

The background of the cover is a painterly landscape painting. It depicts a rural scene with a body of water in the foreground where three cows are standing. A person is visible on the left side of the water. The background shows rolling hills and a few trees under a vast, cloudy sky. The painting style is soft and textured, with visible brushstrokes.

Northern Campine Regained

Creating a regenerative strategy

Wouter Daantje Benjamin Nouwens | Metropolitan Ecologies of Place | P5 Report

Master Thesis-P5 Report
MSc Architecture, Urbanism and Building Sciences-Track Urbanism
Faculty of Architecture and the Built Environment
Delft University of Technology

Northern Campine Regained

A regenerative strategy

Graduation Lab: Metropolitan Ecologies of Place

Author: Wouter Daantje Benjamin Nouwens

Student number: 4995201

Supervisors

First Mentor: Ulf Hackauf-Environmental Technology and Design

Second Mentor: Rodrigo Cardoso- Spatial Planning and Strategy

Copyright 2025 All rights reserved. During the making of this report references for text and figures are mentioned in the chapters and literature list are used. The remaining images are created by the author and can be used or reproduced while mentioning this report as a reference.



Bouwkunde



Abstract

The Northern Campine is experiencing depletion. Various forms of this phenomenon are already evident; natural areas are suffering due to intensive agriculture, resulting in a loss of biodiversity. Coupled with climate change, this depletion will worsen. Villages are experiencing a drain on services and a shift in population. This study seeks to develop a regional strategy centred on regenerative sustainability. Rather than focusing on a single aspect, the multiple dimensions of soil, production, society, and history are taken into account. Through spatial and policy analysis, as well as spatial and institutional imagination, the main research question, "How could regenerative sustainability counter ecological and social depletion resulting from intensive land uses and rural shrinkage in the Northern Campine region?" is addressed. Building on the regional strategy, a simulation is conducted across three stages of implementation. This simulation illustrates the various levels at which choices are made, the effects these might have on policy and design, and includes a potential framework for participation. The most significant finding concerns the implementation of regenerative sustainability. The spatial choices made in alignment with it primarily resolve spatial issues. While policy and governance matters can be addressed through spatial design and analysis, they are not entirely resolved. Nevertheless, this study investigates the possibilities arising from a focus on soil as a foundation and regenerative sustainability.

Keywords: *Regenerative Sustainability, Resilience, Depletion, Northern Campine, "Soil as Base"*



Hubert, E.J.J. (1818-1880) "Veen in de Kempén" [painting]. KMSKA



Table of Contents

Abstract p.3

Motivation p.8

1: Introduction

1.1 Northern Campine p.12

1.2 Problem Field: Depletion p.20

1.3 Problem Statement p.32

1.4 Objective and research questions p.34

2: Methodology

2.1 Aim p.38

2.2 Methodological Framework p.40

2.3 Conceptual framework p.42

3: The Campine Explored

3.1 Theory p.48

3.2 Policy p.54

3.3 Spatial p.60

3.4 Diachronic p.97

3.5 Conclusion p.108

4: Scenario Analysis

4.1 Scenarios p.114

4.2 Institutional and
Spatial Imagination p.120

4.3 Assessment p.136

5: Building the Regerative Northern Campine

5.1	How to get there	p.142
5.2	National Trends	p.144
5.3	Regional Strategy	p.148
5.4	X-Curves	p.164
5.5	Local Casus	p.166
5.6	Simulation	p.172
5.7	Summary	p.196

6: Evaluation

6.1	Conclusion	p.200
6.2	Discussion	p.204
6.3	Reflection	p.206

7: References and Appendices

Motivation

Growing up in different countries, national borders could be felt clearly. Crossing them was often a lengthy bureaucratic process. Nevertheless, the actual effects of the borders on populations felt minimal. People traversed it daily for work, family, trade, and other activities. Moving to Europe, crossing borders was trivial due to the Schengen Agreement. However, the social situation was the reverse of my previous experiences. While crossing between Rwanda and Uganda, or Ghana and Burkina Faso, took up to several hours, changes felt minimal. The border felt harsher in Meerle, a village between Belgium and the Netherlands. Even though it was a soft border only marked by a tree line here, a small path there, or sometimes even small ditches and creeks, the economic and social differences felt immense. While villages such as Ulvenhout and Chaam were a short bike ride away, we felt obligated to travel to Hoogstraten or beyond by car to go shopping or partake in social activities.

The period I spent in Meerle laid bare some glaring issues with rural areas. While it was a place for young children to explore forests, heaths, bogs, and creeks on both sides of the border, the region lost its shine after a while. Secondary schools were at least 15km away, and a lack of public transportation meant long cycles were necessary in all weather conditions. Shopping became a chore on its own, with the small number of shops that were present closing down further. Even the forests, heaths, and fields became poorer in condition or closed off to visitors. Small farms shut down and were replaced by large industrial-sized ones where

cattle or poultry stayed inside most of the year. The fields that grew various crops and fruits were replaced by maize, resulting in the loss of expansive views in the summer as the maize grew high all around you.

After we had left the village and the region for the nearby city of Breda, the need to return to it daily almost disappeared. The only reason we returned now and then was to visit our grandmother. Even though it was only 30 kilometres away, the drive there often seemed more than 60 kilometres due to the traffic and monotonous landscape along the main roads. With my relocation to Eindhoven and later Delft for studies, I barely return to the region. Only when driving through it to get somewhere else do I realise how poorly the area is set up for climate and socio-economic challenges. While not fully being from the region, I did spend formative years of my life here and know how interconnected the many villages and towns are and how their culture is differs slightly from the rest of the Netherlands and Belgium.

My motivation to explore this region concerns the ecological, social, and economic depletion occurring and how implementing new systems could improve resilience and connections. Instead of viewing rural areas as places providing for larger urban cores, local communities and their needs should be placed first, allowing more resilience and allowing basic and regional needs to be on par with their urban neighbours

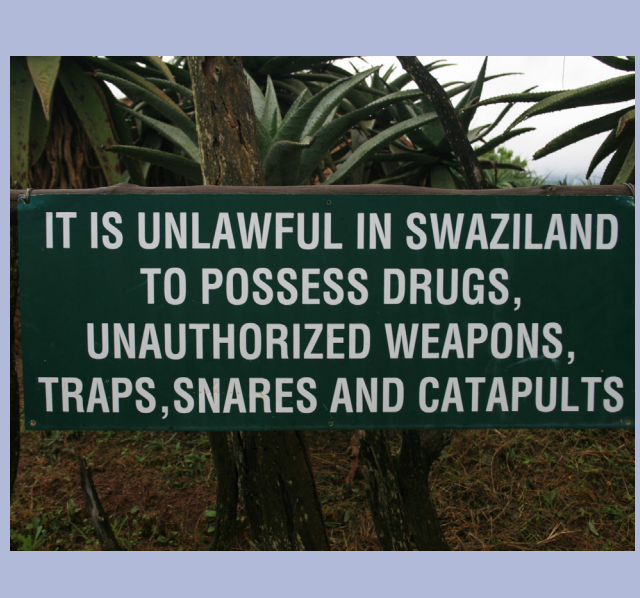
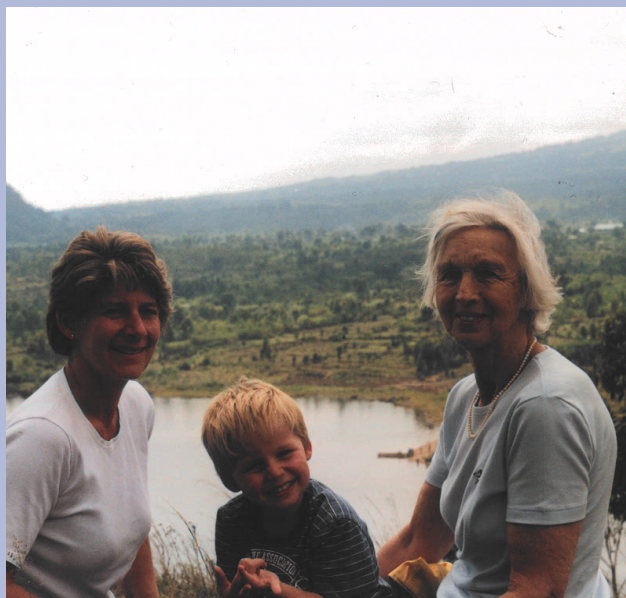


Image 0.1: Collection of family pictures



Smits, J. (1855-1928) "View in the Campine with a plank bridge" [painting]. KMSKA



1

Introduction

1.1 Northern Campine

1.2 Depletion

Production landscapes

Nitrogen Inaction

Rural shrinkage

Policy rift

1.3 Problem analysis: Northern Campine in decline

Nitrogen and climatic changes

Social depletion

Alternative systems

1.4 Problem statement

1.5 Objective and research questions

1.1 Northern Campine

Between Antwerp and Breda and west of Eindhoven, a prominent sandy ridge divides the river valleys of Flanders from the polders and delta of the Netherlands. Millennia of wind and water erosion have created a landscape previously covered by barren dunes, creek valleys, and peat marshes. In past centuries, human activity has allowed this mix of landscapes to be increasingly productive and accessible to humans by planting extensive forests and adding nutrients into the soil. A mix of natural and cultural landscapes characterises the current landscapes of the Northern Campine. Villages and industrial sites provide housing and work for many. Large fields connect the region between the natural areas and villages, providing expansive vistas at times. The presence of humans, in some places going back to early Vikings, has also created a region with an ever-so-slightly different culture. Flower Corsos, Carnaval, Holy Blood Processions and other activities have made it to national and international heritage lists (Kenniscentrum Immatériel Erfgoed Nederland, n.d.; Werkplaats immatérieel erfgoed, n.d.).

Nevertheless, the region is at a fork in the road. Intensive land uses affect the quality of soil, water, and nature. A decline in social cohesion and services poses challenges for the coming years. Climate change further strains the demand and use of land with increasing droughts and periods of rain (Klimaat-effectatlas, 2024). This thesis will look at how the current system of land use has depleted the Northern Campine. A regional strategy that spans both sides of the border will be devel-

oped to address these issues. Using regenerative design and cross-border cooperation, the strategy will make the Northern Campine resilient to changes and return it to a state of natural, social, and cultural vitality.

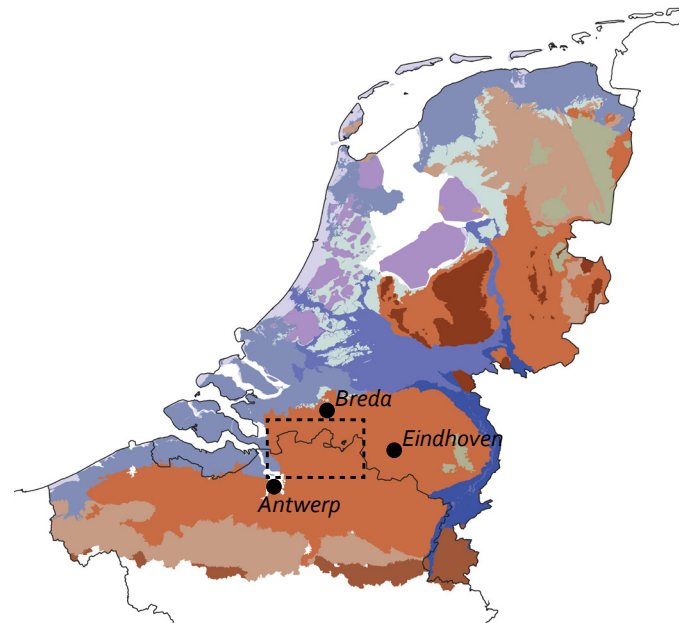


Image 1.1: Soil Typologies Flanders and the Netherlands (Modified from (DINOloket, 2021) and (DOV, 2024))

- Push Moraine
- Löss and Hills
- Sand
- Loam
- High peat
- Low peat
- Dunes
- Reclamations
- Sea Clay
- River Clay
- River Clay (terraces)

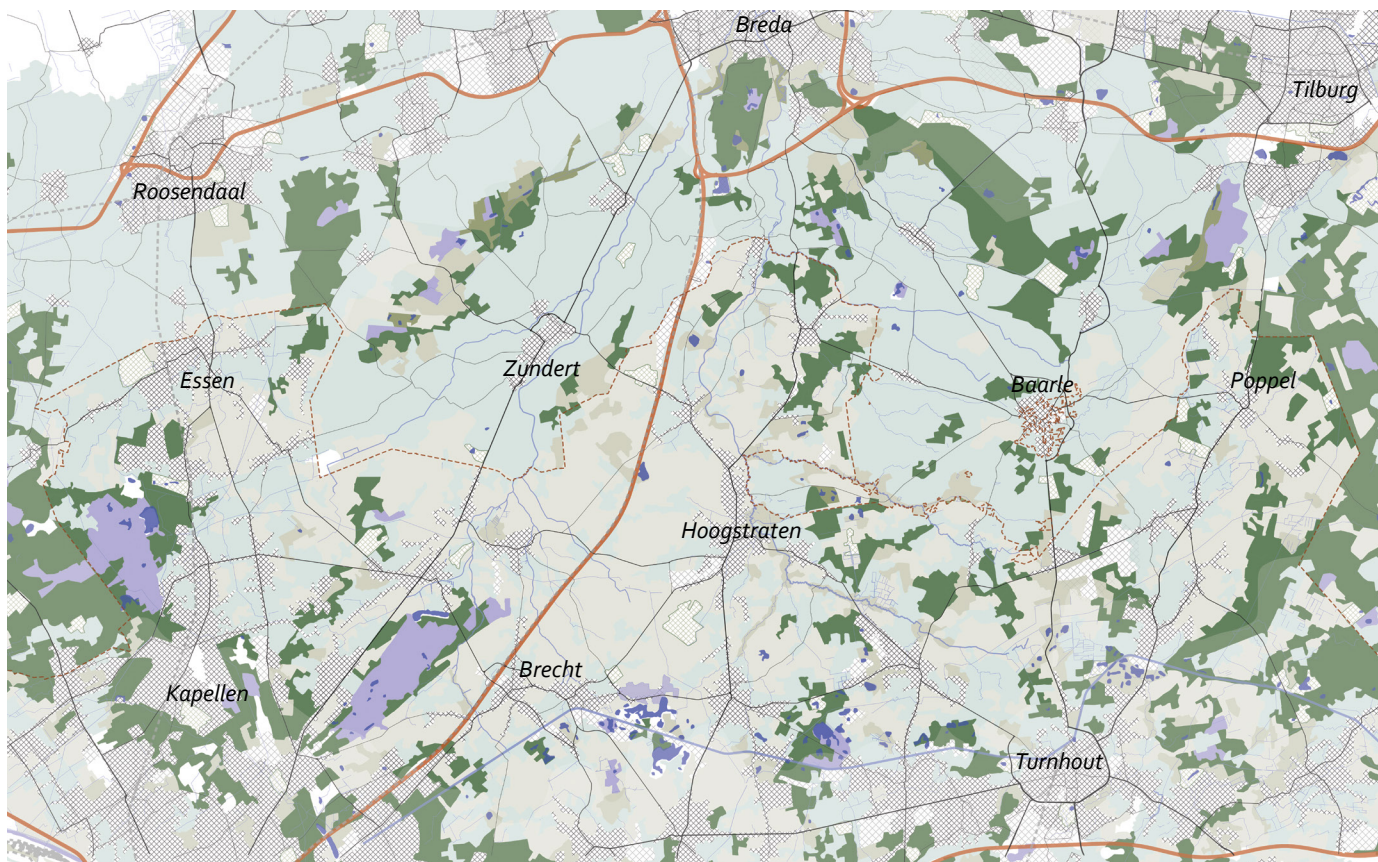
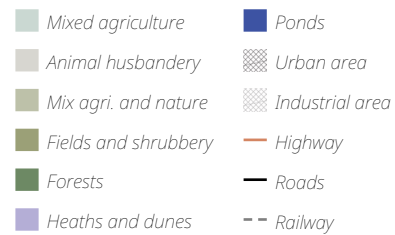


Image 1.2: Northern Campine illustrating the border, land uses and primary towns

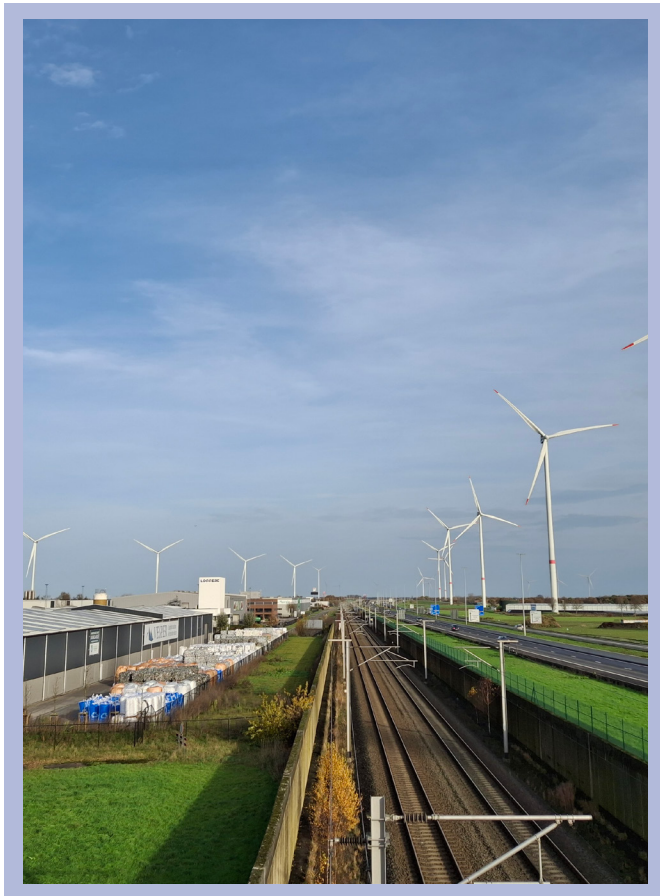


0km 5km 10km



1.1 Northern Campine

What does one see when travelling through the Northern Campine? A brief photo essay shows the region through three main themes. Nature attempts to show the state of biodiversity and quality of natural areas; society explores the culture and state of villages, while the economy looks at the spatial presence of production. The aim is to derive observations concerning challenges and opportunities in the region.



Industrial landscapes focused on passing through and export



Large scale horticulture on concrete and in glasshouses



Hidden corridor of traditional cultural landscape



Deterioration of soil means less diversity in flora



Energy production along open fields

Northern Campine



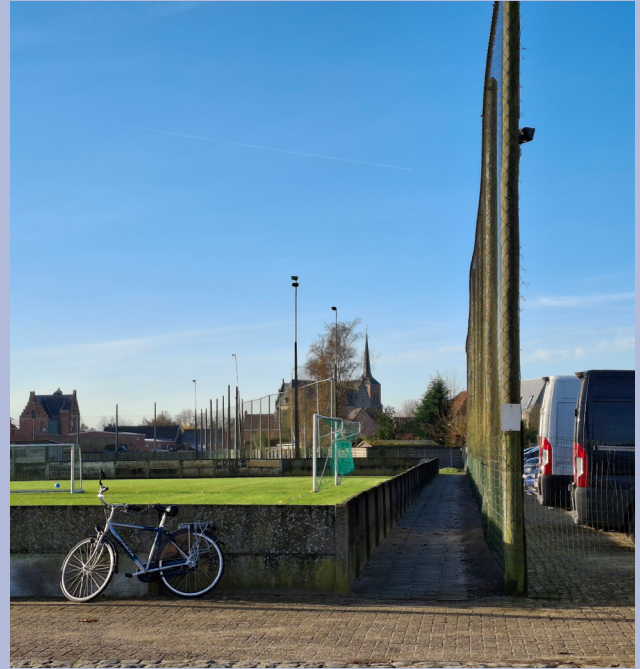
Main streets in villages often empty of stores or inviting public space



Creeks and rivers canalised for water management



Monotonous agricultural fields



Sportsfields accessed primarily by car/van



Semi abandoned halls used for storage and parking



Agro-industry next to natural sites



Abandoned farms dot the landscape



Large parking on central village squares



Canalised creeks form the bulk of natural and leisure areas



Paths crossing large empty fields. During growing season most are maize



Intensive bovine farming replacing fields and pastures



Local culture of shrines for travel/orientation



Expansive vistas between growth seasons

1.1 Northern Campine

Observations | The variation of natural areas from forests, creek valleys to heaths and marshes contrasts with the large, sometimes industrial-scale agriculture taking place. The effects of the agricultural focus on intensive production can be seen in the region's spatial design. Instead of small-scale traditional fields lined by trees, large straight fields have replaced the hedgerows. Even more, cattle are often kept indoors in large sheds. Farmers who could not grow or compete have abandoned their farms in some cases, allowing their fields to be incorporated into larger companies. This intensification of agriculture has created a landscape dominated by open fields with large sheds (Lux et al, 2023). Dispersed within this landscape are clusters of forests and creek valleys. While these look natural, most have been adapted to suit human needs. Furthermore, emissions from agriculture have led to soil degradation, resulting in high acidity. This, in turn, results in a decrease in plants that can grow there, limiting overall biodiversity (RIVM,n.d; Bloot et al., 2025). Villages in the region have a clear divide. Some villages act as regional hubs with stores and other services present. Nevertheless, the majority of villages lack basic services. This requires people to move around daily. What is visible is that this need is fulfilled by the automobile. As a result, many public spaces in villages are taken up by personal vehicles. The combined lack of services and public spaces centred around the automobile creates uninviting village cores that people only pass through. Within this space for automobiles, there are some traces of pre-automobile spaces. Street

corners with small chapels and some small green spaces around them are scattered throughout the region, providing some space for pedestrians and cyclists to rest or orient themselves.

1.2 Problem Field: Depletion

From the observations, a conclusion can be made that the region is undergoing changes. Agriculture is intensifying, nature is deteriorating, and villages are under strain due to a lack of services and stagnant population. These changes can be attributed to various forms of depletion. Depletion concerns the decrease of resources and quality of soil and water (Cambridge Dictionary, 2025). Depletion can also extend to social processes of rural shrinkage (Veiko & Veema, 2017). These forms of depletion are present within the Northern Campine; agriculture depletes soil and water quality, biodiversity and natural areas are depleted in quality, and villages face depletion through loss of services. The presence of the national border strains how the various forms of depletion are resolved. Natural, social, and some other forms of depletion will be introduced in this section as a problem field. These forms of depletion are not entirely separate but can be framed as the result of the development of the Northern Campine as a production landscape.

Agriculture and Nitrogen I The continuing intensification of agriculture in the region strains natural and spatial systems. Growing demand for agricultural products results in an increase in land use and the use of chemicals to increase production. Agricultural companies are becoming larger with the increasing size of fields and buildings (Lux et al., 2023). This increase in agricultural production and use of land strains natural systems through the emission of nitrogen-based pollutants (RIVM, n.d.). In recent years, the effects of nitrogen-based pollutants on soil and nature have been researched

and widely reported on in the Netherlands. Nevertheless, there is currently an impasse between policy and action within the Netherlands. This cascades to many fields. Not only does nature deteriorate, water and soil quality rapidly decline, infrastructure and housing projects are also put on hold, and farmers and conservationists alike are doubtful about what they can do. This results from a lack of responsibility and action to lower emissions to European and Dutch governments' agreed-upon levels (Remkes, 2022). However, this dilemma is not only present in the Netherlands. Just across the border in Belgium, the same issue is occurring. Having seen the social and political upheaval inaction has led to in the Netherlands between 2019 and 2021, the Belgian and Flemish governments are trying to avoid the mistakes made by their Dutch counterparts. Policies such as the "Stikstof decreet" aim to give more insight on how to move forward and emit less nitrogen, ammonia and other nitrogen-based pollutants. However, like the Netherlands. It is unclear for stakeholders, mainly farmers, what they themselves must or could do. Do they have to switch to alternative systems of agriculture? Are all farmers or only younger generations supposed to adapt (Rozendaal, 2024)? There is, both in the Netherlands and Belgium, a need for clarity from governments towards people involved in the actual effects and goals. Otherwise, the effects of nitrogen will only worsen, not only on nature but also on projects concerning broader society, such as housing and infrastructure.

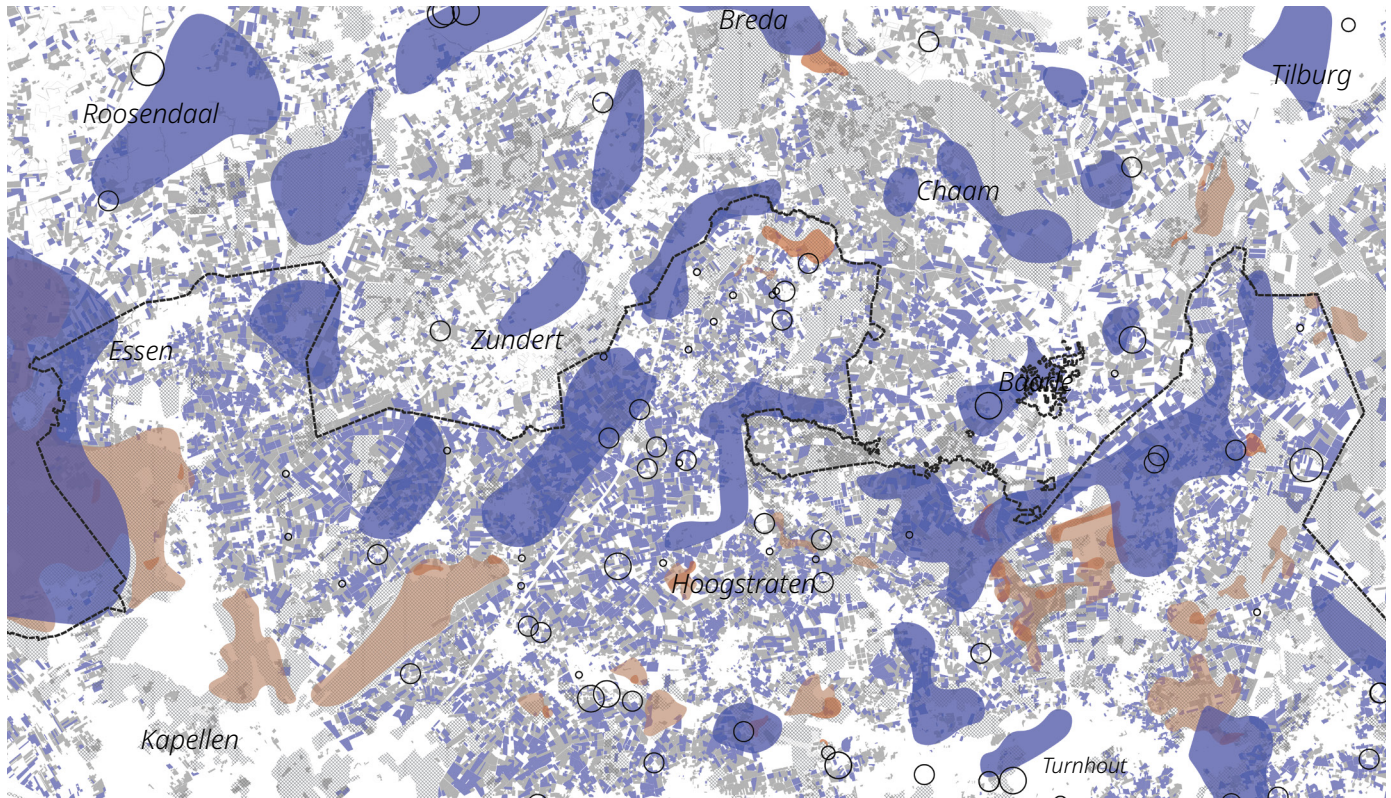
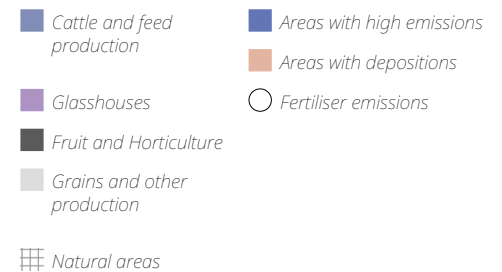


Image 1.3: Nitrogen based fertilisers use in the Northern Campine (After VLOPS and Klimaateffectenatlas)



1.2 Problem Field: Depletion

Cross Border rift | The depletion of natural, soil, and water quality is not the only area in policies that lack connection and clarity. National policies and letters such as “Water en bodem sturend” state a goal of lowering nitrogen, but also the aim to create a sustainable and healthy soil and water system. Additionally, national reports also state to place functions that are logical to avoid pollution or other frictions (Remkes et al., 2020). However, the aim of the national government cannot always coincide with what local governments want or even with other national governments. An instance of this is a situation where the government across the border in Belgium allows the construction of a polluting factory near the border. The only thing the local governments can do is start legal procedures. This can drag on for a long while (Bosma, 2024). Instead of having such a situation, governments across borders should work together when setting up plans that affect both sides of the border. Especially in a period where countries are looking to reinstate the borders resulting from several crises, it becomes important to look at solutions to keep the cross-border exchange, at various scales, intact (Decoville, Durand, 2017).

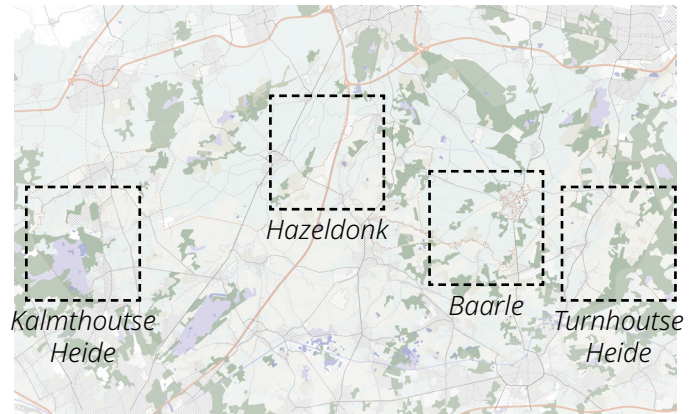


Image 1.4: Location with policy rifts along the Dutch-Belgian border

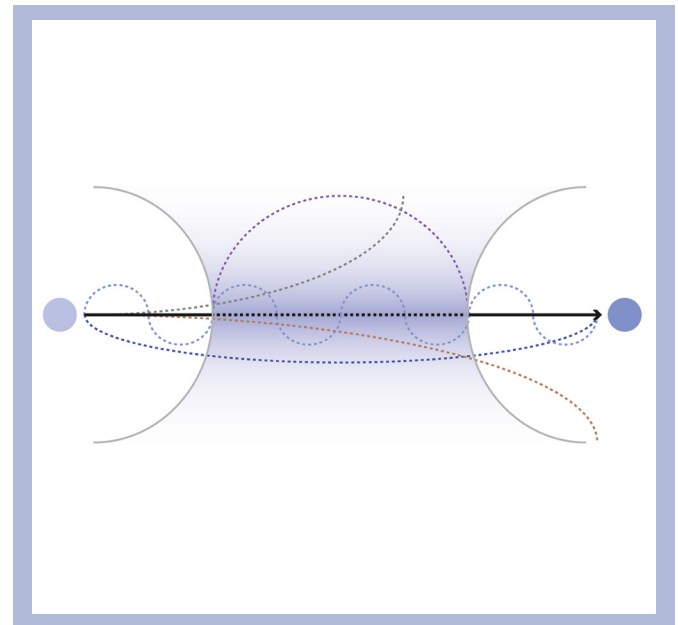
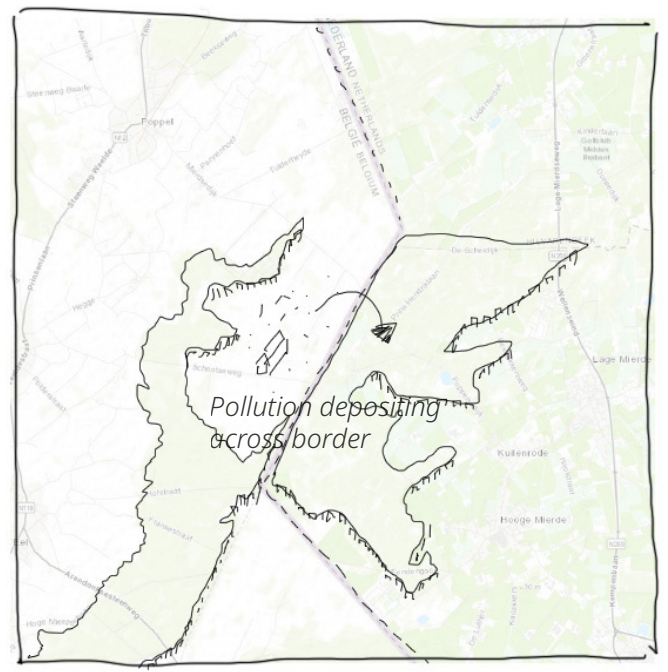
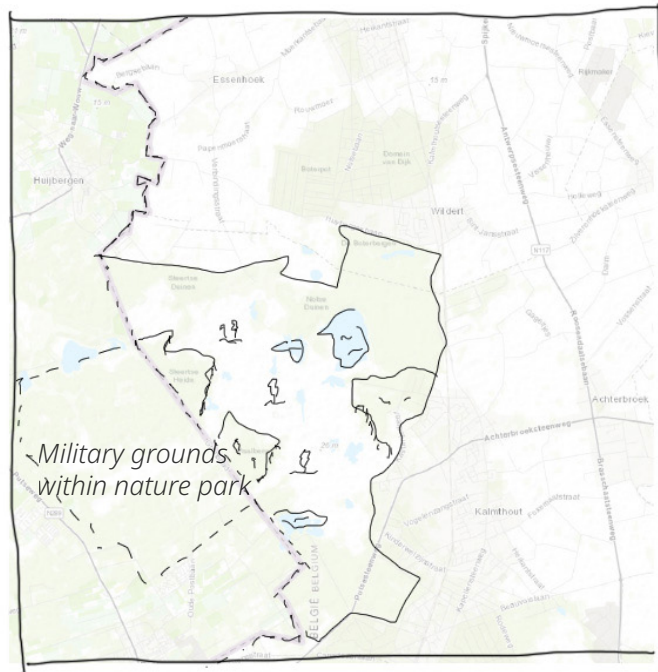
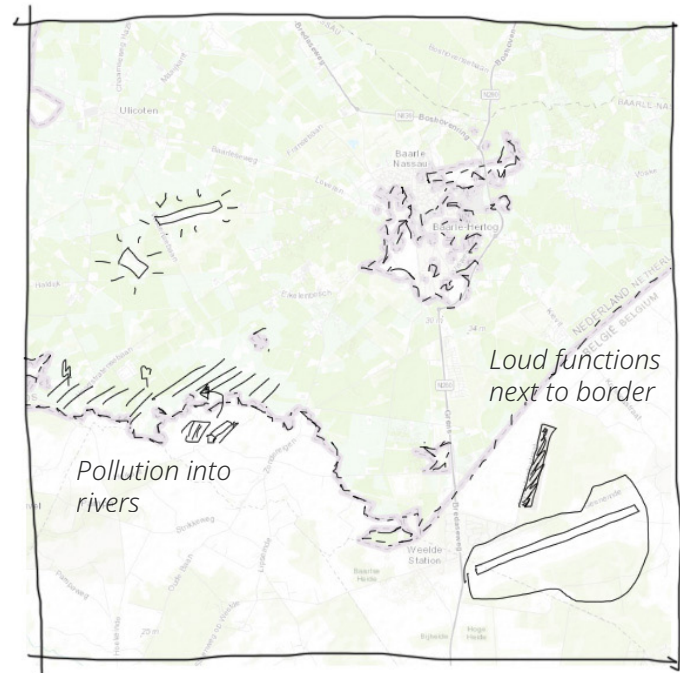
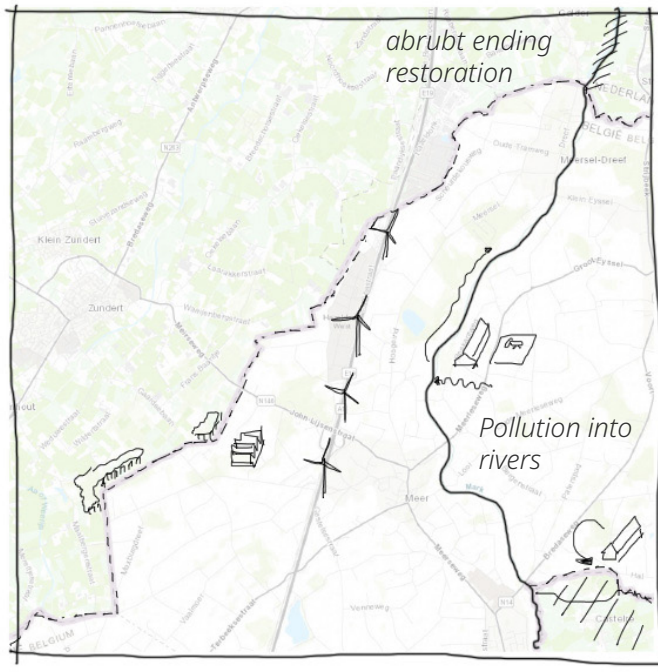


Image 1.5: Policy rift (After EEA, 2024)

Image 1.6: cross border conflicts resulting from policy rift



1.2 Problem Field: Depletion

Rural Shrinkage I Aside from the ecological depletion resulting from nitrogen emissions and depositions, the region also suffers from social depletion. As shown in the photo essay, village cores are suffering from a lack of services. This, combined with the lack of public transportation, results in a car-centric public space as services are in one village or several over. This form of depletion can be explained through rural shrinkage. Rural shrinkage is not as clear-cut as other forms of depletion. There are two types of rural shrinkage. The first is simple rural shrinkage. Here, it is primarily seen as a process of decreasing population within a single generation (Grasland et al., 2008). The second definition of rural shrinkage sees it as a complex process of socio-economic shifts. Advances in technology result in less demand for workers; demand for higher education can lead to younger people moving out of a region; and political or economic crises can affect the state of rural regions, leading to residents moving away to regions with more opportunities, often urban areas (Veiko & Veema, 2017). Political choices resulting in the closure of services such as medical facilities, education, or public transportation can create a vicious cycle where the population decreases, resulting in even further austerity and a decrease in the population (Copus et al., 2020). The form of rural shrinkage used for this thesis is the complex variant. This is due to the connection of the villages with the local economy and the state of services, as seen in the photo essay.



Image 1.7: Examples of Rural shrinkage

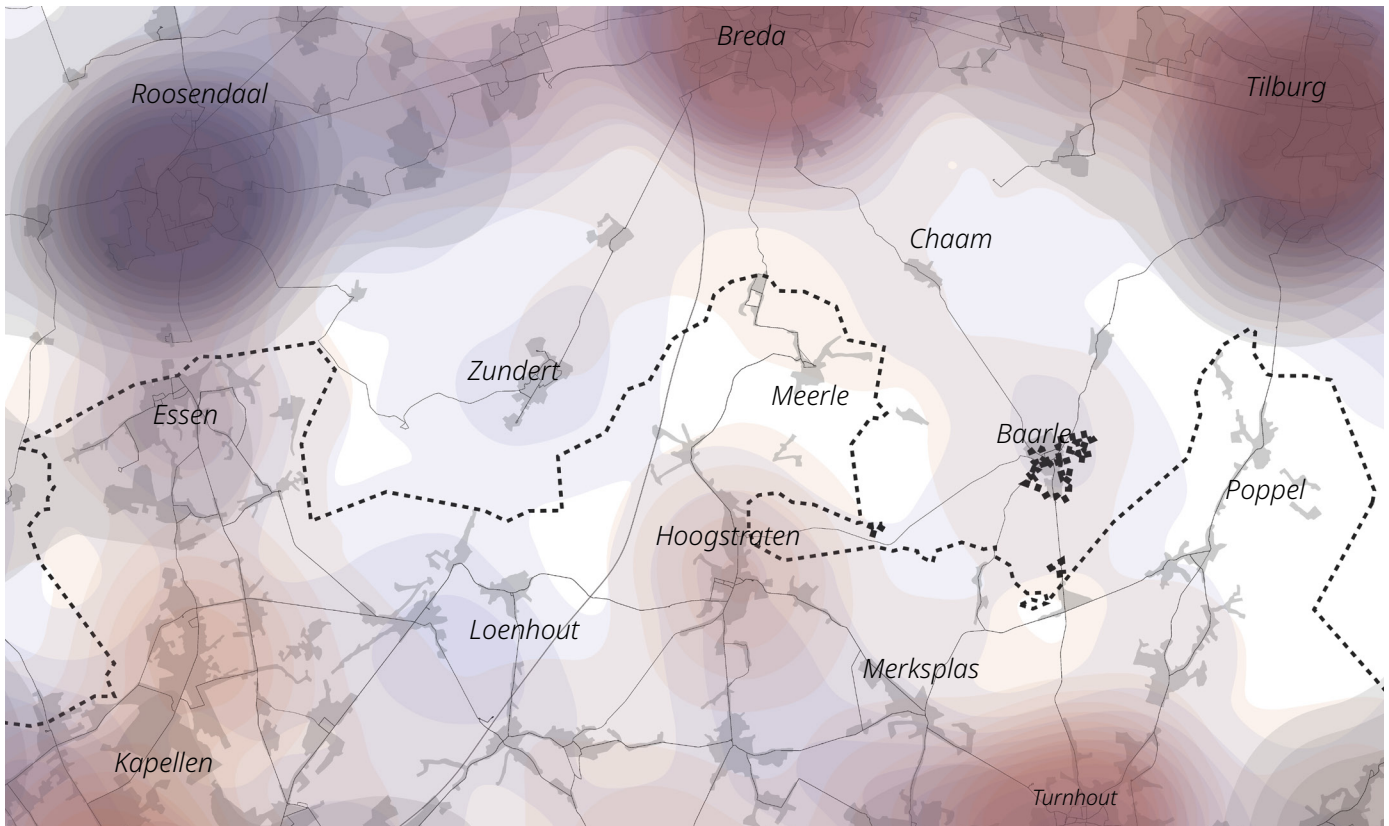


Image 1.8: Heat map of various services (Schools, Shops and Healthcare and buslines) (After CBS and OSM)

From the heatmap above it is visible that the villages along the border have the least amount of services available. The highest concentration of services, mainly healthcare (black), are all situated on the edge in the larger cities in the Netherlands and Belgium. Shops (blue) and education (orange) are present in low quantities throughout the region.



1.2 Problem Field: Depletion

Production Landscapes I The forms of depletion mentioned in this section are connected to each other to some extent. The agricultural intensification results in a decrease in labour demand resulting in a decrease in population, spurring simple rural shrinkage. Political choices resulting in a loss of services increase the population decline as people move away to get closer to services important for them such as education, healthcare or shops. This shifts the simple rural shrinkage to the more complex variant affecting both society and economy. As mentioned before, the agricultural intensification also affects the ecological system through increased emissions of nitrate-based pollutants (RIVM,n.d.). The way depletion is connected can be explained through the creation of the economic and spatial system of production landscapes. Instead of viewing urban and rural areas as opposed to each other, production landscapes link the two together. Non-urban or peri-urban areas are seen as the drivers of urbanisation. The rapid postwar urbanisation resulted in large scale expansion of hinterlands, areas that sustain an urban core. Instead of providing a single urban core with multiple services and products, hinterlands have grown increasingly specialised and disconnected to their original urban cores. Instead, hinterlands nowadays produce for many cores, at a global scale (Brenner and Katsikis, 2020). To increase productivity of such a hinterland, technological advancements are implemented at large scales. Additional capital investment increases the ecological surplus while also extending the reach of a hinterland. The resulting landscape consists of

intensive production for cores that are often disconnected entirely from the production landscape. Local needs and natural systems are neglected in such as landscape as focus lies on production and extraction for export (Moore, 2015). Development is neither urban nor rural as functions are mixed and highly specialised. Production extends beyond agricultural or industrial zones as nature is also seen as areas of production through leisure or ecological services such as carbon capture (Brenner and Katsikis, 2020).

This focus on landscape as production through increasing technological advancements links to the idea of rural shrinkage as described by Grasland et al. (2008). Additionally, the presence of a national border means there are different goals and policies for such a landscape. Focus on growth can further entrench the production landscape as it is seen as the only means to achieve growth. However, while a production landscape does result in economic growth at first, natural limits cannot be extended constantly. At one point, the limits are reached, no matter how much investment is made. After such as peak, production might decrease resulting in less demand for labour. In such a state of decline, infrastructure and large-scale production might shift to other focusses or leave the region entirely, resulting in a depletion of local economy, further worsening the depletion of a region (Moore, 2015)

Large scale energy production



agricultural processing



Cattle grazing



Industrial sized sheds



Image 1.9: Characteristics of Production Landscapes in the Northern Campine

1.2 Problem Field: Depletion

Climatic change I Due to climate change, the Netherlands and Belgium are faced with challenges. While most of the Netherlands and the Flemish valley face increased flooding risk, the Northern Campine, like other sandy soils and ridges, faces different issues. The higher elevation and composition of primarily sandy soils means the region is more prone to groundwater fluctuations. By 2050, some areas will experience an overall decrease in the groundwater level while others will become wetter. This shift also affects the possibility of natural fires and the level of biodiversity. Plants that root closer to the surface will be increasingly unable to attain sufficient water, leading to plant death. Plants that root deeper might get within the groundwater level more often, resulting in more root rot. With more extended and drier periods, natural fires increase, affecting not only nature but also the livability of villages near natural areas. Additionally, longer droughts and lower groundwater levels will also affect the productivity of the land. Not only will crops dry up, but periods of higher water levels, followed by droughts, will also affect the root system of plants, possibly leading to rotting, similar to the natural areas (Klimaateffectatlas, 2024). Overall, the region is undergoing a shift where local issues such as drought will become more widespread and affect both nature and human activities. The main issue arises whether large-scale production will still be possible with decreasing water certainty.

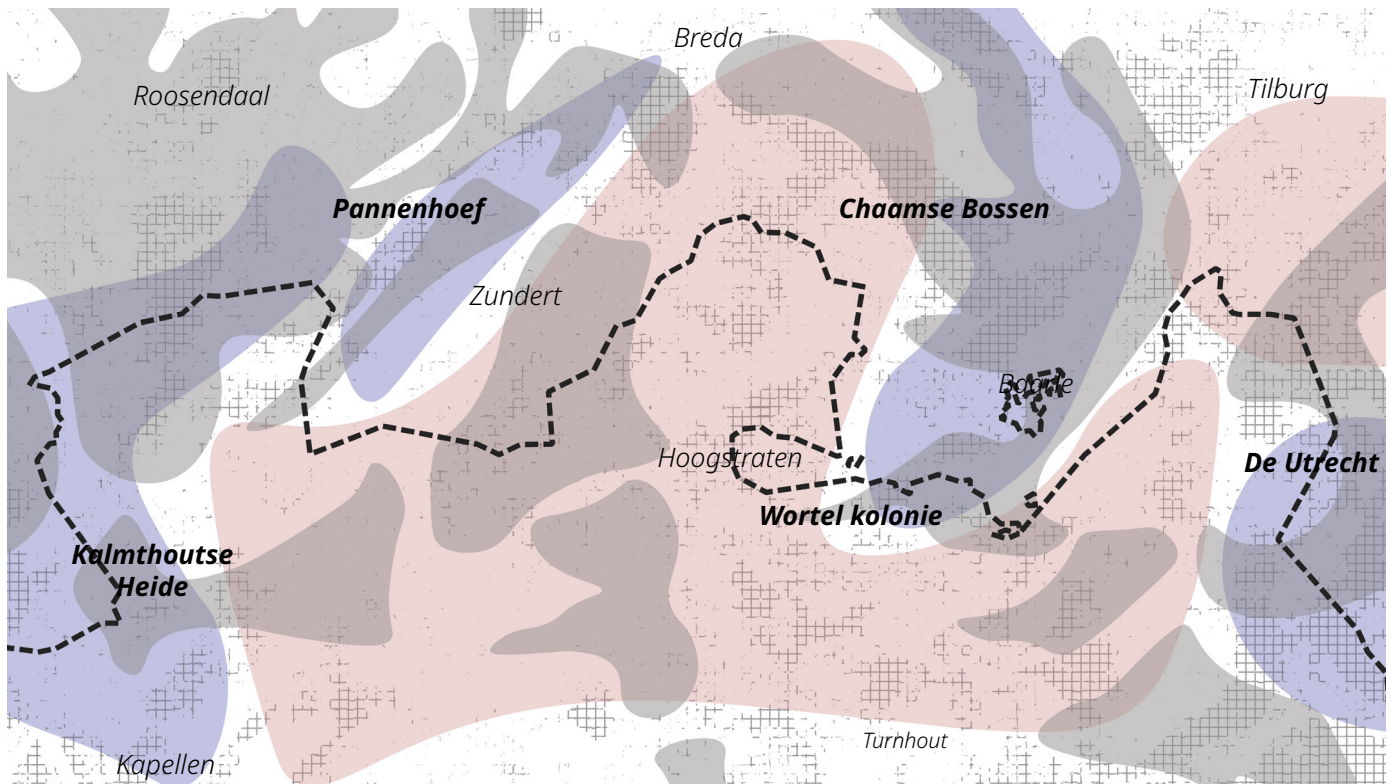


Image 1.10: Climatic challenges Northern Campine (After VLOPS and Klimaateffect-enatlas)

- lowest groundwater level +10> cm 2050
- lowest groundwater level -10> cm 2050
- Drought stress farming
- Natural areas

0km 5km 10km



1.2 Problem Field: Depletion

Alternative systems The natural, ecological, and social depletion of the Northern Campine can be attributed to the creation of a production landscape within the area. Intensification of land-use has resulted in nitrate emissions affecting the state of natural areas, rural shrinkage, and social depletion, which can be seen in a lack of services and car-centric public space. However, current policy inaction results in a stalemate where the current system continues while the depletion issues are worsening (Remkes et al., 2020). Nevertheless, there are alternatives possible to combat the depletion of the Northern Campine. Instead of the linear focus on extraction and production with eventual waste (Moore, 2015), a circular system, as proposed by Raworth (2017), can already reduce waste by using it as new resources for production. This circular system attempts to stay within the natural limits of soil and water systems. Nevertheless, there are some issues. The primary issue is the continued focus on growth. As current views see the urban cores as drivers for growth, a circular system can further deepen the urban-peripheral divide (Corvellec et al., 2022). A system that can expand on where circularity lacks is that of regenerative sustainability. This idea, consisting of multiple sub-elements, aims, like circularity, to create a system where flows are cyclical at the sources, consumption and sinks. It not only means extraction, but also actively returning resources to the earth (Lyle, 1999). Regenerative sustainability can thus be a departure from sustainability to a more systemic change of processes to not only stay within the bounds of natural resources

but also return and mend what has been lost (Gibbons, 2020). The implementation of such an alternative system will also demand a change in policy. Especially in a cross-border region, combining the two sides of the border in a clear vision will be necessary. To achieve this, the system of cross-border cooperation will be explored and implemented.

1.3 Problem Statement

In the past years, the effects of nitrogen emissions and depositions on nature and soil quality have become more apparent. Large-scale intensive farming, mainly livestock farming, and increasing livestock have resulted in a stagnation and even decline in nature improvement (CLO, 2024). Paired with the constant effort to increase ecological surplus through fertilisers and other forms of intensive farming, soil depletion, ecological degradation, and rural shrinkage of production areas can pose a risk to the viability of such a region (Moore, 2015). Especially in regions characterised by low-density urban development and infrastructure aimed at urban growth of neighbouring cores, these issues are visible as existing methods of planning trying to be implemented are centred around the idea of the urban core (Wandl, 2019).

With the climate becoming more extreme in droughts and periods of rain, it becomes more important to look at new, more sustainable ways of production and extraction (Buckton et al, 2023). For this, water and soil need to form the base to ensure sufficient water of good quality and adequate soil quality to allow farming, water storage and climate adaptation in future years (Harbers, Heijnen, 2022). Furthermore, population developments result in shifting amenities and mobility needs, which are currently not addressed adequately (Provincie Brabant, 2022). Especially in a border region, different use of land and provision of amenities can lead to a paradox where amenities such as healthcare are nearby but inaccessible due to being across the border. Research needs to be done on how regenerative sustainability can tackle both ecological and social issues of a production landscape along a border region, incorporating both sides as one singular landscape.

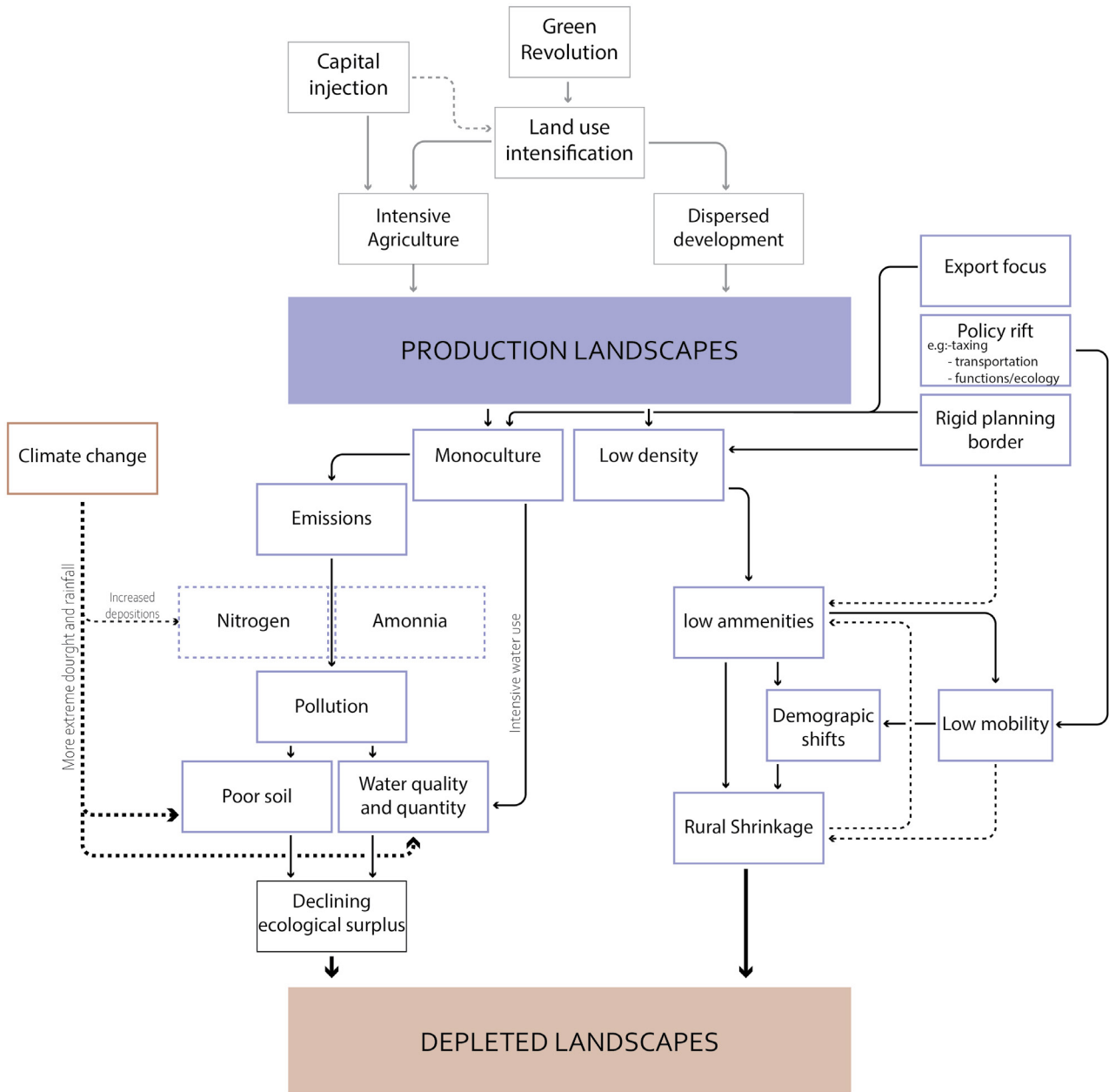


Image 1.11: Problem framework showing the development and effect of production landscapes

1.4 Objective and research questions

This thesis aims to develop a spatial strategy to tackle the various forms of depletion in the Northern Campine. Current plans tend not to combine various themes such as nitrogen, water depletion and rural shrinkage. Alternative systems of rural resilience, regenerative sustainability and accessibility create a shift away from this depletion. Furthermore, as the issues are not limited to national borders, a clear policy framework must be established where **cross-border actors** are considered. By creating a strategy that looks past depletion and a production landscape and tries to create sustainable village cores and agriculture, this thesis fills a gap created by current policies: the spatial translation of nitrogen goals and new housing in depleting rural regions. Alternative systems of **regenerative sustainability** are proposed to look not only at agriculture but also at mobility and other services needed to combat rural shrinkage. Most importantly, the outcome must show that it is a **desirable strategy**.

To achieve the goal of this thesis, a research question will be answered. This question is:

How could **regenerative sustainability** counter **ecological and social depletion** resulting from intensive **land-uses and rural shrinkage** in the Northern Campine region?

This question will be answered in the coming chapters through the use of several sub-questions. These are:

- I** How have land uses shaped the Northern Campine region ecologically, socially and spatially over time?
goal: to understand the spatial development and the resulting issues currently faced
- II** What is **Regenerative Sustainability** and which praxis can improve soil and ecological quality?
goal: to define Regenerative Sustainability and application through policies
- III** What are (spatial) planning principles for sustainable regional development?
goal: to create a policy document for regional development
- IV** Which **spatial structures** and/or conditions can be reused or introduced to combat rural deterioration?
goal: to identify spatial design tools to achieve main goal
- V** Which **scenario** works towards a regional strategy combining theoretical concepts with spatial design? -*goal: to combine policy development and spatial design to achieve a final vision.*



Wellens, J. (1889-1959), "Dunes de Limbourg" (painting), galerie desannonciades



2

Methodology

2.1 Aim

2.2 Methodological Framework

2.3 Conceptual framework

2.1 Aim

The focus of this thesis lies on the Northern Campine region between Breda and the suburbs of Antwerp. With such a large scale and various subjects as main topics, the aim is not to change a single system, such as water or agriculture. Instead, the objective is to create an integrated strategic vision that illustrates the complexity of various systems that arise when moving past a production landscape towards a more regenerative and sustainable one. This strategic vision will be created through a multi-scalar approach combining micro-scale levels of design and policy with more meso and macro scale to achieve a. The thesis combines design and planning together with environment and technology to create a final regional strategy.

Societal relevance | The relevance can be divided into two main components. Firstly, the broader communities of the Northern Campine and, secondly, the accessibility of rural villages. The second is primarily applied to elements specific to the Northern Campine but could form a base for similar border regions in Europe. This thesis is relevant to the communities in the Northern Campine as it tries to address the social depletion and lack of functions within it. The thesis does not give a final implementation. Still, it provides a strategy consisting of design and policy elements on changing living patterns and land use to provide a vital village core. Secondly, the accessibility of rural villages is relevant as increasing ageing and decreasing population results in changes in mobility (Provincie Noord Brabant, 2023). Shifting away from a profit-driven transportation model, this thesis provides a new rural transportation system aimed at increasing

accessibility. As the location qualities and elements are similar to various rural areas across Europe, the design and policy proposal could be relevant to other locations. These results in the thesis make it applicable not only to the direct Northern Campine but to other border regions, too.

Scientific Relevance | Regenerative Sustainability and Cross Border cooperation have been well documented in recent years. However, they have often remained quite theoretical. The relevance of this project within the scientific field will be as follows: Through its exploration of regenerative sustainability and cross-border cooperation, the aim is to illustrate a set of policy choices and design interventions to achieve the many goals stated by national and local governments. This project will expand on the scientific theory by providing direct design interventions through spatial design. For further research or design, combining policy aims into new policy drafts and proposals to eventually create spatial scenarios can form a guide for future research and design implementing policies into scenarios.

2.2 Methodological Framework

This framework aims to indicate the various methods used throughout the project. The research question and sub-questions show relationships between each method and the outcomes. The primary methods used are mapping, literature, and policy review to conduct various analyses. Additionally, X-curves and criteria assessment indicate the timescale at which choices occur while illustrating desirable outcomes. Different methods work together during the Design and imagination phases.

I: Literature review I This method consists of gathering, reading, and reviewing scientific articles, books, and new articles. These are summarised to conclude and review the findings. The result of this method provides an understanding of current (scientific) positions and findings and knowledge gaps. Documents are found using Google Scholar, the TU Delft repository, and news outlets.

II: Policy review I Reading policy documents on various scale levels and topics to achieve an overview of goals and strategies implemented by governments and (national) institutions. Within this method, a qualitative analysis of the documents identifies the overlapping topics and possible gaps within the various policies. The policy documents are found on governmental databases.

III: Mapping I Illustrating spatial structures and systems on maps to achieve a spatial analysis. The mapping findings are provided in a conclusion, which is shown in several synthesis maps according to various chapters. The datasets are found in various sources such as PDOK, EEA, VLOPS, and DOV.

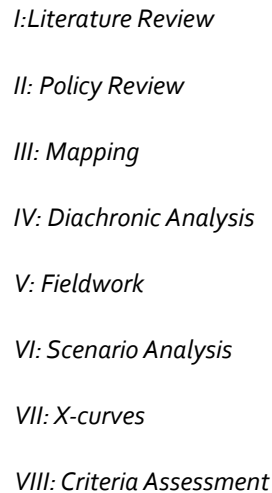
IV: Diachronic Analysis I Using historical maps, reading documents and archival texts to analyse the region's history and spatial development. The outcome provides historical context and traditional systems that were in place in the region.

V: Fieldwork I Conducting fieldwork in the region tries to provide a better understanding of the region's systems, which can be natural, social, and economic. This method expands on mapping and diachronic analysis to give more detailed spatial information about how the systems have shaped the area. Multiple moments and scales of fieldwork can provide information on the many systems addressed in the region.

VI: Scenario Analysis I Based on the outcome of various analyses, existing scenarios are analysed to view possible futures. The goal is to find a future situation that can form the base for a strategy

VII: X-curve I Illustrating the timescale in changing systems based on the concepts from the literature review.

VIII: Criteria Assessment I Establishing criteria based on analyses' conclusions to form a base for evaluation. These are based on the findings in the literature review, policy analysis, and problem field.



Methodological Framework

2.3 Conceptual Framework

Achieving the goal of this thesis is dependent on several concepts. These are described and placed within a conceptual framework. The concepts are placed within the problem framework to illustrate how the urgencies resulting from the production landscape can be resolved.

The climatic changes which result in more frequent droughts and heavy rainfall require more rural resilience. This can extend beyond natural risks to economic resilience as well. Especially in a region where demographic shifts are occurring, it is important that changes in demand and supply of specific services or activities can change with it. The system of resource extraction, economic activity and social provision must change. This system can be replaced by regenerative sustainability. Elements, such as regenerative agriculture and systems, can help restore nature through soil and water quality and decrease emissions from economic activity around farming and logistics. Additionally, regenerative sustainability extends to social systems. This is expressed through regenerative villages, which provide a vital base for villages that provide a mix of functions, activities, and housing while staying within the limits of natural production and ensuring the system can return to a productive state. Such a network of regenerative sustainability and villages in a cross-border region needs a robust mobility system to ensure accessibility.

To achieve this, together with the goals of clean and healthy water and soil, it is important to set up cross-border cooperation. Some of it would hap-

pen on more provincial and national scales, such as accessibility, while other cooperation would be on issues concerning local scales.

These concepts are linked together on certain aspects but vary in degree of influence per sector. Nevertheless, they are all necessary to achieve the goal of a regenerative production landscape in the Northern Campine.

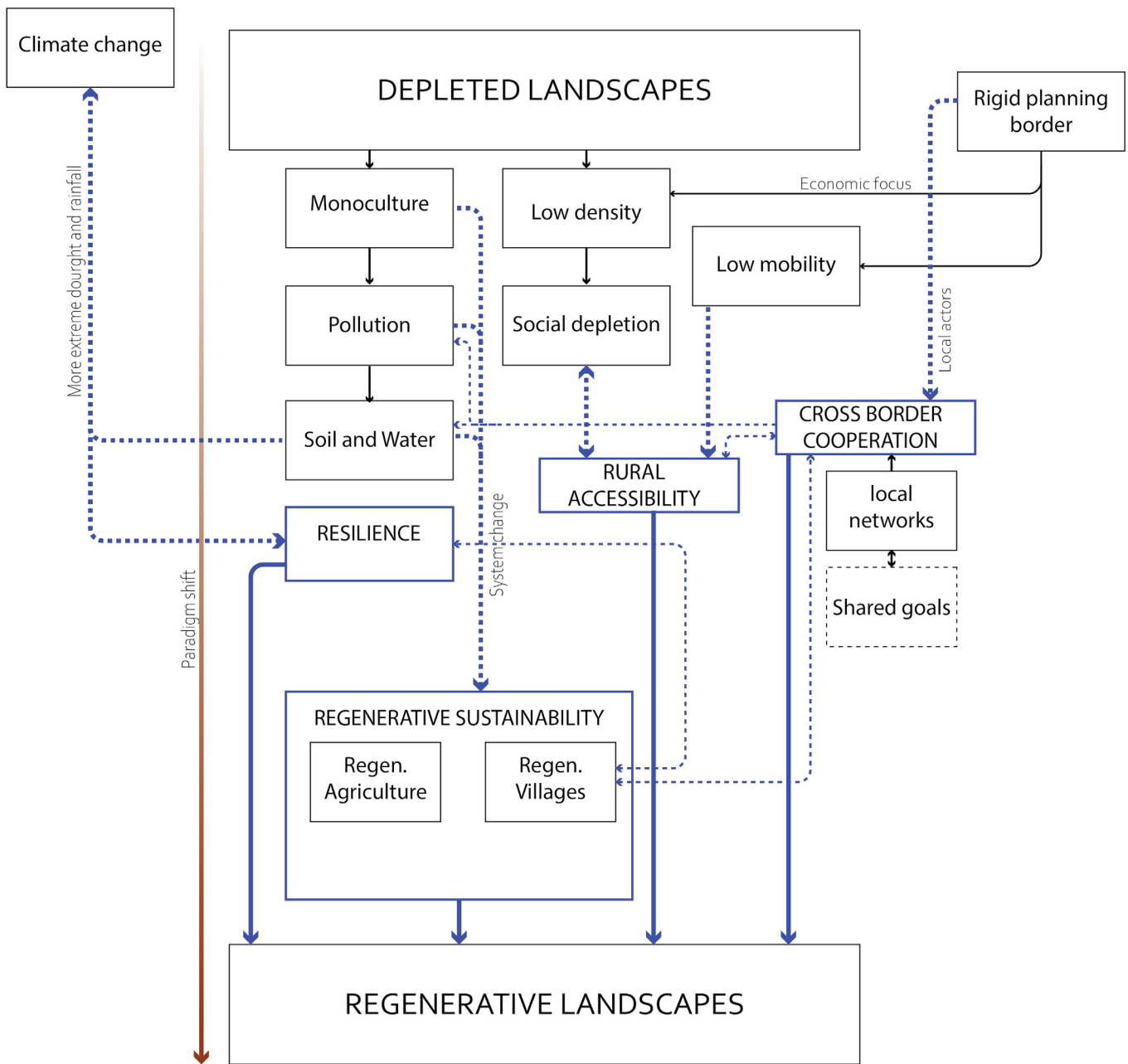


Image 2.2: Conceptual Framework

In the past two chapters, the problems concerning the Northern Campine have been identified. These problems are centred around depletion in various forms. The goal of the thesis, creating a regional strategy that shifts the focus from a production landscape to a regenerative Northern Campine, has been identified. To achieve this goal, a main research question is formulated. The question "How could regenerative sustainability counter ecological and social depletion resulting from intensive land-uses and rural shrinkage in the Northern Campine region?" will be answered using several sub questions ranging from research and policy themes to spatial analysis and design. Together with the various methods mentioned, the thesis will work towards providing an overview on how the concepts can be implemented on the Northern Campine through a Regional strategy.

The next chapter will analyse the current policies, the spatial structure of the Northern Campine and the historical development

How could regenerative sustainability counter ecological and social depletion resulting from intensive land-uses and rural shrinkage in the Northern Campine region?

I: How have land uses shaped the Northern Campine region ecologically, socially and spatially over time? -goal: to understand the spatial development and the resulting issues currently faced

II: What is Regenerative Sustainability, and which praxis can improve soil and ecological quality? -goal: to define Regenerative Sustainability and application through policies

III: What are (spatial) planning principles for sustainable regional development? -goal: to identify policies that help implementing spatial changes to achieve the Regenerative Northern Campine

IV: Which spatial structures and/or elements can be reused or introduced to combat rural deterioration? -goal: to identify spatial design tools to achieve main goal

V: Which scenario works towards a regional strategy combining theoretical concepts with spatial design? -goal: to combine policy development and spatial design to achieve a final vision.



Verheyden, I. (1846-1905) "Bedevaart in de Kempen" [painting]. KMSKA



3

The Campine Explored

3.1 Theory

Production Landscapes

Regenerative Sustainability

Cross Border Cooperation

Resilience

Nature Based Solutions

Accessibility

3.2 Policy

3.3 Spatial

Soil

Social

3.4 Diachronic

3.5 Conclusion

3.1 Theory

This section will discuss various theories that are important to allow the shift from a production landscape to a regenerative one. The findings will create a base for the final criteria with which to assess the results while also forming the position of this thesis..

Production Landscapes | As stated in chapter one, modern production landscapes result from an increasing global urbanisation process. In contrast, original production landscapes coincided with von Thünen's theory of the isolated state. He theorised that a city or consists of a central core with rings around it that provide the urban core with products. This "hinterland" is also set up in various production means and characteristics. Agricultural land, he argued, is different from mining and logging areas. However, the rapid post-war development from the 1950s onwards has shown a dilemma with this idea of the urban core and hinterlands. As more and more productive systems have been intensified to a degree that certain regions have become specialised in one product, the idea of direct hinterlands has become more challenging to argue. Urban areas no longer have a direct hinterland. Products and production thereof are often from areas across the globe. Hinterlands are no longer one specific area outside a city but have become almost every space outside urban cores. Even spaces one might call "nature" have become part of these hinterlands. This is because nature has also become a form of production; instead of direct products, it provides inhabitants from urban cores with space for leisure while having positive externalities for urban cores

through carbon storage and water regulation. The expansion of hinterlands into a global connection of landscapes aimed at production is paired with the expansion of infrastructure networks to allow the movement of products out of these landscapes towards the many urban cores they serve (Brenner & Katsikis, 2020).

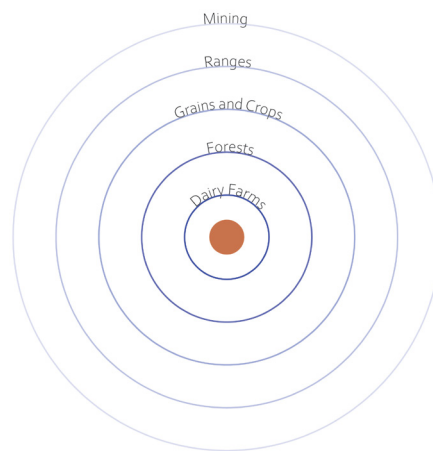


Image 3.1: Hinterland model
Von Thünen

To allow for this development of production landscapes, the current system of capitalism aims at increasing ecological surplus. By ensuring a constant influx of capital, through direct investment or technological means to improve production, the output of a production landscape is constantly increased. However, little to no effort is made to return the landscape to a naturally productive state. As a result, a constant need for investment and improvement is needed to keep ecological surplus at a profitable level. Constant expansion into new areas for production and expansion of networks will eventually result in the ecological surplus falling (Moore, 2015).

Once the surplus has been exhausted, capital investment of the region moves away to find new areas for extraction and production, starting a new cycle. What is left behind in the old production landscape is a soil and water system that is exhausted and can no longer sustain itself. Industry and networks built up during the extraction of an area are of such a large scale that inhabitants have barely any use for them. Jobs and services move away as they have less industry and capacity. This, in turn, leads to a decrease in inhabitants, further decreasing services (Moore, 2015). These areas become difficult to identify. This is because they consist of neither urban nor rural development but of a mix of functions, often directly conflicting with each other and competing for land. Additionally, the networks that are set up act as connections for the urban cores on the edges of these landscapes. This results in these regions becoming places to pass through (Wandl, 2020).

Production landscapes, therefore, result from rapid development and intensification focused on extraction and production for urban cores. These urban cores are no longer directly next to these landscapes but are scattered over the globe. Additionally, the constant expansion of production results in a depletion of the ecology. This inherent downfall of a production landscape results in a loss of jobs and, in turn, services for inhabitants that remain. An alternative form of land use and development can be introduced to combat this decline of production landscapes, both ecologically and socially. While ideas such as sustainable and circular

are often given as solutions to the current systems, a third alternative tries to combine the two and fill their gaps. What results is Regenerative Sustainability.

Regenerative Sustainability I In the past decades, sustainability has become a more important topic across a vast array of fields. However, the current idea of sustainability still heavily emphasises human wellbeing and how to keep improving it within the natural limits. While it better incorporates several aspects of justice and ecology, it still lacks a holistic understanding of the world and its systems. Regenerative Sustainability (RS) is argued to be the next step within the field of sustainability. It moves from a dichotomous view of nature and humans as separate systems to a singular regenerative system (Gibbons, 2020). As Lyle (1994) described, such systems would allow constant renewal of resources through their processes. Additionally, several characteristics of these systems are important. Such systems would integrate natural and social processes through a minimum use of fossil fuels, artificial chemicals, non-renewables and the creation of wastes that can be reabsorbed without damage (Lyle, 1994).

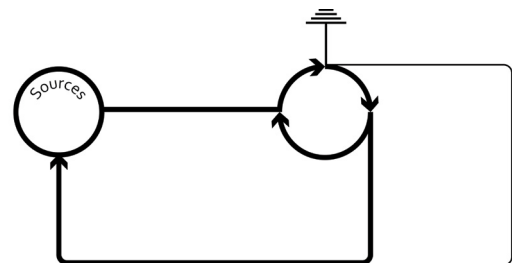


Image3.2: Regenerative Systems (After Lyle, 1994)

3.1 Theory

Building on this idea of the systems, RS expands it by not only looking at the problems and possible solutions in the world but also viewing the broader system as something in constant transition (Gibbons, 2020). This idea of constant transition is reflected in RS's different practices. For instance, Regenerative Development looks at how the concept of RS can be ensured well after the delivery of projects (Robinson & Cole, 2014). Furthermore, RS is steeped in place-based approaches. Local inhabitants and other stakeholders are invited and allowed to participate. Local contexts, cultures and identities are central to projects and plans (Gibbons, 2020). Other RS practices include regenerative agriculture (RA) and regenerative villages (RV). RA argues that healthy soils, through different methods and a minimal use of artificial fertilisers, good water use, and various other actors based on Nature Based Solutions, can help alleviate pollution from intensive agriculture and provide a clearer link between producer and consumer (Gibbons, 2020). Regenerative Villages aims to ensure that villages can rely on their direct surroundings and services to stay vital. This can be achieved through providing an adequate mix of housing to direct demographic changes such as ageing, allowing a mix of uses aside from housing to move away from villages as residential quarters for city workers and ensuring adequate transportation links aside from motor vehicles (Liaros, 2022). If fully regenerative, such villages would have around 6000 inhabitants for every 10 km² (Nieuwe Vroenten, 2024).

What is most important from Regenerative Sustainability is that it includes the idea of regenerative systems focusing on using minimum fossil

fuels and other non-renewables while integrating natural and social processes. Furthermore, it looks at location-specific aspects to achieve a transformation of worldview through different practices. Such practices are not limited to design but include production methods and development.

Rural Resilience I Previous research into resilience often focuses on the broader socio-ecological systems. Resilience is defined by a system's capacity or ability to weather shocks while maintaining its functions and feedback (Walker et al., 2006). However, while it includes rural areas and the socio-ecological systems present there, it often fails to incorporate the fact that rural areas sometimes have a much more fragile system. Therefore, an expansion of resilience to include rural areas has been proposed and explored over the past years. This new idea called "rural resilience" acknowledges that such areas and their systems are fragile to both economic and political mismanagement, as well as large external challenges such as changes in climate. Additionally, its goal is to maintain living standards. The inherent vulnerability of different systems in rural areas makes it important to strive for more specific resilience for these areas. Furthermore, rural resilience can be seen as a prerequisite for broader sustainability, such as regenerative sustainability. If a shock, small or large, can change a system, it is not sustainable, as it does not look far enough into the future to consider various shocks that could occur. Thus, system redundancy must be incorporated to achieve resilience in rural areas. This can be natural systems buffering water and other functions, or societal and cultural buffer-

ing demographic changes (Heijman et al., 2019). For rural areas, several elements are important to incorporate to achieve resilience. Firstly, functional diversity could allow a system to withstand shocks better. If the entire region specialises in one production type, changes in pricing, climate or demographics can already lead to a break in the system. Ensuring variety in functions can thus improve resilience, as the broader system would still be able to continue. Secondly, leadership and information exchange through local networks. This helps identify issues and locations for change while ensuring a clear goal. Finally, a clear distinction between resilience and adaptability must be mentioned. If a system were fully adaptable, it would require constant change while also being focused on specific shocks. Resilience is ensuring the system can adapt to many, often unidentified shocks (Walker et al., 2006).

Rural resilience allows rural areas to absorb various shocks. It needs diversity in functions and clear leadership and information networks to succeed. As a result, it could be argued that a new form of policy creation is also necessary. This is especially clear in the Dutch and Flemish systems of policy, where a top-down approach is still implemented. Furthermore, the presence of the national border complicates creating a single system.



Image 3.3: Depletion in Villages

Cross Border Cooperation I The aforementioned rift in policies in chapter one could be attributed to the present structure and subjects of present-day Cross-Border Cooperation (CBC). In past decades, many efforts have been made to integrate border regions. Many initiatives such as Interreg have been set up in Europe to promote cooperation and regional development (Decoville & Durand, 2017). However, these initiatives have focused on a region's economic development. Such a focus in cross-border cooperation could ultimately deepen social and regional disparities. Instead of looking at economic development, CBC should focus more on the development and integration of social systems to improve inequalities within a border region and in respective urban areas (Wong Villanueva, Kidokoro, Seta, 2022). This means that CBC goes beyond national governments setting goals for border regions to become more economically productive. This new form of CBC will have to be undertaken by local governments to expand their economy and integrate both sides of the border, improve social inequalities and achieve various other goals.

3.1 Theory

Such a CBC will have various determinants and various challenges. The most important determinants are networks, organisational capacity and leadership. Networks can be both formal and informal. Community groups, companies and other formalised groups can indicate cross-border cooperation on local levels. Informal networks such as family ties and sports groups can indicate that a cross-border region is already integrated culturally. Organisational capacity concerns elements that allow or discourage networks to work together across borders. Finally, leadership means identifying people and organisations that partake in cross-border cooperation (Hataley, Leuprecht, 2018). The largest challenge to CBC is that supranational institutions take it up. This is a challenge because of their lack of knowledge in spatial planning. Additionally, this would widen the number of stakeholders and organisations participating in CBC. This can result in local issues or goals of a cross-border region being overlooked. Furthermore, differences in planning culture and understanding of concepts can form an obstacle. This is especially true in the previous obstacle (Decoville & Durand, 2017). Finally, the goals for a cross-border region must be similar and well-defined for all stakeholders (Wong Villanueva, Kidokoro, Seta, 2022). From these obstacles it can already be made clear that the CBC needed to move away from the development and expansion of economic activity and production (through production landscapes) should limit the number of institutions taking part, reduce the scale of institutions as much as possible and focus as much as possible on current organisations and networks in place.

The alternative form of CBC uses existing networks,

organisations and leadership. The scale of these networks should be as local as possible. This also helps ensure knowledge of local issues, planning and aims to be on the same line.

Nature Based Solution I Nature Based Solutions (NBS) are often touted as an all-encompassing method to address and solve climate change in planning and design. It is important to note that it is not a single monolith. Instead, there are several variations concerning the goals they have. Some are focused on climate change mitigation and others on climate change adaptation. Some help with socio-economic sensitivity while others reduce socio-economic exposure (Seddon et al., 2020). In the table below, various examples of NBS and their goals are shown.

Accessibility I Accessibility as a concept has been defined by various researchers. For this research, the term accessibility is defined using Geurs and Van Wee (2004) and Vitale Brovanore and Cotella (2020). Primarily, accessibility is “the extent to which land-use and transport systems enable (groups of) individuals to reach activities or destinations utilising a (combination of) transport mode(s)” (Geurs, Van Wee., 2004). Their definition is based on four components that allow an individual or group to move around. Land use concerns the availability and distribution of functions and jobs compared to the distance these are from housing. Secondly, transportation includes the mode, time, costs, risks, and comfort when using any mode. Thirdly, the availability of modes throughout the day is

expressed in the temporal component. Finally, the individual component includes individual needs. This covers budget, abilities and needs (Geurs, Van Wee., 2004). The conclusion Geurs and Van Wee (2004) make concerning accessibility is that current transportation and accessibility theory and implementation exclude individual components. This lack of individual components is expressed in Vitale Brovanore and Cotella (2020) as well. They identify that rural public transportation is often cut due to low demand and ridership. This increases social inequality and inaccessibility in rural areas. The issue with accessibility stems from the typology of rural villages, the aggregation of services in more urbanised cores. Current practice in public transportation focuses on demand and density. As rural areas will always have a more dispersed demand and low density, a change in practice would be needed to achieve better accessibility in rural areas. Additionally, physical distance is one aspect of accessibility for rural areas. Virtual distance drives an individual's choice for transportation aside from needs and ability. As a result, physical infrastructure in rural areas can drive the level of accessibility (Vitale Brovarone, Cotella, 2020). In conclusion, accessibility concerns the extent to which transport systems enable individuals to reach a destination while also lowering the perceived travel distance and time.

Conclusions I The theory concerning production landscapes gives an idea concerning the origin of ecological depletion. The focus on production and export eventually leads to social and economic depletion. Nevertheless, there are theoretical practices that can offer alternatives. The largest one is Regenerative Sustainability. Expanding on circularity and sustainability, RS forms a system that replaces ecological depletion. Economic depletion can be countered through rural resilience, primarily through diversification of functions, and rural areas can already experience shocks. Resilience in terms of climate links with RS and can be achieved through NBS. Ensuring redundancy and maintaining natural systems to absorb shocks can help further RS. RR and Accessibility can also combat social depletion together. Similarly to combatting economic depletion, adding services together with a mix of housing can deepen resilience on a social level. Linking these new services with inhabitants through different means of transit can increase accessibility. New transit should be service-based and not profit-driven. Especially in areas with lower population density, this becomes important. Finally, to ensure that there is cooperation between the two sides of the border, similar goals and visions on the local level need to be constructed. CBC only works when there is a consensus on both sides.

The various elements of each theory can be seen as criteria for a regenerative Northern Campine. To implement these concepts, the regional strategy in chapter 5 needs to explore how these can be implemented.

3.2 Policy Analysis

This analysis section will look at various policy documents concerning the region of the Northern Campine. The choice of policy documents is based on several subjects, geographical scale and level.

The subjects are based on the theory from the previous section. The first subject is what can be named “viable agriculture”. This entails policy documents that identify issues with the current agricultural system such as the nitrogen crisis or overproduction. “Healthy soil and Water” concerns the documents that place the ecological state of soil and water as a base for the vast scale of functions that occur in urban and agricultural areas. “Spatial planning” includes documents that provide planning tools to achieve various other topics. “Social vitality” means the social state of an area is considered to maintain living standards and/or improve them. Finally, “Accessibility” covers documents that place mobility systems and accessibility of non-urban areas as important subjects.

The geographical scale looks at which regions are considered. As this thesis looks at a specific region within the Netherlands and Belgium, the provinces of Antwerp and North-Brabant are more important on

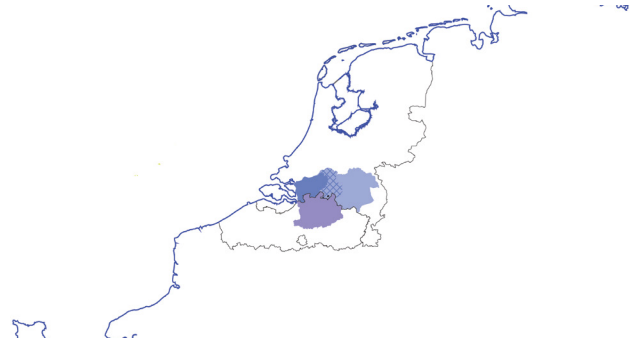


Image 3.4: geographic areas of Policies that cover the Northern Campine

this scale than on national or supranational scales. Nevertheless, some documents cover larger geographical scales. This can be attributed to their subject and governance level. European policy documents will work on a larger scale. However, some can still be important as they provide a common goal or baseline in policy goals. The order in which the documents will be explained will be from the largest scale and highest level to the smallest useful ones.

European Policy I The two important policy pieces here are the Water Framework Directive (WFD) and the EU Climate law. The WFD gives EU member states a base on the water quality they should achieve. It gives clear targets on water quality and provides a legal framework in which the quality is measured and recorded (Directive 2000/60/EC). The Climate Law enshrines several goals into law concerning the climate. The most important goal for the EU is to be climate neutral by 2050. Addi-

tionally, it provides several steps on how to achieve this goal (Regulation 2021/1119). These two European laws have formed the legal base for the national regulations and goals written into policy documents. The following levels to look at are the Dutch National and Belgian Federal levels.

Netherlands Policies I On the Dutch national level, multiple policies and advice have been released. Most of them are concerned with the effects of nitrogen on agriculture (Remkes et al., 2020) and possible spatial and social changes because of system changes (Hamers et al., 2023). Additionally, “Water en Bodem Sturend” (WBS) (Harbers & Heijnen, 2022) shows a shift in policy thinking from land use focuses to a more integral soil-based approach in spatial planning.

North Brabant Policies I Stemming from the Beleidskader (Provincie Noord Brabant, 2022), the policies of North Brabant tend to focus on a shift from human land-use as base to soil and water as driver. Additional goals of bottom-up and multiscalar approaches are worked into the preconditions of the policies.

Due to Belgium’s Federal system, the most important policy documents are created by the regional governments of Flanders and Wallonia. As a result, this level of governance is excluded from this analysis. It is important to note that the federal government keeps track of the goals and ensures the regional governments set up policy in line with them (Dienst Klimaatverandering, n.d).

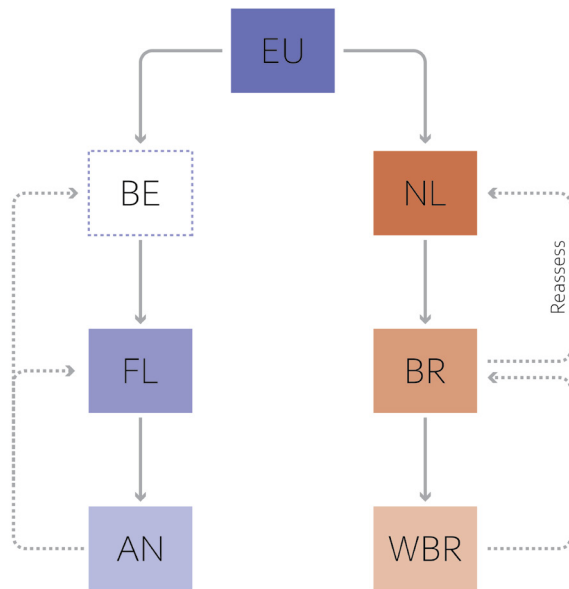


Image 3.5: Hierarchy of Governance levels

3.2 Policy Analysis

Qualitative Analysis I To illustrate the various subjects mentioned in the multiple policy documents, their content is categorised into 5 main topics:

- Viable Agriculture
- Healthy Soil/ water
- Spatial planning and design
- Social Viability
- Rural Accessibility

As a policy can include more than one topic, the occurrence of a topic will be represented in a matrix. The goal is to achieve a qualitative analysis of the various policy documents. Each subject is assessed on their level of explanation. These are:

Omission: not mentioned anywhere.

Acknowledge: a brief mentioning of the subject.

Problematisation: explaining the issues in that field.

Vision: providing an envisioned goal

Strategy: precise plans to achieve the goal are given

This analysis will be shown per policy document, with a summary and its scale shown in a policy passport. The summary of these passports is shown in this chapter. For a detailed look into every passport, look at the Appendix

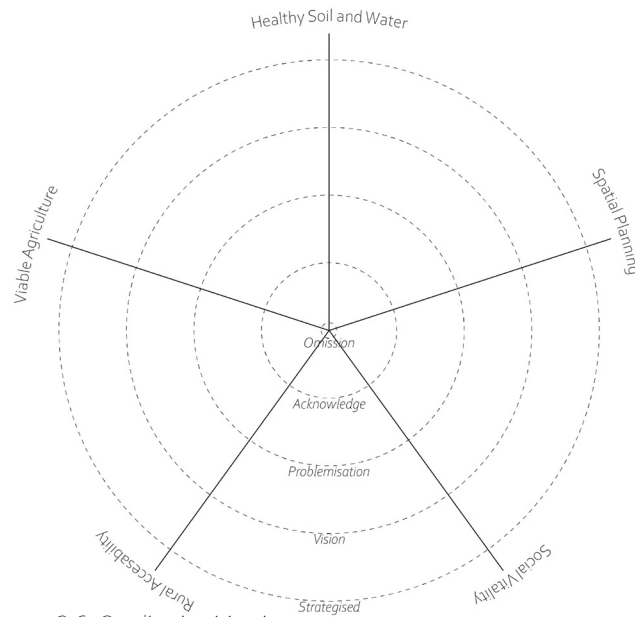


Image 3.6: Qualitative Matrix



Image 3.7: Policy Passport

Policy Passport EU.1

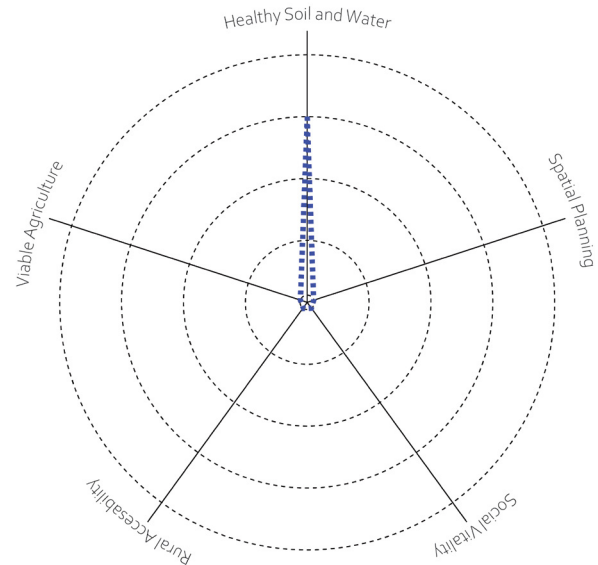


- Year(s): 2000-now
- Scale: Supranational (EU)
- Type: EU Law
- Writer: European Commission
- Client: European Parliament, Member states
- Topic(s): Soil and water

Water Framework Directive (DIRECTIVE 2000/60/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL: Establishing a framework for community action in the field of water policy) (Directive 2000/60/EC)

With the WFD, the EU strives to improve the surface and groundwater quality in the whole of the EU. To achieve this they have provided a list of chemical requirements. Additionally, the framework states how to measure the requirements and when the measurements have to be shared.

Aside from the quality goals, it also forms a legal basis with which organisation or individuals can go to court with if their nation does not safeguard water quality.



3.2 Policy Analysis

Conclusion I From the qualitative analysis we can conclude the following. Due to the European policies really being hard judicial documents, they are limited in the extent they provide clear vision, only for Healthy Soil and Water do they give exact goals. They do not extend into strategy as shaping the policies is left to the member states.

The Dutch policy documents tend to stick to vision too. The visions are often clearly defined and based on broader issues. Nevertheless, it is clear that the problems are clearly identified. Future policies should also give clear strategies on how to achieve the vision.

Similarly, Flemish documents also stay within the vision range. Contrary to Dutch Policy documents, the Flemish ones often stick to certain topics instead of including broader systems linked to issues.

Overall, the main findings are that new policy documents for the northern Campine should strategise more. Define clear ways to achieve these goals such as the farming zoning by Remkes (2022) and Lowering groundcover (Vlaamse Overheid, 2022). The goals and ways these are reached should be done through a participatory approach similar to LABORUIMTE (Atelier Romain, 2024).

Finally, the lack of clear strategies can be a result of the large scale they operate on. As mentioned in section 3.1, small and local scale works best when trying to achieve the CBC goals.

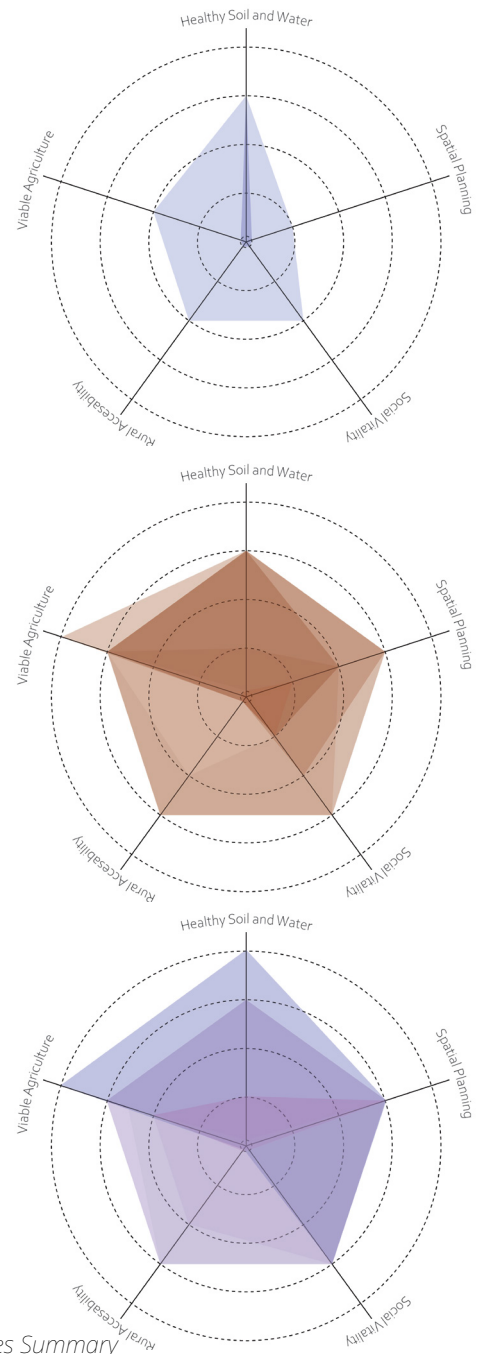


Image 3.8: Matrices Summary

The Literature review and policy analysis conducted can help answer the second and thirds subquestion.

II: What is Regenerative Sustainability, and which praxis can improve soil and ecological quality? -goal: to define Regenerative Sustainability and application through policies

Regenerative Sustainability is an expansion on contemporary Sustainability and Circularity. Instead of ensuring reuse and decreasing waste, it wants to directly put waste back into the system and new resources. This can be expressed in Regenerative Agriculture where soil health and water retention are important. Praxis such as agricultural zoning, mobility shifts and policies promoting functional diversity in villages can help achieve RS

III: What are (spatial) planning principles for sustainable regional development? -goal: to identify policies that help implementing spatial changes to achieve the Regenerative Northern Campine

Similar to the previous question, there are policies such as agricultural zoning, mobility and function diversification. Additionally, the need for policies promoting cross border cooperation are needed. This can be achieved by decentralising tasks.

3.3 Spatial Analysis

With the Policy analysis concluded, the following section will focus on the spatial analysis. This is conducted in a series of steps. Starting by analysing geomorphology, the current state of the northern Campine is slowly analysed by adding natural systems and production systems on top of the base consisting of soil. Social and human systems are analysed after analysing what happens on the soil and landscapes.

Soil - Geomorphology I The first layer to analyse is soil. In what manner has the Northern Campine been shaped, and what soil properties are present? The creation of the Northern Campine has occurred over aeons. Plate tectonics has affected the region. Tectonic shifts had created a mountain ridge. Erosion through wind and water has resulted in the formation of a ridge running South-North. The creek valleys and surrounding areas have been covered primarily by fluvial deposits, mostly Belgian river deposits. Along the northern edge, Rhine-Meuse deposits can be found. Along the plateaus, aeolic deposits can be found; here, there is a differentiation between fine and coarse deposits. As a result, the Northern Campine is a region characterised by sand.

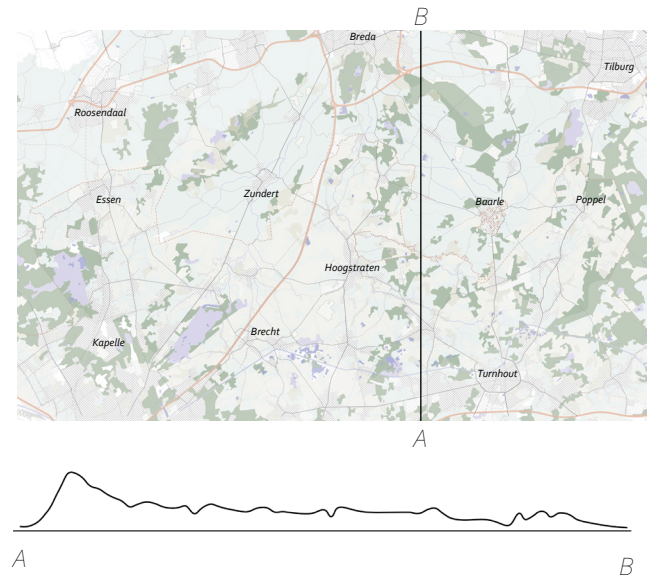


Image 3.9: Geomorphological ridge
(After DINoloket and DOV)

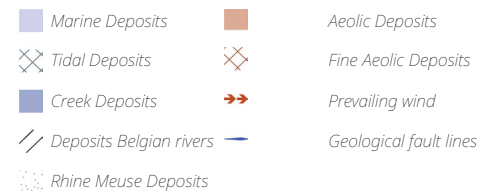
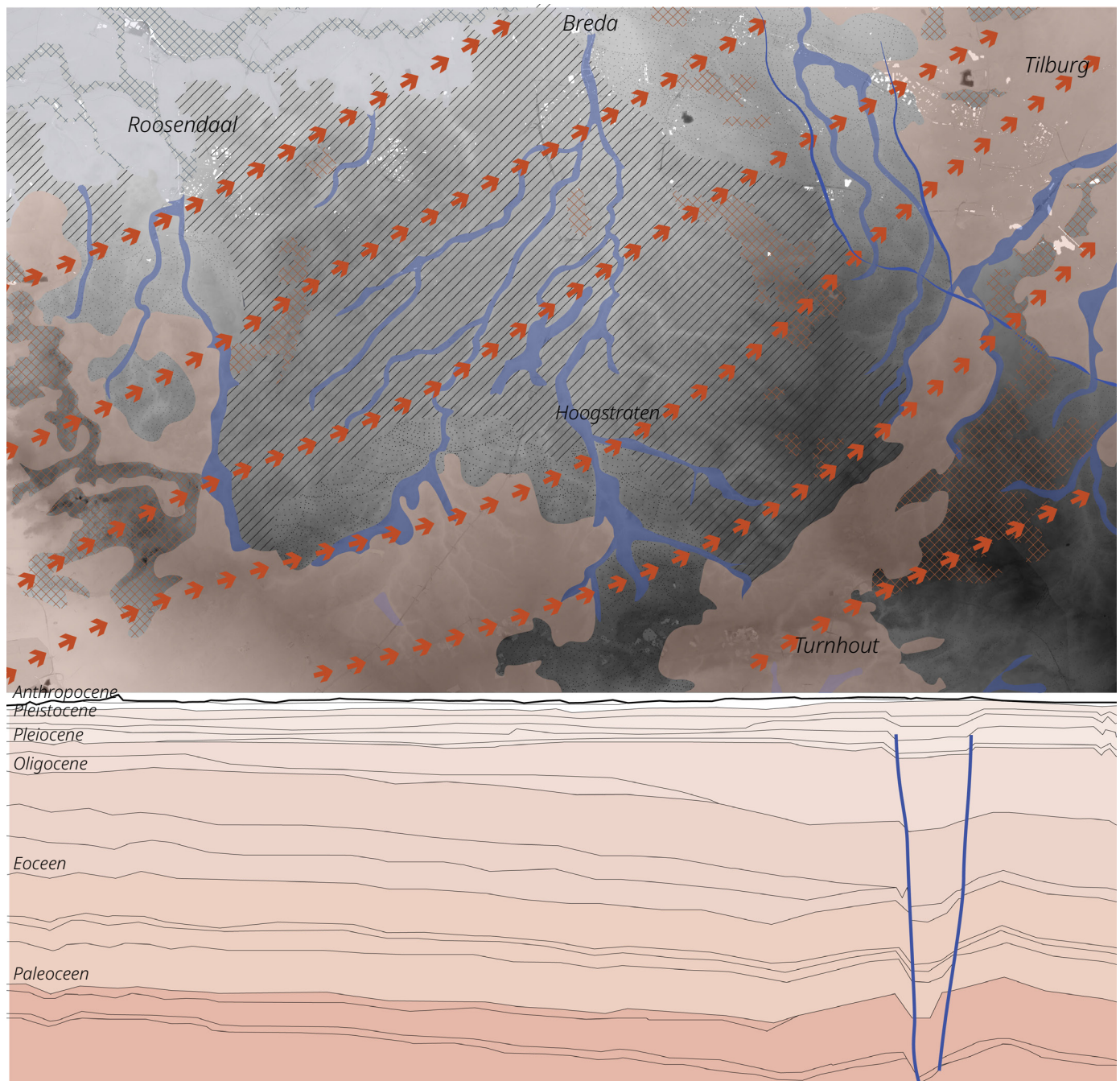


Image 3.10: Geomorphology
(After DINoloket and DOV)



3.3 Spatial Analysis

Soil I Within the region's characterisation by sand, there are many differences. The main differences can be expressed in a matrix varying from Wet to dry and from Sand to Peat. The map on the right illustrates where these soil types are prevalent. Wet soil can be found along the creeks and in lower-lying areas. Drier soils are on the higher plateaus. The presence of soil types is important when implementing policies such as “soil as base” (Harbers, Heijnen, 2022). For these more detailed properties are important, these can be found in the appendix. These properties will be important later when analysing agricultural production.

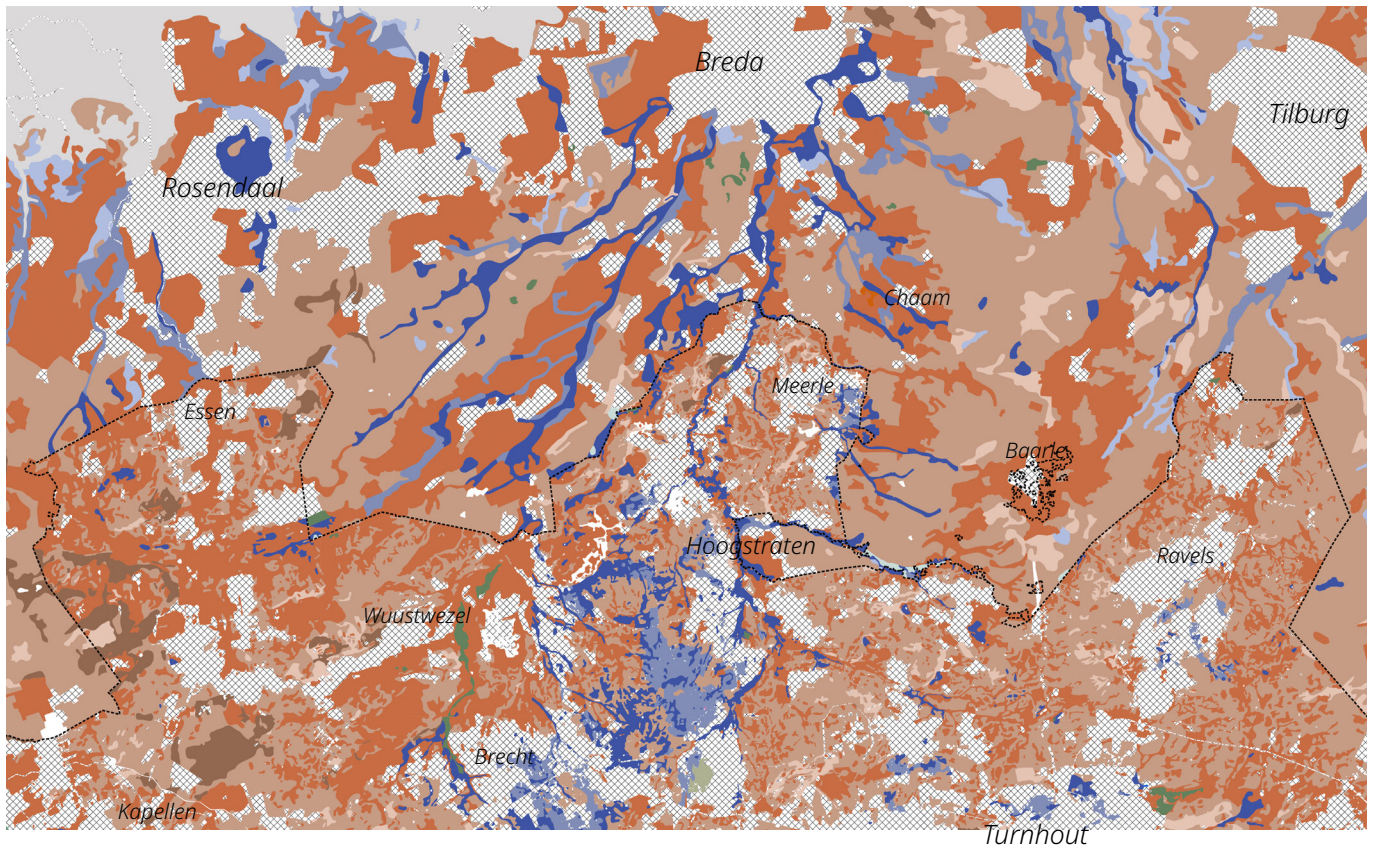
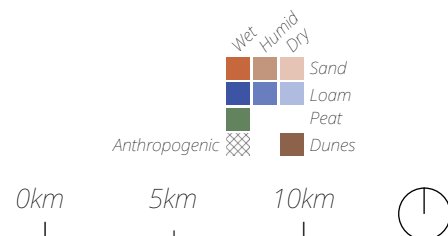


Image 3.11: Soil Typologies (Modified from DOV (2024) and PDOK (2024))



3.3 Spatial Analysis

Soil - Water System I The natural water system results from the divide between the Meuse and Scheldt running on the southern edge of the region. This results in all the creeks flowing northward along a low gradient.

The creeks often result from water upwelling at a single point and then flowing downhill, slowly carving out a valley for itself, connecting with other creeks. As a result, its basin consists of three sections. The upper section is characterised by many small creeks meandering and flowing together. By the lower section, the creek is wider and moves more slowly, taking up more space.

Ponds have a similar origin through upwelling. Due to their location in local depressions on plateaus, they do not have natural outflows in most cases.

Flooding is present mainly in some lower areas along the creeks, and natural flooding can occur with heavy rainfalls. The groundwater levels vary between higher areas and different soil types too.

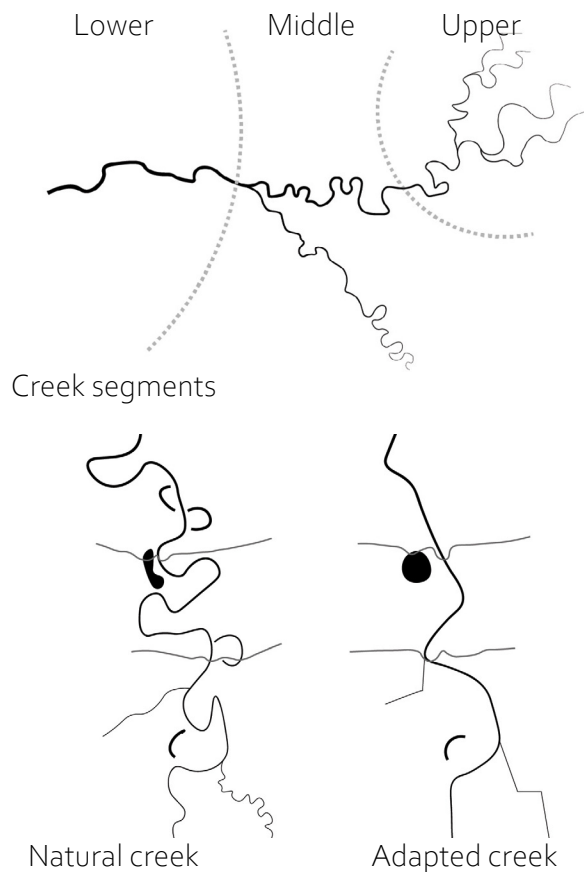
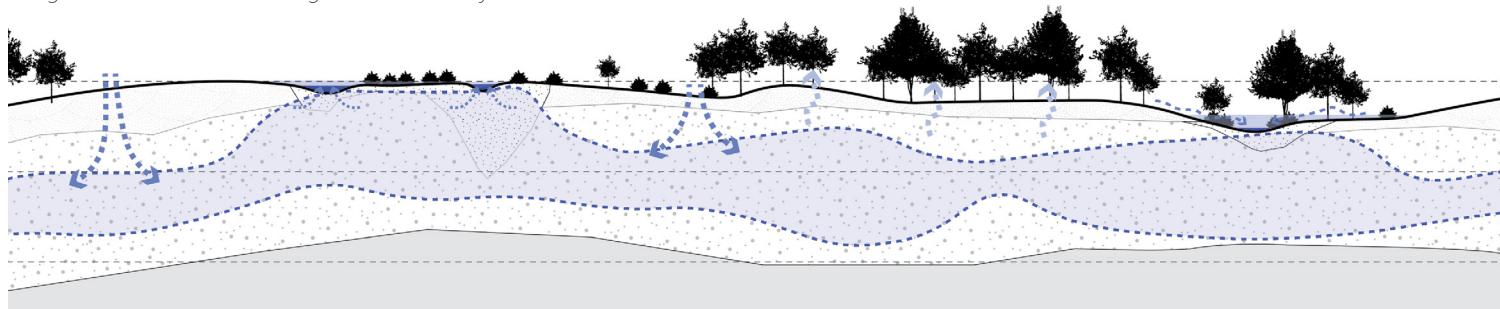


Image 3.12: Creek System and changes illustrating the sections and straightening for human use

Image 3.13: Section illustrating natural water system



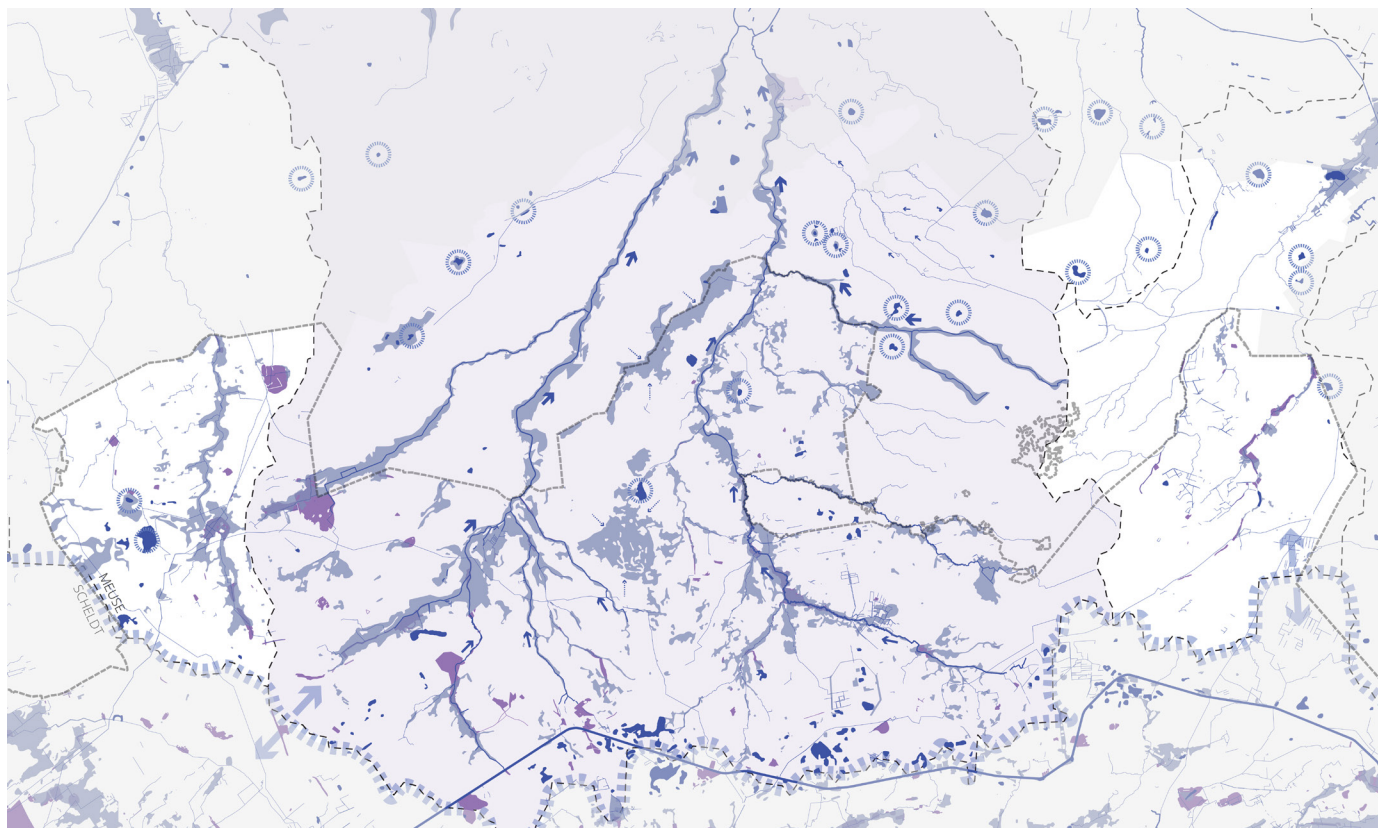
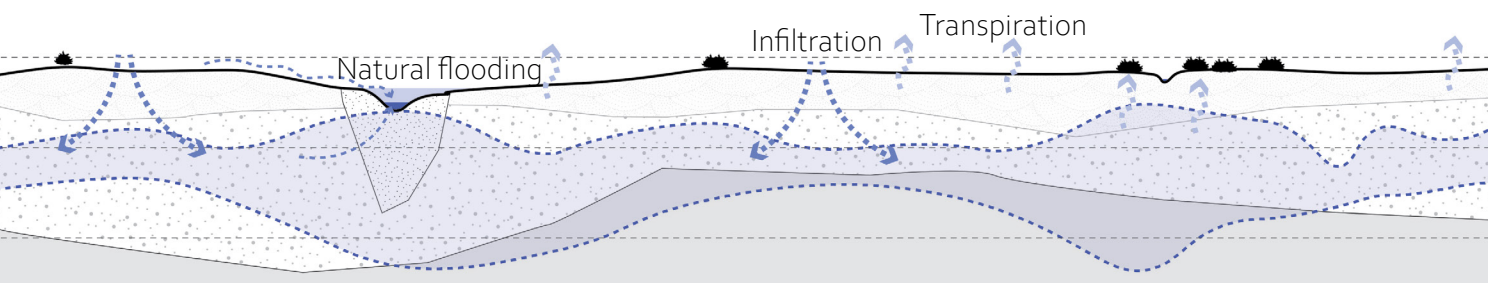


Image 3.14: Natural Water System Northern Campine showing water bassins, creeks, ponds and flodable areas. Primary river basin (Mark river) highlighted.



3.3 Spatial Analysis

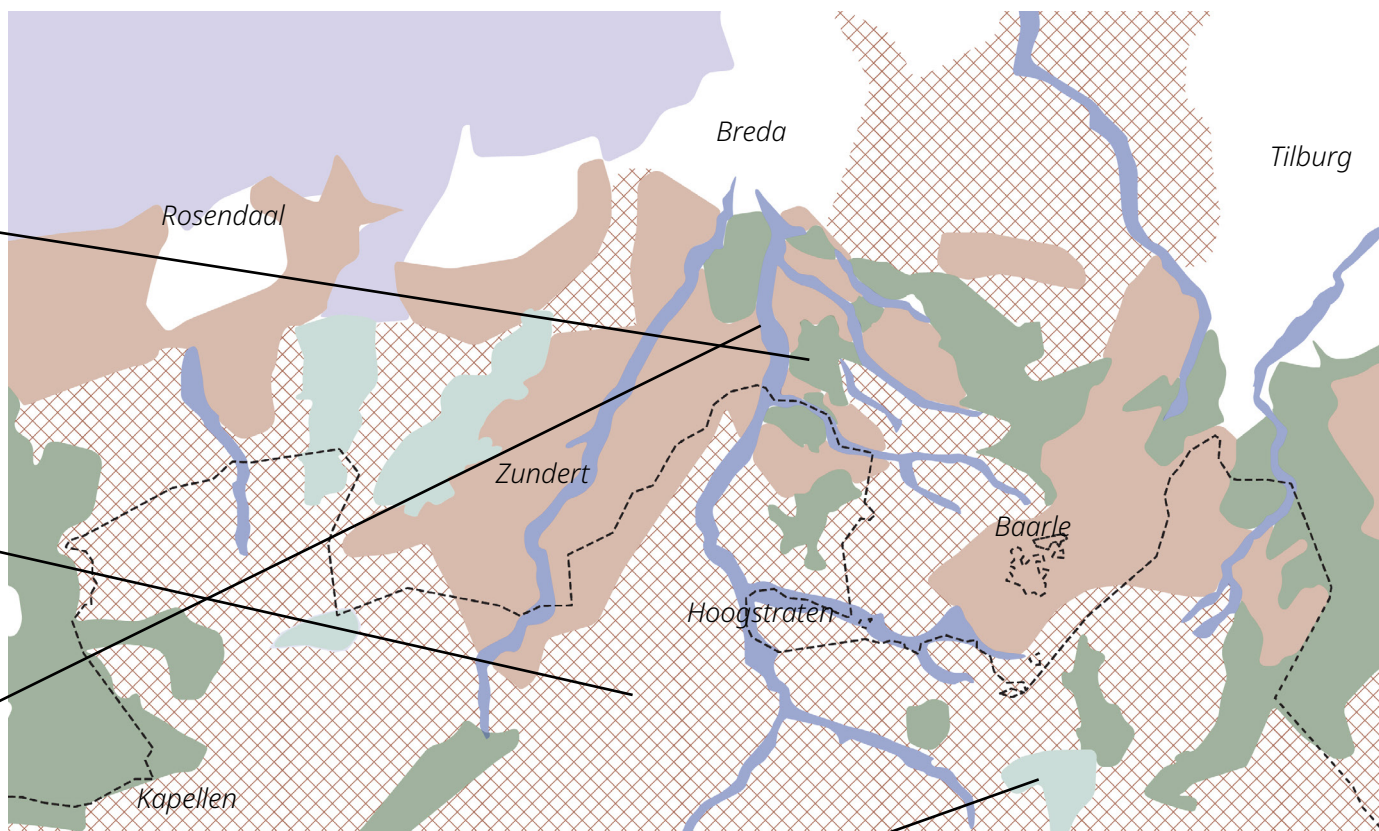
Soil - Ecology and Landscapes I The Soil properties and amount of water present on specific sites and locations have always shaped the type of landscape that occurs naturally. As the Northern Campine is an area reclaimed from barren soils, a mix of old and new reclaimed landscapes makes up the majority of the existing ones. Landscapes such as heaths, planted forests, creek valleys and peatlands are scattered throughout. All these landscapes provide different resources, resulting in a variety of production landscapes.

In the next section, four of the production landscapes are shown. The first landscape shown illustrates natural production. As these spaces are also for human leisure, human production elements are present. However, as leisure is not a direct extraction from the soil or water system, it is placed together with ecology as ecology is the base layer that makes use of the soil and water to provide nature and leisure services.

After the ecology, human extraction and systems are shown. Firstly, the agricultural landscape produces both resources for consumption and pollution. Secondly, the water extraction landscape, showing the locations used as sites for water production. Thirdly, the energy and industrial landscape. These four landscapes combined create several issues and will face challenges surrounding drought and productivity. These issues are shown in a synthesis map after which a “*Challenges and Possibilities map*” will give an insight on locations where changes can be made in the current production system.



*Image 3.15: various landscapes
top to bottom
-Heath/ forest
-New Reclamation
-Creek Valley
-Peat*



3

Image 3.16: landscape typologies present in the Northern Campine

- Marine reclamation
- Creek valley
- Planted Forests and heaths
- Peat
- Old Reclamation
- New Reclamation

0km 5km 10km



3.3 Spatial Analysis

Production I The landscapes, soil types, and water systems form the basis for activities. It is interesting to look what these activities are. While the most visible are human activities such as agriculture and energy production, natural activities also occur. By looking at activities that have an aspect of producing goods and/or services, the goal is to get an understanding of the land use and how the presence of the water and soil layer affects these functions when applying the concepts later. The layers of production that will be analysed are Ecology and leisure, Agriculture, Water extraction and Energy and Industry. These all, to some extent, directly make use of the soil and water systems to achieve production.

Ecology and Leisure I The first layer of production using soil and water is ecology. Plants and animals use the system of soil and water as habitat. Certain animals prefer wetter areas, certain plants thrive on poor dry soils while others prefer a mix of dry and wet. Due to human activity in the past decades and centuries, areas of “wild” nature are no longer present in the Campine. Planted forests to combat desertification, flooded peat mining areas, and other activities created new ecologies. These ecologies nowadays also have a double function of providing leisure for inhabitants. From the map on the right, it is visible how various forms of ecologies form a network of corridors providing flora and fauna to move through the region. While the northern edge is well connected with the east and southeastern sections through a fine network of forests, meadows, creek valleys, and peat marshes,

the central area is almost empty of natural areas. One large natural area is present but due to its use as military ground, presence of fauna might be lower. The double function of natural areas as leisure sites is also shown in circles, showing functions such as campsites, swimming locations, and others.

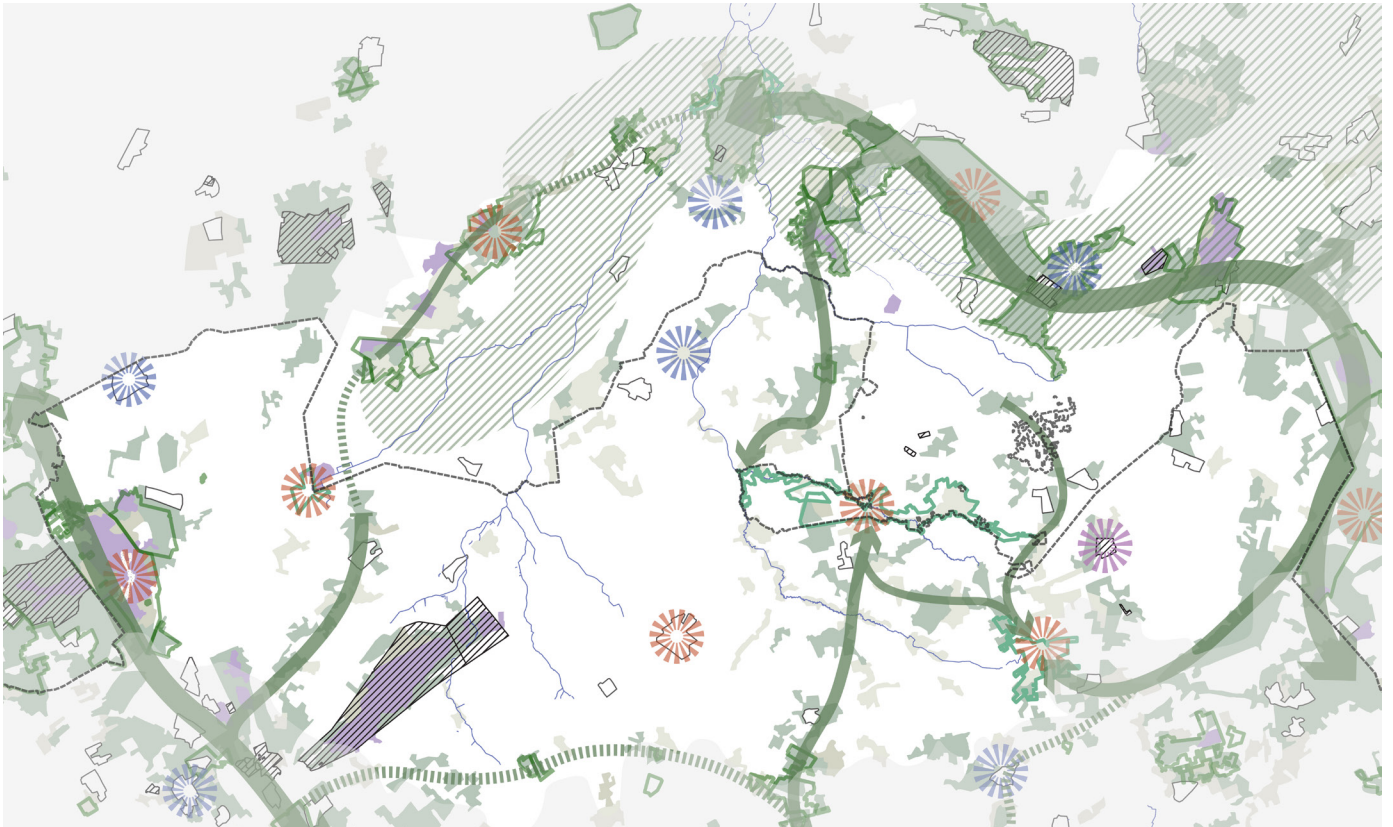
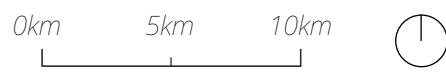


Image 3.17: Location of natural areas, leisure functions and ecological corridors

- Forests
- Mix agri. and nature
- Shrubs and Fields
- Heaths
- Dunes
- Nature Parks
- Creek Valleys
- Privately owned nature
- Van Gogh Park
- Military/private sites



3.3 Spatial Analysis

Agriculture I The Northern Campine has a variety of agricultural sectors. Fruit and horticulture, Grains, potatoes and beets, and animal husbandry. These forms of agriculture use soil directly. Still, not all agriculture is possible everywhere. Soil Organic Carbon is used to determine where various crops and plants can be grown. In its essence, Soil Organic Carbon (SOC) is the measure of how much carbon is present within a soil. As a component of the broader Soil Organic Matter (SOM), SOC can provide insight into the health of and ability to sustain agriculture (Food and Agriculture Organization of the United Nations, 2025). While the percentage of SOC can differ between locations, even at a small scale, a general baseline that is considered adequate is a SOC content of 2%. Below 2% constant addition of fertilisers is needed to maintain or increase crop yield. Fertilisers, while temporarily increasing carbon content, do not increase the overall SOC over time. A sustained SOC below 2% can, in combination with regular use of fertilisers, organic or inorganic, result in overall loss of ecological services of soil (Spink et al., 2009)

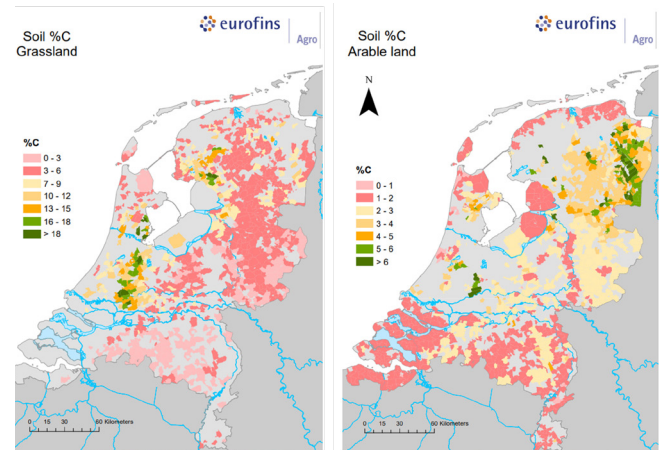


Image 3.18: SOC content Netherlands (Eurofins Agro, 2023)

Within the Netherlands, there are differences in the Soil Organic Carbon. The image on the right shows the SOC content between grassland and cropland. The section of the northern Campine that falls within the Netherlands shows a low percentage of SOC overall. This can also be seen in the historical development of SOC. Additionally, when SOC increases, there seems to be an increase in fertiliser use again. However, it is not clear if both are directly related.

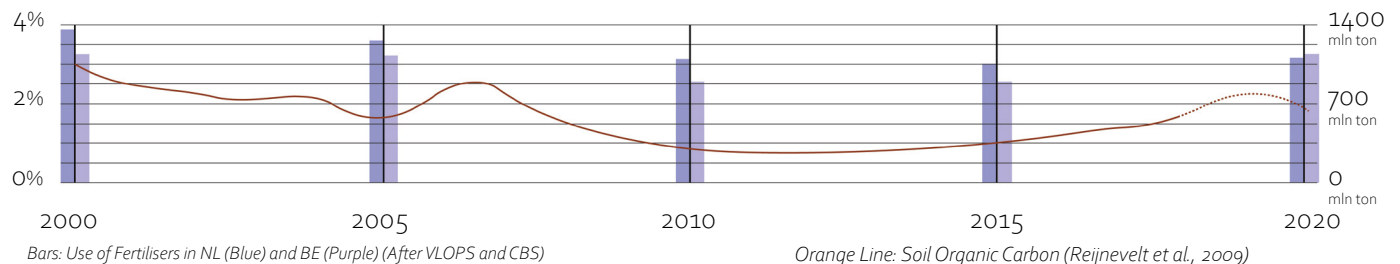
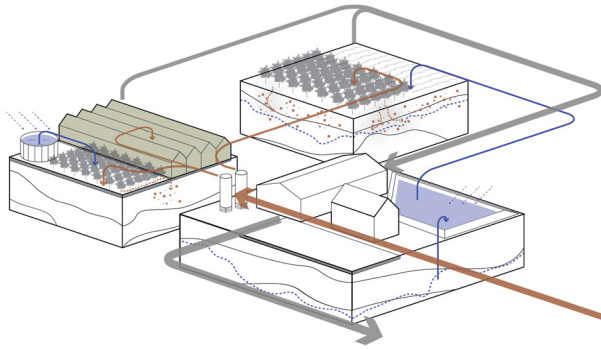
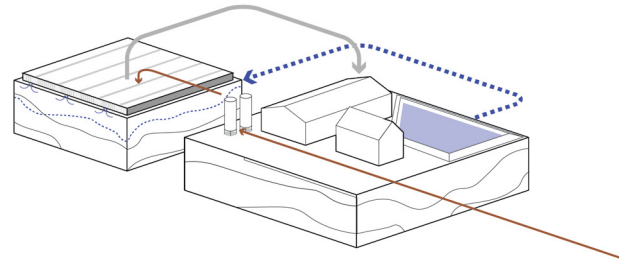


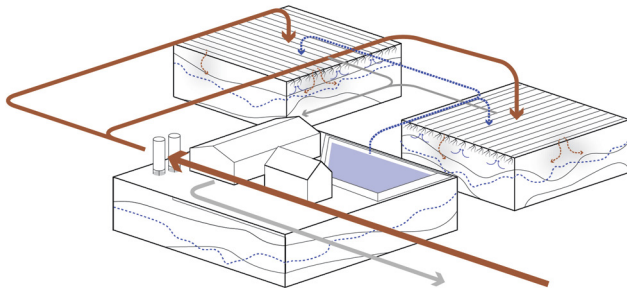
Image 3.19: Development SOC 2000-2020 paired with fertiliser production



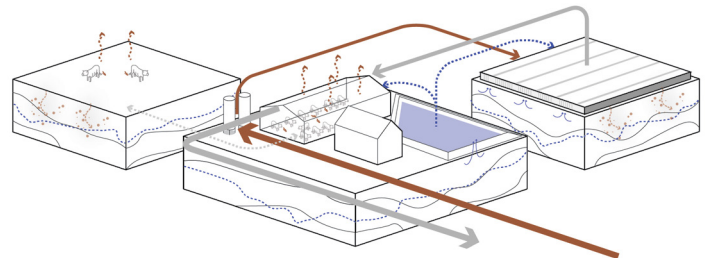
Horticulture:
Require -loamy sand
-good drainage
-avoid compaction
(Dupont, 2017)



Potatoes:
Require -high SOC
-good drainage
-sufficient water
(CeresAI, 2021)



Grains and vegetables:
Require -loamy sand or clay
-good drainage
-avoid peat soils
(Mojid et al., 2020)



Bovine:
Require -low water levels
-feed: same as Grains

Image 3.20: Diagrams of Agriculture types

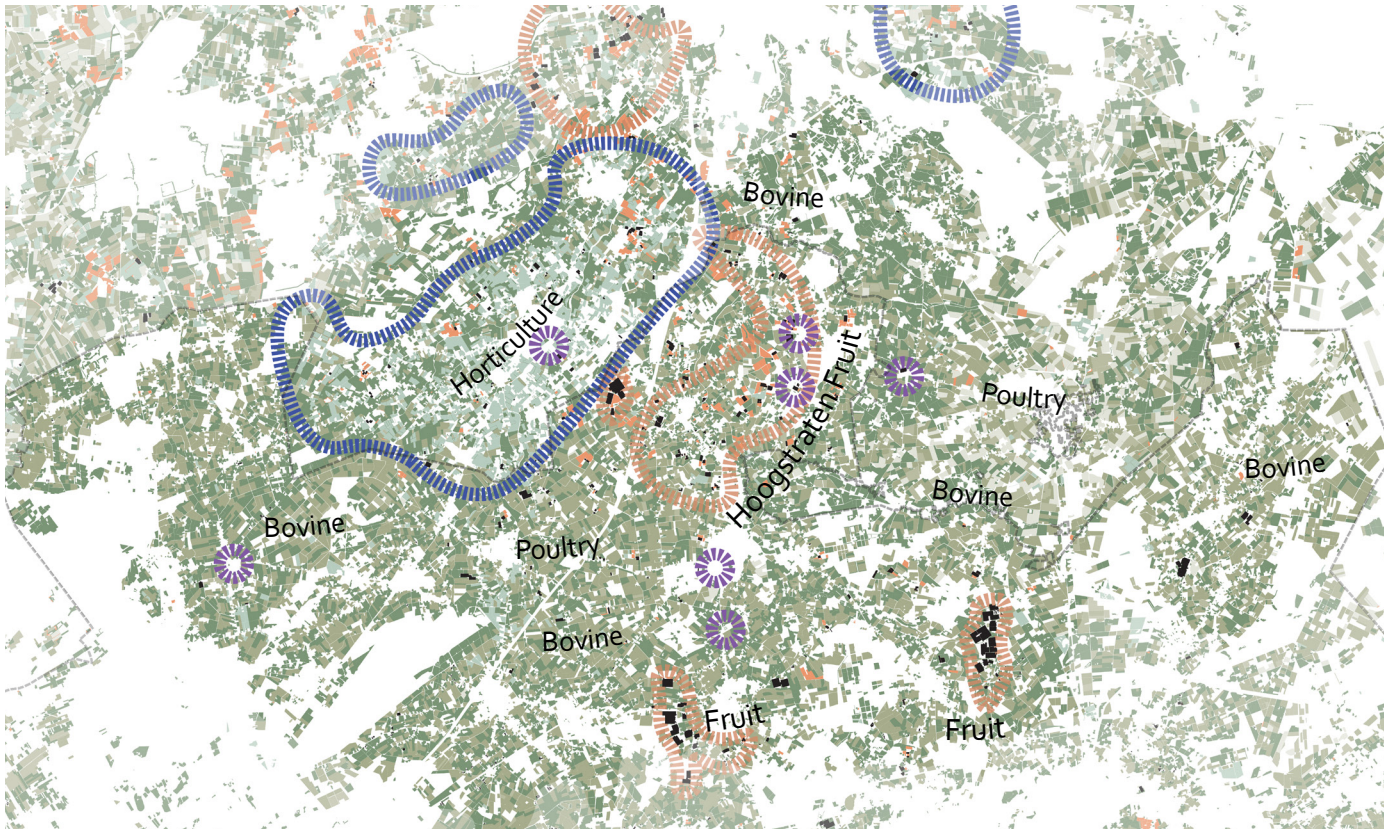
3.3 Spatial Analysis

Combined agriculture I Looking at the presence of agriculture in the northern Campine, it is visible that majority of space is taken up by animal husbandry. This does not only consist of pastures and fields for cattle and other animals, but also of all the fields used for feed production. Within this large scale, intensive form of agriculture, there are pockets of other forms of agriculture. Zundert lies at the centre of an arc of horticulture. However, this horticulture takes place on top of the land through glass houses and tarp covered fields on which potted plants grow. Additionally, fruits are grown around Hoogstraten, either in glasshouses or fields. For a detailed view of exact locations of the agriculture, the Appendix shows each type separately.

For future development, agriculture should diversify. Instead of specialisation in certain locations, different types of agriculture can be mixed. Local needs, soil properties, groundwater presence, and proximity to green spaces should be considered. Remkes (2021) states that a gradient of agricultural systems can be implemented through zoning. Closer to natural sites, bio-based, agroforestry, and traditional forms of farming can be implemented, while furthest away from natural areas, conventional agriculture can still be conducted.



Image 3.21: different forms of agriculture
top to bottom
-Horticulture
-Grains/potatoes
-Husbandry
-Feed production



3

Image 3.22: Agricultural Production
Northern Campine illustrating 4 main
types and different clusters

- Grasslands (cattle etc)
- Feed production
- Grains and vegetables
- Beets and Potatoes
- Horticulture
- Fruit fields open air
- Horticulture and fruit under glass
- Fruit cluster
- Horticulture Cluster
- Agricultural processing

0km 5km 10km



3.3 Spatial Analysis

Water Extraction and treatment I

Brabant and Antwerp use groundwater as their main source. extraction sites are scattered across the region. Around these are often protection sites to maintain a safe water quality. Actual extraction differs between the two. Where in Brabant, a central system provided and maintained by Brabant Water provides water for the entire province, Antwerp has a local approach where different operators extract and provide water and/or sewerage. Additionally, residents often have tanks beneath their residences storing excess rain water for individual use in dry periods (Primarily for watering gardens). Furthermore, the local systems are also visible in the use of water towers across several villages.

The use of private tanks can help decrease demand for groundwater in dry periods.

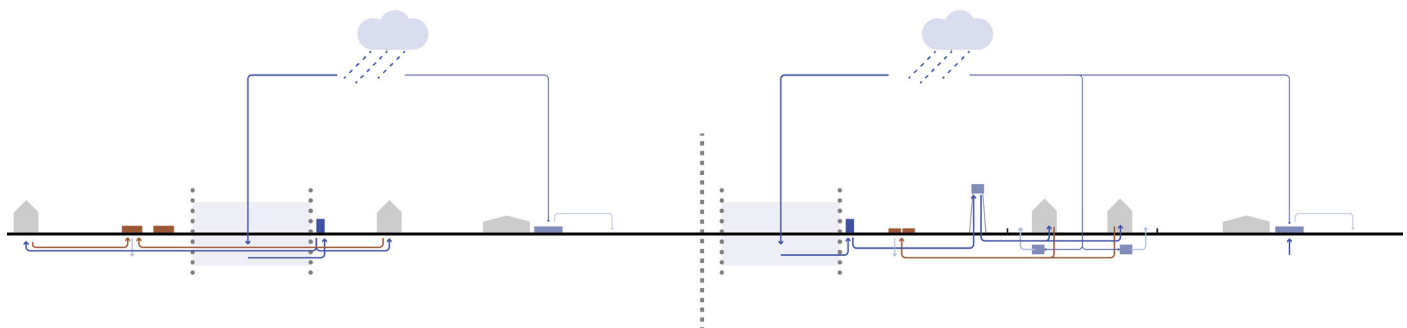


Image 3.23: Schematic representation of water systems in NL (left) and Belgium (right)

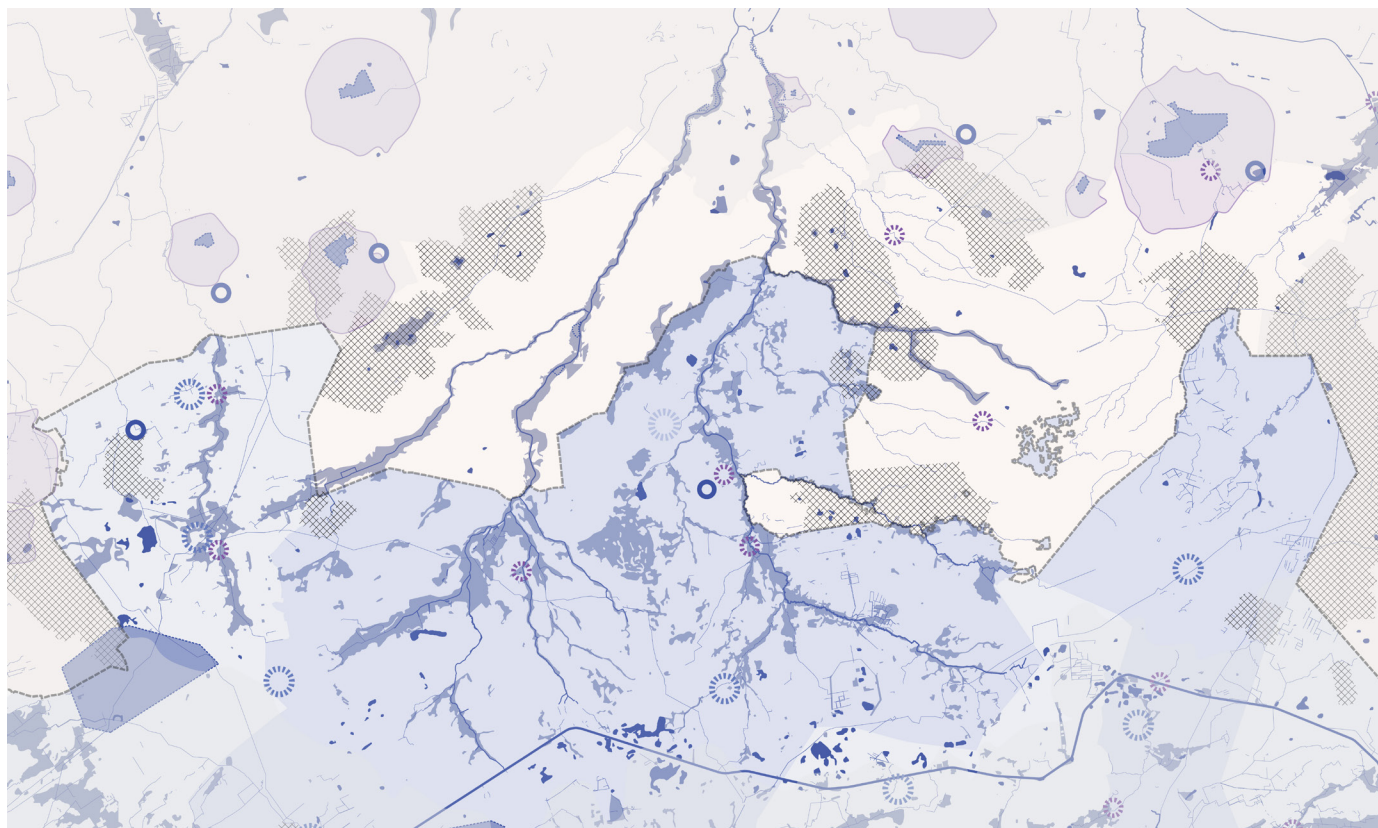


Image 3.24: Water Extraction illustrating protection and extraction zones and which company extracts water and/or takes care of sewerage

- PIDPA Water and sewerage
- PIDPA Water
- Brabant Water
- Protected sites
- Protected groundwater sites
- Water Extraction areas
- water Extraction sites
- Sewerage
- Water Towers
- Dissused Water towers

0km 5km 10km



3.3 Spatial Analysis

Industry and Energy | As the Northern Campine is mainly an agricultural zone, not much industry occurs. Heavy industry or mining occurs along the Northern and Southern edges, along canals around Turnhout and Tilburg. Along highways and railways, industry and logistics have also developed between Breda and Roosendaal. Within the Northern Campine, industry is primarily focused on agricultural products and the export of these products. Hoogstraten and the highway corridor form clusters of industrial and logistical sites.

Providing energy to these industries is important for them to function. As the region is divided between Belgium and the Netherlands, there are two separate energy systems. Shown on the map are the approximate locations of high, medium and low voltage connections. The Netherlands has a voltage network that covers villages with multiple distribution points. In contrast, Belgium has a more concentrated distribution system around the canal and Turnhout. Wind farms are also present in the energy connections. However, there is no direct connection between Dutch and Belgian wind farms to share energy.

If the Northern Campine is to be more resilient, an integrated energy system across borders needs to be implemented. In addition, more local energy production through solar, wind, or other sustainable means can be implemented, reducing the dependence on energy production from outside the region or fossil sources.



*Image 3.25: different forms of industry top to bottom
-Energy
-Logistics and energy
-Logistics
-Agricultural processing*

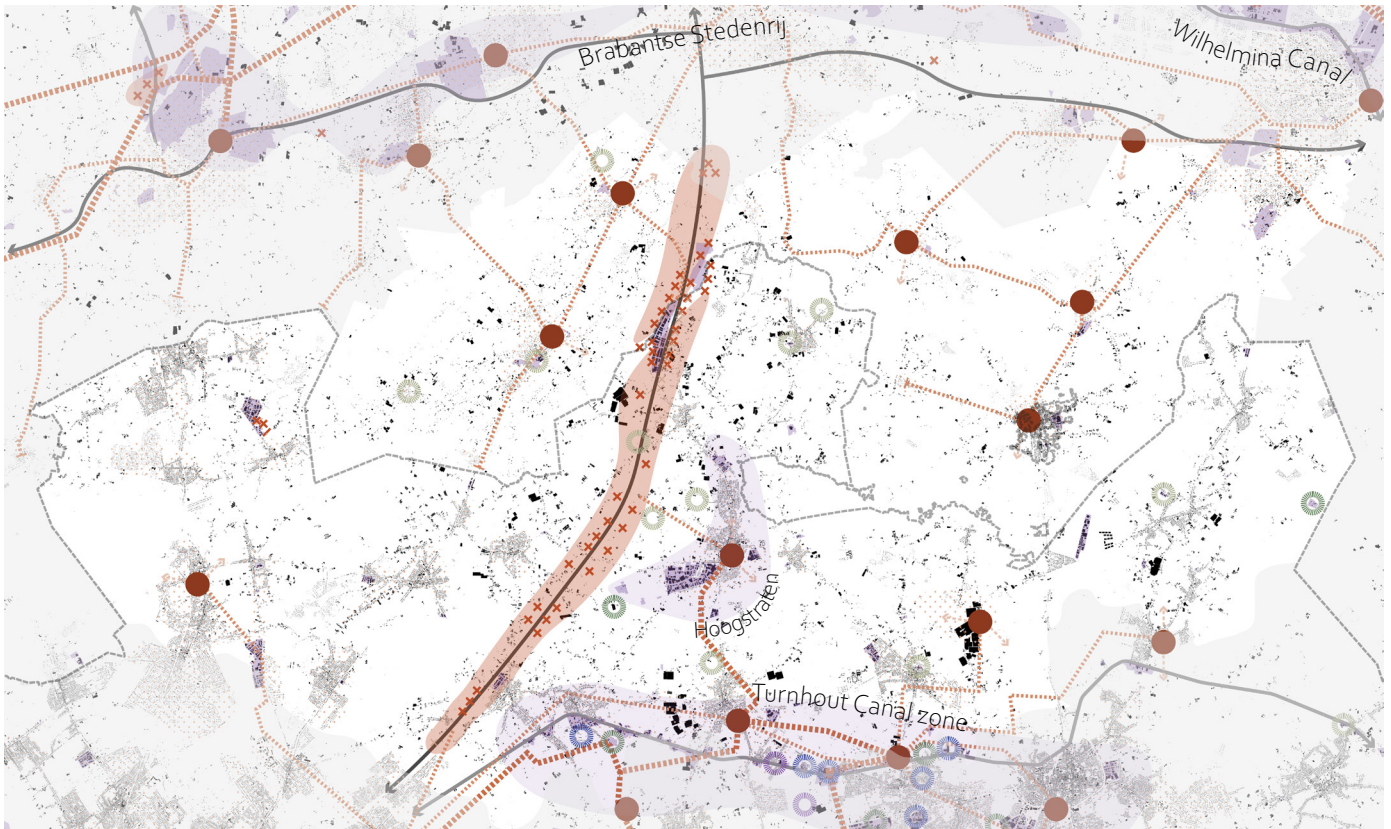


Image 3.26: Energy and Industrial Production illustrating the different types of industry and industrial clusters

- Energy production zone
- Energy usage zone
- High voltage lines
- Medium voltage lines
- Low voltage lines
- Energy distribution hub
- Agricultural processing
- Chemical Industry
- Mining and Ceramics
- Metal Processing
- Commercial and Industrial
- Highway connections
- Waterway connections



3.3 Spatial Analysis

Pollution I The presence of agriculture, industry and other human activities creates emissions. As mentioned, ecology suffers from the effects of nitrogen depositions. Nitrogen depositions are the combination of both Nitrogen (NO_x) and Ammonia (NH_3). The graphs on the right show the emissions of both these elements per sector in 2022. Blue illustrates Belgian emissions and orange Dutch. What is striking is how, for both emissions, one sector stands out. Transportation pollutes the most for nitrogen (NO_x). This is primarily a result of the combustion engines in vehicles. This aspect of nitrogen emissions can be seen on the map on the right. Blue shows nitrogen emissions. The emissions are primarily concentrated in village cores and important roads, such as the highways. Ammonia is emitted primarily by agriculture. The map illustrates how the agriculturally active regions emit this pollutant. Additionally, large emitters are shown. These are centred around small and large agricultural companies such as animal farms, processing plants and fertiliser producers.

To achieve more regenerative sustainability, the emissions and depositions of these pollutants need to be reduced. Changing mobility to a less car-centric focus, reducing combustion engines, and improving accessibility can decrease nitrogen emissions. The decrease in ammonia emissions is directly tied to agricultural use and animal husbandry.

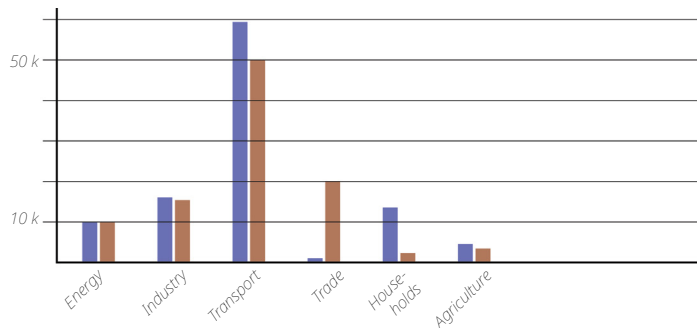


Image 3.27: Emissions of Nitrogen in tons (after Vlaams Milieuagentschap, 2024 and CBS, 2024)

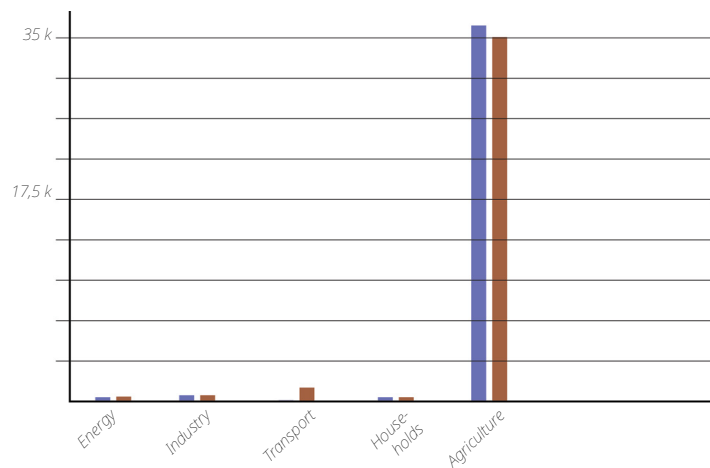


Image 3.28: Emissions of Ammonia in tons (after Vlaams Milieuagentschap, 2024 and CBS, 2024)

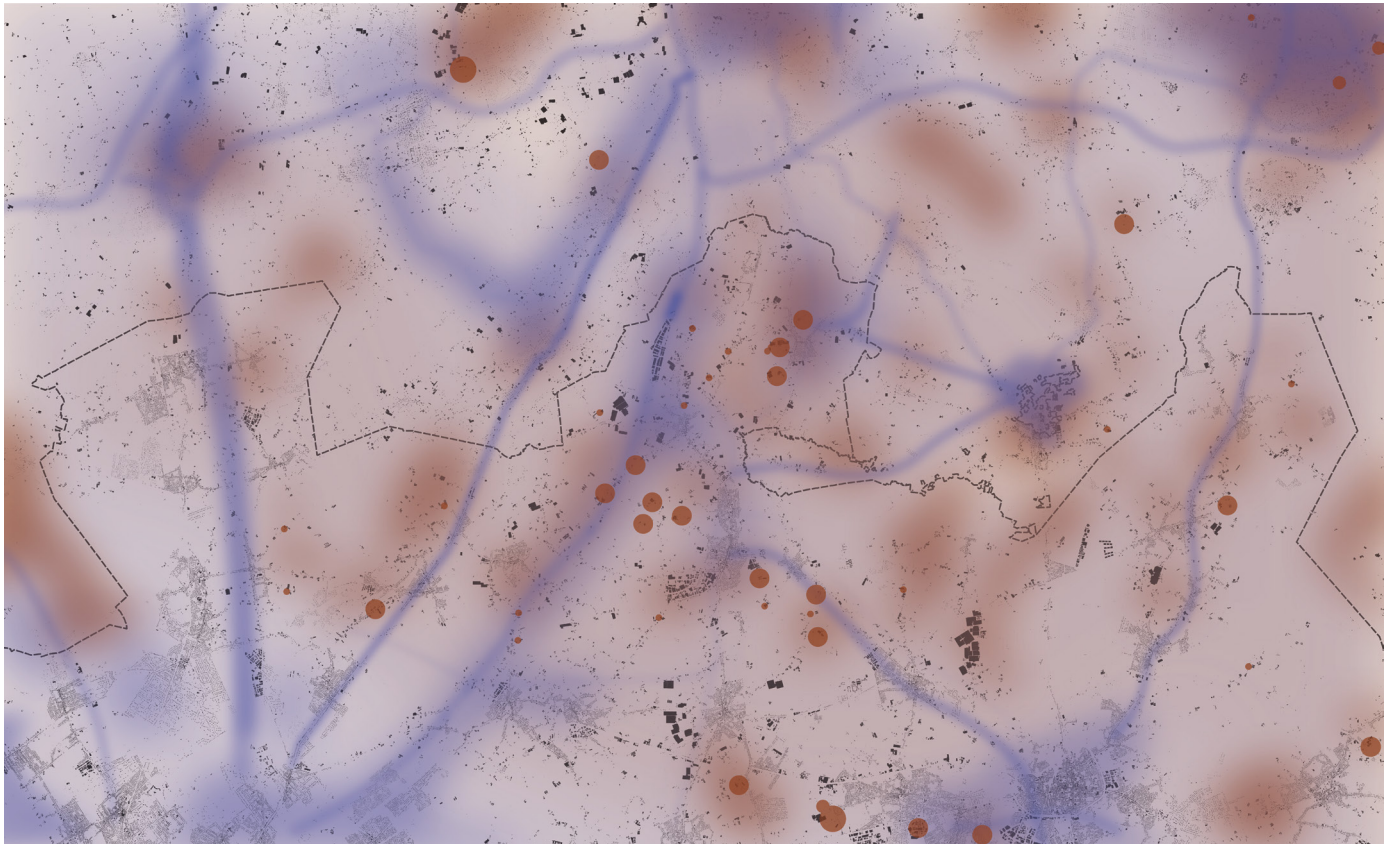
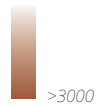
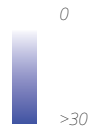


Image 3.29: Ammonia and nitrogen emissions showing locations and areas of emissions and amounts emitted per year

Emissions of Ammonia
(Mol/ha/year)



Emissions of Nitrogen
($\mu\text{g}/\text{m}^2/\text{year}$)



- High Emissions
- Medium Emissions
- Low Emissions

0km 5km 10km



3.3 Spatial Analysis

Pollution - section I The emissions of pollutants affect both land cover and groundwater systems. Agriculture and/or industry emissions can end up in the soil and water system through infiltration, while wind can move air pollutants further away. The effects on nature are a decrease in water and soil quality, sometimes making the soil extremely acidic. This negatively affects existing biodiversity as the natural state of soil in the region is already relatively low in fertility. As a result, the limited plants that can survive the sandy soil conditions decrease further, cascading further into animal diversity (Bloot et al., 2025).

Emissions and depositions onto nature also change how nature provides services to humans. With a decreasing biodiversity, leisure functions are strained further. As a result, people drive further for nature, increasing nitrogen emissions.

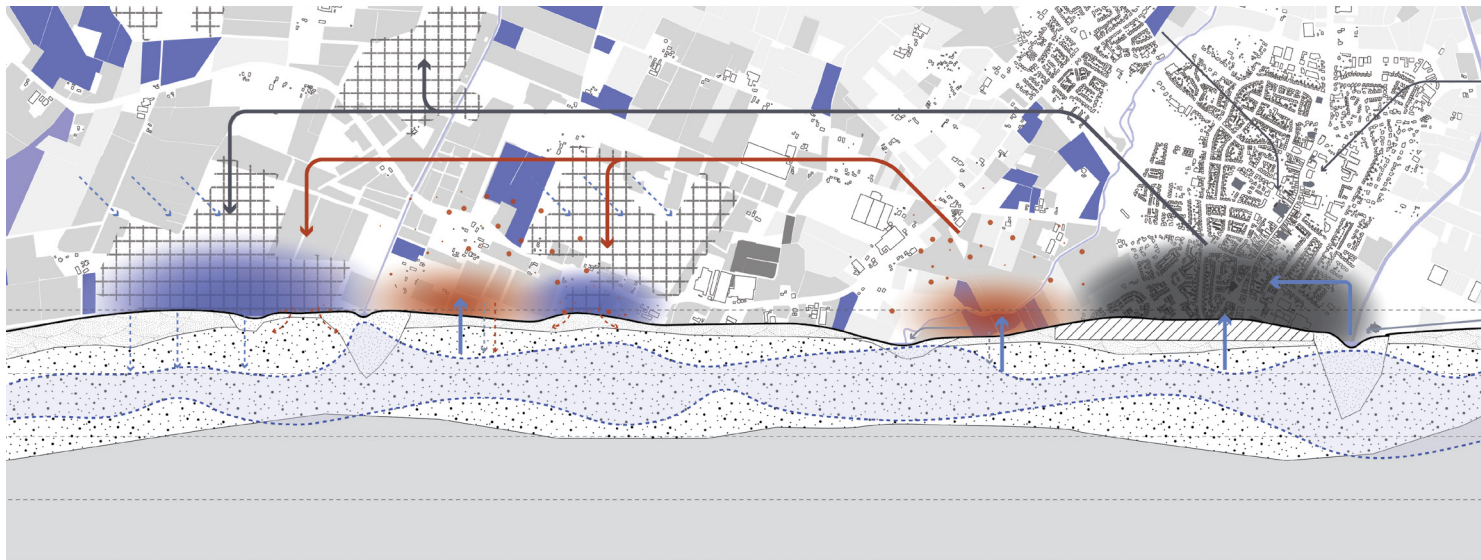
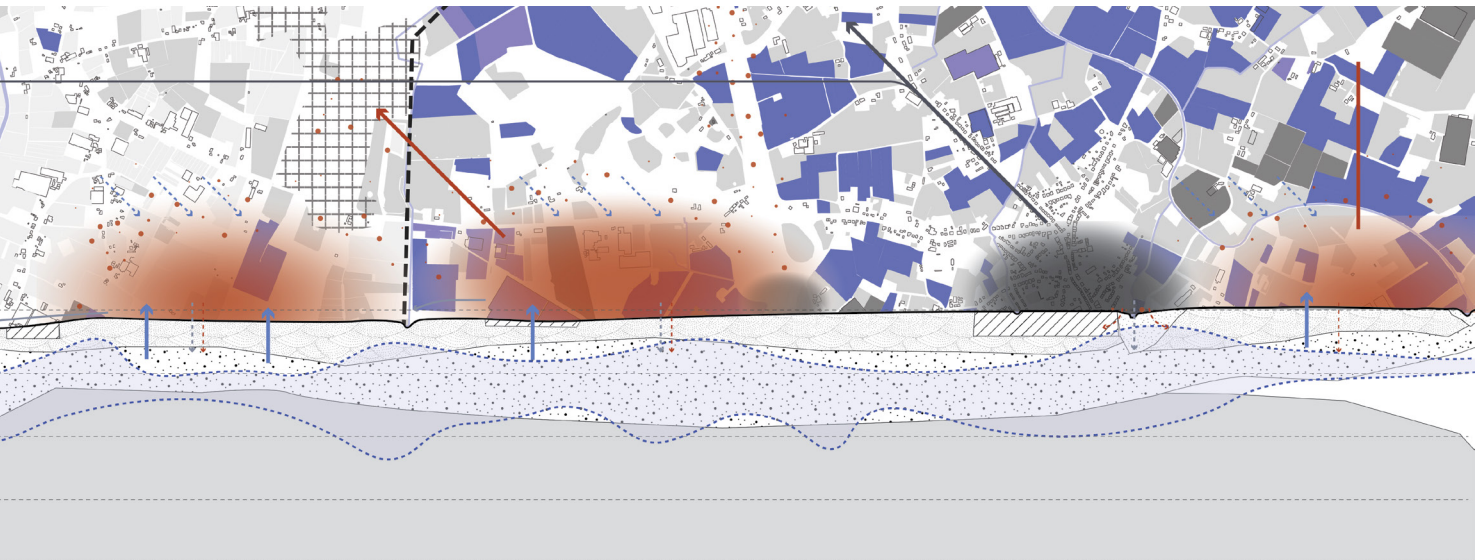


Image 3.30: Pollution section;
The section illustrates the affects pollution has on natural ground cover and the groundwater system. Pollutants move trough the air (orange dots) and land on natu-
ral area (orange arrows). Rain increases the infiltration (dashed orange arrows) into the soil and groundwater eventually being used by plants and humans



3.3 Spatial Analysis

Drought I Climate change affects the presence of groundwater in the Northern Campine. Belgium and the Netherlands have created prognoses for the future. Where the Netherlands foresees areas that will have a decrease in average lowest groundwater levels (Alg), they also see areas with an increase in Alg. In contrast, Belgium expects the entirety of the Northern Campine to experience a decrease in agriculture. This discrepancy between the two results in the map acting as if groundwater changes stick to the border. Nevertheless, the decrease of groundwater levels are something to consider.

The changes in groundwater level directly affect the possibility for human water extraction for consumption and both agricultural and industrial use. Drought stress in plants can occur in areas becoming drier, while root rot can happen in areas that become wetter. The change in groundwater levels will also make extraction more intensive, as it will need to go deeper or open up new wells to maintain a sufficient supply.

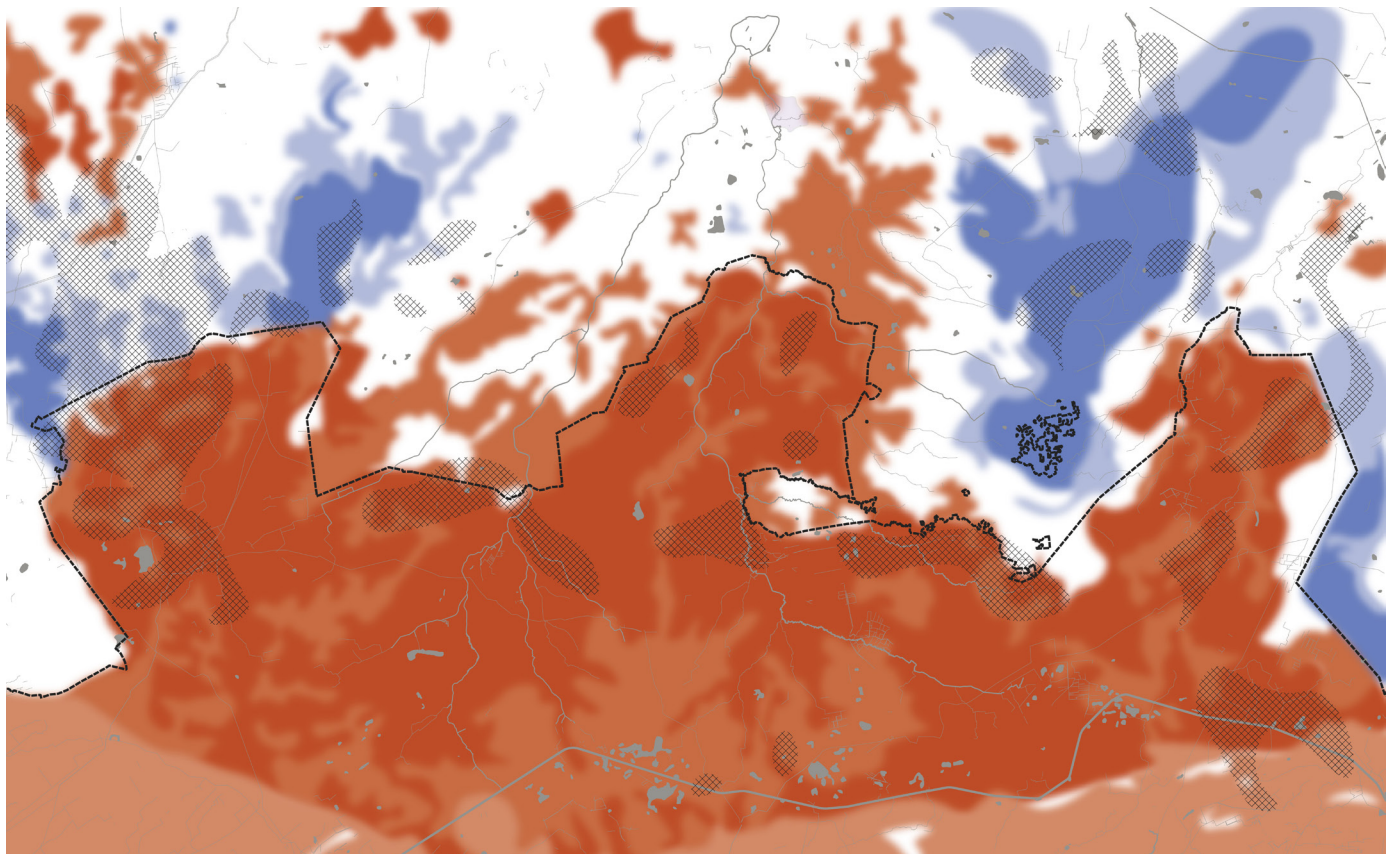
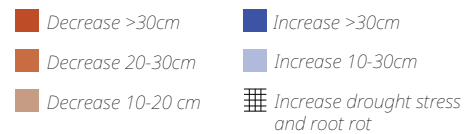


Image 3.31: Future change lowest groundwater levels (LGL) and possible drought stress for agriculture and nature by 2050.



0km 5km 10km



3.3 Spatial Analysis

Spatial Possibilities and conflicts I Moving the Northern Campine away from a depletive landscape to a sustainable or regenerative one will require changes. For instance, more water retention and expansion of ecology through forests and parks. Changing production systems is also possible. However, there are some challenges concerning these changes to the landscapes and production systems. Firstly, conflicts arise regarding water use and drought stress. Secondly, conflicts in land use can occur between industry and urban expansion.

The map on the right illustrates briefly these possibilities and conflicts. An early exploration can be made using “Soil as Base” (Harbers, Heijnen, 2022) as guidelines. In the following chapters, the analysis findings will be combined further and deepened to create more precise possibilities.

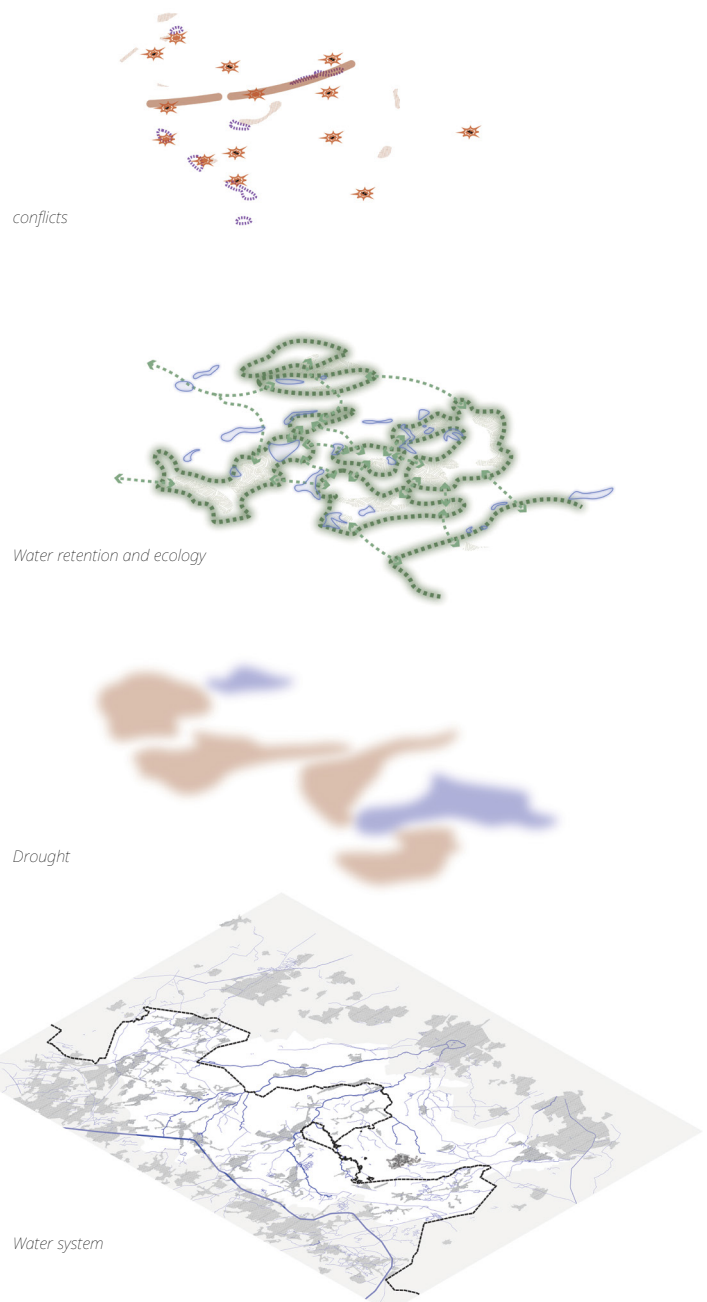


Image 3.32 Layers of possibilities

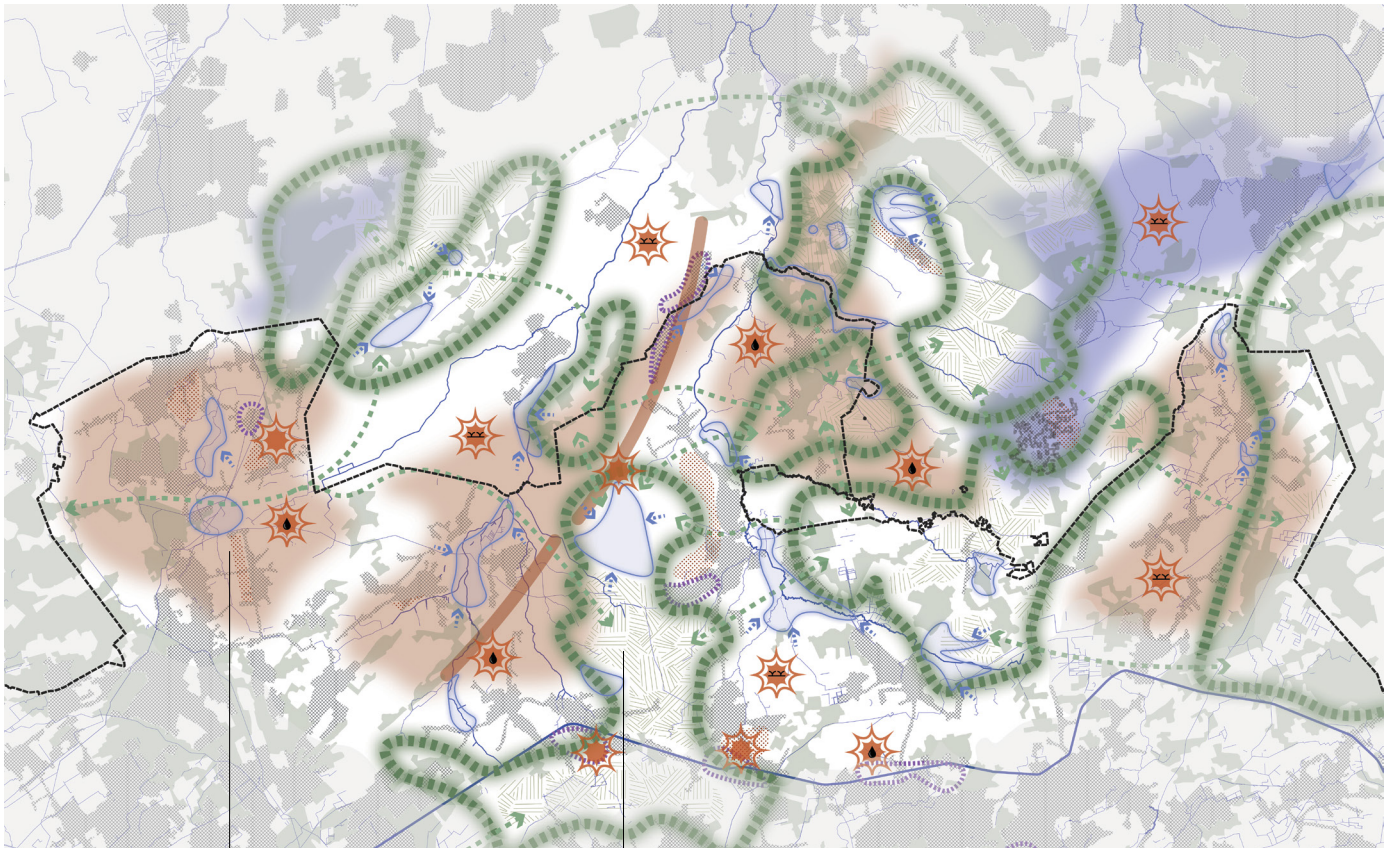


Image 3.33: Possibilities map based on soil analysis

Areas with a decrease in ground-water need more water retention. This to avoid increased drought stress for agriculture and nature and lack of water for residents

In areas for forest expansion, room for agriculture can remain, but should be bio-farming to avoid additional nitrogen depositions

- | | |
|--------------------|---------------------------|
| Forest expansions | Conflict in water use |
| Higher groundwater | Drought Stress/unsuitable |
| Lower groundwater | Conflict in land-use |
| Water retention | Ecological corridors |
| Industrial sites | Water flow |
| Urban expansion | Urban areas |
| Bio-Farming | Energy production |

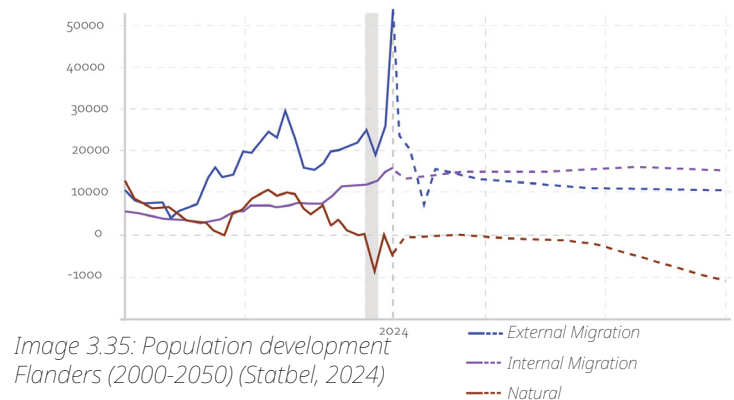
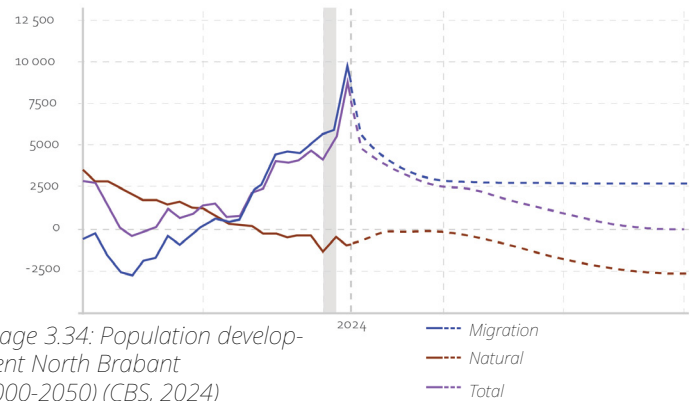
0km 5km 10km



3.3 Spatial Analysis

Society I In this section of the spatial analysis, the social aspects of depletion will be explored. This concerns mainly the presence of housing and future development, as well as services concerning basic needs such as groceries, education, and healthcare.

Society - Demographics I The Northern Campine has a lower population density than other places in the Netherlands and Flanders. This can be seen in the total population in the region. Village cores and cities on the edge of the region show per neighbourhood and house more people. Rural districts are larger while housing much fewer people (Statbel, 2024)(CBS, 2024). Population growth will slow down in the coming years, with migration stagnating and natural population changes declining. This can be seen in the region as population growth until 2035 stays in the single digits in most municipalities along the border. This small population growth can help understand why, until 2050, ageing will increase in the entire region. The ageing of the population also brings with it a decrease in individual mobility (Provincie Noord Brabant, 2023). This can become an issue as services are made increasingly inaccessible with the poor connections in certain areas.



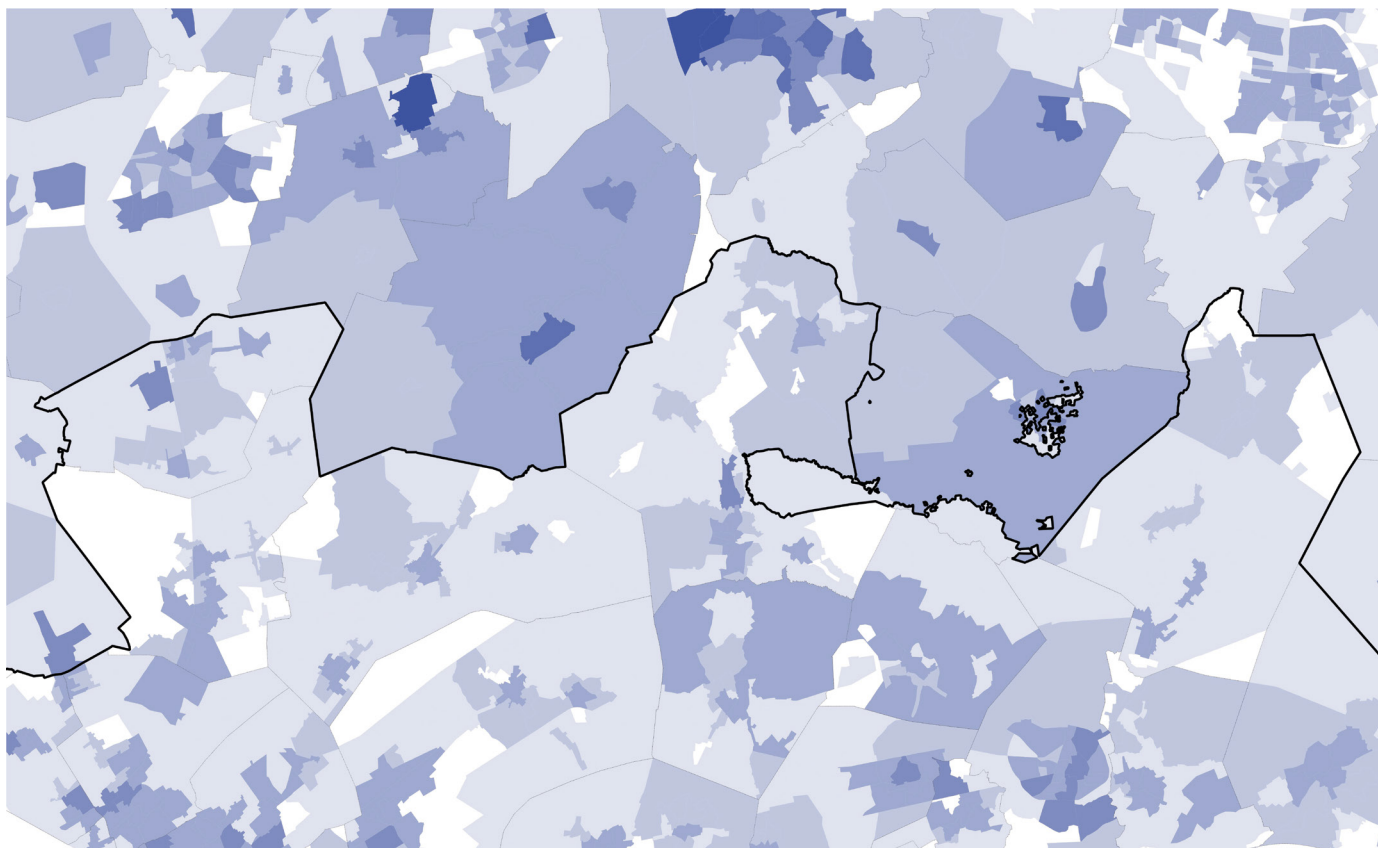


Image 3.36: Population (2024) (Statbel, 2024) (CBS, 2024)



0km 5km 10km

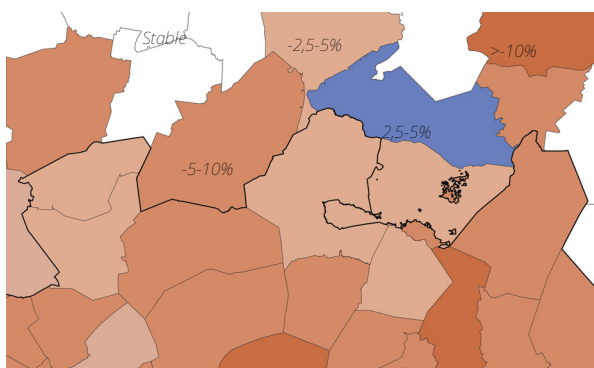


Image 3.37: Population Change (2000-2035) (Statbel, 2024) (CBS, 2024)

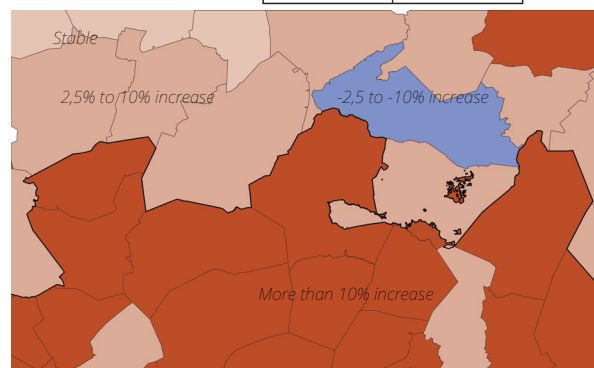


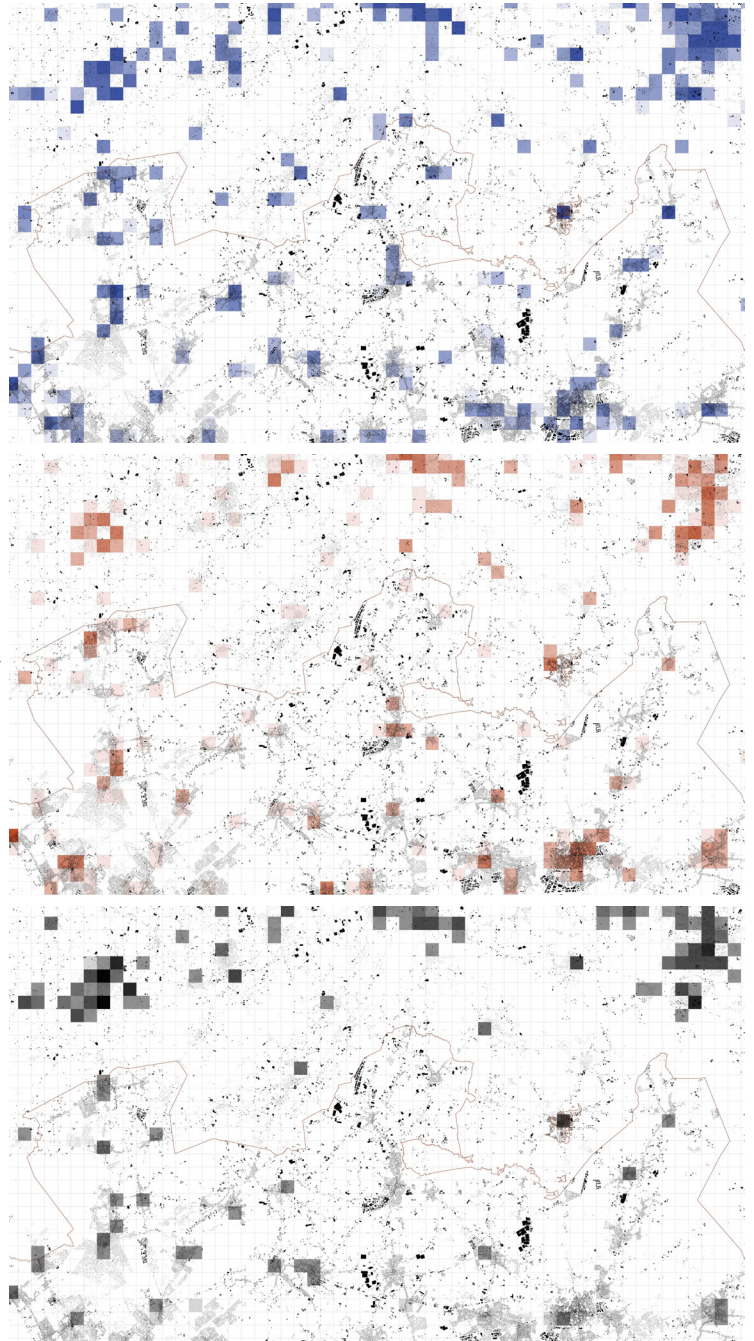
Image 3.38: Aging population (2000-2050) (Statbel, 2024) (CBS, 2024)

3.3 Spatial Analysis

Society - Ammenities I

Amenities meet the needs of residents. While there are many services, three will form the focus. These are: grocery and other food stores, education and healthcare. By looking at the distribution of these amenities, it can be seen that there is a lack of various services in multiple villages. The combined Amenities map illustrates the gap between the urban cores on the region's edges and the villages within it. Healthcare and education especially show a large gap. Even more, the present healthcare providers are primarily General Practitioners (GPs). Specialised help is often concentrated in hospitals in the larger cities. The presence of the border with the current transit system also creates situations where a Belgian GP or hospital is physically closer. However, the only usable ones are often within the Netherlands itself or vice versa.

Placing additional services within villages and towns lacking them can already improve the resilience and viability of a town.



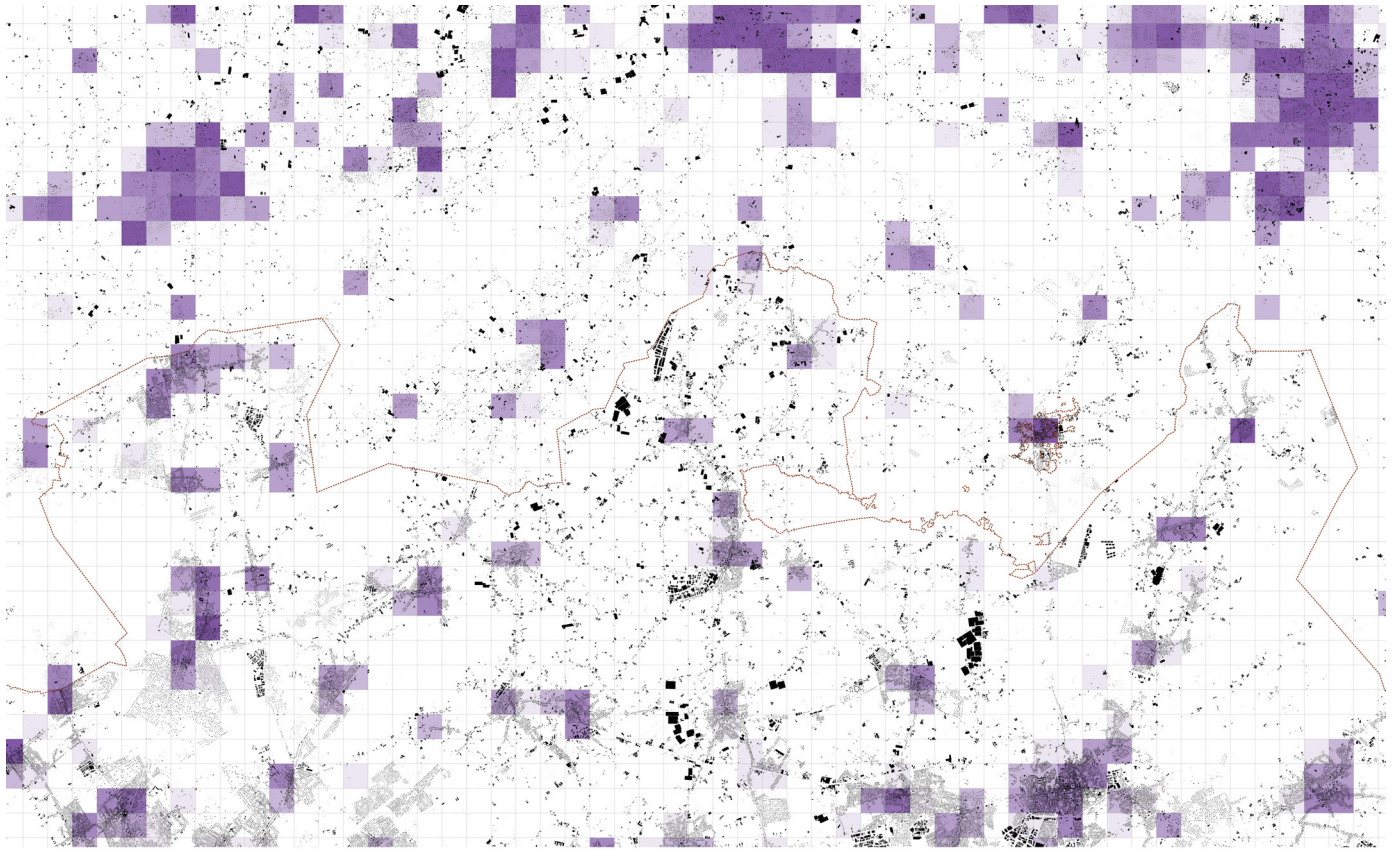
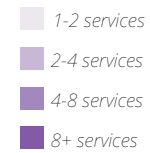


Image 3.39: Services total within grids of 1kmx1km (after CBS,2024, and OSM), combination of service maps shown left top to bottom
 -Shops
 -Schools
 -Healthcare



0km 5km 10km



3.3 Spatial Analysis

Society - Mobility I Mobility in the region is characterised primarily by personal vehicles. However, a fine meshed network of bus lines and cycling routes is present. The bus lines are a radial network connecting the main cities on the edge with the smaller villages around them. Some circumferential lines are present. Lines such as 43b on the Belgian side of the border connects some smaller villages while crossing some radial lines. The radial lines and the national border create several gaps and missing connections. This can be seen around Zundert, where no public transit connections are present to the towns of Meer, Wuustwezel and Sprundel. These gaps are filled with cycling routes. This, however, is not fully accessible for all users.

Line 43b illustrates how many villages can be connected below. However, the timetable shows a low frequency of services, hindering possible use (de Lijn, 2025)

To improve mobility, a future system should close the gaps, provide more frequency and look at more modes aside from bus.

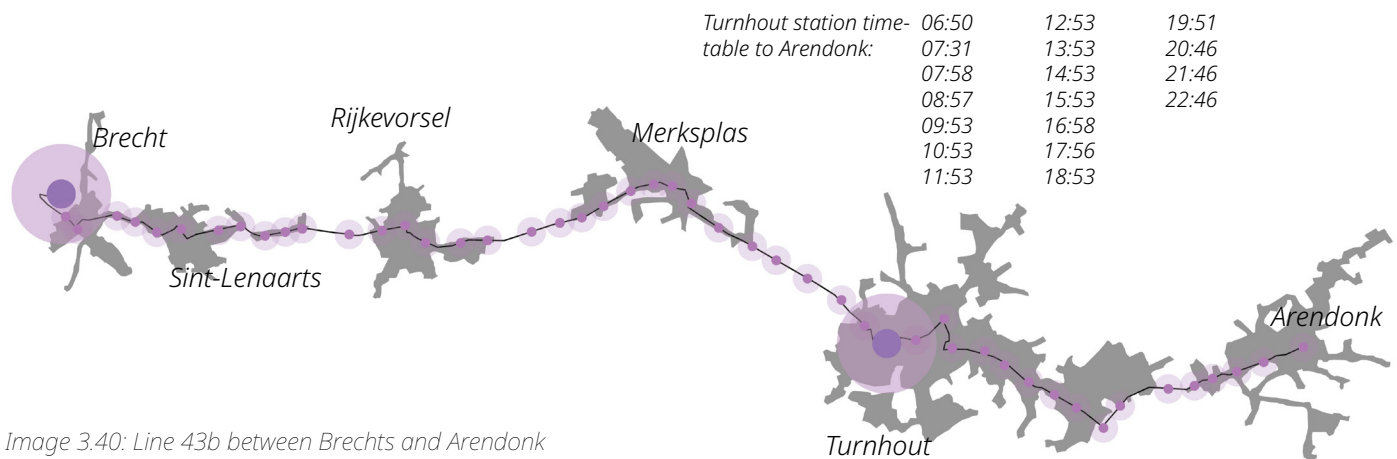
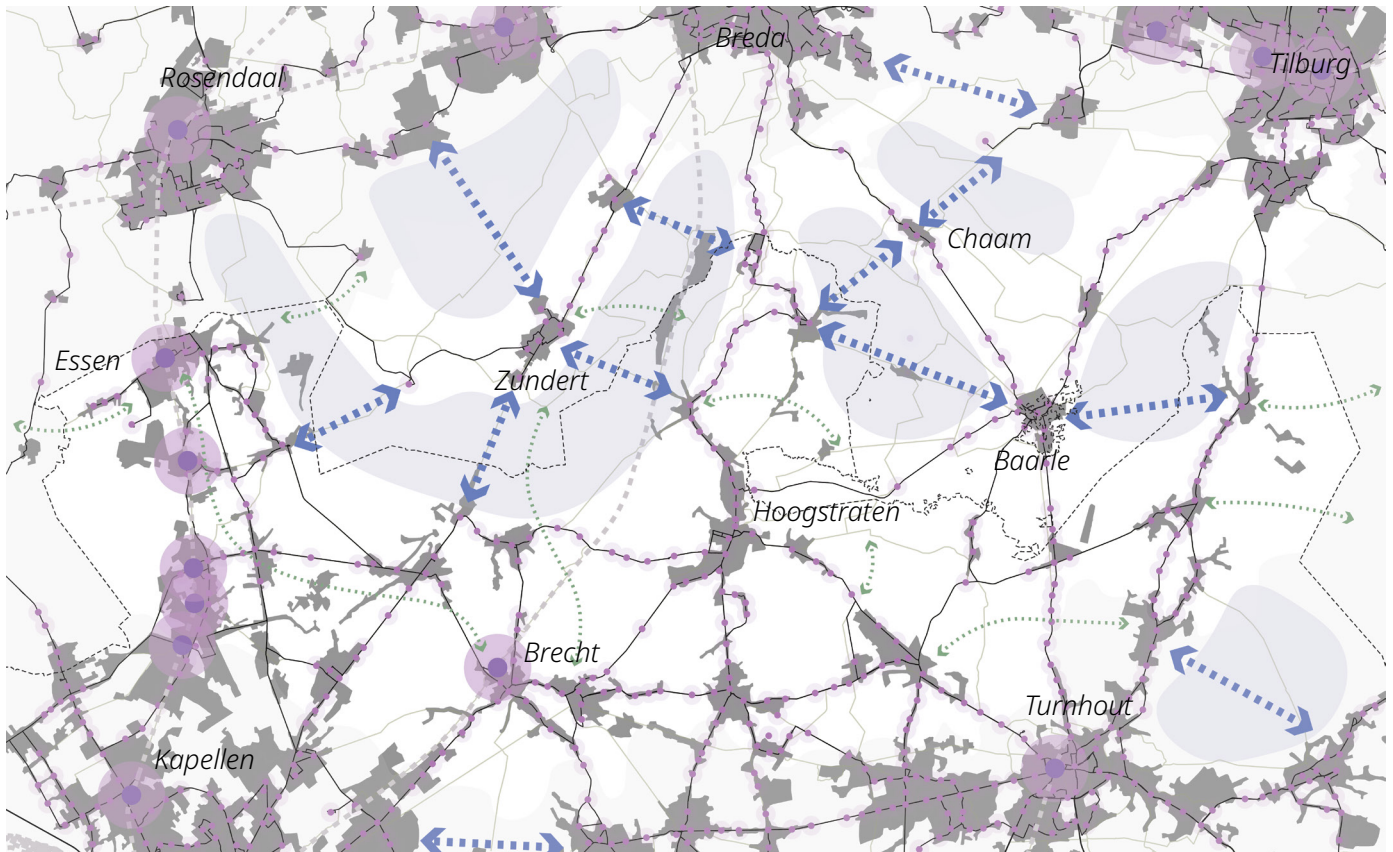
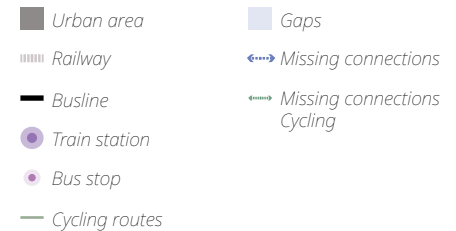


Image 3.40: Line 43b between Brechts and Arendonk



3

Image 3.41: Presence of transportation map with buslines, trainline and cycling routes shown. Dashed lines illustrate the missing links



0km 5km 10km



3.3 Spatial Analysis

Society - Villages and housing I Aside from natural areas and land uses aimed at production, the region consists of many villages. These have developed in various patterns resulting from existing conditions and planning policies over the past centuries.

The base of many villages is similar in both the Netherlands and Belgium. People settled where a path crossed a creek, met another path, or was located in a lower area with sufficient water and arable land. These settlements gained prominence with a church, situated on a crossroad or central square. As villages slowly developed, they mainly grew along the existing paths. This linear development stayed prominent in Belgium during the post-war period while Dutch villages started to be planned, filling the gaps in between the paths with straight networks, flanked often by row houses (Leenders, 2023).

The linear development can still be seen in many villages. Gaps have been filled by industrial and agricultural sites in past years, often creating particular village typologies, as shown on the right.

The presence of villages with gaps in the building development can provide opportunities for densification and expansion. This is illustrated using a hatching on the typologies shown on the right.



Image 3.42: Village typologies and possible areas for expansion (small dots) and densification (large dots)



Weelde



Achterbroek



Meerle

Linear development



Alphen



Schijf



Zundert

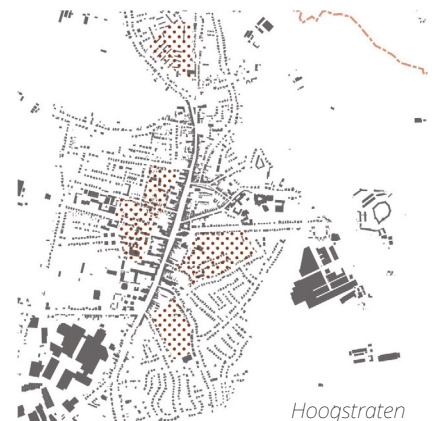
Filled in development



Baarle H. en N.



Merksplas



Hoogstraten

Mix linear and fill

3.3 Spatial Analysis

Opportunities and Challenges I The current village typologies, transportation system, and amenities provide opportunities and challenges. The main opportunity lies in the densification or expansion of villages. The gaps in the urban fabric of the villages can also provide space for services. Instead of focusing on the cities outside the region, a collection of local and regional services clusters can fill the gaps in amenities. Additionally, adding transit connections in locations where they are lacking could help connect villages, providing closer connections to amenities if a specific village cannot provide them. However, for such clusters to form, there would need to be a stable population and adequate transit possibilities. Current economic and political systems might stand in the way, especially when aiming for cross-border cooperation.

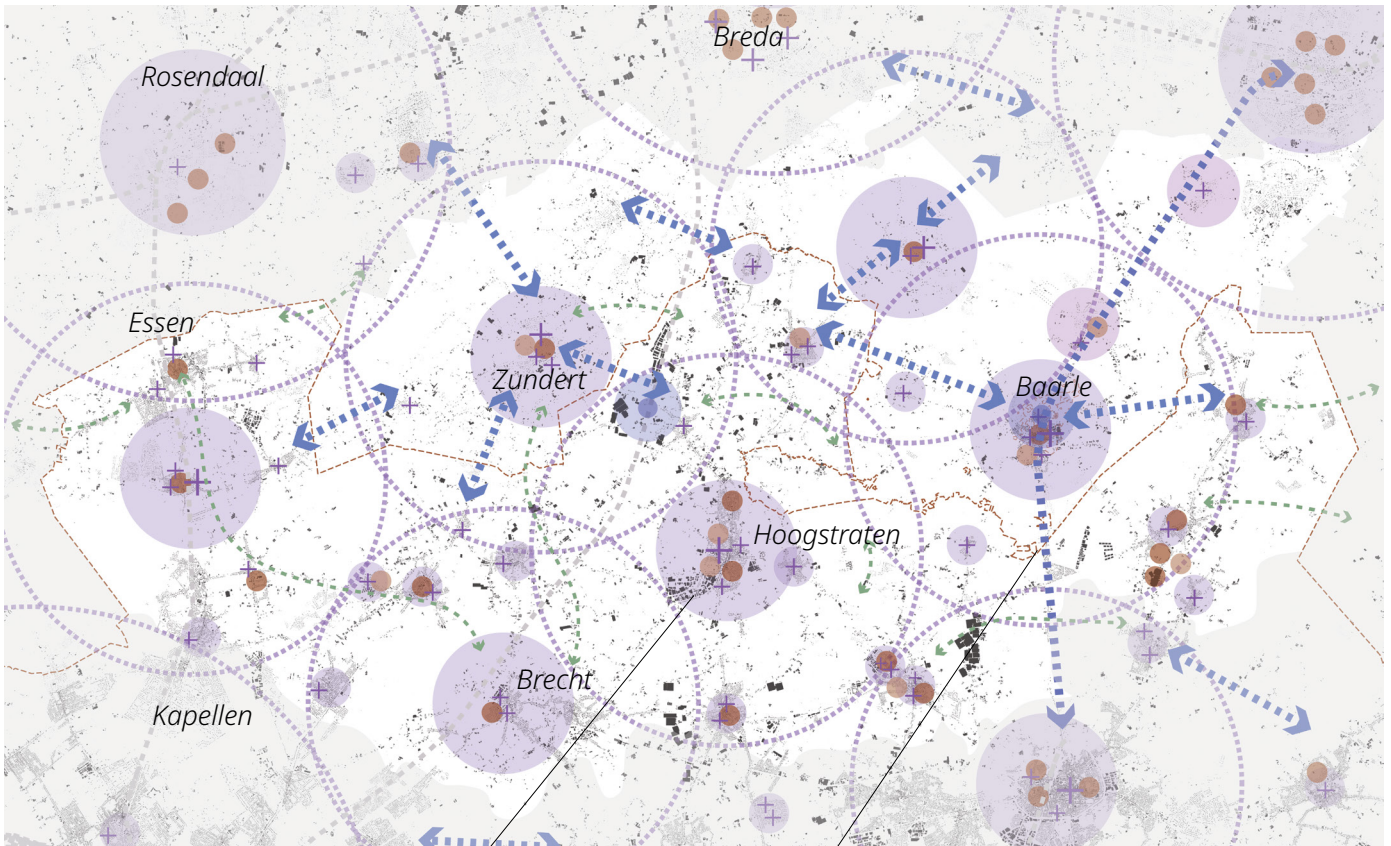


Image 3.43: Social Possibilities map

Larger villages can become hubs through addition of services and densification. Around them, local cores provide local services.

Reinstatement corridors for public transit can improve the accessibility to services outside of the region while also connecting villages in close proximity

- Railway
- + New Services
- Regional core
- Local core
- Densification
- Expansion
- Train station
- Missing connections
- Missing connections Cycling

0km 5km 10km



The Spatial analysis gives insight into the development of the Northern Campine over time. The following section of the Diachronic analysis will look at this further

I: How have land uses shaped the Northern Campine region ecologically, socially and spatially over time? -goal: to understand the spatial development and the resulting issues currently faced

The focus on productivity in the Northern Campine has resulted in intensive landuses degrading soil quality and rural shrinkage.

IV: Which spatial structures and/or elements can be reused or introduced to combat rural deterioration? -goal: to identify spatial design tools to achieve main goal

Some indications of structures that can be used or introduced are identified, the densification of villages, introducing more services and the addition of non car mobility are all examples.

3.4 Diachronic Analysis

Tamed soils I As seen in the spatial analysis chapter, the region's geological history goes back millennia with faults creating plateaus, wind and rivers eroding valleys and hilltops. Human settlement of the region is, in the total frame of time, more recent. As the analysis investigates production landscapes, the historical analysis starts when the region could have been seen as a very early production landscape with the extraction of nature for profit. The arrival of Viking raiders, mainly the lord of local legends, Gelmel, can be seen as the start of forming a production landscape. This Viking sailed down the Mark river multiple times before settling between what would later become Hoogstraten and Zondereigen. On the banks of the Mark, he built a small, fortified mound from which he ruled the surroundings as lord. Taxes and tithes in natura, later money, illustrate that the region was starting to be used for the benefit of people who owned the land (v. Brabant, 2023). Through the centuries, small villages were founded, some as religious pilgrimages, creating a string of villages built next to monasteries in the region. Examples of this are Hoogstraten and Meersel-Dreef. Other places grew due to them forming centres of power. Hoogstraten and Turnhout illustrate this well as they were sites of local keeps and castles for the lords of various counties, diocese and other political divisions. Inheritances, conquests and more eventually led to the region falling under the Dukes of Brabant in the late Middle Ages. All the while, population and production in the region grew steadily. This can mainly be seen in the sudden shift in the landscape. Increasing grazing, felling of forests loosened the sand of the Campine to an extent that wind blew it around,

slowly replacing the mixed landscape of forests, heaths and marshes with barren dunes, heaths and marshes. This state of the landscape stayed constant for the coming centuries (Leenders, 2023).

While the region was part of a single entity most of the time, separations between north and south occurred several times—first between the Republic of the Netherlands and Spain, later Austria. After a short renaissance in the late 18th and early 19th centuries, the cultural changes became apparent. In the 1830s, the border between the Netherlands and Belgium was established, severing centuries-old connections between villages and farmland.

3



Image 3.44: Castle of Hoogstraten "Gelmelslot", ca 16th century (Visit Hoogstraten, 2023) 223

This was exemplified during the Great War when German occupation in Belgium created kilometres-long stretches of fences and electrical wires, called the “Wires of death” to avoid smuggling of goods and people into the neutral Netherlands (Koops, 2023). After the war, this separation was maintained with border controls. Additionally, the interbellum period saw a rapid agricultural development through the reclamation of heaths. Reclamation often occurred by first taming the soil through the creation of forests to later make way for pastures and fields. This reclamation formed the base for the modern production landscape. Modern techniques allowed intensive farming, and logistics were expanded rapidly with large roads and highways (Leenders, 2023).

The single cultural entity of the Northern Campine has disappeared with the constant shift of inhabitants, as well as the significant differences in culture, politics, and economics between the two countries. Nevertheless, the past can give insight into moving away from the modern production landscape. The current landscape aims to constantly increase profit and production levels to the detriment of nature and social structures (Moore, 2015). Traditional systems could provide possibilities for replacing it with a regenerative landscape.

The following section will illustrate historical developments and show which methods might be interesting to reintroduce in the region.



Image 3.45: Early division of Brabant (Tooriaans, 2022.)



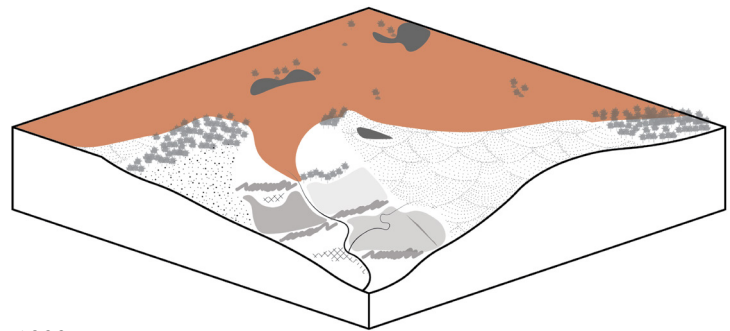
Image 3.46: Death wire (unknown, n.d.)



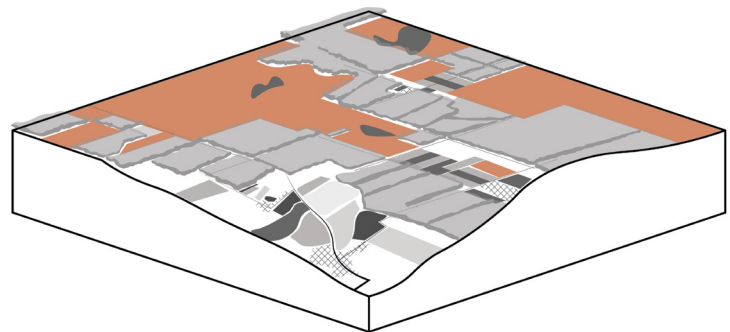
Image 3.46: Detail of Map of Brabant (unknown, n.d.)

3.4 Diachronic Analysis

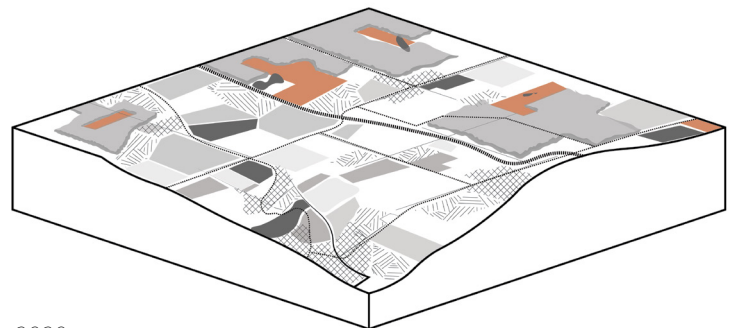
Lanscapes -Heaths I The industrialisation and population growth shifted how the landscape was viewed. Starting in the late 18th century, the 'untamed' heaths were slowly reclaimed. Heaths were slowly planted with forests by selling common land to private companies. Between 1820 and 1920, large swaths of the heath were planted with private and government forests. After the creation of forests, land was sold off again to be converted into agricultural plots (Leenders, 2023). By 2020, most of the heath has been turned into agricultural land. What remains of the heath are small pockets within pockets of forests surrounded by extensive agricultural lands. The industrialisation and population growth shifted the manner in which the landscape was viewed. Starting in the late 18th century, the 'untamed' heaths were slowly reclaimed. Through the selling of common land to private companies, heaths were slowly planted with forests. Between 1820 and 1920, large swaths of heath were planted with private and government forests. After the creation of forests, land was sold off again to create into agricultural plots (Leenders, 2023). By 2020, most of the heath has been turned into agricultural land. What remains of the heath are small pockets within pockets of forests surrounded by large agricultural lands.



1820

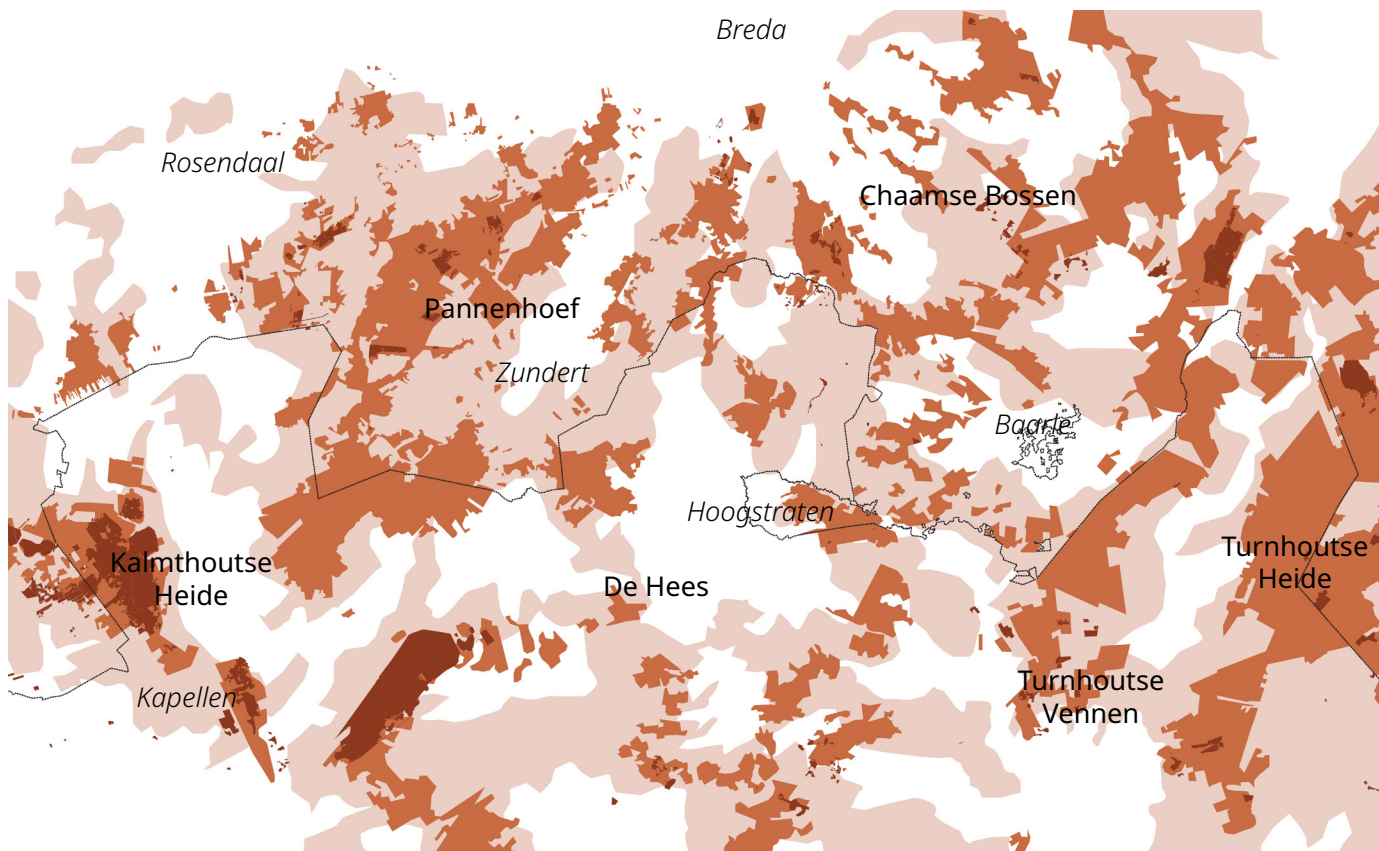


1920



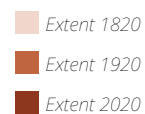
2020

Image 3.47: Development Heaths between 1820 and 2020



3

Image 3.48: Development Heaths 1820-2020 (after Topotijdreis)



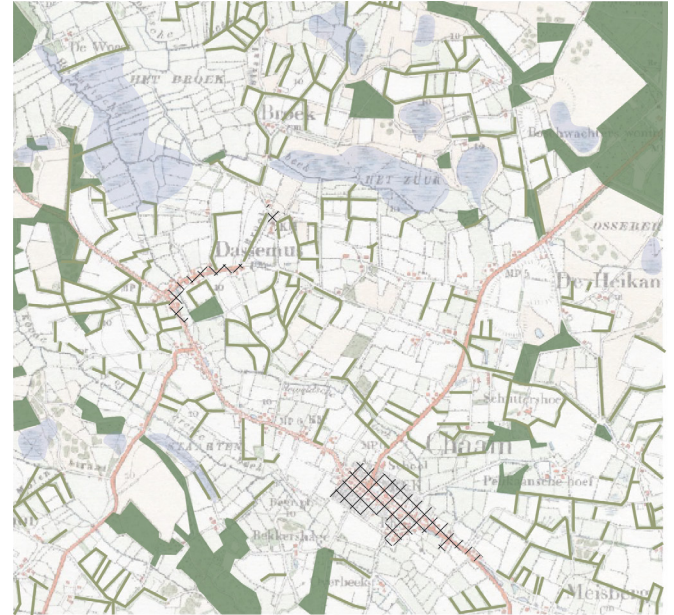
0km 5km 10km



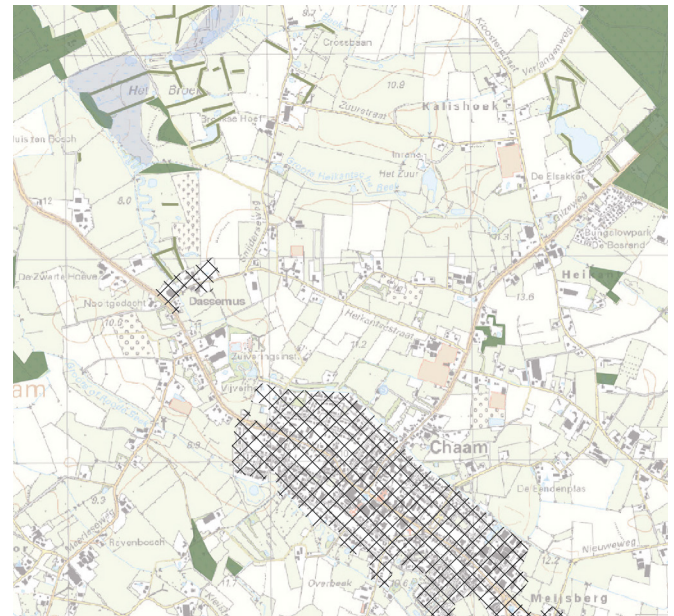
3.4 Diachronic Analysis

Lanscapes- Agriculture, forests | Forests

and agricultural landscapes have also changed. Before the 1920s, villages were surrounded by communal and privately owned grounds. These were often separated by a strip of hedges and trees or small linear mounds. The privatisation of land and industrialisation of agriculture after the Second World War resulted in the small, irregular plots being merged into larger rectangular ones. Additionally, the large swaths of planted forests have been cut down again and replaced by modern agriculture (Leenders, 2023).



1920

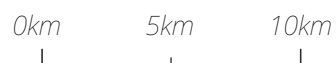
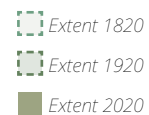


2020

Image 3.49: Development bocages and thickets between 1920 and 2020



Image 3.50: Development Forests 1820-2020 (after Topotijdreis)



3.4 Diachronic Analysis

Transportation I Most of history, transportation ran along sand roads by foot, horse, or wagon. The construction of a steam network and later electrical trams allowed people and products to move more easily through the Northern Campine. Stations became new village hubs linking some of the smallest villages to larger cities such as Antwerp. Nevertheless, by the 1950s, the trams were slowly replaced by buses and personal vehicles. Nowadays, only traces of this network can be seen underneath the region's car-centric design. Nevertheless, this history does show that even when villages were smaller, there was a possibility of creating a network of trams. Even today, their routes are still present, often being changed into walking or cycling paths.



Image 3.51: change
of rail to car transit
(top)
Old rail corridor
(bottom)



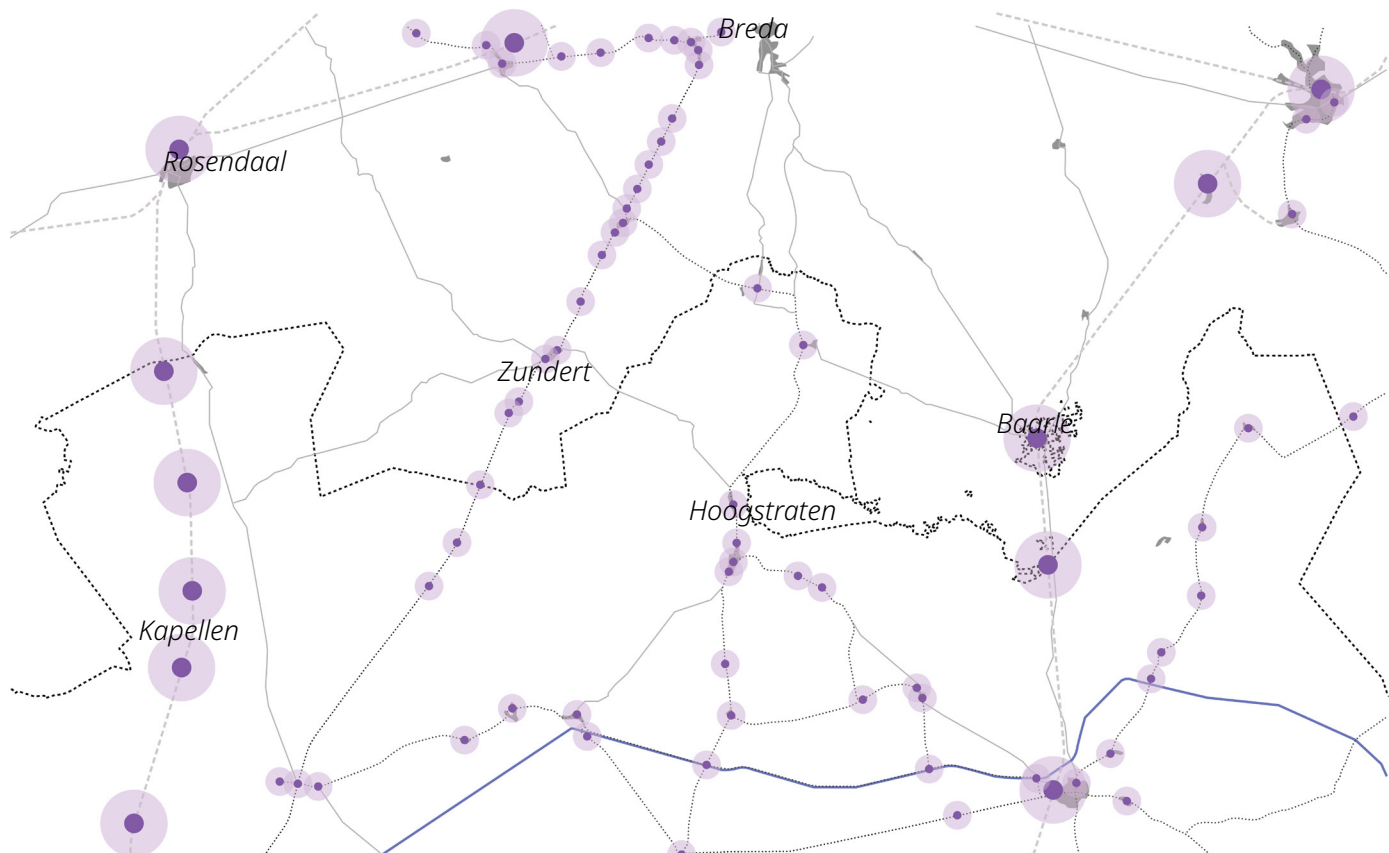


Image 3.52: Rail and tram corridors in 1920 with stations as well as main roads and Turnhoutse Canal

- Tram and Train stations
- Tramlines
- - - Trainlines
- Main Roads

0km 5km 10km



3.4 Diachronic Analysis

Conclusion I Overlaying all the elements of the diachronic analysis can give insight into the overall historical development. One of the most striking conclusions is the loss of heaths. Instead, these region-defining landscapes are replaced with urban areas; forests first replaced them. Afterwards, these forests were replaced by agricultural land. Current urban areas have exploded since the early 1800s and have seldom encroached on previous heath areas. Expanding existing forests and heaths to their previous extent minimally affects villages and towns. Secondly, the previous rail lines are still visible in the area. Replaced either by leisure paths or regional roads, their corridors are visible and often still maintain their width. These possibilities can be taken into consideration when developing the regional strategy.

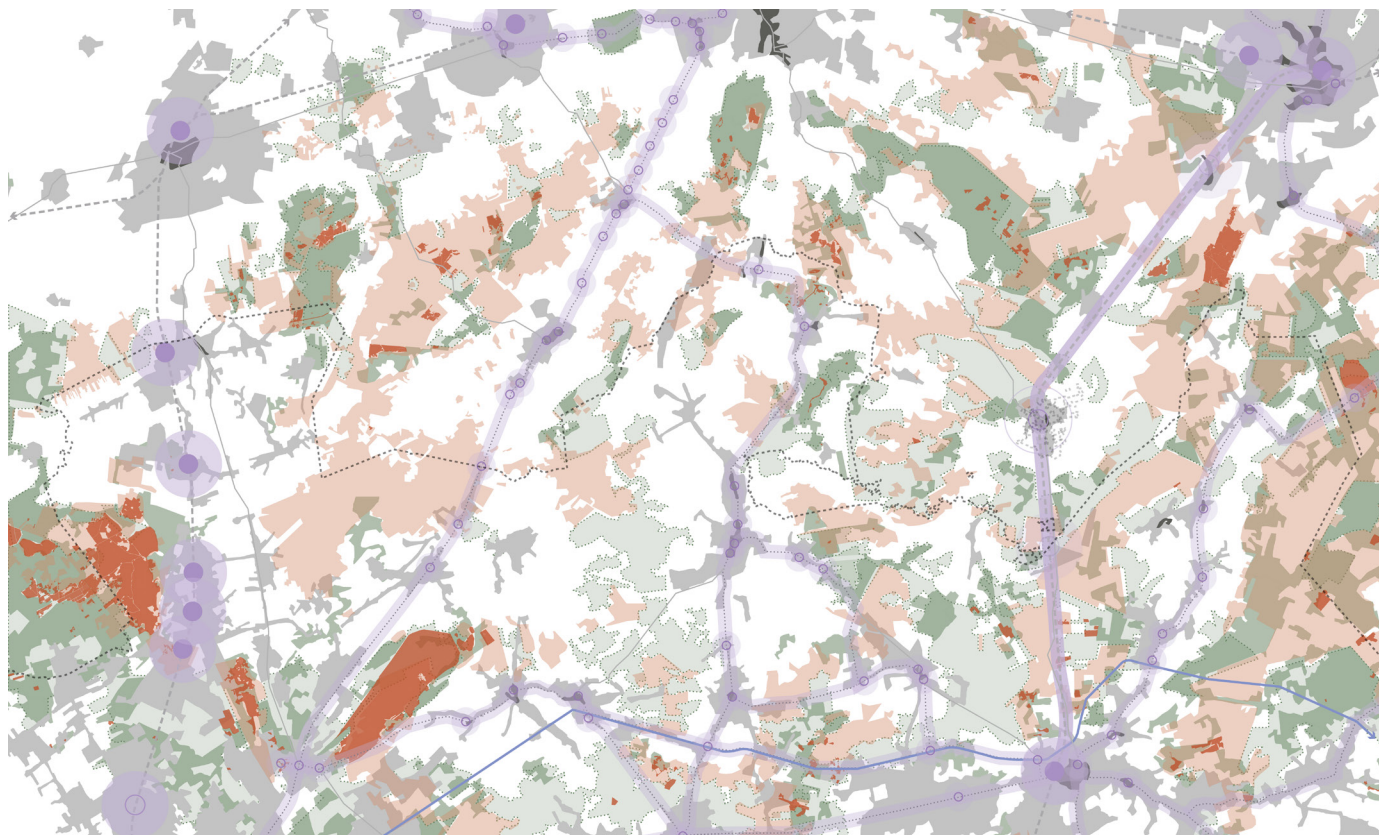


Image 3.53: Conclusion map Diachronic analysis showing changes to forest, heath and urban areas between 1920 and 2020

- | | |
|---------------------|---------------------------|
| Extent Heaths 1920 | Removed tram/train lines |
| Extent Heaths 2020 | Abandoned tram stops |
| Extent Forests 1920 | Train stations |
| Extent Forests 2020 | Trainlines |
| Urban areas 1920 | Main Roads |
| Urban Areas 2020 | Removed tram and railways |

0km 5km 10km



3.5 Conclusion

Over the past chapter, analysis has been conducted in 3 different sections. A literature review helped define the four main concepts while providing insight into the current state of governance and spatial planning in the Northern Campine. Secondly, a spatial analysis covering soil, production and history provided insight into the development of the Northern Campine from a wilderness to a production landscape. The main findings were the strain land uses, such as agriculture, place on natural systems. Additionally, analysing the social challenges and possibilities showed the lack of a clear hierarchy in residential development and provision of services. The findings can be summarised through the first two sub-questions:

What is Regenerative Sustainability, and which praxis can improve soil and ecological quality?

Regenerative Sustainability is the expansion of circularity to include natural and social systems to ensure a constant return of used resources into the system to maintain its viability. Praxis such as Regenerative Agriculture, Villages and Development aim to ensure a regenerative system through multifunctionality, focus on local sourcing and use and, most importantly, the use of pre-existing limits to soil and water systems. If the expansion of ecological surplus is necessary, it should only be achieved by nature-based solutions. (Gibbons, 2020; Lyle, 1994)

How have land uses shaped the Northern Campine region ecologically, socially and spatially over time?

Initially characterised by a mix of dunes, heaths and creek valleys, the Northern Campine has been slowly developed into agricultural land, and forests were planted to counter the growth of the dunes. This shift sped up after 1920 with artificial fertilisers. The resulting landscape is that of intensive agriculture next to small villages. This focus on intensive land use has drained the soil of productivity, depleting demand for labour, creating a spiral where residents leave, to be later followed by the loss of services. Over time, this depletion creates a landscape that cannot absorb ecological, economic and political shocks.

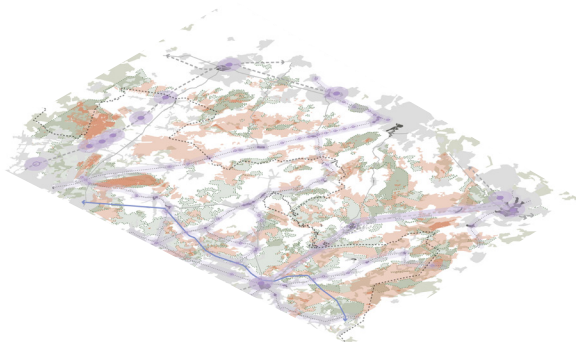
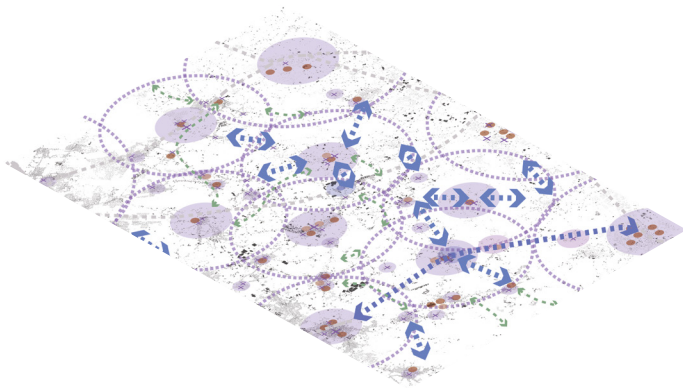
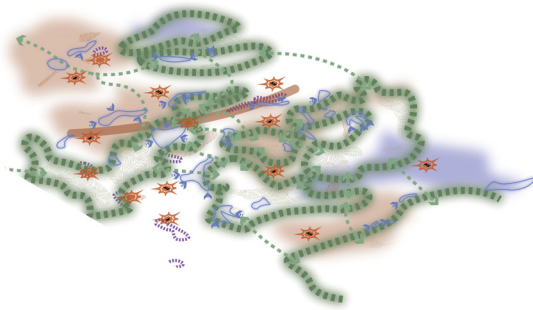


Image 3.54: conclusion maps layer

Conclusion

Image 3.55: Illustrative images of depletion and possibilities

3.5 Conclusion

Criteria I The results derived from the literature review, as well as spatial, social, and diachronic analyses, can facilitate the development of a comprehensive list of criteria. These criteria will assist in evaluating the scenarios presented in the subsequent sections as part of the final strategy. An assessment of the final criteria will contribute to the formation of the concluding analysis. The list of criteria is categorised into three primary parts: Spatial, hybrid, and institutional themes. Within these thematic categories, further distinctions are delineated among specific sub-themes. The objective outlined on the right illustrates the direction in which the strategy should progress to attain the goals of the Regenerative Northern Campine.

Spatial Themes	<i>Soil and Water</i>	
	Water retention	Increased retention
	Flooding	Decreased
	Water Extraction	Bassin based
	Water system	Local systems
	Agricultural use	Based on soil types
	Water quality	High quality
	Soil quality	Healthy and vital
	<i>Ecology</i>	
	Cultural landscapes	Integrated network
	Natura 2000 zones	Expanded with buffers.
	Biodiversity	Recovery
	Blue-Green Network	National and connected
Hybrid Themes	<i>Mobility</i>	
	Modes	Mixed modes
	Network type	Mix radial and transverse
	Core goal	Service based
	<i>Resilience and Regenerative</i>	
	Functions	Multifunctional
	Information exchange	Horizontal
	Governance Networks	Local and horizontal
	Housing provision	mix of types
Institutional Themes	<i>Cross Border Coop.</i>	
	Level of stakeholders	Local and provincial
	Goals	Shared
	Vision	Shared
	Network of actors	Local
	Institutions needed	Limited

Image 3.56: Criteria based on theory, political and spatial analysis



Leemputten, F. van. (1850-1914). "The Distribution of Bread in a village." [painting]. KMSKA



4

Scenario Analysis

4.1 Scenarios

criteria

PBL and VPO

4.2 Institutional and Spatial Imagination

Global entrepreneurship

Fast world

Green Country

Regionalism

4.3 Assessment

4.4 Uncertainties and adjustments

4.1 Scenarios

Following the analysis of the Northern Campine presented in the preceding chapters, which addressed the ongoing depletion and proposed alternatives within the conceptual framework, the subsequent step entails the exploration and examination of existing scenarios pertaining to the Northern Campine. Each scenario will provide insights into the strengths and weaknesses at both institutional and spatial levels. Utilising the criteria established in Chapter 3, the scenarios will be evaluated based on their effectiveness in combating depletion and the implementation of the necessary measures concepts.

Criteria I The criteria for evaluating the scenarios align with the findings from theoretical, spatial, and diachronic analyses. Their objective is to pinpoint specific elements that a scenario should aim for, while not addressing particular methods to achieve these goals. For example, enhancements in water quality can be pursued through both advanced technical measures and Nature-Based Solutions. However, the application of different tools or methods for a single criterion may impact various other criteria. Consequently, disparities may arise between scenarios with similar objectives but utilising different measures or tools. As outlined in section 3.5, the criteria are categorised into three groups: spatial, hybrid, and institutional. Each group contains specific themes such as soil and water, accessibility, and Cross Border Cooperation, each with its own established criteria. These criteria will guide the evaluation of the scenarios and the final design. Each will be rated on a scale from omitted to imple-

mented, represented by --, 0, and ++. These form the base for evaluating the scenarios at the end of this chapter as well as the final strategy from chapter 5.

The aim is to gain insight into how thoroughly each scenario incorporates the different themes and concepts necessary for achieving a regenerative Northern Campine.

Spatial Themes

<i>Soil and Water</i>	-	o	+
Water retention	increased drought	Uneven distribution	Increased retention
Flooding	More extreme	irregular	Decreased
Water Extraction	National level	Regional level	Bassin based
Water system	Singular system	Regional system	Local systems
Agricultural use	Anything goes	Regional specialis.	Based on soil types
Water quality	Unusable	Low quality	High quality
Soil quality	Depleted	Low quality	Healthy and vital
<i>Ecology</i>			
Cultural landscapes	Non-existent	Small pockets	Integrated network
Natura 2000 zones	Agri. taken away land	Agri. next to	Expanded with buffers.
Biodiversity	Further loss	Endangered	Recovery
Blue-Green Network	Not implemented	Disconnected	National and connected

Hybrid Themes

<i>Mobility</i>			
Modes	Single modes	Heavy focus on one	Mixed modes
Network type	Radial, no rural links	Radial to core	Mix radial and transverse
Core goal	High profit	Profit	Service based
<i>Resilience and Regenerative</i>			
Functions	Monofunctional	Some basic services	Multifunctional
Information exchange	No exchange	Top down	Horizontal
Governance Networks	National	Provincial	Local and horizontal
Housing provision	detached	terraced and detached	mix of types

Institutional Themes

<i>Cross Border Coop.</i>			
Level of stakeholders	National	Provincial	Local and provincial
Goals	Diverging	Slight variations	Shared
Vision	Diverging	Similar	Shared
Network of actors	National	Provincial	Local
Institutions needed	Many (national and local)	Multiple	Limited

Image 4.1: Assessment Criteria

4.1 Scenarios

PBL and VPO In section 3.2, the scenario document created by PBL has been analysed. Four scenarios by 2050 have been introduced, providing insight into how the Netherlands can change spatially. A core pillar ascribed to them is the achievement of climate goals. The manner and extent to which these goals are achieved differ across scenarios. Additionally, they accommodate variations using “more” and “less” scenarios. In “more”, population growth, more intense climate change, and greater impact affect the scenario. In “less”, population stagnates, and climate change is less drastic and slightly more uncertain. (Hamers et al., 2023). As these scenarios focus on the Netherlands, the question arises whether they can be extended into Flanders as well. Around 2022, the Flemish Planning Organisation (VPO) began the process of creating spatial scenarios as well. Surprisingly, their timeline and challenges are similar, and sometimes identical, to the PBL scenarios. Climate change, goals, and timelines are identical to the PBL ones, while the scenarios are given slightly different descriptions (Gommers et al.). They are, in essence, similar. As a result, the scenarios from PBL and VPO can be grouped together. Additionally, the PBL scenarios, which have already been developed on a spatial level, can be extended into Flanders. The PBL scenarios are “Global Entrepreneurship”, “Fast world”, “Green Country” and “Regionalism” (Hamers et al., 2023). VPO has named its scenarios “The Amish”, “Donut”, “Deluge” and “Elon-Musk”.

Shown on the right are the PBL scenarios. While these are worked out spatially at a detailed level, the scenarios lack an overall explanation of the uncertainties that shaped them. In this respect, VPO provides a deeper understanding of the uncertainties at play, which will be explained and compared to the PBL scenarios on the following page.

A summary of each of the 4 PBL scenarios can be found in the Appendix

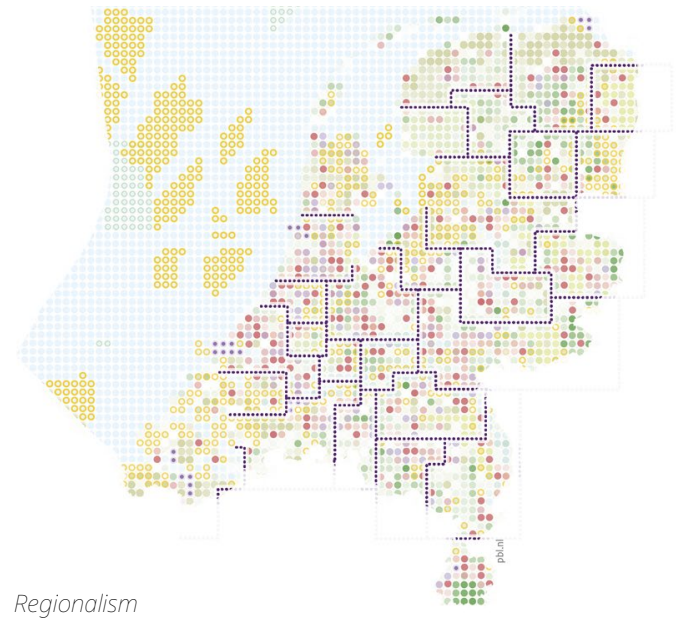
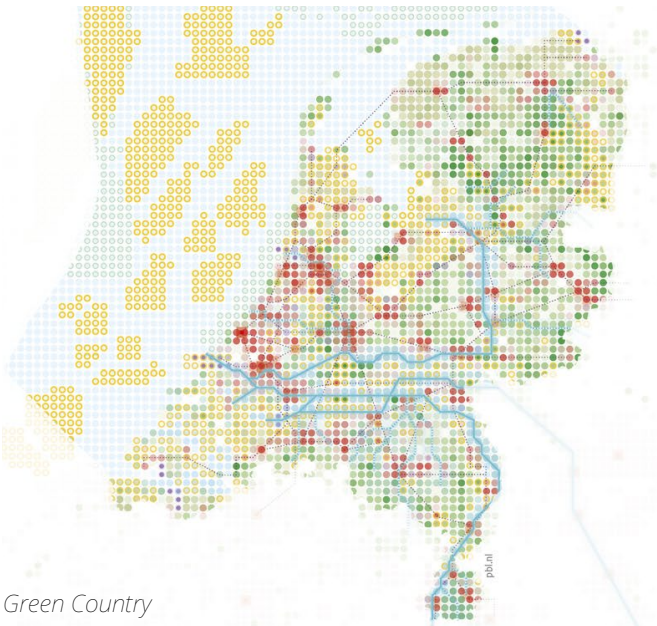
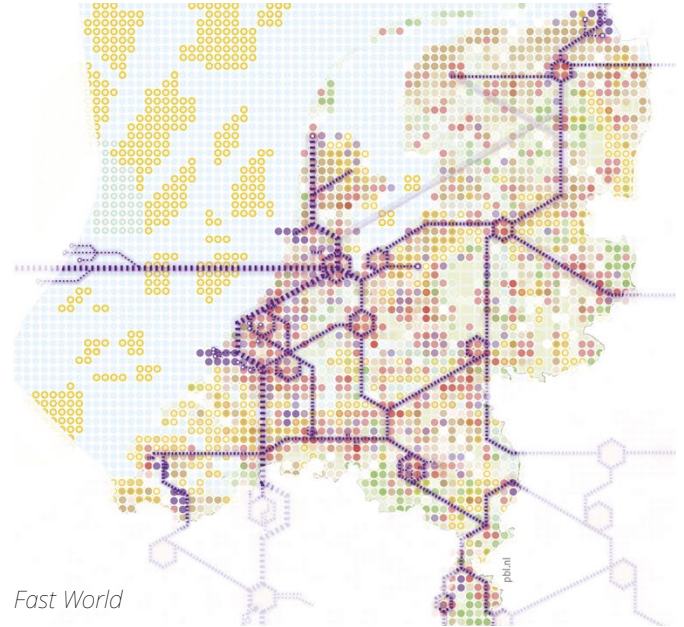
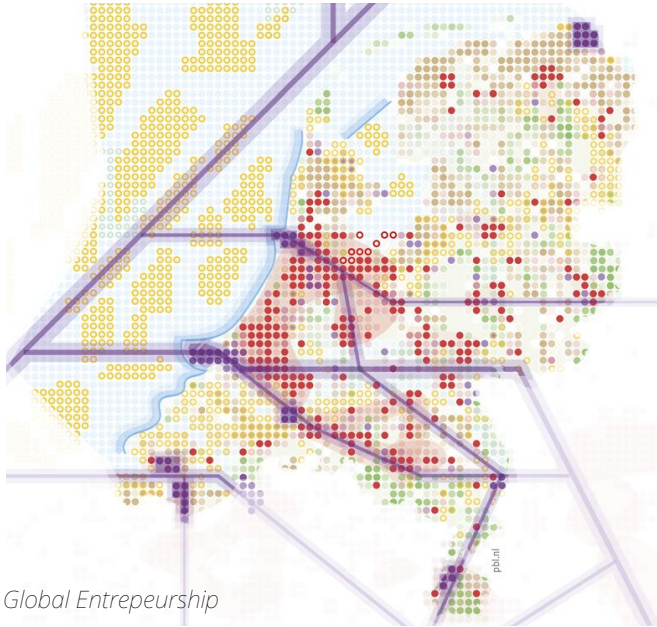


Image 4.2: Overview of scenario diagrams (Hamers et al., 2023)

4.1 Scenarios

Uncertainties | One aspect in which the scenarios identified by VPO expand better than the PBL ones is the uncertainties present. PBL does indirectly touch upon them, such as population growth and climate change, systemic uncertainties, such as the economic system, are only briefly mentioned (Hamers et al., 2023). Nevertheless, VPO gives a better overview of all the uncertainties. They divide the uncertainties into several groups. Key uncertainties are the most important and focus on the broader economic system. Societal Systems look at production, mobility and other systems that are used by society. Human Action concerns more how humans act within the new systems, while Civil Society looks at the participation and inequality of each scenario (Gommers et al.). To make a good comparison between the PBL and VPO scenarios, the PBL scenarios are placed within these uncertainties as well. Instead of naming each scenario each are given a number as shown on the right.

Examining the graph reveals overlaps in the uncertainties among the scenarios. Although there are some minor differences, the scenarios can be grouped or considered as a single entity. For example, scenarios 5 and 6 overlap 11 out of 12 times. Consequently, the subsequent sections of this chapter will use the PBL as a basis. This decision stems from the overlap with the VPO scenarios as well as the level of detail they have been developed to. Nevertheless, the uncertainties presented by the VPO scenarios provide a solid framework for comparing the results of the criteria later on.

- 1: Global Entrepreneurship (PBL)
- 2: Deluge (VPO)
- 3: Fast World (PBL)
- 4: Elon-Musk (VPO)
- 5: Green Country (PBL)
- 6: Donut (VPO)
- 7: Regionalism (PBL)
- 8: Amish (VPO)

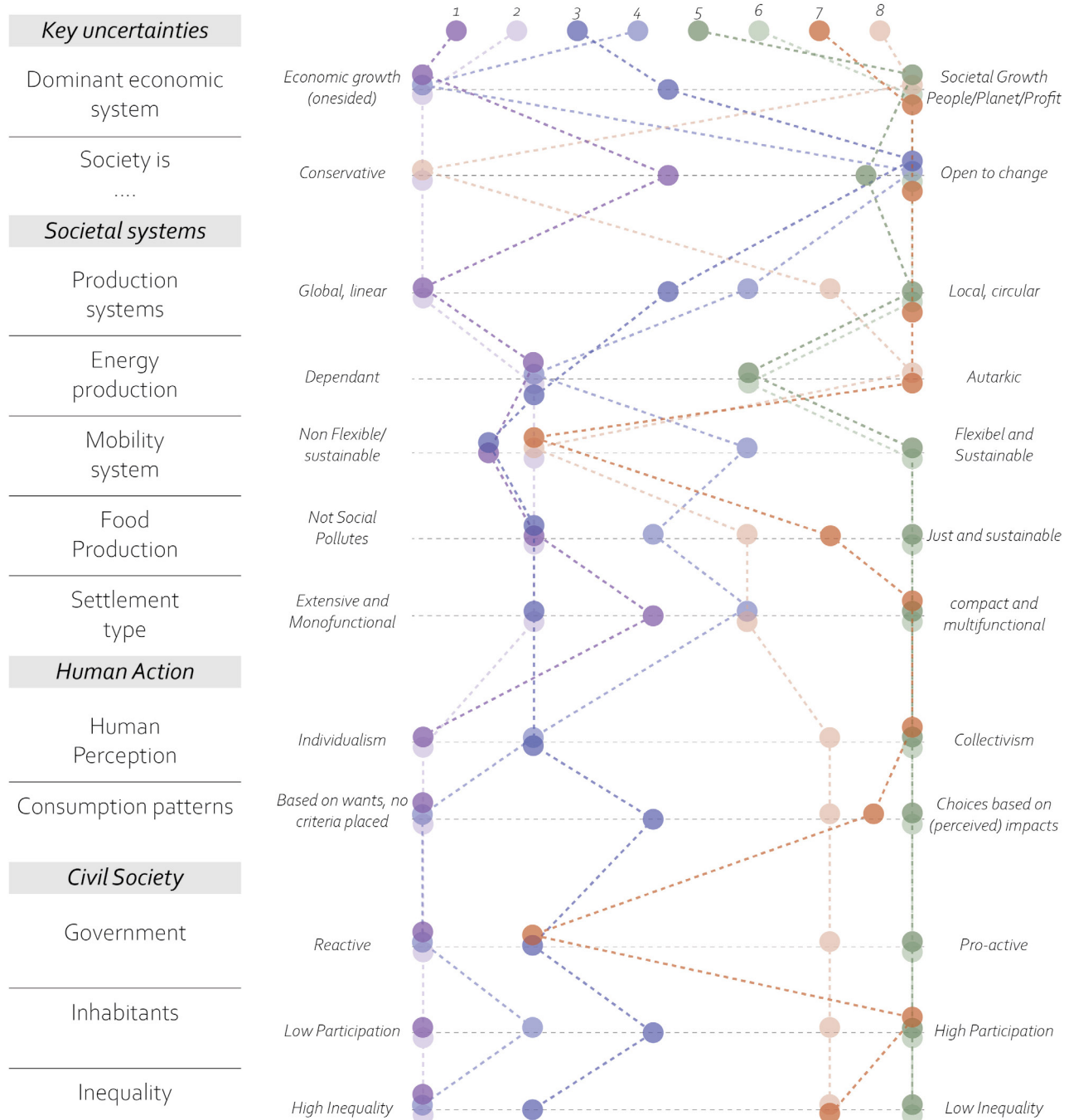


Image 4.3: Overview of uncertainties after Gommers et al. (2024)

4.2 Institutional and Spatial Imagination

The scenarios introduced in the previous section primarily focus on the national level. It is interesting to review how each scenario operates in the Northern Campine, encompassing both the Netherlands and Belgium. This assumes a homogenous system change in both countries. Nevertheless, the baselines of “more” and “less” describe an additional shift in international and European cooperation (Hamers et al., 2023). Consequently, in some scenarios, assuming a homogenous change can be justified. The four scenarios, as described by PBL (2023), will be assessed as follows. Rather than solely conducting the assessment based on the criteria, each scenario will be evaluated through institutional imagination and spatial imagination. This aims to provide insight into the strengths and weaknesses of both governance and spatial design of each scenario.

Global Entrepreneurship - Institutional Imagination I The institutions in Global Entrepreneurship focus on economic growth. National and regional governments act only when agglomerates or other companies begin forming monopolies or when trying to attract market actors. As a result, governments become more distant from residents. Companies dictate land use, while provincial legislatures do have a say in this, primarily concerning soil and water quality. However, the actual use and management are carried out by private companies. Although national and provincial legislatures have climate goals set by the EU, natural areas strictly fall under EU climate laws. Nevertheless, private landowners remain free to do as

they wish. Additionally, private companies provide basic and supplementary services to residents and municipalities, which may ultimately decrease residents' participation or influence.

Strength and weaknesses I This system possesses several advantages. Firstly, emphasising the market can enhance innovation and efficiency. However, it may create a divide between residents and services, as these are no longer directly managed by the municipality. Moreover, the high demand for land driven by the market can intensify conflicts among various stakeholders. Yet, further integration by national governments can already facilitate the alignment of goals. This enables large market players to operate on a cross-border basis, while nature institutions adhere to clear supranational guidelines that allow for quick comparisons. However, relying primarily on the market as the main catalyst for change can exacerbate inequalities, as not everyone has equal access to services and job opportunities created.

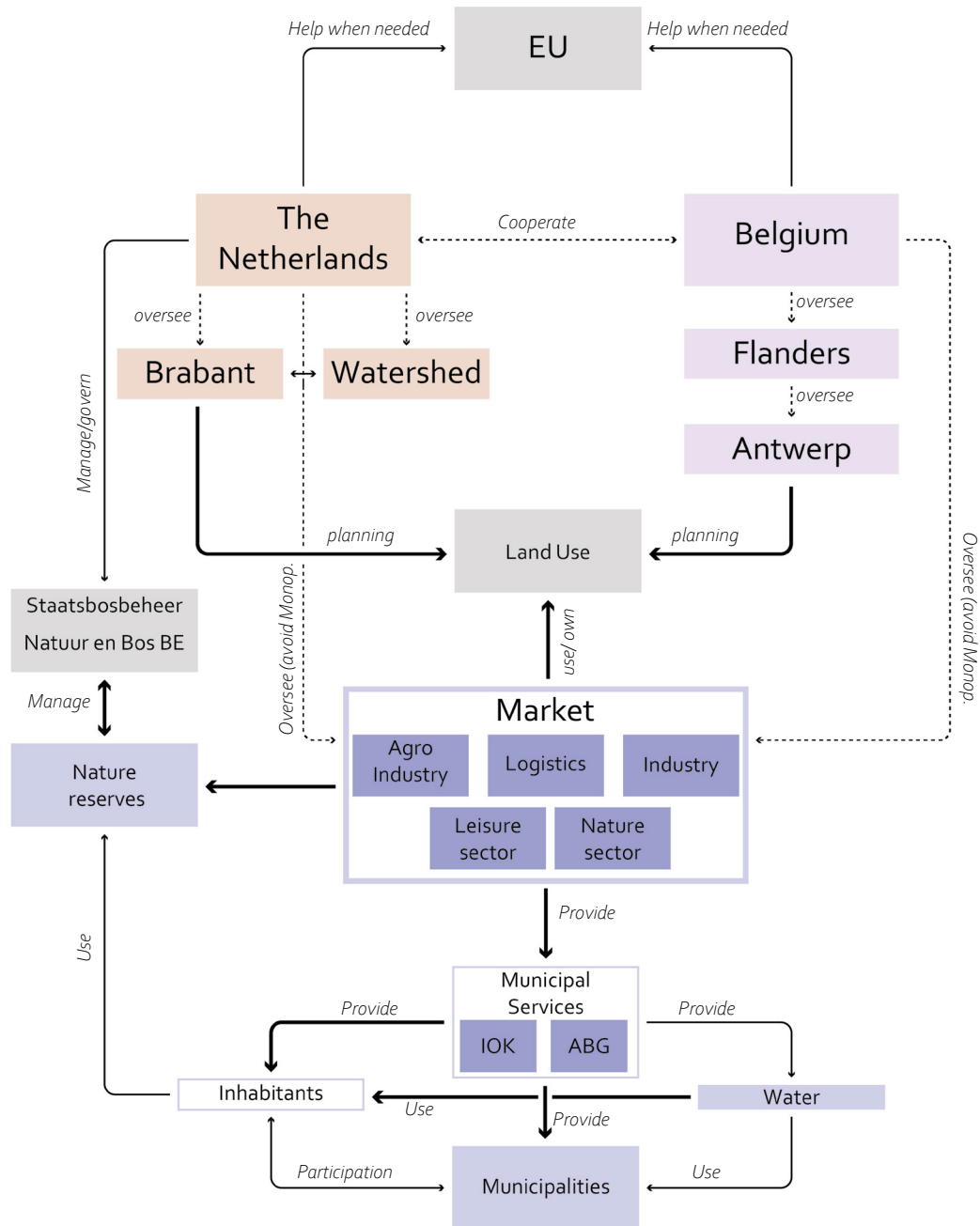


Image 4.4: Institutional structure Global Entrepreneurship

4.2 Institutional and Spatial Imagination

Global Entrepreneurship - Spatial Imagination I The impact on spatial design in the first scenario entails an expansion of the production landscape. A significant increase in green spaces, through expanded forests and creek valleys, primarily serves leisure, healthcare, and residential purposes. Nature has become more a space for human experiences and climate mitigation rather than ecological preservation. The intensified agriculture near urban centres and highways, along with new logistics and industrial developments, contributes to increased pollution in certain areas. Although technological advancements help reduce the pollution from agro-industry, their widespread implementation diminishes the overall reduction in emissions. The growth of industrial, agro-industrial, and residential sectors leads to higher demands for water and energy. New water extraction sites are established along creeks and elevated plateaus, but to minimise water pollution, additional functions are restricted in these regions, resulting in areas with little activity. These locations could potentially serve a primary ecological purpose, with energy production achieved through a combination of solar and wind sources distributed throughout. Lastly, the establishment of new transit corridors links village centres with each other and surrounding urban areas, enhancing accessibility. However, the emphasis on leisure and housing for urban residents may exacerbate the divide between urban and rural communities, as local needs are not consistently addressed met.

Strength and Weaknesses I This scenario demonstrates strengths in spatial implementation. The establishment of new natural areas and the expansion of existing ones, alongside an increased emphasis on intensive agro-industry, can lead to reduced direct water pollution. However, heightened intensity may similarly cause greater deposition of pollutants in the soil, which can eventually seep into groundwater. On the positive side, the distance between these intensive activities and water extraction sites can enhance the quality of drinking water. Moreover, creating extraction sites in wetter areas ensures a consistent water supply. The development of new industrial zones can also generate employment opportunities for villages and improve their connectivity via new transit corridors. However, the establishment of leisure facilities near some villages, combined with a production focus aimed at urban areas, overlooks the direct needs of local residents. This neglect exacerbates economic vulnerability and deepens social divides, particularly since private corporations own most land and all industries. Consequently, while the overall scenario yields a greener landscape, this greenery is of low quality and often inaccessible to residents.

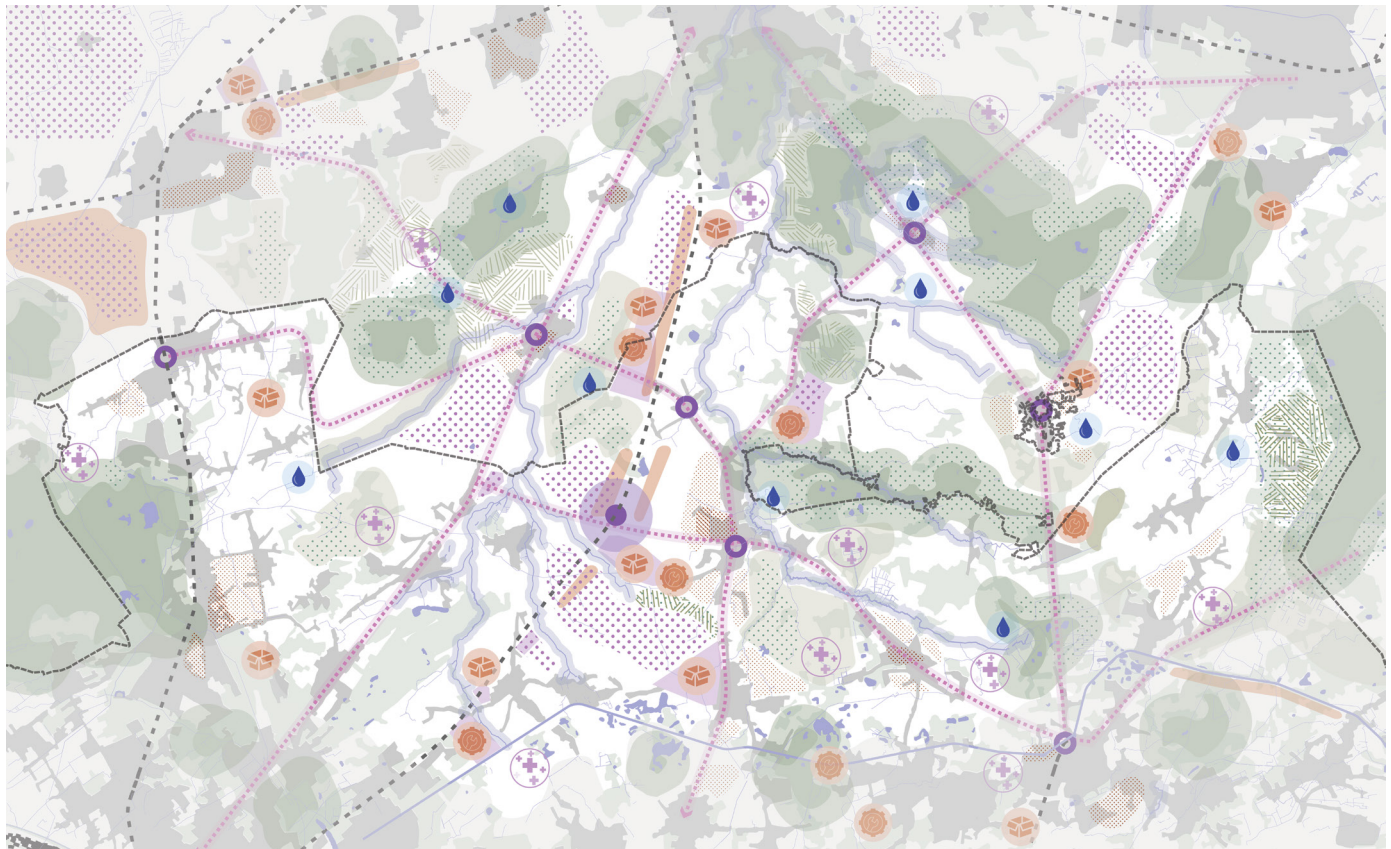
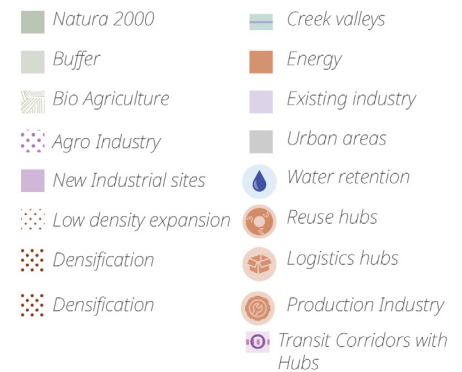


Image 4.5: Spatial imagination global Entrepreneurship showing various landuses and functions by 2050



0km 5km 10km



4.2 Institutional and Spatial Imagination

Fast World I This scenario focuses on a future where society is heavily reliant on technology. Small IT companies provide services to residents and municipalities. Inhabitants are not perceived as a singular entity with a shared goal; rather, they are grouped into various categories. For simplicity, the scheme divides them into three main groups, each with a different emphasis concerning “people, planet and profit.” Due to the scenario's emphasis, which is similar to “global entrepreneurship,” on the market, the market actors influence many of the other institutions. Nevertheless, national and local governments can indirectly affect how the market operates to avoid unfair competition and ensure robust digital networks. Consequently, national governments cooperate more closely on a European level. In contrast to “global entrepreneurship,” social groups are represented in communities. For the Northern Campine, these communities could centre on nature and ecology, economy, and society. Each community includes different actors, but they all aim to represent a specific section of society and ensure there is room for their demands. For instance, the “Kempen region natural group” can incorporate actors who have an interest in or directly use soil, water, and natural areas. As a result, their goals will primarily focus on ensuring the quality of soil and water and improving the natural environment. Overall, the scenario creates a fast-paced world of institutions that primarily focus on achieving their own goals. Nevertheless, all actors and groups utilise technology as the main driver to achieve their goals.

Strength and Weaknesses I The incorporation of various social groups with a range of goals can enable the achievement of different spatial objectives. Nevertheless, this diversification of institutions and social groups can, in turn, lead to social segregation. This is particularly possible as interaction primarily takes place within one's group in the digital realm. As in the previous scenario, the market can foster innovation and enhance technological efficiency. However, if national governments adopt a more hands-off approach to regulation, the possibility arises that market actors begin to form monopolies. This implies that the national government will occasionally have to take firm action. With constant involvement, they can prevent the formation of monopolies at the source directly. Another weakness of this scenario is that the heavy focus on technology increases the likelihood of cyberattacks. This can result in systems being shut down, personal data being stolen, and more (European Council of the European Union, 2025). The effects of such attacks could be mitigated in this scenario as many small IT companies provide digital services instead of a few large ones. Nevertheless, this remains a risk that affects the implementation of this scenario.

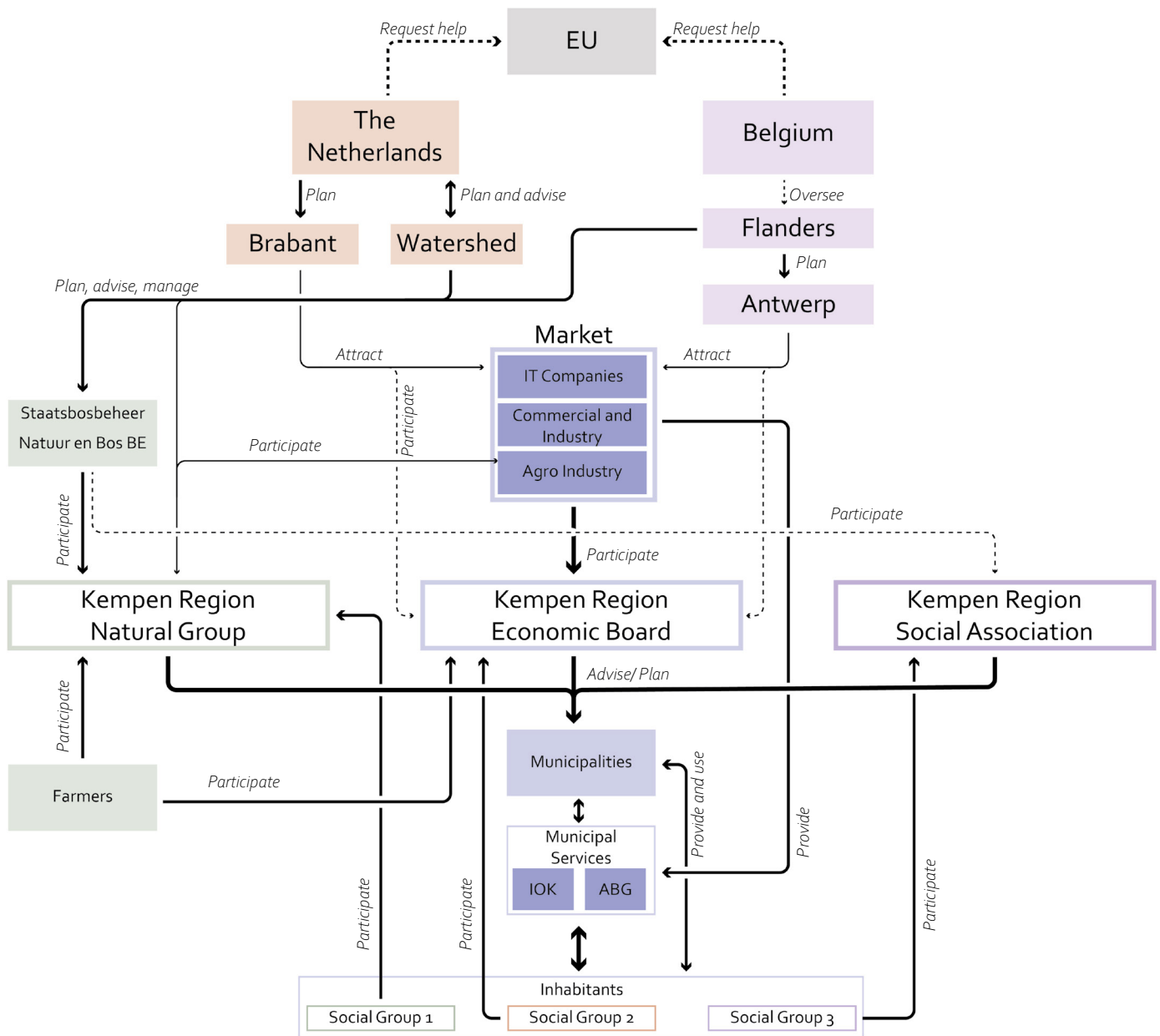


Image 4.6: Institutional structure Fast world

4.2 Institutional and Spatial Imagination

Fast World- Spatial Imagination I

The spatial effects of Fast world can be explained as an organisation of miscellaneous functions. The growth of population, combined with the focus on digital experiences, results in a low-density expansion of urban areas. These are often mixed with data centres, industry or agricultural functions. Shifting needs for goods and services also result in the landscape changing. This can be seen in the presence of nature. Instead of a well-connected network of green spaces, parks and forests are placed wherever room is left at a given point. If certain locations develop different needs, the nature there will be removed once again. This volatility of functions results in an unorganised land-use that covers not only the Northern Campine but also the rest of the Netherlands and Belgium

Strength and Weaknesses I Having a system where land-use can change easily has its strengths. For instance, it can provide quicker solutions to local needs in housing, the economy and other areas. Having different functions closer together can also mean less demand for mobility, as people can stay nearby to access services. However, it does have some weaknesses. The first is the lack of a coherent vision. This can be seen in the way nature is viewed. Instead of the primary element of the landscape, it is viewed as a leftover function. Climate goals and mitigation are neglected, resulting in a continuation or worsening of current issues.

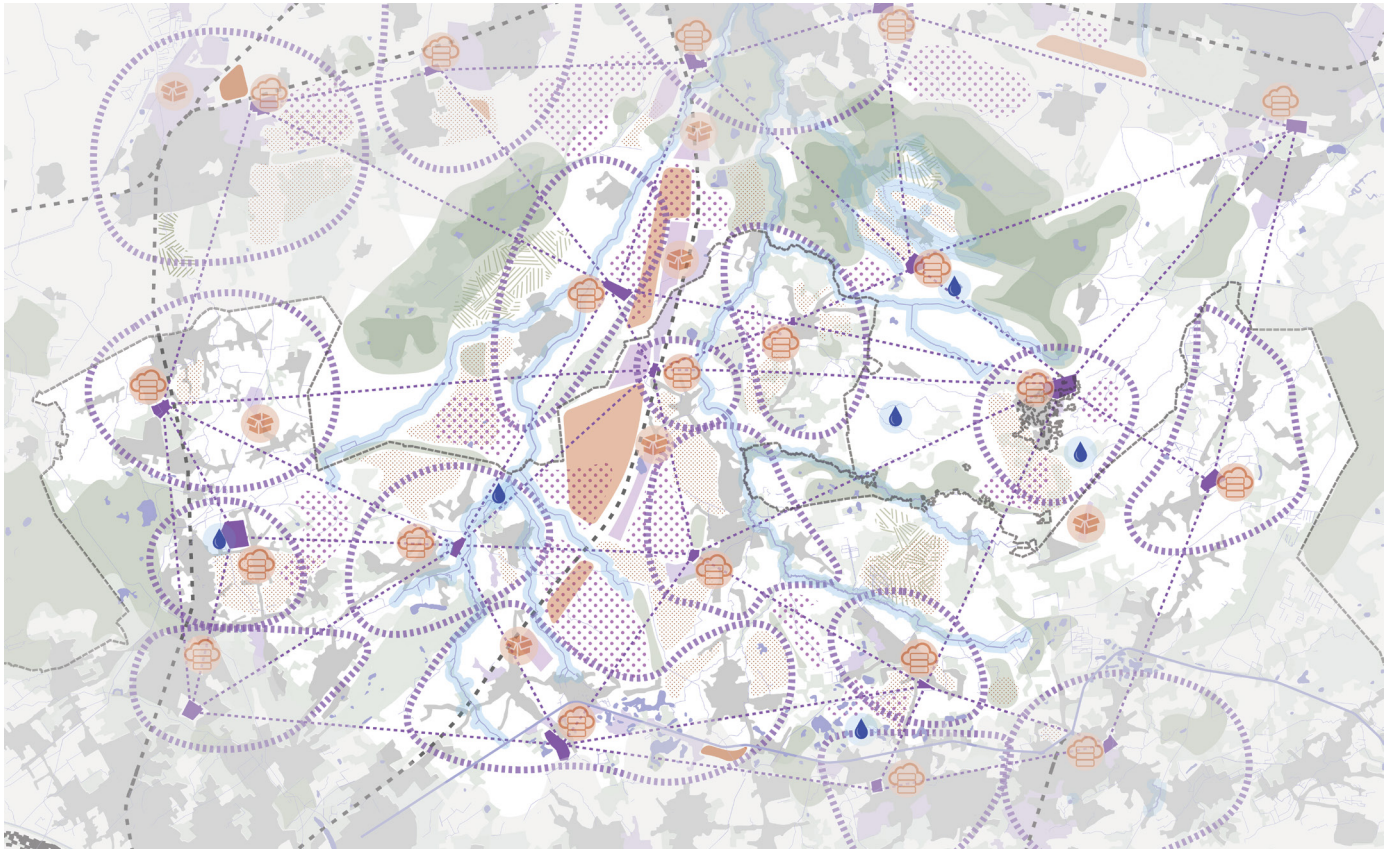
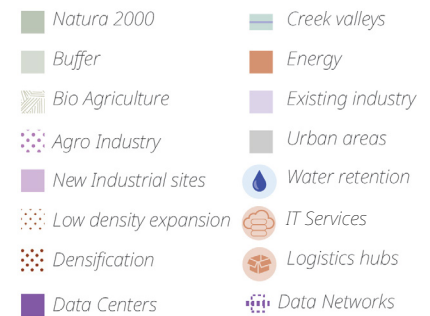


Image 4.7: Spatial imagination Fast World showing various landuses and functions by 2050



0km 5km 10km



4.2 Institutional and Spatial Imagination

Green Country- Institutional Imagination I

The institutions result from a national ecological network. Additional functions, such as agriculture, can be incorporated into such a network. A new institution that includes national conservation organisations such as Staatsbosbeheer can manage soil and water quality by implementing a blue-green network. Additionally, working with new “Vroenten” a clear network of agricultural areas can be created along and within this network. These vroenten combine the needs of residents with the production and knowledge of farmers. EU guidelines and national oversight ensure that climate mitigation and ecological improvement goals are met.

Strengths and weaknesses I The creation of a new landscape organisation can help focus on local ecology and landscape identity. Collaborating closely with national organisations and the new “Vroenten” can provide a clear baseline that balances local needs with national goals. However, the institutions in this scenario are heavily dependent on the aims and guidance set by national governments. The primary objective of climate mitigation, such as water retention and ecological improvement, can overshadow local needs and knowledge.

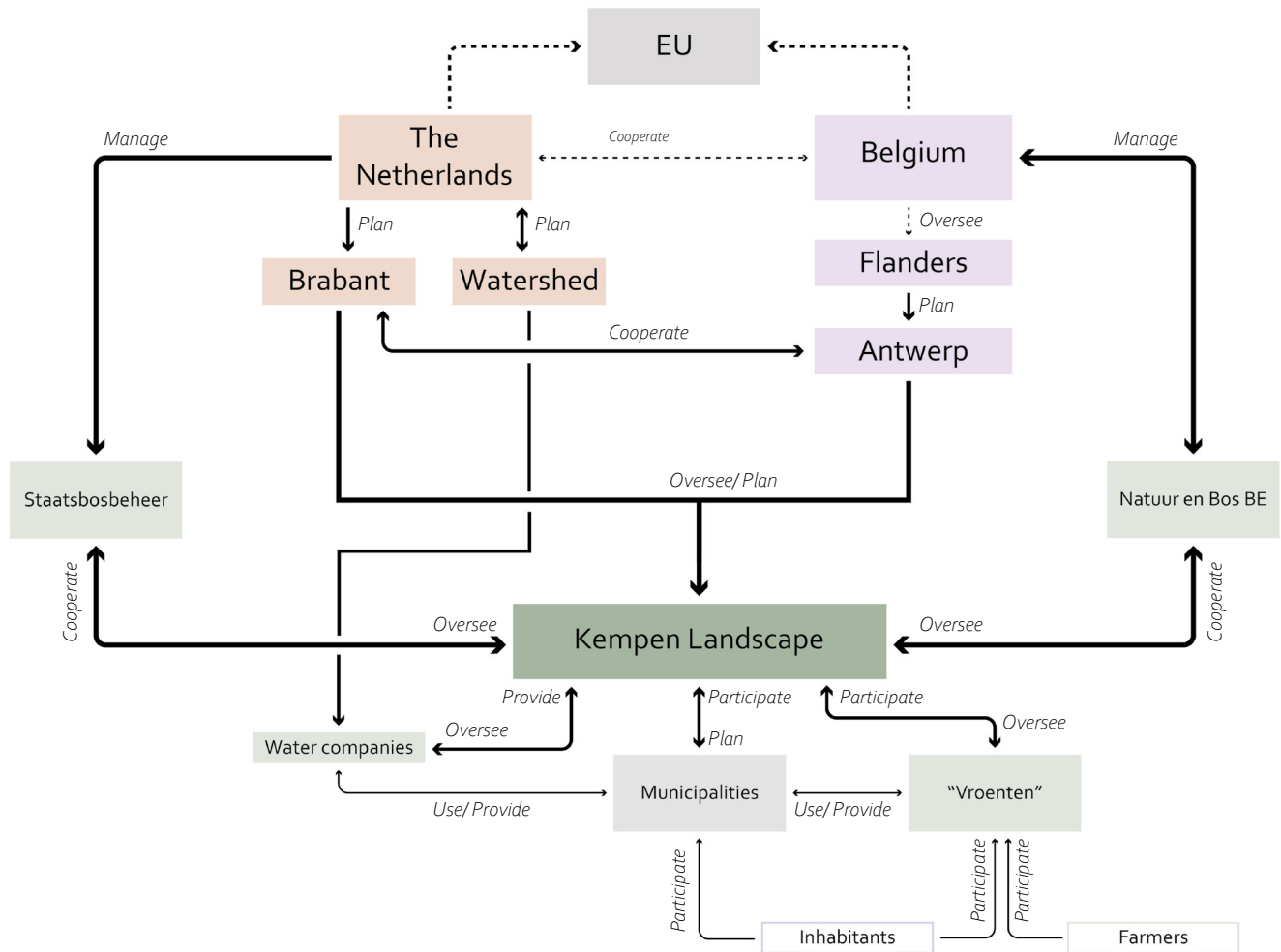


Image 4.8: Institutional structure Green Country

4.2 Institutional and Spatial Imagination

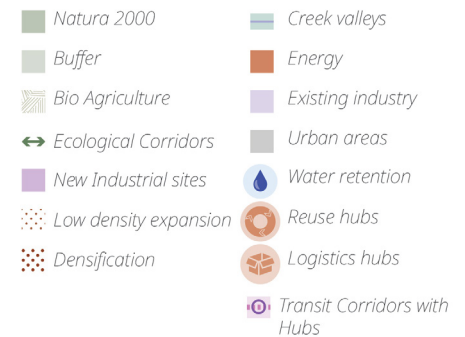
Green Country- Spatial Imagination I A robust network of ecological corridors, creek valleys, and natural parks provides space for nature to develop without direct human intervention. Limited population growth and a focus on urban cores result in villages densifying in the centre with restricted expansion. If expansion occurs, it must allow space for greenery to infiltrate the village. Between the network of green and villages lie agricultural areas that offer a mix of nature-based and conventional agriculture. Generally, agriculture is no longer aimed at intensive large-scale production for export, but rather for local consumption. Instead of large cattle sheds, the remaining livestock can roam more freely as the total number of livestock has been significantly reduced. Facilitating accessibility throughout the region, a network of public transportation connects multiple villages through a combination of high-density and low-density corridors. The expansion of the blue-green network also aids in climate mitigation and adaptation, ensuring a sufficient supply of good quality water.

Strengths and weaknesses I This scenario depends on robust and continuous participation from national governments. If new political challenges arise or shakeups result in a less active government, this scenario might already be less extensive than envisioned. While it does enhance natural networks and provide for climate adaptation and mitigation, specific local needs are overshadowed by national and even European goals. The implementation of the new transportation network

could also pose a burden. If no new services are provided along this network, ridership may be low. It could also serve as a means for urban dwellers along the outskirts to visit the new nature. While this may boost local jobs through leisure, it can make villages less resilient as they might become specialised towards leisure rather than a mix of different services.



Image 4.9: Spatial imagination Green Country showing various landuses and functions by 2050



0km 5km 10km



4.2 Institutional and Spatial Imagination

Regionalism – Institutional Imagination I

The creation of regions can take the following form in the Northern Campine. The regional government consists of three main pillars, each representing different goals while allowing space for local actors. The first pillar concerns soil. Through the establishment of a soil bank, land is managed directly at the local level. National goals regarding soil quality form the foundation, but the methods for achieving these goals are based on the local characteristics of the Northern Campine. The soil bank also determines what functions are allocated where, in conjunction with the “vroenten,” agricultural cooperatives at the municipal scale. It is decided which plots of land are used at any given time. The Vroenten are a combination of local farmers and residents, ensuring food production for local needs. By utilising knowledge of soil properties, slight variations or specialisations can occur between each vroente. Soil is not the only pillar concerning production; the Bassin group deals with water extraction and management. Through natural boundaries and the bassin, a local water system is created for residents, agriculture, and industry. The bassin group can be further divided into water groups that correspond with specific creek sections or source areas. The final pillar is the residents' group, where municipalities, residents, commercial entities, and other groups are represented to ensure that goals and expectations align. If the region encounters issues for which it lacks expertise or needs to collaborate with other governments, a “Support Brigade” from the national government can provide assistance. This would be the only instance in which a national

institution would have direct influence.

Strengths and Weaknesses I Focusing on a local government composed of local actors helps address site-specific issues. However, issues that are not confined to borders can still be felt, as a clear unified approach is lacking. Furthermore, the region spans two nations. This scenario assumes a situation where the EU has integrated to such an extent that national borders barely matter anymore. Current tensions and uncertainty surrounding Schengen and the EU make this increasingly unlikely. Nevertheless, concentrating on local governments to meet local needs and issues could help break the stalemate of current and impending crises.

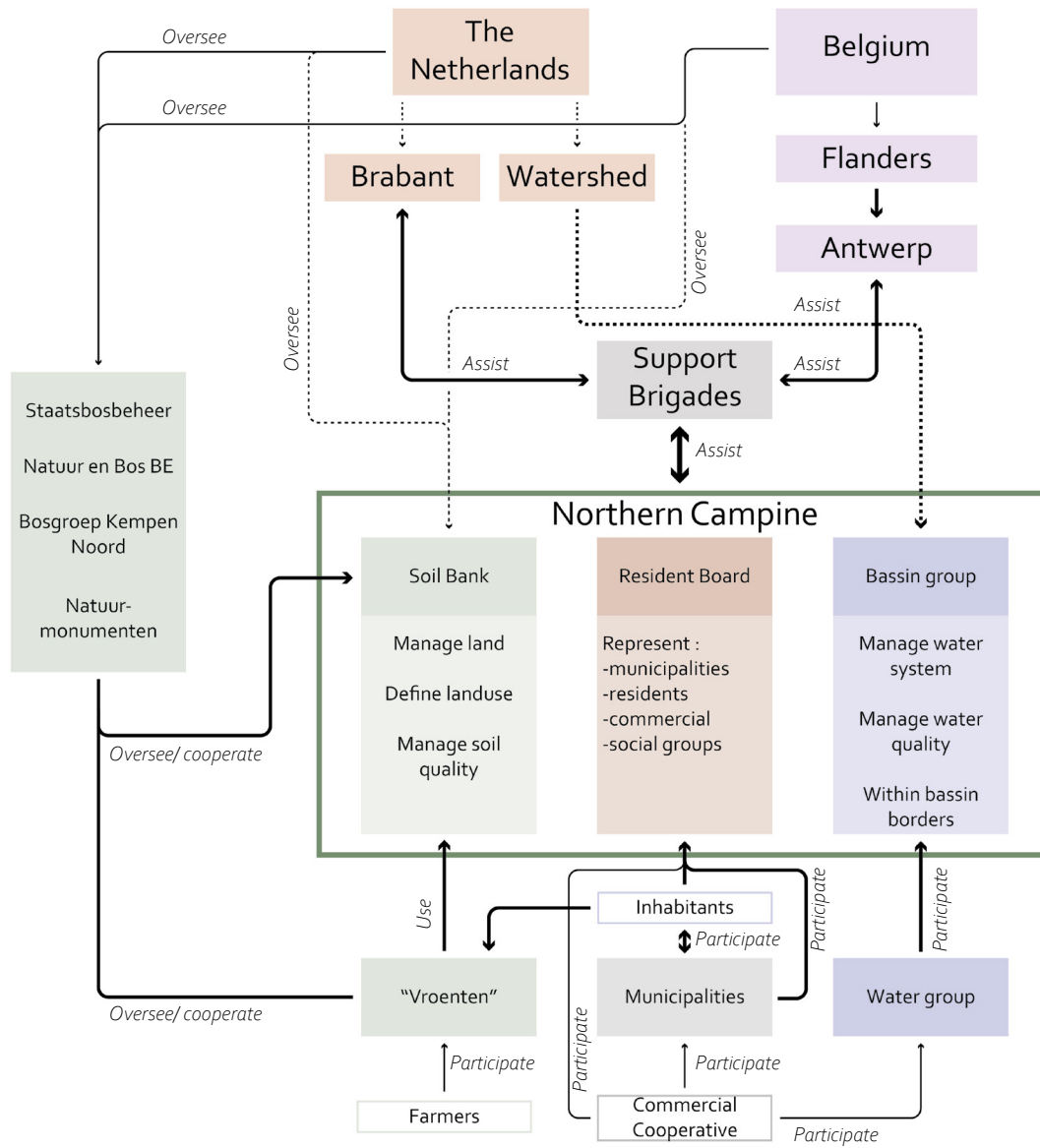


Image 4.10: Institutional structure Regionalism

4.2 Institutional and Spatial Imagination

Regionalism – Spatial Imagination I

Establishing a regional government would result in spatial changes. Creek valleys and green corridors form a local blue-green network. Within and around these spaces, cooperative farming occurs, mixing natural farming with small-scale conventional practices. These cooperatives supply food to specific villages and towns. The exchange of goods among these cooperatives would take place through local shops and existing infrastructure. Water extraction is primarily conducted within the natural system. New water groups that follow the borders of smaller watersheds and river sections create local sites for water extraction. As soil is a shared resource, certain zones or plots may be left fallow while soil quality is enhanced there. This is a process that can take place on any plot. Connecting the various towns is a network of cycling paths. Additionally, local bus systems address gaps on demand.

Strengths and Weaknesses I Focusing on local production and communal land ownership can enhance soil quality while also addressing local needs directly. Establishing commercial hubs within the region can increase resilience, as the area would become less reliant on a single activity. However, adhering to the regional system might isolate it from neighbouring systems. This could become problematic, especially during periods of peak drought or heavy rainfall. This disconnection is also evident in the absence of a mobility network. This situation may develop into a highly autarkic, agriculturally based system of unconnected regions.



Image 4.11: Spatial imagination Regionalism showing various landuses and functions by 2050

- | | |
|--------------------------|-------------------|
| Natura 2000 | Creek valleys |
| Buffer | Energy |
| Vroenten with bio. agri. | Existing industry |
| Recovering plots | Urban areas |
| New Industrial sites | Water retention |
| Low density expansion | Reuse hubs |
| Densification | Logistics hubs |

0km 5km 10km



4.3 Assessment

Implementing the four scenarios on an institutional basis and through spatial deployment offers a view of how each could function after implementation. To evaluate the scenarios, the criteria introduced at the beginning of this chapter are employed. By examining these criteria, several conclusions can be drawn. The first is the clear distinction between the scenarios focusing on “more” and those concentrating on “less”. Overall, the latter scores higher across each theme. This can be attributed to the fact that the scenario of Global Entrepreneurship lies closest to the current system. Additionally, the heavy emphasis on technology and growth from Global Entrepreneurship and Fast World indicates that the space required by data centres and population growth conflicts with the space necessary for climate mitigation and resilience. This is evident in the criteria assessment of these scenarios. In terms of spatial themes, their scores are considerably lower. Although some scenarios mention Cross Border cooperation, these often achieve it through supranational cooperation rather than local CBC, as explained in Chapter 3. When incorporating the layers of uncertainty from section 4.1, a second layer of evaluation can be performed. While Green Country and Regionalism score well on the criteria from the theory and spatial analysis, the substantial system change required may make these more challenging to implement, particularly in political aspects, given that recent years have witnessed a stagnation in decisiveness.

Spatial Themes						
	Soil and Water	Global Entrepreneur.	Fast World	Green Country	Regionalism	
	Water retention	0	0	+	0	
	Flooding	-	-	+	0	
	Water Extraction	-	0	+	0	
	Water system	-	+	0/+	0	
	Agricultural use	-	-	+	0	
	Water quality	-	+	+	+	
	Soil quality	0	0	+	+	
	Ecology					
	Cultural landscapes	0	-	+	0	
	Natura 2000 zones	+	-	+	+	
	Biodiversity	0	-	+	+	
	Blue-Green Network	-	-	+	0	
	Hybrid Themes					
		Mobility				
	Modes	-	-	0	+	
	Network type	0	0	0	0	
	Core goal	-	0	+	+	
	Resilience and Regenerative					
	Functions	0	+	+	+	
	Information exchange	-	+	+	+	
	Governance Networks	0	0	-	+	
	Housing provision	-	+	+	+	
Institutional Themes						
	Cross Border Coop.					
	Level of stakeholders	-	0	+	+	
	Goals	-	-	+	0	
	Vision	-	-	+	0	
	Network of actors	-	-	0	+	
	Institutions needed	-	-	-	+	

Image 4.12 Criteria assessment filled in

Spatial, theoretical and policy analysis resulted in an understanding of the region and its development. The scenario analysis has taken pre-existing scenarios, applied them onto the Northern Campine . Reviewing their insitutional and spatial changes through the criteria (analysis conclusion) leads to "Green Country" being taken as the base for the regional strategy. the question answered in this chapter:

V: Which scenario works towards a regional strategy combining theoretical concepts with spatial design? -goal: to combine policy development and spatial design to achieve a final vision.

"Green country" works towards a regenerative Northern Campine. The expansion of natural systems and a focus on biological production is in line with Regenerative Sustainability and Rural resilience. Implementation of mobility networks also improves on accessibility. The institutional imagination illustrates how various policy fields can be combined together with cross border cooperation. As a result, the scenario "Green Country" scores highest on the criteria assessment.





Grabeels, F. (1829-1896) *"The Season of Revival"* [painting]. Musées Royaux des Beaux-Arts de Belgique



5

Building a Regenerative Northern Campine

5.1 How to get there

5.2 National Trends

5.3 Regional Strategy

5.4 X curves

5.5 Local Casus

5.6 Simulation

5.7 Summary

5.1 How to get there

With the selection of the Green Country scenario, the next step is to transform it into a specific strategy design aimed at achieving the “Regenerative Northern Campine”. This chapter will develop a regional strategy using various methods. The steps taken can be illustrated in the diagram on the right. Rather than creating a fully integrated strategy that considers every possible national, provincial, and local policy, certain trends will be utilised. These primarily focus on the national level. It is assumed that these trends arise from the chosen scenario, which already accounts for national policies and societal changes anticipated by 2050. The trends outlined in this chapter are more specific to the issues present in the Northern Campine. By employing these trends, the Regional Strategy translates them, along with the analysis and scenario, into spatial planning and design elements. These elements are connected to the concepts discussed in chapters two and three. Together, the spatial planning and design elements form a Regional Strategy Map. To portray the differences in chronological development and the hierarchy of the various elements of the strategy map, an X-curve is utilised. This curve aids in understanding the manner in which transitions unfold. Finally, to demonstrate that the implementation of the strategy relies on both regional and local choices, a simulation of the regional strategy at the local level will be conducted.

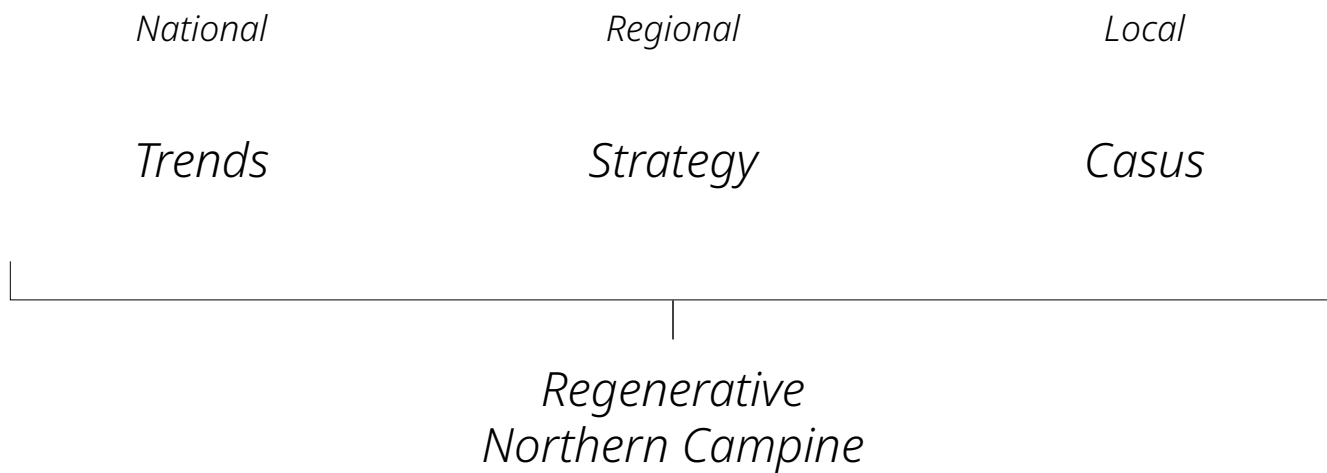


Image 5.1: Development scheme of scales and elements needed for the Regenerative Northern Campine

5.2 National Trends

Implementing the scenario “Green Country” into a future regional strategy requires several trends at the (supra)national level. These trends examine the political choices and societal shifts necessary for the strategy to be implemented effectively and to achieve success. They will later form the basis for the planning and design decisions in the Regional Strategy. The trends are as follows: Protein Shift, Breaking the Impasse, (Supra)National Blue Green Network (BGN), Schengen +, Economic Decentralisation/Incentivisation, Service Funding, Soil as Base.

I: Protein Shift | This trend focuses on a social change in dietary habits. Instead of meat and dairy products forming a sizeable section of our diet, plant-based proteins are emerging as the primary source of protein. This shift, while seeming difficult to achieve, is already occurring. In Flanders, regional policies and plans have already been introduced. The goal is for 60% of the protein diet to consist of plant-based proteins (Gielen et al, 2023). This shift would eventually result in a decrease in livestock. As a result, the question arises whether remaining livestock can be intensified or whether pastures can be replaced by other functions.

II: Breaking the Impasse | An important trend concerning ecology indicates a national breakthrough regarding the Nitrogen Dilemma (Remkes et al., 2020). Specific tools, policies, etc. can vary, but the core objective is to achieve a decrease in conventional intensive agriculture. The implementation of zoning and the expansion of bio-farming

alternatives are the results of this breakthrough. Currently, there are signs that the impasse can be resolved. Provinces are already implementing zoning (Provincie Gelderland, 2025) or even buying out farmers adjacent to critical nature areas (NOS, 2025). As a result, this trend is merely a matter of time before fruition.

III: (Supra)National BGN | Connecting the existing Natura 2000 areas, forests, and natural spaces is a vital component of “Green Country.” To accomplish this, a European or nationally developed network of Blue and Green Corridors is necessary. Blue corridors focus on linking landscapes characterised by wet areas, such as rivers, lakes, and creeks, while Green corridors pertain to forested landscapes, grasslands, and more. There is potential for overlap between the two. Moreover, land-dwelling animals can utilise both systems for migration. This network can be facilitated by the reduction in livestock resulting from the previous trend. Furthermore, a functional mix of agriculture and ecological networks can be realised through the promotion of new agricultural practices.



Image 5.2: Illustration of possible BGN in the Netherlands

IV: Schengen + I While Schengen has brought benefits over the four decades it has been in place, its focus has primarily been economic. In the coming years, the EU aims to emphasise safety as well (European Commission, 2025). However, this trend indicates a version of Schengen in which healthcare, water systems, energy, and other services are integrated more comprehensively across countries. In a border region such as the Northern Campine, having a healthcare system based on proximity rather than national borders can greatly benefit residents living along the border. Moreover, local-level cooperation for water use and extraction can be expanded, as a new EU system can provide assistance where needed.

V: Economic Decentralisation/Incentivisation I Instead of seeing urban areas as drivers of economies, smaller villages and towns get the opportunity to develop a local economy too. A new European and national system incentivising commercial activities in smaller towns and villages can provide more resilience and stable population levels in rural regions. Existing activities such as agricultural processing can remain or reshaped to local needs.

VI: Service Funding I Extra funding for education, healthcare, and other services can enable the village to maintain or reinstate these services. National programmes training individuals to become teachers or paramedics can fill gaps in the work-

force where necessary.

VII: Soil as Base I Instead of considering economic and human needs when planning functions, the types of soil and natural water systems dictate agriculture and the scope of industries. Additionally, ecological corridors are determined based on the available soil and water. Water retention can be enhanced in arid areas (Harbers, Heijnen, 2022).

As there is an overlap between various trends concerning policy and social changes, the diagram below illustrates the categorisation of each trend un-

A: Regenerative Sustainability

B: Rural Resilience

C: Cross Border Cooperation

D: Accessibility

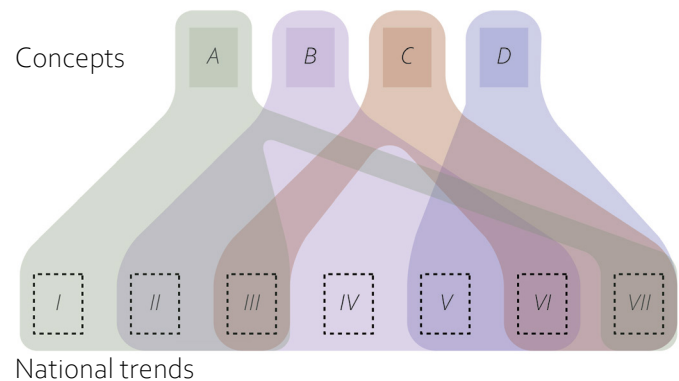


Image 5.3: Links between Concepts and Trends

5.2 National Trends

The trends require choices made by the EU and/or national governments. These can vary from policy decisions and plans to funding and social campaigns. When one of these choices is implemented, a milestone is achieved in the broader process of realising the trends. To understand the general timescale on which these trends operate, their milestones are named and displayed on a timescale between 2025 and 2050. The year 2050 is chosen as the endpoint for these trends in line with the scenario scale from PBL (Chapter 4).

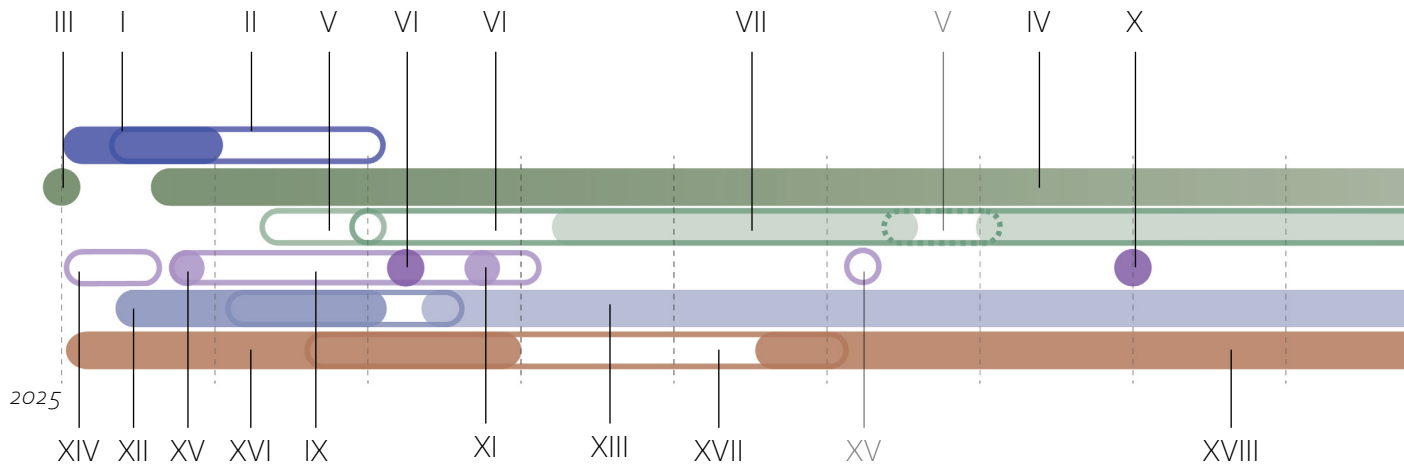


Image 5.4: Indicative Policy timeline

Protein shift

- I: Campaign to achieve shift in human consumption
- II: Incentivise farmers to shift

Breaking the Impasse

- III: Creating a national plan / policy
- IV: Implementation of National plan

National BGN

- V: Designing the Network
- VI: Constructing the Network
- VII: Maintaining and adjusting the Network where needed

Schengen +

- VIII: Adoption by EU member states and Parliament
- IX: Information Campaign
- X: Implementation on EU scale
- XI: EU fundings

Economic Decentralisation

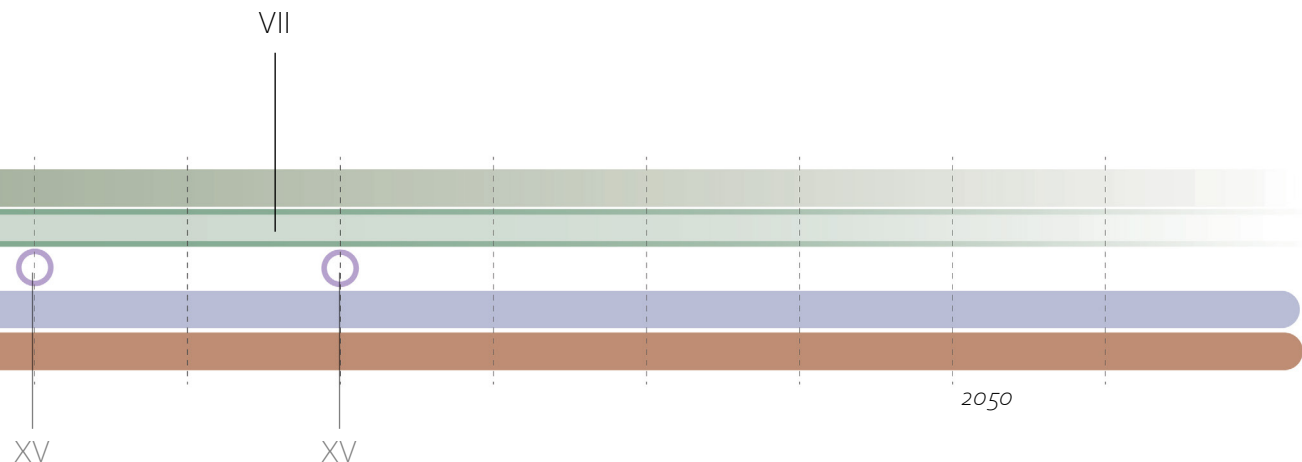
- XII: Changing planning and funding
- XIII: Campaign to make funding possibilities clear, incentivisation

Service Funding:

- XIV: Information Campaign
- XV: Introducing funding

Soil as Base:

- XVI: creating National Policy identifying which functions where
- XVII: Campaign before implementation
- XVIII: Implementation of National Soil Bank



5.3 Regional Strategy

The trends from the previous section establish several prerequisites for the creation of the regional strategy; however, they are not the only ones. The development of the regional strategy can be summarised in several steps. The trends, along with the possibilities drawn from the analysis in Chapter 3, create a set of key strategies. These strategies are illustrated with example projects on which parameters and designs can be applied to implement the key strategies. Ultimately, these strategies are consolidated into a regional strategy map. The purpose of this map is to demonstrate how the regenerative Northern Campine can be realised at a regional level. Accompanying this map is a timeline detailing the implementation of the projects and the necessity of any policies.

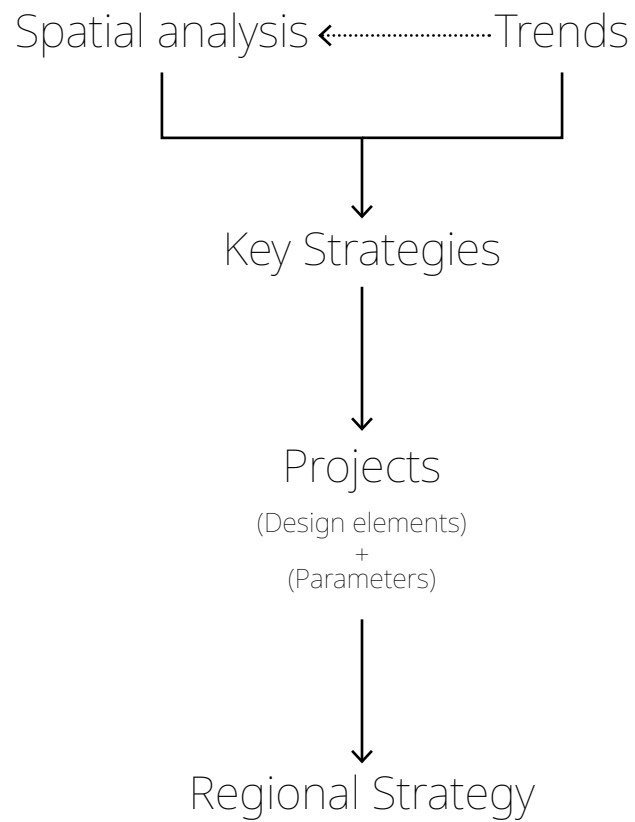


Image 5.5: Regional Strategy development scheme

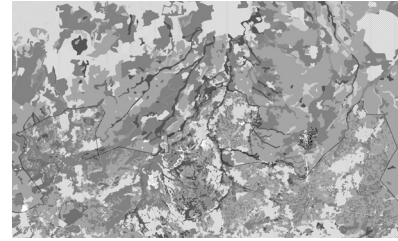
5.3 Regional Strategy

Spatial, Diachronic and Policy Analysis I

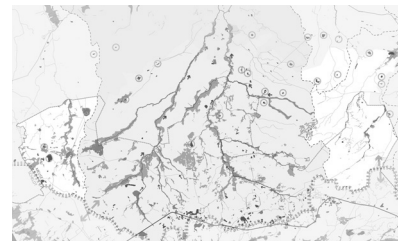
This section combines the results of the various analyses to present the possibilities. These possibilities are also associated with the different trends. The following spreads showcase and explain three main possibilities, while additional ones are included in the Appendix.

Soil as Base I Taking the trend of Soil as Base, as prescribed by Harbers & Heijnen (2022) as a starting point, the combination of soil properties, water systems, pollution, and climate change results in several possibilities. Shown here are the possibilities for types of agriculture. These are also based on the specific soil properties needed for the various types of agriculture currently present in the Northern Campine.

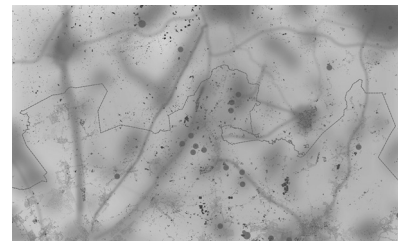
Rather than the majority of the region being dominated by animal husbandry and associated agriculture such as feed production, a new agricultural land use and cover is feasible. Soil quality, water availability, and pollution levels determine areas suitable for various types of agriculture. The most crucial areas are marked with black hatching; these include the dunes and peat soils. They are unsuitable for agriculture and can already be classified as zones lacking agricultural activity. Grains, horticulture, and animal husbandry are also indicated on the map. Instead of large, contiguous areas designated for each type of agriculture, a patchwork of different types is possible



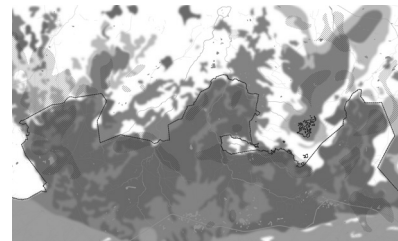
p. 63 Soil map



p. 65 Natural Water system



p. 79 Pollution Map



p. 83 Drought Map

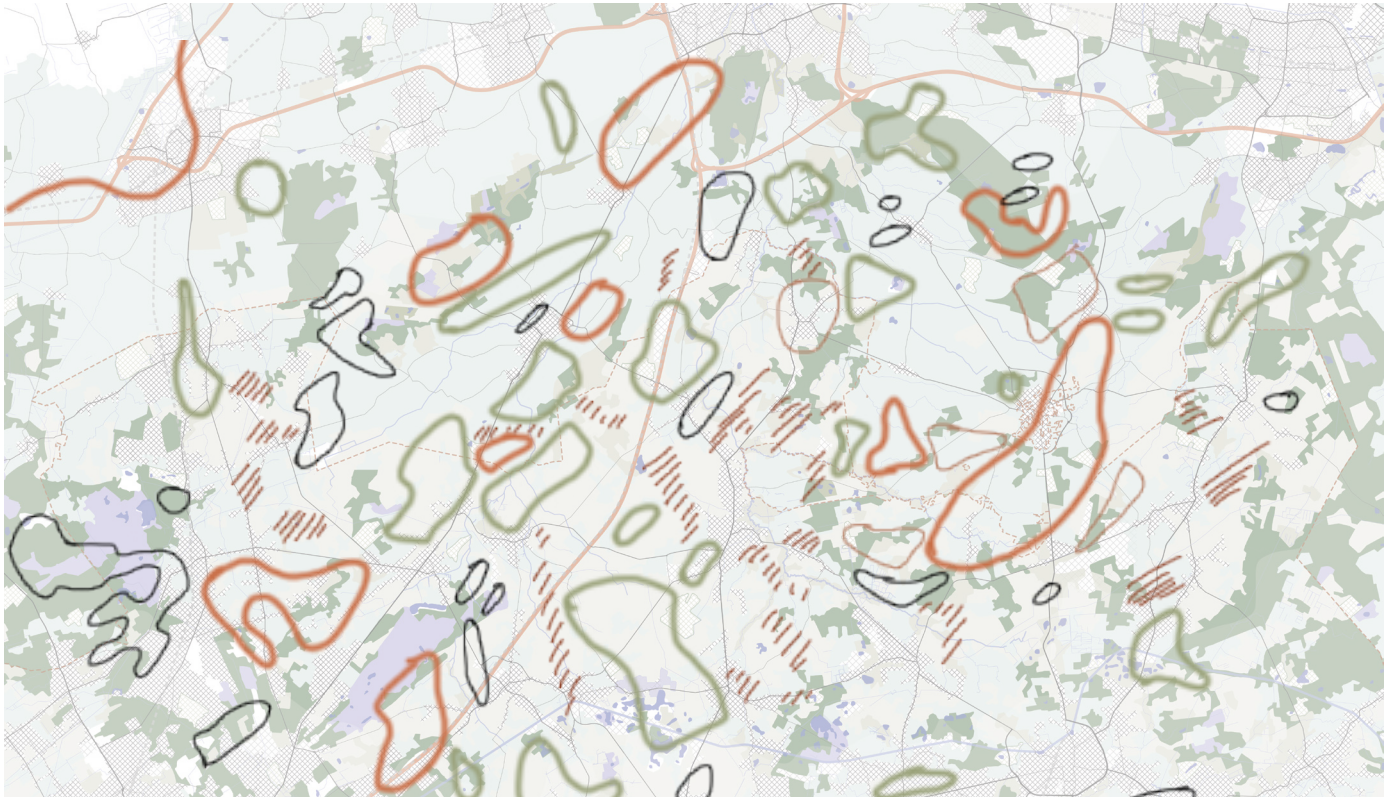


Image 5.6: Possibilities Agriculture after layering findings from spatial analysis

- Horticulture
- Grains
- Vegetables
- Glass based agriculture
- No agriculture

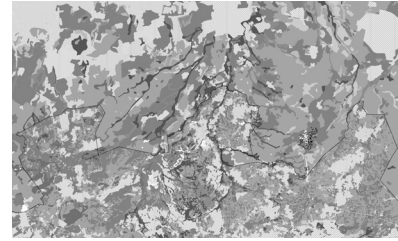
0km 5km 10km



5.3 Regional Strategy

Blue Green Network I The establishment of a national blue-green network is supported by a regional counterpart, as outlined in the scenario. The potential for such a regional network, alongside the expansion of forests and restoration of heath, can be derived from the soil map, ecology map, and historical conclusions map. This leads to a viable network of green and blue corridors that connect natural areas within and beyond the Northern Campine. Integrating this framework with the previous agricultural possibilities provides a clear vision of how agriculture and BGN can collaborate.

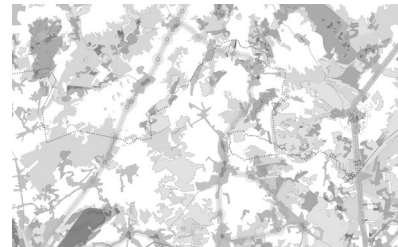
Additionally, the BGN can provide opportunities for the trend “Breaking the Impasse”. As noted in the analysis, tools such as agricultural zoning can be employed to achieve a reduction in nitrogen. These zones can be bordered by ecological corridors, providing clearer spatial delineation than merely a colour on a policy map.



p. 63 Soil map



*p. 69 Ecology
and Leisure*



*p. 107
Conclusion
Diachronic*



*p. 153 Soil as
Base*



Image 5.7: Possibilities Ecological Network
based on spatial analysis



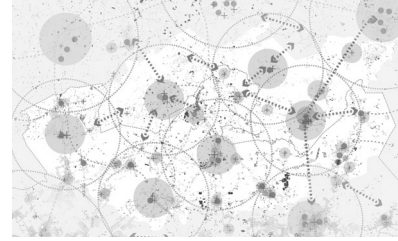
0km 5km 10km



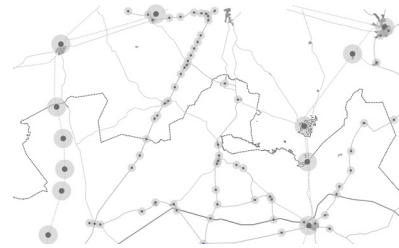
5.3 Regional Strategy

Schengen + and Economic Decentralisation I

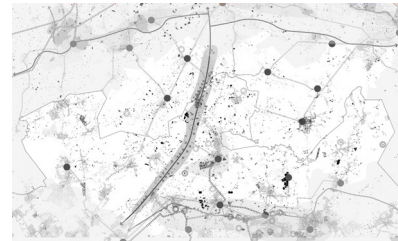
As these trends increasingly focus on social and economic changes, their potential is primarily at the policy level. However, the addition of services—both commercial and healthcare—does have a spatial component. By analysing the population development maps from section 3.3 (p. 86, 87) alongside the conclusion map of the social analysis and the historical transportation map, we can uncover various possibilities. Regarding social aspects in the Northern Campine, policy choices are necessary to harness spatial opportunities.



p. 95 Conclusion Social



p. 105 Historical transit



p. 77 Energy and economy

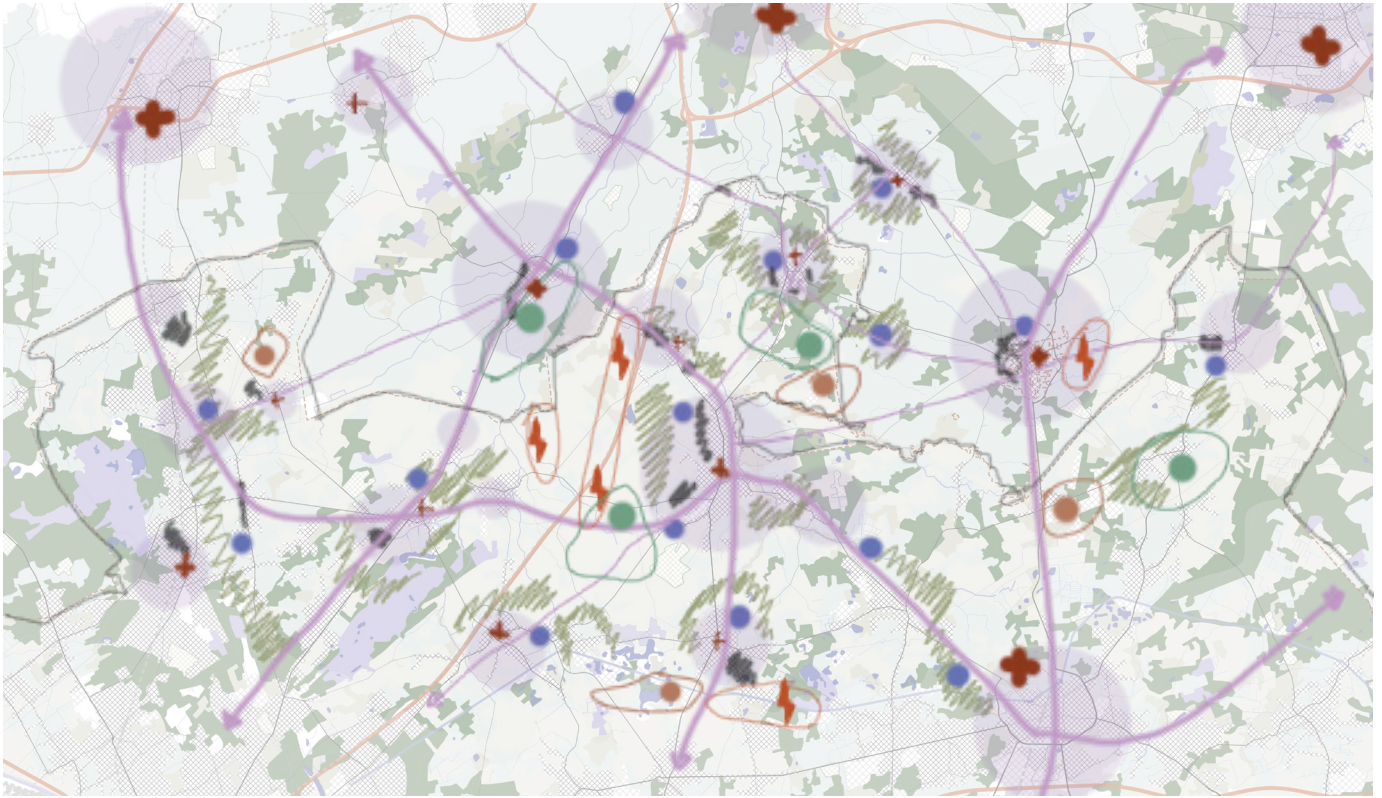


Image 5.8: Possibilities Services, transit corridors and economic functions

- | | |
|--------------------------|------------------------|
| Agricultural Research | Regional hospital |
| Circular construction | Local clinic |
| Agricultural processing | Local first responders |
| Local Cooperatives | Service Hub |
| Transportation corridors | |
| Urban expansion | |

0km 5km 10km



5.3 Regional Strategy

Key Strategies I The conclusions of the analysis, possibilities, and trends can be distilled into six key strategies for the Regional Strategy: Vital Villages, Regional Transit, Rural Densification, Agricultural Zoning, Local Water Systems, and Blue-Green Network.

I: Vital Villages-Adding services and densifying village cores to improve proximity to services and increase economic resilience.

II: Regional Transit-Connecting villages cores together with non-car mobility. Being connected to close villages is more important than direct links to large cities.

III: Rural Densification-Repurposing old industrial sites, filling in gaps in the fabric and demolishing linear development where possible to make dense village cores while maintaining village identities.

IV: Agricultural zoning-Identifying zones in which different types of agriculture are or are not allowed. The aim is to improve agricultural and ecological diversity and protect nature areas.

V: Local Water system-Setting up local water systems and improve water retention to combat increasing droughts and increasing resilience. Compartmentalization instead of large provincial or national systems.

VI: Blue Green Network-Creating a network of ecological corridors expanding habitats and creating spatial divisions for functions.

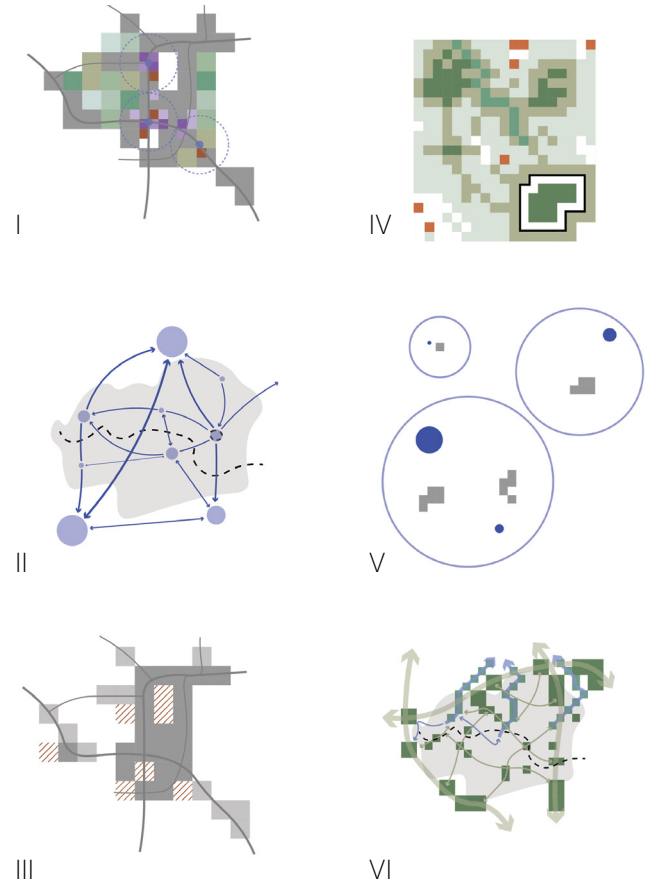


Image 5.9: Diagrams Key Strategies

These six key strategies can encompass a broad range of parameters, projects, and choices. To illustrate the direction of such parameters, the following pages present several possible “projects”. The aim is to provide design choices and policies that can be implemented to achieve the Regenerative Northern Campine. These are based on real-life examples or design paradigms.

Projects - 1: Cooperative Agriculture | Rather than the current system of private farms exporting goods to markets outside the region, a system of cooperative farming could be established. Given the presence of numerous small-scale shrubberies within private gardens, it can be observed that there is an interest in self-sufficiency. By combining this with the expertise of current farmers in land management, new farms could be formed. These would focus on meeting the demands of residents, dividing existing fields for varying crops or livestock based on needs and soil conditions. The produce could be processed and sold at the local market, while any surplus could be sold to external processors or markets.



Image 5.10: Icon Cooperative Agriculture



Image 5.11: Icon Services

2: Services | Adding services is a secondary project aimed at achieving the key strategy. This integrates the provision of services with their proximity within a village. The goal is to ensure villages can become more self-sustaining, as opposed to the current lack of services in all villages. Consequently, villages and the region can become more resilient as the loss of a service in one village does not mean the entire loss of this service in a broader area.

5.3 Regional Strategy

3: Healthcare system I Expanding on the “Services” project, a new system of healthcare provision can improve accessibility to this service. Setting up a system similar to the SAMU and SMUR in France (DGOS, 2024), accessibility to healthcare can be made easier. No longer is there a central hospital only in main cities, local clinics in towns and first aid posts in villages can provide healthcare in the smallest villages. This is especially important considering the greying population.

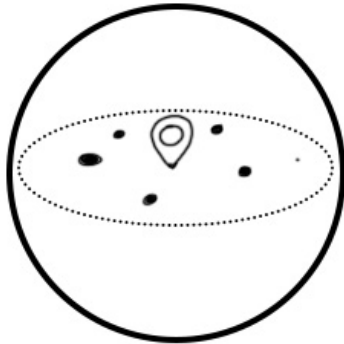


Image 5.13: Icon Proximity

5: Car Free MobilityI As pollution from vehicular traffic contributes to the worsening conditions of nitrogen, a shift in mobility can help alleviate this issue. Focusing on new transit corridors, expanding cycling routes, and improving safety for cyclists and pedestrians can make mobility within villages more car-free while providing more options for inter-village travel apart from the car.

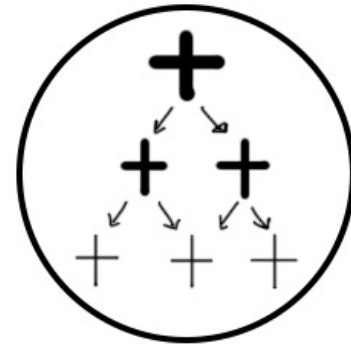


Image 5.12: Icon Healthcare System

4: Proximity I The spatial analysis revealed a shortage of services in several villages. Although some services are typically available, they are dispersed over a larger area, located further from transit connections. Proximity suggests that services should be situated close to transit links. A walking distance of 10 to 15 minutes would be ideal. Consequently, services might cluster more within specific areas of each village.



Image 5.14: Icon Non-car Mobility



Image 5.15: Icon Reusing and Expanding

7: Village Quality and Density I Densification or expansion of villages should adhere to the spatial quality commonly found in such areas; heights of up to three stories are the maximum, and façade types like gabled roofs are preferred. Building typologies such as shared courtyards, inner streets, or square living are favoured over detached housing. If detached buildings are necessary, avoid single-family housing and instead focus on creating apartment blocks or terraced houses.



Image 5.15: Icon Agricultural and Nature zoning

6: Reusing and Expanding I As seen in the spatial analysis, some village typologies provide possibilities for expansion and densification. Re-using industrial sites can create new village neighbourhoods. Expansion can occur in parts of the urban fabric left empty. Densification in existing parts of the villages can help compact villages and avoid further linear development

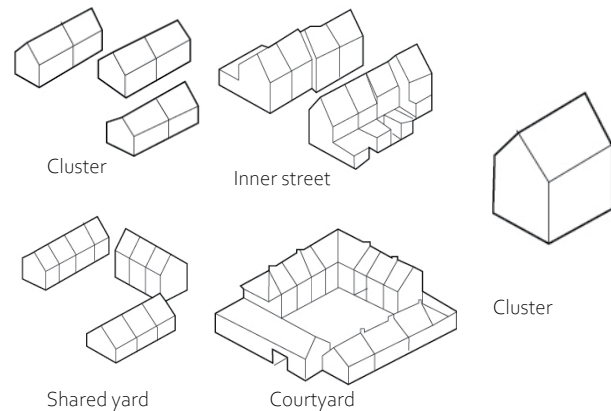


Image 5.15: Typologies Village Quality and Density

8: Agricultural and Nature zoning I As proposed by Remkes (2022), agricultural zoning can enhance natural qualities by removing intensive agriculture from Natura 2000 or ecological corridors. Around "Green Zones," the majority of bio farming (60+%) is mixed with conventional agriculture. In these two zones, the focus lies on extensification. Red zones are areas where conventionally intensive agriculture is permitted. Technical solutions are utilised more in these zones to combat nitrogen and other pollutants. Surrounding Natura 2000 or depleted soils, black zones prohibit any agriculture or human activity aimed at restoring soil health.

5.3 Regional Strategy

9: Agricultural types | Expanding on which agriculture can happen in the green and orange zones, several types are used as examples. Each focusses on biopharming. Cooperative farming, local residents work with farmers. Crop rotation, changing crops each growth season to combat soil depletion. Pastoralism, moving around herds of livestock between fields. Agroforestry, mixing crop, livestock and others with horticulture or wood industry.



Image 5.16: Icon Agricultural Types

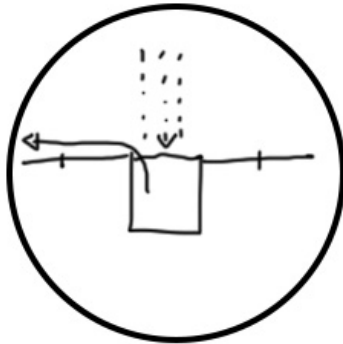


Image 5.17: Icon Local Water extraction and retention

11: Ecological Corridors | Ecological corridors, which connect natural areas, can vary in size. The dimensions depend on the level of network to which they are linked. Additionally, soil properties influence specifics, such as blue or green corridors. More detailed sketches of potential corridors are available in the appendix.

10: Local Water extraction and retention | No agriculture is permitted within these sites and in a buffer zone of 100 to 500 metres. To ensure that water quality and quantity are preserved, new groups involving local actors are established. This group also incorporates water retention measures to enhance soil quality. As water flows across borders, effective management and the establishment of quality goals are essential. Assistance from both Provincial and National Governments may be sought.

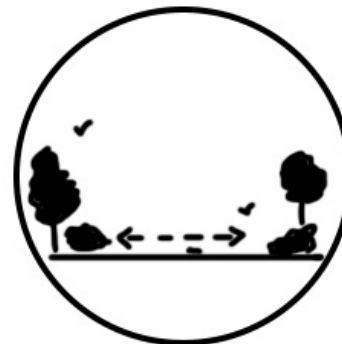


Image 5.18: Icon Ecological Corridors

Hierarchy I Similar to the National Trends, there are areas of overlap between the concepts and key strategies, which are illustrated below. For instance, Regenerative Sustainability primarily aims to improve ecological function while also seeking to change production systems. Consequently, the strategies that cover this are linked to it. Likewise, Resilience, which encompasses resilience for both natural and economic shocks, is related to strategies concerning ecology as well as economy. Furthermore, each of the projects described on the previous pages can fall under multiple key strategies. The result is a variety of possibilities for implementing the key strategies to achieve the overall

goal of creating a regenerative Northern Campine. It is important to note that these projects do not represent a definitive list of options to ensure the shift away from depletive landscapes. The ones provided here are initial examples. Furthermore, they cannot always function individually; some interdependence is present.

A: Regenerative Sustainability

B: Rural Resilience

C: Cross Border Cooperation

D: Accessibility

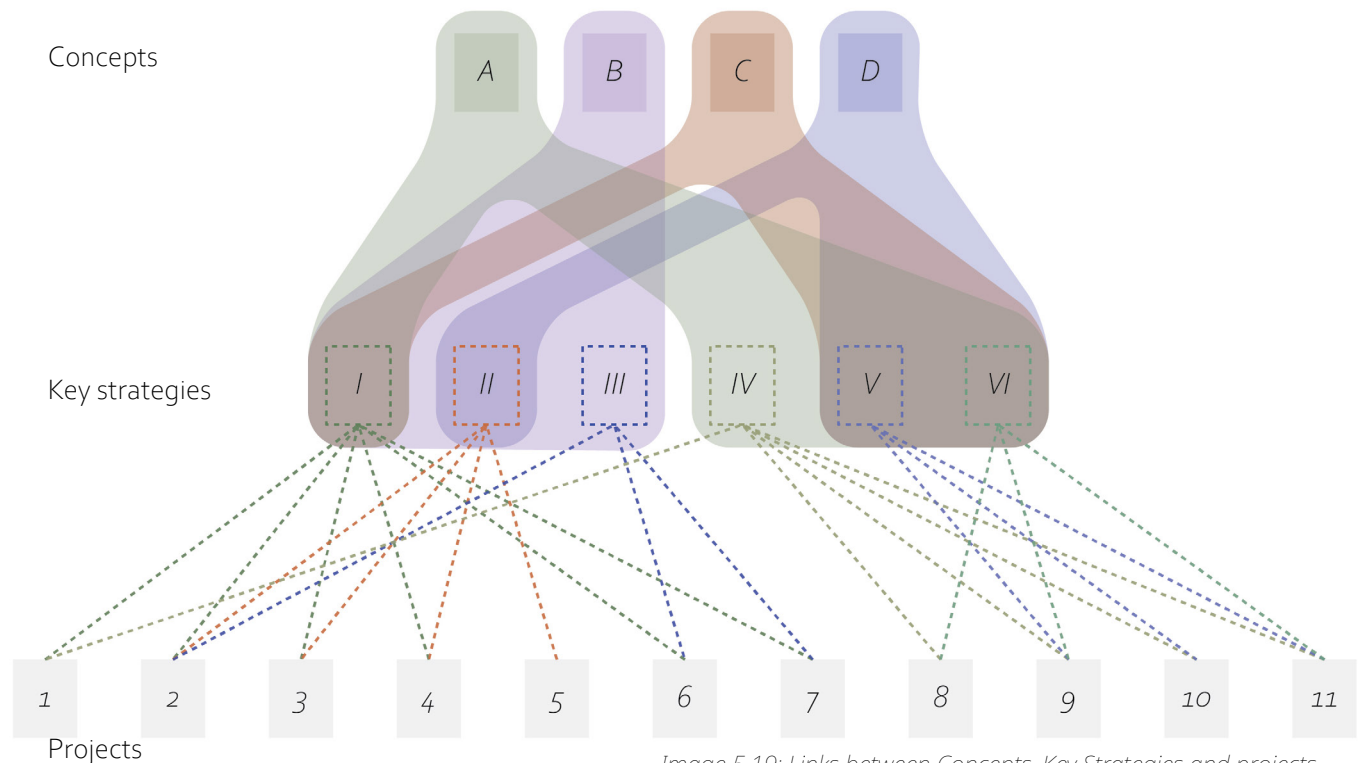


Image 5.19: Links between Concepts, Key Strategies and projects

5.3 Regional Strategy

With the trends, strategies, and projects, the regional Strategy Map can be established. Since many more combinations of projects are possible within the key strategies, the Regional Strategy Map presented here is merely one potential outcome, akin to the possibilities maps at the beginning of this section. The foundation of the regional Strategy Map consists of the ecological network, which creates the framework within which agricultural zoning is incorporated. Factors such as water retention, soil properties, and climatic changes determine where specific agricultural zoning occurs. Moreover, the Ecological Networks also provide the framework for forest and heath restoration efforts. Urban densification, transit corridors, and service expansion constitute the final layer of social activity. The sites of urban densification rely on population development. Nonetheless, assuming population growth, changes in age demographics and housing needs may necessitate additional housing. Therefore, identifying areas for the construction of these new housing developments can be crucial to prevent future conflicts with the BGN or agriculture.

The Regional Strategy Map seeks to integrate the various levels, elements, and systems essential for achieving the Regenerative Northern Campine. While preserving and enhancing traditional elements such as heaths, creek valleys, and communal agriculture, the principles of regenerative sustainability, rural resilience, rural accessibility, and cross-border cooperation can function harmoniously together.



Image 5.21: Regional Strategy Map

5.4 X-Curves

To explore the implementation of the Strategy Map over time, an X-curve is employed. Illustrating transitions, the curve displays the speed at which they occur. The progression of time is represented on the horizontal axis, while the vertical axis indicates both the creation and termination of systems. The termination of one system and the creation of a replacement system unfolds in three stages. Initially, the existing system becomes destabilised as new processes are introduced. As these new processes accelerate and expand, the destabilisation also intensifies. At one point, a period of chaos arises where the new system overtakes the old system. Following this, a phase of stabilisation for the new system occurs after it has surpassed the old. The old system is gradually phased out further (Silvestri et al, 2021).

The concepts explained in chapters two and three are selected as the systems replacing current paradigms: Regenerative Sustainability, Rural Resilience, Cross Border Cooperation, and Rural Accessibility. These concepts are implemented through various policies and design choices. As these all occur at different moments in time, the X-curve is integrated with the policy timelines from the previous sections. The aim of this combination is not only to illustrate the time required for the system changes but also to demonstrate which systems may need more time, which are affected by policy changes, and the extent to which each change occurs.

As there are four systems being altered, four X-curves are created. Displayed on the right are the four curves combined, with one highlighted below to detail the exact processes and the levels at which changes occur. The three other curves can be found in the Appendix.

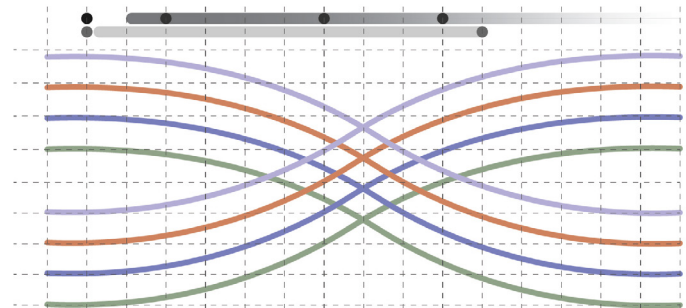


Image 5.21: X-curve

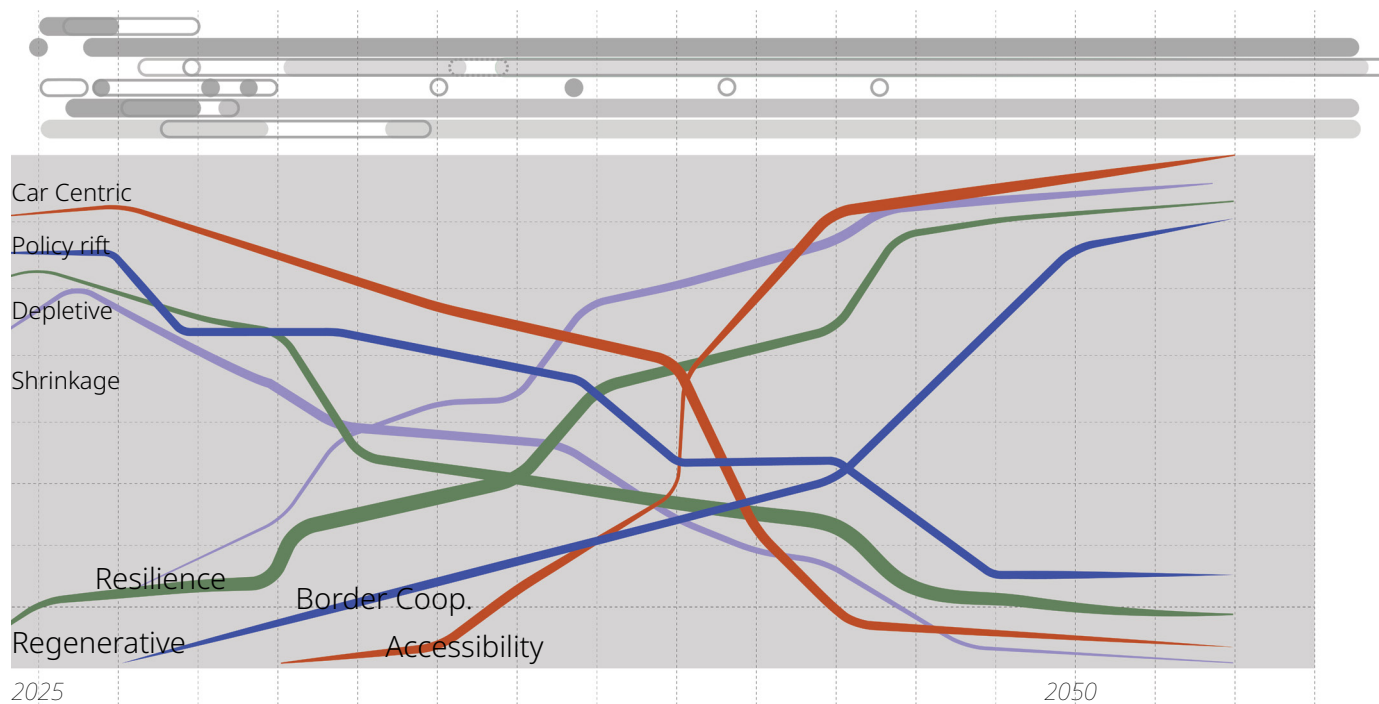


Image 5.22: X-curve Northern Campine 2025-20250

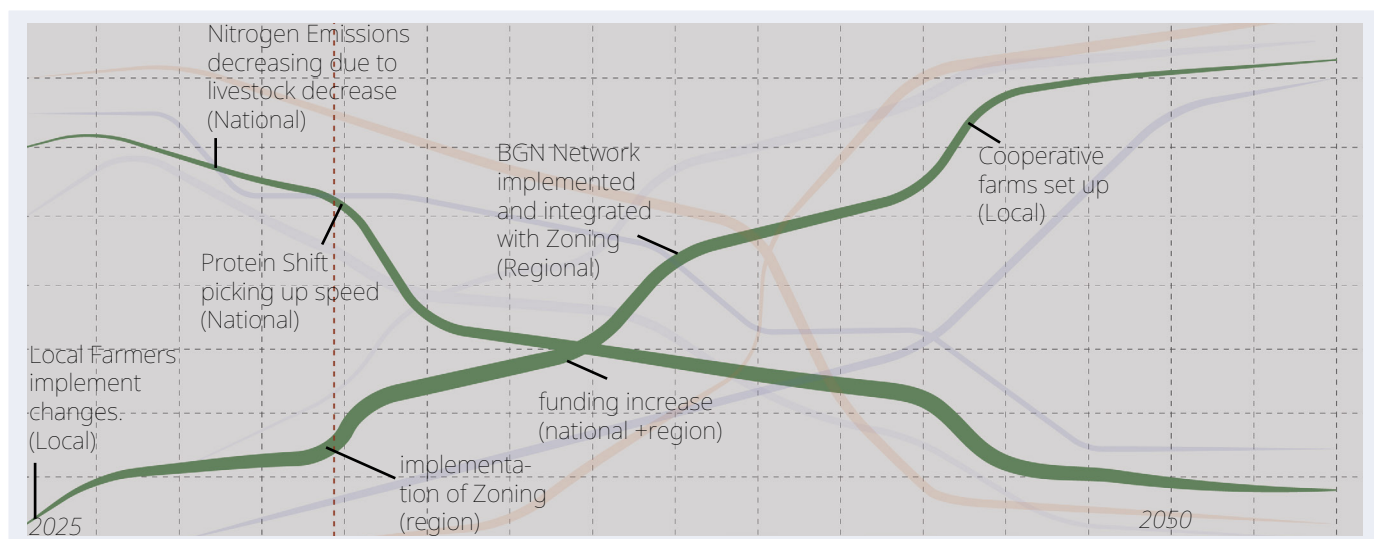


Image 5.23: X-curve Northern Campine 2025-20250 focus on Regenerative Sustainability

5.5 Local Casus

The implementation of the Regional Strategy cannot be fully understood without examining the changes it brings about at the local level. To illustrate this, a case study is explored, specifically the area between the villages of Meerle and Ulicoten. This location was chosen as it encompasses all the various issues identified in chapter 1. The village core lacks services, has poor transit options, and the presence of the national border, alongside different land uses, affects water quality and management. Additionally, agriculture in this area is a mix of various forms, with a focus on bovine farming. Adding to the convergence of depletion, this case study also includes all the landscapes present in the Northern Campine, such as planted forests, heaths, creek valleys, peat bogs, and reclamation landscapes. Therefore, this small area of around 10 km² serves as an excellent case study for implementing the Regional Strategy and its associated projects.

The casus will be completed by first illustrating the existing situation along with the various forms of depletion present. Afterwards, the same area after the implementation of the strategy is depicted. Placing the changes along the X-curve demonstrates how different projects operate independently from one another while still propelling the region towards a regenerative Campine. Following this, attention is directed to the region. Two sites are elaborated upon in more detail: one village core, that of Meerle, and one creek valley along the Border, the Strijbeeksche Beek.

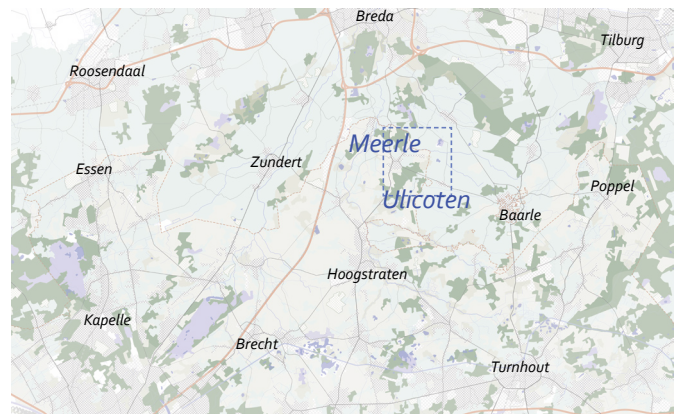


Image 5.24: Location of casus



Heath Landscape North of Meerle



Abandoned Agriculture near Meerle



Reclamation Landscape between Meerle Beek and Ulicoten

Local Casus



Sint Salvator in Meerle



Main Street Ulicoten

5.5 Local Casus

Current Situation I The current situation illustrates the depletion of the Northern Campine. Villages that lack services or frequent connections to the outside, save for personal cars, are surrounded by a vast expanse of agricultural land. Fields of corn and maize (orange) do not produce directly for human consumption but serve as feed for bovine farming (left white). Within these fields, there are pockets of horticulture under glass, tarps, or in open fields. The large empty fields are hardly fragmented by tree lines or ditches and blend into one another almost seamlessly. Within this extensive network of agricultural land, some pockets of forests and heath landscapes can be found. Between Meerle and Ulicoten, the planted forest Den Rooy has replaced heath with straight rows of trees. Along the edges of the casus, small remnants of traditional landscapes can be found. Bocages that mix forests, creek valleys, and pastures offer a glimpse into what is possible in the region when implementing systems based on soil and traditional structures. These bocages can be established even without a clear regional strategy, serving as new plot edges. Finally, the national border between Belgium and the Netherlands, sometimes along the Strijbeekse Beek and sometimes through fields, has created rigid lines in the agricultural areas and straightened the creek. The result is a landscape without a clear sense of what it values. Agriculture occupies most of the space but is not always visible, as fields are often left empty throughout the year. Villages are further shrinking, and ecology remains disconnected.

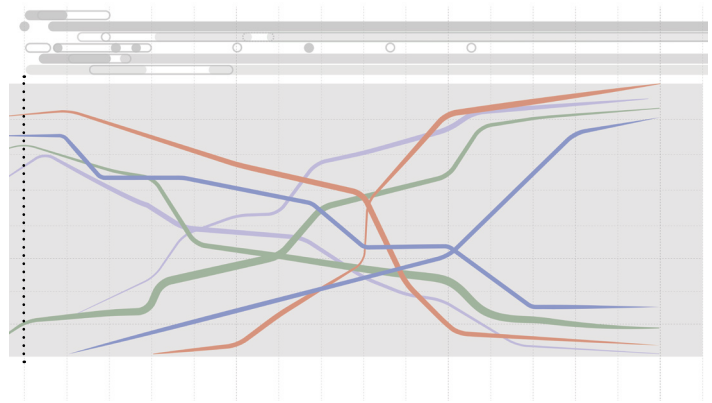
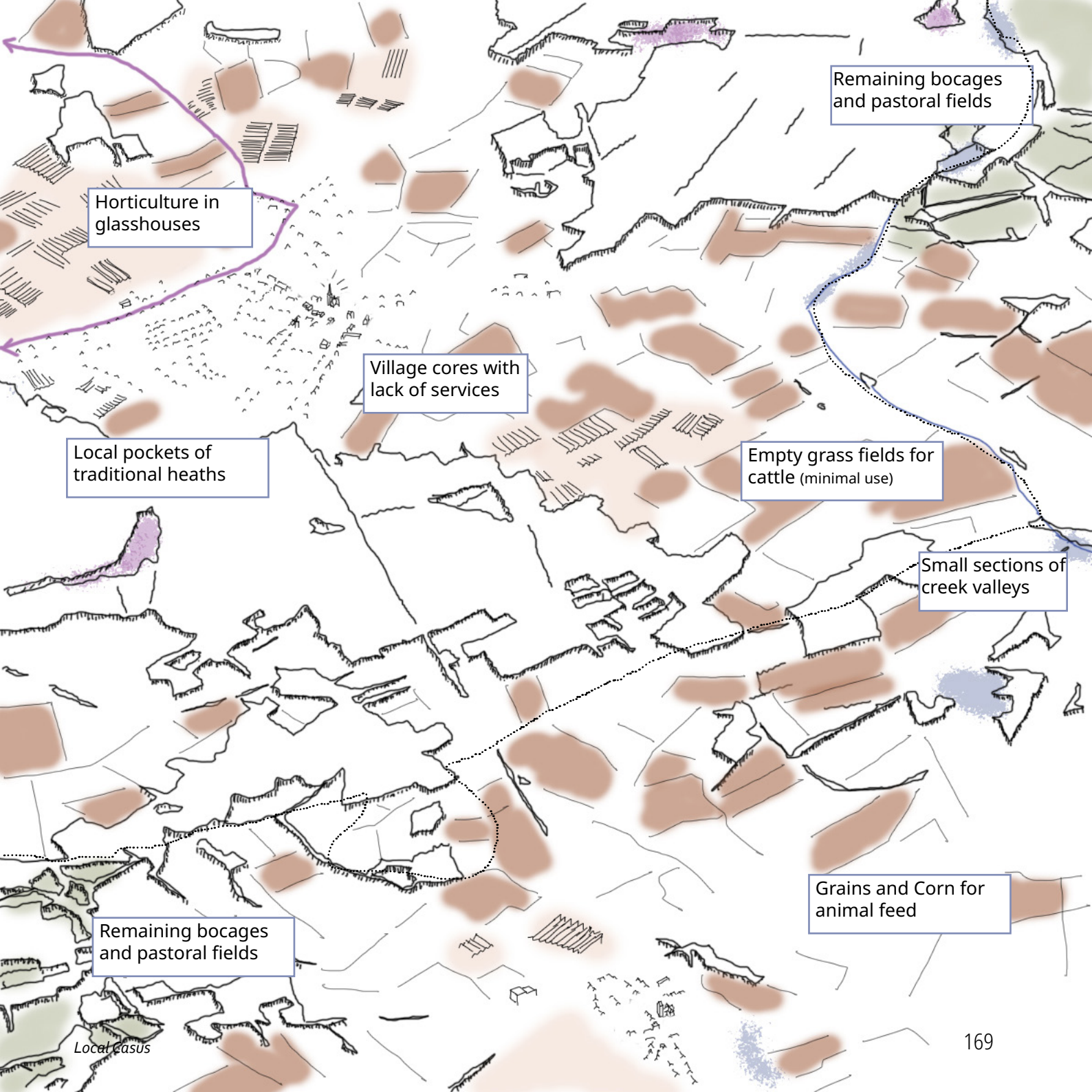


Image 5.25: X-curve showing point in time

Image 5.26: Local casus current situation, illustrating the issues



Remaining bocages and pastoral fields

Horticulture in glasshouses

Village cores with lack of services

Local pockets of traditional heaths

Empty grass fields for cattle (minimal use)

Small sections of creek valleys

Remaining bocages and pastoral fields

Grains and Corn for animal feed

Local Casus

5.5 Local Casus

Regenerative Campine I The implementation of the Regional Strategy creates an entirely new landscape. Forests and creek valleys are linked through ecological corridors. Agricultural zoning creates a patchwork of different types of agriculture depending on soil properties. In some areas, agriculture is prohibited to further protect natural sites. Small corridors consisting of thickets, ditches, or lanes contribute to a landscape characterised by bocage. The expansion of forests and restoration of heathlands restore more of the landscapes for which the Campine is known. Within villages, densification and the addition of services increase the region's resilience. Connecting villages with new modes of transport, such as public transit or expanded cycling networks, provides people with more choices in how they wish to move. Instead of agriculture being primarily for export, local systems of cooperative farms allow food to be grown and consumed directly by residents according to their needs. The expansion of creek valleys and water retention also enables greater local water extraction. As the wettest grounds are along the border, cooperation on water and soil management is essential. The trends in funding and Schengen+ facilitate such cross-border cooperation more effectively. While the changes may seem massive, the structure of land ownership can be maintained. Some extensification and redistribution of land might be necessary to implement the zoning, but this generally does not affect the overall size of plots.

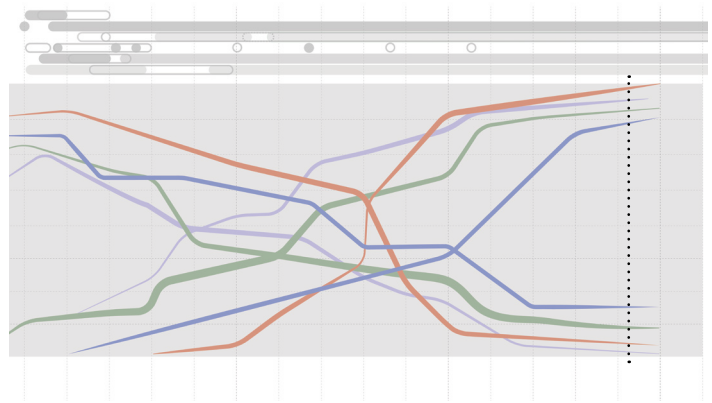
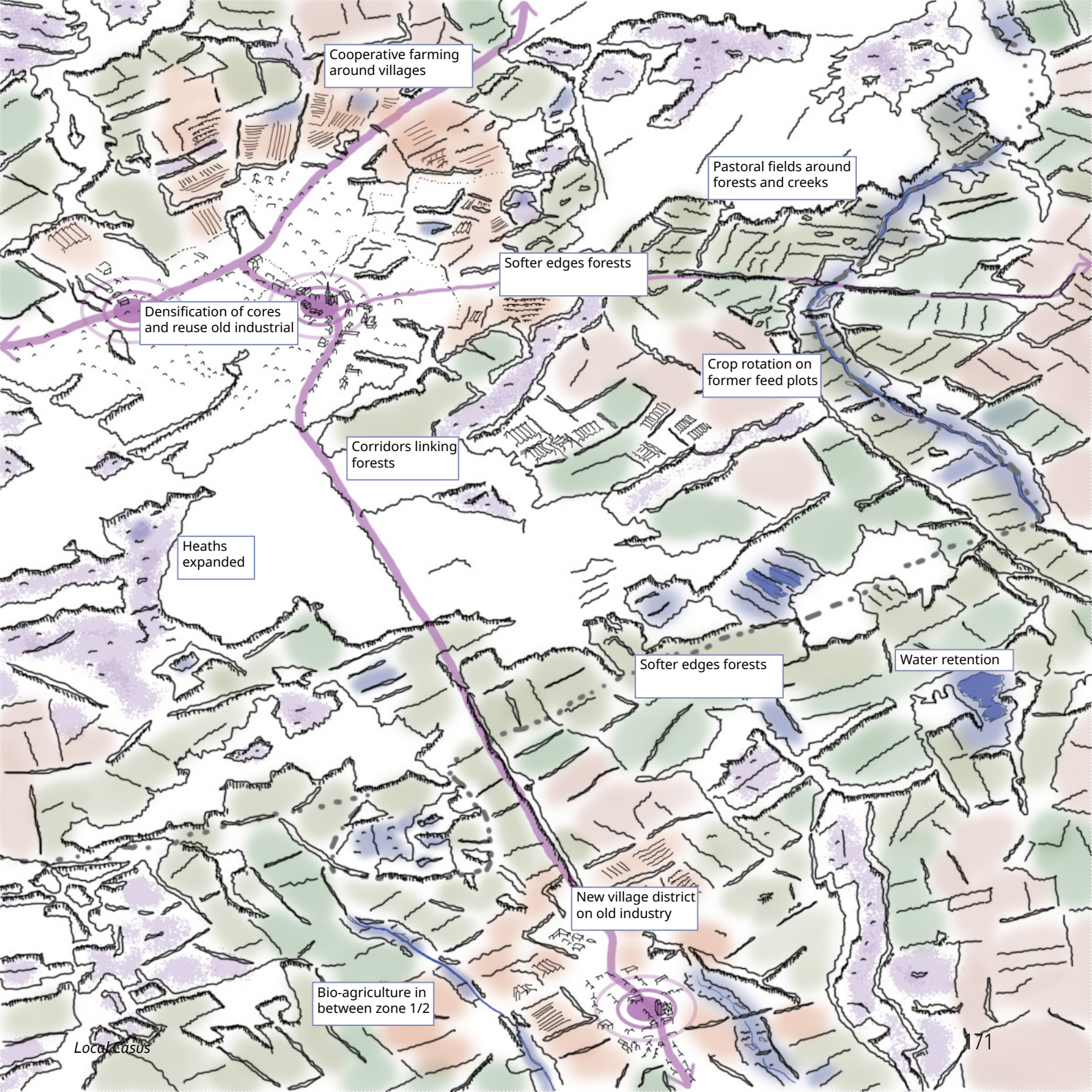


Image 5.27: X-curve showing point in time

Image 5.28: Local casus after implementation of strategy, showing changes to natural and agricultural areas as well as villages



Cooperative farming
around villages

Pastoral fields around
forests and creeks

Softer edges forests

Densification of cores
and reuse old industrial

Crop rotation on
former feed plots

Corridors linking
forests

Heaths
expanded

Softer edges forests

Water retention

New village district
on old industry

Bio-agriculture in
between zone 1/2

5.6 Simulation

With the local casus explained, it is interesting to examine three main stages of implementation towards this future landscape. By employing the same levels of national, regional, and local choices, an initial framework of participation can be established. This aims to illustrate which choices need to be made at each level while also identifying the necessary stakeholders to include. After depicting this system of participation across different levels, three moments will be highlighted through imagination and a description of possible choices. These choices can determine the economic direction of a location as well as its ecological and social systems. The three stages are: Initiation, adaptation, and consolidation.

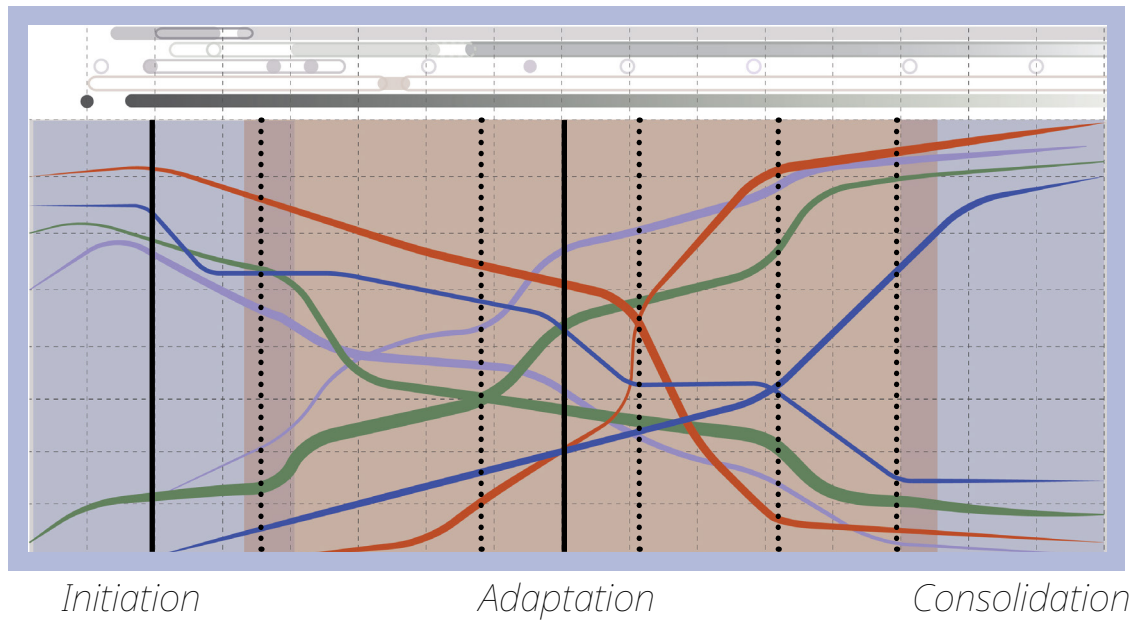


Image 5.29:X-curve illustrating the main stages of simulation with various points of participation (Closed line, regional level; Dotted line, local level)

5.6 Simulation

Soil as Base- National policy I Based on the trends from several sections, national choices are made. These are executed through national or European institutions and must be implemented by regional policymakers. Consequently, this level is the least participatory. The choices considered in this simulation include the implementation of “Soil as Base” (Harbers, Heijnen, 2022) as spatial planning policy, the protein shift being conducted, the creation of a Blue Green Network on a national and international scale, and the implementation of Agriculture and Nature zoning through buffers around Natura2000 sites.

Noorderkempen- Regional Board I The national choices influence those made at the regional level. Shown on the right are some of the decisions made by provincial and regional governments. These choices can be articulated in a regional strategy, as previously established. Instead of imposing this directly on the municipalities and other stakeholders, a new regional board has been created. This board, covering the Northern Campine, combines national and provincial actors with local stakeholders. Rather than merely serving as a governing body that enforces the created strategy without modifications, it functions as an arbiter to resolve conflicts. These conflicts may arise between local actors and national ones, or even among members within the board itself. Adjustments to the strategy can occur, as a connection between the board and national actors exists. However, these adjustments must align with the objectives stated at the national

and/or provincial level. To ensure that “Soil as Base” is achieved, this regional board can appropriate natural and agricultural land to assess potential functions while also enhancing soil and water quality. Finally, instead of being centrally managed for the entire region, subdivisions are present. These local chapters do not adhere to precise municipal borders. Instead, they represent areas characterised by specific identities. Nevertheless, the Regional board can prevent conflicts between these chapters by mitigating the side effects of decisions spilling into neighbouring chapters

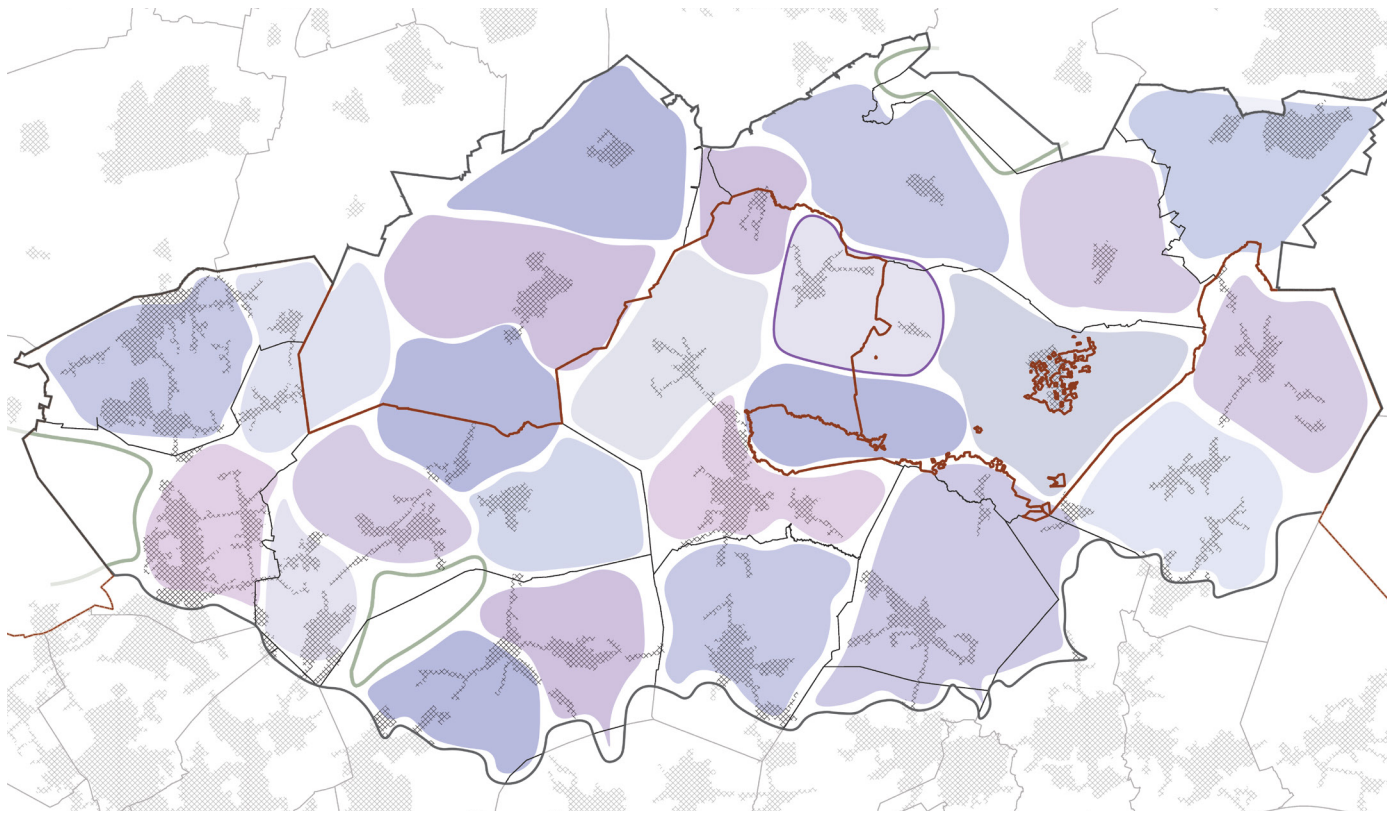


Image 5.30: Northern Campine Board with local chapters (Purples) and natural Chapters (Green)

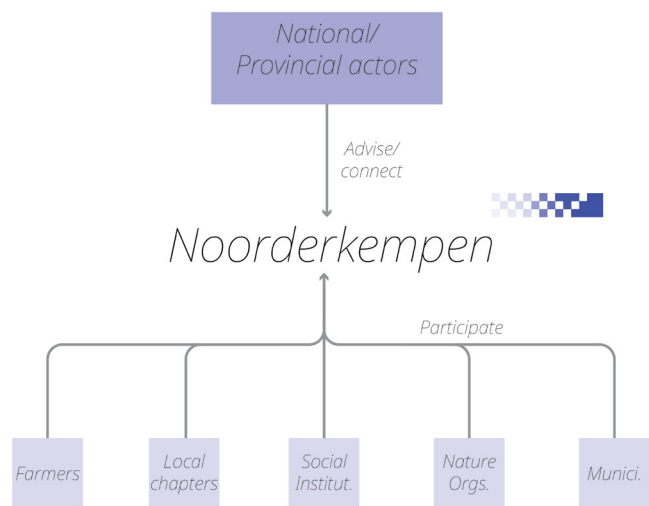


Image 5.31: Northern Campine Board, members and connections

5.6 Simulation

Implementation I The aim of the strategy is to realise the regenerative Northern Campine. The previous section (5.5) depicted how this appears on a local scale around the villages of Meerle and Ulicoten. However, the necessary choices to be made at the local level have not been addressed. Some important decisions at the local level are outlined here. These include ecological considerations, economic changes, and decisions affecting the social and spatial fabric of the villages.

Choices Needed

- Location Agricultural and nature zoning
- Ecological corridors locations and types
- Transit Corridors
- New Services
- New economy
 - eg: cooperative farming and processing
 - circular building sector
- Types water retention
- Locations water extraxtion

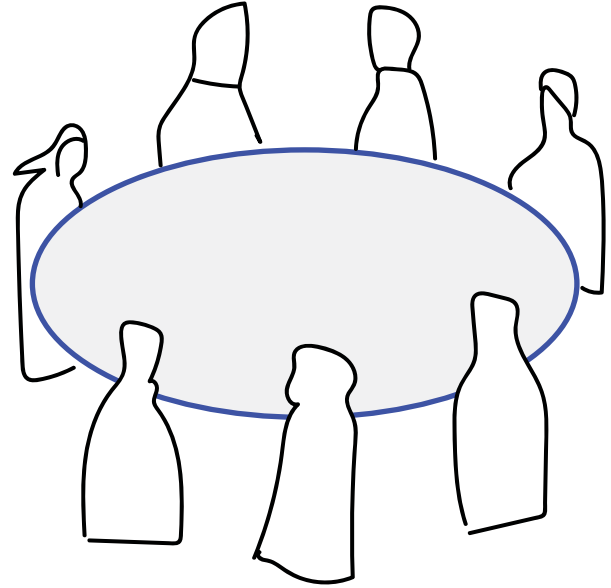
Image 5.32: Illustration of a future Regenerative Landscape around Meerle and Ulicoten



Simulation

5.6 Simulation

Local Chapter I The choices made on the previous page can be determined by the local chapter of the Northern Campine. This chapter represents all residents, farmers, commercial owners, and more. They make decisions regarding the placement of precise functions, which locations become corridors, and the specific plots designated under the new agricultural zoning. While still adhering to the regional strategy, they can decide on specific designs and the types of activities they wish to implement in their village. These choices are not final. After initiation, changes may still be made depending on developments or new opportunities arising from prior decisions. Allowing local representation in the chapter can enhance participation and identify issues early on implementation.



Members

- Farmers
- Residents
- Municipal representative
- Regional board representative
- Commercial owners
- Water companies
- Socio-cultural institutions

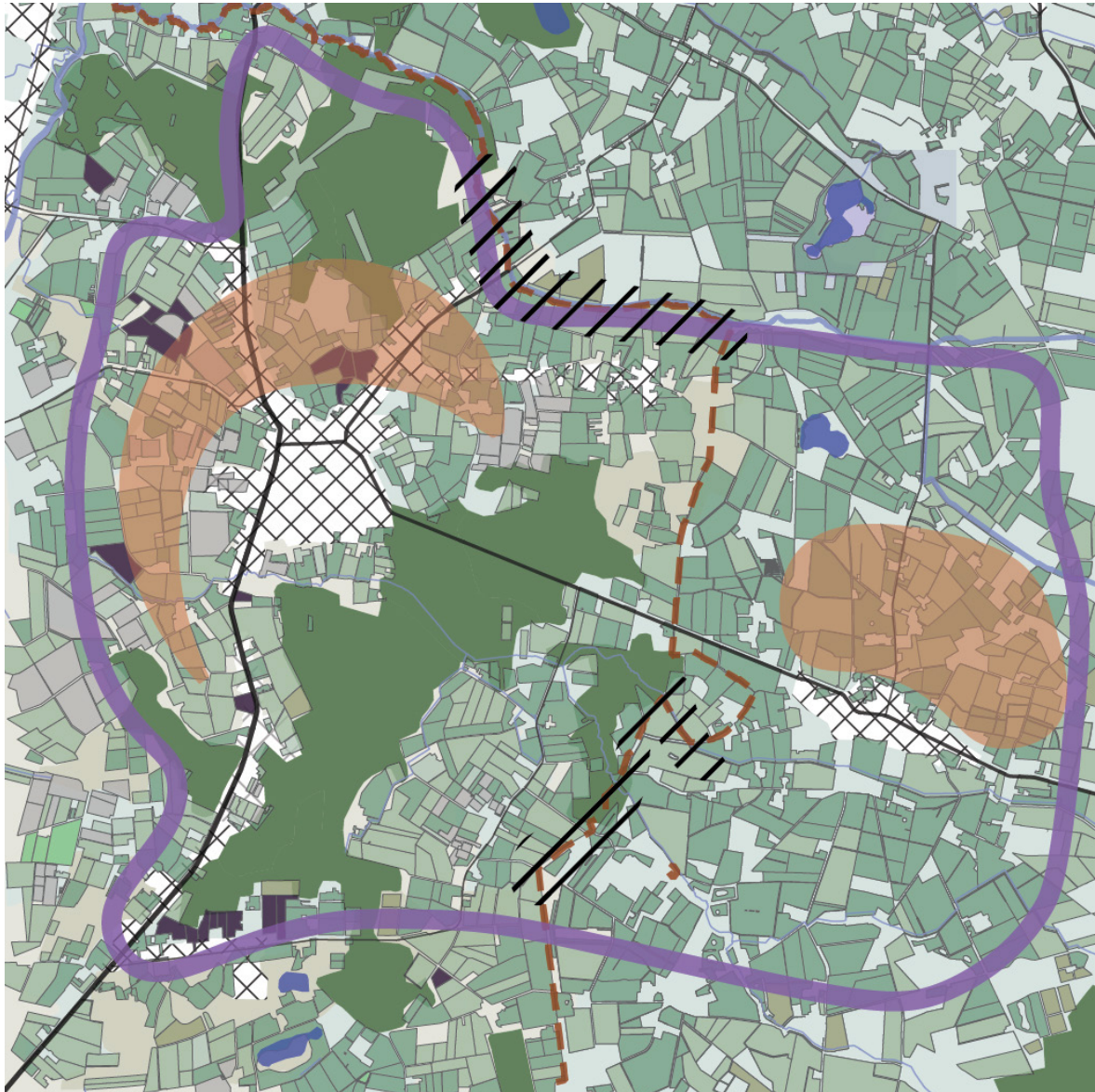


Image 5.33: Illustration of a possible chapter showing landuses, conflict areas and the commons for cooperative Agriculture

Commons
 Chapter border

Conflict area

5.6 Simulation

Initiation I The current situation shows the village core in a state of depletion; car-centric mobility has taken over public spaces. Services have left the village, resulting in abandonment. Demographic shifts have already led to some changes in the urban fabric. Choices can be made on how to counteract this depletion in the short term before larger changes are implemented. Identifying sites for densification of the urban fabric can facilitate later development. Removing parking spaces and adding on-road bike lanes can support the mobility shift. Allocating abandoned spaces for temporary functions, such as repair hubs and studios, can bridge the gap before new service buildings are established. Finally, the creation of a cooperative farming group can occur before all the land has been allocated. Choosing specific production types and agricultural practices can aid implementation later.

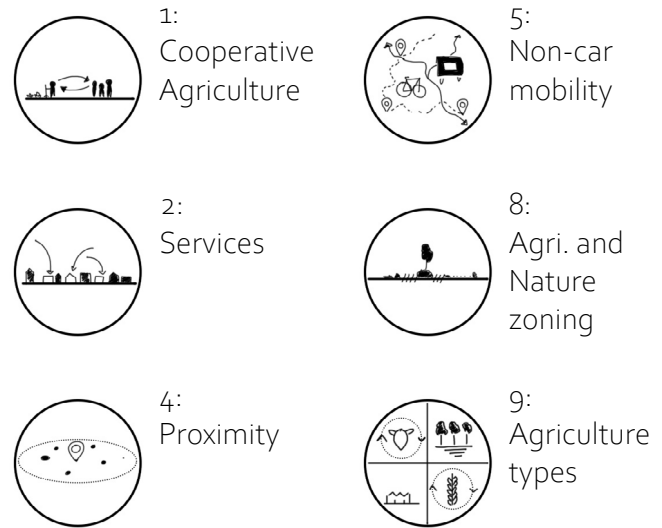


Image 5.34: Possible Projects that can be used



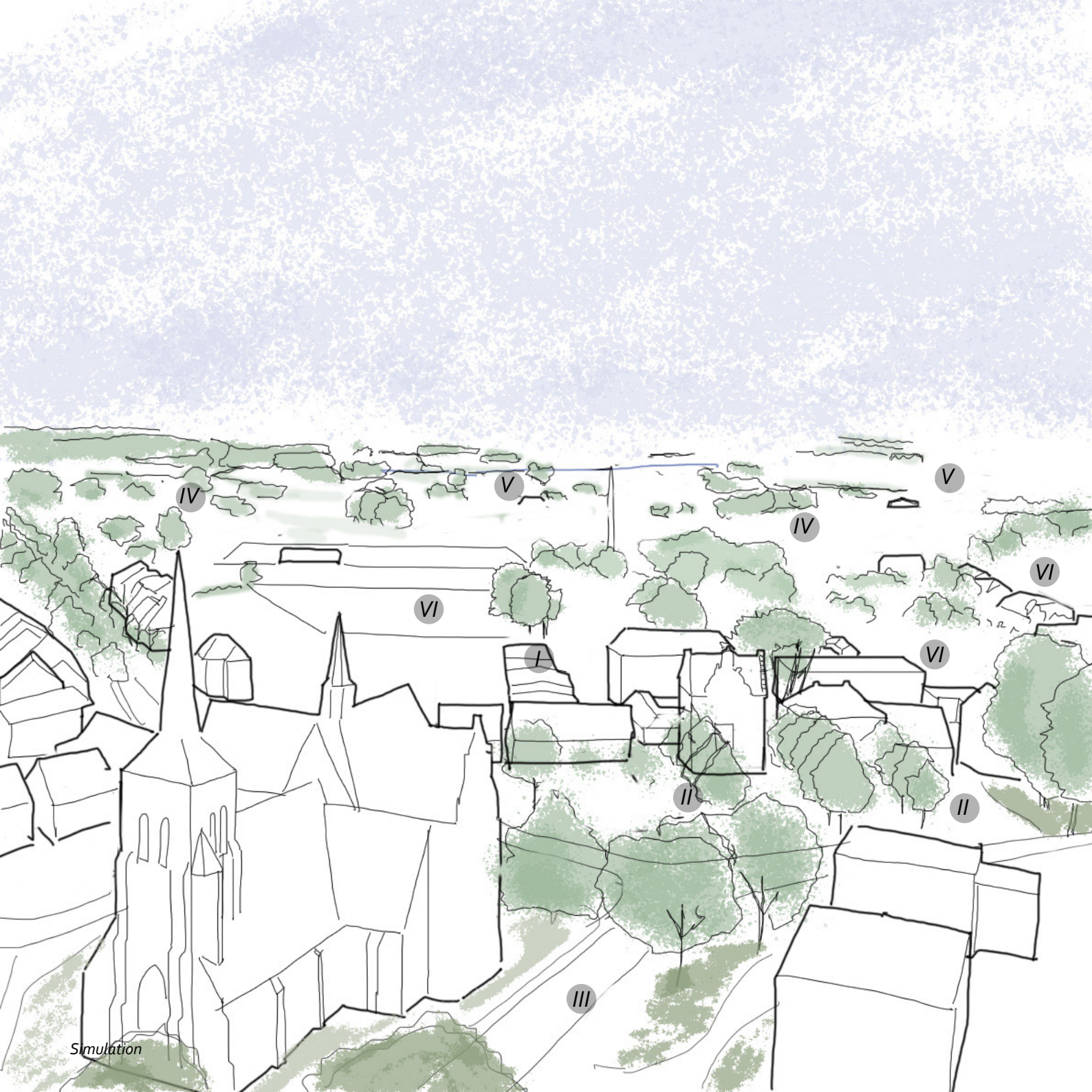
Image 5.35: Village Core and edge at initiation

Choices

- Repurpose abandoned buildings
- Remove parking spaces
- Improve cycling infrastructure
- Set up Cooperative Agriculture
- Extensification
- Identify spaces for densification



Image 5.36: Village Core at initiation with possible choices



Simulation

5.6 Simulation

Adaptation I After the first stage, some changes have already been made to the village core and its surroundings. These changes result in a second round of choices. The first choices cover the type of economy the village core wishes to create. Choosing to prioritise agricultural processing allows a rural village to expand production beyond basic goods. Additionally, opting for specific services can foster a local economy specialised in one or two fields. Circular construction, IT focus, healthcare, and more are possible. Establishing a marketplace enables goods and services to be exchanged. The second set of choices examines the expansion of the Blue Green Network and the extensification of remaining agriculture.

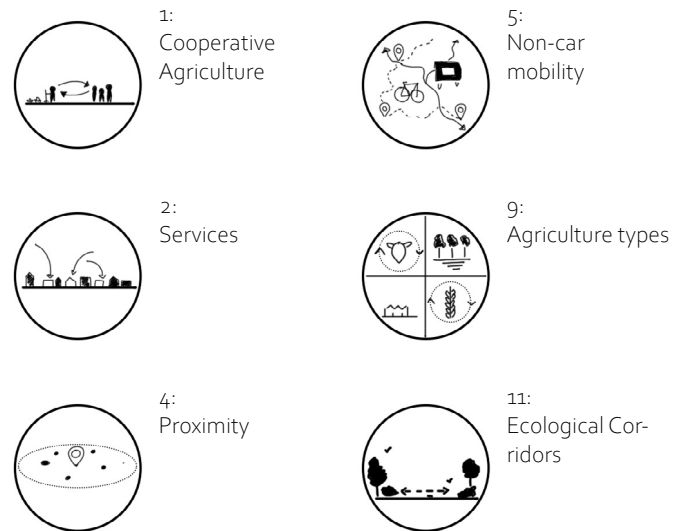


Image 5.37: Projects that can be used with choices

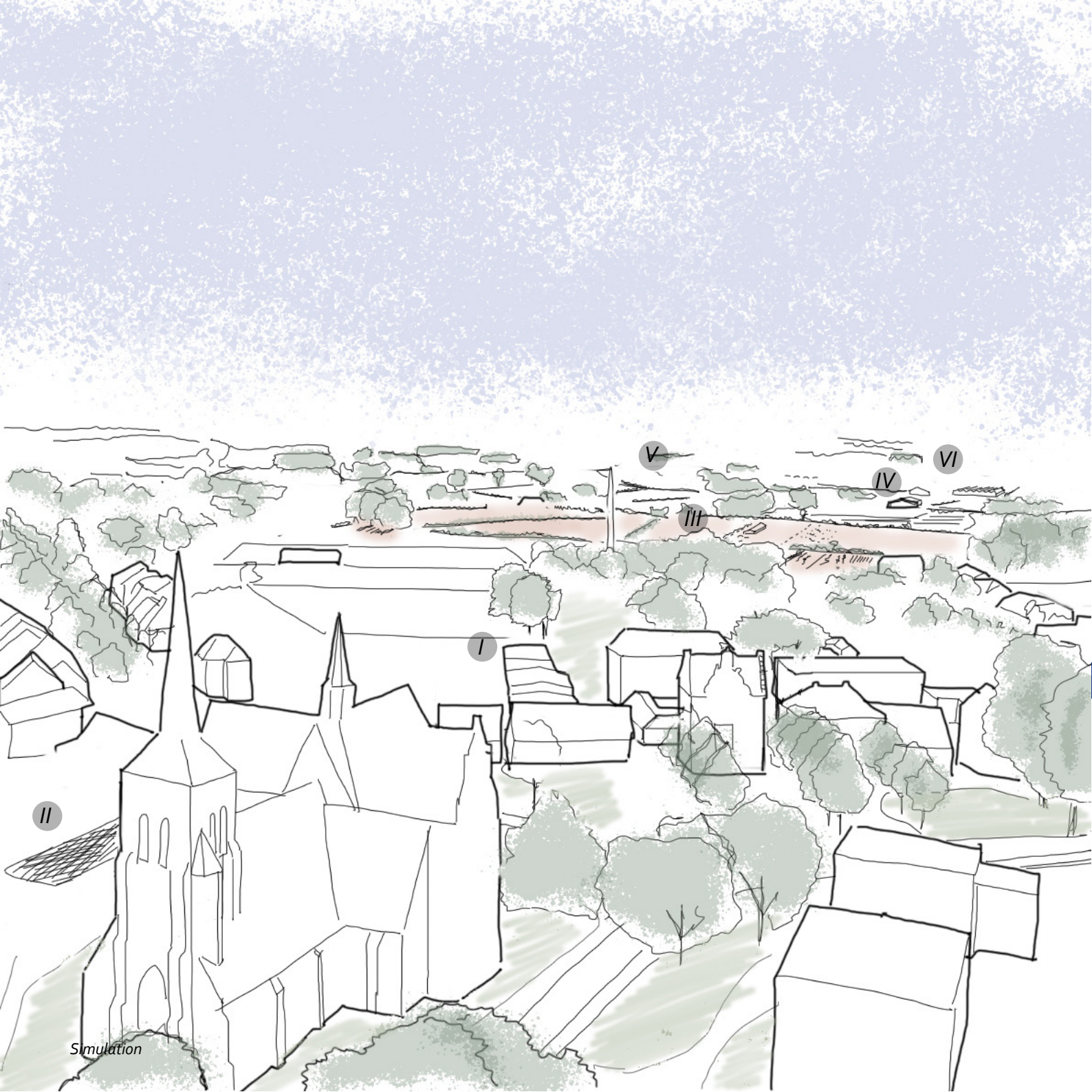


Image 5.38: references illustrating changes between initiation and adaptation

Choices

- Densification and services I
- Market space II
- Expansion cooperative agriculture III
- Setting up processing IV
- Further Extensification V
- Expanding BGN VI

Image 5.39: Village Core during adaptation with possible choices shown in grey circles



Simulation

5.6 Simulation

Consolidation I Once the choices from the previous stage have been implemented, the new village core has been fully developed. New production systems allow locally produced goods to be sold in the village first, while new services have been established in the central square. As a result, the village core becomes a place where residents can find basic services, exchange goods, and meet in a space prioritising people. While one village cannot provide every service a resident might need, movement between villages will always remain. Ensuring that each village is linked to multiple others reduces car use. Finally, allowing for the densification and expansion of villages can create new housing. However, to avoid the haphazard development seen in the past decades, this new housing should adhere to the parameters of dense typologies and maintain village qualities.

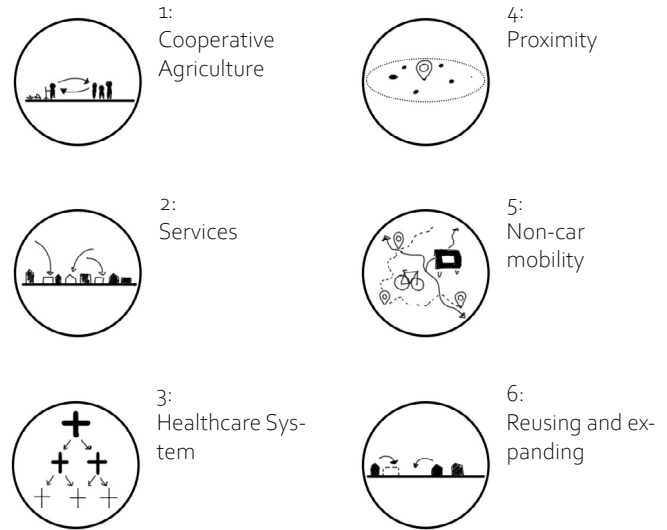
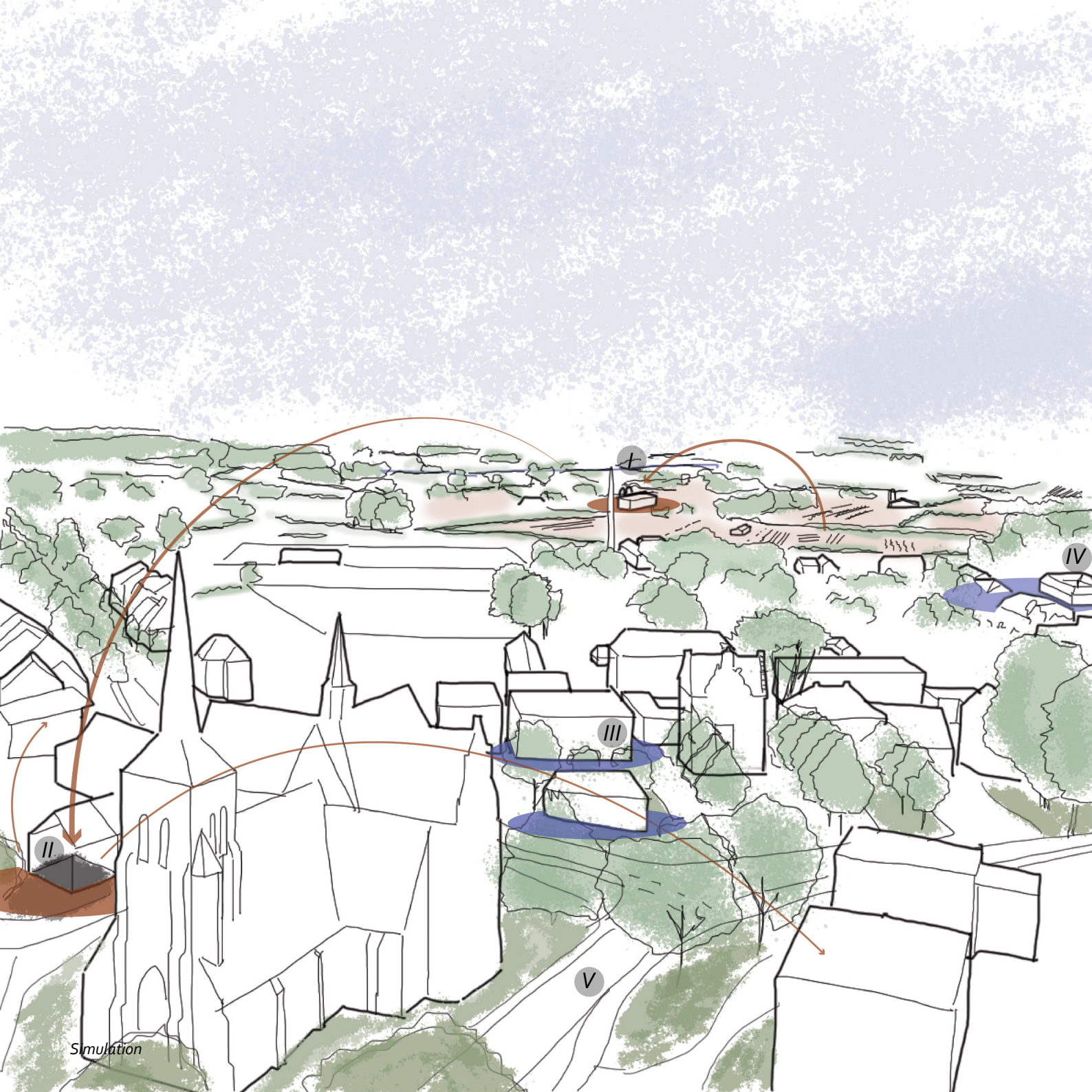


Image 5.40: Projects that can be used with choices



Image 5.41: References of functions and typologies new village

Image 5.42: Village Core at consolidation with possible choices with arrows illustrating new cooperative system



Simulation

5.6 Simulation

The simulation of changes to a village core from depletive to regenerative illustrates just one village core. Depending on the choices made by the regional board and local chapters, numerous futures are possible. Villages can begin specialising in certain productions or services to distinguish themselves, while also establishing new economies that differ from the current agricultural model. Although the strategy and simulation envision changes by 2050, this does not imply that nothing will occur thereafter. Social changes, political shifts, and economic shocks may still take place. Future developments beyond 2050 can continue to utilise the new system of regional and local participation simulated here. Choices will differ as challenges will vary. Nevertheless, the foundational policies should be preserved to prevent a reversion to depletive landscapes. A comparable simulation of a creek valley has also been conducted and can be found on the following pages.



Image 5.43a: Eye level view of village square current situation

Image 5.43b: Eye level view of village square at with new consolidation buildings and functions



Simulation

5.6 Simulation

Initiation I The creek valley depicted in this simulation belongs to the Strijbeeksche creek. Running north of Meerle and Ulicoten, its final stretch forms the border between the Netherlands and Belgium. Currently, the valley can be described as devoid of life. Distinct boundaries border large grass and maize fields. The creek itself has been reduced to a canalised ditch with steep banks. Trees are sparse outside of the forested areas. Nevertheless, there are choices available to initiate the implementation. Instead of abrupt edges of fields, hedgerows could be introduced along the existing plot lines. The small pockets of the creek valley further downstream illustrate that this is feasible. Secondly, instituting nature and agricultural zoning along the creek and the forests provides a preliminary site for agricultural extensification. Combined with additional vegetation, water retention along the creek can be enhanced. These initial choices, such as the hedgerows, can already be undertaken by farmers prior to the formation of a final strategy. However, the continuation is contingent upon adequate funding and ultimately the cooperation of governing bodies, akin to hedgerow creation and maintenance in Friesland (Albers, 2025).

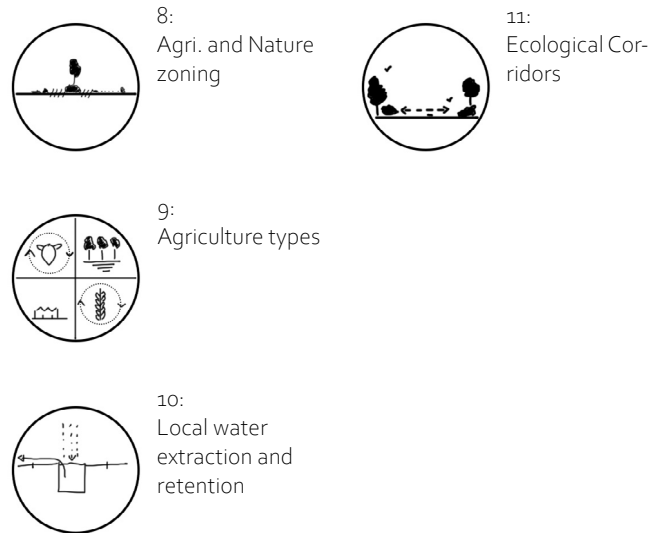


Image 5.44: Projects that can be used with choices

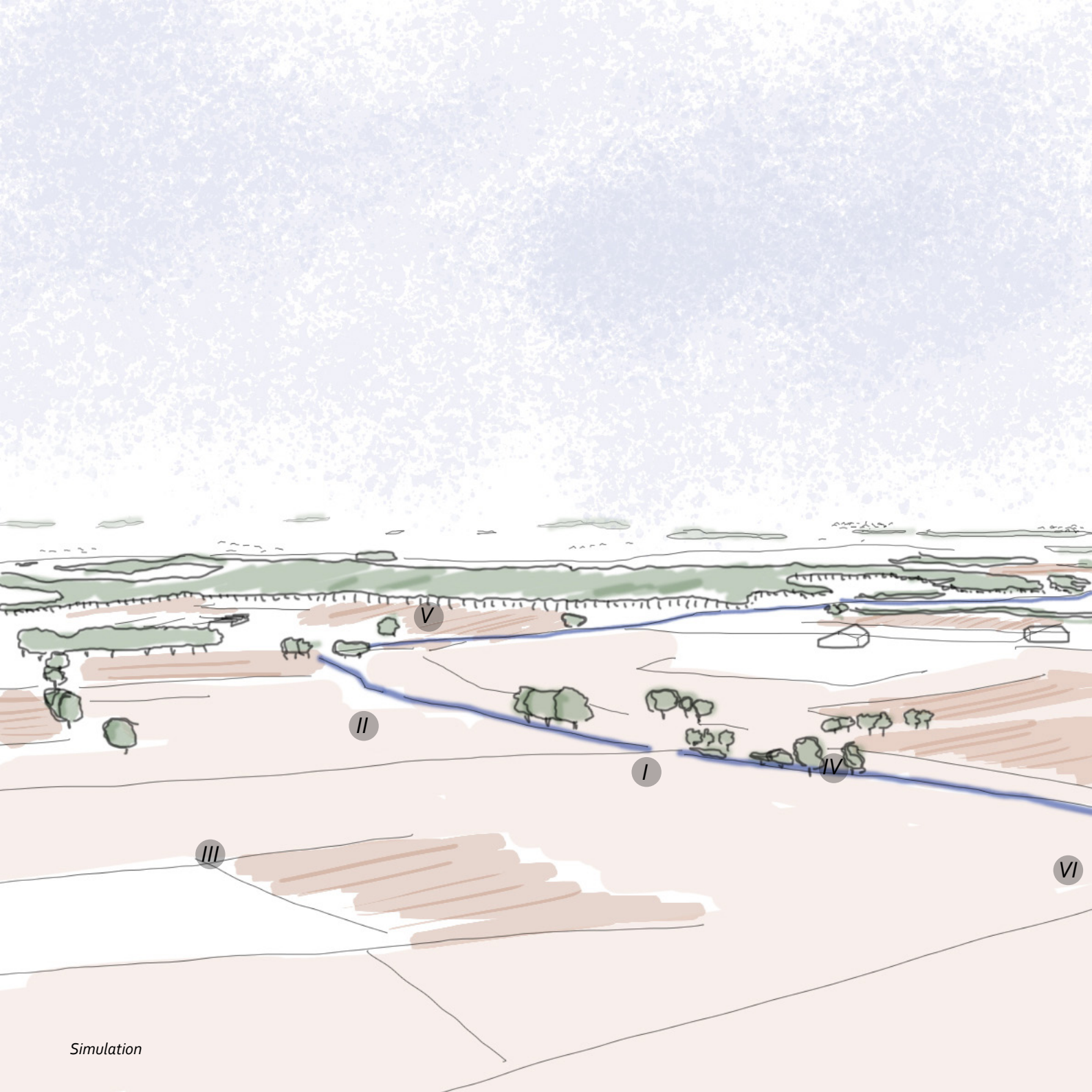


Image 5.45: Images illustrating places of change in Creek Valley

Choices

- Hedgerows as plot edges I
- Agriculture types II
- Water retention through vegetation III
- Extensification IV
- Agricultural zoning V

Image 5.46: Creek valley at initiation with possible choices



5.6 Simulation

Adaptation I After initiation, whether by local farmers and landowners or by Northern Campine, the adaptation of the creek valley is in progress. The new zoning establishes an ecological corridor that connects the hedgerows with the forests. Decisions made at this stage address specific locations and the further extensification of agriculture. Hedgerows can be utilised again to reduce plot sizes, facilitating greater extensification. Improvements in water retention through creek restoration, pond creation, and similar efforts can take place once initiation has been completed. This phase of implementation relies on the established local chapter and the Northern Campine regional board.

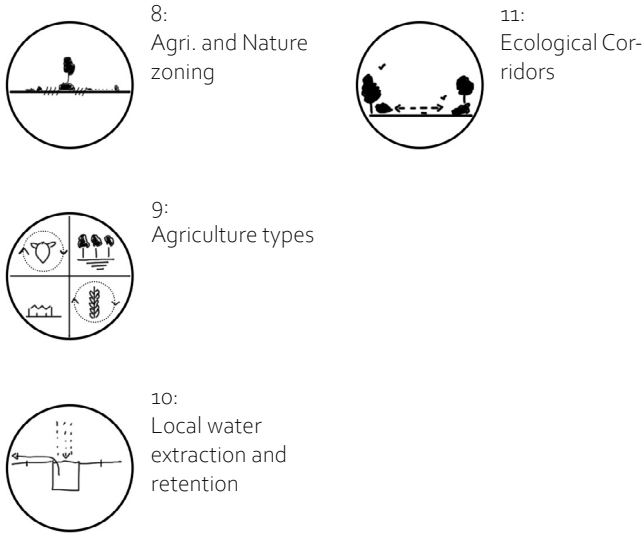


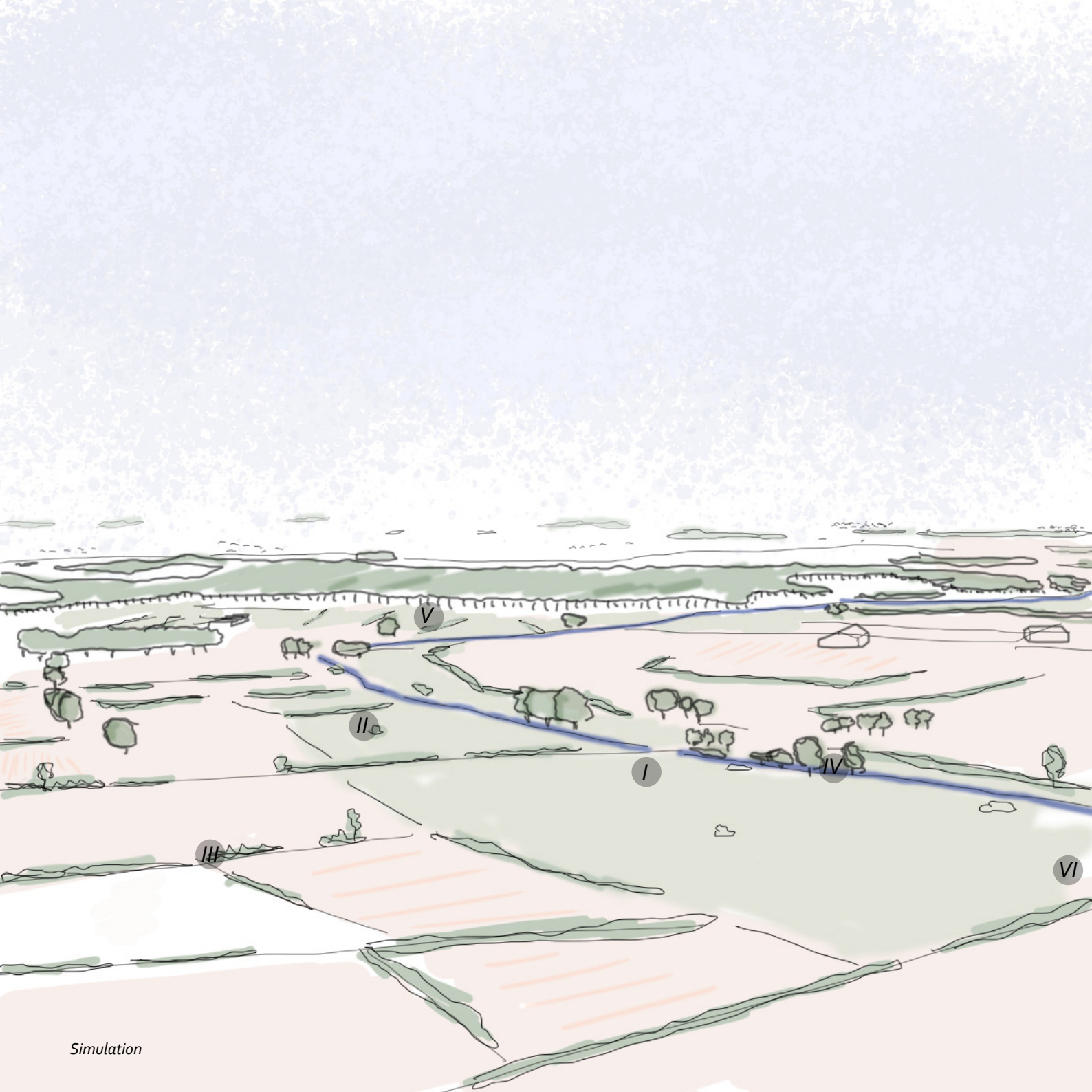
Image 5.57: References for changes between initiation and adaptation

Choices

- Agricultural zoning
- Agriculture types
- Thickets
- Water retention
- Extensification
- Expanding BGN



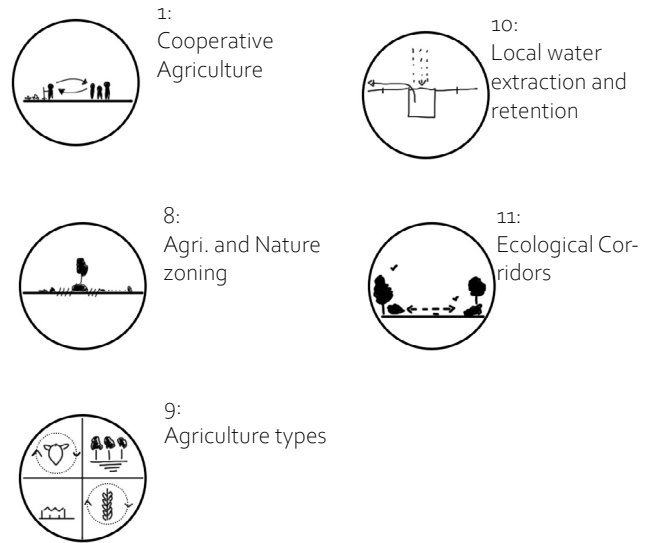
Image 5.48: Creek valley during adaptation with possible choices



Simulation

5.6 Simulation

Consolidation I In the final stages, agricultural extensification has been implemented. This is achieved through the use of nature zoning, agricultural zoning, and various types of agriculture. The restoration of the creek and the establishment of hedgerows have created a fine-grained local network of ecological corridors that extend into the surrounding forests. This network also facilitates the establishment of new fields. Instead of high banks, the creek now has more space to flow freely. Ponds and vegetation along its course allow for greater water retention. The creation of these new fields and agricultural types can also enhance connections to local markets or be leased to cooperative farms. The previously depleted agricultural landscape surrounding the creek valley has been replaced with a new bocage landscape that ensures the regeneration of ecological functions while also accommodating new agricultural systems.



Choices

- Connect to local market
- Agriculture types
- Connected Thickets
- Water retention
- Extensification
- Maintain BGN



Image 5.49: Creek valley at consolidation with possible choices

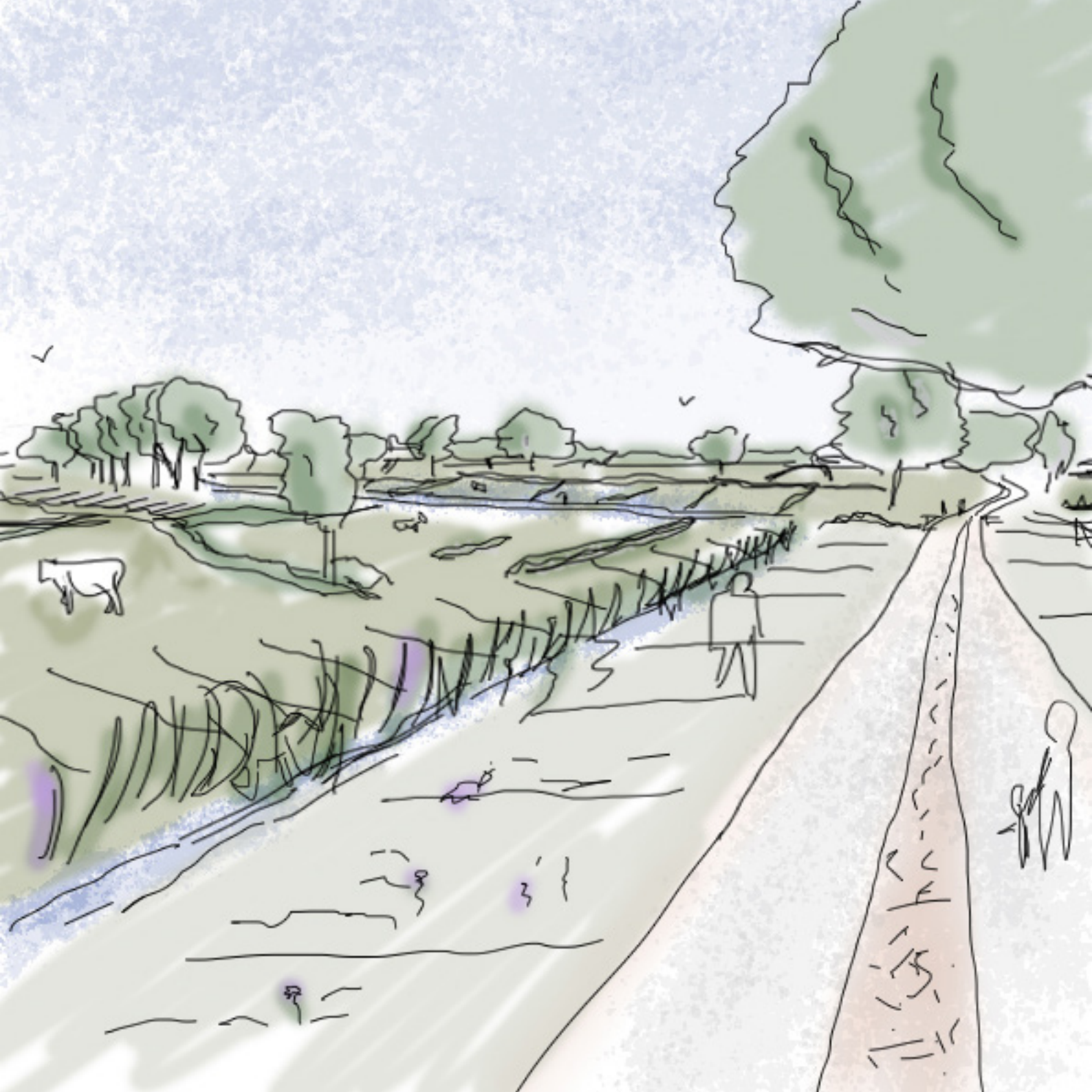


The creek valley has transformed from a rigid landscape of fields and canalised ditches to a new, dynamic environment. This landscape is characterised by a series of bocages surrounding a lower-lying creek. Instead of high riverbanks, gentle slopes serve as buffers against flooding and allow cattle to graze closer to the creek. The expansive rigid fields have been replaced with a blend of pastures and diverse crop fields. Depending on the agricultural choices made, there may be a significant variety of crops or a regular crop rotation. Creek valleys can become both natural and agricultural spaces. This can ensure production while also enhancing ecological connections and creating natural habitats for residents. The introduction of new water retention strategies in the creek valley can bolster resilience against climate shocks. The various types of agriculture can also strengthen economic resilience, as they no longer rely on a single form of production.



Image 5.50a: Eye level view of creek valley current situation

Image 5.50b: Eye level of creek valley at consolidation showing various fields and agriculture as well as new places for water



5.7 Summary

Summary I The previous chapter explored the choices and possibilities on the national, regional and local scale needed to achieve the Regenerative Northern Campine. By assuming national trends that define policy choices and societal shifts, the regional strategy uses these trends, together with the results of the analysis in chapter 3. A local casus is illustrated showing the current and future scenario as well as the process of change expressed through an X-curve. A simulation is done to illustrate how specific choices influence the landscape while also illustrating a new system of participation and governance. The aim is to illustrate that specific choices, design, policy or other, change the landscape and economy through time and that they can influence choices in later stages. The imagination and simulation together illustrate how the Regenerative Northern Campine can be achieved through design, governance and participation.

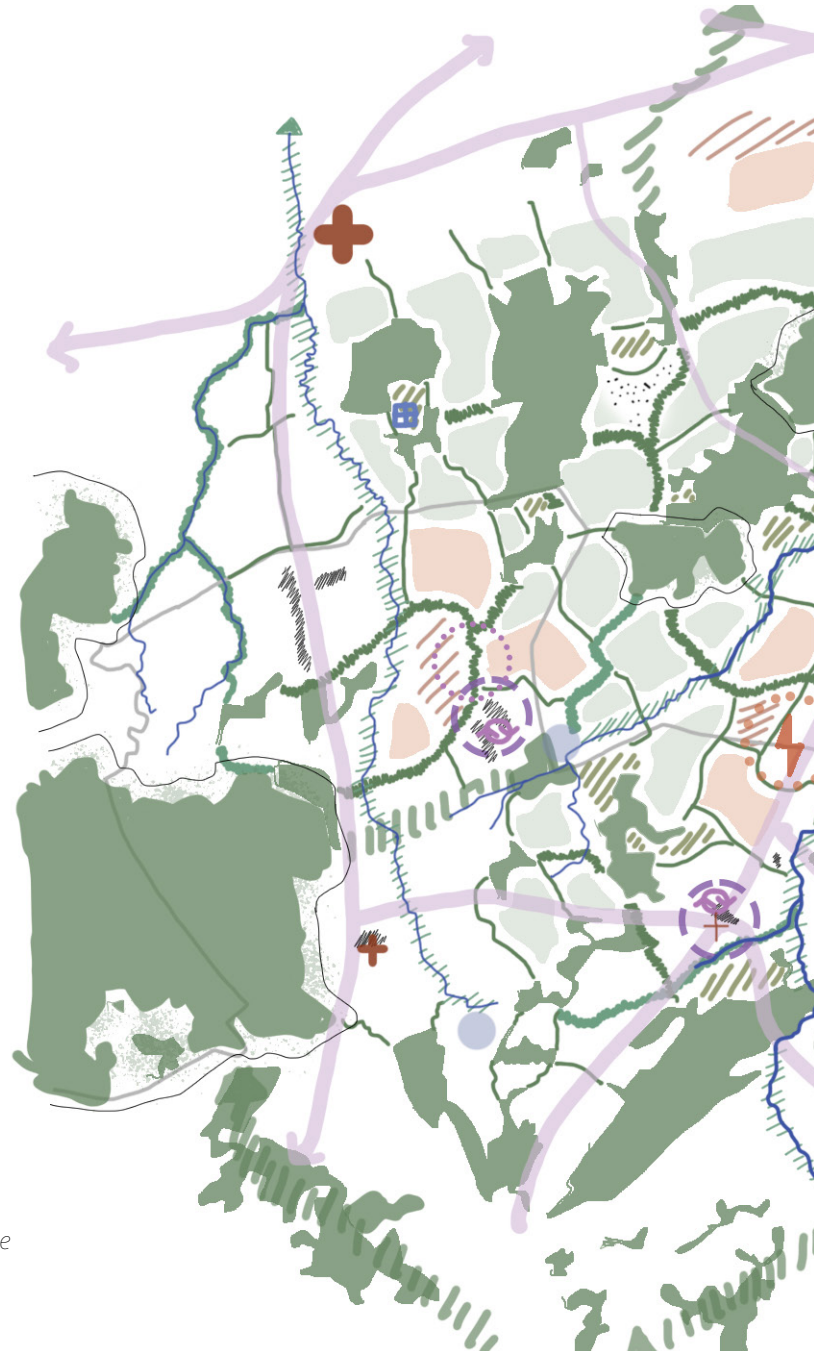
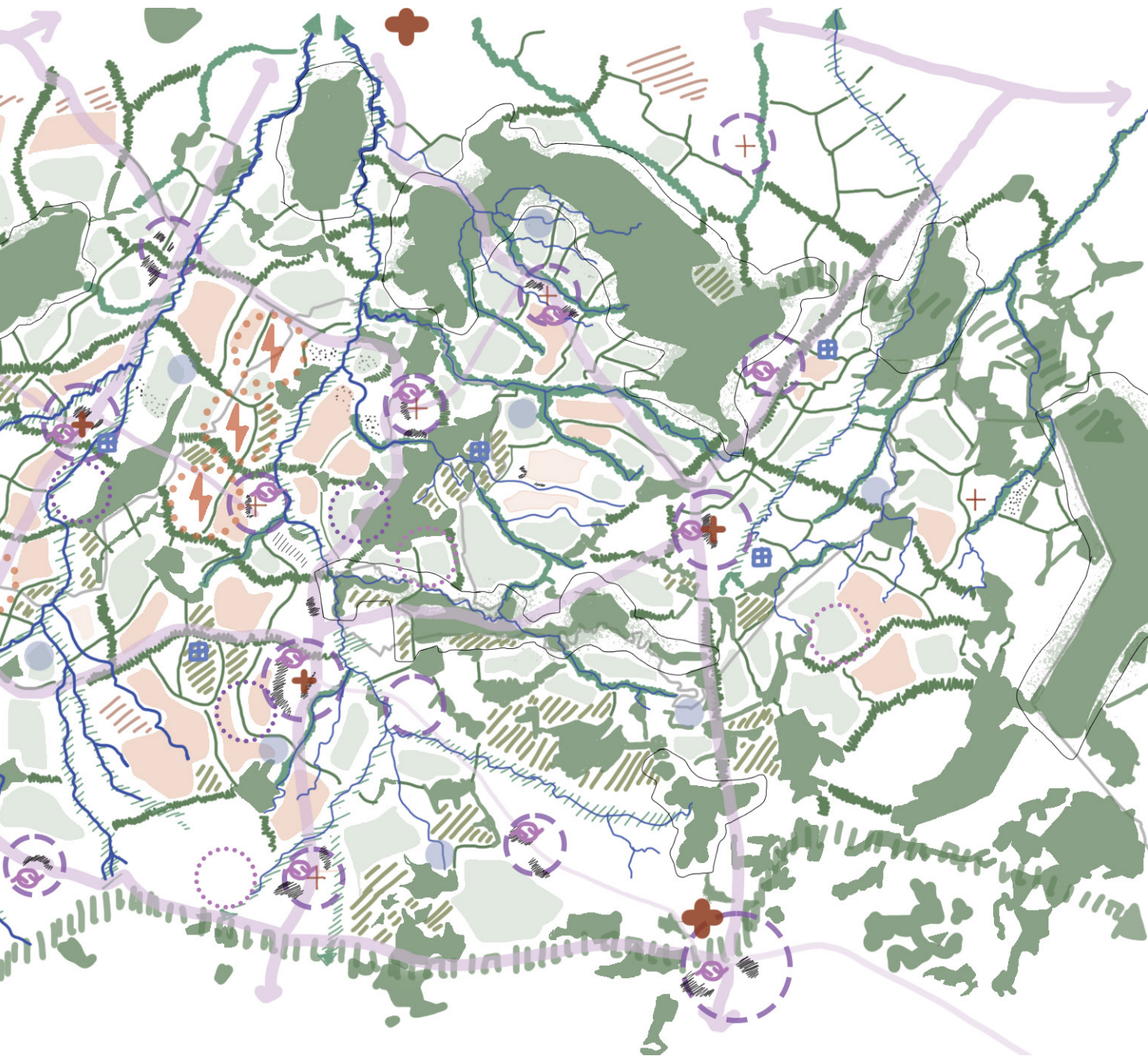


Image 5.51: Regional Strategy Map, legend can be found on page 163





De Vriesart, H. B. (1842-1877) "The Campine" [aquarel]. KMSKA.



6

Evaluation

6.1 Conclusion

6.2 Discussion

6.3 Reflection

6.4 Personal Reflection

6.1 Conclusion

Aim I The stated aim of this thesis was to create a strategy that transforms a depletive landscape to a regenerative one. An understandable depiction of current issues and possible systems was important to achieve this. Illustrating the issues spatially and identifying policy challenges showed the gap between current and future possibility. The main question was “How could regenerative sustainability counter ecological and social depletion resulting from intensive land-uses and rural shrinkage in the Northern Campine region?” This section will describe the results of this question.

Main Result I Since the thesis looked at solving a scala of issues a clear definition of regenerative sustainability was needed. What did Regenerative Sustainability encompass, as stated in the first sub-question? While a definition was given for RS, it consisted of multiple elements. Not only sub-elements of itself, such as regenerative agriculture and regenerative villages, but also additional concepts. This was due to RS’ elements often being heavily focused on ecology rather than ecology and society. Concepts such as rural resilience and accessibility expand or can be incorporated into RS as they focus on social issues. This inclusion was important as the main research question stated both ecological and social depletion. The concepts of rural resilience and accessibility are also introduced as alternatives to intensive land use and rural shrinkage in the second part of the research question. The combination of RS with additional concepts provided various tools and ideas that work on various levels and timescales. However, as these tools often fo-

cus on a single issue or theme, the incorporation of the concepts into one framework was of utmost importance. This is due to the thesis attempting to address multiple issues and not one. Combining the tools together and creating hybrids of tools taken from analyses and research ensured that the various issues were addressed to some degree. What came next was a constant convergence and divergence of tools, concepts and scales to create the final strategy.

Evaluation based on the criteria list illustrates that the focus on RS indeed helps shift the landscape from depletive to regenerative concerning ecological themes. Although more social and political themes are mentioned, they are not fully shifted or resolved. A definitive answer to the main research question can be formed as follows: Regenerative Sustainability allows for a shift in thinking from depletive systems of production to systems that focus on the natural limits based on soil. The connection with social aspects can be strengthened through the implementation of local systems aimed at meeting the needs of locals first rather than external needs.

Secondary Results I Answering the research question was divided into five sub-questions, together broadly covering three stages: Exploration, Imagination and Implementation. Exploration consisted of the theoretical, policy, spatial and diachronic analysis to get an understanding of the Northern Campine. Imagination consisted of reviewing existing scenarios and evaluating them with

Spatial Themes

Soil and Water

Water retention	+
Flooding	+
Water Extraction	o
Water system	+
Agricultural use	+
Water quality	+
Soil quality	+

Ecology

Cultural landscapes	+
Natura 2000 zones	+
Biodiversity	+
Blue-Green Network	+

Hybrid Themes

Mobility

Modes	+
Network type	+
Core goal	+

Resilience and Regenerative

Functions	+
Information exchange	o
Governance Networks	o
Housing provision	+

Institutional Themes

Cross Border Coop.

Level of stakeholders	o
Goals	+
Vision	+
Network of actors	o
Institutions needed	o

Spatial Themes	Soil and Water	Ecology	Hybrid Themes	Mobility	Resilience and Regenerative	Institutional Themes	Cross Border Coop.
Water retention	increased drought	Uneven distribution	Increased retention	Modes	Single modes	Heavy focus on one	Mixed modes
Flooding	More extreme	irregular	Decreased	Network type	Radial, no rural links	Radial to core	No rural and consumer
Water Extraction	National level	Regional level	Basin based	Core goal	High profile	Profit	Service based
Water system	Singular system	Regional systems	Local systems	Functions	Monofunctional	Some basic services	Multifunctional
Agricultural use	Anything goes	Regional special	Based on soil types	Information exchange	No exchange	Top down	Horizontal
Water quality	Unstable	Low quality	High quality	Governance Networks	National	Provincial	Local and horizontal
Soil quality	Depleted	Low quality	Healthy and vital	Housing provision	detached	Personal and detached	role of types
Cultural landscapes	Non-existent	Small pockets	Integrated network	Level of stakeholders	National	Provincial	Local and provincial
Natura 2000 zones	Agri. taken away land	Agri. next to	Experienced with buffers	Goals	Diverging	Slight variations	Shared
Biodiversity	Further loss	Endangered	Recovery	Vision	Diverging	Similar	Shared
Blue-Green Network	Not implemented	Disconnected	National and connected	Network of actors	National	Provincial	Local
				Institutions needed	National	Multiple	Limited
					Mainly consumer and producer		

Image 6.1: Final Criteria Assessment

6.1 Conclusion

findings from exploration. Finally, implementation combined the two previous stages to create and evaluate a single strategy. The analysis of various concepts provided a theoretical background with which criteria could be set up. These criteria were backed or expanded on in the policy, spatial and diachronic analyses of Chapter 3. This helped combine the ecological, social, and economic forms of depletion, mainly due to the spatial analysis approach. Taking soil and ecology as a base on which other activities take place, findings and formation of criteria could be linked to spatial elements instead of only political or social. Taking soil as the base was in line with policy analysis that showed it was a shift in planning policy already occurring. Additional policy analysis informed supplementary elements to consider. Mobility, economic planning, social planning, and agriculture policies incorporated the concepts while also showing which aspects and elements of the Northern Campine to analyse further. The overlap between policy choices and spatial design of the Northern Campine became clear primarily when looking at the (production) landscapes and social shrinkage present. The second part, imagination, reviewed scenarios created by national boards and/or researchers already incorporating several of the concepts. Additionally, the choice of reviewing scenarios instead of developing new ones stemmed from there being significant overlaps between initial scenario development and reviewing existing ones. Imagining these scenarios on the Northern Campine allowed a more detailed review of them using the criteria set up after Chapter 3.

The third stage, implementation, combined the findings and conclusions from the first two stages while also evaluating the result. An important aspect was to make choices explicit. Different trends fit within different concepts. Furthermore, choices of strategies and projects were based on the analysis and the possibilities created by multiple layers. For instance, soil properties and policies such as “soil as base” (Harbers, Heijnen, 2022) created the possibilities for agriculture and the Blue Green Network. The expansion of transit and services is dependent on the possibilities where they can be incorporated into current networks and villages. This multilayered aspect of choices underlines that the development of a strategy cannot happen on one single level; it is dependent on choices and trends on a national level, visions on regional scales and local agency. Yet, there have been instances where personal choices have been made regarding design. One of these is the use of hedgerows and thickets. While they are currently present in pockets, their implementation locations were a personal choice based on analysis. Furthermore, the choice of densification and expansion of villages was based on spatial analysis, not necessarily on statistical data and local planning practices. Nevertheless, these choices show there may be room for designers or local actors to express personal preferences. As a result, evaluating the regional strategy illustrates that system changes do not all occur simultaneously or at the same level. The X-curves illustrate that some choices or changes can start and achieve completion sooner while others need more time or start later. Combining the design elements

of the regional strategy with policy elements also illustrates that there can be cooperation and supplementation between the two. Some local design choices, such as location, typologies and form of hedgerows, housing and services, can inform policy choices on a regional scale, while other choices in planning might provide clear visions which design choices should adhere to. Images help to convey different processes occurring at once, showing their links, separations and dependencies on each other. This shows that changing or tinkering on one system can complement another system change.



Image 6.2 View of Turnhout in the 16th Century [Woodprint?] Leerhuislelie

6.2 Discussion

Throughout this thesis, several limitations were encountered. These will be discussed in this section. Limitations occurred within the location itself and methods used. The goal of identifying these limitations is to evaluate the process while also providing points of improvement for future research or research to delve into further.

Location I The main limitation concerns the location. As it is a cross-border region, two sovereign nations have their own different approach to governance. This had been explained in section 3.2. While differences in governance helped form insight on how a regional strategy can be implemented, one limitation kept recurring throughout section 3.4. Datasets concerning soil and water systems, pollution, population and other elements stayed within national borders. Usage of different terms, levels of detail and calculation models often created combined maps that had wildly different conclusions on both sides of the border. Actual site visits would prove that this was not the case several times. The constraint of time made it difficult to recalculate and critically review each dataset separately. As a result, some data and analysis-driven assumptions had to be made. As a result, there are several maps that are not as detailed based on the amount and quality of data available. Future research into this topic might need a precise delineation of data to use or invest more time in solving this limitation. Adding to this, the choice of location limits direct transferability. Not many regions in the Nether-

lands or Belgium have the exact same soil conditions and landscapes present. It can be argued that the regional strategy is really limited to this region as it is based on the specific location-based analysis. However, the addition of national policies such as “Soil as Base” (Harbers, Heijnen, 2022) and theories allow for the main concepts of Regenerative sustainability, the analysis, and design approach to be transferable to other regions along national or even regional peripheries.

Methods used I The second limitation stemmed from several methods used or left out. The usage of multiple methods laid bare a main limitation. Policy analysis, while useful, can only be fully integrated into research if the intended outcome is a policy driven proposal or planning system. The overall focus of this thesis, resulting in a strategic design, limits how much policy analysis was eventually used in the outcome. Additionally, the use of trends as prerequisites for the implementation of the scenario from Chapter 4 can be viewed as a limitation. If one or multiple of these trends are not implemented in the coming years, large sections of the strategy explored in this thesis is already futile. A deeper reflection of this limitation will be mentioned in section 6.3. The lack of some methods also influences the achievability of the explore strategy. As the focus lies on changing landscapes from depletive to regenerative, large changes will need to be made by residents, farmers, municipalities and more stakeholders. As there is not a clear stakeholder analysis conducted, there is no clear distinction of needs and powers of each stakeholder nor

are these included in the strategy. This limitation has been attempted to be resolved by identifying the policy and social trends on a national and regional scale through simulation. Nevertheless, this is something that future research or expansion of this strategy might take into account when looking for implementations.

While there are limitations present, the focus on literature and spatial analysis to develop a regenerative Northern Campine provides a way of reviewing issues such as shrinkage and nitrogen. Seeing the various forms of depletion as the consequence of previous policy and planning choices and not as separate issues allows for the creation of an integral proposal.

6.3 Reflection

Position within the Studio I The creation of the regional strategy was informed by and helped develop/expand my position within the field of urbanism. Personal interest had already been shifting towards a regional scale rather than a local one from the start of the masters. Therefore, the studio and subject proved a moment to further develop this interest. The emphasis that the studio placed on the intersection between system and design thinking showed me that certain problems or developments do not stand on their own. Ecological, social, political and economic structures influence each other. Instead of planning as main driver, design is underscored as tool for narrative power and explaining alternative futures. Thus, the studio is linked with the core tenet of the Master track; the Built environment encompasses design, science and societal considerations. The thesis that has been developed since choosing the studio aimed not only at envisioning an alternative future based on research and design but also attempted to link this future and change with realism through policy changes. The intersection of system and design thinking occurred within my thesis. The natural system often intersected with design. This can be seen in design choices of ecological networks and agricultural zoning. These designs were the result of analysing existing systems of nature and production. Afterwards, these were translated into design possibilities. This step needed more design thinking rather than system. However, an expansion or deviation occurred. As the thesis focusses on a cross-border region, it became clear to me that the ecological and social systems are not the only ones

to delve into. Policies and choices in spatial planning kept coming back into the research. As a result, my personal position within urbanism is not a completely neutral one. Even though I tried to keep the thesis as neutral as possible, through analysis of many factors, the creation of the future scenario required a position in what I personally view as a desirable future. Still, having this view rooted in theoretical, policy and spatial analysis allows for a level of realism, no massive or, in my eyes, extreme changes are proposed.

Process I This tendency to realism does give way to some points of improvement, mainly concerning the process. My approach and methodology are based on current situations and understandings. Therefore, a detailed review of the literature seemed necessary alongside a clear understanding of the chosen location. Instead of having the connection between literature and location flow naturally, I initially forced the link, assuming connections that were hard to explain at times. The resulting reordering, evaluating and shifting of focus throughout the first chapter had a knock-on effect on the analysis. The drive to be as detailed as possible led me to keep deepening the analysis, trying to understand policy choices and their spatial effects more. To avoid getting lost in theory and analysis, a common problem for many, I had to force myself to let go of some realism. The conducted analysis and literature review at that point allowed me to make educated assumptions on future developments and choices. This choice in adding some imagination also helped rewrite the research questions to

become broader rather than the precise and closed questions they were originally.

Since the start, design was not intended as a tool to create final solutions with, but to illustrate a possible future. Changes in spatial organisation would not necessarily result completely from design but from the concepts and strategies they included. Trying to include design into the concepts made me wonder whether I needed theoretical backing for every design choice. Here, the drive for realism and clarity conflicted with using design as an explorative and narrative tool. Reviewing the scenarios made by PBL (2023) illustrated that their designs were not thoroughly explained using theory, but were only made to illustrate the changes envisioned. Trying to explain my thesis to people outside of urbanism, I noticed that I was relying heavily on theoretical ideas and not directly using design. Shifting my process from full realism to a mix of realism-informed imagination allowed me to illustrate possible futures more easily. This shift towards imagination made the simulation easier. Instead of designing an entire village core based on actual demand, architectural details, or and more aspects one might encounter when constructing buildings or creating services, I imagine possibilities. The actual shape, function, and location will probably differ; nevertheless, the simulation enabled the translation of ideas into comprehensible drawings, rather than a realistic design proposal. What was lacking in the beginning were clear definitions of the concepts used. While each had theoretical backgrounds, they were often limited to social or economic studies rather than spatial plan-

ning or design. I believed I required a very precise and detailed source, well-explained examples, and more. This focus on perfection at times constrained the development of the spatial analysis. However, the absence of a single definition for the concepts permitted me to craft definitions more aligned with the thesis, blending multiple fields with spatial planning and design.

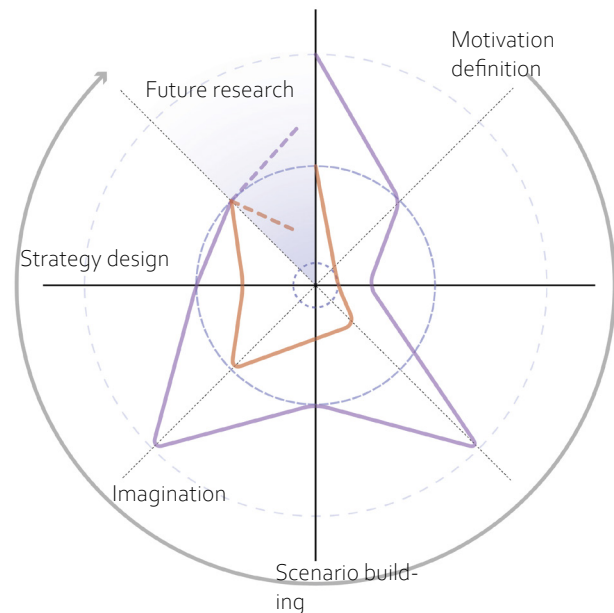


Image 6.3: Realism Well, Illustrating desired convergence and divergence (Purple) VS. Experienced. IN the center is full realism and further out more imagination

6.3 Reflection

It has been briefly mentioned how research and design are connected in the previous paragraph. It can be further stated that research influences design and vice versa. The main aspect in which this was evident in the thesis appeared in chapter 5.3. The findings from the research, analysis, and theory influenced the choices made during the design process. This is evident in the layering when constructing the possibility maps. Conducted research became a tool for explaining design choices. Conversely, design also influenced research. Throughout the process of creating the regional strategy and key strategies, design assisted in identifying gaps in the research. Additionally, employing design also aided in visually representing the findings from research as well as in text. This began to be the case around P2. While grappling with illustrating political changes in each scenario, a design approach was adopted to conceptualise institutions. This led to a basic understanding of the social changes linked to the political ones.

Academic, social and ethical

implications | The processes, methods, and findings of this research hold academic value. Firstly, the expansion of Regenerative Sustainability to encompass spatial planning and design, along with its connection to other concepts, enhances this academic worth. This broadening of the scope of RS aims at integrating design with planning. Furthermore, the brief inclusion of various facets such as economic systems contributes to the value of RS as a tool, alongside design and policy imagination, for forming a comprehensive strategy. On a socie-

tal level, value can be observed in the positioning of rural landscapes. Instead of merely attempting to address the ongoing shrinkage and designing for further depletion, the thesis endeavours to envision a positive future. Extraction is no longer the primary driver for change in rural areas; rather, villages can establish independent cores with services, local production, and mixed housing options. The identity of this specific region is closely linked to the existence of heath landscapes. By creating a system of production that expands these landscapes, we also strengthen the local identity and distinguish it from the rest of Belgium and the Netherlands. The breadth of the topic introduces some limitations, as described in section 6.2; some aspects are addressed but not further explored. Nevertheless, the extensive scope of this thesis facilitated the exploration of interconnected systems. Agriculture and other production systems result from both natural systems and human/political choices. Changing merely one of these systems may not resolve issues in each. Implementing modifications at a planning level, such as "Soil as Base" (Harbers, Heijnen, 2022), and layering changes in other systems, illustrates that multiple systemic changes are required. Some aspects of this thesis may lead to ethical dilemmas. The primary ethical issues that arose concern rural shrinkage and the social depletion of the area. To avoid negative conclusions attributing blame to the type and quality of available services, we chose to focus on the quantity of services. This decision also aimed to prevent personal bias or unconscious prejudices from influencing conclusions. My personal history with and knowledge of the area

allowed me to identify various possibilities considering the region's historical services. Although mentioned previously in section 6.2, transferability is a double-edged sword. Implementing the exact same design choices and ideas in different regions may pose challenges. The ideas and designs developed here are the result of local conditions regarding soil, historical development, and current issues. For instance, expanding heaths or groundwater extraction may perform poorly in low-lying areas of deltas or coastal regions. However, the methods employed and the layering of systems in the analysis offer a transferable approach. Almost every location comprises three elements: soil and water, natural and human production, and social/historical development. If one wishes to implement the concepts within their own region, they can make significant progress by utilising this method of analysis. Nonetheless, full transferability of these methods and concepts can only be achieved when there are considerable geopolitical borders involved, which may not necessarily be national. Decentralised nations can exhibit substantial differences between provinces, states, departments, or prefectures. The exploration and development of the strategy using Dutch and Flemish scenarios is specific to this thesis. Ultimately, while transferability is feasible for the analysis and concepts, implementation will vary considerably.



Haeck, L. (1868-1928) "Eve in the Campine" [Oil painting]. KMSKA



7

References and Appendices

References

Appendix

- Policy passports
- Spatial Analysis
- Scenarios
- X-curves

References

- Albers, M. (2025, April 24). Bij gebrek aan overheidsbeleid doen deze Friese boeren zelf aan landschapsbeheer. Retrieved June 2, 2025, from <https://www.volkskrant.nl/binnenland/bij-gebrek-aan-overheidsbeleid-doen-deze-friese-boeren-zelf-aan-landschapsbeheer-b36e3beb/?referrer=https%3A%2F%2Fwww.google.com%2F>
- Agentschap Landbouw en Visserij. (2024). *Schaalgrootte: veestapel. Landbouw & Visserij*. <https://landbouwcijfers.vlaanderen.be/landbouw/landbouw/schaalgrootte-veestapel>
- Atelier Romain. *Boerenland, regio Voorkempen* (2024). Studie in opdracht van LABORUIMTE (Departement Omgeving & Team Vlaams Bouw meester).
- Arnouts, G. (2024). *Strategische agenda en actieprogramma 2024-2028 "West-Brabant in transitie naar een nieuwe economie."* In STRATEGISCHE AGENDA EN ACTIEPROGRAMMA REGIO WEST-BRABANT 2024-2028.
- Bloot, R., Bus, C., & De Vos, E. (2025, January 29). 'Dit kabinet maakt natuurherstel belachelijk.' De Groene Amsterdammer. <https://www.groene.nl/artikel/dit-kabinet-maakt-natuurherstel-belachelijk>
- Bosma, F. (2024, November 9). *Zeeland en Noord-Brabant staken juridisch verzet tegen bouw Antwerpse plasticfabriek*. NRC. <https://www.nrc.nl/nieuws/2024/11/09/zeeland-en-noord-brabant-staken-juridisch-verzet-tegen-bouw-antwerpse-plasticfabriek-a4872496>
- van Brabant, L. (2023). *Gelme!, een Scheldewiking?*. https://semafoor.info/fr/Blog/Article/10033#_edn3
- Brenner, N., & Katsikis, N. (2020). *Operational Landscapes: Hinterlands of the Capitalocene*. Architectural Design, 90(1), 22-31. <https://doi.org/10.1002/ad.2521>
- Centraal Bureau voor de Statistiek. (n.d.). *Stikstofemissies naar lucht*. Centraal Bureau Voor De Statistiek. <https://www.cbs.nl/nl-nl/dossier/dossier-stikstof/stikstofemissies-naar-lucht>
- CLO (2023). Gebieden terreinbeherende organisaties, 2023 (indicator 1283, versie 07, 15 november 2023), www.clo.nl. Centraal Bureau voor de Statistiek (CBS), Den Haag; PBL Planbureau voor de Leefomgeving, Den Haag; RIVM Rijksinstituut voor Volksgezondheid en Milieu, Bilthoven; en Wageningen University and Research, Wageningen.
- Compendium Voor De Leefomgeving (2024, February 20). Stikstofdepositie, 1990-2022. <https://www.clo.nl/indicatoren/nlo18920-stikstofdepositie-1990-2022#bronnen>
- Compendium Voor De Leefomgeving (2024, July 2), Milieukwaliteit van landnatuur: stikstofdepositie, 1994-2022. . Compendium Voor De Leefomgeving. <https://www.clo.nl/indicatoren/nl159206-milieukwaliteit-van-landnatuur-stikstofdepositie-1994-2022>
- COA. (n.d.). Gilze - Prinsenbosch. [www.coa.nl.https://www.coa.nl/nl/locatie/gilze-prinsenbosch](https://www.coa.nl/nl/locatie/gilze-prinsenbosch)
- Copus, A., Kahila, P., Fritsch, M., Dax, T., Kovács, K., Weber, R., Grunfelder, J., Löfving, L., Moodie, J., Ortega-Reig, M., Ferrandis, A., Piras, S., Meredith, D., & TEAGASC. (2020). *European Shrinking Rural Areas: Challenges, actions and perspectives for Territorial governance*. In *European Shrinking Rural Areas: Challenges, Actions and Perspectives for Territorial Governance* [Report]. <https://archive.espon.eu/sites/default/files/attachments/ESPON%20ESCAPE%20Main%20Final%20Report.pdf>
- Decoville, A., & Durand, F. (2017). *Challenges and Obstacles in the Production of Cross-Border Territorial Strategies: The Example of the Greater Region*. Transactions of the Association of European Schools of Planning, 1(1)
- Dee, R. (n.d.). 2.9 corridor width. https://www.fs.usda.gov/nac/buffers/guidelines/2_biodiversity/g.html
- Departement Omgeving. (2018). *Strategische Visie Beleidsplan Ruimte Vlaanderen*. In <https://www.vlaanderen.be/publicaties/beleidsplan-ruimte-vlaanderen-strategische-visie-geïllustreerde-versie>
- De Lijn. (n.d.). <https://www.delijn.be/nl/lijnen/>
- Dienst Klimaatverandering. (n.d.). *Federaal beleid. Klimaat | Climat*. <https://klimaat.be/klimaatbeleid/belgisch/federaal>
- Directive 2000/60/EC. DIRECTIVE 2000/60/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL: *Establishing a framework for community action in the field of water policy 23 October 2000*. <https://eur-lex.europa.eu/eli/dir/2000/60/oj>
- European Commission. (2025, April 23). Schengen continues to bring benefits 40 years after its creation. European Commission. https://commission.europa.eu/news/schengen-continues-bring-benefits-40-years-after-its-creation-2025-04-23_en
- European Council of the European Union. (2025, February 21). What are the top cyber threats in the EU? [www.consilium.europa.eu.https://www.consilium.europa.eu/en/policies/top-cyber-threats/](https://www.consilium.europa.eu/en/policies/top-cyber-threats/)
- Food and Agriculture Organization of the United Nations. (2025). What is soil organic carbon (SOC)? | Global Soil Partnership | Food and Agriculture Organization of the United Nations. <https://www.fao.org>

org/global-soil-partnership/areas-of-work/recsoil/what-is-soc/en/

- Geurs, K.T., van Wee, B. (2004), *Accessibility evaluation of land-use and transport strategies: review and research directions*, Journal of Transport Geography, Volume 12, Issue 2, 2004, Pages 127-140, ISSN 0966-6923, <https://doi.org/10.1016/j.jtrangeo.2003.10.005>.
- Gibbons, L. V. (2020). Regenerative—The New Sustainable? Sustainability, 12(13), 5483. <https://doi.org/10.3390/su12135483>
- Gielen, B., Thewissen, K., Jaspers, S., Rubens, K., & Departement Omgeving. (2023). A new narrative for the protein shift. In Departement Omgeving. https://omgeving.vlaanderen.be/sites/default/files/2024-05/EIWITSHIFT_Eindrapport_ANewNarrativeForTheProteinshift_ENG_o.pdf
- Gommers, A., Verhaegen, K., Couderé, K. (KENTER) i.s.m. Steven Libbrecht (ESSET) (2022), Basisscenario's voor de toekomst van de fysieke leefomgeving, uitgevoerd in opdracht van het Vlaams Planbureau voor Omgeving
- Gommers, A., Verhaegen, K., (KENTER) (2024) Routekaart voor de verdere uitwerking van ruimtelijke toekomstscenario's en bijhorende kaartbeelden (Leefomgeving Vlaanderen 2050), uitgevoerd in opdracht van het Vlaams Planbureau voor Omgeving.
- Grasland, C., Ysebaert, R., Corminboeuf, B., Gaubert, N., Lambert, N., Salmon, I., Baron, M., Baudet-Michel, S., Ducom, E., Rivière, D., Schmoll, C., Zanin, C., Gensel, J., Vincent, J.-M., Plumejeaud, C., Van Hamme, G., Holm, E., Strömgren, M., Coppola, P., . . . Ivana Katsarova. (2008). Shrinking Regions: A paradigm shift in the geography and territorial development (Report IP/B/REGI/IC/2007-044; p. III). European Parliament. <https://www.europarl.europa.eu/activities/expert/eStudies.do?language=FR>
- Hamers, D., Kuiper, R., Van Dam, F., Dammers, E., Evenhuis, E., Van Gaalen, F., De Hollander, G., Van Hoorn, A., Van Minnen, J., Nabielek, K., Pols, L., Rijken, B., Rood, T., Snellen, D., Bastiaanssen, J., van Bommel, B. PBL. (2023). *Vier scenario's voor de inrichting van Nederland in 2050. Ruimtelijke Verkenning 2023*, In PBL. <https://www.pbl.nl/uploads/default/downloads/pbl-2023-vier-scenarios-voor-de-inrichting-van-nederland-in-2050-4832.pdf>
- Harbers, M. G. J., & Heijnen, V. L. W. A., (2022) *Kamerstuk II 2022-2023, 27625/30 015 Waterbeleid, Bodembeleid*, https://www.tweedekamer.nl/kamerstukken/brieven_regering/detail?id=2022D50136&did=2022D50136
- Hataley, T., & Leuprecht, C., (2018) Determinants of Cross-Border Cooperation, Journal of Borderlands Studies, 33:3, 317-328, DOI:10.1080/08865655.2018.1482776
- Heijman, W., Hagelaar, G., van der Heide, M. (2019). *Rural Resilience as a New Development Concept*. In: Dries, L., Heijman, W., Jongeneel, R., Purnhagen, K., Wesseler, J. (eds) EU Bioeconomy Economics and Policies: Volume II. Palgrave Advances in Bioeconomy: Economics and Policies. Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-030-28642-2_11
- Kenniscentrum Immaterieel Erfgoed Nederland. (n.d.). *Bloemencorso Zundert*. Retrieved November 11, 2024, from <https://www.immaerieelerfgoed.nl/nl/bloemencorsozundert>
- Kenniscentrum Immaterieel Erfgoed Nederland. (n.d.). *Carnavalcultuur*. Immaterieel Erfgoed. <https://www.immaterieelerfgoed.nl/nl/carnavalcultuur>
- Knotters, M., Teuling, K., Reijneveld, A., Lesschen, J.P., Kuikman, P., (2022) Changes in organic matter contents and carbon stocks in Dutch soils, 1998–2018, Geoderma, Volume 414, 2022, 115751, ISSN 0016-7061, <https://doi.org/10.1016/j.geoderma.2022.115751>.
- Krosse, M. (2015). *Mariken van Nieumeghen* (pp. 1–39). [https://onlinederlands.nl/Mariken%20van%20Nieumeghen%20\(vrij%20vertaald%20door%20M%20de%20Krosse\).pdf](https://onlinederlands.nl/Mariken%20van%20Nieumeghen%20(vrij%20vertaald%20door%20M%20de%20Krosse).pdf)
- Koops, E. (2023, November 9). *De Dodendraad - Dodelijke draadversper ring tijdens de Eerste Wereldoorlog*. Historiek. <https://historiek.net/de-dodendraad-dodelijke-draadversperring-tijdens-de-eerste-wereldoorlog/149000/>
- Leenders, K. A. H. W. (2023, June 19). *Taxandria - Landschapsbiografie deel 1*. Issuu. https://issuu.com/createlli/docs/boek_1a_digitaal_taxandria_landschapsbiografie_deel1
- Liaros, S., & De Silva, N. (2022). *Human settlements arranged as networks of regenerative villages with nature-based infrastructure ecosystems*. Civil Engineering and Environmental Systems, 39(4), 328–346. <https://doi.org/10.1080/10286608.2022.2128341>
- Lux, W., Berx, C., Lemmens, L., Helsen, K., De Haes, J., Colson, M., . (2023). *Provinciaal Beleidsplan Ruimte Antwerpen*. In Provinciaal Beleidsplan Ruimte Antwerpen. <https://www.provincieantwerpen.be/lokale-besturen/gemeenten-in-beweging/data-en-analyse/provinciaal-beleidsplan-ruimte-antwerpen.html>
- Lyle, J. T. (1994). *Sustainability in the Neotechnic Era*. In Regenerative design for sustainable development (pp. 10–11). John Wiley & Sons, INC.
- Ministère du Travail, de la Santé, des Solidarités et des Familles. (2024, August 9). Samu / Smur. Ministère Du Travail, De La Santé, Des Solidarités Et Des Familles. <https://sante.gouv.fr/systeme-de-sante/structures-de-soins/article/samu-smur>
- Moore, J. W. (2015). *Capitalism in the web of life; ecology and the accumulation of capital*. In J. W. Moore, Chapter 4: The Tendency of the Ecology

references

cal Surplus to fall (pp. 66-80). Verso.

- Moeys, N. (2023, 28 februari). *Na de supermarkt verdwijnt nu ook de bus. Ook Brabant weet de verschraling op het platteland niet te stuiten. 'Hier is niets meer'*. De Volkskrant.nl. <https://www.volkskrant.nl/nieuws-achtergrond/na-de-supermarkt-verdwijnt-nu-ook-de-bus-ook-brabant-weet-de-verschraling-op-het-platteland-niet-te-stuiten-hier-is-niets-meer~bd82f11d/>
- Natuurkennis. (n.d.). *Landschapsecologie nat zand* - Het Kennisnetwerk Ontwikkeling en Beheer Natuurkwaliteit (OBN). <https://www.natuurkennis.nl/landschappen/nat-zandlandschap/nat-zandlandschap/landschapsecologie-nat-zand/>
- Natuurmonumenten. (n.d.). *Markdal*. <https://www.natuurmonumenten.nl/natuurgebieden/markdal>
- Nieuwe Vroenten. (2024, November 19). *Uitgangspunten*. <https://www.nieuwvroenten.nl/uitgangspunten/>
- Nolf, M., & Coppens, T. (2019). *Groeten uit de Westhoek*. Samenleving & Politiek, nr. 7, 6–11. <https://www.sampol.be/2019/09/groeten-uit-de-westhoek>
- NOS. (2025, April 11). *Onteigenen is no-go voor Wiersma, maar Noord-Brabant gaat het toch doen*. <https://nos.nl/nieuwsuur/artikel/2563256-onteigenen-is-no-go-voor-wiersma-maar-noord-brabant-gaat-het-toch-doen>
- PBL. (2022, July 6). *Prognose: in 2035 vooral meer inwoners in en om grotere gemeenten*. Planbureau Voor De Leefomgeving. <https://www.pbl.nl/actueel/nieuws/prognose-in-2035-vooral-meer-inwoners-in-en-om-grotere-gemeenten>
- du Plessis, C. (2011). *Towards a regenerative paradigm for the built environment*. Building Research & Information, 40(1), 7–22. <https://doi.org/10.1080/09613218.2012.628548>
- Provincie Gelderland. (2025, April 17). *Een volgende stap in de stikstofaankpak*. <https://www.gelderland.nl/nieuws/een-volgende-stap-in-de-stikstofaankpak>
- Provincie Noord Brabant. (2022). *Beleidskader leefomgeving*. <https://www.brabant.nl/onderwerpen/omgevingsbeleid/beleidskader-leefomgeving-2030/>
- Provincie Noord Brabant. (2023). *De bevolkings- en woningbehoefteprognose*. <https://bevolkingsprognose.brabant.nl/hoofdstuk/wonen-met-zorg-en-welzijn.html>
- Raworth, K. (2020, September 30). *Exploring Doughnut Economics*. <https://www.kateraworth.com/doughnut/>
- Regulation 2021/1119. Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ('European Climate Law'). <https://eur-lex.europa.eu/legal-content/EN/TX/?uri=CELEX:32021R1119>
- Reijneveld, A., Van Wensem, J., & Oenema, O. (2009). Soil organic carbon contents of agricultural land in the Netherlands between 1984 and 2004. *Geoderma*, 152(3–4), 231–238. <https://doi.org/10.1016/j.geoderma.2009.06.007>
- Remkes, J. (2022). *Wat wel kan: Uit de impasse en een aanzet voor perspectief*.
- Remkes, J. W., van Dijk, dr. J. J., Dijkgraaf, prof. dr. E., Freriks, mr. dr. A., Gerbrandy, drs. G. J., Majj, W. H., Nijhof, ir. A. G., Post, E., Rabbinge, prof. dr. ir. R., Scholten, dr. M. C. Th., & Vet, prof. dr. L. E. M. (2020). *Niet Alles Kan Overal*. Adviescollege Stikstofproblematiek. <https://open.overheid.nl/documenten/ronl-e1d98609-6f59-4245-8758-ecooda553db5/pdf>
- Robinson, J., & Cole, R. J. (2014). *Theoretical underpinnings of regenerative sustainability*. Building Research & Information, 43(2), 133–143. <https://doi.org/10.1080/09613218.2014.979082>
- UNESCO World Heritage Centre (n.d.). *Colonies of Benevolence*. UNESCO World Heritage Centre. <https://whc.unesco.org/en/list/1555/>
- UNESCO World Heritage Centre (n.d.). *Flemish Béguinages*. UNESCO World Heritage Centre. <https://whc.unesco.org/en/list/855>
- Rozendaal, J. (2024, September 19). *Emoties lopen hoog op tijdens informatieavond over toekomst landbouw na stikstofdecreet*. VILT. <https://vilt.be/nl/nieuws/emoties-lopen-hoop-op-tijdens-informatieavond-over-toekomst-landbouw-na-stikstofdecreet>
- Seddon, N., Chausson, A., Berry, P., Girardin, C.A.J., Smith, A., Turner, B., (2020) Understanding the value and limits of nature-based solutions to climate change and other global challenges. *Phil. Trans. R. Soc. B* 375 20190120 <http://doi.org/10.1098/rstb.2019.0120>
- Silvestri, G., Diercks, G., Matti, C., SATURN, MOTION EIT Climate-KIC, Irene Vivas Lalinde, Jose Manuel Martin Corvillo, Carlos Delgado, & Christoph Brodnik. (2021). *X-Curve*. In DRIFT & EIT Climate-KIC Transitions Hub (Eds.), DRIFT Transitions Hub Climate-KIC EU. <https://drift.eur.nl/app/uploads/2022/02/X-Curve-booklet-DRIFT-EIT-Climate-KIC-2022.pdf>

Spink, J., Hackett, R., Forristal, D., Creamer, R., Teagasc, & Teagasc. (2009). Soil Organic Carbon: A review of 'critical' levels and practices to increase levels in tillage land in Ireland. In Teagasc, Oak Park Crops Research Centre, Co.Carlow. <https://www.teagasc.ie/media/website/publications/2010/soilorganiccarbon.pdf>

Stedelijke Regio West Brabant. (2023). AFSPRAKEN WONINGBOUW 2022-2030. https://www.volkshuisvestingnederland.nl/bi_naries/volkshuisvestingnederland/documenten/publicaties/2023/04/21/woondeal-noordoost-brabant/Woondeal+West-Brabant+West.pdf

SRBT-woondeal. (2023). *Afspraken woningbouw 2022-2030*: SRBT-woondeal.

Statbel. (2024, February 13). *Bevolkingsvooruitzichten*. <https://statbel.fgov.be/nl/themas/bevolking/bevolkingsvooruitzichten>

Statistiek Vlaanderen. (n.d.). *Verwerking en export van dierlijke mest*. Vlaanderen. <https://www.vlaanderen.be/statistiek-vlaanderen/milieu-en-natuur/verwerking-en-export-van-dierlijke-mest>

Troeh, Frederick R., and Louis M. (Louis Milton) Thompson. *Soils and Soil Fertility*. 6th ed. Ames, Iowa: Blackwell Pub., 2005.

Vitale Brovarone E, Cotella G. *Improving Rural Accessibility: A Multilayer Approach*. Sustainability. 2020; 12(7):2876. <https://doi.org/10.3390/su12072876>

Vlaamse Overheid. (2022). *Vlaamse mobiliteitsvisie 2040*. In Vlaamse Mobiliteitsvisie. https://assets.vlaanderen.be/image/upload/v1645112287/Vlaamse_mobiliteitsvisie_2040_DEF_kospcu.pdf

Vlaamse Regering. (2022). *CONCEPTNOTA BOUWSHIFT Plan van Aanpak*. In www.vlaanderen.be (pp. 2–6).

Walker, B., Gunderson, L., Kinzig, A., Folke, C., Carpenter, S., & Schultz, L. (2006). *A Handful of Heuristics and Some Propositions for Understanding Resilience in Social-Ecological Systems*. Ecology and Society, 11(1). <http://www.jstor.org/stable/26267801>

Werkplaats immaterieel erfgoed. (n.d.). *Heilig bloedprocessie hoogstraten*. Tradities, Gebruiken, Praktijken, Kennis En Vaardigheden. <https://immaterieelerfgoed.be/nl/erfgoederen/heilig-bloedprocessie-hoogstraten>

Werkplaats immaterieel erfgoed. (n.d.-b). *Leonardusprocessie Sint-Lenaarts*. Tradities, Gebruiken, Praktijken, Kennis En Vaardigheden. <https://immaterieelerfgoed.be/nl/erfgoederen/leonardusprocessie-sint-lenaarts>

Wong Villanueva, J.L., Kidokoro, T. & Seta, F. (2022) *Cross-Border Integration, Cooperation and Governance: A Systems Approach for Evaluating "Good" Governance in Cross-Border Regions*, Journal of Borderlands Studies, 37:5, 1047-1070, DOI:10.1080/08865655.2020.1855227

Images

Van den Ackerveken, R. (2009, July 2). Vroeger en nu: Statie Hoogstraten. Het Nieuwsblad. https://www.nieuwsblad.be/cnt/blrva_20090623_002

BNN vara. (2014). *Tip: Doe de kneedproef - Vroege Vogels - Vroege Vogels*. <https://www.bnnvara.nl/vroegevogels/artikelen/tip-doe-de-kneedproef>

CeresAI. (2021, February 9). Avoiding over-watering and under-watering in potatoes. Retrieved April 4, 2025, from <https://ceres.ai/blog/avoiding-over-watering-and-under-watering-in-potatoes>

Charles Wellens (1889-1959), peintre belge. (2013, October 31). <https://www.galeriedesannonciades.ch/nos-ventes-en-ligne/des-sins-2013-10-31/wellens-charles-2-detail>

Delftse Kaart. (2024, August 12). Repair Café Stunt - Delftse kaart. <https://delftsekaart.nl/activiteit/repair-cafe-stunt/>

Dupont, T. (2017, January). General Soils 101. https://treefruit.wsu.edu/orchard-management/soils-nutrition/general_soils_101/

Erfgoedbank Hoogstraten. (n.d.). <https://www.erfgoedbankhoogstraten.be/php/hoostraten1.php?s=360&trefwoord=Hoogstraten>

Eurofins Agro. (2023, October 27). Presence of carbon in Dutch agriculture. <https://www.eurofins-agro.com/en/presence-of-carbon-in-dutch-agriculture>

FFA Architecture and Interiors, Inc. (2025, March 31). Farmer's Market Pavilion - FFA Architecture and Interiors, Inc. FFA Architecture and Interiors, Inc. <https://ffadesign.com/projects/farmers-market-pavilion/>

Furniere, M. (2018, January 30). *Wandeling doorheen het Turnhouts Vennengebied* (3,5 - 8,5 of 12 km) - Effen Weg vzw. Effen Weg Vzw. <https://www.ewweg.be/events/turnhouts-vennengebied/>

Gemeente Sint-Gillis. (n.d.). *Kempens landschap*. <https://collections.heritage.brussels/nl/objects/66128#&gid=null&pid=1>

Heritage Brussels (n.d.) *Heymans Adrien-Joseph*. <https://collections.heritage.brussels/index.php?section=objects&lg=nl&actor=3787>

- KMSKA. (n.d.-a). Avond in de Kempen. <https://kmska.be/nl/meesterwerk/avond-in-de-kempen-o>
- KMSKA. (n.d.). Brooduitdeling in het dorp. <https://kmska.be/nl/meesterwerk/brooduitdeling-in-het-dorp>
- KMSKA. (n.d.-b). *De kempen*. <https://kmska.be/nl/meesterwerk/de-kempen>
- KMSKA. (n.d.-b). Kempens landschap met vlondertje. <https://kmska.be/nl/meesterwerk/kempens-landschap-met-vlondertje>
- KMSKA. (n.d.-c). *Veen in de Kempen*. <https://kmska.be/nl/meesterwerk/veen-de-kempen-1>
- KMSKA. (n.d.-d). *Veen in de Kempen*. <https://kmska.be/nl/meesterwerk/veen-de-kempen>
- Leerhuis Lelie. (n.d.). Kerkhoven in Turnhout. <http://www.leerhuislelie.be/7.%20Geschiedenis/oude%20kerkhoven.html>
- Lieteberg. (n.d.). *Het Panorama van de Kempen | Lieteberg*. <https://www.lieteberg.be/nl/toerisme-zutendaal/erfgoed/het-panorama-van-de-kempen>
- Mojid, M. A., Mousumi, K. A., & Ahmed, T. (2020). Performance of wheat in five soils of different textures under freshwater and wastewater irrigation. *Agricultural Science*, 2(2), p89-p89.
- MSK Gent. (2023, May 9). *Sunset on the heath - Adrien Joseph Heymans*. <https://www.mskgent.be/en/collection/1877-b>
- Musées Royaux des Beaux-Arts de Belgique. (n.d.). Kunstwerk « Het seizoen van de herleving » – Koninklijke Musea voor Schone Kunsten van België. <https://fine-arts-museum.be/nl/de-collectie/florent-craeels-het-seizoen-van-de-herleving>
- Musées royaux des Beaux-Arts de Belgique. (n.d.). *Paysage en Campine*. <https://fine-arts-museum.be/fr/la-collection/edouard-huberti-paysage-en-campine?artist=huberti-edouard-jules-joseph-1>
- museum@hoogstraten.be. (2023, December 17). *Expo "Gelmelslot"* | VisitHoogstraten. <https://visithoogstraten.be/blog/expo-gelmelslot/>
- Marlon Blackwell Architects. (2023, November 28). Marlon Blackwell Architects » Gentry Public Library. <https://www.marlonblackwell.com/project/gentry-public-library/>
- Natuurmonumenten. (n.d.). Markdal. <https://www.natuurmonumenten.nl/natuurgebieden/markdal>
- Noguera, J., PhD, Ortega-Reig, M., Del Alcázar, H., Copus, A., Berlina, A., Moodie, J., Mantino, F., Forcina, B., Weck, S., Beißwenger, S., Hans, N., Tagai, G., Koós, B., Kovács, K., Uzzoli, A. (2017). *PROFECY – Processes, features and cycles of inner peripheries in Europe*. In *Applied Research*. <https://archive.espon.eu/sites/default/files/attachments/D5%20Final%20Report%20PROFECY.pdf#viewer.action=download>
- Pomona vzw. (n.d.). Start je boerderij — Pomona vzw. Pomona Vzw. <https://www.pomonavzw.be/start-jullie-boerderij>
- Processies van de Noorderkempen. (n.d.). Eerste graad middelbaar. <https://www.processiesvandenorderkempen.be/educatief-luik/eerste-graad-middelbaar>
- Projecten uit Toolbox Dorps Architectuur in de kijker in de Architect. (2022, March 18). AR-TUR. <https://ar-tur.be/dossiers/project-en-uit-toolbox-dorps-architectuur-in-de-architect>
- Rijksdienst voor het Cultureel Erfgoed. (n.d.). *Bestand: Dekzandstratigrafie Best*. https://kennis.cultureelerfgoed.nl/index.php/Bestand:Dekzandstratigrafie_Best.jpg#/media/Bestand:Dekzandstratigrafie_Best.jpg
- Rijksdienst voor het Cultureel Erfgoed. (n.d.). *Hoogveen*. [https://kennis.cultureelerfgoed.nl/index.php/Bestand:Veenprofiel_\(2\)_small.jpg](https://kennis.cultureelerfgoed.nl/index.php/Bestand:Veenprofiel_(2)_small.jpg)
- Toorians, L. (2022, February 3). Alle oude kaarten van hertogdom Brabant op een rij in 'Brabantia Ducatus.' Brabant Cultureel. <https://www.brabancultureel.nl/2019/01/27/alle-oude-kaarten-van-hertogdom-brabant-op-een-rij-in-brabantia-ducatus/>
- Unknown. (n.d.). *Death wire between Netherlands and Belgium*. <https://beeldbank.spaarnestadphoto.com/search.pp?flush=1&multikeword=SFA001009996&searchtype=o#ctr-thumbnails,Publicdomain>. <https://commons.wikimedia.org/w/index.php?curid=145927932>
- KMSKA. (n.d.). *Bede vaart in de Kempen*. <https://kmska.be/nl/meesterwerk/bedevaart-de-kempen> (Isidore Verheyden)
- Veracht, E., Mayeres, I., Poelmans, L., Van der Meulen, M., Vanhulsel, M., & Engelen, G. (2016). *Ontwikkelingskansen op basis van knooppuntwaarde en nabijheid voorzieningen – eind-rapport*. Retrieved from Mol: <https://www.ruimtelijkeordening.be/NL/Diensten/Onderzoek/Studies/articleType/ArticleView/articleId/8954/Ontwikkelingskansen-obv-knooppuntwaarde-en-voorzieningen>
- Visit Brabant. (n.d.). *Nationaal Park De Loonse en Drunense Duinen*. Visit Brabant. <https://www.visitbrabant.com/nl/locaties/2558488508/>

nationaal-park-de-loonse-en-drunense-duinen

Wilson, R. (2020, November 24). Community centre completed by Collective Architecture in Fife. The Architects' Journal. <https://www.architectsjournal.co.uk/buildings/community-centre-completed-by-collective-architecture-in-fife>

Datasets

CBS Statline. (n.d.). <https://opendata.cbs.nl/statline/#/CBS/nl/>

Datavindplaats. (n.d.). Natuurbeheerplannen. Vlaanderen.be. <https://www.vlaanderen.be/datavindplaats/catalogus/natuurbeheerplannen>

DINOLoket. <https://www.dinoloket.nl/ondergrondmodellen/kaart>

DOV (Digitaal Ondergrond Vlaanderen). <https://www.dov.vlaanderen.be/portaal/?module=verkenner>

EEA geospatial data catalogue. <https://sdi.eea.europa.eu/catalogue/srv/eng/catalog.search#/metadata/044814bf-0a21-41f7-83bd-596f3afb364d>

European Environmental Agency (EEA) SDI Datashare. <https://sdi.eea.europa.eu/data/52d72616-9451-4472-8d33-c77cbb47ac2b>

PDOK. <https://www.pdok.nl/>

STATBEL <https://statbel.fgov.be/nl/open-data?category=209>

Vlaams Milieus Agentschap <https://vmm.vlaanderen.be/feiten-cijfers>

Appendix I Policy Passports

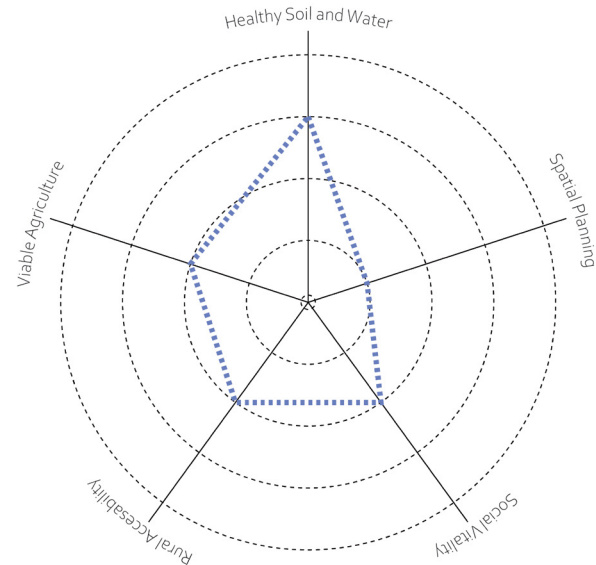
Policy Passport EU.2



- Year(s): 2009-2021
- Scale: Supranational (EU)
- Type: EU Law
- Writer: European Commission
- Client: European Parliament, Member states
- Topic(s): Environment, Economy

European Climate Law (Regulation 2021/1119. Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999. **(Regulation 2021/1119).**

The European Climate law is a expansive piece of legislation that aims to create a fossil free EU where nature is protected. Nation states have to make the central target. Similar to the WFD it is legal document that does not focus on spatial planning but provides a base with which member states can develop their own policies to achieve the fossil free goal.



Policy Passport NL.1

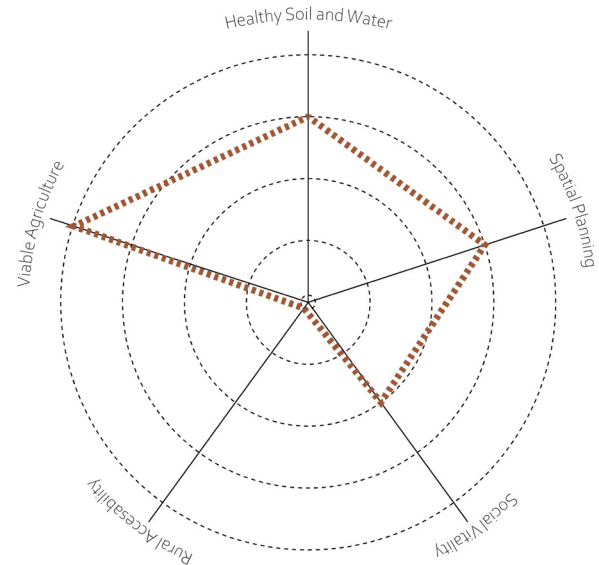


- Year(s): 2022
- Scale: National
- Writer: J. Remkes
- Client: Dutch Government
- Topic(s): Nitrogen and Spatial planning

Wat Wel Kan: Uit de impasse en een aanzet voor perspectief (Remkes, 2022)

Written as a consequence to "*Niet alles kan Overal*" (Remkes et al., 2020), this document tries to give insight on how to move away from the nitrogen inaction present in policy development. Ideas such as a new "ground bank", agricultural zone types around nature and others are aimed at creating a breakthrough around Nitrogen.

The ground bank would have the National government own land and lease it to farmers to have alternating uses. Zoning around nature would identify areas where alternative agriculture is necessary and where a mix of current and alternative systems is possible.



Appendix I Policy Passports

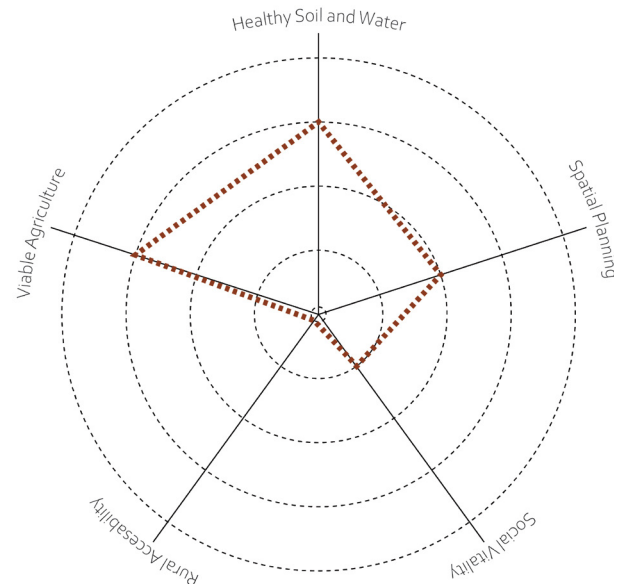
Policy Passport NL.2



Water en Bodem Sturend: Waterbeleid, Bodembeleid (Harbers, Heijnen, 2022)

Sent to Parliament by the minister for infrastructure, the letter argues and urges to shift from a landuse and land cover central focus in spatial planning to focus first on soil and water quality and water supply of locations when planning and allocating functions there. Together with the Remkes (2022) this policy indicates a shift in thinking while also attempting to provide a vision of how and where agriculture could take place in the future aside the many other functions present in the Netherlands.

- Year(s): 2022
- Scale: National
- Type: Letter to Parliament
- Writer: M. Harbers, V. Heijnen
- Client: -
- Topic(s): Soil and Water, Spatial Planning



Policy Passport NL.3



Vier scenario's voor de inrichting van Nederland in 2050. Ruimtelijke Verkenning 2023 (Hamers et al., 2023)

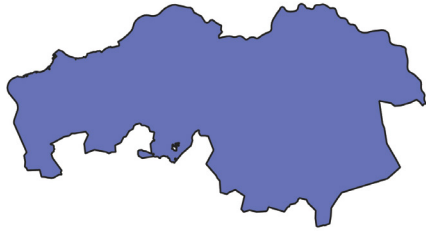
4 scenarios are developed illustrating a set of possible futures for the Netherlands. These look at an axis of local vs global and less vs more. The aim is to illustrate spatial changes in urban, peri-urban and rural areas. While providing vision, precise proposals or indication on how these scenarios could become reality are limited. It remains a document to illustrate the challenges present in the Netherlands while providing understandable future situations.

- Year(s): 2023
- Scale: National
- Writers: Hamers, Hamers, D., Kuiper, R., Van Dam, F., Dammers, E., Evenhuis, E., Van Gaalen, F., De Hollander, G., Van Hoorn, A., Van Minnen, J., Nabielek, K., Pols, L., Rijken, B., Rood, T., Snellen, D., Bastiaanssen, J., van Bemmelen, B.
- Client: PBL
- Topic(s): Viable Agriculture, Economy, Spatial Planning, Social Vitality, Soil and Water



Appendix I Policy Passports

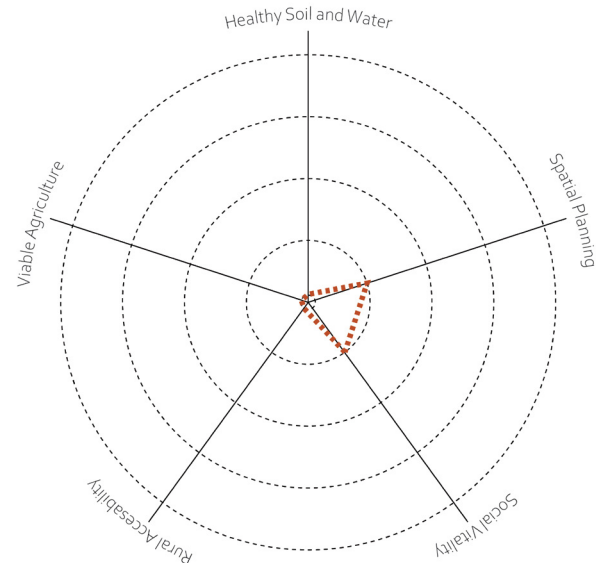
Policy Passport BR.1



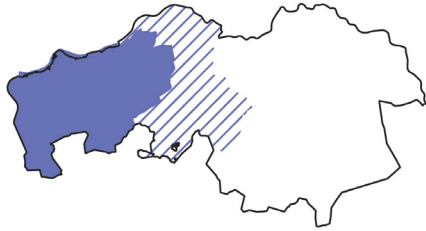
Beleidskader Leefomgeving (Provincie Noord Brabant, 2022)

This policy explains the spatial goals of the Province of North Brabant. As this does not cover each specific topic in detail, it gives several key elements the specific policy documents per topic should and will apply. These range from looking through multi layers to looking both round (People, Planet, Profit) and Wide (Community, Government, Entrepreneur). five additional rules give as preconditions. Healthy soil and water ties in with the national shift as shown in “Water en Bodem Sturens”. Area specific, Sustainable energy, multifunctional and avoiding redirection to future generation form the other rules.

- Year(s): 2022
- Scale: Provincial
- Writer: Provincie Noord Brabant
- Client: -
- Topic(s): Spatial planning, mobility, economy, society, energy, agriculture



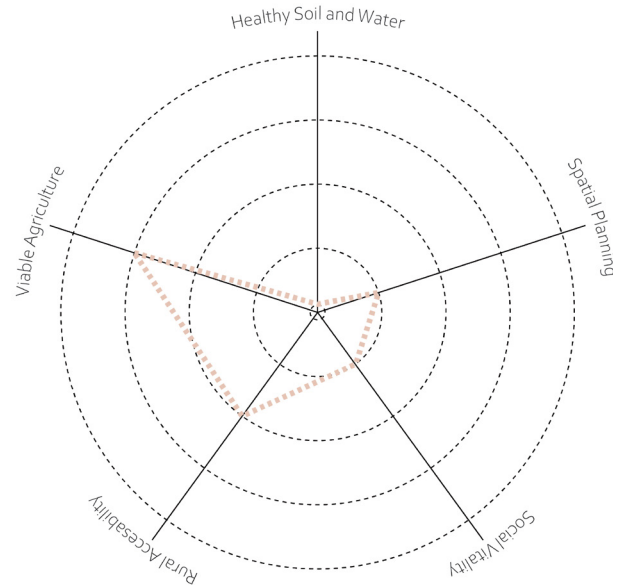
Policy Passport BR.2



- Year(s): 2024
- Scale: Local
- Type: Programme
- Writer: G. Arnouts
- Client: West Brabant
- Topic(s): Economy, energy, agriculture

Actieprogramma 2024-2028 (Arnouts, 2024)

Focussing on economic activities and production, this policy tries to create a vision of the provincial economy can make use of existing networks, knowledge and development to place itself on the regional stage as driver of education, green technology and energy between the port of Antwerp and Rotterdam and next to the Brainport region in Eindhoven. As this policy focusses on Economy and networks it gives an overall vision for the near future. Elements that should be protected in the economy and agriculture are explained. Strategies and longterm changes are neglected.



Appendix I Policy Passports

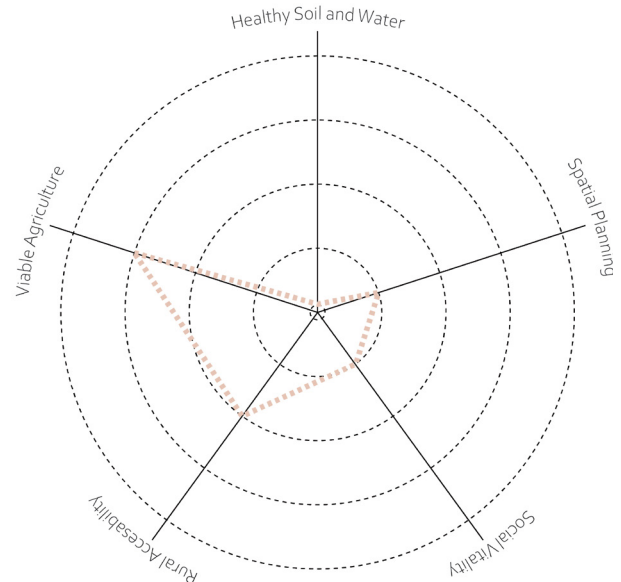
Policy Passport BR.3



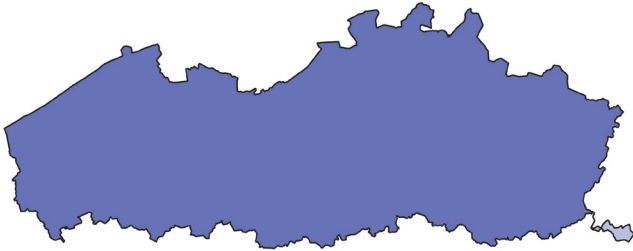
- Year(s): 2023
- Scale: Local regional
- Type: Programme
- Writer: Stedelijk Region West-Brabant, SRBT
- Client: Municipalities
- Topic(s): Housing

Woondeals (Stedelijk Regio West Brabant, 2023) (SRBT-woondeal, 2023)

These two documents outline hard numbers of new housing each municipality should build by 2023. It does not give information on location and other goals such as the type of living environment should be achieved with the new housing. What can also be seen is the urban focus as most housing is allocated to the larger municipalities.



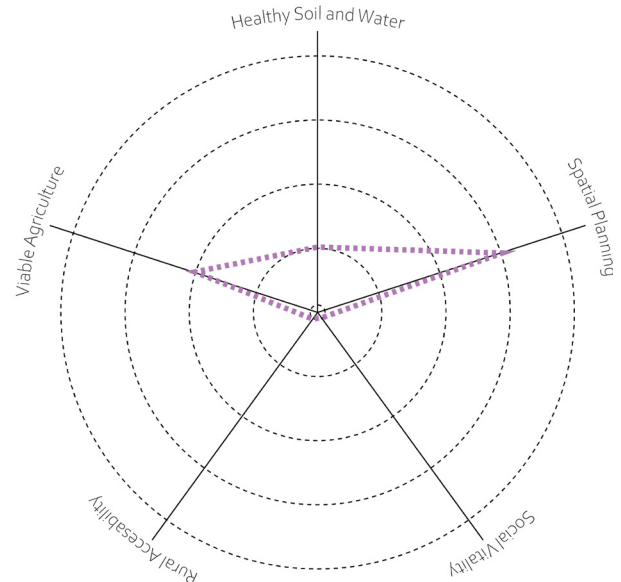
Policy Passport FL.1



- Year(s): 2022
- Scale: Regional
- Type: Law
- Writer: Vlaamse Regering
- Client: -
- Topic(s): Nitrogen and Spatial planning

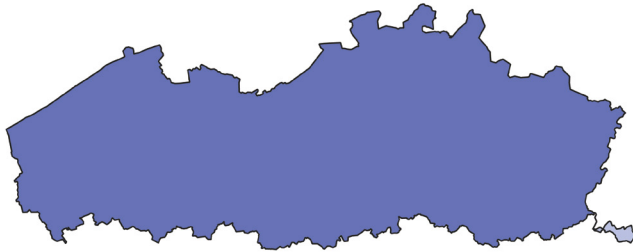
Bouwshift (Vlaamse Regering, 2022)

Similar to the Nitrogen crisis in the Netherlands, Flanders wants to avoid a cascade where nitrogen leads to problems in construction and other fields. To plan ahead, the government proposes a shift to reduce hard ground covering such as concrete in Flanders. A new subsidy system is proposed and changes to the planning system to make it easier to change building practices to achieve the lowering of hard ground covering. What it does not directly do is provide alternatives.



Appendix I Policy Passports

Policy Passport FL.2



- Year(s): 2018
- Scale: regional
- Type: Strategic vision
- Writer: Departement Omgeving
- Client: -
- Topic(s): Soil and water, spatial planning, mobility, agriculture, society

Strategische visie (Departement Omgeving 2018)

This vision document states goals of improved connectivity, densification, provision of services nearby and new systems of agriculture and energy to name a few. What lacks are clear strategies on how provincial and local governments but also designers on how to create the envisioned region. As a result, the document stays in the vision section and does not provide clear plans.



Policy Passport AN.1

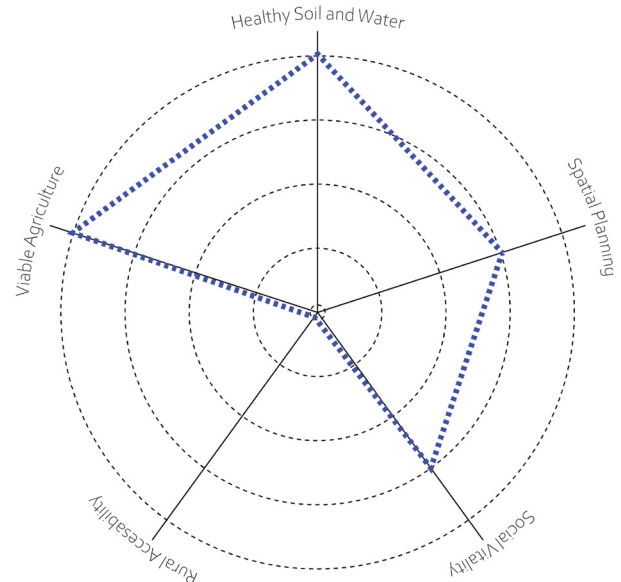


- Year(s): 2024
- Scale: Provincial
- Writer: Atelier Roman
- Client: LABORUIMTE, Flemish Government, Province of Antwerp
- Topic(s): Agriculture and spatial planning

LABORUIMTE Voorkempen (Atelier Romain, 2024)

LABORUIMTE Voorkempen takes the growing issues of nitrogen and intensive farming in a large area of Antwerp and provides a vision and design elements on how a shift can be achieved. Through participation practices with residents and farmers, needs are incorporated in the envisions landscapes. These visions are not set in stone and provide an idea of how agricultural production could look in the nearby future.

As it is a design focussed project, planning and policy changes are barely suggested. This keeps the spatial planning aspect in a state of vision.



Appendix I Policy Passports

Policy Passport AN.2



Provinciaal Beleidsplan Ruimte Antwerpen (PBRA) (Lux et al., 2023)

The PBRA provides a vision on what to do with empty farms and housing resulting from population changes and land use intensification. Design visions are given for various landscapes ranging from rural to industrial. It does not delve deeper into policies needed to allow such changes. Additionally, a lack of focus on how to ensure healthy soil and water makes it apparent that it focusses on human systems primarily.

- Year(s): 2023
- Scale: Provincial
- Type: Provincial Vision
- Writer: Lux, W., Berx, C., Lemmens, L., Helsen, K., De Haes, J., Colson, M.
- Client: Province of Antwerp
- Topic(s): Spatial planning



Appendix I Spatial Analysis

Soil - Properties I



Carbon:
-Higher zones ■
-Lower zones ■■■
Groundwater: ■■■
Acidity
-Higher zones ■■■
-Lower zones ■■



Carbon:
-Higher zones ■
-Lower zones ■■
Groundwater: ■■
Acidity
-Higher zones ■■■
-Lower zones ■■



Carbon:
-Higher zones ■
-Lower zones ■■
Groundwater: ■
Acidity
-Higher zones ■■■
-Lower zones ■■■



Carbon:
-Higher zones ■■■
-Lower zones ■■■
Groundwater: ■■■
Acidity
-Higher zones ■
-Lower zones ■



Carbon:
-Higher zones ■■■
-Lower zones ■■■
Groundwater: ■■
Acidity
-Higher zones ■
-Lower zones ■



Carbon:
-Higher zones ■■■
-Lower zones ■■■
Groundwater: ■
Acidity
-Higher zones ■
-Lower zones ■



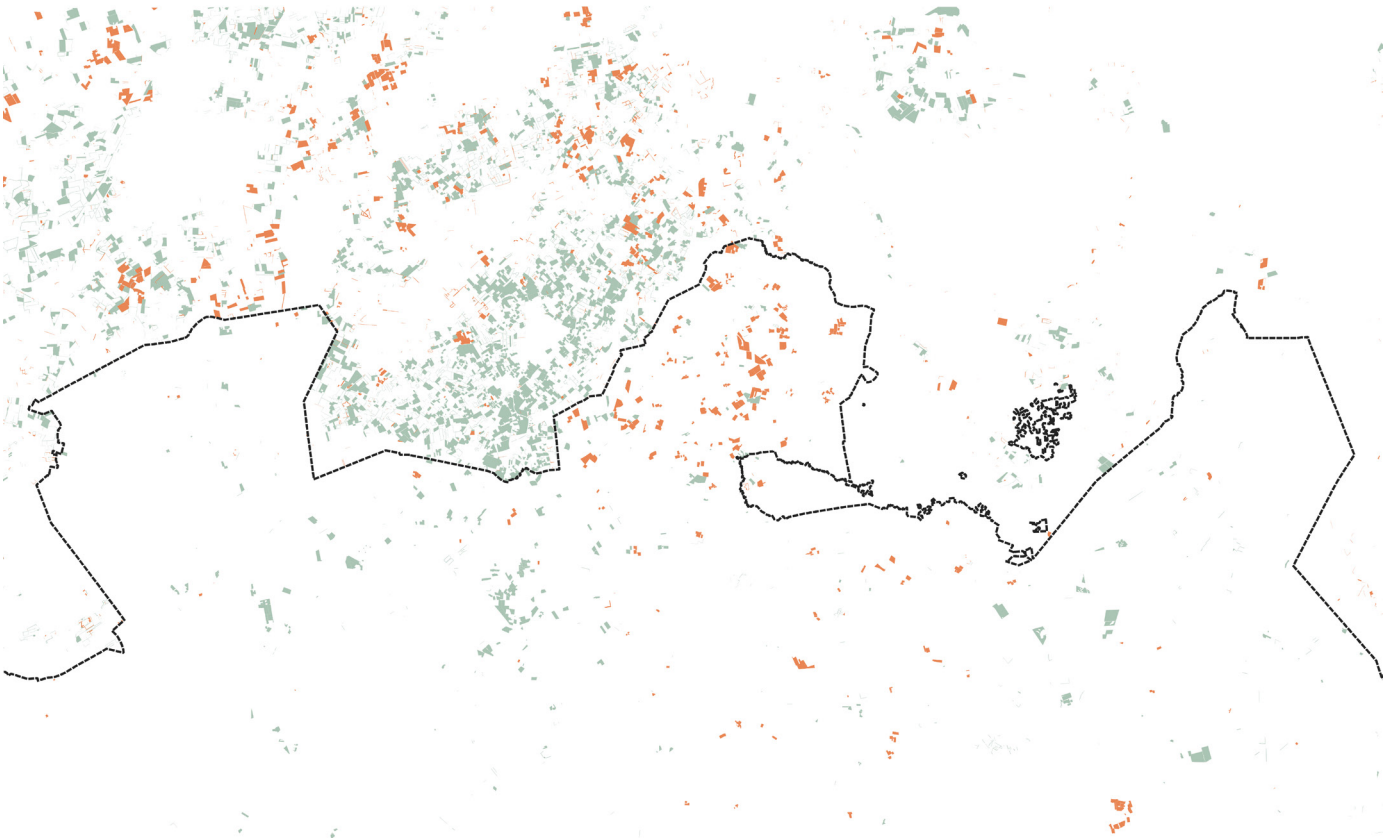
Carbon:
-Higher zones ■
-Lower zones ■■■
Groundwater: ■■■
Acidity
-Higher zones —
-Lower zones —



Carbon:
-Higher zones —
-Lower zones —
Groundwater: —
Acidity
-Higher zones —
-Lower zones —



Appendix I Spatial Analysis



Locations of horticulture and fruit production, both on open fields and in glasshouses

Fruit
Horticulture





Locations of potato and beet production in open fields

Potatoes and Beets

0km 5km 10km



Appendix I Spatial Analysis

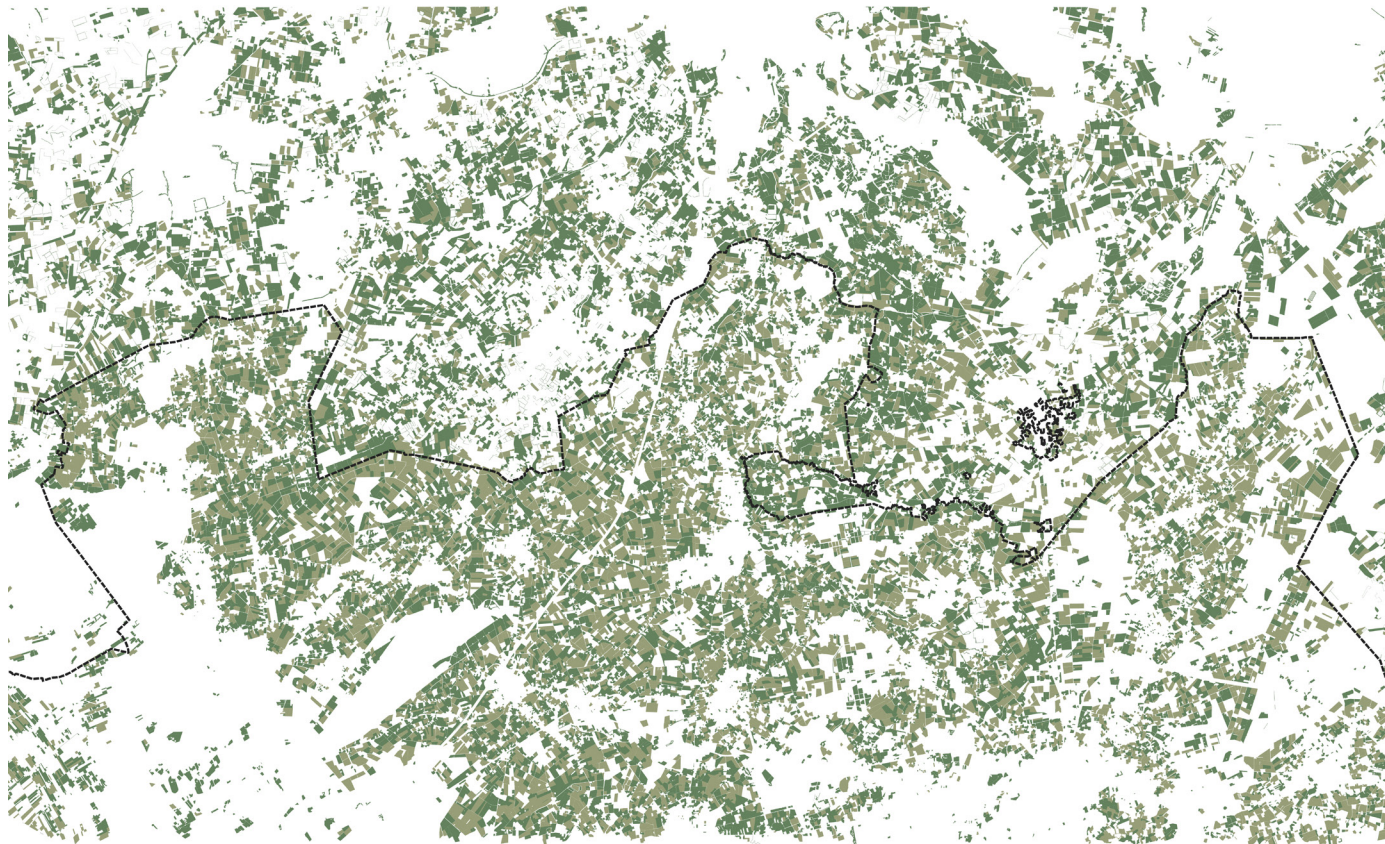


Locations of grains and vegetables production in open fields and glasshouses

Grains and Vegetables

0km 5km 10km





Locations of livestock herding and feedproduction, only fields are shown, sheds left out.

- Grasslands (cattle etc)
- Feed production

Appendix I Scenario analysis

Global Entrepreneurship

Baseline: More

Continuous population and economic growth create an urban core in the west of the country. This core is surrounded by a hinterland consisting of production areas and smaller urban cores. To achieve high productivity in industry and agriculture, technological advancements are implemented and developed. These are also implemented to lower emissions and mitigate climate change. However, the large amounts of intensive, industrial scale agriculture negate these improvements. As a result, natural areas still suffer from nitrogen emissions and other issues. The expansion of natural areas seems good at first, but these are primarily for the benefit of urban dwellers. Leisure, health-care and private forests are located along primary natural parks. Clear spatial planning policies lack as land use is decided on by private landowners and commercial conglomerates. (Hamers et al., 2023).



Global Entrepreneurship concept diagram (Hamers et al., 2023)

System shift

Technology

Government



The map above illustrates the creation of the central metropolis in the west of the country with an arc of supportive landscapes with a mix of intensive agro-industries, logistics and industry, and service based green space. The resulting structure is a more fragmented landscape without clear differentiation between various regions

Fast World

Baseline: More

Extensive integration of the digital world creates a fragmented society of different groups with different goals and use of land. Social, economic and other interaction take place within the digital world. As a result, housing does not have to be near work. Workplaces change location often depending on where there is demand. Similarly, small scale IT companies change location often. Goods and services are provided online too increasing demand for logistics and energy. Agricultural production is integrated fully with technology. Digital planning replaces spatial planning to allow easier decision making of residents and companies. The need for mobility decreases resulting in a lack of connectivity within the country. Rapid changes in land use results in land often sitting empty. These empty plots get used as locations for spontaneous nature. Overall, a patchwork of housing, industry, agriculture and nature covers the entire country, removing local and regional identities (Hamers et al., 2023).

System shift

Technology

Government



Fast World concept diagram (Hamers et al., 2023)

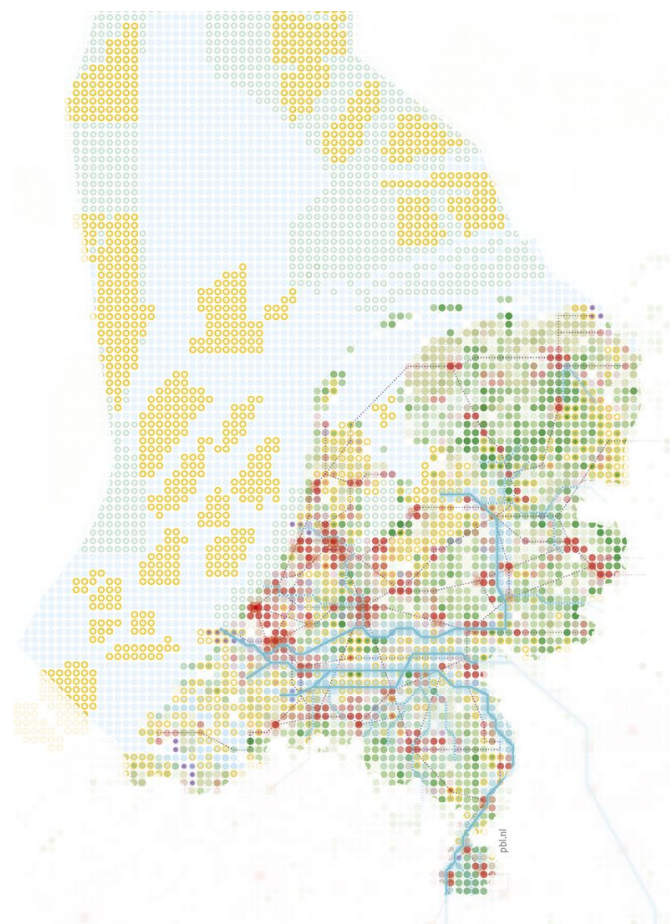
The map above gives an idea of the spatial changes. Instead of urban cores, the landscapes become a mix of functions without clear hierarchy. Local differentiation decreases as a result. Instead of mobility networks, data networks cover the country allowing the digital world to be accessed.

Appendix I Scenario analysis

Green Country

Baseline: Less

A lower population growth, less focus on economic growth and reliance on technology to achieve climate goals results in a society living together with nature. A national blue-green network connects and expands nature. Nature Based Solutions provide solutions for changes in climate such as more extreme droughts and rains. Additionally, soil and water dictate which functions go where. Instead of urban expansion, cities and villages become denser creating hubs for services, mobility and circular economy. The shift to a circular economy is the result of government policy to lower consumption. As a result, agriculture is less focused on specialisation but provides a mix of conventional and nature-based farming. The resulting landscape is a mix of natural landscapes mixed with dense cores and agricultural production (Hamers et al., 2023).



Green Country concept diagram (Hamers et al., 2023)

System shift

Technology

Government



Above the creation of the national green network can be seen extending into the neighbouring countries. The urban areas form hubs within a mobility and energy network. Between the green network and urban areas, agricultural production consists of a mix of forms instead of heavy specialisation.

Regionalism

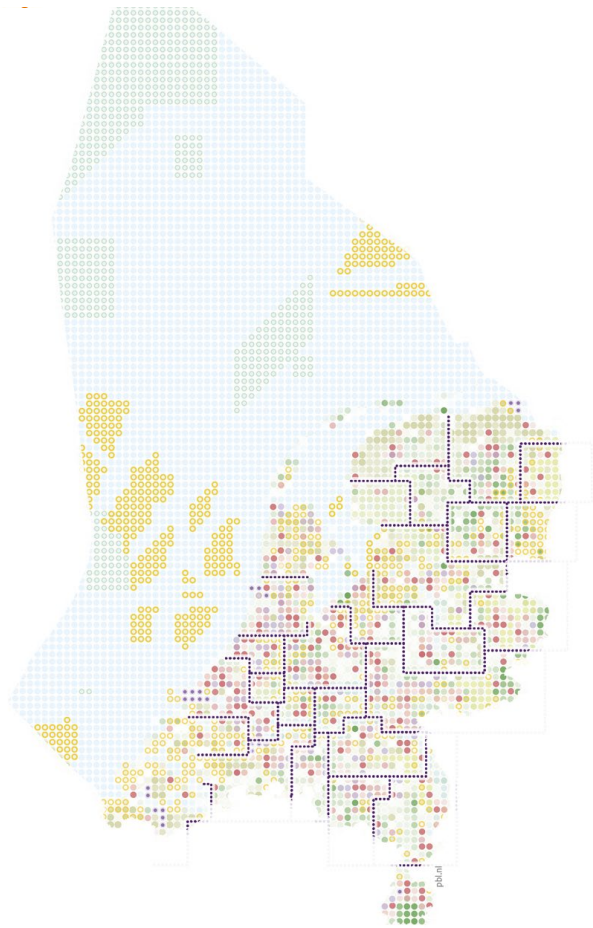
Baseline: Less

In this scenario, local communities and regions are the most important aspects. Instead of national and provincial governments forming the main driver for spatial design and planning, new regional governments fulfil this task. As a result, local issues can be resolved more efficiently. A focus of local production and resolving of climate mitigation creation a mosaic of cities, towns, villages and regions with different identities spread across the Netherlands. Agricultural is more and more run on a cooperative basis alongside family-owned farms. This gives agriculture the opportunity to produce directly for local needs as residents can decide what they want. Commercial cooperatives on the edge of villages and cities use shared infrastructures and energy systems to create local loops. A local focus and economy have led to needs being fulfilled rather easily and nearby. Resulting from this, the need to travel outside ones direct surroundings or region have diminished. Walking and cycling form the core of mobility. If further travel is necessary, busses or shared mobility provide this (Hamers et al., 2023).

System shift

Technology

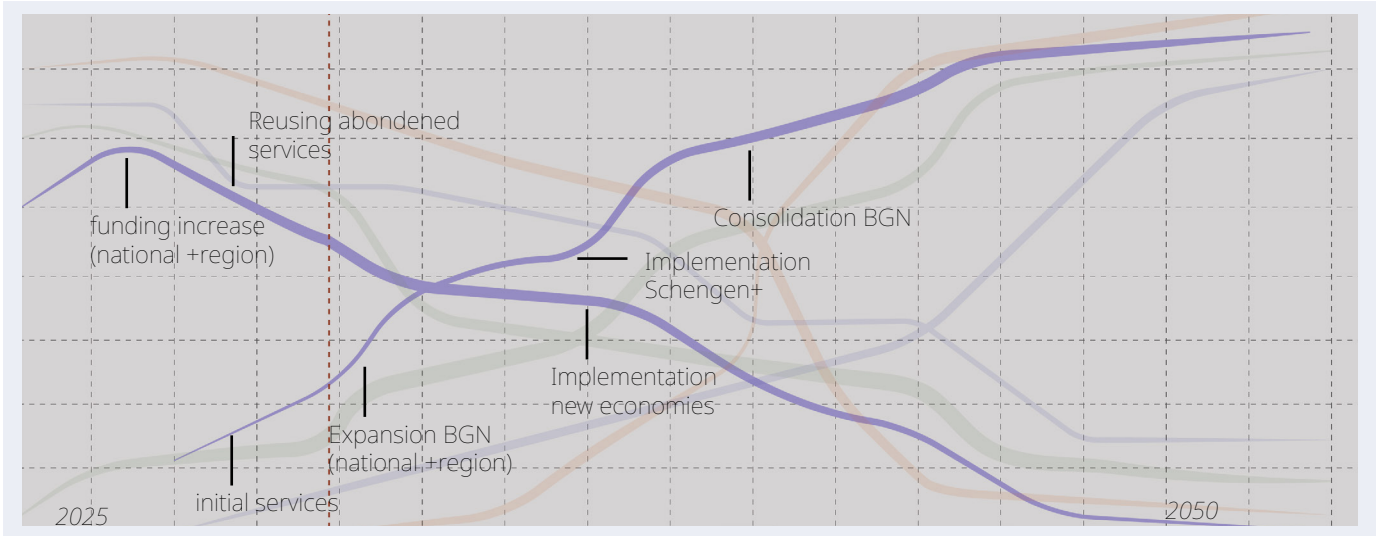
Government



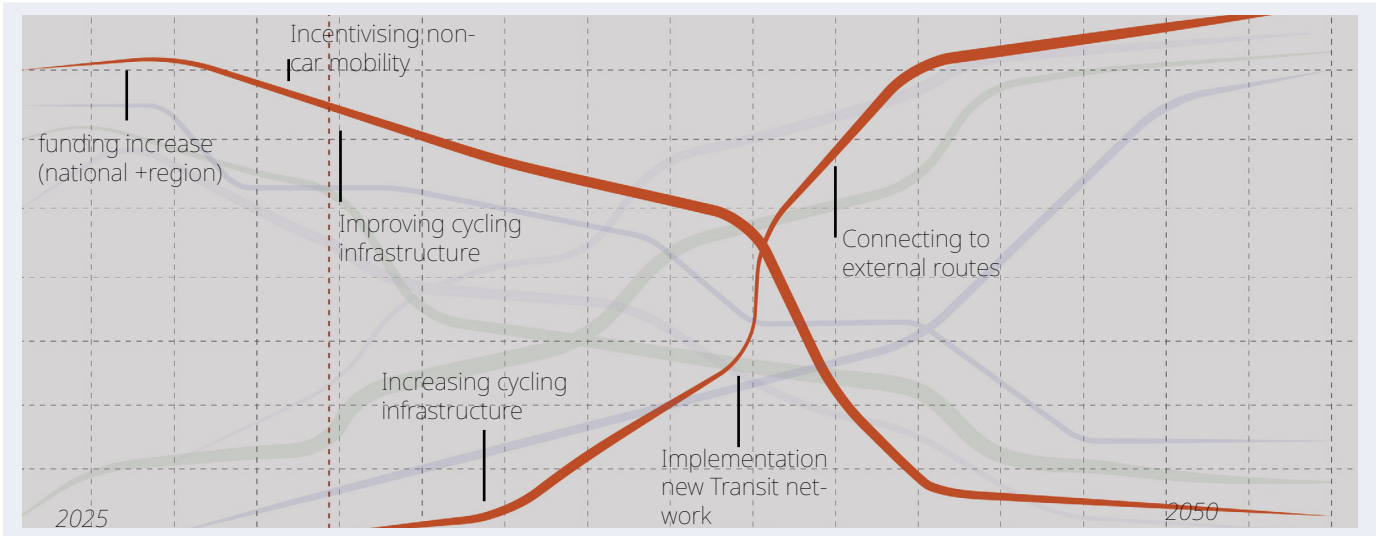
Regionalism concept diagram (Hamers et al., 2023)

The concept of regionalism is shown in the image above. The entire country is divided into several regions, each with slightly different focus and functions. This gives the nation a variation of identities.

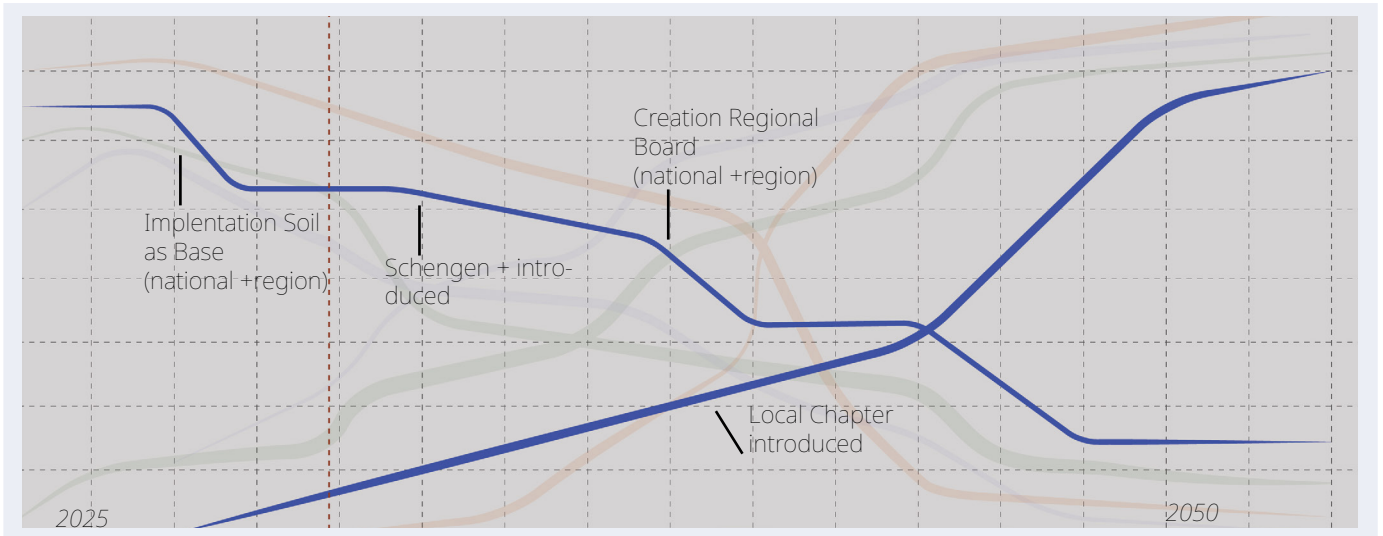
Appendix I X-Curves



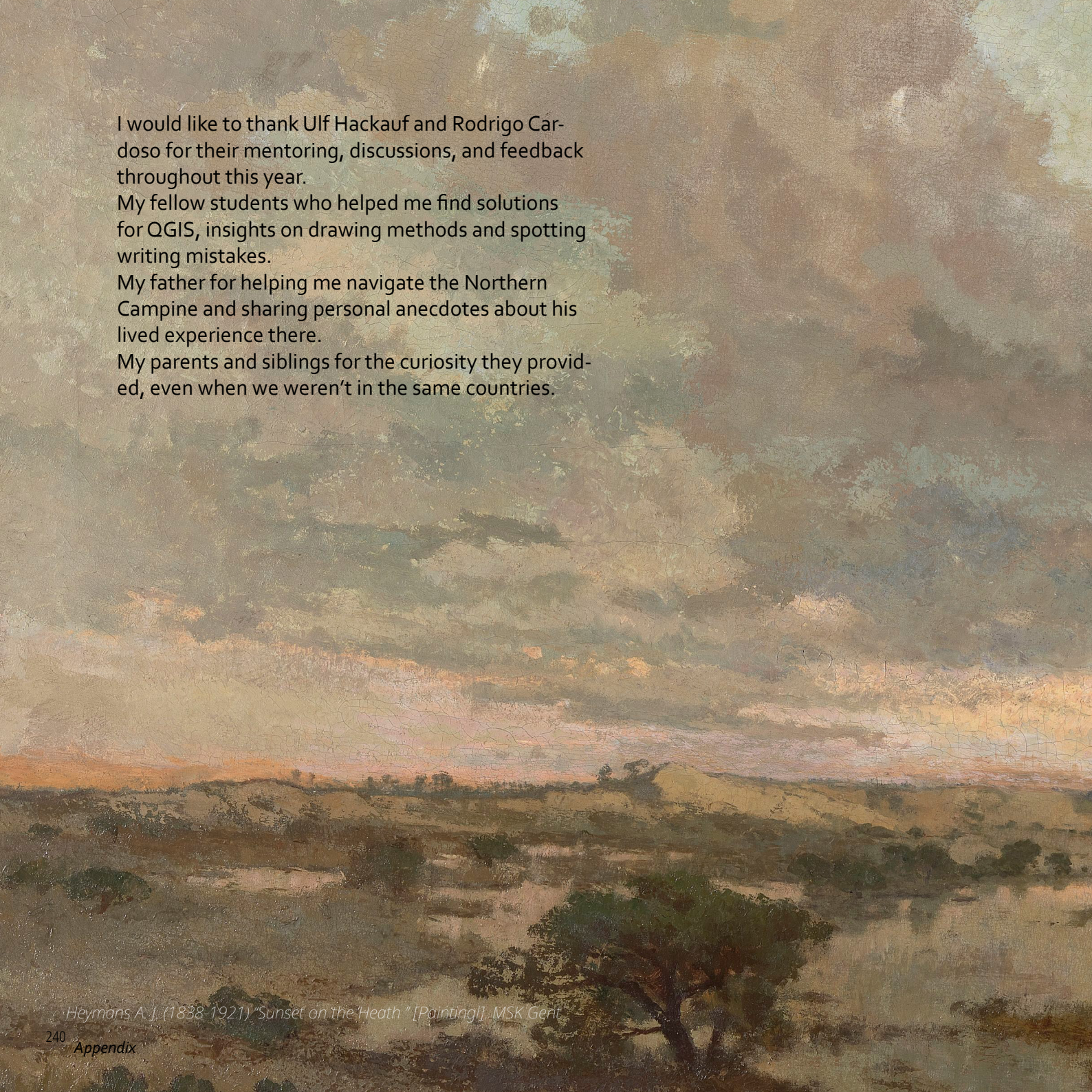
X-curve Resilience



X-curve Accessibility



X-curve Cross Border Cooperation



I would like to thank Ulf Hackauf and Rodrigo Cardoso for their mentoring, discussions, and feedback throughout this year.

My fellow students who helped me find solutions for QGIS, insights on drawing methods and spotting writing mistakes.

My father for helping me navigate the Northern Campine and sharing personal anecdotes about his lived experience there.

My parents and siblings for the curiosity they provided, even when we weren't in the same countries.

Heymans A. J. (1838-1921) "Sunset on the Heath" [Painting]. MSK Gent

