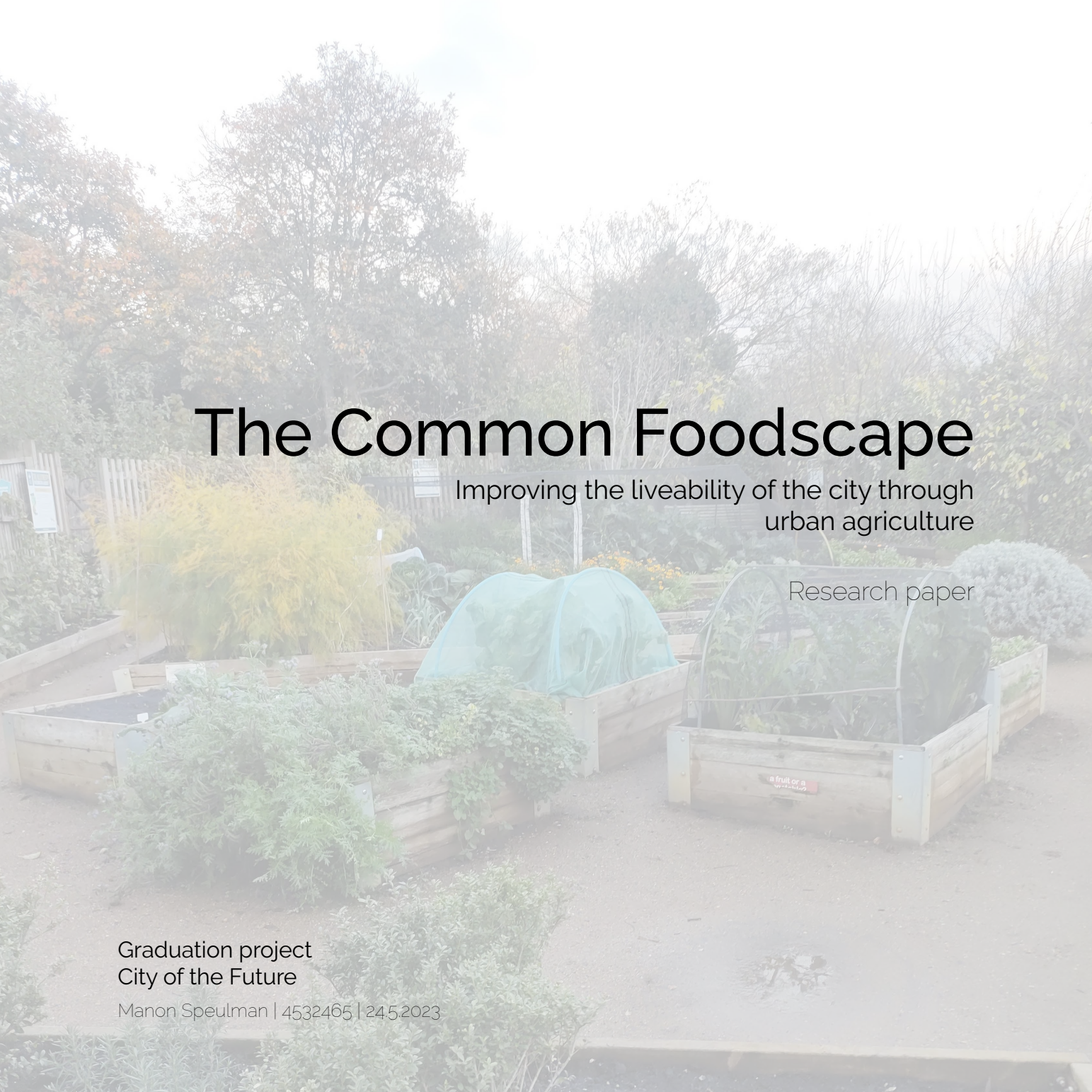

The Common Foodscape

Improving the liveability of the city through urban agriculture

Research paper

Graduation project
City of the Future

Manon Speulman | 4532465 | 24.5.2023

"Food shapes cities, and through them, it moulds us – along with the countryside that feeds us"
Carolyn Steel (2013)

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Abstract

Food is a vital part of our lives and throughout history it has shaped our cities. However, our current agricultural practices exhaust our natural environment and are threatened by climate change. Next to that, the design of our food system is highly susceptible to global instabilities. With the population only increasing and more people living inside cities, the pressure on the food system is only growing. This increases food insecurity and further planetary urbanization.

Urban agriculture is seen as a possible method to transform the food system into a sustainable system. In research, the qualities of urban agriculture and its effect on the food system are discussed. Yet, the effect on the direct surroundings are mostly ignored. At the same time, when these effects are reviewed, little differentiation is made between different types of urban agriculture. Hence, this paper focuses on the question: How can urban agriculture be implemented into cities to improve the liveability of the city? This is done using literature review, case study analysis and design experiments.

The research shows that the effect of urban agriculture on liveability is highly dependent on the strategy that is being implemented. Liveability consists of six dimensions: Stability, education, healthcare, facilities, social cohesion and physical environment. No direct effects can be measured on stability education and healthcare. Nevertheless, literature suggests there might be indirect positive effects. Facilities, social cohesion and physical environment can be improved through urban agriculture. Here, the strategy that is being implemented determines which dimension of urban agriculture is improved. There is not one strategy that improves all aspects of liveability, instead each strategy has its own strength. Other aspects that influence the liveability are the production system, activity, area, location, product and destination. Altogether, there is not one design in urban agriculture that can improve liveability, some aspects of urban agriculture might decrease liveability. Hence, a balance needs to be found between changing the food system and creating a qualitative living environment.

Content

Glossary

Aeroponics
The growing of food without direct substrate. Instead mist is used to provide necessary nutrients.

Accessibility
The ease in which a space or building can be entered or used, independent of the relation of the individual to the space or program.

Anaerobic digestion
The production of biogas and nutrient-rich digestate, by breaking down biodegredable materials in an oxygen-free tank using microorganisms. The digestate can be a valuable fertiliser whereas the biogas can be transformed into energy using a generator (Lim & Liu, 2019).

Aquaculture
The cultivation of fish as a food resource.

Biomass
Agricultural waste, organic waste, vegetation or plant residue, which is used as a renewable energy source.

Blackwater
Water contaminated with human, animal or food (production) waste.

Built
Built is a scale of design. The built scale includes all buildings, expansions and characteristic elements of buildings. These elements cannot be seperated from the building and are mostly context dependent.

Council homes
A form of social housing. The land and buildings are owned by the council and rented to people with a low income.

CPUL
Continuous Productive Urban Landscapes. A strategy of urban agriculture focused on the connection and redesign of outdoor space.

Closed
A closed design or proposal is one that has little to no interaction with the non-users and can only be used by a select group of stakeholders. The building and its program cannot be accessed by passerby. Key in this is the inaccessibility of the function. The facades of the building can be transperant, but the building can still be defined as closed.

Ecosystem service:
The effects ecosystems have on people or society. Key examples are the production of food, cleaning of water, shadow, heat reduction, shelter and recreational space (Based on Birtles et al., 2013)

Farming carpet
A concept in the smartcities strategy. It includes the landscape of agricultural fields, in which special attention is paid to the selection of plants based on colour, pattern and texture (Lim & Liu,

2019).

Foodscape
The foodscape consists of the network of food-related program in and surrounding a city.

Foodsystem:
The chain of activities from production to consumption

Furniture
Furniture is a scale of design. It entails all elements that can be placed inside a building or public space, but are not depedent on the direct context to function.

Greywater
Domestic waste water.

High tech architecture
High tech is a style of architecture based on modern technologies, materials and construction methods. Materialisation is often glass and steel. The style is independent of the local context and climate.

Hydroponics
The growing of food in water.

Infrastructure
Infrastructure entails all networks of transport. This includes, but is not limited to: Roads, sewage and power cables.

Livestock
Animals which are used for food production. Common in London are pigs, cattle and chickens.

Liveability:
The context and situation dependent needs and desires for quality of life and wellbeing. In which quality of life is the combination of everything that creates a meaningful, comfortable and enjoyable life

Monocropping
The act of cultivating one specific crop on larger areas or fields to optimize production.

Open
A design is defined as open, when it is accessible to all and the program can be used and profited from by both stakeholders and passerby. The site interacts with a variety of stakeholders.

Organoponics
The growing of food in soil.

Permaculture
A form of agriculture based on environmental synergies (Permaculture Research Institute, 2019).

Podcar

Resilience:
The adaptability of a system in case of disaster, internal or external forces

Spatial
Spatial is a scale of design. The spatial scale includes public, semi-public and private spaces that are not enclosed on all sides by walls and a roof.

Transperency
The ability to see into a process, building or system. Urban agriculture can only be defined as transperent, when most of the process is visible for an outsider.

Urban agriculture:
The act of producing food in the intra-urban and peri-urban area. As well as food related activities.

Urban metabolism:
The combination of all socio-economic and natural processes in a city.

VCF
Vertical City Farm. A strategy of urban agriculture, which includes indoor food production, using modern technologies to increase yield. Mostly focused on horticulture and aquaculture.

Venacular architecture
Venacular is a style in which traditional and local materials and construction methods are used. (Ghisleni, 2020)

Introduction

Food is a vital part of our lives. Without it, we cannot survive. Throughout history we have gone from a self-sufficient system, where everyone cultivated their own food, to a system where we can walk into a supermarket to find any produce we would like from all around the world, or even ready-meals. The way we view food, the products we expect to receive have a strong influence on our surroundings. As such, food has in its own way shaped the city (Steel, 2020). The challenge of having access to fresh food in a city, has had strong effects on the design of infrastructure, agricultural land and urban design all throughout history. Consequently, urban agriculture is not a new idea. Instead it has been around for aeons. It can be seen in the qanat tunnel irrigation networks of Ancient Persia, the terraced farming of Machu Picchu, or the victory gardens occurring during the second world war (Lim & Liu, 2019).

Image 1: The effect of soil erosion on farmland in the UK [1]

More recently interest in urban farming has seen an increase. The realization that our current food system is exhausting the planet, and thus itself is slowly creeping in (image 1). We expect a bigger variety of produce, for a lower price, all while our population and cities are growing, increasing the need for food inside the city (image 3)(Steel, 2020) (Swyngedouw, 2015)(Dubbeling et al., 2009). As a result, planetary urbanization is taking place. This is the process in which densification of and living inside the city lead to the exhaustion of terrain and natural systems outside the city (Swyngedouw, 2015) (Yigitcanlar & Dizdaroglu, 2015)(Wiskerke, 2015). An important factor in planetary urbanization is the increased need for food and thus agricultural land outside of the city. The expansion of these agricultural lands has led among others to demolishment of natural ecosystems (Yigitcanlar & Dizdaroglu, 2015) (Armanda et al., 2019).

However, the environmental consequences of our current food system are only part of the problem. Food, or more specifically the food system also has a social consequence (Ericksen, 2007)(Steel, 2020) (Lim & Liu, 2019), Food security and accessibility are decreasing due to global instability, economic crises and climate change among others (Ericksen, 2007) (Despommier, Giacomelli & Carter, 2020). As a consequence, less people have access to enough and nutritious food, which can lead to health problems (University of Oxford, n.d.).

Image 2: Urban agriculture in London (based on OpenStreetMap, 2022)

For those reasons, the rising interest for urban farming is not surprising as it has been named as one of the main methods to transform our food system. The idea is that it could not only reduces and reverses planetary urbanization, by stopping the expansion of agricultural land, it could also improve the quality of living inside the city and change people's relation to food. Urban agriculture has been attributed many different aspects. It reduces the carbon footprint of food production and can improve the accessibility of food (de Zeeuw & Drechsel, 2015) (Koc et al., 2000). It creates a new economic system inside the city with different job opportunities (Despommier, Giacomelli & Carter, 2020). On top of that, presence of agricultural green spaces In the city can improve the urban micro climate (Dubbeling et al., 2009). Altogether, urban agriculture seems like a promising solution to many of the issues in our current food system.

Research framework

Urban agriculture is a quickly developing topic. Much has been written about the need to change our food system as well as the effectiveness and qualities of urban agriculture. However, the focus in existing research is often on food security and the consequences urban agriculture has on our natural environment. The relation between liveability and urban agriculture has been mentioned, but remains on the urban micro climate qualities that urban agriculture has on the city. However,

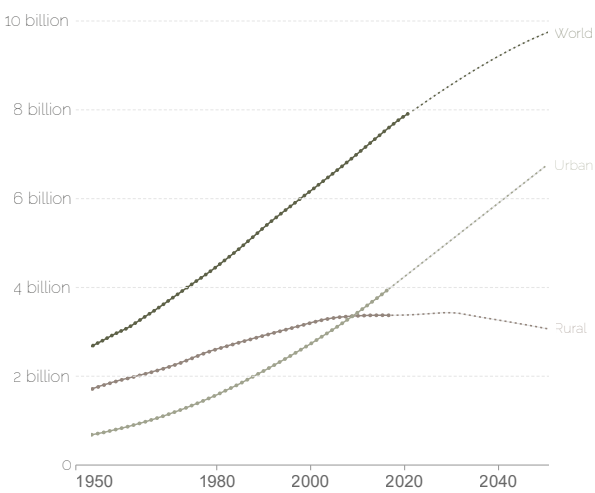


Image 3: Patterns of population growth and urbanisation (based on (Roser & Rodés-Guirao, 2019) & (UN Department of economic and social affairs, 2019)

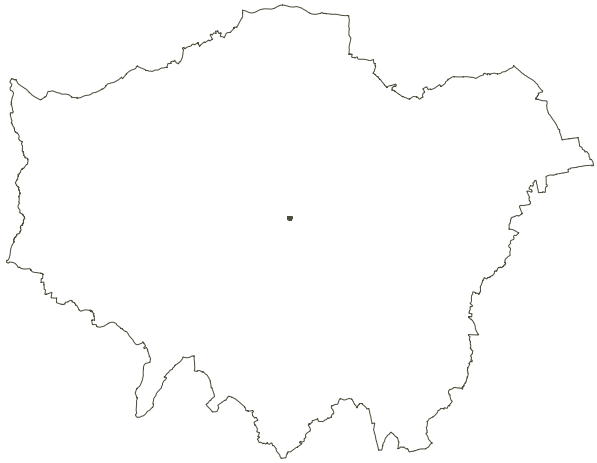


Image 4: The ecological footprint of London (based on Garnett, 2000)

the interdisciplinarity of urban agriculture asks for a bigger overview of the actual effect on the city and those that live in it. This should be done, not only from a general overview, but also taking into account the different typologies of urban agriculture and the significantly different effects they have on the environment, spatial quality and the socio-economic structure of society. This research strives to shed light on this topic by answering the question:

How can urban agriculture be implemented into cities to improve the liveability of the city?

To answer this question this paper will first expand on the food system and the effects it has on the city, through literature reviews (chapter 1). Secondly it will define the concepts of urban agriculture (chapter 2) and liveability, based on literature as well as policy documents. The insights gained from the different existing liveability indexes will be used to set up a liveability framework that can be used to test the effects of urban agriculture on liveability (chapter 3). After this, the paper researches which types of urban agriculture can be implemented in the city. For this, a set of case studies will be analysed, compared and organised to determine patterns or specific types of implementations. Next to this, literature will be used to review the main proposed strategies of urban agriculture (chapter 4). The types and strategies defined in this part of the research will be designed and tested on a site in London (chapter 5). For this, not only the spatial characteristics of these types will be defined, but this so-called toolbox will also be based on the socio-economic systems of the

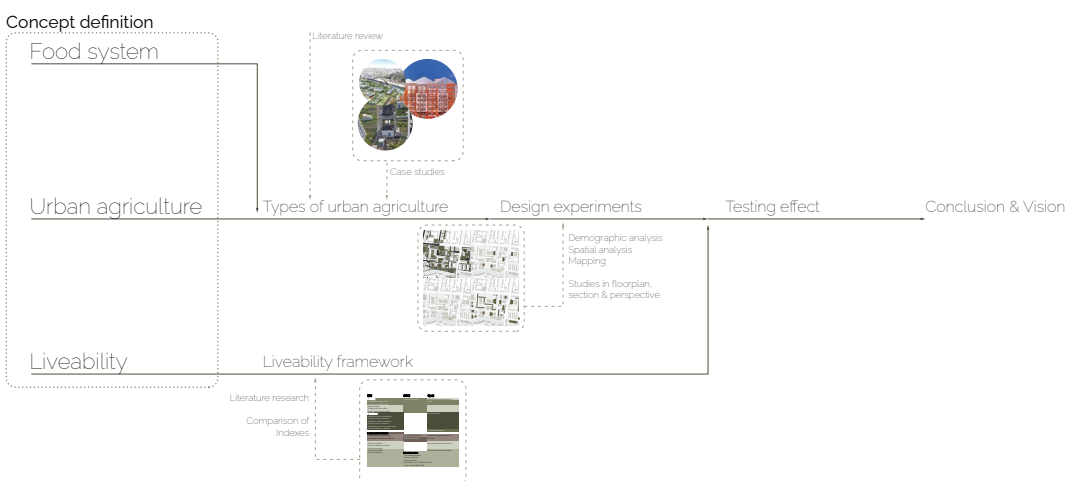


Image 5: Research process and methodology

interventions (chapter 6). Lastly, the interventions from the toolbox will be tested using the earlier established liveability framework. The results from this test will conclude on the effects of different urban agriculture interventions on the liveability of the city (discussion and conclusion).

Location

Not all cities are comparable when it comes to their food system and possible implementation of urban agriculture. This research uses London as a location, due to the urbanization issues and population growth the city deals with. As a consequence, the city encounters a growth of food insecurity (The Food Foundation, 2022). London already has a large food-scene as well as an existing culture of urban food production. Examples of this are the "City farms" which have existed since 1970 (Garnett, 2000) and the old war gardens which have now been transformed into allotments and can be found in most public parks. The popularity of these, and other allotments is growing, with city inhabitants having to wait years for a spot (Appendix 1). Next to interest, London also has policies encouraging urban agriculture (Baker & de Zeeuw, 2015). While most food production still takes place in allotments or peri-urban space, there is an increase in small intra-urban and environmentally oriented agriculture projects (the polis blog, n.d.). The combination of policy foundation, existing start-ups and research, and a high interest among inhabitants, makes London an interesting site to research the spatial implementation.

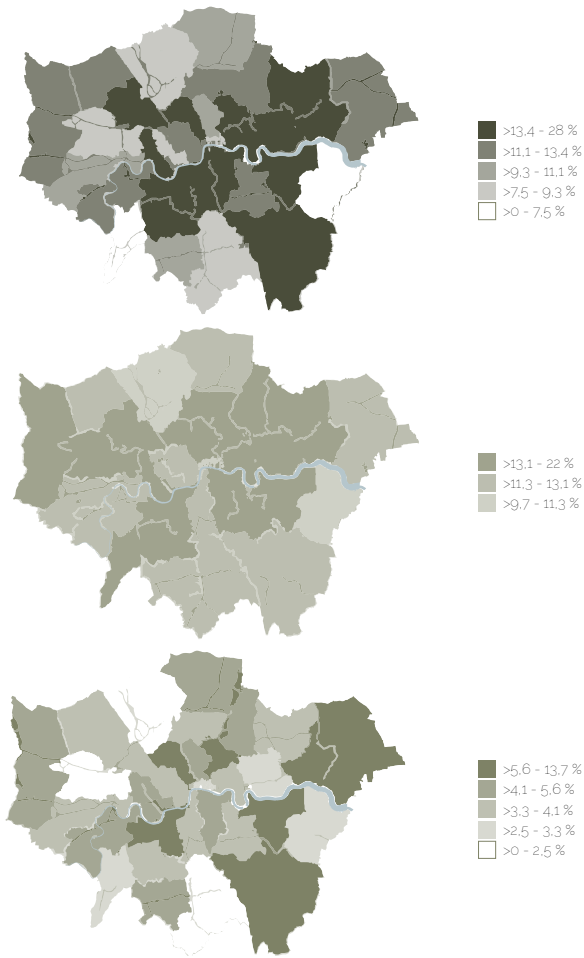


Image 6: Struggle for food, worry about food & hunger in London (based on Moretti et al., n.d.)

1. The food system

The food system is the chain of activities from production to consumption. (Ericksen, 2008). The food system starts on the countryside, produce is processed and packaged, sometimes on the country side, sometimes in industrial areas, and distributed around the globe. Fresh produce and readymade meals van be found in grocery stores or markets, and dinner is served in cafés, restaurants and other food hubs (Steel, 2020). The last step in the system is the consumption of the food. However, this overview of the food system does not take into account the waste that is created through packaging and food waste itself. Waste should form the last step in the system. It contains need to collect waste, move it back out of the city, sort the packaging materials or biowaste, and demolish or store these. All these steps, have a spatial form. They take place somewhere on this globe and thus have an effect on their surroundings. This spatiality is referred to as the foodscape (Wiskerke & Verhoeven, 2018). The landscape in which all different parts of the food system take place, from production to consumption.

Image 1.1 shows a simplified diagram of the linear system. In reality the food system is complex and multifactored (Morgan, 2009). As such it has influence on social justice, health, water, space, energy, transport and economics. Image 1.3 visualises this complexity. In this the food system consists of four important components (Ericksen, 2008)

_The interaction between the natural and human environments, which lead to the following activities:
_The activities from production to waste (Ericksen, 2008) (University of Oxford, n.d.)
_Outcomes of the activities
_Other food security factors.

The consequence is a diagram of how the extensive food system should be visualized (University of Oxford, n.d.). Here, the outputs of the food system are divided into food security, social welfare and environmental welfare. The effects of these outputs are fed back into the system and influence the food system (Ericksen, 2008). This explains how the problems in the food system keep strengthening each other. For example, our current method of production exhausts soil, thus

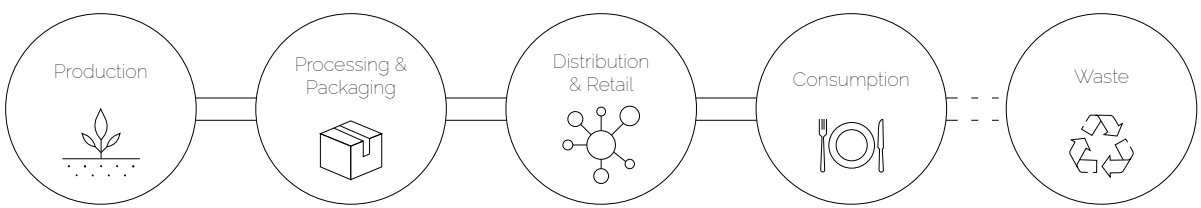


Image 1.1: The lineair food system

food per area becomes lower, As a consequence, the amount of food and thus food accessibility decreases, this reduces social welfare, which leads to higher needs, more production area to compensate for the reduced yield and thus more exhausted soil (reduction of environmental welfare). These feedbacks show the importance of moving to a more sustainable and resilient food system. A system that is circular instead of linear (image 1.2)

Socio-economic feedback is not only population growth or inflation, it also entails the way we view food. The produce consumed is strongly influenced by the price, the convenience, the quality and healthiness (Steel, 2013). This leads to food being produced cheaply and processed heavily. The cheap production process leads to the exploitation of workers in the agricultural sector, livestock mistreatment and the exhaustion of soil and other natural resources (Steel, 2013). Therefore, the redesign of the food system should not only focus on a circular process using different techniques. It should reinvent our relation to food, as it is the only method to change the system in place. A way to start this social transition is the creation of a transparent food system in proximity to and in connection with the residents of the city.

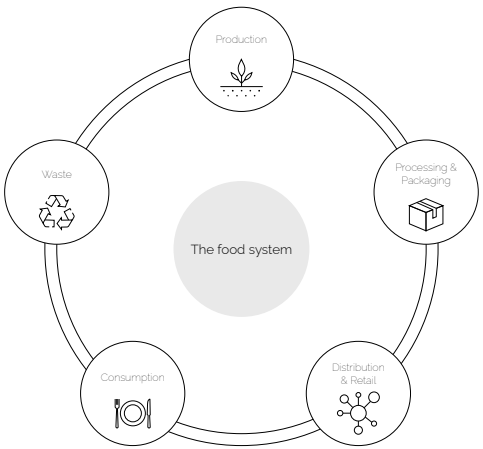


Image 1.2: The circular food system

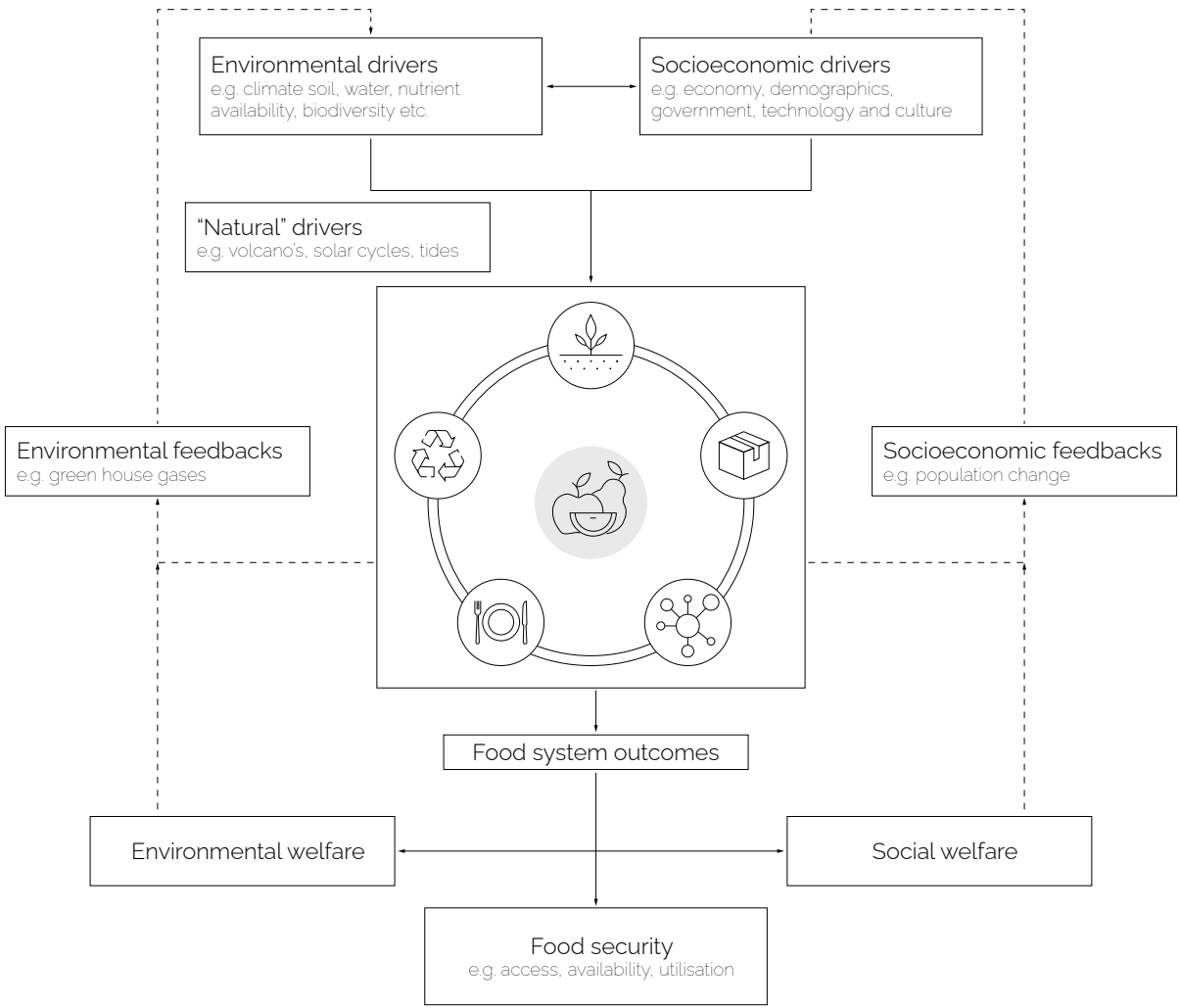


Image 1.3: The food system in relation to feedbacks and drivers (based on (University of Oxford, n.d.)

2. Liveability

Liveability are the context dependent needs and desires for quality of life and wellbeing (Birtles et al., 2013) In this quality of life is the combination of everything that creates a meaningful, comfortable and enjoyable life (Kielbaso, 2008). Key aspects of liveability are health, environmental and social economic indicators (Kohomenko et al., 2020). Liveability is an intangible concept. It considers the interrelation of physical-environmental and cultural dimensions of cities and how they improve human development and community wellbeing. Since its introduction in 1980, the term has become an important measurement tool and goal in policy making (Paul & Sen, 2020). Liveability in itself is multifactored, indicating that it has many different factors which can be interrelated or unrelated to each other.

Due to liveability being intangible, it can only be measured using different factors. Consequently, when liveability is used in policy making or as measurement tool, it is done using an index. There is not one liveability index which is used in all contexts. Instead, various indexes are used, and each has its own set of indicators. The set up and indicators of each index are dependent on the context, user, and purpose of the index (Paul & Sen, 2020) (Tennakoon & Kulatunga, 2019). Since an index is the clearest method to gain an overview of the different dimensions of liveability, and the method to make measuring liveability the most transparent, this research will use an index as well.

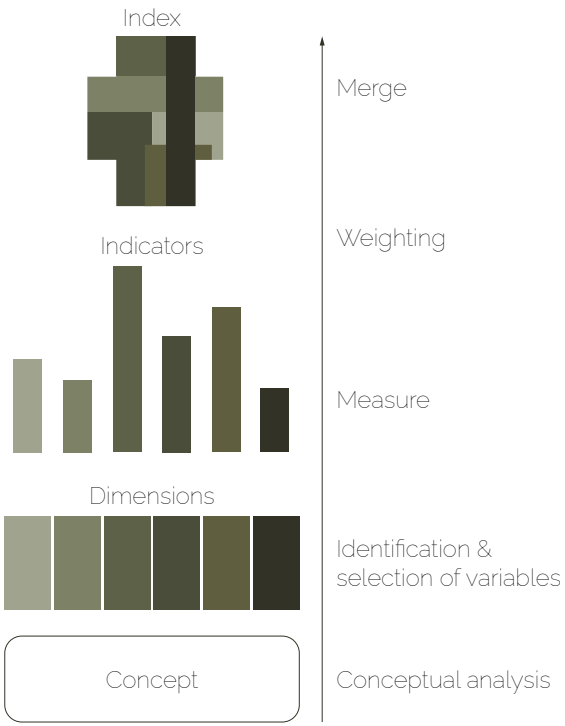


Image 2.1: The formation of an Index (based on Yigitcanlar & Dizdaroglu, 2015)

Image 2.1 shows the structure of an index. An index is based on a concept, in this case liveability. From here, the dimensions of liveability are determined. This is done using existing frameworks. These dimensions are split into indicators, which are characteristics of the dimensions that can be measured and valued (Yigitcanlar & Dizdaroglu, 2015). Yigitcanlar and Dizdaroglu (2015) also refer to the weighting of different indicators. In this

research all indicators will be valued equally.

To prevent a bias in the liveability framework, in which specific factors are over or undervalued, the index will be based on three globally recognized frameworks (Tennakoon & Kulatunga, 2019): The Global Power City Index, which creates and analyses data for planning urban policies and corporate strategies (Appendix 2) (IUS, 2022); the Quality of Living Index, which focuses on the liveability for employees abroad (Appendix 2) (Mercer, 2020); and the Global Liveability Index (Appendix 2) (Economist Intelligence, 2022). However, these indexes are all still broad. To create a more urban oriented index, the Dutch liveability index "Leefbaarometer" and the British index "liveable London Dimensions" are used (Leidelmeijer & Mandemakers, 2020) (Clavin, 2014). Image 2.2 summarizes these five frameworks into six dimensions: stability, healthcare, education, facilities, social cohesion and physical environment.

Different indicators of these indexes are used to come to a consistent framework. However, this set-up of the framework disregards, many of the spatial characteristics of spatial interventions. Since

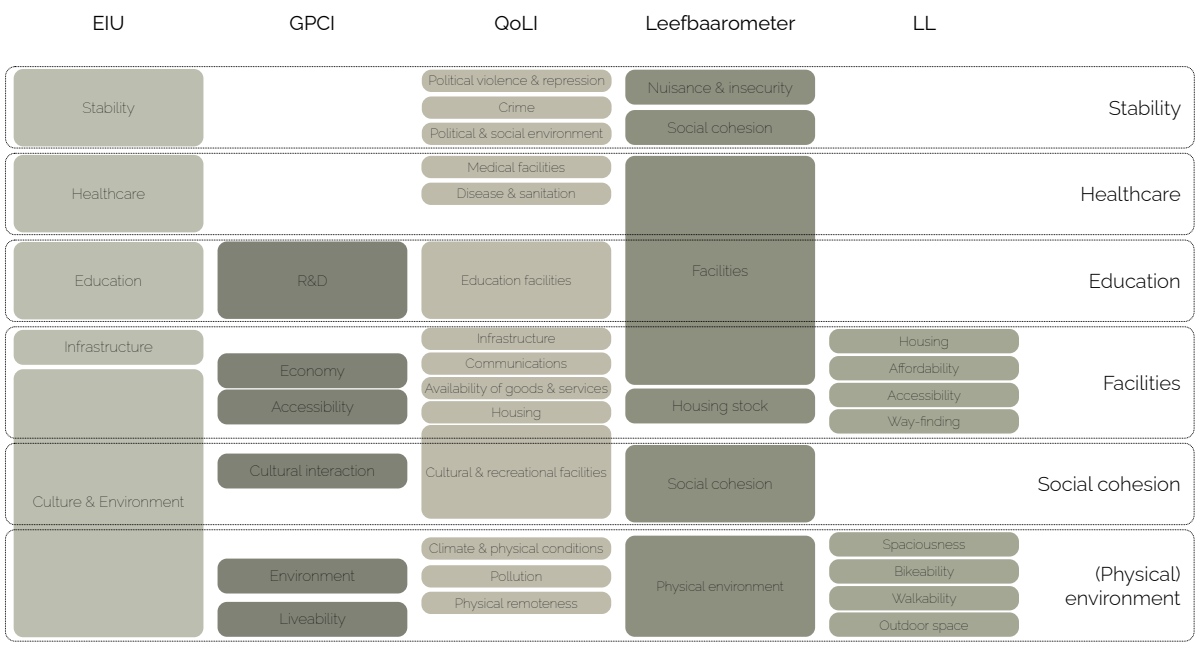


Image 2.2 The compiling of the liveability index

the designs that need to be measured are not executed, the effect cannot directly be measured in existing data or by interviewing inhabitants. As a consequence, there is a need for more specific spatial characteristics that can test the effect. To compensate for this, the liveability index on the built environment by Southworth (2003) is used. Southworth (2003) has researched the effects of the built environment on liveability and from here defined different measures that affect the liveability. Together different indicators from these six frameworks are used as indicators to be able to define liveability.

Altogether, this establishes the following framework (Image 2.3).

Liveability framework

1. Stability

_Violent crimes
_Destruction
_Disturbances
_(Experienced) nuisance and insecurity
_Threat of terror and conflict
_Level of political freedom
_Natural hazards (flood, fire earthquakes etc.)

2. Healthcare

_Availability of healthcare
_Quality of healthcare
_Availability of over-the-counter drugs
_General healthcare indicators
_Distance to health care

3. Education

_Availability of private education
_Quality of private education
_Public education indicators
_Distance to education

4. Facilities

_Quality of road network
_Quality of public transport
_Quality of international links
_Availability of good-quality housing
_Quality of energy provision
_Quality of water provision
_Quality of telecommunications
_Job possibilities
_Accessibility of nutricious food and drink
_Leisure and culture

5. Social cohesion

_Diversity life phases
_Population density
_Mutation rate
_Development households
_Social cohesion
_Tolerance
_Social or soft spaces

6. (Physical) environment

_Mixing of functions
_Green space (quality, proximity and accesibility)
_Water (quality, proximity and accesibility)
_(Micro) climate (heat stress, noise, air quality, wind, sun and shadow humidity)
_Accidents
_Car density
_Abandoned buildings and waste space
_Pedestrian acces, routes, conflicts
_Bicycle access
_Maintenance
_Proximity & quality of public or shared space

Image 2.3 The liveability Index (dimensions & indicators)

3. Urban agriculture

Urban agriculture is the act of producing food and the activities surrounding this, in intra-urban or peri-urban areas. It concerns the production of food and materials, as well as related processes such as distribution and packaging (Mougeot, 2000). Urban agriculture is integrated in the urban ecosystem (Dubbeling et al., 2009)(Mougeot, 2000). It does not form a separate program that is being executed inside the boundaries of the city, instead it is related to social, economic and environmental flows and systems.

The definition of urban agriculture is broad, and thus it can take shape in many different ways. Mougeot (2000) defined six main components of urban agriculture, which determine this shape (image 3.1):

Activity

Types of economic activities are the processes taking place in the system such as cultivation, processing and trade (Mougeot,2000).

Product

While most urban agriculture sites focus on the production of food for either people or livestock, some sites focus on raised food products such as (medicinal) herbs or the keeping of livestock. Lastly there are decorative or agro-industrial production sites (Mougeot,2000).

Location

The different density and spatial characteristics of these city areas, create a significant difference in the type of urban agriculture that can be

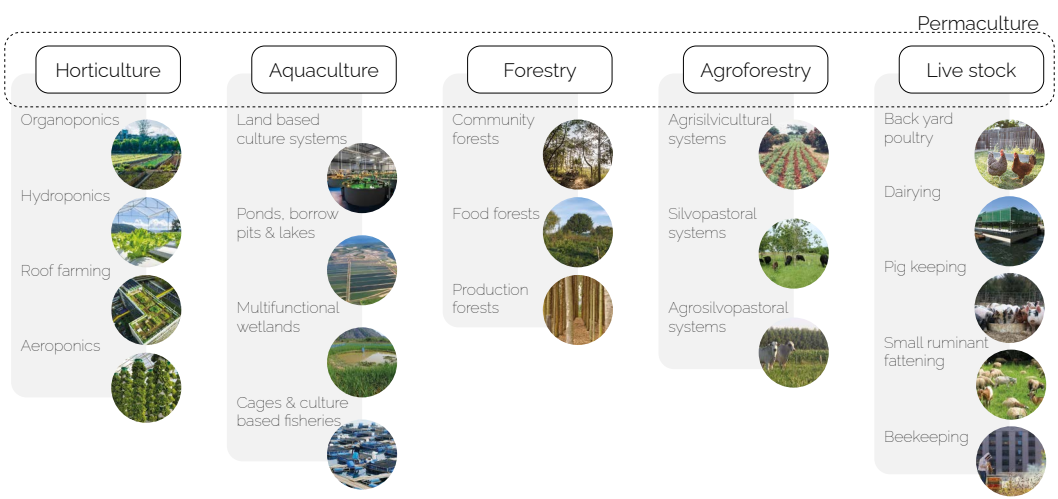


Image 3.2: Types of production systems (based on, de Zeeuw & Drechsel, 2015; Clark & Nicholas, 2013; Nair et al., 2021) [2-19]

implemented at these locations (Mougeot,2000). This research will focus on intra-urban spaces.

Area

The type of area can be defined by many different characteristics: built or open, public or private, lease or owned, indoors or outdoors (Mougeot,2000). All characteristics influence the design possibilities as well as the effects.

Destination

The product destination defines whether food is for personal use, or for commerce (Mougeot, 2000). This also defines the different economic systems behind the production site.

System

Looking at production methods, there are five main types of production systems (Lwasa & Dubbeling, 2015) (image 3.2). Each system creates different produce. Horticulture is used for most vegetables, herbs and some fruits. Forestry produces fruits, agroforestry forms a combination between horticulture and forestry and thus can produce fruits as well as vegetables and herbs that grow well in the shade. Aquaculture is the production of fish, while live stock deals with all other animals and their products (Lwasa & Dubbeling, 2015). Noticeable, all these production systems are currently being used in cities. However, where horticulture and sometimes forestry and aquaculture are used in developed countries. Agroforestry and livestock are only found in the cities of less developed countries.

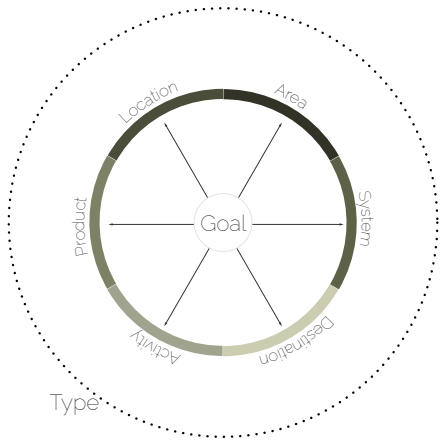


Image 3.1: Components of urban agricultural types

Lastly, the type of production system also influences the scale on which food can be grown or produced (Mougeot, 2000).

Goal

An important component of urban agriculture that Mougeot does not describe is the goal of the site. When reviewing urban agriculture in London, as well as different case studies, four main goals can be determined: food production, education, community and recreation (Despommier et al., 2020)(Appendix 1). Most sites strive for two or more of these goals. However, there seems to be a clear divide between interventions focussing on a high yield food production, and those that focus on community or recreation (Despommier et al., 2020)(Appendix 1).

4. Implementations

Different configuration of the urban agriculture components, creates a significantly different design, Image 4.1, compares "Growing Underground" to "Sitopia" and shows the difference these components can make (Growing Underground, n.d.) (Sitopia Farm, n.d.). Therefore, describing "the" form or style of urban agriculture is impossible. With the spatial effect and socio-economic effects differing this much, the effect of liveability will also differ per intervention and situation.

To be able to determine the effect on liveability and determine the main types of urban agriculture interventions, a collection of case studies is organised and compared (see Appendix 3 for an extensive overview). Some have been executed, some have not or were never meant to be (image 4.2). These case studies are examples on the architectural form and language of urban agricultural proposals. This leads to the question, whether there are consistent patterns and characteristics in architectural form and urban

Image 4.1: Variety in urban agriculture (left: Growing Underground [20], right: Sitopia Farm [21])

Image 4.2: The collection of case studies [22-53]

agriculture sites. These patterns or characteristics can be implemented into the design experiments.

In urban agriculture there is a high contrast in form and materialisation of projects. This can be defined as the more vernacular projects using recycled, reused and ecological materials, and the high tech projects, using glass, steel and sometimes concrete. A similar contrast can be found between open projects, sites where everyone can walk into, participate or visit and where workshops or other activities are organised to invite and educate people, and closed production centres, which are only opened for (paid) tours, that have high security, as to not spoil the crops, and do not share the discoveries made on site. Image 4.3 shows the interrelation between these two contrasts, showcasing a clear correlation between the open and vernacular projects in comparison to the closed high tech projects. There are a few outliers, that have both an open and high tech design. However, these are all research or design projects that have not been built.

At the same time, this pattern is related to the goal of the site as well. Image 4.4 emphasizes all sites whose goal is to create a high yield production centre. With the exception of a few outliers, these projects are all closed and hight tech. This seems to indicate that projects focused on production, do not interact with the surrounding urban fabric.

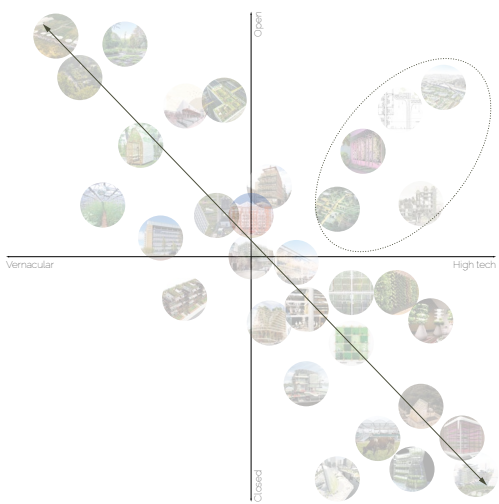


Image 4.3: The relation between style and character

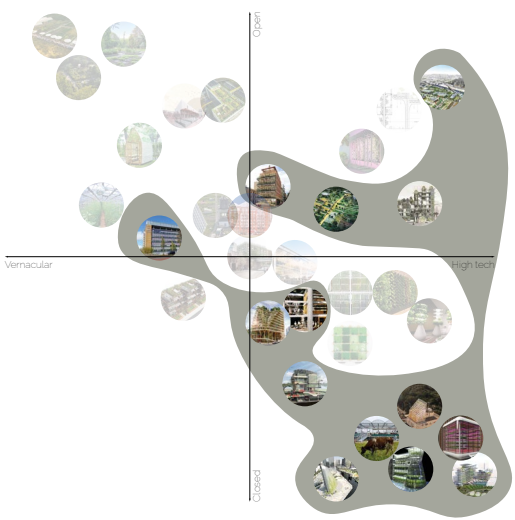


Image 4.4: Sites with a high yield production goal

The case studies also occur on multiple different scales, There are small interventions which can be moved around, or situated anywhere, independently from the context. These interventions are referred to as "furniture". Then one scale up, there are the "built" interventions. These consists of projects on the scale of a building. They can be complete buildings, façade or roof interventions, or even part of a building program. Compared to furniture, they are more context dependent and less flexible in their execution. The largest scale is "spatial" these are the interventions that consist of (semi) public space. They are outdoors, and are highly context dependent. They can scale up to city wide plans. However, none of the case studies are on a higher scale than the neighbourhood. Image 4.5 sorts the case studies to these scales. This makes clear that the scales are not completely fixed. There are case studies that fall into two or even all scales.

The last analysis focuses on the relation between scale, character and style (image 4.6). The comparison shows the most open and vernacular projects all being spatial projects. All furniture is high tech design, with most of it also falling in the closed category, as they form a part of specific material developments or research that is not being shared with outsiders. Buildings form the most diverse group as they are both vernacular and open as well as high tech and closed.

Image 4.5: Organisation of projects and scale

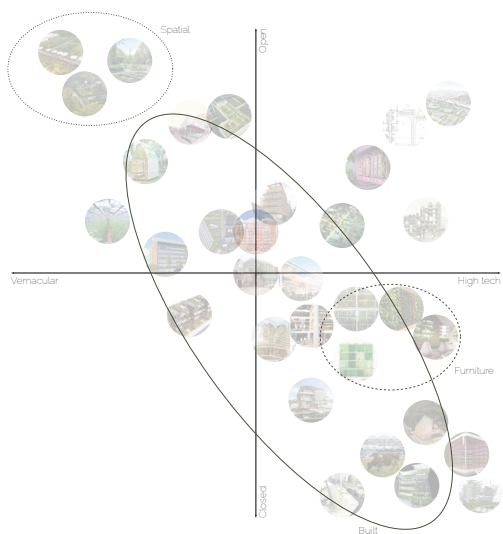


Image 4.6: Relation scale, style and character

5. Strategies

A Strategy

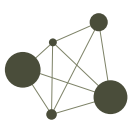
As discussed before, the type of urban agriculture is determined by six components. An important seventh component that plays a central role in the type is the goal. It determines the role and importance of the other factors. The different components affect each other, how is partly defined by the goal, but more importantly by the strategy or vision on urban agriculture (Image 5.1). The strategy can be seen as the determinant factor between the different components of urban agriculture. It determines the consequences of the goal and how this influences the different components of urban agriculture. Next to that, it determines the influence the different components have on each other. It values the consequences of the components and steers the outcome. Throughout these examples and in literature, there are five main visions and strategies that envision the implementation of urban agriculture:

Image 5.1: Strategy as urban agriculture components

Vertical city farming

Transformation

Continuous productive urban landscapes



Smart cities

Sitopia

Image 5.2: The five main strategies of urban agriculture

Vertical city farming

Vertical city farming is a strategy in which food is produced inside the city in buildings. These vertical farms have as purpose to turn as high of an agricultural yield as possible in a controlled environment free from the effects of climate and pests. Inside these farms hydroponic or aeroponic systems will be used as opposed to the conventional production in soil. Clear consequences of vertical farming are the reduced use of space outside of the city, leaving agricultural lands to return back to nature and restore the now damaged ecosystems. Secondly, these means of production have a significant lower transport distance, lower use of water, but a higher energy need. Vertical city farms are still highly dependent on intensive fertilizer and are not suitable for livestock as the keeping of animals in enclosed buildings is inhumane (Steel, 2020)(Despommier et al., 2020)

Image 5.3: Vertical City Farming [54]

Transformation

Transformation is the act of changing a building or public space to accommodate urban agriculture. This is done by adapting the roof, façade of a building, or the function of a building or public space. Classic examples of this strategy are the greenhouses on roofs, facades or in public spaces (Appendix 3). Transformation strategies, if implemented top-down are most often part of gentrification projects. Urban agriculture is implemented as a means to make the existing space more green, attract new inhabitants or create a meeting point for fragmented communities. Projects that are created bottom-up, such as Prinzessinnengarten in Berlin, are focused on the existing inhabitants, their public space and food access (Atelier groenblauw, n.d.)(Appendix 1). Both forms have a clear social character, but a different approach to the stakeholders. The transformation strategy characterises itself as a pinprick strategy, it has little to no relation to the rest of the city, and urban agriculture is a means to improve the living quality of a building or area. As a result, small urban agricultural interventions implemented in new buildings also fall under this strategy. Most transformation interventions come from a sustainable perspective, which often translates to re-useable or recycled materials. Specifically bottom-up projects use this materialisation due to their low budget. This leads to a more vernacular style which is most prone in spatial projects (Appendix 3).

Image 5.4: Transformation [34]

Continuous productive urban landscapes.

Continuous productive landscapes, or CPUL in short, is the strategy of creating a network of multi-functional open urban spaces. The term "productive" in CPULs refers to more than food production. The open landscape is productive in the economic, social and environmental sense (Viljoen et al., 2005). Therefore, the landscape consists on urban agriculture, commercial and recreational public spaces, ecological corridors, natural spaces and a vehicular free infrastructure (Bohn & Viljoen, 2010). In CPUL there is place for both high yield commercial cultivation and personal gardening. More than a form of local food production, CPULs are seen as a "natural pocket" or "route" inside the city, which connects it to the surrounding natural landscape. They form a place of leisure, recreation and reflection (Viljoen et al., 2005). CPULs do not intent to erase the existing urban network. Instead, it builds on and over the existing network. However, inside the CPULs there is little space for cars. Instead the focus will be on slow traffic. This is key to create healthy vegetation, but also leads to silent, smell and pollution free spaces (Viljoen et al., 2005). As such, the CPUL strategy concerns not only a landscape and program, but more importantly an ambience and the creation of multiple ecosystem services.

Image 5.5 Continuous productive urban landscapes [55]

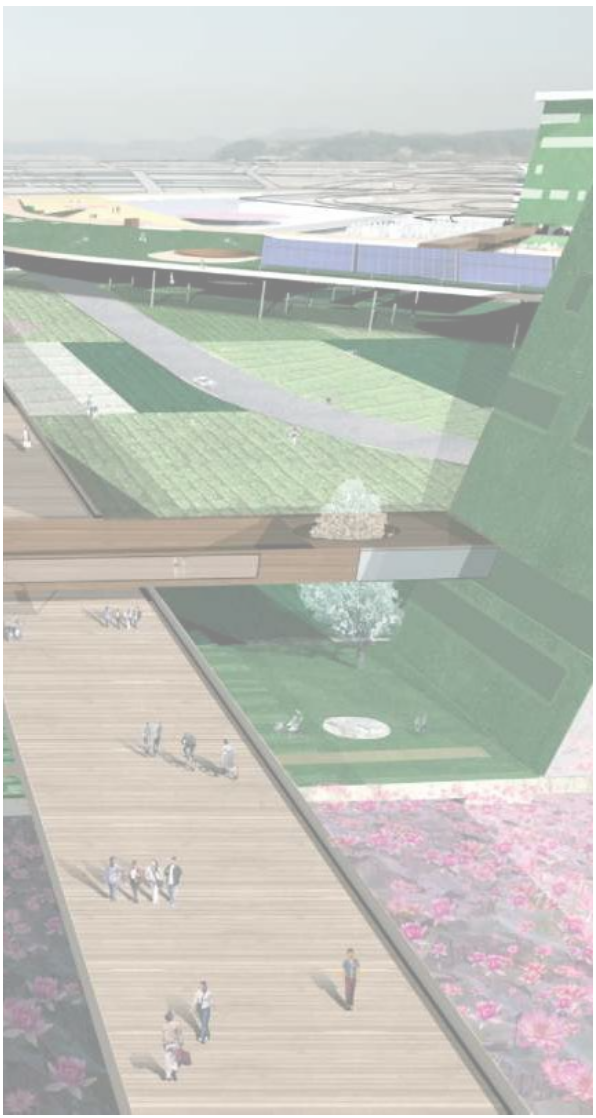


Image 5.6: Smart cities (Lim & Studio 8 Architects, 2007) [56]

Smartcities

Smarticities focus on creating a harmonious integration of nature with built form, instead of conquering nature or protecting the original state of nature (Lim & Liu, 2019). At the core of the smartcity is the transformation of infrastructure. By removing the car and replacing this with "podcars". This creates space for new urban landscapes, with the key landscape being urban agriculture (Lim & Liu, 2019). Urban agriculture is an important connector in creating a circular or closed system. Smartcities define different urban agricultural landscapes, from aquaculture, kelp farms, life stock keeping and orchard hubs. All of these have their own place in the food-water-energy-waste system. Characteristic of this strategy is the utopian vision on not only a new system, but also a new socio-economic structure, infrastructure and design or form. The new style and the aesthetic of the "farming carpet" should also encourage agrotourism, strengthening the socio-economic structure (Lim & Liu, 2019).

Sitopia

Sitopia cannot be directly translated into a spatial characterization, Instead it is more of an utopia, a vision on the relation between people and food. Sitopia is the idea of using food to reconnect no other humans and non-humans. It is also food as a method to understand what being human means (Steel, 2020). An important part of this vision are the sitopian economics: cheap food cannot exist. To improve the food system, food should be valued appropriately, as the cheap food that is produced of as now, cannot produced in a healthy and sustainable way. Sitopia sees food as the core of our society and the food system and the only method to improve the food system is strengthen the relation between humans and the food system. This act will solve the problems of the food system, and urban agriculture should play an important role in this (Steel, 2020). However, it is not only about new or different production methods, but also about the policies in place, the diet and education (Steel, 2020).

Image 5.7: Sitopia (Escofet, 2019) [57]

Overview & relations

Image 5.8 shows a comparison between these visions. Sitopia focuses on a way of living, a vision on our economic system, our relation with food and our valuation of food and our planet. As such it does not create specific spatial design or strategy. Therefore, sitopia can be the way of living in which transformation, CPUL, smart city or vertical city farming strategies are being implemented. Consequently, the other four strategies are organised from vernacular to high tech, with sitopia situated above it as incomparable vision. All strategies have multiple goals, ranging from community to food security, and education to environmental recovery. Where CPUL, smart cities and vertical farming a top down and designed method, transformation is more often bottom up. The visions also differ in scale and materialization.

Case studies

The strategy can be seen as a guideline. However, it is not completely responsible for the outcome. As a consequence, the designs using these strategies can still have a significantly different design and sometimes impact on the environment. Image 5.9 shows the division of the case studies among the strategies and demonstrates the variation between different implementations. Some of the case studies fall under multiple strategies.

All examples can be shared below these four strategies. Interestingly the examples that fall under multiple strategies are research or design projects that have not been executed (image 4.2 p.25).

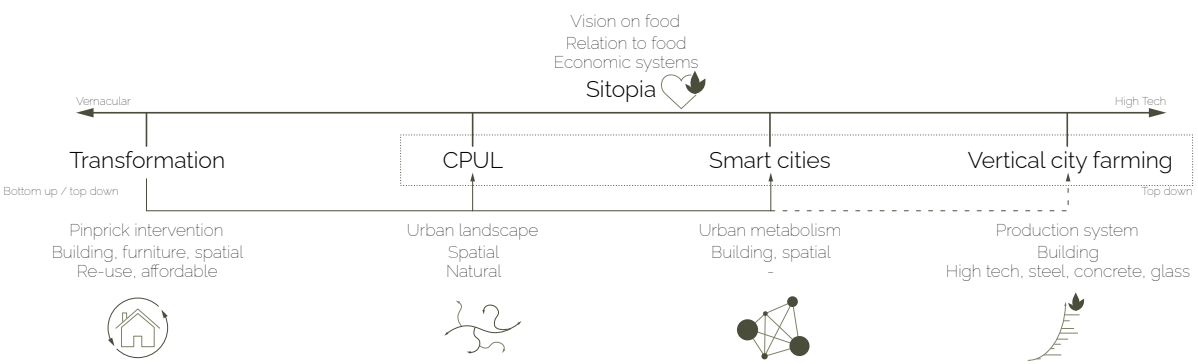


Image 5.8: Overview strategies and characteristics

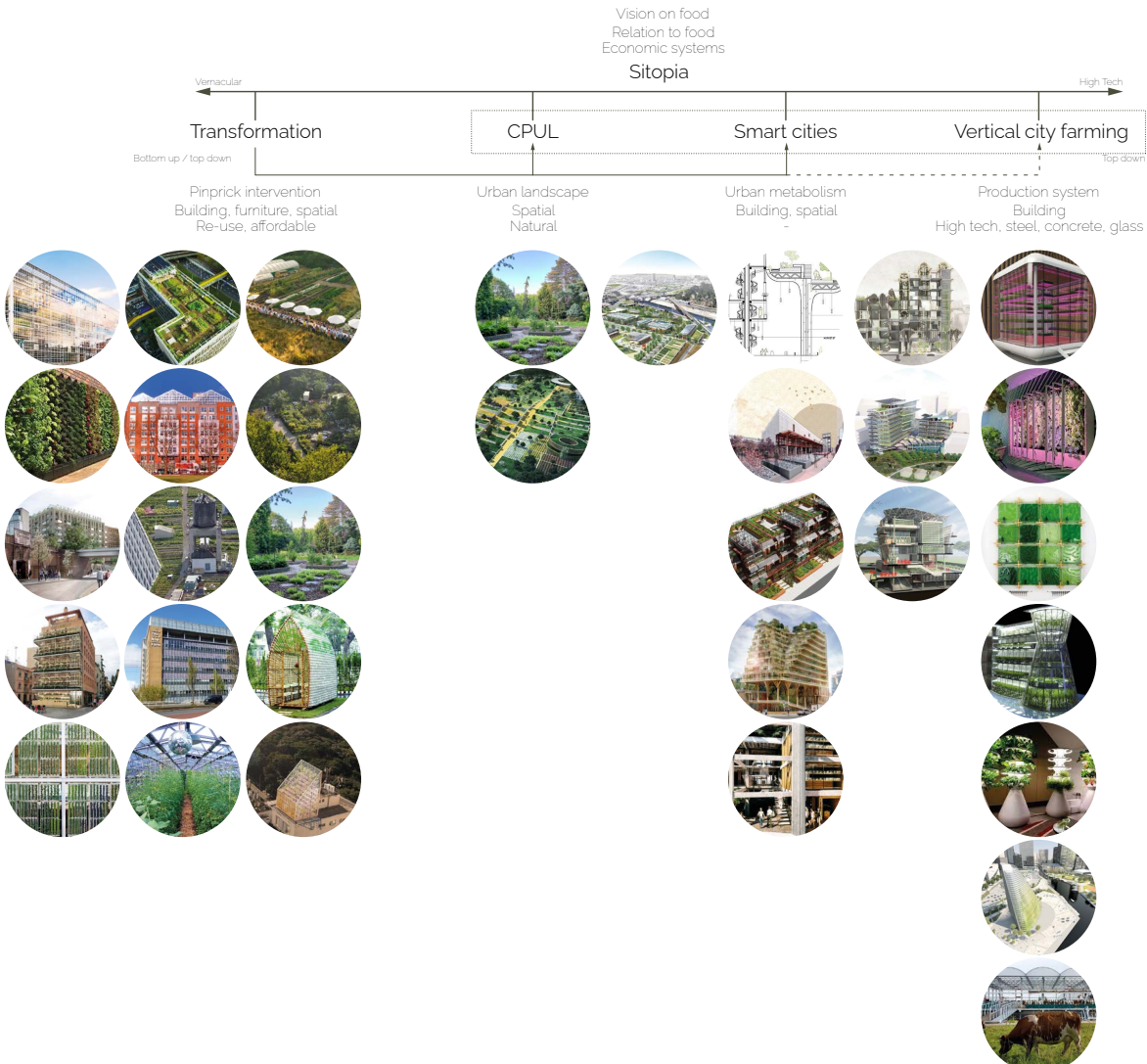


Image 5.9: Relation between strategies and case studies

6. Design experiments

The previous chapter described the five main strategies in urban agriculture. To be able to evaluate their effect on liveability and compare the different strategies, their spatial consequences should be determined. Since Sitopia determines a way of living and does not have any clear spatial guidelines, it will not be used in the experiments. Instead the focus will be on VCF, transformation, CPUL and smartcities.

The experiments include a variety of design proposals that focus on the main characteristics of the strategies. All experiments have been designed on the neighbourhood scale. This

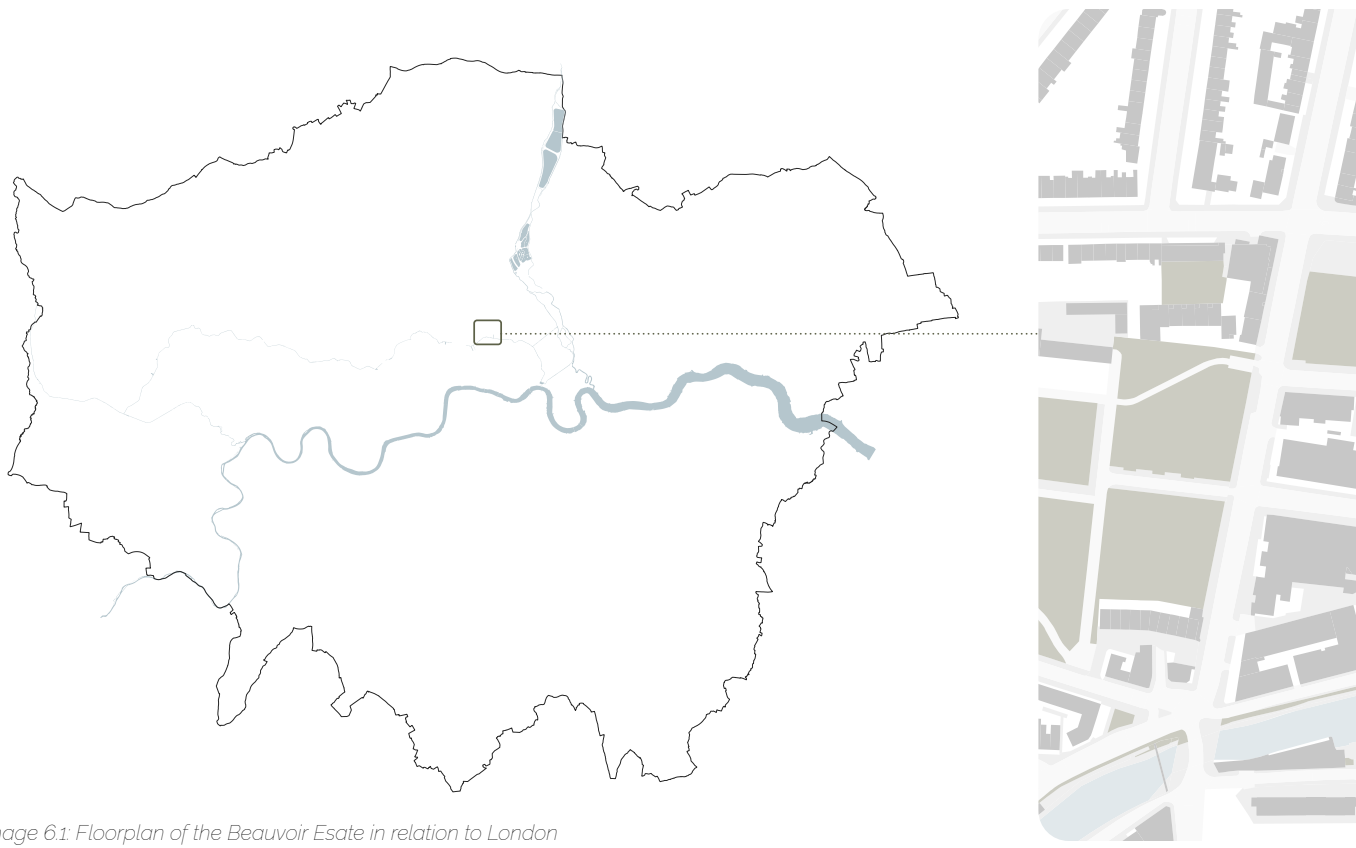


Image 6.1: Floorplan of the Beauvoir Esate in relation to London

to make them more comparable as switching between built, neighbourhood and city scale would also affect different and larger or smaller groups of stakeholders. Next to that, since the detail level of each scale is different, the spatial effect will be more difficult to determine. Thus focussing on the neighbourhood scale ensures that the effect on different public space typologies and different building space typologies are taken into account.

For the design area, the Beauvoir Estate in Hackney, London is chosen. This site is of interest due to its currently low liveability standards (CDRC, 2019). It

is characterized by the 1960 council homes, the open public spaces and the connection to the Regent's Canal. Appendix 4 includes pictures of the Beauvoir Estate and direct surroundings for a more in-depth overview of the site

Next to an urban plan, each design proposal consists of a schematic section, and a perspective sketch. For each proposal the most relevant view is chosen. The positioning of the views can be found on page 36.

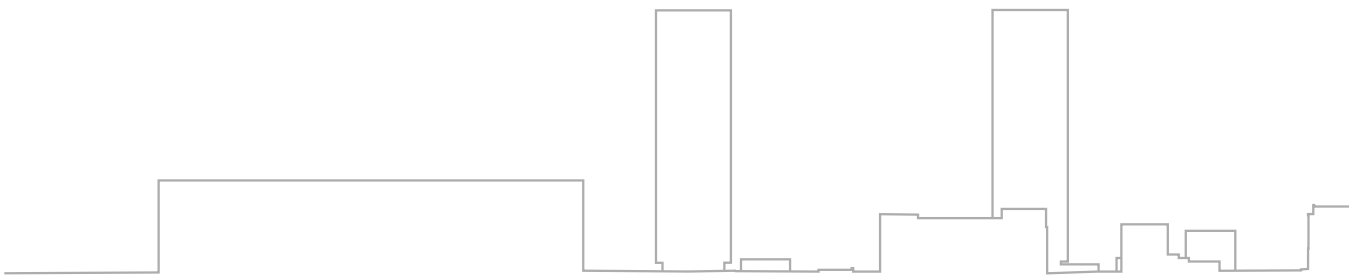


Image 6.2: Schematic section of the Beauvoir Estate

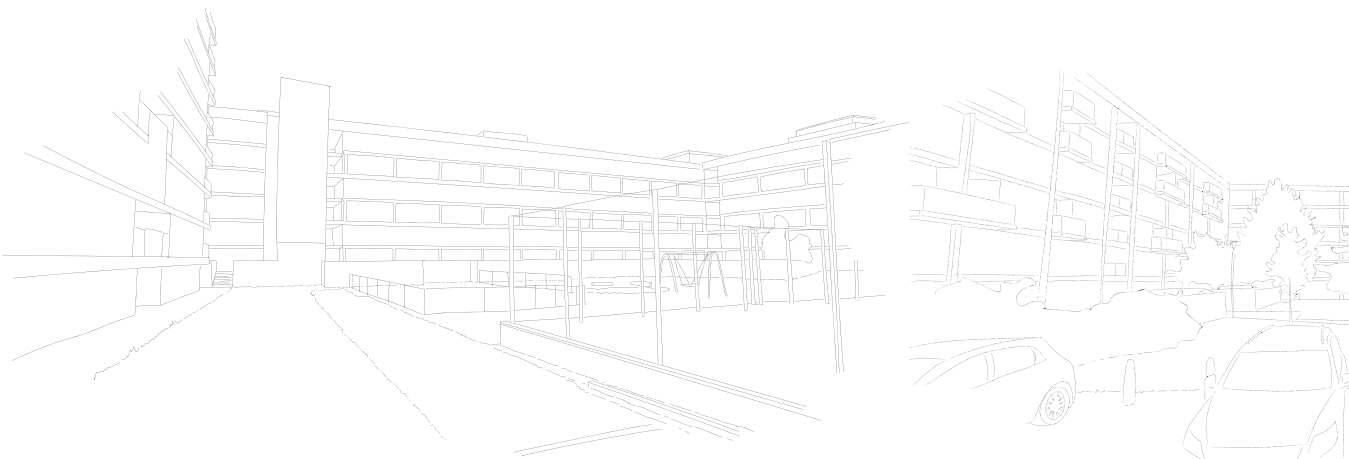
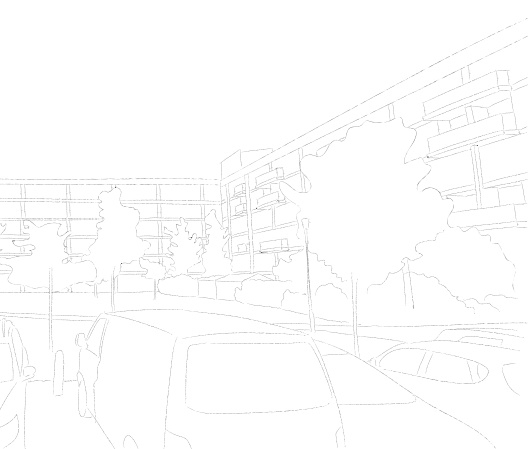


Image 6.3: Perspective sketches of the Beauvoir Estate, numbered 1-3 from left to right



Repurpose existing flats

Image 6.4: Schematic section repurpose

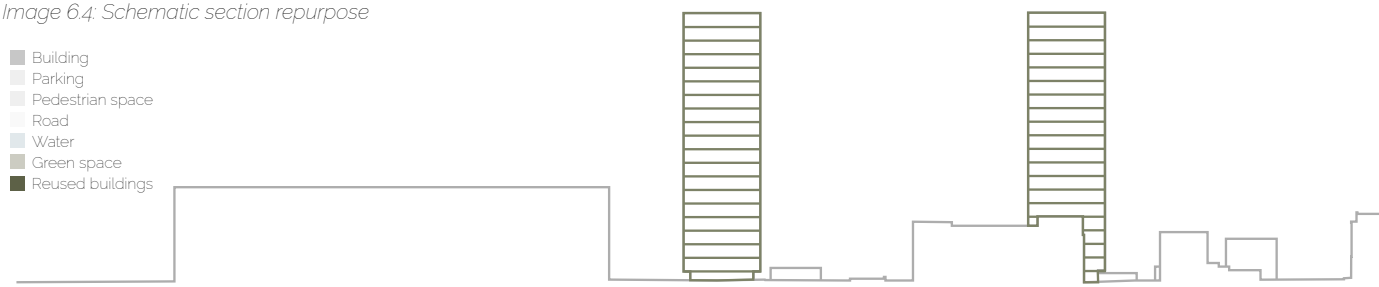


Image 6.5: Urban plan repurpose

This proposal consists of stripping the existing five towers and transforming them in indoor production centres. Thus, the built environment will not densify further. Instead, the amount of residences in the estate is significantly reduced. The new program will increase the amount of traffic in the area. The towers are already well connected to the infrastructure and have enough

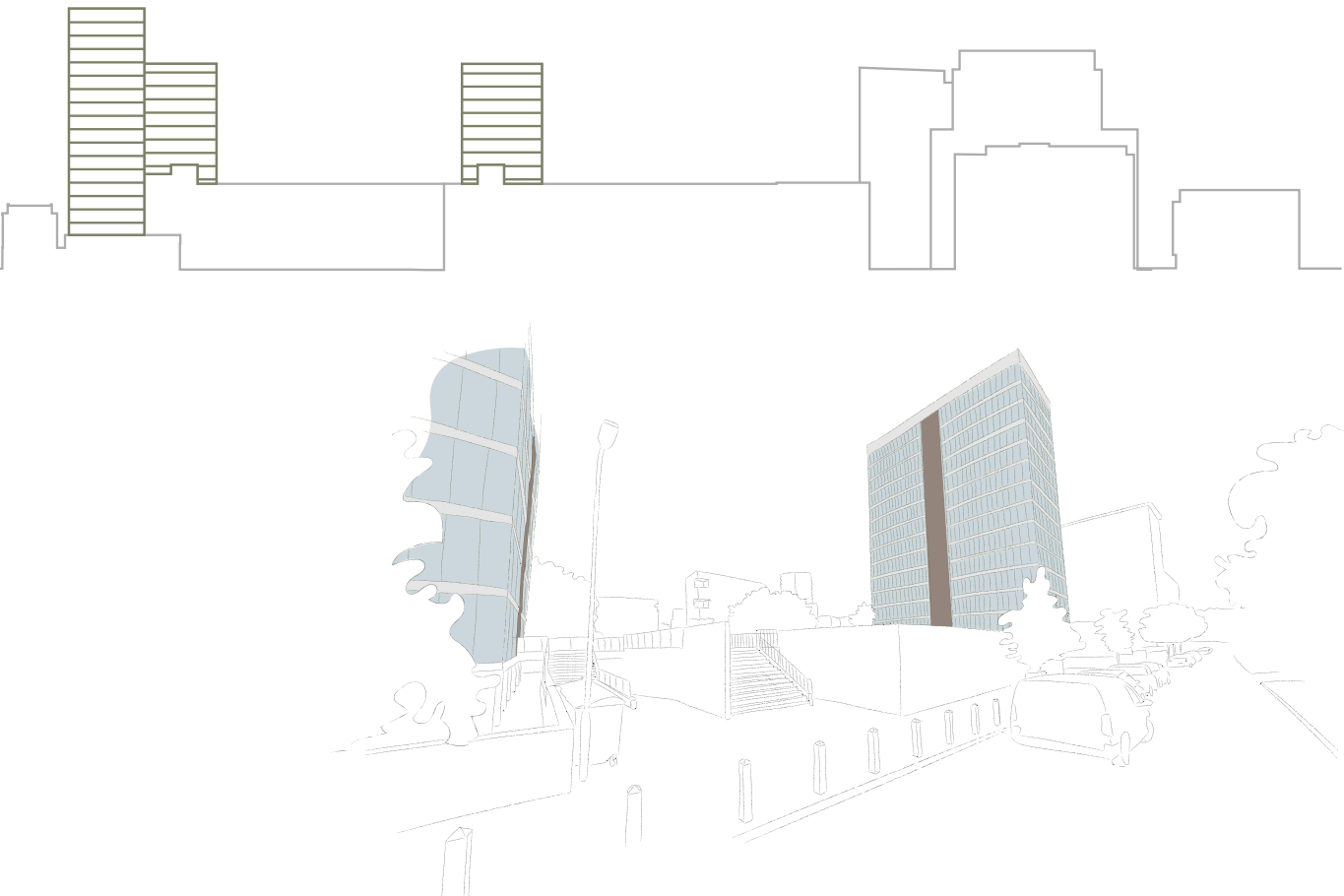


Image 6.6: Sketch perspective view 3 repurpose

parking space surrounding them, to allow for the increased transport. Fitting with the case studies, a modern high-tech materialisation is chosen, which contrasts with the existing buildings. Even though the materialisation of the proposal is open, the buildings itself are not public domain.

Image 6.7: Schematic section VCF towers

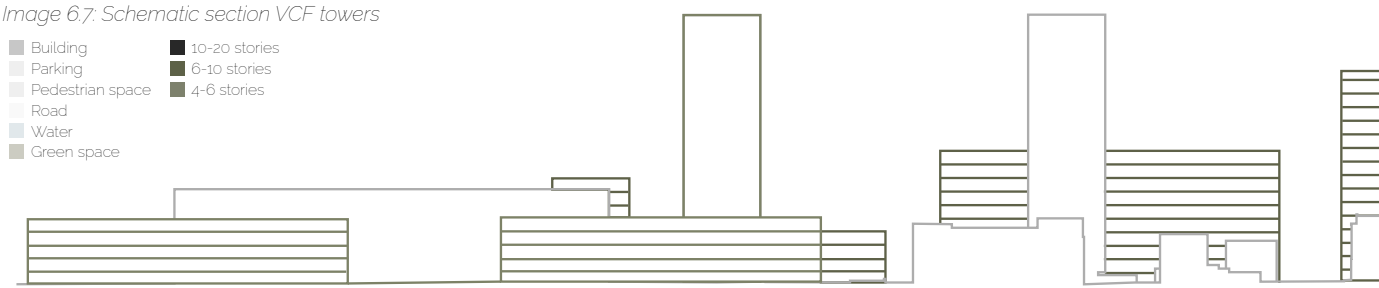


Image 6.8: Urban plan VCF towers

This design includes multiple new buildings destined for indoor production. They are placed in the public spaces. Therefore this is a form of densification, but instead of residences, production program is added. The buildings are placed wherever possible, with variety in height to prevent to reduce the shadow effect on the existing blocks. The forms are based on the main

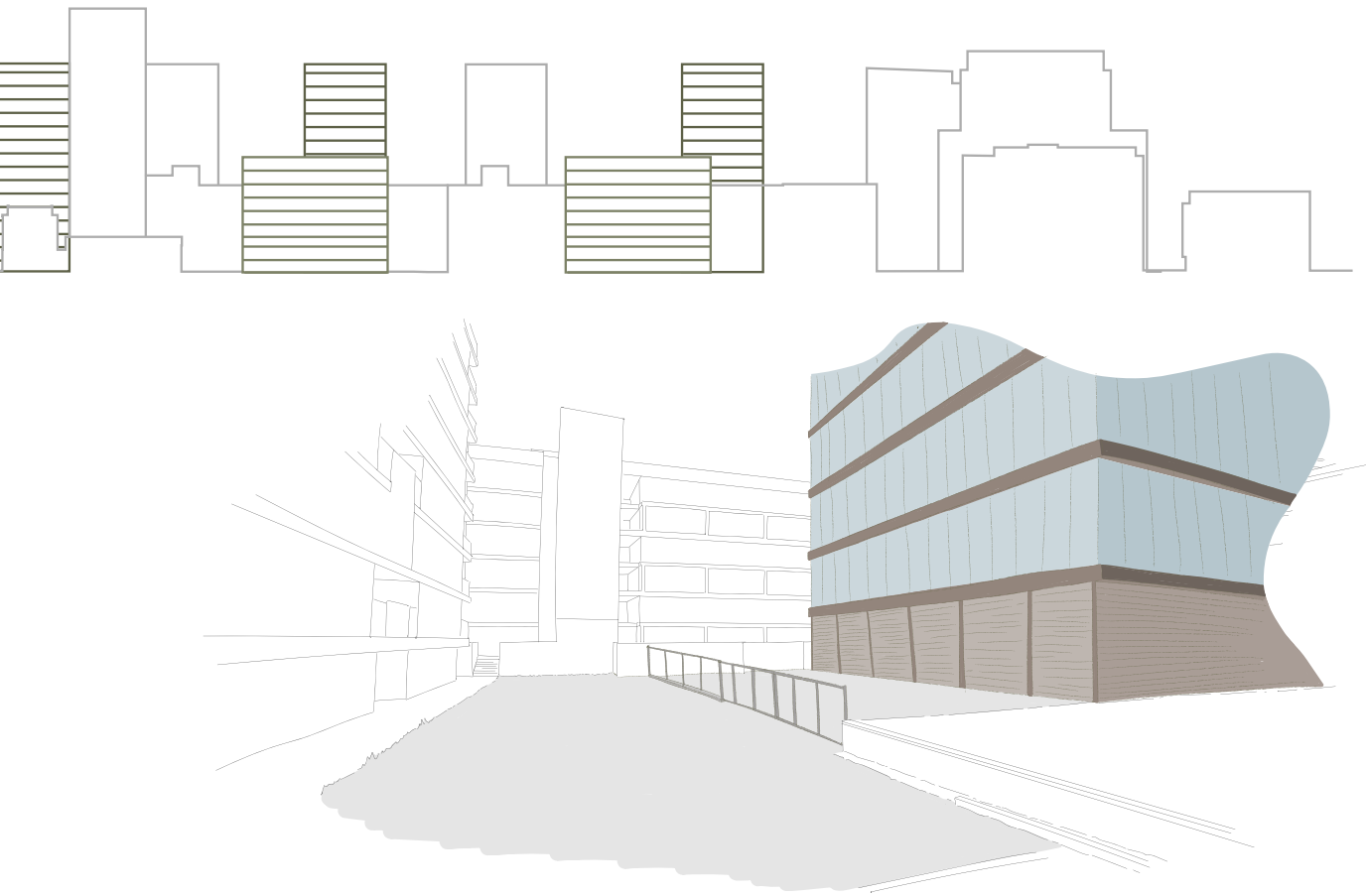


Image 6.9: Sketch perspective view 1 VCF towers

existing grid lines and the orthogonal character of the place. The new buildings and program will lead to an increased need for infrastructure as well as a more intensive use of the current road system.

Due to its closed character, the inhabitants of the estate and the production centres will function as two independent and unrelated systems.

Green roofs

Image 6.10: Schematic section green roofs

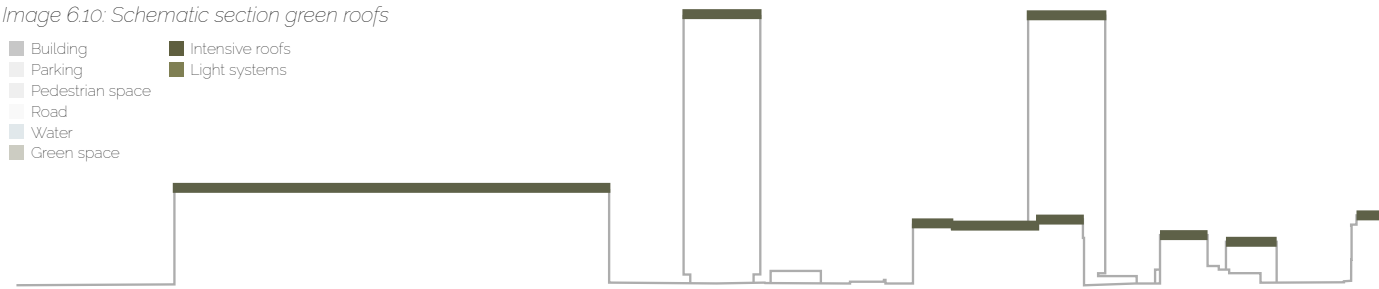


Image 6.11: Urban plan green roofs

All flat roofs in, and surrounding the estate are transformed into green roofs. Most buildings consist of light systems, which is the addition of planters to the roof. These are more lightweight and better adaptable for most roofs. The other buildings have intensive systems, which means soil is added on top of the existing roof, and produce is farmed directly on top. The buildings where this is done are suitable for this due to their stronger construction, and existing vertical transport. With

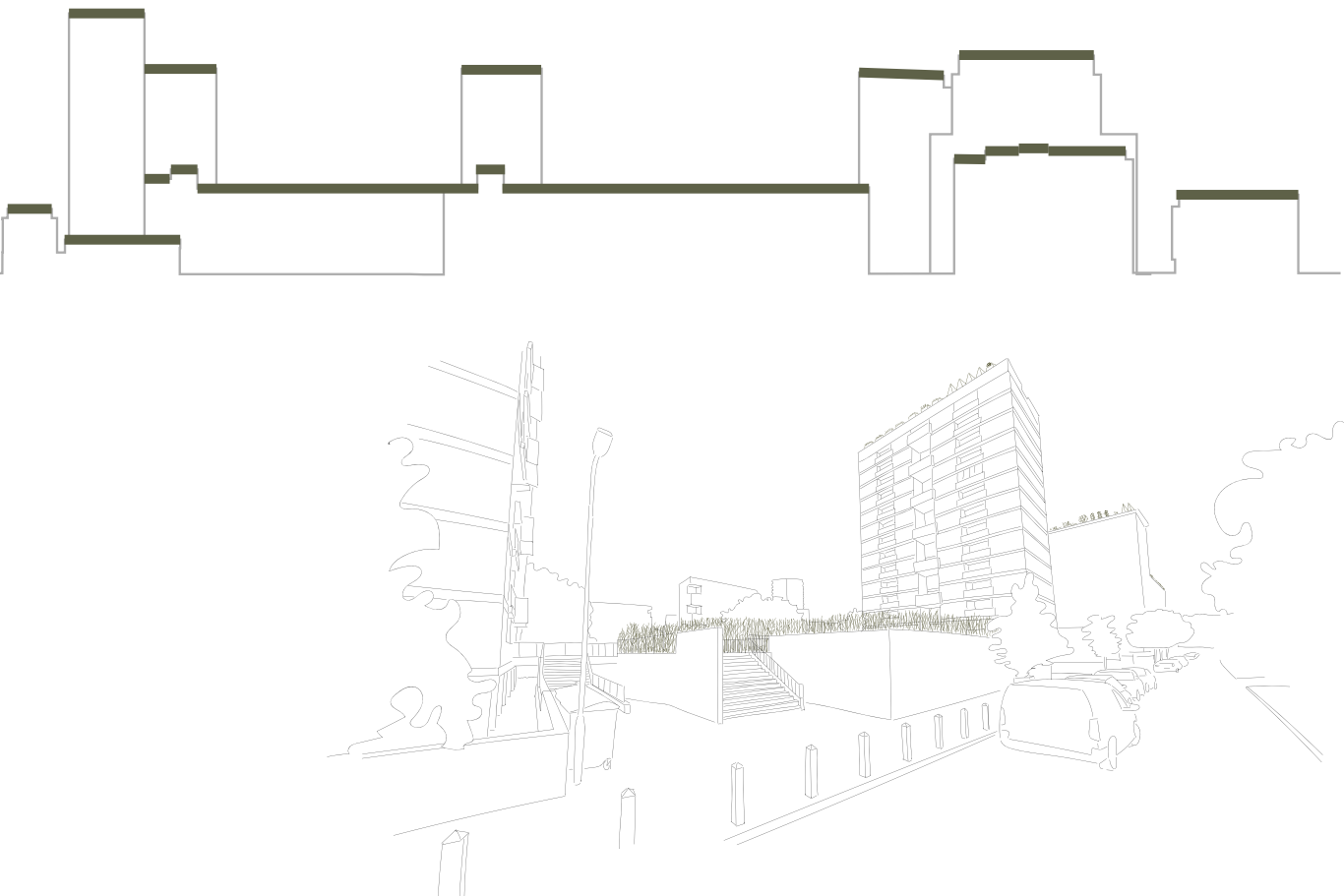


Image 6.12: Sketch perspective view 3 green roofs

the exception of the lower platforms, most of the new green roofs will not be experienced by inhabitants. Here the choice is made to have the intensive roofs managed by companies to create a higher yield, whereas the light system roofs can be seen as communal territory. This creates some social value. This strategy maintains the existing public spaces, but due to the height, the influence of the green roofs on the urban micro-climate is lower.

Greenhouses

Image 6.13: Schematic section greenhouses

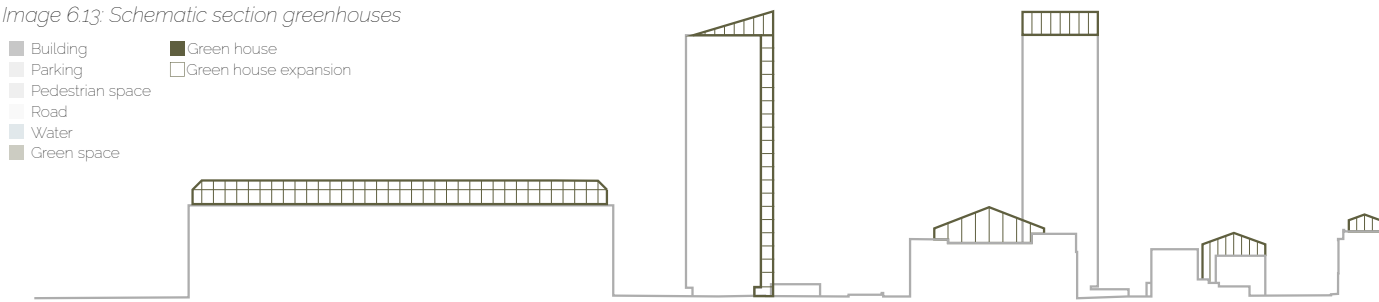


Image 6.14: Urban plan greenhouses

Two different forms of greenhouses are used in this design proposal: Additions to the roof of the building and greenhouses that cover the façade and roof. The addition of new structures to the building can change the quality of the residences, the greenhouses can be used to reduce heat loss, but the facades that are covered in greenhouses also reduce the direct solar light inside the homes.

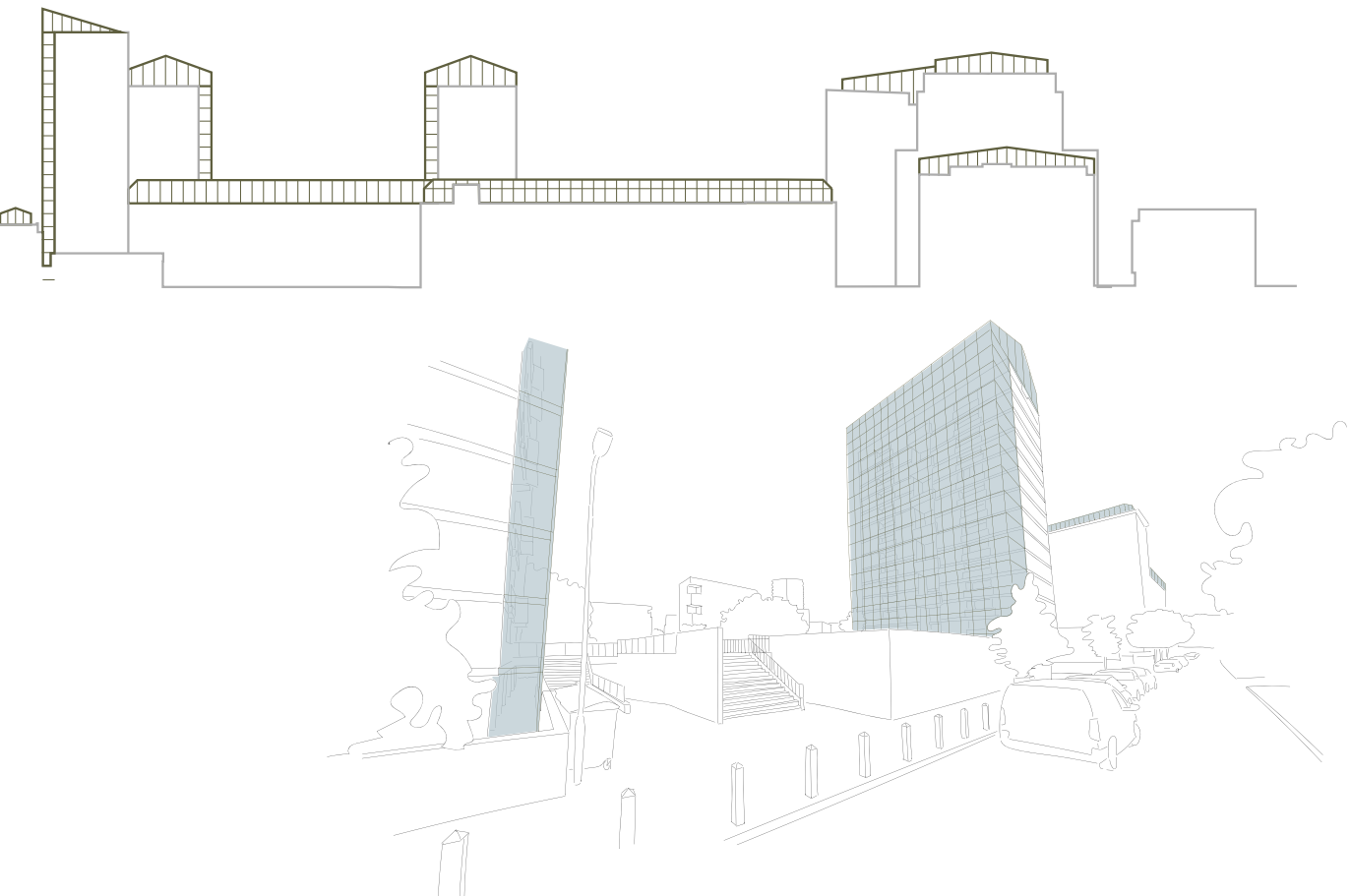


Image 6.15: Sketch perspective view 3 greenhouses

With the green spaces being covered, little effect is created on the urban micro-climate. In this proposal, part of the greenhouses are used as communal gardens. The shelter created by the greenhouses, makes the roofs a more comfortable common space.

Production facades

Image 6.16: Schematic section facades

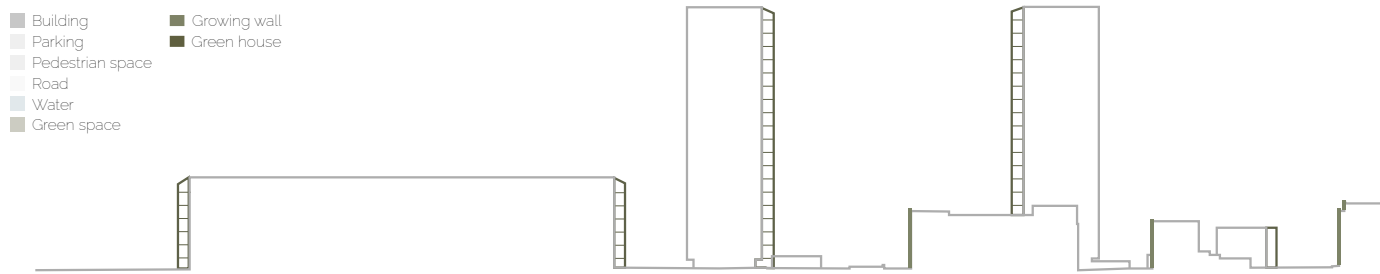
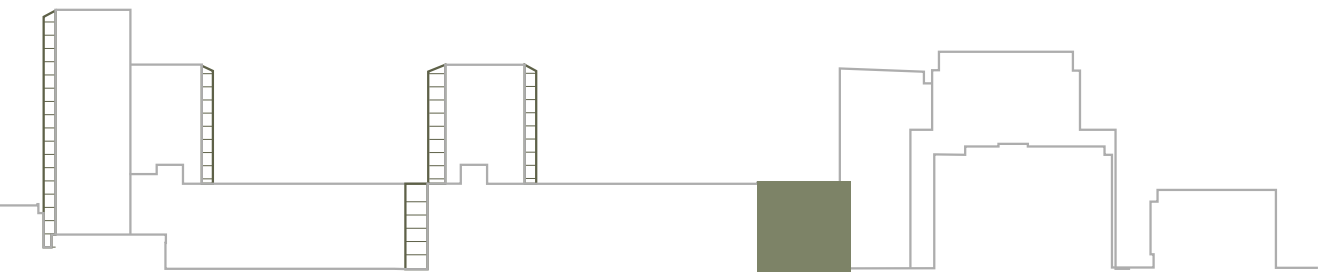


Image 6.17: Urban plan facades

This design consists of green facades, where crops grow outdoors and greenhouse facades, where crops grown in a controlled environment. The facades are oriented towards the sun, as to allow the produce to grow. As a consequence, not all facades used are blind facades. Where these new constructions do help with insulation and climate control, they also prevent natural ventilation, and



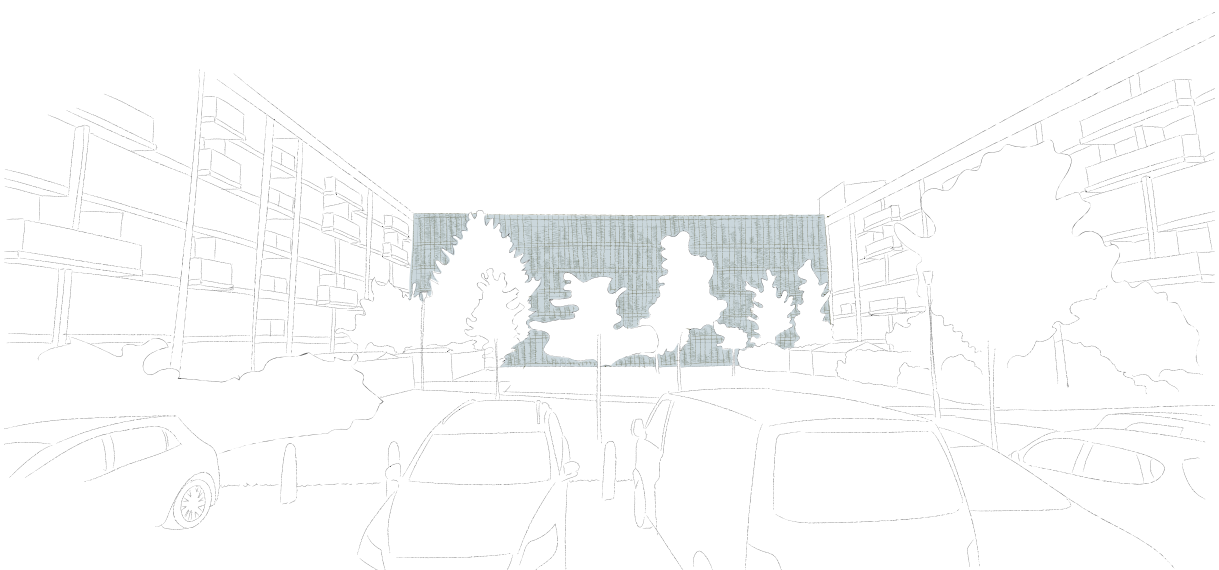
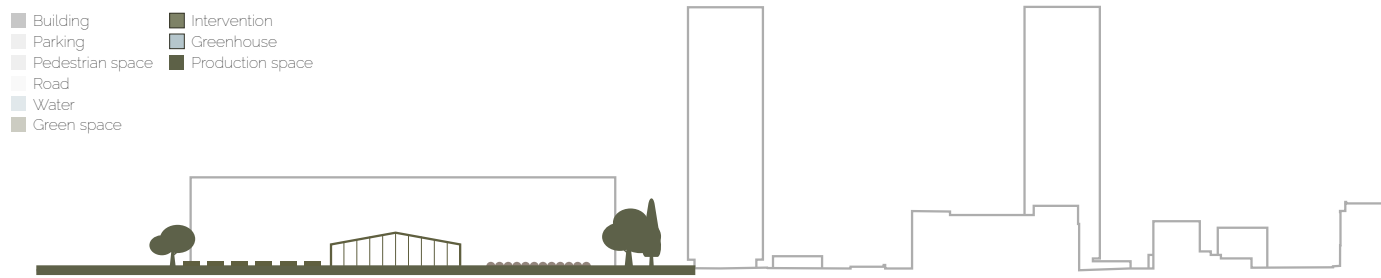


Image 6.18: Sketch perspective view 2 facades

direct daylight, reducing the quality of some of the residences. The vertical systems, make it difficult for all residents to interact with the production systems. The new green facades do improve the urban micro-climate.

Image 6.19: Schematic section public space interventions



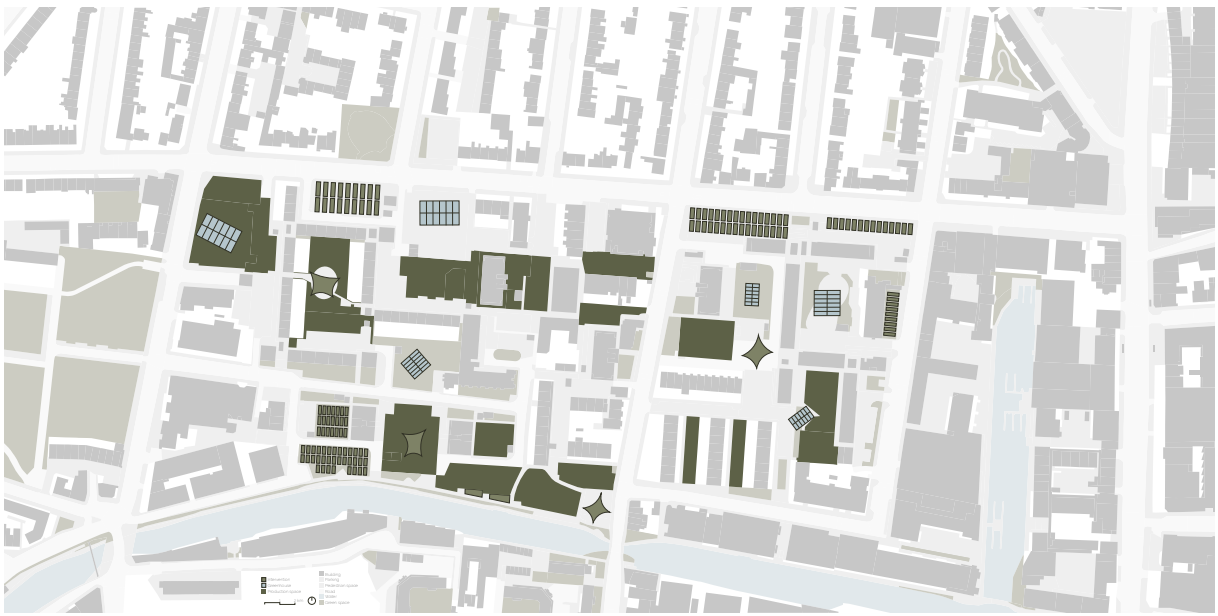


Image 6.20: Urban plan public space interventions

The proposal combines different spatial and urban strategies as seen in the case studies. Key in this are small communal green houses, with surrounding public space; communal gardens; shelter spaces and allotments. The goal of the design is to create different social spaces. The program, but also the size of spaces should help with natural interaction as well as the organisation of meetings and

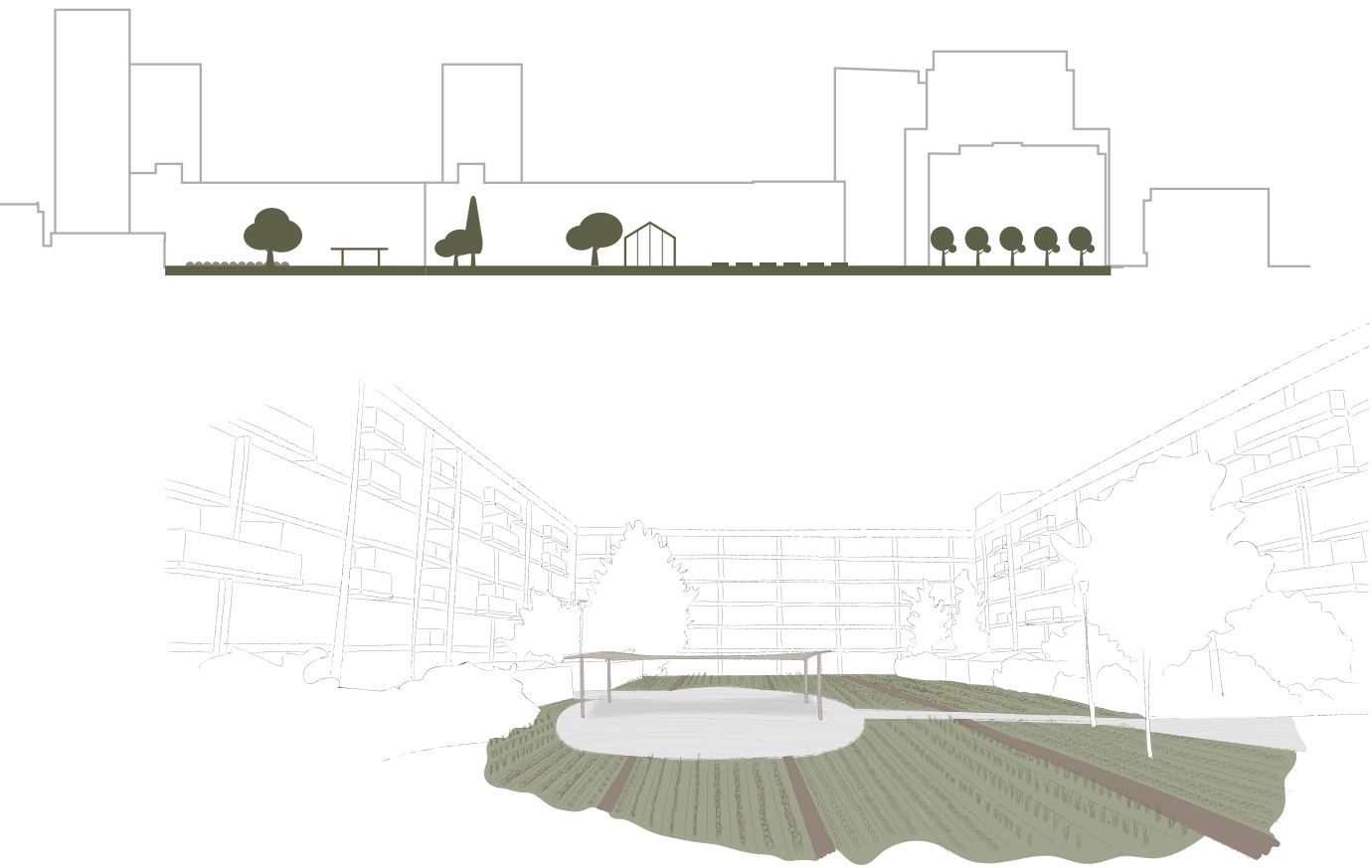
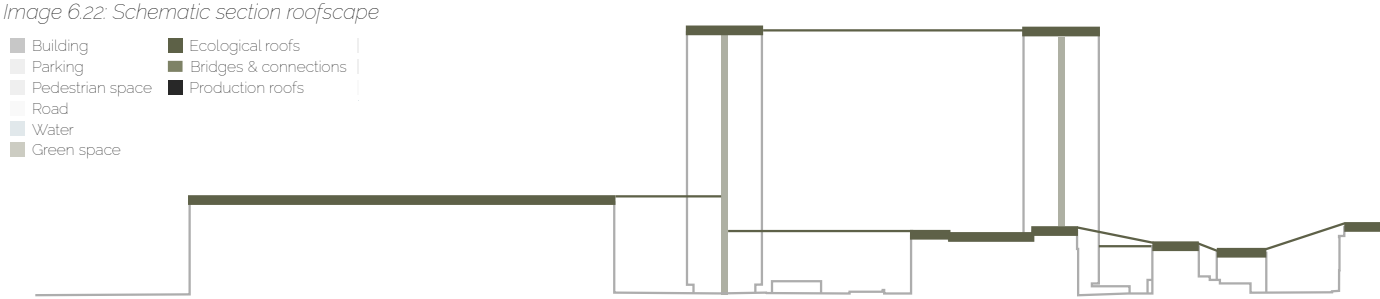


Image 6.21: Sketch perspective view 2 public space interventions

activities. The greenhouses can be used to grow seedlings, which can later be planted. As such it also has a more educational function. The overall yield of the sites is low and inhabitants will only be able to grow a small part of their daily needs.

Image 6.22: Schematic section roofscape



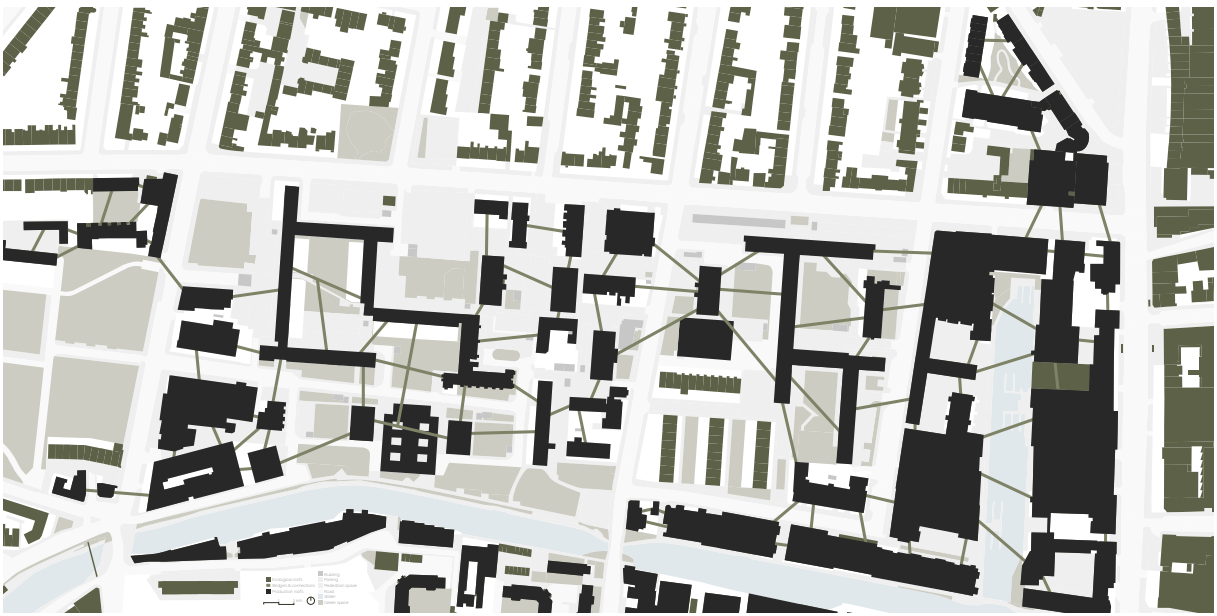


Image 6.23: Urban plan roofscape

CPUL consists of a network of open spaces. This design proposal creates this network on the existing roofscape of the buildings. A landscape of different production roofs is created. They are connected using bridges. Due to the height difference between buildings, some of the bridges are connected to floors of other towers. This would mean these floors become part of the public landscape. The vertical transport of the flats, now becomes part of the public landscape

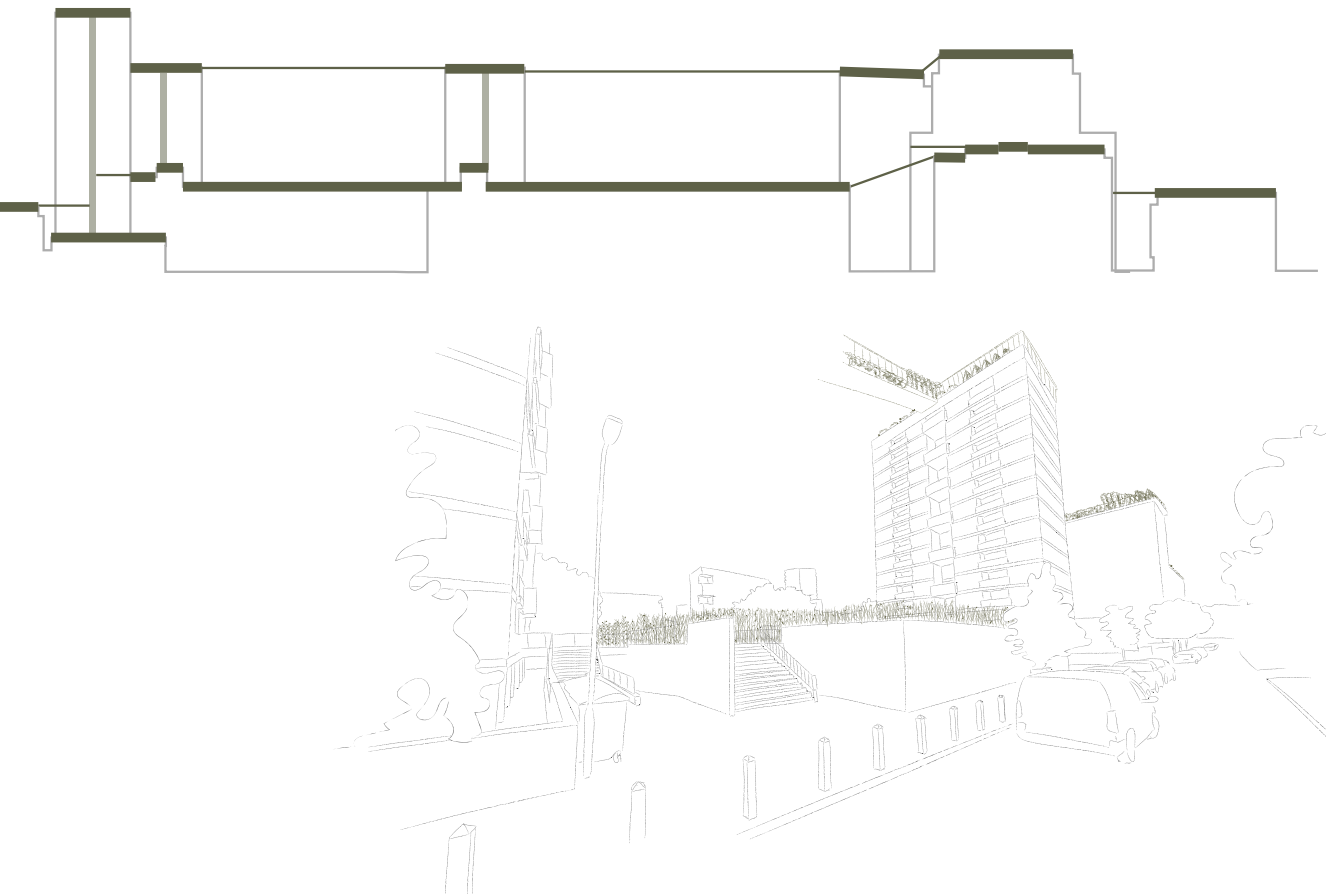


Image 6.24: Sketch perspective view 3 roofscape

as well, and will be intensively used to move goods from the roofs down.. As a consequence, privacy is reduced, and some of the residences will be transformed into public space. By raising the production landscape, the public space on the ground floor continues to host recreational program.

Image 6.25: Schematic section public space

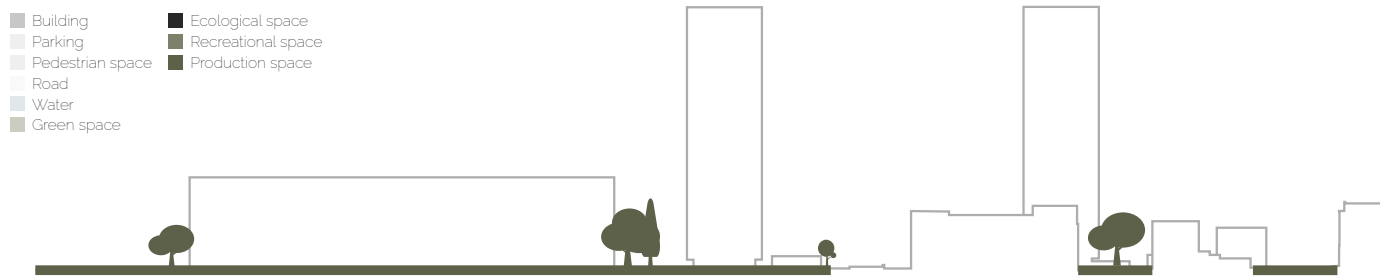


Image 6.26: Urban plan public space

This proposal focuses on transforming the existing public space. The main public spaces are connected, the parking spaces are integrated into the system, and so are some of the roads. The design consists of three types of public space: ecological, recreational and production. To create as high of a yield as possible, most space will become production oriented. Some central

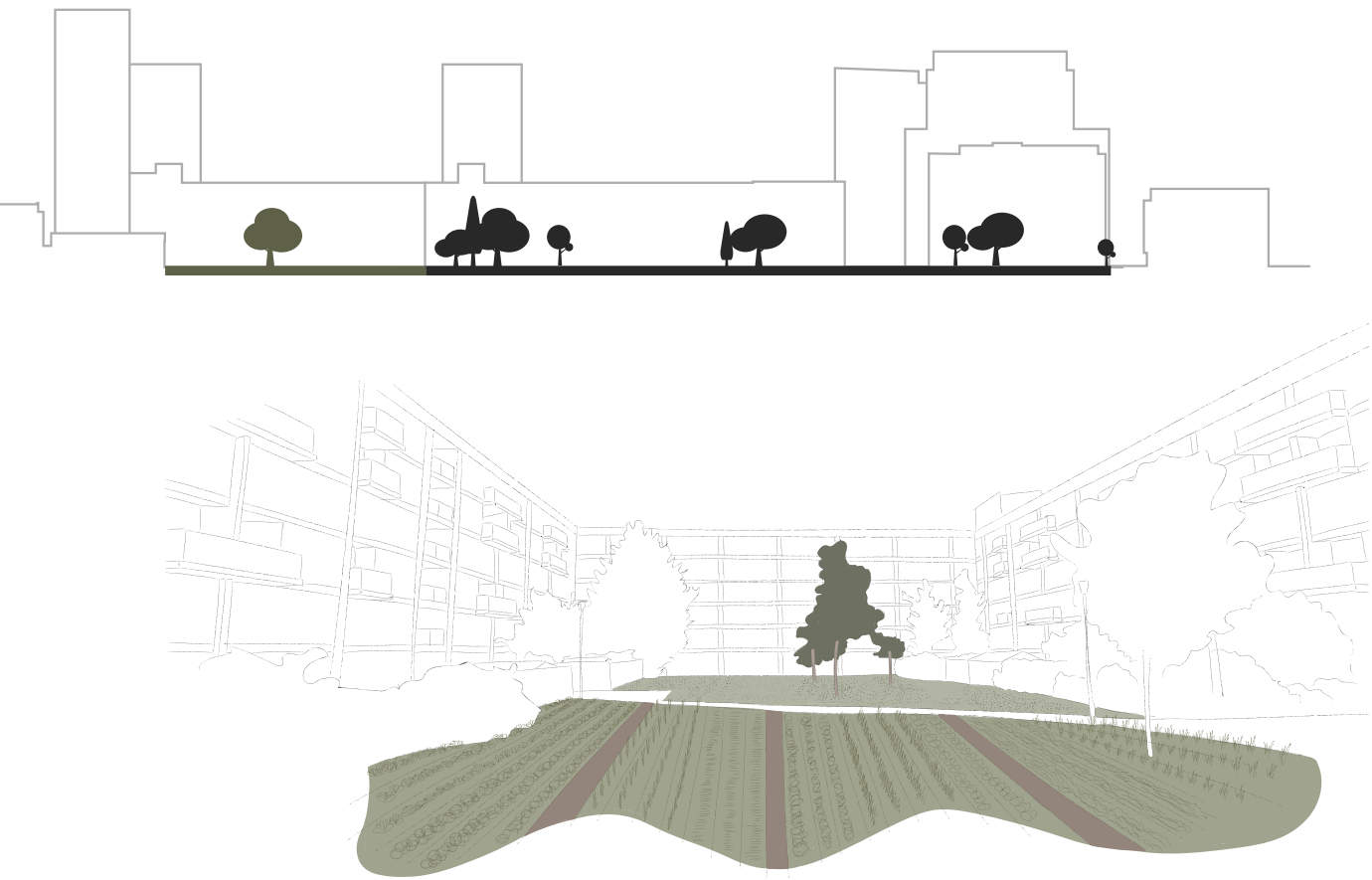


Image 6.27: Sketch perspective view 2 public space

recreational spaces are maintained, to create playgrounds and meeting spaces. The connection to the surrounding neighbourhoods and parks is created using ecological spaces surrounding the roads. In this proposal, car space is significantly reduced, meaning residents are dependent on pedestrian walks and public transport.

Image 6.28: Schematic section public and private space

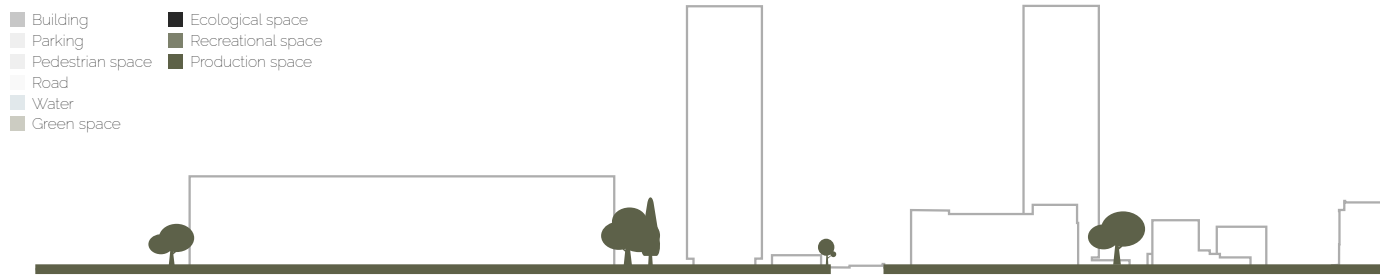
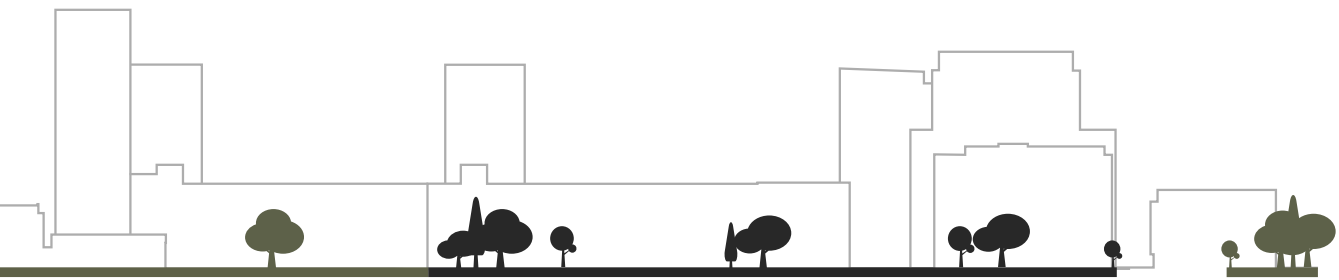


Image 6.29: Urban plan public and private space

This last design is an extension to the public space proposal, Here all private space is integrated into the network of open space as well. This strongly reduces the privacy of inhabitants and also limits their space and freedom in outdoor space. However, it does create a stronger network, with more production space. The inclusion of private space also makes it possible to extend the network



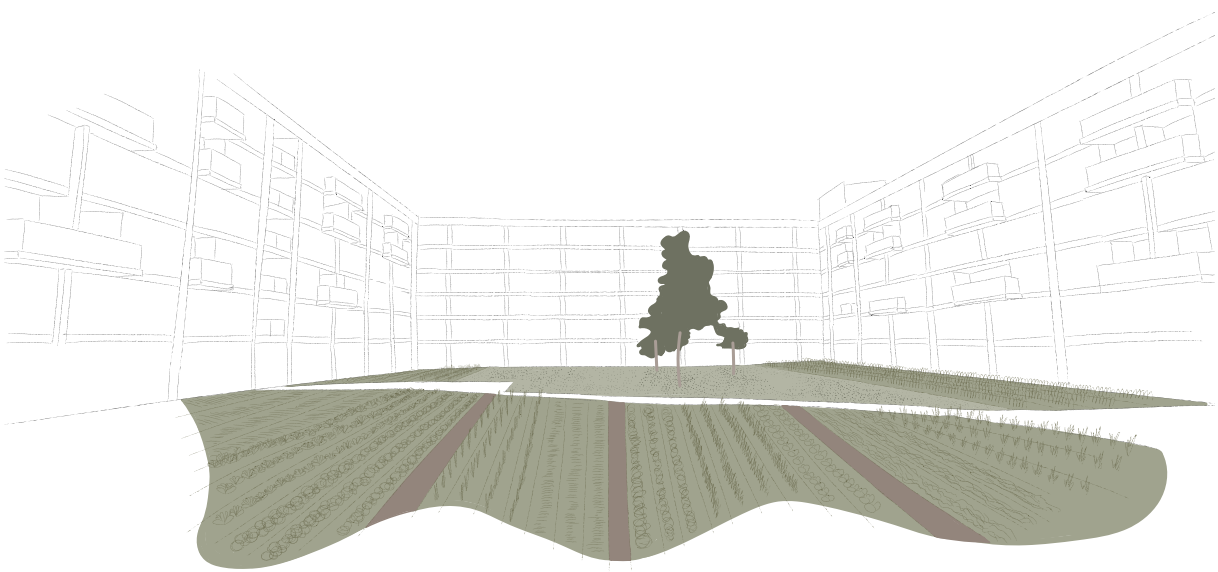


Image 6.30: Sketch perspective view 2 public and private space

to surrounding blocks, where little public space is. The estate is designed as two closed blocks, in which there is no space for cars. This creates the effect of buildings placed inside the production landscape instead of landscape placed between buildings.

Building system (small enclave)

Image 6.31: Schematic section building system

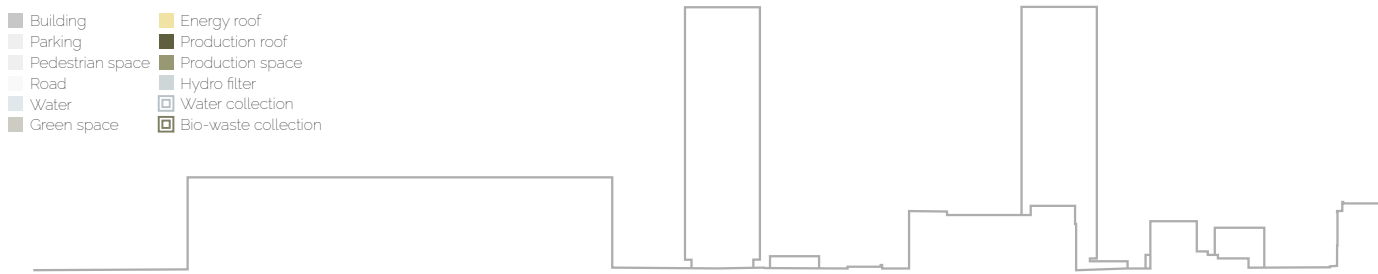
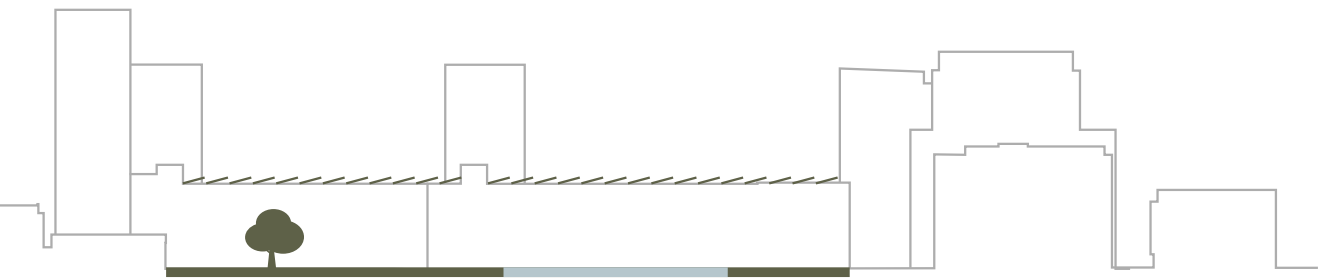


Image 6.32: Urban plan building system

An important principle in the smartcities strategy is the connection of flows to create a circular system. This design strives to do so on a building scale. The central space inside the building is used as production space. An pond is used as hydro filter to re-use the greywater from the building. Part of the roof is used for solar energy, the rest is used to produce food. The bio-waste is also collected on site. It would be possible to use anaerobic digestion to create biofuel and fertiliser. However,



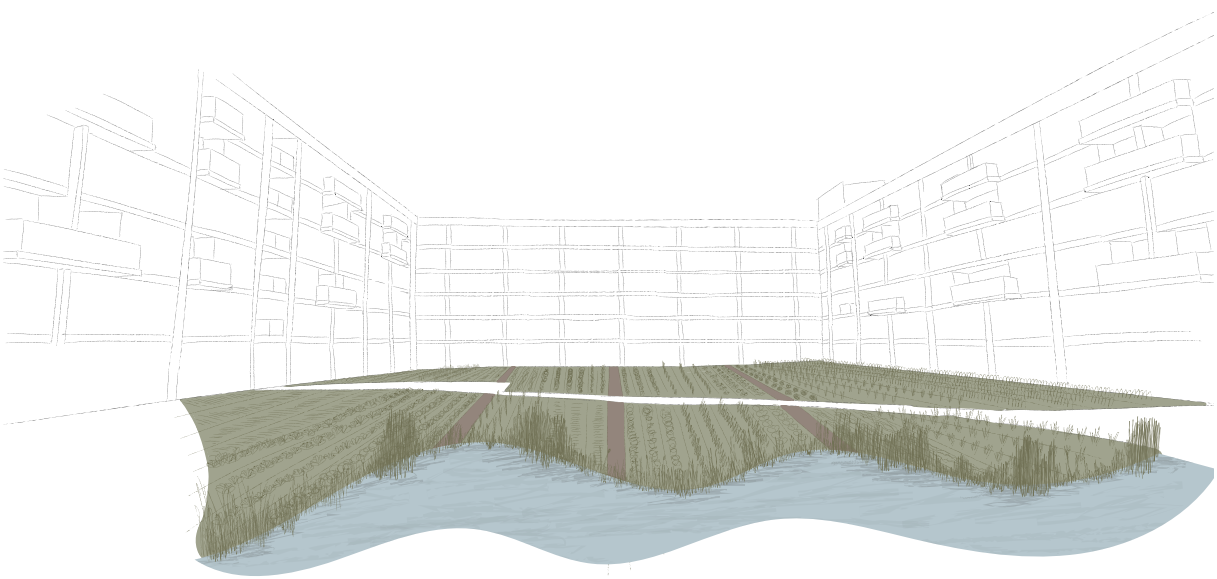


Image 6.33: Sketch perspective view 2 building system

the storage of waste and produced gasses would significantly reduce the liveability of the area. With the space available it is impossible to produce enough food and energy for all of those living in the building. Therefore, in this small enclave circularity would be impossible. Next to that, the agrotourism, architectural style and infrastructure of smartcities are impossible to integrate on this scale.

Neighbourhood system (neighbourhood enclave)

Image 6.34: Schematic section neighbourhood system

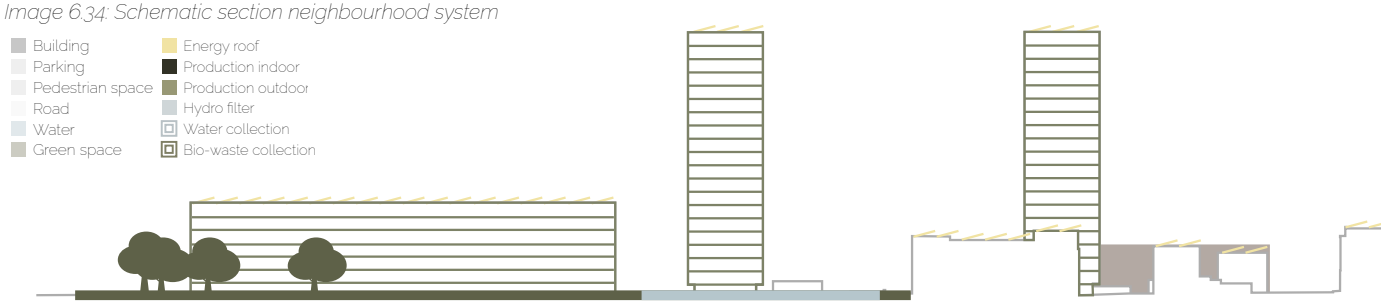


Image 6.35: Urban plan neighbourhood system

This proposal scales the methods of smartcities up to the neighbourhood level. By creating a larger system, it is easier to balance the different functions. However, with an average person needing 350-1000 m2 of agricultural land for their food consumption, this surface area is still to small for the needs of all inhabitants (Wiskerke & Verhoeven, 2018). Therefore, more than half of the

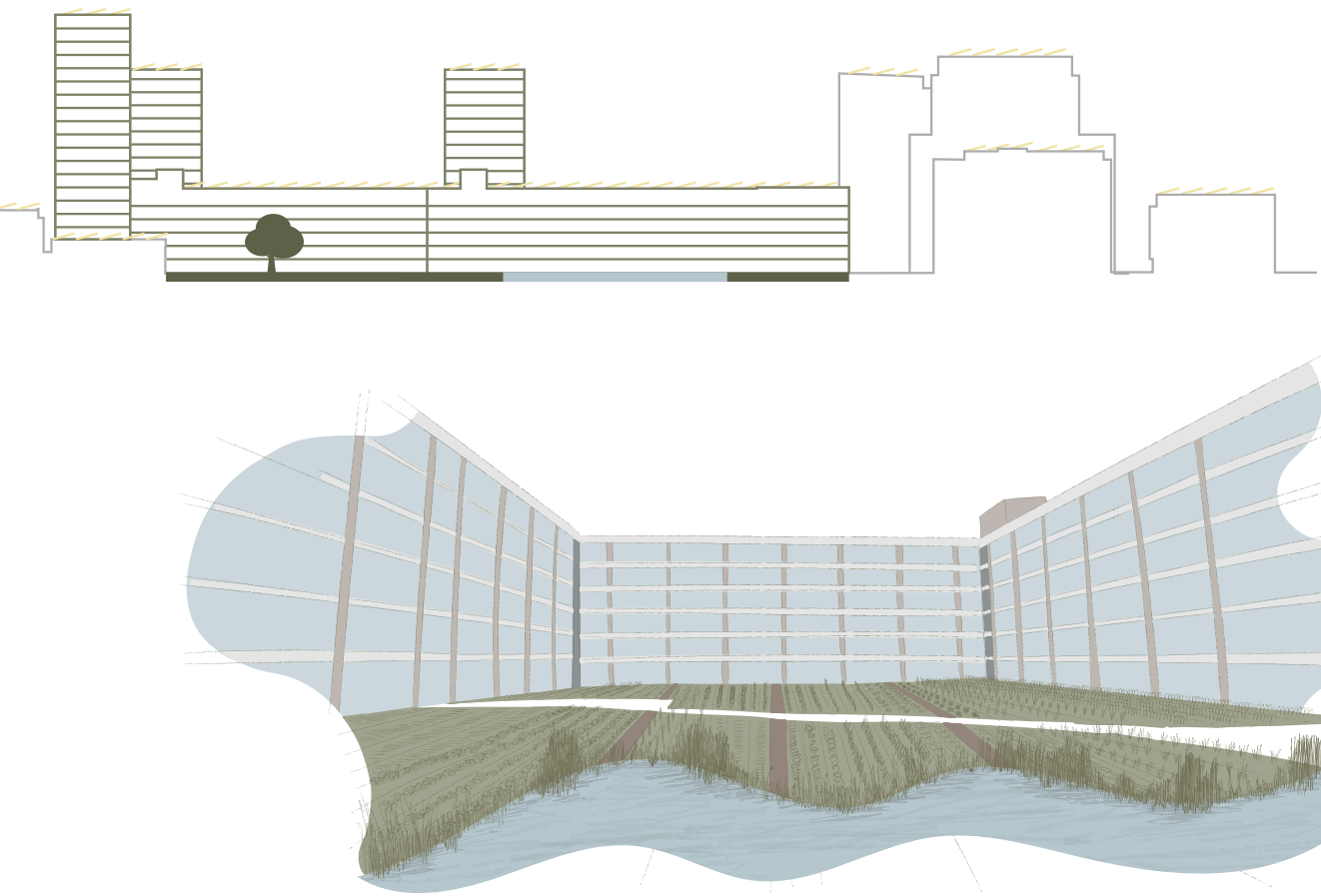


Image 6.36: Sketch perspective view 2 neighbourhood system

residences is transformed into indoor production centres. The old industrial buildings on the west side are used as transport hub for the biowaste. The area still uses the existing road system, which will create an increase in transport throughout the neighbourhood. The changes in program in the neighbourhood, also strongly reflect on the character and thus identity of the area.

City system (regional enclave)

Image 6.37: Schematic section city system

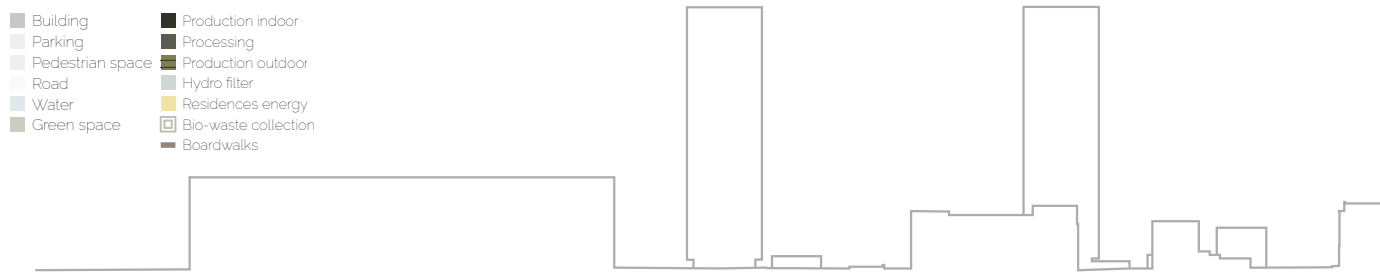
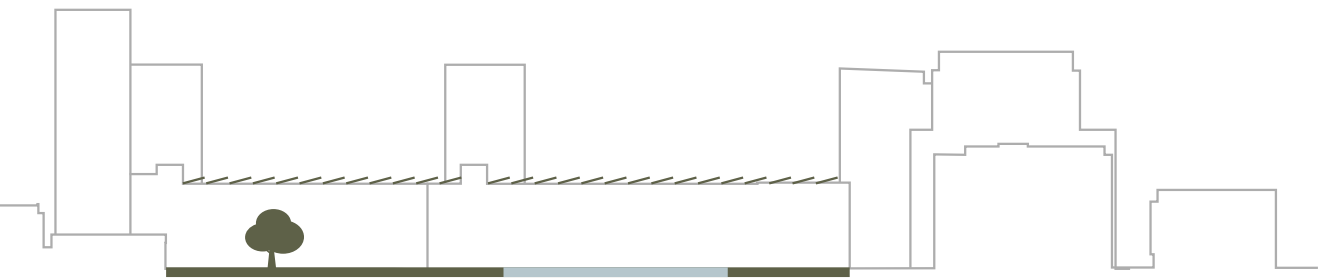


Image 6.38: Urban plan city system

The last design transforms the existing neighbourhood from a residential space, to a production hub. In this proposal all outdoor space is transformed into agricultural land and the infrastructure is transformed into a boardwalk system. This leads to the farming carpet, which is a principal design characteristic of smartcities. All buildings are transformed into, or replaced by production centres. In the current proposal the buildings are all transformed to reuse as much



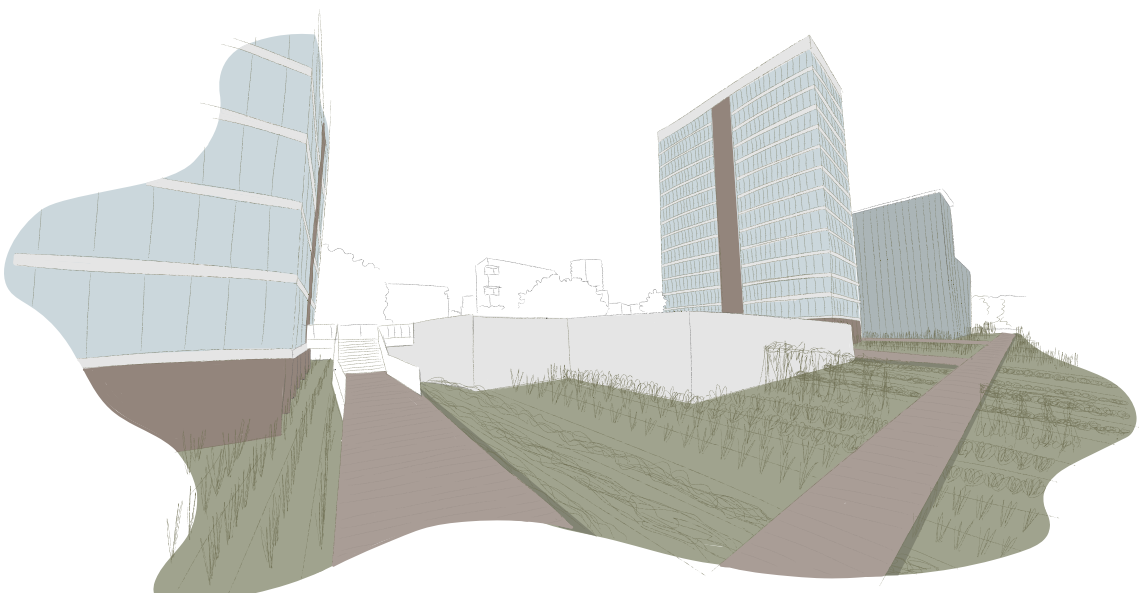


Image 6.39: Sketch perspective view 3 city system

of the existing structures as possible. In this case, the estate becomes a hub for a bigger part of London, this will increase the need for transport and processing, but also increases the exchange of energy and resources with the surrounding blocks. However, in the end, the estate is not a residential area anymore, which implies that the area is not liveable anymore.

7. The effect

The different design experiments show the range and variety of urban agriculture. Even though all projects focus on food cultivation, via a horticulture production system in an intra-urban location, the non-fixed aspects, such as the goal, product destination, area and strategy create a variety that influences the liveability of the city differently. An overview of this effect can be found in image 7.1. For this table only the direct effects of the intervention on the direct surroundings are taken into account.

As a consequence, no effects are noted for stability healthcare and education. Here not direct effects could be determined. However, there can be indirect consequences. Urban agriculture can lead to better food access, the lower food travelling distance leads to produce with a higher nutritional value (source missing) and the increased food interaction can lead to more awareness (Gerster-Bentaya, 2015) . All of this together leads to a more nutritious and healthy diet (Gerster-Bentaya, 2015) (Mougeot, 2000). This reduces health risks and chronic diseases related to nutrition and food, which reduces the pressure on the healthcare system (University of Oxford, n.d.). At the same time, due to traffic and soil contamination, food produced via urban agriculture might contain toxic residues and thus form a health threat (Gerster-Bentaya, 2015)(Mougeot, 2000). Equally, a more interactive experience with food while growing up, can educate children on food, production, cooking and diet (based on interviews, Appendix 1). Nonetheless, none of these effects can be confirmed or determined using these design experiments. Therefore, for stability, healthcare and education a 0 (not measured) is noted.

There are clear direct effects on facilities, social cohesion and the physical environment.

Vertical City Farming

This strategy focuses on a high food production yield. As a consequence, it is a closed system with little to no effect on the social cohesion (Despommier, Giacomelli & Carter, 2020). The production centres do not interact with the inhabitants. It creates no interactive platform and depending on the design implementation even reduces the amount of social space.

VCF has a negative effect on the physical environment. Due to the production taking place in a closed of space, there is no influence on the urban micro-climate which is, in other proposals, the most influential factor (Deelstra & Girardet, 2000). The new production centres will lead to more transport in the area. Both new material for the production process should be shipped to the site, and products should be sold on site or moved out. In all of these cases a significant increase in transport will occur. This will lead to more exhausts, smell, noise and possible pollution. All these factors have significant negative effects on the physical environment.

VCF does significantly increase the facilities in the area. It will mainly do this via job possibilities and

Type	Stability	Healthcare	Education	Facilities	Social cohesion	Physical environment
Vertical city farming						
New vertical farming towers	0	0	0	++	+/-	-
Repurpose existing flats	0	0	0	+	-	+/-
Transformation						
Green roofs	0	0	0	+/-	+	+
Green houses	0	0	0	+	++	+/-
Production facades	0	0	0	+/-	+/-	+
Public space interventions	0	0	0	+	++	+/-
CPUL						
Roofscapes	0	0	0	+	+	+
Public space	0	0	0	+/-	+	++
Public and private space	0	0	0	-	+	++
Smartcity						
Building system	0	0	0	++	+/-	+/-
Neighbourhood system	0	0	0	++	+/-	+
City system	0	0	0	++	-	+

- negative, +/- neutral (different indicators nullify each other's effect), + positive, ++ very positive

Image 7.1: Overview of the determined effects of the design experiments on liveability

food-access (Despommier, Giacomelli & Carter, 2020). As the buildings have a closed system, in principle exchange of energy, waste or water with the surrounding residences, is not obvious, However, residual heat of the production centres could be used in the residences. This would also be positive for the facilities as it is a sustainable energy source.

Transformation

Transformation interventions have a strong impact on the social cohesion. As this strategy has the purpose of introducing social interaction, physical exercise and education, they influence the social integration much more than facilities or food security. The management strategy behind these interventions, does matter for the overall social impact. When the site is designed from a bottom-up perspective, or managed by local residents, the new design is accepted and more actively used, then in cases where the site is managed by a company or the residents were not included into the design process.

Depending on the type of intervention, there is an effect on the physical environment. In the case, of green roofs, or green façades, the urban micro climate is improved. The greenhouses only influence the environment by creating more insulation, thus improving the housing quality slightly. Public space interventions, have a large effect on the quality of public space as well as the urban micro-climate. The interventions have little effect on the infrastructure. However, when these interventions are executed in cooperation with residents, their care for their own public space increases, which can improve maintenance and overall quality. The extension of facades and roofs as forms of public space also creates an interesting variety of public spaces and increases

The proposals create new facilities in the sense of recreational spaces and food access for those using the sites. However, the food yield is relatively low, meaning it will only cover a small part of the inhabitants' diet..

Due to its small scale, transformation has relatively positive effects. It is the least disruptive to the existing site, but as a consequence, also has the lowest impact on the food system.

Continuous Productive Urban Landscapes

Due to the introduction of new meeting spaces, there will be a small increase on the topic of social cohesion as well as an increase in the amount and variety of social or soft spaces. The design itself, does not densify the population on site. Instead it protects the existing density.

CPUL has a strong effect on the urban micro-climate. The increase in agricultural, recreational and ecological greenspaces increase the amount of ecosystem services, which is an important indicator of the physical environment (Appendix 5). Since food produced outdoors, near infrastructure can also be polluted due to exhaust fumes (Viljoen et al., 2005), the infrastructure is changed into a

bike and pedestrian oriented structure. Which is positive for the pedestrian and bicycle access, but negative for the quality of the road network. This however, is measure under facilities.

Facilities is the aspect where CPUL has the impact on. CPUL has little systemic integration with the surrounding city fabric. The main exceptions to this are the positive impact on leisure and cultural space as well as the small increase in food accessibility. There is a negative impact on the road system, as part of the CPUL blocks certain routings. Lastly, in the public and private space proposal, the integration of the private gardens into the public space, reduces the quality of some of the residences. These private outdoor spaces are highly valued by the inhabitants and thus removing them, lowers the facilities in place.

Smartcities

When it comes to social cohesion, the smartcities design proposals have little effect on this. They do not create public spaces or interactive environments. Their main influence on the demographic of the area is the demolishment of residences in the city and neighbourhood proposal to make space for indoor production centres. Therefore, in the city system the estate has no residences anymore which can only be seen as a reduction of the density, demographic diversity and social cohesion.

Smartcities improve the physical environment slightly via new infrastructure and an increase in green space and water, which also improves the urban micro climate. Specifically in the city proposal, but also in the neighbourhood system there is a decrease in car density and slow traffic is placed more central. Which also positively effects the liveability of the area. Due to the small scale of the building intervention, the effect on the environment is a lot smaller than of the other design proposals.

The main impact of smartcities on liveability is caused by facilities. Smartcities strongly influence the surrounding urban fabric. Their key principle is the integration of energy, water, food and waste systems to come to a circular system (Lim & Liu, 2019). Therefore, they can create new energy, water and waste systems that are more sustainable and local. As such the quality and stability of infrastructure is improved. Next to that, smartcities have a higher production yield when it comes to food, as long as it is integrated into a larger scale. Due to the production sites being managed by companies and not by self-sufficient individuals, job possibilities are created, which is an important facility as well. Though, this also means that there is no social interaction or community surrounding the food production, hence the lower score on social cohesion.

8. Discussion

Limitations

An important limitation of this research is subjectivity of liveability. Liveability is a key concept in this research. It describes all things that create a meaningful, enjoyable and comfortable life. However, what these concepts entail is dependent on the norms and values of the user. Therefore, this paper has not only given an overview of the effects as measured by the researcher, but also the exact input of the design experiments. As such, it can be up to the reader to implement their own valuation on the proposals.

Secondly, the design proposals are not executed, hence the effect cannot be measured. Instead the effects on liveability as determined by this research are based on the effects of the case studies as well as different literary sources. Thus, the results are theorized instead of physically measured.

Lastly, this research has only succeeded in giving a general overview of urban agriculture and all its varieties as well as the effects of these different types. Therefore, it has only scraped the surface of urban agricultural interventions, possibilities and their effects. Instead of an in-depth analysis of urban agriculture, the research is a global overview. As such the research can form a starting point for further development of urban agricultural strategies.

Further research

The focus of this research has been on the relation between urban agriculture and liveability. As such it has designed a variety of urban agricultural interventions and theorized using literature and case studies what their effect would be on liveability. Through this set-up, the main focus of the research was on spatial consequences of urban agricultural sites. Using the concept of liveability, the socio-economic side of these interventions was discussed, but the influence of different management and financial systems was disregarded. Due to the social nature of urban agricultural interventions in London, it would be interesting to develop this topic further.

Next to that, this research focused on the influence of different urban agricultural strategies on liveability. However, the effect of the other components of urban agriculture were only shortly discussed. A more in-depth research on these components and their effect on each other, could lead to better integrated implementations of urban agriculture.

Practice

Overall urban agriculture has a lot of potential when it comes to the reinvention of the food system. However, in London the interventions are fragmented and created via a bottom-up system. They are focused on the social and educational values of urban agriculture, and though important, these interventions do little for the food system and ecological footprint of the city. Instead, a city wide plan is necessary to reach the full potential of urban agriculture. One in which intensive production is implemented with respect for the

existing urban fabric and those inhabiting it. This research has shown the possibilities of urban agriculture and the wide variety of interventions. The value of urban agriculture is more than the creation of social spaces, and can, if well integrated, have a positive effect on the liveability of the city. However, it is necessary to create a top-down plan to integrate food systems into the city. Not only from a spatial perspective, but also to streamline the exchange of knowledge and materials, or to create an economic system in which this new production process can take place.

9. Conclusion

This research has strived to answer the question: How can urban agriculture be implemented into cities to improve the liveability of the city? The answer to this is not unequivocal. Instead, urban agriculture comes in many different forms, which have different effects.

The reason no unequivocal solution can be given is the complexity and multifactoriality of the food system. The interaction with environmental and socio-economic systems, create an array of unplanned feedbacks. These influence the direct and indirect surroundings of both the tangible and intangible foodscape. Therefore, searching a relation between the food system and liveability makes sense.

Liveability is a concept that it much broader than the quality of the physical environment. It also concerns safety and stability, health, education, facilities, infrastructure, economy, functions and social cohesion. This wide range of aspects of liveability also make it impossible to create the perfect liveable surrounding. The introduction of a new function, concept, building or space can positively impact one aspect, but negatively impact another. The transformation of a parking space into a park, will improve the urban micro-climate and create new qualitative public space, but it will also reduce the accessibility of the surrounding buildings, and demolish infrastructure for those dependent on cars. Therefore, the assessment of liveability is dependent on the values of those creating the index and the measurement of the indicators. This all makes liveability a subjective topic, but one that is important to critically reflect on all sides of an urban or urban agricultural intervention. Throughout this project six main aspect have been used to reflect on liveability: stability, healthcare and education. Multiple conclusions can be drawn from this.

First of all, it is clear that there are no clear direct effects on stability, healthcare and education. There can be indirect effects, such as that of a more nutritious diet on the healthcare system, but

Type	Facilities	Social cohesion	Physical environment	Other
Vertical city farming	++	+/-	-	Restores nature around the city
Transformation	+/-	++	+	Repurpose of buildings & gentrification
CPUL	+/-	+	++	Strenghtens ecology in the city
Smartcities	++	+/-	+	(More) circular waste system

Image 9.1: Effects of strategies on implementation

these effects are indirect and theorized and thus cannot be proven through this research.

By contrast, clear effects can be determined for facilities, social cohesion and physical environment. Here the strategy of urban agriculture matters for the effect it has (image 9.1). Not all effects on the liveability of the city are positive.

Next to the effects of the different strategies, other components of urban agriculture also influence the liveability of the city (image 9.2). When it comes to the physical environment it matters whether food is produced indoors or outside, since indoor production has little influence on the micro climate. The type of production can matter, as livestock keeping creates more noise smell and has overall more impact on the physical environment then horticulture. Other influences are the products, medicinal herbs can influence peoples health, whereas flower production has a lower impact on peoples diet and overall well-being. Commercial production can create new job opportunities, while private production creates recreational opportunities. Lastly, the focus in the design proposals has been on the production of food. Nevertheless urban agriculture also includes other steps in the food system such as processing, distribution or waste management. Burning of bio-waste has a significant negative effect on the physical environment, distribution significantly increases pressure on infrastructure, and processing can create economic possibilities. Even though the research has not gone in depth into these components, they should not be forgotten in the overall evaluation as they influence the liveability of a neighbourhood.

Lastly, the case studies and experiments show that there is a duality in urban agriculture. Projects either focus on communal and educational qualities or high production yield. This leads to different architectural styles, different interaction with the direct surroundings, different impacts on the food system and different effects on liveability. Where the communal and educational projects have a lower impact, they mostly influence liveability positively. For high yield sites, this is different. Due to their industrial and commercial character,

Image 9.2: Components of urban agriculture types

these sites often effect the liveability negatively and have little interaction with their surroundings. If production centres would be designed with a more open character and with attention for the local context, these projects could form a valuable addition to the urban fabric.

Overall urban agriculture has a significant effect on the liveability of the city, though not on all factors and not always positive. This does not indicate that urban agriculture should not be implemented, as next to the positive effects on liveability, urban agriculture also has direct and indirect, positive effects on the restoration of the environment, food accessibility and security, health and food education, and the ability to feed the increasing population. Instead this conclusion should be used to research further on the negative consequences and to design urban agricultural sites in such a way that they take into account and minimize these consequences. For this the strategies can be combined or optimized through the different components.

Next to that, an assessment of the current quality of living in the area is an important foundation for the implementation of urban agriculture. Depending on this score and which aspects of liveability need to be improved, the most fitting urban agriculture strategy can be implemented. In case of a low quality of public space, or lack of green, introducing CPUL could be a solution. When the area is in need of an economic boost, VCF might be the solution. Smart cities could be the core of new urban developments or the renewal of existing urban infrastructure. Lastly, transformation would be of interest in bottom-up scenario's, or area's lacking communal spaces and social structures.

Altogether the role urban agriculture has in an area, forms the foundation of a liveable design strategy. Interventions with a social or educational goal, focussed on horticulture, improve the liveability of the area. On the other hand, the introduction of high yield production facilities effect the liveability both positively and negatively. A key role in this, is that of transport related to the production facilities. The increased need for transport of trucks and other heavy vehicles, the quality of the physical environment is reduced. However, if this is taken into account in the design process, and a low-impact transportation system is implemented, a new sustainable and liveable food system can be created inside the city.

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Appendix

A1 Interviews & Site visits
A2 Liveability indexes
A3 Case studies
A4 Photos Beauvoir Estate
A5 Relation Ecosystem services
A6 Design assignment

A1. Interviews & Site visits

A1.1. Foodscape – Michael Thorp

Foodscape is an urban agriculture site in Camden, London. It is located on Rochester square. The current location of Foodscape is a test site. It falls under the "open space" law of London, which indicates what areas should remain open and unbuilt. At the test site, Foodscape works on the further development and implementation of their design into roofscapes and other open spaces.

The goal

The idea of Foodscapes stems from three problems concerning producing your own food in the city.

_Space: The allotments in London are full and they have long waiting lists (multiple years)

_Time: City life is quite busy, due to your job or family people are sometimes not able to work in their gardens for longer periods of time. Or maintain their products consistently.

_Skill: To be able to consistently produce vegetables and fruit, people need certain skills. People that just begin with their own garden often do not know what they are doing, which leads to them having little success. As a consequence people quit their garden, before they can become successful.

The Principle

Foodscapes consists of two parts.

A product:

A T-shaped planter box, with built in irrigation system and the spatial layout in which this planter can be implemented in the built environment;

A model:

Foodscape has developed its own maintenance, educational and community model surrounding the planter box. Users rent a part of a planter. They can chose to do the complete maintenance themselves, or ask the manager to either completely or party maintain and grow the food. The idea is that the manager can teach the users how to maintain their own plants over time and help out when the users are to busy. On each site, activities can be organized focussing on cooking, pickling and preserving of produce as well as planting and creating of cuttings.

Next to the personal planters, they also have communal planters. These are used as backup for when the harvest of individuals fails. However, they also function as recreational and educational elements for schools or people with a disability. For the schools and health centres, lower planters are used to ensure all users can reach the top of the planter.

Over time the idea is to create a digital platform in the form of an app, to maintain the community. This app could have different functions, such as exchange of knowledge, notifications of harvest ready produce, organisation of activities, sharing of recipes and growth updates on produce.

The planters

The image on the right shows the design of the planter. It has an integrated irrigation system. All planters are set up to prevent shade on each other and to ensure they receive sun on all sides. This design can produce about three times as much vegetables as a flat surface would.

One of the main obstacles in the usage of the vertical planters is that seeds will not grow in them. Therefore, on the vertical sides cuttings are used. To be able to grow seeds, an extra green house on site is used.

Plants

Which plants can be place where in the planter needs to be determines carefully as root vegetables cannot grow vertically and need a lot of depth for example. The plants on the top are

extra sensitive to being eaten by birds. Therefore, on top of the planter vegetables are used that birds dislike, such as leeks. As the site uses no pesticides, there is a risk in losing all crops. Therefore, different pest reducing plants are used as a natural defence mechanism.

Foodscape has around 40 different species of vegetables, with around 20 species during the winter. The company is still testing which

vegetables and species work best and which gain the most stable and highest harvest in the planters. Foodscape does not grow very exotic vegetables, but has different species of "forgotten" vegetables, such as black tomatoes, which you cannot find in the grocery store.

It is important to note that the vegetables produced in these planters are not enough to maintain someone or a complete household. The produced vegetables can be seen as a "bonus" to the diet.

Users

Foodscape has users from all different backgrounds and age groups. The main user group are millennials and Gen-Z (20-30 years). However, also people in their forties, with or without children, and pensioners. At this moment about 46 people use the current site.

Next to the "normal" users, Foodscape also has a function in the local community. Some of the planters have been made lower on purpose so people from the nearby recovery centre can use them, as well as the children from the nearby school. In the case of the school the planters are used as an educational method, whereas for the

inhabitants of the recovery centre, the planters are a means to do something independently. Foodscape also sees itself as a "calming" space, which is good for people's (mental) health.

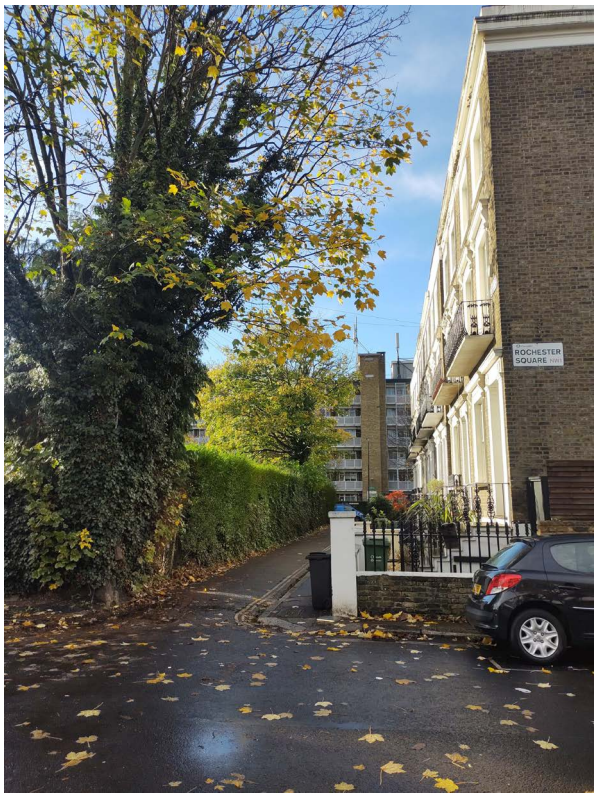
Expansion

Currently the company is working on extending to other sites such as roofs, parking lots and underused or unused public spaces. They are aware that creating an agricultural roof has multiple difficulties such as the access and the ability of the construction to carry the extra weight.

On top of that, weather on rooftops is more extreme, such as sun reflections and wind. Due to the height of the planter, when placed on a rooftop it will need extra stabilisation or ankers to prevent being blown over by wind. However, here we need to keep in mind that all forms of outdoor agriculture are dependent on weather, such as frosts, heat and humidity. Therefore, as long as the system stays outdoors, it will have better and worse production years.

Foodscape has specific interest in the implementation of their system onto parking lots. Other options would be the roofs of public buildings. They do not see possibilities in residential buildings due to different reasons.

_Privacy. A public roof would lead to people walking on top of others houses, which could lead to (noise) disturbances.
_Ownership. Is it a public roof and can anyone own or lend an allotment box or do you get one with your house. If you use this last set-up. How do you make sure everyone uses their boxes and they do not end up abandoned on the roof.
_Roof access. Foodscapes works with existing roofs. Therefore adding on existing residential buildings, would mean extension of the existing staircases and or elevators. This is both expensive, and if only the staircases are extend, the roof will not be accessible for disabled people. This issue is less pressing in public buildings as roof access is more often already implemented in the design.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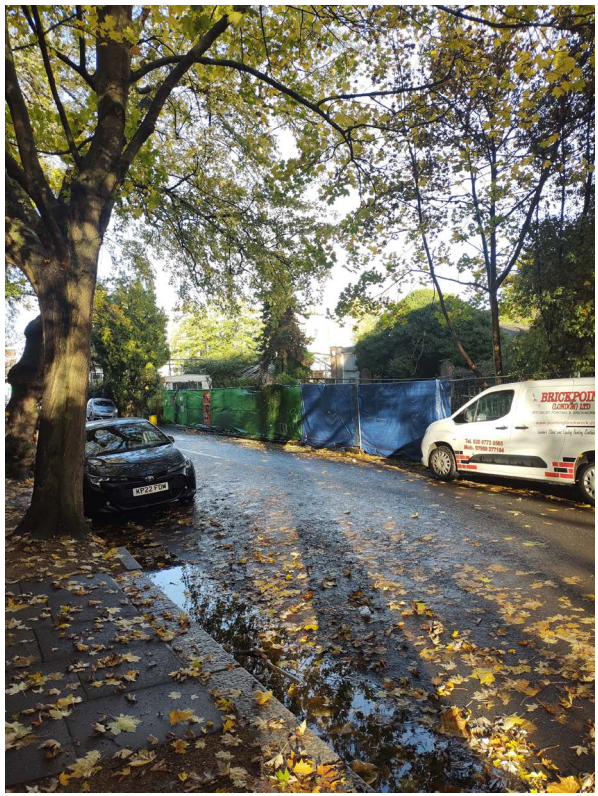


A1.2 Spitalfields City Farm – Chris Gorgay

Spitalfields City Farm is a communal city farm situated in Tower Hamlets, London. Here I speak to Chris Gorgay, the community grower.

Goal

The goal of Spitalfields is not the production of food or food security. The production on site is a method to help create a bonding space as food is something we all need and thus something we can all connect to. However, the production of vegetables and herbs does help to keep the farm running, as the products are sold on site. The main focus of Spitalfields is on the animals they have.

Animals on site

Spitalfields City Farm is one of the bigger city farms of London. It has a big variety of animal species. However, these animals are not there to produce food. Spitalfields city farm is a sanctuary. Therefore, they do not buy these animals to promote or grow the farm, but instead create a shelter for animals that have no home anymore.

Work

At Spitalfields work about 15 people, they are the consistent workforce and monitor and help the volunteers. There are three different types of volunteers on the site.

Corperate volunteers:

These are companies that use Spitalfields as a community building activity and a method to get their employees back into nature. Every day Spitalfields hosts 10-15 corperate volunteers.

Well-being volunteers:

They are people who are not doing well. They are here to recover by connecting to nature and physical work. These volunteers sometimes take home some of the food they produced and harvested as a method to have fresh and nutricious food. Something they do not always have access to. Next to that, being able to eat something that they have produced themselves

gives a feeling of pride, which can be important for their recovery process. Spitalfields has 10-15 well-being volunteers per week.

Locals:

These are people that live in the neighbourhood and like to help out. There are no clear numbers about how many there are.

Community

The function of Spitalfields is social and educational. There is a big tent on site where people can meet and organise activities as well as a small shop where you can buy products such as jam and fresh vegetables. There is also a small tent on site where you can buy something to eat and drink. Noticeable, Spitalfields City Farm is situated in a very multicultural area of :London. Therefore, a lot of their communication is therefore, not only in English, but also in Bengali.

Spitalfields organises different activities, such as bringing all the animals back to their stables in the evening. Next to that, they also host school trips. As such they have not only a communal function, but also and educative function.

Gardens

Next to the vegetable garden and animal pens, Spitalfields has a small wildlife garden, which is meant to have its own small ecosystem and create a relaxing atmosphere for visitors and volunteers to sit after working. On top of that the garden attracts pollinators which help with the production of food. Lastly, there is a plant nursery, which is where most of the produce that is sold is grown.

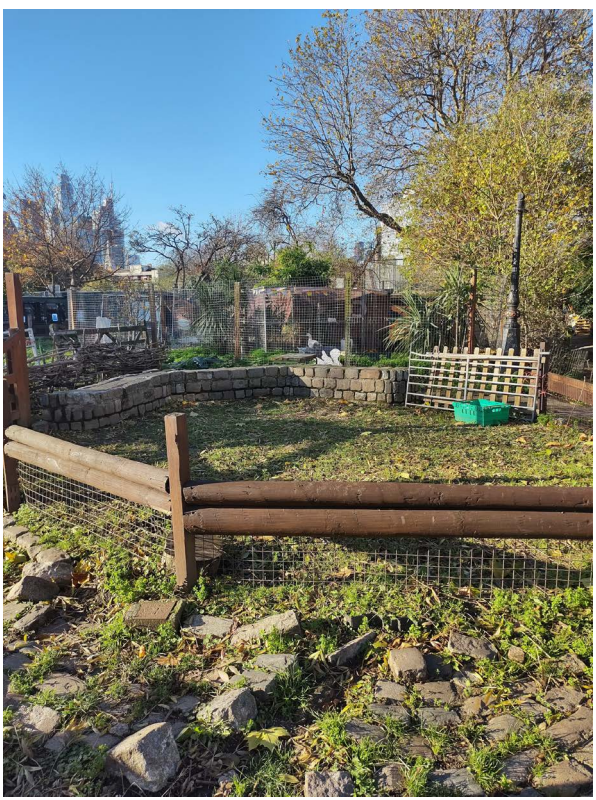
Financial system

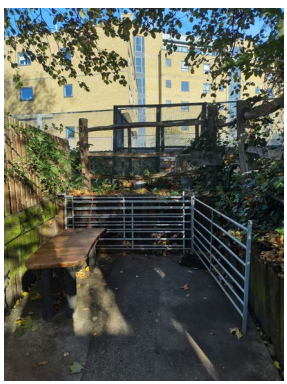
Spitalfields functions on grants, donations and selling products. Next to that, they organise private cuddling or care sessions with the animals. Without government grants or donations, the farm would not be able to exist. As such it is not independent and not always sure of its existence.

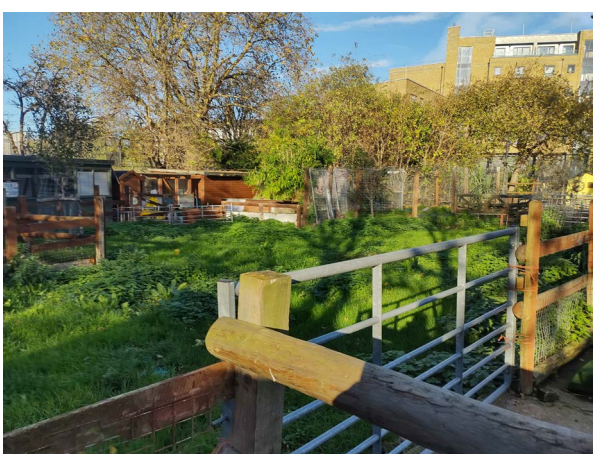
Edible London

Before he worked at Spitalfields City Farm, Chris was one of the founders of Edible London. This organisation works on food security and specifically on access to organic food for those with a lower income. Before the pandemic, the organisation worked with 50 different organisations. Due to corona pandemic, Edible London collapsed. It still exists, but delivers to far less organisations (10-15). Since it was not possible for many of the founders and employees to get around financially themselves while working at the organisation, many left.

I visited the website of the organisation and they still exist. Their last project big project consisted of producing one million meals through crowd funding. It seems the organisation has changed direction a bit as it now not only focuses on producing new food, but also reducing food waste as an important means to improve food accessibility and security.







A1.3: Oasis Farm Waterloo – Luke Rosier

Oasis Farm Waterloos is an urban farm situated on the South Bank of London. Here I met with Luke Rosier to discuss, the purpose and functioning of this site.

Goal

Oasis Farm Waterloo has a community focus, It was founded by charity "Oasis", in cooperation with Jamie's farm. Oasis is an organisation which, among others, works on food security. Jamie's farm works with young people or children in difficult situations such as foster care. These children are taken to farms outside of the city to work there.

This way they are close to nature and moved out of their problems.

Site characteristics

The farm consists of multiple outdoor planting areas, multiple small greenhouses, a kitchen, barn and stables. The stables host multiple animals, which are health on site, for the interaction with children and the positive effect his has on their well-being. The barn is of big importance for the farm. It is rented out for activities and as such is responsible for 50% of the farm income. The barn is also used by the farm itself for activities.

Users

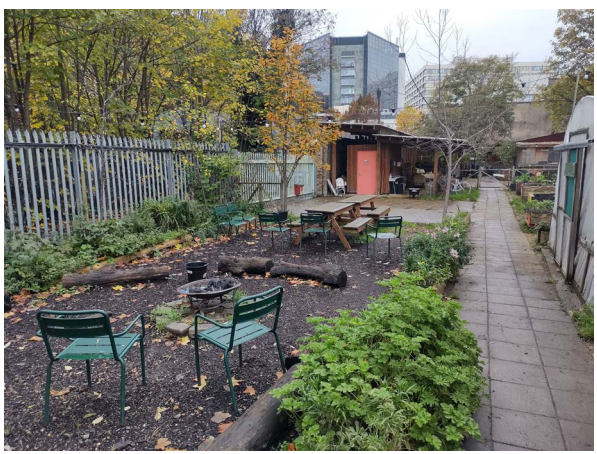
The farm hosts different school groups of eight children age 11-14. The children work in small groups of three so they can actively participate. For the children it is also possible to use the outdoor kitchen on site to cook the vegetables they have harvested.

Next to school groups, the farm is used by the charity Jamie's Farm. They use the farm about half a day per week. The children participating in the project work on the site for six weeks.

The farm is not open to the public, except for some activities. As a consequence, the farm has a lower integration into the direct community.

Work

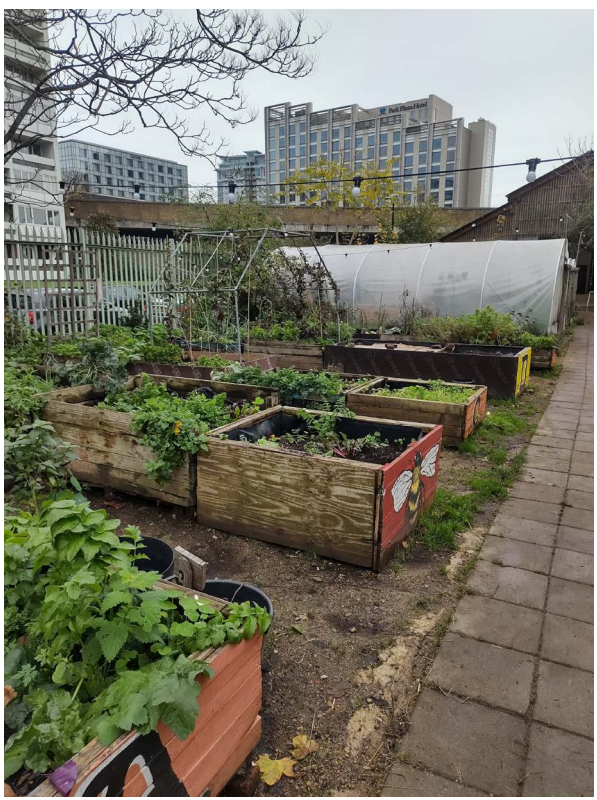
The farm has one full-time employee and three part-time employees. The rest is run by volunteers. Some of these volunteers are from the direct neighbourhood, and this forms the strongest connection to the direct surroundings. The task of the volunteers is not to maintain the production site, this is done by the children visiting. Instead it is the task of the volunteers to guide the children



when they work.

Financial system

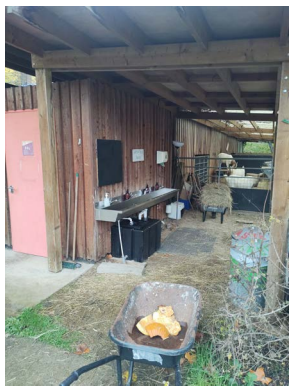
As discussed before, the farm is dependent on renting out the barn for a large part of their income. Next to this, the site is run by donations and the income from the school visits.

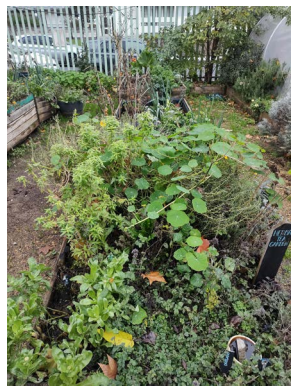




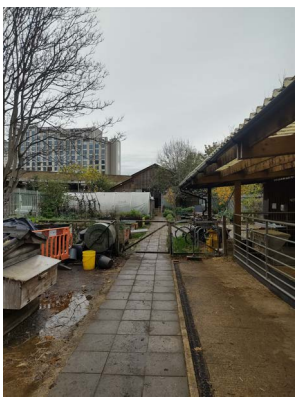
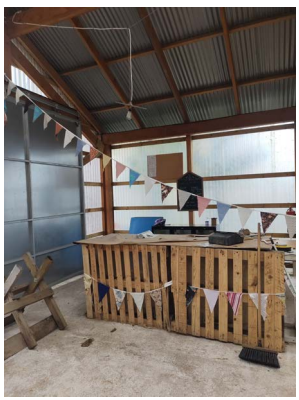
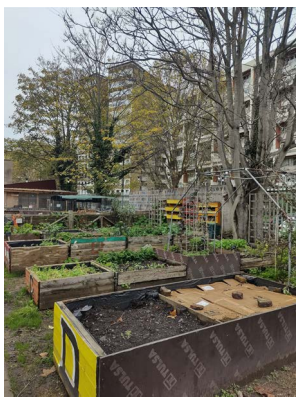









ET ME TAKE YOU BY THE HAND AND LEAD YOU THROU

A2. Liveability Indexes

Quality of Living Index

- Housing
- Climate and physical conditions
- Pollution
- Disease and sanitation
- Medical facilities
- Education facilities
- Infrastructure
- Physical remoteness
- Political violence and repression
- Political and social environment
- Crime
- Communications
- Cultural and recreation facilities
- Availability of goods and services

Imgage A3.1: Quality of Living Index (based on Mercer, 2020)

London liveable city project.

1. Accessibility
   - _PTAL
   - _Pedestrian/cycle infrastructure
   - _Proximity to services
2. Affordability
   - _Management fees
   - _Diversity of tenure types
   - _"Affordable" units
3. Bikeability
   - _Cycle safely
   - _Surface
   - _Storage
4. Housing
   - _Family housing
   - _Diversity of typologies
   - _Privacy
   - _Building standards
5. Outdoor space
   - _Use and activities
   - _Links
   - _Comfort and image
   - _Green infrastructure
6. Spaciousness
   - _Space standards
   - _Massing
7. Way-finding
   - _Urban layout of edges
   - _Landmarks
   - _Nodes
   - _Barriers
   - _Signposting
8. Walkability
   - _Footpaths
   - _Signage
   - _Maintenance
   - _Personal security
   - _Traffic

Image A3.2: London liveable city project (based on Clavin, 2014)

Global Liveability Index

1. Stability	25%

_Prevalence of petty crime
_Prevalence of violent crime
_Threat of terror
_Threat of military conflict
_Threat of civil unrest/conflict

2. Healthcare	20%

_Availability of private healthcare
_Quality of private healthcare
_Availability of public healthcare
_Quality of public healthcare
_Availability of over-the-counter drugs
_General healthcare indicators

3. Culture and Environment	25%

_Humidity/temperature rating
_Discomfort of climate for travellers
_Level of corruption
_Social or religious restrictions
_Level of censorship
_Sporting availability
_Cultural availability
_Food and drink
_Consumer goods and services

4. Education	10%

_Availability of private education
_Quality of private education
_Public education indicators

5. Infrastructure	20%

_Quality of road network
_Quality of public transport
_Quality of international links
_Availability of good-quality housing
_Quality of energy provision
_Quality of water provision
_Quality of telecommunications

Image A3.3: Global Liveability Index (based on Economist Intelligence, 2022).

Global Power City Index

Economy

_Market size
_Market attractiveness
_Economic vitality
_Human capital
_Business Environment

R&D

_Academic resources
_Research environment
_Innovation

Cultural interaction

_Trendsetting potential
_Tourism resources
_Cultural facilities
_Visitor amenities
_ International interaction

Liveability

_Working environment
_Cost of living
_Security and safety
_Well-being
_Ease of living

Environment

_Sustainability
_Air quality and comfort
_Urban environment

Accessibility

_International network
_Air transport capacity
_Inner-city transportation
_Transport comfortability

Image A3.4: Global Power City Index (based on IUS, 2022)

Dutch Liveability Index

1. Physical environment

_Proximity highways
_Proximity primary roads
_Proximity train tracks
_Proximity high voltage lines
_Proximity transmission tower
_Proximity wind turbines
_Mixing of functions
_Proximity of green space
_Proximity of dunes
_Proximity open nature
_Proximity agricultural land)
_Proximity water
_Proximity semi-built
_Earthquake risk
_Heat stress
_Noise impact
_Flood risk
_Air quality
_Accidents
_Car density
_Shop vacancies

2. Housing stock

_Surface area housing
_Proximity monuments
_Building height
_Housing vacancies
_Building period
_Private rent
_Housing for sale
_Overpopulation
_Building type

3. Facilities

_Distance to education
_Distance to horeca
_Distance to culture
_Distance to shops
_Distance to health care
_Accessibility
_Density of facilities
_Job accessibility

4. Social cohesion

_Diversity life phases
_Population density
_Mutation rate
_Development households
_Social cohesion

5. nuisance and insecurity

_Violent crimes
_Destruction
_Disturbances
_(Experienced) nuisance and insecurity

Image A3.5 Leefbaarometer (Dutch liveability Index) (based on Leidelmeijer & Mandemakers, 2020)

Liveability of the urban built environment

1. Access
   - _Pedestrian access, routes, conflicts
   - _Bicycle access
   - _Transit access

2. Street and Path systems
   - _Locations of walkways, bikeways, trails, scenic parkways
   - _Streetscape continuity, street definition
   - _Street patterns, intersection patterns, block sizes, problem intersections
   - _Sidewalk and street widths
   - _Streetscape (lighting, paving, furniture, signing, fences, etc.)
   - _Street tree inventory and pattern
   - _Utility poles, wires

3. Built form
   - _Scale, massing, transperency
   - _Grain: coars or fine, heterogeneous, homogeneous
   - _Buidling types, materials, character, condition
   - _Historic structures

4. Public spaces
   - _Open spaces, parks, plazas, social spaces
   - _Patterns of use, types of use

5. Activity
   - _Visible activity, pedestrian activity, people generating uses
   - _Night life, 24 hour activity
   - _Diversity, mixed use vs. single use

5. Natural factors
   - _Topography
   - _Prominent natural features
   - _Landscape types
   - _Drainage patterns
   - _Sun or shadow, solar access
   - _Microclimate: wind, extreme temperatures
   - _Historic landscapes
   - _Habitats, habitat connectivity and gaps
   - _Hazards: fire, flood, earthquake faults and epicentres, landslide potential, tsunami
   - _Wetlands

6. Views
   - _View corridors, landmarks, natural features
   - _Critical skylines, shorelines, ridgelines

7. Control
   - _Public property ownershop, public control

8. Other
   - _Noise contours
   - _Waste spaces, soft spaces, adaptable spaces
   - _Maintenance
   - _Safety, accidents, crime

Image A3.6 Liveability of the built environment (based on Southworth, 2003)

This index is specialised in the relation of the physical environment and liveability. It has been a key input for the indicators on the physical environment in the final liveability index.

Life quality score

1.	Housing	x/10
2.	Cost of living	x/10
3.	Startups	x/10
4.	Venture capital	x/10
5.	Travel connectivity	x/10
6.	Commute	x/10
7.	Business freedom	x/10
8.	Safety	x/10
9.	Healthcare	x/10
10.	Education	x/10
11.	Environmental quality	x/10
12.	Economy	x/10
13.	Taxation	x/10
14.	Internet acces	x/10
15.	Leisure and culture	x/10
16.	Tolerance	x/10
17.	Outdoors	x/10

Image A3.7 Life quality score (based on Teleport & Pozzi, n.d.)

The life quality score was used as a source of inspiration. Since all topics were already visible in the other indexes, the life quality score was not used.

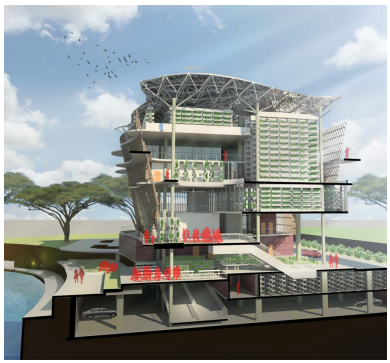
Life quality score

Economy	**x/10**
2. Cost of living	x/10
3. Startups	x/10
4. Venture capital	x/10
8. Business freedom	x/10
13. Economy	x/10
14. Taxation	x/10
Stability	**x/10**
9. Safety	x/10
17. Tolerance	x/10
Healthcare	**x/10**
10. Healthcare	x/10
Environment	**x/10**
1. Housing	x/10
12. Environmental quality	x/10
16. Leisure and culture	x/10
18. Outdoors	x/10
Education	**x/10**
11. Education	x/10
Infrastructure	**x/10**
5. Travel connectivity	x/10
6. Commute	x/10
15. Internet access	x/10

Image A3.8 Life quality score re-organised

A3. Case studies

The Arbor House
Danois Architects, PC
NYC, USA
Executed project
_https://agritecture.tumblr.com/post/55872300757/the-arbor-house-integrating-agriculture-where-it
_ https://www.housingfinance.com/management-operations/bronx-development-encourages-healthier-lifestyles_o



Gardens of the Future
MJZ,
Poland,
Not built
_https://www.designboom.com/architecture/mjz-urban-farming-masterplan-research-center-poland-10-20-2020/
_ https://m-j-z.com/project/gardensoft-hefuture

LA River Urban Agriculture Green Infrastructure Plan
MJZ,
Los Angeles, USA
Not built
_https://www.designboom.com/architecture/mjz-urban-farming-masterplan-research-center-poland-10-20-2020/
_ https://m-j-z.com/project/gardensoft-hefuture

Inter-Farm-Market
Interactive Biophilist
Malaysia
Research project
_https://www.behance.net/gallery/37595739/Vertical-Farming-Architecture-Inter-Farm-Market

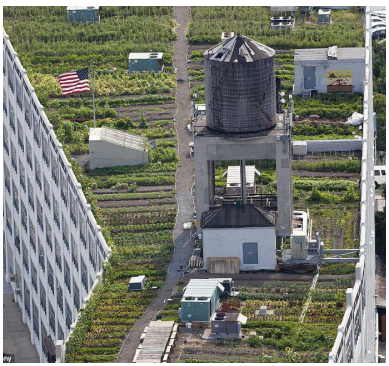
Camden Goods Yard
Allies and Morrison, Niall McLaughlin Architects, Piercy & Company
London, United Kingdom
Not built (planned)
_ https://www.camden.gov.uk/documents/20142/145786127/Site+Allocations+2020+-+05+Camden+Goods+Yard.pdf
_ https://www.skyscrapercity.com/threads/camden-goods-yard-chalk-farm-u-c.2013888/

Greenbelly
Alex Losada, AVL studio & Camille Lassale
Location: Undefined
Not built
_ http://www.greenbelly.org/index.html
_ https://www.designboom.com/architecture/greenbelly-sun-rain-organic-waste-09-13-2018/

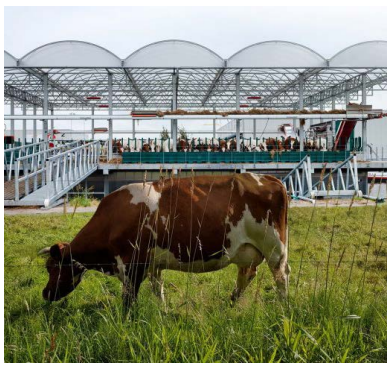
NEWFARM
Agritecture.com
NYC, USA
Not built
_https://agritecture.tumblr.com/post/123125623452/newfarmnewyork-mixed-use-manhattan-vertical-farm
_ https://www.re-thinkingthefuture.com/2021/07/14/a4590-what-is-agritecture/

DakAkker
ZUS
Rotterdam, Netherlands
Executed project
_https://dakakker.nl/site/

Clepsydra
Bruno Viganò & Florencia Costa
Europe
Not built
_https://www.bfi.org/challenge/2011/clepsydra-urban-farming/
_ https://agritecture.tumblr.com/post/121560694 36/clepsydra-urban-farming
_ https://ecofriend.com/clepsydra-urban-farming-vertical-greenhouse-to-bring-farming-to-the-cities.html

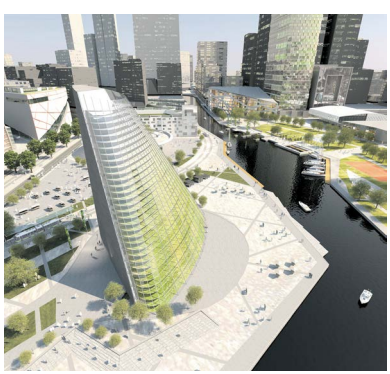


Long Island City
Brooklyn Grange
NYC, USA
Executed project
_ *https://www.brooklyngrangefarm.com/*
_ *https://www.brooklyngrangefarm.com/blog/of-lifecycles-and-leases*



Vegetable Nursery House
1+1>2 International Architecture JSC
Vietnam
Executed project
_ *https://www.archdaily.com/484661/vegetable-nursery-house-1-1-2-international-architecture-jsc*

BIA 01
Oscar Rodriguez
London, UK
Not built
_*https://www.architectureandfood.com/new-builds?lightbox-dataItem-jod62ptl2*



Floating Farm
Goldsmith company
Rotterdam, Netherlands
Executed project
_https://floatingfarm.nl/de-farm
_https://goldsmith.company/floating-farm-dairy/
_https://rotterdam.info/locaties/floating-farm/

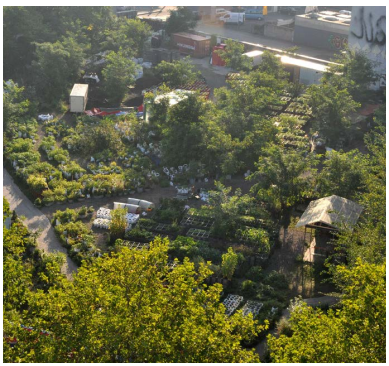
Vertical Harvest
e/ye design
Jackson, USA
Executed project
_https://verticalharvestfarms.com/
_https://agritecture.tumblr.com/post/141843426222/a-ski-town-green-house-takes-local-produce-to
_ https://www.designboom.com/architecture/eye-design-vertical-harvest-in-jackson-2-28-2015/

Newark Vertical Farm
Weber Thompson
Newark, USA
Not built
_ Despommier, D., Giacomelli, G. A., & Carter, M. (2020). The Vertical Farm (Tenth Anniversary Edition): Feeding the World in the 21st Century (Anniversary). Picador.
_https://agritecture.tumblr.com/post/19596436100/newark-vertical-farm

Voedselbos de Overtuin
Trompenburg
Rotterdam, Netherlands
Executed project
_https://trompenburg.nl/voedselbos/
_http://pauldegraaf.eu/voedselbos-de-overtuin-geopend/

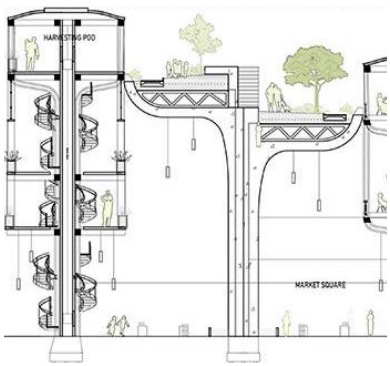
Plantscraper
Plantagon International
Linköping, Sweden
Not built
_https://www.agritecture.com/blog/2019/2/22/swedish-vertical-farming-company-plantagon-international-declares-bankruptcy
_https://www.dezeen.com/2018/01/15/video-skyscraper-plantagon-urban-farm-world-food-building-movie/

USA Pavilion at Expo Milano 2015
Biber Architects
Milan, Italyw
Pilot
_ https://www.world-architects.com/en/architecture-news/reviews/usa-pavilion-at-expo-milano-2015-2



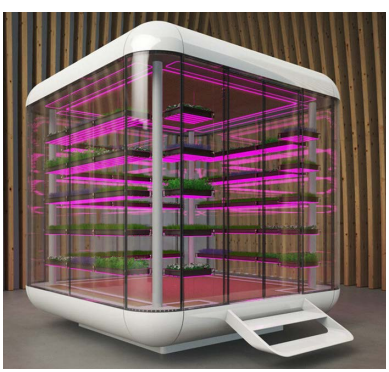
Prinzessinnengarten

Prinzessinnengarten Kollektiv
Berlin, Germany
Executed project
_https://prinzessinnengarten.net/
_https://prinzessinnengarten-kollektiv.net/



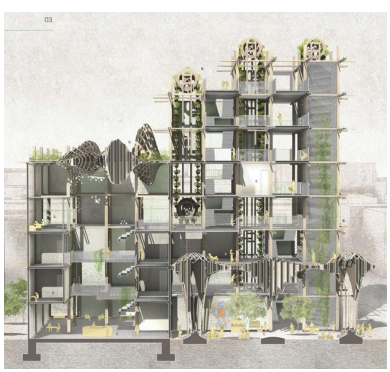
The Coral

Ulrim
Location: undefined
Pilot
_https://www.designboom.com/technology/ulrim-the-coral-algae-farming-07-11-2019/
_https://www.ignant.com/2019/09/12/this-micro-algae-indoor-farm-shows-the-promising-future-of-plant-technologies/



EmotionCube®Microgreer

Studio Oberhauser
Location: undefined
Pilot
_https://www.studio-oberhauser.com/design/product-design/emotioncubemicrogreen/



Urban Agro Hub
Nurin Qistina Binti Abd Rahman
Sentul, Malasya
Research project
_http://www.presidentsmedals.com/Entry-58891

The New Farm
Space & matter
The Hague, Netherlands
Executed project
_https://thenewfarm.com/
_https://www.impactcity.nl/en/city-farming-new-farm/
_https://www.urbanfarming-greenhouse.eu/the-new-farm-in-den-haag-operated-b

Lettuce Grow Farmstand
Square Mile Farms
Location: Undefined
Pilot
_https://www.flipsnack.com/F69A55F-F8D6/office-farming-square-mile-farms/full-view.html
_ https://www.squaremilefarms.com/officefarms

The Farm Wall
Square Mile Farms
Location: Undefined
Pilot
_https://www.flipsnack.com/F69A55F-F8D6/office-farming-square-mile-farms/full-view.html
_ https://www.squaremilefarms.com/officefarms

The Urban Farm
Molly Rose Agnew
London, UK
Research project
_http://www.presidentsmedals.com/Entry-57991

Agrotechture
Juan Manuel Guzzy
Mexico City, Mexico
Research project
_ https://www.presidentsmedals.com/Entry-59381

Productive Insurgence

Lahiru Fernando
Wadduwa, Sri Lanka
Research project
_https://www.presidentsmedals.com/Entry-56801

Power Plant

Marjan van Aubel
Location: Undefined
Pilot
_https://www.dezeen.com/2018/10/31/marjan-van-aubels-rooftop-greenhouses-design/
_ https://marjanvanaubel.com/power-plant-2/
_ https://www.dutchdesignawards.nl/gallery/powerplant/
_ https://dissidentgardens.hetnieuweinstituut.nl/en/power-plant

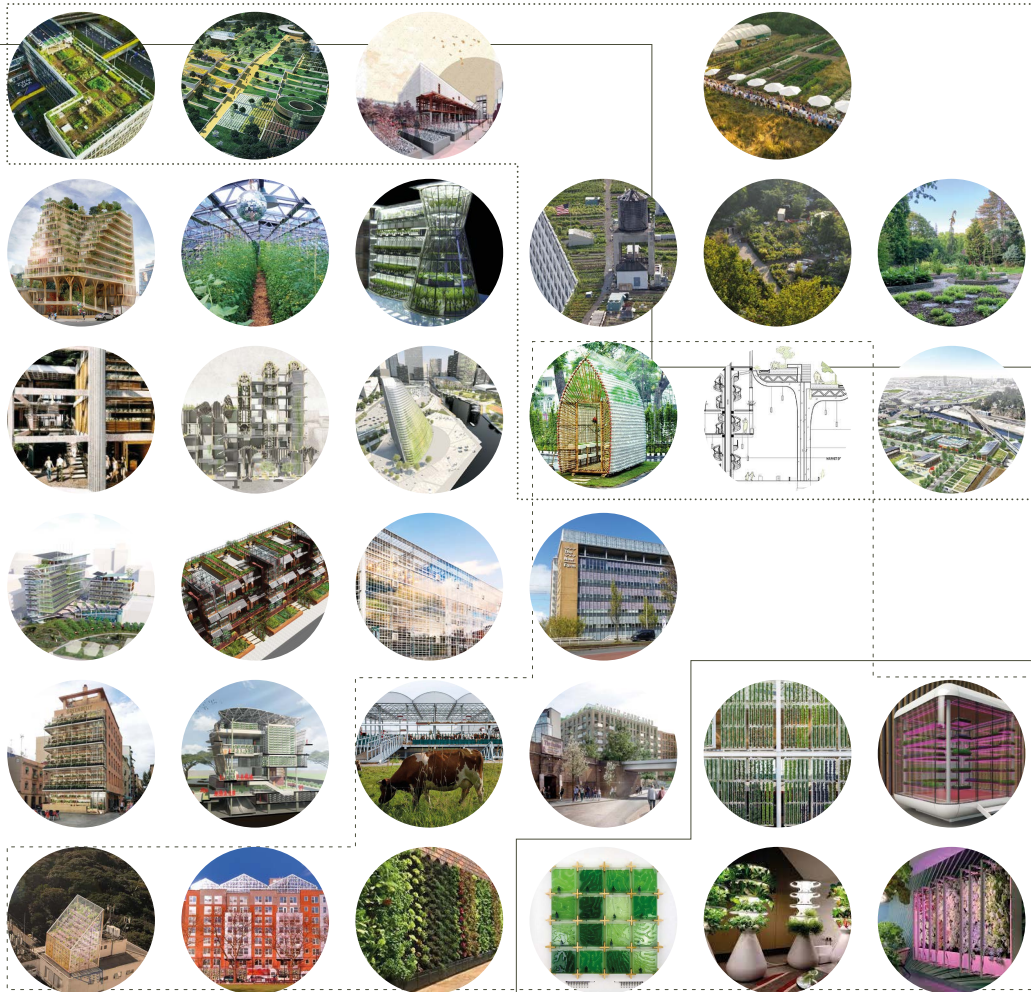
Sitopia Farm

Designer Unknown
London, UK
Executed
_https://sitopiafarm.com/
_https://www.thegrocer.co.uk/sourcing/sitopia-farm-a-utopian-idyll-of-farming-in-inner-london/660900.article
_https://foodresearch.org.uk/blogs/sitopia-farm/

Home Farm
Square Mile Farms
Location: Undefined
Pilot
_https://www.squaremilefarms.com/homefarms

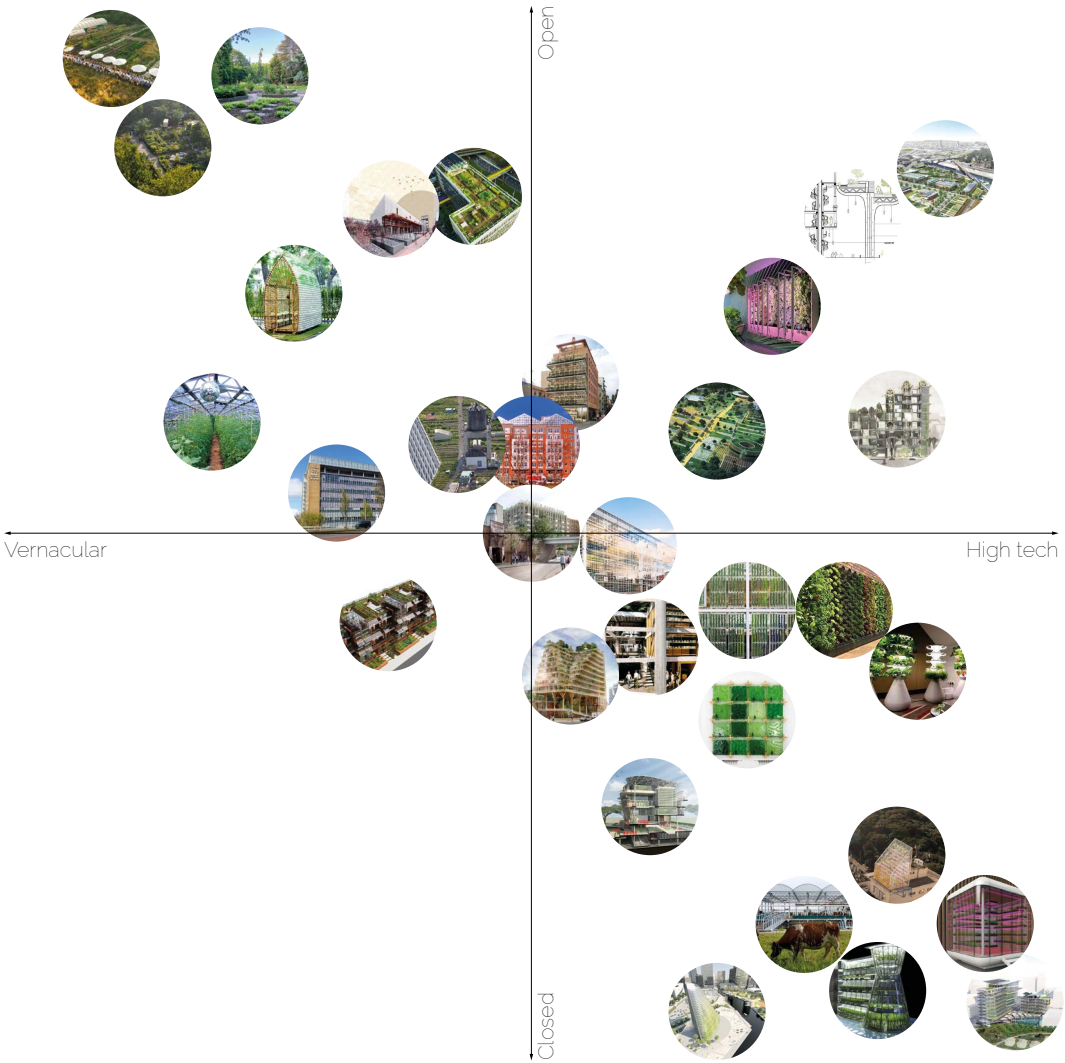
Edible London Wolfslane
Edible London; Studio Gil & Practice Architecture
London, UK
Executed project
_https://ediblelondon.org/about/
_https://www.wolveslane.org/
_ https://practicearchitecture.co.uk/project/wolves-lane-horticultural-centre/

Spatial



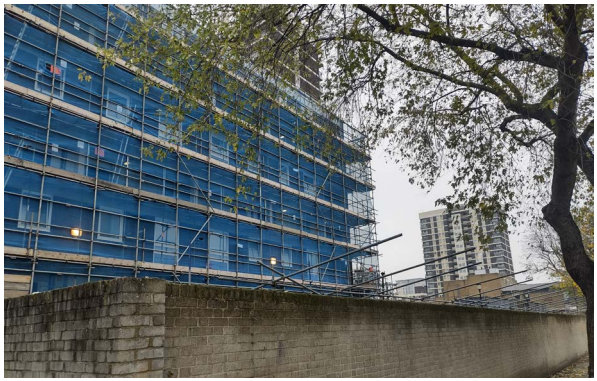
Furniture

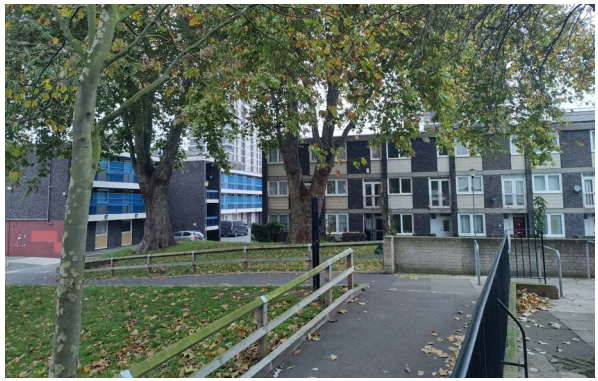
Built


Open
Vernacular
High tech
Closed

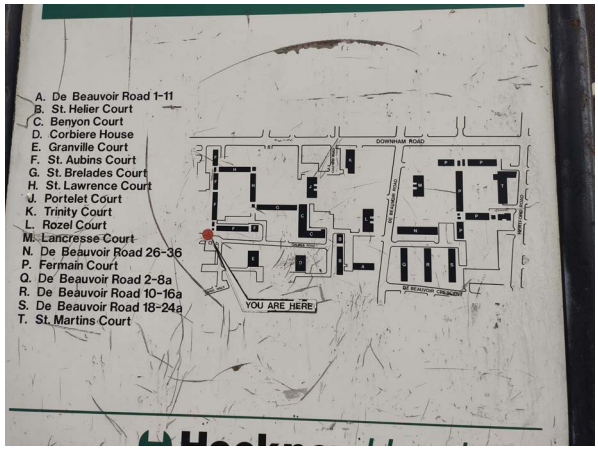
A4. Photos Beauvoir Estate

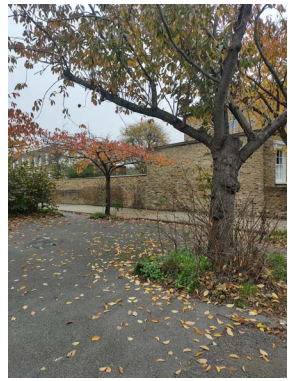

ROSE
LIPMAN
BUILDING
Rose Lipman Community Centre

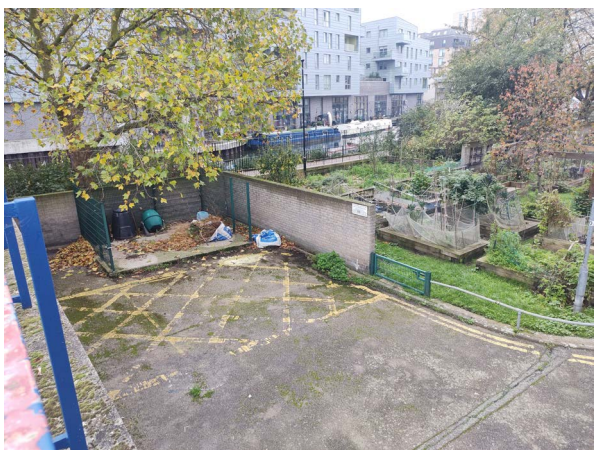




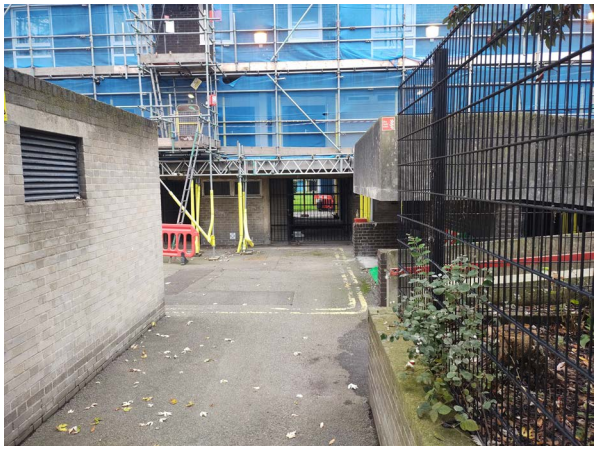
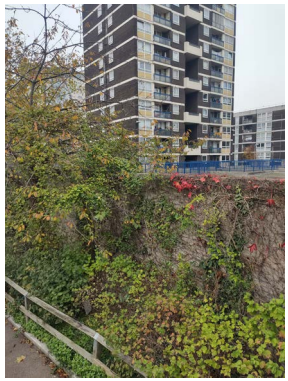
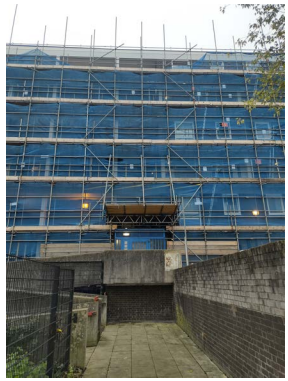

Welcome to
De Beauvoir Estate


A. De Beauvoir Road 1-11
B. St. Helier Court
C. Benyon Court
D. Corbiere House
E. Granville Court
F. St. Aubins Court
G. St. Brelades Court
H. St. Lawrence Court
J. Portelet Court
K. Trinity Court
L. Rozel Court
M. Lancresse Court
N. De Beauvoir Road 26-36
P. Fermain Court
Q. De Beauvoir Road 2-8a
R. De Beauvoir Road 10-16a
S. De Beauvoir Road 18-24a
T. St. Martins Court
DOWNHAM ROAD
YOU ARE HERE

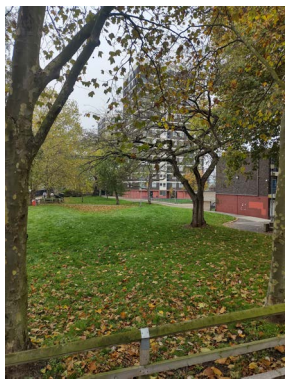


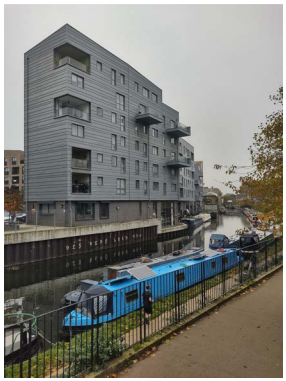


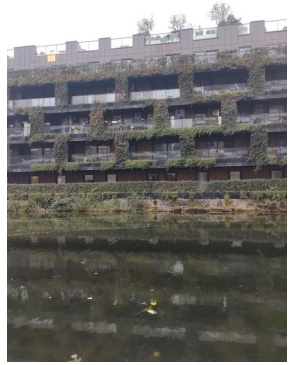

De Beauvoir Estate Garden Allotments
This Grow Your Own Allotment Garden was set up by
the De Beauvoir Tenants & Residents Association
and is run by a group of residents who live on
the estate.
If you live on the estate and are interested in







A5. Ecosystem services & liveability

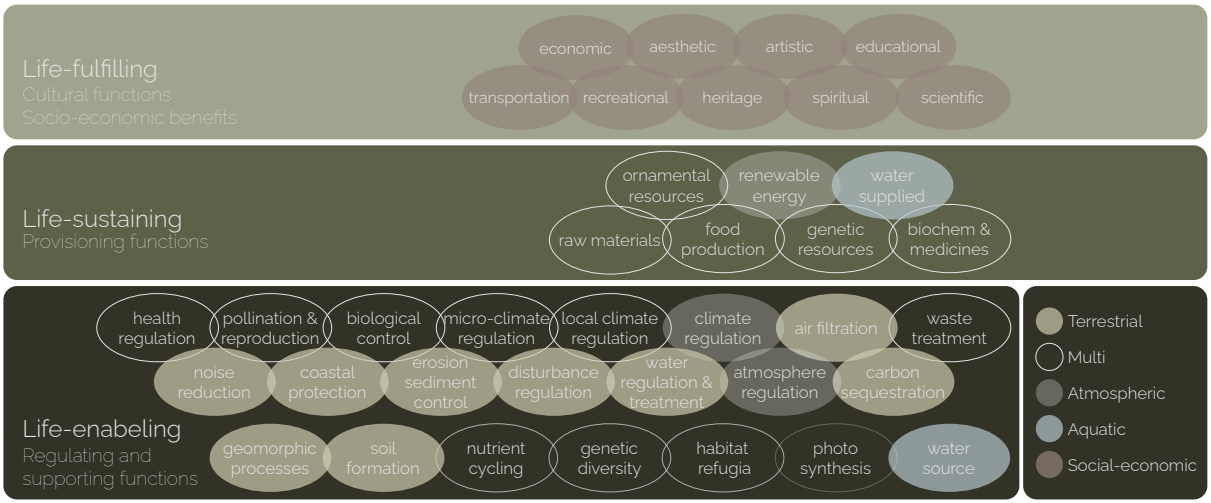


Image A5.1: Ecosystem services (based on Birtles et al., 2013) & (Mcleod, 2023)

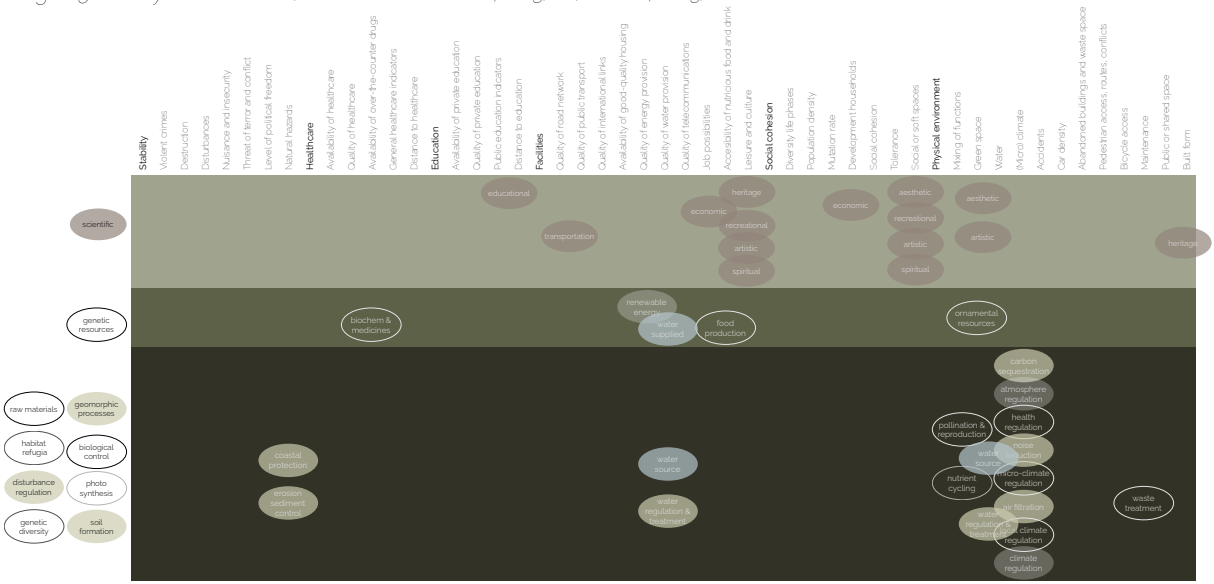


Image A5.2: Ecosystem services (based on Birtles et al., 2013)

A6. Design assignment

This research forms the foundation for the design project "The Common Foodscape". This project will take place in the Beauvoir Estate, and will form an extension on the design experiments of this research. The research defines five key principle to implement into the design.

First, the design site should be further analysed, not only taking into account the spatial characteristics, but also the demographics. From here, the current liveability should be measured to be able to see what can be improved upon and which strategies would be most fitting to these problems. This reflection using the liveability index should be done throughout the design process. Important design decisions should be reflected on using this index.

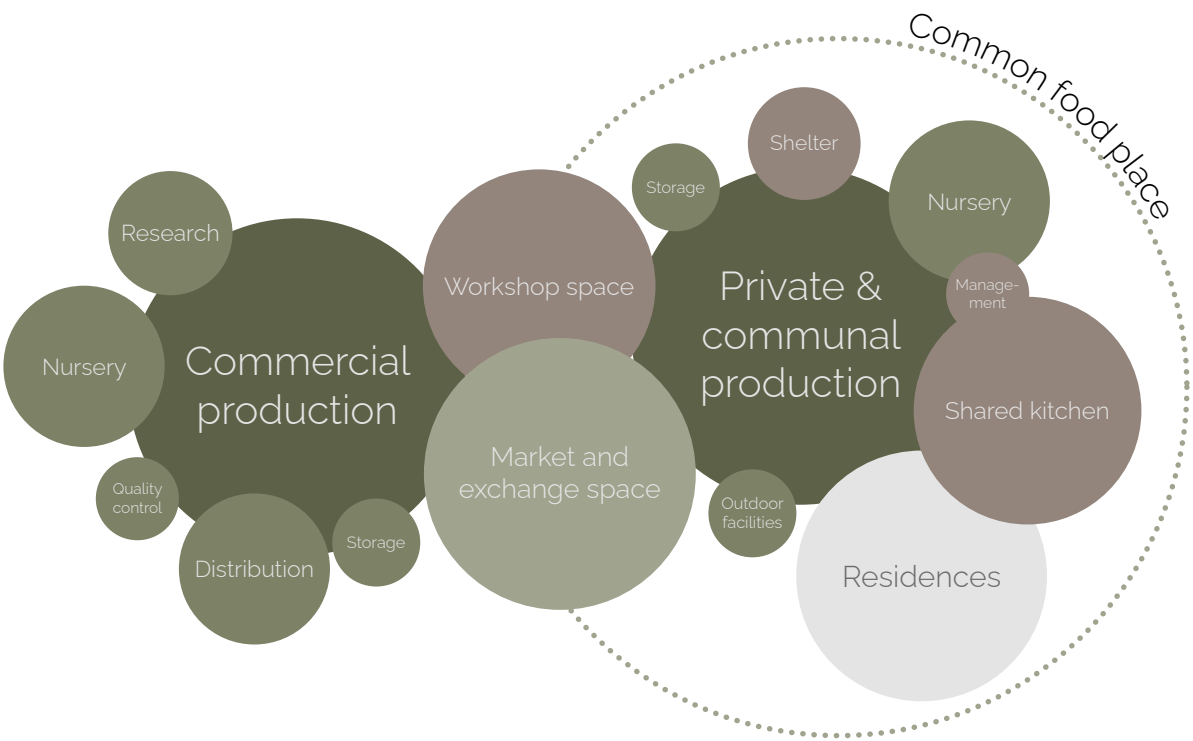


Image A6.1: The proposed program

Second, from here the implementation of the four spatial urban agriculture strategies can be determined. The site offers perspective to use all four. As part of the design goal is to create not only a social or educational production site, but also a high agricultural yield, the introduction of vertical city farming on site is necessary. For this a new building will be needed to design on site. Transformation will be implemented for the existing residential buildings to increase the housing quality. Smartcities will be at the core of the new infrastructure system and CPUL will form the basis of the public space landscape.

Third, the interviews and case studies have shown that the successful urban agriculture projects are those where the residents were actively participating in the urban agriculture sites. As such, it is important for inhabitants to embrace the design proposal. Next to that, the strategy Sitopia defines that simply changing production methods is not enough. There is a need for a new valuation of food and the food system. The integration of production inside the city is the first step in this. However, the social transition can only be completed via the interaction between people and the food system. This is why in the design proposal transparency, accessibility and food centred public spaces are critical.

Fourth, the research has led to a clear program for the project. It defines a series of functions which are necessary and which strengthen each other (image A6.1). Here, both the productive program and the social program are integrated.

Lastly, the integration of intensive production in a residential neighbourhood calls for a thorough reflection on the existing infrastructure and a proposal for a sustainable and low impact transport system for the site. This proposal should reduce the noise, smell and pollution connected to intensive transport.

Overall the goal of the design is to create food production in the Beauvoir estate in a way that improves the liveability of the area. To do so the following elements should be designed: a new sustainable energy, water, food and waste infrastructure; new food centred public spaces; interaction