal structural units arranged according to the inhabitant's programme, set in dialogue with a rectangular greenhouse envelope. Rather than being contained within the greenhouse, the hexagonal units extend beyond it — some fully enclosed within the conditioned greenhouse space, others partially emerging from it, and others standing fully outside in direct contact with the productive landscape. This interplay between the hexagonal units and the greenhouse perimeter is what generates the organic form of the dwelling: not a box within a box, but a fluid assembly in which the boundary between inside and outside is defined by the configuration of the units themselves rather than by a single enclosing envelope.

The spaces produced by this relationship — where a hexagonal unit steps outside the greenhouse, where the greenhouse edge cuts through a cluster of units, where inside and outside meet at an angle — become the most spatially rich moments of the

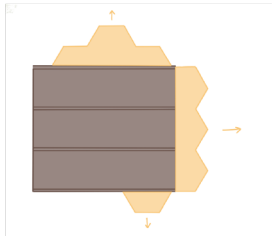
dwelling: half-season thresholds, productive gardens, sheltered outdoor rooms. The greenhouse expands the effective living area, extends the usable season of outdoor spaces, and contributes to the dwelling's energy balance through passive solar gain, while the units that reach beyond it maintain a direct, unmediated relationship with the landscape.

The three dwelling variants — for the new farmer (45–65 m², compact, with direct landscape access and a work module), the hybrid resident (70–90 m², modular, with space for remote work and family life), and the seasonal worker (30–40 m², compact, easily shared) — are all generated by different combinations of the same hexagonal unit, ensuring constructive efficiency and architectural coherence across the settlement while allowing each dwelling to find its own organic relationship to the greenhouse envelope and the landscape beyond.

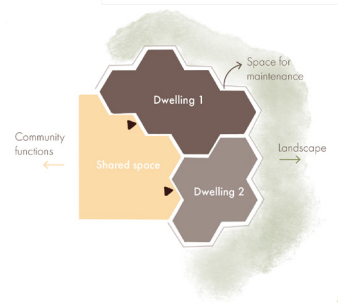
What makes this system powerful is precisely

this balance — the form is fixed, but the interior is not. Every dwelling is built from the same hexagonal unit, the same greenhouse envelope, the same constructive logic. From the outside, the settlement reads as a coherent whole. But inside, each dwelling is configured differently — more units for a family, fewer for a worker, a work module for the farmer, an extra bedroom as the children grow. The architecture adapts to the life inside it without losing its identity on the outside.

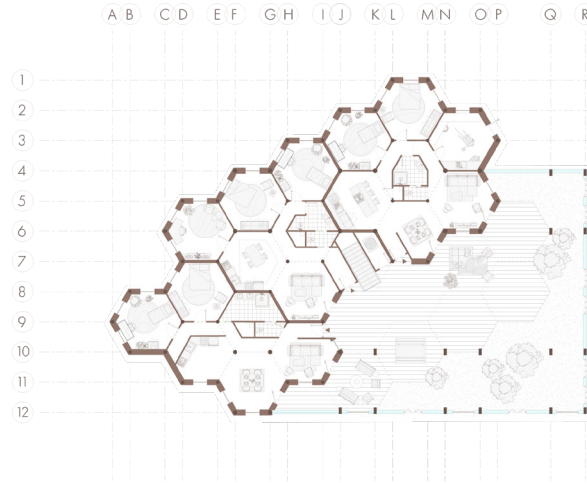
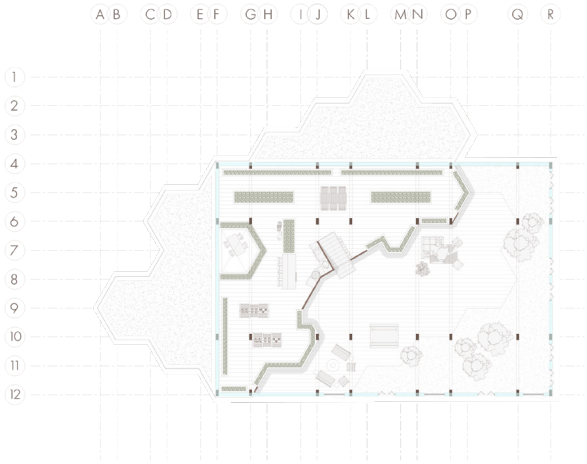
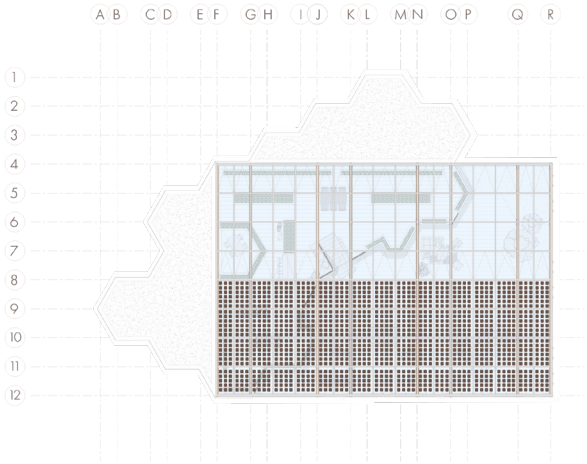
Beyond the initial configuration, the modular logic of the hexagonal unit allows the dwelling to evolve with the life of its inhabitants. A unit that functions as a child’s bedroom today can be repurposed as a home office tomorrow; a shared living space can be subdivided as the household grows, or opened up as it contracts. This capacity for spatial adaptation over time means that the dwelling is never finished — it is a living assembly that responds to the changing needs, rhythms, and compositions of the people who inhabit it, without requiring structural intervention or significant construction work.



Orthogonal vs. organic geometry. A.L.W. Niemeijer (2026)



Principe housing. A.L.W. Niemeijer (2026)



Example possible floorplan (Zoom in Appendix VI.). A.L.W.Niemeijer (2026)

III.E HOUSING TYPOLOGY

FORM : A GRADIENT FROM INTERIOR TO LANDSCAPE

The section through a typical dwelling reveals more than a spatial sequence — it reveals a system. Every layer does something. Every threshold produces something. Moving from the deepest private interior outward through the greenhouse and into the productive landscape is not just a spatial experience — it is an environmental, ecological, and social one simultaneously.

Spatial gradient : inside, threshold, outside.

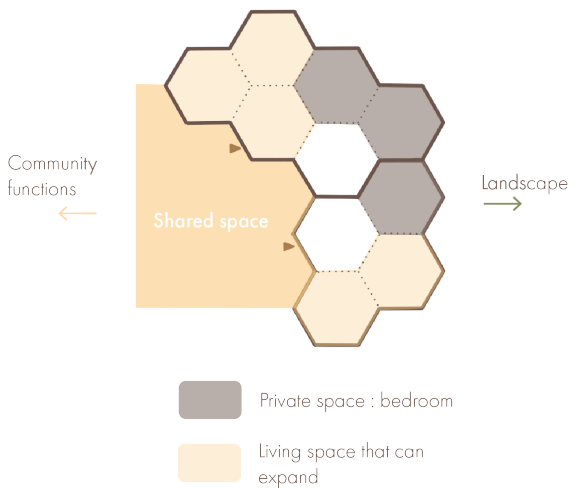
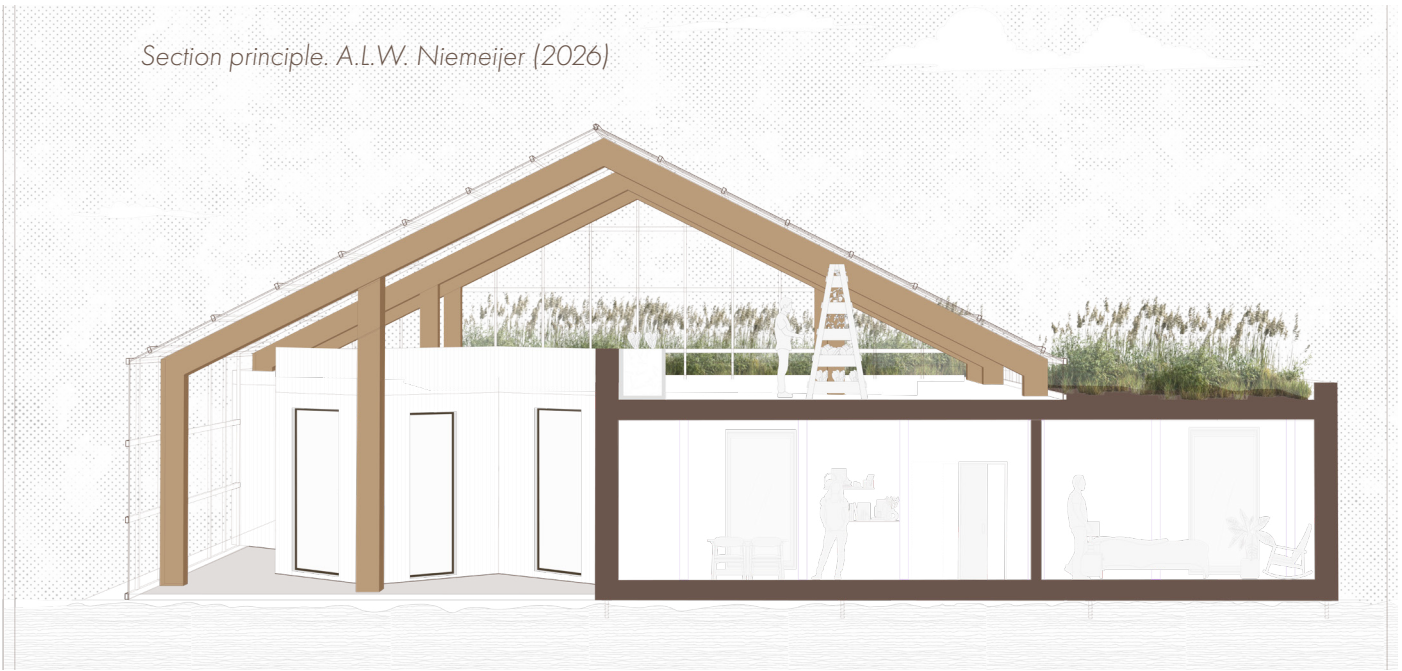
The innermost layer is the heated, enclosed living space: the combination of hexagonal units, oriented inward for privacy and thermal comfort. The middle layer is the greenhouse threshold: conditioned but transparent, productive and porous, functioning as the primary environmental regulator of the dwelling. The outer layer is the landscape: the productive garden, the communal zone, the rewetted polder beyond. Moving through these three layers — from the most private to the most collective, from the most enclosed to the most open — is the fundamental

spatial experience of living in this settlement. It is an architecture of gradual dissolution, in which the boundary between the domestic and the ecological is not a wall but a sequence of thresholds.

Entry and communal logic.

The dwelling is entered through the greenhouse, not directly from outside. This is not merely a practical decision but a spatial and social one: every inhabitant passes through the shared productive space of the greenhouse before reaching their private living units. The roof production — shared between residents — is visible and accessible from this threshold. The greenhouse is therefore not only an environmental buffer but the daily meeting ground of the community: a space where private life and collective life overlap, where the act of coming home passes through the act of tending the shared garden.

Section principle. A.L.W. Niemeijer (2026)



Principe floorplan. A.L.W. Niemeijer (2026)

functions as a rewilded green buffer — deliberately unmanaged vegetation that grows freely between the dwelling and the wider landscape, reinforcing the experience of being immersed in nature and providing ecological habitat for the fauna of the polder.

Climate : winter and summer.

The greenhouse envelope plays a central role in the thermal performance of the dwelling. In winter, it becomes essential — a warm buffer between the heated interior and the cold polder air outside. The WKO heat pump draws on the stable temperature of the ground beneath, circulating warmth through the underfloor heating system at low temperature. The BIPV panels still produce energy even in the grey Dutch winter light. The settlement turns inward, becomes self-sufficient and resilient. In summer, it opens. The greenhouse ventilates through ridge openings. The rooftop gardens are in full production. The terrace fills with people. The boundary between inside and outside almost disappears.

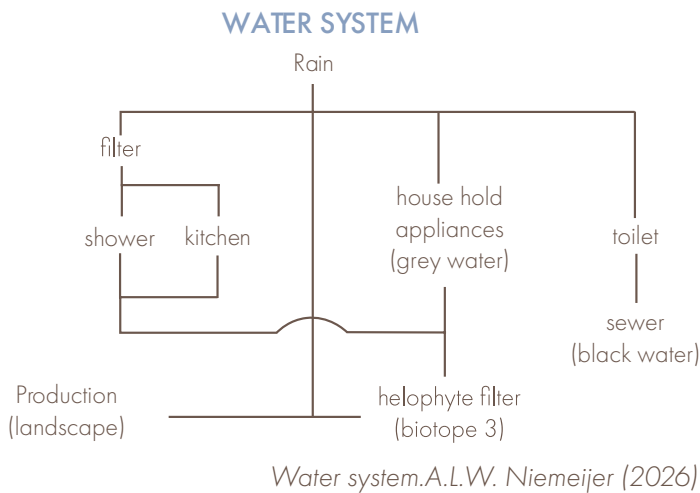
Water.

Rainwater and household greywater are collected and filtered through a helophyte filter system — planted roof sections positioned on the hexagonal units outside the greenhouse envelope, where Typha and reed purify water naturally before returning it to the ground. This system reduces consumption and improves the quality of water reintroduced into the peat landscape. Additional helophyte filter systems are placed across the site at ground level, further

Orientation and privacy gradient.

The dwelling is organised around a clear spatial gradient between collective and private life, reinforced by orientation. The greenhouse side facing the interior of the circular settlement — towards the shared communal spaces and productive garden — accommodates the more public functions of the dwelling: the kitchen, living room, and dining area. These spaces are directly connected to the shared greenhouse threshold so that they can be opened up and extended into it — allowing a dinner to spill into the greenhouse, or a communal harvest activity to flow naturally into a shared meal. On the opposite side, facing outward towards the rewetted polder landscape, the more private functions are situated: bedrooms and bathrooms, oriented away from the communal core towards the open landscape. On this outer edge, a strip of approximately 5 metres

contributing to the restoration of water quality in the rewetted polder.



Energy.

Solar panels provide the primary energy source for the settlement, organised as two complementary systems. The community building roofs carry standard high-performance photovoltaic panels across a total of 537 m² – 337 m² south-facing and 200 m² south-east/west-facing – producing approximately 92,400 kWh per year. This covers almost exactly the energy consumption of the community buildings themselves, making each building effectively self-sufficient in energy terms. Semi-transparent BIPV panels on the south-facing roofs of the nine greenhouses generate approximately 19,600 kWh per year per greenhouse, for a total of approximately 176,400 kWh per year. Against an estimated dwelling demand of approximately 82,500 kWh per year – based on 55 dwellings consuming approximately 1,500 kWh each, significantly below the Dutch national average of 3,500 kWh thanks to the greenhouse thermal buffer, Typha insulation, WKO heat pump, and WTW heat recovery ventilation – the settlement produces a substantial surplus. This surplus is first used to charge the five shared electric vehicles, which also function as short-term batteries for the settlement. The remaining surplus is fed back into the grid. (For detailed calculations, see Appendix III.)

Three new biotopes.

Beyond its spatial and environmental performance, the dwelling itself becomes a generator of biodiversity. Three distinct biotopes emerge from its architecture. The first is the rooftop outside the greenhouse – the helophyte filter system creates a

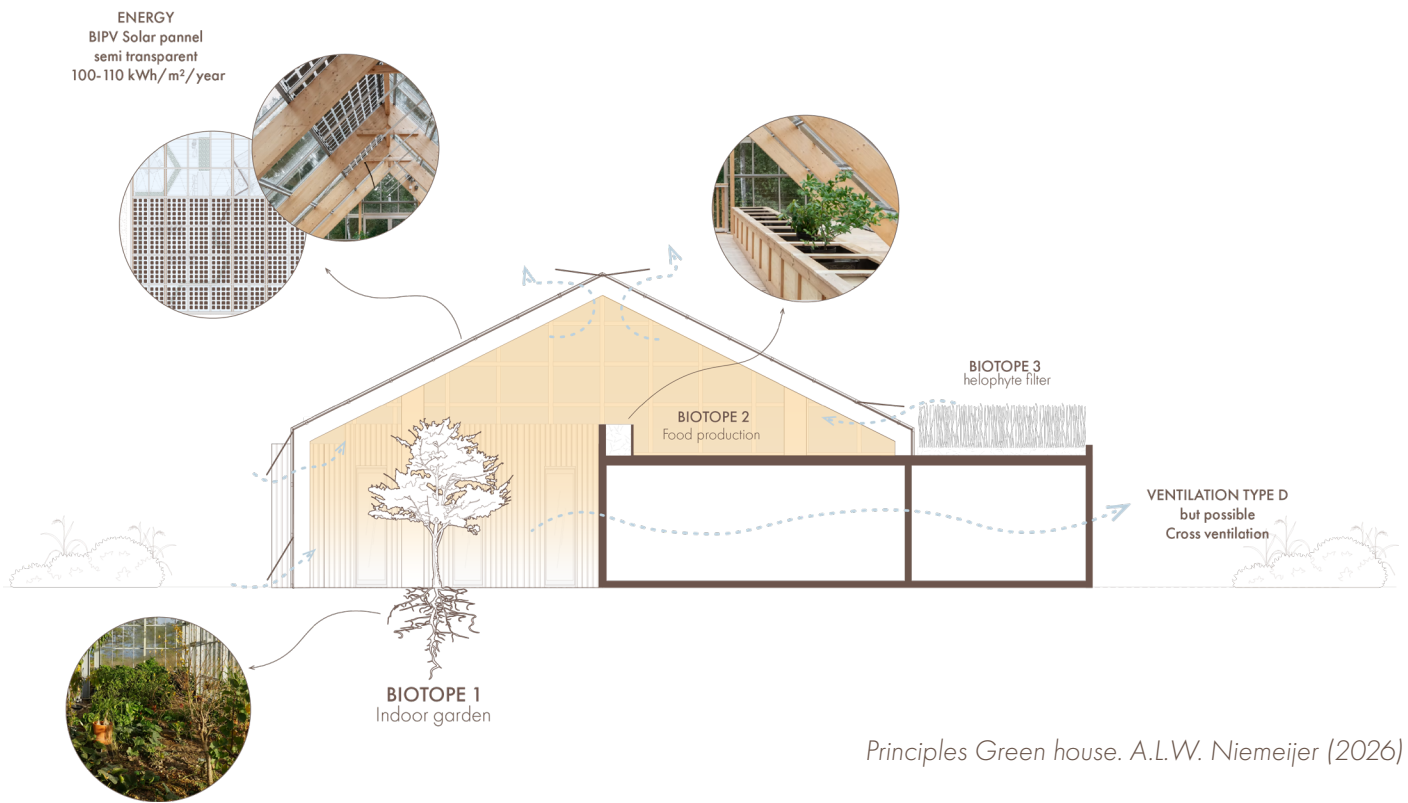
wetland-like habitat directly on the roof, connecting the domestic scale of the dwelling to the ecological logic of the rewetted polder. The second is the rooftop inside the greenhouse – the cultivated beds of fine crops, herbs, and vegetables form a productive habitat that attracts pollinators and supports the biodiversity of the wider settlement. The third is at ground level beneath the greenhouse – here the soil is open, and the moderated climate allows plants and small trees to grow directly from the ground, creating a space that is neither fully domestic nor fully natural. Together these three biotopes mean that the dwelling does not merely sit within an ecological landscape – it actively produces one.

Structure.

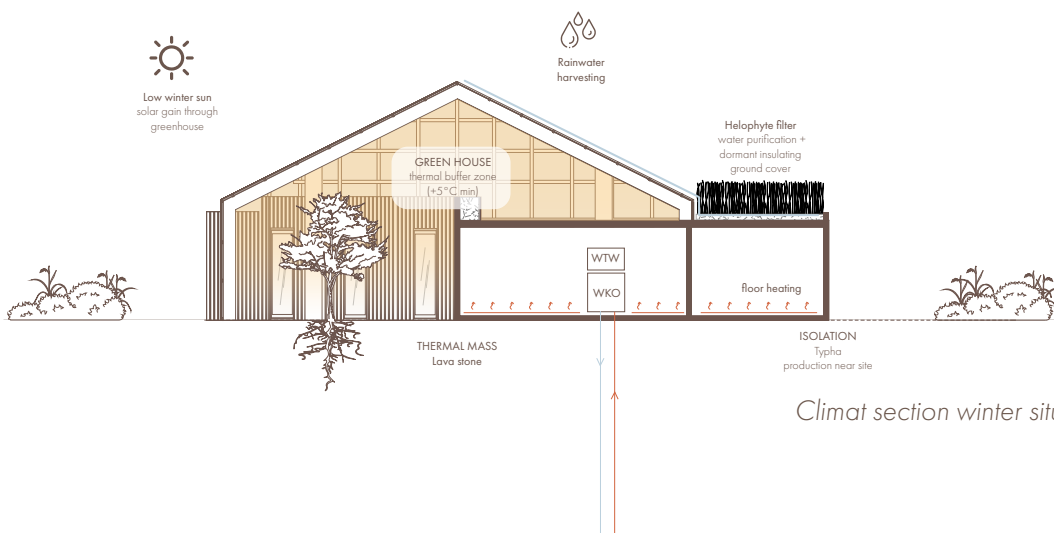
The structure is as honest as the concept. Hexagonal CLT columns : 200mm point-to-point for dwelling loads and 250mm where greenhouse spans bear down that align with the dwelling geometry, to create more esthetics (and easier) connections. Floor and roof are built from continuous CLT half-hexagon strips, 2,165mm wide, running across multiple units from column to column, reducing waste and speeding assembly. The greenhouse spans 17 metres in glulam timber with steel tension rods. Screw pile foundations require no concrete and no excavation, fully demountable, leaving the ground undisturbed when the settlement reaches the end of its life. (For detailed explanation, see Appendix IV.)

Materials.

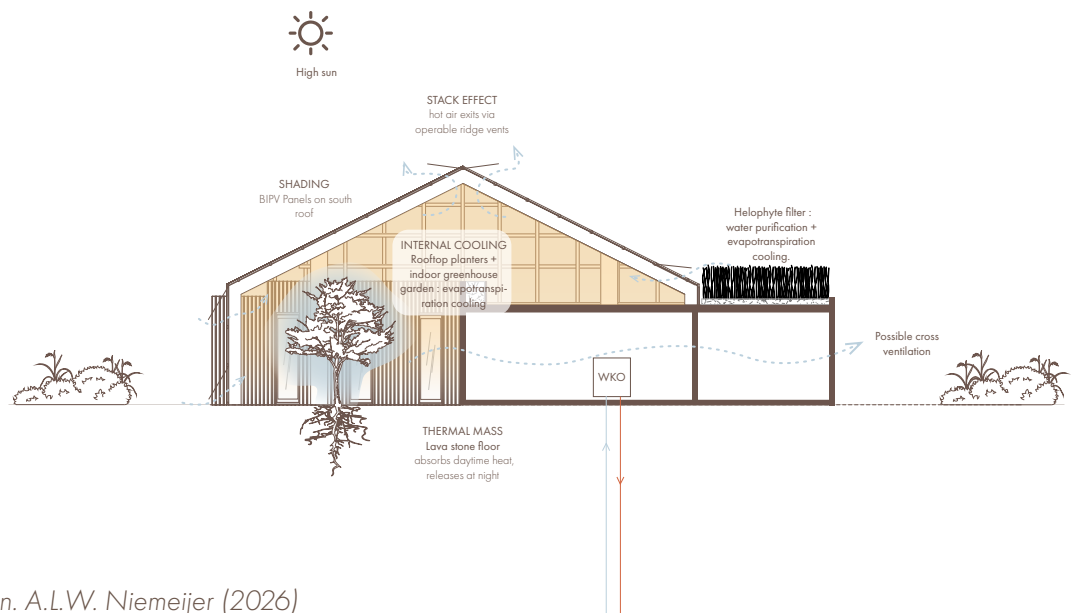
The insulation in the walls is Typha – harvested from the paludiculture fields surrounding the settlement. The material that restores the peat landscape also keeps the inhabitants warm in winter. The exterior cladding is vertical Accoya timber boards – durable, moisture-resistant, and locally sourced. The roof structure is CLT, the floor is CLT on screw piles with a dry underfloor heating system. Every material choice is an argument : for locality, for circularity, for a building culture that takes responsibility for the landscape it inhabits.



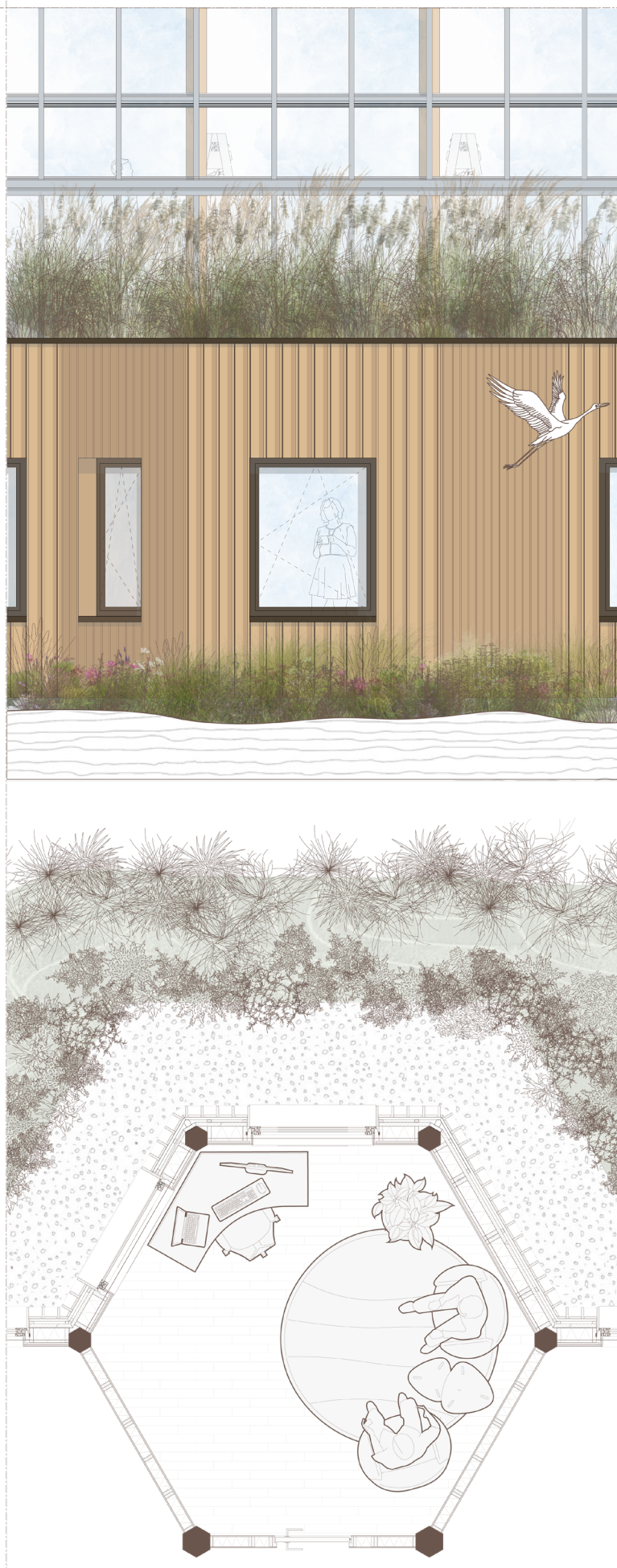
Principles Green house. A.L.W. Niemeijer (2026)

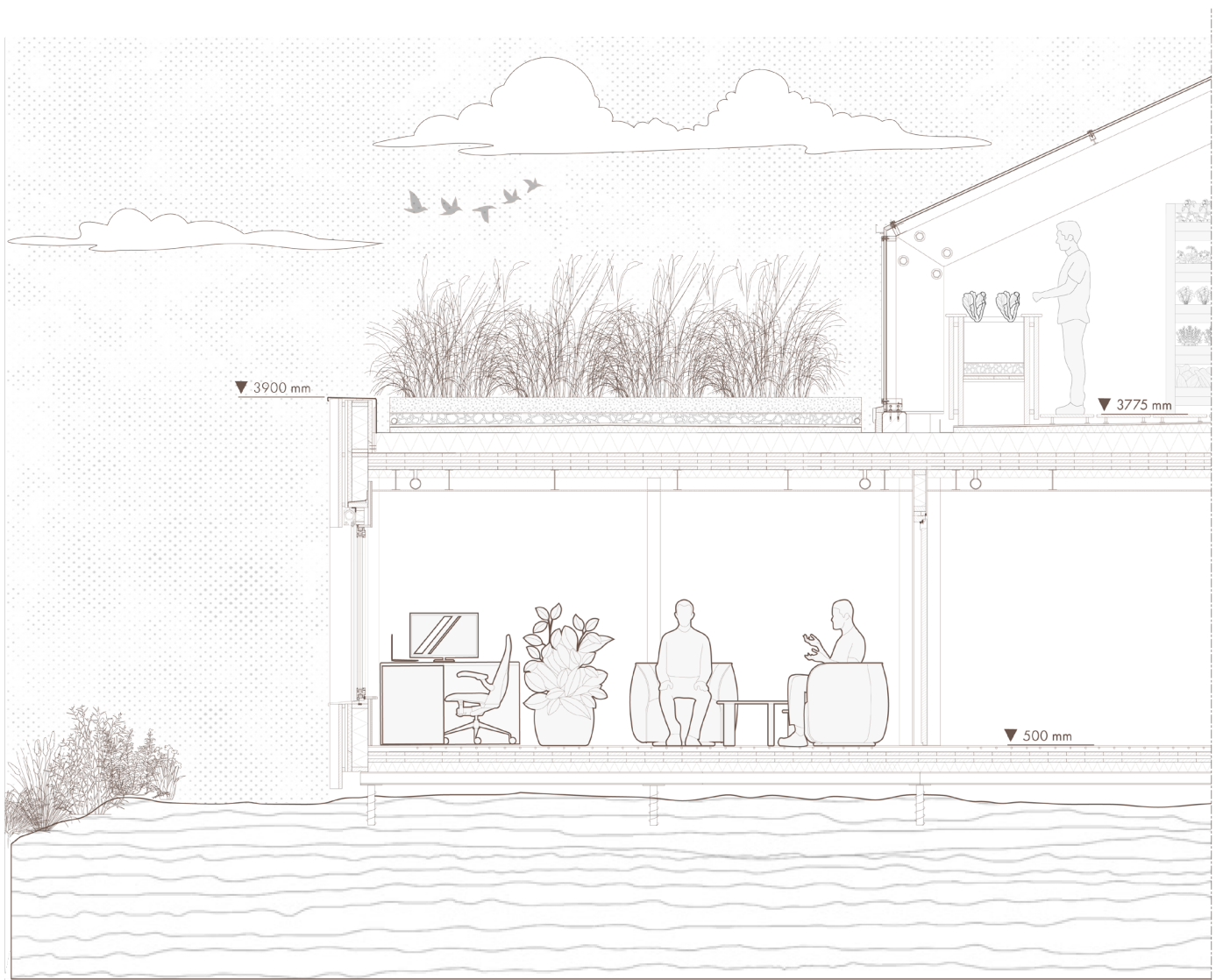


Climat section winter situation. A.L.W. Niemeijer (2026)



Climat section summer situation. A.L.W. Niemeijer (2026)





For 1:5 Detail see appendix V

PART IV. CONCLUSION & DISCUSSION

IV. A CONCLUSION

This project set out to answer a single question : how can a new community living model, rooted in a productive peat landscape, create spatial and architectural conditions for collective life while enabling ecological regeneration and climate-adaptive inhabitation ? The answer, as this design demonstrates, is not a formula — it is a system.

The landscape came first. Not as a backdrop, not as a constraint to be overcome, but as the generative foundation of every decision. The soil gradients, the water levels, the rewetting scenario of the ZUS, SWECO, & FLUX Landscape Architecture (2022) masterplan — these did not simply inform where to build. They determined what was possible, what was responsible, and what was meaningful. The landscape set the possibilities and the limits. And crucially, it never stopped being part of the system once the design began. It remained active — structuring land use, orienting dwellings, generating production cycles,

and defining the ecological conditions within which human inhabitation became possible.

This is perhaps the most fundamental argument of the project : that in a fragile, transitional landscape like the Vlietlanden, architecture cannot be designed against the ground. It must grow from it, respond to it, and remain in dialogue with it. The settlement does not sit on the landscape — it is produced by it.

From this foundation, three layers of productivity emerge — ecological, material, and social — not as separate themes but as a way of grouping and understanding the smaller systems that together constitute the whole. The productive landscape generates ecological value through paludiculture, agroforestry, and biodiversity restoration. The dwelling generates material value through food production, energy, water filtration, and biobased construction. The community generates social value through shared steward-

ship, collective infrastructure, and a new relationship between inhabitants and the land they live on. Each layer strengthens the others. The helophyte filter on the rooftop connects the domestic scale to the ecological logic of the polder. The Typha harvested from the rewetted fields insulates the walls of the house. The farmer who manages the landscape also educates the community that depends on it.

The three target groups — the new farmer, the hybrid resident, and the seasonal worker — are not simply users of this system. They are constituent parts of it. The landscape offers them food, shelter, and meaning. In return, they offer the landscape care, labour, and continuity. This reciprocity is what distinguishes the project from conventional housing development : it is not a place you move into, it is a place you commit to.

The architectural typology — hexagonal dwelling units combined with a rectangular greenhouse envelope — gives spatial form to this reciprocity. The form is fixed, the interior is flexible. The greenhouse is rigid, the hexagon is organic. Their tension produces

something neither could achieve alone : a threshold condition in which the boundary between domestic interior and productive landscape is never quite resolved, always active, always alive. Three new biotopes emerge from this combination — wetland habitat on the outer roof, productive microclimate on the inner roof, and open ground beneath the greenhouse — demonstrating that the architecture itself can generate ecological conditions rather than simply accommodating them.

Finally, this project proposes principles that extend beyond this specific site. The logic of letting the ground lead — understanding the soil, reading the water, allowing the landscape to determine form and position — could be applied in other fragile or transitional landscapes. The hexagonal units could be larger or smaller depending on ground conditions. The settlement could take a different shape in a different place. What remains constant is the method : start with what the landscape offers, and build from there.

Impression of the settlement. A.L.W. Niemeijer (2026)



IV. B IMPLICATIONS AND RECOMMENDATIONS

This project has implications for architectural practice at a moment when the relationship between building and landscape is being fundamentally rethought. As climate change accelerates the transformation of vulnerable territories — coastal zones, river deltas, rewetting peatlands — architects will increasingly be called upon to design not for stable ground but for ground in transition. This project suggests that such conditions are not obstacles to good architecture. They are its most productive starting point.

The woonlandschap model developed here — housing as a lever for ecological regeneration, production as the organising principle of community life — offers a spatial alternative to both conventional suburban development and romantic rewilding. It demonstrates that it is possible to build in a sensitive landscape without diminishing it, provided that the design begins with a genuine understanding of what the ground can support and what it needs.

For the architectural profession, the project raises a question about expertise. Designing in a productive peat landscape requires knowledge of hydrology, agronomy, ecology, and community organisation that goes beyond conventional architectural training. This project was built on assumptions — about what farmers want, about how communities form, about what paludiculture requires spatially — that could only be fully tested through sustained engagement with the people and practices involved. Future development of this model would require genuine collaboration with landscape ecologists, farmers, and future inhabitants from the earliest stages of design. The missing voices in this project — particularly those of agricultural practitioners — are not a failure but a direction : towards a more embedded, more collaborative, and more humble architectural practice.

The project also implies a rethinking of affordability in housing. Rather than approaching affordability through subsidised rent or reduced construc-

tion costs, this model proposes collective sufficiency — shared energy, shared food, shared tools, shared space — as a spatial strategy for lowering the cost of living. This approach requires governance structures and community organisation that architecture alone cannot provide, but that architecture can make possible by designing the conditions for them.

Impression from the productive roof. A.L.W. Niemeijer (2026)



IV. C REFLECTION

This project began somewhere else entirely.

The first idea was simple — compact wooden houses, Scandinavian in spirit, scattered in nature like a vacation park. Pitched roofs, clean forms, beautiful material. It was a safe idea. A comfortable idea. And it had almost nothing to do with this specific landscape, this specific challenge, or this specific question.

The leap came from a question asked at the right moment : what makes this project yours ? What will people remember ? The answer was not in the form I had — it was in a direction I hadn't yet taken. Experimenting with modular container logic, combining units, stacking functions, and then — almost by accident — arriving at the hexagon. A form borrowed from the masterplan, connected to the idea of production through the beehive, and suddenly capable of doing something the rectangle never could : breaking the orthogonality of the polder from within the architecture itself.

The moment things fell into place was the moment the hexagonal units began to push out beyond the greenhouse envelope — not in a straight line, not aligned, but organically, following their own logic. The greenhouse stayed rigid, rectangular, referencing the farm tradition of this landscape. The hexagon pushed against it. And in that tension, the most interesting spatial condition of the entire project appeared : the threshold between inside and outside, between domestic and ecological, between the controlled and the wild. From that moment, everything else followed. This is perhaps the most important lesson of this graduation : kill your darlings. The first idea is rarely where you end up — and that is not a failure, it is the process. The willingness to abandon a comfortable starting point, to follow a strange idea into unfamiliar territory, to trust that something interesting might be waiting on the other side of uncertainty — that is what design asks of you.

The biggest challenge was understanding the landscape. I biked through the Vlietlanden nearly every week during this project. I watched the light change across the flat grass, saw the rabbits at dusk, felt how enormous and empty and beautiful it was. And I struggled — genuinely struggled — with the idea of building there at all. Everything seemed too large next to that emptiness. Every mass felt like an intrusion. I resolved that tension slowly, and imperfectly. Partly by trusting that the project would not stand alone — that other buildings in the masterplan would give it context, that the settlement would be embedded in a larger transformation rather than dropped into virgin landscape. And partly through the design itself : by keeping the dwellings compact and low, by leaving generous space between and around them, by letting the landscape flow through the settlement rather than being pushed to its edges. The openness of the polder was not something to be overcome — it was something to be preserved inside the project.

There is a personal dimension to this reflection that belongs here too, even if it is difficult to articulate. Graduation is a moment of significant doubt — about choices, about direction, about whether what you are making is good enough, meaningful enough, original enough. For a perfectionist, the impossibility of finishing something that feels complete is a particular kind of difficulty. This project taught me that completion is

not the goal. Commitment is. You commit to an idea, you follow it seriously, you make it as good as you can with the time and knowledge you have — and you accept that it is one answer, not the answer. What I would do differently, given more time, is listen more. I would have spent weeks with farmers — not to validate my assumptions but to replace them. The new farmer in this project is a carefully constructed figure, but she is my construction. What the “new Farmer” actually wants, what she would find useful, what spatial conditions would make her work meaningful and her life good — I do not fully know. That humility should have been built into the process from the beginning. And I would have explored co-housing more deeply — not as a social concept but as a spatial and legal reality. How do communities actually form around shared production ? What makes them last ? What makes them fail ? These are questions that architecture can help answer, but only if the architect has first listened carefully to the people who have lived them.

This project is one answer to a question the Vlietlanden is already asking. It is imperfect, incomplete, and built on assumptions that future work would need to test. But it is serious, it is grounded — literally and conceptually — and it proposes something that I believe the landscape, and the people who will one day live in it, deserve : a place worth tending.

Impression from the office. A.L.W. Niemeijer (2026)



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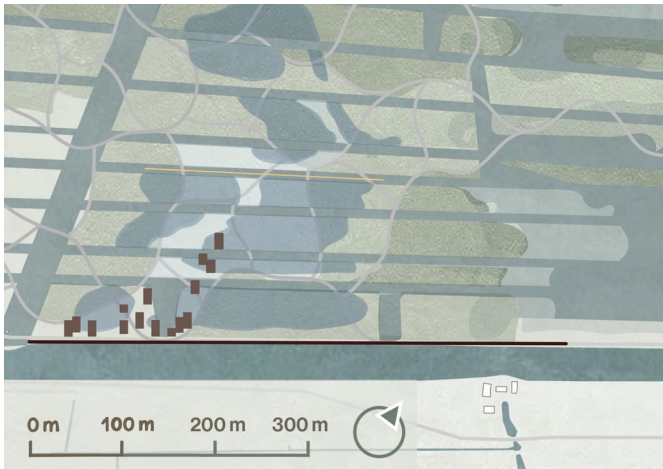
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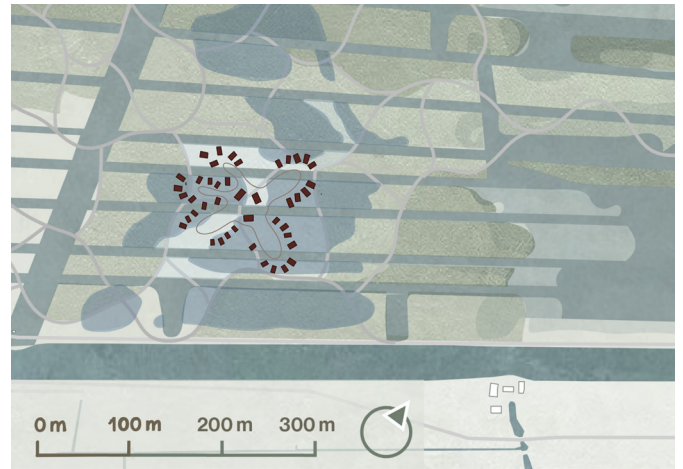
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** Note : Throughout this report, a combination of translation tools, some of which are AI-powered, were used to support clearer and more natural english, as english is not my first language.

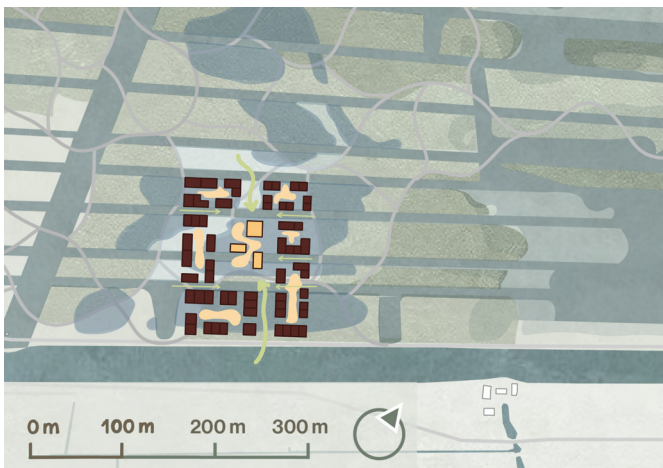
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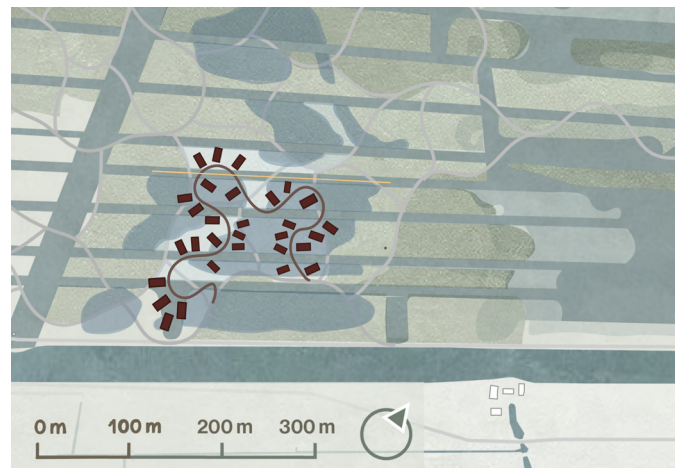
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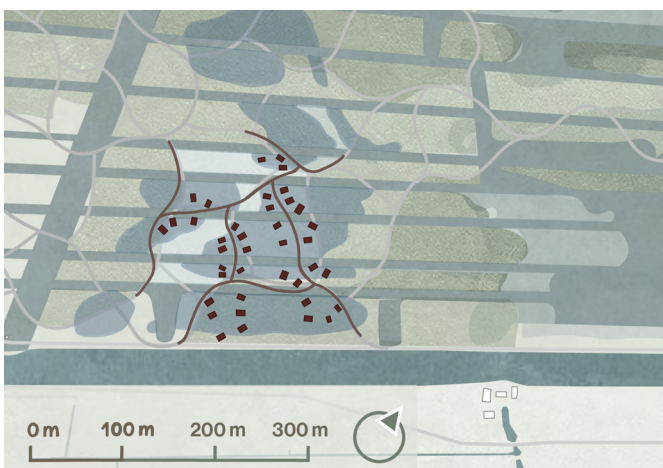
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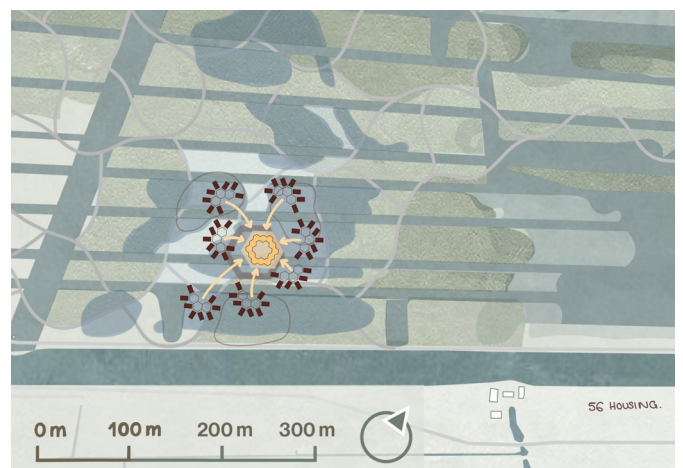
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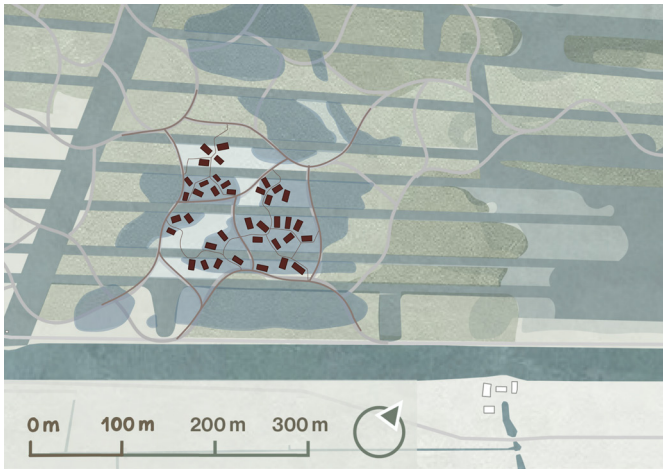


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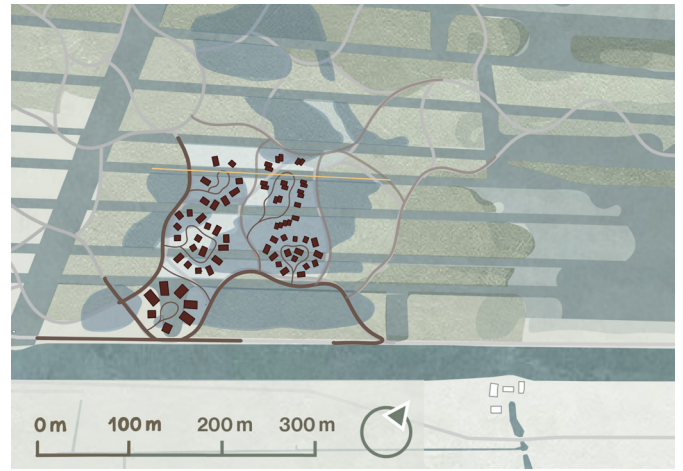


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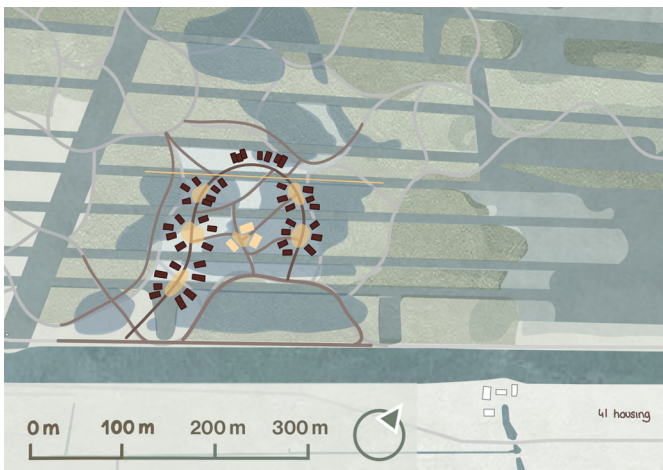
Settlement Study . A.L.W. Niemeijer (2026)



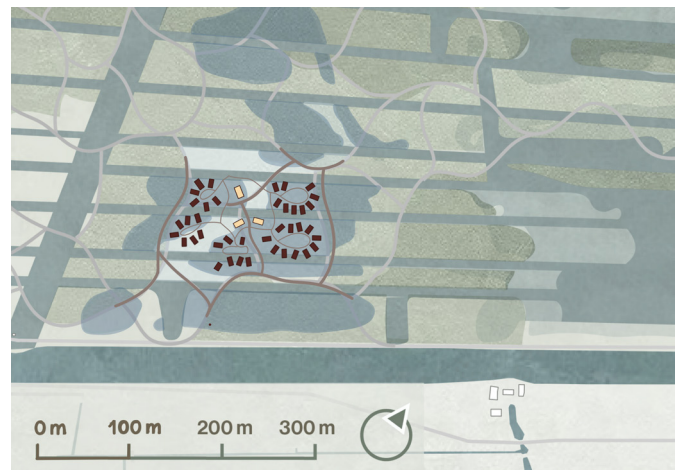
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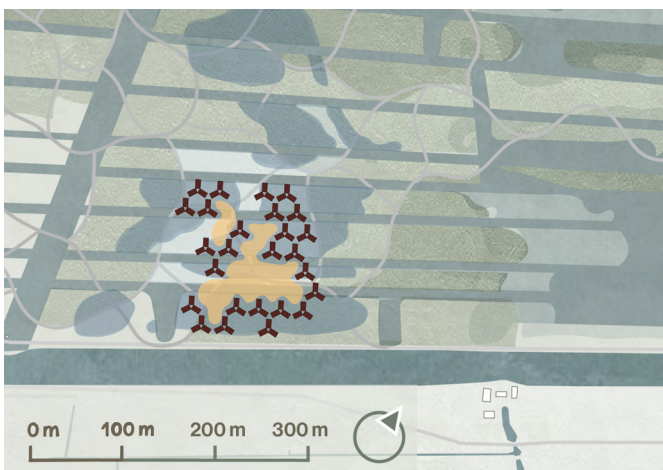
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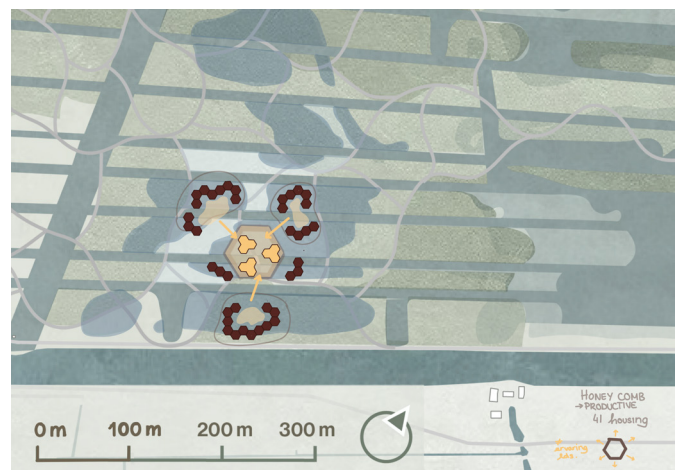
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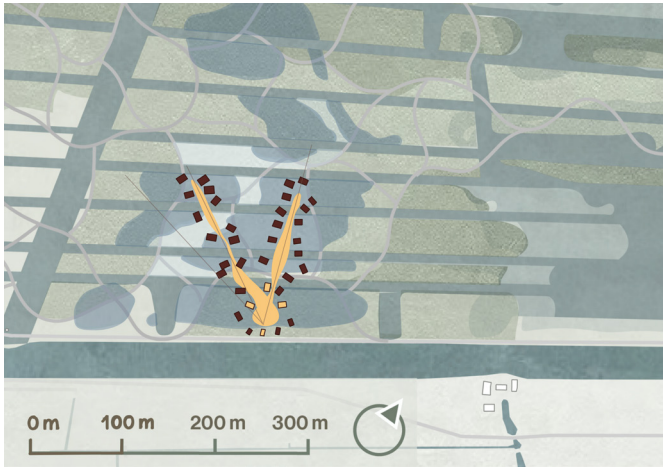
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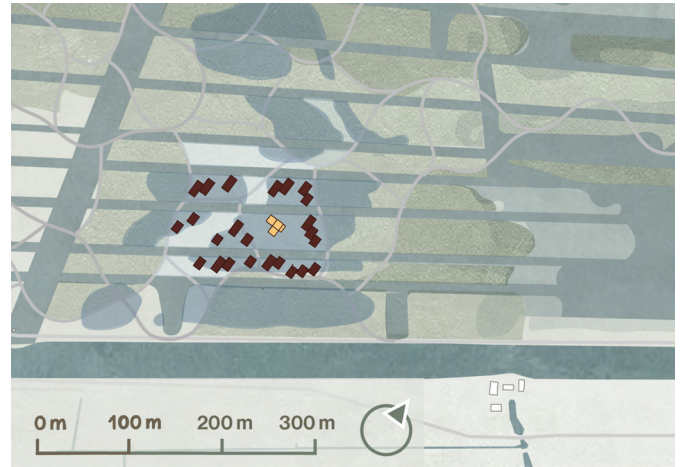
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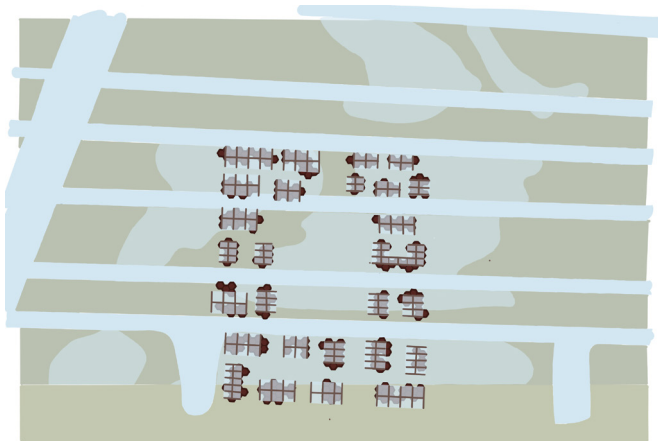
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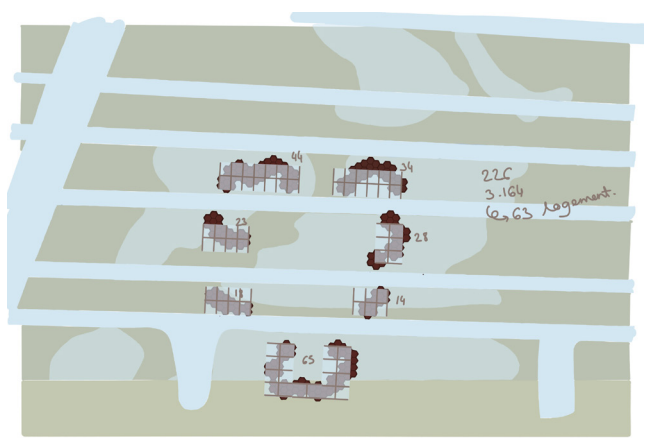
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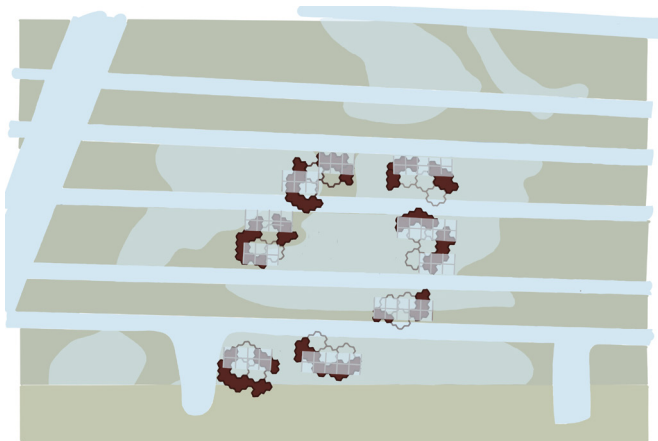
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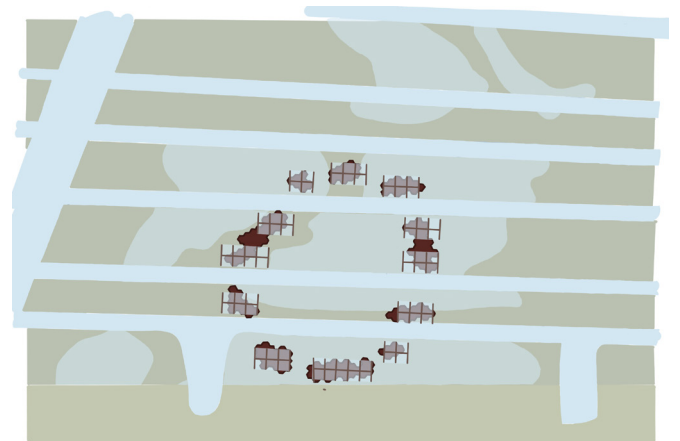
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Option 16

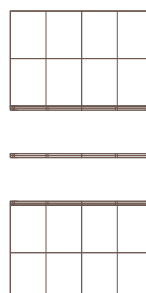
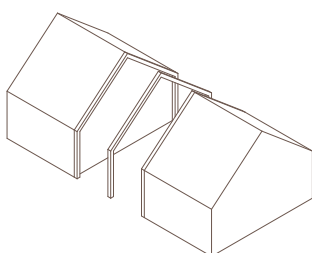
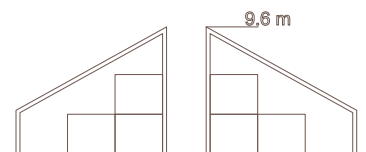
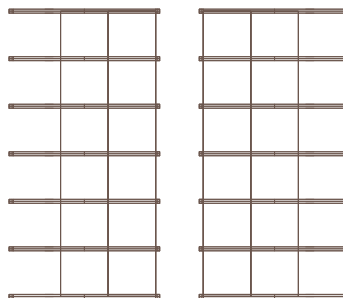
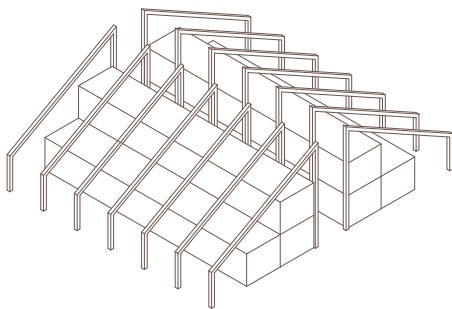
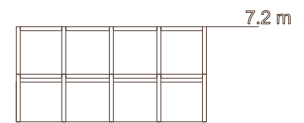
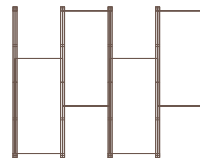
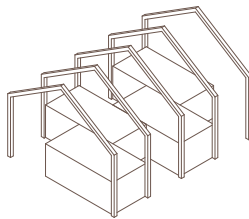
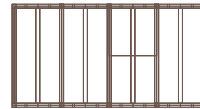
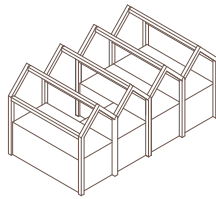
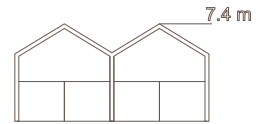
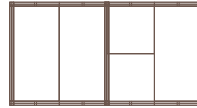
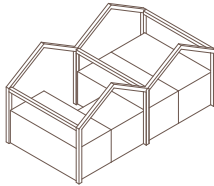
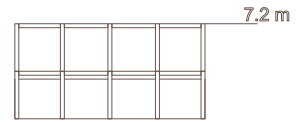
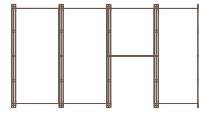
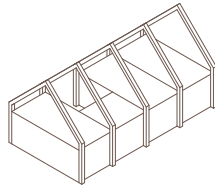


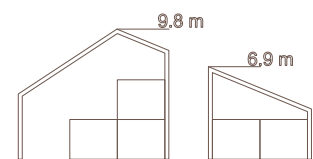
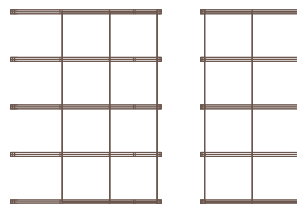
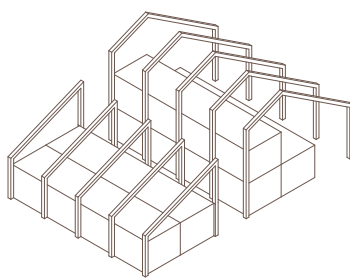
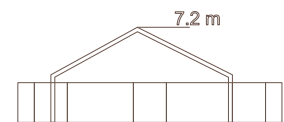
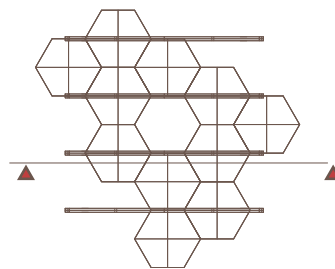
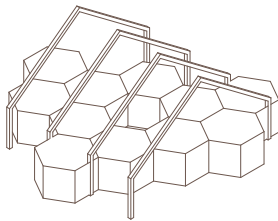
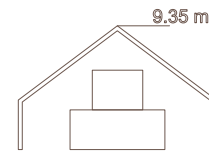
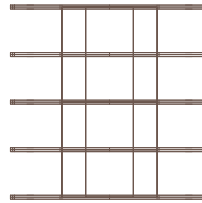
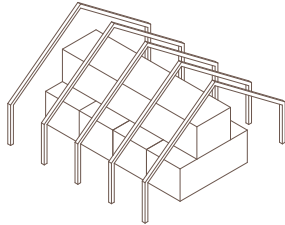
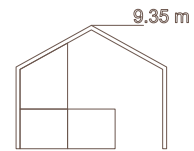
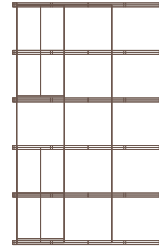
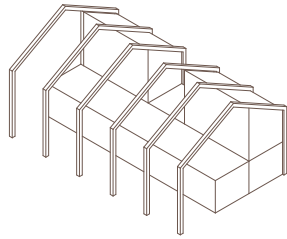
Option 17



Option 18

APPENDIX II. FORM STUDY HOUSING





6.9 m

APPENDIX III. ENERGY PRODUCTION

The settlement's energy needs are met through two complementary systems : standard photovoltaic panels on the community building roofs, and semi-transparent BIPV panels integrated into the south-facing greenhouse roofs.

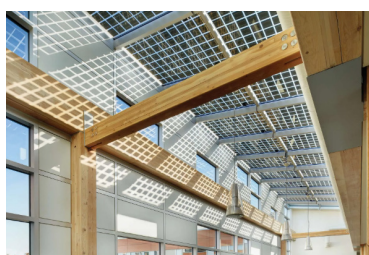
The community building roofs provide a total of 537 m² of panel surface — 337 m² south-facing and 200 m² south-east/west-facing. Using a panel output of 220 Wp/m², 950 peak sun hours per year for the Netherlands, a system efficiency of 85%, and an orientation correction factor of 92% for the south-east/west surfaces, the community building panels produce approximately 92,400 kWh per year. This covers almost exactly the total energy consumption of the community buildings — including the shared kitchen, laundry facilities, workshops, restaurant, and the charging of the five shared electric vehicles — making the community buildings effectively self-sufficient in energy terms.

The BIPV panels on the greenhouse roofs (semi-transparent at 120 Wp/m²) cover approximately 202 m² of south-facing surface per greenhouse. Each greenhouse produces approximately 19,600 kWh per year. Across the nine

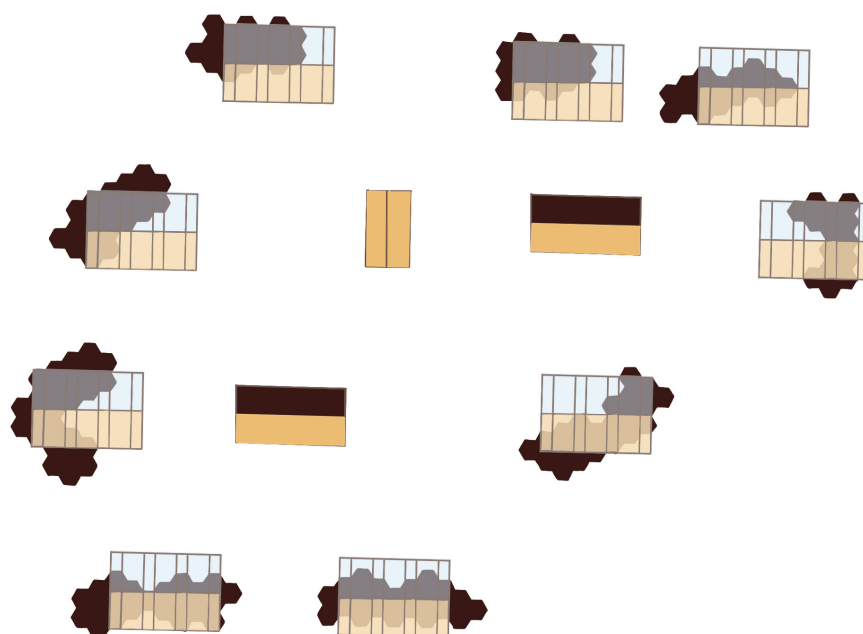
greenhouses of the settlement, total BIPV production reaches approximately 176,400 kWh per year.

Against an estimated dwelling demand of approximately 82,500 kWh per year — based on 55 dwellings consuming approximately 1,500 kWh each, significantly below the Dutch national average of 3,500 kWh due to the greenhouse thermal buffer, Typha insulation, WKO heat pump, and WTW heat recovery ventilation — the settlement produces a substantial surplus of approximately 97,800 kWh per year. This surplus is first used to charge the five shared electric vehicles, which also function as short-term energy storage for the settlement. The remaining surplus of approximately 60,000 kWh per year is fed back into the grid.

Note : Community building consumption figures are indicative estimates based on typical energy use for similar building functions.



Semi-transparent BIPV panels. From Invitaic (n.d.). Retrieved from <https://invitaic.com/transparent-2/>



- Semi-transparent BIPV panels on serre
- High efficiency solar panels on community buildings

Solar panel placement scheme. A.L.W. Niemeijer (2026)

ENERGY PRODUCTION CALCULATION

The Commons — Porous Ground Settlement, Vlietlanden

GENERAL ASSUMPTIONS					
Parameter	Value	Unit	Notes		
Panel output — standard panels	220	Wp/m²	High performance standard PV		
Panel output — BIPV semi-transparent	120	Wp/m²	Onyx Solar / Sunovation ~50% transparency		
Peak sun hours — Netherlands	950	hours/year	Dutch annual average		
System efficiency	0.85		Inverter + cable losses — standard 85%		
Orientation factor — plein sud	1		100% reference		
Orientation factor — south-east/west	0.92		92% of south-facing		

COMMUNITY BUILDINGS — Production (Standard PV Panels)					
Surface	Orientation	Area (m²)	Orient. Factor	Production (kWh/year)	Notes
South roof	Plein Sud	337	1	59868.05	South-facing roof
SE/SW roof	South-East/West	200	0.92	32687.6	SE/SW-facing roof
TOTAL Production Community Buildings (kWh/year)				92555.65	

COMMUNITY BUILDINGS — Consumption by Function			
* Consumption figures are indicative estimates — to be verified with an energy consultant			
Building / Function	Total building area (m²)	Consumption (kWh/y	Notes
BUILDING 1 — Total area: 179 m²			
Shared Kitchen		8000	Cooking equipment, refrigeration, lighting *
Multipurpose room / Shared Living Room		2000	Lighting, AV equipment *
Building 1 Subtotal	179	10000	
BUILDING 2 — Total area: 449 m² (332 + 117 m²)			
Shared Laundry (8 washing machines)		7000	8 machines × ~875 kWh/year each *
Workspace (ground floor)		3000	Computers, lighting, equipment *
Workshop + Wood Workshop		5000	Power tools, lighting *
Workspace +1 floor (117 m²)		2000	Computers, lighting *
Shared car charging (5 electric cars)		37500	5 cars × 75 kWh battery × ~100 charge cycles/year *
Building 2 Subtotal	449	54500	
BUILDING 3 — Total area: 467 m² (332 + 135 m²)			
Restaurant (ground + first floor)		15000	Kitchen, HVAC, lighting, refrigeration *
Atelier licht		3000	Lighting equipment, tools *
Local kiosk + food storage + refrigeration		8000	Refrigeration units, lighting *
Building 3 Subtotal	467	26000	
TOTAL Consumption Community Buildings (kWh/year)		90500	

COMMUNITY BUILDINGS — Energy Balance	
Production (kWh/year)	92555.65
Consumption (kWh/year)	90500
Surplus / Deficit (kWh/year)	2055.65
Status	SELF-SUFFICIENT ✓

BIPV GREENHOUSE — Semi-transparent panels per greenhouse				
Parameter	Value	Unit	Notes	
Greenhouse length	25	m	Fixed for all 9 greenhouses	
Greenhouse width (overspanning)	17.3	m	Fixed for all 9 greenhouses	
Roof inclination	25	degrees	Optimal for Netherlands	
South-facing proportion	0.5		50% of total roof area	
Inclination factor (1/cos 25°)	1.103		Plan area → actual roof surface	
Available surface factor	0.85		15% deducted for structure + ventilation	

South-facing plan area (m²)	216.25
Actual south roof surface (m²)	238.52375
Available BIPV surface (m²)	202.7451875
BIPV production per greenhouse (kWh/year)	19646.00867

DWELLINGS — Energy Demand				
Parameter	Value	Unit	Notes	
Dutch average consumption per dwelling	3500	kWh/year	National average — reference only	
Estimated consumption this project	1500	kWh/year	Reduced: greenhouse buffer + Typha Rc5 + WKO + WTW	
Number of dwellings	55	dwellings	Average of 50-60 dwellings	
TOTAL Dwelling Demand (kWh/year)		82500		

SETTLEMENT TOTAL ENERGY BALANCE				
Number of greenhouses	9	greenhouses		

PRODUCTION	
Community buildings production (kWh/year)	92555.65
BIPV greenhouses total (kWh/year)	176814.078
TOTAL PRODUCTION (kWh/year)	269369.728

CONSUMPTION	
Community buildings consumption (kWh/year)	90500
Dwellings consumption (kWh/year)	82500
TOTAL CONSUMPTION (kWh/year)	173000

BALANCE	
Surplus (kWh/year)	269369.728
→ Shared car charging (5 cars × 75 kWh × 100 cycles/year)	37500
→ Net export to grid (kWh/year)	231869.728
Ratio production / consumption	1.6x
Settlement status	ENERGY POSITIVE ✓

APPENDIX IV. STRUCTURAL SYSTEM

Structural System

The structural system of the dwelling is based entirely on cross-laminated timber (CLT), chosen for its biobased character, prefabrication potential, and compatibility with dry assembly principles. Every element — columns, floor strips, and roof strips — is produced in CLT and assembled on site without adhesives or concrete, making the structure fully demountable at the end of its life.

Columns

The columns have a hexagonal cross-section, chosen for its direct geometric compatibility with the hexagonal dwelling typology. A hexagonal column section aligns naturally with the angles of the facade and interior walls, eliminating the need for custom angular connectors and significantly simplifying the connection details.

Two column sizes are used across the settlement:

- **Small column : 180mm point-to-point:** used for columns carrying only the floor or roof load of the dwelling, without the greenhouse spants above
- **Large column : 250mm point-to-point:** used for columns that also carry the greenhouse spants, which introduce significantly higher loads

All columns rest on steel screw piles driven into the peat without excavation or concrete, ensuring a fully dry and demountable foundation system.

Floor and Roof Structure

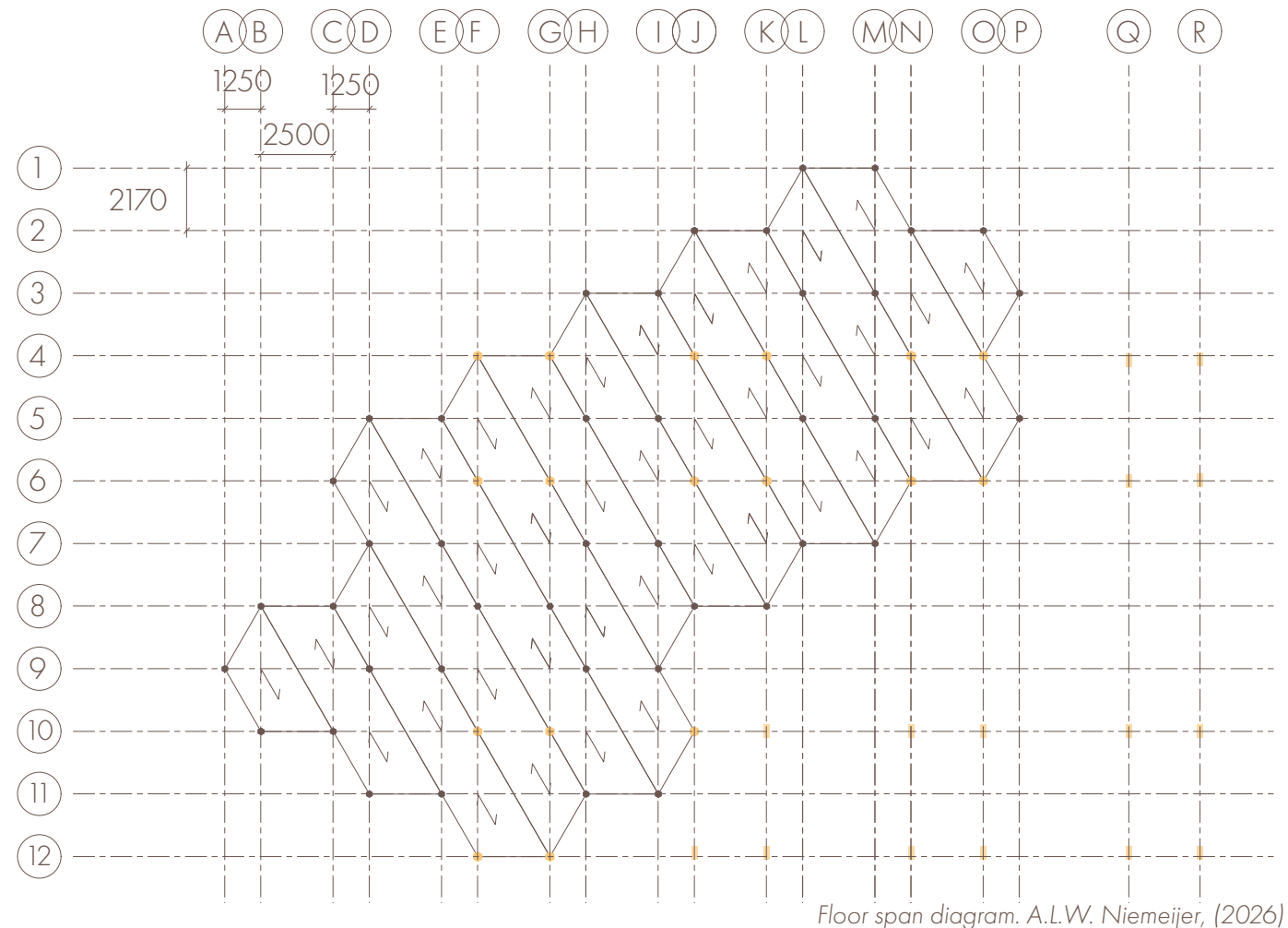
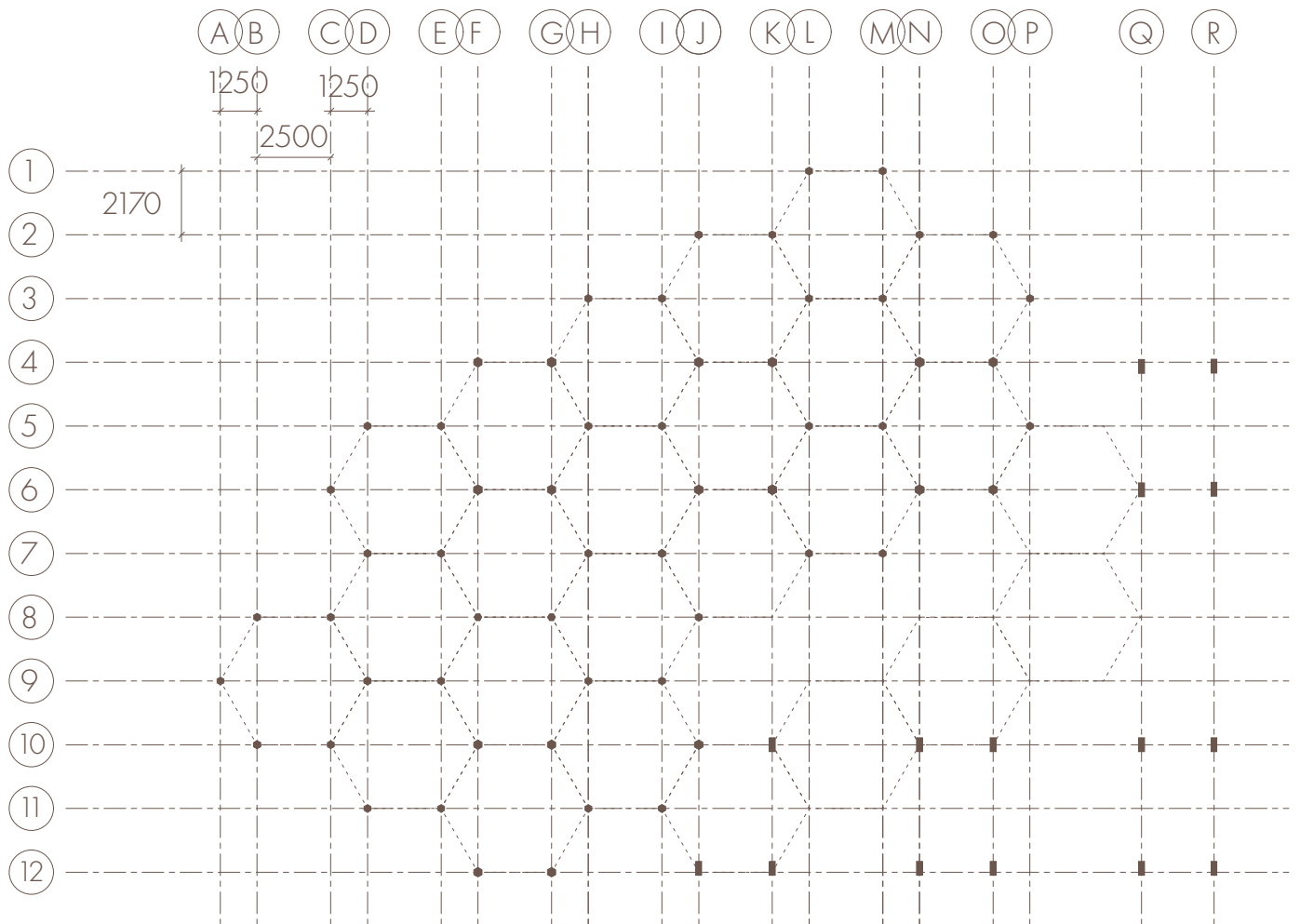
Rather than cutting individual CLT panels to

the hexagonal shape of each unit, the floor and roof are constructed from long CLT strips in the form of half-hexagons, with a fixed width of 2,165mm and a variable length depending on the dwelling configuration. These strips run continuously across multiple hexagonal units, spanning from column to column. This approach reduces the number of individual elements, speeds up assembly, minimises cutting waste, and produces a more efficient structural system overall. The strips are placed side by side to form the complete floor or roof surface, with connections between strips made with dry metal fasteners.

Connections

All structural connections are dry, bolted or screwed. Column-to-foundation connections use steel shoes bolted to the screw piles. Floor and roof strips bear directly on the hexagonal columns and are secured with steel angle brackets. The greenhouse spants bear on the large columns via steel crown connectors. This dry assembly logic means the entire structure can be disassembled in reverse order — greenhouse first, then roof, then floor, then columns, then screw piles — leaving the ground undisturbed.

**Note : Column dimensions are indicative and based on preliminary load calculations. Final dimensioning to be confirmed by a structural engineer in accordance with NEN-EN 1995 (Eurocode 5).*



KOLOM

(SERRE + DAK)

(SPANT) SERRE DAK $142,8 / 2 = 71 \text{ kN}$
 EIGE GEWICHT $5,7 / 2 \sim 3 \text{ kN}$
 DAKTERRAS $6,9 \text{ m}^2 \times 7,80 \text{ kN/m}^2 \sim 18 \text{ kN}$
 EIGE GEWICHT KOLOM 2 kN
TOTAAL 94 kN
 $200 \times 1 \text{ mm}$

KOLOM

(zonder serre)

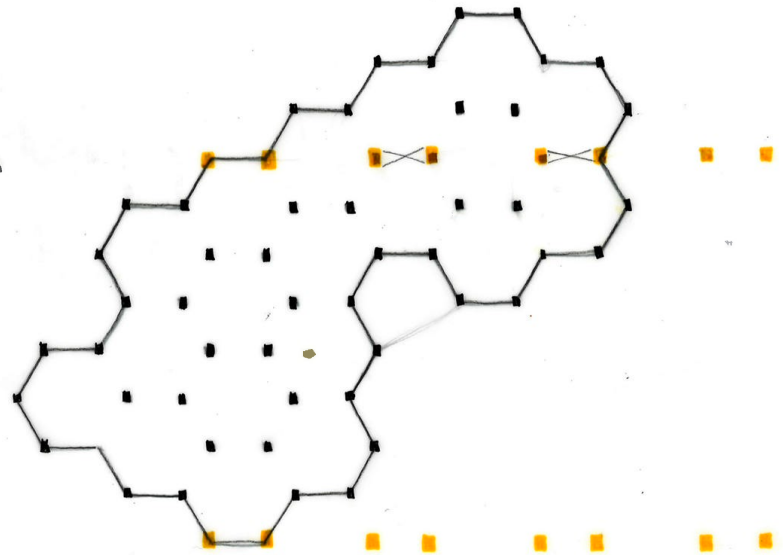
HELOFYTENFILTER $\sim 6 \text{ kN/m}^2$

DAK STRUCTUUR $1,0 \text{ kN/m}^2 \times 6,9 \text{ m}^2 = 6,9 \text{ kN}$
 HELOFYTENFILTER $2,5 \text{ kN/m}^2 \times 6,9 \text{ m}^2 = 17,25 \text{ kN}$
 GROEN DAK SUBSTRAAT $1,5 \text{ kN/m}^2 \times 6,9 \text{ m}^2 = 10,35 \text{ kN}$
 SNEEUW $0,7 \text{ kN/m}^2 \times 6,9 \text{ m}^2 = 4,83 \text{ kN}$
 ONDERHOUD $0,5 \text{ kN/m}^2 \times 6,9 = 3,45 \text{ kN}$
TOTAAL 42,78 kN

DAKERRAS LEEFRUIMTE $\sim 7 \text{ kN/m}^2$

DAK STRUCTUUR $1,0 \text{ kN/m}^2 \times 6,9 \text{ kN} = 6,9 \text{ kN}$
 TEELTBARKEN+AARDE $3,5 \text{ kN/m}^2 \times 6,9 \text{ kN} = 24,15 \text{ kN}$
 PERSON / GEBRUIK $1,5 \text{ kN/m}^2 \times 6,9 \text{ kN} = 10,4 \text{ kN}$
 MEUBEUS/MATERIAL $0,5 \text{ kN/m}^2 \times 6,9 \text{ kN} = 3,45 \text{ kN}$
TOTAAL 44,9 kN

KOLOM GULAM
 $140 \times 140 \text{ mm}$

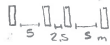


WIND VERBAND

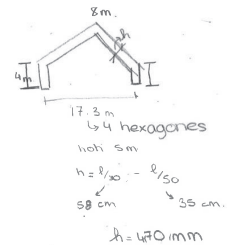
↳ in smalle ruimte
 ↳ door tot Rail=0
 ↳ dus geen opening
 in wind.

RYTHM

Follow hexagone

 $h=0,4h = 5 \text{ m of } 2,5 \text{ m}$

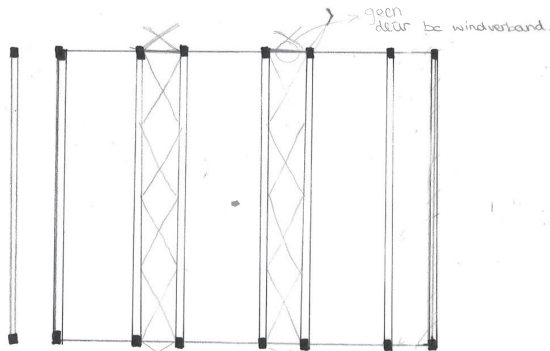
↳ midden kolom
 sat. croisement.

ASTING OP HET DAKVLAK
AN DE SERRE

glas (30-40 kg/m²) $0,38 \text{ kN/m}^2$
 rielen (40-45 kg/m²) $0,43 \text{ kN/m}^2$
 rium constructie $0,15 \text{ kN/m}^2$
 lashing $0,50 \text{ kN/m}^2$
 n houd $0,70 \text{ kN/m}^2$
 0,50 kN/m²
TOTAAL 2,20 kN/m²

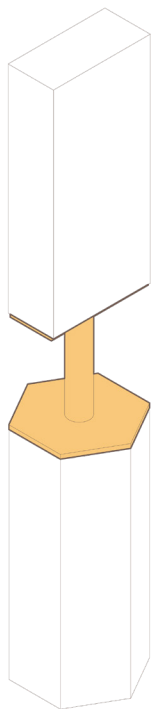
NG DER SPANT

DAK $64,9 \text{ m}^2 \times 2,2 \text{ kN/m}^2 = 142,8 \text{ kN}$
 ENICHT $5,7 \text{ kN}$



SPANTEN
 Gulam (gem. gewicht)
 dichtheid $\sim 500 \text{ kg/m}^3 = 5 \text{ kN/m}^3$
 gemiddeld profiel $140 \times 470 \text{ mm}$
 volume per spanten
 $17,3 \text{ m} \times 0,14 \text{ m} \times 0,47 \text{ m} = 1,14 \text{ m}^3$
 gewicht per spant
 $1,14 \times 500 \sim 570 \text{ kg} \rightarrow 5,7 \text{ kN}$
 per spant.

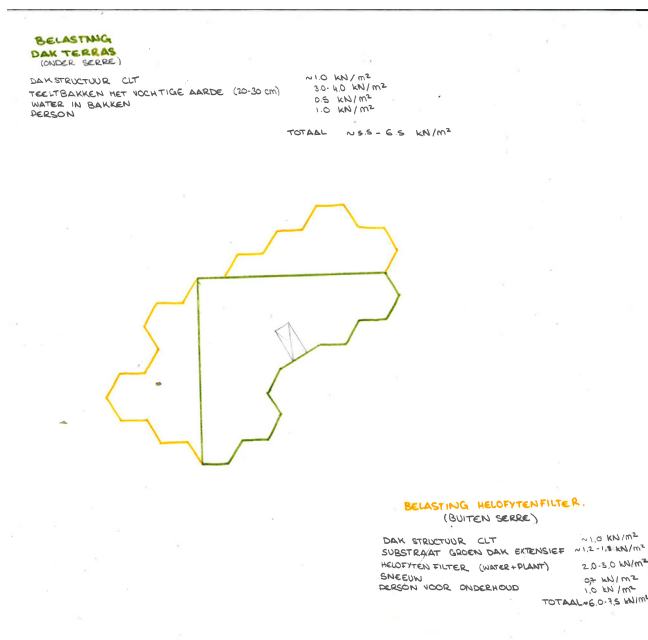
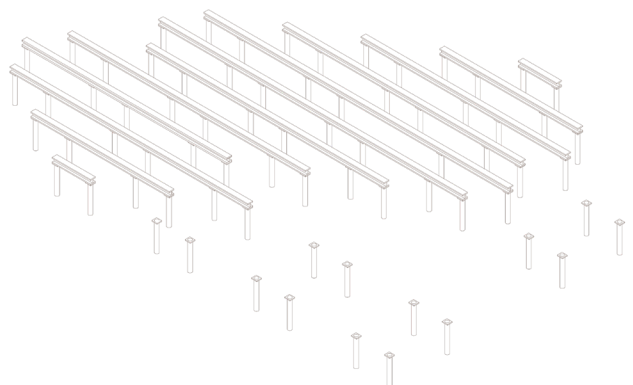
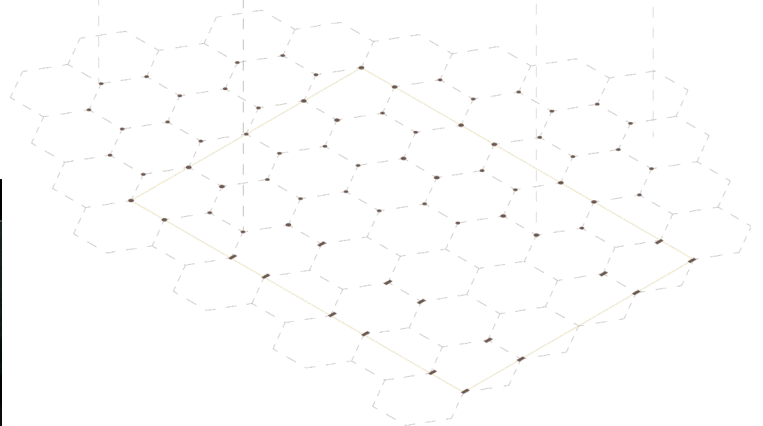
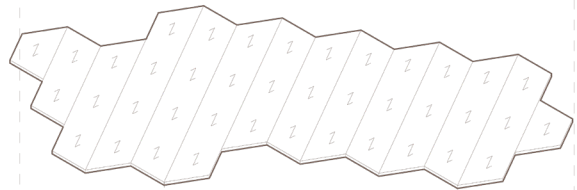
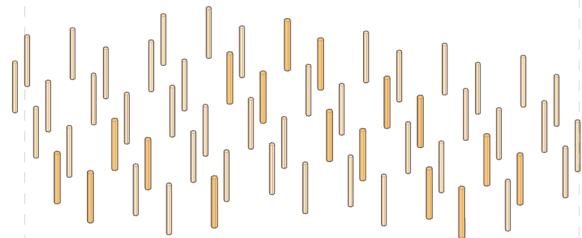
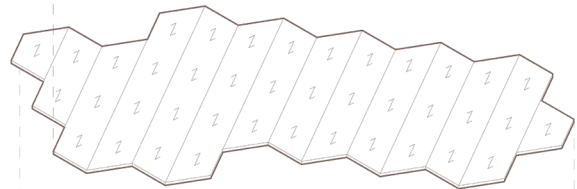
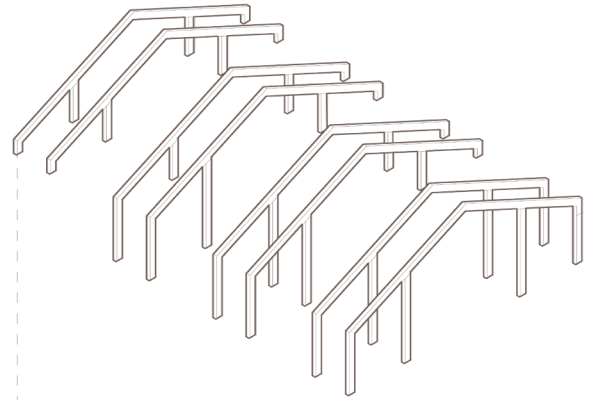
SERRE.



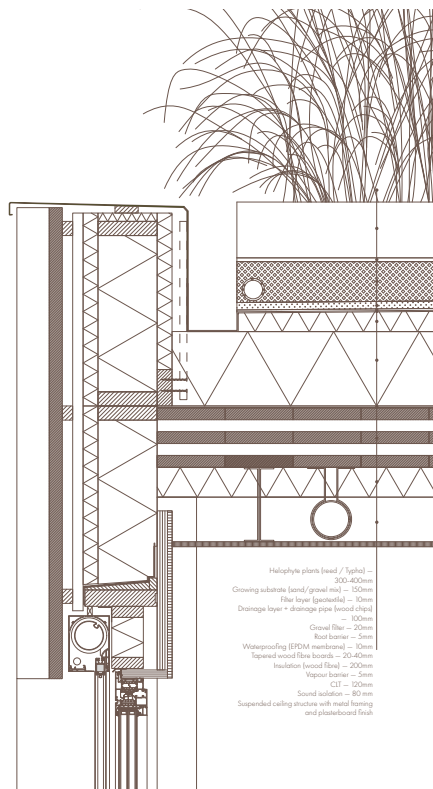
RAFTER greenhouse

STEEL SHOE ('poer')
Steel connection between green-
house rafter to CLT column

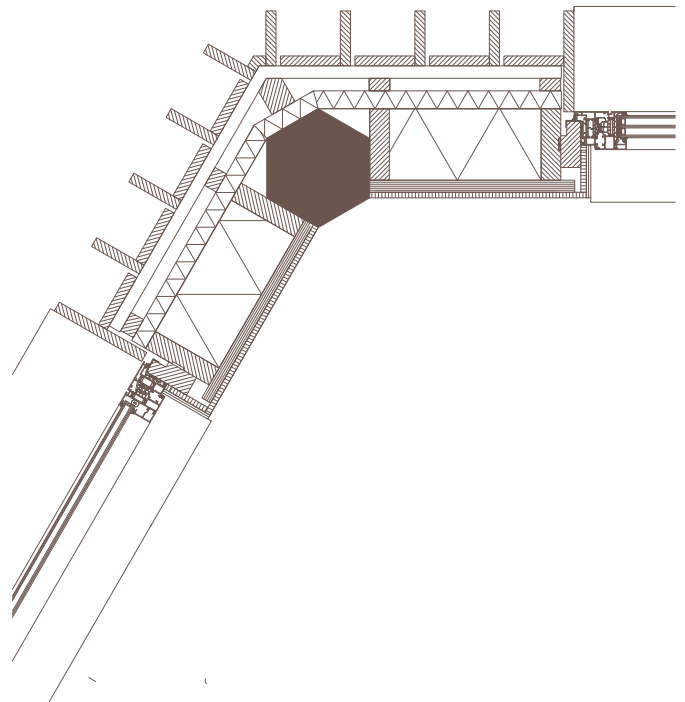
COLUMN inside



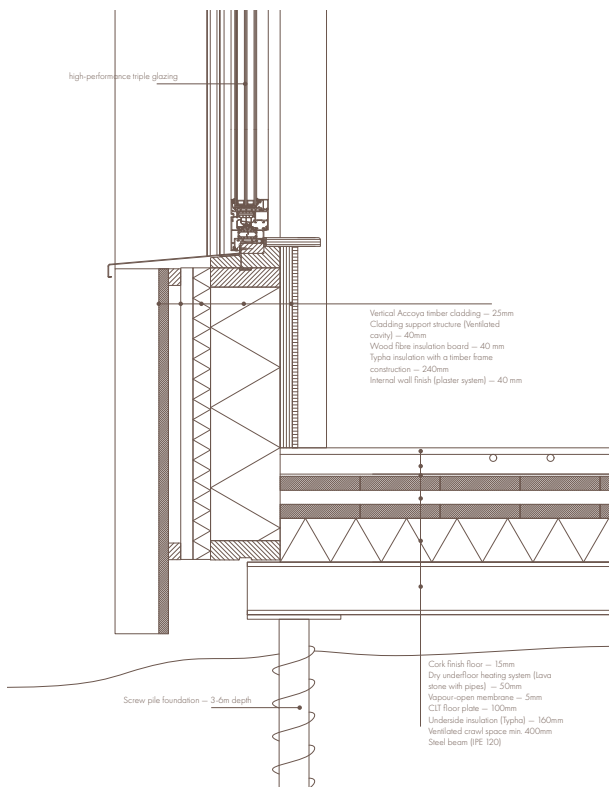
APPENDIX V. CONSTRUCTION DETAILS



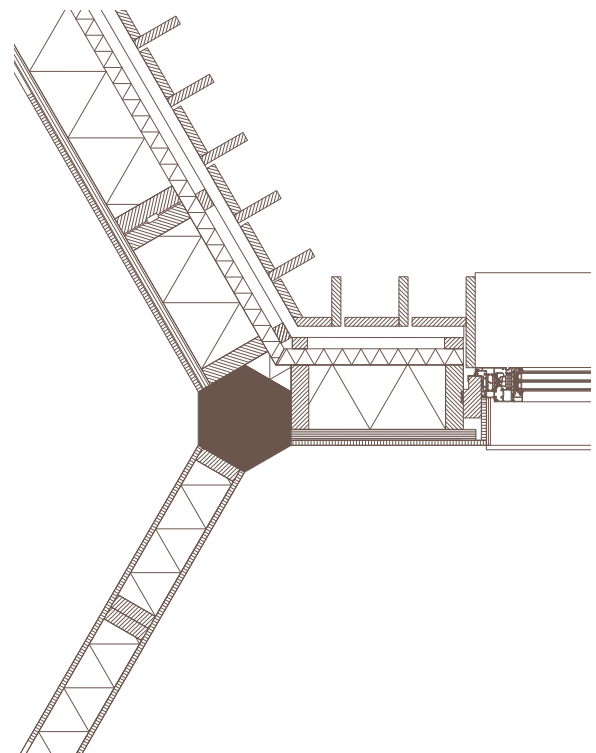
Detail 1:5 Vertical section Roof edge
A.L.W. Niemeijer, (2026)



Detail 1:5 Horizontal section extern angle.
A.L.W. Niemeijer, (2026)

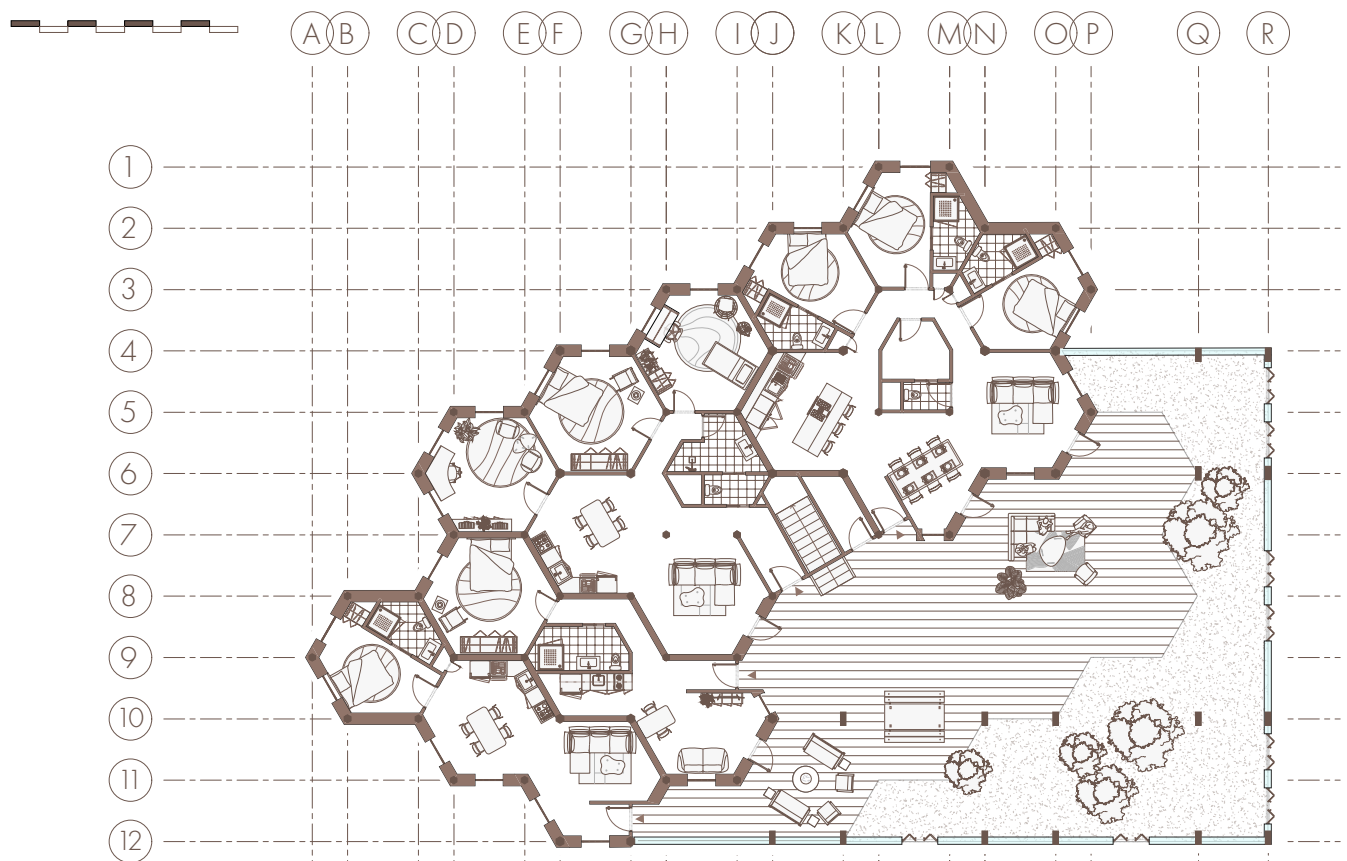


Detail 1:5 Vertical section Foundation
A.L.W. Niemeijer, (2026)

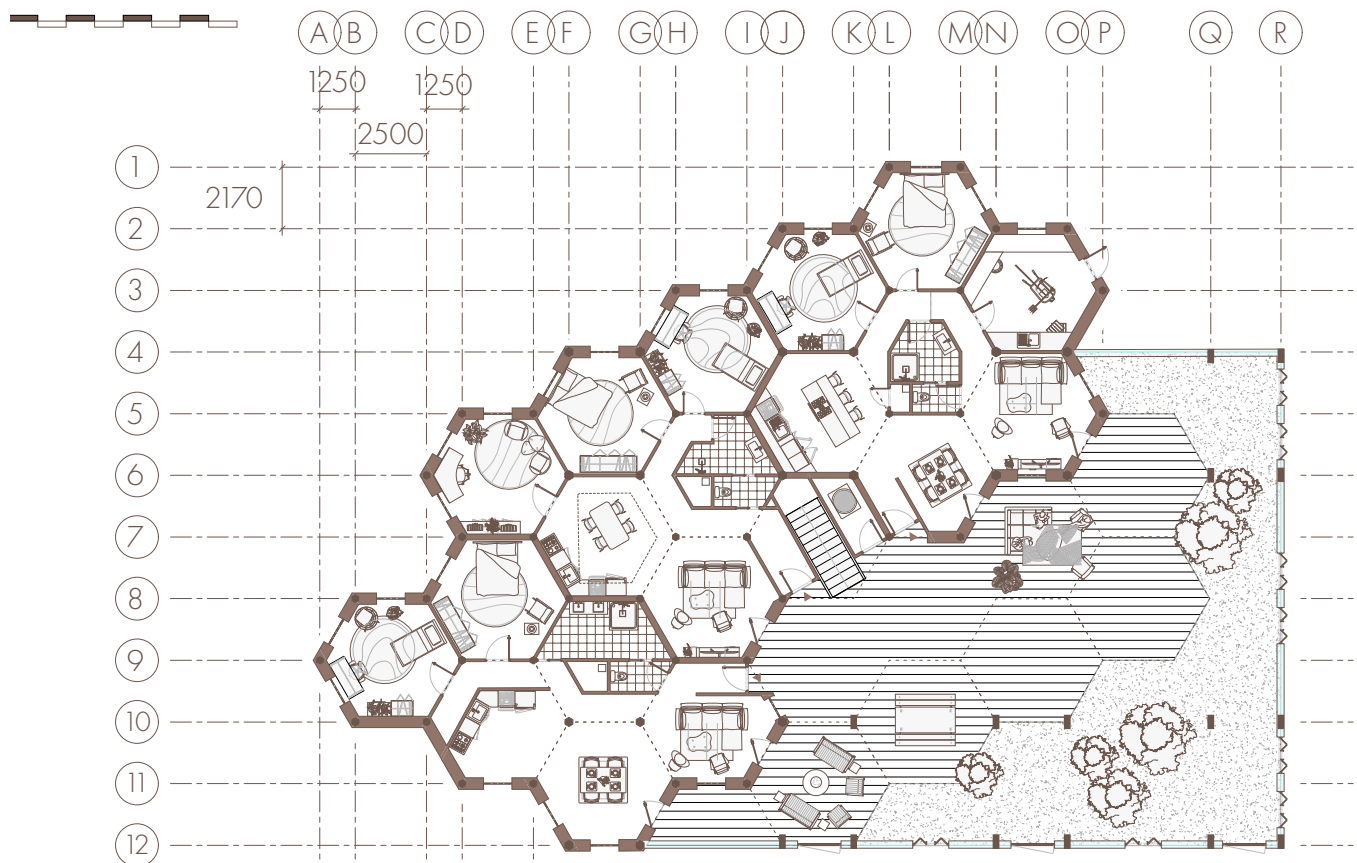


Detail 1:5 Horizontal section intern angle.
A.L.W. Niemeijer, (2026)

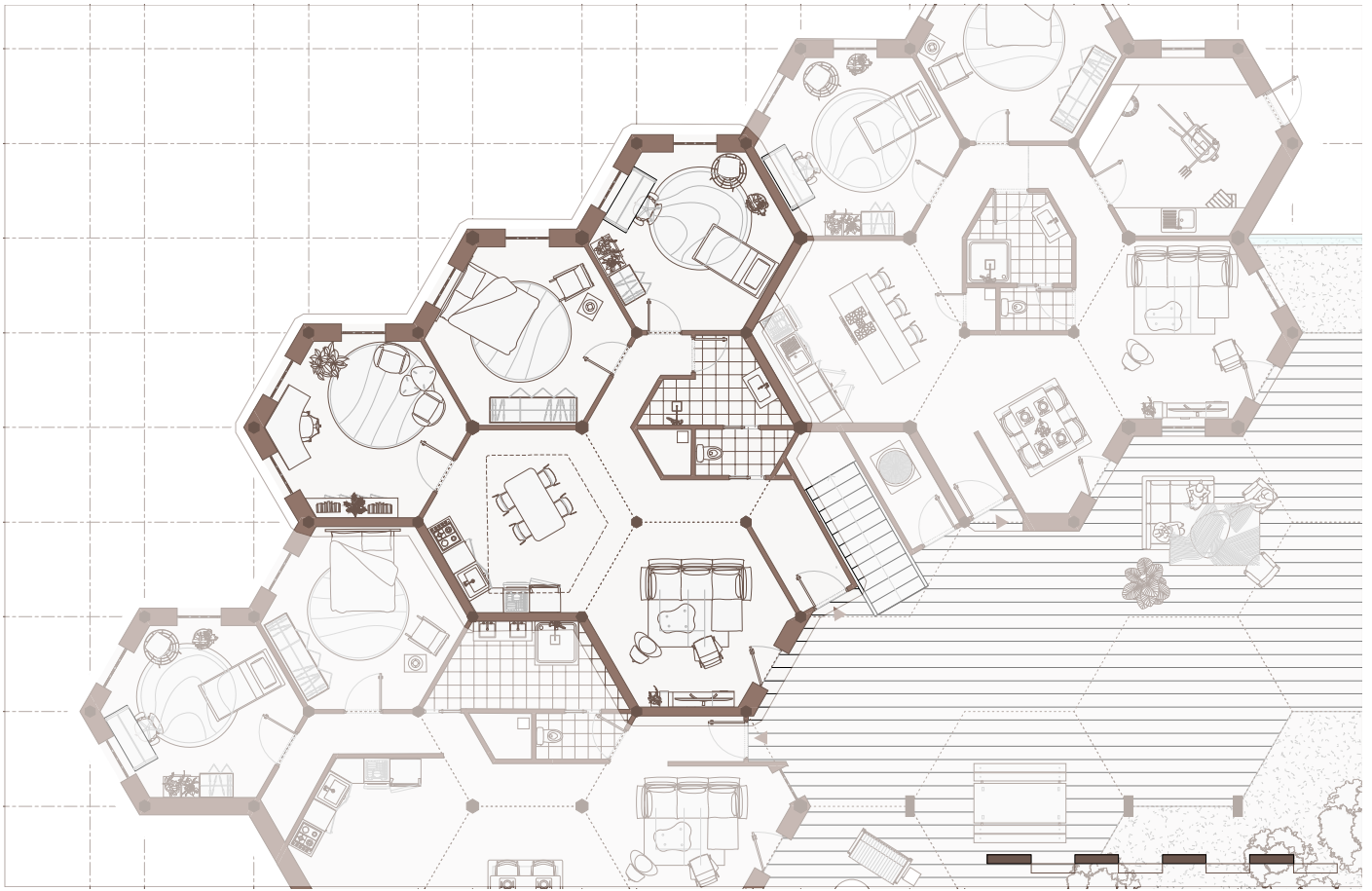
APPENDIX VI. FLOORPLANS



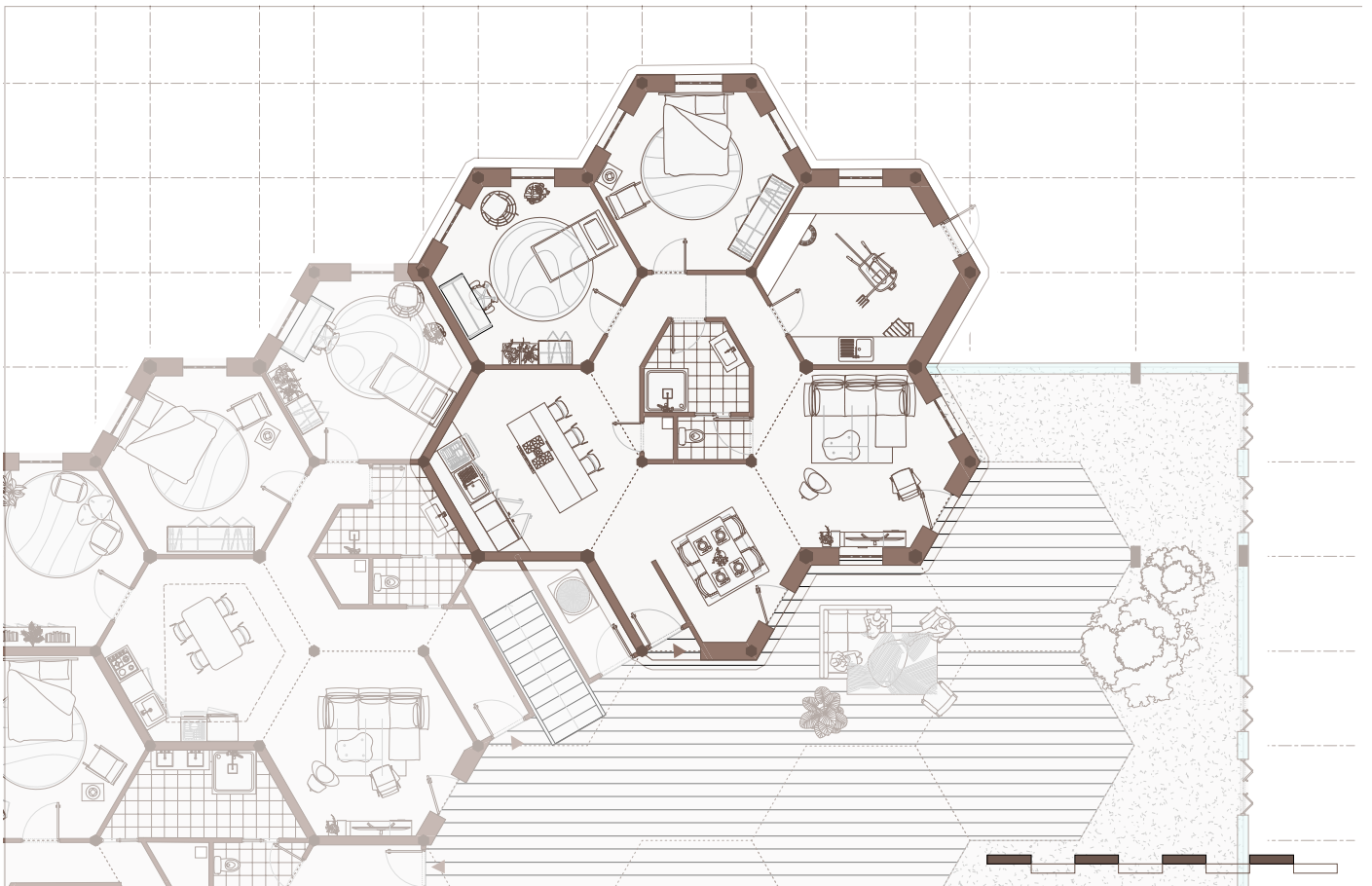
Possible floorplan (1 hybrid resident, 2 studio workers, 3 bedroom workers). A.L.W. Niemeijer, (2026)



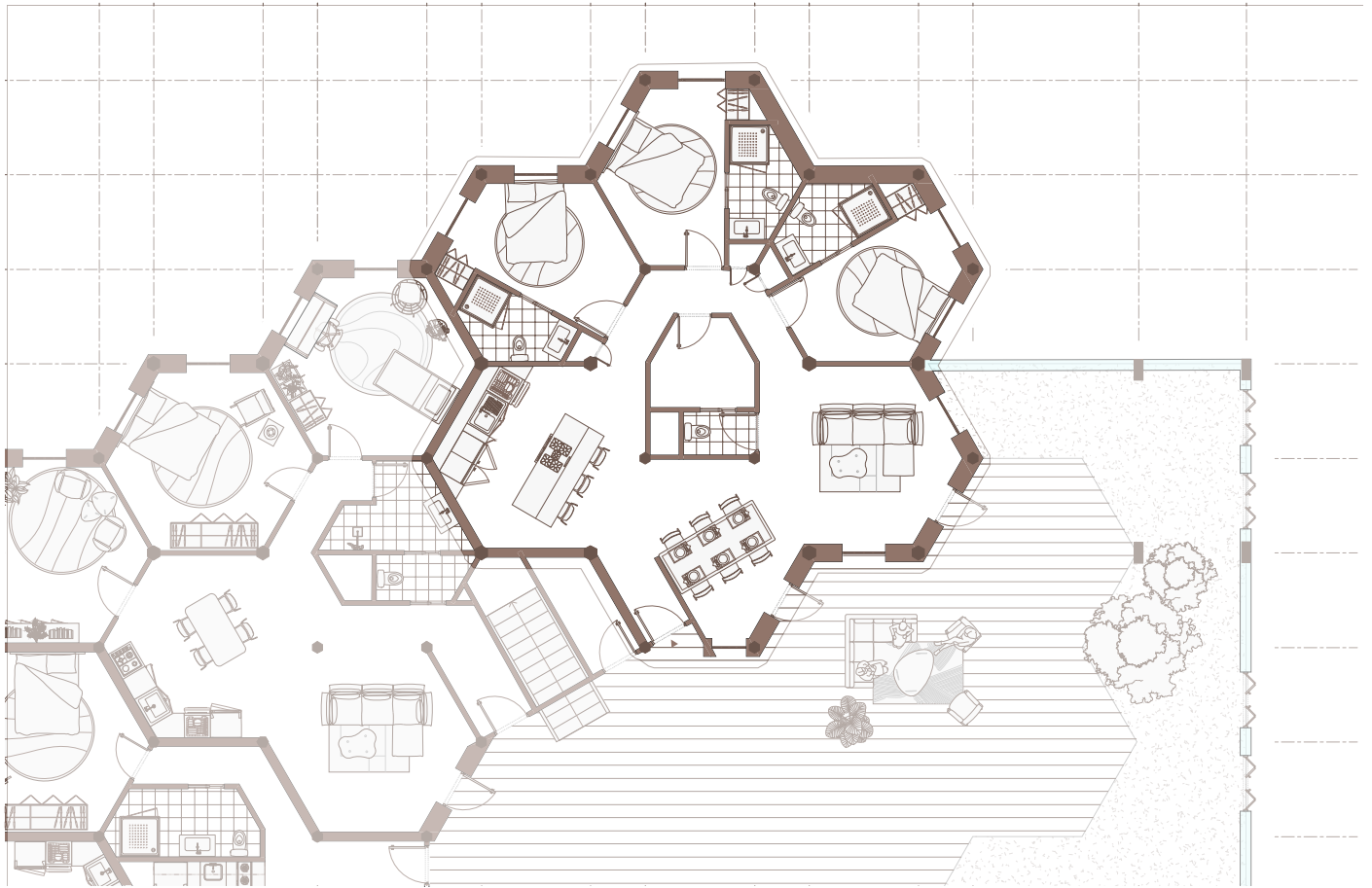
Possible floorplan (2 hybrid resident, 1 farmer). A.L.W. Niemeijer, (2026)



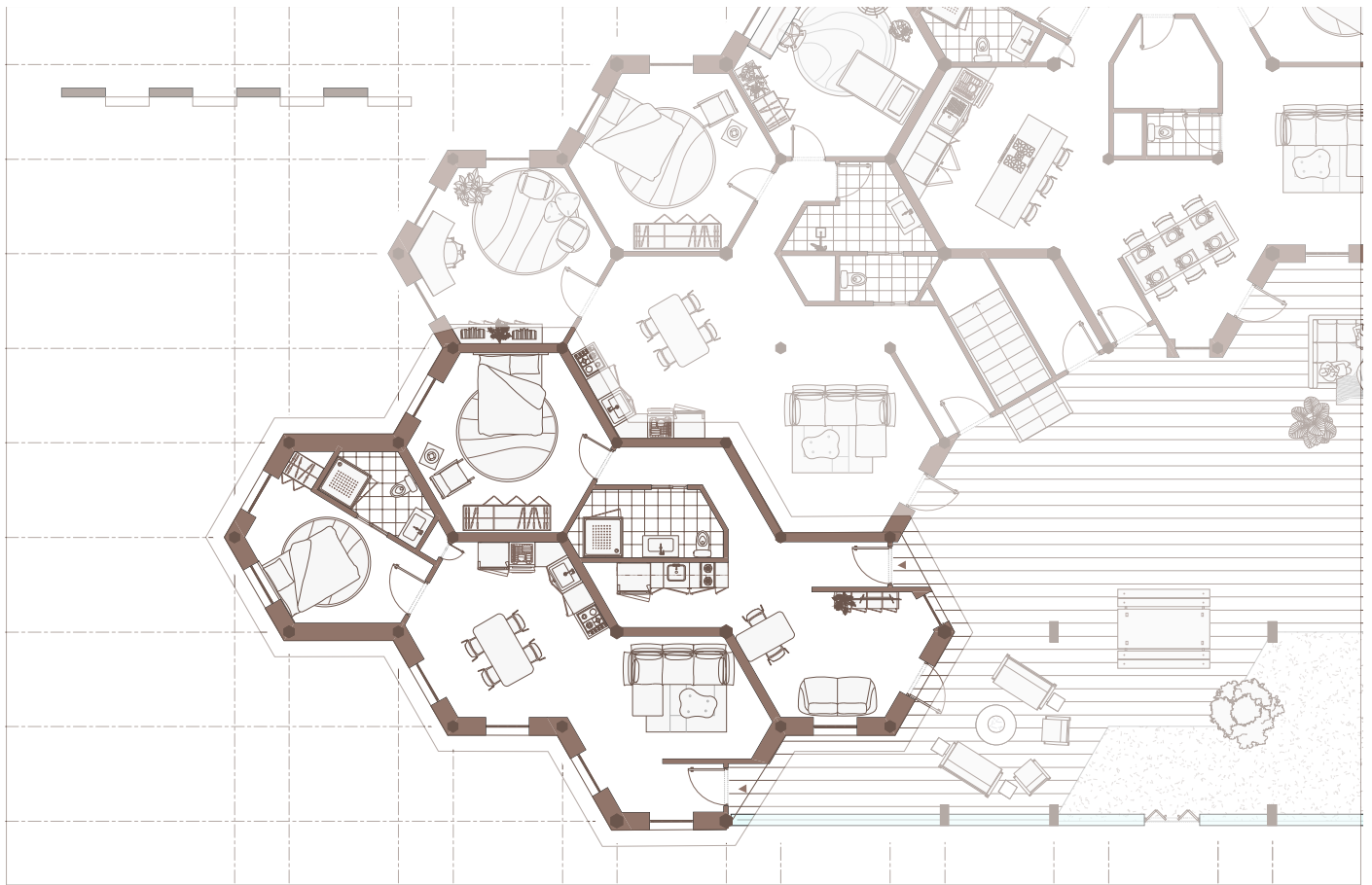
Possible floorplan housing hybrid resident. A.L.W. Niemeijer, (2026)



Possible floorplan housing farmer. A.L.W. Niemeijer, (2026)



Possible floorplan housing workers. A.L.W. Niemeijer, (2026)



Possible floorplan studio workers. A.L.W. Niemeijer, (2026)

APPENDIX VII . GROUP MASTERPLAN



A1 presentation
Graduation studio

AR4AD150 Advanced Housing Design *Ecologies of inclusion*

Amélie Niemeijer, Ara Warten, Floor van Hoor, Floris de Bruijne, Lisa van Dijk, Meike Traa
5089778, 5024129, 6095577, 6172954, 5286026, 5303583

Responsible supervisor
Supervisor

Oliv Klijn
Robbert Guis

June 10, 2026

THE PLAN

Introduction

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Masterplan booklet

[2/71]

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, SWEKO 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.



I	THE PLAN
II	RESEARCH
III	VISION
IV	MASTERPLAN
V	THEMES

THE PLAN

Sustainable environment

The starting point for this group was the theme of sustainable environment. Within this framework, the Midden-Delfland area was analysed, including the municipality's ambitions and the future scenario developed by ZUS, SWECO and FLUX Landscape Architecture in 2022. This scenario, which explores a transformation towards diverse landscape typologies, formed the basis for the development of the masterplan. The Vlietlanden was selected as the project location, as it contains the full range of landscape conditions described in the ZUS proposal. This creates an interesting setting for the project, as traditional building methods will no longer suffice. Therefore, new ways of living, coexisting and community building must be explored.

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.

Masterplan

The masterplan is guided by a set of spatial principles: the natural landscape is leading, water dynamics structure spatial organisation, ecological zones define accessibility and development, and built interventions remain minor to and adaptable within the landscape.

The masterplan is based on a fundamental principle: the natural landscape forms the foundation of all spatial interventions. Elevation differences within the area are used to create overflow zones that respond to extreme weather conditions, such as heavy rainfall, and function as water buffers that can be utilised during periods of drought. Rather than controlling water, the design embraces seasonal fluctuations, allowing lower areas of the Vlietlanden to flood more frequently and operate as dynamic ecological systems. In doing so, the pressure on existing water pumping infrastructure is reduced. The ecological structure is further informed by the existing nesting locations of the black-tailed godwit. These birds return to the same nesting sites annually and are highly sensitive to spatial disturbance. This has led to the designation of inaccessible nature zones, particularly towards the eastern edge of the site where ecological value is already high. These areas are strategically aligned with key sightlines to preserve the

identity and visual openness of the landscape, in accordance with ambitions of the municipality.

Surrounding these protected areas, buffer zones are introduced where limited recreational use is permitted. These zones mediate between strictly protected nature and areas where development is allowed. All spatial interventions are carefully positioned to maintain existing sightlines and landscape continuity.

An organic cellular structure is overlaid onto the landscape, functioning as a spatial framework that organises development zones, accessibility, and ecological areas. This structure enables a flexible approach in which areas can expand or contract over time in response to environmental conditions and social needs, while ensuring that development remains confined within clearly defined boundaries. In this way, urban expansion is controlled and the ecological integrity of the landscape is protected.

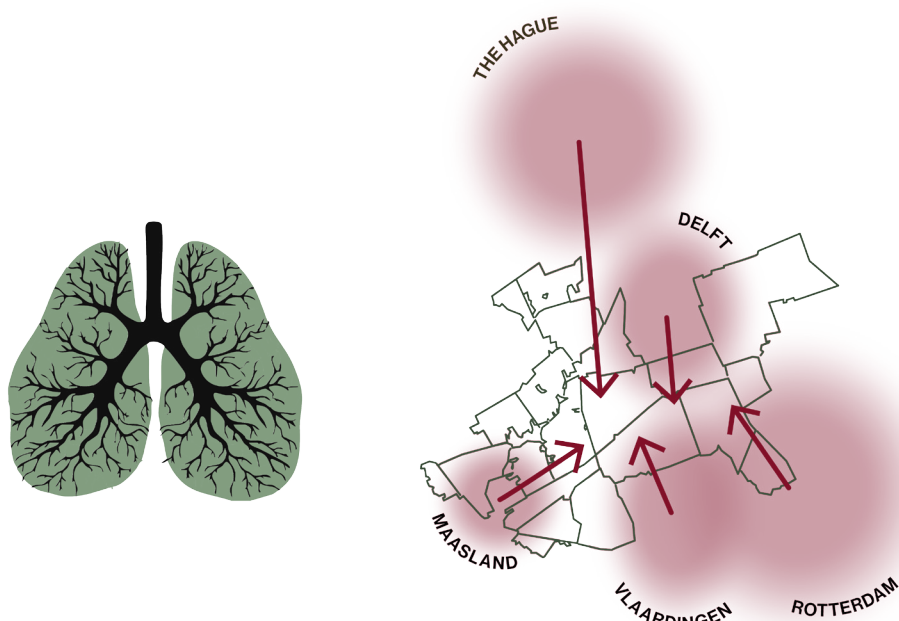
Mobility within the masterplan prioritises slow movement. Cars are treated as guests, only a limited number of routes accommodate vehicle access, while parking is concentrated at the edges of the site. The existing mobility hub is reinforced and expanded to support public transport and cycling infrastructure, encouraging alternative modes of transport.

Together, these strategies establish a spatial framework in which ecological performance is prioritised, while enabling new forms of inhabitation that are embedded within the dynamics of the landscape.

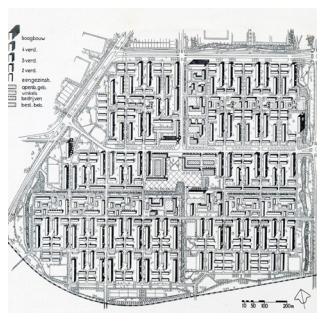
Themes

Each group member uses the masterplan as a foundation to explore a specific aspect of living within this landscape through one of the following themes: biodiversity, healthcare, work, education, recreation, or production. These thematic explorations act as repeating layers on top of the masterplan. While small adjustments to the spatial configuration are possible, they must remain consistent with the core principles of the masterplan.

The objective is to develop a comprehensive understanding of how different societal functions can be integrated within this framework, ultimately contributing to a refined and cohesive vision for a new way of living in which ecological, social, and spatial systems are in balance.



**THE GREEN LUNG IS UNDER PRESSURE FROM
BUILDINGS, RECREATION AND PEOPLE**



Pendrecht, Rotterdam



Stedenwijk Noord, Almere stad



Ypenburg, Den Haag



Marktkwartier West, Amsterdam

Wederopbouw
1940 - 1965

Flevopolder
1950 - 1986

VINEX
1995 - 2005

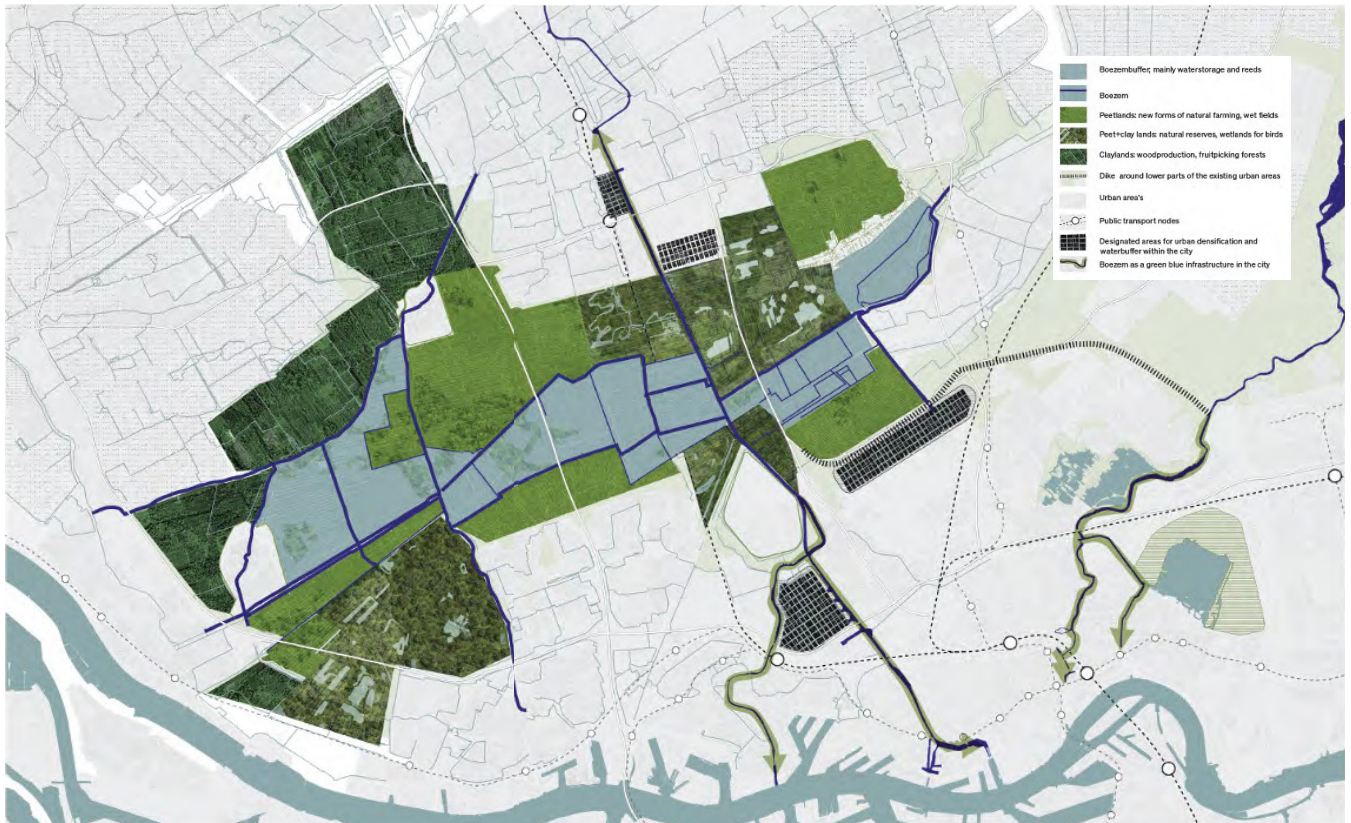
Modern urbanism
2005 - now

RESEARCH

Plan by ZUS

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Masterplan booklet

[9/71]



RESEARCH

Sustainable environment

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Masterplan booklet

[10/71]

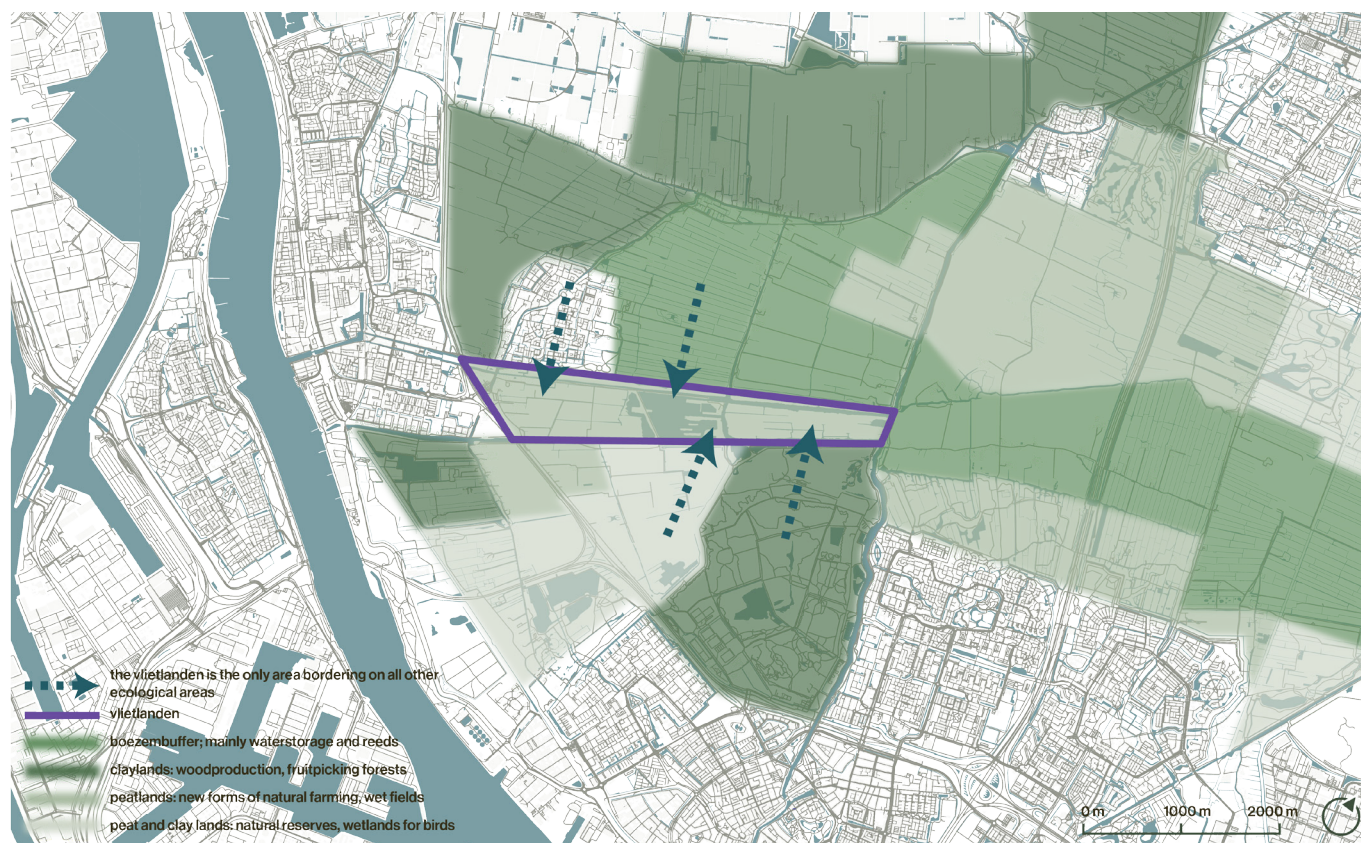
Designing a new way of living that creates a healthy and sustainable society, where sustainability goes beyond technical solutions such as solar panels and actively contributes to the restoration of biodiversity and natural systems

RESEARCH

Vlietlanden ZUS

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[11/71]

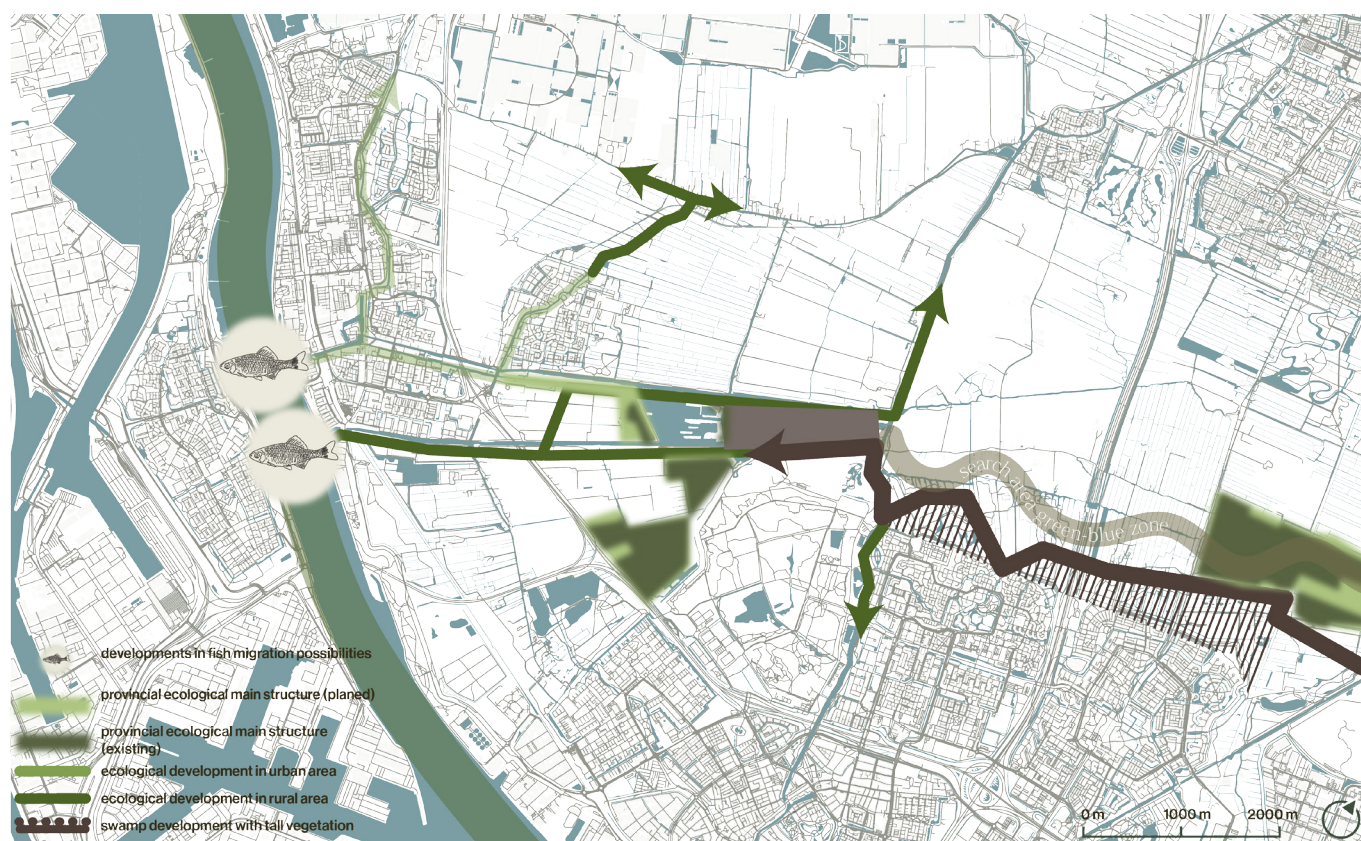


RESEARCH

Natural networks

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Masterplan booklet

[12/71]

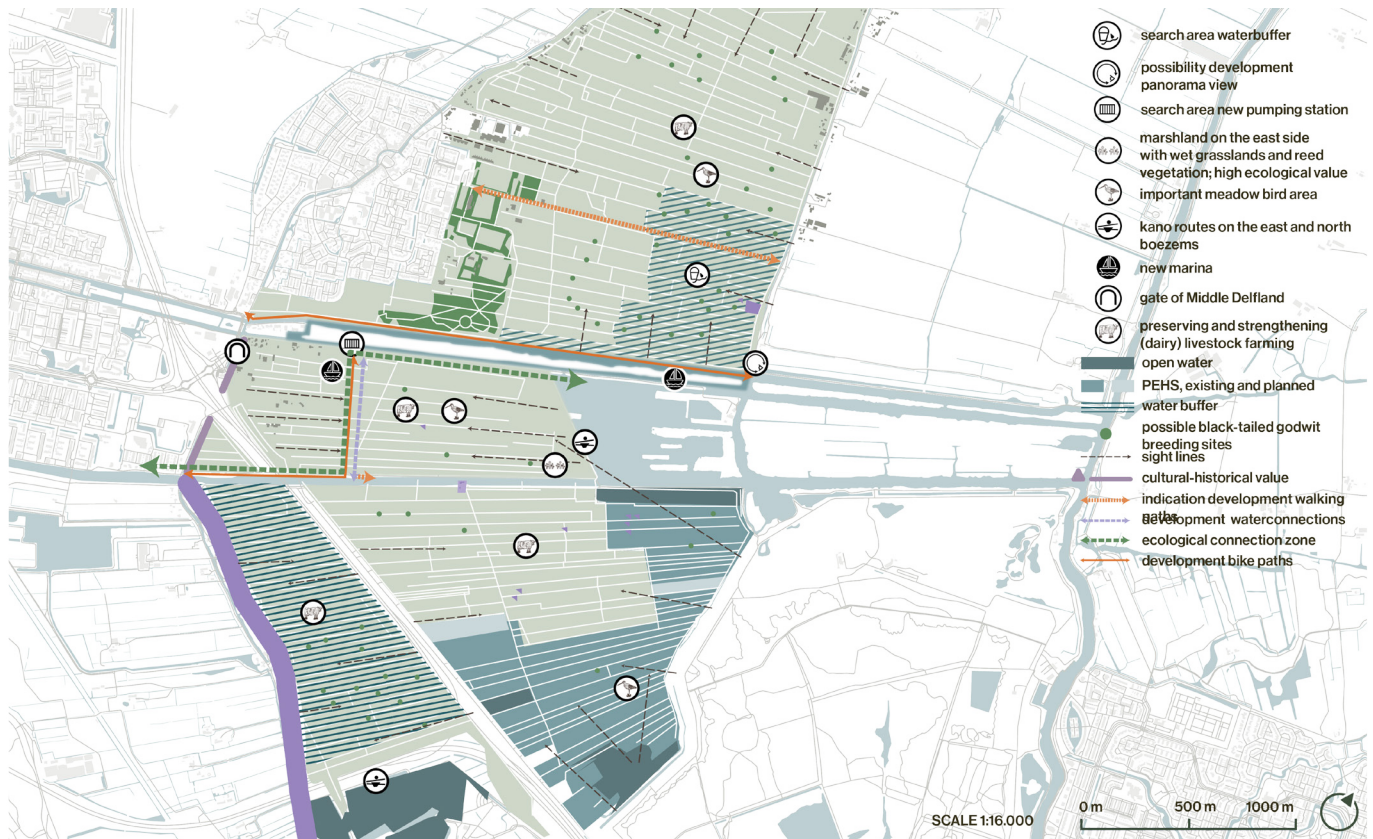


RESEARCH

Vision municipality Midden-Delfland

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Masterplan booklet

[13/71]

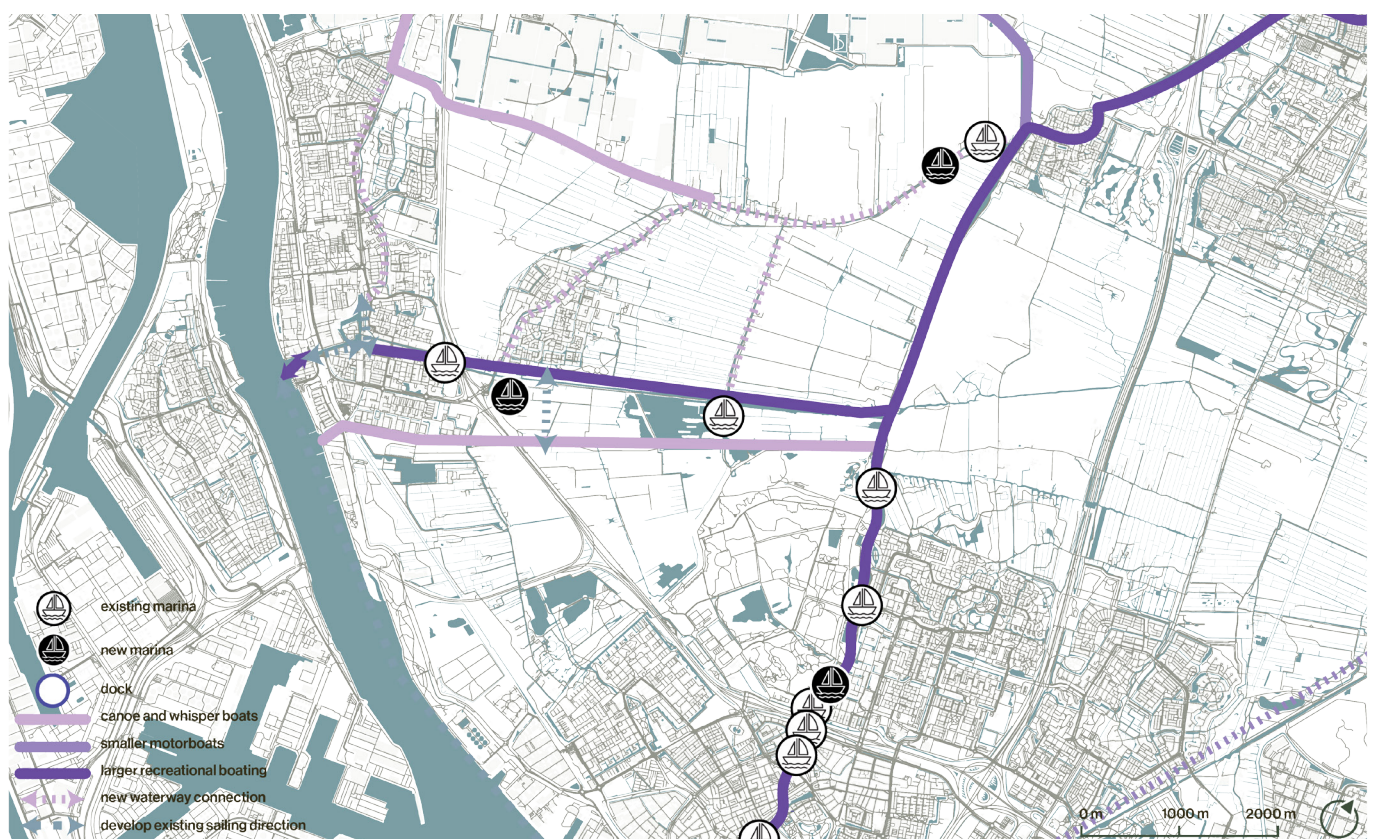


RESEARCH

Water recreation

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Masterplan booklet

[14/71]

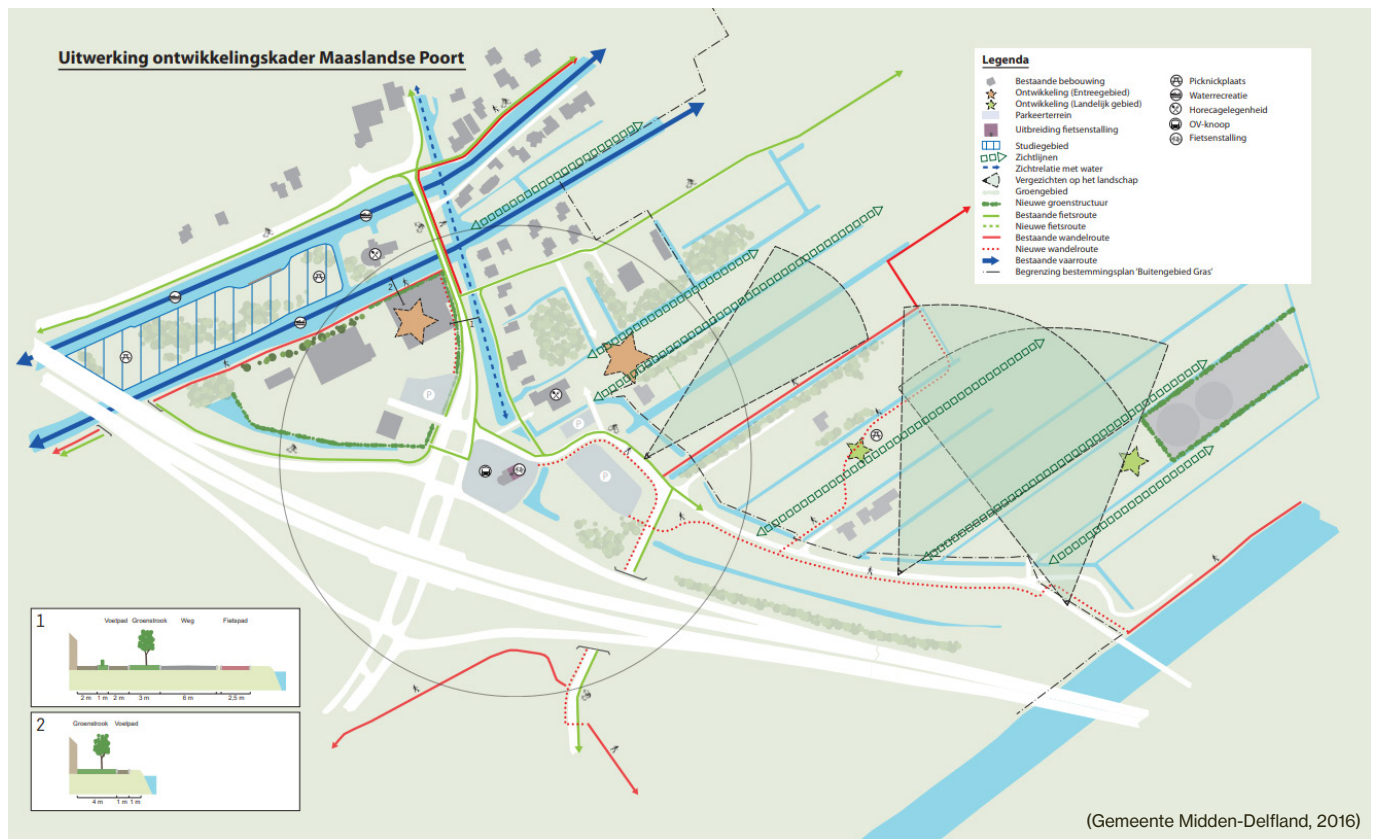


RESEARCH

Maaslandse Poort by municipality Midden-Delfland

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[15/71]



VISION

“A healthy living environment for people and nature, where humans, animals and natural systems are functioning in balance. A community is being formed here, where everyone plays their part in striving for this healthy living environment. This project is a pilot in nature driven approaches to production, health care, recreation, work, education, biodiversity and water in the built environment.”

VISION

Six pillars of a healthy living environment

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[18/71]



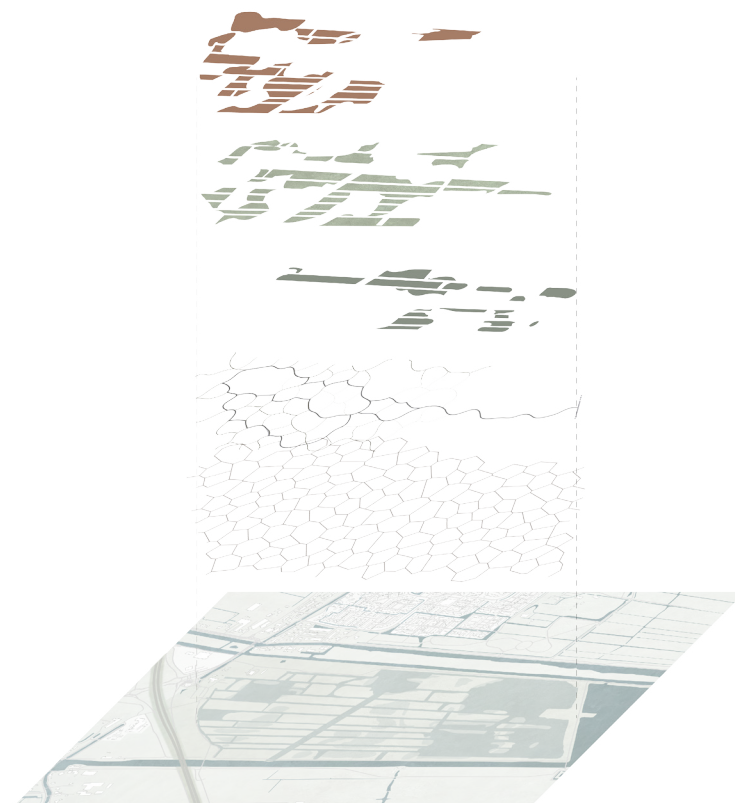
MASTERPLAN

MASTERPLAN

Build up

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[20/71]

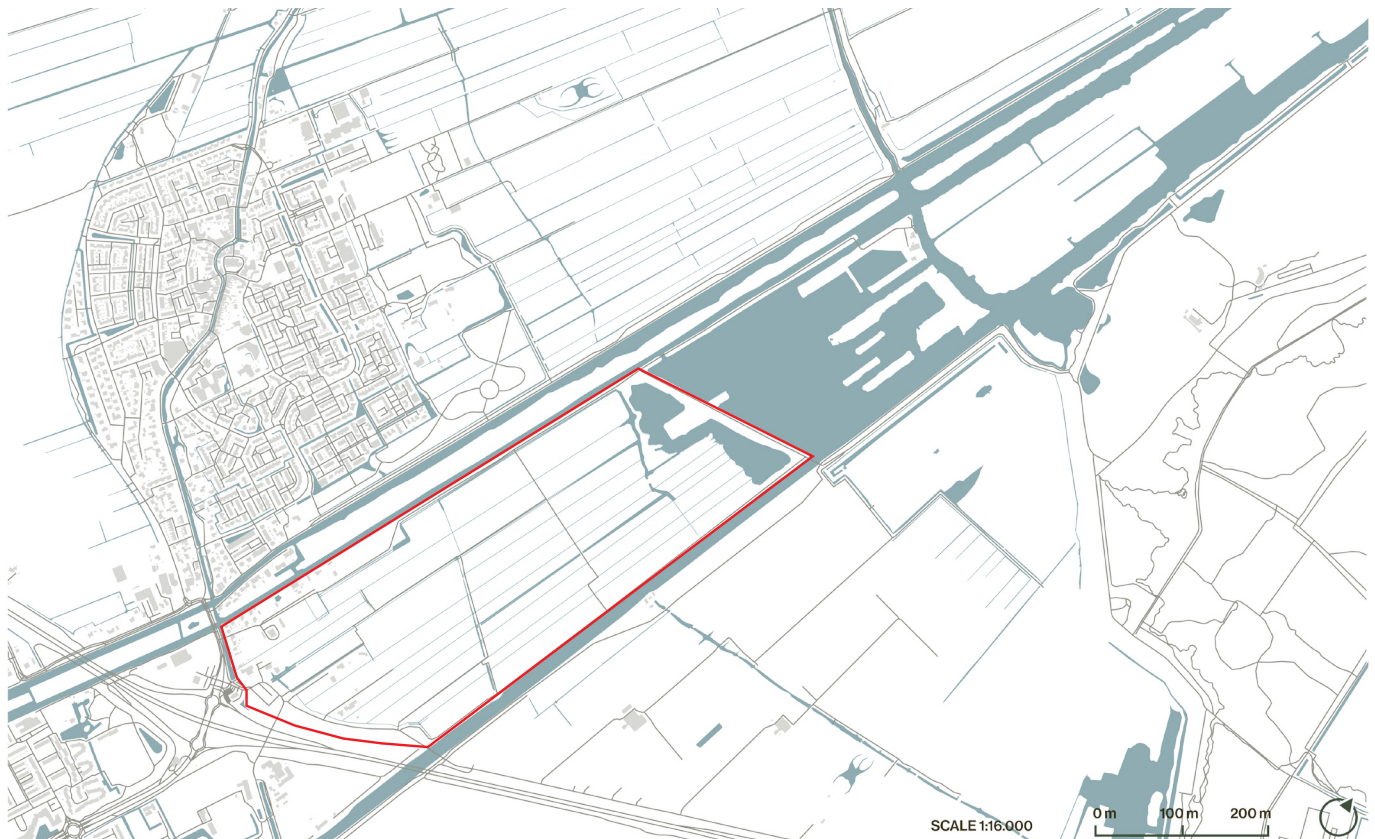


MASTERPLAN

Current situation

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Masterplan booklet

[21/71]



MASTERPLAN

Historic polder structure 19th century

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Masterplan booklet

[22/71]

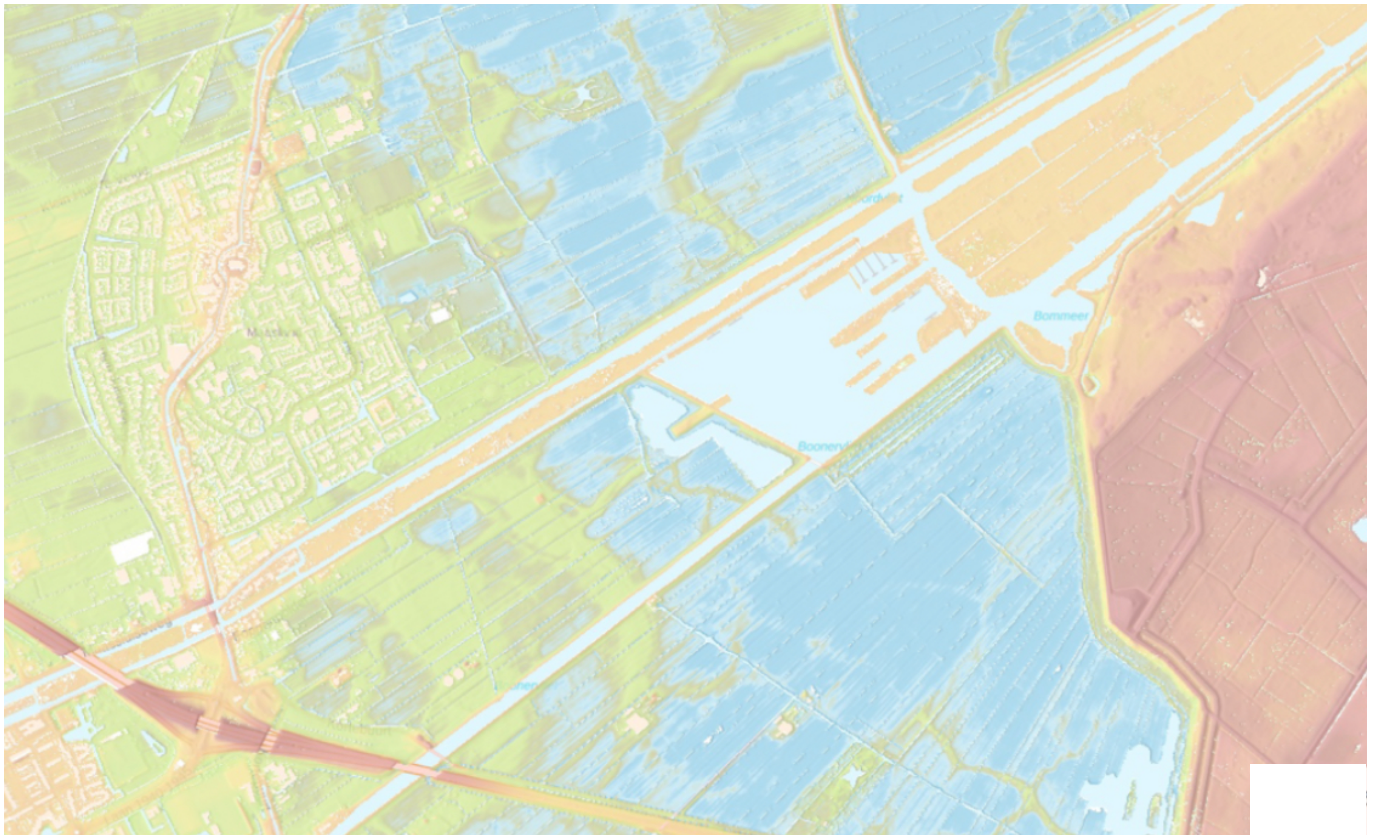


MASTERPLAN

Height map Foppenpolder

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Masterplan booklet

[23/71]

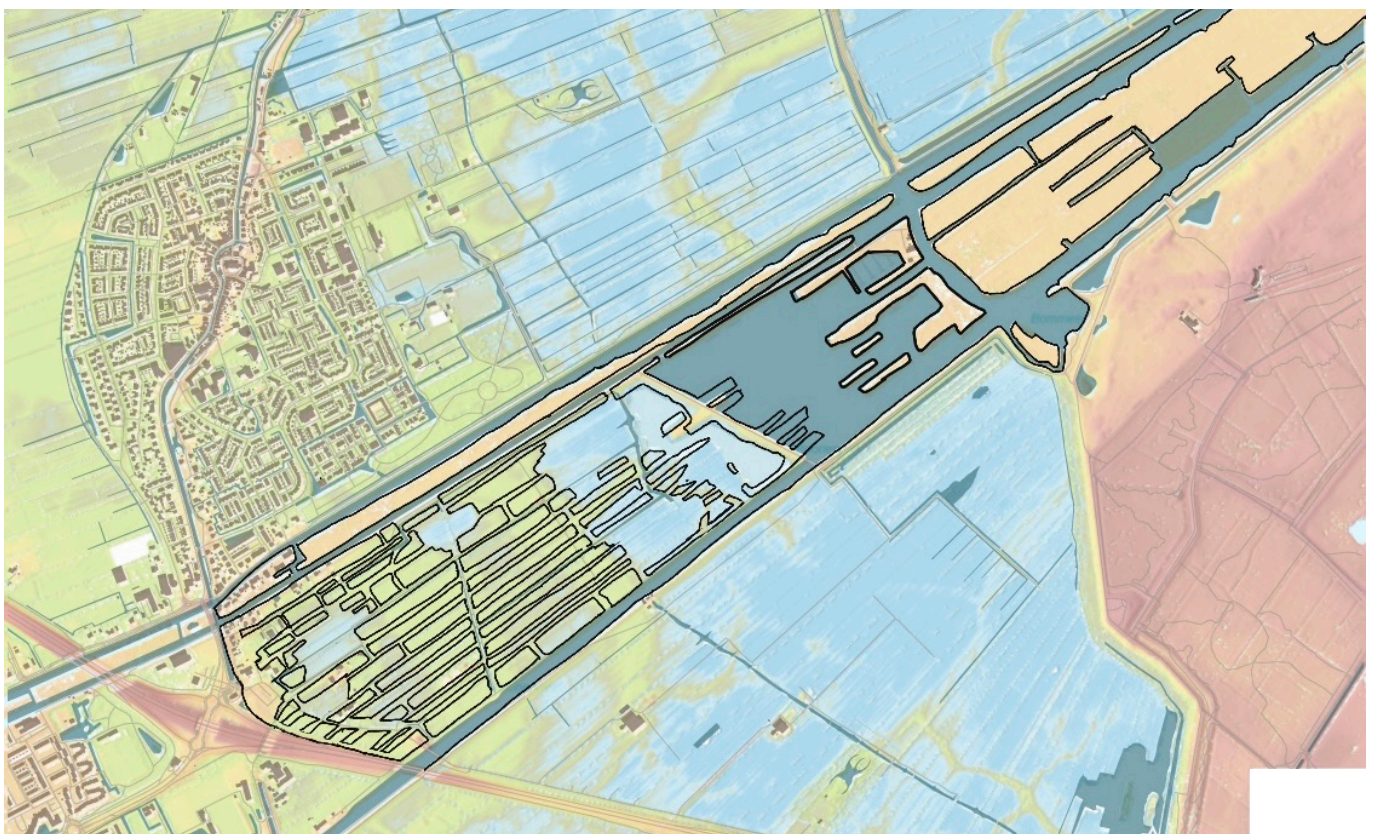


MASTERPLAN

Height map Foppenpolder/New landscape

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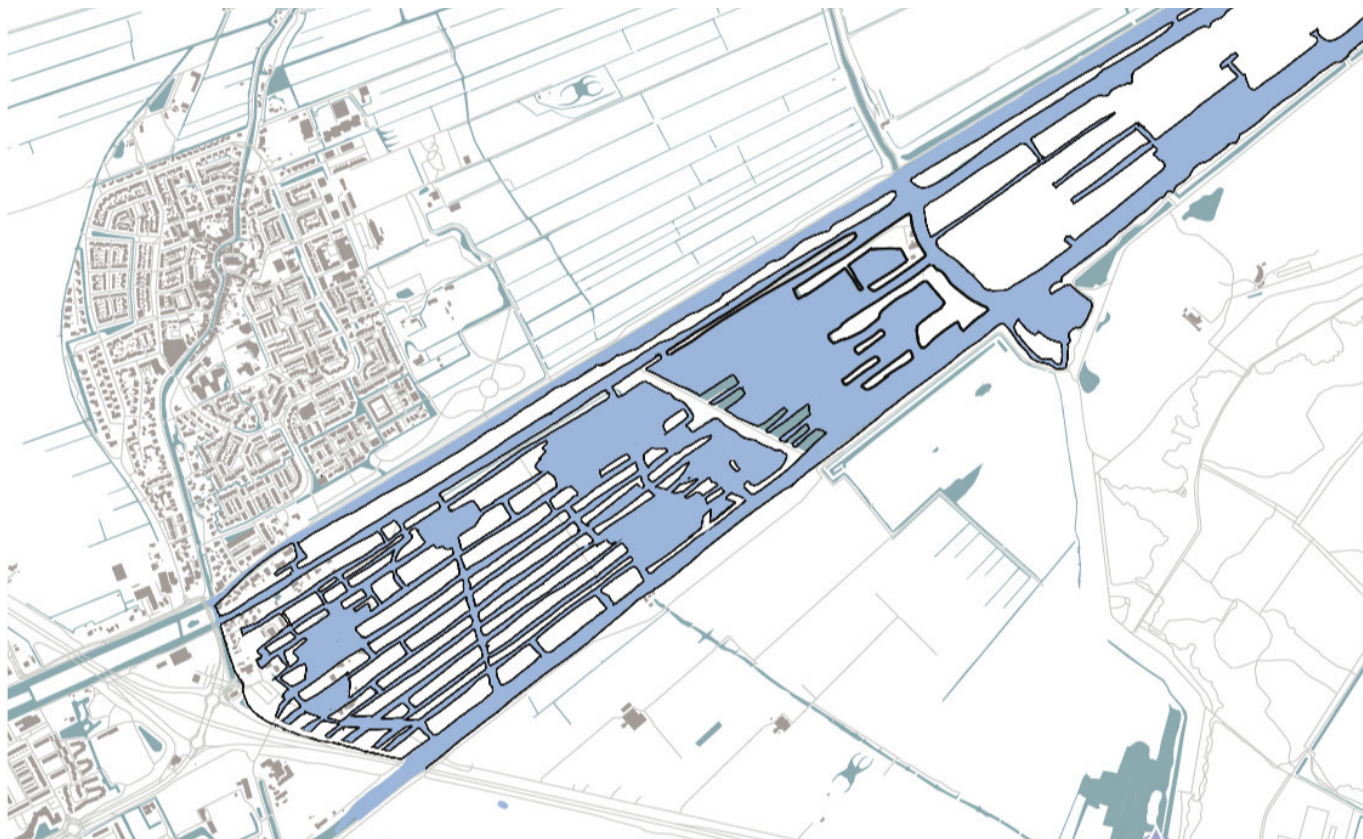
[24/71]



MASTERPLAN
New landscape sketch

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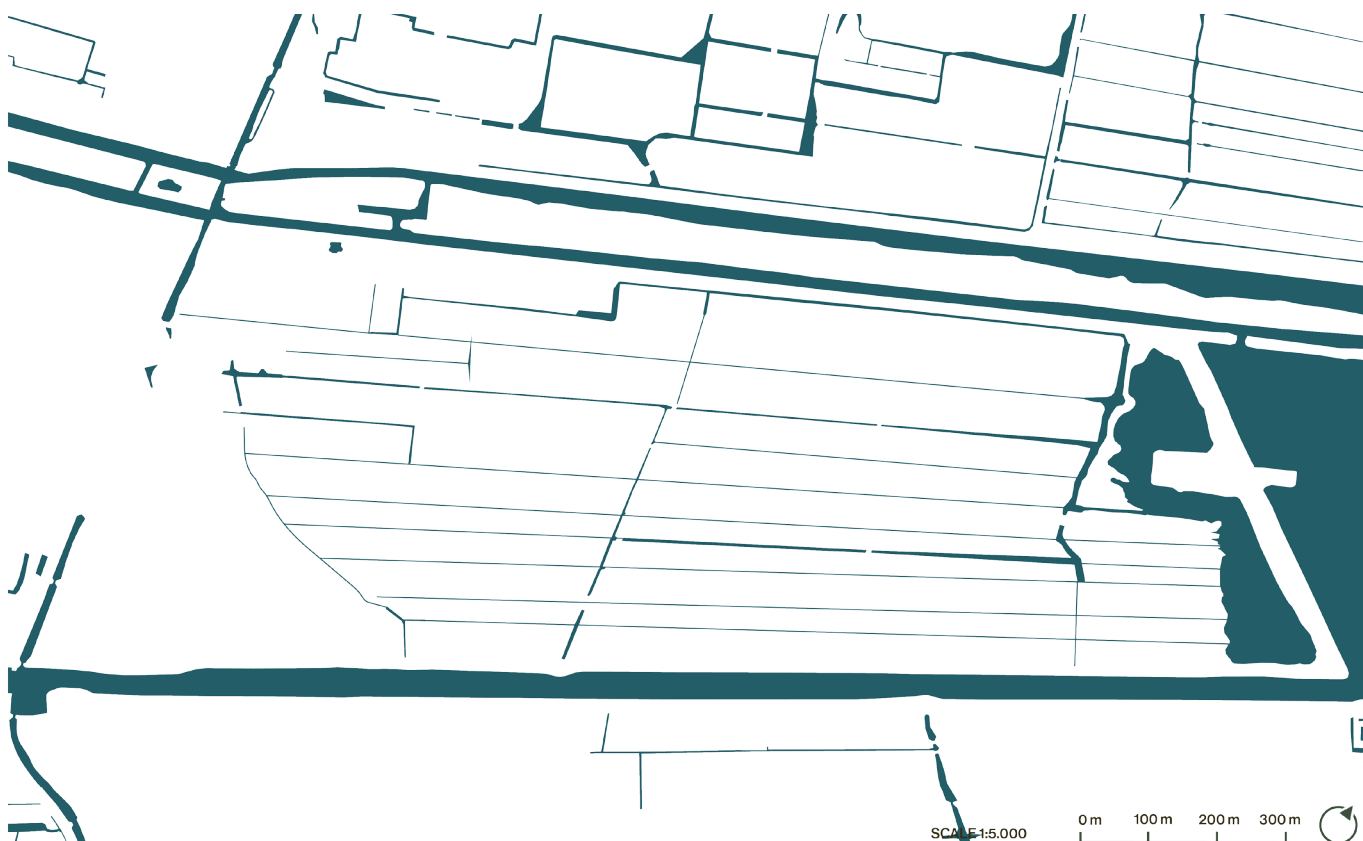
[25/71]



MASTERPLAN
Current water landscape

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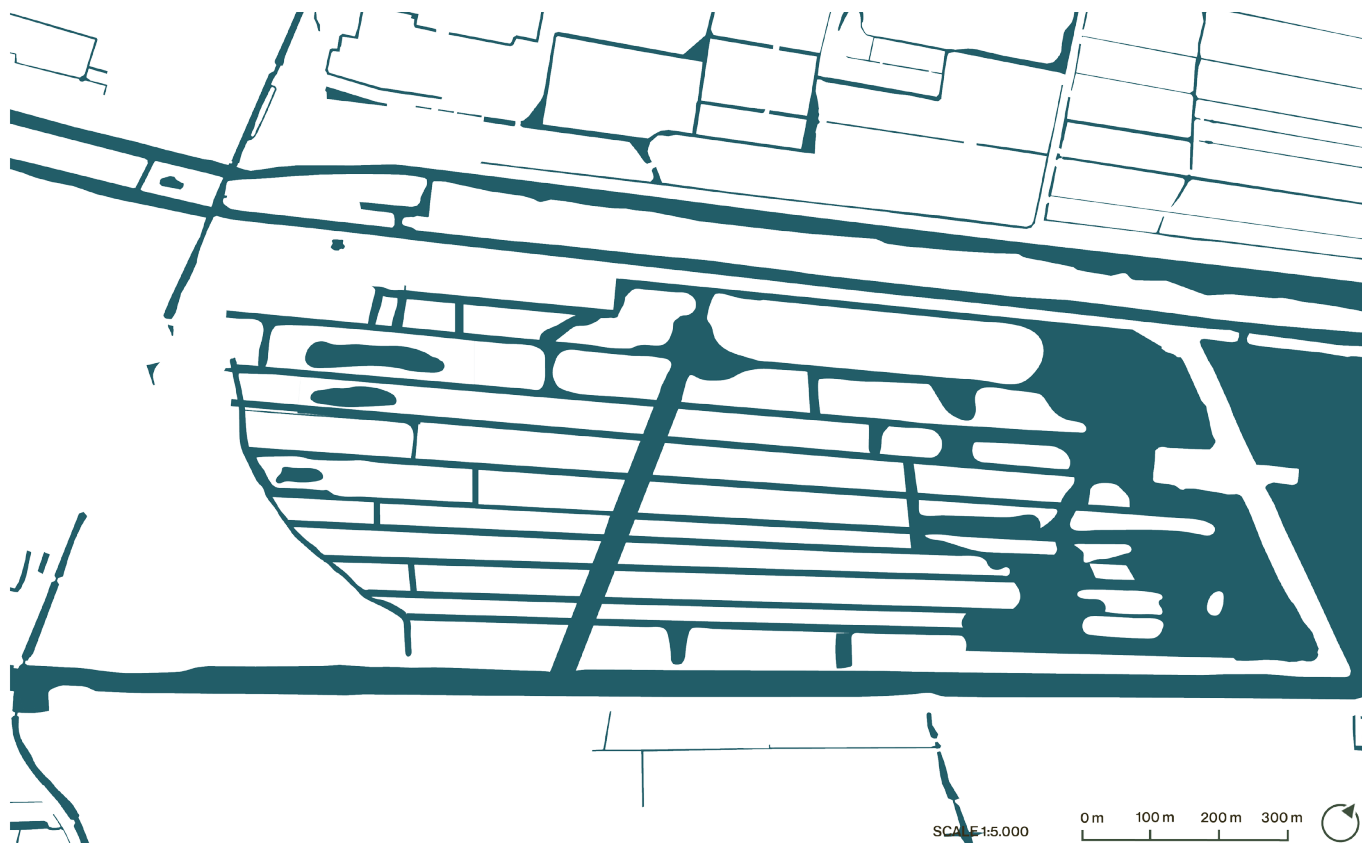
[26/71]



MASTERPLAN

New water landscape *Dry situation*

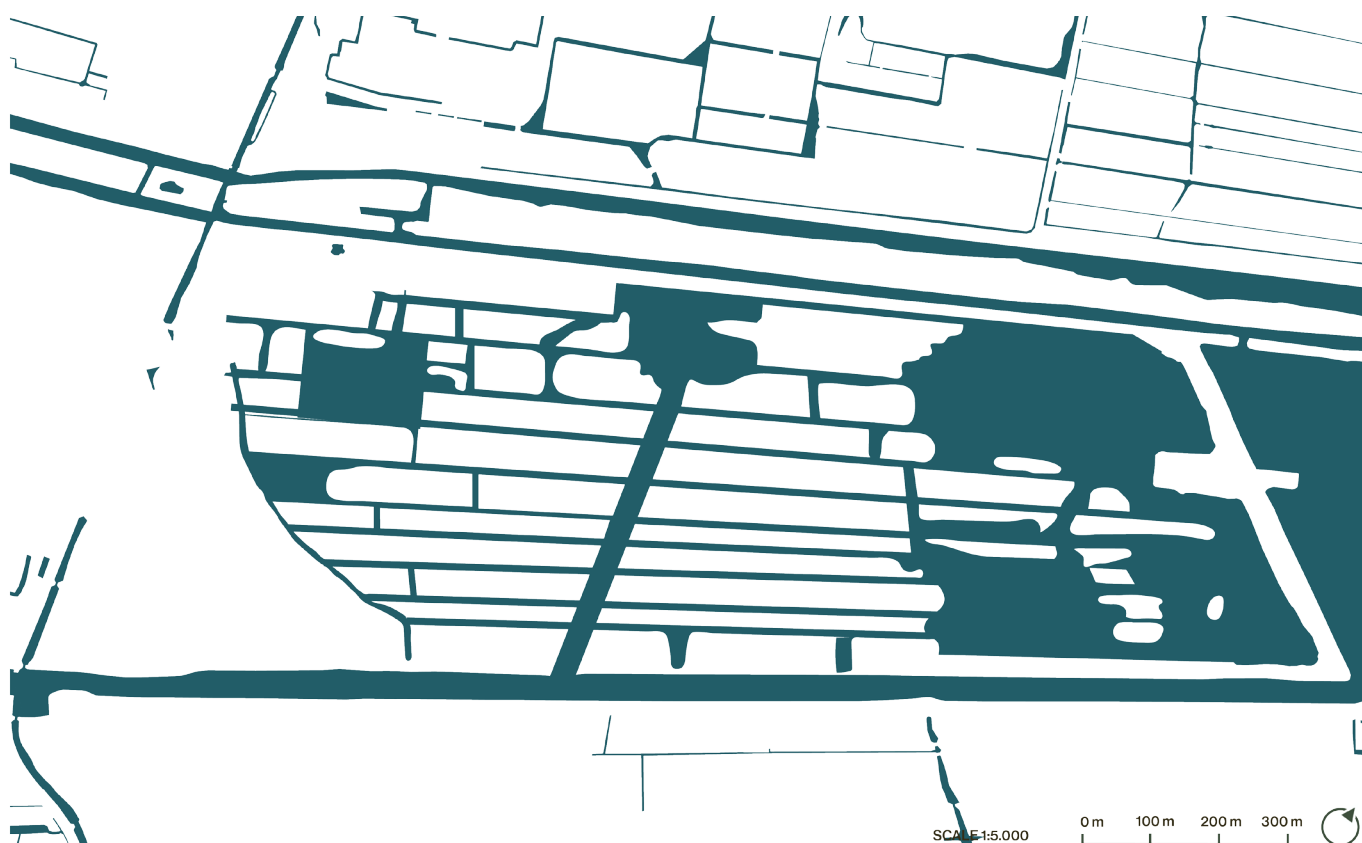
[27/71]



MASTERPLAN

New water landscape *Regular situation*

[28/71]

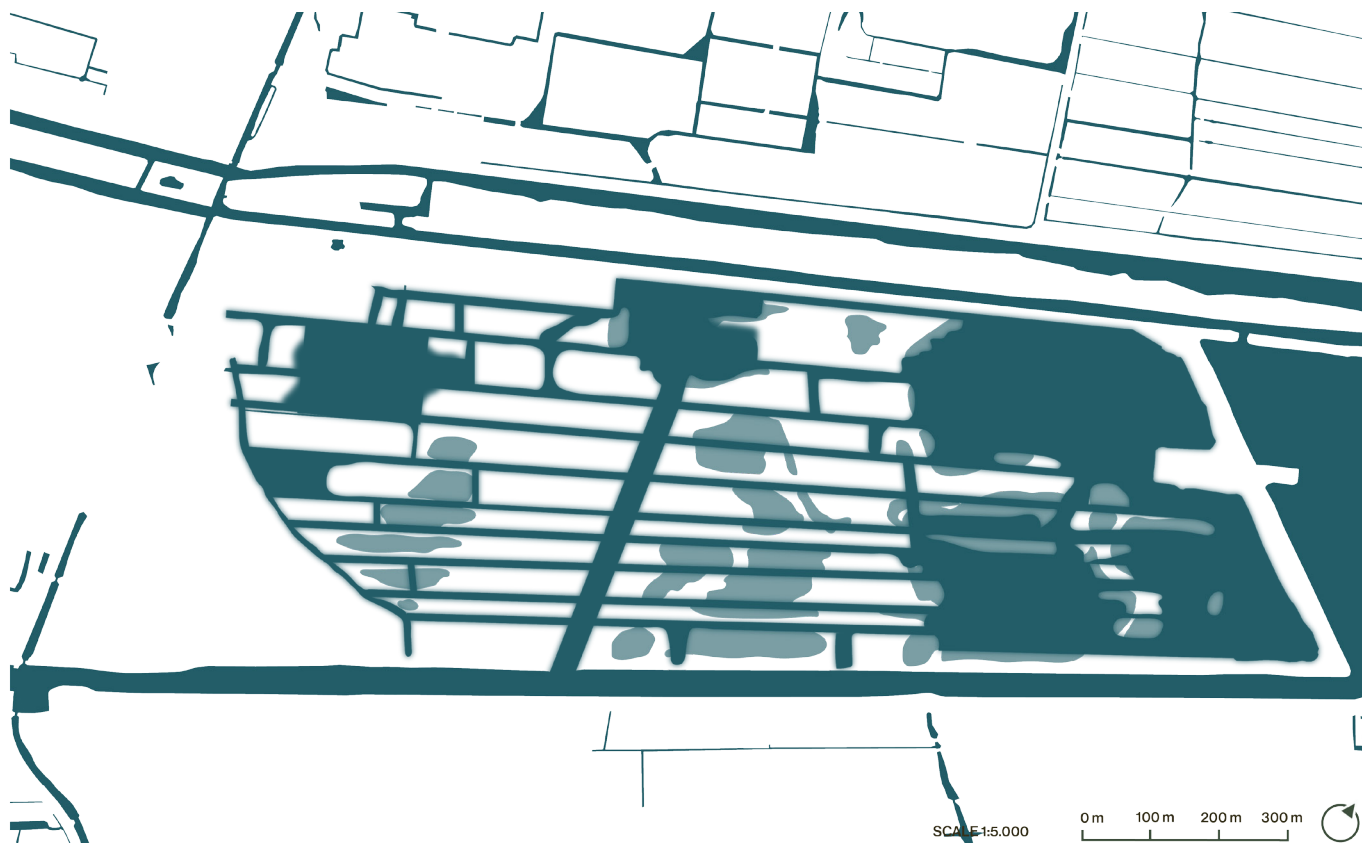


MASTERPLAN

New water landscape *Wet situation*

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[29/71]



MASTERPLAN

New water landscape

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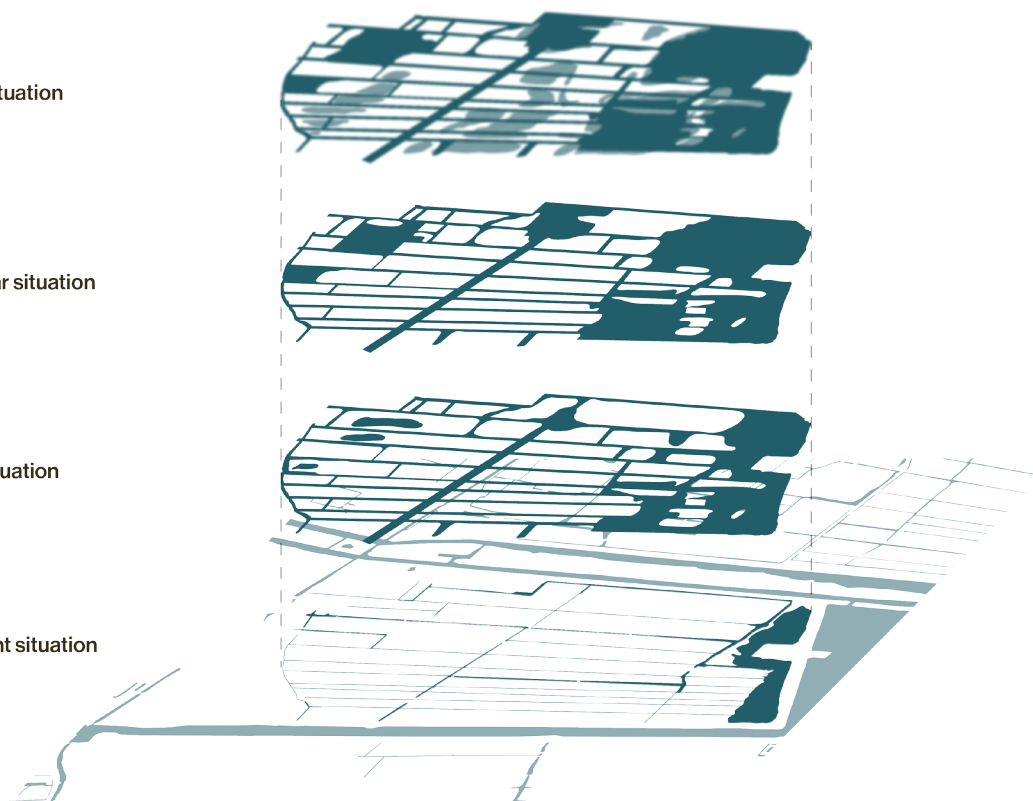
[30/71]

wet situation

regular situation

dry situation

current situation

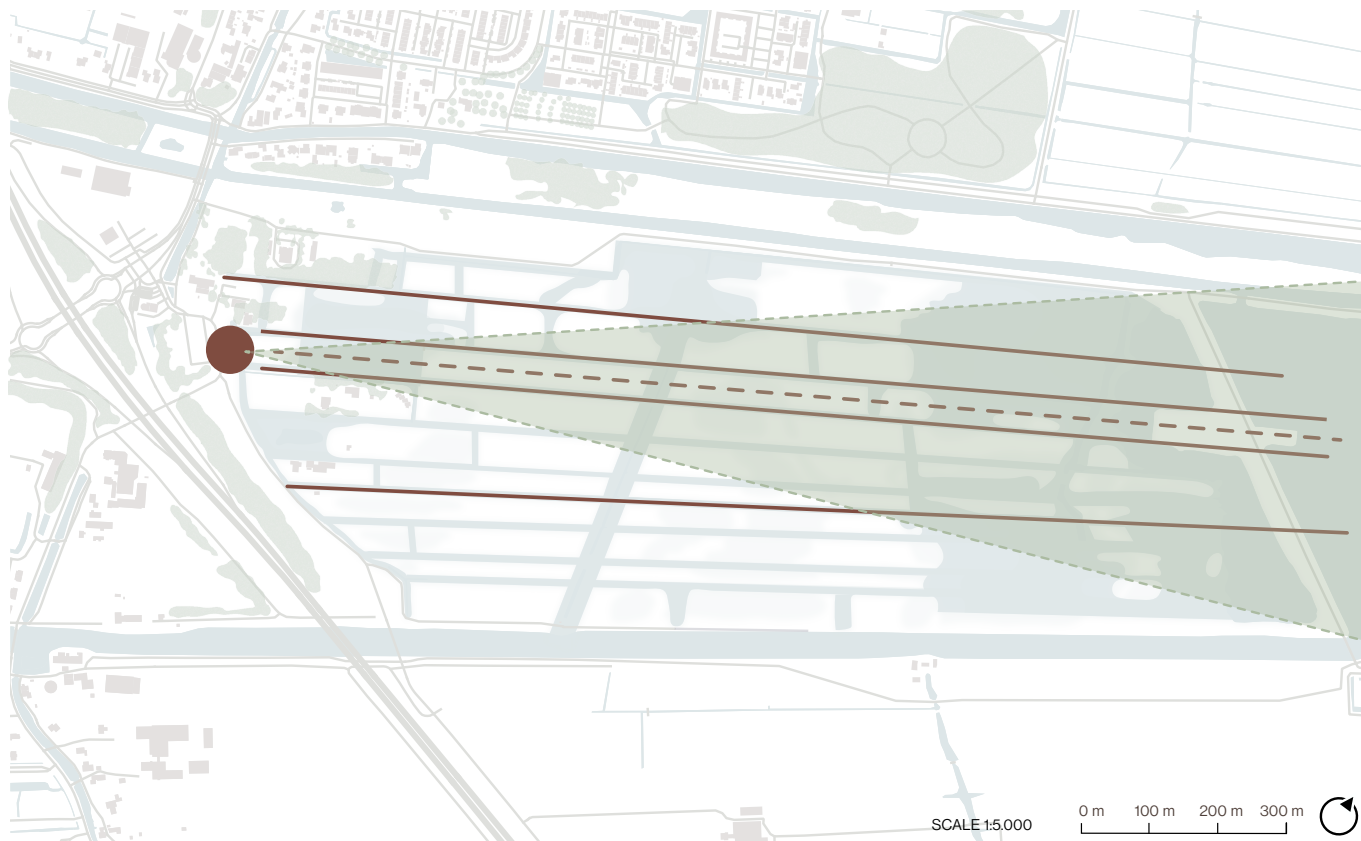


MASTERPLAN

Sight lines and vistas

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Masterplan booklet

[31/71]

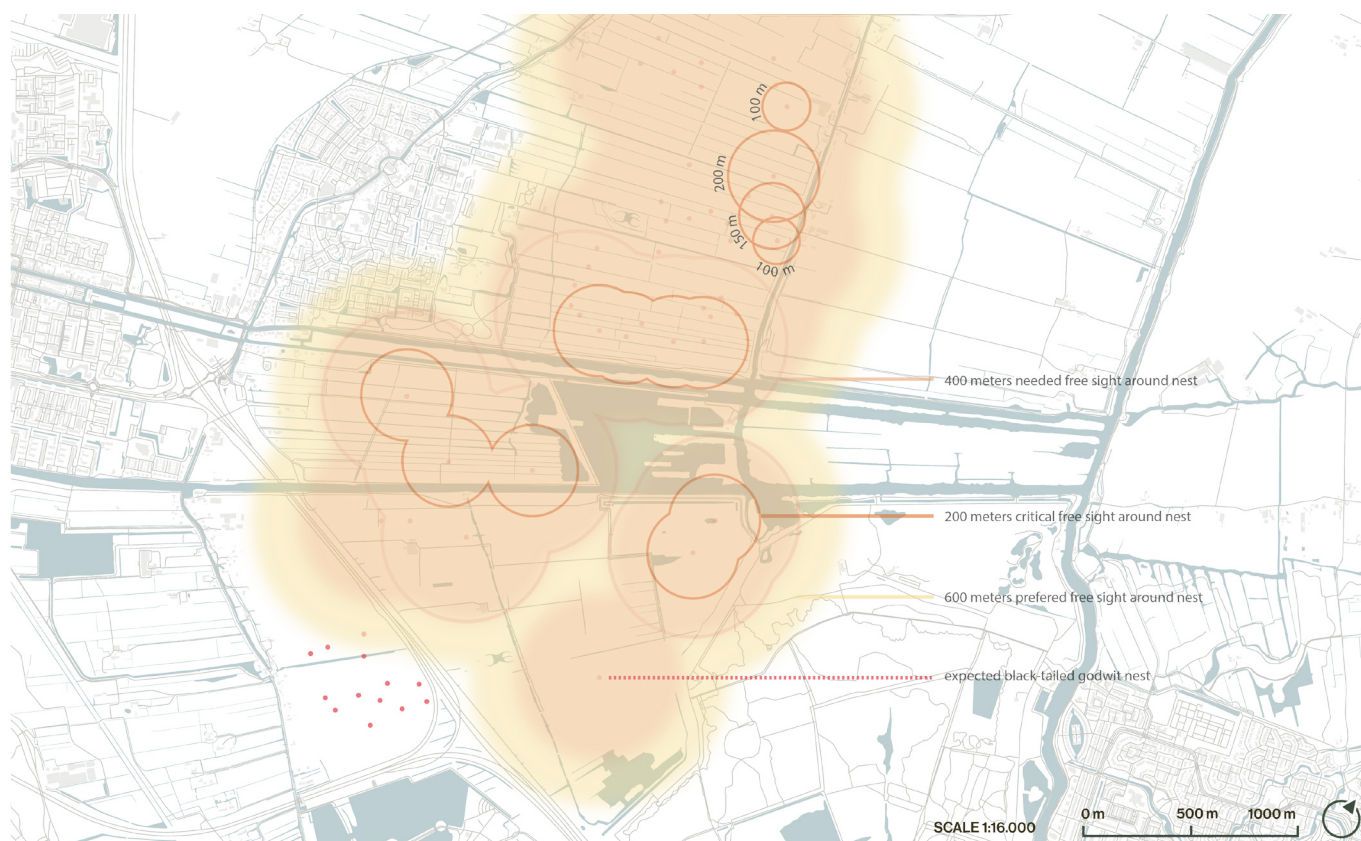


MASTERPLAN

Birds nests Grutto

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[32/71]

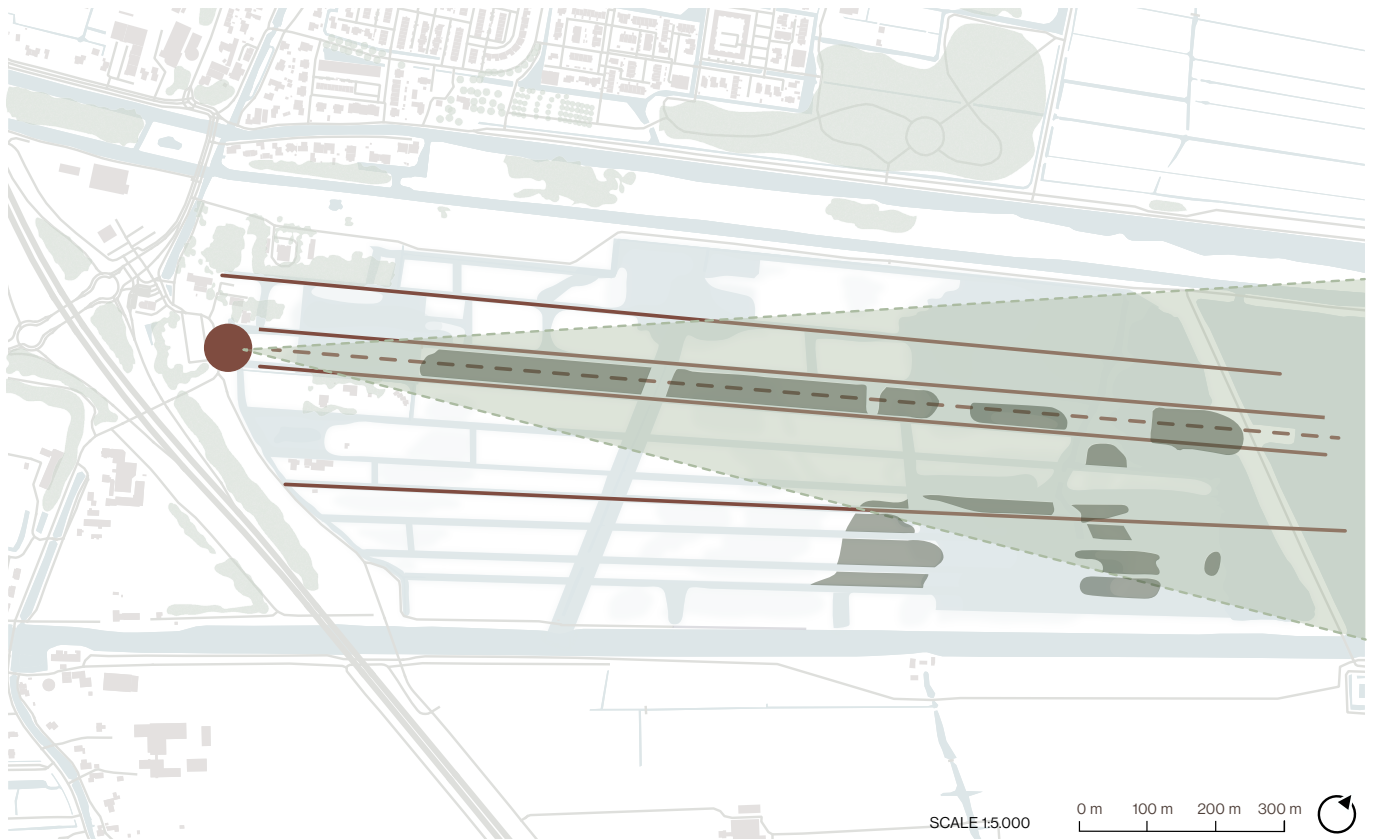


MASTERPLAN

Green zones

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[33/71]

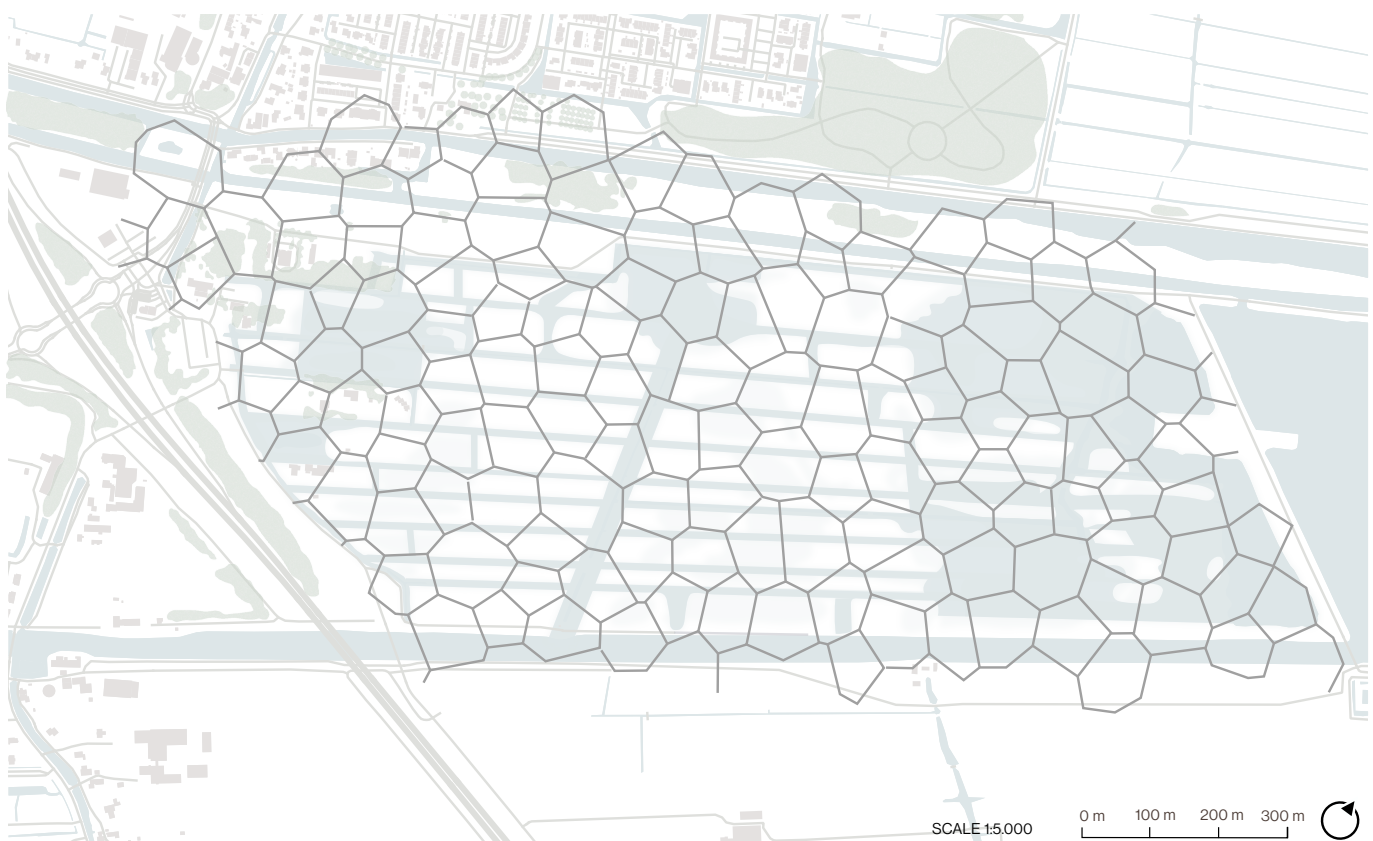


MASTERPLAN

Cell pattern

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Masterplan booklet

[34/71]

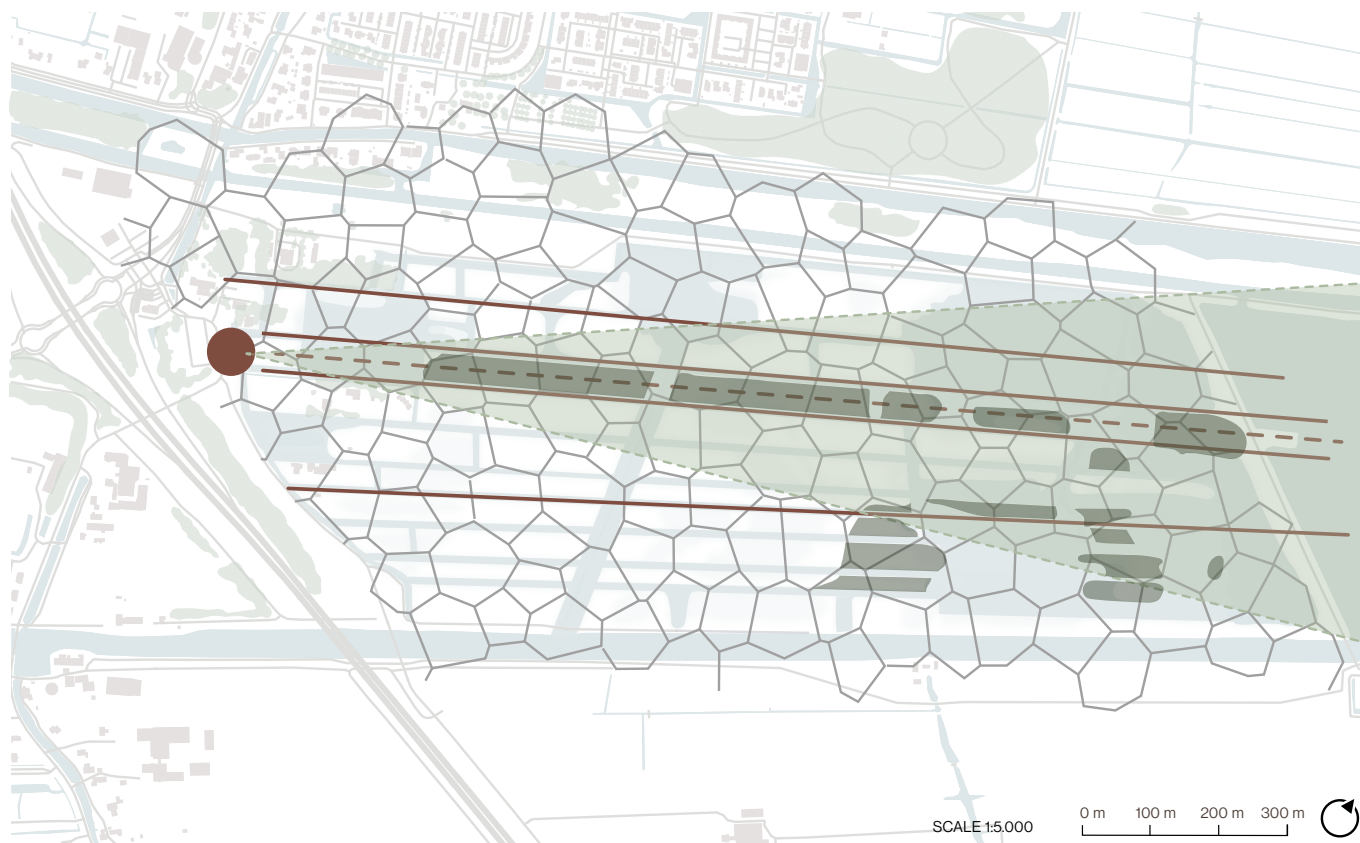


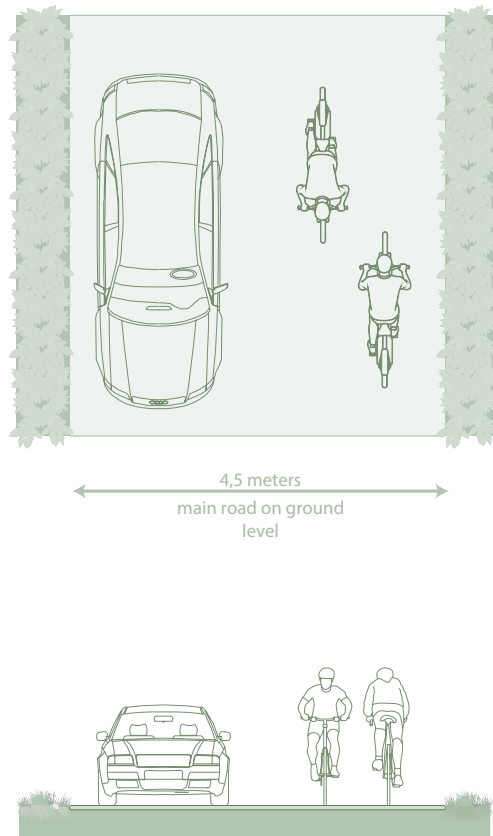
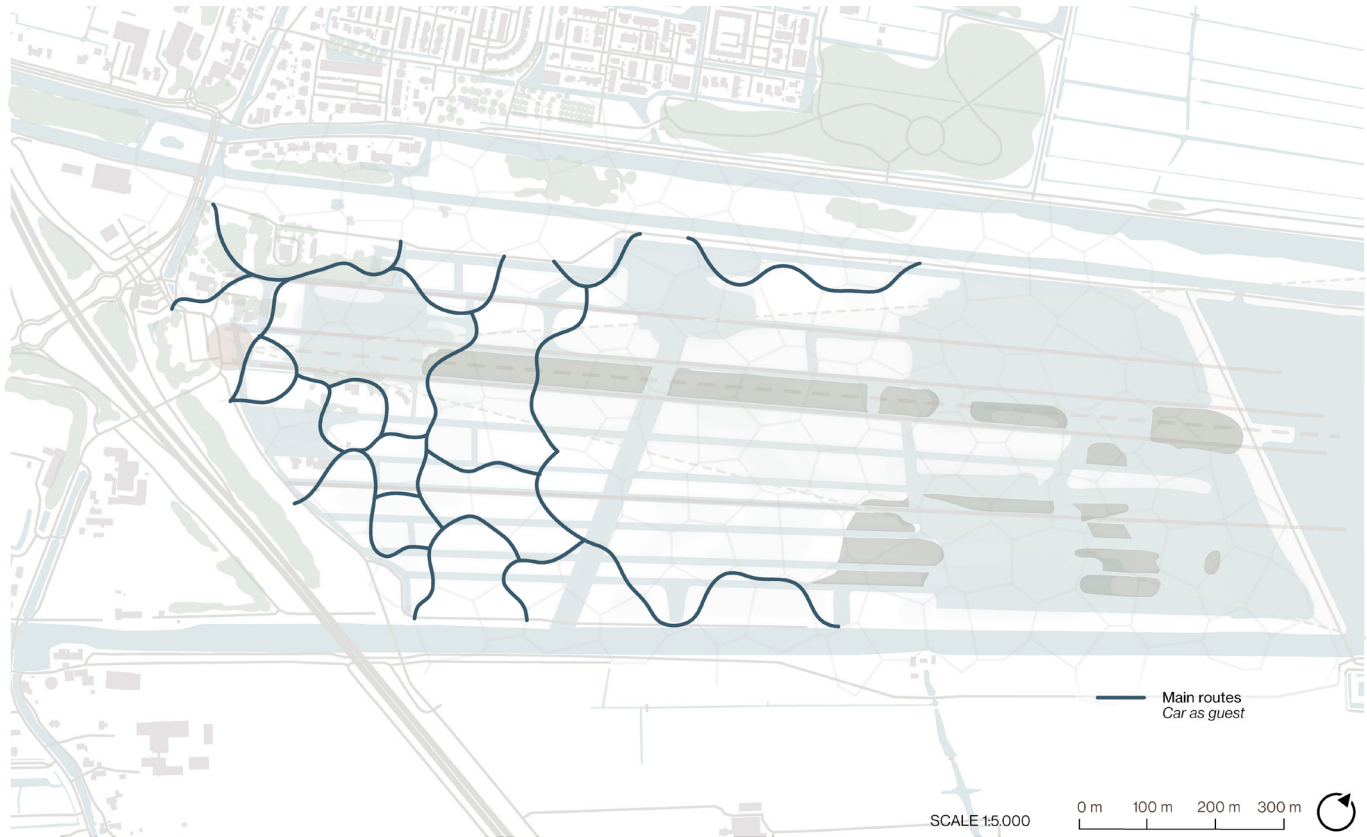
MASTERPLAN

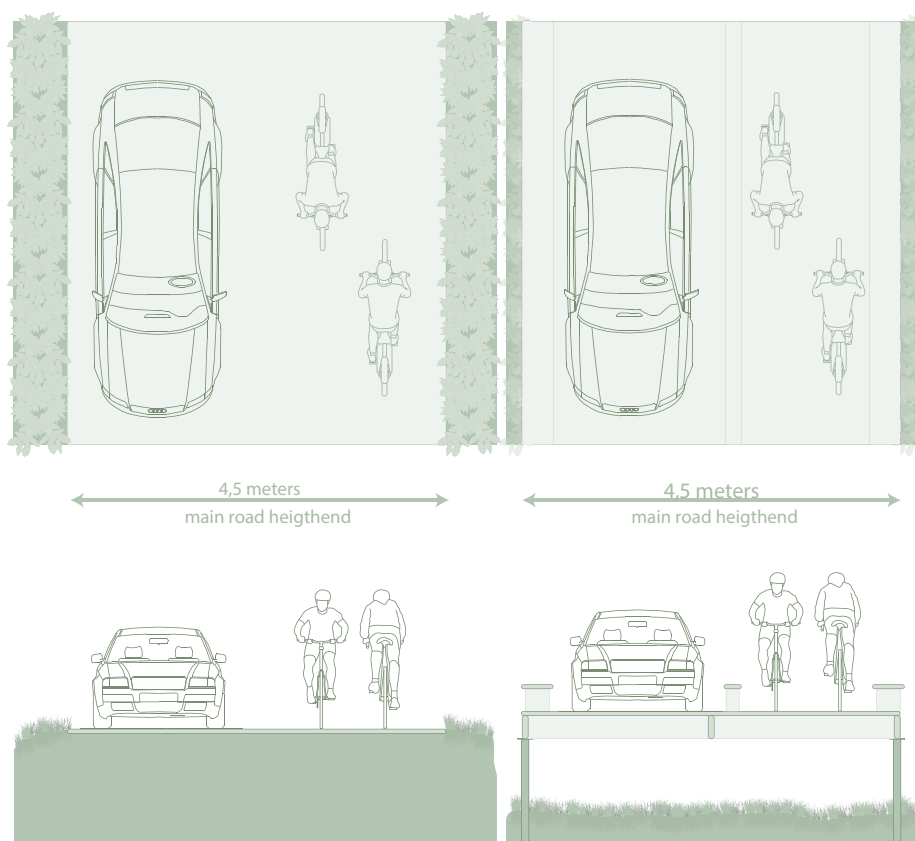
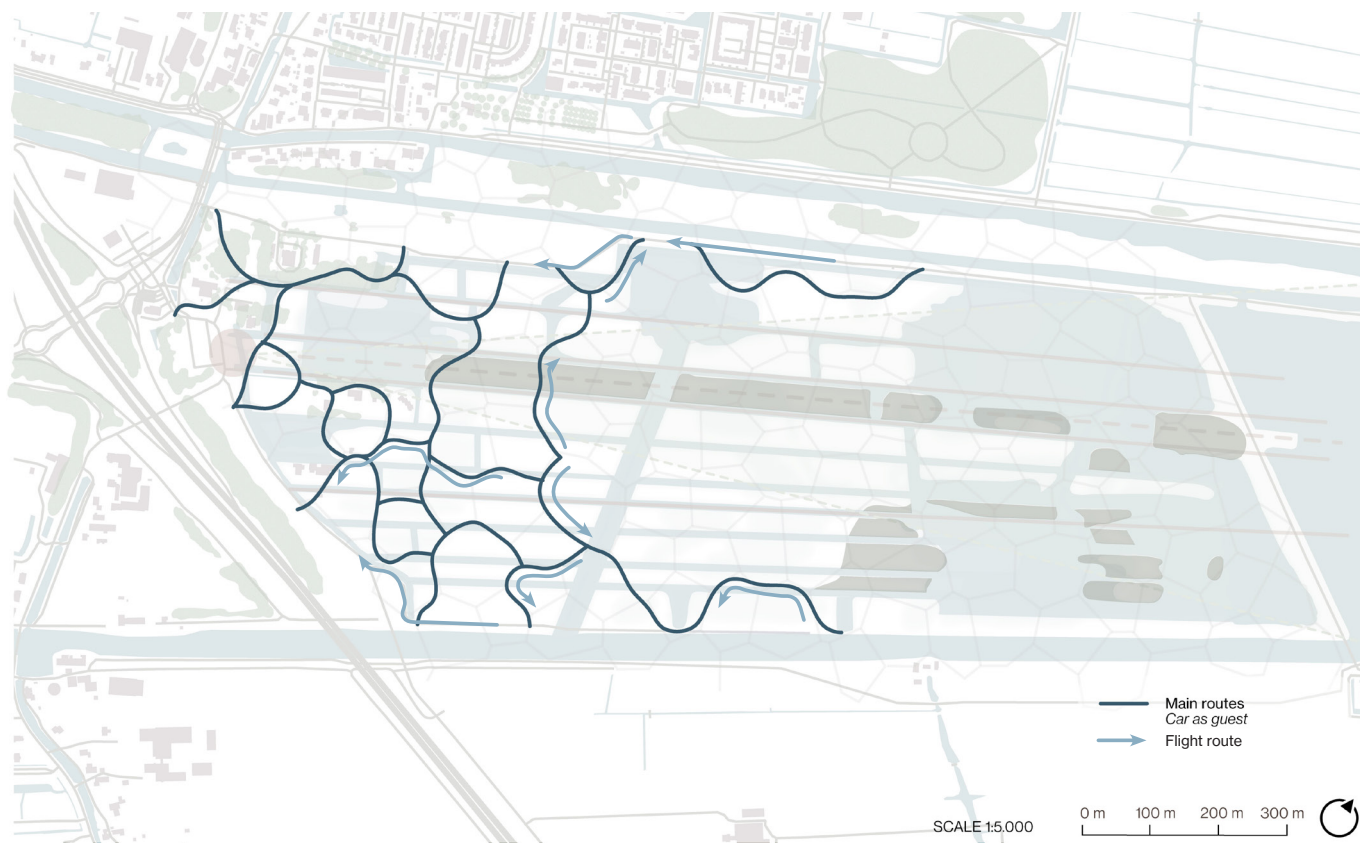
Cell pattern

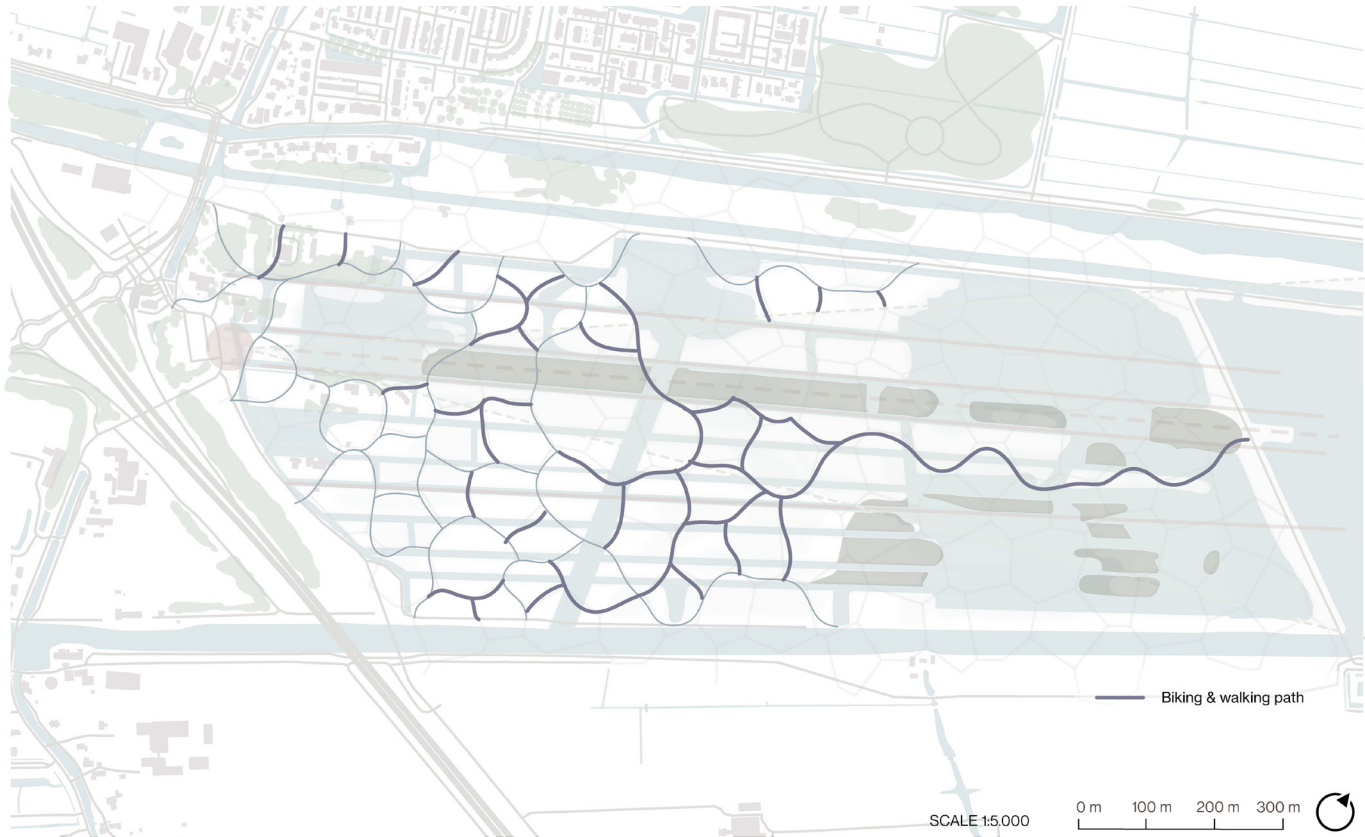
AR4AD150 Advanced Housing Design
Masterplan booklet

[35/71]







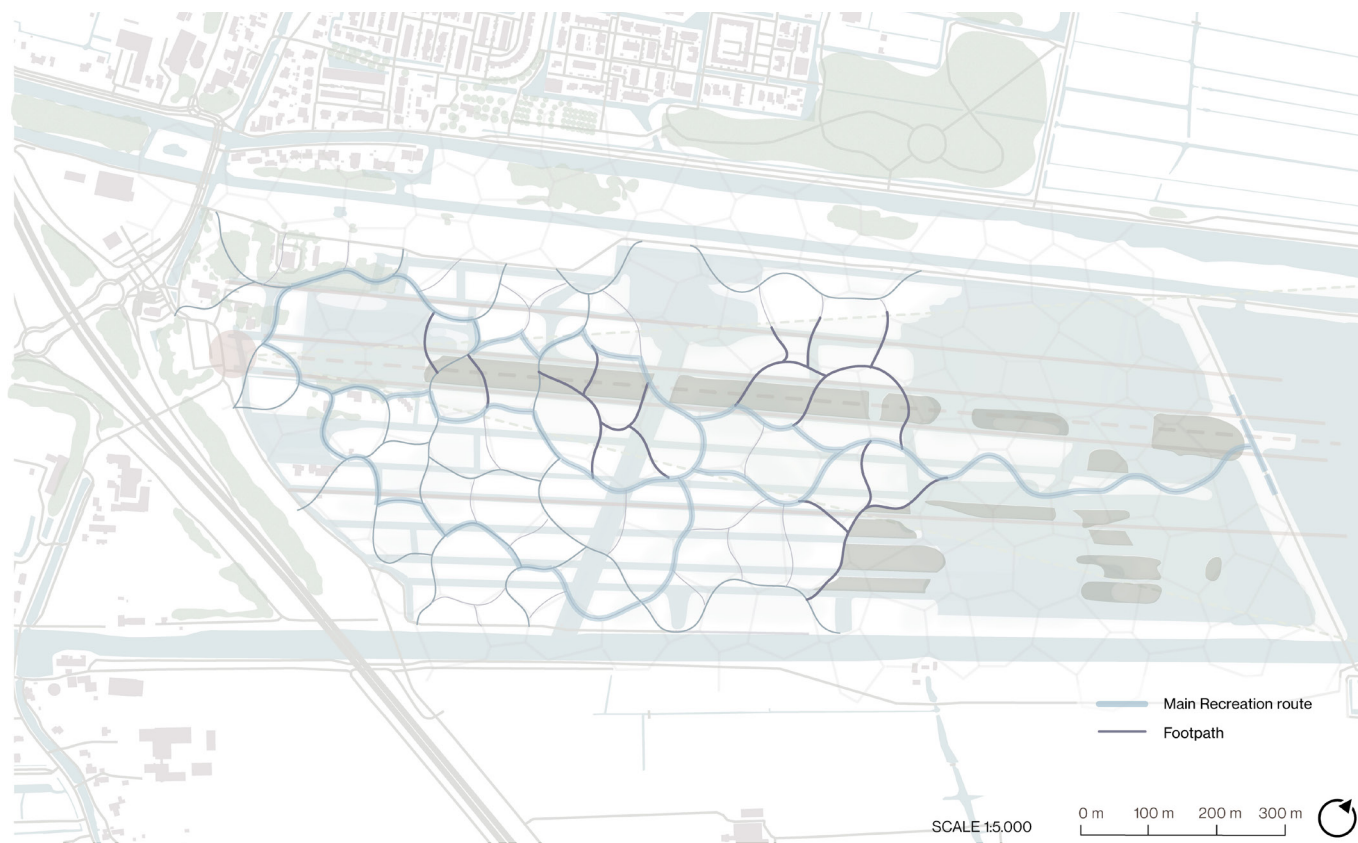


MASTERPLAN

Walking paths

AR4AD150 Advanced Housing Design
Masterplan booklet

[42/71]

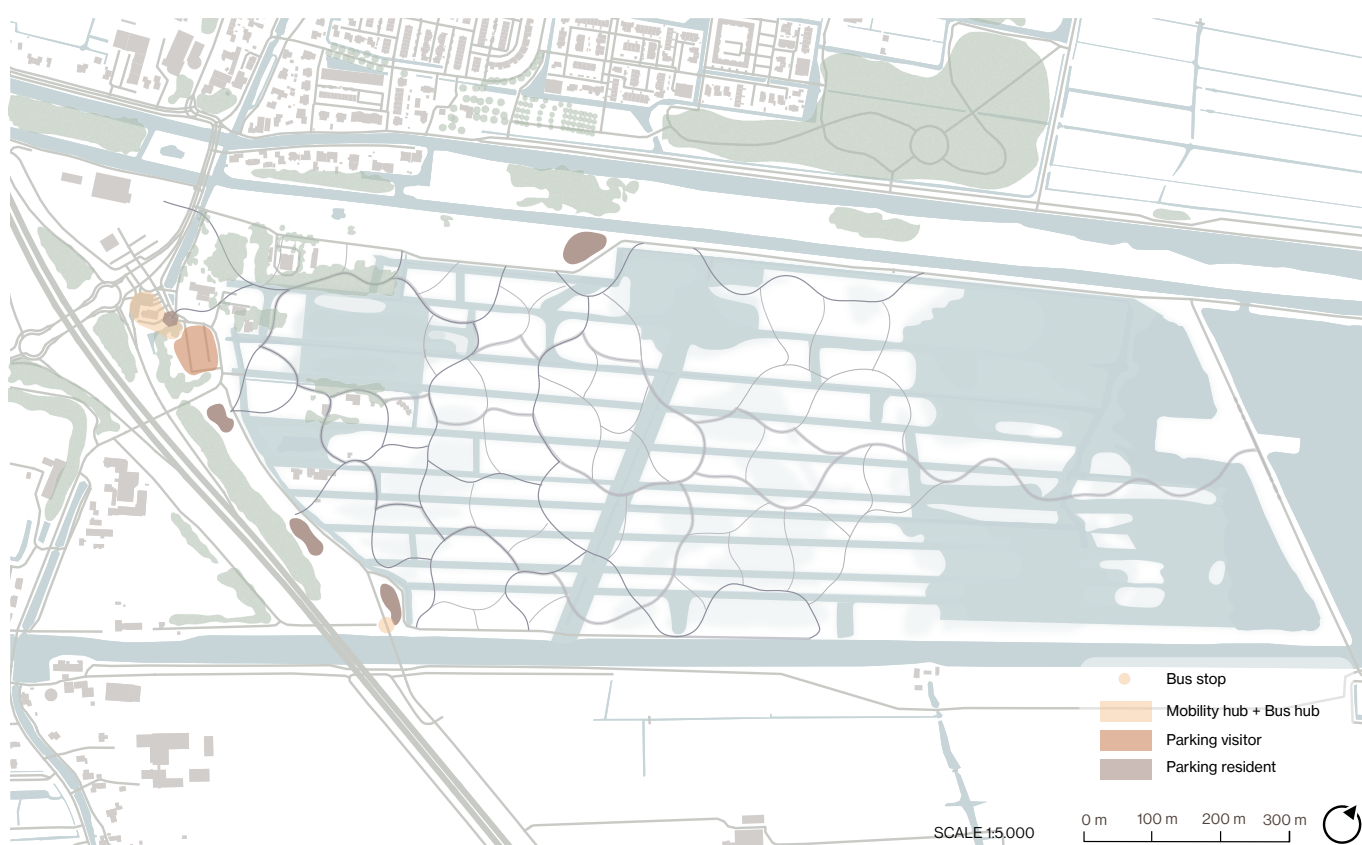


MASTERPLAN

Mobility

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Masterplan booklet

[43/71]

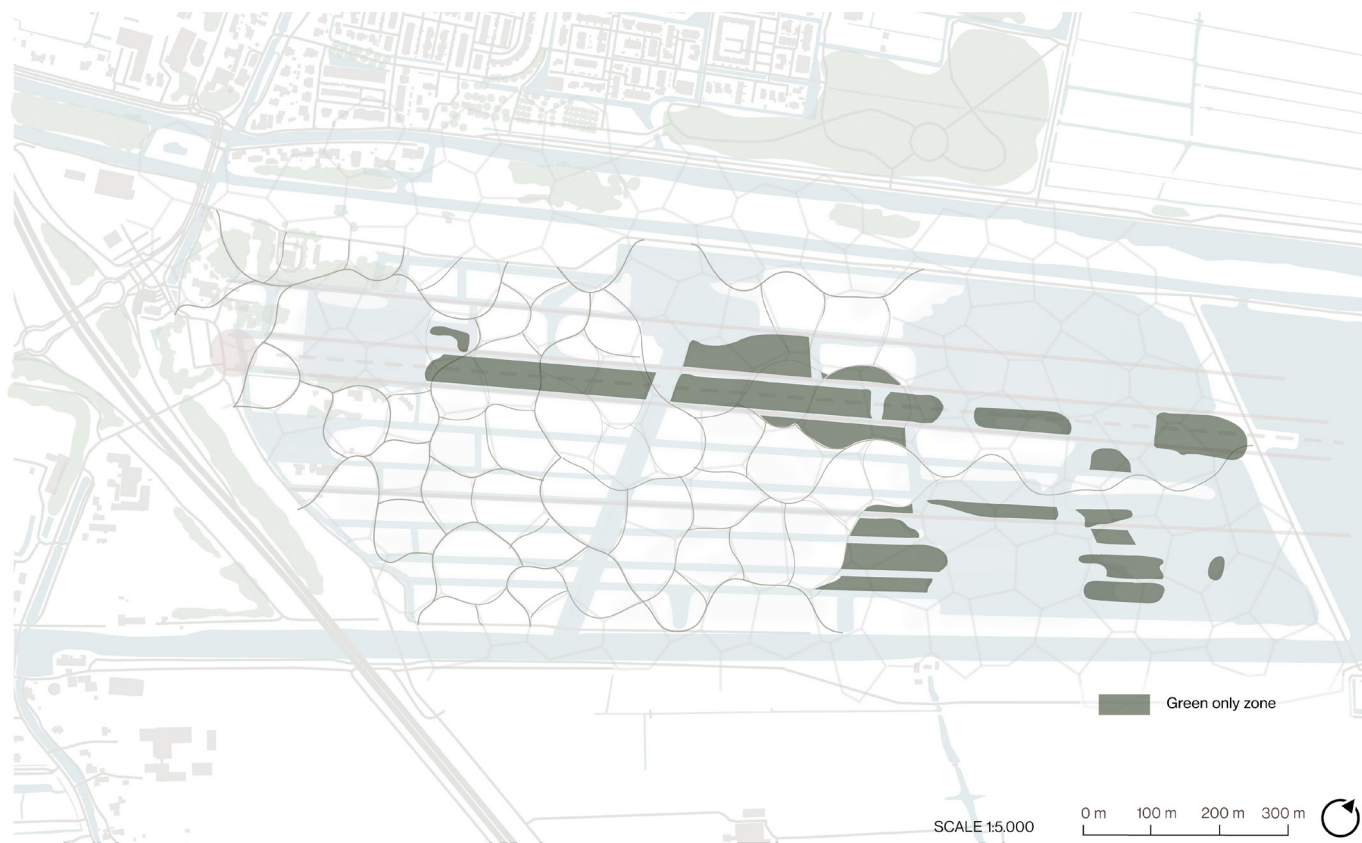


MASTERPLAN

Land use restriction plan *Green only zone*

AR4AD150 Advanced Housing Design
Masterplan booklet

[44/71]



MASTERPLAN

Impression *Green only zone*

AR4AD150 Advanced Housing Design
Masterplan booklet

[45/71]

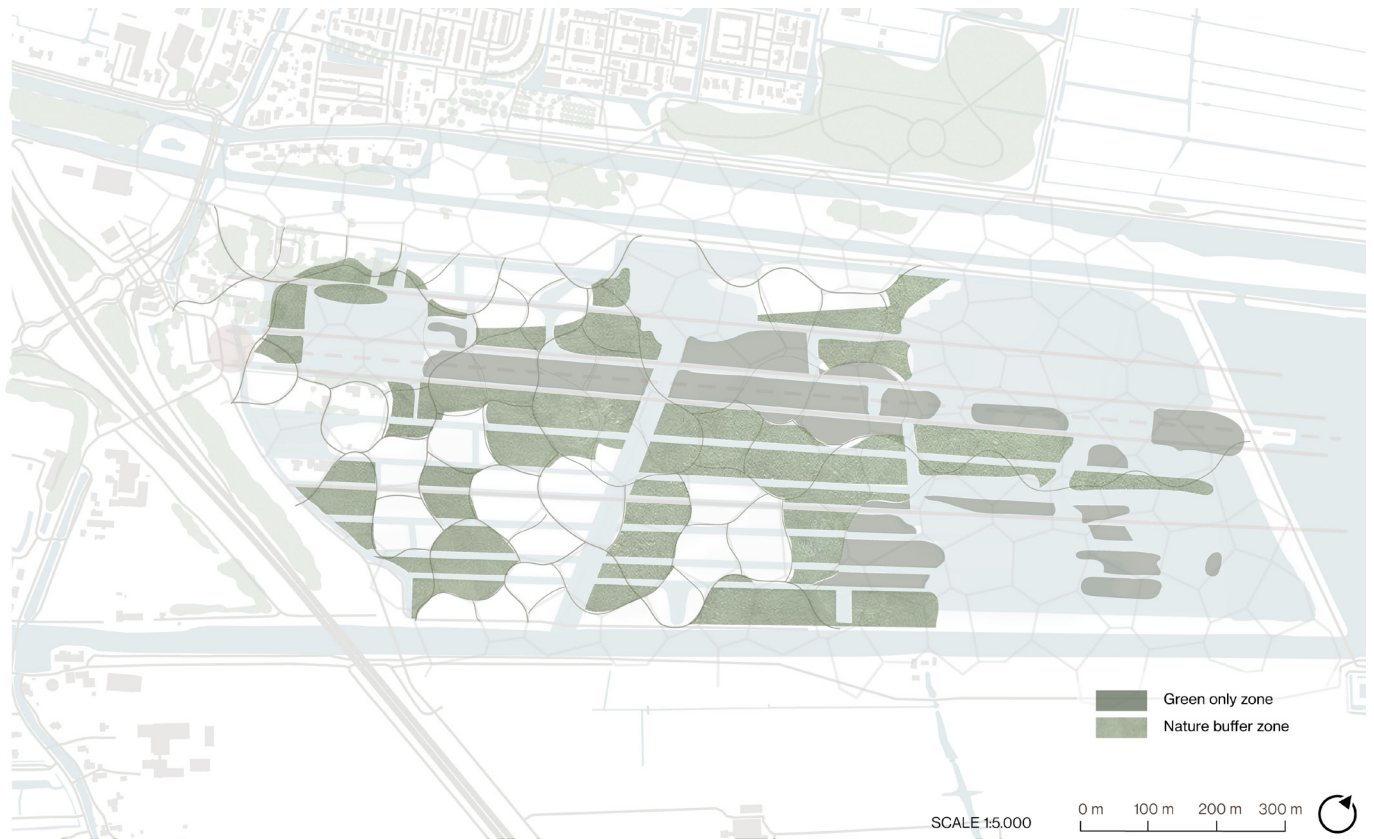


MASTERPLAN

Land use restriction plan *Nature buffer zone*

AR4AD150 Advanced Housing Design
Masterplan booklet

[46/71]



MASTERPLAN

Impression *Nature buffer zone*

AR4AD150 Advanced Housing Design
Masterplan booklet

[47/71]

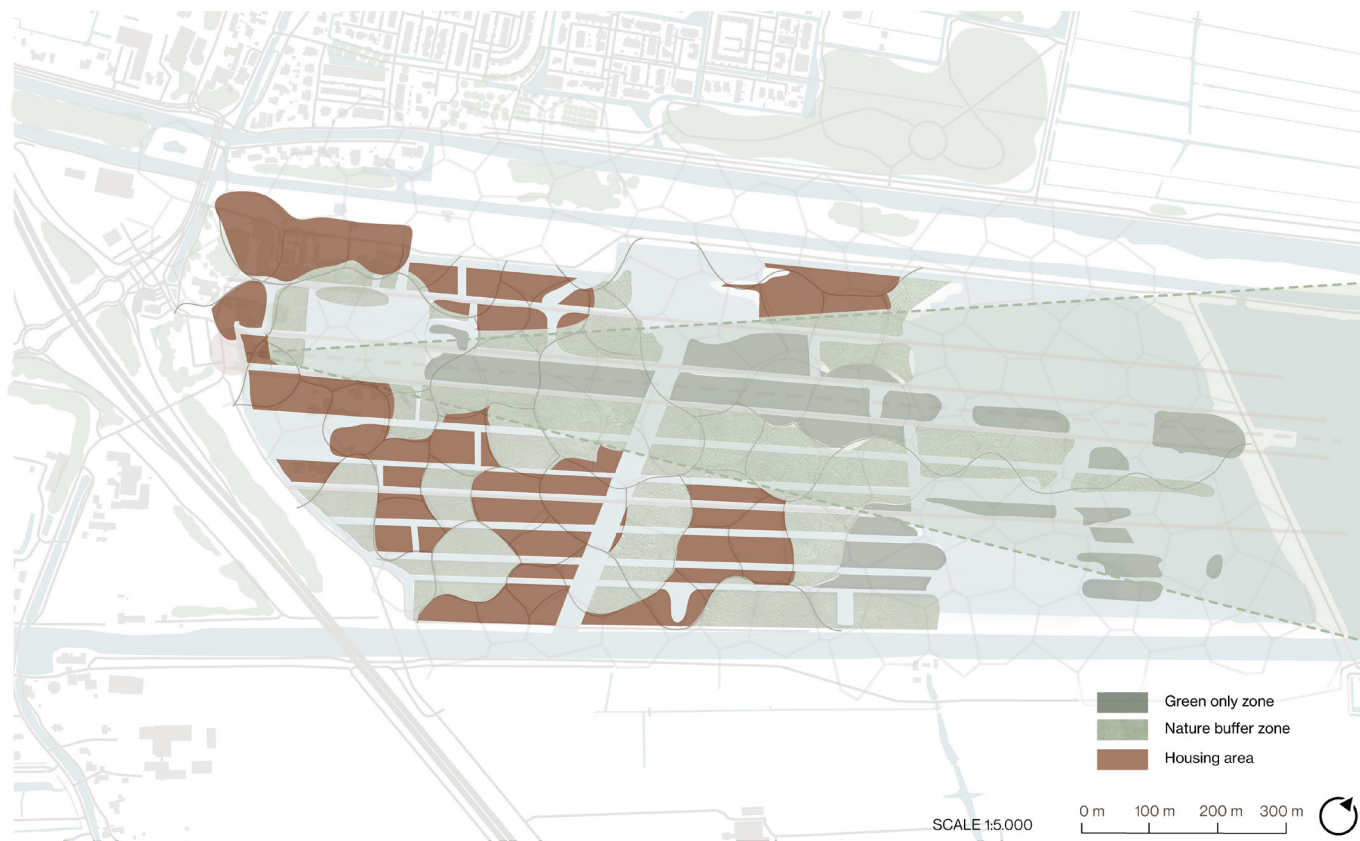


MASTERPLAN

Land use restriction plan *Housing area*

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Masterplan booklet

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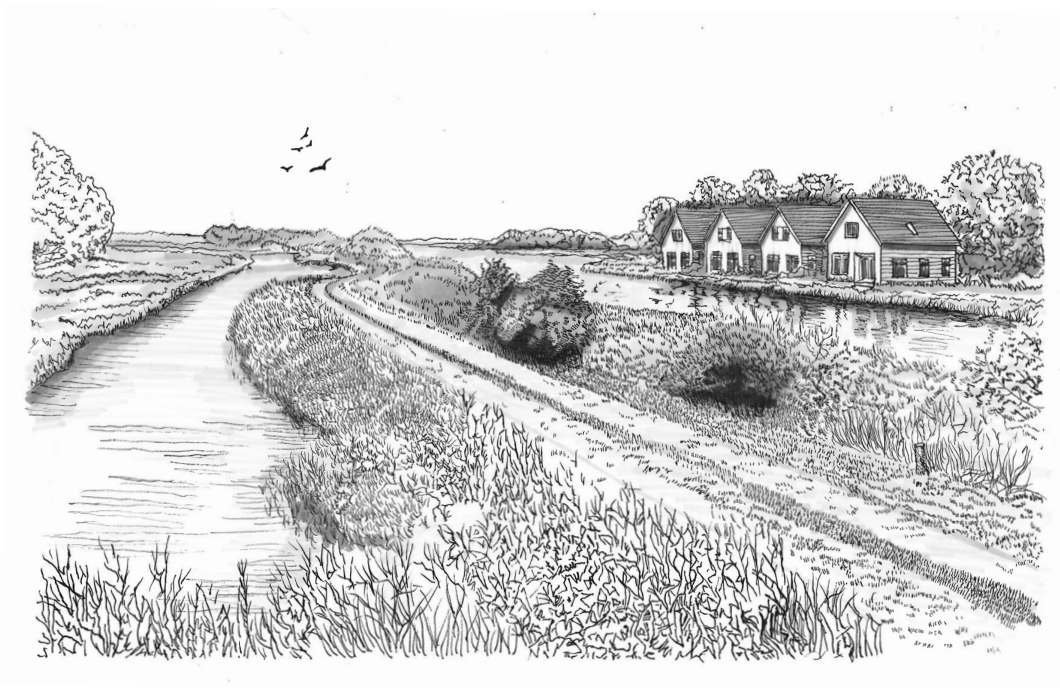


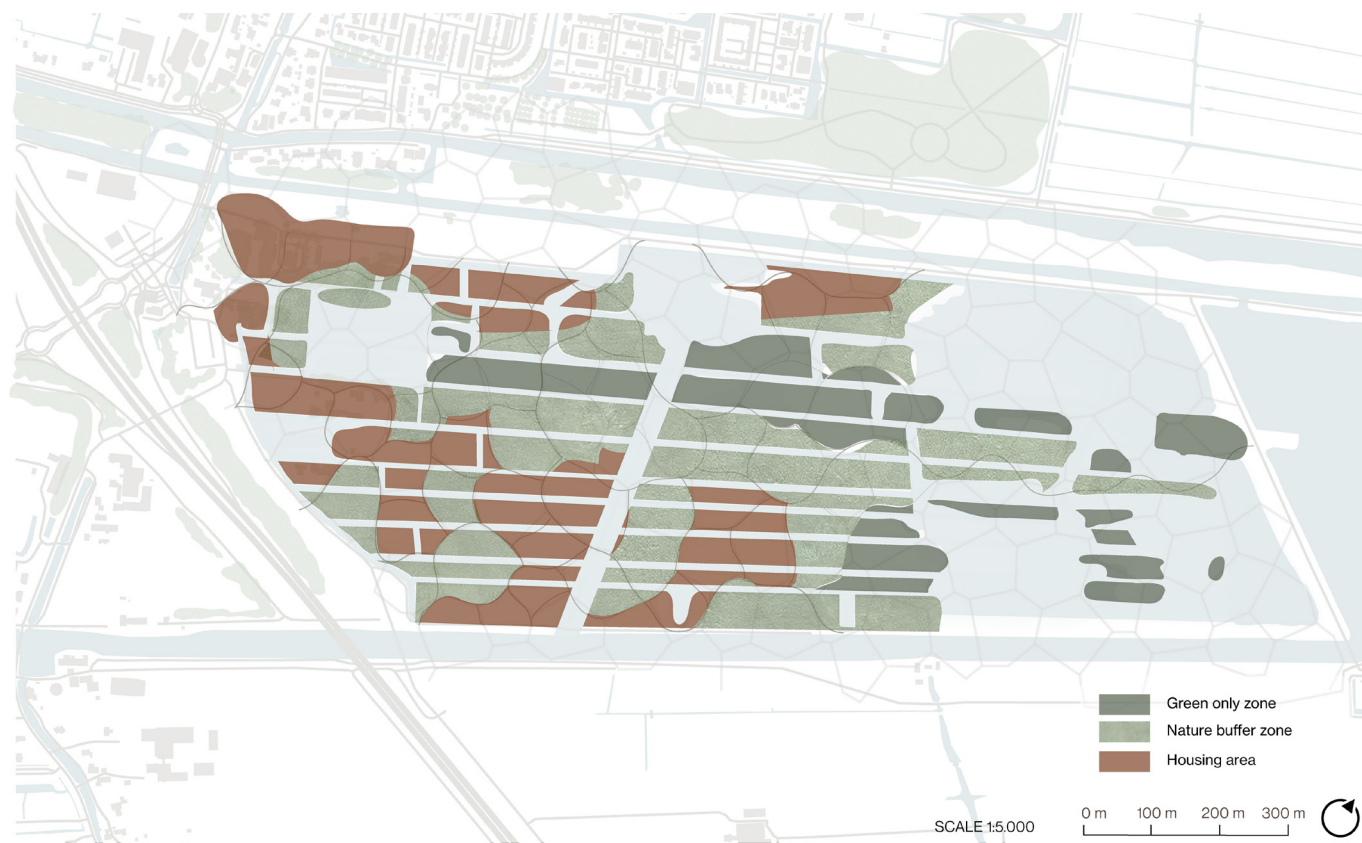
MASTERPLAN

Impression *Housing area*

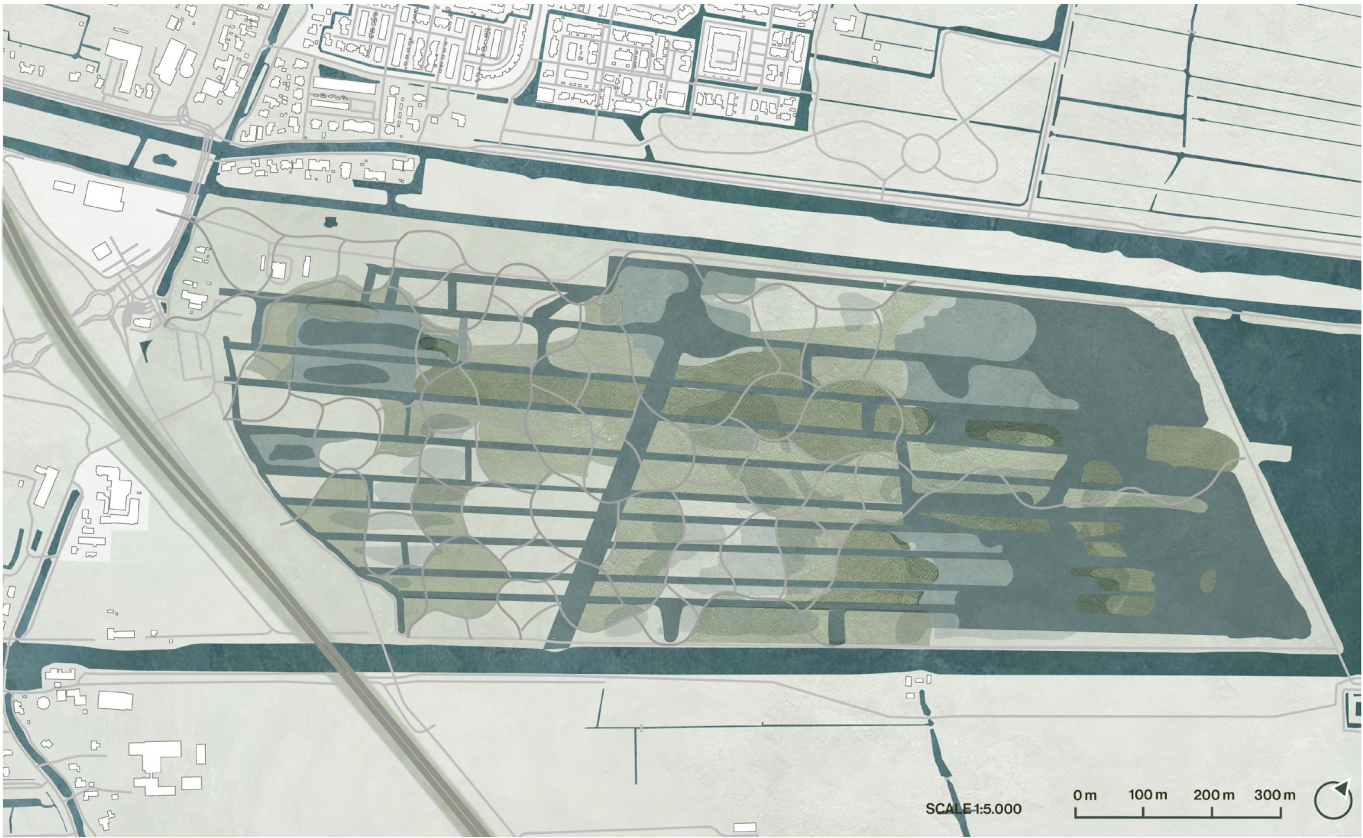
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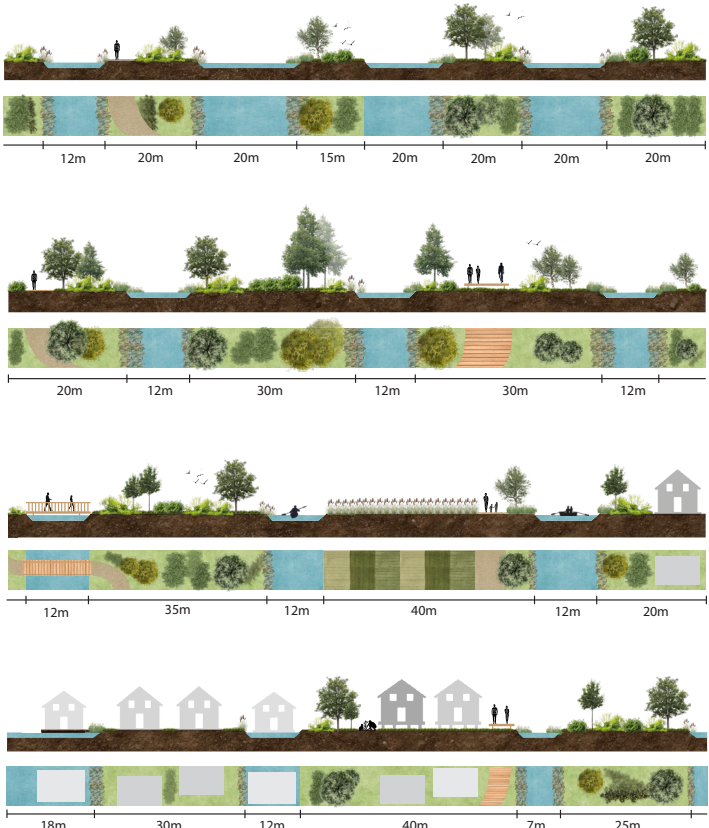
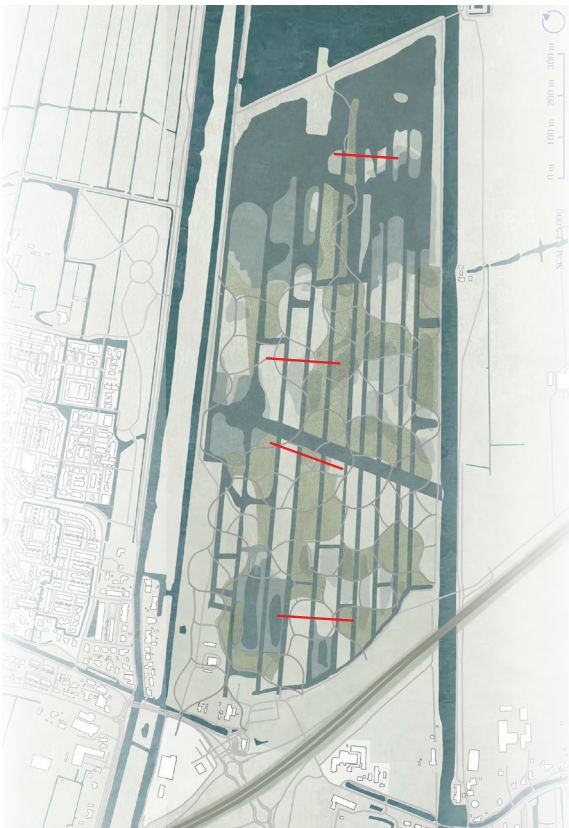


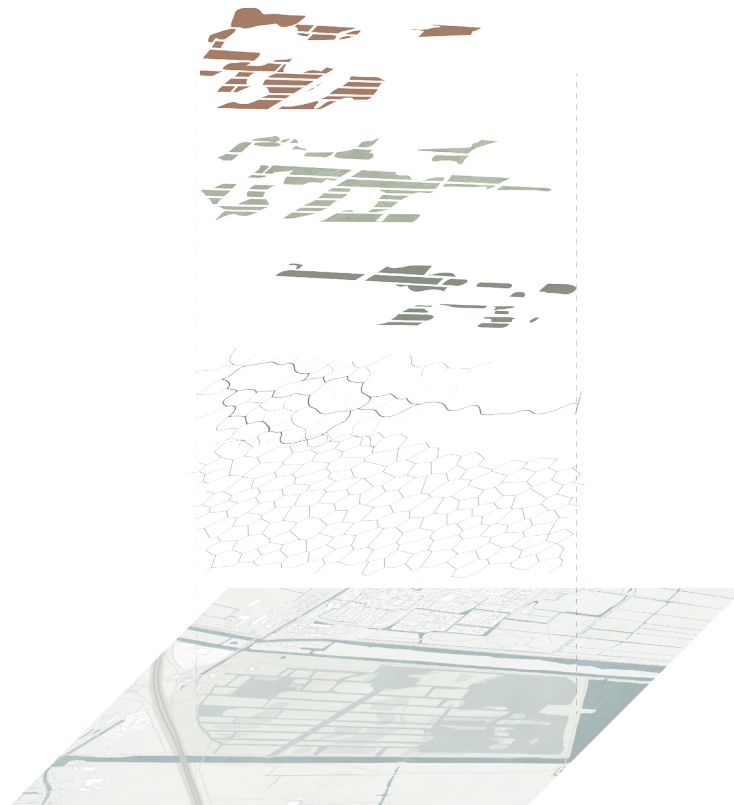


MASTERPLAN
Impression of the masterplan



MASTERPLAN
Section of the masterplan



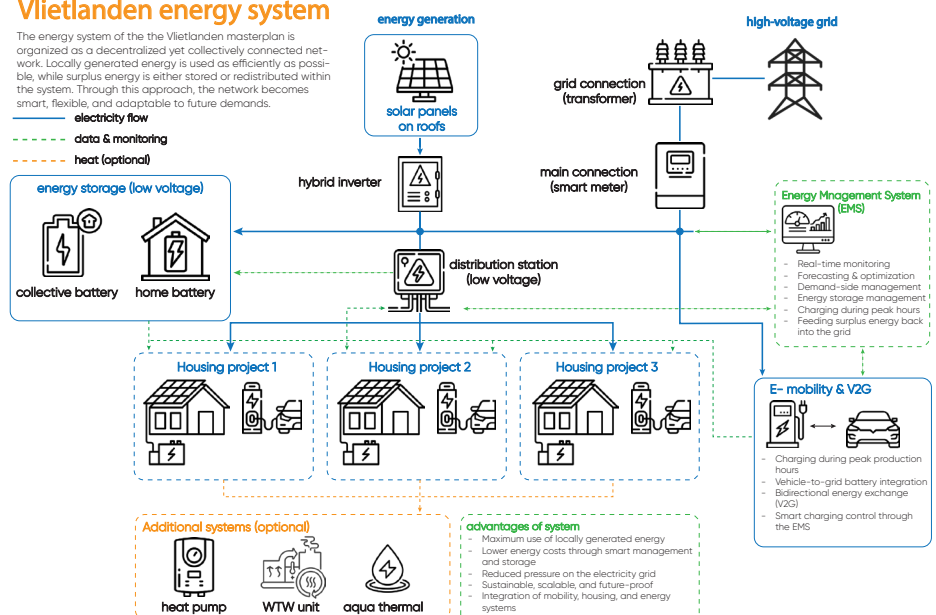


The energy system in the Vlietlanden masterplan is designed as a decentralized yet connected smart grid. Each housing development produces its own renewable energy through rooftop solar panels, while still being linked to a shared local network and the wider public grid. When there is surplus energy, it is first exchanged between neighbourhoods before being stored in both collective and individual battery systems. Electric vehicles also play a role, acting as temporary storage through Vehicle-to-Grid (V2G) technology and charging during times of peak solar production.

An Energy Management System (EMS) continuously monitors energy demand, weather conditions, storage levels, and consumption patterns to optimize how electricity is distributed and used. This approach helps reduce strain on the national grid, increases the use of locally generated energy, and lowers overall costs. The system is designed to be flexible and scalable, creating a strong connection between mobility, housing, and renewable energy generation.

Vlietlanden energy system

The energy system of the Vlietlanden masterplan is organized as a decentralized yet collectively connected network. Locally generated energy is used as efficiently as possible, while surplus energy is either stored or redistributed within the system. Through this approach, the network becomes smart, flexible, and adaptable to future demands.



MASTERPLAN

Infrastructure Roads

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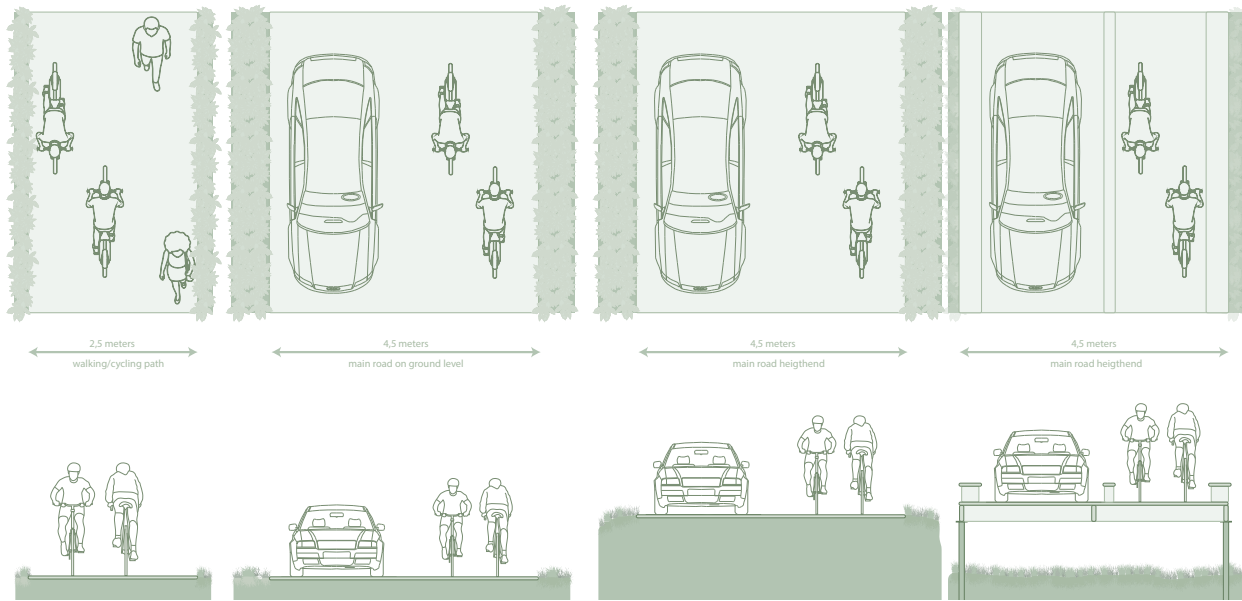
[55/71]

The masterplan includes different routes. Each one is designed differently according to its function. The main roads are wide enough for two cars to pass in each direction, as well as having a cycle lane in every direction.

As the plan focuses on the land as a natural system, some areas may be prone to flooding. To ensure safe movement to and from a location, elevated flight routes are created. These are located on a dike or a platform.

Recreational paths are at ground level and suitable for bikes and pedestrians travelling in both directions. These paths have a shell layer on top, which allows ground-dwelling creatures and rainwater to pass through, while providing a clear path for visitors.

These paths are part of the new way of living that this plan has introduced. The focus is on nature first and foremost, with elements added to encourage living in this location. You cannot always access these paths, but this further promotes the connection with nature and living with the elements, due to their availability throughout the year.



MASTERPLAN

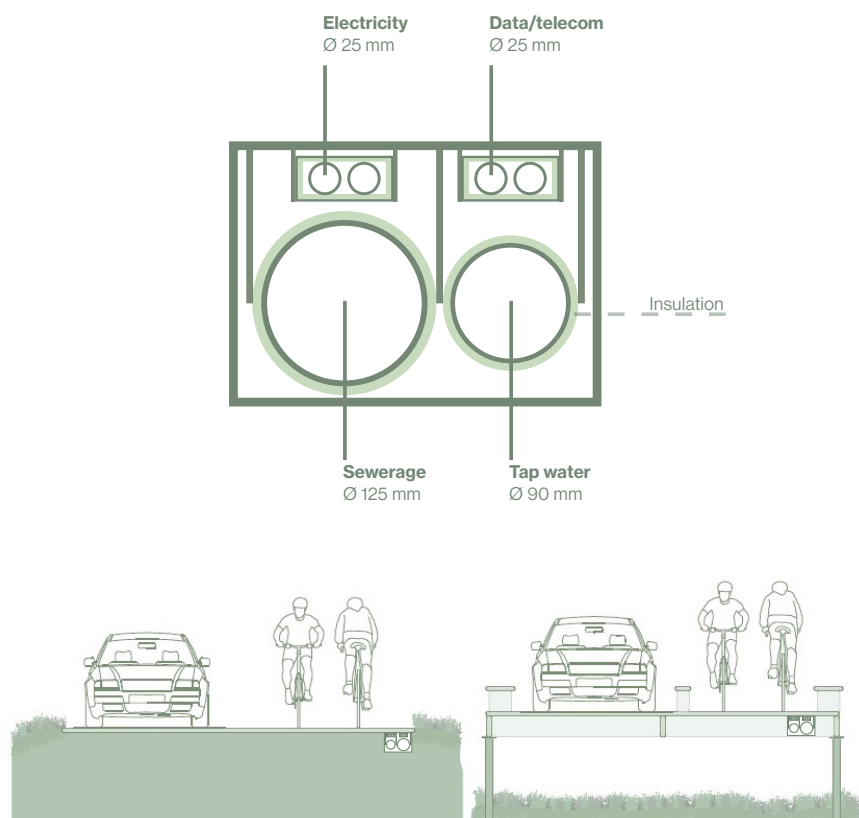
Infrastructure Services

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The different projects within the masterplan are each connected to a larger water and electricity system. There are three types of structures: water supply, water drainage, and electrical cables. These three structures are located beneath the flight routes. The different pipes and cables are clustered in one tunnel that can be mounted underneath the flight route structure. Because this is above the ground, the pipes and cables need to be insulated to prevent them from any damage frost might cause. Besides, the electrical cables need to be placed higher than the water structures to avoid any possible water damage.

In the masterplan, there is a division between grey water and wastewater. Only the wastewater is discharged into the larger sewer system. As a result, the sewer pipe can be smaller than normal (125 mm). The tap water pipe and the electrical cables are regular sized. Depending on the number of houses per project, the size of the cables and pipes can be enlarged if necessary.



MASTERPLAN

Infrastructure *Helophyte filter*

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Greywater within the settlement is treated locally through a natural helophyte filtration system integrated into the landscape. Water from showers, sinks, and washing machines is guided through planted gravel beds, where reeds and microorganisms gradually purify the water before it is returned to the surrounding environment.

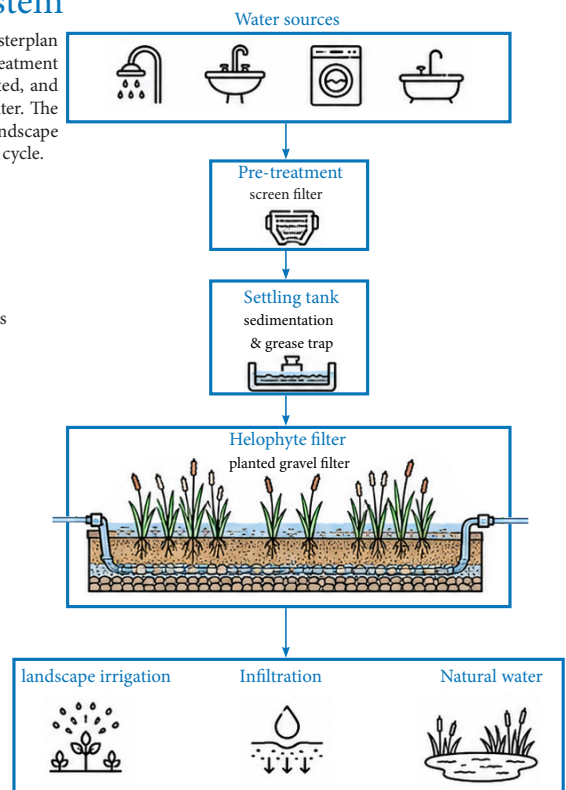
Rather than relying on energy-intensive technical systems, the filtration process works together with natural biological cycles. In this way, water becomes visible again as part of daily life, reinforcing the relationship between the settlement and its surrounding ecology. The helophyte filters are not only infrastructural elements, but also contribute to biodiversity and the spatial quality of the landscape itself.

Vlietlanden water system

The water system of the Vlietlanden masterplan is organized as a decentralized, natural treatment network. Greywater is collected, pre-treated, and purified through a planted (helophyte) filter. The cleaned water is then safely reused for landscape irrigation or returned to the natural water cycle.

system advantages

- Natural & sustainable treatment
- Low energy consumption
- Improves local biodiversity
- Reuses water locally
- Reduces pressure on freshwater resources
- Scalable & decentralized
- Low operational costs



MASTERPLAN

Infrastructure

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RAINWATER

Within the masterplan, the plan builds on the strategy proposed by ZUS, FLUX and SWECO (2022). In the future, the Vlietlanden area will be transformed into a water buffer retaining excess water during wet periods for use during dry periods. This is particularly relevant in the context of the polder, where continuous drainage accelerates subsidence. By working together with the water and giving it space within the plan, rather than pumping it away, we aim to counteract this subsidence. For this reason, rainwater will be allowed to discharge directly onto the landscape rather than into the sewer system. This maintains higher groundwater levels and contributes to a more climate-adaptive and resilient environment.

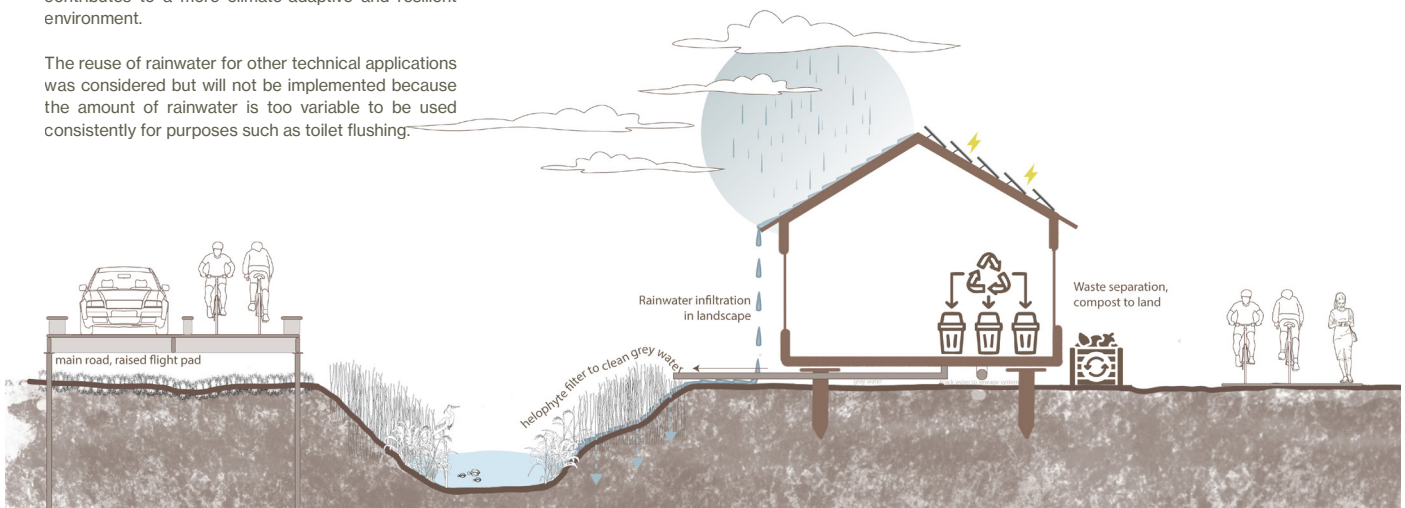
The reuse of rainwater for other technical applications was considered but will not be implemented because the amount of rainwater is too variable to be used consistently for purposes such as toilet flushing.

WASTE MANAGEMENT

Waste management within the settlement is approached as an extension of its broader ecological values. Each dwelling is equipped for selective waste sorting: separating glass, packaging, and residual waste at source, encouraging residents to develop more conscious consumption habits as part of daily life. Depending on location within the settlement, waste is either collected directly from the dwelling or consolidated at central collection points, emptied on a weekly basis to minimise disruption to the car-light environment.

Residents are also encouraged to compost their organic waste, returning nutrients directly to the soil and closing the cycle between consumption and cultivation. Composting is understood here not as an obligation but as a natural extension of living in close relationship with the land.

More broadly, the hope is that the settlement fosters a way of living that tends towards generating less waste: through local food growing, shared facilities, repair, and reuse. The ambition is not simply to manage waste better, but to make it less necessary in the first place.



MASTERPLAN

Six pillars of a healthy living environment

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EDUCATION

EDUCATION

Location

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RECREATION

RECREATION

Location

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Masterplan booklet

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PRODUCTIVE LANDSCAPE

PRODUCTIVE LANDSCAPE

Location

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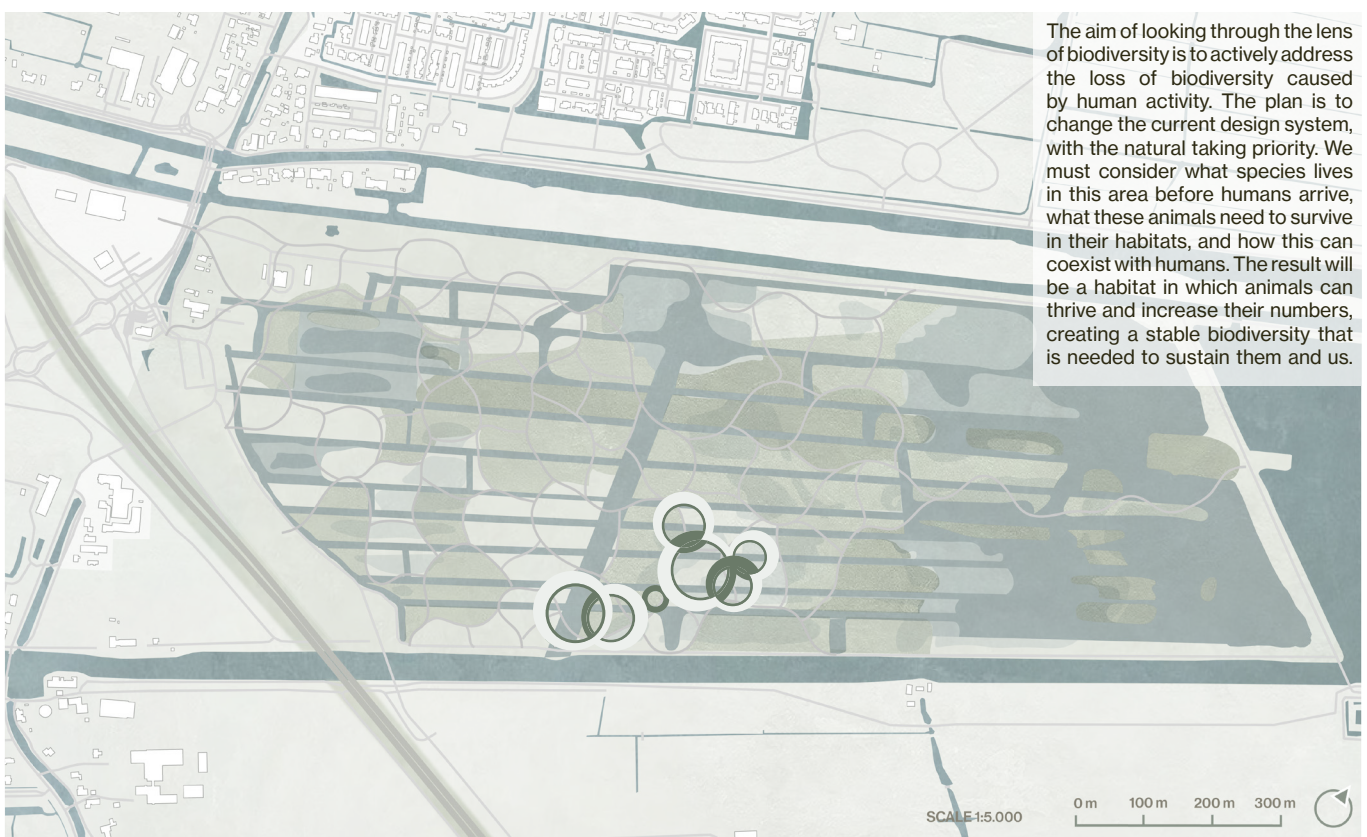
BIODIVERSITY

BIODIVERSITY

Location

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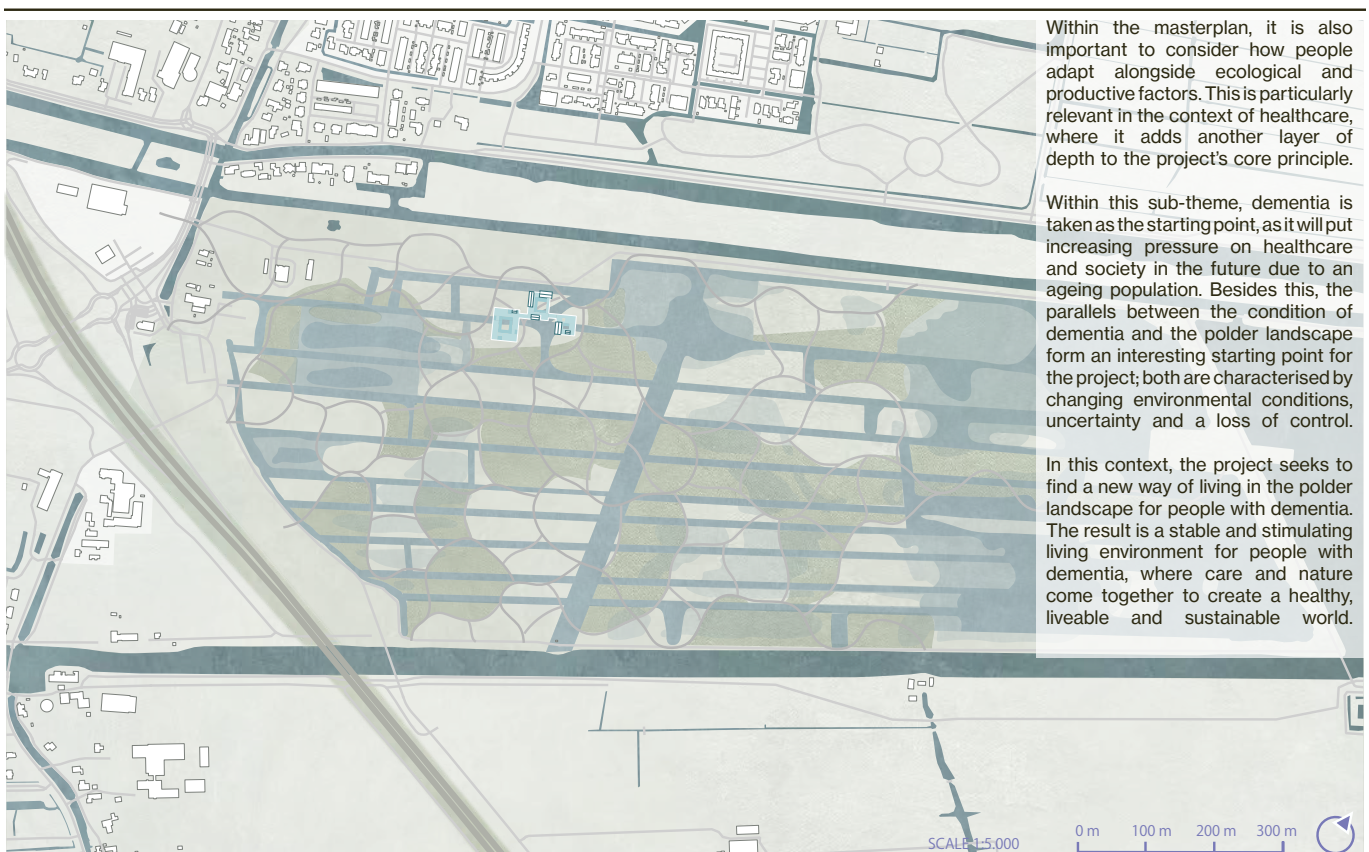
HEALTH CARE

HEALTH CARE

Location

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WORK

WORK Location

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APPENDIX VIII. DATA MANAGEMENT CHECKLIST

Instruction

This checklist is relevant for all graduation projects of the Master AUBS. The form is intended to highlight common aspects of graduation projects that require particular attention with regard to planning the research and data management. Relevant information and supplementary sources regarding each question are provided below each question.

With this checklist, the faculty wants to avoid that students unexpectedly find themselves in complex and stressful situations, in which ethical or privacy matters and/or other laws and regulations become an issue. In projects involving humans, certain types of data processing increase the risks to the human participants: planning such projects requires additional evaluations and advice from university staff before ethical approval can be received and the project can begin. In the case of a graduation project, obtaining additional advice or permits may delay the project with an extra education period or semester. To avoid this, it is recommended that students set up a graduation project with a low level of risk. Therefore, all students have to check their risk, by completing this checklist before their A1.

The first section of the checklist (A) should be completed by all students, together with their supervisor, during the planning of the graduation project, before the A1. It does not need to be submitted to anyone for review or approval. Please consider questions 1 to 3 carefully in relation to the intended graduation project, and answer with 'yes' or 'no'.

The second section of the checklist (B) should only be completed if the graduation project involves working with data from human participants. In that case, the student and their supervisor must apply for and receive ethical approval from the [Human Research Ethics Committee](#) (HREC) before the project can begin (see the paragraph 'Explanation and follow-up' after the questions). The student can submit the application to the HREC, but the supervisor is responsible for making sure that the project is compliant with relevant privacy regulations and ethical policies.

Section A. General considerations	yes	no
1. Is the graduation project conducted as part of an internship (at a company), or as part of a research project at TU Delft? If a student's graduation project is conducted at a company or as part of a research project at the university, questions of data ownership and intellectual property rights need to be addressed in a written graduation or internship agreement before the project begins. Student and supervisor should consult the Intellectual Property Rights of Students webpage. Additional information can also be found in the Extended Personal Research Data Workflow. If applicable, complete the Confidentiality Agreement.		X
2. Does the project involve conducting (part of) the research outside the Netherlands? Students who intend to travel abroad (even to other EU countries) for study, exchange, research, internship, or graduation project purposes need to follow the Travel Safety Protocol. This includes attending a mandatory Travel Safety Training Session: see the Disclaimer.		X
3. Will the research involve processing data from humans, such as running a survey, conducting interviews or workshops, collecting data through social media or internet forums, or re-using existing datasets about humans provided by a third party? (If 'yes', see follow-up questions 4 to 13 in Checklist B.) Students who work with data from human participants must complete the next section and apply for and receive ethical approval from the Human Research Ethics Committee (HREC) before conducting the research.		X

Section B. Extended risk factors (only if question 3 has been answered with 'yes'.)	yes	no
4. Will the project involve participants who may be considered vulnerable, such as the elderly, refugees or asylum seekers, ethnic minorities, patients, or people with disabilities? Participants who may suffer very adverse consequences (for instance, due to discrimination) if their personal data became publicly available can be considered vulnerable.		X
5. Will the project involve participants who cannot themselves give informed consent for taking part in the project, but for whom consent must be obtained from a legal guardian? Participants who cannot give informed consent can include, for instance, children or participants with intellectual disabilities, mental disorders, or dementia. Such participants are also considered vulnerable in the context of the General Data Protection Regulation (GDPR).		X
6. Will the project involve processing any of the special categories of personal data below? - Race - Ethnicity - Criminal offence data - Political opinion - Union membership - Religious or philosophical beliefs - Sex life and/or sexual orientation - Health data (including measurements such as heart rate) - Biometric or genetic data (including fingerprints, iris scanning, facial recognition) The General Data Protection Regulation (GDPR) defines a stricter rules for processing special categories of personal data. If it is necessary to process these data in a project, it is it is important to provide additional safeguards.		X
7. Will the project involve processing personal data that could be considered sensitive, such as the ones listed below? - Information about a person's income, debts, or other payments - Information about a person's (un-)employment status - Information about a person's performance at school or work - Information about relationship problems or (gambling) addiction - Information about poverty, domestic violence, or youth welfare/social work involvement Some types of personal data are considered sensitive, because they can have a high impact on the privacy of the data subject if other persons gain access to these data. Sensitive personal data should only be processed if necessary: in such cases, additional safeguards need to be put in place.		X
8. Will the project involve processing video-recordings, or photographs of participants? TU Delft considers photographic and video-materials of research participants to be sensitive personal data. If such data need to be processed, additional safeguards must be put in place.		X

Section B. Extended risk factors (only if question 3 has been answered with 'yes'.)	yes	no
9. Will the project involve sharing or transferring personal data between multiple partners or collaborating organisations involved, such as between TU Delft and an internship company? According to privacy law, sharing personal data between organisations requires a privacy agreement to be in place: setting this up takes time, and requires support from additional university staff. Furthermore, personal data sharing can potentially expose research participants to different types of risks: these risks must be considered in the ethical application.		X
10. Will the project involve deception, or covert observation of participants? In some types of research, obtaining informed consent for processing participants' personal data is not an option: for instance, if the research involves deception, or the research is covert (conducted without participants knowing about it). In such situations, the steps to mitigate risks to participants are important, and an alternative legal basis for processing the participant's data needs to be established with the help of additional support staff.		X
11. Will the project involve working with social media data? Social media data are personal data, but since it is usually not possible to ask for informed consent for processing social media data, another legal basis for processing the participant's data needs to be established. Processing of social media data also involves legal considerations related to terms of use of data from third-party platforms: therefore, research with social media data requires expert support on privacy, ethics, and legal matters.		X
12. Will the project involve using learning algorithms or other AI to analyse, combine, or otherwise process data from participants? The use of AI in research involves many considerations in terms of data protection, ethics, security, and intellectual property: for more information, see TU Delft's Instructions for use of Generative AI.		X
13. Will the project involve participants who are based in a country or countries outside of the EU? Students affiliated with TU Delft must comply with Dutch and EU regulations of personal data processing (GDPR). Furthermore, the student and their supervisor must make sure that the research complies with local (privacy) legislations of any foreign destinations. Additional support from an external (local) expert may be required.		X

Explanation and follow-up

If you have answered 'no' to all questions 4 to 13, your project is likely to be considered low or minimal-risk: see the paragraph 'Projects with minimal or low-risk' on the next page.

If you have answered 'yes' to one or more of the questions 4 to 13, your research likely involves extended or high risks to participants, according to the [General Data Protection Regulation](#) (GDPR) and TU Delft's privacy and ethical policies: for information regarding such projects, see the paragraph 'Projects with extended or high-risk' on the next pages.

Projects with minimal or low-risk

If you have answered 'no' to questions 4 to 13, your project is likely to be considered low-risk. This does not mean that the project involves no risks at all, but suggests that these risks can likely be addressed by the student and supervisor in the application to the [Human Research Ethics Committee](#) (HREC) within the timeline for a graduation project and without need for additional support.

Compiling the HREC application:

An application to the HREC generally involves a Data Management Plan (DMP), a risk-identification and mitigation checklist, and informed consent materials. Master's students at ABE who intend to compile a HREC application are advised to make use of the following support documents:

- the [student guide](#)
- the [Example Data Management Plan](#) for MSc projects

The graduation supervisor is [responsible](#) for the student's project and ethical application, and must provide support for compiling the HREC application documents.

Additional support

For low-risk student graduation projects, compiling of the HREC application documents should be done by the student in consultation with the supervisor. The Faculty Data Steward can be contacted for individual questions at datasteward-BK@tudelft.nl; however, the Data Steward does not provide detailed feedback on student DMPs for low-risk HREC applications.

Additional resources

The HREC has guides available for [completing the checklist](#) and for compiling [informed consent materials](#). Additionally, the [Guide to the Extended Personal Research Data Workflow](#) has been created to help researchers and students who work with human participants comply with both GDPR principles and TU Delft's policies on Data Management and Human Research Ethics.

Timeline

Minimal or low-risk HREC applications are generally processed faster than extended or high-risk applications (see the paragraph below). Nevertheless, the initial evaluation by the HREC usually takes approximately 2 weeks, and may take longer during busy periods or holiday: see the [HREC website](#) for up-to-date information. Additionally, the application may require revisions before final approval is granted. If you do not receive an initial response about your ethical application after 4 weeks from the time of submission, you may follow up with the HREC to enquire about an update.

Projects with extended or high-risk

If you have answered 'yes' to one or more of questions 4 to 13, there are potential increased risks related to how data from human participants will be processed in your project. These risks will need to be addressed in consultation with the Data Steward and other relevant support staff before submitting the ethical application to the [Human Research Ethics Committee](#) (HREC).

Compiling the HREC application

An application to the HREC generally involves a Data Management Plan (DMP), a risk-identification and mitigation checklist, and informed consent materials. Master's students at ABE who intend to compile a HREC application are advised to make use of the following support documents:

- the [Ethical Approval & Data Management Planning Student Information](#)
- the [Example Data Management Plan](#) for MSc projects

The graduation supervisor is [responsible](#) for the student's project and ethical application, and must provide support for compiling the HREC application documents.

Additional support

Once the DMP has been compiled and reviewed by the supervisor, feedback should be requested from the Data Steward via DMPonline. After this, any other necessary support staff will need to be contacted. Crucially, if the project involves one or multiple ways of personal data processing that could result in high-risk to the participants according to the GDPR, the TU Delft Privacy Team must be consulted to establish whether or not a [Data Protection Impact Assessment](#) (DPIA) is required.

Additional resources

The HREC has guides available for [completing the checklist](#) and for compiling [informed consent materials](#). Additionally, the [Guide to the Extended Personal Research Data Workflow](#) has been created to help researchers and students who work with human participants comply with both GDPR principles and TU Delft's policies on Data Management and Human Research Ethics.

Timeline

It can take a long time to compile a complete research plan and HREC application for projects involving extended risks. DMP feedback from the Data Steward usually takes around 2 weeks, but can take longer during busy periods or holidays. Receiving additional support from other staff, such as the Privacy Team, can take anywhere from a few days to multiple weeks, depending on the project and capacity of university staff. If a DPIA is deemed necessary, it can take anywhere from 4 weeks to several months.

It is important to note that advice from the Privacy Team or other support staff, as well as any additional documents (such as necessary contracts, or a DPIA, if needed) must be in place before the application is submitted to the HREC. The initial evaluation by the HREC can be processed in 2 weeks, but may take longer during busy periods or holidays: see the [HREC website](#) for up-to-date information. Additionally, the application may require revisions before final approval is granted. If you do not receive an initial response about your ethical application after 4 weeks from the time of submission, you may follow up with the HREC to enquire about an update.

Considering the limited time available for students conducting their graduation projects, students working with data from human participants are strongly advised to prioritise low-risk research projects. If a student project necessitates processing data in ways that are considered extended or high-risk, both student and supervisor need to be aware of the extended processing times involved in obtaining ethical approval and beginning the graduation project.