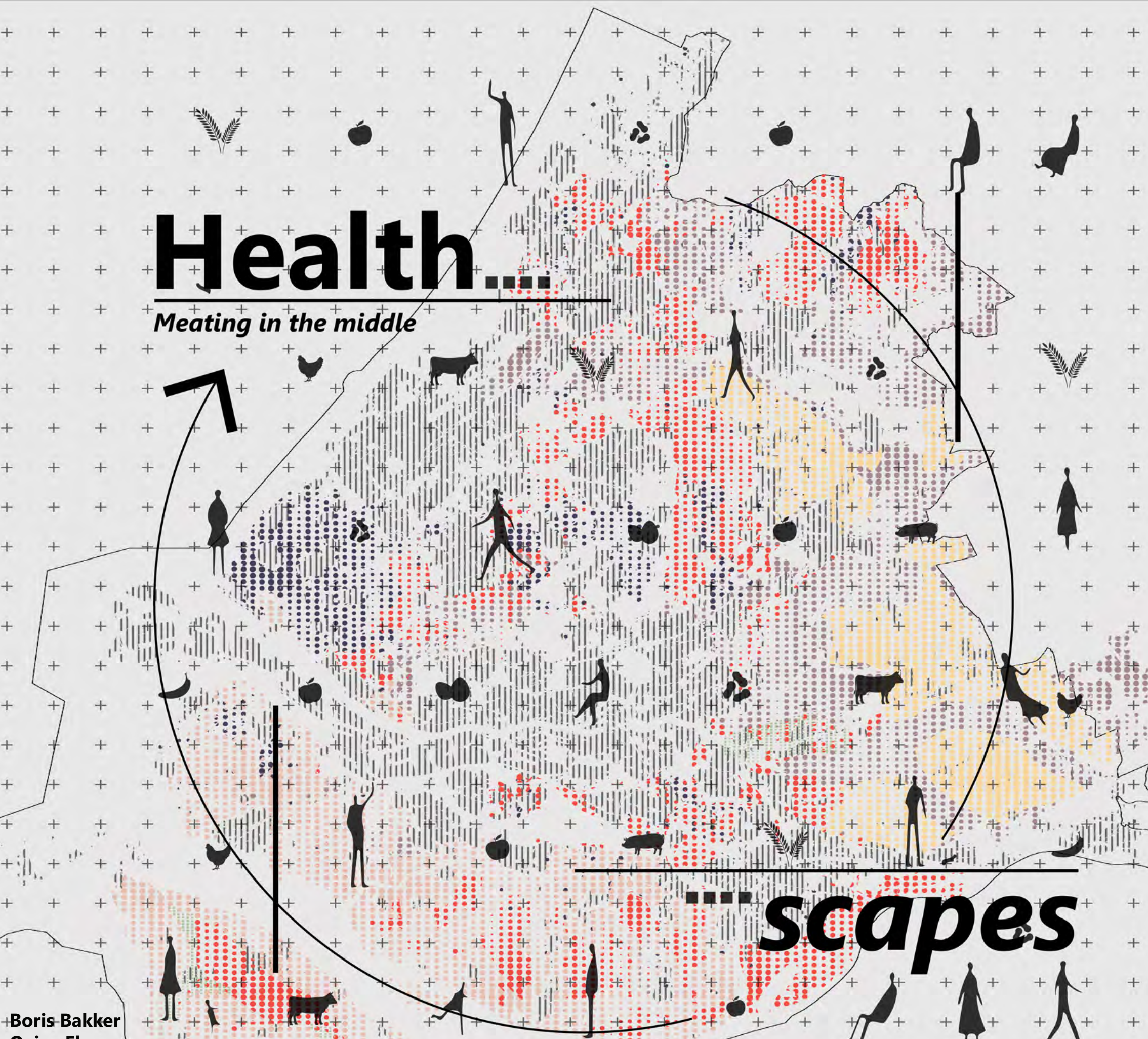
Health....

Meating in the middle



...scapes

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Healthscapes–Meating in the middle

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CONTENTS

1. ABSTRACT

The future poses a major problem of feeding 9 billion people by 2050, while the current system of agriculture in itself is unsustainable and demands resources which exceed the planetary boundaries. Further continuing this trend of exploitation and destruction of ecology will only worsen the planetary stresses the Anthropocene has established. Hence emerges the urgent necessity to reorganize and reinvent our current food system towards a sustainable and circular one to sustain life on our planet.

Accordingly, the primary goal of this project is to achieve sustainability in the food sector, thereby achieving circularity and food security. The Netherlands has an extraordinary position in the global market and is globally leading in agricultural research, technology and innovation. Therefore it could prove to be fruitful to develop a regional sustainable agricultural model that could become a role model for sustainable agriculture globally. The vision is to reduce the spatial impact of our food system while discontinuing the destruction of new habitats. To achieve this, a healthy diet must be embraced, which not only proves to significantly improve our health but also facilitate a transition towards a healthier planet.

By evaluating the spatial, environmental and health impacts of the current model, the negative externalities at each stage of the food sector are investigated. The diversification of the crops to be grown within South Holland is crucial in order to facilitate the transition from a food exporter to a self-sufficient region with respect to the food sector. To encourage more sustainable food production and enhance the relationship between people and their food production, it is invaluable to invest more power in the producers. Finally, the various steps involved in the food systems and the gap between people and the source of their food are reduced by initiating big food retail corporations to focus on food production.

Thus, the transformation of the food industry through the integration of a sustainable agriculture model and reshaping the public's perception of food consumption and dietary needs, will ultimately create a more healthy and balanced landscape, while aiming towards the collective goal of mitigating climate change.

Keywords: Agrifood sector, self sufficiency, diet change, land use, crop diversification, biodiversity, planetary boundaries, sustainable agriculture, Lancet diet, South-Holland

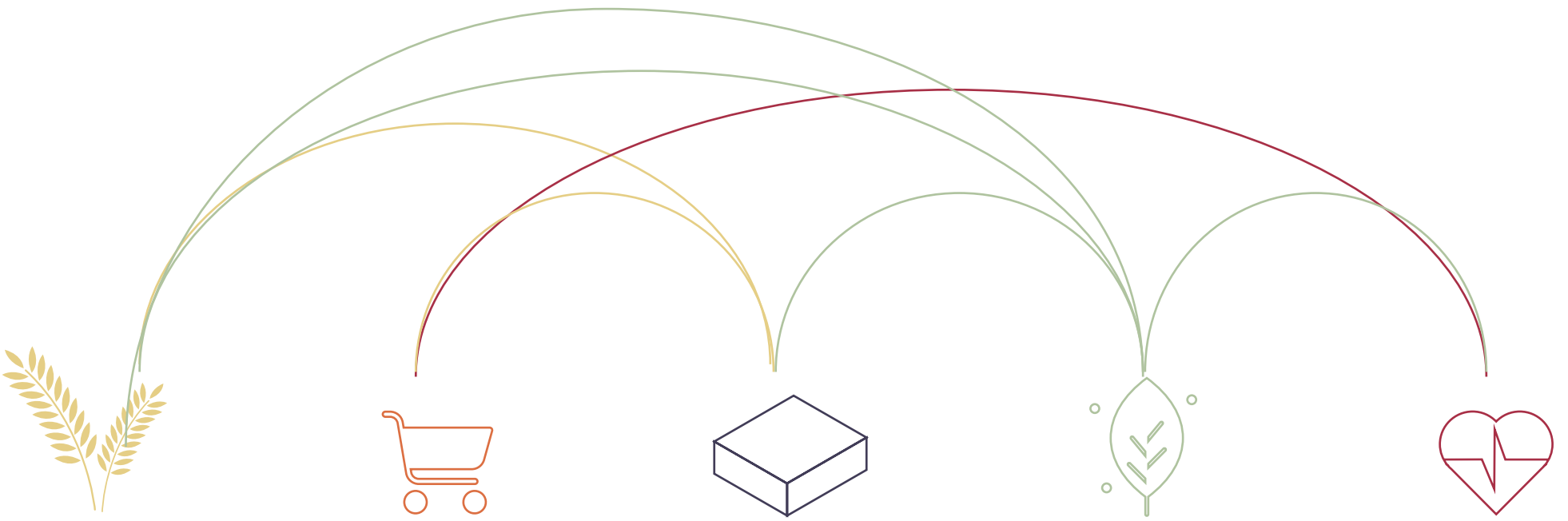
Fig. 1: Project area.

2. INTRODUCTION
INTRODUCING THE 2050 CHALLENGE

Regional design in today's globalized world sets the challenge for an evidence-based understanding of regional structures and development trends, as well as an understanding of the intertwined connections of design, planning and politics. The beginning of this century set out an ongoing race for investments and policies, by increasing the number of policies involved in various regions. The negative aftermath of this process has come in the front line of public discourse over the last decade since the pressure on societies from the occurring phenomena (environmental crises, social inequalities, health and humanity to name a few) is, in many cases, overwhelming. Current economic growth model follows a linear form of "take-make-dispose" that overlooks at the environmental impacts. Recent policies have shifted their focus to achieve equilibrium between economy, society and environment, by adopting the model of "circular economy". This concept draws attention to a reasoned use of resources and reuse of byproducts in production and consumption circles.

The objectives of this course focus on the province of South Holland, the most populated province in the Netherlands with more than 3.7 million inhabitants (CBS,2020). It lies on the Rhine, Meuse and Schelde delta, covering about 3.400 km^2 from which 600 km^2 are water. It is part of the agglomeration of the Randstad, containing The Hague, the administrative center of the country, Rotterdam, a large metropolitan port city, several medium-scale cities and also a big number of small cities. The focus of this project is framed within the policy agenda set by the Province of South Holland to embrace a 100% circular economy by 2050, to comply with the rules of the Nationaal Klimaat Akkoord and the EU environmental regulations.

The scope of this project is the food-producing landscapes of the region and their interrelations with consumer patterns. While agriculture is a major source of prosperity in the region, producing € 5.5 billion annually, it generates an immense amount of negative environmental externalities that will be further investigated in the following chapters. Therefore, our focus seeks to transition to a circular model that would close nutrient cycles, recycle residual flows, apply clean energy solutions and restore natural habitats.



1

Production

Resource consumption of food production is massive and lacks in efficiency.

2

Consumption

Up to 50% of food are lost/wasted before consumption.

3

Spatial quality

Agriculture already has an immense footprint that should not be increased any further.

4

Environment

Agriculture's footprint has caused the loss of whole ecosystems around the globe.

5

Health

The current global diet culture is a major cause of health issues in humans.

Fig. 2: Main problem fields.

3. WHERE DO WE STAND?
3_1 PROBLEM STATEMENT

The footprint of our food consumption is increasingly reflected in our environment. Agriculture is estimated to take up 38.5% of global land use, while cities, for example, take up only 5%. Much of this land is actually not directly intended for human consumption, but is instead dedicated to animal feed (Foley, 2014). In addition, the agricultural sector is responsible for almost a quarter of global greenhouse gas emissions (Ahmed et al., 2020).

This pattern is reflected in the Netherlands, and particularly in South Holland. The country is the second largest exporter of food in the world and this is mirrored in its land use. A large part of the total land area is reserved for agricultural use. In addition, the province of South Holland is currently facing increasing pressure on land, both in terms of spatial expansion and intensive use. More intensive agriculture in recent years has led to an overshoot of the planetary boundaries, resulting in a drastic loss of biodiversity and earth degradation (Dastrup et al., 2019).

Therefore, in order to achieve the National Climate Accord 2050 and the targets of the Paris Agreement, there needs to be a transition in the food system towards a:

- self-sufficient production-consumption chain must be facilitated by a change in society's perception of food.
- sustainable circular material flows
- efficient use of limited landscapes.

Fig. 3: News clipping stressing trade agreements.

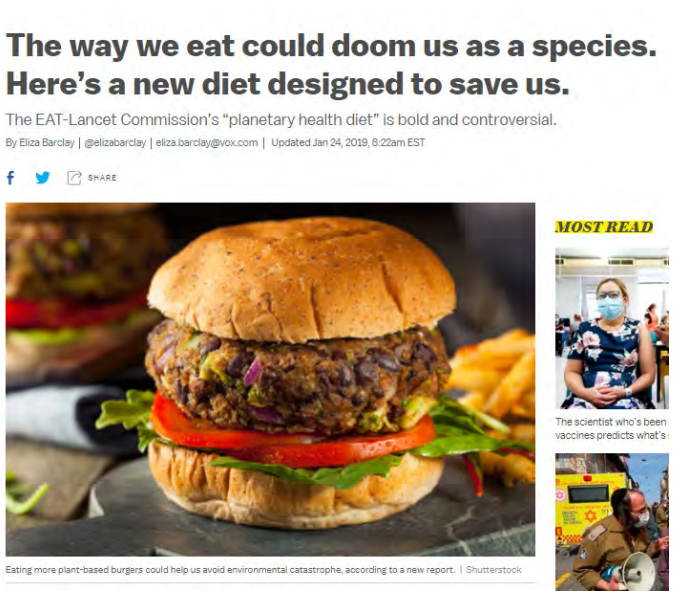


Fig. 4: News clipping proposing diet change

Fig. 5: Climate emergency in the UK

3_2 RESEARCH QUESTION

Main question

"How can spatial strategies support the necessary transition to a more sustainable agricultural model and shift in dietary habits in South Holland?"

Sub questions

"How can we produce more food by keeping or reducing our current agricultural footprint?"

"What new technologies can improve the efficiency of our production?"

"What does our current food culture look like?"

"What is the impact/footprint of our current diet on the landscape?"

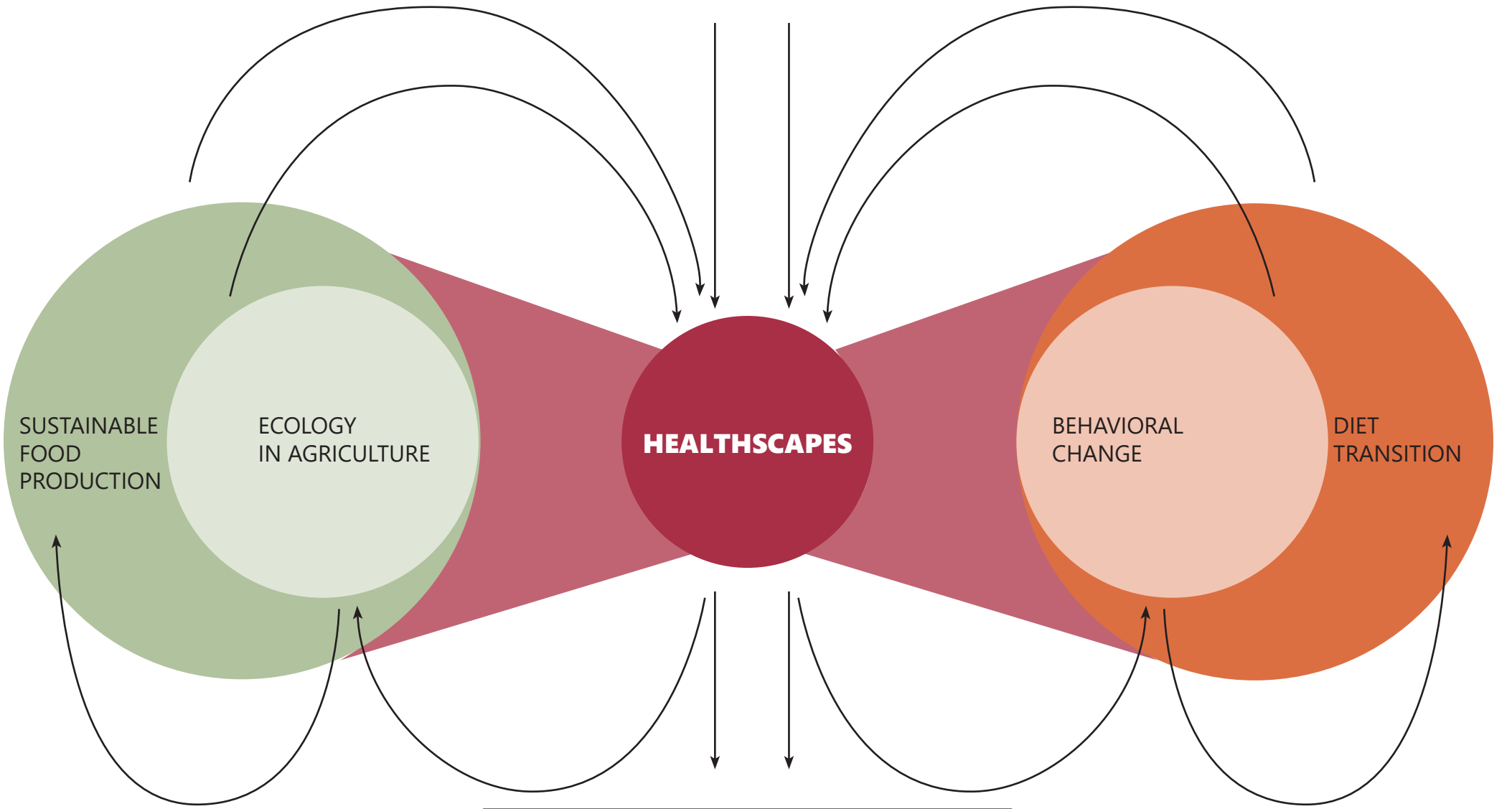
"How can a future transition add to the circular economy?"

"How can we reduce the consumption of resources?"

"What are the current ex- and import structures of the agricultural sector and how are they going to change in the future?"

3_3 CONCEPTUAL FRAMEWORK

How can spatial strategies support the necessary transition to a more sustainable agricultural model and shift in dietary habits in South Holland?



Current agricultural sector is the single largest contributor to environmental pressures because of an immense land use and output of greenhouse emissions to produce certain types of food.

Fig. 6: Conceptual Frameworkm figure by author

Fig. 7: Crop harvesting. By (unsplash.com)

3_4_1 SUSTAINABILITY IN AGRICULTURE

The agricultural sector in South Holland needs to shift towards a more sustainable system to halt the negative externalities that have derived from it and preserve the country's natural resources and ecosystems while ensuring an adequate and healthy food production in the future. The concept of sustainability has gained popularity in scientific circles and is open to many interpretations. It lies on the notion of meeting the needs of the present without compromising the ability of future generations to meet their own needs. This idea comprises three pillars: economic, environmental, and social; widely known as profit, planet, people.

Sustainability encourages stakeholders to form decisions for the long-term, rather than on short-term gains, such as the next year's earnings. It promotes a way of thinking where the environmental, social and human impacts of every action taken prevail over the imminent profits or losses that may occur. For agriculture to become more sustainable the following environmental issues need to be considered:

Soil quality

Soil is indispensable for preserving ecosystems and safeguarding food security. Soil fertility is under an ongoing pressure and is vulnerable to soil erosion and extensive use of chemical fertilizers. Improper agricultural practices, overgrazing and deforestation are some of the main causes of soil erosion. Uncontrolled farming is also linked to a significant loss of nutrients, especially micronutrients and phosphorus. It is estimated that 97 percent of phosphate, potassium and micronutrients are currently imported from outside the EU. Recent estimations predict that the global phosphorus reserves will be exhausted by 2100. China, being the one holding the greatest phosphorus reserve worldwide, has restricted exports in 2008 to protect their resources (Smaling, 2012). However, there is still a yearly surplus of 50.000 tonnes of phosphorus in the soil (40%) and in surface water (10%) and is captured in sewage treatment and incinerators (50%) (Smaling, 2012). Using artificial fertilizers is one of the primary causes for those problems. The majority of artificial fertilizers consist of nitrogen, which is based on ammonia, a chemical responsible for acidifying the soil. This acidification is decreasing phosphorus. Furthermore, nitrogen accelerates the dissolution of humus. It is hence clear that even though it increases soil fertility on the short term, it diminishes it on the long-term.

Climate and air quality

Agriculture is highly threatened by climate change which is responsible for water shortages, temperature increase or more severe weather phenomena (Bindi and Olesen, 2011). Paradoxically enough, agriculture is held responsible as a major driver for climate change, being the second largest greenhouse gas producer of the EU (Pendolovska et al., 2014). Sustainable climate management is one of the EU's major targets, mainly focusing on alternative energy sources, reducing methane emissions and actively store carbon.

"Here we are, the most clever species ever to have lived. So how is it we can destroy the only planet we have? "

Jane Goodall

Water

Water availability is vital for any form of agriculture. The effect of climate change has particularly raised concerns in the Netherlands. In recent years, temperatures have risen by 1.7 ˚C, summer days have increased by 20 and heavy rainfalls are becoming more frequent. Salinization has also become prominent in coastal areas, threatening crops that are not salt-resistant. Current agricultural systems use tap water, surface water and ground water. In heavy rain periods farmers need to dispose water, whereas in drought periods they are facing a lack of water and turn to tap water. The water that is returned in the system is highly contaminated by nutrients and pesticides.

Landscape

Landscape is a dynamic phenomenon that is formed of interconnected and ecologically rich areas, as the result of the continuous exchange between manmade and natural environment. These environments are shaped by cultural, economic and social accelerators. Landscape has an aesthetic and economic value for humans, since it enhances our well-being and also provides us with the goods that are essential for our survival. It also plays a key role for biodiversity and climate since all landscapes are part of a greater regional ecological structure. In the context of South Holland, the landscape has gradually weakened due to the agricultural intensification and the feverish urban expansion.

3_4_2 ECOLOGY IN AGRICULTURE

Fig. 8: Multiple cropping. By (https://eagronom.com/en/blog/crop-rotation/)

The Netherlands is one of the most densely populated countries in the world (see Appendix 2). A significantly high percentage of its land is currently consisted of highly productive agricultural areas. There is little land that could be identified as part of virginal ecosystems. The main origins of the decline in biodiversity have been the intensification of agricultural production, the drainage of wet areas for farmlands etc. (WOt-Technical Report, 2019). What is more, the monocultural agricultural fields, unsustainable fishing, overgrazing, climate change, eutrophication and the use of artificial fertilizers are decreasing the quality of natural areas.

Agriculture has made less progress towards sustainability than the forestry sector. Biodiversity on agro-lands still follows a downward trajectory, despite the occurring positive efforts that have been made through the Common Agricultural Policy by the EU or the national environmental schemes. The Dutch agricultural model in particular, is considered a success story since it generates an income of 101 billion dollars from exports, holding the 2nd position in global exports (PBL, 2014). This is by no means an incidental fact, since it entails a long tradition historically and has led to pioneering scientific and technological research on that field. On the contrary, this success has provoked a number of negative externalities, such as environmental threats, greenhouse gas emissions, food waste, and even an obesity epidemic.

Given the uprise in the global population to up to 8 billion people, it has become imperative to rethink the way we produce food, preserving rather than exhausting our natural resources, while aiming at creating resilient ecosystems.

The science of agroecology constitutes feasible solutions towards significant developments on sustainable agricultural systems, in order to achieve harmony with the larger ecosystem. According to the USDA, agricultural ecology "is the study of agricultural ecosystems and their components as they function within themselves and in the context of the landscapes that contain them". Agroecology is not a new term. It can be traced back in scientific literature since the beginning of the 20th century and has evolved to a societal movement in the 1980s. As a movement, it pursues to link agriculture to society (Silici, 2014). More recently, it has entered the public discourse in a number of global institutions, such as the 2011 Report on Agroecology and the right to food, presented by the Special Rapporteur on the right to food to the UN Human Rights Council.

Agroecology is founded on bottom-up and territorial practices that will eventually yield contextualized solutions in local, small-scale environments. The correlated innovations combine science with traditional practical knowledge of producers, while at the same time enhance their autonomy and empowers communities as fundamental drivers for change.
In order to regenerate their agricultural systems and achieve multiple of the Sustainable Development Goals, various countries worldwide have embraced the following 10 principles that have originated from regional seminars on agroecology:
Diversity | Synergies | Efficiency | Resilience | Recycling | Co-creation and sharing of knowledge | Human and social values | Culture and food traditions | Responsible governance | Circular and solidarity economy

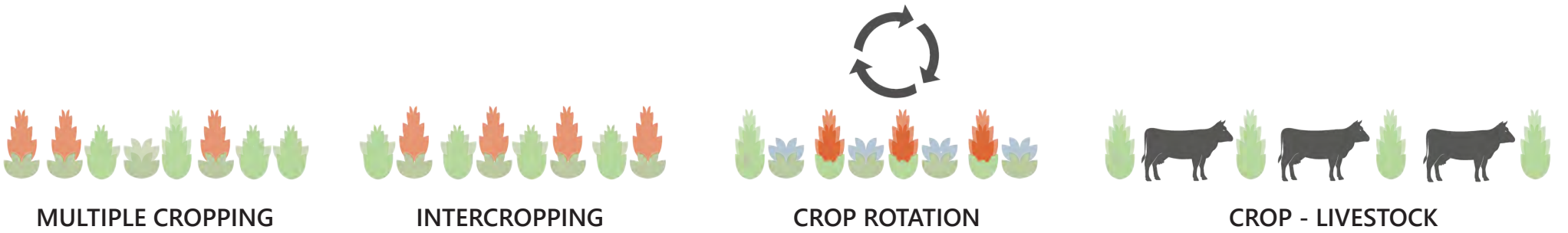


Fig. 9: Schematic diagram of various polyculture farming systems. Figure by author

Diversity

Diversification of farming is crucial for a future shift in sustainability to protect natural resources from further overexploitation. Clearly, farms contain organisms (worms, honeybees, weeds, animals, microbes etc.) while resting on the environment (landscape, water, air, soil, climate). In a time when many of these species seem to decline fast, agroecological systems optimize the diversity of species in a variety of ways.

The most common practice so far has been monoculture, which is the practice of growing a single crop or plant or livestock species, while using the exact same soil. Even though this practice is considered a highly efficient specialized production, it comes with a set of problems. It upsets the natural balance of the soil and decreases the variety of bacteria and microorganisms that are needed to maintain the soil's fertility and can lead to pathogens and diseases both in plants and animals. Unlike monoculture, a polyculture crop production system promotes the growing of multiple crops either simultaneously or in a crop rotation. Although this system is more labor intensive, it is certainly more constructive for the environment, as it is linked with the following advantages:

• Better nutrient utilization, since the nutrients that are not utilized by one crop will be beneficial to another crop.
• Better soil utilization since the soil is used throughout the whole year.
• Less land and water use- a single farm is much easier to manage its irrigation
• Higher crop resistance to plant pests- plants become more immune to pests
• Better soil properties- growing of different crops on the same land enhances the soil properties, making it more suitable for crop production
• Soil erosion control
• Increased biodiversity–growing a variety of plants on the same land increases local biodiversity
• Meets the food demands–a polyculture system requires less land to produce more food.

Polyculture overall minimizes risks and provides stable yields. The following systems are used to implement a polycultural system into farming:

Multiple cropping

Multiple cropping is a form of polyculture in which farmers grow more than two crops on the same field throughout one year. Typically, after the main crop is harvested, the planting of the next follows until the end of the year. Arable crops, vegetables, fiber or grain crops are repeatedly grown in a steady progression.

Intercropping

Intercropping is the farm system in which farmers grow two or more crops simultaneously in the same field, which can be done in rows or mixed. By combining crops, a more efficient use of land is ensured. Intercropping is commonly called an agroforestry system since smaller crops are planted underneath higher crops.

Crop rotation

Crop rotation is the system of planting different crops sequentially on the same plot of land to enhance soil health and soil biology, optimize nutrients contained in the soil and eliminate pests and weeds. A simple rotation might incorporate two or three crops and a complex one might incorporate more than ten. The term soil capital is used to define how soil building practices are an investment for farmers in long-term soil productivity (Sustainable Agriculture Research and Education, 2009).

Crop-livestock production

Integrating crops and livestock helps in closing the nutrient cycle of cattle feed and manure. It enhances economic and ecological sustainability, biological diversity, improves soil health, hence it increases environmental resilience, contributing to climate change adaptation and mitigation.

3_4_3 DIET TRANSITION

We appear to be so used to our current consumerist ways that we seem unable to realize what the negative effects of our consumption are and are even unable to imagine a different way of going about. The issue with our current diet lies mainly in the popularity of meat consumption. Livestock farming is the single largest contributor to global greenhouse gas emissions and use of land, accounting for 18% of GHG emissions and for 80% of total land use (Steinfeld et al., 2006). As a growth in population and its wealth is expected, we can imagine an increase in meat popularity as well. The effects of the current trend of consumption is not just shown in the environment, but also reflects in our health.

Although we mostly do not encounter anymore malnutrition and deficiencies in the Netherlands, a surplus of inhabitants could eat much healthier. Only 2% of young adults in the Netherlands eat 150 grams of vegetables per day, while the recommended is even at 200 grams per day. As currently a lot of the available foods and drinks are redundant, eating more and other than you need has become so easy that many people have become overweight, leading to 54 percent of adult men and 43 percent of women in 2011 (Statistics Netherlands, 2012).

The diagram features the baseline scenario, performed by Stehfest et al (2009), which indicates the expected increase in consumption of livestock products. It shows an expected increase of 12 GigaTons CO2 eq/yr by 2030 & 2050 and total GHG emissions with (78%) resulting in an estimated 72 GigaTons. Along with this, livestock production will shoot up due to the expending population and it's increase in meat consumption popularity. By this time, crop and livestock production will be more efficient and as we the consumption of pork and poultry will become increasingly more popular leading to a total increase in livestock landuse of 4%. Considering the negative externalities of these production types, an increase in CO2, N2O and methane emissions is near inevitable while it is more than clear than we cannot permit any.

Turning this process around and transitioning to a diet that incorporates less meat would open up to several beneficial possibilities; reducing the biodiversity loss due to land conversion and strengthening climate change mitigation. By reducing the lands used for livestock forming, the emission of methane and nitrous oxide are reduced, as well as making carbon sequestration possible by regrowing these lands with natural vegetation. Although it would have beneficial effects for the environment and climate, the change in diet could significantly affect parties that are reliant on the meat production on an economical scale as well as influencing people's choice overall.

So, as making a shift to less meat-intensive diet could drastically reduce the negatives externalities that go with livestock production, the diagram also shows scenarios for changing to healthier diets. One option consists of substituting all meat with plant-based proteins, while the other is based on the Willer diet and contains a daily consumption (in fewer amounts) of beef, pork and poultry. The diagram indicates a substantial decrease in global pastureland of 45% (almost 9 million km2) and 10% decrease in cropland for the Healthy diet. The no-meat diet would result in even more reduction of landuse. The remarkably low decrease in land use for crop cultivation can be explained by the replacement of meat protein by pulses, which require comparable amounts of space. Despite that, the amounts of ghg emissions are 20% lower compared to the baseline scenario which reduce the environmental pressure significantly. Considering that these abandoned lands can recover to their natural states, it would provide great benefits for biodiversity as well. These hopeful results do assume that the lands that become abandoned are allowed to recover to the natural state and are not given a new function (Netherlands Environmental Assessment Agency 2010).

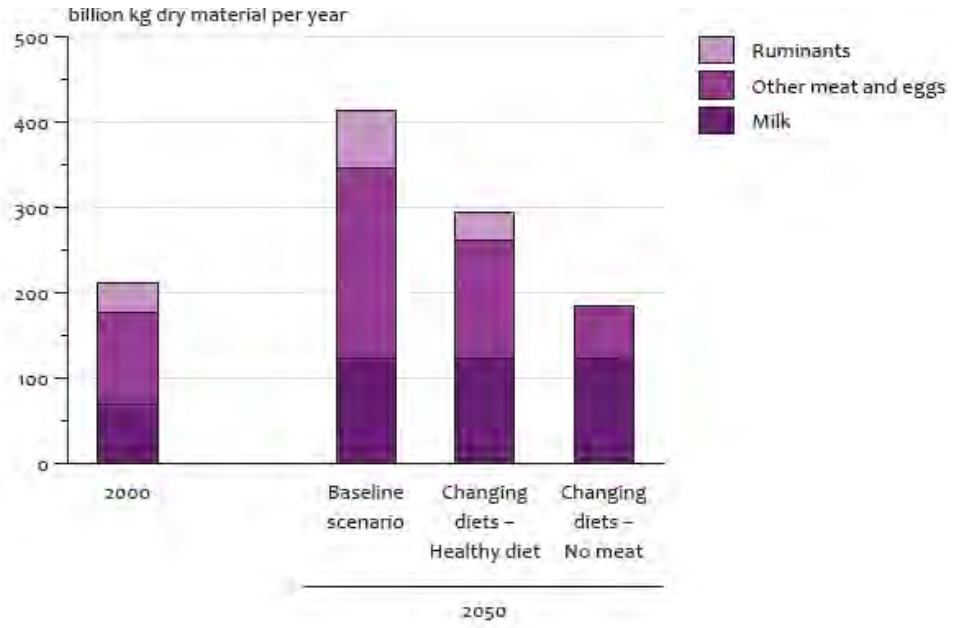


Fig. 10: Livestock production scenarios. By Rethinking Global Biodiversity Strategies, p. 80

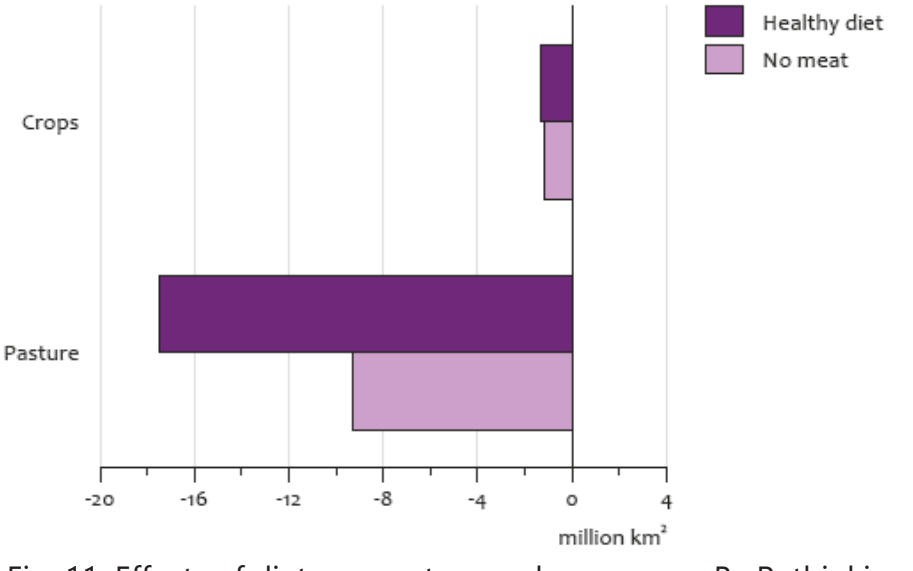


Fig. 11: Effects of diets on pasture and crops area. By Rethinking Global Biodiversity Strategies, p.81

Fig. 12: Current typical Dutch diet versus proposed Lancet diet. Figure by author (Eat-Lancet-Commission, n.d.; RIVM, 2020)

Providing solutions

The author of the previously proposed diet, further developed on his work and in collaboration with scientists from various countries and disciplines, has attempted to reach scientific consensus about a sustainable global food system. Posing an answer to the question "Can we feed a future population of 10 billion people a healthy diet withing planetary boundaries?", the EAT-Lancet¬ report (2019) stresses the urgency for change and proposes a healthy diet, sustainable food production and a set of actions to bringing this transition to realisation.

According to the report, most scientific studies conclude that a less meat-intensive diet rich in plan-based foods prove to be most beneficial for health goals and relieving environmental pressure (accordingly to previous source). A healthy diet should optimize health, defined broadly as being a state of complete physical, mental and social well-being and not merely the absence of diseases. The diet proposed would mean in-crease consumption of healthy foods like fruits, vegetables, legumes and nuts by 200% while consuming 50% less red meat and added sugars. Although this would be a large pill to swallow for large groups of indi-viduals, analysis of the potential impact on diet related disease mortality shows that the resulting health benefits of the dietary change cannot be ignored. According to the LANCET commission, roughly 11.3 million deaths (19-24%) among adults would be prevented yearly, would we transition from our current diet to healthy diets.

For the transition to sustainable food production, the commission proposes boundaries for six categories of systems and processes that are affected by food production. These boundaries define the limits the global food production should stay withing to prevent irreversible pro-cesses within the Earths systems. These boundaries do assume that the Paris Agreement will be followed and that the global agricultural system will change to more sustainable alternatives in such a way that land use would serve as carbon sinks rather than sources.

Five strategies have been defined to support action for this transformation. As many transitions require, the first step would be the search for (inter)national commitment. Ways to stimulate this commitment could be by promoting availability, accessibility and affordability as well as improving information and marketing surrounding healthy foods. Increasing investments in public health information and sustainability education could also help

Secondly, the focus of agricultural companies needs to shift from producing large quantities of food to producing healthy foods. Within these modes of production, special emphasize should be on incorporated enhancement of biodiversity.

Thirdly, building further on the previous aspect, agriculture should be driven by sustainability and system innovation. This would involve various sustainability goals, for example water efficiency, phosphorus recycling, biodiversity integration and yield gap reduction.

Set up a coordinated management over land and oceans to conserve biodiversity. Helpful tools could be the implementation of zero-expansion policies for new agriculture land into natural ecosystems to support the restoration of degraded land, as well as adopting the 'Half-Earth' strategy in which 50% of Earth is perceived as a protected ecosystem.

Finally, heavily reducing food losses and waste at the fields of consumption and production by technical innovations on the production side and public policies on the consumption side (EAT. 2019).

Concluding, the Lancet diet provides a realistic perspective that would feed 10 billion people a healthy, balanced and sustainable diet. Of course, the greatest challenge at hand will revolve around the question of how to lead those 10 billion people to shift to a different diet?

3_4_4 BEHAVIORAL CHANGE

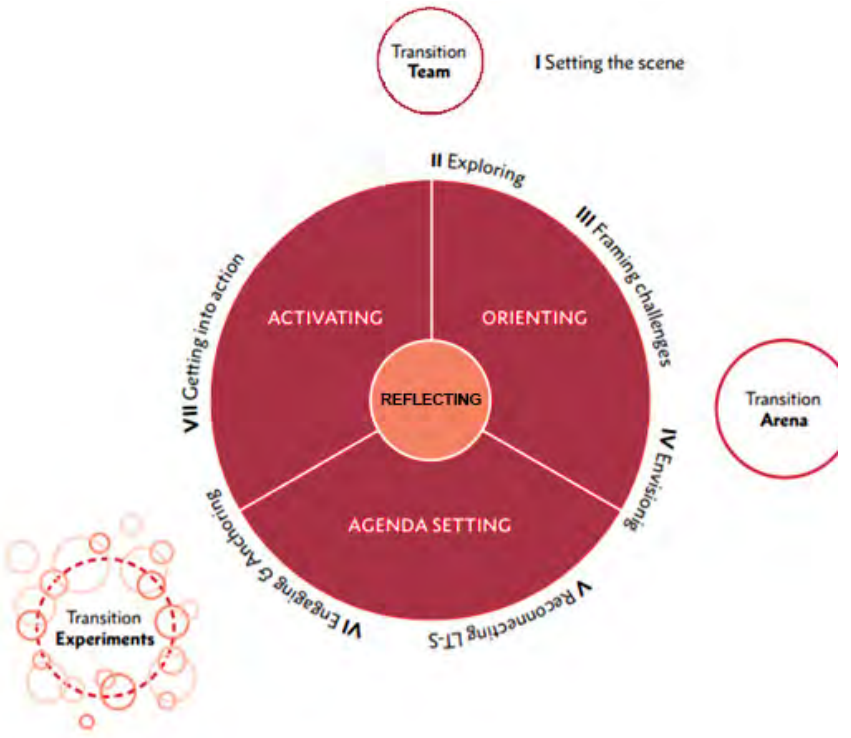


Fig. 13: Structure of the transition management process. By Roemers et al., 2018

Change is often perceived as negative, and as Luke Durward (TEDx Talks, 2014) correctly pinpoints being the case; we are often afraid of change. Still, as the previous chapter clearly defined, we urgently need to. So can we not simply "change the environment to match the goal" and get rid of all bad foods and replace them with healthy foods?
Luckily, but in this case maybe unfortunately, we do not and should not live in a system where certain changes can be imposed upon a community. However, if people need to change 'willingly' the question arises how such a transition can be influenced.
Thus it becomes our mission of finding out how we stimulate people to make a change in dietary habits. Moreover, as the project relates to the urban realm, the question becomes what spatial strategies can contribute to this shift in behaviour.

For research on the topic of behavioural change, inspiration has been drawn from transition management theories, an approach specifically designed to guide and accelerate specific transitions.
Transition management, as described in Roorda et al (2014), can provide methods for guidance for transitions in a sustainable direction. It has a wide range of application possibilities and contains six principles to guide sustainable transitions.
- Getting insight into the system (a full-bodied understanding of the situation at hand is necessary)
- Aim for system innovation in small but radical steps
- Give room to diversity and flexibility (as it is unsure what the future holds exactly, it is required to be open and flexible and explore multiple varying solutions)

Can we justify promoting a project that would change the way people behave?

- Co-create (it is important that multiple stakeholders, all with varying perspectives, positions and practices are incorporated into the decision-making process)
- Give room to change agents (actors that are comfortable in working with alternative ways of thinking should be bound into the process for triggering and engaging purposes)
- Facilitate social and institutional learning (learning is an important aspect for social transition. By making use of reflection and stimulating openness and mutual trust, the learning process can be enhanced to learn about new processes and current constraints).

These are translated into four types of interventions
- Orienting
Analysing the current situation and positioning oneself to the current trends, challenges and societal actors.
- Agenda setting
Setting a common direction and creating a shared sense of ownership and ambition for sustainable future. Includes setting a common direction and ambitions within the network of actors, and helping actors to incorporate this with their own agenda and practices.
- Activating
This includes taking up the action in the form of specific plans to be carried out in the defined direction.
- Reflecting
This focusses on the learning part of the process by making use of monitoring and reflecting. In this way, the actors learn from each other as well as from taken decisions and carried out experiments.

In this project we aim at covering as much of the transition managements principles and the corresponding interventions. As outcome, we hope to achieve three different aspects
- a sense of direction by defining a strategic future perspective
- an impulse for local change, which contains a stimulation of local initiatives to boost the transition
- collective empowerment, achieved by incorporating location specific actors to engage in opportunities that can support the sustainable transition

To provide guidance for the manner in which transition management could be applied, a structure has been developed that can be adjusted to the project situation at hand.
The transition management approach makes use of a key instrument; the transition arena.

I. Setting the scene for transition management	A **transition team** is formed to drive the process and embed it in the local context.
II. Exploring local dynamics	The transition team starts to explore the city's dynamics, conducting interviews and doing desk research, and working towards a **system analysis** and **actor analysis**. Based on the actor analysis, a diverse group of change agents is invited to engage in a series of meetings as a **transition arena** group.
III. Framing the transition challenge	The change agents first explore the transition challenges and create a shared **problem framing**.
IV. Envisioning a sustainable city	Subsequently, they exchange and elaborate perspectives on a possible future, thereby creating **visionary images** for the future of the city.
V. Reconnecting long term & short term	As a final step in the transition arena setting, the change agents elaborate **transition pathways**, indicating fundamental changes and corresponding actions needed to reach the envisioned future. The ideas brought forward by the transition arena are summarized and published in a **transition agenda**.
VI. Engaging & anchoring	Actions are undertaken to make the transition agenda public and give others a chance to adopt and adapt it, and relate it to their own agenda and practices.
VII. Getting into action	**Transition experiments**, radical short-term actions in line with the transition agenda, are initiated or adapted. Through these actions, more actors become engaged. Insights from these experiments can be taken to a more strategic level.

Fig. 14: Outline of the process structure with the seven guiding phases. By Roemers et al., 2018

The transition arena can be defined as a 'safe' setting in which different actors can share their perspectives, expectations and agendas and engage in critical reflection and direction building. Unfortunately, as we cannot fully engage with different governments, research institutes and citizens, nor as we ourselves are actors with radically different positions, perspectives and agendas, we are not able to fully address all the seven parts mentioned in the process structure. Therefore, we engage in the process structure up to the phase four (envisioning a sustainable city) and partly part five, as we do connect a long term vision with short term interventions. Finally, as we also propose transition experiments in the form of strategic projects we cover a part of phase seven, though it is harder to reflect on the resulting effects and insights.

On another note; a change in behaviour is an ethical question as well. Can we even promote a project that would change the way people behave? At the start of the paragraph it is phrased how we should not live in a system where certain changes can be forced upon a community. However, we are currently endangering the equal distribution of burdens and benefits for both our generation as the future generation by disturbing the environment and therefore endangering our species to such an extent that it might not be about doing things willingly anymore. The previous chapter showed the many negative externalities of our current dietary habits. Considering these effects, whether it is ethical to stimulate such a change in behaviour might not weigh up against the negative externalities of continuing this way of living.

Luke Durward stresses in his TedTalk (2014) how to achieve an envisioned change, the environment should be met to reach the set goal. In our case, as we are in the field of the urban realm, the environments that are encountered are current and future modes of food distribution. These are the subject specific locations where people engage most directly with their environment. Therefore, these are also the locations to promote the change in diet, to 'get in people's faces' with alternative options, to "get rid of all the bad things, and replace them with the good things". As stated in the previous paragraph, the transition in dietary habits is one that cannot be imposed, but should me influenced. Consequently, influencing the behaviour to change the diet is primarily a case of promoting awareness and "getting into peoples faces" in the most engaging environments.

For the realisation of a sustainable agri-food model, we can imagine that both sides changing can enhance the transition process. The agro-ecosystem is to a large extend managed by human decision-making (Antle et al., 2001, in Rieswijk, 2015), and Rieswijk (2015) accurately describes that according to Burton and Paragahawewa (2011); "Environmental-friendly measures need to become em-bedded within farming cultures as part of conventional 'good farming' practice". Therefore, it is necessary to stay away from imposing new ways and achieve a transition to more sustainable agriculture through behaviour changing techniques. So as we have the consumer that has to change his dietary habits, so we have the producer that has to change its way of production.

To trigger motivation among the producers (farmers), different techniques can be used. Firstly, information techniques can be helpful in situations where farmers are already on the brink of changing, but do not know for sure which behaviour to adapt. Therefore, consulting could help them transform their means into actions. On this scope, common marketing techniques can help overall as sustainable farming is quite a new subject and farmers should therefore be informed and actively stimulated to participate. Secondly, stimulating certain behaviour like taking up green initiatives with monetary rewards might prove to work. Such a positive motivational technique is closely related but seemingly opposite to another technique; constraining ones choices with coercive techniques. For example, income support (which is and has for a long time been quite an important element for farmers) could be reduced or denied if a farmer does not take any sustainable measures .

Also, research has shown that when individuals can take a direction of their own choosing, an increase in motivation and persistence is often encountered (Patal et al, 2009). Finally, simply not every farmer is capable of making such a transition on his own. Therefore, farmers can put their trust in companies that aim at improving the farmers' living standards. These companies (waterboards, Boerenbond) can be of influence on the behaviour of farmers. These techniques help us pave a direction for the strategies and policies that might help us to achieve improved sustainable production

3_5 METHODOLOGY FRAMEWORK

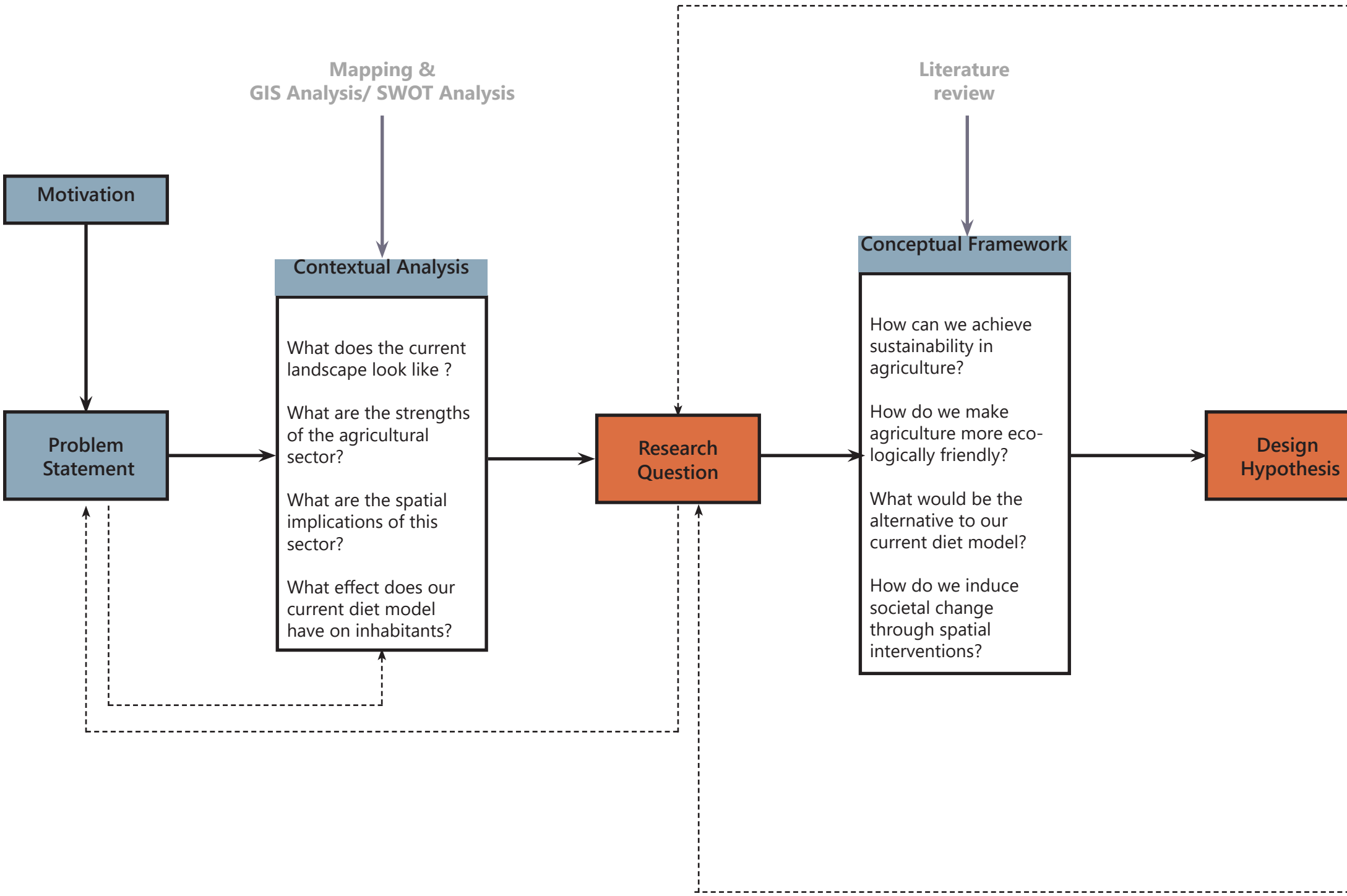
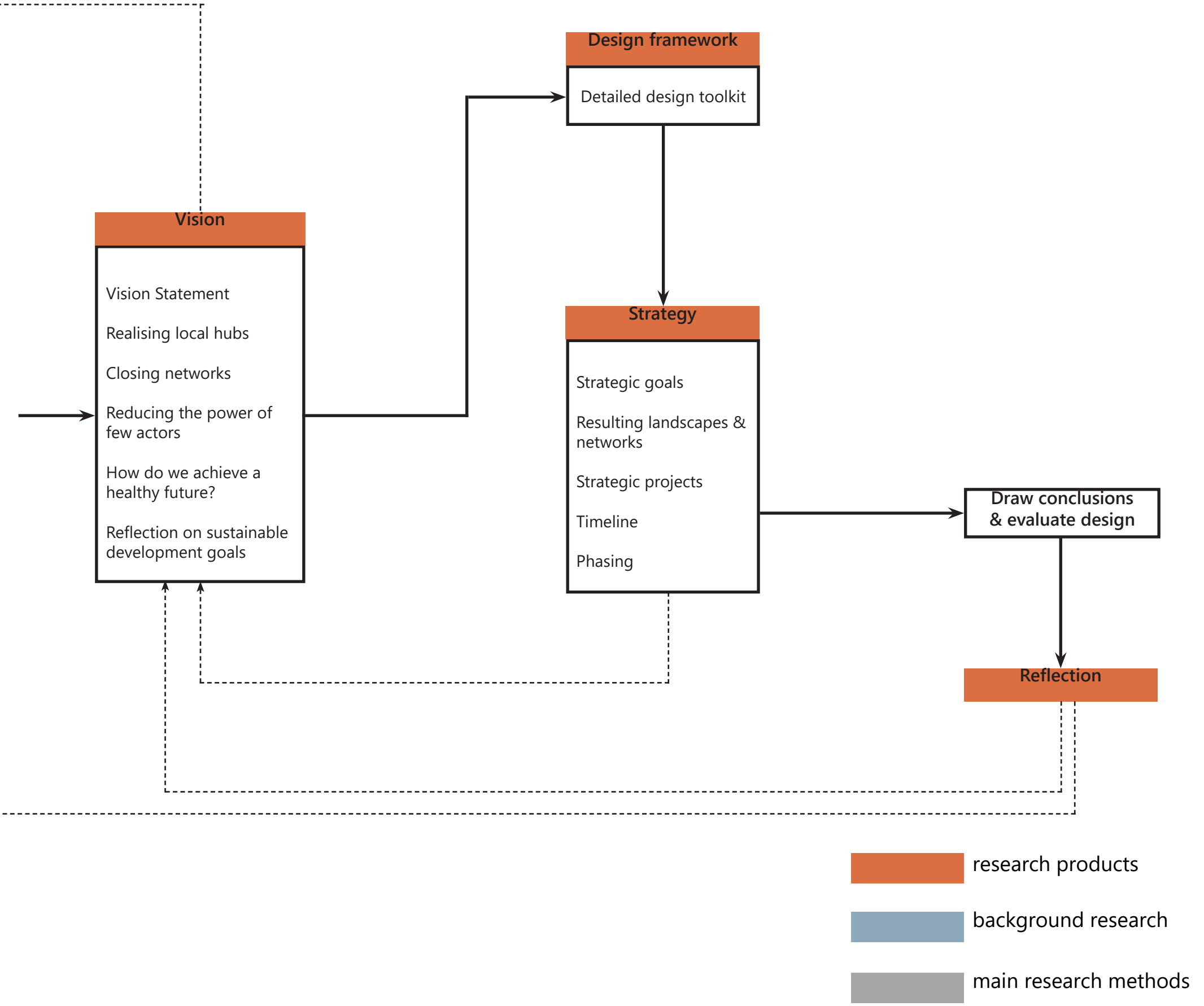


Fig. 15: Methodology Framework.


Design framework
Detailed design toolkit
Vision
Vision Statement
Realising local hubs
Closing networks
Reducing the power of few actors
How do we achieve a healthy future?
Reflection on sustainable development goals
Strategy
Strategic goals
Resulting landscapes & networks
Strategic projects
Timeline
Phasing
Draw conclusions & evaluate design
Reflection
research products
background research
main research methods

4. What's on the menu?
4_1 UNDERSTANDING SOUTH HOLLAND

South Holland is the result of a synergy between 52 municipalities (see Appendix 1) that illustrate a strong regional image of attractive historical cities and contemporary urban metropolises. The province is highly urbanized and industrialized, with the port of Rotterdam being one of the world's largest ports. Approximately half of the province's surface is covered by the agricultural sector which is a main actor in its economic activity, contributing to the country's position as the second largest exporter of agricultural products worldwide. Greenhouse horticulture in particular is a key agri-food sector, with a total number of 2.550 registered glasshouse companies, accounting for half of the Netherlands' total and making it the largest greenhouse area in the world.

The Dutch agriculture sector is well known for its high efficiency and the innovations it incorporates; however this efficiency is only profitable in economic terms and not profitable for the environment or for society. While most of the produced goods are exported, the environmental problems that arise stay within the region, and therefore, a change in the sector is critical.

A vision and a strategy are developed in this project to build the above mentioned change. This change entails the notion of perceiving South Holland's landscapes as "Healthscapes" that promote environmental and societal health. It is particularly important for this research to highlight the interaction between people and agriculture and stress the fact that agricultural practices depend on social habits and demands; hence a cultural shift in dietary habits is the first step.

In 2018 in South Holland there were:

Fig. 16: Figures of the agricultural sector in South Holland. Figure by author, based on: Roemers et al. 2018

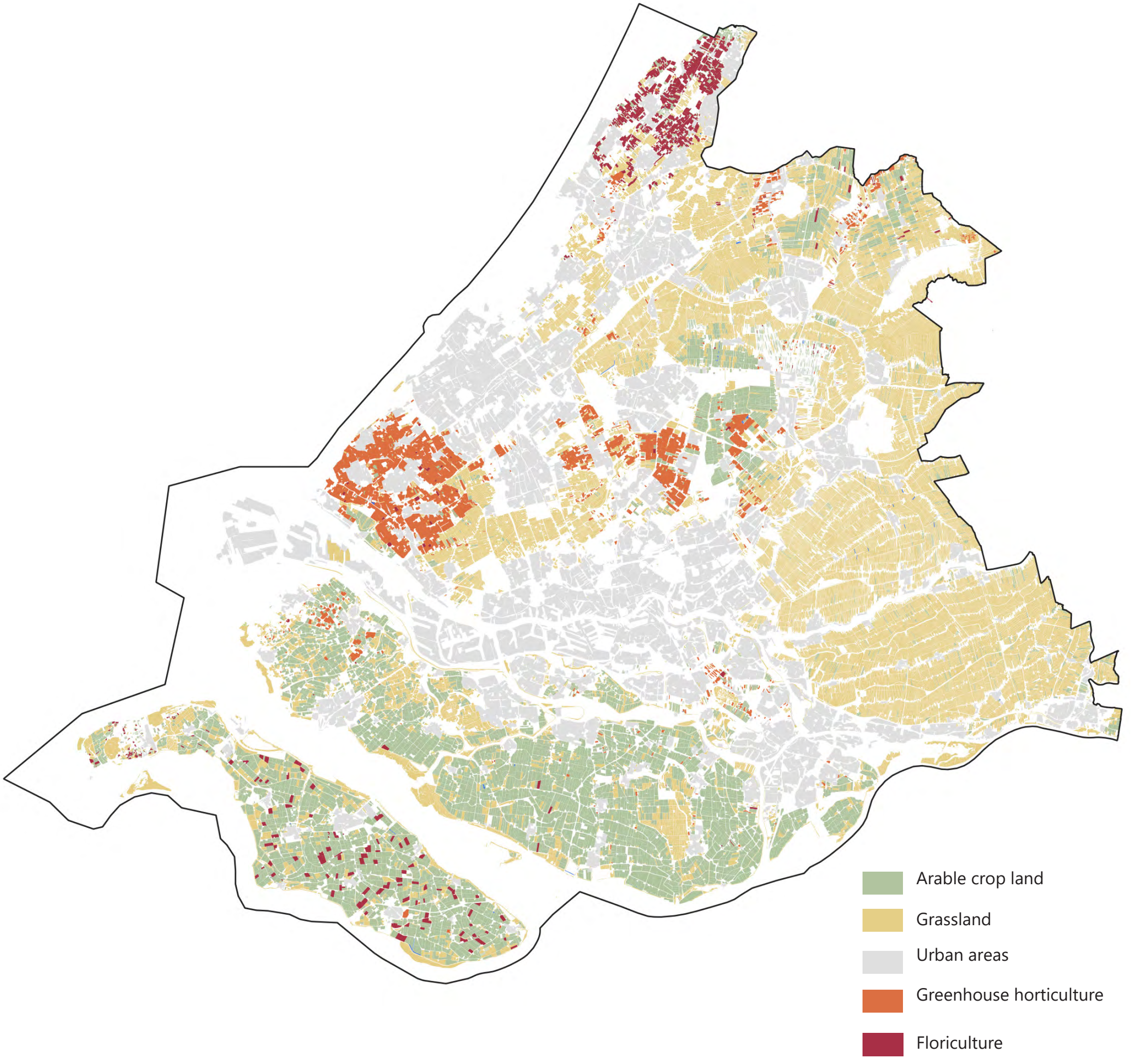


Fig. 17: Current land use in South Holland.
Figure by author (Nationaalgeoregister.com)

4_2 Agrifood landscapes

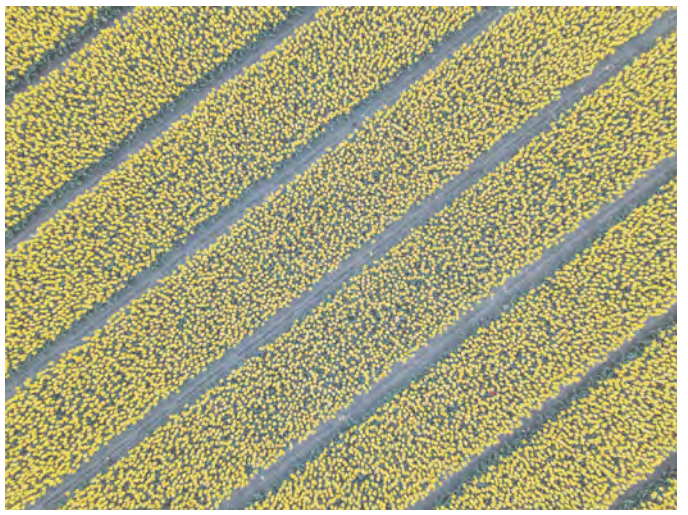


Fig. 18: Flower fields in Goeree Overflakkee (Unsplash)

Fig. 19: Greenhouse structures in Westland. (Unsplash)

Fig. 20: Typical Dutch polder landscape with cows in the lowest part of the country. (Pixabay)

The Netherlands is well known for the scenery of its landscape and has a great diversification in its landscapes compared to its small surface area. However, most of these landscapes are production types. When one thinks of the Dutch landscape, one often imagines fields of tulips. The Dutch floriculture is a traditional and stable product of export and the third most financially contributing product of export of the Netherlands making it the core of the flower market (Neefjes, 2019).
The vast stretches of flower fields are visually impressive and a great attraction for tourists (for example Keukenhof), but the flower culture has large costs and environmental challenges as they are often highly dependent on chemical agents, fertilizer and carbon-based energy (Porter, Ramirez-Vallejo, & van Eenennaam, 2011).

In line with the Dutch mentality of specialisation and optimalisation, green houses have over the years grown to be a large part of the landscape and economic sector. Greenhouses allow for a controlled environment which species of vegetables, flowers and other plants can be grown that otherwise would not be able to endure the Dutch atmospheric conditions. In total, 10.000 hectares of land are taken up by greenhouses, which yearly produce around 4,5 billion euros yearly in vegetables, fruits, plants and flowers (Centraal Bureau voor de Statistiek, 2012).
Although greenhouses provide (Fig. 19)optimal conditions for growing products inside, they use the land to the fullest extent where other modes of agriculture still provide some possibilities for biodiversity. Next to that, greenhouses use large amounts of water, together have an energy consumption comparable to 1,2 million households and yearly contribute to 73% of all CO2 emissions coming from the total agricultural sector (Drift & Metabolic, 2018)

By far the largest space is taken up by grasslands used for livestock cultivation. For example, in South Holland alone, 42% of all land is reserved for livestock farming. Historically, to create more agricultural lands, the Dutch pumped the water out of the lands by creating the polder-structures (Canon van Nederland, z.d.).
To make the land suitable for Livestock cultivation, the water level has to be lowered to make the land dry enough. By lowering the water leven in peat soil lands, the peat oxidizes and nitrogen gets released into the atmosphere (Kwakernaak, van den Akker, Veenendaal, van Huissteden, & Kroon, 2010). Combined with the fact that livestock cultivation already greatly contributes to the amount of GHG-emmissions, it becomes apparent that this type of cultivation on a large scale is unsustainable.

The final portion is taken up by the arable cropland located on potent soil, for example seaclay. Hence why we can see that large portions of and around Goeree-Overflakkee are fruitful for arable cropfarm. These cultivation lands contain mostly mais, wheat and potatoes (Rijksoverheid, 2009).. Research has shown that the monocultural production types, highly intense use of landscape and chemicals negatively affect the biodiversity and soil quality (Centre for Genetic Resources, the Netherlands (CGN) & Wageningen UR (University & Research Centre), 2015).

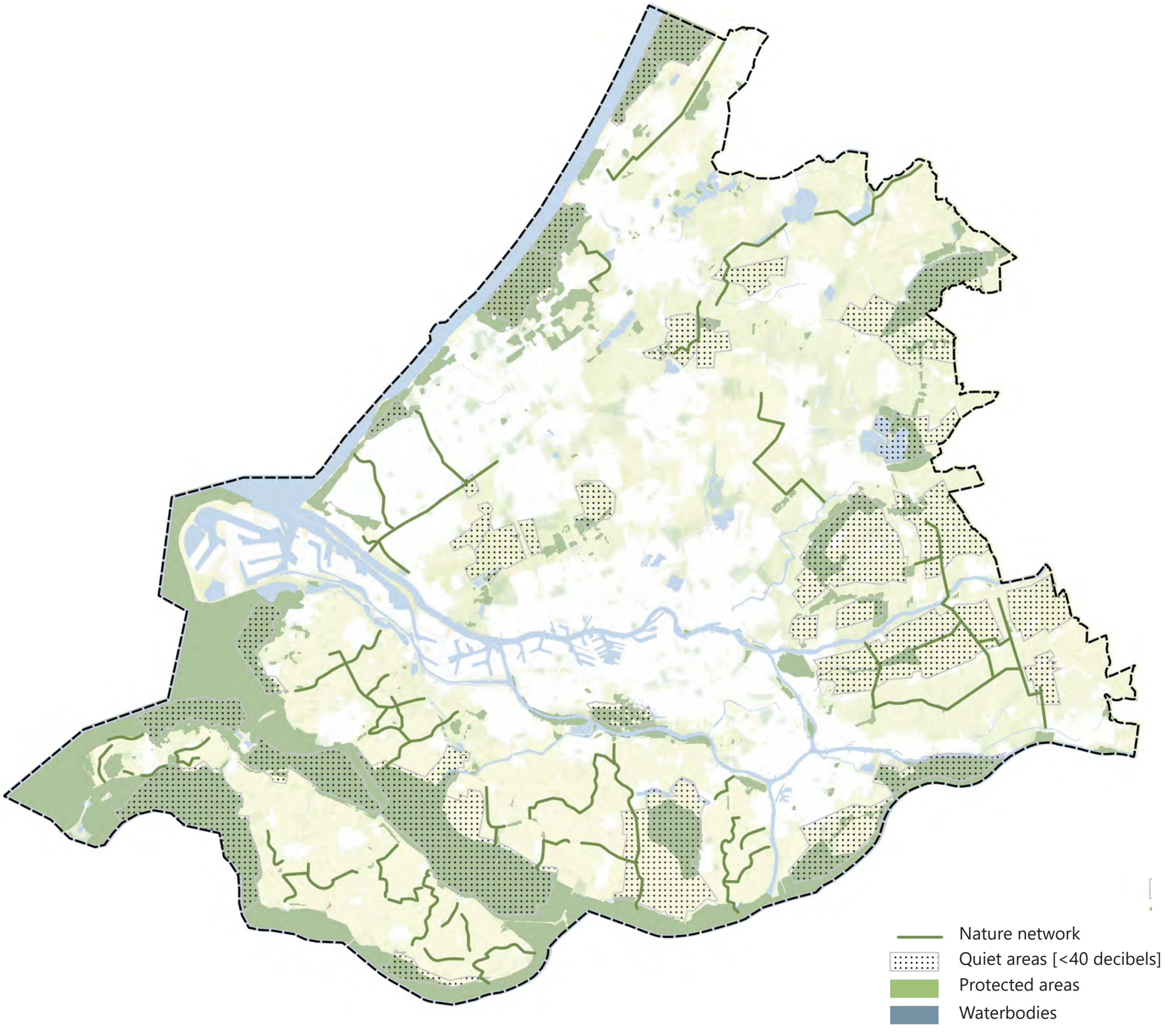
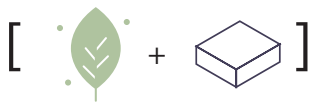


Fig. 21: Current nature networks in South Holland.
Figure by author (Nationaalgeoregister.com)

4_3 Biodiversity loss



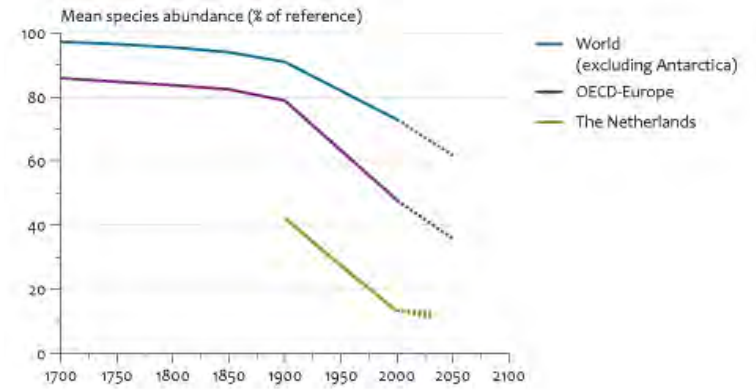


Fig. 22: Development of biodiversity in the Netherlands.
By Nootenboom et al., 2006

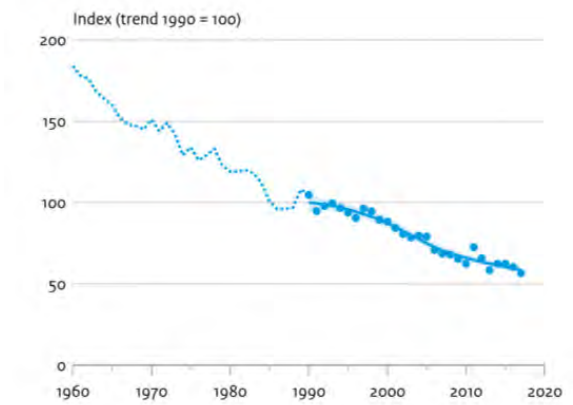


Fig. 23: Farmland birds in the Netherlands.
By Nootenboom et al., 2006

The term biodiversity is used to describe the number of species in an area. In this context, it is often associated as well with the diversity in form and function of living things and used as a synonym for life on earth (Swingland, 2000). Biodiversity is essential for existence on earth and urgently needs to be strengthened and protected (Chivian & Bernstein, 2010).

However, since detailed records were kept, it has declined strongly worldwide and is still doing so. In the Netherlands, the situation is particularly dramatic. Almost the entire country has been settled or cultivated as a result of the intensification of agriculture and urbanisation that began in the 20th century, leaving only little space for nature. Although the protection of certain Natura 2000 sites that can be seen in Figure 21 has had a positive effect on biodiversity, the remaining nature is still under strong pressure. A major cause of this is agriculture. Through intensified and monofunctional land use, extensive use of pesticides and fragmentation of the landscape, ecosystems are being destroyed or damaged (PBL, n.d.). Especially insects and field and meadow birds, as can be seen in Figure 23, have shown a strong decline (PBL, 2014).

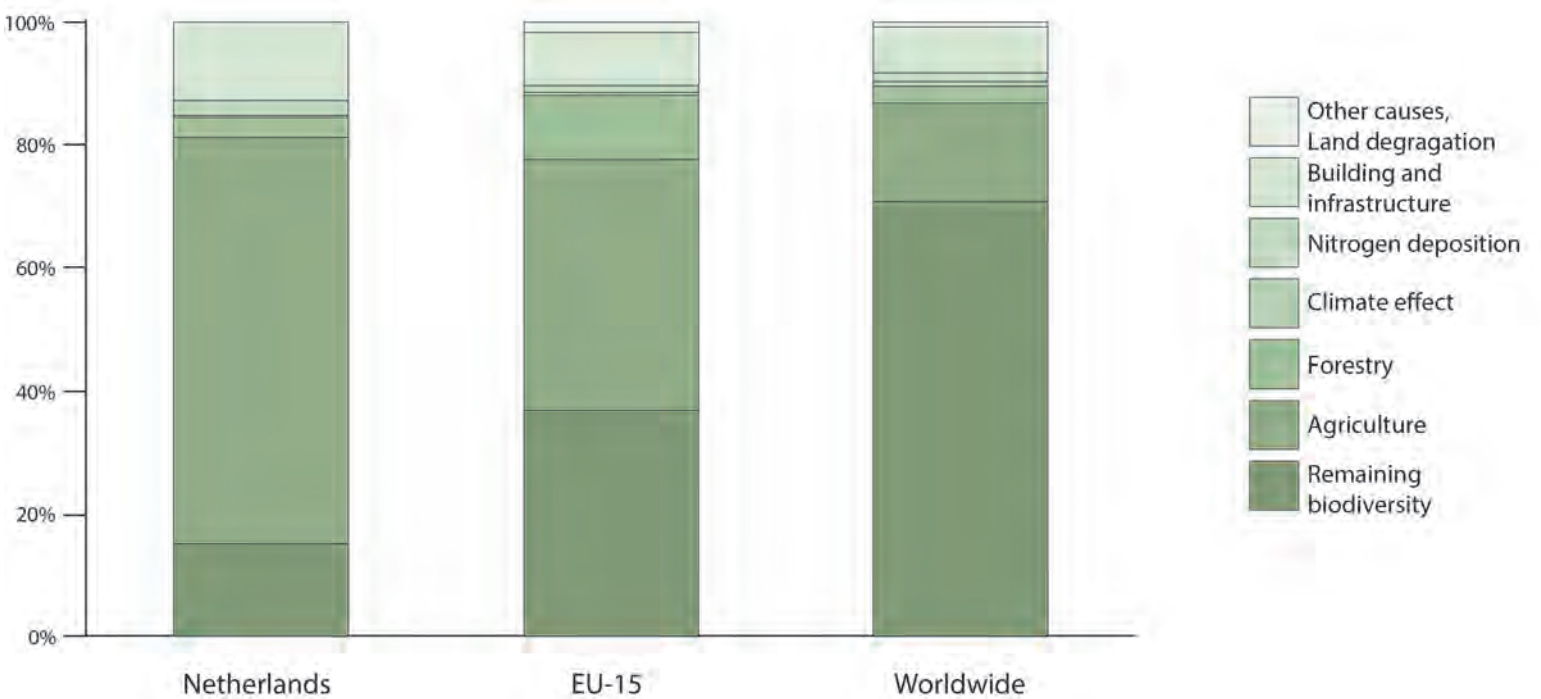


Fig. 24: Biodiversity loss in 2000 compared to original natural situation in the world. Figure by author (Nootenboom et al., 2006)

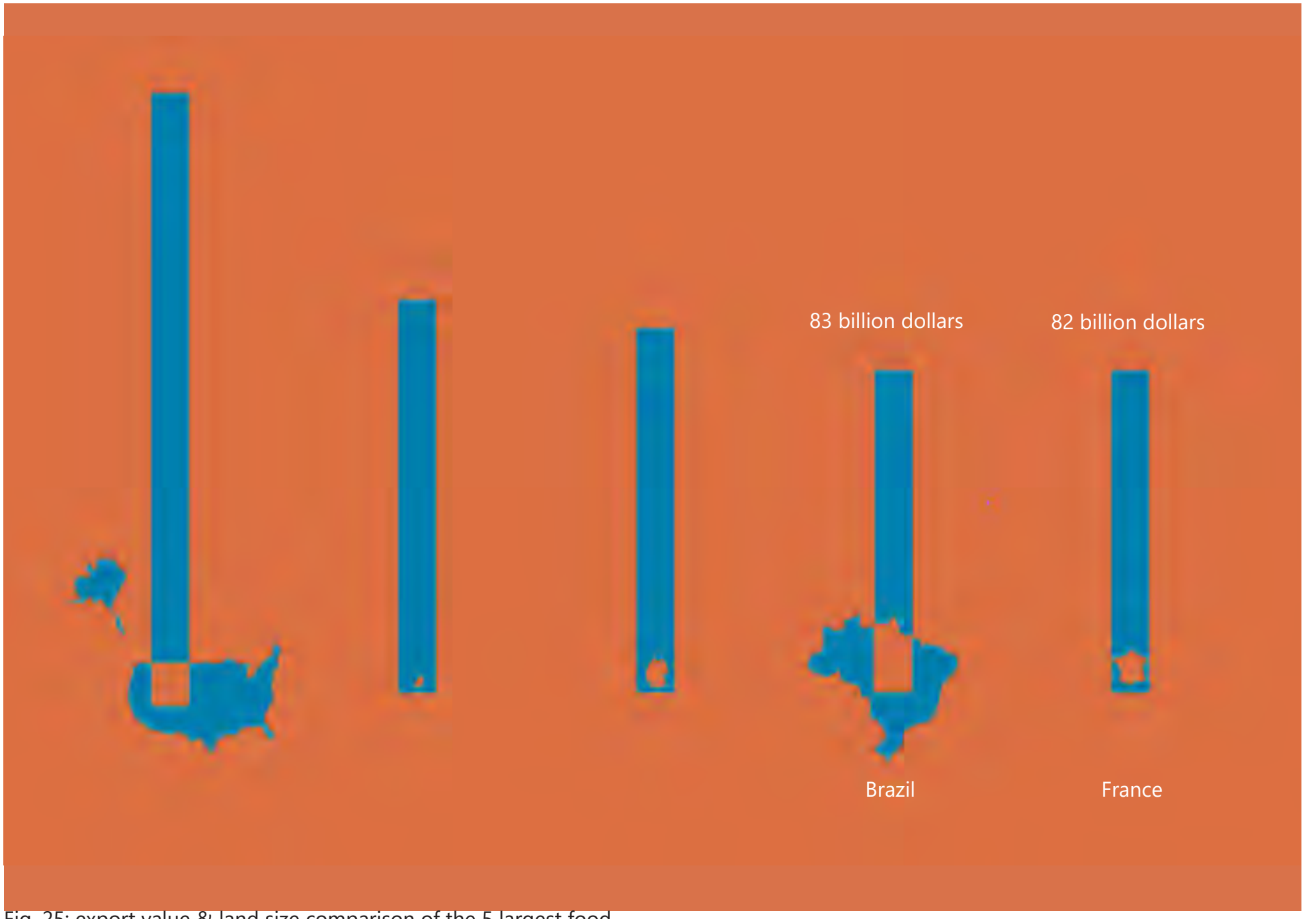


Fig. 25: export value & land size comparison of the 5 largest food exporteurs. (PBL, 2014)

4_4 Economic strengths of the agriculture sector

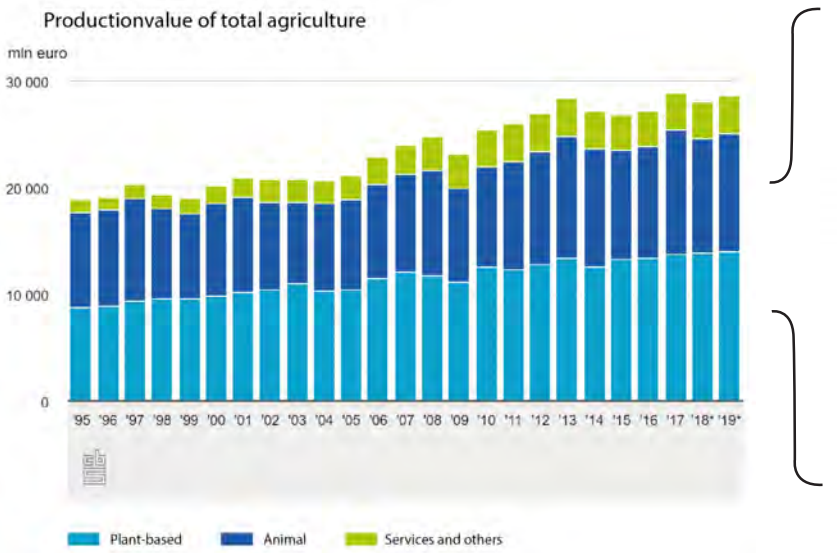


Fig. 26: Production value of the agriculture industry per sector (CBS, 2020) Afrian, K. R. V. D. W. (2020, 7 mei).

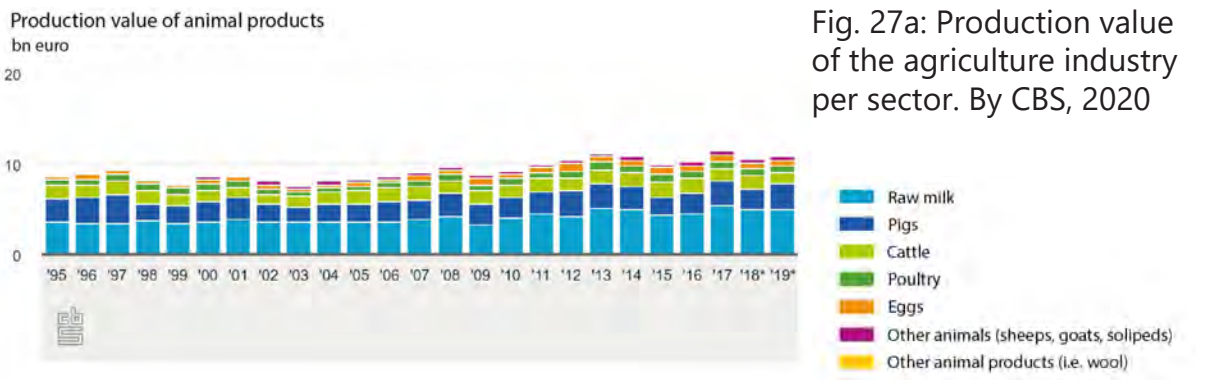


Fig. 27a: Production value of the agriculture industry per sector. By CBS, 2020

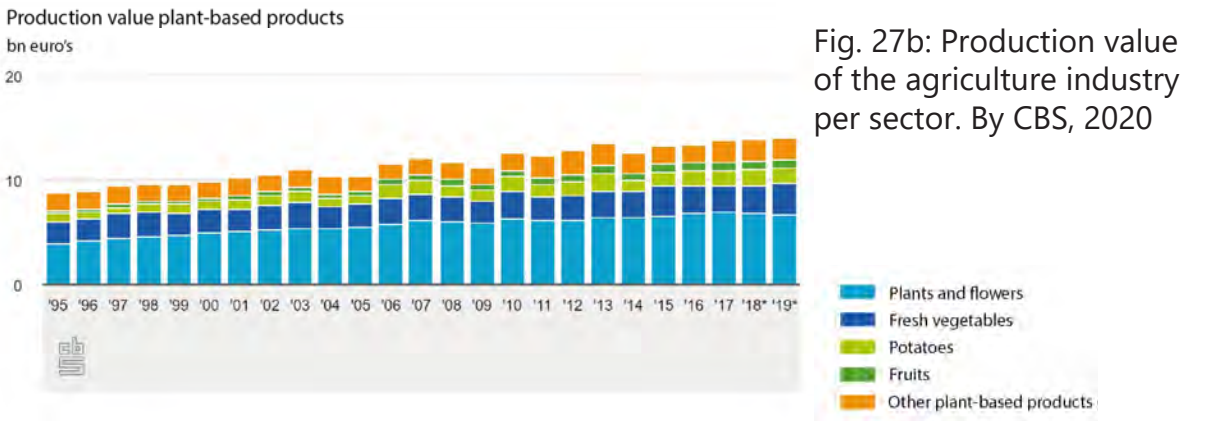


Fig. 27b: Production value of the agriculture industry per sector. By CBS, 2020

The economy of the agricultural sector

The Netherlands is with a stunning export value of 101 billion dollars the second largest exporter of food in the world (PBL, 2014), which is quite remarkable for a small country with a high population density. The largest contributor to this export is the meat industry (CBS, 2019). Export of dairy products has become part of the Dutch identity due to the abundancy in its typical landscapes; the wide and open polder landscapes have shaped the Dutch Cultural landscape to its current state.

The total agricultural sector provides the dutch economy with a total of 1,4% (CBS, 2018) of the gdp, but when taking in account the full agrocomplex, which also incorporates processing & distribution companies, the industry provides 6,4 % of the total dutch gdp (CBS, 2018).

CBS divides the sector in three different categories, as can be seen in figure X, to evaluate production value. The production value of animal production consists of 38,5% of the total production value while plant-based products generate 49,2% of the complete production value.

When taking a closer look at these numbers it becomes clear that floriculture is the biggest part of the production value of plant based products. Although it is the biggest contributor to the production value, its value is currently declining, a similar decline is visible in the period of 2007-2009 during which the Netherlands was battling an economic crisis. This crisis is also visible in the total production value, yet as the floriculture is now behaving in a similar way as in 2007-2009 the overall plant-based production is not. We speak of decline within a sector that is growing, the complete production value of plant based trades has risen for the past five years, this is mainly due to a 13% growth in value of the vegetable industry. (CBS, 2019)

The animal produce sector has been fluctuating for the past 5 years, the pork industry is one of the main katalysators of these fluctuation. China has been having problems with the African swine flu, hence the price of pork meat has risen significantly in the past year and has achieved the highest value of the past 20 years. All meat products other than pork experience very little change, it is a secure sector with little fluctuations.

So although the meat industry is a big & secure part of the production value, the vegetable industry is experiencing much higher growth rates. The Dutch agricultural sector is robust and a big part of the Dutch economy.

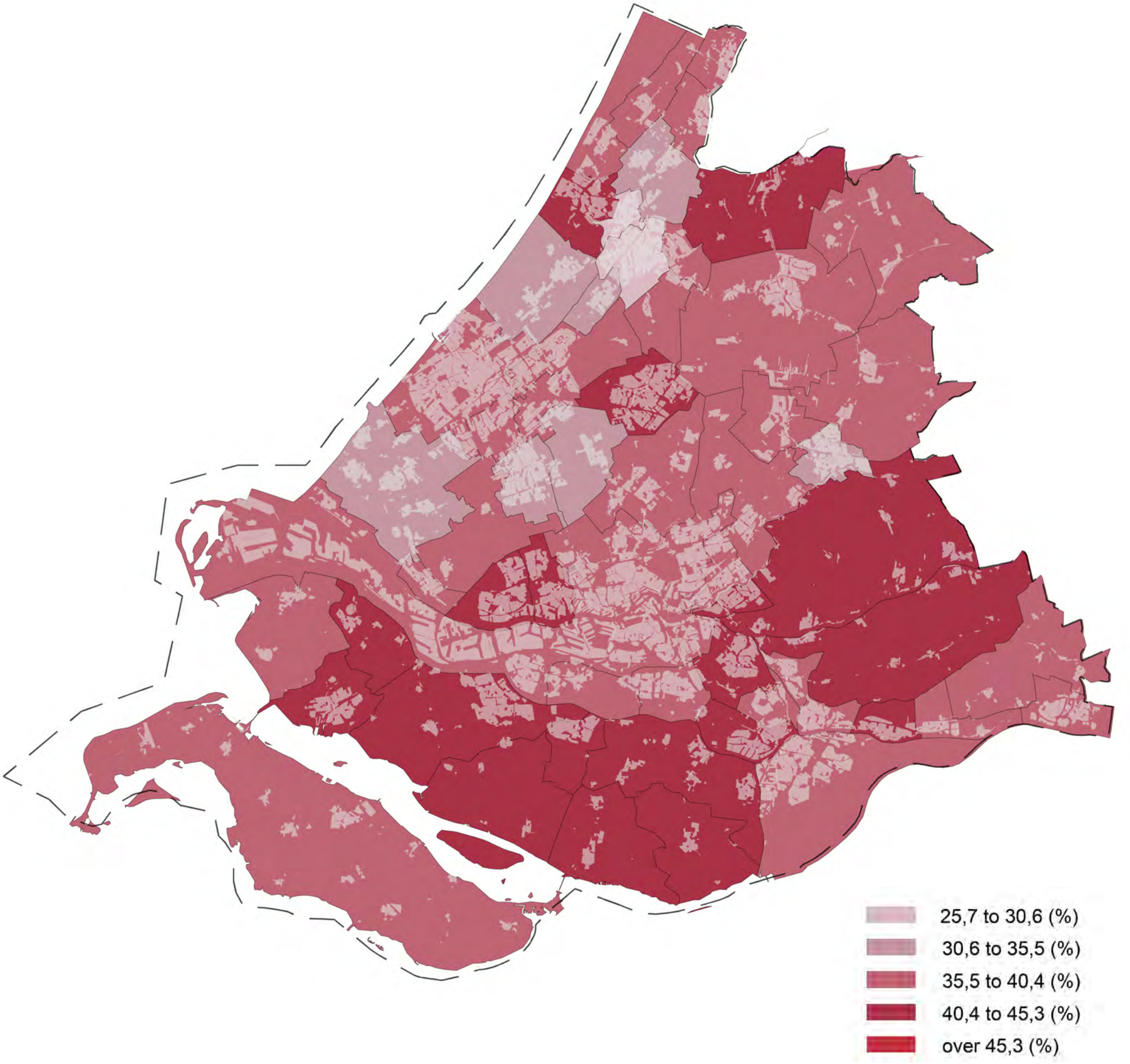


Fig. 28: Obesity percentages in South Holland. Figure by author (Statline)

4_5 Obesity and overweight issues

[♥]

Fig. 29: Dietary habits in Delft's center on market day. Photo by authors.

The Dutch diet has changed significantly over the past decades. Increased economic prosperity has had an important influence in this, since people are now able to buy bigger quantities and better quality of food. The supply of food has also grown considerably larger as a result of the intensified agricultural production and the prevalence of big consumption chains.

Although there is an economic inequality among households, the share of money people spend on their food is approximately the same in all income groups, due to the fact there are usually more households in the highest income groups. As long as the distribution of the budget across food categories is concerned, the biggest trend that is observed is the decrease in bread and potatoes consumption and the increase of animal products, meaning meat, fish and dairy products. An average Dutch person in the '50s ate more than 350 grams of potatoes per day whereas today this amount 230 grams. In over half a century, the average person has increased his cheese consumption by three and a half times.

Malnutrition and nutritional deficiencies may belong in the past but the largest part of the population could still benefit from a healthier diet within the official guidelines. This would entail eating more fruit, vegetables and fish, and less saturated fats. The Dutch hardly eat the recommended 200 grams of vegetables per day, while only 2 percent of young adults (19-29 years) consume 150 grams a day. In the case of milk, full-fat milk has been largely replaced by alternatives which contain less fat.

The above described abundance of food and animal products has clearly made it more difficult to keep the balance between eating and exercising and has marked its impact on the population's health. Nationally representative data collected in 2016 show that 54 percent of men and 43.4% of women aged 20 years and older were overweight. The ratio of men and women that were obese was 18.1% and 19.5% respectively (Fig. 32). These are considerably higher ratios compared to twenty years before, when 39 percent of men and 31 percent of women exceeded the suggested weight (Statistics Netherlands, 2012).

Increase of diabetes

A healthy diet and a balanced body weight contributes to good health overall. A disease that is closely linked to obesity is diabetes. In 2011 4.7% of the population had diabetes, nearly twice as the 2.8% in 2001. This rise is not solely related to the growing number of obese people, but also to the fact that people nowadays live longer. The risk of diabetes rises with age and is influenced by increased weight (World Health Organisation, 2013)

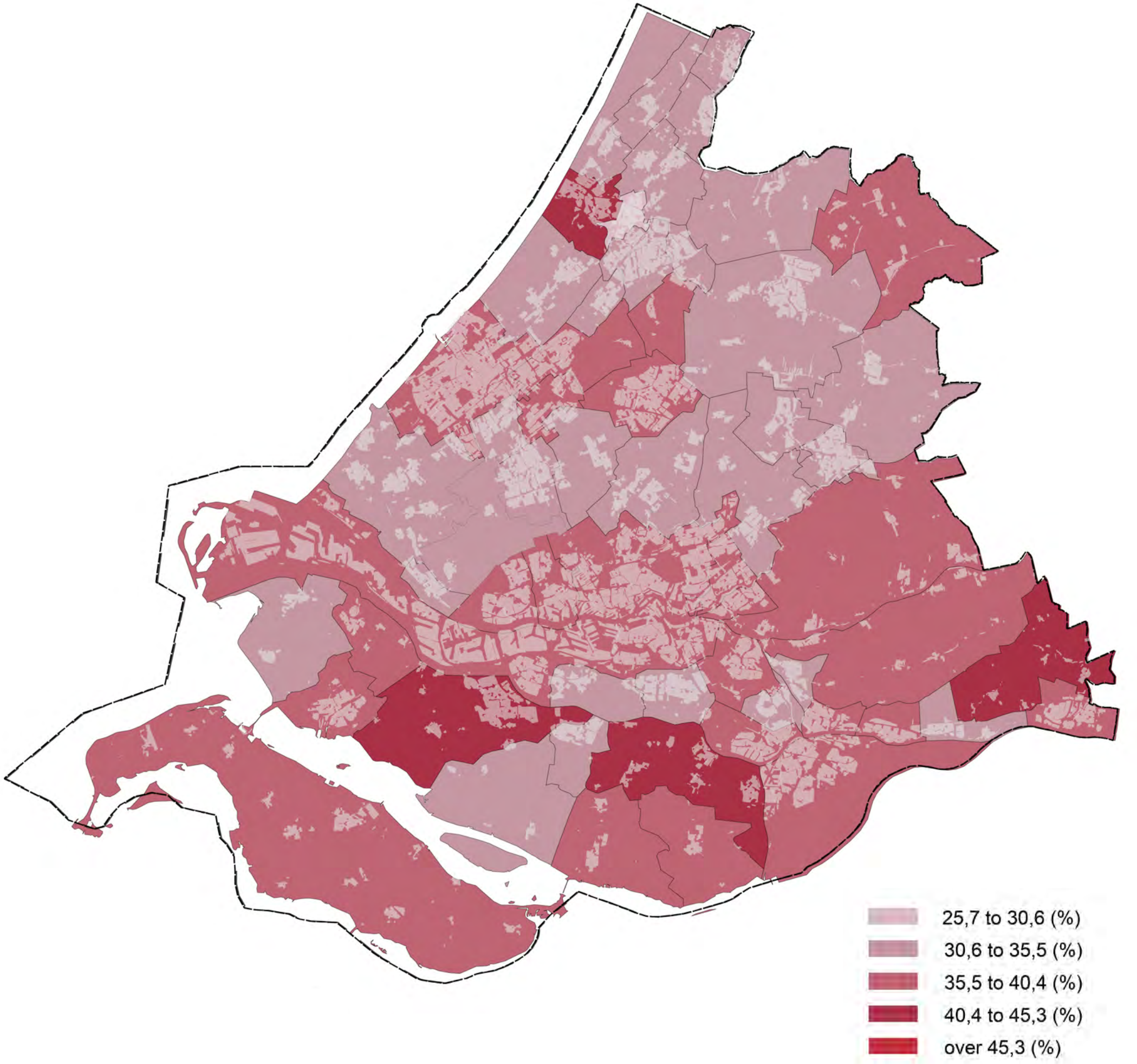


Fig. 30: Overweight percentages in South Holland. Figure by author (Statline)

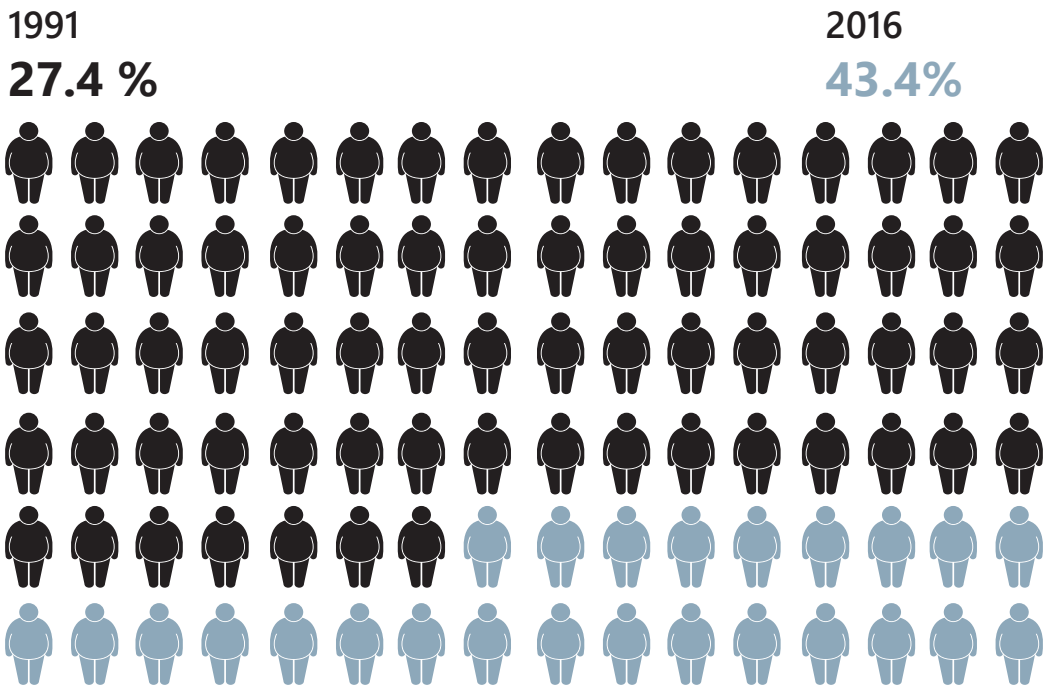


Fig. 31: Overweight percentages in the Netherlands. Figure by author (Statistics Netherlands, 2012)

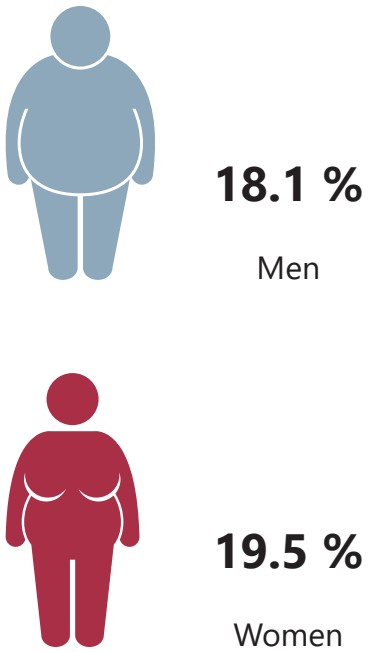
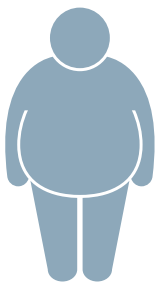


Fig. 32: Obesity percentages in Netherlands in 2016. Figure by author (Statistics Netherlands, 2012)

Types of diabetes

Type 1

Often occurs in teens or early adulthood. 10% of patients have Type 1 diabetes



Type 2

Emergence of Type 2 is increased in overweight, inactive or older people. 90% of patients have Type 2 diabetes.

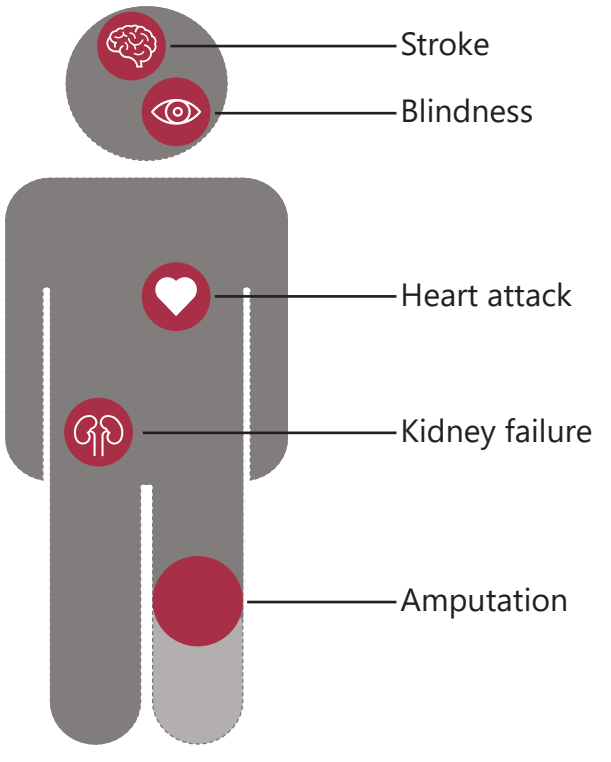
Gestational

Occurs during pregnancy.

Fig. 33: Facts about diabetes. Figure by author (Statistics Netherlands, 2012) _34

Consequences

Diabetes can lead to many complications in many human organs and ultimately, increase the risk of premature death.



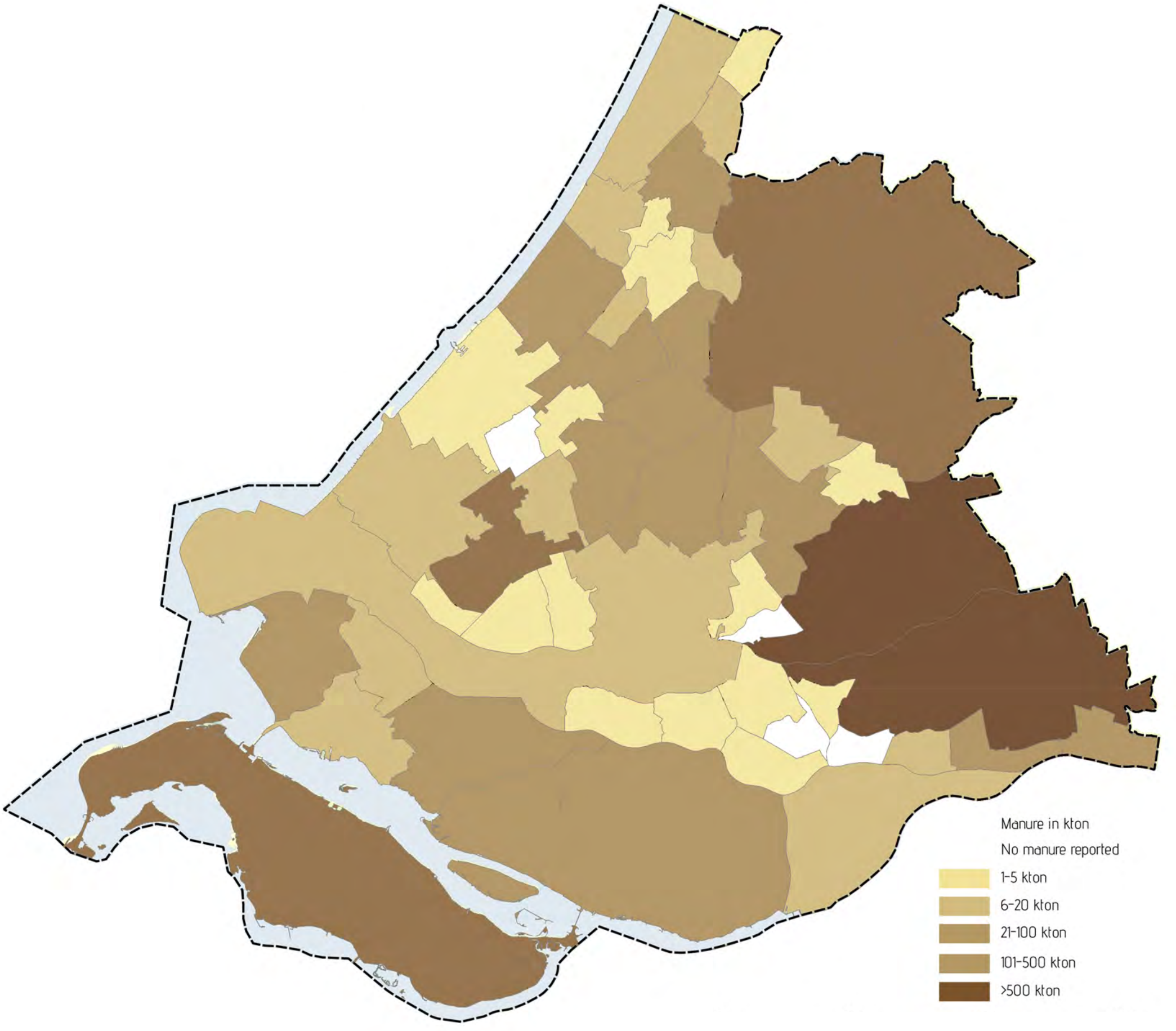
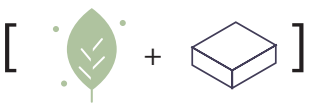


Fig. 34: Distribution of produced manure in South Holland.
Figure by author (Nationaalgeoregister.com)

4_6 It all comes down to manure



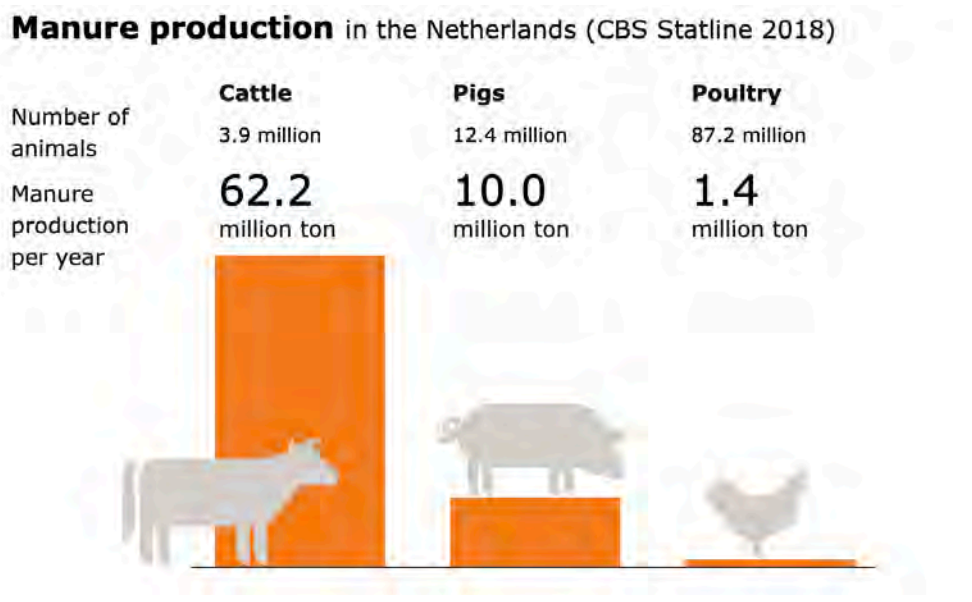


Fig. 35: Yearly manure production in the Netherlands per livestock. By Wageningen Livestock Research, 2014)

Despite its small size, the Netherlands has a rather large number of livestock farms. In comparison to the European average, Dutch farms have four times the amount of animal biomass per hectare (Stokstad, 2019). Their intensive production and high imports of feed and mineral fertilisers have led to a high abundance of manure and nutrients in the country. A total of 72 billion kilograms of manure was produced on Dutch livestock farms in 2010, which was reused as fertiliser (PBL, 2014).

Animal manure is in itself an important basis for Dutch agricultural production and provides plants with important nutrients to increase their productivity. However, the plants cannot completely absorb the abundance of manure, which can lead to contamination of soil and water or evaporation as ammonia. These pollutants are particularly nitrogen and phosphates (Wageningen Livestock Research, 2014). For example, the unabsorbed nitrogen will get into surrounding waters and lead to algal blooms, which in turn are deadly to some marine life.

Overfertilisation also leads to problems on the fields themselves. The soil becomes acidic and damages the roots of the plants, making them unable to absorb enough nutrients, necessitating human intervention (Stokstad, 2019). In South Holland, manure production is particularly concentrated in the east and on Goeree-Overflakkee in the south (See figure 34). This is mainly due to past use, as these regions also have the highest density of livestock.

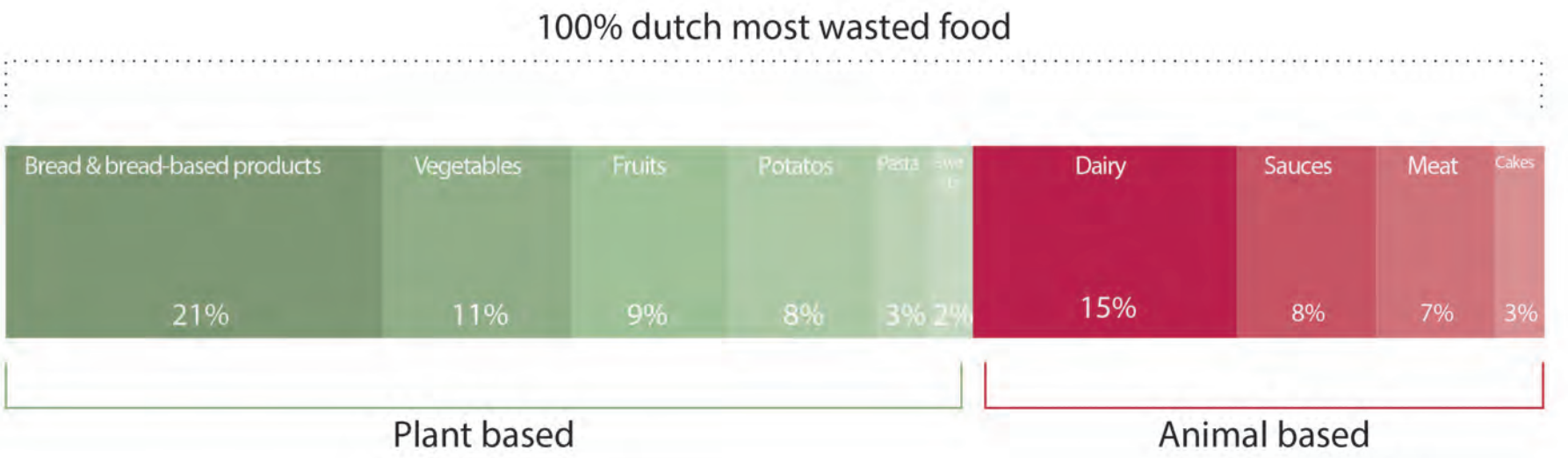


Fig. 36: Most wasted types of food in the Netherlands. Figure by author (van Dooren, 2019)

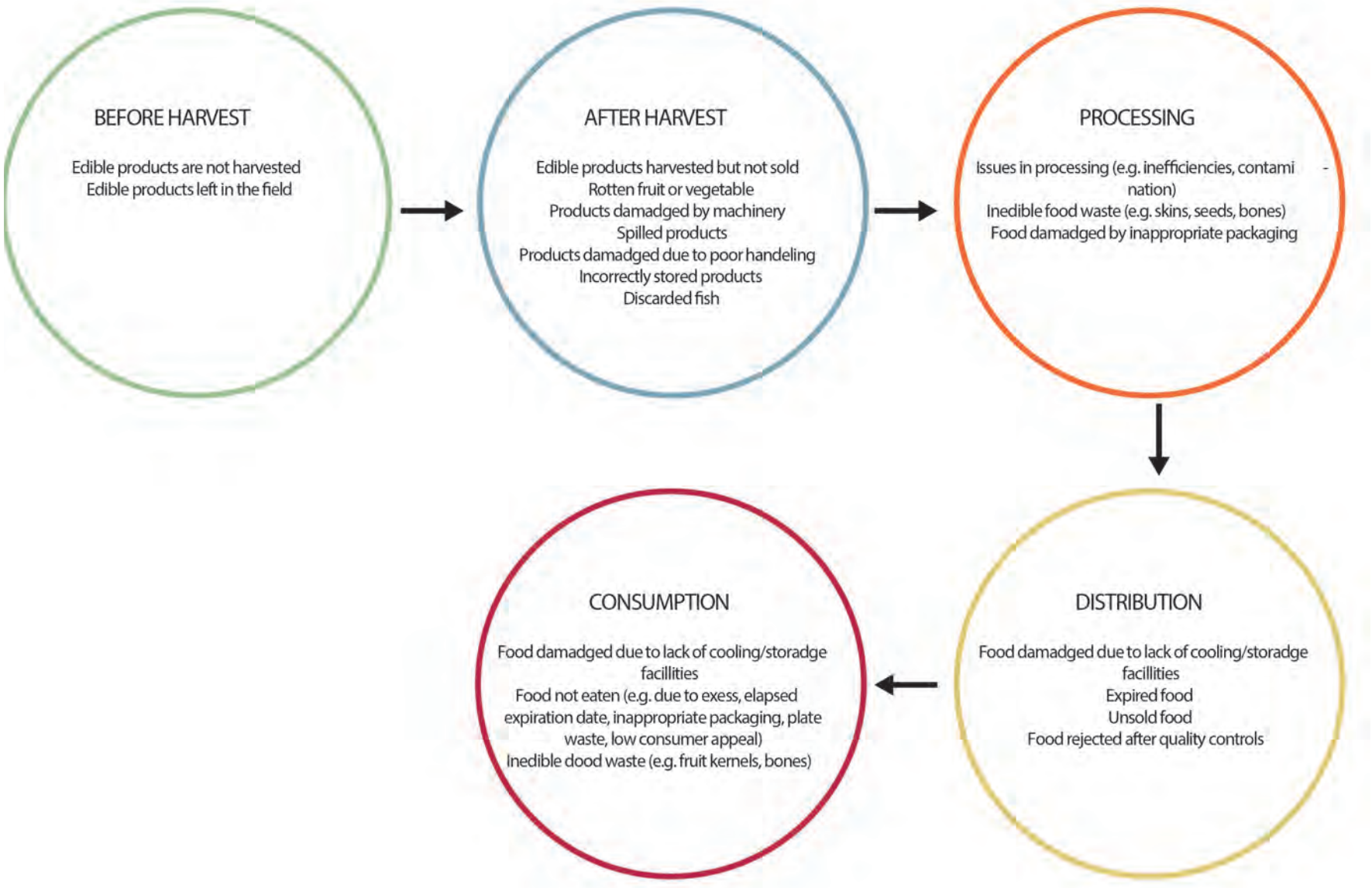


Fig. 37: Food waste in the different stages of the food production. Figure by author (Sanchez et al., 2020)

4_7 Are you gonna finish that? The battle against food waste

Fig. 38: Wasted food. By

Food waste is a key issue in ensuring sustainable development becausee of its direct economic, social and environmental impacts. The United Nations has set a goal in its sustainable development target 12.3 that "by 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses" (United Nations, 2015). Also the European Union has taken up the issue and names food waste as one of the central topics in its farm to fork strategy published in May 2020 (European Union, 2020).
Worldwide, up to one third of the products intended for humans in the food industry are not consumed, which entails a waste of a wide variety of different resources that must be avoided in the future to provide a more sustainable Europe (Gustavsson et al., 2011).

What is food waste?

Food waste is defined as food that was intended for human consumption but was discarded or used elsewhere beforehand. Most often, we talk about avoidable and unavoidable food waste. The unavoidable includes inedible parts of food that are removed in different production stages of the food chain (Gustavsson et al., 2011).

What is wasted where?

Food waste occurs throughout the entire food supply chain. It starts in agricultural production and ends in the consumption behaviour of households. In the Netherlands, consumers account for the largest share of food waste, between 30 and 50 per cent. Even food that was actually suitable for consumption is therefore mainly burnt in the rubbish without any added value. Per person, approximately 34 kg of food was thrown away in Dutch households in 2019 (van Dooren, 2019). This is a full 8-11% of their annual food purchase, which also results in an annual expenditure of 150 euros per person. As can be seen in Figure 36, foods such as bread, dairy products, vegetables and fruits account for the largest share of wasted food.
In contrast, the waste generated by production in the Netherlands is relatively low. The 10 to 20 percent of losses are mostly caused by process losses (see Figure 37) or by other uses, such as biogas or fodder production (Soethoudt & Timmermans, 2013). Food waste also occurs in supermarkets. These can usually be attributed to mismatches between inventory and demand as well as product damage (Het Groene Brein, n.d.).

What are the consequences of food waste?

In addition to the losses on the consumer side, food waste has other significant consequences. As the agricultural sector in its current state is already a heavy burden on the environment, this situation is only exacerbated when food is wasted instead of consumed. It leads not only to environmental consequences, such as the heavy use of resources like water, soil and energy, but also to economic and social consequences. The environmental impact of food waste increases throughout the supply chain and the later a product is wasted, due to the cumulative inputs (Scherhaufer et al., 2018). According to the European Commission, the best way to tackle this in industrialised countries is to educate people and create greater awareness amongst the food industry, retailers and consumers. In addition, a good and safe alternative use must be found for food that is thrown away, in order to turn the process into a cycle (Sanchez et al., 2020).

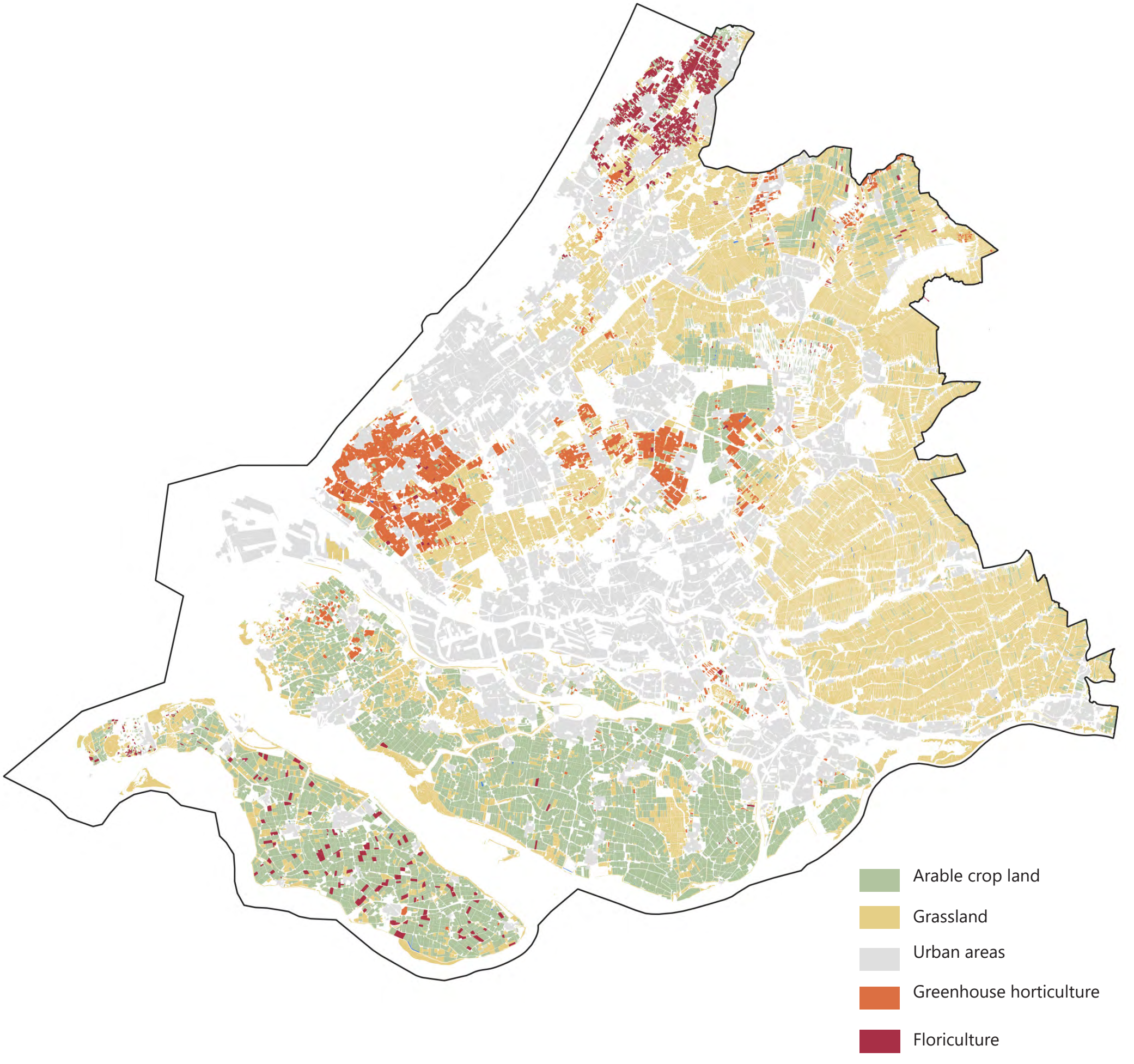
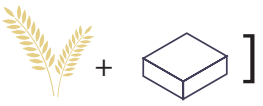
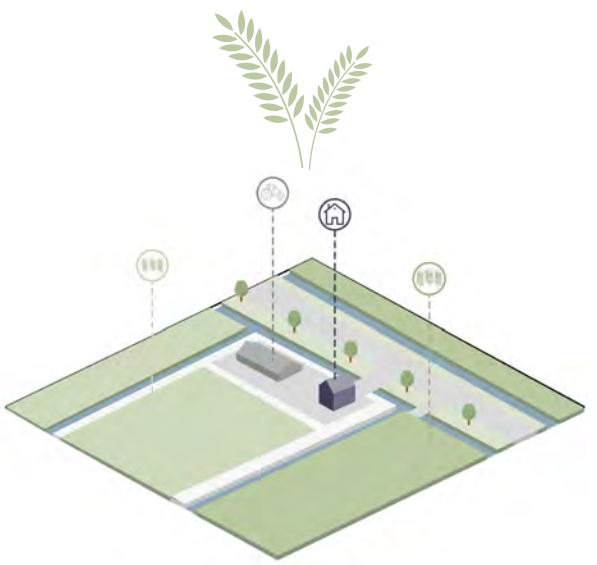


Fig. 39: Detailed landuse of agriculture in South Holland.
Figure by author (Nationaalgeoregister.com)

4_8 Production typologies





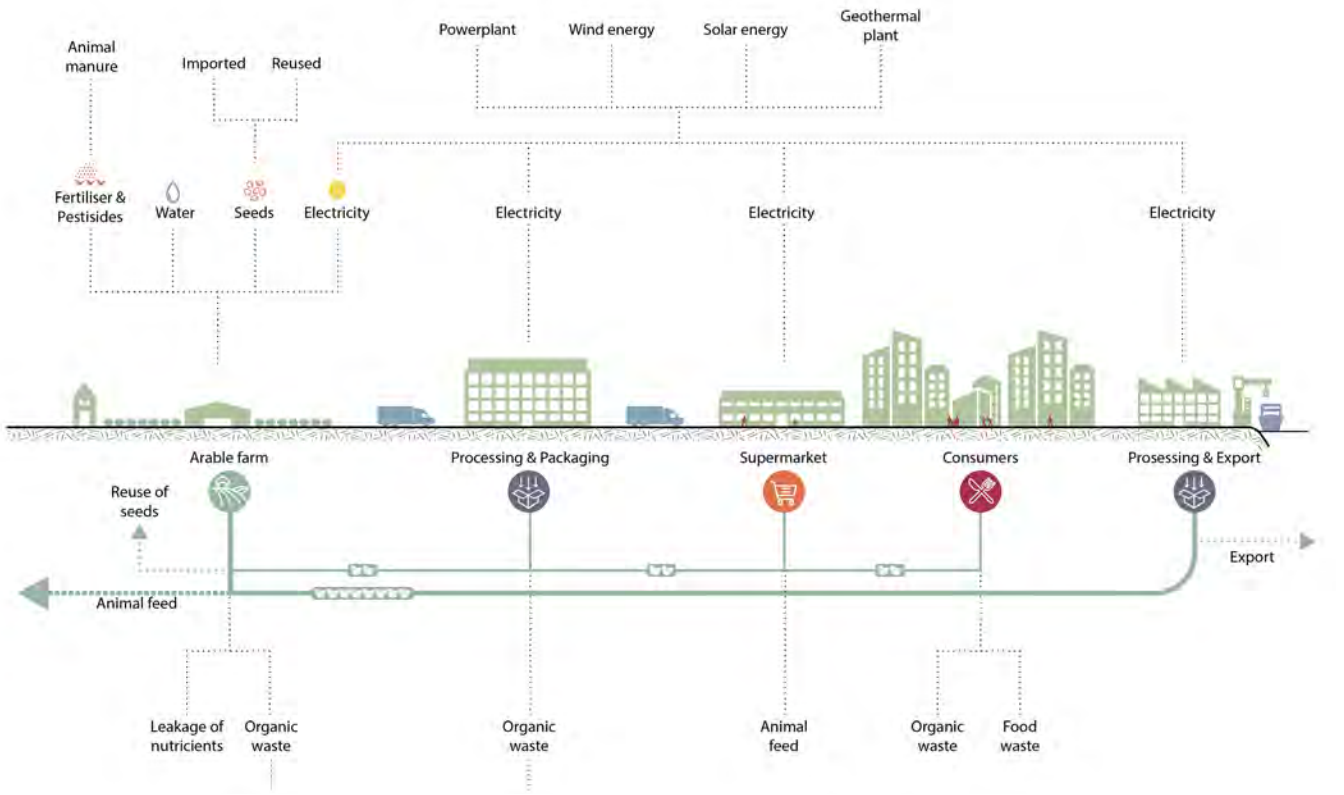
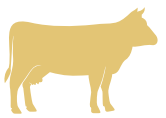
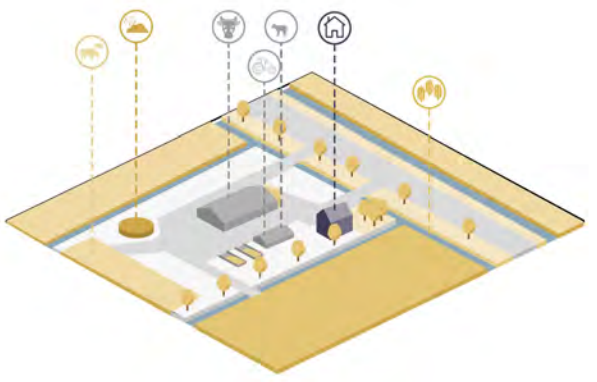


Fig. 40: Arable farm. Figure by author





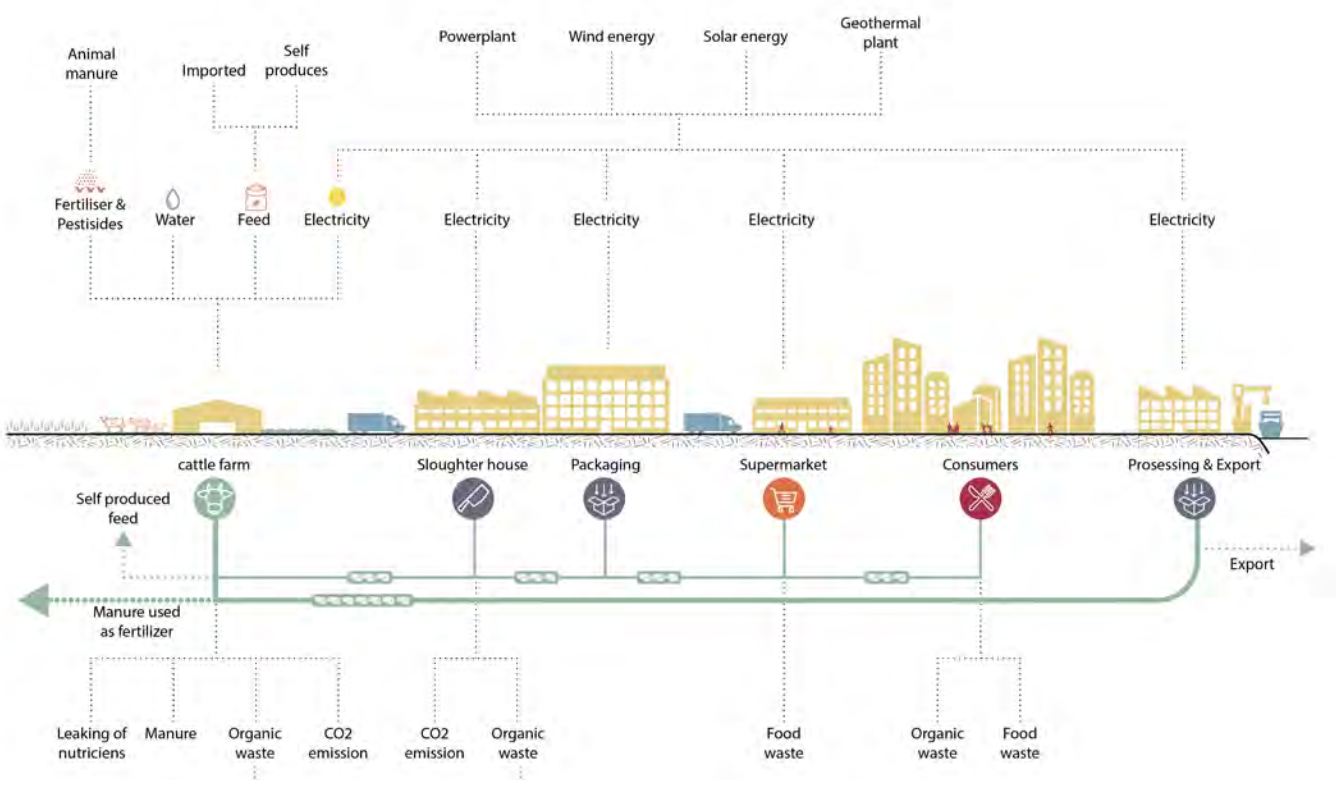


Fig. 41: Livestock farm. Figure by author

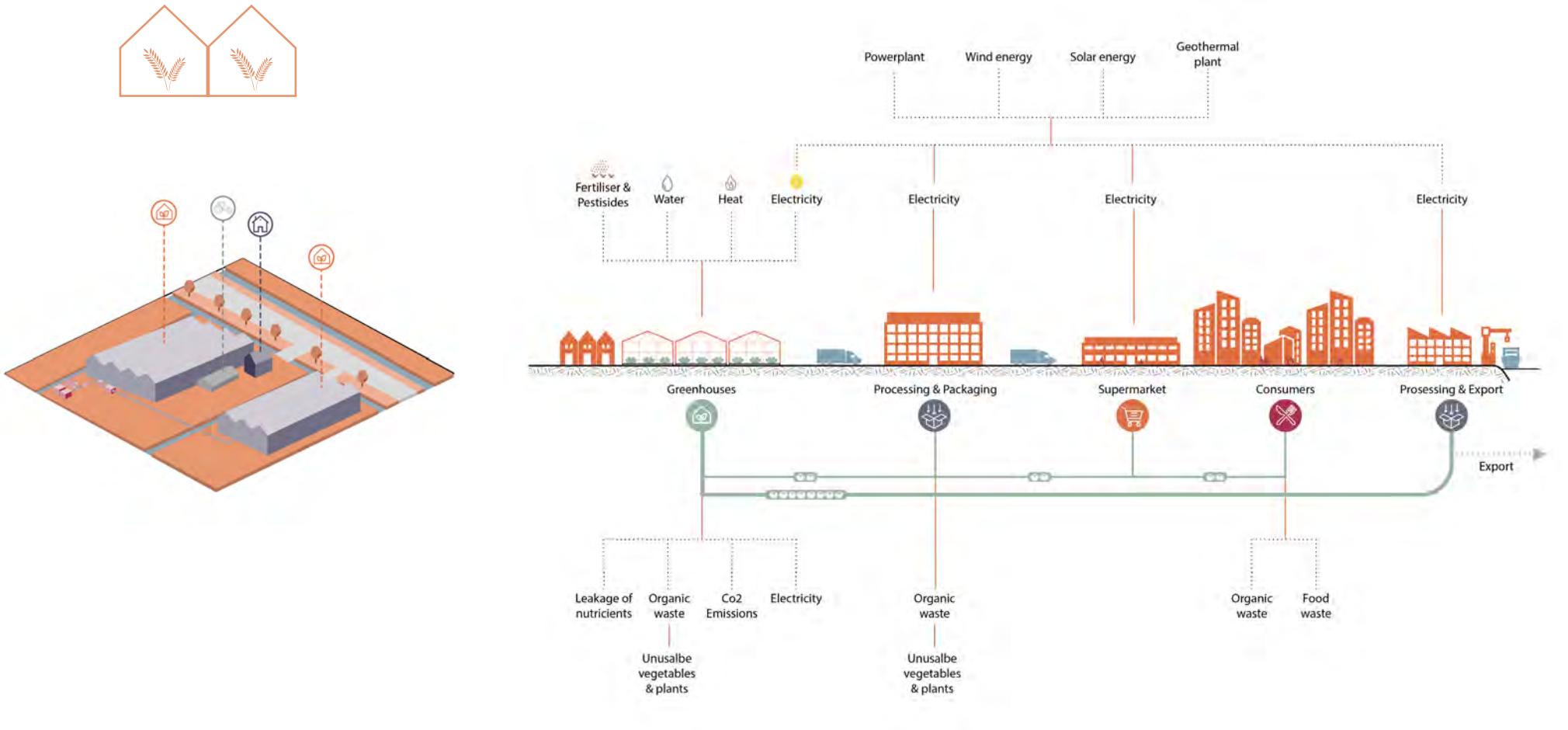


Fig. 41: Greenhouse. Figure by author

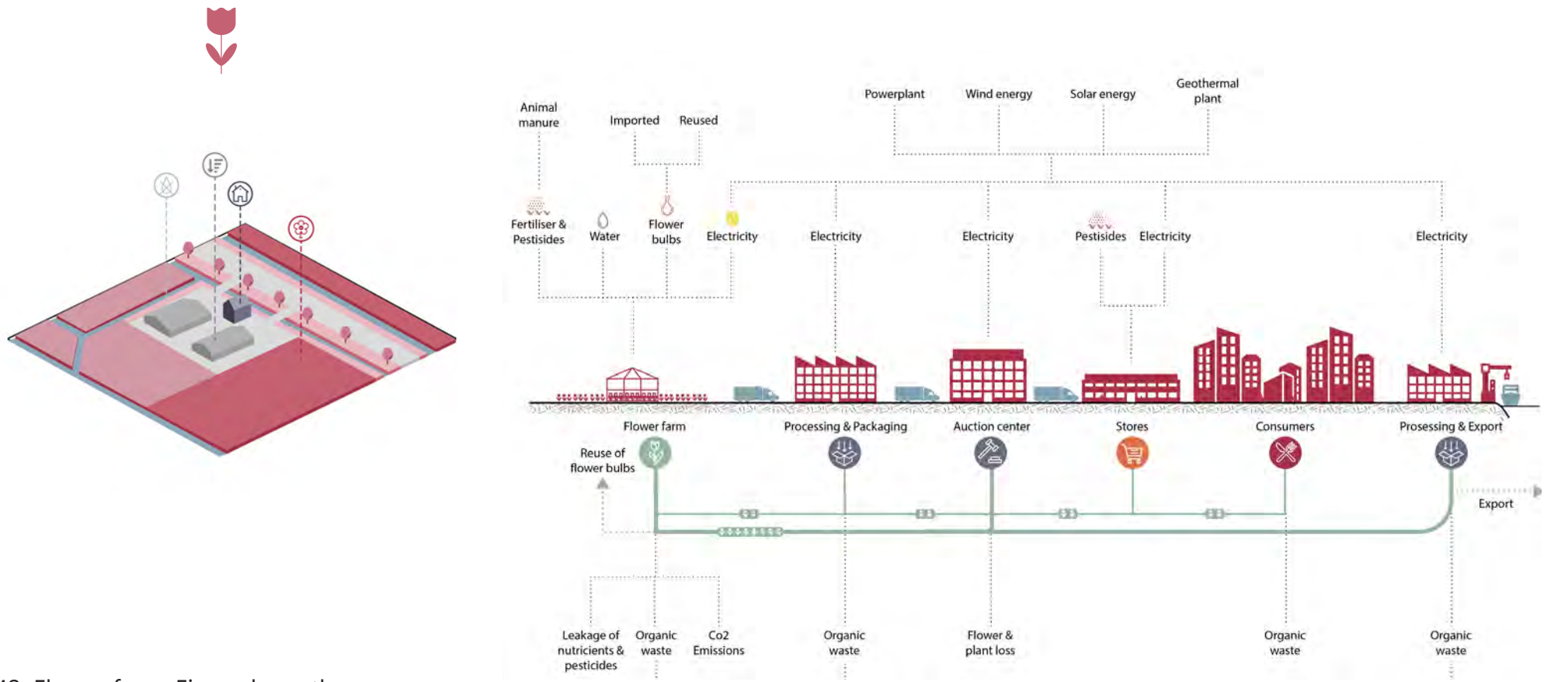
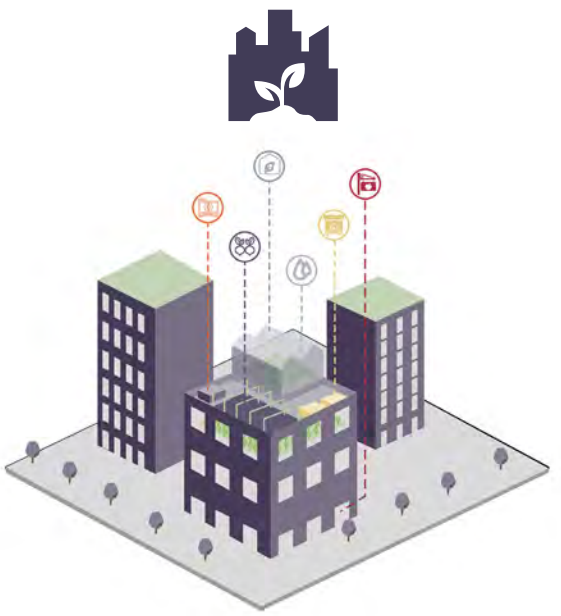


Fig. 42: Flower farm. Figure by author



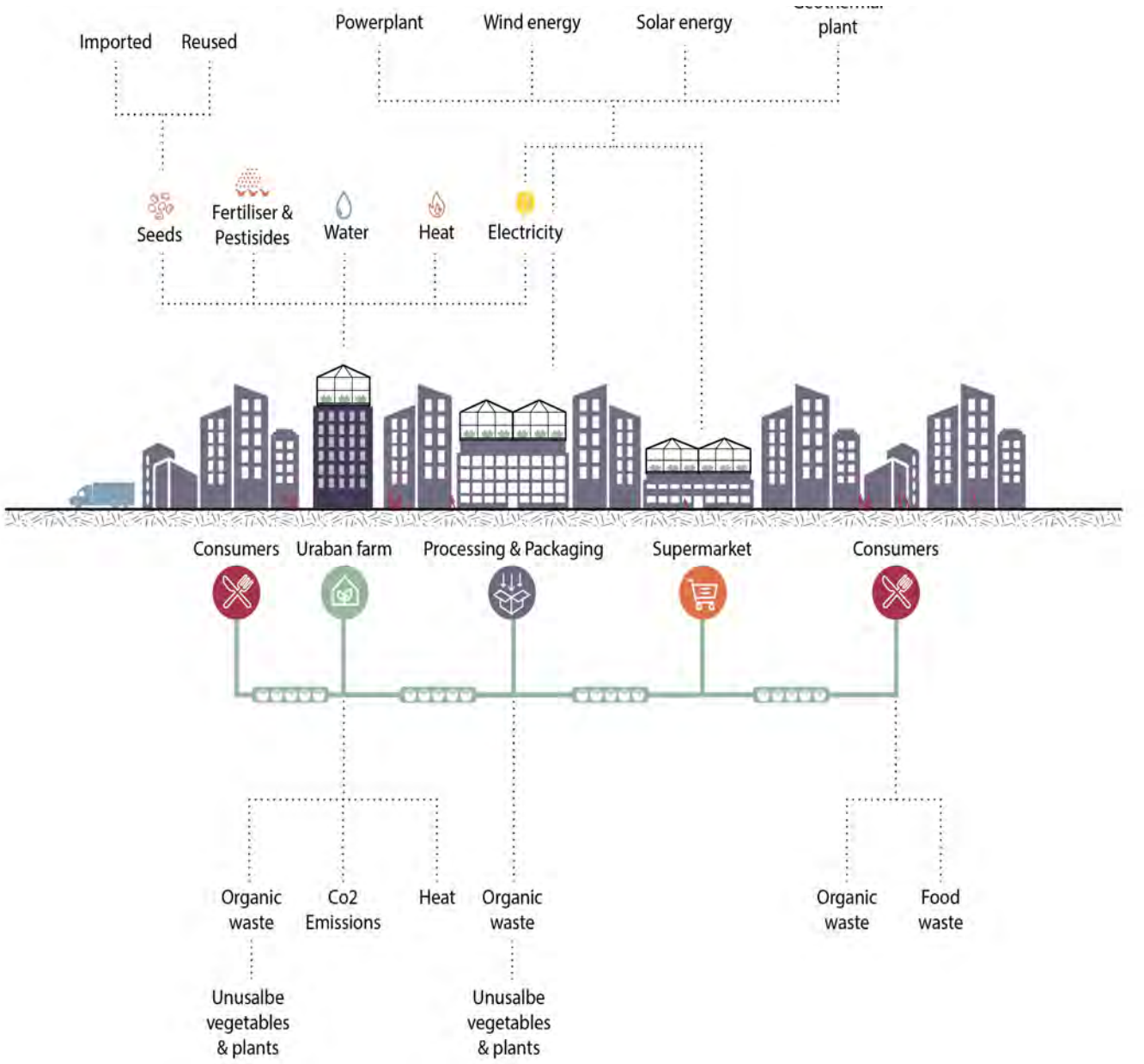
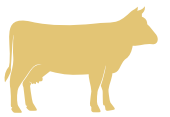


Fig. 43: Urban farm. Figure by author



+ High yield per hectare of food that is important for the diet

+ Produces popular foods

+ Highly productive in producing valuable products

+ Makes NL biggest flower exporter in the world

+ High production rate and has shorter consumption routes

- Current management threatens biodiversity

- Has a large footprint of land use and carbon & nitrogen emissions per product

- Big energy demand and produces green house and nitrogen emissions

- Loses products due to long routes and causes soil pollution while not contributing to nutrition

- Has a big energy demand and is connected to high initial investments

Fig. 44: Positive and negative characteristics of different typologies

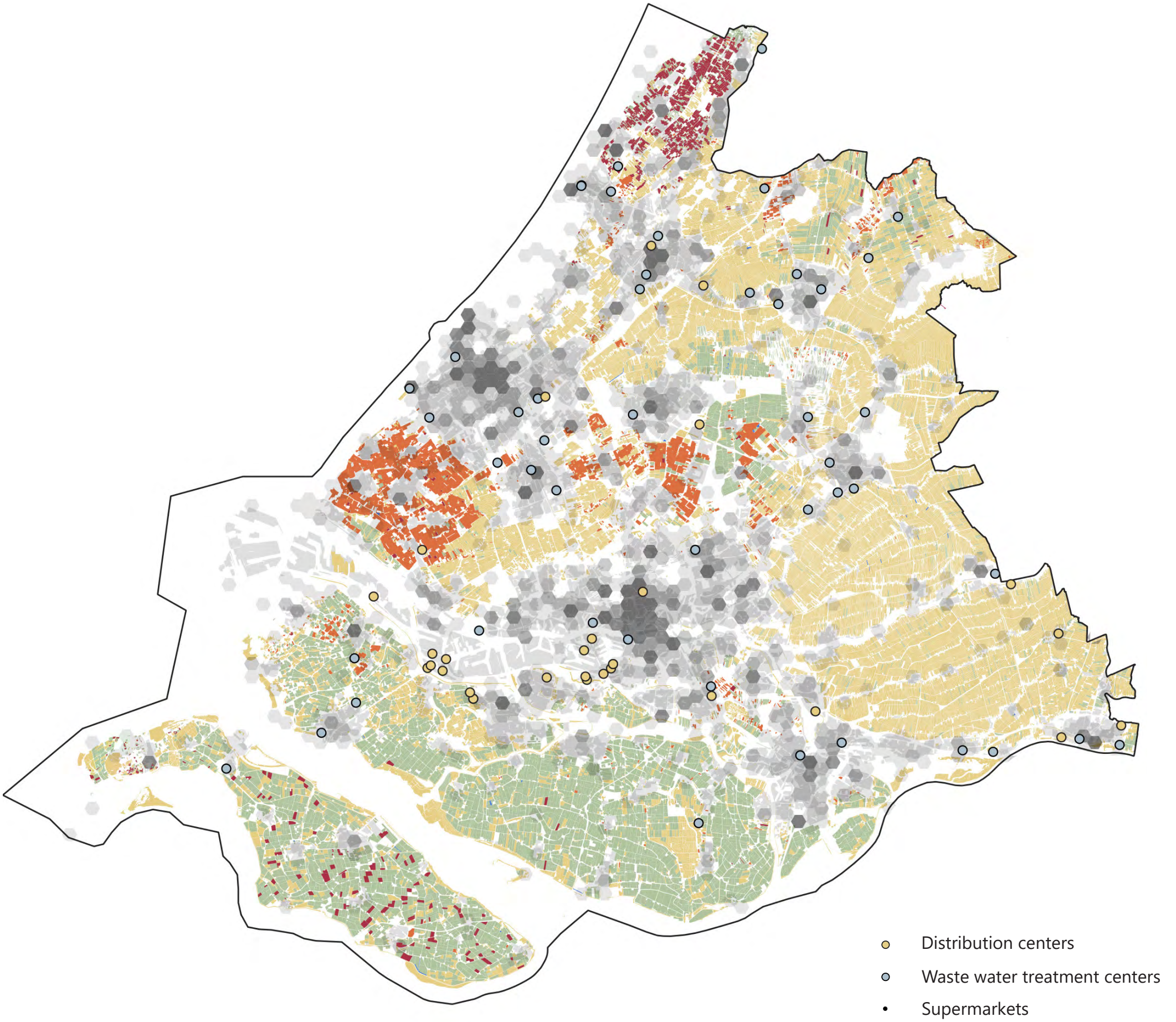


Fig. 45: Localisation of the consumer landscape in South Holland.
Figure by author (Nationaalgeoregister)

4_9 Consumption typologies

[+]

Supermarket

Cafe and restaurants

To get grip on the distribution side of the food-sector and it's corresponding flows as well, it is necessary to map the different consumption typologies and their relationships to other institutes. Four main locations for distribution of foods have been chosen. These provide helpful information about what typologies might prove to be suitable for which kid of interventions. For example, most people buy there foods at supermarkets which are therefore suitable locations to create awareness. Cafés and restaurant could influence what people perceive as good foods, while fast food chains can influence the availability / accessibility of healthy foods. Markets are attractive locations for promotion of local foods, contributing to food mile reduction. Finally, institution canteens, for example at schools and sports facilities, might prove to be a suitable location for creating awareness and promoting a healthy diet due to engagement possibilities and are able to do it from an educative perspective.

Fast food chains

Markets

Institution canteens

Fig. 46: Different typologies of food retail. Figures by author

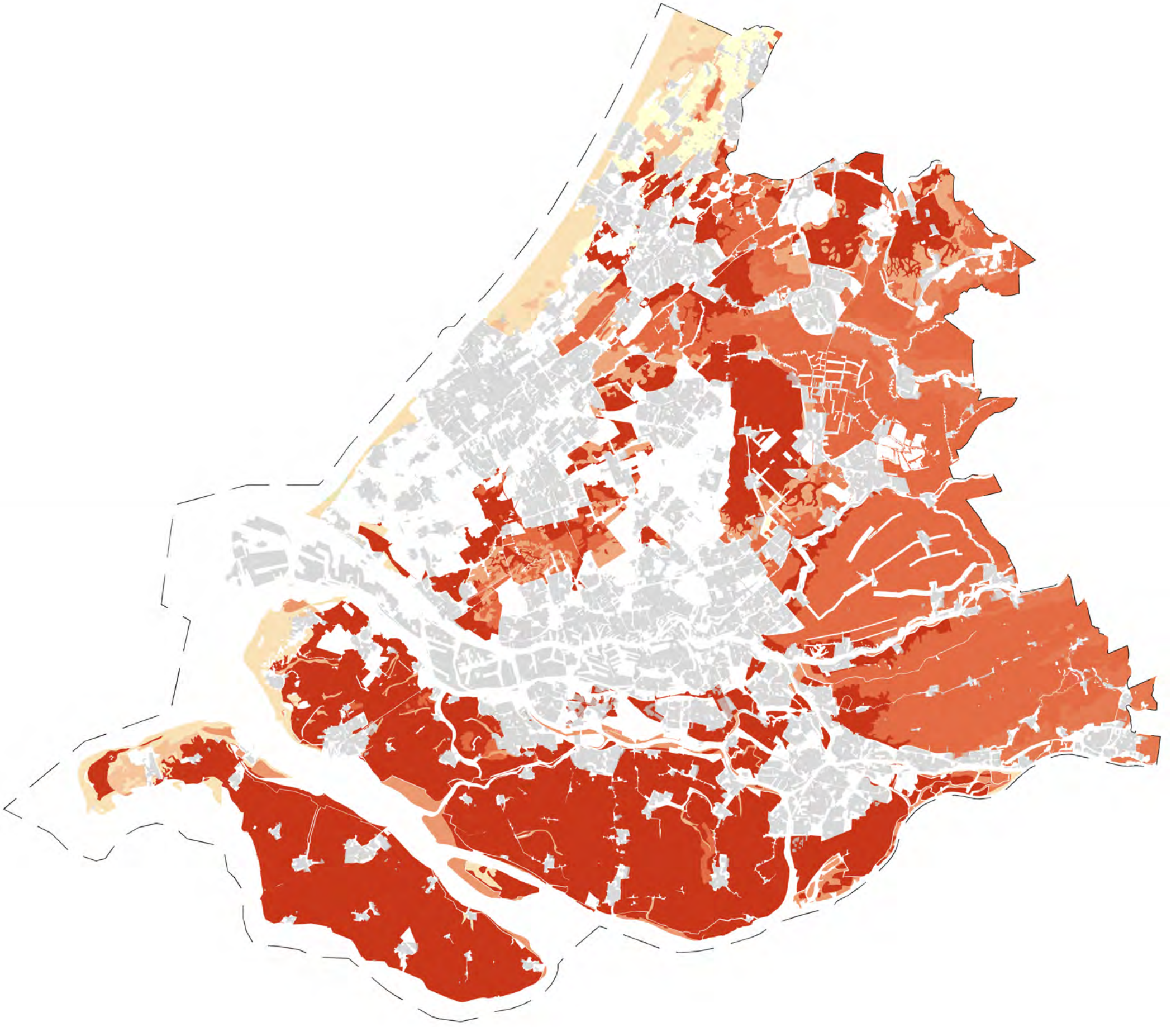


Fig. 47: Different soil types in South Holland.
Figure by author (nationaalgeoregister.com)

4_10 Dictator in the underground Potentials in the soil

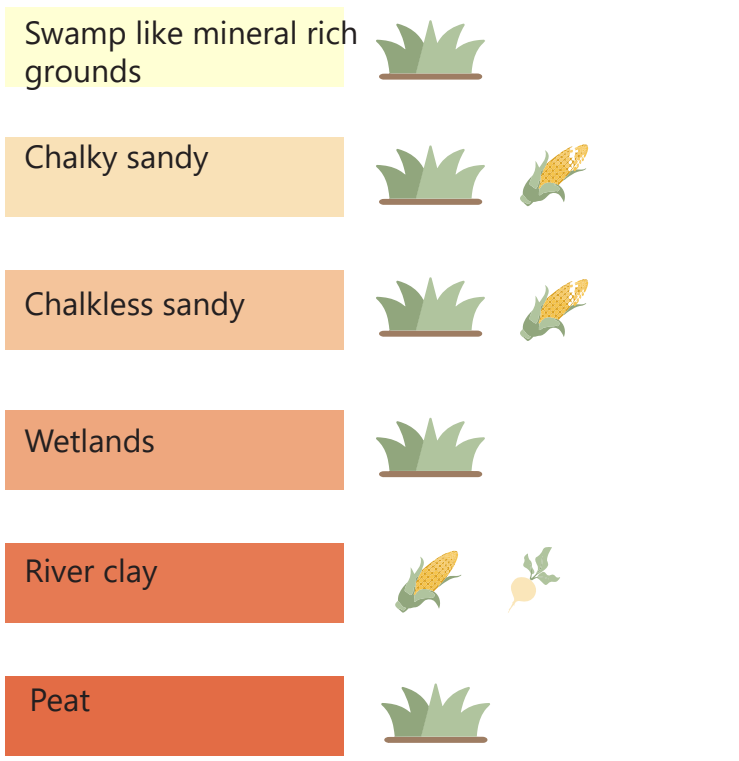


Fig. 47: Soil suitability for different crop types.
Figure by author (Futurefood-zuid-holland, n.d.)

The soil is the basis for agriculture and, together with the groundwater level in a particular area, influences the type of cultivation. In combination, different evaluation factors can be determined, such as water retention capacity, load-bearing capacity and workability for a potential agricultural use of the soil (Silvis et al., 2016).

In general, the soils of South Holland are anthropogenically shaped and, due to their geographical location on a large river delta, they are wet and particularly fertile in the coastal regions (Römkens & Oenema, 2004). Besides sand, which is hardly found in the region, the most suitable and fertile soils for agriculture in South Holland are the sea clay soils (Silvis et al., 2016). They are found especially near the river delta in the south of the region. Here, for example, cereals, potatoes, beets, maize, but also orchards can be cultivated (Futurefood-zuid-holland, n.d.).

The other major soil type in South Holland is peat soils,which usually have high groundwater levels and must be heavily drained for a possible cultivation. These are mainly found in the north-east of the region. Due to the high groundwater level, they are not particularly fertile or suitable for arable farming and are therefore mostly used for grassland and livestock farming (Silvis et al., 2016).

The clustered land use shown in Figure _ is therefore mainly due to the soil type and is directly related to it. Accordingly, the different types of production cannot be evenly distributed in the region, but are bound to certain areas due to the existing soil types.

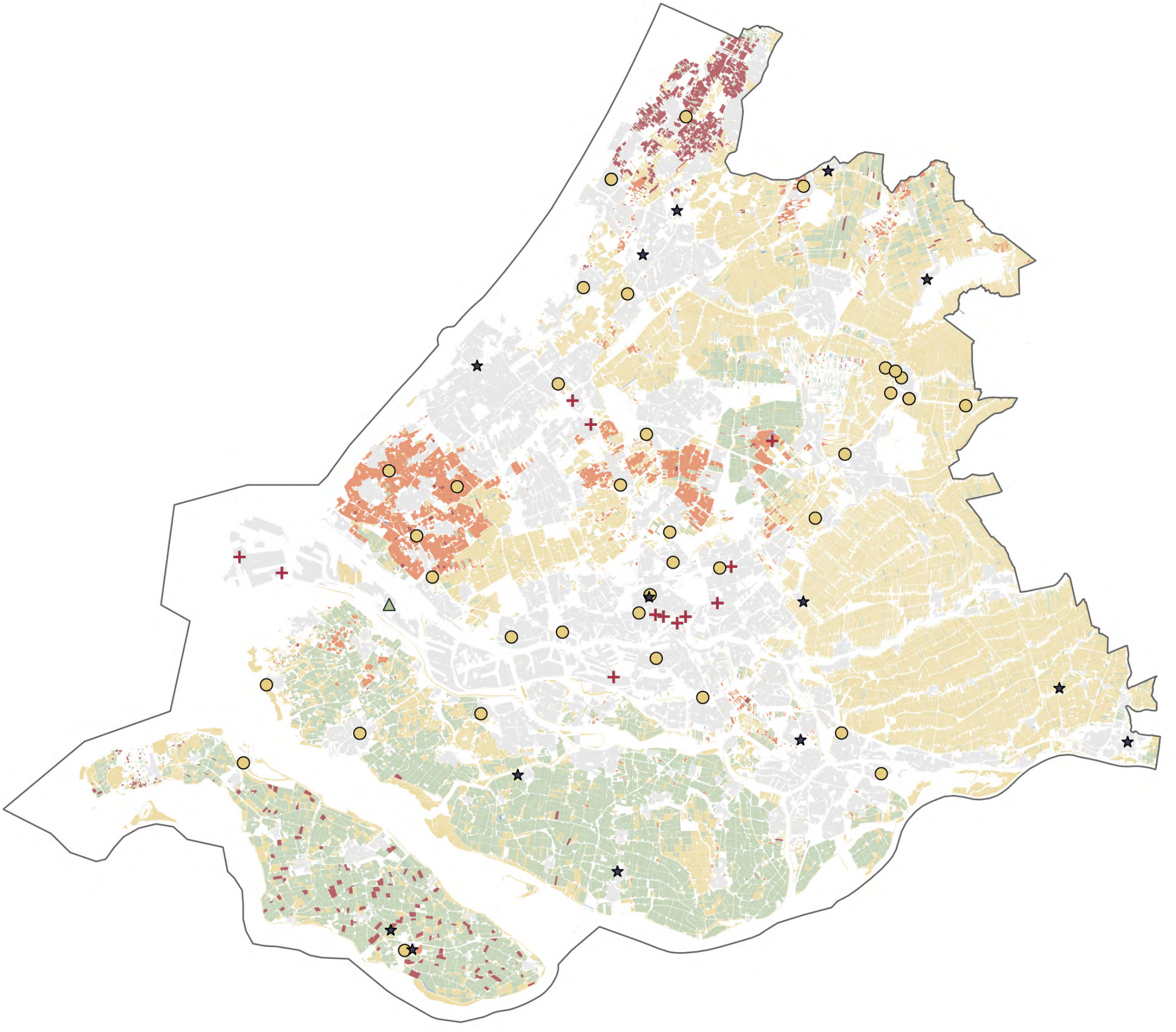


Fig. 48: Location of renewable Energy productions in South Holland.
Figure by author (Nationaalgeoregister)

4_11 Energy potentials

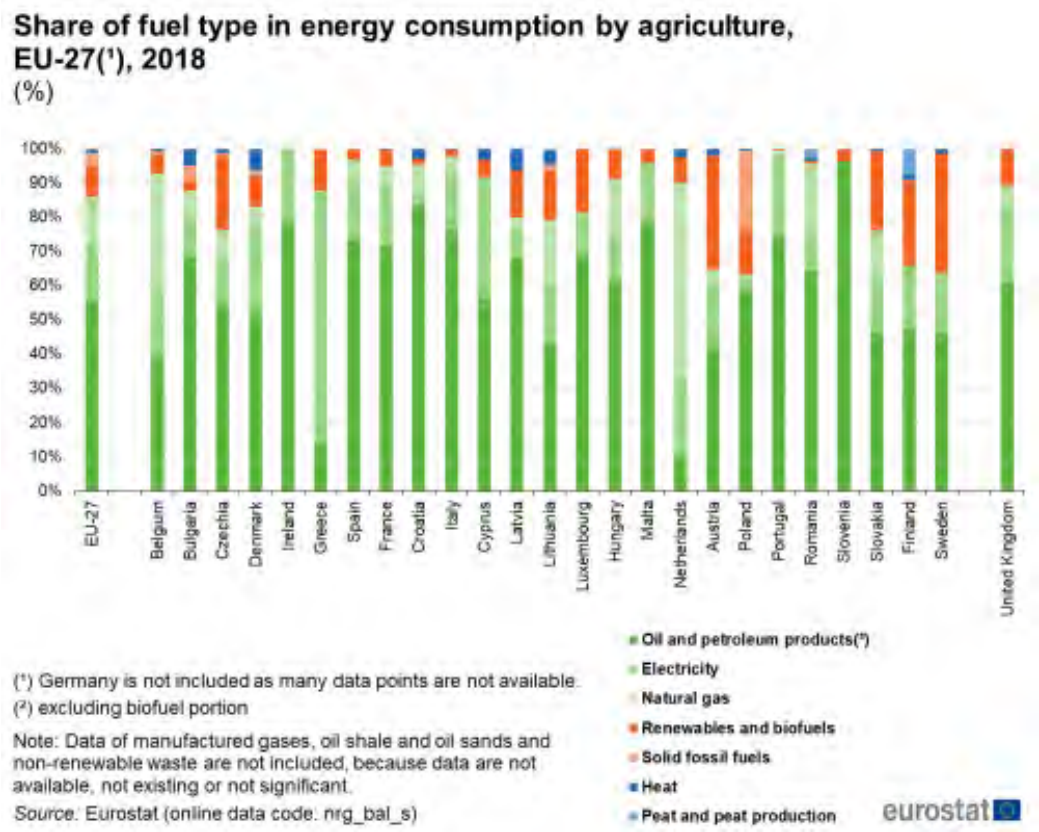


Fig. 49: Energy consumption in Europe of agricultural sector. Figure by author (Eurostat Statistics, 2018)

Biogas plants

Wind & water energy plants

Solar energy processing plants

Thermal & nuclear energy plants

Greenhouse gas emissions continue to rise worldwide. This can be attributed not only to the use of fossil fuels for energy production, but also to agriculture, which is one of the largest contributors of greenhouse gases such as carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O). About one quarter of global energy consumption is consumed by the food production chain alone (Poore & Nemecek, 2018). The high proportion of greenhouse gases emitted is not only due to the energy consumption of fossil fuels used for the different technologies and machines. The largest share of emissions in agriculture is caused by livestock and animal husbandry, which produces methane, an emission that is significantly more harmful than carbon dioxide. Arable farming mainly emits nitrous oxide through the use of nitrogenous fertiliser and a quarter of the total emissions are caused by greenhouses, which use natural gas to heat and light the cultivated areas.

While global emissions continue to rise, Europe, and especially the Netherlands, has managed to reverse this trend and reduce them compared to the 1990s. This is mainly due to stricter regulations, which have reduced the nitrogen content of fertilizers, as well as the reduction of livestock in the cattle industry (Rijksdienst voor Ondernemend Nederland, 2016). This trend must be further promoted. The expansion of renewable energy could also offer potential in this regard.The current production sites, which can be seen on Figure_, are located particularly in the coastal regions. Therefore, these areas are particularly advantageous for an energy transition. For example, Goeree-Overflakkee in the south of South Holland already has the ambition to become energy neutral, which they have only just missed so far (Gemeente Goeree-Overflakkee, 2016).

4_12 Environmental threats

Fig. 50: Areas affected by salinization in South Holland. Figure by author (Nationaalgeoregister)

Salinization

An environmental problem is the salinization of the soil. South Holland is strongly affected by this process due to its direct location on the sea and river delta. This problem will likely be exacerbated in the future by rising sea levels and the subsidence of the polder areas, among other factors. Increased pressure on the river delta, changing precipitation patterns, extreme weather conditions will increase the salinity in ground and surface water, especially in the coastal region of the Netherlands (Oude Essink, 2012).

Figure 50 shows that the southern provinces of South Holland and the region around the port of Rotterdam are particularly affected. High salt concentrations in the soil can cause various types of damage to plants. For instance, the roots can get damaged, which can lead to a lower absorption capacity of the plants and thus to lower yields (European Communities, 2009).

Until now, the salinization of soils has mainly been combated with the help of infiltration of fresh water. However, this entails many costs and immensely high water consumption. For a more sustainable future, this is where more research on other ways of dealing with the problem is needed (Boer & Radersma, 2011).

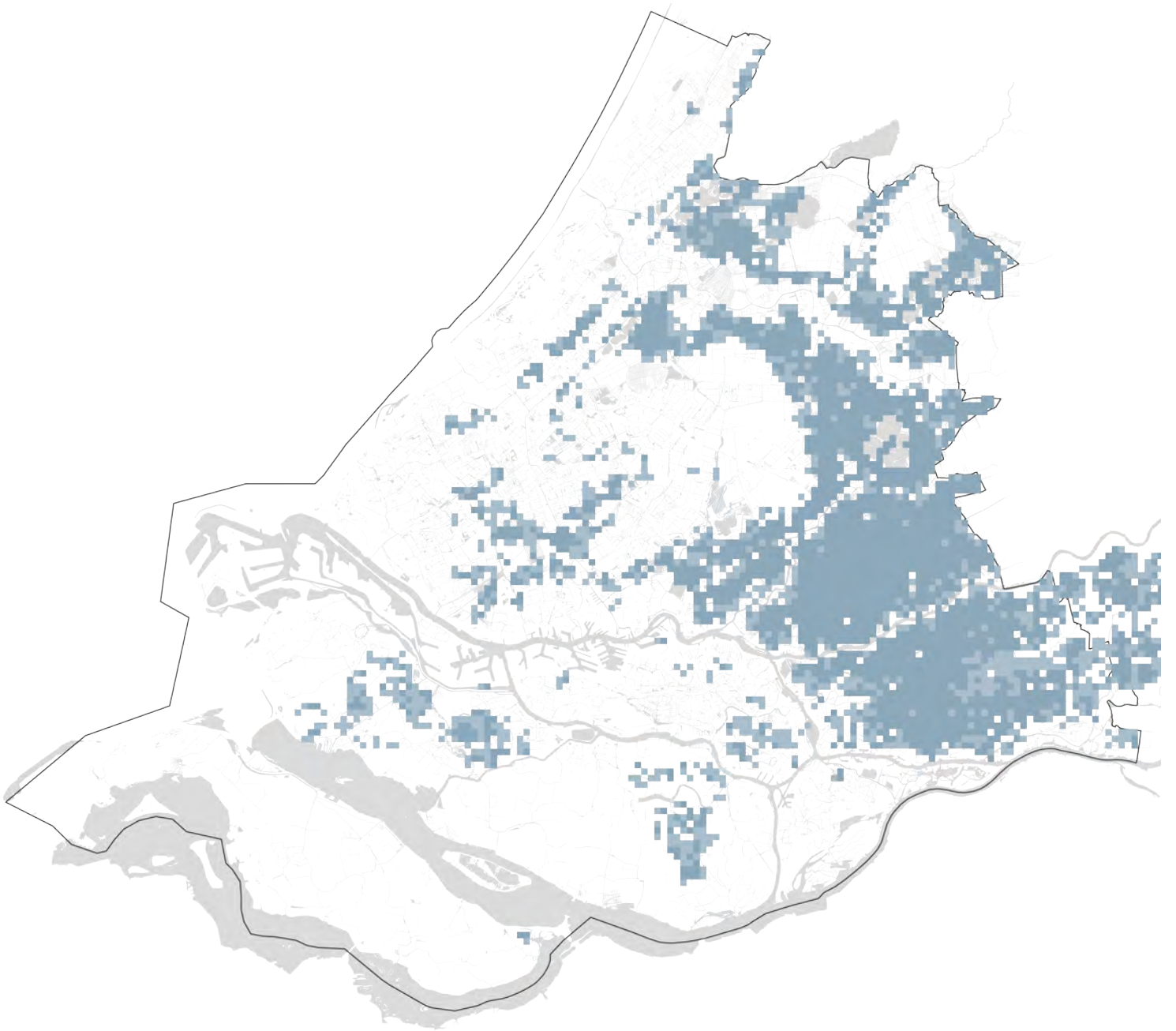


Fig. 51: Areas affected by Subsidence in South Holland. Figure by author (Nationaalgeoregister)

Subsidence

Due to the permanent drainage of rural peatlands, a large part of the Netherlands suffers from land subsidence, which in combination with the rise in sea level has resulted in more than half of the country now being below sea level (Querner et al., 2008). In South Holland, this affects most of the eastern part of the region, which is predominantly used for cattle farming (see figure 51). Currently, the lowering of the ground level amounts to one to two centimetres per year. This low soil level leads to the ground being wetter, which also increases the risk of flooding in the historic core areas of the Netherlands year after year (Brouns et al., 2014). But not only does the risk of flooding increase due to the continuous lowering of the groundwater level, but the peat also begins to oxidise as it is drained. In the process, it produces large amounts of CO2 emissions, which must be prevented.

Accordingly, the area is in a dilemma, as lowering the groundwater level and draining the area are necessary for agricultural use, but this also damages the soil at the same time, and farmers have to take action against soil subsidence at a certain point. However, these measures do come with great costs, as they can either harm or improve existing functions and interests (Born, 2016).

4_13 Conclusions from analysis

From extensive analysis of the region of South Holland in the context of agriculture the following key problems that the region faces become evident:

1. Exhaustive use of land - land has been overexploited extensively and has become the highest commodity in South Holland since different sectors compete for it. Agriculture currently is predominantly dependent on land and needs urgent action.
2. Biodiversity - It has been a common practice to expand agriculture and city boundaries onto nature areas to suffice the demand of the consumers in this region. This mindless spatial expansion depletes biodiverse areas and if this trend continues the province of South Holland might run out of its already sparse nature areas.
3. Diet - Consumerism in South Holland is on the rise with emphasis on meat consumption which has various negative externalities affecting the environment and demands more space. On the other hand, excessive consumption per person also leads to health issues among a large proportion of our society.
4. Food waste – Over half of the food produced is being wasted across different stages of production which has enormous impact on the environment use of more resources and over burdens the agri-food industry to increase production.
5. Manure – As a major exporter of livestock products the Netherlands rears a huge number of livestock for its meat, the meat is exported but the region is left with excessive manure. The requirement of manure for other food production barely meets the amount of fertilizer that is being produced in the region.
6. Typologies of food production - Current agri-food production is characterized by monocultural crops spread across vast expanse of land. It is highly resource intensive, excessively polluting the environment and the crop matrix considerably reflects the dutch diet and mainly towards profitability. The production modes exclude biodiversity and also diversity in the crop matrix. While the region is known for its flower production,this sector does not contribute to the nutrition of the people.
7. Soil - The typology of food production does not correspond to the soil type it is practiced on.
8. Energy potentials - Although the region has potential for renewable energy, this is not yet reflected in the food production sector which demands a high requirement of energy.
9. Salinisation - Salinisation is a growing problem in south holland with already limited availability of land, it threatens the quality of soil fit for food production.
10. Peat subsidence – Peat being a characteristic soil type of this region when drained of natural water releases CO2 worsening its effects on nature. Over modification of original landscapes adds to environmental impact of the agri-food sector.

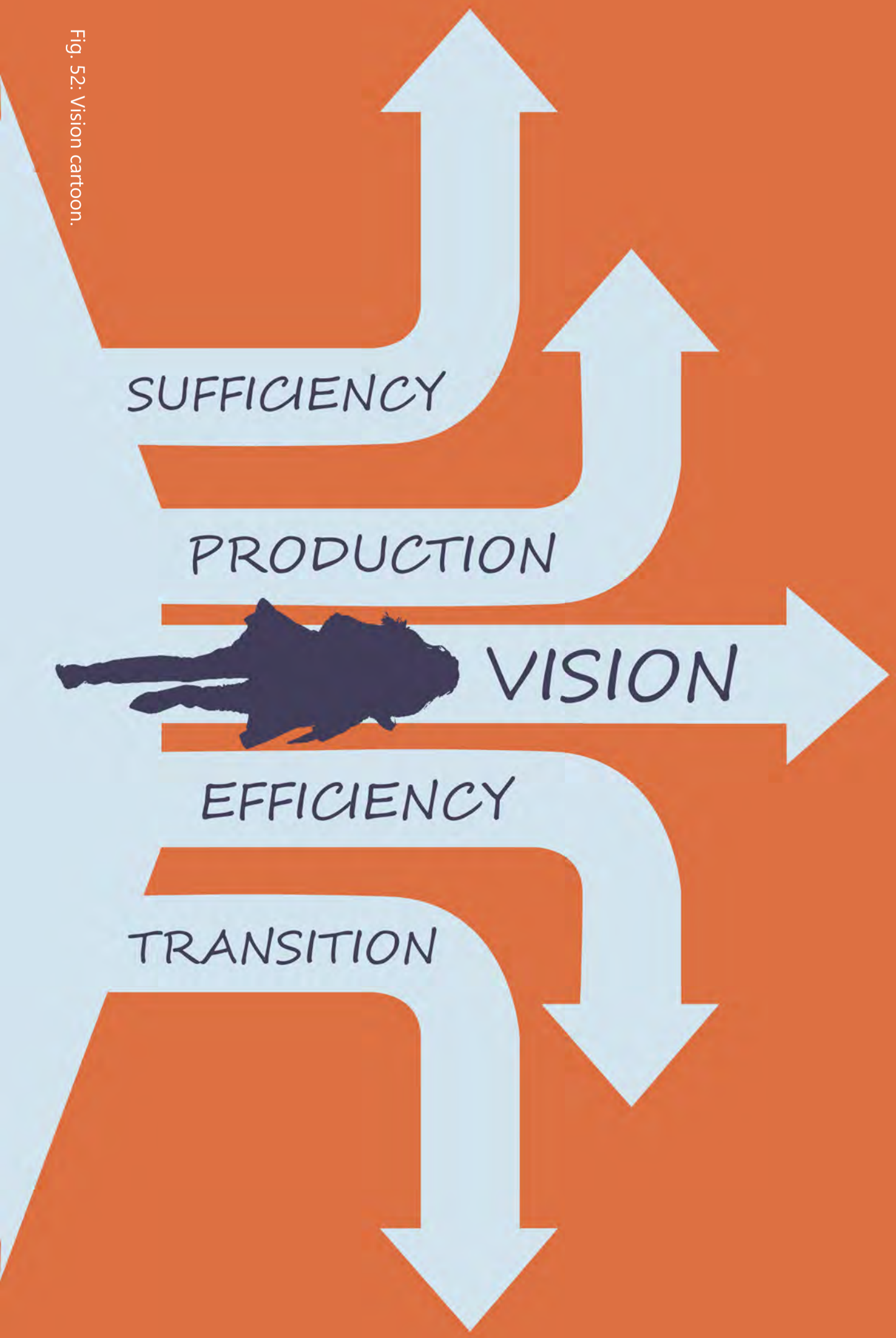


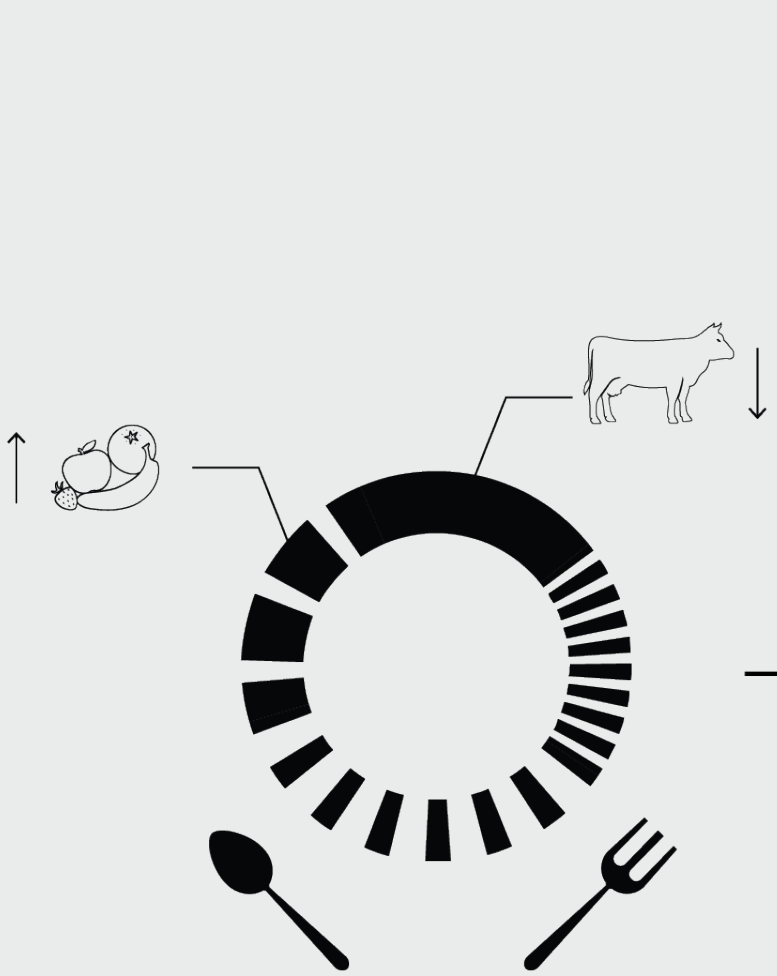
Fig. 52: Vision cartoon.

5. HEALTHSCAPES 2050

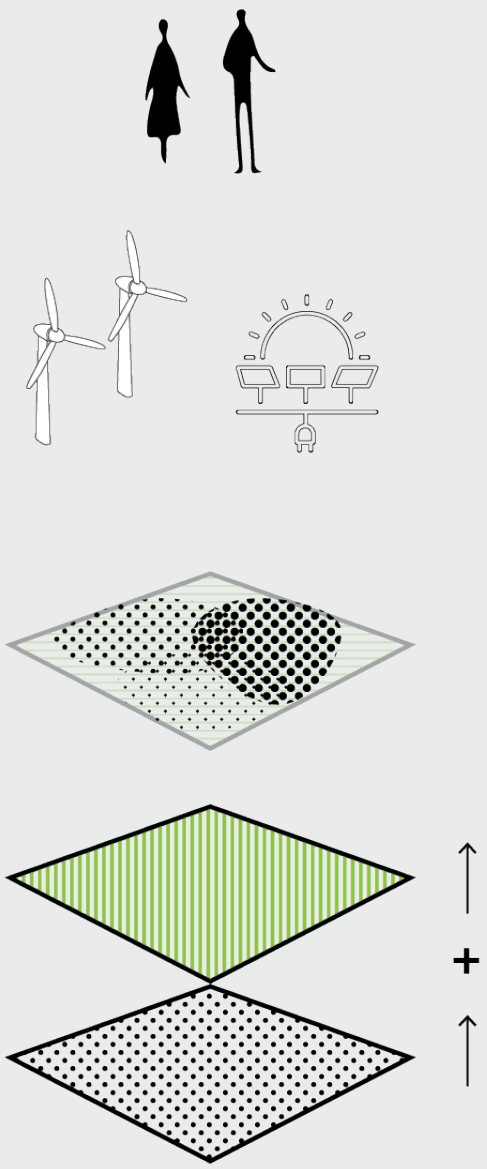
The landscape of South-holland has been unrecognisably modified from its original landscape to serve human needs, and especially agriculture. After evaluating the current mode of agriculture, one comes to the conclusion that it is currently unsustainable and proves to be extremely damaging to the environment. As found in earlier that there lies a problem in each stage of the food sector, i.e high consumption pattern of meat leading to a massive production of livestock feed further leading to degradation of diverse habitats around the world, inefficient modes of agriculture leading to overexploitation of resources and eventual health issues due to the current consumption trend.

The main goal of the "Healthscapes" is to improve the health of the Planet and the People by transitioning towards a sustainable diet and transforming the systems of agriculture to achieve a balance between nature and humans.

Fig. 53: Glimpse of the vision.



Diet Transition



Land Transformation

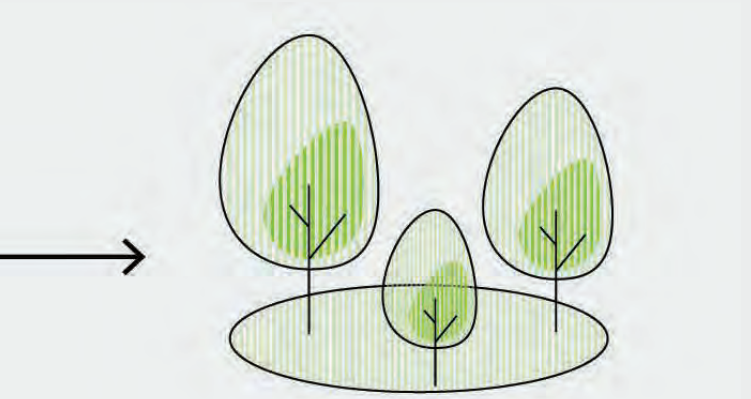
Fig. 54: Vision framework.

5_1 Vision framework

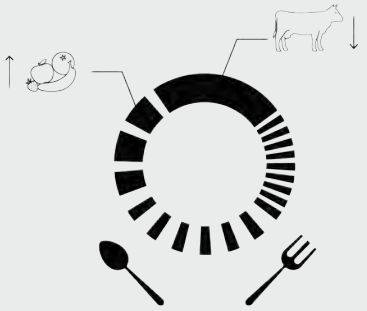
1.Diet Transition - The first step towards a sustainable future is to transition the average Dutch diet into a Lancet diet. Raising the awareness of people and their unsustainable consumption patterns and encouraging active participation of people with production of food is crucial.

2.Land Transformation - In order to minimise the footprint of the Dutch diet, it is essential to take control over how we produce and where we produce food. Thus resulting in a self-sufficient model of agriculture with approximately 70% of Dutch food requirements are satisfied and considerably changing the currently cultivated crop mix in the region. Finally the proposal aims to improve existing cultivation methods in terms of reduction in energy use, recycling nutrients in the organic matter cycle, reduction on the dependency of land, reduce natural resources usage, enhancing diversity of crops, animals and lastly intensifying of lands that now seem to have potential to produce more.

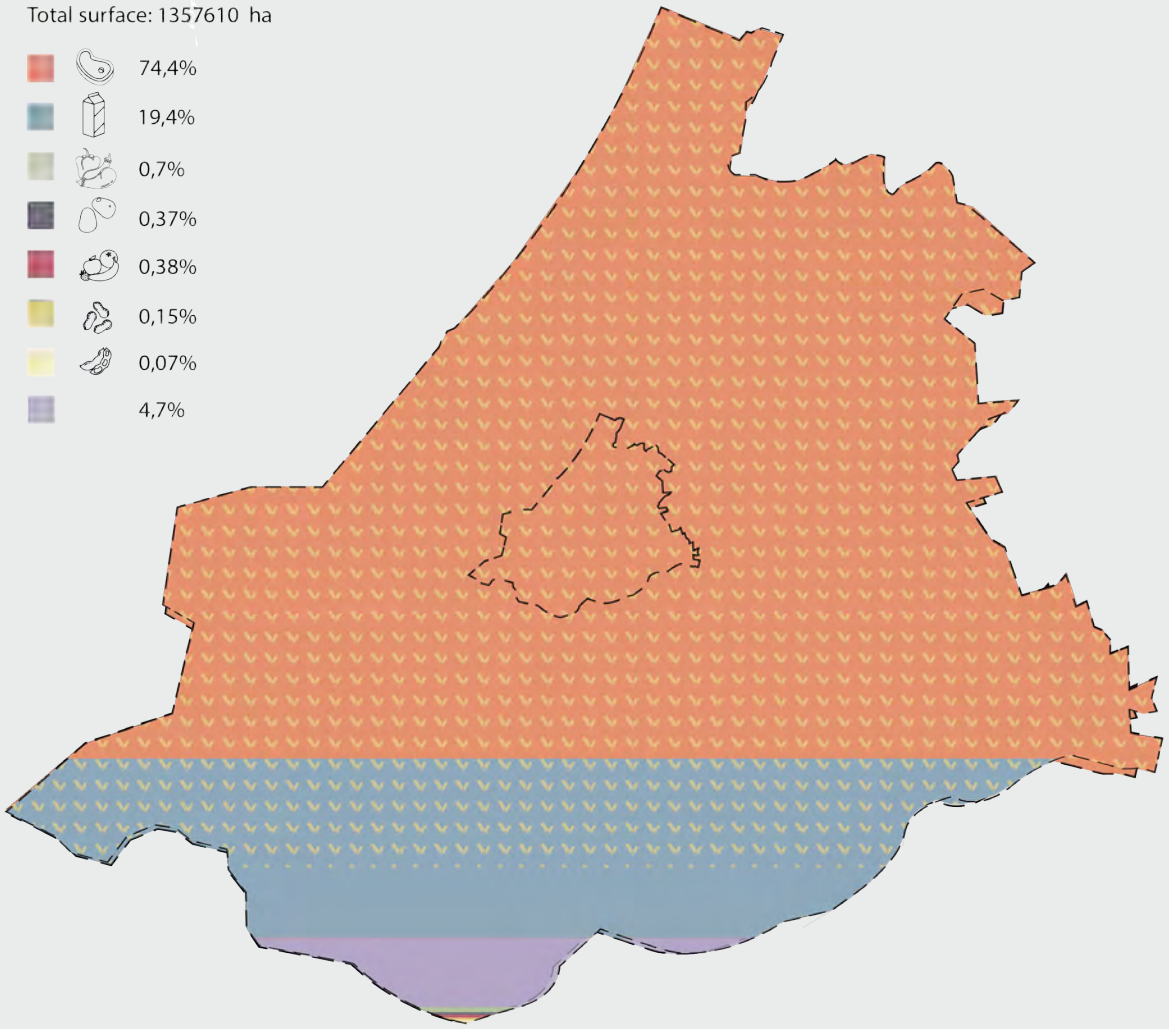
3.Biodiversity - By halting the expansion of agricultural land and deploying land that will be gained after the diet change more room for biodiversity will be provided.



Biodiversity

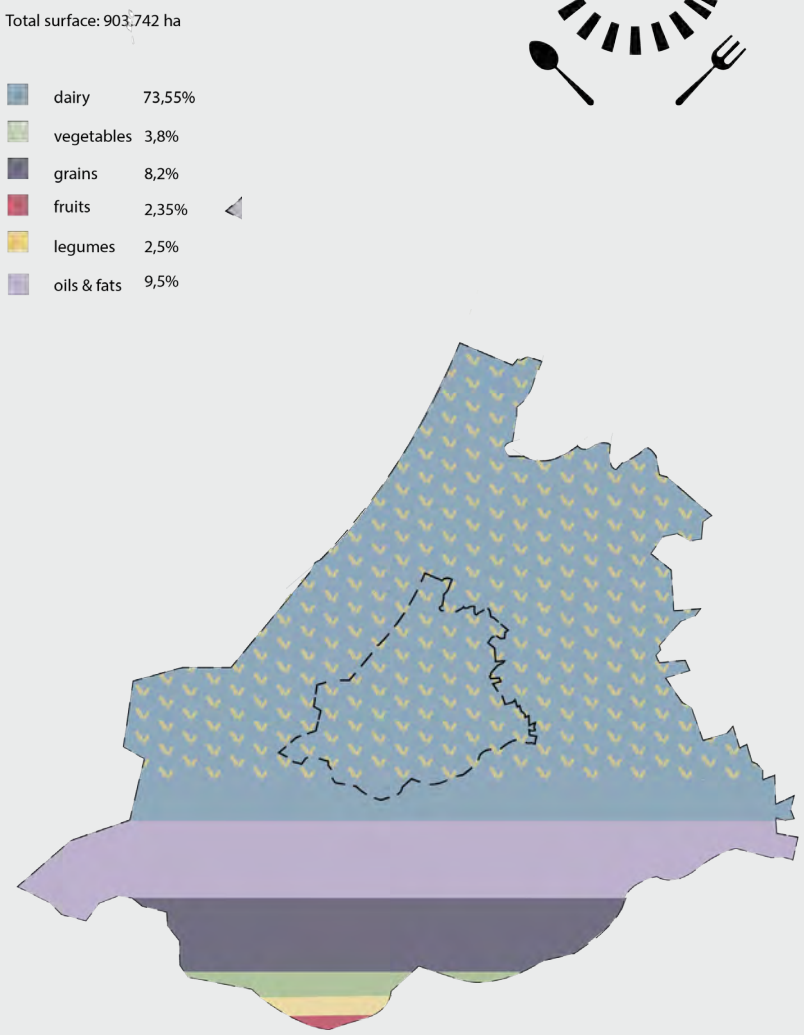


Total surface: 1357610 ha



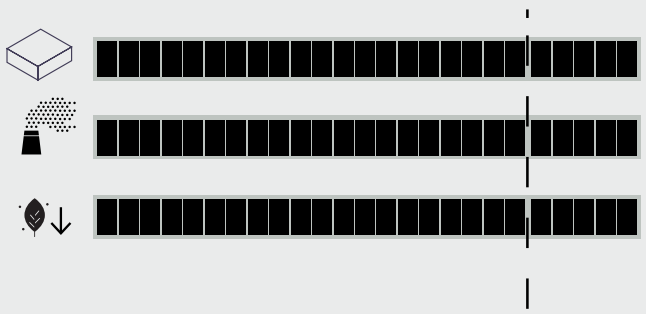
	74,4%
	19,4%
	0,7%
	0,37%
	0,38%
	0,15%
	0,07%
	4,7%

Total surface: 903.742 ha



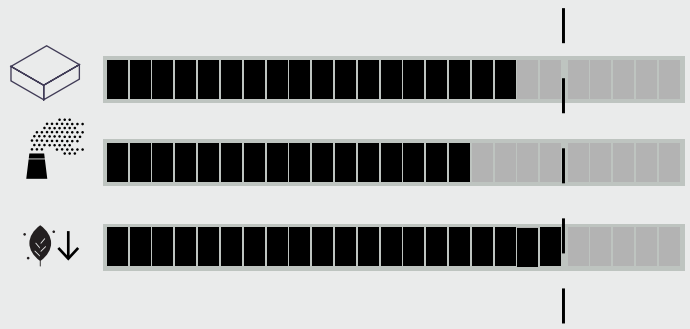
dairy	73,55%
vegetables	3,8%
grains	8,2%
fruits	2,35%
legumes	2,5%
oils & fats	9,5%

Current Average Dutch diet



Planetary boundaries

Vegetarian diet



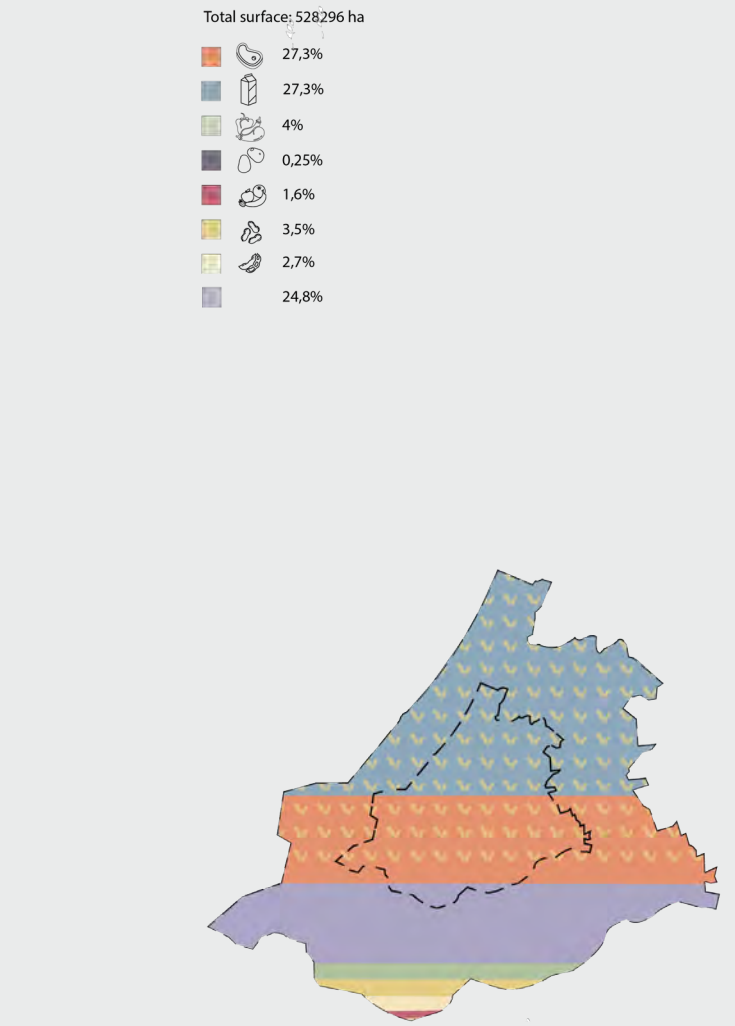
Planetary boundaries

Landuse

Emissions

Biodiversity loss

5_2 The Lancet diet's spatial footprint



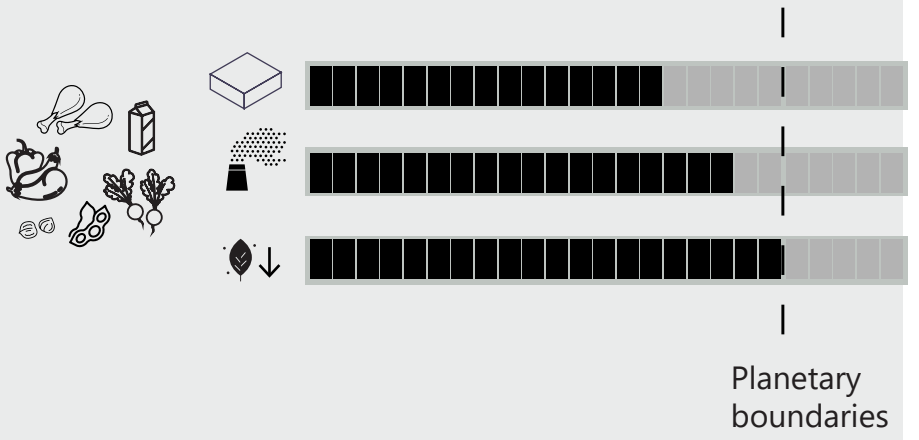
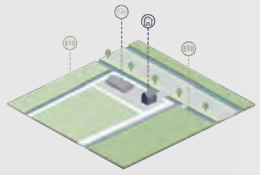


Fig. 55: Spatial impacts of our diet. Diagrams by author (Willett et al., 2019; Dietary guidelines for Americans, 2020; Resetting global expectations from agricultural biofuels, 2009)

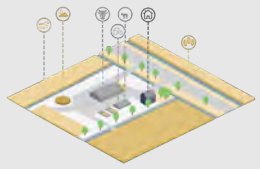
Our current diet reaches far beyond the planetary boundaries and will continue to do so in the years to come if we are not willing to change our ways of consuming.

South Holland consists of approximately 270.000 hectares of habitable land. If the current diet would be grown and consumed locally an area of around 5 times the size of South Holland would be needed as can be seen in figure 5. When implementing the lancet diet an area of approximately twice the size of South Holland is needed. Since only half of the province is currently used for agriculture a complete self sufficient food industry will remain hard to achieve but sustaining the region of South Holland locally will become a lot more feasible (CBS,2018).

It is important to take into account that the region of South Holland is the most densified region of the netherlands. South Holland provides home for approximately 25% of the dutch eater while consisting of only 12% of the total surface. When implementing the diet on the scale of the Netherlands it will provide to be even more feasible.

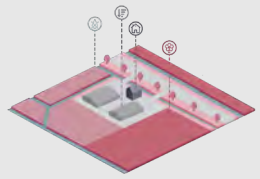


Arable monoculture



Cattle farming

Greenhouses



Floriculture

Feed

Energy

Production

Distribution

Consumption

Waste

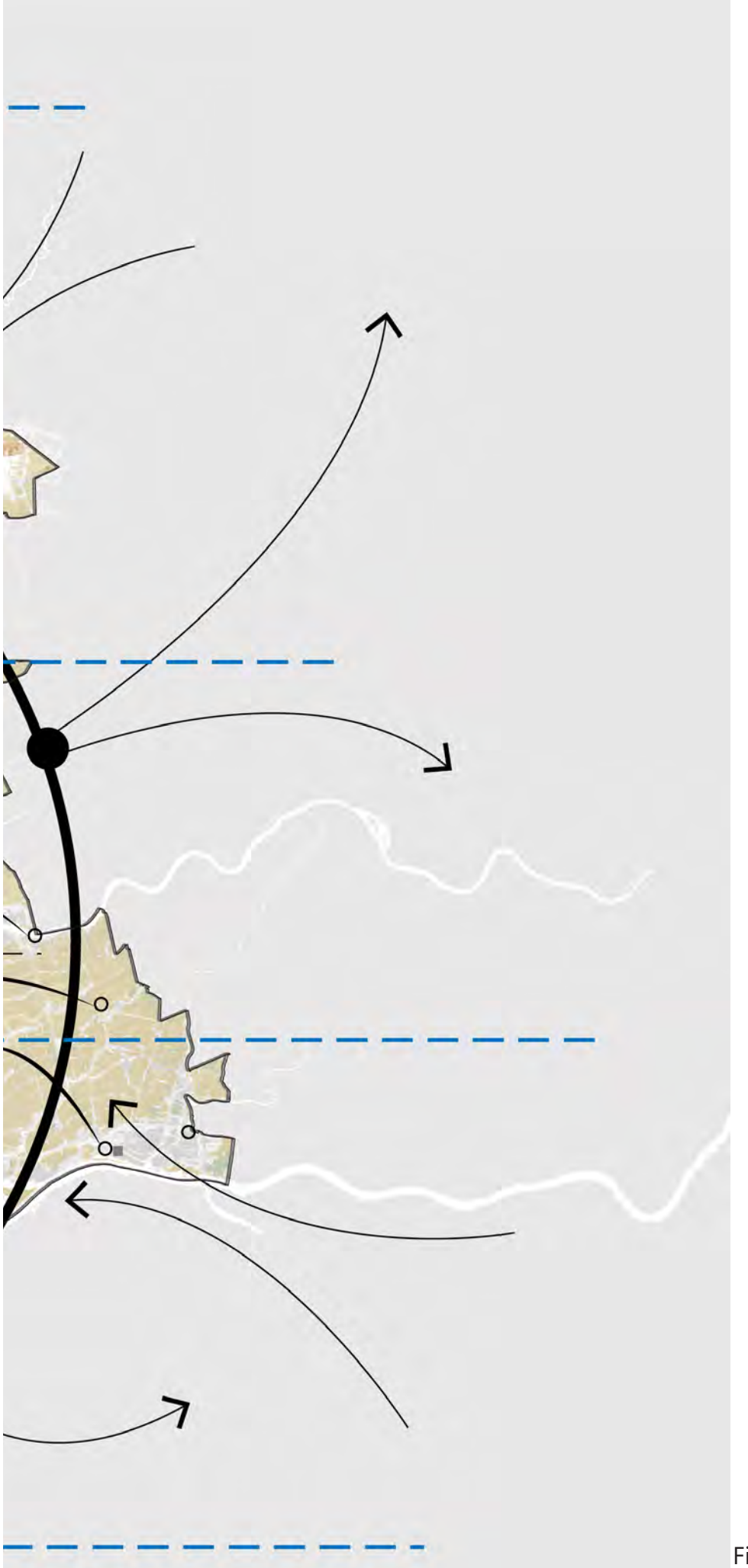


Fig. 56: Current agricultural model in South Holland. Figure by author

5_3 Current agricultural model

In South-Holland it is seen how the cities and hinterlands are synonymous to consumption areas and production areas respectively.

1.The current agricultural model heavily depends on the import of fossil fuels, livestock feed, crops (grains, fruits, vegetables and other processed food). A large part of the exports is based on processing of imported goods. (shown in black and green arrows outside the ring in Fig.).

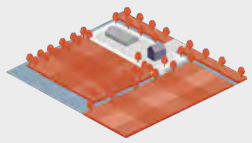
2.The largest part of the crops that are produced in the region of South Holland is increasingly mono-functional and there can be found a rapid decline of (agro)biodiversity. (shown in the land-use map).

3.Logistics of the food sector starts from import of Livestock feed, energy to the production centres, then the produce moves on to the distribution centres or processing units and ends up in the larger consumer zones namely the cities.

Hence there exist a clear distinction between the consumption zones and the production zones. Thus there exist a disconnect in people's relationship with their food.

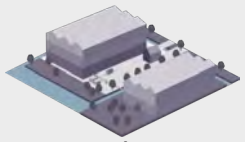
4.The Waste from this region although being treated is not re-purposed.

5. Finally big-food corporations control the market in terms of what is produced and what is being sold with taking into consideration the sustainability of the products they produce and without consulting the farmers, people's collective opinion.

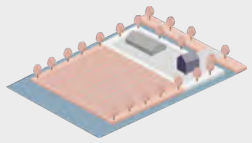


Arable polyculture

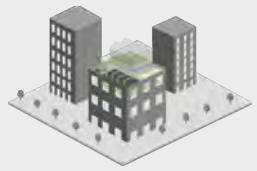
Cattle + Polyculture



Greenhouses



Salt water farm



Urban agriculture

Duckweed farm

Agro-forestry

Fig. 57: Resulting Landscape. Figure by author

5_4 Resulting landscapes

The initial outcome of the diet change translates onto the production landscapes to accommodate the proportion of the modified diet. The transformation of the landscapes will be derived from the tool kit of sustainable productive landscapes that has been formulated. Producers both in urban and rural areas would have a choice to choose from different models of productions from the tool kit to achieve the desirable sustainability standard mentioned in the policy. The tool kit will grow as new sustainable innovations in the food industry emerge.

The Resulting landscapes of 2050 are envisioned to fall under 3 broad categories namely:

1. Poly culture - Adding mono-culture farms with diverse crop mix, combining livestock and arable farming, intensifying production by incorporating diversity.

2.Biodiverse Landscapes - The remaining land gained from the diet transition is envisioned to expand protected nature areas and flood peat soil polders with water to grow duckweed which will serve as livestock feed there by reducing oxidation of peat soils.

3.Urban Agriculture - The 3 main reasons for the introduction of urban agriculture is to create awareness by bridging the gap between producers and consumers. Secondly to reduce land dependency of agriculture and lastly to reduce food miles.

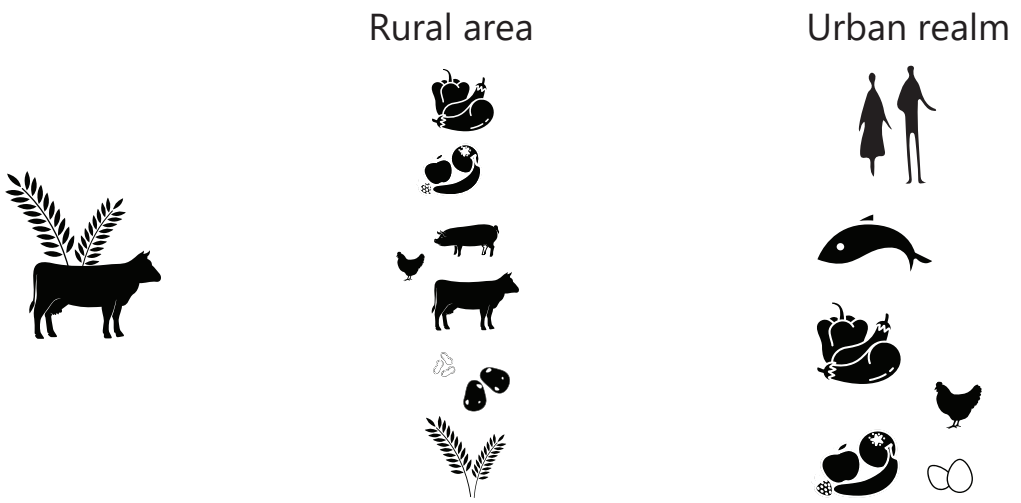


Fig. 58: Crop matrix.

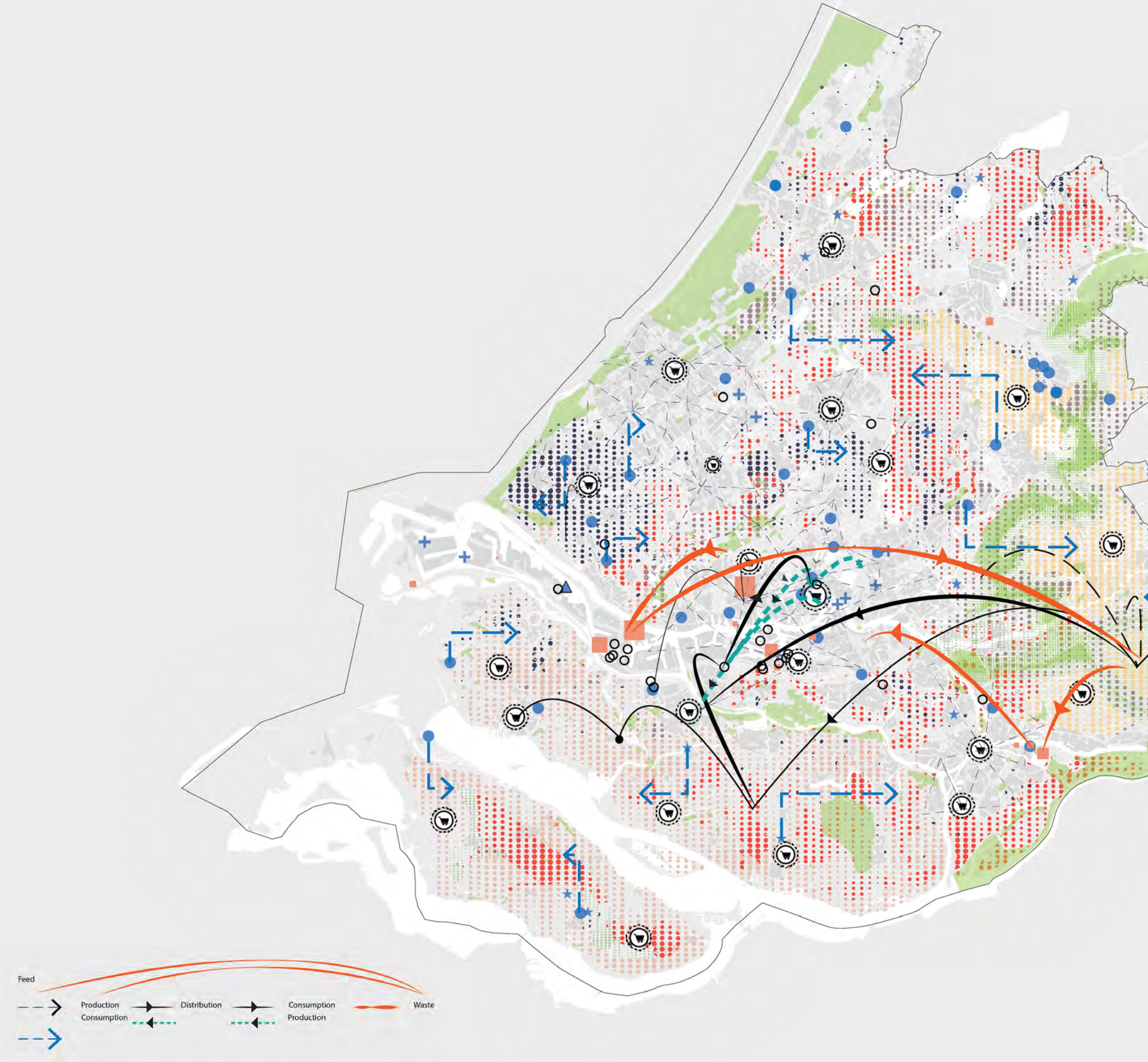
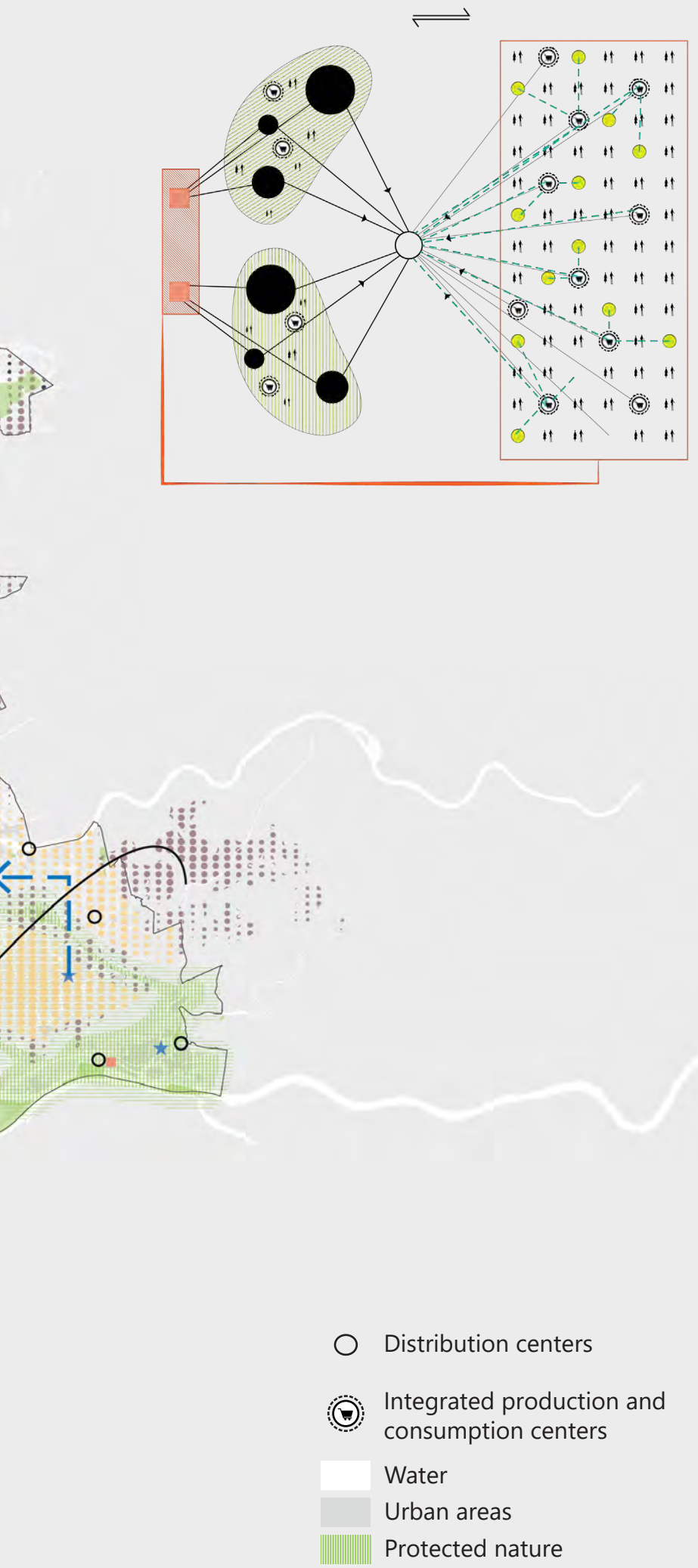


Fig. 59: Closing networks, Figure by author



5_5 Closing networks

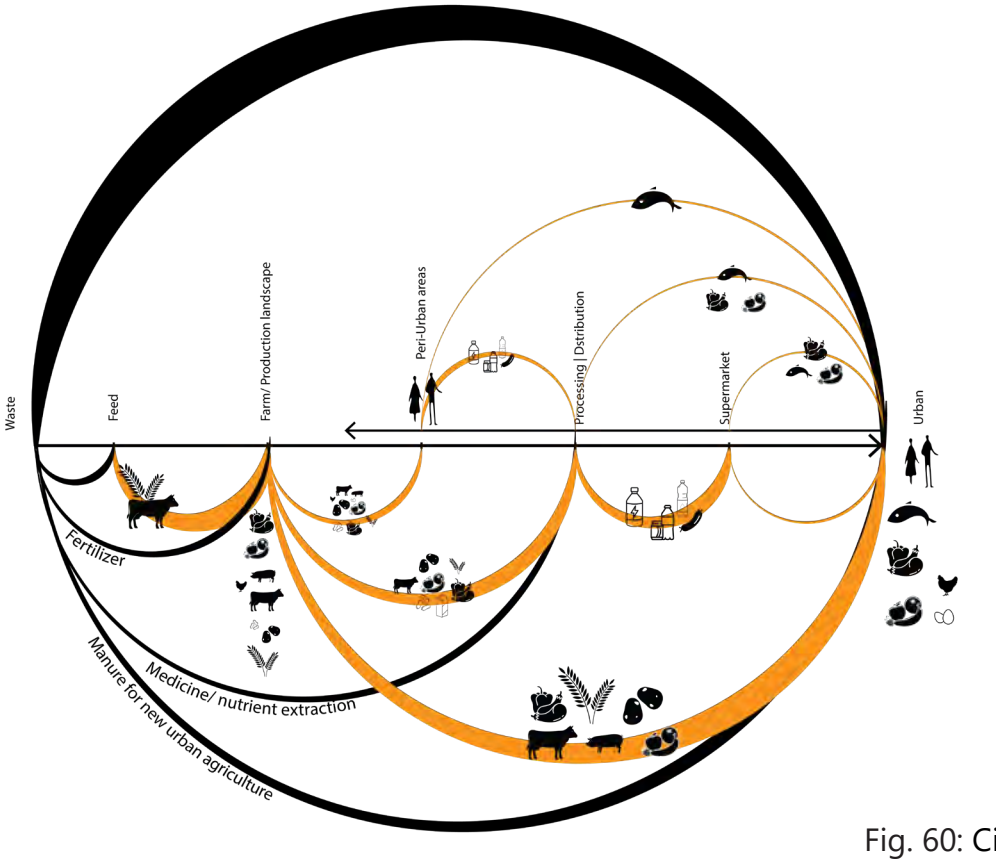


Fig. 60: Circular flows.
Figure by author

To achieve circularity of flows it is necessary to close the networks. By localising and diversifying production the flows are also localised.

1.The energy input will be replaced by renewable energy sources produced on-site and derived from neighbouring energy parks[highlighted in green icons].

2. Production of duckweed in peat soil provides feed for the livestock along with collection of organic waste.

3.By increasing production not only in the hinterlands, but also in the urban centres creates a reverse flow of material from the urban to the rural areas, as the urban centre can only create certain types of crop such as fish, vegetables and fruits, when produced in surplus can follow the network of goods i.e. urban producers take their produce to the supermarket which then can be loaded in the trucks that deliver the goods from rural areas on their way back.

4.The transformation of waste water treatment plants into waste treatment and fertilizer production plants gives opportunity to produce convert nutrients from waste to value. These captured and processed nutrients as fertilizers could then be sold to the urban centres where new farms are being created or to other fields such as livestock feed, medicines to re-purpose the nutrients.

Fig. 61: New power relations. Figure by author

5_6 Reducing the Power of few actors

The outcome of engaging people in the production network results in a new power relation between producers and consumers.

By creating food committees the decision making involves citizens, farmers, government agencies and corporation. They will actively participate in deciding what composition of crops will be produced and where it will be produced. It is not an attempt to overthrow big-corporations businesses rather a democratic model of decision making in issues related to food.

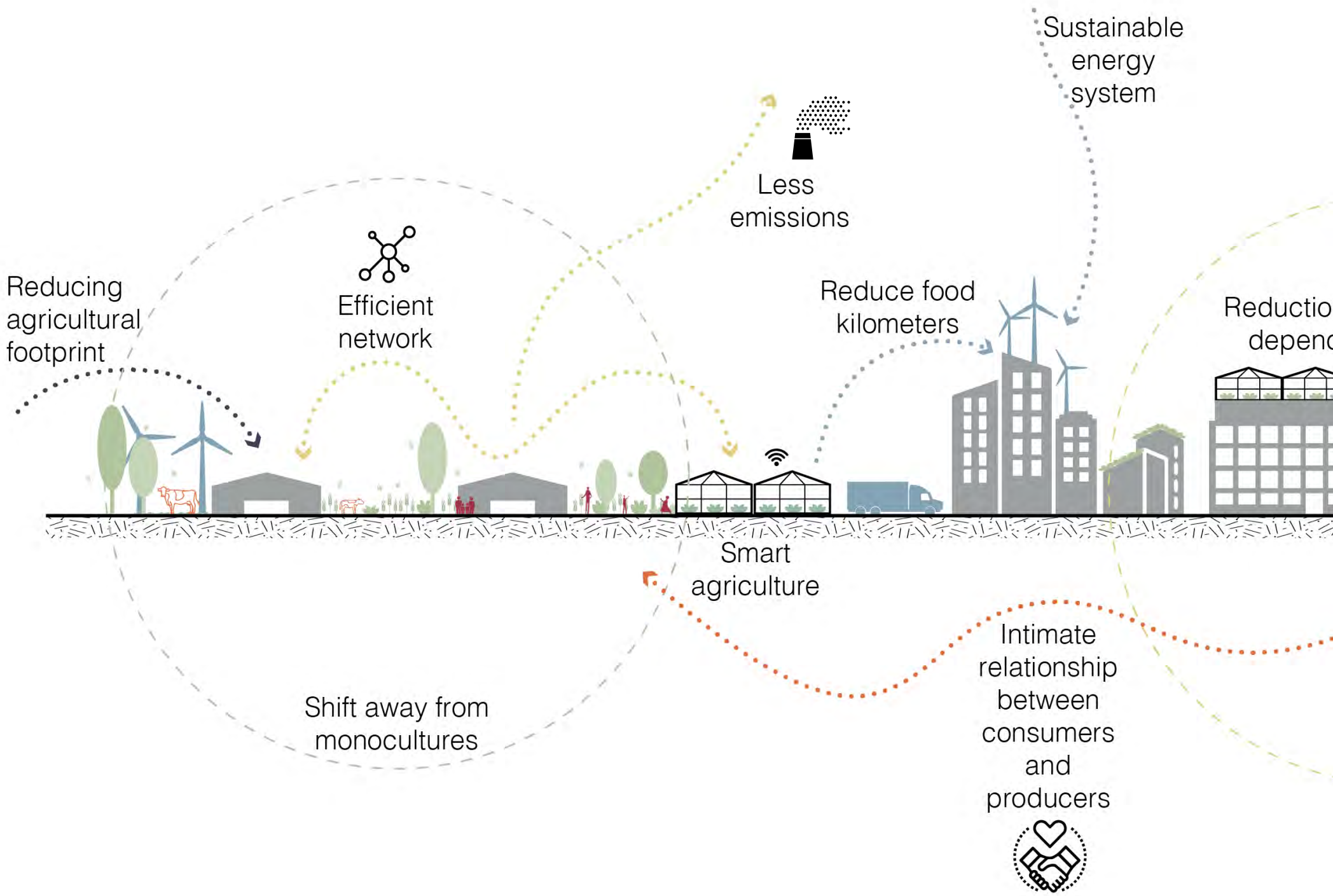


Fig. 62: Future flows of Healthscapes. Figure by author

5_7 Healthscapes future flows

The future of our healthscapes depends on efficiency and the composition of our food flows. To achieve the ideal healthscapes there has to be given more importance to innovation of sustainable technology and implementation of these technology across the Dutch landscapes, as well as higher priority climate change mitigation in the future.

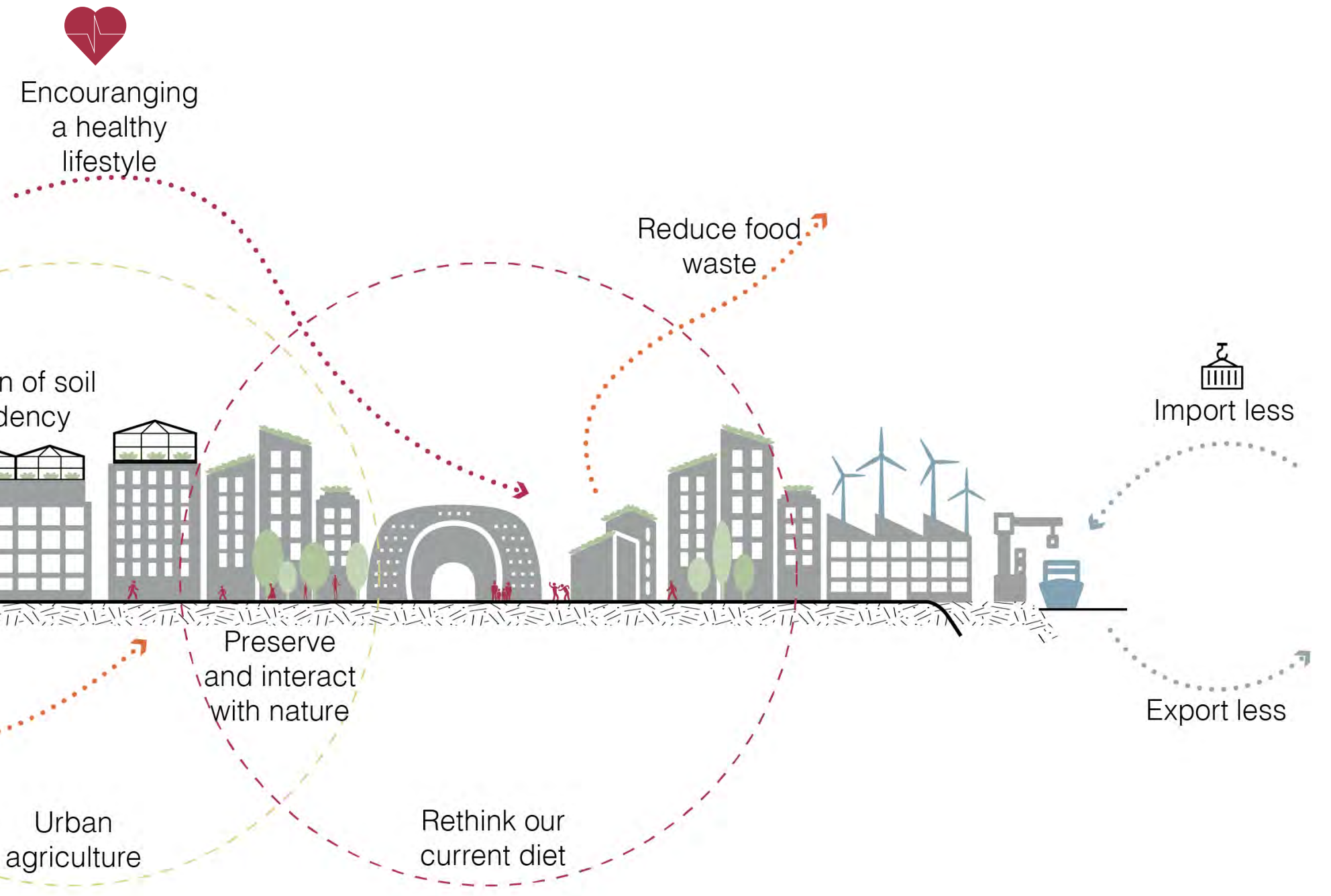


Fig. 63: Incorporated SDGs. By United Nations, 2015

5_8 Societal Relevance

The overall goal of the project is to strengthen the circular economy of South Holland and make the region more sustainable. In doing so, public goods are created or promoted to benefit society. In this way, Healthscapes will promote sustainable agriculture and have a positive impact on the health of the community. In order to achieve societal relevance and a reflective approach, the strategies are linked to the Sustainable Development Goals (SDGs) established by the United Nations. They are aimed at ending poverty and hunger in the world. In this context, they do not foresee a one-dimensional approach, but recognise the links to different sub-areas, such as improving health and education, strengthening the economy as well as fighting climate change and protecting the environment. Our project relates specifically, but not exclusively, to nine of the seventeen goals mentioned. These are explained in more detail in the next paragraphs (United Nations, 2015).

Health

Healthscapes are intended to raise awareness in society. By changing eating habits, the health of each individual but also the planet should be positively influenced. In order to achieve a more conscious and improved consumption pattern, more food security and higher quality levels must be created in the food sector while promoting sustainable agriculture. Furthermore, the implementation of urban agriculture not only raises awareness among communities, but also creates many new perspectives and networks for residents by developing a sustainable cityscape. These goals adhere to the SDG 2, 3, 11, 12 (United Nations, 2020).

Resource efficient agriculture

The vision introduces the idea to reduce the footprint of our current agricultural model and become more sustainable while remaining economically profitable. In order to do so, close cooperation with the various stakeholders is crucial. Our goal is to "encourage and promote effective public, public-private and civil society partnerships, building on the experience and resourcing strategies of partnerships" (United Nations, 2015) which aligns to SDG 17: Partnership for the goals. With the implementation of a more resilient agriculture that still promotes productivity and production, but also helps adapting to climate change and maintaining local ecosystems. New innovations, a focus on renewable energies, improving organic waste cycles and other planned changes will pave the way for sustainable industrialisation in the food sector in the future. Therefore SDG 2, 7, 9, 12 are also addressed (United Nations, 2020).

Environmental awareness

Through targeted interventions, the ecosystems located in Zuid Holland are to be protected and restored through a more sustainable use of our resources. For example, biodiversity loss in particular is to be counteracted by changing the previous monocultures to polycultures. Through the renaturation and creation of wetlands on peat soils and the reduction of livestock farming, negative environmental impacts are further minimised like it is. By reducing the "global greenhouse gas emissions and addressing adaptation to the adverse impacts of climate change"(United Nations, 2015) the resilience to climate change and capacities for natural systems are strengthened. Accordingly, the targets of SDGs 13 and 15 are taken into account and compliance with the Paris Agreement is supported (United Nations, 2020).

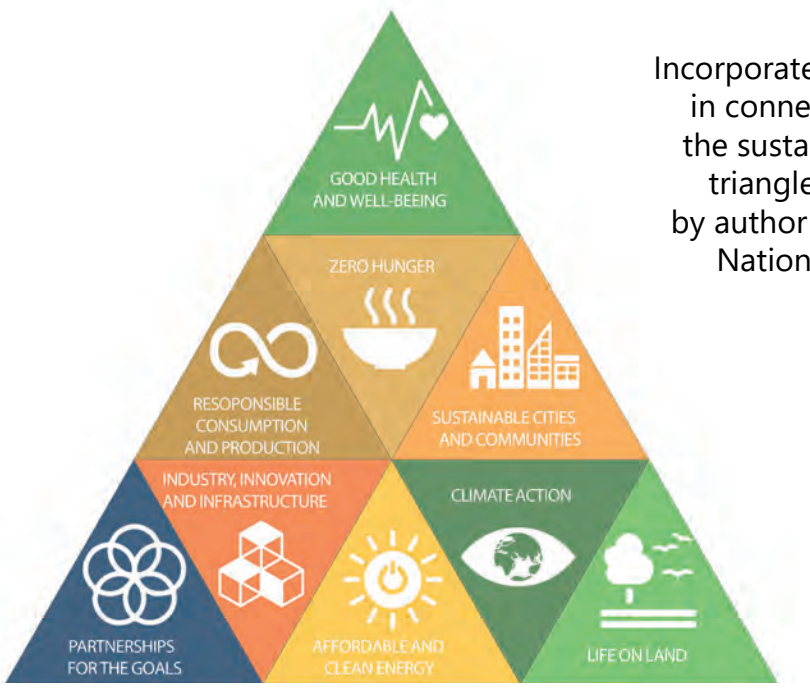
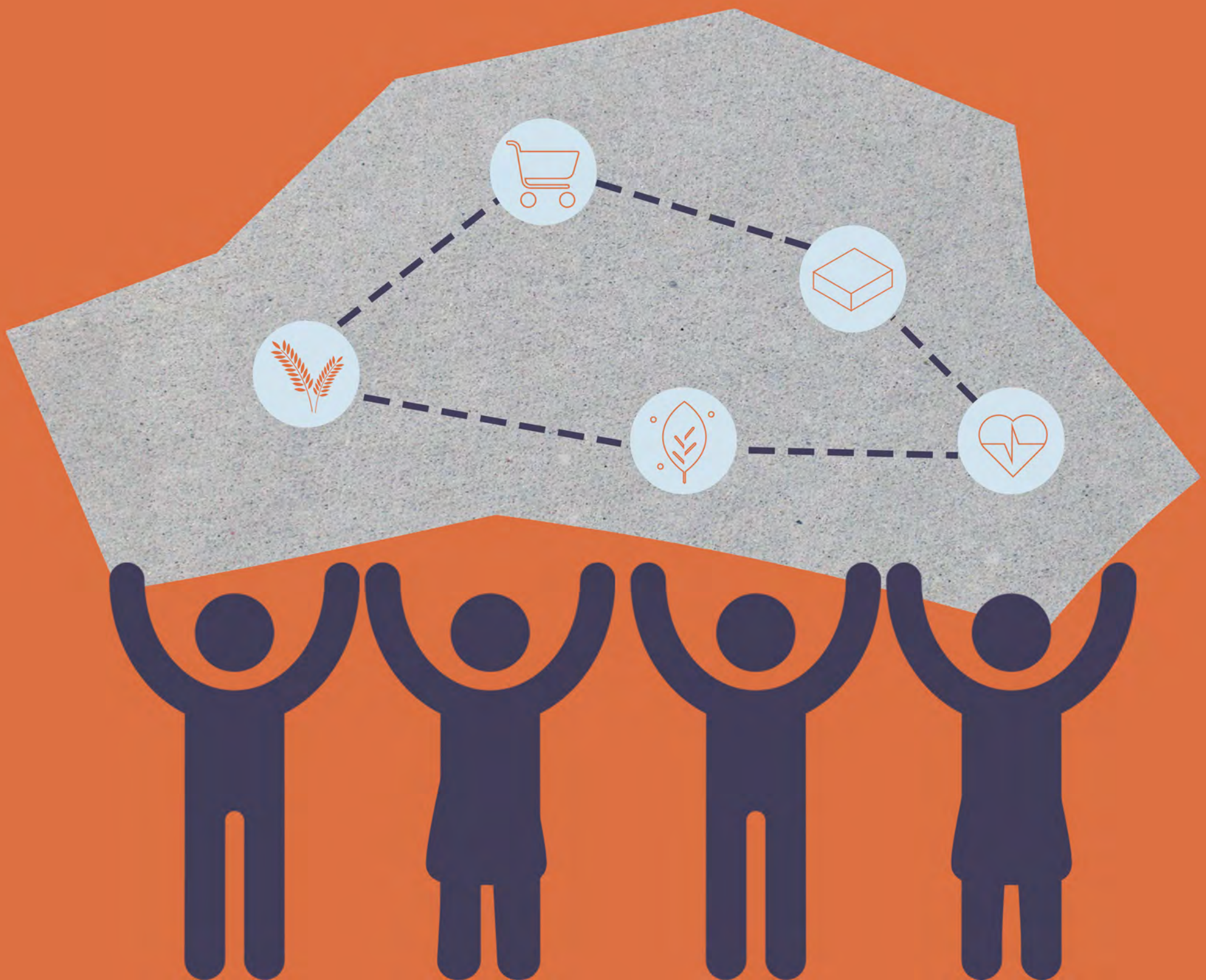


Fig. 64: Incorporated SDGs in connection to the sustainability triangle. Figure by author (United Nations, 2015)

Fig. 65: Healthscape. Figure by author

By integrating the proposed goals and interventions, we could imagine how these come together in all-encompassing Healthscapes. They help generating a sustainable agricultural sector by creating a balance between social needs, ecological protection and efficient production.

Fig. 66: Strategy for achieving the Healthscapes. Figure by author

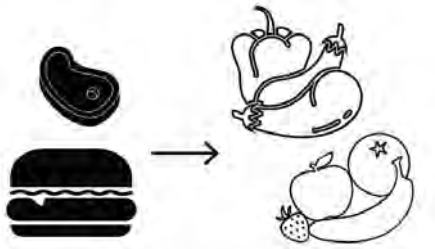


6. STRATEGIES FOR HEALTHSCAPES

Fig. 67: Main objectives pursued in the strategy. Figures by author

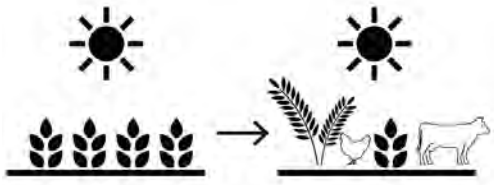
Reducing the footprint of agriculture.

Decreasing emissions in our flows and using less resources.



Rethinking of our current Western diet model.

Encouriging a healthy lifestyle.

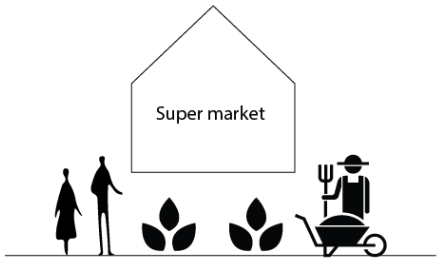


Shift away from monoculture.

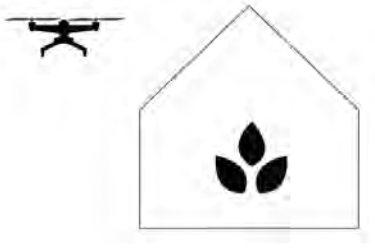
Efficient networks of resources and food supply.

Reducing food waste

Sustainable energy systems.



Create a more intimate relationship between producers and consumers.

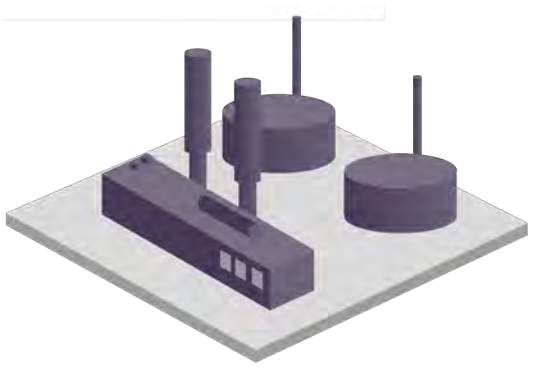


Intensifying food production by research on technology.

The following starting points are ways of achieving the previously proposed vision for a healthy region of South Holland.These will be the starting points in different kinds of area specific design tasks to make sure the vision can be achieved throughout the entire province of South Holland in a precise and organized manner.

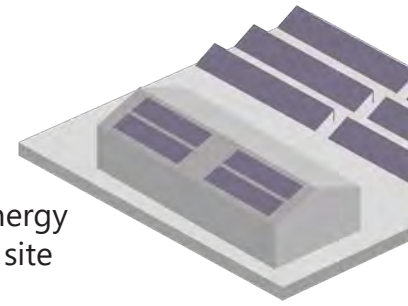
6_1 Detailed design toolkit

Energy transition



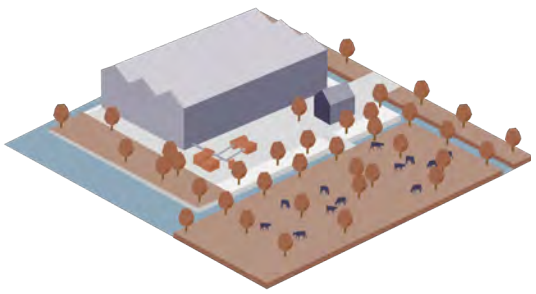
a. Biogas plant

b. Wind energy park



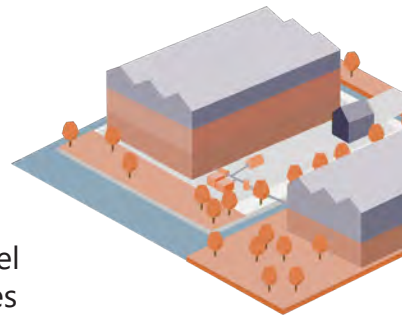
c. Solar energy panels on site

Production

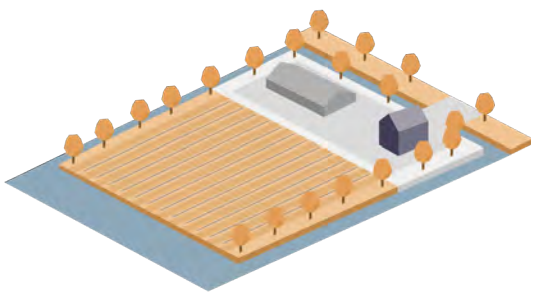


a. Greenhouse + cattle fields

b. Polyculture + livestock fields

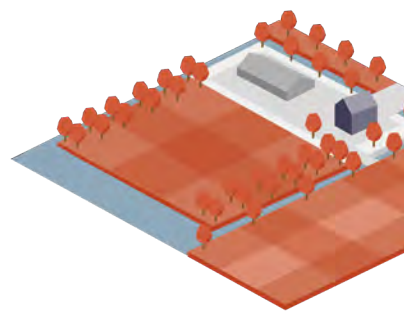


c. Multi-level greenhouses



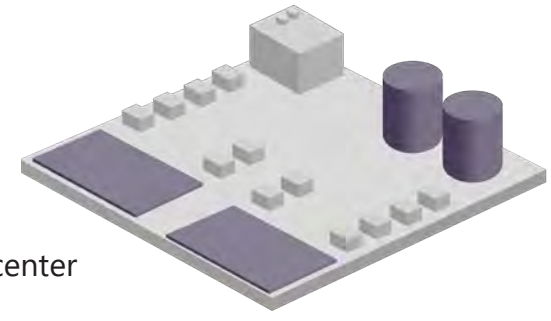
e. Greenhouse + cattle fields

f. Floating greenhouses



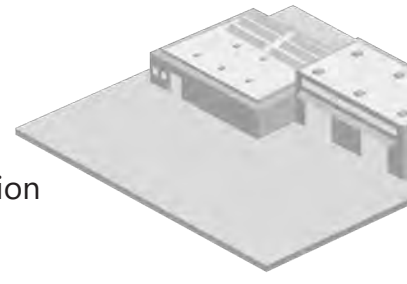
g. Arable polyculture

Processing



b. Waste collection center

b. Water treatment plant

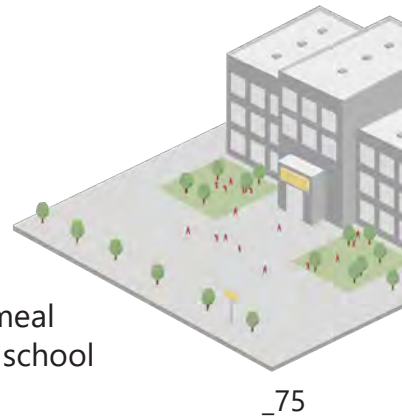


c. Distribution center

Urban realm

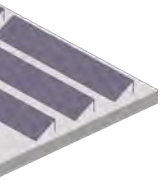
a. Pop-up production

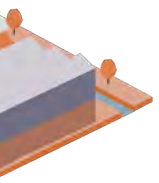
b. Productive street



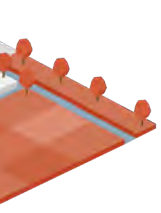
c. Healthy meal program in school canteens

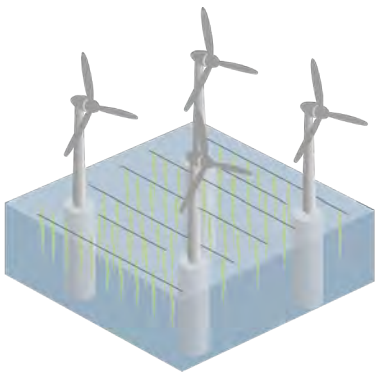
Fig. 68: Design toolbox.
Figures by authors



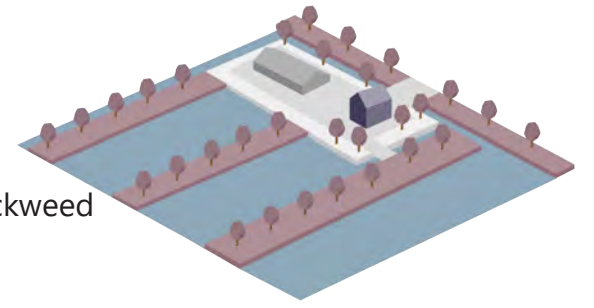


d. Agroforestry

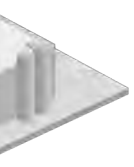


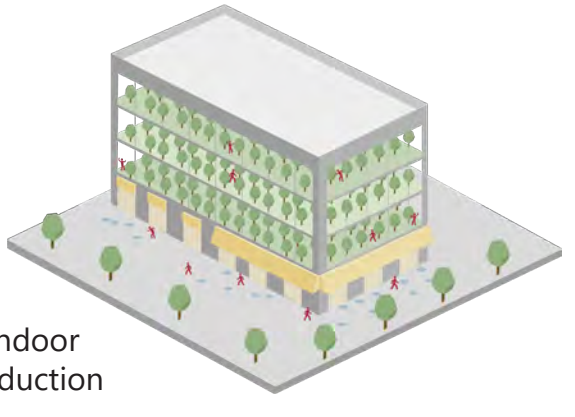


h. Seaweed farm

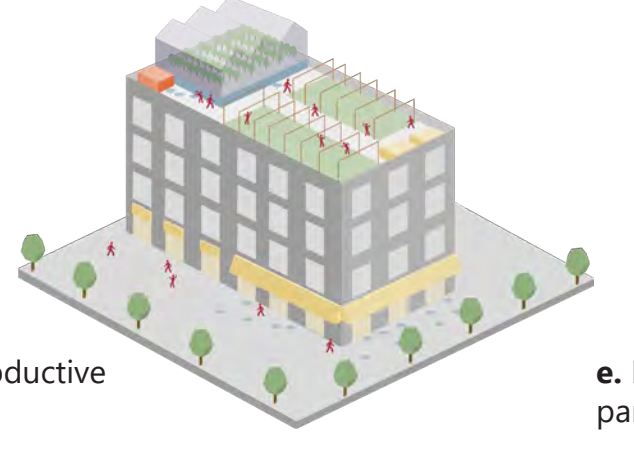


j. Duckweed farm

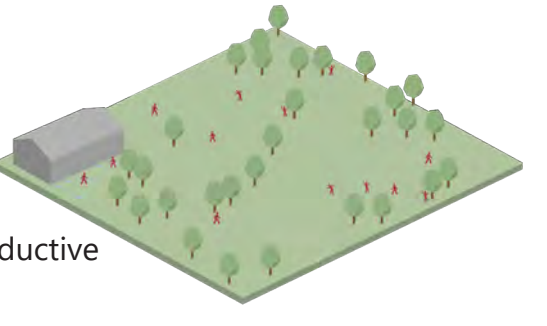




d. Indoor production



e. Productive roof



e. Productive park

Current synergies and conflicts

Fig. 69: Current synergies between stakeholders. Figure by author

Fig. 70: Current problems between stakeholders .Figure by author

Future synergies and conflicts

Fig. 71: Expected synergies after implementation of the vision. Figure by author

Fig. 72: Expected problems after implementation of the vision Figure by author.

6_2 Regional stakeholders analysis

Fig. 73: Power/Interest matrix of the different stakeholders. Figure by author.

When looking at the power versus interest it becomes clear that a close relation with meat producers and supermarkets is urgent. This projects demands most change in these industries, supermarkets in the urban area will have to change their business models and meat industry related companies will inevitably be reduced in size. We will have to convince these parties through use of regulations and subsidies.

In case of the meat industry a solution to the walls that we build for their industry we provide a change towards a more luxurious industry. The current slaugtherhouses can remain but will have less of a feel of industrial production. Animal welfare will become a much more valued principle.

When looking at the current collaborations and conflicts, generally observe a big number of parties already working together. Farmers often unite to solve bigger agricultural problems, development companies and agricultural organisations work together to develop urgent necessities. Yet we also see some current conflicts in the industry. One of the biggest problems is the increasing divide between the city dweller and the rural inhabitant (Appendix 3). by letting city dwellers and farmers work together we hope to decrease this divide and open the door to a closer relationship throughout the region of South Holland.

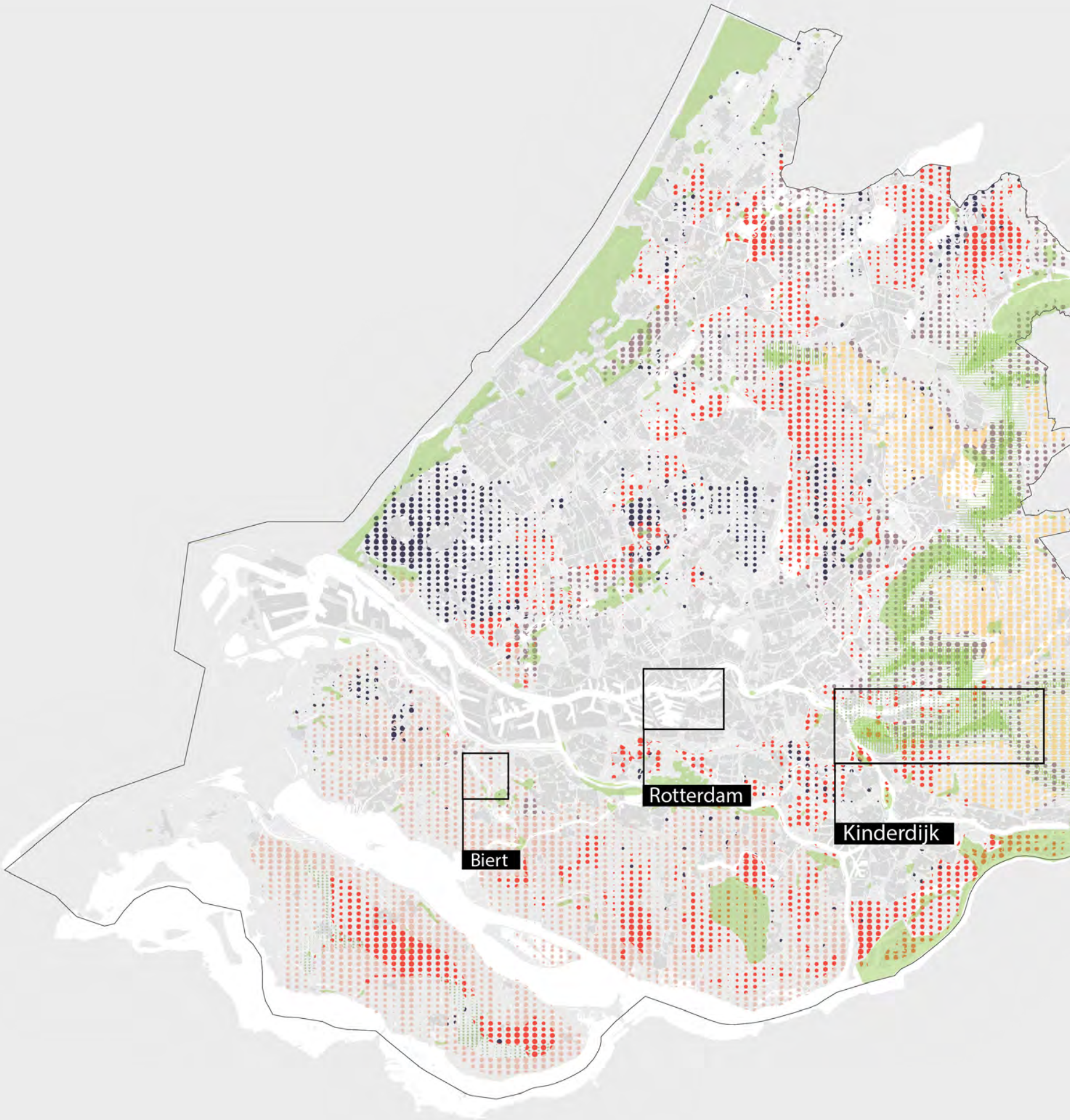
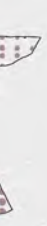


Fig. 74: Location of three case studies. Figure by author

6_3 Strategic Projects



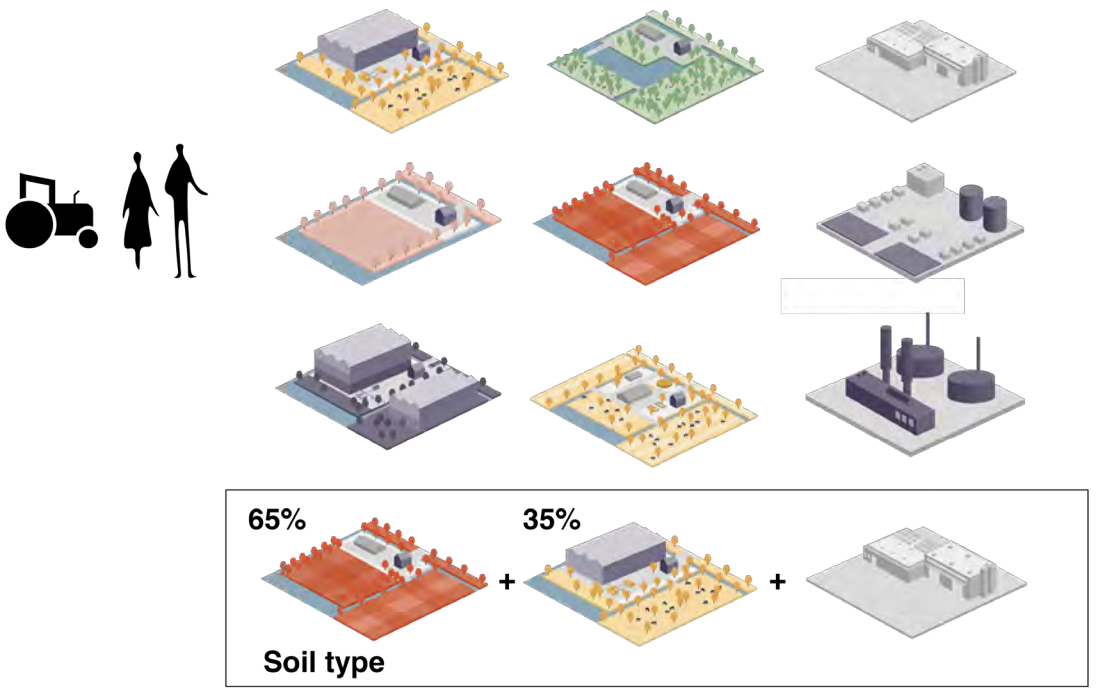


Fig. 75: Possibility of future composition of typologies for farmers. Figure by author

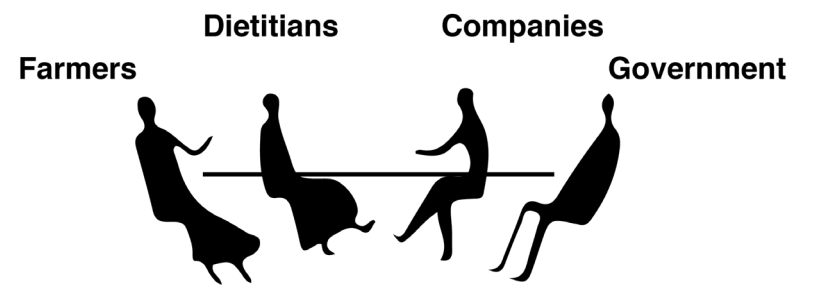


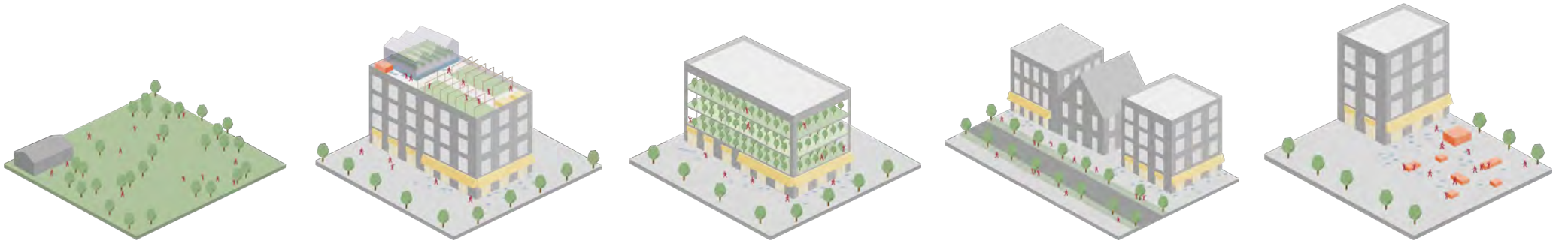
Fig. 76: Participation and consideration of different interests. Figure by author

Fig. 77: Passing on knowledge to younger generations. Figure by author

A GROW-EAT Rotterdam

The transformation of the urban landscape plays an important role in the project. Through targeted interventions, productive and sustainable cityscapes are to be created, which are designed to establish a new connection between consumers, producers and production sites. Urban farming not only encourages a fundamental social transformation of the population, but is also part of a strategy to combat climate change and ensure food security. They offer the environmental benefits and qualities of valuable urban green space and provide microclimates and habitats for fauna and flora. Additionally, they enable the closing of the nutrient cycle through the production of fertile soil, reduce food waste, produce nutritious food and create a strong community in the city. The goal of the intervention is not exclusively production. Much more, the focus is on engaging and educating urban dwellers in the agricultural process and raising awareness about the problems that have been analysed earlier. The whole process of urban production is made visible in the everyday life of the city. The farms open up to the population and pass on their knowledge and products to the local public. In particular, cooperation with schools and educational institutions in form of knowledge transfer and food distribution is promoted. In order to implement the above-mentioned goals, 5 different overarching typologies of urban agriculture have been developed, which can be implemented in different cities. To get a better insight into these strategies and their effects, a case study of a possible lighthouse project in Rotterdam, the most densely populated city in South Holland, will be presented.

Design toolkit



	community garden	rooftop garden	vertical farm	edible street	pop-up production
MICRO	vegetables + fruits + small livestock run by urban communities	vegetables + fruits + insects distributed immediately through shops	(+LED light) hydroponics + mushrooms	fruits + nuts collected by nearby inhabitants	temporary fruits + vegetables gardens
MESO	**mixed farm** vegetables + fruits + medium livestock	**mixed rooftop farm** vegetables + fruits + small livestock	**mixed vertical farm** vegetables + aquaponics		
MACRO	**mixed farm** vegetables + fruits + livestock	**mixed rooftop farm** vegetables + fruits + medium livestock			

Fig. 78: Design toolkit for urban intervention. Figures by author

Existing condition

Fig. 79: Street view outside Vasteland 84, Zalmhaven. By Google Earth

Fig. 80 Street view of the Schouwburgplein relation with the adjacent fast food chains. By Google Earth

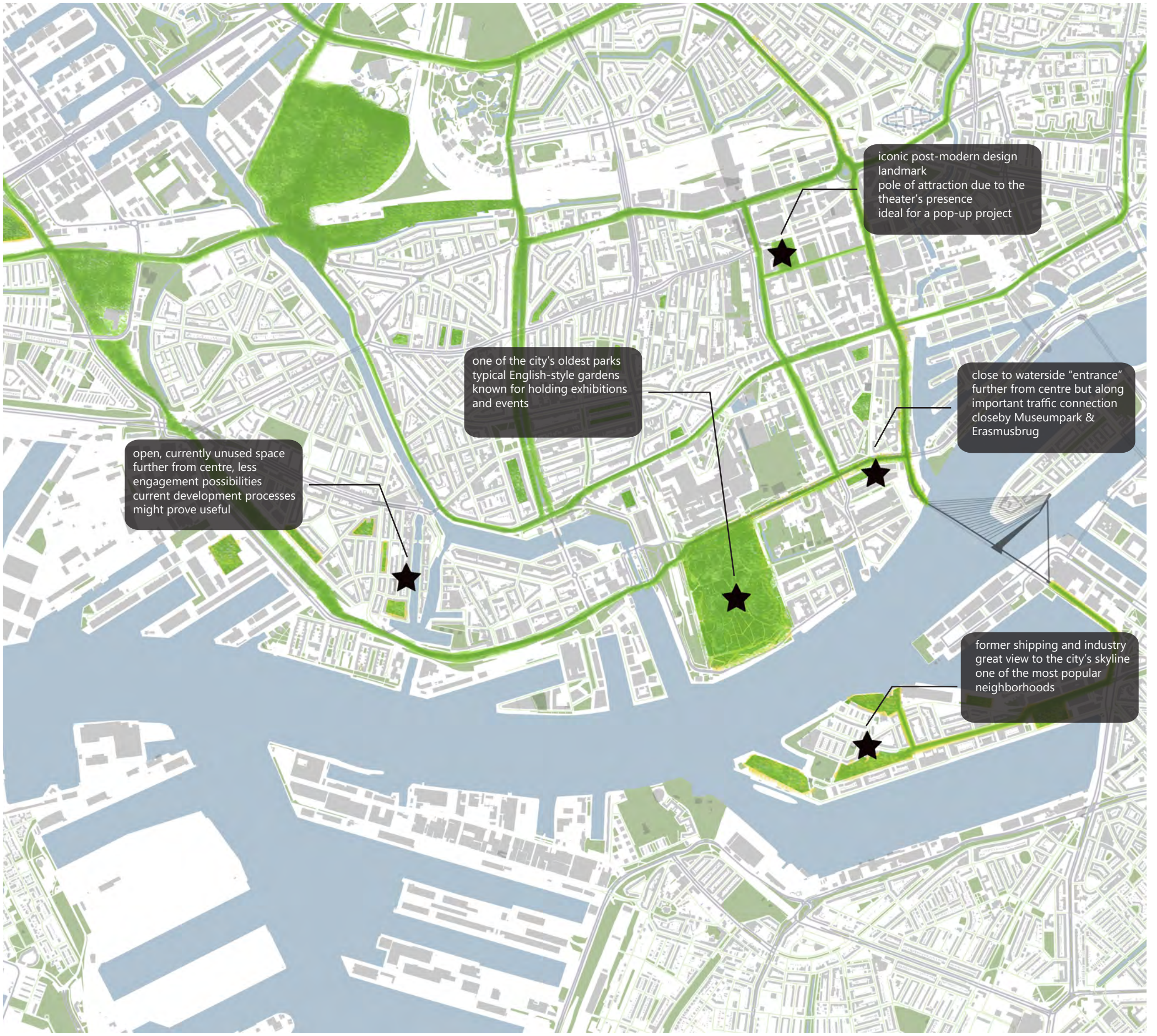


Fig. 81: Possible Locations in Rotterdam for different urban interventions. Figure by author (Nationaalgeoregister)

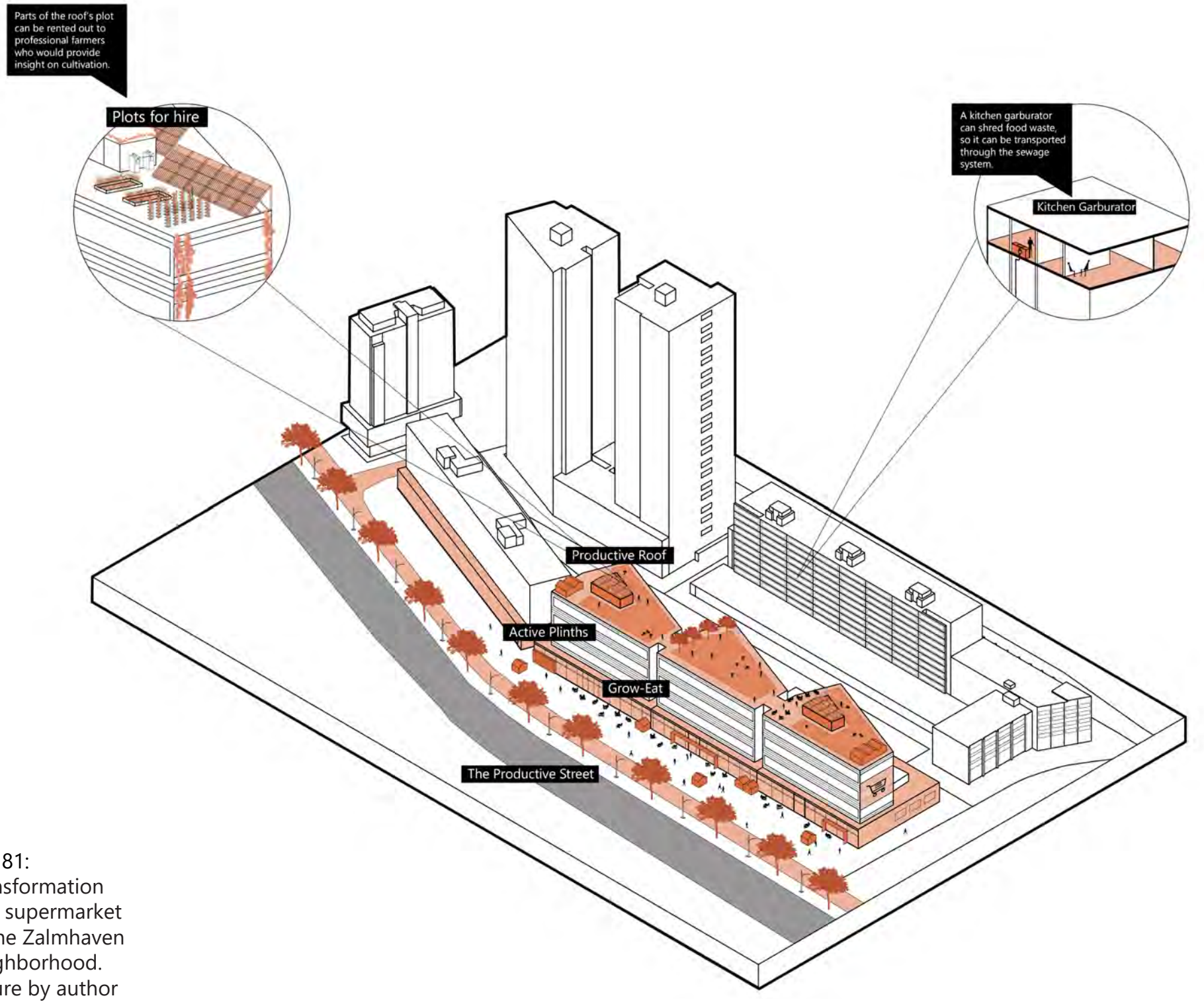


Fig. 81:
Transformation of a supermarket in the Zalmhaven neighborhood.
Figure by author

An exemplary project is the transformation of a building complex in Zalmhaven, Rotterdam. The roof of the building is being transformed into a rooftop farm, which creates a synergy with the supermarket on the ground floor. The plots of the roof garden are to be cultivated for the supply of the neighbourhood on the one hand and rented out to residents with professional supervision on the other. This creates an exchange of knowledge between the different parties and generates profitable sources of income for farmers.Not only the roof becomes a productive landscape, but also the base of the building is activated by setting up a Grow-Eat Restaurant connected to a busier street that eventually becomes part of a slow-moving traffic model in the city. This will attract the attention and interest of passing pedestrians and tourists. By welcoming consumers who want to know more about the quality of the food they eat, this new way of producing and consuming catalyses a change in the eating behaviour of the wider society.

Local stakeholders analysis

So far, farmers feel that they and their work are not valued enough, especially by the urban population. Their perspective was explained in a seminar organised by BAJK (Brabant's Young Farmers' Association) (Appendix X). The focus of this urban intervention is to strengthen the bond between the farmer, the product and the urban dweller.

At the same time, this project will test what is the potential of changing the current eating habits of city dwellers. Luke Durward, guest speaker at the TED x YorkU conference, inspired us to come up with an experiment. Durward explained in his TED talk how he changed the eating habits of his brother: "We made his environment work for him, instead of against him" (source, youtube). In the case of his brother this meant reorganizing the eating environment of the individual by simply replacing the bad foods with healthy foods. This principle will be implemented as a trigger project on a city scale by harvesting healthy crops throughout the city. The aim is to create an environment that promotes healthier options. The outcomes of this experiment will be evaluated every 5 years.

Strategies to induce change in the rural landscape such as meat taxes will form a conflict between the government and the inhabitants. Community farms will create a better understanding of the environmental externalities of different modes of farming. By letting people experience the environmental costs of cattle versus the cost of harvesting crops we hope to soften the protests towards this possible future decision.

Whether the project works strongly depends on the openness of the inhabitants towards the new interventions in the city. We will have to be mindful of the expectations of the city dweller when designing the urban farming areas. We are not trying to eliminate the sense of "living in a city" but we are trying to incorporate a farming structure in the cityscape.

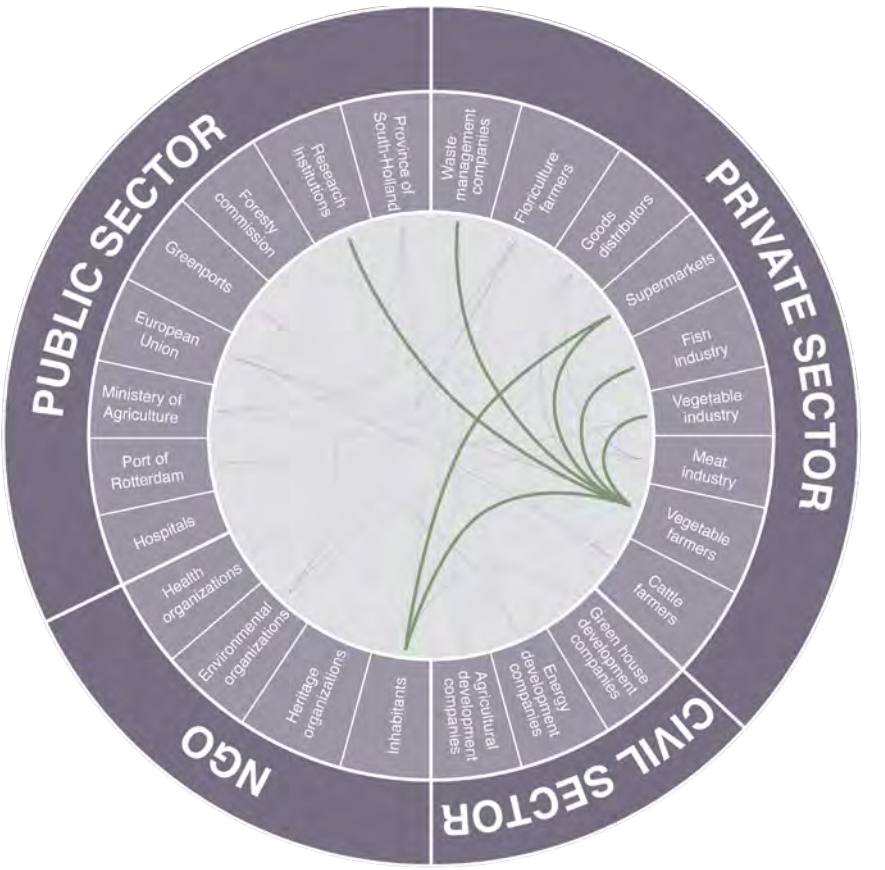


Fig. 82: Future synergies. Figure by author

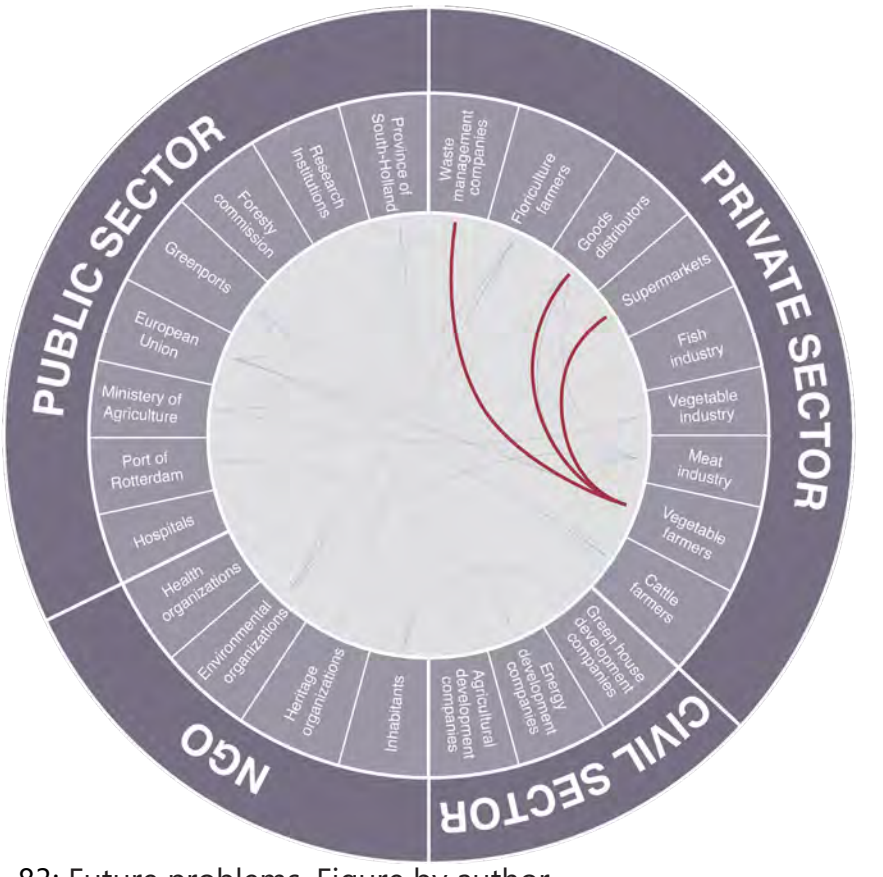


Fig. 83: Future problems. Figure by author

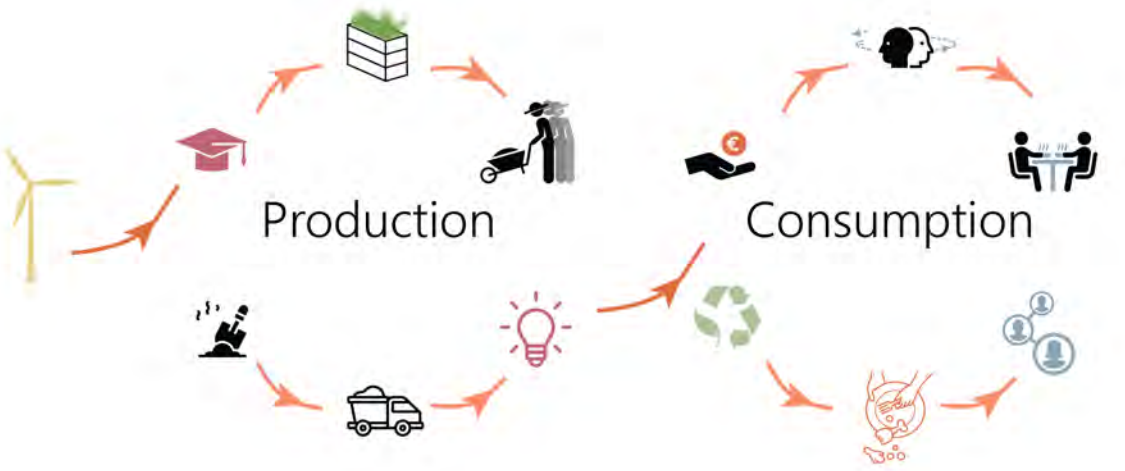


Fig. 84: Strategy concept for circularity in urban areas. Figure by author

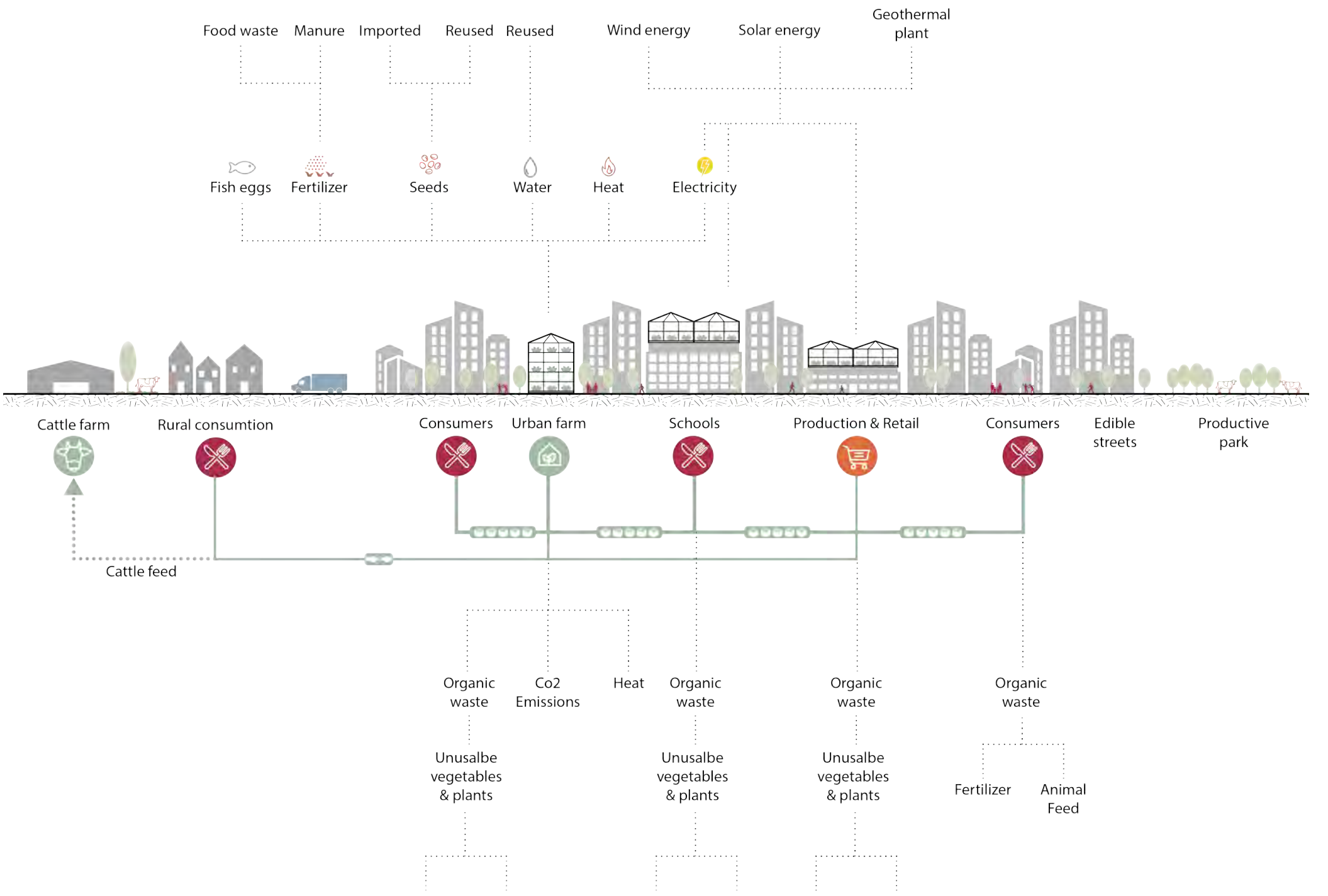


Fig. 85: Systemic section of future flows in urban areas. Figure by author

Fig. 86: View of the supermarket's roof where production and awareness take place simultaneously. Figure by author

B SUSTAINABLE BIERT

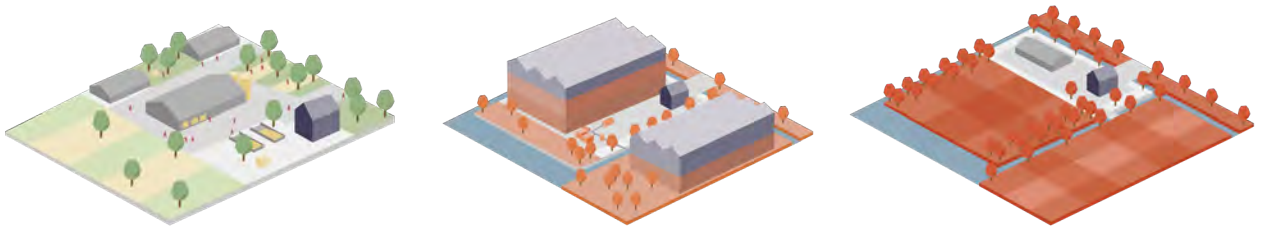
In order to feed the future population of South Holland within planetary boundaries, in addition to a change in diet, an intensification of current production is needed. The aim is to ensure the competitiveness of food production in South Holland as far as possible. However, this transformation must be socially acceptable and, above all, sustainable. For this purpose, three different typologies have been defined that deal with future efficient food cultivation in rural areas: Polycultures in combination with animal husbandry, sustainable arable farming and multilevel greenhouse complexes.

In general, agriculture in the future will no longer be monofunctional, but exclusively polyfunctional. The integration of multi-cropping, intercropping and companion planting will enrich the existing landscape and enhance biodiversity. In addition, polycultural livestock management will primarily provide more qualitative habitat for the animals that also contribute to the cultivation of the soil. Through agroforestry and the new fodder sources, these animals are granted more space for quality outdoor space suitable for animal husbandry, which was previously used for fodder cultivation. Multi-layer cultivation in greenhouses with LED lighting, hydroponics and aquaponics improve the efficient use of land, water and nutrients. In doing so, South Holland benefits from its previous expertise in greenhouse cultivation and multiplies its profits. In general, cultivation becomes more circular. In return, the import of foreign goods, such as chemical fertilisers and seeds, is reduced. Instead, things that might previously have been considered waste, and whose potential was misjudged are now increasingly reused, recycled and traded regionally.

In order for sustainable industrial agriculture to thrive, there needs to be a background of a close contact between producer and consumer. In order to bring them closer together, the distribution of locally produced food in the form of farm shops is promoted. Accordingly, the focus is more on local supply instead of high export figures.

For a possible implementation, the focus was on the southern region of South Holland with the largest share of fertile sea clay soil, which is best suited for the cultivation of different foods. In the following, the region around Biert in the south of Rotterdam, which has a mix of arable farming and cattle farming, will be discussed exemplarily.

Design toolkit



polyculture + livestock | multi-level greenhouses | arable polycultural farm

Fig. 86: Design toolkit for sustainable industrial agriculture. Figures by author

Existing condition

Fig. 87: Street view Dorpsweg in Biert. By Google Earth

Fig. 88: Rural landscape in Biert. By Google Earth

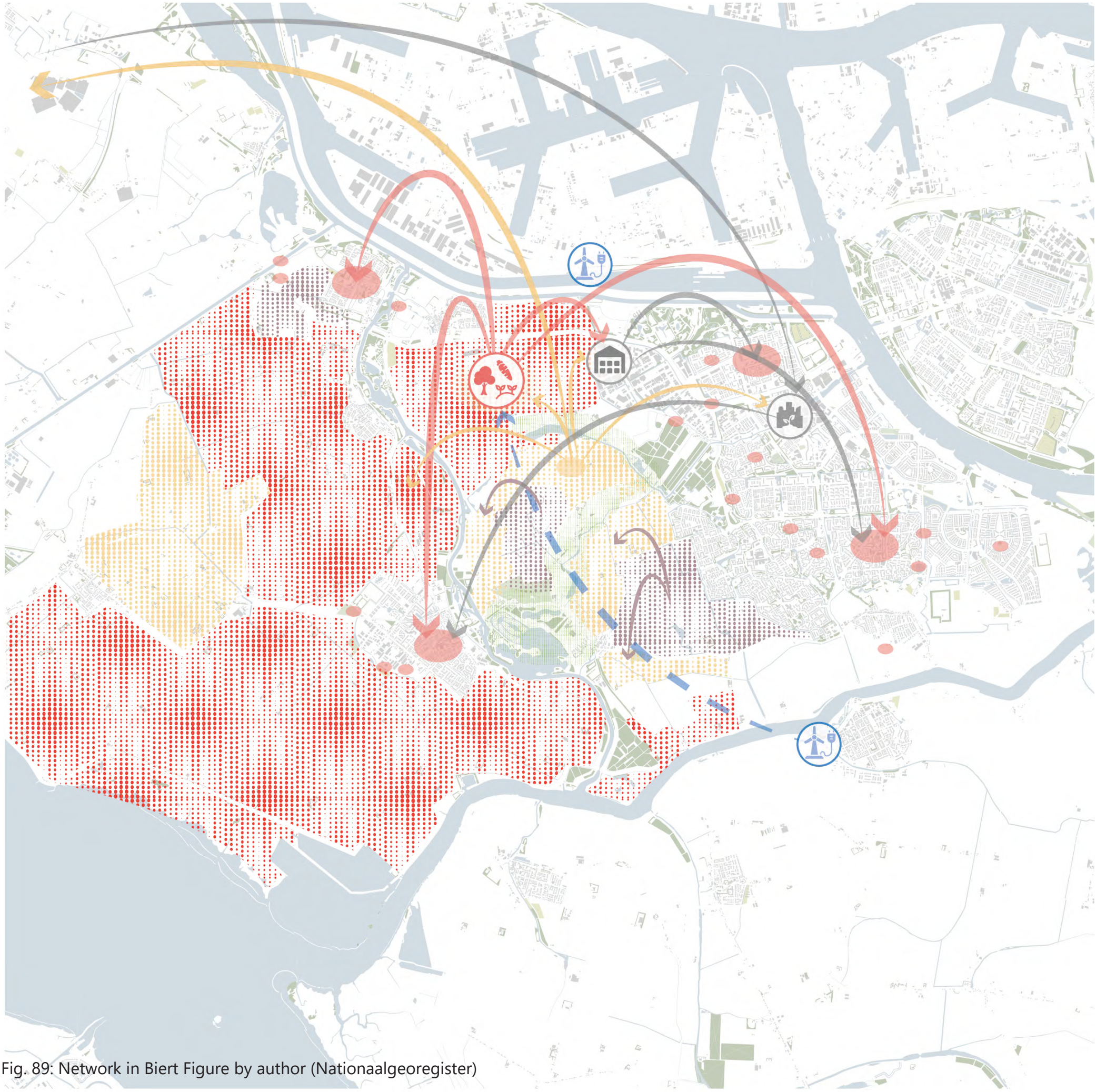


Fig. 89: Network in Biert Figure by author (Nationaalgeoregister)

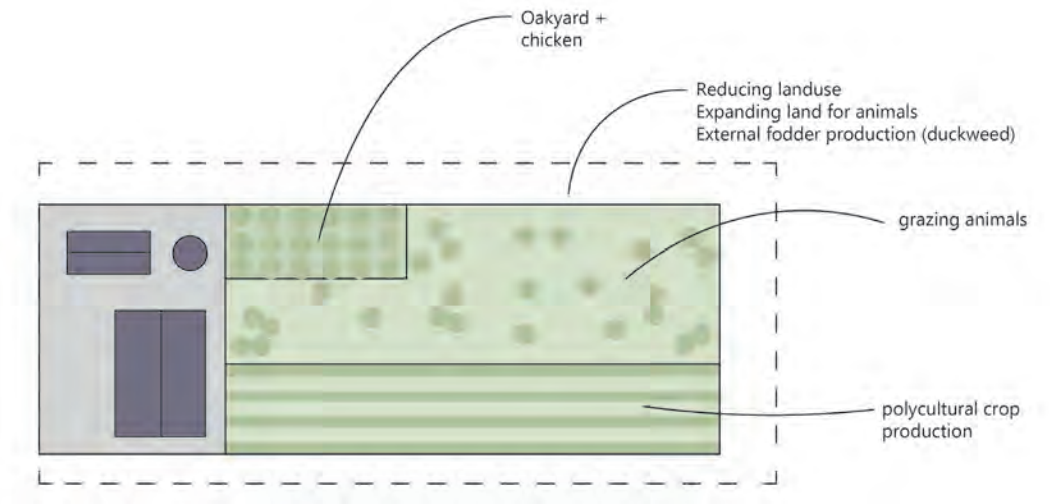


Fig. 90: Systemic strategy of new future land use of cattle farms.

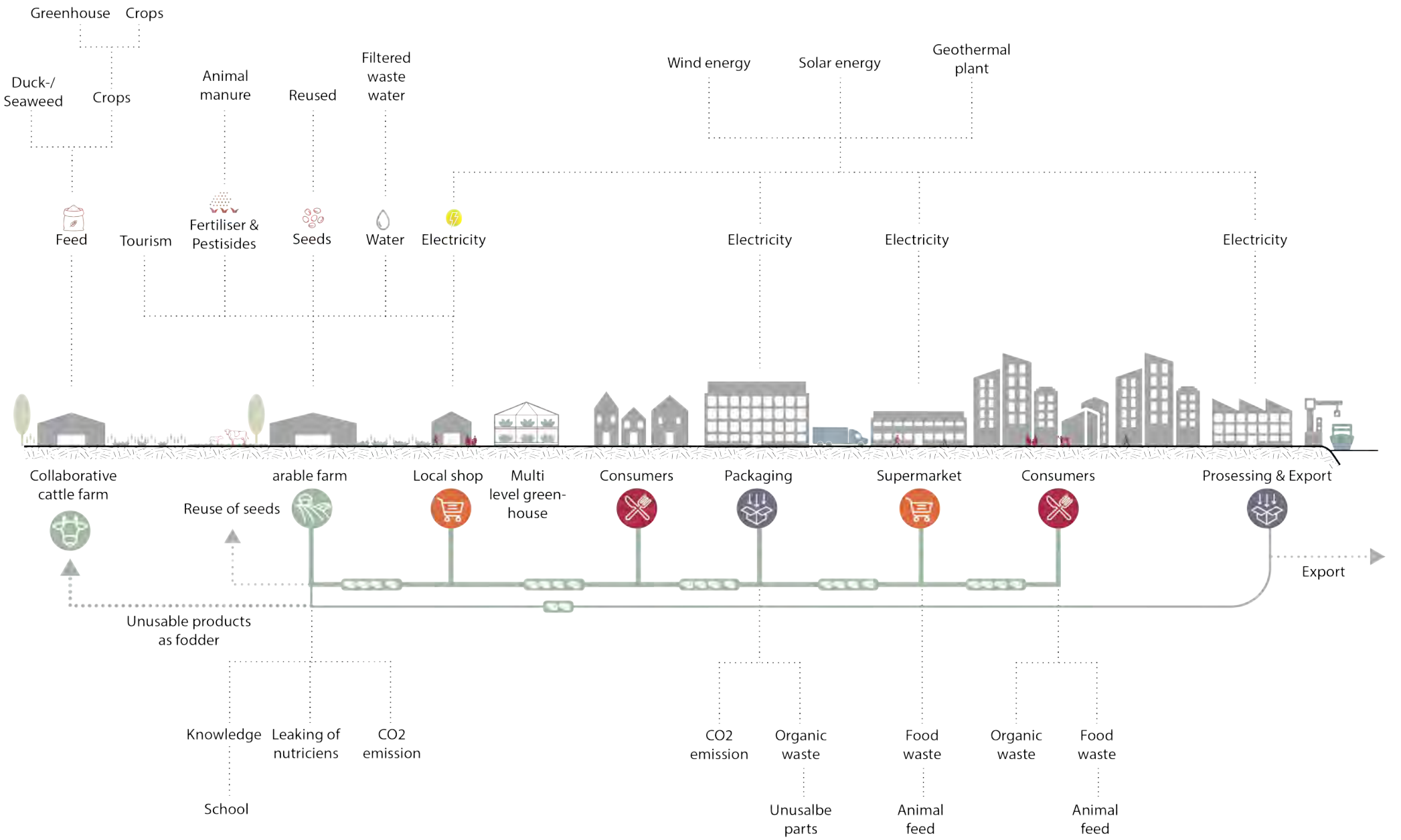


Fig. 91: Systemic section of future flows of arable farms. Figure by author

Fig. 92: View of the polyculture farm. Figure by author

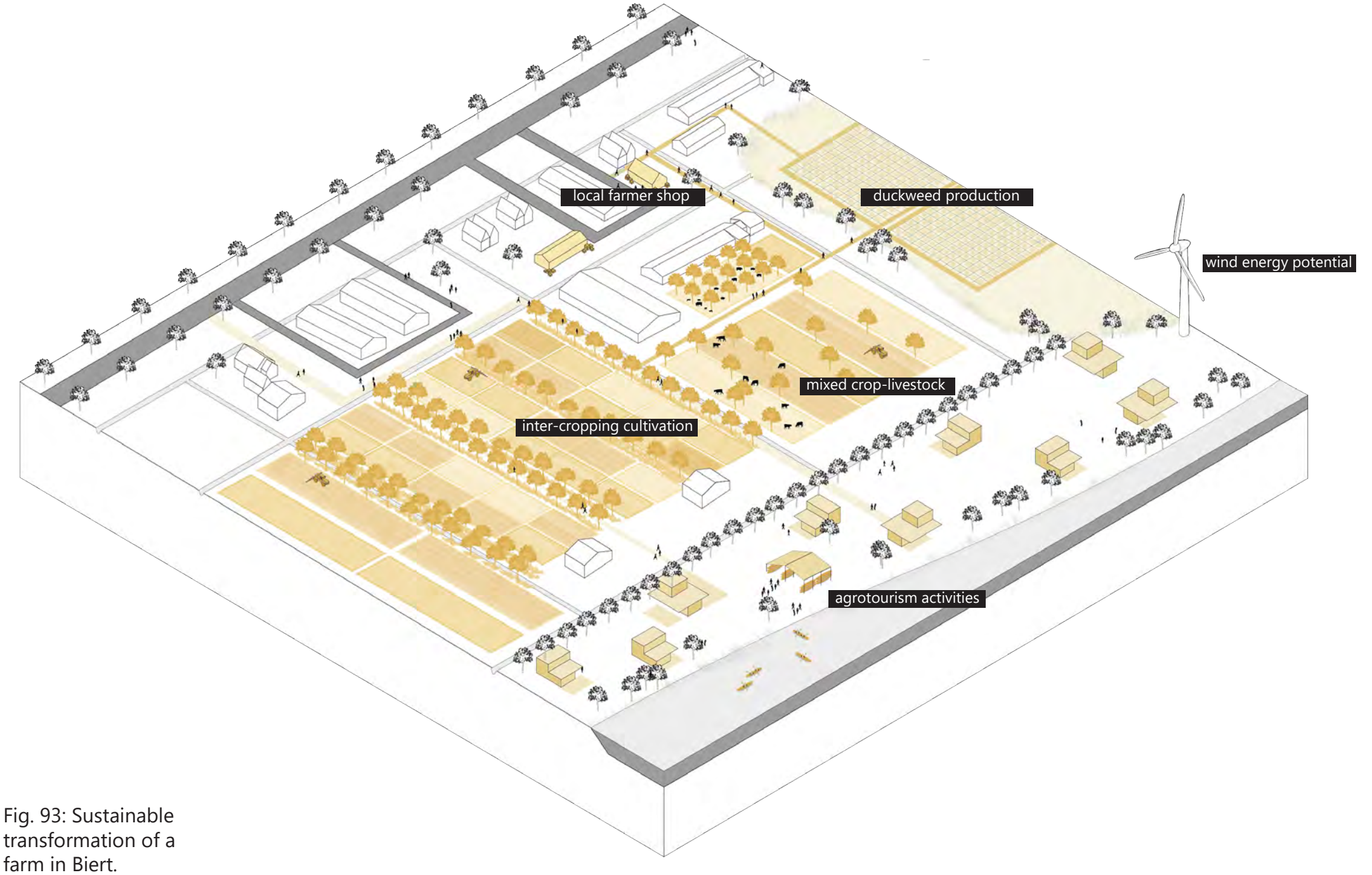


Fig. 93: Sustainable transformation of a farm in Biert.
Figure by author

By using new and innovative production techniques, cultivation can be intensified while reducing environmental impact and the use of external resources, while enhancing animal welfare and space quality. Differences in the type of agriculture are mainly defined by soil qualities.In addition, more space will be freed up for actual food production aimed at human consumption, as most fodder production will shift to areas with peat soil that were previously entirely occupied by grasslands and livestock. In addition, agro-tourism may prove to be a fruitful combination to improve citizen engagement.

Local stakeholders analysis

To understand more about the farmers and their willingness to change we worked together with the BAJK to come up with a story about the frustrations of a typical dutch farmer (Appendix X+1). To summarize: the farmer is willing to change, but they think that the cost of change will be on their behalf. They also fear the change since it now mainly consists of goals for the agricultural sector instead of area specific and regulated change. The strategic projects in both Biert and Kinderdijk show the farmers that area specific change is possible. The created tool-kit for soil-connected interventions will provide an assurance of precisely managed change in the agricultural sector. The strategic projects are a showcase of the implementation of our toolkit.
When designing the new agricultural landscape it is necessary to be working together with heritage organisations. The agricultural landscape has to change yet it should not have to mean the loss of the dutch polder landscape.

Fig. 94: Future synergies. Figure by author

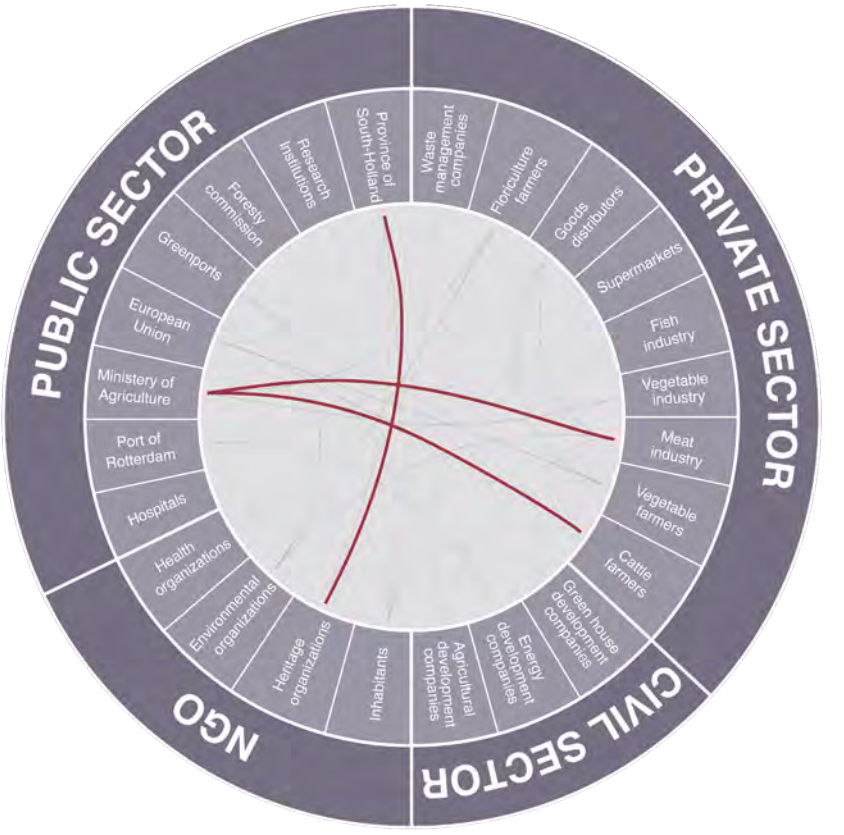


Fig. 95: Future problems. Figure by author

C Kinderdijk agroforest

The current use of the eastern peatland region is unsustainable and needs to be changed. To decrease oxidation, the plan is to raise the groundwater level and create wetlands. The goal is to strengthen the biodiversity and expand the natural areas. However, the new nature should remain productive as far as possible and continue to be managed at low intensity.

To achieve this, three possible typologies were implemented. The first one is silvopasture, which is a mixture of natural biotope and livestock, The second includes duckweed farms, using the newly created water areas and producing nutrient-rich fodder, and the final one includes floating greenhouses on multiple levels. This multifunctional utopian foodscape is composed of a mixture of these different production systems.

As a case study, the area near Kinderdijk has been chosen, which is directly adjacent to a nature reserve and is currently used for intensive cattle farming on peat soil.

Design toolkit

agroforest

crops + fruit trees+ livestock

floating greenhouse

hydroponic + LED cultivation + aquaponics

duckweed farm

Fig. 96: Design Toolkit for new nature on peat soil. Figures by author

Existing condition

Fig. 97: View over Natura 2000 area in Kinderdijk. By Google Earth.

Fig. 98: View over Kinderdijk. By Google Earth.

Fig. 99: Network around Kinderdijk. Figure by author (Nationaalgeoregister)

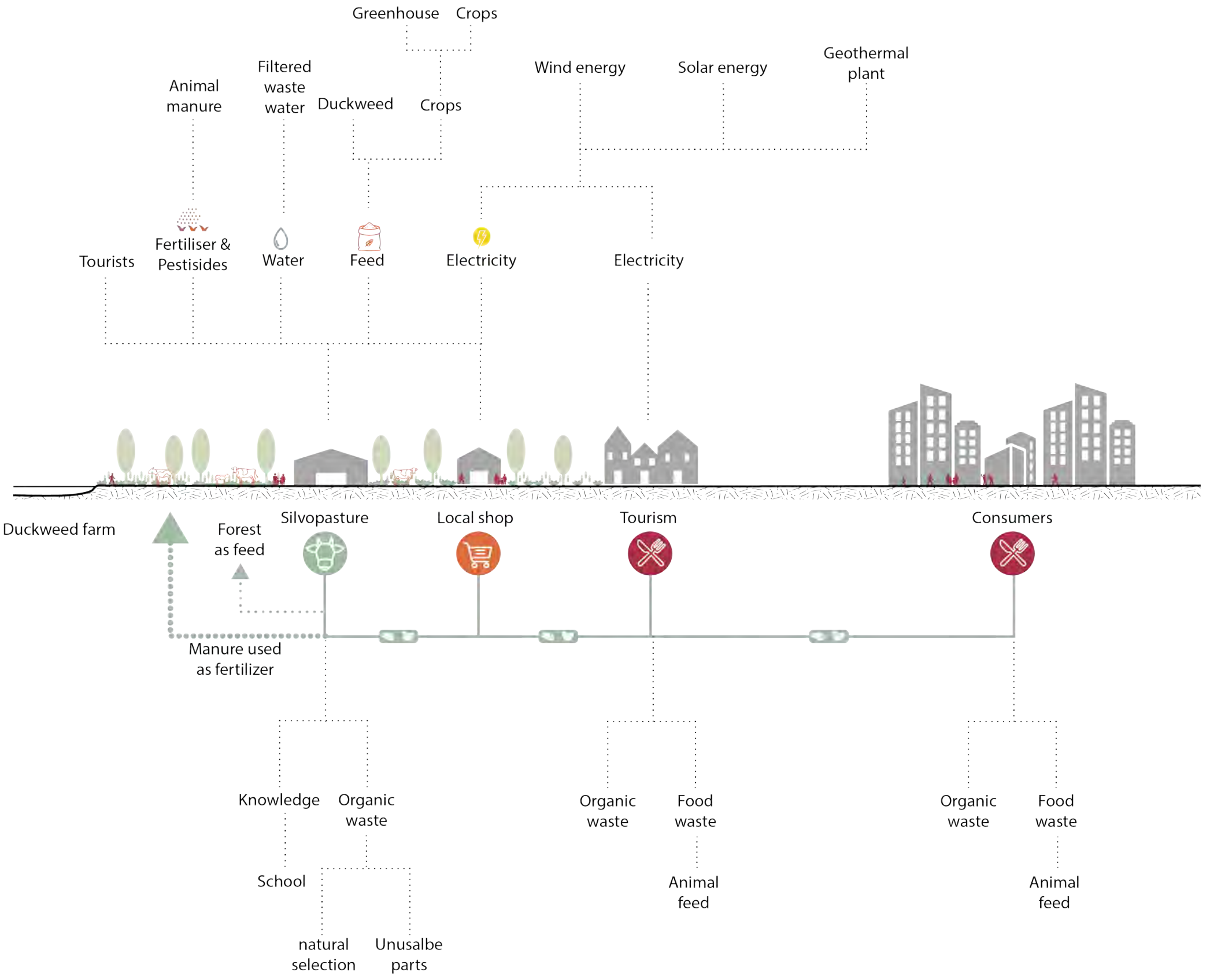


Fig. 100: Systemic section of future flows of new nature areas. Figure by author

Fig. 101: View of Agritourism in constructed wetlands. Figure by author

Fig. 102: Detailed section of salvopasture in relation to agritourism.

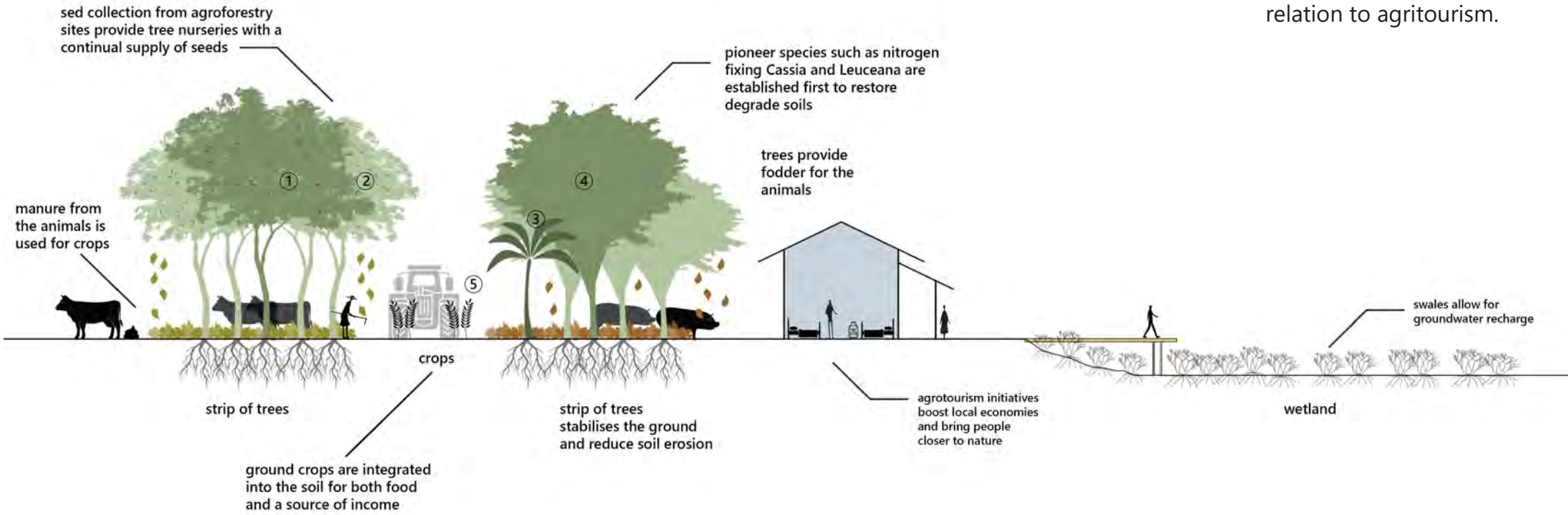


Fig. 103: Transformation of former cattle farms to new nature. Figure by author

Local stakeholders analysis

In order to achieve the goal of strengthening biodiversity and creating new nature in the wetlands, the cooperation and connection between the farmers, especially the cattle farmers, and the Forestry Commission and environmental organisations is promoted.
Through newly formulated synergies between the tourism, health and education sectors and the farmers, the area's history and nature can become more attractive and accessible to the public. This project also appeals to and stimulates the wider society and inhabitants of South Holland. As a result, the landscape itself is regenerated and becomes richer, more vibrant and more diverse.

Due to the rise in the groundwater level, the previous land use as pasture land for cows is no longer possible to the same extent. Accordingly, the biggest problem is expected to be between the cattle farmers and the Ministry of Agriculture, who are causing the change in the landscape, since the farmers will have to reorient themselves and their livelihoods will change significantly. Compensation is to be provided by the state to facilitate this change. The landscape is also very well known for its milk and cheese production, and the relocation and reduction of production may also lead to conflicts between South Holland and heritage organisations.

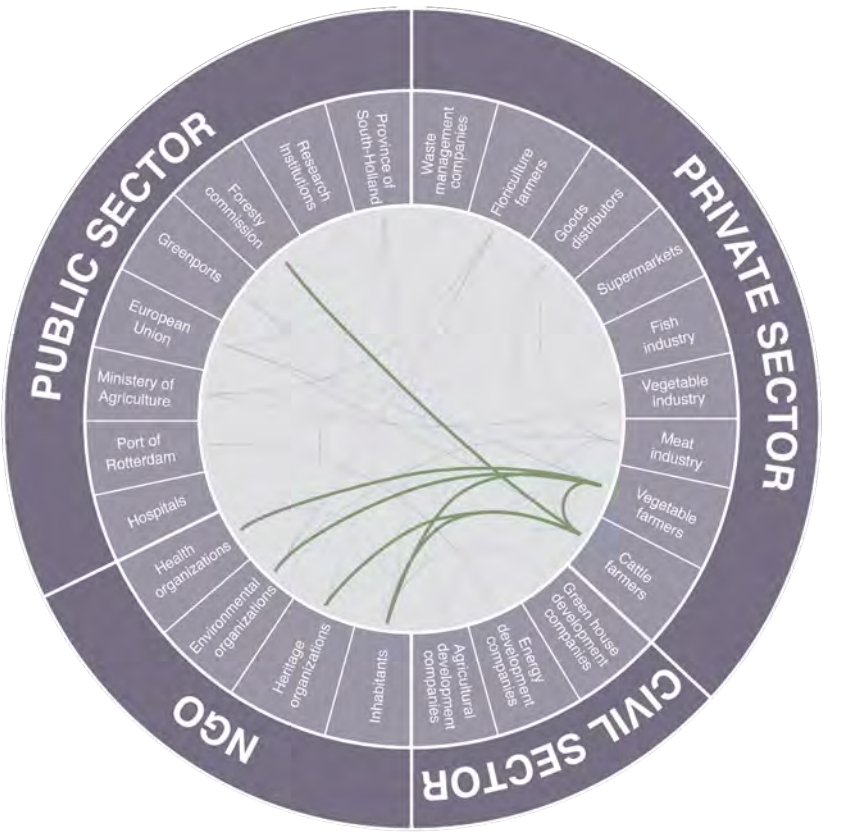


Fig. 104: Future synergies. Figure by author

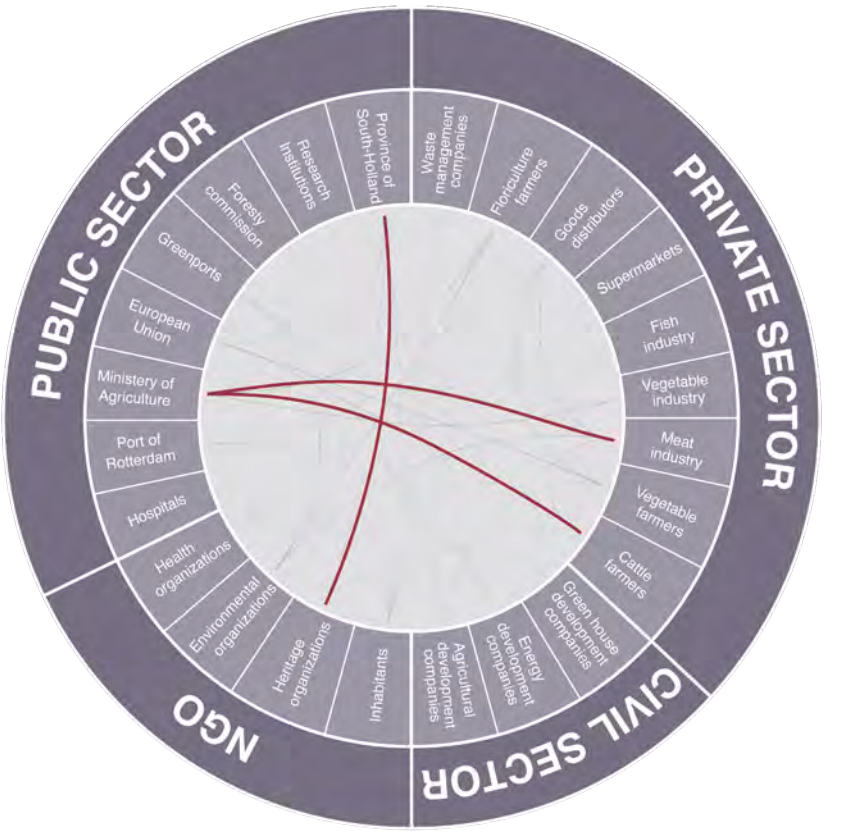


Fig. 105: Future problems. Figure by author

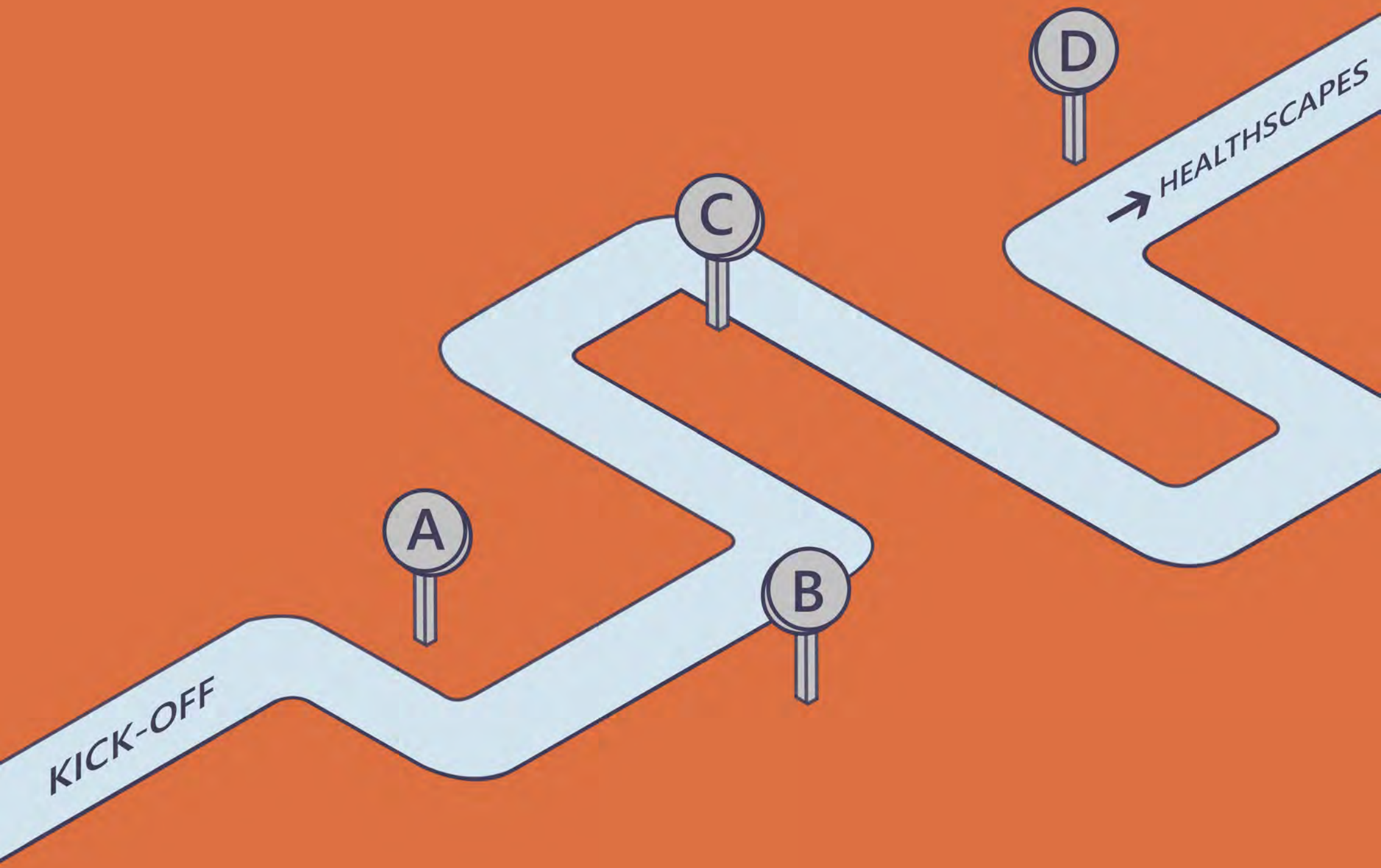


Fig. 106: Healthscapes in time.

7. Healthscapes in time

In order to create a sustainable and circular agricultural sector in South Holland, the project addresses five different themes that will be transformed by 2050. These five themes are: Diet transition, sustainable production, energy transition, social justice, waste management.In each of these sub-areas, different stakeholders are addressed, which requires different sequences of different policies, technical developments, social engagement and spatial strategies. These are distinguished from each other in the diagram with the help of the corresponding colours.

Furthermore, the project has been divided into three different phases, each with different intermediate objectives:
1. Creating the scene for change
2. Specifying the change
3. Time for change.
These are explained in more detail below.

In Phase One -Creating the conditions for change - the focus lies on development, promoting a change in eating habits as well as a closer relationship between farmers, production and city dwellers. This involves educating residents about crop harvesting and healthy eating. It also creates an understanding of the environmental impact of the food industry through internships at urban farms. Moreover, "KNOW YOUR FOOD", an educational programme in which schools serve food along the structure of the Lancet diet and educate about food production will be introduced. At the same time, farmers are supported in switching to more sustainable energy use and waste management. This includes creating an organic waste processing network and better regulating manure emissions.

Phase Two -Specifying the change - creates the first steps for the transition of the rural landscape. In this phase, policies and subsidies dominate, caused by the pressing need for change. The strategic projects in Biert and Kinderdijk will be examples of how the new agricultural model should work, including diversifying crops and typologies and increasing biodiversity.In addition, mandatory renewable energy sources and on-site water treatment & meat taxes risk creating friction in society. The tools needed for these constraints were created in phase one.

Phase Three -Time for change - is all about rural transition. unsustainable landscapes (e.g. cattle farms) need to be reduced and more resiliently converted, such as to duckweed farms using the new wetlands. Thereby, the maximum allowable transfers will be strictly regulated. Agro-tourism will be marketed to create a new source of income for farmers, while not straying too far from their main desire to maintain their occupation.The time of implementation of the three case studies is indicated by the coloured highlights.

7_1 General timeline

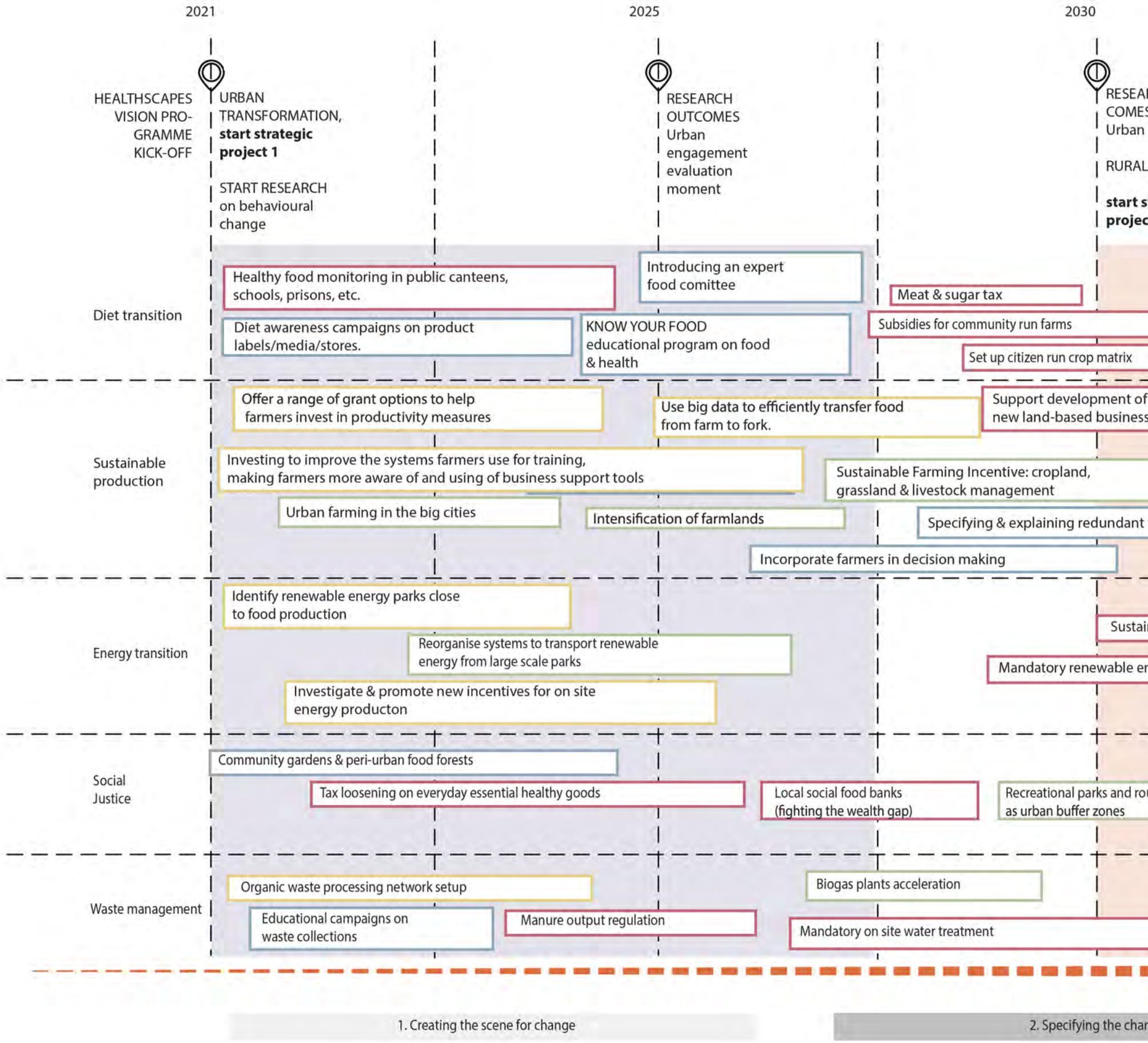


Fig. 107: Strategic timeline. Figure by author

2035
2040
2045
2050

RCH OUT-
S
engagement
TRANSFORMATION
trategic
ts 2 & 3

RESEARCH OUTCOMES Biodiversity increase evaluation moment

RESEARCH OUTCOMES Biodiversity increase Evaluation moment

ses

Nutritionally unproductive landscapes to be reduced/reused

Crop diversification according to estimated Lancet diet standards

Maximum allowable transmission

farming typologies

Subsidies to transition to new farming typology

nability tax on major corporations

nergy source onsite.

utes

Agri-tourism initiatives to stimulate local economies while reconnecting to nature

Collection points in urban areas

Upcycling hubs in schools

nge

3. Time for change

Strategic project 1

Strategic projects 2 & 3

policy

social engagement

technical developmer

spatial strategy

policy

technical development

social engagement

spatial strategy

7_2 Phasing

PHASE ZERO

In order to shape the new agricultural environment, an evaluation of the existing land's properties was needed. To give a sense of this area specific approach, the soil types and current land uses have been determined.These layers form the basis for the proposed change in agricultural typologies. While examining the following phasing maps, it is important to realize that the proposed typologies are not the definite solutions. They demonostrate only one way of implementing the previously created framework. Different sequences are possible, yet the same kind of evaluation of the land is needed.

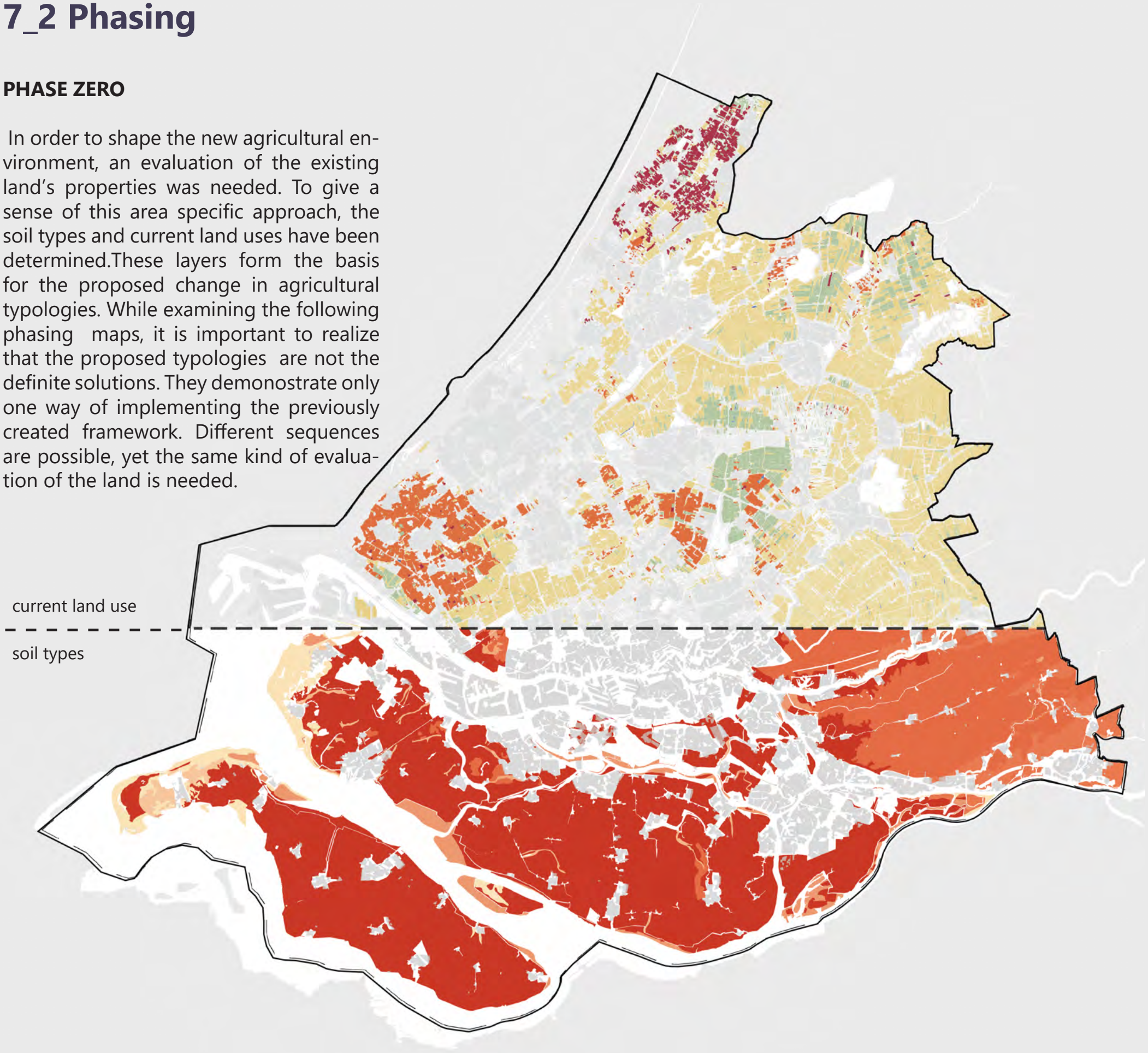


Fig. 108: Phase zero. Figure by author

PHASE ONE
CREATING THE SCENE FOR CHANGE

The urban environment will be changed to an environment that encourages the inhabitants to choose healthy eating options.
Furthermore, fruit streets and collective urban farms will create a deeper understanding towards our food among the city dwellers. “KNOW YOUR FOOD” an educational program in which schools will serve food according to the suggestions of the Lancet diet and educate children on food production will be introduced.

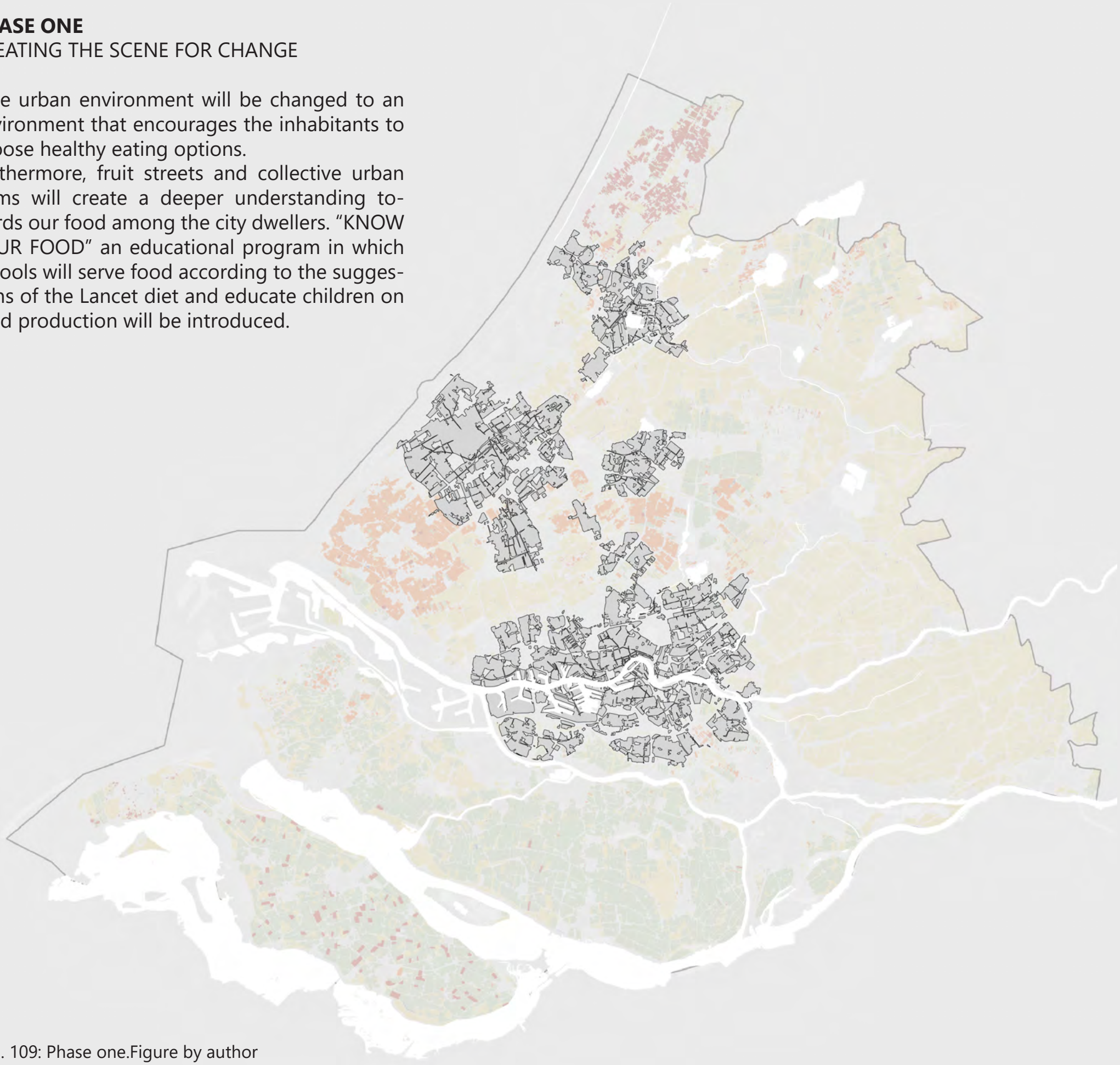


Fig. 109: Phase one.Figure by author

PHASE TWO
SPECIFYING THE CHANGE

The focus in this phase will be on the endangered agricultural areas. In the southern part of the region, the observed salinization problems dictate the phasing, while in the eastern regions declining biodiversity problems being targeted.

In the southern part of the region, stricter water management & diversification of the crops will increase the soil quality, while in the eastern part, biodiversity will be increased by synergizing biodiverse areas and agricultural landscapes.

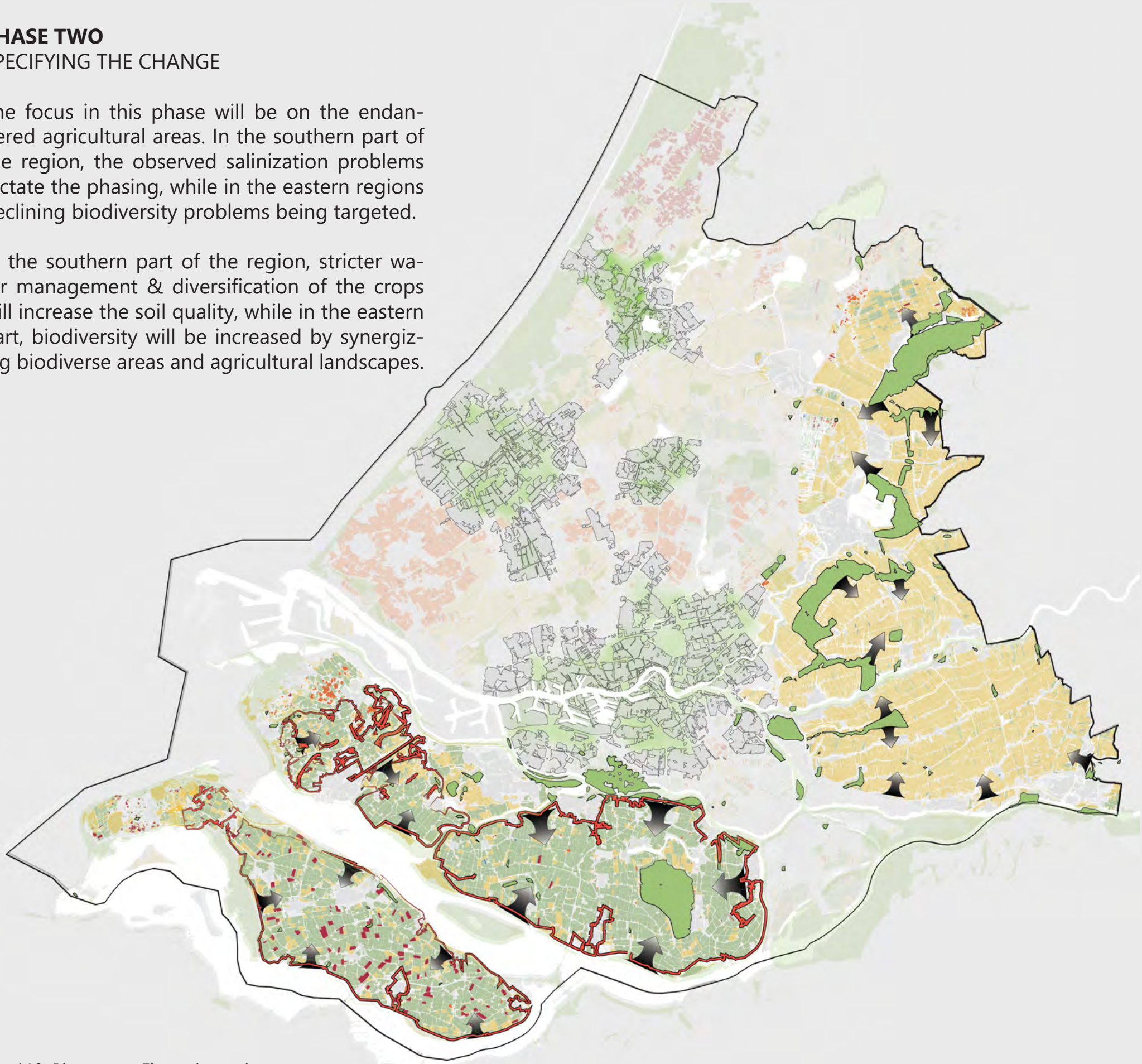


Fig. 110: Phase two. Figure by author

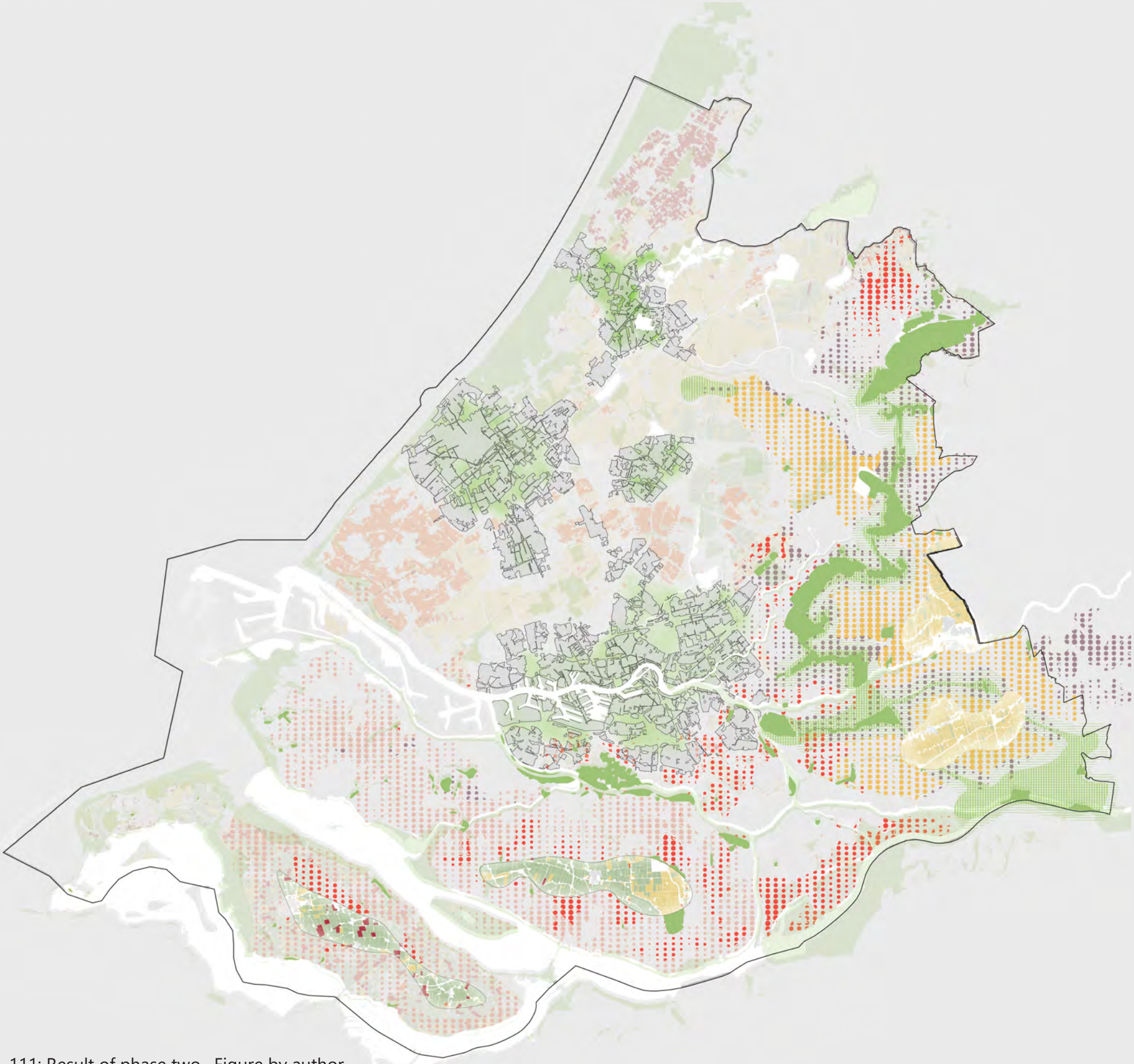


Fig. 111: Result of phase two. Figure by author

PHASE THREE

TIME FOR CHANGE

The worst problems of the agricultural sector will have been solved in phase two. Phase three focuses on the rest of the agricultural landscapes in South Holland. Focus areas in this phase are the green house industry and the northern farming regions. Energy developments initiated in step one will make it possible to change the green house area to a much more sustainable area.

A healthy region of South Holland is created.

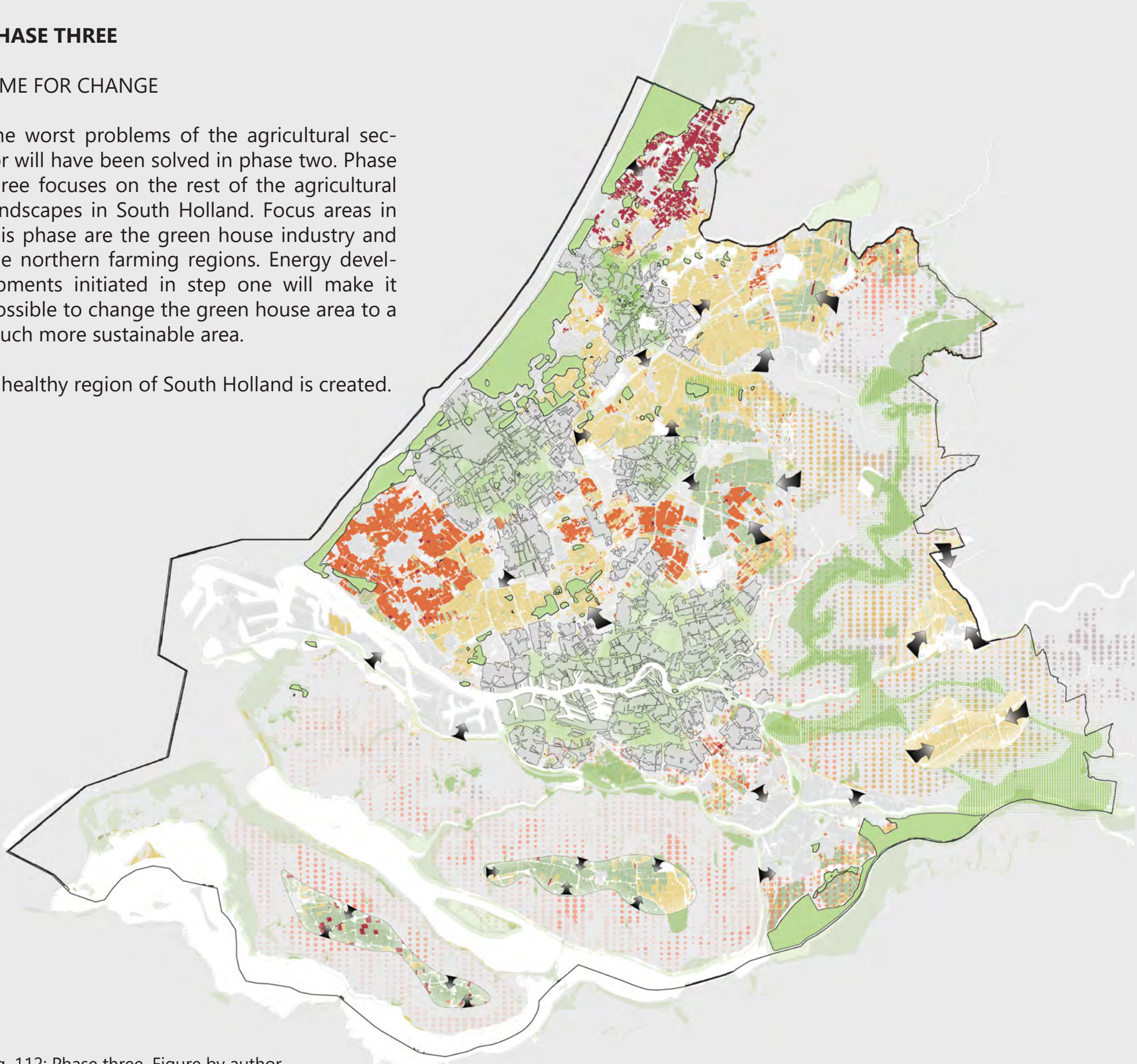


Fig. 112: Phase three. Figure by author

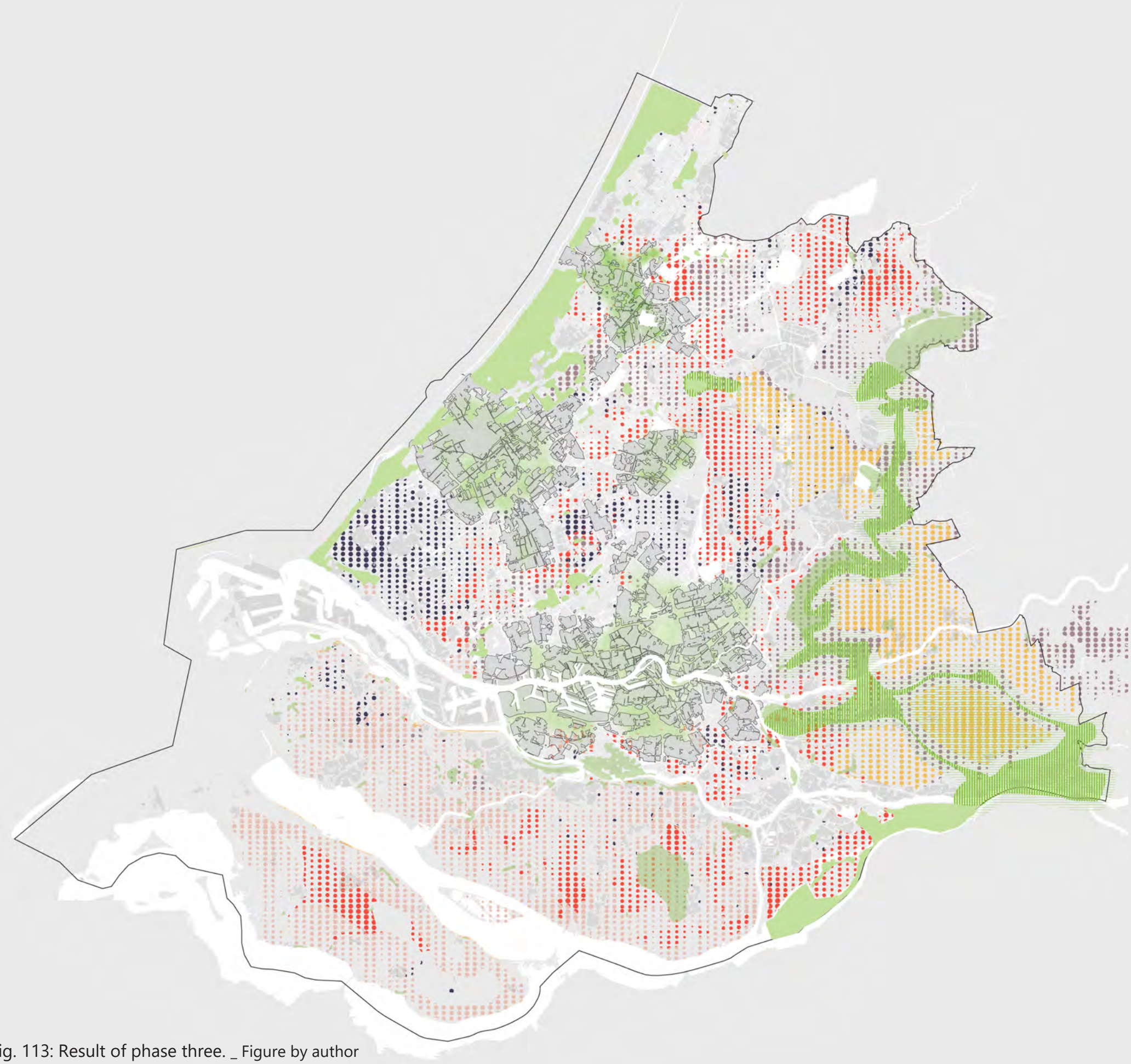


Fig. 113: Result of phase three. _ Figure by author

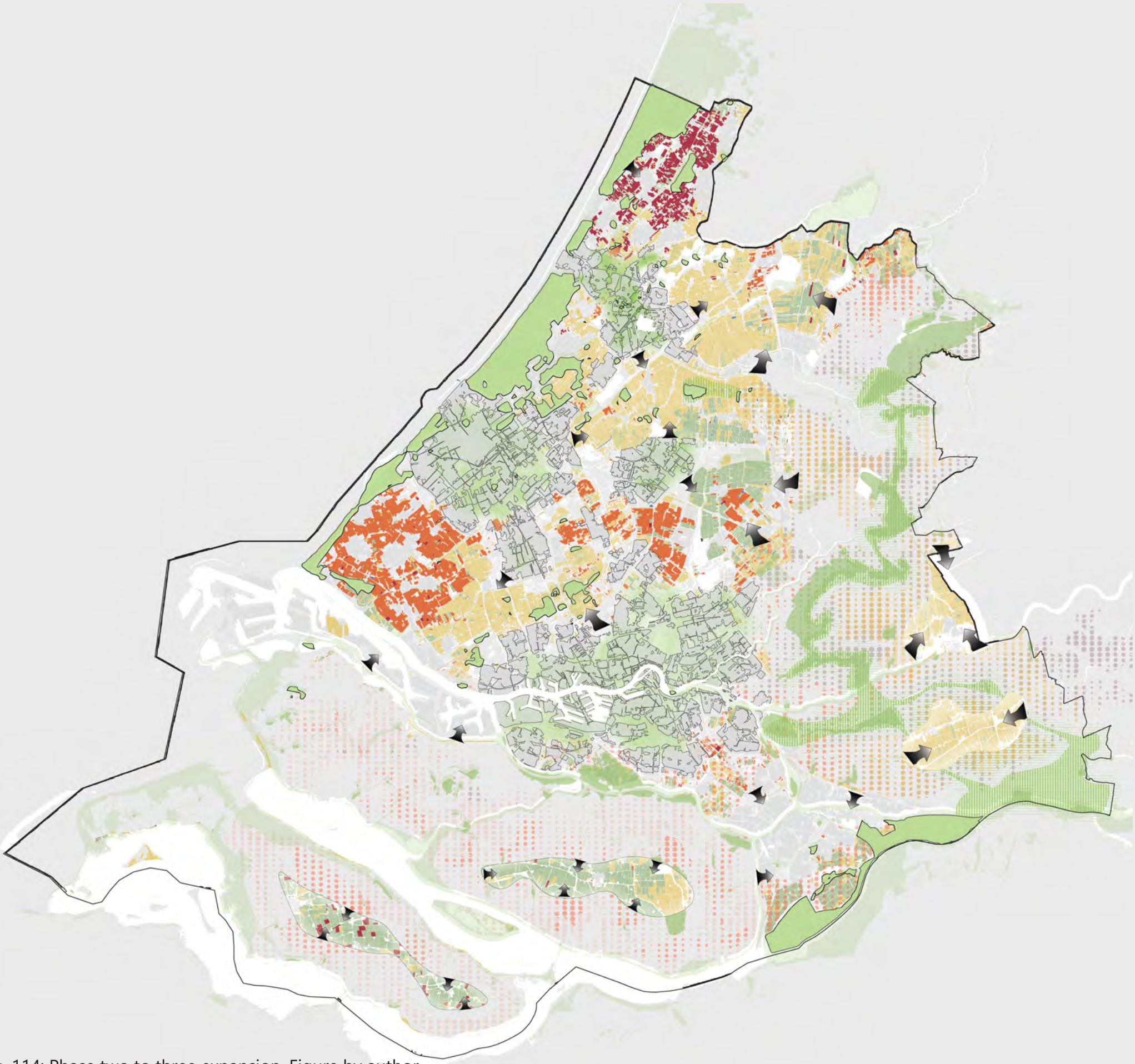


Fig. 114: Phase two to three expansion. Figure by author

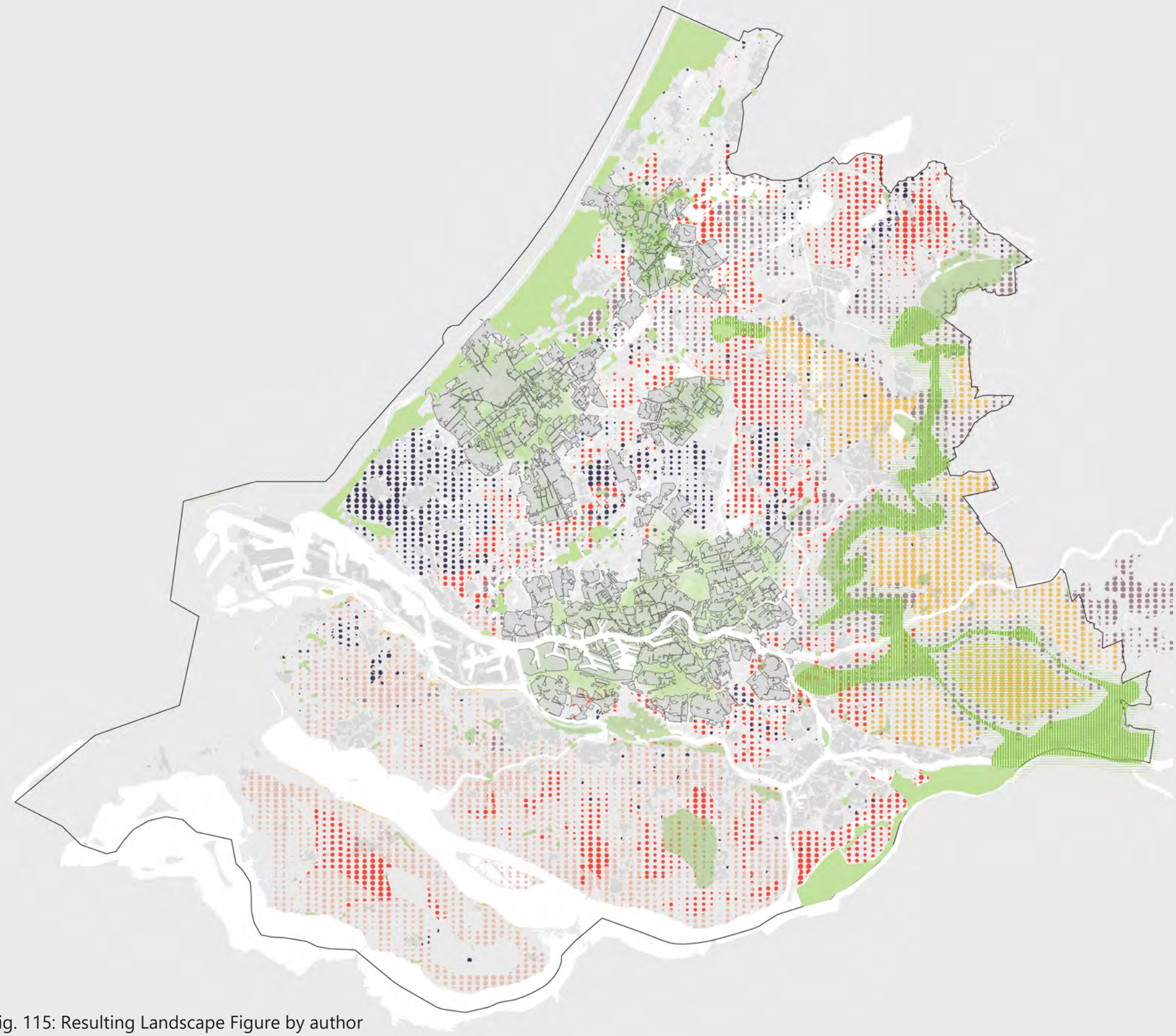


Fig. 115: Resulting Landscape Figure by author

8. CONCLUSIONS

Food provisioning has not been a key focus of spatial design and planning in the past decade. Even if it was addressed, there always existed a distinct division between urban and rural planning. Food being essentially related as part of agriculture leads to it being categorized as a rural issue even though it contributes majorly to the cities which represent most of the consumption population. In South Holland there still seems to exist a pattern of urban areas surrounded by agricultural zones with a stark distinction of their boundaries. This also owes to the disconnection between the people and the food that they eat and the spatial and environmental outcomes of their diet.

The agenda that has been posed by the national government to develop 1 million homes to fulfill the housing demand by 2050 and the pressure to produce more food to maintain food security in the future compete with each other for land. While the current mode of production in itself is unsustainable, expanding production will only worsen the outcomes. Also climate change has a greater impact on our food production.

Therefore, the vision of this project aims at shifting the notion of food production from being restricted to the rural realms to production in urban areas as well, along with transitioning the current average Dutch diet to a population following the average Lancet diet. The result of changing the diet will immediately be reflected in the production typologies that we currently have. This shift is envisioned to be the guiding forces in transforming agricultural landscapes more sustainably into the proposed Healthscapes.

The Healthscapes are aimed at improving the health of the Planet and the People. The transformation of the landscapes will be derived from the toolkit of sustainable productive landscapes that has been formulated based on current innovations in the agro-food industry, yet is open to include new innovations in the future. Producers both in urban and rural areas would have a choice to choose from different models of production from the toolkit to achieve the desirable sustainability standard mentioned in the policies. The proportions of various typologies of production is based on the need to satisfy the average Lancet diet in the future. Thus, by this transition, future South Holland would gain land which would be put into use for bio-diverse zones.

The transition from a take-make and waste economy to a circular economy poses an urgent need to close our flows of materials and waste, thus this project envisions to reuse waste organic products from production to be reused in new urban farms in the cities, also by introducing new innovative technology to reduce the use of resources in the future.

The transformation of the food sector certainly needs a regional scale planning and this project aims to bridge the gap between people and their food.

8_1 Group reflection

Discussions and reflections

The main aspiration of the Healthscapes 2050 project is to promote a healthy living environment while striving for a dynamic balance between the three main societal groups that are either involved or affected by agriculture in South Holland. The first group would be the agricultural sector and its practitioners, whose contribution to the economy is highly important by setting the country as a forerunner in the global context of trading goods. The second group would be the inhabitants of South Holland, who have grown disconnected from nature and are now following the typical Western lifestyle, an unhealthy way of living that also impacts the environment without them realizing it. Last but not least, this project takes into account the silent stakeholders of the region, such as the natural ecosystems and the future generations, who will face an inevitable crisis if no action is taken. By strengthening the natural areas in the region and specifically by initiating a transformation of the peat soils in the east, the proposal essentially gives land back to nature, diminishes the growing environmental threats of salinization and subsidence while overall offering a better spatial quality to humans and animal species.

Societal Relevance

The main concern of this proposal has been the correlation between dietary habits and their influence on agriculture, as well as the impact of the observed Dutch diet model on long-term health. This project is highly relevant to the context of the province's agenda because it affects one of the most lucrative economic sectors and a great number of employees occupied in it. Suggesting an alternative economic model in which regional sufficiency and local consumption have priority over global trade transactions may sound like a controversial suggestion, and that is why a thorough strategy, perhaps even on a national or European level, needs to be developed first. Altering the existing modes of production or downsizing a big number of farms would cause an unavoidable backlash by farmers' unions. Financial support by the state to the farmers is a first step to help them undergo the transition and hence, protect the social tissue from potential crises. However, financial support in itself is not enough for future development. That is why this project aspires to engage all stakeholders in a bottom-up collaborative approach that would provide a series of solutions and business opportunities for those who might get affected.

It is of great importance to highlight that the public goods that are provided within this vision are considered more valuable than the financial predominance of the Dutch agriculture. Our design interventions and their supporting policies will decrease air and soil pollution levels, offer better quality landscapes to a wider range of the population and, ultimately, it will shield people's health against the predominant unsustainable externalities.

The proposal not only deals with South Holland from a regional perspective, but also contributes to international goals like the UN's Sustainable Development Goals (SDGs) (United Nations n.d.). The Healthscapes concept relates to at least nine out of the seventeen SDGs, mostly correlating to the zero hunger ambition, steering responsible production and consumption, the advocacy of well-being and sustainable cities and regions.

Ethical Issues

As we embraced the role of the regional planner we realized the responsibility it entails when it comes to understanding and analyzing the complexity of regional development problems, sensing the ethical issues that arise in the process of designing for people and critically reflecting on the role of technology in future societies. In the final Capita Selecta lecture we participated in "The Great Planning Game", where we were introduced to various profiles of regional planners (Sehested, 2009) and we had to choose the planner that fitted our group's approach the most. Among the different types as a group we decided that we identify more as the process planner and the strategic planner.

By perceiving ourselves closer to the process planners, we identify that solving the puzzle of sustainable agriculture includes many affected parties that need to be integrated in the decision process. In order to carry out a carefully planned phasing plan we found ourselves struggling with finding the right combinations of actions and policies to achieve an efficient and resilient process, which still remains flexible. Due to our project's controversial suggestion of drastically changing our habits collectively as a population, we are aware that we need to have good communication skills to engage the public, that is why we worked on shaping an appealing vision

for the transformation of the region's landscape that a wider audience can identify with. This very last aspect also matches with the strategic planner profile, whose main interest is to engage political authorities in the design process, as well as to seduce investors, mainly in large urban projects that would be most suitable to activate economic activity, quite similar to our urban trigger projects.

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Appendix

1. Individual reflections

Self Reflection - Boris Bakker

While growing up between the polders and greenhouses, I have formed a strong understanding of the Dutch agricultural landscape and have always been rather aware of the environmental pressure we as humans are responsible for. Strangely enough, I seem to have never really put one and two together as I have never been really aware about what I eat, or seemed not to care as much about it. Therefore a combination of awareness and unawareness influenced my choice for the agri-food sector.
Although the knowledge remains that mostly all projects start with this recognisable struggle, it seems that the feeling of being lost in a vast sea of information and possibilities had never been as strong as at the start of the current quarter. A bit to my own surprise, diving into the complex dynamics and systems that belong to the regional scale and specifically to the agri-food industry for the first time, developed a feeling of attraction to the scale of the project. The scale made me more aware and most of all interested in larger scaled processes in the field of politics and economy as well, which are subjects I until recently had an aversion to.
"Ours is a crisis of imagination: we cannot imagine a future that is not market-based"
"These crises seem to have a common root in our economic system: capitalism in its current predatory form is not socially, economically or environmentally sustainable" (Rocco, 2021).
These ideologies accurately describe the situation; our current forms of capitalism are so deeply rooted in the social and economical structures and we are not able to imagine another way, while it's negative effects are more than visible in our current landscapes. "Healthscapes" propose a slightly different manner of going about that would reduce the negativities to a large extent, though it is paramount that these are adopted willingly. As Burton and Paragahawewa (2011) describe; "Environmental-friendly measures need to become embedded within farming cultures as part of conventional 'good farming' practice". By making environmental-friendly measures the mode of farming that is generally considered the right one, and by giving farmers the choice in which manner they can transform to sustainable ends, the chances for increased motivation to the envisioned sustainable ends are increased.

However, the ethical question around influencing a behavioural change remains. Though as climate change and negative effects on the environment become undeniable, we might need to find common ground and put individualities aside.
"Our minds are colonised by ideas of individual freedom and entrepreneurship that are meaningless if we cannot agree on how we will live together in our cities and in planet whose recourses are finite." (Rocco, 2021). This influences the perspective of the ethical question about how imposable a behaviour change is and how necessary it is for people to adapt their dietary habits.
Finally, the high complexity of the assignment taught me more about the design process and my role and interests in it. The personal goals I set for myself described how I wanted to become more comfortable in taking the lead and providing clearance and structure in teamwork. This became not only desirable but absolutely necessary to be able to get an overview of the vast amounts of information in a situation where we can hardly possibilities) provided necessary strength, while tutor meetings provided techniques for better ways of discussing with and presenting to group member to enhance the process of reaching of consensus.

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Self Reflection – Oviya Elango

"The countryside is now the frontline of transformation. A world formerly dictated by the seasons and the organisation of agriculture is now a toxic mix of genetic experiment, science, industrial nostalgia, seasonal immigration…., in other words more volatile than the most accelerated city."
-Rem Koolhaas

The Countryside exhibition by Rem Koolhaas in MoMA New York certainly enlightened me about an obvious fact that we stress on more than half the world's population living in the cities while our understanding on the remaining rural landscapes is limited. I found agriculture in South Holland very interesting, also coming from the southern part of India, I always caught myself comparing agricultural landscapes in India and while researching we found a lot of issues majorly cropping from our choice of diet and unsustainable production methods. This urged me to become a vegetarian for the extent of the course, at least until the time I'm writing this text. Working with a group of 5 people from diverse backgrounds lead to different perspectives and lead to better understanding of the region.

In this region the methods used for agriculture predominantly follow the mundane monotonous repetition of similar mono-culture typology of production on a larger scale with mechanised substitution for its various processes rather than innovation in sustainable production. I certainly believe food production while being heavily derived out of the demands from the urban centres yet does not find its priorities when it comes to planning of the region, possibly due to the notion of agriculture being associated with the rural areas. Hence we believe there needs to be coherent planning with respect to food in relationship with the urban alongside the rural areas.

We envisioned a comprehensive model of Healthscapes which would bridge the gap between health of the people and health of the planet by transformation in the urban area to develop a production and consumption zone to enhance awareness among people about the sustainable lancet diet and then move on transforming our landscapes according to the diet in a sustainable manner by engaging actors such as farmers and consumers take part in the decision making.

The SDS lectures and the methodology workshops helped me a lot to put the role of a regional designer in perspective. I understood how even without creating something new, by researching, understanding the problem and connecting different flows we arrived at the "design" we proposed. So I felt that the discussions in our group gave rise to most design strategies and vision. For example, implementation of duckweed production in peat soils not only reduces destruction of habitats in a foreign land but also reduces peat soil oxidation thereby preventing CO2 emission.

Initially I wondered how we would do regional planning during a pandemic, but workshops and the lectures we organised appropriately to guide the project. At the end I enjoyed working on this scale and the potential that this scale possesses. I believe regional design is a combination of research, collaboration, discussion to design and finally implementation.

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Reflection - Yoran Erami

In urban design and especially in regional design a sharp sense of the future is needed. Although we are not fortune tellers, by evaluating research & trends an estimation of a possible future is possible. It is our job to provide guidelines that connect intentions to final outcomes (Madanipour, 2006). These final outcomes are educated guesses. In this project we evaluated outcomes along examples of current structures, yet these examples are often implemented on a smaller scale, since our project demands change on a regional scale, results may differ from our desired outcomes but a direction is given.
It is important to be critical towards the suggested final outcomes of your project. The lecture of Roberto about social justice really made us think about what the implications will be within the society. The life boat principle in particular is very applicable to our project.
We focus on transforming the region of south holland to follow the guidelines of the Lancet diet, spatially and mentally. This will result in a landscape within South Holland that provides goods that will be eaten within South Holland so less export will be needed. The region of South Holland is too dense for

this kind of regional sufficiency yet if implemented on the scale of the Netherlands a fully self sufficient country becomes really feasible. In our project we aim to develop a mindset in which we promote to eat healthy foods from the surrounding areas. Momentarily we produce food for all corners of the world, we have set our selves with the burden of producing huge quantities with industrial speed. Currently we are the second largest food exporter in the world, while being one of the smaller countries (PBL, 2014). With our plan this position will be reduced, and our country will be able to provide food in a sustainable way keeping more production within our borders. This is where the life boat principle becomes applicable: are we okay with producing in a unsustainable manner, which is a way more sustainable way of production then common throughout the rest of the world (in this case the lifeboat is the size of the world) or should we make our own produce more sustainable and produce only for ourselves (in this case the lifeboat is the size of our own country)?
Roorda describes in "Transition management in the Urban context" how we, in transition management, should aim for system innovation in small but radical steps. The change of the agriculture in the region of South Holland could be such a small but radical step on the scope of the world. Our project could be an example for the rest of the world, yet the big question remains: will the rest follow?

Self reflection - Katerina Inglezaki

The number of individuals living in urban areas surpassed the number of those living in rural areas for the first time this past decade. Thus, cities become the epicenter of political power and accumulate almost all the wealth in the world, and "feeding them, building a sustainable food system, now becomes a major political issue"1. "More than 50% of the world's population live in urban areas nowadays", says André Torre2, Director of Research at INRA, attached to the Food and Agriculture Organization (FAO), predicting that this percentage could reach 80% by 2050. However, farmers still account for approximately half of the world's population. The demographic imbalance that will inevitably arise in the future given the predictions for nine billion people by 2042 has always made me wonder of what the future demand of food will be and the role of regional design in planning the food sector. Also, how the production modes correspond to the future needs.

The intensive agricultural model of the Netherlands which has been highly appreciated and respected in the global market is undeniably linked to a great number of negative externalities, mainly revolving around a decrease in biodiversity, soils impoverishment due to the predominant monocultural fields, extreme weather phenomena related to climate change that significantly decrease the crops production. These challenges can only be solved at a regional scale and the complexities it involves needs innovative and sustainable production typologies.

To tackle these above mentioned problems which affect the lives and income of millions, we envisioned a future which would formulate the Healthscapes concept. Our main ambition was to improve the health of the people by introducing the Lancet diet and transitioning towards a sustainable agricultural model to achieve self-sufficiency in South Holland. My personal aim was to emphasize the importance of biodiversity in every landscape, and so we integrated this into our envisioned future resulting landscapes, to give land back to nature and repair the mistakes of the past.

When thinking of a possible diet transition though, it is critical to realize that the habits we embrace are not precisely our own personal choice, rather than a part of our nation's food culture. Coming from the South of Europe where food culture is highly integrated in our lifestyle and often even becomes part of a country's marketing image when it comes to tourism and exporting products, I have gained an understanding of the Dutch context in which we had to adapt our design. While in the South people are more accustomed to reusing ingredients and inventing new recipes and products from them, in the North people are more used to a "take-make-waste" reasoning and are highly influenced by the Western dietary habits that are now promoting the easier and quickest options. Therefore, one could assume that the Dutch people could be more receptive and broad-minded in alternative food choices since they are generally more open to international cultures.

Meating in the middle

The multi-scalar and complex task of a regional design project requires a close collaboration between team members and often extensive discussions and negotiations to reach the best possible result. The online education that we have been receiving since the beginning of the academic year has definitely been a challenge for us as a team since we could no longer do quick sketches and brainstorm sessions. However, this process has toughened our understanding of regional design processes, and I am happy to say that I now feel more confident in working on such a scale. The

Capita Selecta series and the SDS workshops have proven to be very valuable in our development throughout this quarter, since they provided us with extra guidance on critical issues that we later incorporated in our research.

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Self Reflection - Lilly Petter

Over the years I was always aware of the influence of my diet on the environment and the footprint we leave on the planet. I have always found the agricultural model in South Holland intriguing and to understand more in this field I choose the Agro-food sector for a regional planning studio. Coming from the north of Germany I am more used to seeing open crop fields and studying about the Food system in South holland struck a strong differentiation in the mode of agriculture the two neighboring countries with the similar land and weather conditions have.

I wasn't used to this scale before, at the beginning I was overwhelmed by its complexities and found it challenging. But working in a group of 5 people with different backgrounds, it was difficult to find common ground, yet it helped me accelerate and actually enjoy the process. I think it was a big step in my urbanism education that I was afraid to take before. While I was vaguely aware of the impact of our diet on the environment while researching I found how massive huge it actually is.

"Feeding cities takes a gargantuan effort; one that arguably has a greater social and physical impact on our lives and planet than anything else we do." – C. Steel (2008)

"Yet few of us in the West are unconscious of the process… Food arrives on our plate as if by magic, and we rarely stop to wonder how it got there"-Johannes S.C Wiskerke & Saline Verhoeven (2018)

These ideologies influenced me throughout the design process and acted as guiding principles for the project. The region of south holland posed a modern challenge of efficiency against sustainability, while the region gains a lot of profit from the agri-food sector and does not contribute to the nutrition of the people. To shift away from this model we envisioned The Healthscapes, with 2 main goals one addressing the inhabitants of south holland and the other the transformation of landscapes towards a sustainable agri-food sector there by helping bring down the effects of climate change.

Although the process of presenting the regional design was initially massive, i found the SDS lectures very helpful in dealing with the same and organized at the right time These workshops guided me to move through the scales. While the methodology course supported with valuable methods to put into practice and gave us insightful feedback. I believe the structure of this course helped me stay on track even in these precarious circumstances. I was inspired to become vegan. Overall, i found this studio inspiring and motivated to work in regional scales.

References:
C. Steel (2008): Hungry CityHow Food Shapes our Lives. London: Random House
Johannes S.C Wiskerke & Saline Verhoeven (2018): Flourishing foodscapes

2. Records of the BAJK

This appendix consists of a part of the records of the BAJK of when they were talking with the region of Noord-Brabant.
Anton Bartelen is a member of the BAJK and Elies Lemkes is member of the board of the region Noord-Brabant. The full discussion has been recorded and is visible on YouTube under the title “In gesprek over het perspectief van de jonge boer”. We had email contact with the BAJK and they provided us with the records of the conversations.

Dutch text

Anton Bartelen: ‘De essentie van wat een agrariër doet, is voedsel produceren. De helft van de vijfduizend bedrijven in Brabant verzorgt 92 procent van de productie. We zorgen dat mensen zorgeloos van eten kunnen genieten. Die kerntaak mag meer worden gewaardeerd, zodat we als agrariërs in staat worden gesteld om een eerlijke boterham te verdienen.’

Elies Lemkes: ‘Er moet inderdaad iets veranderen in het systeem. Gelukkig zie ik dat de landbouw- en voedselketen in beweging begint te komen. Tegelijkertijd is het ook belangrijk om je als agrariër niet blind te staren en om ook te zeggen: “Mijn bedrijf verschiet van kleur.” Want er moet ook een knop om. Over tien jaar ben je als agrariër méér dan een voedselproducent.’

Anton Bartelen: ‘Verschieten van kleur en je bedrijf aanpassen, anders val je ertussenuit. Maar laten we niet vergeten dat Campina gecertificeerde boeren de laan uit heeft gestuurd. Dat de burger die eisen stelt aan de landbouw een andere is dan de consument die in de supermarkt voor het schap staat. Dat Nederland en de rest van Europa niet op één lijn zitten. Sterker nog, zelfs binnen Noordwest Europa lukt het niet om tot één beleid te komen. Het gevolg van dit alles is dat de gereedschapskist van de agrariër niet meer vol genoeg is om te kunnen meebewegen.’

Elies Lemkes: ‘Onze boeren lopen inderdaad voorop, de rest van Europa volgt. Al gebeurt er in andere landen ook best veel, hoor. De ontwikkelingen gaan dus door, alleen: je moet als agrariër wel mee kúnnen.’

Anton Bartelen: ‘De essentie van het primaire bedrijf moet bij de voedselproductie liggen en CO2-opslag moet iets extra’s zijn. Maar die opslag moet geen nieuw verdienmodel worden, want daar geloof ik niet in.’

English text

Anton Bartelen: "The essence of what a farmer does is produce food. Half of the five thousand companies in Brabant provide 92 percent of the production. We ensure that people can enjoy food without any worries. That core task should be appreciated more, so that we as farmers are able to earn a fair living. "

Elies Lemkes: "There is indeed a need to change in the system. Fortunately, I see that the agricultural and food chain is starting to move. At the same time, it is also important not to stare blindly as a farmer and to also say: "My company is changing its model." Because a turning point has to come at some stage. In ten years' time as a farmer you will be more than a food producer. "

Anton Bartelen: "Change in model and adapt your company, otherwise you will fall out. But let's not forget that Campina has dismissed certified farmers. That the citizen who makes demands on agriculture is different from the consumer who stands in front of the supermarket shelf. That the Netherlands and the rest of Europe are not aligned. In fact, even within Northwestern Europe it is not possible to maintain a single policy. As a result of all this, the farmer's toolbox is no longer full enough to move with it."

Elies Lemkes: "Our farmers are indeed at the forefront, the rest of Europe will follow. Yet keep in mind that change is also happening in other countries. Developments will continue, as a farmer you have to be able to keep up. "

Anton Bartelen: "The essence of the our model must lie in food production and CO2 storage must be something extra. But that storage should not become a new revenue model, because I don't believe in that. "

This part shows a self-made story line about the struggles of a typical farmer. This story has been discussed with and approved by the BAJK.

Dutch text

Mijn naam is Wim, ik ben een boer, momenteel ben ik niet helemaal tevreden met de regering. Afgelopen 70 jaar hebben mijn vader en ik een bedrijf gerund. We hebben enorm moeten uitbreiden na de tweede wereld oorlog onder het motto van 'wij als nederland willen nooit meer zonder voedsel hoeven te zitten'. We werden de spil in het proces voor het verzorgen van voedsel op het bord van de burger.

Sinds dat klimaat verandering een probleem is geworden ervaren wij in de agricultuur sector enorme veranderingen. Onze landen worden herbestemd tot natuur gebieden of worden omgezet naar woningsgebieden. De overheid neemt echter niet in acht dat wij als boeren ook ruimte moeten blijven hebben voor ontwikkeling, de boer is de afgelopen jaren weinig in beleidsplannen voorgekomen en wordt vooral gezien als de eigenaar van het land waar de oplossing gezocht wordt. Voor de boer betekend dit dat bijvoorbeeld landen rondom natuurgebieden worden herbestemd naar natuur gebieden of een combinatie van natuur en agricultuur. De boer die moet veranderen krijgt vervolgens een nieuw gebied aangewezen, deze nieuwe gebieden krijgen vervolgens allerlei nieuwe regelgevingen waardoor de boer enorm in zijn groei beperkt gaat worden. Deze beperking zijn met het oog op duurzaamheid, maar hier worden wij momenteel niet voor gecompenseerd. Om het samen te vatten: Wij krijgen een nieuw land om onze baan op uit te voeren maar tegelijkertijd moeten wij volledig van business model veranderen door alle regelgeving die hieraan verbonden zit. Deze verandering worden wij niet tot nauwelijks voor gecompenseerd en wij zijn bang dat dit uiteindelijk resulteert in bedrijven die deze veranderingen niet kunnen bewerkstelligen en daarmee moeten stoppen als boer.

Het is raar dat deze verandering van business model volledig/in een niet goed gereguleerde mate (bijvoorbeeld hoe dit in zijn werk ging bij de boer in friesland die wilde uitbreiden maar nu op het matje wordt geroepen door de rechter omdat het niet duidelijk bewezen zou zijn) volledig bij ons wordt neergelegd. Daarnaast zijn wij ook boeren en zijn wij geen techneuten/energie-experts/water management experts en hebben wij er weinig vertrouwen in dat een boer in dit opzicht de mogelijkheden heeft om individueel te veranderen. Natuurlijk willen wij ons als boeren kunnen ontwikkelen maar daarvoor is een duidelijke, gebiedsspecifieke aanpak nodig.

Daarnaast is het volgende probleem dat er een grote scheiding is tussen de boer en de consument/voedselproducent/voedseldistributeur (bijvoorbeeld bewoners van steden & albert heijn). Het kost ons als boer enorm veel geld om te verduurzamen, maar ondertussen vertikt de consument om meer te betalen voor de producten die wij leveren als boer. Dit is gek, wij zijn er namelijk om ervoor te zorgen dat jij als consument eten op je bord krijgt maar ondertussen is de consument niet bereid om ervoor te zorgen dat wij dit ook kunnen blijven doen als boer.

Om het samen te vatten: er worden ons continue allerlei ristricties gegeven (waarvan wij opzich ook het nut inzien) en tegelijkertijd is er niemand die ons begeleid in hoe wij kunnen komen waar wij moeten zijn omdat het weinig tot geen gebiedsspecifieke ingrepen zijn maar eerder doelen waarin wij ons pad zelf moeten gaan vinden en tegelijkertijd is er niemand in de consumenten kring zich bewust van wat voor gigantische opgave wij als boer tegenoverstaan en denkt de consument/supermarkt alleen aan het laag houden van de prijs zodat ze makkelijk hun eigen hachje kunnen blijven onderhouden terwijl uiteindelijk de boer met de gebakken peren zit.

English translation

My name is Wim, I am a farmer, at the moment I am a little fed up with the government. My father and I have run a business for the past 70 years. We had to expand enormously after the second world war, the motto of the expansion being: 'we as the Netherlands never want to be without food again'. We became the the main pillar in the process of bringing food to the plate of the citizen.

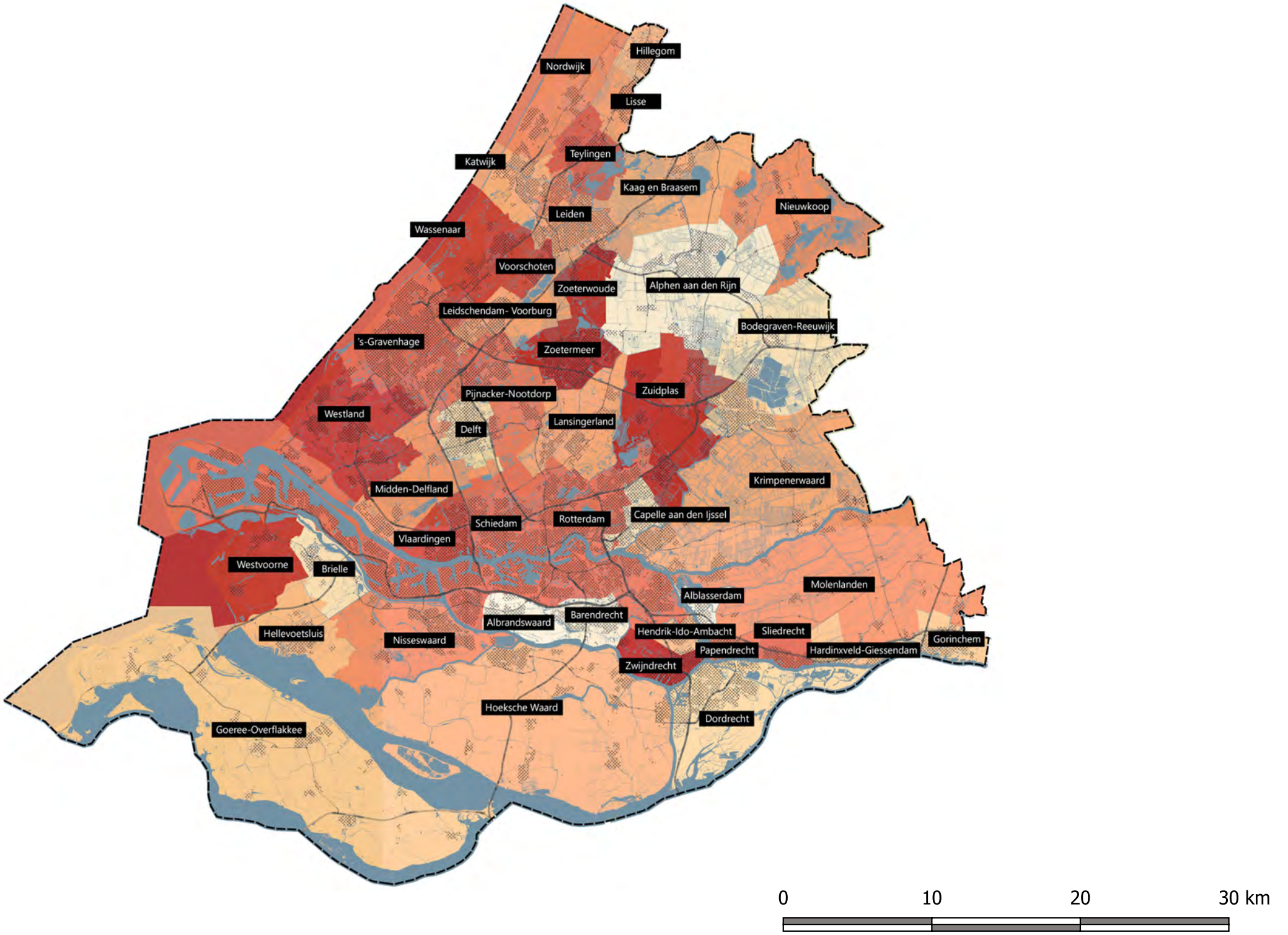
Since climate change has become a problem, we are experiencing enormous changes in the agricultural sector. Our lands are being repurposed into natureal or residential areas. However, the government does not take into account that we as farmers must also continue to have room for development, the farmer has not been featured in many policy plans in recent years and is mainly seen as the owner of the land that can be used for the solution or our current societal problems. For the farmer, this means that, for example, land around nature areas is repurposed into nature areas or a combination of nature and agriculture. The farmer who has to change is then assigned a new area, these new areas are then given all kinds of new regulations, which will limit the farmer's growth enormously. These limitations are for sustainability reasons, but we are currently not being compensated enough for this. To summarize: We are getting a new country to do our job in, but at the same time we have to completely change our business model due to all the regulations associated with this. We are hardly compensated for this change and we are afraid that this will ultimately result in companies that cannot realize these changes and have to stop being farmers.

Furthermore this change of business model is not properly regulated (for example, a farmer in Friesland wanted to expand but is now being stopped by court because it the interventions he proposed have not been researched to a trustworthy extend). We have to manouvre our way through the new interventions and hope that we use the right ones otherwise expansion will be stopped. In addition, we are also farmers and we are not technicians / energy experts / water management experts and we have little confidence that a farmer has the possibilities to change individually in this respect. Of course we want to be able to develop as farmers, but this requires a clear, area-specific approach.

In addition, there is a large division between the farmer and the consumer. As a farmer, it costs us a lot of money to become more sustainable, but in the meantime the consumer refuses to pay more for the products we supply as a farmer. This is odd, since we are there to ensure that you as a consumer get food on your plate, but in the meantime the consumer is not prepared to ensure that we can continue to do this as a farmer.

To summarize: we are continuously given all kinds of restrictions (of which we also see the usefulness) and at the same time there is no one who guides us in how we can get where we need to be because the proposed plans have little or no area-specific interventions but rather goals, in which we have to find our own path. At the same time no one in the consumer circle is aware of the gigantic task we face as a farmer and the consumer / supermarket only thinks of keeping the price low so that they can easily maintain their current way of living. All in all the farmer has to change most while no one else is willing to.

3. Administrative boundaries



4. Demographic analysis

Population of the Netherlands on 100x100m grid.
Vertical grid is exaggerated by 3x.
Image by author. Data from worldspop.org
Visualised using QGIS and Aerialod.

The population of the Netherlands has been ageing for quite some time. From 2002 onwards, however, this ageing process accelerated when a relatively large group of the population reached the age of 65 in that year due to the increase in the number of births between 1937 and 1944 (Garssen, 2011). The acceleration will become even stronger in the coming 15 years as the post-war baby-boomers join the over-65 age group (Van Duin and Garssen, 2011). The number of people aged 65 and over is expected to increase from 2.6 million in 2011 to 3.8 million in 2025 (see Figure 4). In 2025, 22% of the population will be aged 65 or over, compared with 16% in 2011.

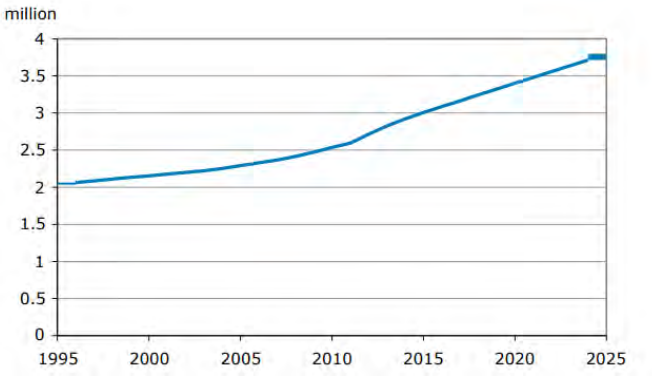
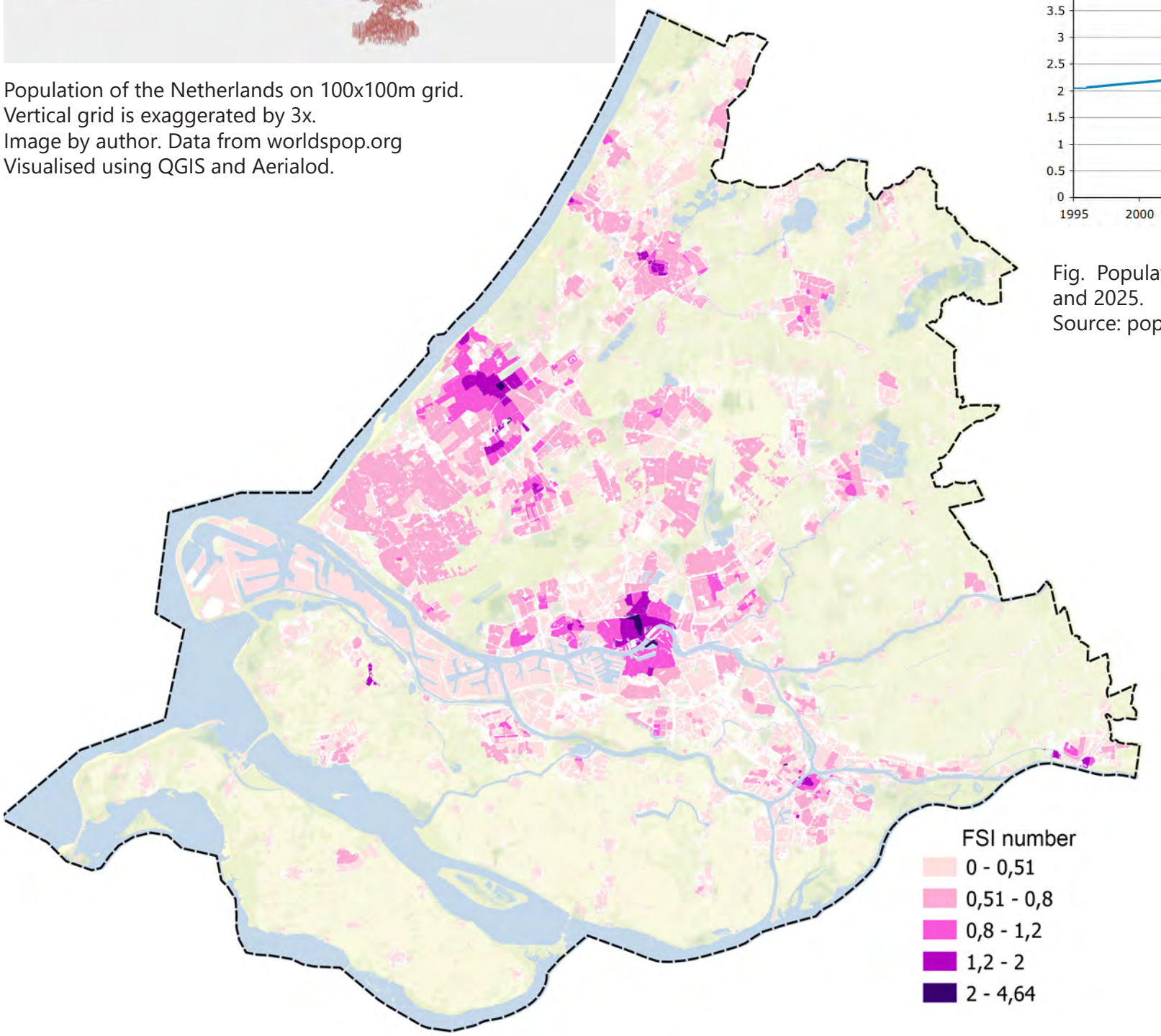
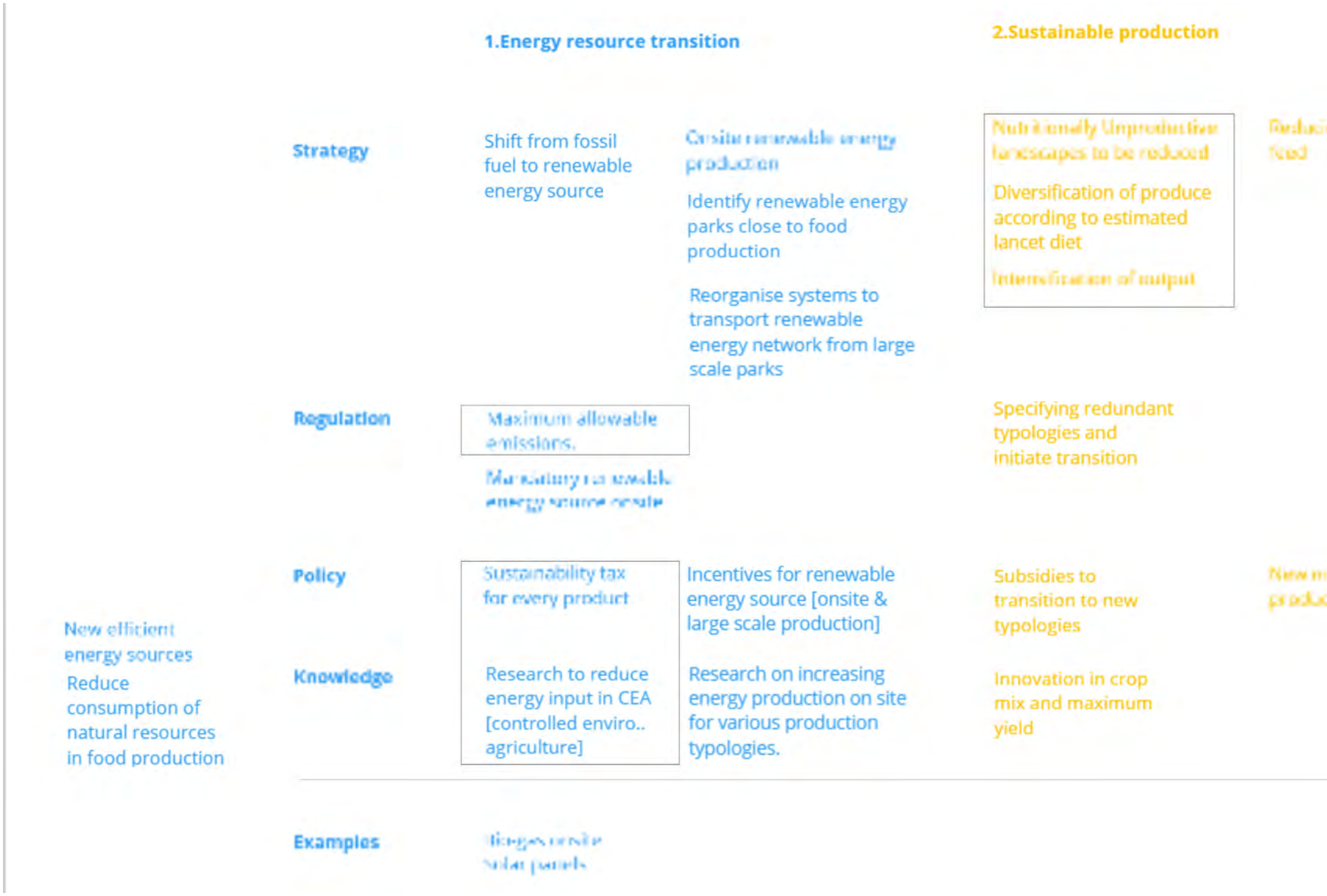


Fig. Population aged 65 and over between 1995 and 2025.
Source: population projections 2010–2060, CBS



5. Policies package



3.Power relation-Investing power with the farmers | Reduce market control of big corporations

Producing locally and making production zones as consumer zones.

Using big data to efficiently transfer food from farm to fork. [thereby reducing food miles]

Incorporating farmers in decision making.

Subsidies for community run farms

To set up citizen run crop matrix.

Maybe introduce a farming comitee? led by farmers, dietitians, health professional as to provide decisions on what has to be cultivated?

4.Diet transition

Awareness campaign , Marketing of unhealthy food culture.

To implement healthy food in public canteens, schools, prisons etc.

Meat tax

Make healthy food accessible and affordable

Education on healthy diet

5.Waste management

Manure from cattle farming to be used for producing energy

Nutritions like No2 and ... to be treated before letting water into natural systems.

REuse waste in different industries

Net zero emission
To achieve zero effluents ending up in natural systems

Bio-mass to help produce biodegradable plasctics.

innovative uses for waste in the system for other industries

New networks that emerge out of the strategies