AGRONOMIC RENAISSANCE

Towards a socially fairer and circular agrifood system in the AMA region
ABSTRACT

The AMA region wants to make the transition towards a circular economy. To make the circular economy happen, social, environmental and economic challenges have to be integrated in the transition. This report will identify these challenges and propose a vision, a development strategy and projects/policies to propose a new system in the sector where most of these challenges come together: the agrifood sector. The agrifood sector being one of the most polluting sectors in the world plays a key role in a circular economy.

The project uses the circular economy as a tool to establish normative change in the case of the imbalanced agrifood sector. The development strategy of the project provides a framework for a future circular economy in a fairer agrifood sector. The framework encompasses localising the food network and creating a local circularity in the flows of energy, water, heat, fodder, CO2 circulation and organic material. This localisation aims to create jobs for the low to middle educated people that are struck by socio-spatial polarization. It also suggests new ways of protein production and of the usage of peatlands. The conclusion is that, while already a big portion of the circular economy can be realised, more research is needed to be able to make the circular economy happen in the agrifood sector. To balance the sector, it has to be deconcentrated and localised. This localisation is essentially a modern form of the traditional sector from the 18th and 19th century. Therefore it’s called an agronomic renaissance. Due to the traditional nature of the sector, institutional change has to happen, which can only be achieved by a long term strategy, strong policy and a periodical review. Giving the sector guidance and a perspective is important to instigate the change needed for a circular agrifood system that also accounts for the social, environmental and economic challenges mentioned. This project gives a possible direction for this long term perspective.

Key words: circular economy, agrifood sector, deconcentrating, new farmer, localising, Amsterdam Metropolitan Area.
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INTRODUCTION
X-RAY OF AMA

In the introduction the project gives an overview of the problem statement, the vision, the theoretical framework and the methodological framework. This chapter lays the basis for the further project and serves as a short overview of the report.
INTRODUCTION OF REGION

A REGION ON A CROSSROAD

The area which this project is about is the Amsterdam Metropolitan Area (AMA). This area is named after Amsterdam, the capital of the Netherlands. The area has approximately 2.3 million people living there now, which is expected to grow by 250,000 households in 2040.

The AMA is also part of the Randstad region that is composed of three major sub-regions: the aforementioned AMA, the Utrecht agglomeration and the Rotterdam-The Hague metropolitan area.

While the AMA plays an enormous logistic role with Schiphol and the Amsterdam Port, the Rotterdam port also contributes largely to the logistic sector in the Randstad (CBS, 2016c).

However, when considering all facets of the Dutch economy the AMA is by far the winning region in the Randstad. With the region being in the top 5 of Europe’s most important economic regions and leading positions in terms of knowledge, innovation and connectivity, the area is the most important area in the Netherlands.

The region holds three logistic mainports: the Aalsmeer greenport, the Amsterdam sea port and the Schiphol international airport. Amsterdam also has a big high services sector and is becoming an increasingly high-educated knowledge hub.

When considering the configuration of the area itself, one can see the polycentric morphology of the AMA region. Important components of the region include Almere, Lelystad, Haarlem, Amsterdam, Schiphol, Zaandam and Hilversum.

Another striking characteristic of the region is the holistic mix of landscape and urban environments. In a country with a strong planning tradition, even the landscape is planned. This resulted through time in an orchestrated pattern of urban function and productive landscape. The configuration of this landscape/urban metropolitan pattern is unique in the world and gives the region a specific identity.

Zooming in to Amsterdam this holistic mix is visible by the green wedges that divide the city. The pattern follows the masterplan ‘Algemeen Uitbreidings Plan’ from Van Eesteren that proposed these green wedges already in 1934.

However, the AMA region has structural social, environmental and spatial challenges that threaten the sustainability of these aspects. This report will identify some of these challenges and propose a vision, a strategy and projects/policies to tackle these challenges.

The project will use the agrifood sector as a tool to solve multiple challenges at once, while being realistic about the impact on the current system.
PROBLEM STATEMENT

COMPACT OVERVIEW OF THE CHALLENGES

The Netherlands is a small country (41,540 km², including 7,755 km² of open water) with an average population density of 504 people per km² land area in 2016 (CBS, 2016d). Its geographical location has always been a stimulus for transport and trade to and from the European hinterland and across the world (Wintel, 2000).

The Amsterdam metropolitan region, which lies in the polycen- tric Randstad has been a eco- nomically strong global area. It comprises of 36 municipalities with a population of 2.4 million people, i.e. more than 14 per- cent of the total population of the Netherlands (Amsterdam Metropolitan Area, 2018). It has gained this position based on its long history in farming due to its relatively fertile soils in a flat landscape, fresh water supplies and excellent logistics. The combination of these fac- tors, together with a govern- mental policy that strongly sup- ports a competitive agricultural sector, good entrepreneurial skills, support from a state-of- the-art agricultural research and education system, innovative supply and processing indus- tries, the availability of inex- pen sive natural gas supporting greenhouse horticulture and Floriculture. Moreover, as the production of cheap fertilizers, pesticides, and processed food.

The AMA is no exception to this worldwide trend. Counting with the cargo focused Schiphol Airport and also Amsterdam Harbour, the region stands out for its big logistic function and agrifood exporting sector. These companies contribute a lot to the before mentioned shift in the food system. Not only is the agrifood exporting market affected by this, also in the re- gion itself the agrifood sector is experiencing an enormous trend in concentration. 55,000 farmers in the Netherlands are being controlled by only five big distribution companies in 1950 to only the 55,000 in 2016 (Noordhoff, 2014).

This concentration of power also causes a non-circular food sector in terms of waste, energy, nutrient-reuse, water and also a big amount of unnecessary extra transporting miles from produc- ers to processors, to distribution, to supermarkets and only then to consumers.

Research question:

How can the agrifood sector in the Amsterdam Metropolitan Area be reformed through spa- tial policies and projects into a more local and circular form, which ultimately contributes directly to social, environmental and economic sustainability?

DRIVING FORCES

Scarcity of resources

Dependency on imported resources (fertilizer, animal feeding, nutrients and energy)

Air pollution and emissions

Automation and digitalization

Climate change

Increase in food waste generation

PRESSURE

Long food miles

Dependency on imported resources

Air pollution and emissions

Climate change

Increase in food waste generation

STATE

Centralized power in food supply chain by 5 distribution companies

Centralized accumulation of jobs in Amsterdam

High pressure on land use and soil pollution

Missing jobs for low- and middle educated population

ENVIRONMENT

Quality degradation of food products

Human health and biodiversity at risk

ECONOMY

Farmers’ revenue and consumers’ diet are controlled by “big bosses”

Spatially unbalanced economy

SOCIAL

Missing jobs for low- and middle educated population

MISSING JOBS FOR LOW- AND MIDDLE EDUCATED POPULATION

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Air pollution and emissions

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LONG FOOD MILES
Food is one of the basic needs for human beings. The agrifood system in the city is also connected to many other urban issues in different stages of production, processing, consumption and food waste management. Thus, optimizing the agrifood system can promote improvements in many aspects of the region. As the world’s second largest agricultural products exporter, the Netherlands has a vital agrifood system that plays a crucial role in the region development. Facing the challenge of increasing population and limited resource, the AMA is very representative in the Netherlands in terms of agrifood system optimization.

Because of the rise of the knowledge economy the low to middle educated people are under pressure in the AMA. Jobs in Amsterdam require more and more high educated workers, which drives creates a big influence of knowledge workers. The sheer popularity of the city and the direct surrounding area, causes a rise in land value prices. This results in socio-spatial polarization: low to middle educated social groups being forced out of the city towards the edges of the AMA region.

To tackle the main problem that we found in the AMA, the lack of power of farmers and the loss of local jobs caused by the concentrated agrifood system and the focus on the knowledge economy, our vision is the deconcentration of the agrifood chain and converting the agrifood system in the AMA towards a localised indigenous one, which makes use of local potentials and resources. This localised agrifood system aims to downscale the agrifood system, provide much healthier and more local agricultural products, improve the agrifood transport, create jobs for vulnerable social classes and on top reduce the food miles. All while making comprehensive steps towards a circular agrifood economy.

More spatially, our vision focuses on the areas with great opportunities.
- Almere and Lelystad can work together as twin-cities. Lelystad functions in agriculture production, distribution, processing and consumption. Almere functions as a residential center with corresponding services. The cities can work together to create a local balance in the Flevoland region. Based on the Flevokust harbour and the Lelystad airport, Flevoland can also strengthen the synergy of food components with other cities within the region and even with other regions.
- Zaanstad can turn the current monoculture of grassland and meat/dairy production into a more diverse agrifood production, which also reduces the global carbon footprint, and improve the current food processing system on a local level.
- The seed valley in the northern Enkhuizen is now export oriented, but in the new agrifood system, the valley also has the opportunity to increase the domestic production rate according to the local demand.

Wageningen University and other agriculture research institutes in the region can provide technical and intellectual support for the new system.

As the tool that helps us to create the new agrifood system, circular economy plays an essential role in connecting the food cycle and other flows in the regional scale. This contributes to side effects, such as bioenergy production, water reuse and organic waste recycling.

As aforementioned, another side effect lies in the social aspect. The reformed and circular agrifood sector can provide more job opportunities in different sectors. After deconcentrating, the selected areas will form their own agriculture centres in a local scale, which will create more diverse posts and enhance the synergy between high and lower educated people. Thus, in the regional scale, has also positive effects on reducing the existing socio-spatial polarization.

Concluding, the vision relates normative values like social, environmental and economic sustainability, while providing a framework for a future circular economy and a fairer agrifood sector.
**THEORETICAL FRAMEWORK**

This project is based on 5 spatial theories, which can be seen in the table below:

<table>
<thead>
<tr>
<th>Theoretical Framework</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Borrowed Size</td>
<td>The concept of borrowed size refers to the idea that cities can achieve advantages through the exploitation of the benefits of other cities.</td>
</tr>
<tr>
<td>Knowledge Economy</td>
<td>This theory proposes that cities can develop a functional specialization, which can lead to increased economic growth.</td>
</tr>
<tr>
<td>Socio-Spatial Polarization</td>
<td>The theory of socio-spatial polarization suggests that cities can gain advantages through the manipulation of socio-spatial differences.</td>
</tr>
<tr>
<td>Localized Agro-Food System</td>
<td>This theory focuses on the role of localized agro-food systems in supporting cities.</td>
</tr>
<tr>
<td>Theoretical Basis of the Project</td>
<td>This framework connects the other theories, framing the project in a more specific form.</td>
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**THEORETICAL BASIS OF THE PROJECT**

The circular economy is the theory about the economic system where resource flows are circular instead of linear. This means that the ends and beginnings of linear resource chains are connected in a circular or repetitive way. The paper 'the circular economy, localised food networks' (Geissdoerfer et al., 2016), while the municipality of Amsterdam, 2016) noted is that a decentralisation of the social-economic classes towards the edges of the metro- politan area. This debate later on switched to the functional London metropolitan area. The paper concludes that borrowed size will play a role in the project as the polycentric model of the AMA facilitates a sharing economy with a localised food network into the London metropolitan area. However, localised food networks are a substitute for the benefits of agglomeration. (Berg, 2016: 288) These dimensions are multicellular and comprise of different elements like housing, mobility, food distribution and production, relations between multinuclear components and a balance of agglomeration benefits and costs, among others. The paper concludes that borrowed size occurs when a city exhibits urban functions and/or performance levels not associated with larger cities or within networks of cities on multiple scales but rather through the activ- o substitute for the benefits of agglomeration. (Berg, 2016: 288)

**Knowledge Economy**

The knowledge economy is the theory of the knowledge economy. The knowledge economy is a beneficial one (Geissdoerfer et al., 2016: 759). According to Aspinall et al., (1992) the role of scale, specialisation and agglomeration is expected to be a substitute for the benefits of agglomeration. (Berg, 2016: 288)

**Socio-Spatial Polarization**

The theory of socio-spatial polarization suggests that cities can gain advantages through the manipulation of socio-spatial differences. (Berg, 2016: 288). These dimensions are multicellular and comprise of different elements like housing, mobility, food distribution and production, relations between multinuclear components and a balance of agglomeration benefits and costs, among others. The paper concludes that borrowed size occurs when a city exhibits urban functions and/or performance levels not associated with larger cities or within networks of cities on multiple scales but rather through the activ-
influences prosperity in medi- um sized cities at the edges of a metropolitan region. Another aspect that is hardly written about is adequate policy at the local level for the knowledge economy. The existing recommend- ations tend to be general or directed towards specific as- pects (Berg, 2017).

Considering the case study Berg- dorf of the Amsterdam knowl- edge economy, he concludes that “the Amsterdam strategy towards the information society takes the form of a strategy for a region in a knowledge economy. The approach is more bottom-up than top-down and local government focuses on general conditions. (…) Generally speaking, the approach is rather to stimulate the actors in the knowledge infrastructure and the business sectors to envisage the relevant develop- ments.” (Berg, 2017)

Where Amsterdam is doing very well on the aspect of the knowledge economy because of a big amount of positive pull factors, the other cities in the region are not profiting of the knowledge economy. That the knowledge economy can have a negative effect on social co-hesion, is observed in the paper (Berg, 2017). This leads to social inequalities and ultimately to socio-spatial polarization if the knowledge economy is consid- ered in a regional spatial way.

Conclusion

Concluding the theoretical framework, one can state that the project and its underlying theories is complex and very multifaceted. The challenge will be to relate the theories in each other in such a way that it sup- ports the project and creates the correct synergies between the different components. One should be wary of the negative effects some of the underly- ing theories can have on other aspects of the project. How- ever, projects and policymaking always brings about difficult choices in which a responsible urbanist should find the ideal balance. This is what this pro- ject tries to achieve, a balance of interconnected theories in an explicit and spatialized way.

METHODOLOGICAL FRAMEWORK

The methodological framework of the project consists out of three phases. The first phase is the diagnosis which comprises the introduction and the analy- sis which leads to a problem statement of the challenges the region faces. Through this phase we understand where we are with the region. The second phase is the prognosis which comprises the vision. This phase formulates a foresight of what we can expect to happen if our project is implemented. The third and last phase is the prescrip- tion that comprises of the de- velopment strategy and the key project. In this phase there will be decided what should be done to realize the prognosis by introdu- cing projects and policies.

The first phase gives an over- view of the project in the intro- duction with the problem state- ment and the vision statement. In the analysis we start with the morphogenesis which is a mor- phological analysis of the ‘birth’ of the region. This method puts the region into a historical per- spective which results in leads to regional development. After the morphogenesis the graphs and trends chapter will give an overview of the agrifood sector in the Netherlands and the AMA. In this chapter we will use the method of trend ex- trapolation to project current trends in the Flevoland and province. Furthermore, we will explain the most important trend extrapolation to project current trends in the Flevoland and province. Furthermore, we will explain the most important steps that have to be taken to realize our key project.

To conclude our project, we will reflect on the circular economy and give a conclusion of the project. After the conclusion we make recommendations for fur- ther research into the topic.
ANALYSIS
DNA OF THE REGION

In the analysis the research done in the project is shown. It lays the foundation for the vision and the development strategy. In this research the traditional and the modern food sector will be explored, while the circular economy becomes spatially explicit.
Through time, the Amsterdam metropolitan area has had multiple functions. However, trade has always been a prominent activity in the region. Roughly, the morphogenesis of the region can be divided in three important eras: stacking port, transit (airport and stacking transport).

Amsterdam was founded in 1275 AD. Then still being a small village, the economic crossroad of the dam in the Amstel formed, meaning that it grew into a local port and market which resulted in the first trade activities. While these first trade activities were initially focused on beer and hemp, soon Amsterdam started to incorporate other goods like agricultural produce. This meant that the economy and demographics of the city steadily grew.

Going forward in the history, around 1650 the Amsterdam region is the most important trade region in the world. The region grows to a stacking port and market where high services like banking, insurance, cartography and printing start flourishing. At this time the Zaanstreek region is the number one manufacturing region in the world. In the agricultural sector, more value is continuously being added by the introduction of food processing and better logistics.

Around 1700 the processing takes on a dominant role in the port. The importing of raw materials from colonies, adding value and then exporting again of goods makes Amsterdam very rich. This means huge popularity and then exporting again of goods makes Amsterdam very rich and then exporting again of goods makes Amsterdam very rich. This means huge popularity.


Around 1700 the Amsterdam region almost misses the industrial revolution because of the aging manufacturing industry still being based on old windmills and sawmills. This results in the region becoming more and more impoverished and old fashioned, as opposed to other centres in Europe. Cities in the region start to specialize in labour. Amsterdam stays the financial and cultural centre of the Netherlands. The agricultural sector in this time however experiences what is referred to as the 'golden age of agriculture'. Great production is achieved by rapid mechanization and local food services are efficient in delivering food to consumers. The farmers are among the richest people in society.

Going into the turbulent 20th century, the AMA still trades in colonial goods like tea, tobacco, coffee, spices and condiments. The market is very liberal oriented. Social housing is built around the old city caused by comprehensive housing laws in the 1900’s. While the neutral status in the first world war makes the country rich, the economic crisis of 1929 hits hard in the region because of its international and banking focus. The second world war causes the last big famine in the region.

After the second world war, the region rapidly changes. Schiphol airport becomes important because of the pioneering of the LHM in civil air services. In Amsterdam there is a high grade of unemployment. Material age due to the second world war causes a big shortage in housing. The Jewish persecution causes a 10% drop of demographics in the region. Economic consequences of the second world war include the diamond and textile industry being in an economic crisis, while the basic industries like clothing, beer breweries, manufacturing and vehicle production flourish.

Towards the 70’s and 80’s, there is a recovery of growth and an explosion of youth culture. The region retains its position on the world map by investing in business offices, machine industry, manufacturing and exportable high yield food production. Workers from Morocco and Turkey are flown in to work in the low to middle educated jobs. Because of the aforementioned famine in the second world war, Dutch agricultural policy shifts towards a policy that’s driven on high yield production. This results in the region being a stacking port function and becomes a transit (airport, being the gateway to Europe. The Zuiderzee is developed as a central business district and the region offers more and more towards a polycentric metropolitan. From 2010 onwards high tech industries and the knowledge sector become more important. Creative industries spark the economy and the high yield food production and processing still is an important part of the economy. However, the environment gets a bigger role in planning and policy. Urban metabolism and the circular economy are introduced.

Based on: (Bontjes, Skeutjes, 2007) (Wintle, 2000)
The Netherlands is the second biggest exporter in the world of agrifood products in terms of value (Noordhoff, 2014). This is mostly caused by the big multinational companies like Nestle and Unilever being located in the Netherlands. These companies import food products, add value to them and then export them again to mostly European destinations.

In terms of production, the Netherlands is found on the 22nd place in the world (Noordhoff, 2014). This is still a big achievement as it is on the 133rd place in the world in terms of land surface (CIA, 2013). This high placement in terms of production is caused by the high yields/hectare the Dutch agricultural lands produce. These high yields are a result of post-war policy and the big knowledge sector.

After the second world war and the famine of 1944, the Dutch government wanted to create food security and a surplus on the trade balance. To accomplish this, the government invested heavily on agricultural production which ultimately through policy led to one of the highest production/hectare in the world. The knowledge factor also came into play with the leading position the Agricultural University of Wageningen plays in the sector.

When considering the agricultural land in the Netherlands in terms of use, corn is the most used crop. The corn produced in the Netherlands is mostly for animal feeding and in this way directly connected to meat and dairy production.

Potatoes is on the second place in terms of land-use. This crop has become very popular in the Netherlands due to its short production to consumption chain. It is also relatively easy to produce and holds a good amount of proteins/gram. The Netherlands produce as many as 6,801,000 tons of potatoes per year (FAO, 2013). This enormous production of potatoes means that the Netherlands is 300% self-sufficient in this product (Knijff et al., 2011).

Other popular crops are wheat and beet. These are also easy to produce and have a relatively high profit/hectare.

The import of agrifood products, adding value and then exporting again is the core business of the Dutch food sector. Mainly caused by big multinationals like Unilever and Nestlé, the adding value food industry delivers a big contribution to the country’s GDP.

When looking at the top handled products in the Netherlands according to the FAOSTAT, products like milk and potatoes are for the most part being exported. This export consists of imported, domestically produced and enriched products.

What is striking in the graphical is the small role domestic consumption plays in the total amount of handled goods. Animal feeding is also a big destination of imported and produced goods.

Source: Noordhoff, WRR, 2014

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**BIGGEST EXPORTERS**

Source: Noordhoff, 2014

**TOP 4 USE OF AGRICULTURAL LAND**

Source: Noordhoff, 2014

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**TOP 4 HANDLED PRODUCTS - DESTINATIONS**

Data from 2009

- **Milk**
  - Production 11,487
  - Consumption 5,916
  - Export 9,003
  - Import 4,751
  - Animal feeding 1,502

- **Potatoes**
  - Production 7,381
  - Consumption 1,252
  - Export 5,728
  - Import 6,176
  - Other 1,176

- **Wheat**
  - Production 1,423
  - Consumption 1,242
  - Export 2,509
  - Import 1,212
  - Other 1,093

- **Soy beans**
  - Production 2,445
  - Export 1,737
  - Import 1,100
  - Other 1,375

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**TRENDS**

**AGRICULTURAL PRODUCTION AND EXPORT**

**HANDLING OF AGRICULTURAL PRODUCTS**
The amount of agrifood companies has decreased dramatically. From more than 400,000 companies during its peak in the 1950's, it fell to around 55,000 in 2016 (CBS, 2016).

A cause of the dramatic decline in companies is the exponential growth in scale of a single company. From around 5 hectares in 1930 to around 26 hectares in 2010. What has to be noted is that within this time the Flevoland polders were introduced. This caused a huge new source of big agricultural land parcels.

Another cause for the dramatic rise is land consolidation. In order to be economically competitive farmers could trade their lands with one another to create bigger consecutive pieces of land.

The percentage of workers in the agrifood sector has gone down dramatically. The drop has multiple causes, one being that other sectors have become more and more important in the Dutch economy, providing more jobs than the agricultural sector. Another reason however is the mechanisation of agricultural processes and the decline of companies. This decline in jobs has consequences for job opportunities in agricultural areas.

The power positions in the agrifood sector have changed over time. In this graph power is measured by how much influence a specific stakeholder has on the pricing of an end product. What can be seen is the dominant position of local food services and the farmer in the years before 1900. Retail and industry do not play a significant role during those years. However, after 1900 the industry becomes dominant as food processing comes up. The farmers lose some power but stay in a comfortable position. The biggest change takes place from the 1950’s forward. The consumer society is created in the United States and also starts to influence the European market. Throughout the years, retail becomes bigger and bigger. With this shift in scale, there is also a shift in power. Farmers become more and more dependent on the processing and distribution networks of the retailers, while local food services are almost entirely left out. This results in the retail sector asserting dominant power over farmers, enforcing lower margins and changing the sector into a very tough and unchangeable institution. However, local food services trends are on the rise since the 90’s and can play a key role in the change of the system.
The concentrated agrifood sector

The power positions assessed on the last page shows the clear dominance of the retail sector. This dominance is also seen when making a lines pattern of the flows in the agrifood sector. 55,000 farmers deliver their goods to 6,500 manufacturers which then cascade their goods to the 1,500 suppliers in the Netherlands. These suppliers do business with only 5 purchasing offices. These offices are Ahold, Superunie, Jumbo Group, Lidl and Aldi. All of these groups are multinational companies which means most of the enormous revenues made in the sector, go abroad. The locality of the producers therefore do not see the financial and spatial effects of these profits. The 5 purchasing offices deliver the goods to 25 supermarket formulas who ultimately distribute to 16.7 million customers in the Netherlands. The supermarket is a big part of Dutch shopping culture. 90% of inhabitants do their groceries weekly or even daily at these supermarkets. In these supermarkets most food is pre-packaged and carefully selected on beauty. The consumer stands far from the producer in this system.

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From the brief overview of the morphogenesis analysis and the trends, the conclusion of traditional and contemporary food chain can be figured out.

In the traditional food chain, farmers can face directly and easily to the consuming market and most of time they also process and distribute the products themselves.

In the contemporary food chain system, however, because of the upscaling, farmers now become only producers and they have very limited opportunities to sell their products directly to the consumers.

Today, there are lots of steps and stages that should be taken before the food can be delivered to the consumer’s table. What’s more, because of the globalization and the development of transportation, farmers now produce less and less food for local demand.

In order to figure out the specific situation of food system in AMA region, deeper research and mappings about food and other related sectors are taken and presented in the following part.

Exports of agricultural products far exceed the imports.

From 2000-2015, the imports of agricultural products have more than doubled during these 15 years versus a 75 percent growth of total imports.

The export value of agricultural products grew almost as fast (about 85 percent) as the total export value.
There are three main production areas in the AMA region. Flevoland (light clay land) is suitable for crops like corn and vegetables. Zaanstad (peat and sand) is mainly grassland that produces dairy and meat. Aalsmeer (zavel) is an area for horticulture. Three areas are all export oriented.

Sand: Sandy soils are ideal for crops such as watermelons, peaches, and peanuts, and their excellent drainage characteristics make them suitable for intensive dairy farming.

Peat: Peat is an important raw material for horticulture.

Zavel: Zavel is suitable for horticulture.

Clay: When clay combines with sand and silt, it becomes loamy soil and is suitable for growing crops like vegetables and fruits.
CURRENT FOOD SYSTEM

FOOD DISTRIBUTION - STAKEHOLDERS

Port Wholesaler
Food Processor
Main Retailer
Food Logistics Company

Source: Based on CBS, Spotzi

CURRENT FOOD SYSTEM

FOOD DISTRIBUTION - INFRASTRUCTURE

Current food distribution system in the AMA region mainly relies on the road transportation. 40% trucks is food related.
CURRENT FOOD SYSTEM

FOOD CONSUMPTION

Source: Results of the first two years of the Dutch National Food Consumption Survey 2012-2016, CBS

People in Netherlands (0-79 years of age) consume on average a total of 3 kg drinks and foods per day. Almost 2 kg of this concerns beverages (other than dairy beverages) such as tea, coffee, water, soft drinks, juices and alcohol. Approximately 40% of the remaining foods including dairy is of animal origin.

CONCLUSION - FOOD MILES

In the current food system, most products are export oriented which means the farmers don’t produce what local people demand. Besides, ‘Producer-Consumer’ only contributes little part in the system, which is mostly done by the limited current open markets (time limited and location limited). The food transport is mainly by traditional trucks.

This current food system causes large quantities of food miles which causes lots of pollution and waste.
There are many different flows involved in the different stages of food system. For example, food production is always linked to water flows and food distribution has a close connect to energy flows.

In order to understand the food system deeper, it is necessary to clarify the flows that related food system.

The diagram shows how different flows connect to food system in different stages.
FOOD & FLOWS

WATER

Amsterdam Water Supply Dunes
37.5 Million m³/y

Waterleidingplas & Bethunepolder
25 Million m³/y

North Holland Dune Reserve
32.5 Million m³/y

Source: The Amsterdam Dune Water Machine

FOOD & FLOWS

WASTE

BIOCEL
MAX 30,000 T/y

ZAW
MAX 110,000 T/y

Green Mill
MAX 120,000 T/y

AEB
MAX 3,545,000 T/y

Source: GOOGLE map, AEB annual report

Quantity of the waste (2016)
1,972,790 tons

40% of household waste is food waste.
The municipalities of Amsterdam and Haarlemmermeer offer the most jobs in the AMA region, but just a small amount of agrifood related work opportunities. The horticulture region, the municipalities Uitgeest and Aalsmeer, employ together nearly 10,000 people, which is around 35% of all the offered jobs in this area. This results because of the concentration of production, processing and distribution within the same territory. Whereas in the grassland region Zaanstrek, the total amount of agrifood related jobs is relatively low, because it is limited to the primary component, the production sector. Activities of the secondary sector are not located in the same area, but concentrated in Amsterdam. The same phenomenon occurs in Flevoland. Due to the concentration of facilities in Amsterdam, Almere and Lelystad provide very few jobs in the secondary component of the agrifood sector, but mainly in the direct production sector (CBS, 2016d).
According to the “Economische Verkenningen Metropoolregio Amsterdam 2017” the average education level of the workforce of the AMA in 2015 is divided into 19% lower, 40% middle and 42% higher educated. Compared to 2009 the higher educated population rose 5%, whereas the middle educated stagnated and the lower educated decreased 5%.

In Amsterdam and Haarlem around half of the workforce is high educated, whereas in areas like Almere-Lutjebroek and Zaanstreek-Waterland just around 30% and the stake of low educated is relatively high. (Gemeente Amsterdam, 2017)

Amsterdam and Haarlem are standing out with their extreme high land value, not just in the AMA, but also in the entire Netherlands. Amsterdam is especially for the high educated population a popular place to live due to its global connectivity and its broad offer for culture and recreation. The same counts for Haarlem city. With the rising land value in time the middle and low educated population is banished out of this popular areas and has to move further away to less expensive places, like Flevoland (CBS, 2016)
The region of Amsterdam and Amstelland-Meerlanden shows a high positive difference of commuting patterns. Especially Amsterdam with more than 288,000 daily incoming commuters stands out with its amount of work opportunities. The surrounding regions apart of Gooi en Veechtstreek count with a negative difference of commuting. In Zaanstreek-Waterland are commuting daily 81,000 persons towards other regions, and in Almere-Lelystad nearly 65,000.

The concentration of jobs in the city of Amsterdam and Amstelland-Meerlanden doesn’t only attract people to commute within the AMA, but also from outside this region. In total 340,000 persons travel daily for work from external regions. (Gemeente Amsterdam, 2017)

because of the high availability of jobs in ICT, financial and business services and also in culture, sport and recreation, especially high educated workers commute daily from surrounding regions to Amsterdam. The Schiphol airport offers a lot of jobs in the logistic sector for low and middle educated workers, which is clearly shown in the commuting scheme. (Gemeente Amsterdam, 2017)
From indicator analysis, we can find that areas around Zaanstad and Flevoland are the weak point in the AMA region.
After analyzing the income, unemployment rate, amount of low educated population and non-western immigrants, it is clear that the municipalities of Lelystad and Zaanstad are showing the highest socio-economic vulnerability in the AMA (CBS, 2016).

Through the analysis of current food system, food & related flow, food & society, we can draw a conclusion that almost everything is concentrated in the Amsterdam and surrounding area.

From food system perspective, it is the center of food processing, food logistics and food distribution.

From food & flow perspective, it is the center of energy production (fossil fuel energy), waste and water treatment.

From food & society perspective, it is the center of high-skilled jobs, education and knowledge.

Source: CBS
REGIONAL VISION
RECIPE FOR RESILIENT AMA

The regional vision states the direction in which the AMA has to go. Using maps and sections the vision on the food sector and the other aspects that were previously researched, will be shown.

- Power positions
- The new agrifood sector
- Vision map
In our vision we strive to reform the power of the four traditional stakeholders in the sector. These stakeholders, the retail, food services, industry and farmers have over the recent years shown clear trends as to what direction they were going in the future. The retail sector nowadays has the biggest power position, followed by the upcoming food services, the down-trending industry and the farmers. We propose a reinforcement of the food services trend, a more powerful position for farmers while the retail sector loses some power. This balances the power more evenly throughout the sector and complies to our goals in localising the food sector. Food services can play a key role in the realisation of a local food infrastructure, while the farmers process and distribute their own produce.

The new farmer will integrate multiple new aspects. The farmers will create a new localised market in which they produce, process and distribute their own crops. This new market is supported by food hubs in the cities and based on food services that work in the same way as Picnic and HelloFresh. The new farmer does not only integrate the processing and distribution as new forms of activity, he or she also directly uses a localised form of circular economy to produce ground materials and new environmentally sustainable products like biodiesel and bio-plastics by re-using residual streams. For the new sector model this means the power of a farmer grows because he or she gets an viable business alternative to the traditional food chain. This limits the power of the five big purchasing offices in the chain. For the locality it will mean more low to middle educated technical jobs in the sector which positively affects the socio-spatial polarization.

Power positions

<table>
<thead>
<tr>
<th>Year</th>
<th>1980</th>
<th>2000</th>
<th>2010</th>
<th>2018</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>Minimal</td>
<td>Dominant</td>
<td></td>
<td></td>
<td></td>
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As stated by the WRR
AMA regional vision is based on three different layers:

- **Agrifood hub & localized economy**
  - Diversify
  - Deconcentrate
  - Localize

- **Transportation connection**
  - Multiple
  - Sustainable

- **Knowledge corridor**
  - Communication
  - Cooperation
Vision Goals

- Diversify the agriculture products according to local demand.
- Deconcentrate the processing and distribution function, create several local Agronomic hub to partly combine the food production, processing and distribution. Also make the resource circular in the local scale by improving the food system.
- Strengthen the relation between Almere and Lelystad, creat twin-cities and make them support and complement each other.
- Create local jobs in local sector and improve new economic products.
Vision Goals

- Enhance the relation between port and airport for food import and export in the global scale.

- Reuse the waterway and make use of the railway system for food transport and distribution in the regional scale.
Vision Goals

1. Strengthen the connection between different food-related knowledge clusters and offer support to the high-tech food system.
In the development strategy the report states the essential policies and projects needed to reach the vision. The development strategy is multiscalar and will go from the supranational scale to the local scale. It also holds a roadmap and a timeline in which a suggestion of steps to be taken is included.

- Strategy map
- Stakeholder analysis - regional
- Nutrition for sustenance
- Alternative protein research
- Business model - regional
- Road map
- Proposed policy outlook
In the regional strategy traditional water- and railway transport is reinforced.  Flevokust Harbor will be directly connected to the harbor of Amsterdam, Zaanstad and the seed valley in Enkhuizen via waterway.

There will be introduced four different kinds of food hubs in the AMA region according to their surrounding production and condition. In Flevoland and Haarlemmermeer the main trading products of the proposed food hubs will be crops, alternative proteins & vegetables, whereas in Zaanstad region with its grasslands the main stake will be organic fertilizer, meat and dairy products. The food hub in Enkhuizen will be mainly for regional seed distribution. In our proposal the Food Center Amsterdam trades exclusively regional products and redistributes them to its surrounding areas.

Conclusively in the region are two main distribution hubs for agrifood: Lelystad with the direct connection to the Flevokust harbor and the new airport with cargo potential, and Amsterdam Food Center with the closeby harbor and Schiphol airport.

Another important point is to introduce new bio-energy plants and deconcentrate energy production in the region. New plants are projected in proximity to the before explained food hubs and agricultural production land, as for example in Almere, Zaanstad and Emmeloord.

Besides that, we also propose an upgrading of the existing water purification plants in the region, in order to increase the capacity and facilitate integrated water reuse systems to close loops of waste water flows.
When looking at the current average consumption of an AMA inhabitant, one can calculate the area needed for the production of the products consumed. As seen in the graphic, meat, fish and dairy products take up most space in an average diet: as much as 730 m² per year. When looking at the recommended consumption, the amount of space needed per year is considerably lower.

In the Flevopolder already a big chunk of potatoes, grains, arable crops and legumes are grown for human consumption. Most of it is export oriented, however when these crops would be solely for the local market, the recommended consumption of potatoes, grains, legumes and vegetables/fruits can be realised for as much as 1.170,724 persons.

In the current business model this is not realistic as the exporting of these products is more viable. However, when the business model would be overturned to a more indigenous local one, already most of the people in the direct region and even parts of Amsterdam can be fed solely by the Flevopolder.
Duckweed/Azolla

Duckweed is a bushy and fast-growing flowering plant that grows in water. Its plants can be harvested in 3 to 6 months and contain a lot of protein. It can be used as a protein source because several factors contribute to this: it can grow under conditions that most crops cannot because it can grow under water, and it is an efficient producer of biomass. Duckweed requires only 3 hectares of cultivation. From recent research has shown that duckweed is competitive for generating biofuel because it is a photosynthetic plant on earth and is full of proteins. It also grows in water and therefore does not use farmland and feed on water, which purifies the water. It is therefore good for producing biofuel. It also has other applications: for example, the farmer has two products: traditional agriculture and plants grow twice as fast. An aquaponic uses on average 90% less water than traditional agriculture. The cultivation of fish use the water to grow. Because of the soil and the necessary to NO3. This serves as food for the plants that growing plants (symbiotic culture). In an Aquaponics system, the cultivation of fish (aquaculture) combined with the cultivation of vegetables (hydroponic crops) that are grown in water. The movement theory behind fish getting into the water by bacteria first converted to NO2 and then to NO3. This serves as food for the plants that use the water to grow. Because of the soil and the plants the water purified and rich in O2. The fish are also used and is a good crop for improving digestion. In addition, produces the farmer has two products: traditional agriculture and plants grow twice as fast.

Insect

Insects are an indispensable element in the processing of residual flows. However, it's true that insects do not contain sufficient amino acids and the culture of the company is too close to replace with duckweed. The cultivation of insects is very similar to that of duckweed. Duckweed is also used as a fertilizer, which is an important advantage for the farmer. Duckweed is a bushy aquatic algae that provides 8x10^11 calories of calories per hectare per year. Duckweed can be used as a protein source because it is a photosynthetic plant on earth and is full of proteins. It also grows in water and therefore does not use farmland and feed on water, which purifies the water. It is therefore good for producing biofuel. Duckweed as a biofuel anaerobic digestion provides 4.5 times more CO2 per hectare of duckweed per year than traditional agriculture. Ducks can be used as (home) animal feed, bird feed, ornamental plants and are soap and cleaning products and chitin can be used as (home) animal feed, bird feed, ornamental plants and are soap and cleaning products and chitin can be used in the manufacture of products. Fats and carbohydrates are processed into oils. Other algae species mainly grown for the production of biofuel. Some species are processed into oils. Other algae species contain a lot of proteins. Due to the high protein content algae excellent animal feed, as a substitute for soy from research that algae are used to 30% of the pig feed and can make up to 25% of the chicken feed.

Pulses (leg:Lupins)

Lupins are legumes that are a possible replacement for soy in pig feed. These plants are very hardy and do not require a great deal of water. The flowering plant is native to Europe and is 35% to 43% protein. Lupins can replace soy in pig feed. Lupins have a lower yield than soy, which currently 9.25 kg / ha. The movement theory behind the yield of the two plants could be the same and are lauded. Research shows that with a total replacement of soy with lupins is possible to achieve a gain of 2.5 kg of dry feed per pig. The yield per hectare increase of lupins can replace soy in pig feed. Lupins as protein in human food or feed. In addition, produce the farmer has two products: traditional agriculture and plants grow twice as fast. In addition, produce the farmer has two products: traditional agriculture and plants grow twice as fast.
**ALTERNATIVE PROTEIN RESEARCH**

**AGRIFOOD APPLICATION OF AZOLLA**

1. Alternative and sustainable protein source

Azolla can be used as an alternative source of proteins. It is very suitable for animal feeding and has potential for human consumption. Nowadays 25% of cow-feeding can already be substituted by Azolla. Research can heighten this percentage significantly. For human consumption Azolla proteins can be used for alternative forms of meat, drinks, sauces and cosmetics. EU regulations are now being reconsidered to allow this extraction of proteins from Azolla.

If 50% (10,000 hectares) of the Noord-Holland peatlands would be used for Azolla, 25% of the total diet of animals consisting of unsustainable proteins like soy and corn can be substituted by Azolla. Research can heighten this percentage significantly.

2. Biodeisel/bioplastics

Considering the fatty acids profile, Azolla is suitable for usage as biodeisel or bioplastics. Per hectare of open paludiculture of Azolla, 600-800 liters of biodeisel can be produced. This isn't enough to be competitive against palmoil, but offers options when the extraction of Azolla is cascaded.

3. Fertilizer

Because Azolla is able to subtract nitrogen from the air, it can be harvested as a fertilizer. This method is already successfully being used in wet agriculture in China and India.

4. Phosphorus source

Azolla is being used as a method of bioremediation and water purification. This results in less to no subsidence and brings down CO2 emissions caused by peat. Considering the fatty acids profile, Azolla is suitable for usage as biodiesel or bioplastics. Per hectare of open paludiculture of Azolla, 600-800 liters of biodiesel can be produced. This isn't enough to be competitive against palmoil, but offers options when the extraction of Azolla is cascaded.

Source: Marktverkenning Paludicultuur, 2016

**PROMOTION**

In order to introduce the new diet better to the inhabitants, new sectors such as Agrieduca- tion, Agritrend and Agritourism can be created and improved for promotion.
The regional business model gives an answer to the following questions:
How can a localized and re-gionalized agrifood system be introduced and made feasible within the context of the current globalized economy? Does it create new jobs in the transition phase, and if yes, in which moment? How can the agrifood sector be prepared to adapt towards the growing knowledge economy and the connected increasing amount of high educated population?

The introduction of "cash crops" gives the producer the opportunity to reach really high revenues after a short time and a relatively small investment. This allows further investments which require higher inputs, such as localized processing and the facilities for the collective circularity on the farm communities. This can be founded by proposed credits from the Rabobank and possible subsidies of the European Union and national government, such as the rural development program or the ministry of economic affairs. Especially with the introduction of local processing and distribution new working opportunities will be created, where they are needed. Alternative protein farming and the proposed circularity allow the integration of innovation in the agrifood sector and thereby the adoption towards the growing knowledge economy.

An accompanying ongoing investment besides direct on-farm transitions is the promotion of new data and related products. This can be directly funded by the existing CAP policy of the European Union and can thereby also create a few new jobs in person-to-person promoting programs. Indirect revenues of this investment will come in time, when the demand and market for regional products has grown.
BUSINESS MODEL - REGIONAL

The current energy, water, food processing and distribution system of the AMA is concentrated in Amsterdam. The local business model proposes the creation of circular farming communities in order to deconcentrate the present mentioned functions within the regions and close small loops of waste, energy and water streams. Thereby a more localised economy will be created and the farmer has the opportunity to regain power by working in a cooperative way.

The minimum size of a farming community is determined by the needed amount of four stakeholders, which fulfil the following functions: Energy production through a bio-digester, water storing, local processing and local distribution. The largest community size is limited by the maximum distance of 3km between two farms in order to keep the food miles and emissions low. Bigger communities can include more circular farming elements than the four basic ones. In order to diversify and strengthen the cooperation, possible additions could be a local food on-farm shop, which sells the food products of all community members, agrifood tourism facilities like a restaurant or a farm stay hotel, a knowledge and innovation re- search center or in case of livestock farming, a communal manure storage.

The minimum size of a farming community is determined by the maximum distance of 3km between two different farms in order to reduce emissions and create a sustainable system.
Before main actions of the strategy towards a regional agrifood system can start, the “Food Tables” (Voedseltafel) of municipalities have three years to decide on a tailored business model for their region. The so-called food tables consist of different stakeholders of the area connected to food production, processing, distribution, energy, water and waste, and will select representatives for the “Food Council” of the MRA. The food council discusses about policies and higher decisions.

From 2021 actions from different sub-categories such as the agronomic hub, knowledge, transport and localized economy can start. The food tables and food council of the MRA will still be existent and meet regularly and be responsible for supervision, innovation and communication (Van de Wier, 2018).
PROPOSED POLICY OUTLOOK

FUNDING
- CAPPA: A special package of grants and subsidies should be provided in a fair proportion to the rural agricultural sector and to the local and global marketing of the food produced.
- Market value of the food produced in the agro-economic hubs should cater to the fluctuation of consumer demand and the amount of food production.

AGRICULTURE
- Promotion of protected food production and innovative farming techniques in the form to increase the nutrient capacity of the soil with recommendation from the knowledge sector.
- Food production should be facilitated with technical and climate assistance from the knowledge and innovation sector to enhance the quality of the products in the food chain.
- Promotion of specific crop-round food production in the form to increase overall and economic capacity of the food produced.
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- Funding under corporate social responsibility should be allocated for "The Corporate Diet" of the company and should be paid directly to the producer and the distributor.

LIVESTOCK
- Certain percentage of the food produced in livestock farming should be reserved for the food chain.
- Culture practices and livestock farming should be reserved for the food chain.

NUTRITION
- Consumption of processed food should be undertaken with standards set by the knowledge sector.
- Promotion of specific and diverse food that caters to the nutritional needs of the food chain.
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In this chapter the project will apply the development strategy in a more specific way. It makes clear what the spatial consequences are for the landscape and zooms in on the newly created communities. It is also a suggestion of what a local circular economy could look like.

- Updating Flevoland
- Current situation
- Local vision
- Regional circularity
- Business model - local
- Stakeholders analysis - local
- Stakeholders engagement - local
- Stakeholders engagement - community
- Zoom in - farm community
The so-called ‘Ijsselmeerpolders’ have a long planning history that already dates back to 1848, when after the successful inpoldering of the Haarlemmermeer, the Zuiderzee got in the picture. Two events were necessary to convince the then liberal political landscape to vote for the inpoldering. First there was a food shortage during the first world war, which proved the vulnerability of the Netherlands in terms of food security. In combination with continuously rising population numbers, an expansion of the agriculture area was deemed necessary. The second factor that influenced decision making was the flood of 1916. This proved the vulnerability of the dykes around the Zuiderzee (Haartsen, 2009: 27).

In 1918 the decision was made to execute the plans for the ‘Zuiderzeewerken’. When planning the Fluvopolders, the agricultural parcels could be planned in ideal sizes according to the mechanical standards, preferred business management, costs of landscaping and the land use of the time realised. Because of the absence of historical landscape structures, planners made straight block structures that were of big scale and rational. The post-war mechanisation made big parcels possible that were on average between 30-45 hectares with the biggest even comprising 60 hectares (Haartsen, 2009: 29).

The rational planning according to a strict grid meant that planners thought they could create the society. Willem Drees, the prime minister of the time, and other people saw the Ijsselmeerpolders as the example of the makeable society. They expected that the settlers would leave all tradition behind, and create new land and a new society. The government had a very strict policy in the beginning that chose the settlers based on religion, social class and education. They also chose where these new settlers would come to live and work (Nieuw Land, 2009). Eventually the cities Almere and Lelystad started to grow and the government lost their influence on who lived where and did what.

Concluding, the Fluvopolders are historically very planned and guided by strict policy. However, this policy has not been updated throughout the years, which lead to land consolidation and new typologies of agricultural companies. In this project we want to update the strict policies of the Fluvopolders to a new 21st century form, which sets the direction towards a socially, environmentally and economically sustainable future for the Fluvopolders. Planning instruments like prescribed uses of land guide the farmer towards circularity, while policies regarding cash crops and alternative forms of proteins create new opportunities. In this sense the Fluvopolders will experience a renaissance, again to its roots.
The vision for Flevoland enhances the existing water and rail transport ways for agrifood distribution. With the projected “Flevokust harbor” a more sustainable way of transport will be made feasible in a close future.

Another important part is the diversification of croplands in order to adjust the production by meeting local demand and additionally re-nutri sh the fertile soil. Thrifty food hubs will be introduced in all bigger settlements. The main food hub will be in Lelystad for further re-distribution towards Amsterdam and the sub-food hubs in Almere, Dronten, Zeewolde and Emmen will give farmers the opportunity to enter bigger markets by cooperative power. Therefore every city will enhance their strengths in the current agrifood system and have a specific function in Flevoland to make it work in a cooperative and circular way. Lelystad’s main function will be distribution due to the proximity to the harbor and airport. Almere’s main focus will be food services due to the connectivity to Amsterdam and the growing population. Whereas smaller cities, Urk and Zeewolde, will be specific in food processing and supplies due to the existing accumulation of companies. Dronten will expand their already existing role as an agrifood knowledge city with the AERES University, and provide innovation for the whole region.
In the key development strategy, we want to achieve the Flexi-land regional circularity, which requires different flow synergies are all integrated in the new agrifood system.

In the new synergy model, we create different typologies that can be used in the food production area according to the vision. We considered energy, water, organic, fodder and CO2 flows and figure out how they connect to each other by these spacial typologies and different elements. Furthermore, we choose energy flow, water flow and organic flow to set the regional facilities in the Flexiolland area, which is very essential part in this new agrifood system.
The local produced and processed food of Flevoland’s farmers, which is not sold on farmers markets or direct on-farm sales, is distributed according to the nearest food hub for regional food. Every food hub fulfills various functions. By combining distribution and processing facilities the food chain will be shortened, and by providing a market hall with an integrated exhibition space for entrepreneurs the consumption of local produced food will be promoted.

The transport has to correspond to sustainable conditions and is therefore organized in a collective way in the farming communities. The sub-food hubs in Dronten, Emmeloord, and Almere are connected to the commercial retail market, the institutional market, such as schools and hospitals, and via online applications the direct consumer market.

The main food hub in Lelystad has additionally the function of a redistributor to the Food Center Amsterdam due to the proximity of the projected agrifood harbor “Flevokust” and Lelystad airport. In this case the existing waterway route will be enhanced.
In the energy synergy, we propose bioenergy plants in the urban area as the regional energy facilities. The biodigesters, windmills and solar panels in the green houses are proposed in the farm land to realize the circulation in the local scale and in the new food sector.

Plus the existing two bio plants, we add 5 new plants in Almere, Dronten and Emmeloord.

**ENERGY SYNERGY**

**REGIONAL CIRCULARITY**

**ENERGY SYNERGY**

Energy demand (agriculture sector) 6,500,000 kwh/d

Energy output

- Regional bioenergy 92,000 kwh/d
- Local sustainable energy 3,600,000 kwh/d
- 24,000 kwh/d

Electricity grid Farm community
In the water synergy, local water storages for the agrifood usage are proposed to work together with the existing regional water purification station and make the water flow circular in the local level. After the purification, pour water can be conveyed through the waterpipe and reuse locally instead of discharge into canal.

According to the population growth and the water usage in the agrifood sector, the RWZI in Almere, Dronton and Tollebeek are being upgraded.
In organic synergy, bioenergy plant in the regional scale and manure storage in the local scale are proposed to make the organic waste circular. Moreover, phosphate farming and manure storage are work together to make the fertiliser self-sufficient.

Because Flevoland is main production area for bioenergy, so the bioenergy plant in this area also serve for other regions in the whole AMA area.
Besides energy, water and organic synergy, the fodder flow can also be circular within the farmland. Instead of the existing dependency on fodder import, the proposed food system can realize the animal fodder self sufficient.

By using CO2 storage and CO2 pipeline, the CO2 that collected form main road and bioenergy plants can be conveyed to the green houses and alage fields. The CO2 storage station is proposed to be together with regional bioenergy plants.
Observations show that due to recent reclamation the condition and structure of agriculture land in ‘Flevoland’ is because of the influence of historic polder structure and policy influence of the government. Conclusively, an average agricultural plot size of 30 ha is observed in the ‘Flevoland’.

According to ‘Common agricultural policy’, under direct payment and greening scheme 5% of the agricultural plot is reserved as biodiversity and 1 ha of the land is used for personal holdings and the left over land is used extensively for agricultural production.

According to the strategic development plan, hash cultivation as cash crops for medicinal purposes is proposed, which generates capital for the initial investment of the proposal.

Considering the existing policies and site conditions for the business model, an average plot size of 30 ha is taken into consideration according to the requirement and collaboration potential of the community. Considering the existing policies and site conditions for the business model, an average plot size of 30 ha is taken into consideration according to the requirement and collaboration potential of the community.

The agronomic renaissance

Focus on primary production & export orientation monoculture

- energy generation and supply
- waste recycle and manure cultivation
- experimental farming for protein production

A NEW ECONOMY FOR THE AGRIFOOD SECTOR

The energy farmer

-多元化 of crops
- Bio-digestion plant
- Bio-gas storage

The water farmer

-多元化 of crops
- Local water storage

The processor & distributor farmer

-多元化 of crops
- Local processing, packaging & distribution

The current farmer

Focus on primary production & export oriented monoculture

- Experimental farming for protein production
- Experimental farming for protein production
- Experimental farming for protein production
- Experimental farming for protein production
- Experimental farming for protein production

Business Model - Local

Agricultural Land

Personal Holdings

Bio-diversity reserve

Cash Crops

Circularity and Pilot Projects

Traditional Agriculture

Projected Context

Current Context

Agricultural Land

Personal Holdings

Bio-diversity reserve

Cash Crops

Circularity and Pilot Projects

Traditional Agriculture

10% plot of land is kept for traditional agriculture crop as well as livestock production for local economy based on; -experimental farming for protein production

- waste recycle and manure cultivation

- energy generation and supply

- experimental farming for protein production

12% plot of land is proposed for community collaboration projects consisting of; -knowledge institution and farmers collaboration.

80% plot of land is kept for traditional agriculture crop as well as livestock production for local economy based on;

- experimental farming for protein production

- waste recycle and manure cultivation

- energy generation and supply

Considering the existing policies and site conditions for the business model, an average plot size of 30 ha is taken into consideration according to the requirement and collaboration potential of the community.
**Current Context**

- **Subjects**
  - Farmers
  - Processors
  - Wholesalers
  - Retailers
  - Distributors
  - Producers
  - Organizers
  - Logisticians
  - Marketing
  - Tourists
  - Consumers
  - Media
  - Campaigns
  - Pesticides
  - Fertilizers
  - Manure
  - Bio-energy companies
  - Organic producers
  - Processors
  - Restaurants
  - Food councils
  - National Government
  - Infrastructure
  - Transportation
  - Energy Production
  - Agriculture
  - Agro-industry
  - Food Council
  - Supply chain
  - E-commerce
  - Circular economy
  - Social entrepreneurship
  - Research institutes
  - Universities
  - NGOs
  - Business associations
  - Local governments
  - Local communities
  - Other stakeholders

- **Players**
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**Projected Context**

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**Engagement Strategy**

- **Connect and Network** with the existing ecological networks for the existing project entrepreneurs and the food table representation.

- **Create ENGAGE** by broadcasting information for events, university research pilots, communication campaigns.

- **Finalize the project guidelines** in the context of fundraising collaboration and sustainability.

- **Identify patterns** and develop the potential for the project.

- **Provision of space** and the local community organizations.

- **Finalize the common agenda** for the project.

- **Engage in the Local economy** and the region economy.

- **Evaluate the positive and negative IMPACT of the project** in the local community organization.

- **Collaboration of the farm plots** for the development of sustainable transport system.

- **Project permission** for the implementation of the project.

- **Grant for the development of the project** from the local government.

- **Form the food table** for the local community organization.

- **Allocation of land for FOOD TABLE** for the local community organization.

- **Formation of the food table** for the local community organization.

- **Community formation** for the local community organization.

- **Relevant to food table** for the local community organization.
STAKEHOLDER ENGAGEMENT - COMMUNITY

SURVEY and ESTIMATE the existing site condition and requirement. EVALUATE the potential of the whole project. COLLABORATE with research institutes and community farm members. SURVEY and ESTIMATE the existing site condition and requirement. EVALUATE the potential of the whole project. COLLABORATE with research institutes and community farm members.

ENGAGEMENT STRATEGY PLAN

STAKEHOLDER ENGAGEMENT - COMMUNITY

Farming community distributors

Farming community processors

Farming community cash crop producers

Farming community protein producers

Energy company employees

Logistics company employees

Food company marketing/ services

Special package

Special package

Subsidized rate for circular project installation

Funds for protein promotion

Permit to cultivate medical weed as cash crops

Study of agricultural research and study opportunities for youth from farm community.

Equitable distribution of funds

Funds allocated to be decided based on the phasing plan of the project.

Planning project phasing on plots

Depending on the optimal requirement of certain project needs.

Plan formulation based on availability of resources and time period.

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Plan formulation based on availability of resources and time period.
The small scale farm community has four plots and each plot undertake one compulsory component according to the community principle - energy produce, water storage, local processing or local distribution.

Because this site is very close to the IJsselmeer lake, so fresh water farming for alternative protein (algae farming) is also proposed.

The community shared facilities are working together to create the circularity in a local scale and they also connect to the regional facilities to transfer energy, water and waste.
In the middle scale, besides the compulsory components, some optional can also be considered.

In this case, one farmer create a knowledge institution that integrate technology into agriculture.

Knowledge institution can provide agricultural training, new technology introduction and application, helps the farmers and other people get more knowledge of agriculture and food.

The institution is also a monitoring station for the precision agriculture.
The large scale community lies beside the main road to the Lelystad and Almere, which is quite accessible by the residents in these cities.

In the north and west direction of this community, there is a natural area which can be regarded as the urban outskirts attractions.

So in this case, we propose a tourist center as an innovation project in the community, and create an urban suburb agricultural landscape that integrate experiencing, leisure and sightseeing for short trips for the urban residents.
ZOOM IN - FARM COMMUNITY

IMPRESSION - PROPOSAL

BEFORE

AFTER
CONCLUSION & REFLECTION
CLOSING THE LOOP

In this last chapter the report concludes with the scientific and societal relevance, the ethical consideration and suggestions of further research. After this a reflection is added to reflect on the circular economy and the project as a whole.

- Scientific relevance
- Societal relevance
- Ethical relevance
- Reflection on circular economy
- Group reflection
- Self reflection
Regarding the scientific relevance of the project, the agronomic renaissance towards a socially fairer and circular agricultural system in the AMA, the project can be seen as a catalyst for further scientific research into the topics assessed. The project gives a framework in which further scientific research can strengthen the vision and strategy.

The main proposal the project makes is a reform of the agricultural sector into a more local and circular form, which ultimately contributes directly to social, environmental and economical sustainability. The main theoretical concepts used in the proposal are the concepts of borrowed size or ‘twin cities’, the circular economy, localised food networks, socio-spatial polarisation and the knowledge economy. These main concepts have already been thoroughly researched through time. Based on these numerous researches the vision and strategy of the project were conducted.

The project handles the concept of borrowed size or ‘twin cities’ by introducing a more regional approach to the food sector. By assigning multiple cores in the AMA that work together as twin cities: food logistics, production and food services can each grow in a specialized place. In the project, Almere and Lelystad work together in regards of food logistics (Lelystad) and food services (Almere). Proactive regional partners around these cities produce and process the food. This local food network in Flevopolder functioning according to the borrowed size principle has to however be part of a bigger borrowed size principle, comprising of multiple facets like infrastructure and other sectors. This stretching of the borrowed size concept is necessary according to the paper by B. Meijer stretching the concept of borrowed size (Meijers, Burger 2010). Further scientific research is therefore needed to make sure the borrowed size concept will work at its full potential in the Flevopolder. The scientific relevance of including this theory is to make the theory work in not only a regional, but also a local scale with a very explicit and measurable application.

The circular economy is the foundation of the project. Every decision taken is carefully assessed in the context of the circular economy theory. By for example linking the flows of fertilizer production and agricultural land-use in peatlands to paludification and soil production for use as fertilizer, the project makes sure that local potentials get a regional synergy. Other concepts of the circular economy like re-using waste flows and re-fracturing nutrients from unused resources also play a big role in the project. The scientific relevance of making use of circular flows in the food sector is that the food sector actually touches upon all facets of the circular economy. It is connected to waste, water, energy and water. A successful circular system in the food sector can contribute largely to success in other flows. By using the theoretical concept in a regional planning project, the circular economy also becomes spatially explicit, which contributes to the circular actualisation of the circular economy. However, due to the novelty of the circular economy in the Dutch food sector, there are a lot of uncertainties. Quantity of circular potentials are hard to estimate and literature about the circularly oriented concept is specific and explicit about the food sector. An opportunity to strengthen the project would be to move in-depth scientific research towards the topic of the circular economy in the food sector.

Localising food flows is a hot topic in the current world of food policy organisations like the FAO and the EU. Countries like Finland, Australia and Canada are already going towards a more food centered policy in stead of an agriculture policy. In these policies there is more room for local production-consumption initiatives. The Netherlands is also exploring the possibilities of a localized food network in a comprehensive report of the Dutch Scientific Council of Government Decisions. In this report called ‘naar een voedselbeleid’ towards a food policy (WRR, 2014) the council interviewed important stakeholders in the food sector and researchers/policymakers in the practice. The conclusion of this report stated that the Dutch food sector should move to a more food centered food policy that comprises ecology, sociology and food values in the food miles and is healthy. In that regard the council makes a call on the findings of the scientific council. Therefore the project is scientifically relevant. It proposes a strategy that implements a big part of the scientific council’s conclusion stated that the project helps to start the “much needed food chain” (WRR 2014) in the food sector. The report also stated the importance of food policy of the Netherlands has historically been implicit. With the project this policy becomes explicit. Also “Flexicampus”, a temporary agricultural project on the Flexipolder initiated by the Interreg project Foodward (4EU) by the European Union started in 2017 and will last until 2022. The aim is to improve the implementation of regional policies that stimulates the delivery of innovation to create sustainable food chains.

Socio-spatial polarisation is the most important spatial inequity in the food sector that the project tries to tackle. Socio-spatial polarisation is caused by the increasing land values in the AMA. Because these rising prices can’t be afforded by the lower and middle educated people they have to move out from example Amsterdam towards the edges of the AMA like Almere or even Lelystad. As a result these lower social classes start to polarize in the cities furthest away from Amsterdam. Because the areas mostly have less infrastructure connections and less job opportunities Amsterdam, the work/living distances increase for these classes. The project tries to tackle this spatial inequality by creating jobs in the localised and circular food system creates low to middle educated jobs and in that way contributes to the tackling of the negative sides of socio-spatial polarisation. In a broader future perspective the introduction of a regionalised food system can also prepare and exploit these areas to adapt sustainable food systems in the future.

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Concluding, the scientific relevance of the project is multifaceted. While there is still a lot of the projects and policies outer economy in the AMA, the circular food system. The circular food system creates low to middle educated jobs and in that way contributes to the tackling of the negative sides of socio-spatial polarisation. In a broader future perspective the introduction of a regionalised food system can also prepare and exploit these areas to adapt sustainable food systems in the future.
The societal relevance of the project is closely related to the theoretical concepts of socio-spatial polarization and the knowledge economy. The societal relevance in a broader sense can be measured using the sustainable development goals of UN Habitat.

Socio-spatial polarization, as described in the theoretical framework and the scientific relevance chapter, the polarization of economically weaker social groups towards the edges of the AMA region because of an increase in land value in the central region of the AMA. The knowledge economy is the focus of a national or regional economy on a knowledge based economy by high-educated people and high-tech research facilities. This knowledge economy is centered around the city of Amsterdam and mostly attracts high educated inhabitants. This causes land value prices to rise which result in socio-spatial polarization.

The project tries to counter the negative effects of socio-spatial polarization by creating jobs in the low to middle educated levels in the food sector. This creates a socially fairer region where job opportunities are not only available for high educated people. To realize these jobs, the project localizes parts of the food sector which creates opportunities for them to climb out of poverty. Good health and well-being is achieved by the promotion and production of healthy local food in a diet that also includes alternative proteins. Quality education is realized by the strengthening of the knowledge economy throughout the levels. From low to middle to high education facilities closely related to local activities. Affordable and clean energy is being created by investing in biodiesel and other forms of biological resources. Decent work is provided by the creation of jobs in the local environment. Industry, innovation and infrastructure are improved to cater to the new localized food economy and innovative knowledge sector. Reduced inequalities are reached in the project by spreading job opportunities throughout the region and making sure lower social classes have access to knowledge. Resource consumption and production is realized by creating a new circular localized economy that works together with the local society and specific local spaces. The project found a way to link the AMA region. While the scale of agri-food production companies grew, the amount of companies that were able to keep the current prosperity and opportunities in the region which has a functional monocentrality. These changes take time and are planned for the long-term. This is necessary to prevent the political and societal change needed. For example, the current political landscape in the Netherlands is quite liberal and right. In order to meet the two challenges in mind the problem statement and the project was formulated. The purpose of the project is to deal with climate change and poverty. The project ‘the agronomic renaisaissance’ has three moral pillars that the base of the project. Analysis showed that socio-spatial polarization in the AMA was getting disproportionate forms. The rising of land prices in Amsterdam, caused by its enormous high society pull factors like the knowledge economy and high services, resulted in a diaspora of the lower to middle situated inhabitants. These groups were being forced to the edges of the AMA-region. Away from job opportunities and facilities.

At the other hand the concentration in the food sector of five big supermarket offices diminished the power of the farmers in the AMA-region. While the scale of agri-food production companies grew, the amount of companies that were able to keep the current prosperity and opportunities in the region which has a functional monocentrality. These changes take time and are planned for the long-term. This is necessary to prevent the political and societal change needed. For example, the current political landscape in the Netherlands is quite liberal and right. In order to meet the two challenges in mind the problem statement and the project was formulated. The purpose of the project is to deal with climate change and poverty. The project ‘the agronomic renaisaissance’ has three moral pillars that the base of the project. Analysis showed that socio-spatial polarization in the AMA was getting disproportionate forms. The rising of land prices in Amsterdam, caused by its enormous high society pull factors like the knowledge economy and high services, resulted in a diaspora of the lower to middle situated inhabitants. These groups were being forced to the edges of the AMA-region. Away from job opportunities and facilities.

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The circular economy in the agricultural sector is akin to a renaissance, as it essentially revalues and rejuvenates the traditional agricultural lifespan. The constant re-adding value to products, whether in the form of usage of pastures, alternative protein sources like algae and duckweed, will most likely eventually benefit all. This is because the production of new materials, which subtracts nutrients from the air and also cures photosynthesis for carbohydrates, is a closed loop. By closing the agricultural production loops, we are able to create a synergy that mutually benefits from one another.

In the socio-economic dimension, we are able to consider the socio-spatial pruning of the industrial economy in agricultural landscapes that can profit from the created job opportunities in the reformed agricultural sector, while also getting an opportunity to better their food lifestyles towards a healthier and more eco-friendly diet.

The water, waste, energy, food, organic, fodder and CO2 circulation is closed locally, on farmer’s businesses. This means that re-extracted flows in its production, process and consummation. With the re-extraction of surplus protein sources, we are able to be considered when proposing products that can be re-introduced in agricultural systems. While the trend in meat consumption is increasing, the potential increase in meat production on pastlands by the aforementioned paludiculture solution for peatlands is deemed necessary for a sustainable society, the transition to a more sustainable agricultural sector, while also getting an opportunity to better their food lifestyles towards a healthier and more eco-friendly diet.

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When reflecting as a group on the entire project ‘the agronomic renaissance’ we are thoroughly aware of the environmental footprint that has to be considered when proposing products that can be re-introduced in agricultural systems. While the trend in meat consumption is increasing, the potential increase in meat production on pastlands by the aforementioned paludiculture solution for peatlands is deemed necessary for a sustainable society, the transition to a more sustainable agricultural sector, while also getting an opportunity to better their food lifestyles towards a healthier and more eco-friendly diet. However, this project is about more than only the circular economy. The circular economy is a tool to reach other social, environmental and economic goals. Like Geissdoerfer et al. (2017) argue the circular economy towards a new sustainable paradigm, the circular economy is a condition for a sustainable society and their regulation is beneficial (Giesbersdofer et al., 2018: 767). Following this reasoning, the circular economy should not be a tool to reach other socio-economic goals.

With the project, we tried to close the loops by looking at what was necessary in the food sector and the societal reality of the AMA. Through research we discovered that, while the circular economy is not the main answer to these challenges, the circular economy does play a facilitating role for change. According to us, because circularity is deemed necessary for a sustainable society, the transition to the circularity has to be used for multiple challenges.

In the project we closed the loops by reforming the food sector to a more local one, which makes profound use of circular economy.

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SELF REFLECTION

SEBASTIEN REINKINK

The planning tradition in my country is, as thoroughly as
assessed in the debating stra-
tegic planning, lectures, very
much embedded in its DNA. The
Netherlands is the most planned
country in the world and it is
famous for the key principle: ‘pol-
deeer’. We like to settle planning
problems by involving everyone
and then meet in the middle (to
state it exaggerated). Therefore
for me, it is clear why we engage
in strategic spatial planning. In
formed my home country and
brought identity to the land-
scape. Planning protected her-
tage landscapes, minimised urban
spread in green areas like the
green heart and created a
super functional and liveable
countryside. By thinking ahead, chal-
genes like population growth,
traffic jams and overcrowding of
inner-cities can be managed.

However, I am very much aware
that planning can also bring
about failure. Because planning
is typically about a long stretch
of time and in the future, trends
and mechanics can change over
time. A good example of this in
our project, is the planning of the
Flevoland polders. The orig-
inal idea was to plan 6 villages
in the polder where agricultural
land workers could live with their
families and go to their work
easily. Another important prin-
ciple is the proposed propor-
tional mono-cultural crop cultivation
in the AMA, which are including
the farmers need, which is
the design process, is to define
the key principles of stra-
gategic planning. The project
needs high stake-
holders to change that?

Conclusively the main challenges
I faced during this quarter were
A) Stakeholder participation for me
is key for the success of a pro-
tect. Involving the right stakehold-
and at the right time can make the
project. What I found hard was to
convince stakeholders with an
economic power to cater to societal
groups. During the pro-
ject there were times where so-
cial goals were deemed more
important than direct economic
prosperity. Long term planning
can then be the key to change
institutionalised power positions
gradually into another system.
An important role plays the gov-
ment in this development.
Good governance is also a pre-
condition for planning the exter-
val values should be protected
by this government.

Concluding, the strengths of the
project were in the long term
gradual planning and the atten-
dition of multiple normative
groups in an comprehensive
development strategy. The
weaknesses were the many un-
certainties in the strategy. Be-
tween the actual capitalistic
and common values is the pro-
progression of a collective
use. This approach tries to
fighting for a more local and
environmental conditions and
and consumers, that there is an
private companies, producers
and consumers, but also the envi-
mental and societal goals. A
project at the right times can make the
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for our proposal “The Agrono-
mic Renaissance” I engaged
in strategic spatial planning
approaches. It is a well elaborated
roadmap to a weak basis for change, it
is however important to guide the
project there were times where so-
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SELF REFLECTION

LIU CHANG

In my point of view, planning is always a complex and implicated because everything you do is uncertain. But I still engage in strategic spatial planning and violate the principle of farm community. But precisely because of the principle of farm community, it is impossible to find all the evidence which is uncertain and you can never find them because everything you do is multiple aspects to make this solution more feasible and reliable. However, I do know that many uncertain parts relate to the barriers. We don’t know what kind of jobs and how much of the jobs we can create in the transition. For the reason why, I engaged a strategic spatial planning approach, I think having only the targets are not clear, precious and efficient enough to help the region or city to achieve the goals. We need to publish the actions, practices and policies which strongly connected with the space, activities, timeliness, stakeholders and etc. in different scales, and that is exactly the core of strategic spatial planning.

Strategic spatial planning is the game of uncertainty.

When reviewing the whole design and planning of our project, I found that actually I had the greatest benefit from the process of our food topic: Agronomic Renaissance. There are changes in different food hubs and another kind of "concentration". We don’t know what kind of jobs and how much of the jobs we can make to create in the transition. For the reason why, I engaged a strategic spatial planning approach, I think having only the targets are not clear, precious and efficient enough to help the region or city to achieve the goals. We need to publish the actions, practices and policies which strongly connected with the space, activities, timeliness, stakeholders and etc. in different scales, and that is exactly the core of strategic spatial planning.

In our project, I suppose the key principle in the strategic spatial planning we use is Sustainability. When we talk about Agronomic Renaissance, we use the circular economy happen, social, environmental and economic challenges have to be integrated in the transition. For the reason why, I engaged a strategic spatial planning approach, I think having only the targets are not clear, precious and efficient enough to help the region or city to achieve the goals. We need to publish the actions, practices and policies which strongly connected with the space, activities, timeliness, stakeholders and etc. in different scales, and that is exactly the core of strategic spatial planning.

Strategic spatial planning is the game of uncertainty.
SELF REFLECTION

GAYATRI MUJUMDAR

Planning plays an integral part to reach a desired goal. Throughout history planning has been at the core of any administrable expansion. Different ways of planning demonstrate, the diversity of planning as a tool; how inclusive is it, on what governance levels is it imposed, on what levels are the stakeholders participating? It is also quintessential to understand the regional dynamics with respect to spatial planning. In the case of this project “The agronomic renaissance” the brief was focussed on the task of integrating circular economy into regional planning of the AMA region. As a group with holistic mix of international and Dutch students, our group focussed foremost on understanding the dynamics of the AMA region. Result was a comprehensive and detailed understanding of the region and the impact of multi scales of governance on the socio-spatial, economic and environmental aspects that comprise and form the AMA region.

Strategic Spatial Planning as I have understood is a necessary and constructive tool to address the problems of the region with a series of actions and plans that are symbolic of activities that need to be taken in a defined time frame to manage and create scope for other activities while involving the stakeholder participation from the outset. Major factors like population rise, globalization and the climate change have alarmed the political bodies of resource scarcity and resulted in rethinking about the dynamics of the food produced through intensive farming methods that are creating global warming and contaminating the soil simultaneously depleting of its essential non-replenishable nutrients. Food is the driver for the economy of the Netherland since its inception and has been the basis for all the other business developments. Our proposal particularly addresses the dynamics of the food sector in the AMA region and even with the transition towards a circular economy how it can still capture on to its concurrent status in the economy bracket by being local and sustainable.

Conclusively there are still very many questions that need to be addressed and researched upon regarding the role of all the other stakeholders and how the proposal can then modify and adapt to the requirements of them. Simultaneously it still remains a question of great debate as to how strategic planning can be made more coherent and adaptive in a developing country with multiple multi stakeholders when now climate change and globalization are stated to be at its peak?
APPENDIX
GLOSSARY OF ITEMS

- Action chart
- Community size calculation
- Statistics
- Bibliography
Healthy food diet for everyone

Diversification of agricultural products

Short food chain

Interconnecting network of production, distribution and consumption

- Advertisement
- Agroeducation

Environmentally sustainable

- Facilitate adoption of new technologies
- Increase direct marketing
- Communitate how food choices support sustainability
- Seasonal vegetables and fruits diet
- Alternative forms of protein production like Azolla or Algae etc.

- Localized and collaborative processing of raw agricultural products
- Shared manure storages in farmer communities for natural fertilizer production
- Local water storages in farmer communities

- For the cooperation restaurants, listing locally grown products
- Staff and others to distribute low-cost fruit and vegetable bags
- Organic certification of producers and processors
- Gardens, at the same time to promote the local agrofood.

- Combining natural remediation and agricultural production
- Re-use food waste in short cycle processing for animal feeding
- Use paludiculture to produce fertilizers/phosphorus and increase productivity and ecological integrity of the crop in ecosystem

- Sensing local food needs
- Monitoring the food chain

- For the promotion of local and regional food production
- The position of the producers in the food chain

- For the cooperation restaurants, listing locally grown products
- Staff and others to distribute low-cost fruit and vegetable bags
- Organic certification of producers and processors
- Gardens, at the same time to promote the local agrofood.

- Localized and collaborative processing of raw agricultural products
- Shared manure storages in farmer communities for natural fertilizer production
- Local water storages in farmer communities

- Bio Digester

Considering calculations reference from Garcia, 2005

On 25ha of land in agriculture,72 ha arable crop land, 160 ha arable fixed land, 500 cows as livestock, amount of water generated is 10,644.1 kg/day, and size of the digester is 60 cubic meter. Digestate of 915kg/day and digestate of 1225kg/day or 2510kg/day is produced daily after 40 days of retention time.

Therefore for 30 ha of agricultural land, size of the digester required is 60 cubic meter producing an energy of 50 kW and digestate (fertilized) of 1225kg/day with an retention time of 40 days.

Estimated percentage land required for the digester, fertilizer storage, biogas, waste storage is 0.4% of 30ha.

Wind Energy

Considering calculations reference ("NREL: Power Technologies Energy Data Book - Wind Farm Area Calculator", n. d.)

A wind turbine requires 0.12ha of land to generate 1000 kW depending on the local conditions with the turbines being places 9 to 10 turbines apart.

Estimated percentage land required for 1 windmill is 0.3% of 30 ha with additional area required for access.

Water storage


Average annual water requirement for agriculture in 2010 was 258 cubic meter per hectare. Therefore water requirement for 30 ha, if irrigated every 5 days is 206 cubic meter. So area requirement for a cylindric water storage tank is 53 square meters.

Estimated percentage land required for water storage tanks is 0.4% of 30 ha.

Protein production, Processing, Distribution

Considering reference of the land use under persona holdings equal area was reserved for the production of protein and processing, distribution.

Therefore estimated percentage land required for protein, processing and distribution is 8% of the 30 ha

Protein production, Processing, Distribution

Considering reference of the land use under persona holdings equal area was reserved for the production of cash crop—medical cannabis.

Therefore estimated percentage land required for cannabis is 2% of the 30 ha.
## ECONOMY & JOBS

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## STATISTICS

### FOOD PRODUCTION IN FLEVOLAND

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<th>Land for pastures (ha)</th>
<th>Pastures production (ton)</th>
<th>Land for vegetables (ha)</th>
<th>Vegetables production (ton)</th>
<th>Land for forage (ha)</th>
<th>Forage production (ton)</th>
<th>Grain production (ton)</th>
<th>Other grain production (ton)</th>
<th>Total crop production (ton)</th>
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**Land for feedstuffs (ha)**

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**Horticulture (ha)**

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**Horticulture under glass (ha)**

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REGULATIONS


