

# Modular Community Garden

Towards a sustainable life



Abdullah Natsheh, Jeevan Prem M, Mohammed Rshdan  
Chalmers University of Technology | MPDSD 2020|

Design Studio Planning and Design for Sustainable Development in a Local Context: Bengtsfors -  
Architecture of Rurban Territories



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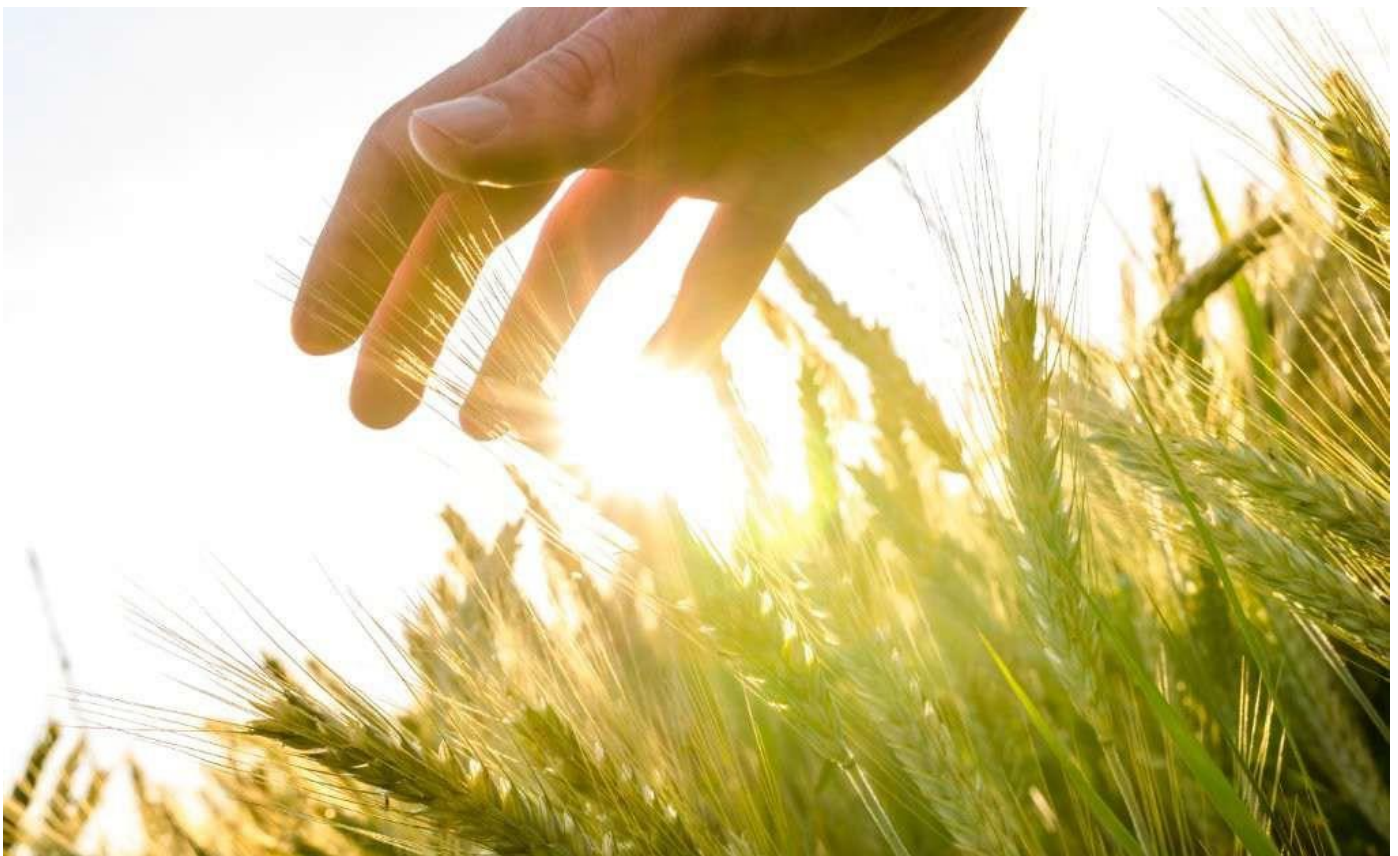


## Abstract:

The study explored the existing situation and possible future directions of Bengtsfors municipality. The project moves in the direction of tackling several issues involving the municipality of Bengtsfors and provide proposals utilizing the existing positive features in context. The process of urbanization has increased due to a lack of many employment opportunities and minimal social activity within the municipality which has created a negative trend.

The proposal is intended to provide an alternative to the existing typologies and increase the belongingness to the municipality. The need for a spatial intervention that enhances social connections and economic generation was identified and possible options were explored within this range. The discussions led to the option of flexible community modules.

The Modular community gardens offer Bengtsfors flexible farming nodes, that can be started by just a few members, and can expand further based on the interest from the community. The project tackles the different societal issues, providing communal and public spaces throughout the municipality, to strengthen the social bonds within the communities. It also tackles the economic and unemployment problems, providing fresh crops for the villages, as well as job opportunities for the community, in the farming sector.





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## WHO ARE WE?

We are a group of three students, Abdullah Natsheh, Jeevan Prem M, and Mohammed Rshdan who share a common interest in working towards a sustainable future. We are from three different backgrounds where Prem is from India, Abdullah is from Jordan, and Mohammed who has lived in Sweden for five years.

We, as a team, have the same orientation in making a change and discussing possible futures in the field of architecture. We enjoy a great deal of having interesting discussions to develop our project and to reach the goal to achieve sustainable development for the benefit of those interested in this project.

Indeed, we are always looking for something new that enriches our knowledge and diversifies our ways of thinking about future architecture. We love the challenges for a better future.



Abdullah Natsheh



Prem Madugula



Mohammed Rshdan

# BACKGROUND



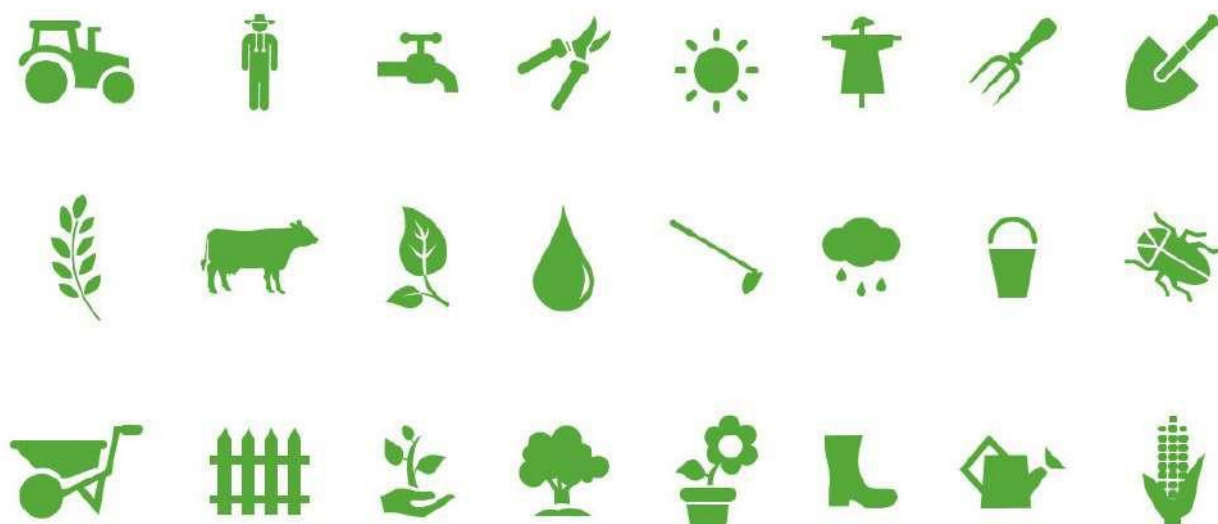


# INTRODUCTION

Agriculture today is widely dominated by industrial methods. The main concern with agro-industry is that it has been masking the fundamental issues of unsustainable farming creating a false sense of food security among communities, in relation to one of the local development objectives for Bengtsfors municipality, which is to lessen the environmental footprint by choosing locally produced food.

We do understand that some sudden matters are changing our world towards unexpected trends such as epidemics, COVID 19 one of these. The world has changed under this pandemic, where people are still losing their jobs and the unemployment levels are raised in each community. The municipality of Bengtsfors is facing this problem and people are wondering about, what is the solution? In addition, how the solution can be sustainable to face any problem that could happen in the future?

Therefore, we must have enough flexibility to live with these things and thus search for new sustainable ways and methods that secure our transition towards better life and future. Therefore, the project addresses these issues from the standpoint of rurban development.



## BENGTSFORS IN ITS CONTEXT

### Bengtsfors, Sweden

Bengtsfors Municipality (Bengtsfors kommun) is a municipality in Västra Götaland County in western Sweden. Its headquarters is located in the town of Bengtsfors.

The present municipality was formed in 1971 when the former town (köping) of Bengtsfors (instituted in 1926) was amalgamated with the municipalities of Bäckefors, Lelång and Steneby, according to the municipality homepage (*bengtsfors.se*).

Bengtsfors municipality is one of five municipalities in Dalsland.

Just under 10,000 people live in the municipality of Bengtsfors. The municipality is best known for its scenic surroundings and all the lakes (399) that cover about 17 percent of the area and Dalsland's canal that flows through several places in the municipality, according to (*bengtsfors.se*).

The municipality has six urban areas, of which Bengtsfors is the central area. The other towns are Dals Långed, Billingsfors, Bäckefors, Skåpa-



(Source, *bengtsfors.se*).



The municipality's area is 890 square kilometers, which means that the people who live here have plenty of space, 11 inhabitants per square kilometer. Just under 70 percent of the population lives in one of the six urban areas and the rest live in the countryside, according to (*bengtsfors.se*).

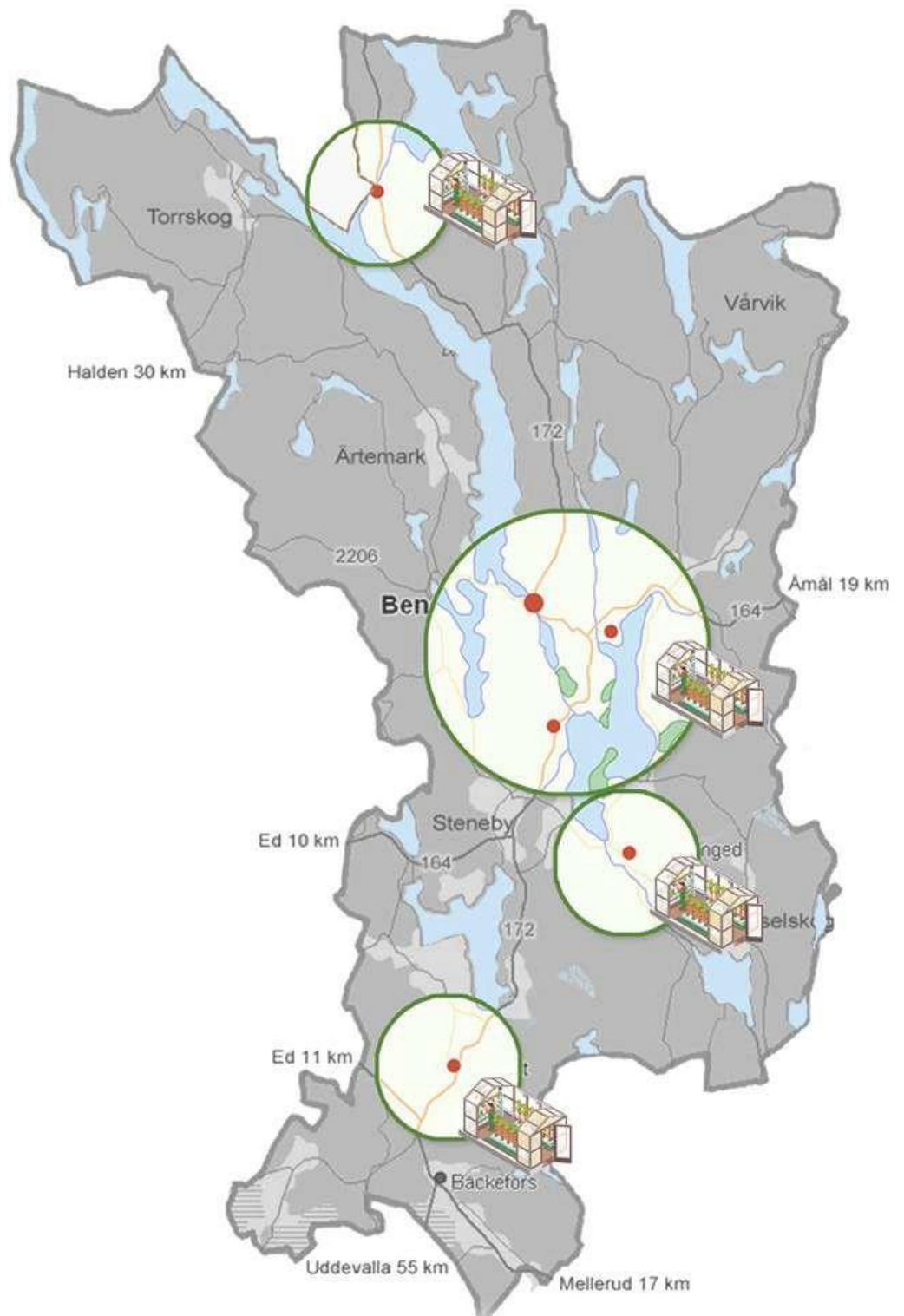


## ABOUT THE PROJECT

The project revolves around the idea of creating different interconnected farming nodes throughout the municipality of Bengtsfors, tackling the various societal, economic issues, through modular community gardens.

The project aims on offering economic and food stability to the municipality, through community and commercial farming zones. It also enhances community relations by creating new ways of interaction based on context.

The proposal consists of different gardening modules across multiple villages in Bengtsfors, which allows for growing healthy, safe, local produce year-round in a sustainable way.



# SWOT

The project is based on three previous stages that dealt with; the local situation, the broader context and the rural future in the municipality of Bengtsfors. Each stage has a specific analysis that related to the case study, where the project is designed, depending on this analysis.

The proposal addresses the strengths, the weaknesses, the opportunities and the threats, that municipality of Bengtsfors highlighted within the “SWOT ANALYSIS”.

## S

### STRENGTHS

**S: Communal Engagement:**

Smaller settlements and communities can create a feeling of familiarity and a sense of belonging. Voluntary civic engagement in the local community is important to give life to places.



## W

### WEAKNESSES

**W: Uncertain Future:**

The rapid change of society that has happened over the last decades is making work and development perspectives in the region uncertain. It is difficult for people to picture their future.



## O

### OPPORTUNITIES

**O: Ruralisation:**

Increased interest in life in the countryside, closeness to nature, and a connection to the production of the food and products used.



## T

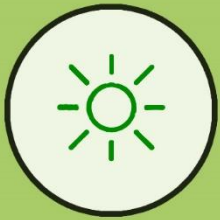
### THREATS

**T: Climate change:**

It might cause flooding, heavy rains, droughts, and forest fires. Current biomes (spruce forests) in the municipality are not resilient to changes, because of monoculture forestry.



# AIM





## WHY IS THIS NEEDED?

### Why does the municipality of Bengtsfors need this project?

The municipality of Bengtsfors has a strength by the existence of a natural rural environment surrounding the six major villages. However, many barriers have limited this social connection between people and nature.

Statistics issued by the municipality of Bengtsfors indicate that the population of the municipality is constantly decreasing, due to several reasons. The most important of these reasons is the loss of job opportunities, which shows the unemployment rate reaching 30 percent among adults. This is not to mention the negative impact of the pandemic of COVID 19 on the economic situation and its repercussions.

Therefore, this project aims to explore the effect of introducing community gardens to the municipality of Bengtsfors offering alternative economic sources, local food resources, and new ways of interaction with the municipality.

The purpose of the modular community gardens project is to enhance belonging within Bengtsfors by reducing segregation and encouraging people to stay.

### Who is the project for?

The project examines the social aspects and relationships between different groups of society, by performing the same work that they are interested in. We realize that the goal is to achieve sustainable development, which can be contributed through social sustainable interventions by increasing social connections, and increased mental and physical attachment to nature.

This makes the purpose of this project to reduce levels of segregation in the local community, as many groups within the community participate in this project.

The proposal also provides an opportunity for the residents to gain new knowledge and new ways to interact with each other.

### How is the project carry out?

The project is based on methodologies that take the ecosystem services approach, and case study into consideration, as these methodologies have guided the idea through many successful global examples of creating community gardens.

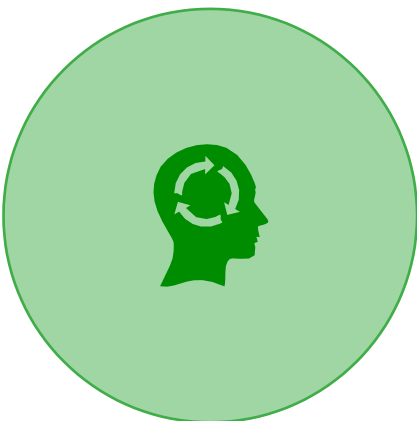
## OBJECTIVES



ALTERNATIVE ECONOMIC SOURCES.



ENHANCE BELONGING TO BENGTSFORS.



NEW WAYS OF INTERACTION.

## STRATEGIES

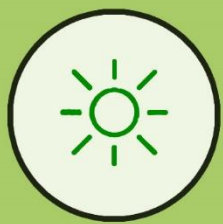
- To implement alternative ways of acquiring food.
  - To achieve mutual benefits for all members of the local community.
  - To offer alternative livelihoods and solutions.
  - To improve vegetable intake, and work towards food security in the local community.
- 
- To promote social sustainability through the cooperation and sharing of experiences between inhabitants and the stakeholders.
  - To emphasize social relationships in the local community.
  - To promote sustainable values to preserve the cohesion of the local community.
  - To limit the segregation in the local community

### **NEW WAYS OF INTERACTION:**

- To create recreation places where people can meet each other.
- To provide fresh, safe, affordable food.
- To help to relieve stress and increase sense of wellness.
- To provide social opportunities that build a sense of community and belonging



# ANALYSIS



## METHOD

The project is based on methodologies that are taking the ecosystem services approach, the participatory, and case study into consideration. However, these methodologies have guided the idea through many successful global examples of creating community gardens.

### **Ecosystem services approach.**



Ecosystem services can support the project through provisioning services, such as food, water, wood, fiber, etc. These help participants to attain physical health.

Cultural services such as spiritual, aesthetic, educational, entertainment, etc. These help participants to have mental health.

Supportive services, such as nutrient cycle, soil formation, primary production, etc. These help participants to reach an adaptation.

Regulating services, such as climate regulation, flood regulation, water purification, etc.

### **Case study.**



This method revolves around on how to adapt a modular community garden in different locations in the municipality of Bengtsfors because each site can have special conditions, as the design concept relies on flexibility to allow the project to exist in all these six towns.

# PROJECT COMPOSITION



## **Commercial farming**

Where participants can work in producing crops, which can be sold through markets that are located in the garden itself or the local markets.



## **Community farming**

Where the participants can grow crops and vegetables for self-use, and thus each participant can achieve some sort of self-sufficiency in regards to food.



## **Communal Interaction spaces**

Where participants and visitors from the local community or guests can carry out joint activities that enrich knowledge and thus reach an integrated community within itself and with others.

## MODULE LEVELS

The proposal is a standard unit where the spaces can be 'removed from /added to' according to the needs and engagement of the community. The incrementation is majorly in the agricultural unit which can be grown gradually.

### How the modular is established?

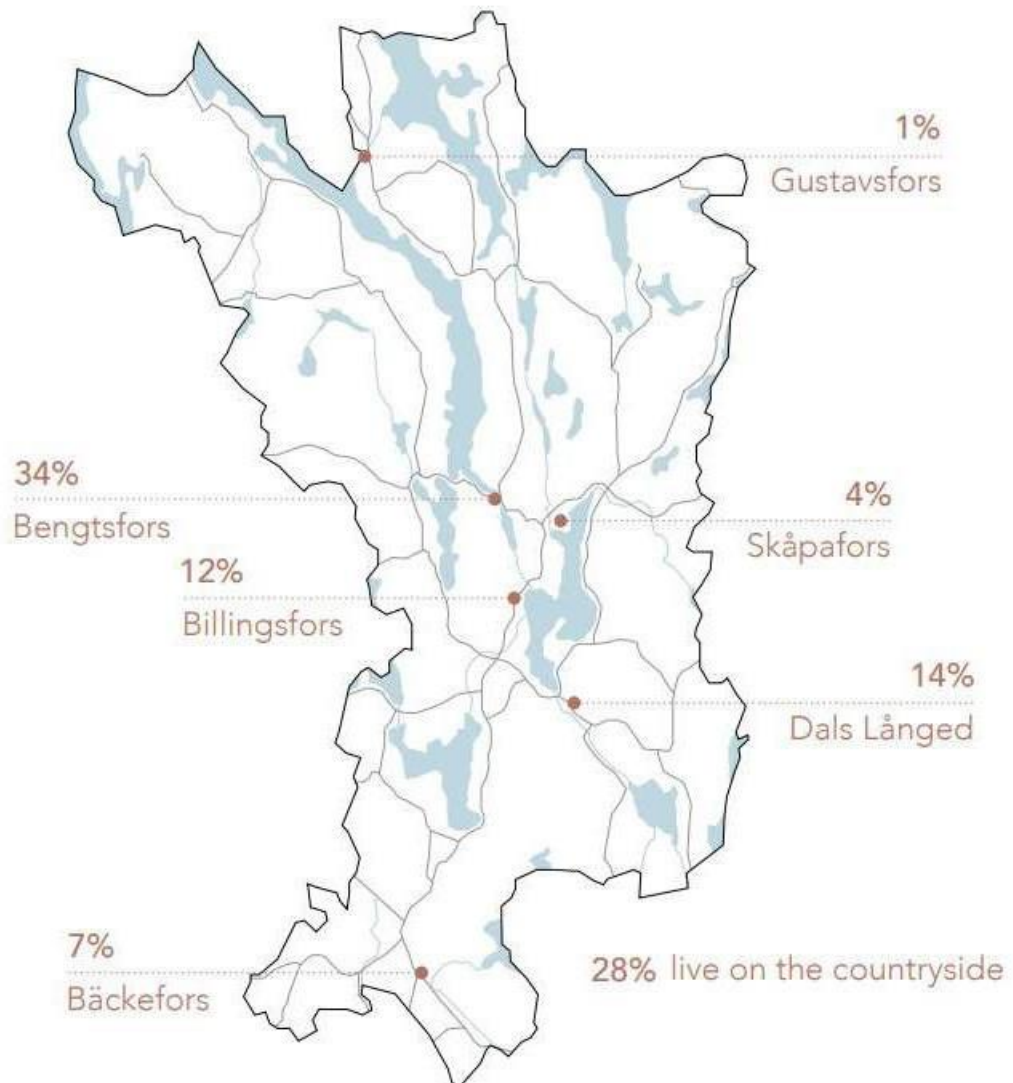
Creation of the modular unit starts with three factors;

#### A. Population in each town.

(Source, *bengtsfors.se*).

## Population

Map of population distribution in the municipality's different settlements.

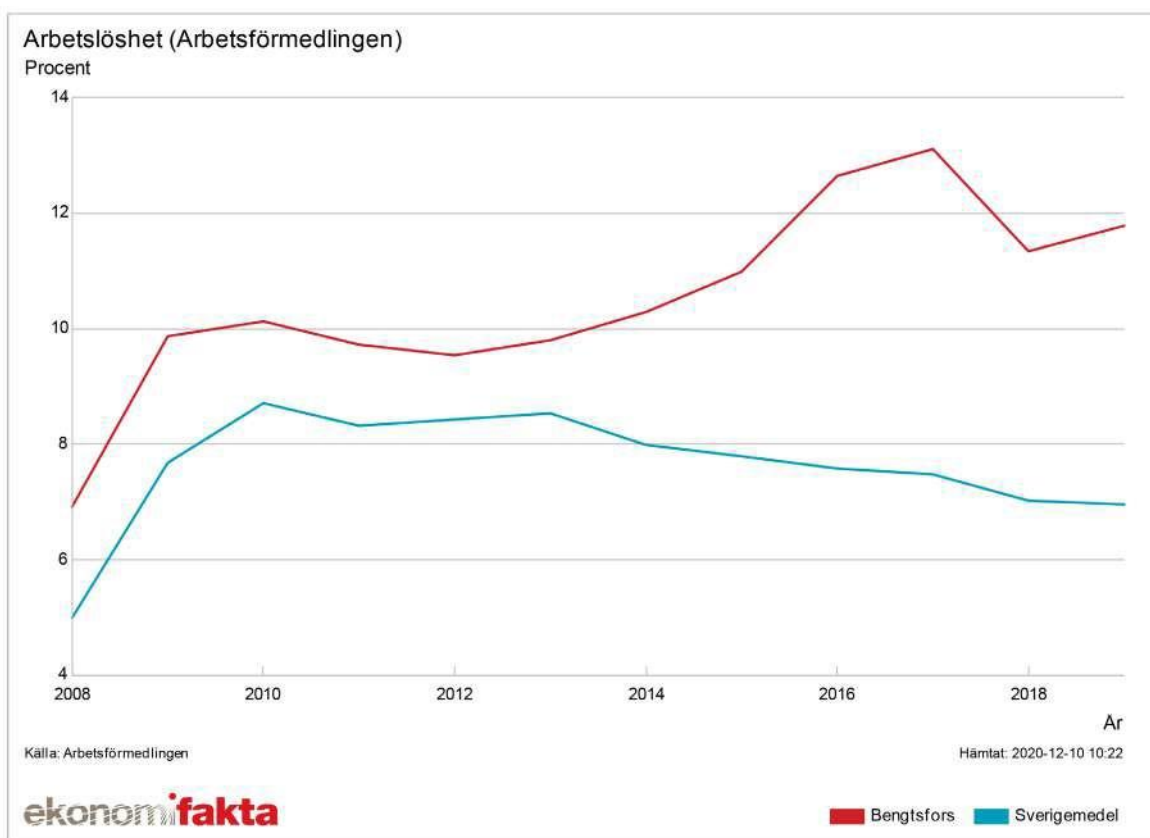


# MODULE LEVELS

## How the modular is established?

Creation of the modular unit starts with three factors;

### B. Unemployment rates in the municipality.



(Source, *ekonomifakta.se*).



## MODULE LEVELS

### **How the module is established?**

Creation of the modular unit starts with three factors;

### **C. The percentage of interest in each towns,**

OBS, *"No statistics were made in this regard"*.

## MODULE LEVELS

Based on this information/ research, we have created some guiding factors based on which the development and incrementation of the module can be achieved. These factors are based on the number of people involved in the working force and the spatial division based on project composition.

### 10 Person- Module



### 30 Person- Module



Area req for 10 mod

(Plot area per person: 15 sqm)

Plot area(for the module): 150 sqm

Commercial: 45 sqm (30% of the module area)

half a floor (indoor)

Educational:

Indoor: 20 sqm (approx)

Market: 25 sqm

Daycare/ play center:

Storage :

Area req for 30 mod

(Plot area per person: 15 sqm)

Plot area(for the module): 450 sqm

Commercial: 135 sqm (30% of the module area)

1 floor (indoor)

154 (planting beds)

Educational:

Indoor: 20 sqm (approx)

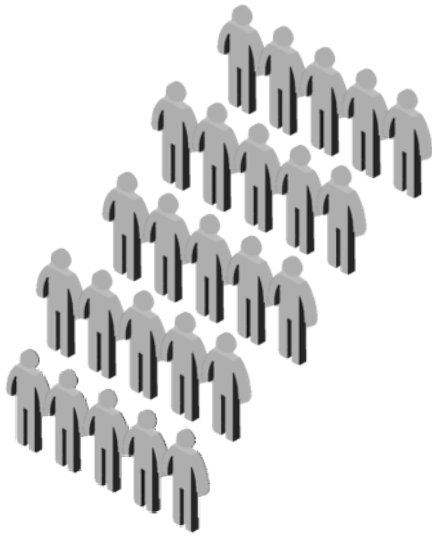
Market: 25 sqm

Daycare/ play center:

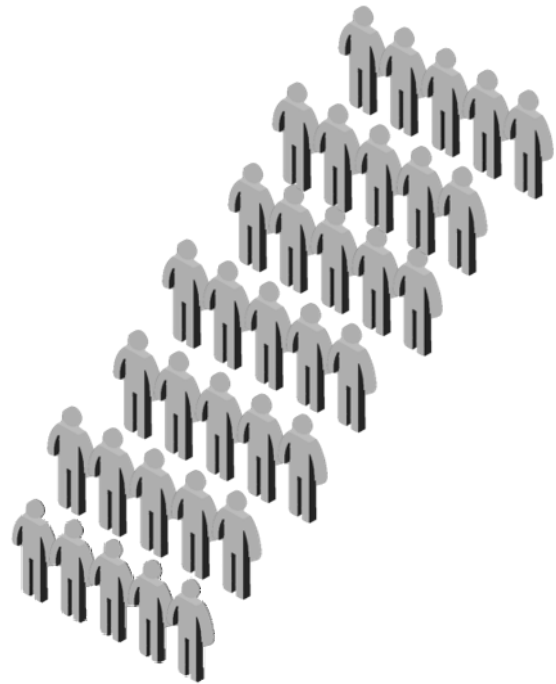
Storage : 5 sqm

# MODULE LEVELS

## 50 Person- Module



## 70 Person- Module



Area req for 50 mod

(Plot area per person: 15 sqm)

Plot area(for the module): 750 sqm

Commercial: 225 sqm (30% of the module area)

2 floors (indoor)  
154 + 110 (Planting beds)

Educational:

Indoor (workshop): 20 sqm (approx)

Market: 30 sqm

Daycare/ play center:

Storage : 7 sqm

Area req for 70 mod

(Plot area per person: 15 sqm)

Plot area(for the module): 1050 sqm

Commercial: 315 sqm (30% of the module area)

3 floors (indoor)  
154 + 110 + 96 ( planting beds)

Educational:

Indoor (workshop): 20 sqm (approx)

Market: 50 sqm

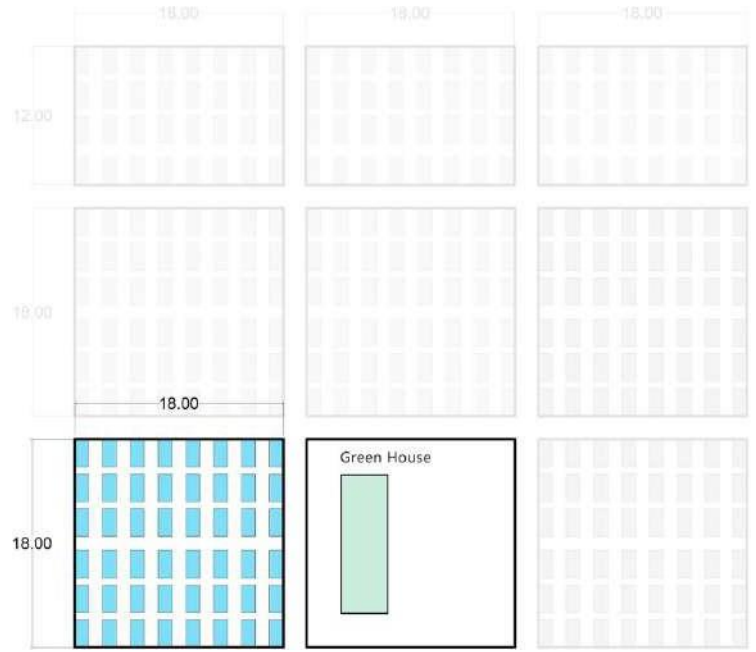
Daycare/ play center:

Storage : 12 sqm

# MODULE LEVELS

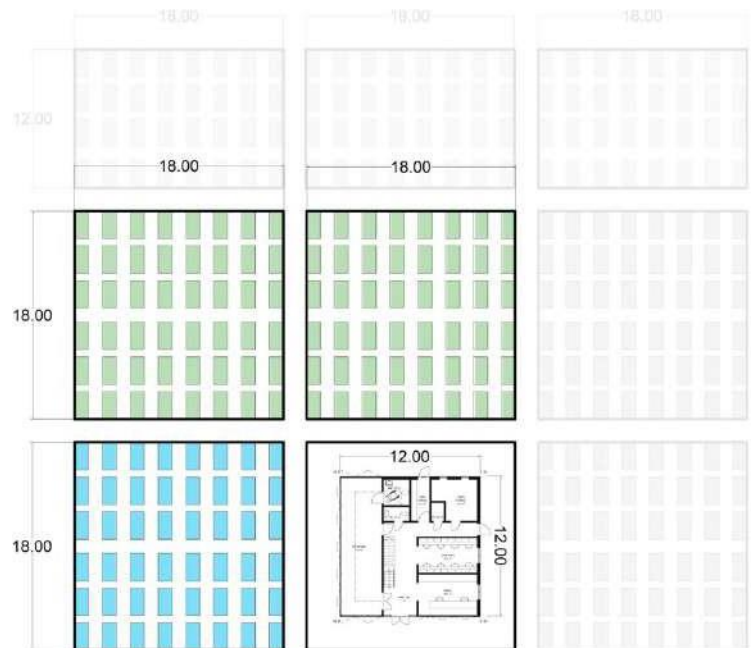
## Module 10

Plot area per person: 15 sqm.  
Communal farming area: 150 sqm.  
Planting beds : 52.  
Building levels: 0.

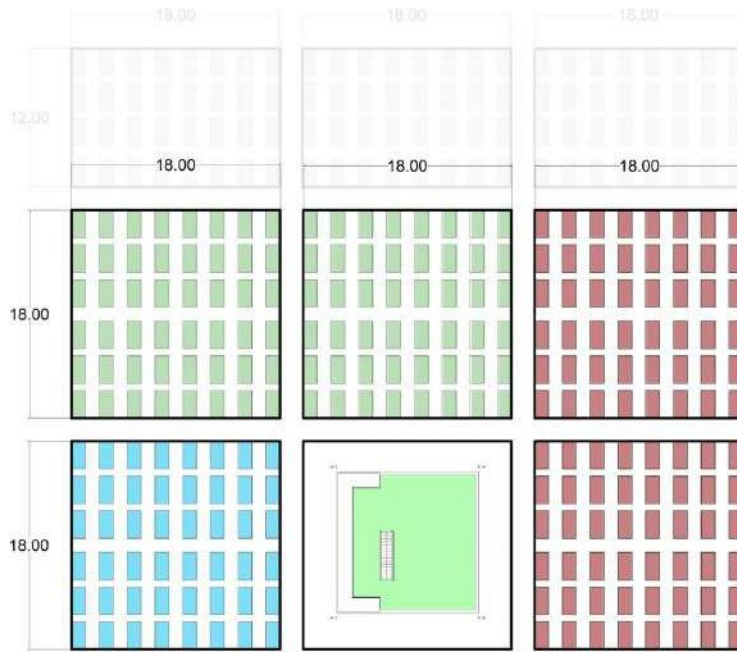


## Module 30

Plot area per person: 15 sqm  
Communal farming area: 450 sqm  
Planting beds : 156 units.  
Commercial farming area: 135 sqm.  
Building levels: 0-1

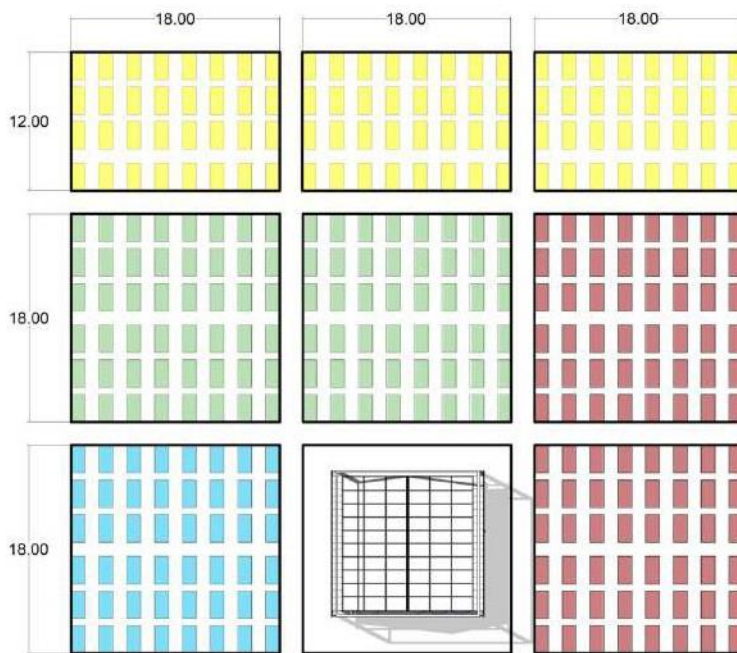


# MODULE LEVELS



## Module 50

Plot area per person: 15 sqm  
Communal farming area: 750 sqm  
Planting beds : 264 units  
Commercial farming area: 225 sqm  
Building levels: 2.  
One Building

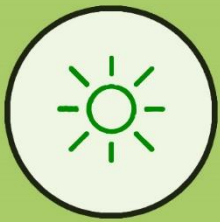


## Module 70

Plot area per person: 15 sqm  
Communal farming area: 1050 sqm  
Planting beds : 360 units  
Commercial farming area: 315 sqm  
Building levels: 2.  
Two Buildings



# DESIGN STRATEGIES



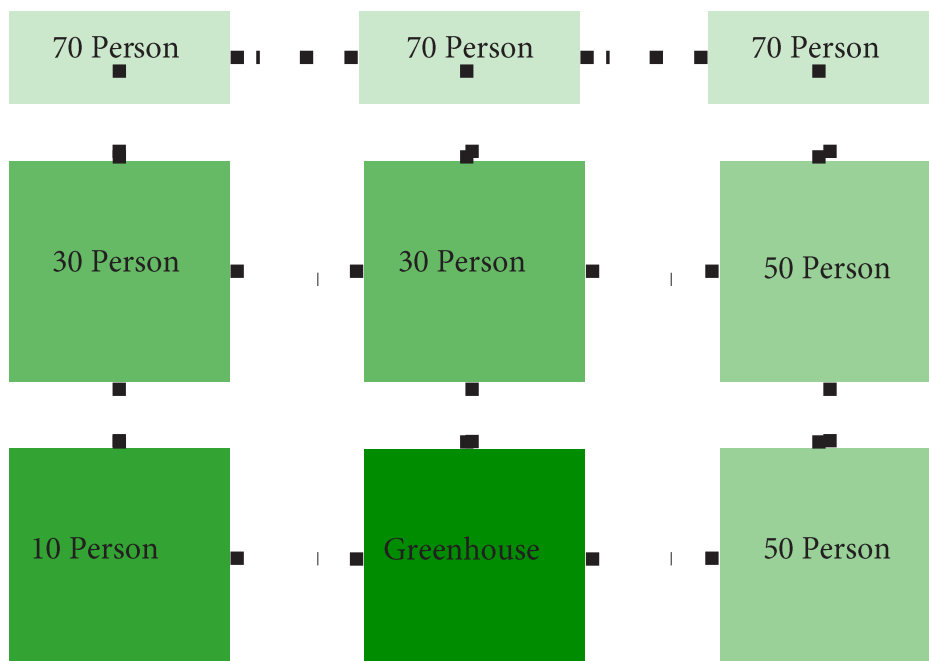
# The Lego Concept



## A. Spatial planning

The additive and subtractive nature of Lego blocks are adapted to give the modular community garden its flexibility, which needs to apply in different sites in the municipality.

### Outdoor planting



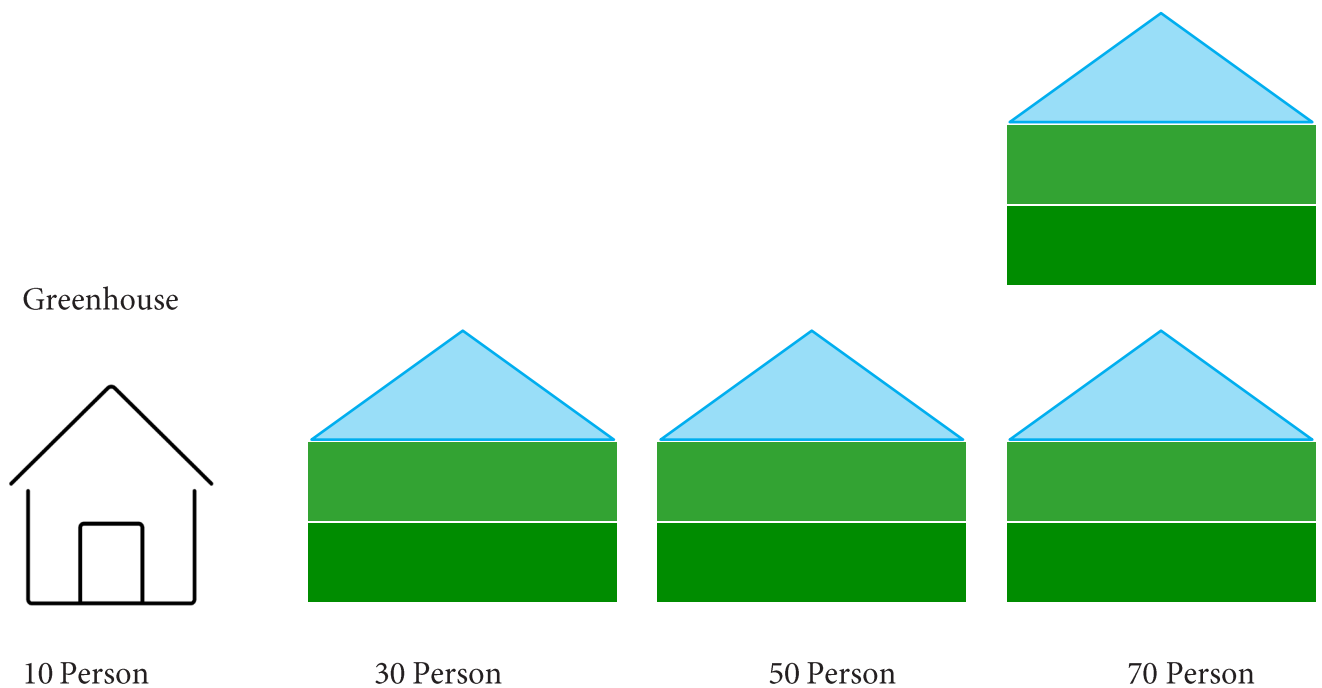
# The Lego Concept



## B. Vertical stacking

The building mass which is mainly the commercial module can be added to the individual site and multiplies in number along the incrementation with the size of the modular community garden.

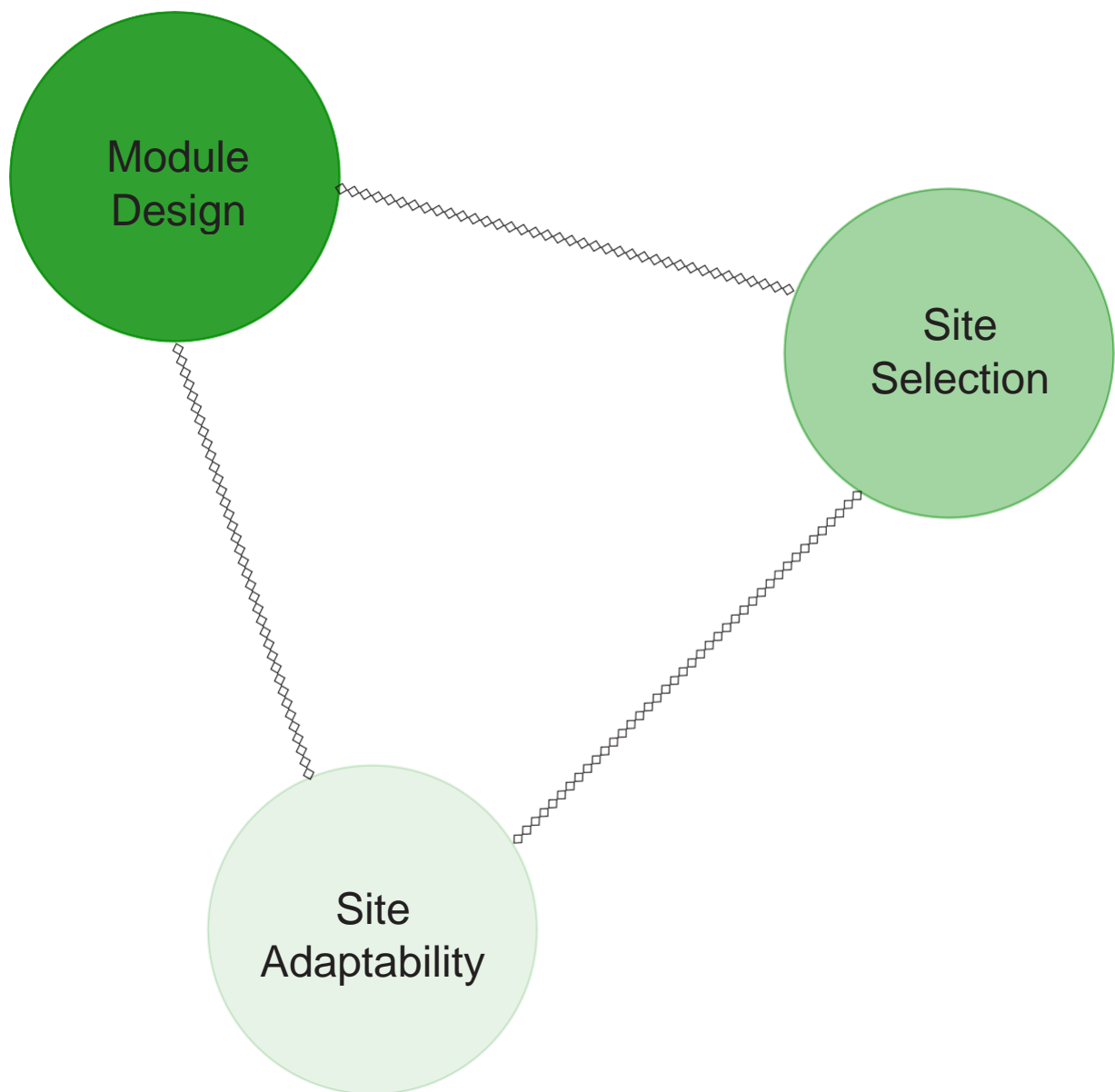
Indoor commercial  
farming



In this way, the design allows for more indoor planting area.

## DESIGN FLOW

The design concept is based on the following aspects, which makes the design strategy balanced to have a sustainable concept.



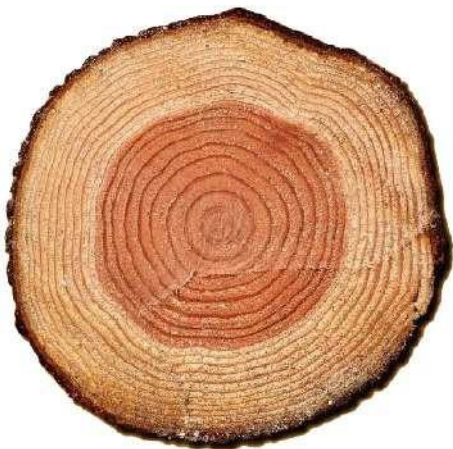
# MATERIALS

## A. WOOD

When choosing materials to work with, it was important for us to resort to a material that has the ability to last for life and be of high quality, with the possibility of reuse.

We believe that wood is one of these materials that can be compatible with the goals of sustainable development and the goals of the project, as wood is not only for building an area for internal cultivation, but it can be used to make benches and planting beds.

The wood is cheap material in Sweden and available within the region of Västra Goteland, according to website (*traguiden.se*).



## B. CELLULAR POLYCARBONATE

To achieve the transparency in the greenhouse and allow sunlight inside the building.

It is about how using a cheap material to achieve sustainability.





# MATERIALS

## C. SHIPPING CONTAINERS & RECYCLED MATERIALS

Bengtsfors is part of the Västra Goteland region, which includes the largest container port in Scandinavia. About 60 percent of Swedish container traffic is handled at the port of Gothenburg, which is about 185 km southwest of Bengtsfors, according to website ([portofgothenburg.com](http://portofgothenburg.com)).

Consequently, the province includes a fair number of containers that we believe can be used and prepared for commercial cultivation.

Some recycled materials are also used in the project, such as wood in the manufacturing of planting beds, building animal houses and benches.



## D. GLASS

To achieve transparency in the greenhouse, glass is mixed with cellular polycarbonate sheets to allow sunlight inside the building. This mixing works to minimize the radiation of sun in the summer time, where some of plants do not need a very strong radiation.

The goal is to use recycled windows, where it contributes to make the cost lower and achieve sustainability.



# DESIGN PROCESS



# MODULE DESIGN

## A. Commercial farming

The commercial module consists of farming elements within an enclosed environment to tackle the issues of the harsh climate in Sweden. The employment opportunities within the project exist mainly in this module.

The building hosts a market space where people who are not a part of the community/ commercial gardening modules can also acquire vegetables creating more possibilities of drawing larger crowds to the site.

The commercial module also hosts spaces for holding workshops and educational activities regarding community and commercial farming to the residents.

### 10 Persons- Module

A single greenhouse for “Commercial farming” – Optional based on group interest.

(Source, [sv.decorexpro.com](http://sv.decorexpro.com)).



# MODULE DESIGN

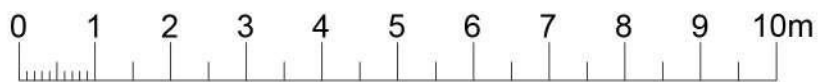
## A. Commercial farming

The building hosts a market space where people who are not a part of the community/ commercial gardening modules can also acquire vegetables creating more possibilities of drawing larger crowds to the site.



PLAN 0

1 : 100

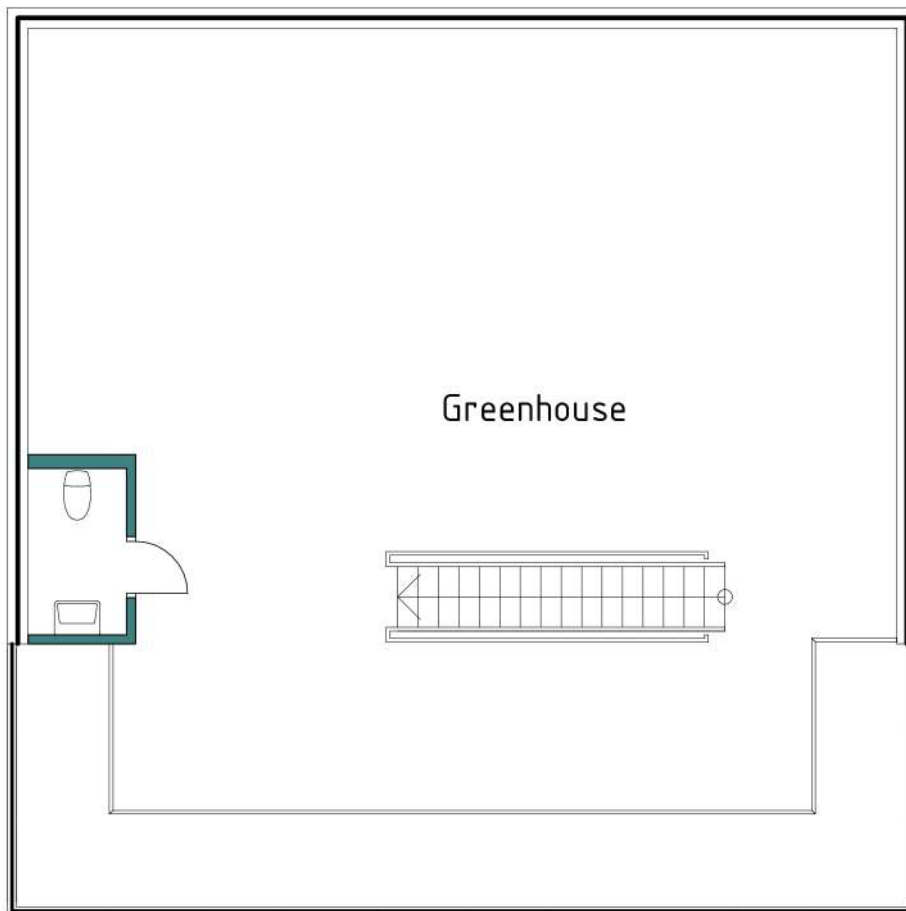


SKALA 1:100

# MODULE DESIGN

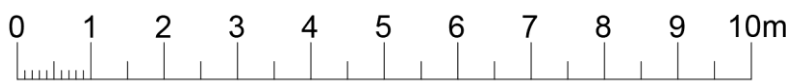
## A. Commercial farming

The upper floors consist of greenhouse spaces, allowing for indoor farming.



PLAN 1

1 : 100



SKALA 1:100



# MODULE DESIGN

## A. Commercial farming

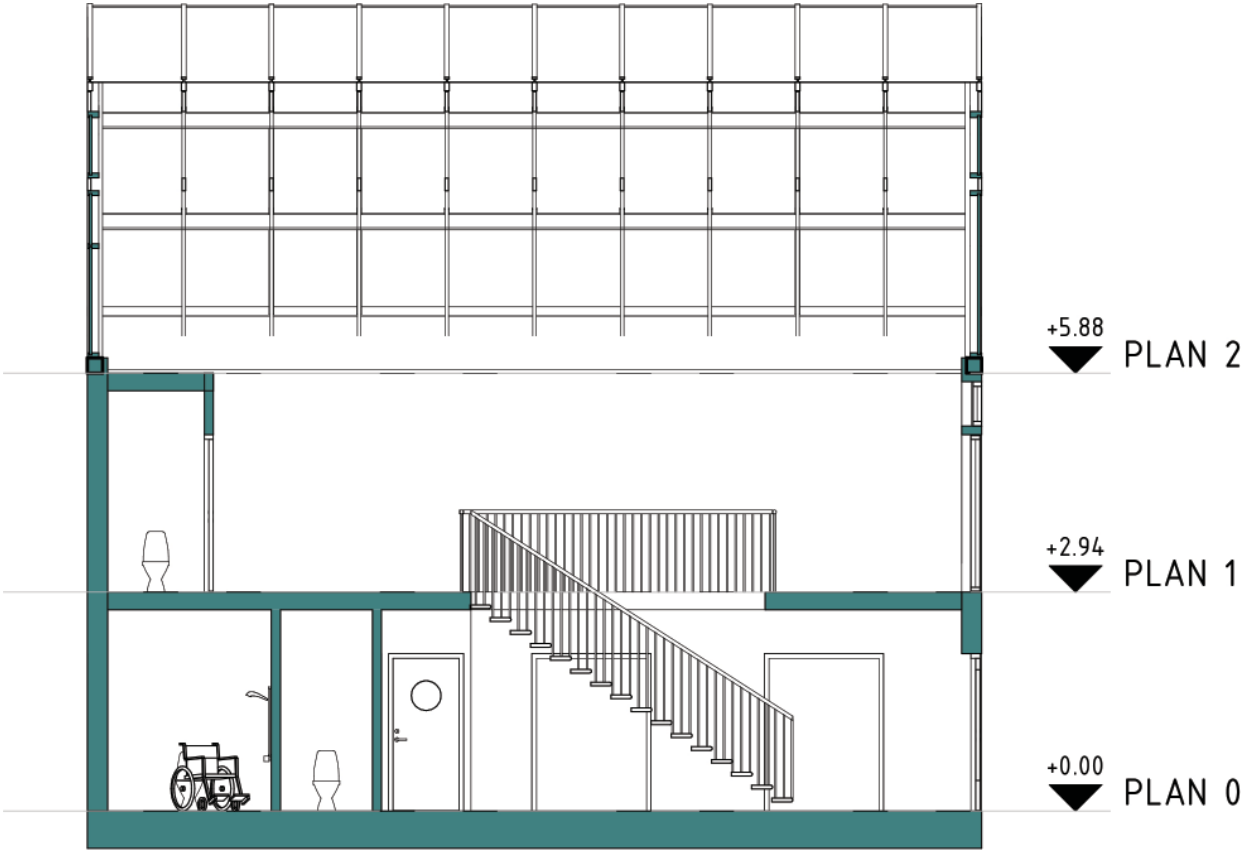


Section A-A

1 : 100

# MODULE DESIGN

## A. Commercial farming



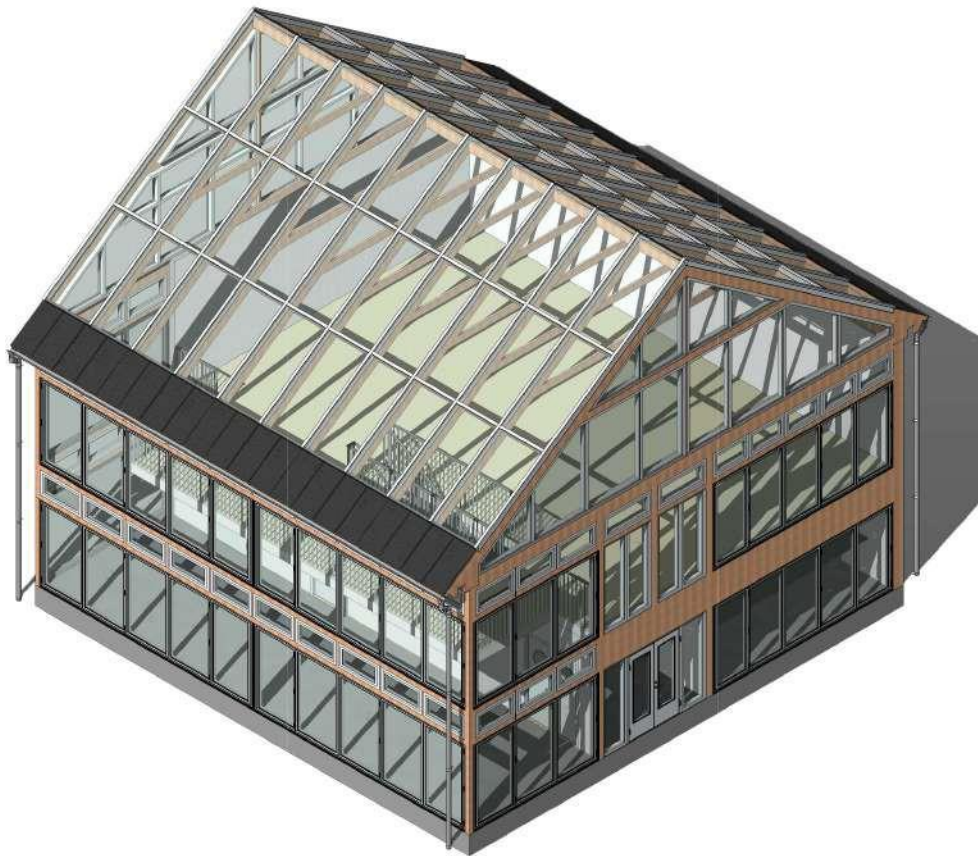
Section B-B

1 : 100

# MODULE DESIGN

## A. Commercial farming

Perspective showing the greenhouse building for the commercial farming.



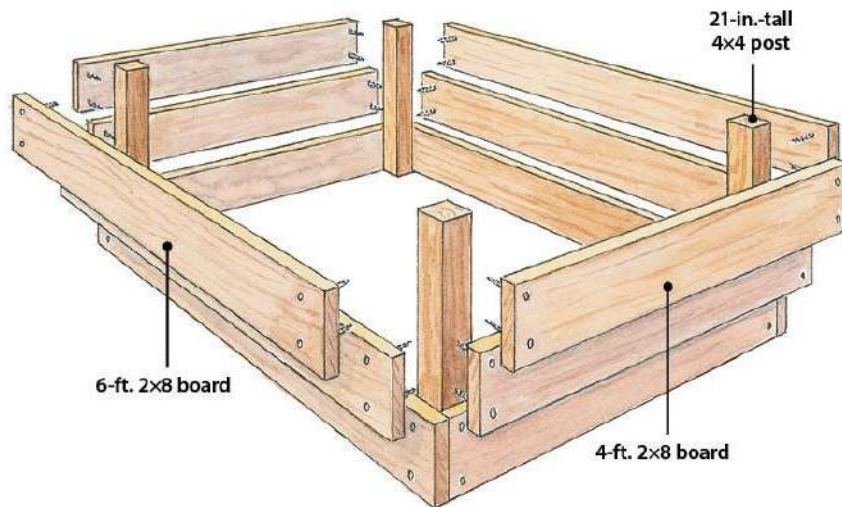
# MODULE DESIGN

## B. Community farming

All farming activities take place outdoor, in order to allow the participants to grow crops and vegetables in some seasons of the year.

Farming by using planting beds.  
Made of used wood

(Source, [gardengatemagazine.com](http://gardengatemagazine.com)).



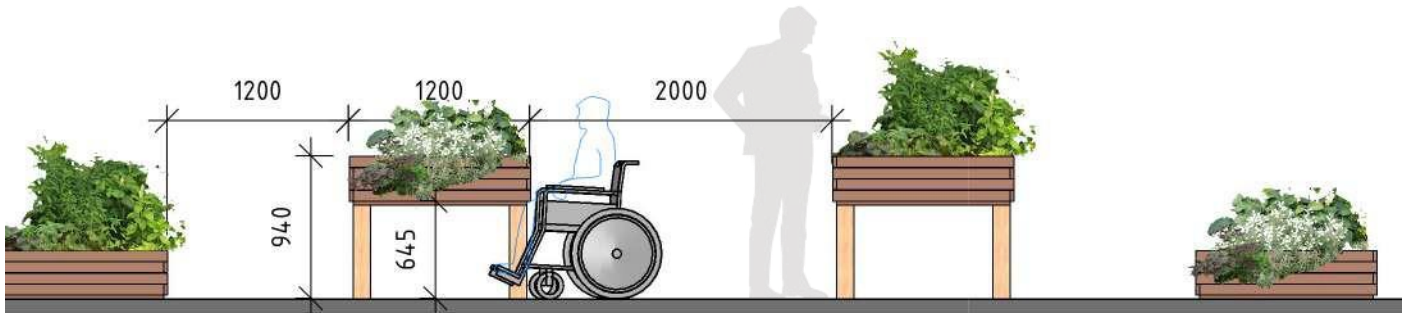
Farming on the ground.



# MODULE DESIGN

## B. Community farming

Farming by using raised planting beds.  
Made of used wood



Scale 1:50

The purpose of this is to provide an opportunity for different groups of society to participate

## C. Social Interaction spaces

The project contains some public places for visitors, in order to create greater opportunities for integration and make the social aspect sustainable.

Places of play for children



Places of recreation to enjoy nature



Places to sit



Animal husbandry area





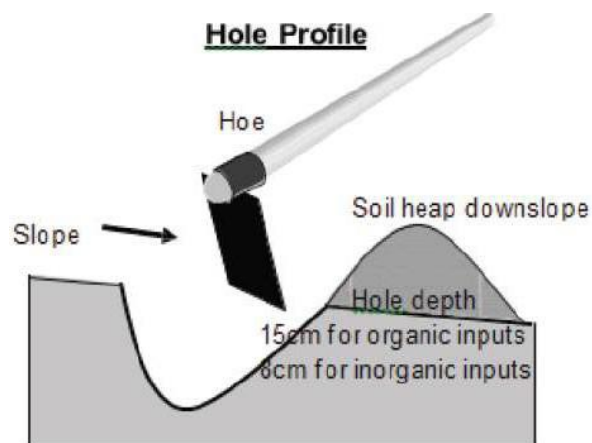
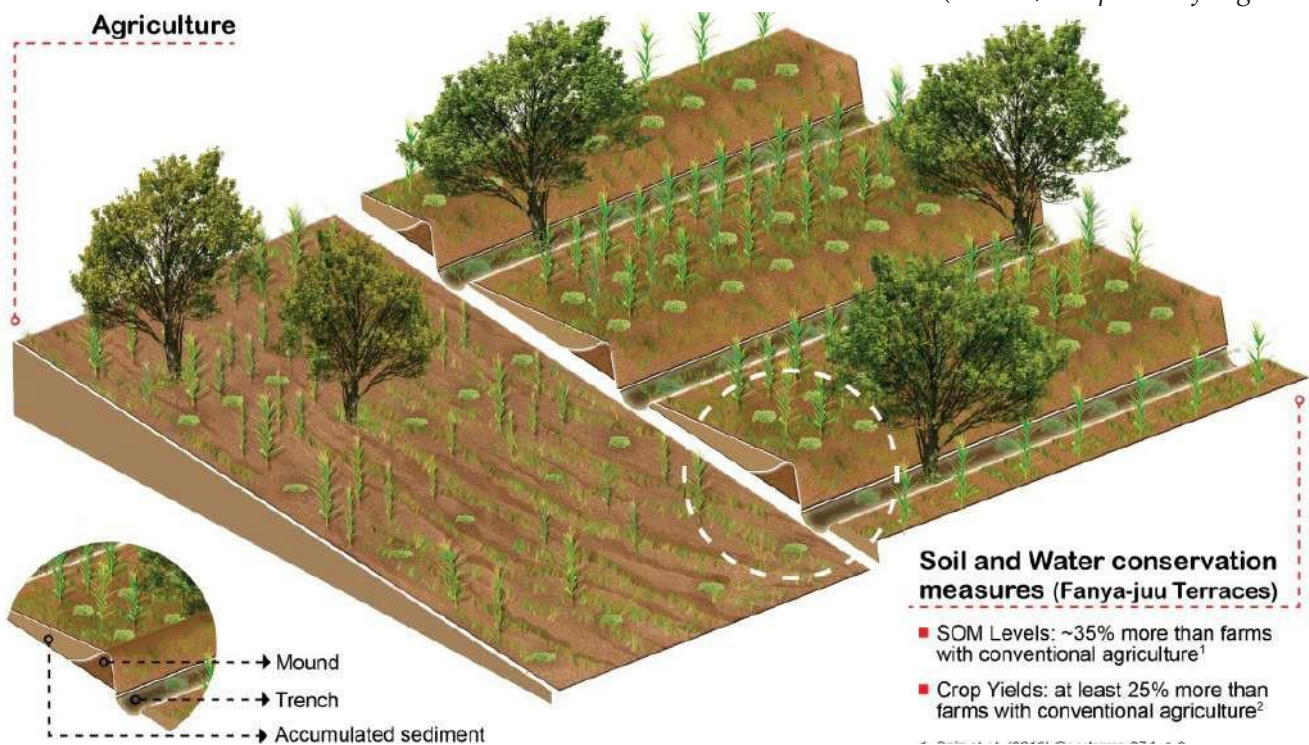
# MODULE DESIGN

## D. Downhills farming

Some of the sites have a slope and the idea is to exploit the plots to its full potential, therefore the design takes this challenge into consideration.

### Farming on sloping ground

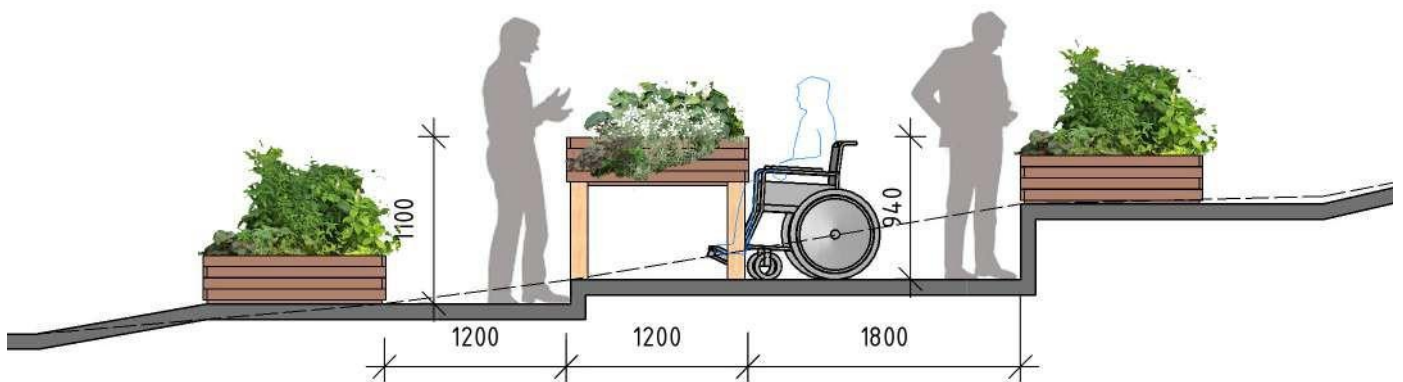
(Source, [samples.ccafs.cgiar.org](http://samples.ccafs.cgiar.org)).



# MODULE DESIGN

## E. Downhills farming Dealing with planting beds

The idea is how to make the downhill accessible and make it easy to use.



AS seen in this section, we suggest making slopes like a stair where we can use the risers for farming. The idea here is to achieve an integrated solution even if the contour lines are difficult.

## GUIDING QUESTIONS

How the community garden strengthens the local situation through sharing and community building. What is the function of working on a community garden, from a social perspective. What is the social difference between 5-10-30-50-70 people?

The function of a community garden starts as an educational node in the particular community, starting at the smaller scales of module 5. The community garden will introduce the idea of farming in groups and enhance the social bonds within the community itself.

In the module phase of 10-30 participants, the social module;(a second layer of the module) will be introduced, transforming a part of the community garden into a public space, by adding public facilities within the garden; Eg. (a playground, a small café, seating area, a natural

trail, depending on the needs of the community and the context of the site).

This will result in including other social groups in the community garden, allowing the part of the community who might not be part of the community garden itself, to join in and learn more about the project.

# GUIDING QUESTIONS





## GUIDING QUESTIONS

In the module of 30-50 participants, the commercial module; (The third layer of the module) will be introduced, transforming the community garden into a productive project with an economic base. In this stage of the community garden, a new social groups will take part in the project. Jobs in the commercial greenhouse buildings will allow the pre-existing community to welcome and coexist with people, that might be from outside of the community, tackling the issues of polarization within the communities, and taking a further step towards a more inclusive society.



In the module of 50-70 participants, the community garden will turn into a bigger project becoming a central attraction itself. From that point on, the idea of the module can start taking place in different nearby locations and growing from a single community garden into a new lifestyle.



## GUIDING QUESTIONS

### **Is a modular community garden more flexible in maintenance?**

Community working not only offers inclusiveness but also flexibility. The maintenance will be done easier as the roles and responsibilities might be interchanged and adjusted based on the existing interest and availability of the workforce.

For example, a person who is a part of the community garden regularly can still take a gap or break from being a part of it without affecting the production of the community garden since their role can be replaced by other members.

### **Where does the proposal get nutrition for the plants from? (Circularity of resources)**

Animals are introduced as a parallel to the introduction of the commercial module in the project, around the 30-50 stage. An animal house will be added to the community garden, housing Sheep/chickens. The waste generated from the plantation can be partly used as feed to the animals and the waste generated from the animals can be utilized in composting which in turn will be used in providing nutrition to the plants.

### **How are the module sizes and proposals formed?**

The intention is to bring people together with a productivity issue, it is one of the main goals of this project.

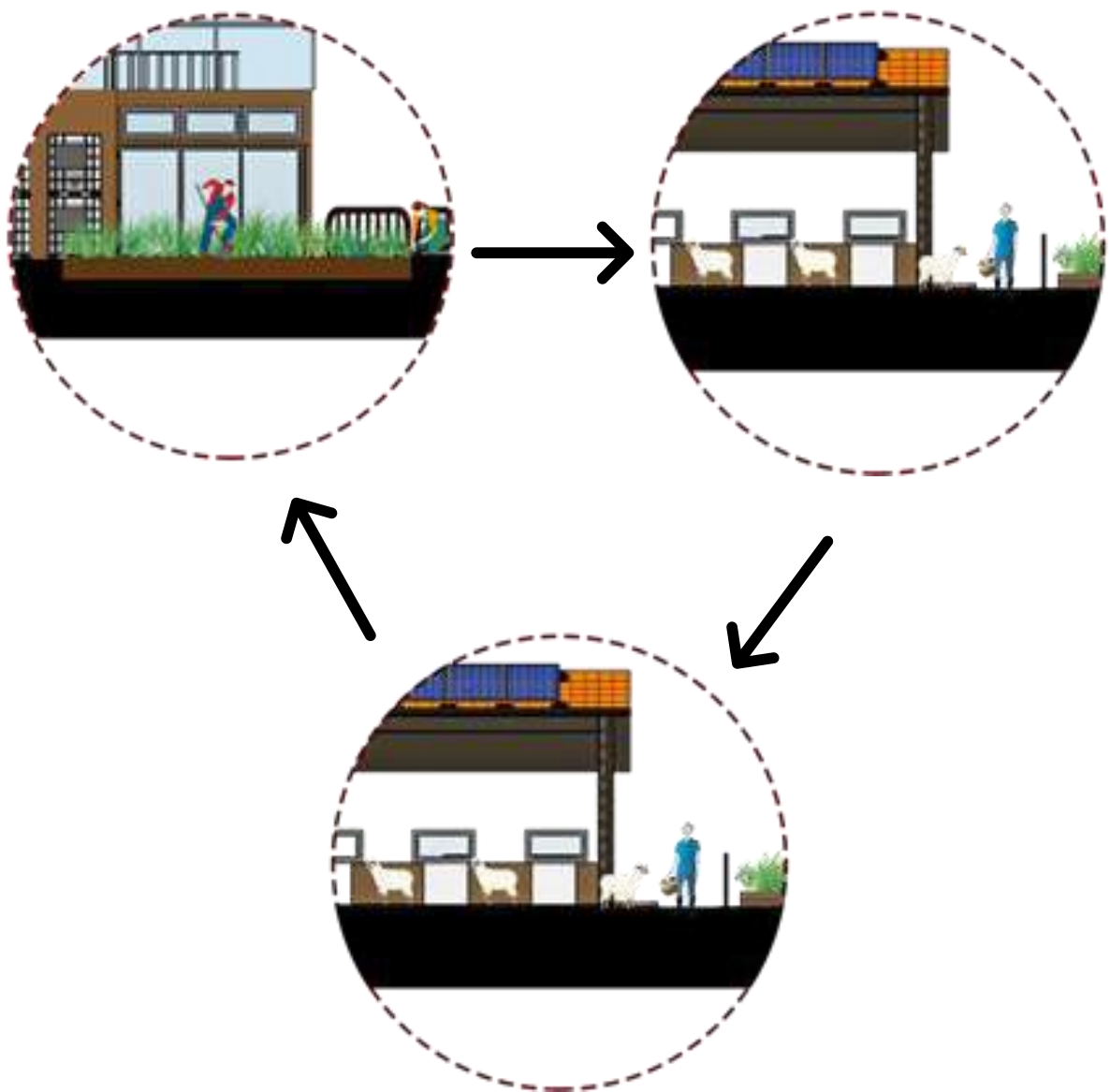
The sizes and proposals can be adapted to specific requirements across the municipality, where the social elements are adaptable to settlement requirements. Size and numbers can be flexible and can be used as a heuristic rather than strict rules.



## GUIDING QUESTIONS

### How are animals included in the project?

The circularity of the resources in the earlier stages of the community garden starts at composting the green waste produced in the composting bins, and in the latter stages after the introduction of animals, new composting bins are added for animal waste.



## GUIDING QUESTIONS

### **How the module sizes and proposals are conceptual examples, rather than finished proposals.?**

The intention of bringing people together with a productive cause is one of the main intent of this project. The sizes and proposals can be adapted to the specific requirements across the municipality with the social elements adaptable to the settlement requirements. The size and numbers can be flexible and can be used as a guiding factor rather than

### **How are the animals included in the project?**

The circularity of the resources in the earlier stages of the community garden starts with composting the green waste produced in the composting bins, and in the latter stages after the introduction of animals, new composting bins are added for animal waste.

# PROPOSALS



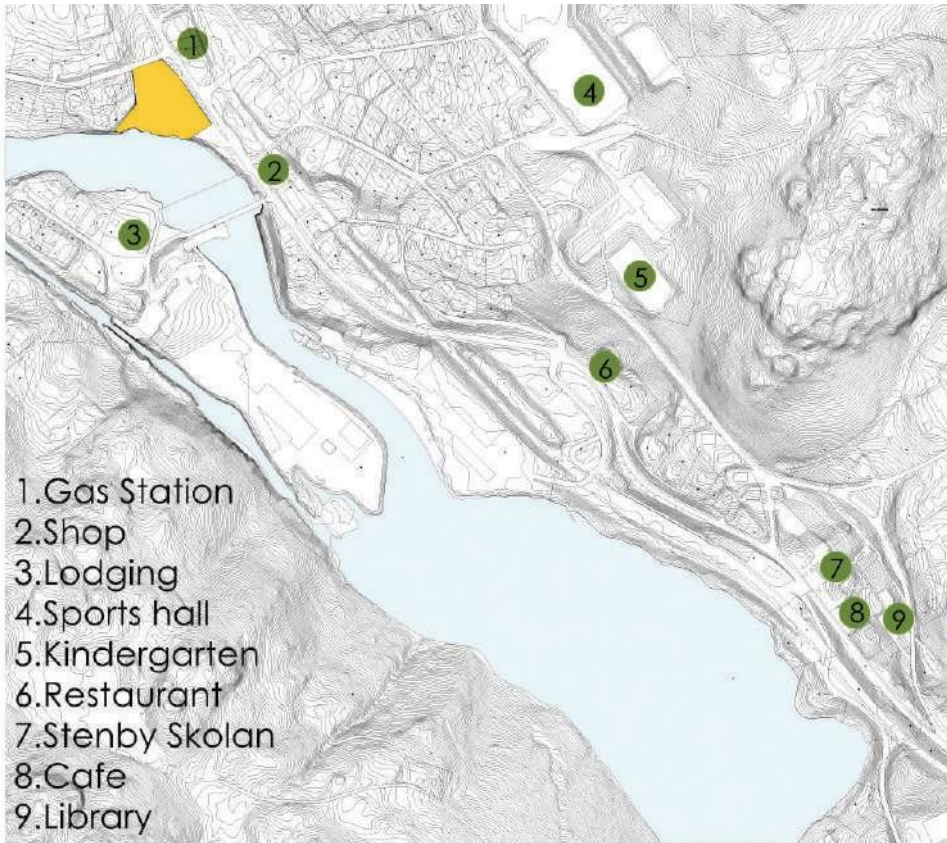
# SITE SELECTION & ANALYSIS

## Dals Långed





# Services



## Site analysis



Site 

## Access(macro)



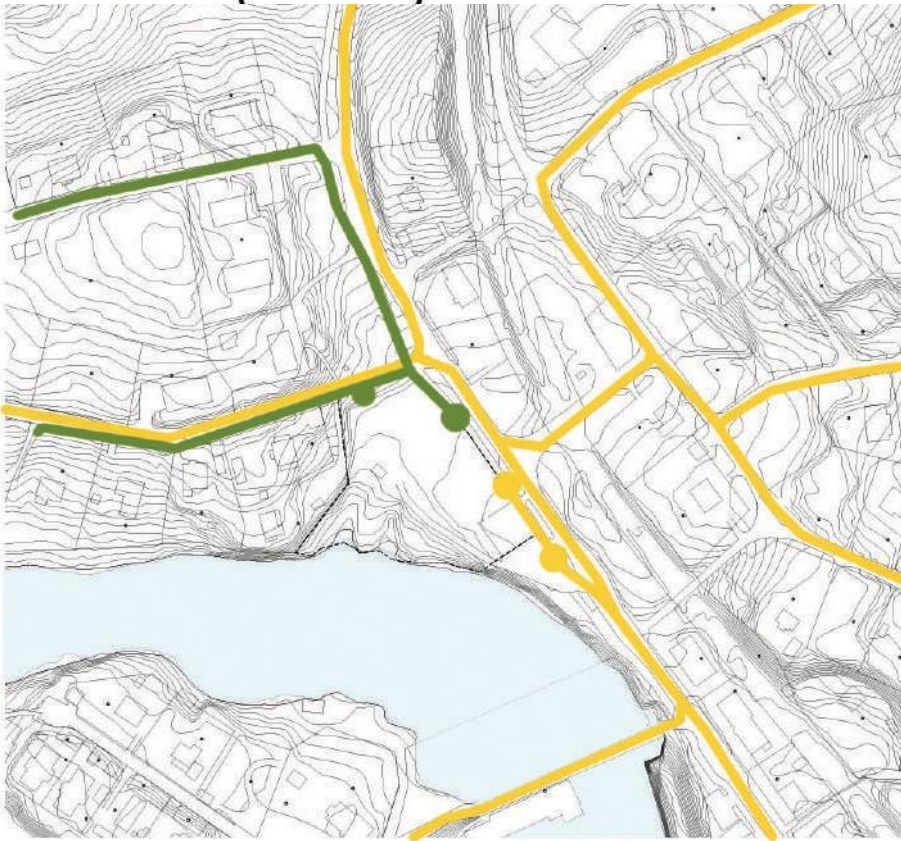
The site is near to a residential area, making it possible to be a link for a public space that links the community to the waterfront.

Railway track  Access road 





# Access (micro)

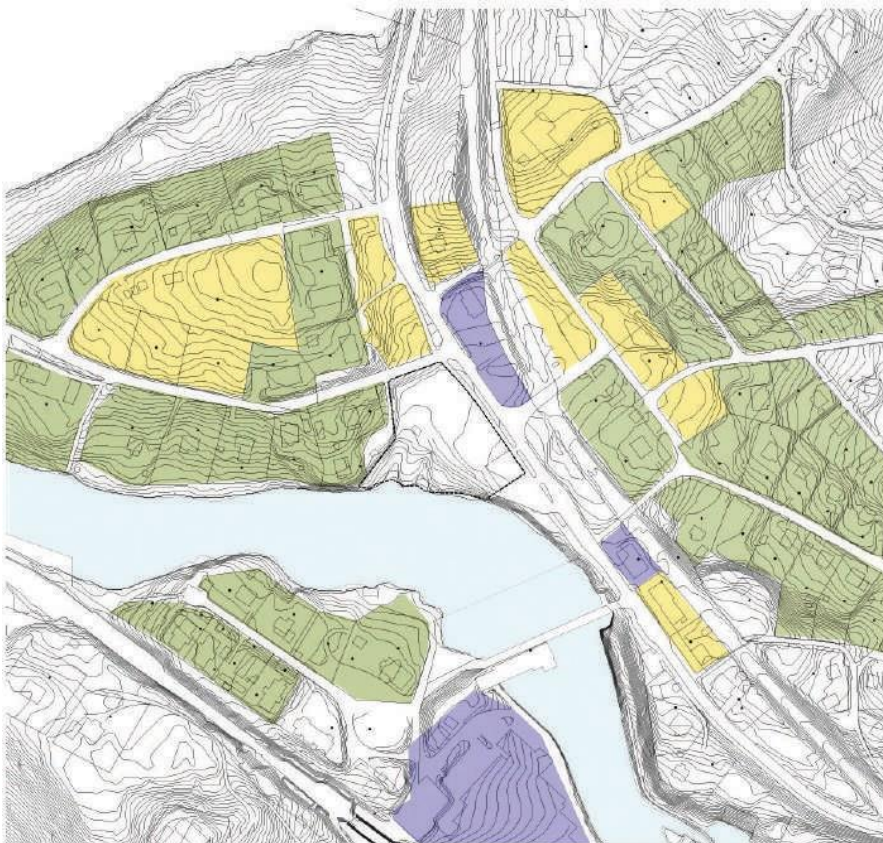


Site analysis



Access road ——— Walking path ———

# Surrounding land use

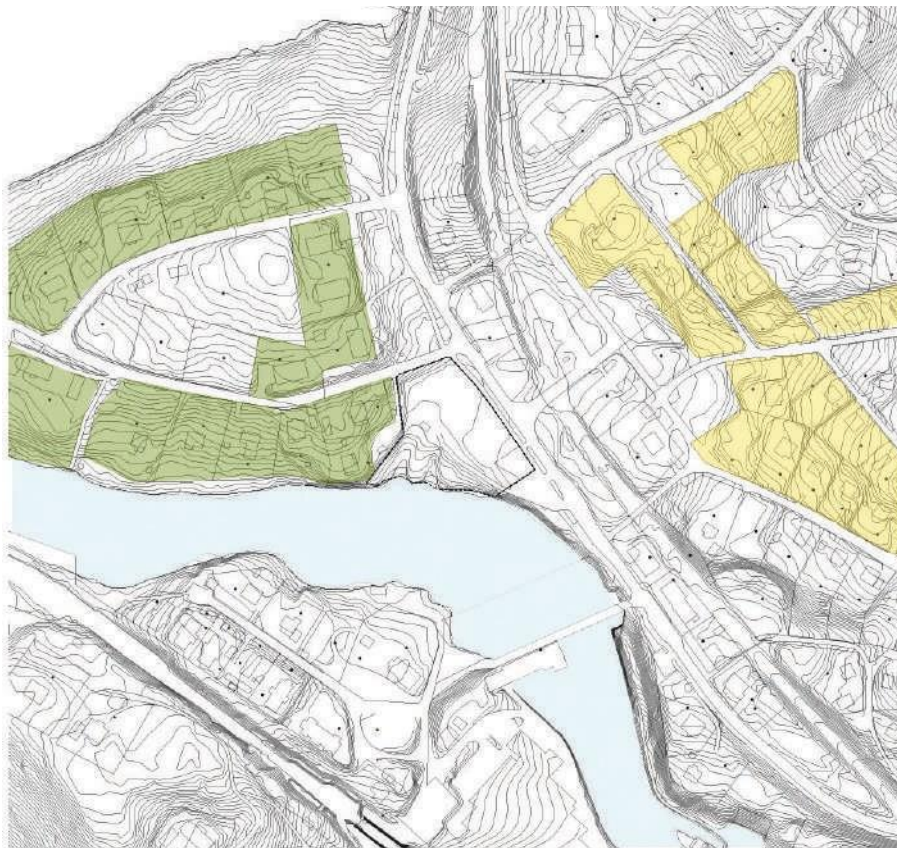


Residential ——— Community ——— Commercial ———







# Catchment area



## Site analysis



Primary user  Secondary User 

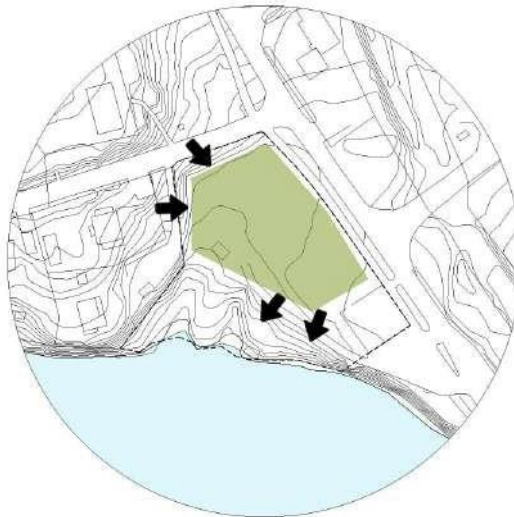
## Site dimensions



# SITE DESIGN PROCESS

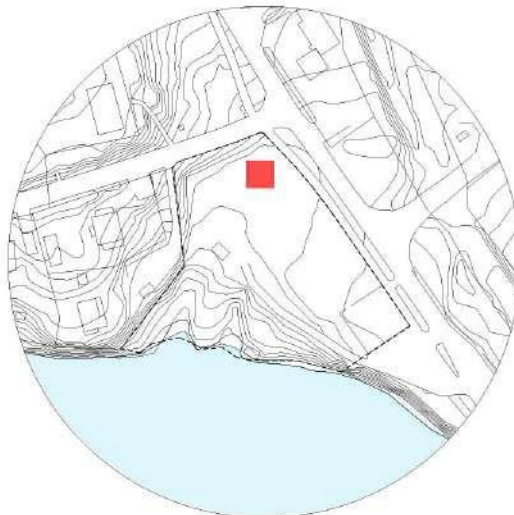
## Dals Långed

1



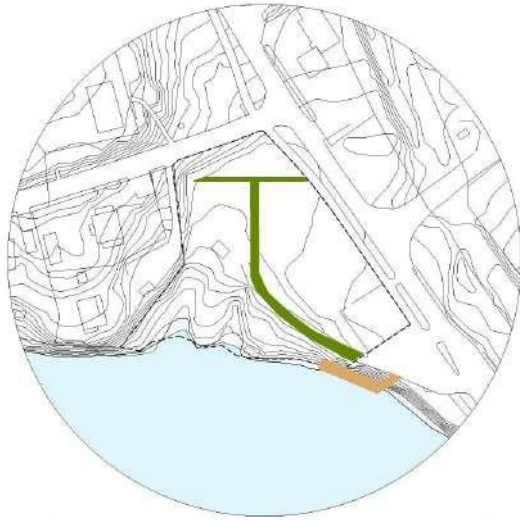
Understanding farming / productive zone based on existing slope

2



Placement of building w.r.t no shade on farming areas





3

Introducing new pathways & water from w.r.t contours



4

Design inclusion of existing trees on site



5

Final overlap of process





# ADAPTABILITY TO SITE & PROPOSAL

## Dals Långed, Master Plan



## Dals Långed 50 person module

### LEGEND

1	Animals area	11	Solar panels
2	Animals house	12	Playground
3	Composting area	13	W.C
4	Raised planting beds	14	Bike parking
5	Planting beds	15	Nature trail
6	Greenhouse & building	16	Recreation area
7	Sitting place	17	Jetty
8	Planting on ground	18	Info area
9	Planting container	19	Market area
10	Parking		

The jetty that connects the residents to the waterfront, where the social interactions are at the start of the site. The first thing people face, is a small market where it is possible to interact.

In the same time, the nature trail also starts there where people can meet and enjoy their time in this garden.



# ADAPTABILITY TO SITE & PROPOSAL



● Module 30

● Module 50

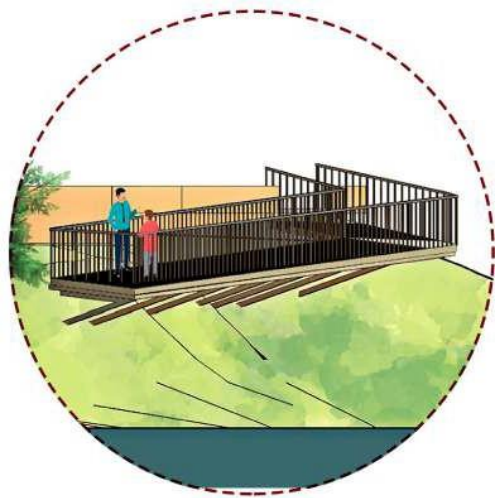
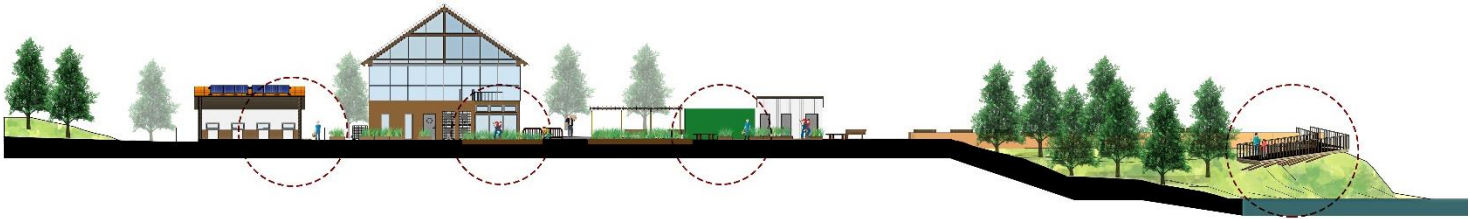
● Module 70

The spaces which enable the people of dals langed to access the water body physically are very few. Therefore, the water deck with the market space within the proximity would be good



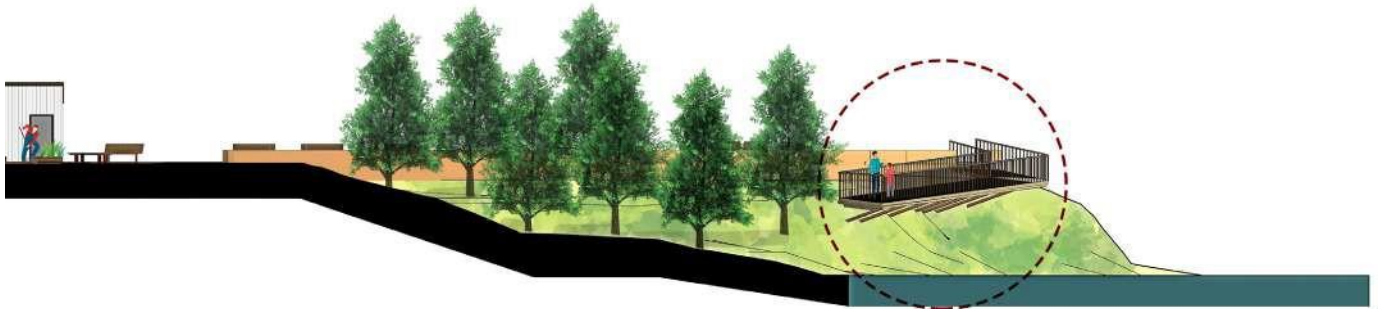
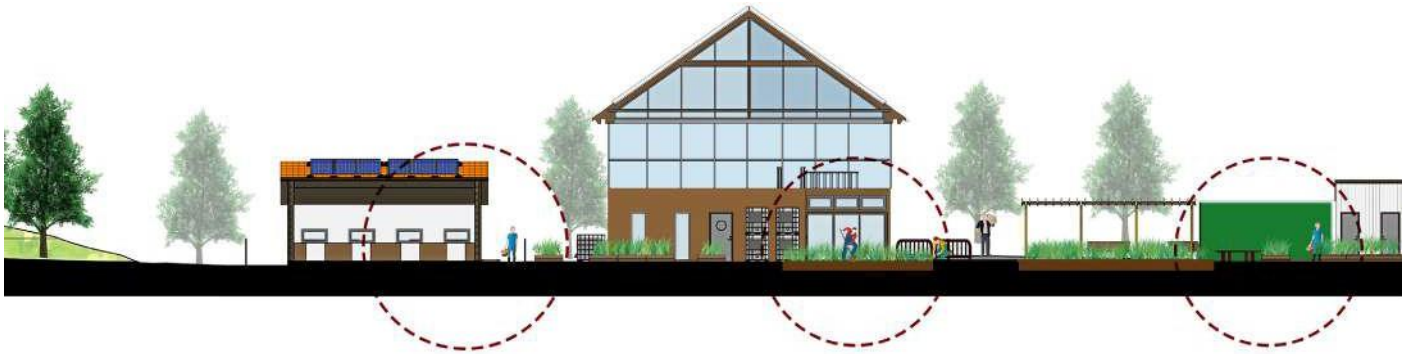
# ADAPTABILITY TO SITE & PROPOSAL

## Dals Långed, Section

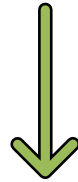


# ADAPTABILITY TO SITE & PROPOSAL

## Dals Långed, Section



# ADAPTABILITY TO SITE & PROPOSAL



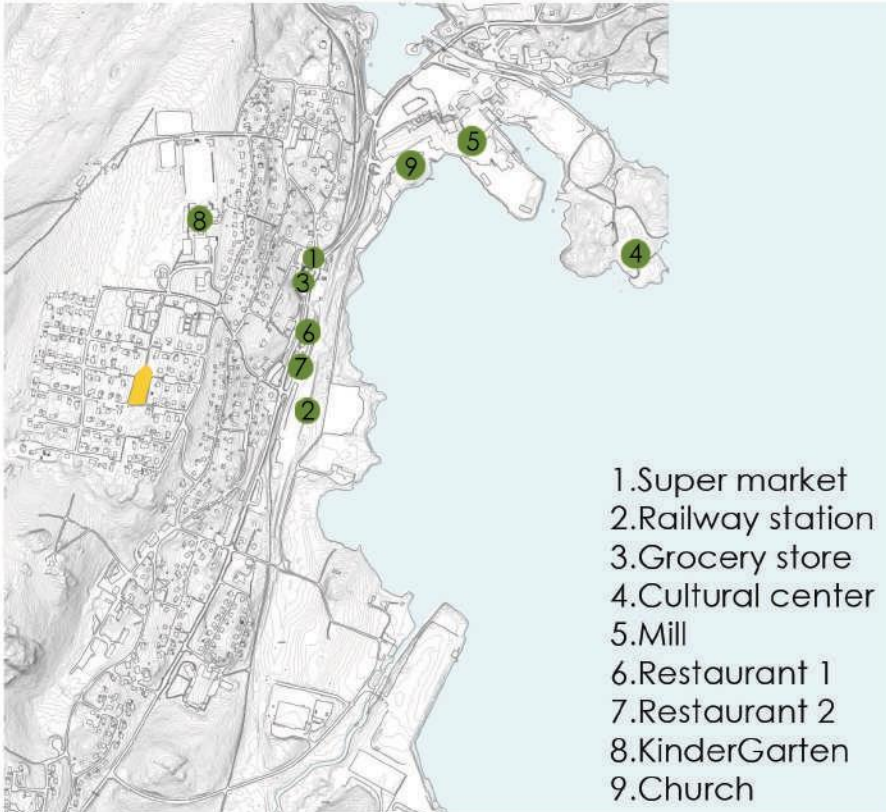


# SITE SELECTION & ANALYSIS

## Billingsfors



# Services




## Site analysis



Site 

## Access(macro)



Railway track  Access road 

The site is at the heart of the residential area, offering a meeting place for everyone. It is a new option for a bigger diversity outside of the paper mill industry working.





# Access (micro)

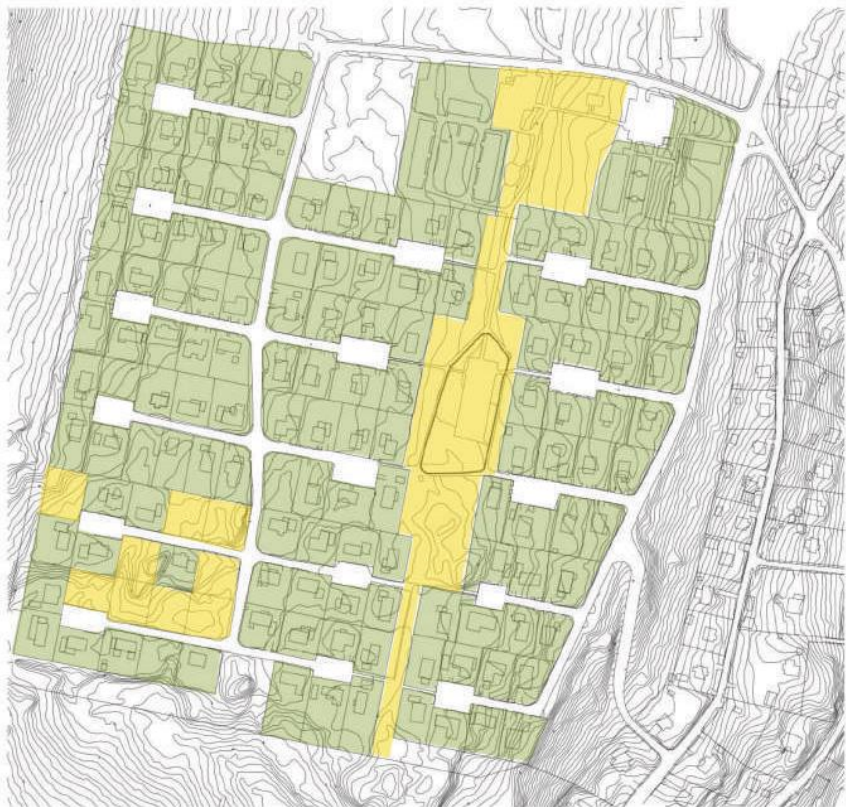


Site analysis



Access road ——— Walking path ———

# Surrounding land use



Residential ——— Community space ———







# Catchment area



Site analysis



Primary user  Secondary User 

# Site dimensions



# SITE DESIGN PROCESS

## Billingsfors

1



Understanding existing pathways

2



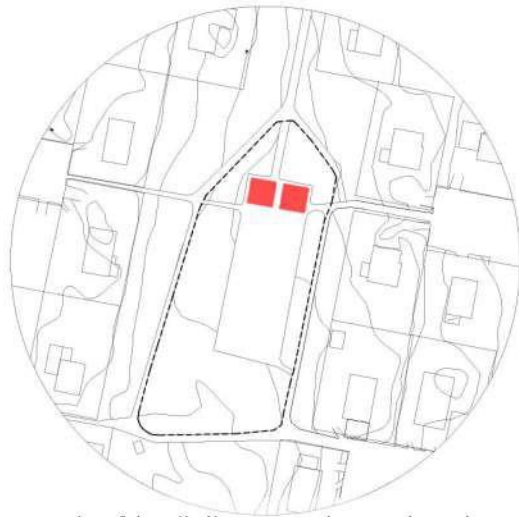
Design inclusion of existing trees on site





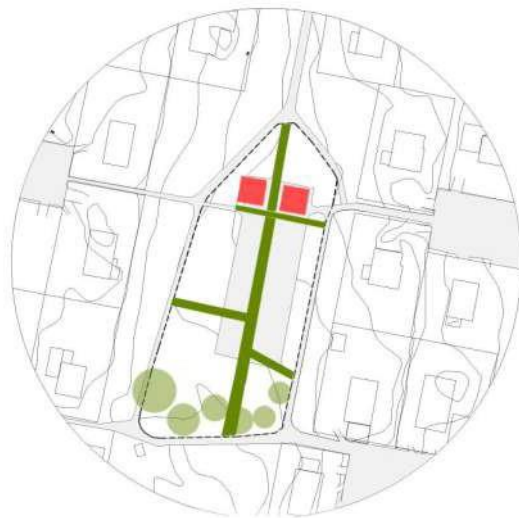
3

Introducing new pathways & connections



4

Placement of building w.r.t no shade on farming areas



5

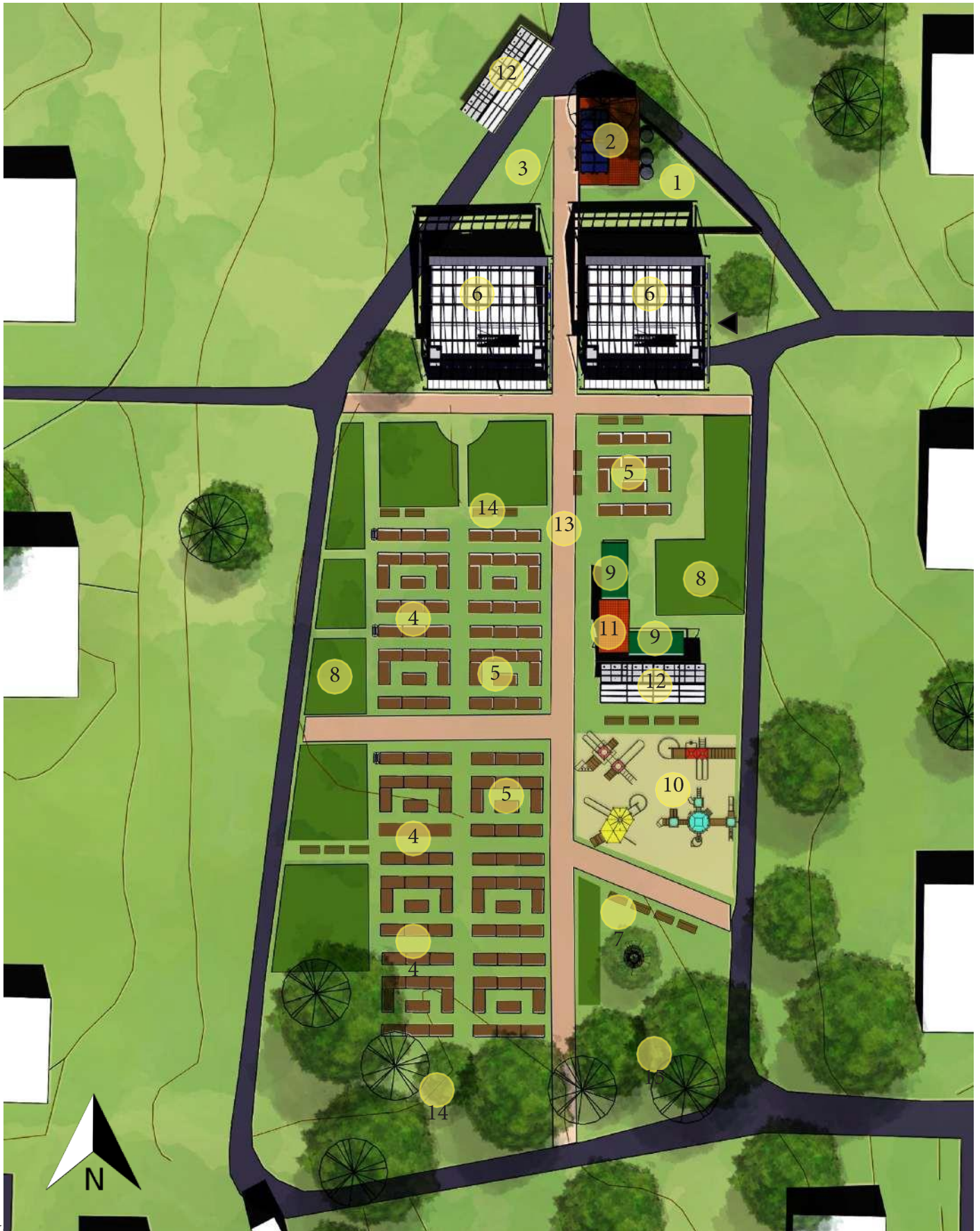
Final Overlap of process





# ADAPTABILITY TO SITE & PROPOSAL

## Billingsfors, Master Plan



## Billingsfors 70 person module

### LEGEND

1	Animals area	10	Playground
2	Animals house	11	W.C
3	Composting area	12	Bike parking
4	Raised planting beds	13	Nature trail
5	Planting beds	14	Recreation area
6	Greenhouse & building		
7	Sitting place		
8	Planting on ground		
9	Planting container		

The playground allows all of the residents to participate in the community garden. The parents can monitor their kids while working and maybe encouraging kids to be a part of farming activities from younger ages.

There is also an opportunity to park your bicycles at the start and the middle of the site.



Module 10

Module 50

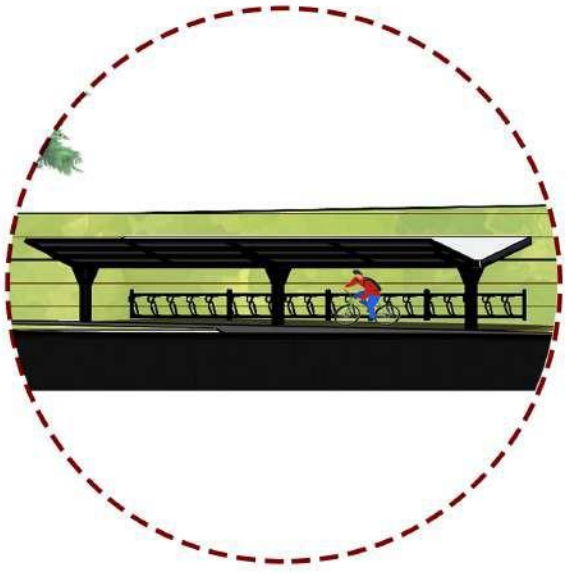
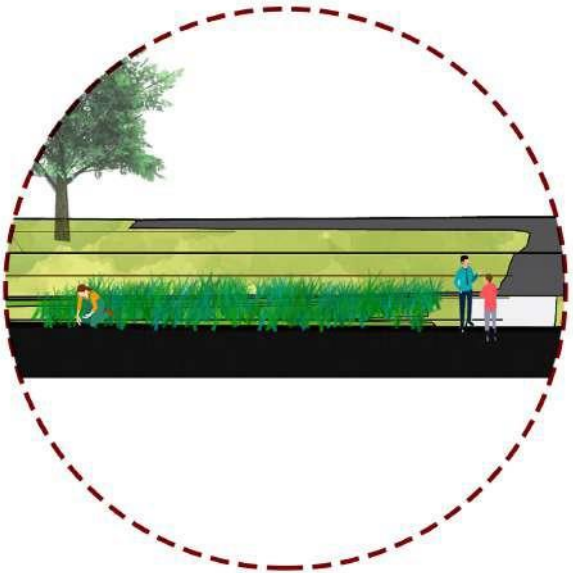
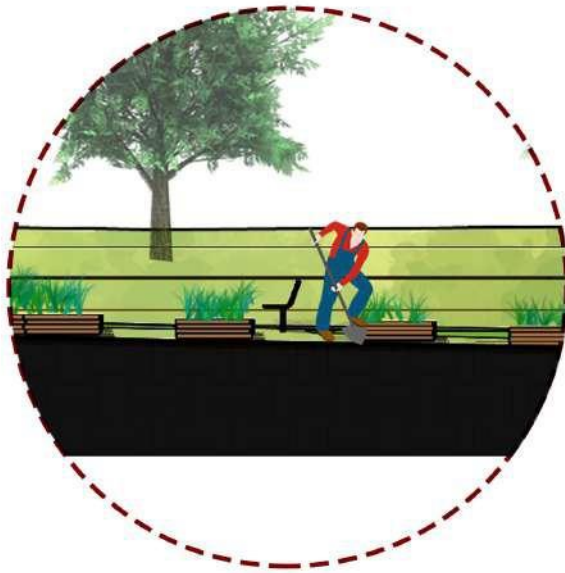
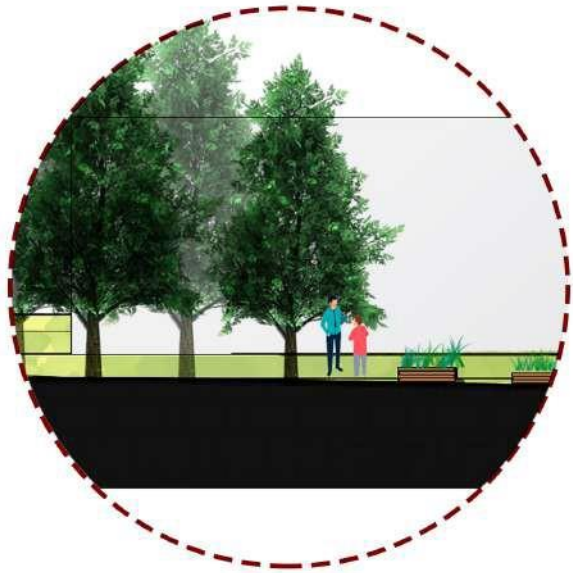
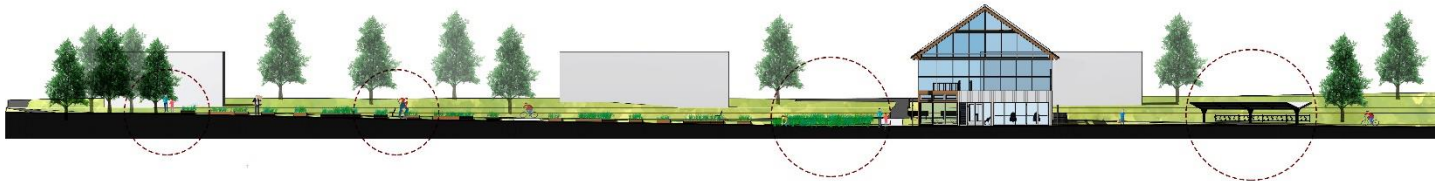
Social Module

Module 30

Module 70

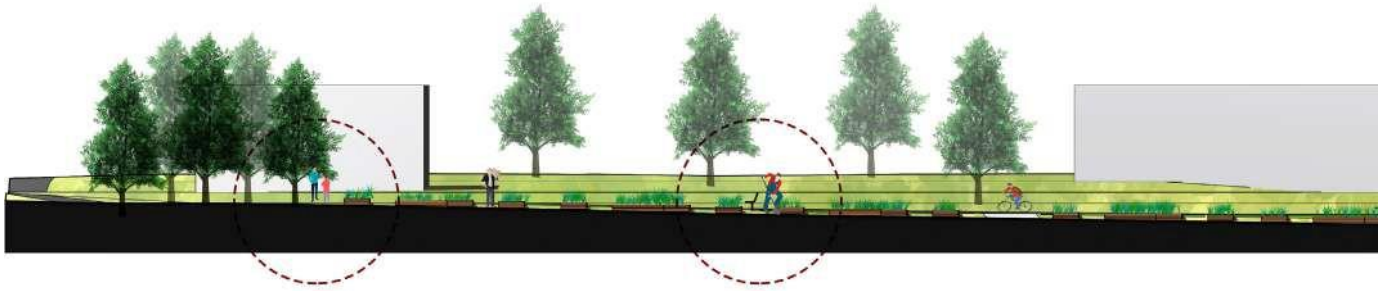
This project creates new spatial connections, transforming underutilized common space in the backyard of a residential zone into a new land use pattern.



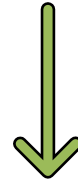
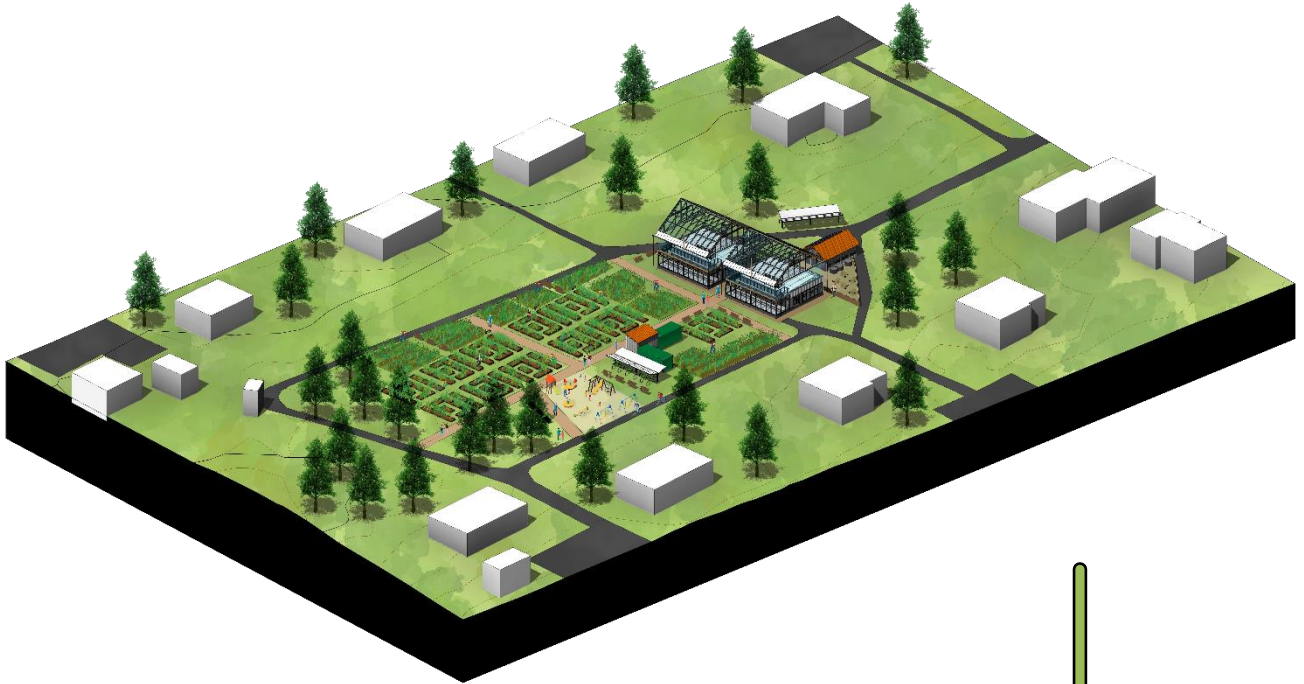


# ADAPTABILITY TO SITE & PROPOSAL

## Billingsfors, Section



# ADAPTABILITY TO SITE & PROPOSAL





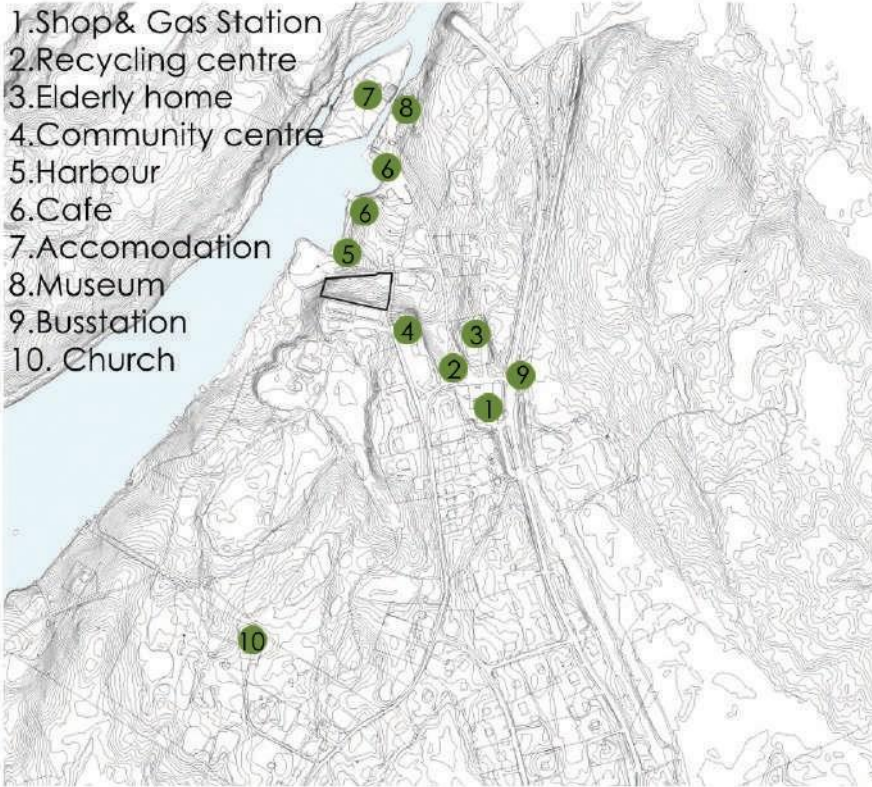
# SITE SELECTION & ANALYSIS

## Gustavsfors



# Services

- 1. Shop & Gas Station
- 2. Recycling centre
- 3. Elderly home
- 4. Community centre
- 5. Harbour
- 6. Cafe
- 7. Accomodation
- 8. Museum
- 9. Busstation
- 10. Church

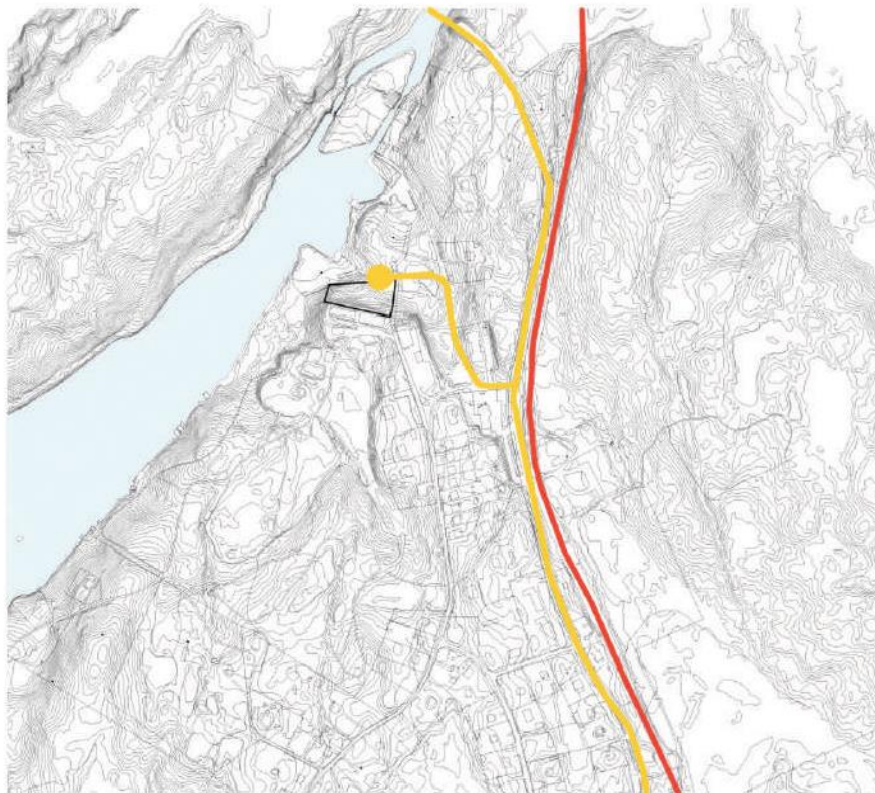


## Site analysis



Site 

## Access(macro)



The site is an intersection between the 3 different (residential/ harbor/ tourism) zones.



Railway track  Access road 



# Access (micro)

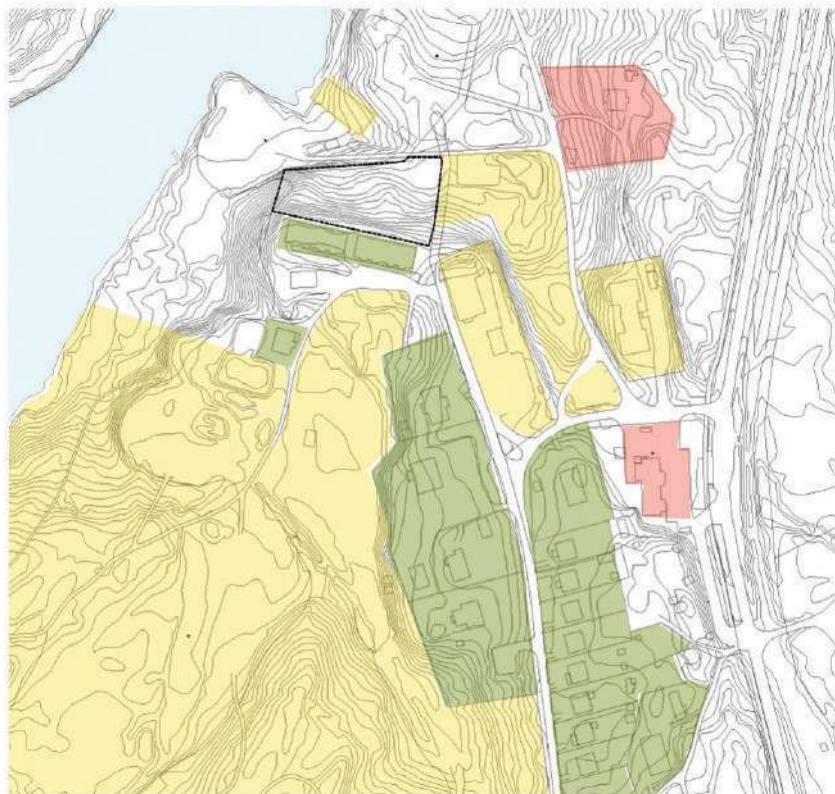


Access road ——— Walking path ———

## Site analysis



# Surrounding land use



Residential — Community — Commercial —



# Catchment area



Primary user — Secondary User

## Site analysis



## Site dimensions

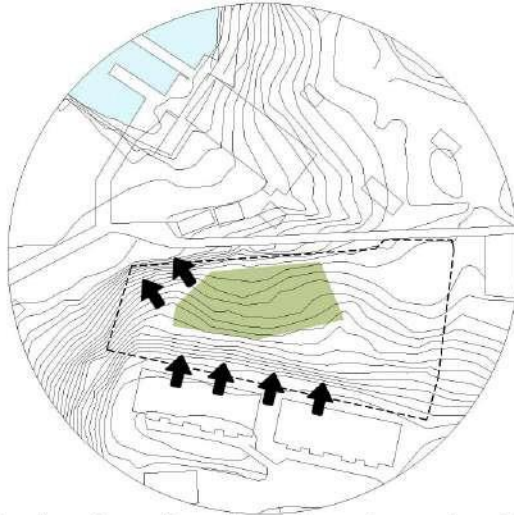




# SITE DESIGN PROCESS

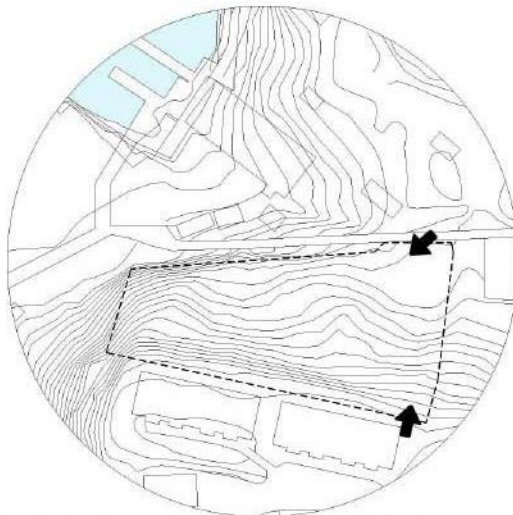
## Gustavsfors

1



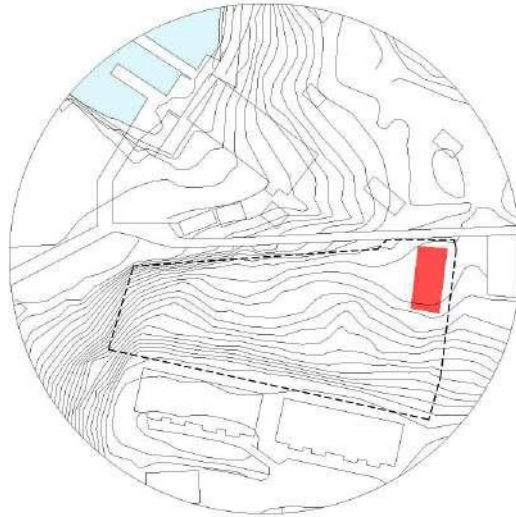
Understanding farming / productive zone based on existing slope

2



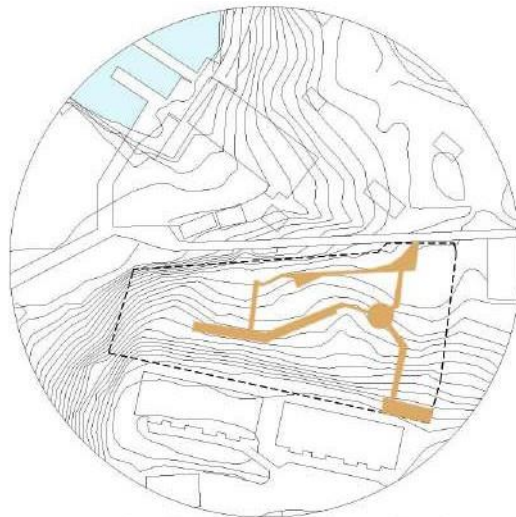
Establishing access from high and low points of the site





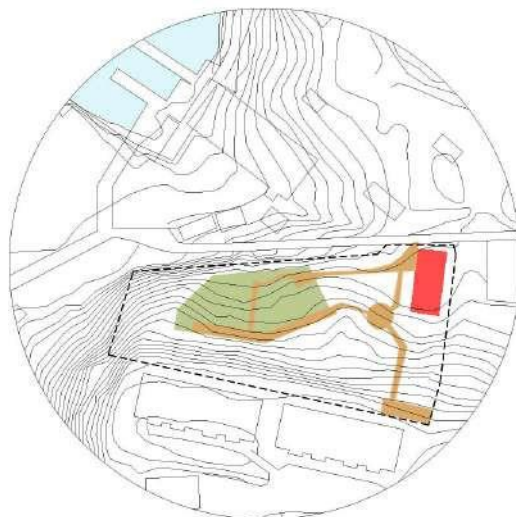
3

Placement of services and cafe at the access towards the harbour



4

Placement of connections for transition within the site



5

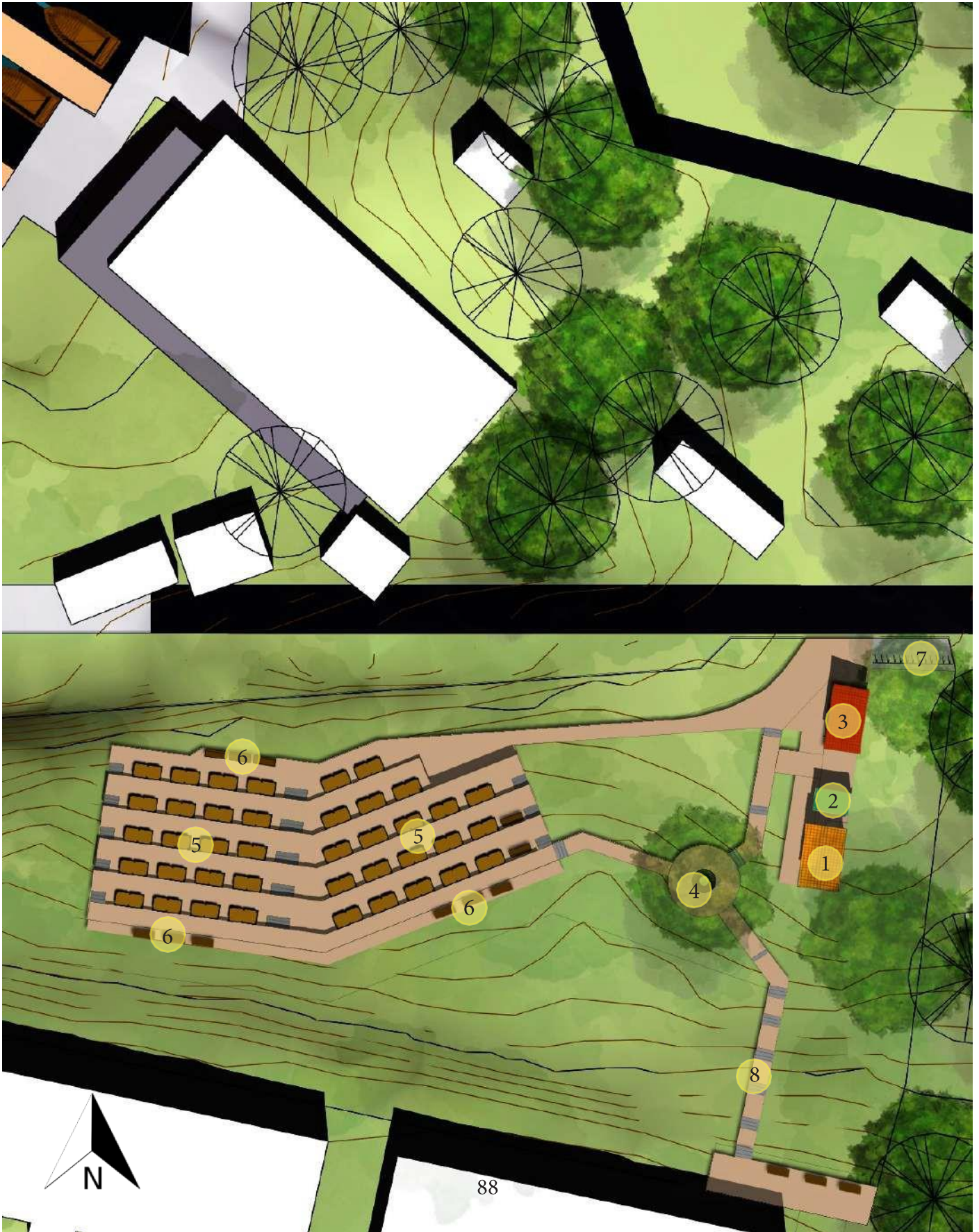
Final overlap of process





# ADAPTABILITY TO SITE & PROPOSAL

## Gustavsfors, Master Plan



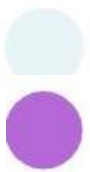
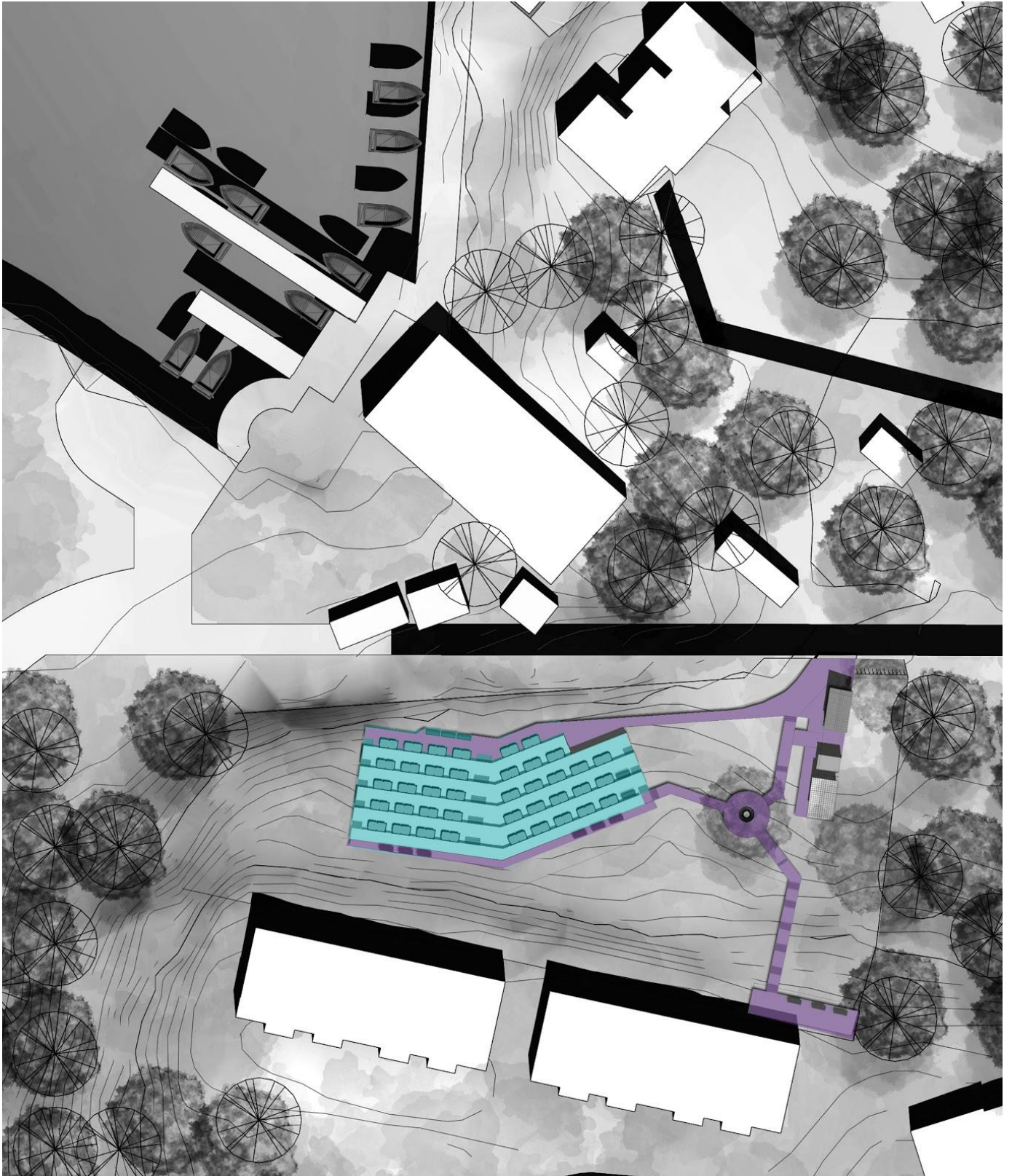


## Gustavsfors 10 person module

### LEGEND

- 1 W.C
- 2 Crops storage
- 3 Cafe
- 4 Platforms
- 5 Planting beds
- 6 Sitting place
- 7 Bike parking
- 8 Stairs

The social platforms and the stairs are added to connect the residential area with the harbor and interactive spaces. They connect the residential area with the harbor providing new pathways and invite the tourists to enjoy the site view.



Module 10

Social Module

### Social module

The typology of zones are spread all along Gustavsfors only interactive at one junction. The social platform provides a new alternative for bridging people together.

# ADAPTABILITY TO SITE & PROPOSAL

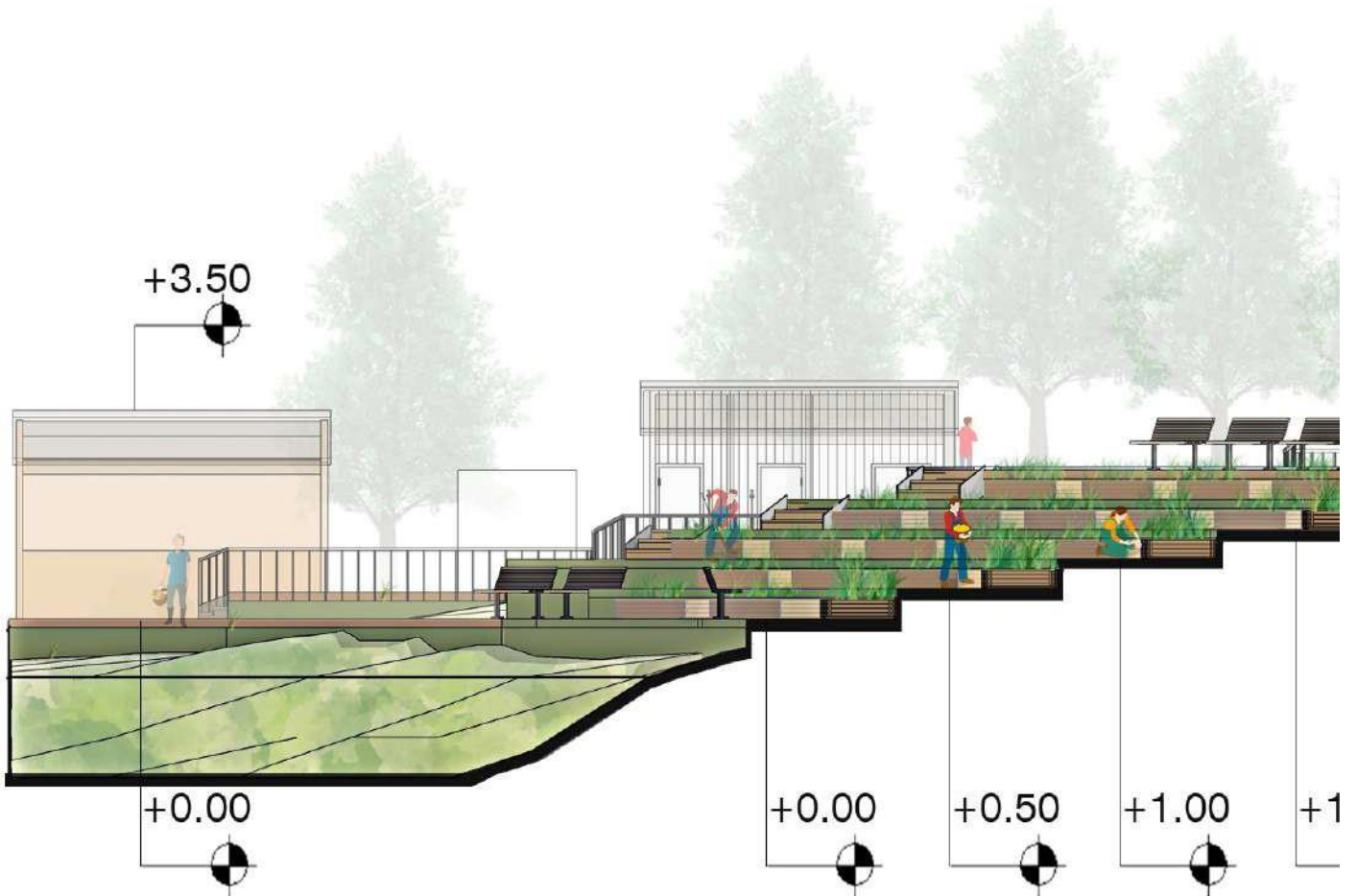
## Gustavsfors, Section





# ADAPTABILITY TO SITE & PROPOSAL

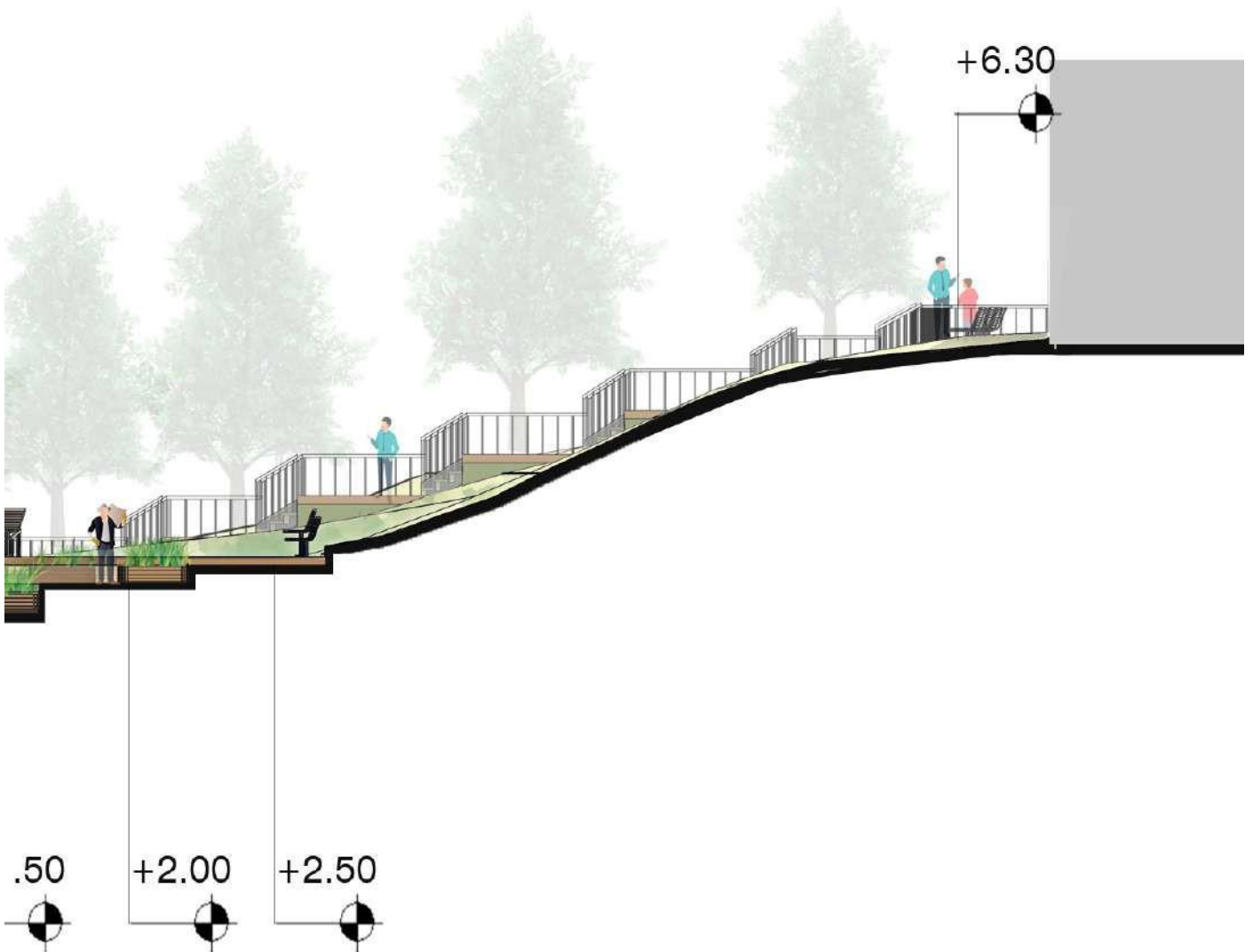
## Gustavsfors, Section



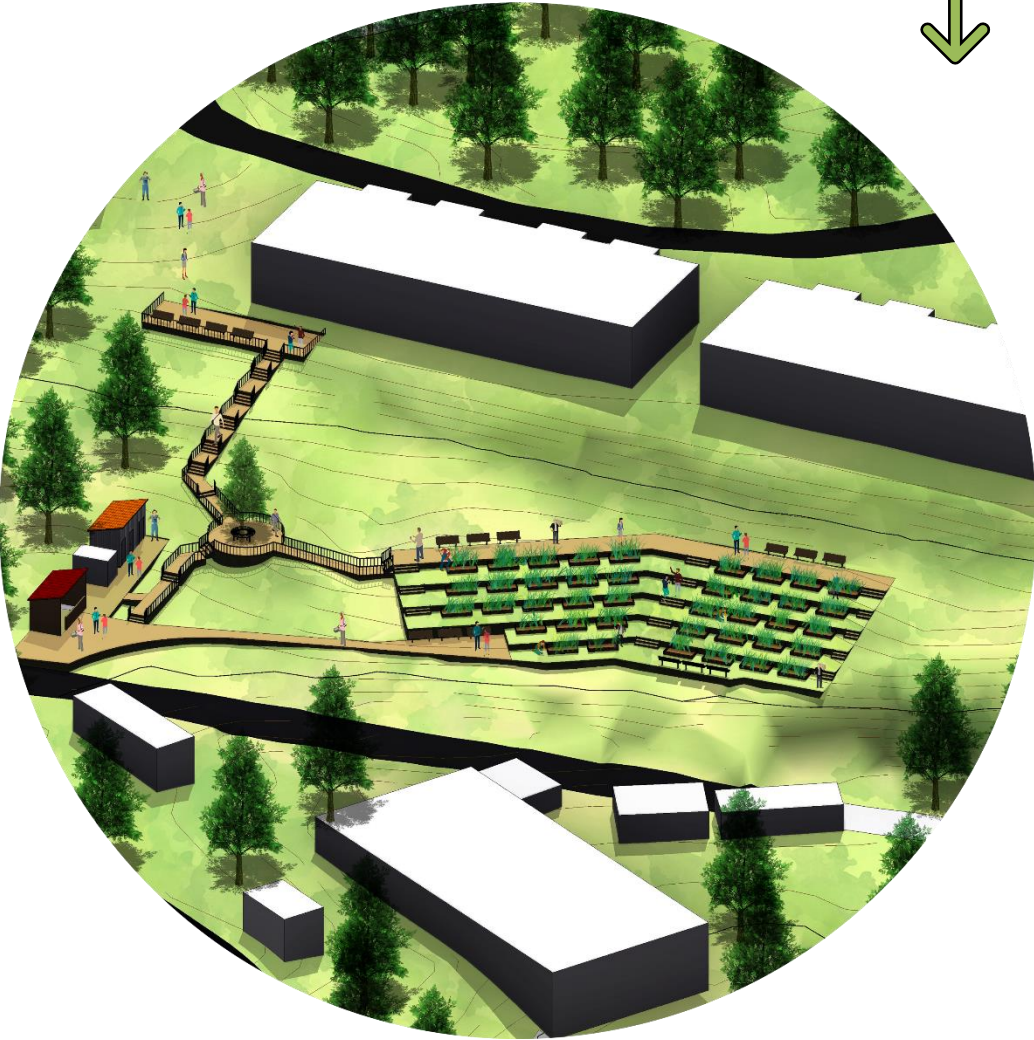
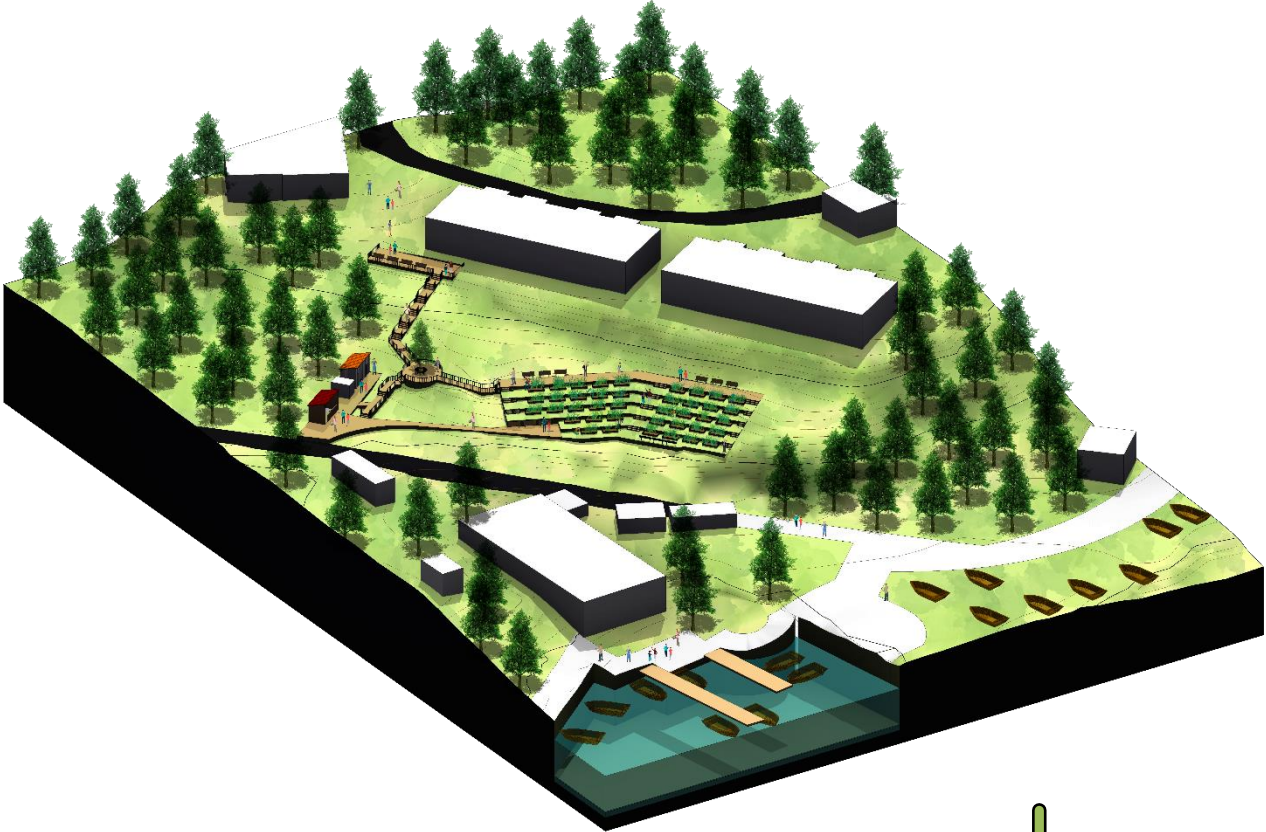


# ADAPTABILITY TO SITE & PROPOSAL

## Gustavsfors, Section



# ADAPTABILITY TO SITE & PROPOSAL





# REFERENCE PROJECTS

## “DUG” Denver Urban Community Gardens

DUG was incorporated as a 501(c) (3) non-profit organization in 1985. Chris Cordts a Colorado State University Extension Agent and others were starting these gardens, after being inspired by the efforts of a small group of local gardeners in the Highlands neighborhood.

From this idea, the original three gardens were formed: the Shoshone Community Garden, the El Oasis Community Garden and the Pecos Community Garden.

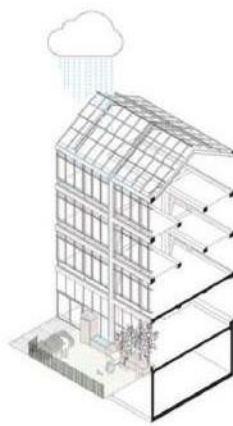


# REFERENCE PROJECTS

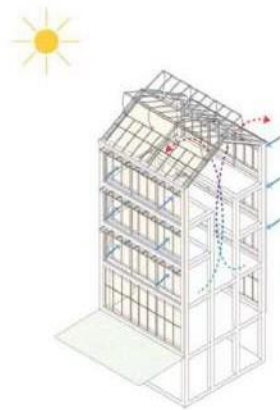
## The future of urban agriculture with a vertical farming complex

By a French architecture, firm Ilimeigo, where the project is located in the Parisian suburb of Romainville.

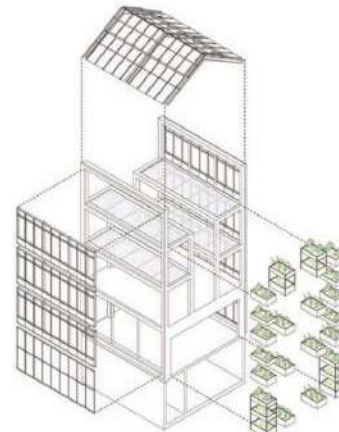
The project integrates food production into the city through a 1000 square meter greenhouse that maximizes sunlight and natural ventilation.



Consumption reduction; managing, storing and redistributing water.



Renewable energies  
Taking advantage of solar energy and ventilating to avoid overheating during the day



Prefabrication  
Thinking a constructive plan based on the prefabrication of the elements (structure, facades, containers, etc.) and creating inertia to retribute the excess of calories stored up at night





# NORMS & STANDARDS

## The Floating Urban Forest, Swale

A food forest is a low maintenance sustainable gardening and agro-forestry system based on woodland ecosystems. The concept traditionally incorporates perennial vegetables, fruit trees, nut trees, shrubs, herbs, and vines. Their yield aims directly benefit local communities.

Swale provides free and nutritious food to the visiting public. Part living-art, part sustainable food practice, Swale encourages our world to rethink what is possible when it comes to community gardening in an urban environment.



These are some of the reference projects that inspired us, as well as a few community-level garden systems that just cannot be mentioned all right now. All of them contributed to enrich our knowledge of community gardens.

# NORMS & STANDARDS

## The site standards



When it comes to the standards of site selection, we follow these standards according to The National Recreation and Park Association NRPA- hand-book, (*nrpa.org*):

- The site is easily accessible by gardener and community staff throughout the day and evening. Maintenance, irrigation and supervision is required. The design provides barrier-free paths to allow everyone's access to the garden.
- A flat location with full, direct sunlight throughout the day (6 to 8 hours of sunlight).
- Location adjacent to water sources - such as ponds, lakes, and rivers - can also be used to water the garden with appropriate permission. The design is based on collecting rainwater from roofs and save it in rain barrels for reuse in the garden.
- The sites are well-drained, not soggy location, in order to allow soil absorbs the water after a rainstorm. We avoid low places when choosing a garden site, as moist soil can lead to fungal problems on the garden.
- Determine the location of any underground facilities that could be located within garden site.  
Damaged gas, water, and electricity lines can be very dangerous and destructive. The overhead electrical lines that might limit equipment clearance for work or pose a risk to users. In this case, the project needs support and collaboration between municipality and stakeholders.
- Sketch patterns of sun and shade: Observe the site over the course of a day. Indicate which areas receive at least 6-8 hours of sun per day, and only place vegetable beds in those areas, that when it comes to implementation phases.

# Facilities



The design offers these standards according to The National Recreation and Park Association NRPA- hand-book, (*nrpa.org*):

1. Benches – Places to stop and rest are great for gardeners and very important for those with mobility challenges. They should be located in the shade, if possible, along the accessible route, and throughout the garden. Benches can be made of many natural materials, such as boulders or tree trunks.
2. Accessible Restrooms – The design evaluates the community garden for accessibility and makes modifications as necessary.
3. Shade – Most gardening occurs in the summer months. Heat can pose potential dangers for people who fail to keep their bodies cool and hydrated. The design provides places for people, particularly those most at risk (e.g., children, elderly, people with medical conditions), to access the shade. Shade can be provided under trees, garden structures, and picnic shelters or within the building.
4. Water – Water for plants and people is important in the garden. The concept is based on harvesting rainwater for plant watering, and provide a potable drinking fountain for people.
5. Transfer Spots – People who travel with wheelchairs or scooters or who have walking challenges can transfer onto a platform or a series of stepping platforms to provide access up to something or down to the ground. Use transfer points to provide access to soft mats on the ground for direct access to the soil. The design considers using a transfer spot to achieve access to a table- height garden.
6. Garden Beds – we design garden beds width for the maximum reach for an adult and a child, the width is 1200mm and it has access on both sides.
7. Table-height Gardens – Plantable tables can be constructed out of simple materials such as wood. Table-height gardens are a great ways to include children and people with disabilities or limited mobility in gardening activities. The table height allows for a person in a wheelchair to have direct access to the soil, the height is 940mm.

## Facilities



8. The composting area- The design takes into consideration offering a space for composting, which is a beneficial and sustainable practice. Composting not only provides an organic source of nutrients for the garden soil, it also makes great use of leaf litter, grass clippings, and other easily decomposed organic matter that is generated in huge volumes in a park setting.

Additionally, composting programs can be designed to encourage children and families to compost at home, at school, or by bringing their organic matter and fruit and vegetable peelings to a common facility in the park. This gives your gardeners a sense of ownership and empowerment while providing an educational opportunity to understand how some kinds of waste can become a part of the growing cycle.

9. The animals area- The design offers this option to attract more people who are interested in animal husbandry.
10. The parking and bike area- Generally, the accessible route originates from an accessible building, parking lot, drop-off, or bus stop. The proposal makes accessible parking and bike spaces available near the garden.





# CROPS DATA



Growing food in a community garden plot is a unique method of gardening with great benefits and some difficult challenges, especially regarding to the type of crops that can be grown and benefit the participants.

## What to Plant in a Community Garden

Here are some crops and vegetables that we can recommend that could benefit the participants, because these plants have low maintenance:

sno.	crop	soil	days to harvest	Possible for indoor growth	possible for vertical growth	root length
1	corn		60 to 100 days	yes		60 cm
2	potato		75-120 days	yes		50 cm
3	wheat		125-140 days	yes	no	60-80 cm
4	oat		about 60 days	no		15-20 cm
5	barley		around 90 days	yes	yes	80 cm
6	sugar beet		45 to 65 days			15-20 cm
7	carrot		60-80 days	yes		20cm
8	tomato		60 to 80 days	yes		60-80 cm
9	lettuce (hydro-ponics)		40-60 days	yes	yes	10 cm

BASIL



BEETS

EGGPLANT



GARLIC

CABBAGE



KALE



LEEKs



ONIONS



PARSLEY



POTATOES



THYME



SWISS CHARD



OREGANO



ZUCCHINI



PEPPER



HOT

TOMATO



# TECHNICAL REQUIREMENTS

The project goes with the concept of sustainability in the urban development. Therefore, the question is about how to build this garden in sustainable and affordable ways in order to get the desired benefits. The design offers sustainable solutions when it comes to technical issues to meet the garden's needs.

## **The construction and cladding materials**

### **The structure of the building and greenhouses:**

Referring to one of the aims of the project, which is about how to create alternative economic resources in the municipality of Bengtsfors, so our thoughts are based on using local materials to build in a modular way. Sweden is a country of forests, so the wood is available in abundance and in the Västra Göteland region; are some of factories that produce wood intended for construction.

### **The foundation plate:**

The foundation will be a concrete plate to the ground, to be accessible. Here is an example of details

### **The facades:**

The concept of facades is based on a transparency method in some parts to let daylight across to the inside and contribute supporting the heating and lighting system.

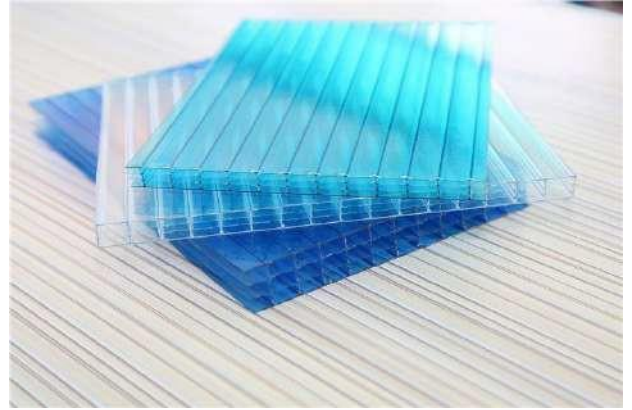
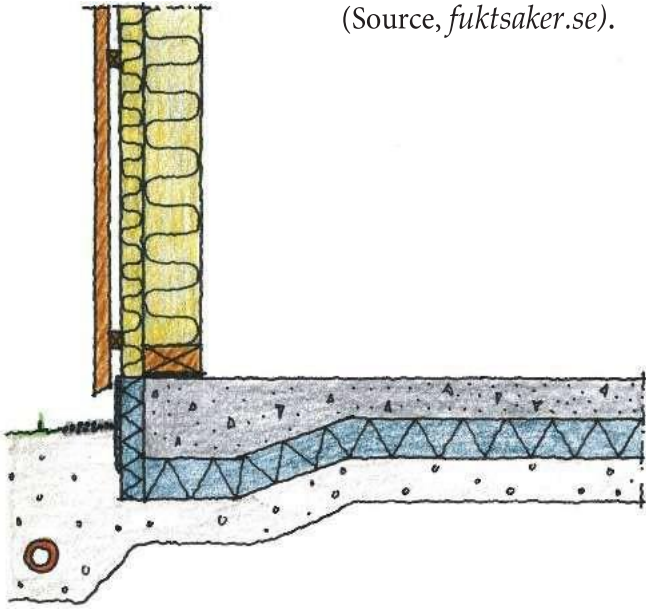
### **The roof:**

The roof will be constructed from wood and a combination of translucent materials such as glass and cellular polycarbonate sheet.



# TECHNICAL REQUIREMENTS

(Source, [fuktsaker.se](http://fuktsaker.se)).





# TECHNICAL REQUIREMENTS



## The lighting system

Three factors need to be considered when it comes to the greenhouse's lighting system:

1. The type of crop being grown,
2. What time of year it is,
3. How much sunlight is available?

Greenhouses generally require six hours of direct or full spectrum light each day. If this cannot be achieved naturally "especially in Sweden", supplemental lighting must be incorporated.

Supplemental lighting is the use of multiple, high-intensity artificial lights to promote crop growth and yield.

According to website (*greenhouse-management.com*), the most efficient lamps used for supplemental lighting in greenhouses are High-Intensity Discharge (HID) Lamps.

The light intensities and efficiencies obtained by high intensity discharge lamps are higher than either incandescent or fluorescent lamps.

These lamps have a high light output, (and produce a lot of heat) so they should be placed at 609mm or more above the top of the plants, (*greenhouse-management.com*).



## The heating, ventilation, air conditioning systems, HVAC.

The main challenge in the project is how to stabilize temperature fluctuations in greenhouse cultivation, as we know that Sweden is a country characterized by these sudden fluctuations throughout the year.

Traditionally, people do this by blasting energy through the heating or cooling systems of a greenhouse. However, the most sustainable way to create a stable greenhouse is to harness the excess solar energy that comes during the day, store it and use it at night.

Therefore, our concept is to design and build these units so that they do not require a lot of heating and cooling in the first place, and this means using an insulated and sealed structure building, using suitable roofing materials, and directing the greenhouse towards the south. Glass Facing - As all our light shines in the Northern Hemisphere.

OBS, "We did not do a calculation of the capacity of heating that the greenhouse requires".

Therefore, we suggest implementing two methods of heating system.

# TECHNICAL REQUIREMENTS

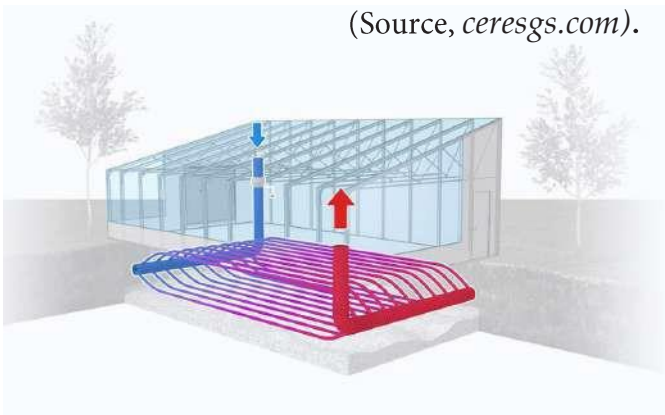


## The heating, ventilation, air conditioning systems, HVAC.

**Method A;** is called The Earth Tubes or a Climate Battery.

**Method B;** is called solar water heating system.

(Source, *ceresgs.com*).



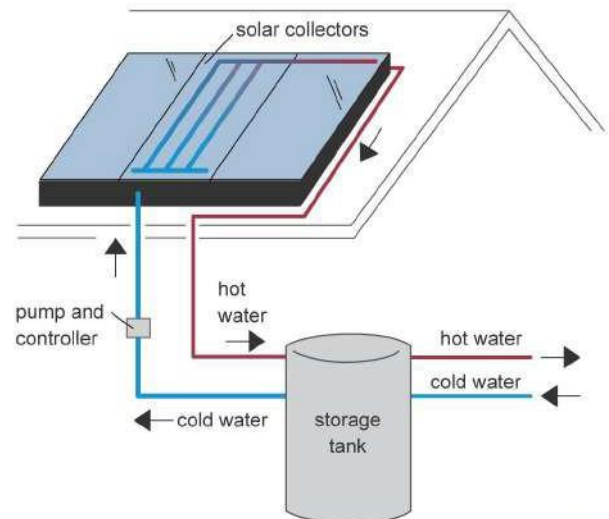
The mechanism of energy transfer and storage in this system is working, when the greenhouse heats up during the day, a fan pulls warm moist air from inside the greenhouse through a network of tubes buried under the greenhouse (most systems consist of two layers of tubes buried under the greenhouse).

At night when the temperature drops, the water vapor condenses, and the energy is released.

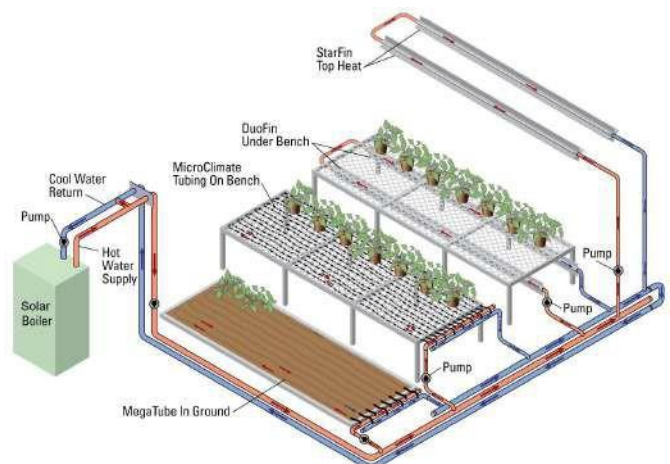
This energy is stored in the soil, which causes the soil to heat up. Thus, the process creates a large mass of warm soil under the greenhouse all year round.

At night, when the greenhouse temperature drops, the fan turns on again and takes this

### Basic components of a solar water heating system



(Source, *eia.gov*).



(Source, *biothermsolutions.com*).

# TECHNICAL REQUIREMENTS



## The power system

Our target is to achieve a modular community garden that will be environmentally friendly and get net-zero emissions.

Therefore, renewable energy resources are key to this modular system. We use solar panels to generate electrical power to provide the modular its need of energy.

The process called agrivoltaics, means that we can farm crops under the solar panels in order to get some of shadow and protection.



## The water system

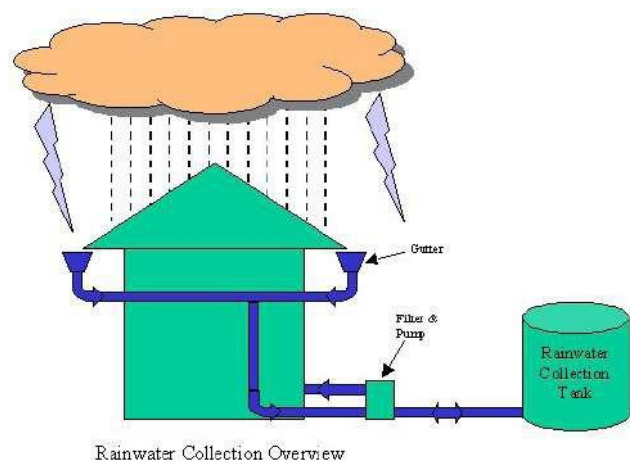
The goal is to save water and reuse it sustainably; therefore, the water system is divided into two parts:

### A. The water for irrigation, which has two methods:

**Method A:** The water that comes from the rain will be collected in barrels to be used for watering the plants.

OBS, *"We did not count the number of liters that we could collect from rain and snow each year at the site."*

We realize that the rainwater will not be sufficient for the needs of the community garden.



(Source, [greensystems.net](http://greensystems.net)).

# TECHNICAL REQUIREMENTS

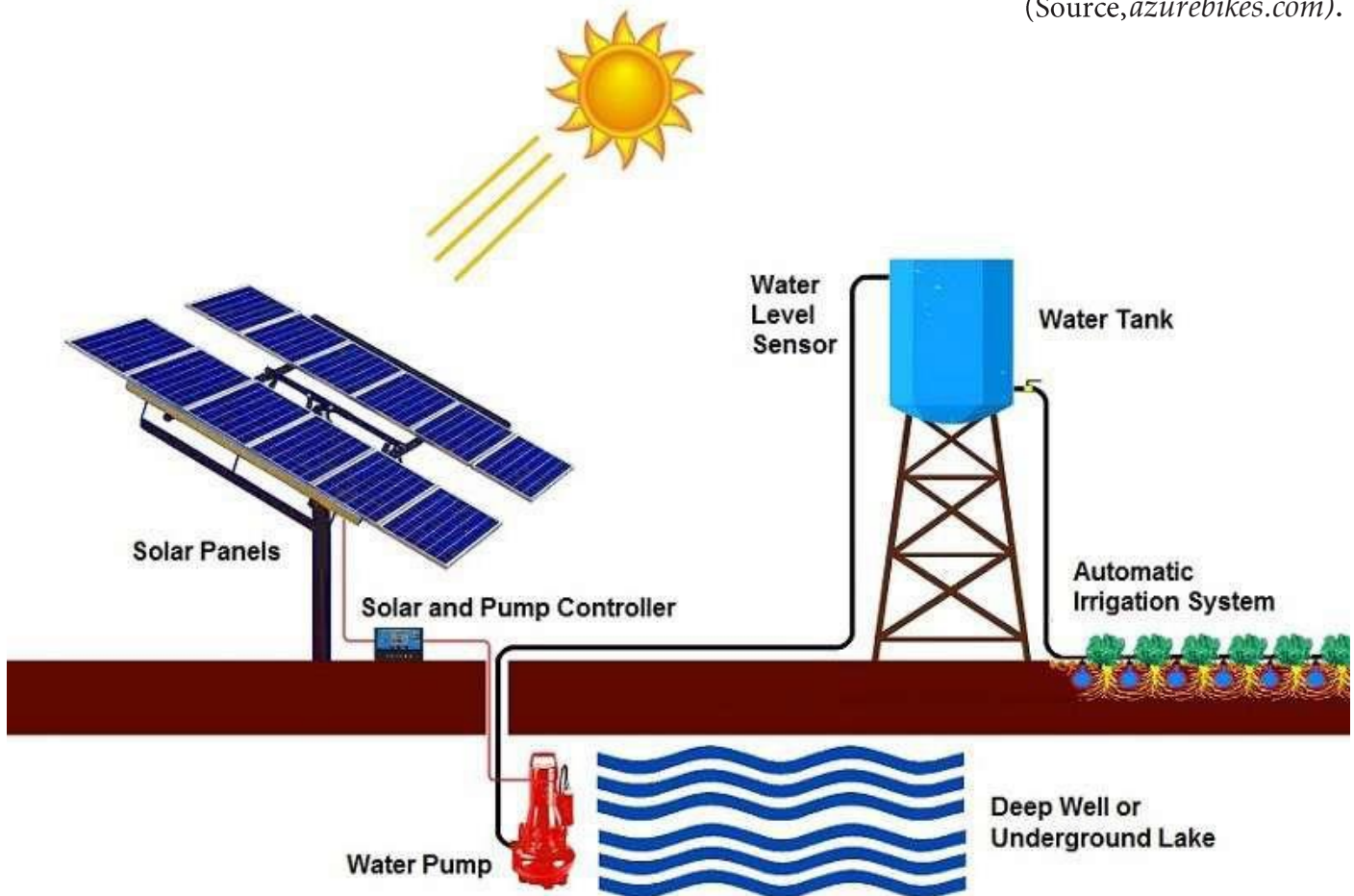


## The water system

- A. The water for irrigation, which has two methods:

**Method B:** The solar water pump for irrigation, which is based on the sun to generate energy to pull water and pumping it from water resources such as lakes or wells into tanks and then distribute it into in-outdoor planting area.

(Source, [azurebikes.com](http://azurebikes.com)).





# TECHNICAL REQUIREMENTS



## The water system

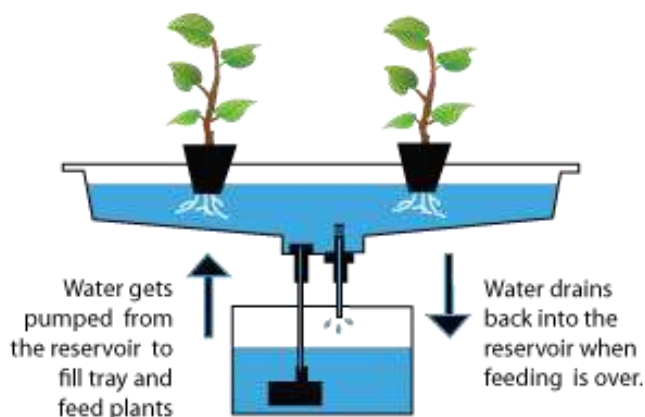
### Indoor water concept, Hydroponics

The users can grow effectively in a range of climates. The produce from pollution and unsafe levels of lead.

### Closed-Loop Indoor Food Production

Unlike traditional agriculture, hydroponics is a technology that provides a closed-loop indoor food production solution, which is positive for our human health as well as the health of our environment.

Here are some of the elements of hydroponic technology, which makes it a closed-loop indoor food production system:



## The water system

### B. The water for people to drink

There are different requirements to process the water depending on the use, whether for drinking and cooking or to be used in the WC draining system.

To save water and keep the process sustainably we propose a recycling system for gray water.

B. The water that comes from the shower has its own recycling system and when mixed with urine can be used for irrigation.

C. The gray water that comes from W.C will be crossed through a filtration system to produce a compost.

The rest of water will go to the municipal sewage system.

(Source, [powerhousehydroponics.com](http://powerhousehydroponics.com)).

# CONCLUSION



In conclusion, We as participants in the local context course tried to visualize new visions towards a sustainable horizon, by looking at the possibilities available to us within our local biological and environmental surroundings.

The development of the intervention was done with the existing situation in context and prioritized the importance to tackle major issues within the municipality. The project is a vision towards a better future, especially as it provides sustainable alternative economic solutions to involve all groups of society to achieve social inclusion that leads towards a sustainable society.

Finally, the project provides rural environmental planning that is consistent with the local context of the municipality of Bengtsfors, thus achieving environmental sustainability

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*By Thenral Mangadu, Michael Kelly, Max C. E. Orezzaoli, Rebecca Gallegos, and Pracheta Matharasi. Department of Public Health Sciences, The University of Texas at El Paso, El Paso, TX, USA.*
- **Community gardens and wellbeing amongst vulnerable populations: a thematic review.**  
*By Pernille Malberg Dyg, Søren Christensen, and Corissa Jade Peterson<sup>1</sup>, University College Copenhagen, Department of Nursing and Nutrition, 2200 Copenhagen, Denmark and Roskilde University, Institute for People and Technology, 4000 Roskilde, Denmark.*
- **Growing Community Gardens,**  
*by A Denver Urban Gardens' Best Practices Handbook for Creating and Sustaining Community Gardens.*

## WEBSITES:

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