AgriNature

Transitioning Agricultural Practices to Integrate Nature

COLOFON

AgriNature

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ABSTRACT

The Netherlands holds the title of the world's second-largest exporter of agricultural goods, primarily due to Wageningen University's pioneering research and innovation. However, this success has led to significant challenges. Intensive farming practices have strained resources and disrupted local water and soil cycles, sparking protests from frustrated farmers. Moreover, the quality of fresh water in the Dutch Delta has deteriorated due to pollutants like NO2 and PO4, exacerbated by increasing salinization pressure from the North Sea. This linear system has resulted in waste accumulation and biodiversity loss, endangering both agriculture and natural ecosystems' sustainability.

To address these challenges, our goal is to integrate nature into existing agricultural practices, thus restoring a balance with local ecosystems. The AgriNature project aims to achieve this by analyzing the interplay between agriculture and nature, assessing water and soil management spatially, and fostering a participatory approach with farmers.

The first phase of this transition starts with engaging farmers who are already implementing sustainable methods like agroforestry and saline agriculture, the project establishes Living Labs for co-creation, knowledge sharing, and policy influence. Waterboards and governmental agencies will mediate and provide support, connecting farmers to stakeholders and creating financial incentives. The project also recognizes the necessity of a protein transition towards more plant-based or lab-grown alternatives, aiming to decrease nitrogen pollution and eventually rewild cattle. In the second phase, AgriNature plans to expand innovations to other farmers and establish Agroparks as hubs for innovation and technology. Consumer awareness centers will promote understanding of the protein transition and the need for biodiversity. A nature regeneration center will oversee rewilding efforts and flood risk management using nature-based solutions. The third phase will future proof these efforts by continuing innovations within the established research and development networks.

Ultimately, AgriNature envisions a symbiotic relationship between agriculture and nature, empowering farmers as stewards of the land and promoting ecologically sensitive practices. Through multidisciplinary collaboration and integration of natural cycles into urban planning and agriculture, the project aims to serve as a global model for sustainability, fostering soil health, water conservation, and biodiversity preservation.

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Image by Floyd Shazly

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Introduction

The Dutch Delta region is an interestingly dynamic and multifaceted area. The Rhine and Meuse spatially connect the low lying land to upstream regions in mainland Europe. The dynamic transition between water and land provides uniqueness to natural areas, home to many protected Natura 2000 habitats fostering biodiversity. The region is quite densely inhabited. Spatial quality of the landscape outside of the urban centers is largely determined by agricultural land use. Together these characteristics set the stage for the project of AgriNature.

AgriNature as a project aims to reimagine the relationship between agriculture and nature in a regional vision to be achieved through a just sustainable transition being proposed in a collaborative strategy. Central to this is the inclusion of stakeholders from diverse sectors—ranging from farmers and policymakers to environmental advocates and researchers.

Problematization

The Dutch Delta region is facing various challenges regarding the relationship between agriculture and nature. The conventional practices of agricultural intensification have exerted profound pressure on the delicate balance of ecosystems.

This brings us to the first of four main problems: biodiversity. Related to biodiversity there is the issue of nitrogen. Large quantities of nitrogen deposition are negatively affecting protected natural areas. It is therefore imperative to reduce nitrogen emissions, for example through the reduction of livestock which is a significant source of nitrogen emission in the Netherlands. This is something we will further elaborate on providing evidence later in the report.

Next, political action to address the emission of nitrogen initially involved little regard for the interests of farmers causing severe discontent, leading to a series of large protests. Lastly, climate change effects worsen prospects for farmers as sea level rise will cause increasing salinization pressure threatening the profitability of agricultural land. In summary, in addition to the entangled biodiversity-nitrogen-political crisis, we are awaiting a salinization crisis. In other words, the relationship between agriculture and nature is in crisis and action is urgent.

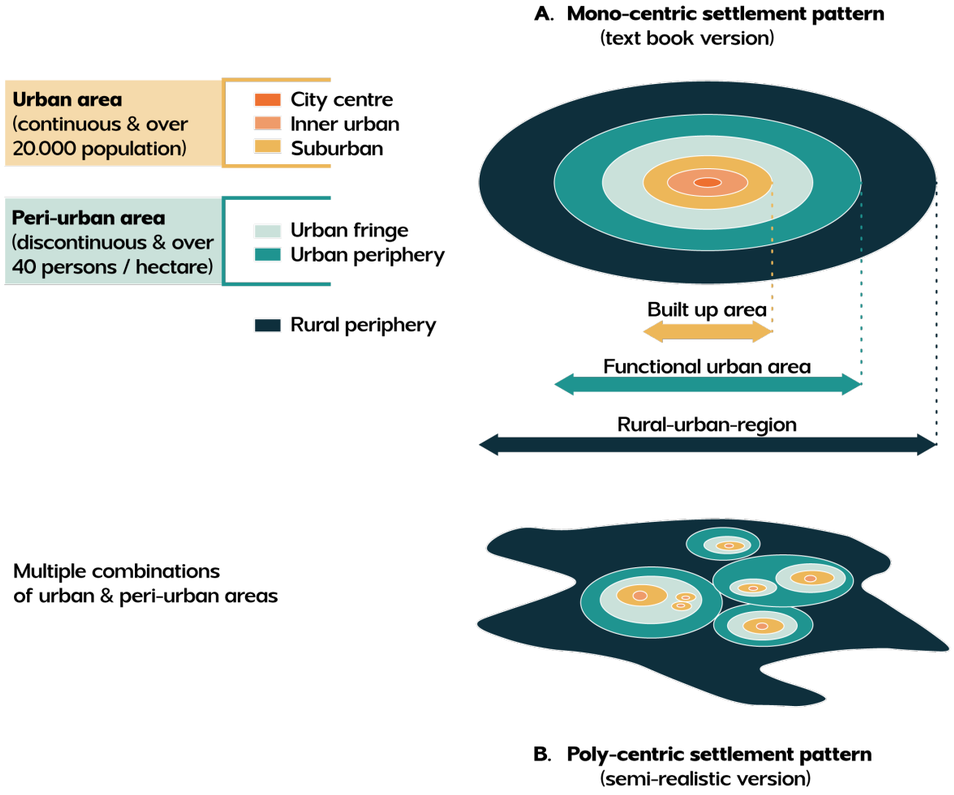


Figure 1.1: Nesting of the peri-urban area in a spatial hierarchy of urbanicity. Source: Piorr et al. (2011), edited by author.

The Role of the Peri-urban

The increasing recognition of peri-urban areas over the last two decades has overruled the urban-rural dichotomy. The term entered the domain of spatial planning within the EU, primarily through the PLUREL project, which defines peri-urban areas as 'discontinuous built development containing settlements of each less than 20,000 population, with an average density of at least 40 persons per hectare (averaged over 1km cells)' (Piorr et al., 2011). Figure 1.1 shows how the peri-urban area defined as such is nested in a spatial hierarchy of urbanicity.

Other terms have also been used to describe the phenomenon of the intermingling of urban and rural in space. Territories-in-between is a term introduced by Wandl et al. (2014) in their work on the characterization of such spaces, also discussing several other terms, including urban fringe, peri-urban, diffuse city, and, sprawl. The latter is being rejected as an accurate synonym because of its association with monofunctional residential areas, whereas territories-in-between are characterized by a complex mix of uses in a high level of functional diversity with a corresponding ratio of 0.5 jobs per resident, which is a slightly higher than the 0.4 ratio in the urban areas of South-Holland (Wandl et al. 2014).

The inclusion of the working population in the demographic criterium for the characterization of the territories-in-between, together with the inclusion of large infrastructure as a criterium, marks the main difference in comparison with the definition of peri-urban areas by Piorr et al. (2011). As a result the Rotterdam harbor entirely is more logically qualified as a territory-in-between instead of partially rural like in the PLUREL project (Wandl et al., 2014).

The economic relevance of peri-urban areas is also underlined in the PLUREL project which lists Economy and Employment as the first of eight peri-urban agendas. Other functional agendas brought forward in the PLUREL project include Food and Farming emphasizing the dependency of food security in urban areas on peri-urban agriculture, and, Landscape, ecology, recreation, and tourism addressing the multitude of ecosystem services to be fulfilled in peri-urban areas, such as biodiversity, water supply, flood control, soil quality, landscape aesthetics and the capacity for climate change adaptation.

In the context of the Dutch Delta Region the role of peri-urban areas regarding water management is especially relevant considering the geographic characteristics of a delta: vast flows of water, low-lying land, and, proximity to the sea. The other main particularity in this context is the high level of agricultural production and land use in (this part of) the Netherlands emphasizing the role of the peri-urban regarding food production.

Image by Floyd Shazly

02
APPROACH

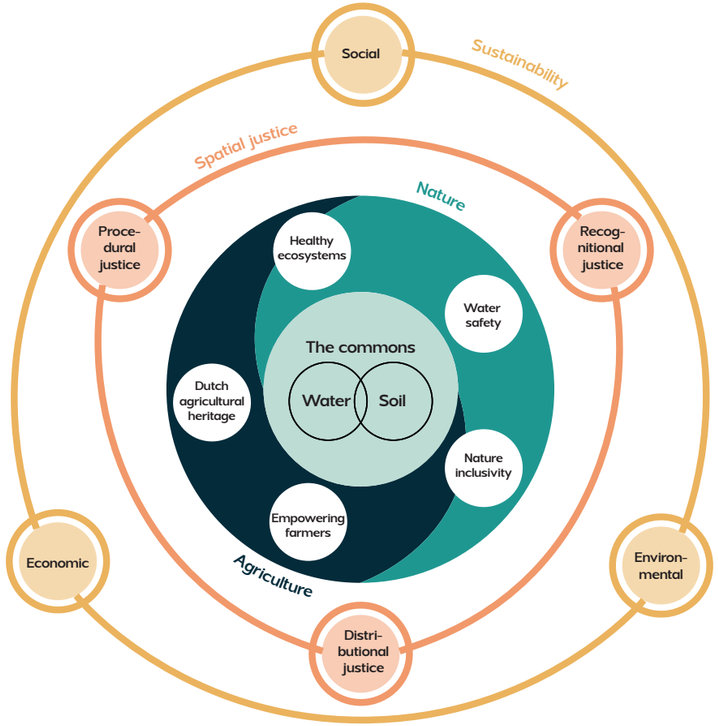


Image 2.1; Theoretical framework. Source: by author

Theoretical Framework

The project of AgriNature seeks to propose a sustainable and just transition harmonising agriculture with nature. The concepts 'sustainable' and 'just' are each broken down into three main components based on the works of respectively Purvis et al. (2019) and the EEA (2024). Together these six components form a cloud of moral condition hovering around the spatial domain of the project's focus.

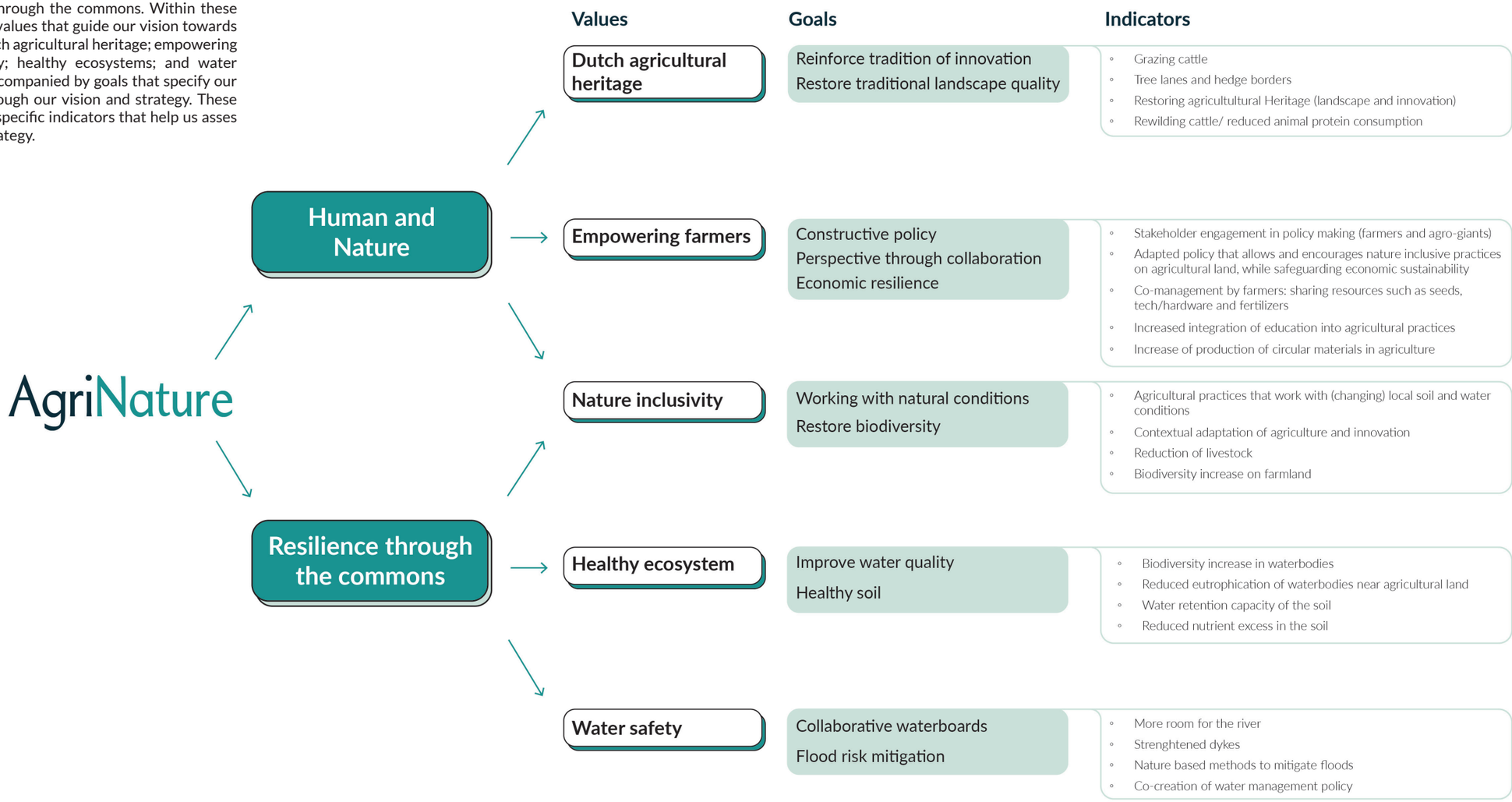
The focus of the project contains two main perspectives that persue a synergy through transition: agriculure and nature.

At the core of these main perspectives lie the systems of water and soil. These systems are considered the commons because of their crucial part in the spatial preconditions that allow the existence of all else, including agriculture and nature.

Lastly, we have defined five main values projected onto the main perspectives. These main values will help us define concrete goal in the next step of our approach.

Goals and Values

The concept of AgriNature can be broken down into Human & Nature and Resilience through the commons. Within these main themes we have five values that guide our vision towards AgriNature. These are Dutch agricultural heritage; empowering farmers; nature inclusivity; healthy ecosystems; and water safety. These values are accompanied by goals that specify our direction and guide us through our vision and strategy. These goals are accompanied by specific indicators that help us asses the effectiveness of our strategy.



Conceptual Framework

Throughout time the spatial claim of agriculture has increased at the cost of nature. More and more land has been taken up by agriculture that is also increasingly monocultural. We are currently at a point where the strain that agriculture puts on our soil and water systems exceeds the natural limits. Water and soil are being exhausted and the system can only be artificially sustained. This can be seen in a decline of biodiversity in agricultural areas and in natural areas that border agricultural land.

To curb this decline in biodiversity, while continuing to feed a growing population we will integrate the practice of AgriNature. AgriNature involves the implementation of nature inclusive agriculture that works with local water and soil cycles. It creates a symbiosis between agriculture and nature.

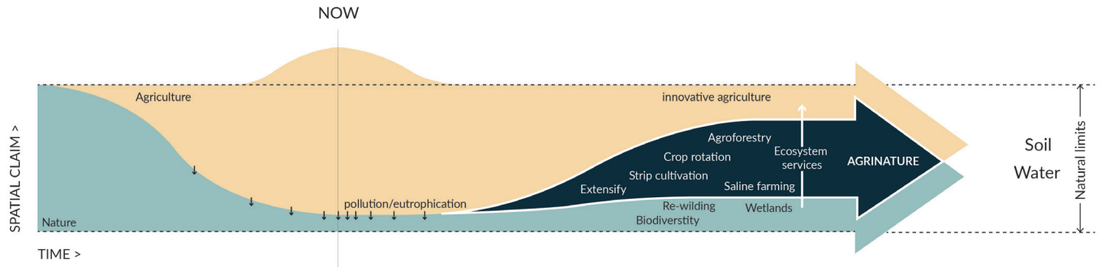


Figure 2.2: Conceptual framework, Source: by author

Research Question

How can the linear intensive practice of agriculture in the Netherlands transition into a resilient system, reestablishing a balance with capacities of the local natural system, meanwhile contributing to the restoration of biodiversity and the innovation and value of the traditional dutch agricultural landscape?

Methodology

Our methodology framework serves as a roadmap for tackling the design challenge presented, focusing on the creation of *Spatial Strategies for the Global Metropolis*. Initially, we conducted individual literary research within the thematic scope of *sustainable spatial transitions in Dutch peri-urban regions*. This foundational phase allowed us to familiarize ourselves with relevant literature and identify key concepts and trends.Subsequently, through a collaborative review of our findings, we determined a specific location of interest and formulated a focused research question to guide our project. It is to be noted that in later phases the chosen location and research question evolved with our growing knowledge and understanding. Our methodology diagram illustrates a series of cascaded steps, each building upon the knowledge and outputs generated in preceding stages. These steps are represented above the connecting lines. While the final step involves reflection and evaluation of our decisions and their impact on our research question, it's important to note that our group engaged in continuous evaluation and reflection throughout each phase. This iterative process facilitated smaller circular design iterations within the larger linear progression toward our research goals and final outcomes.

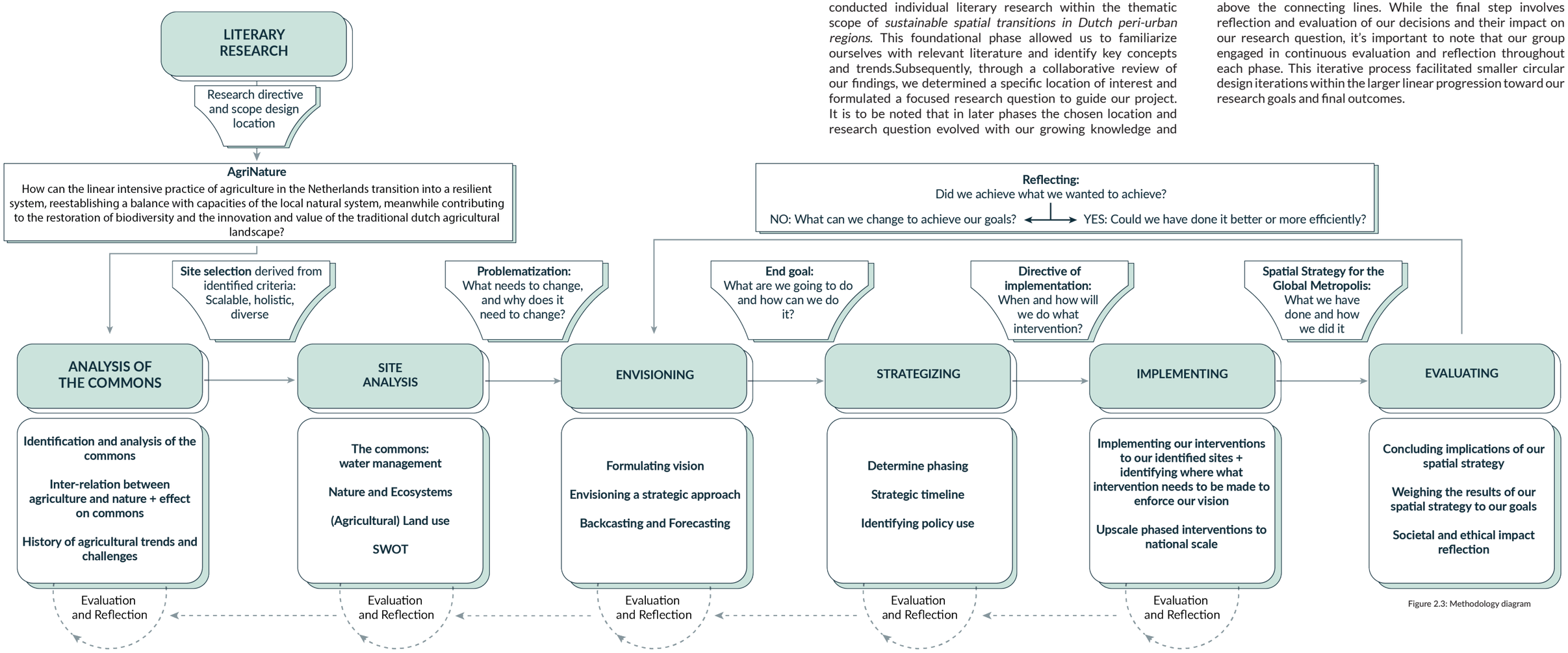


Figure 2.3: Methodology diagram

Image by Floyd Shazly

03
REVEALING INTERRELATIONS OF AGRICULTURE AND NATURE

Identification Commons: Soil Types

The Netherlands boasts a diverse array of soils, each with its own unique characteristics and implications for urban and rural planning. Our analysis categorizes the Dutch landscape into four primary soil types: Dunes, Peat, Podzol, and Poldervaag, each influencing land use and development in distinct ways.

Dune

Starting with the sandy Dune soils, prevalent along the coastal regions and Wadden Islands to the northwest, we encounter soils with low fertility and acidity. Despite these challenges, matured dune soils exhibit remarkable resilience, capable of sustaining significant amounts of organic matter (McLachlan, A., & Brown, A., 2006).

Peat

Peat soils, on the other hand, present considerable challenges in civil and environmental engineering. Formed through the accumulation and decomposition of organic materials in waterlogged environments, peat soils are notably weak and compressible. With a carbon content around 75%, these soils pose environmental risks if exposed to oxidation, releasing CO2 into the atmosphere upon dewatering Gowthaman, S. G., Chen, M. C., Nakashima, K. N., Komatsu, S. K., & Kawasaki, S. K., 2022).

Podzol

Podzols, found in forested landscapes on coarse parent material rich in quartz, feature a distinct subsurface layer known as the spodic horizon. While this layer contains accumulated humus and metal oxides, the upper layers often lack essential nutrients due to leaching, rendering cultivation challenging due to acidity and climatic factors (Encyclopaedia Britannica, 1998).

Poldervaag

Lastly, Poldervaag soils, originating from reclaimed land through drainage, feature high clay content (Bakker, H. & Schelling, J., 1989). While these soils can retain significant amounts of water, their propensity to swell when wet and shrink when dry necessitates careful planning to prevent issues like soil compaction (under influence of machinery and livestock), particularly during wet winters (H.J.S. Finch, A.M. Samuel, G.P.F. Lane, 2014).

DUNE IMPLICATIONS

- Low fertility
- Poor water retention with high permeability
- High risk of leaching due to high permeability / Fast drainage
  Prone to erosion

PEAT IMPLICATIONS

- Medium fertility if managed carefully
- Very high water retention with low drainage
- Risk of waterlogging when wet
  Prone to subsidence
  Organic carbon decomposition (CO2 release) when dewatered

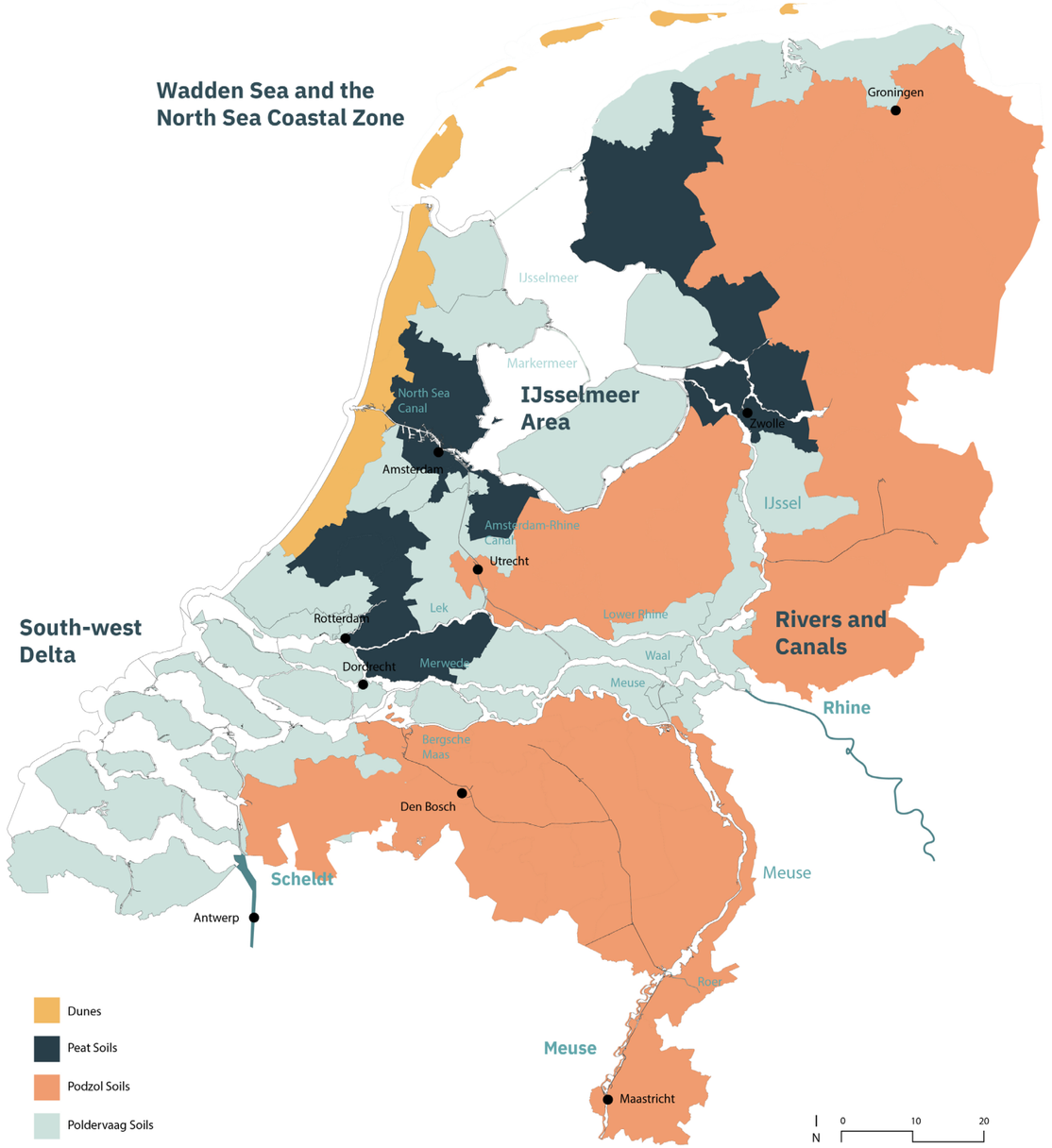
PODZOL IMPLICATIONS

- Low fertility
- Poor water retention with high permeability
- High risk of leaching due to high permeability / Fast drainage
  Desiccation risk in dry periods due to poor water retention

POLDERVAAG IMPLICATIONS

- High fertility
- High water retention with low permeability
- Risk of waterlogging when wet
  Prone to salinization
  Prone to subsidence

Figure 3.1 (left): Soil Implication Table, Source for icons: (www.thenounproject.com)
Figure 3.2 (right): National soil map, Source: (Bodemdata, n.d.)



Identification Commons: Waterflows

The fresh water in the Netherlands comes mainly from the Rhine and Meuse Rivers in the Southeast. This water flows into the North Sea and the Wadden Sea (Water Management in the Netherlands, 2019). The quality of fresh water has declined in the past few years, due to pollution from agricultural practices, as well as industrial activities (STOWA, 2015). This contamination is made worse by the increased groundwater salinisation in the western part of Netherlands, including the delta region (National Water Plan 2016-2021, 2015). The salinisation is partly endorsed by the soil types of the area, where poldervaag and peat soils retain groundwater well (see previous page). The National Delta Program works effectively to manage flood risk in the Netherlands (National Delta Program 2021, 2020), but with increasing fluctuations in rainfall and sea-level rise, there is a need to maintain existing water levels and their dependant ecosystems.

These challenges have also seeped into the soil cycle because of its close link with the water cycle. Increased salinisation and soil depletion has resulted in many farmers facing challenges of reduced fresh water supply. This change in soil and water quality has also impacted existing biodiversity in the delta region.

Figure 3.3: Analysis of water flows in the Netherlands
Sources: (Water Management in the Netherlands, 2019), (National Water Plan 2016-2021, 2015), (STOWA, 2015), (National Delta Program 2021, 2020)

Nature and Biodiversity Analysis

In the Netherlands, the loss of surface area and quality of original nature has been significantly greater than the average in Europe or the world. In recent decades, this decline appears to have slowed down in Europe and come to a halt in the Netherlands. (Wageningen University, 2023b) The agricultural sector stands out as the leading cause of biodiversity loss. This data underscores the country's position as having the lowest remaining biodiversity compared to other nations. The dominance of agricultural activities highlights the urgent need for sustainable farming practices to mitigate further biodiversity loss and foster ecosystem health. Internationally, it has been agreed that by 2030, 30% of the land and water surface on Earth should be designated as protected natural areas. To reach this goal, approximately 4% (around 150,000 hectares) of protected nature should be added in the Netherlands. (United Nations, n.d.) The Netherlands faces a critical challenge with its water quality, ranking the lowest among EU nations, with just one percent of water bodies meeting 'good' standards. This poor quality significantly impacts biodiversity, as excessive nutrients, pesticides, and emerging contaminants degrade aquatic ecosystems. Urgent action is needed to address these issues and safeguard biodiversity. (Wageningen University, 2023a)

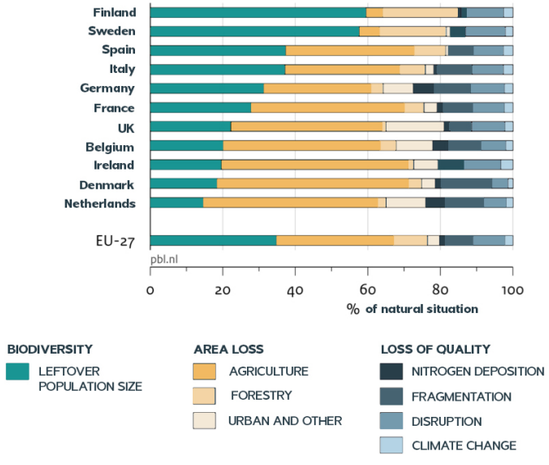


Figure 3.4: Causes of Biodiversity Loss in Europe, Source: (GLOBIO, PBL)

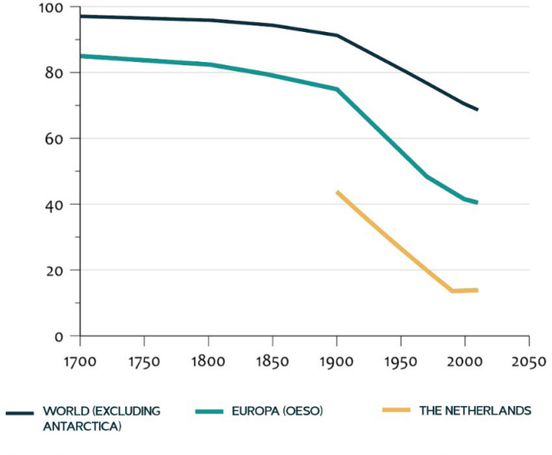


Figure 3.5: Mean Species Abundance (% of reference), Source: (Netherlands Environmental Assessment Agency)

Figure 3.6: Protected Natural Sites in the Netherlands,
Source: (PDOK)

Water-Soil-Biodiversity Section

The main challenges faced by the delta region are mono-cultural agricultural practices, salinisation, soil depletion, and poor freshwater quality (National Water Plan 2016-2021, 2015). Rise in sea levels and continued eutrophication from farmlands, chemical runoff from industries and nitrogen over-deposition, have put increased pressure on the natural soil and water cycles (STOWA, 2015). This has resulted in a decline in biodiversity, including loss of farmland birds and decrease in fish migration.

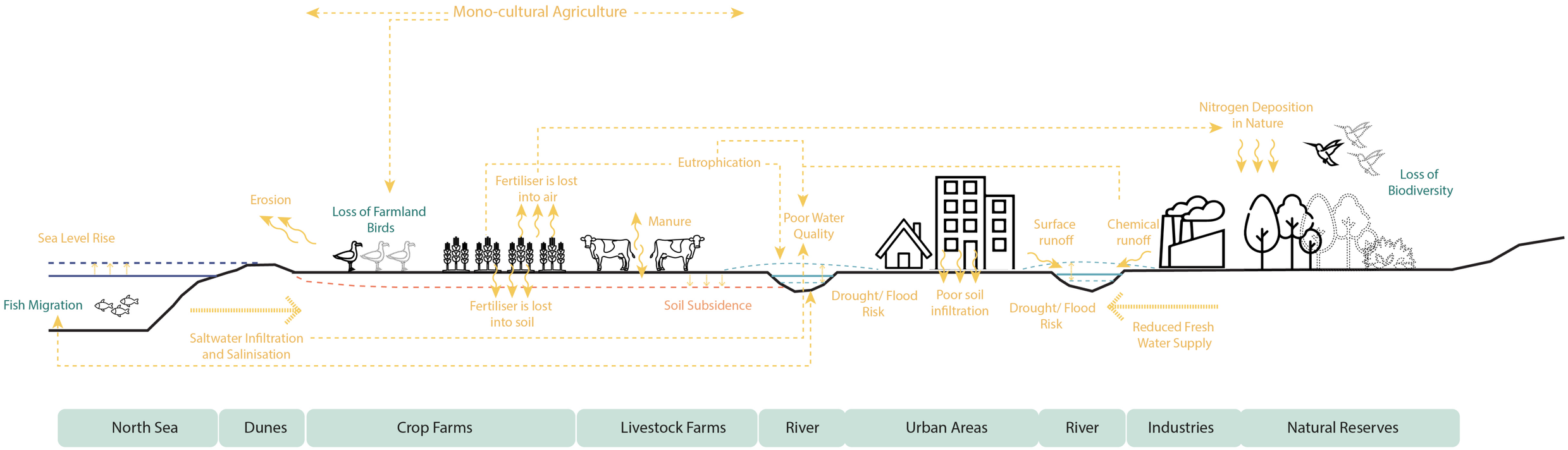


Figure 3.7: Interrelations of water, soil, and biodiversity challenges in the Dutch Delta region.
Sources: (National Water Plan 2016-2021, 2015), (STOWA, 2015). Source for icons: (www.thenounproject.com)

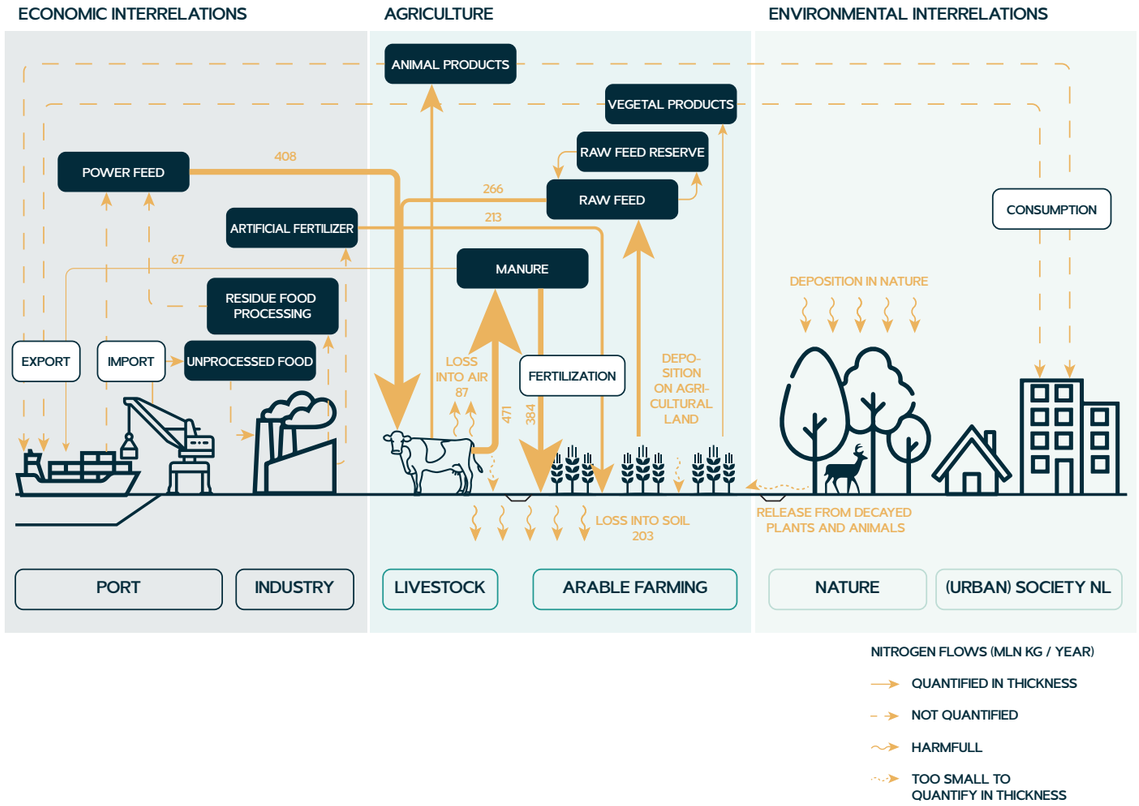


Figure 3.8: Quantified Nitrogen flows related to agriculture in the Netherlands. Illustration by author. Data from Stroomschema Voor Stikstof en Fosfor in de Landbouw, 2022 (2024). Source for icons: (www.thenounproject.com)

Nitrogen

Nitrogen gas (N2) itself is inert and abundant in the atmosphere. It's derivatives however, such as nitrogen oxides (NOx) and ammonia (NH3), pose significant threats to the environment. While nitrogen oxides originate mainly form traffic and industry, ammonia emissions stem predominantly from agricultural practices, particularly livestock farming. Animal waste releases ammonia, which evaporates into the atmosphere. As a result, approximately two-thirds of nitrogen deposition in the Netherlands is attributed to ammonia, primarily originating from agricultural activities (Stikstof | RIVM, z.d.).

The threat to the environment of nitrogen can be measured by the KDW: the critical deposition value (KDW) is the amount of nitrogen deposition that an ecosystem can withstand over an extended period without clear damage occurring. When nitrogen deposition exceeds the KDW, the likelihood of vulnerable plant species disappearing is greater, threatening biodiversity. Especially ecosystems that require nutrient-poor conditions are sensitive to environmental pressure caused by nitrogen deposition (Milieudruk door Stikstofdepositie op Landnatuur, 1994-2021, 2023).

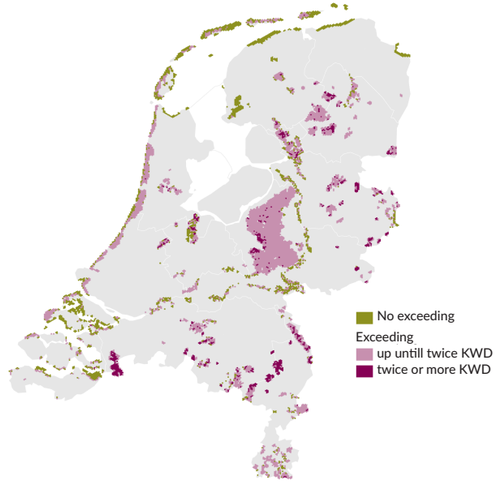


Figure 3.9: Exceeding of critical deposition value in nitrogen sensitive Natura 2000-areas 2021 from Overschrijding van Kritische Depositiewaarde in Natura 2000-gebieden 2005-2022 (2023).

In 2021, the Nitrogen Reduction and Nature Improvement Act (Wsn) was passed. This law outlines the required proportion of nitrogen-sensitive habitats within Natura 2000 areas with a nitrogen deposition lower than the KDW: by 2025, the goal is 40%, by 2030 it's 50%, and by 2035 it's 74%. In 2005, 20% of the surface area of nitrogen-sensitive nature in Natura 2000 areas had a nitrogen deposition lower than the critical deposition value. This increased to 29% in 2022 (Overschrijding van Kritische Depositiewaarde in Natura 2000-gebieden 2005-2022, 2023).

The systemic section in figure 3.8 reveals the quantification of nitrogen flows within the agricultural sector and their interrelations to society and economy. Especially through concentrate feed and fertilizers, large amounts of nitrogen enter agriculture annually. Each year, there is a surplus that burdens the soil and air. In 2022, the surpluses in agriculture amounted to 312 million kg of nitrogen (Stroomschema Voor Stikstof en Fosfor in de Landbouw, 2022, 2024).

Our Approach to the Peri-Urban

Our perception of the peri-Urban aligns with the definition proposed by Wandl et al. (2014), that is, to not perceive the peri-Urban based on demographic density but more in relation to spatial characteristics of the 'territories-in-between (TiB)' (Wandl et al. 2014). We do not believe that there is a fixed gradient from rural to urban, but that the peri-Urban is a complex mix of urban, industrial, agricultural, and natural areas.

This led to our selection of our key locations. Our main criteria was to find a peri-Urban area that fits the categories above and faces the water, soil and biodiversity challenges highlighted before. Through the intervention of AgriNature, our aim was to make the peri-Urban connect more to the urban areas through knowledge sharing networks, multi-stakeholder collaboration, nature regeneration and agro-tourism.

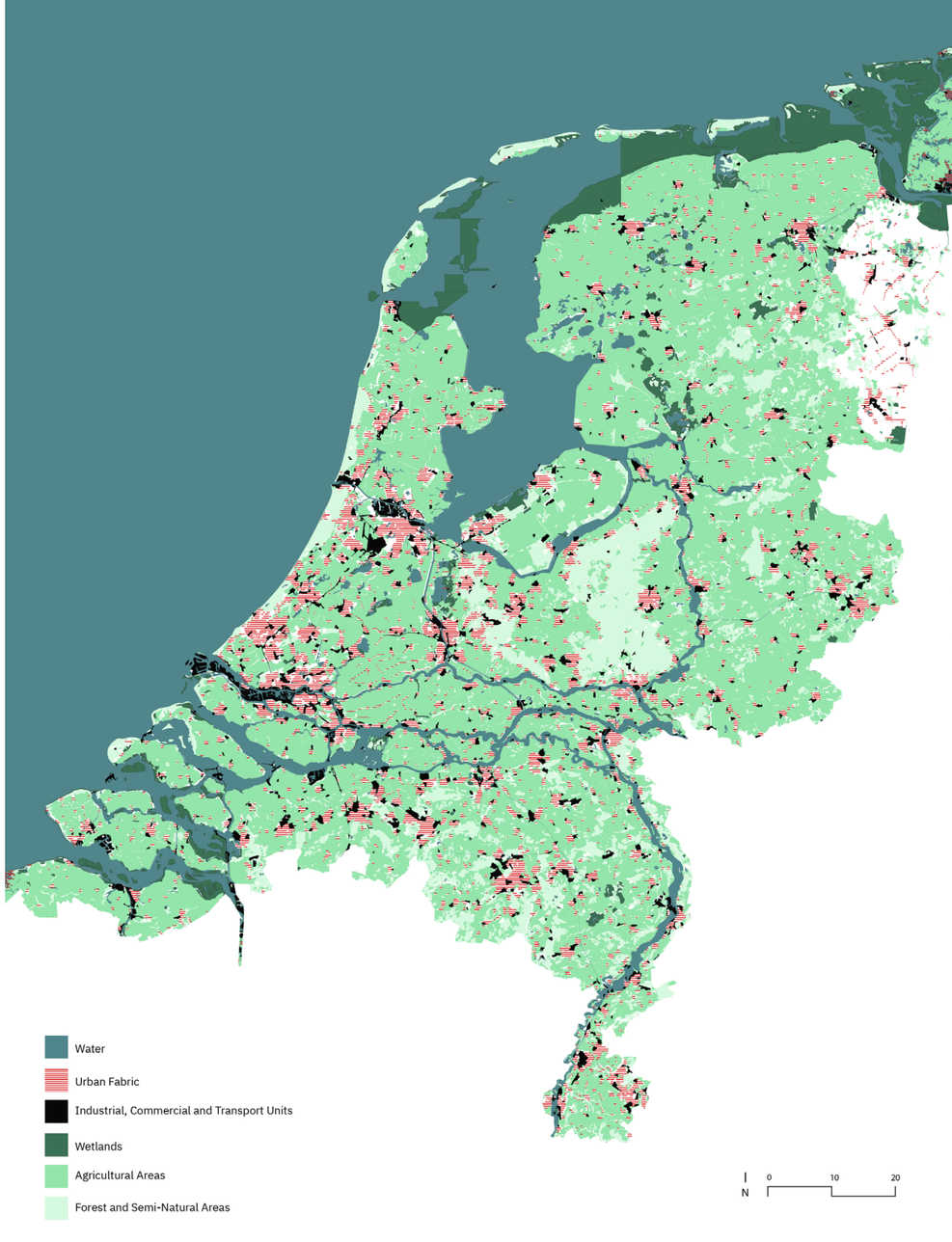


Figure 3.10: Land Use map of the Netherlands. Source: (CLC 2018)

European Policy Analysis

International level

The **Paris Agreement** is a landmark international treaty within the United Nations Framework Convention on Climate Change (UNFCCC) that aims to address climate change by limiting global warming to well below 2 degrees Celsius above pre-industrial levels, with efforts to limit the increase to 1.5 degrees Celsius. Key points include:

Each participating country sets its own nationally determined contributions (NDCs) to reduce greenhouse gas emissions.
Regular monitoring and reporting of progress are required, with a global stocktake every five years to assess collective efforts.
The agreement emphasizes adaptation to the impacts of climate change, particularly for vulnerable countries and communities.
It promotes climate finance, technology transfer, and capacity-building support for developing countries to facilitate their transition to low-carbon and resilient economies.
The Paris Agreement represents a collective commitment by nearly all countries to combat climate change and work towards a sustainable future.
(United Nations, 2015)

The 2030 **Agenda for Sustainable Development** is a global blueprint adopted by the United Nations to address pressing global challenges and achieve sustainable development across economic, social, and environmental dimensions. Key points include:

Seventeen Sustainable Development Goals (SDGs) covering a range of issues, including poverty eradication, health, education, gender equality, climate action, and sustainable cities.
The agenda emphasizes the interlinkages between different goals and the need for integrated approaches to development.
It promotes inclusive and participatory processes, involving governments, civil society, businesses, and other stakeholders.
Implementation of the agenda requires concerted action at the national, regional, and international levels, as well as adequate resources and monitoring mechanisms to track progress.
The 2030 Agenda represents a universal commitment to building a more equitable, prosperous, and sustainable world for present and future generations.
(United Nations, 2023)

The **Convention on Biological Diversity (CBD)**, established in 1992, is an international treaty promoting sustainable development and biodiversity conservation. Key points:

Setting global goals and targets for the conservation and sustainable use of biodiversity.
Promoting the fair and equitable sharing of benefits arising from the utilization of genetic resources.
Facilitating international cooperation and capacity-building to address biodiversity loss and its underlying drivers.
Encouraging the integration of biodiversity considerations into national development plans and policies.
Supporting scientific research and monitoring efforts to better understand and manage biodiversity.
Providing a framework for Parties to the convention to develop and implement national strategies and action plans for biodiversity conservation.
The CBD is a key instrument for global biodiversity governance and plays a crucial role in efforts to address the current biodiversity crisis.
(United Nations, n.d.)

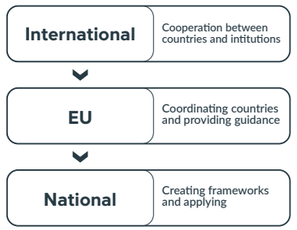


Figure 3.11: Hierarchy of Political Levels

Figure 3.12: Agenda for Sustainable Development
Source: (Azote for Stockholm Resilience Centre, Stockholm University CC BY-ND 3.0.)

Figure 3.13: Circular Economy Action Plan
Source: (EU CEAP, CEN-CENELEC)

EU level

The **Common Agricultural Policy (CAP)** is an EU policy that aims to ensure a stable and sustainable agricultural sector while promoting economic growth, environmental protection, and social cohesion. Key points include:

Providing financial support to farmers to ensure a stable income
Promoting sustainable farming practices and environmental conservation
Ensuring food security and quality standards
Supporting rural development and diversification of rural economies
Enhancing competitiveness and innovation in agriculture
Addressing societal concerns such as animal welfare and public health
(European Commission, 2024)

The **National Emission Reduction Commitments Directive** (2020-2029) sets binding targets for EU member states to reduce specific harmful emissions like sulfur dioxide and nitrogen oxides. Key points:

Enforcing national emission reduction targets.
Implementing strategies for targeted reductions.
Monitoring progress and fostering collaboration.
Advancing the transition to a low-carbon economy for better air quality and sustainability.
(European Environment Agency, 2023)

The **Circular Economy Action Plan (CEAP)** is an EU strategy to promote sustainability by minimizing waste and maximizing resource efficiency. Key points:

Setting targets to reduce waste generation and increase recycling rates.
Promoting eco-design and product durability to extend product lifecycles.
Encouraging the use of secondary raw materials and fostering markets for recycled materials.
Supporting businesses and innovation in circular economy practices.
Integrating circular economy principles into various sectors, including manufacturing, construction, and services.
Collaborating with stakeholders to accelerate the transition towards a circular economy.
(European Union, n.d.-a)

EU Nature Restoration Laws encompass legislation aimed at restoring and safeguarding natural habitats and biodiversity. Key points include:

Establishing legal frameworks for habitat restoration.
Setting targets for nature restoration activities.
Facilitating species recovery and ecosystem enhancement.
Integrating restoration into various policy sectors.
Providing financial support and incentives.
Strengthening enforcement and monitoring mechanisms.
Contributing to broader environmental goals and international agreements.
(European Union, 2024)

The **EU Green Deal** is a comprehensive policy initiative aimed at transforming the European Union into a sustainable and climate-neutral economy by 2050. Key points include:

Achieving net-zero greenhouse gas emissions
Transitioning to renewable energy sources
Promoting energy efficiency and circular economy principles
Preserving biodiversity and restoring ecosystems
Developing sustainable transportation infrastructure
Ensuring a just and inclusive transition for all citizens and sectors.
(European Union, n.d.-b)

From the EU Green deal are a few interesting strategies:

1. The **Farm to Fork Strategy** is an EU initiative aiming to make European food systems more sustainable, from production to consumption.

2. The **EU Biodiversity Strategy** is a comprehensive framework aimed at preserving and restoring biodiversity across Europe.

3. The **Circular Economy Action Plan** is an EU strategy to promote sustainability by minimizing waste and maximizing resource efficiency.

Natura 2000 is a network of protected natural areas within the European Union, established to conserve biodiversity and safeguard habitats and species of European importance. Key points:

Designating sites based on their ecological value and contribution to biodiversity conservation.
Encompassing a wide range of ecosystems, from forests and grasslands to wetlands and marine areas.
Implementing conservation measures to maintain or restore habitats and species populations.
Involving stakeholders and local communities in the management and monitoring of Natura 2000 sites.
Balancing conservation objectives with socio-economic activities to promote sustainable development.
Serving as a cornerstone of EU nature conservation policy and contributing to global biodiversity conservation efforts.
(Ministerie van Landbouw, Natuur en voedselkwaliteit, n.d.)

The **8th Environment Action Programme** is an EU initiative outlining strategies and actions to protect the environment and promote sustainable development. Key points:

Achieving 2030 greenhouse gas reduction targets and climate neutrality by 2050
Enhancing adaptive capacity and resilience to climate change
Advancing towards a regenerative growth model and circular economy
Pursuing a zero-pollution ambition for air, water, and soil
Protecting, preserving, and restoring biodiversity and natural capital
Reducing environmental and climate pressures from production and consumption
(European Union, 2023)

European Policy Analysis

The European Union recognizes the critical role of food production in light of population growth and shifting dietary habits. However, it acknowledges the imperative for agriculture to transition towards sustainability due to its significant environmental and climate impacts. European agricultural regulations aim to strike a balance between economic interests and environmental conservation, with the Common Agricultural Policy (CAP) being central to this endeavor. The CAP provides financial support to farmers while increasingly emphasizing sustainability requirements, including conditions for receiving subsidies and compliance with environmental and climate legislation. (European Commission, 2024)

Under the Green Deal, the EU aims to advance the sustainability of the food system through various measures targeting pesticide reduction, sustainable farming practices, and circular agricultural production. Strategies like the Farm to Fork and Biodiversity Strategy set ambitious targets for reducing pesticide use, promoting organic farming, and enhancing biodiversity conservation. Additionally, the EU supports organic agriculture through regulations and financial assistance, with the goal of allocating 25% of agricultural land to organic farming by 2030.

Furthermore, regulations address specific areas such as water reuse in agriculture, crop protection, and fertilizer use to mitigate environmental risks associated with farming activities. The circular bio-economy approach encourages resource efficiency and waste reduction in agriculture, with measures promoting the use of organic waste for energy production and incentivizing sustainable practices.

Decentralized governments play a crucial role in implementing agricultural policies, addressing challenges like nitrogen emissions, water pollution, and land use planning. They can support the agricultural sector through subsidies, infrastructure investments, and regulatory oversight, ensuring compliance with EU rules while fostering sustainable agricultural practices.

Figure 3.14: Key Objectives of the CAP (2023-2027), Source: (EU Agriculture and Rural Development)

Key Points:

CAP Common Agricultural Policy (CAP) provides financial support to farmers while incorporating sustainability requirements.

GD The Green Deal aims to promote sustainable farming practices and reduce environmental impacts across the food system.

Strategies like "Farm to Fork" and the Biodiversity Strategy set targets for pesticide reduction, organic farming promotion, and biodiversity conservation.

EU regulations address areas such as water reuse, crop protection, and fertilizer use to mitigate environmental risks in agriculture.

Organic agriculture is supported through regulations and financial assistance, with the goal of allocating 25% of agricultural land to organic farming by 2030.

Decentralized governments play a vital role in implementing agricultural policies and supporting sustainable practices at the local level.

Agricultural Stakeholder Analysis

Farmers are a small actor in the overall agricultural sector. Moreover, they are very diverse with different type of farmers, such as dairy, meat or crop farmers, but also organic and farmers that use standard farming techniques. In contrast, many industries that are related to the agricultural sector are very big and therefore have more power. In addition, governments also have large power in shaping the agricultural sector through policies. In short, the farmer is a small spider in a big web on which it has little influence.

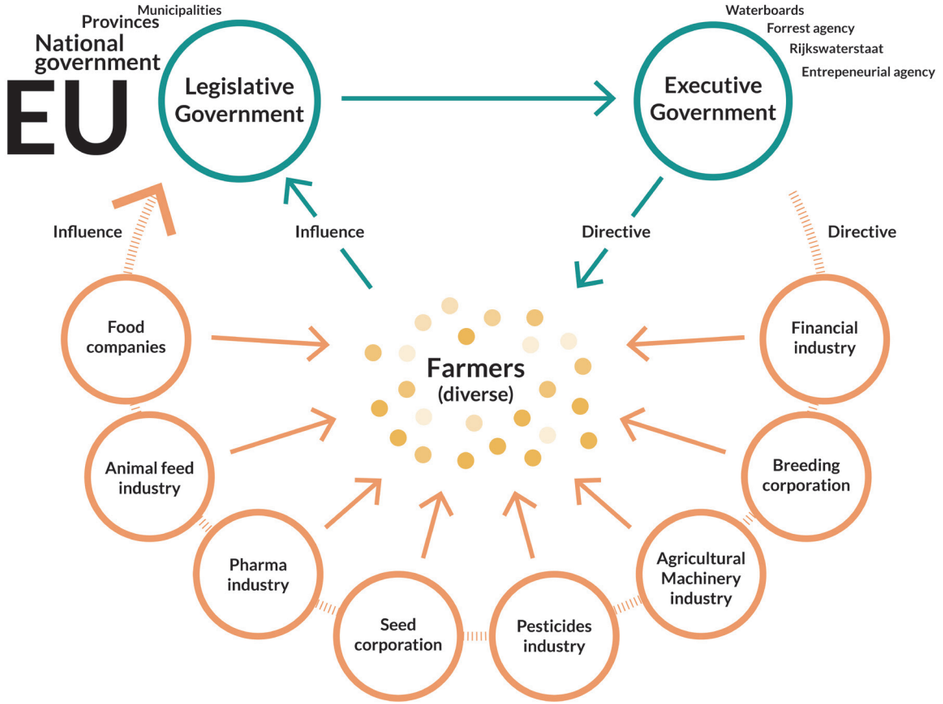


Figure 3.15: Stakeholder Analysis of the Agricultural Sector, Source: Illustration by author

Agriculture Timeline

The Dutch government has continually grappled with balancing the needs of farmers with environmental and societal concerns, leading to tensions and protests within the agricultural sector. The grievances of farmers often center around perceived regulatory burdens and economic pressures, while legislative efforts aim to address environmental challenges and promote sustainable agriculture. This timeline provides a concise overview of the evolving relationship between Dutch farmers and agricultural policy over the past decades.

Milk Quota and Overproduction
1970s-1980s

- Implementation of milk quota to curb overproduction. Farmers are limited in their milk production.
- Despite attempts to reduce milk surplus, overproduction remains an issue, leading to a milk surplus.

1992

- Implementation of the Common Agricultural Policy (CAP) by the European Union, which provides subsidies to farmers but also introduces quotas and environmental regulations.

McSherry Reform and Subsidies
2000s-2010s

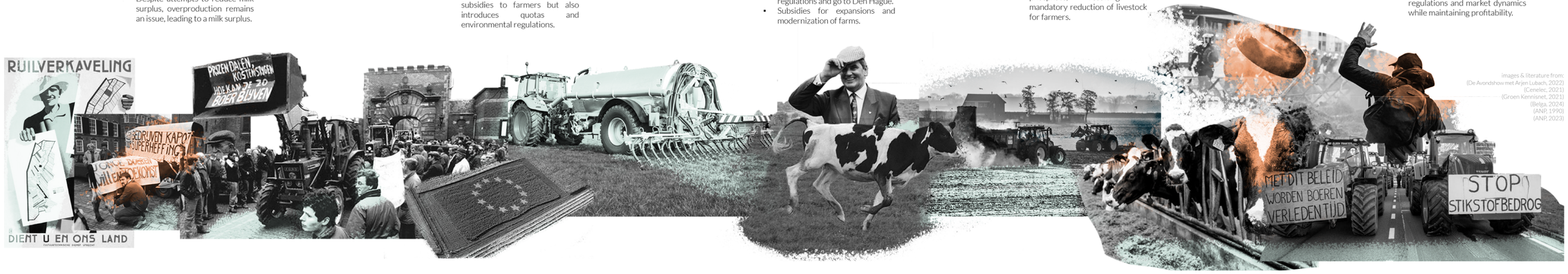
- Prices of agricultural products lowered, farmers receive subsidies per cow to compensate for income.
- Farmers express discontent and frustration with the changing agricultural policies and regulations and go to Den Hague.
- Subsidies for expansions and modernization of farms.

Phosphate Reduction Plan
2017

- Overproduction leads to excess phosphate, resulting in mandatory reduction of livestock for farmers.

2021-NOW

- Ongoing discussions and negotiations between farmers, government, and environmental organizations to find a balance between agricultural interests and environmental concerns.
- Adoption of new technologies and practices in agriculture to reduce emissions and improve sustainability.
- Persistent challenges for farmers in adapting to changing regulations and market dynamics while maintaining profitability.



Images & literature from:
(De Avondshow met Arjen Lubach, 2022)
(Cenelec, 2021)
(Groen Kennisnet, 2021)
(Belga, 2024)
(ANP, 1990)
(ANP, 2023)

Scale Enlargement and Land Consolidation
1945-1965

- Farmers are compelled to engage in land consolidation and scale enlargement under Minister Mansholt's policy to increase efficiency.
- Small farms are merged into larger units with one type of livestock or crops.
- Post-World War II reconstruction efforts focus on boosting agricultural production.

Fertilizer Law and Pig Law
1990s

- Intensive agriculture is restricted due to environmental concerns.
- Maximum levels for manure production and pig herds are introduced, with quotas and restrictions for farmers.

Late 1990s-2000s

- Dutch farmers face increasing pressure to comply with stricter environmental standards, including regulations on emissions and land use.
- Rising concerns among farmers regarding decreasing incomes and perceived bureaucratic burdens.

Abolition of Milk Quota
2015

- Liberation Day for farmers: milk quota is abolished, allowing farmers to produce as much milk as they want.
- Formation of interest groups such as Farmers Defence Force (FDF) to represent farmers' interests and organize protests.

Court's Nitrogen Ruling
2019

- The Netherlands must adhere to nitrogen rules, impacting farmers situated near nature reserves.
- Farmers' permits are revoked, rendering their businesses illegal or requiring them to be bought out.
- Farmers block highways and disrupt traffic in major cities to draw attention to their grievances.

Zooming in

The focus areas are selected based upon the characteristics of soil, water, nature, agriculture. The previous analyses of these characteristics have resulted in the selection of two focus areas, the Oosterschelde and the Biesbosch as seen in figure 3.18.

Oosterschelde

The Oosterschelde is a former estuary of the Scheldt river. Due to the construction of the Oosterschelde surge barrier and the Oyster dam completed in 1986 this relation changed. The Oosterschelde is now separated from the river regulated connection with the sea creating a brackish ecosystem with some tidal influence. This unique ecosystem has been given a Natura2000 protected status. The waterbody is surrounded low lying land that is protected by dykes. The primary land use is agriculture which is mainly focused on crop cultivation, but also has some livestock farming. Due to the low lying land the area is experiencing salinization of the groundwater, creating challenges for agriculture. The soil consists of poldervaag that has a lot of sea clay.

The unique brackish water conditions and its interrelations with nature and agriculture make the Oosterschelde a very interesting test case for synergizing nature and agriculture.

Biesbosch

The Biesbosch is a Natura2000 protected natural area near the city of Dordrecht. The delta of the Meuse and Rhine river cross right through it creating unique wetland conditions. Due to the fluctuations in water levels of the river, the area also has a very dynamic relationship with the water. This unique water conditions allow for a variety of nature. The Natura2000 area is surrounded by large patches of agricultural land with a mix of crop cultivation and livestock farming. The soil is composed of Poldervaag soil which is the most common subclassification of soil types in the Netherlands.

These unique interrelations of nature, agriculture, water and soil make the Biesbosch a perfect test case to synergize the connection between nature and agriculture.

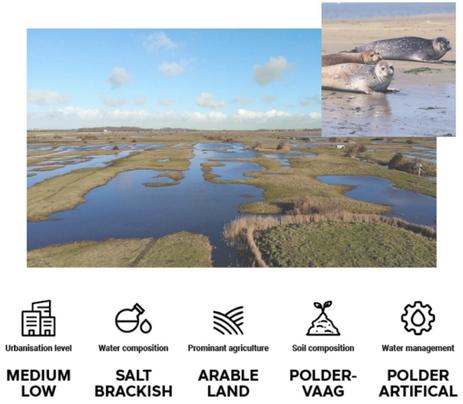


Figure 3.16: Characteristics of the Oosterschelde area. Images by: Jacobusse (2022)

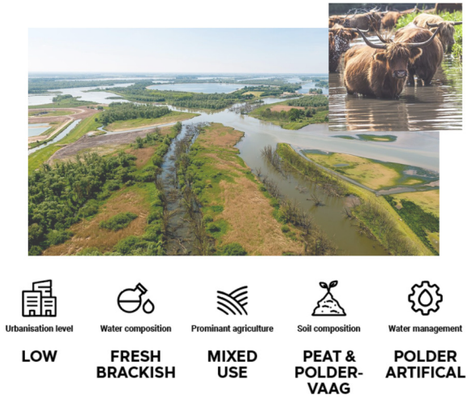


Figure 3.17: Characteristics of the Biesbosch area. Images by: Redactieholland.com (2023). Source for icons: (www.thenounproject.com)

Figure 3.18: Clusters of soil, water, land use and geographic conditions showing the two zoom in areas of the Biesbosch and Oosterschelde. Sources: (CLC 2018, Bodemdata, and EuroCrops)

Biesbosch Water

The Biesbosch is the meeting point of the Nieuwe-Merwede and the Amer which combine into the Hollandsche Diep. Because of this, the area has a strong relationship with water. This is most evident in the Natura2000 area of the Biesbosch where the flows of water create a unique ecosystem. The dynamism of the water also poses risks. Due to higher fluctuations in water levels of the river the availability water and safety pose potential problems. Moreover, the over nutrification of the soil by manure and artificial fertilizer poses risk for the quality of the water.

The water in the area is managed primarily by four parties, Rijkswaterstaat, national water management and three waterboards. The management of the water can be characterized by safety, quality and access of water, the points of interest regarding water management can be seen in figure 3.19.

Safety

1. Pastures that also function as floodplain during high water discharge of the river

2. Flood risk from the rivers.

Availability

1. Evides produces drinking water in the area.

2. Surface water and ground water is used to irrigate crops.

3. The rivers are used as transportion routes.

Quality

1. The natural area of the Biesbosch is strongly affected by the quality of the water.

2. Nutrient runoff from pastures and arable land poorly effects the quality of the water.

3. Purified sewage water is dicharged in the river.

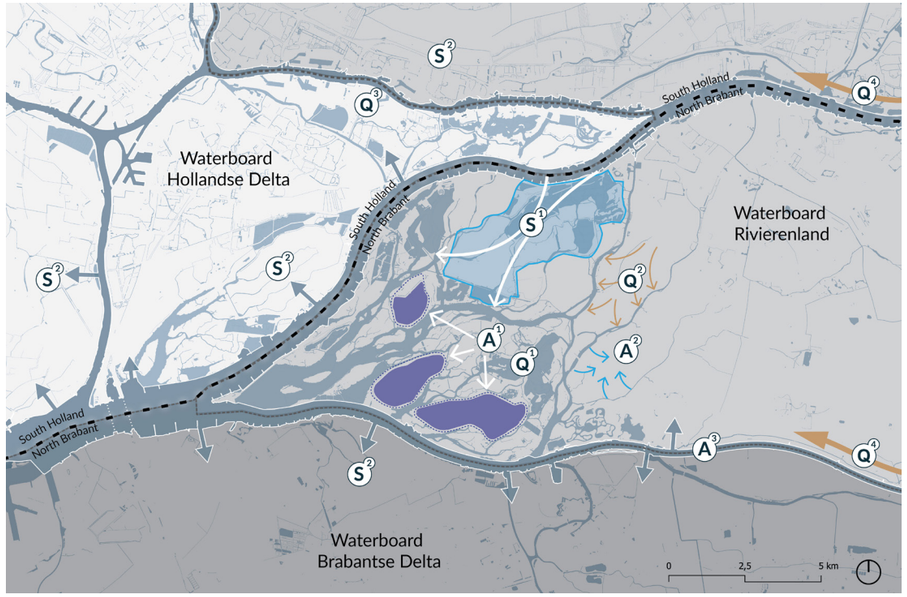


Figure 3.19: Watermanagement Biesbosch. Source: own map based on OpenStreetMap contributers

Oosterschelde Water

The Oosterschelde is a former estuary of the Scheldt river. Since 1986 the waterbody is closed off from the river by a dam and has a regulated connection with the sea through the storm surge barrier, the Oosterscheldekering. This creates a unique brackish condition that results in a unique ecosystem. However, this Brackish water also creates a risk. Due to a rising sea level and the accompanied increased pressure of the seawater the ground is salinizing. This is exacerbated by longer dry periods due to climate change, putting a strain on the availability of fresh water. Additionally, the rise in sea level creates a higher flood risk.

The water in the area is managed primarily by two parties, Rijkswaterstaat, national water management and one waterboards. The management of the water can be characterized by safety, quality and access of water, the points of interest regarding water management can be seen in figure 3.20.

Safety

1. The storm surge barrier Oosterscheldekering regulates the inlet water from the sea and can be closed off.

2. The dunes form a natural barrier for the sea

3. The land in Zeeland is seperated from the Oosterschelde by dykes.

Availability

1. The agricultural land is dealing with a lack of fresh water for the irrigation of crops.

Quality

1. The pressure form the brakkish water in the Oosterschelde causes salanization in the polders.

2. The tidal influence from the sea creates a unique ecosystem.

3. Wetlands behind the dykes .

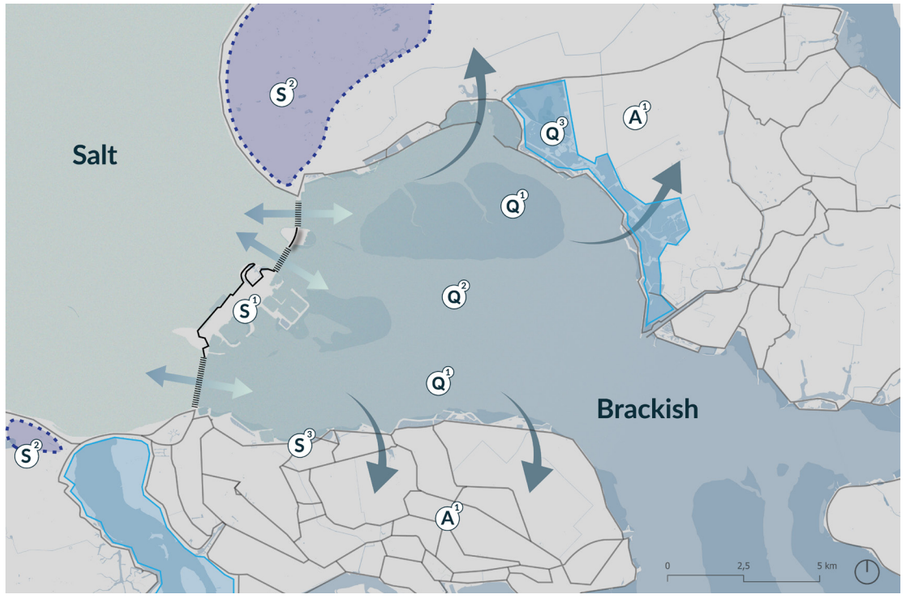
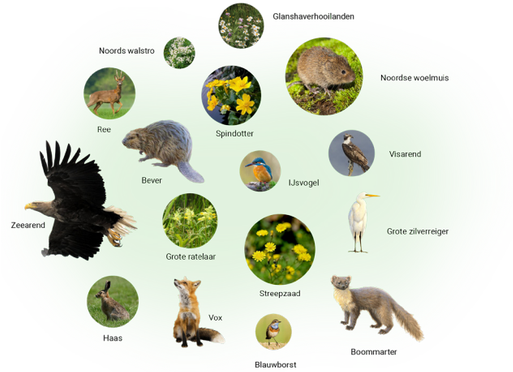


Figure 3.20: Watermanagement Oosterschelde. Source: own map based on OpenStreetMap contributers

Biesbosch Nature

The Biesbosch is characterized by large differences in altitude and gradients. The area comprises nutrient-rich and wet soils in the valley, with hay meadows and forested areas. The higher, dry slopes consist of nutrient-poor upper halves and more nutrient-rich lower halves. Despite changes caused by the Delta Works, the Biesbosch retains its botanical and faunal qualities. Only in the Sliedrechtse Biesbosch is there still a tidal difference of about 70 cm. The dynamics changed into a marshland after the Delta Works. Despite the disappearance of certain ecosystems, the Biesbosch remains valuable for various bird species. It is a breeding and resting area for, among others, the bluethroat, marsh harrier, spoonbill, and various waterfowl. (Ministerie van Landbouw, Natuur en Voedselkwaliteit, n.d.-a)



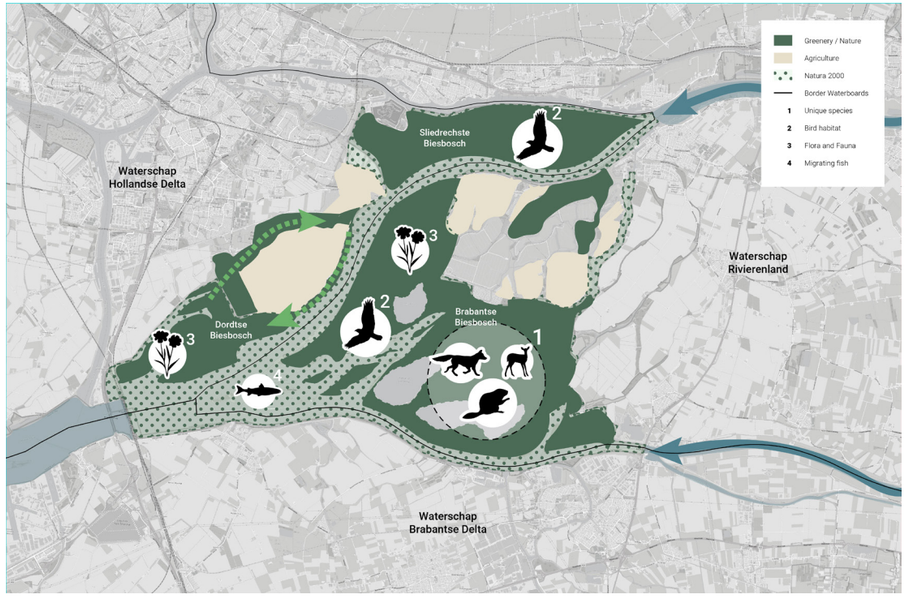


Figure 3.21: Watermanagement Biesbosch with known species present. Source: own map based on OpenStreetMap contributers

Oosterschelde Nature

In 1986, the Oosterschelde was closed off from the sea by a storm surge barrier, which still allows tidal activity to some extent. As a result of tidal currents, erosion and sedimentation processes occur, resulting in a varied pattern of salt marshes, mudflats, and intertidal areas. These areas mainly consist of moist grasslands and open water. The water, intertidal zone, and inland areas together form the habitat for the rich flora and fauna of the region. The large variety of environmental types in the area is accompanied by a great diversity of animal and plant species. This diversity of environmental types is determined by factors such as tides, currents, water temperature, altitude, water quality, and sediment composition. (Ministerie van Landbouw, Natuur en Voedselkwaliteit, n.d.)

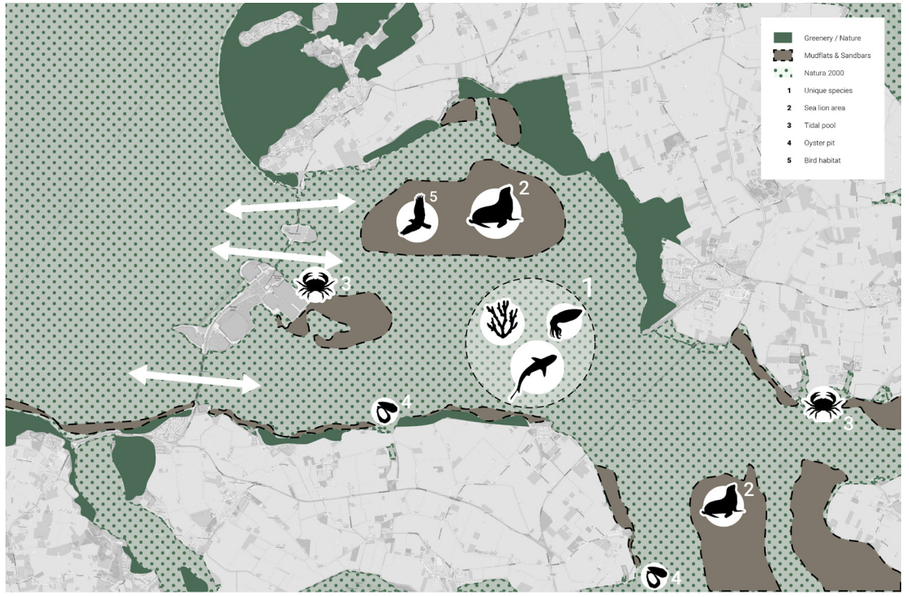


Figure 3.22: Watermanagement Oosterschelde with known species present. Source: own map based on OpenStreetMap contributers

Biesbosch Agriculture

The regional land-use analysis of the Biesbosch and it's surroundings reveals a landscape characterized by distinct features. At its core lies the Biesbosch National Park, serving as a vital habitat for wildlife and a key element in water management due to its extensive wetlands. Surrounding the park are meandering pastures and arable polders, contributing to the region's agricultural tapestry.

Notably, the Biesbosch serves multiple functions beyond wildlife preservation and flood mitigation. It also acts as a significant source of fresh drinking water and incorporates pasture landscapes, demonstrating a blend of human and natural elements.

Urban areas are strategically situated along riverbanks, facilitating harbor activities within their industrial districts. For visitors seeking to understand the ecological and practical importance of the region, a visitor centre located within the park offers educational resources.

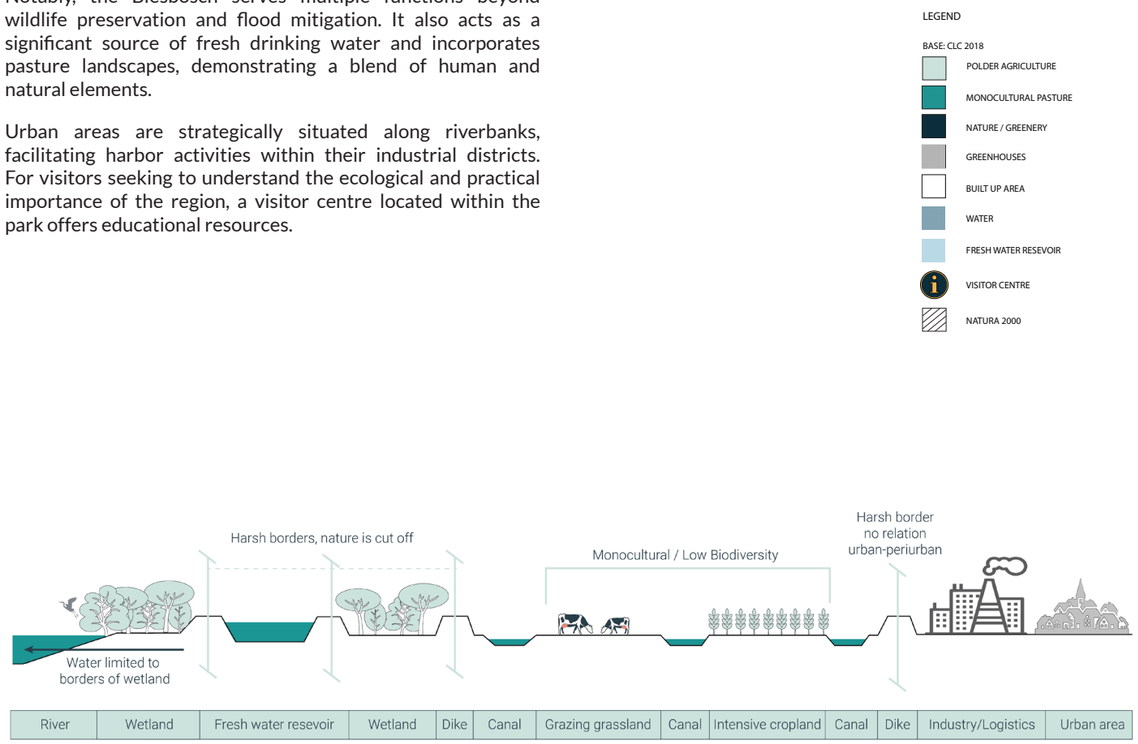


Figure 3.23: Land-Use Section Biesbosch

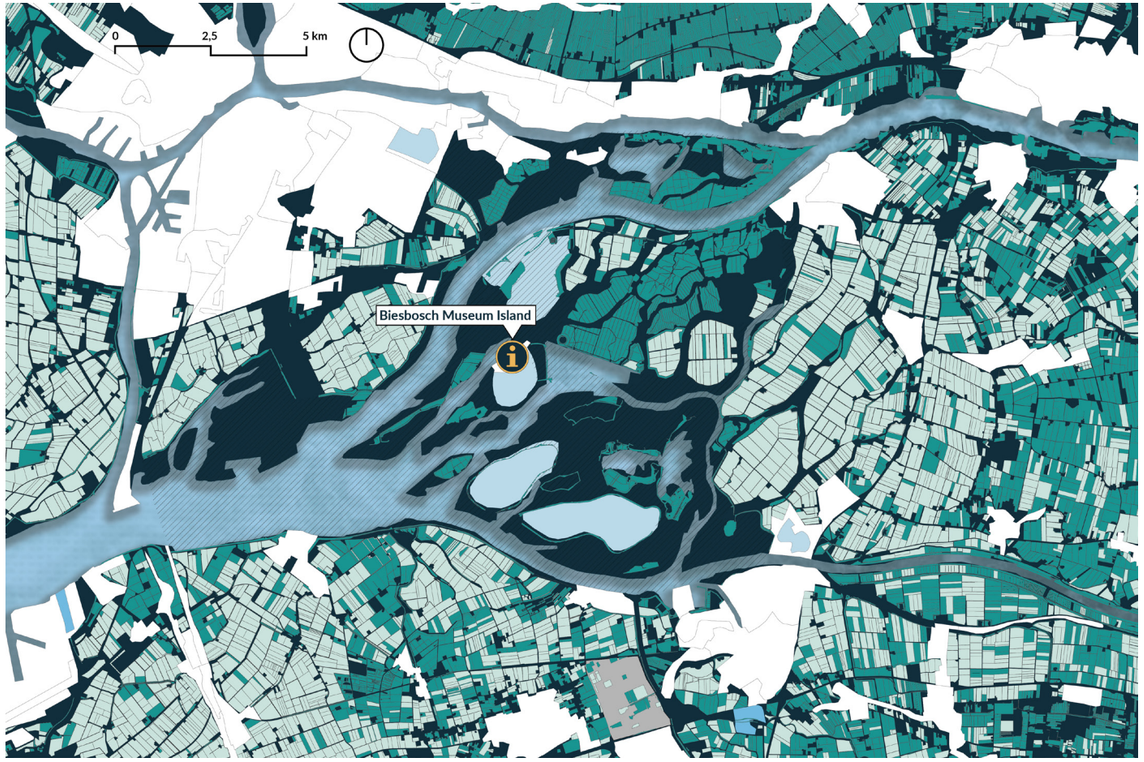


Figure 3.24.: Land-Use Map Biesbosch

Oosterschelde Agriculture

The land-use analysis of the Oosterschelde region reveals a landscape shaped by natural, human, and engineered factors. Positioned within the Dutch delta, the Oosterschelde estuary serves as the convergence point for three significant European rivers: the Rhine, Meuse, and Schelde.

Bordering the delta's saline waters are natural buffer zones comprising dune-scapes and wetlands, crucial for mitigating tidal and storm surge impacts on inland areas. Beyond these zones, the landscape is predominantly characterized by arable polders, where freshwater crops, which are in conflict with the scarcity of freshwater (p.29), are cultivated, interspersed with grassland pastures for cattle grazing.

Urban centres are distributed across the region, interconnected and featuring industrial zones with logistical infrastructure and workplaces reflecting local economic activities.

The Oosterschelde delta is safeguarded by the Dutch Delta Works, a notable engineering endeavour designed to regulate water flow and protect against storm surges (Ministerie van Infrastructuur en Waterstaat, 2024). Atop these structures sits the Neeltje Jans museum, providing educational insights into the Delta Works' significance and commemorating the 1953 flooding event that spurred their construction (Museum Watersnoodramp - Deltapark Neeltje Jans, 2022). This centre serves as an informative resource for visitors seeking to understand the region's historical and environmental context.

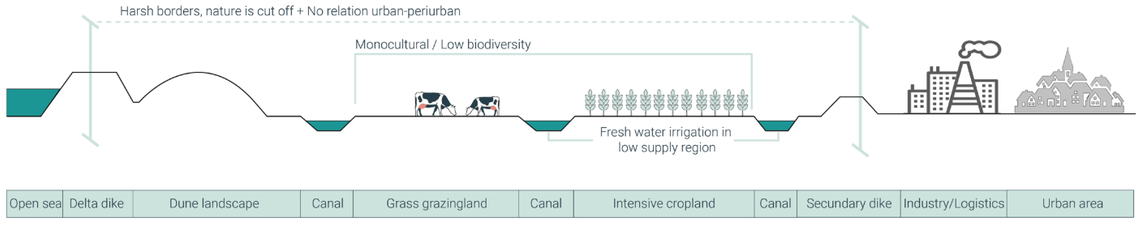


Figure 3.25: Land-Use Section Oosterschelde

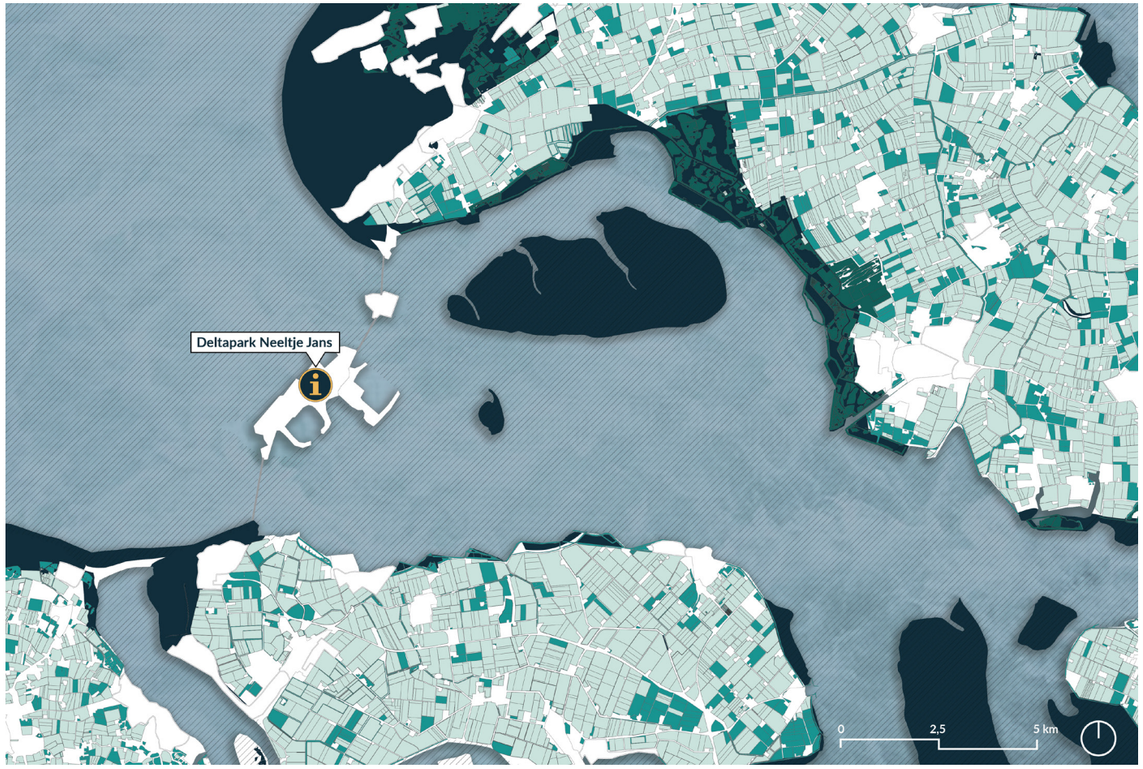


Figure 3.26: Land-Use Map Oosterschelde

Conclusion - Zoom in areas

In conclusion, our analysis of the urban-regional dynamics in the Biesbosch and Oosterschelde areas of the Netherlands reveals a complex interplay of environmental, economic, and social factors. The Biesbosch area faces challenges stemming from monocultural agricultural practices and the resultant nutrient overloading, exacerbating eutrophication. While wetlands provide some flood mitigation, their efficacy is hindered by rigid borders. Additionally, the proximity of industrial zones and harbours poses a threat of pollutant leakage into the natural environment. Moreover, rapid population growth necessitates urban sprawl, further encroaching on natural spaces. Similarly, the Oosterschelde area grapples with monocultural agriculture and freshwater demands in a saline environment, rendering it susceptible to droughts during water scarcity. Both regions share water-related challenges and confrontations with urban expansion pressures. Addressing these issues requires holistic approaches that prioritize sustainability, biodiversity conservation, and balanced urban development to safeguard these vital ecosystems for future generations.

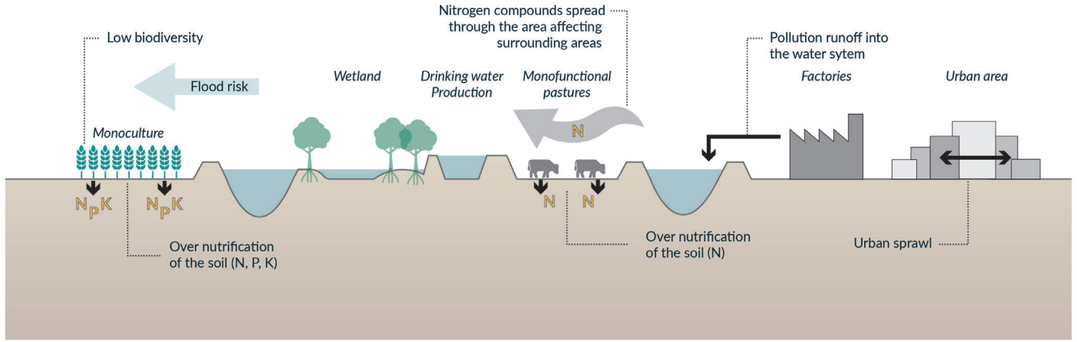


Figure 3.27: Conclusions Section Biesbosch

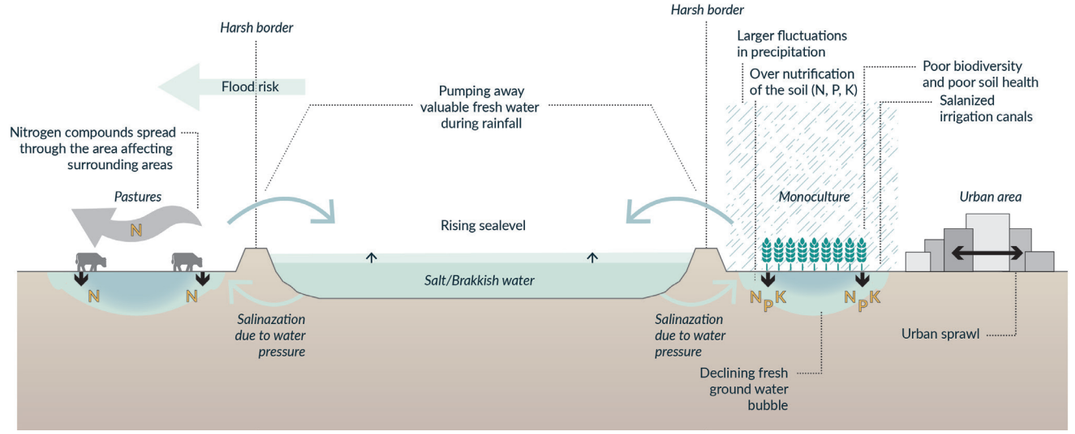


Figure 3.28: Conclusions Section Oosterschelde

SWOT Analysis

STRENGTHS

1. Presence of biodiverse landscapes protected by Natura 2000.
2. High green percentage.
3. Existing systems of water purification and distribution.
4. Existing system in place for flood mitigation.

WEAKNESSES

1. Mono-functional land use.
2. Soil depletion due to intense agricultural practices.
3. Season-bound productivity of land.
4. Minimal transition between agriculture and natural areas.

OPPORTUNITIES

1. Opportunity to expand existing water management systems, including wetlands.
2. Large areas with permeable surfaces and no pavers.
3. Adjacency of agriculture and Natura 2000.
4. Communal identity driven spirit within farmers and residents.

THREATS

1. Agricultural runoff (NH4, PO4 and more).
2. Chemical runoff from nearby industries.
3. Disconnect between natural, agricultural, urban, and industrial areas.
4. Reduced fresh water supply due to contamination and salinization.

One of the main observations from our analysis is that agricultural areas are adjacent to Natura 2000 areas which is a threat as pollutants such as NO2 contaminate the soil and water. We aim to turn this adjacency into an opportunity by integrating nature within agriculture through sustainable farming practices such as agroforestry and strip farming, while minimizing nitrogen production by rewilding cattle. To manage flood risk, we also aim to use existing water management systems, including wetlands and floodplains, while maximizing their productivity through increased saline farming and seasonal crop rotations. The concentration of these threats and opportunities can be seen more around the Biesbosch and Oosterschelde areas, which became our main strategic locations.

Figure 3.29: SWOT analysis map.

Image by Floyd Shazly

04
ENVISIONING AGRINATURE

Human and Nature

+ Empowered Farmers form **local co-management bodies** to have a greater voice

+ Farmers **share resources** such as crops, seeds and fertiliser to minimise waste and optimise use of agricultural land

+ Regulation of policies / subsidies to allow farmers to become **caretakers of nature**

+ **Expansion of wetlands** along the shoreline to allow further flood mitigation and NO2 absorption. Salt tolerant crop farming also flourishes

+ **Phasing out livestock** industry by abolishing cattle farming and moving towards a protein transition

+ **Purification by plants** on canal/ ditch banks delineating fertilized farmland

+ **Intensify production** of crops, meat and dairy in areas called "Agroparks" which are shared by farmers

+ **Extensify production** to integrate agriculture with nature by incorporating methods like agroforestry, pixel farming, strip cultivation

+ **Rewilding the cattle**

+ Creating **biodiverse vegetative borders** along rivers to strengthen soil and mitigate floods

Resilience through the Commons

Vision Statement

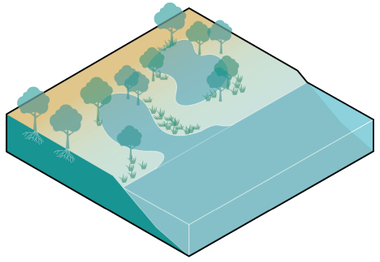
In 2040, agricultural practices in the Dutch delta region have evolved into a symbiotic relationship with nature, driven by the innovative concept of AgriNature. Nature regeneration is actively pursued through methods such as nature-based flood mitigation, water purification, and nature-inclusive farming. Livestock farming is gradually shifting towards extensification, with plans to phase out the industry altogether, as alternatives like lab-grown meat are being researched. Farmers are joining forces to experiment and expand innovative practices such as saline agriculture, agroforestry, and strip farming, supported by EU subsidies. Additionally, agrotourism initiatives aim to raise consumer awareness about this sustainable protein transition.

By 2060, the principles of AgriNature have spread beyond the Dutch delta region to a national scale. Local farmers, liberated from the economic dominance of industrial agriculture, have become stewards and regenerators of ecosystems. Expanded natural areas, including wetlands, floodplains, and forests, now form a dense ecological network. Farmers continue to share their knowledge through 'Agroparks', fostering collaboration among peers and educating consumers. The human diet has shifted towards plant-based foods and lab-grown meat as protein sources, leading to a phased-out livestock industry and the rewilding of cattle in designated areas within the new nature network. Consumers have access to lab-grown meat and various plant-based protein alternatives. Sustainable farming practices have become mainstream, supported by flexible policies and subsidies.

In 2100, the established research and development network persists in innovating to adapt to changing natural conditions. By intensifying natural cycles in collaboration with farmers, soil health is promoted, clean water is ensured, and biodiversity flourishes once again, harmonizing with site-specific, natural water and soil cycles.

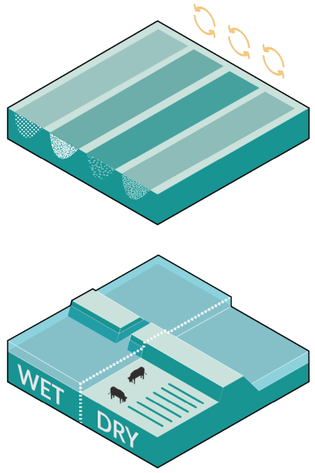
Building Blocks

To envision the spatial implications of our objectives we have created building blocks on a small spatial scale. These building blocks are divided into two sets. The first set focusses on collaboration between farmers. The second set focuses on collaboration with nature.



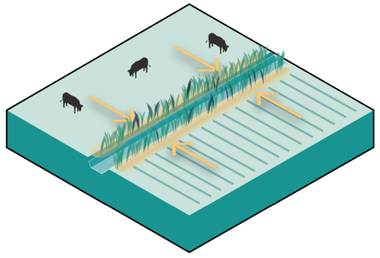
1 FLOOD MITIGATION

- Biodiverse borders
- Natural water retention



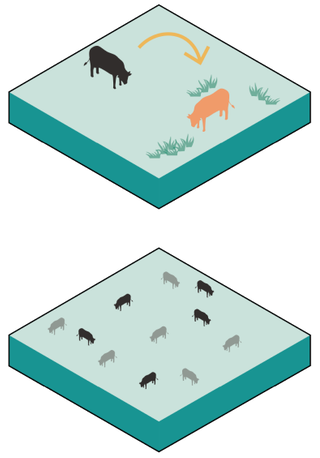
2 ADAPTATION SOIL & WATER

- Working with natural conditions
- Crop selection based on site conditions
- Seasonal crop rotation



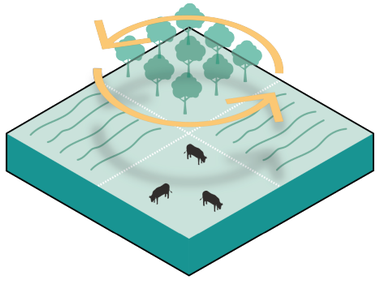
3 PURIFICATION

- Catching run off at the source
- Purifying plants along the water



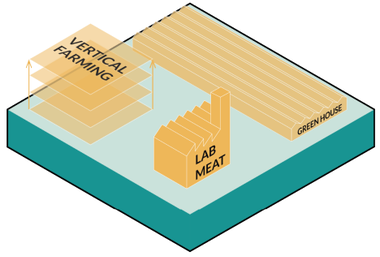
4 PHASING OUT LIVESTOCK INDUSTRY

- Responding to protein transition
- Reduction of cattle
- Rewilding cattle



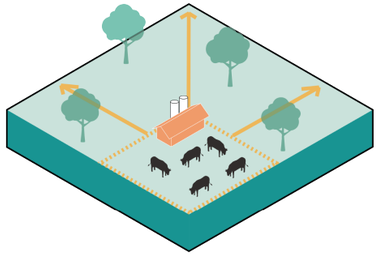
1 CO-MANAGEMENT OF RESOURCES

- Collectively practice agriculture and nature conservation



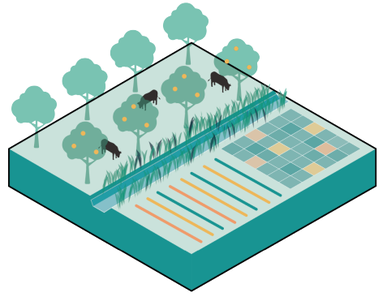
2 CLUSTERING INTENSIFIED PRODUCTION

- Agroparks are shared by farmers
- Intensive food production to meet demand



3 EXTENSIFYING PRODUCTION FARMLAND

- Space to include nature
- Farmers become shepherds of nature



4 COMBINING LAND USES

- Agroforestry
- Establishing biodiversity network
- Strip farming
- Pixel farming

Stakeholder Analysis Overview

The current imbalance of power among stakeholders must shift to achieve more sustainable and healthy practises.

By mapping the stakeholders and placing them in a power interest diagram, we aim to understand and visualize the relationships and dynamics between key actors in our initiative. Who holds the most influence, where do interests align or conflict, and how can power be redistributed to achieve more sustainable and equal outcomes.

Agro-Industry leaders currently wield excessive influence driven primarily by profit motives. Our aim is to recalibrate this power dynamic, fostering a landscape where Agro-Industry leaders prioritize sustainability over profit, thus fostering a more equal relationship with farmers enabling them to operate freely and independently from these leaders.

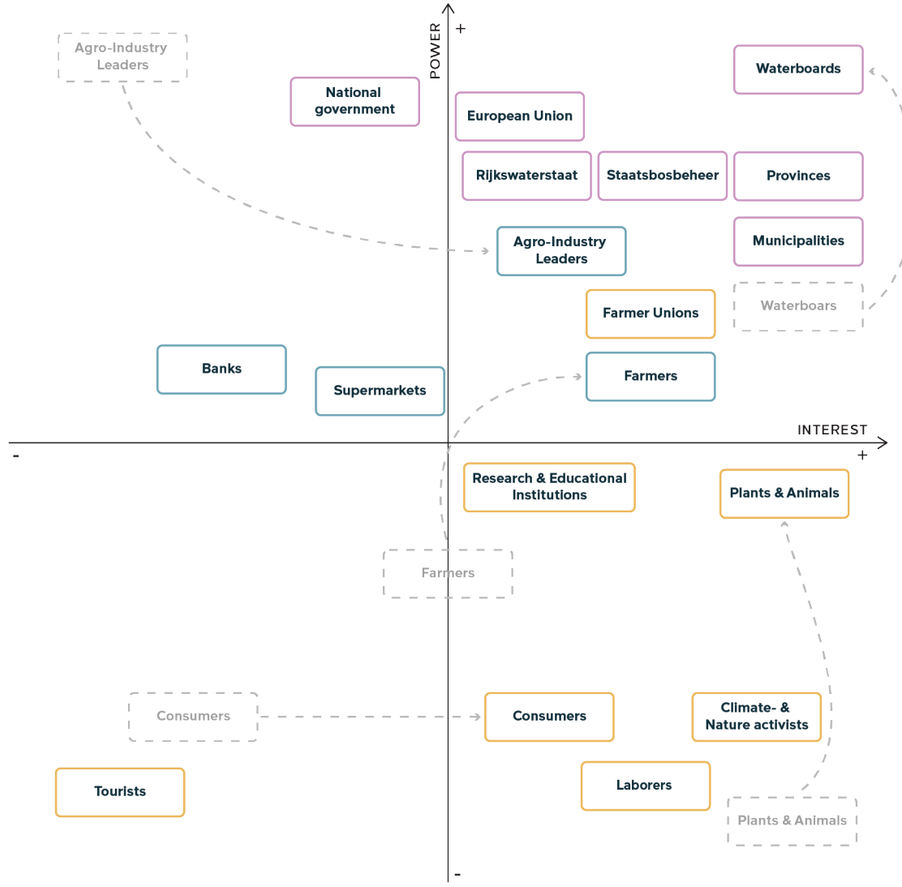
Waterboards, with their pivotal role in water resource management, are poised to lead in the implementation of AgriNature practices, needing a boost in their authority.

Consumers, crucial players in the demand chain, must become more aware of these issues, driving change through their choices.

Lastly, we advocate for a paradigm shift where plants and animals have greater rights, fostering harmonious coexistence with humanity.

Civil	Private	Public
Research & Educational Institutions Interest: Advance agricultural knowledge, innovation, and sustainability through research and education	**Plants & Animals** Interest: Survive, change current practises and restore ecosystems for biodiversity and ecological balance.	**National Government** Interest: Balance agricultural policy to support farmers and comply with EU regulations ensure food security, stimulate and economic growth
Climate- & Nature activists Interest: Promote environmental conservation, biodiversity, and climate resilience within agricultural practices.	**Farmers** Interest: Diverse group of farmers, mainly dedicated to cultivating and harvesting crops or raising livestock efficiently to sustainably meet market demands while ensuring profitability and environmental stewardship.	**Staatsbosbeheer** Interest: Manage and conserve national forests, nature reserves, and landscapes for ecological, recreational, and cultural purposes.
Farmer Unions Interest: Advocate for fair wages, government subsidies, and sustainable farming practices to support agricultural communities.	**Supermarkets** Interest: Advocate for fair wages, government subsidies, and sustainable farming practices to support agricultural communities.	**Rijkswaterstaat** Interest: Manage water resources and infrastructure to prevent flooding, ensure water quality, and support agriculture.
Tourists Interest: Experience and appreciate agricultural landscapes, culture, and activities while contributing to local economies.	**Banks** Interest: Providing financial services, and facilitating economic growth through lending, investment, and wealth management strategies.	**Provinces** Interest: Manage regional resources, infrastructure, and policies to support agricultural development and environmental conservation.
Consumers Interest: Access affordable, quality produce while prioritizing ethical and sustainable consumption practices.	**Agro-Industry Leaders** Interest: Maximize profits through large-scale agricultural operations and market dominance.	**Waterboards** Interest: Manage water levels, quality, and distribution to support agriculture, prevent flooding, and protect the environment.
Laborers Interest: Secure fair wages, safe working conditions, and job security within the agricultural sector.	**European Union** Interest: Ensure regulatory compliance, sustainability, and economic stability within member states.	**Municipalities** Interest: Ensure efficient infrastructure and services to support local agriculture and economic development.

Power-Interest Dynamics



Pioneers

Agroforestry

Agroforestry is the combination of woody plants with crop cultivation or livestock on the same plot. In the Netherlands this also involves food forests and agriculture that exclusively cultivates perennial crops. Wageningen University and Research (2022) writes that the practice has ecological as well as economic benefits. The practice has positive effects on the biodiversity and soil conditions. Moreover it diversifies a farmer's income making them financially more resilient.

The Netherlands has an organization, called Agroforestry Netwerk Nederland, that aims to proliferate the practice agroforestry. The network is a collective of different stakeholders in the agricultural sector involving farmers, government, farmers interest groups and educational institutions. They aim to help more farmers adopt agroforestry by sharing knowledge of pioneering farmers through workshops, excursions and their website. Furthermore, they are collaborating closely with governments to make sure legislation doesn't interfere with practicing agroforestry (Agroforestry Netwerk Nederland, n.d.).

Figure 4.1: Young tree planted in a cattle pasture of the farm Tussen de Hagen in Stoutenburg, the Netherlands. By Tussen de Hagen (n.d.)

Salt Farming

Salt farming involves the practice of cultivating crops that are salt tolerant or salt loving. Brackish water is used, instead of fresh water to irrigate crops. This allows the cultivation of crops in areas that are salinizing due to sea level rise and/or more extreme droughts.

Saline farming is not yet widely implemented. On the island of Texel the Salt Farm Foundation (n.d.) is testing the tolerance of crops to salt. The foundation is an initiative of a farmer supported by different levels of government. The pilot has resulted in the, commercially viable cultivation of saline potatoes and carrots among others.

Figure 4.2: Example of the saline crops being sold. By: Tim ter Heide

Strip Cultivation

Strip and pixel cultivation involve the practice of mixing and rotating crops on one piece of land. Wageningen University & Research (2023) shows that strip cultivation has a big potential since it increases the yields from crops compared to when they would be grown monoculturally. Moreover, the practice improves biodiversity and makes farmers financially more resilient, because it spreads risk.

Strip cultivation is still very novel. There are 50 farmers that are experimenting with it in a practice network of Wageningen University & Research. However, only a handful employ the technique on a larger scale. The practice requires a lot of knowledge about the different crops and how they respond to specific site conditions. Expansion of strip cultivation is therefore moving slowly (ibid.).

Figure 4.3: Strip farming pilot at the farms of ERF near Almere in Flevoland. By ERF (n.d.)

Livestock Extensification

Extensification of livestock increases the amount of grazing space per animal. It decreases the amount of pollution per acre and allows for more nature inclusive pastures. Since the pastures can allow for more than just grass they allow for different plants improving biodiversity.

Staatsbosbeheer (the national forest agency) aims to improve the biodiversity and reduce the environmental pressure around the natural areas it manages. It is currently collaborating with 30 farmers around its reserves to implement more nature inclusive practices. Staatsbosbeheer leases their land to these cattle farmers to extensify their practice and compensates them for helping them manage the natural area. It aims to increase the amount of farmers involved to 80 by 2025 (Staatsbosbeheer, n.d.).

Figure 4.4: Extensified livestock at a farm that collaborates with Staatsbosbeheer to create more nature inclusive pastures. By Staatsbosbeheer (2022)

Anchors

Anchors serve as pivotal elements, embodying and empowering our grassroots AgriNature pioneers while encapsulating our driving factors. Defined as structural entities, our anchors play multifaceted roles in promoting innovation, raising awareness, celebrating culture, and fostering participation and partnership. To solidify our strategy and firmly embank our anchors in the sand, we aim to institutionalize them.

This institutionalization process involves both physical and conceptual dimensions. Physically, we envision the establishment of Agroparks and Regeneration hubs as tangible manifestations of our anchors. Conceptually, we aim to embed our principles in policy frameworks, consumer awareness initiatives and market dynamics. In this chapter, we elucidate the roles, functions, and institutional manifestations of our anchors, which include Living Labs in Agroparks which form our main Innovation and Education Centres. Supplementary to these are the Regeneration and Consumer Awareness Centres (see appendix).

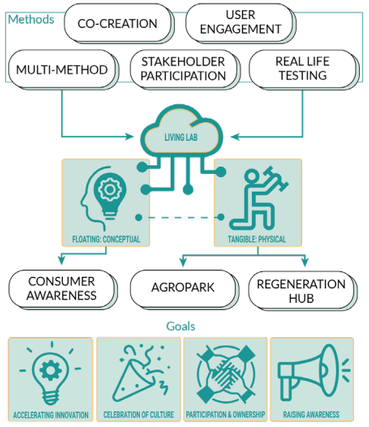


Figure 4.5: Organisational structure of the Living Labs and connections to Agroparks (Innovation & Education Centres), Regeneration Centres and Consumer Awareness Centres.

Innovation & Education Centre

(Peri-Urban)

The Innovation & Education Centre is a multifaceted space designed to facilitate the exchange of ideas, expertise, and resources among diverse stakeholders in the agricultural sector. At the heart of this center lies a commitment to innovation, where cutting-edge technologies and research initiatives intersect with traditional farming practices.

With key features such as knowledge sharing networks, research and development facilities, multi-stakeholder organisations, tech hubs and incubators, it engages communities such as farmers, researchers, students and tech companies, and gives them a platform to work together.

The Innovation & Education Centre serves as a catalyst for driving positive change in agriculture, bridging the gap between tradition and innovation, and empowering communities to embrace sustainable farming practices for a resilient and prosperous future.

Consumer Awareness Centre

(Urban)

The Community Engagement Centre serves as a vibrant hub for fostering connections, raising awareness, and promoting sustainable agriculture practices among diverse stakeholders, including consumers, farmers, and local communities. Rooted in the principles of education and collaboration this center offers immersive experiences that inspire appreciation for the vital role of agriculture in our daily lives.

With key features such as consumer awareness initiatives, farm-to-table experiences including culinary workshops, marketplaces for local products and farm tours, it engages communities such as farmers, local residents and consumers.

The Community Engagement Centre is more than just a place; it is a catalyst for social change, empowering individuals and communities to make informed choices that promote health, sustainability, and prosperity for generations to come.

Regeneration Centre

(Peri-Urban)

The Regeneration Centre serves as a collaborative hub for restoring ecosystems, enhancing biodiversity, and fostering dialogue among stakeholders committed to nature conservation and sustainable land management practices. With a focus on holistic regeneration and ecological restoration, this center provides a platform for innovation, research, and policy development at regional and national scales.

This center has key features such as research hubs for habitat assessments and ecological monitoring, policy developmeny and implementation for sustainable land-use practices and education and outreach programs. It brings together communities such as conservationists, government bodies, research institutes as well as local residents.

The Regeneration Centre serves as a catalyst for positive change, inspiring collective action and fostering a deeper connection to the natural world.

Existing Drivers

The current organisation of stakeholders is such that water and soil cycles, agriculture and natura 2000 areas are managed by various government bodies and form interconnected loops of communication (Ministry of Infrastructure and Water Management, n.d.). Pilot farmers are disconnected not only from other farmers, but also from ways to expand their practices through knowledge sharing and potential subsidies. The Dutch Farmers Association (LTOs) are the only mediators between policy makers and the farmers (Agriculture and Horticulture Organization of the Netherlands (LTO), 2024). The District Waterboards are beginning to expand their roles from water management to nature management including Natura 2000 areas. However, the latter is still largely controlled by the Ministry of Agriculture, Nature, and Food Quality (LNV) along with the Rijkswaterstaat – for wetland management- and the Staatsbosbeheer – for forests or dense areas (Staatsbosbeheer, 2024). While private stakeholders such as banks and food production companies still influence policy making, end users such as consumers are left out of the discussion.

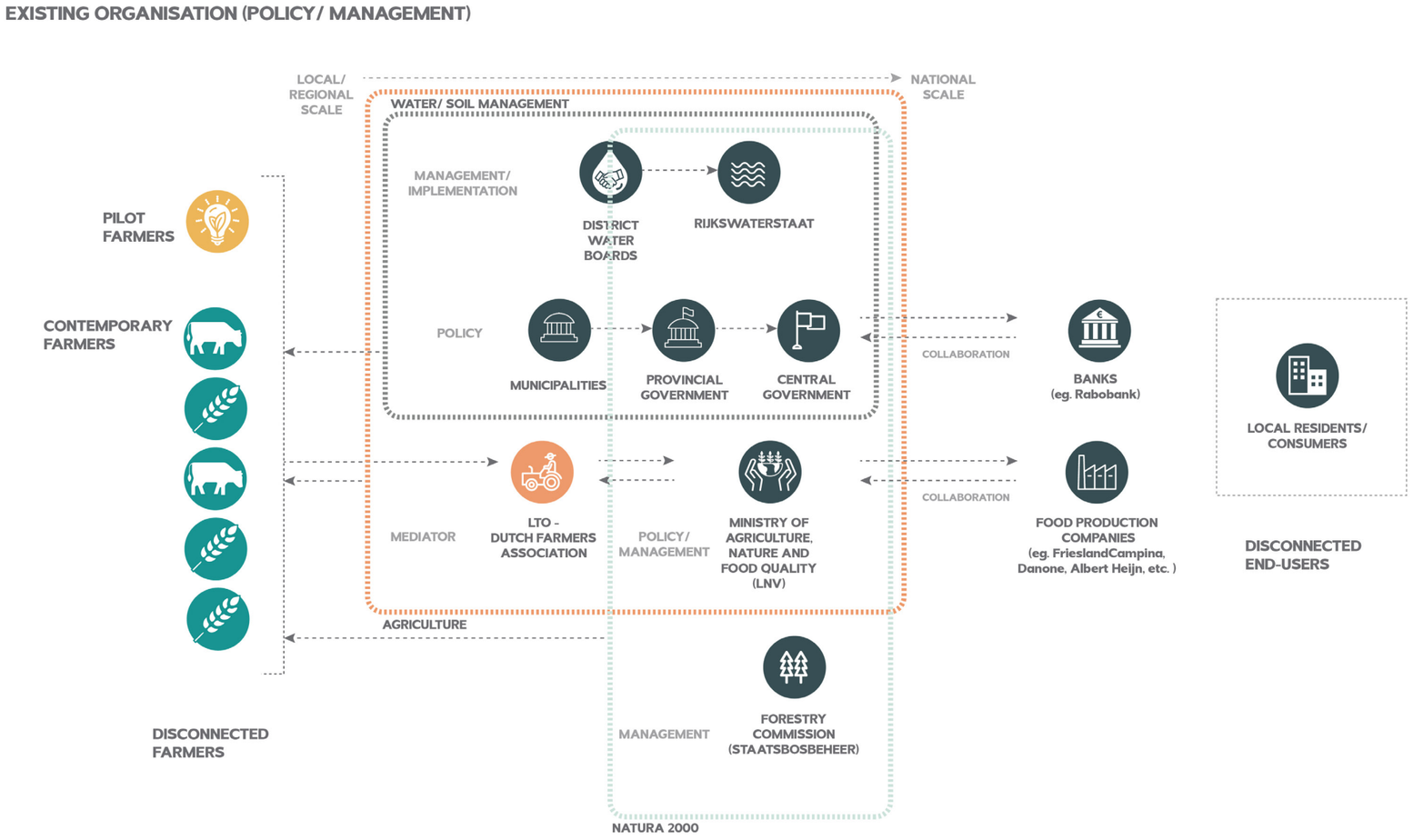


Figure 4.6: Existing organization of strategic elements. Source for icons: (www.thenounproject.com). Illustration by author.

Proposed Drivers

We propose a restructuring of the local stakeholders by giving a greater role to the District Waterboards and the LNV. Pilot farmers now form a knowledge, resource and technology sharing network with other contemporary farmers, called the Living labs. The District Waterboards, LTOs and LNV will all become mediators for these farmers and facilitate them in getting subsidies for their practices through flexible policy making. This will be possible because these mediators will be in communication with the Rijkswaterstaat, Central and Provincial Government as well as the Staatsbosbeheer (Forestry Commission). The interests of farmers will be protected, while they will also be connected to banks, food production companies and consumers to create effective change. Educational institutes within Agroparks will have a major role of collaboration with farmers to produce continued technological experimentation. Consumers will participate in initiatives and activities to make them more aware of the transition towards sustainable farming methods. Agroparks will thus embody all the networks and functional flows to ensure a future proof expansion of key locations on a regional and national scale.

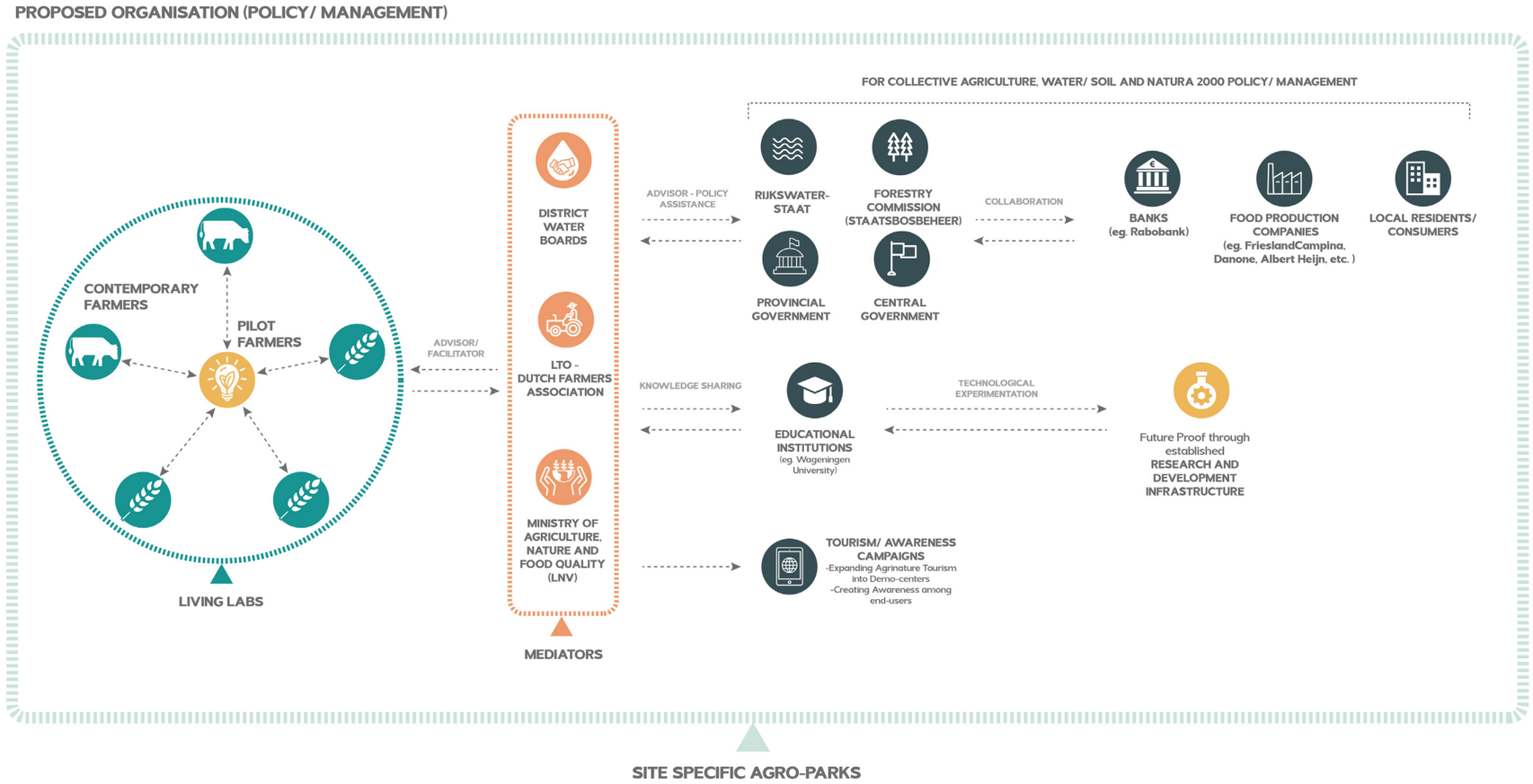


Figure 4.7: New organizational structure of strategic elements. Source for icons: (www.thenounproject.com)
Illustration by author.

Vision for AgriNature in the Delta

The Regeneration centres (Figure 4.8) are responsible for flood mitigation, water, and soil management, and monitoring the phasing of rewilding cattle. Using nature-based solutions to mitigate floods, wetlands and floodplains are expanded to improve water retention capacity, while biodiverse vegetative borders help strengthen dikes and prevent soil erosion by keeping the soil together. Rewilding of cattle is done through a network of eco-corridors and eventually there will be a larger concentration of these closer to the Groene Hart and Veluwe National Park, due to a higher green percentage.

The pilot farmers will collaborate with other farmers to form a Living Lab network (Figure 4.9). This will share its novel techniques and knowledge with Agroparks, which will then communicate these to other Agroparks. The Agroparks are proposed on existing educational institutions for this reason, and they become innovation centres that create awareness among other farmers, and stakeholders such as government bodies, private food production companies, banks and even consumers. By establishing an open chain of communication between all public and private stakeholders, these Agroparks will become the basis for introduction of more flexible policies and subsidies for farmers so they can continue practicing nature-inclusive agriculture.

In the next chapter we will zoom into the Oosterschelde and Biesbosch areas to define clear strategies and phases of implementation. We conclude our strategy on with the implications of this proposal on a national scale. Here the potential for global expansion will also be discussed.

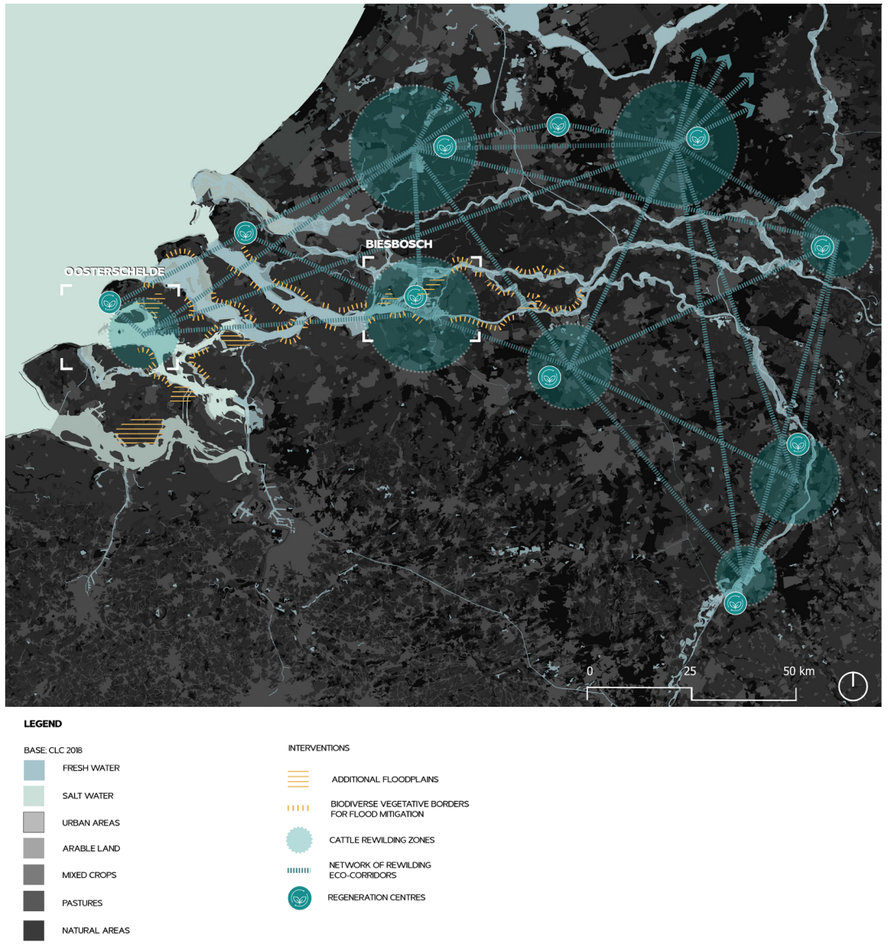


Figure 4.8: Vision Map: Nature Regeneration Network

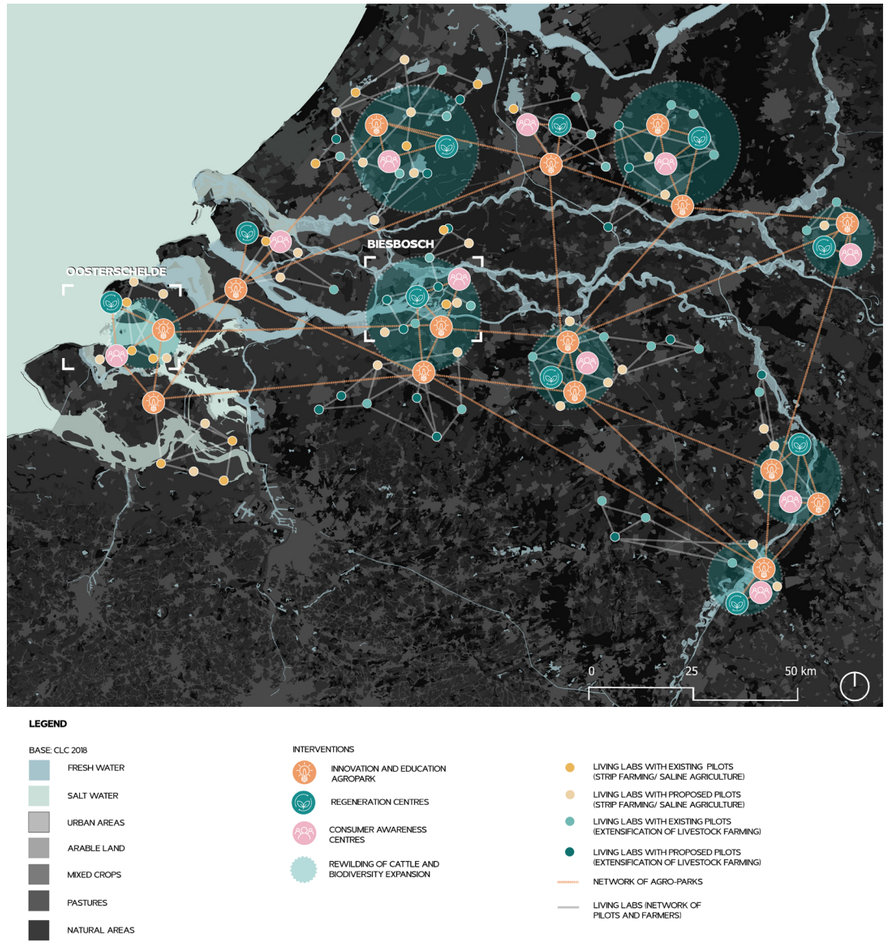


Figure 4.9: Vision Map: Innovation, Education and Consumer Awareness Networks

Image by Floyd Shazly

05
STRATEGIZING THE TRANSITION

Phasing In and Out

Based on the x-curve exercise presented by Dabrowski (2024) as a tool for understanding the stages of sustainability transitions we have divided the vision of our project into three domains of transition: the role of animals, power dynamics between farmers and policy makers, and respect for cycles and nature, shown in respectively figures 5.1, 5.2, and 5.3. Each of these are defined by the elements being phased in a phased out.

A particularly critical element we are proposing to phase in is the rewilding of livestock animals. It is important to go about this carefully as a previous project rewilding large herbivores at the Oostvaardersplassen in the Netherlands has famously backfired, leading to mass starvation necessitating human intervention supplementing feed or controlling the population by regular culling. Kopnina et al. (2019) reviews critically how this has turned Oostvaardersplassen into a recreational area characterized by meat production rather than a rewilded natural area, emphasizing how the inappropriate application of the term rewilding will only undermine its meaning by deeming high levels of human intervention acceptable.

Based on the lessons learned from the critical review of Oostvaardersplassen by Kopnina et al. (2019) we are proposing a transition that starts with the extensification of livestock and integration of livestock animals into natural areas. A practice that has already been initiated by Staatsbosbeheer (Natuurinclusieve Landbouw, z.d.). Through a smooth transition that will ultimately result in a rewilded scenario as human intervention is gradually phased out responding to the establishment of a healthy balance between the size of population and territory. A crucial condition therein is the possibility of migration for the animals.

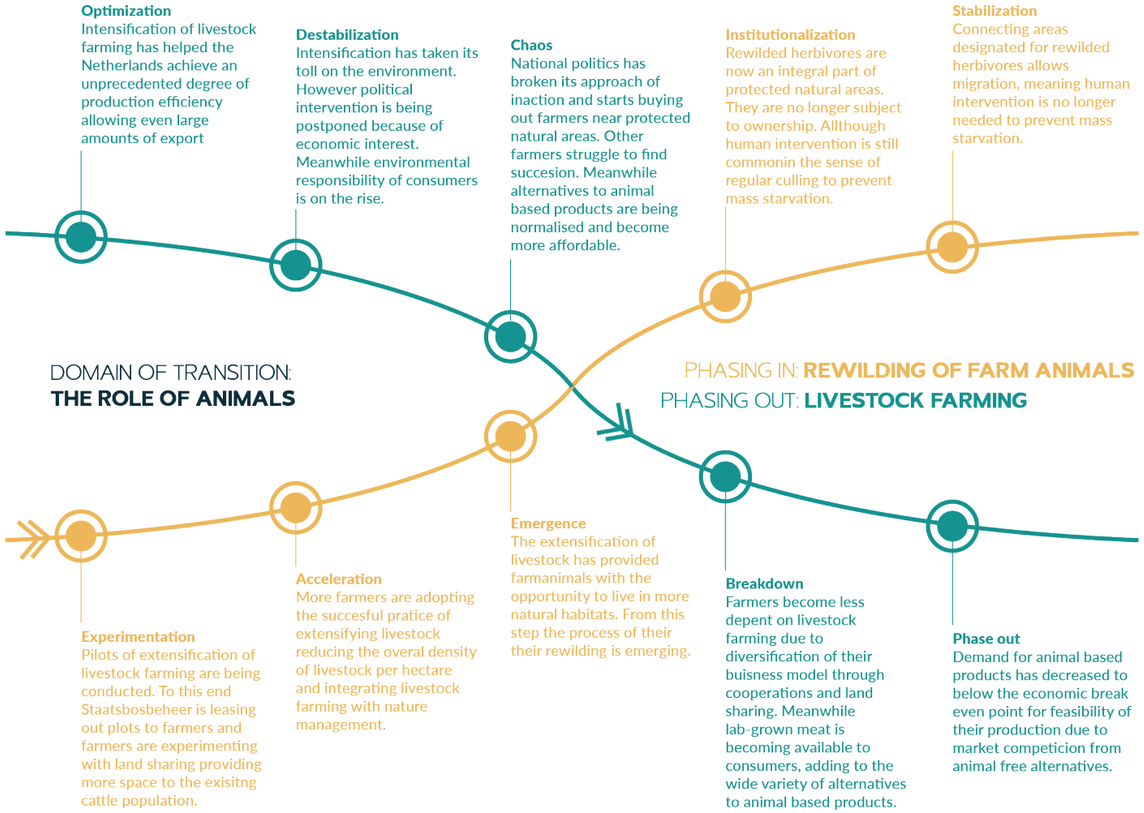


Figure 5.1: X-curve for domain of transition “the role of animals“, phasing in rewilding and phasing out livestock farming.

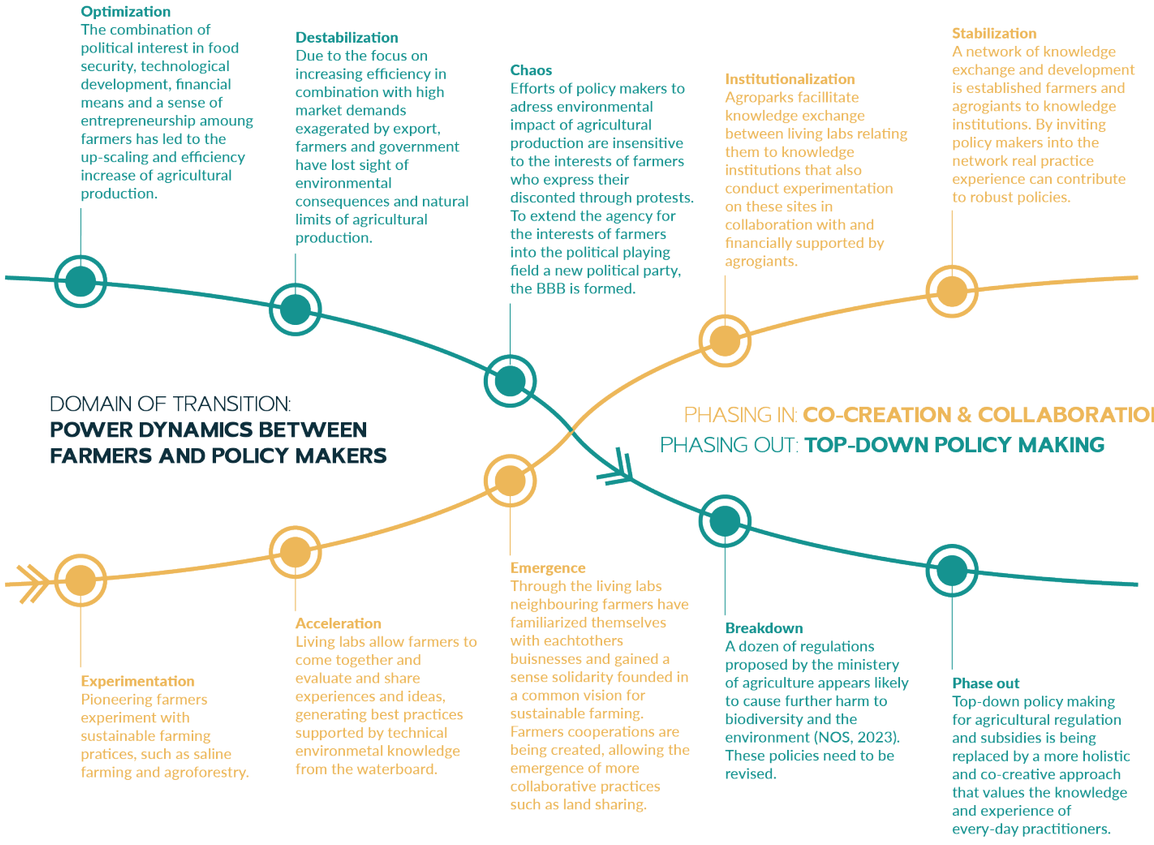


Figure 5.2: X-curve for domain of transition "power dynamics between farmers and policy makers", phasing in co-creation & collaboration and phasing out top-down policy making.

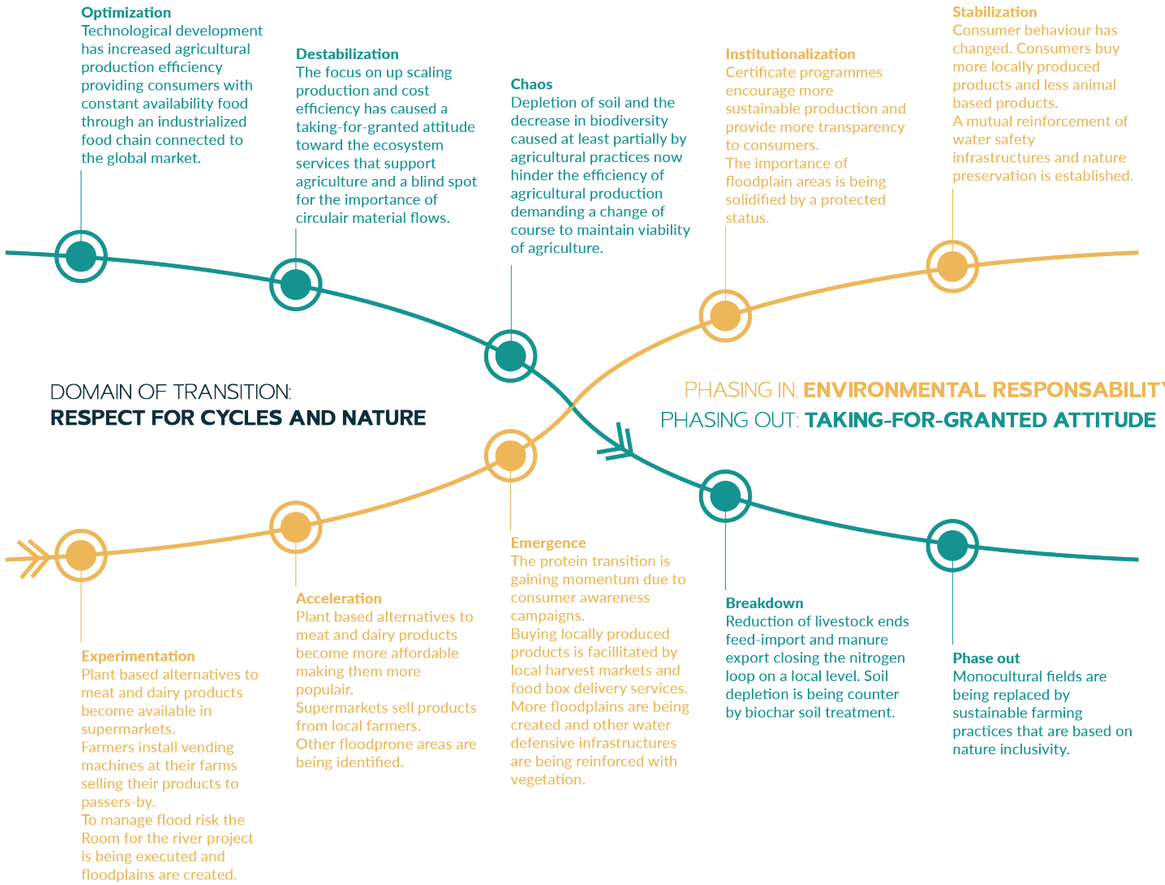


Figure 5.3: X-curve for domain of transition "respect for nature", phasing in environmental responsability and phasing out taking-for-granted attitude.

Timeline

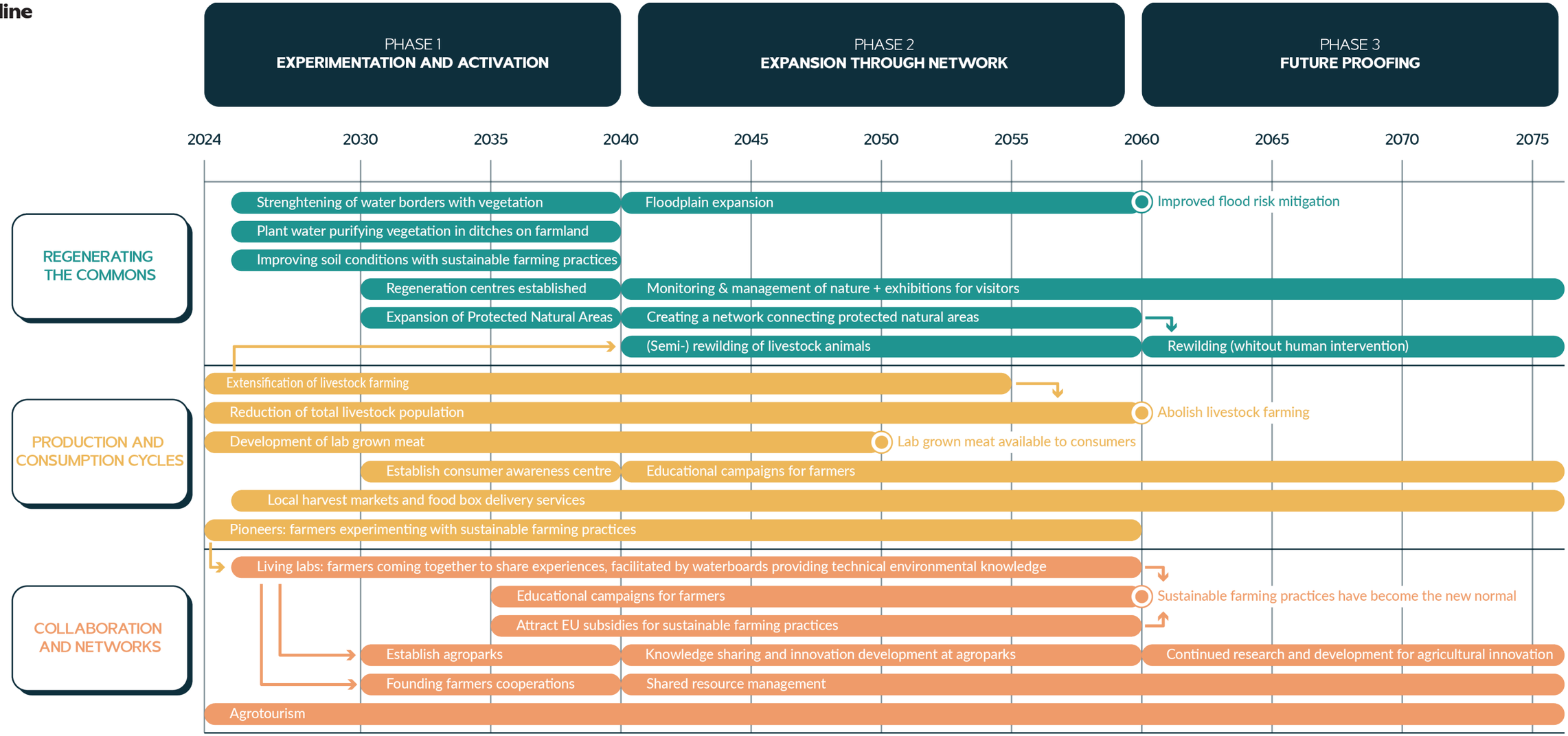


Figure 5.4: Timeline | Grouped into three categories the proposed interventions are projected on a timeline divided into three fases until 2075. Dependencies between interventions are represented by arrows. | Source: by author

Policy Implementation per phase

PHASE 1 | EXPERIMENTATION AND ACTIVATION

Demonstration Farms and Pilot Projects

Create demonstration farms and pilot projects to showcase successful examples of nature-inclusive and sustainable agriculture. Allow farmers to visit these sites to learn about innovative farming techniques, exchange ideas, and gain hands-on experience.

Collaborate with leading agricultural research institutions and sustainable farms to establish demonstration sites where farmers can observe and participate in trials of conservation agriculture, precision farming, or closed-loop farming systems.

Alignment with current policies

The EU Green Deal and its initiatives, such as the Farm to Fork Strategy, aim to promote sustainable agriculture and include funding for demonstration farms and pilot projects to showcase innovative farming techniques.

National-level agricultural policies also support similar initiatives, providing funding or resources for demonstration sites to promote sustainable practices among farmers. (Rijksoverheid, 2021)

Financial Incentives and Support Programs

Provide financial incentives and support programs to encourage farmers to adopt nature-inclusive and sustainable practices. Offer grants, subsidies, and tax incentives for implementing agroecological methods, investing in renewable energy, and adopting circular farming systems.

Establish a government-funded grant program to assist farmers in transitioning to organic farming, agroforestry, or regenerative agriculture practices, providing financial support for equipment purchases, training, and infrastructure upgrades.

Alignment with current policies

Common Agricultural Policy (CAP) include financial incentives and support programs to encourage farmers to adopt sustainable practices. These involve subsidies, grants, or tax incentives for implementing agroecological methods or investing in renewable energy.

The Circular Economy Action Plan (CEAP) at the EU level offer funding opportunities or incentives for circular farming systems, aligning with the strategy of providing financial support for sustainable agriculture practices.

Example

The Dutch Sustainable Dairy Chain offers training programs and workshops to dairy farmers on topics such as biodiversity conservation, water management, and energy efficiency. (Wageningen University, 2023)

Education and Awareness Campaigns

Launch educational campaigns to raise awareness among farmers and society about the importance of transitioning to more sustainable agricultural practices. Highlight the benefits of nature-inclusive farming, such as improved soil health, biodiversity conservation, and resilience to climate change.

Collaborate with agricultural universities, research institutions, and NGOs to organize workshops, webinars, and outreach programs that educate farmers and the public about sustainable farming techniques and their environmental impact.

Alignment with current policies

Both national and EU-level policies include provisions for educational campaigns and awareness-raising efforts to promote sustainable agriculture practices. For example, the EU Biodiversity Strategy supports educational initiatives highlighting the benefits of nature-inclusive farming. (European Commission, 2021)

Example

The "Beter Leven" certification program, initiated by the Dutch Society for the Protection of Animals, raises awareness among consumers about animal welfare standards in livestock farming and encourages them to choose products from farms that adhere to higher welfare standards. (Beter Leven, 2023)

PHASE 2 | EXPANSION THROUGH NETWORK

Technology Adoption and Innovation Hubs

Establish technology adoption and innovation hubs to facilitate the integration of cutting-edge technologies and digital tools into farming practices. Provide farmers with access to training, technical support, and funding opportunities to adopt precision agriculture and renewable energy solutions.

Develop a network of smart farms equipped with sensor technology, drones, and data analytics platforms to optimize resource use, monitor crop health, and reduce environmental impacts, serving as innovation centers for technology-driven agriculture.

Alignment with current policies

The Horizon Europe program supports technology adoption and innovation hubs through funding for research and innovation projects related to precision agriculture and renewable energy solutions.

National-level policies also include funding or support mechanisms for establishing innovation hubs or providing technical assistance to farmers for adopting cutting-edge technologies. (Rijksoverheid, 2023)

Example

The Wageningen University & Research (WUR) Farm of the Future project explores innovative technologies such as precision agriculture, robotic farming, and sensor-based monitoring systems to optimize resource use and reduce environmental impact. (Farm of the Future, 2024)

Financial Incentives and Support Programs

Provide financial incentives and support programs to encourage farmers to adopt nature-inclusive and sustainable practices. Offer grants, subsidies, and tax incentives for implementing agroecological methods, investing in renewable energy, and adopting circular farming systems.

Establish a government-funded grant program to assist farmers in transitioning to organic farming, agroforestry, or regenerative agriculture practices, providing financial support for equipment purchases, training, and infrastructure upgrades.

Alignment with current policies

Horizon Europe, often funds collaborative research projects aimed at addressing societal challenges, such as sustainable agriculture. These projects foster collaboration between farmers, researchers, and industry stakeholders to co-create solutions and share knowledge.

National agricultural research institutes and universities also receive funding or support for research networks and knowledge exchange platforms focused on sustainable agriculture.

Education and Awareness Campaigns

Launch educational campaigns to raise awareness among farmers and society about the importance of transitioning to more sustainable agricultural practices. Highlight the benefits of nature-inclusive farming, such as improved soil health, biodiversity conservation, and resilience to climate change.

Collaborate with agricultural universities, research institutions, and NGOs to organize workshops, webinars, and outreach programs that educate farmers and the public about sustainable farming techniques and their environmental impact.

Alignment with current policies

Both national and EU-level policies include provisions for educational campaigns and awareness-raising efforts to promote sustainable agriculture practices. For example, the EU Biodiversity Strategy supports educational initiatives highlighting the benefits of nature-inclusive farming. (European Commission, 2021)

PHASE 3 | **FUTURE PROOFING**

Regulatory Framework Management and Policy Optimization

Streamlining and optimizing build-up regulatory frameworks and policy incentives to sustain nature-inclusive and sustainable agriculture. Implement robust mechanisms for monitoring, enforcement, and compliance to ensure effective implementation of established policies.

Enhancing coordination and collaboration among relevant government agencies, stakeholders, and international partners to address emerging challenges and adapting policies. Utilize feedback mechanisms to continuously evaluate policy effectiveness, identify areas for improvement, and adjust regulatory measures to achieve long-term sustainability goals.

Alignment with current policies

The National Emission Reduction Commitments aligns with the strategy of streamlining regulatory frameworks and implementing robust mechanisms for monitoring and compliance to achieve long-term sustainability goals.

The implementation and optimization of the Environment Action Programme involves enhancing coordination among relevant government agencies and stakeholders to address emerging challenges and adapt policies to evolving needs.

Global Partnerships and Sustainable Development Goals

Forge global partnerships and collaborative initiatives to address pressing environmental challenges and achieve sustainable development goals. Engage with international organizations, governments, and civil society groups to promote knowledge exchange, technology transfer for sustainable agriculture.

Join international initiatives such as the UN Decade on Ecosystem Restoration, the Bonn Challenge, and the Sustainable Development Goals to mobilize resources, share best practices, and coordinate efforts to combat climate change, conserve biodiversity, and promote sustainable agriculture on a global scale.

Alignment with current policies

The Convention on Biological Diversity promotes global partnerships and collaborative initiatives to address environmental challenges and achieve sustainable development goals, aligning with the proposed strategy.

Through provisions for international cooperation and goal alignment towards sustainable development, the Paris Agreement supports the strategy of forging global partnerships for sustainable agriculture.

Scaling-Up Sustainable AgriNature Programs

Expand and institutionalize successful nature-inclusive and sustainable AgriNature programs to achieve widespread adoption and long-term impact. Invest in capacity building and training for farmers, extension workers, and agricultural professionals.

Integrate sustainability criteria into policies, procurement practices, and certification standards. Promote multi-stakeholder partnerships and collaborative initiatives. Allocate funding to incentivize innovation in sustainable agriculture. Monitor and evaluate the impact of scaled-up programs to ensure progress towards sustainability goals.

Alignment with current policies

Both national and EU-level policies include provisions for educational campaigns and awareness-raising efforts to promote sustainable agriculture practices. For example, the EU Biodiversity Strategy supports educational initiatives highlighting the benefits of nature-inclusive farming. (European Commission, 2021)

Example

The Sustainable Agriculture Initiative Platform (SAI Platform) is a global multi-stakeholder initiative that brings together food and beverage companies, agricultural producers, NGOs, and academia to promote sustainable agriculture practices. (SAI Platform, 2024)

Intervention Catalog

To create an overview of the interventions that we are proposing as a part of our strategy a catalog of intervention cards is provided here. Each card represents an intervention which is depicted by an icon. Below the name of the intervention a brief description of the intervention and its relevance is written.

The interventions are categorized into the same three categories that were introduced in the timeline – regenerating the commons, production and consumption cycles, and collaboration and network – and color coded accordingly. Furthermore, the typological nature of the intervention is mentioned at the top of each card. There are four types: spatial intervention, farming practice, research & education, and policy.

Finally, the stakeholders related to the intervention as well as the project values the intervention contributes to are listed at the bottom of the card.

N.B. Three actors that are not part of the stakeholder framework established in this project are mentioned on the cards, SIRE and VVV-offices, because they can play an important facilitation role regarding the intervention they are listed to. 1001 Hectares is a crowdfunding initiative by LTO and urgenda (1001ha.nl, 2024). SIRE is a non-profit foundation producing advertisements advocating for the bettering of society. VVV-offices are official tourist information points located throughout the Netherlands.

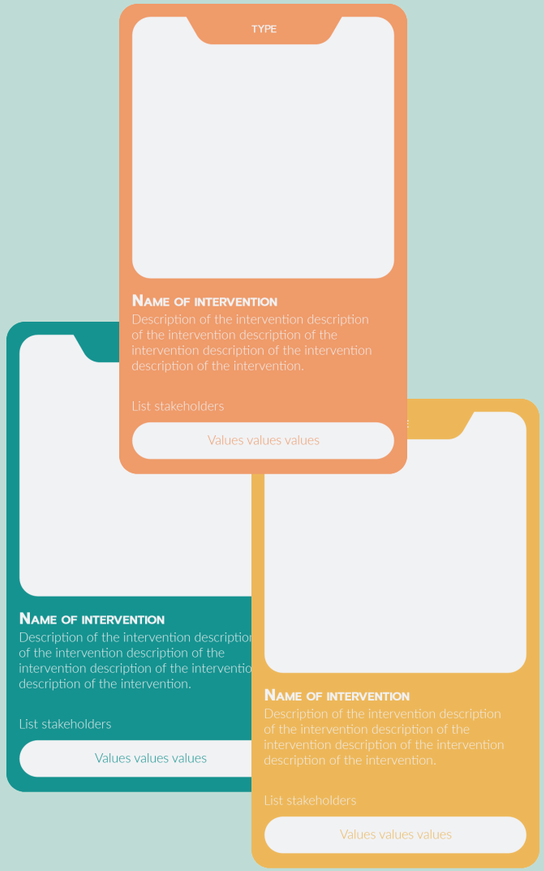
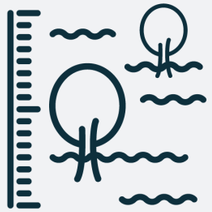


Figure 5.5: Template cards

SPATIAL INTERVENTION



Floodplain expansion

Allowing floodwaters to overflow riverbanks in more designated areas. This can be combined with agricultural land use or nature preservation, creating wetlands.

Waterboards, Rijkswaterstaat, land owners

Water safety: flood risk mitigation

SPATIAL INTERVENTION

Vegetation reinforced waterborders

Existing water defense infrastructure can be enhanced by vegetation as the roots hold together the soil. Meanwhile this vegetation contributes to biodiversity.

Waterboards, Rijkswaterstaat, Staatsbosbeheer

Water safety: flood risk mitigation
Nature inclusivity: biodiversity

SPATIAL INTERVENTION

Water purifying vegetation farmland

Planting water purifying vegetation around farmland helps prevent runoff of redundant nutrients spread into the wider watersystem negatively affecting nature preservation areas.

Farmers, waterboards

Healthy ecosystem: water quality
Nature inclusivity: biodiversity

SPATIAL INTERVENTION

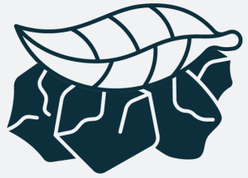
Expansion of protected natural areas

The waterboards will be designated a directory role in the living labs providing technical knowledge as well as providing democratic legitamicy to their plans and actions.

Staatsbosbeheer, land-owners

Nature inclusivity: biodiversity

FARMING PRACTICE



Biochar soil treatment

Adding biochar, a charcoal-like substance, to soil improves fertility, water retention, and carbon sequestration, enhancing agricultural sustainability.

Farmers, waterboards, producers and vendors

Healthy ecosystem: soil health

FARMING PRACTICE

Seeding herb rich pastures

Replacing regular gras seed mix with herb rich gras seed mix turns grazing fields into a viable habitat for meadow birds contributing to biodiversity and helps prevent soil depletion.

Farmers, crowdfunding initiative 1001 Hectare

Healthy ecosystem: soil health
Nature inclusivity: biodiversity

RESEARCH & EDUCATION

Regeneration centre

At this centre stakeholders with responsibilities regarding nature management come together to discuss progress of regeneration efforts. The centres will also be open to public for visits.

Waterboards, Staatsbosbeheer

Nature inclusivity: respect natural conditions
Water safety: collaborative waterboards

SPATIAL INTERVENTION

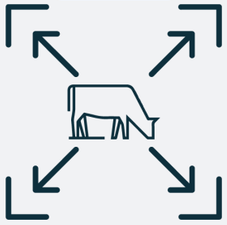
Rewilding

As livestock farming will be phased out, rewilding of livestock will be phased in to preserve and restore a landscape quality characterized by grazing cattle.

Staatsbosbeheer, Rijkswaterstaat, land owners

Agricultural heritage: landscape quality
Nature inclusivity: biodiversity

FARMING PRACTICE



Extensifying livestock

The number of animals per hectare will be reduced to respect the natural limits of soil. As downscaling per farm is economically difficult, options are retiring farmers or land sharing.

Livestock farmers and their neighbour farmers

Nature inclusivity: respect natural conditions
Agricultural heritage: landscape quality

RESEARCH & EDUCATION

Consumer awareness centre

The consumer awareness centre are interactive museum-like locations where consumer can learn in a fun way about the food production chain and the impact of their behaviour.

Consumers

Indirect contribution to values

RESEARCH & EDUCATION

Local harvest markets/boxes

Local harvest markets and delivery boxes shorten the food chain, reducing pollution, providing consumers with fresh products and making farmers less economically dependent.

Farmers, consumers

Empowering farmers; economic resilience

RESEARCH & EDUCATION

Lab grown meat

The production of lab grown meat will in time render livestock farming redundant by meeting the demand for 'animal'-based protein, which is also decreasing due to the protein transition.

Research institutes, EU, producers and vendors

Agricultural heritage: reinforce innovation

FARMING PRACTICE

Agroforestry

Planting fruit, nut and other trees on farmland contributes to biodiversity and helps farmers diversify their production becoming more economically resilient to changing demands.

Arable farmers

Empowering farmers: economic resilience
Nature inclusivity: biodiversity

FARMING PRACTICE

Pixel farming

This practise allows a high grade crop mixing by utilizing digital technology like drones and sensors to monitor and manage crops, optimizing resources and increasing efficiency.

Arable farmers, tech developing agrogiants

Agricultural heritage: reinforce innovation
Nature inclusivity: biodiversity

FARMING PRACTICE

Strip farming

By cultivating alternating strips of crops or vegetation this practice helps to reduce erosion, enhance soil fertility, and sustain biodiversity by preventing monoculture.

Arable farmers

Healthy ecosystem: soil health
Nature inclusivity: biodiversity

FARMING PRACTICE

Saline farming

To cope with increasing salinasation due to sea level crop selection for farming in sensitive areas will be based on salt tolerance, a characteristic possibly enhanced by research.

Farmers in salinisation sensitive areas, WUR

Nature inclusivity: respect natural conditions
Agricultural heritage: reinforce innovation

POLICY

Certification programs

Certification programs help farmers by improving market access, ensuring quality standards, and stimulating environmental and social responsibility in consumers.

EU, national government

Empowering farmers: constructive policy

RESEARCH & EDUCATION

Agrotourism

Agrotourism includes experiences like farm stays, tours, and activities on farms. This contributes to consumers awareness as well as economic resilience of farmers.

Farmers, tourists, VVV offices, booking platforms

Empowering farmers: economic resilience

RESEARCH & EDUCATION

Living labs

Through a collective of pilot projects farmers can experiment together finding out best practices for sustainable farming methods facilitated by knowledge from the waterboards.

Farmers, waterboards

Empowering farmers: collaboration

RESEARCH & EDUCATION

Agroparks

The agropark is a facility for experimentation of high tech innovations related to agriculture and a home base for knowledge exchange between living labs with connections to other agroparks.

Knowledge institutions, living-lab farmers

Empowering farmers: collaboration

POLICY

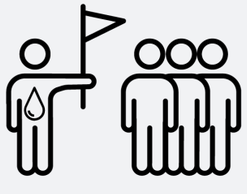
Farmers cooperations

The rise of megafarms is challenging the feasibilty of smaller farmers. The founding of cooperations can help them become more resilient through resource sharing etc.

Farmers

Empowering farmers: collaboration

POLICY



Directory role for waterboards

The waterboards will be designated a directory role in the living labs providing technical knowledge as well as providing democratic legitamicy to their plans and actions.

Waterboards, farmers participating in living labs

Water safety: collaborative waterboards

RESEARCH & EDUCATION

Educational campaigns

Different educational campaigns can be catered towards either consumers increasing awareness about certificates or to farmers engaging them in the agropark network.

Knowledges institutions, SIRE

Indirect contribution to values

POLICY

EU subsidies

As the practices proposed here contribute to EU-goals, it is likely to obtain EU funding for the experimentation, development and up-scaling of these sustainable farming practices.

EU

Empowering farmers: constructive policy

Image by Floyd Shazly

06
SPATIALIZING THE TRANSITION

Transitioning Biesbosch | Phase 1

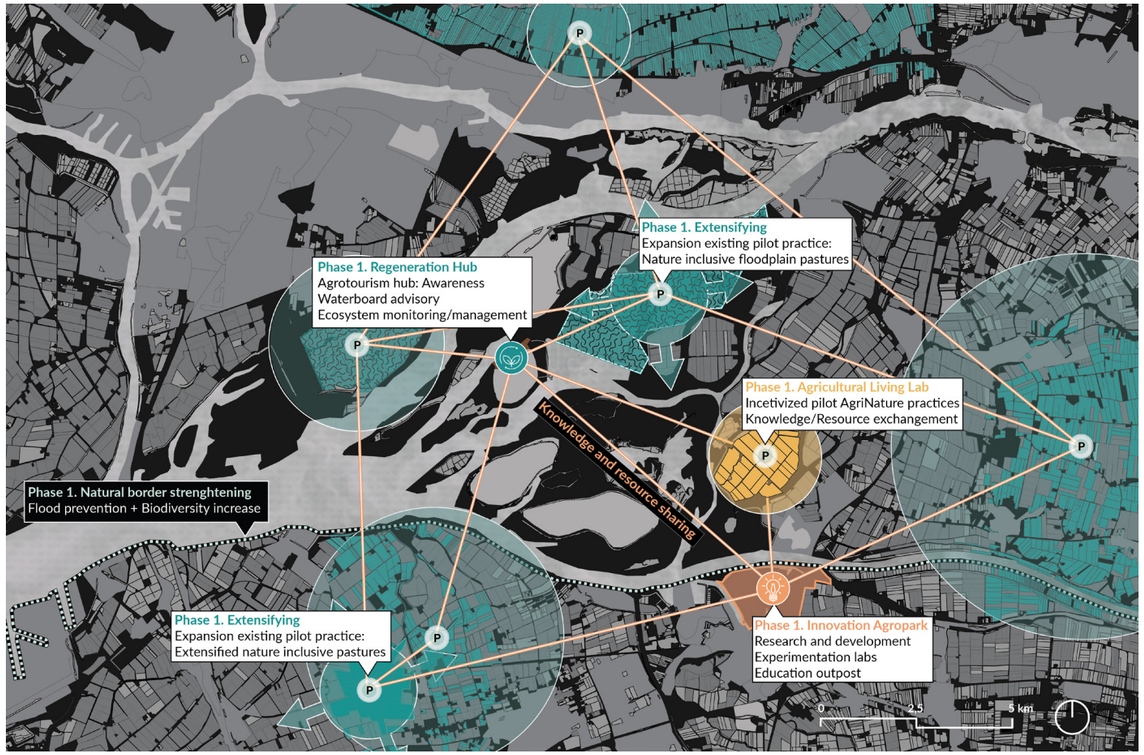


Figure 6.1: Phase 1, Biesbosch

Short cycle
Tree species: Apple tree, Pear tree
Economic product: Fruit, Veneer wood

Medium cycle
Tree species: Walnut, Birch, Sugar Maple, Cherry
Economic product: Fruit, Medicine, Maple syrup, Lumber (interior finishing), Walnuts (short cycle)

Long cycle
Tree species: Oak, Dutch Red Cedar
Economic product: Lumber, high grade Biochar

Figure 6.2: Tree type inventor

Experimentation and Activation

Phase 1 capitalizes on existing pioneering projects in Altena, which already align with AgriNature principles. Initiating rewilding efforts, we extensify existing pastures to restore the traditional Dutch pasture-scape (Barkham, P., 2022), aiming to reverse the declining biodiversity trend in the Netherlands . Two pilot projects delineate rewilding strategies: utilizing pasture grounds as floodplains to mitigate flood risk and enhance wetland ecosystems, and integrating vegetation into monocultural grass grazing lands away from riverbanks. Carefully selected trees provide ecosystem services and economic benefits, with long-term prospects for construction lumber and short-term gains from, fruit production (see appendix). These new means of economic production (fruit, nuts, syrup, lumber and biochar) will relieve farmers dependance on intensified agricultural practices, smoothing the transition towards AgriNature (see appendix). Expanding Altena's strengths, the existing visitor centre transforms into a regeneration hub, while the Geertruidenberg industry area becomes an Agropark. These sites form an interconnected living lab for knowledge and resource sharing, where incentivized farmers pioneer AgriNature practices, fostering collaborative sustainable development.

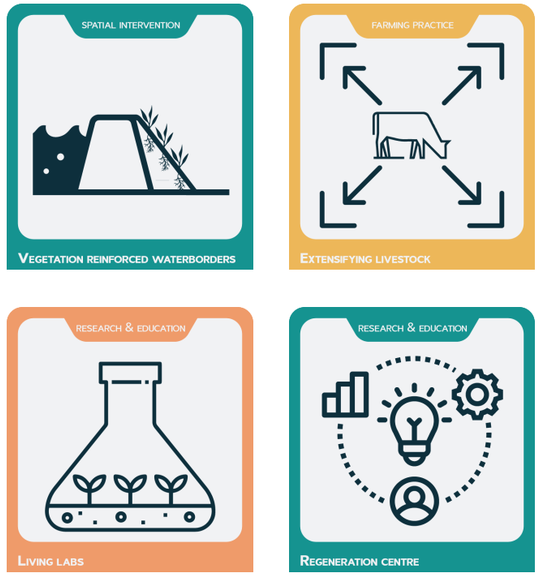
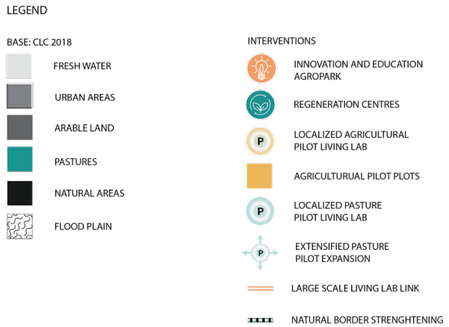


Figure 6.3: Cards Phase 1, Biesbosch



Transitioning Biesbosch | Phase 2

Figure 6.4: Phase 2, Biesbosch

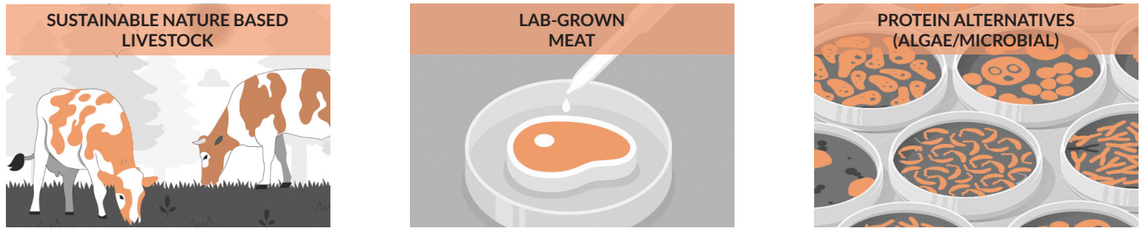


Figure 6.5: Protein transition, new means of production

Expansion Through Network

In Phase 2, the journey towards rewilding takes a significant leap forward. As the trees planted in the previous phase mature, the landscape undergoes a transformation. Cattle now roams freely in their newly vegetated habitat, liberated from industrialized processes. Meanwhile, at the Geertruidenberg Agropark, lab-grown meat experiments pave the way for a decline in traditional cattle protein production.

To maintain ecological balance, cattle populations are carefully managed to prevent oversaturation of the ecosystem, with sustainable culling ensuring a controlled level of protein production. This approach, while allowing cattle to live by the rules of nature, acknowledges the limitations of current plot sizes in sustaining equilibrium. This is done to prevent starving populations and oversaturated ecosystems as seen with the rewilding of the Oostvaardersplassen, Flevoland.

The pilot living lab practices of AgriNature agriculture and floodplain pastures, have now spread to various corners of the region. These initiatives remain interconnected through a larger knowledge and resource-sharing living lab, which includes the regeneration centre and Agropark.

The introduction of vertical farming within the Agropark enables intensified production, facilitating extensification elsewhere. Guiding these new pilot living labs through their transition is the pivotal role of the waterboard, which incentivizes, guides, and shapes policy to ensure the success of sustainable urban and rural development.

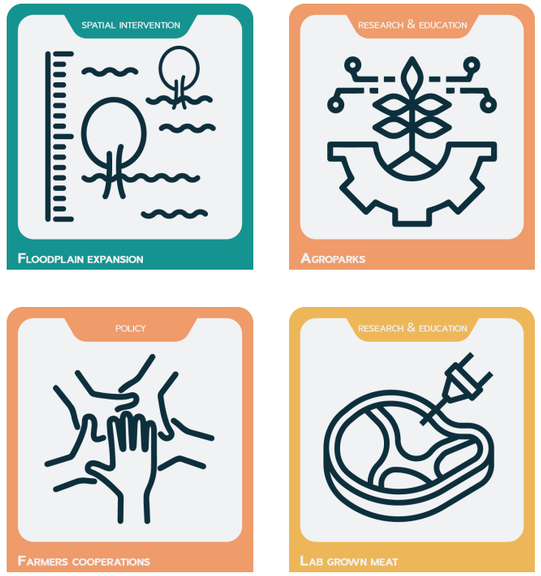


Figure 6.6: Cards Phase 2, Biesbosch

Transitioning Biesbosch | Phase 3

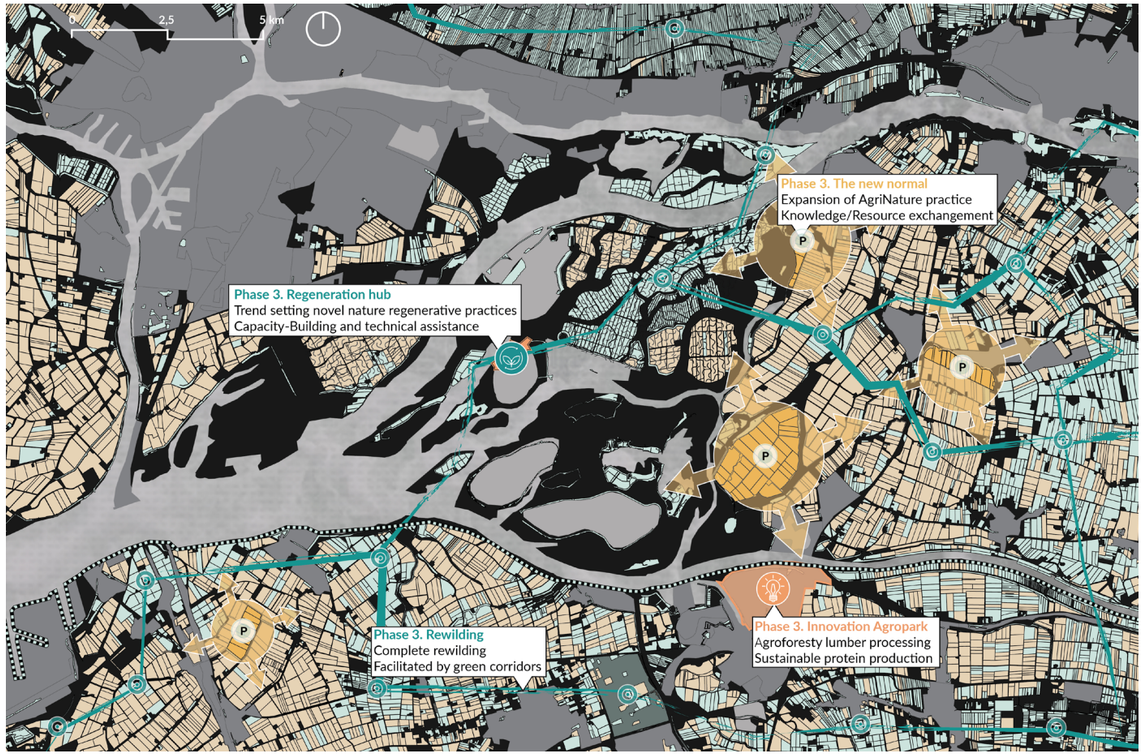


Figure 6.7: Phase 3, Biesbosch

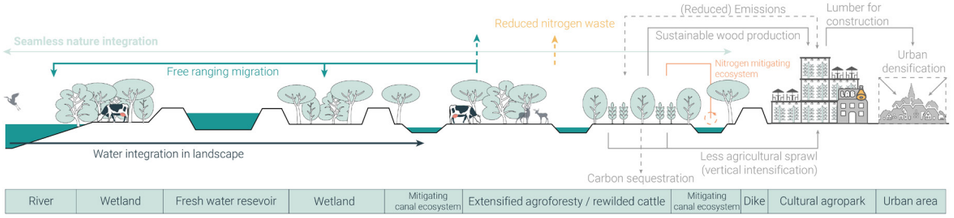


Figure 6.8: New functional systemic cross section Biesbosch

Future Proofing

In the final phase of development, complete rewilding is achieved by establishing green corridors that connect pastures, enabling free migration for wildlife. These corridors not only facilitate regional migration but also link with larger nodes across the Netherlands, ensuring natural population control and distribution (Carroll, C., & Noss, R. F., 2020). As traditional cattle protein production diminishes due to rewilding, sustainable alternatives such as lab-grown protein compensate for the loss.

The initial pilot living labs, practicing AgriNature principles, have expanded to cover all remaining arable land in Altena, effectively extensifying the region. These labs form a regional collective, collaborating with the regeneration hub and Agropark, which in turn is connected to Agroparks and regeneration hubs across the country. Here, ongoing experimentation and the search for best practices drive continuous improvement, supported by incentives and policies set forth by the waterboard.

The long cycle trees on AgriNature plots and rewilded pastures have now grown to maturity and are ready for sustainable harvest and processing, which happens localized in the Agropark. This lumber is used for constructing and cladding new homes to fulfill the ongoing densification demand in nearby urban area's (PBL/CBS, 2022). Furthermore, the seasonal adaptation of the Biesbosch to water levels plays a crucial role in flood mitigation, embodying the harmonious integration of nature-based solutions into the development strategy.

Figure 6.9 Cards Phase 3, Biesbosch

Biesbosch becomes a greater hub of agrotourism. Tourists visit to see the expanded nature network, with rewilded cows and diverse bird and animal species. Nature inclusive agricultural practices such as agroforestry and strip farming can be seen with further reserach and experimentation happening in innovation centers. Regeneration centers also manage newly implemented nature based solutions for flood mitigation.

Transitioning Oosterschelde | Phase 1

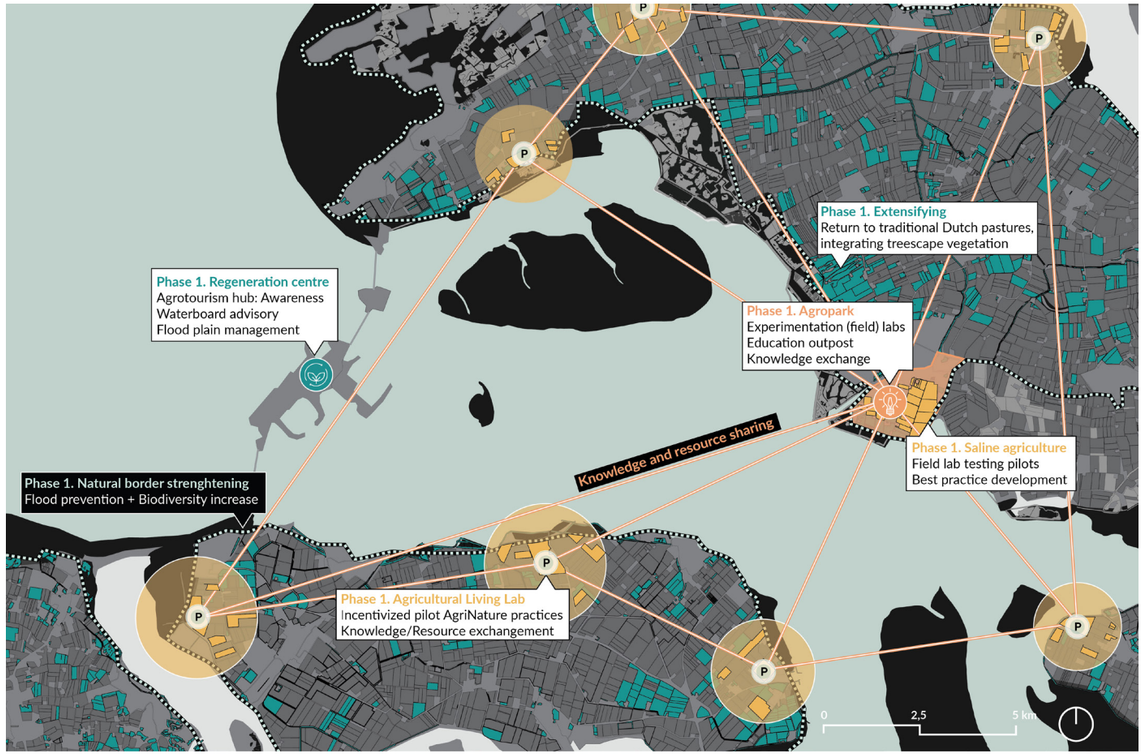


Figure 6.10: Phase 1, Oosterschelde

Experimentation and Activation

In the first phase of transitioning Oosterschelde, the focus lies on reinvigorating monocultural pastures through re-vegetation efforts, mirroring the approach taken in Altena. By returning to traditional Dutch pasture practices, we aim to enhance biodiversity and promote ecological resilience. Simultaneously, as we extend pastures, the island's borders are strengthened with a robust vegetation line, anchored by deep-rooted plants. This natural barrier not only prevents erosion but also provides protection against storm surges, bolstering the island's resilience to climate-related challenges (Sutton‐Grier, A. E., Wowk, K., & Bamford, H. A., 2015).

Expanding upon the existing visitors centre "Neeltje Jans," we establish a regeneration hub. Here, the waterboard collaborates with selected incentivized pilots, guiding them in transitioning towards saline AgriNature practices tailored to the unique coastal environment. These pilots, comprising diverse farmers, form a localized living lab where knowledge and resources are shared. Moreover, they are integrated into a larger network through connections with the regeneration hub and Agropark, strategically located in Zierikzee's logistical district.

Within the Agropark, an additional pilot living lab serves as an incubator for avant-garde practices, fostering innovation and experimentation. Acquisition of Agropark fieldlab plots is facilitated through subsidies for current owners to experiment or through outright purchase from existing landowners, ensuring broad participation in the development process.

Figure 6.11: Cards Phase 1, Oosterschelde

Transitioning Oosterschelde | Phase 2

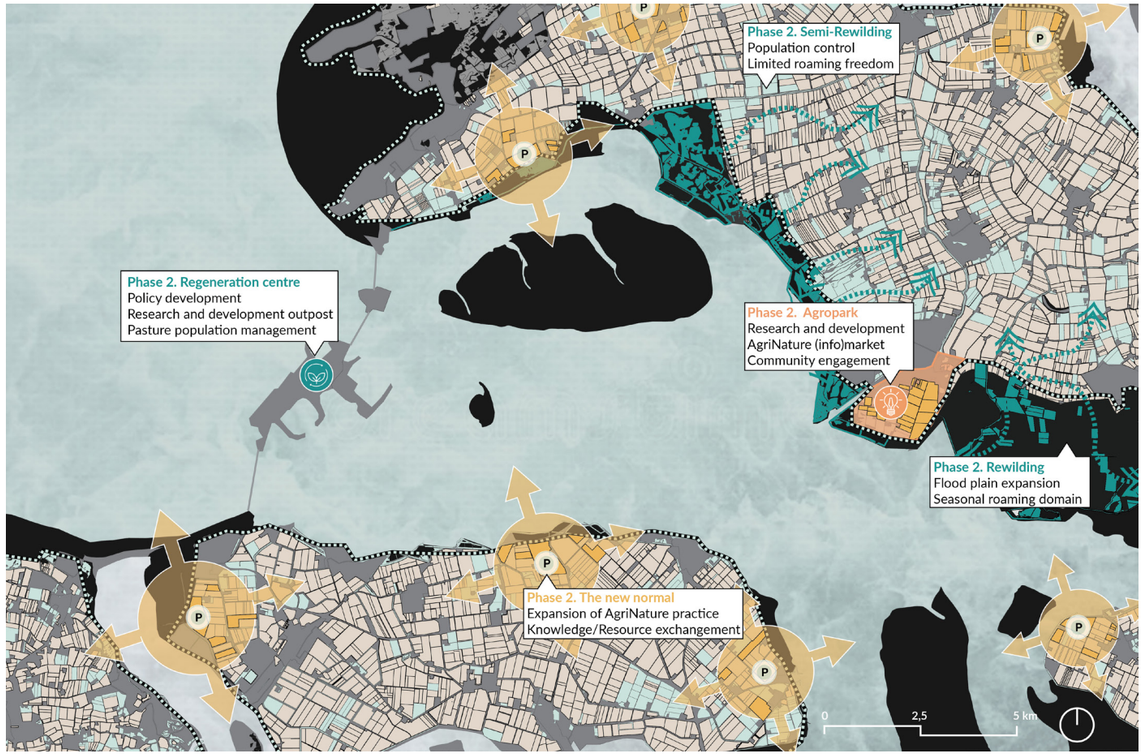


Figure 6.12: Phase 2, Oosterschelde

Expansion Through Network

In the second phase, the rewilding process is advanced, following the same strategies implemented in Altena. Pastures undergo continued transformation to create natural habitats for cattle, contributing to the preservation of biodiversity. Population management ensures that ecological equilibrium is maintained, preventing oversaturation of the ecosystem.

Following the biodiverse borders established in previous 1, a new floodplain and wetland ecosystem emerges. Through land buyout initiatives guided by, large-scale nature reclamation becomes possible, allowing for the restoration of natural landscapes on a significant scale.

The newly formed wetlands adapt to seasonal water levels, serving as grazing lands for semi-rewilded cattle during low seasons and providing essential flood mitigation during periods of high water.

Meanwhile, the pilot living labs established in phase 1 play a pivotal role in knowledge dissemination, engaging with neighbouring communities and forming an interconnected regional living lab. Integrated with the Agropark and regeneration hub, these initiatives are supported by the waterboard through incentives, subsidies, and policy interventions.

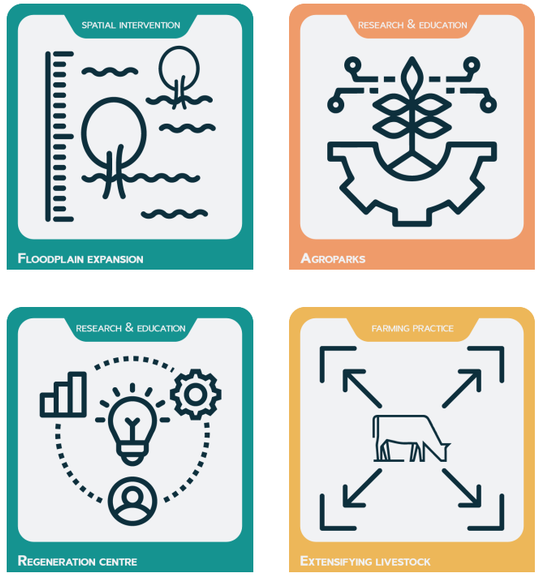
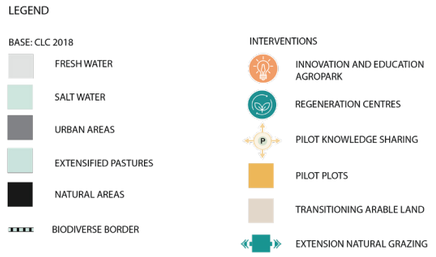


Figure 6.13: Cards Phase 2, Oosterschelde



Transitioning Oosterschelde | Phase 3

Figure 6.14: Phase 3, Oosterschelde

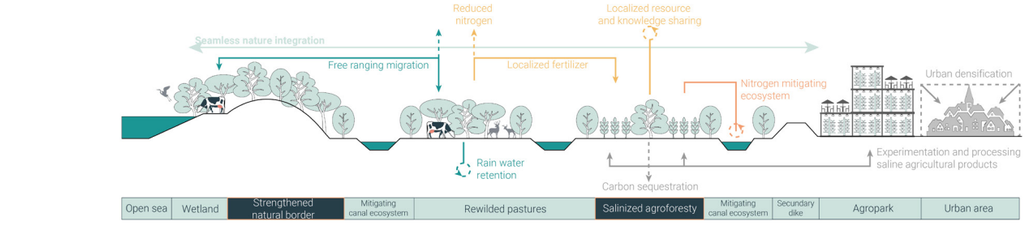


Figure 6.15: New functional systemic cross section Oosterschelde

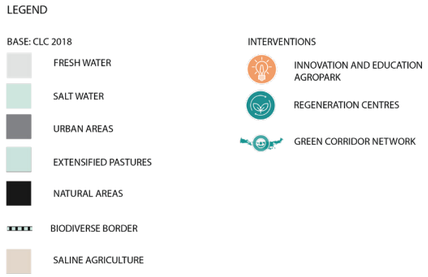
Future Proofing

In the final phase of development, complete rewilding of cattle is achieved. Green corridors connect nodes together which tie in to the regional connection of rewilded pastures allowing for free migration and a natural equilibrium (Carroll, C., & Noss, R. F. (2020).

The addition of vegetation to pastures not only enriches the soil but also serves as a natural erosion deterrent. These areas now retain rainwater, a precious resource that was previously lost to the sea. This retention significantly bolsters the fresh water supply in the Delta region, mitigating water scarcity concerns.

Furthermore, saline AgriNature practices have become the new norm. Through the implementation of saline irrigation and cultivation of saline-tolerant crops, the dependency on fresh water has drastically dropped. This shift is particularly crucial in a region characterized by high demand for fresh water and uncertain supply. The adoption of saline interventions enhances the resilience and capacity of the Oosterschelde, ensuring sustainable agricultural practices and environmental stewardship for generations to come.

Figure 6.16: Cards Phase 3, Oosterschelde



Saline agriculture can be seen flourishing in the Oosterschelde region with salt-tolerant plants such as zeekral and potatoes, while rewilded cows can be seen in floodplains where they can graze seasonally. Biodiverse borders of dense vegetation strengthen existing dikes, and bird and animal species flourish in the new, balanced ecosystem. Research hubs can be seen continuing experimentation while local communities are engaged through culinary workshops to better adapt to the protein transition.

AgriNature Networks | Netherlands

The expansion of AgriNature in the rest of the Netherlands and beyond follows the same strategy as the Oosterschelde and Biesbosch. The clusters, which can be seen in figure 6.17, guide this expansion strategy. These clusters show areas with similar soil & water conditions and agricultural practices. This informs the strategies that are employed and the structure of living labs and agroparks. New living labs will be initiated as can be seen in figure 6.18. Living labs in the same cluster are linked to an agropark allowing them to share knowledge and collaborate. Connections of living labs and agroparks are based on the same cluster conditions and the proximity of the living lab to the agropark. The agroparks are located adjacent or close to existing educational institutions. This allows a close cooperation between living labs and educational institutions, accelerating innovation.

On national scale the agroparks, and their associated educational institutions, share knowledge with each other as can be seen in figure 6.19. Experience from the living labs is shared bottom up on the national level through this knowledge network. At the same time the educational institutions distribute new technologies and insights through this network top-down. This bi-directional exchange of knowledge will speed up the transition to a widespread implementation of AgriNature practices in the Netherlands.

Figure 6.17: Soil, water, agriculture and geographic clusters on the Dutch scale. Based on Corine Land Cover 2018, altered by author

Figure 6.18: Distribution of Living labs and connections with innovation agroparks. Based on Corine Land Cover 2018, altered by author

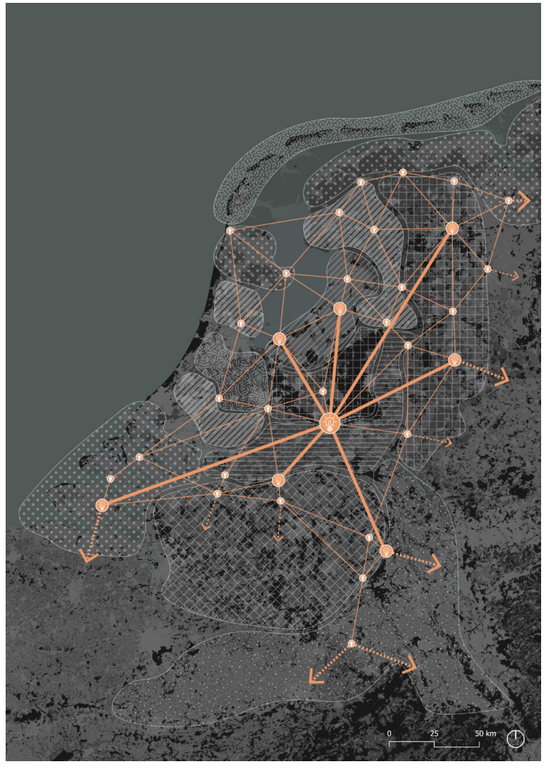


Figure 6.19: Knowledge network connections. Based on Corine Land Cover 2018, altered by author

Image by Floyd Shazly

07
CONCLUSIONS

Conclusion and Reflection

How can the linear intensive practice of agriculture in the Netherlands transition into a resilient system, reestablishing a balance with capacities of the local natural system, meanwhile contributing to the restoration of biodiversity and the innovation and value of the traditional dutch agricultural landscape?

To transition linear intensive agriculture in the Netherlands to a resilient system, restoring balance with the local ecosystem and boosting biodiversity, we must embrace sustainable, inclusive farming practices. Collaboration between stakeholders representing different sectors, including waterboards, Staatsbosbeheer, and farmers, is essential. Together, these stakeholders can develop integrated land management strategies that optimize water use, enhance flood resilience, and promote biodiversity conservation while supporting agricultural productivity. Making farmers the shepherds of nature is key to this transformation, empowering them to adopt sustainable practices, embrace innovation, and uphold the cultural heritage of Dutch agriculture while safeguarding the environment for future generations.

Scientific Relevance
In addition to existing literature about sustainable and nature inclusive farming practices the AgriNature project elaborates on the possible integration of agricultural practices and water and nature management through a spatial exploration of a collaboration based strategy.
Despite our focus on the value of co-creation we were not able the engage with stakeholders due to limited time and resources. For further elaboration on the topic we recommend in depth interviews with farmers about their willingness to become part of a widespread knowledge sharing network as we have proposed here.

Societal Relevance
The AgriNature project offers inspiration to farmers seeking to adapt their business to a more sustainable and future proof model. Also, it invites waterboards to engage more directly with farmers pointing out the potential mutual benefits of integrating sustainable farming practices with spatial interventions for flood risk management. Moreover, we are encouraging environmentally aware consumer behaviour.

Ethical Reflection
To reflect on the ethical implications of the AgriNature project we will discuss several stakeholders that are being strongly impacted starting with the famers. The objective of the project is to empower them. Providing several strategies for improvement of economic resilience and suggesting collaborations that help them build political agency. Considering this, it is safe to say that the interests of farmers are being taken into account properly rendering the ethical impact of the project on farmers positive.

Another important ethical consideration is the AgriNature approach to the phasing in of rewilding livestock trough a transition starting from the extensification of livestock. The objective of rewilding on its own is a clear advocacy for the intrinsic rights of the animals concerned. However, in this proposed transition it is crucial to take into account the responsibility of humankind to manage population control until a natural equilibrium is established. Refusing human intervention before this state is achieved would be extremely unethical as this would expose the animals to the horrific fate of mass starvation.

PERSONAL REFLECTIONS

Mahaa Ejaz

Throughout our process, I've come to realize the complicated relationship between research and design. Initially, our focus was predominantly on understanding the challenges within the agricultural sector, which allowed us to grasp the complexities before diving into design solutions. This approach mirrored our group dynamics, as we tended to lean towards practicality over conceptualization, and struggled to visualise our ideas in the beginning. However, as we delved deeper into research, particularly examining water management in the Netherlands and its implications for agriculture, we began to envision design solutions on a broader scale. It was not easy at first to think of the natural and man-made cycles on a local, delta and national scale, but once we understood how much they are all inter-connected, it was exciting to see how we could begin. Integrating nature within agricultural practices while addressing issues like flood mitigation and water purification became central to our project's vision.

Our process was far from linear; we encountered challenges in aligning our individual research directions. Despite initial struggles, the mid-term assessment served as a pivotal moment for realignment and deeper group discussions. It highlighted the importance of a shared vision, which significantly clarified our planning and design strategies. Case studies, particularly exploring existing living labs in the EU and existing pilot agricultural practices, played a very important role in grounding our vision and guided our project forward cohesively.

As we progressed, I gained a deeper understanding of the significance of stakeholder organizations in shaping design proposals. Since my perception of design was previously more spatial, the realization that policy changes and reorganisation of stakeholder roles can profoundly influence spatial design was eye-opening for me. Navigating various scales, from regional to spatial, was initially daunting, yet ultimately all the pieces started falling into place. Though our group encountered minor setbacks post-mid-term, we successfully regrouped and made progress.

Personal discovery played a significant role in this journey. Aside from my interest in stakeholders, policy, and water management, I realised the importance of illustrating spatial qualities through collages. The latter helped enhance our design clarity. However, challenges persisted, particularly in organizing report tasks efficiently. In hindsight, assigning one person to focus solely on report compilation could have streamlined our efforts.

One regret that I have with this project is the lack of time and resources to actually engage with other farmers and adapting our vision according to their insights. This would have made our idea much more grounded and enriched it further.

In conclusion, this project has been a profound learning experience, highlighting the symbiotic relationship between research and design. It emphasized the criticality of a shared vision, the transformative power of policy integration, and the dynamic nature of collaborative design processes. Personally, it has deepened my appreciation for the multifaceted aspects of regional design, igniting a passion for holistic problem-solving and creative exploration.

Tim ter Heide

This course has introduced me to designing spatial strategies for transitions. Additionally, this is the largest scale I have ever worked on. Because of the high level of complexity this brings, I experienced this as quite difficult. It proved very difficult to grasp the extend of a large spatial problem. The interrelatedness of topics made it challenging to define the extent of problems and solutions. As a group we have had several times where we felt our framing of the problem slipped through our fingers, which made us feel disillusioned afterwards.

Finding a compromise between comprehensiveness and detail proved difficult because of the interrelatedness of different topics and the sheer amount of information available. Within the very limited time of 9 weeks this forces you to make choices of what to include and what not. As a group we focused on the relation between nature and agriculture. In the beginning of the project, we all started investigating this topic. However, I think our research approach was a little too individual, causing us to generate a lot of information without a strong correlation. Sharing our knowledge and coming to a common understanding of the topic has therefore been challenging. This proved difficult when we were defining the vision. It made us have to filter an approach built from a wide scope of possibilities. While I anticipated the development of our strategy to be more streamlined, this also proved challenging. Implementing our vision on different scales opened up a lot of new questions and discussions.

This experience has, however, taught me a lot about how designing spatial strategies and implementing policies works in practice. It has shown me that communication and making ideas explicit is very important to create a common understanding and direction. Additionally, the course has made me realize that a large part of design is convincing other people of your idea/concept. This is especially true for complex and large-scale spatial strategies such as the one in this course.

I experienced the workload of this course as quite high. The course involved many workshops and inspiration sessions that we were strongly encouraged to attend. Group work also made the course more challenging since this required us to discuss a lot. The pressure to come up with concrete products at each tutoring session was sometimes stressful. Discussing unfinished or preliminary products proved challenging, since these are still very open to interpretation. This often caused a divergence of topics instead of the sometimes very necessary convergence. In addition, the tight schedule of the course as a whole added to the pressure to come up with something concrete before the next presentation.

Overall, I look back at a challenging, but very interesting quarter.

Sandy Prikanowski

Group dynamic: Throughout the quarter our group dynamic has developed positively. Evidently, it was far from perfect due to the frequent circumstance-related absence of various group members. However, we have managed to establish a collective attitude of being respectful of each other's time management and appreciative of each other's work. This has resulted in a rather pleasant and constructive atmosphere of collaboration.

Roughly halfway into the quarter, there was one incident after which we ended up having a group discussion about feedback which helped dissolve most of the tension. I am glad to say that this has been the only conflict in our group and, importantly, that the impact of it on the group dynamic was even positive as the issue had been smoothed over by the group collectively establishing some common values about feedback.

Project process: Looking back on the development of the project, I think we were put off track quite a bit by the emphasis on the site visit in the first weeks. As the assigned scale for the project was regional, but it is impossible to visit a region in just one day, we ended up with a focus on the location of our site visit, the Biesbosch, which isn't suitable for the task of developing a regional vision and strategy. Realizing this in the third or fourth week we extended our focus including more zoom-in locations in the Delta region. However, I feel like this has caused the logic of our approach to be a bit backward throughout the project.

After much strugglesome path searching, in the final weeks our narrative has become quite clear, with the main obstacle being the consistency in the terminology of our proposals – pilots, pioneers, living labs, agroparks, hubs, and centers. Sorting them out and tying them together into a supportive network has been the final challenge in our project.

Personal contribution to the group: During the project, most of my effort has been spent on critically overviewing the structure of the project, trying to make sure all separate parts add to the whole. Although, of course, determining the structure of a project is not a one-person task and its success depends on collaboration and communication, I was very glad to read in the peer review that the other group members recognized my effort in this aspect and found it helpful.

In the end, the product I am most proud of is the intervention catalog I made in the final week. With some more time, I would have liked to make them even a bit nicer, by putting more craftsmanship into the drawings on them. However, they serve their purpose as they are. Structuring and categorizing all of our proposed interventions and relating them to stakeholder and project values was a very helpful exercise to me and will hopefully also be helpful to readers to gain a sense of clarity and overview.

Floyd Shazly

Starting my master degree with this research and design project was a significant leap that challenged me intellectually and conceptually. As I delved into the intricacies of the Delta region, farming practices, and regional planning in general, I realized that I was missing some general knowledge. Keeping up with my groupmates and tutors proved to be a significant hurdle, requiring me to rapidly expand my understanding of various subjects. The complexity of the system we were addressing, with its intertwined social, environmental, and economic dimensions, added another layer of difficulty. To me, understanding and revealing the interrelations between these elements was quite challenging. Additionally, working through with different scales, added to the complexity.

One of the most enlightening aspects of the project for me, was gaining deeper insights into the challenges faced by farmers. Despite (mainly) well-intentioned policies and programs, there are significant gaps between stakeholders' needs and the implemented solutions. Trying to solve these problems presented its own set of challenges. Each proposed solution seemed to bring forth new obstacles, making it difficult to go forward and requiring continuous adaptation and innovation to overcome these challenges.

Our strategy development was anything but linear. Instead, we went back-and-forth by simultaneous doing research, design, and planning. Despite generating numerous ideas and products, many did not align with our final narrative. We often found ourselves uncertain of which direction to take, not because we weren't on the same page, but mainly not knowing how prioritize discussions and developments. However, through multiple revisions and iterations, I think we gradually managed to organize our process and connect our research, vision, and strategy in a coherent manner to explain the AgriNature principle.

Throughout the project, our research served as the foundation upon which our design decisions were built. By conducting thorough research, we gained valuable insights though different scales. This knowledge informed our design choices, ensuring that our proposals were grounded with evidence adapted to the specific needs of the stakeholders. Our vision provided guidance amidst the project's complexities. It helped us form our values and goals, offering a cohesive framework to work with. Continually evolving in response to new insights and challenges, our vision drove us toward new solutions.

Moreover, I learned the necessity of embedding governance aspects into our planning proposals. Recognizing the intricate web of regulations, policies, and stakeholders involved, we understood the importance of aligning our proposals with existing governance structures. By integrating governance considerations, we aimed to ensure the feasibility and viability of our designs within the broader socio-political context. Maintaining a critical attitude was crucial throughout this project, as it allowed me for deeper evaluation of ideas, ensuring that we prioritized solutions that were both practical and capable of making a significant difference. Through navigating these complexities and embracing a critical attitude, I gained a deeper understanding on how regional design works and how multifaceted sustainable development can be.

Valdemarr van Staveren van Dijk

Reflecting on our group project, I've come to appreciate the intricate relationship between research and design. As emphasized through our early exercise on the Flat Earth theory, decisions based solely on emotion or societal pressures often lead to less logical outcomes. This understanding has been particularly relevant as we tackled significant societal issues, influencing the socio-economic and ecosystem levels of our surroundings.

Throughout the course, I've recognized the tendency for designers, including myself, to fall prey to biased opinions and emotions when making design choices. However, this course has been transformative in challenging these biases and fostering a greater awareness of my own and others.

As urban planners and designers, we are tasked with providing grounded solutions that consider the well-being of all stakeholders. Central to this process is the formulation of a vision, which, while allowing for creativity, must also be rigorously validated and adapted to real-world scenarios. Learning methods like backcasting and forecasting during the methodology course has been particularly enlightening in this regard.

Previously, I tended to rely solely on backcasting, envisioning radical futures and building towards them. While this approach is valuable, it often neglects current trends and the needs of current stakeholders. Incorporating forecasting allows for a more nuanced approach, aligning with current policies and trends while still fostering creativity. By merging these techniques, we can develop holistic strategies that are both imaginative and feasible, ultimately maximizing positive impacts.

When envisioning our strategy we were pushed to form a thorough understanding of the governance aspects embedded in our proposal. This needed consideration of regulatory frameworks, stakeholder engagement processes, and decision-making structures. Incorporating governance aspects ensured that our proposals were not only technically feasible but also politically and socially acceptable. Throughout the project, we embedded governance considerations into our design process, acknowledging the importance of aligning our proposals with existing policies and regulations while also striving for innovative solutions.

This course has profoundly influenced my perspective as a designer, equipping me with the tools to navigate complex planning and design challenges. Moving forward, I am committed to applying these insights to my future projects, ensuring that my designs are not only innovative but also grounded in reality and beneficial to all stakeholders involved.

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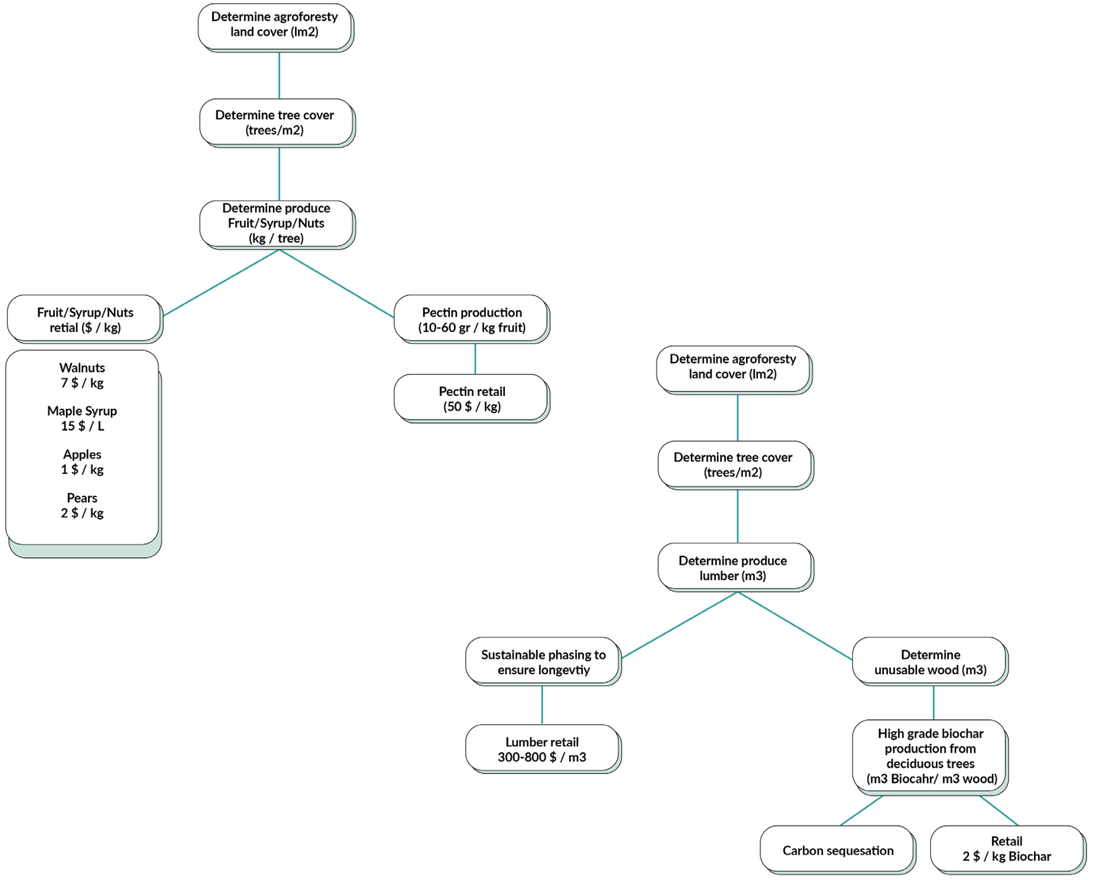
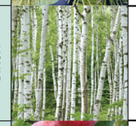
APPENDIX

Economic Viability - Agroforestry



SPECIES	LIFECYCLE (FOR PHASING)	SOIL REQUIREMENTS (FOR LOCATION)	PRODUCTION (SOCIO-ECONOMIC OPPORTUNITIES)
SUMMER OAK 	**Long Cycle** In nature: 130 years Ready for lumber farming: 80 years	Oak trees are highly adaptable (growing in acidic, alkaline, loamy, moist, sandy, well-drained, and clay soils). While the tree prefers average moisture, it has some flood and drought tolerance.	1. For window frames, sills, doors, stairs, and floors as structural timber for housing construction, bridges, and shipbuilding 2. For furniture, both indoors and outdoors in hydraulic engineering, as oak becomes extremely hard when in contact with water 3. Wood waste: Biochar production
WALNUT 	**Medium Cycle** In nature: 100+ years Ready for lumber farming: 40 years Walnut production: 8+ years	The walnut grows on many types of soil, but thrives best on fertile, well-draining, deep-rooted soil with plenty of humus. The walnut is fond of lime.	1. Wood: Mainly interior furniture 2. Walnuts 3. Wood waste : Biochar production
SUGAR MAPLE 	**Medium Cycle** In nature: 500+ years Syrup production: 40 years	Most maple trees are adaptable to many soil types, including clay. They prefer a well-drained but moist soil of average fertility. Though some maple varieties will grow in swamps, other will handle periods of wet soil due to heavy rainfall but constantly wet soil could be problematic.	1. Maple syrup 2. Wood: Interior finishing (floors, kitchen boards) 3. Wood waste: Biochar production
DUTCH RED CEDAR 	**Long Cycle** In nature: 1000+ years Ready for lumber farming: 50-70 years	Grows best on medium to very rich brown earth soils with fresh to moist soil moisture but will tolerate calcareous soils if grown under light shelter. Not suited to very poor and very dry soils but will grow on gleys and occurs on some peat soils in its natural range.	1. Wood: Facade/Interior cladding (possible without preperaton, naturally water resistant) 2. Wood waste: Biochar production
DOUGLAS FIR 	**Medium Cycle** In nature: 500+ years Ready for lumber farming: 40-60 years	Douglas-fir grows best on well-drained deep soils and will not thrive on poorly drained or compacted soils. Along the coast it is mostly found where marine sandstones and shales have weathered deeply to fine-textured, well drained soils.	1. Wood: Facade/Interior cladding (possible without preperaton, naturally water resistant)
BIRCH 	**Medium Cycle** In nature: 80-100 years Ready for lumber farming: 40-60 years	Soil acidity - Birch trees do best on slightly acidic soils (pH 5.0 - 6.5), though the white-barked birches especially our native paper birch-are capable of growing well on alkaline soils.	1. Wood: lumber, veneer, plywood and pulpwood 2. Medicine: Sugarbirch - muscle, reuma 3. Medicine: Paperbirch - skin, stomach
APPLE 	**Short Cycle** In nature: 15 years Apple production: 3-5 years	pples trees can grow in a wide range of soils from medium textured clays to gravelly sands. However, poor soils will produce poor results and the best crops are found on fertile sandy soils and loams. Soils should be well drained.	1. Fruit: apple 2. Wood: firewood, small craft 3. Wood: Biochar production
PEAR 	**Short Cycle** In nature: 30 years Pear production: 3-5 years	Pear trees grow best in well-drained sandy loam soil that has a pH between 6.0 – 6.5 (although they can also tolerate soils with a pH of 5.0-7.5). However they can also survive in other soils as long as they are well-draining.	1. Fruit: pear 2. Wood: Veneer, architectural millwork, marquetry, inlay, carving, musical instruments, furniture, cabinetry, and turned objects 3. Wood: Biochar production
CHERRY 	**Medium Cycle** In nature: 25 years Ready for lumber farming: 16-20 years Cherry production: 6-7 years	Cherry trees grow best in deep (at least 4 feet), well-drained loam soils. They will tolerate less desirable soil, but may do poorly on excessively sandy, heavy or wet soils.	1. Fruit: Cherry 2. Wood: Fine furniture and cabinet making, moulding and millwork, kitchen cabinets, paneling, flooring, doors, boat interiors, musical instruments, turnings, and carvings. 3. Wood: Biochar production

Agroparks - Typology Details

Innovation & Education Centre

(Peri-Urban)

The Innovation & Education Centre is a multifaceted space designed to facilitate the exchange of ideas, expertise, and resources among diverse stakeholders in the agricultural sector. At the heart of this center lies a commitment to innovation, where cutting-edge technologies and research initiatives intersect with traditional farming practices.

Key Features:
Knowledge Sharing Platform: The center serves as a vibrant platform for sharing knowledge among farmers, researchers, and educators. Workshops, seminars, and training programs are regularly organized to disseminate information on sustainable farming techniques, soil conservation methods, and biodiversity enhancement strategies.

Research and Development Facilities: Laboratories and research facilities are available for conducting experiments and trials on innovative agricultural technologies and practices. Research institutes collaborate with farmers and tech companies to explore emerging trends such as lab-grown meat, vertical farming, and precision agriculture.

Tech Hub and Incubator: The center houses a tech hub and incubator space where startups, entrepreneurs, and technology companies converge to develop and test new agricultural innovations. From drone technology for crop monitoring to devices for smart irrigation, this collaborative ecosystem fosters creativity and entrepreneurship in agri-tech.

Multi-Stakeholder Collaboration: The center facilitates multi-stakeholder collaboration, bringing together public and private organisations - such as waterboards and educational institutions - with farmers to co-create policies, strategies, and action plans for a sustainable transition of agricultural practices.

Communities Involved:
Farmers: Farmers are actively involved in knowledge-sharing activities, participating in workshops, field demonstrations, and on-farm trials to learn about new technologies and practices.
Researchers: Research institutes and academic institutions conduct experiments and studies on-site, contributing to advancements in agricultural science and technology.
Students: Students from universities and vocational schools engage in experiential learning opportunities.
Tech Companies: Technology companies collaborate with farmers and researchers to develop and commercialize innovative solutions for the agricultural sector.
Government Agencies: Government agencies collaborate on policy development, regulatory enforcement, and funding initiatives to support farmers in incorporating nature-inclusive practices.

The Innovation & Education Centre serves as a catalyst for driving positive change in agriculture, bridging the gap between tradition and innovation, and empowering communities to embrace sustainable farming practices for a resilient and prosperous future.

Consumer Awareness Centre

(Urban)

The Community Engagement Centre serves as a vibrant hub for fostering connections, raising awareness, and promoting sustainable agriculture practices among diverse stakeholders, including consumers, farmers, and local communities. Rooted in the principles of education, collaboration, and experiential learning, this center offers immersive experiences that inspire appreciation for the vital role of agriculture in our daily lives.

Key Features:
Consumer Awareness Initiatives: The center hosts educational programs and demonstrations aimed at raising consumer awareness about innovations and best practices in agriculture. Visitors learn about sustainable farming methods, organic production techniques, and the importance of supporting local farmers in their communities.

Farm-to-Table Experiences: Farm-to-table experiences provide visitors with the opportunity to connect directly with farmers and producers, experiencing firsthand the freshness and quality of locally grown and harvested foods. Interactive cooking classes, culinary workshops, and tasting events highlight the seasonal bounty of the region and showcase the diversity of agricultural products.

Marketplace for Local Products: The center features a marketplace where farmers and artisans showcase their products, offering visitors the chance to purchase fresh produce, artisanal goods, and locally made crafts. Farmers' markets, pop-up shops, and agricultural fairs create opportunities for direct sales and networking between producers and consumers.

Farm Experiences: Guided tours and farm experiences offer visitors immersive insights into the daily operations of a working farm, allowing them to engage in hands-on activities such as harvesting fruits and vegetables, feeding animals, or participating in farm chores.

Communities Involved:
Consumers: Consumers engage in educational and culinary experiences that promote awareness of sustainable agriculture practices and support for local food systems.
Farmers: Farmers showcase their products and share their stories with visitors, building relationships with consumers in the community.
Local Communities: The center serves as a gathering place for residents to celebrate agricultural traditions, cultural heritage, and community resilience.

The Community Engagement Centre is more than just a place; it is a catalyst for social change, empowering individuals and communities to make informed choices that promote health, sustainability, and prosperity for generations to come. Through shared experiences and collective action, we can cultivate a brighter future for agriculture and society alike.

Regeneration Centre

(Peri-Urban)

The Regeneration Centre serves as a collaborative hub for restoring ecosystems, enhancing biodiversity, and fostering dialogue among stakeholders committed to nature conservation and sustainable land management practices. With a focus on holistic regeneration and ecological restoration, this center provides a platform for innovation, research, and policy development at regional and national scales.

Key Features:
Multi-Stakeholder Collaboration: The center facilitates multi-stakeholder collaboration, bringing together government agencies, conservation organizations, research institutions, and local communities to co-create policies, strategies, and action plans for nature regeneration and land stewardship.

Research Hub: Monitoring stations, and research facilities provide the infrastructure for conducting scientific studies, ecological monitoring, and habitat assessments. Researchers and scientists collaborate on interdisciplinary projects to develop innovative tools and technologies for land and nature management.

Policy Development and Advocacy: The center serves as a forum for policy development and advocacy on regional and national scales, influencing decision-making processes and promoting legislative measures that support nature conservation, habitat restoration, and sustainable land use practices.

Education and Outreach Programs: Educational programs, workshops, and field trips engage the public in hands-on learning experiences, raising awareness about the importance of ecosystem services, biodiversity conservation, and the interconnectedness of nature. Outreach initiatives foster a sense of stewardship and empower individuals to take action for environmental sustainability.

Communities Involved:
Government Agencies: Government agencies collaborate on policy development, regulatory enforcement, and funding initiatives to support nature regeneration and ecosystem restoration efforts.
Conservation Organizations: Conservation organizations lead efforts to protect and restore habitats, manage wildlife populations, and engage in community-based conservation projects.
Research Institutions: Research institutions conduct scientific studies, ecological monitoring, and habitat assessments to inform land management decisions and conservation strategies.
Local Communities: Local communities participate in decision-making processes, contribute traditional knowledge, and engage in habitat restoration activities to enhance ecological resilience and community well-being.

The Regeneration Centre serves as a catalyst for positive change, inspiring collective action and fostering a deeper connection to the natural world. Through collaboration, innovation, and shared commitment, we can regenerate landscapes, revitalize ecosystems, and create a sustainable future for all.