

THE METROPOLITAN PARK

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Metropolitan Ecologies of Place
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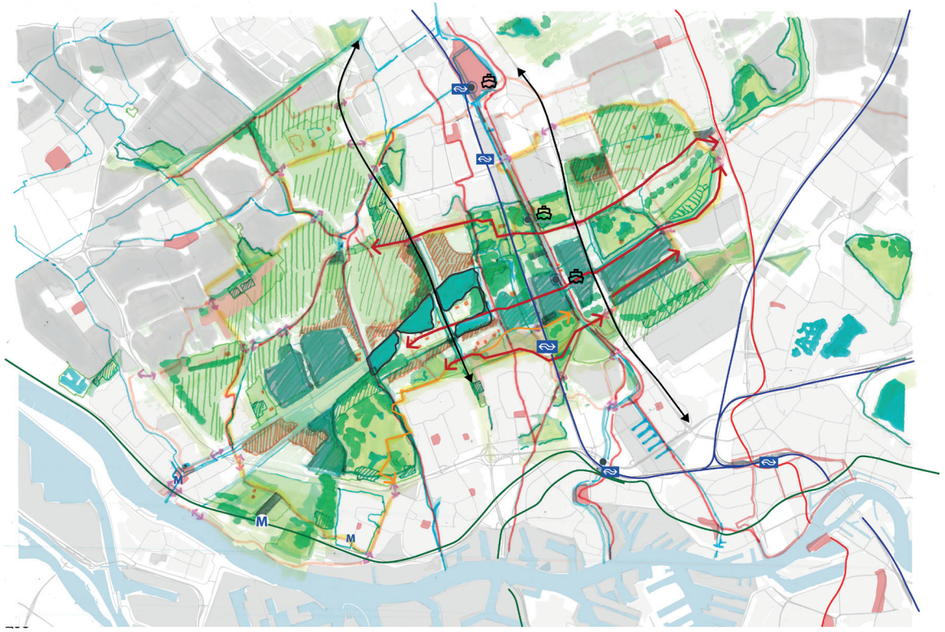
In deze master thesis ''Een visie voor Midden-Delfland als metropolitaan park in 2070'', worden de uitdagingen die spelen voor het gebied Midden-Delfland, en op regionaal schaalniveau voor de provincie Zuid-Holland, bestudeerd. De focus ligt op de transformatie van (Bijzonder Provinciaal Landschap) Midden-Delfland tot een duurzaam metropolitaan park, waar ecologisch behoud, landbouwproductiviteit en recreatieve functies samenkomen. Het doel is om een levendig landschap te creëren voor de omliggende steden, waarbij de stedeling wordt verbonden met het groene platteland. Deze visie biedt hen de mogelijkheid om een breed scala aan ecologische, agrarische en recreatieve locaties in Midden-Delfland te ervaren.



Een onderzoekende tekening van Midden-Delfland 2070 na de optimalisatiefase. Zie hoofdstuk 7, pagina 210.

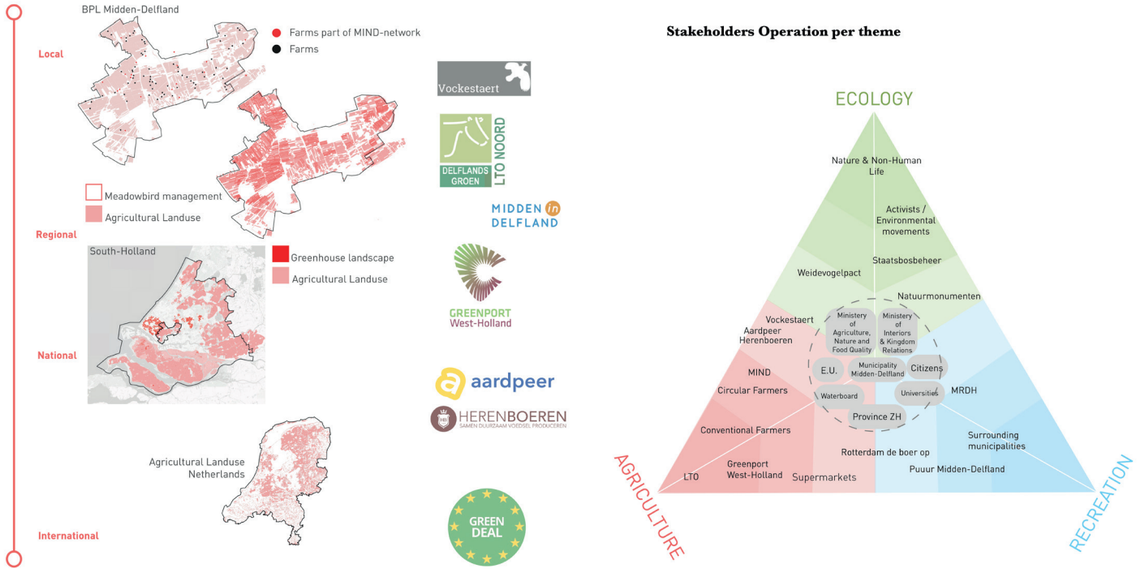
Achtergrond en Probleemstelling: Verstedelijking en klimaatverandering

De uitdagingen waarmee Midden-Delfland wordt geconfronteerd, worden gevormd door klimaatverandering en verstedelijking als cruciale factoren. Dit veenweidegebied, dat hoofdzakelijk wordt gebruikt voor veeteelt, is daarnaast van ecologische waarde dankzij een aantal moeras-, riet-, veengebieden en bossen. Naast het open, groene polderlandschap wordt het gebied gekenmerkt door grote infrastructuurlijnen, zoals snelwegen en spoorlijnen, die het landschap in noord-zuid richting doorsnijden. De afgelopen 50 jaar heeft de sterke verstedelijking van omliggende steden zoals Rotterdam, Schiedam, Delft, Den Haag en het Westland geleid tot een aanzienlijke toename van het aantal inwoners in de provincie. Dit betekent dat de beschikbare ruimte is afgenomen en de recreatieve druk is toegenomen. De gemeente benadrukt het belang van recreatie in dit gebied, aangezien Midden-Delfland wordt gezien als een essentiële groene buitenruimte voor de 2,3 miljoen inwoners van de metropoolregio Rotterdam-Den Haag (Gebiedstafel Bijzonder Provinciaal Landschap Midden-Delfland, 2021).

Naast de uitdagingen van verstedelijking, wordt Midden-Delfland steeds kwetsbaarder voor klimaatverandering. De KNMI-klimaatscenario's voorspellen tegen 2100 een temperatuurstijging van 4,9 graden en een zeespiegelstijging van 2,5 meter (Bessembinder et al., 2023). Zuid-Holland, gelegen aan het einde van een rivierdelta en grotendeels onder NAP, wordt hierdoor steeds kwetsbaarder voor wateroverlast en overstromingen. Daarnaast vindt er in de regio bodemdaling plaats, als gevolg van intensieve controle over het waterpeil in veenweidelandschappen (Stout & Dijkman, 2021). Bodemdaling draagt bij aan de uitstoot van CO2 en het verder verzakken van het maaiveld versterkt de kwetsbaarheid voor klimaatveranderingen. Hoewel de landbouw al stappen zet richting een natuurinclusievere bedrijfsvoering, zoals met weidevogelbeheer, blijft het gebruik van meststoffen en pesticiden een bron van vervuiling die de waterkwaliteit aantast en het ecosysteem verstoort (Altenburg & Wymenga ecologisch onderzoek, 2018). Dit onderstreept de complexiteit van de uitdagingen waarmee Midden-Delfland wordt geconfronteerd en de noodzaak van een geïntegreerde aanpak om een duurzame toekomst voor het gebied te waarborgen.

Toekomstvisie voor Midden-Delfland: Een Routekaart naar 2070

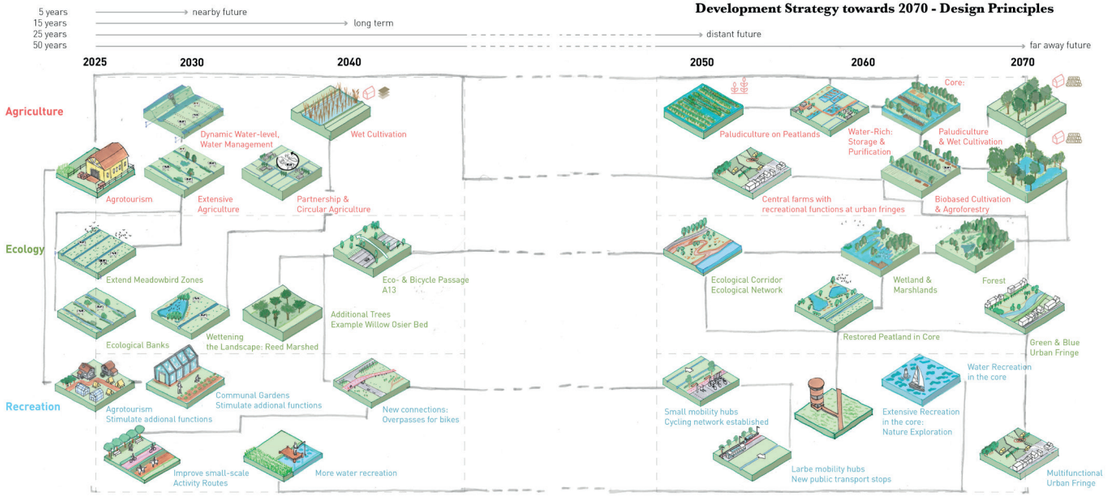
Midden-Delfland, de regio, provincie en het rijk hebben de afgelopen decennia actief ingezet op de bescherming van dit unieke gebied; van de toezegging van 'Rijksbufferzone' in de jaren zestig, via de inrichting van het platteland volgens de Reconstructiewet in de jaren zeventig, tot de uiteindelijke benoeming als ''Bijzonder Provinciaal Landschap'' (Gemeente Midden-Delfland et al., 2017). Het gebied wordt gewaardeerd om haar agrarische, ecologische, culturele en recreatieve erfgoed. Het doel van deze thesis is om de gewenste ontwikkeling van Midden-Delfland, te onderzoeken en ontwerpen, rekening houdend met toekomstige uitdagingen. Het resultaat is een visie die verbeeldt hoe het landschap er in de toekomst mogelijk uit zal zien. Door bestuurlijke analyses van stakeholders en beleid te combineren met ontwerpvoorstellen, biedt het een routekaart naar 2070 met inzichten voor belanghebbenden en gemeenten.



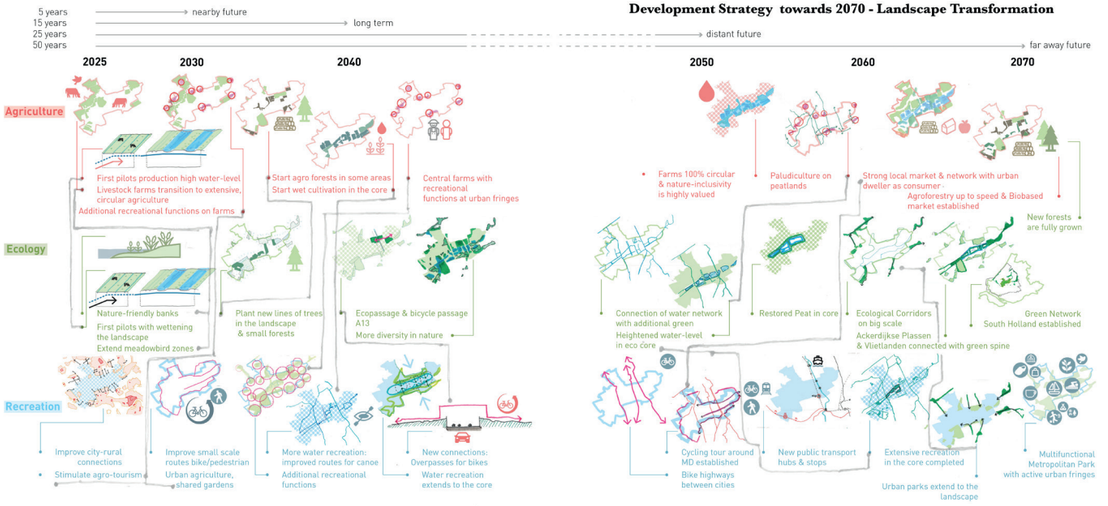
Stakeholders Operation per theme

De analyse van actoren en belanghebbenden in Midden-Delfland is terug te vinden in hoofdstuk 8, vanaf pagina 234.

Development Strategy towards 2070 - Design Principles



Development Strategy towards 2070 - Landscape Transformation



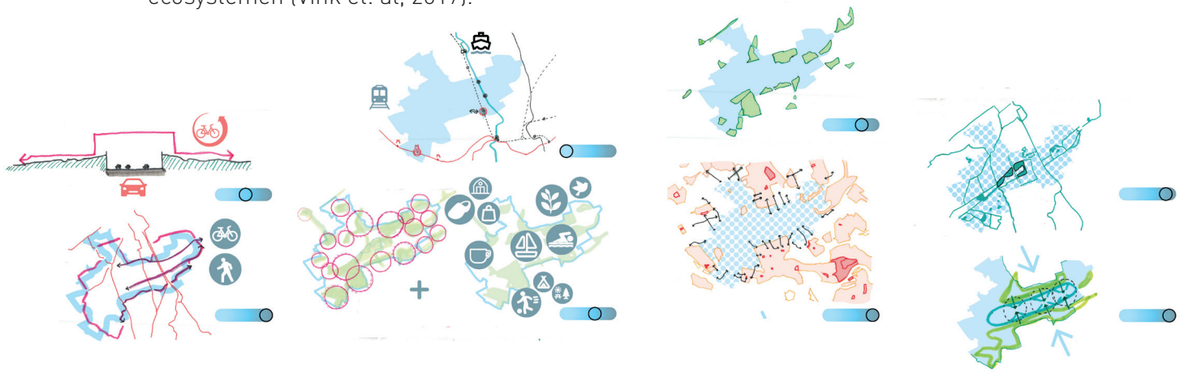
De beschrijving van een routekaart en strategie met tijdlijn is terug te vinden in hoofdstuk 8, vanaf pagina 256.

Maximalisatie Methode

In dit rapport wordt onderzocht hoe de transitie van een ecologisch, recreatief en agrarisch landschap naar een duurzame toekomst kan worden bewerkstelligd door de problemen op te lossen met synergiën te vinden tussen de thema's ecologie, landbouw en recreatie. De hoofdvraag die in dit rapport wordt onderzocht is tevens: "Hoe kan de ontwikkeling en integratie van het ecologische karakter, de agrarische sector en de recreatieve functies bijdragen aan het bevorderen van een duurzame toekomst voor de regio Midden-Delfland richting 2070?"

Om tot een visie te komen, is in dit rapport de maximalisatiemethode gebruikt, die helpt bij het ontwerpen op transparante en integrale wijze. Met deze methode zijn de verschillende thema's en oplossingen eerst afzonderlijk geanalyseerd in de huidige situatie en vervolgens gemaximaliseerd voor een duurzaam 2070. Vervolgens zijn de maximalisaties van de drie thema's met elkaar vergeleken en is in de optimalisatiefase gekeken naar welke oplossingen de meeste potentie hebben om gecombineerd te worden.

De tijdshorizon die voor het opstellen van de visie gekozen wordt, rijkt tot het jaar 2070. Deze tijdshorizon maakt visionaire oplossingen mogelijk die minder compromissen stellen, doordat het een perspectief biedt dat verder gaat dan korte termijn doelen, typische beleidscycli en wereldwijde duurzaamheidsdoelstellingen. Bovendien sluit deze tijdlijn aan bij het ecologische aspect van de visie, doordat natuurinclusief ontwerp een langetermijnplanning vereist voor de ontwikkeling van ecosystemen (Vink et. al, 2017).



De maximalisatie van de drie thema's is terug te vinden in hoofdstuk 6, vanaf pagina 161.

Belangrijkste bevindingen

De focus op efficiëntie in de ruimtelijke inrichting van Nederland heeft geleid tot een zeer productief agrarisch landschap. Toekomstig beleid, gericht op duurzaamheid en water- en bodem-sturend beheer (H+N+S Landschapsarchitecten et al., 2023), vereist echter landschappelijke veranderingen. In veenweidegebieden moet het waterpeil worden verhoogd om bodemdaling tegen te gaan. Dit herstel van de natuurlijke bodem en het veen maakt het watersysteem beter bestand tegen zowel natte als droge periodes. De kwetsbaarheid van veenbodems vraagt ook in Midden-Delfland om een transitie in de landbouwsector. Paludicultuur, waarbij natte gewassen worden verbouwd, zoals cranberry's, en het verbouwen van riet en lisdodde voor biobased materialen, biedt nieuwe kansen. Daarnaast kan in Midden-Delfland, op minder kwetsbare kleibodems de overgang naar extensieve kringlooplandbouw (Janmaat et al., 2022), ook wel circulaire landbouw genoemd, worden versterkt. Dit kan bijdragen aan het behoud van het oorspronkelijke landbouwkarakter terwijl natuur-inclusieve productie wordt gestimuleerd. Al deze oplossingen, van nieuwe waterpeilen tot natte teelten, worden in het toekomstbeeld geïntegreerd.

Naast de transitie in landgebruik moet de focus naar 2070 liggen op betere verbindingen tussen platteland en steden. Groene buitengebieden zijn essentieel, vooral omdat inwoners van Zuid-Holland momenteel de minste toegang tot groen hebben. Momenteel zijn de verbindingen vooral gericht op steden, terwijl het platteland wordt doorkruist. Recreatieve bestemmingen in Midden-Delfland kunnen beter benut worden, vooral de potentie van waterrecreatie in het veenweidegebied. Door de ecologische hoofdstructuur toegankelijker te maken en recreatieve waarden te integreren met toekomstige landbouwbedrijven, zal dit leiden tot een overgang van agrarische monocultuur naar een diverser landschap.

Recreatiegebieden aan de stadsranden kunnen landbouw verbinden met stedelingen en lokale voedselketens ondersteunen. Door meer recreatiegebieden en voorzieningen als toegangspoorten tot het landschap toe te voegen, wordt de relatie tussen landbouw en lokale burgers verrijkt, betrokkenheid gestimuleerd en waardering voor het landelijke erfgoed vergroot. De groeiende vraag naar recreatie door bevolkingsgroei vereist duurzame mobiliteitsoplossingen en een betere bereikbaarheid van het platteland vanuit de steden. De beperkte groene ruimte en auto-gecentreerde infrastructuur vormen obstakels. Duurzame mobiliteitsoplossingen, zoals het verbeteren van fietsroutes en het toepassen van de principes van de 15-minutenstad (Luscher, n.d.), kunnen de connectiviteit verbeteren en gezondere vervoerswijzen bevorderen.

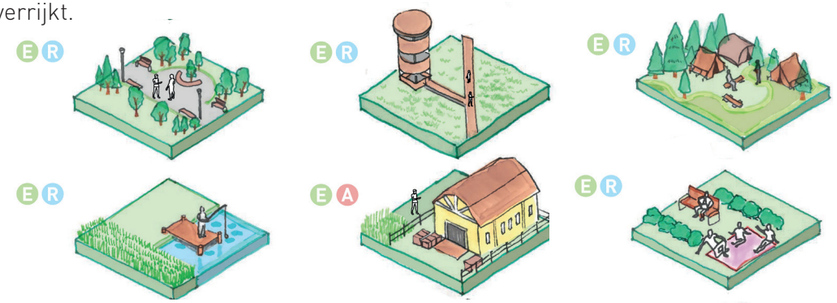
Ontwerp

Centraal in het ontwerp voor Midden-Delfland staat de transformatie tot een duurzaam metropolitaan park. Het omvat verschillende strategische 'lokale ontwerpinterventies', die de synergie in verschillende ontwerpprincipes voor de uitdagingen in 2070 laten zien. Het voorstel omvat:

1. Ecologisch kerngebied:
Een gebied waarin natuurlijke ontwikkeling de boventoon voert, omringd door een bufferzone, met bestaande recreatiegebieden aan de stadsranden als grenzen. Door het strategisch verdelen van diverse habitats, zoals veengebieden, moerassen en bossen, wordt biodiversiteit bevorderd.

2. Natuurinclusieve Landbouw:
Daarnaast wordt voorgesteld om het landgebruik van de agrarische sector te verschuiven naar meer natuurinclusieve methoden, waaronder paludicultuur, evenals het bevorderen van agroforestry op de minder kwetsbare kleibodems. Door het creëren van strategische corridors wordt ecologische verbindingen gewaarborgd en fragmentatie wordt verminderd.

3. Recreatiegebieden:
Bestaande recreatiegebieden dienen als toegangspoorten tot het landschap, met een verbeterd fietsnetwerk. Door het gebruik van onbenut groen in het hart van Midden-Delfland en het uitbreiden van waterrecreatie worden klimaatoplossingen extra versterkt, zoals de toevoeging van een recreatieplas in de kern voor extra kanoverbindingen. Door het toevoegen van zowel intensieve als extensieve recreatiezones en het creëren van thematische activiteitenclusters, ook op boerenerven, wordt de recreatieve ervaring voor zowel inwoners als stedelingen verrijkt.

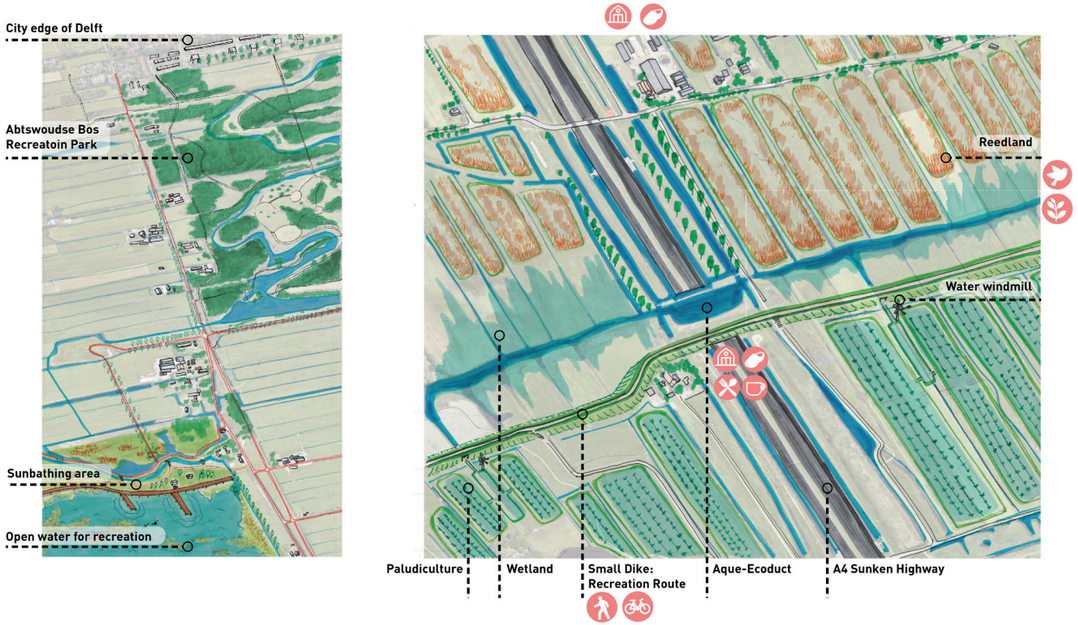


De ontwerp principes en synergiën tussen de drie thema's zijn terug te vinden in hoofdstuk 4, vanaf pagina 113.

4. Synergieën tussen Thema's:
De synergiën tussen de verschillende thema's, met name op het gebied van aanpassingen aan waterstelsel door verhoging van waterpeil en toevoeging van extra water, vormen de drijvende kracht achter de optimalisatie. Een hoger waterpeil wordt zowel door de landbouw als de ecologie vereist om bodemdaling te voorkomen. Bovendien leidt dit tot een intensief waterrecreatiegebied met kansen voor meer recreatieve functies in het hart van Midden-Delfland. Door te focussen op het verbeteren van niet-auto gerelateerde transportnetwerken en het versterken van lokale handelssystemen voor boeren, kunnen landbouw- en recreatie doelstellingen met elkaar worden verzoend.

5. Fiets & Eco verbinding:
Een laatste concrete lokale interventie omvat een nieuw fietsecoduct dat verschillende natuurgebieden verbindt, waarbij mobiliteit, recreatie en ecologische netwerken worden gecombineerd.

De lokale ontwerpinterventies zijn terug te vinden in hoofdstuk 7, vanaf pagina 215.



Conclusies & Aanbevelingen

Om de ontwikkelingsstrategie voor Midden-Delfland 2070 tot een succes te maken, is een focus op het behoud van de unieke karakteristieken van het landschap cruciaal, inclusief het agrarische gebruik, de fietsbaarheid, en de ecologische waarde en aantrekkelijkheid voor weidevogels. Tegelijkertijd zullen aanpassingen nodig zijn om tot een duurzaam toekomstbeeld te komen. De huidige intensieve landbouwpraktijken hebben geleid tot bodemuitputting en bodemdaling, wat de ecologische diversiteit heeft verminderd. De traditionele visie op het landschap komt niet overeen met de werkelijke ecologische toestand. Daarom is een nieuwe benadering nodig, waarbij natuurlijke veenlandschappen worden hersteld en natuurvriendelijke landbouw wordt bevorderd.

Op nationaal niveau moet het beleid voor ruimtelijke ordening een integrale aanpak omarmen, waarbij de transitie van intensief landgebruik naar extensief, natuur inclusief landgebruik in de agrarische sector wordt gestimuleerd, samen met andere uitdagingen zoals recreatie en biodiversiteit. Nieuw beleid voor alternatieve landbouwmethoden, zoals paludicultuur en agroforestry, moet door de nationale overheid worden gestimuleerd. Deze transitie vereist bescherming tegen grondspeculatie en financiële ondersteuning voor boeren die hun land willen veranderen (Janmaat et al., 2022). Provincies en gemeenten kunnen samenwerken om nieuwe technieken en benaderingen te pionieren.



Een overzicht van het metropolitan park Midden-Delfland met visualizaties is terug te vinden in hoofdstuk 9, vanaf pagina 280.

Het stimuleren van meer samenwerking tussen belanghebbenden, zoals boeren, burgers, waterschappen en gemeenten, kan een gedecentraliseerde vorm van bestuur vereisen, waardoor lokale bestuursorganen worden versterkt. Zo'n decentralisatie kan de lokale markt van een regio als Midden-Delfland versterken en zo de rol van de (internationale) markt verminderen, waar de veehouderij momenteel van afhankelijk is. Dit sluit aan bij de groeiende voorkeur voor lokale, duurzame voedselproductie en circulaire systemen.

De decentralisatie biedt een antwoord op algemene beleidsvorming bij het aanpakken van complexe lokale uitdagingen. Momenteel neemt het vertrouwen van boeren in de overheid af vanwege hun marginale invloed te midden van de dominantie van economische groei en de vraag naar hoge productie en lage prijzen van hun melkproducten (Remkes, 2022). Een meer gerichte, gedifferentieerde aanpak kan de samenwerking weer effectief maken. Dit onderzoek vult overheidsdocumenten zoals de NOVI (Rijksoverheid, 2020) aan, die de eerste transitie stappen in veenweidegebieden beschrijven. Dit onderzoek benadrukt de complexiteit van lokale kwetsbaarheid en de behoefte aan een genuanceerde strategie, onder andere gebaseerd op water- en bodemcondities. Gedecentraliseerde aanpak vergroot de effectiviteit door lokale overheden in staat te stellen veranderingen af te stemmen op specifieke uitdagingen en oplossingen. Dit kan nieuwe grondwaterpeil sub-gebieden omvatten, begrensd door tussenboezems, die gezamenlijk worden beheerd door belanghebbenden zoals gemeenten, waterschappen, boeren en leden van de gemeenschap. Dit bevordert samenwerking tussen lokale bewoners, vergroot milieubewustzijn en deelt de verantwoordelijkheid voor het landschap.

Door lokale uitdagingen aan te pakken met een gedifferentieerde strategie en de verantwoordelijkheid voor het landschap te delen, kan een veerkrachtig, bloeiend en levendig metropolitaan park in Zuid-Holland worden gecreëerd, dat zowel recreatief gebruik, landbouwproductiviteit, ecologische diversiteit als gemeenschapsbetrokkenheid bevordert: van stedeling, tot dorpeling, tot vogelaar tot boswachter tot boer!

Master Thesis
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Midden-Delfland: The Metropolitan Park towards 2070

Graduation Lab: Metropolitan Ecology of Places

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Urbanism

TU Delft BK Bouwkunde

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Midden-Delfland:

The Metropolitan Park towards 2070

Wieke van Ulsen



[Fig.1] 'De Gaag' between Delft and Den Hoorn (Photograph made by author.)

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Abstract

Midden-Delfland is located in the province of Zuid-Holland and bordered by cities like Delft, Den Haag, Vlaardingen, Schiedam and Rotterdam. The area consists of an open, peat-meadow landscape, dominated by livestock farming.

Over the past 50 years, this landscape has transformed into a densely urbanized and fragmented part of the Southern Randstad. The accelerated pace of urbanization has reduced the available space to mitigate the effects of climate change. The KNMI climate scenarios predict a temperature increase of 4.9°C and a sea-level rise of 2.5 meters by 2100 (Bessembinder et al., 2023). Located at the end of a river delta and mostly below sea level, the province of South Holland is becoming increasingly vulnerable to flooding as extreme weather events become more frequent. In addition, the A4 motorway and railway infrastructure that cross the landscape from north to south, create a fragmented landscape. In light of these concerns, a strategic plan is needed to mitigate the effects of climate change. This requires the identification of areas and spaces that can act as buffers against water shortages and extreme weather events. The region of Midden-Delfland emerges as a location of interest. In addition to the need to create more green buffer zones, the importance of connecting urban areas with rural areas becomes clear. The municipality of Midden-Delfland (Gebiedstafel Bijzonder Provinciaal Landschap Midden-Delfland, 2021) describes its role as an outdoor green area, which should be accessible to 2.3 million inhabitants of the metropolitan region of Rotterdam-The Hague. This attraction of people into the area, in search of recreational green space, places considerable pressure on the Midden-Delfland region.

In 2017, this region was designated the title as a 'Bijzonder Provinciaal Landschap' underlining its status as a distinctive provincial landscape. This designation serves to protect its rich historical, agricultural, ecological, cultural, and recreational heritage However, this designation is not legally binding and serves more as a qualitative label.

This thesis is centered around three dominant themes: ecology, recreation, and agriculture. The development of the design titled 'the Metropolitan Park', serves to illustrate the significance of this area for the surrounding urban area.

In addition to its agricultural function, this area also has a strong ecological character. The Midden-Delfland region is home to a multitude of ecologically rich habitats, including peat bogs, wetlands, meadow bird zones, and forests. Currently, the agricultural sector plays a significant role in the conservation of the ecological character, with numerous farmers participating in the management of their land for the meadow birds populations. Despite this contribution, the agricultural sector still has a negative impact on environmental changes in Midden-Delfland. Farmers strictly control the water level for their agricultural practices. Low water levels dry out the peat soil, which in turn causes the peat to oxidize and emit CO2. The oxidation of peat leads to subsidence, making the land increasingly vulnerable to floodings and droughts. Furthermore, the use of pesticides, manure, and fertilizers by farmers results in eutrophication, water pollution, and the accumulation of excessive nitrogen and carbon dioxide, which harms the natural environment (Altenburg & Wygema ecologisch onderzoek, 2018).

This thesis proposes a new vision, accompanied by a development strategy for the future of the 'Bijzonder Provinciaal Landschap', that overcomes the duality of collaboration and conflict between the agricultural and ecological sectors. The research is divided into two sections: a design section and a governance-oriented section.

The maximization method is used to investigate each theme, with the aim of identifying optimal solutions. In order to develop an integrated vision for the year 2070, spatial conflicts are addressed. The research will also address the development of policy, the identification of stakeholders, and the outlining of strategic steps. Eventually, this thesis provides insights for municipalities such as Delft, Rotterdam, The Hague, and Midden-Delfland itself, encouraging the formation of integrative alliances and the pursuit of sustainable trajectories.

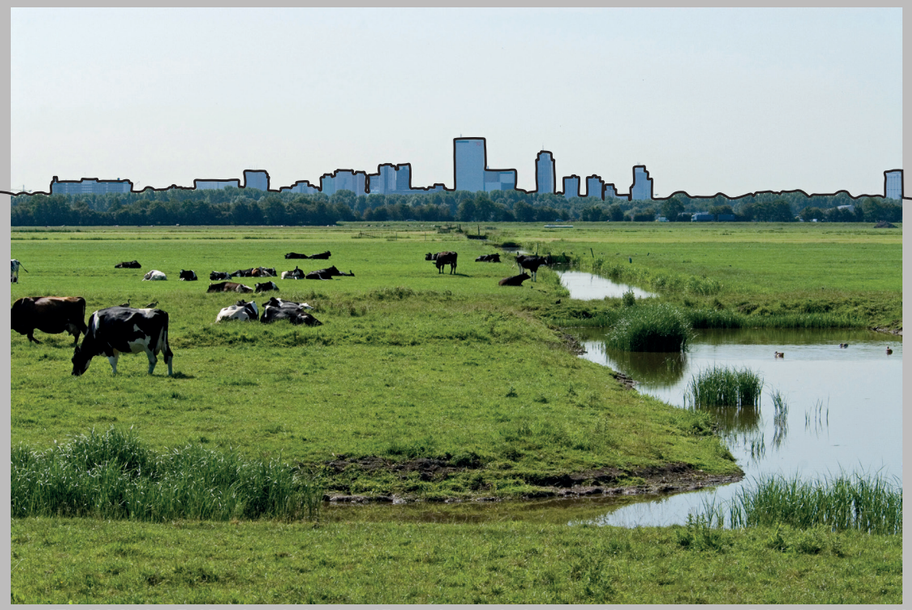
Author's Note

Dear reader,

This thesis fulfils the role of my final project of the Master track Urbanism within the broader programme of Architecture, Urbanism and Building Sciences at the Technical University of Delft. The thesis has been developed within the studio 'Metropolitan Ecologies of Place', a studio that addresses ecological and socio-economical transitions of today. During my master, I followed both courses from the disciplines of urbanism and landscape architecture, so my goal was to cover both topics within the thesis. Finally, I am happy to present the vision design of this report, for a specific region: The area of Midden-Delfland. This area is located at the nexus of the urban and the rural, and therefore serves as a perfect example to combine both urban design as well as design for rural landscapes. Connected to the city, it serves as an ecological, agricultural, and recreational landscape, but it is also subject to various complex issues that threaten its sustainability. This thesis will proceed to examine the future of Midden-Delfland, focusing on the year 2070. I hope to provide you, the reader, with an enjoyable and inspiring document.

Wieke.

Chapter 1

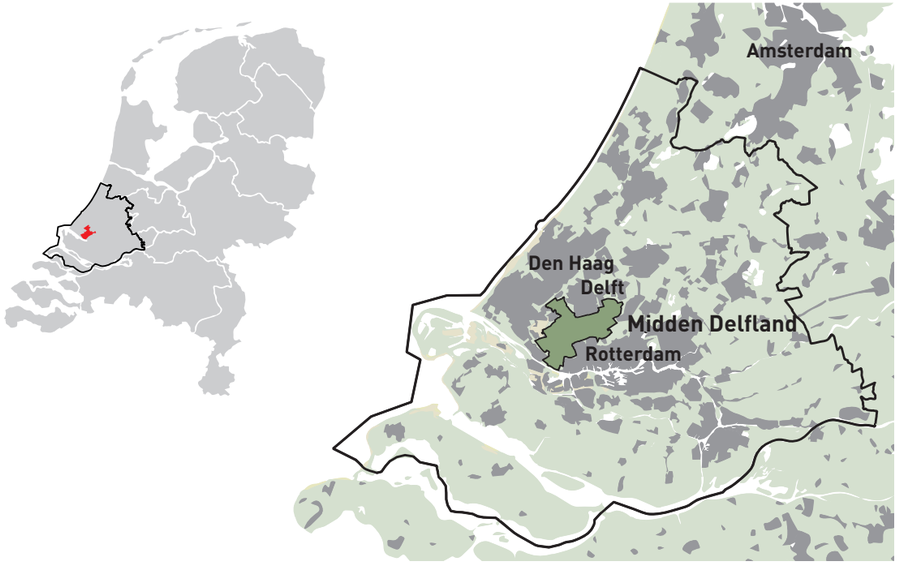


[Fig.2] Midden-Delfland, with the city of Rotterdam at the horizon. (*Natuurmonumenten, Polder Schieveen, 2023)*

Introduction

Midden-Delfland: an open, green character

Midden-Delfland is a region with an open character, in the province of South-Holland, The Netherlands. The area is bordered by three bigger cities: Delft, Den Haag and Rotterdam. Next to this, cities like Vlaardingen, Pijnacker-Nootdorp and Schiedam are part of the borodering urban area. Another border is the productive urban area of Westland: a greenhouse landscape. In 2017, the area was granted the classification of "Bijzonder Provinciaal Landschap" (Gebiedstafel Bijzonder Provinciaal Landschap Midden-Delfland, 2021), as a special provincial landscape. This title was designated to ensure that the "openness" as a characteristic of the area would be conserved, as well as its agricultural, cultural and recreational heritage and the biodiversity present in the area.



[Fig.3] Location BPL Midden-Delfland . Made by author. (QGIS, 2023)

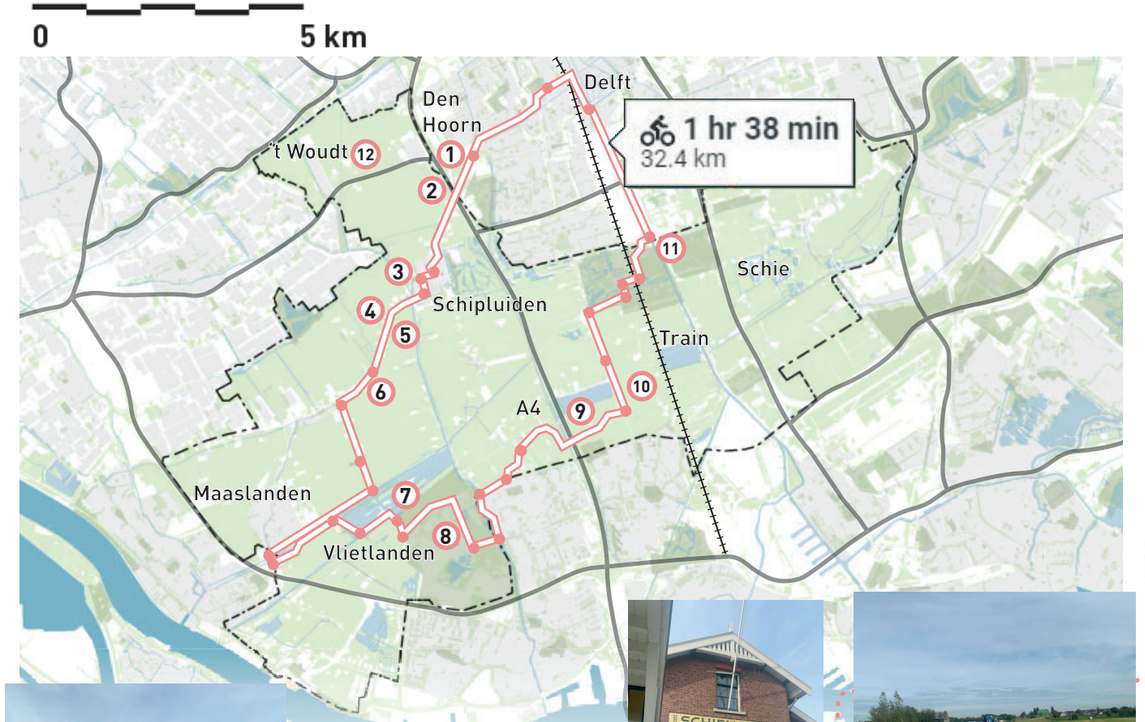
Cycling through rurality

When cycling through the region, one might initially just notice the open, green character of the landscape of Midden-Delfland. However, by taking a closer look, the rich history of this area will slowly become visible. Layer by layer, it reveals itself on the green and blue canvas, with the city in the distance: as each change of the landscape has been built upon the other, with distinctive elements that have stayed permanently, like the height difference of the creek ridges, the rhythm of the plots, the dikes, the windmills and the historic buildings in and around the villages.

Around 5000 years ago, this area was more closely connected to the sea than it is today. Behind the dune ridges and in between the tidal channels, a swampy landscape emerged, leading to the formation of peat. The remnants of this peat in Midden-Delfland today, are classified as 'peat-meadow'. Additionally, the tidal influence of the sea contributed to the development of clay deposits and creeks. Under influence of the tides, sandy deposits were also brought in. During this era, the first inhabitants tried to alter the landscape and settle here. Since the middle-ages, humans have been digging ditches and draining the landscape to make it more habitable and for agricultural practices. Due to these alterations, the peat settled in more and more, causing the soil to subside over the years. However, the creek ridges, consistent of sand and clay, stabilized and remained and as elevated mounds. These became ideal higher locations for new settlements, shaping the characterizing villages of Midden-Delfland: Maasland, Schipluiden, Vlaardingen, Den Hoorn and the small picturesque village of 't Woudt (IJsselstijn & Mils, 2017).

What began with the layout of small ditches and dikes in the Middle Ages, evolved into a bigger, complex system of canals and waterways, designed to protect the land from flooding. The introduction of windmills, dikes and even mechanical pumps, further enhanced the control over the water, which became a distinctive feature of Midden-Delfland. This control even facilitated the reclamation of new land by poldering the swampy areas. This structure of polders and main waterways has remained recognizable for centuries in Midden-Delfland.

Because peat is less fertile and therefore less suitable for growing crops, livestock farming is the predominant form of agriculture in this region. This type of production also has a clear impact on the landscape: the sight of grazing cows in green meadows is a common sight for every commuter in Midden-Delfland.





1 Differentiation in use, leisure at waterfront



2 Aquaduct



8 City at the edge



9 Big infrastructure



3 Village / heritage

4 Quay mowing



10 Train underpassage



11 Industrial character of the Schie

[Fig.4] A bicycle trip through Midden-Delfland. Made by author. (QGIS, 2023)

The benefit of these open, expansive green meadows, is that it creates the aforementioned sense of openness and tranquillity. It allows every visitor to enjoy the landscape with wide open views into the distance. Unique for Midden-Delfland is the city that is visible at the end of the horizon from almost every wind direction. The city really 'frames' this special landscape.

The agricultural use of the landscape in Midden-Delfland, also attracts a specific biosphere with distinct species. A lucky visitor might catch a glimpse of meadow birds, drawn to this type of habitat. Midden-Delfland therefore offers a wide variety of nature: from wetlands to forests. One example is Vlietlanden, a nature reserve preserving a heightened peat-landscape , which has remained less alternated by humans and which anchored itself in the landscape by its height difference.
For recreational activities, this area provides great possibility to cross by bike, but other modes of recreative transport are also possible: from walking to horse riding, skating or canoeing. Along the edges, a visitor can settle down after a long bike ride on one of the benches in the recreational forests, like Abtsowoudse bos. Apart from what the open landscape has to offer, these places connect the city and the countryside, especially for the city dweller looking for a break from city life.



5 Art & Sightseeing



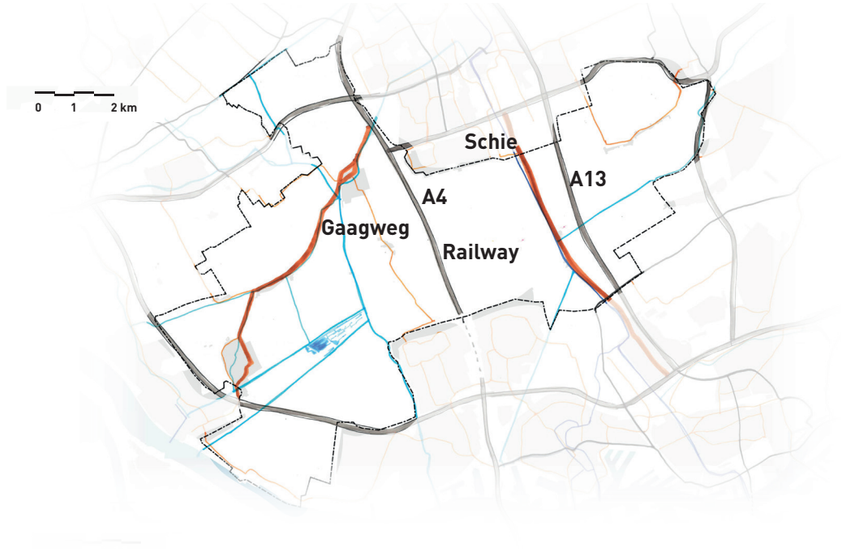
6 Food production



7 Vlietlanden

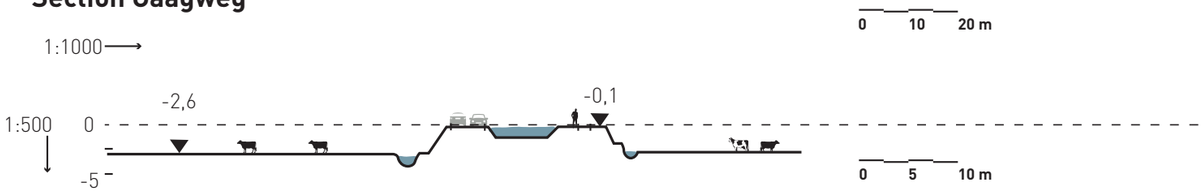


12 Picturesque 't Woudt

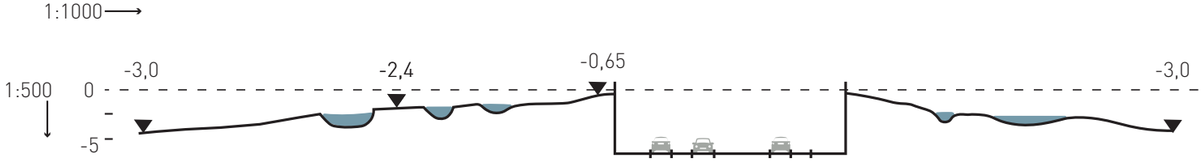


[Fig.5] Zoom-in on infrastructural barriers crossing Midden-Delfland . Made by author. (QGIS, 2023)

Section Gaagweg



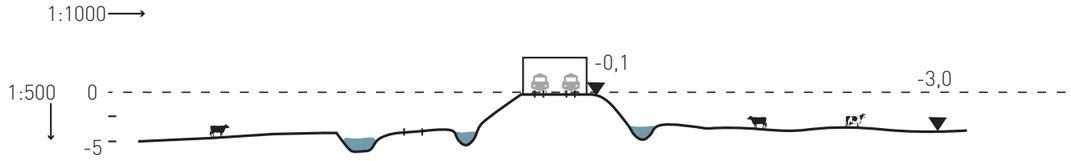
Section A4



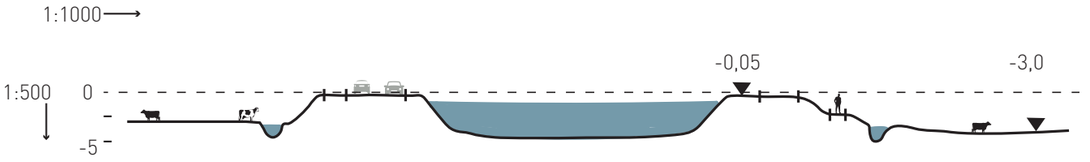
Landscape Sections

Even though the area is known for its openness, it is crossed by some big infrastructural lines form north to south direction, shown on this page. This creates a fragmented landscape. An example is the A4 highway, which although it is sunken in the landscape, forms a line of infrastructure that is hard to cross. There is also a railway cutting through the area that connects Delft and Schiedam. The Schie is a canal that is more industrially oriented than ecologically friendly with hard banks for traffic.

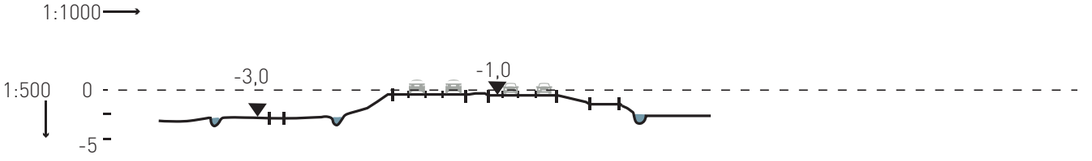
Section Railway



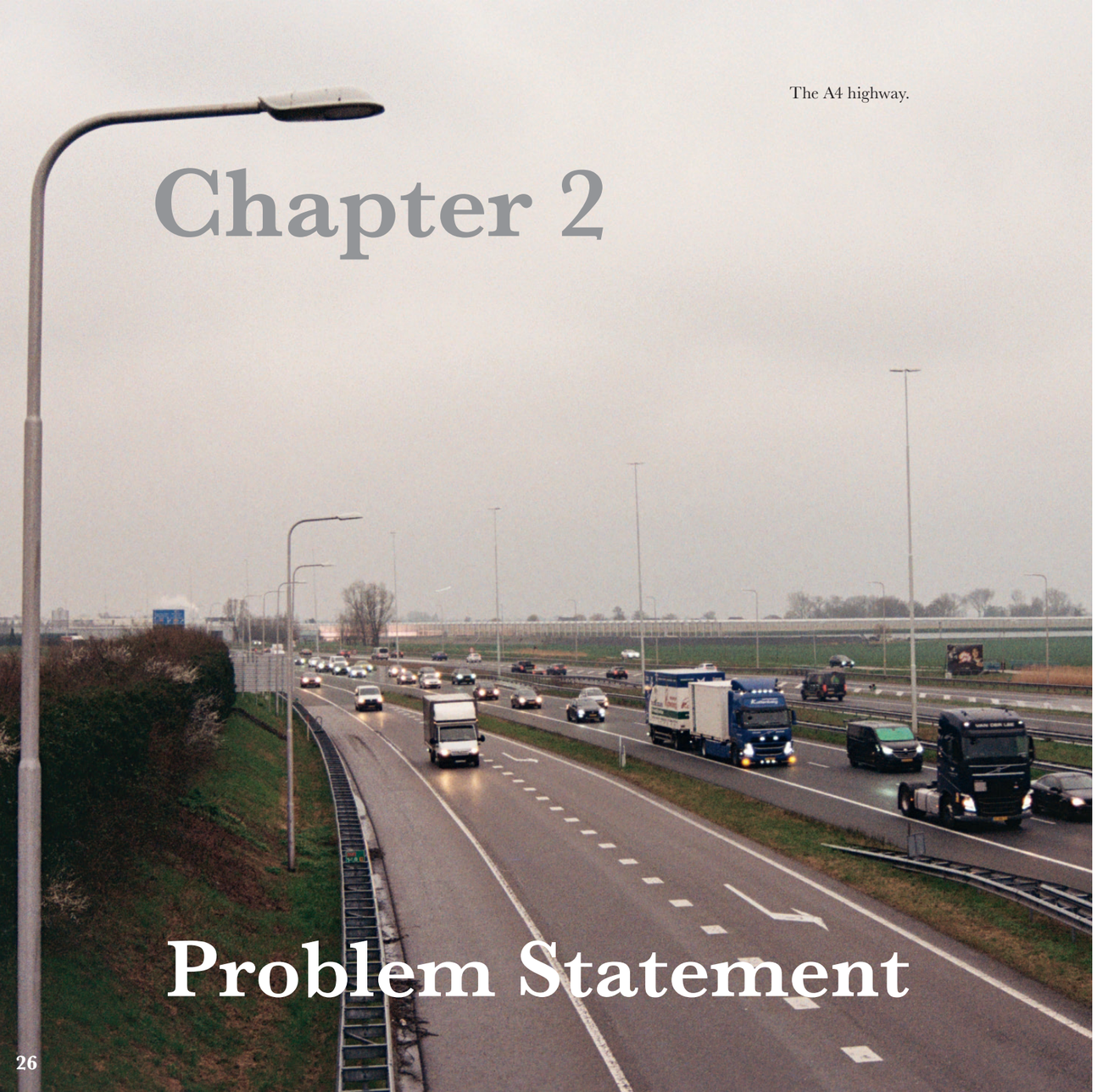
Section Schie



Section A13



[Fig.6] Landscape Sections . Made by author.



The A4 highway.

Chapter 2

Problem Statement

2.1 Introducing the challenges on the bigger scale: Climate Change

Antrophocene

As humanity, we have now entered the Anthropocene epoch, a period succeeding the Holocene, the previous geological era. This shift, driven by the accelerating growth of inventions and technologies during the industrial period, marks a new era where humanity has become the prominent force, impacting our planet on all scales. By exploitation of our natural resources, we have been able to burn fossil fuels for production, transportation and many other purposes (Crutzen, 2006). This has led to substantial amounts of greenhouse gas emissions such as CO2, polluting the air. CO2 is emitted by burning oil, natural gas or coal. Livestock farming also contributes to the release of emissions into the atmosphere (Bos et al., 2023).

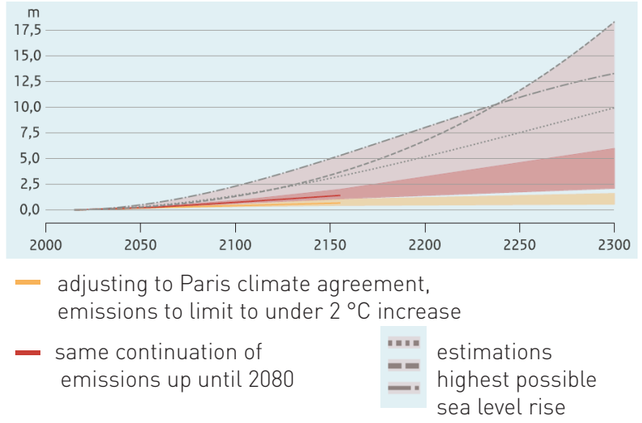
Paris Climate Agreement

As a result, the global climate is changing, and our Earth is warming up. This inevitably has its impact on the Netherlands. To confront this global challenge, decisions have been made to limit climate change through the Paris Climate Agreement (UNFCCC, 2018), adopted at the UN Climate Change Conference in 2015. The agreement states that the participating countries aim to restrict "the increase in the global average temperature to well below 2°C above pre-industrial levels" and pursue efforts "to limit the temperature increase to 1.5°C above pre-industrial levels.". The Netherlands is part of the Paris Agreement and is also actively taking steps to reduce greenhouse gas emissions to mitigate climate risks.

KNMI Climate Scenario's

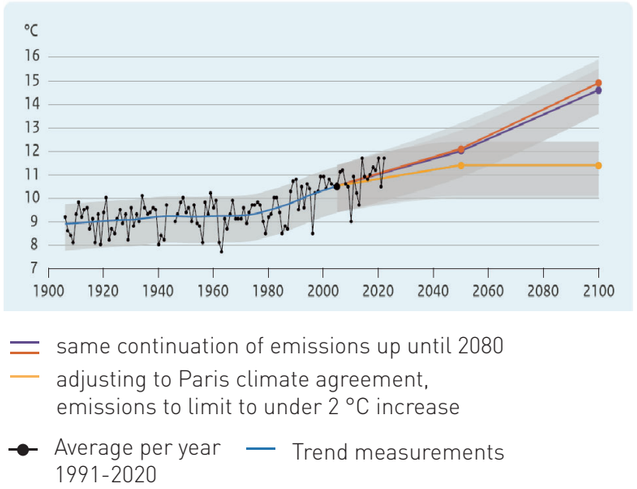
The urgency for the Netherlands to participate in the climate agreement has recently become more evident after the Royal Netherlands Meteorological Institute (KNMI) presented the new developments following their research into the national weather and climate. This institute outlined the severe effects of climate change, providing predictions and figures in their climate scenarios (Bessembinder et al., 2023). Beyond the limited temperature increase of the Paris climate agreement, they predict a global temperature increase of 4.9 °C in 2100 , if greenhouse gas emissions continue without restrictions, maintaining the current pace until 2080 and flattening afterwards. Further heating of the Earth will increase the frequency and intensity of heatwaves, extreme precipitation patterns (rainfall), and droughts. This is also applicable to the Netherlands. However, a particularly concerning change for the country is the rise in sea level. Due to the global temperature increase, the icecaps of Greenland and Antarctica are shrinking rapidly, heightening water-levels with melting water. The consequence for the Dutch coast is an increase in sea level rise of 1 meter after 2150. This can reach up to 2.5 meter around the year 2100.

Sea level rise in the Netherlands until 2300



[Fig.7] Sea level rise in the Netherlands until 2300. (Bessembinder et al., 2023)

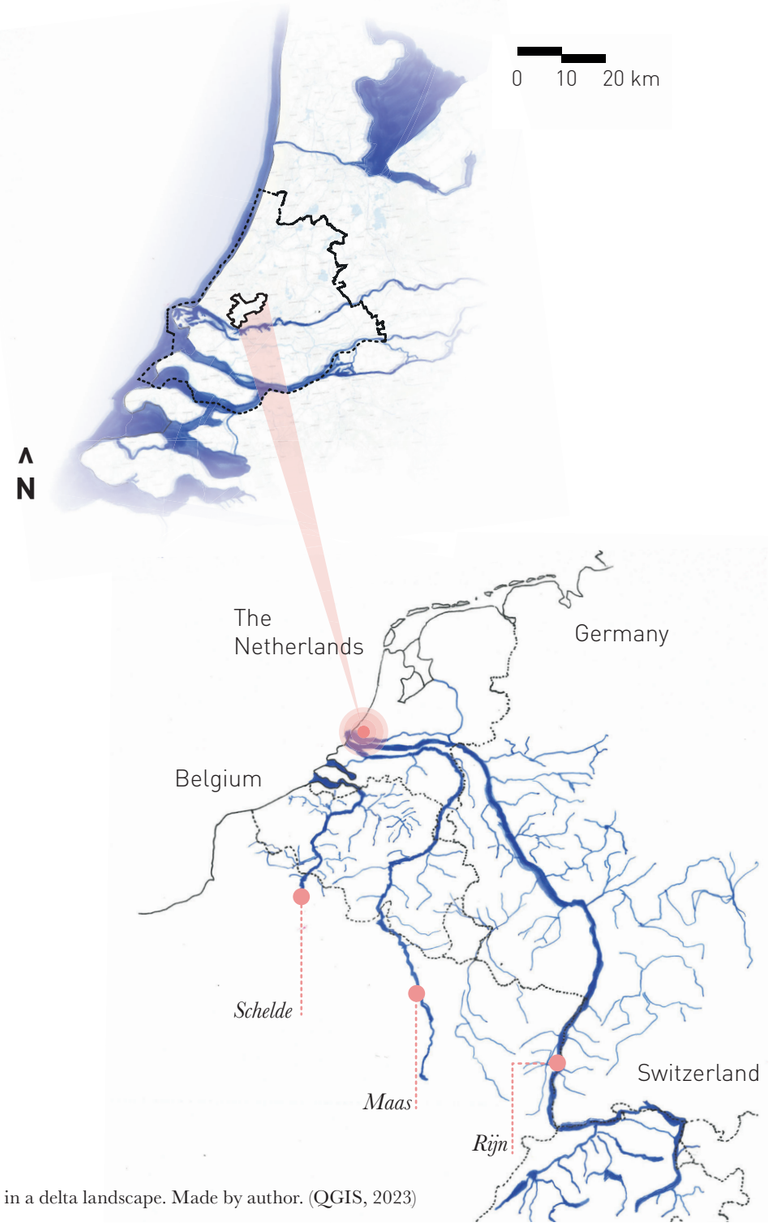
Yearly temperature in the Netherlands



[Fig.8] Yearly temperature in the Netherlands. (Bessembinder et al., 2023)

Delta Landscape of South Holland

In the light of these predictions, urgent challenges also arise for the future of the province of South Holland and the region of Midden-Delfland. South Holland is strategically positioned in a delta landscape closely connected to the sea. Here, the port of Rotterdam acts as a trading hub and the hinterland is transformed into a habitable landscape by poldering with dikes. However, due to this reclaimed land, the area no longer functions as a typical delta, with limited influence from the sea and swamps, peat formation and tidal changes (Schra et al., 2022) The coastal peat and river clay landscape is now protected by coastal sand ridges, dams, and dikes, but the strategic location also brings significant vulnerability.

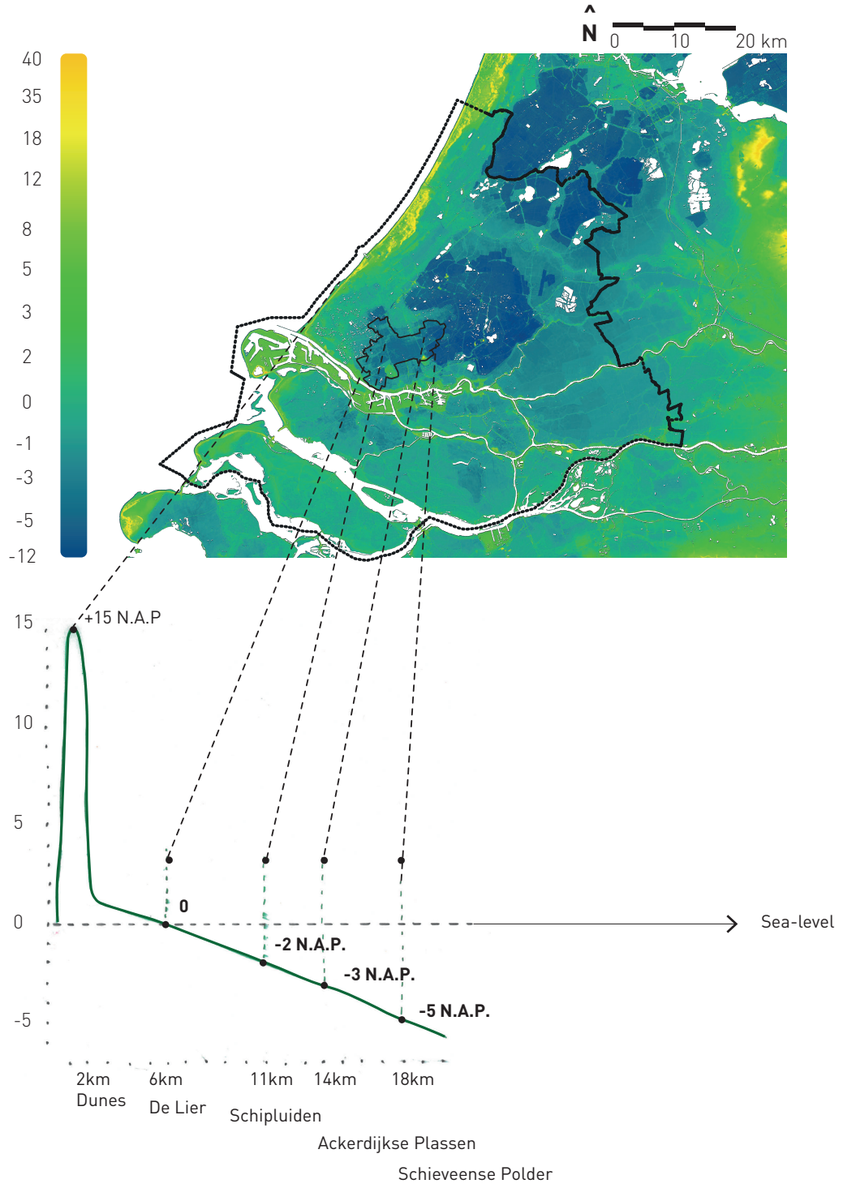


[Fig.9] Midden- Delfland situated in a delta landscape. Made by author. (QGIS, 2023)

The lowlands of South-Holland

The majority of land in the province is located below sea-level, as illustrated by the height map and ground level figures in figure 10. Some areas, particularly the peat landscapes, are at risk of subsidence. The rising sea level poses a major threat, primarily through the increased risk of flooding. Additionally, several other the risks arise, such salinization, shortages of freshwater, heat stress and water excess in urban areas due to more extreme periods of heat and rainfall (Provincie Zuid-Holland, 2018).

Given the growing threads shaped by the effects of climate change, there is a need for the province to develop a smart strategy to mitigate these changes. This strategy should involve the careful allocation and consideration of space, identifying areas that can store and collect excesses water and that can serve as buffer zones during longer periods of heat stress and drought. The region of Midden-Delfland emerges here as a location of interest: this will be elaborated on further in this chapter of the Problem Statement.



[Fig.10] A big part of South Holland is located below sea level. Edited by author. (Actueel Hoogtebestand Nederland (AHN), 2023)

2.2 Zooming in on Midden-Delfland: Problematization

Midden Delfland's open, green character: bordered by cities

The Midden-Delfland area was previously introduced as an open peat-meadow landscape primarily dominated by livestock and dairy farming. Furthermore, the rural landscape is scattered with natural areas, characterized by meadows, waterways and small historic villages, located on higher grounds.
In 2017, this region was granted the classification of "Bijzonder Provinciaal Landschap" (Bijzonder Provinciaal Landschap Midden-Delfland, 2021), underlining the existence as Special Provincial Landscape and to installed protect its openness. However, the endurance of this classification is threatened by future developments, while urbanization and climate change as upcoming challenges have shown that the protection of an open, more 'natural' area has become more and more urgent over the past decade.

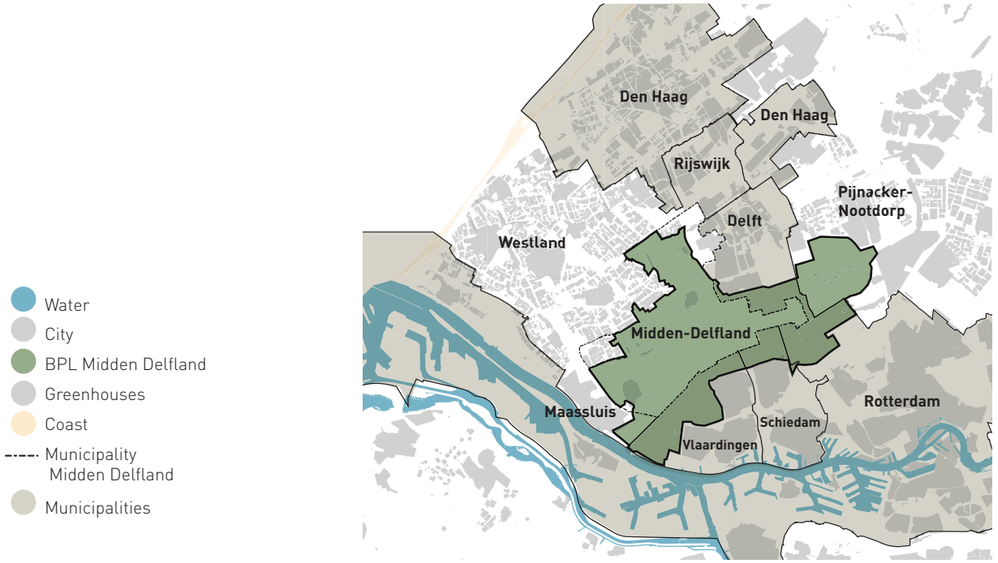
Midden Delfland: an area of interest, to be further explored:

To understand the current state of Midden-Delfland, it is important to understand the policy-making processes shaping its landscape. The Policy Document analysis in the beginning of Chapter 4, starting circa 1950, outlines the steps taken by governmental parties. Formed on January 1st, 2004, from the merger of Maasland and Schipluiden municipalities, Midden-Delfland's borders differ from BPL Midden-Delfland's, extending beyond the Schie waterway (see figure 11). This thesis makes use of the borders of BPL Midden-Delfland. The first interest for the region arose when Midden-Delfland was designated a 'Rijksbufferzone,' a buffer zone established by the national government. The 'Reconstruction-law' started the process of arranging the functions in Midden-Delfland on behalf of the province of South-Holland. Since 2011, the area does not have a legislated and protected status anymore, as the national government withdrew from landscape and rural policies, leading to decentralization. The responsibility was handed over to the provinces who gained control over the spatial development of their rural areas. The planning of the A4 highway precedes the 1950s, but execution in Midden-Delfland occurred decades later, with the aim to create a highway that minimally impacts the natural landscape. The A4 was completed between 2012 and 2015.

After the decentralization, the municipality still wanted to protect the area from urbanization, which resulted in the assignment of the title 'Bijzonder Provinciaal Landschap.' However, this title, that lasts for a period of eight years, is not legally binding and serves more as a qualitative label.

Looking ahead, national policy documents also indicate uncertainties for Midden-Delfland. The province of South-Holland aims to construct 170,000 new homes by 2040, potentially expanding residential areas into the open landscape. The KNMI climate scenarios predict a temperature increase of 4.9°C and a sea-level rise of 2.5 meters by 2100, raising questions about Midden-Delfland's future role. Situated in a low-lying area, it stands as a patch of green amidst urbanized land.

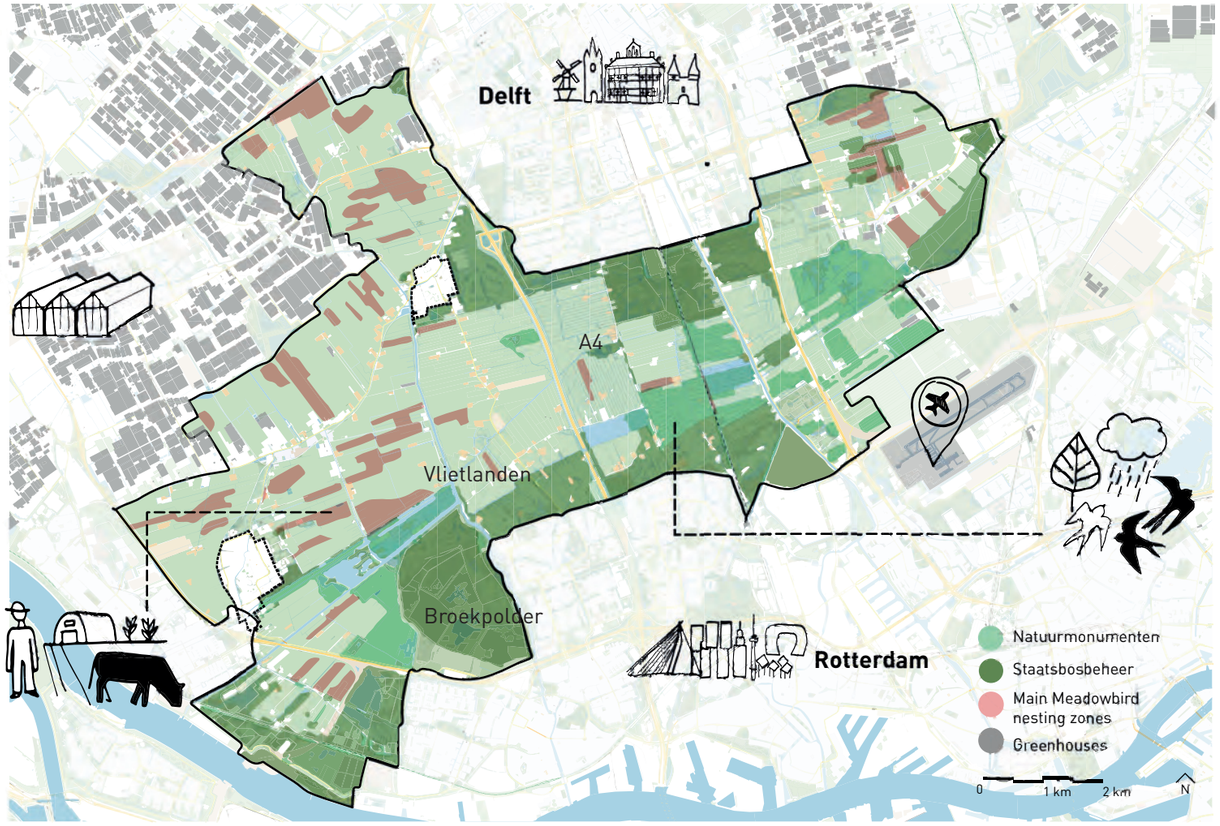
All these uncertainties serve as an interesting foundation for this thesis to propose a new plan and vision for the future of 'Bijzonder Provinciaal Landschap' Midden-Delfland.



[Fig.11] Map showing the borders of the municipality and the borders of BPL Midden-Delfland. Made by author. (QGIS, 2023).

Rapid Urbanization

Before the Second World War, Zuid-Holland was mainly a coastal area with water and peat meadows and a few compact towns scattered around a network of waterways. This landscape has changed considerably in recent decades due to human influence and development. Over the past 50 years, urbanization has played a key role in reshaping the spatial arrangement, transforming the province into a densely urbanized and fragmented part of the Southern Randstad (see the timeline of figure 13). This transformation includes the development of residential and economic areas such as Rotterdam Airport and greenhouse landscapes (as shown in figure 12). The transition from cities in a landscape to a landscape where cities and their hinterland are intertwined reflects this change (Gemeente Delft et al., 2009). This urbanization trend, largely driven by the expanding Rotterdam-The Hague metropolitan region, intensifies the competition for space



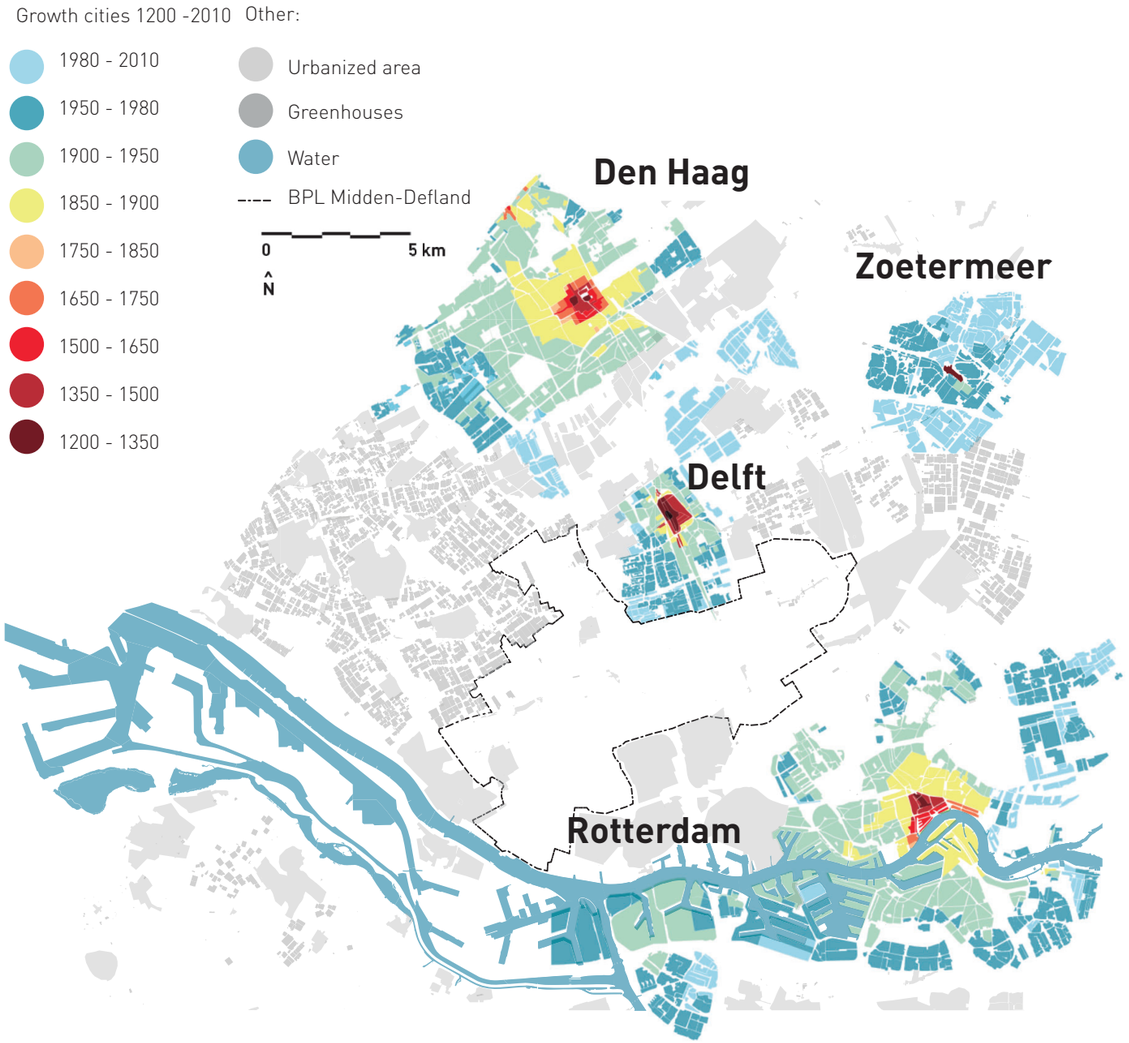
[Fig.12] Overview Bijzonder Provinciaal Landschap Midden-Delfland. Edited by Author. (Altenburg & Wygema ecologisch onderzoek, 2018)

Looking at the past spatial developments of the last 50 years, agricultural land in the province has been diminished from 61% to 45%, making way for urbanized areas, while also incorporating some green and recreational areas, that grew from 5% to 10% (Bureau Verkenning en Monitoring Provincie Zuid-Holland et al., 2022). However, despite this growth, the availability in green space within cities is under threat. The future also presents another challenge of densification in terms of urbanization. From the period of 2010 to 2040, the government wants to build around 170, 000 new homes. Densification without expanding into the hinterland means that densification within cities will decrease the availability of green spaces. More people in the same city area will result in an increased need for green spaces such as parks (Provincie Zuid-Holland et al., 2017).

Preserving this patch of nature is crucial for mitigating the aforementioned climate change effects. However, Midden-Delfland remains the only designated area in South Holland to provide ecosystems services and nature, there will be a lot of pressure on this middle part. Beside the aim to create more green spaces within cities, connecting urban areas with rural areas is also essential. The municipality of Midden-Delfland, within their vision toward 2040, (Bijzonder Provinciaal Landschap Midden-Delfland, 2021) envisions its role as an outdoor green area, directed at 2.3 million inhabitants of the metropolitan region of Rotterdam-The Hague. However, accommodating such a large population seeking recreational opportunities in green areas will be a big challenge for Midden-Delfland.



[Fig.13] Timeline Urbanization BPL Midden-Delfland. Edited by author. (topotijdreis.nl, n.d.)



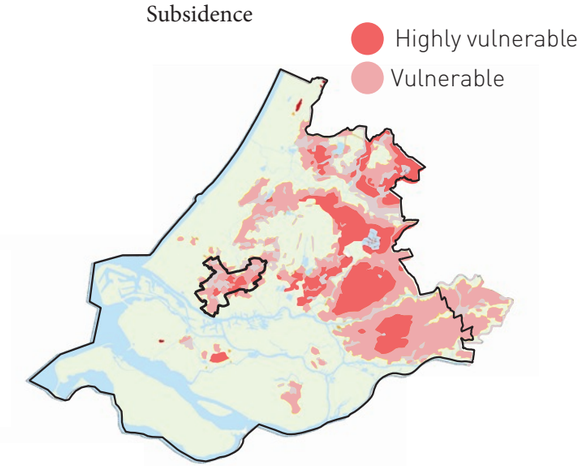
[Fig.14] Growth of cities in South-Holland from 1200-2010. Edited by author. (Rijksdienst voor het Cultureel Erfgoed, n.d.)

Ecological values of the landscape

The ecological values of the area are all the biodiversity qualities typical of a peat meadow landscape, including peat bogs, wetlands, meadow bird zones and woodlands. The area is also attractive as a resting spot for migratory birds on an international scale, thus contributing to a wider ecological habitat. Most of the areas of higher ecological value are controlled by nature conservation authorities such as Natuurmonumenten and Staatsbosbeheer. However, these institutions are not the only ones in control of nature. In the current situation, the agricultural sector in Midden-Delfland plays a major role in the conservation of ecological sites, as a significant number of farmers participate in managing their land so that it is suitable for meadow birds in the designated season (Altenburg & Wymenga ecologisch onderzoek, 2018).

Duality of the problem

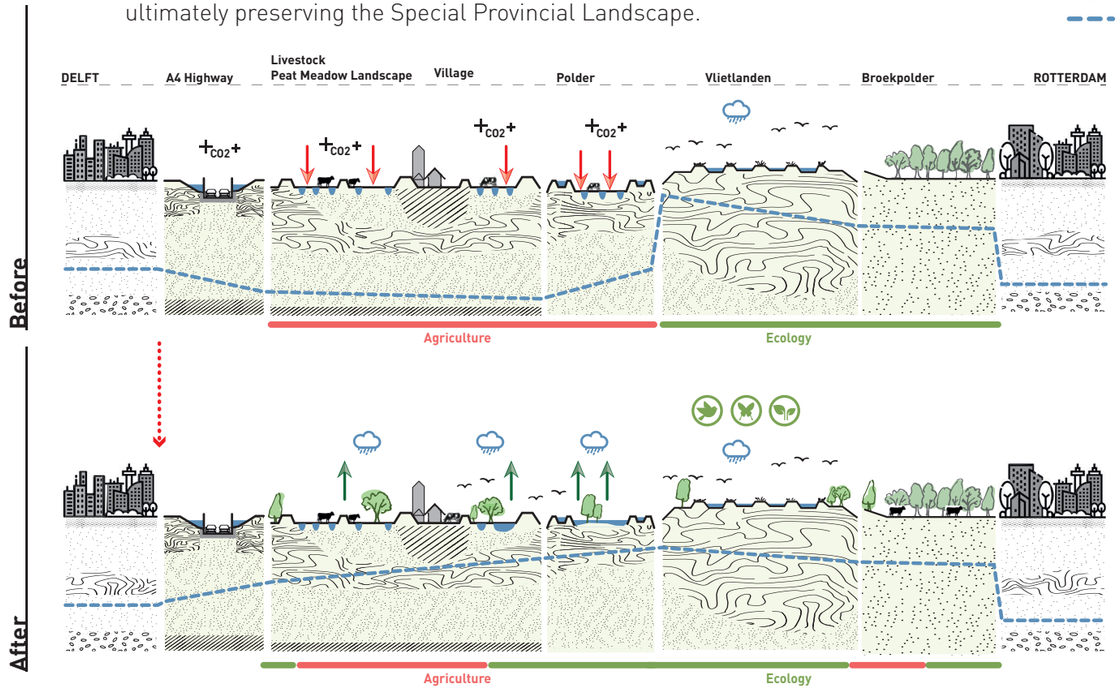
Despite the ecologically beneficial contribution of the agricultural sector to the area, this sector also significantly contributes to negative environmental changes in Midden-Delfland. Farmers strictly control water levels to ensure their agricultural practices and productivity. Low water levels can dry out the peat soil, leading to peat burning of peat, oxidation and CO2 emissions. Maintaining this system causes the subsidence of soil, making the land even more vulnerable to floodings and droughts. Additionally, the use of pesticides, manure, and fertilizers by farmers results in eutrophication, water pollution, and excess nitrogen and CO2, all of which have a negative impact on nature (Altenburg & Wymenga ecologisch



[Fig.15] Subisdence in South-Holland. Edited by author. (Oude Essink, et. al, 2008)

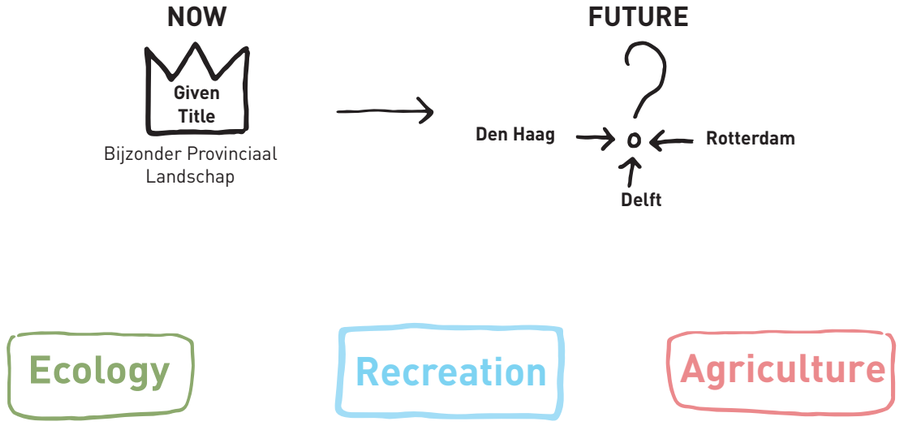
Envisioning a future: three themes

Opportunities for Midden-Delfland lie in creating a stronger alliance between ecologists and famers in the area, to explore ways in which the agricultural sector can support ecological values, in a more circular and sustainable way. This approach could enhance the endurance as an open landscape and ecological health, while simultaneously strengthening the position as a green, recreational center for the surrounding cities. Currently, the title of Special Provincial Landscape (BPL Midden-Delfland) is adapted by the municipality of Midden-Delfland and acknowledged by the province of South-Holland. However, this is not a legally binding protection and is adapted for just 8 years. With urbanization and unsustainable agriculture posing threats, it is imperative to continue striving towards sustaining important values for Midden-Delfland. This thesis explores ways in which the open landscape, ecological aspects, sustainable agriculture and sufficient recreational possibilities can last, ultimately preserving the Special Provincial Landscape.



[Fig.16] Landscape section, before & after, showing subsidence and water level. Made by author.

The three themes that are essential to sustaining and further examining this challenge are: agriculture, recreation and ecology. If these three themes are integrated within a vision, they can strengthen each other. For instance, establishing recreational functions that connect citizens or urban dwellers with the area can raise awareness of its significance, fostering greater urgency to protect its natural environment. This way, the area takes a role as a green heart that mitigates climate change effects. To function well as a green heart, a focus on the ecological state of the area is crucial. Farmers can benefit from an ecologically healthy environment, with high biodiversity, while recreational opportunities offer them ways to engage and connect locally. This interrelationship between the themes will be explored further in the following chapters.



[Fig.17] The three themes.



Meadow with small village ‘t Woudt at the distant horizon.

Chapter 3

Research Approach & Methodology

3.1 Aim of the Research

After outlining the key characteristics of the area and the challenges of climate change and urbanization affecting the region in the previous chapter, this chapter will elaborate on the aim of the thesis. Following the identification of the main problems in the area and the analysis of the policy-based trajectory of the past decades (which will be discussed in more detail in chapter 4) for the protection of Midden-Delfland, it becomes clear that the future protection of the area is uncertain.

Given the potential of the area as an important open green space for the surrounding cities, an interest for new, stimulating perspectives arises. While the current title of Special Provincial Landscape (BPL) recognizes the value of the area and tries to combat further rapid urbanization, that may lead to the shrinking of the open landscape of Midden-Delfland, current policy documents still shed too little light on developments in the future. Therefore, this thesis will try to look further into the future, towards the year 2070, with a vision-design to investigate how the area can be optimally adapted to change, focusing on the three main themes: agriculture, ecology and recreation. The right spatial exploration combining these three themes is needed to support the vision. In order to arrive at the best desired combination of the three themes, the maximization method is used, which is explained and illustrated in more detail further on in this chapter. This is a method to weigh and compare different scenarios or options in a comprehensible way. After this, visualizations by design will show how an optimal combination and integration of the three themes is spatially contextualized.

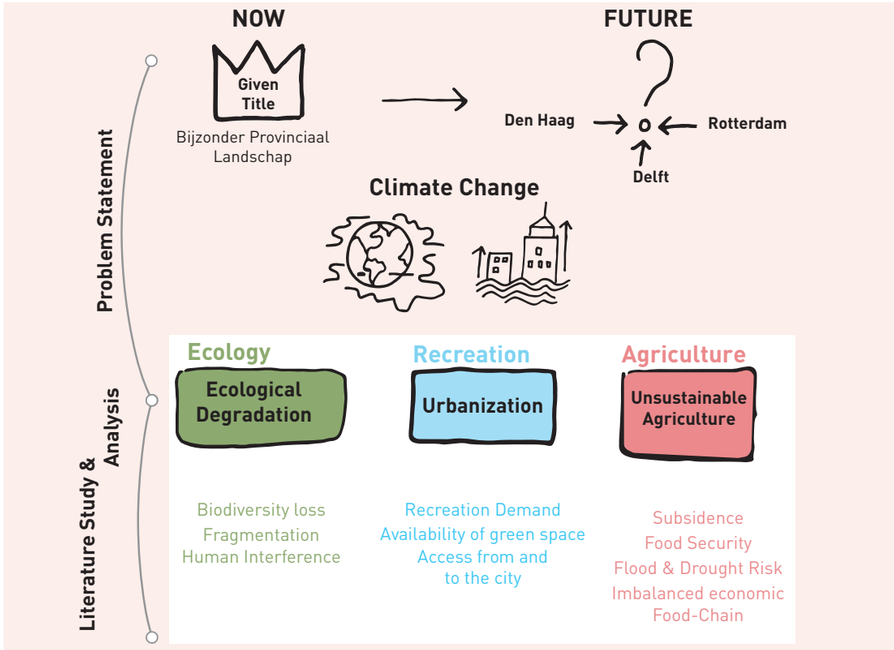
Finally, this thesis will pay attention to policy in terms of a development strategy, by making insightful which stakeholders play a role and what strategic steps can be taken by governmental institutions in the coming years to make the vision more realistic and achievable. The results of this thesis will mainly be created for the municipalities that have a connection with the landscape, namely Delft, Rotterdam, The Hague and Midden-Delfland itself. In addition to being insightful for farmers or nature conservationists, such as Natuurmonumenten or Staatsbosbeheer, it aims to be a document that steers the governance of the municipality in the direction of nudging these actors to change their trajectories and start integrative alliances.

Main Research Question

Research Question:

WHAT - A sustainable future for the region of Midden-Delfland
WHERE - Midden-Delfland
WHEN - Towards the timeframe of 2070
HOW - development and integration of the ecological character, agricultural sector and recreational functions
FOR WHO - the surrounding urban areas & the region itself

Overview of Problem statement



[Fig.18] Problem Statement.

3.2 Subquestions

1. What are the major events in policy making for the area of Midden-Delfland that have led to the assigning of the title ''Bijzonder Provinciaal Landschap''?

2. What are today's overlapping key issues in the fields of ecology, agriculture and recreation and how can these findings be used to address the spatial challenges facing Midden-Delfland?

3. What is the current condition of ecology, recreation and agriculture for the region of Midden-Delfland?

4. How can the maximization of each perliminary theme (ecology, agriculture and recreation) be achieved for the given location with the implementation of sustainable solutions, and what would the outcome of this maximization mean spatially?

5. How can the three preliminary themes be optimized and combined to create a vision towards 2070?

6. What development strategy is needed for Midden-Delfland to accomplish the created vision towards 2070?

3.3 Methodology

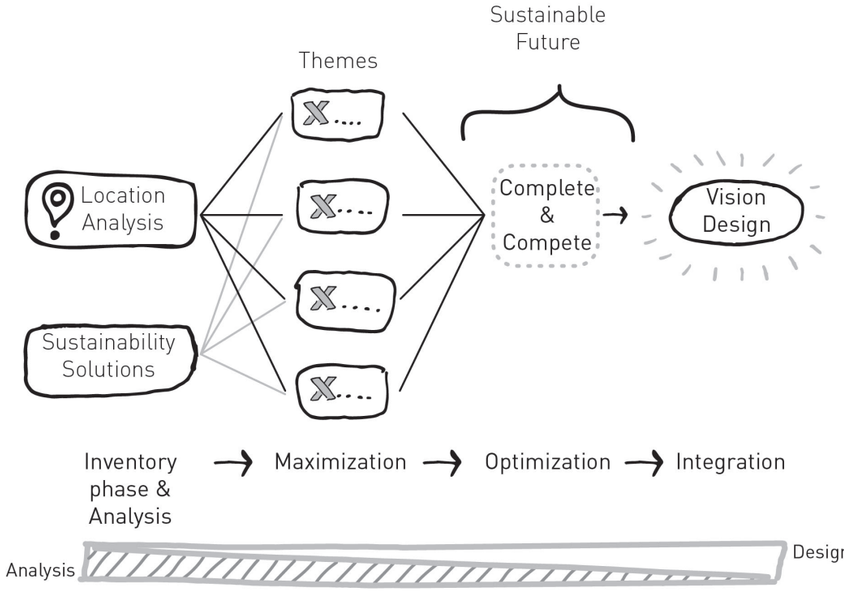
Literature Review
Theoretical knowledge to answer the research question will be gained through a literature review. This literature study on topics such as nature-inclusivity, circular agriculture, biodiversity, urbanization and climate change will support the design-choices made for the three themes with scientific proof.

Spatial analysis
An in-depth knowledge of the spatial characteristics of specific topics is necessary to make decisions when creating a vision for 2070. So analysis on topics of the landscape are for example: which (agricultural) practices are where, soil-typology, water management, subsidence, distribution of species and biodiversity, habitat connections and corridors and so on. Apart from spatial information gained through literature and google maps, spatial data is collected with QGIS-mapping, which is a software providing geographic information. An important source of open geodata is the PDOK database, ''Publieke Dienstverlening Op de Kaart'', owned by the 'National Geodata Register'. This is the national publicly owned source for geodata.

Design
The design will help to make visible what spatial qualities would be achieved if the different themes were developed and integrated, for a more sustainable future for Midden-Delfland, using design principles to mitigate climate change and urbanization. It makes visible what the future of Midden-Delfland could look like and what the result would be if agriculture, ecology and recreation worked in synergy. For the design process, the 'Maximization Method' is used in this thesis, which is illustrated in figure 19 and 20, and further explained on the next page.

The Maximization Method

The final outcome of this thesis will be a vision design and development strategy based on the Maximization Method and Research through Design. This method is used to design urban spaces that optimize specific objectives while satisfying various constraints. It consists of four steps: analysis, maximization, optimization and integration. This approach aims to achieve the optimal situation for situation for a sustainable, future urban metabolism, by focusing on the three main themes of the thesis: agriculture, ecology and recreation. Each theme will be considered independently at first to allow a full exploration of possible futures, allowing for a focused design process without early compromises (NWR Quintis et al., 1998).
The first step is to analyze the current situation and the autonomous future situation for each theme. This involves identifying the challenges and opportunities within agriculture, ecology and recreation. By looking at each theme separately, it is possible to fully understand the potential developments and appropriate current practices for the location. This detailed analysis forms the basis for the next steps and ensures that all aspects of the area are considered in a complete way.

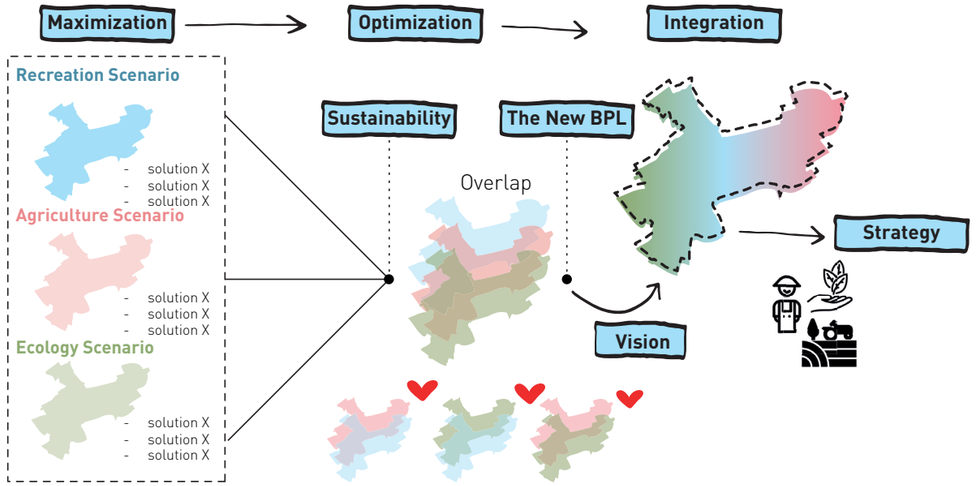


[Fig.19] Steps of the Maximization Method .

In the maximization phase, the focus shifts to establishing the optimal conditions for each theme. Metabolic flows or themes are 'maximized' based on their location, looking at how different interventions can improve the pathway and climate resilience of the area. This involves exploring sustainable spatial interventions that enhance each theme.

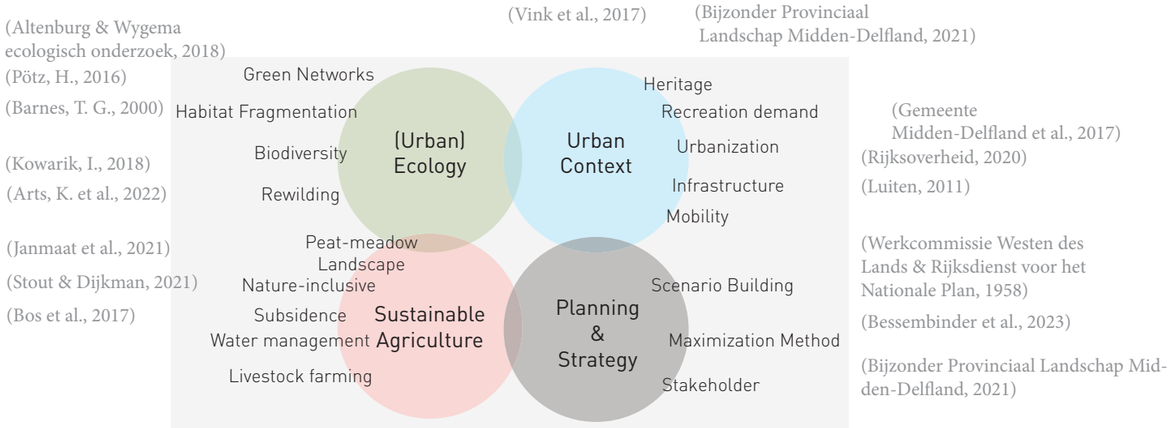
The next step, the optimization phase involves combining the different themes, recognizing and addressing potential spatial conflicts. The challenge is to find a compromise between competing strategies, while creating synergies where certain themes overlap. The optimization process results in a new BPL landscape framework that integrates the most relevant aspects of agriculture, ecology and recreation.

Finally, the integration phase focuses on combining the measures in a way that results in a coherent vision design. The proposed design aims to optimize the use of available space by focusing on different flows (for example the water system, the mobility network) in the area through different times and scales. This approach of maximization, helps urban designers to make use of these flows as a framework for design.



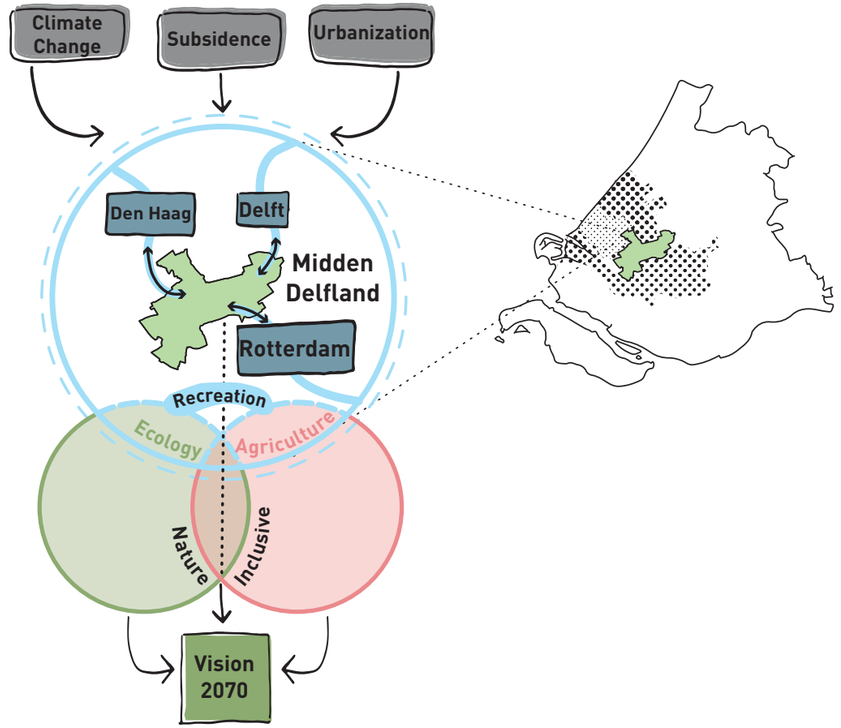
[Fig.20] Steps of the Maximization Method for this thesis.

3.4 Theoretical Framework



[Fig.21] Theorethical topics and main literature.

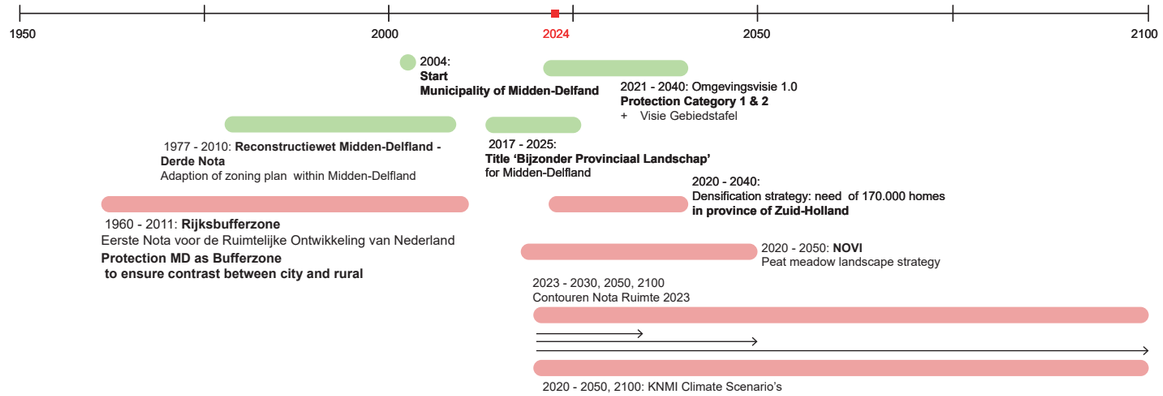
3.5 Conceptual Framework



[Fig.22] Conceptual Framework.

3.6 Timeframe

The timeframe chosen for this thesis is 50 years, up to the year 2070. This choice can be explained by the selected themes that influence the creation of the vision. This is mainly in line with existing policy documents on the future planning of the Netherlands. Most documents, such as the NOVI (government) and the KNMI climate scenarios, take 2050 as the main benchmark (see Figure 23). Within this timeframe, the predictions can remain quite concrete. However, this thesis extends the exploration beyond 2050 to 2070. In the first place, the ecological aspect of the vision has determined this choice, because designing for and with nature, not just in spite of it, requires long-term planning, commitment and patience. It takes more than a few years to see results, perhaps even more than a decade. This is also important for the development of an ecosystem. Vink, Vollaard and de Zwarte (2017) state that nature-inclusive design is a practice that initiates an ecological process that is in need of maintenance. This process is more important than just creating a green image by planting specific species for a design: creating the right living conditions for the desired ecosystem is key. Traditional urban parks and gardens are usually designed in a certain layout, which is maintained to prevent them from evolving over time into an unpredictable state. In this case, 'time' is really needed to shift the way of designing into process-based design of a landscape. Looking back at the past of Midden-Delfland, the Reconstruction law started in the 1970s and the recreational parks derived from the plans have now matured, 50 years later. To start a new cycle with the implementation of a new vision, a new period of 50 years will be needed to see clear results.



[Fig.23] Timeline to support chosen timeframe of 2070.

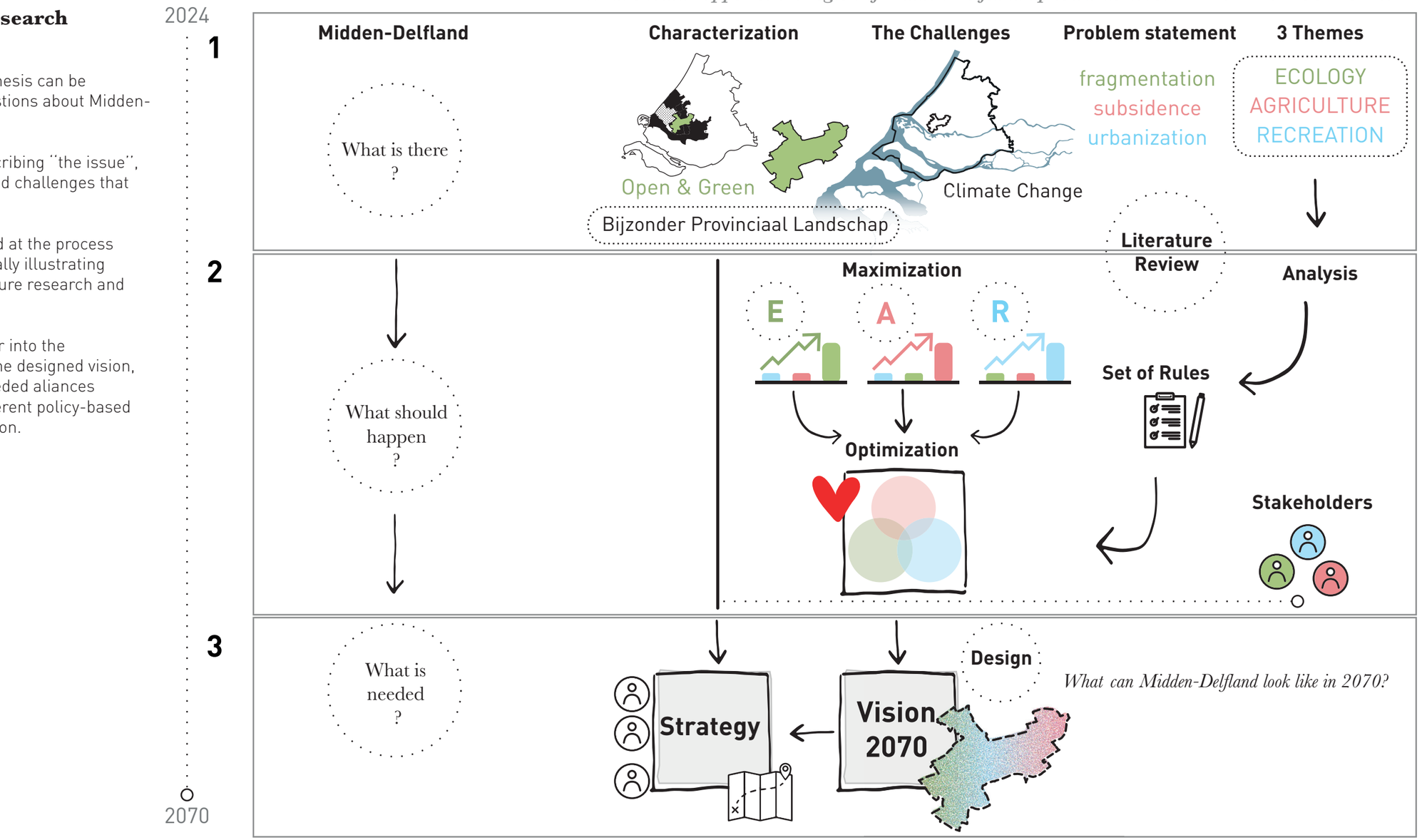
3.7 Overview of the Research

A symplified structure of this thesis can be explained with three main questions about Midden-Delfland.

The first question is about describing "the issue", the current state of the area and challenges that arise.

The second question is directed at the process of creating a vision and eventually illustrating this vision, supported by literature research and analysis.

The third question looks deeper into the development strategy behind the designed vision, describing the governance, needed aliances between stakeholders and different policy-based steps behind achieving this vision.



Chapter 4

Literature Review

Secondary road along the A13 overlooking the polder landscape.

Subquestions

1. What are the major events in policy making for the area of Midden-Delfland that have led to the assigning of the title of the title 'Bijzonder Provinciaal Landschap'?

2. What are today's overlapping key issues in the fields of ecology, agriculture and recreation and how can these findings be used to address the spatial challenges facing Midden-Delfland?

This chapter will elaborate on the trajectory of Midden-Delfland, focusing on the impact of policy development and changes within these policies over time. Furthermore, it will dive deeper into the three selected main themes. ecology, agriculture and recreation, that dominate the spatial arrangement of Midden-Delfland. First, the body of knowledge, provided through literature review on each theme is stated. Second, the concepts within each theme will be examined in relation to Midden-Delfland's specific context. To end the chapter, the intersection between the three themes is addressed.

Interferences of ecology and the urban landscape through infrastructure.

The policies that have influenced

Midden-Delfland over the past decades.



Art along the Gaagweg.

4.1 Policy Document Analysis

4.1 Policy Documents Analysis: Timeline

How governance influenced Midden-Delfland:
an overview in policy-based steps

Already since the 1950s, Midden-Delfland has been recognized as a significant entity. Even before that, it had a rich history that created the unique landscape of today. But how did this interest in the area, which later evolved into 'Bijzonder Provinciaal Landschap', or Special Provincial Landscape, arise?
To understand the events that led to the configuration of the functions that Midden-Delfland has today, it is important to look back at the past decades. An analysis of the steps in policy decisions of the government parties can clarify the steps of how Midden-Delfland spatially transformed into the shape it has now. In this process, a timeline reveals policies at different levels of government: local, regional and national, starting around 1950 (see figure 24 & 25).

Before the twentieth century, the natural landscape and its processes were the most influential in transforming the area. Take, for example, the villages that that arose on higher mounds and creek ridges in the landscape (Ijsselstijn & Mils, 2017). Since the modern era, starting in the 21st century, this relationship with nature has disappeared increasingly. Infrastructure became more independent and spatial developments could not only be explained through the old landscape framework, but also by the acceleration of technical development, especially after World War II. The technical control over water became more innovative, for example with dikes, pumping systems and sluices. But it also became faster and easier to construct buildings and infrastructures. Beside new technological interventions, spatial developments began to be steered, controlled and installed through governmental reports, development plans, and legislation. This became a complex process, in which economic, political and societal concerns had to be considered and negotiated by different stakeholders and parties. This institutional framework has also had an impact on the region of Midden-Delfland and its spatial development, which will now be described step by step through time.

2004: the start of Municipality Midden-Delfland

The municipality of Midden-Delfland was established on the date of January 1st, 2004, by the merger of the two formerly independent municipalities of Maasland and Schipluiden.It is important to note that the borders of this municipality are different from the borders used for this thesis, which uses the borders of BPL Midden-Delfland, explained further on in this chapter. In this way, it extends the responsibility for the wider region of BPL Midden-Delfland, also covering parts east of the Schie, one of the main waterways in the area. The merger of the municipalities highlighted their growing awareness and responsibility to improve the protection of this green zone as well (Gemeente Midden-Delfland, 2020).

1960 – 2011: Midden-Delfland as Rijksbufferzone in first NOTA

With the adaptation within the first NOTA (Werkcommissie Westen des Lands & Rijksdienst voor het Nationale Plan, 1958), the first national planning report for spatial development, the attention to protect Midden-Delfland as a landscape, from governmental perspective, started. Midden-Delfland was one of the first areas in the Netherlands that was assigned as a 'Rijksbufferzone', a buffer zone. This was to ensure that the growing urban development and built environment of Delft and Rotterdam would not merge. In was also envisioned that this greener rural area would remain a region for functions such as recreation, nature and agriculture within the rapid urbanization of the Randstad. In this way, the contrast between city and rural would stay more concrete and Midden-Delfland would compensate for the shortage of recreational functions in the cities: a reoccuring theme that would remain for decades to come. This protection in terms of planning was established with a very top-down approach to serve the communal interest of the metropolitan region. It was decided within the national government and supported with investments and subsidies for recreational areas (Gemeente Midden-Delfland et al., 2017).

1977 – 2010: Reconstruction of Midden-Delfland within third NOTA

After its status as a Rijksbufferzone, with the implementation of the 'Reconstruction-law' (Reconstructiewet), on behalf of the province of South-Holland, the arrangement of functions in Midden-Delfland took shape and developed further (Polder, 2017). This law aimed to improve the spatial conditions for the agricultural sector, recreation and natural areas, mainly to serve the surrounding cities. The changes in the region as a result of this law are still visible and impact today's landscape. It took around thirty years to complete and execute all the plans. A zoning plan was designed for the whole region, with agriculture envisioned in the core and recreation and nature reserves on the edges. In this way, the law focused on creating clear borders and sketched a long-term vision, to limit the growth of urbanized areas and greenhouses. Meadows were transformed into recreational areas, nature parks and forests, such as Abtswoudse bos and Broekpolder (Gemeente Midden-Delfland et al., 2017).

1999 – 2011: Last phase as Belvedère-zone

The protection established with the Rijksbufferzone continued shortly after the designation as a Belvedere area. This status focused specifically on the openness and cultural-historical values of the agricultural landscape. This status and government policy ended in 2009. Since 2011, the area no longer has a legally protected status. This change was supported by the national government, which withdrew from landscape and rural policy. Decentralization took place, with the provinces instead taking responsibility the spatial development of their rural areas (Gemeente Midden-Delfland et al., 2021).

1995 – 2015: Groen – Blauwe Slinger, a green-blue corridor

One of the plans that resulted from this new provincial responsibility was 'De Groen-Blauwe Slinger', a green-blue corridor. The creation of more nature and recreation areas was intended to separate urban cores and connect larger rural areas. The project thus works on the larger scale of the southern Randstad and counteracts the strong development of VINEX-wijken or suburbs, with an emphasis as well on a sustainable water network (H+N+S Landschapsarchitecten et al., 2023).

2008-2020: Red contours, plan of Haaglanden

From a higher political level than the local BPL Midden-Delfland, the status of the area was also discussed by the Haaglanden region (Stadsgewest Haaglanden, 2008), a collaboration of several municipalities in South Holland. This collaboration has currently evolved into the metropolitan region Rotterdam-The Hague metropolitan region. Even though this was not legally binding, Haaglanden assigned protection outside the 'red contours'. Within the red contours, urban development could take place. Midden-Delfland was assigned as a green buffer outside these red contours.

2016 – 2020: Hof van Delfland

Another recognition for Midden-Delfland on a higher provincial level is the fact that in 2016, Midden-Delfland was included in a plan by the landscape chair of Hof van Delfland as the sub-area 'Central Park'. This plan came from stakeholders operating at the provincial level, such as water boards, nature conservation parties and municipalities. The ambition was to connect urban and rural parks on a larger scale and develop them as recreational areas. Midden-Delfland was centrally positioned in these plans (Stichting Landschapsfonds Hof van Delfland, n.d.).

Even though the last two plans do take the Midden-Delfland area into account, the decentralization of government and the withdrawal of the national government have made the existence of the area and the role it now plays for the surrounding cities more vulnerable for the future. Planning at the national level, as in the 1970s and 1980s, also meant that there were more visionary ideas, regulations, and subsidies to create a straightforward plan. The implementation of several major infrastructure projects is already showing cracks in the protection of this area, such as the completion of the A4, the construction of a new tunnel connecting the banks of the Maas nearby (Nieuwe Waterweg), and the construction of new railway lines between Den Haag and Rotterdam. Looking to the future, a number of policy documents, explained on the following pages, show the uncertainty that Midden-Delfland now faces.

2000 – 2021: Compensation for highway A4 with IODS-program

Since the 1930s, with the rise of the car as the main means of transportation, the Dutch government has been planning a connection within the Randstad between Amsterdam and Leiden, the A4 highway. In Midden-Delfland, as this region is part of the route, plans were developed in the 1950s to build a connecting highway in the landscape. In the 1960s, preparations were already done on site. However, it took decades before more action was taken, because there were many protests against the plans. Eventually most of the A4 between Amsterdam and the southern border was built, except for the part in Midden-Delfland. The fact that the existing main route of Midden-Delfland, the A13, was becoming increasingly congested with traffic, sped up the process to build the new highway eventually.

To mitigate the controversy around cutting through a natural landscape, the main purpose of its design was to build a highway that cannot be seen, heard or smelled. This led to a mostly sunken highway. The A4 was realized between 2012 and 2015.

Apart from this, a program was set up to support the quality of the area and as compensation, supporting the livability of the region. In 2000, the province of South Holland sets up the IODS program (Integrale Ontwikkeling tussen Delft en Schiedam), a development program between Delft and Schiedam. More investments were made in the landscape: recreational facilities, cleaning up of scattered greenhouses, construction of ecological connections and investments in sustainable dairy farms.

2017 - 2025: Given Title 'Bijzonder Provinciaal Landschap'

After the decentralization of responsibility, a new urgency arose to protect Midden-Delfland from urbanization. In 2017, the area was designated as 'Bijzonder Provinciaal Landschap', meaning a special provincial or rural landscape, by the province of South Holland, at the request of the municipality of Midden-Delfland. The initiative was therefore a bottom-up approach. In the end, the title was assigned for a period of 8 years, and included in the ''Nature Conservation act'' by the national government (Veenenbos, 2022). However, this still did not mean a legally binding protection in terms of planning, but more of a qualitative label for recognition, support and stimulation of parties and networks involved. From this, the landscape 'chair' arose, consisting of different stakeholders (municipal, from the agricultural sector, nature conservation parties), who together formulated a vision for 2040. Today, the title 'Bijzonder Provinciaal Landschap' is still important as a deterrent, trying to slow down the possibility ow new infrastructural developments and new housing. The borders of this titled landscape can be seen on the timeline (figure 24). The province did stricter protection determining two categories two categories. The first protects the ''crown juwels'', areas with the most cultural heritage and nature reserves, where development can only take place with a high degree of exception, in line with its qualities and values. Category two includes the meadow-bird zones, recreational areas and the 'green buffer zone'. Spatial development is possible, but with a strong respect for the values of the area and with a contribution to spatial quality (Gebiedstafel Bijzonder Provinciaal Landschap Midden-Delfland, 2021).

2020 - 2050: NOVI

An interesting development at the national government level is ''the Nationale Omgevingsvisie (NOVI)'', the National Environment Vision (Rijksoverheid, 2020). It will be adopted in 2024 and is a long-term vision for the next 30 years, until 2050. It focuses on the spatial planning and environmental policy in the Netherlands and addresses issues such as land use, infrastructure, and environmental protection. One of the main topics within this document is the need for 1 million houses in the future and the transition to circular agriculture. This document does not refer to Midden-Delfland specifically, but it does refer to vulnerable peat meadow landscapes, affected by subsidence. This could also apply to Midden-Delfland. Different options to prevent subsidence in peat meadow landscapes with agricultural include a change of land use to a higher water level, or even a change of the overall use to a more nature-oriented purpose. It is stated that some areas need extra protection, but Midden-Delfland is not specifically mentioned.

2020 – 2040: Densification South Holland

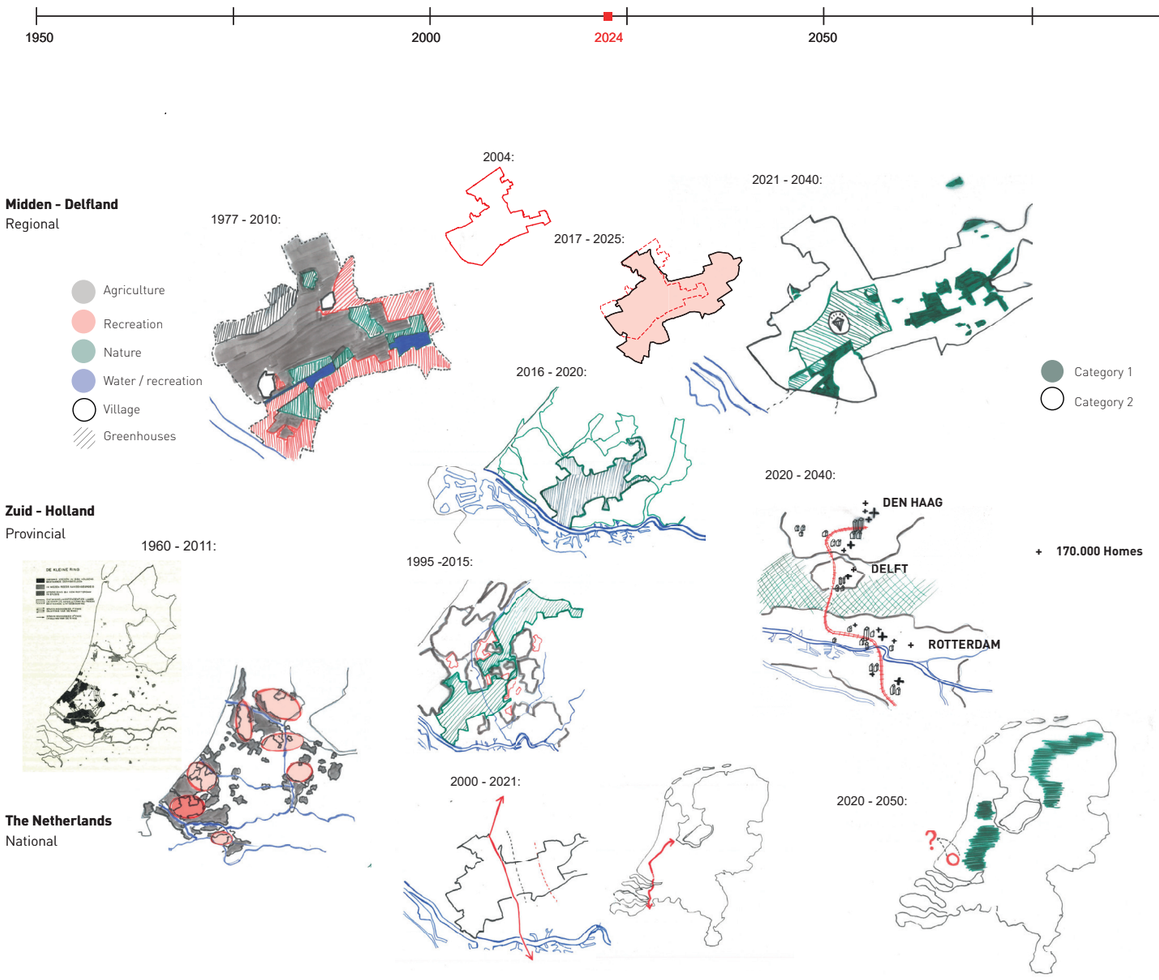
At the national level, the province of South Holland is required to build 170,000 new homes until 2040, in alignment with the NOVI's 2040 housing plans. This can be seen to form a direct threat to the open landscape of Midden-Delfland. However, the current focus of policy documents is on 'accessibility', which states the objective to densify around public transport hubs. Some of the designated transportation lines go through the region, yet these hubs are not situated within Midden-Delfland (Move Mobiliteit & Verstedelijking, 2019).

2030, 2050, 2100: Contouren Nota Ruimte 2023

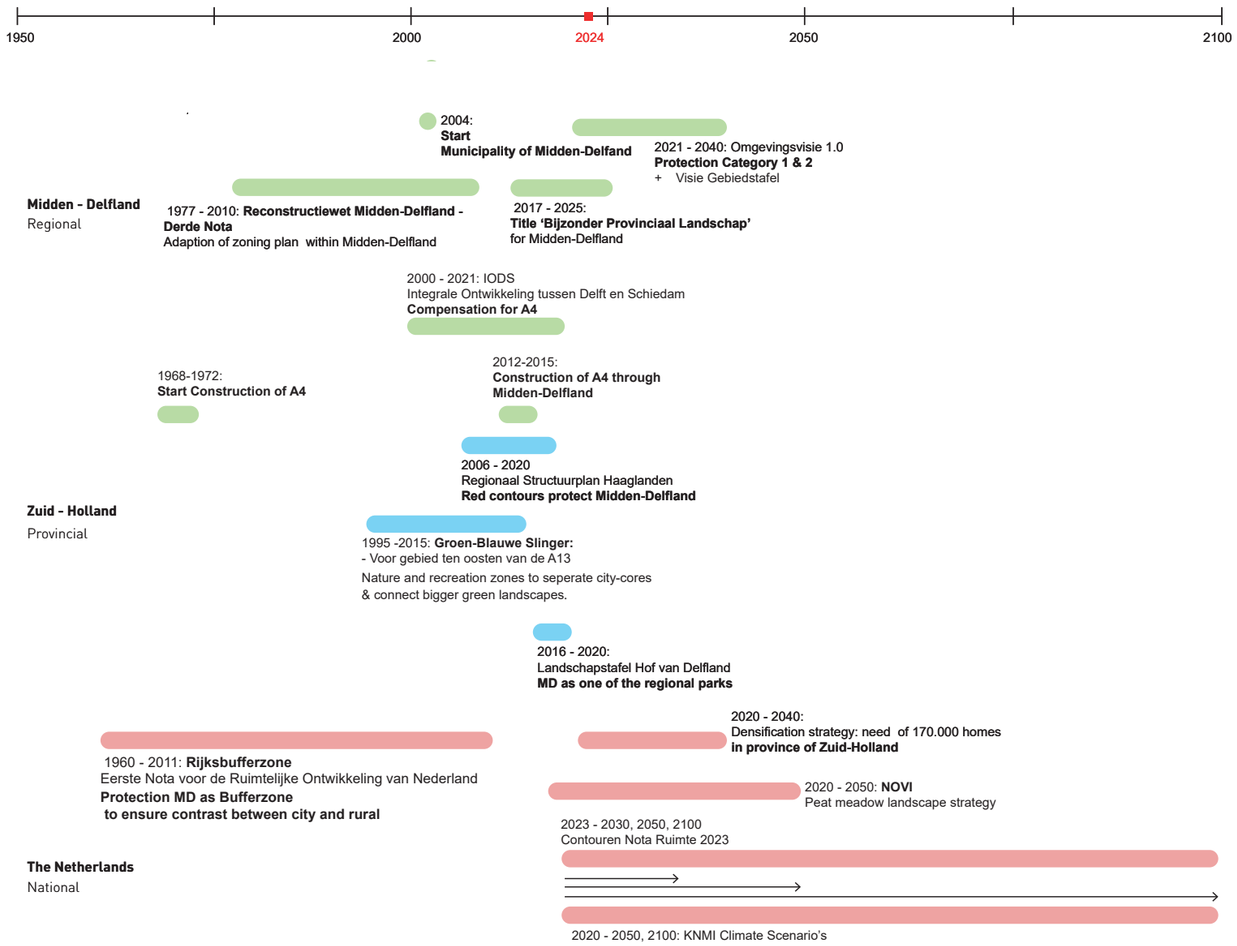
The document Contouren Nota Ruimte 2023 (Ministerie van Binnenlandse Zaken en Koninkrijksrelaties & Volkshuisvesting en Ruimtelijke Ordening), the report on planning for 2023 from the Ministry of the Interior and Kingdom Relations (National), supports the statements of the NOVI and extends the timeframe to consider benchmarks from 2030, 2050 and 2100. Furthermore, the plan calls for a transition towards circular agriculture, an increase in water levels in peat-meadow landscapes, and a change in the methods of production in agriculture. Finally, it advocates for the integration of agricultural and ecological structures in the Netherlands.

2050, 2100: KNMI Climate Scenario's:

Finally, the KNMI climate scenario's, by the Royal Netherlands Meteorological Institute look even more concrete and further into the future, predicting a global temperature increase with 4,9 °C in 2100 and a sea-level rise increase with 2,5 meters around the year 2100 (Bessembinder et al., 2023). In light of the low-lying lands of South Holland, situated below sea level, it is interesting to think about the future role of Midden-Delfland, the green patch located in the midst of urbanized land. How will different stakeholders and the government take a position towards this formerly protected area in their future development strategies?



[Fig.24] Timeline - events in governance for Midden-Delfland - Visualization. Made by Author.



[Fig.25] Timeline - events in governance for Midden-Delfland. Made by Author.

To Summarize

Over the past decades and throughout its history, Midden-Delfland has undergone many changes and transformations, shaped by a series of policy interventions and shifts in governance. From its status as a Rijksbufferzone in the 1960s to the recent assignment of the 'Bijzonder Provinciaal Landschap' title in 2017, governmental policies have consistently played a role in preserving the region's uniqye landscape amidst pressure of urbanization. The Reconstruction-law in the late 20th century also played a crucial role at balancing all agricultural, recreational, and environmental interests. However, the transition to decentralized governance since 2011 has brought new challenges and uncertainties, particularly in the context of climate change and urban densification plans. While recent policy documents like the NOVI provide a long-term vision for spatial planning, the future of Midden-Delfland remains uncertain. This calls for a careful consideration of stakeholder perspectives and exploration of alternative future scenarios, as elaborated on in further chapters. Thus, this chapter has demonstrated both past successes and ongoing challenges in managing the balance between urban development and environmental preservation. Furthermore, it highlights the dynamic and evolving nature of policy and governance processes, emphasizing the need for comprehensive and inclusive approaches to address the challenges. Moving forward, critical reflection on past policy outcomes and a proactive exploration of alternative future scenarios will be essential in guiding sustainable development trajectories for Midden-Delfland.

Finally, all the uncertainties provide a good foundation and opportunity for this thesis to illustrate a new plan and vision for the future of 'Bijzonder Provinciaal Landschap' Midden-Delfland.

Future Midden-Delfland:

spatial challenges facing

literature study per theme

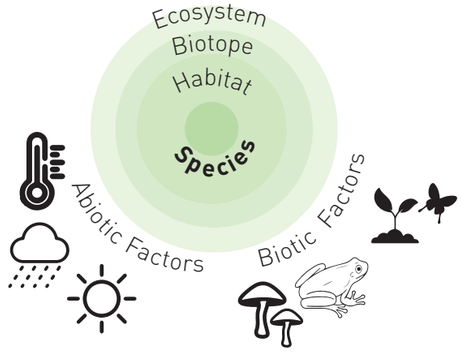
Nature reserve Ackerdijkse Plassen.

4.2 Ecology

4.2 Body of Knowledge & Concepts: Ecology

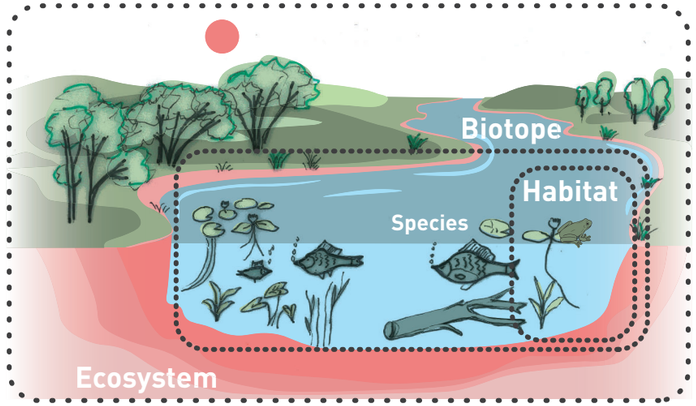
What is Urban Ecology ?

The specific site of Midden-Delfland, discussed in this thesis, is an open, rural area that at first seems to be very natural. However, it is situated within a very urban region. When entering the surrounding cities through the edges, the presence of ecological benefits from vegetation and green do not end here. Within cities, an abundance of green infrastructure and spaces can be found, with many different plant- and animal species. The profession that studies the topic of green in the city is ''Urban Ecology''. According to Vink, Vollaart and de Zwarte (2017), 'Ecology is het science that studies the relationship between living organisms and their interaction with their environment'. Elaborating on this term, Urban Ecology focuses on the biological approach of mutual relationships between species, including the human species, and their link with the environment, especially the city. These relationships between living species and organisms are influenced by a number of factors, including abiotic, non-living, and biotic factors, living. Examples of abiotic factors include, for example the climate or quality of the soil. Biotic factors relate with any other species, for example with the presence of competing or symbiotic species.



[Fig.26] Concepts of (Urban) Ecology, Made by author.

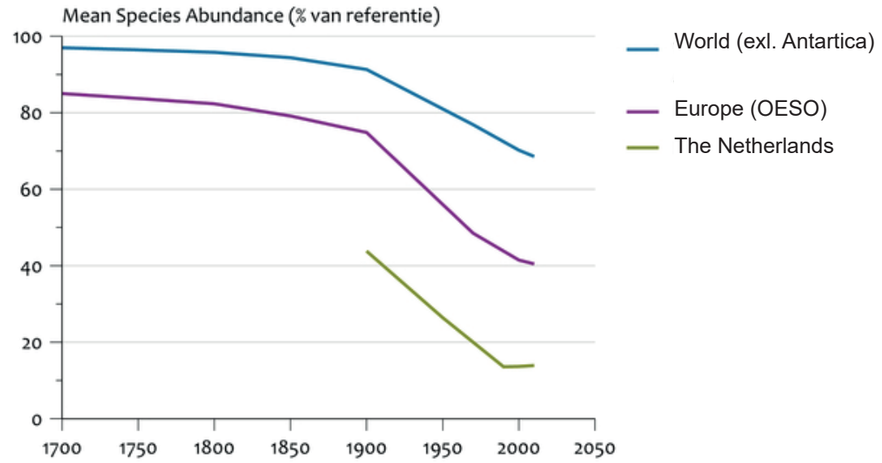
Together, biotic and abiotic factors form a biotope: a distinct landscape type with uniform environmental conditions. In cities, many different biotopes can be distinguished, each consisting of different habitats for diverse species to live and thrive. Because of the proximity of cities to Midden-Delfland, the science of Urban Ecology is of importance as it considers the whole interrelation of biotopes within urban ecosystems. The urban ecosystems of Den-Haag, Rotterdam, and Delft are close enough to intersect and touch upon Midden-Delfland. The city influences the biotopes of the countryside and vice versa. Besides, human occupation and influence extend beyond urban area, with occupation of the hinterland that has been present for centuries. In this thesis, the metropolitan region of South Holland with the urban-ecosystem and rural ecosystem of Midden-Delfland, is considered.



[Fig.27] Concepts of (Urban) Ecology, Made by author.

Biodiversity Loss

Biodiversity is declining globally, a trend that is also evident in the Netherlands Human activities have drastically impacted the rate of biodiversity loss over the past decades, as shown in figure 28. Contributing factors to this loss include change in land use, such as agricultural practices or the development of living environments, environmental pressure from burning fossil fuels, and habitat fragmentation (CBS et al., 2024). Biodiversity is a crucial indicator to show the health of ecosystems on different scales, as it includes both the number of species as the degree of diversity within a certain ecosystem. Ecosystems consist of interdependent species that rely on each other and interact with the environment. All these interrelations underscore the importance of diversity, as species cannot survive on their own (Pötz, 2016). For example, during breakouts of diseases, a diverse ecosystem is more resilient; the most vulnerable species get affected and decline, but the ecosystem will still have a range of species that can survive (Vink et al., 2017).



[Fig.28] Biodiversity decline, the Netherlands compared to Europe and world-wide (CBS et al., 2024)

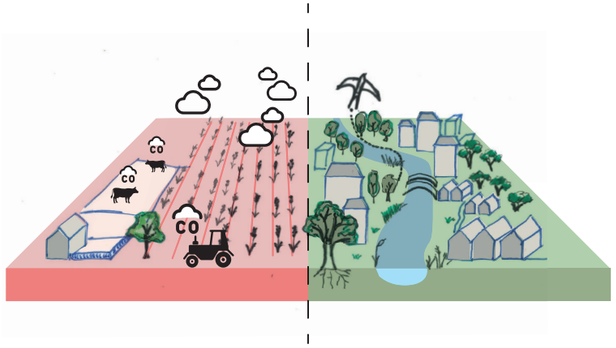
City vs. Countryside

Compared to Europe and the rest of the world, the average remaining mean species abundance, an indicator for biodiversity, is significantly lower in the Netherlands. Especially the biodiversity of semi-natural grasslands and agricultural land is declining. The diminished species abundance is caused by the increasing use of fertilizer and pesticides in the agriculture, along with increased production. The excessive use of pesticides has resulted in nitrogen emissions, which grow with the accumulation of the emissions from mobility flows and energy production. All these emissions settle on the countryside, creating overly abundant fertile land where specific nitrogen-attracted species overpopulate the biotope. This leads to the process of homogenization, where opportunistic species explode in growth and dominate, causing a monoculture and displacing characteristic species.

Before urbanization accelerated, cities were mostly separated from nature and represented small cores of activity within a wide stretch of green. Nowadays, the Randstad om the Netherlands is very densely populated, and the landscape has transformed into completely urbanized land with pockets of productive agricultural areas serving as green spaces in between. Only a few parts remain as nature reserves, which at the same time require a strict regime of maintenance. However, in contrast to the described developments on the countryside, biodiversity in cities is increasing more than expected. In our current times, the city can be seen as a whole ecosystem on itself, where human developments and natural elements coexist (Vink et al., 2017). This rise in urban biodiversity can be attributed to growing awareness of green spaces and the establishment of parks within cities. These green islands have enabled diversity in terms of habitat. In the concrete environment, different types of vegetation can be found in a generally warm atmosphere with enough food available. Cities exhibit higher biodiversity due to the dynamic spatial changes, more stable locations and the unique combination of stone and vegetation (Pötz, 2016).

Resilience, Diversity

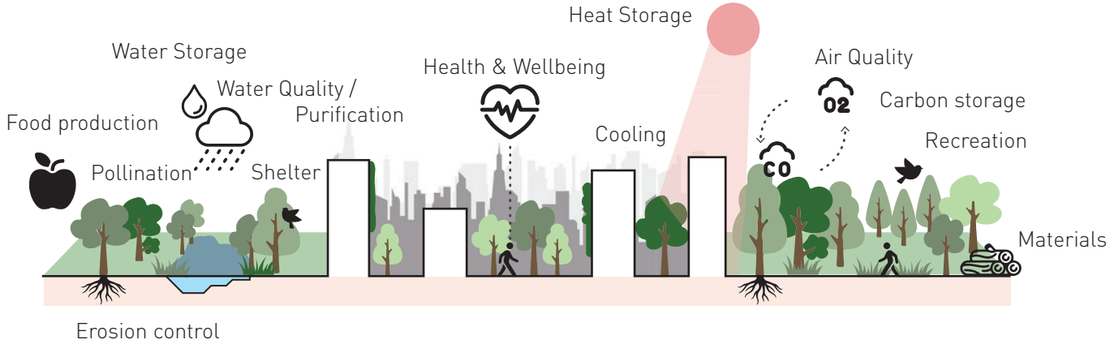
Avoiding monocultures in Midden-Delfland is crucial because of the vulnerability of having only a few species. Such monocultures make the area vulnerable to disruptions and are in need of frequent maintenance to sustain a specific condition. Instead, it is better to create some resilience, for the long-term endurance of nature. Resilience, defined as a system's ability to withstand disturbances and reorganize itself while maintaining function, structure, and identity, is essential. A diverse biotope is self-sustaining and lacks dominant species. The diversity within ecosystems also answers to the different groups of species that have varying habitat needs. Therefore, emphasizing diversity and resilience over monoculture, promotes a healthier and more sustainable ecosystem. (Vink et al., 2017)



[Fig.29] Biodiversity in cities vs. monoculture in rural areas. Made by Author.

Ecosystem Services

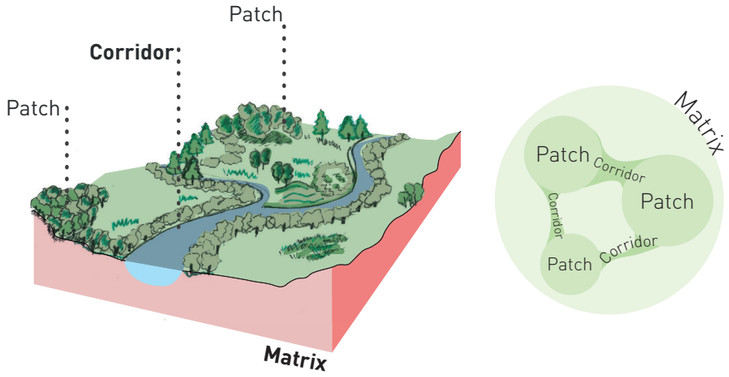
A high rate of biodiversity in the city has numerous benefits, primarily through the provision of ecosystem services. These services include the benefits offered by the ecosystems, which extend to benefit the agricultural sector as well. Examples are: the retention and drainage of surface water, enhancement of water quality, efficient water management, pest control, heat regulation, cooling effects provided by plants, improvement of air quality, and a range of additional benefits for human well-being. These include improvements in health and well-being, as well as the provision of cultural, recreational, and aesthetic benefits (NatureScot Nature Agency, 2023).



[Fig.30] Ecosystem services, (NatureScot Nature Agency, 2023) Made by author.

Patch-corridor Matrix

To understand the structure of a specific landscape, the Patch-corridor Matrix (Barnes, 2000), can be a valuable framework. According to this this concept, a landscape consists of three main components, a matrix, patches and corridors. The matrix represents a diverse collection of areas, forming a cluster of interacting biotopes. The scattering of smaller green biotopes often occurs due to dispersed urban land. These individual biotopes within the matrix are called the patches. Patches are nonlinear surfaces that differ in vegetation from their surroundings. When patches are smaller in size, the importance of connecting corridors between these patches increases. The shape and size of the patch determines its interior habitat. Therefore, a larger single patch has a larger interior species diversity and the necessity of corridors for species movement decreases. Corridors allow for species to move freely throughout the matrix and promote interaction among them.



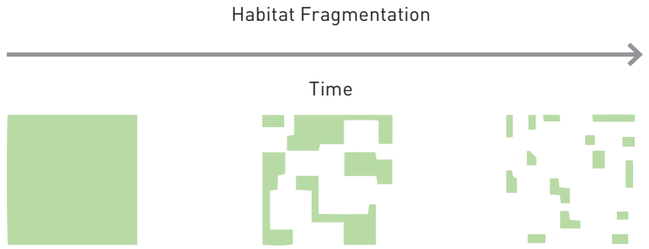
[Fig.31] Patch corridor matrix.Made by Author. (Barnes, 2000)

Green Networks

In the patch-corridor Matrix, the focus lies on the overall network, which is established by implementing connecting corridors. In urban areas, green and blue networks have become increasingly important to support climate-related mitigations such as heat stress and flood risk. Here, 'green' refers to vegetational surfaces and parks, while 'blue' refers to water structures. The green networks, consisting of more 'natural' and biodiverse patches nestled between agricultural lands, are equally crucial for rural areas (Pötz, 2016).

Habitat Fragmentation

Habitat fragmentation occurs when a particular area is cut and decreased until only isolated patches remain. This results in habitat loss and discontinuity and eventually leads to habitat isolation. Decrease in the amount of habitats for species to thrive in and decrease in connectivity contributes to biodiversity loss and overall ecological degradation.



[Fig.32] Habitat Fragmentation. Made by Author.

Rewilding

The demand for a higher rate of biodiversity in Midden-Delfland, can possibly be answered with the solution of rewilding. Rewilding is a conservation approach where the focus lies on the restoration of ecosystems to their natural state and making space for the ecological qualities of wilderness, by leaving an area to let natural processes to shape the land, with little human influence. In the Netherlands, rewilding involves key principles such as trophic rewilding, enhancing connectivity and the creation of core areas, all working towards the ultimate goal of restoring a more balanced and self-sustaining ecosystem. During trophic rewilding, predators are introduced back into a more isolated and cultivated habittas, which causes a cascade in the food chain and restores the ecological balance. In addition to reintroducing species, 'abiotic rewilding' is the restoring of biophysical conditions, through for example enhancing wind patterns in the dunes, or better applicable for Midden-Delfland, the return to a more natural water-level. Currently, the water level in this country is strictly controlled by humans, while a dynamic water level is much more suitable for origin species of the former ecosystems (Arts, K. et al, 2022).

The Wild Europe Initiative (WEI), adapted by the European Parliament (2013) defines wilderness as the following: "A wilderness is an area governed by natural processes. It is composed of native habitats and species, and large enough for the effective ecological functioning of natural processes. It is unmodified or only slightly modified and without intrusive or extractive human activity, settlements , infrastructure or visual disturbance."

Nature conservation: the traditional way

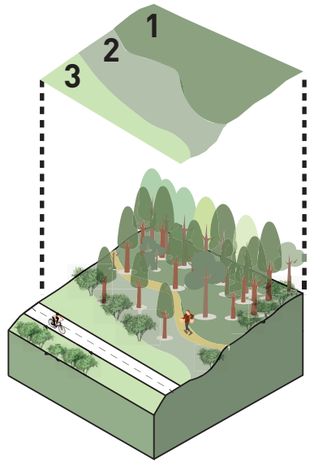
Like stated before, benefits of this approach are the restoring and strengthening of ecosystems and the increase of biodiversity. Here, the emphasis is on biodiversity as a result of natural processes instead of the result of human conservation, which is focusing too much on singular species and very specific types of habitat. In this sense, rewilding differs from traditional nature conservation, that looks back at an ecological state of the past and tries to combat further degradation.

The strategy of rewilding is not without risks for a country like the Netherlands. Looking at the past, the Dutch nature conservation has often been intertwined with extensive agricultural use. Many endangered species and vegetation types from these agricultural landscapes depend on active management practices like mowing and grazing. For instance, the black-tailed godwit, a characteristic meadow bird, relies on managed wet grassland. Rewilding would threaten these species as it transforms grassland into a more forest-oriented zones, unsuitable for them (Arts, K. et al., 2020). However, it is essential to note that before the agricultural era, these birds did not rely on human intervention and were not considered "meadow" birds. Over time, as the birds lost their original habitat, they adapted and developed this dependency on maintenance. Returning to the bird's original biotope might lead to a decline in godwit populations to before pre-agricultural levels. Nevertheless, the process of rewilding could mean the return of many other species.

Three zones & Size

The Wild Europe Initiative (2013) proposes a scheme with three wilderness zones, which provides a framework for considering ecological zones. This helps to consider the distribution of these zones over an area and how to approach more human-oriented wilderness, for example on a farmer's land. The scheme divides wilderness into three areas: the core zone, buffer zone, and transitional zone. The core zone is strictly off-limits to humans.

The Wild Europe initiative emphasises the varying minimum sizes for wilderness areas, with these varying according to the ecosystem type. A boreal forest complex may require a minimum area of 100,000 hectares to allow natural processes to function optimally. In contrast, a wetland area may function independently with a minimum area of 2,000 hectares. In order to be designated as wilderness, a new core area must be a minimum of 3,000 hectares in size. It is recommended that the total core and buffer zones are at least 8,000 hectares, with the buffer becoming unnecessary if the core exceeds 8,000 hectares. The combined area should be sufficiently large to allow the expansion of the core zone to a minimum of 10,000



1. Core
Very limited to human acitivity / access. Dominance of natural processes.

2. Buffer Zone
Hiking trails can be present. Emphasis on restoration / rewilding of natural habitats and processes. Over time can be incorporated into the core zone and expand outwards into the transition zone.

3. Transition Zone
Range of human acitivities are permitted, but with management controls preventing development of major infrastructure. Limited noise and ligt pollution.

[Fig.33] Three Zones of Wilderness. Made by Author.

Urban Wilderness

The concept of wilderness is now finding its place in urban planning, with 'urban wilderness' as the new terminology. This term creates a paradox, or 'contradictio in terminis', as natural and urban environments have traditionally been seen as opposites. Despite these definitions, wilderness areas are emerging within cities, particularly in areas that have undergone post-industrial transformation. Moreover, as stated in the previous pages, cities can be seen as diverse ecosystems, varying in size, population density, fragmentation and land use.

Four Natures en Wilderness potential in the city

Urban environments have undergone different intensities of human interference, gradually transforming original, pristine ecosystems into urban landscapes. In his paper, I. Kowarik (2018) uses the "Four Natures Approach" to categorize the transformation stages in urban environments into four types. These types are related to nature, but result in different human-nature interactions and degrees of conservation.

Nature 1: Remnants of pristine ecosystems.
Nature 2: Patches of agrarian land uses.
Nature 3: Designed urban greenscapes.
Nature 4: Novel urban ecosystems, such as wastelands, vacant lots, and heaps, emerging after disruptions in ecosystem development, often due to building activities.



[Fig.34] The Paradox illustrated, humans disturb the wilderness. Made by Author.

Applying concepts of Ecology to Midden-Delfland

Midden-Delfland is an example of an area largely dominated by monocultural agriculture. To better align with the evolving ecosystems that cities have become, the area can be explored through concepts, mentioned in this chapter, like biodiversity, resilience, diversity, habitat fragmentation, and ecosystem services, which are related to Urban Ecology. The challenge for Midden-Delfland is to enhance biodiversity by providing a variety of habitats for various species, ultimately aiming at greater biological richness. The emphasis on diversity and resilience over monoculture promotes a healthier and more sustainable ecosystem. Even on a global scale, Midden-Delfland can function as part of an ecological network. As the area is attractive as a resting place for migratory birds, flying northern Europe to the south during the winter season, it can contribute to a larger ecological habitat and green network (Altenburg & Wygema ecologisch onderzoek, 2018).

In Midden-Delfland, the construction of major infrastructure, like the A4 highway, the A13 and the railway has increased habitat fragmentation. These big lines cut through the landscape from north to south, creating big barriers that are impossible for wildlife to cross. The challenge lies in overcoming these barriers and increasing the overall green network.

It seems to be a contradictory challenge to want more wilderness in the rural area of Midden-Delfland, trying to increase biodiversity. Midden-Delfland is so closely related to urbanity, so how can wilderness exist so close to an urban region? It is questionadreble whether all four types of wilderness are relevant in this case, as traditional wilderness approaches match best with natural remants of pristine landscapes (nature 1 as stated by Kowarik). However, Kowarik (2018) also states that 'novel urban wilderness areas can emerge in small plots of derelict land, for example abandoned lots, railway areas, cemeteries and a range of informal green elements within the urban matrix'. As wilderness exists across a broader scale continuum, Midden-Delfland is also suitable for this concept.

To summarize, the region of Midden-Delfland serves as a good example of the complex dynamics between ecological concepts and the peri-urban landscape. The fact that the emergence of urban wilderness is possible in areas within derelict urban spaces, further highlights the adaptability of ecological concepts to diverse landscapes such as Midden-Delfland. By making use of clever zoning and taking an explorative attitude towards the phenomenon of rewilding, it is possible to achieve a state of wilderness in Midden-Delfland. In this way, Midden-Delfland can strive towards greater biodiversity and ecosystem resilience, continuing to preserve its ecological status, even with cities and infrastructure nearby.



[Fig.35] Fragmentation by big infrastructures. Made by Author.



Future spatial challenges facing Midden-Delfland: literature study per theme

4.3 Agriculture

Farmhouse nearby Delfgauw.

4.3 Body of Knowledge & Concepts: Agriculture

Agriculture in Midden-Delfland

In Midden-Delfland, a community of predominantly dairy and livestock farmers, also known as 'melkveehouders' has settled. Although there is some integration between ecology and agriculture in the area, significant challenges lie ahead for this sector. The shift to exclusively dairy was initially necessary due to the wet conditions of the peat soil, which were too infertile for crop cultivation. However, the current landscape conditions may no longer support the practices of livestock farming either. Therefore, a new perspective on dairy production in the area is needed, recognizing the evolving conditions and the need for adaptation. (Bijzonder Provinciaal Landschap Midden-Delfland, 2021).

The agricultural sector in the Netherlands

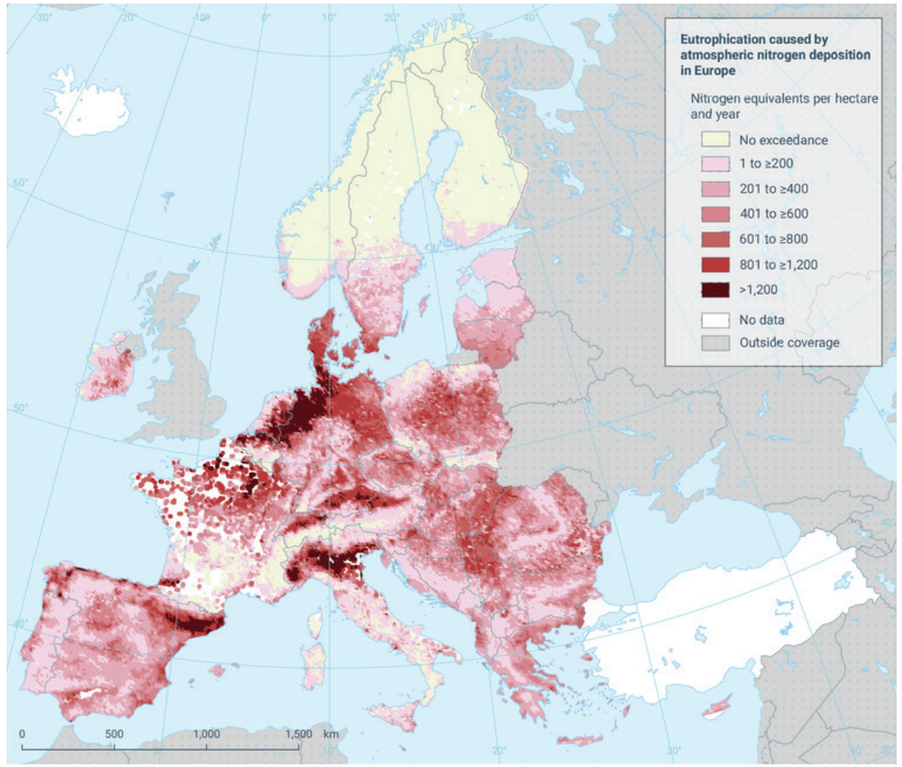
In the Netherlands, the agricultural sector has undergone significant changes, beginning with the policy from the last century under S. Mansholt (Van Merriënboer, 2013), focusing primarily on upscaling and intensification. The main goal was to increase production to ensure that no citizen would experience hunger again after World War II, This policy lead to significant increase in production. Conventional farms were transformed into large-scale businesses that had to maximize profits at varying production prices. Advancements in technology and the use of synthetic fertilizers enabled investments in mechanizing farms and boosting harvests. As a result, some farms transformed into factory-like enterprises, not fixed to land typology anymore, with large stalls of livestock and an industrial character (Remkes, 2022). This policy trajectory also made the Netherlands a bigger player in the agricultural sector on a supranational level. l. Nowadays, much of the country's production is intended for international export. The upscaling and intensification of livestock farming have also led to the increasing amount of nitrogen pollution in the Netherlands.

Nitrogen Pollution

Nitrogen, an essential element for the agricultural sector, can often be found in fertilizers and plays a key role in the life cycle of plant and crop cultivation. Most nitrogen emissions today stem from human activities in the agricultural sector, as well as industries and infrastructure (Remkes, 2022). Nitrogen pollution poses a significant a threat to the environment, polluting the air and water with excessive nutrients. While nitrogen is a crucial for plant growth, it can also have several negative effects on the environment, including eutrophication, acidification, and biodiversity loss.

This is a major issue in the Netherlands and neighboring Belgium, which have the highest atmospheric nitrogen emissions in Northwestern Europe (Exceedance of Atmospheric Nitrogen Deposition Above Critical Loads for Eutrophication in Europe in 2021, 2022). In these countries, the agricultural sector is a primary source of nitrogen emissions, with livestock farming and fertilizer use being major contributors. In response, the Dutch government has introduced measures to reduce nitrogen emissions, such as restrictions on livestock numbers, fertilizer usage, and land use adjustments.

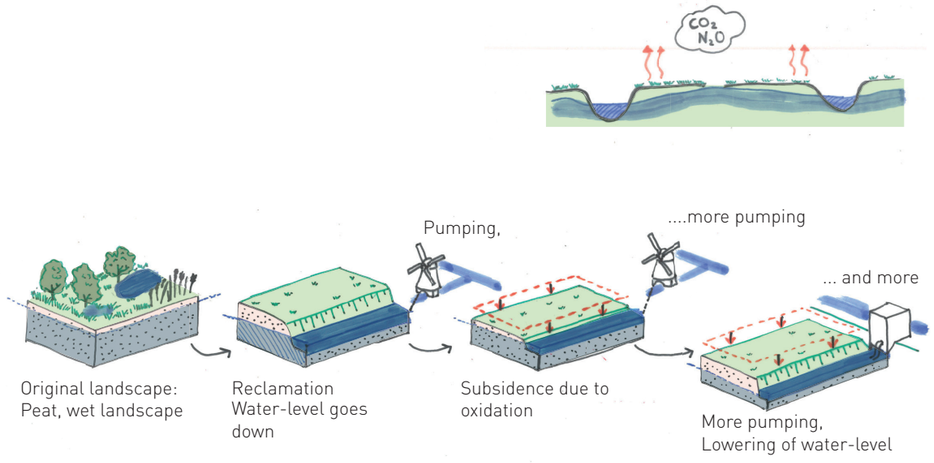
For nature conservation, it is crucial where nitrogen is deposited, as this determines the location where it will disturb the nutrient balance and affect ecosystems. Policy often refers to deposition (precipitation). When this deposition in sensitive natural areas exceeds certain standards, there is a risk of environmental degradation (Remkes, 2022).



[Fig.36] Nitrogen desposition in Europe. (EuroGeographics & FAO (UN), 2023)

What is a Peat-meadow landscape?

A peat meadow landscape is a specific landscape type, characterized by its unique soil typology. Peat soils consist mainly of organic matter from decomposing plant material. These soils can facilitate water retention and store nutrients. The accumulation of peat is a long-term process that takes thousands of years and requires anaerobic and wet conditions for the organic material to decompose in a slow process. The gradual process allows the formation of peat. The province of South Holland, including Midden-Delfland, is located at the end of the river delta, where wet conditions and the deposition of river clay made the creation of this peat meadow landscape possible.



[Fig.37] The ongoing cycle of subsidence.Made by Author.

Peat-meadow landscape: Subsidence

Furthermore, subsidence is a common phenomenon in peat-meadow landscapes. Today, with almost no original peatland areas left in the Netherlands, most of these previous landscapes have been transformed to meadows for dairy and meat production. In these area, the water level is kept much lower than the original water-rich state. Historically, the groundwater was drained by small ditches, but ongoing subsidence required more active intervention. Groundwater is now managed in higher storage canals, called the "boezem", initially using windmills to pump the land dry initially and later replaced by mechanical pumping stations. The deliberate lowering of the water level exposes the peat to air, allowing oxygen to reach the peat and "burn" it, resulting in CO2 emissions. Additionally, ongoing dewatering causes the peat soil to sink, the now introduced phenomenon of subsidence. This water-level optimization of the water-level accelerated during the post-war period due to the need for upscaling and intensifying the agricultural sector (Arts, K. et. al, 2022).

In some places, especially where subsidence has brought the land to sink up to 8 meters below sea level, it is clear that ''business as usual'' is no longer sustainable. New ways of land use are urgently needed to change the trajectory. The well-known slogan 'waterpeil volgt functie' or 'water level follows (agricultural) function' is no longer up to date. Land use needs to shift towards sustainable water use, even more urgently to mitigate the effects of climate change. Lowering the water-level might help sustain dried land, however, the subsidence resulting from this process is a vicious cycle. As the water level is lowered, the peat oxidizes and shrinks again, causing the soil to subside, which brings the land closer to the current water level and makes it wetter, requiring another lowering of the water level, which causes the peat to oxidize again, and so on (Bos et al., 2017). Argumentatively, the social costs, such as having to raise quays and roads each time due to subsidence, are also increasing. Human-induced subsidence in the Netherlands has rates as high as 2 cm per year, (2 meters per century) (Erkens et al., 2018).

The largest long-term decline occurs in the peatland areas; urban areas appear relatively stable. In terms of soil typology, soil subsidence due to peat oxidation obviously plays the biggest role in peat soils, but this also takes place in clay on peat soils and marshy soils. The extent to which subsidence occurs depends, among other things, on the thickness of the clay cover (clay on peat) and the amount of peaty material (peaty soil).

Circular Agriculture

About 48 livestock farmers out of an estimated total of 55 agricultural businesses in Midden-Delfland, are working together on circular agriculture. The goal of this more sustainable approach is to maintain the quality and fertility of the soil, while looking for methods to make for more future-proof methods to make the business more sustainable at the same time. Farmers focus on closing the cycle of manure, animal, soil and plant, increasing efficiency, reducing emissions, becoming more nature-inclusive and soil-concious and improving economic profitability and resilience.
Within these cycles and successive stages, circular agriculture seeks to return to the original state and balance of energy, raw materials and nutrients.
There are a few key steps in circular agriculture:

1. Keeping the cycle closed
External manure, fertilizer and feed for cattle are not imported and used, or used as little as possible.

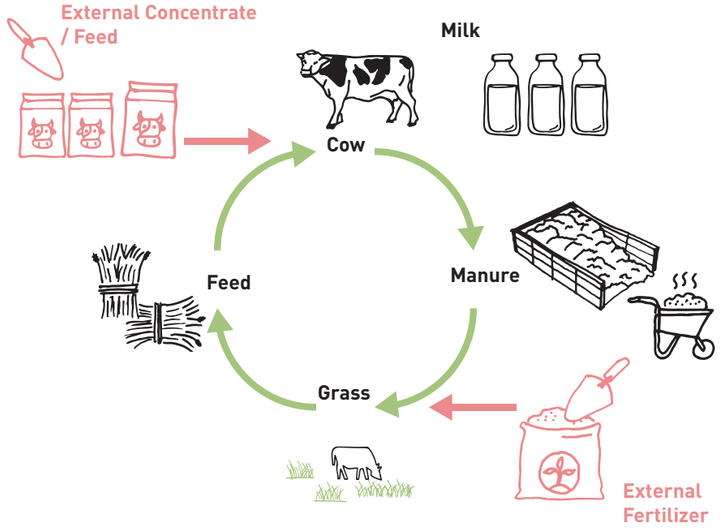
2. Feed control
Farmers aim to find a good balance of protein, structure and energy in the feed to maximize the use and yield of that protein. In this way, the cows release as little nitrogen into the atmosphere as possible.
By providing more structure in the feed, the nitrogen in the soil is better adapted to growing grass through manure, resulting in less nitrogen emitted.

3. Urea-number
The balance of nutrients is checked by the farmer through the urea-number, a nitrogen compound, traceable in milk.

4. Food from the land
A circular farmer fertilizes his land with his own manure, allowing grassland to grow as a source of protein and feed for the cows. The cows process the grass, producing milk and manure. Some farmers also grow their own corn, which is fertilized with their own manure again, to provide additional feed for the cows. These practices eliminate the need for external manure, feed, and fertilizer.

5. Nature-inclusive Agriculture
Farmers can take other steps to become more nature-inclusive and reduce emissions, by measures such as planting herb-rich grasslands and selling products locally, which shortens the supply chain and reduces emissions from transporting goods.

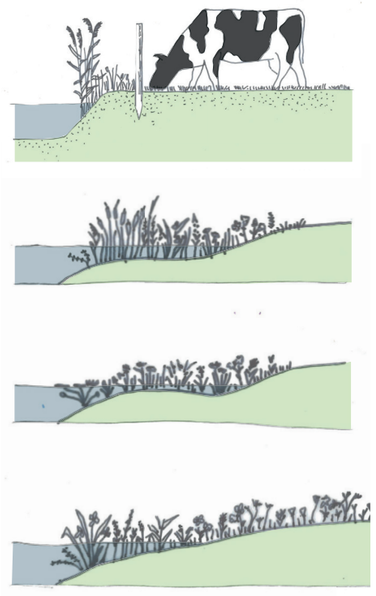
Circular farming is an intensive practice in terms of land surface, as sufficient land is needed to provide cows with enough grass. Other sustainable practices include more outdoor grazing and fewer young cattle. Outdoor grazing allows cows to graze outdoors for longer periods of time, utilizing their own grass feed and releasing less ammonia as manure does not accumulate (as it does in indoor stalls). In addition, the manure contributes with a more balanced share of nutrients to nature. By keeping fewer young cows, farmers can keep their cows longer and feed them more efficiently as they get older (Janmaat et al., 2021).



[Fig.38] The cycle of circular agriculture. Made by Author. (Janmaat et al., 2021)

Nature-friendly banks

Another way of farmers to enhance biodiversity in the area, is by creating nature-friendly banks at the edges of their agricultural plots. A nature-friendly bank is a gradual transition from wet to dry, featuring a gentle slope or a submerged terrace that supports plant growth. The transformation of these banks provides a smooth transition between land and water, making it easier for various bird species, such as the godwit, to find food. This helps to create diverse habitats for plants and animals, which ultimately improves water quality. This quality is improved by the presence of aquatic plands, that provide enough oxygen. These banks require responsible management by neighboring farmers to prevent damage, such as installing fences to keep grazing cows out. The collaborative effort of creating nature-friendly banks not only increases biodiversity but also highlights the role of farmers in preserving these essential ecosystems (Vockestaert, 2019).



[Fig.39] Nature-friendly banks with different slopes. Made by Author.

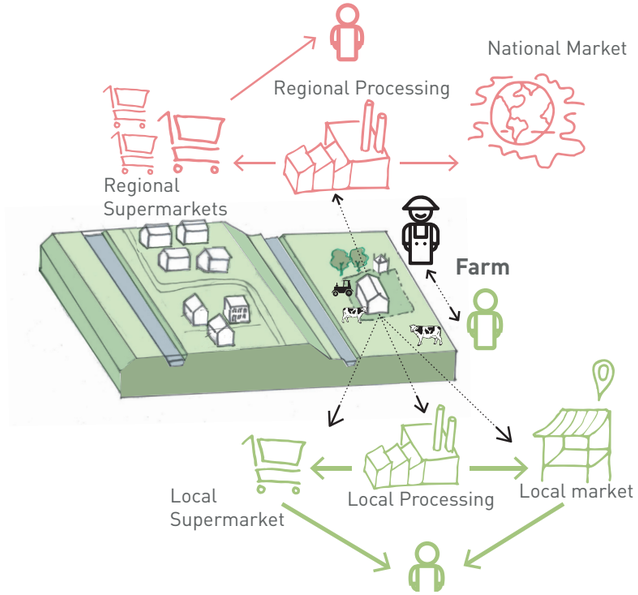
Local Market

A transition towards a more local market for the agricultural sector could significantly contribute to the overall transition towards a more sustainable future. Producing food in the same region as it is consumed reduces environmental impact due to shorter transportation distances, compared to supplying the national and global markets with Dutch dairy products. Besides, this approach fosters a stronger and more direct farmer-consumer connection, offering recreational benefits and promoting community engagement. For instance, local shops on the location of the farm, where consumers directly buy products that are locally grown, create awareness among visitors of sustainable farming practices.

To break the long chain between farmers and consumers, this asks for a focus on regional marketing, particularly for vegetables, dairy, and meat through direct sales. Additionally, products like bread and beer, which require processing in a factory, should also be sold directly. Local processing enhances regional employment, benefiting consumers with fresh, sustainable food and farmers with fair prices.(Bijzonder Provinciaal Landschap Midden-Delfland, 2021) (College van Rijksadviseurs, 2020) This principle of local "Vermarkten" involves branding local products. There is a growing need to enhance consumer appreciation for healthy, locally produced food in Midden-Delfland. The challenge lies in linking consumer appreciation for the landscape, production methods, and biodiversity to their food choices.

An exemplary case of a locally focused farm is Hoeve Biesland, a biodynamic farm located on the outskirts of Delftse Hout recreational area in the Bieslandse polder, Delfgauw. Initially started as a dairy farm, it transitioned to biodynamic practices in 1997 under farmer Jan Duijndam. Recognizing the need for a sustainable plan near the expanding city and a nature reserve, Jan transformed his traditional livestock farm. Hoeve Biesland now includes a bakery, butcher shop, vegetable garden, and grocery store. Visitors can tap raw milk on-site and access the supermarket for farm products and local items. Hoeve Biesland prioritizes local marketing, supplying its products to nearby supermarkets and restaurants (Hoeve Biesland, 2023).

This model, also visualized in figure 40, showcases the potential of sustainable, local food production and direct marketing, aligning with evolving consumer preferences and supporting regional economies.



[Fig.40] The transition towards a more local market. Made by Author.

Applying concepts of Agriculture to Midden-Delfland

To conclude this chapter, an overview was provided of the agricultural dynamics, environmental challenges, and innovative strategies relevant to all peat-meadow landscapes in the Netherlands, specifically focusing on Midden-Delfland. This region is primarily characterized by a community of dairy and livestock farmers, known as 'melkveehouders'. These farmers actively manage large portions of the landscape, employing various forms of agricultural nature conservation. One notable practice is 'weidegang,' which involves allowing cows to graze in meadows, thereby maintaining the landscape's attractiveness for meadow birds (weidevogels) and contributing to its remarkable polderlandscape image. Another example is the timing of mowing schedules to avoid disturbing the nesting periods of meadow birds.

Despite these transitions towards environmentally conscious practices, such as circular agriculture, significant challenges like subsidence and nitrogen pollution require urgent attention from the sector. Individual measures and minor adjustments within the scope of circular agriculture might not be enough to address future challenges. Instead, an integrated approach is needed. The spatial dimension of land-use change for agriculture forms the missing link to be considered after the contextual foundation set by the literature review. In the following chapters, this thesis will explore the region's soil conditions and incorporate the spatial layer into the subsidence problem. This will include examining new spatial layouts for the area and the water system, to mitigate the effects of subsidence.

By implementing initiatives highlighted in the literature, such as dynamic water-level management and nature-friendly banks, Midden-Delfland can move towards a more sustainable agricultural future while preserving its rich agricultural heritage and natural ecosystems.

Future spatial challenges facing

Midden-Delfland:

literature study

per theme

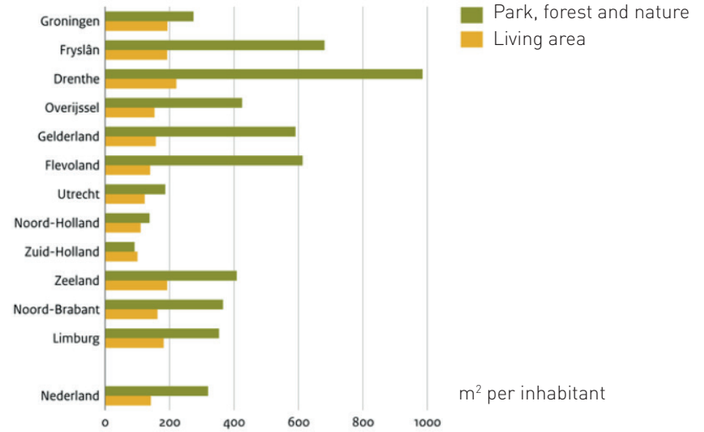
Railway crossing the landscape.

4.4 Recreation

4.4 Body of Knowledge & Concepts: Recreation

Recreation: a growing demand

The municipality and the collaborative landscape table of BPL Midden-Delfland, describe the open landscape as a recreational 'backyard' for 2 million people For 2050, the estimated population growth is 453,000 people in the province of South-Holland, meaning an increase from 3.7 million for the whole province to 4.2 million (Centraal Bureau voor de Statistiek, 2023). This expected growth means that even more than 2 million people will be looking for available outdoor green space. The rapid growth of South Holland, has reduced the amount of available space per inhabitant over the past century. Compared to other provinces in the Netherlands, the inhabitants of South Holland are provided with the least amount of green space per inhabitant (see figure 41). The high level of urban occupation makes it the only province where the availability of green space is even lower than the availability of urban living space. Despite limited green space, the remaining recreational areas are becoming increasingly important for health and well-being. Addressing challenges such as ensuring accessibility, changing activities, and creating connections to outdoor green spaces are explored in this chapter.

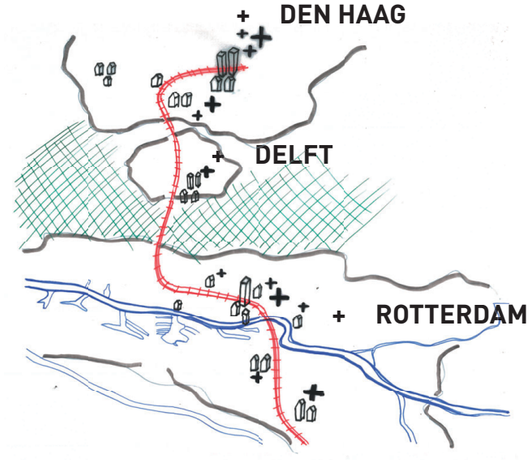


[Fig.41] Green space & Living space per inhabitant, per per province, 2017. (CBS et al., 2024)

Accessibility

In terms of mobility, urban planning often prioritizes car connections. The highways primarily serve as transit routes that only work on a larger scale, at the expense of the recreational value.
The Southern Randstad region faces significant future challenges, including the need of an improved traffic flow, population growth resulting in a regional housing task of 240,000 new homes and finally, the need to enhance sustainable mobility. The metropolitan region Rotterdam Den Haag, MRDH, aims to address these challenges by densifying urban areas around efficient public transport nodes, focusing on sustainable mobility, and strengthening the metropolitan region in the Southern Randstad. This involves improving faster connections, further linking urban and regional public transport networks, and enhancing bicycle facilities.

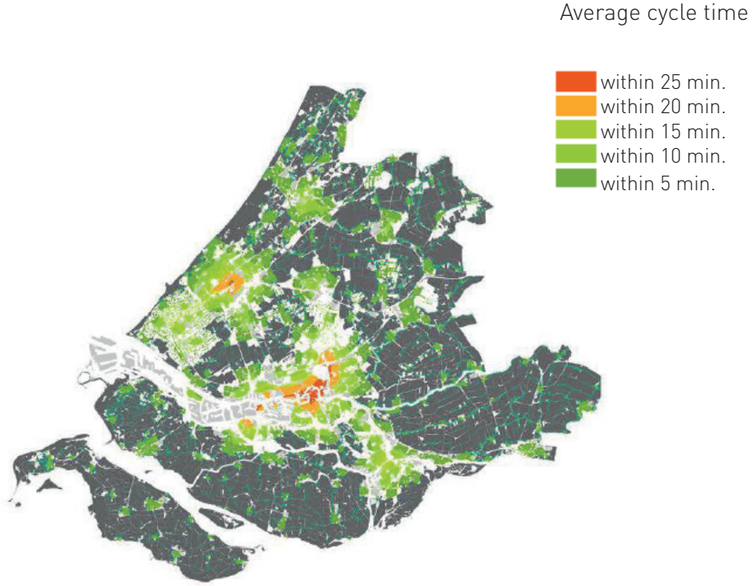
In developing the bicycle network, MRDH distinguishes between its utilitarian and recreational functions, which have different requirements. On the one hand, there is a need for comfortable, traffic-safe but fast routes and (wide) recreational routes (slow lanes) between urban and rural areas. The use of bicycles is increasing, especially in cities. The emergence of the e-bike creates new opportunities for (longer) cycling trips for distances up to 15 kilometers. (Metropoolregio Rotterdam Den Haag, 2016)



[Fig.42] Densification around public transport nodes by MRDH. Made by author.

The 15 minute city

Following the theory of the 15-minute city (Luscher, n.d.), an ideal city ensures that residents can reach essential amenities, work, recreation spots, and commercial areas within a 15-minute walk or bike ride from their homes. This discourages car use and makes the environment more livable, sustainable, and healthy within highly urbanized areas.
Figure 43 illustrates the extent to which residents of South Holland can reach the countryside from the city centers, within 15 minutes by bicycle. It shows that only a limited number of residents in existing urban cores and villages can reach higher-valued landscapes with bigger surfaces within the 15 minutes. There is room to improvement here, including: enhancing bicycle connections, strategically locating placing public transport hubs, and overcoming infrastructure barriers (Provincie Zuid-Holland et al., 2017).



[Fig.43] Accessibility by bike from city-centers to green infrastructure. (Provincie Zuid-Holland et al., 2017)

Extensive & Intensive recreation

Policy documents often refer to "extensive" and "intensive" recreation areas. Intensive recreation areas have more infrastructure and facilities, such as walking paths and signs, and can accommodate a higher density of visitors. Extensive recreation areas have far fewer facilities because the intended number of visitors is lower. Extensive recreation is often practiced in natural areas to avoid disturbance of habitats and the ecosystems present (Den Boon et al., 2019).

Destinations & Connections

Within the recreation function, a distinction can also be made between destinations and connections. Destinations are places where visitors go to stay longer. Destinations are places where visitors stay for a longer period of time and may be the site of various activities such as relaxation, sports or visits to recreational facilities such as cafés, farms, camping sites or cultural heritage sites. On the other hand, 'connections' can be seen as a recreational activity in itself. This involves exploring the landscape on foot, on horseback, by bicycle or by other means of transport (Provincie Zuid-Holland et al., 2023).

The development and transition in policy: quantative & qualitative

Currently, the interest in recreation and tourism in urban planning within the province of South Holland is growing alongside other issues with spatial demands, such as climate adaptation measures, energy landscapes, housing shortages, infrastructure and agriculture (Bureau voor Ruimte & Vrije Tijd et al., 2023).

This attention to recreation started in the 1960s, when the national government selected designated outdoor recreation areas to manage the increasing pressure of mass recreation. These were the 'Rijksbufferzones', which included the protection and development of recreational areas such as Midden-Delfland. Farmland was transformed into walking, cycling and nature parks. After this phase, in the 2000s, the focus shifted to developing recreational opportunities in and around cities. There was a political recognition that there was a significant need for recreation in and around the city. The 'RODS' policy of the 2000s, which means 'recreatie om de stad', 'recreation around the city', addressed this quantitative lack of outdoor green space for citizens. The quantitative strategy for recreation was later abandoned, with the decision to focus solely on the quality of existing recreational areas. The reasons for this included a lack of funding, implementation capacity and, particularly, a shortage of land. As a result, recreation policy is no longer a national responsibility today (Vereniging Deltametropool et al., 2019).

The quantitative view of the past focused on extensive areas for outdoor recreation with a buffer function. Today, recreation areas are much more diverse and form multi-purpose areas with benefits for issues such as health, climate regulation, timber production, nature development and biodiversity. The mobility of recreationists has increased drastically, resulting in a wider choice of recreation destinations. Recreation has changed from a monothematic activity to something that can be done anytime, anywhere, even on a bike ride to work, and has taken on a diverse, network-oriented character. Trends in recreation are cumulative: options are added with, for example, electric vehicles, but what we did a century ago also remains an option, such as walking and horseback riding (Vereniging Deltametropool et al., 2019).

The growing pressure on recreational areas

It is known that the pressure on existing recreational areas will increase due to the predicted population growth and urban densification in the Randstad. In addition, other developments in population behavior will increase this pressure. For example, the increase in the number of visitors to nature and recreation areas can be explained by people's growing interest in 'being outdoors'. For city dwellers, this interest is motivated by the need to exercise, to be with and study nature, and to escape the city. A leisure survey (ContinuVrijeTijdsOnderzoek) provides insights into Dutch participation in leisure activities. Outdoor recreation, including recreational walking, has the highest priority, ahead of outdoor shopping and partying and going out in the evening. Activities in outdoor recreation areas have the highest participation rates and became particularly popular during the COVID-19 crisis in 2020, especially walking and cycling. During the pandemic, there was a peak in all forms of outdoor recreation. However, even before COVID-19, there was a growing interest in the outdoors, and this is expected to continue in the coming years (CBS et al., 2021).

Recreational pressure can have a different consequences, not only for nature itself, but also for user groups and the quality of life of local residents. Research among recreational users and foresters reveals the following common concerns: reduced visitor experience due to crowdedness, damage and disturbance of nature, unintended and prohibited use of space (e.g. barbecuing in prohibited areas, unleashed dogs chasing rare species), mobility congestion (e.g. parking congestion), and pollution and waste (Bureau voor Ruimte & Vrije Tijd et al., 2023). The increased recreational pressure is mainly due to a consistent lack of attention to allocating sufficient space for recreation. Currently, there is no national standard for the amount of recreational and green space that can be considered as a spatial claim to be included in spatial plans.

Future Recreation Trends

As the pressure on recreational spaces increases in the future, it will be necessary to adapt the design and organization of these spaces to the further demographic development within the province. In recent decades, there has been a growing societal focus on healthy lifestyles, with exercise playing a central role. However, in the province of South Holland, more than half of the population is overweight and a significant amount of the urban population does not meet the guidelines for physical activity. At the same time, there has been a renewed appreciation for green spaces, where people increasingly go outside to exercise and relax. The growing focus on healthy living increases the need for exercise opportunities in green spaces. Sports and exercise in public and green spaces will become increasingly popular.

Population growth and the demographic shift towards a higher number of older people will continue to influence the leisure sector as more people and older people seek leisure activities that suit their interests and physical abilities. This trend may drive the need for increased accessibility and the development of activities focused on relaxation and well-being that are suitable and not too demanding for older generations.

Technological developments, such as electric vehicles and information technology, will change recreational behavior and encourage sustainable forms of mobility. A growing awareness of nature and heritage will stimulate demand for sustainable recreation. Climate change will lead to a growing need for shelter from heat, and drought mitigation. Warming water increases the likelihood of algae growth and causes greater risk of poor water quality, while the wetter winters may bring heightened risks of flooding. Climate change mitigation efforts, including carbon storage in forests and peatlands, will become increasingly important in addressing these challenges (Provincie Zuid-Holland et al., 2023).

Applying concepts of Recreation to Midden-Delfland

With the knowledge of increasing urbanization, the pressure on recreational functions is applicable for Midden-Delfland. Its proximity to urban areas attracts many inhabitants from the neighboring cities. What stands out is the low density of the municipality of Midden-Delfland itself, next to small scattered municipalities with greenhouse infrastructure such as Westland and Pijnacker. On the other hand, the higher population density of municipalities such as Maassluis, Vlaardingen and Schiedam will provide the increasing recreational pressure.

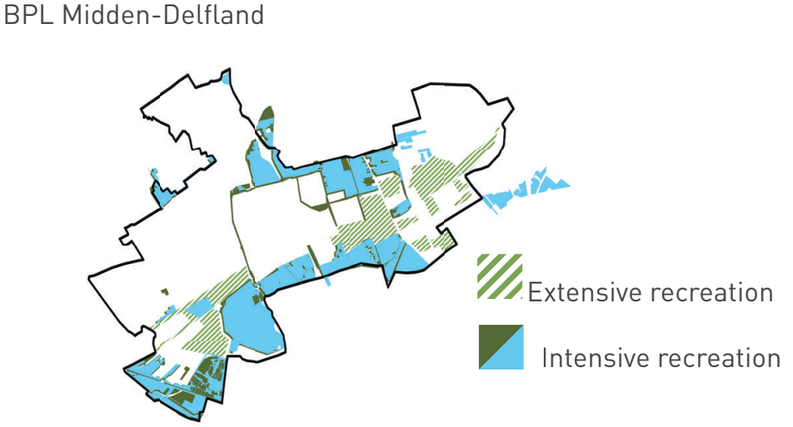
Recreation in Midden-Delfland: lay-out of the landscape

The recreational landscape of Midden-Delfland can generally be divided into two parts. On the one hand, visitors can enjoy the core area: this is the open, agricultural area consisting of the polders in the central part. The main characteristics of this core area are its quietness and open space. Some parts of this polder landscape function as extensive recreational areas and are managed in specific ways because of the nesting meadow birds, and visitors are only allowed to use the paths through the meadows during limited seasons. On the other hand, on the edges of Midden-Delfland there are the 'urban fringes' with recreational extension areas, which are often characterized by a more wooded environment. These urban fringes are intended for intensive recreation and offer the best connections to the cities and surrounding municipalities via the BPL, but the green structures do not always contain suitable infrastructure to facilitate these good connections. As a result, the mental proximity of the recreational areas and the open landscape from some adjacent urban areas remains limited.

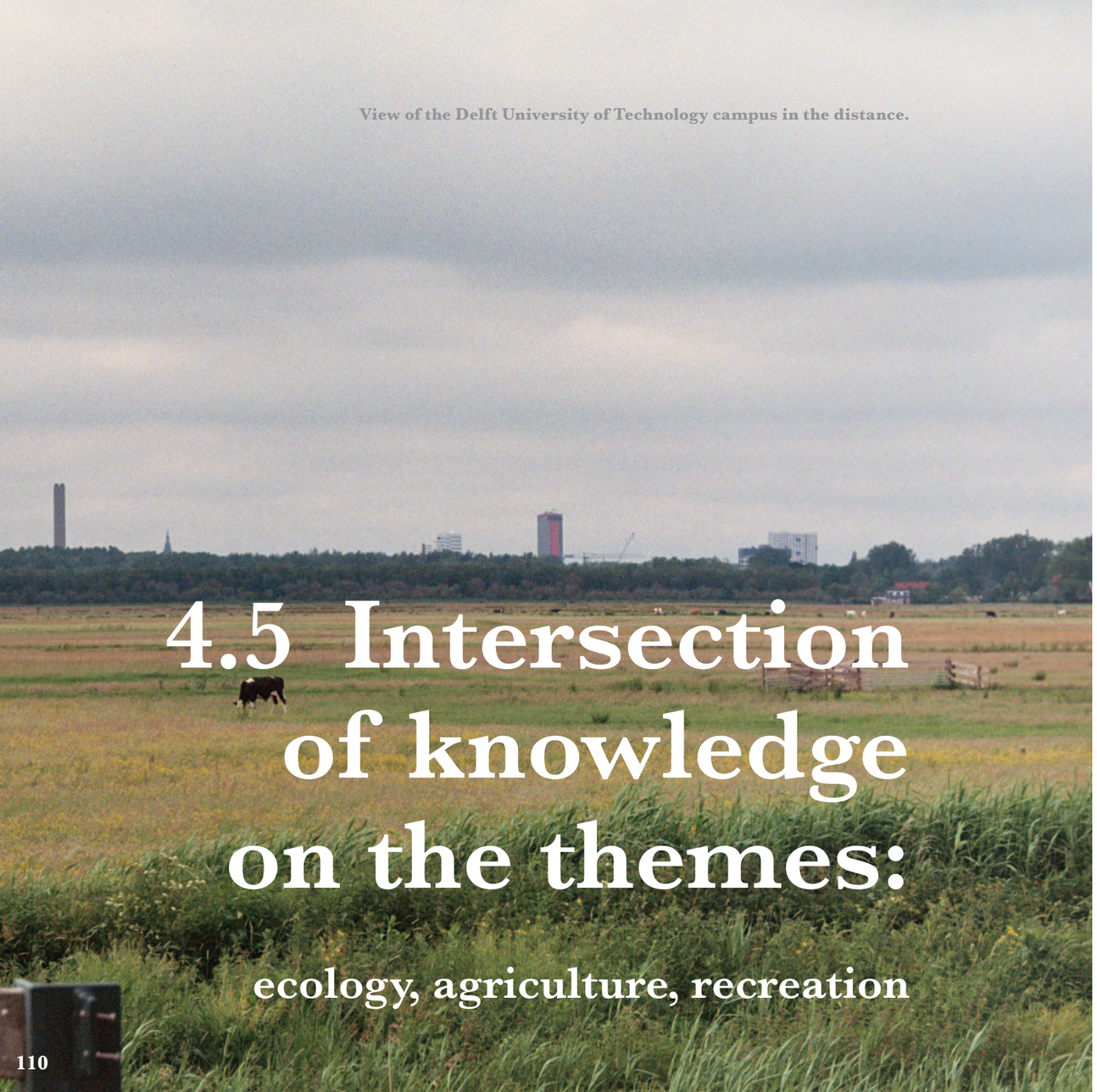
Accessibility of Midden-Delfland

In terms of mobility, Midden-Delfland is quite well connected by car, with the A4 and A13 highways crossing the area and forming major barriers in the landscape. In order to maintain the vitality of Midden-Delfland and preserve its open landscape, the accessibility of recreational values could be increasingly prioritized. However, the share of public transport and cycling to reach this vital Midden-Delfland for the future is limited (Move Mobiliteit & Verstedelijking et al., 2019).

In conclusion, the growing demand for recreational activities amidst population growth and urbanization needs to be addressed, ensuring accessible outdoor spaces for health, well-being, and community engagement in Midden-Delfland and the whole the region of the province. However, limited green space and the dominance of car-centric infrastructure are currently significant barriers to achieving this goal. By prioritizing sustainable mobility solutions, such as improving bicycle networks and embracing the principles of the 15-minute city, Midden-Delfland can improve connectivity and promote healthier, greener modes of transportation. In addition, it is critical to recognize the diverse needs of recreational users and adapt to evolving recreation trends. This may require a re-evaluation of the current spatial layout, which features intensive fringes contrasting with an extensive core. Balancing conflicting demands and preventing the concentration of recreational pressures in certain areas will be key tasks going forward, requiring difficult choices that will be explored in upcoming chapters.



[Fig.44] Diagram intensive and extensive recreation. Made by author.



View of the Delft University of Technology campus in the distance.

4.5 Intersection of knowledge on the themes:

ecology, agriculture, recreation

Although there is often a need for differentiation between the three themes in terms of land use, functions, and different policies and stakeholders, there is also a strong similarity within the themes. To conclude this chapter, the initial intersections between the themes are briefly discussed, after which more attention will be given to this overlapping and integration in the further chapters.

Nature-inclusive agriculture

Firstly, the steps already taken in Midden-Delfland towards nature-inclusive agriculture have been addressed. This allows nature to coexist with human influences from the agricultural sector in the area. It is acknowledged that the landscapes of the livestock farmers are not strictly separated from the natural ecosystem, but rather work together. However, the literature has shown that a "rewilding strategy" can have a strong positive impact on the development of nature in the area, which is less compatible with the more human-oriented applications of nature-inclusive measures within the agricultural sector.

Peat restoration vs. water management for production

Second, another similarity, but also a contradiction and intersection, can be found in the approach to the peat meadow landscape and the management of water levels. Within ecology, restoration of peatlands would be the ideal solution. Within agriculture, however, there is a broader focus on the management of the water system to still allow production, either with alternatives or the latest technological innovations to drain and "wet" the land.

Green outdoor space

Recreation and ecology can go hand in hand, as outdoor green spaces serve not only as recreational spaces, but also as valuable green corridors connecting habitats within an ecosystem, thus increasing the total area of the ecosystem in which species can live and operate.

In search of a ‘Green Norm’

A green norm is a standard used to measure or evaluate the amount of green space available per person in a specific area. The purpose of a green norm is to establish guidelines for the optimal amount of green space available per resident to promote health, well-being and quality of life. It defines a specific amount of green space that should be available per resident, measured in square meters (Bureau voor Ruimte & Vrije Tijd et al., 2023). The European Commission’s Nature Restoration Law provides some clarification on the minimum amount of green space in the Netherlands. However, this law has not yet been adopted. It is already known that all EU countries will be obliged to develop national restoration plans based on the EU Nature Restoration Law. One of the binding goals of the law concerning recreational areas, is that:

“By 2030, no new losses of green urban space; by 2050, an increase of 5%, with a tree canopy cover of of at least 10% in European cities (The EU Nature Restoration Law, 2024).”

One way to create more space for recreation could be by connecting to more nature reserves of the NNN, the Dutch Nature Network. However, this would require zoning to align the use for nature and people.Two examples of existing green norms are:

1. The Nature Based Solutions, 3-30-300 rule: 3 trees in view from a home, 30% tree canopy coverage in the neighborhood, and a green area of at least 1 hectare within 300 meters.

2. A norm for recreational use of green spaces around the city suggests a minimum of 500 m² of green space per household within a maximum of 5 kilometers from the city center (in units of at least 1000 hectares).
(Cortesão et al., 2024).

The implementation of green norms not only fosters the enhancement of urban ecosystems but can also promote a harmonious balance between ecology, agriculture and recreation. By setting standards for the amount of green space available per person, these norms aim to improve public health, well-being, and overall quality of life

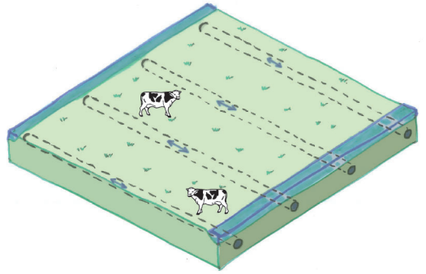
Listing design principles for each theme & finding synergies

The following pages explore the intersection of the themes of ecology, agriculture, and recreation, and outline guiding design principles. Because each theme presents its own unique set of challenges, a nuanced understanding of their interactions can provide valuable context for designing the vision for Midden-Delfland’s future. To structure the possible sustainable solutions for Midden-Delfland, the design principles are organized first by theme and then by their combined synergy. Symbols alongside each principle indicate its primary thematic focus and potential synergies, next to the main symbol (see Figure 45). The smaller icons represent the theme with which they can work in synergy. This approach not only provides a framework for sustainable development, but also highlights the diversity of design principles and their potential impacts on the landscape. These principles serve as guidelines for shaping Midden-Delflan’s vision, ensuring the coexistence of diverse activities while striving to preserve the region’s ecological richness and cultural heritage.



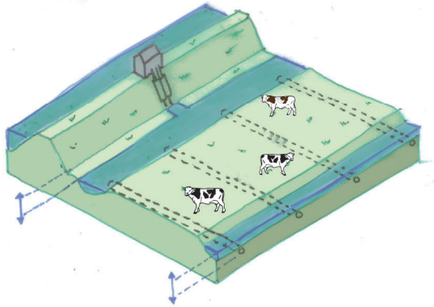
[Fig.45] Legend of symbols that represent the themes.

Design Principles Agriculture



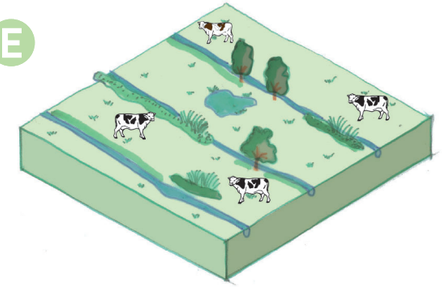
Drainage System

This approach uses Underwater Drains (UWD). Unlike indirect groundwater control through ditch levels, UWD allows direct influence on groundwater levels. This enables more localized, precise control, creating a responsive water system. Drainage pipes are laid at regular intervals (4 to 6 meters apart) below ground level, creating a "shortcut" between ditch and groundwater levels. This reduces variation within each plot and promoting efficient water drainage and infiltration. (Stout & Dijkman, 2021)



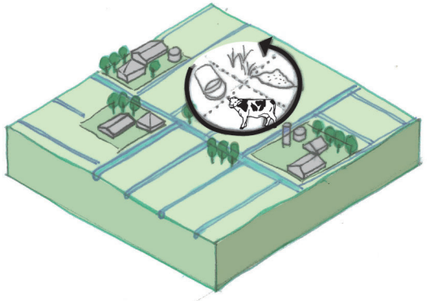
Dynamic water-level Management

This method is slowing down soil subsidence through dynamic water-levels. For agricultural purposes, a minimal drainage level is necessary, which can vary depending on activities. Adequate drainage (50-60 cm) is crucial during activities like grazing or harvesting grass. When the land is inactive, a higher water level (30-40 cm) can be maintained without significantly affecting agricultural functions. Drainage pipes are spaced 10-15 meters apart, and dynamic water levels allow temporary water storage in rural areas, particularly useful in winter. (Stout & Dijkman, 2021)



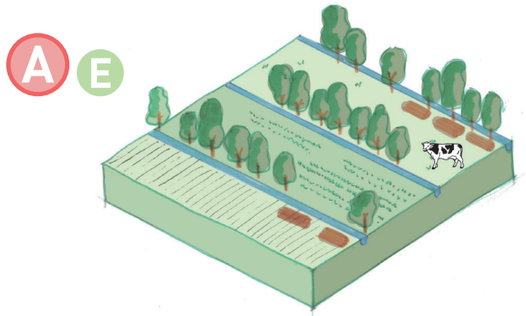
Extensive Circular Agriculture

Extensive farming aims to produce food across more land (production space) with fewer external inputs, like fertilizers and pesticides. Typically, less is produced per hectare compared to intensive agriculture, but this is far less harmfull to the environment. Small parcels of land could be used for water storage to reduce subsidence and peat oxidation locally. In extensive livestock farming, animals mainly consume locally grown feed, often grass. Unlike intensive farming, extensive practices are land-dependent, utilizing animal manure for their own agricultural land. (PARK Noord-Holland et al., 2021)



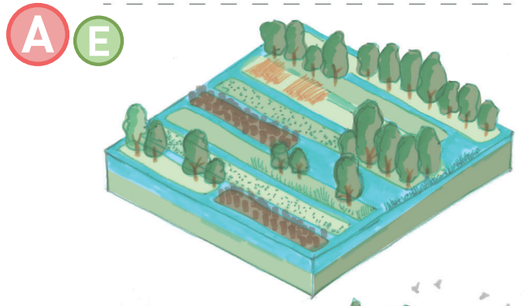
Partnership & Circular Agriculture

Circular agriculture could benefit from partnership, as parts of the cycle can be exchanged to overcome excesses of feed for cattle and manure. Collaboration makes investments more manageable, spreading costs across multiple businesses. This approach enhances resilience against poor harvests, as farmers can support each other financially during challenging times. (College van Rijksadviseurs, 2020)



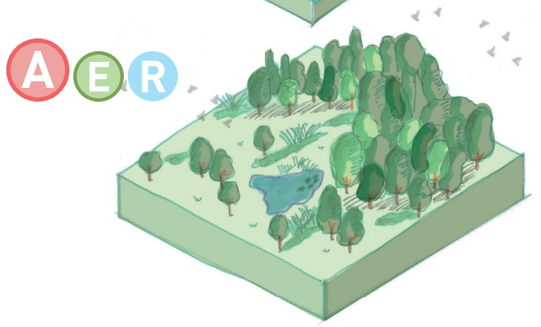
Biobased Cultivation

Switching to more biobased crops achieves reduction in greenhouse gas emissions – partly by emitting less and partly by capturing carbon. The market for biobased construction materials is emerging, with developed chains for crops like hemp and flax. However, newer crops like cattail, reed, and willow are in an experimental processing phase and suitable to be grown on peat soils. For example, reed has applications in insulation and roofing. (Provincie Zuid-Holland et al., 2022)



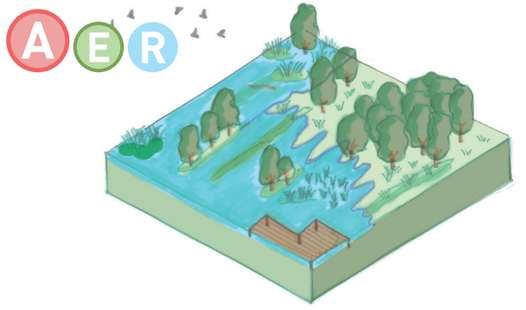
Paludiculture / Water-proof Crops

In the future, soil subsidence will lead to lower, wet areas, making dairy farming and the grazing of cows on dry meadows not durable and unsustainable. New experiments focus on cultivating crops under highly wet conditions and high water-levels. Current trials involve bulrush, cranberry, reed, and peat moss. (Stout & Dijkman, 2021)



New Nature, (food) Forest

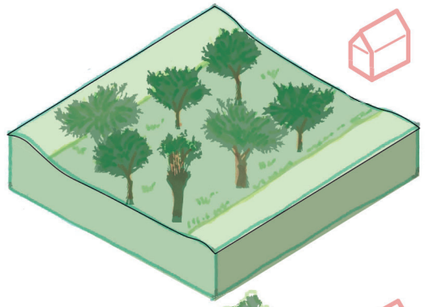
Food forests blend agriculture with nature for sustainable food production. Layered vegetation and perennial plants are used for cultivation. Trees and shrubs bear nuts and fruits, while open spaces consist of flowers and herbs. Traditionally, wood served various direct purposes in farming, from fences to tools. Farmers maintained small forests, periodically harvesting trees and allowing them to regrow. Such small wooded areas, mainly featuring oak, alder, hazel, willow, elm, and ash, can grow on peat. (Provincie Zuid-Holland et al., 2022)



New Nature, Wetland

Restoring original marsh peat landscapes can be beneficial for ecological and economic reasons. Thriving peat, growing instead of depleting doesn't emit greenhouse gases; instead, higher water levels encourage peat to accumulate non-decomposing plant material, sequestering CO2. Elevated water levels counteract subsidence. Marsh peat also attracts recreationists, exploring via boardwalks or canoe routes to witness returning flora and fauna. over time. While farmers resist, prioritizing meadow bird preservation this environment possibly revitalizes many other diverse species. (Arts, K. et. al, 2022)

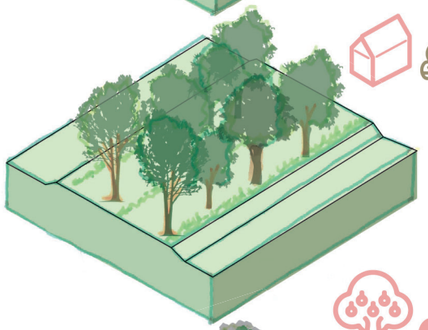
In Depth Cultivations



Willow Osier Bed

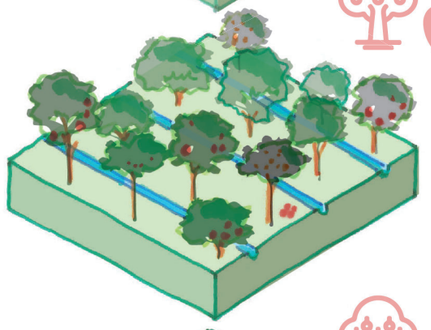
This is a traditional form of agriculture in the Netherlands, where willows are grown on relatively wet agricultural land. An advantage of this type is that the willows are a characteristic feature of the landscape and contribute to the cultural-historical image of the Dutch polder landscape. This type is suitable for peat soils as the willows can be grown in very wet conditions. All kinds of structures can be woven from the willow branches, which are used in construction.

(Provincie Zuid-Holland et al., 2022)



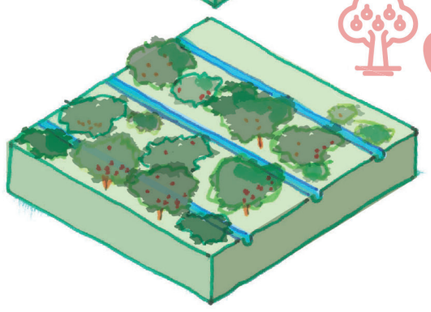
Dry Forest

This type of cultivation also refers to the cultural-historical image of coppice forests, which used to be common landscape elements in the Dutch countryside, where the wood that could be chopped was used directly for constructions on the land. Typical trees for the peat meadow landscape are oak, birch, poplar and hazel (Provincie Zuid-Holland et al., 2022).



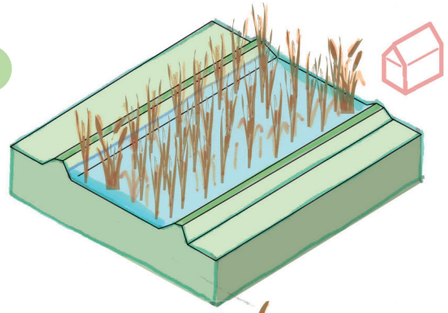
Food Forest, Trees

Before the intensification of the agricultural sector, the presence of orchards with fruit trees in the farm yards was more commonly seen, these were called 'Hoogstamfruit Boomgaarden'. Different types of fruit and nut trees are suitable for a landscape like Midden-Delfland, for example walnut, apple, plum, cherry and pear trees. (BOOM Landscape & De Natuurverdubbelaars, 2022)



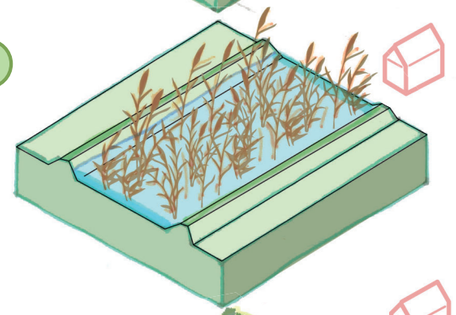
Food Forest, Lower Shrubs

Possible types of fruit-shrubs are for example blueberry, raspberry and cranberry, suitable for peat soils. Food forests can attract visitors who come to pick the fruits for recreation, contribute to biodiversity and replace milk and dairy production of livestock farming, but still offer other forms of food production. (BOOM Landscape & De Natuurverdubbelaars, 2022)



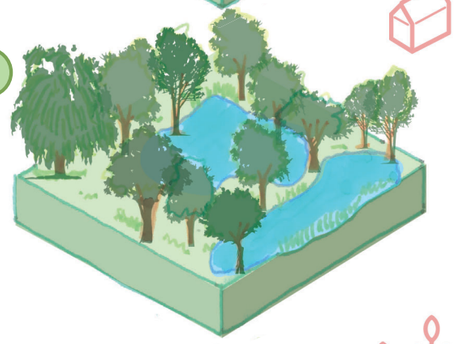
Wet Cultivation: Bulrush / Cattail

The bulrush is a perennial crop that grows in high water levels of 10-30 centimetres above ground level. The economic value of this plant is its use for biobased building material and insulation material. In addition, the plant acts as a natural water purifier by absorbing nutrients and the vegetation can serve as a food source for livestock. (Westerhof, 2021)



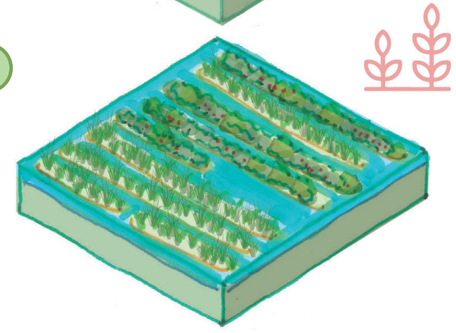
Wet Cultivation: Reed

This is a type of vegetation that commonly grows in Midden-Delfland. Reed is used in construction for example in roofing material and crafts, and holds significant economic value. Reed can be grown on many types of growing sites, often marshy lands and is not dependent on strict water level changes and the availability of nutrients (Westerhof, 2021)



Wet Forest

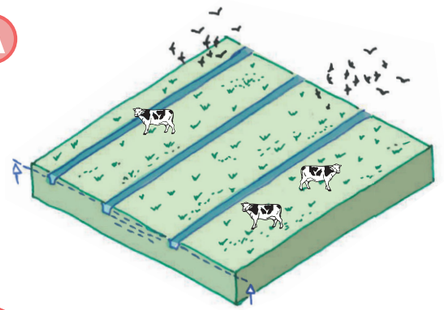
A carr or fen woodland, is a forest type that thrives on wet, marshy soils, such as along rivers, streams or in bogs. Not all tree species are suitable for (temporary) flooding. It is characterised by a diversity of tree species adapted to wet conditions, such as birch alder, willow and ash. After a few years the trees are mature enough to be chopped into wood, usable for construction purposes. (Provincie Zuid-Holland et al., 2022)



Paludiculture Food Production: Cranberry & Wild Rice

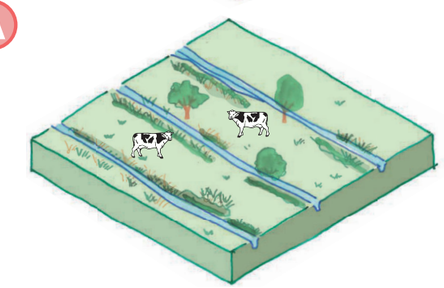
Paludiculture involves cultivating crops like cranberry and wild rice in peat meadow landscapes with heightened water-levels. This practice conserves peatlands, vital carbon sinks, while offering sustainable agricultural alternatives to livestock farming. These crops thrive in wet environments, reducing the need for drainage, thereby preserving peat and mitigating carbon emissions. (Westerhof, 2021)

Design Principles Ecology



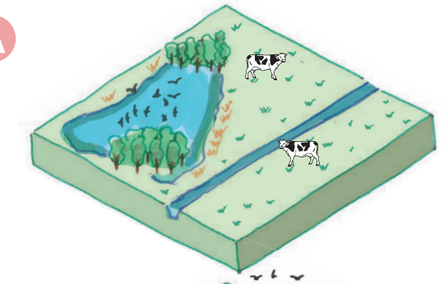
Herb-Rich Meadows for Bird Species

Promoting herb-rich meadows in Midden-Delfland benefits specific meadow bird species, by providing diversity in habitat and food. Achieving this involves specific land management practices by farmers, encouraging them to maintain these meadows and coordinating mowing schedules to avoid disrupting breeding seasons. This approach fosters biodiversity, crucial for the local ecosystem's health. (Altenburg & Wygema ecologisch onderzoek, 2018)



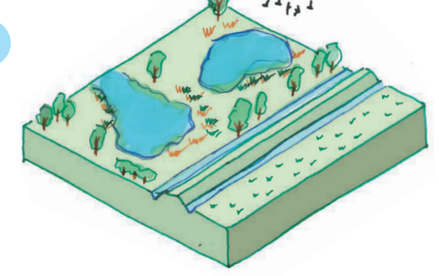
Ecological Banks

Ecological banks in Midden-Delfland consist of gently sloped edges of agricultural ditches that enhance biodiversity. Providing a variety of habitats with different water levels and flow speeds appeals to native species compared to harsh ditch edges. Avoiding mowing on these banks also supports diverse environments, benefiting plant and animal life.(Altenburg & Wygema ecologisch onderzoek, 2018)



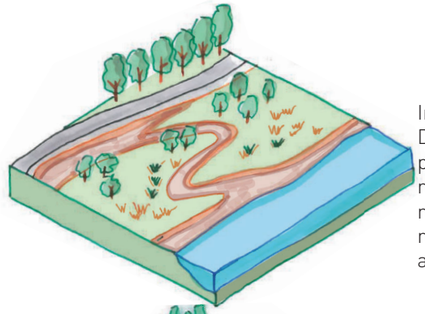
Wet Landscape - Reed Marshes

By allowing parts of a farmer's land to be inundated and left alone, original wilderness can return here, like reed marshes for example. With high seepage pressure or regular flooding, a wetland with vegetation develops on the surface of the landscape. When a pond silts up and can no longer be considered a water body, swamp is formed. Depending on water composition and fluctuations, many vegetation types are possible. Management of marshes usually involves a combination of maintaining the hydrological conditions of the area and counteracting afforestation. (Altenburg & Wygema ecologisch onderzoek, 2018)



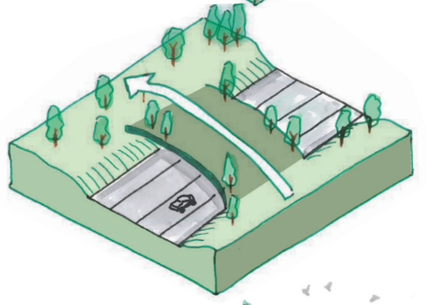
Restore Peatland

Restoring peatlands in Midden-Delfland involves revitalizing areas damaged by human activities like peat extraction or dewatering. It often includes measures such as raising water levels, reforesting areas and creating buffer zones to prevent further degradation of the peat.
Challenges arise due to historical values and economic activities. Implementing restoration requires collaboration among stakeholders and government agencies, considering agriculture, hydrology, and infrastructure. (Smolders et al., 2019)



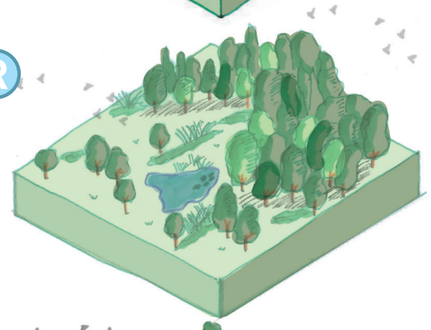
Ecological Corridor

Implementation of an ecological corridor in Midden-Delfland improves connectivity between natural areas, potentially along waterways or between patches of nature reserves or greenery. This offers the possibility to integrate recreational paths for visitors, offering an engaging route through nature. This approach fosters biodiversity and enhances the ecological resilience of the region.



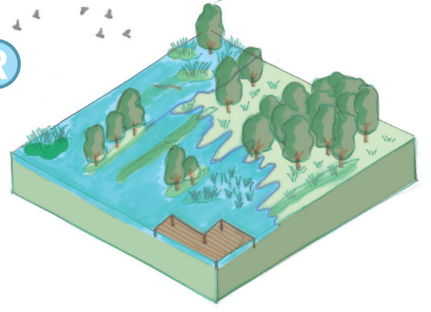
Ecopassage

To enhance Midden-Delfland's ecological network, more ecopassages are essential. An example is the Eco-aquaduct, that spans the A4 highway, allowing the small river Zweth to continue and enabling wildlife crossings. These structures mitigate habitat fragmentation, fostering biodiversity and allow for safe movement of animal species across the landscape.



Forest

A characteristic process in the peat landscape is land consolidation, proceeding through several stages. First, there is open water in which residues of aquatic plants slowly accumulate. This develops towards marsh plants that can grow in the deeper water. Eventually, a peat bed consolidates further and eventually even peat moss reedbeds or a damp forest develop. (Van Duinen et al., 2017) In Midden-Delfland, forests play a vital role in the local ecology. These wooded areas, consisting of wetland forests and riparian woodlands, contribute to biodiversity, stabilize peat soils, and provide habitat for diverse flora and fauna.



Wetland

To achieve landscape differentiation in Midden-Delfland, a balance should be established between wetlands, marshland habitats and forests, which are crucial for the stability of peat soils. All environments provide recreational opportunities, allowing visitors to appreciate the varied natural landscape. Wetlands regulate water flow and support unique species, while forests provide shade, and protection from the wind.

Design Principles Recreation

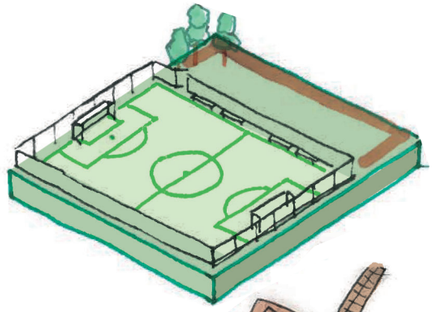
R



Playground

Playgrounds in Midden-Delfland offer space for children to connect with nature and engage in play with others in an outdoor setting, promoting social and physical activity and connection with the local landscape. Playgrounds are mainly found in intensive recreational areas and in the urban context of villages. In the forests of for example Broekpolder, they are more ecologically and nature-oriented, by using natural materials such as tree trunks or by building a course to climb among the trees.

R



Sportsfields

In Midden-Delfland, outdoor sports facilities are mostly found in the categories of golf courses and courts such as tennis or football pitches. Sports fields provide recreational opportunities for residents and visitors and encourage active lifestyles and community engagement. Opportunities lie in integrating them with the landscape by using eco-friendly materials and minimizing impact on the environment.

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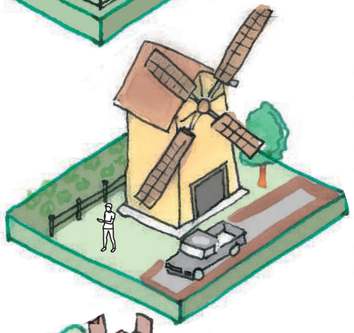

Heritage Site

The landscape of Midden-Delfland was subjected to many changes over the past centuries, transitioning into the current polder landscape that allowed for the settlement of historical villages and farms. The traces of the river streams, from pre-human settlement are still visible with creek ridges across meadows. Apart from that, the landscape houses some archeological sites. By enabling visitors to find these heritage sites, next to highlights such as windmills or duck decoys, awareness of the past arises and the historical and cultural significance of Midden-Delfland is emphasized.

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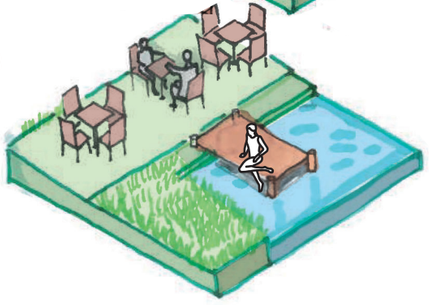

Café - Restaurants

A café-restaurant in Midden-Delfland serves as a stop for locals and tourists, providing a space to relax and enjoy food and drinks. Incorporating products from the local market, such as sourcing ingredients from nearby farms, enhances its role in promoting the region's agricultural landscape.

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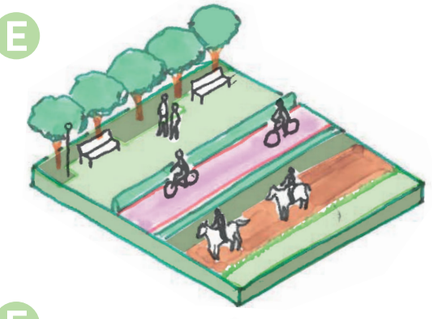

Activity Routes

Activity routes can offer designated paths for walking, cycling, and horse riding, providing opportunities for residents and visitors to explore the diverse landscapes while minimizing disturbance to sensitive ecosystems. Besides, the ability to actively explore the landscape outdoors contributes to a healthier lifestyle.

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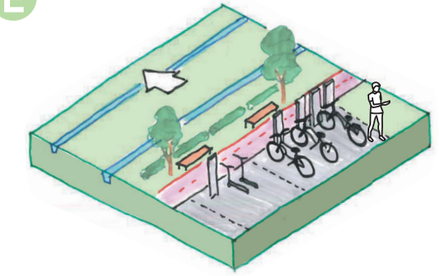

Mobility Hub - Small

A small mobility hub for (electric) bicycles can serve as a starting point for visitors to experience the landscape. Even electric bikes can be included for further distances and eco-friendly transportation, encouraging cycling as a sustainable means of exploring the landscape with again a minimizing disturbance of sensitive ecosystems.

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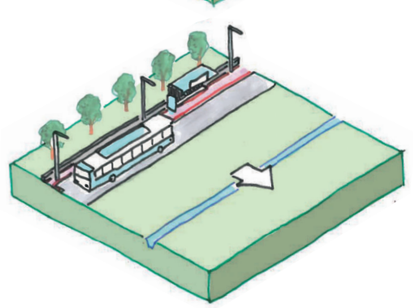

Mobility Hub - Large

A large mobility hub for public transport facilitates easy access to recreational activities in Midden-Delfland, reducing reliance on cars and promoting eco-friendly travel options, which limits the environmental impact. This type of mobility is less suitable for access to ecological zones that demand minimal human disturbance.

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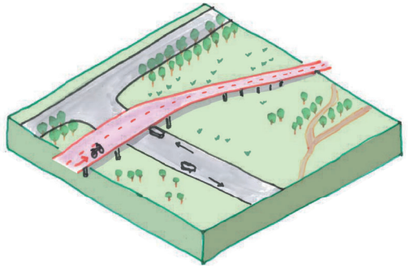
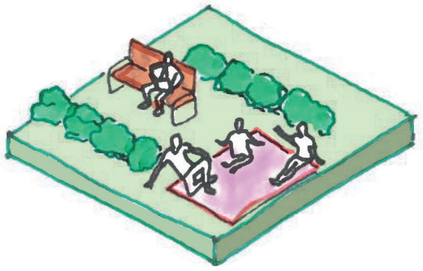


Overpass for Cyclists - Pedestrians

An overpass for cyclists and pedestrians enhances safety and accessibility, to overcome the big infrastructural barriers like the highways and train tracks that cross the landscape, allowing easy movement across roads and waterways and establishing better connections for city-dwellers that explore the rural, outdoor landscape from an urban environment.

Design Principles: Finding Synergies

E R



Relaxation Area - Picnic

To create a relaxation area such as a picnic spot, maintaining a mowed lawn within a recreational zone or forest invites visitors to unwind in an outdoor setting. This approach uses green space as a destination for relaxation and community. This design principle is very simple and flexible in space allocation, accommodating various recreational activities.

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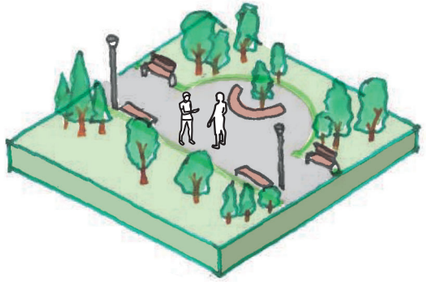

Park

Green outdoor spaces can become parks by maintaining accessible vegetation, establishing clear pathways, and providing outdoor furniture and amenities such as benches, trash bins, and nighttime lighting. This transforms them into inviting spaces for community use and relaxation.

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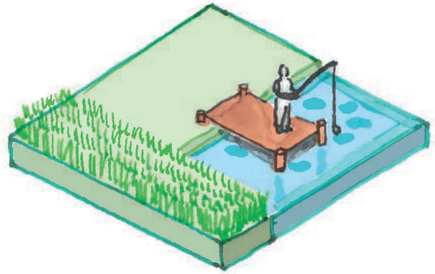

Waterfront

Enhancing the waterfront with a quay or dock provides opportunities for recreational activities like fishing, swimming, and enjoying the water's edge. These additions facilitate direct interaction with the waterways of Midden-Delfland and create inviting spaces for relaxation and leisure. Whether it's convenient spots for parking your canoe, taking a refreshing swim on a hot day, or simply sitting by the water's edge.

E R



Lake / Open Water

Depending on water depth, water buffers, and ecological wetlands can provide recreational experiences by enabling various boating activities, such as canoeing. Improved waterway connections for canoeing enhance accessibility and expand opportunities for exploring the natural beauty of the water-rich Midden-Delfland region.

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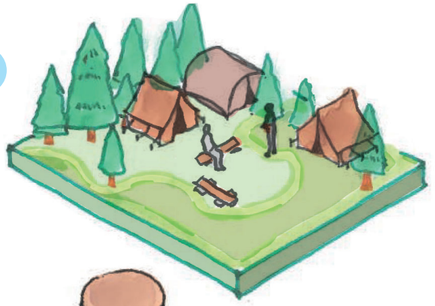

Campsite

A campsite serves as a function that blends recreational activity with ecological zones, as the gradation in wilderness of the surroundings can differ, based on the preference for nature exploration. Campsites provide an outdoor nature experience.

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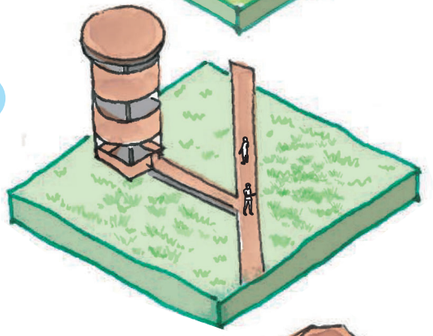

Nature Exploration

Experiencing new nature reserves in Midden-Delfland can be made accessible for recreational use with raised pathways in wetlands and the installation of watchtowers to provide views of the vast landscape.

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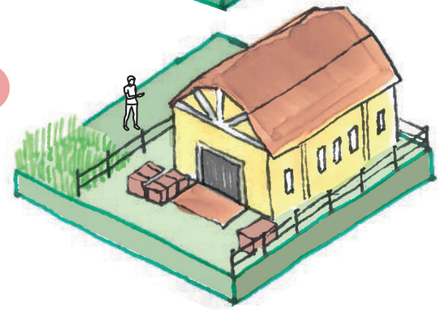

Agrotourism

Agro-tourism combines recreational side businesses with traditional farming practices, enhancing the farmyard with additional functions such as shops featuring locally produced goods, Bed & Breakfast accommodations, shared vegetable gardens, or restaurants

E A



Communal Garden

Communal vegetable gardens or general gardens are a way to connect visitors within a community and to a place in the area, contribute to the increase in biodiversity and increase food production. This can also be seen as a side task of a farm.

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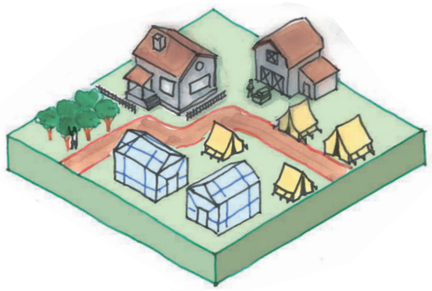

Agrotourism with Accomodation

The farmer can attract visitors to its company in various ways, by offering accommodation in the form of additional housing on the property or by facilitating a campsite.

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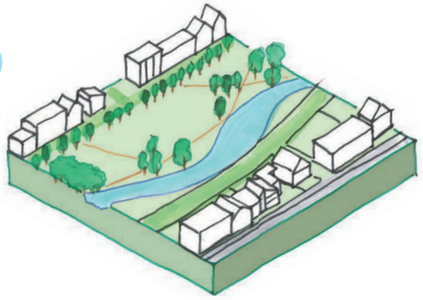
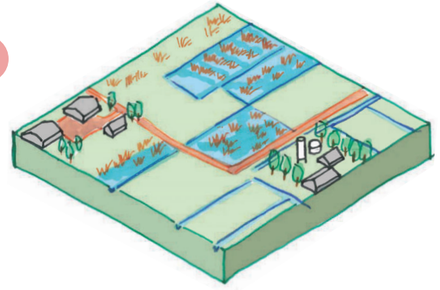


Green and Blue Urban Fringe

Extending parks and recreational green areas into the urban context and neighborhoods, creates green fingers that reach out to the rural areas, forming a green-blue urban fringe that ecologically connects city and countryside.

E A



Water Storage & Purification

Implementing water storage and purification systems on agricultural land ensures sustainable management, buffers water, and mitigates pollution runoff, enhancing productivity while protecting water resources against droughts or floods.

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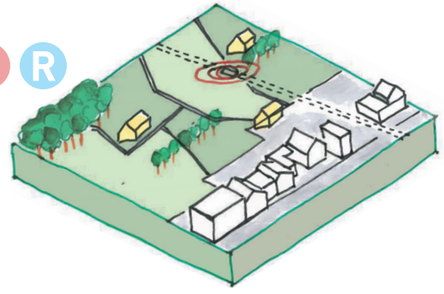
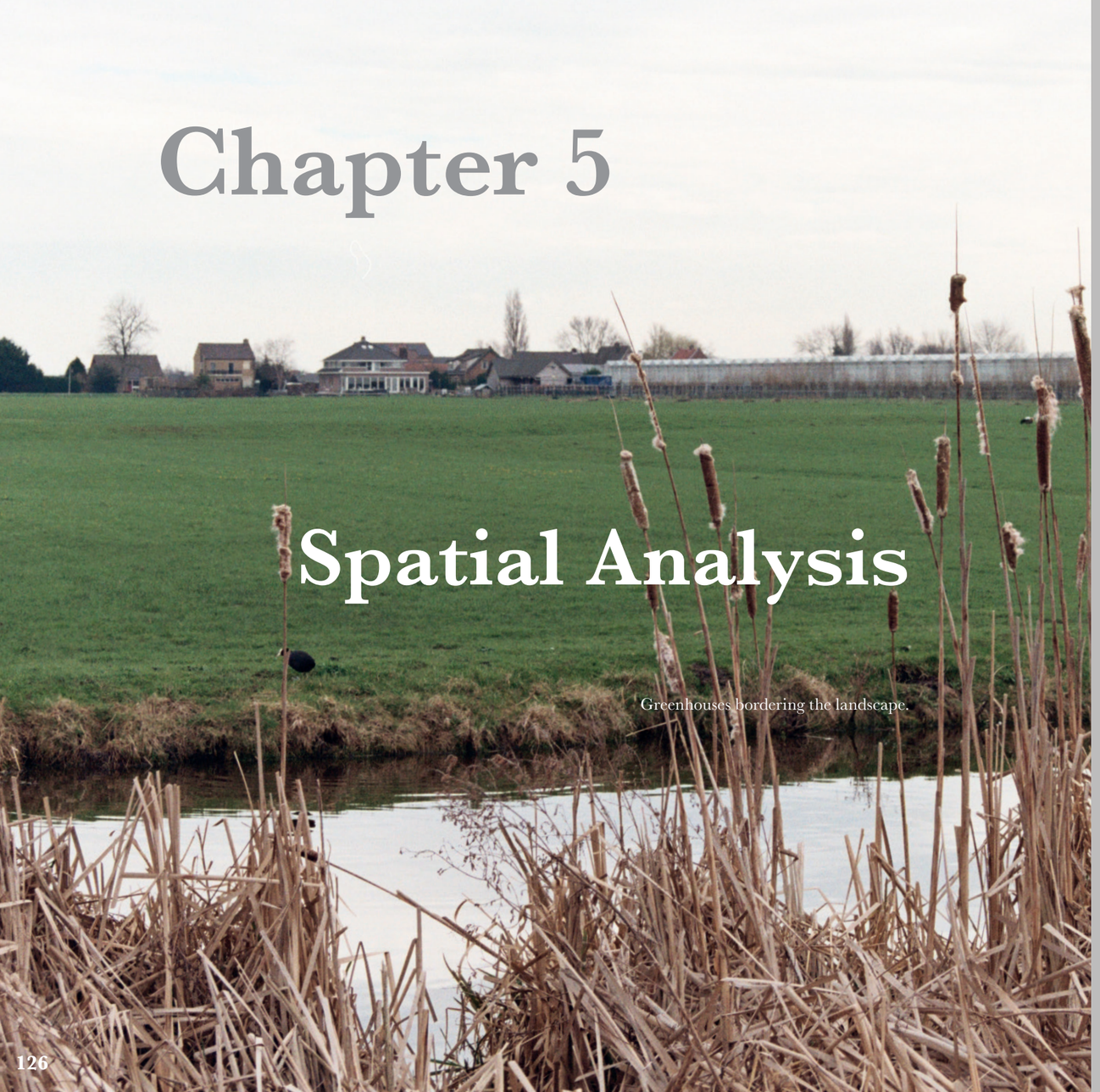


Multifunctional Urban Fringe

The goal of creating synergies, is to achieve the transition zone between urban and rural areas, characterised by diverse land uses and activities that serve multiple purposes, such as recreation, agriculture and ecological conservation, and promote connectivity and sustainability.

Chapter 5

Spatial Analysis



Greenhouses bordering the landscape.

Subquestion

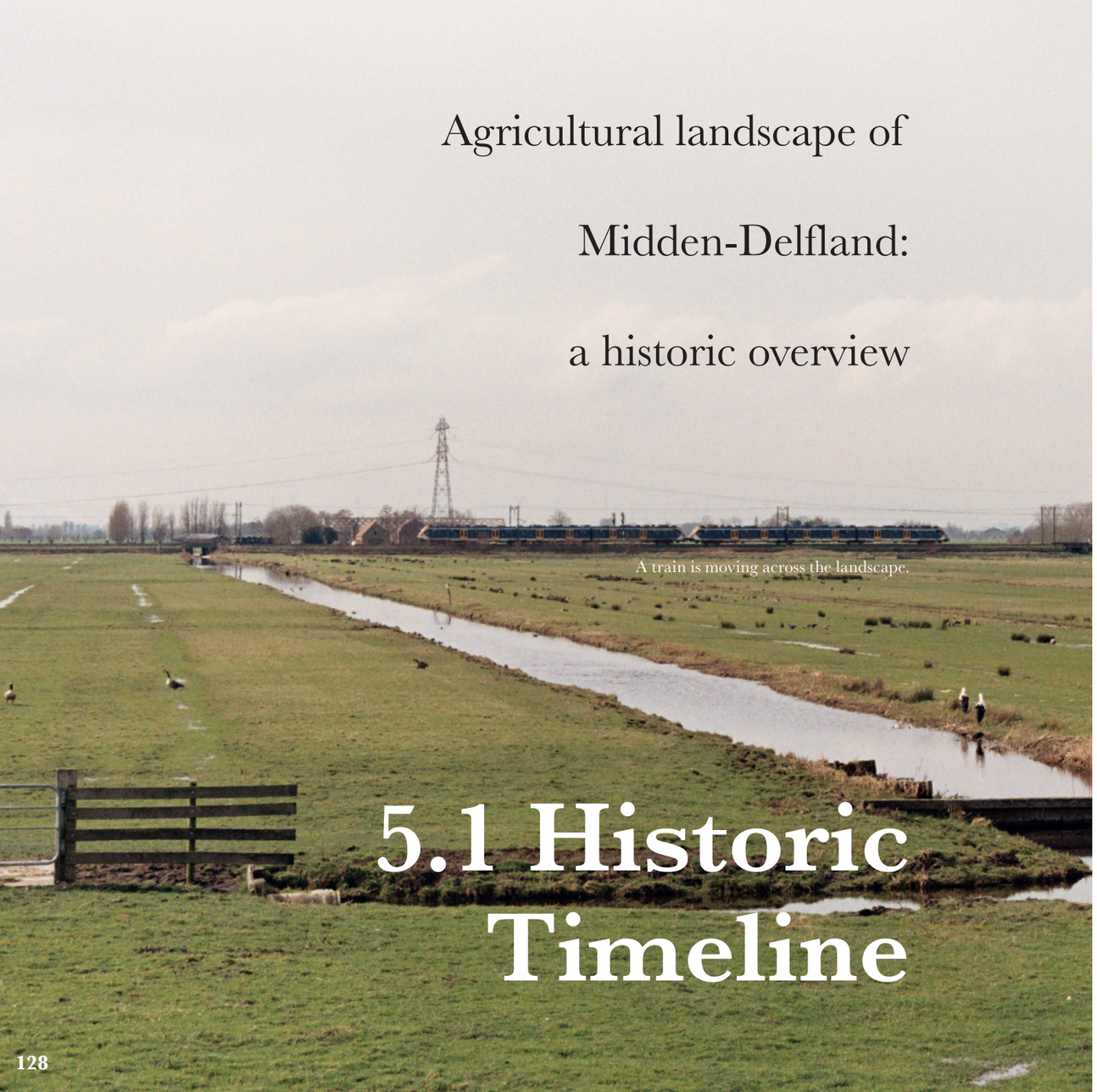
3. What is the current condition of ecology, recreation and agriculture for the region of Midden-Delfland?

The next chapter focuses on the spatial dynamics of Midden-Delfland, of importance to set a context before starting the maximization phase. It builds upon the previous literature review chapter, in which the current developments and body of knowledge per theme have already provoked an idea of possible ideas for possible futures for each theme. This chapter delves into the historical transformation and the spatial translation of the current conditions per theme, creating a base of knowledge that can support the maximum feasible and desirable outcome for a sustainable future of ecology, agriculture and recreation. However, in order to think about future prospects for the area, looking back at how the landscape has been transformed by human influences will also give better insights. The first part of this chapter shows how humans have shaped the landscape to suit their values of liveability throughout history. During the battle for control over the water-rich landscape, they built the polder structure with its dikes and ditches, eventually enabling a boom in urbanization. The extent of control over nature becomes evident, with the underlying question of how much of this strong control should persist in the future. In addition, the contrast between the green and calm polder landscape and high-urban interventions with infrastructure, is shown in cross-sections of the landscape. Finally, this chapter will dive further into the themes of ecology, agriculture and recreation separately, describing key aspects for each theme, supported by analytical maps.

Agricultural landscape of

Midden-Delfland:

a historic overview



A train is moving across the landscape.

5.1 Historic Timeline

In the current landscape of Midden-Delfland, the imprint of a complex history and human interventions and influences are still visible. Over time, the land has changed drastically for agricultural purposes, each episode leaving its traces on the landscape, without entirely erasing the previous timeframe. The result is a layered landscape, showing these layers of time with elements, patterns and structures. This chapter captures the change, supported with a historic timeline of drawings on the provincial and Midden-Delfland scales.

until 800 A.D. – Peat formation

Approximately 5000 years ago, the Dutch coast settled in, after which the formation of dunes by geological processes of sea streams were formed on the coastline of the Netherlands. This natural barrier allowed for stable circumstances and swampy forests and lakes with thick layers of peats in the hinterland (Ministerie van Onderwijs, Cultuur en Wetenschap, 2020). The influence of the sea was present for ages, visible in the clay deposits on the peat and in the remnants of a tidal creek structure in the area (Provincie Zuid-Holland, n.d.) (Gemeente Delft et al., 2009).

until 1500 A.D. – First Urban Growth

The area gradually became a prosperous agricultural and cattle breeding area, but the fact that the land had sunken lower due to subsidence, created an area at the same level as the sea. This made the area very vulnerable: in the 12th century there were huge floods. An important seawater barrier was eventually created: the Maasdijk (ca. 1250), one of the first main dikes. This gave the opportunity for agriculture to flourish and the emergence of small settlements that grew into cities such as Delft, Vlaardingen and Schiedam (Midden-Delfland In Beeld, 2017). Managing excess water became an important task for governing parties, leading to the establishment of the Hoogheemraadschap. The need to be able to drain excess water to the river Maas via locks was high. Collaboration between De Zeven Ambachten and Geestambachten expanded the administrative body.From the 12th century on people started extracting peat from the soil for energy production, excavating big chunks of land which turned into lakes eventually. By draining water from peat, peat starts to rot and evaporates, causing the soil to subside, which causes wet soil again, making it necessary to drain more. Over the years the soils subsided so much that in large areas the soils became too wet for growing crops, so the agricultural sector carried on with just livestock farming instead (Midden-Delfland In Beeld, 2017) (Erfgoedhuis Zuid-Holland, n.d.).

An example of a lake that arose from peat extraction are, De Ackerdijkse Plassen. Despite minimal changes from 1700 to 1900, the region's small towns and villages harmoniously coexisted with the surrounding land in a rich rural life, showcasing a picturesque image of human settlement and nature.

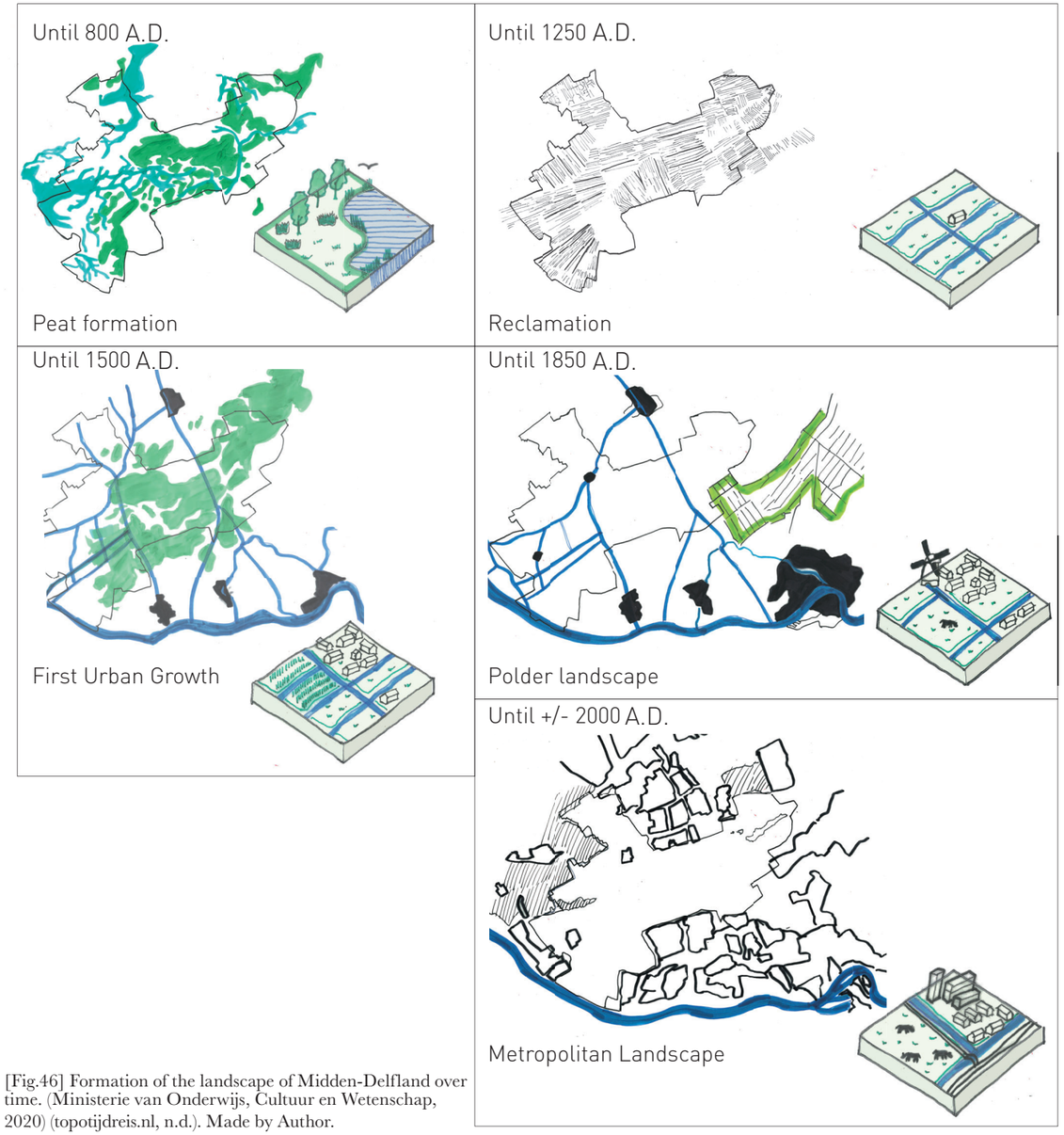
until 1850 A.D. – Polder Landscape
In the early 15th century, windmills were built in the Delfland area, at that time a new technology to take even more control over water and to drain the wetter areas. Development continued with the introduction of mechanical pumps, expanding areas suitable for livestock farming. During the 19th and 20th century many dikes, pumping stations and other interventions were built to make sure the soil remained dry enough. Examples include some reclamation polders like the Polder Schieveen and the Berkelse Polder in the mid-18th century.The land served the city, producing food and fuel for the adjacent towns. Rivers, canals and waterways connected the land to urban markets, like the big market in Delft. The land provided products of high quality for city and region: milk, butter, cheese and eggs, vegetables and fruits (Midden-Delfland In Beeld, 2017).

until +/- 2000 A.D. – Metropolitan Landscape
In the post-war era, the agricultural sector shifted from only producing for the regional market to global trade. National policies, driven by the necessity to ensure food so that hunger will never be a threat, stimulated increasing yields. This led to a reorganization of the land for optimal agricultural efficiency, with farms undergoing restructuring and scaling up. At the same time, the postwar period witnessed a rapid expansion of housing, industries, business parks, ports, greenhouses and infrastructure. Cities and villages are expanding. Small characteristic ''ribbon'' villages like Pijnacker, Zoetermeer, Nootdorp, and Berkel en Rodenrijs grew so much that their longitudinal historical outline as a ribbon village, was largely lost (Gemeente Delft et al., 2009).

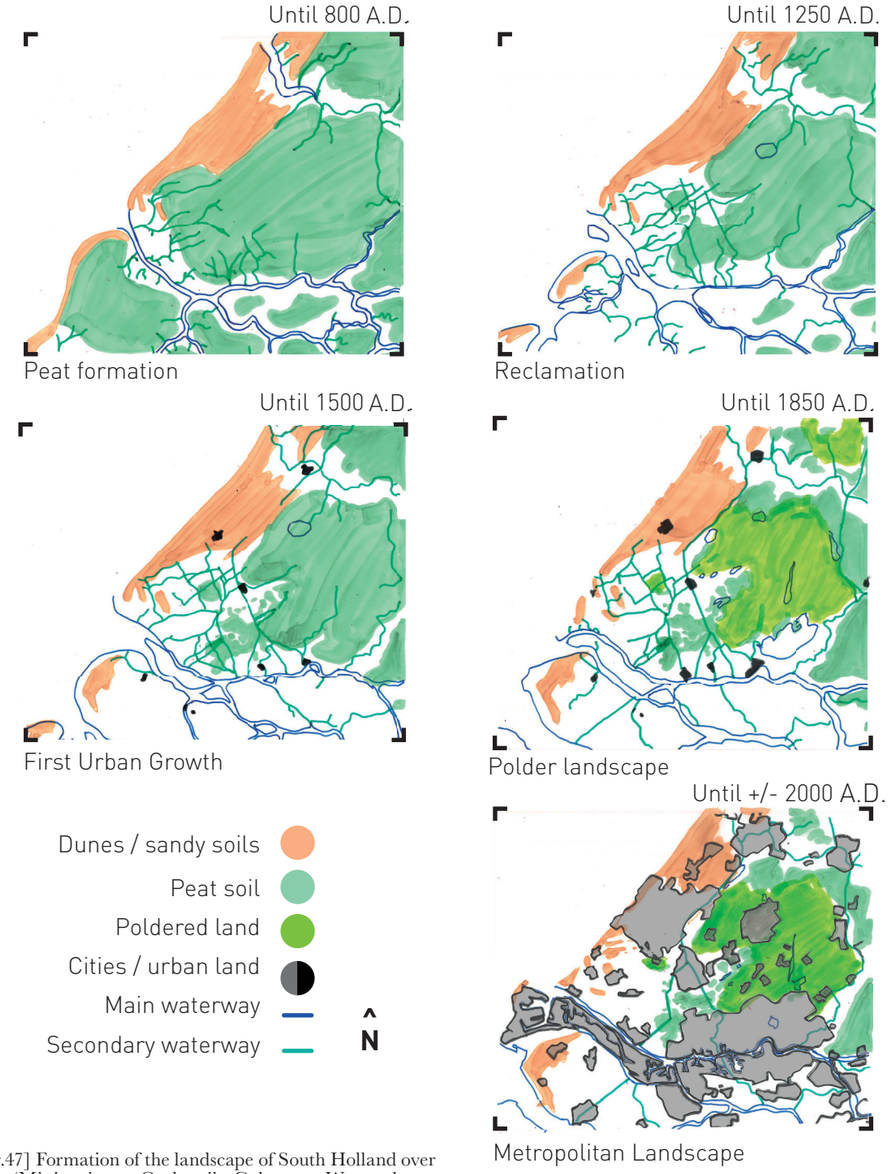
Moving Forward

To conclude this chapter, the changes in the landscape over centuries have been described, from its origins in peat formation to its evolution into a polder landscape and eventually a metropolitan area. The region's history is characterized by the interaction between human settlement and nature, with agriculture playing a central role in shaping the landscape.

Moving forward,emphasizing the importance of historical context and the area's unique characteristics is crucial in making plans for the future. While preserving the layered landscape and cultural heritage currently receives high priority in policy documents,there is a need for a new balance between human and ecological influence. Not all agricultural practices that have been here for decades can be sustained into the future in the same way. When developing the vision, cultural heritage will be a topic alongside sustainable agricultural practices that respect the environment and support local communities. Balancing urban development with the preservation of highly valuable outdoor green landscapes will be key to ensuring the long-term viability and resilience of Midden-Delfland for future generations. Being aware of the past, being aware of ingenious inventions and the battle against the water, will help respect the existing stakeholders that highly value the perseverance of the cultural heritage. Meanwhile, new interests from city dwellers of the surrounding urban landscape can increase.



[Fig.46] Formation of the landscape of Midden-Delfland over time. (Ministerie van Onderwijs, Cultuur en Wetenschap, 2020) (topotijdreis.nl, n.d.). Made by Author.



[Fig.47] Formation of the landscape of South Holland over time. (Ministerie van Onderwijs, Cultuur en Wetenschap, 2020). Made by Author.

5.2 Landscape Sections

Landscape Sections' Location

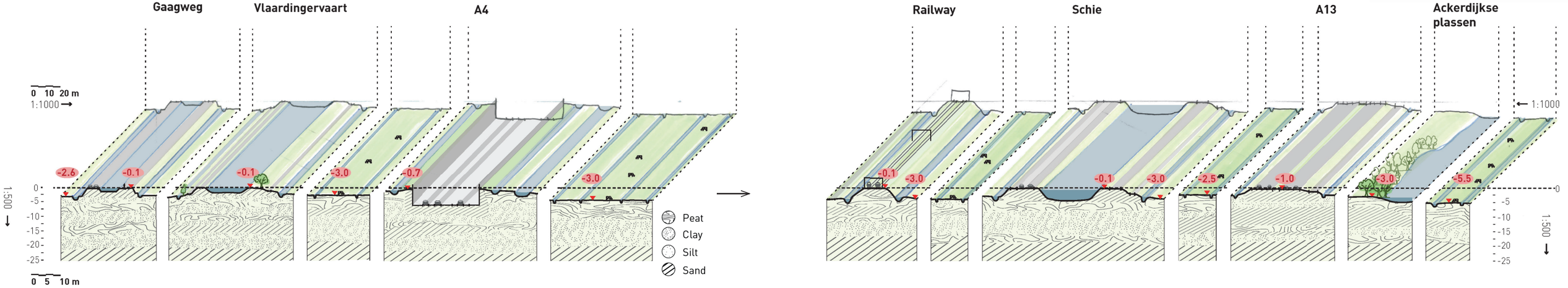
Even though the Midden-Delfland area is known for its openness, the area is crossed by some big infrastructural lines. This results in a fragmented landscape. For example, the A4 is the main highway that is sunken in the landscape but still hard to cross. There is also a railway cutting through the area that connects Delft and Schiedam. Furthermore, the Schie is a canal that is more industrially oriented than ecologically friendly with hard banks for traffic.These infrastructural elements not only divide the landscape physically but also show the contrast of urban interventions and Midden-Delfland's rural, green character. Through landscape sections, presented in the following pages, this contrast is shown.

[Fig.48] Locations of Sections. Made by Author. (Google Earth, QGIS, 2024)

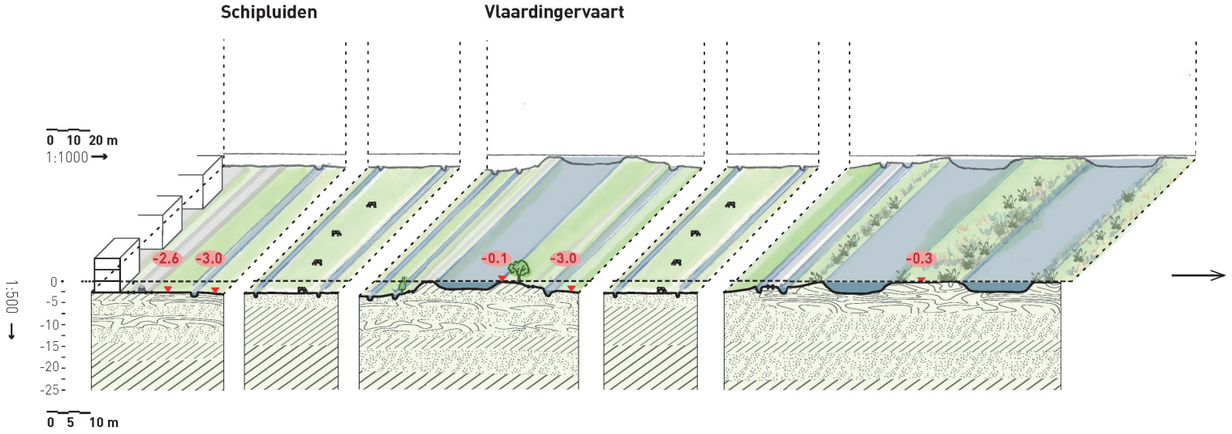


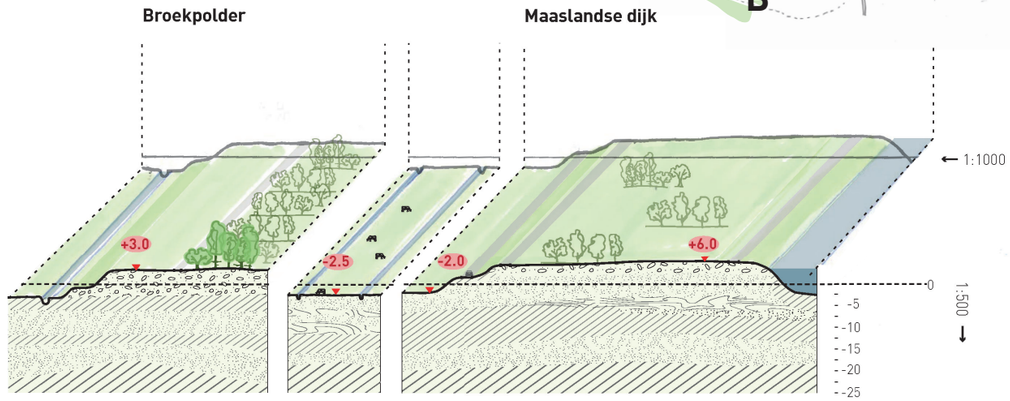
Sections A - East to West

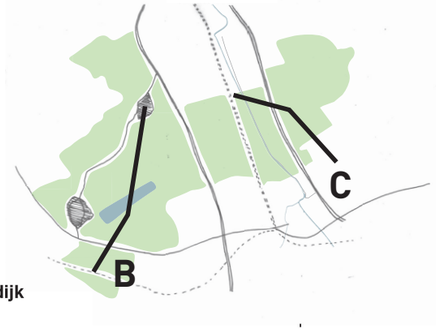




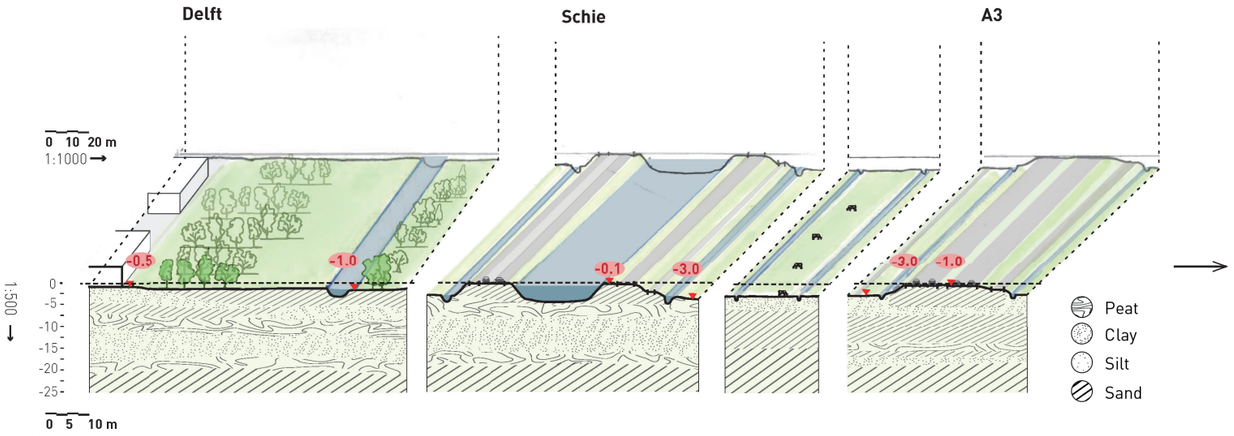
Sections B - North to South

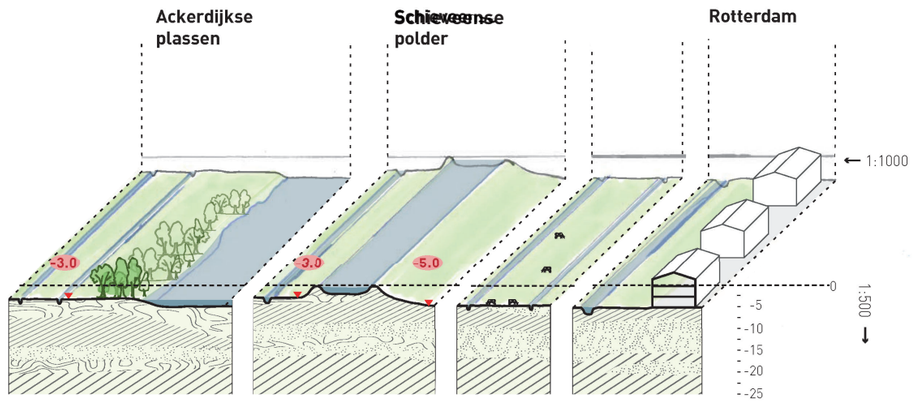






Sections C - North to South





Ecological landscape of Midden-Delfland

Nature reserve Ackerdijkse Plassen with the city of Rotterdam in the distance.

5.3 Spatial Analysis Ecology

The Unique Ecological landscape of Midden-Delfland

The title "Bijzonder Provinciaal Landschap" was given to protect and highlight the unique agriculture, heritage, but also the natural values of Midden-Delfland. Most of this Special Provincial Landscape is a peat-meadow area, with many plots owned by agricultural companies. A smaller part, with more diverse vegetation, is publicly accessible and includes protected nature and recreational areas managed by Natuurmonumenten and Staatsbosbeheer. The ecological richness of Midden-Delfland emphasizes the importance of preserving the natural heritage of the landscape.

Important area for migratory birds

The Dutch peat-meadow landscape is unique in the world, characterized by wetter areas, open grassland and semi-open marshes. The Netherlands has a key position for migratory birds, along the East Atlantic migratory route along the coast, slightly inland. This coastal habitat is nutrient-rich and vital for numerous bird species during spring and autumn. Many of these birds follow a fixed migration route from their breeding areas to their overwintering areas and vice versa. In winter, the region becomes a significant hub for waterbirds and serves as a breeding ground for the Black-tailed Godwit, with over three-quarters of the world population breeding here. This highlights Midden-Delfland's international responsibility for conserving of this species. Apart from the Black-tailed Godwit, the area supports various meadow and wintering birds, as well as diverse flora and fauna in wet meadows and flowery grasslands (Altenburg & Wygema ecologisch onderzoek, 2018).



[Fig.49] Redshank on grassland. (Veldman, n.d.)



[Fig.50] Vlietlanden, a peatland. (Midden-Delfland In Beeld, n.d.-a)

Midden-Delfland's Ecological Diversity:
Three Nature Typologies

1. **Peat Meadows:**
These open landscapes play a crucial role in supporting meadow-birds. Unfortunately, the decline of grassland areas and intensified agriculture have affected meadow-bird populations. However, farmers in Midden-Delfland are working to reverse this trend by using specific method of land management (mowing and leaving different types of flowery grassland) with the needs of meadow-bird life cycles.

2. **Lowland Peat Bogs & Swamps:**
This wetter, semi-open type of nature is rich in natural values suitable for wet peat areas. It is suitable for marsh bird species that thrive in environments with high water levels.

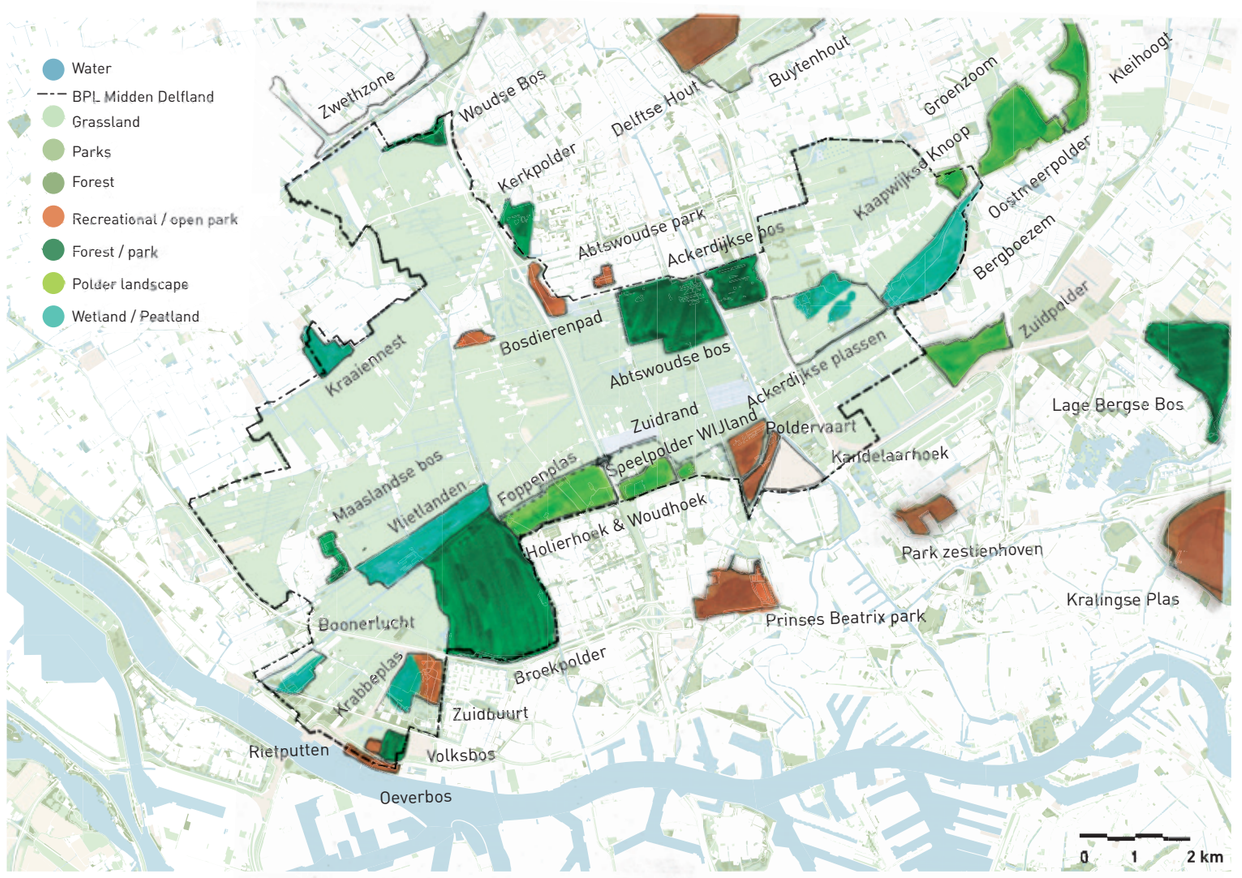
3. **Recreational Forests**:
Resulting from the Reconstructiewet, these relatively young natural and recreational areas at the borders create a more enclosed landscape. Despite their recent development, they contribute to Midden-Delfland's biodiversity, providing opportunities for species that move back and forth from urban areas. These recreation areas are vital for the region's biodiversity, fostering a connection between city and nature. An example of species found here are protected bat species, frequently found in an around the cityborders of Midden-Delfland.(Altenburg & Wygema ecologisch onderzoek, 2018)



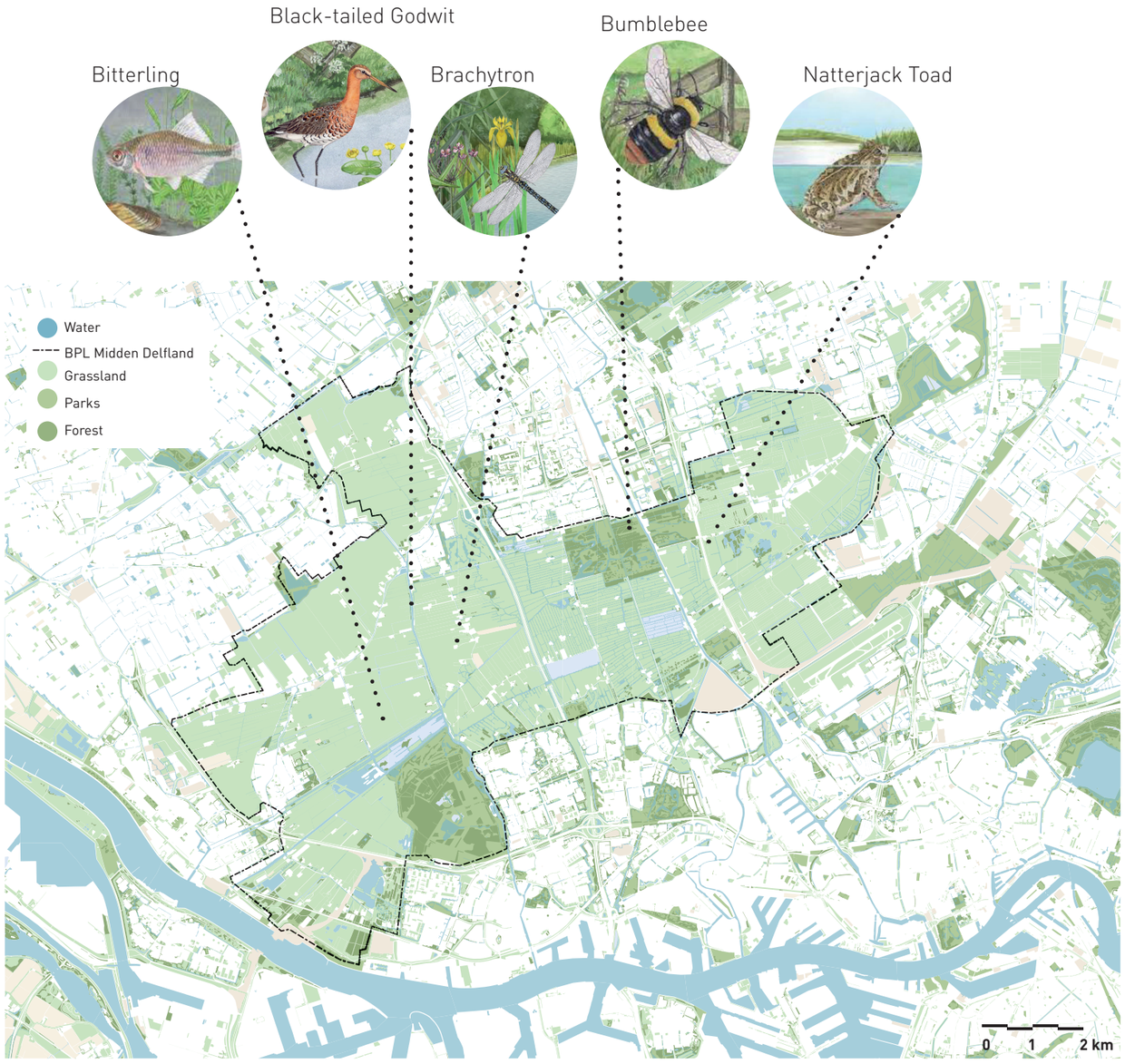
[Fig.51] Recreational Borders.
(Midden-Delfland In Beeld, n.d.-b)



[Fig.52] Swampy areas.
(Vereniging voor Natuur- en Milieubescherming Pijnacker, n.d.)



[Fig.53] Midden-Delfland Names and character of Green Areas. Made by Author. (QGIS, 2023)



[Fig.54] Midden-Delfland General Green Areas. Made by Author. (QGIS, 2023)

Species

From a Provincial level, 40 iconic species have been selected to strengthen the ecological network. When these species flourish and have a healthy population, other species benefit from this.The iconic species have been selected based on their remarkability and representative value. The iconic species in Midden Delfland are: Little Swan (wintering waterfowl), Little Owl (breeding birds in and around farmyards and farmyards), Northern vole (robust marsh connectivity), Argus butterfly (flowery roadsides and grasslands), Brachytron and/or Bitterling (water and helophytes, water quality), Reed-orchid (sparse places and flowery banks), Bittern (marsh birds) and Bluethroat (reed and roughs) (Altenburg & Wygema ecologisch onderzoek, 2018).

From the 40 species, the 'small five' has been selected by the Waterboard of Delfland (Hoogheemraadschap) (Provincie Zuid-Holland & Hoogheemraadschap van Delfland, n.d.):

- **Black-tailed Godwit:**
  Lives in puddles of meadows and breeds in wet, herb-rich grassland.

- **Meadow Bumblebee:**
  Lives in open landscapes, along forest edges, in grasslands and in gardens.

- **Brachytron:**
  Occurs in clean, clear waters with well-developed riparian vegetation.

- **Natterjack toad:**
  Lives in shallow, clean waters that warm quickly in the polder.

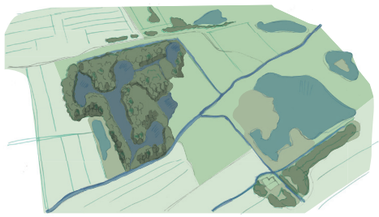
- **Bitterling:**
  A freshwater fish found in still or gently flowing water with well-developed underwater vegetation. Are dependent on freshwater mussels as they lay their eggs in these, which require clean nutrient-poor waters.

Midden-Delfland General Green areas



Ackerdijkse Plassen is a marshland core of relatively large scale with much variation in site conditions within the area (open/closed, wetter/drier), marshland bird species are regularly seen. This area is largely hydrologically closed off from the surrounding landscape, which prevents highly nutrient-rich and polluted water from the surrounding agricultural areas from entering. Natuurmonumenten's main goal in this area is to preserve and establish as many biotopes as possible for the different species of birds that breed or migrate in this area. Cattle grazing has been chosen to keep the grasslands open. The alternation of reed beds, bushes, marshland, ponds, extensive banks and meadows combined with sophisticated hay meadow management and water levels should provide optimal living conditions for as many species as possible. Because no disturbance for the birds is of great importance, the area is not freely accessible to visitors. It is possible to walk or bike around the lake area. For birdwatchers, there are two observation huts and a watchtower. (Natuurmonumenten, n.d.-a)

Broekpolder is one of the recreational areas of Midden-Delfland. This area is not located on the original lower peat soils anymore: a layer of contaminated silt from the harbor of Rotterdam was dumped here and after redevelopment, the polder was transformed into a nature and recreation area. The Broekpolder entails many forest area with an extensive bicycle and footpath system. Experiencing nature, walking and cycling are the main forms of recreation. Many watersports facilities and activities are available along the Vlaardingervaart canal, closeby. (Stichting Federatie Broekpolder, n.d.)



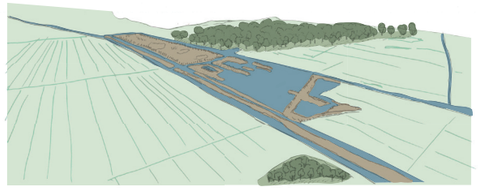
1. Ackerdijkse Plassen



2. Broekpolder

Vlietlanden is located between two old waterways, the Noordvliet and the Boonervliet. This reed bed on a peat-soil has never been excavated or drained. The original peat areahere has been sustained. Thus, the peat has not sunk in and lies just above the surrounding vlieten (waterways) at basin level and much higher than the surrounding polders. There are significant areas of perennial reed marsh in this area. In addition, the flowery hay meadows in the Vlietlanden show a very varied vegetation. This makes the hay meadows in the Vlietlanden especially remarkable in spring and early summer with many different coloured flowers. The root vole is a species of reed marshes and dynamic conditions. Areas such as the Vlietlanden are therefore extremely suitable for this vole, because of the high water level. (Natuurmonumenten, n.d.-b)

The **Abtswoudse Bos** is a very varied recreational area with large areas of forest, marsh and rough terrain and open grassland for play and sunbathing, located by water. There are many walking and cycling paths through this area. In the center of the forest a Landart project called "Mother Earth" can be found, a hillside natural artwork in the shape of a woman's body. The forest areas are typical remnants from the Reconstruction Act of the 1970s: straight lines, hard transitions and uniform forest patches with one tree species and all trees of the same age. Forest types are determined by abiotic conditions: a peat or clay soil, and dry to very wet conditions. The dry conditions are especially suitable for species such as oak, beech and poplar; wetter conditions, on the contrary, encourage the development of ash, alder, willow and birch. (Vereniging Deltametropool et al., 2019) (Altenburg & Wygema ecologisch onderzoek, 2018)



3. Vlietlanden



4. Abstwoudse Bos

Agricultural landscape of

Midden-Delfland

Cows grazing in the meadow landscape.

5.4 Spatial Analysis

Agriculture

MIND-innovation network

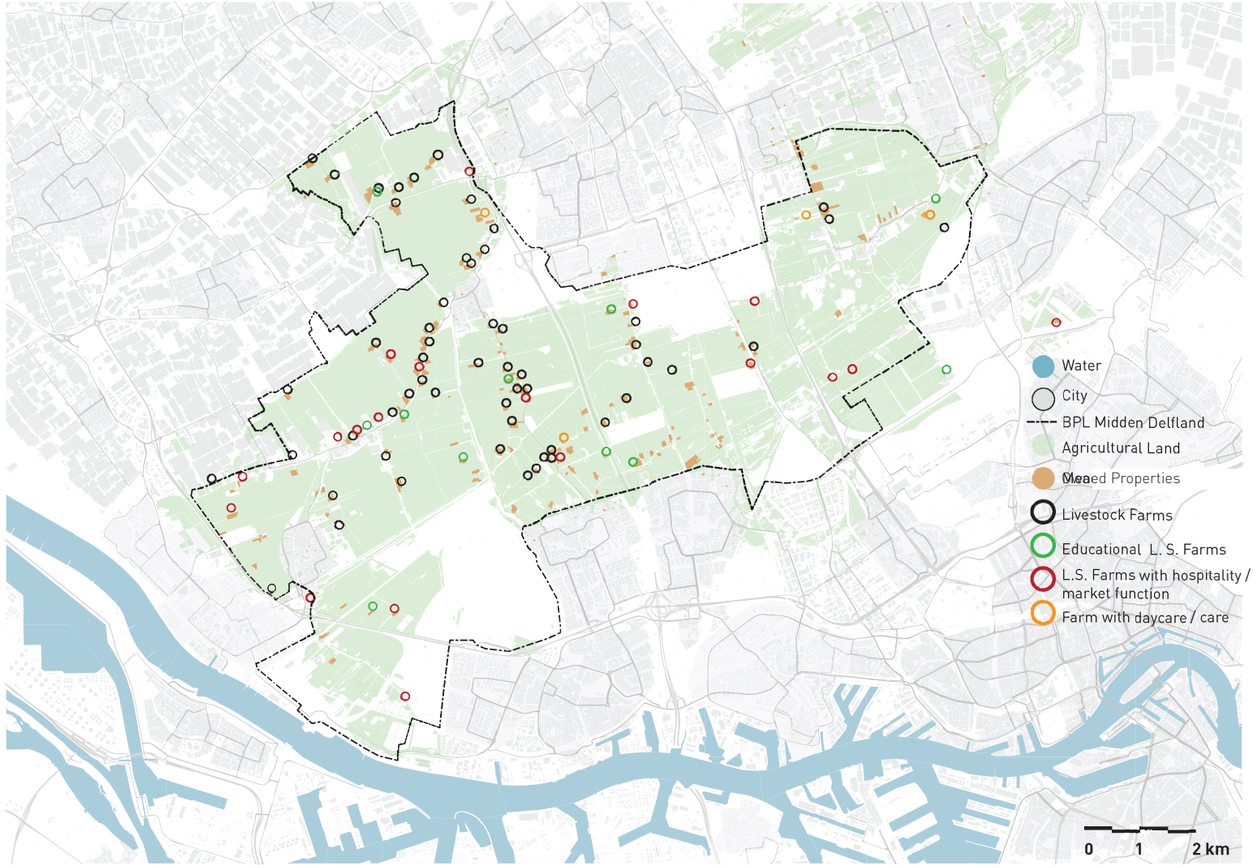
The map in figure 55 shows the location of livestock farms in Midden-Delfland. A significant number of these farms incorporate other businesses within their firm, such as daycare functions or other local initiatives and hospitality functions. Apart from that, a major group of farmers is part of the MIND-innovation network, which aims to strengthen and sustain the agricultural sector (Midden in Delfland, 2023). The innovation network Midden in Delfland (MIND) supports local farmers in developing sustainable, circular, and innovations, trying to increase the connection between cities and farmland. It is a setup that was initiated by the municipality of Midden-Delfland, IODS (Integral Development between Delft and Schiedam) and the Province of South Holland. Almost all farmers are now transitioning towards circular farming. Additionally, the land owned by farmers is protected from price speculation to keep them in the area. Other initiatives include a network of young farmers and organized farm visits for citizens (Janmaat et al., 2021).



The sale of local products in Delfgauw.

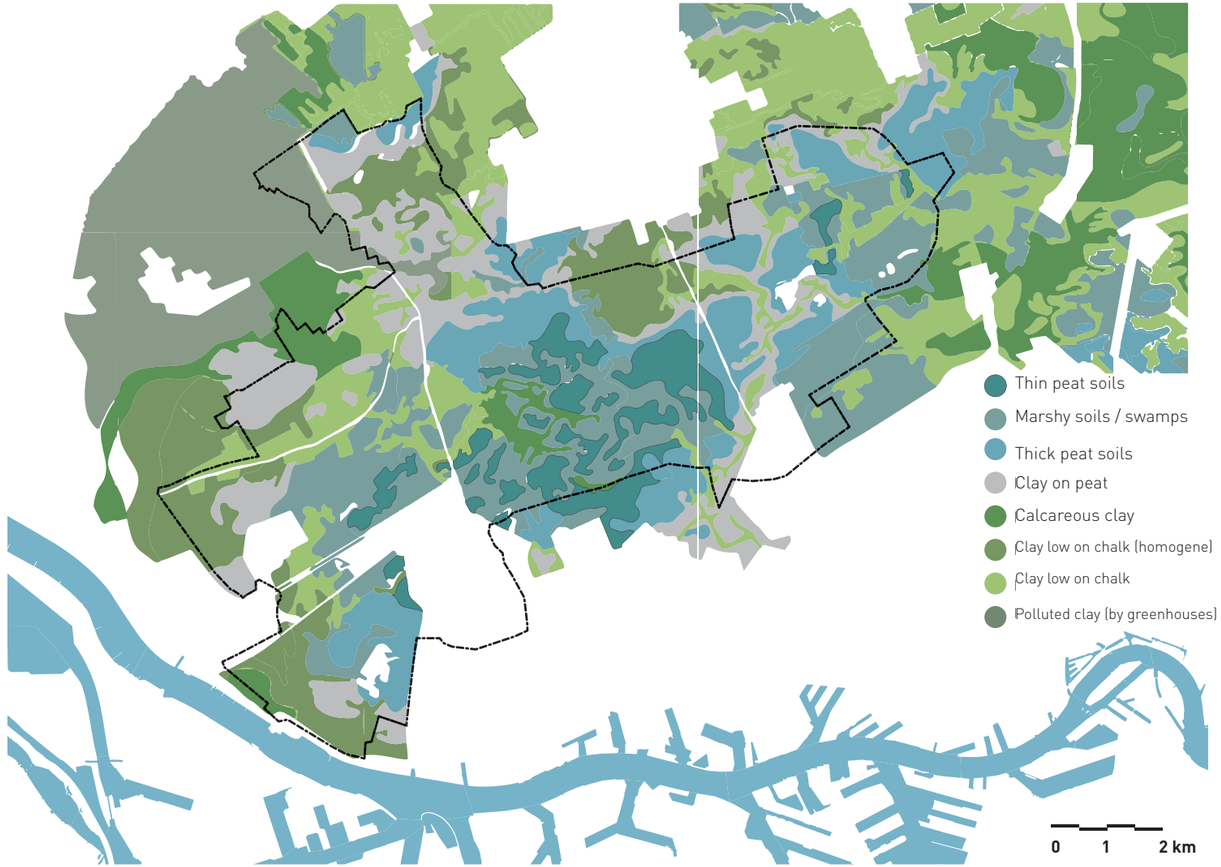
Soil Typologies

The Special Provincial Landscape consists of a great diversity in the soil types, shown in figure xx. The main categories of these soil types include: clay/silt, clay on peat, peat and marshy soils. (Stout, Dijkman, 2021) Midden-Delfland is largely dominated by peat, with some clay soils in the western region.

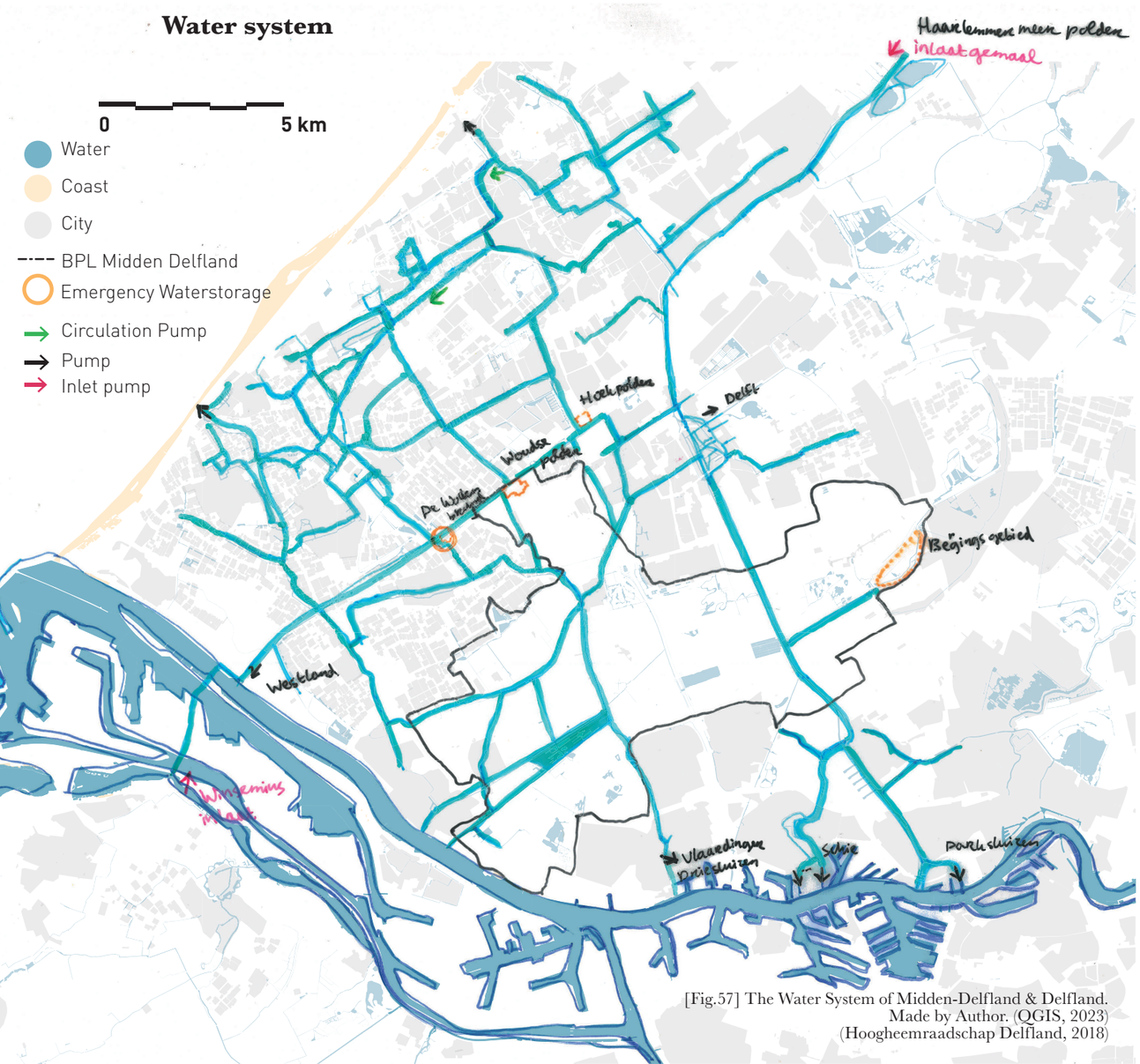


[Fig.55] Locations of agricultural sector in Midden-Delfland. Made by Author. (QGIS, 2023) (Janmaat et al., 2021)

The thickness of peat varies in different locations, for example showing thicker peat in more nature oriented areas, as the soil has been less drained, and less peat has evaporated and oxidized because of this. By overlaying the agricultural plots with the soil typology underneath the surface, a deeper insight can be given about the operating farmer's prospects for the future. In general, clay soils tend to be more fruitful than peat soils for crop cultivations and are less vulnerable to subsidence.



[Fig.56] Soil Typology Made by Author. (QGIS, 2023) (Bodemkundig Informatiesysteem (BIS) Nederland et al., n.d.).



[Fig.57] The Water System of Midden-Delfland & Delfland.
Made by Author. (QGIS, 2023)
(Hoogheemraadschap Delfland, 2018)

Control over the Water System

As described in the preceding pages, the effective control over the water level results in the subsidence occurring in Midden-Delfland. The water system serves the dominant agricultural function in Midden-Defland. But how do the province and waterboard in their part take control over this water-level and how does the water-system work?

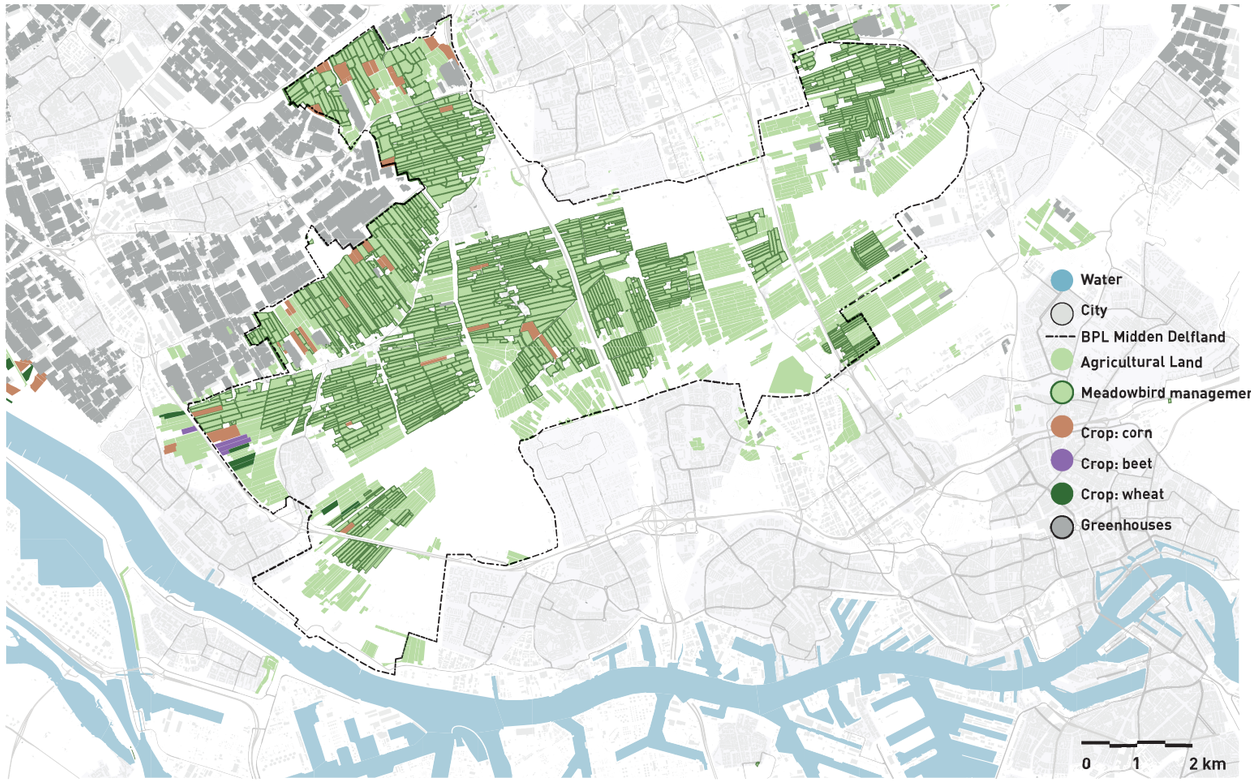
The water system of Midden-Delfland is part of a bigger system for the region of Delfland, owned by 'Hoogheemraadschap Defland' the water board. The overall goal of the Defland water system, is to drain excess water from all polders to its own primary canal, known as the 'boezem'. On the other side, during shortages of water, this boezem provides water to the polders. The boezem can be seen as the main water basin and canal, a structuring spine of the whole water system of Delfland. Polders situated below sea-level transport the water with pumping stations, higher polders make use of weirs and the higher grounds nearby the dunes (also in the Westland), drain the water freely to the boezem without machines. Collecting all the water, the boezem transports this through six main pumping stations to the North Sea, Nieuwe Waterweg and the nieuwe Maas (cannels of the port of Rotterdam).
In dry periods, the water system can make use of a lake in the south, Brielse Meer for additional water access. The distribution of sweet water becomes more vulnerable due to climate change leading to longer periods of drought, which calls for careful consideration where to distribute extra water to. The water-level, opposite to all the different water-levels in the polder, always stays at the same level of -0,43 meter below sea-level (NAP). Delfland also has a number of emergency storages, used to relieve the boezem. In the area, a few projects are set up to function as storage areas for peak water excesses. In the Woudse polder, serving the Westland area and the ''Bergboezem'' in the east of Midden-Delfland, which combines water storage with creating space for meadowbird natural areas.

In peat-meadows with agricultural functions, the water-level is regularly adjusted, a term called water-level indexation, in order to enable livestock farming. Each polder can have a different water-level, as they are divided into 'peilgebieden'. This makes integrated water management a difficult task. In some monitoring areas, the level is slightly higher in summer (precipitation shortage - greater risk of peat oxidation) than in winter (precipitation surplus - less oxidation of peat). This adaptive approach addresses the complex dynamics of water management in the region. (Hoogheemraadschap Delfland, 2018)

An extension of the water system analysis can be found in Appendix 2.

Meadow- Bird management

In Midden-Delfland, the majority of the dairy farmers maintaintheir land to be attractive for meadow birds. The map in figure 58 shows areas of meadow bird management, land use, and a few plots that are are used for crop cultivation. Farmers adjust their mowing schedules to the birds' nesting and breeding seasons and practice 'weidegang,' allowing cows to graze outside these seasons, promoting diverse vegetation growth through natural fertilization (Janmaat et al., 2021). To support meadow birds further, farmers sow herb-rich grasslands, establish ecological water banks, and manage ditch edges to foster diverse flora and fauna (Bijzonder Provinciaal Landschap Midden-Delfland, 2021).



[Fig.58] Land-use and meadowbird management of agricultural land.Made by Author. (QGIS, 2023) (Bodemkundig Informatiesysteem (BIS) Nederland et al., n.d.).

Cycling through Midden-Delfland.

Recreational landscape of

Midden-Delfland

5.5 Spatial Analysis

Recreation

TOP - locations

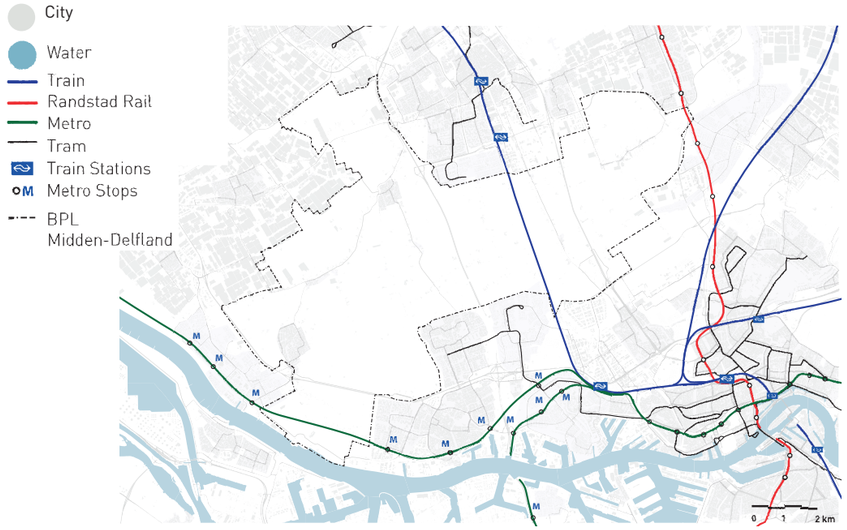
To already enhance the use of the bicycle network, TOP-locations, Touristic transfer points, have been implemented in Midden-Delfland. These locations are starting points where visitors can park their car and from which walking and bicycle routes start. The TOP's are remarkable green poles and landmarks in the landscape, also providing its visitor with information about Midden-Delfland (Midden-Delfland in Beeld, 2011).



[Fig.59] Bicycle network. Made by Author.(QGIS, 2023)

Midden-Delfland's Accessibility

The analysis on this page in figure 60 shows how Midden-Delfland is accessible through different modes of transportation. For public transport, the closets railway stations are 'Schiedam Centrum' in the south and 'Delft Campus' in the north. The neighborhoods of Delft South and Vlaardingen offer possibilities to access the inner landscape by tram. The tram, metro and train can bring visitors to the outskirts of the area. Concludingly, a public transport stop in the center of the area is only viable by bus, which stops in the smaller villages like Schipluiden. The area remains best accessible by car. Bicycle connections are mostly present in the directions from north to south and are often cut off by infrastructural barriers



[Fig.60] Public Transport Midden-Delfland. Made by Author. (QGIS, 2023)

City Edges

The transformation of Midden-Delfland into a recreational landscape becomes most evident in its urban fringes or borders, where the interaction between urban and nature and rural surfaces occurs. These fringes mark the edges of the BPL, hosting urban areas and recreational spaces from neighboring municipalities. While some areas are well-connected, the green structures often lack attractive recreational connections.



[Fig.61] Borders of Midden-Delfland. Made by Author. (QGIS, 2023)

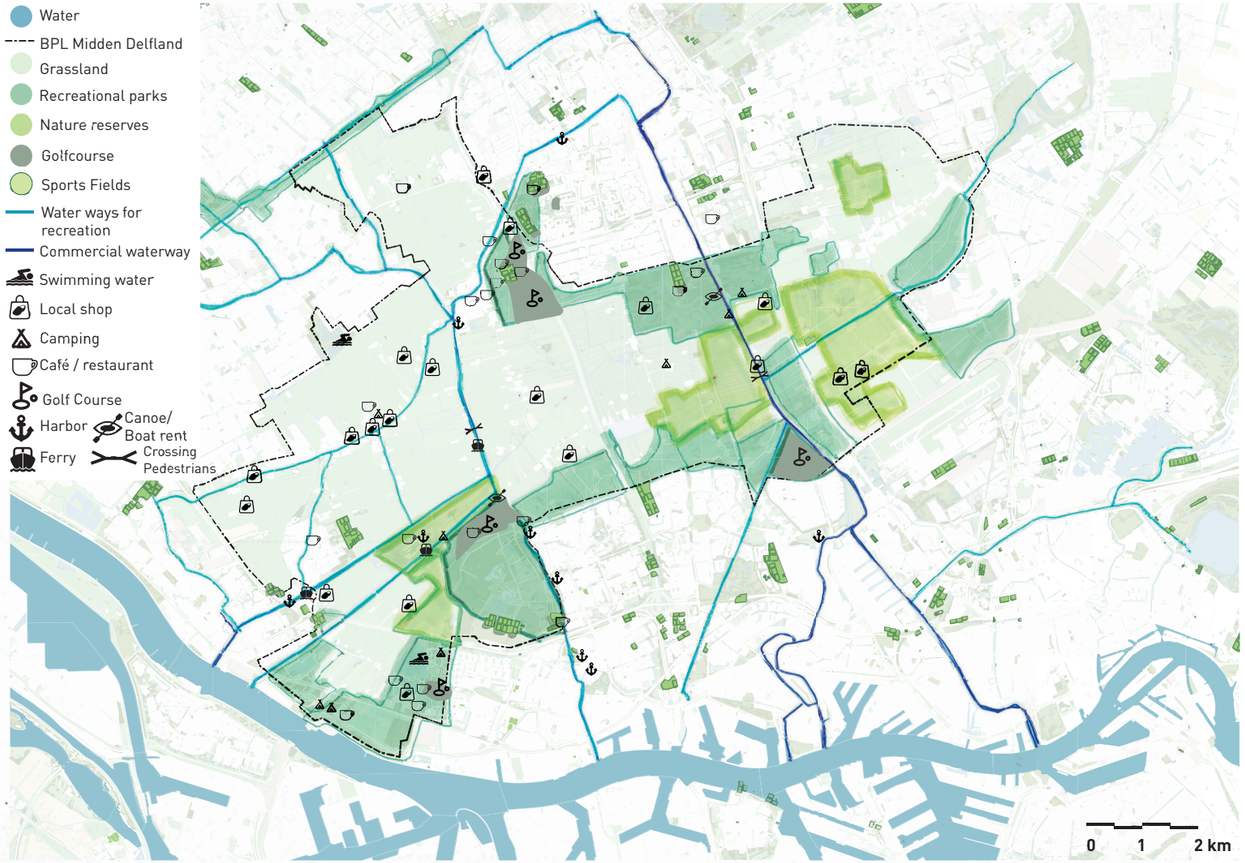
As urban development develops relatively slow within the boundaries of Midden-Delfland, the city borders are still under development. These borders show all different kinds of activities , like the development of new natural zones, recreational zones or the dispersal and cluttering of industrial functions like greenhouses. These are locations with potential for spatial change due to the lack of trajectory in future planning, great variety of functions and social differences in the city borders. These locations also form a threat to the open landscape, as described in the book, 'Stadsranden Atlas van de Zuidvleugel' (Luiten, 2011) ,

1. Tanthof – Abtswoudse Bos
is a neighborhood where the city enrolls into the countryside and this transition is softened with green recreational space. The new park, Abtswoudse Bos adds new character in between the city and the rural.

2. The Zuidrand, or Southern Border of Midden-Defland,
is a green belt as well, where the slower transition from city-oriented neighborhood to recreational functions, to agricultural functions is created. This is an example of how urban areas slowly penetrate into the agricultural landscape and diminish the open landscape with small steps of new developments.

3. 'Polder Oudeland'
is a border close to the highway N471 and other infrastructural barriers, in this case also the Rotterdam airport. Next to neighborhoods, companies and industries have filled in the previous polder landscape. They benefit here from the visibility of the location as seen from the highway.

Another typology of city-borders, remarkable for Midden-Delfland, are the 'warehouse' borders, in this case consisting of greenhouses. These are monofunctional terrains where big warehouses or greenhouses turn their back to the landscape.



[Fig.62] Recreation map of Midden-Delfland. Made by Author. (QGIS, 2023)

Recreational Functions

Midden-Delfland offers a variety of recreational activities, both for city residents seeking tranquility in an ecologically oriented setting, those looking for a more active outdoor experience, or individuals that want to get familiar with the livestock farming and agricultural character of the region. The contrast in options is visible in the lay-out of the recreational functions of Midden-Delfland, with the recreational parks at the borders meant for a more intensive use and the extensive recreation at the core. The core wants to emphasize the open, agricultural character of the landscape. Here Midden-Delfland allows visitors to enjoy the quietness and escape from the city's hustle.

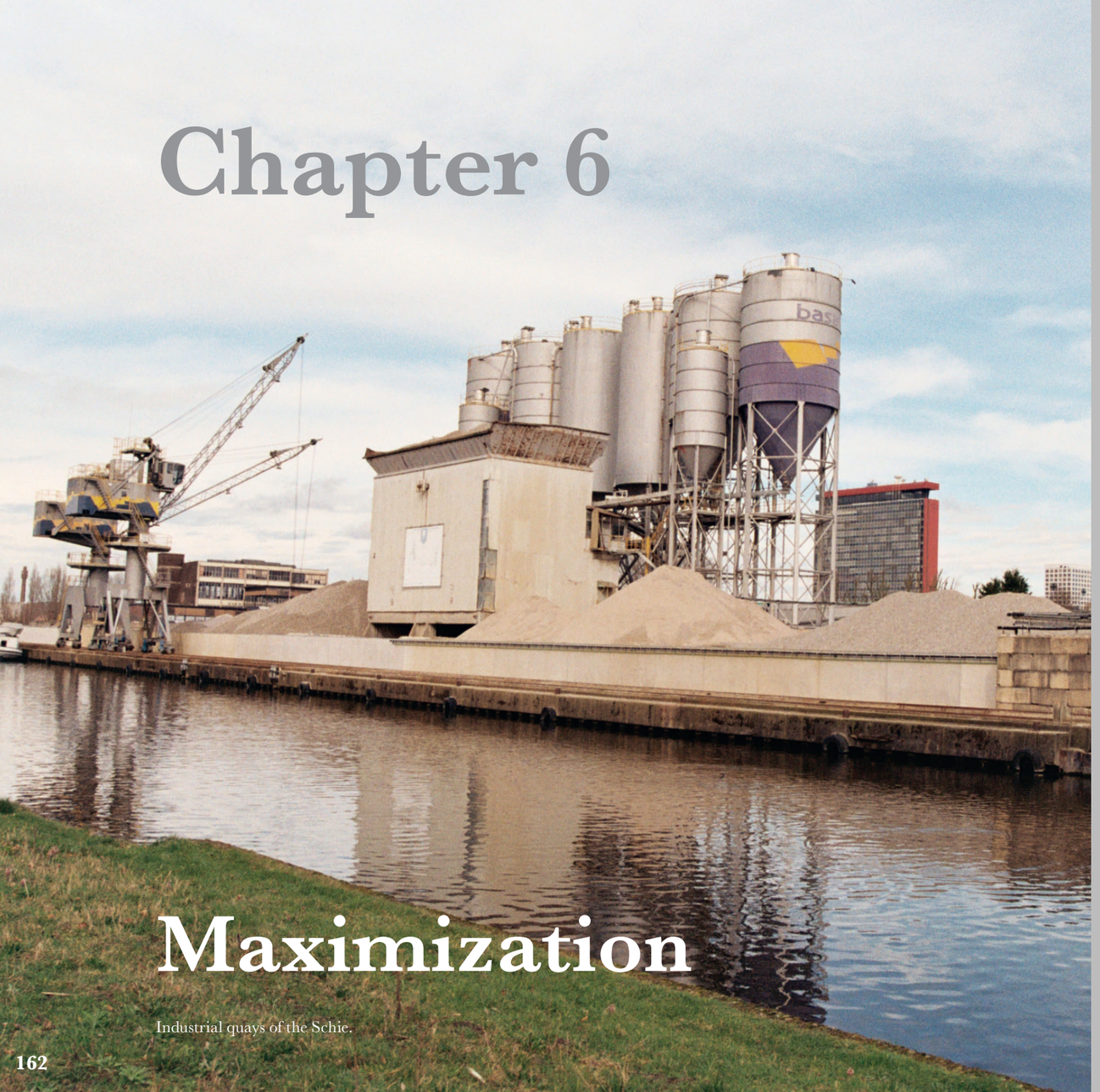
A network of different recreational routes spans the region, offering options of transportation form cycling, walking, horse riding, canoeing, to skating and more. To have a rest, there are many cafés and restaurants scattered throughout the area to visit. The water network offers and extra option to the landscape exploration. A broadening trend is the integration of recreation in the agricultural sector, with farmers offering walking paths on their lands, selling local goods and providing education experiences.

Apart from the city in sight, Midden-Delfland goes beyond nature and agriculture by offering the historic villages like Maasland, Schipluiden and 't Woudt. All are picturesque highlights to attract visitors. Each village has a different identity, providing opportunities to experience local life. Recreational borders act as entry points, offering access to the entire landscape of Midden-Delfland.

(Bijzonder Provinciaal Landschap Midden-Delfland, 2021) (Latour et al., 2018)

Chapter 6

Maximization



Industrial quays of the Schie.

Subquestion

4. How can the maximization of each preliminary theme (ecology, agriculture and recreation) be achieved for the given location with the implementation of sustainable solutions, and what would be the outcome of this maximization mean spatially?

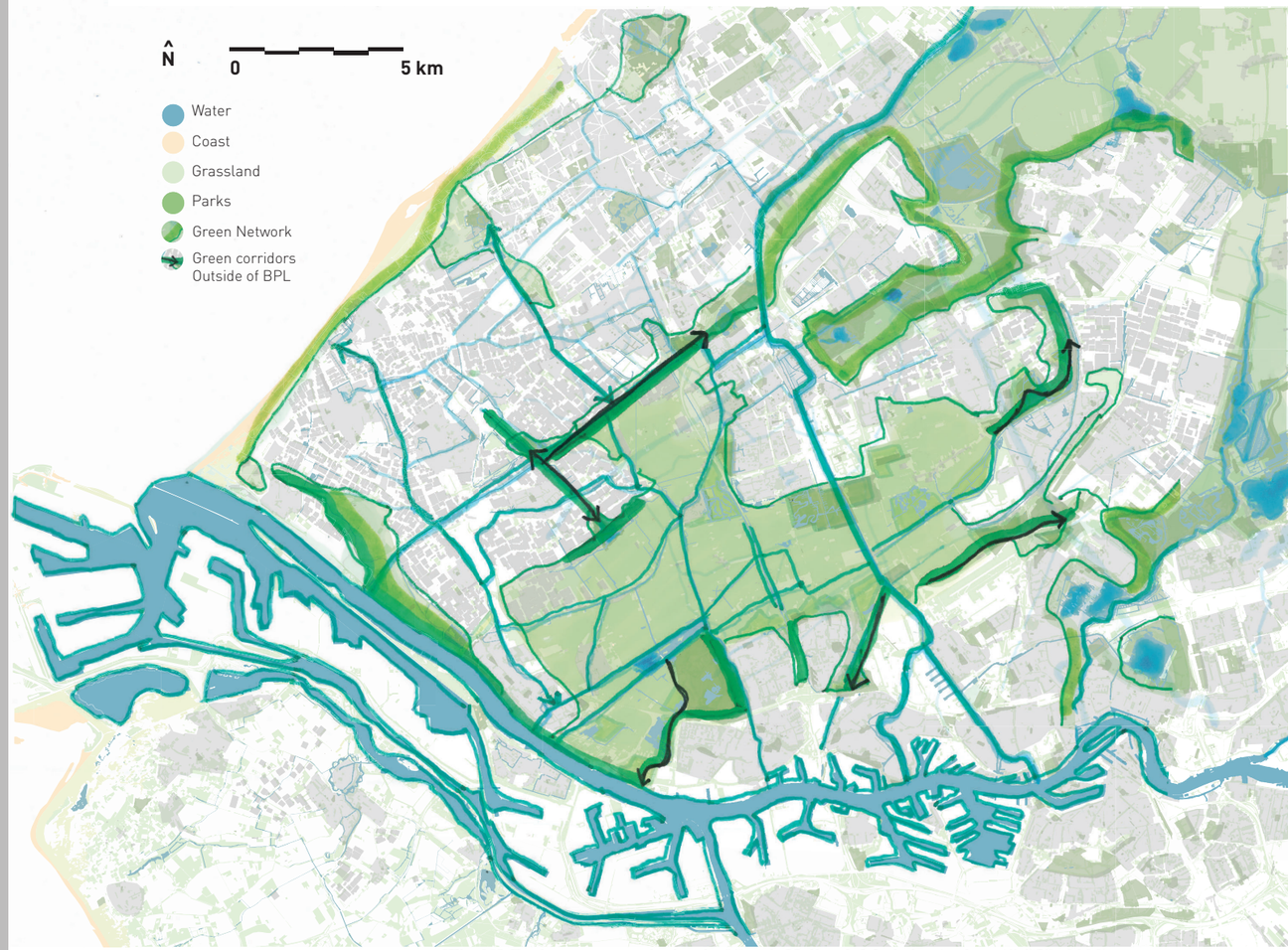
The previous literature review chapter has outlined how all three themes are involved with the current threats of climate change, urbanization and unsustainable agriculture that Midden-Delfland is subjected to. It also describes how the title of Special Provincial Landscape (BPL) establishes an urgency for the protection of this rural landscape, but lacks future development plans. Following up on the analysis of the three themes, this thesis arrives at the first steps of envisioning spatial outcomes. To achieve optimal integration of the separate themes, this chapter will start with the first phase of the maximization method, finding the maximum status for each theme individually. Hence, the goal of this chapter is to find the optimal autonomous situation for each theme. It is important to state that the three themes and the title of BPL will be evaluated in the light of a more sustainable future. This already creates a lens through which the maximization process is executed, not solely focussing on the current values per theme, but considering future generations. For instance, within the agricultural theme, emphasis is placed not only on maximizing yields and profits, but also on designing principles that align with the landscape and soil characteristics.

6.1 Maximization Ecology



[Fig.64] Envisioning a completely ecological landscape (Edited by author.)
(Natuurmonumenten, n.d.) (GroenLinks, 2017)

Green connections on the level of South Holland



[Fig.65] Ecology map on the level of South Holland. Made by Author. (QGIS, 2023)

Ecology - Elaboration on Maximization Choices

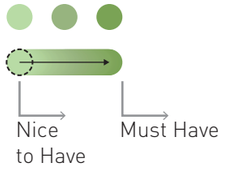
In the middle of the new ecological reserve of Midden-Delfland, a zone is created that is almost entirely **free from human influence**, so that nature can develop on its own. This offers the possibility to develop into a **rewilding zone**, where the peat landscape and its accompanying biotope can flourish. It is a waterlogged area and the climate here allows for vegetation to accumulate slowly and develop into **peat material**, storing CO2 from the atmosphere. A **buffer zone** will be incorporated, with the use of the existing recreational zones as borders of the ecological core zone. These recreational zones already exist at the northern and southern border, in between the A4 and the Schie-zone. The railway creates less of a border, as the buffer zone around this infrastructural line was already inaccessible for humans and rich with vegetation and it will remain that way.

The **differentiation** in types of **habitat** is dispersed over the area. This differentiation consists of the peatland in the core, but also of swamps, forests, wetlands and grasslands. The variety in habitat improves the rate of biodiversity, as different options are offered to different types of species, from predators to small insects. Forest patches are strategically positioned, as they should not take away too much of the **openness** of the landscape, but increase the variation in sights. Openness of the landscape has to remain in some areas, to attract and preserve certain meadow bird species.

Some open meadowland can stay for agriculture to sustain the **agricultural biotopes**. However, the practice of dairy farming is diminished to a minimum, as the cow is merely seen as a species that is embedded in the ecosystem as a grazer and provider of fertile manure to improve growth of vegetation. The **grazing** of cows leaves the meadows more maintained and open, but the farms work completely **nature-inclusive**, providing the right conditions for meadow-birds, by leaving the grassland herb-rich, with natural banks that gently slope down into the water ditches. The water-level is less controlled and always in favor of maintaining the different types of habitat, one wetter than the other, to sustain the differentiation.

In the layout of natural zones, the **creek ridges** serve as guiding lines, respecting them as references to **traces** of landscape formation. They frame patches of nature, stand out in the landscape and influence visitors to recall the landscape before it was occupied by humans. Given the lack of untouched nature in the Netherlands, this approach provides a connection to the past.

In Midden-Defland, the ecological structure is strongly divided into fragmented islands, due to big infrastructural lines that cut through the landscape. To maximize ecological activity and to enlarge the whole matrix of green in which animals can move around, the green structure needs to be a **connective structure** as much as possible. Entities that can function as **corridors** connect the separate patches of the landscape. There is one **Eco-aqueduct** that forms a connection for water and nature over the A4-highway, which can be used to connected the areas that border the A4. Apart from this one physical connection, the basis of the network can be guided by the **water system**. Implementing a broad enough water structure along the A4 highway, allows it to function as a soft edge to the natural areas and added to the existing water network. The overall water system is the **framework** for the ecological zones of Midden-Delfland that even continue along these corders away from the borders of BPL and connect with green zones in the surrounding cities.



As shown on the next page, for each maximization principle, there is an indication added to show which principles have a higher prioritu an which have a lower priority.

Ecology - Maximization Principles



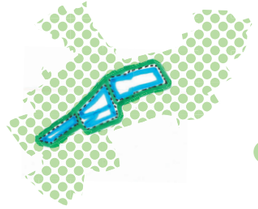
Preserve & Protect Existing Nature

Some open meadowland can stay for agricultural use to sustain biotopes that derive from this land-use. The practice needs to be completely nature-inclusive, providing the right conditions for meadow-birds, by leaving the grassland biodiverse with a diminished mowing regime. As Midden-Delfland already includes patches of green parks, forests, reedlands, swamps, and other existing green areas of good quality, this existing nature is respected and preserved.



Create Variety in Habitat

Creation of differentiation in types of green: swamps, forests, wetlands, grasslands. The forest are dispersed patches and never take away too much of the open view.



Create a Core Wilderness Zone & incorporate a Buffer Zone

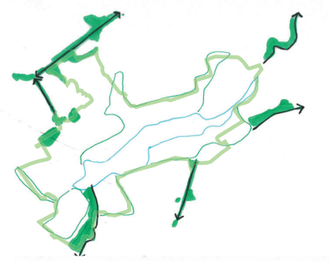
Creating a zone where nature can develop on its own. The incorporation of a buffer zone where human visitors are allowed.



Connect Green & Blue Networks

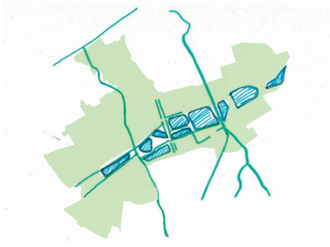
Connecting the green system as much as possible; through water entities like canals and ditches. The basis of the network is guided by the water system.

Nice to Have → Must Have



Connect Green & Blue Networks

Connecting the green system as much as possible; through water entities like canals and ditches. The basis of the network is guided by the water system.



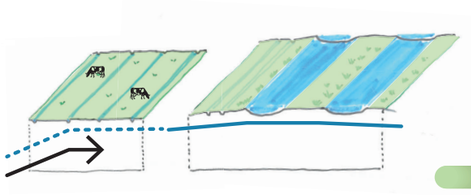
Restore the Natural Ecosystem

In the core area, restoration of the original ecosystem of Midden-Delfland is underway. Through careful rehydration and sustainable land management practices, the aim is to recreate natural habitats and mitigate carbon emissions.



Creek Ridges as Landscape Traces

The old creek ridges form traces in the landscape that the new natural zones can follow to reveal the old landscape patterns.



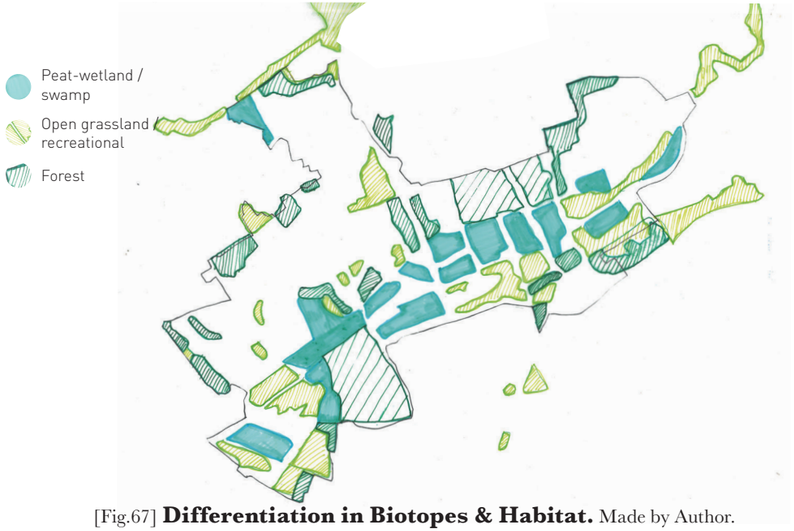
Water-level goes up

To prevent subsidence, water levels will be raised in the most vulnerable regions, maintaining peat soil underwater. This helps in preserving the natural ecosystem. The water level is maintained approximately 20 to 40 centimeters below the current ground level.

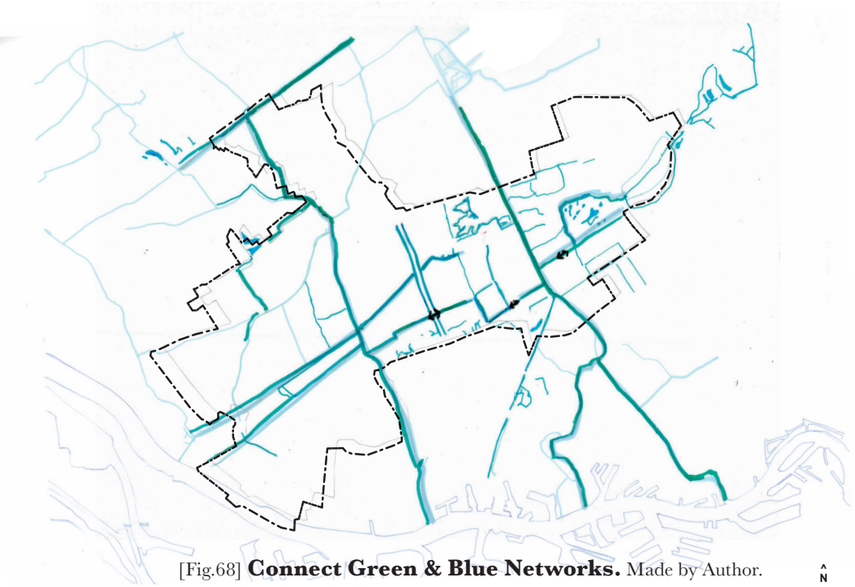
Ecology - Maximization Principles



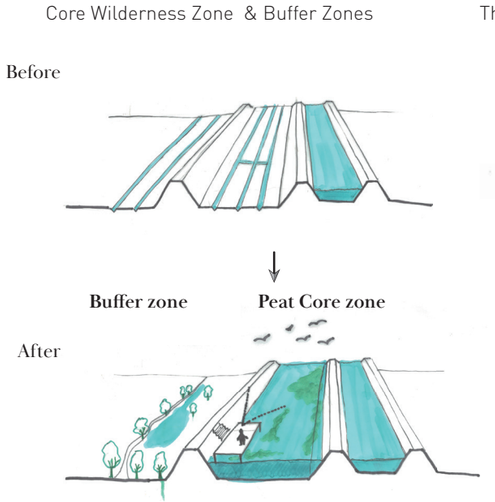
[Fig.66] **Core Wilderness Zone.** Made by Author.



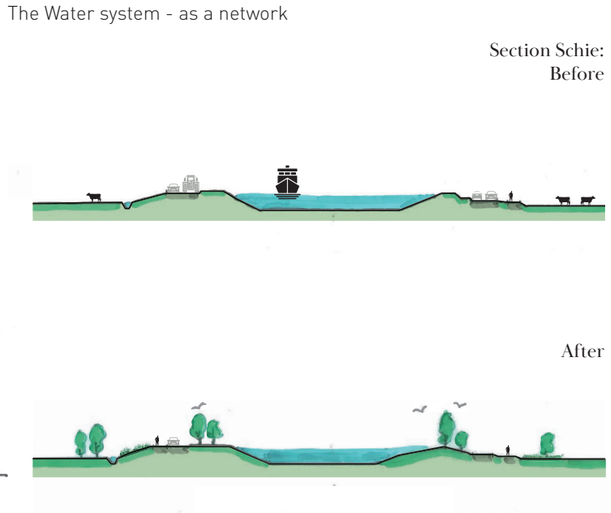
[Fig.67] **Differentiation in Biotopes & Habitat.** Made by Author.



[Fig.68] **Connect Green & Blue Networks.** Made by Author.

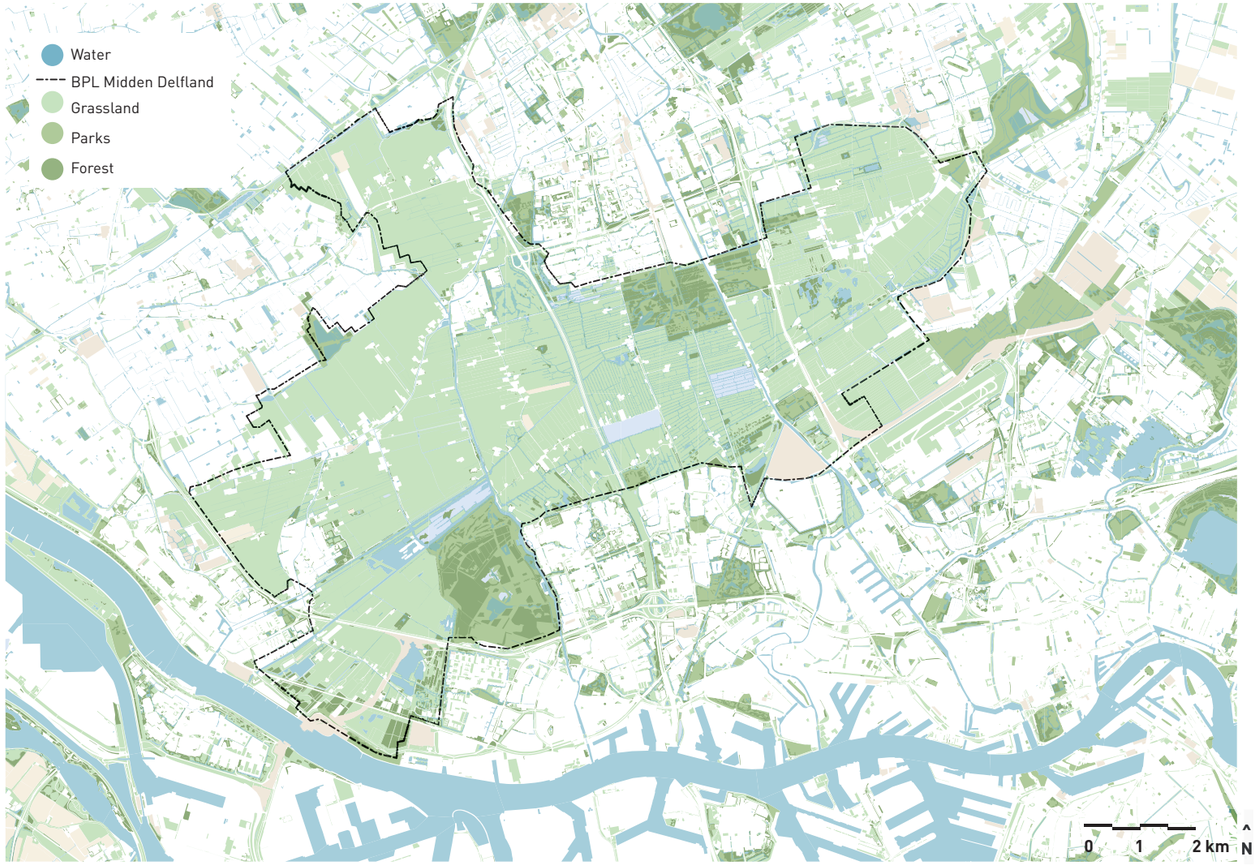


[Fig.69] Sections Peat Core Zone. Made by Author.



[Fig.70] Sections Schie. Made by Author.

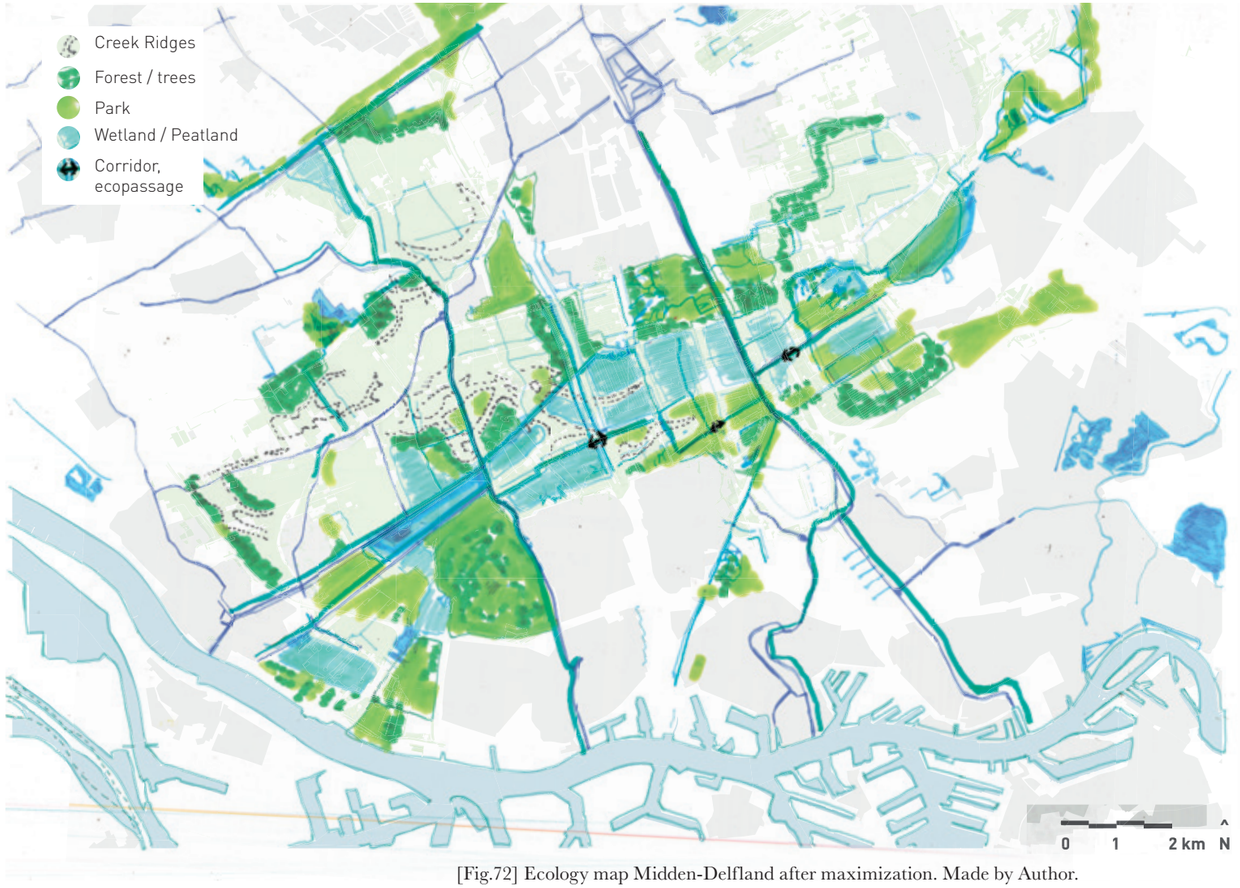
Before



[Fig.71] Ecology map Midden-Delfland before maximization. Made by Author.

After

Maximization Ecology Overview



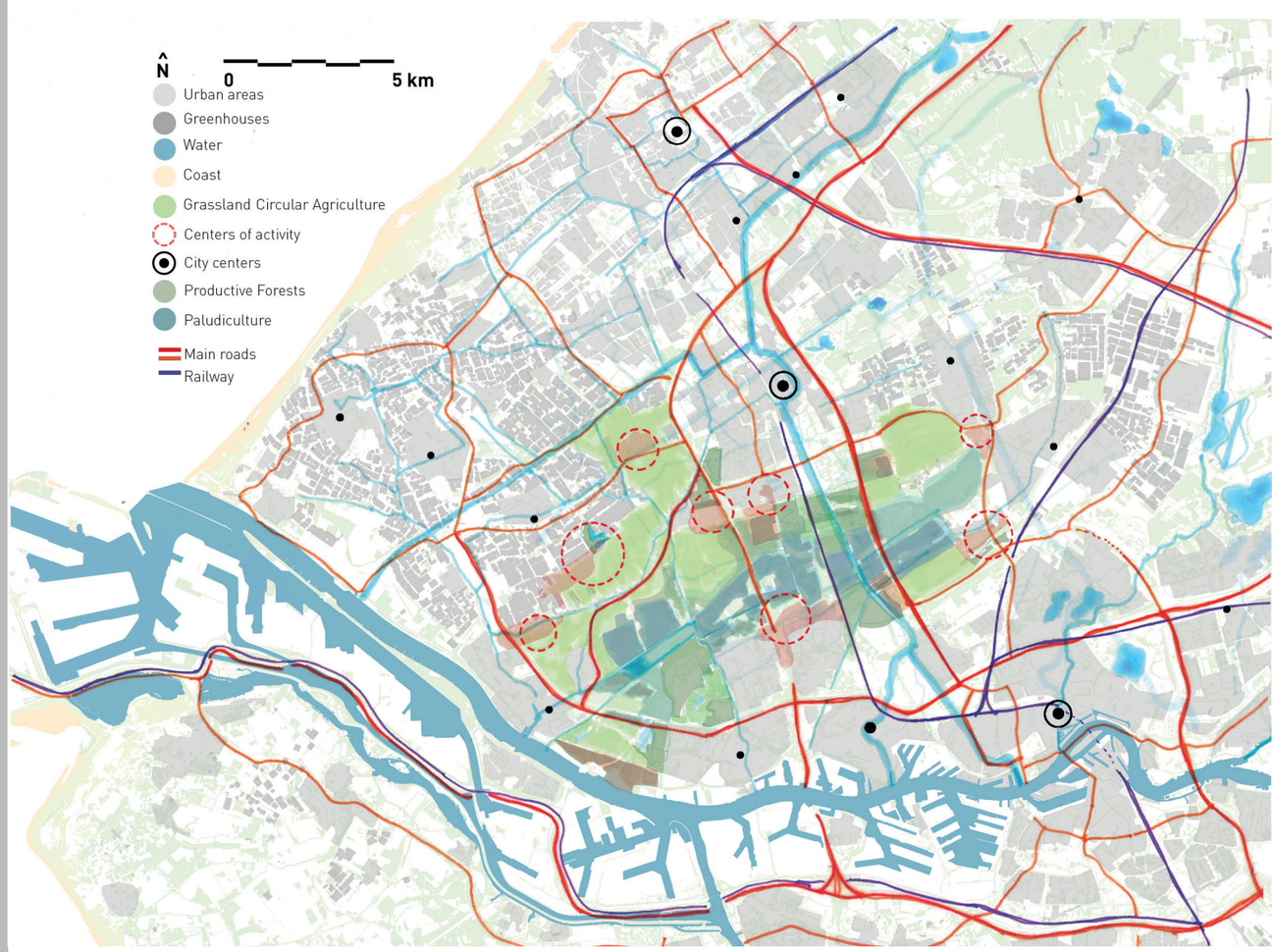
[Fig.72] Ecology map Midden-Delfland after maximization. Made by Author.



6.2 Maximization Agriculture

[Fig.73] Envisioning a completely agricultural landscape (Van Den Burg, 2019)

Rural - City connections on the level of South Holland



[Fig.74] Agricultre map on the level of South Holland. Made by Author. (QGIS, 2023)

Agriculture - Elaboration on Maximization Choices

The spatial analysis of Midden-Delfland and literature review of Dutch agriculture in the previous chapters indicate that the **peat-soils** are highly vulnerable to **subsidence.** To mitigate this, a **shift in land-use** is necessary, **raising water levels** to prevent further subsidence. These locations will no longer be as suitable for livestock farming, as the soil will get more soggy. Despite this change, the agricultural sector stands to benefit through **paludiculture**. For example, the cultivation of cranberries or types of rice cultivation will become the substituting type of food production. Another example of paludiculture is the cultivation of cattail, a type of vegetation suitable for biobased building materials (insulation). The wetter environment serves as a valuable **water storage and buffering system**, useful for managing rainfall and droughts

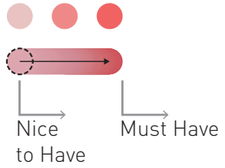
To support this transition to alternative types of agriculture, certain areas will be allocated as **productive forest**. In wetter, vulnerable regions, poplar, willow, ash, oak, and hazel trees thrive on the underlying peat soils of Midden-Delfland. The benefits of the forests is the availability for periodic harvests for **building materials** and **carbon sequestration**, storing CO2.

In the future, the whole livestock farming sector of Midden-Delfland will transition to **circular agriculture**, while preservation of the area's **rural character** is ensured. Circular agriculture calls for **extensive use of land**, so the farmers will need a sufficient acreage. As there are now approximately 50 circular farms in the area, a certain amount of land will be reserved for them. They will be located in the most suitable locations where the soil allows for extensive, circular use. However, **water management solutions** stated in chapter 4, will be used to prevent subsidence and to keep the land as wet as possible in designated seasons, for example with the use of a water drainage system for the meadows.

Livestock farming plots should prioritize **nature-inclusive measurements**.This entails maintaining rich vegetation for **meadow birds** and synchronizing mowing with their life cycles, considering breeding and nesting periods. Additionally, conserving **ecological banks** and quays on agricultural plots establishes an interconnected ecological network.

The **recreational areas** bordering Midden-Delfland, serve as vital connections between the agricultural sector and the **citizens** from the surrounding municipalities, as well as those within the boundaries of Midden-Delfland. These current recreational areas are preserved as much as possible into the future, but their **strategic positioning** will be leveraged to establish **centers for trade and connection**. This way, the transition of the agricultural sector towards a **local market** is facilitated, operating as locally as possible. Small scale facilities for the processing of dairy products and for the sale of other crops (from paludiculture) can be set up in these strategic locations. This way, the agricultural sector connects with the surrounding urbanized areas, enhancing **community engagement** in places where people already come to be outside and enjoy nature.

To establish the local market and enhance the new local system, **improved routing and transportation** connections are essential for farmers in Midden-Delfland. This way, farmers are the first priority in Midden-Delfland in order to easily conduct their daily business operations. Right now, the connections from north to south are sufficient enough, but the connections from east to west need to be improved to make way for transport logistics of the farmers.



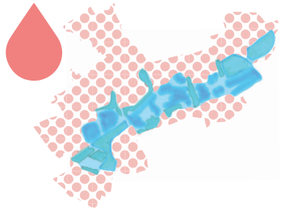
As shown on the next page, for each maximization principle, there is an indication added to show which principles have a higher prioritu an which have a lower priority.

Agriculture - Maximization Principles



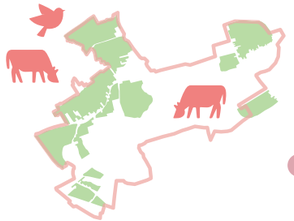
Land-use change to Biobased Material Production & Paludiculture

Land-use change and heightening of the water-level for areas with highest subsidence risk. The use of the land will change to paludiculture, wet productive forests or cultivation of water resistant crops for bio-based materials.



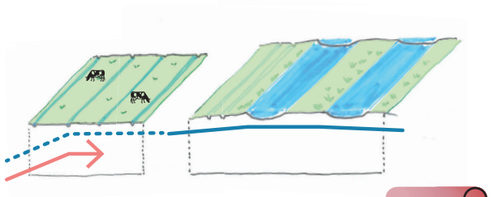
Areas for Water Management & Storage

Water storage zones are needed for buffering rainfall, more frequent floodings and droughts. Aditionally, allocating space for productive forests with species sutiable in wet areas help with sequestering CO2.



Transition to Circular Farming as Standard

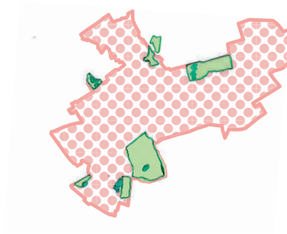
To sustain the original rural character, all livestock farming that stays will have to make the complete transition towards circular farming. These farms will be located in the most suitable locations, where the soil allows for grazing of cows. Water management solutions will be needed to prevent subsidence.



Water-level goes up

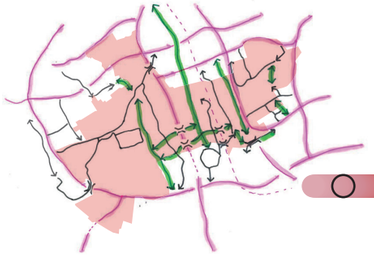
Increasing water levels in vulnerable areas prevents further subsidence, facilitating paludiculture and biobased material production while enhancing water storage for managing climate challenges. The water level is maintained approximately 20 to 40 centimeters below the current ground level.

Nice to Have → Must Have



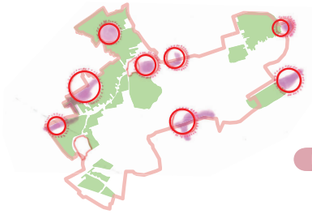
Preservation of important Recreational areas

Current recreational spaces bordering Midden-Delfland are preserved, serving as trade and connection hubs to facilitate the transition to a local market, enhancing community engagement and nature appreciation.



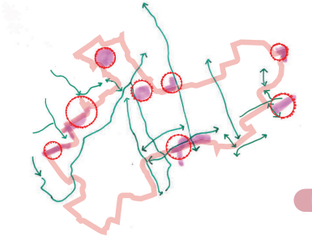
Improved Local Network

A local market system is set up improved, so a better routing for the farmers is needed for transportation of goods. Enhancing routing and transportation connections prioritizes farmers' daily operations, particularly improving east-west routes to accommodate trade.



Centers of Activity & Accessibility for the City

Utilizing strategic recreational areas as hubs for trade at the borders, close to the municipalities establishes vibrant centers, fostering a transition to local markets and enriching community engagement within urbanized surroundings.

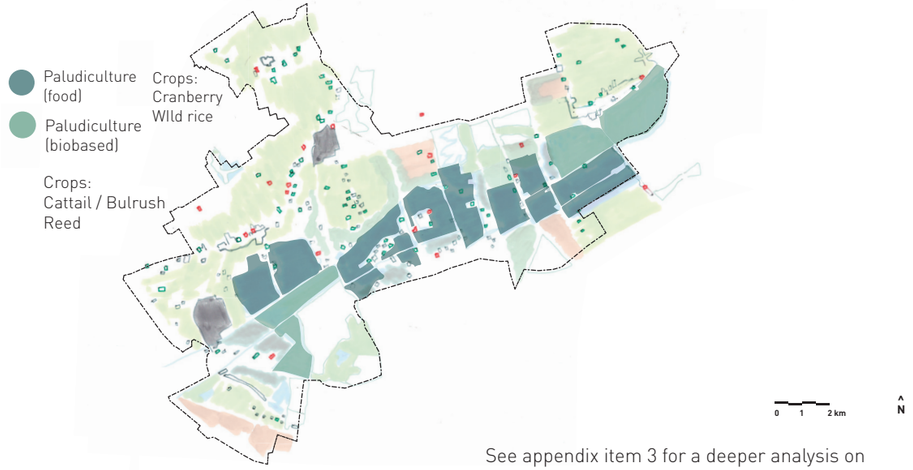


Local Market & System

Establishing the overall system of a local market is facilitated by setting up small-scale facilities for dairy product processing and sale of paludiculture crops. Integrating with surrounding urbanized areas is prioritized.

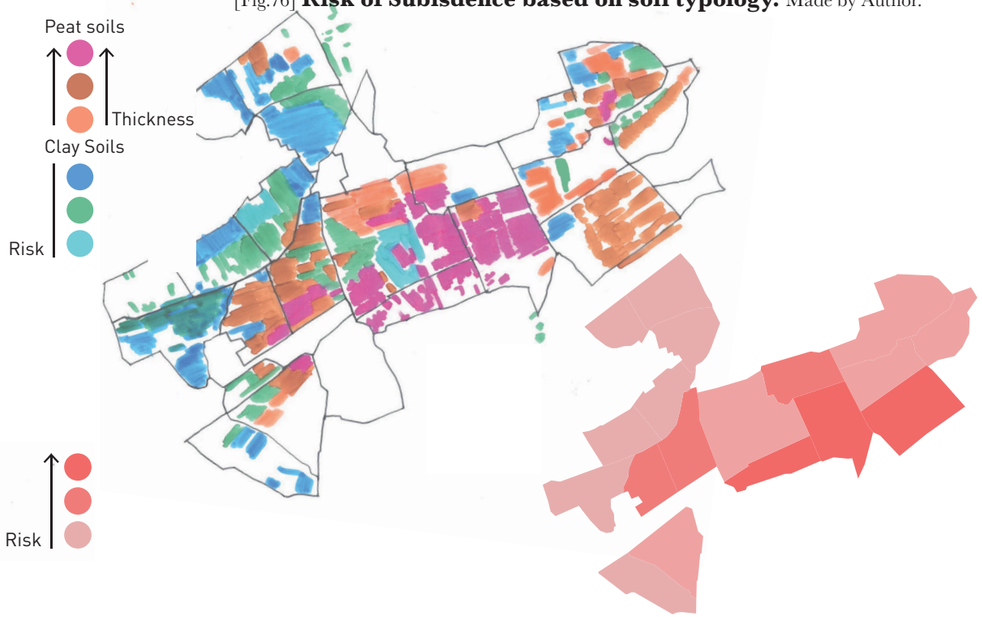
Agriculture- Maximization Principles

[Fig.75] **Paludiculture & Biobased Cultivation.** Made by Author.



See appendix item 3 for a deeper analysis on soil typology.

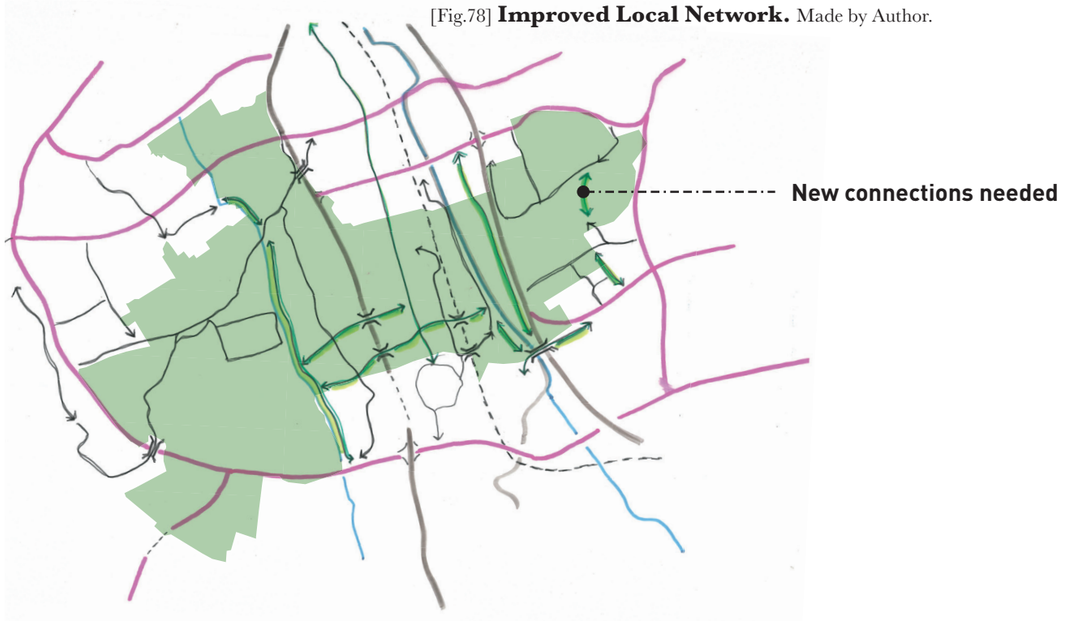
[Fig.76] **Risk of Subisdence based on soil typology.** Made by Author.



[Fig.77] **Productive Forests.** Made by Author.



[Fig.78] **Improved Local Network.** Made by Author.

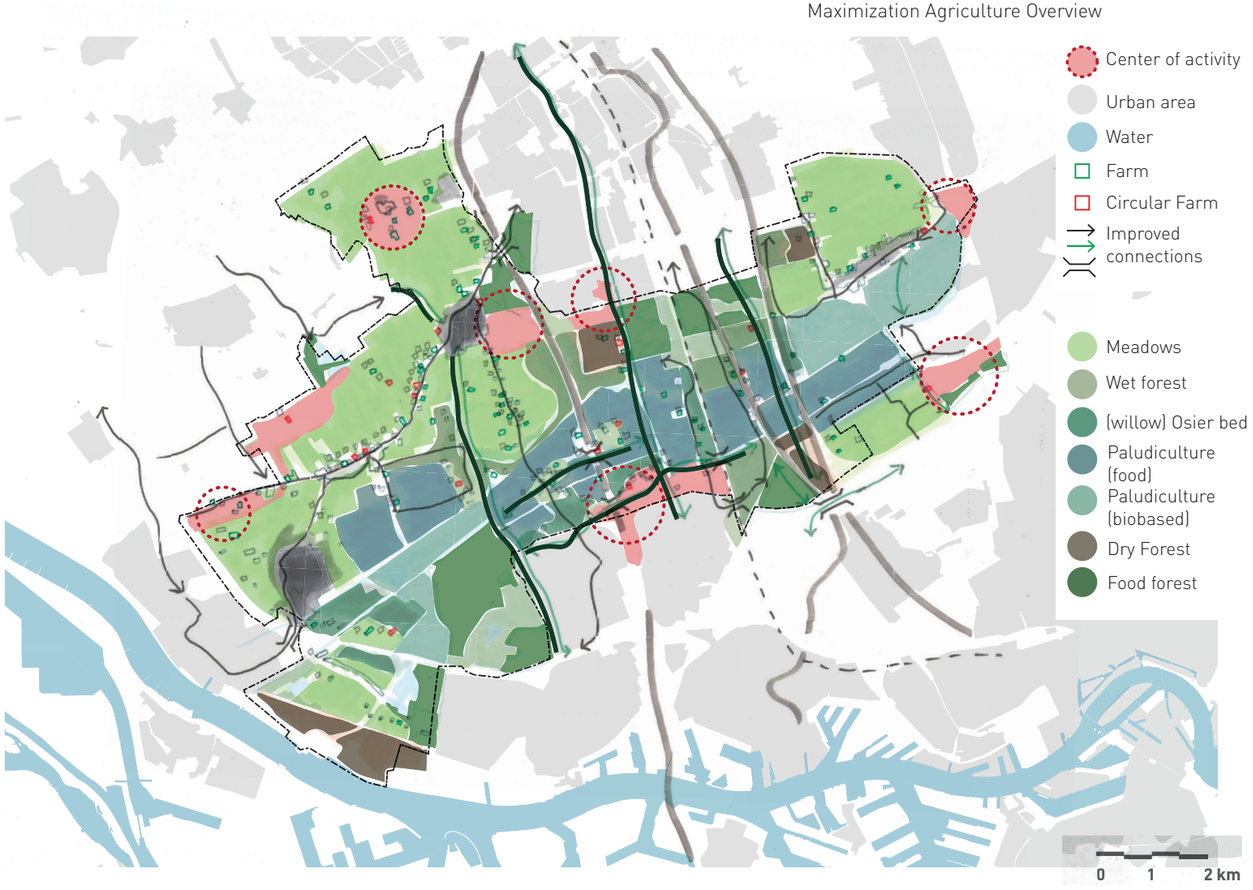


Before



[Fig.79] Agricultural map Midden-Delfland before maximization. Made by Author.

After



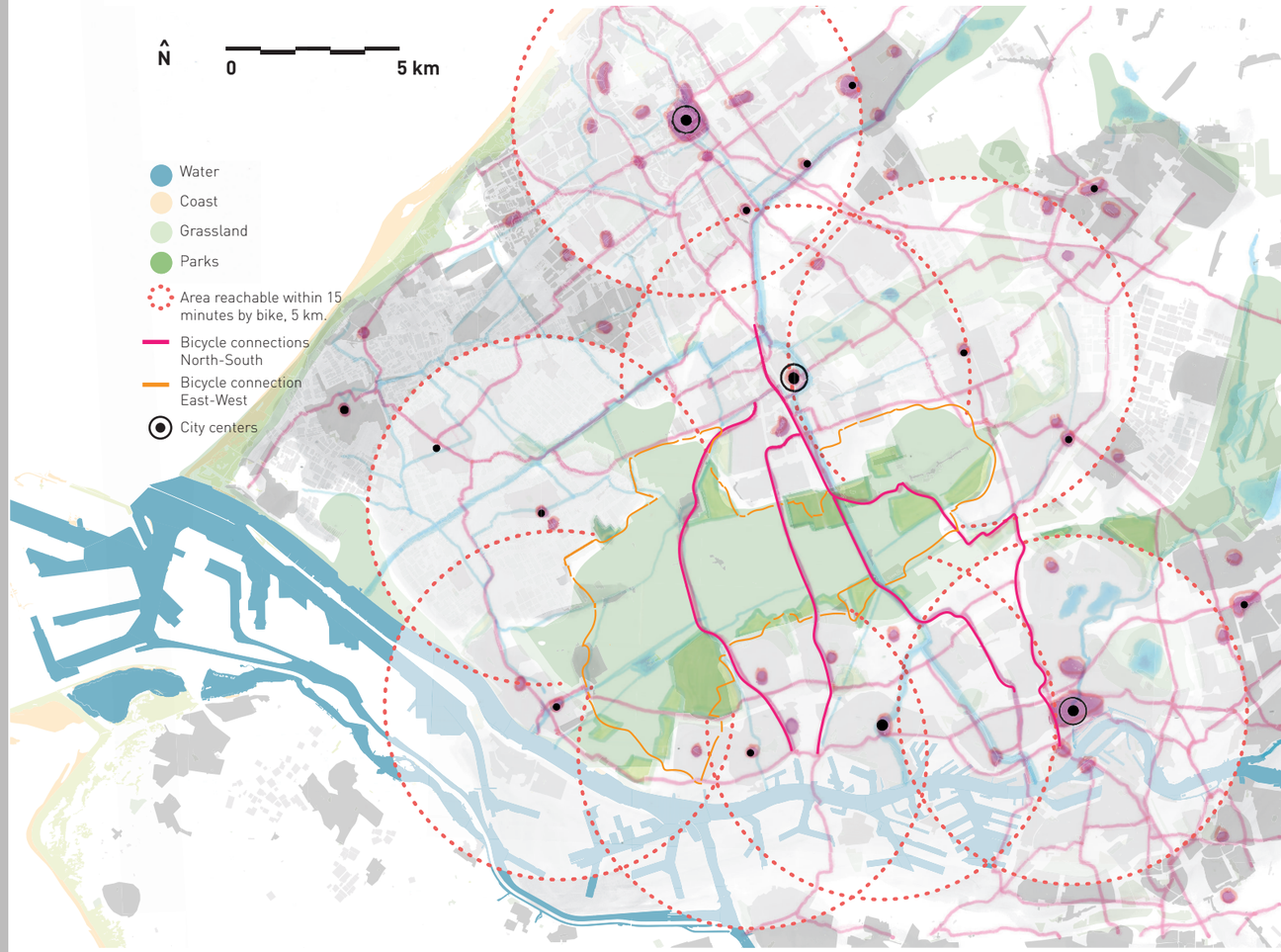
[Fig.80] Agricultural map Midden-Delfland after maximization. Made by Author.

[Fig.81] Envisioning a completely recreational landscape (Image made by author)



6.3 Maximization Recreation

Rural - City connections on the level of South Holland



[Fig.82] Recreation map on the level of South Holland. Made by Author. (QGIS, 2023)

Recreation - Elaboration on Maximization Choices

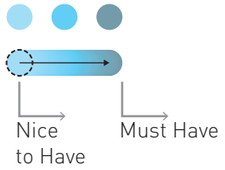
In the province of South Holland, rapid **urbanization** has reduced the **available green space** per person and the **access** of individuals to public green spaces. Currently, only a limited number of residents can easily reach valuable landscapes, like the inner landscape of Midden-Delfland, from their homes. To address this, a focus on maximizing and enhancing **connections between urban and rural** areas is urgent. The concept of the **15-minute city**, where essential amenities and recreational spots are reachable within a 15-minute walk or bike ride, offers a solution of interest. Adapting this strategy **reduces car use** and car dependency, leading to a more sustainable and healthier environment. The aim is to improve connections between the surrounding **urban centers**, of for emaple Vlaardingen, Schiedam and other villages, and the recreational zones of Midden-Delfland. This is to ensure that the landscape serves as **the green backyard for surrounding cities**. Some borders of the landscape are already well connected, but there are many **harsh transitions** still to be found, especially at the borders of the greenhouse-landscape.There should be a focus and improvement on the **gateways** to Midden-Delfland, so that citizens have a **clear direction** towards the landscape. Smart utilization of existing recreational areas bordering the Special Provincial Landscape of Midden-Delfland, is crucial. These areas are currently mostly positioned at the border. They could serve as starting points for facilitating gateways, with **new recreational zones** added where necessary.

To increase citizens' possibility to recreate in Midden-Delfland, the **bicycle network** should be improved. However, there are still some big **infrastructural barriers** in the area to overcome that still obstruct these connections. Currently, the North-South connections for bicycles are the easiest to enhance and can potentially serve as **bike-highways** between bordering city-cores. Future plans, to accomplish the highest potential for recreation, should prioritize creating **a bicycle tour**, with more emphasis on biking around Midden-Delfland from **east to west.**

Promoting cycling as the primary means of transportation benefits both the environment and **public health.** Special attention should be given to creating bike highways for **electric bikes**. Within recreational parks, agricultural plots and forests, an emphasis should be put on the visitor's **possibility to walk around** and pedestrian paths should be kept clear.

The urban-rural divide could even be bridged with increasing **public transport stops** and by implementing boat taxis. As regional policies, like the metropolitan region Rotterdam-The Hague, are already investigating increasing and intensifying the railway system, Midden-Delfland could adapt to this strategy and advocate for new public transport stops nearby. The **boat taxi** is an idea to intensify the recreational use of the big water structures (among which the Schie canal) that already cover the landscape.

While existing recreational zones mostly lie along the borders of Midden-Delfland, there is **untapped green space** within the core. This presents opportunities for **new destinations**, answering to an **increasing pressure** of citizens from the bordering municipalities of the province. Increasing water-based recreational opportunities can address climate change issues and **diversify activities**, attracting a wider range of visitors. Additionally, in teh future, increased **water-recreation** provides cooling locations during heatwaves and droughts.Improved infrastructure and thematic clusters of activity will create a vibrant and accessible recreational landscape for residents and tourists alike, enriching the recreational experience.



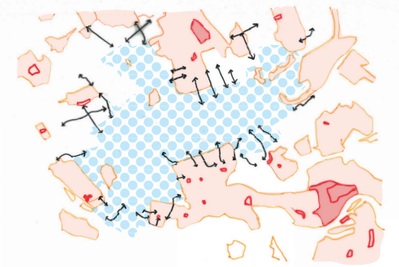
As shown on the next page, for each maximization principle, there is an indication added to show which principles have a higher prioritu an which have a lower priority.

Recreation - Maximization Principles



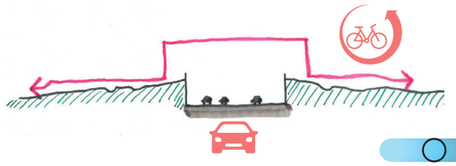
Preserve Existing Recreational Zones

Utilize the current recreational areas bordering Midden-Delfland, as gateways to the landscape. This will help establish the urban-rural connection and enhance the vital character of these areas, for local enjoyment and biodiversity conservation.



Improve Urban-Rural Connectivity

The goal is to improve the links between urban centers of the surrounding municipalities and Midden-Delfland, to ensure equitable access for all residents and to develop the area into a 'green backyard', or 'metropolitan park' for the urban landscape.



Overcome Infrastructural Barriers

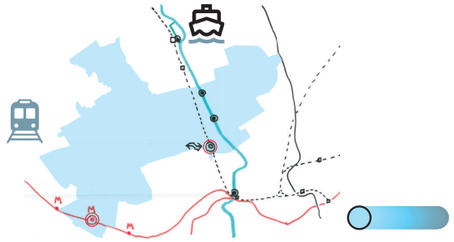
Address obstacles, mostly caused by infrastructural lines of the highways (A4 & A13) and the railway, hindering the bike and pedestrian access to recreational areas. For these modes of transportation the connectivity is prioritized.



Promote Possibilities to Walk and Bike around

Encourage active transportation and discouraging car-use, by establishing clear pedestrian pathways within recreational areas and bicycle lanes between destinations, for a healthier lifestyle.

Nice to Have — Must Have



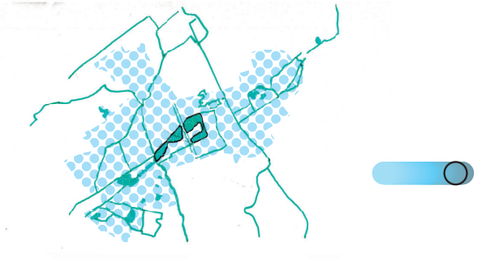
Innovative Modes of Public Transport

Introduce efficient and eco-friendly transportation options, like boat taxis, to bridge urban-rural gaps and enhance accessibility. Add public transport stops on the existing metro, bus, train or tram network.



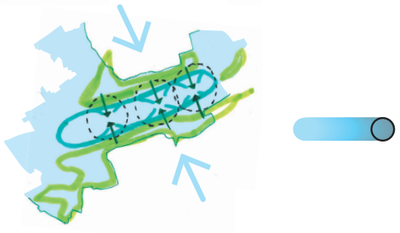
Diverse Clusters of Activity

Develop varied recreational hubs with different types of activities, to adapt to different interests, enriching experiences for residents and tourists.



Intensive Water-Based Recreation

Expand water-based activities to the core to offer additional opportunities for recreation throughout the whole landscape. Aditionally, mitigate climate change effects and offer refreshing options during heatwaves.



Intensive Recreation extends to the Core

Utilize monocultural, low-function green spaces within Midden-Delfland's core to meet the growing demand for recreational area, diversifying activities and enhancing the overall recreational landscape.

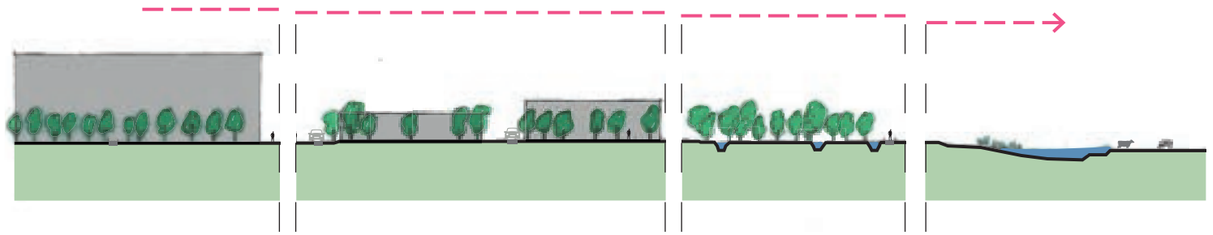
Recreation - Maximization Principles



[Fig.83] **An intensive, recreational water zone.** Made by Author.



[Fig.84] **New modes of public transport for accessibility from the cities.** Made by Author.

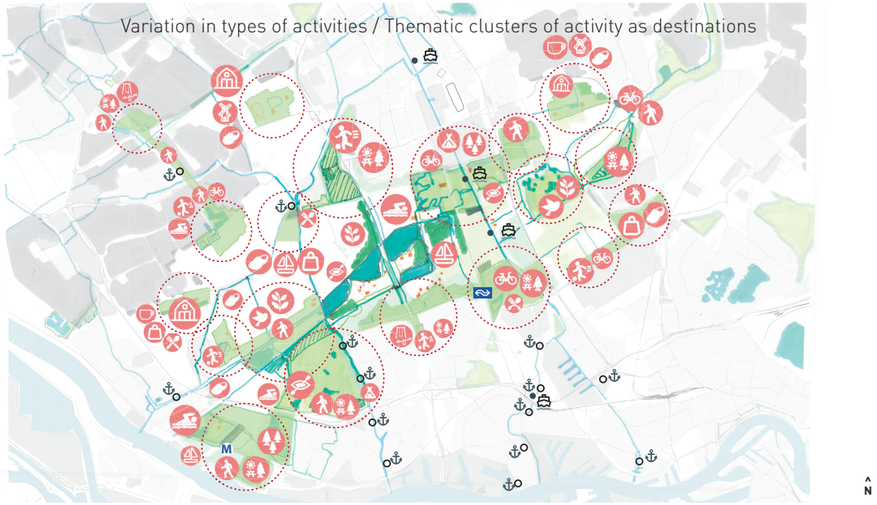


[Fig.85] **Improve City and Rural Connections.** Made by Author.

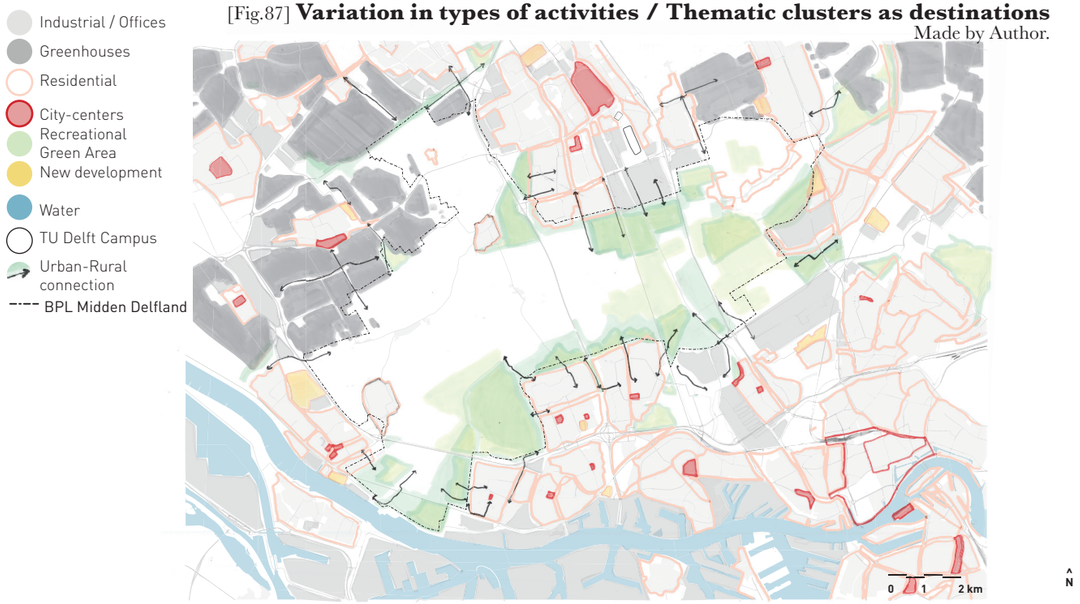
[Fig.86] **Improve Bicycle Network- A tour around Midden-Delfland.** Made by Author.



Recreation - Maximization Principles



[Fig.87] **Variation in types of activities / Thematic clusters as destinations** Made by Author.



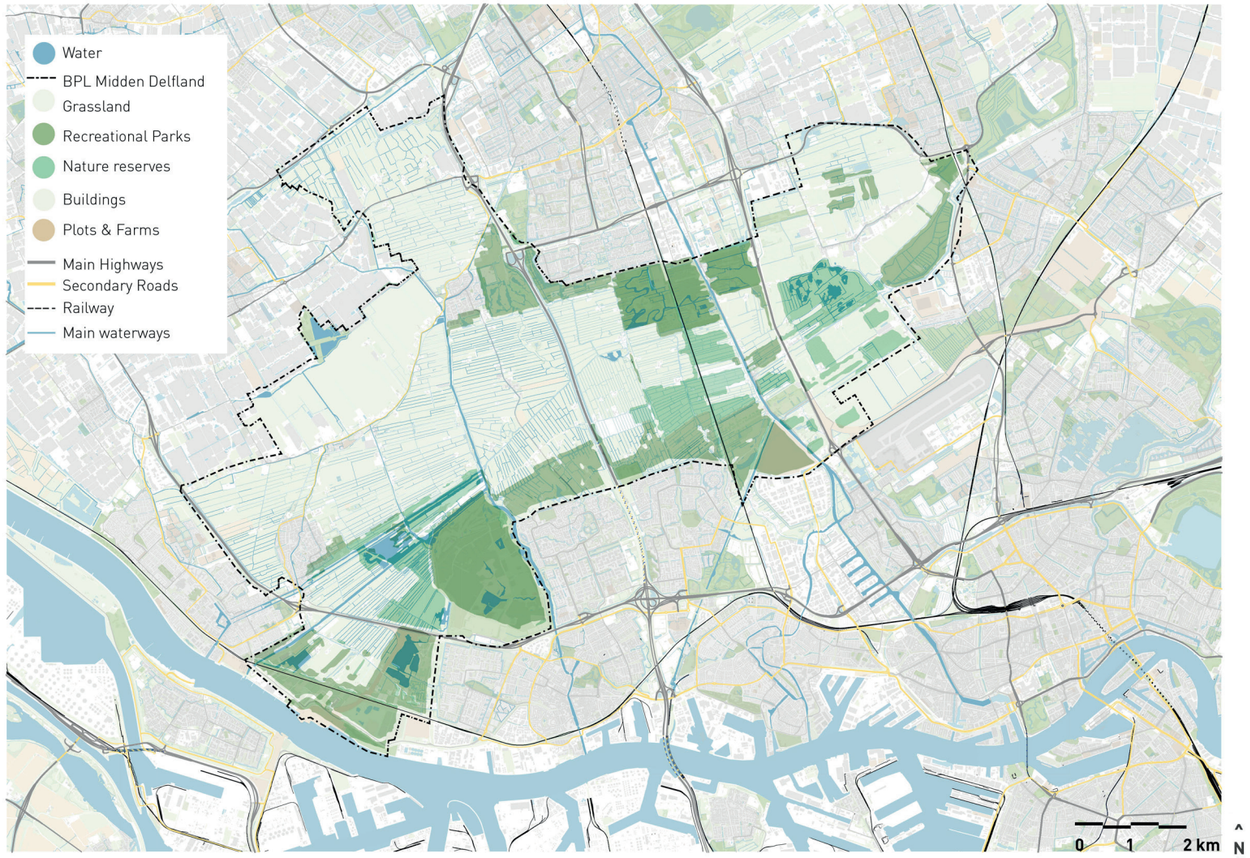
[Fig.88] **Connections City to BPL.** Made by Author.

Recreation - Types of activities and functions



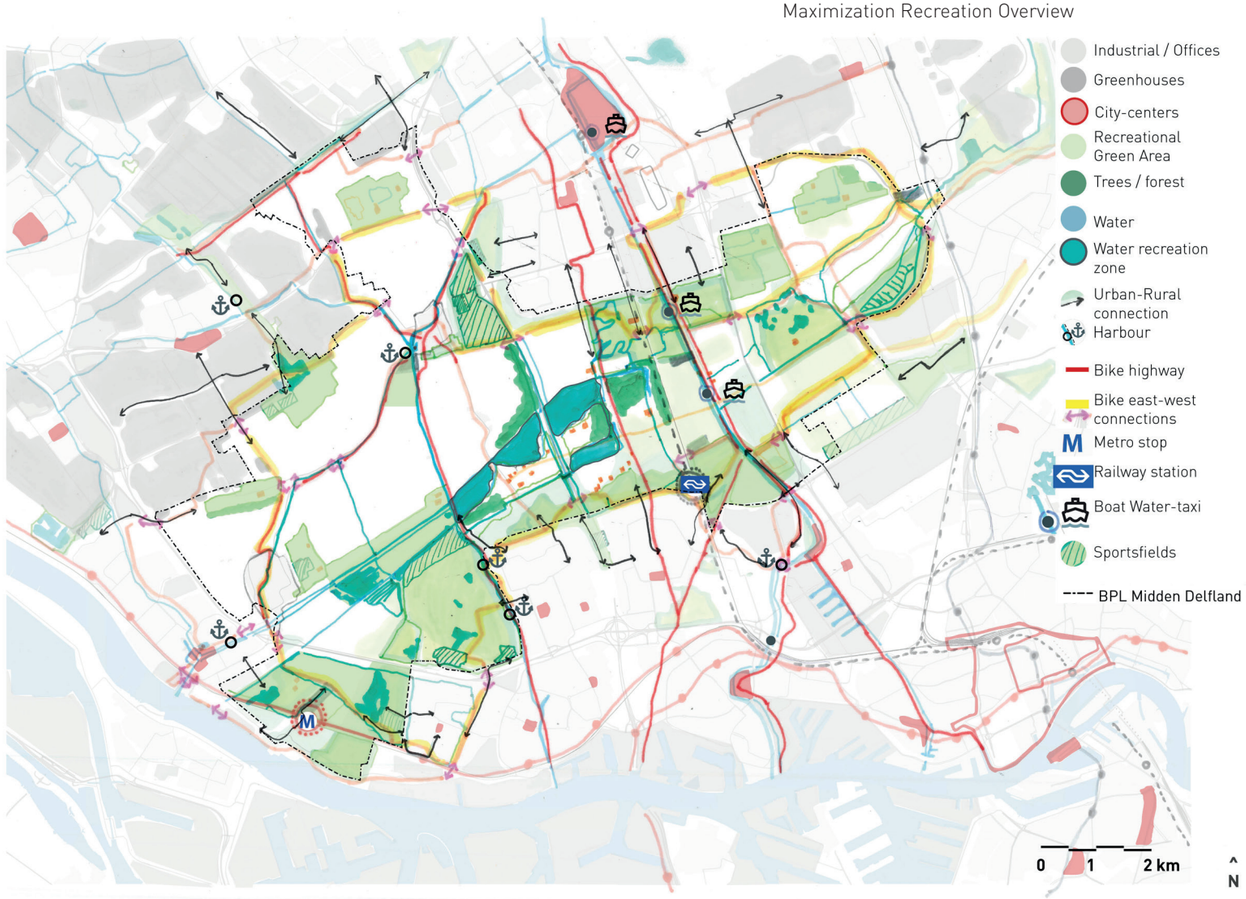
[Fig.89] **Legend for types of activities and functions.** Made by Author.

Before



[Fig.90] Recreation map Midden-Delfland before maximization. Made by Author.

After



[Fig.91] Recreation map Midden-Delfland after maximization. Made by Author.

Flowery fields in summer in Midden-Delfland.

Chapter 7

Design Optimization,

Vision for The Metropolitan Park

Optimization & Local Design Interventions

Subquestion

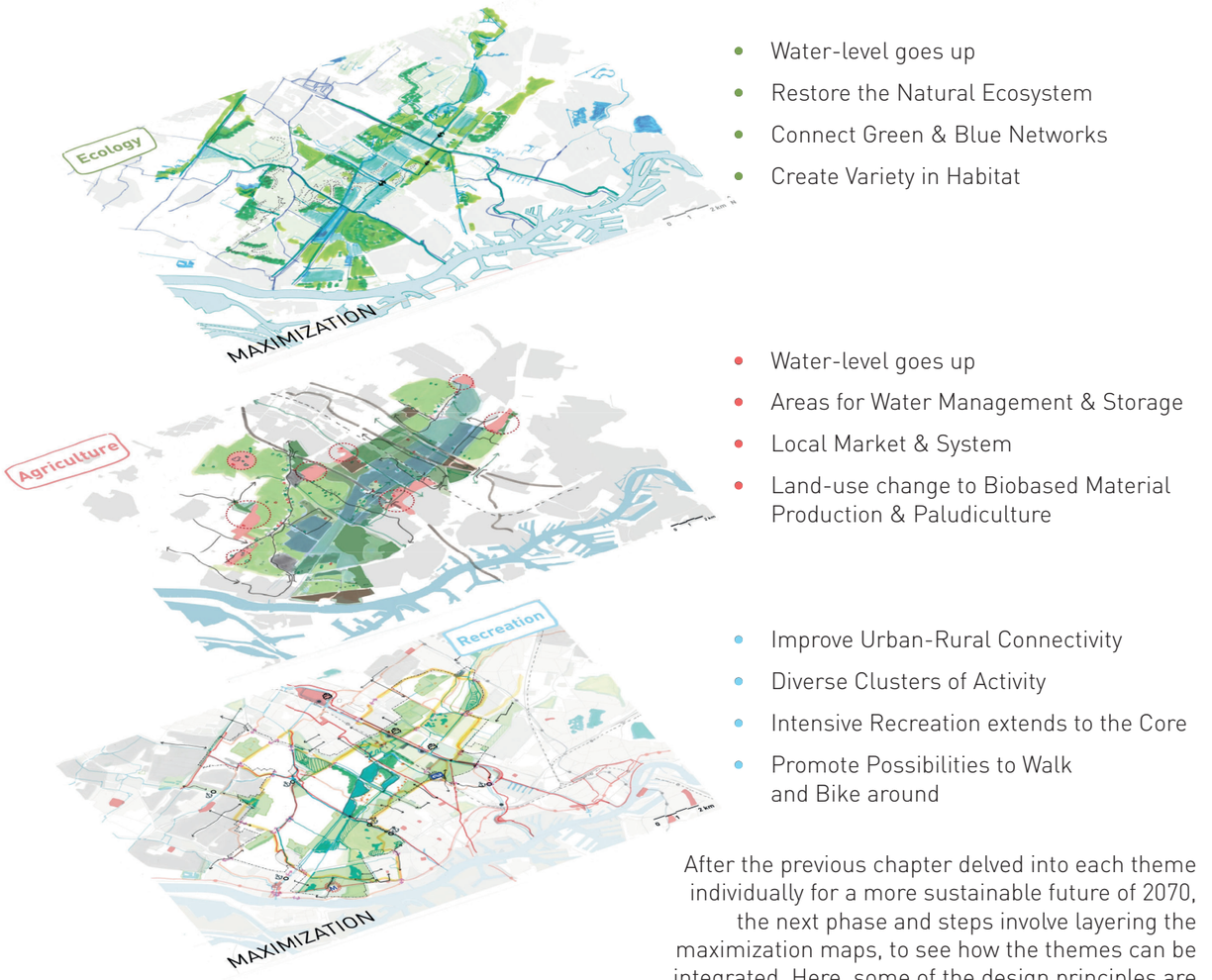
5. How can the three preliminary themes be optimized and combined to create a vision towards 2070, re-evaluating the core values of BPL Midden-Delfland?

The Optimization chapter dives deeper into the future development of Midden-Delfland towards 2070, with the core values of BPL Midden-Delfland in mind while addressing upcoming challenges. This section explores the integration of the themes. It begins by overlaying maximization maps, prioritizing essential design principles crucial for the sustainability of each theme. A central challenge emerges: reconciling conflicting spatial needs, especially regarding stakeholder priorities. By analyzing these conflicts and synergies, new pathways for integration can be found, for example making use of the water system as a unifying force. The chapter shows the vision design and then focuses on local design interventions, which proof the possibilities for integration on a more specific scale. For example, the design of the ecological core highlights sustainable practices and shows how nature exploration can be combined with adaptive agricultural strategies.

The urban fringes of Vlaardingen overlooking the rural landscape in summer.

7.1 Vision Design
Optimization

Overlaying the themes: Optimization Must Haves



- Water-level goes up
- Restore the Natural Ecosystem
- Connect Green & Blue Networks
- Create Variety in Habitat

- Water-level goes up
- Areas for Water Management & Storage
- Local Market & System
- Land-use change to Biobased Material Production & Paludiculture

- Improve Urban-Rural Connectivity
- Diverse Clusters of Activity
- Intensive Recreation extends to the Core
- Promote Possibilities to Walk and Bike around

After the previous chapter delved into each theme individually for a more sustainable future of 2070, the next phase and steps involve layering the maximization maps, to see how the themes can be integrated. Here, some of the design principles are prioritized as must haves. These are principle that are essential in order for the separate themes to persist.

[Fig.92] Overlaying the Maximization maps. Made by Author.

The Conflicts: Battle for Space

A



- Land-use change to Biobased Material Production & Paludiculture

R



- Intensive Recreation extends to the Core

E



- Create a Core Wilderness Zone & incorporate a Buffer Zone

The biggest conflict in the comparison between the themes arose with the conflict of space. The conflict is also dependent on which stakeholder values you make the most important. In this case, if we can also view ' nature' as a stakeholder, it is a conflict between the agricultural sector and the farmers, the visitors and citizens and nature on who gets the highest priority. Does the vision opt for the landscape to become a nature reserve, peaceful and quiet with little human intervention, does it need to make room for a lot of visitors and liveliness, or should it be serving the region in terms of economical yields, for example in the food-sector? For now, a preliminary conclusion is that the recreational functions are essential for the region, considering its very urbanized context. That is why recreation should play a bigger role in the future. This way, the region, including bigger municipalities around it are concerned with the value of the green outdoor space for their inhabitants. Citizens will recognize the significance of the area and this will help to develop it as a metropolitan park that should be protected from big infrastructure.

In the appendix (appendix item 4), tables present a layout of all design principles compared with each other, theme by theme, this gives a more extensive insights into the comparison, to find conflicts and synergies and matches between the three themes.

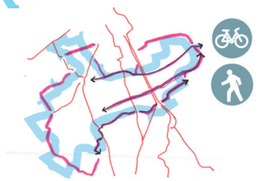
The Complementation: Networks

R



- Innovative Modes of Public Transport

R



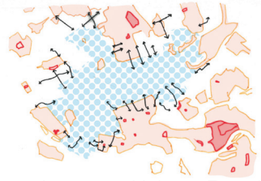
- Promote Possibilities to Walk and Bike around

A



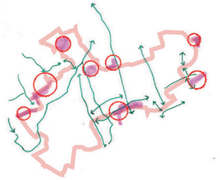
- Improved Local Network

R



- Improve Urban-Rural Connectivity

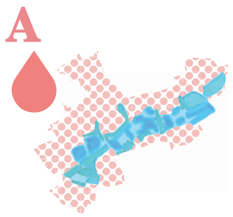
A



- Local Market & System

Looking further into complementation of the themes and finding synergies, a lot of opportunities arise for improvement when considering the need for an improved network. This applies not just for the bicycle but also in terms of water transportation. If we compare agriculture and recreation, the connection with the surrounding city-centers needs improvement, but there is also need for an improved local trade system for farmers, and this is where both topics can match. By strategically utilizing existing recreational zones at the borders of Midden-Delfland, all themes can contribute to strengthening the city-rural connection, expanding the green network, and facilitating local market interactions.

The Complementation: Water



- Areas for Water Management & Storage



- Restore the Natural Ecosystem

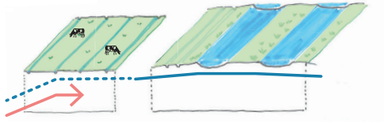


- Intensive Water-Based Recreation



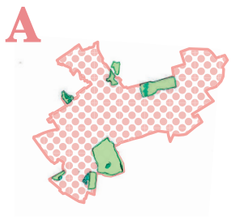
- Connect Green & Blue Networks

- Water-level goes up



During this optimization phase, it becomes clear that many synergies between the themes can be created on the basis of the water system. Both the agricultural sector and ecological landscape are in need of a higher water-level to prevent subsidence and bring back the original ecological peat-landscape. Additionally, the accessibility to water recreation in Midden-Delfland is currently not utilized to its maximum. An intensive, water recreational area can also provide more recreational functions in the core of Midden-Delfland.

The Complementation: Existing Green



- Preservation of important Recreational Zones



- Preserve Existing Recreational Zones



- Preserve & Protect Existing Nature

Finding Synergies

As discovered in the previous pages, a lot of synergies can be found. To make the optimization process easier, photographic collages show how integration of the three themes could work in the design. The basis for these collages are photographs from the landscape of Midden-Delfland, for ecology this resembles nature reserve Ackerdijkse Plassen, for agriculture meadows for livestock farming and for recreation one of the bicycle lanes along the polders landscape and agricultural meadows. By firstly looking at the themes separately, it is already shown how the landscape can transform.

For example, with the agricultural theme, it shows that the landscape transformed from a monoculture to a diverse landscape, with circular and nature inclusive farming as the highest priority. By taking this exploration a step further, the diverse productive landscape is combined with ecological corridors like lines of willow trees or ecological banks, which enables the step to bigger variety in habitats, giving species more possibilities to migrate between different ecospheres.

When discovering synergies for ecology, the landscape becomes a swampy and wet landscape because of the heightened water-level. However, in this situation the wet landscape only serves the ecological benefits for the area. What if this landscape is combined with clear routing that does not interfere with nature in a drastic way. A clear, heightened routing will ensure that the visitors stay within the designated paths and it will minimize disturbance.

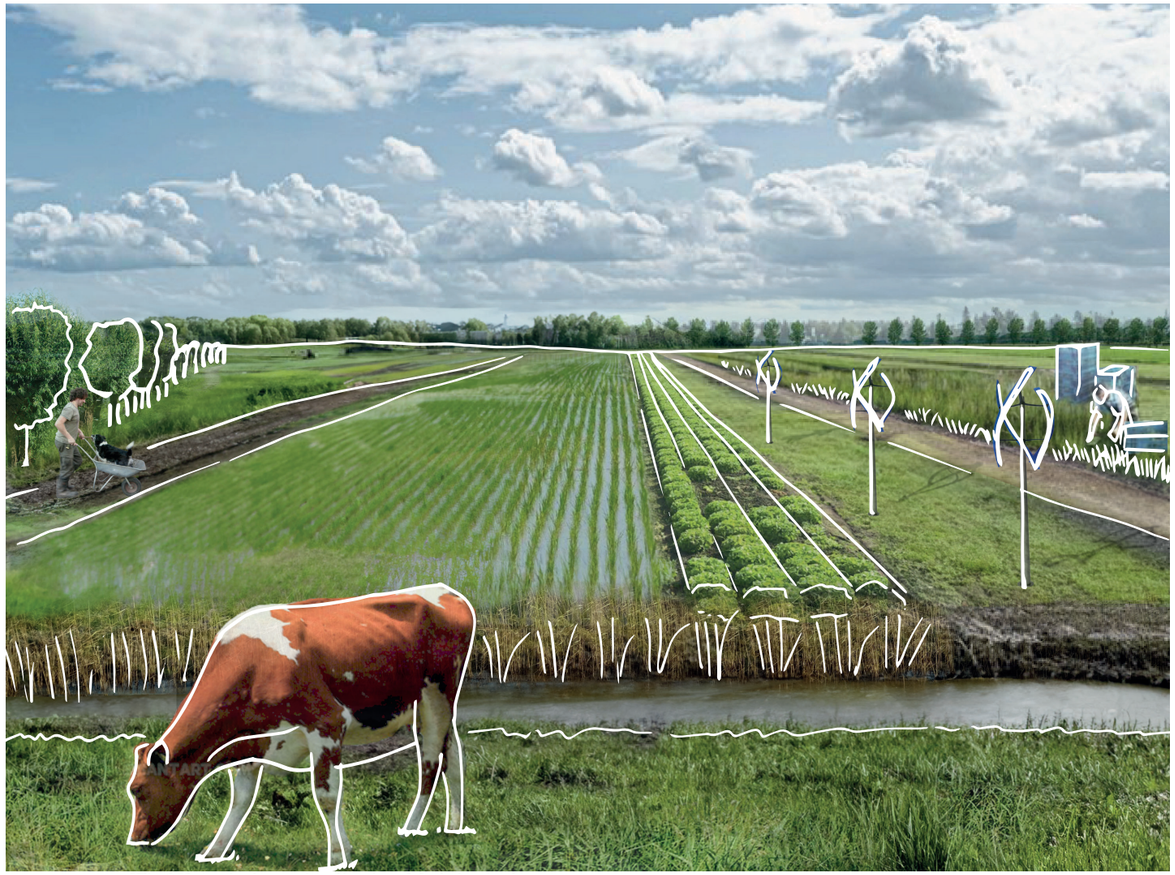
Considering the last photographic collage for recreation, facilitating bike infrastructure and additions to make more use of the waterscape will improve the experience of the landscape. But an experience for citizens can also really be increased within the agricultural sector. In some parts of Midden-Delfland additional functions are already present at farms, but the second image is to show how it can be elevated to a higher level, including communal gardens and cafés on the farmers plot.



[Fig.93] Ecology visualization. Made by Author.



[Fig.94] Ecology and Recreation visualization. Made by Author.



[Fig.95] Agriculture visualization. Made by Author.



[Fig.96] Agriculture and Ecology visualization. Made by Author.



[Fig.97] Recreation visualization. Made by Author.

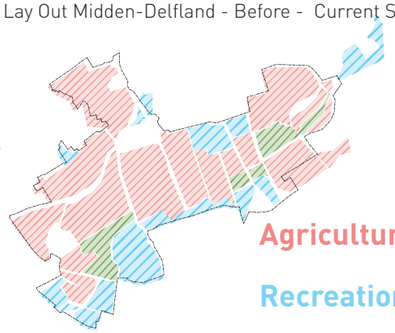


[Fig.98] Recreation and Agriculture visualization. Made by Author.

Final Optimization Map & Zoom-in Locations

In the former situation, the zoning of Midden-Delfland consisted of mostly agricultural land with some recreational areas at the border and ecological nature reserves in the middle, of which the last one had the most limited space. In vision design, more recreation and ecology is envisioned towards the middle of Midden-Delfland. This way, the area also becomes more interesting and diverse for visitors throughout the whole landscape, instead of just at the borders. The map experiments with implementing the synergies between the themes in different areas.

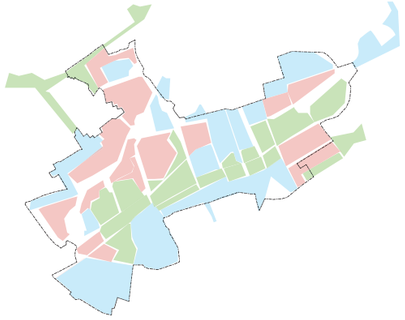
Lay Out Midden-Delfland - Before - Current Situation



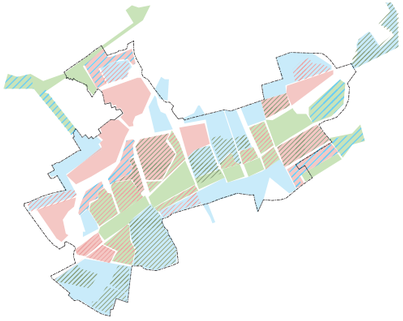
Agriculture

Recreation

Ecology



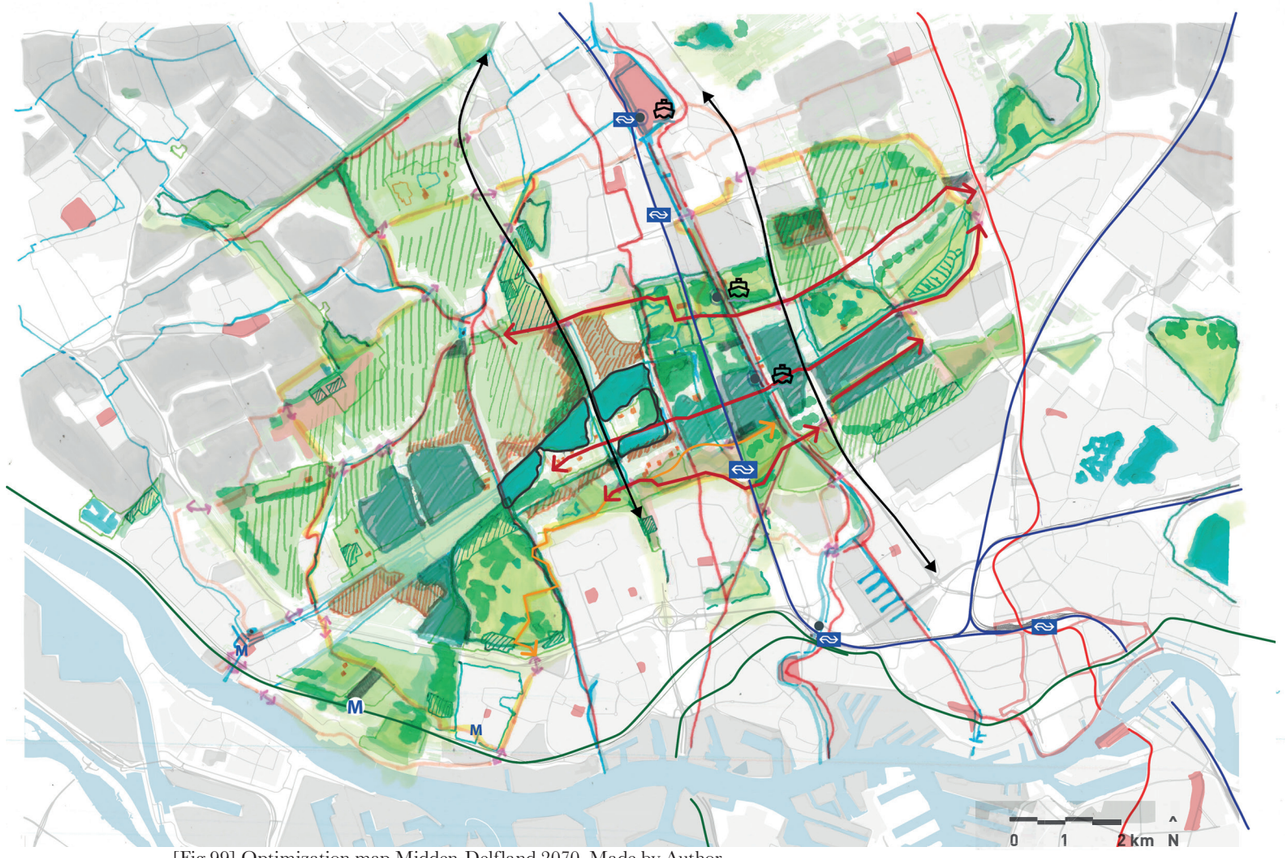
Lay Out Optimization



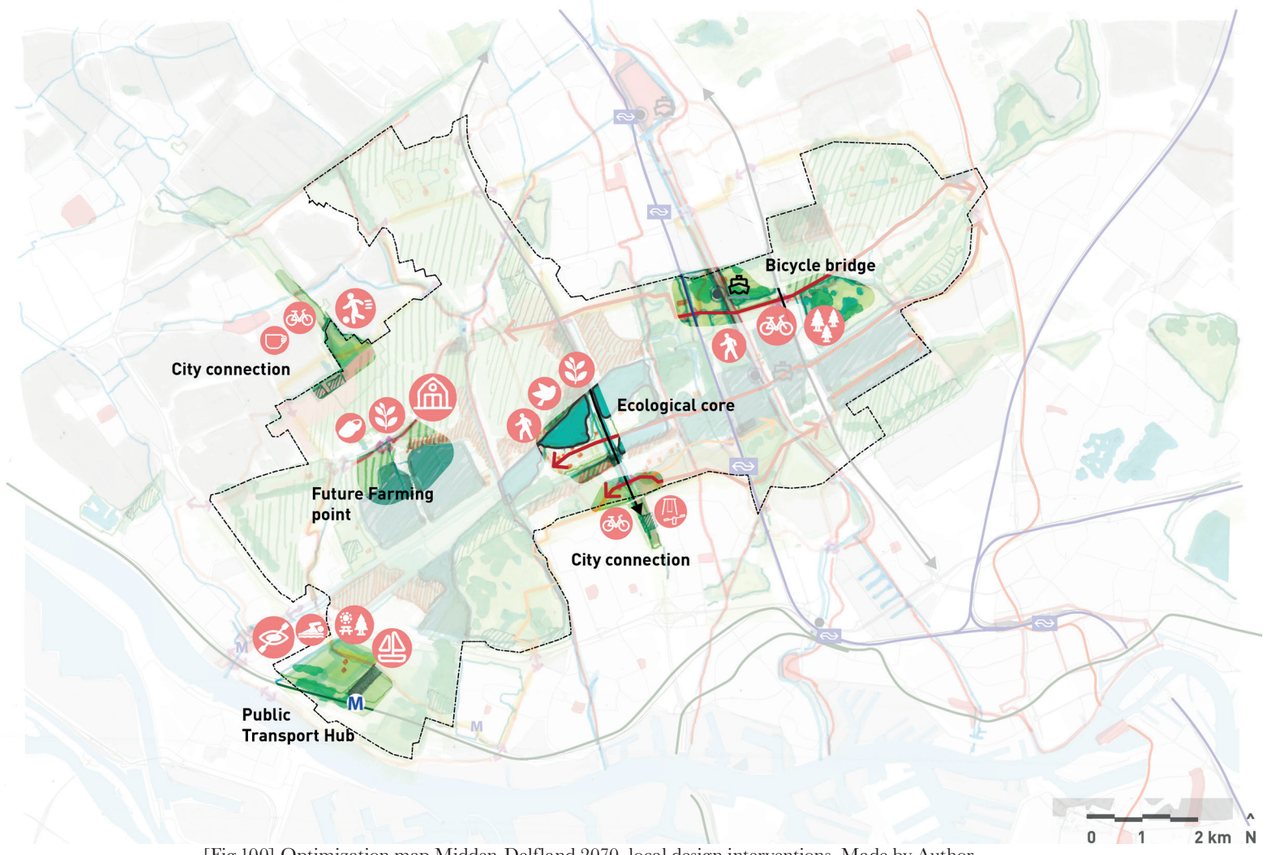
Creating Synergies

Secondary Function

Primary Function



[Fig.99] Optimization map Midden-Delfland 2070. Made by Author.



[Fig.100] Optimization map Midden-Delfland 2070, local design interventions. Made by Author.

Overview layers of optimtization

BPL Midden Delfland

Bicycle Network
- Bicycle Connection
- Bicycle Connection
- East to West Connection
- Cycling Tour
- Bicycle highways

Public Transport
- Metro
- Railway (Train)
- Randstadrail
- Metro stop
- Railway station
- Boat Water-taxi

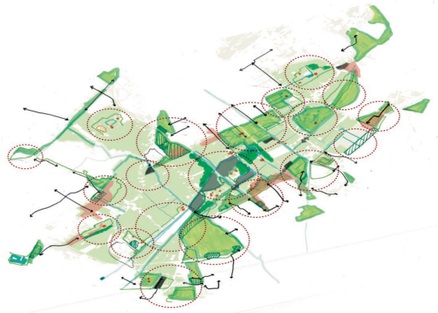
Urban Context
- Industrial / Offices
- Greenhouses
- Residential
- City-centers
- New development
- Water
- TU Delft Campus
- Urban-Rural connection







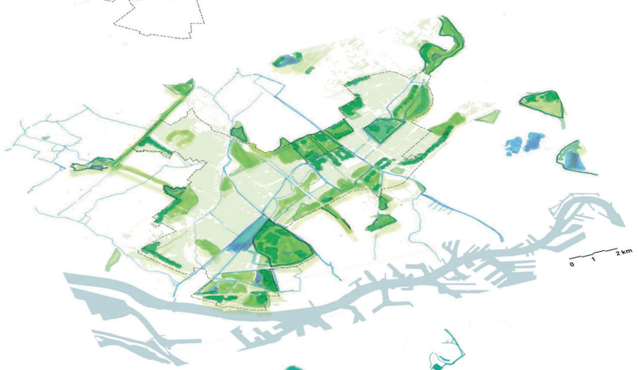
Activities & Centers
- Urban Fringe Transition
- Sports areas
- Centers of Activity
- Recreational Area
- Forest / Trees
- Urban-Rural connection
- Water Recreation Zone



Land-use / Production
- Circular Extensive farming
- Paludiculture
- Wet Cultivation Biobased Crops



Green
- Trees / Forest
- Swamp
- Recreational Area



Water
- Water connections
- Water network
- Maas River



[Fig.101] Overview with all layers of the optimization phase. Made by Author.

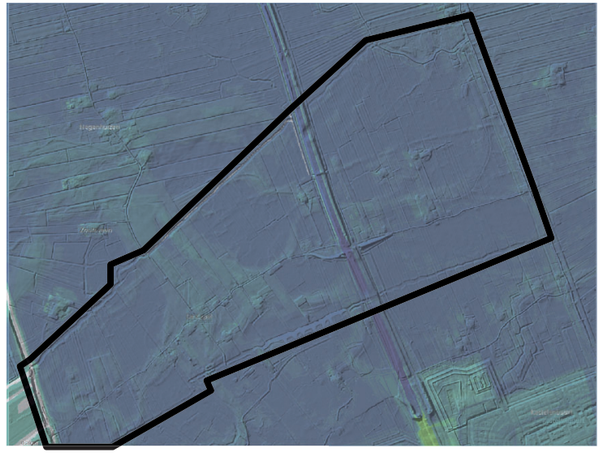
Cycling along the Buitenwatersloot canal through Den Hoorn towards the inner landscape of Midden-Delfland.

7.2 Vision Design

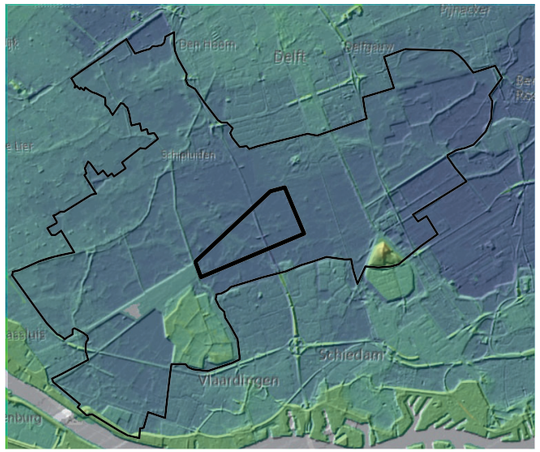
Local Design Interventions



The Ecological Core - Location

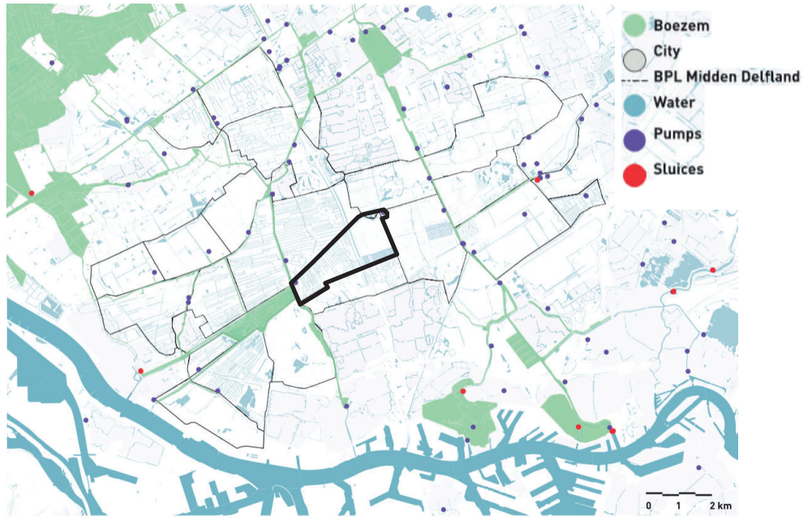


[Fig.102] Zoom in Location (Actueel Hoogtebestand Nederland (AHN), 2023)



[Fig.103] Ground-level height, one of the lower points of Midden-Delfland (Actueel Hoogtebestand Nederland (AHN), 2023)

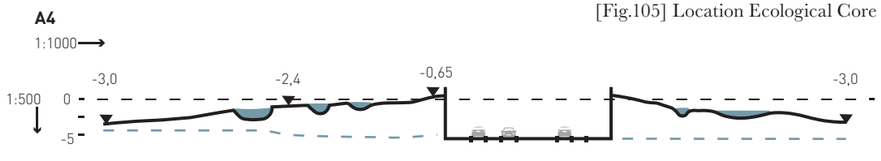
See appendix item 2 for a deeper analysis on the water system.



[Fig.104] Position within the water network and boezem system of Midden-Delfland (Made by author), 2023)



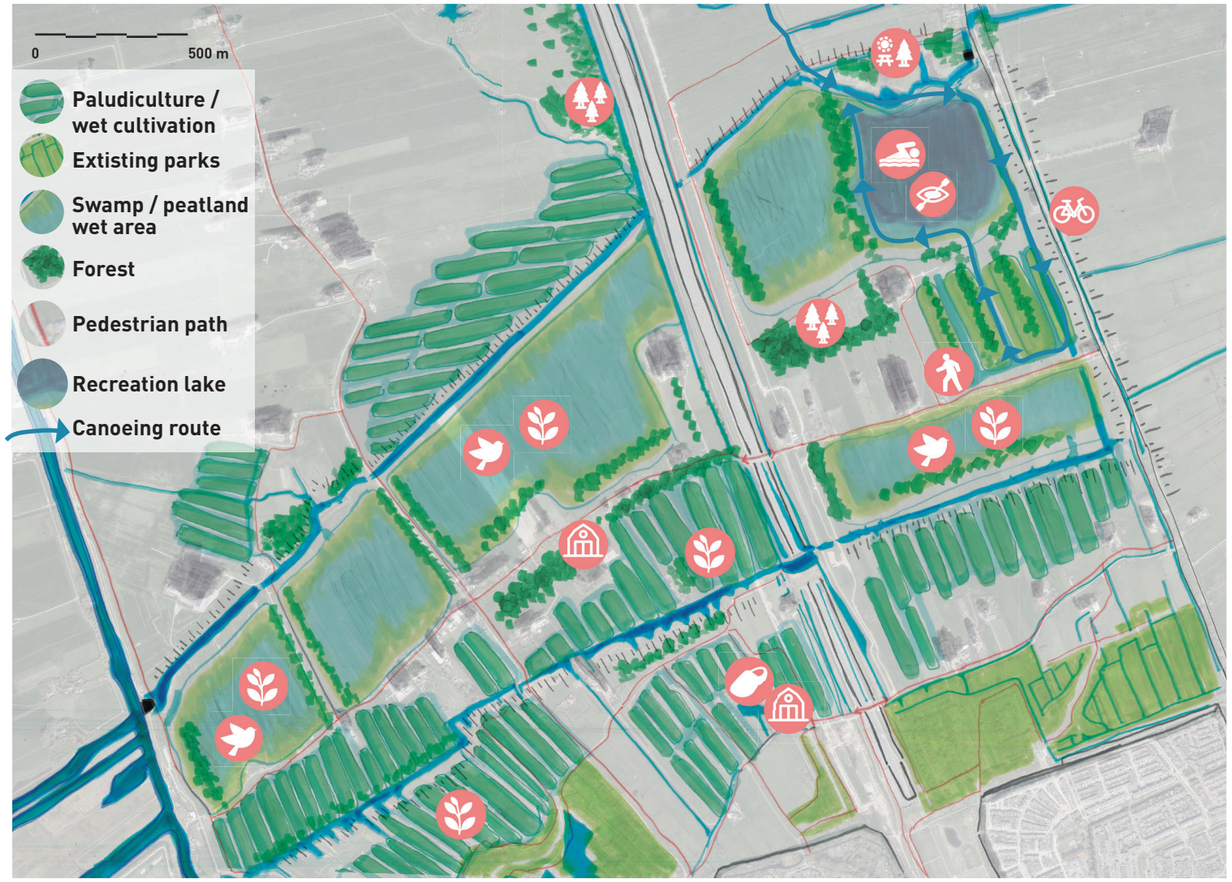
[Fig.105] Location Ecological Core & Zoom-in locations. Made by Author.



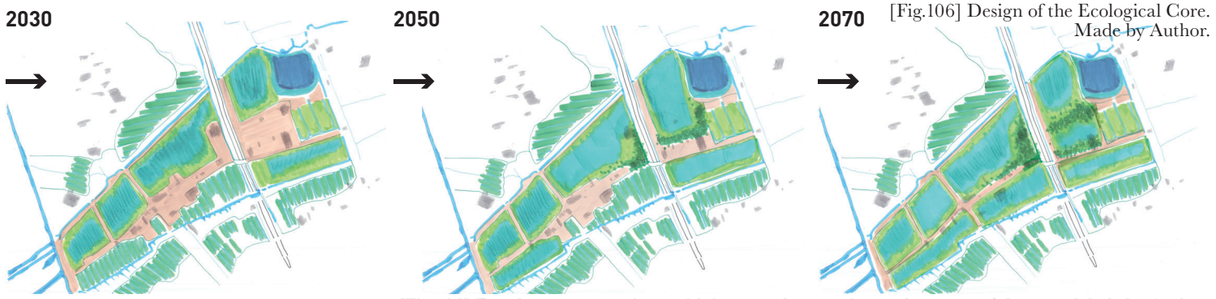
[Fig.106] Sections before design.

0 20 40 m

0 10 20 m

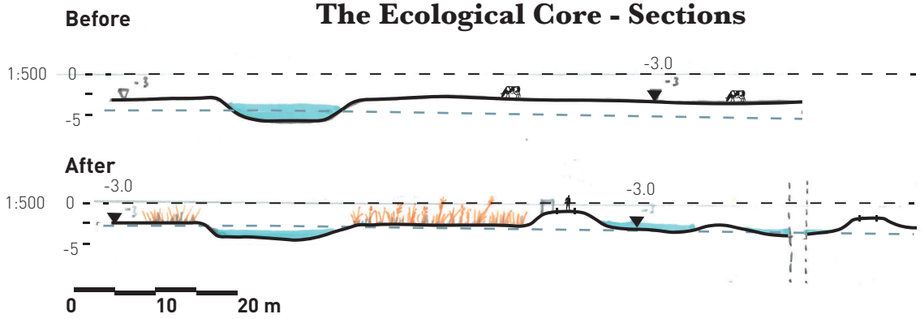


[Fig.106] Design of the Ecological Core. Made by Author.

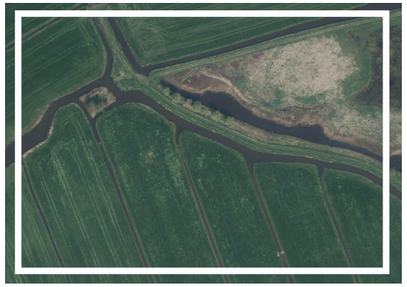


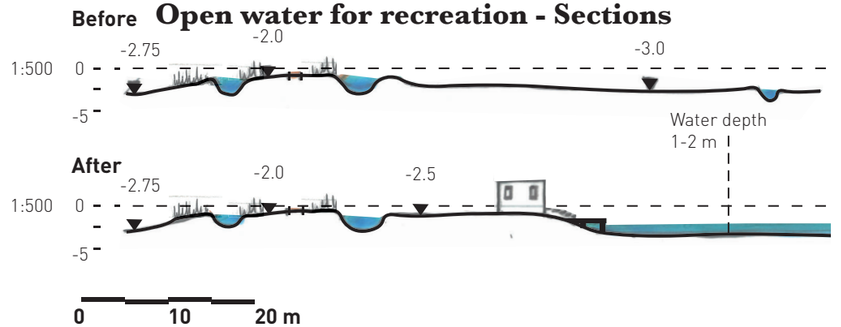
[Fig.106] Development over time, with increased vegetation and wetness of the area. Made by Author.



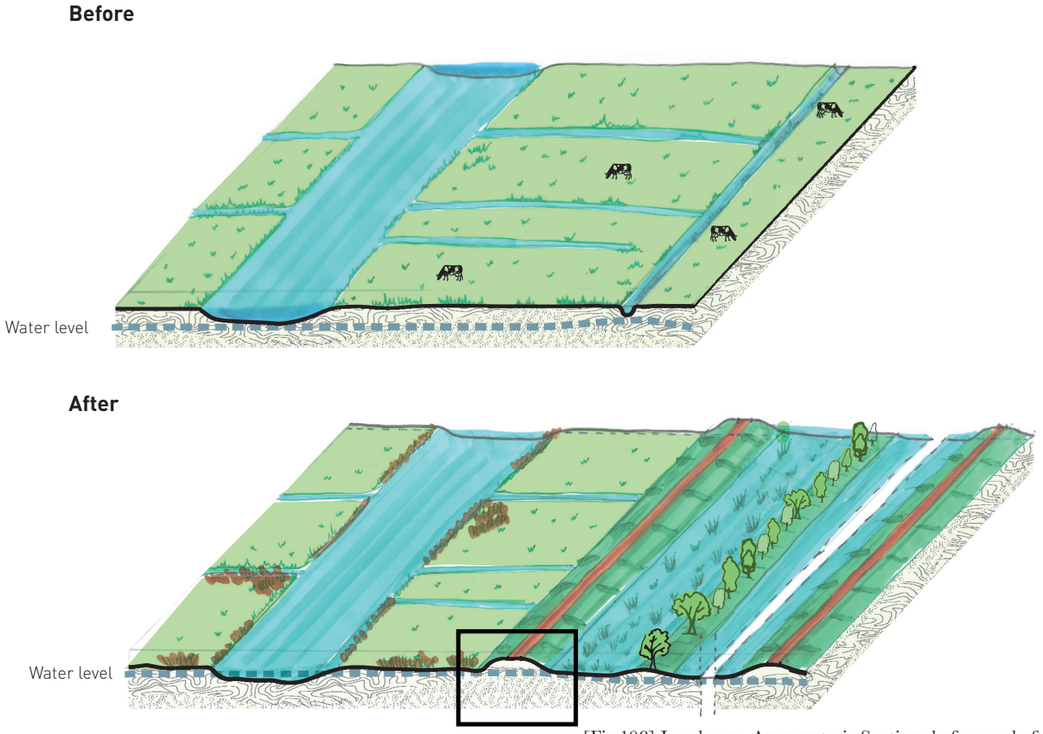


[Fig.107] Sections before and after. Made by Author.

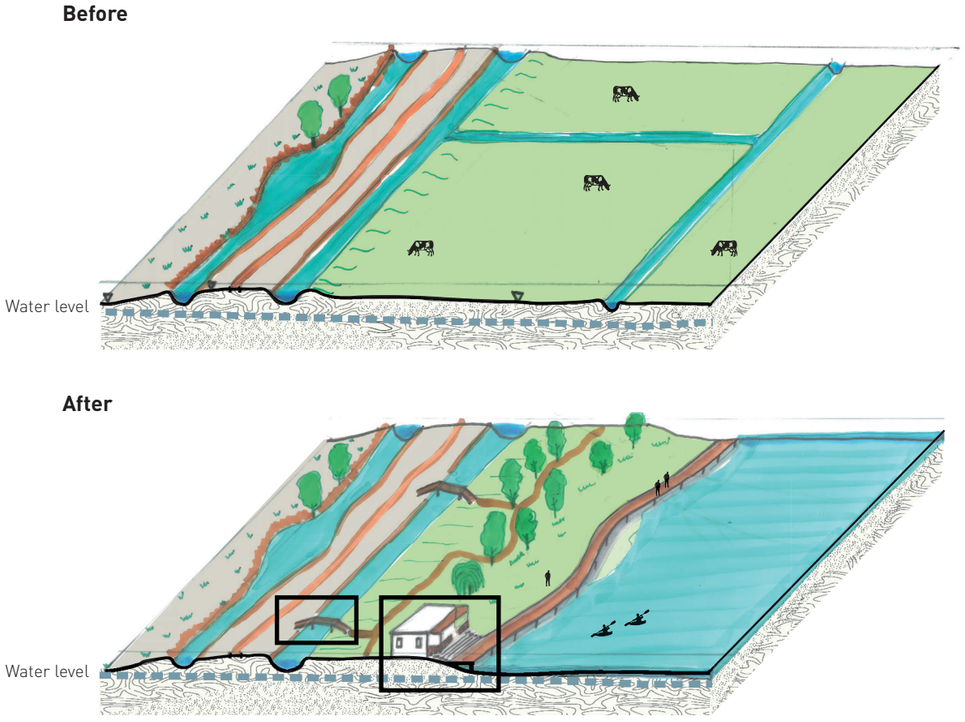




[Fig.109] Sections before and after. Made by Author.

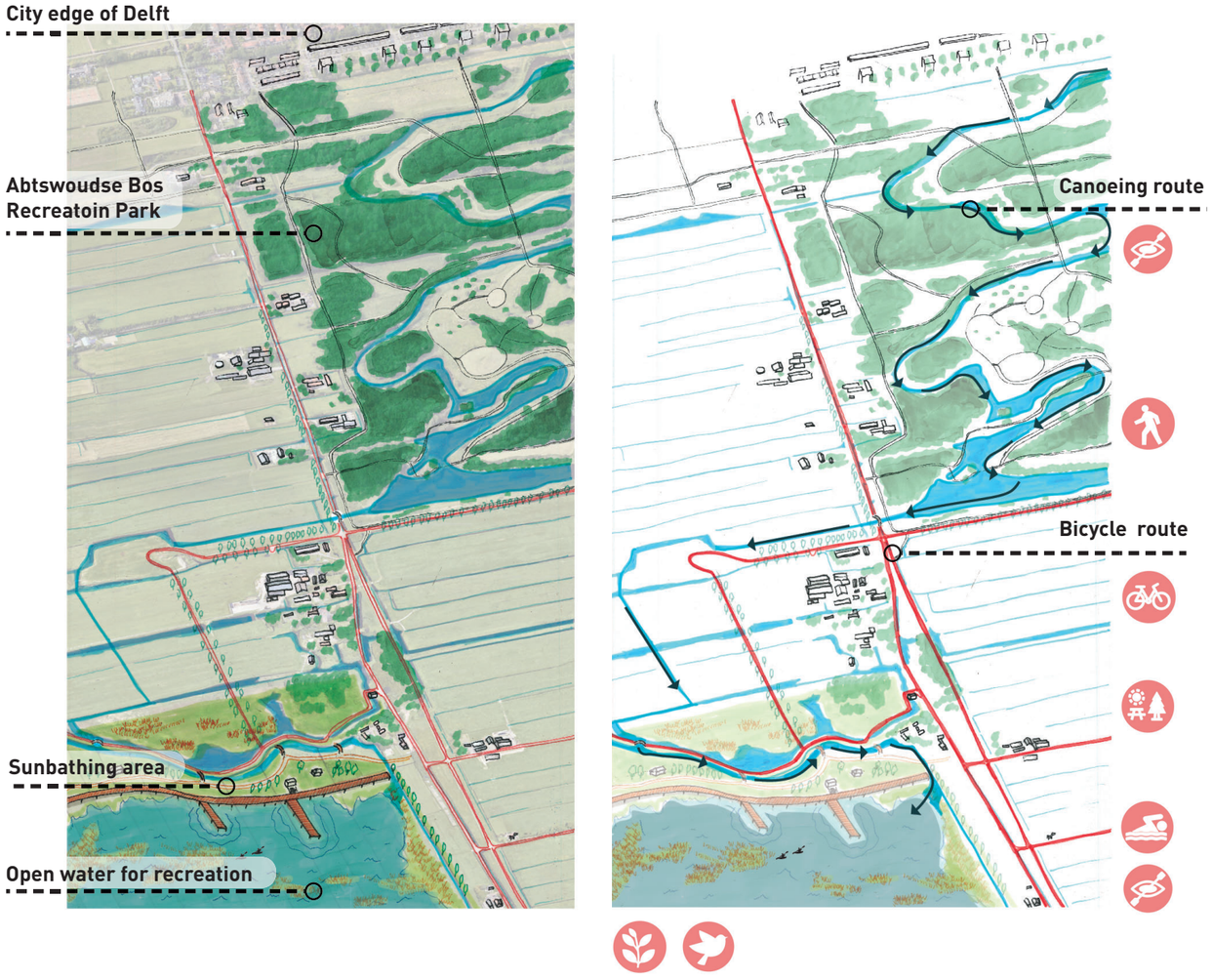


[Fig.108] Landscape Axonomteric Sections before and after
Made by Author.



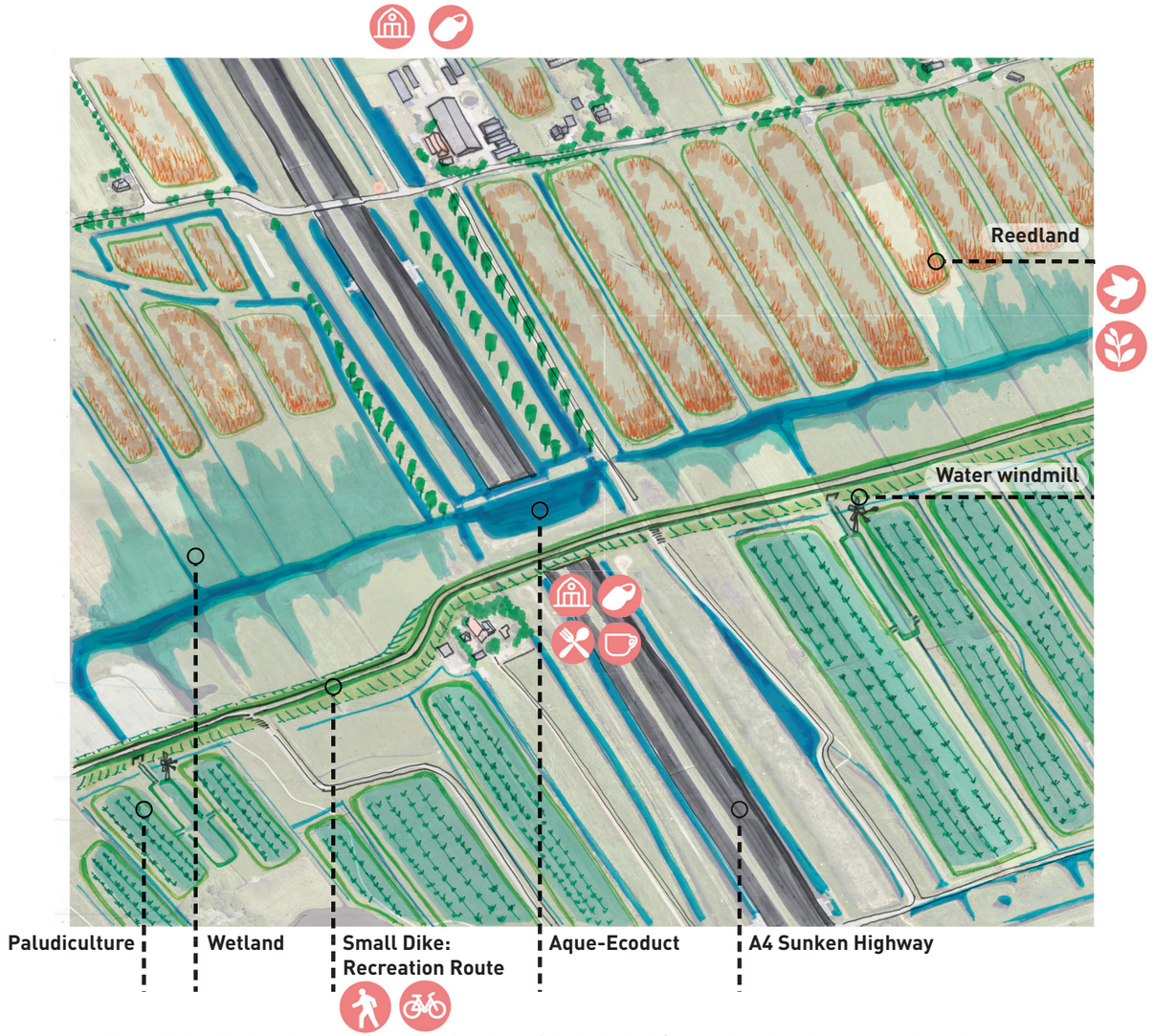
[Fig.110] Landscape Axonomteric Sections before and after.
Made by Author.

Zoom-in Visualization: Open water for recreation



[Fig.111]Visualization drawings of the canoeing routes and the connection with Abtswoudse Bos. Made by Author.

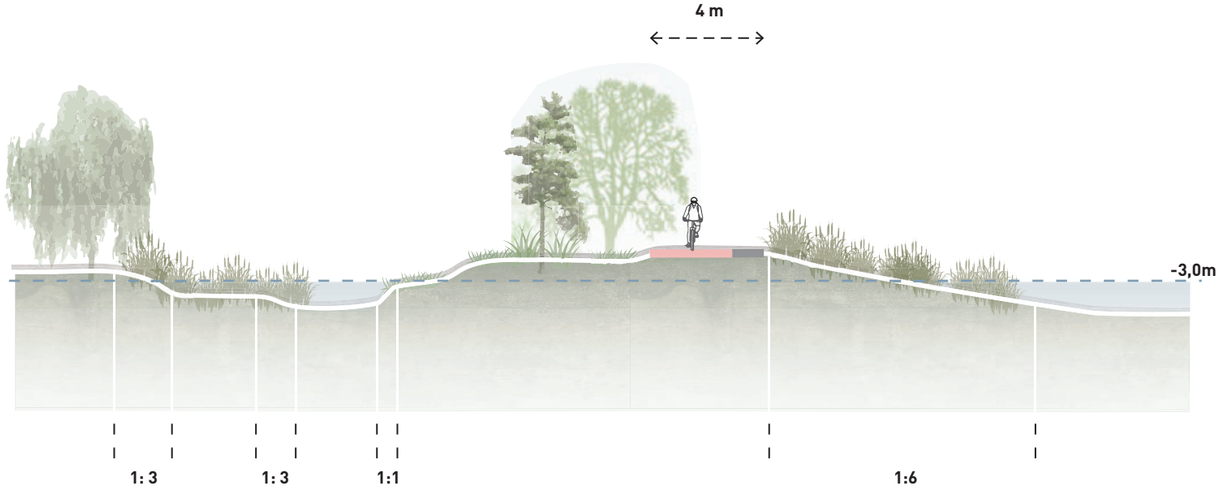
Zoom-in Visualization: The Ecological Core



[Fig.111] Visualization drawings of the agricultural use of the Ecological Core and the Aquaduct crossing the A4 highway. Made by Author.

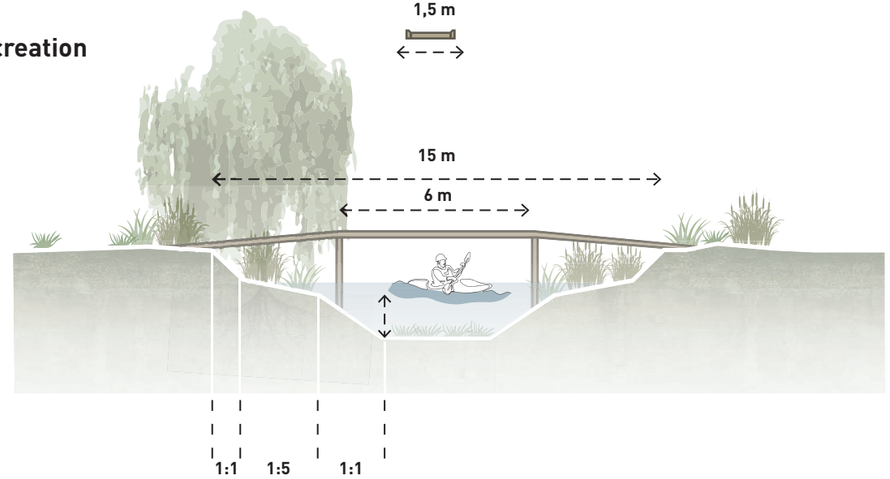
Ecological Core - Explanation & Details

The Ecological Core, the first local design intervention, focuses on preserving biodiversity and ecological resilience while enhancing recreational opportunities. The Ecological core is located in central, lower lying area of Midden-Delfland, with peat soil as its foundation. The intervention integrates water recreation facilities, including a canoeing water structure connected to Abtswoudse Bos. Diverse habitats are created within the core to support a wide range of plant and animal species, like reedlands and more wooded areas. Additionally, the surrounding buffer zone prioritizes sustainable land management practices such as nature-inclusive farming and agroforestry. A key aspect of the intervention is the adaptive livestock farming strategy, which involves implementing a network of a tussenboezem to regulate and raise water levels and address subsidence and CO2 emissions. This tussenboezem expands the surface area of the boezem system, creating independently managed peilvlakken within the waterway network. Water reservoirs within the intervention area serve as storage and purification systems, ensuring a reliable water supply for irrigation during dry periods. Furthermore, these reservoirs offer opportunities for activities like paludiculture and wet cultivation for biobased materials, enhancing the ecological and economic potential of the region.



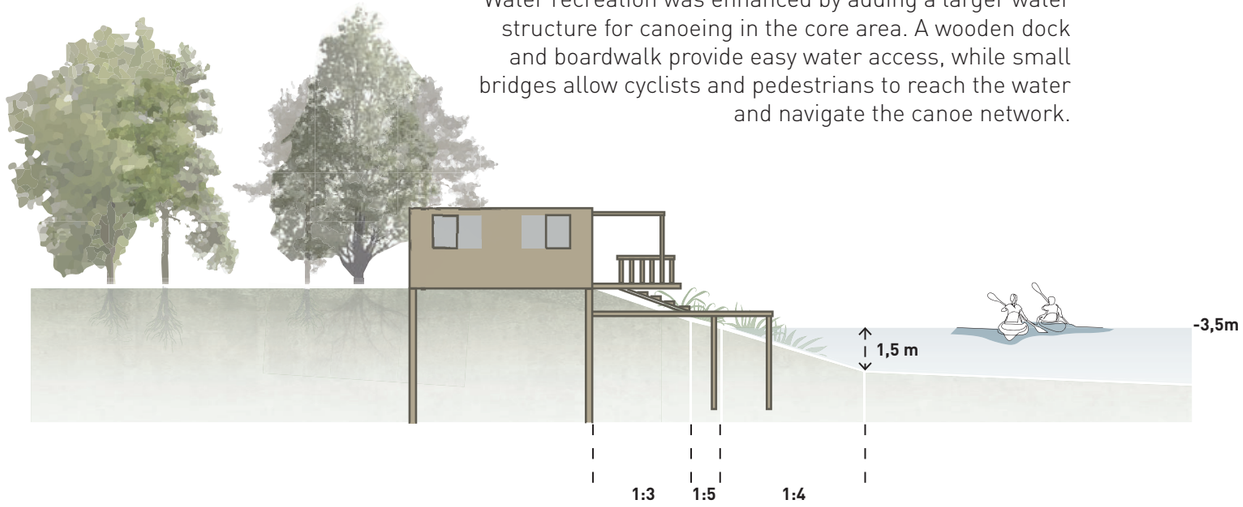
Detail A
The Ecological Core

Detail B
Open water for recreation



New Canoeing Network

Water recreation was enhanced by adding a larger water structure for canoeing in the core area. A wooden dock and boardwalk provide easy water access, while small bridges allow cyclists and pedestrians to reach the water and navigate the canoe network.

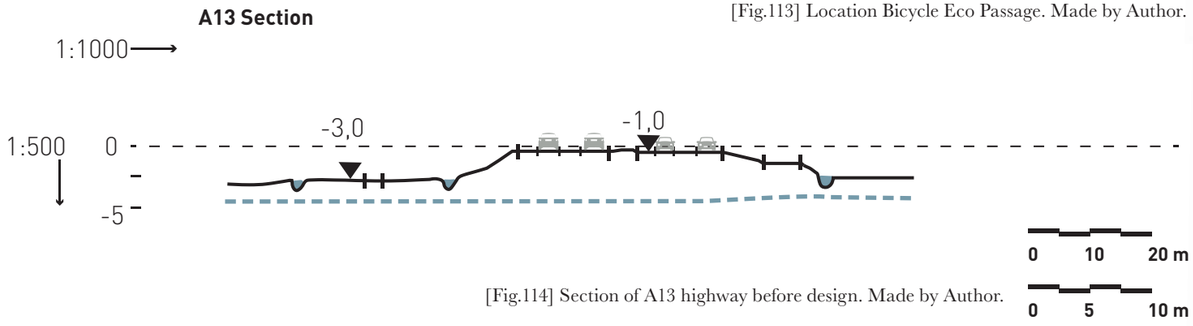


Detail C

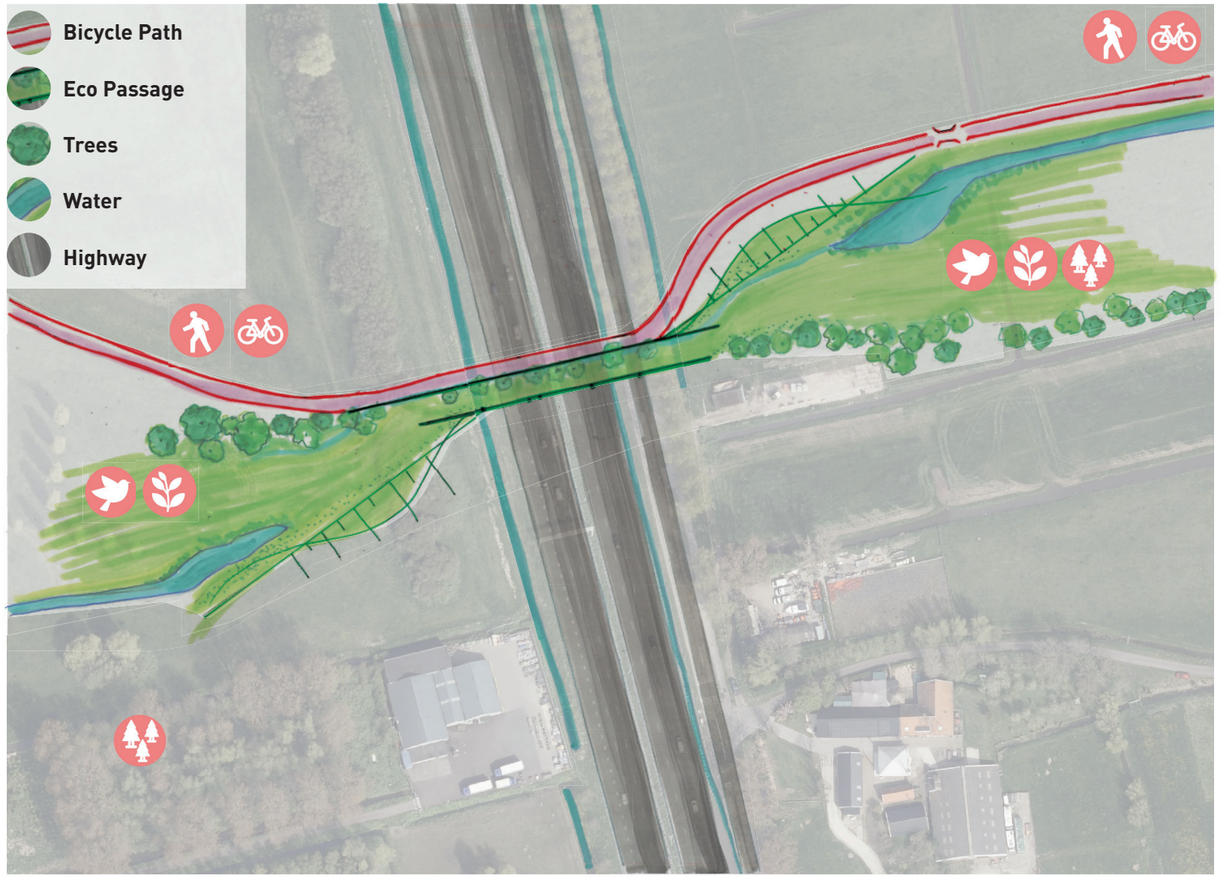
[Fig.112] Detail sections of the Ecological Core. Made by Author.



[Fig.113] Location Bicycle Eco Passage. Made by Author.

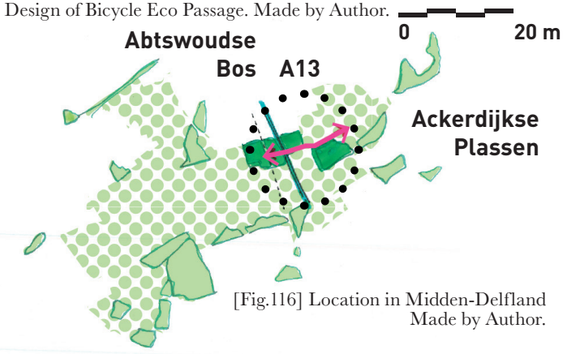


[Fig.114] Section of A13 highway before design. Made by Author.



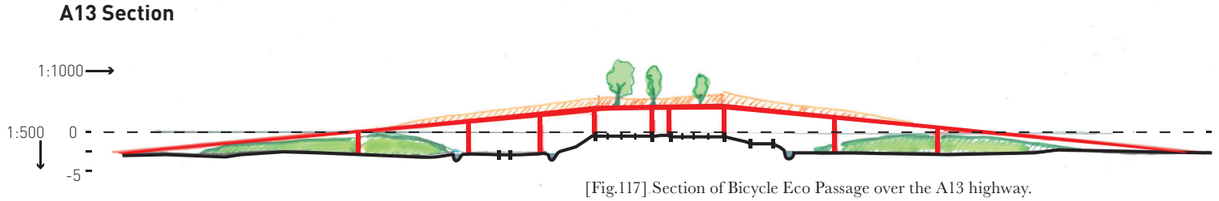
[Fig.115] Design of Bicycle Eco Passage. Made by Author.

New Plan Bicycle Eco Passage

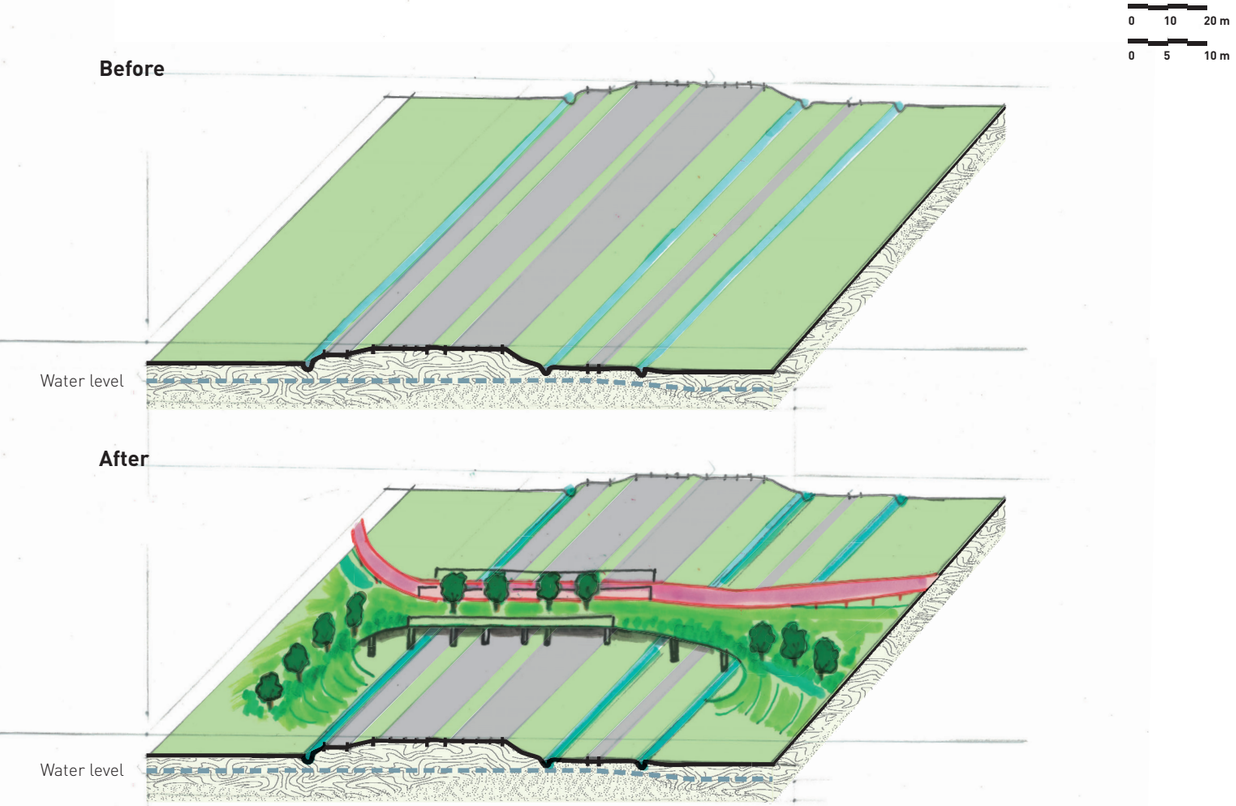


[Fig.116] Location in Midden-Delfland
Made by Author.

Sections

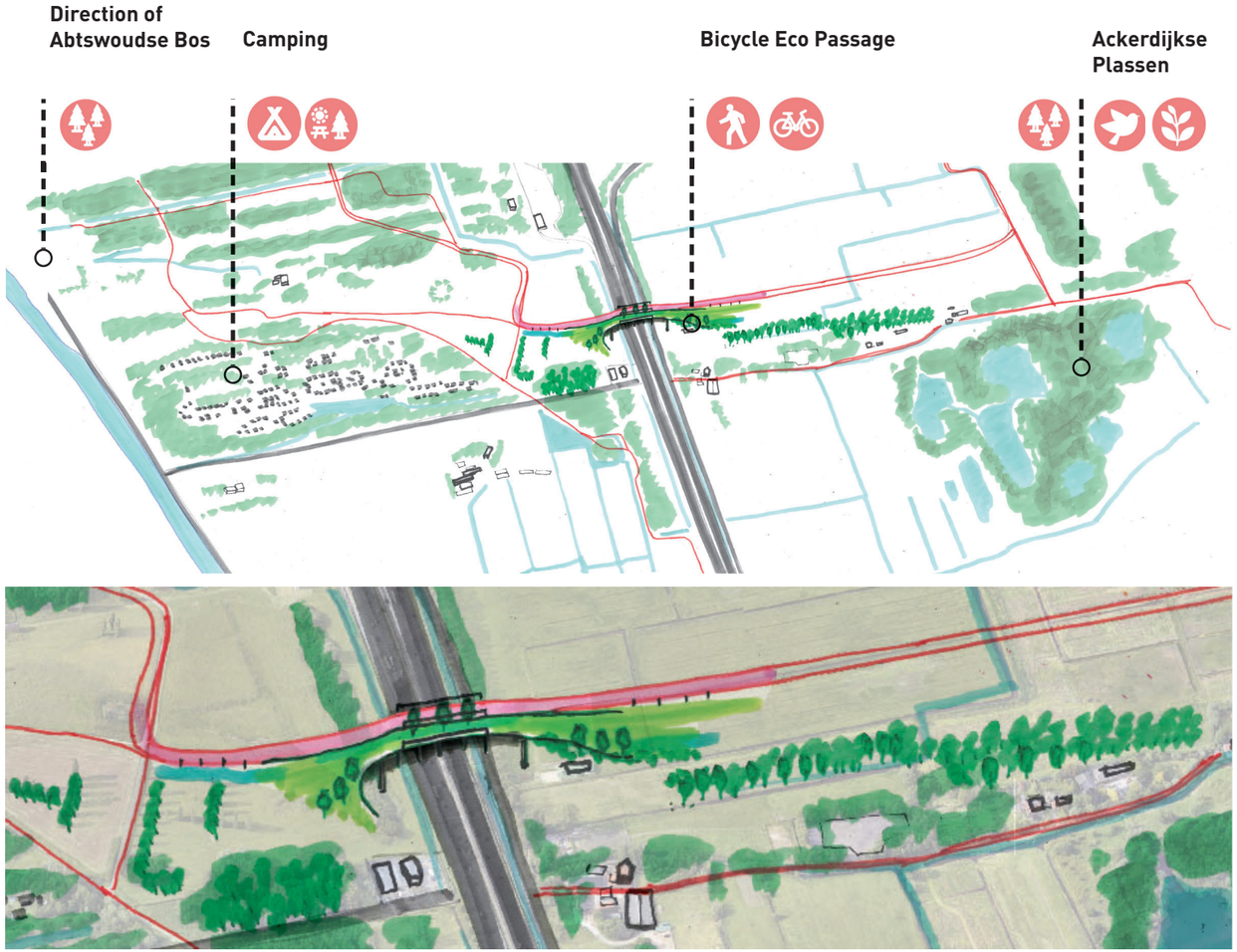


[Fig.117] Section of Bicycle Eco Passage over the A13 highway.



[Fig.117] Landscape Axonomteric Sections before and after. Made by Author.

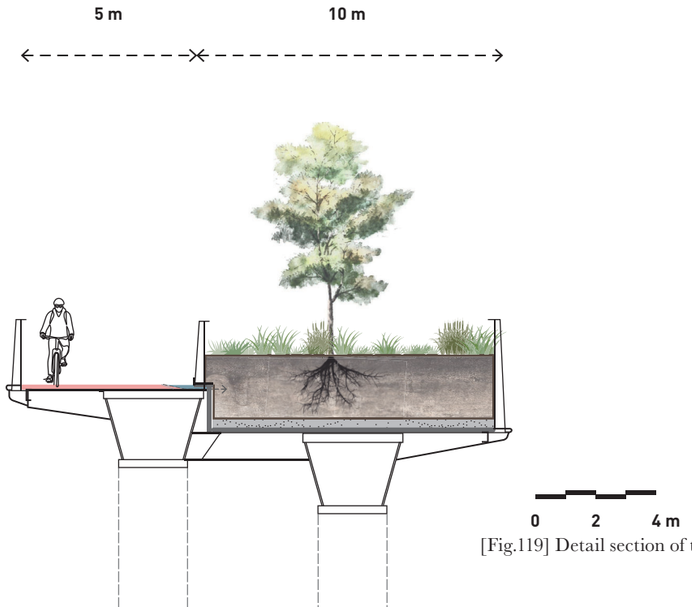
Zoom-in Visualization: Bicycle Eco Passage



[Fig.118] Visualization drawings of Bicycle Eco Passage connecting Abtswoudse Bos and Ackerdijkse plassen. Made by Author.

Bicycle Eco Passage - Explanation & Detail

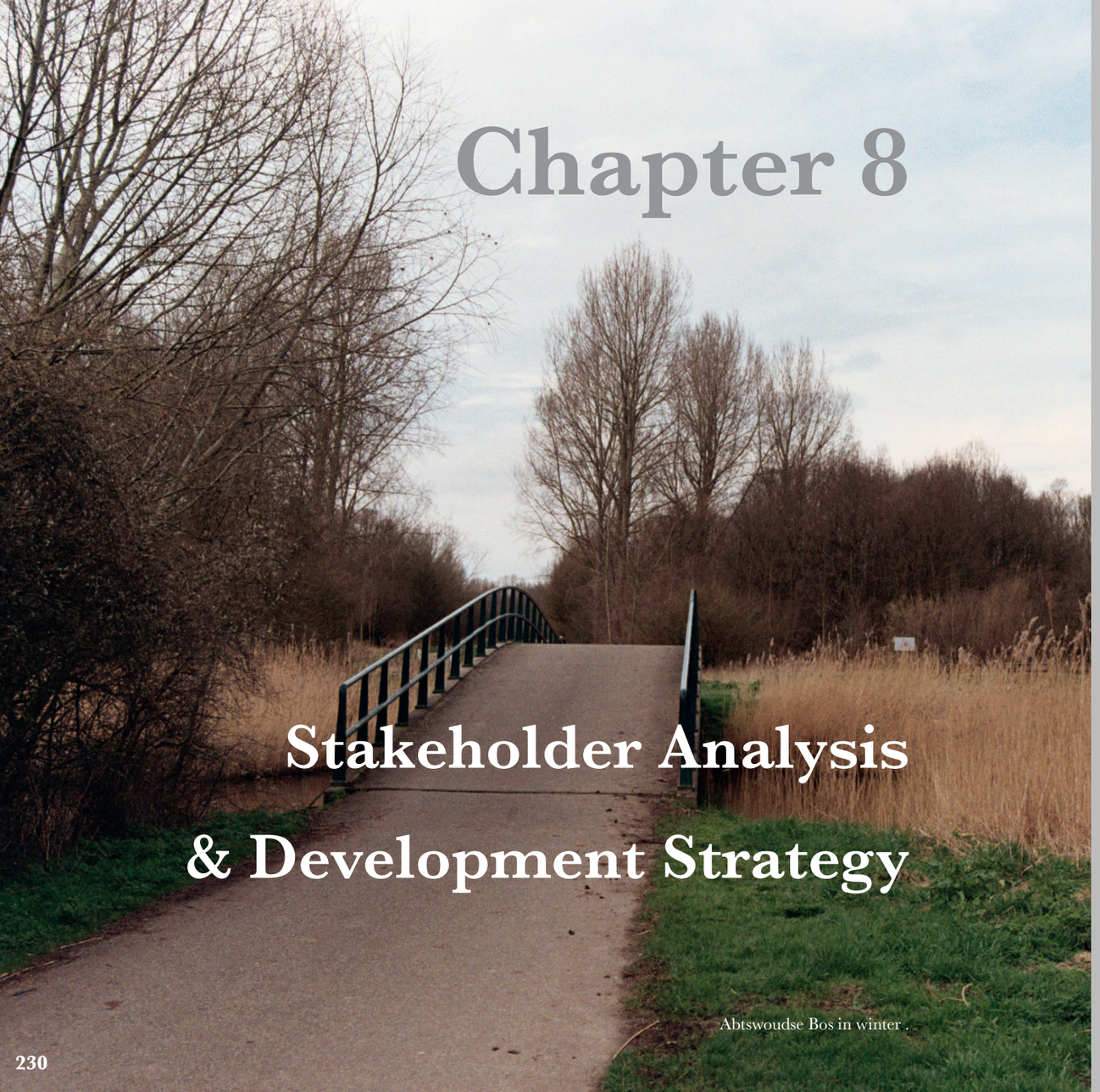
The second local design intervention is the Bicycle Eco Passage. This intervention integrates both the themes of recreation and ecology, while benefiting the agricultural sector, as it will get visitors and local customers from A to B more easily. Since the current focus of bicycle connections in Midden-Delfland is more on north-south connections, more east-west connections are essential for the future use e of the metropolitan park. This bicycle connection will also connect two important natural and recreational areas: The Abtswoudse Bos and the Ackerdijkseplassen. Given the ecological value of these areas, the passage includes a broader structure designed for flora and fauna, targeting small animals like the Natterjack Toad, Eurasian Beaver, Otter, and Root Vole that may occur in Midden-Delfland. The bridge gently slopes over the area and crosses the A13 highway. In the future of 2070, it functions as a corridor and green link in the bigger ecological network of Midden-Delfland. To read more about different ecological corridors that can be combined with iconic species for Midden-Delfland, read Appendix 1 - Quantifying Ecology.



[Fig.119] Detail section of the Bicycle Eco Passage. Made by Author.

Chapter 8

Stakeholder Analysis & Development Strategy



Abtswoudse Bos in winter .

Subquestion

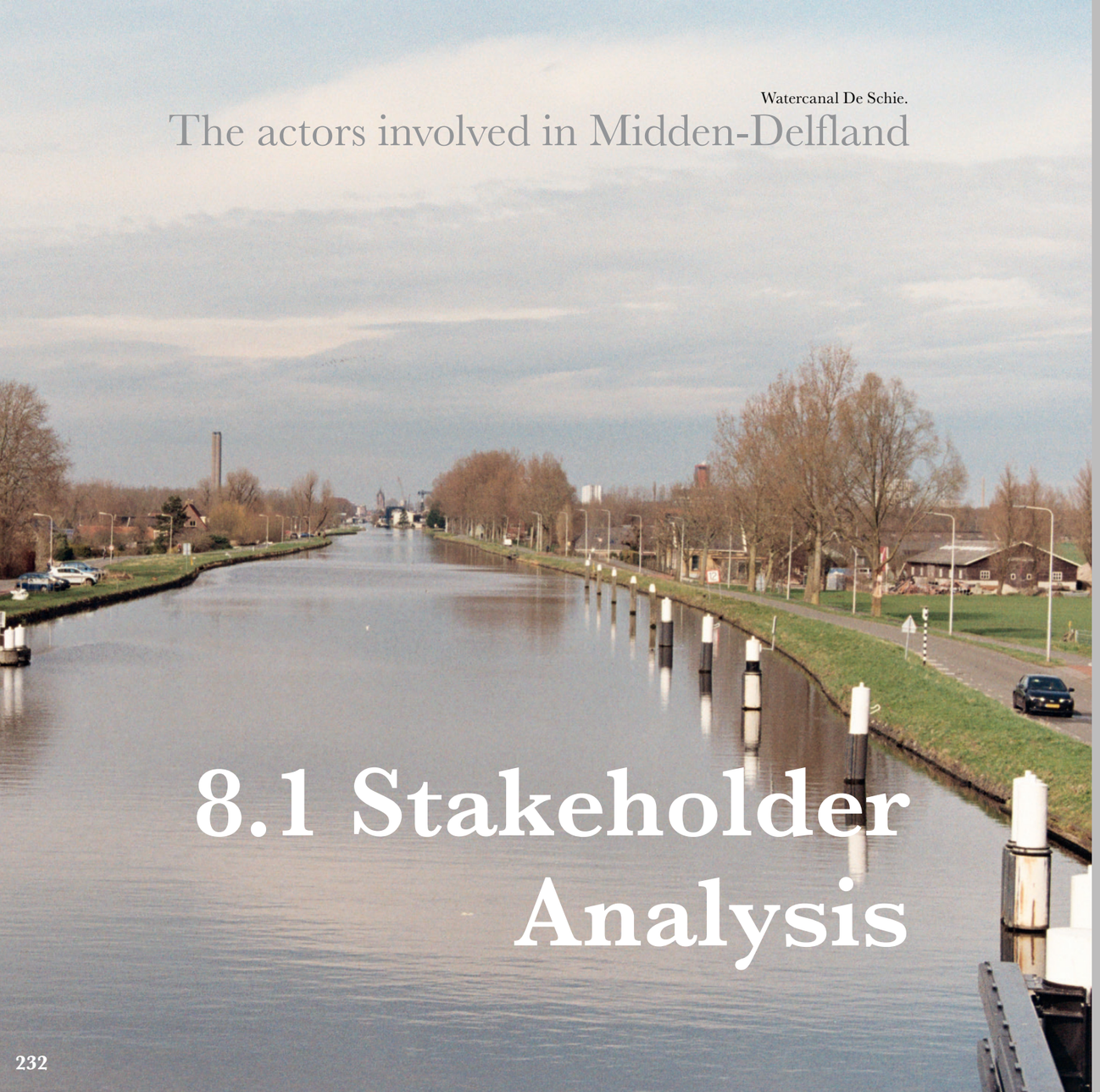
6. What development strategy is needed for Midden-Delfland to accomplish the created vision towards 2070?

This chapter focuses stakeholder identification, and strategic development steps necessary for governmental bodies to realize the vision of transforming Midden-Delfland into a metropolitan park by 2070. It aims to provide an institutional and realistic context for this visionary design, creating an insightful overview of policy developments and the diverse values of stakeholders involved.

The chapter begins by identifying stakeholders and uncovering the dynamics between them, identifying key players an potential collaborators. It then examines the current policies that influence Midden-Delfland, highlighting key legislative frameworks and regulatory measures that need to be considered in the strategic planning process. By understanding these existing policies, stakeholders and policy makers, the targeted audience among other readers of this thesis, can better navigate the complexities of policy implementation and alignment with the long-term vision.

The chapter also outlines a strategic phasing framework, based on the specific needs and challenges of Midden-Delfland. The phasing and timeline distinguishes between short-term and long-term implementations of the vision. In the short term, the focus is on initiatives that can be quickly realized to create immediate impact, such as pilot projects and initial infrastructure investments. For the long term, the strategy emphasizes sustainable practices, extensive stakeholder engagement, and adaptive management to ensure resilience and sustainability over the decades.

Overall, this chapter serves as a roadmap for transforming Midden-Delfland into a thriving metropolitan park, aiming to inspire a future characterized by environmental sustainability, recreational opportunities, and agricultural resilience.



Watercanal De Schie.

The actors involved in Midden-Delfland

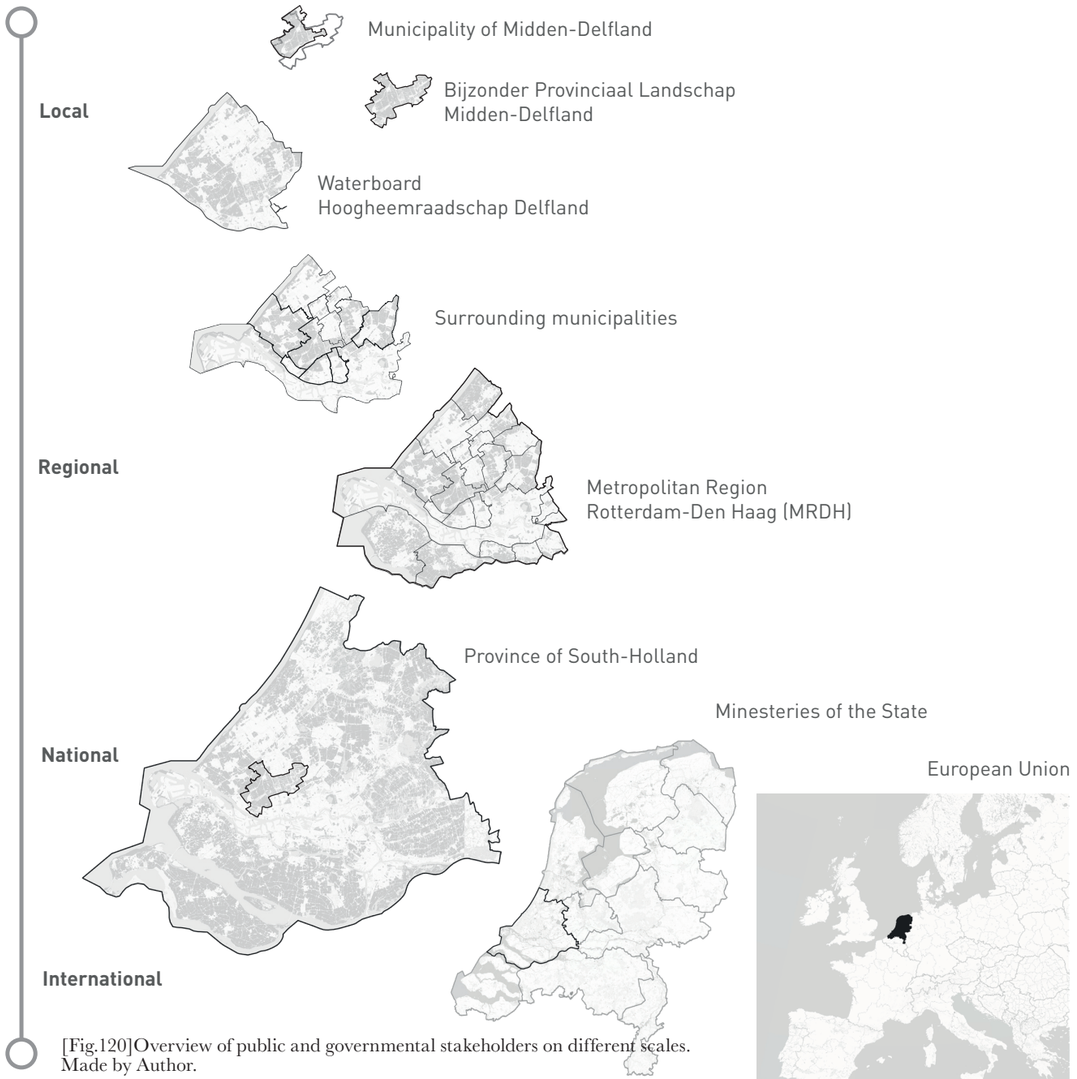
8.1 Stakeholder Analysis

This section of Chapter 8 provides a stakeholder analysis of Midden-Delfland, highlighting the individuals and groups involved in the area's development and preservation. By looking into the different interests, values, and capabilities of various stakeholders—including government bodies, non-profit organizations, local farmers, and environmentaly engaged institutions—this analysis aims to reveal the dynamics that influence the decision-making processes and potential collaborations.

The chapter is structured to provide a detailed overview of stakeholders, categorized into governance, ecological, recreational, and agricultural sectors. It also explores the impact of governance on multiple scales, from local to international levels. Additionally, the analysis delves into the primary conflicts and synergies among stakeholders, identifying which groups are central to future developments and which need empowerment in order to have the potential to participate in regional planning for the future.

By providing these insights, the chapter aims to enhance the understanding of the stakeholder landscape in Midden-Delfland, so that regional sustainable development for 2070 can be contextualized and strategically informed.

Governance on different scales



[Fig.120]Overview of public and governmental stakeholders on different scales. Made by Author.

	Public Stakeholders	Interests / Central Values	Capabilities and Resources
PU1	Municipality Midden-Delfland	sustainable agriculture, biodiversity, heritage / recreational value, water quality, spatial quality , Protection of open peat-meadow polder landscape	power to more localized levels, community engagement, infrastructure development, zoning and land-use regulation,
PU2	Landschapstafel BPL Midden-Delfland	The preservation and development of the Midden-Delfland area, spatial quality, sustainable agriculture, biodiversity, awareness of the region, recreation, water and climate	A collaboration in steering decion making of 9 surrounding municipalities, the waterboard, Staatsbosbeheer, Natuurmonumenten, Midden-Delfland vereniging and the LTO.
PU3	Surrounding Municipalities	availability of green, spatial quality mobility & accessibility, recreation, social cohesion	Consists of: Delft, Lansingerland, Maassluis, Pijnacker-Nootdorp, Rotterdam, Schiedam, Vlaardingen, Westland. Can formulate policies within spatial boundaries & provide funding.
PU4	Staatsbosbeheer	State Forest Management, nature conservation, improve recreation	Funded by Ministery of Agriculture, management and conservation of natural areas, forests, and outdoor recreational spaces
PU5	Waterboard / Hoogheemraadschap Delfland	water safety, water quality and quantity, purification of waste water.	control over water-levels in the polder, monitoring water storage capacity, water quality. M unicipalities of Delfland & The Province are involved, Board installed through democratic elections.
PU6	Metropolitan Region Rotterdam - Den Haag	sustainable development, livability, mobility/connectivity, economic development of Den Haag & Rotterdam	A collaboration between various municipalities in the greater Rotterdam and The Hague area. implementation and planning of infrastructure, in charge of the mobility network
PU7	Province of South-Holland	Sustainability & Climate Action, Urban Development, Economic Growth, Transportation and Mobility	decisions on spatial planning, allocation of budget, implementation of "Omgevingswet". (NOVI).
PU8	Ministry of Agriculture, Nature and Food quality (National)	Sustainability in agricultural sector, nitrogen reduction, nature conservation, food quality and safety	formulating policies, providing funding, establish & management of the NNN. Nitrogen Reduction and Nature restorati-on Act, (per region)
PU9	Ministry of the Interior and Kingdom Relations (National)	citizen-livability (housing)	formulate policy, regulations, responsible for coordination, supervision and policy implementation
PU10	European Union	Unity & Collaboration between member states;	Laws, Funding, Coordination through: Farm to Fork, European Green Deal, CAP Environmental measures, Natura2000

[Fig.121] Overview of public and governmental stakeholders . Made by Author.

Stakeholders Ecology

C17 **Vockestaert**
Agricultural Nature Association

Vockestaert, dedicated to conserving Midden-Delfland's nature- and agricultural open polder landscape and heritage, operates through three core groups: Green and Blue Services, Agricultural Nature Management, and Education and Recreation. Collaborating with farmers, it prioritizes meadow bird preservation. Vockestaert, with LTO Delflands Groen, makes use of a green fund to support green services and nature compensation measures. The focus is on the collaboration between agriculture and nature. (Vockestaert, 2021)

C18 **Weidevogelpact**
Meadow Bird Pact

The 'meadowbird-pact', Weidevogelpact stems from Vockestaert in partnership with Natuurmonumenten. The goal of the pact is maintaining the meadow bird population in Midden-Delfland, through various measures such as protecting nests and plots, and promoting herb-rich grassland and polder banks. (Vockestaert, 2021)

PR12 **Natuurmonumenten**
Nature conservation organization (private sector)

This organization is dedicated to nature conservation, through habitat protection, restoration efforts, and sustainable management practices. It maintains and controls the Vlietlanden nature reserve and Ackerdijkse Plassen (lakes) in Midden-Delfland among other more open grassland zones for meadow birds.

PU4 **Staatsbosbeheer**
Nature conservation authority (public sector)

Staatsbosbeheer, operating from governmental authority-level, is responsible for managing and conserving forests, nature reserves, and parks in the Netherlands. It plays a key role in preserving trees and natural landscapes within recreational areas of Midden-Delfland, such as Abtswoudse Bos and Broekpolder.

PU8 **The Ministry of Agriculture, Nature and Food Quality**

The Ministry of Agriculture, Nature, and Food Quality is a governmental body that advocates for sustainable agriculture, nature preservation, food security, and climate adaptation. Presently, its efforts concentrate on promoting sustainable farming practices, reducing nitrogen and CO2 emissions, safeguarding biodiversity, ensuring food safety, and fostering rural development, all aimed at securing a healthy future for the Netherlands. (Ministerie van Algemene Zaken, 2022)

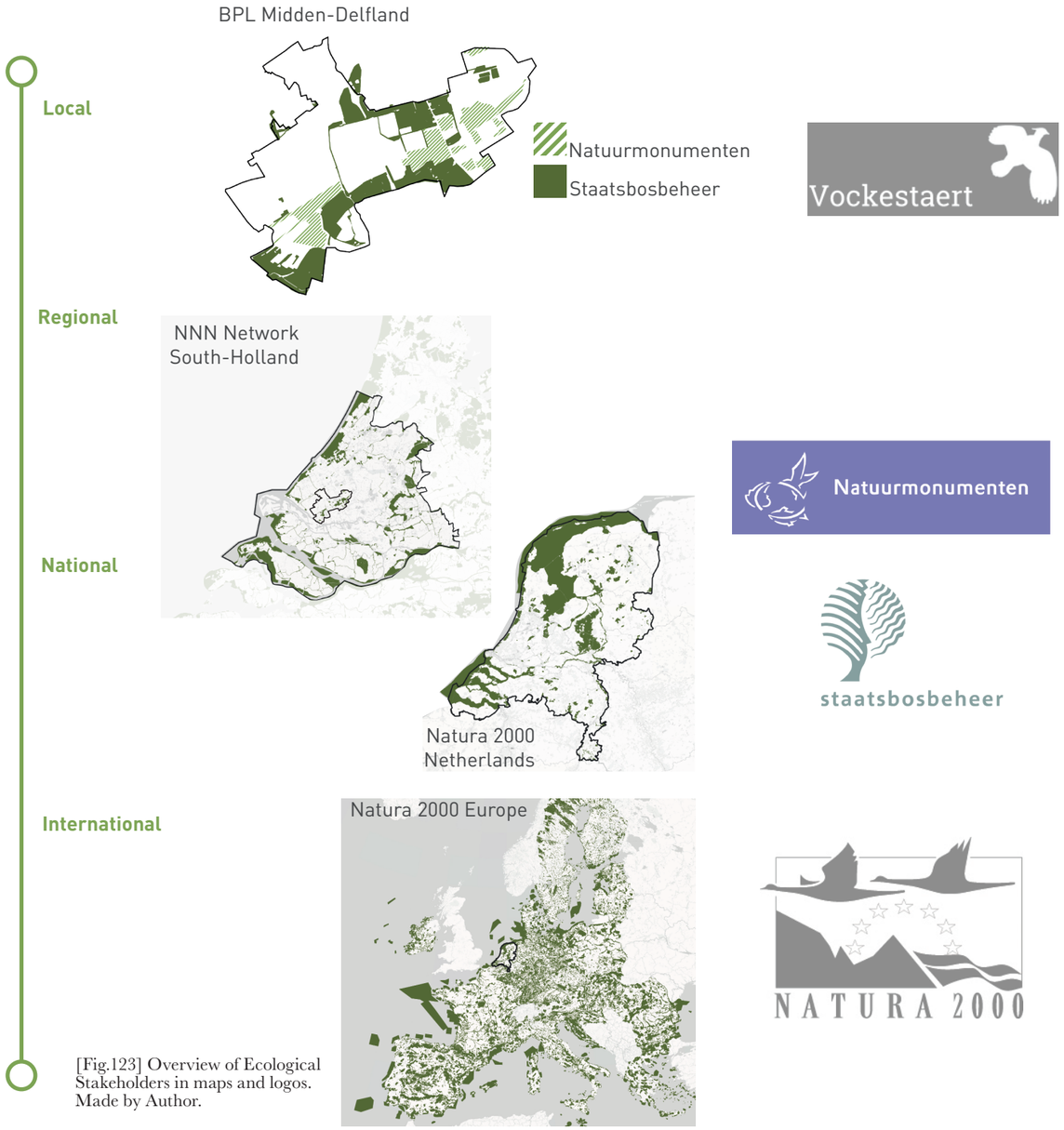
The Nature Network Netherlands (NNN) is a cohesive network of natural areas in the Netherlands, intended to strengthen and protect nature. This ecological main structure was established by the Dutch government, including the Ministry of Agriculture, Nature and Food Quality, provincial and municipal authorities, as well as organizations such as Staatsbosbeheer and Natuurmonumenten.

PU10 **The European Union**

The European Nature Restoration Law, still a proposed legislation in 2024, aims to restore and safeguard natural ecosystems. This law, along with the EU's biodiversity strategy, is integral to the European Green Deal. It targets restoring at least 20% of EU land and marine areas by 2030, and all ecosystems by 2050. Specific objectives include restoring peatlands by raising water levels, impacting areas like Midden-Delfland. (The EU Nature Restoration Law, 2024)

Natura 2000 is a network of protected natural areas across Europe, established by the European Union, to conserve biodiversity and protect endangered species and habitats. Furthermore, it aims to ensure the long-term survival of Europe's most valuable and threatened ecosystems while promoting sustainable land use and development.

[Fig.122] Overview of Ecological Stakeholders. Made by Author.



[Fig.123] Overview of Ecological Stakeholders in maps and logos. Made by Author.

Stakeholders involved with ecology & Key policies

In Midden-Delfland, a wide range of stakeholders is committed to preserving and enhancing the region's natural environment. These stakeholders range from local associations and national conservation organizationts, to government agencies and the European Union, each playing a unique role in ecological conservation.

The Agrarische Natuurvereniging Vockestaert, involves local farmers, aims to integrates sustainable agriculture with nature conservation. Their focus is on increasing biodiversity on farmland and implementing nature compensation measures. However, they face the challenge of balancing farmers' economic interests with ecological goals, which will require more innovative financial support mechanisms in the future.

Natuurmonumenten, a private nature conservation organization, is actively involved in preserving natural landscapes such as Vlietlanden. Alongside them, Staatsbosbeheer, a government agency, combines ecological preservation with public engagement. Both organizations face ongoing challenges in balancing recreational use with habitat protection, requiring new adaptive management strategies.

The European Union indirectly has a major influence on environmental policy in Midden-Delfland through legislative frameworks and funding programs. Key policies such as Natura 2000, the European Green Deal, and the Biodiversity Strategy for 2030 provide guidelines and financial support for regional conservation efforts. While Natura 2000 establishes protected areas with strict conservation measures, it is not directly applicable to Midden-Delfland. The European Green Deal aims for climate neutrality, and the Biodiversity Strategy for 2030 sets ambitious targets for protecting and restoring ecosystems, indirectly impacting local conservation practices. These policies require local stakeholders to align their activities with broader EU objectives, fostering collaboration across various governance levels. This multi-leveled approach underlines the importance of cooperative efforts in achieving sustainable environmental outcomes for Midden-Delfland.

Stakeholders Agriculture

Vockestaert
Agricultural Nature Association
C17

Initially formed by dedicated Midden-Delfland farmers, Vockestaert Association now has many farmers of the area as members. It supports sustainable farming practices and promotes biodiversity, indirectly impacting the agricultural sector by preserving and enhancing the natural environment. Besides other parties, farmers canmake use of Vockestaert's green services reward system, from their 'green fund'. (Vockestaert, 2021)

LTO Noord Delflands Groen
Agriculture and Horticulture Organisation
C19

This local branch of LTO represents farmers' interests in Midden-Delfland. Nationally, LTO serves as an advocacy organization for the agricultural sector, supporting farmers and horticulturists. Key issues include agricultural policy, sustainability, and economic matters. The organization emphasizes the importance of dairy farmers in preserving and managing the landscape of Midden-Delfland.

(Delflands Groen – De Agrarische Belangenbehartiger in Midden-Delfland, n.d.)

MIND
Circular farmers Network
C20

A collaboration of Midden-Delfland, LTO Delflands Groen, and the province of South Holland. In this network, dairy farmers work together on circular agriculture, sharing data and knowledge, and promoting sustainable soil management. They focus on resource cycles within their farms and foster connections between farmers and urban consumers, encouraging shorter supply chains. MIND provides financial support for innovation, sustainability, and balancing farming with nature conservation. (Janmaat et al., 2022)

Coventional Dairy farmers
PR14

Approximately 50 conventional dairy farmers in Midden-Delfland are part of the MIND Network. These farms are beginning to adopt sustainable practices with a focus on future environmental impact and soil health. However, there remains a group of farmers in the area primarily concerned with economic profit, prioritizing conventional dairy production methods over environmental concerns.

Greenport West-Holland
PR13

Greenport West-Holland is the horticulture cluster of greenhouses bordering Midden-Delfland, consistent of flower, plant, vegetable and fruit trading firms. It aims to become a leading global hub for horticultural innovation and trade. Geographically close, Greenport West-Holland and Midden-Delfland have common interests in horticulture and agriculture. In the future, this relationship could further develop through collaborative initiatives focused on sustainable agriculture, innovation, and environmental conservation.(Greenport West-Holland- Greenport, 2024)

Aardpeer
Land Ownership Foundation
C21

Aardpeer aims to unite individuals, farmers, and nature by facilitating access to land for nature-focused, socially inclusive, and economically viable projects. Their goal is to promote sustainable soil restoration, biodiversity, and nature conservation while fostering new socio-economic ties. Operates regionally.
(Stichting BD Grondbeheer et al., n.d.)

Herenboeren
Farming Coörporations
PR16

Herenboeren is a grassroots movement and foundation creating community farms across the Netherlands. Each unit, owned by 250 households, shares the harvests. Cooperative members are encouraged to engage in farm activities and governance. Herenboerderijen prioritize chemical-free, nature-driven agriculture, for which it advocates change on governmental levels.
(Herenboeren, 2024)

National Rural Area Program
*(NPLG)
The Ministry of the Interior and Kingdom Relations
PU8
PU9

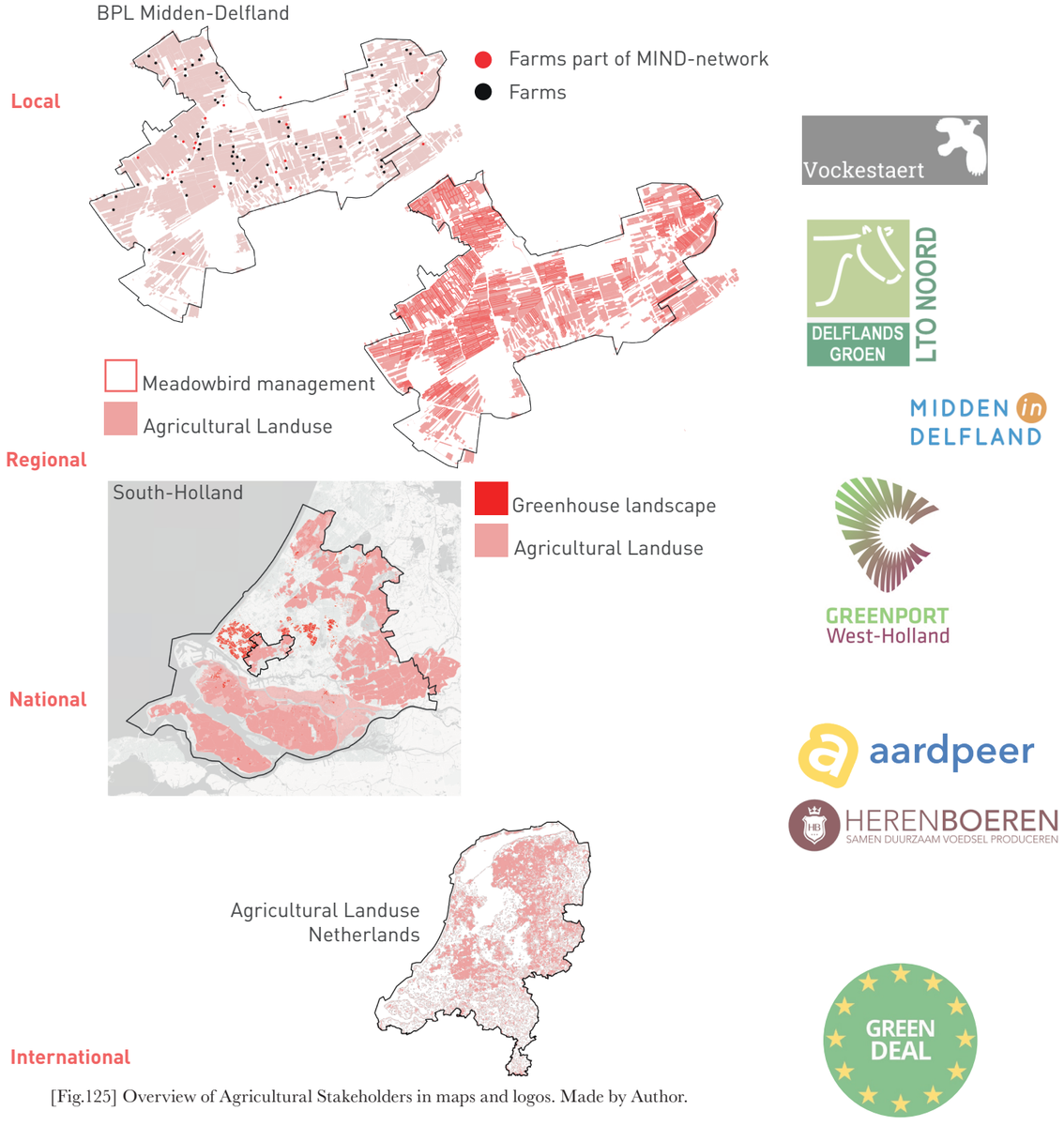
The aim of this program (NPLG) is to provide solutions to challenges of nature (including nitrogen), water quality, soil and climate. By combining measures in an area-based approach, nature is restored. The agricultural sector will need to ensure its activities comply with the carrying capacity of the area. This can lead to more focus on sustainability, nature-inclusive agriculture, and biodiversity conservation.
(Ministerie van Binnenlandse Zaken en Koninkrijksrelaties, 2023)

The European Union

The European Green Deal, stated by the EU, aims for climate neutrality by 2050 and recognizes agriculture's significant role in achieving this goal. Nitrogen emissions, among other environmental impacts, are highlighted as challenges that need to be addressed within the agricultural sector. The Farm to Fork Strategy, as part of the European Green Deal, focuses on creating a more sustainable food system, starting with agricultural production. (European Council, n.d.)

[Fig.124] Overview of Agricultural Stakeholders. Made by Author.

*Nationaal Programma Landelijk Gebied



[Fig.125] Overview of Agricultural Stakeholders in maps and logos. Made by Author.

Stakeholders involved with agriculture & Key policies

Agriculture in Midden-Delfland is influenced by a diverse group of stakeholders. The local dairy farmers are central to the agricultural landscape. One example is the Agrarische Vereniging Vockestaert, which is active in improving sustainable agriculture and ecological viability in the area. Another active part of the local farming community is the MIND network, which plays an important role in promoting circular agriculture. This network of about 50 farmers focuses on sharing knowledge and data to improve soil health and rural-urban connections, although some farmers continue to use conventional dairy farming methods. In addition, Greenport West-Holland, a nearby horticultural cluster, is close to the inner landscape of Midden-Delfland and creates opportunities to work with local farmers to drive innovation and trade in horticultural and dairy products.

Examples of other initiatives focused on a more sustainable future for (livestock) farming and agriculture, include Herenboeren and Aardpeer. The Herenboeren movement creates community-owned farms where members actively participate in farming and management, with an emphasis on chemical-free, nature-based agriculture. Aardpeer, a land ownership foundation, supports these efforts by connecting individuals and farmers to initiate projects that enhance biodiversity and restore soils.

The agricultural sector is influenced by governance at the national level. At the national level, the Dutch Farmers' Union (LTO Nederland) advocates for farmers' interests and ensures that agricultural policies support both economic productivity and environmental protection. Government agencies, in particular the Ministry of Agriculture, Nature and Food Quality, set influential policies, such as nitrogen restrictions, that affect the more localized sectors. These nitrogen restrictions derive from European Union legislation; for example, in the Green Deal, the goal of climate neutrality by 2050 affects allowed emissions from the agricultural sector.

Citizens

C25

In the villages of BPL Midden-Delfland, citizens are seeking opportunities to experience and utilize the outdoor space, to engage in various recreational activities within the landscape. The urban edges of the Midden-Delfland, consist of the surrounding municipalities: Delft, Vlaardingen, Schiedam, Westland, Maassluis, Pijnacker-Nootdorp, Rijswijk, Delft, Lansingerland, The Hague, and Rotterdam. The many citizens in these areas also pose the need for recreation.

Cittaslow municipality Midden-Delfland

PU1

Midden-Delfland is a Cittaslow municipality. This is a certification for towns under 50,000 residents focusing on environment, landscape, local products, hospitality, sustainability, infrastructure, cultural heritage, and identity preservation amidst urbanization. It raises awareness among policymakers to take responsibility in development. Midden-Delfland offers tranquility amidst an urban landscape, where residents and visitors value nature and community.
(Gemeente Midden-Delfland, 2020)

Bijzonder Provinciaal Landschap Midden-Delfland

PU2

Midden-Delfland, recognized as Special Provincial Landscape (BPL), is valued its agricultural heritage, open polder landscape, and ecological aspects. Nine municipalities are represented in the Landscape Table BPL. Both BPL and the municipality promote sustainable tourism and outdoor activities within the area, safeguarding the landscape's openness and biodiversity.
(Bijzonder Provinciaal Landschap Midden-Delfland, 2021)

'Rotterdam de boer op' Regional farming engagement project

C22

"Rotterdam hits the road to the farm!" is a collaborative project supported by a private investor (Postcode Loterij), fostering nature-inclusive agriculture and sustainable food chains. Coöperations between farmers, nature conservers, entrepreneurs and local businesses are established. It links Rotterdam with the surrounding rural areas, like Midden-Delfland, encouraging citizen engagement through farm visits, markets, and events to promote regional agriculture.
(Nationale Postcode Loterij & LIFE All4Biodiversity, n.d.)

Puuur Midden-Delfland Local marketing organization

C23

'Puuur Midden-Delfland' is a local marketing organization aiming to promote BPL Midden-Delfland as a recreational destination. Founded by agricultural entrepreneurs (dairy farmers), local (food) producers and tourism businesses, its focus is on showcasing what the area has to offer, including hiking trails, activities and shops for regional products, bridging the connection with urban citizens.
(PUUUR Midden-Delfland, 2024)

Stakeholders Recreation

Metropolitan Region Rotterdam-Den Haag (MRDH)

PU6

The MRDH views Midden-Delfland as a valuable green area within the urban environment, aiming to preserve its nature and recreational opportunities. Additionally, MRDH focuses on implementing more metropolitan main cycling routes between Den Haag and Rotterdam, including through Midden-Delfland. As the bicycle serves both practical utilitarian and recreational purposes, this involves ensuring safe, fast routes and recreational lanes (slowlanes connecting urban and rural areas.
(Metropoolregio Rotterdam Den Haag, 2016)

Surrounding municipalities

PU3

The surrounding municipalities utilize BPL Midden-Delfland for recreation, recognizing its value as green space. Delft residents rely on Midden-Delfland's landscapes for recreation due to scarce green spaces in the city. Connections with neighboring municipalities include the Broekpolder managed by Vlaardingen in collaboration with Midden-Delfland, and De Zuidrand located along the outskirts of Schiedam,and Rotterdam. (Bijzonder Provinciaal Landschap Midden-Delfland, 2021)

Province of South Holland

PU7

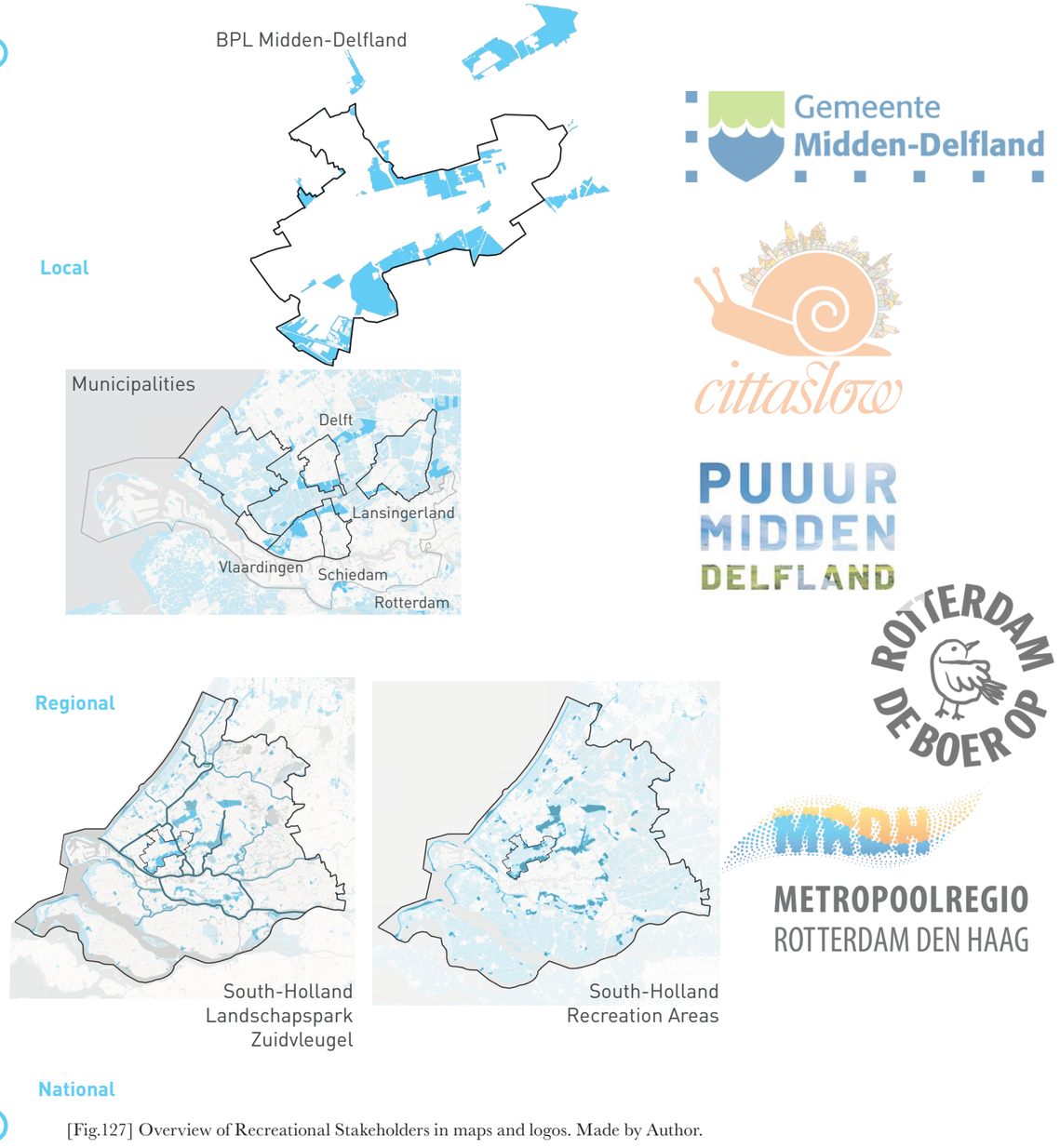
South Holland aims to create an attractive, healthy, and vibrant living environment. Addressing rising recreational demands, it seeks sustainable management of existing and new recreational areas, connecting urban and rural spaces with recreational routes, and renewing recreational destinations. The province will work on creating an attractive urban landscape along six waterways in the coming years according to the 'South Wing Landscape Park / Landschapspark Zuidvleugel' vision.

The Ministry of the Interior and Kingdom Relations

PU9

In the coming years, space allocation is crucial for accommodating the densification of the country with 1 million new homes. The Ministry (BZK) recognizes this, alongside the increasing need for recreation as significant challenges. To ensure fair distribution of limited space and enhance the quality of living environments, the national government will exert stronger control over these matters, prioritizing water and soil considerations in spatial planning.
(Ministerie van Binnenlandse Zaken en Koninkrijksrelaties, 2023)

[Fig.126] Overview of Recreationa Stakeholders. Made by Author.



[Fig.127] Overview of Recreational Stakeholders in maps and logos. Made by Author.

Stakeholders involved with recreation & Key policies

Recreation in Midden-Delfland involves a diverse group of stakeholders, all of whom have a special interest in the important role the landscape plays in recreation, including at the regional level. At the heart of the importance of recreation are citizens who actively participate in and benefit from local recreation areas, can appreciate specific places in the landscape, and can advocate for the preservation of the area's nature and heritage.

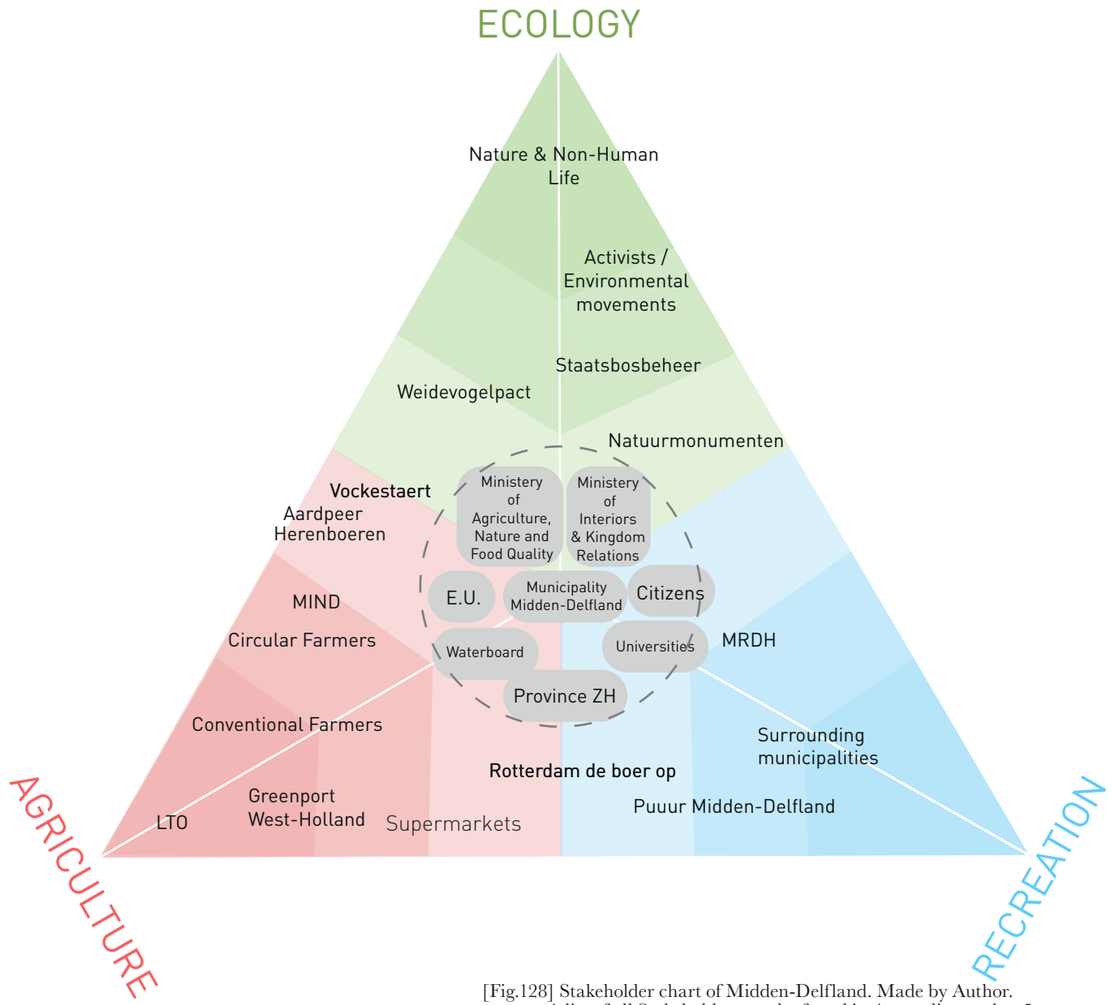
Local initiatives such as Puuur Midden-Delfland promote the region as a recreational destination and highlight local activities and products. "Rotterdam de boer op" connects city dwellers with the countryside through, for example, farm visits. The designation of Midden-Delfland as a Special Provincial Landscape underlines the unique recreational value and ecological significance of the area and ensures protection and sustainable development.

The Rotterdam-The Hague Metropolitan Region (MRDH) is promoting Midden-Delfland as a green area in an urban context and improving the metropolitan cycle routes that connect The Hague and Rotterdam. Surrounding municipalities, including Delft, Vlaardingen, Schiedam and Rotterdam, together use and manage the green spaces, which are mostly located at the edge of Midden-Delfland, using Broekpolder as an example.

The Province of South Holland aims to create an attractive living environment by addressing rising recreational demands and sustainably managing these areas. Their strategy, aligned with the vision "South Wing Landscape Park / Landschapspark Zuidvleugel" plan as an example, seeks to enhance urban landscapes within the province, in this case along the waterways.

At the national level, the Ministry of the Interior and Kingdom Relations (BZK) prioritizes recreational needs taking into consideration the rising housing demands. Their policies ensure spatial planning that considers water and soil management to improve living environments.Together, these stakeholders ensure Midden-Delfland remains a well known location for recreation, while balancing the needs for new infrastructure and housing, agriculture, and conservation.

Stakeholders Operation per theme



[Fig.128] Stakeholder chart of Midden-Delfland. Made by Author.
A list of all Stakeholders can be found in Appendix number 5.

Summarizing all stakeholders involved

After naming and analyzing the primary stakeholders involved in Midden-Delfland based on the three themes, it is important to mention other stakeholders that, although not mentioned extensively, have a significant influence on the region. The European Union influences local policies through policies such as the European Green Deal and the Common Agricultural Policy (CAP). National ministries, particularly the Ministry of Agriculture, Nature and Food Quality and the Ministry of the Interior and Kingdom Relations, implement policies and regulate land use, attemtping to balance agricultural production with nature conservation. At the regional level, the province of South Holland and municipalities such as Delft, Rotterdam and Schiedam work together on spatial planning and recreational development. The Delfland Water Board plays an important role in managing water levels and water quality, essential for maintaining the region's ecological balance.

Public transport operators or companies have an impact on the area by providing access to recreational areas, which can help make them more accessible to residents and visitors. Their role in sustainable mobility also contributes to a more sustainable 2070. Consumers influence agriculture by demanding sustainable products and encouraging farmers to adopt more sustainable practices. Supermarkets, responding to market demand, have a strong impact on farmers' economic profit and control food prices.Universities and research institutions contribute valuable knowledge and innovation and support sustainable agriculture, conservation and recreation development.

Nature and non-human life, while not traditional stakeholders, are an intrinsic part of the ecological health of the region. Their presence and well-being are indicators of successful conservation practices. Activists and environmental movements advocate for sustainable practices and policies that protect the environment. Their efforts are critical in raising awareness and driving change. Collectively, these stakeholders ensure a balanced approach to managing the Midden-Delfland, addressing the needs of recreation, agriculture, and conservation while promoting sustainable development.

Scale & Level of Stakeholder Operation



[Fig.129] Scale & level of Stakeholder operation. Made by Author.

public, **pr**ivate, **c**ivic

PU1	Municipality Midden-Delfland
PU2	Landschapstafel BPL Midden-Delfland
PU3	Surrounding Municipalities
PU4	Staatsbosbeheer
PU5	Waterboard Delfland
PU6	MRDH
PU7	Province of South-Holland
PU8	Ministery of Agriculture, Nature & Food quality
PU9	Ministery of the Interior and Kingdom Relations
PU10	European Union
PR11	Public Transport
PR12	Natuurmonumenten
PR13	Greenport West-Holland
PR14	Conventional farmers
PR15	Circular farmers
PR16	Herenboeren
C17	Vockestaert
C18	Weidevogelpact
C19	LTO Noord Delflands Groen
C20	MIND Circular Farmers Network
C21	Aardpeer
C22	Rotterdam de boer op
C23	Puuur Midden-Delfland
C24	Activists
C25	Citizens / Consumers
C26	Universities
C27	Nature & Non-human Life
PR28	Supermarkets

Conflicts

Several potential conflicts can be determined due to differing interests among stakeholders in Midden-Delfland. For instance, a first assumption is that the local farmers feel disadvantaged by nitrogen emission policies imposed by the Ministry of Agriculture , Nature & Food Quality, impacting their agricultural practices, economic profitability and overall company strength. Similarly, a tension could emerge between farmers and organizations like Weidevogelpact and LTO Noord regarding land management practices aimed at preserving biodiversity. An interest in the relationship of farmers with Natuurmonumenten and Staatsbosbeheer also arises, due to the current lack of collaborative efforts, even though mutual benefits could arise from such partnerships.

Urban development initiatives by the Metropolitan Region Rotterdam-The Hague (MRDH) sometimes conflict with conservation goals, as infrastructure projects may disrupt the natural landscape. Likewise, the plans of public transport companies to expand infrastructure might interfere with the region's recreational use, which must be carefullu coordinated by municipalities .

Furthermore, the Waterboard (Hoogheemraadschap Delfland) faces challenges in balancing the water management needs of farmers with ecological conditions, highlighting the complex interplay between agricultural activities and environmental sustainability in the region. This is complicated by the diverse and site-specific water level requirements (peilvlakken) that farmers must maintain.

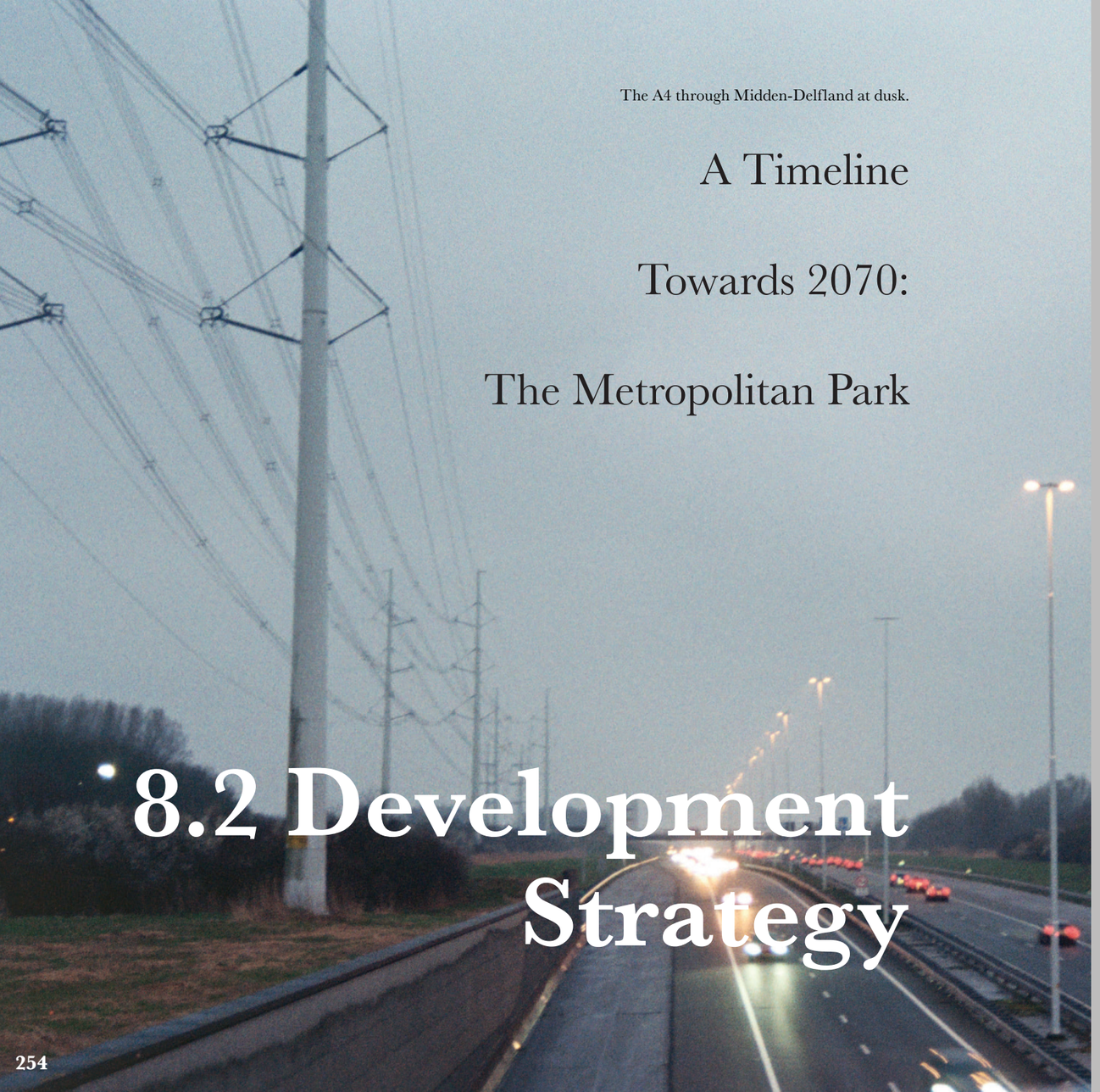
Connections

Despite the conflicts, there are numerous opportunities for stakeholder cooperation in Midden-Delfland. Farmers stand to benefit from circular farming initiatives supported by both government agencies and local nature inclusive associations like Vockestaert. Universities and research institutions can provide valuable resources and expertise to assist farmers in transitioning to more sustainable practices. Increasing consumer demand for ethically sourced and produced food may motivate supermarkets to promote local sustainable agriculture, benefiting both the environment and the agricultural sector. Government agencies at local, regional, and national levels can collaborate with civic initiatives like the Meadow Bird Pact to enhance biodiversity and promote sustainable land management practices. Strengthening collaboration with local initiatives needs to increase for maximizing impact.

Effective partnerships between the water board and nature conservation groups can ensure sustainable management of water resources while supporting biodiversity conservation efforts. Additionally, collaborative projects between public transportation agencies and recreation planners can improve access to recreational areas, fostering community engagement and environmental stewardship among citizens.

What becomes evident from this analysis is that stakeholders from the public sector operate at all scale levels, including ministries, cities, provinces, and the municipality. This indicates that significant achievements can be made through the collaboration of these stakeholders. Stakeholders from the private sector and civil society operate more locally, such as farmers, Natuurmonumenten, or universities.

The municipality of Midden-Delfland emerges as central in these connections, serving as the gatekeeper and connector from the local to the national level. This crucial role highlights the municipality's potential to facilitate and coordinate collaborative efforts among diverse stakeholders.



The A4 through Midden-Delfland at dusk.

A Timeline

Towards 2070:

The Metropolitan Park

8.2 Development Strategy

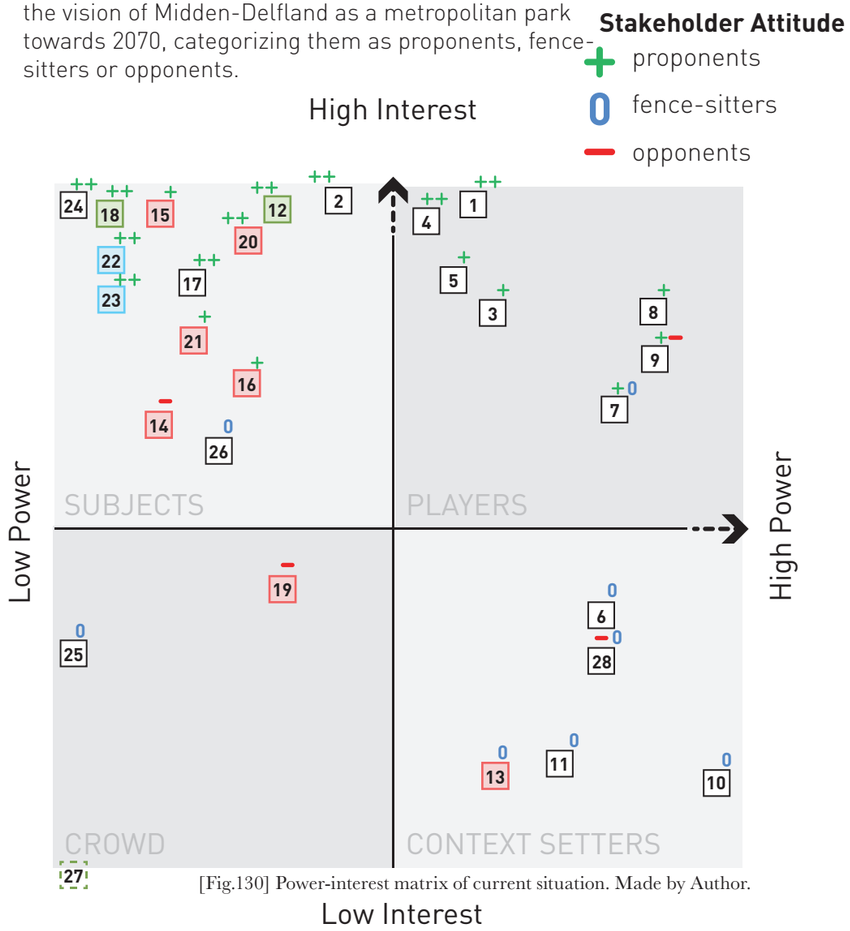
This second section of chapter 8 concludes the work on the transformation of Midden-Delfland into a metropolitan park by 2070. It represents the final step in this visionary journey by exploring stakeholder dynamics, analyzing and interpretating future policies and strategic planning. The chapter begins with an analysis of the current and future roles of stakeholders within the region. It then offers a forward-looking perspective on the evolving landscape, informed by insights from expected future policy directions. Based on this analysis, it outlines a strategic phasing framework that is tailored to the region's specific needs and challenges. The development strategy for Midden-Delfland towards 2070, presents a comprehensive strategy that is divided into five phases. By involving a diverse array of stakeholders, from local farmers to government agencies, this strategy aims to establish more collaboration for the future and to support innovation at every step. Finally, this chapter serves as an example or directional approach to guide stakeholders, policy makers and residents towards a future marked by environmental sustainability, recreational opportunities and agricultural resilience.

Power-Interest matrix **Current**

public, **pr**ivate, **c**ivic

PU1	Municipality Midden-Delfland
PU2	Landschapstafel BPL Midden-Delfland
PU3	Surrounding Municipalities
PU4	Staatsbosbeheer
PU5	Waterboard Delfland
PU6	MRDH
PU7	Province of South-Holland
PU8	Ministery of Agriculture, Nature & Food quality
PU9	Ministery of the Interior and Kingdom Relations
PU10	European Union
PR11	Public Transport
PR12	Natuurmonumenten
PR13	Greenport West-Holland
PR14	Conventional farmers
PR15	Circular farmers
PR16	Herenboeren
C17	Vockestaert
C18	Weidevogelpact
C19	LTO Noord Delflands Groen
C20	MIND Circular Farmers Network
C21	Aardpeer
C22	Rotterdam de boer op
C23	Puuur Midden-Delfland
C24	Activists
C25	Citizens / Consumers
C26	Universities
C27	Nature & Non-human Life
PR28	Supermarkets

This power-interest matrix reveals the influence and attitudes of different stakeholders towards sustainable agriculture, nature preservation and recreational development. It also clarifies each stakeholder's stance on the problem statement and if they support the vision of Midden-Delfland as a metropolitan park towards 2070, categorizing them as proponents, fence-sitters or opponents.



[Fig.130] Power-interest matrix of current situation. Made by Author.

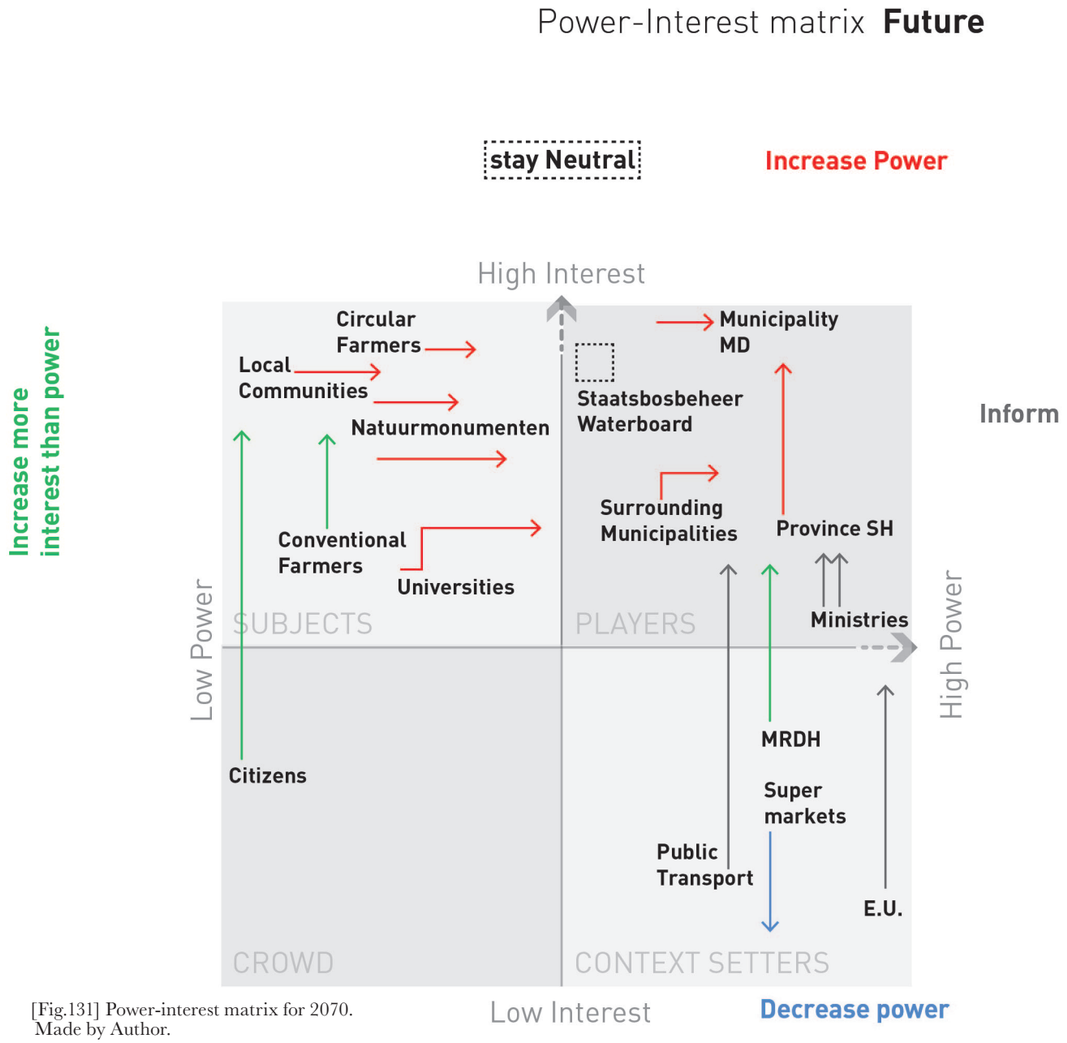
Power-Interest Matrix

Looking at the analysis of stakeholder's position and their power in relation to their interest, the stakeholder group with the most power, is that of the governmental stakeholders from the public sector. In this case, examples are governmental bodies like the ministries, the province, municipalities and cities. On a higher level of governance, there is significant authority and influence to drive policy changes that support new types of land use, recreational activities, and biodiversity enhancement. At the local level, the municipality of Midden-Delfland plays an important role in shaping policies and practices that align with environmental preservation and development goals for 2070. However, to effectively implement sustainable land-use practices and enhance biodiversity, cooperation and support from higher levels of governmental agencies are essential. Less powerful are civic initiatives like the 'Weidevogelpact', and private organizations consisting of ecological farmers (Vockestaert), even though they have a really high interest in the preservation of Midden-Delfland as a natural area ("Increase Power" in figure 130).

Possible opponents for sustaining Midden-Delfland primarily as a nature-oriented area include the conventional farmers and organizations supporting them (presumably LTO Noord), who are not keen on using their land for biodiversity values as it threatens the profitability of their profession. These farmers are concerned about the implications of giving up their land for ecological purposes. Even if they wish to become more sustainable and circular, they fear for their companies' survival due to market demands for higher productivity and lower product prices. These parties need to be informed and empowered in the strategy that will be further elaborated on ("Increase more interest than power" in figure 130).

Another possible opponent that needs a better perspective on the matter is the MRDH (Metropolitan region Den Haag Rotterdam). It is crucial to prevent them from wanting to increase infrastructural connections through Midden-Delfland just for the benefit of the cities. Apart from that, the Ministry concerned with housing tasks, must be informed that this area is too valuable to further development of neighborhoods towards the open landscape ("Decrease power" in figure 130).

A current fence sitter is the universities, even though they could contribute valuable information on the future of the agricultural sector by allocating certain researchers on this matter. Another strategy to ensure the values of Midden-Delfland for the environment is to involve universities as costumers of the circular farms. This would create a strong partnership that empowers the farmers in the area.



[Fig.131] Power-interest matrix for 2070. Made by Author.

Explanation of the Development Strategy

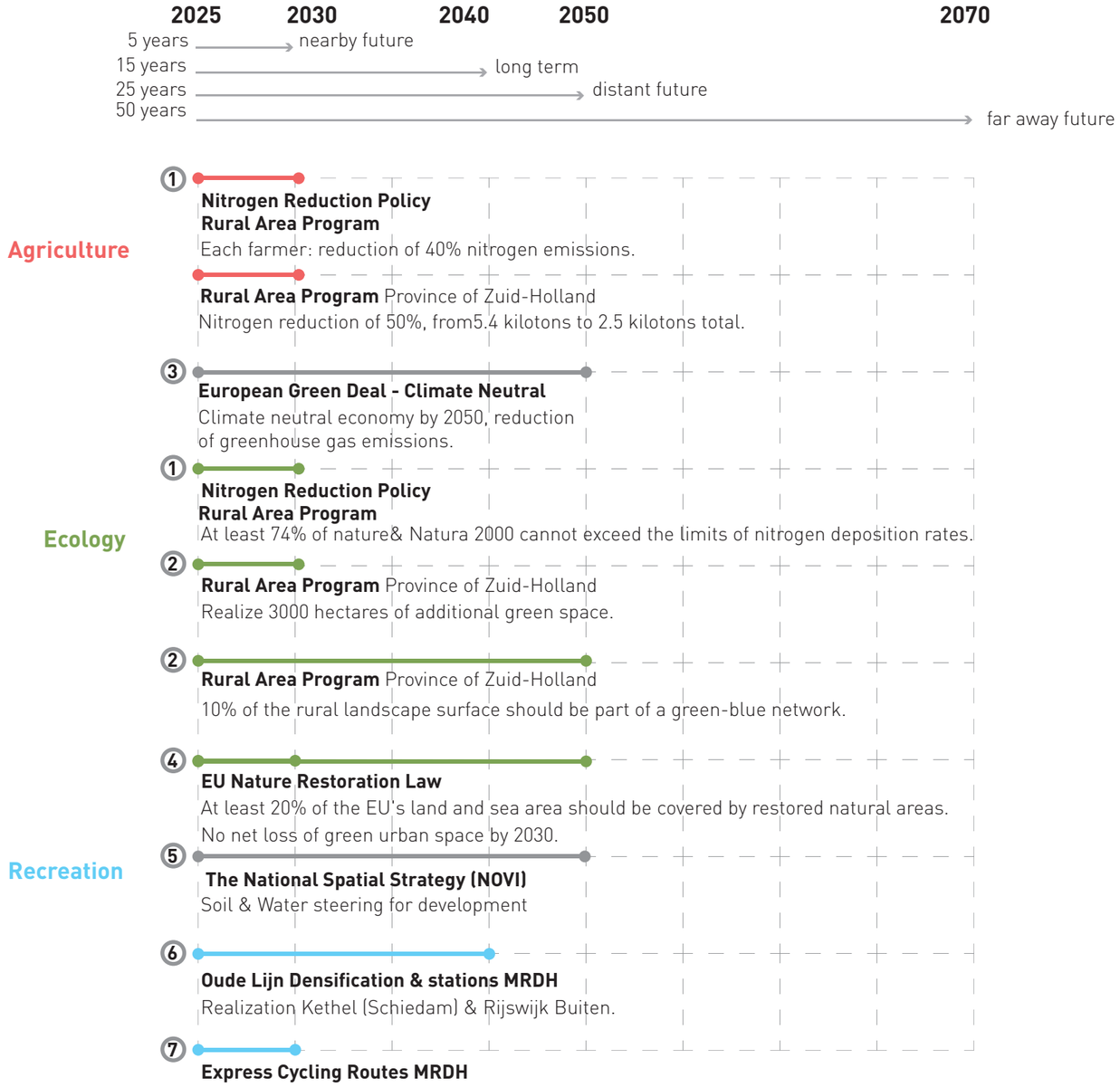
The following pages present a three timelines for the development strategy, all of which serve slightly different purposes.

The first timeline illustrates the most important upcoming plans and policies for Midden-Delfland at different levels of government that need to be taken into account when designing a vision for Midden-Delfland. It illustrates a context behind the envisioned future of 2070 and clarifies why different design principles are emphasized, such as the transition in the agricultural sector towards nature-integrated and circular agriculture, as emissions in this sector need to be reduced.

The second timeline shows how the landscape can be transformed in the short and long term, showing the milestones for the whole region, for the different timeframes, and in which timeframe they fit best.

The third timeline is more precise and combines most of the design principles (from chapter 4), showing which ones work in the near future and which are more realistic to implement in the distant future.

Finally, the different phases of the development strategy are described, supported by actions and implementations and stakeholder groups that can support each phase. This phasing is based on the different phases that a transition includes, coming from the transmission model of Simons et al (2023) and modified and reshaped to the vision for the Metropolitan Park of Midden-Delfland towards 2070.



[Fig.132] Timeline of upcoming policies. Made by Author.

Upcoming Policies

1 Ministry of Agriculture, Nature and Food Quality - Nitrogen reduction policy



The policies on nitrogen emissions in the Netherlands address the current excess amount of nitrogen in water and soil, harming biodiversity and the population's health. The government also focuses on the agricultural sector to reduce the emissions and additionally invests in nature restoration. To achieve this, the amount of nitrogen disposition in nature needs to be drastically reduced.

In 2030, at least 74% of nature areas and Natura 2000 zones cannot exceed the limits of nitrogen deposition rates.

Apart from this, the national government wants to stimulate a transition towards circular agriculture. Responsible is the Ministry of Agriculture Nature and Food Quality.

From a national level, with the 'Rural Area Program', a new policy will be adapted to reach a reduction of 50 percent in nitrogen emissions. In the agricultural sector, this means that the emissions of each farmer needs to be diminished with around 40 percent.

(Ministerie van Algemene Zaken, 2024) (Ministerie van Volksgezondheid, Welzijn en Sport, 2024)

2 Rural Area Program Province of Zuid-Holland

This new vision program is adapted by the province and focusses on nature, water, nitrogen emissions and climate for a vital and robust rural landscape of the province. Inside the province, three zones are selected: peat-meadow landscapes, the dunes and the delta landscape. Together with smaller governmental parties like municipalities, the province will come up with the right measurements for the transition of the rural landscape.



For ecology, they stated to realize 3000 hectares of additional green space until 2027.

Until 2030, the reduction of nitrogen emissions should be about 50%, from 5,4 kilotons to 2,5 kilotons.

10% of the rural landscape surface should be part of a green-blue network in 2050.

(Provincie Zuid-Holland, n.d.)



3 European Union - European Green Deal

The main goal for the European Emission and the Green Deal is to transform the landscape of alle member states into a climate-neutral economy by 2050, meaning a significant reduction of greenhouse gas emissions. Other policies that support this strategy are the circular economy transition, aiming to reduce waste production and promoting recycling and the Farm to Fork strategy that promotes sustainable agriculture and food chains.

4 European Union - Nature Restoration Law

The Nature Restoration Law (NRL) is a law that is currently (2024) not yet fully installed and that will very likely require EU member states to implement restoration measures.

By 2030, at least 20% of the EU's land and sea area should be covered by restored natural areas, with the goal of restoring all ecosystems by 2050.

Besides that, the law asks for no net loss of green urban space by 2030.

(The EU Nature Restoration Law, 2024)

5 Ministry of the Interior and Kingdom Relations - NOVI - The National Spatial Strategy



The National Spatial Strategy (NOVI) is a long-term vision, looking ahead 20 to 30 years, developed by the National government for spatial development. It integrates water and soil management, 'bodem-water sturend' policies, aimed at ensuring a healthy living environment by responsibly managing water and soil. This includes measures for water safety, climate adaptation, efficient use of space, circular economy, and conservation of nature and biodiversity.

(Rijksoverheid, 2020)

6 Oude Lijn Densification & stations MRDH

The metropolitan region has formulated the densification strategy to develop the 'Oude Lijn' and to densify around this infrastructural connection with housing and workplaces. This is a railway line between Leiden and Dordrecht, already connecting the cities of Leiden, The Hague, Delft, Schiedam, Rotterdam and Dordrecht.

The policy formulates a need to double the railway tracks from 2 track sets to 4 between Delft and Schiedam, the installment of railway viaducts and 4 new railway station, of which two are of interest: 'Rijswijk Buiten' and 'Schiedam Kethel'.
The plans for this strategy will be developed until 2030 and the prediction is that the construction activities will be completed in 2040.

(ProRail, 2024)

7 Snelfietsroutes - Express Cycling Routes - MRDH

This policy embraces the ambitions of smaller municipalities and the Metropolitan Region of Rotterdam to improve and construct a network of bicycle routes, connecting working and living areas. The plan includes the following routes relevant for Midden-Delfland: Delft-Rotterdam, Den Haag-Pijnacker, Naaldwijk-Rotterdam. The plan also includes installing new bycicle bridges and connections. See figure x. The prediction for completion is between 2026 and 2028.

(Metropoolregio Rotterdam Den Haag, 2016)



[Fig.133] New Express Cycling Routes. Made by Author.

Development Strategy towards 2070 - Landscape Transformation

5 years → nearby future
15 years → long term
25 years → distant future
50 years → far away future

2025 2030 2040 2050 2060 2070

Agriculture

First pilots production high water-level
Livestock farms transition to extensive, circular agriculture
Additional recreational functions on farms
Start agro forests in some areas
Start wet cultivation in the core
Central farms with recreational functions at urban fringes
Farms 100% circular & nature-inclusivity is highly valued
Paludiculture on peatlands
Strong local market & network with urban dweller as consumer
Agroforestry up to speed & Biobased market established

Ecology

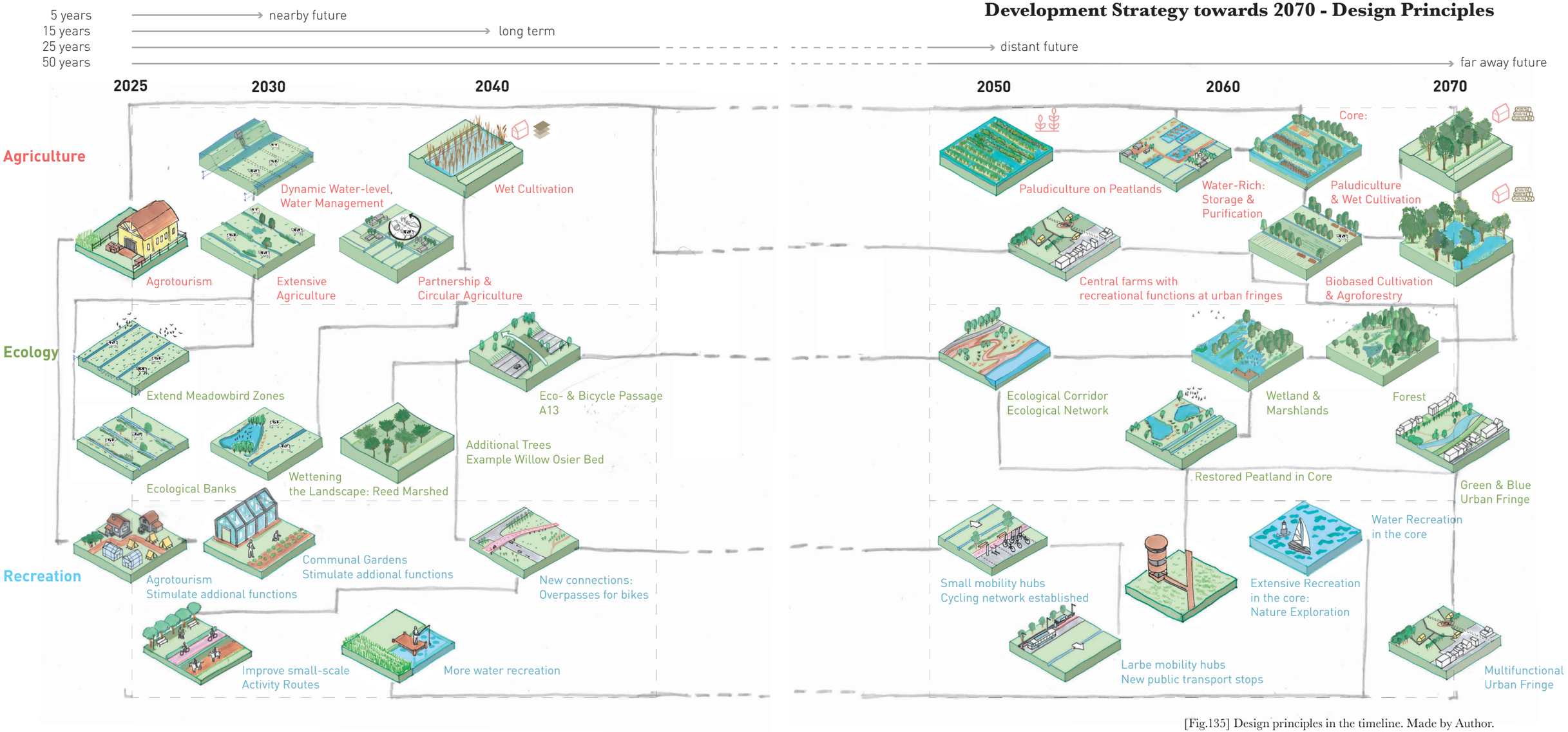
Nature-friendly banks
First pilots with wettening the landscape
Extend meadowbird zones
Plant new lines of trees in the landscape & small forests
Ecopassage & bicycle passage A13
More diversity in nature
New forests are fully grown
Connection of water network with additional green
Heightened water-level in eco core
Restored Peat in core
Ecological Corridors on big scale
Ackerdijkse Plassen & Vlietlanden connected with green spine
Green Network South Holland established

Recreation

Improve city-rural connections
Stimulate agro-tourism
Improve small scale routes bike/pedestrian
Urban agriculture, shared gardens
More water recreation: improved routes for canoe
Additional recreational functions
New connections: Overpasses for bikes
Water recreation extends to the core
Cycling tour around MD established
Bike highways between cities
New public transport hubs & stops
Extensive recreation in the core completed
Urban parks extend to the landscape
Multifunctional Metropolitan Park with active urban fringes

[Fig.134] Landscape transformaton timeline. Made by Author.

Development Strategy towards 2070 - Design Principles



[Fig.135] Design principles in the timeline. Made by Author.

The development strategy for Midden-Delfland towards 2070, presents a comprehensive strategy that is divided into five phases.

Phase 1: Foundations & Initiatives

2025 -2034

In the first phase starts the development with establishing a strong framework for cooperation and decision-making. Initially, the economic system still pressures the landscape for economic growth and for the livestock farming sector to produce efficiently, at a low price. However, stakeholders, such as the local agricultural sector and nature conservation authorities like Natuurmonumenten and Staatsbosbeheer, have become familiar with the challenges of climate change (more extreme weather and land subsidence) and the need for sustainable solutions. Therefore, this phase begins with involving stakeholders, including local farmers, environmental organisations and government agencies, in the transition to make Midden-Delfland a metropolitan park by 2070. The urgency for change is growing and some leaders and different parties are willing to seek cooperation in putting sustainability issues on the agenda. At the same time, extensive research and planning efforts are being carried out to map ecological, agricultural and recreational needs and identify key areas for developments and intervention. Pilot projects with, for example, raised water levels are being carried out to test the feasibility of different design principles.

Stakeholders:
Engage Stakeholders: Collaborate with local farmers, environmental NGOs (Natuurmonumenten) government agencies (such as the Ministry of Agriculture, Nature, and Food Quality), and research institutions (universities) to establish partnerships and initiate dialogue.Pilot Projects: Work closely with farmers, conservationists, and community members to implement small-scale pilot projects, with support from local municipalities and funding agencies

Actions & Implementations:
Initiation of dynamic water-level management strategies; Subsidies for extensive circular agriculture; Pilot projects nature-inclusive Agriculture;
Introduction of partnership models for circular agriculture; Pilot projects with herb-rich meadows for bird species; Introduction of agro-tourism ventures, addition of extra functions to agricultural firms

Design Principles: (Dynamic Water-level Management), (Extensive Circular Agriculture), (Partnership & Circular Agriculture),(Herb-Rich Meadows for Bird Species), (Agro-tourism)

Phase 2: Scaling Sustainable Practices

2035-2045

In the second phase, the strategy focuses on scaling up sustainable practices. A market emerges in which supply and demand for various sustainable solutions compete, creating a larger surface of innovation and engagement. Market players, liek the supermarkets, the government and financial institutions start investing and playing a bigger role. They provide the market with more available resources, infrastructure and financial support. Successful pilot projects are expanded to larger areas, involving a wider spectrum of stakeholders in sustainable land management practices. Significant investment is being made in infrastructure development, including the construction of ecopassages, activity routes and recreational facilities to improve regional accessibility and connectivity. Efforts are also being made to advocate for the integration of sustainable practices into regional planning frameworks (bestemmingsplannen) and policies to ensure long-term involvement and support from decision-makers.

Stakeholders:
Expand partnerships to include regional development agencies (MRDH), businesses, and educational institutions, engaging a wider range of stakeholders in scaling up sustainable practices. Engage with local businesses, including food producers and green technology companies, to foster innovation. Collaborate with urban planners, engineers, and transportation authorities (NS & RET) to develop infrastructure projects, with input from local residents and environmental organizations.
Start advocating for policy changes at the regional and national levels, working with policymakers and legal experts to integrate sustainable practices into legislation and planning frameworks.

Actions & Implementations:
Experimentation with biobased cultivation methods and integration within agricultural practices;
Development of paludiculture food production areas
Development of communal gardens and shared agricultural spaces

Design Principles:
(Biobased Cultivation), (Paludiculture Food Production)(Communal Garden)

Phase 3: Accelerated Transition

2045-2055

The third phase accelerates the transition to sustainability by embracing innovation and adaptation. Climate change challenges, such as heavy rain periods, become increasingly visible in daily life, making the need for solutions more urgent.
These solutions arise more easily through the application of technologies and innovative approaches. Local communities, especially farmers, are empowered to take responsibility for sustainability initiatives, supported by programs aimed at increasing skills and knowledge in sustainable land management. However, these local communities include not just the established farmers, but also citizens from surrounding municipalities who do not live in the municipality of Midden-Delfland, but know the landscape initially because of buying locally produced food and by participating in recreational activities. This involvement results from a more established local food network increased by attraction with recreational activities and facilities.

Stakeholders:
Partner research institutes to develop technologies and innovative solutions for addressing climate change and other challenges.
Stakeholder Empowerment: Empower local communities, farmers' cooperatives, and grassroots organizations to take the lead in implementing sustainable practices, with support from government agencies and civil society groups.
Offer workshops and educational initiatives led by experts in sustainable agriculture, conservation, and community development, targeting farmers, residents, urban citizens (from Delft, Rotterdam, The Hague).

Actions & Implementations:
Expansion of wetland restoration projects;
Enhancement of waterfront areas for recreational purposes;
Promotion of wet cultivation.

Design Principles: (New Nature, Wetland), (Waterfront),

Phase 4: Optimization & Integration

2055-2065

As the timeline progresses to the fourth phase, the strategy focuses on optimization and integration. The market is chaotic, with various companies competing in new activities like wet crop cultivation and the sale of biobased material. There seems to be an increasing awareness among government policymakers to listen to stakeholders driving the transition and a decreased interest in conservative stakeholders. Strong monitoring and evaluation mechanisms are in place to assess the effectiveness of implemented strategies. Collaboration is encouraged across different sectors, from recreational use of citizens to food and agriculture. This integration of design principles across ecological, agricultural and recreational domains, promoting holistic and interconnected solutions.

Stakeholders:
Monitoring and Evaluation: Establish multi-stakeholder committees and representatives from government, academia, civil society, and industry to assess the impact of implemented strategies and identify areas for improvement.
Foster feedback loops with input from diverse stakeholders to respond effectively to changing conditions and emerging challenges.

Actions & Implementations:
Optimization and fine-tuning of sustainable practices;
Integration of water storage and purification systems;
Expansion of green and blue urban fringe into surrounding neighborhoods at the fringers of the landscape;
Establishment of multifunctional urban fringes after several projects are completed (like new recreational functions, new nature-inclusive farms).

Design Principles: (Water Storage & Purification), (Green and Blue Urban Fringe), (Multifunctional Urban Fringe)

Phase 5: Vision Realization & Refinement

2065-2070

Finally, in the fifth phase, efforts come together in the realisation of the long-term vision for Midden-Delfland. Continuous learning and knowledge sharing among stakeholders enables innovation and refinement of the ecological, recreational and agricultural strategies. The government (municipalities and the region) brings influence through its policy-making and fiscal role that enables it to phase out the old system and make the new system the starting point of policy. Proven solutions are institutionalised and lacking, unsustainable companies are bought out or compensated to exit. Based on lessons learned and changing priorities, efforts are made to ensure sustainability and resilience of outcomes beyond 2070. Through this carefully planned and implemented phased approach, Midden-Delfland can navigate to a sustainable future in 2070.

Stakeholders:
Stakeholders: Vision Implementation: Coordinate efforts across all stakeholders, including government agencies, private sector partners, NGOs, and community groups, to realize the long-term vision for sustainable development in Midden-Delfland.

Actions & Implementations:
Completion and refinement of the sustainable landscape vision.
Finalization of agro-tourism with accommodation projects;
Implementation of nature exploration initiatives;

Design principles: (Agro-tourism with Accommodation), (Nature Exploration)

Chapter 9

A tunnel for cyclists to pass under the railway.

Conclusion & Reflection

274



9.1 Conclusion

The tram bridge over the Vlaardingervaart canal near Schipluiden, now serves as a bicycle bridge.

Introduction & Context

From a water-rich lagoon with clay and peat deposits to the densely urbanized southern Randstad of today, the Dutch river delta landscape has changed drastically over the centuries. Amidst this urban expansion, Midden-Delfland still exists as a green, open patch. However, this rural area now faces significant challenges, primarily driven by urbanization and climate change.

This peat meadow landscape, primarily used for livestock farming, holds significant ecological value due to its swamps, reedlands, peat areas, and forests. However, the area is fragmented by major highways and railways running north to south. Over the past 50 years, drastic urbanization in surrounding cities such as Rotterdam, Schiedam, Delft, The Hague, and Westland has caused a significant population growth in the province. This urban growth has led to limited available space and increased recreational pressures. As a result, the municipality of Midden-Delfland emphasizes the importance of recreation, viewing the landscape as an essential green backyard for the 2.3 million inhabitants of the Rotterdam-The Hague metropolitan region.

Apart from the challenges of urbanization, Midden-Delfland is becoming increasingly vulnerable to climate change. According to KNMI climate scenarios, temperatures are predicted to rise by almost 5 degrees by 2100, and the sea level is expected to rise by 2.5 meters. This makes the area, which is largely below sea level, even more vulnerable to flooding. Additionally, the area is facing soil subsidence caused by intensive water level control, a common issue in agricultural use of peat meadow landscapes. Subsidence contributes to CO2 emissions, and the further sinking of the ground level increases the region's vulnerability to climate change.

Despite efforts by the agricultural sector of Midden-Delfland to adopt more nature-inclusive practices, such as meadow bird management of land, the use of fertilizers and pesticides remains a significant source of pollution, harming water quality and ecosystem health. The conflict between agricultural productivity, ecological preservation, and environmental protection underlines the complexity of the challenges facing Midden-Delfland and emphasizes the importance of an integrated approach to ensure a sustainable future for the region.

Research Approach

The aim of this thesis is to develop, demonstrate, and create Midden-Delfland's adaptation to future challenges through a visionary design approach. By integrating governance-oriented research with design proposals, it provides a roadmap to 2070, offering insights for stakeholders and municipalities. The vision illustrates the region's path towards a resilient future as a metropolitan park, benefiting both local residents and the broader Rotterdam-Den Haag metropolitan region.

To guide the research and design in transitioning Midden-Delfland's peat meadow landscape towards 2070, the following research question was formulated:

How can the development and integration of the ecological character, the agricultural sector and the recreational contribute to a sustainable future for the region of Midden-Delfland towards 2070?

The need to adopt a forward-looking perspective that takes into account long-term sustainability and resilience led to the choice of 2070 as the target timeframe. This choice allows for a more visionary and less compromising solution, by encouraging a perspective that goes beyond short-term goals, extending typical policy cycles and global sustainability targets. In addition, by recognising that nature-inclusive design requires long-term planning for ecosystem development, the timeline is consistent with the ecological aspect of the vision.

Findings & Maximization

The Maximization Method plays an important role in creating the vision design for this thesis. It involves exploring the three key sub-themes - ecology, agriculture and recreation - separately to maximize their potential. After an analysis of the current conditions, the potential solutions for the maximization of the landscape are uncovered. This is followed by the integration and combination of the design principles during the optimization phase.

Analyzing policy documents and the historical context highlights the government's important role in preserving Midden-Delfland as an open landscape. Initially designated as a Rijksbufferzone, the area faced new challenges after the decentralization and increased urbanization, leading to uncertainties about its protected status.

Looking at the historical timeline reveals a reoccurring recognition for protection of the landscape in policy and the complex relationship between human settlement and nature in the area. This timeline shows how agriculture has historically shaped the landscape. The need to integrate past values, heritage and unique characteristics of Midden-Delfland into the development of a vision design becomes clear.

The focus on efficiency in spatial planning in the Netherlands has created a highly productive agricultural landscape. However, future policy, focused on sustainability, water, and soil-management, requires landscape changes. In peatland areas, water levels must be raised to combat subsidence. This restoration of the natural peat soil makes the water system more resilient to both wet and dry periods. Addressing the vulnerability of peat soils requires a transition in Midden-Delfland's agricultural sector. Paludiculture, involving the cultivation of wet crops like cranberries, alongside the cultivation of reeds and cattail for bio-based materials, offers new opportunities. On less vulnerable clay soils, promoting extensive circular agriculture can sustain agricultural traditions while promoting nature-inclusive practices. All of these solutions, from new water levels to wet crops, are integrated into the future vision.

In addition to land use transitions, looking towards 2070, improving connections between rural and urban areas is crucial. Green outdoor areas are essential, especially since residents of South Holland currently have limited access to green space. Currently, connections are mainly focused on cities, while rural areas are traversed. Recreational destinations in Midden-Delfland can be better utilized, especially the potential of water recreation in the peat meadow area. Making the main ecological structure more accessible and integrating recreational values with future farms will lead to a transition from agricultural monoculture to a more diverse landscape.

Recreational areas at urban edges play a crucial role in connecting agriculture with urban dwellers and supporting local food chains, while also enhancing community engagement with rural heritage. As the population growth increases demand for, addressing sustainable mobility solutions and improving rural accessibility from cities becomes increasingly important. Overcoming obstacles posed by limited green space and car-centered infrastructure requires implementing sustainable mobility solutions. Sustainable mobility solutions, such as improving bicycle routes and applying the principles of the 15-minute city, can improve connectivity and promote healthier modes of transportation.



[Fig.136] Layers of the vision Design. Made by Author.

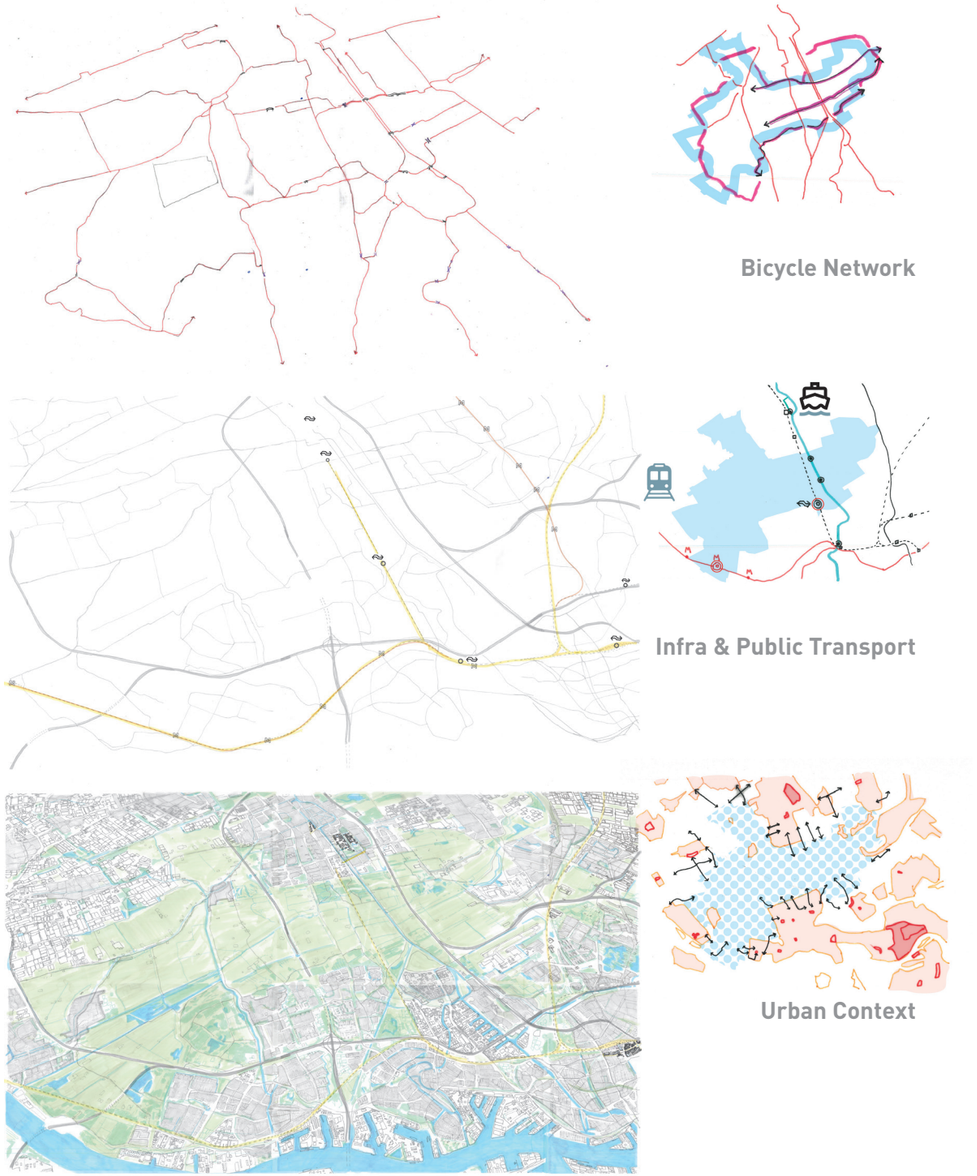
Despite their differences, agriculture, ecology, and recreation intersect in various ways, evident in initiatives like nature-inclusive agriculture and green corridor creation. The guiding design principles aim to harmonize different activities and offer a framework for sustainable development in Midden-Delfland.To summarize, the maximization phase identified key principles from literature review and spatial analysis for each theme.

To maximize the ecological character of Midden-Delfland, a core rewilding zone is proposed, surrounded by a buffer zone, using existing recreational areas as boundaries. Diverse habitats like peatlands, swamps, and forests are strategically distributed, promoting biodiversity and ecological resilience.

Agriculture is moving towards nature-inclusive practices that support habitat conservation and adapting to soil subsidence challenges. Paludiculture and wet cultivation of crops for bio-based materials offer alternative agricultural opportunities in wetter conditions. In this thesis, soil-specific spatial choices are made to allocate where these drastic measures need to take place. Transitioning the livestock sector to circular agriculture preserves the rural character while fostering nature-friendly practices.

Utilizing untapped green space in the core of Midden-Delfland and expanding water-based recreation opportunities will not only offer additional recreational amenities and new destinations but also contribute to climate change mitigation by addressing both water excess and scarcity issues.

To maximize recreation, enhancing connections between urban and rural areas is essential. Existing recreational areas serve as gateways, with improved bicycle networks benefiting both the environment and public health. Bridging the urban-rural gap with more public transport stops and boat taxis can improve accessibility.



[Fig.137] Layers of the vision Design. Made by Author.

Optimization & reflection on the Vision's Syngergies

After the maximization of the themes, the optimization phase refines the design principles and evelops the spatial outcomes for a sustainable future. This phase involves comparing the themes and addressing the spatial conflicts. The possible outcomes ranged from a peaceful and quiet future with little human interference, to a lively park with many visitors, to a productive landscape that serves the region's economic needs. It became clear that prioritizing the recreational sector would be crucial to the region's recognition and protection, as a metropolitan park amidst urbanization pressures.

Synergies between themes, particularly in relation to the water system, emerged as key drivers for optimization. Both Agriculture and Ecology need a higher water level to prevent subsidence and to restore the original ecological peat landscape. Additionally, an intensive, water recreation area offering water-based activities, can also provide more recreational functions in the core of Midden-Delfland. A focus on improving non-car transportation networks and strengthening local trade systems for farmers presented opportunities to reconcile agricultural and recreational objectives. Comparing agriculture and recreation, the connection with the surrounding city-centers needs to be improved, but there is also a need for an improved local trading system for farmers, and this is where both themes can match. The optimization and vision design show how the landscape can be transformed from a monoculture to a diverse landscape for a more sustainable future, if circular and nature inclusive agriculture becomes a top priority.

The different landscape transformations significantly impact spatial quality and recreational value. Ecological landscapes, such as wetlands and peat restoration zones, support biodiversity and water management but require extensive areas and limited access. To address reduced accessibility of the ecological landscapes, clear routing and infrastructure improvements aim to minimize disturbance to nature while enhancing the visitor experience. On the other hand, productive agricultural solutions like agroforestry and circular farming offer more accessible landscapes enhancing biodiversity and community interaction through local markets. In the former situation, the zoning of Midden-Delfland consisted mainly of agricultural land with some recreational areas on the border and ecological nature reserves in the middle, of which the latter had the most limited area. By integrating the stated approaches, the landscape diversity will be enriched.

[Fig.138] Bird's Eye View - Midden-Delfland
The Metropolitan Park towards 2070



Design

Central to the design for Midden-Delfland is its transformation into a sustainable metropolitan park. Furthermore, it consists of two strategic local design interventions that demonstrate synergy across different design principles for the challenges of 2070. The proposal includes:

1. The Ecological Core: An area where natural development predominates by distributed diverse habitats such as peatlands, marshes, and forests, surrounded by a buffer zone. Creating strategic corridors ensures ecological connectivity, from Vlietlanden to Ackerdijkse plassen, and reduces fragmentation.

2. Nature Inclusive Agriculture: Additionally, it is proposed to shift agricultural land use towards more nature-inclusive methods, including paludiculture, as well as promoting agroforestry.

3. Recreational areas: Existing recreational areas serve as gateways to the landscape with an improved cycling network. Enhancing both intensive and extensive recreation zones and creating thematic activity clusters, including on land of farms, enriches the recreational experience for both residents and urban dwellers.

4. Synergies between themes:
Synergies between different themes, particularly in adjusting water systems by raising water levels, drive optimization. This soilution is required by both agriculture and ecology to prevent soil subsidence. Moreover, this leads to an intensive water recreation area in the heart of Midden-Delfland. Expanding water-based recreation increases the liveliness of the core through for example, adding canoe connections. Focusing on improving non-car-related transport networks and strengthening local trading systems for farmers can combine agriculture and recreation objectives.

5. Bicycle Eco Passage: A final concrete local intervention includes a new bike ecoduct connecting various natural areas, combining mobility, recreation, and ecological networks.

Development Strategy & Policy Recommendations

The development strategy for Midden-Deflland up to 2070 presents a strategy that starts with stakeholder involvement, research and pilot projects to test the design principles, experimenting with paludiculture and wet crop cultivation. After the initiation phase, the strategy evolves towards scaling up sustainable interventions. Successful initiatives are scaled up and policies are integrated in decision making to ensure long-term commitment. Significant investment will be made in infrastructure development, including the creation of eco-passes, activity routes and recreational facilities aimed at enhancing regional accessibility and connectivity. As we move into the more drastic transformation of the landscape, the strategy accelerates towards embracing innovation and adaptation, empowering the local farmer communities but also the citizens outside of Midden-Delfland. As the timeline progresses, the strategy focuses on optimization and integration, with robust monitoring and cross-sector collaboration. In the final phase, continuous learning and knowledge sharing among stakeholders will enable continued innovation and refinement of strategies, ensuring sustainability and resilience of outcomes beyond 2070.

To ensure the development strategy's success, a shift in the perspective of policymakers, particularly within the established municipality of Midden-Delfland, is necessary. This change is directed towards the current highly valued practices and landscape conservation of the past decades and the resulting form that the landscape of Midden-Delfland has taken. The peat meadow landscape is a landscape typology that is prized for its ecological significance in the especially for meadow birds. While the designation of 'Bijzonder Provinciaal Landschap Midden-Delfland' initially seemed appropriate, the landscape's value has diminished due to intensive agricultural practices, soil depletion, subsidence from low water levels, and reduced ecological diversity. The traditional view of the open, green polder landscape's value does not correspond with the ecological state it has in reality. Thus, a new approach is required to restore natural peat landscapes in some areas and promote nature-friendly agriculture in others

From a higher level of governance, spatial planning must embrace integration, recognizing the value of land use change in the agricultural sector for other challenges, such as the need for more recreational activities and more biodiversity.

In most cases, spatial planning practice is not just about agriculture, it has to bring together all kinds of functions and tasks such as housing, climate adaptation and mobility. Different deadlines and conflicting interests for each task, make it difficult for officials to find the right spatial integration in an area. The development of new policies for new types of agricultural land use, from paludiculture to agroforestry, is in the hands of the national government. However, this transition requires protection against land price speculation and financial support for farmers shifting land use. It also means that some agricultural land will be redistributed, reducing its economic value. Provinces and municipalities can collaborate to pioneer new approaches, demonstrating potential improvements to higher levels of government (het Rijk).

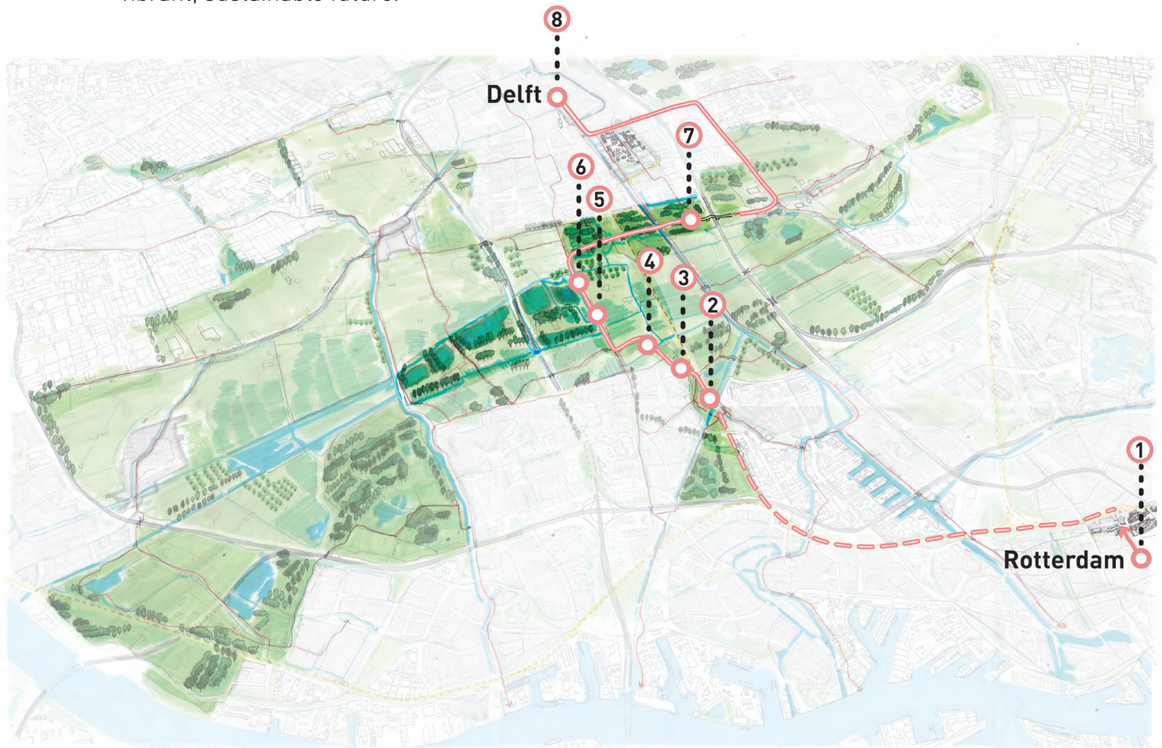
The recommendation is to facilitate more cooperation between stakeholders, including farmers, citizens, water boards and municipalities, in the joint development and management of the region. This may require a more decentralized form of governance, empowering local governance bodies.Such decentralization facilitates a transition away from reliance on global food markets, on which the livestock sector is currently dependent. A growing preference for local, sustainable food production aligns with a shift towards circular, healthier systems, reducing carbon emissions. The emergence of a more decentralized and regional approach promotes self-contained communities and more connected and sustainable urban environments.

In addition to empowering local communities, decentralization offers a potential solution in addressing complex local challenges. Currently, farmers' trust in government is declining due to their marginal influence amidst economic growth and the demand for high production and low prices of products. From a broader perspective, national government documents such as the NOVI tend to generalize all peatland landscapes. However, this research highlights the complexity of local vulnerability and the need for a nuanced, local strategy. A more targeted, differentiated approach could position farmers within peat meadow landscapes more cooperatively. Decentralization allows tailored responses to local challenges, enhancing effectiveness. For instance, in peatlands, this might involve creating new water table sub-areas bounded by numerous tussenboezem wetlands.These sub-areas should be jointly managed and implemented by relevant stakeholders, including municipalities, water boards, farmers and community members. This may foster cooperation among local residents, environmental stewardship, sharing the responsibility for the landscape.

The Metropolitan Park towards 2070:

Cycling through Midden-Delfland

As this thesis began with a bicycle tour through the rural landscape of Midden-Delfland, the vision is completed with a new visualization of this landscape in 2070. The bicycle journey starts from Rotterdam and leads to Delft, passing through innovative landscapes and various sights. The route showcases the transformation into a sustainable metropolitan park, blending urban and rural environments. Experience the new Schiedam Kethel railway station, agro-tourism at urban edges, wet cultivation fields, diverse agricultural landscapes, and serene recreational waters in the ecological core. Cross the A13 via a green eco passage, witnessing the integration of ecology, agriculture, and recreation. This journey offers a glimpse into a vibrant, sustainable future.



[Fig.139] A bicycle route through future Midden-Delfland, indicating the locations of the eye-level perspective visualziations. Made by Author.

Starting point from the city of Rotterdam



New Railway station Schiedam Kethel



Agrotourism at urban edges of Midden-Delfland



Wet cultivation & Extensive Circular Agriculture



Diverse Agricultural Landscape



Recreational Water in the Ecological Core



Crossing the A13 with the Bicycle Eco Passage



Arriving in the city of Delft



Limitations & Future Directions of Research

The thesis proposes partial redevelopment of water infrastructure, such as a new water recreation zone, to address environmental challenges based on a general understanding of water availability. However, further research is needed to determine realistic dimensions for components such as water reservoirs and wetlands, taking into account the entire water network of the region (in this case, Delfland) and local and regional water demands. The role of the water board and its expertise in the implementation of design interventions related to water deserves deeper exploration due to its significant impact. In addition, insight into the economic aspects of agricultural land use change is crucial. Providing a revenue model for each alternative production mode could significantly influence decision making in landscape transformation. For example, understanding the costs associated with transitioning to low-input agriculture is essential. Further research is needed to assess the financial risks associated with no policy change, maintaining the current economic system of livestock farms, and the economic costs and risks of environmental degradation, in order to compare different scenarios.

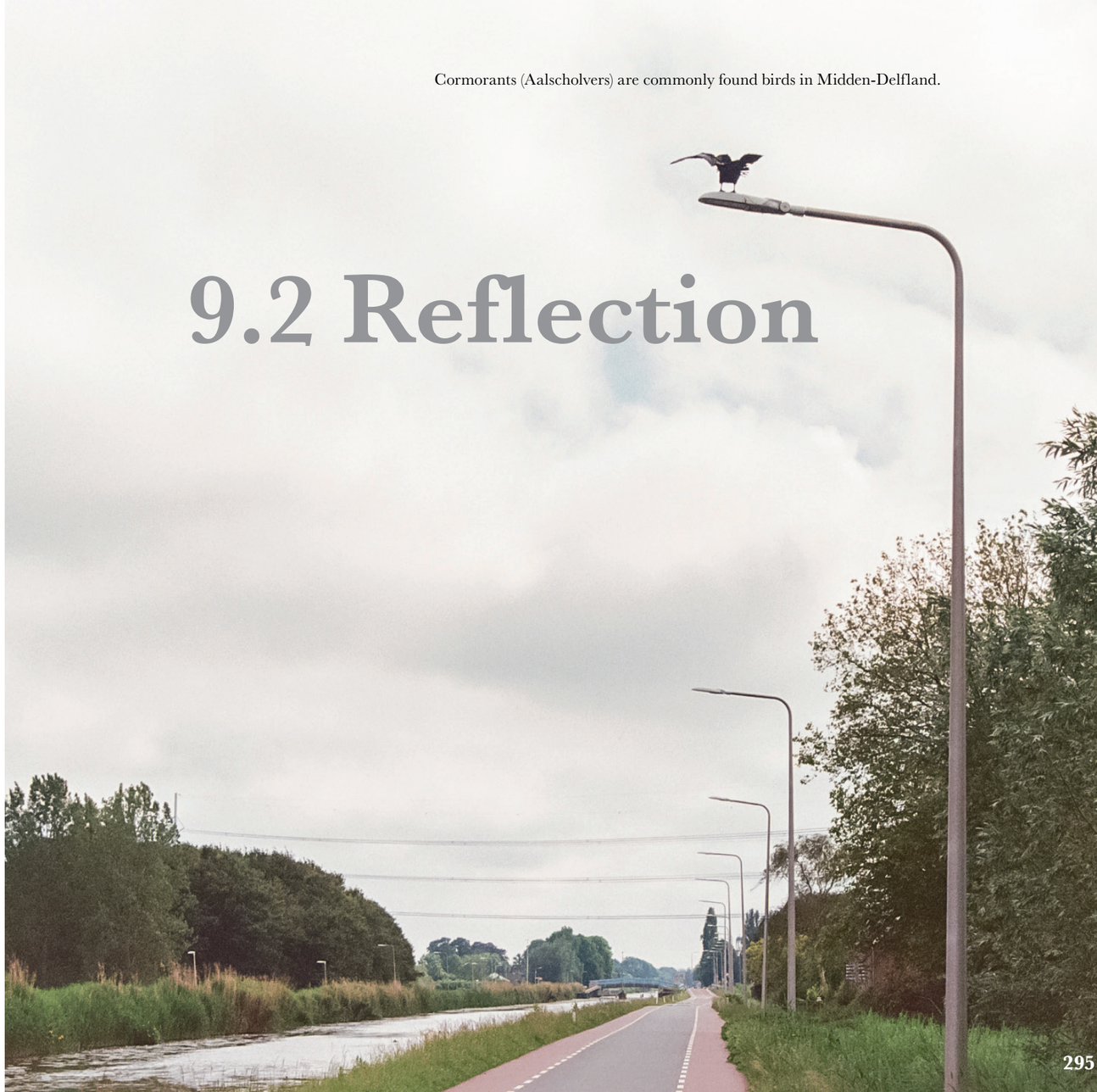
While the Maximization Method was a helpful approach to analyse the three themes and generate a range of solutions for the vision, its limitations must be acknowledged. This methodology inherently guides the theme selection, potentially overlooking other relevant themes that could significantly impact the final vision. This selection process, although based on analyzed challenges in the problem statement, also reflects the author's assumptions about possible futures, adding subjectivity. For example, prioritizing issues like the water system or housing could have changed the vision's outcome. In addition, the depth of analysis for each theme may vary, resulting in generalization for some aspects. Certain data gaps, such as precise land parcel boundaries, livestock farm locations, or pollution levels, often hinder informed decision-making. Land ownership, from farmers, to Natuurmonumenten, to Staatsbosbeheer, is complex and not always defined, which can further complicate planning efforts. To address these limitations and refine planning strategies, future research could include analysis of the spatial distribution of individual farms, taking into account factors such as numbers of cattle per farm, size of the land, the export volume, and their spatial relationship to the economic market and consumers in urban areas.

9.2 Reflection

Within the development strategy of this thesis, the upcoming policies are outlined. Among these policies, the examination of potential nitrogen restrictions for agriculture reveals the intricate relationship between agriculture, economics, and policy. This relationship is crucial because policy decisions, regulatory frameworks, subsidies, and other measures of governance profoundly affect the operating environment of farmers. Ignoring the policy dimension makes it difficult to fully understand the challenges and potential barriers to the adoption of sustainable farming methods. Future research should delve deeper into the different types of constraints on future nitrogen emissions, the political landscape, and its impact on agricultural constraints in Midden-Delfland to address this gap. Increased engagement with policymakers, farmer organizations, and stakeholders can shed light on decision-making processes, identify conflicts of interest, and suggest strategies for fostering collaboration and effective governance. The need for a larger context for political and economic issues shows where the design aspect of creating a vision is lacking.

In today's public debate, national spatial planning has regained its role and initiatives for future scenarios for the Netherlands are widely available, for example to combat rising sea levels. These plans also support and inspire the work of this thesis. Hajer and Pelzer (2022) in their article "The future asks for more than pictures", argue that although the development of more visions for the future of the Netherlands is a positive development, spatial problems do not always ask for spatial solutions Even if spatial visions and pictures start a discussion and put a dot on the horizon for change, they argue that for the most pressing spatial problems our country is currently dealing with, non-spatial solutions are at least as important. For example, while reflecting on the political aspect to the field of the agricultural sector, at the heart of the nitrogen crisis are people's diets, the power of agribusiness and major economic parties, and the modern belief in society that innovative technology is the answer to almost every problem. The spatial future also requires solutions and policies on a legal, financial and cultural level. Hajer and Pelzer propose interdisciplinary teams as a solution, combining institutional knowledge with normative theory and spatial visualization. They emphasize how spatial planning is driven by things that are not tangible, such as the legal zoning plan. "Now is the time for broader ateliers in which we can involve citizens and designers in thinking about the future of the Netherlands, together with anthropologists, geographers, sociologists, philosophers, economists, lawyers and other disciplines." Concludingly, a recommendation for further research on the topic of this thesis is to establish a more interdisciplinary approach, finding the help of experts from other disciplines.

Cormorants (Aalscholvers) are commonly found birds in Midden-Delfland.



Introduction

This chapter will reflect on the thesis, providing insights into the selected topic, drawing conclusions from both research and design aspects, diving into the design process and methodology, and examining the societal and scientific significance of the thesis.

The initial goal for this thesis and its topic, was to intersect the disciplines of landscape architecture and urbanism, to combine knowledge from both disciplines. By choosing an area that touches both the urban (urbanism) and the rural (landscape), Midden-Delfland is relevant to this goal. In addition to its spatial context, connected to the city while serving as an ecological landscape on a larger scale, there are functions and complexities that threaten a sustainable future. This made the chosen thesis topic, writing a future vision, relevant to the Metropolitan Ecologies of Place studio, which focuses on ecological and socio-economic transition in the face of climate change. Transitions on both levels become visible as the thesis argues for the preservation and development of an open, green landscape in the province with ecological significance. In addition, the importance of serving as an open space for the population within the highly urbanized province is of great importance, while actors and residents within the boundaries of Midden-Delfland should still be heard, such as the large group of farmers who operate here.

The master's program in Architecture, Urbanism and Building Sciences addresses the urgency of designing our built environment for the future, while dealing with climate change. Sustainable solutions to the challenges of climate change are also addressed in my thesis. An example is the design interventions that enhance access to green areas outside city centers and investigate the role of the agricultural sector within the shared living environment of urban and rural communities. In this thesis, the aspect of design practice is used to envision a possible different future and to spatialize and contextualize ideas. The skills taught in the Master's program are essential in this process. This involves clear communication of research and design results to various stakeholders and experts from fields outside of urbanism and landscape architecture. As a student of landscape architecture and urbanism, I can combine my knowledge of the built environment with the study of ecological systems to predict and shape urban development and future spatial needs.

Research & Design

Within the project, research and design are closely intertwined and not strictly separated. Initially, literature review highlighted urgent challenges: climate change and urbanization in South-Holland. This informed the main research question, mainly design-oriented, focused on Midden-Delfland's sustainable future and the development of a vision up to 2070. Besides, literature review helped to identify three key themes, guiding the design process: ecology, agriculture and recreation. The clarity of these three themes was not immediately discovered. I ended my P1 with the statement that I wanted to focus on a scenario-based approach for my thesis for which I selected two scenarios, one emphasizing sustainable agricultural practices and another prioritizing ecology.

However, feedback from mentors and studio teachers led to the inclusion of a third focus, recreation as a reaction to the demand for a more 'urban' project. The third theme highlighted Midden-Delfland's integration with its metropolitan surroundings. This theme helped me to understand that in order for the BPL Midden-Delfland to endure, it needs societal recognition and value.

Further research on these themes served as the foundation for design decisions, gathering insights through literature review, spatial analysis, data collection, and interviews. For example, by understanding the impacts of unsustainable agriculture, subsidence and urbanization on Midden-Delfland, I was able to formulate design interventions aimed at promoting sustainability, ecological conservation, and societal well-being. After gathering different solutions, further research on the actors from the area helped to decide and evaluate the representation of each theme for the vision, also on specific areas. Additionally, research helps in understanding stakeholder perspectives, ensuring that design solutions are relevant and answer to societal demands.

Reflecting on this journey, I realized the importance of different themes influencing the final design outcomes. The assumption is that literature review makes this choice objective because the main challenges should rationally come from literature review, but I think this process of selecting the viewpoint is unconsciously not entirely objective and dependent on personal experiences and knowledge.

Methodology

The primary methodology used in this thesis is 'The Maximization Method', a method used for urban design that optimizes specific objectives (in this case for a sustainable future, the perseverance and accessibility as a green park for the urbanized landscape), while satisfying various constraints. To summarize, the four steps of this method are analysis, maximization, optimization and integration. In the maximization phase, the autonomous future optimal situation for each theme is investigated. From my point of view, this method is not just suitable to structure the complexity of a project where various demands and constraints need to be satisfied and integrated. It is also a method that tries to reveal the design process for the creation of master plans and visions. Often, the jump from research to design in presented work is quite quick, showing an integrated result, without revealing intermediate steps and choices that led to the final design. It is interesting to consider if the maximization method can solve the gap of knowledge on the representation of the design process, apart from design results. This is why the following reflection question is formulated:

Is the maximization method a valuable method for students to show the entire design process within a project?

My personal answer to this question is that the method definitely structures the design process into more concrete steps and can provide argumentation for certain design choices. This approach enabled me to explore different scenarios and evaluate their implications thoroughly. However, in the case of my thesis, not all design choices can be rationally decided within the method. The methodology asks for a clear evaluation-system to make the choices after and during optimization. This is also why policy and stakeholders are integrated within my thesis, they provide the societal context for making the choices within the maximization method. However, here, dilemmas still arise in deciding whose voice to make the loudest and most heard. Showing the options and considerations with the support of the more governance side of the thesis creates a better understanding of certain design choices when the thesis is transferred to other readers (from municipalities or other governmental levels).

During the process towards my P2, I experienced some difficulties during the maximization phase, keeping the focus and imagining what would be the maximized outcome for each theme. This difficulty in focus is the result of many interrelations between the themes. However, making too many compromises from the start is not the goal of the Maximization in the first phase. To make sure each theme and the accompanying solutions are completely analyzed without missing anything, this first step should be taken.

Apart from this, I think that the optimization phase, when the themes of the design are compared with each other, is still difficult to visualize for the viewer. In this phase, the designer should show where the different solutions compete and complete. But making the decision which solution wins in this competition is not always rationally arguable. I personally concluded that in my project, the competition was mostly based on the limited space available. Often both solutions were possible, but for the implementation of all, more space would be needed. The conclusion was to make the best use of the space by finding synergies between the themes, so that they are both present, but not always equally.

Ethical Consideration, Societal Value and Implications

During the design process, especially the maximization phase, the ethical considerations of my thesis also came forward. An example is the need for the agricultural sector to work as nature-inclusive as possible, while having the dairy production and economic growth of farms at stake. Another consideration is that nature can flourish at best without interference of humans, by creation of wilderness and allowing ecological processes to develop, but Midden-Delfland is surrounded by an urban area in need of highly infrastructural connections. This fragments the ecosystem and creates barriers. The battle for space and tendency to expand the cities and urban living environments into the hinterland also puts pressure on the 'Special Provincial Landscape' if its cultural, ecological, agricultural, recreational values are not recognized and respected. The ethical consideration here is finding the most important characteristics and values to sustain and parts that need reconsideration and redevelopment, like the traditional type of agriculture here: livestock farming with cows.

My thesis tries to broaden perspectives on traditional agriculture, nature conservation and the relationship between urban and rural areas for recreational purposes. The expertise of the Netherlands of reclaiming land and pumping our polders dry is worldly known, and keeping an unnatural water-level to be able to practice agriculture is common ground. However, awareness of issues such as nitrogen emissions and soil subsidence has grown, highlighting the need for more sustainable practices. The Netherlands is one of the most advanced countries in terms of agriculture, crop cultivation and cattle breeding, with a high level of technical expertise (Bos et al., 2023). However, there is a gap in how all this knowledge is executed towards a more sustainable future. Most farmers are aware that they will have to diminish their carbon footprint, and limit their nitrogen emissions. This demand contradicts their position on the global market, which demands upscaling their production to keep their prices low, resulting in more unsustainable choices. There is an urgent need to transition towards sustainable, circular, and regenerative agriculture, considering the growing impact of climate change on agricultural processes and ecosystems. Recognizing agriculture not just as an industry but as an integral part of natural processes is crucial, especially in vulnerable areas like the Netherlands' delta region. With our expertise already at hand, we can become pioneers in the world.

There is a necessity of awareness of soil, water systems and ecosystems in agriculture. For urbanization this topic also becomes more relevant. Building in vulnerable areas while having limited space is a hot topic in the Netherlands. The principle that soil and water conditions should form a more prominent basis for urban planning choices is getting more acknowledged by governmental parties, designers and planners (H+N+S Landschapsarchitecten et al., 2023). Regarding nature conservation, existing policies in the Netherlands are outdated, focusing primarily on sustaining old ecosystems and specific species. A more future-oriented approach should prioritize restoring and establishing self-sustaining ecosystems through natural processes (Arts, K. et al., 2022.)

The societal relevance of my thesis lies in preserving green spaces like Midden-Delfland, a rural area in the middle of urban development. By promoting the area's significance in terms of heritage, recreation, biodiversity, and agriculture, my research supports the argument for maintaining it as a natural recreational area for the surrounding inhabitants of the metropolitan region. As the province of Zuid-Holland is a delta and very vulnerable to sea-level rise and flooding, the necessity to retain some permeable land is urgent. Besides, this area should counterbalance the loss of biodiversity due to urbanization.

Transferability of Research

My work aims to inform policy decisions and inspire positive change in land planning practices, supported by scientific literature. This contributes to the fields of landscape architecture, urban planning, and environmental management. Assessing the transferability of my project involves evaluating how the insights, methodologies, and outcomes can be applied and adapted to other contexts beyond the specific case study of Midden-Delfland.

The spatial exploration of possible future land uses in this thesis shows similarities with aspects of numerous scenarios of Mooi NL (Noordhuizen et al., 2024). Mooi NL is a government program of the Ministry of the Interior and Kingdom Relations, 'laying the foundations for building the Netherlands of the future'. As part of their research on transitional locations within urban territories, they investigate the development of nature-inclusive cultural landscapes.The research calls for soil, water and ecology as the basis for development, which is applicable for the vision design of this thesis.The Midden-Deflland 2070 vision design can function as an example of one of the design concepts (spatial-economic profile) illustrated by Mooi NL. Their clear concepts help to structure the specific tasks for a transition, which would also help to further define the roadmap for Midden-Delfland. Out of their ten archetypical planning concepts, the ones most relevant to Midden-Delfland are: concept 3, Natural recreational landscape, concept 8, Agro-tourism and number 9, Nature Inclusive Agriculture. Three study areas were taken as test-cases to investigate what design concepts, measures and tools could be promising for transition areas. The study area of Midden-Delfland can be added to this exploration.

Transferring the project within Mooi NL's frameworks could direct a more specific focus on the future landscape typology of Midden-Delfland. MooiNL also inspires for other types of possible future landscapes, with more climate adaptation related landscape that maximize CO2 sequestration and energy landscape that implement green energy production with windmills and solar panels, possible transformation that can also be tested and analyzed for Midden-Delfland.

The utilization of 'The Maximization Method' provided a structured framework for decision-making, which can be adapted and applied to various urban design projects. By demonstrating the effectiveness of this methodology in the context of Midden-Delfland, I provide an example for other researchers and practitioners to adopt similar approaches in their projects. Moreover, the stakeholder engagement and policy integration strategies employed in my research contribute to the transferability of the project results. This brings along the last reflective question:

How can stakeholders be more effectively involved in the creation of a designed vision for addressing future regional challenges?

To ensure that design solutions are contextually relevant and aligned with societal needs and aspirations, it is important to involve local actors and policymakers in the decision-making process. For future research, stakeholders can be more effectively engaged through a participatory design approach that involves stakeholders throughout the project lifecycle. A potential next step for further research would be to ask different stakeholders, representing the three themes, for their feedback on the vision design. It would be interesting to see if experts from fields outside of urban and landscape design understand a design that was constituted through the maximization method. This could include organizing sessions before the optimization phase, where the results of the maximization method are discussed, and stakeholders provide input for the following design and optimization phases. By comparing these results to other sessions where the optimization phase is completed solely by the designer, we can assess the impact of early stakeholder engagement on the final design. The results of this experiment can provide insights and a final list of recommendations for policymakers and designers using this methodology, enhancing the transferability for the project results to other contexts. This approach can help to further bridge the gap between research and practice, fostering collaboration between stakeholders and enhancing the impact of design interventions.

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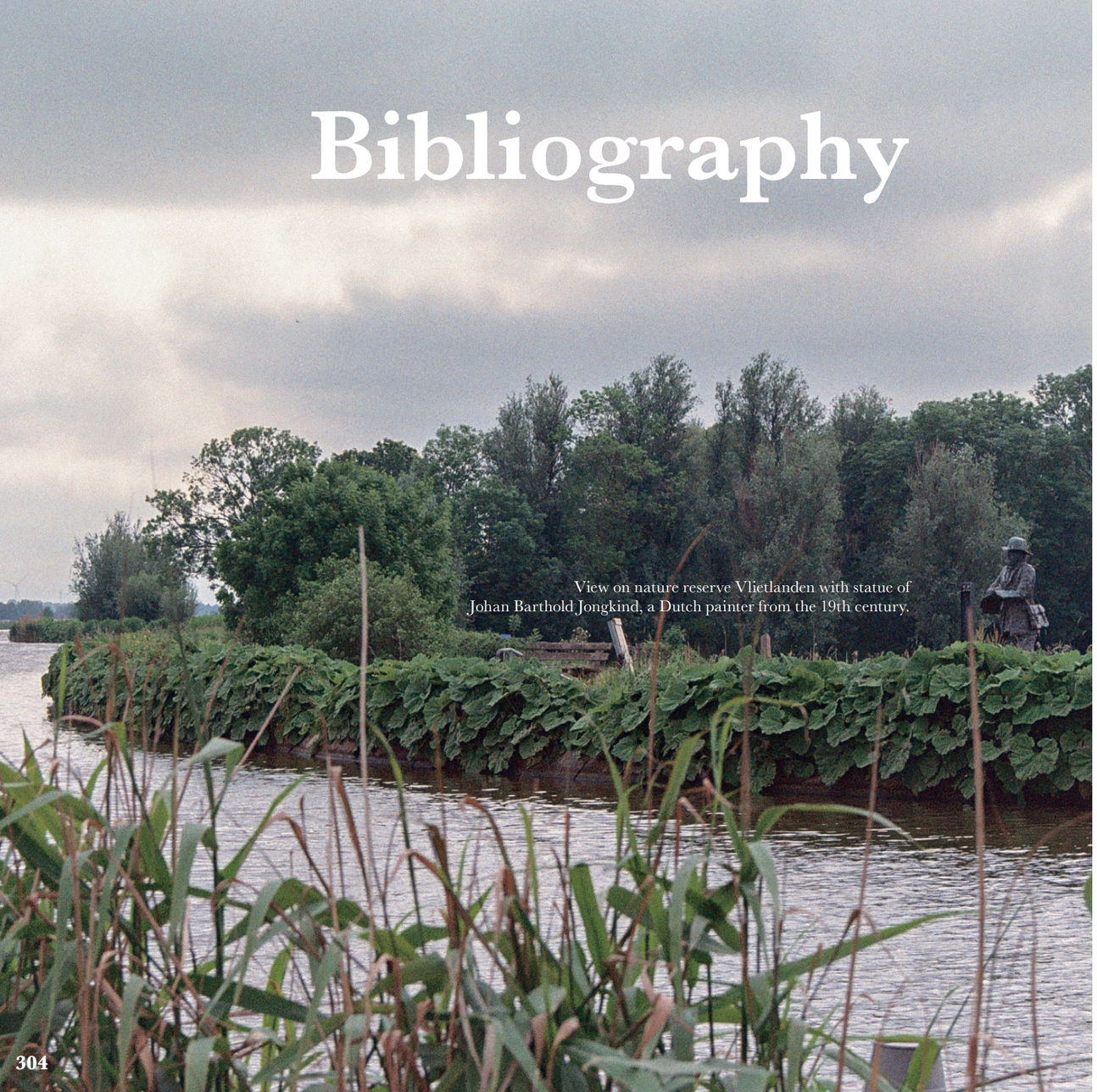

View on nature reserve Vlietlanden with statue of
Johan Barthold Jongkind, a Dutch painter from the 19th century.

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Appendix

The appendix shows supporting maps, figures, and drawings used in the development and design process of this thesis.



The green pastures and water ditches that embrace the agricultural character of Midden-Delfland.

Appendix 1 - Creation of the vision: Quantifying each theme

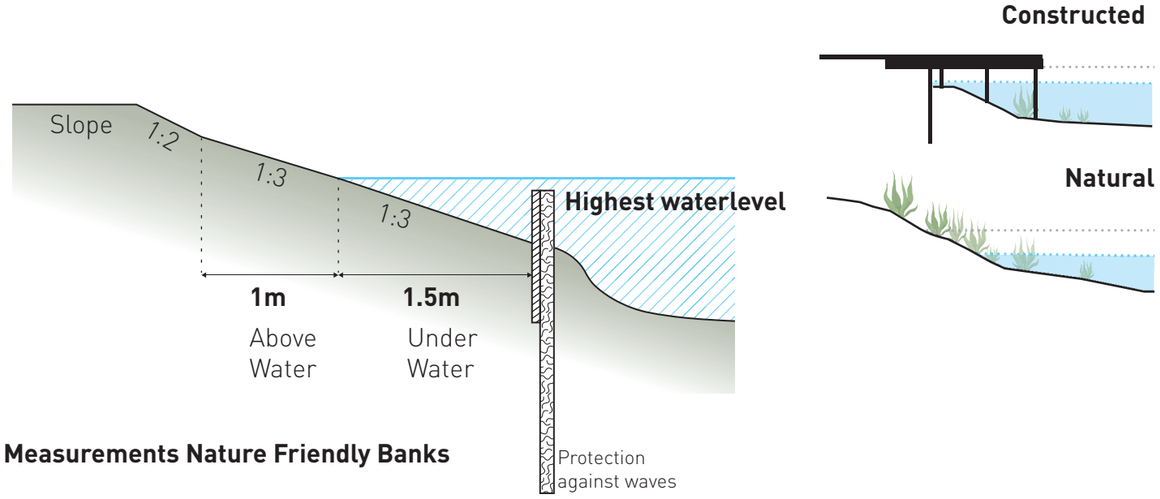
In this appendix, for all themes, numbers area assigned to specific aspects for design. This way, the design of the local interventions can be executed more concretely, having a checklists for different dimensions of different parts of the design. For example, concerning ecology, deriving from literature review, the area of a wilderness zone is projected to Midden-Delfland. The dimensions for an ecological bank and the slope proportions are displayed. Lastly, different types of ecological corridors to overcome infrastrucutural barriers are displayed, with next to this the most common species for Midden-Delfland and the desired dimensions for corridors.

For agriculture, the minimum dimensions per crop typology are provided and additional information on costs and yields are displayed. It is also calculated how much space is needed for circular agriculture as compared to conventional livestock farming. The numbers for circular farming are based on amount of cattle and surface of agricultural firms in Midden-Delfland, whom are part of the MIND-network.

In terms of recreation, the text provides information on the dimensions of bicycle paths, the 15-minute city principles assigned to Midden-Deflland, the water depths for recreation, and the amount of green space that Midden-Delfland can cover for inhabitants to meet the green norm.

These are all tools to help develop the overall vision design and the local design interventions.

Quantifying Ecology

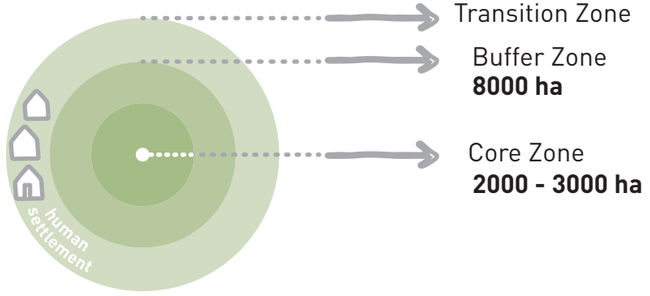


Measurements Nature Friendly Banks

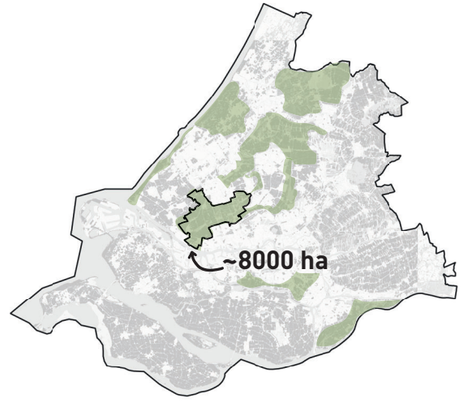
(Hoogheemraadschap van Rijnland, 2021)

Wilderness zone

Realizing enough space for nature to flourish



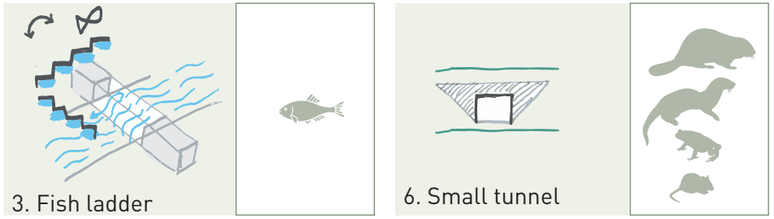
Zones of wilderness
-
nature reserves

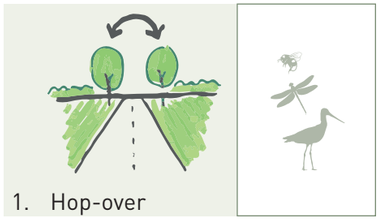


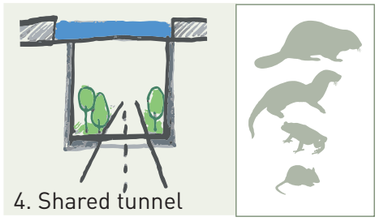
(Wild Europe Initiative, 2013)

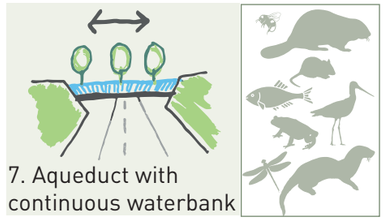
Types of ecological corridors

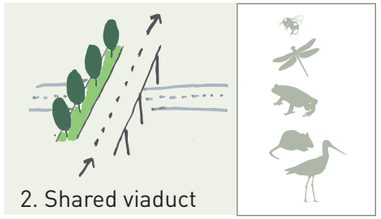
(Wansink et al.,2013)

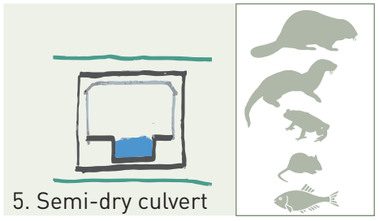


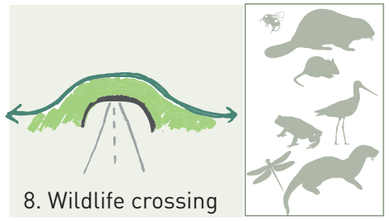






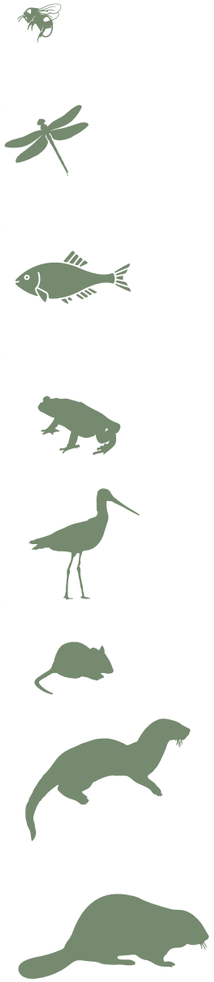






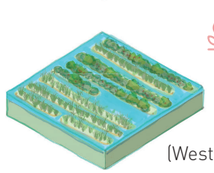
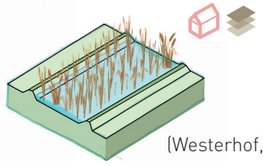
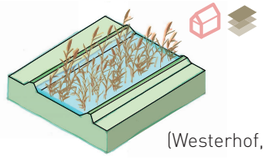
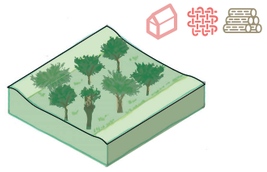
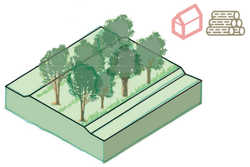
Iconic species Midden-Delfland - fauna

Name	Habitat	Habitat in Midden-Delfland	Minimum Width Corridor
Bumble Bee *Bombus hypnorum*	fly from march till october in various types of flowery grassland, use tree cavities to nest in	flowery grasslands of the peat-meadow landscape Abtswoudse Bos, Broekpolder	-
Hairy Dragonfly *Brachytron Pratense*	hundreds of sq. meters -ponds, lakes, fens, ditches, canals, rich in vegetation	ecological banks of farming plots, Ackerdijkse plassen, Vlietlanden, Abtswoudse bos	10 m
Bitterling *Rhodeus Amarus*	water depth > 60 cm , water with freshwater mussels, temperate freshwater fish	Ackerdijkse plassen, Vlietlanden, Foppenplas	0,5 m
Natterjack Toad *Epidalea Calamita*	hundreds of sq. meters, sandy, heathland or human influenced areas. Pools with a slight slope.	ecological banks of farming plots, Ackerdijkse plassen, Vlietlanden, Foppenplas	2,5 m for ecopassage
Black-tailed Godwit *Limosa Limosa*	lowland wet grasslands, coastal grazing marshes, pastures, wet areas. breeding season:may, april in grassland.	flowery grasslands of the peat-meadow landscape	100 ha for habitat size with a surrounding buffer of 600 meters
Root Vole *Alexandromys Oeconomus Arenicola*	0,05 -0,2 ha. Grasslands, higher vegetation, reedlands, swampy areas.	Ackerdijkse plassen, Vlietlanden, Foppenplas	2,5 m for water banks 15 m for ecopassage
Otter *Lutra Lutra*	3 - 10 km of waterbanks. Rivers and wetland, coastal & marshland	Ackerdijkse plassen, Vlietlanden, Foppenplas	0,5 m for tunnel 1,5 m for ecopassage
Eurasian Bever *Castor Fiber*	100 - 300 meter of waterbanks Woodland, slow moving river valley bottoms, floodplains.	Ackerdijkse plassen, Abstwoudse bos & Broekpolder (near water)	10 m for tunnel 15 m for ecopassage



Quantifying Agriculture

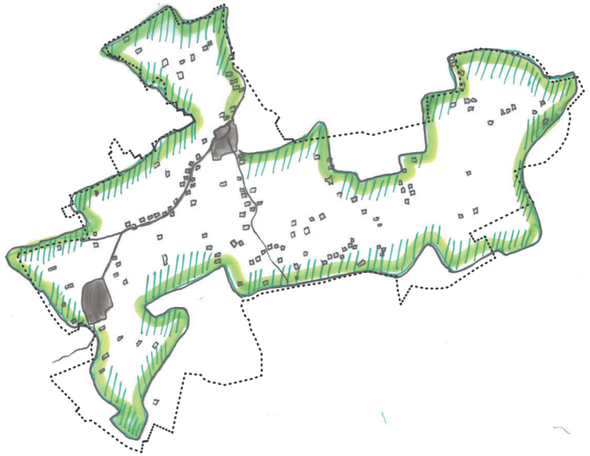
Quantifications for land-use changes with a higher water-level

Crops / Production type		Ground-water table	Harvest & planning	Investment & Costs	Yearly Costs	Yields	Biobased Production	Min. Area & Area in vision
Cranberry *Vaccinium Macrocarpon*	 (Westerhof, 2021)	- 0,25 m	Harvest starts after 3 years. 3-4 ton/ha 6-12 tons/ha after 10 years	€60.000 per ha €8000 for machine	-	€ 7 - 10 euros per kg € 7000 - 10.000 euros per ton	-	-
Lisdodde / Cattail / Bulrush *Typha latifolia*	 (Westerhof, 2021)	Water-level can fluctuate - 0,20 m + 0,10 m	Harvest starts after1 year. year 1: 5 year 2: 7,5 13 ton ds/ha after 3 years	€6000 - 8000 per ha	€250 - 1500 per ha	€80 - 120 per tons ds	15 - 20 per tons ds / per ha 150 - 250 m^3 insulation material	min : 5-10 ha
Riet / Reed Beds *Phragmites australis*	 (Westerhof, 2021)	- 0,20 m + 0,20 m	Harvest starts after 3 years. year 1: 7,5 year 2: 15 ton ds /ha	€12.500 per ha	€600 per ha	€50 per tons ds	reed for 0,57 roof/house per hectare	-
Wilg / Willow / Osier bed *Salix viminalis*	 (Provincie Zuid-Holland et al., 2022)	- 0,20 m + 0,20 m	Fast growing tree year 1: 5 year 2: 10 ton ds /ha lifespan: 20 years 15.000 willows per ha	€ 3500-6000 per ha	€250 per ha	€80 per tons ds	-	min : 5 ha
Agro Forestry Poplar, Ash, Alder (fast growing trees) Birch, Oak, Beech (slower growing trees)		Water-level can fluctuate Wet forest: - 0,20 m + 0,10 m	Fast growing tree 1,87 m^3 per ha takes 30 years Slow growing tree 1,84 m^3 per ha takes 70 years with density 200 trees	€ 2000 per ha	€ 80 per ha	€ 50 per m^3 € 100 per m^3	-	min : 50 ha

Production type	Ground-water table	Production	Yields	Livestock Density	Approximate Area per farm
Conventional Livetock farming	In Midden-Delfland Highest: -0,4 m Lowest: -7 / -8 m	9000 kg milk on average per cow per year	€ 46,75 per 100 kg milk	2,3 cows per hectare	45 ha 105 cows per firm
Circular Livestock farming	Water-level can fluctuate	7500 kg milk on average per cow per year	Biological Milk € 56,5 per 100 kg milk	1,7 / 1,5 cows per hectare	60 ha 90 cows per firm

Current landuse

(Veldman, 2015)



Total Surface: **8000 ha**

Agricultural Land: **6000 ha**

55 farmers total

50 circular farmers

5 conventional farmers

future → move on with this group of 50

40 ha x **50 farmers** =
2000 ha needed
for circular livestock farms
1 / 3 of agricultural land

60 ha x **50 farmers** =
3000 ha needed
for circular livestock farms
1 / 2 of agricultural land

Farmers	Surface land	Cows	young cattle
1 Gerard van Winden	18 ha	30	10
2 Arie van den Berg	77 ha	90	
3 Dirk Gravesteyn	67 ha	59	20
4. Gerard van Winden	18 ha	30	40
5. Hans van Adrichem	45 ha	56	
6. Jan Piet Snijders	19 ha	35	12
7. Jan van der Kooij	40 ha	60	
8. Kees van Mil	45 ha	80	35
total	329 ha	440	117

329 / (440+117) = 0,59 ha per cow

approx. 70 cows per farmer

Land needed per farm: 41 ha → 60 ha desirable for circular farming

(Midden in Delfland, 2023)

(Veldman, 2015)

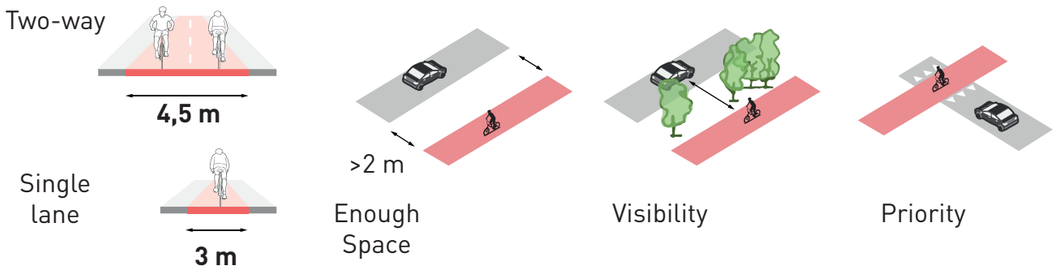


2000 + 500 ha



Quantifying Recreation

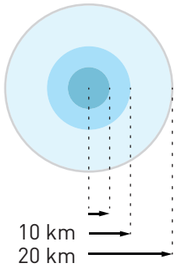
Dimensions bicycle-paths



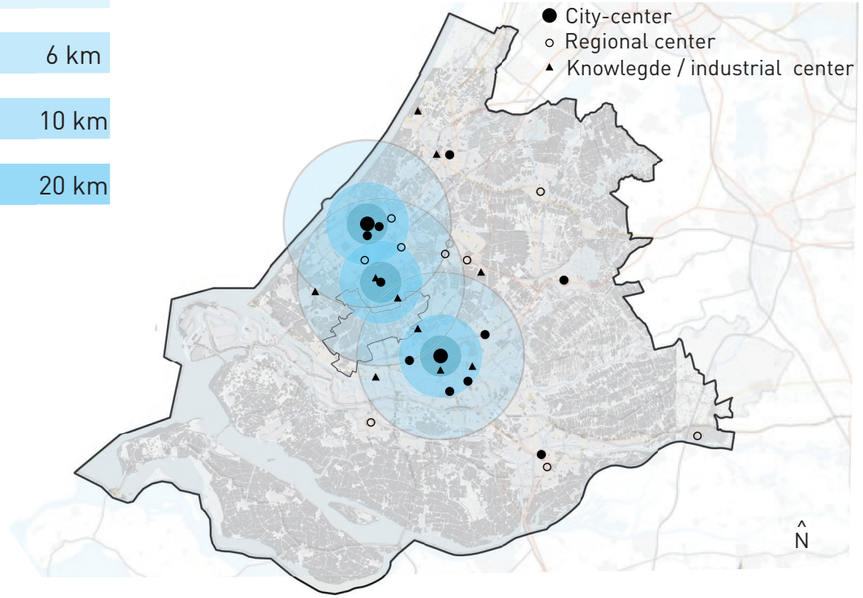
(Metropoolregio Rotterdam Den Haag, 2016)

15-minute city

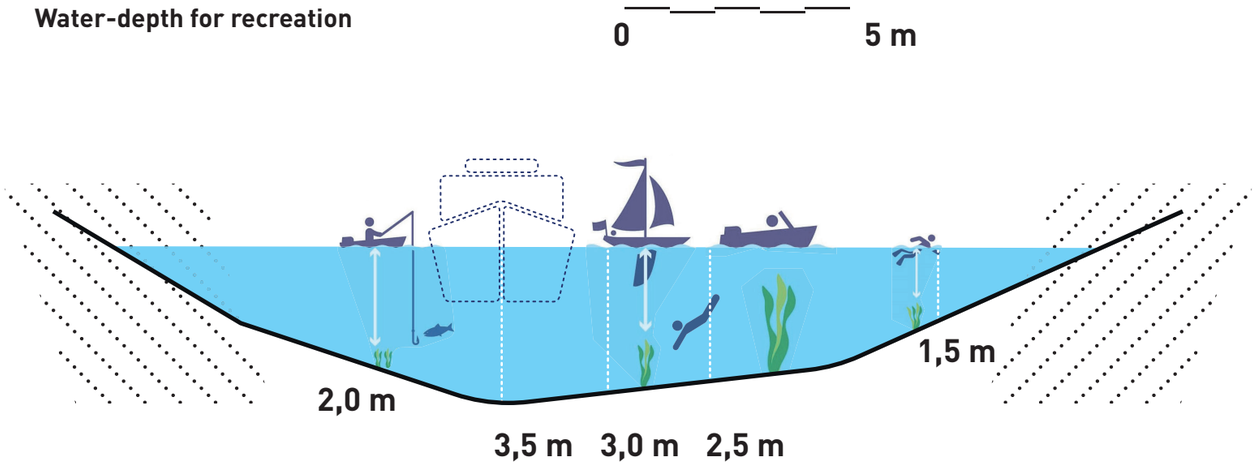
15-minute bike	4 km
15-minute electric bike	6 km
50-minute bike	10 km
50-minute electric bike	20 km



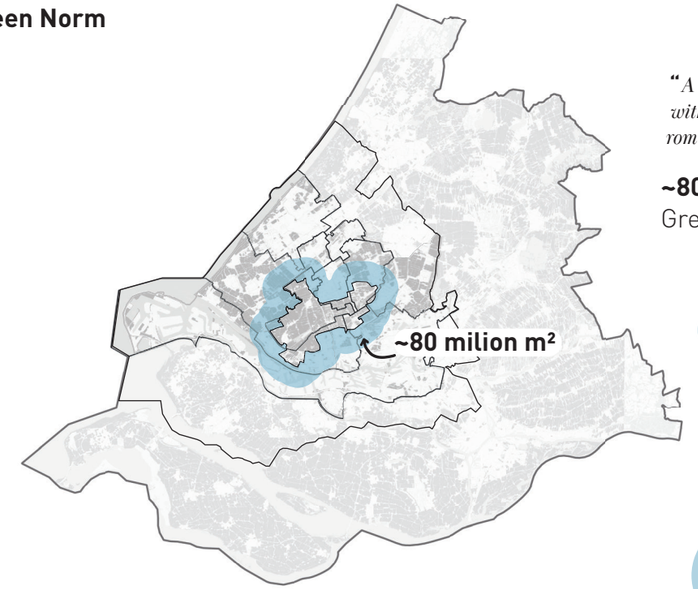
(Luscher, n.d.)



Water-depth for recreation



Green Norm



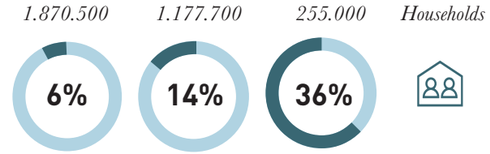
(Centraal Bureau voor de Statistiek (CBS), n.d.)

"A minimum of **500 m² of green space per household** *within* **a maximum of 5 kilometers** *from the city center (in units of at least 1000 hectares)."*

~80.000.000 m²: 500 m² =
Green for **160.000 households** within **5 km.**



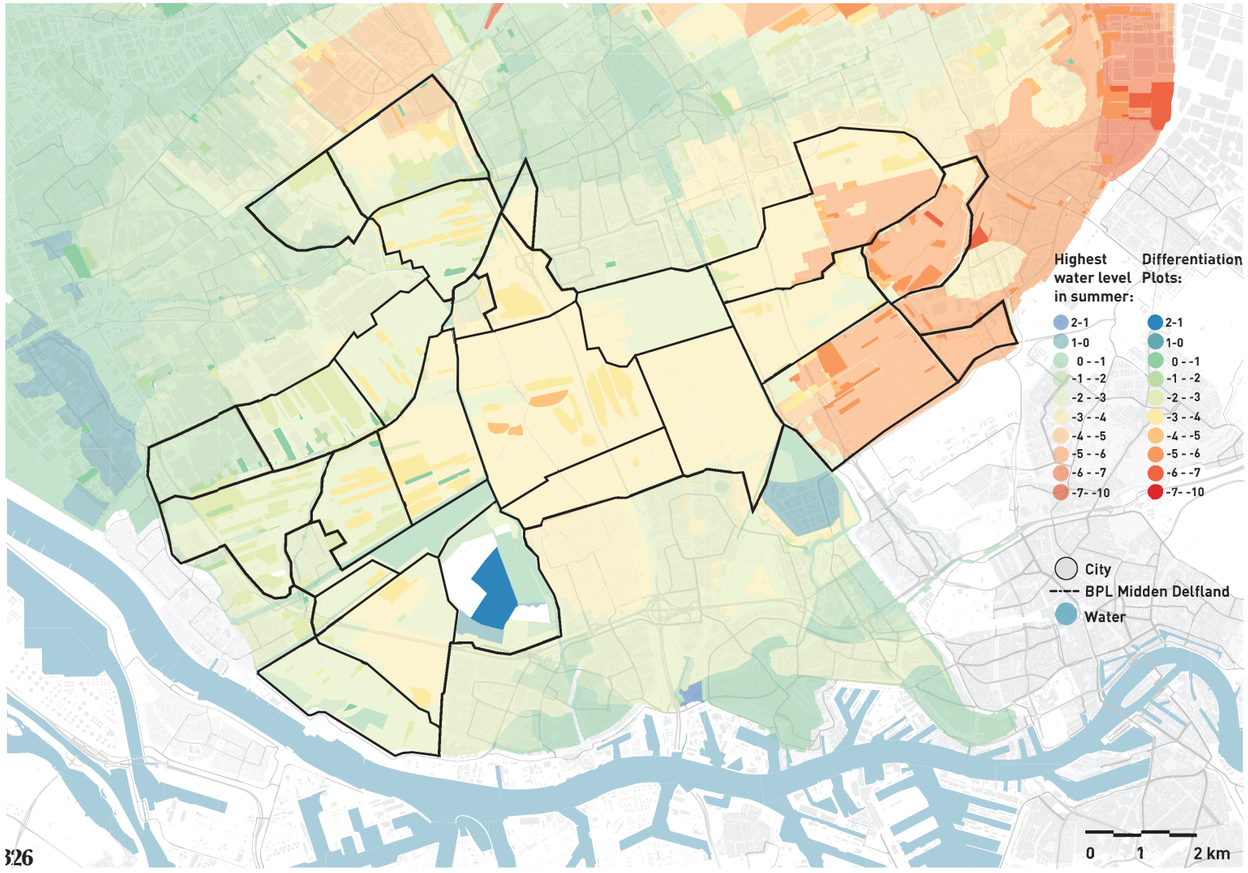
Percentage of households to cover Green Norm:



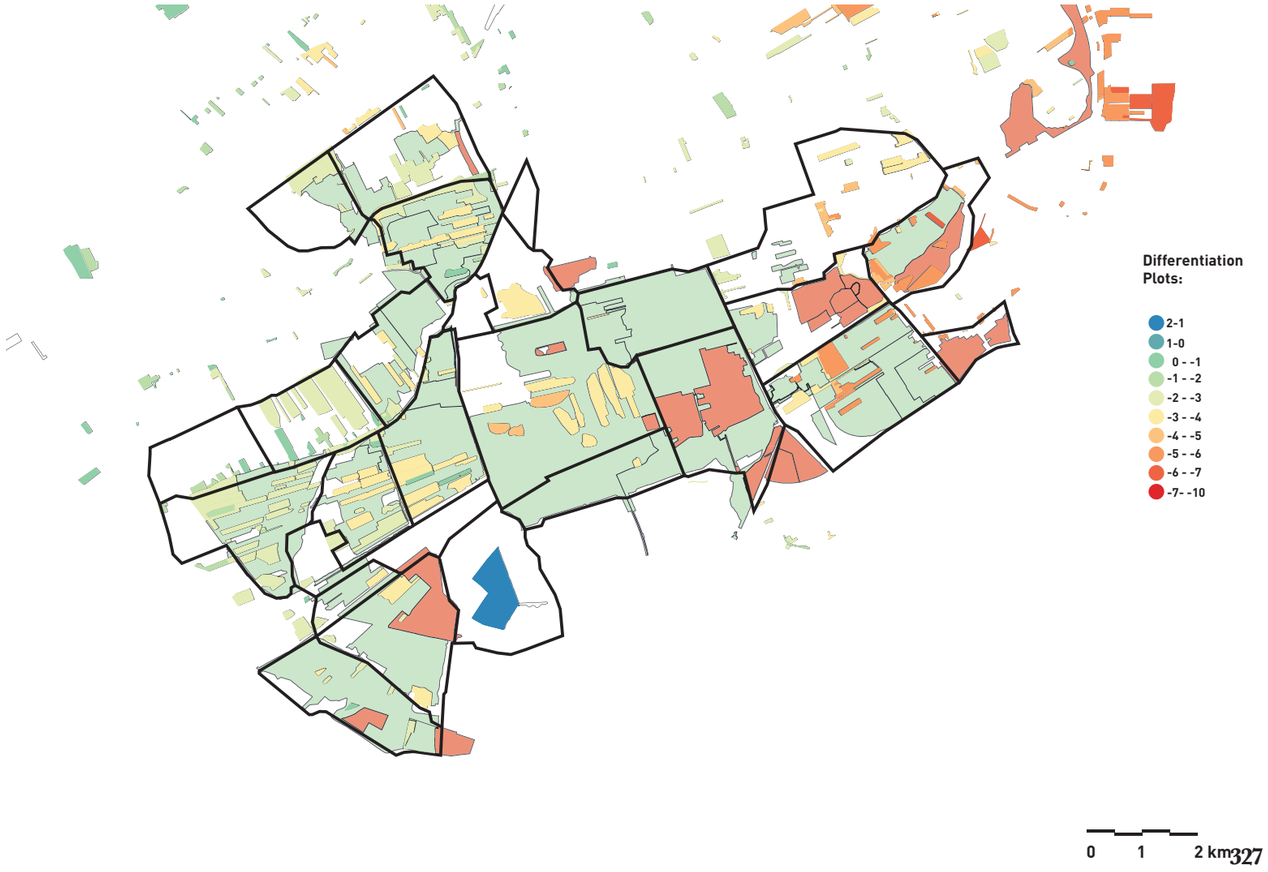
* *Delft, Schiedam, Vlaardingen, Westland, Maassluis, Pijnacker-Nootdorp, Lansingerland, Midden-Delfland*

Appendix 2 - Analysis of the water system

Peilvlekken & Accompanyin water levels in Midden-Delfland.Made by Author.
(QGIS, 2023) (Provincie Zuid-Holland, 2023)

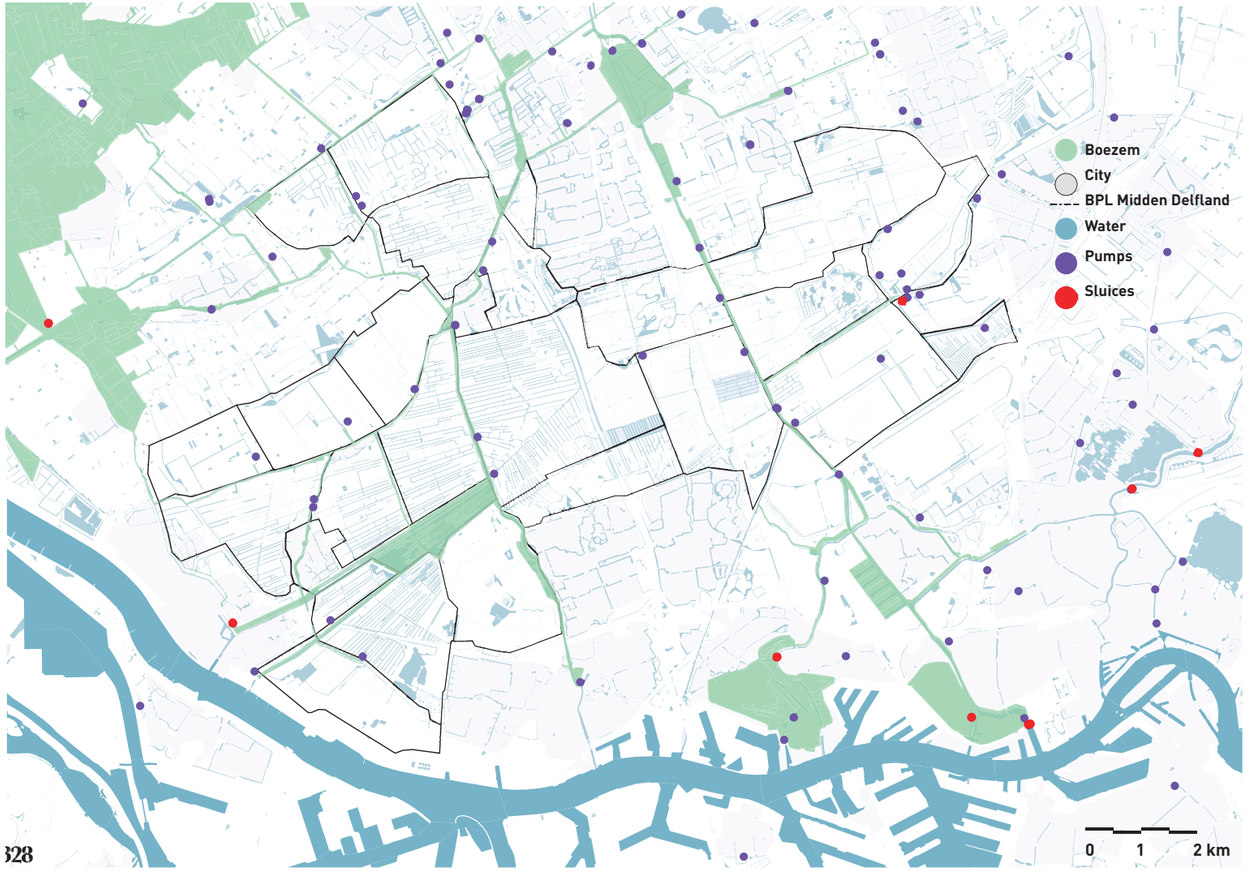


Fixed Peilvlekken & Accompanyin water levels in Midden-Delfland.Made by Author.
(QGIS, 2023) (Provincie Zuid-Holland, 2023)



Appendix 3 - Soil Typology Analysis

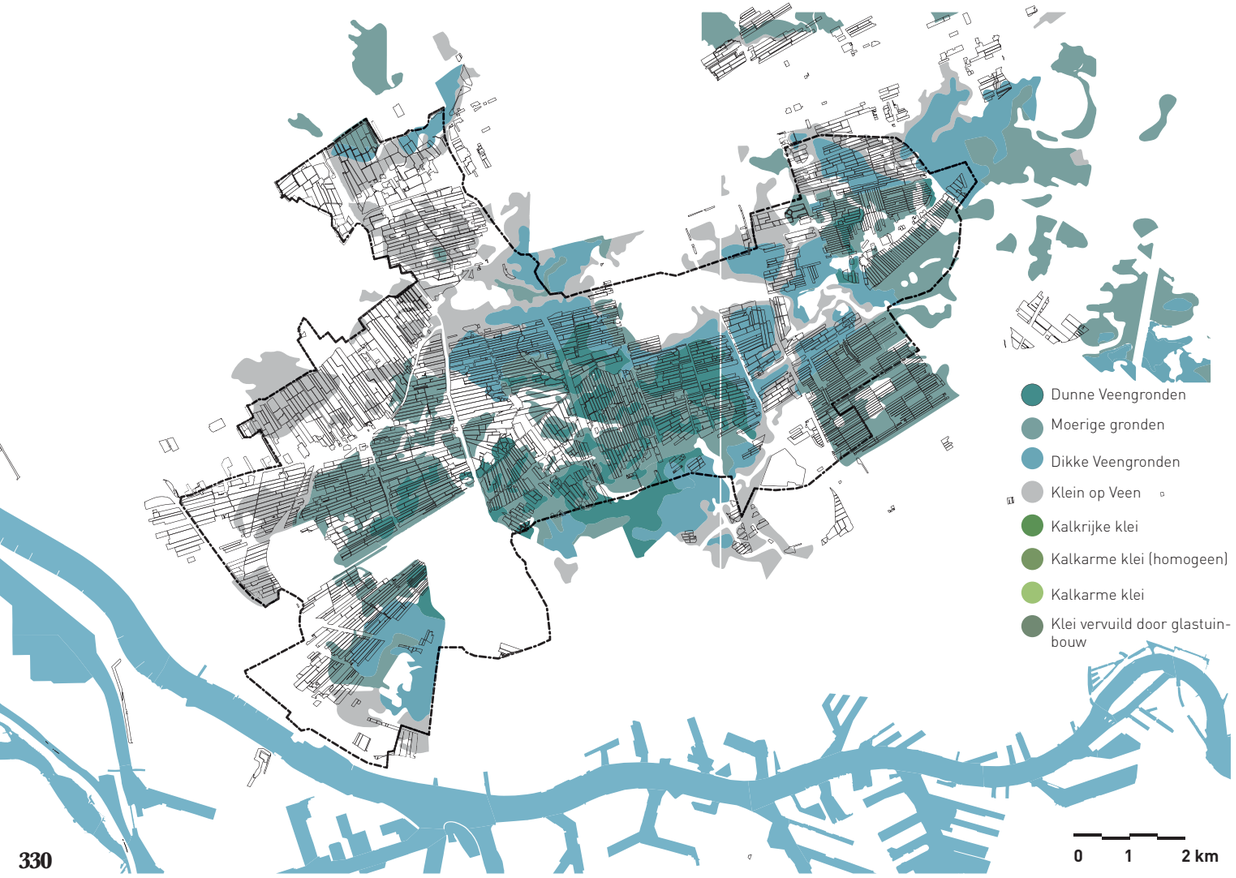
Water network and boezem system of Midden-Delfland.Made by Author. (QGIS, 2023)



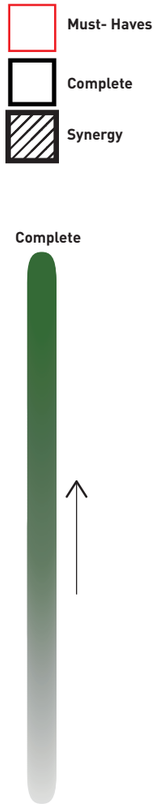
Agricultural Plots & Soil Typology, Clay Soils Made by Author.
(QGIS, 2023) (Bodemkundig Informatiesysteem (BIS) Nederland et al., n.d.).

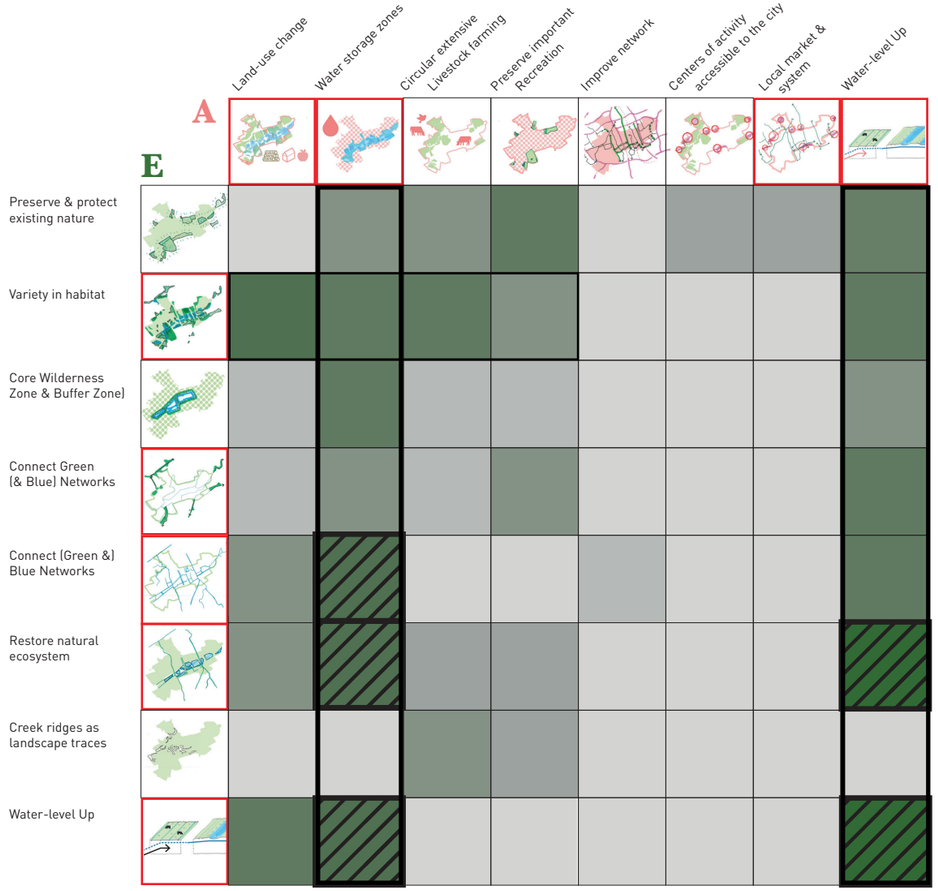


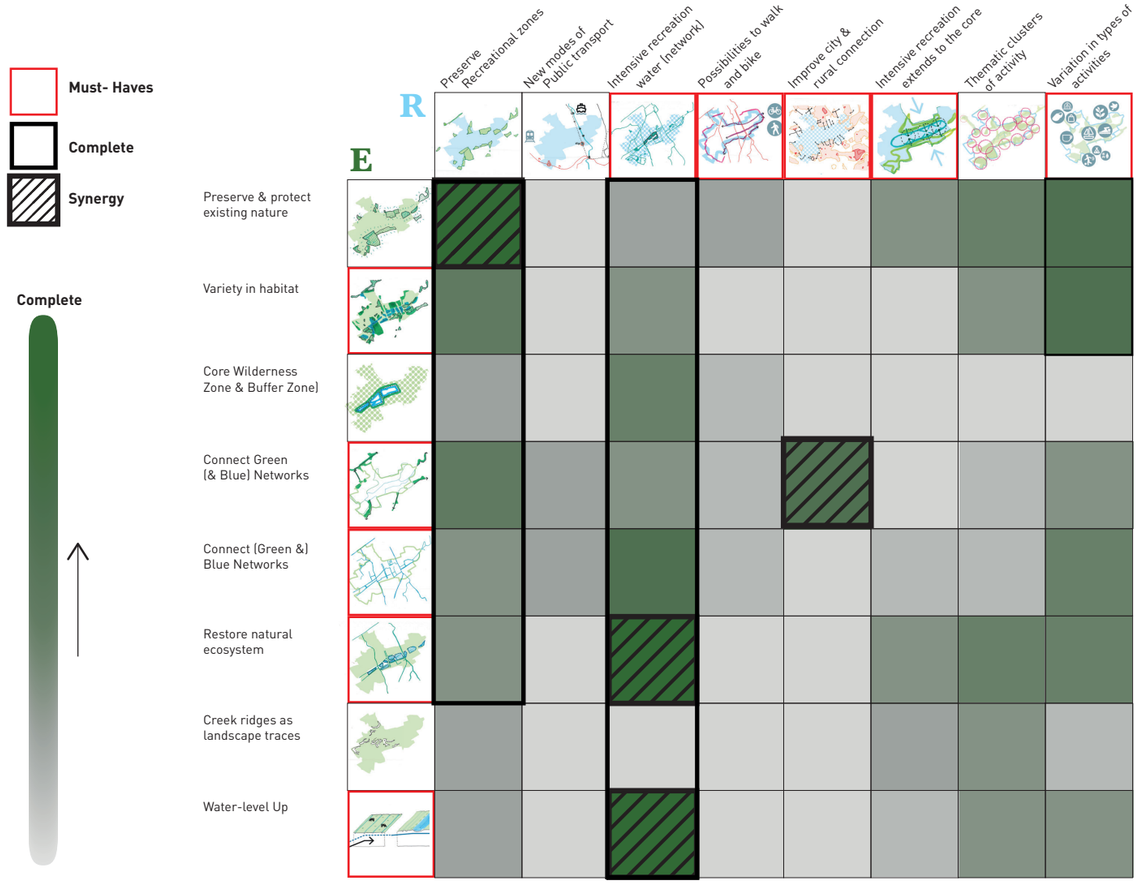
Agricultural Plots & Soil Typology, Peat Soils Made by Author.
(QGIS, 2023) (Bodemkundig Informatiesysteem (BIS) Nederland et al., n.d.).

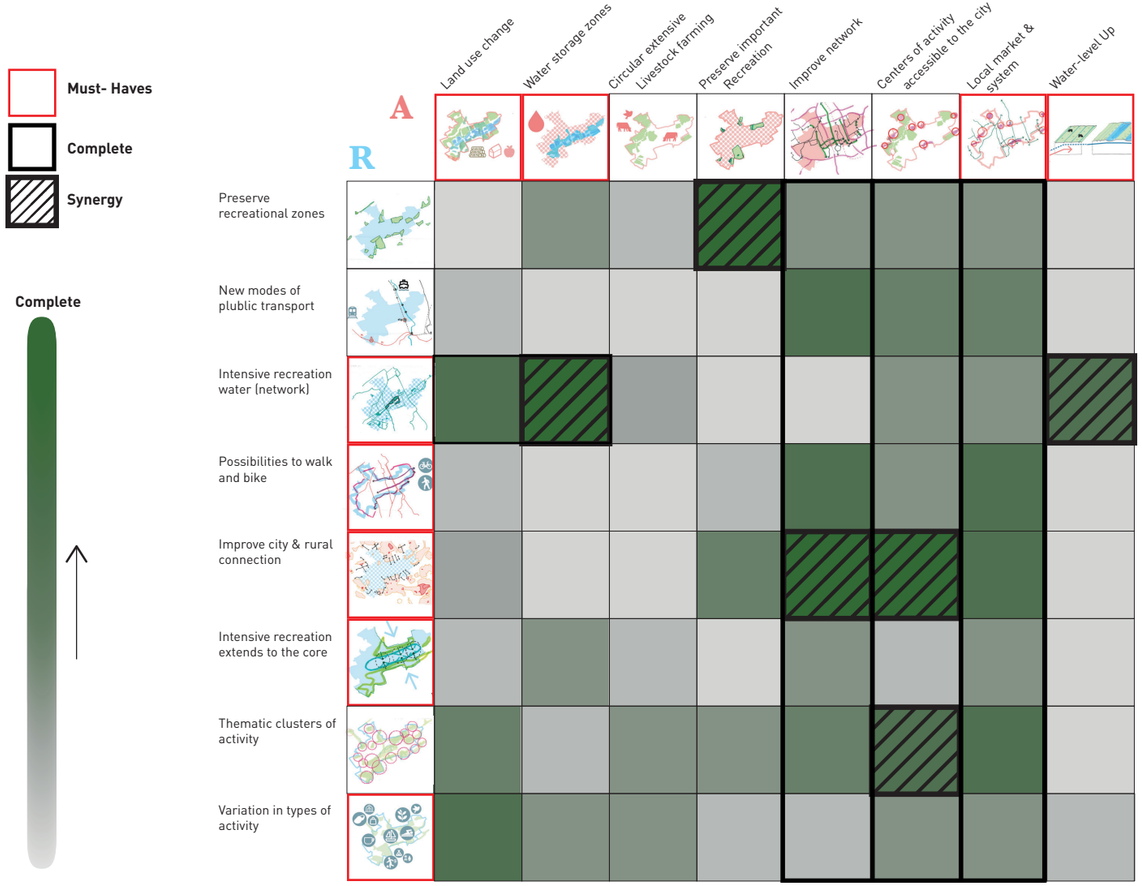


Appendix 4 - Maximization Matrix - comparing the themes






Must- Haves
Complete
Synergy
Complete
R
E
Preserve Recreational zones
New modes of Public transport
Intensive recreation water (network)
Possibilities to walk and bike
Improve city & rural connection
Intensive recreation extends to the core
Thematic clusters of activity
Variation in types of activities
Preserve & protect existing nature
Variety in habitat
Core Wilderness Zone & Buffer Zone)
Connect Green (& Blue) Networks
Connect (Green &) Blue Networks
Restore natural ecosystem
Creek ridges as landscape traces
Water-level Up


Must- Haves
Complete
Synergy
Complete
A
R
Land use change
Water storage zones
Circular extensive Livestock farming
Preserve important Recreation
Improve network
Centers of activity accessible to the city
Local market & system
Water-level Up
Preserve recreational zones
New modes of plublic transport
Intensive recreation water (network)
Possibilities to walk and bike
Improve city & rural connection
Intensive recreation extends to the core
Thematic clusters of activity
Variation in types of activity

Appendix 5 - Overview - Stakeholder Analysis

	Stakeholders: Public / Private / Civic	Interests / Central Values	Capabilities and Resources
PU11	Public Transport Companies (RET, NS)	Accessibility and accountability on public transport for everyone. NS is the passenger railway operator (trains). RET primarily operates tram, bus, and metro services in the Rotterdam-The Hague metropolitan area.	Both are owned by Het Rijk, the national government.NS: Maintenance and logistics of railway network and public transport network. Constructs new stations and connections. ProRail manages the Dutch rail infrastructure, while NS operates passenger train services on it.
PR12	Natuurmonumenten	Society for Preservation of Nature Monuments (NGO)- nature conservation Concerned with habitat fragmentation & biodiversity loss in NL	collaborates with governmental bodies, other organizations, and local communities, uses fundraisers, advocates for legal protection
PR13	Greenport West-Holland	Promoting sustainable horticulture and agriculture in the region. Aims to be the first climate-neutral Greenport in the Netherlands.	Consists of three parties - entrepreneurs, the governments and knowledge institutions - working together . a public-private partnership. Economically driven: competitivness, sustainability, and resilience
PR14	Local / conventional farmers	Economic interest for their own company, despite of natural systems	Voting / Protest, Making their voice heard through farmer's unions, initiatives, organisations
PR15	Local /organic / circular farmers	Economic interest for their own company, on the grounds of/ in harmony with natural systems	Voting /Protest , taking a role as pioneers,- Making their voice heard through farmer's unions, initiatives, organisations
PR16	Herenboeren Farming Coörporations	Local, sustainable food production, connection to the land. Each Herenboeren farm operates autonomously, but they are united by a shared commitment to sustainable agriculture and community building.	Herenboeren use the agricultural expertise, financial contributions, and labor of their members to collectively own and manage farmland
C17	Vockestaert Agricultural Nature Association	Association promoting sustainable agriculture practices while preserving and enhancing biodiversity and natural habitats.	Non-governmental organization (NGO). Vockestaert creates partnerships and funding to implement projects, advocate for policies, and provide education on sustainable farming and habitat preservation.
C18	Weidevogelpact Midden Delfland	nature conservation, collaboration compensation for A4 highway To prevent the decline of meadow bird populations in Midden-Delfland	Partnerships with farmers, provide funding, create projects, practice management of the area and actively improve biodiversity
C19	LTO Noord Delflands Groen	represent the interests of farmers Securing playing field of the farmers in MD, the recreational and heritage character could threathen their profitability	Dependend on local actors, initiate projects and try to achieve goals by influencing policy
C20	MIND Circular Farmers Network	Non-profit organization, stimulates collaboration, environmental stewardship, resource efficiency and knowledge sharing among farmers.	Consists of a network of local farmers and has the capability to financially reward contributing farmers.
C21	Aardpeer, Land Ownership Foundation	Fostering land access for small-scale farmers and promoting responsible land management. Collaborates with other foundations (Herenboeren).	Funding & partnerships. Puts in advocacy efforts to ensure fair access to farmland and encourage environmentally friendly land management.
C22	'Rotterdam de boer op' Farming engagement project	Fostering nature-inclusive agriculture and sustainable food chains. Links Rotterdam with the surrounding rural areas, focus on citizen engagement.	An non-profit, collaborative project supported by a private investor (Postcode Loterij) Organize activities, workshops, events and educational programs to raise awareness about sustainable food production.
C23	Puuur Midden-Delfland Local marketing organization	Promote BPL Midden-Delfland as a recreational destination Community, Sustainability, Quality, Connection, Authenticity	Founded by agricultural entrepreneurs (dairy farmers), local (food) producers and tourism businesses, its focus is on showcasing what the area has to offer, through leveraging partnerships, marketing , and community engagement.
C24	Activists / Environmental Movements	environmental protection, sustainability, social justice, and community empowerment Examples: Greenpeace, Extinction Rebellion	Resources in organizing, advocacy, and mobilization of public support for environmental causes. volunteer networks, expertise in campaign strategies, and access to media platforms, raise awareness, influence policy
C25	Citizens / Consumers	Interst in Midden-Delfland: mostly recreation, buyers of local agricultural products Lack of green space in their approximate environment (city), need for recreation	Making their voice heard through unions, initiatives, organisations, voting, protests
C26	TU Delft, WUR, Erasmus	Education	Scientific knowledge and skills to educate certain people on a variaty of topics
C27	Nature & Non-Human Life	Biodiversity, Conservation, Ecosystem Health	Functioning of natural habitats, genetic diversity, and ecological resilience, critical for sustaining life and supporting ecosystems. (represents the broader interests of nature and non-human life).
PR28	Supermarkets (like Ahold)	Economic interest, active in the food sector	Influence on costumer behaviour & choices for biological products control low-food prices for farmers' production.