

# The Fertile City

Raising Food Awareness Through Architecture



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Msc Graduation Thesis  
Technical University Delft





## Research Report

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## Preface

This Master thesis is a part of my graduation studio of the chair of Dwelling at the Technical University of Delft

As a response to the current food practices I have chosen a topic based on a personal fascination: food awareness. During the past few years this topic has attracted my attention because of my interest in greenery and healthy food. Combining this topic with architecture led me into the hunting for the link between architecture and food. Considering all the positive aspects of greenery in cities, it will also gain another value to the city, which is the production of food.

I would like to thank my mentors within Delft University of Technology, Pierijn van der Putt as my research mentor and Theo Kupers as my design mentor for their tutoring and support during the first semester of my graduation process. I would also like to thank my family and friends for their believe in me and support during my study and especially during the graduation year.

Jino Fattah  
Delft, June 2018







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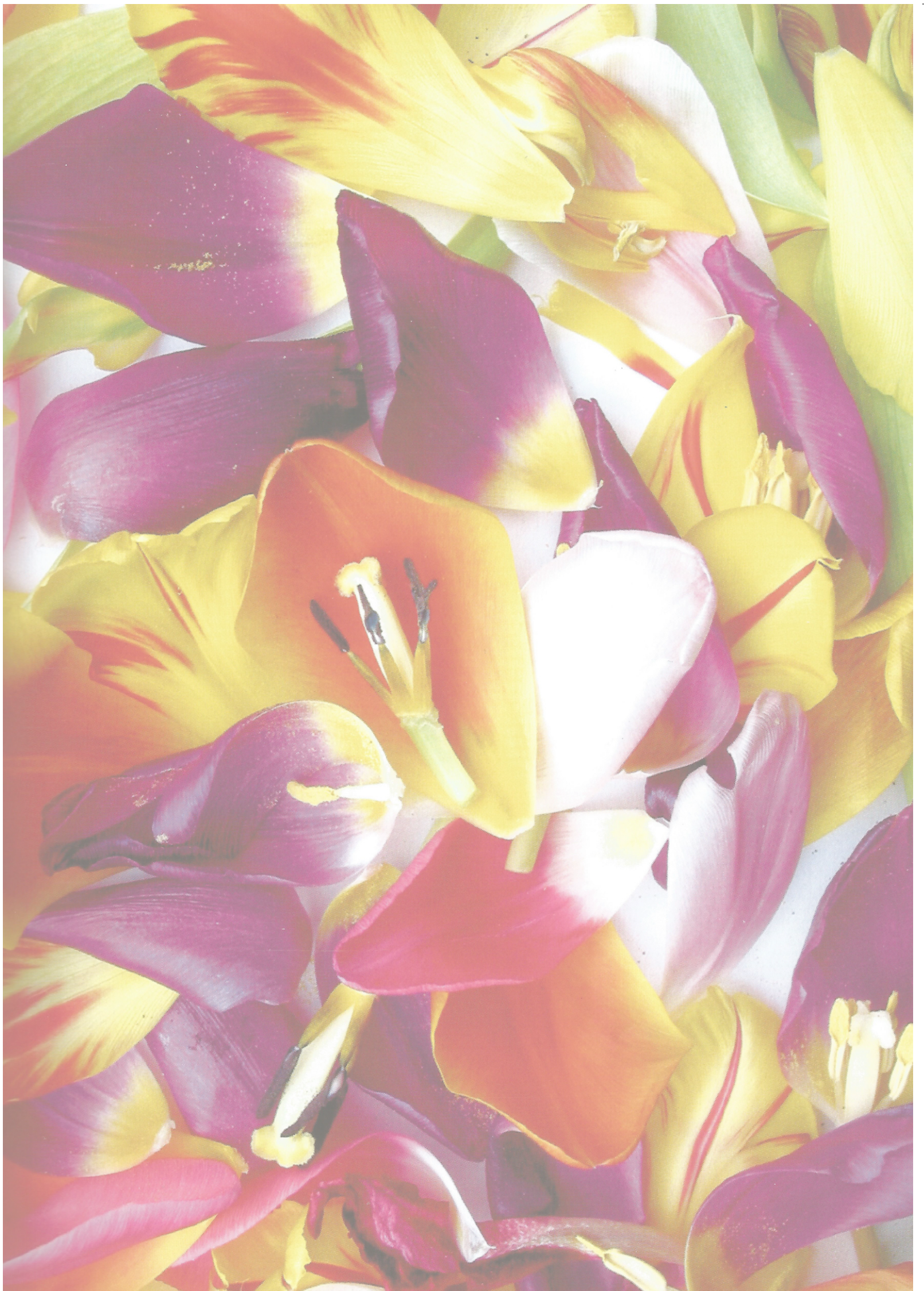
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# Introduction

## The assignment

For this academic year the assignment of the Dutch Housing Graduation Studio is to determine the City of the future and especially Amsterdam. The city of the future could be determined by means of current affairs. What do cities need to be or become in order to solve a current social, physical or economical problem in the society.

The topic could be chosen using literature studies, newspapers or by a personal fascination. The topic should also be applied to a residential building that has to be designed after an in-depth research about the topic.

After choosing a topic, the aim is to select a site for the studio project. The location for this academic year is the centre of Amsterdam, around the canal Belt, between the Singelgracht and the Lijnbaansgracht. Literature studies, analysis's and writing a manifesto lead to a design brief with a proposal for a design project.

I have chosen a topic for my graduation project based on a personal fascination and a topic that has started increasingly to attract attention during the past few years. This topic is food awareness.

More and more people will live in cities in the near future to live close to their work, university or because of all the facilities in cities.

It is expected that the world population will grow to 10 billion people by 2050 with majority living in cities. In Europe it is estimated that 80% of the population will live in cities by that time. As more people are going to live in cities, the demand for food in cities will also increase enormously. But it seems like this is something that is not taking seriously into account, we are increasingly losing the awareness that we are reliant on the natural world as much as our ancestors were.

The aim of this thesis is to raise people's awareness for food, so that people have more knowledge about where their food comes from and how it is produced. The aim is also to make citizens able to grow their own fruits and vegetables and not to be 100% dependent on the unsustainable world's food system.







# Chapter 1. Research Studies

## 1.1 Topic and Relevance

Cities are attracting people increasingly because of the work opportunities, universities and wide range of facilities. It is estimated that the world population will grow up to 10 billion people by 2050 with the majority living in cities. In Europe 80% of the population will live in cities by that time (Food and Agriculture Organization of the UN, 2017).

As more people will move into cities, the demand for food in cities will arise too. This means that somewhere else in the world natural landscapes have to be transformed into agriculture in order to feed us. Yet 73% of deforestation can be attributed to agriculture and deforestation is likely to continue with projected increases in food demand (Global Environmental Change 28).

These landscapes does not only feed people but also animals, a third of the annual corn crop globally is used to feed animals to provide people with meat. This is considered not a efficient way of providing us with food (Steel, 2008). Carolyn Steel states in her book that nineteen million hectares of rainforest are lost every year to create new arable land, although at the same time an equivalent amount of existing arables is losing to salinization and erosion. Even though the produced food uses a great amount of fossil fuel and makes other costs, it is not valued.

Half the food produced in the USA is currently thrown away. At the same time people are not even managing to feed the planet properly, while a billion of us are obese, a further billion starve. In addition 80 percent of global trade in food now is controlled by just five multinational corporations which give them the power to completely control the food system (Steel, 2008).

The UN report (Food and Agriculture Organization of the UN, 2017) estimates that 70% more food need to be produced by 2050 to feed the expected 10 billion of world population. That is equal to 1 bn tones more wheat, rice and other cereals and 200 more tones of beef and other livestock. This is a very difficult to achieve because most available farmland is already being farmed and in ways that decrease its productivity and lead to soil erosion and water wasting.

The aim of this research is not to solve this unsustainable global food system, but rather to make people aware of what is going on and how our food model has been transformed through decades. This will make people aware of the big impacts the controlled food system has on the climate, their food and therefore their health and even their wallet.



# Chapter 1. Research Studies

## 1.2 Problem Statement

The population growth in cities demand more food to feed everyone. As cities became distance independent, it was no longer necessary to produce food in the close environments. Agricultural sites moved outside the city and over time it became possible to even import food from any place in the world. The space in the city was used for other developments and agriculture sites moved outside the city.

Today food is developed in a mass globalized system which causes a long distance between the production and people consuming it. The globalized food system separated food production from its consumers and therefore the relationship between people and their food is being lost. People do not really have any idea how and by who their food is produced and where it comes from. Supermarkets are one of the greatest examples of this distanced relationship between people and their food. In Amsterdam supermarkets have taken over the sale of food since almost thirty years ago.

The food production industry intensified and developed into a large scale production to meet the needs of the growing population in the cities. The population growth in cities goes hand in hand with its ecological footprint. The ecological footprint of cities is about the number of m<sup>2</sup> land needed to feed the city. Food is taking almost a third of the environmental footprint; food production has big environmental impact because of the high greenhouse gas emissions caused by production methods and the use of pesticides and infrastructure to transport the food. Although the Netherlands has globally the second biggest export of agricultural goods, the food system is not sustainable due to the above mentioned reasons.

## 1.3 Research Question and Hypothesis

As mentioned before the aim of this thesis is not to find an immediate solution for the unsustainable world food system, but rather to take a step towards raising the awareness of people about all what is globally going around about our food system. This is indirect a great step into changing our food model. This leads to the research question of this thesis which is:

How can the architecture of a residential building create an active way for people to get involved in the food system again?

In order to answer this question research studies have been made, including literature studies, plan analyses and site analysis.

When people who share the same interest and fascination about food awareness will live at the same residential building or in the same neighborhood, they can share their knowledge and build up an sustainable urban environment with a sustainable food system. Due to this people can relate much better to their food.

### Sustainable Food System Goals



Figure 1. Sustainable food system goals. Source: own illustration





## Chapter 1. Research Studies

### 1.4 History | Back to the beginning

This paragraph is about the history of food production, how our ancestors fed themselves and how this process developed through time. The books that have been used in this paragraph are *Hungry City* by Carolyn Steel and *Farming the City* by Francesca Miazzo and Mark Minkjan. Also the graduation thesis *Creating a Sustainable Living Environment* by Andrea Nienoord (2014) has been used.

Carolyn Steel explains in her book *Hungry city: How food shapes our lives* (2008), how modern food production has damaged the balance of human existence. Few of us are conscious of the process of how food reaches our plates. She explores the historical context at each stage of food's cycle.

It started about 12000 years ago after the last ice age, in an area of the world in the ancient near East, called fertile crescent. People started with a radical new way of feeding themselves. Instead of hunting and gathering and following food around they discovered the idea of harvesting grasses which made it possible to stay in one place. That was the beginning of farming settlements dotted around the fertile crescent, as also elsewhere in the world. It was these farming settlements around the fertile crescent that grew big enough to become cities. These cities were the first urban settlements on earth and give an insight of how one fed a city by discovering grain and by farming. These cities were small and very compact, their size were dependent on how much food could be produced around the city to feed everyone.

Furthermore Carolyn Steel explains that any city in the preindustrial era was flowing with food and also physically shaped by food. Citizens could see grains coming into the city through rivers, animals walking into cities and how food was sold on markets on streets, so that nobody living in a city like that could not be aware of where their food came from. This is lost with the advent of industrialization, which caused a big change in the system of feeding cities

The development of cities can roughly be divided into four periods: a period before industrialization, a period of urbanization after industrialization, a period of suburbanization and a period of re-urbanization (Nienoord, 2014, p. 33).

The industrial revolution was the mechanization of work and started around 1900 due to the invention of the steam engine. During this period manual labour was replaced with the use of machines. In addition, the way of transport changed drastically with the introduction of different transportation techniques like trains. Due to this, distances became less important and cities could become independent and grow bigger. At that time twenty percent of people worldwide lived in urban areas. Because of industry and technology cities offered more jobs than its surroundings. This employment attracted people to cities and resulted in urbanization; a transition from rural to urban living started. Contrary to modern cities that developed in a fast and often uncontrolled way, the growth of old cities were limited in its space within city walls.

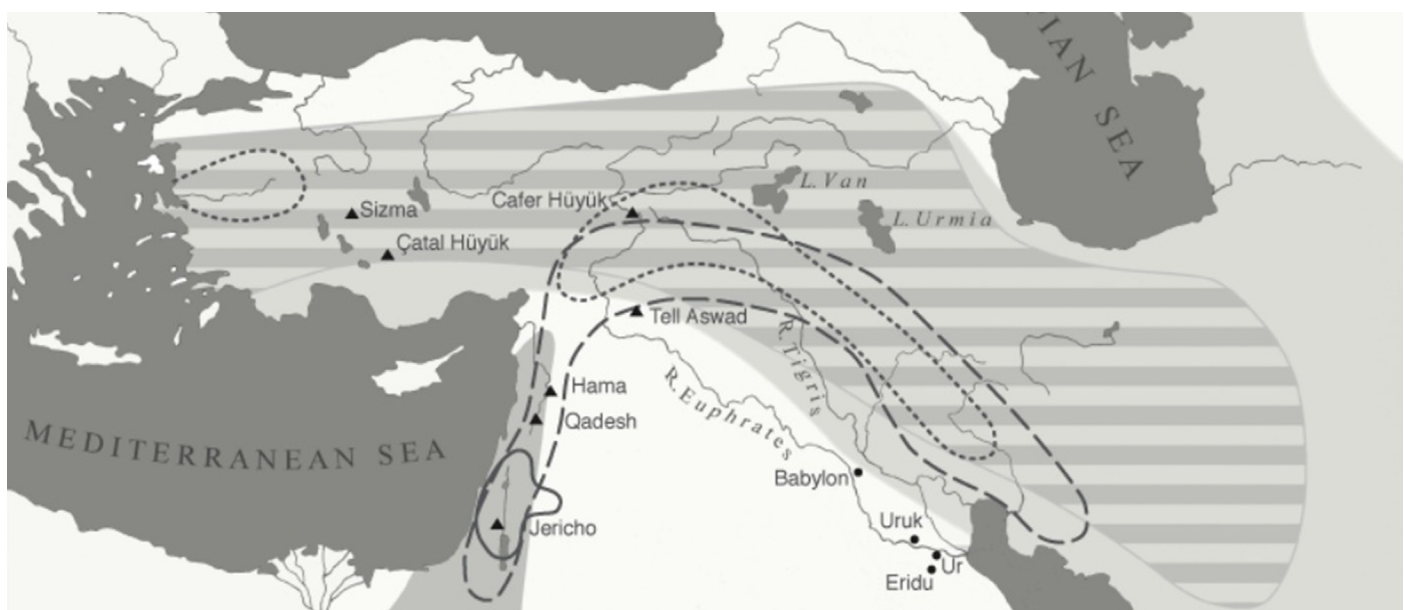


Figure 2. The fertile crescent. Source: *Hungry City*

## Chapter 1. Research Studies

### 1.4 History | Back to the beginning

Around 1960 suburbanization started to take place in a large number of cities. People moved from cities to surrounding countryside. They escaped the noisy and air polluted industrialized cities and moved to the countryside for its greenery, space and rest. Due to this movement, the countryside needed to deal with much more inhabitants and commuter traffic. In addition, businesses also moved to suburbs because of the lower ground prices and more space and accessibility. The development of suburbs spread the borders of cities and the countryside get scattered.

Re-urbanization started when people started to move back to the city again from around 1980 because of traffic jams caused by increased commuter traffic. In 1950, more than two-thirds (70 per cent) of people worldwide lived in rural settlements and less than one-third (30 per cent) in urban settlements. In 2014, 54 per cent of the world's population is urban. The urban population is expected to continue to grow, so that by 2050, the world will be one-third rural (34 per cent) and two-thirds urban (66 per cent). Europe, with 73 per cent of its population living in urban areas now, is expected to be over 80 per cent urban by 2050 (UN report, 2014).

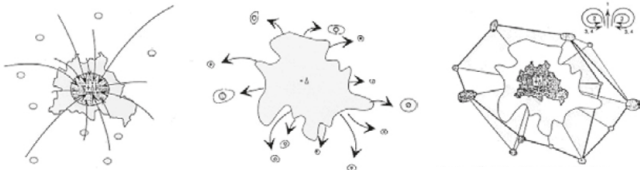


Figure 3. Urbanization, suburbanization and re-urbanization.  
Source: kuleuven.be



Figure 4. Animal transport. Source: Hungry City

## Chapter 1. Research Studies

### 1.5 Unsustainable Food Model

After industrialization and advent of railways cities started to expand quickly and became large metropolitan areas. At the same time the agricultural industrial landscape in other parts of the world also started expanding in similar way. The railways made it possible to grow large amounts of grain because trains could then transport it to cities. This was the beginning of a big transformation of extraordinary landscapes which resulted in an massive global abundance of grain. Later this mass of grain was used to feed animals instead of grass. This became a new industrial model of how to create cheap beef on the basis of this massive grain production (Steel, 2008).

By 1870 17 million cattle were produced and canned or frozen and shipped out to any part of the world. This was the beginning of the nowadays meat production model. A third of the global grain harvest and the majority of soy beans goes to animals instead of directly to people. It is possible to feed about 10 times as many people if we ate the grain or the soy beans directly instead of passing it through an animal first. This is a unsustainable food system that has evolved.

In addition there is no 'cheap' meat, it is called cheap because all of the true costs are externalized. Degradation of soil is one of those costs, fantastic grasslands and pasture lands were for thousands of years kept stable and fertile by local ecology, which has now been replaced by an unstable and unfertile monoculture production of plants. This changed everything about how cities are supplied with food.

### 1.6 Supplying Cities With Food

Carolyn Steel explains the completely new food system that has been arisen to feed urban areas; often motivated by public health and technological innovation which brought us from chaotic urban street markets to homogenized supermarkets run by corporate giants, with a whole new discipline which is called food logistics.

The invention of supermarkets, which happened in America in the 1920s, has changed the way we inhabit cities fundamentally. Instead of going into town, to buy food, we drive out to large, anonymous boxes to sell their long-life products. This created an enormous distance between people and their food and was the beginning of the modern relationship with food.

Steel states about this that *"In the modern food industry, small producers, suppliers and retailers all share the same problem. They are relics of a bygone era. Cities in the past were fed by thousands of individuals - a plethora, if you like, of Peter Clarkes - who either brought produce to market themselves, or sold it on to suppliers to take it for them. The food supply was so vitally important to cities that most had laws in place to prevent anyone from gaining a monopoly in the trade, either by getting too large a share in the market for any one food, or by operating in more than one stage of food chain"* (Steel, 2008, p. 61).

Today's food system is far away from how it used to be. Most of the food is produced and distributed by 'food clusters', firms that globally control the food system from gene to supermarket shelf.

The civic aspect of selling food disappeared, and simultaneously much of the character and purpose of our cities. Eighty percent of global trade in food now is controlled by just five multinational corporations which give them the power to completely control the food system. that gives them incredible power over our wallets and our bodies too.

## Chapter 1. Research Studies

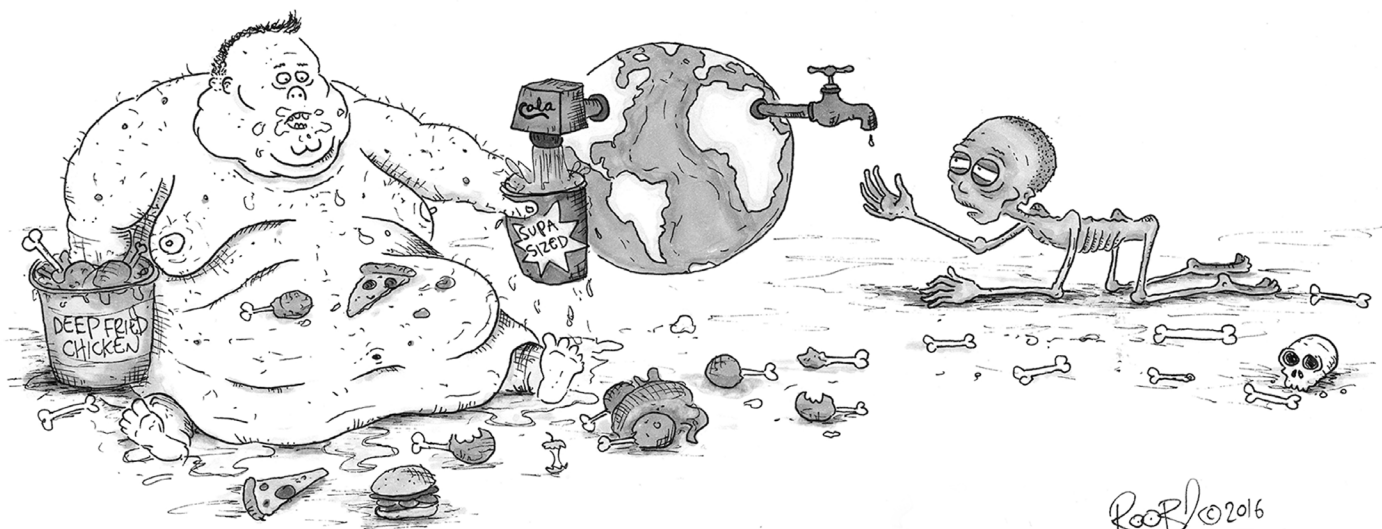
### 1.7 The city paradox

Steel describes in her book the paradox of behaving as if living in cities and feeding cities is something that we already have solved. Nothing could be further from that. About 20% of the global arable land is degraded because of the monocultural production caused by the current food system and about 70% of available fresh water is used in irrigation of farming. 30% of the greenhouse gases are caused by food and farming and by deforestation in order to grow food for cattle.

Although the industrial food system is able to produce huge amounts of food, there is a big difference between the quality of the food now and how it was. Steel explains that different studies have shown that the fruits and vegetables produced now contain just a fraction of the minerals and nutrient as opposed to what it was before the industrial food system, due to the way it is produced. The same thing happens with beef, whereas it supposed to contain omega-3, the current food system produces beef with omega-6. These kind of changes are changing the whole balance of our food and that is not good for our health.

Food system used to be incorporated in the daily live of cities, but because of the shift being controlled by the government to free markets it is no longer visible. Food systems used to feed all citizens whereas now it provides food only where there is money.

WE LIVE IN A WORLD WHERE EPIDEMICS  
OF MORBID OBESITY & STARVATION COEXIST





# Chapter 1. Research Studies

## 1.8 Utopia

According to Carolyn Steel (Hungry City, 2008, p. 305) Utopianism is an attempt to give us a way to think about dwelling holistically including all the disciplines such as architecture, urbanism, sociology, political and so on. She states that how we feed ourselves is interwoven with the question how we live. This is not a new question and probably one of the oldest questions humans have had.

The idea of Utopia, meaning 'no place' or 'good place', was first used by Plato and was adopted by Thomas More in 1516 (Hungry City, 2008, p. 291). More invented this fantasy world called Utopia where people live in a series of semi-independent city states, which was limited in size and arranged in a network. The city states were about a day's walk from every other one. The city streets were broad and lined with terraced houses with huge back gardens in which the inhabitants loved to work:

*"They're extremely fond of these gardens, in which they grow fruits, including grapes, as well as grass and flowers. They keep them in wonderful condition – in fact, I've never seen anything to beat them for beauty or fertility. The people ... are keen gardeners not only because they enjoy it, but because there are inter-street competitions for the best kept garden"* (Hungry City, 2008, p. 292).

In Thomas More's Utopia everyone is a food and gardening lover, where men, women and children farmed.



Figure 5. Thomas More's Utopia. Source: Hungry City

## Garden Cities

Garden city is another example of an utopian vision from the early 20th century, by Ebenezer Howard. His idea behind Garden Cities was to stop building big scattered metropolis and instead building a network of small, independent, self-sufficient city states, connected to one another by railways.

In 1902, Howard republished his misinterpreted concept of Garden city, as Garden Cities of To-morrow. This would be a Garden City that would combine the benefits of town and country living, while neutralizing the disadvantages of both. The City was a city state that would occupy 6000 acres of land of which 1000 would be owned by community (Steel, 2008, p. 299).

The aim of the clustered cities was to have the sense of living in a small sized town and at the same time enjoy all the advantages of a great most beautiful city which is located in the centre of all the small city states. The larger Central City with a population of 58000 will offer the benefits of urban life, whereas the small sized city states would offer the fresh delights of the country.

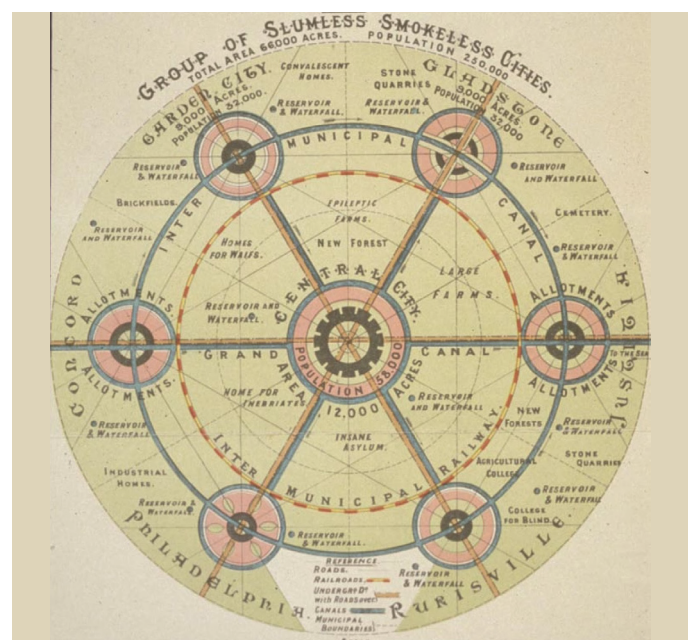


Figure 6. Garden Cities. Source: Hungry City

# Chapter 1. Research Studies

## 1.8 Utopia

### Broadacre City

Another example of an utopia where agriculture was an important part of the idea is the Broad-acre City of Frank Lloyd Wright. Wright who had a great love for nature welcomed the disappearance of all large cities. People should be out in the air and light and no longer in cities as they did in the dark ages. In Broad-acre City each family should own at least one acre of land to raise their own food and all industry should be spread around vast green lands and connected by highways (Blake, 1965).

Each house will have a garden and each household a car in order to become semi-independent. All facilities like schools, shopping centers and even offices and so on will be located in large green parks and modern communications like the radio, the telephone etc. will make this decentralization possible. Autos will be the most important transport and the pedestrians can exist safely only within the one acre (4000 m<sup>2</sup>) land. This example of a city would be a model for a city that guarantee individual freedom and connection with the nature (Wright, 1932).

Jane Jacobs was one of the critics about broad-acre city and she states: *“Whether they were driven by “love” of nature or sought to develop equitable regions, they promoted the dispersal of human activity “throughout large territories, fit into natural resources.” In so doing, however, they promoted the consumption of ever-larger pieces of nature and helped create the problems we today associate with sprawl”.*

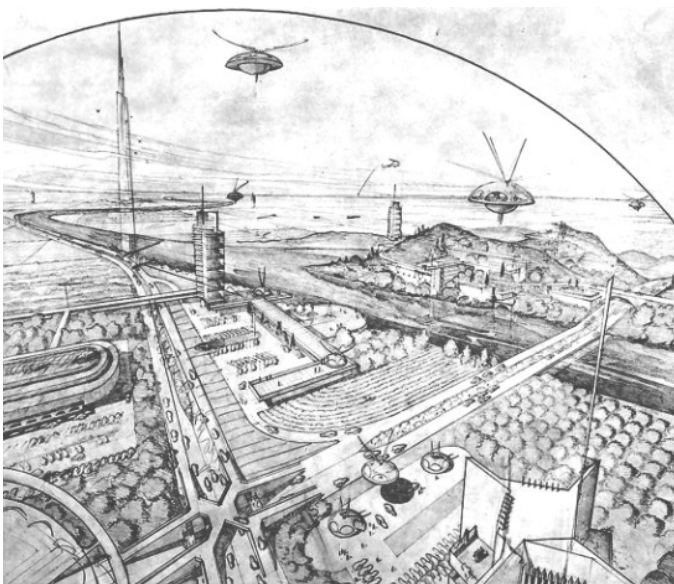


Figure 7. Broadacre City. Source: The Disappearing City

## 1.9 Sitopia

The thing with Utopian projects is that they all doomed to fail, but food is one thing that all the utopian visions have in common. Steel took out this food aspect and put it in a new vision called Sitopia, which basically means food place.

In a Sitopia people are well aware of where their food comes from and how it has been produced and processed. In addition people are aware of the necessity of altering the power structures that currently control the food system. But who does control food? Is it farmers, supermarkets, government, agribusiness or just people? In the end every single person does; as politicians need our votes, supermarkets need costumers too. They only have power because we give it to them (Steel, 2008, p. 307-308)

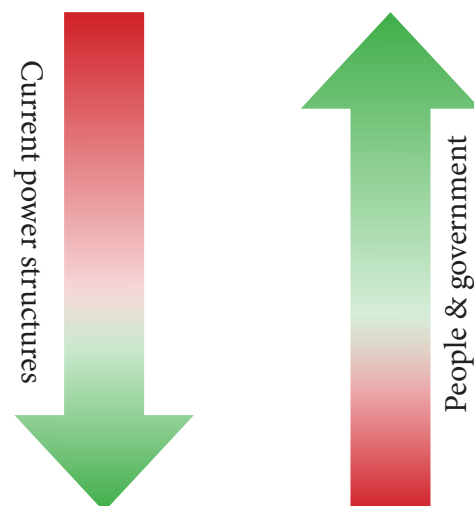


Figure 8. Altering food system controllers. Source: own illustration



## Chapter 1. Research Studies

### 1.10 Reconcile Cities, Peoples and Food

The research in this thesis have shown that our food system is a complex system which give the complete power to certain corporations and completely eliminate participation of the consumers. The actual producers of food, the farmers, don't have any relation with the consumers of food. They have to go through food corporations or supermarkets to reach the consumer, so that these business structures have all power to control the food system.

For steel this power must be divided fairly between all the participant of the food system. More power has to go to the producers and consumers and less to the business corporation. Also producers and consumer should be able to meet and work together. This is already a trend that starts slowly to grow, for example in the Netherlands.

Herenboerderij is an initiative of a group farmers and consumer who work together. It is a sustainable, mixed company with the aim to produce healthy and tasty food for a good price. Their motivation is having more control over their food and to be able to trust that food is produced fairly, with respect for the farmer, the animals and nature. Each household pay monthly to the farmers on basis of how much food they want to receive. The farmers in return offer the whole year healthy, fresh and locally produced food to their customers. The next sub-paragraph will give more insight to how to reach a more sustainable food supply in cities.

#### Towards a sustainable food supply

Urban agriculture is in many developing countries a well-established practice and a powerful way in which citizens make the city livable while making a living at the same time. With its potential for social empowerment, combined with environmental benefits, urban agriculture has potential to help us re-arrange our advanced, but somewhat tired, western cities. Local food growing, within city limits, can help make cities more resilient in a positive and inclusive way.

Urban agriculture can be used as a tool for making new connections in the urban ecosystem, connecting realms such as health, food, energy, waste management and real estate, thus making the overall network more responsive and flexible (Miazzo & Minkjan, 2013, p. 35).

Successfully delivering urban agriculture projects takes daring and innovative urban farmers working with different forms of agriculture that occupy spatial an agricultural niches. Using urban agriculture as an instrument for making the city more sustainable involves designers such as architects, landscape architect, urban designers and planners developing urban planning and design strategies that support and guide urban farmers initiatives for the benefit of the city (Miazzo & Minkjan, 2013, p. 35).

### Reconciling 'Cities-Peoples-Food' model



Food awareness



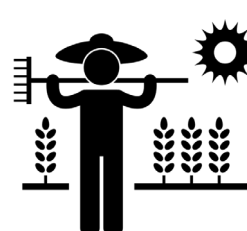
Food based education



Value food



Local food



Consumers = co-producers

Figure 9. Reconciling 'Cities-Peoples-Food' model. Source: own illustration





# Chapter 1. Research Studies

## 1.11 Urban Agriculture

### Types of urban agriculture

In the book *Farming the City* the types of urban agriculture are defined as cultures (ways of cultivation) or combinations of cultures (poly-cultures) complete with their defining spatial characteristics. They differ in their relation to the soil and the built environment, their relation with the essential flows of the city and the impact they have on public space socially and esthetically. Therefore they offer different benefits to the city and respond to different opportunities. Figure 10 gives an overview of relevant types of professional urban agriculture that allows to take place in cities. These types match agricultural and urban needs as shown in table 11 (Miazzo & Minkjan, 2013, p. 40-41).

Forest gardening is one of the urban agriculture types, it is a soil-bound and largely self-managing food forest. This is a small ecosystem optimized for a large and varied edible output. Forest gardening requires time and a broad understanding of natural processes, cycle and interactions.

Allotment garden-style food growing is soil-based cultivation from ground level cultivation in full soil to raised beds, or in soil layers on rooftops. This type fits the image most people have of urban agriculture. Allotment-style production aims to deliver fresh vegetables directly to restaurants and individuals by combining smart cultivation schemes, making use of the small spaces and microclimates of the city.

At the other hand there is controlled indoor substrate cultures such as hydroponics and aquaponics, with fresh produced food that is available the whole year. Hydroponic can be seen as a high tech version of this type. When hydroponic is implemented in a building waste energy and water can be reused. Aquaponics works just like forest gardening, with poly-cultures, closing loops internally but also open to incorporating streams of organic waste. Aquaponics and hydroponics require a lot of knowledge en high investments.

These four types complement each other in the products and services they deliver, in their needs and requirements, and in the way they fulfill the spatial, socio-cultural and environmental needs of the city. They represent different values: from the importance of healthy soil to the need for affordable food production in sufficient quantities. Instead of choosing

between these approaches, each should be embraced for its particular qualities and for the diversity that a combination of types provides (Miazzo & Minkjan, 2013, p. 40-41).

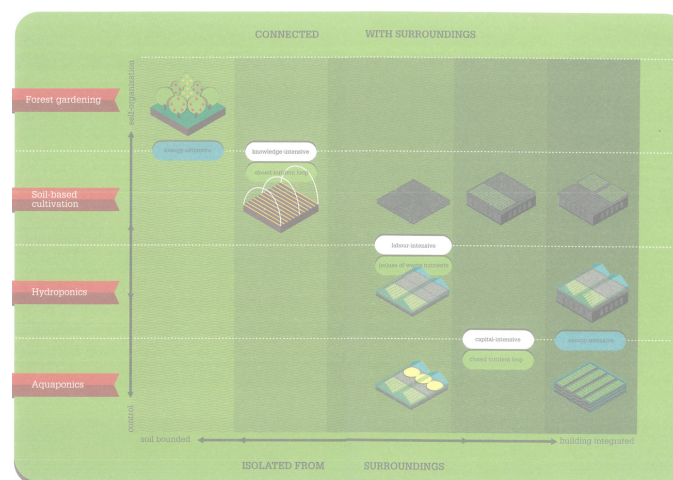


Figure 10. Urban agriculture types. Source: *Farming the City*

Agricultural needs (Demand)	Urban supply
Sunlight / daylight	Plenty of sun-exposed surface
Nutrition / fertilizer / irrigation	Waste flows (nutrition, irrigation, substrate, heat)
Soil /substrate	
Micro-climate / environment	Micro-climate
Space	Vacant space / niche space / temporary space
Loading capacity (integrated in buildings)	Underused constructive capacity
Labour (intensive/extensive)	Labour force (employees)
Market	Customers
Urban needs (Demand)	Agricultural supply
Public green design & management	Aesthetics
Ecosystem services	Relative biodiversity
Education (nature, food production, life skills)	Experience of seasons / hands-on learning / work experience
Therapeutic work	Therapeutic work
Appropriate jobs	Skilled and unskilled labour
Water storage	Water intake & evaporation
Climate control (cooling / heating) at building and neighbourhood level	Evaporative cooling
Water improvement, soil and air quality	Purification of water, soil and air
Waste treatment and management	Organic waste treatment

Figure 11. Agricultural and urban needs. Source: *Farming the City*

# Chapter 1. Research Studies

## 1.11 Urban Agriculture

### Global examples of urban agriculture

Critical citizens find their role as food consumers too limited and want to exercise more influence and control over their food choices in a broad sense. Tim Lang, Professor of Food Policy at City University, London, explains this as the importance of 'food democracy' where every citizen has access to sustainable and healthy food. (Miazzo & Minkjan, 2013, p. 24).

In this sub-paragraph some examples of urban agriculture, in the area of local food practice, initiated by citizens over the whole world will be depicted.

Each project has been placed within an urban development framework and 'tagged' with one or more of seven info graphic labels to indicate its key dynamic: (Miazzo & Minkjan, 2013, p. 111)



**Social:** the project creates or strengthens communities and social ties, and/ or support communication and cohesion.



**Economic:** the project creates jobs, supports local economic activity and/ or promotes a viable business model.



**Education:** the project teaches food skills and promotes awareness about food, health and the environment.



**Environmental:** the activities are sustainable or beneficial to the environment in terms of nature, waste, energy, soil, water and air.



**Health:** the project provides affordable, nutritious, fresh and healthy food and supports a positive public health agenda.



**Infrastructure:** the project contributes to the food infrastructure in terms of growing sites, transportation, community platforms and/ or planning.



**Liveability:** the project creates interactive spaces, helps to reduce antisocial behavior and provides urban amenities from cultural events and cafés to attractive and edible green space.

# Chapter 1. Research Studies

## 1.11 Urban Agriculture



AgroCultures Nomadic / Nomadi  
AgroCulture

Rome, Italy

Starting date: October 2010  
Status: In progress



Cascina Cuccagna

Milan, Italy

Starting date: 2011  
Status: In progress



Roppongi Nouen Farm

Tokyo, Japan

Starting date: 2010  
Status: In progress



# Chapter 1. Research Studies

## 1.11 Urban Agriculture

### Urban agriculture in Amsterdam

*“Here’s a question for Amsterdam City Counselors; at the most general level, what are all city dwellers most interested in? The answer is hardly controversial – the availability of seasonally independent, fresh and affordable food”* (Miazzo & Minkjan, 2013, p. 23).

Back in 1934, the first Central Food Market was run by an alderman, while today’s food supply is left largely to market forces. With the project Proeftuin, which means Experimental Garden (2006-2010), Amsterdam combined, connected and scaled up initiatives leading to the creation of a sustainable regional food supply chain. The aim was to stimulate all initiatives for fresh and sustainable food that is accessible and affordable for everyone with respect for our fellow human workers (fair trade) and for livestock (animal well-being) and at the same time minimizing the impact upon the environment.

There is in Amsterdam a growing number of young people involved with developing food platforms and networks. They inform citizens about sustainable food systems, possibilities for growing food and examples of urban farming from abroad. They improve awareness of the taste and quality of our food. Their work gains much appreciation and support from a growing number of companies and institutions (Miazzo & Minkjan, 2013, p. 24).

There are in Amsterdam around 50 small scale initiatives growing food locally, which are often created spontaneously by community initiatives. Most of these examples have mixed purposes such as health awareness, social cohesion or education. There are in Amsterdam also restaurants (Zuidpark) and offices that are growing vegetables on the roof of their buildings or on an adjacent empty plot (Miazzo & Minkjan, 2013, p. 25).



Zuidpark Urban Farming Rooftop

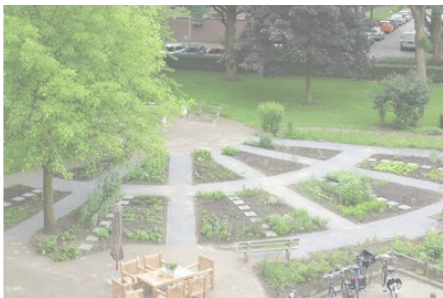
Amsterdam, the Netherlands

Starting date: June 2012

Status: In progress

# Chapter 1. Research Studies

## 1.11 Urban Agriculture



Rijp en Groen Tolsteeg

Utrecht, the Netherlands

Starting date: January 2012  
Status: In progress



Uit Je Eigen Stad / From Your Own City

Rotterdam, the Netherlands

Starting date: October 2012  
Status: In progress

# Chapter 1. Research Studies

## 1.12 The Development of Allotment Gardens in the Netherlands

### History

Allotments, in Dutch a *volkstuin* usually consist of patches of land with a noncommercial purpose where individuals, friends or families can grow their own food like fruits and vegetables and also flowers and trees. The allotments often have sheds and sometimes a shelter for seasonal or weekend accommodation.

Until the 13th century only rich people planted vegetables and from the 14th century also people from other population segments started to practice gardening. The aim was that these people could grow their own food. Many cities in Holland provided plots of land outside the city for gardening. Also benefactors provided pieces of land on the farmland to the poor peasants. Long after this period during the industrial revolution, gardens were made also available for the working class to make it possible for them to grow their own food. So the first allotments, which was called laborer gardens, were charitable to support the poor population.

From the 19th century a lot of garden were made available for the working class. These gardens were regarded not only as a tool to fight poverty, but also as a improvement of the ethical condition of the working class population.

From the 20th century, the gardens started also to gain another function in terms of allotments. The purpose of this type of gardening is to have some quite and piece time and to enjoy sun, light and fresh air as a counterpart to the city life.

The First and Second World War had big influence on the development of the allotments. Because of food scarcity the gardens were again only used to grow food. After the war, when the food scarcity was over the gardens were used for recreational purposes.

From around 1950 the allotments were also provided with a shelter and from 1970 people were allowed to use these shelters as weekend accommodation. From this period sheds were implemented to avoid vandalism.

Beside the luxurious recreational allotments (*recreatietuinen*), there are still allotments that are used as gardens to grow vegetables (*nutstuinen/ moestuin*) along railways and other unused plots.

### Current review

Nowadays the allotments (*volkstuinen*) are generally located on the edges of cities. They have mostly recreational purposes and are used by people from different backgrounds. Where allotments used to be a hobby for retirees, it is now also a popular activity for new target groups, especially women, singles and young families.

Less and less people have an allotment for economical reason or as way for food supply, but rather as a recreation accommodation for the family to escape the crowded city. In big cities especially singles and families do not have a garden and therefore they rent an allotment garden mostly on the edge of the city. The shelters are no longer used just as a storage for the gardening equipments, but also a place to kook and stay. So this makes the allotment gardens also a place to socialize, meet other people and arrange activities.

There is nowadays a huge demand for allotments which cause a long waiting list for the gardens and especially in Amsterdam. But unfortunately allotment gardens are nowadays more and more replaced or removed. At the same time there is fortunately also a growing awareness for the importance of this greeneries (Zeevat, 2001, p. 13-20).



## Chapter 1. Research Studies

### 1.13 Educational Allotment Gardens

In the Netherlands about one hundred thousand children have a school garden at this moment. This paragraph will explain how school gardens in the Netherlands have been developed through the years and the use of it as an educational allotment garden for the pupils.

At around 1900, J. Stamperius, a head teacher at a school in Amsterdam was the first one that taught children outside in the open-air. Adjacent to his school in Amsterdam, he created a school garden and taught 23 children in his garden. The garden consisted of six times one by three meter plots. Couple of years later classical children's' gardens have been built all around the country and also around companies, for the children of the working class, not only for educational purposes, but also as a support for the families' food supply.

Around 1918 teachers discovered children's' gardens and started to interfere with this gardens. They saw the importance of this gardens for children and how it could keep them away from street. Many school gardens have been created all around the country. In these school gardens, each child got a piece of garden which he or she could grow plants (Kranendonk & Zeevat, 2004, p. 22-23).

Around 1920 the city of Amsterdam started a research about the benefits of school gardens for children and it turned out that school gardens has a tremendous positive effects on children. According to this data, the school association Amsterdamse Vereniging voor Schoolwerktuinen decided to create a garden with 280 gardens in it. Thirteen schools got the permission to make use of this gardens for the education of the pupils.

Around 1940 – 1945 a lot of gardens disappeared because of the crisis and war and the lower subsidies. It was only from 1950 that school gardens have been built again and by 1960 there were about eight school garden complexes where about four thousand children could do gardening. And later in 1970 the amount of gardens grew up to twelve garden for about six thousand primary school children.

In 1980 school gardens in the Netherlands reached the peak, school gardens where to find all around the country. The relation between the child and nature became increasingly important and gardening was practiced ecologically. In 1990 nature and environmental education was made compulsory. While a lot of schools had to visit a garden in the surroundings to



Figure 12. J. Stamperius, the first school garden. Source: de Schooltuin



# Chapter 1. Research Studies

## 1.13 Educational Allotment Gardens

practice the gardening based class, more and more schools started to create a garden around their schools. In this way the children were able to see and experience the garden every day. The nineties could be characterized as a period with a lot of attention paid to the quality of the environment of children through bringing more nature in and around their living environment. From around 2004 the amount of school garden complexes decreased drastically because of austerity measures.

An example of the school gardens is the circle gardens in Groningen. The city Groningen has three school gardens managed by the Natuurmuseum Groningen museum. About 2500 children from different groups do gardening at these circle gardens.

According to Ger, a teacher at the schooltuin Beijem is circle shaped garden the most pleasant and enjoyable shape to do gardening with children. As a coach you could stand in the middle of the garden and having a good view to everyone. Everyone is close to the centre where the explanation take place. Also the materials and seeds are handed on from the centre of the circle garden. Esthetically it also more charming

than the square or straight shaped gardens because plants grow concentric. Especially with big plants like sunflowers it provides a very beautiful view. By creating several circle gardens next to each other, there will remain four angular points around each circle that is very suitable for growing big plants. Circle gardens occupy approximately 35% more space and need more work to construct and maintain it. A diameter of 10 meter is enough for about 26 gardens of 2 m2 (Kranendonk & Zeevat, 2004, p. 50).













## Chapter 3. Manifesto

### 2.1 The Fertile City

World populations are increasingly moving from rural to urban centers. People prefer to live close to their work and want to take advantage of the present facilities in cities. It is estimated that the world population will increase and reach 10 billion by 2050 with the majority of people living in cities. In Europe eighty percent of the population will live in cities by this time, as if it were most normal thing in the world, forgetting that people need to eat and are as dependent of the natural world as our ancestors were. The increasing amount of people living in cities demand bigger ecological footprint somewhere else in the world. More and more of the natural world has to be transformed into farmland to be able to feed everyone. These landscapes are not only used to feed people, but also animals since a third of the annual grain crop globally gets fed to animals rather than to human. It takes much more grain to feed a human if it is passed through an animal first and that is not a very efficient way of feeding people. In addition nineteen million hectares of rainforest are lost every year to create new arable land and at the same time the same amount of existing arables is lost to salinization and erosion. Although the current way of food production is unsustainable and takes a lot of valuable land and resources, people don't value food since great amounts of the food produced is lost between production and consumption and thrown away. The majority of global trade in food is controlled by a handful of companies and control the majority of the food we can buy. This means that they make most of the decisions about what we eat and how to feed the planet. A billion of the world population are obese while a further billion starve from hunger. And last but not least, just like during the ancient history when there was a myth about good old times when food grew from trees without having to labor, the myth of nowadays is to make cheap food. There is not such a thing like cheap food or cheap meat, it is called cheap because all of the true costs are externalized, such as degradation of soil.

The development of cities have had a great influence on the development of food production during the past periods. The development of cities can roughly be divided into four periods: a period before industrialization, a period of urbanization after industrialization, a period of suburbanization and a period of re-urbanization. About approximately 10,000 years ago in the ancient Near East, known as the Fertile

Crescent, two extraordinary inventions agriculture and urbanism happened roughly in the same place and at the same time. This is no accident, because agriculture and cities are bound together and need each other. Our ancestors were nomadic hunter-gatherers who spent their lives tracking the annual migration of the beasts that formed the basis of their diet. Later, settled villages could be established due to new farming methods. Discovery of grain by our ancient ancestors made it possible for the first time to produce a food source that was large enough and stable enough to support permanent settlements. The size of the city was very dependent on the surrounded productive farm land and the amount of food produced that could feed the inhabitants. Cities developed in an organic way depending on the actual need.

The industrial revolution was the mechanization of work and started around 1900 due to the invention of the steam engine. During this period manual labour was replaced with the use of machines. In addition, the way of transport changed drastically with the introduction of different transportation techniques such as trains and this changed everything. Due to this, distance became less important and cities could for the first time grow any size and shape, in any place and become independence. Cities used to be constrained by geography, they used to have to get their food through very difficult physical means. All of sudden they were effectively emancipated from geography. Because of industry and technology cities offered more jobs than its surroundings. This employment attracted people to cities and resulted in urbanization, a transition from rural to urban living started.

Around 1960 suburbanization started to take place in a large number of cities. People moved from cities to surrounding countryside. They escaped the noisy and air polluted industrialized cities and moved to the countryside for its greenery, space and rest. Due to this movement, the countryside needed to deal with much more inhabitants and commuter traffic. In addition businesses also moved to suburbs because of the lower ground prices and more space and accessibility. The development of suburbs spread the borders of cities and the countryside get scattered.

Re-urbanization started when people started to move back to the city again from around 1980 because of



## Chapter 3. Manifesto

traffic jams caused by increased commuter traffic. In 2014, 54 per cent of the world's population was urban. The urban population is expected to continue to grow, so that by 2050, the world will be a third rural (34 per cent) and two thirds urban (66 per cent). Europe, with 73 per cent of its population living in urban areas now, is expected to be over 80 per cent urban by 2050.

The population growth in cities demand more food in order to feed everyone. As cities became distance independent, it was no longer necessary to produce food in the close environments. Agricultural sites moved outside the city and over time it became possible to even import food from any place in the world. Today food is developed in a globalized system and there is a long distance between this production and people consuming it. Food production is separated from its consumers and this resulted in a lost awareness of where our food come from and the entire food cycle. A lot of people don't realize that there exist more kind of fruits and vegetables than the ones offered in the supermarket. To reconcile the relationship between people and their food, the distance between producers and consumer of food must decrease. People have to be able to be aware of the food cycle and have proper knowledge about what they eat and where it comes from. It is simply not enough to look at the label on food in supermarket to know what we eat since those information could be misleading. Cities must be largely self-sufficient in food by producing food locally in cities and the adjacent land area. Like Ambrogio Lorenzetti's message through his painting tries to make clear; it's about the relationship between the city and the countryside, if the city looks after the country, the country will look after the city.











## Chapter 3. Plan Analysis

### 3.1 Introduction

People are increasingly becoming less aware of where their food come from and how it is produced. In order to reconcile the relationship between people and their food and especially citizens, one need to get more knowledge about this topic and why it is important to be aware of it. For the graduation project a residential building will be designed where there is place for urban agriculture and especially in terms of allotment gardens. In this way people will be involved in the process of food awareness and the inhabitants can grow their own food which has many advantages like mentioned in chapter one and two.

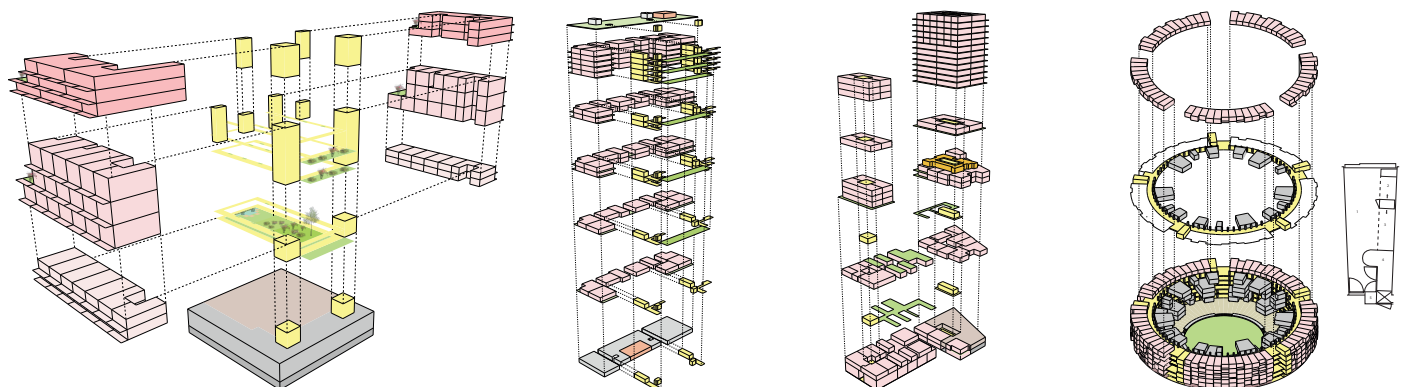
Four case studies has been selected to be analyzed. Since this topic in combination with residential building is quite new, the case studies are buildings that are under construction. The fourth case study is a residential building with a combination of private and communal shared living spaces. Creating communal spaces is something that I wanted to implement in the project together with food production and food awareness, so that its inhabitants and the local inhabitants could meet and share their knowledge together.

The first three case studies are analyzed according to the following research questions, and the fourth case study is analyzed according to the last question:

1. How can urban agriculture be implemented into the design of a residential building?
2. What are the dwelling types that fit this type of building?
3. What kind of urban agriculture based activities can raise people's food awareness in a residential building?
4. What kind of communal and shared living spaces could be implemented into a residential building?

The answers to these research questions will be used as reference and design tools for own graduation project. They must offer an insight into the possibilities of urban agriculture inside residential buildings and the matching dwelling types. It will also provide knowledge about the activities that could be implemented into the building design that contribute to raise the inhabitant's food awareness and the possibilities for communal and shared places.

A specific strategy will be followed to analyze the case studies. Exploded view drawings will offer an overview of which kind of urban agriculture are implemented into the residential buildings and where this is located in the building. Also to indicate the kind of urban agriculture based activities that raise people's food awareness and the communal spaces that are implemented into the projects and especially the forth case study. Drawings of dwelling plans will offer an insight into the dwelling types.





### 3.2 New West

Architect office: Olaf Gipser Architects  
Architect: Olaf Gipser  
Location: Postjesweg, Amsterdam

Status: Under construction  
Building surface: 12000 m<sup>2</sup>  
Number of dwellings: 80

New West will be built in Overtoomse Veld in Amsterdam. It is near the city centre of Amsterdam which is only 20 minutes by bike. It is also within easy reach by public transportation and car.

The project architect Olaf Gipser designed the residential building with an urban character, but in the meantime there is a communal, intimate and small scale green courtyard inside the building. The green courtyard is provided with a glazed wall at the south, the city window, which makes the garden visible from inside and outside.

The courtyard is build according to the polder landscape theme. It has six different themes and three vegetation types: Dry, humid and wet. To the south there are two dry zones with flower-rich, low maintenance grassland and a tree with a light trunk and foliage: the birch, as a typical tree of the original peat. In addition, at the north side of the courtyard there are three zones with water and wet vegetation.

Wood balconies are situated along the galleries facing the courtyard. The balconies could be used by the residents to grow vegetables, to put plant trough or a bench.

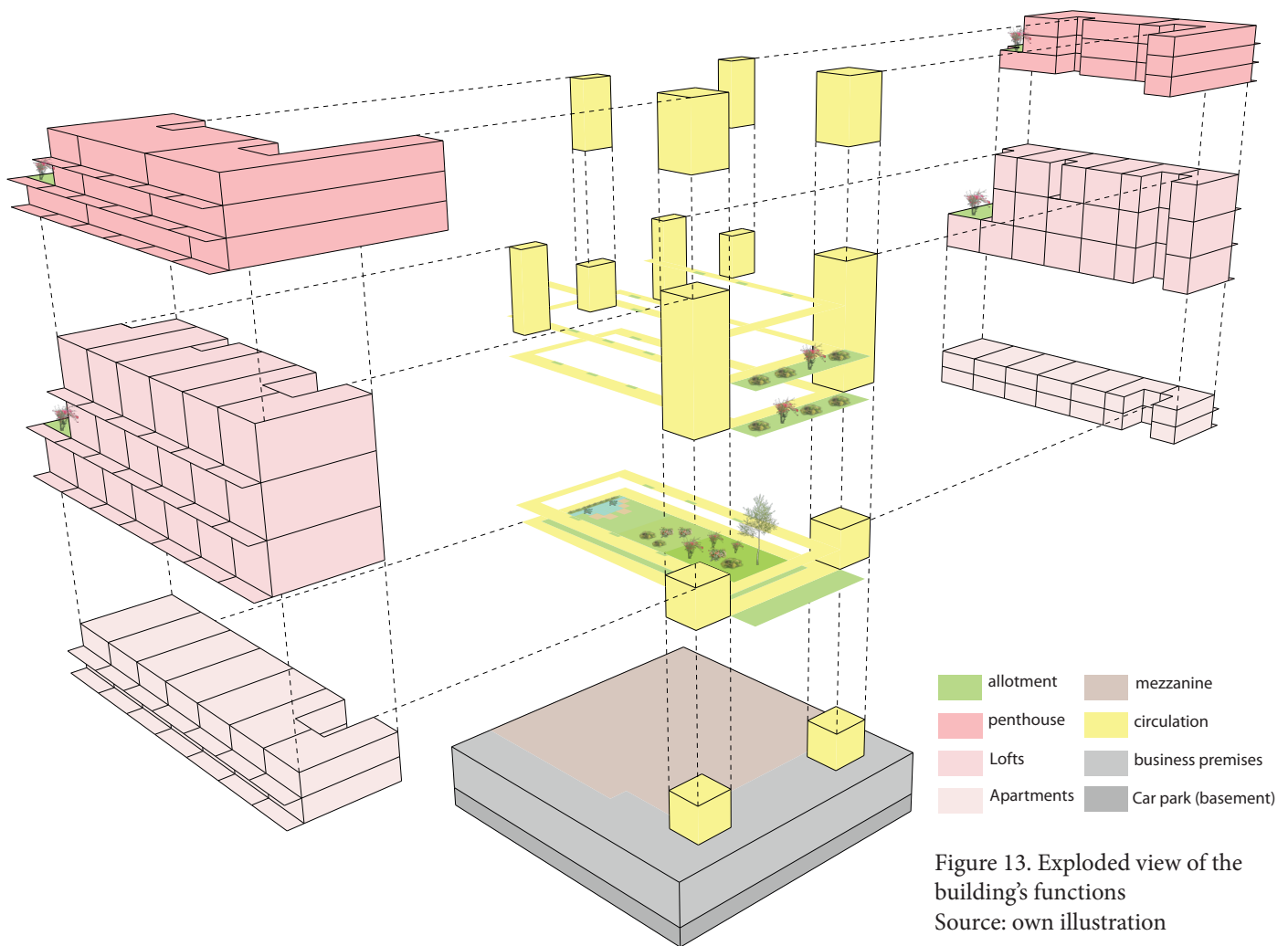
On the first floor to the south, there is a communal city balcony situated. This place could be designed together with the future residents and could be used as a place for the people to come together and meet their neighbors.

On the third en fourth floor there are communal allotments where the residents can grow together their own food. Also these vegetable gardens face south and are behind the glazed wall. This creates a desirable climate for the plants. In addition there is also a possibility for a vertical garden such as climbing plants of Wisteria.

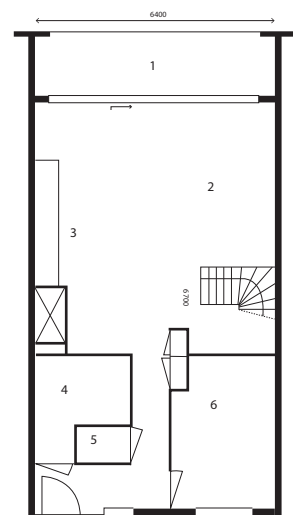
New West has a car parking space in the basement. On the ground floor there are shops, work units and cafés. On the first and second floor there are one layer apartments situated, on the third, fourth and fifth floor lofts with double height and on the sixth, seventh and eighth floor penthouses. Some of the penthouses are provided with rooftop allotments.

Source: [https://woneninnewwest.nl/download/001\\_brochure\\_NEWWEST\\_245x245\\_web.pdf](https://woneninnewwest.nl/download/001_brochure_NEWWEST_245x245_web.pdf)

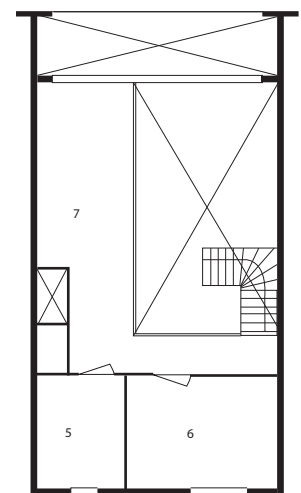




Dwelling type: Penthouse  
Dwelling surface: 118 m<sup>2</sup>



Dwelling type: Loft  
Dwelling surface: 112 m<sup>2</sup>



**Program**

- 1. Balcony
- 2. Living
- 3. Kitchen
- 4. Storage
- 5. Toilet/ bath
- 6. Bedroom
- 7. Study

## Conclusion

New West provides its residents communal allotments and vegetable gardens. The allotments are an extension of the circulation system. They are situated as platforms along the gallery. Also the balconies are an extension of the gallery with the possibility of growing plants and vegetables.

In addition the upper dwellings have their own private rooftop allotments. There is on the first floor a green courtyard with different types of vegetations. The dwelling types that belongs to this building are apartments, lofts and penthouses.



### 3.3 Agro Housing

Architect office: Knafo Klimor Architects  
Architect: Oded Kidron  
Location: Wuhna, China

Status: Completion 2015  
Building surface: 10000 m<sup>2</sup>  
Number of dwellings: 150

Over 50% of the Chinese population reside in cities and their amount will still increase in the future. Massive urbanization will form random communities which will cause loss of exciting cultural tradition and will exhaust natural resources such as water and energy. This migration from rural regions to new urban regions will intensify air and soil pollution.

Agro-Housing introduces a concept of a new urban and social vision that will address problems of chaotic urbanization, by creating a new order in the city and more specifically in the housing environment. Agro-Housing combines high rise apartments with a vertical greenhouse within the same building. The residential building will create a close to home space where families can produce their own food according to their abilities, tastes and choices. This will give citizens more food independence, freedom and additional income.

The Agro-Housing is a combination of housing and urban agriculture. The building exists of two parts, the apartments and the vertical greenhouse.

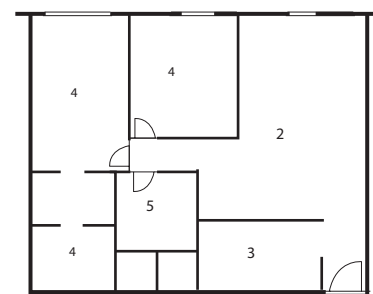
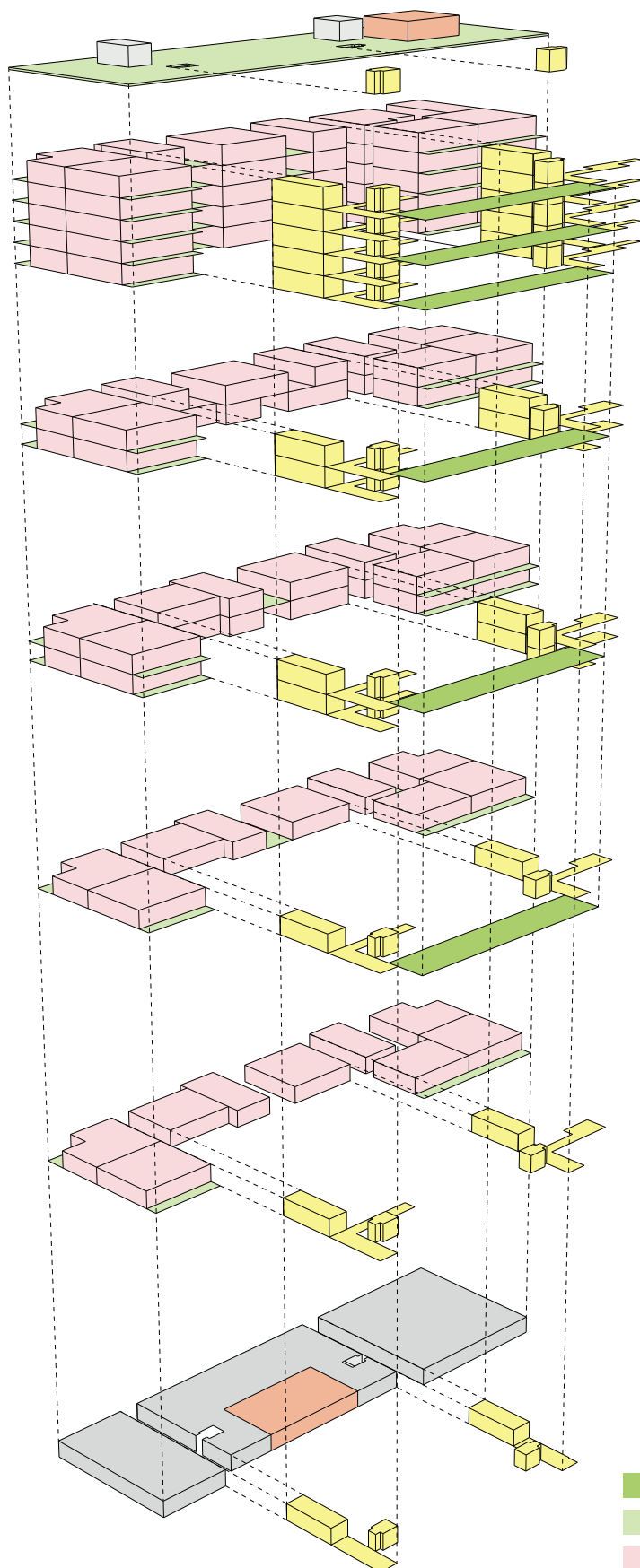
The green house is a multi-level structure for cultivation of agriculture crops such as vegetables, fruits, flowers and spices. Agro-Housing uses as growing method soil-less material like coco peat and growing gutter system. These are soil-less systems that are equipped with drip irrigation, based on recycled “gray water” collected from apartments and rainwater collected from the rooftop. The production can be organic and is also likelier to be healthier, fresher, free of chemicals and mass-produced fertilizers and diseases.

The building offers the residents place for communal activities. The greenhouse could be used as a meeting place. The roof garden offers an open air green space for recreation and gatherings. There is also a sky club on the rooftop to host social gatherings and celebrations. On the ground floor, there is a kindergarten situated for the children to be close to their parents.

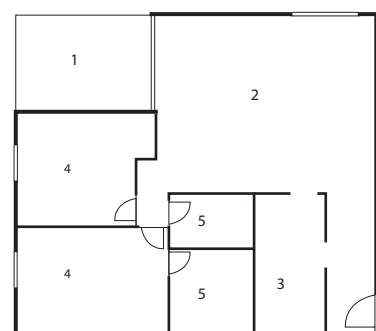
Source: <http://www.kkarc.com/landing-2/07-housing/agro-housing/>



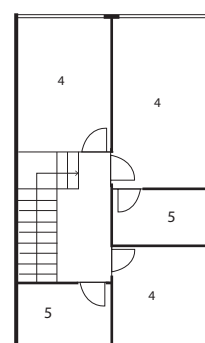




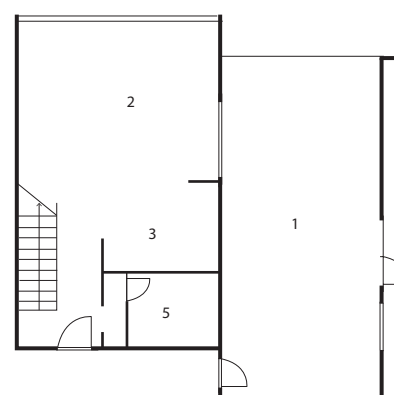
Dwelling type: apartment  
Dwelling surface: 67 m<sup>2</sup>



Dwelling type: apartment  
Dwelling surface: 82 m<sup>2</sup>



1. Balcony/ terrace  
2. Living 4. Bedroom  
3. Kitchen 5. Toilet/ bath



- Greenhouse
- Communal space
- allotment
- circulation
- Apartments
- Storage

Figure 14. Exploded view of the building's functions.  
Source: own illustration

## Conclusion

Agro-Housing gives its residents freedom to grow their own food according to their needs and tastes, manage their homes without having to rely on farmers miles away, and can potentially become a source of income. The multi-storey greenhouse provides each residential unit with ten square meters of

greenhouse space. There is also on the rooftop place for urban agriculture. Beside the possibility for food production, the greenhouse, roof garden and the sky club on the rooftop provide the residents opportunity to gather and meet. The apartments consist of six different dwelling types.

### 3.4 Vertical Garden

Architect office: NL Architects, Chris Collaris Architects, studio Donna van Milligen Bielke, Space Encounters and DS Landschapsarchitecten  
Location: Barajasweg, Amsterdam Sloterdijk

Status: Coming soon  
Building surface: 14.000 m<sup>2</sup>  
Number of dwellings: 144

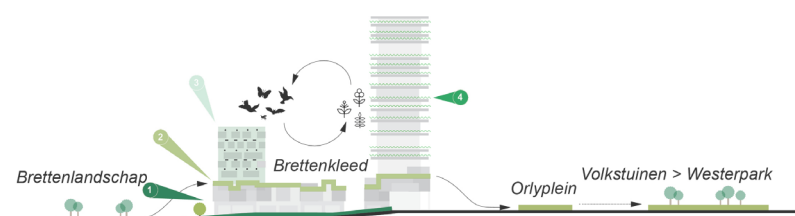
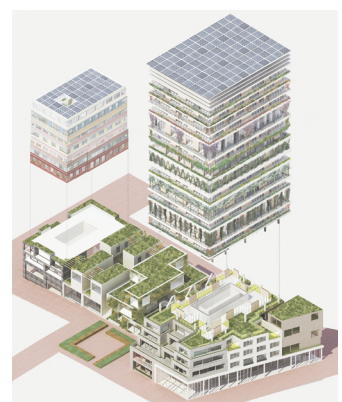
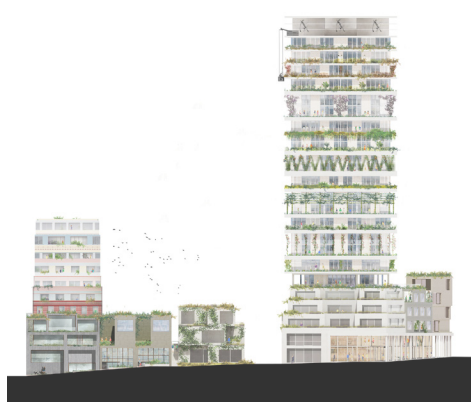
Vertical Garden will be located in Sloterdijk which is a business district that is dominated by office buildings. Sloterdijk will gradually be transformed into a mixed use neighborhood. Vertical Garden offers wide range of dwelling types to invite a diverse population. The ambition of this residential building is to introduce an intricate system of vegetation and water storage that will contribute to reduce the urban heat islands.

Vertical Garden consists of two parts. Part one of the residential building consists of 4 distinct parts. The dwellings at ground floor are double height with place for a car park in some of the dwellings. On top of these dwellings there is a semi public rooftop garden that can be reached from the park by a stair, and also through the staircase that leads to the small tower on the left side of the building. This rooftop deck is a new ground level and provides access to several free standing houses. This rooftop garden is designed as a continuation of the 'Volkstuinpark de Bretten', allotment gardens, on the west and 'Tuinpark Nut en Genoegen', allotments at the eastside. The multilayered façade offers hideouts for many species of birds, bats and insects.

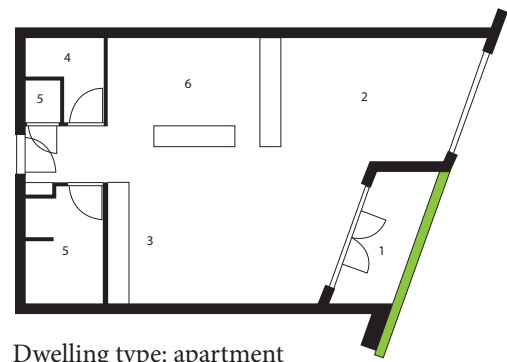
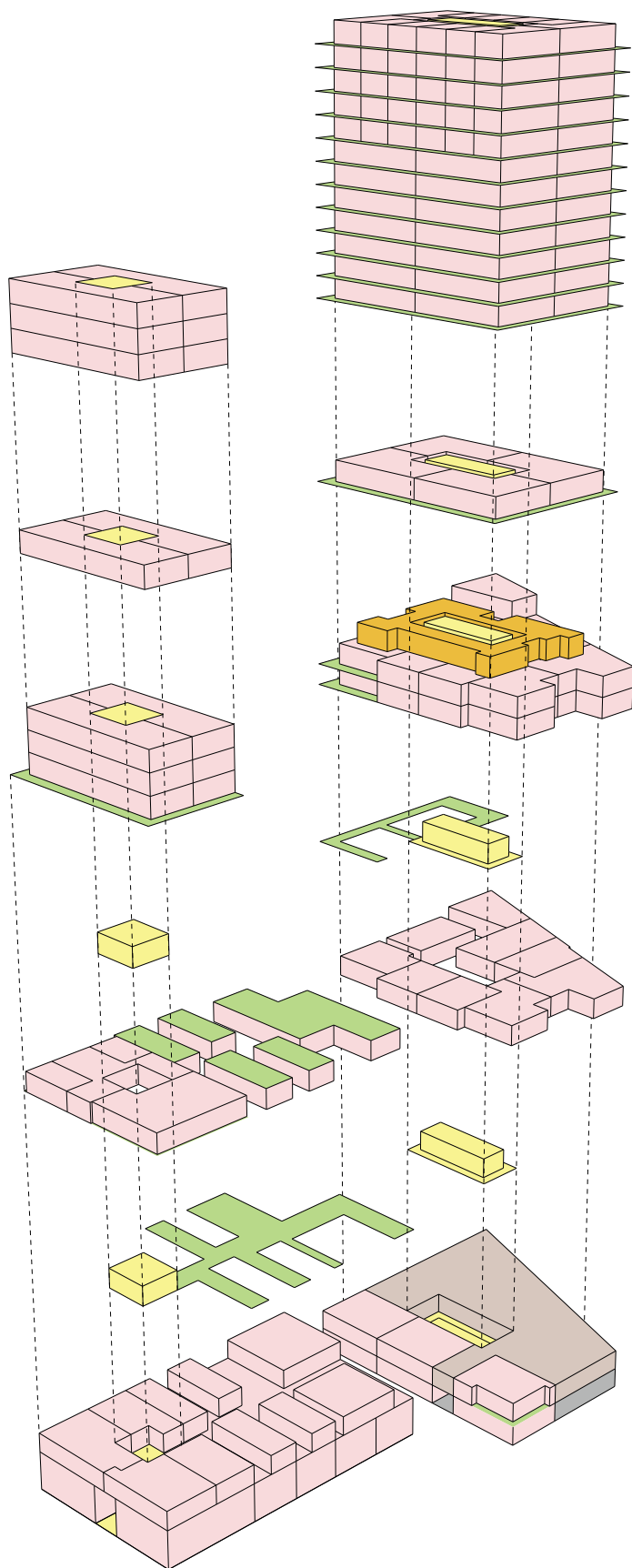
The residential building part with the big tower has a six story plinth. At the ground floor there is space for multiple amenities such as a restaurant, exhibition spaces, meeting rooms and a stage. The entrance of the lobby for the tower above is also located here. The tower is designed as a cultivated landscape with each floor having different types of planting.

At the transition from base to tower, the shared living space is implemented. This place is a collective living room for both parts of the building. It will feature meeting and play rooms, a reading room, a large kitchen, two guest rooms and roof gardens.

Source: <http://www.nlarchitects.nl/slideshow/337/>







Dwelling type: apartment  
Dwelling surface: 50-60 m<sup>2</sup>



Dwelling type: garden loft  
Dwelling surface: 100-125 m<sup>2</sup>

- 1. Balcony/ roof garden
- 2. Living
- 3. Kitchen
- 4. Storage
- 5. Toilet/ bath
- 6. Bedroom

Figure 15. Exploded view of the building's functions.  
Source: own illustration

- Circulation
- Vertical gardens
- Apartments
- Shared living
- Facilities
- Car park/ bike storage

## Conclusion

Vertical garden introduces living in a vertical garden in Amsterdam Sloterdijk, that is dominated by office buildings. This will contribute to transform Sloterdijk to a mixed use neighborhood. With its vegetation the aim is that Vertical Garden will help to reduce the urban heat islands in Sloterdijk.

With the rooftop gardens and the numerous vegetation on almost every layer of the building, the aim of this residential building is to create a vertical landscape with various plants on each story. In addition the aim is also to create a continuity of the allotments at the east and west side of the building.

### 3.5 Tietgenkollegiet

Architect office: Lundgaard & Tranberg Arkitekter  
Architect: Lundgaard & Tranberg  
Location: Copenhagen, Denmark

Status: Constructed 2003-2006  
Building surface: 26.500 m<sup>2</sup>  
Number of dwellings: 360

The Tietgen dormitory project was made possible by a donation from the Nordea Denmark Fund. The idea behind the donation was to realize the dormitory of the future, by creating a clear and visionary architectural idea.

The location of the building is near Copenhagen University in Ørestad North. It is a new planned neighbourhood that is characterized by canals and rigid building structure. With its circular shape Tietgenkollegiet is an urban response to the context by making a bold architectural statement in the recently planned neighborhood. What is unique about the architectural idea of this building as a type of accommodation is the meeting between individual and the collective.

The circular form allows equality and a logical organization of the building. The circular shape completes itself and embrace the inner courtyard

The ground floor contains 5 passages which make the courtyard accessible and in the meantime these passages give vertical access to 5 building sections.

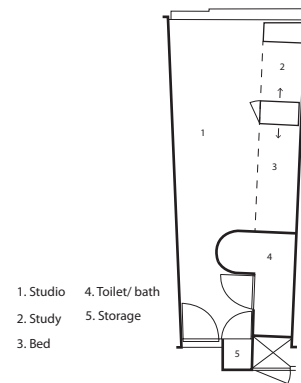
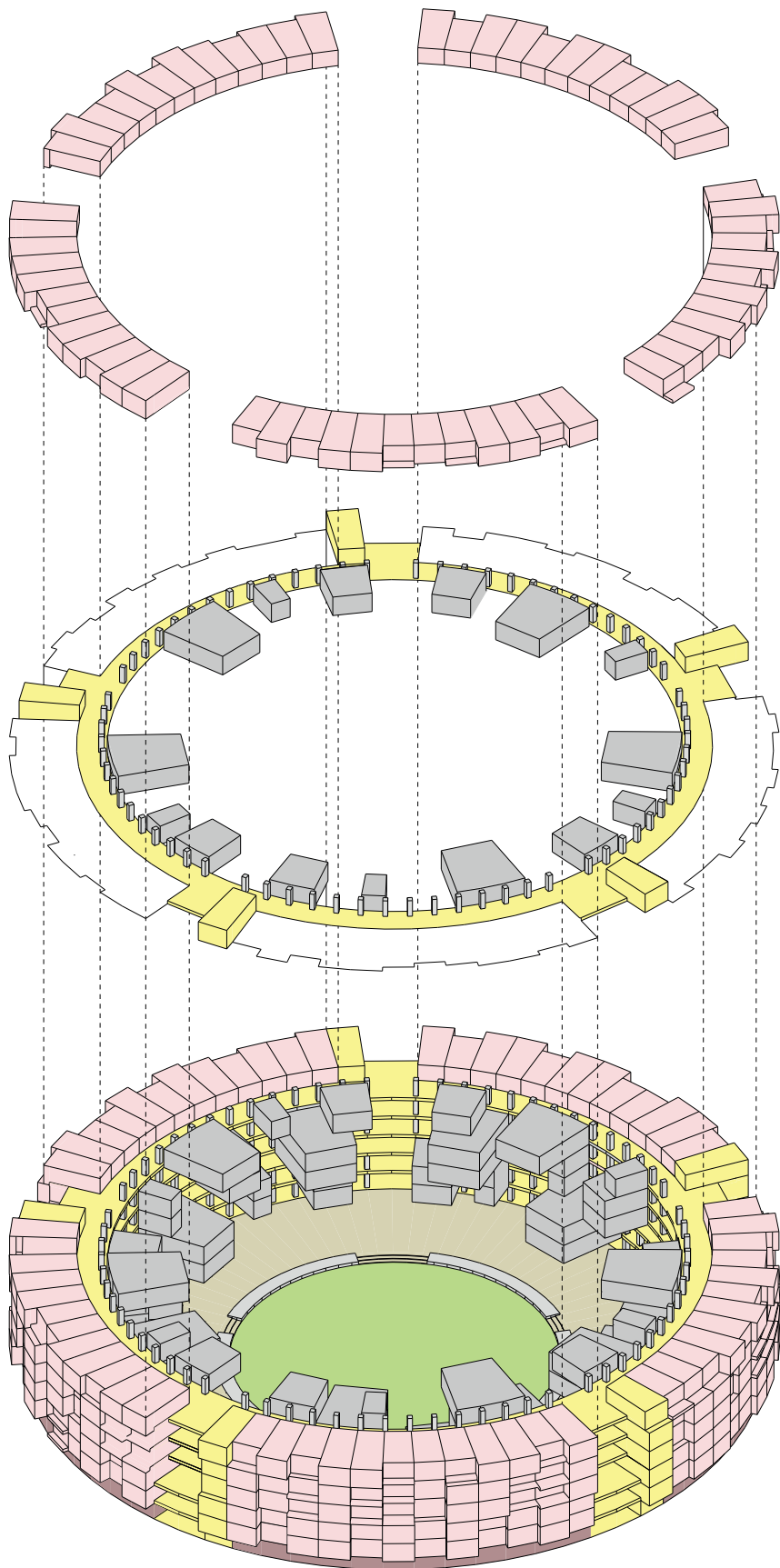
On each floor, each of the 5 section consists of 12 residences organized around a communal area and kitchen. Facilities common to the entire dormitory are grouped at ground level, such as administration, meeting and study rooms, workshops, laundry, mail-room, and a function room.

The upper 6 storeys contain the 360 residences that are placed on the outside with a view to the surrounding city, while the communal functions are oriented toward the inner courtyard. The 360 residences are organized in thirty groups of twelve, each equipped with a shared kitchen, common room and utility room. These communal areas find expression as dramatic, projecting forms pointing inward to the courtyard. The residences are of various depths in a changing tact, giving the outer contour its characteristic crystalline expression.

Source: <http://www.ltarkitekter.dk/tietgenkollegiet/>

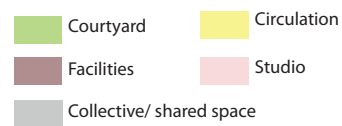






Dwelling type: studio  
Dwelling surface: 32 m<sup>2</sup>

Figure 16. Exploded view of the building's functions.  
Source: own illustration



## Conclusion

Beside the private residence the residential building has communal areas with kitchen, common room and utility room. This gives the residents the possibility to come together, cook together and meet. There is also a courtyard in the centre of the building on the ground floor and common facilities such as meeting

and study rooms, workshops and laundry. All these shared and collective spaces strengthen the community feeling and create possibilities for the residents to meet each other. The shared facilities make it possible to design the private rooms or the studios in a compact way.

### 3.6 Conclusion

As already mentioned in the introduction of this chapter, four case studies have been analyzed to be able to answer the research questions of this chapter set-up in the introduction. The results of the plans will be compared to come to a conclusion.

To answer the first question (1. How can urban agriculture be implemented into the design of a residential building?), the projects show that vegetable and fruit gardens are integrated into the design of the residential buildings, by creating communal and in some cases private gardens where the inhabitants get the opportunity to grow their own vegetables. At New West building are the gardens a collective courtyard and communal allotment and vegetable gardens as an extension of the circulation system. In addition the upper dwellings have their own private rooftop allotments. Agro-Housing residential building has a multi-storey greenhouse which provides each residential unit with ten square meters of greenhouse space. There is also on the rooftop place for urban agriculture. Agro-Housing uses as growing method soil-less material like coco peat and growing gutter system. These are soil-less systems that are equipped with drip irrigation, based on recycled “gray water” collected from apartments and rainwater collected from the rooftop. Vertical Garden project offers rooftop gardens and numerous vegetation on almost every layer of the building. This could be seen as a continuity of the allotments that are present at the east and west side of the building.

The dwelling types that are created in these buildings (2. What are the dwelling types that fit this type of building?) are one layer apartments, lofts, penthouses, double height apartments, maisonnettes and ground bound apartments.

The urban agriculture based activity in the buildings (3. What kind of urban agriculture based activities

can raise people’s food awareness in a residential building?), is providing the inhabitants of the concerned buildings space to grow their own food individually or collectively.

The four case studies have also been analyzed according to the fourth research questions (4. What kind of communal and shared living spaces could be implemented into a residential building?). There are several communal places designed in the projects, like in New West a collective courtyard, collective balconies and platforms, collective allotment gardens, at Agro-Housing a collective kindergarten, sky club on rooftop, collective greenhouse and rooftop gardens. At the ground floor of Vertical Gardens there is space for multiple amenities such as a restaurant, exhibition spaces, meeting rooms and a stage. There is also a shared living space implemented in the building. This place is a collective living room and will feature meeting and play rooms, a reading room, a large kitchen, two guest rooms and roof gardens. At last, Tietgenkollegiet offers communal areas with kitchen, common room and utility room. There is also a courtyard in the centre of the building on the ground floor and common facilities such as meeting and study rooms, workshops and laundry.

Combining vegetable gardens with residential buildings is quite a new topic and therefore it was challenging to find appropriate case studies. After an intensive search I was able to find the case studies that have been analyzed. This helped me to form an idea about how to give urban agriculture a shape and fit it into a residential building. Of course there are more possibilities than analyzed in these case studies, so further research could be very helpful to give more insight. The result of the plan analysis could be seen as design tools and a stepping stone into own design project.













## Chapter 4 Site Analysis

### 4.1 Introduction

This academic year, the studio's location is the centre of Amsterdam, specifically the area between the Singelgracht and the Lijnbaansgracht. Singelgracht was the official boundary of the city upon the Canal Belt's completion. This canal borders popular areas such as Leidseplein, Heineken Brewery, Rijksmuseum, and the Frederiksplein adjacent to the Nederlandsche Bank.

A project site should be chosen from the area around the belt. This is done after visiting the place several times and after deciding the topic for the studio's project. Since my topic for the graduation project is raising people's and especially citizen's food awareness, I tried to find a prominent and visible plot. This kind of residential building type is quite unique and therefore it needs to be well visible to function as an example for the next subsequent buildings. I also tried to find a location that provides plenty space to practice urban agriculture and a place that fits well in its surrounding.

Frederiksplein is a green park adjacent to the Nederlandsche Bank, and the bank will move from this place. It is a big site next to a green park and in the meantime it is a visible and prominent place. That's why I have chosen the location where now the Nederlandsche Bank is situated and that will move from this site.

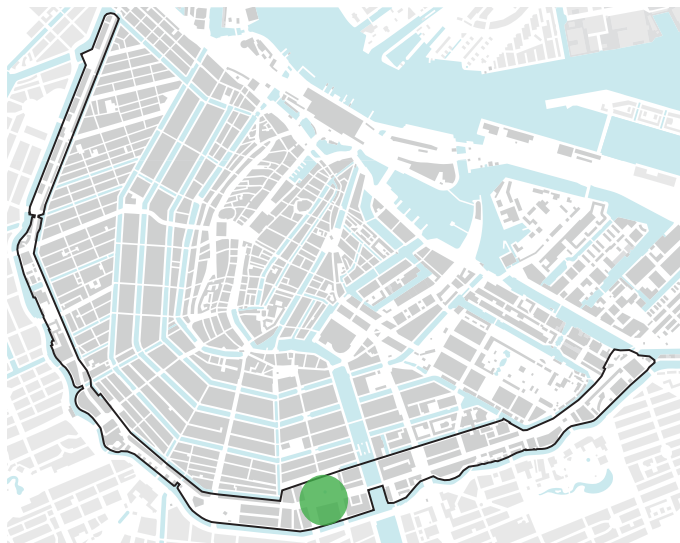


Figure 17. Project location. Source: own illustration

The idea of involving the Frederiksplein into the project task is by creating an 'edible city' where food can be grown in public spaces, like already done before in Amsterdam at the Weesperzijdetuin. Weesperzijdetuin is a neighborhood garden in the public area with edible plants along the Amstel river to the southeast of the chosen project site. The garden is a meeting place for the local inhabitants of the Amsterdam's Weesperzijdestrook.

The garden islands are planted and managed collectively by the local inhabitants. These active inhabitants are members of the union Vereniging Weesperzijdetuin. The Weesperzijdetuin is part of the public domain (the pavement) and therefore everyone is able to walk through the garden or sit on the benches and enjoy the city nature in this part of Amsterdam.

On the other hand only the members of the union Vereniging Weesperzijdetuin are allowed to get a plot in this garden and plant it. Other local inhabitants and interested people are welcome to the events organized by the union in the garden. This could be a nice reference to do the same at and around the project site.

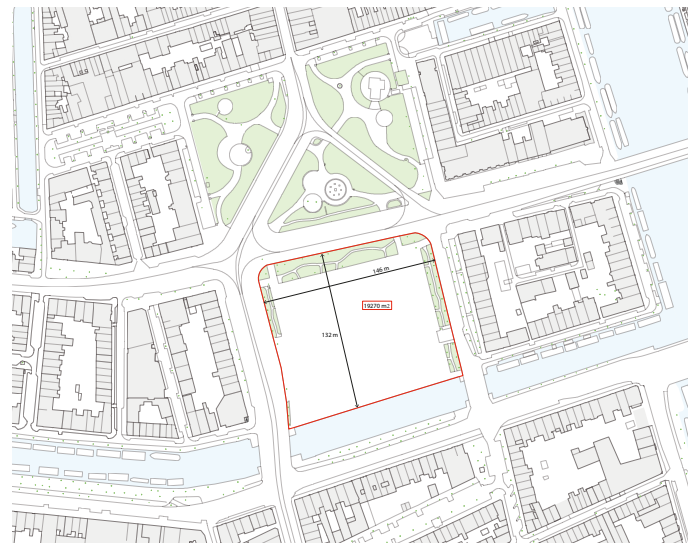


Figure 18. Location Size. Source: own illustration

## 4.2 History

Amsterdam arose as a small medieval settlement on dikes containing the Amstel where it met the IJ. The Amstel was dammed against flooding and this gave the city its name Amstel dam. By the 16th century Amsterdam had grown into a walled city centred on the present Dam.

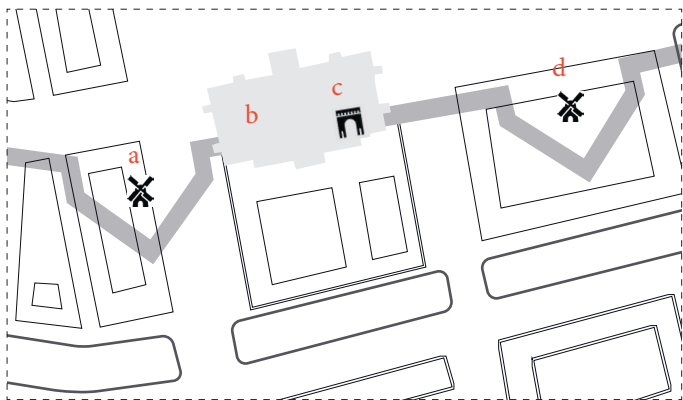
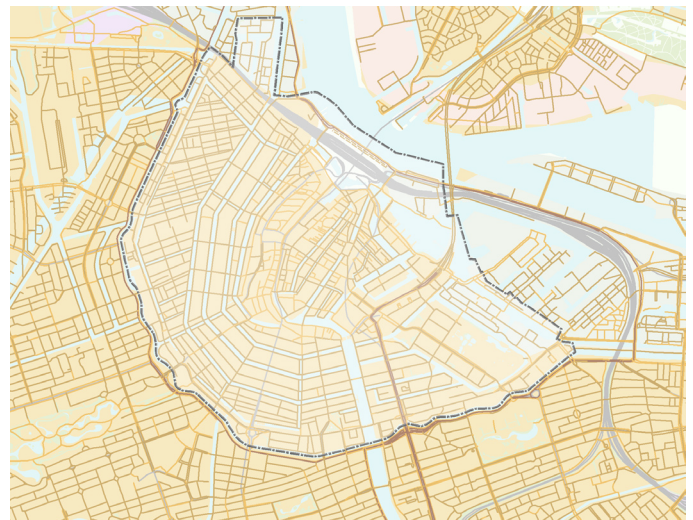
The canal system of Amsterdam dates from the 17th century, which due to the cultural, economic and political prosperity, was also called the golden age. The Herengracht, Keizersgracht and Prinsengracht are the three main canals outside the Singel, dating from the early 17th century. These canals form together with the smaller radial canals a characteristic pattern, which was extended to the east along the harbor and to the west into the Jordaan.

In 1662 the city of Amsterdam started with the fourth city expansion of the city, when Singelgracht with its ramparts became the outer limit of the city. In these ramparts, which gave the canal a meandering shape, were bastions on which mills were located.

Along with the Singelgracht, at the inside of the ramparts, Lijnbaangracht was located. In the course of the nineteenth century the fortification walls started to disappear and the city expanded beyond the Singelgracht.

In the late 19th and early 20th centuries, big physical change came again to the cityscape due to industrialization and the expansion of the city's population. New expensive residential and commercial buildings came to De Pijp, a neighborhood in the southeast of Amsterdam.

In 1876 The North Sea Canal, a new channel into west to the sea, was completed. Also warehouses and new docks were developed along the waterfront and in 1889 Central Station was built on an artificial island in the IJ which is situated north of the city. In the beginning of the 20th century new suburbs were constructed.



History: what was there?

- a. Bastion Ouderkerk, Molen de Haan
- b. Paleis voor Volksvlucht 1864-1929
- c. Utrechtse Poort, City Gate
- d. Bastion Westerblokhuis, Molen de Groen

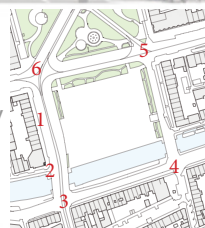
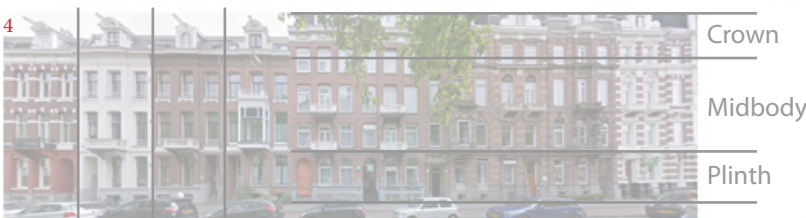


Paleis voor Volksvlucht

Built in: 1864  
Burned down in: 1929  
Function: exhibition hall, later entertainment and shopping-arcade

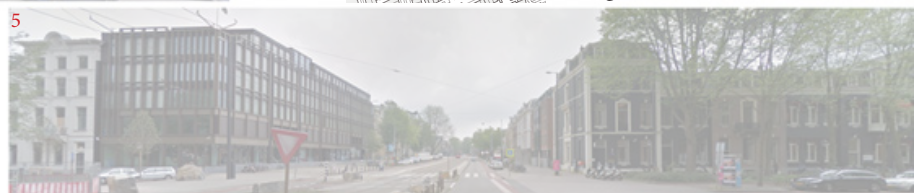


## 4.3 Architecture Styles



A typical Amsterdam's architecture style is that the facades are built according to a certain style; a plinth which is higher than the other parts, a midbody and a crown as shown in the picture alongside.

Another prominent feature is the gabled facades and the division of the facades, in a cohesion way, in smaller parts with different colors and styles, which gives the buildings its small scale characteristic.





## 4.4 Site Impression

### Serial Vision

At the north side of the project location Frederiksplein is situated. This is a park rich in different kind of trees and plants. Also at the place around the project site, where now the Nederlandsche Bank is located, there are big amounts of trees. In contrast, at the south part of the site, along the Singelgracht, there are no trees at all, which makes it a hard transition between the site and the water. At the south side of the adjacent buildings there is a tree promenade along the Singelgracht. This could also be a potential characteristic that might be incorporate at the south side of the project location. In this way a green walkway could be generated along the Singelgracht. At last, the Frederiksplein is isolated from its surrounding by a low brick wall, this could be done against the traffic sound. But at the same time this wall isolates the park from its surrounding and could sometimes attract unwelcome groups and be used for wrong purposes.

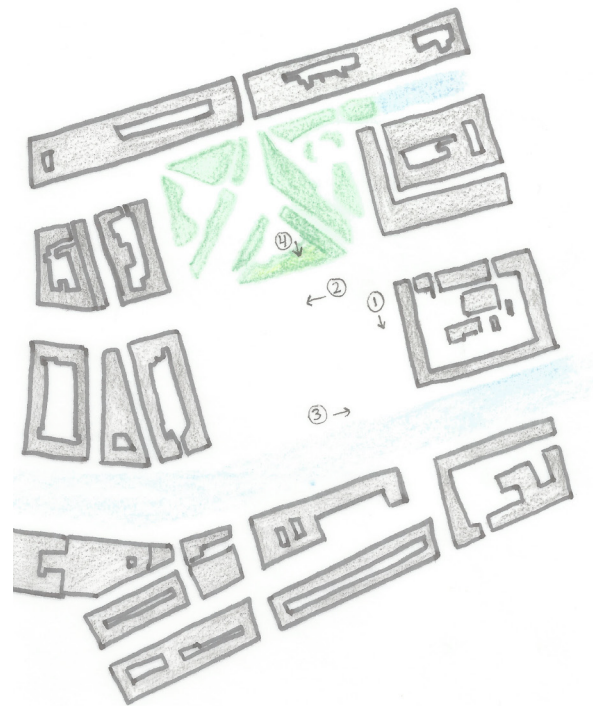
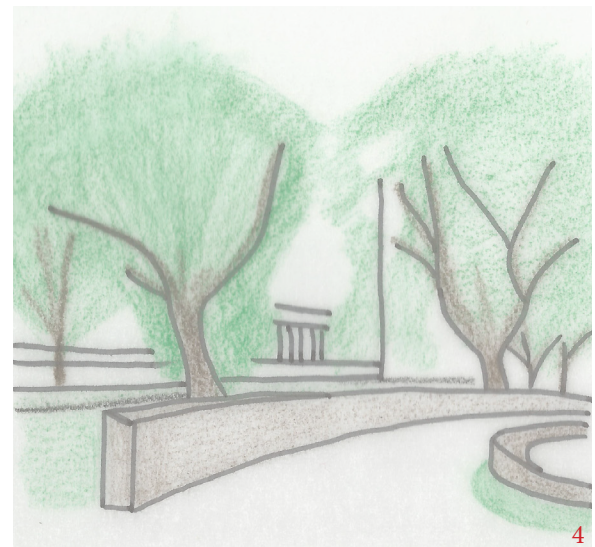
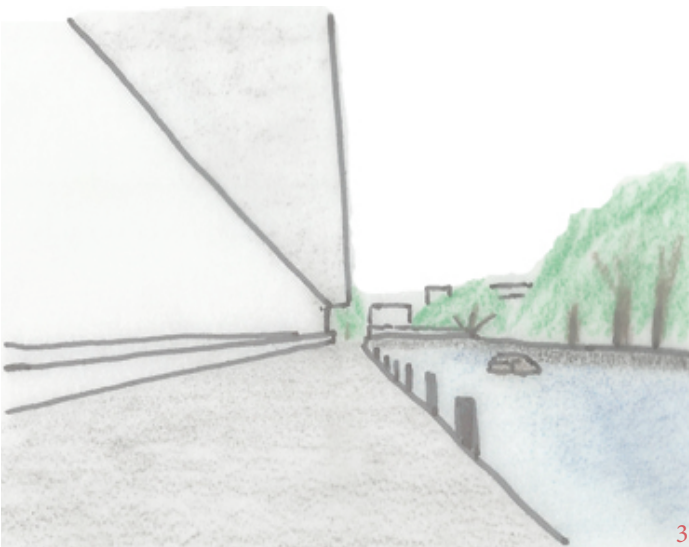
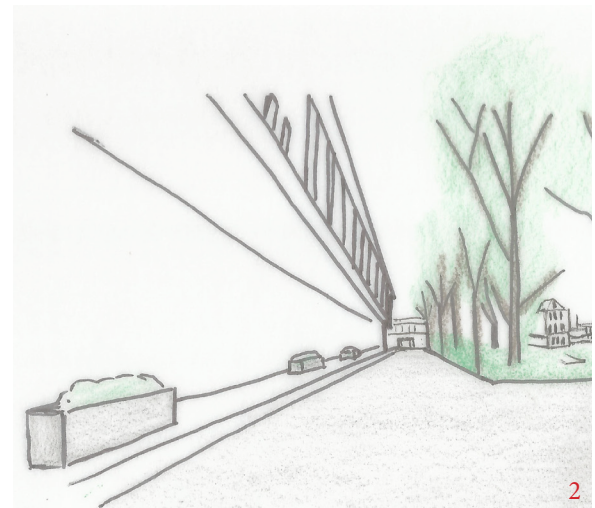


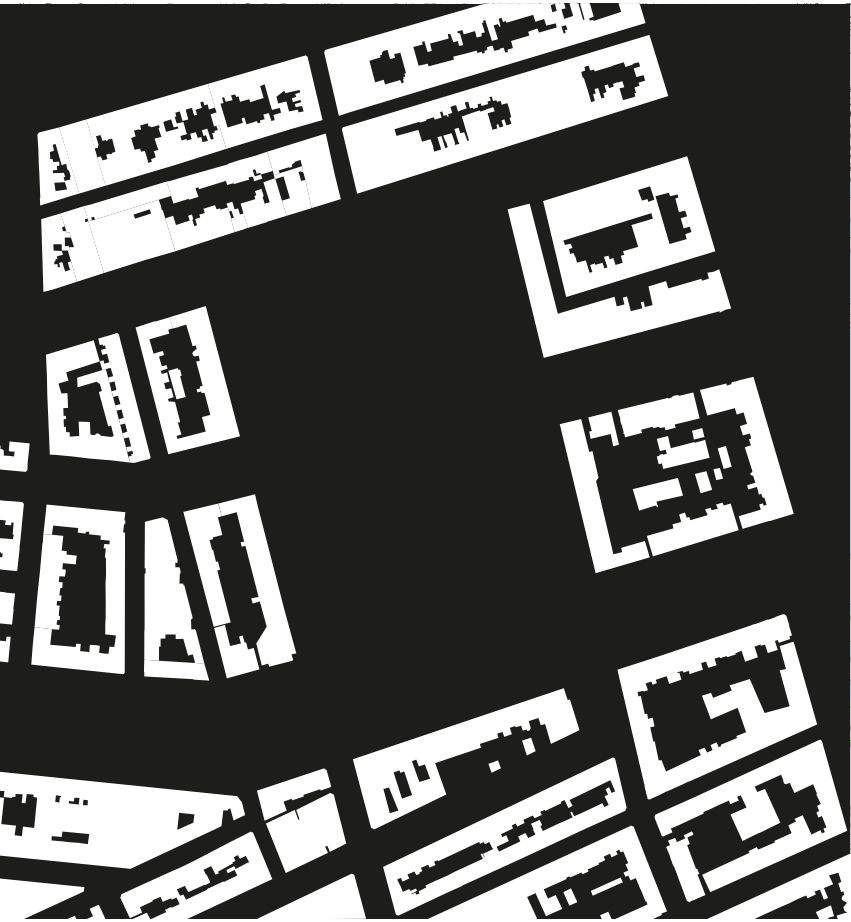
Figure 19. Serial Vision project location.  
Source: own illustration



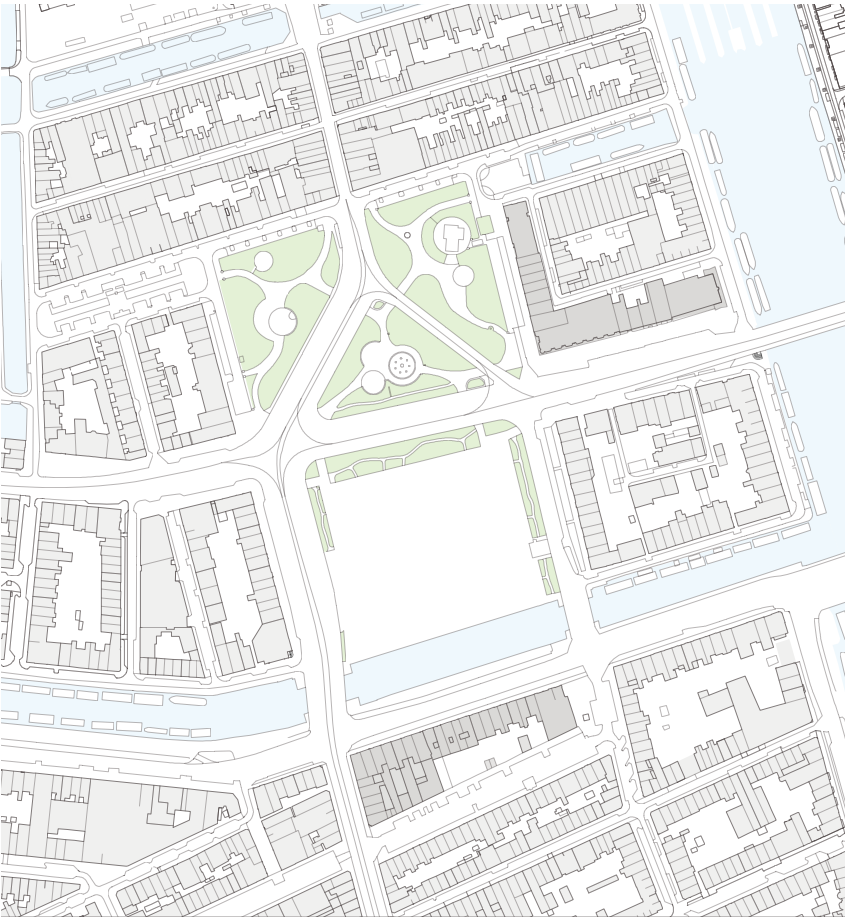


# 4.5 Morphology

Built Fabric | Building Typologies



Built  
Non built

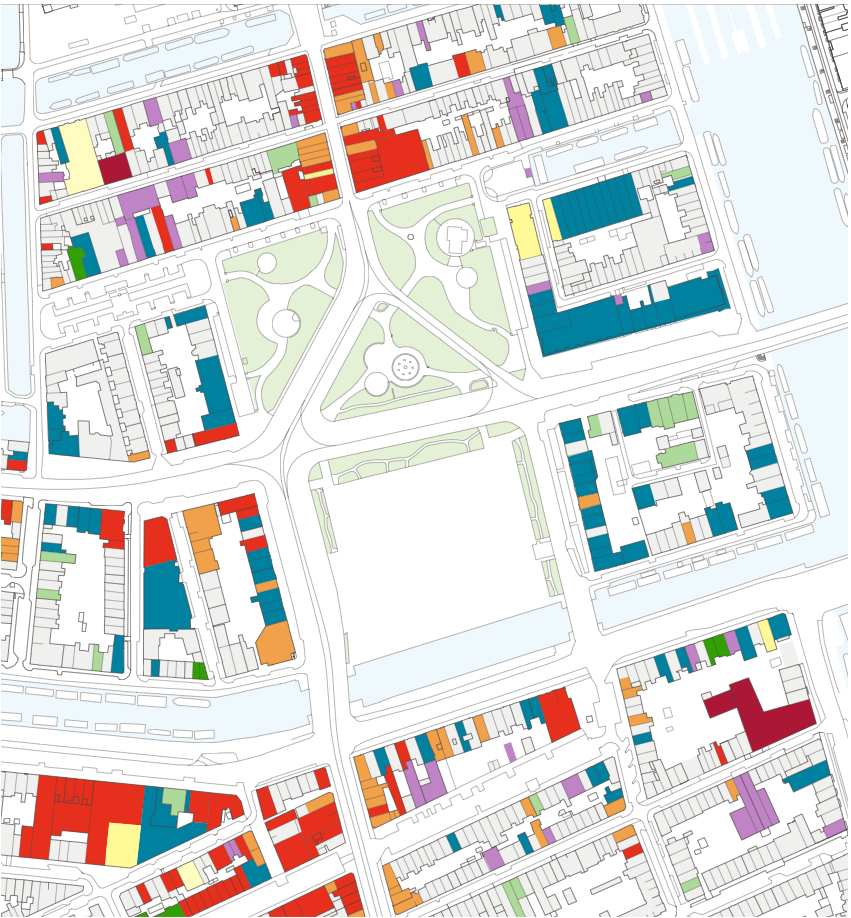


N  
Scale 1:5000

Courtyard typology  
Half open courtyard typology

# 4.6 Figure & Ground

Land Use | Functions



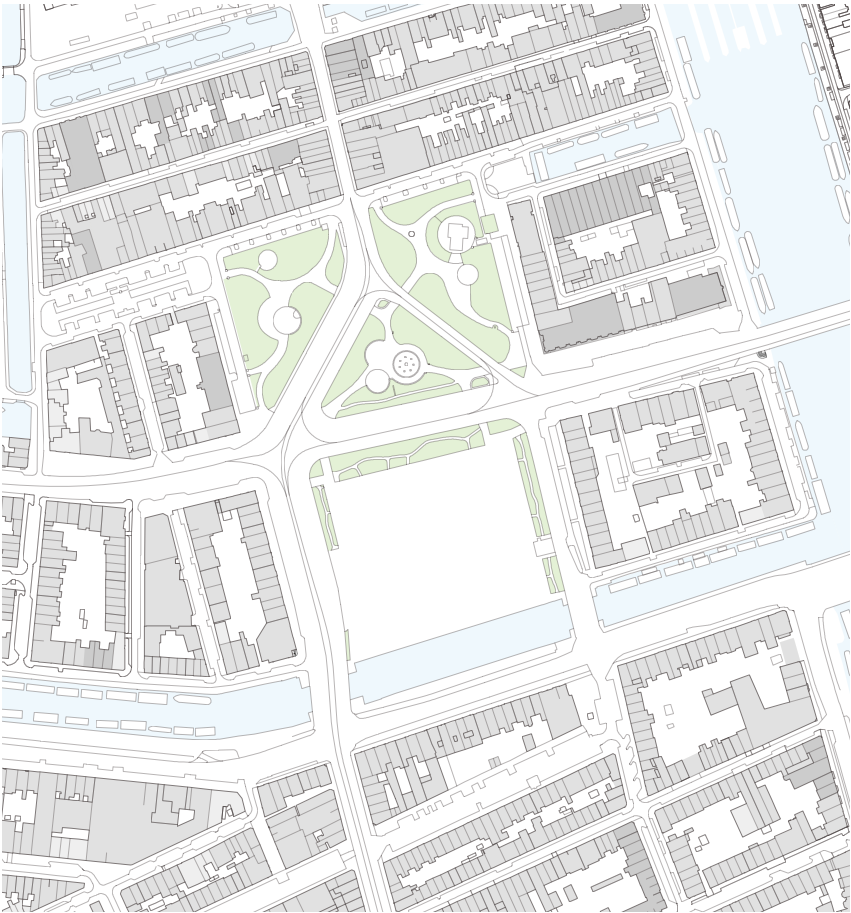


# 4.6 Figure & Ground

Building Age | Building Heights



- < 1860
- 1860-1919
- 1920-1945
- > 1990

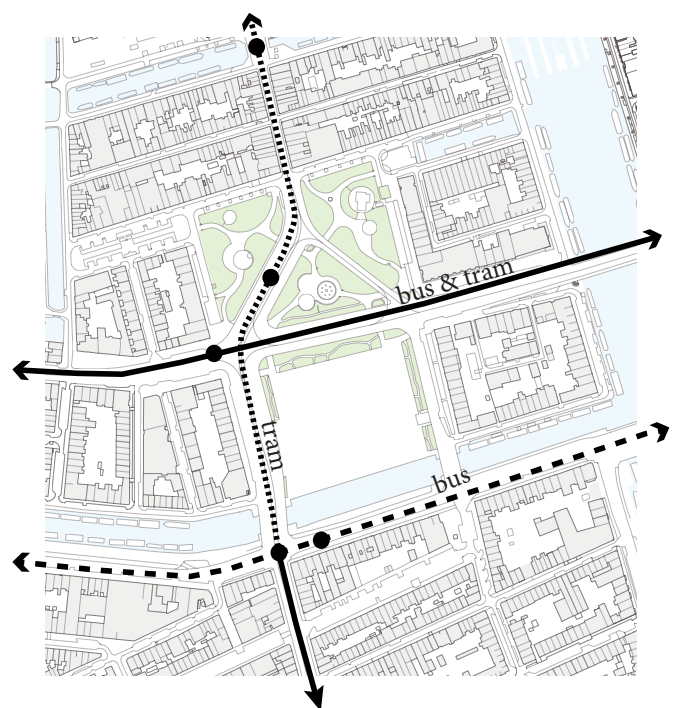
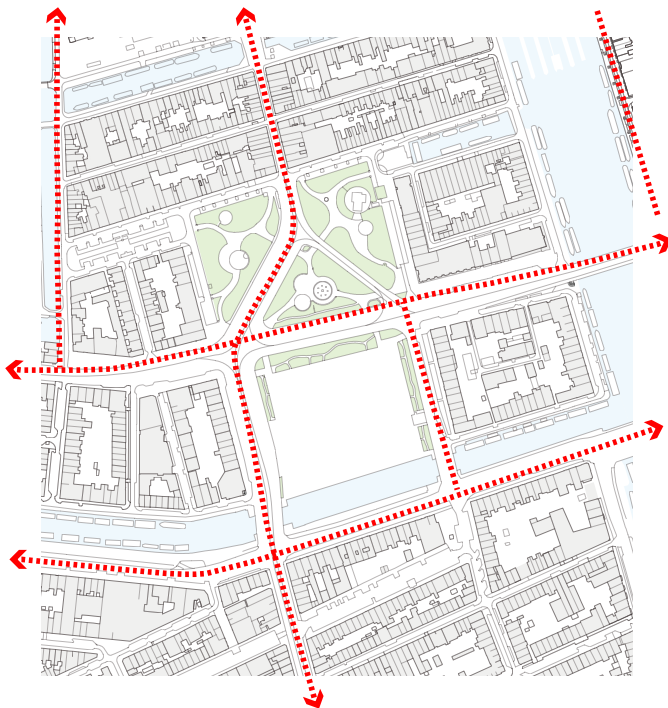
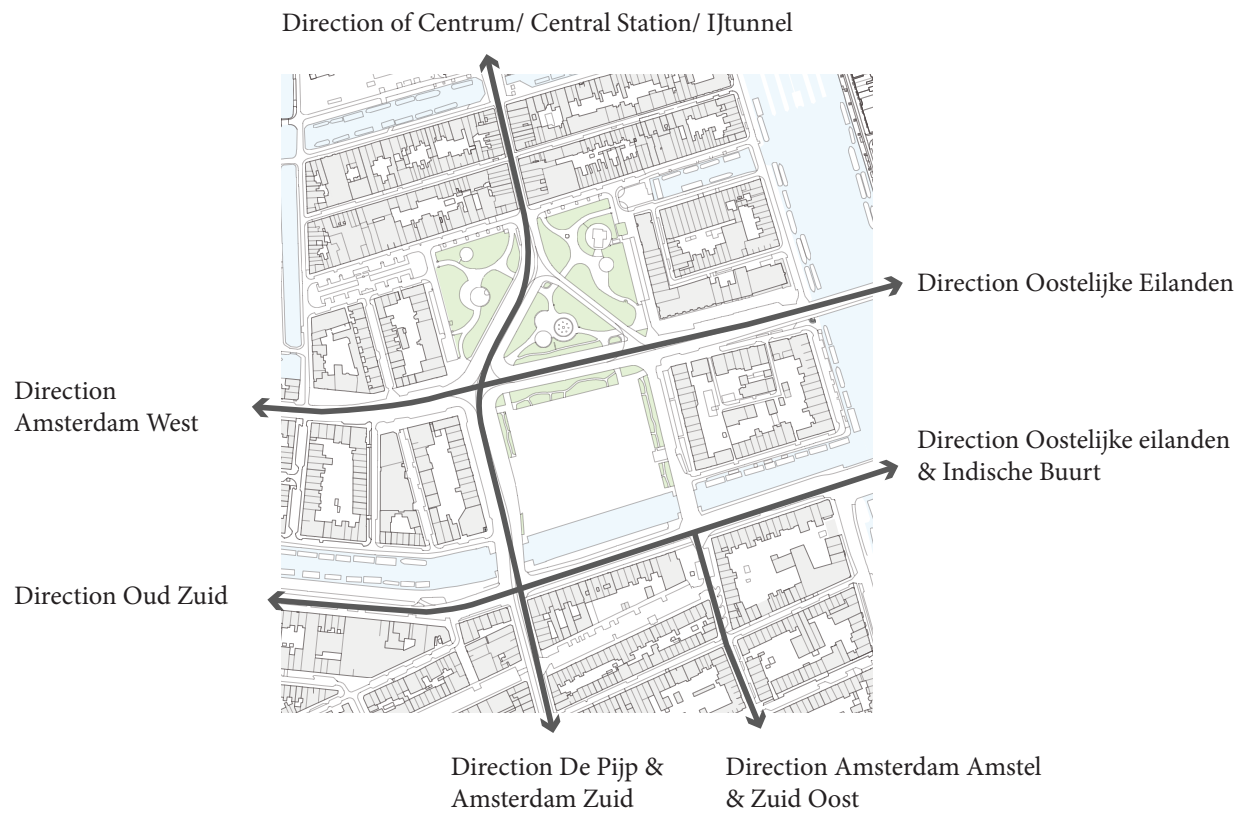


N  
Scale 1:5000

- < 12 m (< 4 layers)
- 12 - 15 m (4-5 layers)
- 15 - 21 m (5-7 layers)

## 4.7 Transport

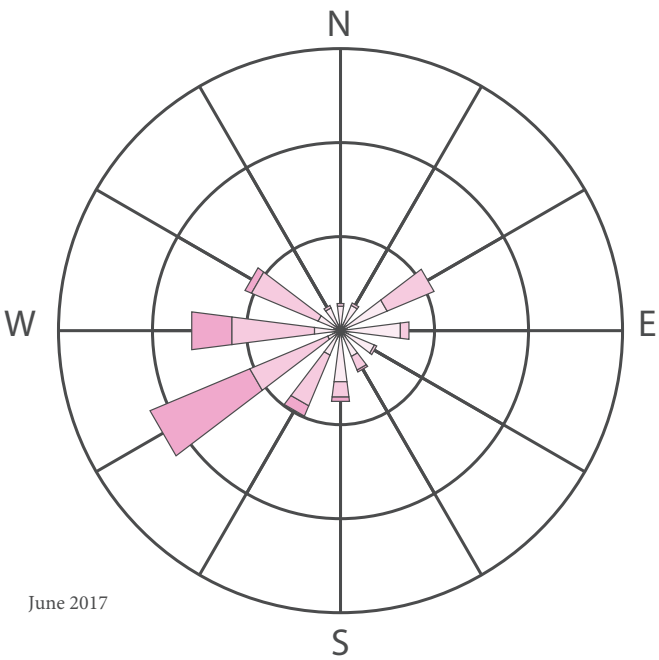
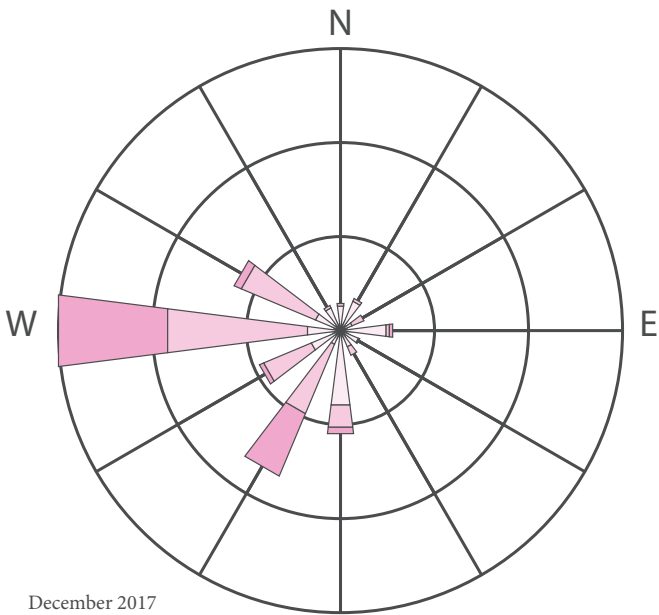
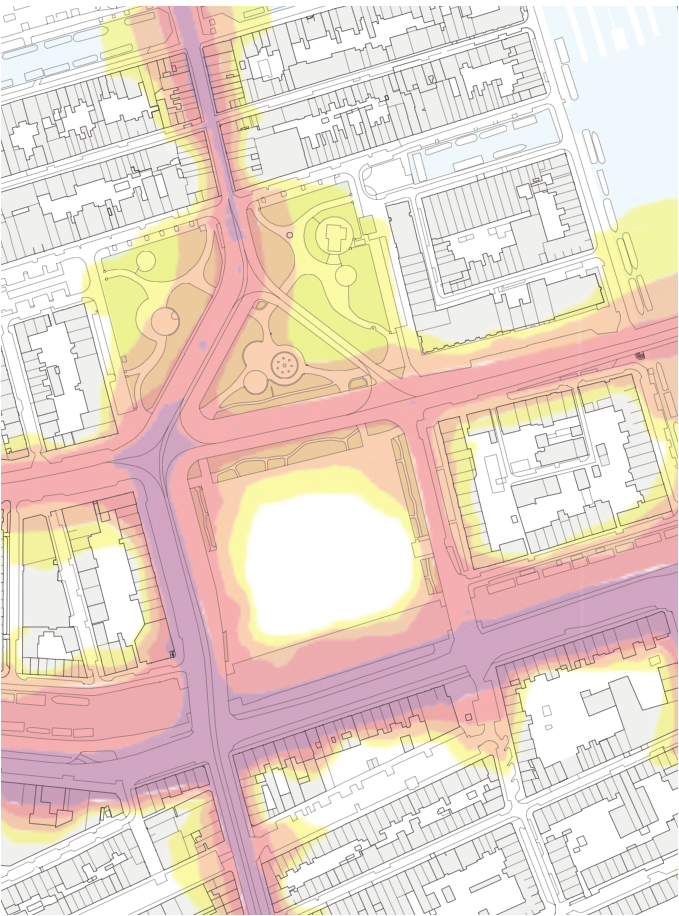
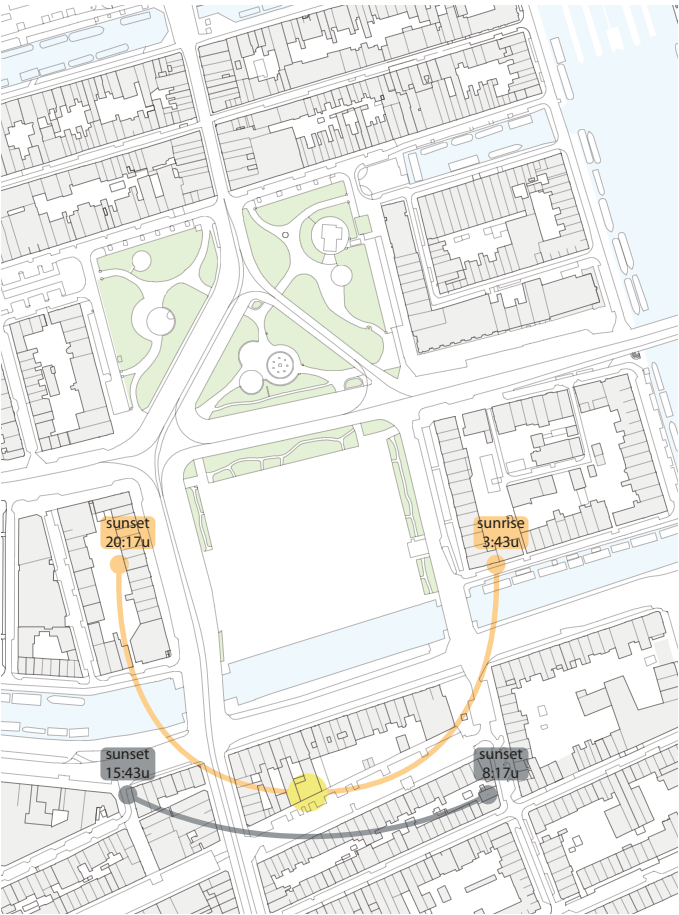
Car Routes | Bicycle Routes | Public Transport Routes





4.8 Climate

Sun Orientation | Sound Pollution Zones | Wind Direction Amsterdam



N  
Scale 1:5000

Sound Pollution Zones

60 - 65 db	70 db or more
55 - 60 db	65 - 70 db

# 4.9 Flora & Fauna

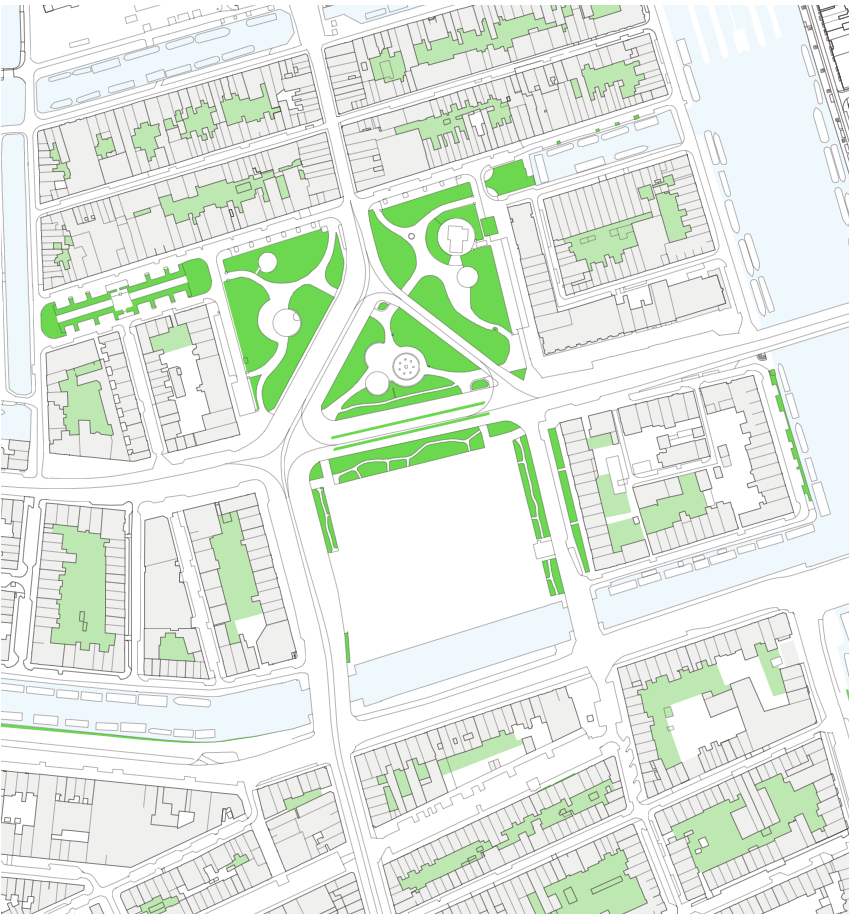
Tree Species | Monumental Trees



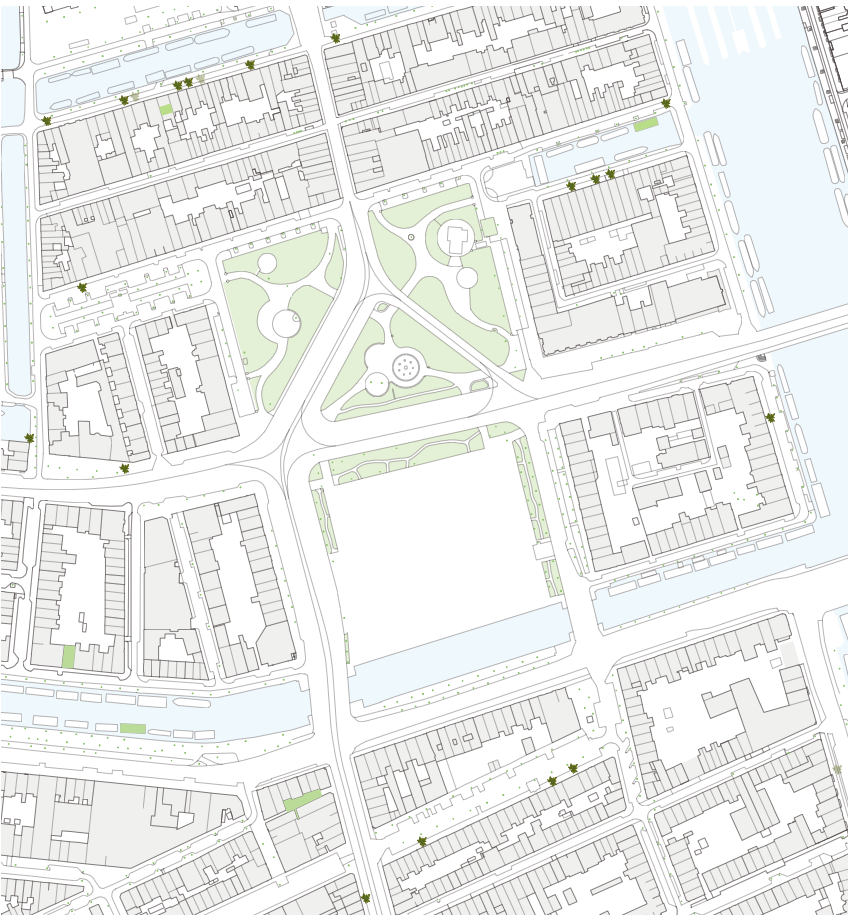


# 4.9 Flora & Fauna

Public & Private Green | Green Roof & Wall Plants



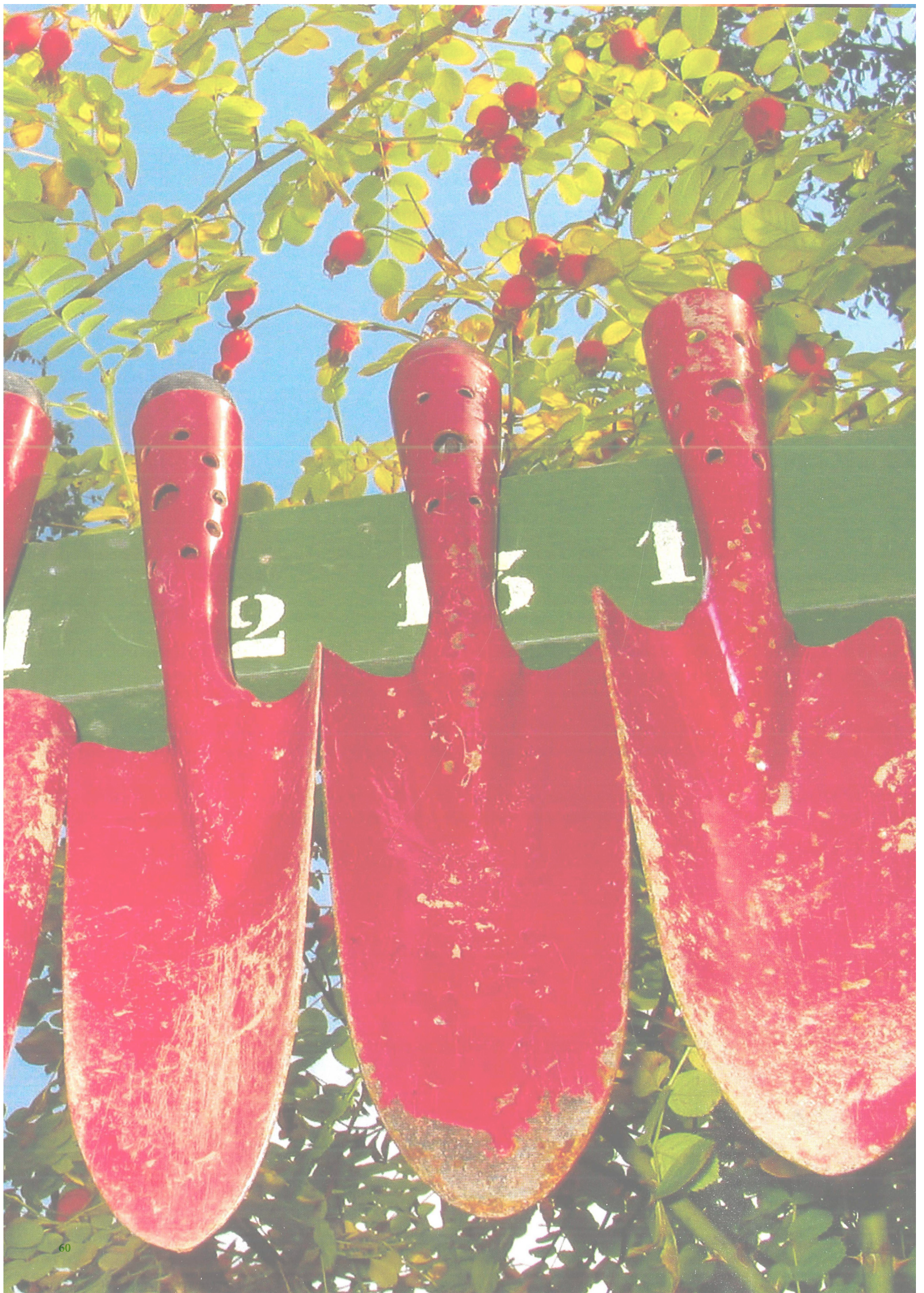
- Public
- Collective/ private



N  
Scale 1:5000

- Wall plant
- Protected wall plant
- Green roof







## Chapter 6. Design Brief

### 6.1 Design Brief and Design Concept

In this paragraph the design brief will be described which consists of a list of requirements for the design. These requirements are set up using the information gained from the researches:

- a residential building with space for practicing urban agriculture for the inhabitants of the building.
- this space must consist of a communal courtyard with allotment gardens, private vegetable gardens and greenhouses.
- some of these gardens and greenhouses must be accessible for people from outside as an exhibition place for food.
- the building contains amenities such as:
  - a shop for selling the locally produced vegetables.
  - a restaurant using the fruits and vegetables from the vegetable gardens.
  - an information centre for providing food and agriculture based information.
  - a classroom for the children from the primary school in the neighborhood
  - the courtyard offers also place for these school children to practice gardening
- the building must have a transparent and inviting character.
- the building must fit with the close courtyard typology buildings in the surrounding and at the same time, it must be visible and be an eye catcher and represent its unique function as a residential building with place for growing food.
- the building must contain approximately 250 to 300 dwellings, each dwelling has its own storage and outdoor space.
- the dwellings must consist of maisonnettes and lofts of around  $96\text{m}^2$ , one layer apartments of  $48\text{m}^2$  to  $96\text{m}^2$  and penthouses of  $96\text{m}^2$  -  $192\text{m}^2$
- food production must be done on a sustainable way and use only clean energy and rain- or waste/recycled water
- a residential building with zero net energy consumption: the total amount of energy used by the building on an annual basis is roughly equal to the amount of renewable energy created on the site or by renewable energy sources elsewhere.

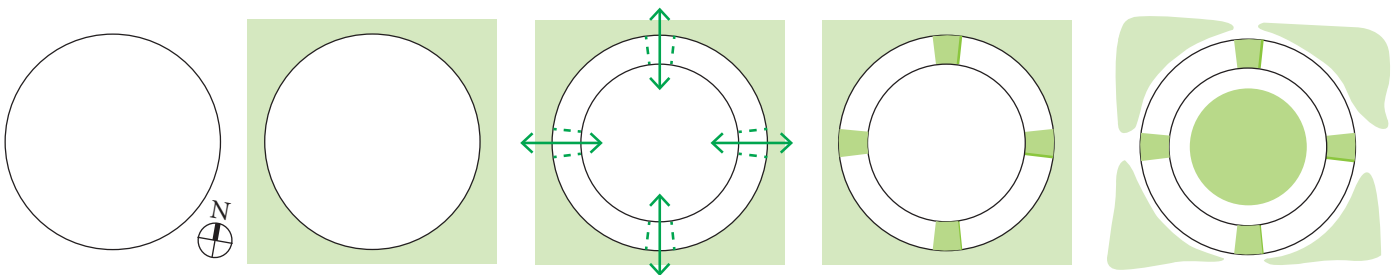
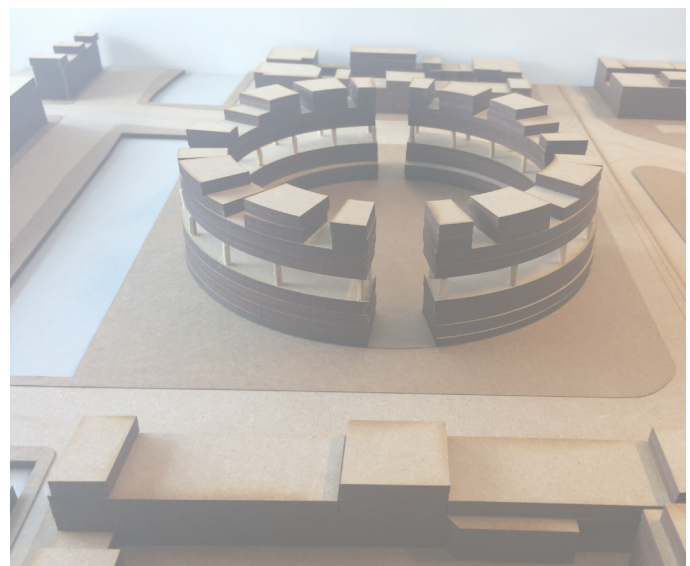


Figure 20. Concept drawings. Source: own illustration



## Chapter 6. Design Brief

### 6.2 Preliminary Design Description

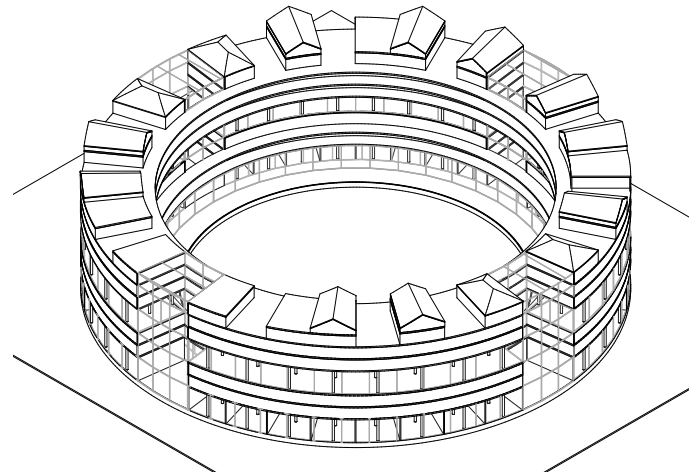
This residential building is the answer to the research question asked at the beginning of this thesis. How can the architecture of a residential building create an active way for people to get involved in the food system again? The Fertile Moon offers the inhabitants the opportunity to practice urban agriculture through private and collective vegetable gardens, in the courtyard, along the galleries and on the rooftop.

After several morphological studies, a closed circle shaped building typology (courtyard typology) has been chosen to follow the adjacent buildings with a courtyard typology. At the same time, because of its quite new function as a residential building for raising food awareness, the building has a circular shape to make a statement and be clearly visible in its surroundings.

The building consists of 8 layers, at the ground floor there is place for amenities such as a room for education purposes, a shop for selling the locally produced food in this building and a restaurant using the locally produced food at this building in their cuisine. At the ground floor there are also maisonnettes and lofts situated. The half-sunken underground car park and storages for the dwellings are located at the basement.

The first, second, fourth and fifth levels consist of one layer apartments. Their size could arrange from 48 m<sup>2</sup> to 96 m<sup>2</sup>, this because of the bay dimension in this building. The bay dimension is 7,2 meter wide with load bearing walls. This size makes it possible to make flexible floor plans either with dwellings of 7,2 meter wide or by putting a wall in the middle, so that there is space for making two smaller dwellings out of it consisting of 3,6 meter wide. At the third floor there is a green house for planting fruits and vegetables and at the same time as an exhibition for people from outside the building. The sixth and seventh layers consist of penthouses of one or two levels, with a private rooftop garden.

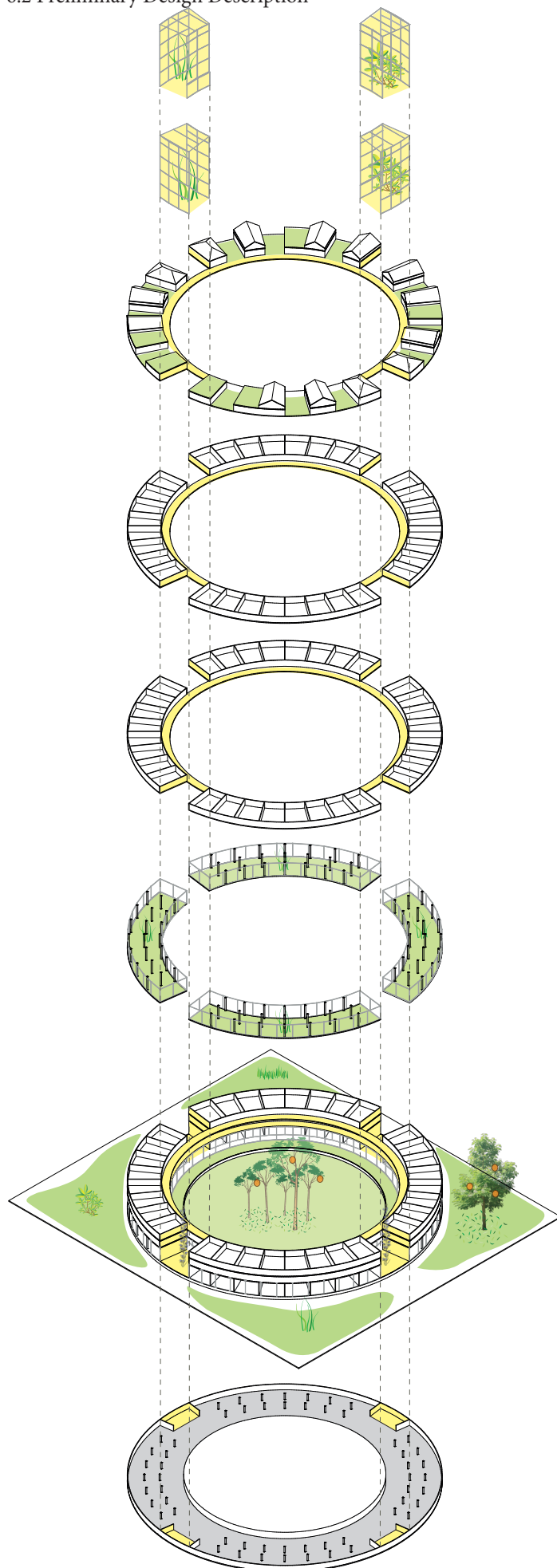
The staircases are transparent greenhouses which connect the green courtyard with its surroundings and make it visible from outside the building.





## Chapter 6. Design Brief

### 6.2 Preliminary Design Description



Total: +/- 250 to 300 dwellings

Staircases  
an extensions of the green courtyard

6th and 7th Floor  
1- or 2-Layer Penthouses with rooftop garden 96 m<sup>2</sup> / 192 m<sup>2</sup>

5th Floor  
1-Layer Apartments 48m<sup>2</sup> / 96m<sup>2</sup>

4th Floor  
1-Layer Apartments 48m<sup>2</sup> / 96m<sup>2</sup>

3rd Floor  
Green House (4 times) 784 m<sup>2</sup>

Ground Floor  
+ 1200mm Amenities + Maisonettes + Lofts 96m<sup>2</sup>

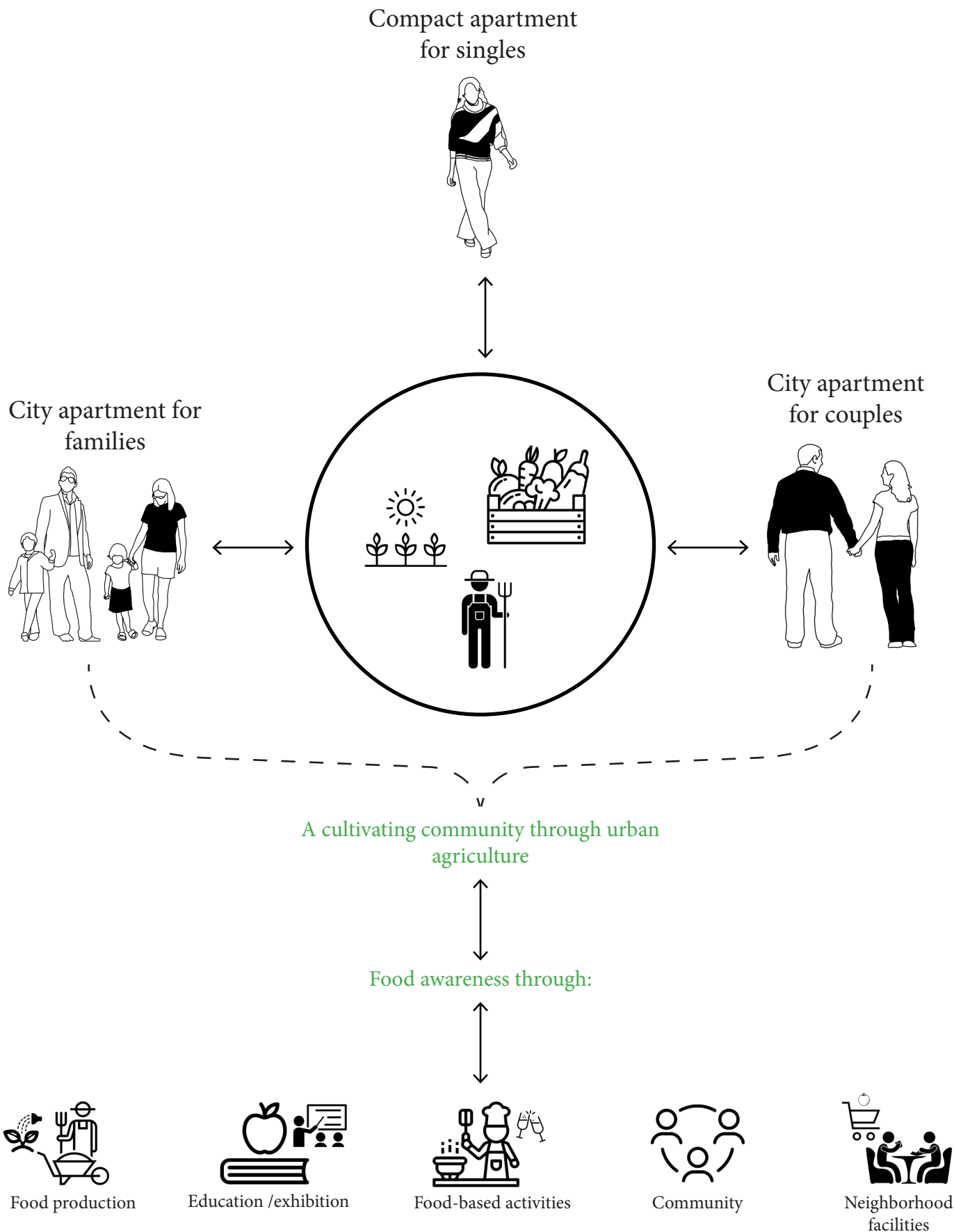
1st and 2nd floor  
1-Layer Apartments 48m<sup>2</sup> / 96m<sup>2</sup>

Basement  
Half-sunken Underground Car Park + Storage

## Chapter 6. Design Brief

### 6.3 Target Groups

A residential building for everyone who wants to get involved in the food production through an active way.













## Chapter 7. Summary

For this academic year the assignment of the Dutch Housing Graduation Studio is to determine the City of the future and especially Amsterdam. The city of the future could be determined by means of current affairs. What do cities need to be or become in order to solve a current social, physical or economical problem in the society.

I have chosen a topic for my graduation project based on a personal fascination and a topic that has started increasingly to attract attention during the past few years. This topic is food awareness.

Cities are attracting people increasingly because of the work opportunities, universities and wide range of facilities. It is estimated that the world population will grow up to 10 billion people by 2050 with the majority living in cities. In Europe 80% of the population will live in cities by that time. As more people will move into cities, the demand for food in cities will arise too. This means that somewhere else in the world natural landscapes have to be transformed into agriculture in order to feed us. Yet 73% of deforestation can be attributed to agriculture and deforestation is likely to continue with projected increases in food demand.

These landscapes does not only feed people but also animals, a third of the annual corn crop globally is used to feed animals to provide people with meat. This is considered not a efficient way of providing us with food (Steel, 2008). Carolyn Steel states in her book that nineteen million hectares of rainforest are lost every year to create new arable land, although at the same time an equivalent amount of existing arables is losing to salinization and erosion. Even though the produced food uses a great amount of fossil fuel and makes other costs, it is not valued.

Half the food produced in the USA is currently thrown away. At the same time people are not even managing to feed the planet properly, while a billion of us are obese, a further billion starve. In addition 80 percent of global trade in food now is controlled by just five multinational corporations which give them the power to completely control the food system.

UN Food and Agriculture Organization estimates that 70% more food need to be produced by 2050 to feed the expected 10 billion of world population.

That is equal to 1 bn tones more wheat, rice and other cereals and 200 more tones of beef and other livestock. This is a very difficult to achieve because most available farmland is already being farmed and in ways that decrease its productivity and lead to soil erosion and water wasting.

The population growth in cities demand more food to feed everyone. As cities became distance independent, it was no longer necessary to produce food in the close environments. Agricultural sites moved outside the city and over time it became possible to even import food from any place in the world. The space in the city was used for other developments and agriculture sites moved outside the city.

Today food is developed in a mass globalized system which causes a long distance between the production and people consuming it. The globalized food system separated food production from its consumers and therefore the relationship between people and their food is being lost. People do not really have any idea how and by who their food is produced and where it comes from. Supermarkets are one of the greatest examples of this distanced relationship between people and their food. In Amsterdam supermarkets have taken over the sale of food since almost thirty years ago.

The food production industry intensified and developed into a large scale production to meet the needs of the growing population in the cities. The population growth in cities goes hand in hand with its ecological footprint. The ecological footprint of cities is about the number of m<sup>2</sup> land needed to feed the city. Food is taking almost a third of the environmental footprint; food production has big environmental impact because of the high greenhouse gas emissions caused by production methods and the use of pesticides and infrastructure to transport the food. Although the Netherlands has globally the second biggest export of agricultural goods, the food system is not sustainable due to the above mentioned reasons.

## Chapter 7. Summary

As mentioned before the aim of this thesis is not to solve this unsustainable global food system, but rather to make people aware of what is going on and how our food model has been transformed through decades. This will make people aware of where their food comes from, how it is produced and the big impacts the controlled food system has on the climate, their food and therefore their health and even their wallet. The aim is also to make citizens able to grow their own fruits and vegetables and not to be 100% dependent on the unsustainable world's food system. This is indirect a great step into changing our food model. This leads to the research question of this thesis which is:

How can the architecture of a residential building create an active way for people to get involved in the food system again?

In order to answer this question research studies have been made, including literature studies, plan analyses and site analysis.

When people who share the same interest and fascination about food awareness will live at the same residential building or in the same neighborhood, they can share their knowledge and build up an sustainable urban environment with a sustainable food system. Due to this people can relate much better to their food.

Food shapes our lives and did shape our cities in the past. Modern food production has damaged the balance of human existence. Nowadays few of us are conscious of the process of how food reaches our plates. Where the city in the preindustrial era was flowing with food and also physically shaped by food, our food system distanced us completely from the production of food. Citizens could see grains coming into the city through rivers, animals walking into cities and how food was sold on markets on streets, so that nobody living in a city like that could not be aware of where their food came from. This is lost with the advent of industrialization, which caused a big change in the system of feeding cities

After industrialization and advent of railways cities started to expand quickly and became large metropolitan areas. At the same time the agricultural industrial landscape in other parts of the world also started expanding in similar way. The railways made it possible to grow large amounts of grain because trains could then transport it to cities. This was the beginning of a big transformation of extraordinary landscapes which resulted in an massive global abundance of grain. Later this mass of grain was used to feed animals instead of grass. This became a new industrial model of how to create cheap beef on the basis of this massive grain production.

The research in this thesis have shown that our food system is a complex system which give the complete power to certain corporations and completely eliminate participation of the consumers. The actual producers of food, the farmers, don't have any relation with the consumers of food. They have to go through food corporations or supermarkets to reach the consumer, so that these business structures have all power to control the food system.

This power must be divided fairly between all the participant of the food system. More power has to go to the producers and consumers and less to the business corporation. Also producers and consumer should be able to meet and work together. This is already a trend that starts slowly to grow, for example in the Netherlands.

Herenboerderij is an initiative of a group farmers and consumer who work together. It is a sustainable, mixed company with the aim to produce healthy and tasty food for a good price. Their motivation is having more control over their food and to be able to trust that food is produced fairly, with respect for the farmer, the animals and nature. Each household pay monthly to the farmers on basis of how much food they want to receive. The farmers in return offer the whole year healthy, fresh and locally produced food to their customers. This is a great example of how people could get involved in food production again.



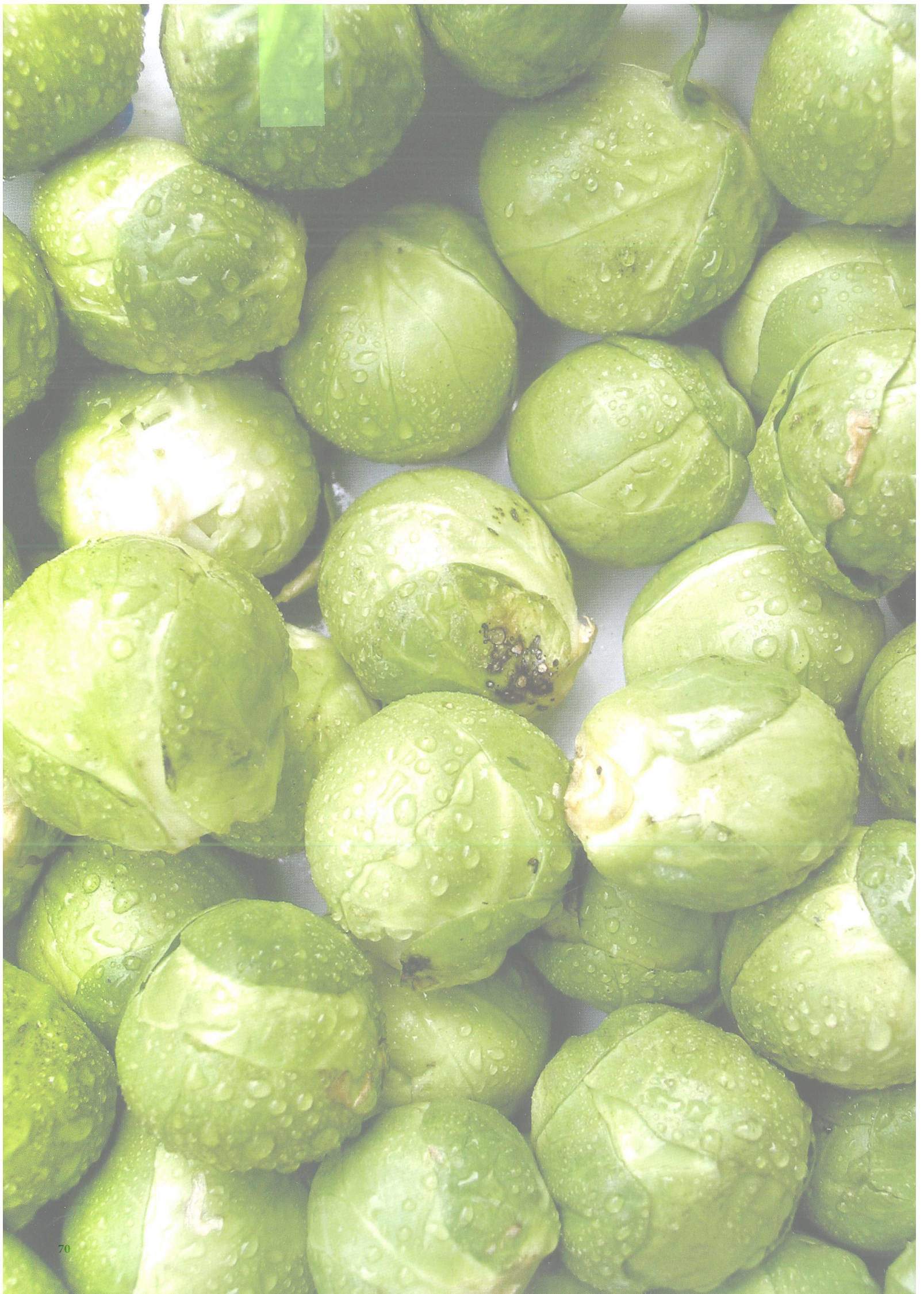
## Chapter 7. Summary

There are four common types of urban agriculture, forest gardening is one of the urban agriculture types, it is a soil-bound and largely self-managing food forest. Allotment garden-style food growing is soil-based cultivation from ground level cultivation in full soil to raised beds, or in soil layers on rooftops. This type fits the image most people have of urban agriculture. Allotment-style production aims to deliver fresh vegetables directly to restaurants and individuals by combining smart cultivation schemes, making use of the small spaces and microclimates of the city. At the other hand there is controlled indoor substrate cultures such as hydroponics and aquaponics, with fresh produced food that is available the whole year.

The four types urban agriculture differ in their relation to the soil and the built environment, their relation with the essential flows of the city and the impact they have on public space socially and esthetically. Therefore they offer different benefits to the city and respond to different opportunities. These four types complement each other in the products and services they deliver, in their needs and requirements, and in the way they fulfill the spatial, socio-cultural and environmental needs of the city. They represent different values: from the importance of healthy soil to the need for affordable food production in sufficient quantities. Instead of choosing between these approaches, each should be embraced for its particular qualities and for the diversity that a combination of types provides

All these studies, including the plan analysis and site analysis led to the design brief. Allotment gardens is the type of urban agriculture that will be implemented in the architecture of the residential building. This is an active way to get people involved in growing and producing food. This will bring producers and consumers of food closer to each other. The inhabitants of this building are not only food consumers but also producers of food, at least for themselves. This residential building and its inhabitants could be regarded as an example or model for other residential buildings and citizens of an active way for engaging people with the food system again.







## Appendix 1.

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