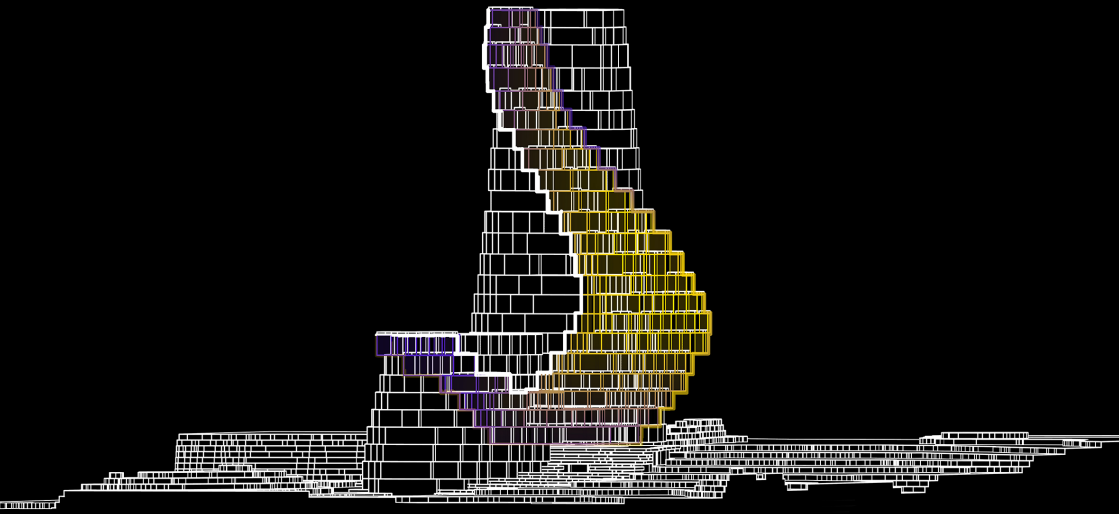
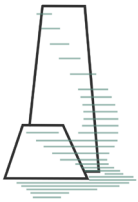
Source book

02.12.2010

Ziyi He
Xinyan Li
Zharkova Olga



Left: outline of south facade



Farming Village

vertical farming system of Pasila

Students: Ziyi He, Xinyan Li, Zharkova Olga

Performative Patterns of High Density

ARK-E3009 Design of Structures Studio
ARK-E2514 Design of Structures Theory
ARK-E5518 Digital Speculative Urbanism Studio
ARK-E5514 Digital Speculative Urbanism Lecture

Teaching team:
Prof. Toni Kotnik, Prof. Pia Fricker, Prof. Carlos Bañón
Luka Piškorec, Kane Borg

A” DS Aalto University Design of Structures

A! CM Aalto University Computational Methodologies for Landscape Architecture and Urbanism

SUTD SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN

AIRLAB architectural intelligence research lab

Concept Description

In normal village, buildings are organized horizontally. Architecture and lanscape interleave and embrace with each other horizontally in each block. Our cencept of vertical village is the stack of horizontal vilalge connected by paths. We called each single village one cluster, in which various functions interacted with landscape.

Landscape is a crucial part of people's life when communicating with architecture. The impact of landscape varies from different defination of landscape.

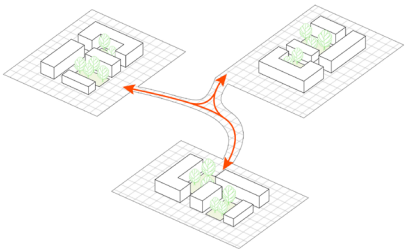
In this project, our defination of landscape is farming composed of two parts, the traditional farming and the vertical farming. Traditional farming could be regarded as the extension of greenery area, with which people could not only benefit from the views, but also having social activities during the planting and cultivating. As for the vertical farming, it is a industrial production. People living in the building would supplied by the agricultural production planted in the vertical farming area inside the tower.

Sunlight is the main factor to control the space orgnization inside towers. Sunlight was used to control the function distribution and the aitrum size. Another important method we use is the growth. We use the sun energy proportion as the starting curves and input the function area proportion as the growth speed, let the space grow in the defined boudnary. Then use the boudnary negotiation to adjust the final result.

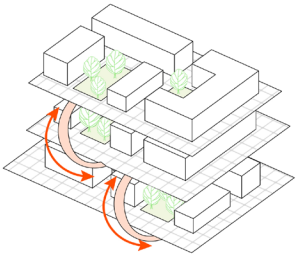
The whole tower is a dynamic system controlled by different proportion of functions input.

Concept

A. Village

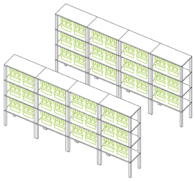


Horizontal/Normal Village



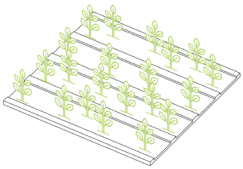
Vertical Village

B. Farming



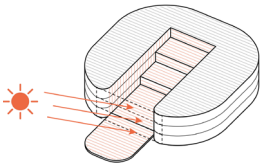
Vertical Farming -
Production

+

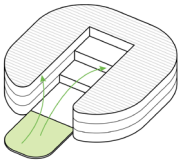


Traditional Farming -
Social acitivty

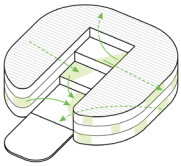
C. Cluster



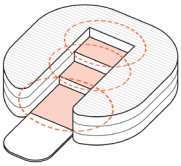
Sun position and
farming position



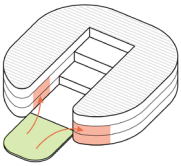
Vertical Farming
Supply for the Residence



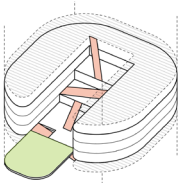
Teaditional Farming
Social activity



Atrium
Public radiation

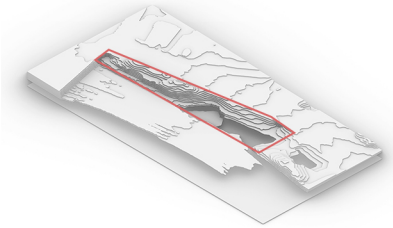


Vertical Farming
Supply For market and
Restaurant

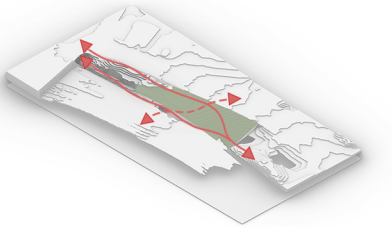


Vertical farming
produces agricultural
product

Process

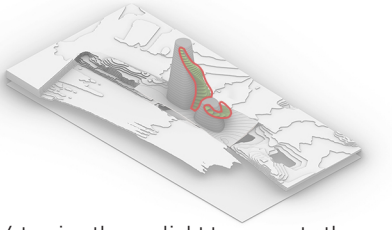


1.site

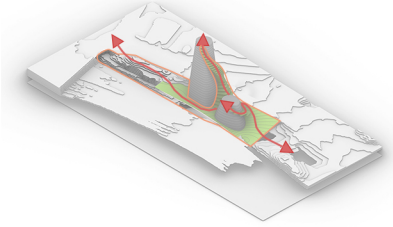


2.reshape the site to connect different levels and create paths

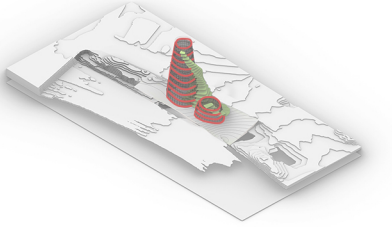
3.test for the least shadow to generate the main volume



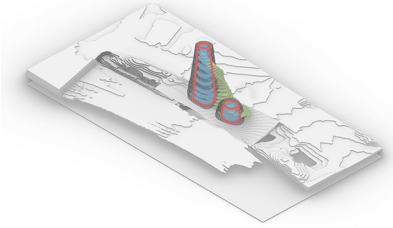
4.tracing the sunlight to generate the farm



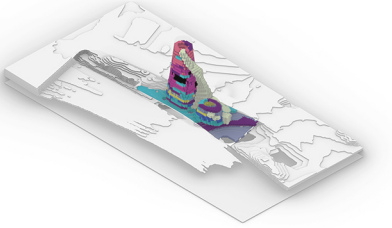
5.farm system connect with the site



6.devide into clusters

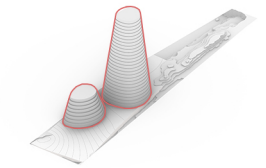


7.atrium in each cluster controled by sunlight

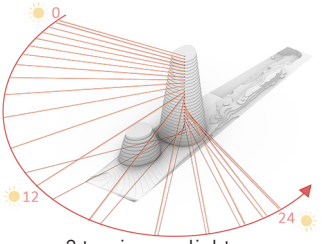


8.function distribution

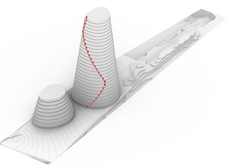
Farm Generation



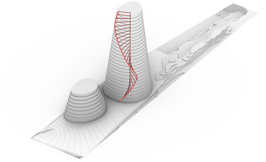
1.site with towers



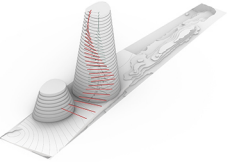
2.tracing sunlight



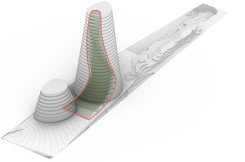
3.intersect with tower



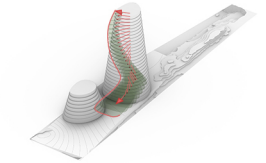
4.direction



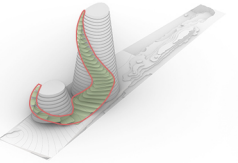
5.radiatial pattern



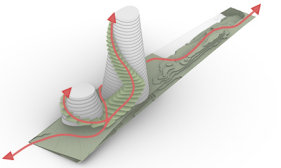
6.farm



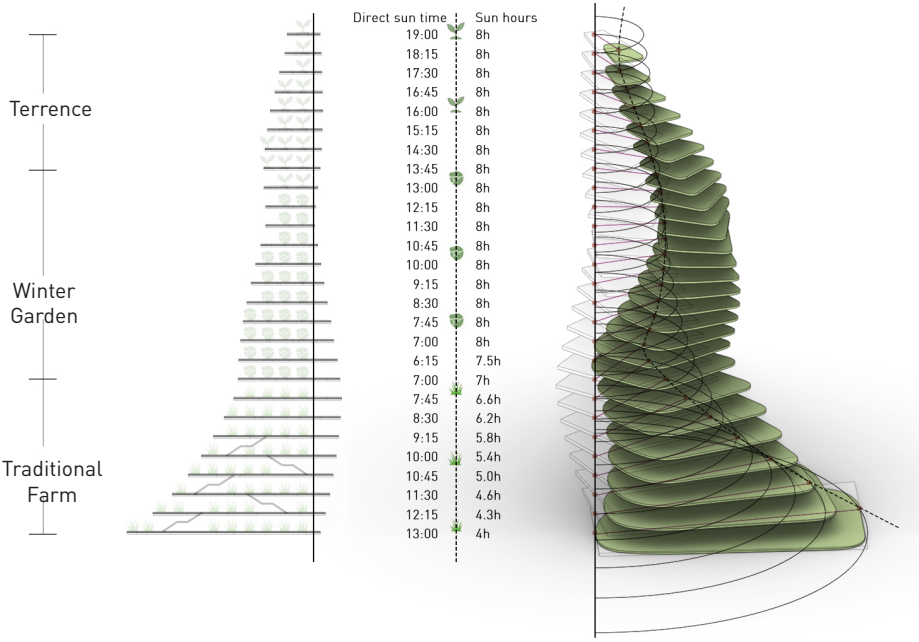
7.movement



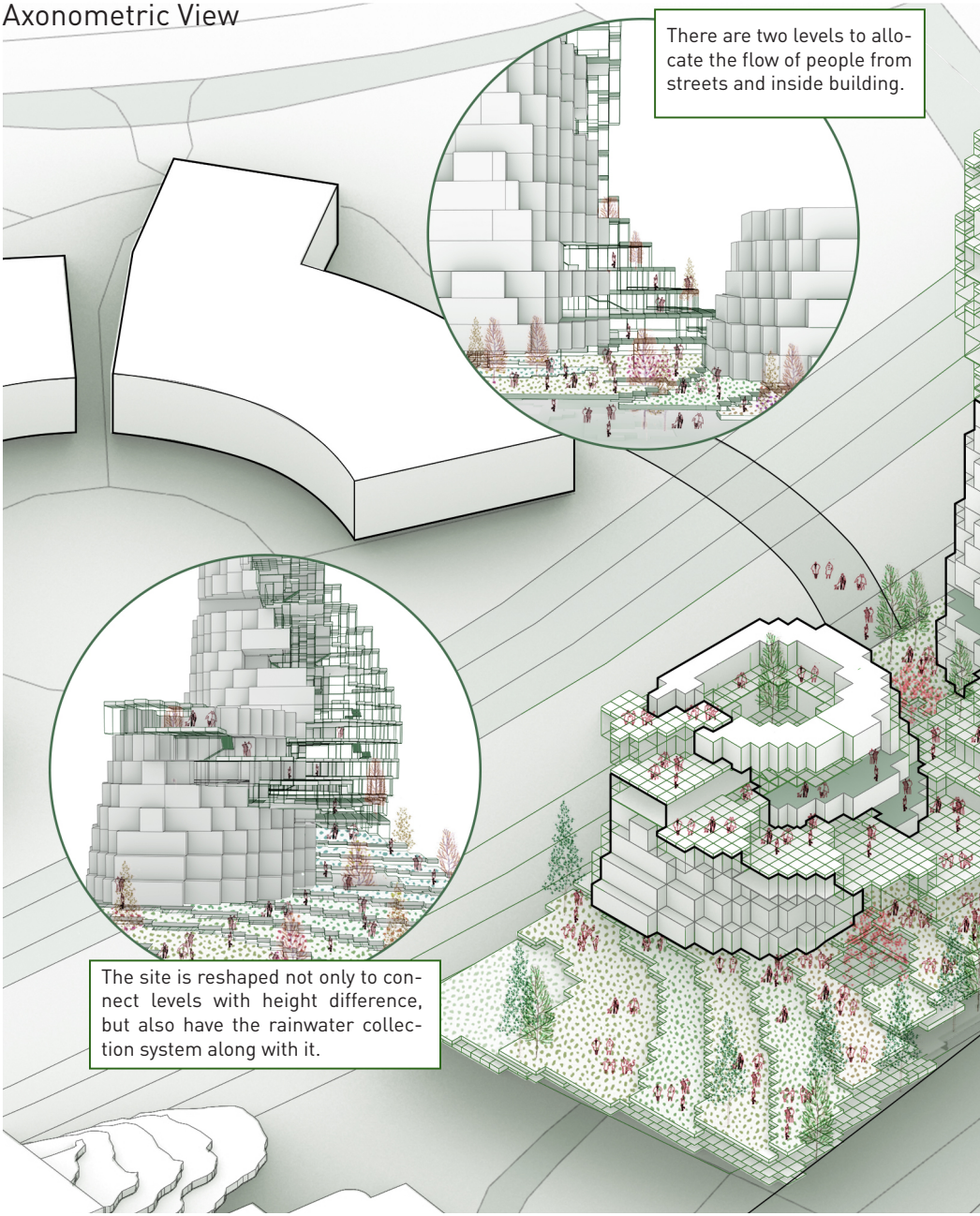
8.farm connection

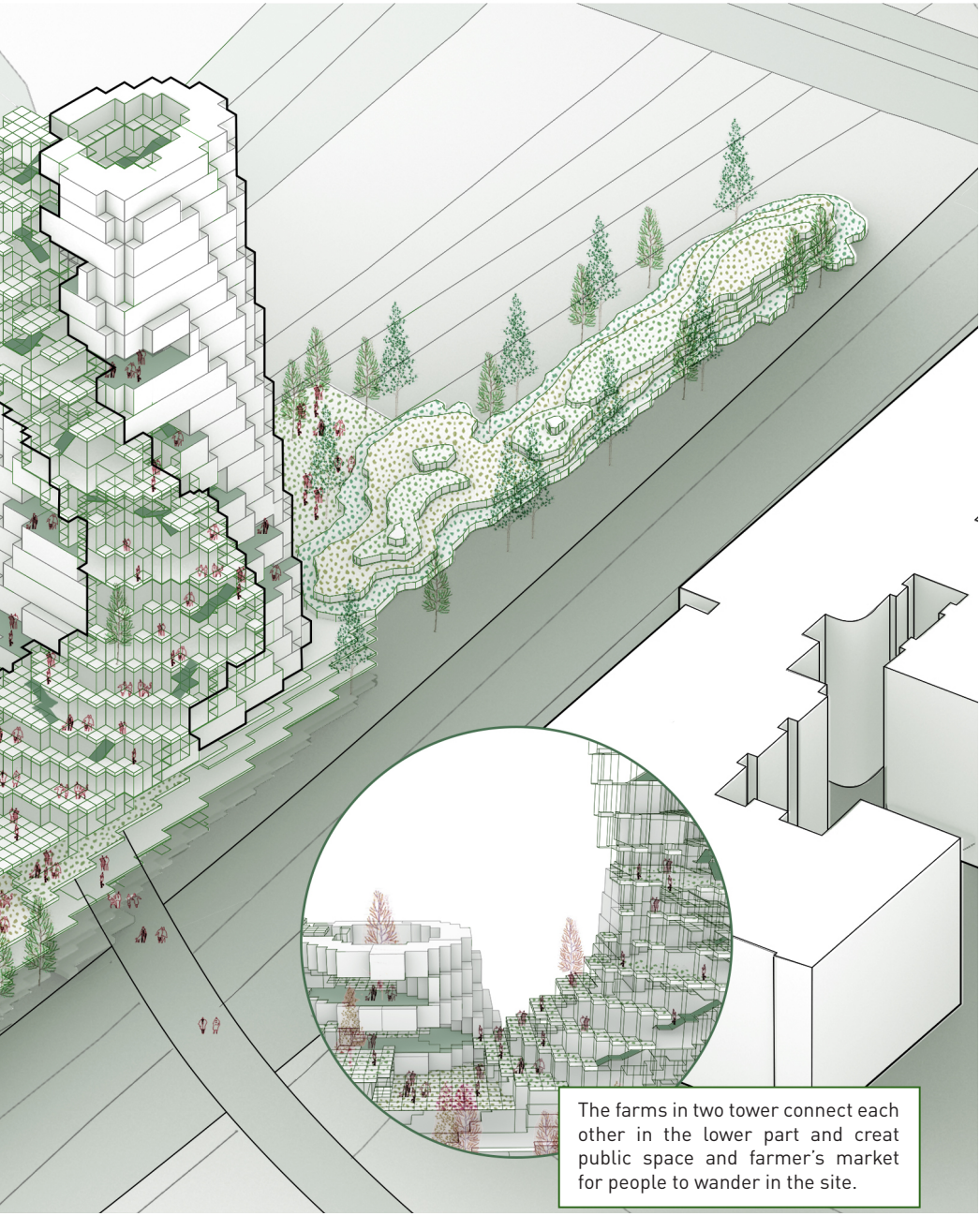


9.farm system



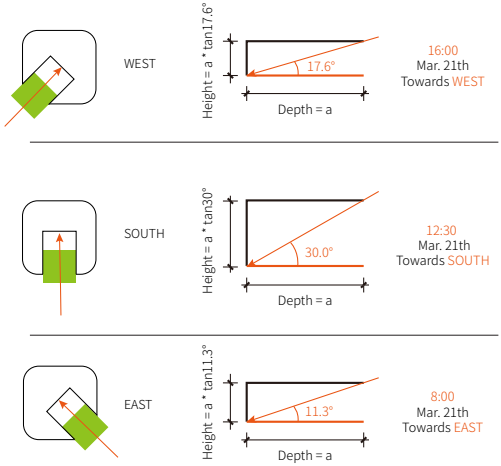
Axonometric View

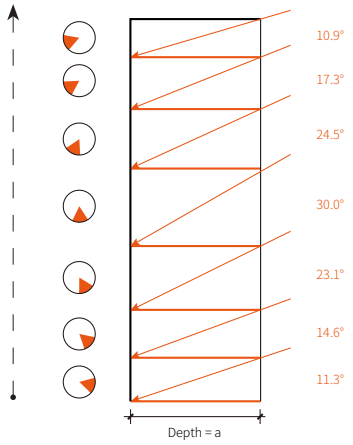


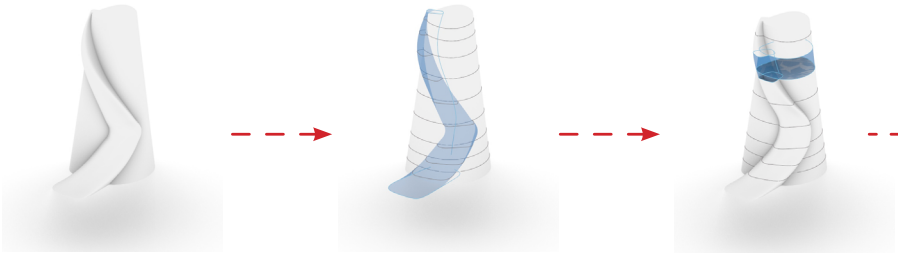


The farms in two tower connect each other in the lower part and creat public space and farmer's market for people to wander in the site.

Cluster division

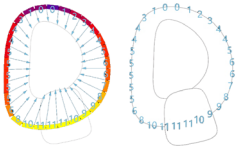




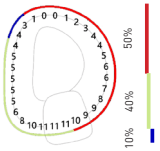


Logic in Cluster

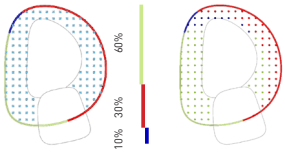
A.Sun Light



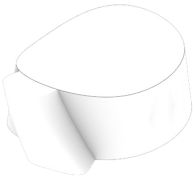
B.Sun Light proportion



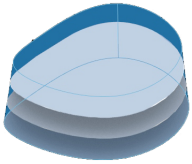
C. Area proportion



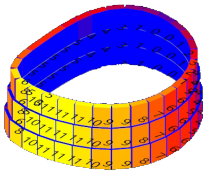
Cluster	Floor	Function	Sun energy proportion	Area proportion
	13	Residence	30%	40%
		Office	60%	50%
		Shop	10%	10%
	14	Residence	20%	40%
		Office	60%	50%
		Exhibition	20%	10%
	15	Residence	30%	60%
		Office	60%	30%
		Market	10%	10%



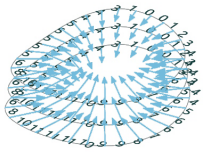
1. One



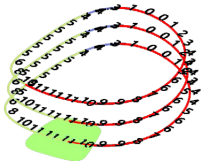
2. Divide into floors



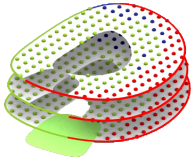
3. Calculate sun



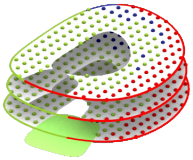
4. Offset space



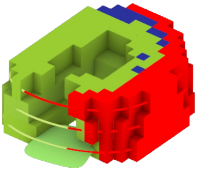
5. Set the starting curves based on the sun energy proportion



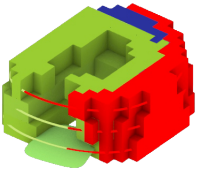
6. Populate cells



7. Space growth

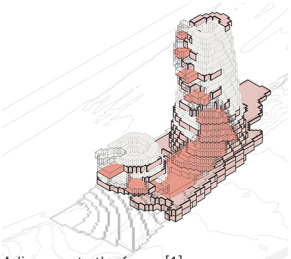


8. Transform point into space

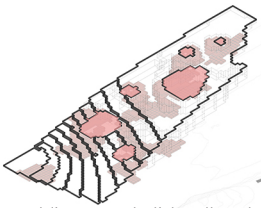


9. Boundary negotiation

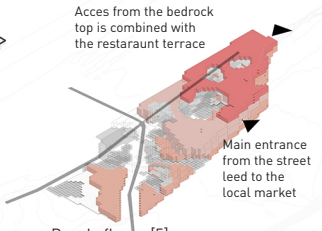
Spatial solution growth process



Adjacency to the farm_[1]
Proportion of the sunlight harvested_[2]
Area occupied_[3]

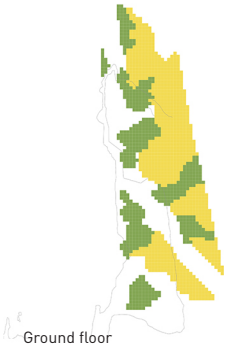


Adjacency to the lightwells and tower's atriums_[4]

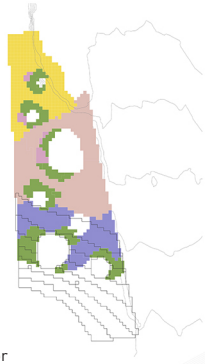


People flow__[5]
Underground path, connects Pasila parts. Quick servises.
Cells do not block people movement

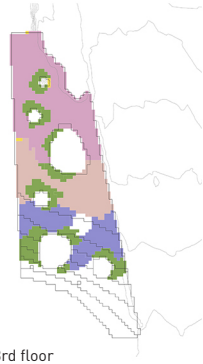
Typical floors



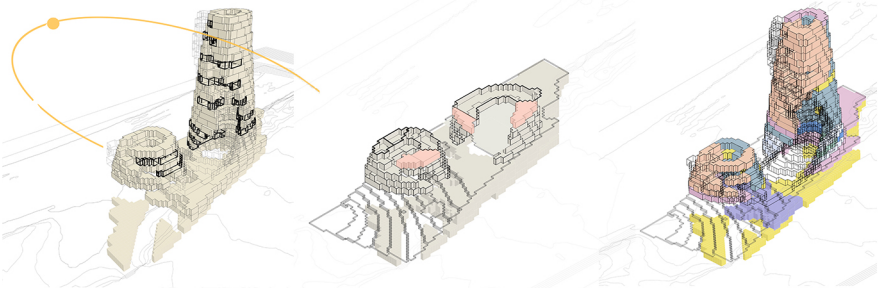
Ground floor
Green_[3] - 25%_[4]_[5]
Retail_[3] - 55%_[5]



2nd floor
Green_[4]_[3] - 10%
Retail_[3] - 20%_[5]
Market_[3] - 45%_[5]_[1]
Learning center__[3] - 25%_[5]_[1]



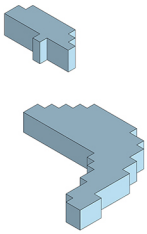
3rd floor
Green_[4]_[3] - 10%
Restaraunt_[3] - 40%_[5]
Market_[3] - 25%_[5]_[1]
Learning center__[3] - 25%_[5]_[1]



To allow sunlight inside the atrium, each cluster incorporates the open space next to the most sunny part of the facade, which is then used as a local market and shared kitchen unit due to its adjacency to the farm. These units are fully glazed.

Growth process is based on the python script which generates the cells of the specific function via finding the balance between input parametrs. Each area has specific priorety based on its location, function.

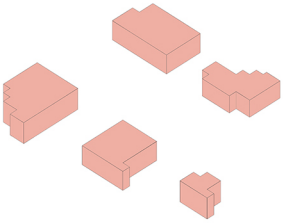
Possible cell typology:



Open spaces\
Co-working_
50-70sqm

Individual units for remote working
15_20_30sqmv

Office units

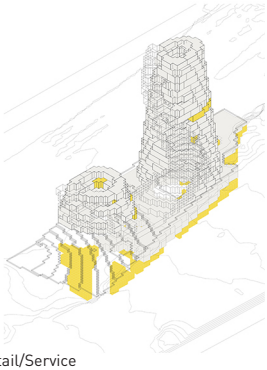


Student housing\Social housing_15_20sqm

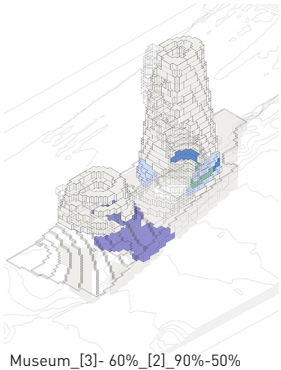
Studio apartments
40_50sqm

2-3 room family apartment
60_70sqm

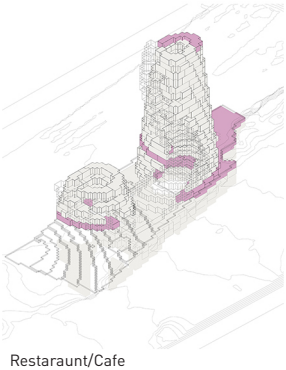
Living units



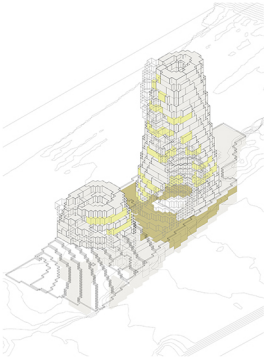
Retail/Service
_[3] 10- 55%
_[5]



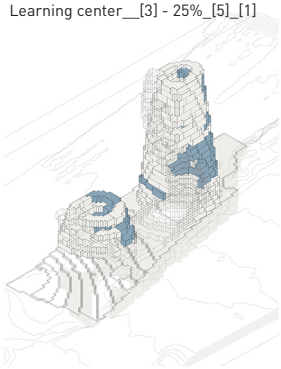
Museum_[3]- 60%_[2]_90%-50%
Exhibition_[3]- 40%_[2]_10%
Farm workshop_[3]- 30%_[2]_60%
Learning center__[3] - 25%_[5]_[1]



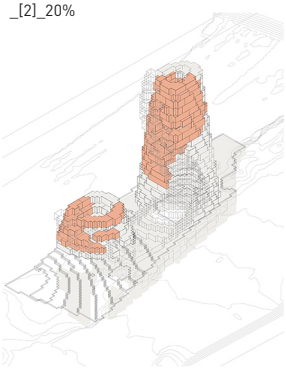
Restaraunt/Cafe
_[3] 20- 40%
_[5]
_[2]_20%



Local market\Shared kitchen
_[3] - 10-25%_[5]_[1]

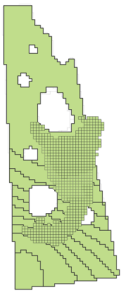


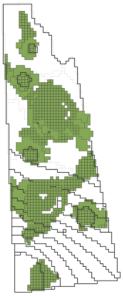
Offices
_[3] - 10-75%
_[2]_30%

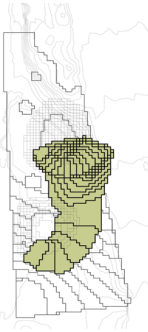


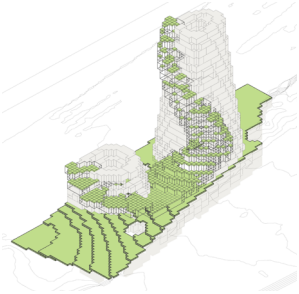
Residential
_[3] - 40-75%
_[2]_60%

Green areas programm and building circulation

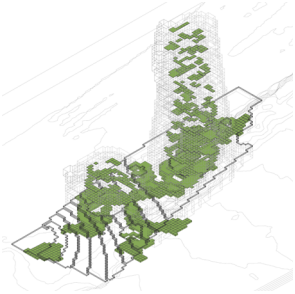




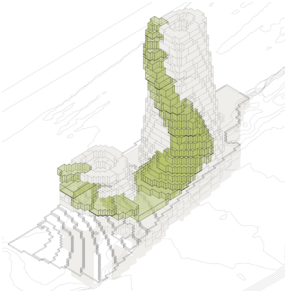




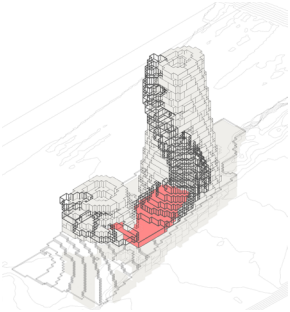
Traditional farms are located on the building "slopes"



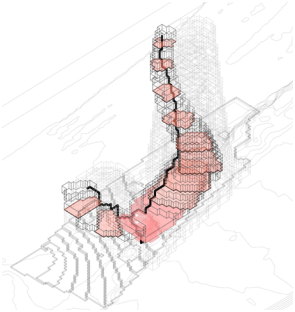
Vertical farms are located on the sunniest parts of the facade. Defined by the the sun rays projections on the facade.



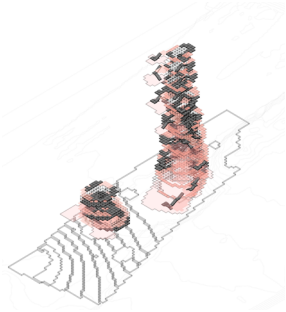
Inner greenery yards are connected in the individual ecosystem. Suitable for the indoor plants. Not enought sun for farming.



Last floor of the vertical farm block is used for the farm managment/storing/ distribution of goods to all consumers.

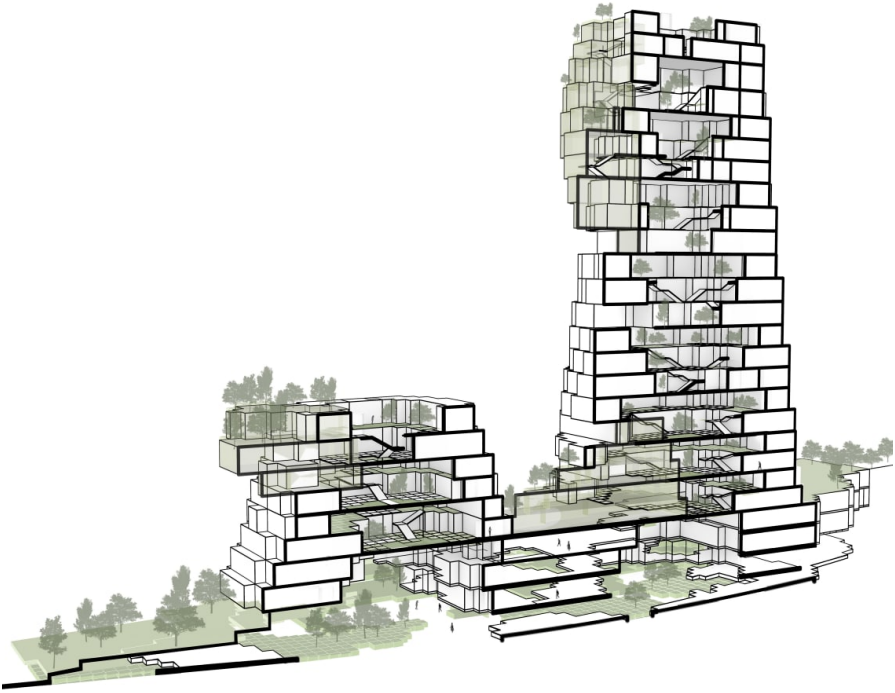


All vertical farms and the managing floor are connected with the shortest path posible. It is then used for the product harvesting, water supply, waste managment.

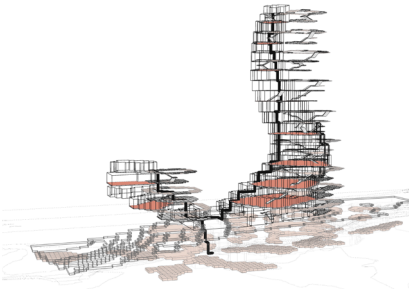


Cluster inner yards are connected with the vertical farming, where 5% of the space is reserved for the private use by cluster users.

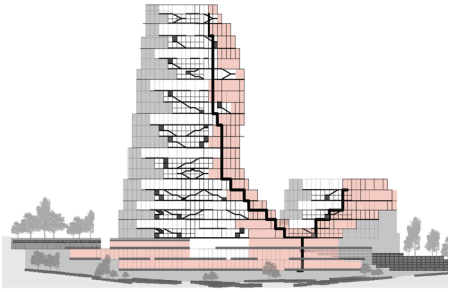
Section and path system



Green areas inside the building are distributed based on the script using parametrs :
- Occupied area (20-30%)
- Adjacency to the lightwells
- Adjacency to the towers's atrium
- People flow (Cells do not block people movement)



The paths in the farm system of two towers are calculated by the shortest walk. The height of farm space in each cluster is defined by the sunlight.



The paths inside the atrium of two towers are calculated by the shortest walk and also connected with the paths of farm system which is in the exteriorWW.