



Landscape Based Agriculture



*Towards a new circular
agricultural system, a stronger
ecosystem and improved liveability*

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00 Abstract

Currently, the agricultural system of South Holland causes many externalities including subsidence, increased flood risks by poor water management, a loss of biodiversity, air pollution and economic problems due to the nitrogen tax. Given these problems, the following research question is chosen: can improving ecological conditions and livability in South Holland be accomplished by creating a circular agricultural system where livestock farming is severely limited?

The goal of this project is to respect and work with the underlying landscape system to construct a new circular agricultural system which is beneficial for the ecological system and livability in South Holland.

This will be achieved by reducing livestock farming by over 90%, which will still leave us with the right amount of animals needed for sufficient manure production. On the remaining land, new types of protein rich, eco-friendly agriculture will be introduced. Furthermore ground remediation will be done, in peat areas the ground water level is increased to battle subsidence and double dikes will be realised to limit the long term flood risk in a natural way while producing seaweed at the same time. To create a stronger economy, knowledge on the new forms of farming and producing meat replacements in the newly introduced meat replacement hub will be created and exported. Lastly an ecological network will be created to strengthen the ecosystem and increase biodiversity. By these interventions a stronger ecosystem is created that will be integrated into people's lives.

To make these interventions happen, scientists need to work together with policy makers and designers to discuss the details of the projects. They will initiate the processes, and then give nature time to heal and achieve the sought after ecological results.

Overall, the following recommendations are given to the province of South Holland:

- Initiate natural changes that will lead to a stronger ecology and underlying landscape
- Give strong incentives for entrepreneurs to be circular: facilitate, stimulate but also regulate
- Take externalities into account when making economic calculations, then a sustainable way is likely to also be the most profitable way.

This report is interesting for policy makers and spatial planners at a national, regional and city scale level looking for spatial solutions to problems with a linear agricultural system as well as policy makers wanting to improve the subsoil conditions. The report is specifically interesting when one is interested in south holland, but can also be applied broader to the Netherlands and countries with similar climates, soil types and ecosystems.

Key words: circular agriculture, livestock farming reduction, ecological system, landscape based agriculture, water management

01 Introduction



The province of South Holland

Looking at the province of South Holland (PZH), it almost seems like a small country of its own with how diverse its landscape is. Being one of the most densely populated and industrialised areas in the world and having the highest population density in the Netherlands (South Holland, n.d.), it is a place where spacious green areas, rivers and the sea coexist back to back with Rotterdam, The Hague and other cities around and between them, making its regional image rich and strong. Unsurprisingly, this makes PZH highly important logistically and economically, not only due to one of the two largest dutch cities being located there, but because of the Port of Rotterdam, Europe's largest sea port. That, along with the amount of industries, makes the province a crucial element not only for the dutch economy, but internationally as well.

Circular economy

Currently, the region is striving to transition towards the circular economy model, which, knowing its scale, can make it become a frontrunner in circularity globally, if the transition goes well. PZH's ambitious main goal is reducing the use of primary raw materials as much as possible, which will help not only in achieving a circular economy, but solve various problems as well, from environmental issues to health-care (Rotterdam Circular, 2019).

Agri-food sector

The goal of our project is to help the province of South Holland transition towards a circular agri-food sector, while solving other existing problems caused by the linear economy model along the way. Spatially, it is the most prominent sector of PZH, taking up more than a half of its surface, with many businesses working

in this field (Drift & Metabolic, 2018). However, it also causes a number of serious issues, worsening the ecology and livability, which, in turn, negatively impacts the economy as well. With our approach, by severely reducing the livestock and introducing a landscape based agriculture system, we want to introduce a solution that not only helps the agri-food sector of PZH become circular, but allows to fix all other interrelated issues, making it possible for other sectors and areas of South Holland become more circular as well.

Figure 1 - Location of PZH: Wikipedia

02 Approach

Problem statement

Intensive livestock farming is linked to a multitude of problems, some of which are quite familiar and relevant for South Holland as well, since the province's grasslands, primarily used by grazing livestock, occupy more than 50% of its territory (CLO, 2019).

To begin with, farming takes up 70% of the nitrogen "budget", of which cattle farming takes up the majority (NL Times, 2019). This has a severe negative effect on the economy, as many projects, especially in the construction sector, are restricted now, causing further aggravation of the Dutch housing crisis (ten Teije, 2019). On top of that, intensive livestock farming makes up less than 1% of the total economic income of the Netherlands (NL Times, 2019), yet it also limits other economically beneficial activities.

Secondly, intensive livestock farming has a major environmental impact. It causes air pollution (Prag et al., 2020) as well as eutrophication, which has a vastly negative effect on biodiversity (Leip et al., 2015). It also forces groundwater levels to be low, leading to ground subsidence (van den Born et al., 2016), which not only makes the province even more vulnerable to flooding, but also causes damages to cities such as Gouda (van den Belt, 2018), threatening both the economy and livability.

At this scale, the issues of economy and ecology in South Holland become the issues of the cities, making them not only spatial but social as well. These societal issues, including human health issues, are not even justified by the need of livestock in order to reach food security. It takes much less resources to feed the population with vegetables, nuts, mushrooms and other plant-based foods, besides, the CO2 footprint of their production is much less compared to the one of the livestock industry (Prag et al., 2020).

As these are issues faced by multiple cities within the province and across the country, it will be beneficial for the municipalities to collaborate with one another to alleviate the problems brought upon them through intensive livestock farming and work together to transition towards a more sustainable land use and regenerative economic cycle.

Research question

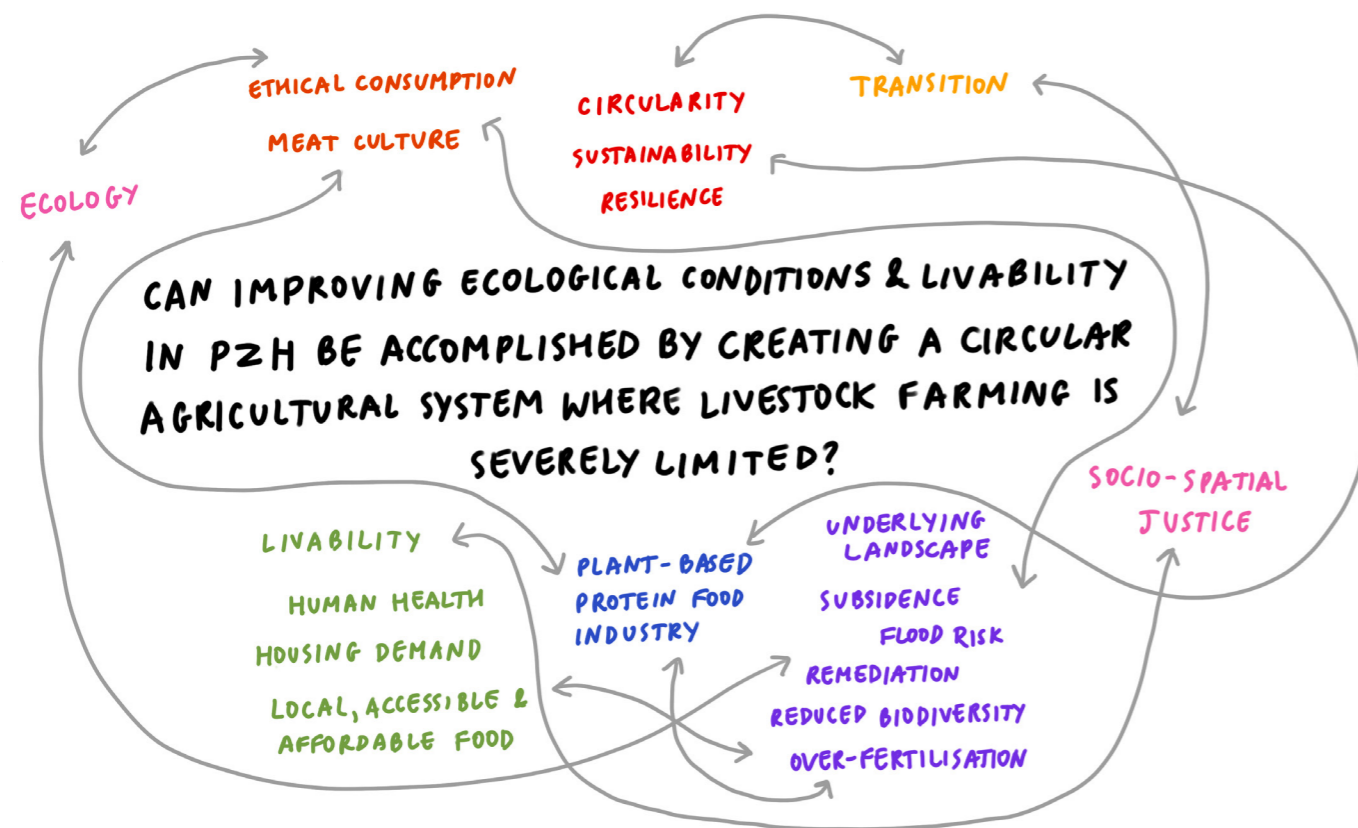


Figure 2 - Research question
By author

Objectives & Goals

Based on the research question as well as the sustainable development goals set by the European Green Deal and the UN, a set of goals and objectives for our future vision of the province of South Holland has been set, namely:

- Creating a new fair, healthy, environmentally friendly and circular agri-food system,
- Taking a much anticipated climate action,
- Restoring, improving and preserving the ecology of South Holland,
- Ensuring good health, well-being and safety for the residents of the province,
- Fostering a conscious consumption and production lifestyle.

Conceptual Framework

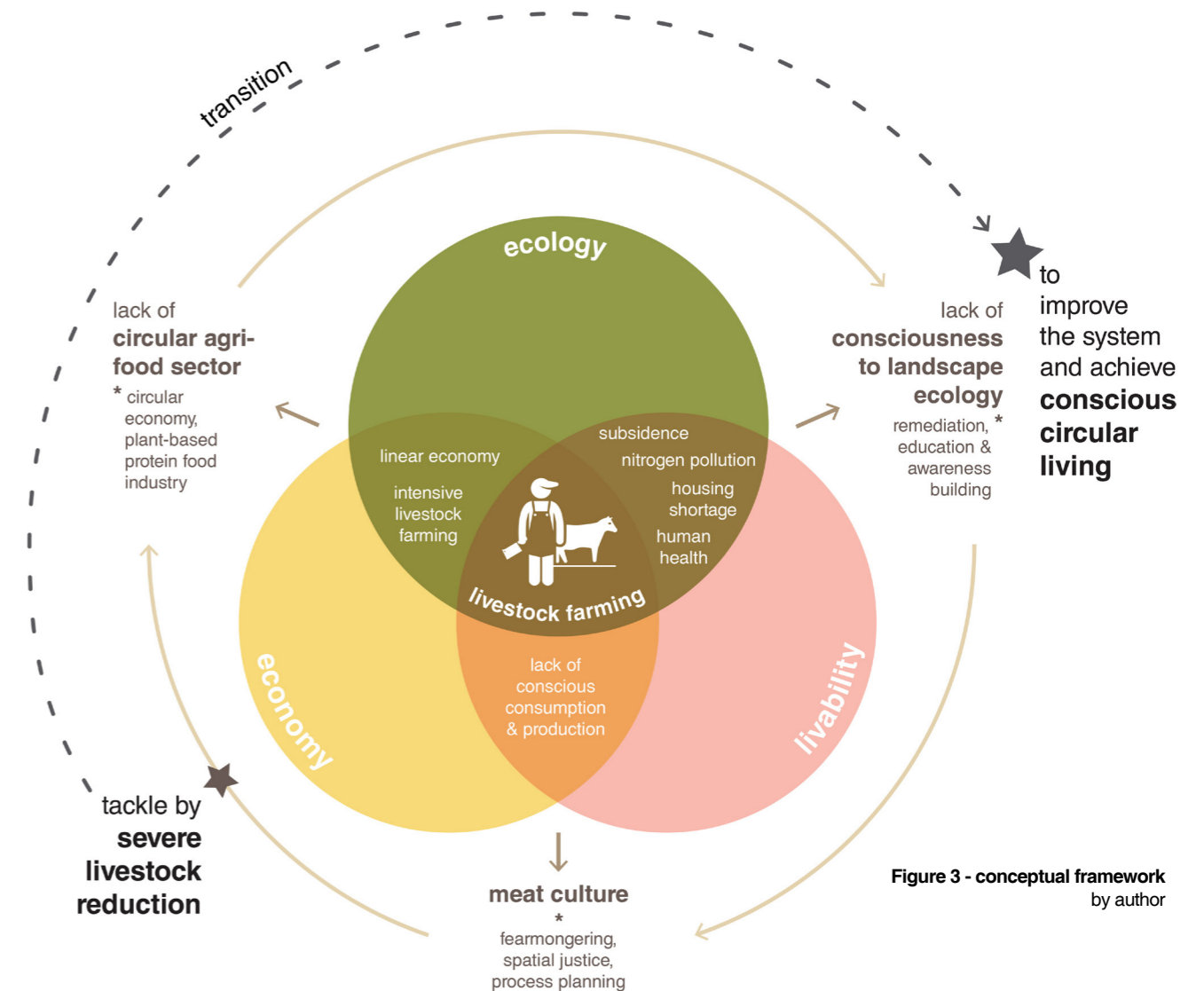
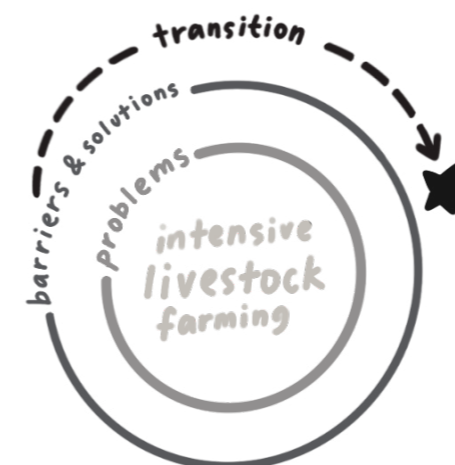


Figure 3 - conceptual framework
by author



1. Identify the problems & interdependencies
2. Identify the barriers blocking the transitions
3. Solve the problems & break the barriers
4. Transition & reach the goals

Figure 4 - key to the framework
by author

The conceptual framework consists of several layers as well as concepts and definitions relevant for our project.

Intensive livestock farming stands at the very core, indicating the starting point of the project, while simultaneously showing its relation to the crucial areas, emphasising their linkage through the issues livestock industry causes. These are the main problems the province of South Holland faces due to intensive livestock farming, elaborated through a number of interconnected concepts and definitions which play the key roles in our research and design process.

The succeeding outer layer shows the three barriers standing on the way to achieving the goals set for South Holland in the previous chapter within each of the corresponding areas, followed by several other interlinked concepts that need to be introduced to break these barriers.

Lastly, the outermost layer illustrates the final goals we strive for the province to achieve as well as the approach chosen for it, which incorporates the solutions for both the barriers and the problems accelerated, caused by or related to intensive livestock farming.

The problems

Linear economy

The essence of a linear economy is the assumption of a constant supply of usually raw natural resources used for the production of various goods which eventually will be discarded, with selling as many products as possible being the main goal (Het Groene Brein, n.d.). Simply put, because of the “take-make-dispose” plan the linear model follows the emphasis is not on the conservation of materials (PBL, n.d.), but on pure profit-making, which means everything is being produced at the cost of our ecosystems’ productivity (Het Groene Brein, n.d.). This is not only inefficient but harmful in many ways, causing a range of ecological and socio-economic issues, such as natural capital disruption, various kinds of pollution and creation of geopolitical material dependencies (Het Groene Brein, n.d.).

Intensive livestock farming

Like linear economy, the goal of intensive farming is to maximise the production, which also causes many residual waste flows to remain unconsidered. Due to that, intensive livestock farming specifically is known to be a significant contributor to environmental issues including biodiversity deterioration, global warming and various **landscape conditions**, such as land degradation, ground subsidence, and air, soil and water pollution. All of these severely impact not only the ecology, but **human health** too (Ilea, 2008).

Housing shortage

The issue of housing shortage is something the Netherlands, a country where the population density is quite high and every square inch of land is accounted for, is closely familiar with. Currently, to accommodate the needs of the ever growing population of the country, almost a million homes need to be built by 2030 (BZK, 2020). There are quite some reasons for the housing crisis the Netherlands are facing right now, some of which (nitrogen pollution and lack of free space) are tied to intensive livestock farming (Lalor, 2021), making the agricultural issues become the issues of livability as well.

[Lack of] Conscious consumption & production

Purely conceptually, conscious consumption and production is when both actions are done with an effort to minimise the ecological footprint, driven by the effort to make the processes have positive social, economic, and environmental impacts (Nguyen, 2021). The real effectiveness and genuinity of conscious consumerism can be debated, since, according to some sources, there is no ethical consumption under capitalism at all. However, it is undeniably clear that conscious consumption and production do not exist within the linear economy (Sariatli, 2017), because it is simply impossible to truly minimise the ecological footprint in a system that values production and profit quantities the most. Linear economy strives to minimise the ecological impact while still retaining the same output, which essentially just delays the moment the system becomes overloaded and dysfunctional (Di Maio et al., 2017). Besides, its marketing strategies, which we, as consumers, sometimes fall for, prevent changes to more sustainable consumption patterns (de Bakker et al., 2011), making “the consumer” become the enemy of the citizen (Bauman, 2009). Thus, a shift towards a more conscious behaviour is not just crucial, but required.

The barriers

Meat culture & fearmongering

The cultural significance of meat has been present since the dawn of human civilisation. Meat and its consumption have always been almost representative of health, strength and masculinity (Ruby et al, 2011), to the point when the meat industry started exploiting its symbolic meanings in harmful ways to reinforce the notion of toxic masculinity (Roth, 2019) and increase the emotional consumption. Meat production companies often even resort to fear mongering, cultivating an impression that a diet without meat is unhealthy and insubstantial (Ruby et al., 2011), which also does not help the transition towards a more sustainable and environmentally friendly plant-based protein diet.

[Lack of] Circular economy

It is probably apparent enough already that the circular economy brings a significant number of benefits with its key principle of closing the material cycles and changing the value from products to services (Het Groene Brein, n.d.), making the production system much more sustainable and effective by not only minimising the ecological impact, but even making the ecological and socio-economic impacts positive (Kjaer et al, 2019). However, the website of Het Groene Brein provides a clear and concise example illustrating the advantages of circular economy over its linear counterpart. They illustrate it using the production of beef, which, coincidentally, elaborates some of the key motivations of our project:

“In a linear economy, the production of beef is made more sustainable by changing the way cows are fed, so that they emit less methane gas for the same amount of meat. This makes production more eco-efficient. In a circular economy, production is made more sustainable by not making beef from cows, but for example by creating a meat substitute. For the beef substitute, plants are then grown that contribute to biodiversity, employment and landscape management. In this way, the ecological, economic and social impact of the same production of ‘beef’ is increased.” (Het Groene Brein, n.d.).

[Lack of] Landscape ecology

The concept of landscape ecology plays a crucial role as well. A science that studies and aims to improve the relationships between ecological processes in the environment and particular ecosystems (Wikipedia contributors, 2021), it integrates various approaches and combines socioeconomics and biophysics to help solve the ecological and environmental issues as well as protect and conserve the ecological processes and landscapes and achieve more sustainable ways of existing, not just for animals, birds and other species, but humans as well, since we are a part of both the landscape and the ecology with our human habitats. If the landscape ecology is not taken into account, many environmental issues

might happen, such as the ones South Holland is facing right now.

The solutions

Consciousness & responsibility

The beneficial effects of conscious and responsible consumption and production have already been discussed here, however, these concepts extend far beyond that. A more responsible behaviour contributes to a more sustainable lifestyle in general, making people become more aware about the consequences their actions have not on the climate, but on society as a whole (Lubowiecki-Vikuk et al., 2021), implying that fostering conscious and responsible ways of thinking, living and acting through **education and awareness building** helps ensure that circular economy and its principles will definitely have the intended effect, while also guaranteeing that the ecological and climate measures put into effect will not be in vain.

Remediation

Aside from integrating a more responsible behaviour into our lives, it is also crucial to repair the damage caused to the environment. In the case of South Holland, environmental and especially soil remediation is crucial for solving the housing crisis and rebuilding the ecosystems and restoring biodiversity, which both declined due to intensive livestock farming.

Spatial justice

Linking social justice and space together, spatial justice involves “the fair and equitable distribution in space of socially valued resources and opportunities to use them” (Soja, 2009). In our case of livestock reduction and transitioning towards a circular and more sustainable plant-based agri-food sector, the implications socio-spatial justice brings is ensuring that the products of the future plant-based protein-rich food industry of South Holland are accessible and affordable for everyone. Currently, participation in the plant-based protein consumption lifestyle is still a privilege only relatively well-off people can partake in (de Bakker et al., 2011), hence, the inclusion of everyone involved is crucial for our project as well.

Process planning

Having discussed such notions like education, awareness building, inclusivity and spatial justice, it becomes clear that the planning approach we are leaning towards the most in this project is process planning, the main task of which is creating processes that integrate, involve and engage all relevant stakeholders (including common citizens specifically) in the decision-making process. Therefore, we shall continue using the principles of this approach further.

Transition

Lastly, the majority of processes discussed in this framework are all transition-based. From linearity to circularity, from lack of awareness to consciousness, from meat to plant-based protein consumption – transition is the main process our design will both be accommodating and using as a means to achieve the desired goals for the province of South Holland.

Methodology

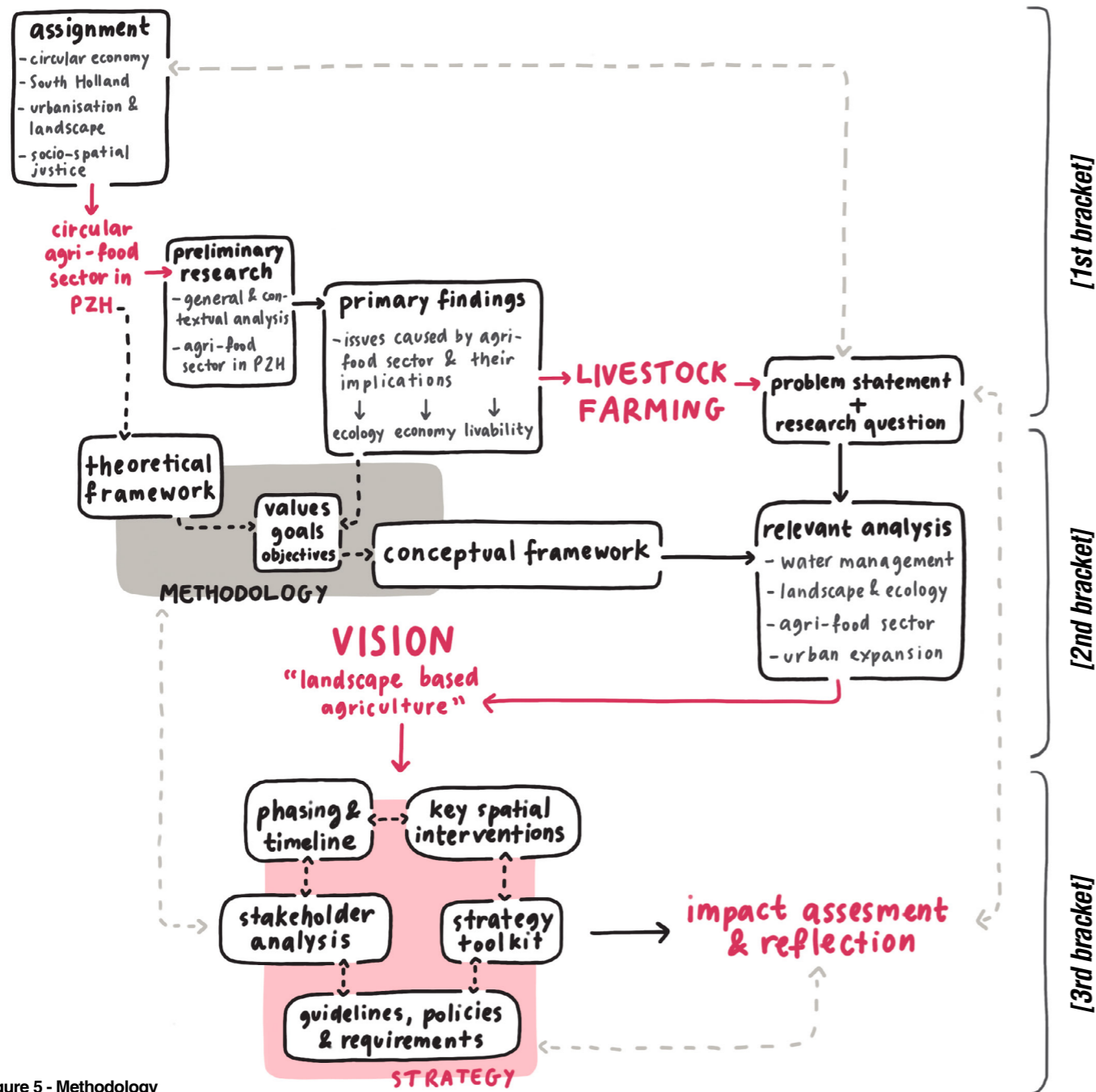


Figure 5 - Methodology by author

[1st bracket]

1. Get familiar with the assignment and its key concepts.
2. Understand the region and its existing and prevailing trends.
3. Identify the existing issues.
4. Define the problem and formulate the research question.

[2nd bracket]

5. Inventorise the relevant and applicable theoretical and problem-specific concepts as well as the research and design methods.
6. Understand the structures and systems of the province of South Holland, and investigate the defined problems.
7. Propose a vision based on the findings and defined values and concepts.

[3rd bracket]

8. Identify the key spatial interventions, new networks of flows, and stakeholders.
9. Implement the interventions in space, enhance the crucial interdependencies, develop the phasing and relevant time lines, consider and prioritise the stakeholders and their roles, and propose the required policies and guidelines.
10. Evaluate the strategy as well as the entire project, and reflect on the process and conclusions.

Conclusion

With our design we are striving to achieve a progressive and livable region, where circular agri-food sector is not just a sustainable innovation, but an element that integrates and improves the ecological, economical and societal conditions, resolving the environmental issues and creating an environment where common citizens are involved and connected to the ecology and agriculture more than ever. With our transparent approach, which is based on realistic and significant issues and considers all the relevant stakeholders, we aim for a set of proposals that allows the province to become more circular, and could be useful for improving the social, economic and ecological conditions into the future of South Holland.

03 The Meat Culture & the Livestock Industry

Meat Culture

Animal meat has been an integral part of our society for the longest time, being one of the things our ancestors relied on the most for survival during the pre-Neolithic periods aside from essentials like fire, water and shelter. Before the Neolithic Revolution and the emergence of concepts like agriculture, hunting and killing animals for their meat has been crucial for humankind. After the invention of agriculture, however, meat still did not lose its status as one of the fundamental parts of our diet because of its high nutritional value (Wyness, 2015). Thus, we proceeded to consume animal meat, which became significantly easier with the help of agriculture, which allowed us to keep and breed animals for food instead of spending much more time, effort and energy chasing and hunting them. Fast forward to current days, and the agricultural and animal keeping practices have progressed so far that intensive animal

farming now not only feeds us, but greatly affects the ecology, hence, our living environment and our own lives in a negative way as well.



Image: Supermarket news

The Society is Changing

Agriculture, however, was not the only thing that progressed. Our society has changed significantly as well, which also included our consumption habits and new outlooks on the ways of eating and our diet. Global climate changes did not go by unnoticed, as some seem to be genuinely concerned for the current environmental and ecological situation (Ellsmoor, 2019). Moreover, a large amount of people show great interest and willingness to make more sustainable life choices (Ellsmoor, 2019), but they just do not know how and where to start (Miller, 2020). These life choices include causing less environmental damage and consuming healthier and more sustainable food as well (Miller, 2020). Moreover, the trends among the younger generations indicate that they consistently show a greater desire to make significant efforts to become more environmentally conscious and sustainable (Miller, 2020), which consequently can or will impact

the behaviour of their parents and might help them make ecologically responsible choices as well. Besides, some farmers are very much interested in moving away from livestock farming in favour of focusing on more environmentally friendly and sustainable farming (Nittle, 2020). Therefore, it is safe to conclude that overall, the society is ready and eager to move towards a more conscious and sustainable lifestyle.

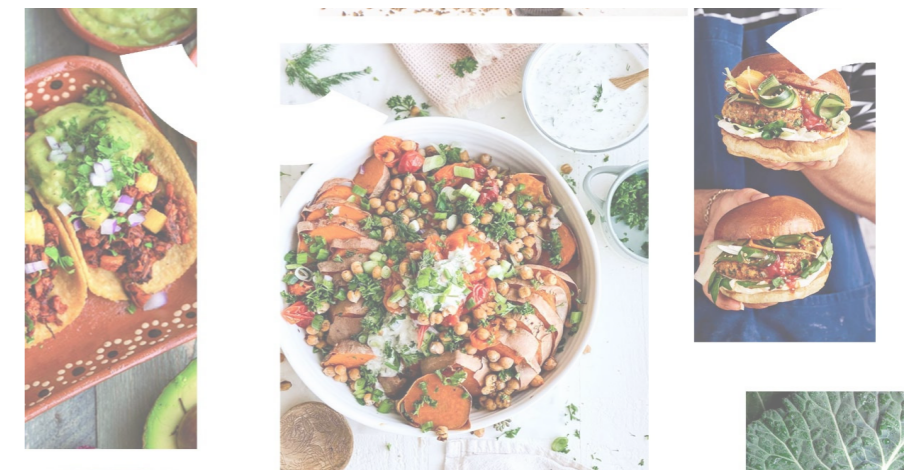


Image: plantfacedclothing

Lack of Access & Awareness

The step towards a lifestyle like that, however, is not the easiest to make. There are two biggest constraints holding an easy and smooth transition back, namely the certain degree of inaccessibility when it comes to sustainable living, including sustainable and less environmentally damaging (plant-based) food consumption, and the lack of awareness. The issue of inaccessibility is quite clear; meat replacement protein rich products, which are essential for a healthy and well-balanced diet, can be unaffordable for less

well-off people (Mensch, 2019). Moreover, it takes an amount of time and effort to plan out balanced and nutritious plant-based meals (Mensch, 2019), which is also not easy for everyone. Many lower-income people are interested in switching to a vegetarian lifestyle, but the time and affordability issues do not allow them to (Mensch, 2019). The problem of awareness, however, is much more complicated, since it is not just a question of teaching more sustainable habits and behavioural patterns to people, but an

issue of anti-plant-based lifestyle and pro-meat consumption lobbying, quite possibly initiated by the meat processing and products industry (Hiar, 2020). Besides, with the incomes and jobs of animal farmers being threatened, there is also quite a resistance, which results even in protests (Schaart, 2019).

Societal Transition

Therefore, an adequate, realistic and inclusive strategy is required in order to facilitate a societal transition from unsustainable and environmentally damaging meat-consuming lifestyle towards a more conscious and responsible plant-based one. This strategy must not only consider

the current trends and issues, but also involve all possible stakeholders of various levels of power and participation and provide the solutions to already existing problems as well as the problems that will arise when the strategy becomes implemented.

The scheme in figure 6, which considers the trends, the issues and the solutions acquired through research and analysis, suggests the way the societal transition should be handled.

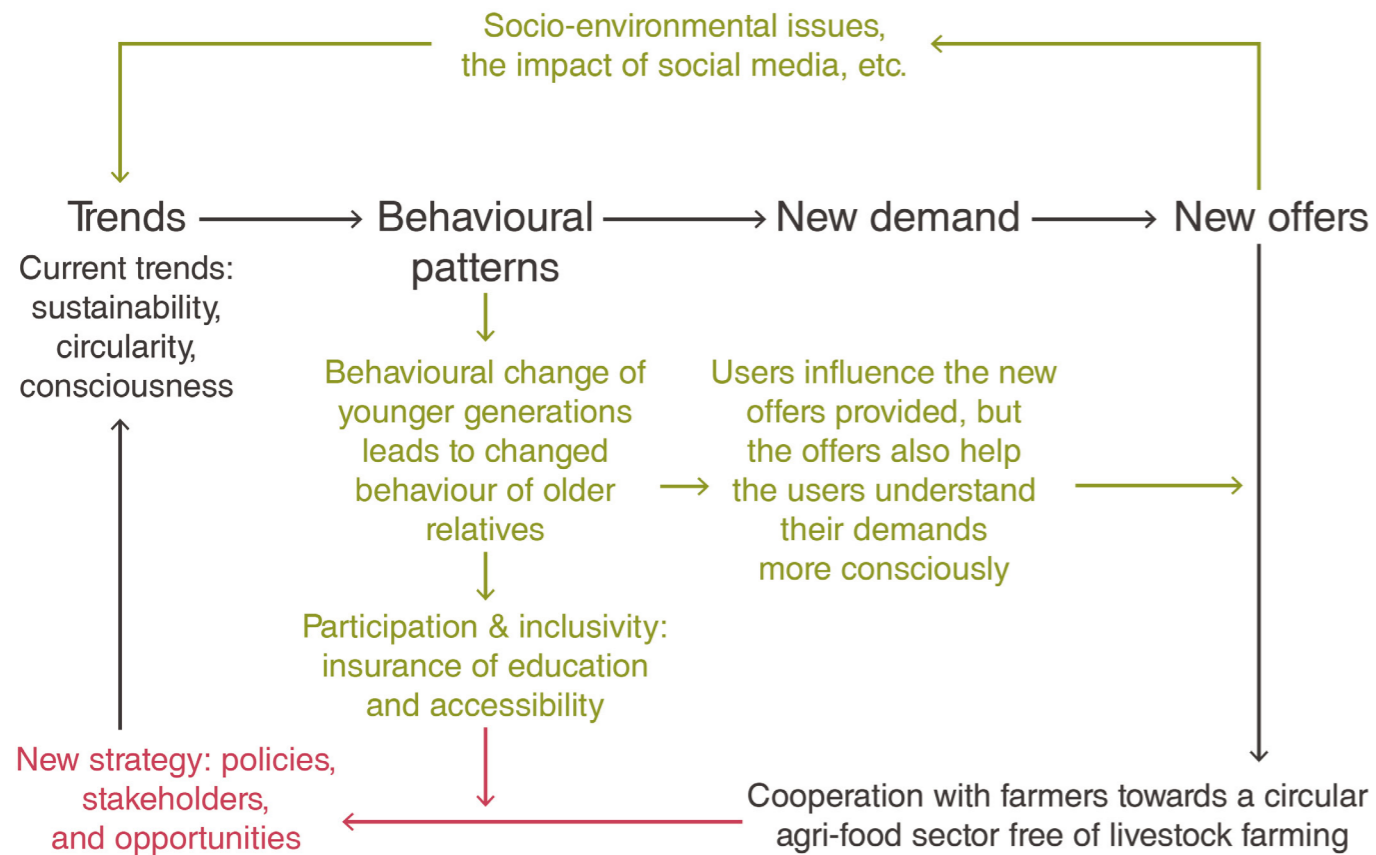


Figure 6 - Societal transition
By author



Figure 9 - Global import & export. Data from (CBS & WUR, 2021)

€95,6 Billion

Export value in 2020

€8,7 Billion (9,1%) from meat
€8,3 Billion (8,7%) from dairy & eggs

€67,1 Billion

Import value in 2020

After the USA, the Netherlands is the biggest exporter of agri-food products in the world (Rijksoverheid, 2019). The total export is valued at 95,6 billion, while livestock and related products encompass 17,8% of this total.

The majority of export from the Netherlands stays within Europe, with Germany, Belgium, the UK and France being the four biggest buyers. Outside of Europe, the US and China are the two biggest buyers, with China being the biggest non-European consumer of Dutch livestock (CBS & WUR, 2021).

The Livestock Industry

The livestock sector in South Holland takes up 20,6% of the total surface area of the province (CBS, 2020). The main reason for this high demand on space is the grasslands for grazing livestock, as well as some fields for cattle feed. Percentage wise – which is in relation to the amounts of the Netherlands as a whole – South Holland has the most cows, while having the least amount of chickens. Furthermore the export of both poultry and beef is around 78%, which is significantly higher than the 43% for pork (Weel, 2020). Lastly, the livestock sector in South Holland produces a yearly amount of around 2,65 billion kg of manure.

Distribution and Network of the Industry

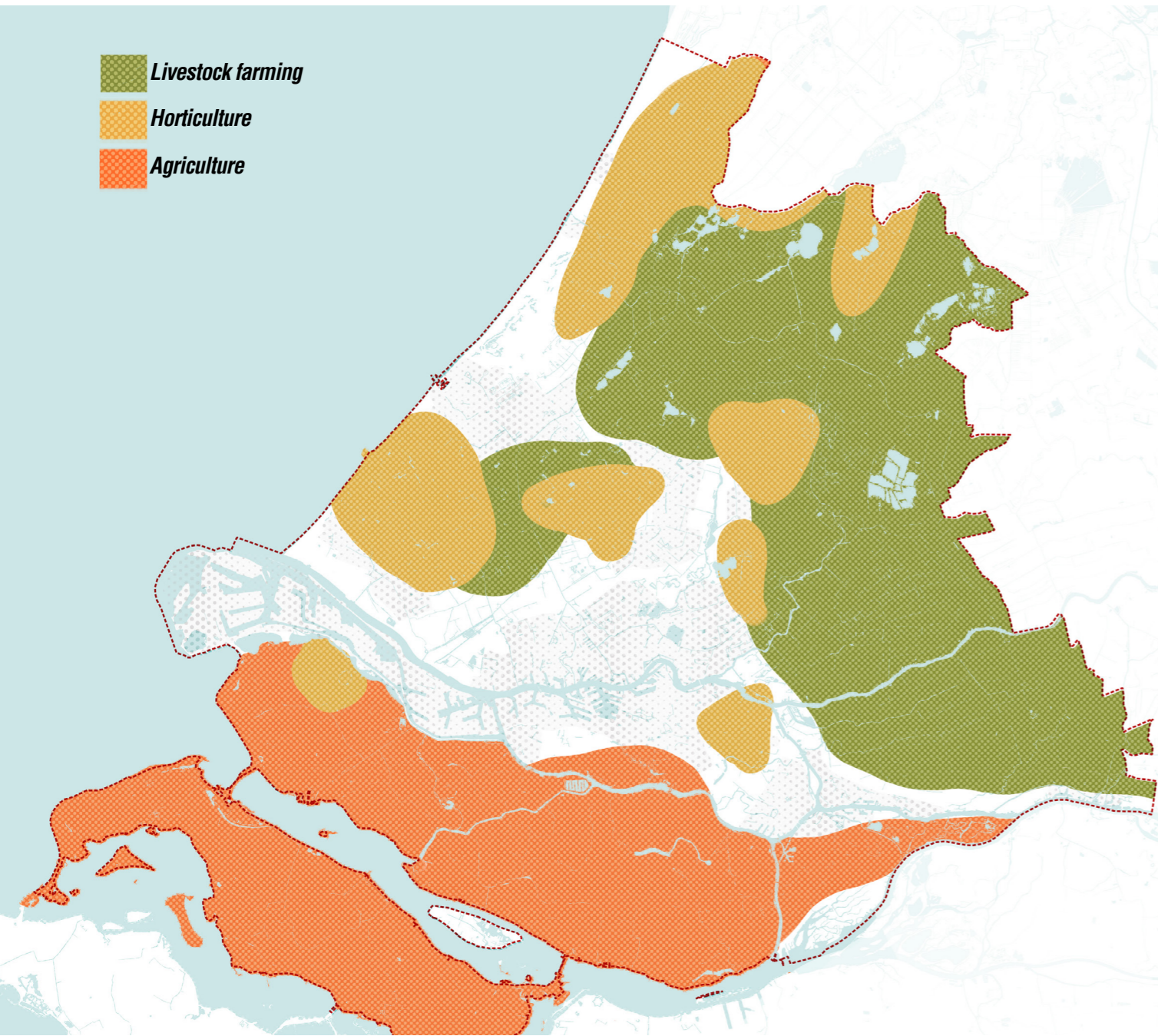


Figure 10 - Distribution of different agriculture types
By author

Distribution

Agriculture takes up more than 50% of the total area of South Holland, not only indicating the role it plays for the province but showing how close the residents actually are to the agricultural land, even if it is not as easy to perceive, especially when residing in cities. This also implies that the issues related to agriculture most likely will impact the living spaces, if they get too severe, which has to be addressed.

Livestock farming

The land meant for intensive livestock farming specifically takes up quite a bit of space as well on its own. The north and north-eastern areas of the province are practically occupied by grasslands, with bigger clusters of urbanised development occupying the remaining land. It is almost as if South Holland is divided, one half being heavily urbanised, with Rotterdam and The Hague as a core, and the other half being monopolised by the livestock

industry, creating a curious dichotomy.

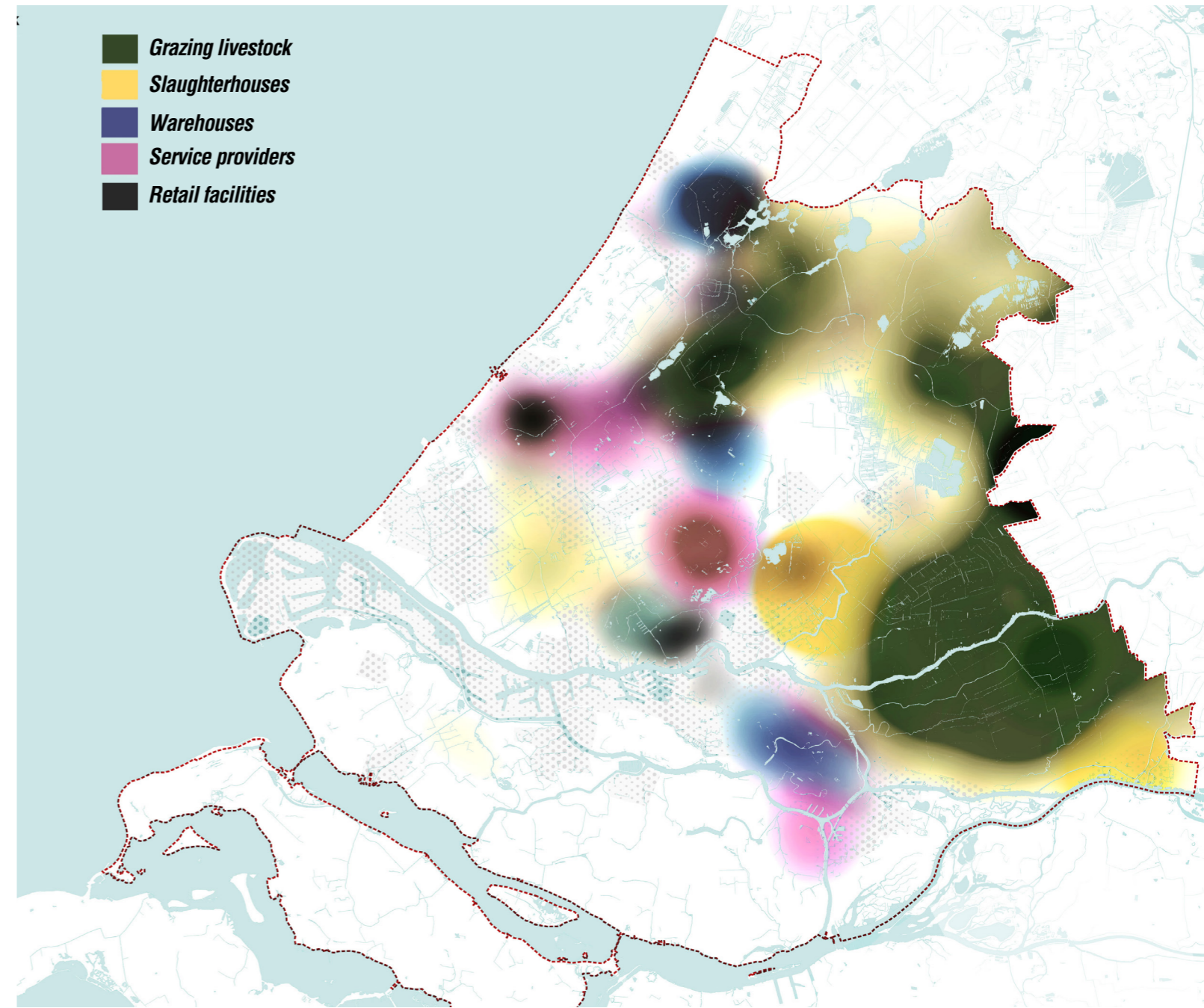


Figure 11 - Livestock industry network
By author

Related industry

Of course, the livestock industry consists not only of pastures meant for the cattle to graze, live and breed on. Five elements, crucial for the industry, are mapped out here to show their relations in space. Grazing livestock is concentrated in the north-east in the less urbanised areas with slaughterhouses mainly situated closer to the pastures rather than the cities as well to make the killing of animals more convenient. Meat warehouses are

bordering on the grazing lands as well, however, unlike the slaughterhouses, they are closer to the urbanised areas to make the transportation to service providing facilities, such as meat processing companies and retail locations more efficient, both of which are located either in the cities or within their close proximity. Thus, the disconnection between the citizens and the actual livestock industry, including the farm animals and everything related

to them, becomes quite understandable, with how hidden and unrelated to the urbanised areas and the infrastructure networks the "core" of the meat industry is.

Linear Flows

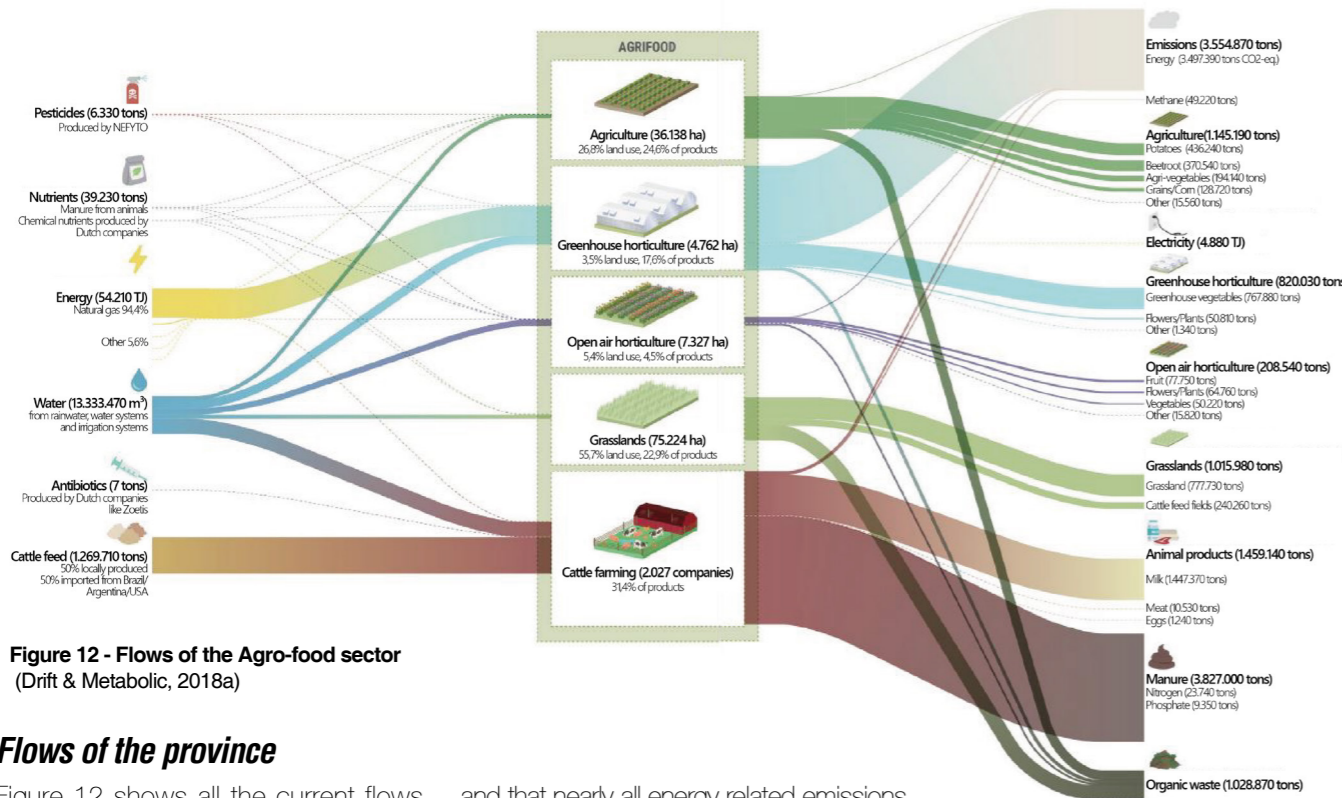


Figure 12 - Flows of the Agro-food sector (Drift & Metabolic, 2018a)

Flows of the province

Figure 12 shows all the current flows within the agri-food sector of South Holland. It functions as a general overview of the current systems in place, as well as a way to compare and find particularities. First of all it becomes very clear that the current meat industry is not that cost/space effective. It uses the most amount of water per kg of product (Nudge, 2015), needs a lot of cattle feed – of which around 50% gets imported (Drift & Metabolic, 2018b) – and produces a relatively low amount of meat. Furthermore a large amount of excess manure is produced here. Other important findings are the fact that a lot of organic waste is produced throughout the different sectors

and that nearly all energy related emissions come from the greenhouse horticulture.

Flows section

The following flows section again looks at current flows within the agri-food sector of South Holland, but this time it is more focused on the livestock industry, as well as on the process 'from land to fork'. In total, five critical points have been located that prevent the system from being circular.

- Import cattle feed (and some nutrients)
- Import of substances for meat replacements
- Excess manure
- High amount of pollution

- Biomass often unused
- In the development of a new system, these points should be taken into consideration to be able to close production loops and go towards a circular agricultural network. Furthermore some related problems – like high amount of plastic packaging – are not on this list, but by first improving these five, the rest will most likely also be solved and/or will follow naturally.

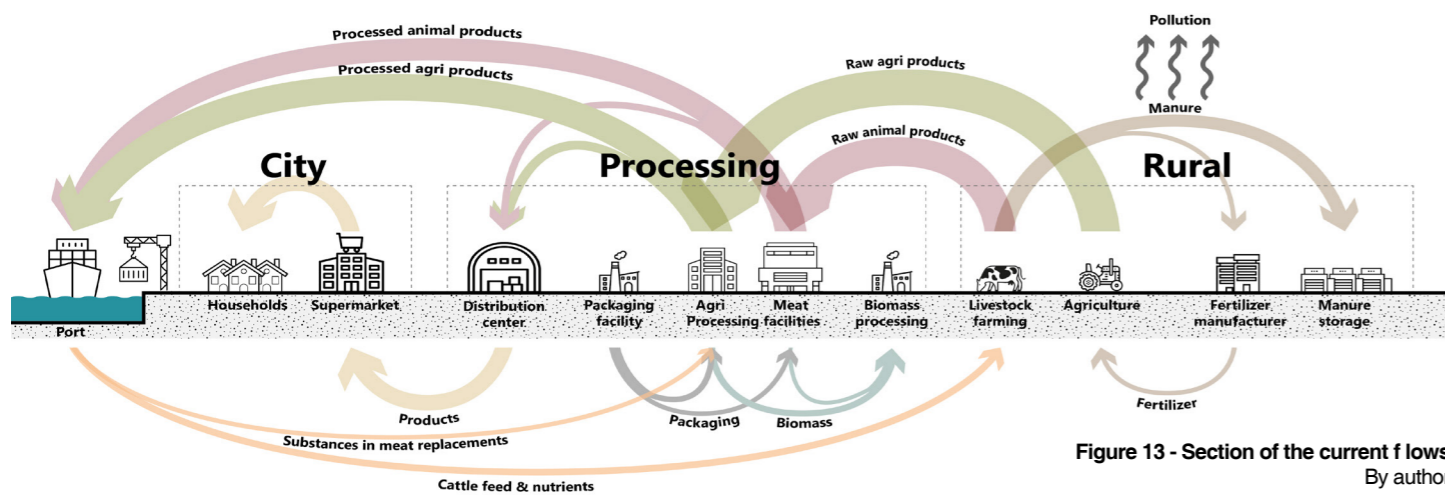


Figure 13 - Section of the current flows By author

Current situation Necessary land

Grasslands
-> 647.284.100 m²
-> 3.415 companies

Cattle feed fields
-> 54.194.500 m²
-> 666 companies

Situation 2050 Necessary land

Grasslands
-> 200.916.985 m² (1.060 companies)
-> 446.367.115 m² available space

Cattle feed fields
-> 16.821.973 m² (207 companies)
-> 37.372.527 m² available space

Reduced according to amount of land needed
483.739.642 m² of free space

Grazing livestock

Cows
-> 157.198 cows
-> 1.452 companies

Goats
-> 25.259 goats
-> 309 companies

Grazing livestock

Cows
-> 48.794 cows (451 companies)
-> 1,73 bln. kg less manure

Goats
-> 7.840 goats (96 companies)
-> 0,012 bln. kg less manure

Reduced to 31,04% before 2050
6,48% of total livestock maintained

Granivores

Pigs
-> 107.183 pigs
-> 86 companies

Chickens
-> 584.198 chickens
-> 16 companies

Granivores

Pigs
-> 0 pigs (0 companies)
-> 0,09 bln. kg less manure

Chickens
-> 0 chickens (0 companies)
-> 0,0076 bln. kg less manure

Removed completely before 2050

Side products/emissions

Manure
-> 2,645 bln. kg / year

Nitrogen emissions
-> 23.744.165 kg / year

Phosphate emissions
-> 9.349.947 kg / year

Side products/emissions

Manure
-> 0,791 bln. kg / year

Nitrogen emissions
-> 7.097.126 kg / year

Phosphate emissions
-> 2.794.697 kg / year

Reduced to only necessary manure for fertilization
1,854 bln. kg less manure
16,65 mln. kg less nitrogen
6,56 mln. kg less phosphate

What is needed?

Arable land: 469.742.700 m²
Strictest pollution norm = phosphate
-> 0,004 kg/m²/year
-> 1.878.971 kg of phosphate
-> 531.560.839 kg of manure

Grasslands: 701.478.600 m²
Strictest pollution norm = nitrogen
-> 0,017 kg/m²/year
-> 11.925.136 kg of nitrogen
-> 1.328.460.173 kg of manure

Total manure needed: 1.860.021.012 kg
% of current cow/goat manure: 73,03%

Fermenting the manure

Qualifications:
- 50% of total manure necessary
- 15% higher nitrogen working
- Nutrients better absorbable
- Kills more unwanted weeds/fungi
- Is less thick

New percentage:
= 73,03% x 0,5 x 0,85 = 31,04% of all current cow & goat manure

Figure 14 - Calculation of current and future material flow By author; data from (CBS, 2021) (RVO, 2020a) (RVO, 2020b) (WUR, 2007)

As stated before, the project will revolve around drastically cutting down the livestock industry as a catalyst for the transition of South Holland towards a circular agricultural system that simultaneously solves a number of other issues. However, it is important to first explain exactly how much the industry will be reduced by.

In 2050, all the granivores in South Holland will be removed, because the project focusses on using the remaining livestock for their manure, educational purposes and dairy products, while the current pig and chicken industry is solely focused on meat. Furthermore the grazing livestock will be reduced to 31,04%, because this is the exact amount that will produce

enough manure as fertilizer for all existing and future agricultural land, as seen in the bottom right of the calculation. Lastly this means that the overall livestock amount will be reduced by 93,52% – leaving only 6,48% of the current total livestock to be maintained.

What are the problems?

Economic problems

"It's a simple calculation, according to De Groot. "70 percent of Dutch nitrogen emissions come from agriculture, a large part of which comes from intensive livestock farming. That is huge. At the same time, the contribution of intensive livestock farming to our own economy is not even 1 percent. The ratio is completely missing." (NL Times, 2019)



Dutch farmers have protested a ruling that curtails the expansion of livestock operations because of the nitrogen pollution they produce. VINCENT JANNINK/ANP/AFP/GETTY IMAGES

Nitrogen crisis from jam-packed livestock operations has 'paralyzed' Dutch economy

By Erik Stokstad | Dec. 4, 2019, 4:25 PM

Image:(NL Times, 2019)

Stikstofprobleem gijzelt woningbouw: huizentekort loopt verder op

Het aantal vergunningen voor woningbouw neemt af. De reden: de schadelijke stikstofuitstoot bij de bouw die natuurgebieden kan beschadigen. Bouwprojecten staan sinds een uitspraak van de rechter over het Nederlandse stikstofbeleid op losse schroeven, waardoor voorlopig lang niet genoeg nieuwe huizen worden gebouwd om de woningnood op te lossen. „Dit gaat helemaal mis”, zegt Jan Fokkema namens projectontwikkelaars.

Image:(Teije, 2019)

Housing shortage

Because farmers, especially intensive livestock farmers, use up around 70% of the nitrogen budget, there is not enough room left in the budget to build a sufficient amount of new houses. This leads to an ever increasing housing shortage (Teije, 2019).

Inefficient food production

Meat is an inefficient way of receiving nutrients, as the animal needs to eat much more calories than it will produce in terms of meat. Especially for cultivating beef a lot of resources are needed. Furthermore, during the production of meat much more CO2 is produced than with the production of other non-meat high protein products (Ritchie, 2020).

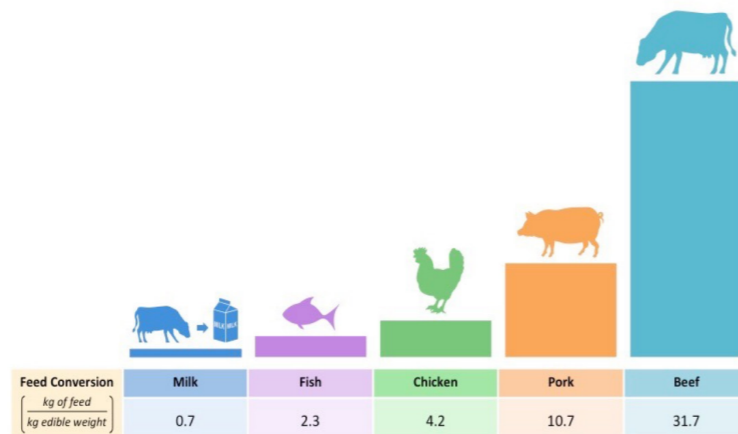
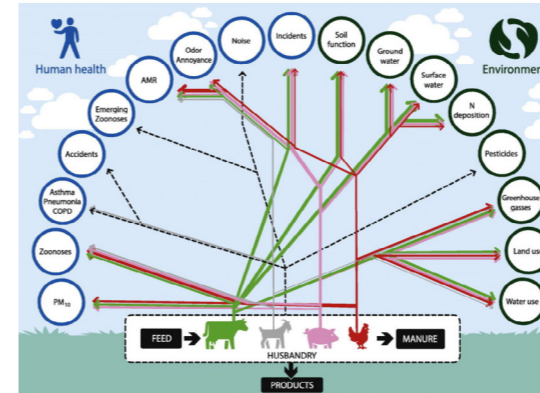


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Fijnstof Image: (Kenniscentrum InfoMil, n.d.)

De luchtkwaliteit heeft een grote invloed op de volksgezondheid. De luchtkwaliteit wordt mede bepaald door fijnstof. De veehouderij is een bron van fijnstof. Ammoniak vormt met deeltjes in de lucht secundair fijnstof.

Biodiversity loss

Due to eutrophication of the surface water, a small amount of species will do very well, taking over almost all other species. This leads to a loss of biodiversity (Netherlands environmental assessment agency, 2014) Furthermore an abundance of nitrogen in the ground leads to new species settling in naturally nutrition poor areas, and thereby taking over the native species (Wetzels, 2021).

Human health

Intensive livestock farming pollutes the air, which has negative consequences for human health. The government regulates the amounts of pollutants farmers are allowed to produce, yet the allowed amount to a lesser extent still is harmful (Kenniscentrum InfoMil, n.d.)

Aggregated indices for trends in eutrophication of different types of fresh water in the Netherlands

31-01-2014 | Publication

As in many European countries, eutrophication of surface waters is a key problem in the Netherlands, caused by high concentrations of nitrogen (N) and phosphorus (P). For implementation of the EU Water Framework Directive (WFD) in the Netherlands, surface water types have been identified and for each water type environmental quality standard concentrations (EQS) were determined for both nutrients.

Especially sandy areas, dunes in the coastal zones and inland moors are heavily impacted. An abundance of nitrogen in the soil leads to **surpluses of nutrients and stimulates weeds that overgrow** the natural flower beddings. That, in turn, has dramatic effects on insect populations and birds."

Image: (Wetzels, 2021)

Animal welfare

Regulations are in place to ensure an absolute minimum level of animal rights, when it comes to intensive livestock farming. While these standards are already widely being questioned, the meat industry manages to often not even comply with the regulations, resulting in serious problems related to animal welfare (Bouma, 2014).

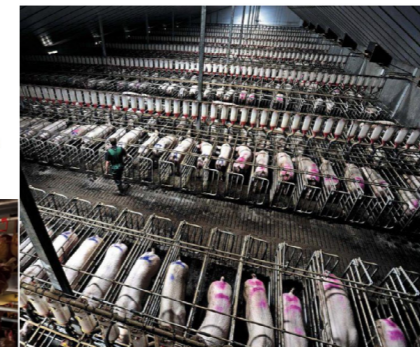
Vleesindustrie begaat 2.7 miljard overtredingen per jaar



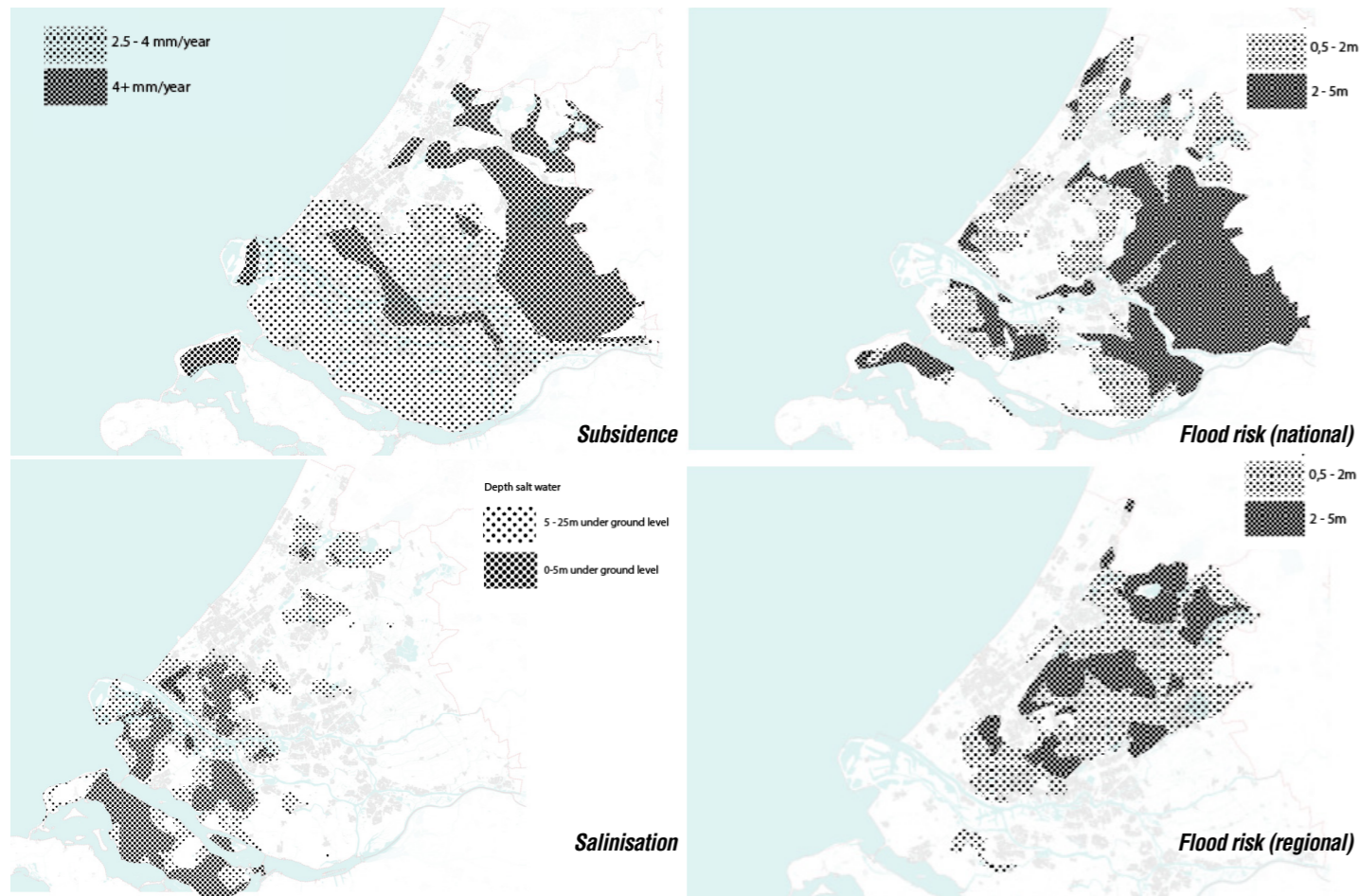
Een kippenboerderij in België. Beeld anp

De veesector grossiert in schending van het dierenwelzijn, zeggen Dier & Recht en Varkens in Nood. Maar er wordt amper tegen opgetreden.

Image: (Bouma, 2014).



Environmental Issues



Subsidence

Subsidence in the province of south holland is mainly caused by oxidation of the peat soil, which is present in part of the province. Oxidation happens when the ground water level is too low, leading the ground to be dry, which leads to the oxidation and collapsing of the ground. In south Holland the water levels are kept artificially low, as this is easier for farmers to farm on. The main problems with subsidence are located close to the Gouda region, where the whole city is subsiding each year, leading to economic losses. The issue is becoming more pressing, as it increases the flooding risk, the economic losses get bigger by the year and the rest of the region is slowly getting dragged along. The most effective way to solve the issue is to raise the ground water level.

Salinization

Salination can be caused by multiple things. It can be caused when too much

irrigation is done on warm days, and the water vaporizes but the salt stays in the soil. It can also be caused by salt water pushing upwards against the fresh groundwater. This has the biggest effect when we have a fresh ground water shortage during hot summers. Although this problem is not directly caused by agriculture, agricultural practices related to watering plants in summer do have an influence, especially in the coastal areas. At the map it is shown that problems with salinization mainly lie on and close to the islands, which on the long term gives problems as it limits the kind of crops that can be grown here. Three main solutions are possible to deal with the salinization:

- 1) Limit salinization by improving the ground water management (in summer) so that the salt water does not get the space to move upwards
- 2) Place a "kwelvoorziening" which reduces salinization
- 3) Plant crops that grow well on saline grounds

Flooding

If the province of South Holland were to flood, there would be water on the streets in the majority of the province. As can be seen on the maps, the worst scenario would be if the national coastal protection dykering would fail, however the effects of the regional one failing also would be significant. The flooding risks in the Netherlands are not directly caused by farmer practices, but due to subsidence caused by groundwater policies for farmers, the land near gouda is lying meters below sea level. There are two main approaches to handle the flooding issue:

- 1) The Dikes can be made higher or other means to keep the water out altogether or parts of lands can be flooded temporarily to further limit the changes of flooding of the whole area.
- 2) The impact of the flooding can be decreased by for example by having measures that decrease the impact of the waves, building flood proof or increasing the height of the ground.

Disconnected Habitats

An analysis on how we connect to nature

How connected are we still to nature? When looking at social media one might argue we are very connected. All the pretty pictures one can find there from people seemingly peacefully walking through nature and stumbling upon the most beautiful scenes. However when looking at the bigger picture one can observe large crowds waiting for their turn to take an Instagram worthy picture. Maybe most astonishing is when one watches the photo spot for a while, and notices how little people take the time to actually observe the scene before or after taking the picture. Our relationship with nature has changed over the years, as has our position in the ecosystem. There was a time where there were no days without being outside in nature, now visiting nature seems to be a weekend activity for most. There was a time everyone knew where their food came from, where people respected nature deeply as they depended upon it. Now we still depend on it, although people seem to experience this differently. Our new ecosystem consists of buildings, factories, companies and infrastructure. But what is nature's role, besides providing opportunities for pretty Instagram pictures? It provides resources that we use, yet we fail to give back to nature what it needs. One could argue this is because of the disconnection between nature and urbanity.

It would be naive to think one could go back to the way it once was, or to even think that would be the solution. Nature should get a new role within our lives,

within our ecosystem. When discussing why people don't visit nature, the conclusion was: why would you? There is so little to do there. It's nice if you go for a walk with friends or to a place with a really nice view, but walking for half an hour through a flat delta landscape alone doesn't sound attractive, it all looks similar and there are no public toilets along the route. And that is if you even managed to get there somehow. From this discussion, three takeaways were found

- 1) Nature should be closer to cities, and easier to reach
- 2) There should be sufficient amenities: public toilets, places to shelter if it starts to rain, a place to fill your water bottle and seating areas
- 3) There should be activities to attract people to nature

Especially the third point is interesting, as here a combination with the agro-food sector could be made. An example of an activity could be to visit a "plukboederij", where you can pick your own apples. It could be little framers shops along the route, where you can get a snack or do groceries for dinner. Also sporting facilities, like a yoga place could be an option. By reintroducing humans to nature in a way that is more in line with their current way of live, nature could become a real part of their ecosystem, which will lead people to respect it, and want to protect it. All parts of nature, not only the instagramable places.

04 Landscape Based Agriculture & Cities

Introduction for chapter

Being a part of the ecology, and one of its most dominant and rebellious “participants” no less, both on bigger, more global and smaller, local scales, the way we, humans, act is bound to have consequences not only for our own ecosystems and habitats, but ones of other species as well (Messerli et al., 2001). Especially now, with our population counting almost 8 billion people worldwide, the ecological impact we cause is greater and heavier than it has ever been, which means the consequences that will inevitably follow in response to our actions are going to be extremely big as well.

At this point, it is practically an axiom that if we proceed to be stuck in our old ways, the ecology will suffer severely to the point beyond restoration, where no climate policies, no matter how extreme,

would be able to help anymore, so there undoubtedly needs to be a societal change. A change in behaviour; a progression towards being more conscious and responsible with regards to ecology and the landscape we inhabit. And what better way to repair and improve our relationship with the landscape than through the agri-food sector, since food is the integral part of our lives, which makes it a topic everyone can understand, relate to and participate in.

One of the ways of creating an environment where awareness, appreciation and participation for landscape ecology as well as environmentally friendly agri-food sector is fostered could be done through landscape based agriculture, which our project focuses on, from investigation and definition of this concept to

its implementation and adaptation both in space and socially. The development of a new agricultural approach, considerate of the underlying landscape and present ecological conditions, will require a collaboration between various stakeholders, from scientists and policy makers to farmers and consumers, touching the topics ranging from ecology to socioeconomics (Landis, 2017). However, first and foremost we are looking into the existing agriculture system and practices in South Holland to understand the context we will be redeveloping.

Landscape Typologies



Central Dutch river zone



Central Dutch Peat bogs



Dutch coastal zone



Southwestern Dutch coastal zone



Reclaimed land



Southwestern sea clay zone

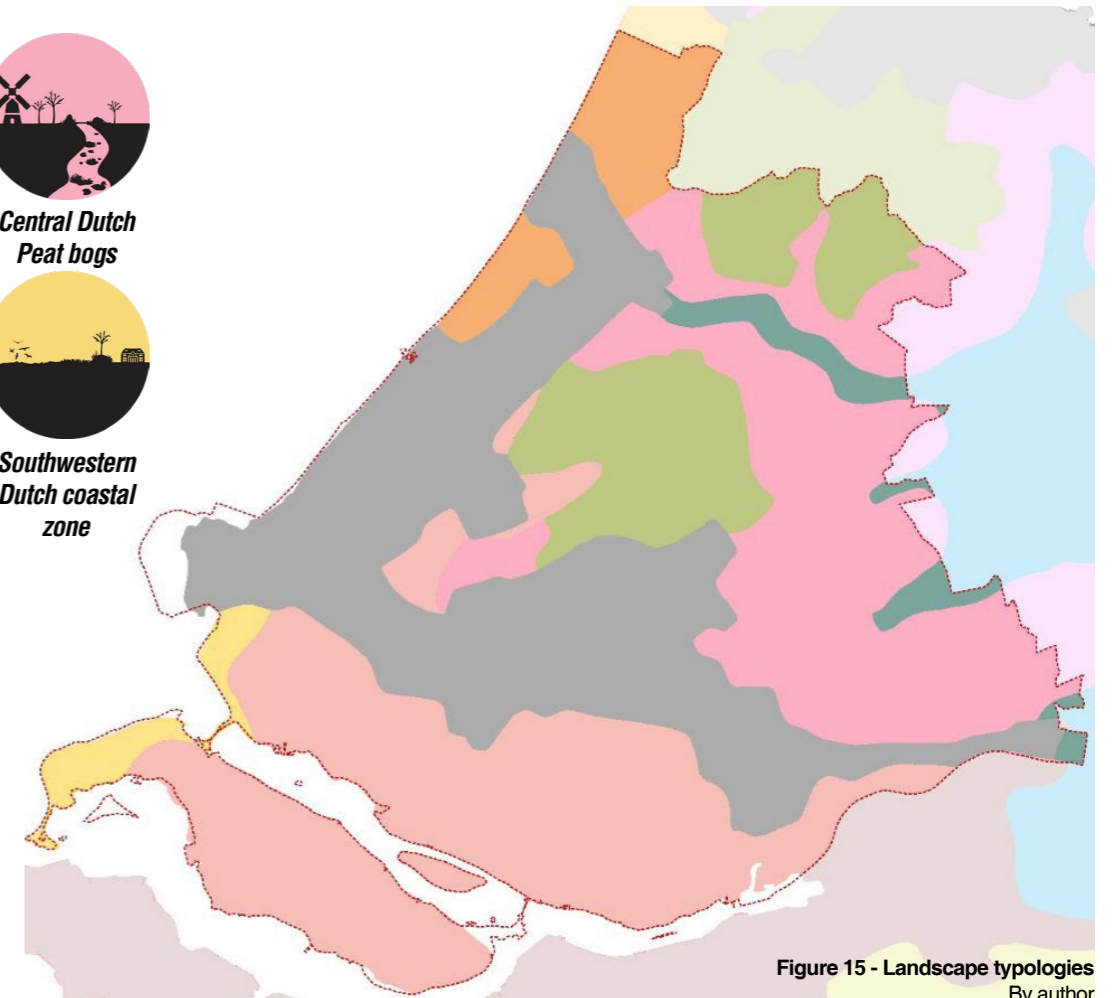


Figure 15 - Landscape typologies
By author

According to Panorama Landscape, there are several landscape typologies in South Holland, all of which have different characteristics, of course. To understand the approaches to be taken with the landscapes, these characteristics have been investigated with help of the report “Ontgonnen verleden: Landschappen en deellandschappen” by Haartsen (2009), summarised and classified for further usability.

Central dutch peat bogs

- A lot of rivers, smaller streams, waterways, dikes and dams
- Beloved for agriculture, however, due to the nature of peat, prone to ground subsidence
- A lot of mills and pumping stations (historically to lower the water levels)
- Polder land division
- Native biodiversity and ecosystems: ducks and moist fields (grienden) with willows; beneficial for biofuel cultivation

easiest to grow crops on)

- Rind dikes and canals
- Artificial water control, mills and pumping stations
- Rational spatial planning and planned settlements

Dutch coastal zone

- Beach ridges, beach plains and young dunes
- Flower bulb cultivation on highest points of beach ridges
- Agriculture on young dunes
- Grasslands on beach plains
- Recreation is of high importance because of the sea proximity

Dutch southwestern coastal zone

- Wadden area with creeks, sand-banks and salt marshes
- Grasslands
- A lot of outside historical locations
- Beach recreation

Southwestern sea clay zone

- Creek ridges, pool grounds and creek remnants
- Agriculture on creek ridges
- Grasslands on pool grounds
- Polder landscape
- Moist fields (grienden)
- Settlements and agriculture on highest parts of the landscape

Central dutch river zone

- Floods and dikes
- Various works on bigger rivers
- Spatial and functional land use arrangement is in great correspondence with the natural capability of the land
- Living on higher parts of the land; floodproof building
- Waterlines (crucial for infrastructure)
- Floodplains, banks and basin areas
- Importance of biodiversity

Reclaimed land (16th-19th century)

- Drained areas and polders which previously used to be open water or wetlands; the ultimate form of an anthropogenic cultural landscape
- Clay, mudflat ground; sand, peat
- So-called “innovation grounds” because of the need of water protection and innovative agriculture methods (reclaimed land is not the

Function	Typology
Recreation	Peat bogs, Coastal zones
Ecology	Peat bogs, River zone
Floodplains	River zone, Reclaimed land
Agri-food	Peat bogs, River zone, Coastal zones, Reclaimed land, Sea clay
Urban expansion	Dutch coastal zone, Sea clay

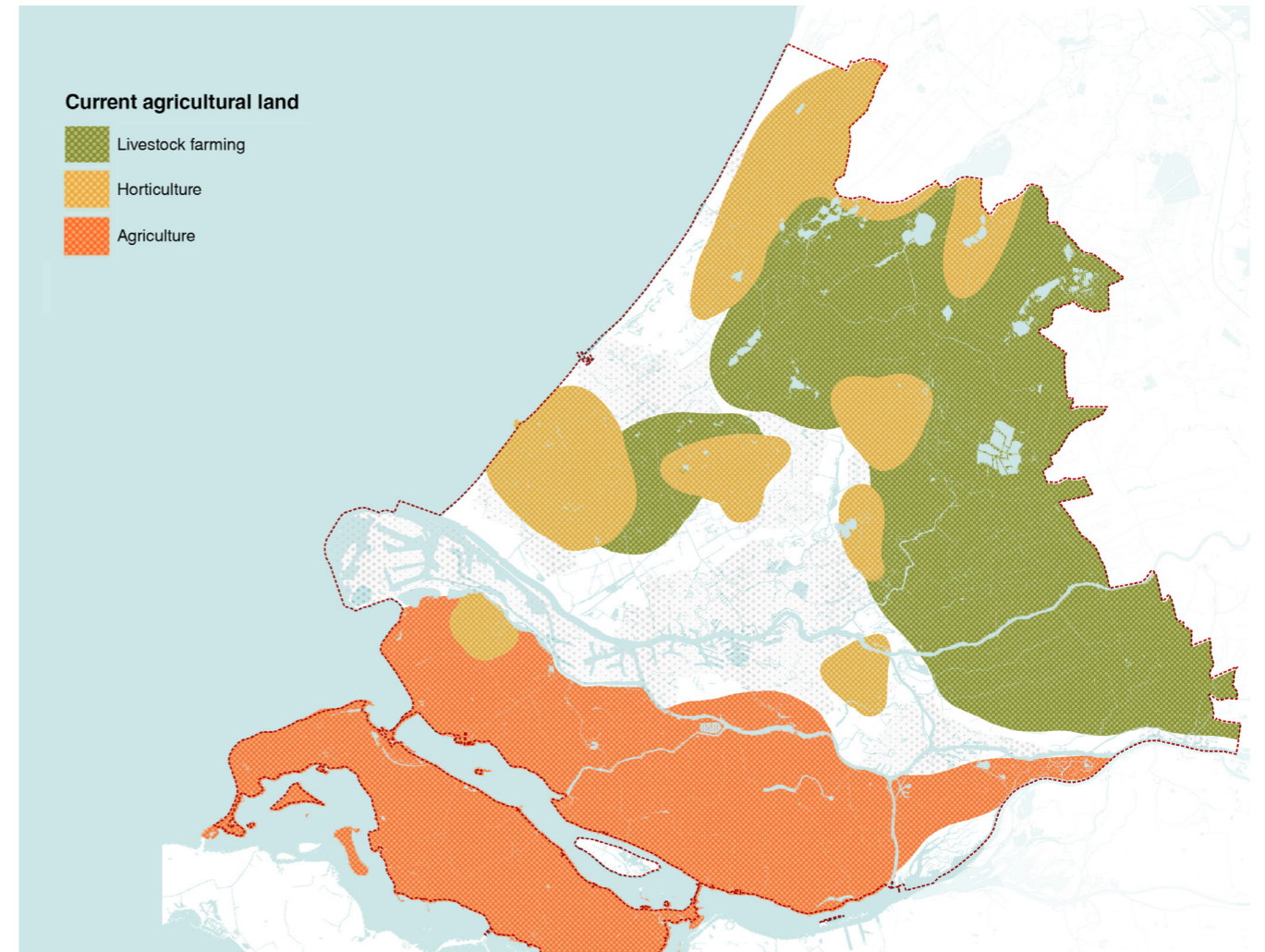


Figure 16 - Current agricultural land
By author

Lack of connection between agriculture and landscape

Currently, the agriculture and landscape in South Holland are quite disconnected from each other. The detachment is the most striking in the central dutch peat bogs area, the landscape typology prone to the subsidence the most, which is being used exclusively for grazing of livestock, an agricultural practice known to cause ground subsidence (van den Born et al., 2016).

Agriculture types & biodiversity

Currently, most of the agriculture we see in the Netherlands is intensive monoculture, which is bad for the environment and the biodiversity (WUR, n.d.). To combat this, research has been done on the different types of polycultures that are viable in the Dutch context – resulting in the six types shown in our vision. Each of the six polycultures has subsequently been valued on its visual effect on the landscape, as well as its recreational value and impact on the biodiversity to help in determining a division within the context of South Holland. For example agroforestry is best in terms of biodiversity, however, its placement is more restricted due to its high visual impact on the landscape, while something like crop rotation is way less impactful, but also

less beneficial for biodiversity. Lastly it is important to mention the difference between intercropping, cover cropping and crop rotation – intercropping is two (or more) types of crops integrated with each other, while cover cropping is crops integrated with regular plants and crop rotation simply means that after harvesting, a new type of crop will be planted instead of the same one each time.

Invisible Agriculture

Research done by J. Clarke in 2012 in the United Kingdom shows that **less than half of the young adults know that milk comes from a dairy cow**. Furthermore, 33% of the respondents did not link a photo of a hen to eggs. The results when people were asked about the growing times of products do not seem to be any better. 10% of the respondents believed potatoes take less than a month to grow, while almost two thirds of the respondents don't know in which month new potatoes can be bought for the first time. Although other age groups score better when it comes to knowledge about food, many still lack knowledge.

One explanation for this could be that **people rarely visit a farm**. 30% of young adults had not visited a farm in 10 years (Clarke, 2012). With many children

not visiting farms regularly they lack insight on where food comes from, how it is produced and what the raw product looks like. However, the blame is not only with the parents. **With intensive livestock farming having rapidly expanded over the years, it has become more and more rare to see a chicken farm where chickens are walking outside**. The often large square barns make it impossible to look inside and see the animals, which is not surprising given the circumstances the animals are held in.

As knowledge about food is important for people to eat healthy, and with regards to the natural environment it would be a fruitful option to further explore the concept of **"plukboederijen"**. These are farms where one can pick fruits or vegetables themselves and pay based on the weight of the

products they picked. For children and even adults, this can be a fun day activity of do once in a while, and for sustainable farmers it can bring them the attention that they need to let people choose their product. Also farms could start having open days, where one can visit the farm and see what the farmer does in exchange for a small fee. Lastly it is proposed to further combine agriculture with recreation by having more mini camping grounds or tiny houses on farming land and making new kinds of landscapes which are naturally suitable for combining agriculture and recreation. Here one can think of agroforestry and the landscaped created by the double dike system, on which more is told in our vision and intervention projects.



Image: Plucking farm
source: iamsterdam

Eco-friendly Urban Expansion

Currently, a lot of urban areas in the Netherlands – and around the world – are not built with ecology in mind. **Fragmented green structures, monofunctional greenery and a disconnect between the urban and non-urban green structure** are just some of the problems modern cities might face (Ruimte met Toekomst, n.d.). And while fixing all these problems in the current cities might turn out to be very difficult, it should be something that is implemented for future urban expansions.

At every urban expansion in South Holland, the focus should lie on the six main guidelines shown on the icons below to achieve an urban area that intervenes with the ecological structure as little as possible (Ruimte met Toekomst, n.d.). Further research will be needed to

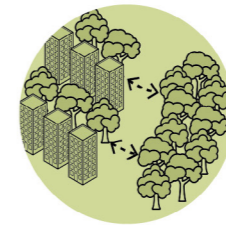
determine the exact implications of these six guidelines in a specific context (like % green, size of buffer zone, width of green structure, etc.), but these guidelines are meant to steer the development in the right direction.

Outside of these guidelines, **physical and legal space should be given to ecology-friendly, alternative living areas**. These areas will not appeal to everyone, but giving people that want to participate the chance to do so will help tremendously in understanding our relation with nature and the ecology. Subsidies, information and expertise should be provided to help these groups get started. Lastly, all new urban expansion should be built completely energy-neutral.



Bundling green & water

- Use water as the "carrier" of green connections
- Combine to create a higher ecological value



Connect urban with regional green structure

- Create one network that connects the entire region
- Connect urban areas with buffer zones and corridors



Prevent fragmentation

- Connect green areas with corridors
- Create one continuous network of green islands and corridors
- Connect on the different scales



Types of green connected to necessary habitat for desired species

- Do research on specific species that live in the area
- Connect their needs to the green that will be implemented



Multifunctional green

- Make the green available for recreational purposes (walking, cycling, sporting, etc.)



Mixing coherence with variety

- Have specific areas within the network that attract people
- Have enough variety for each area to feel (slightly) different, while still maintaining one network

Figure 17 - Urban expansion guidelines
By author

Challenges & Possibilities

What is a SWOT analysis?

We looked in to the condition of the agro-food sector and livestock industry, as well as the relevant issues and problems before we can reach the SWOT analysis of the province. In this section we aim to identify the strengths, weaknesses, opportunities and threats that will influence the province and our vision.

SWOT analysis of South Holland

The structure and functionality of the province define the challenges and possibilities related to the implementation of our vision of livestock limitation and landscape based agriculture. The change on livestock farming and the connection between the new agriculture and the regional landscape will contribute to the goal of a circular province in 2050. The SWOT analysis therefore serves as a self-assessment tool.

STRENGTHS

well connected to other provinces *a big producer in agriculture*

well connected to the rest of the world *strong economy*

Technological / knowledge-wise advanced *lots of knowledge institutes*

very actionable and aware of flood risk problems *a diverse province*

context / ecology aware agriculture *new housing / urban expansion guidelines*

current research & implementation of seaweed farming *ecological network*

trend of less meat consumption

OPPORTUNITIES

WEAKNESSES

housing shortage *large amount of pollution (air & soil)*

disconnected ecology, agriculture and citizens *pesticides & chemicals based agriculture*

fragmented ecological system *disconnected ecology, agriculture and citizens*

lack of awareness and inclusion of citizens related to agri-food sector *intensive & monofunctional agriculture*

very limited space *farmers' protests*

flood risks *subsidence problems*

salinisation problems

THREATS



Images: Europe Real Estate, Sarahstours, That's Farming, Focus2move

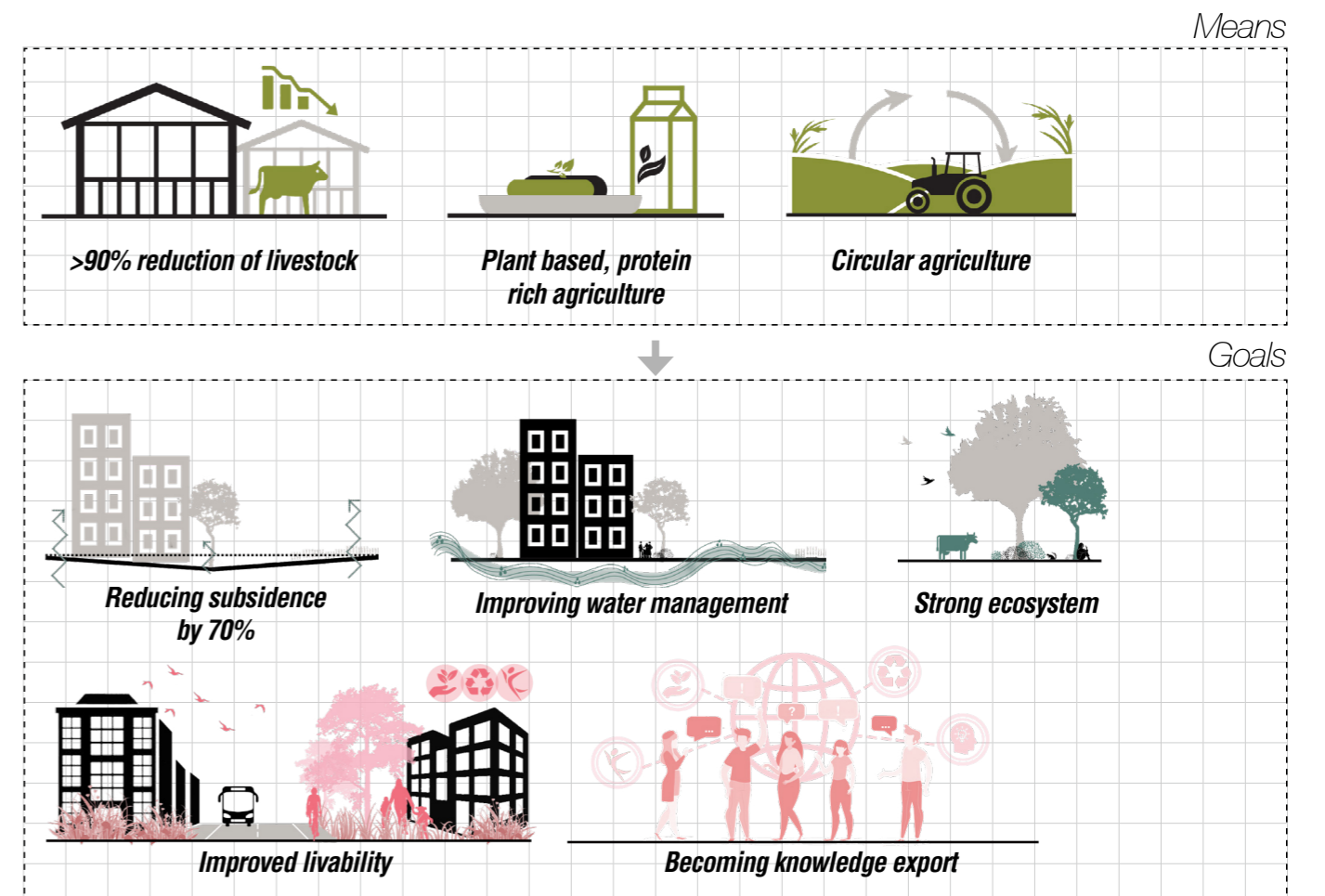
05 Vision

Vision Statement

By 2050, the province of South Holland should have reduced livestock farming by 90%, and have reformed to a circular, protein rich plant based agri-food system. By doing this, subsid-ence shall be reduced by 70%, the flood risk shall be reduced, and fresh water management improved to assure future livability in times of climate change.

Furthermore, the ecosystem will be strengthened by the new agricultural system, where ac-tions are based on the long term capacity of the underlying landscape. By adjusting to the landscape, knowledge will be required on farming in difficult conditions, which will be more and more common given the current speed of climate change. This knowledge, in combina-tion with being a frontrunner in producing tasty meat replacements (a vastly growing market), should make the province an exporter of this expertise on world scale. This new economy, healthy ecosystem and lifestyle will lead to a livable South Holland for the future generations.

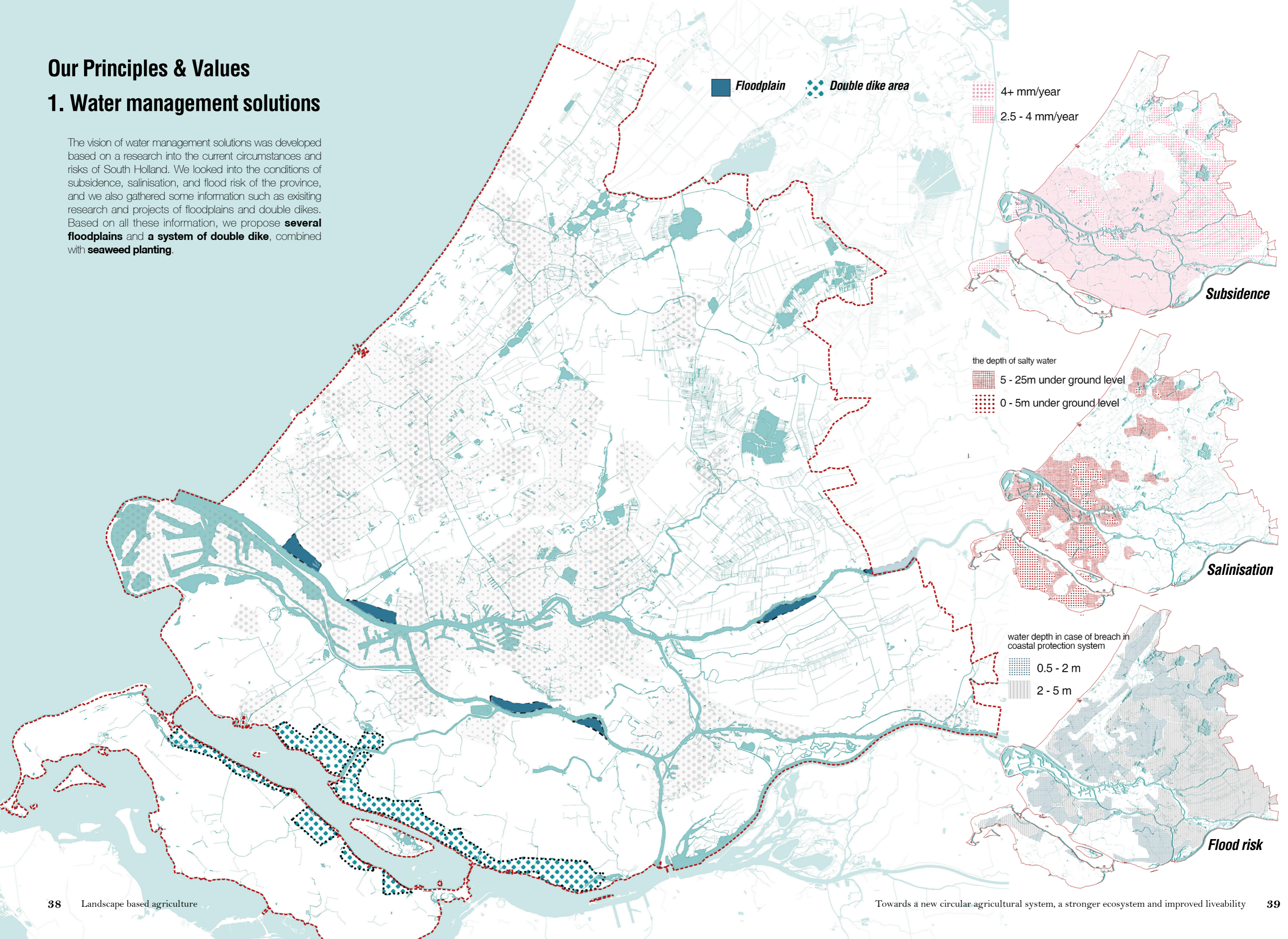
Our goal: Respecting and working with the underlying landscape system to construct a new circular agricultural system which is beneficial for the ecological system and livability by removing over 90% of livestock farming.



Our Principles & Values

1. Water management solutions

The vision of water management solutions was developed based on a research into the current circumstances and risks of South Holland. We looked into the conditions of subsidence, salinisation, and flood risk of the province, and we also gathered some information such as existing research and projects of floodplains and double dikes. Based on all these information, we propose **several floodplains** and **a system of double dike**, combined with **seaweed planting**.



1.1 Water management methods

Double dikes

The double dike system as designed by the NIOZ, is designed to be a more robust coastal defense system in comparison to a traditional dike system (Belzen et al., 2021). The advantages can be found in economical opportunities by creating an interesting recreational landscape and producing foods, as well the long term advantages of having a protection system that works with nature, instead of fighting harder every year against it. The double dike system will be positioned along the Haringvliet. In the first stage, the inland

dyke will be made stronger. Then the outward dyke will be connected towards the sea. Now seaweed can be grown in these areas. Due to sedimentation, the soil will slowly get higher, leading to a point where seaweed production is no longer possible, and a switch to saline vegetables like lamsoor or zeekraal will be made. Over the years, the ground level will keep increasing and an area will be formed which is above water most of the time, yet not all, giving an interesting ecosystem. Finally, the new ground level will

be equal to the average high water level which is a few meters above sea level on average. This will make the areas behind it less vulnerable for flooding and thus requires lower dykes, which is cheaper as well.

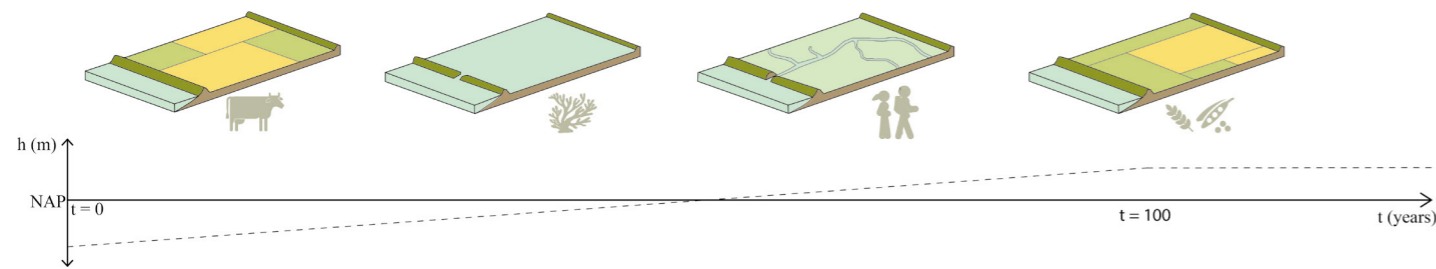


Figure 18 - The scheme of double dike
By author and inspired on a visual form (Belzen et al., 2021)

Salinisation

Research projects will be performed in south holland in order to gain more knowledge on how and what to farm on salinating grounds. This research is useful for the province of south holland, but could also be applied in a broader context in other countries suffering even more severely salinization problems. As the problems with salinization in south hol-

land are not too severe yet, the remaining strategy will mainly be focused on vastly slowing down the process of salinization by improving ground water management for example for farmers as was explained earlier. However not only farming water management needs to be improved, in general water shortages in summer should be prevented. If needed in the

future in certain areas, "kwelvoorzieningen" could be placed. However this does not seem necessary for the predictable future.

Subsidence

The ground water level in the peat areas will be increased in order to battle subsidence.

Water management for farmers

For every farmer it will be mandatory to have an on site water storage of a sufficient size to use it to water all their crops in summer. This facility may be shared with at most four farmers.

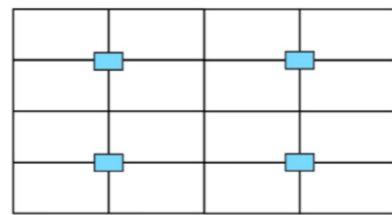


Figure 19 - Water management for farmers
By author

Floodplains

One of the main problems that the Netherlands will always face is **flood risk**. Traditionally, the measures that were taken against flooding were always aimed to try and stop the water from coming in (like dykes and flood defenses), rather than trying to work with the water by giving it sufficient space (Rijkswaterstaat, 2020). However, in recent years we have started to see a change, with the project "Ruimte voor de Rivier" – which directly translates to: "Room for the River" – being the main driver for change in the Netherlands.

The Ruimte voor de Rivier project comprises of 39 interventions along the main rivers of the Netherlands, aimed to give extra space to the river in case of extremely high tides (Rijkswaterstaat, 2020). **Floodplains, secondary channels, dike reparations and obstacle remov-**

als were the main measurements taken in this program. And while the project was very successful, the Rijkswaterstaat (2020) also states that "the climate is constantly changing and the Netherlands will stay vulnerable to flooding. This means we always need to be alert and take precautionary measures, so we can live, work and recreate safely in our country. Protection against high water is never finished."

In our project we propose to continue on the trend of giving space back to the river by **adding a total of 6 new floodplains to South Holland**, as seen in figure 23. The sizes and exact locations are based on the existing floodplains in the Netherlands, where it was found to have an average size of 2-6 kilometers long by up to a kilometer wide. **Furthermore**

the positioning was found to be most effective on the inside of a bend in the river. Figures 20, 21 & 22 show a couple of different examples of measurements from the Ruimte voor de Rivier project where these average sizes are based on. Lastly **floodplains were chosen over secondary channels** because they are a lot more cost efficient and the unique values that a secondary channel can add are not that beneficial for these chosen areas.

Our aimed outcome of adding floodplains is that it will **relieve stress of the existing water (dyke) system in a more long-term solution** (because dykes get exponentially more expensive). Furthermore it **creates unique locations where riparian forest can grow over time** – adding a recreational value to the area.

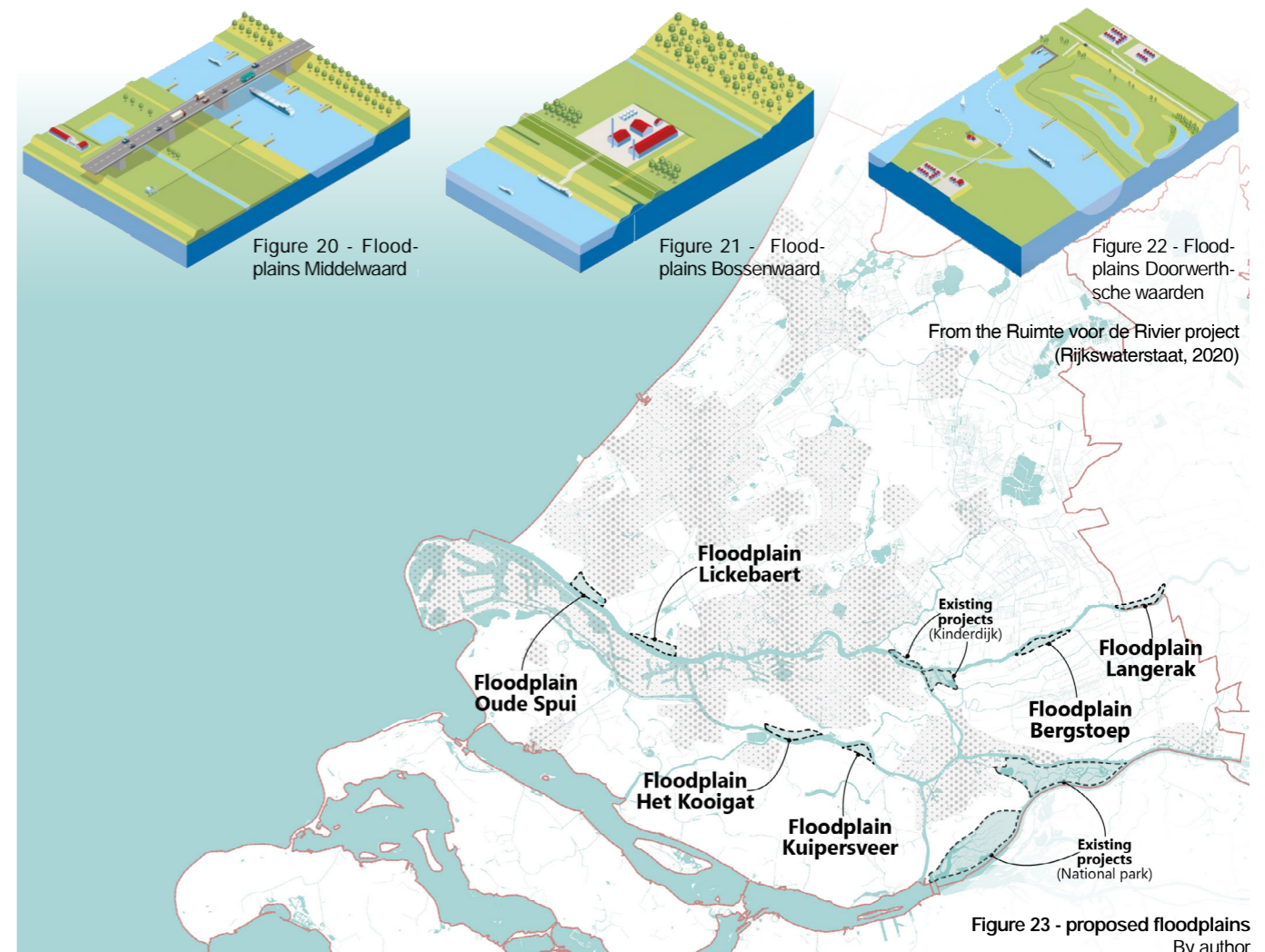
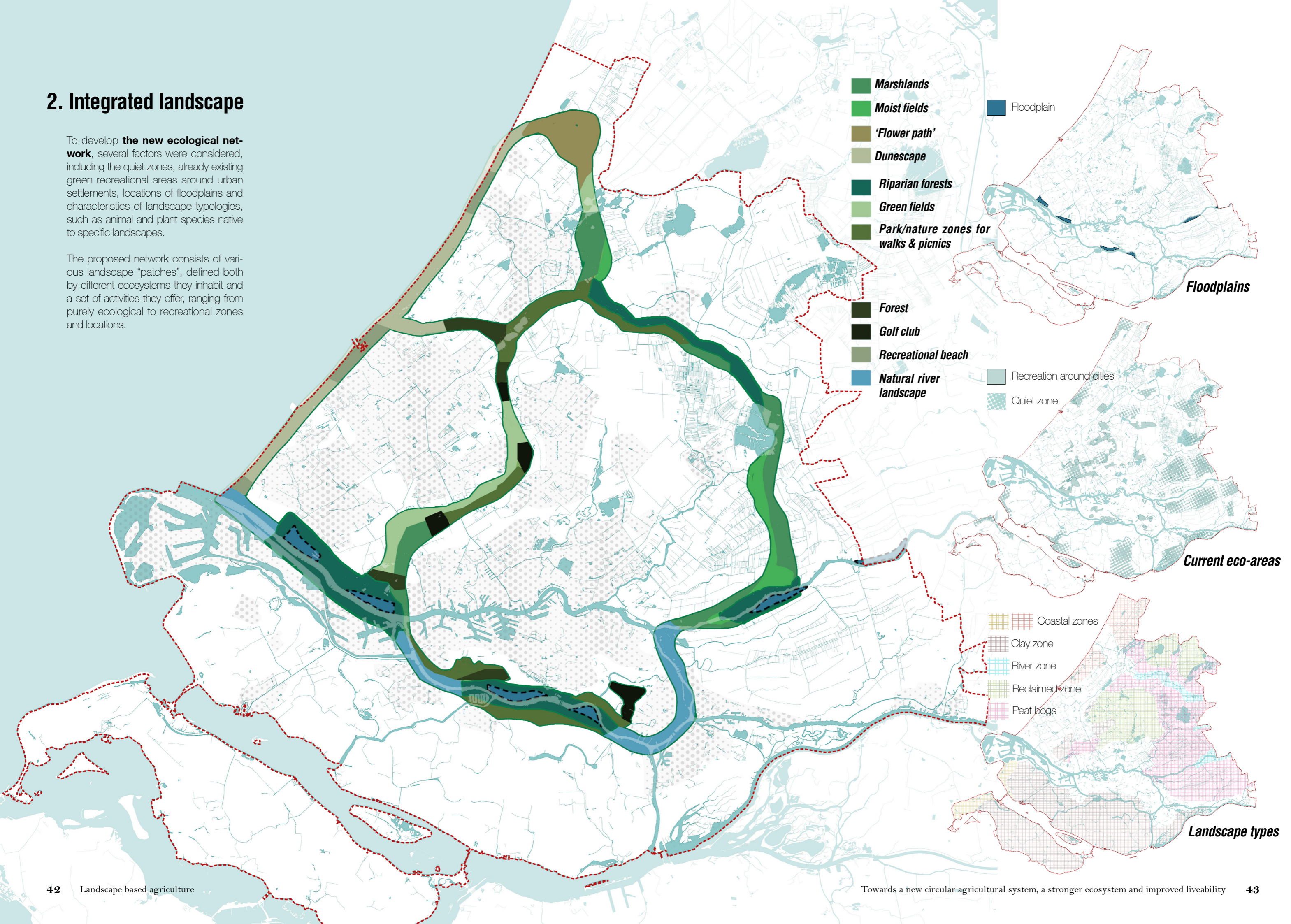


Figure 23 - proposed floodplains
By author

2. Integrated landscape

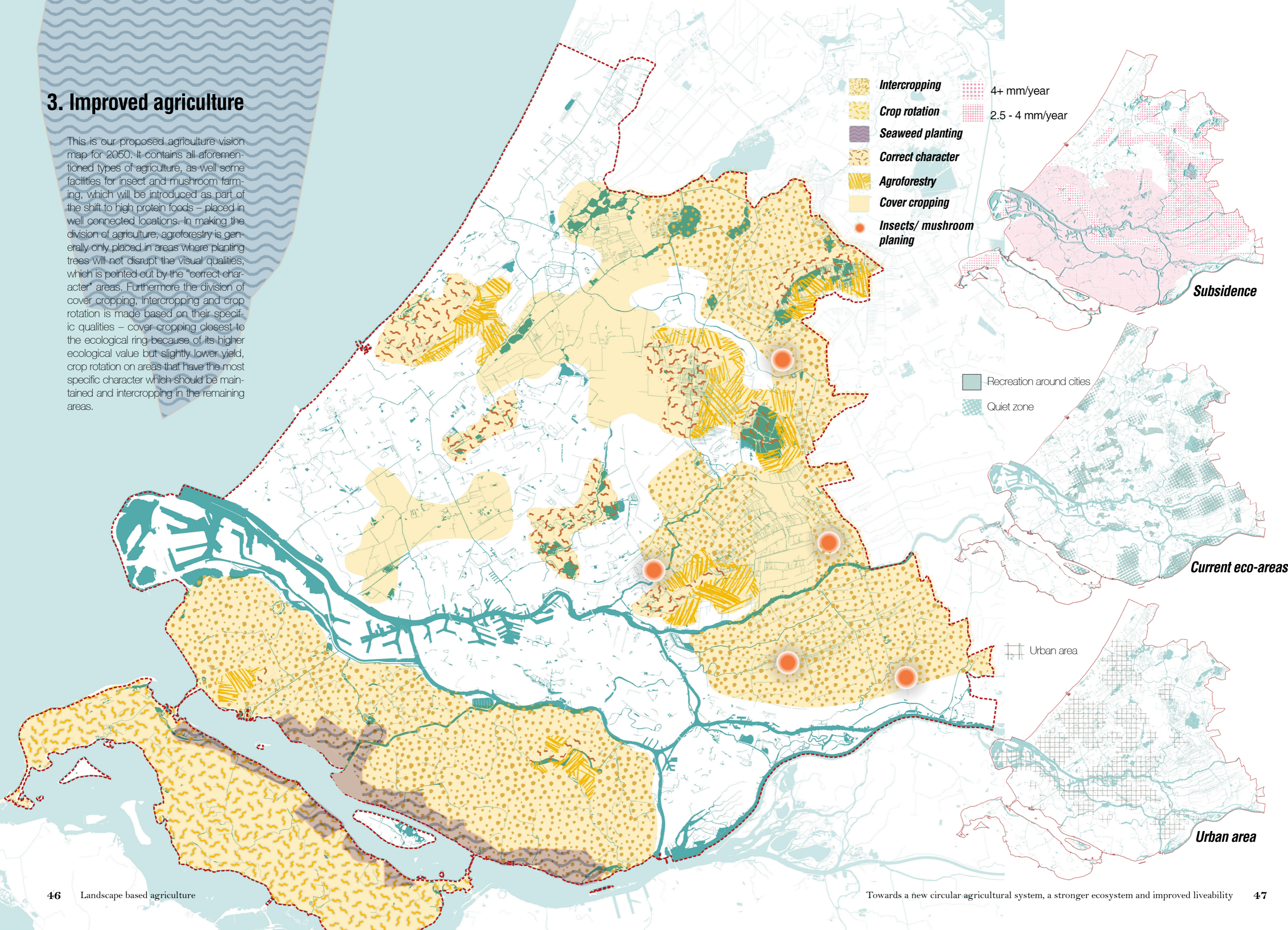
To develop **the new ecological network**, several factors were considered, including the quiet zones, already existing green recreational areas around urban settlements, locations of floodplains and characteristics of landscape typologies, such as animal and plant species native to specific landscapes.

The proposed network consists of various landscape “patches”, defined both by different ecosystems they inhabit and a set of activities they offer, ranging from purely ecological to recreational zones and locations.



3. Improved agriculture

This is our proposed agriculture vision map for 2050. It contains all aforementioned types of agriculture, as well some facilities for insect and mushroom farming, which will be introduced as part of the shift to high protein foods – placed in well connected locations. In making the division of agriculture, agroforestry is generally only placed in areas where planting trees will not disrupt the visual qualities, which is pointed out by the “correct character” areas. Furthermore the division of cover cropping, intercropping and crop rotation is made based on their specific qualities – cover cropping closest to the ecological ring because of its higher ecological value but slightly lower yield, crop rotation on areas that have the most specific character which should be maintained and intercropping in the remaining areas.



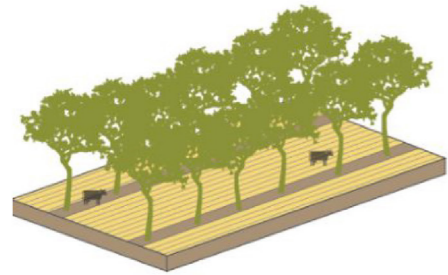
3.1 Agro-types and ground raising

Agriculture types

Based on the locations and ecological qualities, we proposed different cropping methods to fit in the ecological condition and landscape characteristics. We also

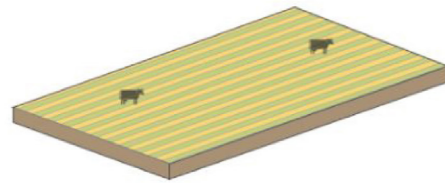
considered the combination between the agri-food sector and other sectors. Several types of farms can also contribute to recreational functions and tourism, while

others may be combined with production of green energy.



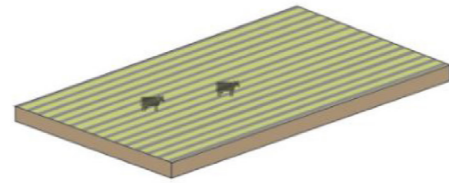
Agroforestry

Visual effect on landscape ++
Recreational function ++
Biodiversity ++



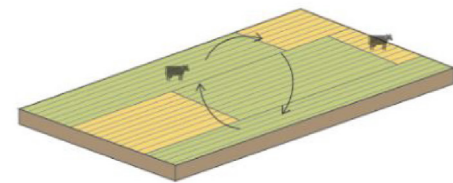
Intercropping

Visual effect on landscape +/-
Recreational function -
Biodiversity +



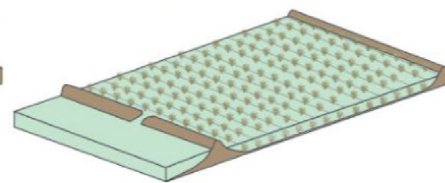
Cover-cropping

Visual effect on landscape ++
Recreational function ++
Biodiversity ++



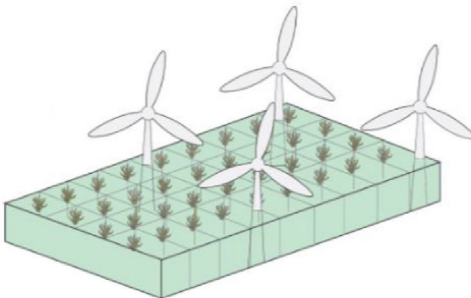
Crop rotation

Visual effect on landscape -
Recreational function -
Biodiversity +/-



Seaweed farming (Double dyke system)

Visual effect on landscape ++
Recreational function ++
Biodiversity +



Seaweed farming (North Sea)

Visual effect on landscape +
Recreational function N/A
Biodiversity +/-

Seaweed planting

The agricultural vision map introduces two main types of seaweed farming – in the North Sea and in the double dyke system. And while both are focussed on growing seaweed, their conditions are vastly different. For the double dyke, *Ulva Lactuca* (Sea lettuce) has been cho-

sen as the main type that will be grown there, mainly because of its limited depth constraints and limited height. *Laminaria Digitata* (Oarweed) and *Palmaria Palmata* (Dillisk) on the other hand will be the two main types of seaweed grown in the North Sea, mainly because of their resis-

tance against flow velocity and their long maximum height – meaning more yield per square meter. More detailed information of our research can be found in the appendix.

Raising the groundwater level

As mentioned before, the groundwater level will be increased in vulnerable areas to combat the current subsidence problems. This will have implications on the farmers – because not all crops can grow under these conditions – however, it is strongly advised to take action sooner rather than later, because otherwise

the subsidence problems will become way more severe (Dutch News, 2020). Furthermore some studies have already been done on crops that are more/less resistant against high groundwater levels (NDSU, n.d.) – with soybeans and corn being two of the most resistant crops – but more research will be needed to fa-

cilitate a more precise overview of which crops will be possible and under what intensity. Furthermore this will be needed first to be able to give a more precise of how high the groundwater level should be.

4. Knowledge network

Existing Knowledge network

An important aspect in trying to gain new types of knowledge is looking at existing institutes and companies that are already in these fields. In total, the province of South Holland will become an expert in four pillars of knowledge: meat replacements and high protein vegetables, (large scale) seaweed farming, cultivating on salinized grounds and practical ways to combat subsidence. This means it is of crucial importance to first look at the ac-

tors that are already involved in research or practices related to these pillars of knowledge, which is summarised in figure 27.

The figure shows a national network of knowledge, with a main core found in the middle of South Holland. However, this does not main the knowledge network will be limited to the province, because for example the research of the university

in Wageningen and experiments in Texel and Zeeland are also very beneficial in moving forward. Therefore this figure is meant as an overview of important actors that can help in becoming an expert and exporter of knowledge in the aforementioned aspects.



Figure 27 - Mapping of the existing knowledge network
By author

4. Knowledge network

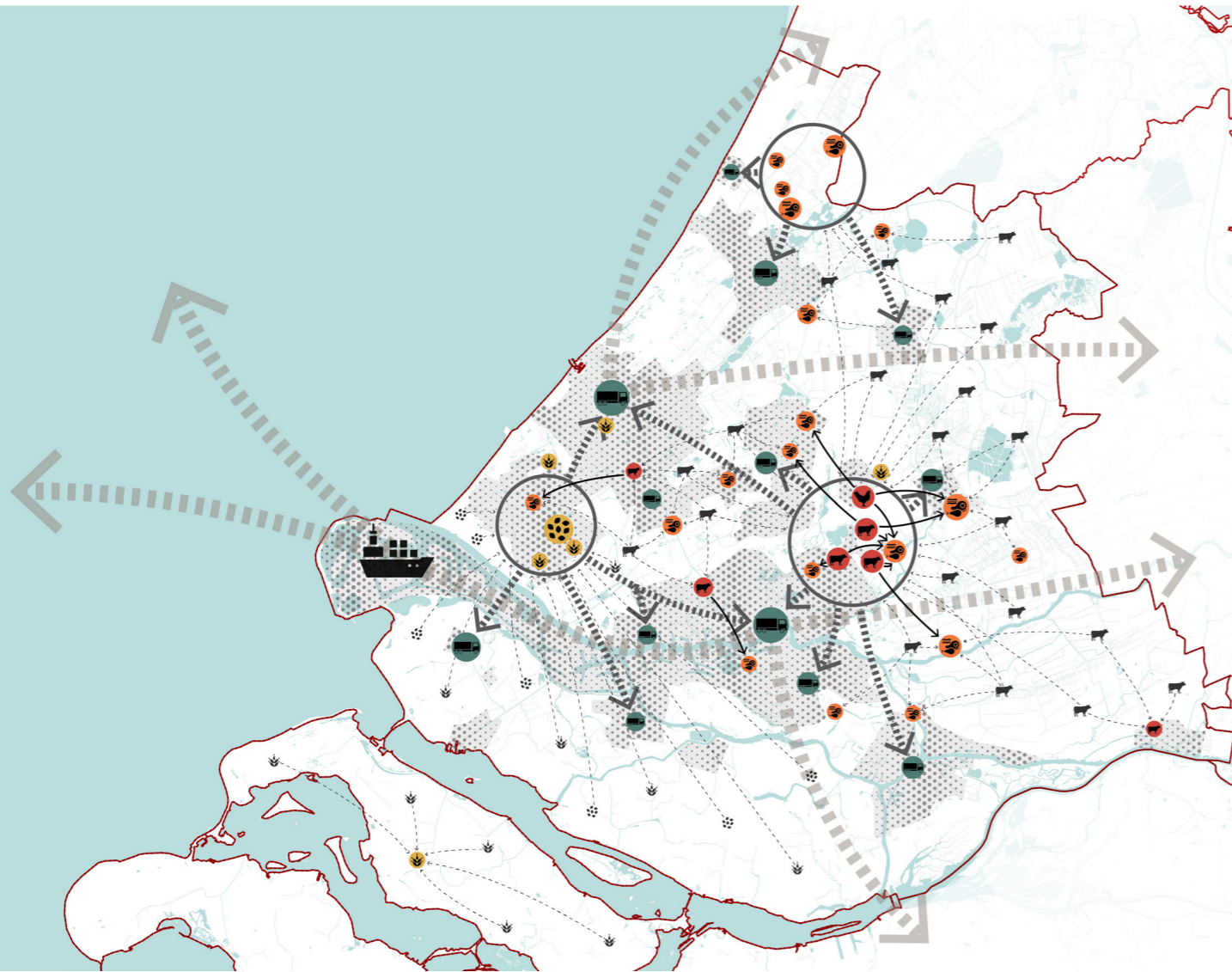


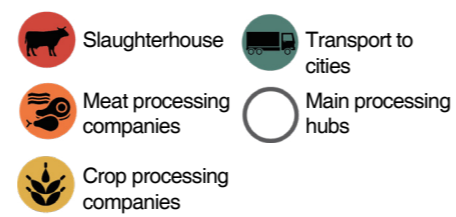
Figure 28 - Mapping of the processing network
By author

Existing processing network

For the proposed vision to be successful, a number of specific types of knowledge is necessary – of which the South Holland will need to become an expert. One of these knowledge pillars is related to meat replacements and high protein vegetables. As seen before, the province of South Holland will drastically cut down on its livestock farming and expand on other types of agriculture. This means the current processing network of South Holland, as seen on figure 28, will also see changes. On the figure, a main processing hub can be found in the middle of the province – located between Rotterdam

and Gouda, and containing the four biggest slaughterhouses of South Holland (Regiobedrijf, 2021).

In the year 2050, this hub will have transformed to a new knowledge and research hub for meat replacements and high protein vegetables. This means the clustering of processing facilities will remain in the same area, because the current network within South Holland is already very efficient – making drastic changes to the entire network unnecessarily expensive and an overkill. However, this does mean that current slaughterhouses will need to



be closed before 2050 and that new processing facilities, as well as new research institute(s), will need to be realised in this area. The decision on placing research facilities next to processing facilities has been made to localise the research and make collaboration between research and practice a lot easier.

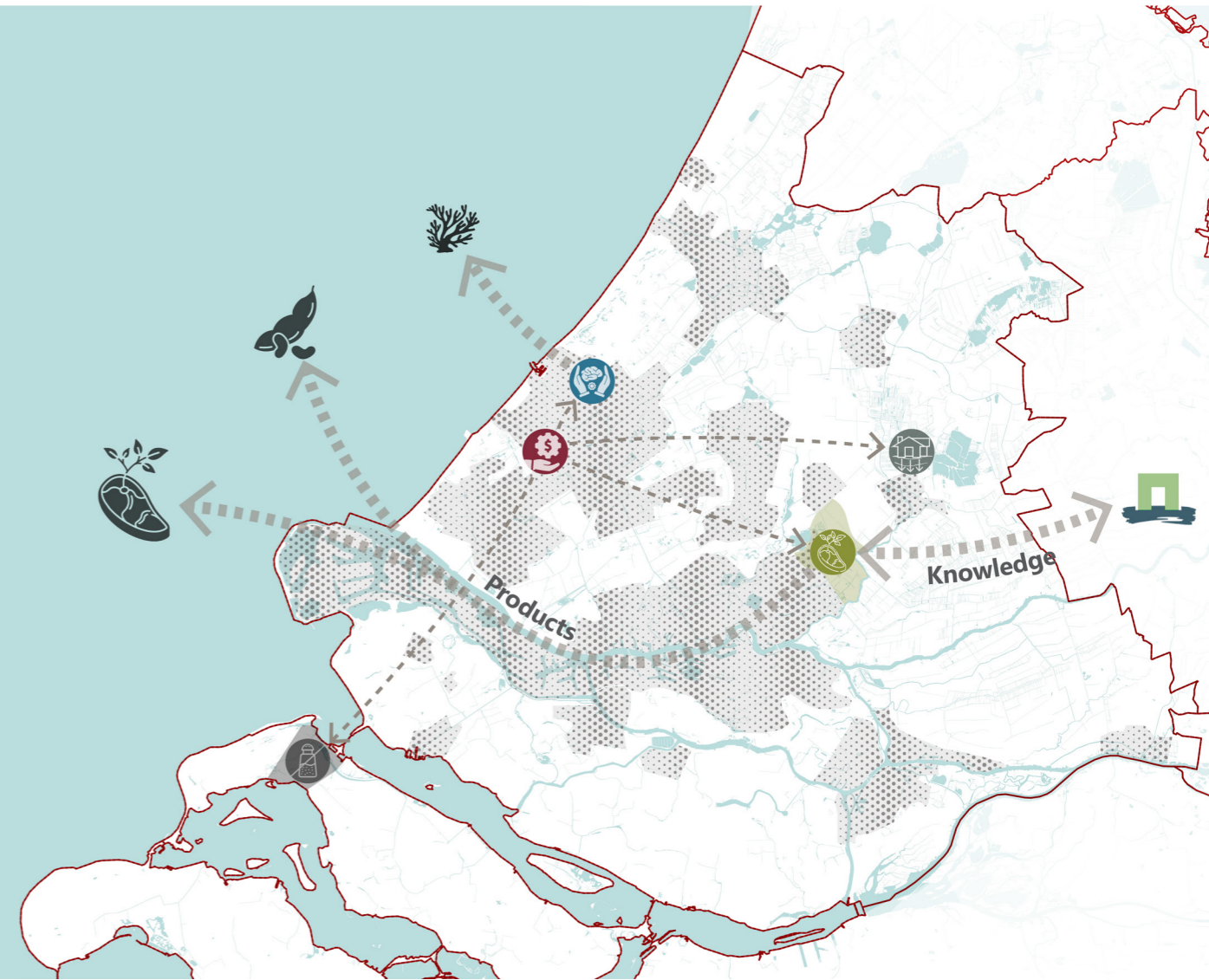


Figure 29 - Mapping of the knowledge vision
By author

Knowledge vision

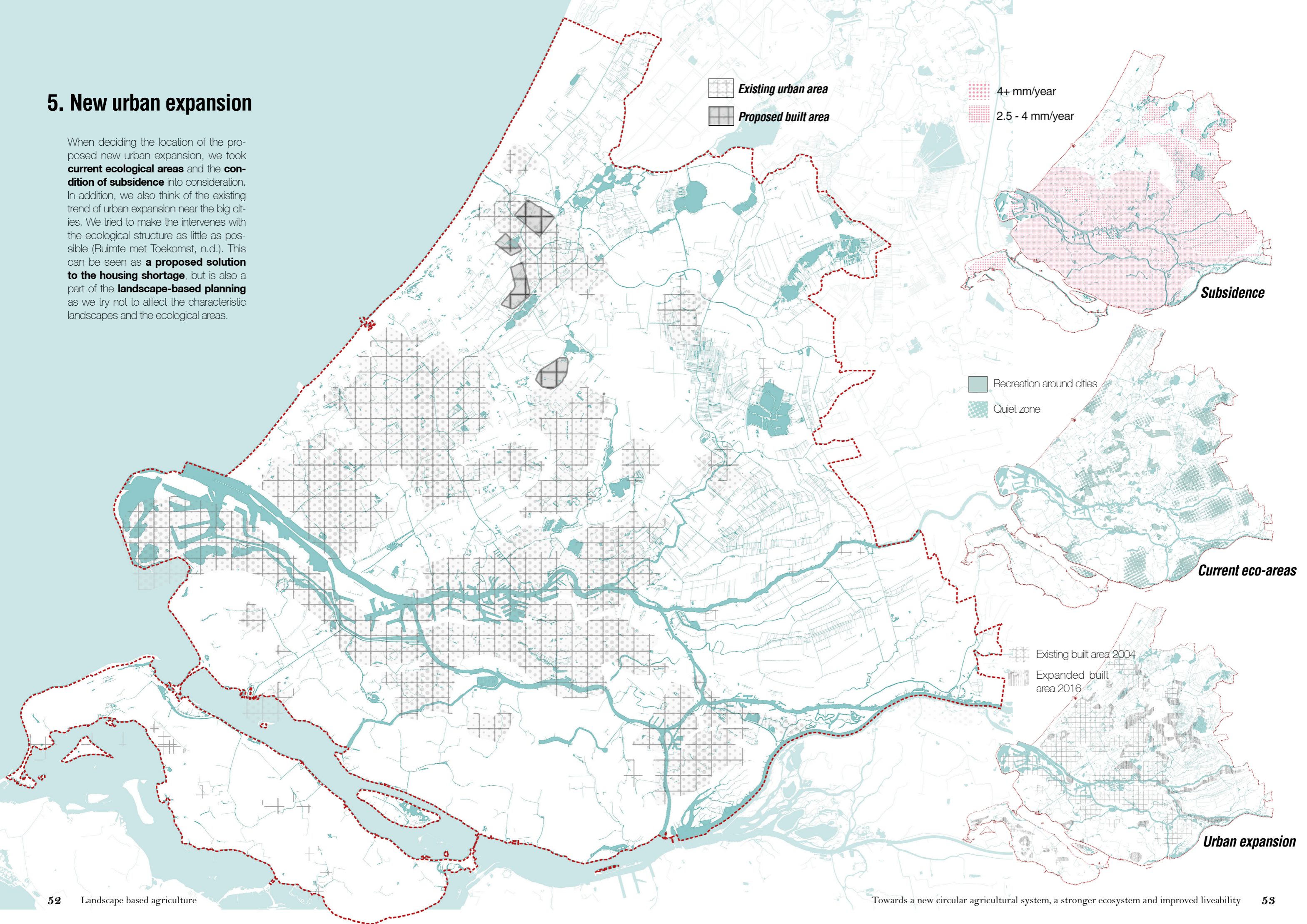
Figure 29 shows the proposed knowledge network of South Holland. As mentioned before, South Holland will become an expert and exporter of four pillars of knowledge, as well as an exporter on products related to this knowledge – like high meat replacements and seaweed. As seen on the figure, main areas have been allocated for research on salinized ground and subsidence – based on the analysis on salinization and ground subsidence. Furthermore a new processing and research hub has been allocated and a “base of operations” for large scale seaweed farming has been pinpointed

(of which experiments will mostly happen on the North Sea and in Zeeland). Lastly, economical support from the province will be needed towards all four pillars of knowledge to help these initiatives move forward.











5. New urban expansion

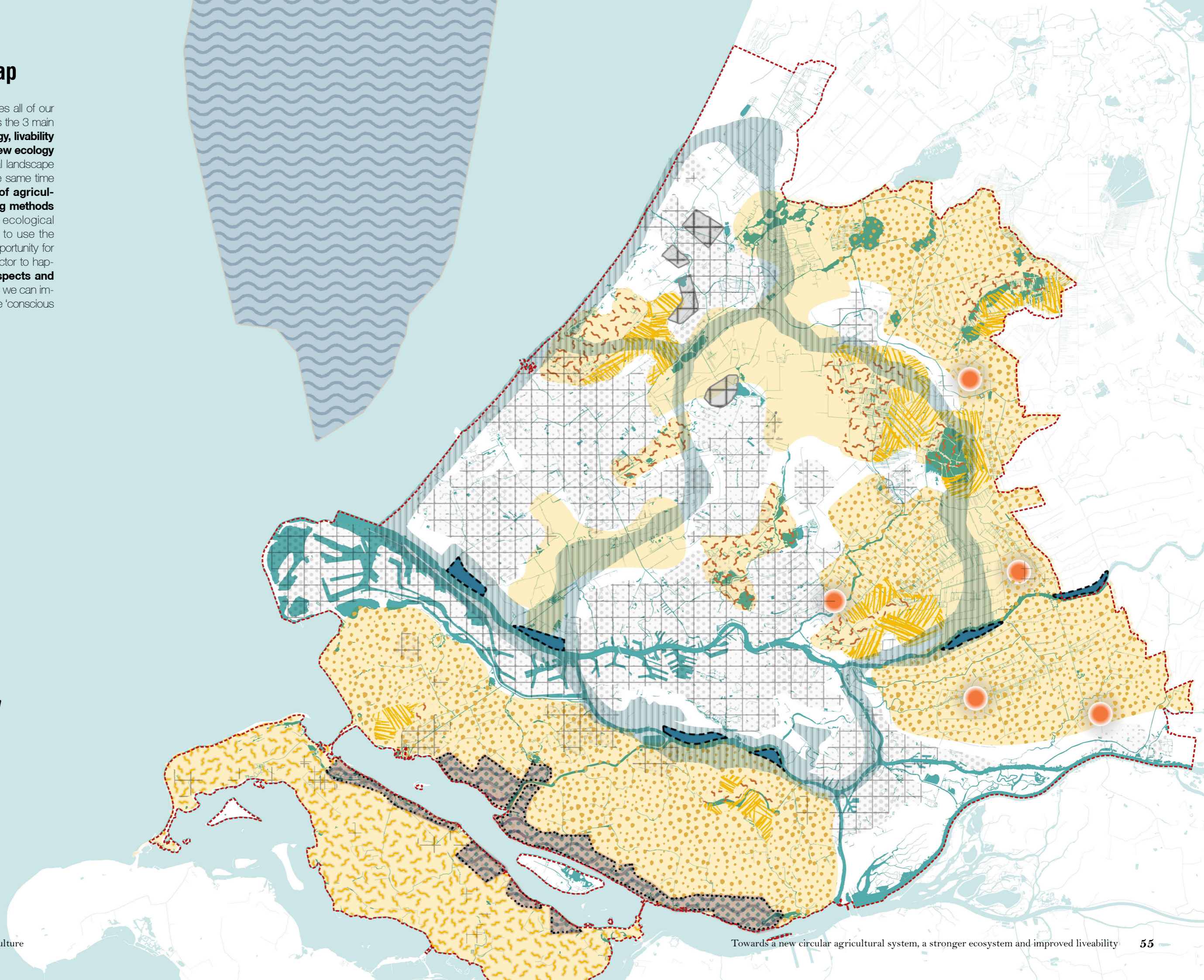
When deciding the location of the proposed new urban expansion, we took **current ecological areas** and the **condition of subsidence** into consideration. In addition, we also think of the existing trend of urban expansion near the big cities. We tried to make the intervenes with the ecological structure as little as possible (Ruimte met Toekomst, n.d.). This can be seen as **a proposed solution to the housing shortage**, but is also a part of the **landscape-based planning** as we try not to affect the characteristic landscapes and the ecological areas.



Final Vision Map

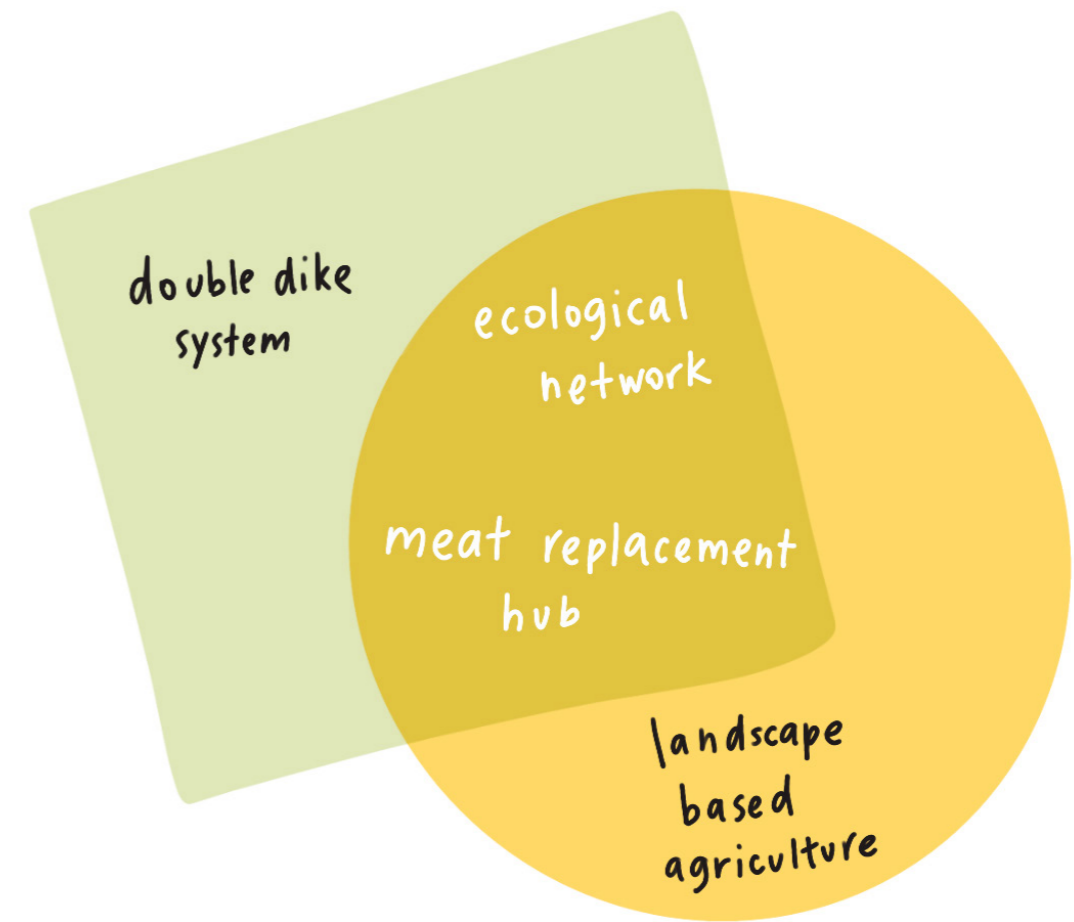
The final vision map combines all of our sub-visions together. It shows the 3 main aspects we focus on: **ecology, livability and economy**. We plan a **new ecology network** connecting regional landscape and people's life, while at the same time proposing a **new system of agriculture with different cropping methods** based on landscape and ecological conditions. In short, we try to use the livestock reduction as an opportunity for changes in the agro-food sector to happen, **bridging the three aspects and reach a balance**. In the end, we can improve the system and achieve 'conscious circular living'.

-  **Intercropping**
-  **Crop rotation**
-  **Seaweed planting**
-  **Correct character**
-  **Agroforestry**
-  **Cover cropping**
-  **Insects/ mushroom planing**
-  **Existing urban area**
-  **Proposed built area**
-  **Floodplain**
-  **Double dike area**
-  **Ecology network**



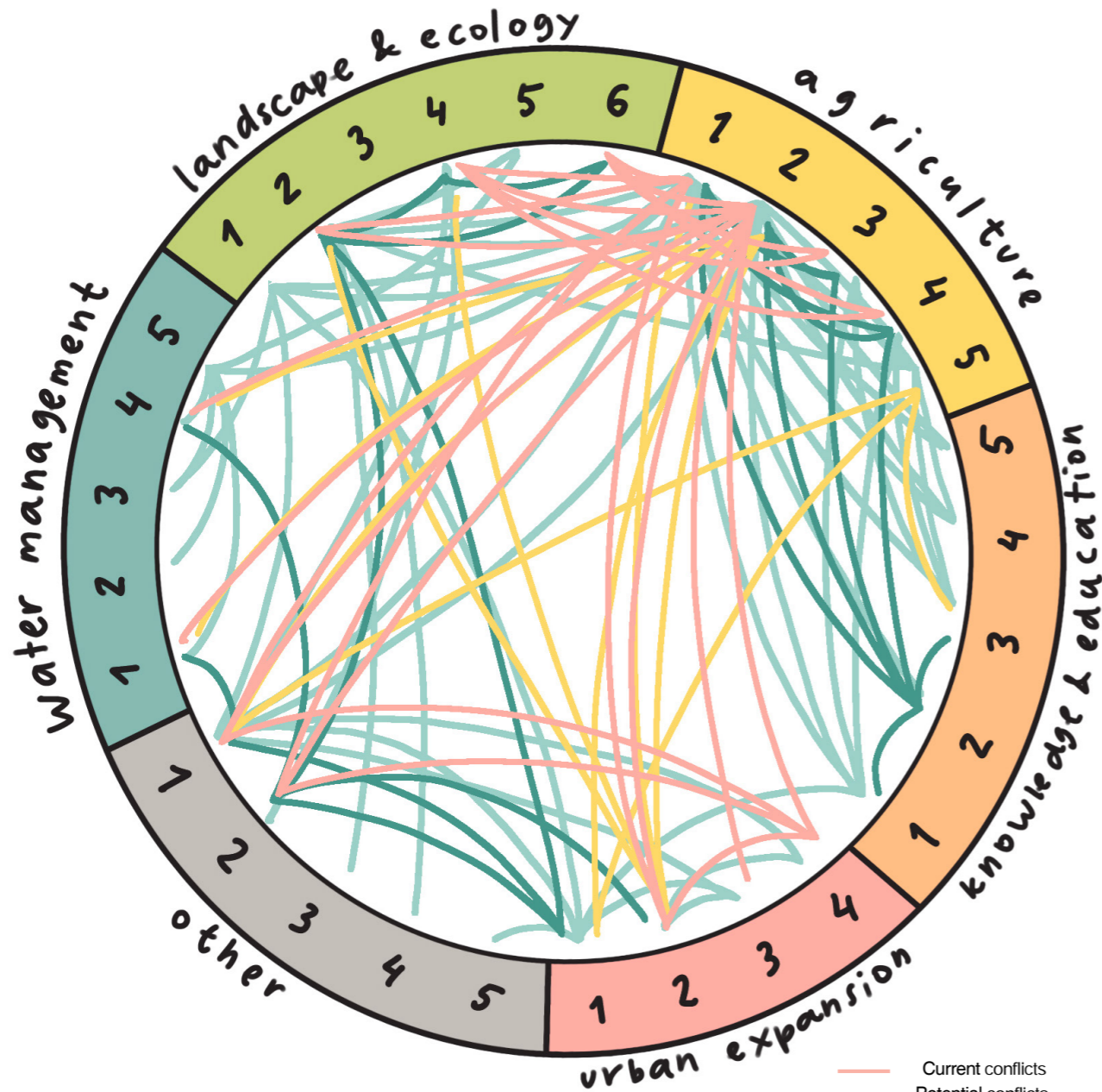
06 Strategy

Principles



-
- visible & accessible agricultural landscape
 - agricultural practices that do not harm local landscapes and ecology
 - multifunctional agriculture land
 - support local initiatives
- activity rich ecological network
 - accessible and efficient plant-based circular agri-food lifestyle participation
 - boost citizen and stakeholder participation and collaboration
- address and improve existing ecological landscape issues
 - preservation and support of existing landscape typologies
 - measures to ensure better ecological awareness

Stakeholder Analysis



Landscape & ecology

1. Remediation researchers
2. Nature & landscape conservation PZH
3. Research institutions
4. Nature protection organisations
5. City residents
6. Wild animals

Agriculture

1. Farmers (plant focussed)
2. Farmers (livestock/animals focussed)
3. Food production companies
4. Nature protection companies
5. Consumers

- Current conflicts
- Potential conflicts
- Current synergies
- Potential synergies

Urban expansion

1. Urban planners
2. Developers
3. Residents of subsidising areas
4. Residents affected by the housing crisis

Water management

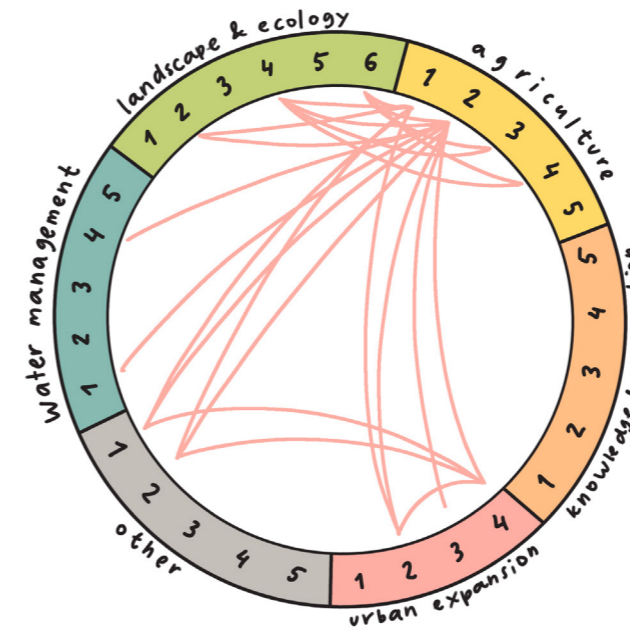
1. Rijkswaterstaat
2. TU Delft
3. IHE Delft
4. Waterboards
5. Double dike developers

Knowledge & education

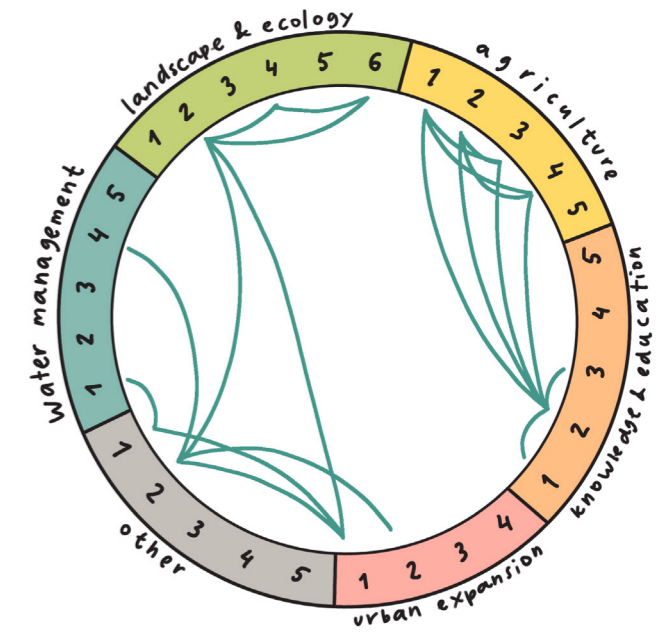
1. Research & innovation institutions
2. Agri-food businesses
3. Meat replacement producers
4. Schools & universities
5. Residents of PZH

Other

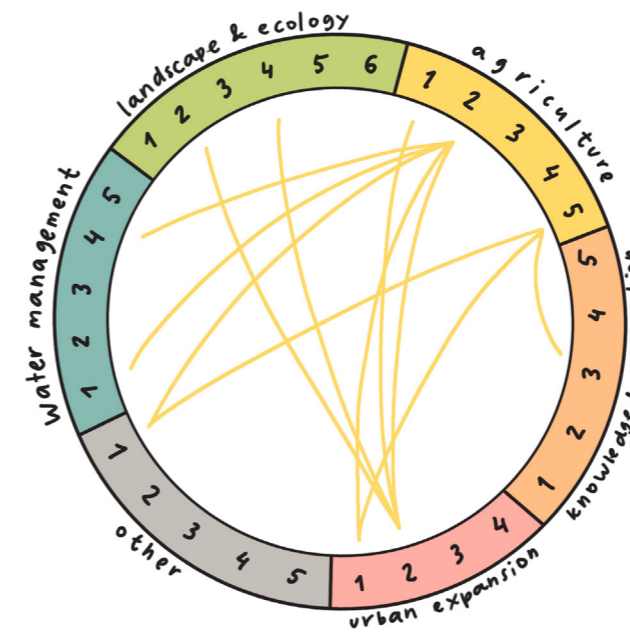
1. Government
2. Municipalities
3. Sports associations
4. Cultral associations
5. Citizens



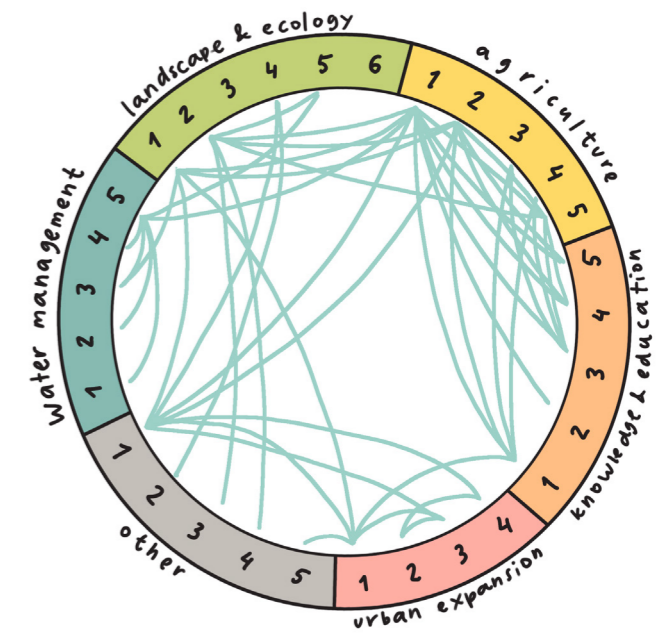
Current Conflicts



Current Synergies



Potential Conflicts

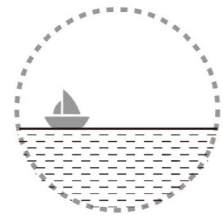


Potential Synergies

For a successful, but most importantly just and feasible strategy, getting to know the stakeholders is crucial, therefore, firstly, an inventorisation of all relevant stakeholders had to be conducted along with the analysis of potential and possible conflicts and synergies to provide the insights on which interventions are not only desired, but required.

The division of stakeholders is based on the areas of interest established in the Vision part of the report, since water management, landscape and ecology, agriculture, knowledge and education, and urban expansion are crucial for the implementation of our project. However, several other stakeholders not belonging to these areas were also included.

Surprisingly, the highest amount of connections between stakeholders of various fields was discovered within the potential synergies. This was both encouraging and challenging at once, since it promised not only the broadness of opportunities but indicated how broad our focus was, which helped in prioritising the goals for the strategy and interventions.



Water management



Landscape & Ecology



Agriculture

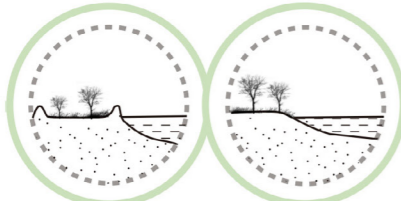


Knowledge



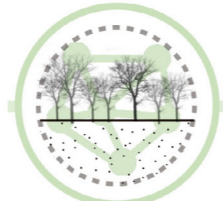
Urban expansion

Natural environment

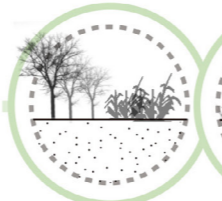


Double dike system

Floodplain



Ecology network



Agroforestry



Cropping methods



Livestock farming reduction



Salinisation treatment



Subsidence treatment



Biodiversity preservation



Salinisation treatment



Subsidence treatment

Built environment



Double dike system



Landscape based planning



Agroforestry



Ecology network

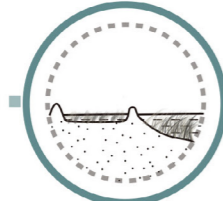


Meat replacement hub

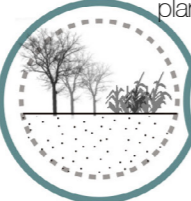


New housing area

Economy



Seaweed planting



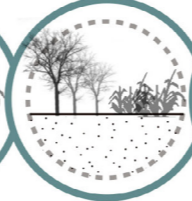
Agroforestry



Cropping methods



Meat replacement hub



Cropping methods



Agroforestry



Meat replacement hub



Agroforestry

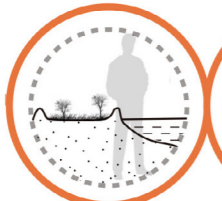


Cropping methods

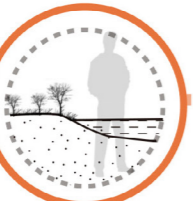


New housing area

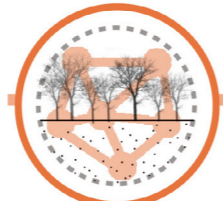
Awareness Building



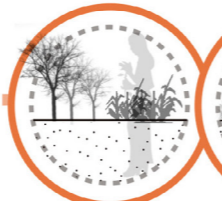
Double dike system



Floodplain



Ecology network



Agroforestry



Meat replacement hub



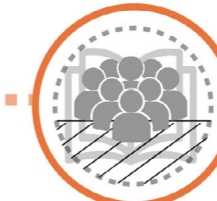
Petting farms



Education & participation

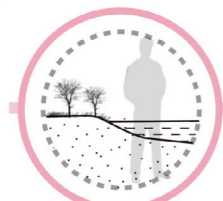


Online trending

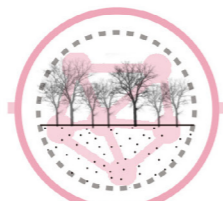


Education & participation

Recreation



Recreational Floodplain



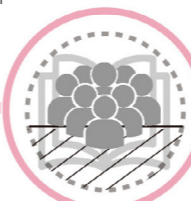
Ecology network



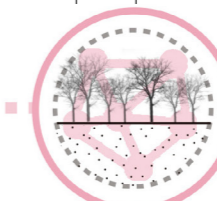
Agroforestry



Petting farms

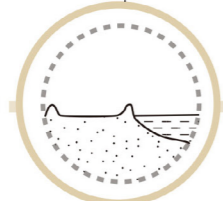


Education center

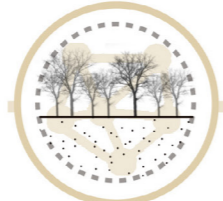


Accessible ecological area

Spatial justice



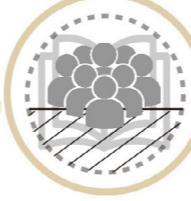
Double dike system



Ecology network



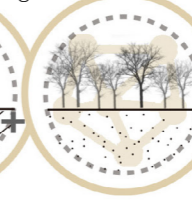
Meat replacement hub



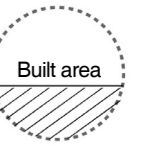
Education & participation



New housing area



Accessible ecological area



Strategic Toolkit

We developed tools considering the issues we addressed in the project, and we tried to look at them from different aspects. This toolkit include strategies for both natural land and built areas, covering multiple topics from water management to urban expansion. The tools are not only technical but also include social aspects. Many of them can contribute to more than one solutions to the problems we are faced with.

Guideline Toolkit

Landscape & ecology

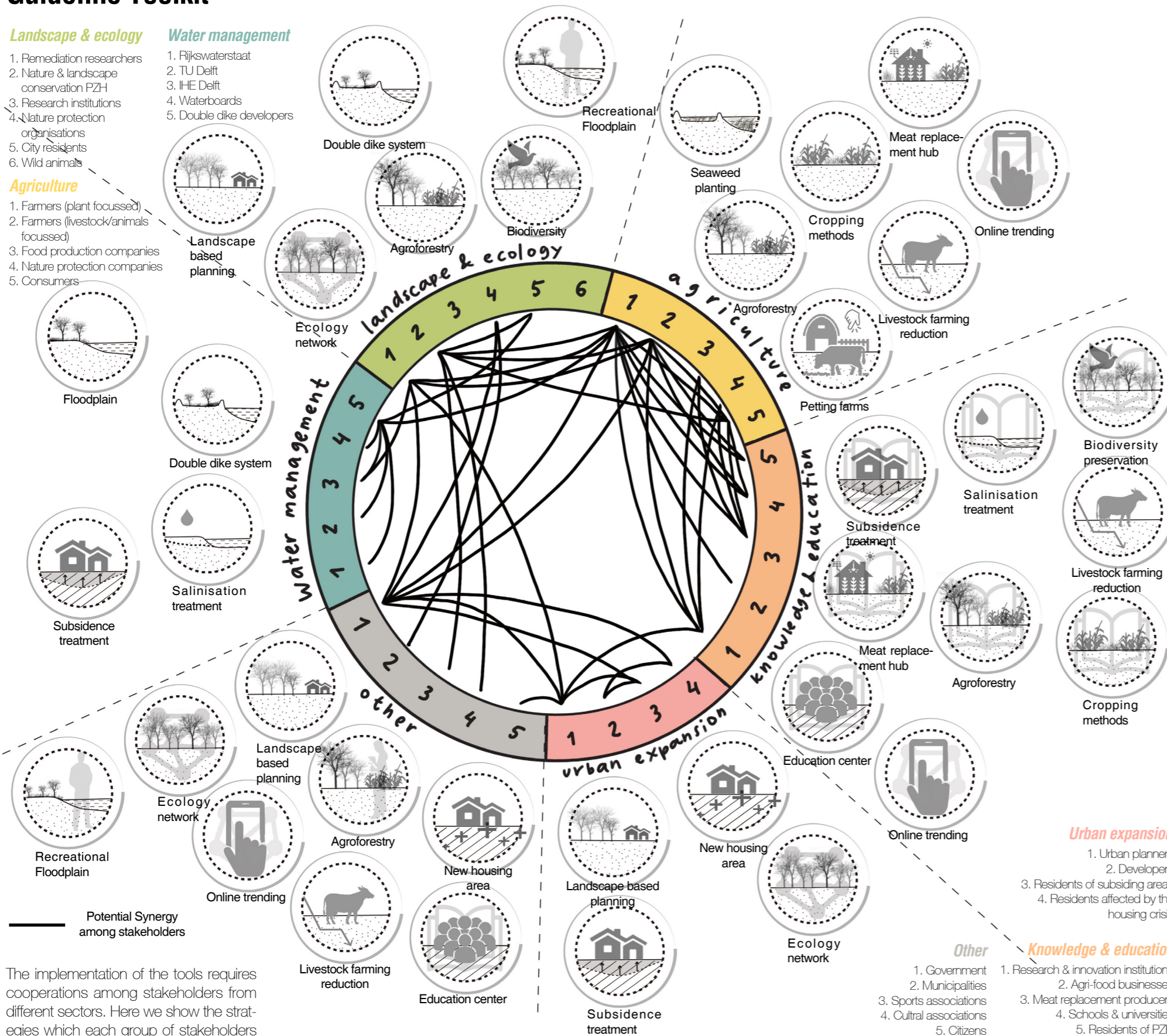
1. Remediation researchers
2. Nature & landscape conservation PZH
3. Research institutions
4. Nature protection organisations
5. City residents
6. Wild animals

Agriculture

1. Farmers (plant focussed)
2. Farmers (livestock/animals focussed)
3. Food production companies
4. Nature protection companies
5. Consumers

Water management

1. Rijkswaterstaat
2. TU Delft
3. IHE Delft
4. Waterboards
5. Double dike developers



The implementation of the tools requires cooperations among stakeholders from different sectors. Here we show the strategies which each group of stakeholders can take part in, indicating their possible synergies.

<p>Double dike system</p> <p>Reference project: Double dike as robust water-retaining landscapes for a prosperous Zuidwestelijke Delta (van Belzen et al, 2021)</p>	<p>Floodplain</p> <p>Reference project: Ruimte voor de Rivier 1. Floodplains Middelwaard; 2. Floodplains Bossenwaard 3. (Urban) Floodplains Doorwerthsche waarden</p>	<p>Salinisation treatment</p> <p>Reference project: Zilt Proefbedrijf Texel (experiments with growing foods on salt soils) 2. Kwelvoorziening (seepage) facility in Perkpolder - Deltares</p>	<p>Subsidence treatment</p> <p>Reference project: 1. Deltares - research institute 2. TNO - research institute, also developed the geomodel of subsidence in the Netherlands</p>
<p>Ecological network</p> <p>Reference project: 1. NERN - in charge of research in this field. Created a plan for Delta region 2050 2. NBN Atlas - collects and combines all natural & biodiversity data</p>	<p>Landscape based planning</p> <p>Reference project: 1. Landscape Character Assessment (Tudor, Natural England, 2014) 2. Forest Amenity Planning Approaches (Ward Thompson, 2004)</p>	<p>Agroforestry</p> <p>Reference: 1. EURAF Nederland: network of organisations involved in the development of agroforestry 2. Agroforestry research trust (NGO - research & education)</p>	<p>Cropping methods</p> <p>Reference: 1. Wageningen UR - specific experiments related to intercropping techniques 2. EOS (Earth Observing System) - benefits/possibilities/ implementations</p>
<p>Seaweed planting</p> <p>Reference project: North Sea Farmers Offshore Test Site -- currently existing test site for farming seaweed on the north sea</p>	<p>Livestock farming reduction</p> <p>Reference project: 1. Greenpeace - created a plan on livestock reduction 2. Wageningen UR - researching on sustainable livestock farming and livestock reduction</p>	<p>Meat replacement hub</p> <p>Reference project: Foodvalley NL - community in Gelderland of companies and research facilities that work towards shaping the future of food.</p>	<p>Petting farms</p> <p>Reference project: 1. Depluktuin (Naaldwijk) 2. Pluk! Groenten Uit West - Cityplot's Community Supported Agriculture (CSA) (Amsterdam) 3. Petting Farm Almere</p>
<p>Education center</p> <p>Reference project: National Park de Hoge Veluwe -- museum & information desks</p>	<p>Online trending</p> <p>Reference project: Vegan trends on social media such as instagram and facebook</p>	<p>New housing area</p> <p>Reference project: 1. ELBAREC & Groen (knowledge platform); 2. Municipality of Deventer: shows how to improve the current ecological system with multiple small interventions</p>	

Urban expansion

1. Urban planners
2. Developers
3. Residents of subsiding areas
4. Residents affected by the housing crisis

Knowledge & education

1. Government
 2. Municipalities
 3. Sports associations
 4. Cultral associations
 5. Citizens
1. Research & innovation institutions
 2. Agri-food businesses
 3. Meat replacement producers
 4. Schools & universities
 5. Residents of PZH

Farmers in Transition

Possibilities

To ensure a relatively smooth transition, it is important to involve the current livestock farmers in this process – as well as farmers that might have to move due to the double dyke and ecological network. In total, seven main options have been developed, each having different benefits and drawbacks. The red options for example are the fastest and most forceable

ways to get livestock farmers out, but they will also be very expensive and will probably have higher resistance. On the other hand the green and yellow options are more desirable, but farmers have to cooperate a bit more. For every option it is important that farmers will be supported and subsidised during the transition to ensure the farmers do not fall into a

'hole', while policies will gradually be increased over time to force the more resistant farmers out.

Most forceable



Buying the farmers out;

Very fast but expensive approach, should only be used on critical areas for development.



Changing policies to force farmers out;

Relatively easy, fast and cheap, but will have lots of resistance. Gradual increase is recommended.

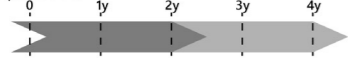
Options; nitrogen tax, increase animal welfare requirements, stricter antibiotics laws, less subsidies, increased tax on non-biological meat products, etc.

Most desirable



Transition to crops/seaweed farmers;

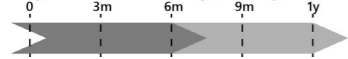
Closest to existing job and the crop farmers can often use the same land. An education process is required and should be fully paid for.



Shift to tourism;

Can be mixed with remaining non-intensive livestock farming and same land can often be used. However, permits for these activities should be easier accessible and these initiatives should be supported.

Options; agritourism, camping, petting zoos, excursions, etc.



Other desirable options



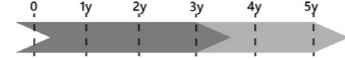
Transition to sectors that need workers; Solves two problems at once, but is further away from their current occupation. Education for willing farmers should be fully paid for.

Options; construction, logistics, healthcare, etc.



Transition to food educators;

Farmers are already involved in the food industry, but advocating for a healthy, meat-free diet might be a very big change. Furthermore the amount of jobs will be limited. However, willing farmers should gain full support.



Transition to caretakers of ecological zones;

Contrary to popular belief, a lot of farmers do care a lot about the environment and willing farmers should gain full support in the transition. However, the amount of jobs will again be limited.

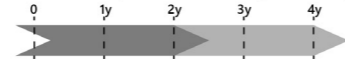


Figure 30 - Possibilities of farmers' transition
By author

Examples

To show how this transition will work over time, a timeline has been developed – together with three examples of specific livestock farmers. Every farmer will have a (slightly) different timeline, making it impossible to show them all, but these examples aim to show how the transition will operate. Starting as soon as possible, all livestock farmers should be informed about the transition that is going to happen during the next 30 years to create transparency, which will also contain the previously mentioned transitional

options to other sectors. Furthermore a governmental organisation should be established that can help farmers in their transition and answer questions. Next, the policies should start to gradually increase, aimed to gradually force livestock farmers out during a period of 30 years, without making the changes unbearable. Furthermore this gives the farmers more than enough time to decide what they want to do with their property, career, etc. For example farmers that are really attached to their property might want to

choose an option that maintains (part of) the land, while others might be more likely to choose a different option. Lastly certain opportunities have a hard stop to them at a certain year, however, this year is not fixed. It mainly functions as an indication that job opportunities are limited in those fields.

Farmers profile

Name: Jan

Age: 56

Occupation: diverse livestock farmer

Interests: Jan is an older farmer whose family has run this farm for multiple generations. He loves his animals and is hesitant to change, but he does acknowledge the livestock industry isn't perfect. However, he currently is not willing to change towards another sector.



(De Standaard, 2019)

Name: Klara

Age: 44

Occupation: livestock farmer (pigs)

Interests: Klara works in a pig farm together with her husband. She loves nature and the outdoors. At work, she tries to give all pigs the best life possible. She loves her job, but still doesn't fully like the industry, mainly because of all the animals that are killed.



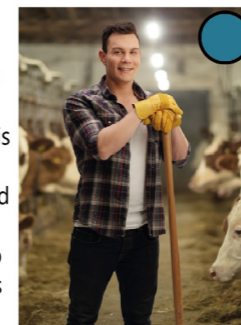
(Boets, 2020)

Name: Daan

Age: 32

Occupation: livestock farmer (cows)

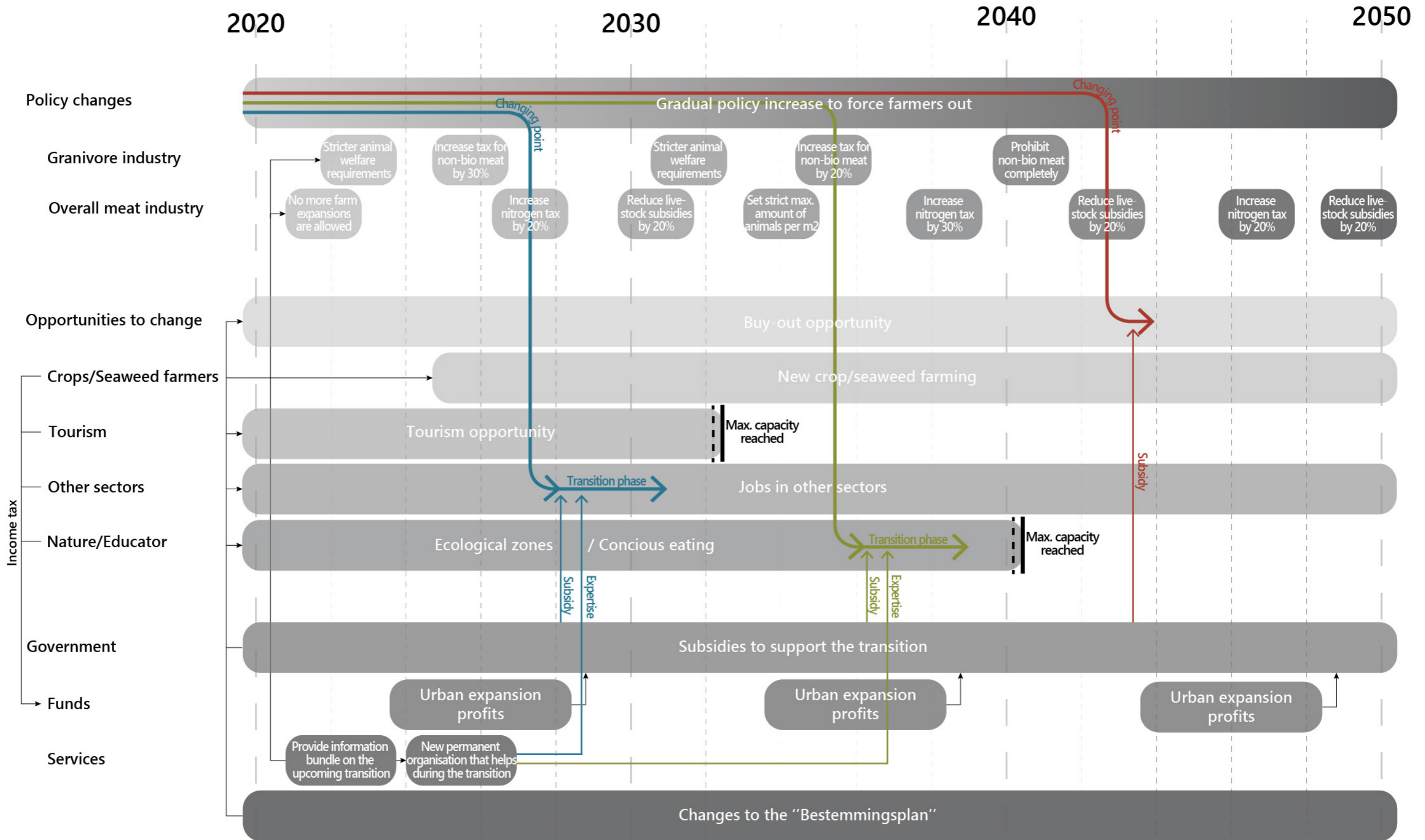
Interests: Daan is a younger farmer who took charge of the farm after his dad wasn't capable to do the work. He enjoys his job, but is not opposed to other opportunities. However, he currently does not have the funds to make a transition and he's unsure as to what will happen to the farm.



(RTV Oost, 2017)

Figure 31 - Farmers profile
By author

Transition timeline



General Timeline

Water management

- Floodplains
- Double dike system
- Heightening groundwater level
- Water management for farmers

Ecology

- Remediation
- Upgrade existing structure
- Add missing links

Urban expansion *

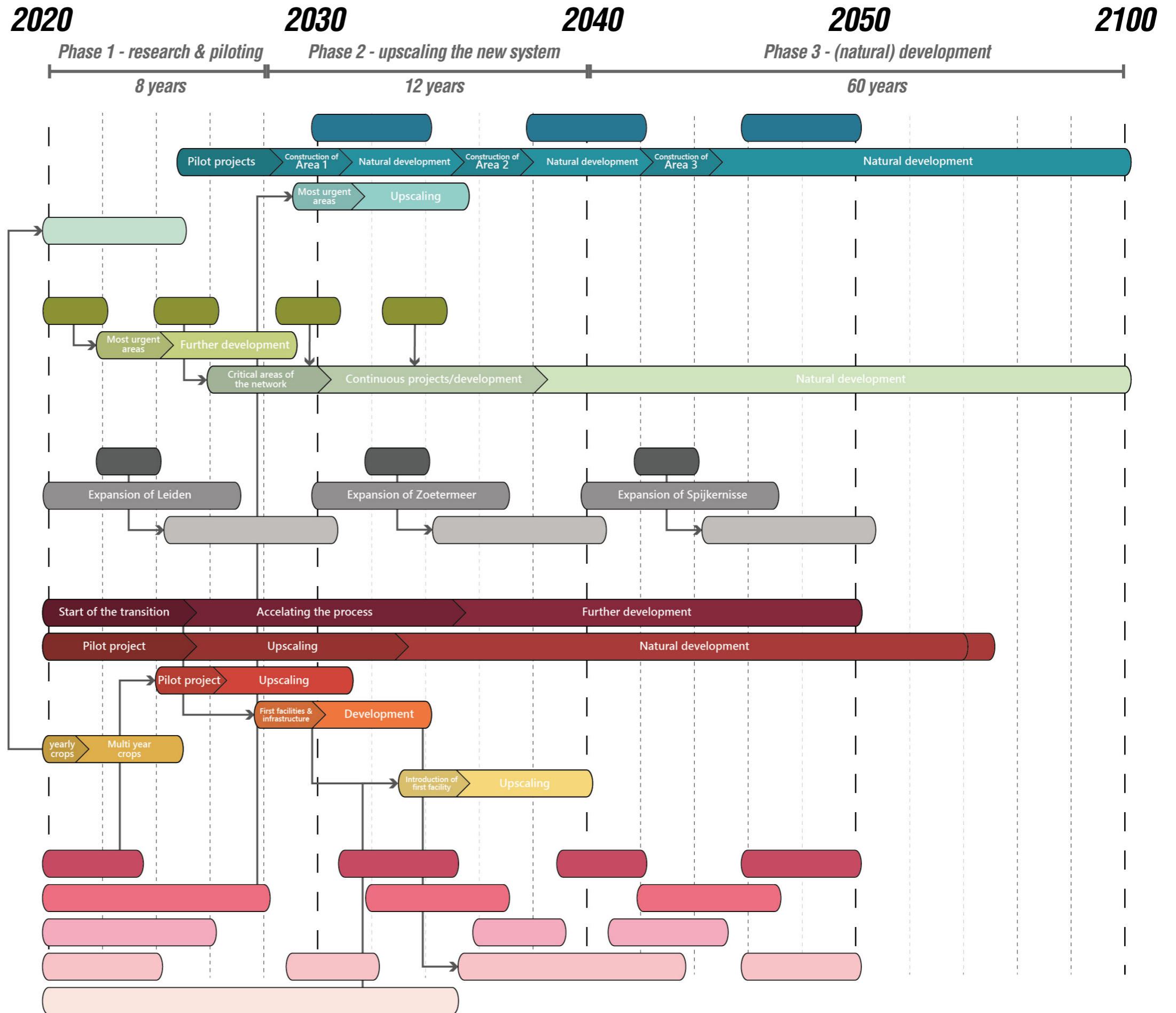
- Remediation
- City planning
- Building phase

Agriculture

- Transition away from cattle farming
- Agroforestry
- Seaweed farm on North Sea
- New processing & research hub
- Transition of existing crops
- Insect/Mushroom farming facilities

Knowledge *

- Research practical seaweed farming
- Research high groundwater cropping
- Research salinized soil cropping
- Research on meat replacements
- Educate people on where their food comes from & on healthy foods



Restructured Flows

In the figure below, the processing network of South Holland can be seen in a section.

This figure focusses more on the route products take 'from land to fork', with all the different stages within that process. In comparison to the existing flow section found on page !!!!! the network has become more circular, because it:

- Removed import for cattle feed and substances for meat replacements
- Removed all excess manure
- Reduced nitrogen/phosphate pollution by over 90%
- Re-uses biomass and reduces plastic usage
- Reduces transport needs by centralising the processing

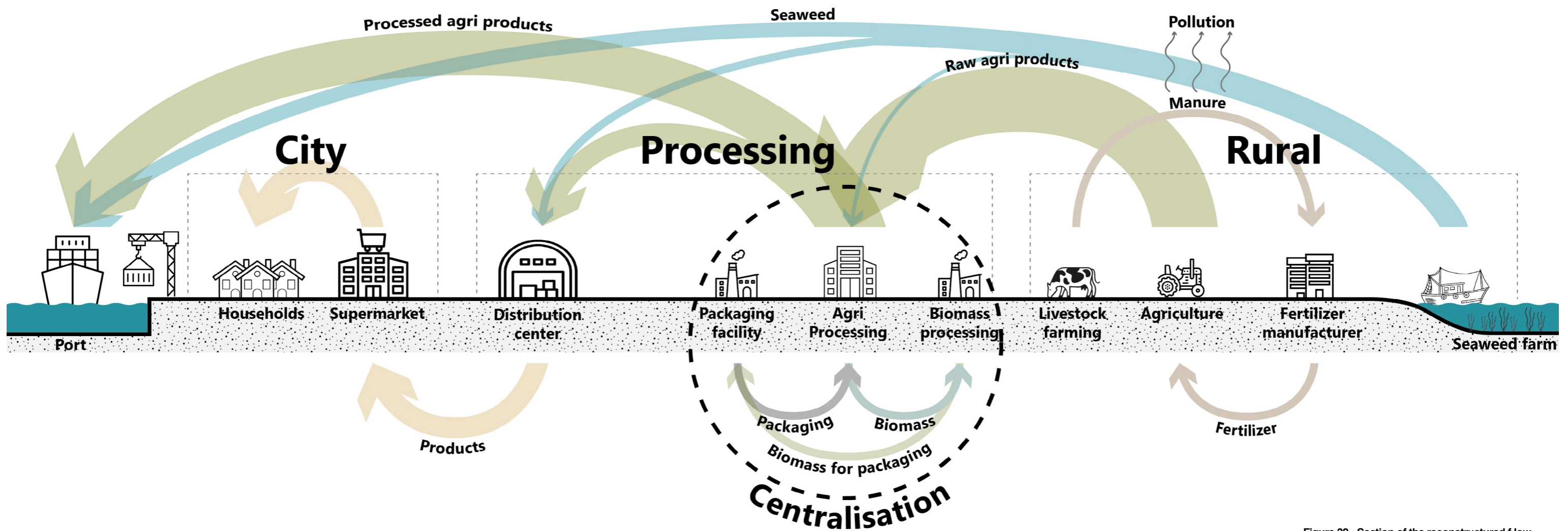







Figure 32 - Section of the reconstructed flow
By author

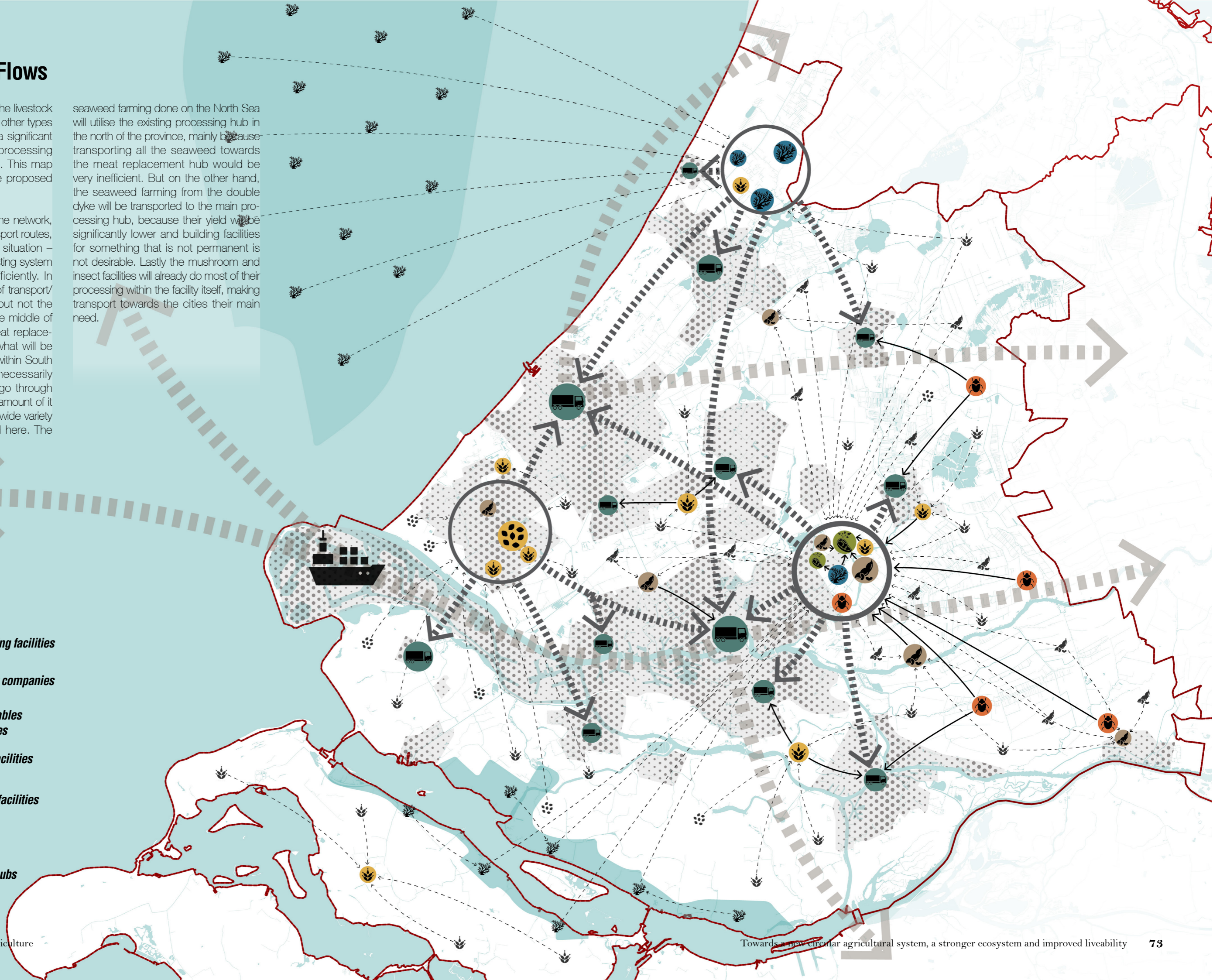
Restructured Flows

In the year 2050, most of the livestock farming will be replaced by other types of agriculture, resulting in a significant change within the food processing network of South Holland. This map shows an overview of the proposed new network.

First of all, some parts of the network, as well as most of the transport routes, are similar to the existing situation – due to the fact that the existing system already operates very efficiently. In these cases the product of transport/export will be changed, but not the flow placement itself. In the middle of the province, the new meat replacement hub can be seen, what will be the main processing hub within South Holland. This does not necessarily mean every product will go through this hub, however, a large amount of it will. Furthermore there is a wide variety of different facilities found here. The

seaweed farming done on the North Sea will utilise the existing processing hub in the north of the province, mainly because transporting all the seaweed towards the meat replacement hub would be very inefficient. But on the other hand, the seaweed farming from the double dyke will be transported to the main processing hub, because their yield will be significantly lower and building facilities for something that is not permanent is not desirable. Lastly the mushroom and insect facilities will already do most of their processing within the facility itself, making transport towards the cities their main need.

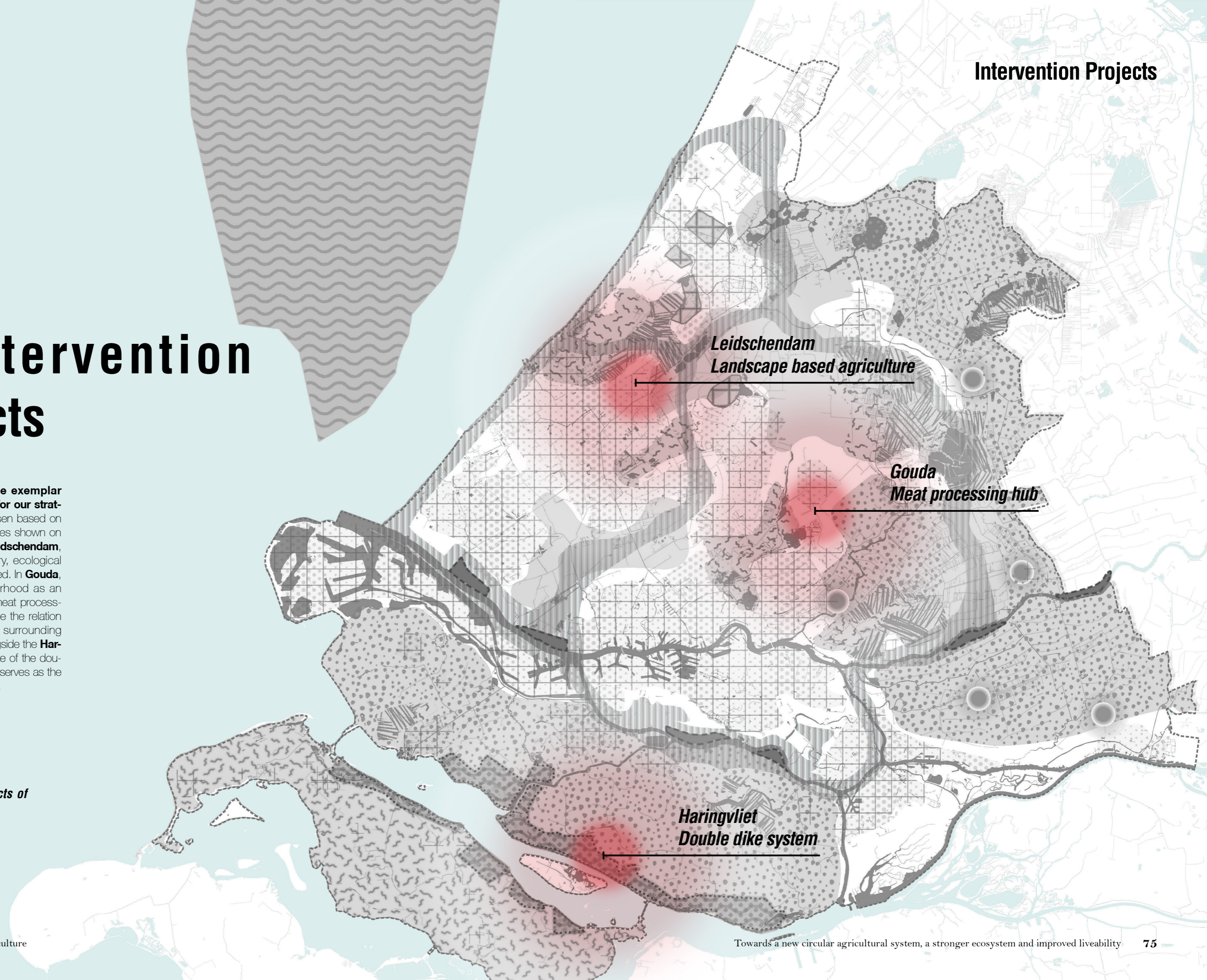
-  **Seaweed processing facilities**
-  **Meat replacement companies**
-  **Protein rich vegetables processing facilities**
-  **Crop processing facilities**
-  **Insect/Mushroom facilities**
-  **Transport to cities**
-  **Main processing hubs**



07 Intervention Projects

The map shows the **three exemplar projects of interventions for our strategy**. The locations are chosen based on the combinations of strategies shown on the site. On the site near **Leidschendam**, an alignment of agroforestry, ecological zone and built area is revealed. In **Gouda**, we take a small neighbourhood as an example of our proposed meat processing hub, so that we can see the relation between the hub and the surrounding built and natural areas. Alongside the **Haringvliet** lies the exemplar site of the double dike system, which also serves as the test site of seaweed planting.

 **Exemplar projects of interventions**



Leidschendam - Landscape Based Agriculture

Implications and goals

The main goal of the intervention based on the landscape-based agricultural system is to encourage and foster emotional connection with the landscape and the ecology with help of agriculture, as well as help build a conscious, responsible, educated and self-aware relationship with the environment. With landscape based agriculture and the ecological network we hope to help nature and agriculture become not just the landscape outside of the cities, but become acknowledged as a crucial, integral and inseparable part of the urban fabric, even while being located outside the city limits.

Participation

To make the interventions both attractive and useful to its key users, which are citizens and farmers and agricultural workers, the activity map introduced in the Vision chapter is used as one of the guiding principles, aiming to ensure the genuine involvement and participation.

Intervention principles

However, it is also important to ensure the transition goes as smoothly as possible not only in social terms, but spatially too. Therefore, two principles to facilitate the interventions in space were developed,

both based on the underlying urban fabric of the landscapes in order to incorporate the man-made and more organic structures together.

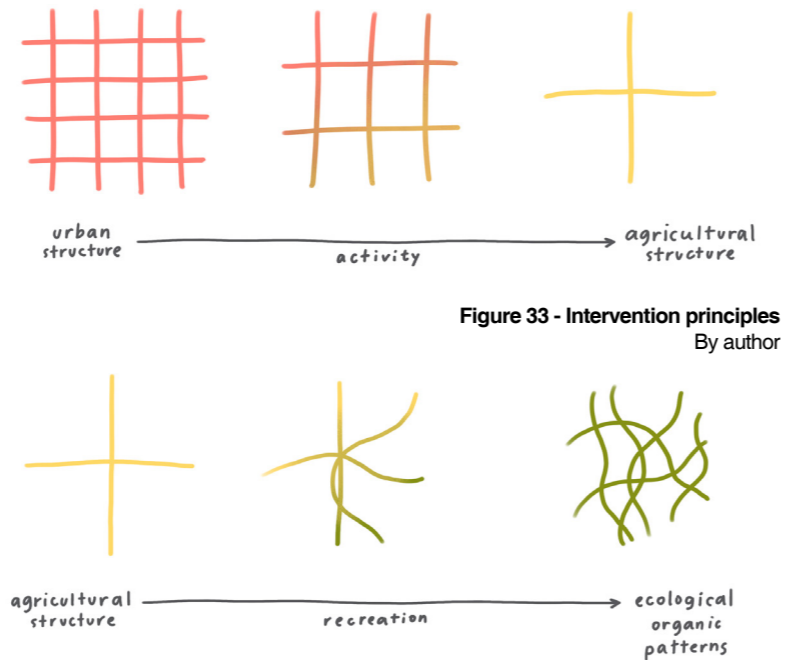


Figure 33 - Intervention principles
By author

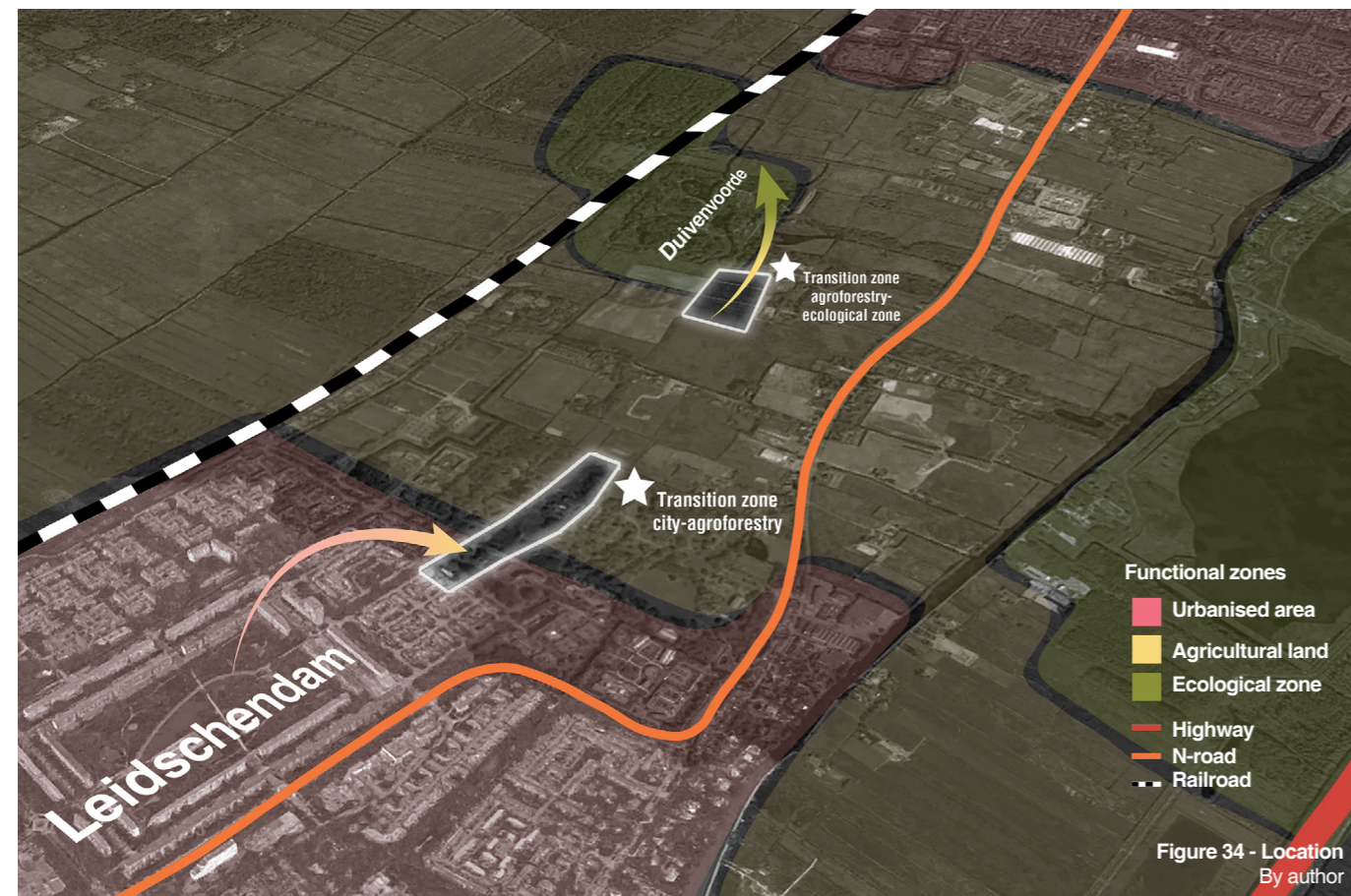


Figure 34 - Location
By author

Location

The location chosen for the intervention is in and next to Leidschenveen, which is both within the proposed ecological network area as well as the new landscape-based agriculture zone. Two intervention areas, one between the city and the agricultural land, and another between the agricultural land and Duivenvoorde, an ecological zone, will help facilitate the urban-agriculture and agriculture-ecology transitions with help of agroforestry, one of the landscape-based agricultural principles.

Agroforestry

In short, agroforestry stands for "agriculture with trees". However, there is so much more to it, since agroforestry enables the integration of agriculture, landscape and ecology in a literal sense. Aside from its agricultural functions, it also ensures the protection of the natural environment as well as the interaction of humans with the landscape and agriculture (What is Agroforestry?, n.d.).

Urban to agriculture

Following the proposed principles, the urban to agricultural land transition will be facilitated through the extensification of the urban grid, allowing its gradual integration into the characteristic agricultural land division system as naturally as possible.

The connection with the agricultural landscape happens through a variety of agriculture related recreational activities: plucking farms allow close informal interaction with farmers and help become familiar with the agriculture in a non-forced manner, and the surrounding green areas are perfect for picnicking and recreation.

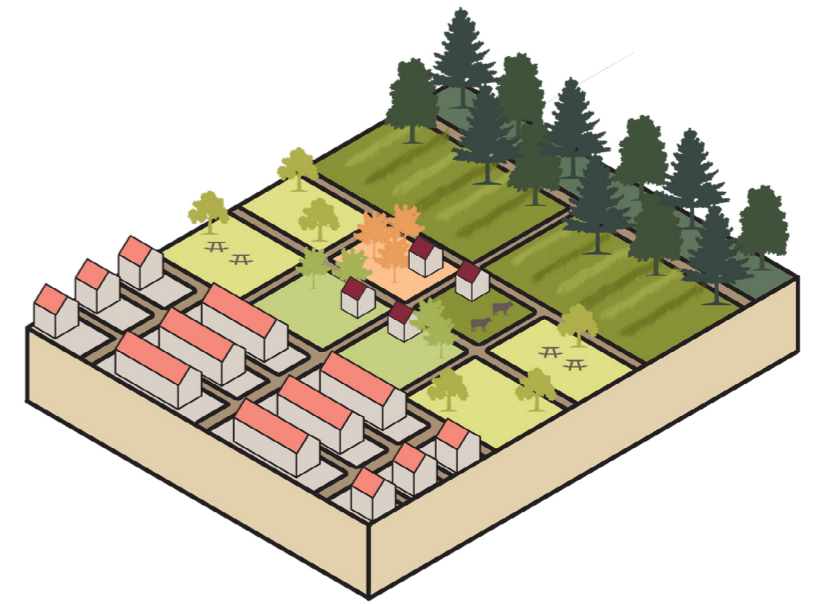


Figure 35 - Urban-agriculture
By author



Figure 36 - Agroforestry impression
By author

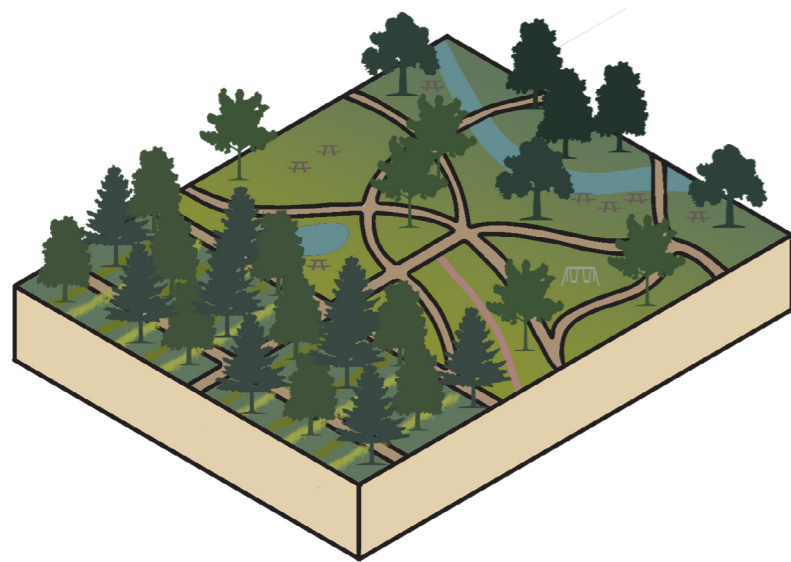


Figure 37 - Agriculture-ecology
By author

Agriculture to ecology

If the transition from the urbanised area to the agricultural one is facilitated through activities and interaction with the landscape, the transition from agriculture to ecology is meant to be more soft and low-key, almost like a barely noticeable gradient.

With agroforestry as an example, the transitional zone is open and less planned, allowing for spontaneity and activities that can be more energetic and community-based or, on the contrary, more quiet and relaxing, allowing for some “alone” time with the landscape. In such a manner, the relationships every person builds both with nature and the agricultural land can be individual and not forced, because everyone is allowed to discover these relationships in their own ways.

Stakeholders

Of course, for both of the interventions the participation of stakeholders from a wide range of areas will be crucial, not only because of the implication the ecological network and landscape-based agricultural approach bring and affect, but for the successful implementation of functioning of the interventions as well. Knowledge institutions, governmental organisations, large- and small-scale companies, and a number of other stakeholders all play important roles for the project. Therefore, some changes need to happen to the current situation in terms of power, interest and attitude shifts.

Shift in power

- Research institutions and nature protection organisations: Since the focus of the network is primarily on ecology, the institutions and organisations working closely with it should gain more power due to their insights, interests and improvements they can offer.
- Ecology remediation researchers and urban planners: With the process of remediation starting, both the remediation researchers and urban planners should be allowed to have

more power regarding the new urban developments, both in planning and policy making.

- Developers and investors: Consequently, developers and investors might lose some of the power, if the planners and researchers gain some of it.
- Citizens: The needs of the citizens should be considered more, especially for the recreational activities, since they will be one of the primary users of the ecological network and the interventions.

Shift in interest

- Citizens: With the range of activities and recreational and ecological zones becoming more integrated spatially and socially we hope to achieve a positive change of interest in citizens.
- Livestock farmers: With significantly more jobs becoming available in the plant-based protein agri-food sector and the implementation of the landscape-based agricultural model, participation in landscape-based ag-

riculture will become more attractive and interesting to some of the livestock farmers.

- Sports and culture associations: Because of the activities and recreational zones of the ecological network, it will definitely become of interest to sports and culture associations, allowing them to become more involved.

Shift in attitude

- Livestock farmers: With the severe reduction of livestock, a lot of livestock farmers will lose their job. The strategy, however, takes it into an account and allows them to transition to other types of work in agricultural or other sectors, which will ensure the retention of their land. In such a way, they can also play a key role in the successful integration of landscape-based agriculture.
- Province and municipalities: Considering the amount of power wished to be given to ecology focussed research institutions and nature protection organisations as well as the

primary users of the interventions, such as citizens, the hesitation of governmental organisations is to be anticipated. However, the plan is to convince them that these changes are beneficial on multiple scales, therefore, hopefully, through the implementation of the interventions, their attitude will shift towards a more positive one.

- Developers and investors: Since interventions like these are aimed to be implemented all over the ecological network, the land developers and investors might be considering for their projects might become unavailable, which, of course, is frustrating. However, with the remediation programme the strategy proposes, new land will become available to them later on, therefore this will only be a temporary issue.

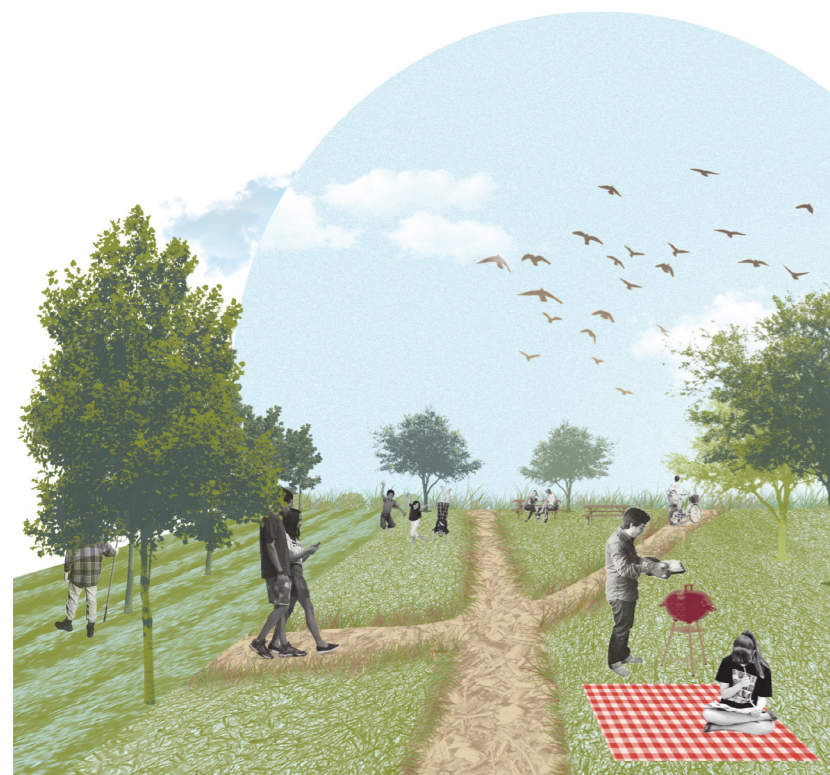


Figure 38 - Agroforestry with ecological network (impression)
By author

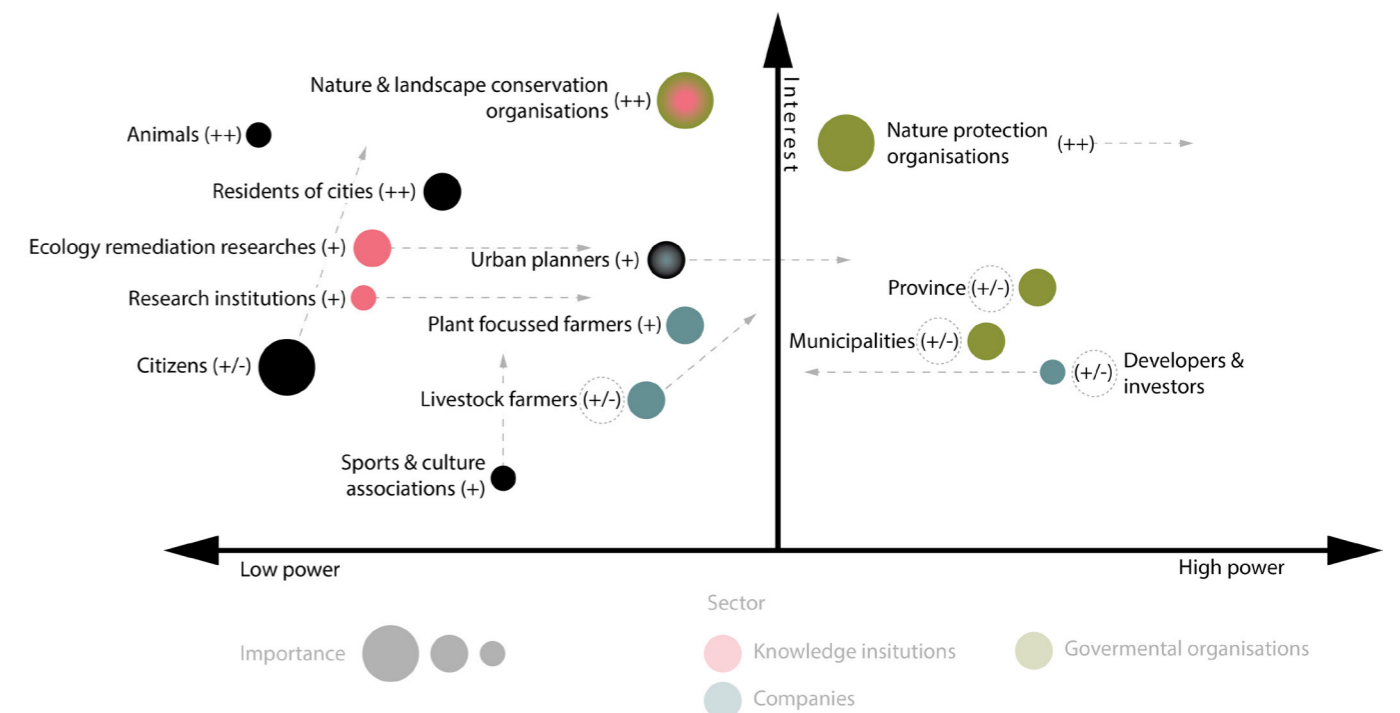


Figure 39 - Stakeholder analysis
By author

Necessary policies

To facilitate the interventions, a number of policy changes are required:

- Changes to the "Bestemmingsplan" to allow the new land-use planning.
- Regulations regarding remediation and pollution, as well as other regulations concerning the ecological issues should be reinforced or introduced.

- The involvement of stakeholders of different power should be reevaluated and revised to ensure the participation of less powerful stakeholders in the decision-making process.

Phasing

The three key phases for the ecological network and landscape-based agriculture are based on the improvement of existing areas, new additions and, lastly, natural development and maintenance. Remediation and development of ecological and recreational zones along with the agriculture are taken care of accordingly.

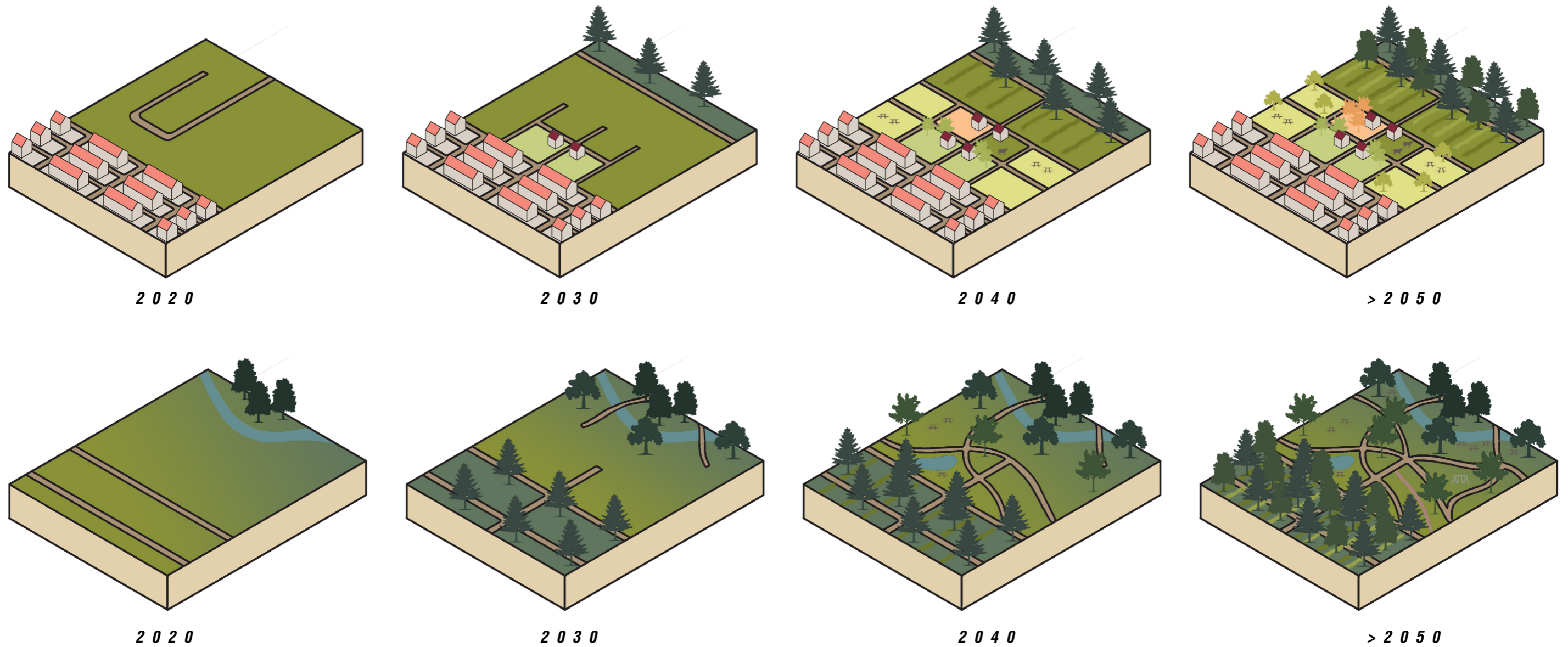


Figure 40 - Phasing
By author

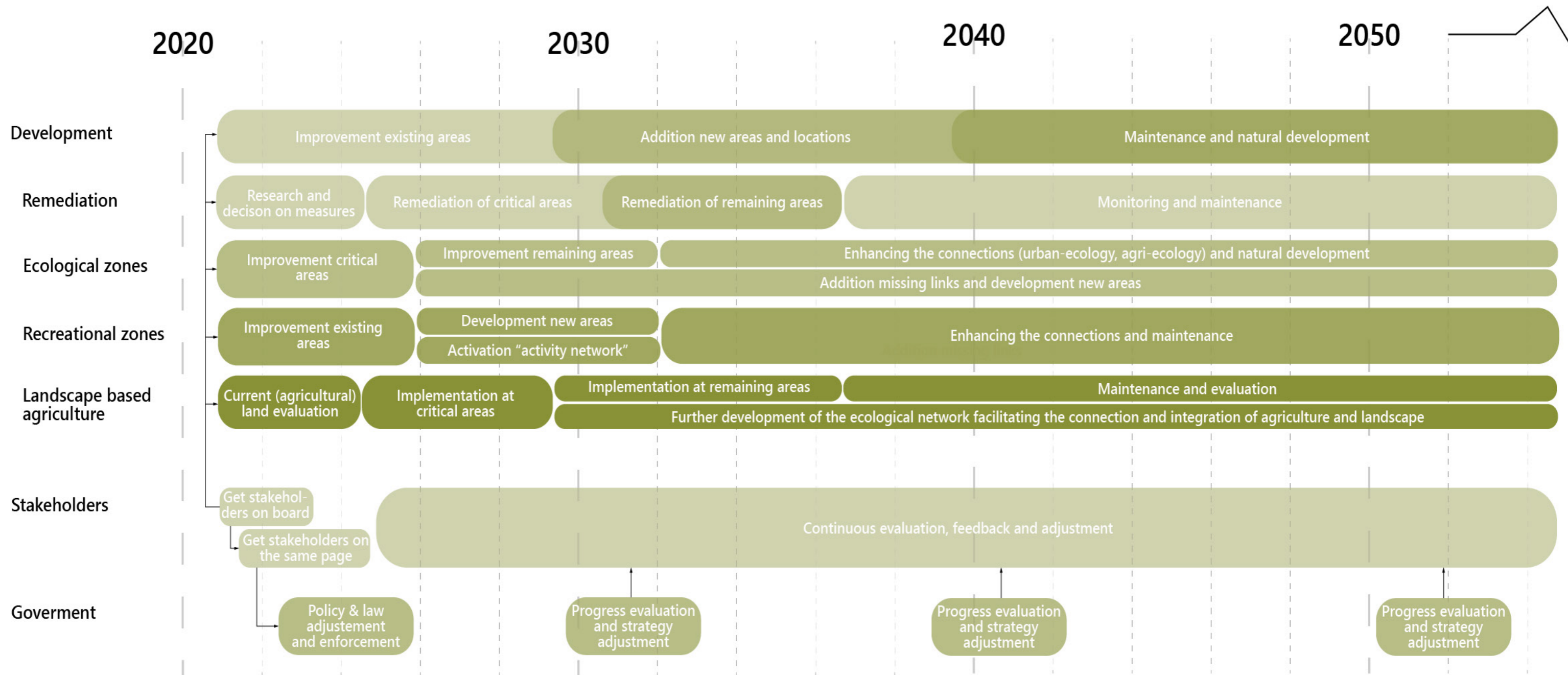


Figure 41 - Timeline of project Leidschendam
By author

Gouda - Meat Replacement Hub

The meat replacement hub found in the vision will be the new main processing hub of protein rich vegetables and meat replacements within the province of South Holland. It will function as a new core of the agri-food processing network, while limiting the impact on the spatial configuration of the current system – meaning the new hub should ‘fit into’ the existing network. This decision has been made due to the fact that the existing processing network is already very efficient, making drastic changes unnecessary and more of an overkill.

Outside of its role in the processing network, the meat replacement hub will also function as a research and development hub for practices related to protein rich agriculture and meat replacements. This addition has been made to combat the research-to-practice gaps that can be currently seen within the meat replacement industry. These gaps in knowledge can be caused due to lack in communication between researchers and practitioners, as well as poor financing and lack of public awareness (Mallonee et al., 2006). And while the latter two causes will already be resolved as a part of the

project, the lack of communication can – and probably will – still be a relevant issue. To resolve this, the new meat replacement hub will function as the main link between research and practice. This does not mean that all research will happen here, however, by placing a research facility that actively interacts with companies within the industry on a local scale, it facilitates an easier interaction.

Location & flows

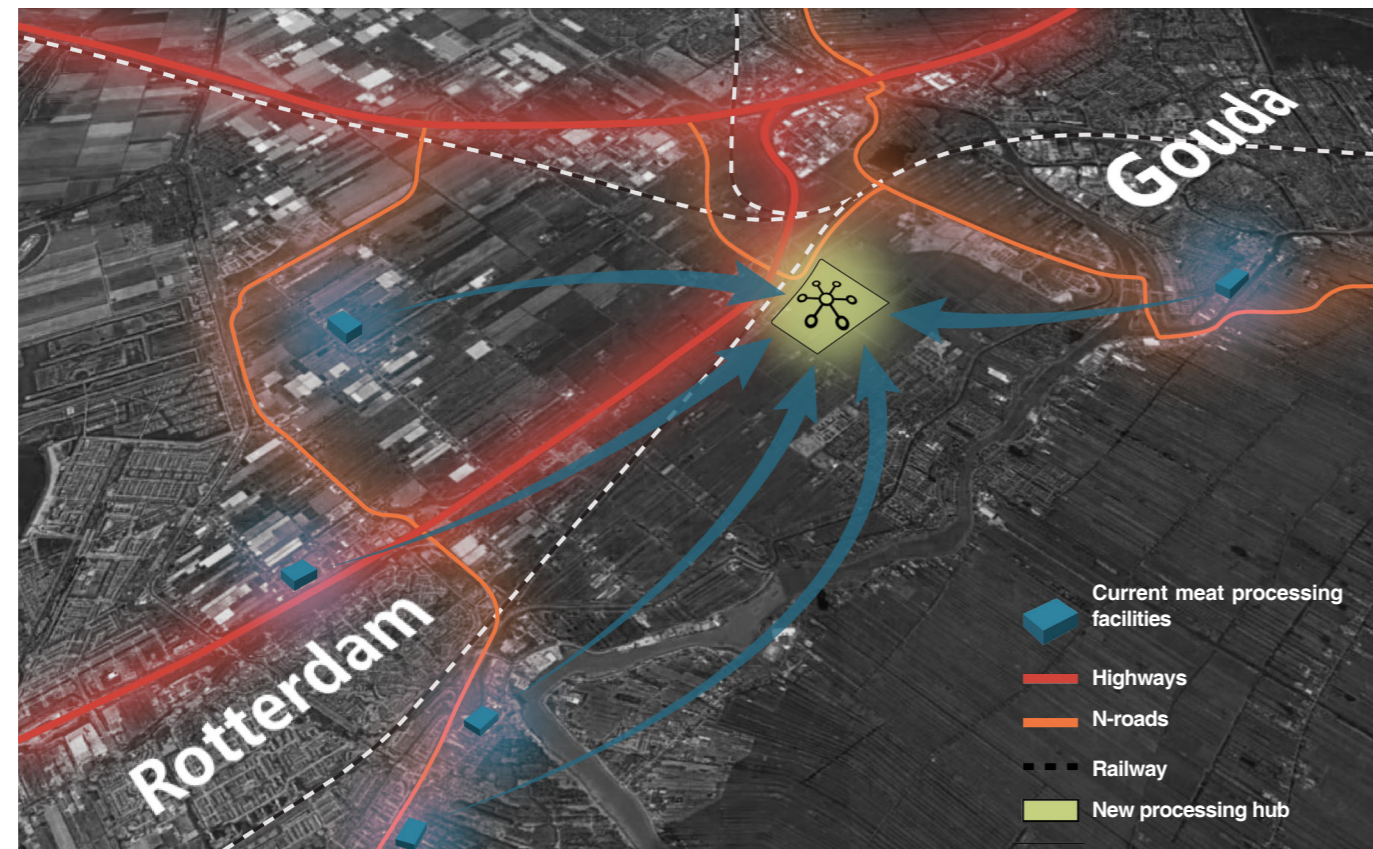


Figure 42 - Location of the meat replacement hub
By author

The new meat replacement hub will be located between the cities of Rotterdam and Gouda, as can be seen on figure 42. It will be placed directly alongside the A20, which is also directly connected to the A12. Overall the location can be described as very well connected to the existing infrastructure network of South

Holland, making it easily accessible for transport. Furthermore the map shows multiple existing processing facilities scattered across the area, who will now all be centralised into one hub. This is done to get the freight transport out of the city and into one streamlined hub.

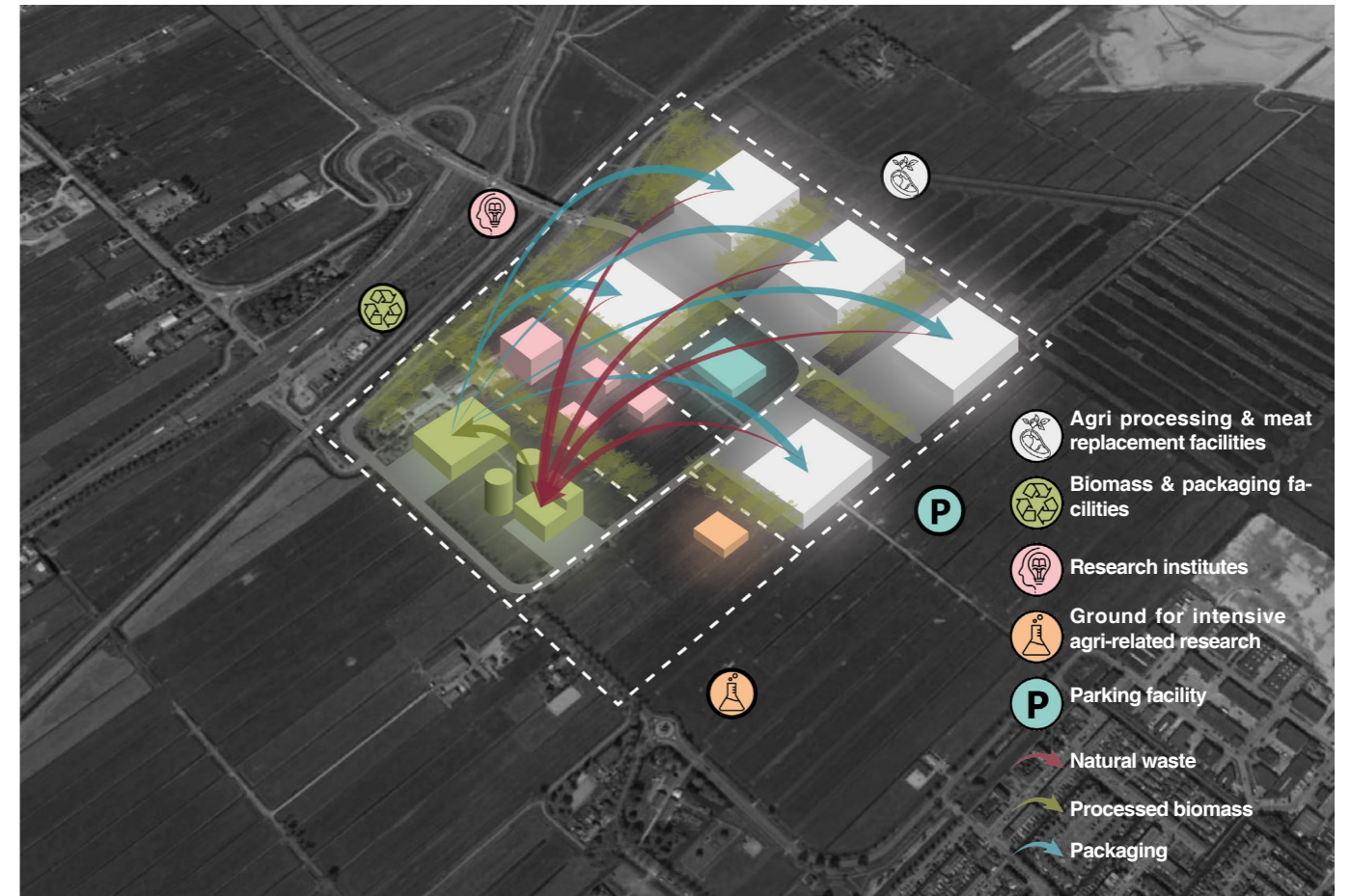


Figure 43 - Flow analysis of the block
By author

As can be seen on figure 44 - a centralisation of processing facilities is proposed. This centralisation will also happen within the new meat replacement hub, as can be seen on figure 43. The new processing hub will contain five main components.

- Agri processing and meat replacement facilities: These large scale facilities will process all protein rich vegetables, as well as some seaweed and other agriculture that comes from the land. Important to note is the fact that not all protein rich vegetables will be processed into meat replacements – only a portion of it will.
- Biomass and packaging facility: During the processing, a lot of biomass will be produced and a lot of packaging will be needed. By combining these two aspects, an opportunity was found to use the biomass created in the meat replacement hub and turn it into packaging. This way, minimal plastics will be used and little

to no logistics are needed to transport the packaging and biomass from and to the processing facilities.

- Research institutes: In the middle of all these processes, a few research institutes will be realised. As mentioned before, they will be placed in the same area as the processing facilities to encourage interaction between knowledge and practice. Furthermore the close proximity makes it way easier to do small experiments and/or ask questions. However, this does mean that researchers and workers should be allowed to access the other facilities within the hub and all actors should be aware of this beforehand.
- Ground for intensive agri-related research: While some experiments will need a larger area to be effective, first ideas and experiments are generally done on quite a small patch of land. A good example of this is Zilt Proefbedrijf (n.d.), who do a lot of testing on agriculture in relation to

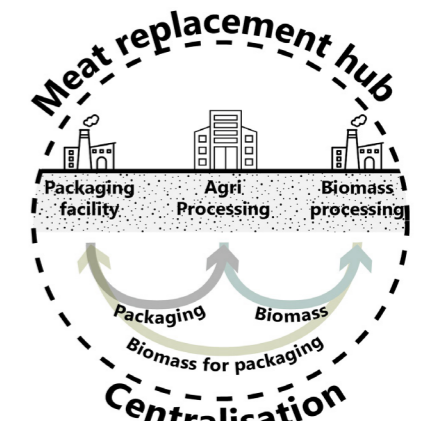


Figure 44 - cut-out of new flow section
By author

salinization, which happens mostly on the small scale. To facilitate and monitor these experiments effectively, an area of around 300x200m has been made available for all types of experiments.

- Parking facility: Lastly, a parking facility has been integrated into the project for the few thousand people that

will work / do research here. While it is still uncertain how the future main mode of transport will look like and operate, it is necessary to create space for all workers to park their vehicle – whatever it might be. Furthermore the first facilities will already be in place before 2030, which is

too short for the Netherlands to have completely transitioned away from cars. However, this does mean an adaptive design should be considered.

Design of the project

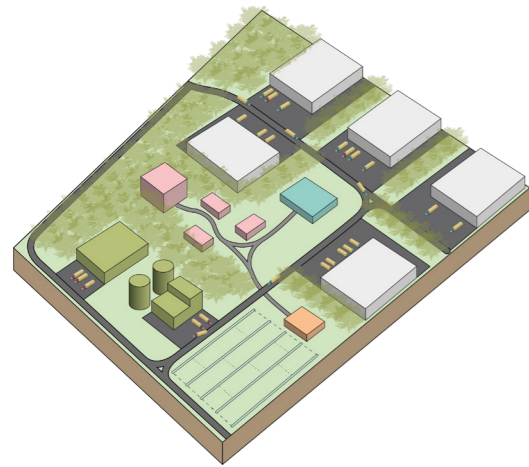


Figure 45 - Final design & impression of the hub
By author

In figure 45, the final design of the meat replacement hub can be seen. The placement of the facilities creates a natural flow of transport through the area – from processing facility to biomass and packaging facilities. However, the exact sizes and locations of these buildings are not fixed – it is mostly to give an indication of what the hub might look like. The natural barriers seen in the figure are important though, and they should follow the guidelines on eco-friendly building proposed in the vision. The area between the research facilities (pink buildings) will function as the main public space where people working around the hub can come and relax, as well as interact. Lastly an impression of the intensive research area can be seen in figure.

The new replacement hub is aimed to achieve the following goals:

- Support the transition away from livestock farming
- Improve communication between researchers and companies
- Reduce necessary transport (by centralising different processing facilities)
- Reduce plastic use

- Re-use the produced biomass
- Improve working quality
- Remove (some) freight transport out of the cities
- Create an environment that encourages knowledge development
- Become a knowledge expert on meat replacements and high protein vegetables

Stakeholders

Due to the impact of this new meat processing hub on the entire processing network of South Holland, a wide variety of stakeholders will be present. First of all some specific knowledge institutes will play a role, who will be the foundation from which new research will be done. Furthermore they already have some expertise in this area. Secondly, a large number of different companies will be involved, each having specific interests and potentially very different views. Lastly there are some governmental organisations who will be responsible for policy and regulation changes that are needed for this project to be achieved. To ensure the project to be a success however, it is

important for some actors to change in terms of power, interest or attitude, with the following changes being desirable:

Shift in power

Meat replacement producers: The main actor that is desired to change in power are the meat replacement producers. They already have some knowledge and expertise in this field and by giving them a place to experiment, expand and let them engage with researchers, they are aimed to become more important within the system.

Shift in interest

Agri processing companies: The current agri processing companies are probably happy with the current way things are going and not that interested to change. However, this transition poses a huge potential for these businesses to expand, making this a very valuable opportunity. Interaction with these actors will be necessary to explain the upcoming changes and develop a combined plan.

Shift in attitude

- Meat processing companies: The current meat processing companies are the main actors that will be against the new processing network – outside of the livestock farmers. Over time their business will have to close and the current market gets pushed away by the vision. However, they do already have a lot of knowledge about the agri-food industry. Therefore these actors will get an opportunity to switch towards the new system, but this does require some cooperation from their side. These actors will never become advocates of this project, however, by thoroughly explaining the transition

that is about to take place and giving them an opportunity out, they will not be left behind.

- Agri processing companies, supermarkets and packaging companies: These three actors are all already involved within different aspects of the food processing network, but probably will also be all just fine with the way things are going. Overall they will benefit – somewhat – from the project, however, they are probably not that enthusiastic to change. By showing them the long-term benefits the project will have on the environment, as well as their monetary gain and overall image – as a promoter of

sustainable, eco-friendly, circular development – these actors are aimed to cooperate.

- The province and municipalities: Given the drastic change away from livestock farming towards a new system of which the meat replacement hub is an important part, the province and the municipalities involved might be hesitant at first. However, by showing them the benefits this transition can bring to the ecology, as well as the health of citizens and other important aspects, their attitude is aimed to be shifted towards a positive one.

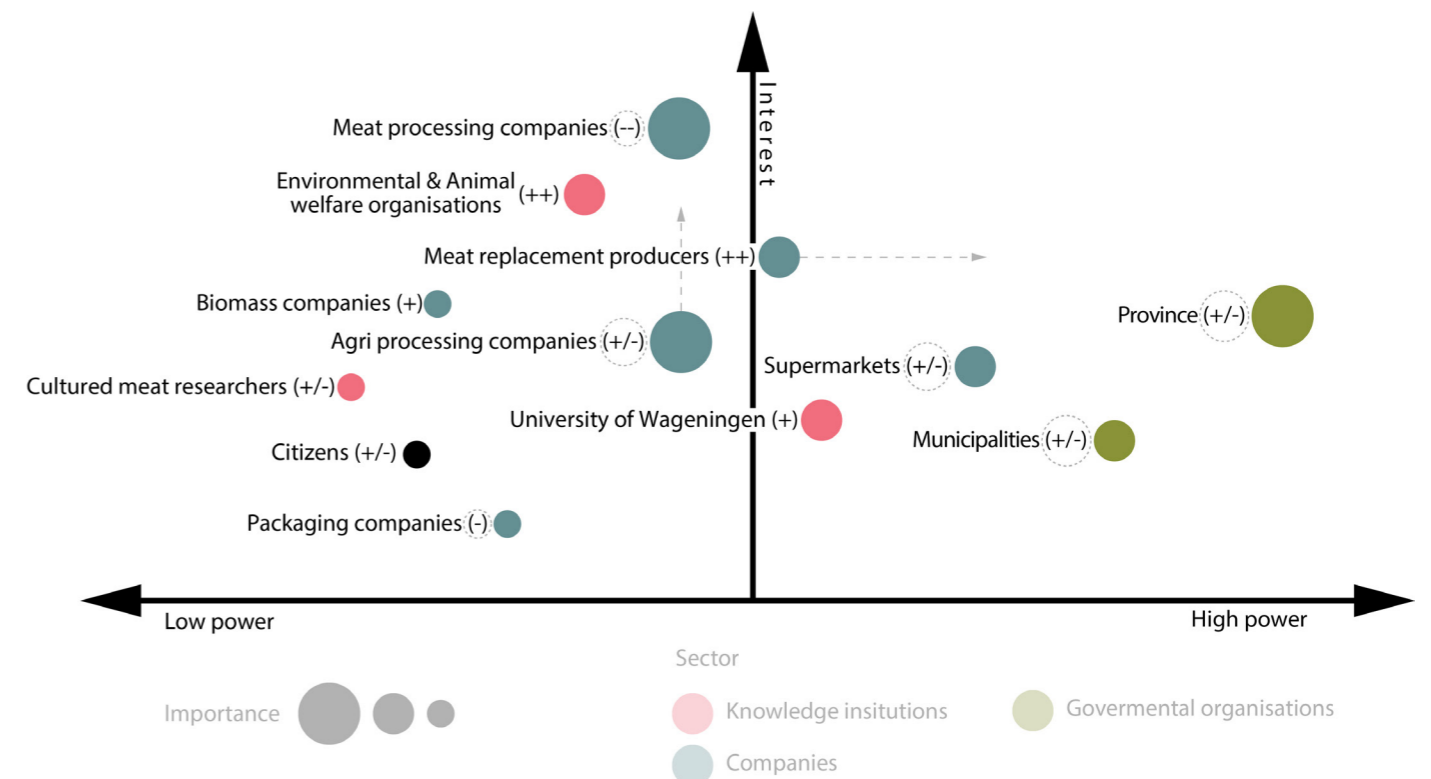


Figure 46 - Stakeholder analysis
By author

Necessary policies

To facilitate the new meat replacement hub, the following policy changes are necessary:

- Changes to the "Bestemmingsplan" are necessary to be allowed to build in this area.

- Regulations regarding noise pollution, light pollution, etc. need to be changed, otherwise the hub will not be able to operate.

Next to policy changes, it is important that an overview is made of what changes will exactly take place as part of the transition away from livestock farming – as a way to better communicate with stakeholders and to help them in their personal transitions.

Phasing

The meat replacement hub will be developed in three main phases, as can be seen in the figures 47 and 48. The first phase, which is until around 2030, will mainly focus on making the new hub functional. Not all facilities will be in place already by 2030, however, this is also not yet necessary, because the farmers transition is still in development. Therefore this phasing is very dependant on the speed in which cattle farming gets removed and

new types of agriculture are introduced. The first phase is also the time in which all important stakeholders should be approached, because almost all of them will play a role in this transition from an early stage.

The second phase is all about gradually upscaling the existing hub, which is also when a lot of uncertainty can be seen. As said before, the development of this hub

is very dependant on the transition away from livestock farming. Therefore, it is important to evaluate this process at certain moments to see how much expansion of the hub is actually needed. Lastly, a phase of natural development can be found. Most of the meat replacement hub is aimed to be finished around the year 2040 – only the research and natural development will still take place beyond this time.

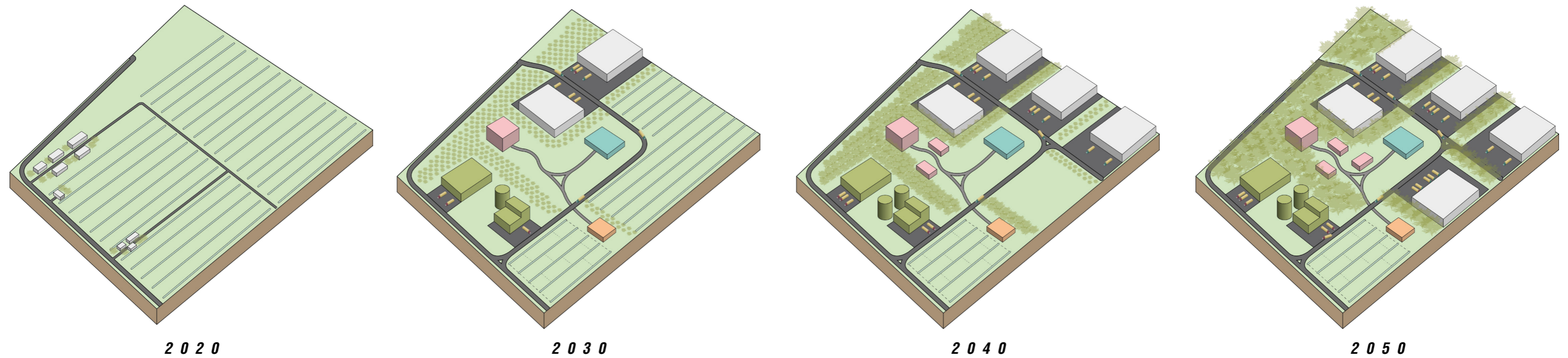


Figure 47 - Phasing of meat replacement hub
By author

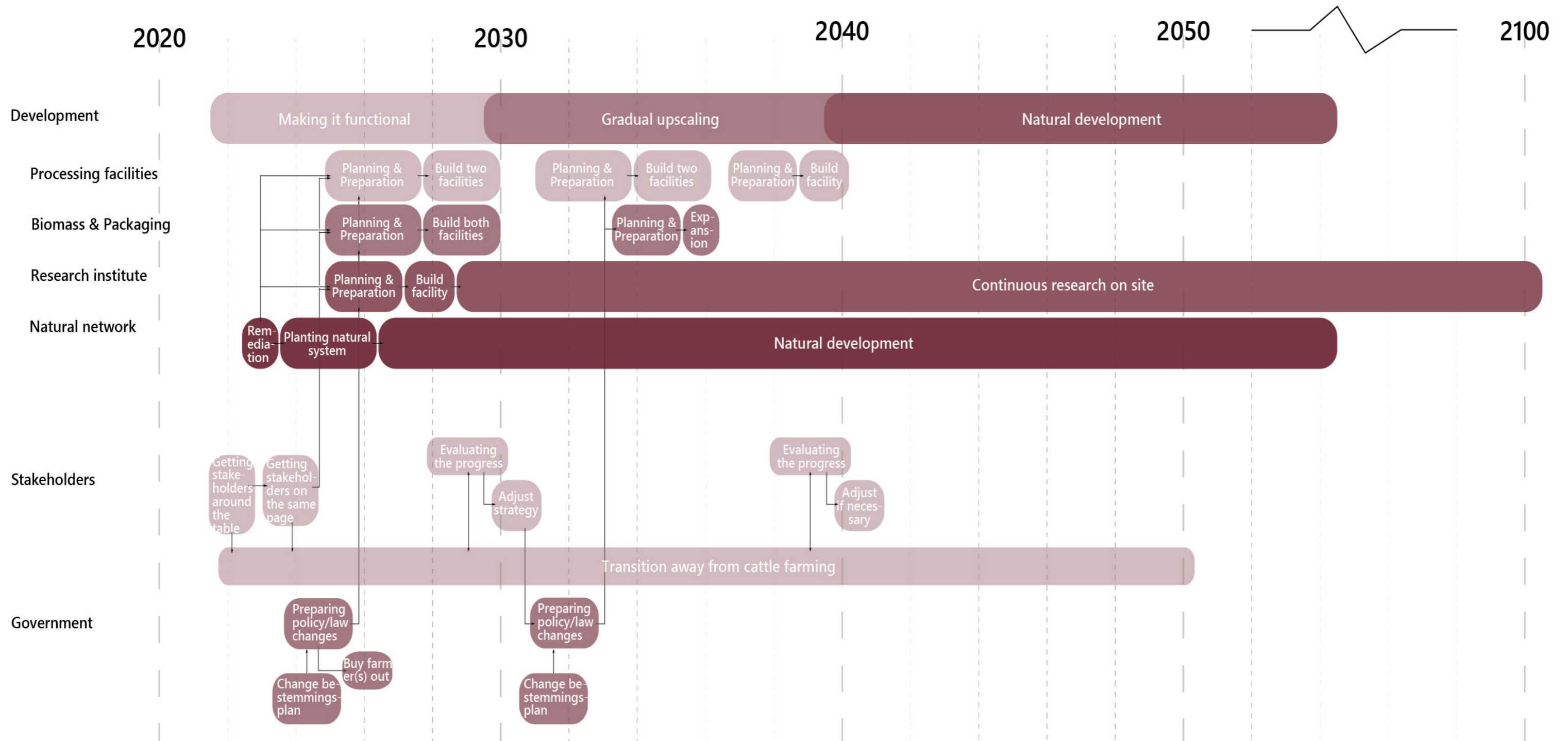
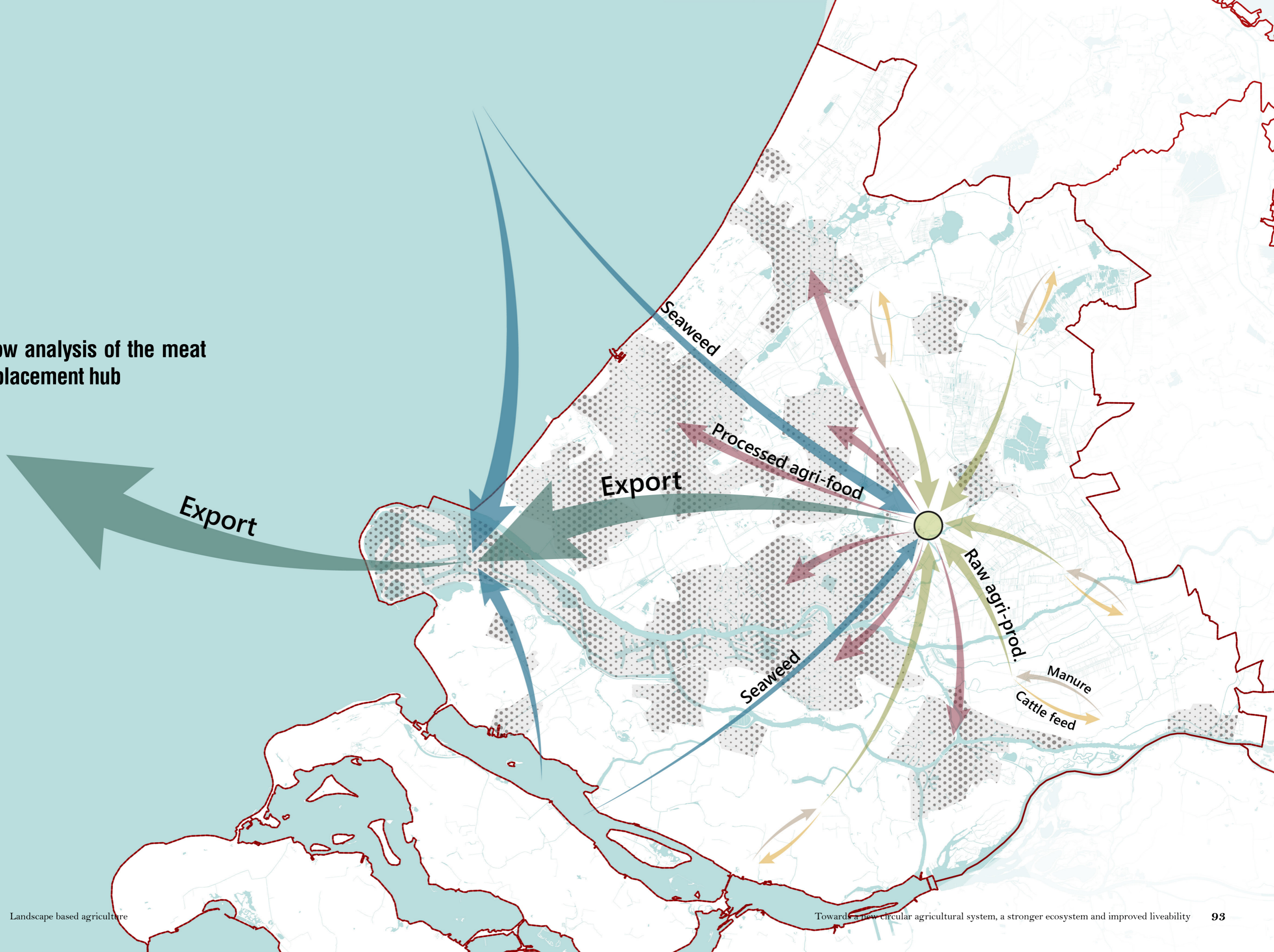


Figure 48 - Timeline of meat replacement hub
By author

Flow analysis of the meat replacement hub



Double Dike System

Location & phasing



Figure 49 - Location
By author; data from Google Earth

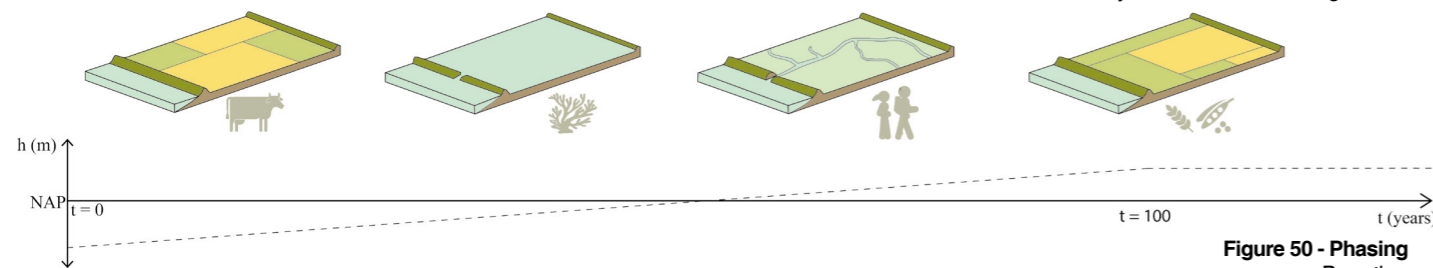


Figure 50 - Phasing
By author

The original plan for a double dike system is developed by the Dutch research institute for sea research, the NIOZ (Belzen et al., 2021). Within our proposal for the agricultural system of south holland, it is proposed to adhere to a part of the original NIOZ proposal, as after doing research on the future of Goeree-Overflakkee, the double dike system seemed to be a very fruitful option in addition to combine new types of agriculture with coastal protection while at the same time strengthening the ecosystem.

The double dike system is proposed to be applied to certain parts along the Haringvliet and Hollands Diep, as can be

seen in figure 49. These locations were chosen according to how suitable they are for the meganisme used by the double dike system, as well as the currently existing landscape. One can observe that the double dike system for example cannot be applied where villages are directly located next to the coast.

The double dike system works in several phases, as can be seen in figure 50. In the first phase the inwards dyke is strengthened, and an opening will be made into the outward dyke. This will allow the water to move in. Due to the tides, sedimentation will take place which will gradually increase the height of the

land. At first, one can grow seaweed in the area, later on saline vegetables are more suitable (e.g. lamsoor or zeekraal). In later stages when only during some time of the high water the land will be underwater, it can mainly be used as a recreational area, as well as being a pleasant place for birds. After around 100 years, the land will be several meters higher, around the average high water level in that place. The 100 years are needed as the Haringvliet and Hollands diep are both relatively sediment poor areas. Now the land will be a few meters above sea level, making it easier to protect it from the sea. Additionally, the following positive consequences are noted:

- It counteracts salinization
- It makes the ground more fertile due to sea clay
- It is good for the biodiversity: especially for birds
- If a dike breaches there will be less damage than with traditional dike breach
- New types of food can be grown there, e.g. seaweed, lamsoor, zeekraal
- If a dyke breaches there is less damage to the ecosystem
- It is cheaper than a traditional dyke. If 50% of the land will be used for new forms of farming it will even be profitable when looking at all costs and gains involved
- It gives new recreational options which is interesting both economically and for citizens
- The seaweed is a new export market

Proposed flow analysis

The newly created flows by implementing the double dike system are shown below.

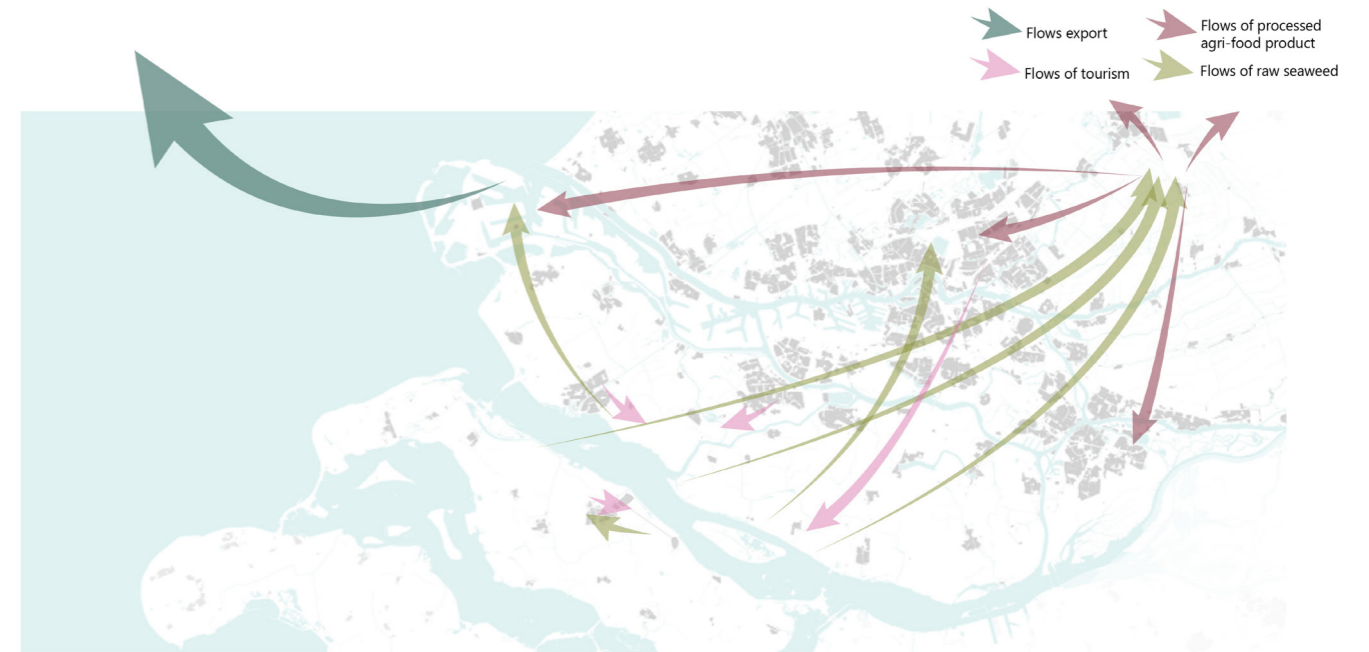


Figure 51 - Flow analysis
By author

However, there are also some difficulties with this project:

- Acquiring the land may be expensive and/or a lengthy process
- The plan may sound like depoldering which can be a very sensitive topic, especially to older citizens
- Laws dictating dike strength need to be adjusted to include the lower risks and therefore lower needed safety standards of a double dike system

Stakeholders

Given the complexity and multidisciplinary nature of the project, a wide variety of stakeholders is present. First of all we have governmental organizations, who are responsible for the regulations needed in order for the double dike proposal to work. Secondly, knowledge institutions are needed to be able to accomplish the sought after results. Thirdly, there are private companies (and landowners) who either profit or potentially lose. Lastly, Citizens and animals are considered to be stakeholders for this project. For some of

the stakeholders it would be beneficial to either increase their interest, their power or their attitude towards the project. The following changes are desirable: power shifts, shift in interest, and shift in attitude.

Power shifts

- Give animals more power: by making biodiversity a more important agenda point. This change already has been happening over the past few years, thus it is expected to keep going on itself.

- Giving Seaweed farmers more power: This can be done by organizing them in groups so they have a shared voice. Another factor already contributing to this is the increasing popularity of products containing seaweed, which gives more and more economical reasons to make space for them.

Shift in interest

- Citizens: Citizens are currently not very involved in the way water is managed in the Netherlands. However for this project it would be a fruitful option to get them more interested as the project will also create opportunities in tourism and recreation. This can be done by informing them better about the different possibilities.

Shift in attitude

- Citizens: associations with depoldering are often negative. Providing citizens with accurate information on the process and the advantages, a shift in attitude can be accomplished
- Crop farmers: For traditional crop farmers, at first chances are moving towards seaweed farming or another sector might not seem attractive. By explaining all the options that are offered to them, the attitude can be made less negative
- Province, municipalities and water boards: Given the large impact the

proposal has on the landscape and the social economical status of the areas where the double dike system would be implemented, The province of south holland, the municipalities and the waterboard might be hesitant towards the proposal. By starting with a small pilot project and showing them the research done on the (long term) advantages and necessity of the project, their attitude is to be shifted towards a positive attitude.



Figure 52 - Stakeholder analysis
By author

Necessary policies

- Policies and incentives are needed to acquire the land that is currently owned by the farmers. The options identified for this can be found in section 'Farmers in transition'.
- The current policies regarding dyke strength are based on having a single dyke. When only having a single dyke, the dyke needs to be stronger than when having a double dike system to protect against the same storm. In order to make the double dike system economically attractive, the regulations on dike strength for

a double dike system should be added to the currently existing regulations.

Next to policies, a good informational campaign is needed to explain the difference between a double dike system and depoldering to gain support from the citizens of south holland.

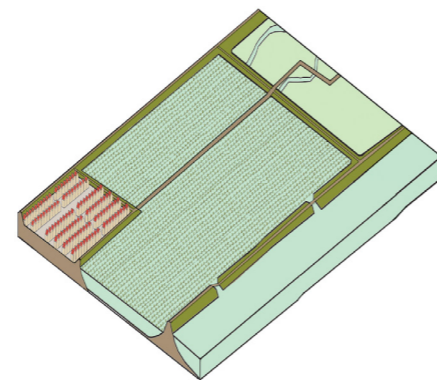


Figure 53 - Final design
By author

Pilot project

To get a better understanding of potential problems that may arise during the construction of the double dike system, a pilot project is proposed. This would allow us to find solutions before implementing the plan on the big scale. The proposed area is located next to the village of zuid beireland (see figure 55). This area was chosen as it can show potential complications as well as benefits of having the double dike system close to villages. Also a part of the inner dyke is present and only needs reinforcement while some parts still need to be built. This allows us to get insight in both processes. As the double dike system needs many years to develop, complete outcomes of the pilot projects will not be known when development on the big scale will start. This is justifiable as the first stages of letting the water in and growing the seaweed are the stages of the project where most difficulties are expected.



Figure 54 - Impression
By author

Timeline

The double dike system takes about 100 years to fully develop around the Haringvliet and Hollands Diep as these are sediment poor areas. For the phasing it was chosen to start the development of the double dike system for different areas at different times. This will give a more interesting landscape, as when making a walk along the landscape, multiple landscapes can be seen. This is also ben-

eficial to develop a stronger ecosystem where biodiversity is increased as compared to the current landscape. From a purely ecosystem perspective, it would have been more beneficial to allow for more time between development of the different areas. This however would not be a smart decision when looking at the costs of development and flood safety.

Due to the continued sea level rise, implementation of the double dike system becomes more expensive with the year, as is also true for maintaining the current system. Therefore, switching as soon as possible would be desirable from this point of view.

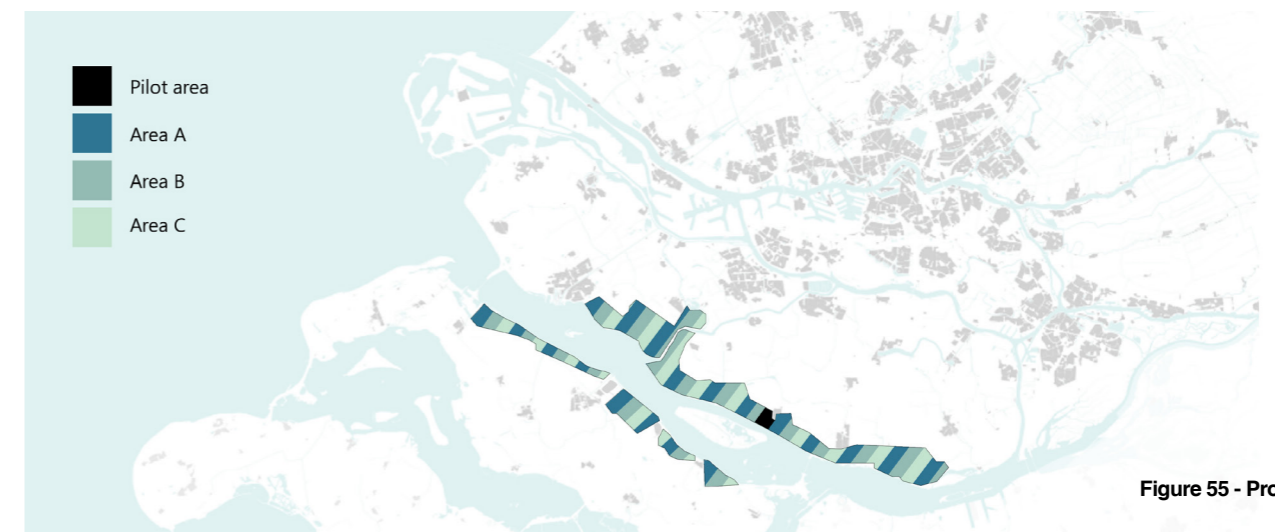


Figure 55 - Proposed area
By author

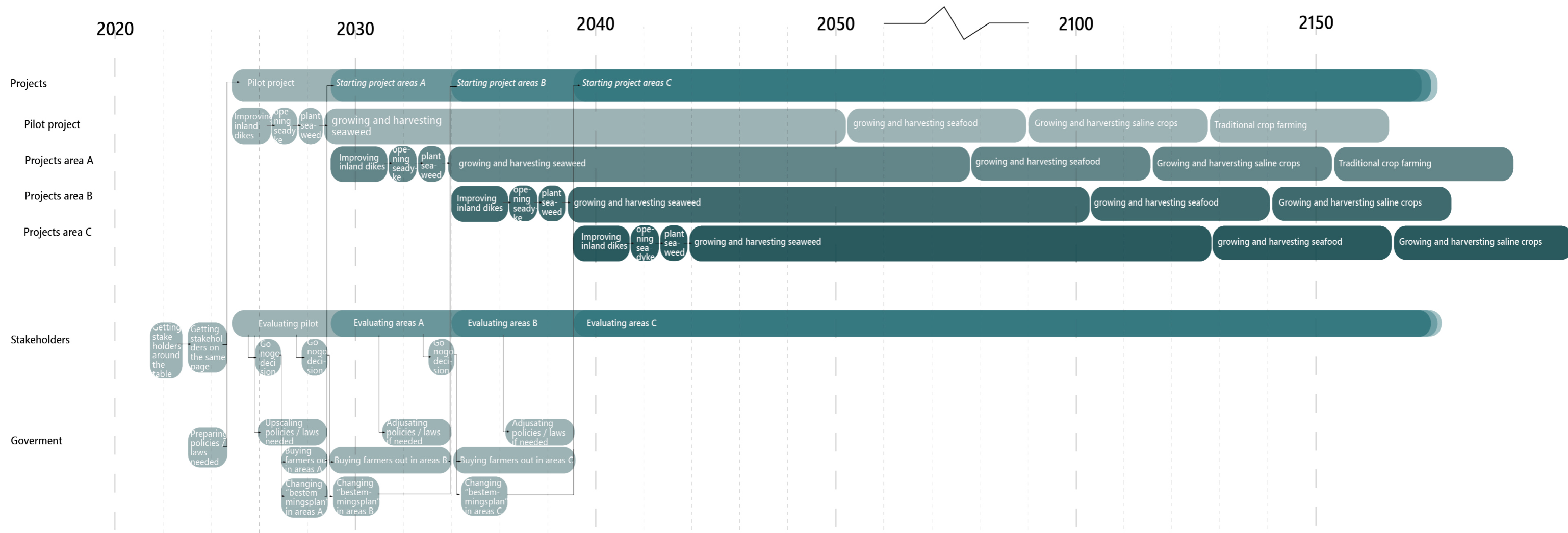
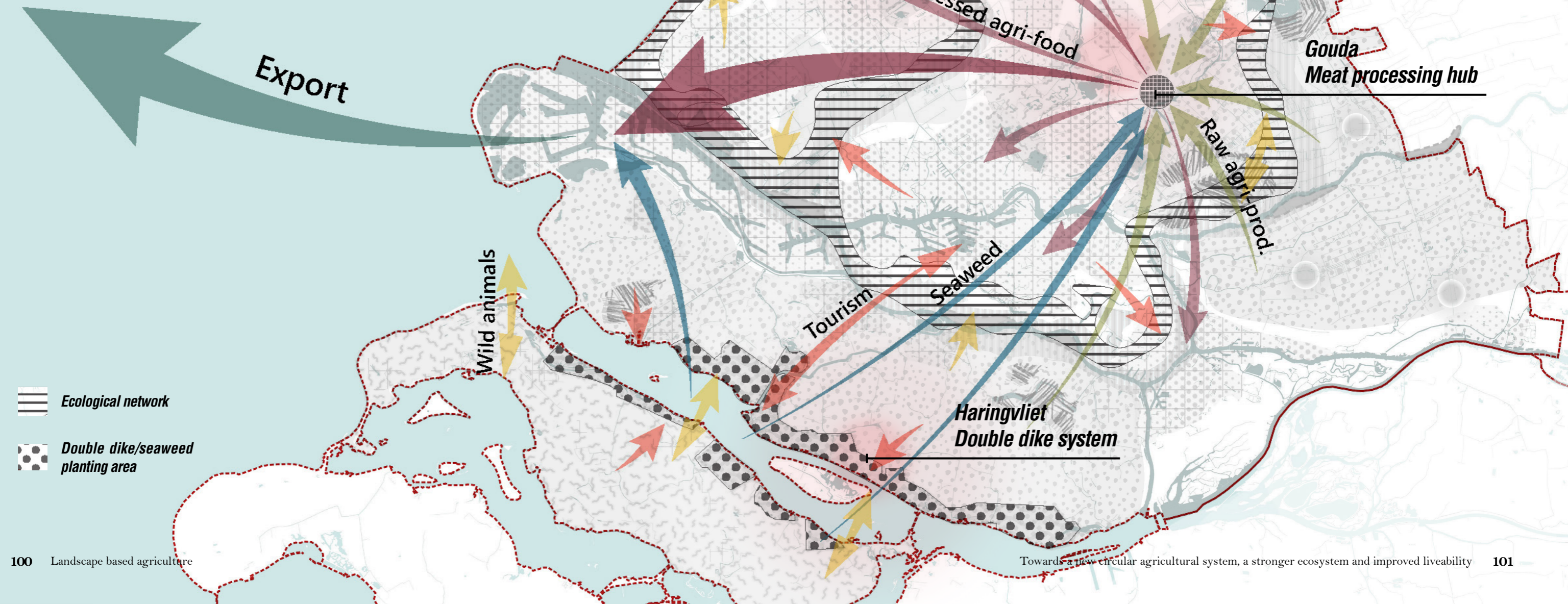


Figure 56 - Timeline of double dike
By author

Synergies of the Key Interventions



08 Ethics

In this chapter, the six core values of the proposed strategy are discussed, along with their relations to the topics of economy, ecology and livability, which were prominent in our research and design process.

Participation

The strategy puts a great emphasis on participation from the very beginning, starting with the research stage and following through the entire course of the project with intervention-specific stakeholder analyses as culmination. This, along with the principles of process planning, makes sure that organisations or individuals with higher amounts of power and influence, such as the government, large companies or developers, do not take over and that common citizens as well as smaller private organisations and businesses receive equal opportunities for the inclusion in the decision-making processes, which ensures the participation of various equally relevant stakeholders.

Responsibility

The strategy also puts an emphasis on the transition towards a more responsible and conscious lifestyle, initially rooted in more sustainable consumption patterns, but eventually changing the human relationship with the ecology and nature as well through urban planning, education and participation. Every intervention is meant to not only raise the awareness about more responsible ways of living and thinking, but actually help the responsibility and consciousness with regards to the environment become an integral part of our daily lives as well.

Equality & justice

From ensuring equal participation opportunities to dealing with animal rights issues and making the vegetarian environmentally friendly lifestyle more accessible and affordable spatially, socially and economically, the strategy focuses on justice in all present aspects and elements it contains.



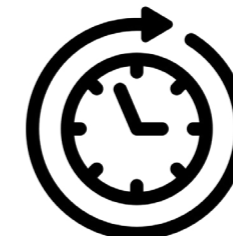
Participation



Responsibility



Equality & justice

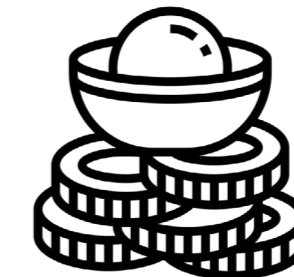


Created by Adrien Coquet from Noun Project

Future prospects



Safety & health



Created by Eucalyp from Noun Project

Prosperity

Prosperity

The proposed project creates economic opportunities for now and for the future. This is done by creating jobs in new types of farming and with the added knowledge network. Not only more jobs are created by this proposal, also the jobs that are created are long lasting jobs suitable for a new sustainable economy. Secondly by building greener eco friendly neighborhoods, the quality of the living environment is increased. Furthermore access to the ecological network also increases the quality of life for citizens living in currently existing highly urbanized areas. The new ecosystem, where nature becomes a part of our habitat contains functions people are looking for in their daily lives to help them in actually visiting the network and profiting from its benefits. By this every citizen gets to benefit, just as every citizen, although not equally, benefits from a stronger economy

Future prospects

It would not be just to only consider the needs of the current generations, and disregard the needs of the future ones. Prosperity over time is one of the key results landscape based agriculture will bring us. By cleaning the ground, combatting subsidence and salinization and by reducing the flood risks, future generations have a better basis to build their welfare upon. Building this basis by working together with nature's abilities to keep landscapes in a good state also ensures these favorable ground conditions in the long term. Furthermore by strengthening the ecosystem and creating an ecological network, biodiversity can be increased. This is just as important as combating climate change in the long term, as we need the ecosystem to function well to allow it to meet our basic needs (Watson, 2019).

Safety

By reducing air pollution, flood risks and subsidence this project aims to contribute towards a safer and healthier living environment for all citizens. It is not fair that currently house owners suffer financial consequences of subsidence while they did not cause the problem. In this project a more fair distribution in the costs and the gains of practices are proposed, leading to citizens suffering less from externalities of company practices.

09 Conclusion

In this report, the possibilities for the implementation of a new ecological network by severely limiting the livestock industry have been explored. The main objective is to show how the introduction of a new ecological system – that uses a landscape based approach – can resolve a number of relevant issues of the province, as well as support the transition towards a circular South Holland.

To establish a clear direction within this project, the following research question has been formulated;
Can improving ecological conditions and livability in South Holland be accomplished by creating a circular agricultural system where livestock farming is severely limited?

Structure of the report

In order to formulate a conclusive answer to this question, extensive research has been done on the current ecological conditions and livability of South Holland, as well as on the current livestock industry. As a result, a number of problems and challenges have been found within these two sectors that have been addressed in a spatial vision for the province of South Holland. The regional vision focusses on resolving existing issues like subsidence, flood risk, biodiversity loss and more by introducing a new way of thinking, working and interacting with agriculture and ecology. To implement the proposed vision, a strategy has developed – focused on giving the reader a clear understanding of the different stakeholders, guidelines and policies that are of importance for this transition to be successful. Furthermore it translates the vision into a spatial and temporal strategy, showing when and where the different actions will need to happen. Part of these actions are a number of key interventions – of which four can be found in this report. These interventions are meant to show on a local to intermediate scale how the proposed vision will operate in the context of space and time.

Results

In order to develop a new agricultural system that improves the ecological conditions and livability within the province of South Holland, a new way of understanding, working and interacting with nature and agriculture has to be developed. Currently the underlying landscape is often overlooked, resulting in problems with subsidence, salinization, biodiversity loss and water management. By introducing a new ecological and agricultural system, these problems can be resolved or at least minimised.

The new ecological network will function as the ecological backbone of South Holland – connecting different ecological zones, creating one continuous habitat. This will result in an increase in biodiversity, as well as having positive effects on the overall ecological conditions. Furthermore this ecological network opens the door to new types of nature like riparian forests. However, during the development of this new system, it is of crucial importance that the 'edge' of the network is not actually the edge of thinking about ecology. On the agricultural land for example, a change is needed in terms of cropping methods. By introducing different polycultures – agroforestry, cover cropping, intercropping and crop rotation – the ecological conditions will be improved and an increase in biodiversity can be seen. Furthermore, in (agricultural) areas with subsidence problems, the groundwater level should be increased in order to reduce these effects by at least 70%.

Another important aspect related to agriculture is the meat industry. In 2050, around 93,52% of the total livestock industry will have been removed – with the remaining 6,48% percentage being for educational and diary purposes. This transition will be happening over a period of 30 years, gradually removing livestock and replacing it by the previously dis-

cussed polycultures. By the severe reduction of livestock, the project is aimed to drastically reduce nitrogen and phosphate pollution, increase people's health, increase biodiversity, solve animal welfare problems and reduce stress on the soil. However, this transition will also impact the lives of a lot of livestock farmers, to whom support and subsidies should be provided to help them through their personal transition towards a new occupation within the same or other sectors.

Outside of the physical and spatial changes, a change in the way people think about ecology and food consumption is also necessary in order for this transition to become a success. The project aims to reconnect people with nature and agriculture by introducing a wide variety of activities within the aforementioned ecological network and agricultural system, like plucking farms, scenic locations, river landscapes and more. It is of crucial importance that people become aware of where their food comes from. By introducing a double dyke system with seaweed farming, floodplains with riparian forests and agroforestry, the bridge between recreation and food production is diminished. The citizens of South Holland should all be part of this transition away from the livestock industry, towards a new, plant-based protein rich diet. By promoting the change towards conscious eating habits and a conscious way of interacting with nature, the project aims to improve people's health and their awareness regarding the environment.

The transition away from livestock farming also facilitates an opportunity to transition towards a new circular agri-food sector. By removing excess manure, re-using biomass as packaging, reduce the necessary import flows and reduce transport needs, the agricultural sector of South Holland will turn into a new circular system with closed production loops. Lastly the transition required certain types of knowledge – like practices related to biodiversity-friendly farming, farming on salinized ground or with a high groundwater level, meat replacements and high protein vegetables – of which the province will become an knowledge expert and exporter. For this to go as efficient as possible however, it is important to build

on existing the knowledge and interact with the current institutes and companies in these fields.

By respecting and working with the underlying landscape, the project 'Landscape based agriculture' constructs a new circular agricultural system which is beneficial for ecology and livability of South Holland. Furthermore it stimulates a new way of thinking, working and interacting with nature and agriculture, bridging the gap between citizens and the natural environment.

What is next?

The next step in realising this strategy is getting in touch with stakeholders to start the discussion on the specifics of the transition. The transition will have a serious impact on a lot of people, so understanding exactly what actions will need to be taken is crucial in creating transparency, as well as being able to better communicate with the different actors. Furthermore, the impact and temporality of the transition away from the livestock industry should be further investigated. Knowing exactly which area will be transitioning when and in what speed will be necessary to show the feasibility of the project. For the ecological network, it is important to further investigate the impact and qualities it will bring, as well as do research on how exactly you engage people with nature and agriculture. Lastly, specific knowledge is necessary in terms of farming on a high groundwater level and farming on salinized grounds to be able to achieve the desired goals.

What als bepaalde dingen niet doorgaan, werkt het plan dan nog?

Risk assessment

While the project 'Landscape based agriculture' proposes a large amount of different interventions that all contribute to improving the ecology and livability in South Holland and go towards a new circular agricultural network without livestock farming, it is unlikely that the project will happen exactly as it is put forward in this report. The context, conditions and development trends of South Holland will drastically change over the 30+ years that this strategy will be active. Therefore it is important to define key areas within the strategy that need to be achieved in order for the overall project to be successful – even without some of the other interventions.

Ecological network

The ecological network proposed in the vision will be crucial in achieving a strong ecology that is advantageous for the biodiversity. Furthermore it plays an important role in reconnecting people to nature – with different activities, scenic locations and recreational values found within the network. But while the ecological network is absolutely necessary in achieving the overall vision, the proposed size, location and activity division are not. In further developing the network, it is important that it will be accessible for all – meaning a relatively close proximity to all cities in the province – as well as being an interesting and diverse place that attracts people. This means the ecological network should provide different qualities and activities than for example a normal park; people should need a reason to visit.

Livestock reduction

Another important aspect of the vision is the livestock reduction, with its related meat replacement hub, farmers transition and shift in agricultural activities. The core aspect of this transition is reducing livestock farming to simultaneously resolve a lot of problems the province currently faces. Therefore the transition itself is absolutely necessary for this project to succeed, because otherwise (some of) the other transitions proposed in the strategy are unable to be set in motion.

Risk Assessment

However, the meat replacement hub is not necessary for the project's success. While it does bring a number of qualities and while it is a crucial aspect of the proposed vision, different – perhaps more scattered – approaches to the new processing network are also possible. Lastly, supporting farmers in their transition is also mandatory, because otherwise the project will progress way too slow and it will be an injustice towards the farmers.

Agricultural switch

As part of the strategy, a switch in agricultural activities is also introduced – from an intensive monoculture towards multiple types of polycultures. This switch will be mandatory for achieving the overall biodiversity goals, as well as for introducing more recreational value to agriculture – which will subsequently help in reconnecting people to agriculture. Especially the double dyke system and agroforestry are important aspects in this, because they both have a high recreational value. Therefore they should both be a part of the new agricultural system, however, their exact placement and sizes are not fixed. In saying that, the double dyke system is pretty limited in its placement and should be placed within the area marked in the strategy – because it has the highest potential for it. As for the other types of polycultures; their division is not that important, it is mostly just important that South Holland completely switches towards polycultures.

Conscious living and eating habits

The fourth crucial aspect of the project is a change in the way people think and interact with nature. The project focusses a lot of reconnecting people with nature and agriculture, as well as building awareness on how food is produced and where it comes from. The reconnection to nature and awareness building transitions are both necessary for the project to succeed, mainly because it will be crucial to get the citizens involved in the transition. Awareness building will help tremendously in people's willingness to change towards the proposed high protein diet, while also improving their health in the

process. The reconnection to nature on the other hand will be crucial in people's understanding of the environment and in promoting a conscious way of living. However, the exact way to do this can still be changed.

Other interventions

The other interventions proposed in the strategy also play an important role, but are not crucial to the project's overall success. For example the floodplains will add unique qualities, as well as adding an additional layer of flood defense, but due to changing conditions or other projects that happen before, this intervention might not be necessary anymore.

To assess whether an intervention is necessary for the overall success of the project, it is important to look at the problems it would solve and qualities it would bring, followed by looking at whether these changes are still necessary or whether there are other alternatives.

10 Reflection

Group Reflection

In a team project, the group is only as strong as its weakest link. Obviously it is technically possible for other team members to take over all the work so the group can still progress, but in a course this intensive every person is needed. Therefore it is important to know exactly what you can expect from your teammates – something we discussed already in the first week by being honest about our strengths, weaknesses and interests. This constructed a foundation of trust, which we expanded on as the project progressed. However, the project did not come without its difficulties. First of all the online environment challenged us all, mainly because quick questions and informal discussions were less easily held. Therefore we organised a few informal meetings in real-life, to actually get to know your group members – subsequently making it easier to be honest and open through the online environment. Furthermore our group struggled a bit in the beginning with moving forward – the project felt like a mountain that was almost unclimbable. But almost daily updates and twice a week discussions on what we want to analyse/work on during the following few days proved to be the solution we needed to start ascending this seemingly unclimbable obstacle. Ultimately this structured way of working helped us progress to the results presented in this report.

Scientific relevance

In a team project, the group is only as strong as its weakest link. Obviously it is technically possible for other team members to take over all the work so the group can still progress, but in a course this intensive every person is needed. Therefore it is important to know exactly what you can expect from your teammates – something we discussed already in the first week by being honest about our strengths, weaknesses and interests. This constructed a foundation

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Societal relevance

In this report, we strived to solve a number of environmental and ecological issues currently present in South Holland, as well as facilitate the transition towards a new circular agricultural system in which the livestock industry is severely reduced. The urgency of these environmental and ecological problems has continuously grown in South Holland and by not taking action now, the problems will only get worse in the future. Therefore our project proposes a new ecological and agricultural network that contributes to a sustainable and healthy South Holland.

By focusing on ecology in relation to the agricultural sector, multiple opportunities were found to remove the most damaging aspects of both sectors in an integrated approach – landscape based agriculture. Damaged land due to intensive monocultures and livestock farming will heal over time and new types of agriculture and nature will be intro-

duced. Furthermore this transition away from livestock farming promotes a healthy lifestyle and a plant-based high protein diet, which will be made affordable and accessible for all.

Also, our project aims to reconnect people to nature and agriculture, while simultaneously building awareness on where your food comes from and how it is produced. These developments will help significantly in realising a conscious way of living – with the goal for people to start living in harmony with the flora and fauna found in the Netherlands. Overall our project aims to create a strong ecological system accessible for all, while simultaneously resolving a number of relevant ecological and circularity issues the province currently faces.

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Appendix Personal Reflection

4684869 | Mark Geers

The Q3 course 'Spatial Strategies for the Global Metropolis' was a very interesting and very unique course for me. First of all because of Covid-19, which severely restricted the possibility to see my group and teachers in person, but also due to the nature of this course. Before this quarter, I feel like the projects were all mainly focused on the design aspects of an intervention, while not focusing that much on other aspects like spatial flows, stakeholders and temporalities. This project completely changed that and gave us the opportunity to understand more about the processes, policies, etc. that go into a spatial strategy for a region like South Holland.

The main aspects I improved on is understanding how spatial structures and flows work on the scale of a region, as well as how to think about stakeholders more than just making a simple stakeholder analysis. Traditionally, things like a stakeholder analysis and phasing diagram were just things I had to make because it was in the list of requirements, but during this project I have started to realise how integrating those parts into the strategy can contribute to a more complete, inclusive result. Furthermore the nature of this project helped me in understanding how to do research/analysis that actually contributes to creating a vision, rather than just starting to do analysis and take it from there. The scale and complexity of the project kind of forced our group to come together and discuss exactly what aspects we want to delve into, simply because you do not have time to investigate everything that is interesting. Therefore – as a group – we learned to prioritise and only research the aspects that bring our project to the next step.

Another important aspect that helped me a lot were the lectures and workshops as part of the course. Even though the online environment was significantly harder for me to keep focused on a lecture for multiple hours, the lectures did teach me a lot about what goes into organising

and realising a plan on such a scale. Furthermore the interactive nature and weekly assignments helped our group with thinking about certain topics, as well as helping us move forward and inspire us during the project.

Thanks to the lectures, combined with the regular tutoring, I believe our group has been able to realise a feasible and inclusive strategy that will change the province of South Holland for the better. Our project started from a very idealistic statement, of which – at the time – I was not sure about its feasibility. But due to good collaboration, analysis, a vision and subsequently the strategies, I really believe that our plan can help the province move forward. Furthermore I was really excited to see how we managed to integrate a number of relevant issues the province currently faces and tackle them together as one coherent end result. However, is saying this, I also know a project like this is never really finished. There is still so much to elaborate and do research on. From exact stakeholder involvement and phasing to the exact spatial and temporal implications of the ecological network – there is still a lot to be learned. However, I do believe this project forms a strong foundation from which these specific research questions can be investigated.

Overall I feel like I have learned more from this project than previous projects, maybe because this type of project was still very new to me. I learned how to better divide tasks and discuss within a group, how the different processes within a project of this scale operate and even how to use Illustrator and make better visualisations. I really hope that in future projects, I can utilise and expend on all the knowledge I gained during this quarter.

Appendix Personal Reflection

5235103 | Min (Jasmine) Cui

Before the course I did not expect to have such a holistic and comprehensive research and discussion on the circular future of the province of South Holland. During this period, I not only grasp a better understanding of the spatial organization and dynamics of the built environment, but also gained some typological knowledge and insights into urbanism tools and techniques. At this time, the aim of a regional design—inventing new ways to maintain spatial quality and equality, as well as the methods used in the process, has been clear to me.

When we set out to build a vision for the agro-food sector in South Holland with livestock reduction as an opportunity, we realized that there will be factors from different aspects to be considered, such as societal trend, the interaction among stakeholders, the ecological and economical conditions, and so on. Therefore, the development of the strategy was not a linear process from research to design. In the whole process, we constantly shifted back and forth between the two to build a logical and comprehensive framework. The ideas of design gave us the direction of our research, and the results of the research helped us evaluate and better adjust the strategy and design to better fit in the conditions of the region.

Besides research of literature, virtual visits, and GIS analysis, we applied the method of research by design as well. By discussing the design within our group and with our teachers and fellow students, we were able to find missing links and new research topics. Our projects of intervention are good instances of the process, revealing the possible synergies that can be created after the implementation of our strategies. In the section of vision and strategy of the project, the connection between the two is also very clear. The vision of each aspect is developed based on research about several current circumstances, and the research in turn supports the vision and strategy. For example, when we present our vision

of water management, we explain at the same time the conditions we take into consideration—the problem of salinization, subsidence, and flood risk. When we address the strategy of floodplains, the research on exemplar projects in the Netherlands are shown to support our views. With our efforts, I think we did our best to build up a logical narrative, showing the connections between research and design.

While developing a framework with the combination of research and design, we also make clear the role of our self—process planners according to Sehested (Sehested, 2010). In order to promote the changes beyond agriculture to form transitions in the field of landscape, ecology and society, our main task is to create democratic processes that can integrate all relevant actors in order to make common decisions regarding the right kind of urban development. In our case, this means the application of livestock reduction and landscape-based agriculture. With farmers as a main stakeholder, we want to integrate non-professional actors in the planning process, during which we will be pedagogues and process consultants. Working as a role like this also brings me new experiences and perspective of view, deepening my understanding that the process of planning and design can be a process of mutual learning.

In conclusion, during the development of the narrative with the combination of design and research, the supportive connections between the two can be revealed and sorted out, forming a holistic and comprehensive framework. In this process, the role of the designer can also be made clear. The research by design method sets a good base for further developing strategies into application, and helps identify the role that designers play in the process of planning.

Source:

Sehested, K. (2010). Urban Planners as Network Managers and Metagovernors, *Planning Theory & Practice* 10[2], 245-263. <http://dx.doi.org/10.1080/14649350902884516org/10.1080/14649350902884516>

Appendix Personal Reflection

4445295 | Nadya Chabayuski

This project has been a big learning opportunity for me, not only because I have never worked with on the regional scale before, but also because it feels like for the first time I got to experience first hand what being an urban **planner** actually is like. Previously, in all the projects I have done, the final products were result of individual work mostly; even when participating in group projects I was the one to make the final decisions, which, while undoubtedly being a pleasant feeling because of getting to be in control, also felt far away from the real work and experience in the urbanist field. The PZH regional planning project, however, seemed to be focussed on showing us exactly that, and these past nine weeks have taught me a lot.

The most important takeaway from this course to me personally was learning how to translate my own opinions and passions into a vision and a strategy that could eventually be implemented in space and actually be practical and realistic enough to become a part of our lives, helping the society and the space we inhabit. Just ideas, no matter how brilliant they are, need to be reinforced with theory and knowledge on how to relate the theory to planning and strategising in a manner that turns these ideas into a strong, just and beneficial product, and this studio along with the Capita Selecta and SDS classes and the Methodology lectures explained these codependent and interrelated processes in an applicable way. Besides, it also made clear how crucial the collaboration and participation are, be it between the stakeholders of our project or the members of our group.

With help of all that, I believe that we were able to create a feasible and strategy that tackles relevant issues and causes a change in something heavily ingrained in our society, all while having started from a very idealistic point, which seemed quite impossible and unachievable in the beginning. We used ecology and landscape as both the starting point and

a tool to help make make the circular economy, conscious and responsible living, and spatial justice become more integrated through encouraging inter-scalar stakeholder collaboration and participation, which addresses not only the problems the PZH faces, but the system as a whole, and it's really exciting to me that our group was able to produce something as ambitious and grounded at the same time. However, there is still a lot to be discussed about the involvement of stakeholders, their power dynamics and ways of working with them during the development and implementation processes, which we could not investigate to the full extent.

Overall though, I really did learn a lot from these complementary courses, from creating better visualisations and collaborating and sharing the work with others instead of just dividing and discussing to understanding my own weaknesses and strengths better, and I hope I will be able to use all this knowledge in my next projects.

Appendix Personal Reflection

4480570 | Rosemarijne Bouma

Due to covid-19, the project was very different from other group projects. Half-way through the project, I saw my group members for the first time in real life. Given the added difficulty of corona, I am very happy with the result of the project. As a group, we managed to find the time to get to know each other, we managed to learn to understand and read each other which resulted in good communication and planning. One of my personal goals was to have and maintain a good work-private time balance throughout the whole project. I think by planning and communicating effectively I was able to achieve this goal. Also, I feel like this allowed me to work more efficiently during working hours and be more creative and sharp, also towards the end of the project.

The lectures on stakeholders and strategic planning have helped me a great deal in gaining insight into how a plan comes to be and is realized. This knowledge led me to a different approach of designing. Not only designing for the end result, but designing for implementation and for the temporary results caused by the often longer duration of implementation. Designing in a way a pilot project can be assessed before implementing the whole system. For me this very strategic and practical way of thinking was a really great addition in knowledge. I have learnt before how to do it for a technical project, and how to perform a verification and validation. Yet writing a script in python or doing more calculations is completely different from the ways to do it in a design project. All these new insights led to an interesting mix of research on design, research on strategy and making a spatial design as well as designing the strategy. Instead of it being a linear process, it was a process of going back and forth, an interaction. This gave a better understanding of how an actual project with different stakeholders would look like.

Another aspect of the course, which I greatly appreciated and simultaneously

found very challenging was the ethics part of the course. Early on I discovered by the design choices one makes, one also makes ethical and political choices up to some extent. On the one hand this has been something comforting for me. I want to have a job in which I feel like I am contributing towards a better, in my point of view thus more sustainable world. Urban design, on every scale level is a means to do that. At the same time, who am I to decide what is needed for the future, what is fair, what should get priority? This course gave me insight in what one could use as guidelines for a just design. Also it strengthened the idea that a design will most likely not be beneficial for everyone, and yet that is not necessarily wrong. As a designer it is our job to design for what the client asks for, while at the same time being true to what we believe in. The overall built environment will end up as a compromise that hopefully comes close to what the majority of inhabitants appreciates. Everyone has their own way of seeing things, their own things to believe in, their own paradigm, and this is fine as long as we are aware of it.

Overall this course allowed me to improve my skills related to teamwork, especially management and planning as a team. I have also improved my visualization skills significantly. Apart from improving skills, I have learnt a lot about strategic design, design implementation and ethics. However, maybe most important for me is that I have discovered I very much enjoy working on this scale, where one can really look at the landscape and human systems in place.



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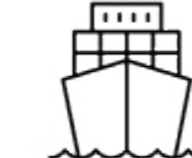
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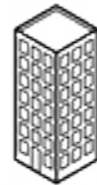
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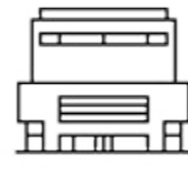
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