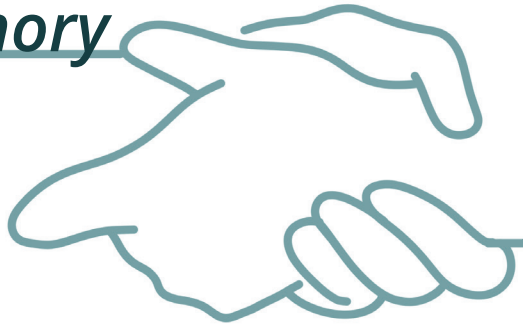
Between *Memory*



And *Landscape*

- A spatial framework at the interface of cognitive and environmental change

Graduation Report
Studio: Advanced Housing - Ecologies of Inclusion
Name: Meike Traa
Student number: 5303583
Responsible supervisor: Olv Klijn
Supervisor: Robbert Guis

PREFACE

This graduation project marks the end of my six-year journey at the Faculty of Architecture in Delft. It has been an incredibly valuable and insightful period filled with inspiring experiences, challenges, growth and countless lessons. Looking back on this period, one valuable insight that has always stuck with me is the strong influence that architecture has on the way people live together and experience the world.

It was mainly during my master's degree that I developed a growing interest in the impact of architecture and the built environment on various societal issues and challenges, and the fact that spatial design affects everyone, every day, even if we are not consciously aware of it.

Within the six themes explored during the collective phase of the studio, the theme of *healthcare* interested me right from the start. The healthcare sector is under enormous pressure, and this will only further increase in the future. A significant part of this pressure will be caused by dementia, a condition that will affect almost everyone at some point in life, either personally or within their social environment. I myself have experienced the enormous impact dementia has on one's family and loved ones, something I will never forget.

What is often overlooked is that, in addition to the medical challenges, dementia also comes with spatial challenges. The spatial environment in particular has a significant impact on patients' well-being. Throughout the process, I was frequently asked: "*What actually is the connection between dementia and architecture?*" It was precisely this question that interested and motivated me. How can I, within the field of architecture, contribute to addressing broader societal problems through creating meaningful and well-designed spatial environments?

Given the social relevance of the project, engaging with healthcare professionals and experts within this field provided valuable insights into practical needs and experiences. I would therefore like to thank everyone who contributed to this, as well as my tutors, studio colleagues and others involved for their support and feedback throughout the process.

Meike Traa
Delft, June 2026

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01.

INTRODUCTION

*"If we do nothing, Midden-Delfland as we know it **will disappear** within the foreseeable future. If we put a fence around it, Midden-Delfland **will also disappear** in the long run."*

(Gemeente Midden-Delfland, 2024)

1.1 Problem statement

The Netherlands is facing a growing number of complex challenges and social urgencies, such as the increasing demand for housing, urbanisation, sustainability, climate change and the restoration of nature and biodiversity (Baptist et al., 2019). In the future, this will require new solutions to pave the way for a new way of life. The area of Midden-Delfland is an exemplary area in the context of these challenges.

The plan of ZUS, FLUX and SWECO (2022) states that the current water system in the polder has reached its maximum capacity and that drastic measures must be taken to ensure its viability by the year 2100. It explains that various zones within the new 'National Productive Park Delfland' will be designated as water buffers where water can be stored for use in times of extreme drought. "Midden Delfland should become a green lung and a sponge for the livability of surrounding cities." (ZUS, FLUX & SWECO, 2022).

These challenges creates an area of tension: while ZUS mentions opportunities for increasing biodiversity, nature and water storage, the green-blue space is under pressure from increasing urbanisation, economic growth and recreational use from surrounding large cities (Gemeente Midden-Delfland, 2024). This tension means that the traditional approaches for spatial densification do not offer a solution in this area.

However, the housing crisis is inevitable. One of the top priorities of the municipality of Midden Delfland focuses on adding suitable living space for the growing number of elderly people (Gemeente Midden-Delfland, 2024). Research shows that the grey pressure, the ratio of people aged 65 and over to those aged 20-65, will only become more pressing in the future (figure 1). Not only this ratio is becoming more unbalanced, but these elderly people are also living to an increasingly higher age. This phenomenon is called double ageing (figure 2), and is expected to have an increasing impact on healthcare and society in the coming years (Centraal Bureau voor de Statistiek, 2025).

One of the consequences of ageing is a strong increase in the number of people with dementia. "Dementia is the umbrella term for a range of brain diseases that are progressive and chronic in their nature. Symptoms include deterioration in cognitive function, behavioural changes and functional limitations. The illness has a profound impact on society and those directly affected by the illness" (Rodgers, 2018). Currently, there are approximately 300,000 people living with dementia in the Netherlands, but by 2050 this number will exceed 610,000 (figure 3). This means that every hour, five individuals will be diagnosed with dementia (Alzheimer Nederland, n.d. -b).

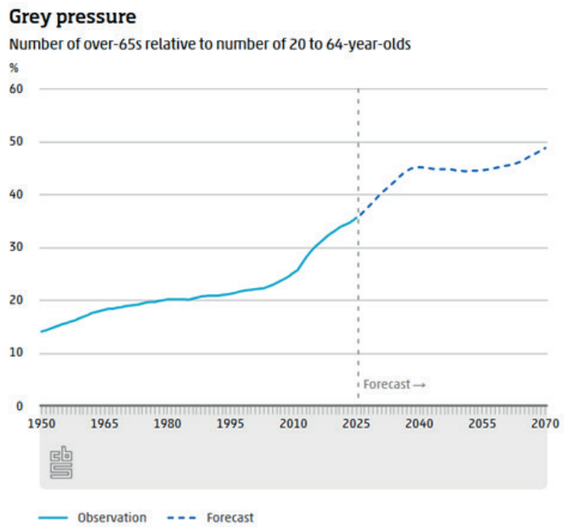


Figure 1: Diagram of grey pressure in the Netherlands (CBS, n.d.)

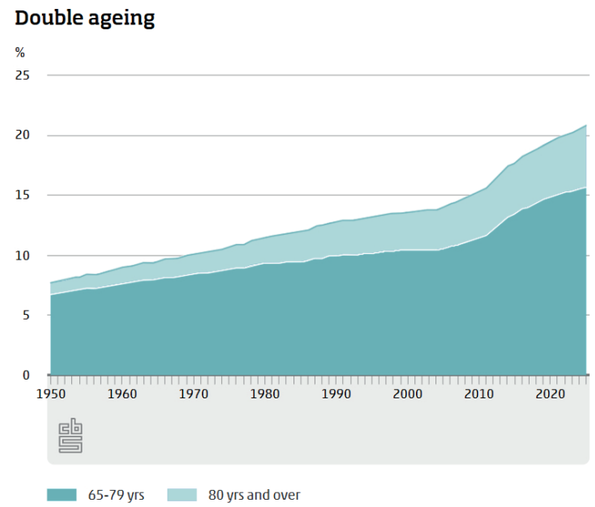


Figure 2: Diagram of double ageing in the Netherlands (CBS, n.d.)

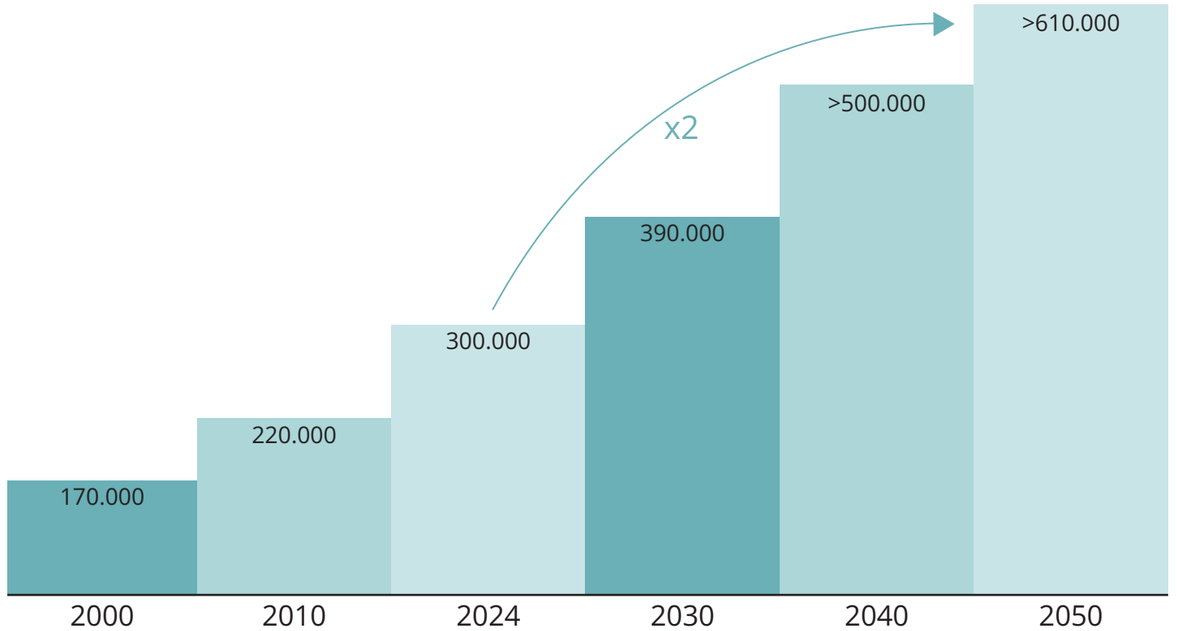
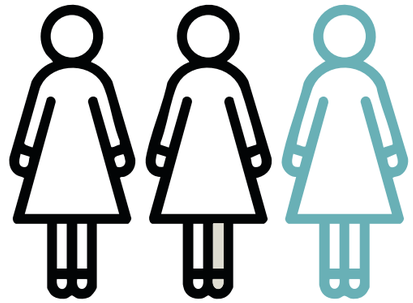


Figure 3: Growing number of people with dementia (Alzheimer Nederland, n.d.)

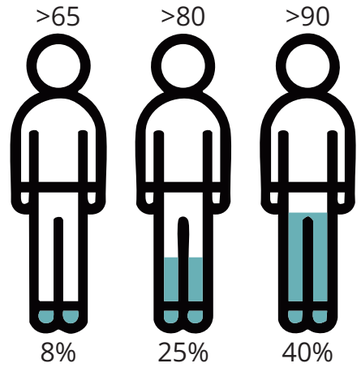
This development is causing growing pressure on both formal and informal care, and is also having a major impact on society. Research by the Rijksinstituut voor Volksgezondheid en Milieu (2018) supports this by saying that not only medical problems but also social problems are increasing, for example through loneliness and isolation, because the majority of patients live alone at home. "The domestic home is the preferred site for care provision for people with dementia and their families, therefore creating a dementia and caring friendly home environment is crucial" (Soilemezi, 2019). However, research by Alzheimer Nederland (2022) shows that these necessary dementia-friendly homes are still scarce, and that there are currently insufficient suitable forms of housing that meet the needs of patients, their caregivers and family members.

In addition, most types of housing available for people with dementia are located in urban environments, even though there is ample evidence that natural landscapes and structures benefit the physical, social and psychological well-being of individuals (Motealleh et al., 2019). "The majority of LTC (Long Term Care) environments are not explicitly designed from the standpoint of facilitating meaningful person-nature connectivity" (Peters & Verderber, 2022). Kellert (2006) agrees with this in his research, stating that, despite the emerging awareness of sustainability, contemporary society and design movements still fail to recognise and preserve the importance of a healthy and varied living environment in order to maintain quality of life. He argues that sustainability nowadays does not go beyond 'low environmental impact design': "a necessary, but by itself insufficient basis for true sustainable design and development" (Kellert, 2006). According to the same study, this principle ignores the equally important need to also design for human-nature interaction, which he believes is inevitable.

1. Ageing population



One in five people develop dementia, one in three will be women



% of people with dementia by age

2. No suitable housing

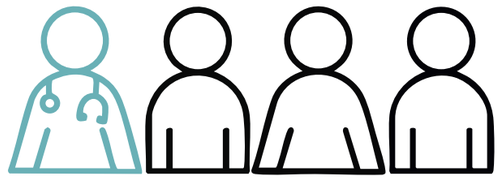


75% of the patients live at home...



... but for 77%, the current housing supply is inadequate

3. Pressure on healthcare (formal + informal)



By 2040, one in four people will need to work in healthcare to solve the pressure



56% of informal carers experience heavy pressure and stress, and his will increase even further

Figure 4: Problem statement (Alzheimer Nederland, n.d. -b)

However, while the challenges of both climate adaptation in the polder landscape of Midden Delfland and of providing suitable, nature-inclusive living conditions for people with dementia may seem distinct, they share an underlying issue; the decrease in stability and control over their environment.

As the future plan of ZUS, FLUX and SWECO (2022) explains, the polder landscape becomes a productive and dynamic system in which water levels and boundaries are no longer fixed (figure 6). While this simplified water management system makes the area future-proof, it also means that control and stability is no longer guaranteed.

The same applies to people diagnosed with dementia. While the disease manifests differently in each individual, patients experience a decline in orientation, structure and control as it progresses. Consequently, they are more frequently confronted with ‘daily situations that are beyond their ability to control’, which often leads to anxiety and panic (Read et al., 2017).

This observation forms the starting point of this research, which aims to create a stable living environment that can provide a sense of connection in these dynamic contexts.

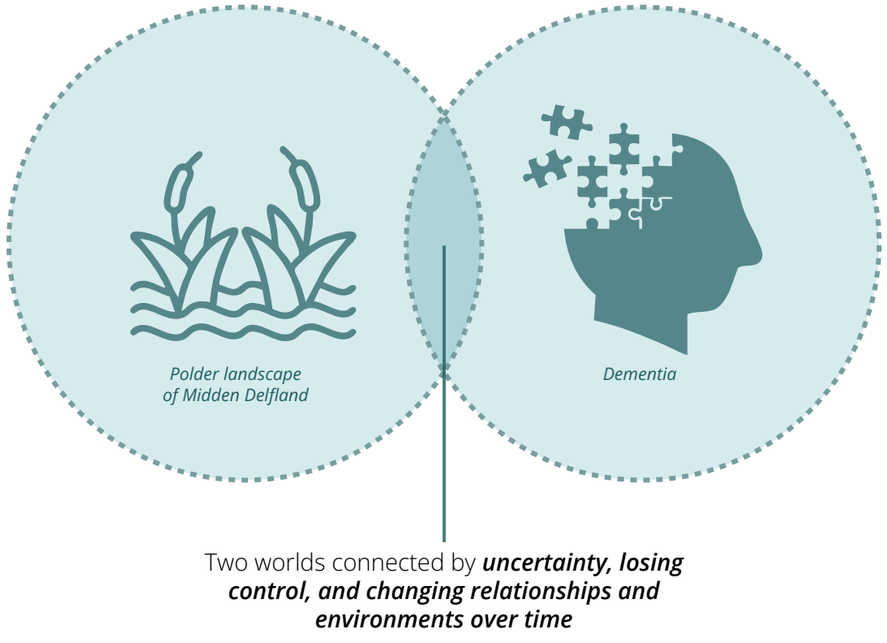


Figure 5: The intersection between the polder landscape and dementia (Meike Traa, 2026)

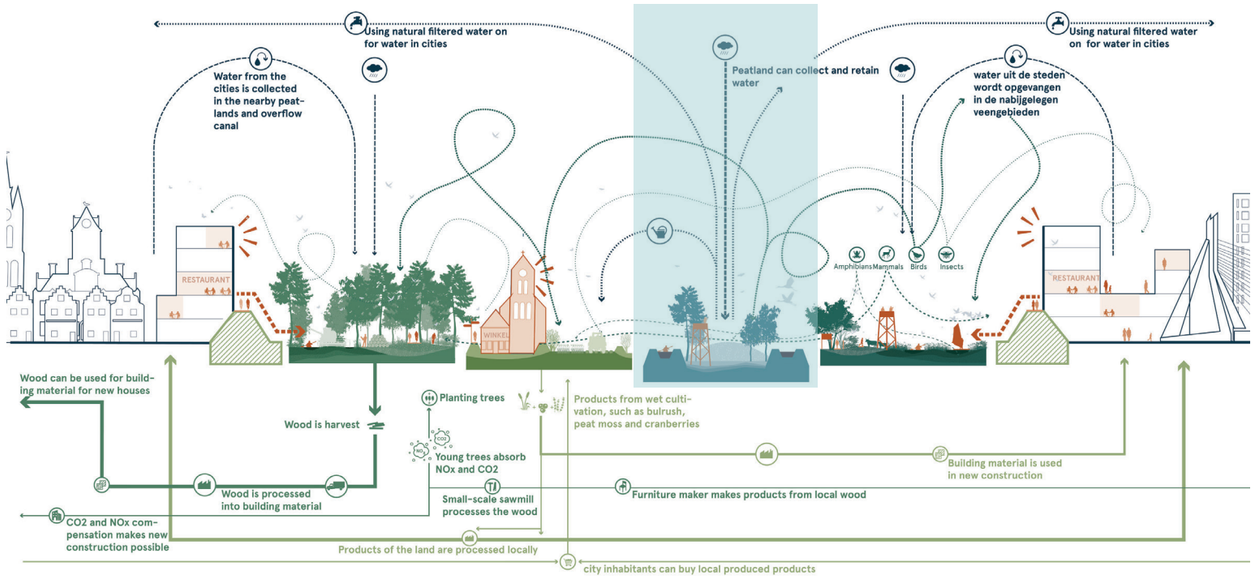


Figure 6: National productive park Delfland; a green lung for the city (ZUS, FLUX & SWECO, 2022)



Figure 7: Problem statement (Meike Traa, 2026)

1.2 Relevance

The relevance of this topic is reflected in the pressure that dementia exerts on both healthcare and society. “Amongst older people, dementia makes the largest contribution to the need for care, much more so than other types of impairment and chronic disease” (Prince et al. 2013). This is evident both in formal care, due to shortages of staff and professionals in the care sector, and in the informal sector, due to the stress and pressure on the shoulders of relatives (Alzheimer Nederland, n.d.). In the future, this pressure will only increase (Rodgers, 2018). In the same study, Rodgers states that innovative developments are needed in response to this, in order to improve the lives of people with dementia from the moment of diagnosis (Rodgers, 2018). Furthermore, this will also enable people to stay in their own homes for longer, which is ultimately an important wish for many patients (Alzheimer Nederland, 2022). However, “In comparison with many other fields, designing for people living with dementia does not have a large knowledge base” (Fleming et al., 2020). Developing a new living concept for this desire to live at home and to enrich and relieve the daily lives of both patients and their loved ones is therefore urgent.

In addition to this, there is an increasing need to build new dwellings in a sustainable and future-proof manner, particularly in a natural and protected landscape such as Midden-Delfland, and to integrate them into the green landscape (Gemeente Midden-Delfland, 2024). In this light, it is interesting and relevant to investigate how the design not only focuses on its contribution to people, but to go further by also looking at the link between people and nature, and how the design and function adapt to the ecological logic, opportunities and boundaries of the area.

Also, although there is a wide range of research on the importance of designing with nature and its impact on human wellbeing in the built environment (Peters & Verderber, 2022), attention to its practical implementation remains limited. “This inattention is especially acute given the growing numbers of persons in LTC (long term care) environments globally who live with dementia and related cognitive disorders and the growing body of evidence that exposure to nature improves cognitive functioning” (Peters & Verderber, 2022). This is also cited in other research. “At this stage, the available knowledge is not being applied in the great majority of countries planning to improve the care of people living with dementia” (Fleming et al., 2020).

Therefore, a gap remains between the theoretical research on this subject and its actual architectural implementation. This presents opportunities to convert this knowledge into an integrated system to provide future-proof solutions for this growing number of people with dementia.

*“**Modern society** has produced an increasingly compromised and degraded natural environment that offers far fewer opportunities to **experience satisfying contact** with nature as an integral part of **ordinary life**.”*

- Stephen Kellert

1.3 Objective

The aim of this research is to develop an architectural design for an innovative system of care and independent living for people with dementia, within the vulnerable polder landscape of Midden-Delfland. The ecological context, opportunities and boundaries of the polder landscape serve as the starting point for this. In addition, biophilic design principles serve as an inspiration in the design process, allowing nature to be fully integrated into the design of this new care structure.

This new structure is achieved by disconnecting healthcare from the current institutionalized and building-centred approach and aiming for a landscape-based system in which care, nature and design are integrally intertwined. Within this framework, the study examines how the natural landscape and architecture can contribute to the well-being and orientation of people with dementia, while preserving and, where possible, even reinforcing the underlying polder landscape and biodiversity in the area.

Although this research is not extensive enough to fully optimise care or maximise dwelling development in response to the housing shortage, the design functions as a spatial model and a bridge between the available theoretical frameworks and its architectural implementation. Literature studies, theories and ideas are explored and applied through research by design, and measured in the specific landscape of Midden-Delfland.

In the future, the ideas behind this research could serve as an example or inspiration for other nature inclusive care models in the Netherlands.

1.4 Research questions

In order to provide structure within the framework of the objective, a number of research questions have been formulated that seek to explore the possibilities to respond to the needs for new dwelling typologies for people with dementia, while simultaneously using the structural and spatial characteristics of the landscape to maximise nature integration.

*How can **architecture** create a **continuous and innovative living environment** for people with dementia, integrating changing **care needs**, **nature** and the **ecological transformation** of the polder landscape in Midden-Delfland?*

This main question is supported by the following subquestions:

- Which ecological conditions and spatial qualities of the Midden-Delfland polder landscape are important when designing future dementia care environments?

- Which spatial conditions support well-being for people living with dementia through the themes orientation and wayfinding, sensory experience, familiarity, mobility and social interaction?

- How can architecture accommodate the progress of dementia, with changing needs and increasing care, while preserving continuity of place and identity?

- How can biophilic design principles contribute to cognitive well-being, orientation and connection to nature in dementia care environments?

Together, these questions form the conceptual framework presented in figure 8. In chapter 3, this framework will be further elaborated and explained.

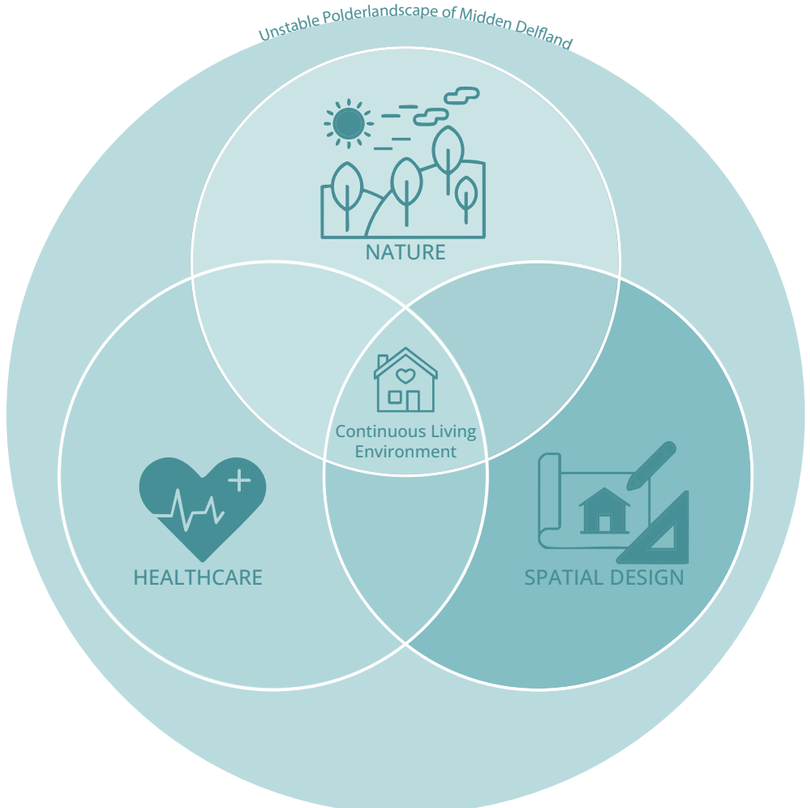


Figure 8; Conceptual framework behind the design process (Meike Traa, 2026)

1.5 Scope

The project is situated in the polder landscape of Midden-Delfland, a distinctive green area located within the Rotterdam-The Hague metropolitan region. The primary spatial context is the Vlietlanden area, particularly around the Maaslandse Poort and the surrounding landscape. It is precisely in this location that conflicts arise between increasing recreation due to the Maaslandse Poort and the area's vulnerability, as well as between the housing shortage and ecological protection. According to the Municipality of Midden-Delfland (2024), a balance must be struck between the landscape and the community. Furthermore, the plan of ZUS, FLUX and SWECO (2022) states that this area will border all types of land in the future. This presents a challenge in terms of making the Vlietlanden a connection between these different areas (figure 9).

While a significant amount of housing development is required, the area's protected status and limited building capacity necessitate an alternative design approach. Simply constructing the required 247,896 dwellings (Rijksoverheid, 2024) is insufficient for such areas. In the context of Midden-Delfland, this means exploring new ways to balance the needs of people, nature and the landscape.

The programme focuses on independent housing for people with mild to moderate-stage dementia, combined with group living and increased healthcare options as the dementia progresses to the severe stage. As a starting point for the spatial layout of the design and the distribution of housing types, research is being conducted into these three stages of dementia (mild, moderate and severe) according to Regier et al. (2016). By doing this, the spatial and environmental design is intended to promote the independence and well-being of these patients. Finally, the supply of dwellings will be combined with sufficient suitable (social) functions and activities.

This research does not address institutional healthcare models and facilities; rather, it focuses on a new way of living that will ultimately alleviate pressure on both formal and informal care. Within this, the spatial needs of dementia patients, the potential and limits of the landscape and maximising nature integration serve as a starting point for the design. However, this also presents a challenge: how can the landscape play a leading role in a care-dependent context while ensuring safety and autonomy for patients?

The research attempts to bridge the gap between existing theory and its implementation in architecture. The result is a spatial framework and design that can also serve as an example or guide for future projects within this research field.

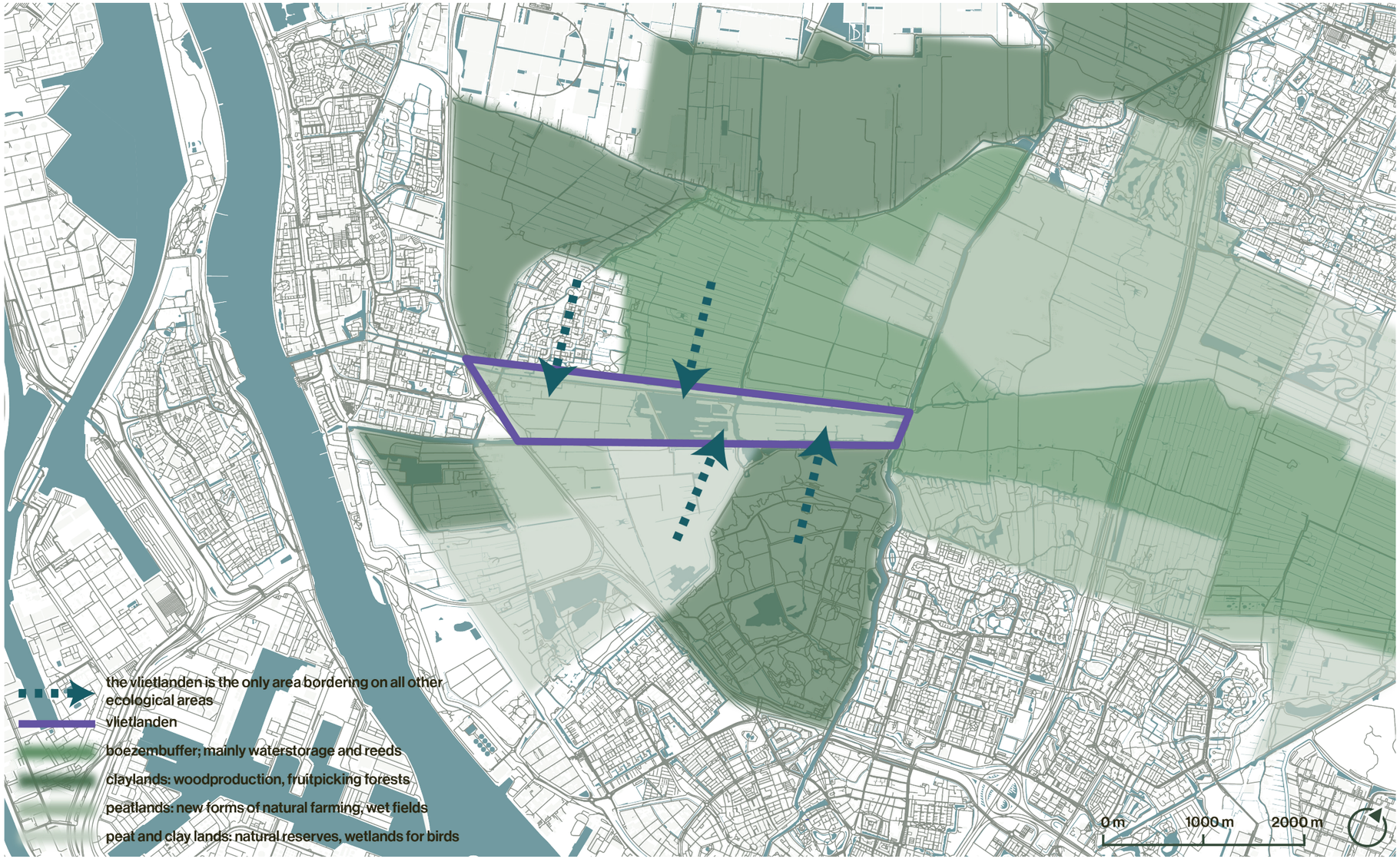


Figure 9: Vlietlanden within context of Midden-Delfland, scale 1:35000 (reduced) (Group Sustainable Environment, 2026)

02.

APPROACH

2.1 Methodology

This research combines qualitative literature research with various analytical and design methods. It is an iterative process involving a cyclical rather than linear method, whereby the design is constructed step by step based on insights from the various sub-methods described below.

Literature review:

The theoretical foundation of this research is formed by conducting a literature review. Scientific articles on dementia, architectural and spatial needs, the principles of biophilic design and the positive effects of integrating nature into architectural design form the basis of the research. Definitions are drawn from this literature and are further explained in the subchapter 'Theoretical frameworks'.

Case study analysis:

It is relevant to look at (inter)national examples and approaches to dementia-friendly living environments and the integration of nature into dementia care. Case studies of both independent living and LTC (Long-Term Care) centres can be used. Based on this research, the opportunities and limitations of current architectural models can be examined.

Research by Design:

Because architectural design plays a central role, the Research by Design method is a core approach. It is used to convert all theoretical knowledge into an integrated design for care and living for people with dementia. The possibilities and strategies for ecological inclusion and dementia-friendly living are tested on multiple scales. Experiments are also conducted with the application of natural elements derived from biophilic design principles, such as the use of specific colours and materials, and visual and non-visual connections with nature. Iterative learning is particularly important at this stage. Reflection, improvement and refinement form the core of this phase, with the ultimate aim of achieving the best possible outcomes.

Site analysis:

The site analysis provides information on the physical conditions of the Midden-Delfland polder landscape. This includes historical, water and soil structures, as well as information about current and future land use and potential development plans. Based on this information, it has been possible to focus in more closely on the specific location of the Vlietlanden and to identify the challenges and opportunities of this site.

Exploratory conversations:

Finally, exploratory conversations will be conducted with architects, healthcare professionals and experts specialising in dementia care. These conversations provide extra insights and information that complement theoretical knowledge from literature studies. For example, they can provide insights into experiences with the current challenges in dementia care and spatial needs and wishes for independent living.

2.2 Theoretical Framework

Research by Soilemezi et al. (2017) states that optimising the physical domestic setting for people with dementia is crucial for various reasons. For example, older people have a strong desire to continue living at home for as long as possible, because a familiar place is meaningful and important to them (Soilemezi et al., 2017). In addition, there is considerable resistance to moving into a nursing home, as people often associate this with losing their freedom and independence (Alzheimer Nederland, 2022). "It has been argued that examining the suitability of the home environment (e.g. size, layout) and manipulating the physical environment (e.g. adaptations) can play a significant role in the management of dementia and the quality of life of both the patient and carer" (Soilemezi et al., 2017).

Bennett et al. (2022) define independent living as "living in a home setting, not in an institution, either on their own or with an informal carer, such as a spouse or relative." Within this, autonomy and independence are important characteristics, and one of the most important aspects to measure this is defined by Marquardt (2011) as wayfinding. "However, spatial disorientation and declining wayfinding abilities are among the frequently mentioned early symptoms of dementia" (Marquardt, 2011). Dementia affects both cognitive and physical abilities, as vision and other senses may also decline. As a result, people with dementia often experience difficulties navigating and understanding their surroundings (Ghamari et al., 2025).

The study examines the spatial challenges of wayfinding in both dwellings and landscapes, and how this can be translated into architectural strategies. Several essential elements for a dementia-friendly environment are described, such as "clear visual cues, recognisable landmarks, colour-coded elements, minimalist aesthetics, and simplified floor plans" (Ghamari et al., 2025). The use of different, contrasting colours, materials, textures, and light help patients to orient themselves and make functions recognisable. Furthermore, Ghamari et al. (2025) mention that adding personal or familiar objects and aspects evoke positive feelings and memories. Lighting design is also mentioned as a crucial factor for the well-being of dementia patients. For example, light can be adjusted to the natural day and night rhythm, which enhances patients' comfort and reduces stress and anxiety levels. Figure 10 shows a guide to the most important steps in dementia-friendly design (Ghamari et al., 2025).

Marquardt (2011) follows up on the research of Ghamari et al. (2025) and Soilemezi et al. (2017), arguing that a supportive design and stimulating wayfinding abilities for people with dementia within the environment are needed. The article concludes with four additional guidelines to support wayfinding abilities: no need for new or higher skills (e.g. reading, interpreting, orientation strategies), allow visual access and overview (all relevant places should be visual), reduce decision making (e.g. avoid many changes in direction, unless implementing reference points), and increase architectural legibility (e.g. identify rooms and functions).

Step 1: Needs Assessment	• Engage with dementia patients, families, and caregivers. • Analyze existing research on dementia needs. • Identify key design considerations.
Step 2: Wayfinding and Orientation	• Incorporate landmarks and architectural features. • Ensure coherent architectural differentiation. • Simplify navigation and minimize decision points.
Step 3: Enhance Sensory Experiences	• Optimize lighting for circadian rhythms. • Use dynamic lighting systems. • Integrate olfactory and multisensory stimulation.
Step 4: Personalization and Familiarity	• Integrate reminiscence therapy. • Encourage personal memorabilia. • Design residential-style living areas.
Step 5: Safety and Accessibility	• Incorporate ergonomic design and assistive features. • Provide non-slip flooring and accessible bathrooms. • Balance safety and autonomy.
Step 6: Stakeholder Engagement	• Collaborate with experts and end-users. • Conduct post-occupancy evaluations. • Gather feedback for continuous improvement.

Figure 10; Step-by-step guide to dementia-friendly design. (Ghamari et al., 2025)

Thereby, contact with the natural world is also essential to promote well-being. However, Bennett et al. (2022) state that a large number of people with dementia do not have access to nature. "Evidence suggests that 50% of people living with dementia in residential care never go outside, and 50% of people living independently with dementia report to leaving their homes no more than once per week" (Bennett et al,. 2022). Therefore, there is a high need for environments where people living with dementia can make meaningful connections with the natural landschape. Bennett et al. (2022) define this meaningful connection as "active and passive engagement in the natural world that holds meaning for the individual, for example, sitting in the park listening to bird song, walking in the countryside or taking part in a group-based outdoor activity such as a walking or gardening group". This connection should be self-evident and therefore implemented as a structural component in the living environment.

There are many documented benefits to integrating these natural elements into architecture. "A growing evidence-based literature focuses on the health-promoting application of biophilic design patterns in LTC environments" (Peters & Verderber, 2022).

Browning et al. (2014) define biophilic design as a set of fourteen design patterns. The research emphasises that "these patterns can foster stress reduction, enhance cognitive performance, emotional-mood, and overall human physiology". The patterns that are specifically relevant when designing for independent living and dementia care are (Browning et al., 2014):

1. ***Visual connection with nature;*** *a view to elements of nature, living systems and natural processes.*
2. ***Non-visual connection with nature;*** *auditory, haptic, olfactory, or gustatory stimuli that engender a deliberate and positive reference to nature, living systems or natural processes.*
3. ***Presence of water;*** *enhancing the experience of a place through seeing, hearing or touching water.*
4. ***Dynamic and diffuse light;*** *the ability to leverage varying intensities of light and shadow that change over time, recreating conditions occurring in nature.*
5. ***Connection with Natural Systems;*** *Awareness of natural processes, especially seasonal and temporal changes characteristic of a healthy ecosystem.*
6. ***Material Connection with Nature;*** *Materials and elements from nature that, through minimal processing, reflect the local ecology or geology and create a distinct sense of place*
7. ***Complexity and order;*** *affording a multiplicity of sensory information that nonetheless expresses clear spatial hierarchies similar to those inherent in the natural environment.*
8. ***Prospect;*** *An unimpeded view over a distance, for surveillance and planning.*
9. ***Refuge;*** *A place for withdrawal from environmental conditions or the main flow of activity, in which the individual is protected from behind and overhead.*

In this project, these patterns are used as an inspiration and strategy for the design of a new way of living for elderly people with dementia. Midden-Delfland, as the unique and green centre in the middle of the Randstad, provides a suitable starting point for this study.

*"**Biophilia** is humankind's innate **biological connection** with nature. It helps **explain** why crackling fires and crashing waves captivate us; why a garden view can enhance our creativity; why shadows and heights instill fascination and fear; and why animal companionship and strolling through a park have restorative, **healing** effects."*

- Browning et al. (2014)

03.

RESULTS

This chapter builds on the research findings from previous chapter to develop the architectural proposal. In this context, architecture is not viewed as a final product, but as an integral component of three equally important and interconnected fields: care, landscape and design. As mentioned before, both the polder landscape and dementia are characterised by overlap in areas such as loss of control, instability, and shifting perspectives. Traditional design methods are therefore insufficient, necessitating a new approach to enable these two worlds to coexist.

Design is employed as a stabilising element, providing a clear and continuous framework within this unpredictable context. Together, these three fields work together and create an innovative and continuous living environment for people with dementia.

The conceptual diagram in figure 11 shows how the three different domains work together within the unstable polder landscape of Midden Delfland. The overlap between these three areas forms the conceptual core of the project, in which environmental dynamics, changing care needs and spatial clarity converge.

The following subsections explain how this diagram, and thus the core of the design, is constructed and provide a more detailed explanation of the importance of each domain.

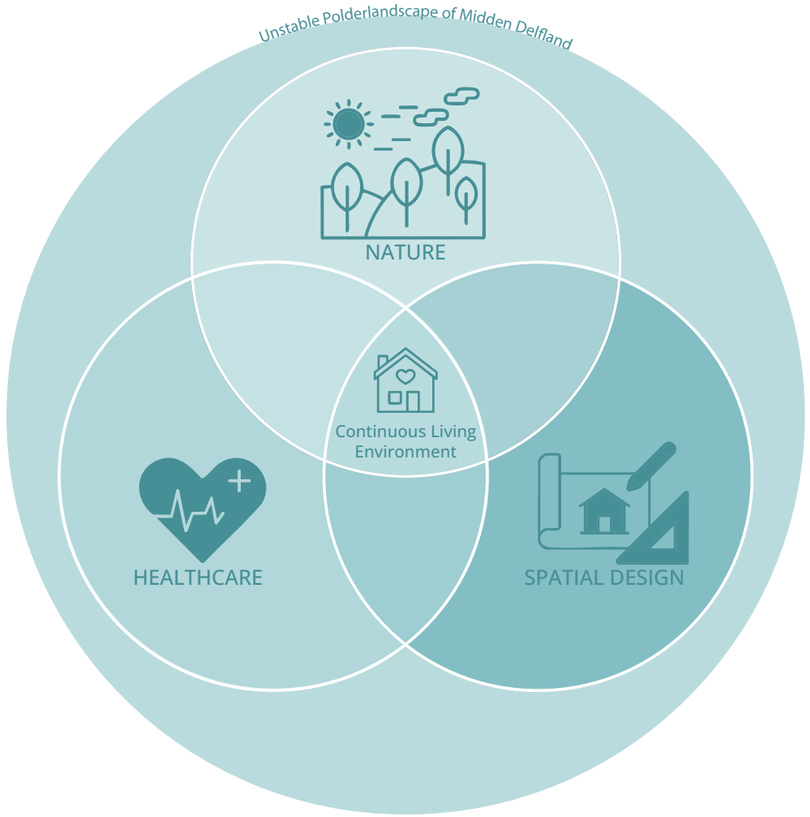
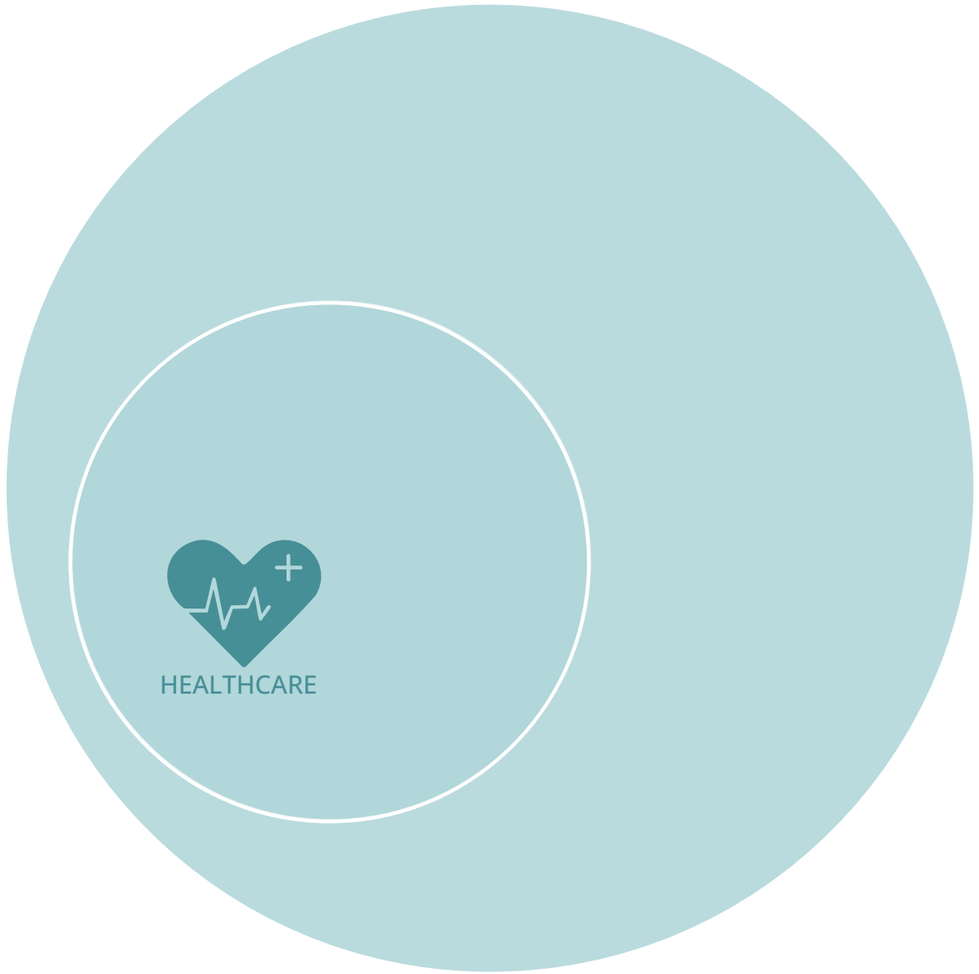


Figure 11; Conceptual framework behind the design process (Meike Traa, 2026)



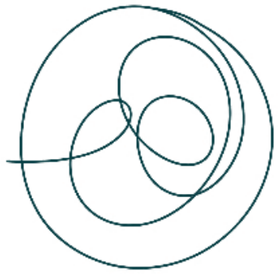
3.1 Healthcare

The fundamental principle of the design lies in understanding and translating the spatial requirements of people diagnosed with dementia. As the disease progresses, individuals become increasingly dependent on their physical and social environment due to declining cognitive and behavioural abilities (van Buuren et al., 2025). Patients are no longer able to shape their environment themselves, which demands a well-designed and clearly structured environment "to better support care, quality of life and independence" (Charras et al., 2024). Research by Marquart & Schmieg (2011) also indicates that the physical environment exerts a strong influence on patients' autonomy and well-being. This emphasizes the significance of ensuring that the environment aligns well with patients' particular wishes and needs.

Understanding these needs begins with identifying the three stages of dementia: mild, moderate and severe. Although the disease progresses differently for each individual, this classification provides a clearer insight into and understanding of the various stages. Each stage has different symptoms and therefore involves different cognitive, physical and spatial needs. Figure 12 illustrates these stages, based on research by Alzheimer Nederland (n.d. -a).

The medical conditions and symptoms of people with dementia can be translated into a set of basic spatial design principles, which serve as a guide throughout the rest of the process from a healthcare perspective. Based on literature studies and expert interviews, the principles are categorised under the following themes: *orientation and wayfinding, sensory experience, familiarity, mobility and social interaction.*

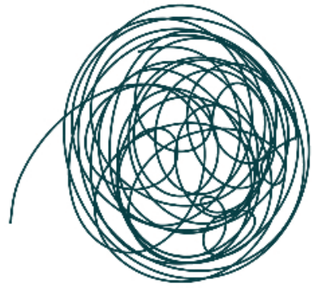
The corresponding design principles for each theme are presented alongside their respective design scale levels (micro, meso and macro), together with a relevant case study that illustrates the application of some of the design principles.



Stage 1: Mild
- Minor changes in behaviour and personality
- Problems with short-term memory
- Concentrating and making decisions
- It becomes harder to learn or understand new things
- Independent living and community interaction is still possible, but provide care nearby
- At this stage, it is often difficult to make a diagnosis



Stage 2: Moderate
- Everyday tasks are becoming more difficult
- Driving is no longer safe
- Difficulties arise in recognising people
- Wandering around the house and the surrounding area
- A disrupted day-night rhythm

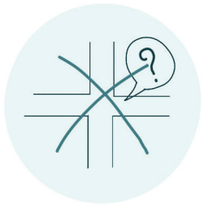


Stage 3: Severe
- The brain is so severely affected that patients are no longer able to function independently
- Restless behaviour and difficulties with speech and language
- 24h care needed, independent living is no longer an option
- Patients need a familiar and safe environment

Figure 12; The three stages of dementia (Alzheimer Nederland, n.d. -a)

Orientation and Wayfinding

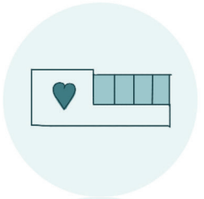
One of the main challenges associated with dementia is spatial disorientation. “Former studies have shown that wayfinding for people with dementia is influenced by architectural characteristics such as spatial organisation, circulation and visibility” (van Buuren et al., 2025). The same study states that wayfinding is essential for independence in daily life and, consequently, quality of life. However, as dementia progresses, the ability to orient oneself and navigate one’s environment declines. As Feddersen & Lüdtke (2018) state, “Cognitive impairments lead to errors in one’s memory of places and a reduced ability to spontaneously adapt to new spaces and unknown situations”. These difficulties and feelings of being lost can result in shame, anxiety and stress among people with dementia (Feddersen & Lüdtke, 2018).



Reduce the amount of crossroads (decision-making points), (van Buuren et al. 2025)
[MESO]



Avoid too many non-essential wayfinding cues (van Buuren et al., 2025).
[MESO]



Clear and visible spatial structures; short corridors, open kitchens (Feddersen & Lüdtke, 2018).
[MESO]



Use of contrasting colours for walls, doors, functions (Charras et al., 2024)
[MICRO]



Provide safe and accessible paths (Feddersen & Lüdtke, 2018).
[MACRO]

Relevant Case Study:
Santa Rita Geriatric Center, Menorca, Spain

Architects: Manuel Ocaña

Year: 2007

Function: Full-time nursing home care and day care for the elderly. Residents are free to wander through the well-designed circulation space.

Capacity: 70 permanent resident + 20 users of the day care center.

Typology: private room, varying in size, with private bathroom and seating area

(Social) functions: physiotherapy, swimming pool, rest room, socio-cultural space, communal gardens, dining room, lounge



Santa Rita Geriatric Center (ArchDaily, 2009)



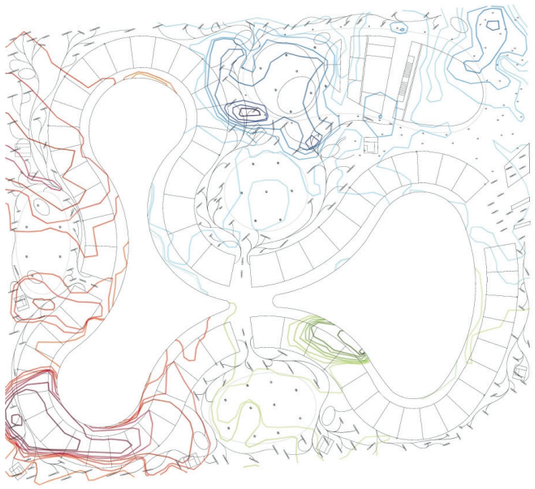
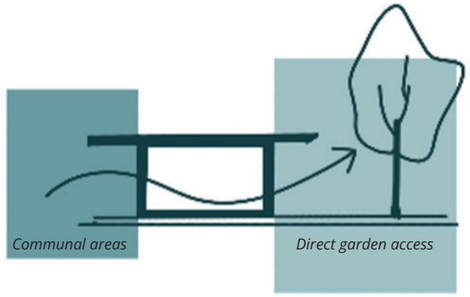
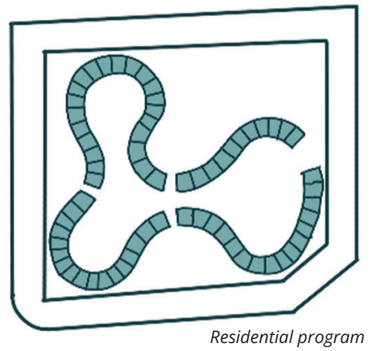


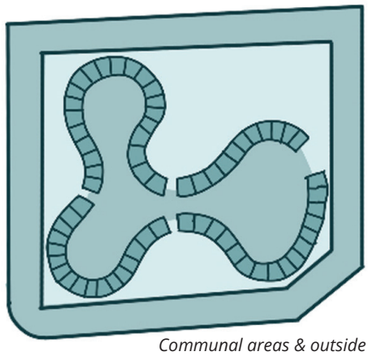
Figure 13; Floor plan and circulation (ArchDaily, 2009)



Section residential unit

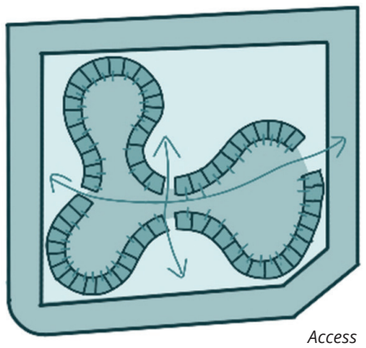


Residential program



Communal areas & outside

Residential
Gardens
Communal areas



Access

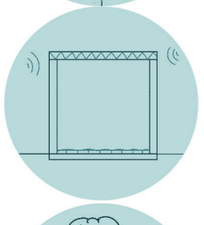
Figure 14; Case study analysis Santa Rita Geriatric Center (Meike Traa, 2026)

Sensory Experience

As cognitive functioning declines, sensory perception becomes increasingly important. “As many studies show, sensory stimulus benefits old people greatly” (Feddersen & Lüdtke, 2018). In particular, the garden is identified in much research as the ideal setting for stimulating the senses (Rodiek & Schwarz, 2007). Such stimulation has been demonstrated to evoke memories from the past, including the use of various scents and materials (Hayne & Fleming, 2014). This assertion is confirmed in the research conducted by Feddersen & Lüdtke (2018): “As certain smells are able to trigger particular memories and pleasant experiences, this possibility is increasingly used to promote a sense of general well-being.”



Design sensory stimulating paths and loops that provide movement (Metzger, 2018).
[MACRO]



Install acoustically absorbent ceilings and soft flooring to reduce echoes and impact noise (Hayne & Fleming, 2014)
[MICRO]



Provide sounds of nature, such as birds, wind, grasses and install water features (Hayne & Fleming, 2014).
[MICRO]



Multi-sensory approach; engaging (more than) two distinct senses simultaneously (Rodiek & Schwarz, 2007)
[MICRO]



Herb gardens provide a symphony of sight, sound, colour, smells and small animals (Hayne & Fleming, 2014).
[MICRO]



Allow easy tool use and gardening, for example by raised flower beds (Feddersen & Lüdtke, 2018).
[MICRO]

However, it is imperative to maintain a balance in the stimulation of the senses. According to Hayne & Fleming (2014), both the under- and overstimulation of the senses have the potential to result in problematic behavioural changes. In their research, they therefore emphasise the importance of ensuring the correct sound level at the optimum time. Paying sufficient attention to this during the design process is therefore crucial.

Relevant Case Study:
Day-care Centre with Therapeutic Garden, Le Creusot, France

Architects: Dehan + Spinga Architects

Year: 2006

Function: Day care and therapeutic garden, as an extension of the existing nursing home complex, to provide natural elements and sensory experience.

Capacity: 12 residents

Typology: X (day-care facility)

(Social)functions: Beauty salon, dining area, therapeutic kitchen, physical exercises, games and creative activities that help stimulate the senses and memory.



Therapeutic garden (Feddersen & Lüdtke, 2018)

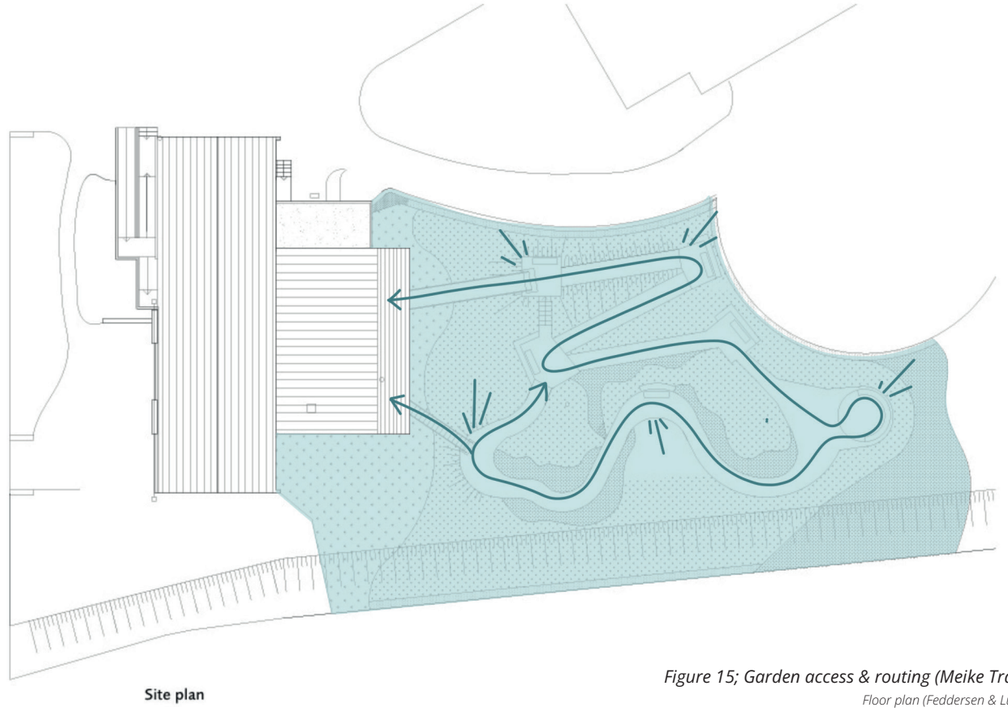


Figure 15; Garden access & routing (Meike Traa, 2026)
Floor plan (Feddersen & Lüdtke, 2018)

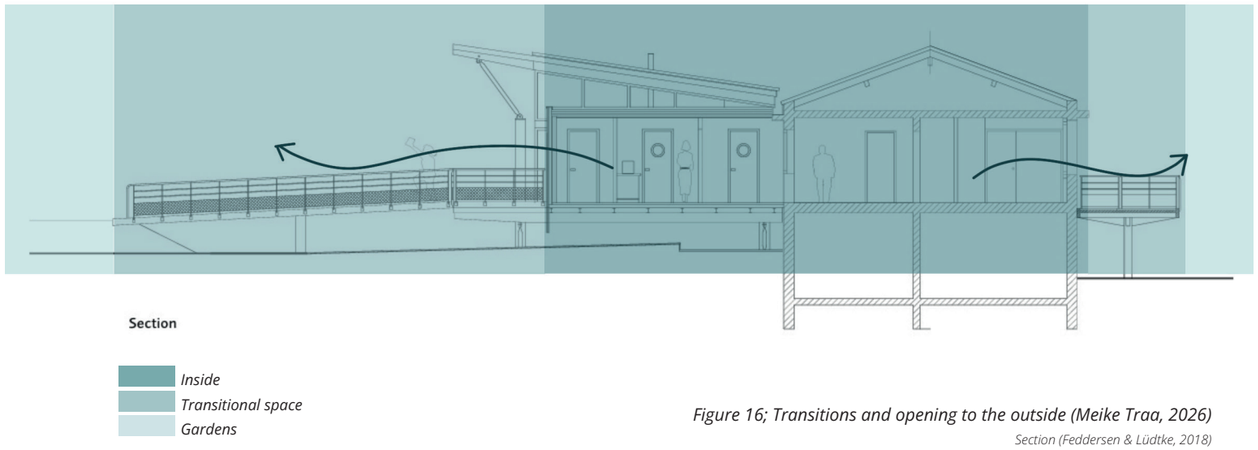


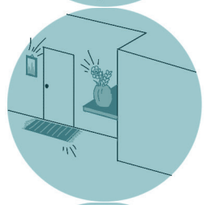
Figure 16; Transitions and opening to the outside (Meike Traa, 2026)
Section (Feddersen & Lüdtke, 2018)

Familiarity

As previously stated in the research, a significant number of elderly people diagnosed with dementia express a strong reluctance to move to a care home or other care facility. This reluctance is frequently rooted in the general perception of such institutions. According to Motealleh et al. (2019), many institutions lack spatial clarity and provide insufficient stimulation, resulting in a lack of engagement. Furthermore, as short-term memory deteriorates with dementia, spatial perception becomes even more important. Thus, Motealleh et al. (2019) emphasise the importance of well-designed dementia-friendly environments. To counter this, a familiar, homely environment must be established that mirrors the patient's previous living space, both in- and outdoors.



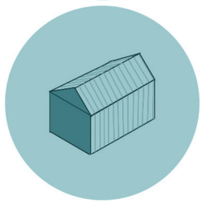
Familiar domestic sounds and smells (Feddersen & Lüdtke, 2018).
[MICRO]



Provide niches for personal furniture and decorations; personal pieces hold memories (Metzger, 2018)
[MICRO]



Autonomy, residents can live according to their own rules (interview)
[MICRO]



Design distinctive and recognisable façades (case study)
[MACRO]



Adapt to the human scale (case study)
[MESO]

Feddersen & Lüdtke (2018) state in their research that "Numerous examples as well as our own experiences have shown that the principle of normality, whether achieved through family-house floor plans, participation in day-to-day activities around the house or the presence of one's own furniture, is most beneficial in helping the elderly, including dementia sufferers, to maintain and make use of their own resources." The extent of comprehensive familiarity, which has often been missing in existing institutions, must therefore be present at every scale level of the design process. This is essential for enhancing the quality of life and well-being of the residents.

Relevant Case Study:
Olsrød Nursing Home, Tønsberg, Norway

Architects: 3RW arkitekter & NORD Architects

Year: X (tender procedure)

Function: Full-time nursing home care and day care for the elderly. Human-scaled and green-centred architecture are key concepts. This human-scale is achieved by dividing up the volumes, resulting in shorter corridors and walking distances

Capacity: 90 units for patients with dementia + day care center

Typology: private rooms, little variation, with private bathroom and seating area

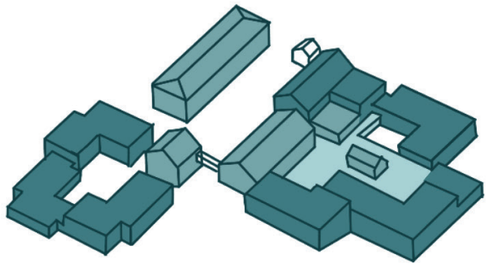
(Social) functions: Common functions, activity center, courtyards, sensory garden. The public program facades are made of coloured woods;



Olsrød Nursing Home (3RW Arkitekter, n.d.)

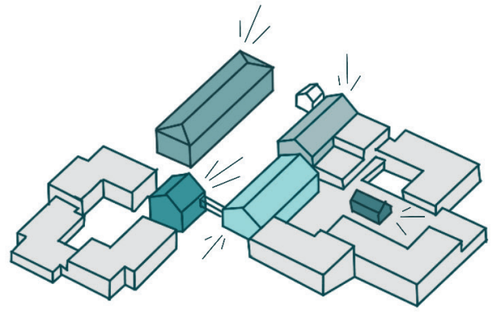


Olsrød Nursing Home (3RW Arkitekter, n.d.)

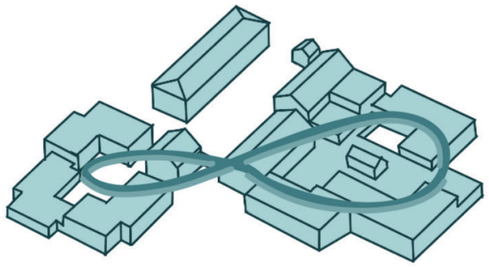


Function distribution

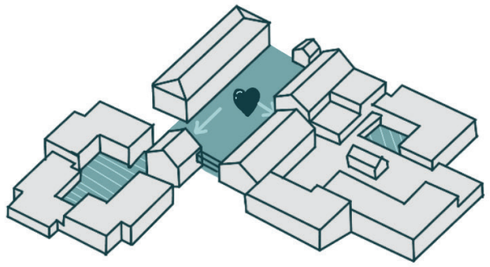
Residential
Communal areas
Administration/employees



Striking facades



Endless circulation

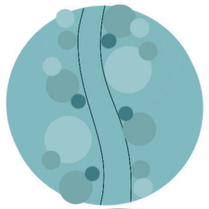


Central courtyards

Figure 17; Case study analysis Olsrød Nursing Home (Meike Traa, 2026)

Mobility

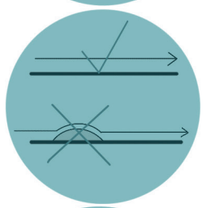
Physical activity greatly promotes a healthy lifestyle and a sense of well-being. "It is not by chance that going for walks is one of the most popular outdoor activities among older people" (Feddersen & Lüdtke, 2018). However, movement becomes increasingly challenging for people with dementia, which necessitates the careful design of the spatial environment. Feddersen & Lüdtke (2018) emphasise the importance of good, accessible paths and walkways, contrasting colours and materials between walls, floors and doors, and clearly recognisable transitions between indoors and outdoors. Furthermore, access to the outdoors is important.



A central wandering path should take people past areas of various habitats such as gardens and several activities (Hayne & Fleming, 2014).
[MACRO]



Provide regular seating areas, both inside and outside, that are visible from afar (Feddersen & Lüdtke, 2018).
[MESO]



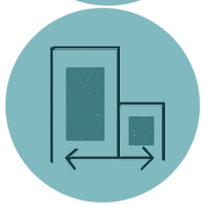
Ensure thresholds are removed to allow for walking (Feddersen & Lüdtke, 2018).
[MESO]



Endless loops allow safe and continuous wandering, no dead ends (van Buuren et al., 2025), (Feddersen & Lüdtke, 2018).
[MACRO]



Close proximity to a toilet, also in the outdoor space (Feddersen & Lüdtke, 2018).
[MESO]



Both longer and shorter routes should be available (Feddersen & Lüdtke, 2018).
[MACRO]

However, in practice, care homes and other care institutions often find themselves in a dilemma between promoting autonomy and ensuring safety. This issue was also identified during several interviews, and it became clear that the priority is slowly shifting from safety to freedom. Regardless of the stage of dementia, residents must always have the opportunity to move around outdoors independently, within safe boundaries.

Relevant Case Study:
Furuset Hageby, Oslo, Norway

Architects: NORD Architects

Year: 2024

Function: Full-time nursing home care and day care for the elderly. Residents can wander over a green loop and three gardens, with different spatial qualities, themes and plants.

Capacity: 112 units for residents

Typology: private rooms, little variation, with private bathroom and seating area

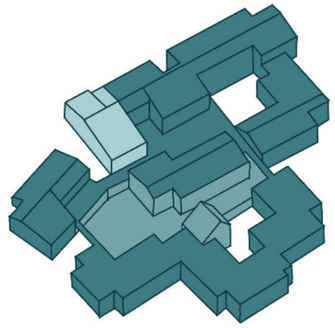
(Social) functions: communal kitchen, recreational gardens, hairdresser, restaurant, lounge areas, culture house, grocery shops, gym studio, a doctor's office and library for both residents and people from the village.



Furuset Hageby (NORD Architects, n.d.)

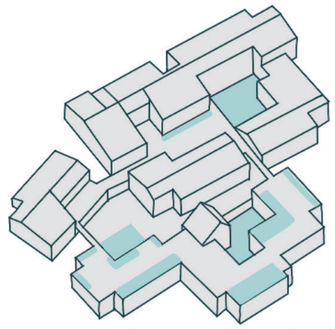


Furuset Hageby (NORD Architects, n.d.)

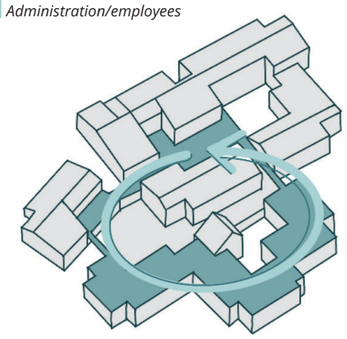


Residential
Communal areas
Administration/employees

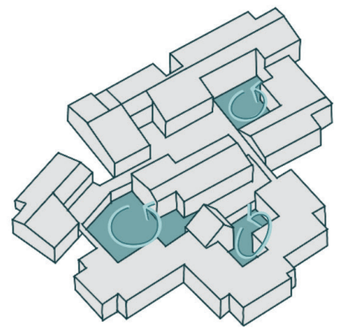
Function distribution



Sensory experiences & gardening



Rooftop circular route



Smaller routes on ground floor level

Figure 18; Case study analysis Furuset Hageby (Meike Traa, 2026)

Social interaction

Social interaction has been demonstrate to have a significant impact on the quality of life of people with dementia. According to Charras et al. (2024), social interaction is one of the fundamental needs of the individual, yet it is frequently disregarded in many healthcare settings. However, research by Feddersen & Lüdtke (2018) suggests that people with dementia actually prefer places where activities are taking place, such as the kitchen or the garden. Research by Regier et al. (2016) highlights the importance of engagement in meaningful activity, which has positive effects on emotions, quality of life and wellbeing. Furthermore, facilitating social interaction and participation have been proven to enhance the sense of welcome and belonging for individuals.

Collectively, these themes demonstrate that the design of care environments for individuals living with dementia should extend beyond the realms of safety and protection. Instead, the environment should be crafted to stimulate movement, wayfinding, perception, identity and social life.



Provide a diverse range of opportunities for both privacy and social interaction (Hayne & Fleming, 2014)
[MESO]



Include links with the local community, for example cafés or childrens play areas (Hayne & Fleming, 2014)
[MACRO]



Provide meaningful activities (in the outdoor space) that bring people together (Motealleh et al., 2019)
[MESO]



Create 'edge spaces' as transition zones between indoor and outdoor life, like verandas or courtyards (Metzger, 2018), (Charras et al., 2024)
[MACRO]

Relevant Case Study:
De Hogeweyk, Weesp, The Netherlands

Architects: Buro Kade

Year: 2008

Function: Full-time nursing home care for the elderly. It offers a safe environment in a familiar setting. Maintaining a normal lifestyle and social interaction are encouraged as much as possible through a diverse range of shops, amenities and green spaces.

Capacity: 152 permanent resident

Typology: 23 homes with small households of 6-7 residents, based on cultural backgrounds and preferences.

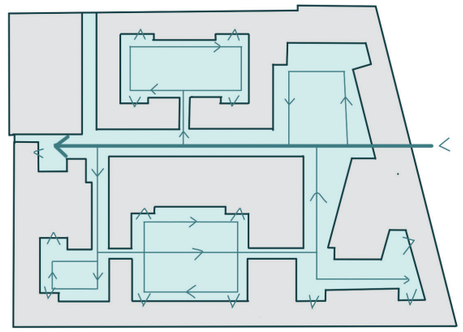
(Social) functions: supermarket, theater, barber shop, restaurant, daycare facilities, outdoor lounge areas, café, and residents are also stimulated to participate in 'normal life' (concerts, zoo, events etc.)



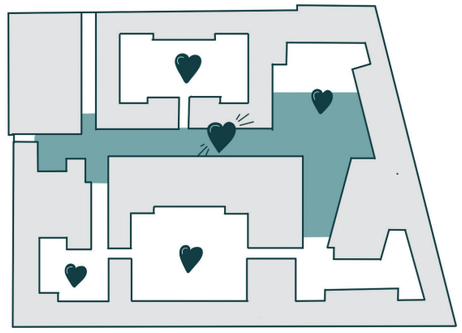
De Hogeweyk (Dementia Village Associates, n.d.)



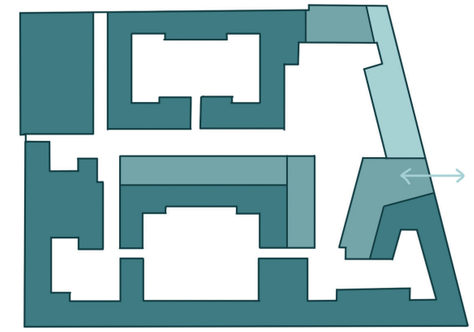
De Hogeweyk, study model (Dementia Village Associates, n.d.)



Boulevard, gardens & routing



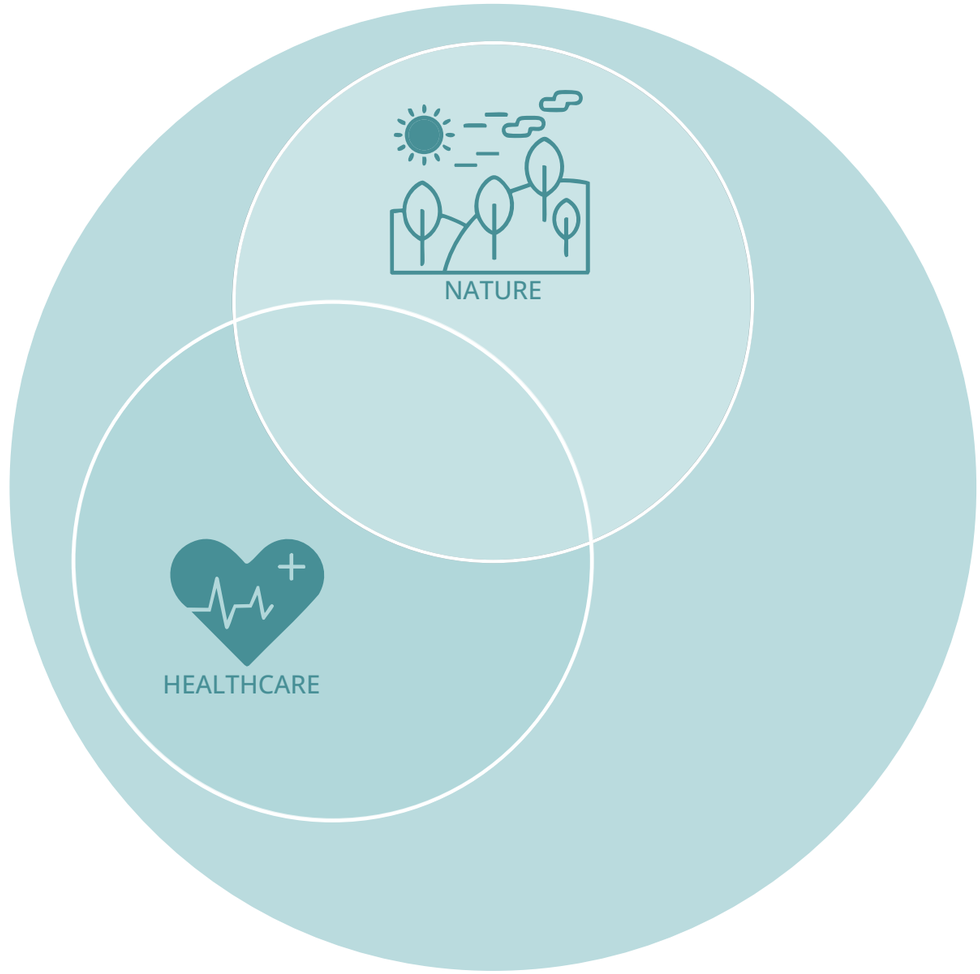
Central boulevard & social interaction



Function distribution

Residential
Communal areas
Administration/employees

Figure 19; Case study analysis De Hogeweyk (Meike Traa, 2026)


NATURE
HEALTHCARE

3.2 Nature

As the research shows, a direct relationship between individuals and their spatial environment is important for people with dementia. Therefore, the spatial environment must be carefully designed at every scale. One fundamental aspect that recurs in every theme; orientation, sensory experience, identity, mobility and social interaction, is nature and access to the outdoors. As mentioned in the theoretical framework, contact with nature has been shown to contribute to individuals' well-being, particularly among older people (Motealleh et al., 2019). Although this is still often lacking in practice within care homes (Peters & Verderber, 2022), its positive impact means it should be a recurring theme in the design process.

Thus, the aim is to prioritise and strengthen the relationship between people and the landscape. "Biophilic design is essential for providing people opportunities to live and work in healthy places and spaces with less stress and greater overall health and well-being." (Browning et al., 2014) The biophilic design principles described earlier by Browning et al. (2014), also presented in figure 20, are used throughout the process as a source of inspiration and a strategy for translating the identified spatial needs of people with dementia into powerful design elements.

Each principle can be linked to one of the above themes. For instance, 'visual connection with nature' contributes to orientation and familiarity; 'non-visual connection with nature' and 'use of natural materials' enhance comfort and sensory experience; and 'prospect and refuge' supports orientation and mobility. Figure 21 shows the relationships between the five themes mentioned earlier and the nine biophilic design principles. Biophilic design and nature are used as tools to strengthen the five themes of orientation, sensory experience, mobility, familiarity and social interaction.

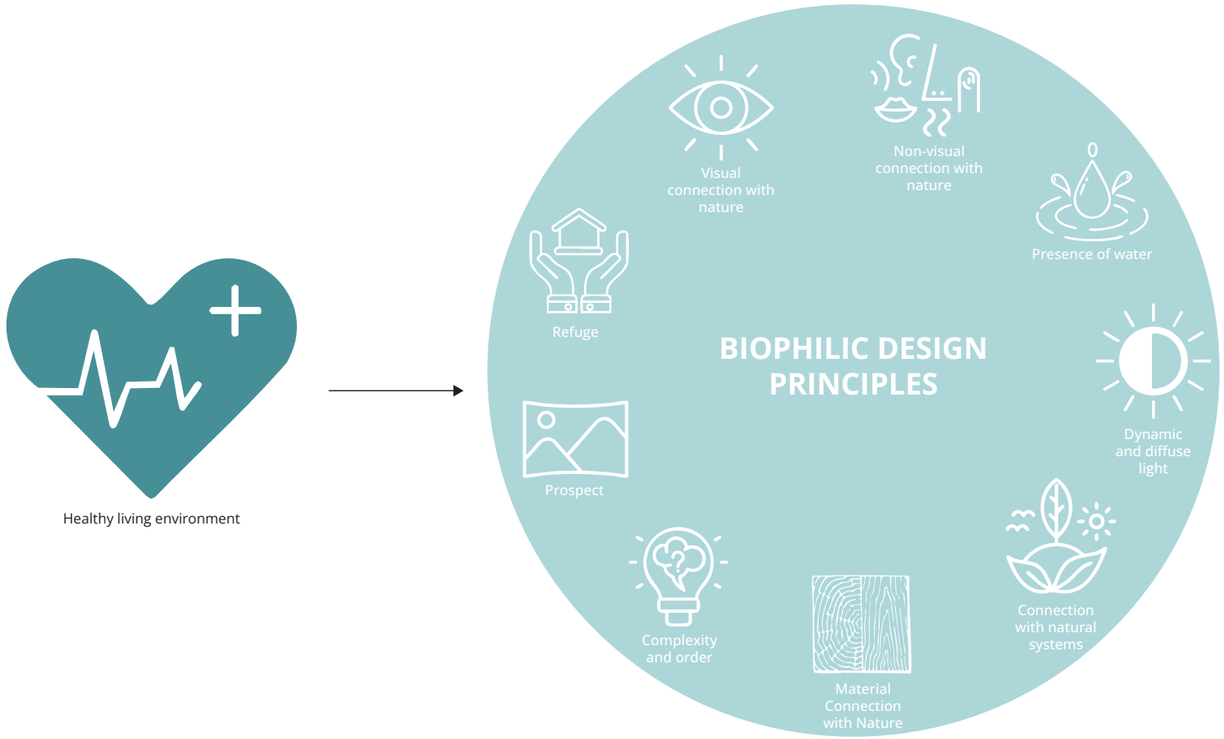


Figure 20; The biophilic design principles related to healthcare (Meike Traa, 2026)

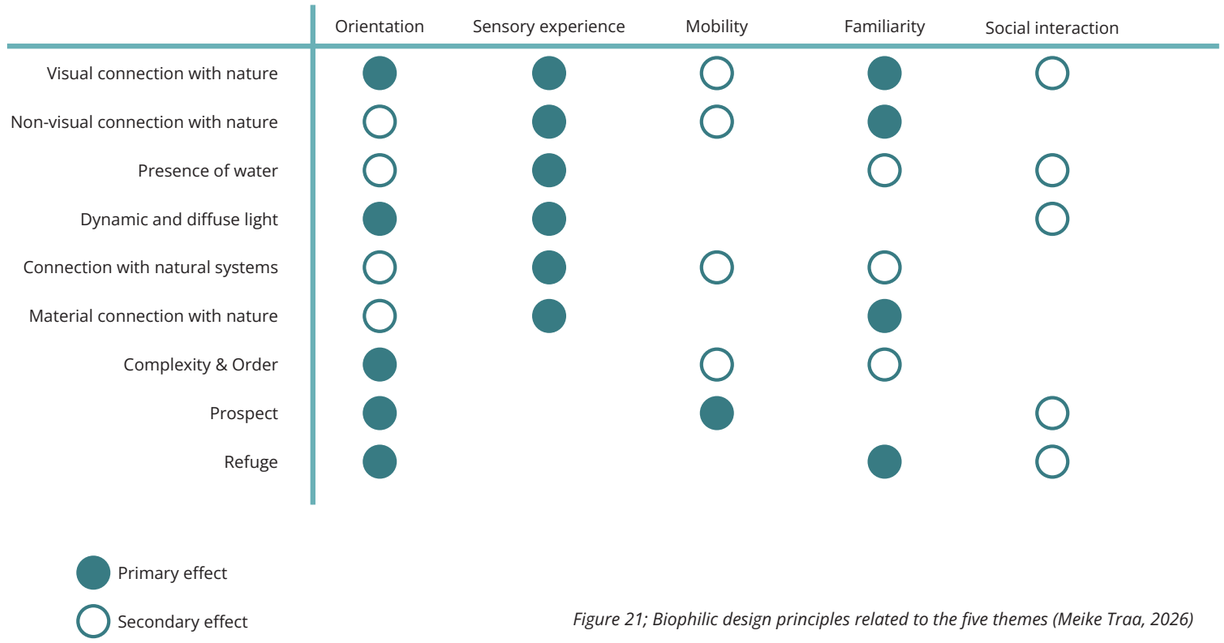
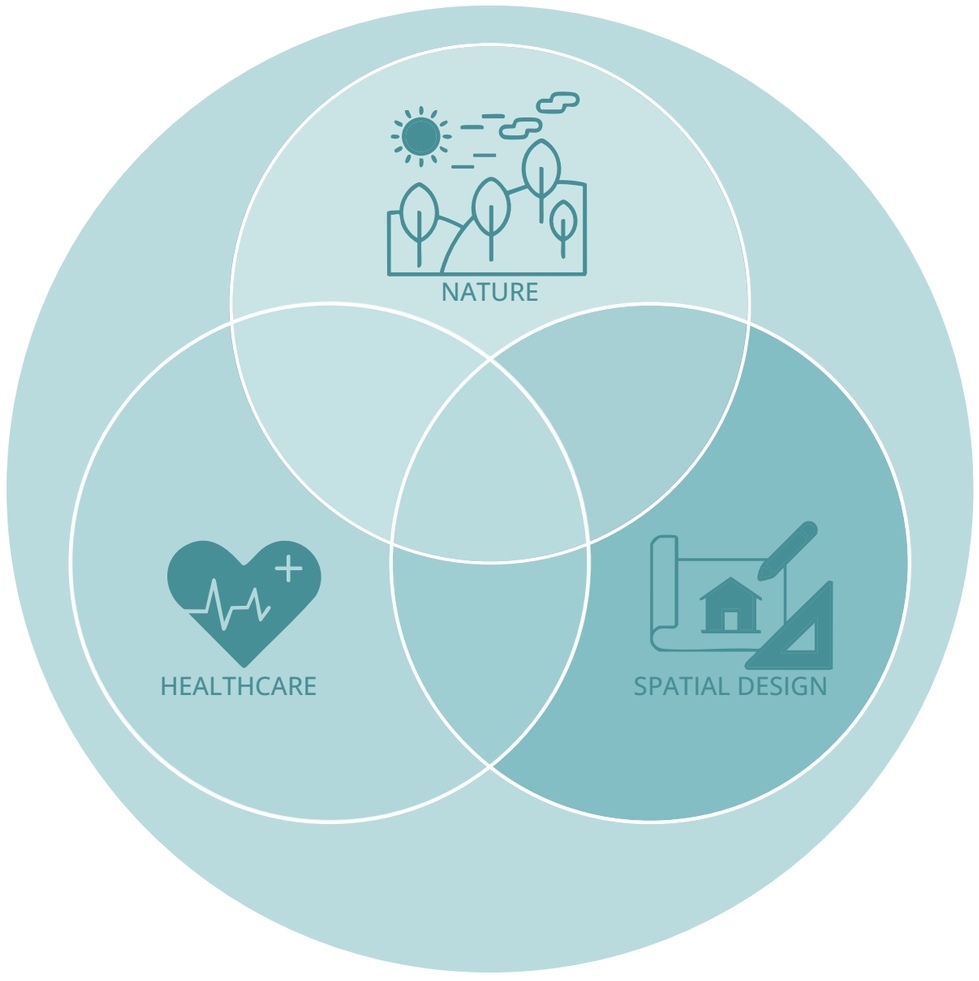


Figure 21; Biophilic design principles related to the five themes (Meike Traa, 2026)



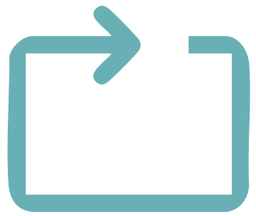
3.3 Spatial design

Building on the previous analysis of both care-related and biophilic design principles, a coherent spatial system can be developed for the design. The previous sections explained the relationship between the symptoms of dementia and biophilic design, and the polder landscape was examined in greater detail. This revealed that both worlds share a fundamental aspect: uncertainty and a lack of control. With this as a starting point, this subchapter delves deeper into the development of the stable spatial framework.

The principles discussed above, together with design principles based on the theme of sustainability, can be translated into the following positions:



Translating specific dementia symptoms into a valuable design



Stimulate wandering by creating endless walking routes



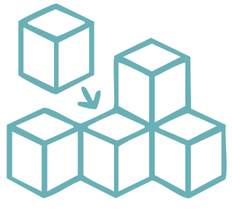
Creating a familiar, safe & personal environment



Integrate biophilic design



Minimal impact on nature and biodiversity



Modular Building

The Masterplan

In order to explain the design, it is important to first focus on the underlying layer: the Vlietlanden masterplan. This plan is developed by the Sustainable Environment group within the Advanced Housing Graduation Studio, in response to the ZUS, FLUX and SWECO plan (2022). The build up of the plan is presented in figure 22. This layout of the site indicates where building is allowed based on the sightlines in the area proposed by the municipality of Midden Delfland. The full development of this masterplan is further described in appendix 06.

The plan focuses on shifting from full control to strategic adaptation. The group proposes a new way of living and inhabiting the landscape, taking water and the natural landscape as the starting point. In practice, this means that new forms of housing will be developed that affect nature and soil as little as possible, allowing seasonal flooding and adaptable systems.

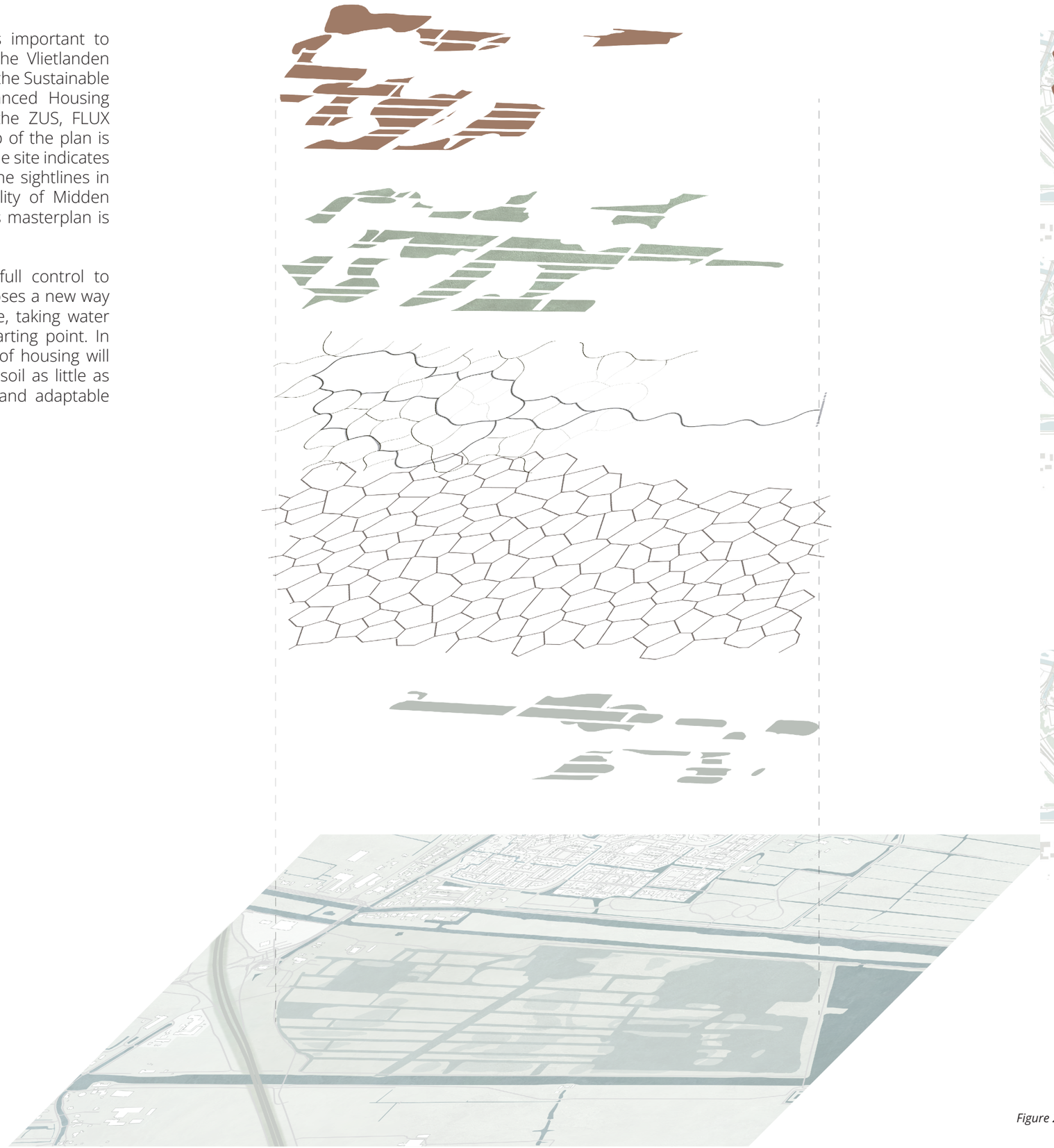


Figure 22; Masterplan build up (Group Sustainable Environment, 2026)

The outcomes of the masterplan research result in a future vision of the Vlietlanden (figure 23). Within this collective masterplan, it is important to select a strategic location for the selected target group of elderly people with dementia. For this target group, both accessibility and safety, as well as a strong connection to the landscape are important. The chosen site (figure 24) is therefore connected to the existing linear route through the Vlietlanden and the collective masterplan's evacuation infrastructure (figure 25). This ensures reliable and safe access to the building for residents, visitors, staff and emergency services. The location is convenient for the surrounding villages of Maasland and Maassluis, as well as for the A20 highway and nearby healthcare facilities in Rotterdam and Maassluis.

At the same time, the location offers great potential for direct connections to nature and views of the polder landscape, which are essential for the well-being of this target group. Finally, positioning the design outside the collectively designated ecological zones (figure 22) respects the landscape and biodiversity in the area.

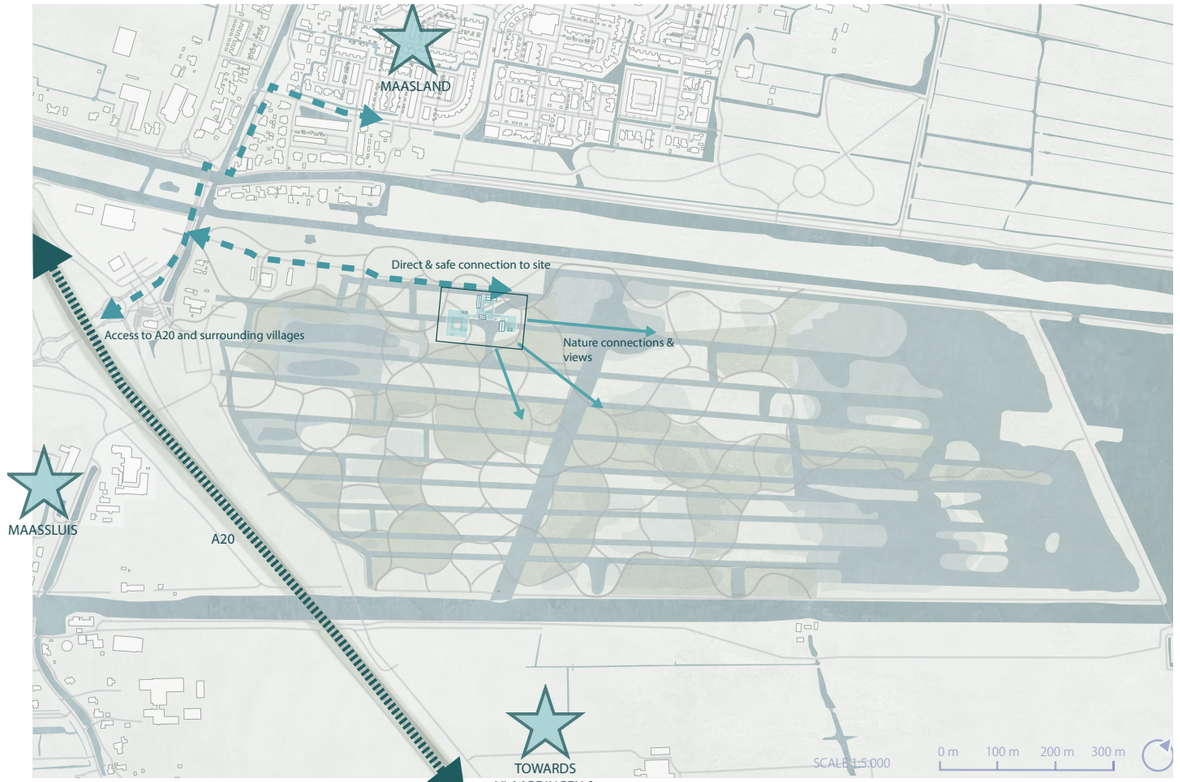


Figure 24; Masterplan - Individual plot choice (Meike Traa, 2026)

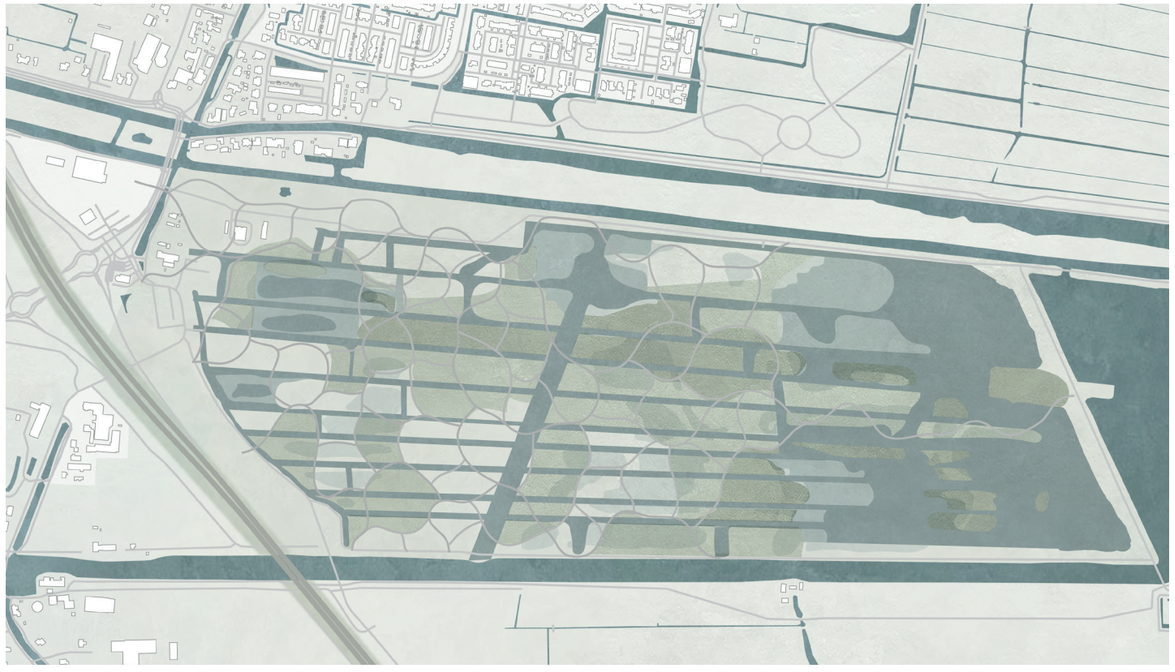


Figure 23; Masterplan - Future vision of the Vlietlanden (Group Sustainable Environment, 2026)

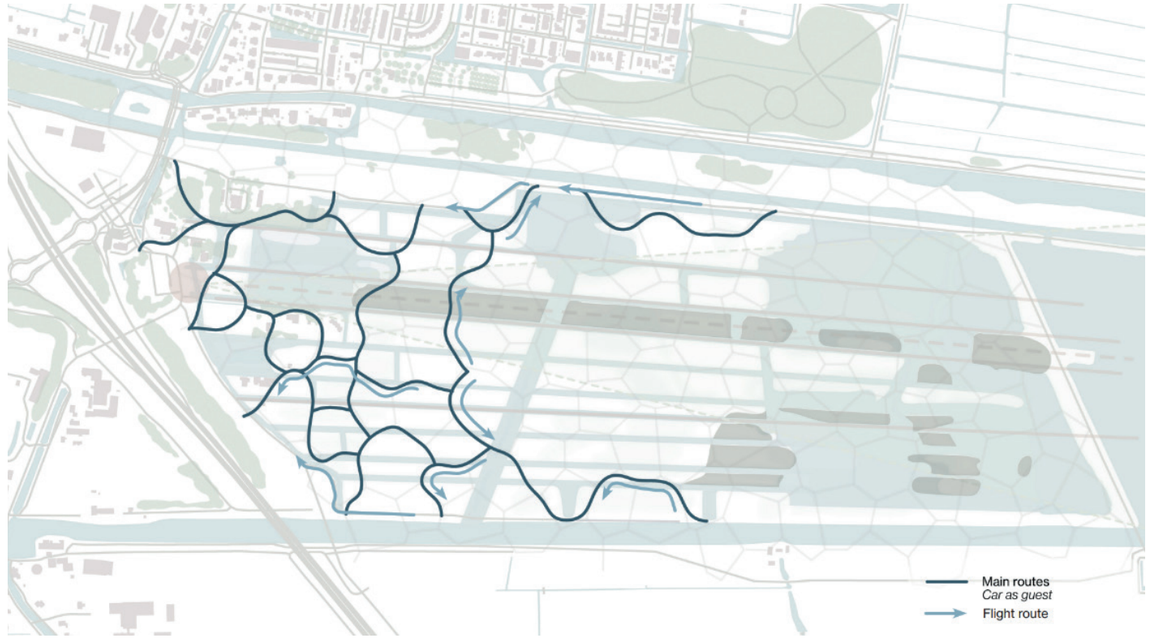


Figure 25; Indication evacuation routes (Group Sustainable Environment, 2026)

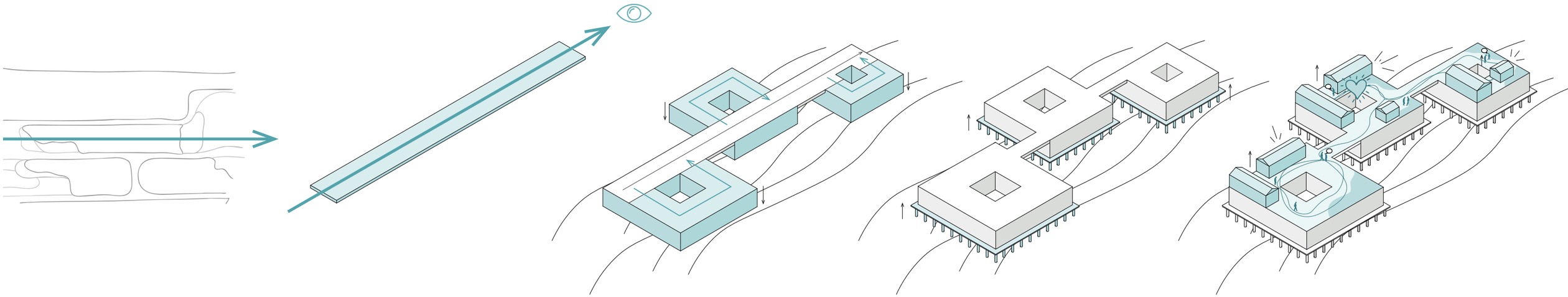


Figure 26; Massing concept of the design (Meike Traa, 2026)

Building the concept

First, the linear elevated route was developed to serve as the backbone of the design. This route is based on the sightlines in the area established by Gemeente Midden-Delfland (2016). Further details regarding these sightlines can be found in appendix 06: the Masterplan. The municipality intends to retain these sightlines in future developments. At the same time, the route provides a point of reference within the design. Furthermore, the linear baseline represents the progression of both the disease pattern of dementia and life itself. A circular form would have been less suitable for this purpose.

Raising this street to level +1 improves orientation and forms a stable, safe core within the landscape, where water fluctuations are common. It also enables safer crossing of the cycle and footpath networks in the area.

The route is then divided into three zones, based on the previously mentioned progression of dementia through the *mild, moderate* and *severe* stages, because care and spatial needs change at these different stages.

The design of these three zones is characterised by spatial variation, becoming smaller and more enclosed as the dementia progresses to the severe stage, during which the patient's world also becomes increasingly smaller.

In the first phase, openness, independence and contact with the community are most important. This phase is therefore characterised by open spaces from which residents can easily and freely interact with the community. The second phase is the transitional phase, which is more closed and where independent living is combined with residential groups. Here, the density increases and the demand for care is greater than in phase 1. Finally, the third phase is characterised by a protected, homely atmosphere with a small-scale residential group and enclosed courtyards. However, visual contact with nature is always maintained from here, which aligns with the principles of biophilic design.

The entire structure is raised on stilts, ensuring that the ground level remains adaptable to flooding. Furthermore, this construction minimises the impact on the underlying landscape, which continues uninterrupted beneath the design into the courtyard gardens. Water is also fully integrated into the design, as the space allows for fluctuating water levels. Finally, this construction principle ensures that the island-shapes formed by the masterplan do not create a rigid boundary for the placement of the volumes. This allows the relationship with the landscape to take on an extra dimension.

Although each phase has its own sheltered living environment, which is in line with the biophilic principle *'refuge'* (figure 27), these buildings are connected by the elevated street. It is here, on this street, where the communal outdoor space is created, which is easily accessible to all residents, regardless of the progression of their dementia. In this way, the environment will always remain the same and recognisable as care needs increase, because people can move within the same system. This orientation and the view are in line with the biophilic principle *'prospect'* (figure 28).

On the +1 level, there are communal functions and activities that are closely aligned with the various stages. These functions are located in distinctive volumes defined by colour, shape and use of materials, making them recognisable to residents.

The entirety of this concept is illustrated in figure 26 and forms the spatial basis of the design.

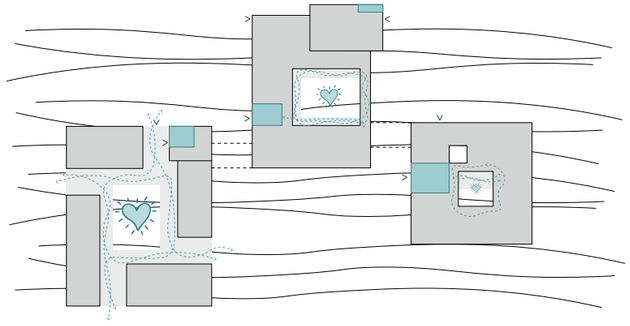


Figure 27; Ground floor circulation, refuge (Meike Traa, 2026)

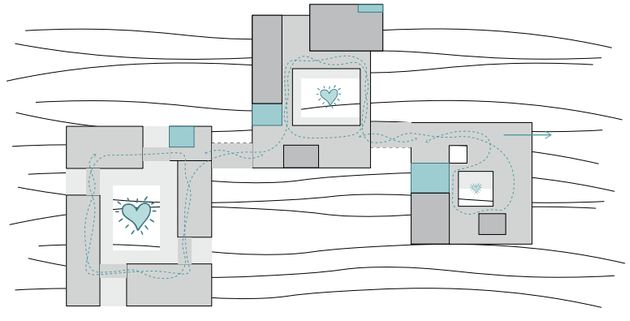


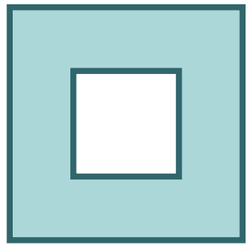
Figure 28; First floor circulation, prospect (Meike Traa, 2026)

Massing development

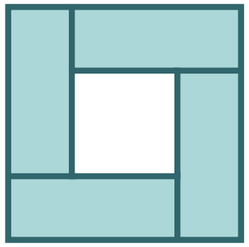
The spatial configuration of the plan is based on the typology of a courtyard. This courtyard offers residents a place of orientation, safety and refuge. It offers a clearly laid-out space that provides a sense of familiarity for people with dementia.

In order to ensure that dwellings receive sufficient daylight and to enhance the connection with the landscape, the volume is split into four equal parts. This creates a clear circulation route within the courtyard that will be repeated in each phase, but gradually transforming across the different levels of care. This design also avoids long, institutional corridors and introduces a gradual transition from private dwellings to semi-private transitional spaces to collective functions that lead out to the landscape.

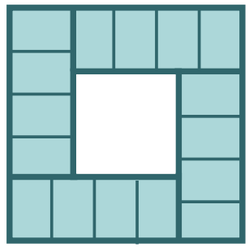
Figure 29 illustrates this transition from communal to private spaces. In this, the kitchen and living room are situated towards the communal courtyard, whilst the private spaces, such as the bedrooms, are located on the outer side, from where residents have a direct view of the polder landscape.



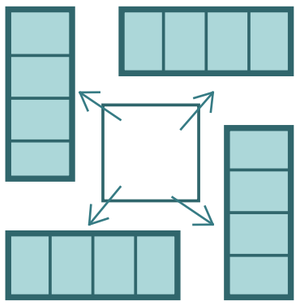
Courtyard typology as starting point



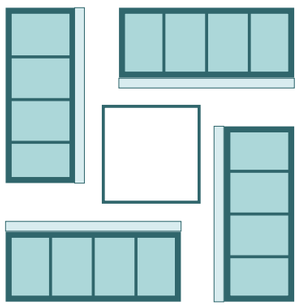
Split into volumes



Add housing units around courtyard



Opening up the volumes



Add semi-private transitional spaces

Figure 29; Massing development diagram (Meike Traa, 2026)

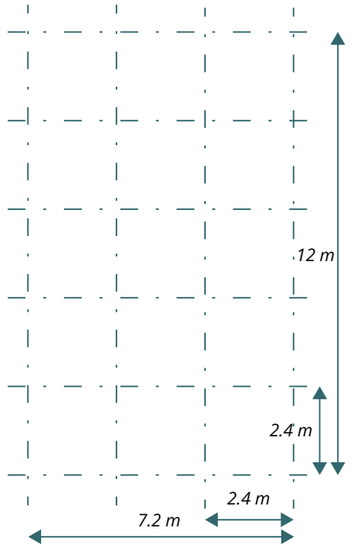
The grid & Typologies

The project is based on a structural grid measuring 2.4 by 2.4 metres. This grid forms the framework for both the housing typologies and the load-bearing structure of the design. A width of 2.4 metres provides ample space for two wheelchairs to pass safely and is therefore suitable for paths and decking. This dimension is also compatible with prefabricated modular façade elements, as will be explained further later in this chapter.

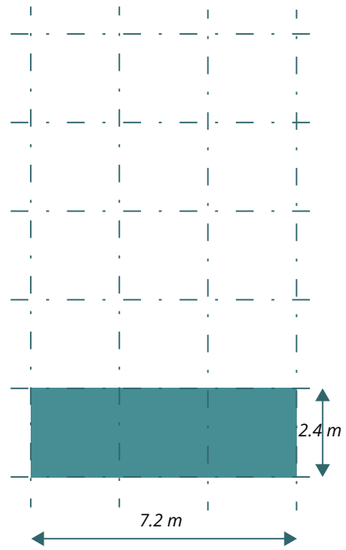
Combining different sizes creates various possibilities for both self-contained dwellings and private rooms within shared living spaces (figure 30).

For self-contained dwellings, an appropriate width is 7.2 metres, allowing all functions to be located on the same floor, thereby promoting accessibility and independence for older people. For smaller rooms in shared accommodation, a width of 4.8 metres is sufficient for a bedroom and private bathroom (figure 30). The communal areas can be multiples of this 2.4-metre size.

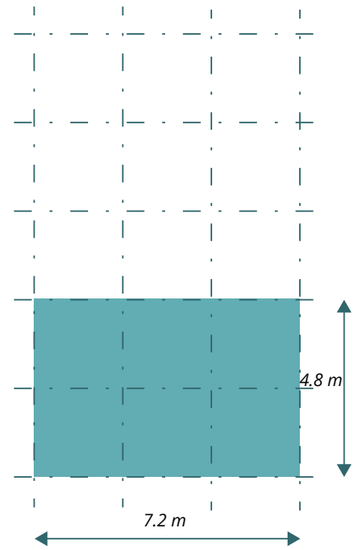
Repeating this layout across the various phases ensures that elements and dimensions remain recognisable whilst allowing spaces to be configured flexibly to meet changing care needs.



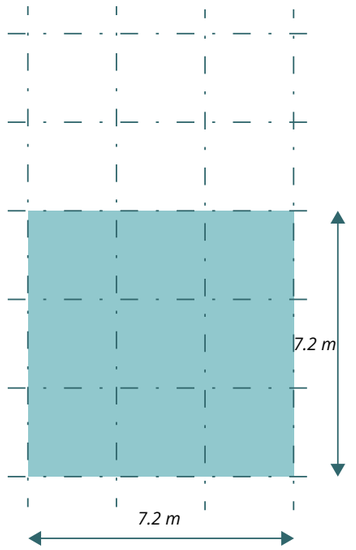
Regular grid 2.4 x 2.4 m



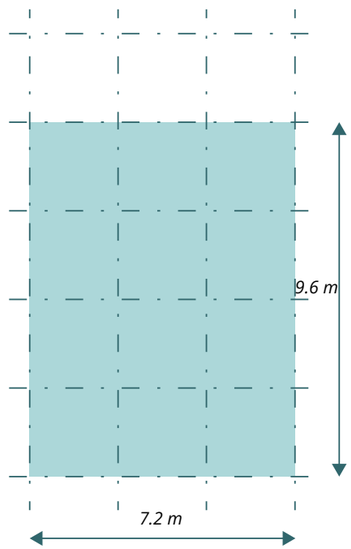
Width of the paths to allow wheelchair users to pass easily (2.4m)



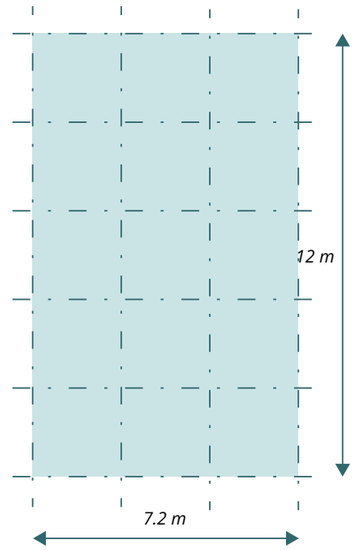
Standard room in coliving house (ca 32 m²)



Small size self-contained apartment (Ca 50 m²)



Middle size self-contained apartment (Ca 65 m²)



Large size self-contained apartment (Ca 65 m²)

Figure 30; Research: fitting dwelling typologies in grid (Meike Traa, 2026)

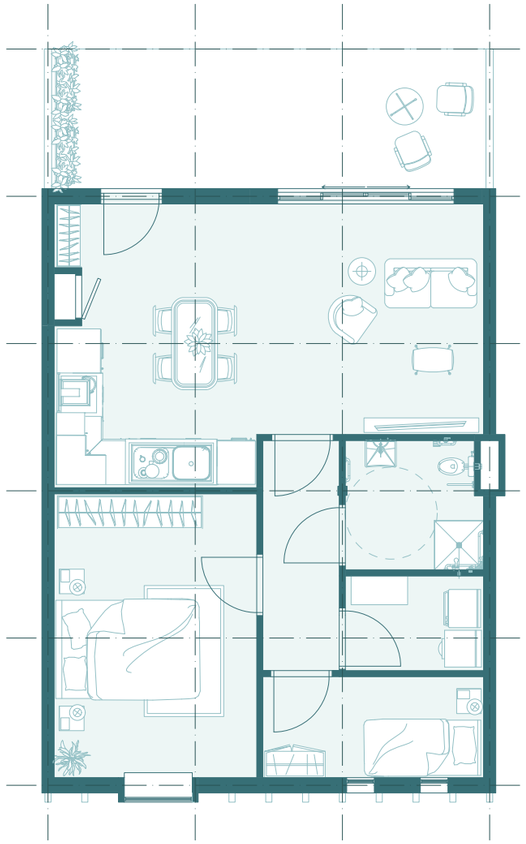
Grid infill - Floorplan typologies (1:100)

To encourage independent living in the mild and moderate stages, the design offers a range of independent dwellings within the proposed grid, ranging from approximately 64 to 80 m².

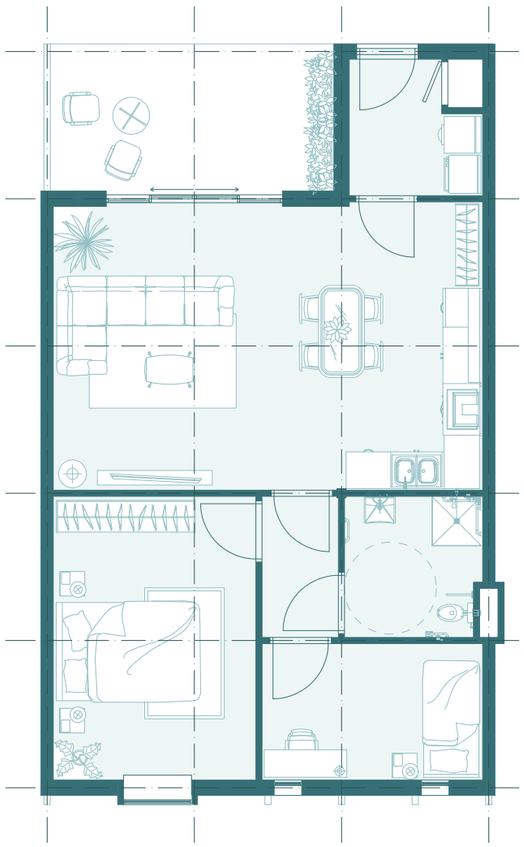
Here, independence is facilitated by a private kitchen, bathroom, outdoor space and guest room. Within one continuous system, these dwellings thus offer the opportunity to live independently at home for as long as possible, with care close at hand where needed.

Furthermore, these dwellings offer couples the opportunity to continue living close together in the case of their partner's relocation to a more care-intensive facility within the system.

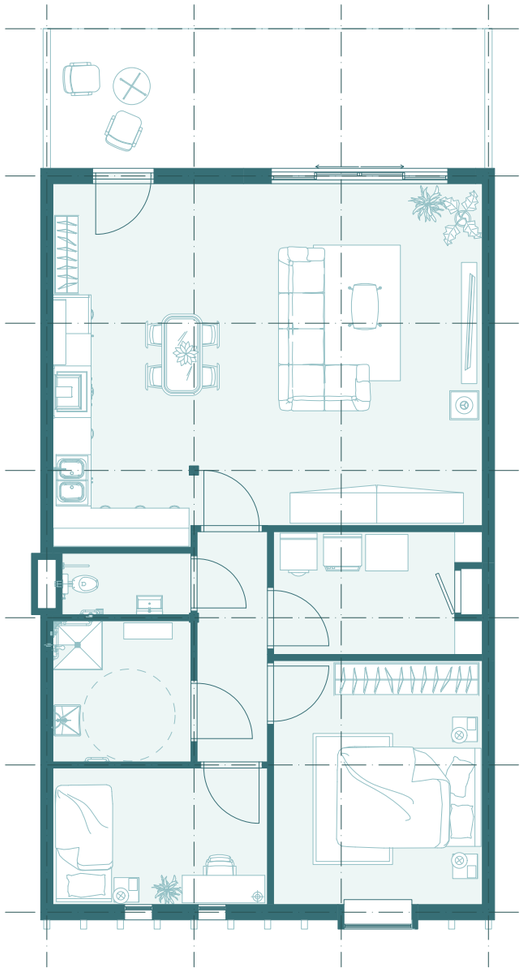
A variety of sizes and layouts gives residents the freedom to choose a home that best suits their living requirements. For example, the compact model may be suitable for individuals, whilst a larger model is more appropriate for flexibility, changing needs or care at home.



A. Small self-contained apartment (app. 64 m²)



B. Medium self-contained apartment (app. 70 m²)



C. Large self-contained apartment (app. 80 m²)

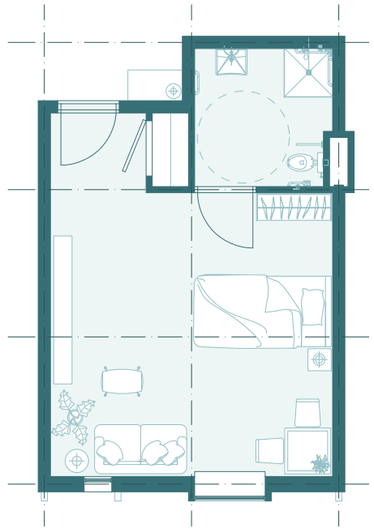
Figure 31; Dwelling typologies independent housing, scale 1:100 (Meike Traa, 2026)

Grid infill - Floorplan typologies (1:100)

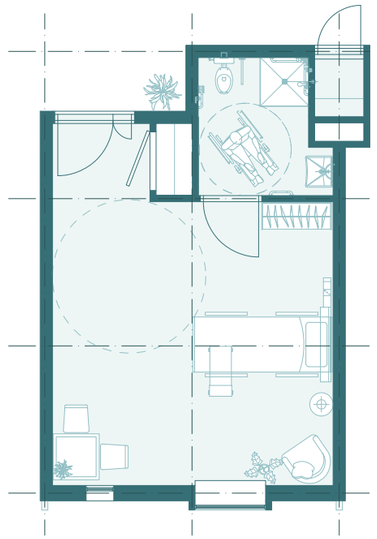
As independence diminishes with the progression of dementia, residential groups are available for patients in the moderate and severe stages, providing full-time care and support.

Residents have their own private bedroom with bathroom (Ca 30 m²) situated on the side of the building that faces the landscape, providing a constant view of nature. The rooms also feature a small seating area where residents can relax. To promote a sense of familiarity and homeliness, residents are encouraged to furnish their rooms with their own furniture and personal items.

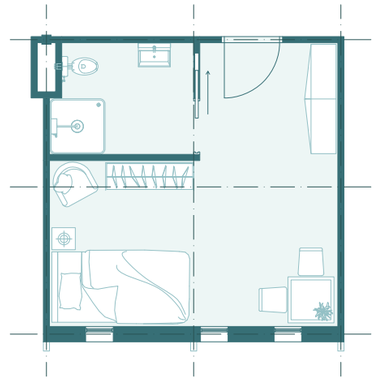
Finally, in the advanced stage, there are also small guest rooms for relatives, to allow them to stay close by when a resident's condition deteriorates.



D. Room in co-living house (app. 30 m²)



E. Room in co-living house (severe stage) (app. 30 m²)



F. Visitor's room (Family/carers) (app. 20 m²)

Figure 32; Dwelling typologies co-living and visitor's room, scale 1:100 (Meike Traa, 2026)

Floorplan residential group (1:100)

The shared accommodation units house eight to ten residents. While residents have private bedrooms and bathrooms, other facilities are shared, which encourages social interaction and improves overall wellbeing. Various seating areas are provided in these communal spaces to divide space and make it feel homely.

Furthermore, the courtyard-shaped layout of the volumes described above avoids long, institutional corridors, with the private rooms opening directly onto the communal spaces to reinforce the homely atmosphere. Each room has its own alcove, which serves as a recognisable transitional space between communal and private areas. Residents can use this alcove to display photographs, flowers, and other personal items. This makes the access from communal areas to residents' private rooms clearer.

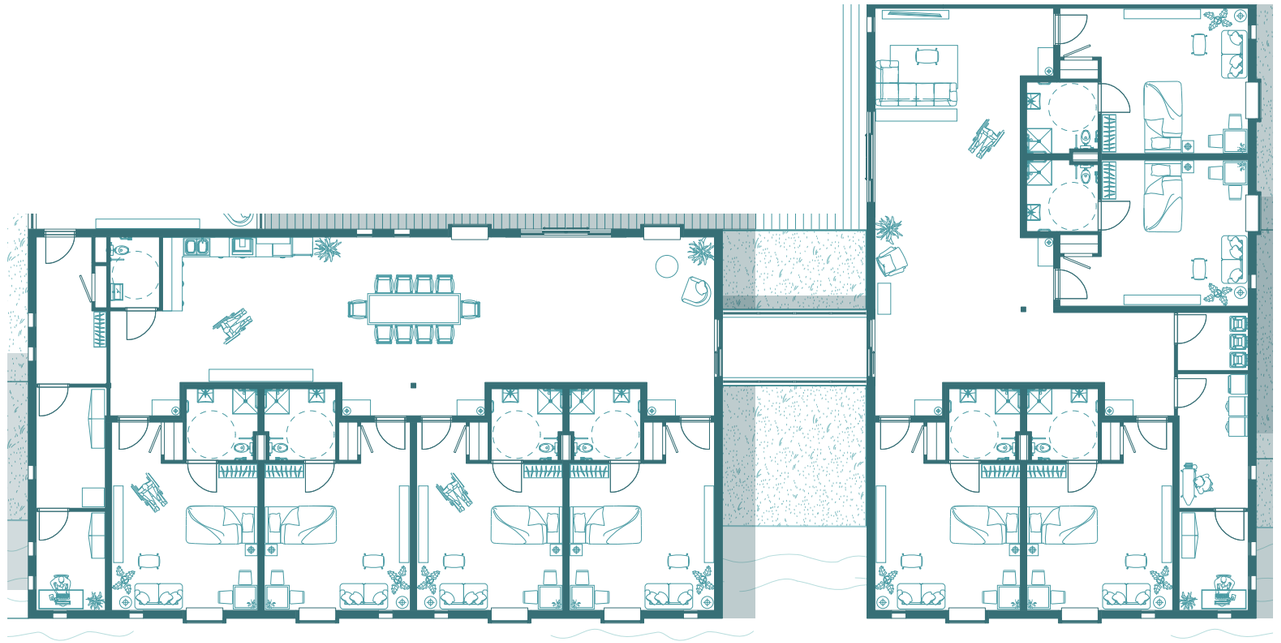
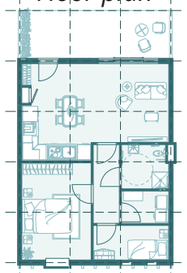
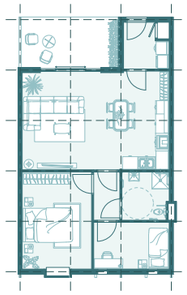
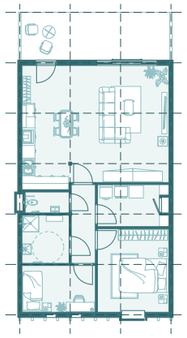
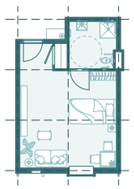
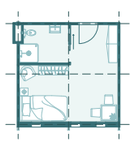


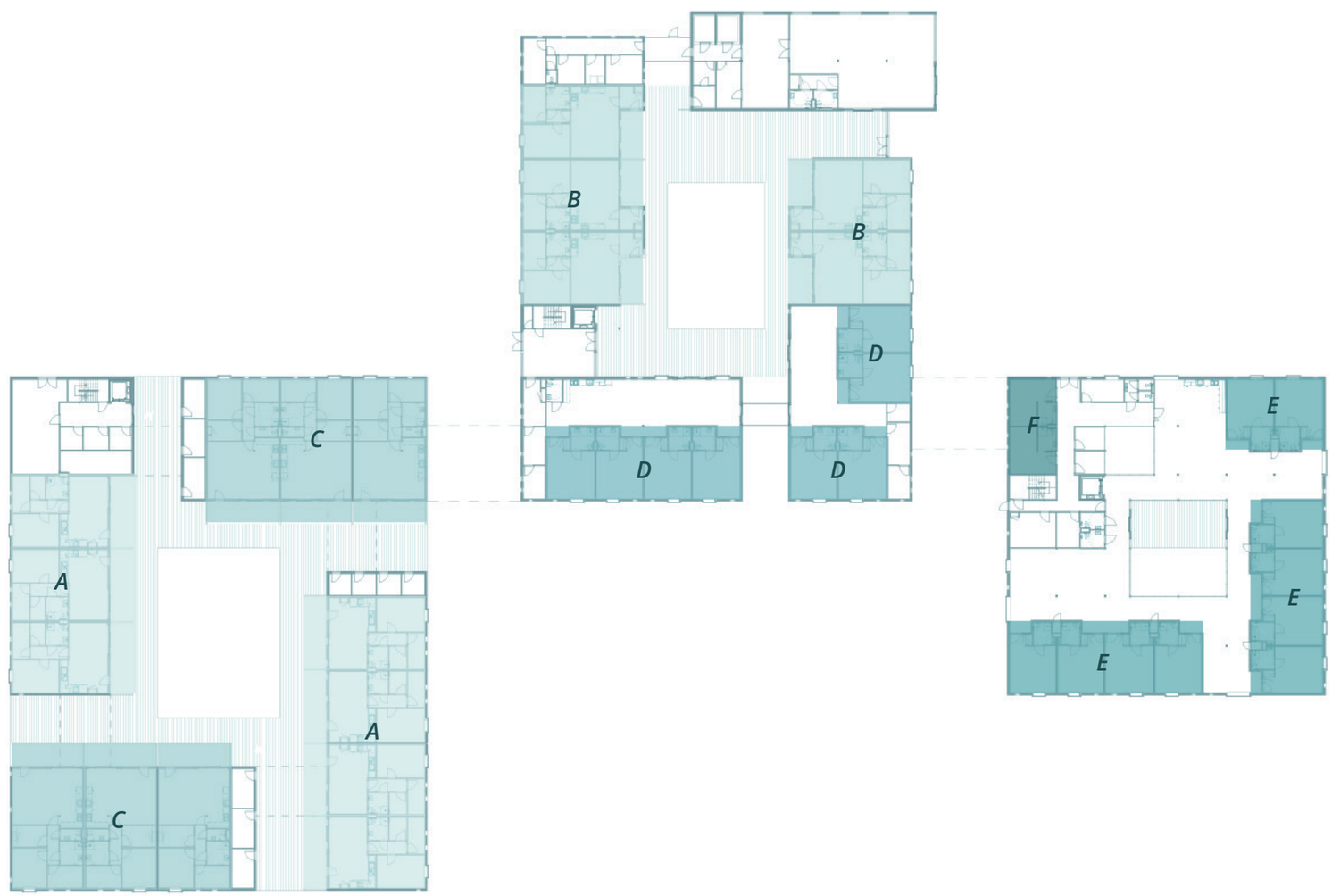
Figure 33; Floor plan living group, scale 1:200 (Meike Traa, 2026)

Zoning mix

Type	Floor plan	Legend	Amount
A			7
B			5
C			6
D			2
E			10
F			8

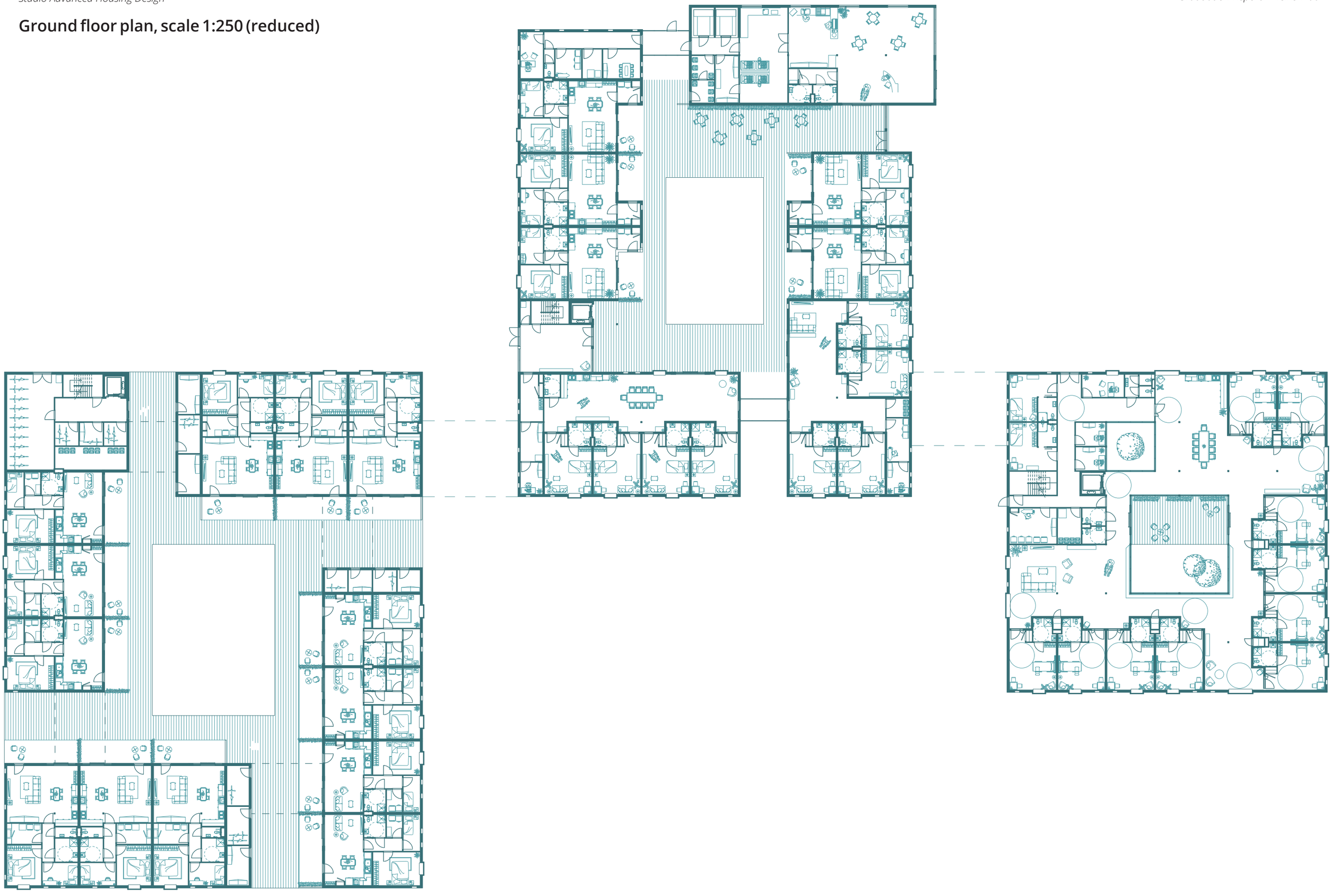
Total: 36 dwellings (+2 visitors rooms)

Zoning plan



Program/typologies get more enclosed as dementia progresses

Ground floor plan, scale 1:250 (reduced)

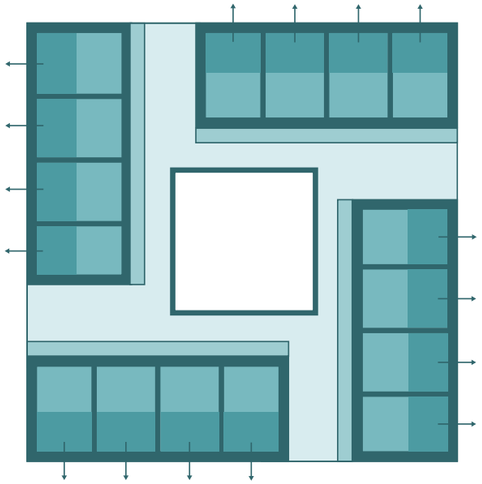


From collective to private

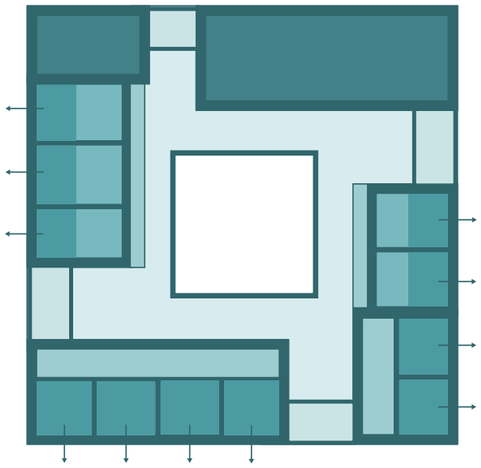
One of the key principles of the design is that, although autonomy, care and support change over time, the structure of the spaces remains the same and recognisable. This recognisability is essential for people with dementia, and will help them feel more at ease in a new setting when moving within the system.

As dementia progresses, the degree of openness will decrease at the various stages. In the first, mild phase, residents have a great deal of freedom and connection with the community. Residents are independent and can seek contact with the outside world. In the moderate and severe phases, the building is more enclosed around an inner courtyard. The social roof landscape is easily accessible to all residents via the lift and connects these phases with one another.

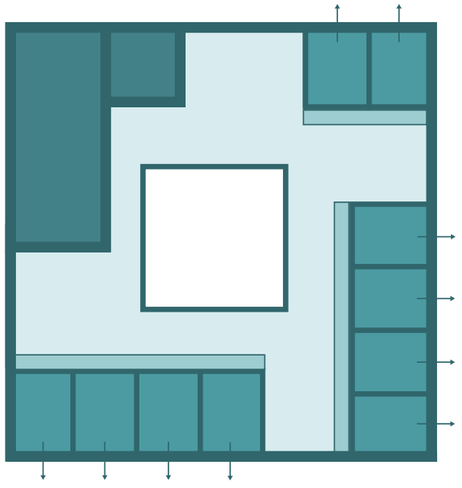
Within the courtyards, transitional spaces emerge between communal and private areas. These transitional spaces recur in every phase, but are given a different spatial expression. In the independent dwellings, the private terrace will connect the home to the communal outdoor space. In the shared living groups, this zone is more sheltered between the communal living areas and the bedroom, which is reflected in wall recesses that provide space for recognition and personal belongings. This spatial arrangement offers a consistent pattern of communal interaction and privacy throughout the entire project.



Mild phase



Moderate phase



Severe phase

Collective spaces
Semi-private transitional spaces
Private living spaces
Private bedroom with landscape views
Other (staff, function)

Figure 34: Collective-private diagram (Meike Traa, 2026)

Masterplan

Zooming out, the project's masterplan aligns with the ideas outlined in the collective plan. The chosen site within this wider plan for the Vlietlanden area is strategically located in terms of accessibility, safety and landscape integration.

The plot is connected to the proposed mobility network. The previously mentioned evacuation routes form the basis of this network, ensuring accessibility is guaranteed, even during periods of high water levels. Figures 36 and 37 show the car and cycle routes to which the project connects. These elevated routes connect to the equally raised volumes above the landscape. Beneath these elevated structures, there is space for installations and pipework, without the need for new underground networks. Appendix 03 shows the existing pressure pipeline in the area to which the installations can be connected.

The car routes are situated on both sides of the plan, whilst the cycle and pedestrian routes run through the plan, stimulating connections and interaction between residents and the community. Parking is situated along these two car routes. This strategic location is easily accessible, yet is not directly visible from residents' bedrooms. Furthermore, the parking area echoes the design language of the rest of the masterplan. By concentrating parking at the edges of the site, priority can be given to pedestrians in the rest of the area. Parking is intended for care staff and other employees, visitors, and there are a few spaces for shared cars for residents who are still able to drive independently. This route also allows emergency services to access the buildings. Additionally, extra space on the wooden decking has been designed on the north side of the third phase for easy emergency vehicle access (figure 35).

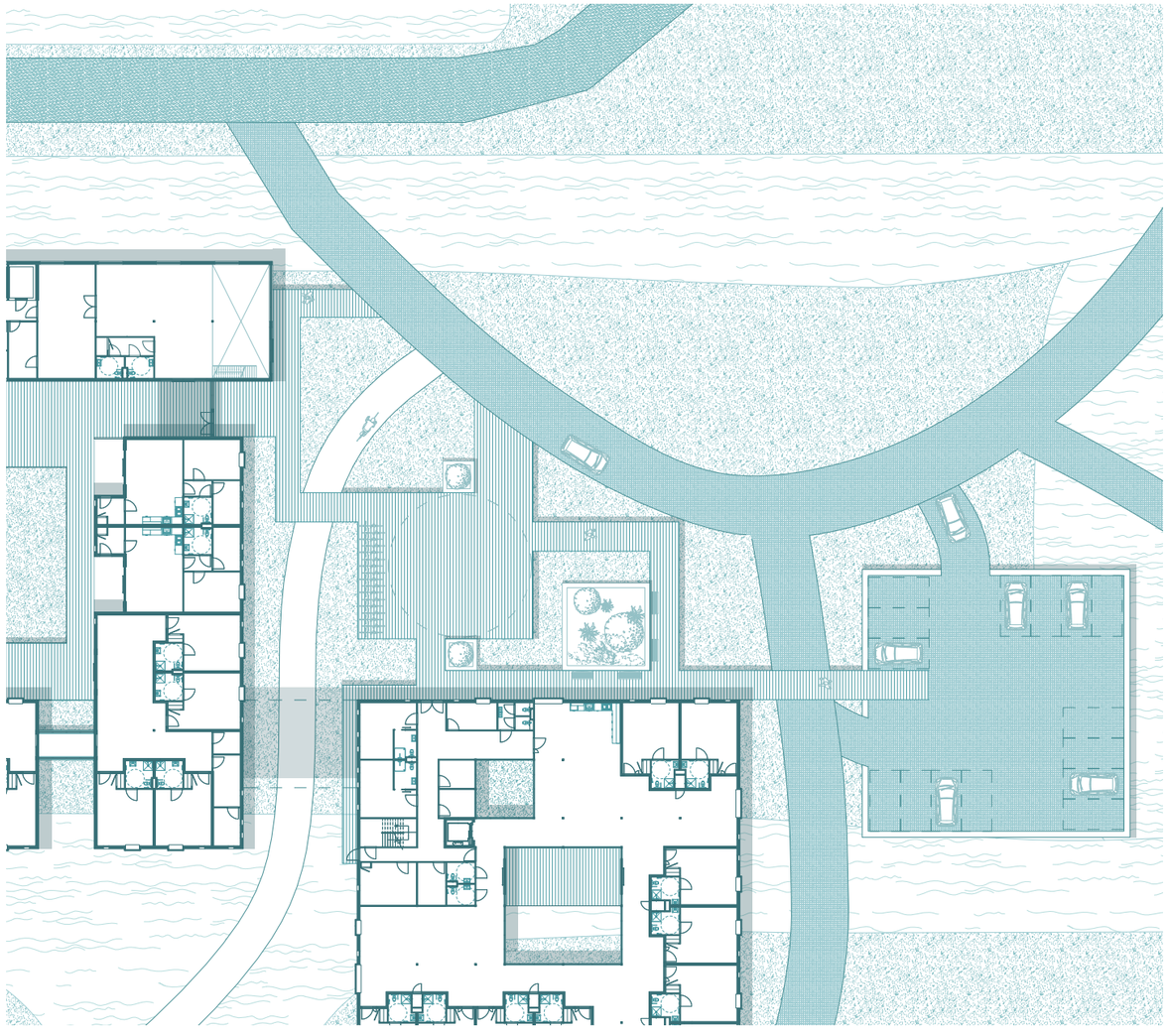


Figure 35; Masterplan; access, parking & emergency services, scale 1:500 (Meike Traa, 2026)

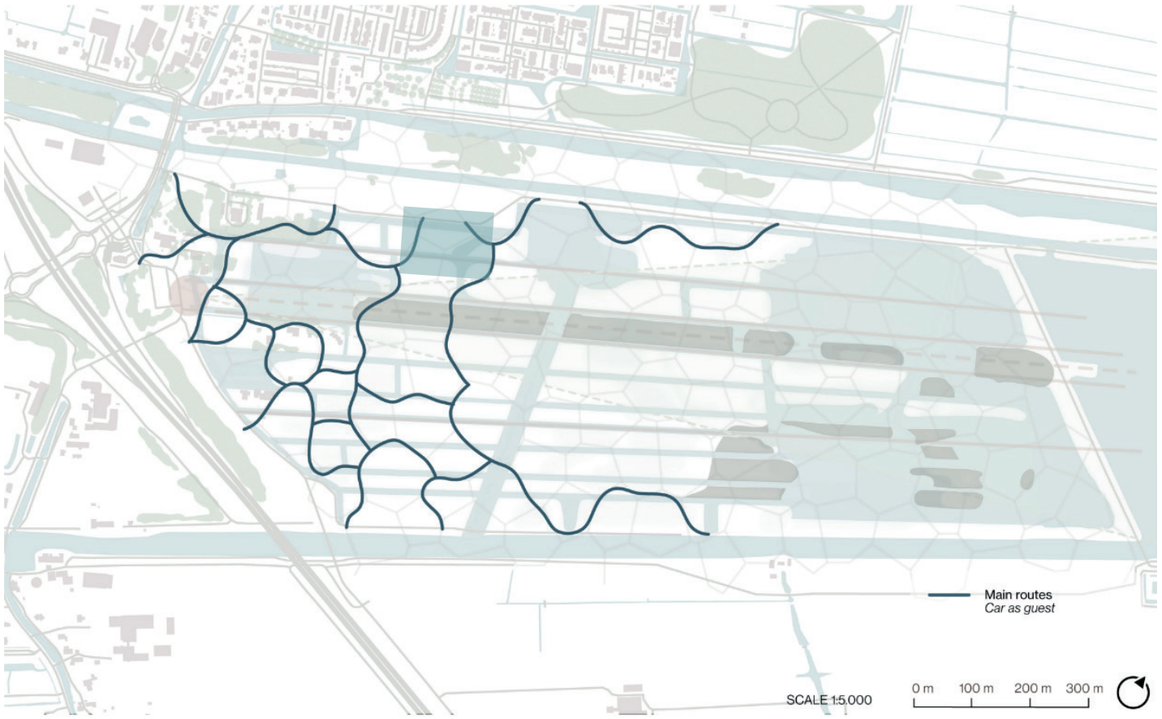


Figure 36; Indication main car routes (Group Sustainable Environment, 2026)

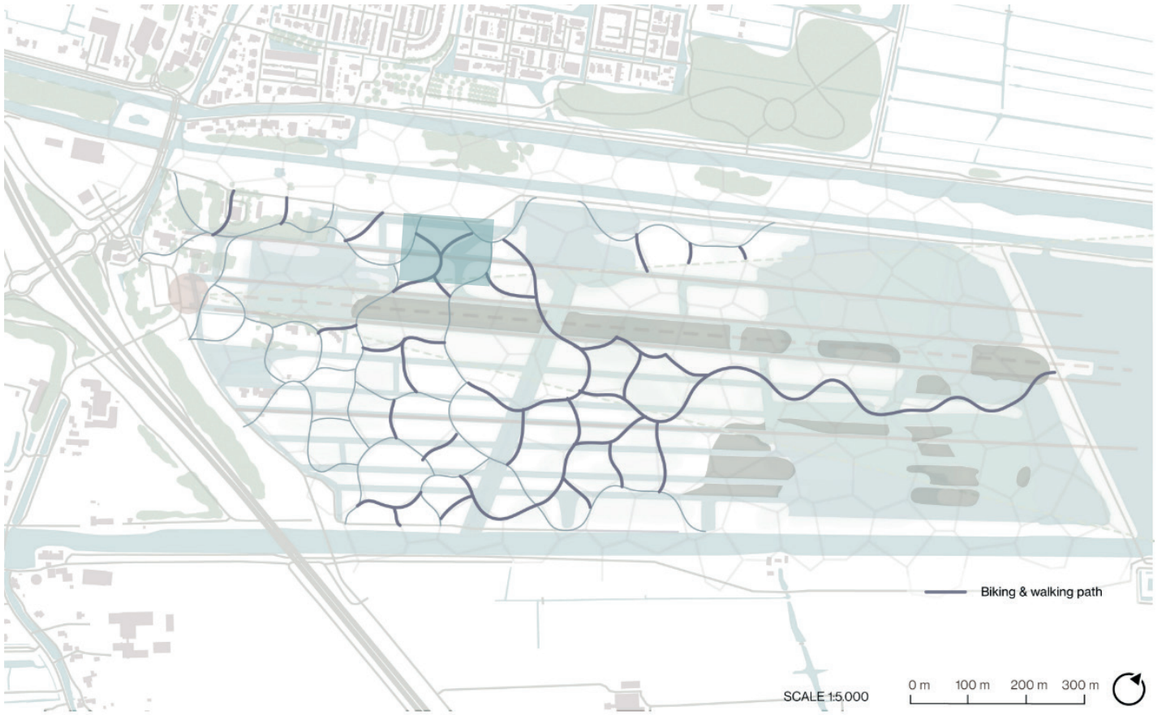


Figure 37; Indication biking & walking routes (Group Sustainable Environment, 2026)

Masterplan

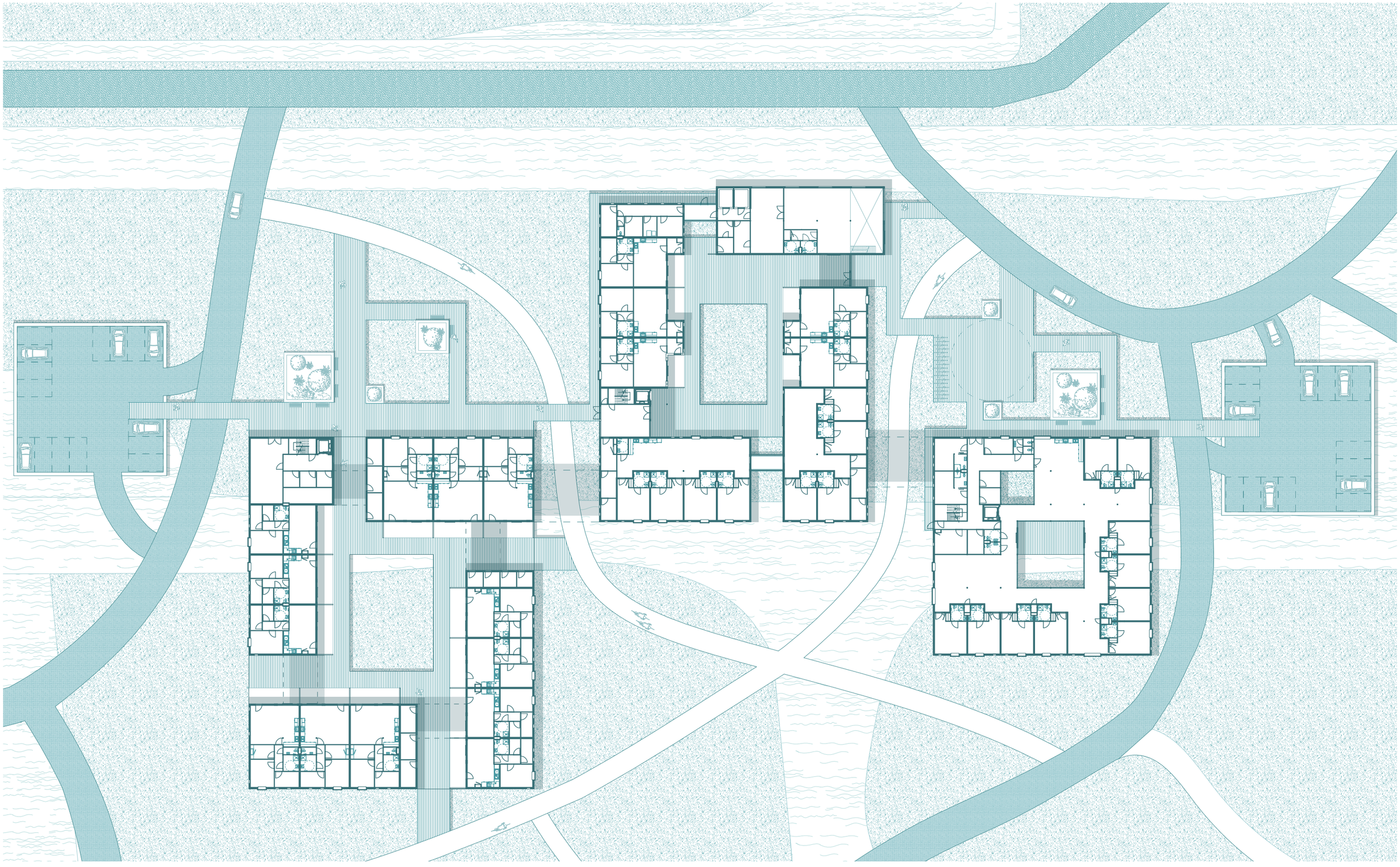


Figure 38; Project masterplan, scale 1:500 (Meike Traa, 2026)

Section

This overview of the entire plan highlights various layers of the design. The section illustrates the spatial contrast between the courtyards on the ground floor (refuge) and the communal space on the first floor (prospect). On the ground floor, the homes are situated in the three different courtyards, where residents experience a sense of security, familiarity and shelter. The courtyard is enclosed, and through the elevation of the project, the landscape extends into the courtyards, stimulating contact between people and nature.

Above this lies the second layer of the project: the communal street. This elevated street strongly contrasts with the spatial experience of the ground level, offering views and openness across the landscape. Here, residents can experience the weather, the seasons, nature and the polder landscape. Pedestrian bridges connect the different courtyards, and from here residents can interact with the community via the cycle routes that run beneath the bridges.

This elevated street is the location for the communal facilities. It offers a diverse range of activities that tie in with the underlying phase, providing proximity to amenities for residents in the three different phases. These amenities include a hairdresser, a music room, a community kitchen, a day-care centre, a physiotherapy practice and a small-scale library. In addition, to the northern side of the plan, adjacent to the main traffic route, there is also a restaurant. At the intersection of residents, their families, visitors and the community, this place encourages social interaction and allows for greater transparency and openness within the project.

The volumes on top adapt to the human scale and adopt a typical house-like appearance, a typology deeply rooted in the human mind. This image contributes to the 'street' feel, and creates distinct and recognisable units accommodating the collective functions. The sizes and angles of the roofs have been determined according to appendix 04.

Whereas the external façades express calmness, rhythm and verticality, as explained later in this chapter, the internal façades are transformed into warm and tactile materials that give the volumes their identity and enhance their recognisability. The positive effect of creating this distinction has been highlighted in many studies, and the use of warm, wooden façade variations aligns with the biophilic design principle of '*material connection with nature*'.

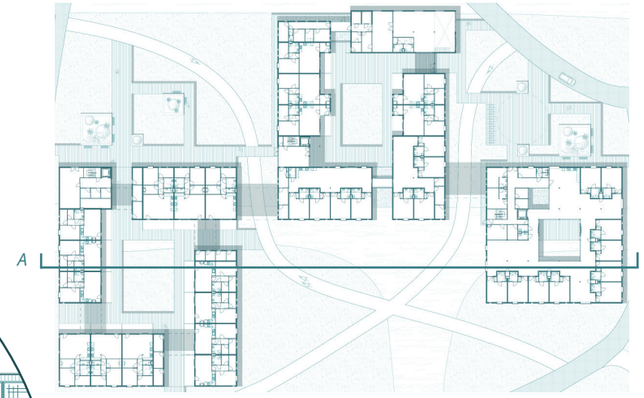
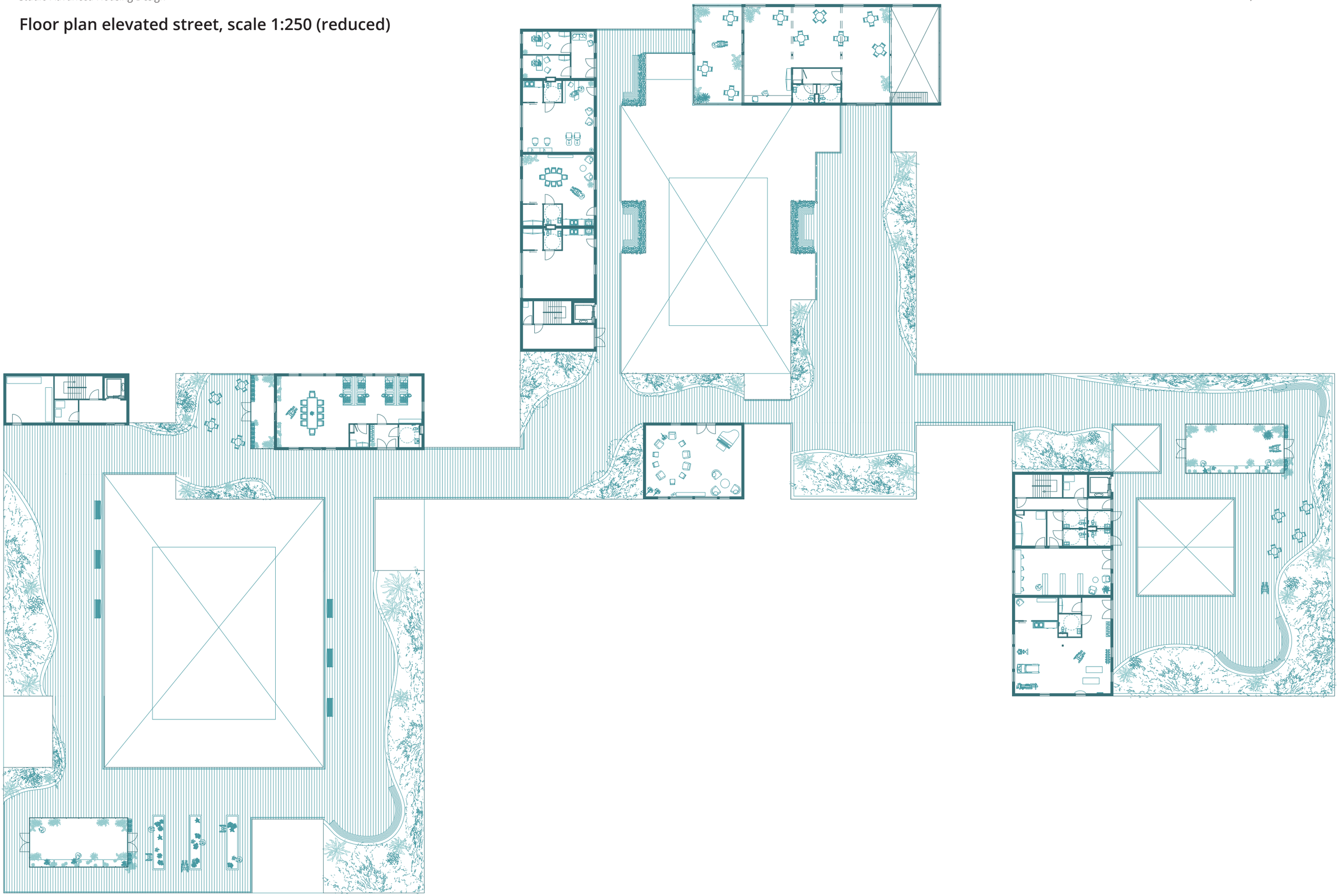


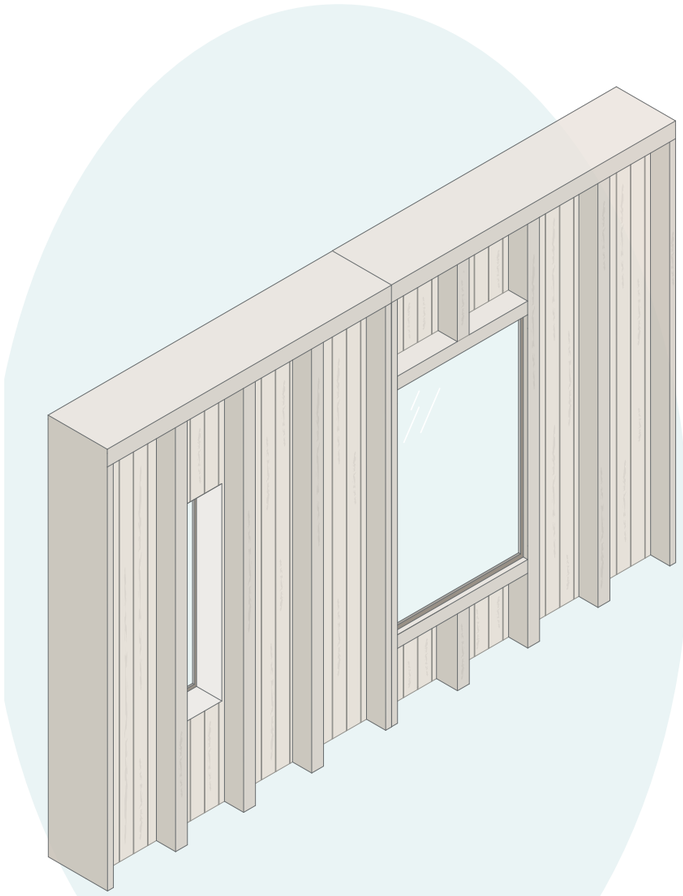
Figure 39; Section AA', scale 1:250 (reduced) (Meike Traa, 2026)

Floor plan elevated street, scale 1:250 (reduced)

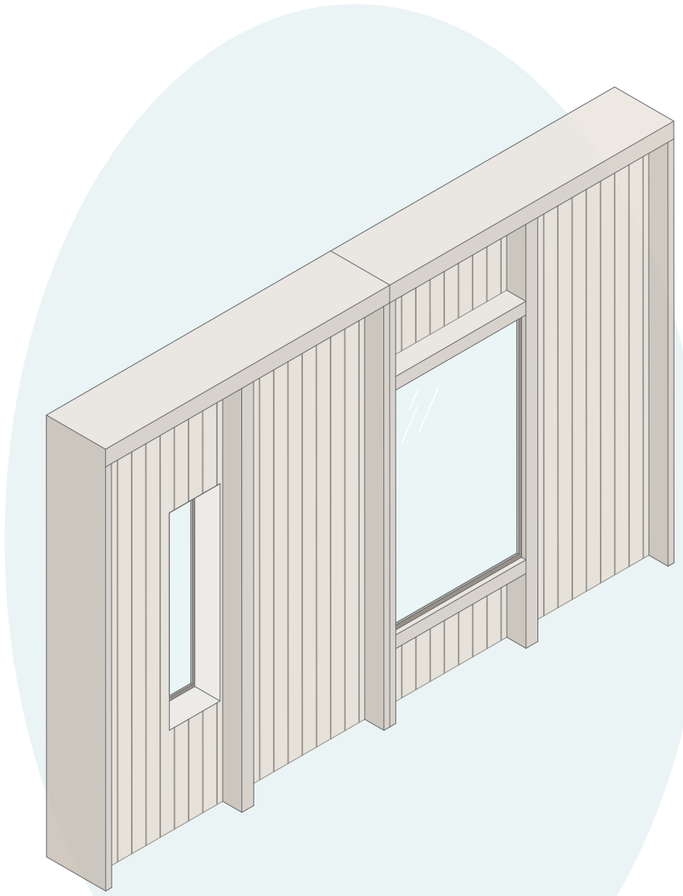


Facade build up

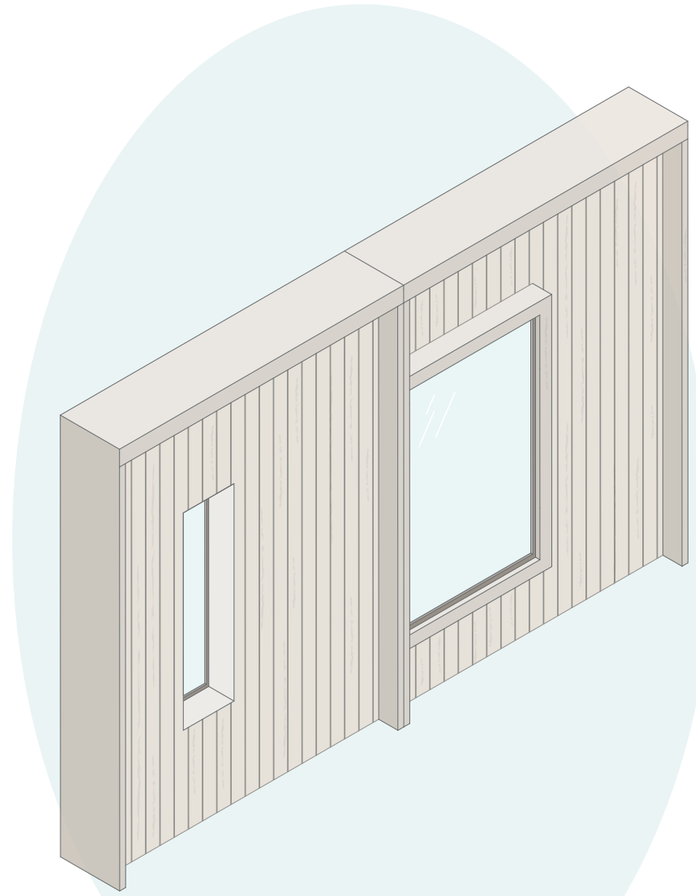
As mentioned above, the façades on the exterior of the building are minimalistic and express a sense of tranquillity and rhythm, reflecting the wide, open polder landscape. The façade reflects the transition of the landscape towards the three different phases, and the rhythm of the façade adapts as dementia progresses. Whilst the façade still has a fast and clear articulation in the first phase, this becomes calmer towards the third phase (figure 40). This method introduces distinction and variation within the same unity of rhythm and materials, and offers orientation and recognisability for residents.



Mild phase



Moderate phase



Severe phase

Figure 40; Facade principle through the different phases (Meike Traa, 2026)

The entire system is modular and prefabricated, which, in the context of the unstable polder landscape of Midden Delfland, offers benefits in terms of transport, construction, and flexibility and adaptability over time. The basis of the façade construction consists of a timber structure, which, in 2.4-metre elements, aligns with the grid in the plan. For the materialisation of the façade, priority is given to bio-based materials, which both contribute to the project's sustainability through CO_2 storage and ensure a healthy indoor climate. The timber cladding also creates a natural transition between the landscape and the building, and the material's natural appearance gives residents a sense of peace and comfort.

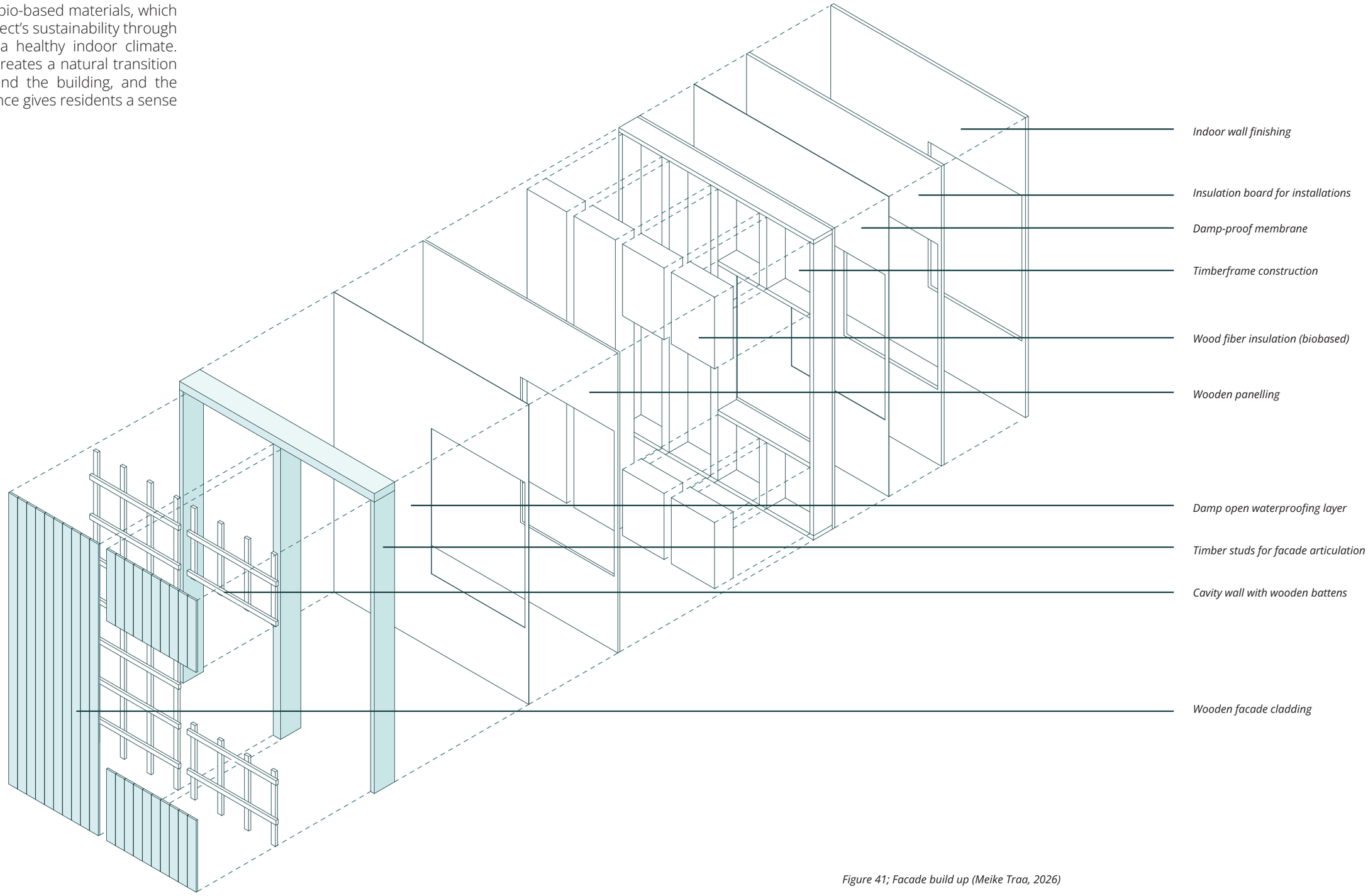


Figure 41; Facade build up (Meike Traa, 2026)

Facade openings

The façade distinguishes between extended bay windows and recessed windows. The detailing of these different openings is shown in figures 42 and 43. The bay windows are located in residents' bedrooms, providing a continuous view of the landscape. The windows provide opportunities to sit, thereby enhancing the experience of and connection with the landscape.

Other windows are positioned further inwards in the façade, which accentuates this distinction and creates depth and shadow in the façades.

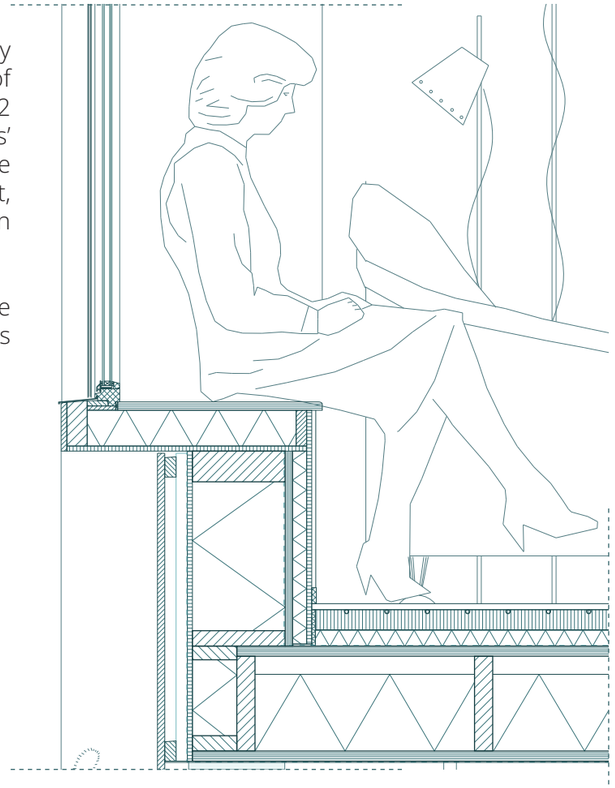


Figure 42; Detail bay window, scale 1:5 (reduced) (Meike Traa, 2026)

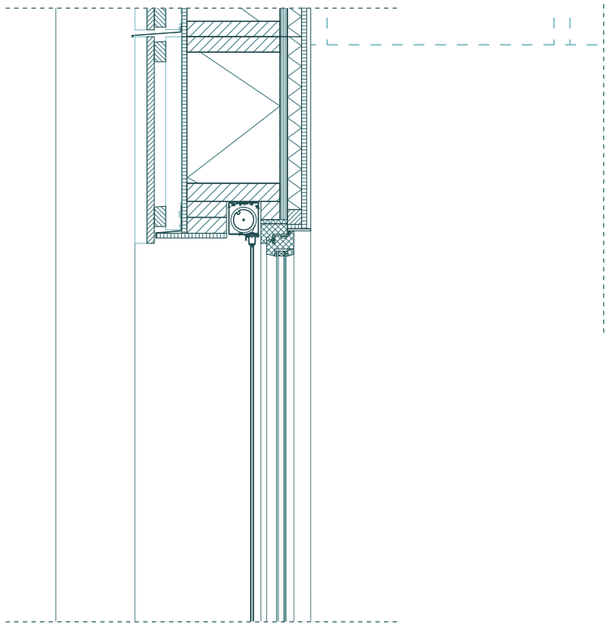


Figure 43; Detail recessed window, scale 1:5 (Meike Traa, 2026)

Construction method

The structure consists of prefabricated elements: load-bearing timber façades with Kerto-Ripa floor elements. The standard size for these floor elements is also 2.4 m, which fits well within the grid. The structure shown in figure 44 illustrates part of the construction of the third phase. Here, in addition to the load-bearing facades, timber beams are used for the construction of the building's infill to ensure more openness and flexibility in the communal spaces.

The elevated structure is realised using steel foundation piles. This method is suitable for unstable soil types, such as found in the polder landscape of Midden Delfland. The piles are screwed into the ground, which reduces noise, vibrations and disruption to both nature and biodiversity in the surrounding area. Furthermore, no concrete is required and there is no curing time, meaning that construction can continue immediately after installation, which speeds up the overall construction time and makes it more efficient.

Finally, the piles are removable and suitable for reuse, meaning they will no longer have an impact on the landscape in the event of future adaptations or dismantling. Due to the relatively low load-bearing capacity of this method, it was decided to install the piles every 2.4 metres within the grid. This allows the weight to be distributed across more points.

Figures 45, 46 and 47 show the structure plans for the third phase of the project.

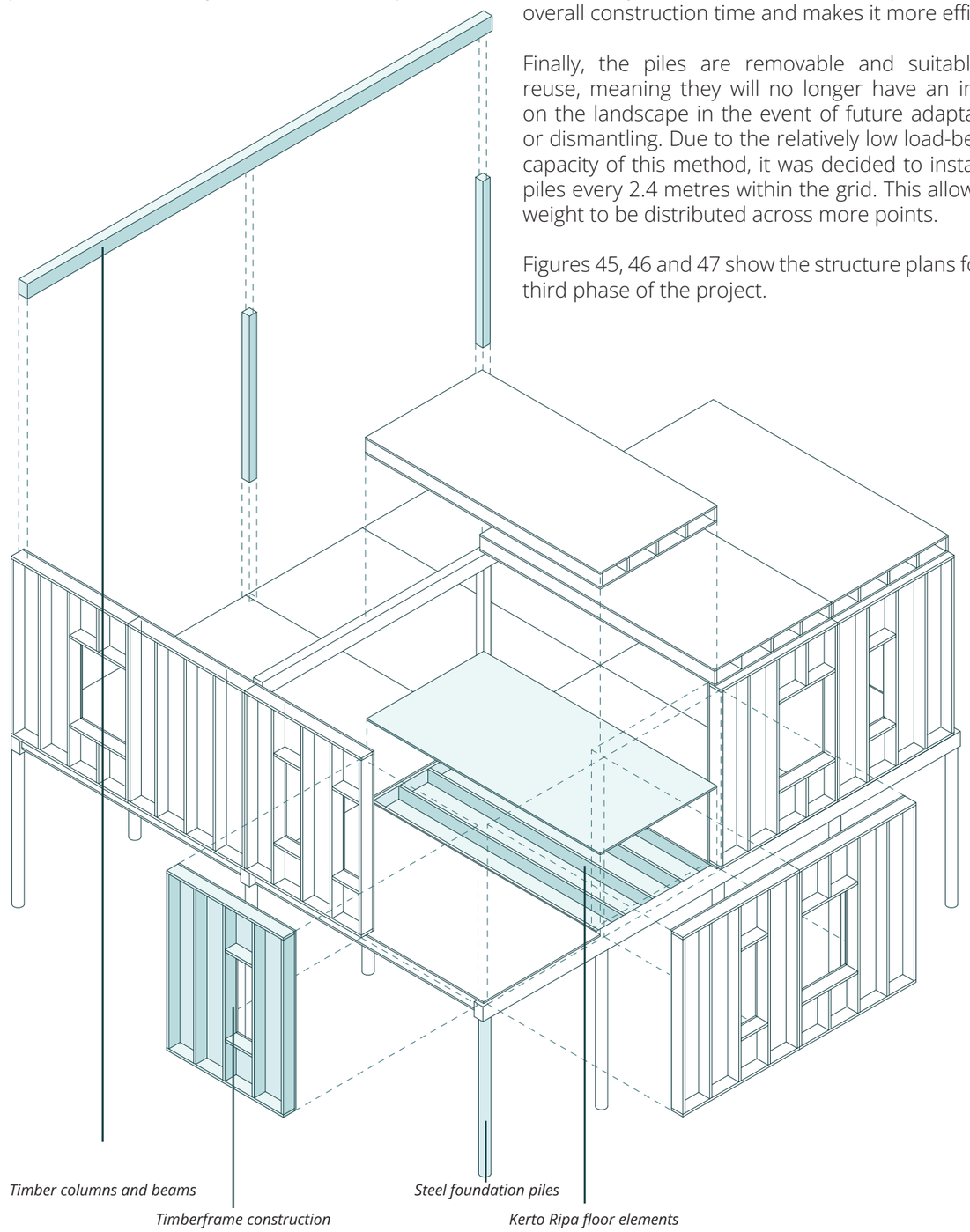


Figure 44; Axonometric drawing construction (Meike Traa, 2026)

Load-bearing structure plans,

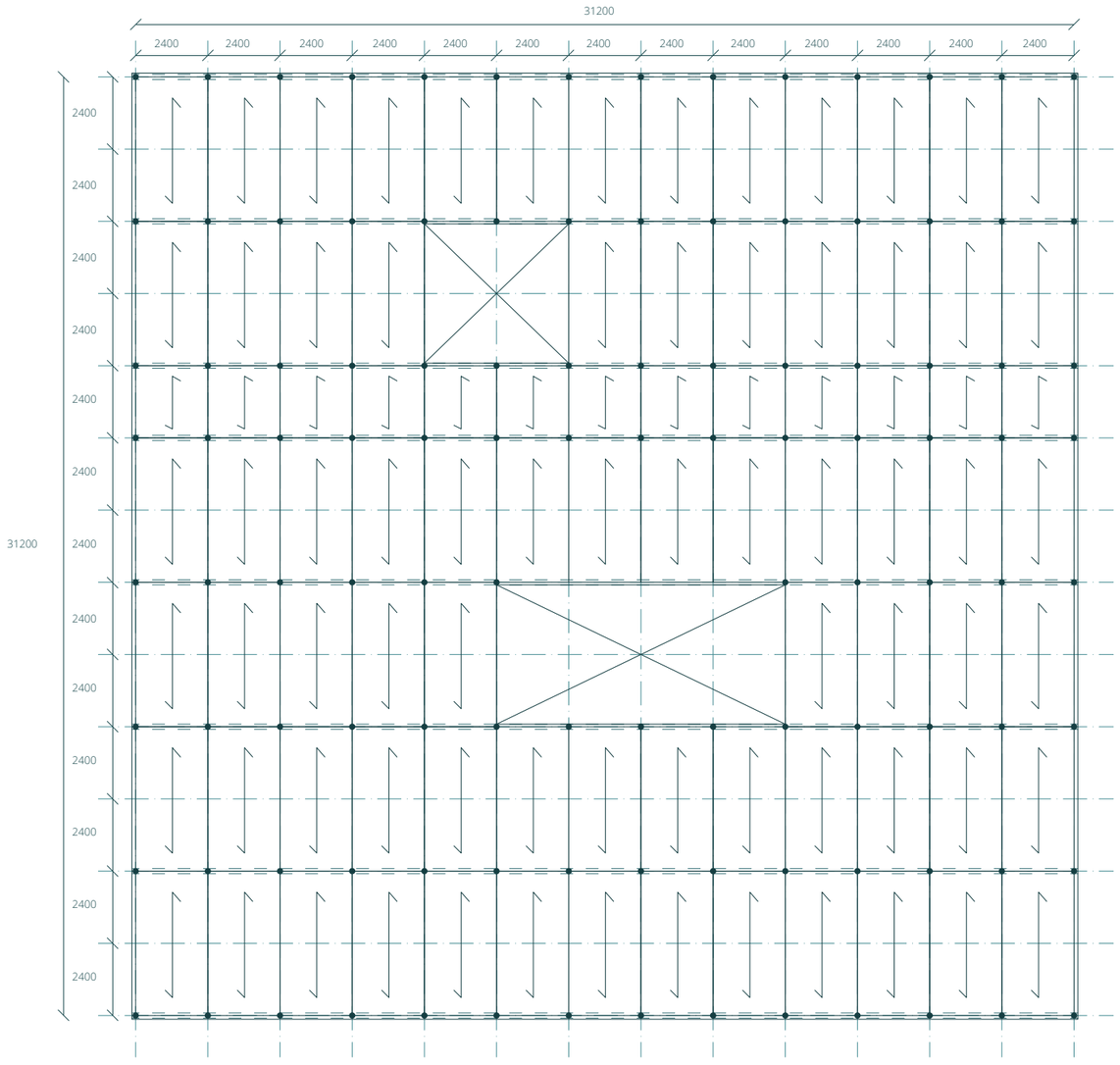


Figure 45; Load-bearing plan ground floor, scale 1:200 (Meike Traa, 2026)

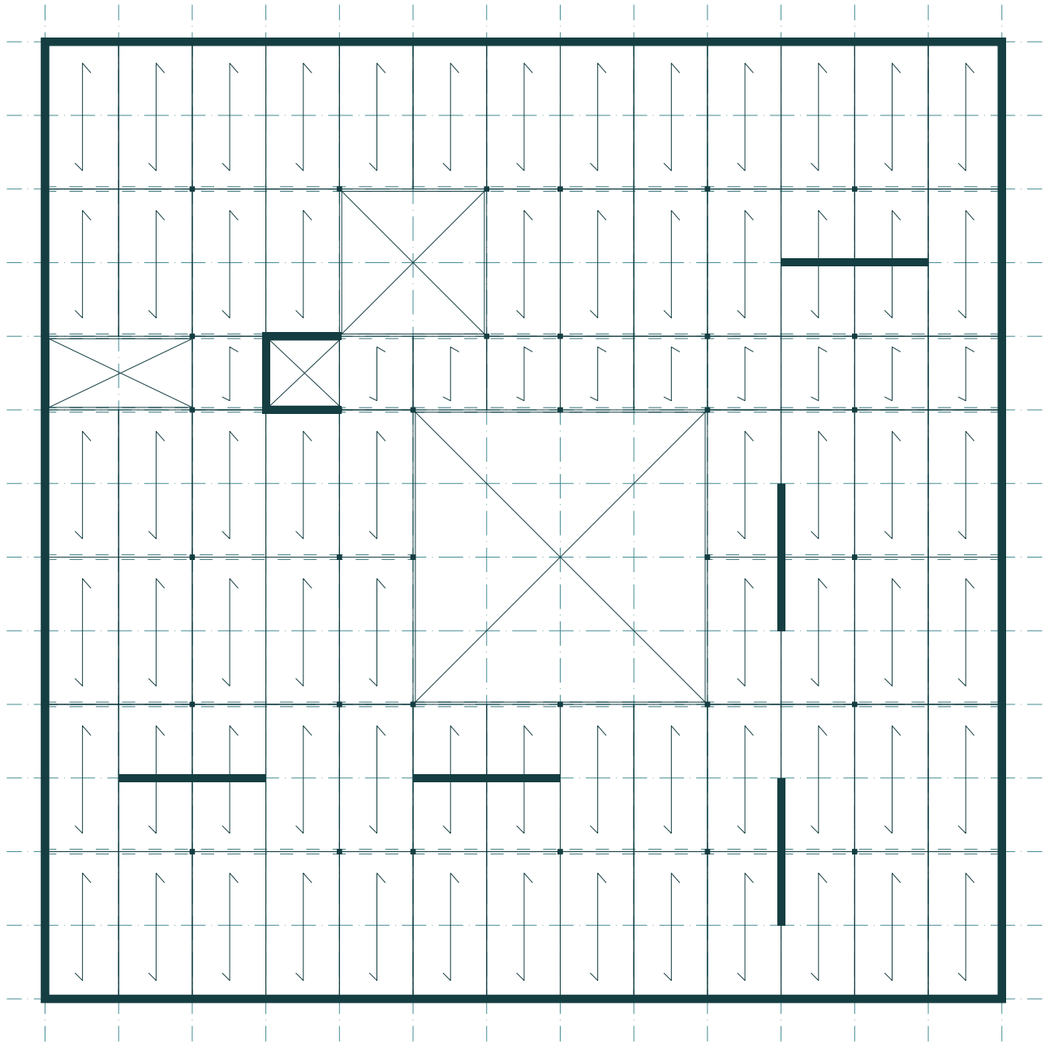


Figure 46; Load-bearing plan first floor, scale 1:200 (Meike Traa, 2026)

Load-bearing structure plans,

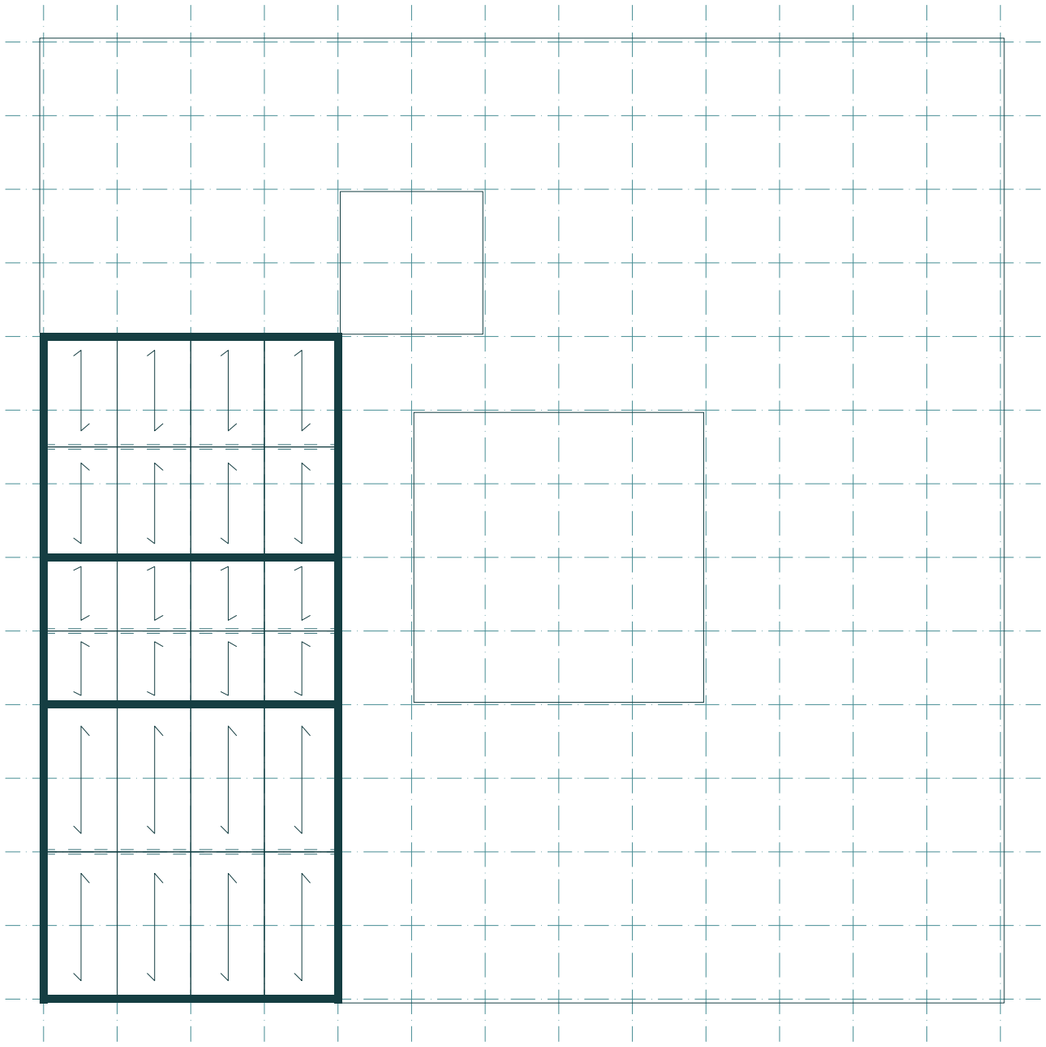


Figure 47; Load-bearing plan roof, scale 1:200 (Meike Traa, 2026)

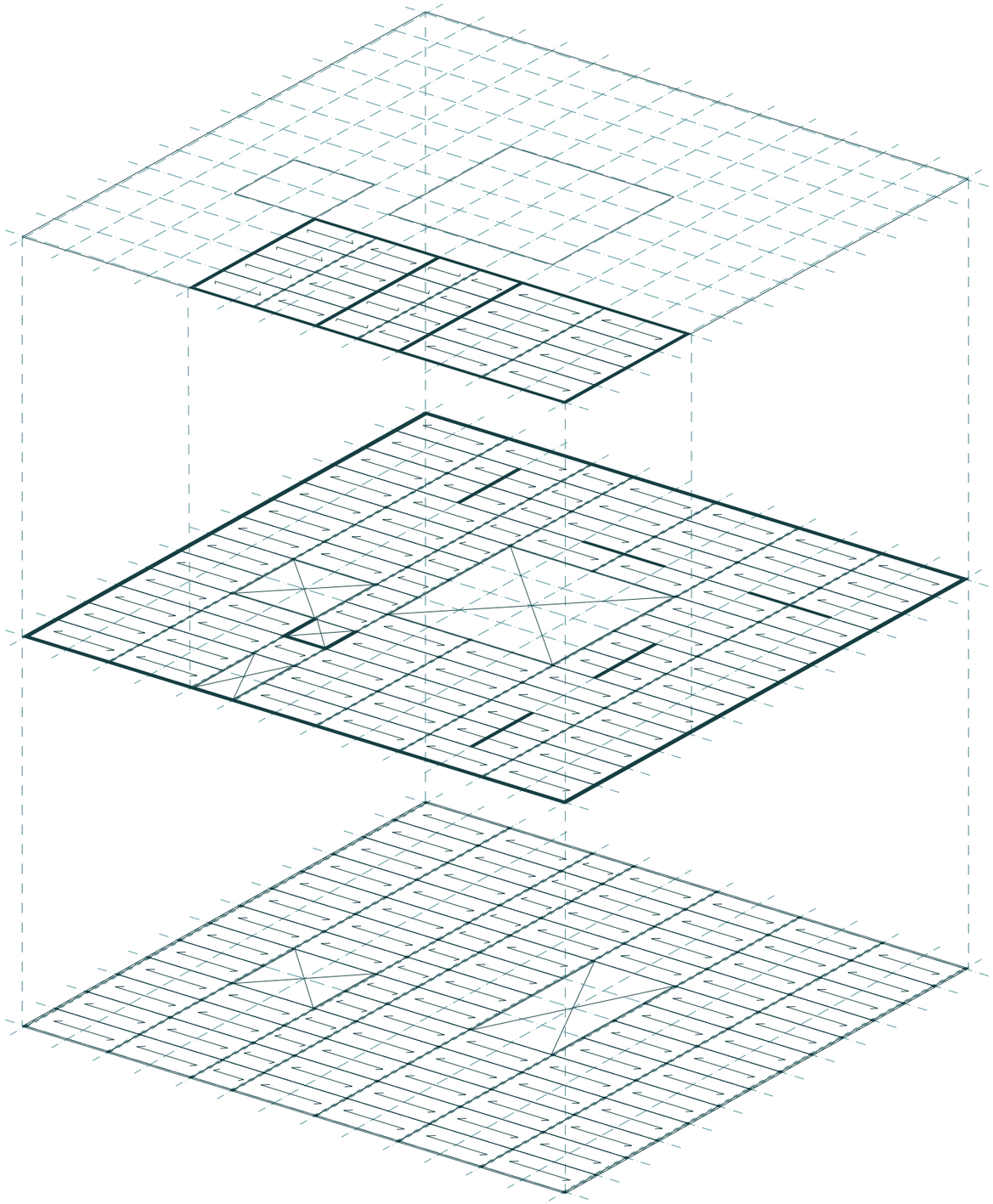


Figure 48; Total construction plan (Meike Traa, 2026)

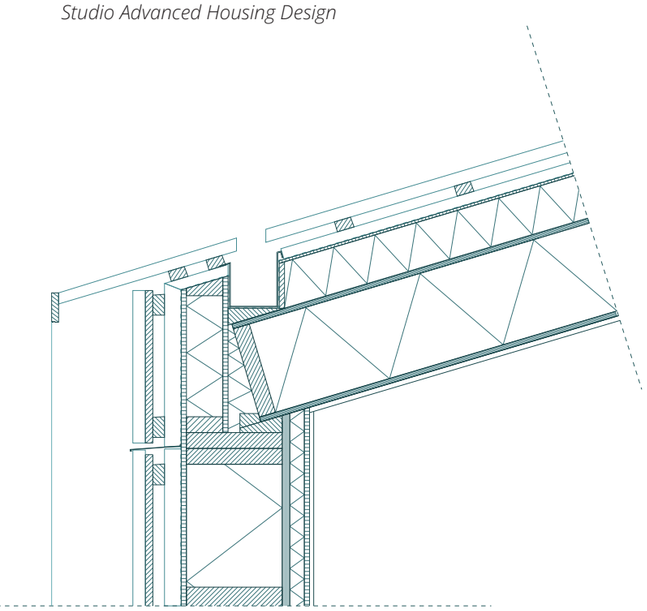


Figure 49; Roof construction detail, scale 1:5 (reduced) (Meike Traa, 2026)

Facade fragment 1:20

Figure 50 shows the façade detail, demonstrating how the various architectural and technical elements of the design come together in the project. The drawing shows how the building is raised on stilts, which minimises its impact on the landscape and allows the landscape to blend into the design towards the courtyards. This raised ground floor provides residents with safety and stability in an unstable landscape, even when water levels rise. As mentioned earlier, the space beneath the floor is used for pipework and installations. This means that these do not need to be integrated into the ground, which further minimises the building's impact on the landscape. The façade cladding is extended down to the ground to visually enclose this space, creating the impression that the building rises from the landscape rather than standing above it.

Additionally, the drawing illustrates the variations in window design, as previously explained. The seating area formed by the bay window offers direct views over the landscape from the private rooms. These private rooms also feature additional acoustic insulation in the form of room-separating walls (see horizontal detail) and acoustic panels. Good acoustics are essential for minimising noise pollution and stimuli, which can lead to feelings of anxiety and stress among people with dementia. Above these acoustic panels, there is space for the air handling system and other installations that create a healthy indoor climate.

Figure 49 shows the structural connection between the roof and the façade.

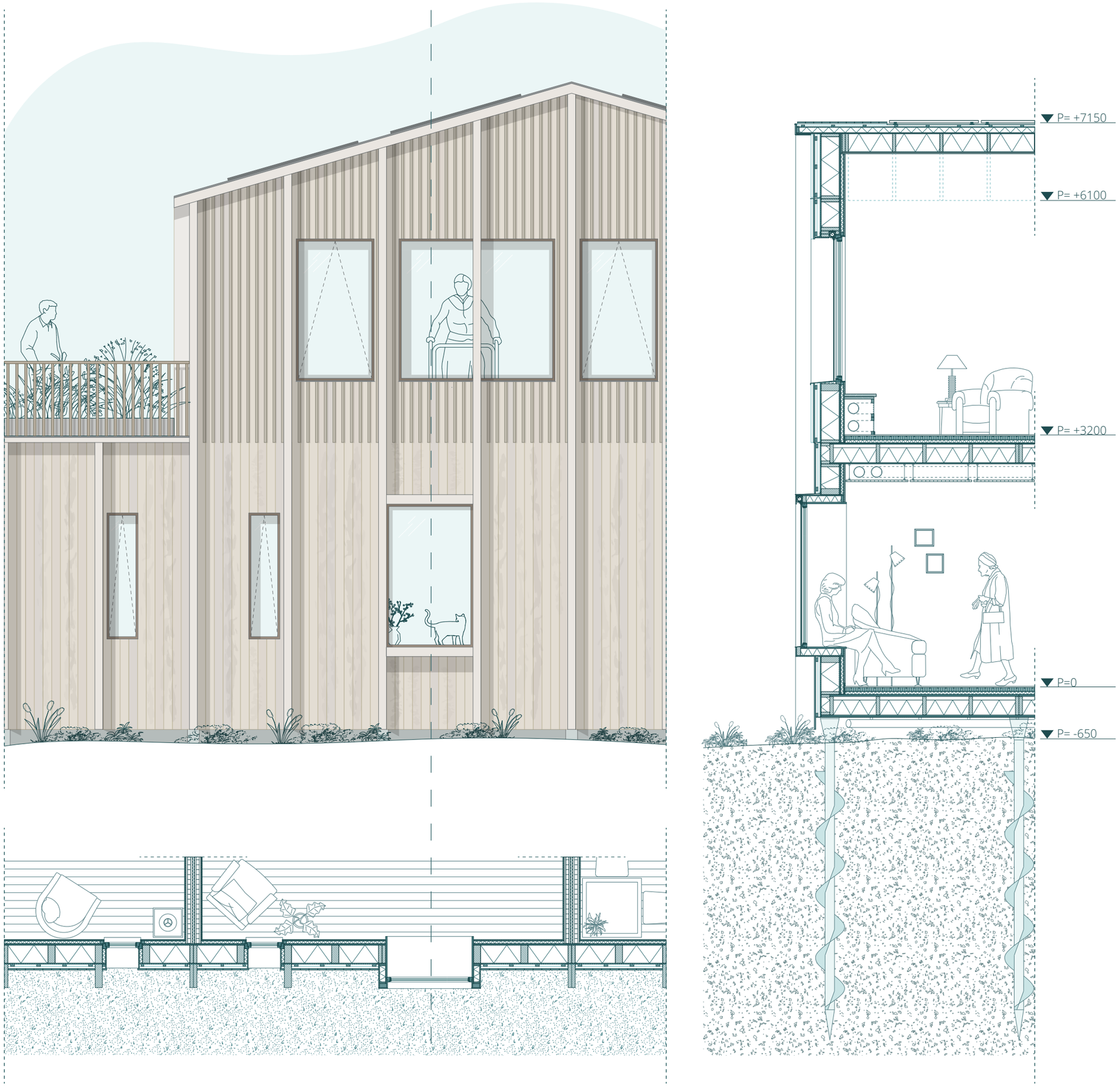


Figure 50; Facade fragment, scale 1:20 (reduced) (Meike Traa, 2026)

Climate design

In the project, climate design is not only applied as a sustainability strategy, but its implementation also contributes significantly to a healthy indoor climate and the comfort of the residents. In a care setting, a stable and reliable system is essential: consistent temperatures, good ventilation, sealing and sound insulation. Together with the ideas from the collective masterplan and sustainability principles, the design's climate scheme can be explained on the basis of the following themes: thermal comfort, ventilation, renewable energy and water management.

Thermal comfort:

Comfort within the building is achieved primarily through passive design principles. The façade forms a thick envelope, with high Rc-values and bio-based insulation. Combined with HR++ glazing, well-insulated window frames and airtight seals, this minimises heat loss in winter and overheating in summer. Furthermore, biobased insulation contributes to a healthier indoor climate. Automated sun blinds are fitted to the outside of the glazing to limit excessive solar heat in summer. Facade overhangs were considered but were not feasible due to the required dimensions. See appendix 04 for further details. To regulate the indoor temperature, low-temperature underfloor heating and cooling has been installed. This eliminates the need for traditional radiators, as their hot surfaces are undesirable within a care environment. Finally, sensors in the building, linked to the systems, help to regulate the indoor climate.

Ventilation:

A continuous supply of fresh, healthy indoor air is essential in a healthcare environment. To achieve this, the design incorporates mechanical ventilation (type D) with heat recovery, ensuring that heat is not lost unnecessarily. Integrated filters ensure a healthier air quality. The heat recovery is combined with a bypass system, which allows cool air to enter directly in the summer to prevent overheating and ensure the indoor climate remains as stable as possible, also during hot summer months.

Renewable energy:

The energy required for the design is generated by solar panels installed on the rooftops on the elevated street. The angle and orientation of these panels have been optimised according to the sun study in appendix 04. These solar panels serve as the energy source for the air-to-water heat pump. A ground source heat pump would not be suitable for this site as it would have a significant impact on the landscape. As care environments have a relatively constant energy demand, energy is stored in batteries during peak solar hours. This promotes self-sufficiency and prevents further overload of the local grid.

Water management:

The water strategy for the project incorporates the collective ideas from the masterplan (figure 51). Rainwater is discharged into the landscape, where it contributes to the area's water storage and helps to prevent soil subsidence. Greywater is also directed towards the landscape, but first passes through constructed wetlands spread throughout the site, where a natural process purifies the water so that it is clean enough to infiltrate into the landscape. Blackwater is discharged via pipelines beneath the building towards the existing pressure pipe that leads to the sewer system (appendix 03).

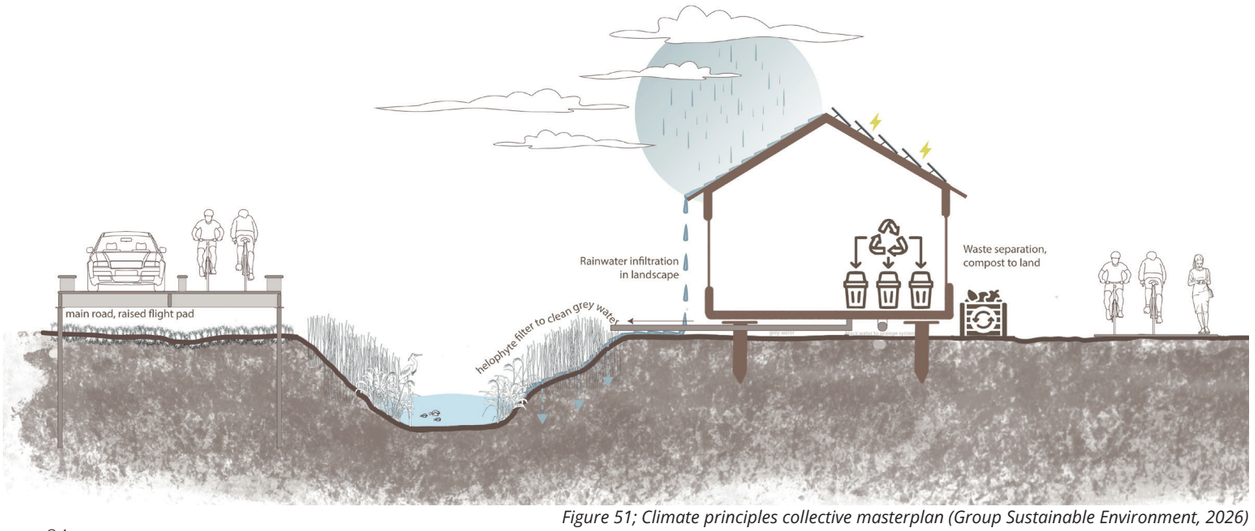
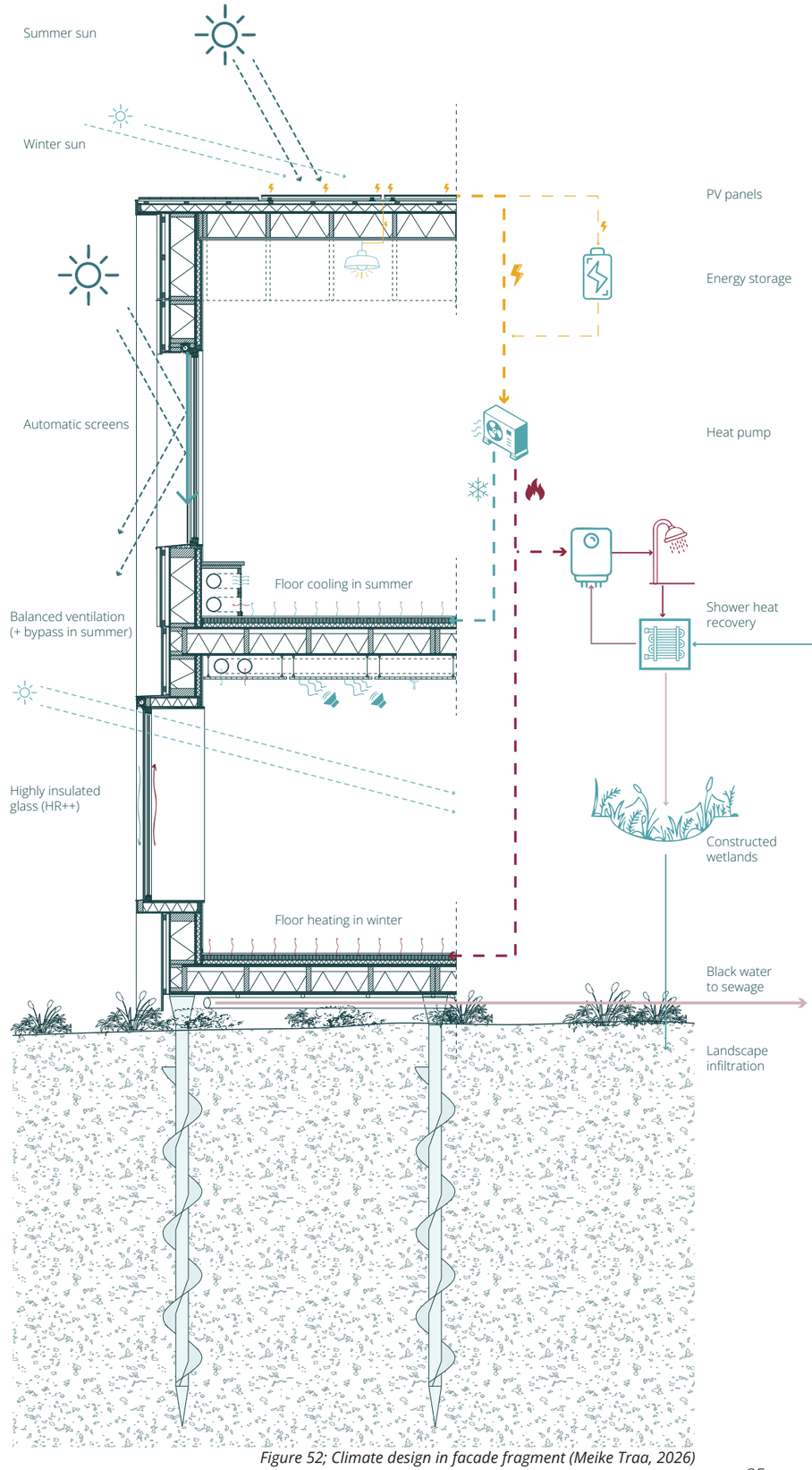


Figure 51; Climate principles collective masterplan (Group Sustainable Environment, 2026)



Facade build up (out - in):
Wooden facade cladding 18mm
Cavity wall with wooden battens 45x28mm
Damp open waterproofing layer
Wooden panelling 12mm
Timberframe construction 38x230mm, c/c 600mm,
filled with 230mm biobased wood fiber insulation
OSB 18mm
Damp-proof membrane
Insulation board for installations 35mm
Indoor wall finishing

Floor build up (out - in):
Insect mesh
Damp open waterproofing layer
Kerto Ripa floor elements 45x235mm, c/c 600mm, filled with 200mm biobased wood fiber insulation
Damp-proof membrane
Wood wool acoustic panel 40mm
Fermacell gypsum fiberboards 50 mm, with integrated floor heating system
Indoor floor finishing

Figure 52; Climate design in facade fragment (Meike Traa, 2026)

The interior

As dementia-friendly design is a recurring theme at all levels of the design process, it is essential to also include the interior design, which is most closely related to the resident's experience. It is precisely at this level that small changes can make a significant difference to the experience, orientation or use of a space. Subsequently, this has a direct impact on the well-being of dementia patients. The axonometric drawing in figure 53 illustrates these interventions for the interior design of the third phase of the plan.

These implementations are based on the findings of the research or on decisions made previously during the process in line with the identified design principles, such as the bay windows designed to strengthen the human-nature connection. In addition, a series of decisions were made focusing on creating a homely environment, such as avoiding long, institutional corridors, incorporating plants and natural materials, and offering the freedom to furnish individual rooms with personal furniture.

Interior elements:

1. Personal furniture in rooms
2. Wall recess as transition space
3. Adapted doors for wider access (bed)
4. Private bathroom for hygiene purposes
5. Storage room with camouflaged door
6. Contrasting colours on floors/walls
7. Accessible handrail with good grip
8. Large windows for nature and social connection
9. Ample seating for resting
10. Familiar items at the bedroom entrance
11. Contrasting colour on the central path
12. Bay windows for direct nature connection
13. Use of natural materials
14. Easily accessible toilets in the corridor
15. Provide plants and gardening
16. Small, scattered seating areas create a homely atmosphere
17. Short corridors
18. Safe and continuous access to courtyard
19. Sufficient space and wheelchair access

Figure 53; Phase three interior (Meike Traa, 2026)

Collage impression: Entrance



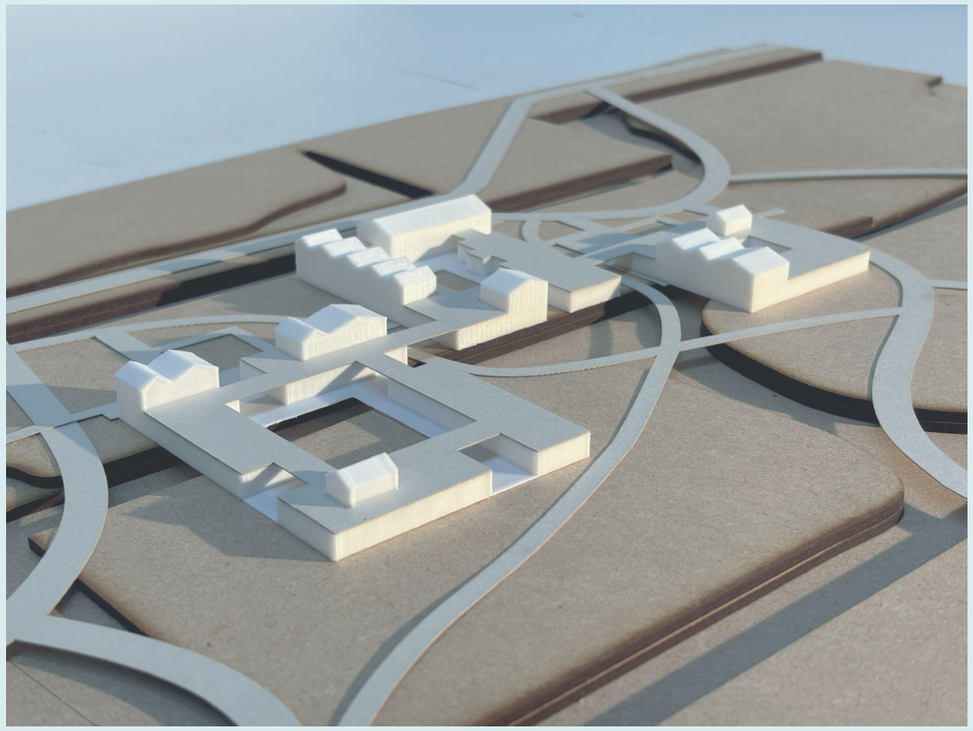
Collage impression: Interior phase 1

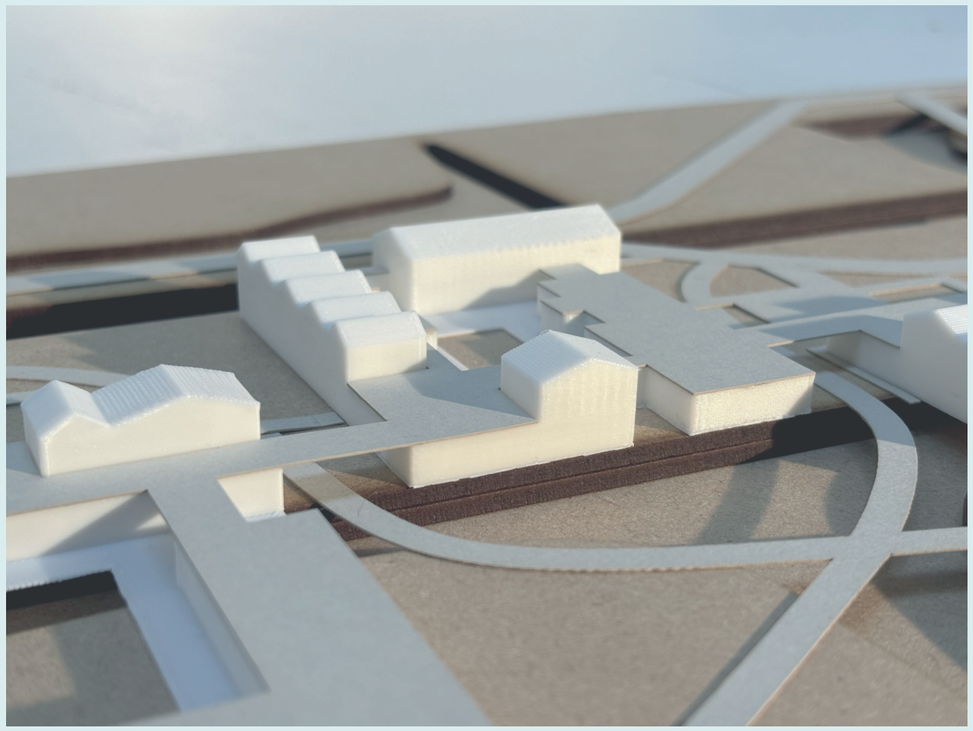


Collage impression: Courtyard phase 3



Physical models



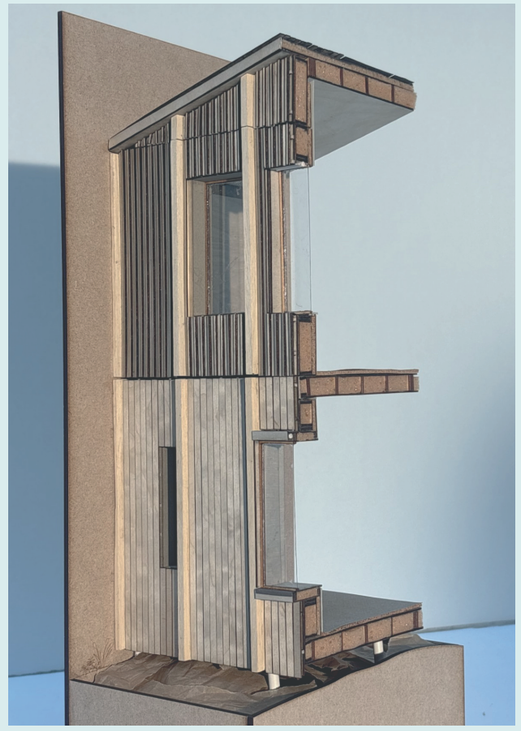


Situation model, scale 1:500









Facade fragment, scale 1:20

04.

CONCLUSIONS

4.1 Conclusion

This graduation research started from the given context of Midden Delfland and explored its relationship with dementia, the disease that will cause the greatest pressure on society in the future. The starting point for the process was the fact that both worlds, dementia and the polder landscape, are connected by uncertainty, loss of control, and environments that change over time.

In this context, the research investigated how architecture can be used to create a healthy and supportive living environment for this target group, integrating both changing care needs and the polder landscape of Midden Delfland.

The research revealed that a well-designed spatial environment contributes significantly to patients' wellbeing, peace of mind, and sense of orientation. As cognitive and physical abilities decline with the progression of the disease, the relationship between patients and their environment becomes increasingly important. Conventional care models often fall short in this regard, frequently only focusing on advanced care in separated urban nursing homes. Due to the institutional image, moving here is avoided by many patients, resulting in a mismatch between the high demand and the limited supply in the market for suitable housing for people with dementia.

At the same time, the changing polder landscape of Midden-Delfland requires future-proof adaptations and new ways of living based on resilience and connections to the ecological system. Within this context, the opportunity arose to explore alternative forms of housing to the traditional care home, bringing together care, landscape and design in an innovative spatial system.

Based on the three stages of dementia, mild, moderate and severe, the design demonstrates that architecture can support changing physical and care needs within the same system, creating a continuous environment rather than institutional separation. These stages are reflected in three symmetrical courtyards, which offer shelter and a sense of intimacy for both independent living in the mild stage and supported living and advanced care in the severe stage.

The courtyards are connected by a raised communal street at the +1 level. This level is used for shared activities, sensory engagement and facilities that encourage social interaction. This connection enables residents to remain within a single, familiar environment where the necessary care services are close at hand.

The specific requirements for a dementia-friendly environment, as discovered through literature research combined with case studies and interviews with professionals, can be categorised under the following themes: orientation and wayfinding, sensory experience, familiarity, mobility and social interaction. These themes can then all be related to architecture and spatial implementation at every scale of the project (macro, meso and micro). For example, at the macro level, this includes the circulation strategy, at the meso level, it involves accommodating social functions and activities, and at the micro level, dementia-friendly design is reflected in the use of colour and sensory stimulation. This scale division emphasises once again the importance of a well-designed physical environment for people with dementia.

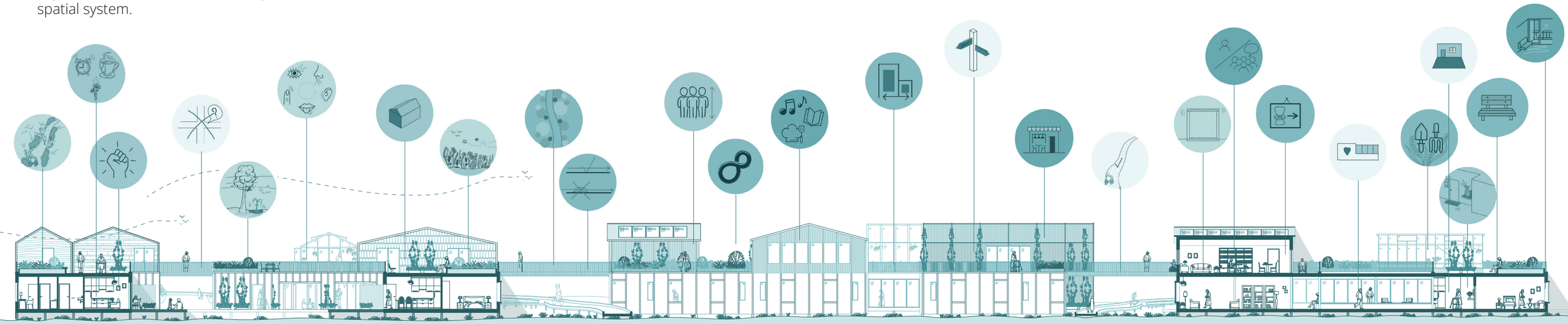
The section in figure 58 illustrates how all these themes and implementations come together in the design. Each principle is reflected in a different way, and they complement each other within the themes. For example, various implementations on the elevated street stimulate sensory experience, mobility and social interaction through diverse routes, sightlines, seating areas and herb gardens. The dwellings in the courtyards foster a sense of familiarity and wayfinding through features such as personal niches, contrasting colours and short corridors. Thus, the project demonstrates that incorporating these principles into an architectural design can enhance the overall sense of orientation and wellbeing of dementia patients.

Furthermore, the design shows how the relationship between nature and dementia care can be strengthened through biophilic design implementations. During the design process, biophilic design functioned as an inspirational method, showing how nature inclusive design can add to patients' wellbeing, sensory comfort and health. A selection of the 14 principles by Browning et al. (2014) relevant to dementia care design were translated into architectural elements to support the human-nature connection. For example, these include the differentiation between refuge in the dwellings and courtyards to prospect from the elevated street, bay windows to stimulate direct nature views from the bedrooms, the use of natural materials and allowing water and nature into the courtyards by raising the entire structure on stilts.

This design feature, raising the structure on stilts, also helps to minimise the building's impact on the ground. The changing and uncertain state of the polder landscape in Midden Delfland calls for a flexible and adaptable approach to construction, which presents technical challenges. Consequently, a modular and prefabricated construction system has been chosen, making the building lightweight and ready for future adaptation.

Viewed on a broader scale, this project highlights many issues that will be relevant to future architectural challenges. The ageing population and the growing need for dementia-friendly environments, along with unstable environments caused by climate change, will become increasingly pressing issues in the future. For this reason, new architectural models are needed that can accommodate multiple transitions simultaneously.

In conclusion, this project provides an innovative architectural framework that embraces and combines the challenges of transitions and uncertainty into a dementia-friendly care environment within the polder landscape of Midden Delfland. The project seeks to find a balance as people and their environment change; between autonomy and care, between nature and well-being, ***between memory and landscape.***



4.2 Recommendation

This project demonstrates how architecture responds to two major challenges of the future: an ageing population and landscape transformation due to climate change. Bringing these themes together shows how architecture can act as a mediator between social and ecological challenges, rather than treating them as separate issues.

However, this separation is still often found in traditional care models, which this project challenges. Traditional models are often based on urbanised institutionalisation and the separation of care, frequently resulting in the relocation of patients. This leads to a disruption of one's familiar environment and social connections. Within the architectural profession, it is important to create alternatives to this traditional model. This project offers an example of this, and demonstrates how architecture can play an active role in creating a continuous living environment by rethinking how care is organised over time. Future research could build on this by further investigating this spatial continuity, and how different levels of care and needs can be integrated into one single system.

Furthermore, many traditional examples still lack a connection with nature. Although numerous studies highlight the positive impact of nature on people with dementia, this aspect is often still lacking in practice. This project has developed an approach to address this, drawing inspiration from the principles of biophilic design to incorporate spatial elements that foster this human-nature connection. Due to limitations within this research, further research is required to fully optimize this human-nature relationship.

Finally, it is important for architects to realise the significant impact the built environment has on the lives of people with dementia. Although dementia is often viewed as a healthcare issue, many of the daily experiences and challenges faced by people with dementia can be directly linked to elements of spatial design. These are present on both a large and small scale. Throughout the design process, it is therefore important to constantly switch between these scales and actively consider the consequences that design implementations have across the different scales.

4.3 Reflection

Throughout the graduation process, one of the key lessons I learnt was how to combine different themes, disciplines and scales within a coherent architectural framework. Of the six themes identified within the sustainable environment group, 'healthcare' appealed to me in particular. Early on in the process, I decided to focus on dementia due to its societal relevance and the significant contribution that architecture can make to the well-being and experience of patients in this field.

However, initially, the polder landscape and dementia seemed distant from each other due to differences in scale and discipline. Developing the connection and the concept proved to be a complex but interesting challenge. As the project progressed, however, these two different worlds converged at the intersection of instability, transition and adaptation. A conceptual foundation that responds to both social and ecological challenges then emerged, upon which I was able to build throughout the rest of the process.

Working across different scales was something I found both challenging and highly valuable during the process. Ideas and decisions derived from the collective masterplan significantly influenced how my individual design could be developed, while simultaneously impacting the daily experiences of future residents. Considering the collective masterplan, the landscape and the target group required constant movement between different scales, from the landscape and accessibility to circulation, materiality and human experience.

Another insight, coming from the research, was the need for a continuous care system in which people with dementia can live until the final stage of the disease. Initially, the focus was on dementia-friendly independent housing. However, it soon became clear during the research phase that, as the disease progresses and care needs increase, patients will no longer be able to live independently and moving to an institutional setting is inevitable. This resulted in a design approach shifting towards a care-inclusive system, prioritising continuity, familiarity, and well-being within the same spatial system over independence. Within this, taking the three stages of dementia as a starting point enabled me to structure this approach and develop the design concept.

To conclude, I experienced this graduation project as a very positive and valuable period. Focusing on the increasingly urgent topic of dementia and combining it with architecture and spatial design gave me important insights. For example, the research helped me to better understand the progress of the disease, the target group, and the importance of connections with nature. Fieldwork and discussions with experts supplemented this with practical experience, enabling me to empathise more effectively with the target group during the design process. Finally, this process has made me more aware of the significant impact that spatial design has on users' daily experiences, which is something that I will continue to apply throughout my career.

05.

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06.

APPENDICES

01. SITE ANALYSIS - HEIGHT MAP

02. SITE VISIT DOCUMENTATION

02. SEWAGE SYSTEM VLIETLANDEN

04. SUN STUDY

05. DATA MANAGEMENT

05. DATA MANAGEMENT CHECKLIST

06. MASTERPLAN VLIETLANDEN (GROUP WORK)

01. SITE ANALYSIS - HEIGHT MAP



Height map scale 1:500 (reduced), (Meike Traa, 2026)

02. SITE VISIT (26 FEBRUARY 2026)



1. Plot choice



2. Sightline





3. Dyke as a natural boundary

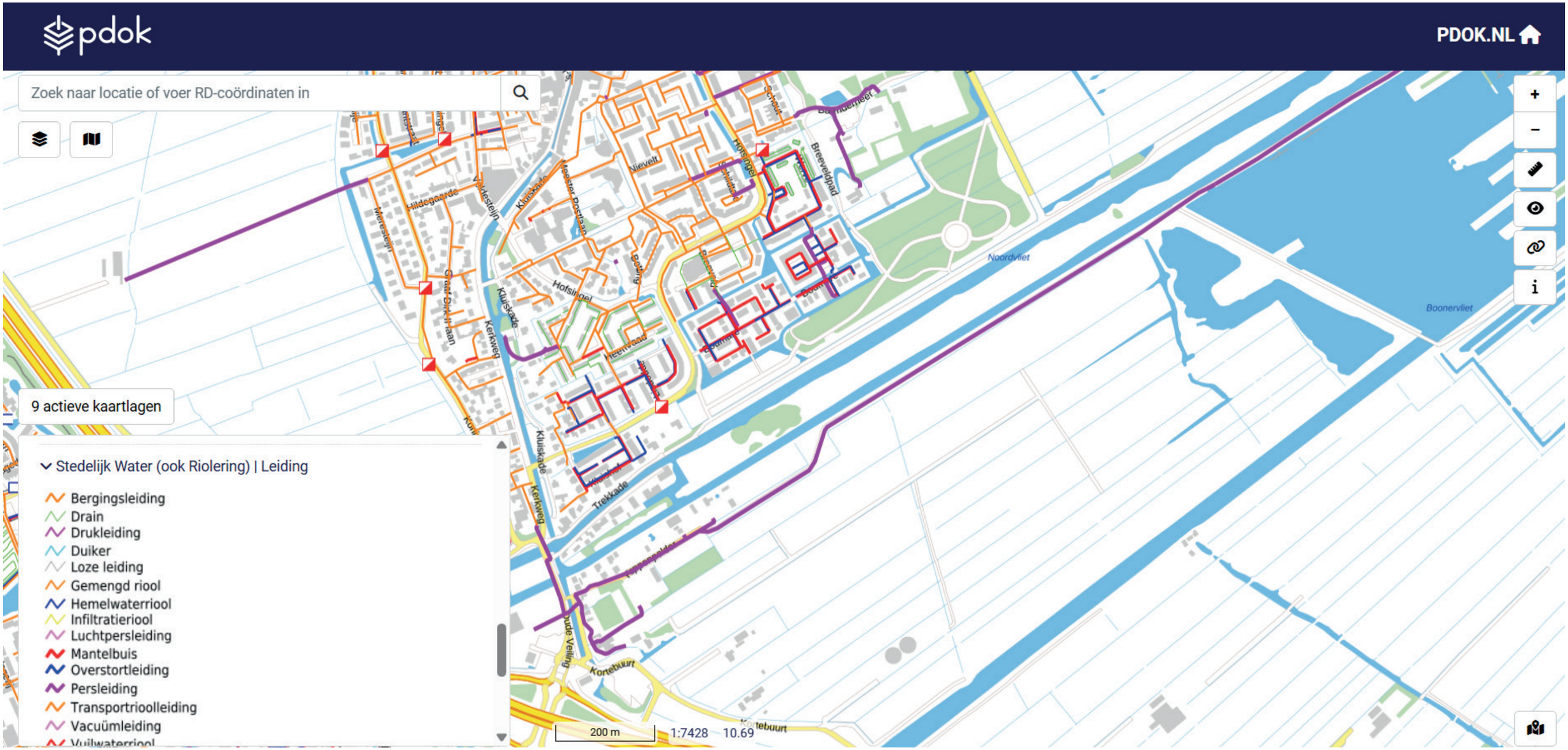


4. Impression of adjacent farms



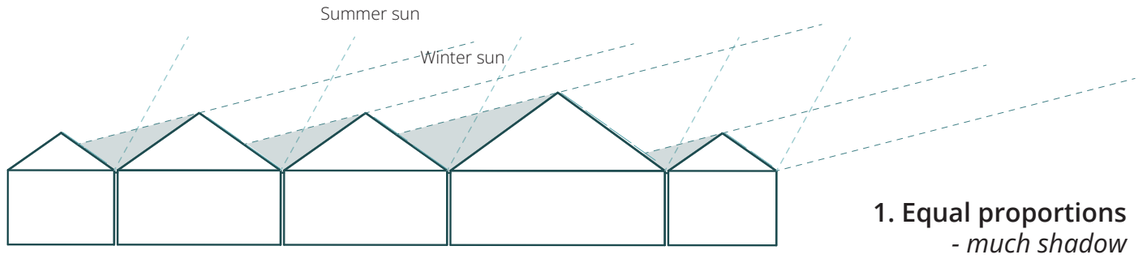
5. Church landmark from site (visual memory)

03. SEWAGE SYSTEM VLIETLANDEN

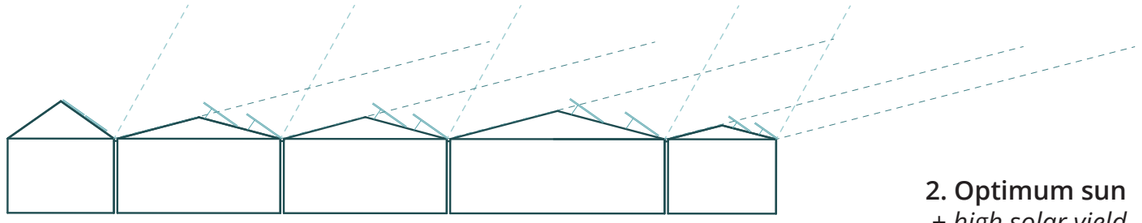


(Stichting RIONED, n.d.)

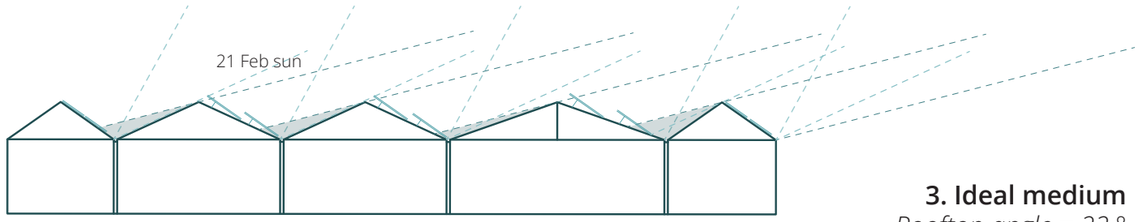
04. SUN STUDY



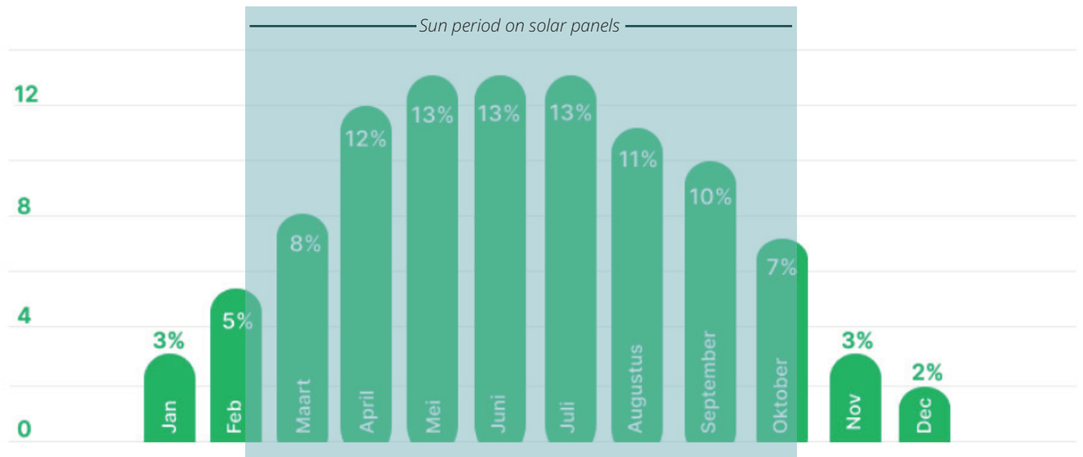
1. Equal proportions
- much shadow
- high roofs
+ pv panels flat on roof surface



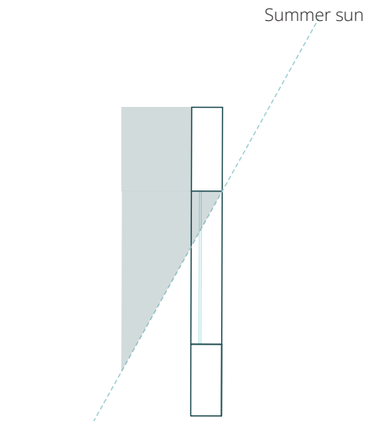
2. Optimum sun
+ high solar yield
- low roofs
- Solar panels are mounted at a steep angle



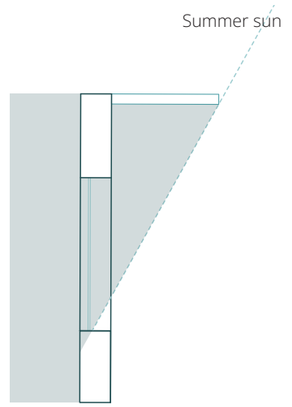
3. Ideal medium
Rooftop angle = 22 °
Maximum sun from 21 February - 22 October



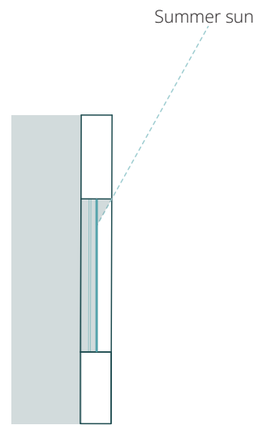
Solar panel yield per month, (Henic, n.d.).



1. Regular situation
- too much sunlight enters the rooms



2. Overhang
+ overhang provides shade in summer
- overhang is too big , interrupting and defining the character of the architecture



3. Screens
+ Provides shade in summer
+ can be installed behind facade cladding (no influence on architecture)

05. 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. Students and their supervisor should consult the Intellectual Property Rights of Students webpage. Additional information can also be found in the Extended Personal Research Data Workflow.		✓
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.		✓
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.	✓	

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.		✓
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).		✓
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.		✓
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.		✓
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.		✓

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.		✓
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.		✓
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.		✓
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.		✓
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.		✓

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.



A HEALTY AND SUSTAINABLE LIVING ENVIRONMENT IN *Midden-Delfland*

A1 presention

Graduation studio AR4AD150 Advanced Housing Design *Ecologies of inclusion*

Responsible supervisior **Olv Klijn**

Supervisor **Robbert Guis**

Amélie Niemeijer, Ara Wartan, Floor van Hoorn, Floris de Bruïne, Lisa van Dijk, Meike Traa
5089778, 5024129, 6095577, 6172954, 5286026, 5303583

June 10, 2026

THE PLAN
Introduction

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



I THE PLAN

II RESEARCH

III VISION

IV MASTERPLAN

V THEMES

THE PLAN

THE PLAN
Elaboration

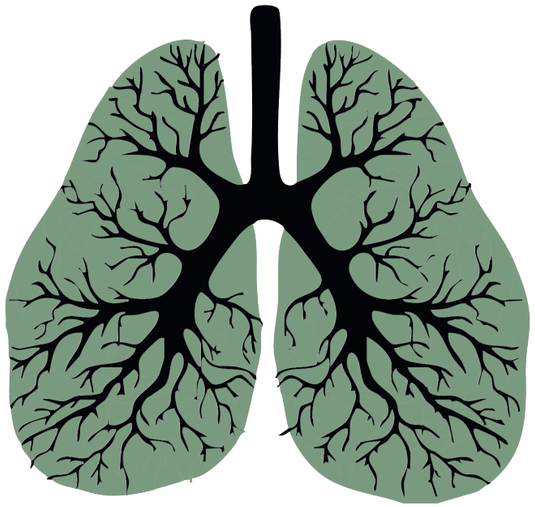
Sustainable environment
The starting point for this group was the theme of sustainable environment. Within this framework, the Midden-Delfland area was analysed, including the municipality's ambitions and the future scenario developed by ZUS, SWECO and FLUX Landscape Architecture in 2022. This scenario, 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.

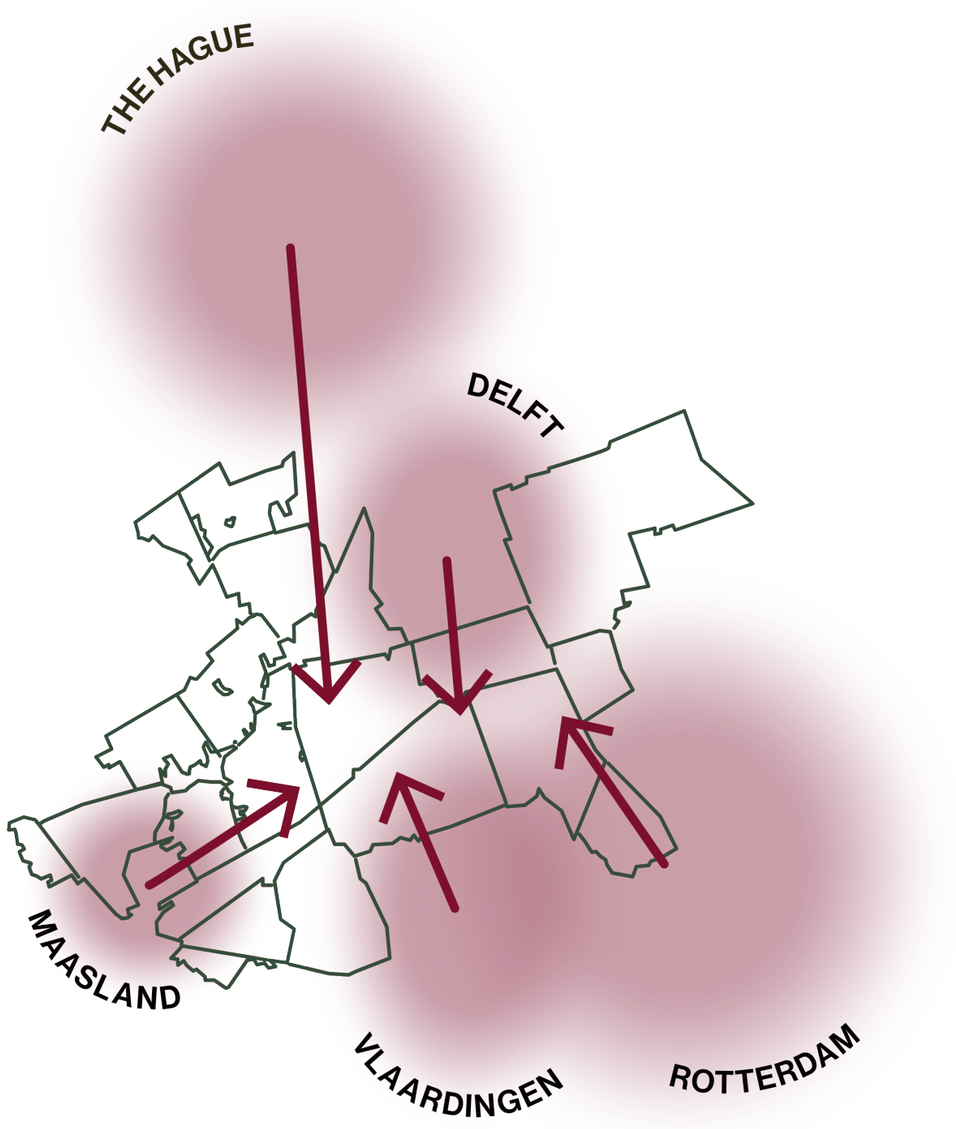
Vision
The foundation laid by ZUS is further developed through a set of supporting ambitions. The project aims to define a new way of living that fosters a healthy and sustainable society, in which sustainability is approached not as a purely technological solution, but as a spatial and ecological condition.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

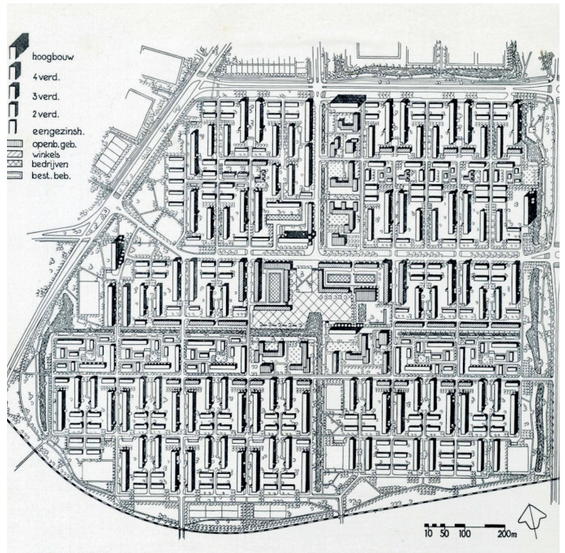
Themes
Each group member uses the masterplan as a foundation to explore a specific aspect of living within this landscape through one of the following themes: biodiversity, healthcare, work, education, recreation, or production. These thematic explorations act as repeating layers on top of the masterplan. 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.

RESEARCH



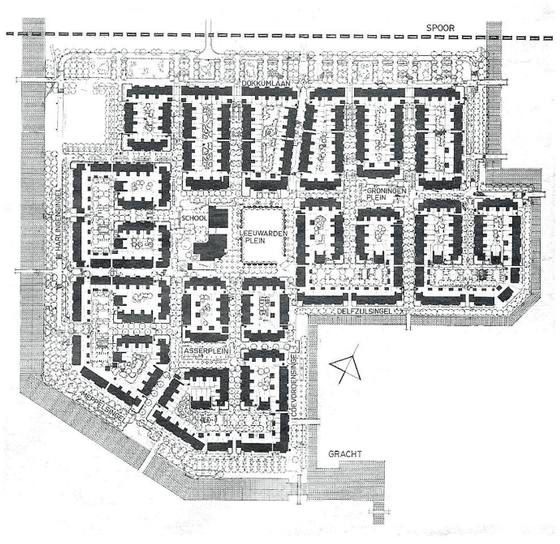


THE GREEN LUNG IS UNDER PRESSURE FROM BUILDINGS, RECREATION AND PEOPLE



Pendrecht, Rotterdam

Wederopbouw
1940 - 1965



Stedenwijk Noord, Almere stad

Flevopolder
1950 - 1986



Ypenburg, Den Haag

VINEX
1995 - 2005

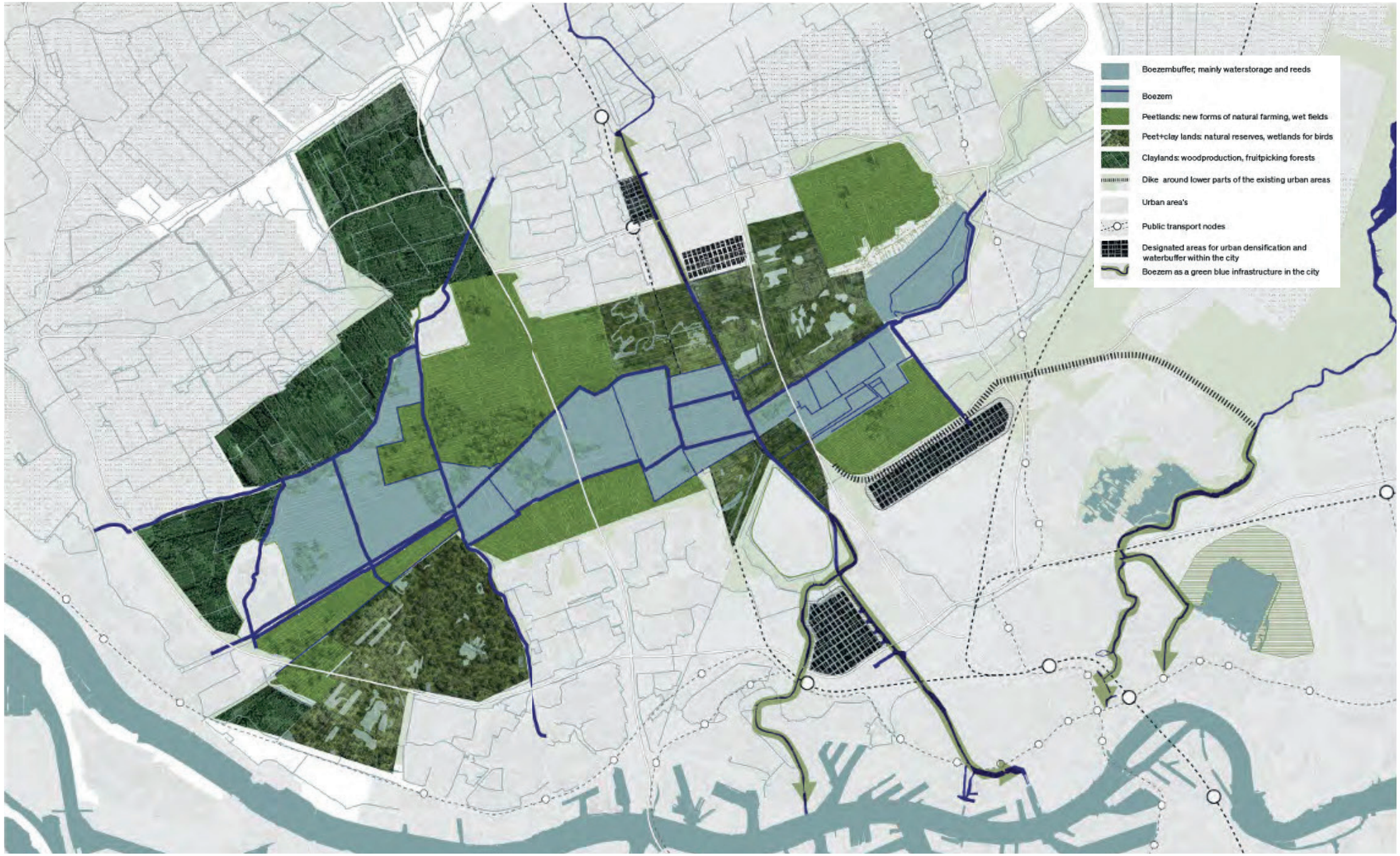


Marktkwartier West, Amsterdam

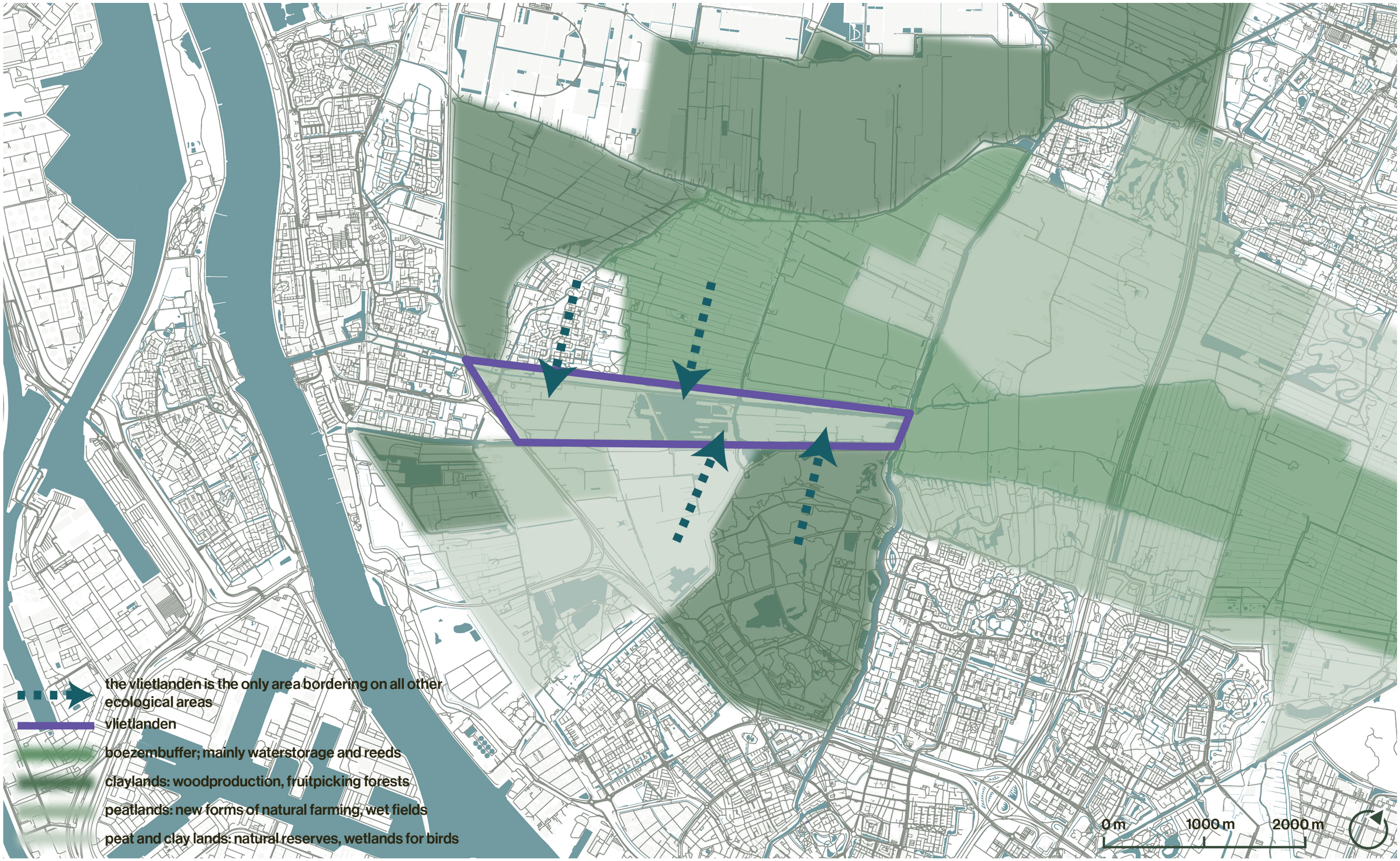
Modern urbanism
2005 - now

RESEARCH

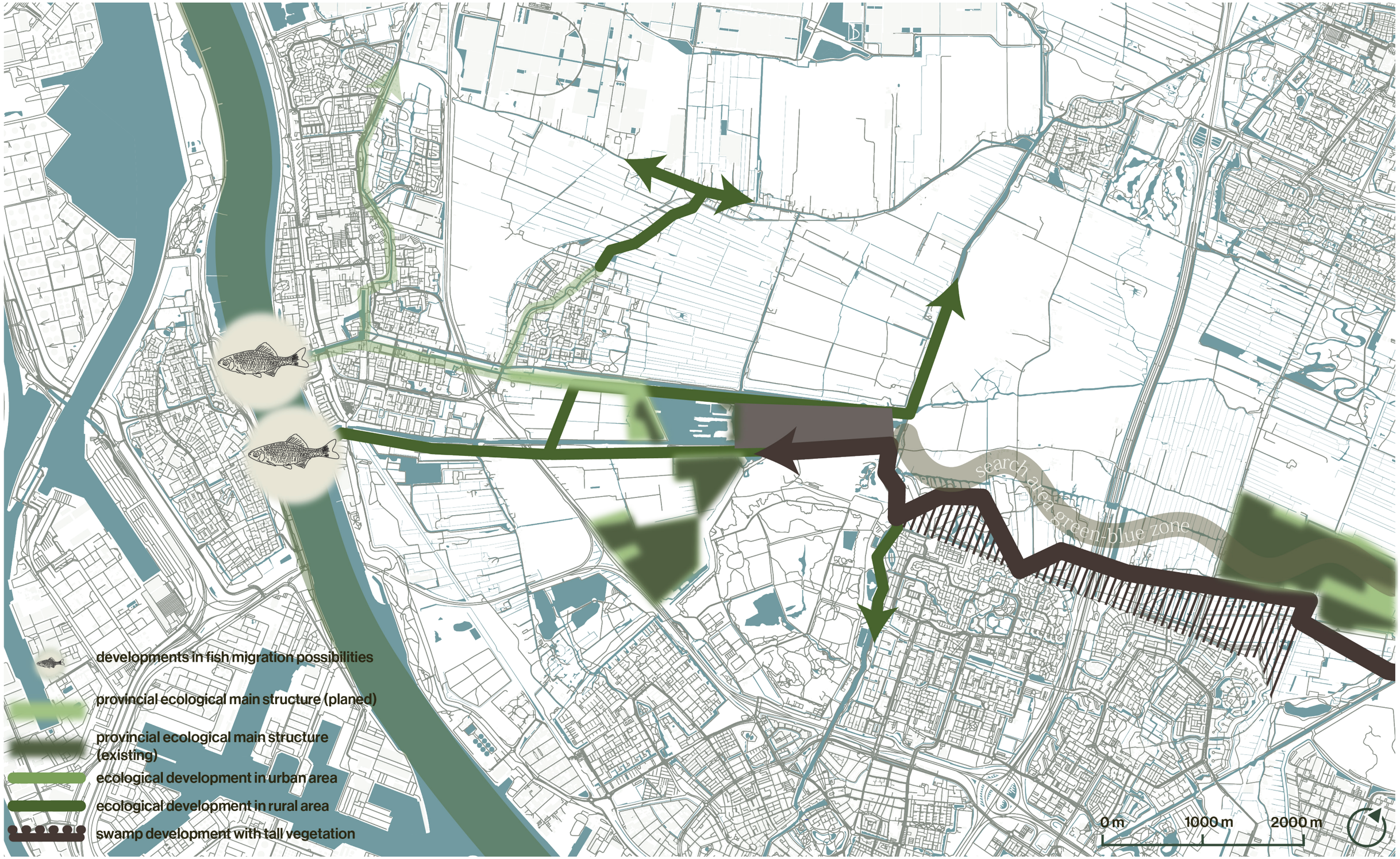
Plan by ZUS



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

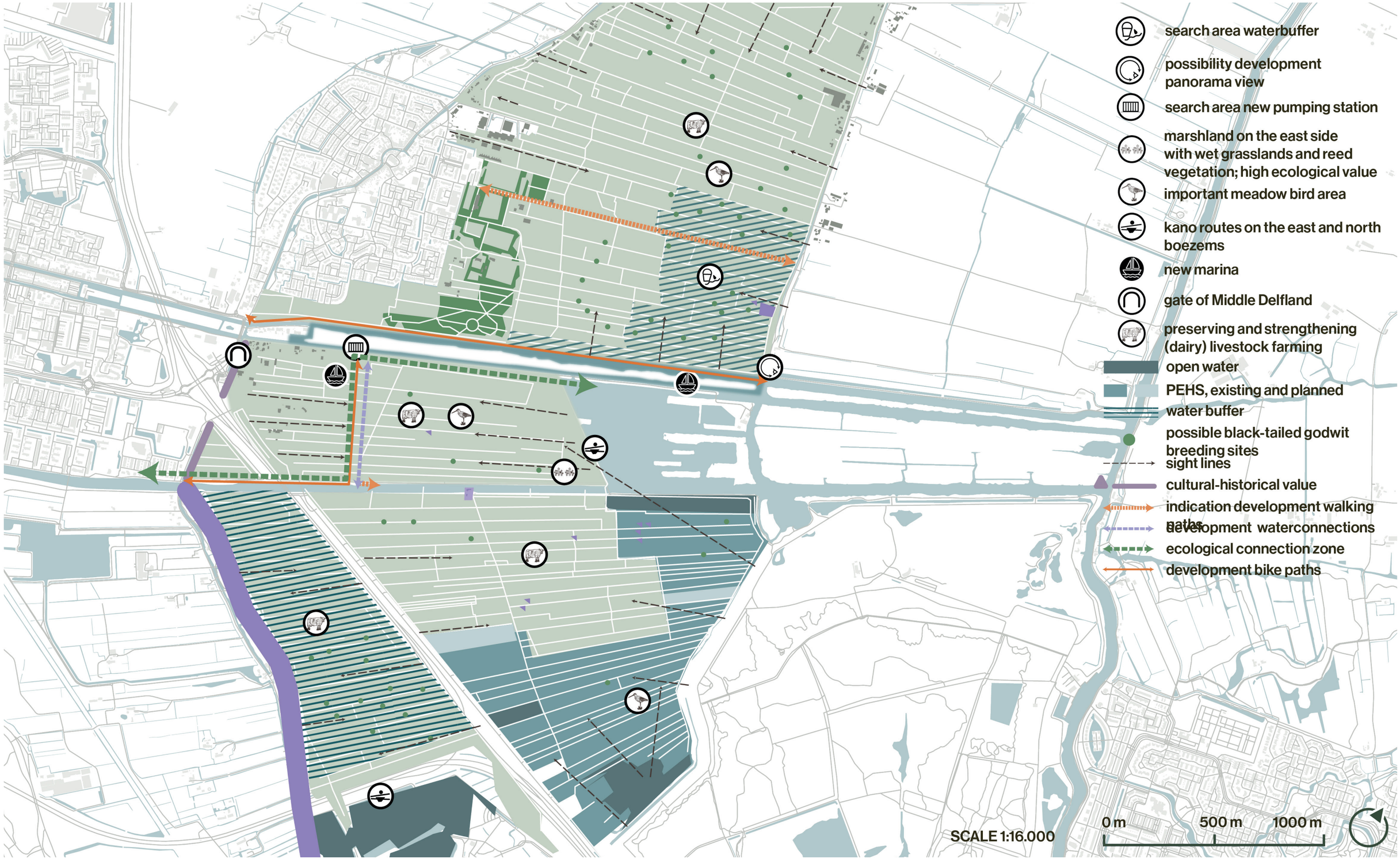

the vlietlanden is the only area bordering on all other ecological areas
vlietlanden
boezembuffer; mainly waterstorage and reeds
claylands: woodproduction, fruitpicking forests
peatlands: new forms of natural farming, wet fields
peat and clay lands: natural reserves, wetlands for birds
0 m
1000 m
2000 m

RESEARCH
Natural networks



RESEARCH

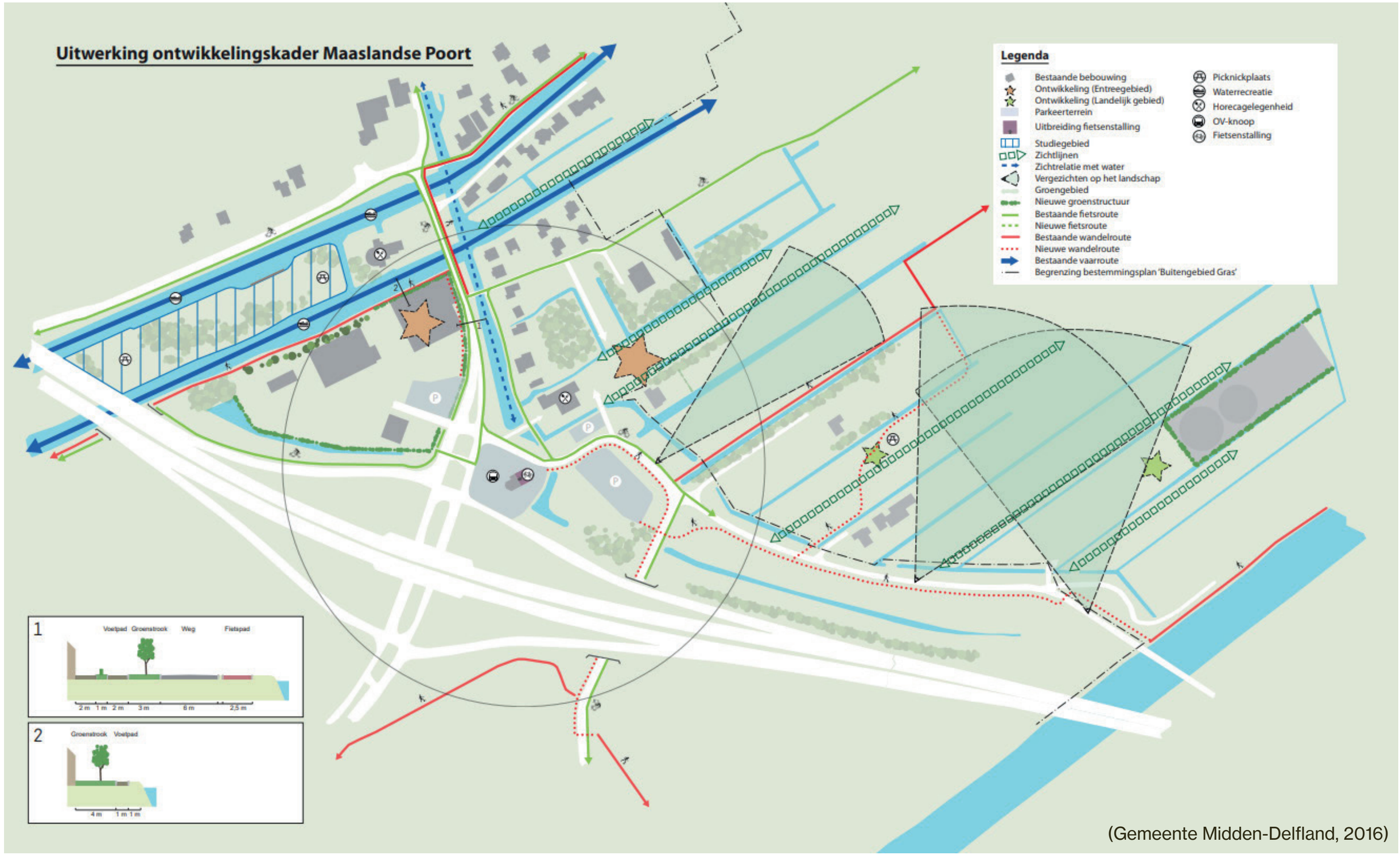
Vision municipality Midden-Delfland



RESEARCH
Water recreation

existing marina
new marina
dock
canoe and whisper boats
smaller motorboats
larger recreational boating
new waterway connection
develop existing sailing direction

0 m 1000 m 2000 m



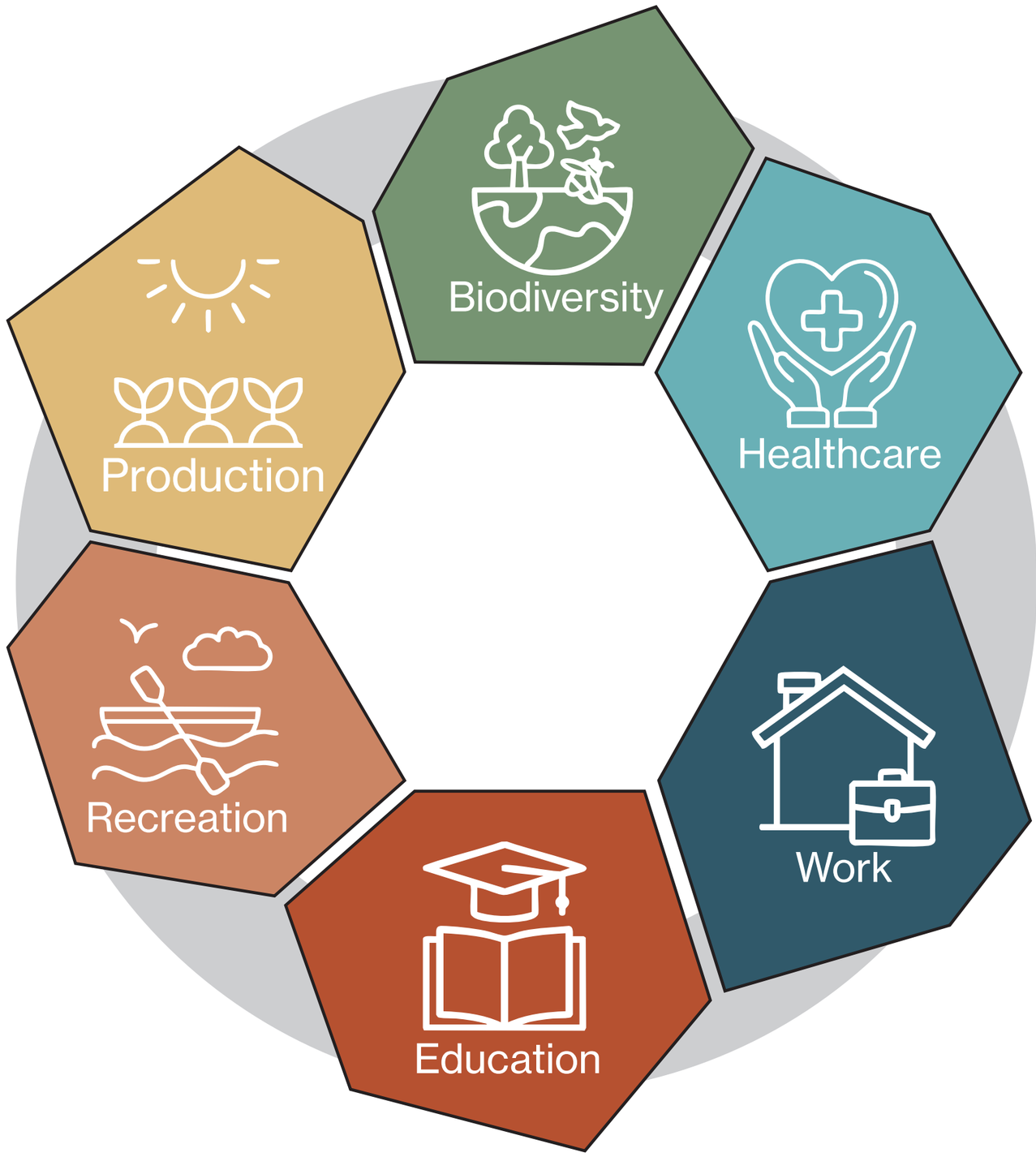
(Gemeente Midden-Delfland, 2016)

VISION

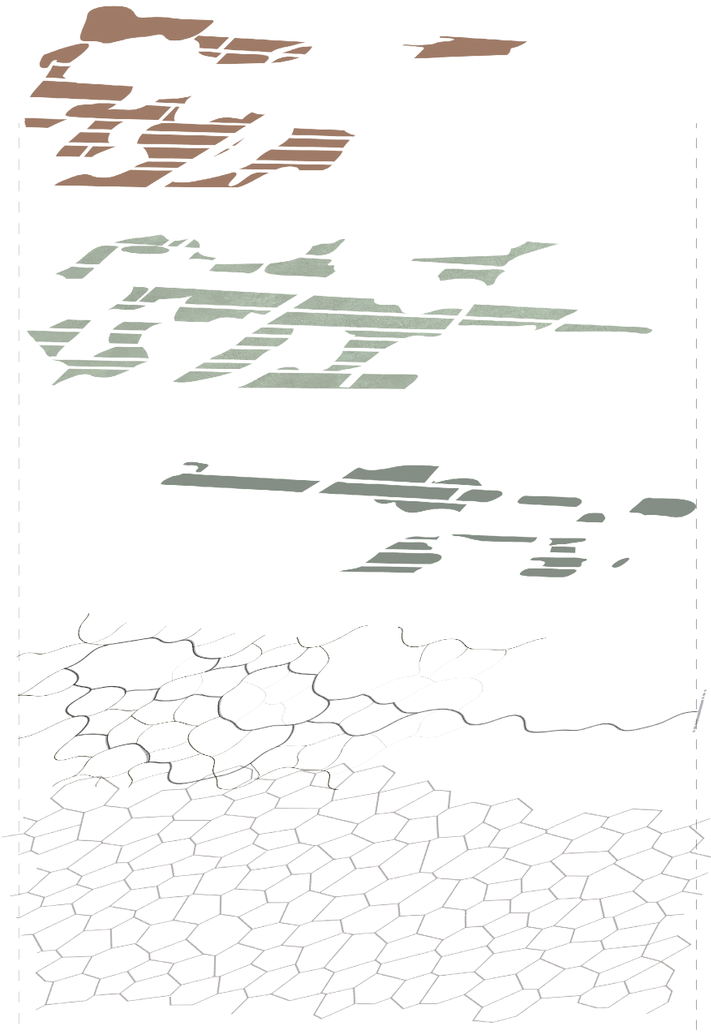
“A healthy living environment for people and nature, where humans, animals and natural systems are functioning in balance. A community is being formed here, where everyone plays their part in striving for this healthy living environment. This project is a pilot in nature driven approaches to production,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

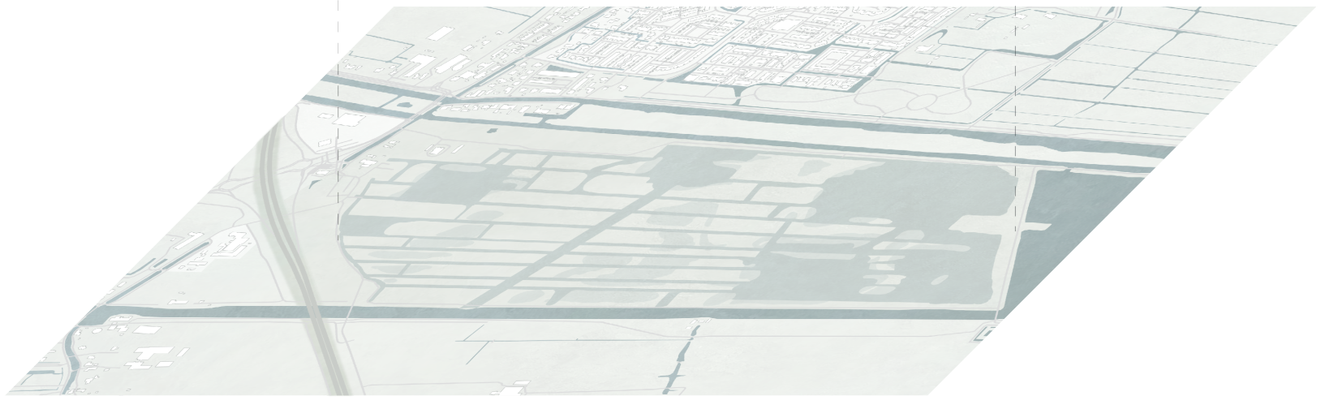
VISION

Six pillars of a healthy living environement

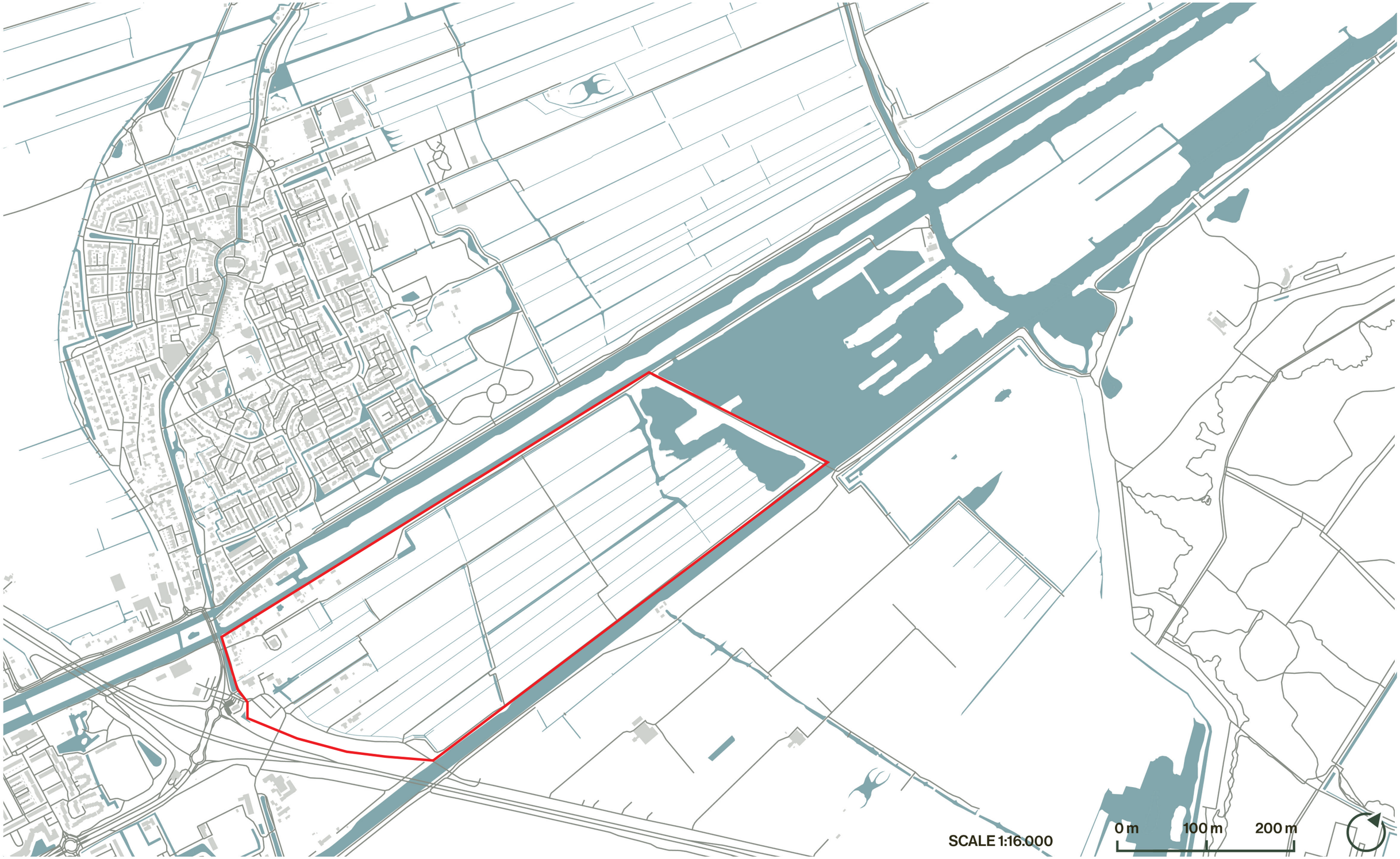


MASTERPLAN





MASTERPLAN
Current situation



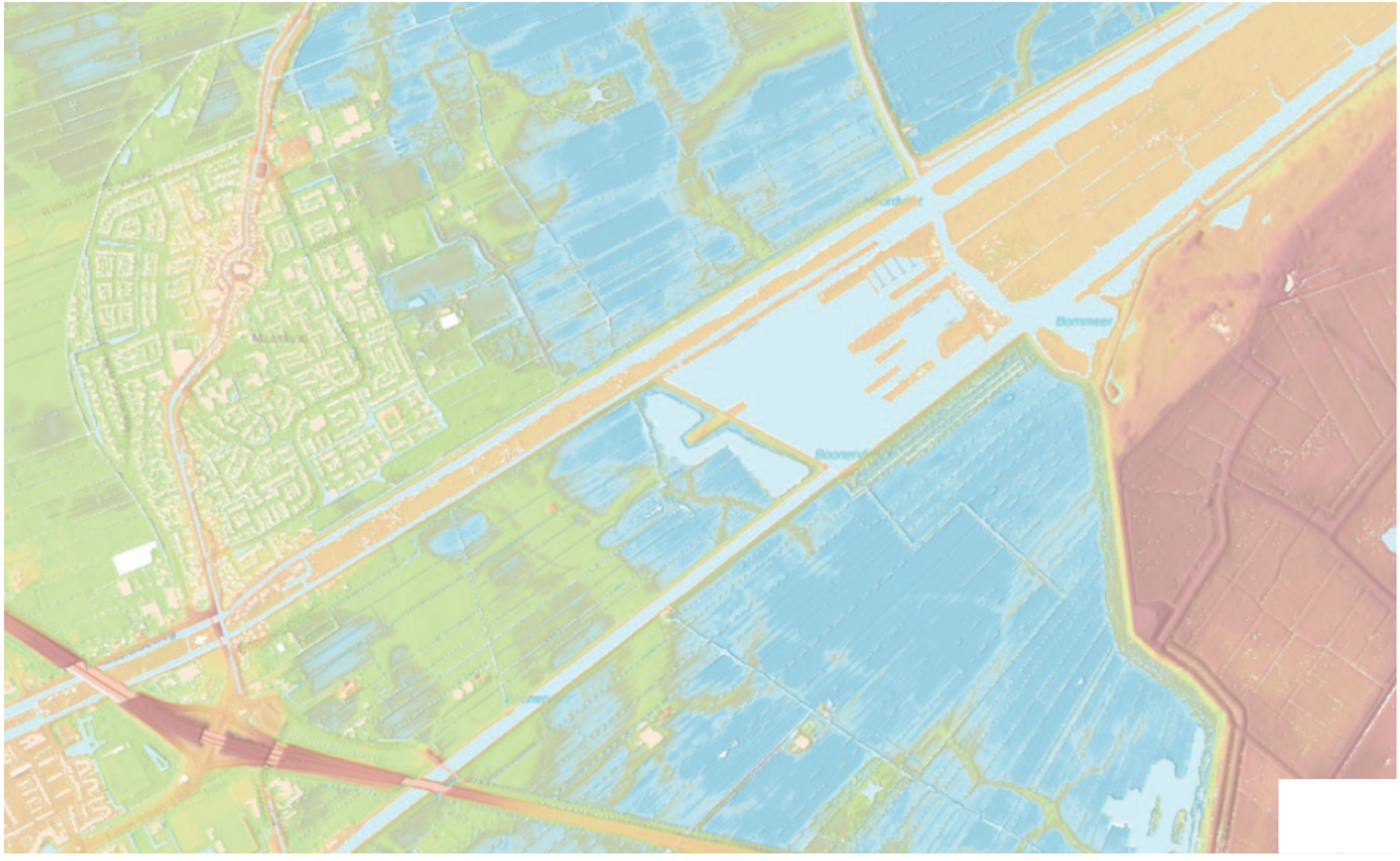
MASTERPLAN

Historic polder stucture *19th century*



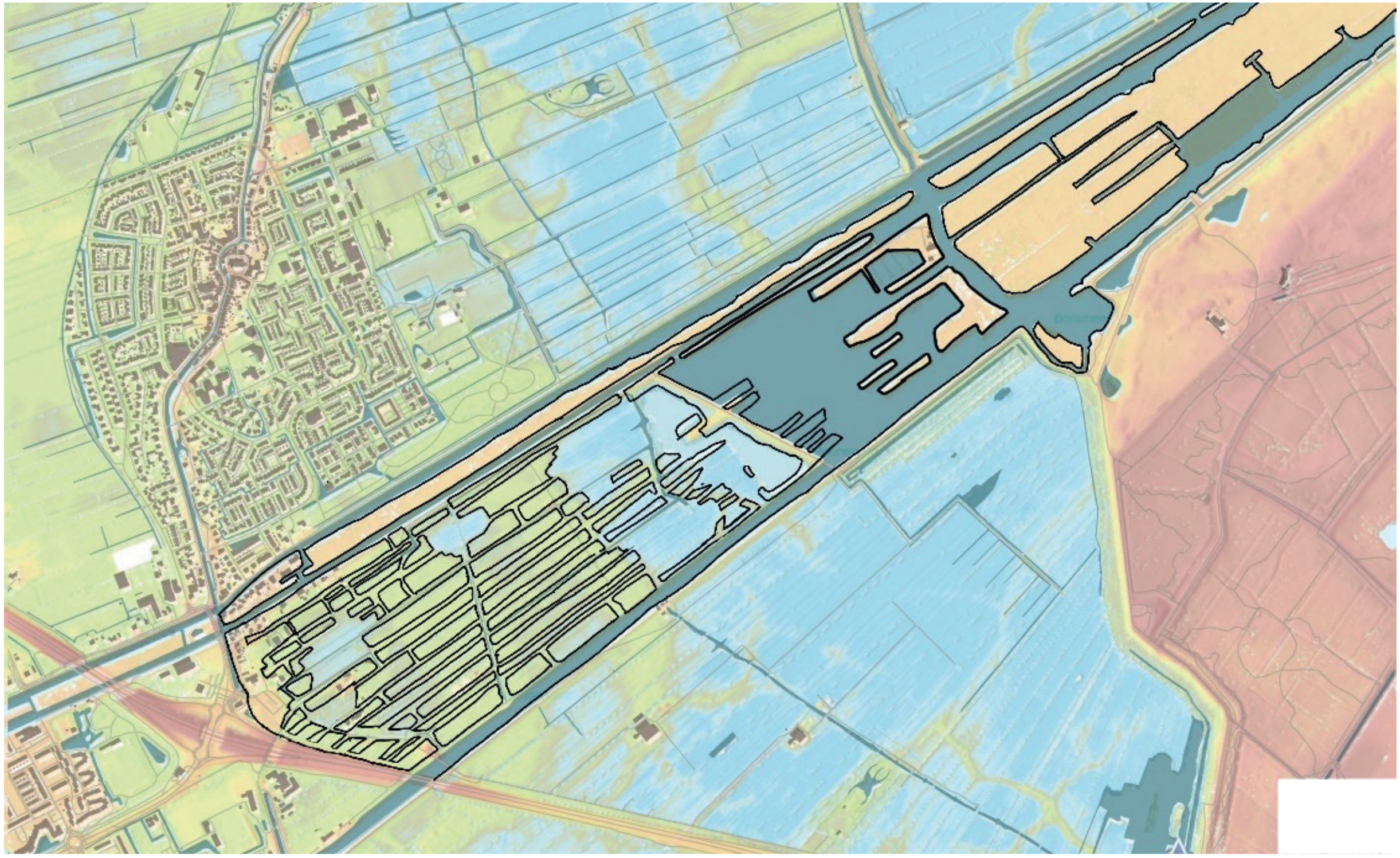
MASTERPLAN

Height map Foppenpolder



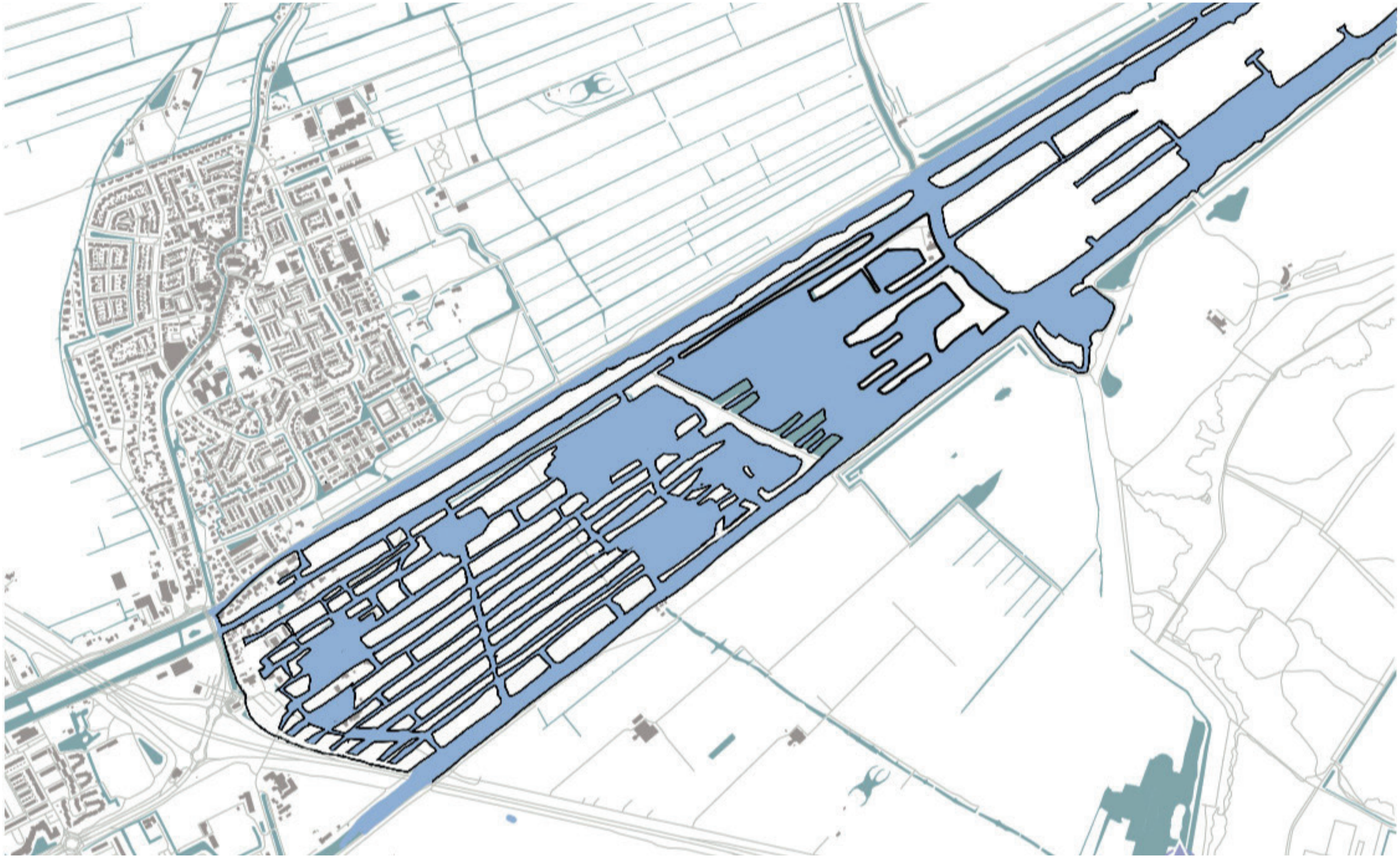
MASTERPLAN

Height map Foppenpolder/New landscape



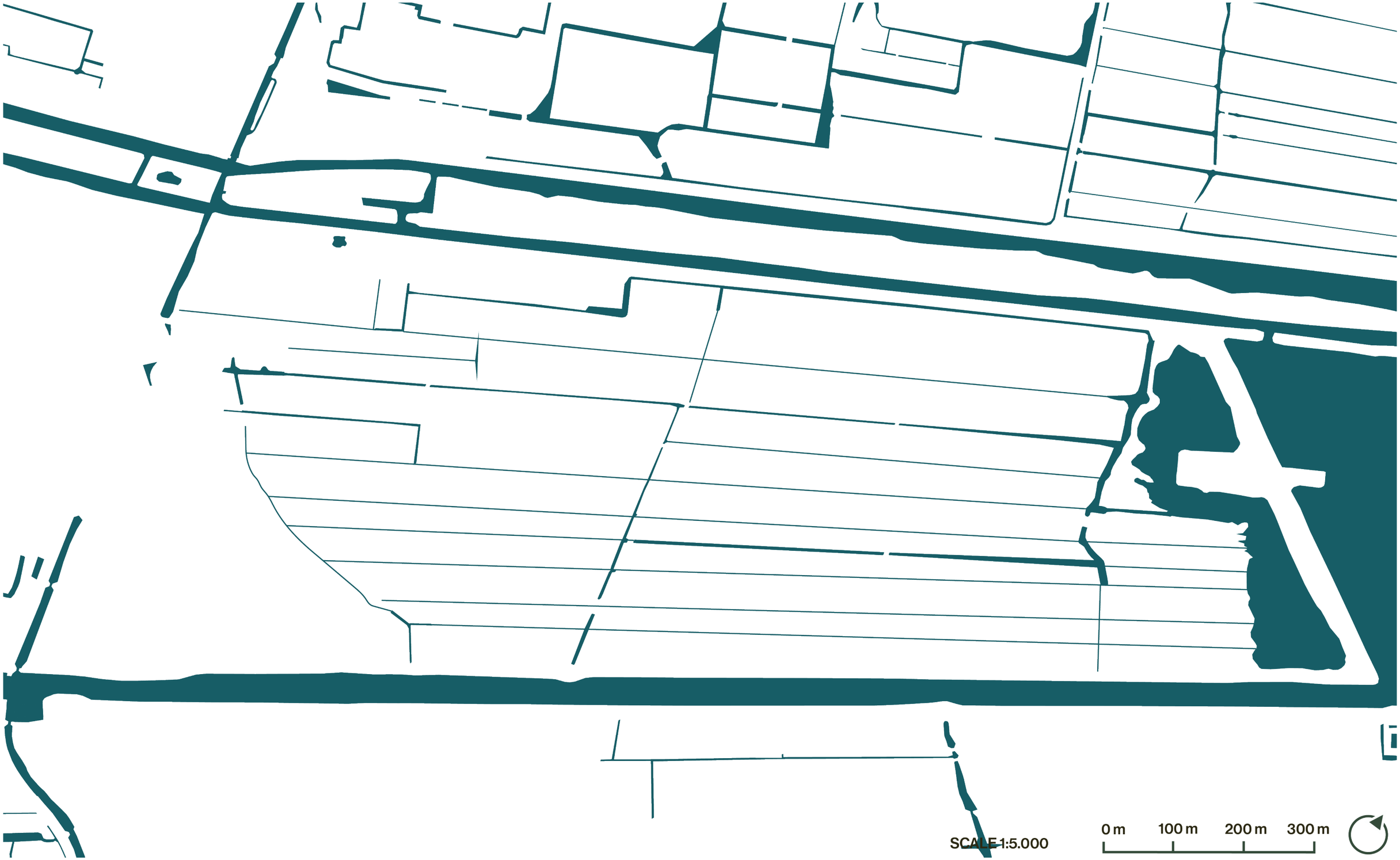
MASTERPLAN

New landscape sketch



MASTERPLAN

Current water landscape



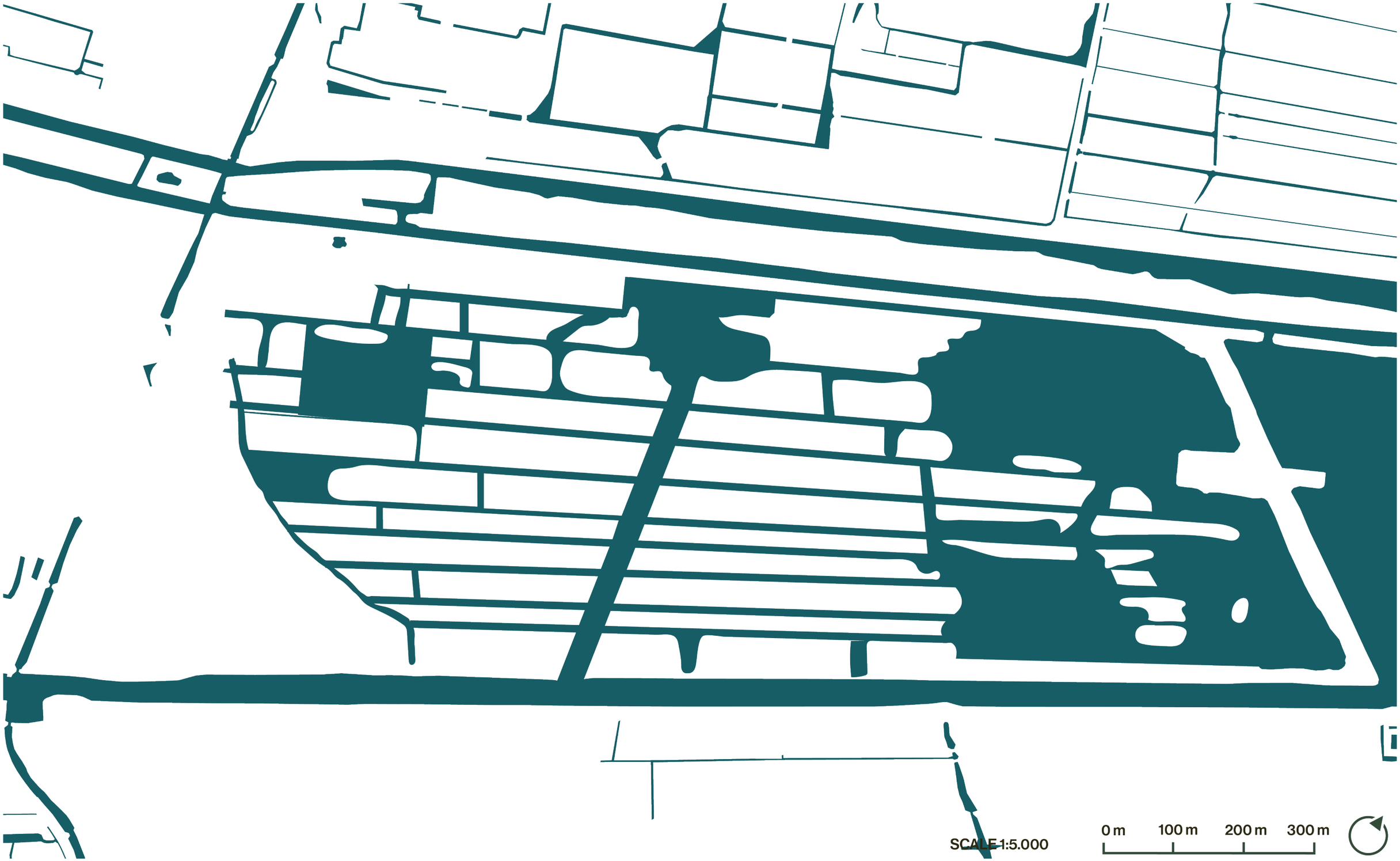
MASTERPLAN

New water landscape *Dry situation*



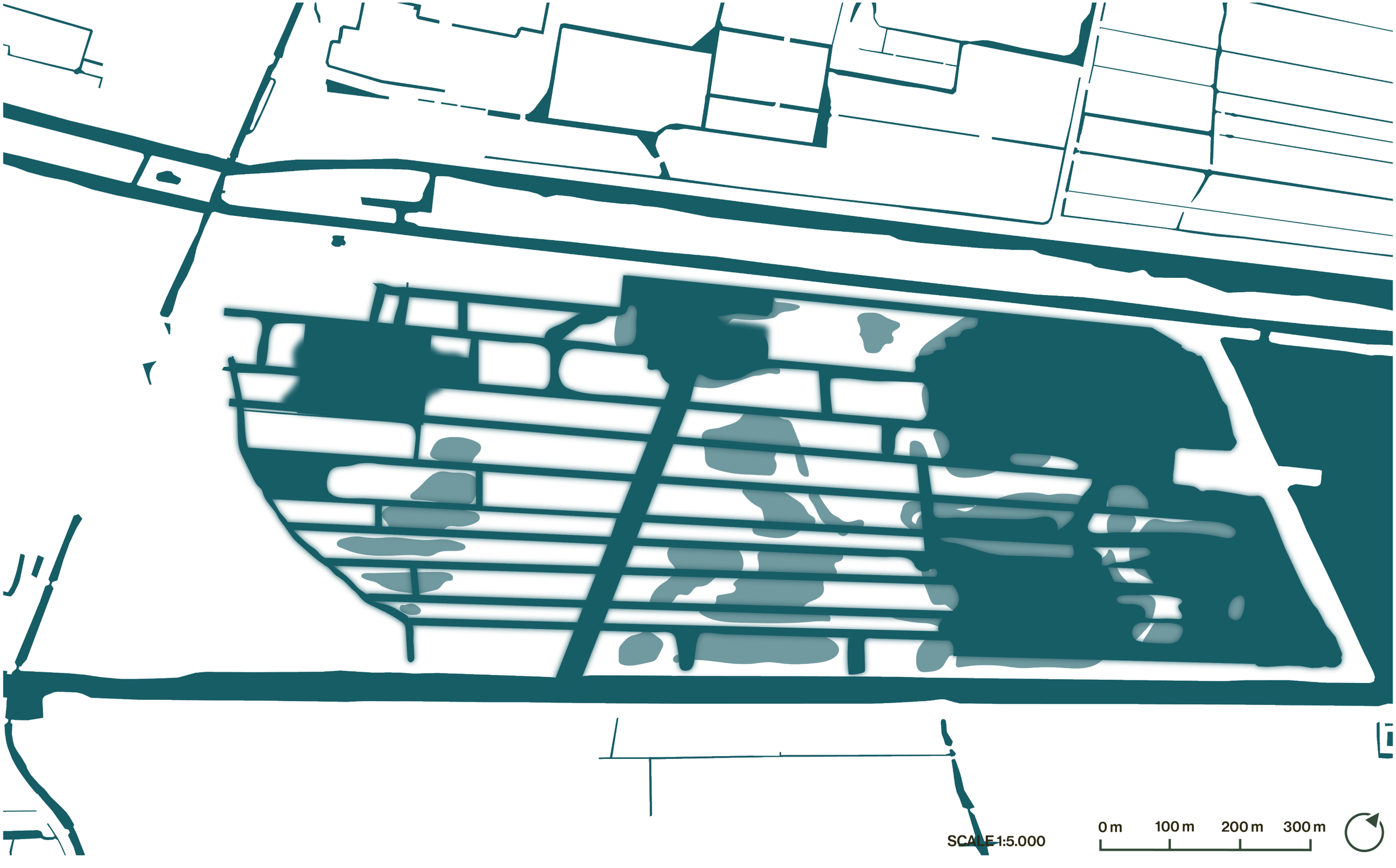
MASTERPLAN

New water landscape *Regular situation*



MASTERPLAN

New water landscape *Wet situation*

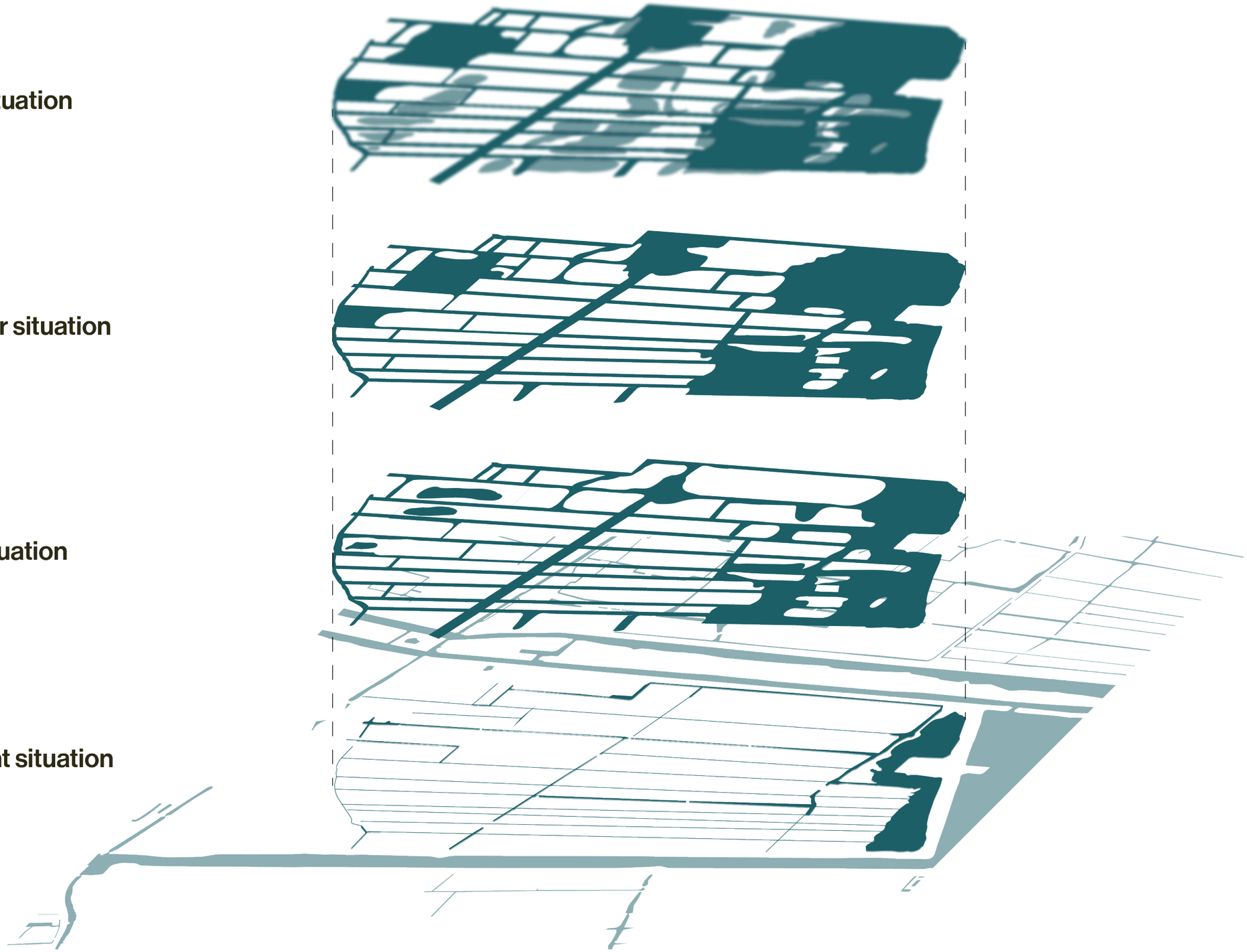


wet situation

regular situation

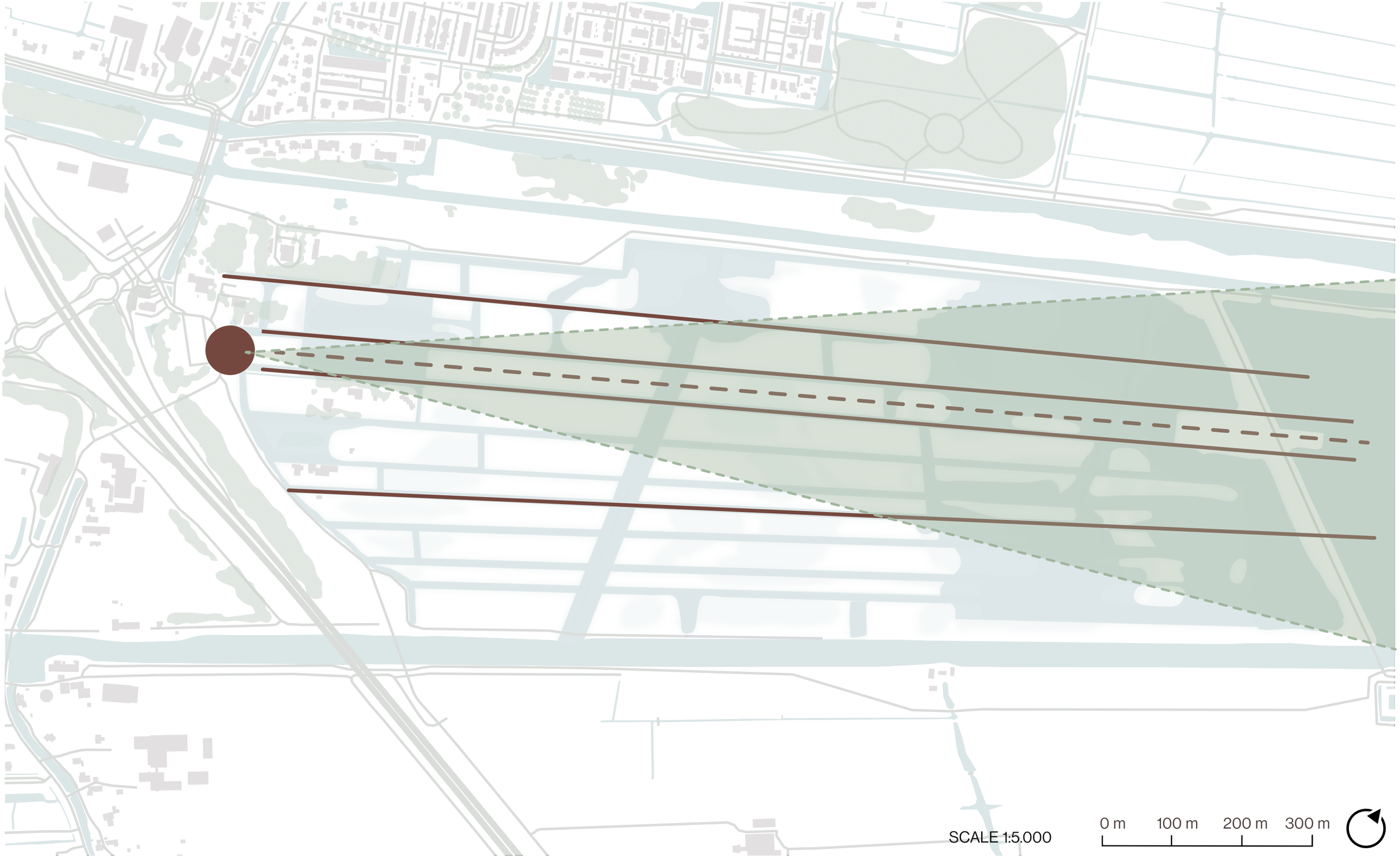
dry situation

current situation



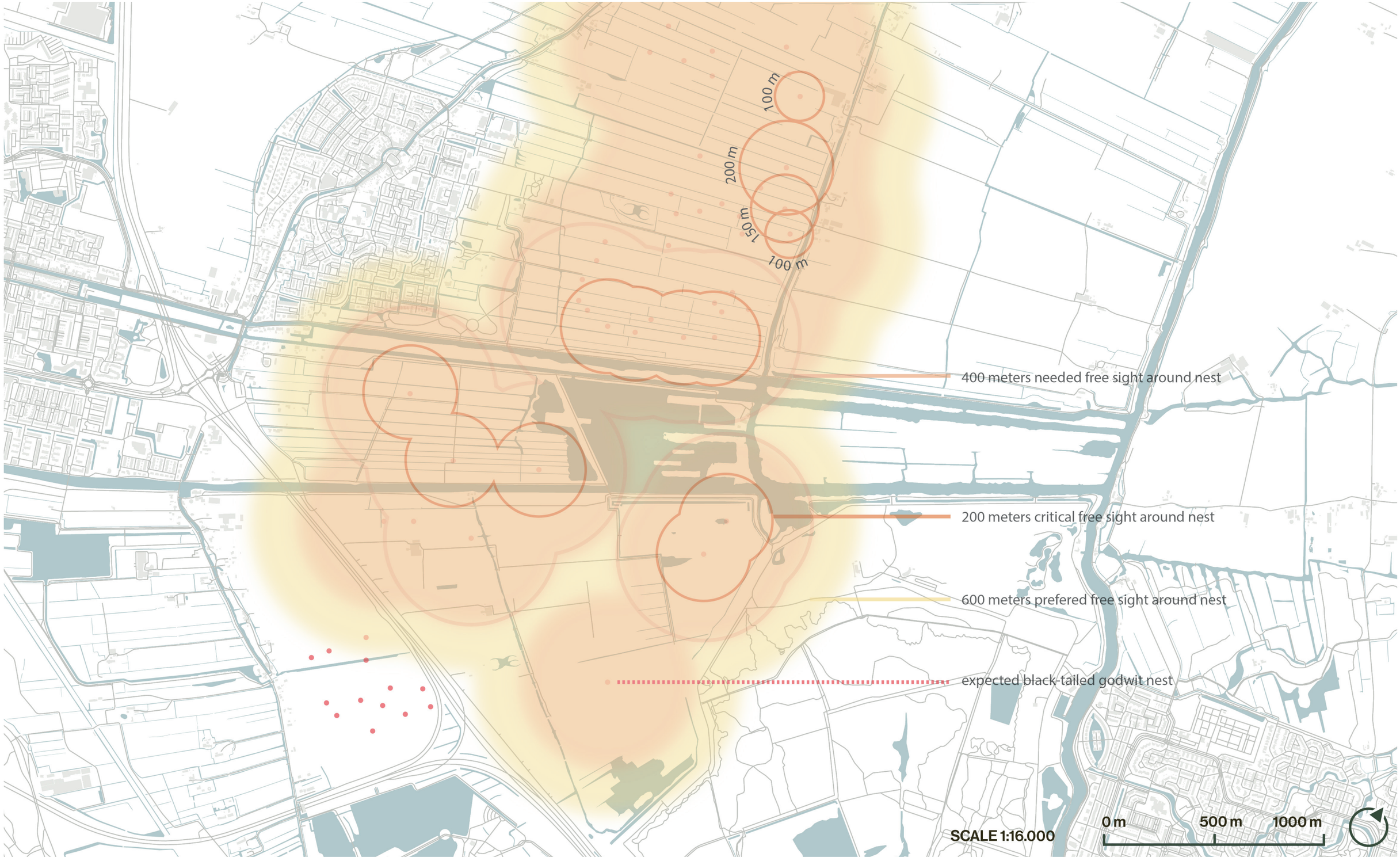
MASTERPLAN

Sight lines and vistas



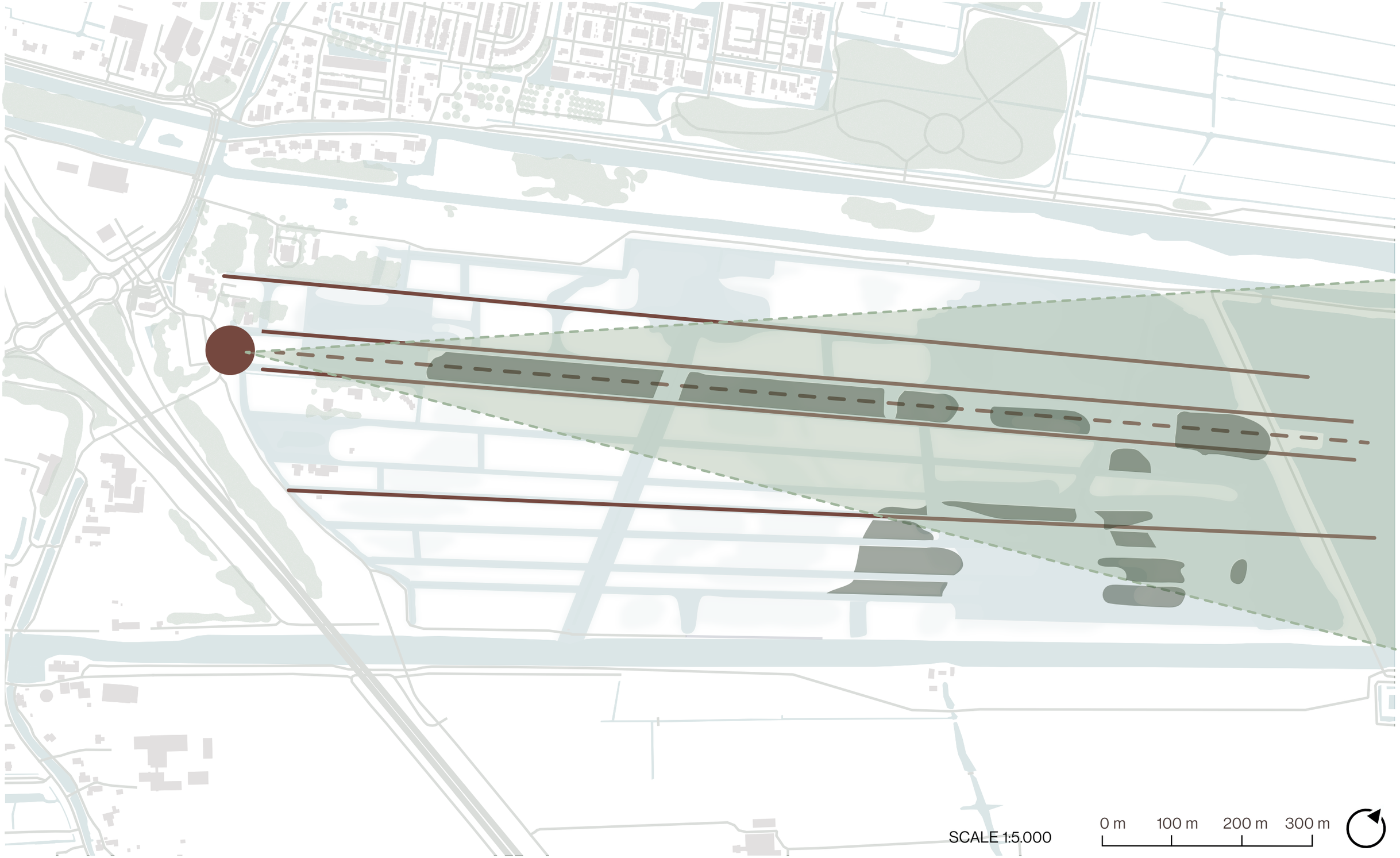
MASTERPLAN

Birds nests *Grutto*



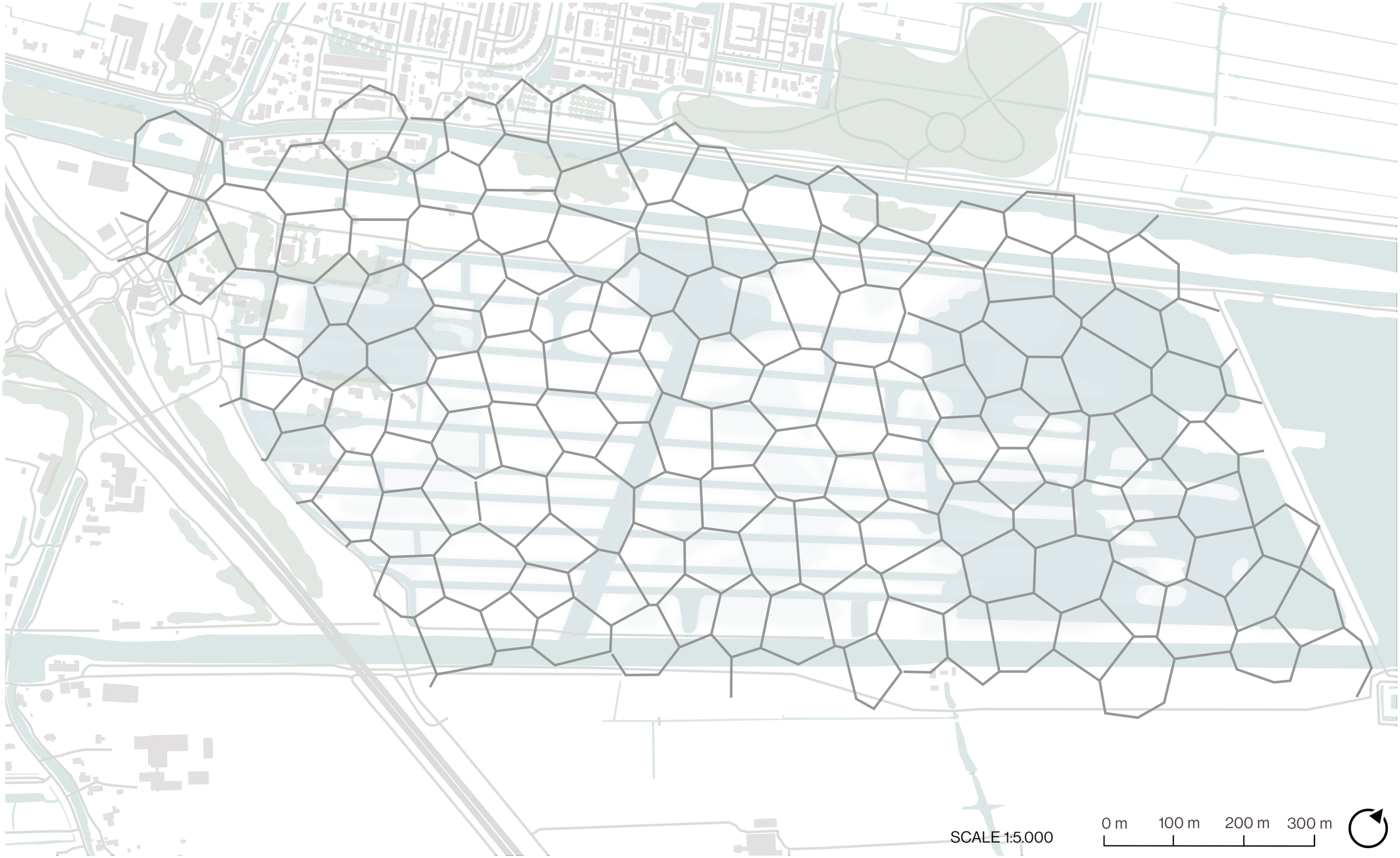
MASTERPLAN

Green zones



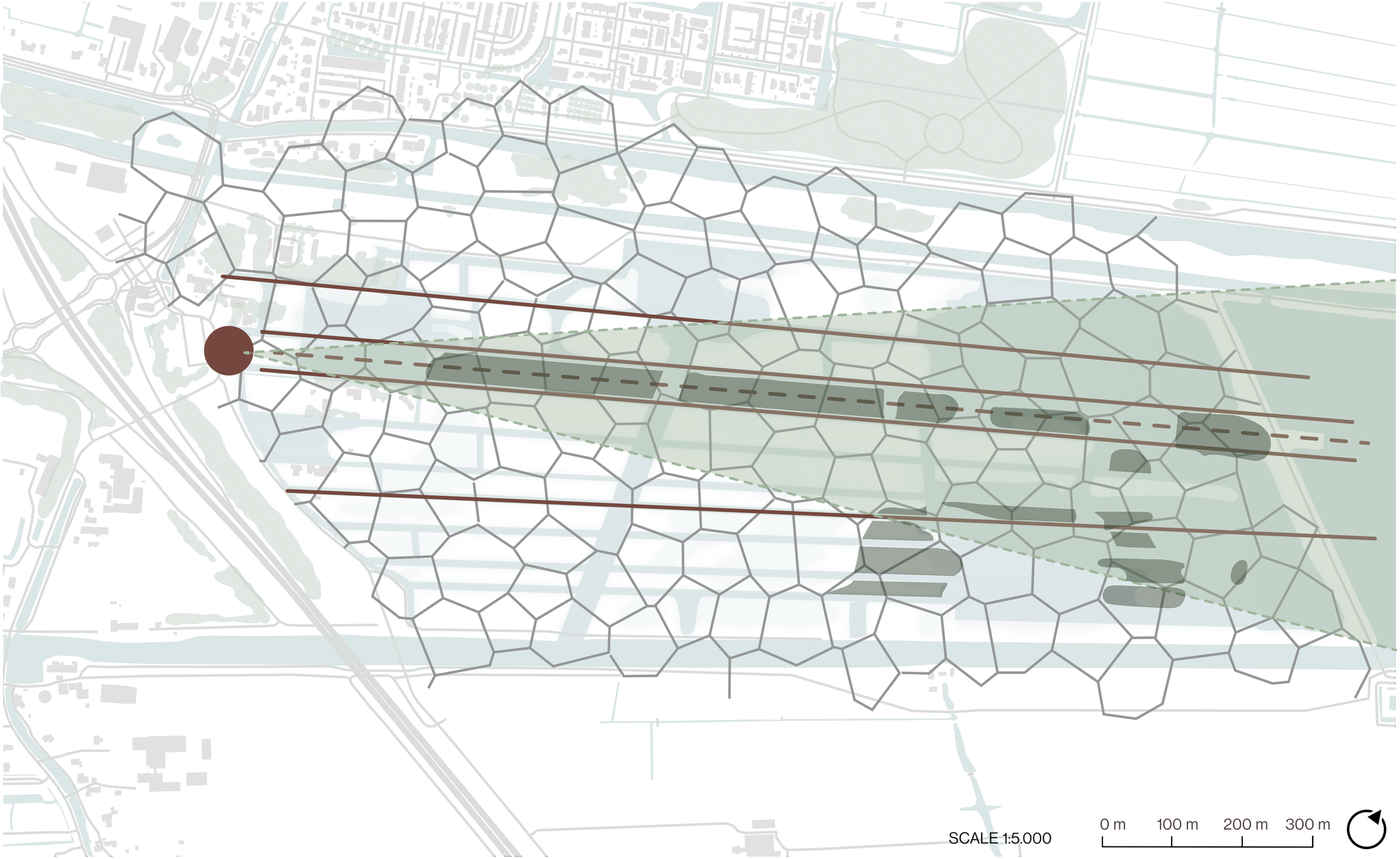
MASTERPLAN

Cell pattern



MASTERPLAN

Cell pattern



MASTERPLAN

Main roads

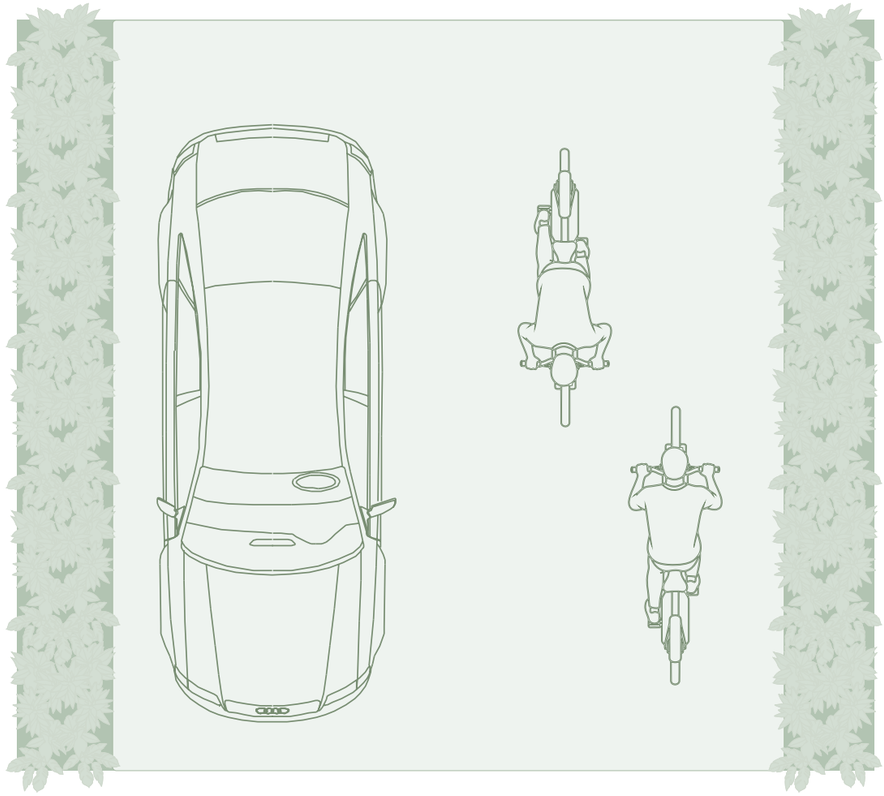
Main routes
Car as guest

SCALE 1:5.000

0 m 100 m 200 m 300 m

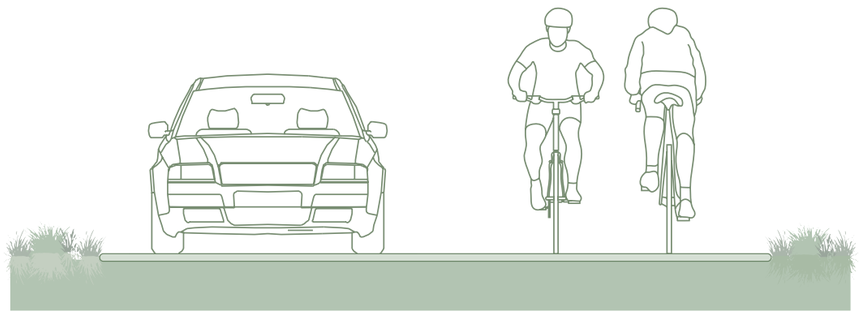
MASTERPLAN

Main roads



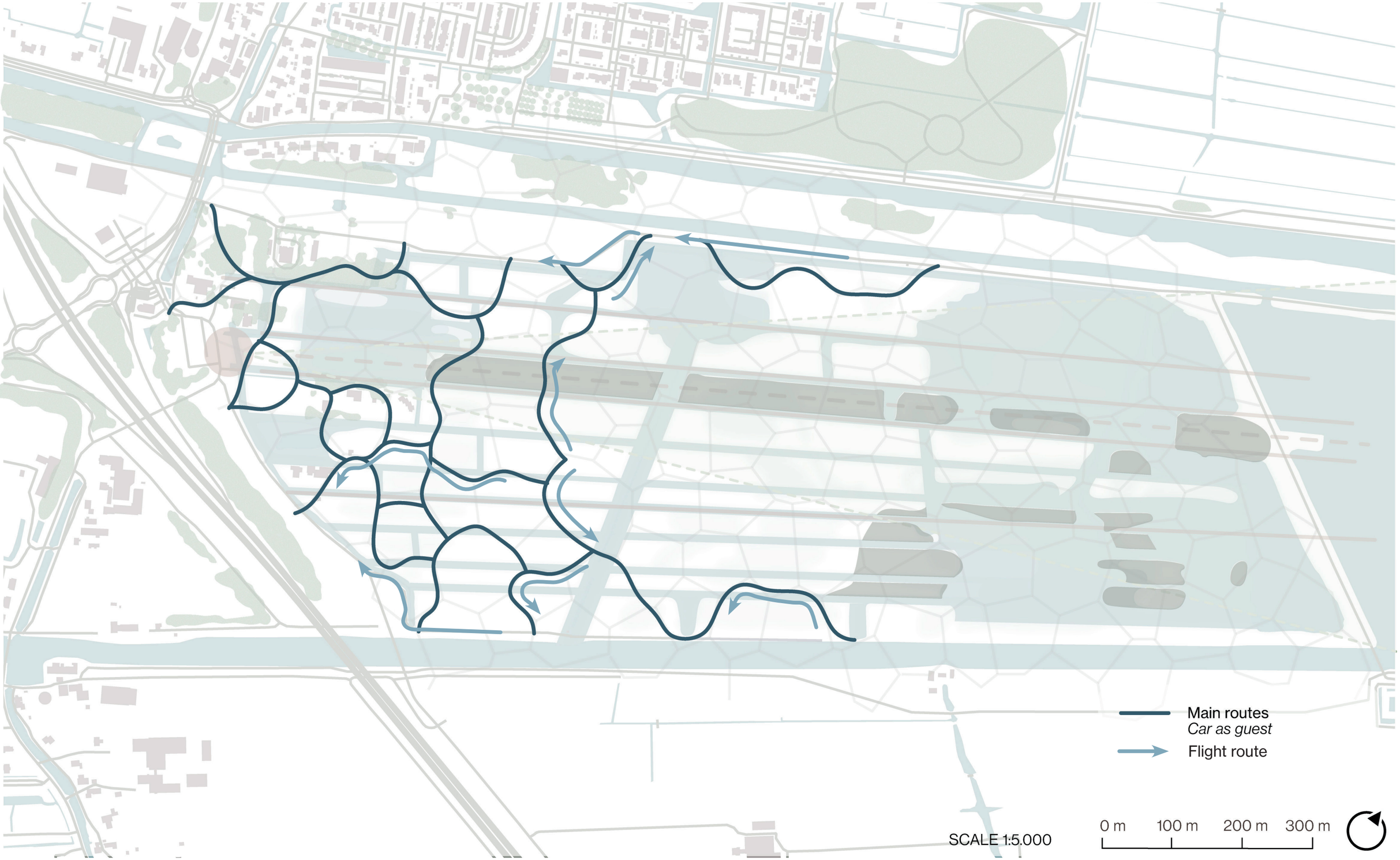
4,5 meters

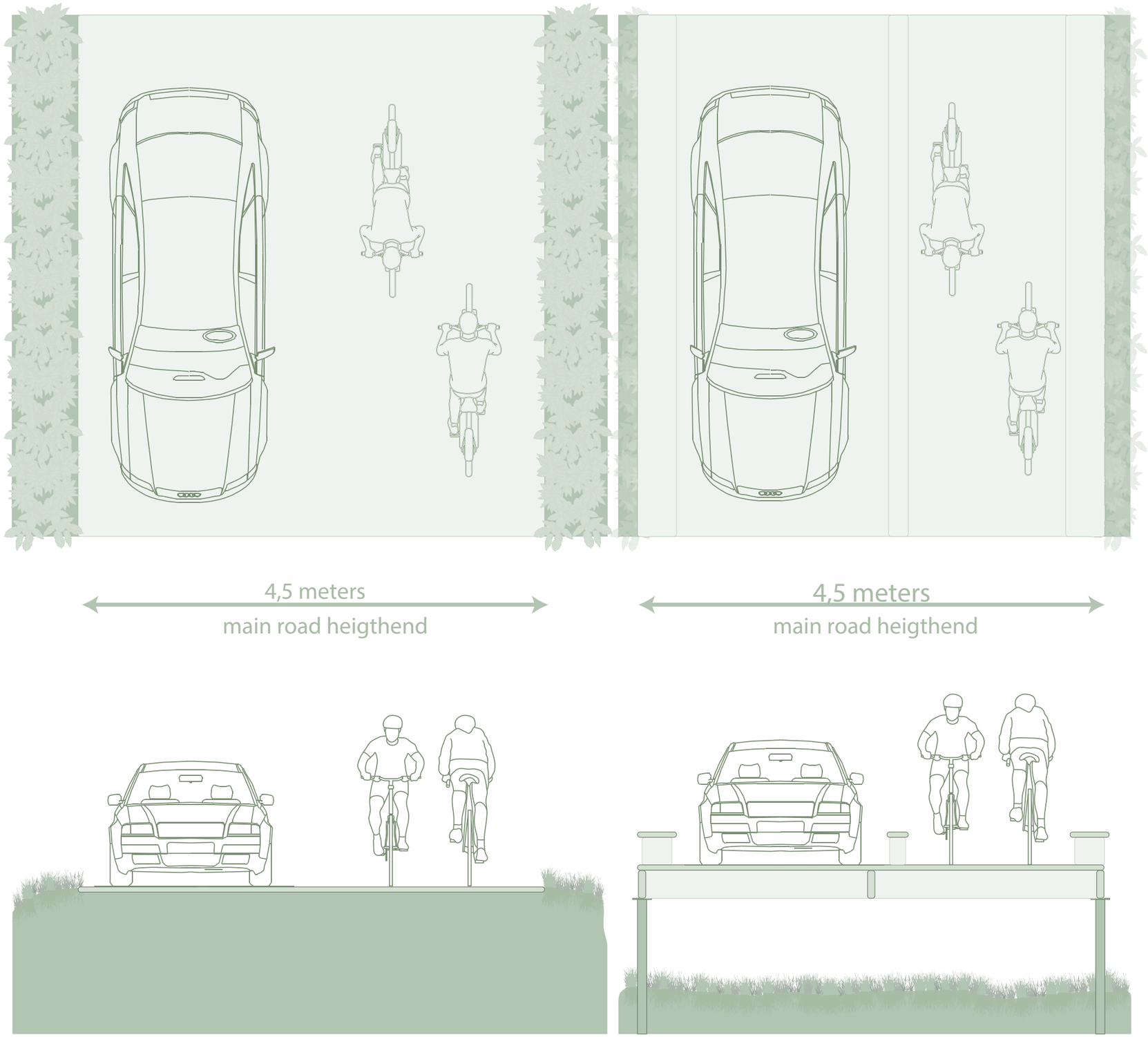
main road on ground level



MASTERPLAN

Flight routes




4,5 meters
main road heigthend
4,5 meters
main road heigthend

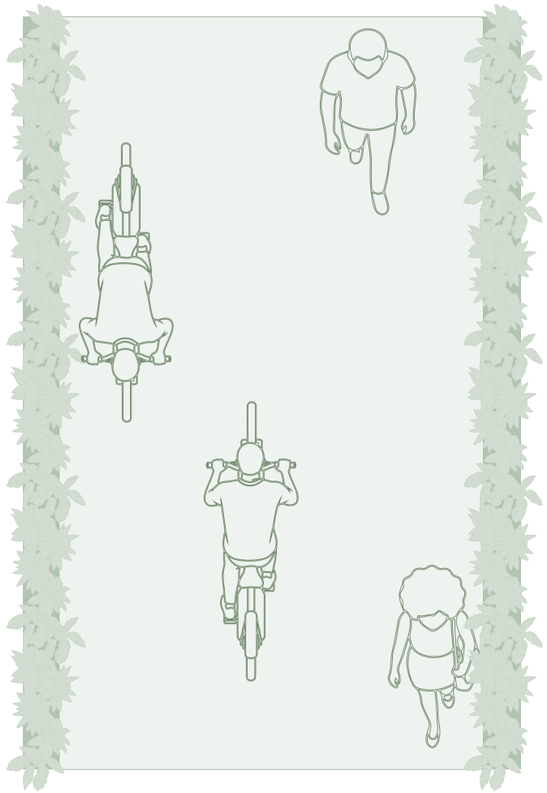
MASTERPLAN

Secondary roads

Biking & walking path

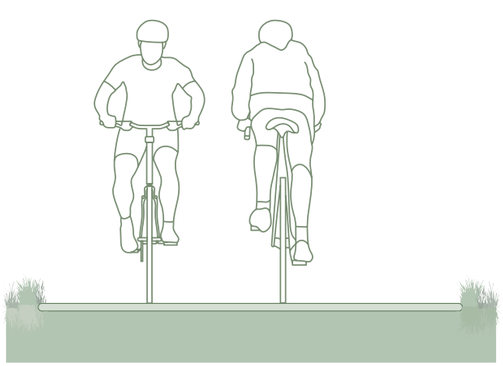
SCALE 1:5.000

0 m 100 m 200 m 300 m



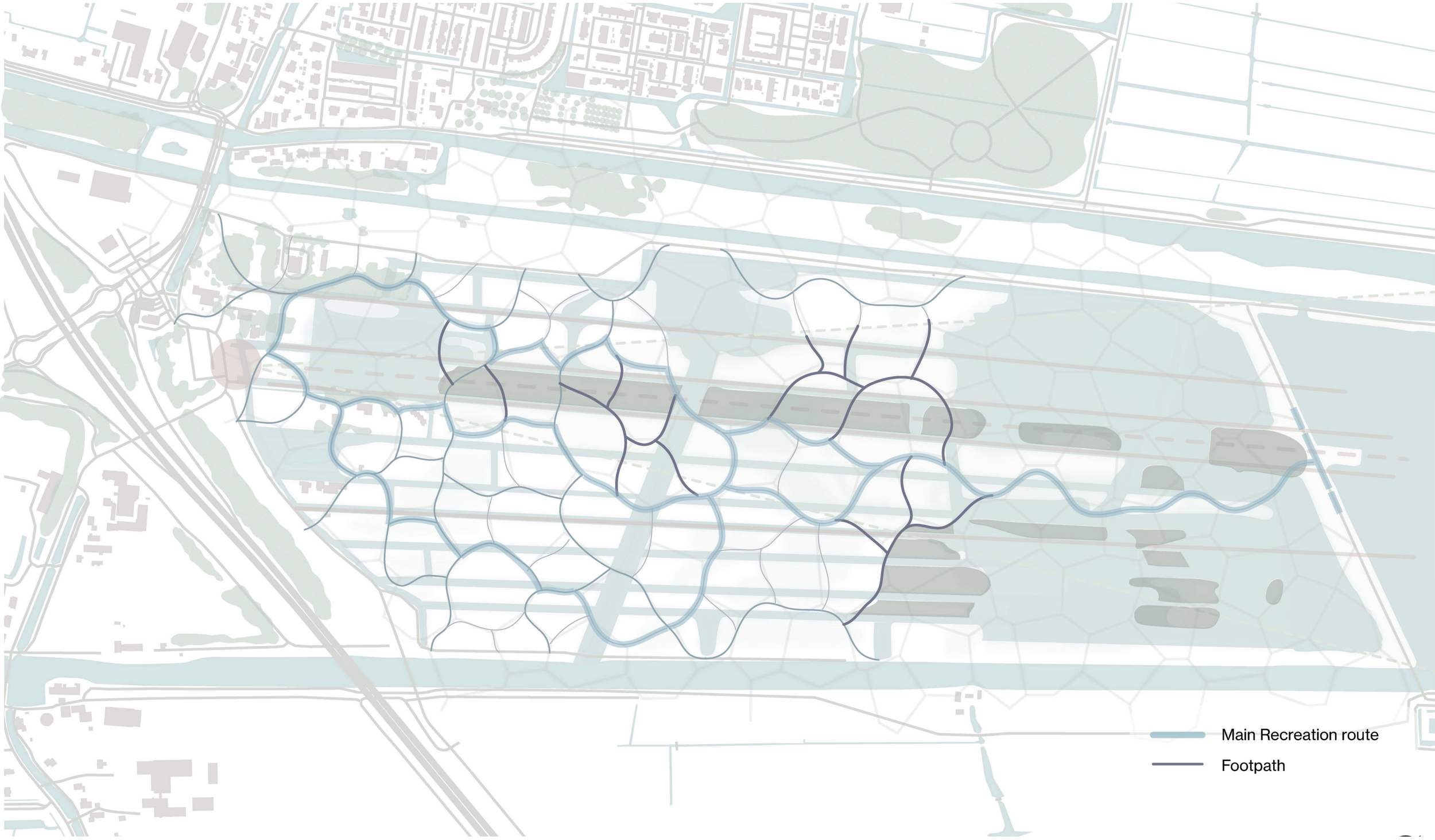
2,5 meters

walking/cycling
path



MASTERPLAN

Walking paths

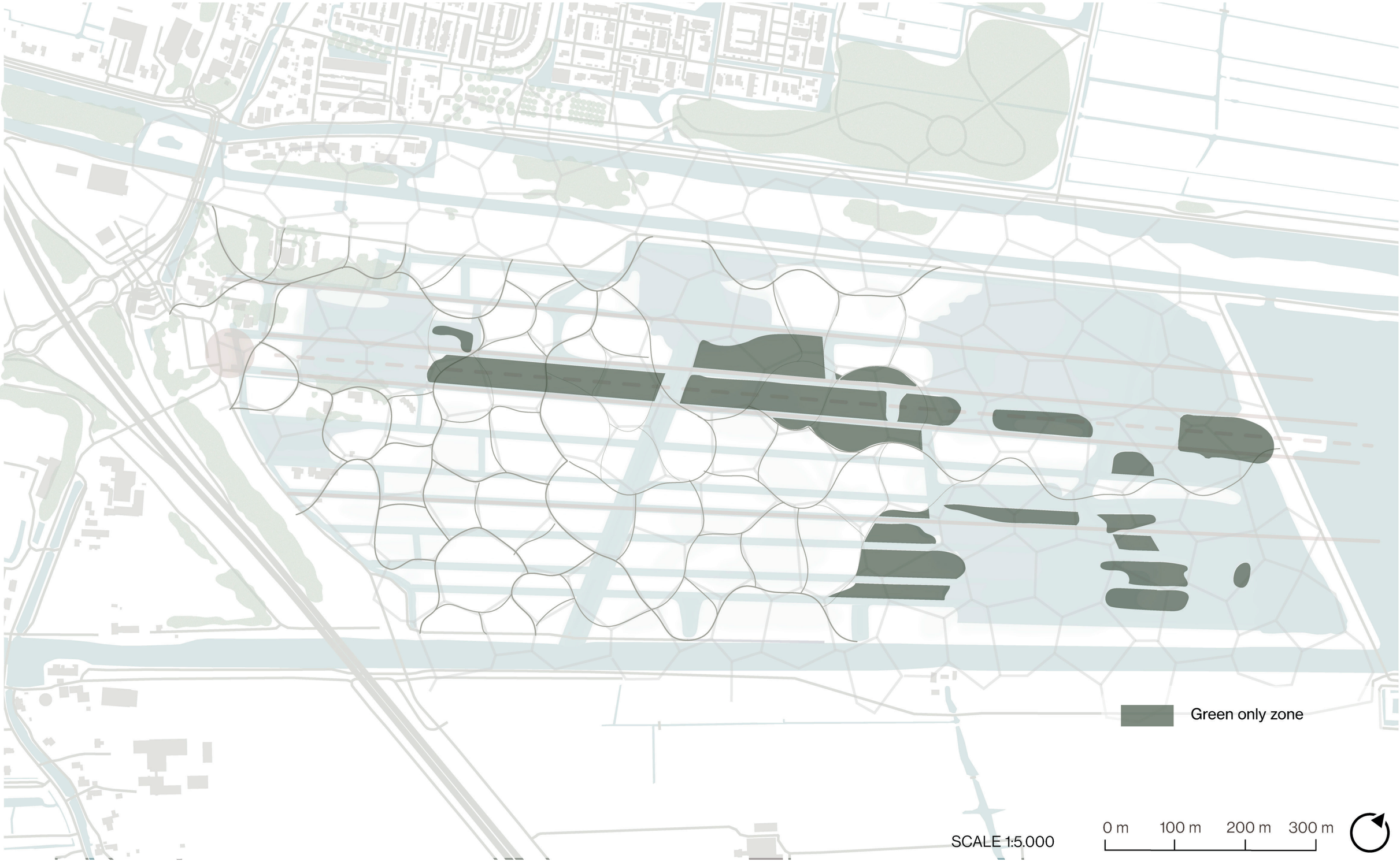


MASTERPLAN
Mobility



MASTERPLAN

Land use restriction plan *Green only zone*



MASTERPLAN

Impression *Green only zone*



MASTERPLAN

Land use restriction plan *Nature buffer zone*

Green only zone
Nature buffer zone

SCALE 1:5.000

0 m 100 m 200 m 300 m

MASTERPLAN

Impression *Nature buffer zone*



MASTERPLAN

Land use restriction plan *Housing area*

Green only zone
Nature buffer zone
Housing area

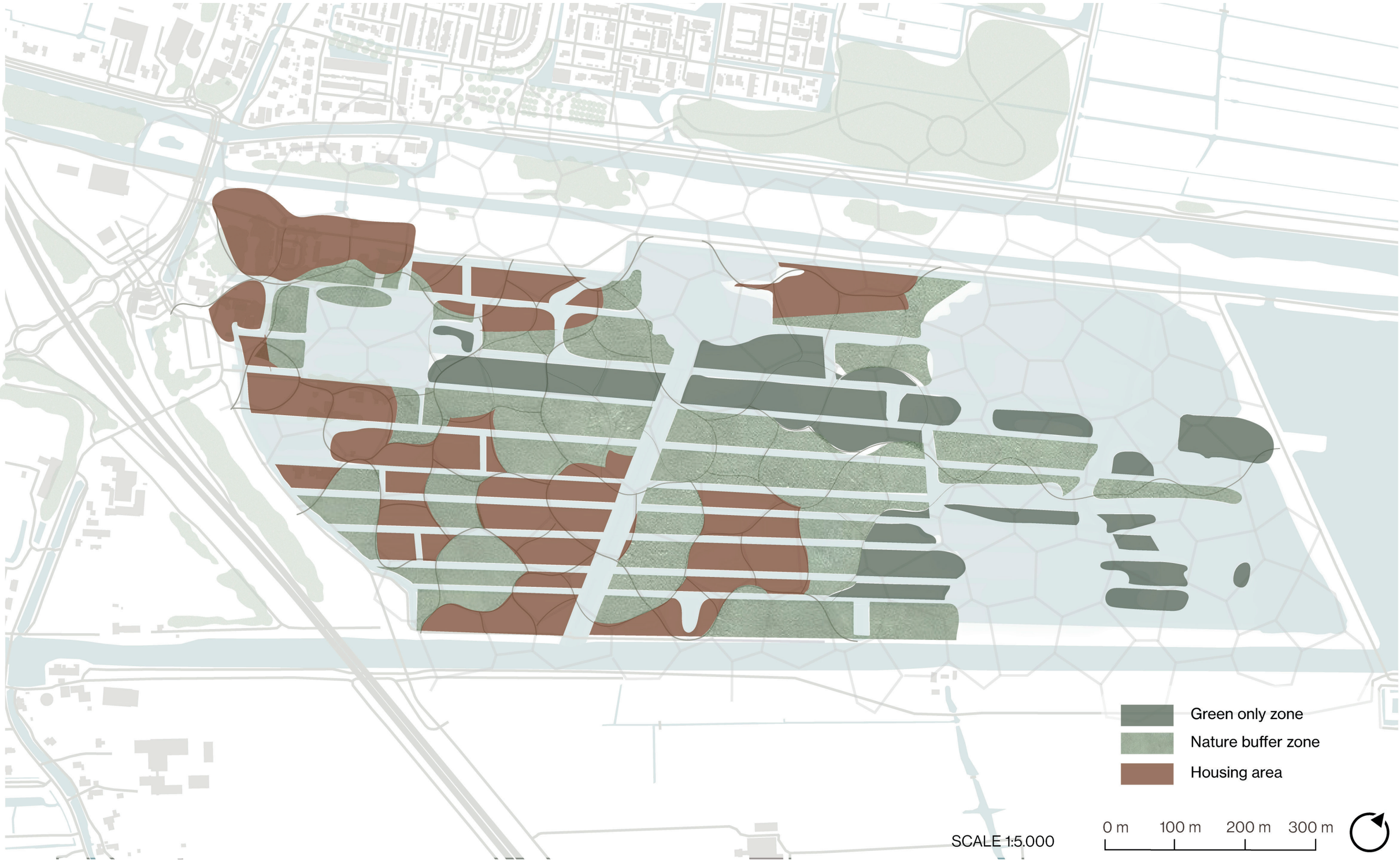
SCALE 1:5.000

0 m 100 m 200 m 300 m



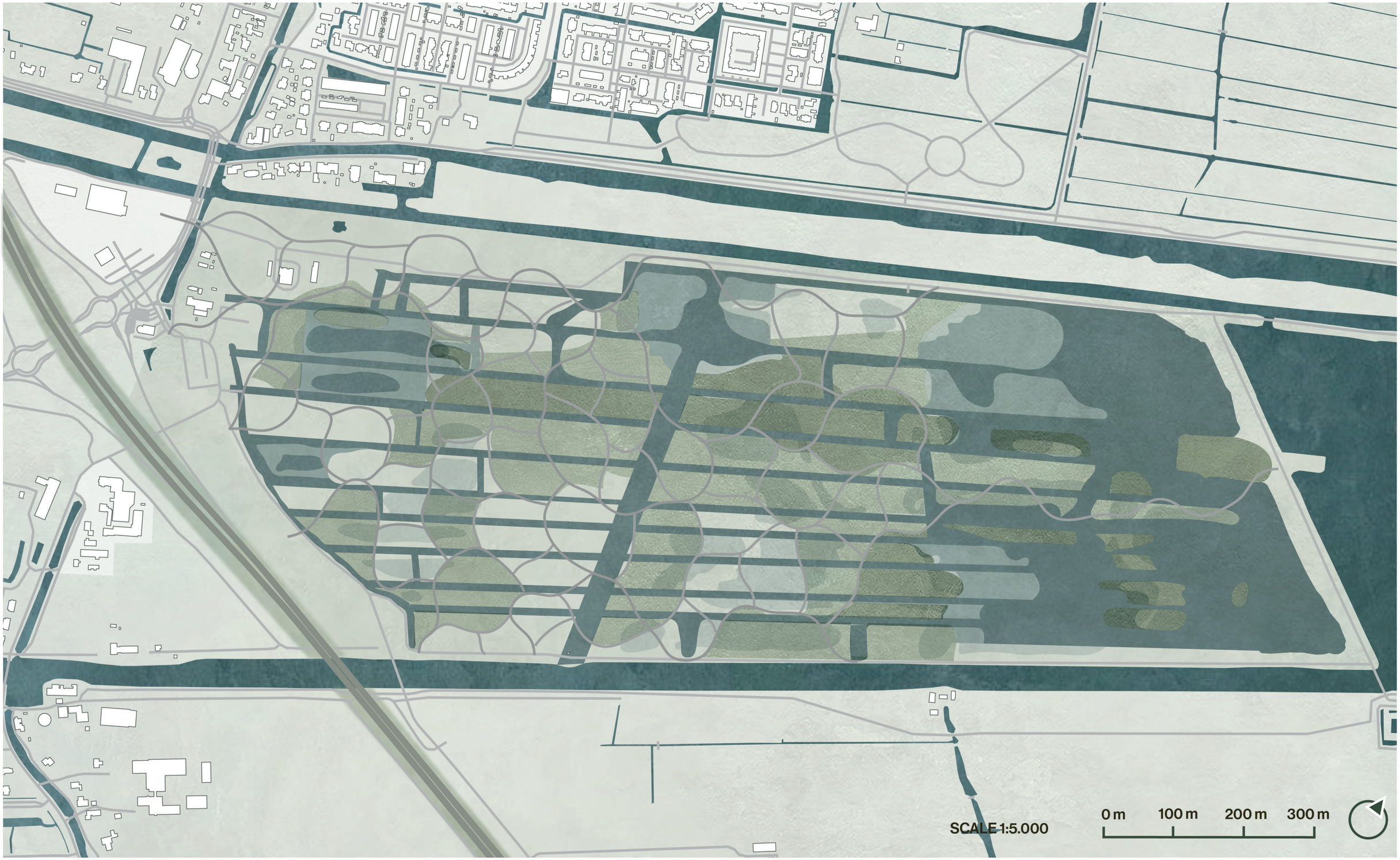
MASTERPLAN

Land use restriction plan



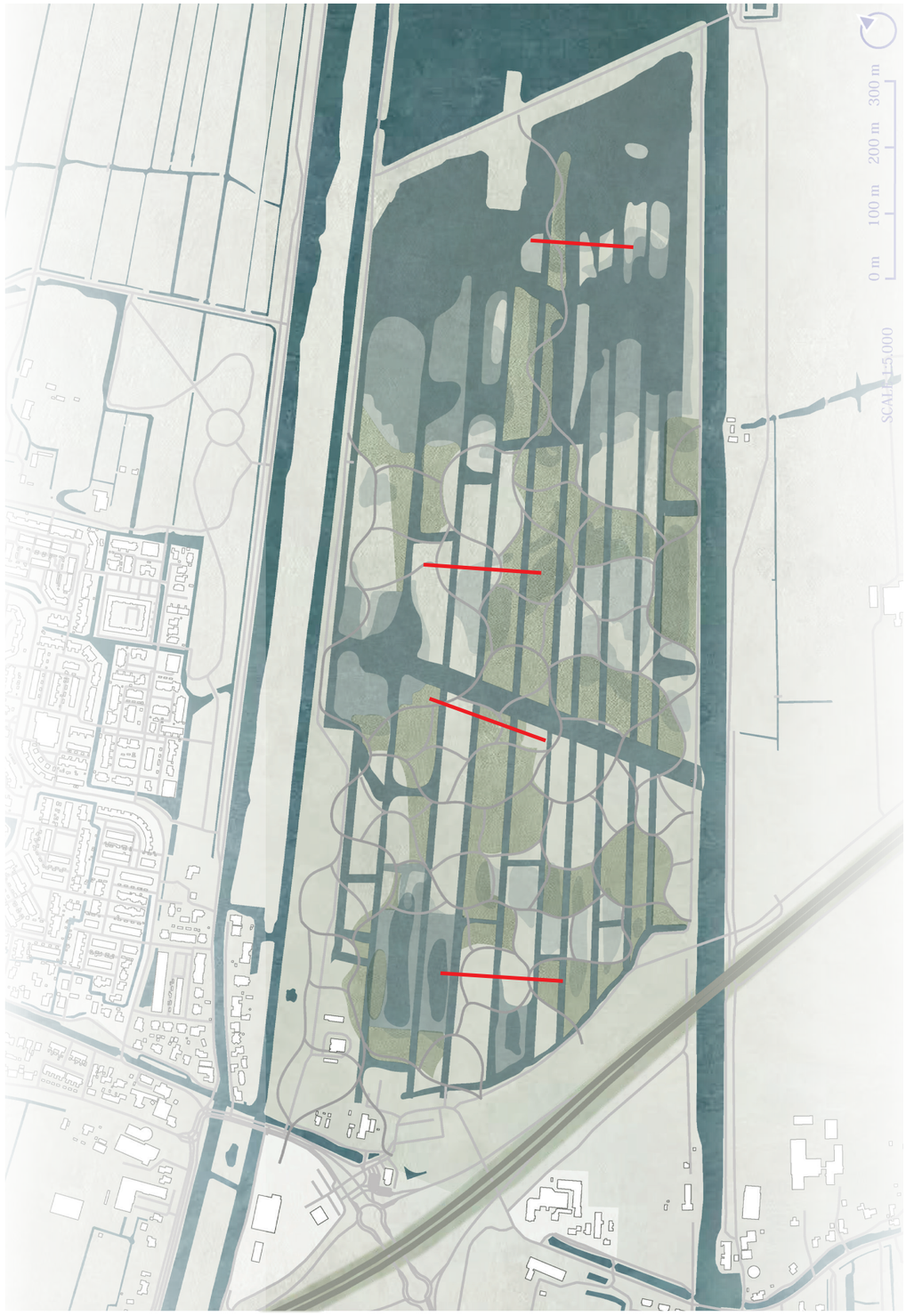
MASTERPLAN

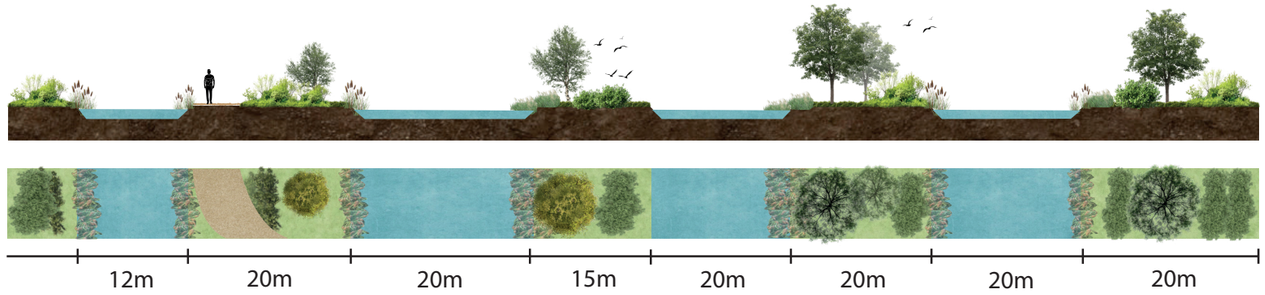
Impression of the masterplan

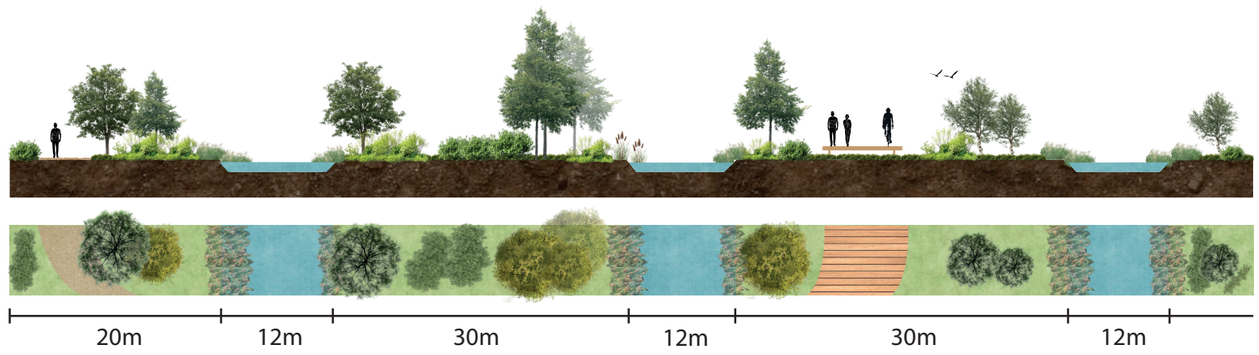


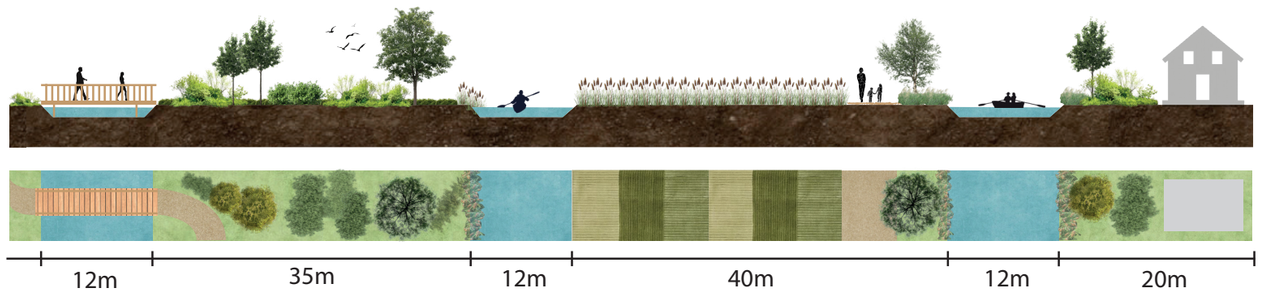
MASTERPLAN

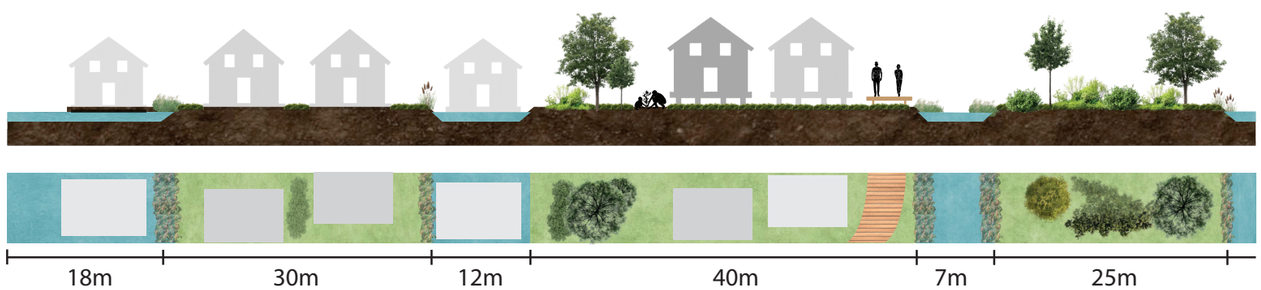
Section of the masterplan

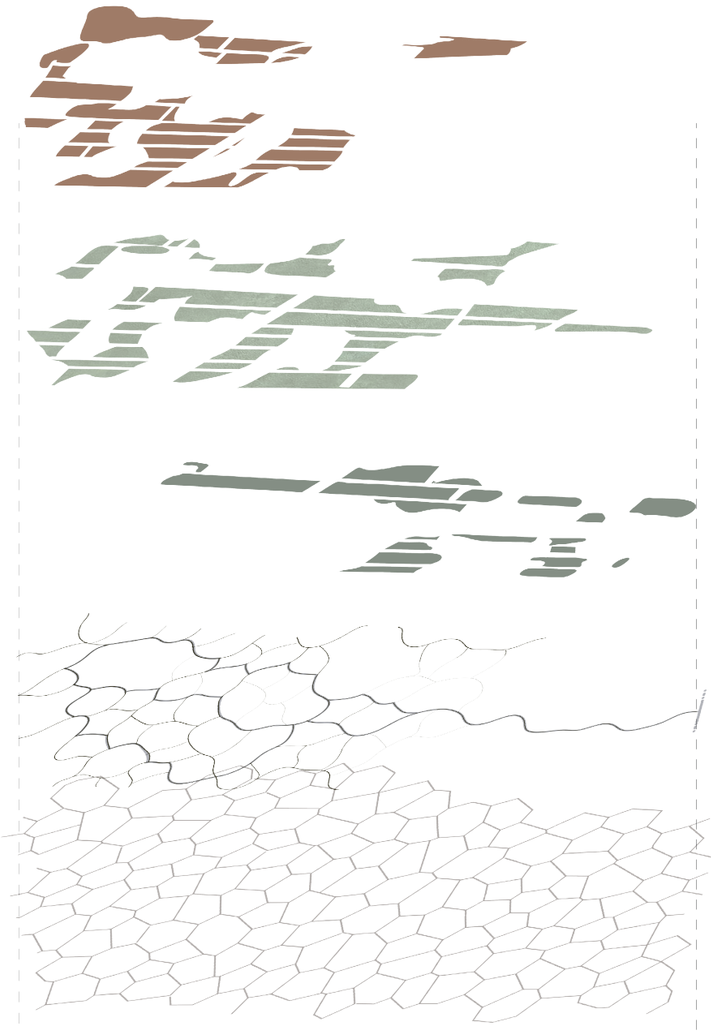


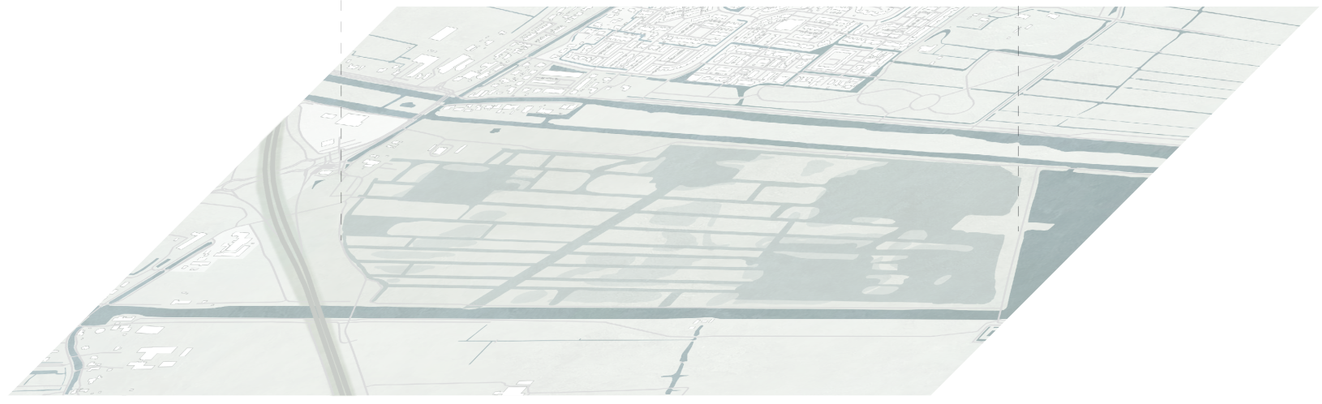






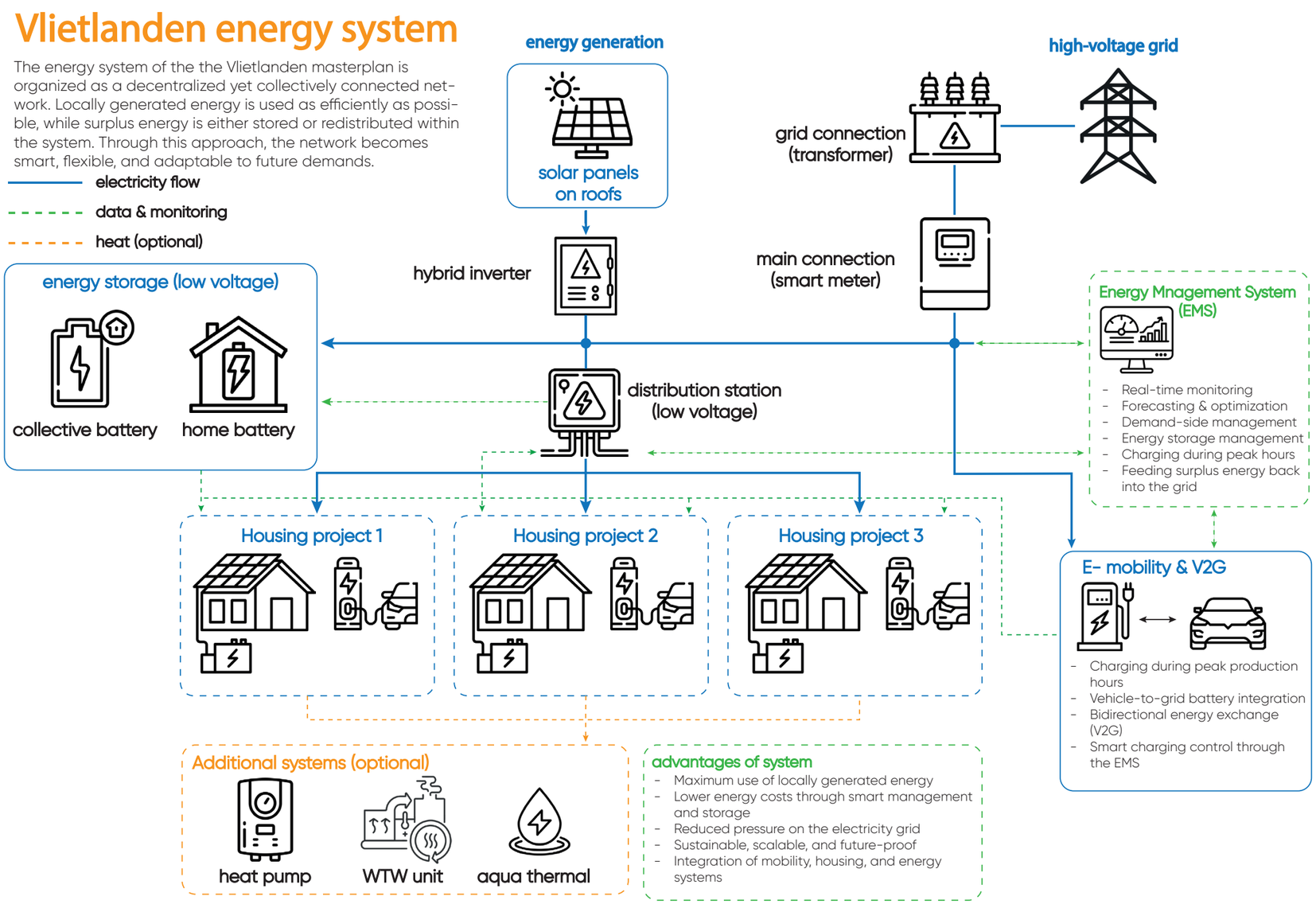






The energy system in the Vlietlanden masterplan is designed as a decentralized yet connected smart grid. Each housing development produces its own renewable energy through rooftop solar panels, while still being linked to a shared local network and the wider public grid. When there is surplus energy, 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.

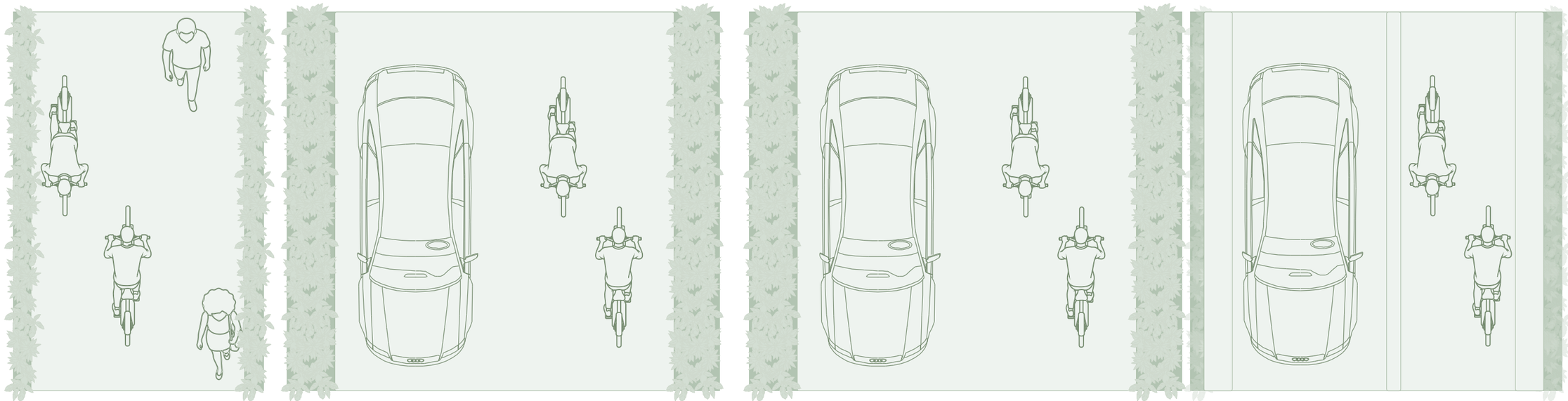


MASTERPLAN
Infrastructure *Roads*

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.

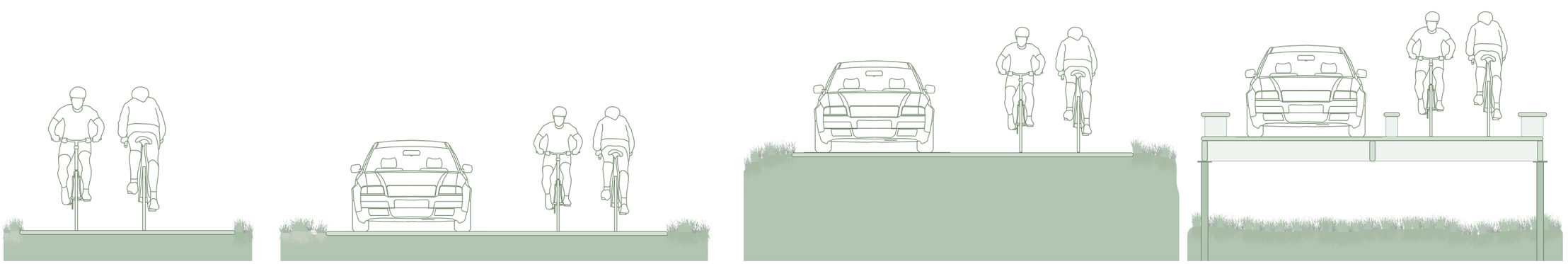


2,5 meters
walking/cycling path

4,5 meters
main road on ground level

4,5 meters
main road heigthend

4,5 meters
main road heigthend

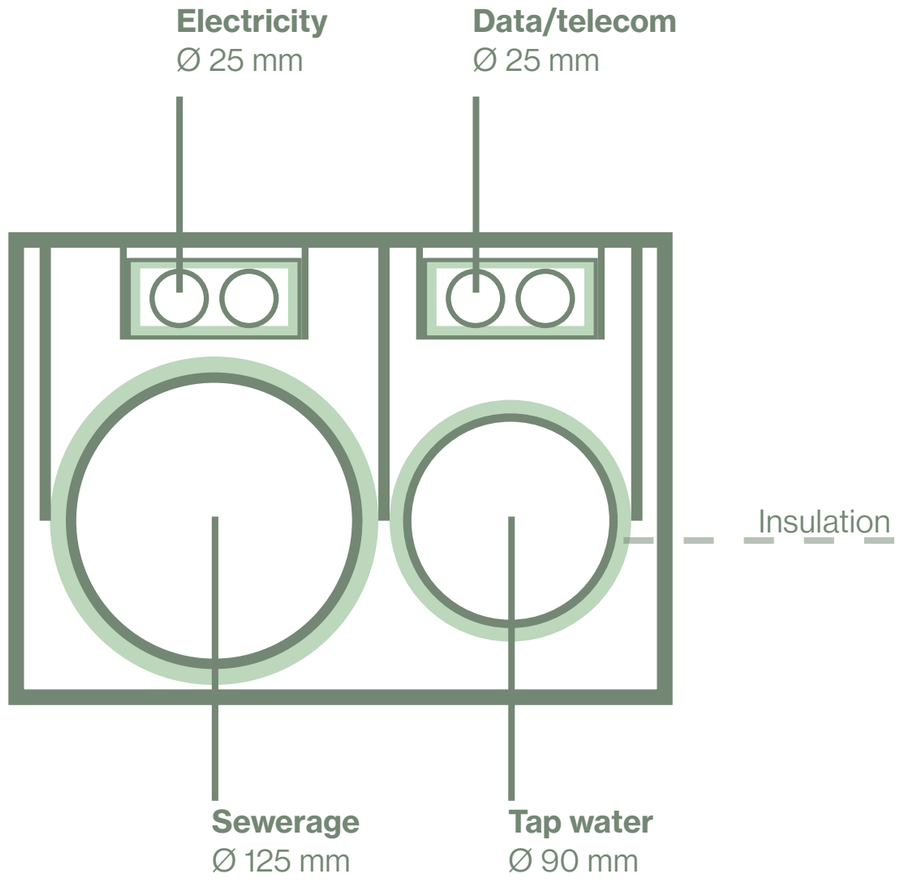


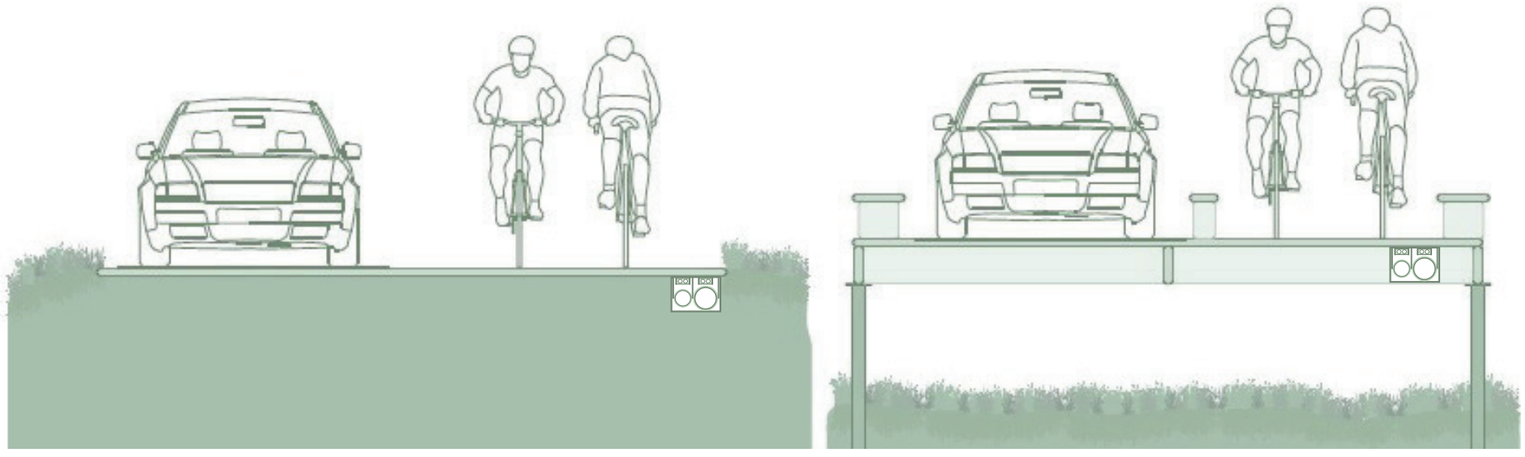
MASTERPLAN

Infrastructure *Services*

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.





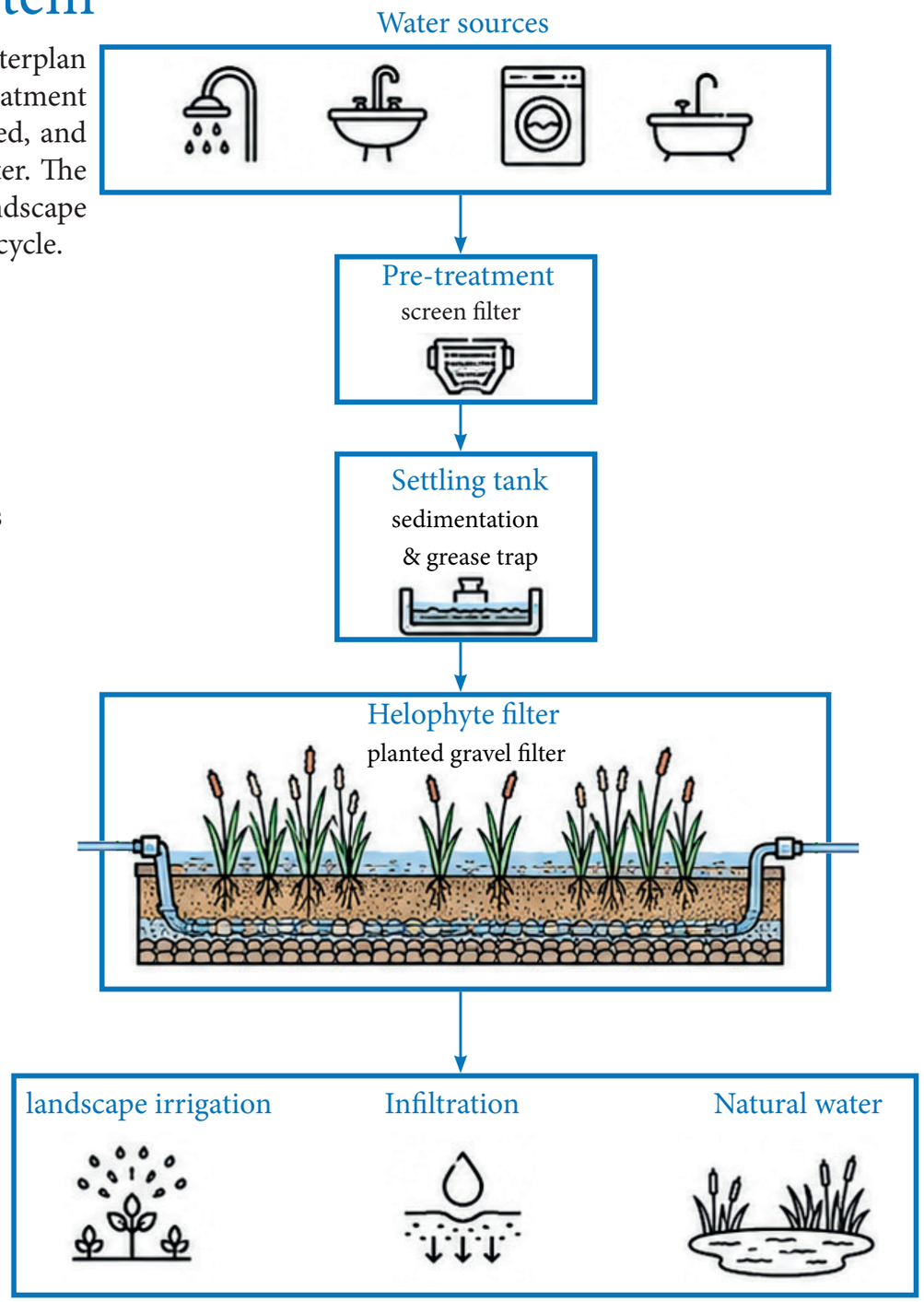
Greywater within the settlement is treated locally through a natural helophyte filtration system integrated into the landscape. Water from showers, sinks, and washing machines is guided through planted gravel beds, where reeds and microorganisms gradually purify the water before it is returned to the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



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.

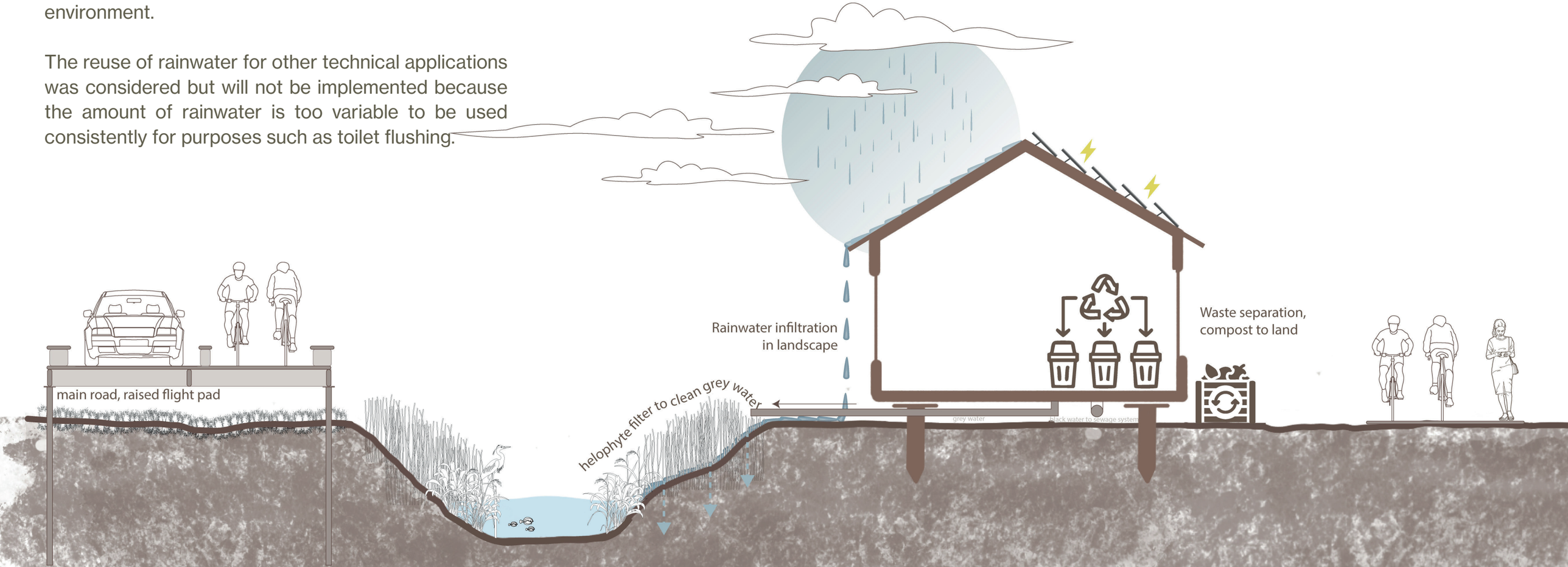
The reuse of rainwater for other technical applications was considered but will not be implemented because the amount of rainwater is too variable to be used consistently for purposes such as toilet flushing.

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.

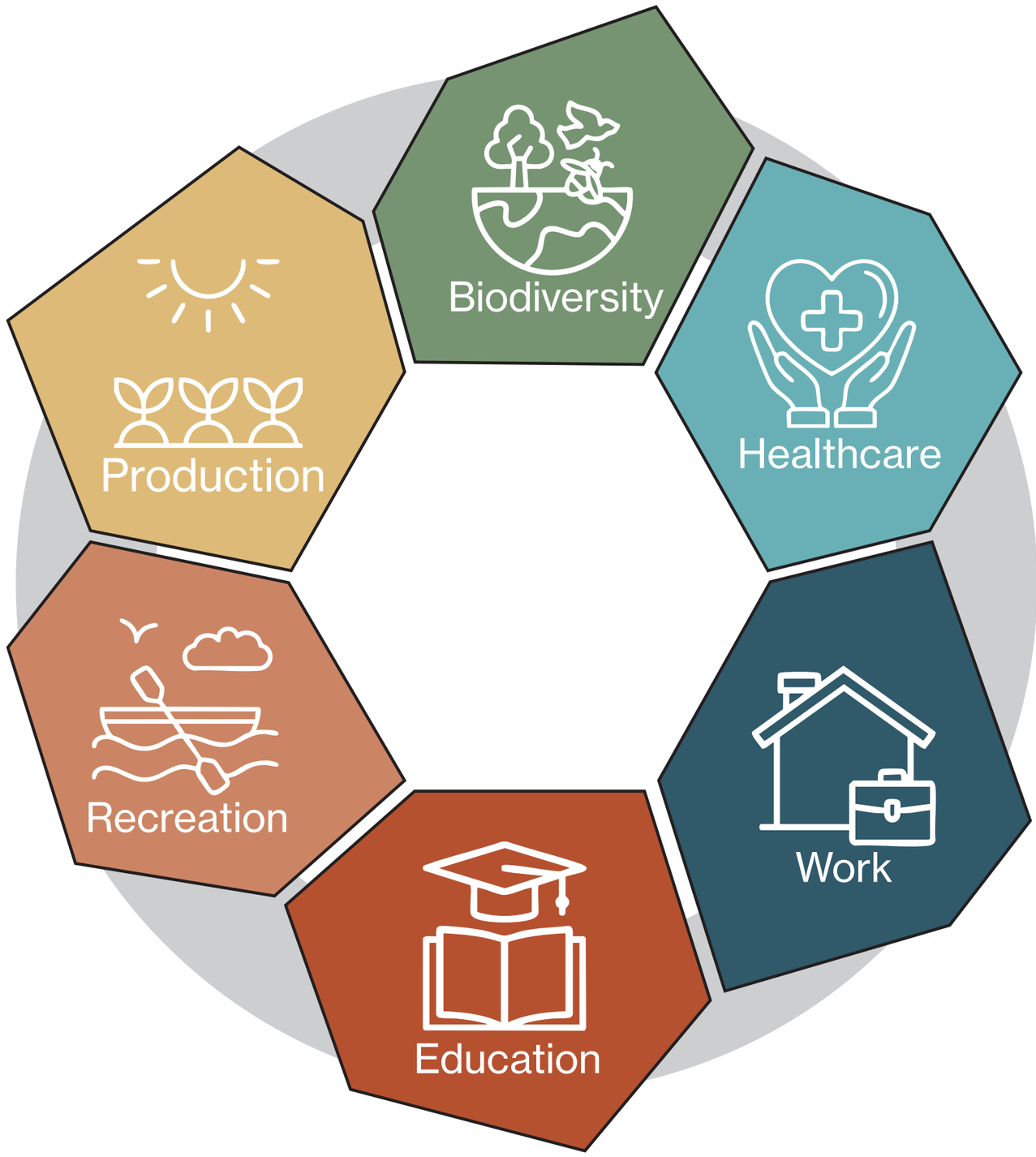
Residents are also encouraged to compost their organic waste, returning nutrients directly to the soil and closing the cycle between consumption and cultivation. Composting is understood here not as an obligation but as a natural extension of living in close relationship with the land.

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.



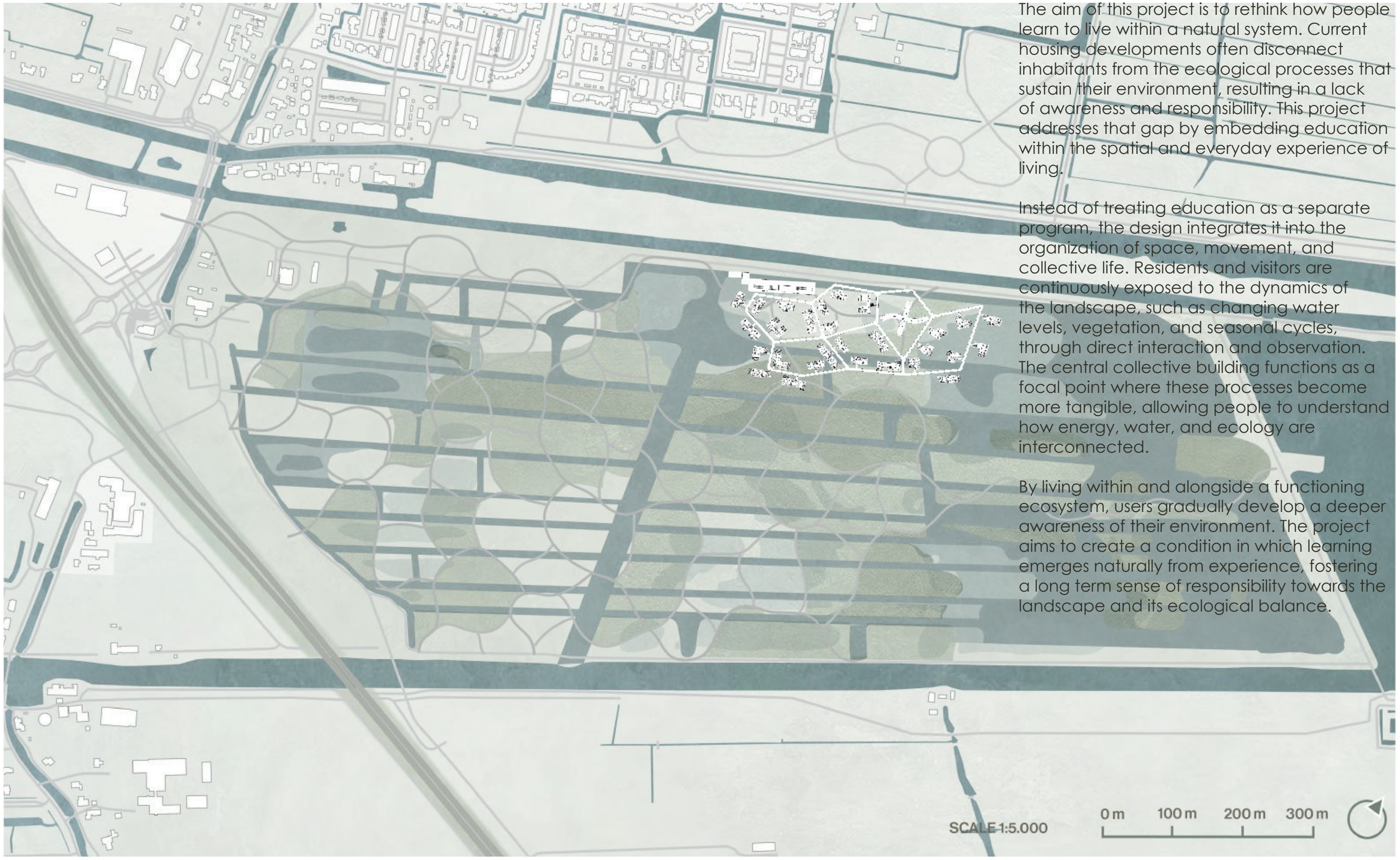
MASTERPLAN

Six pillars of a healthy living environement



EDUCATION

EDUCATION
Location



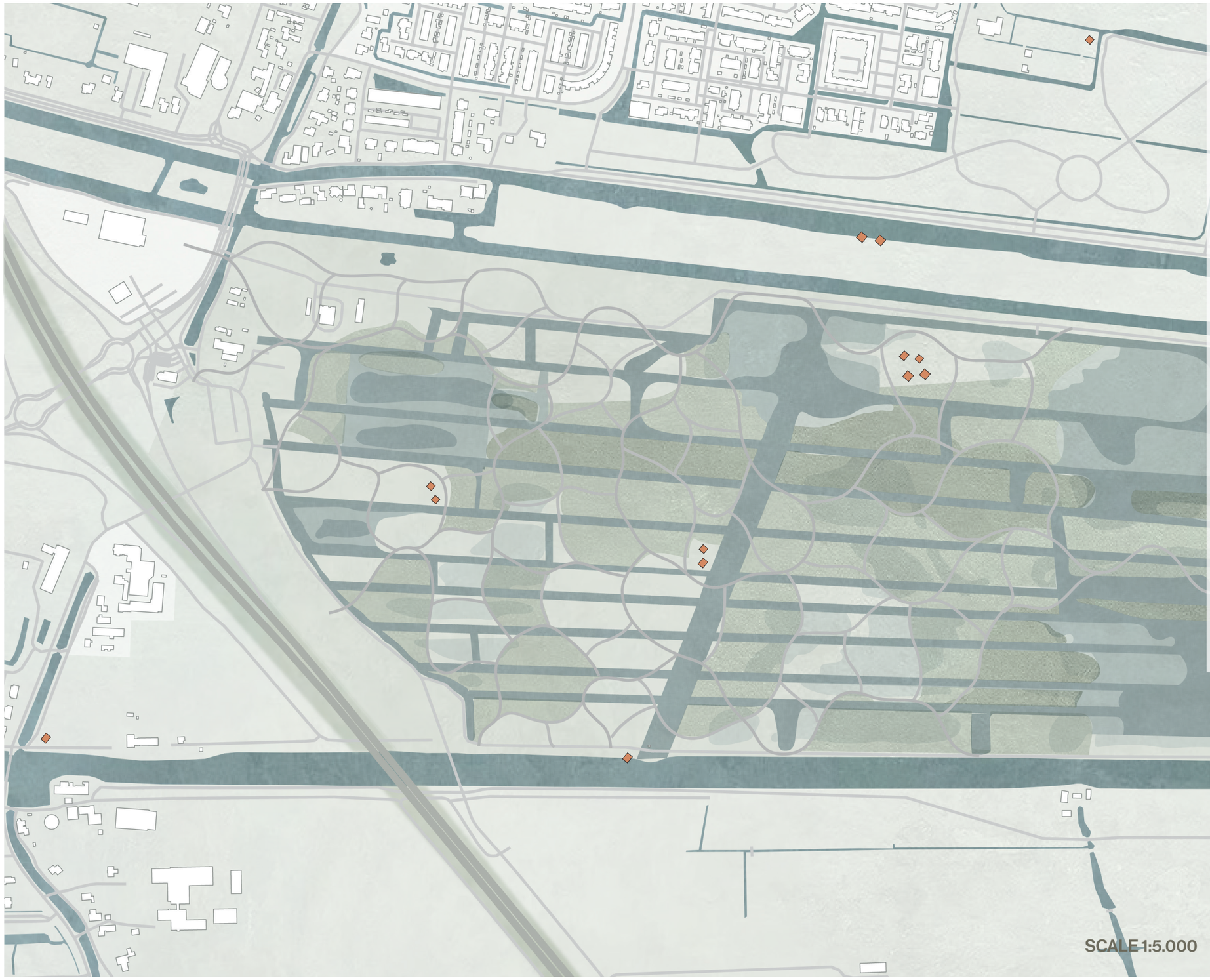
The aim of this project is to rethink how people learn to live within a natural system. Current housing developments often disconnect inhabitants from the ecological processes that sustain their environment, resulting in a lack of awareness and responsibility. This project addresses that gap by embedding education within the spatial and everyday experience of living.

Instead of treating education as a separate program, the design integrates it into the organization of space, movement, and collective life. Residents and visitors are continuously exposed to the dynamics of the landscape, such as changing water levels, vegetation, and seasonal cycles, through direct interaction and observation. The central collective building functions as a focal point where these processes become more tangible, allowing people to understand how energy, water, and ecology are interconnected.

By living within and alongside a functioning ecosystem, users gradually develop a deeper awareness of their environment. The project aims to create a condition in which learning emerges naturally from experience, fostering a long term sense of responsibility towards the landscape and its ecological balance.

RECREATION

RECREATION
Location



This project provides multiple catalog houses, which can be placed anywhere in or close to nature. By changing the the balance between inside and outside, the residents get the opportunity to be more in contact with nature within their own house and be more outdoors, which will enhance a healthy living environment.
One part of the house is insulated, of which only certain rooms can be heated. This part of the house is more compact and includes box beds. The other part of the house is not insulated, but is wind and water proof, surrounded by glass folding doors. This area is can be used as a living space. During winters it might be colder, but when it gets warmer outside the folding doors can be opened and this living space becomes a part of nature.

PRODUCTIVE LANDSCAPE

PRODUCTIVE LANDSCAPE

Location



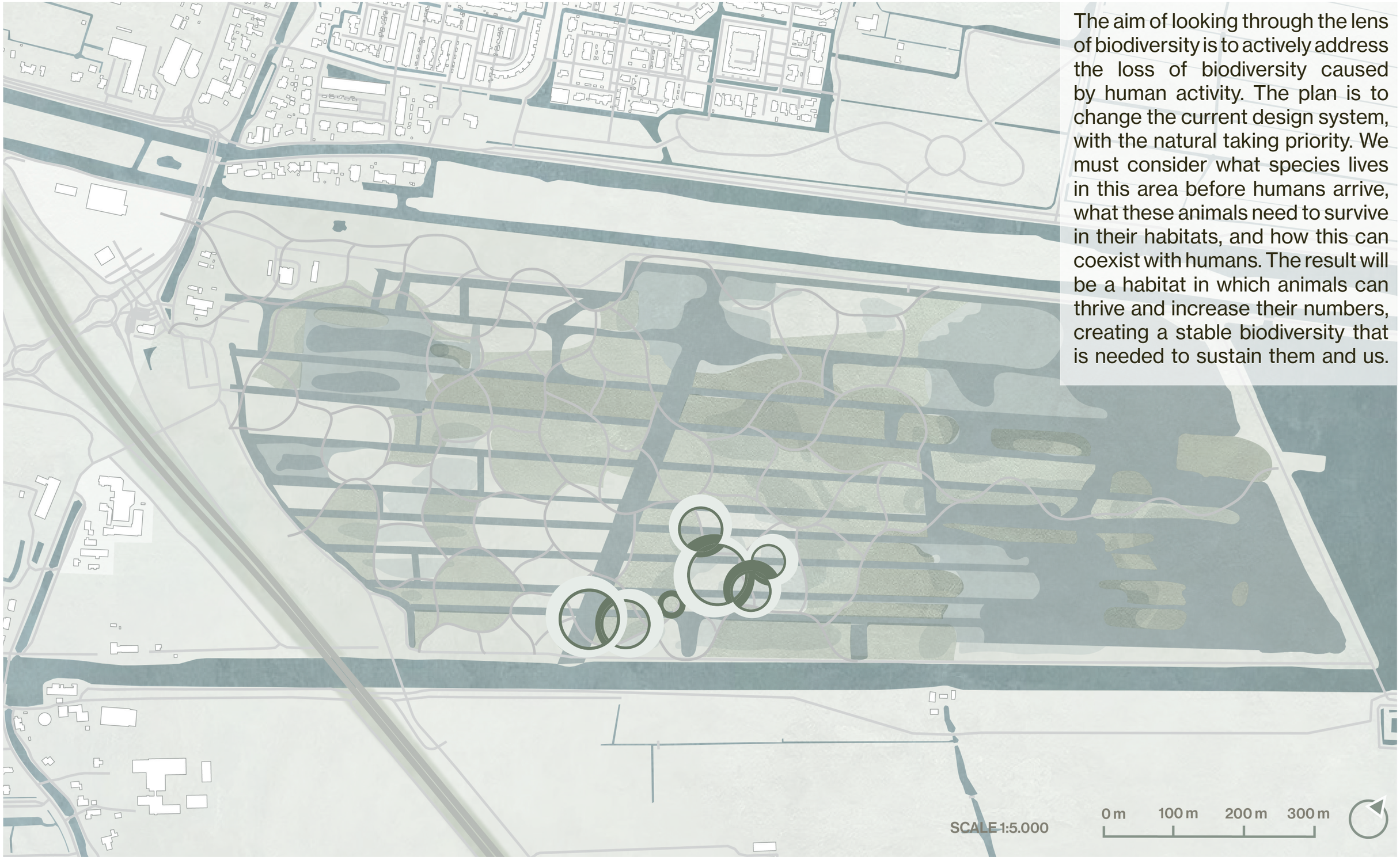
Productive Landscape

This project proposes a new community settlement that inhabits this transition by treating the landscape as simultaneously ecologically, materially, and socially productive. Water and soil gradients dictate land use, which dictates the space for habitation. Three new actors – the new farmer as landscape guardian, the seasonal worker, and the hybrid resident – share a community organised around collective production. A hexagonal dwelling typology, sheltered beneath a productive greenhouse envelope, dissolves the boundary between interior and landscape. Living here means participating in the productivity of the land.

BIODIVERSITY

BIODIVERSITY

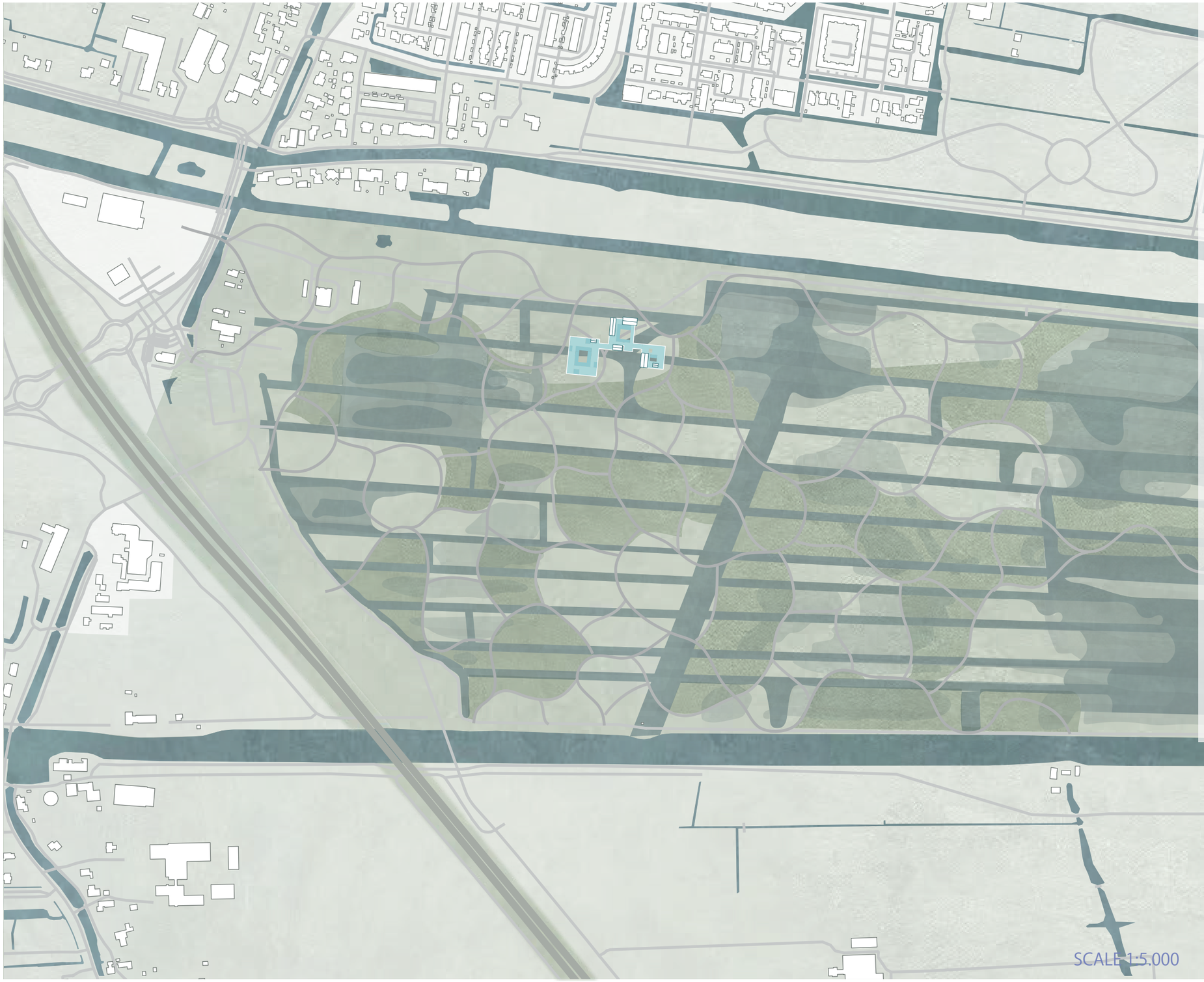
Location



The aim of looking through the lens of biodiversity is to actively address the loss of biodiversity caused by human activity. The plan is to change the current design system, with the natural taking priority. We must consider what species lives in this area before humans arrive, what these animals need to survive in their habitats, and how this can coexist with humans. The result will be a habitat in which animals can thrive and increase their numbers, creating a stable biodiversity that is needed to sustain them and us.

HEALTH CARE

HEALTH CARE
Location

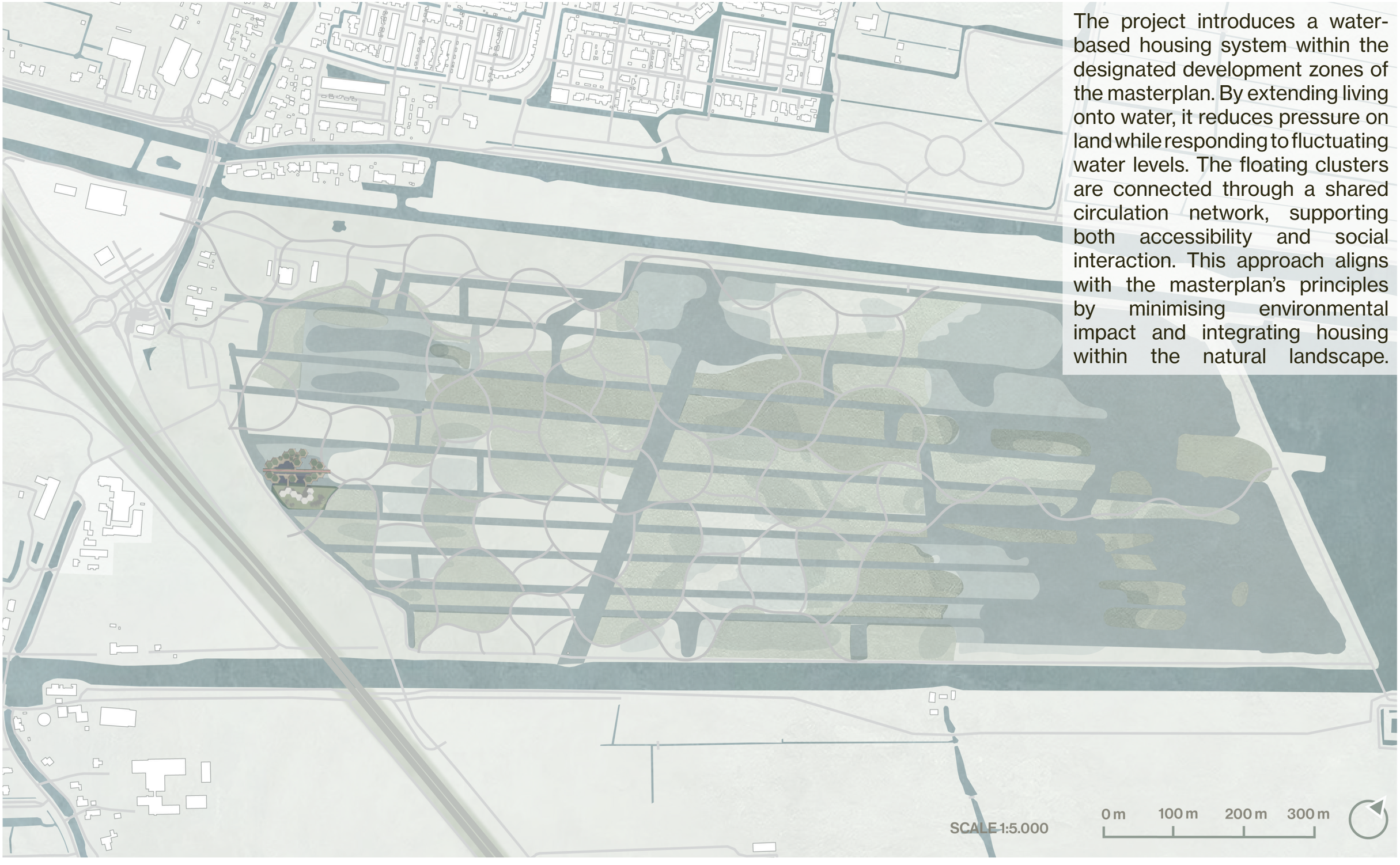


Within the masterplan, it is also important to consider how people adapt alongside ecological and productive factors. This is particularly relevant in the context of healthcare, where it adds another layer of depth to the project's core principle.

Within this sub-theme, dementia is taken as the starting point, as it will put increasing pressure on healthcare and society in the future due to an ageing population. Besides this, the parallels between the condition of dementia and the polder landscape form an interesting starting point for the project; both are characterised by changing environmental conditions, uncertainty and a loss of control.

In this context, the project seeks to find a new way of living in the polder landscape for people with dementia. The result is a stable and stimulating living environment for people with dementia, where care and nature come together to create a healthy, liveable and sustainable world.

WORK



The project introduces a water-based housing system within the designated development zones of the masterplan. By extending living onto water, it reduces pressure on land while responding to fluctuating water levels. The floating clusters are connected through a shared circulation network, supporting both accessibility and social interaction. This approach aligns with the masterplan's principles by minimising environmental impact and integrating housing within the natural landscape.