

Temple of Food

„There have never been cities that could feed themselves.
They have always been parasitic to the countryside“

– Manuel Delanda (2011)

Future Predictions

Scenario 2050

We will need to produce more food in the next 35 – 40 years than in the previous 10.000 years combined, while using less land and resources.

9.8bn

Projected Global Population

68%

Projected Urbanization

11%

Global Land Use

Over 11% of the worlds land is being used as agriculture land.

70%

Increase in Food Production

30%

Global Food Waste

1.6bn tons of food are spoiled on the way to the market or become bad at home.

88M

EU Food Waste

Around 88 million tons of food are wasted annually in the EU, with associated costs estimated at €143bn.

70%

Global Fresh Water Usage

The agriculture industry is the single largest freshwater consumer in the world.

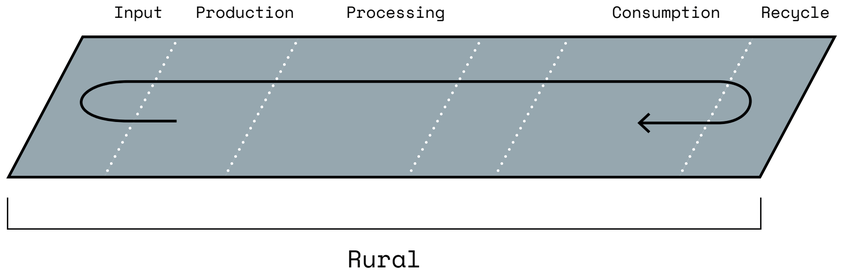
600M

Annual Food Safety Cases

Rethinking Agriculture

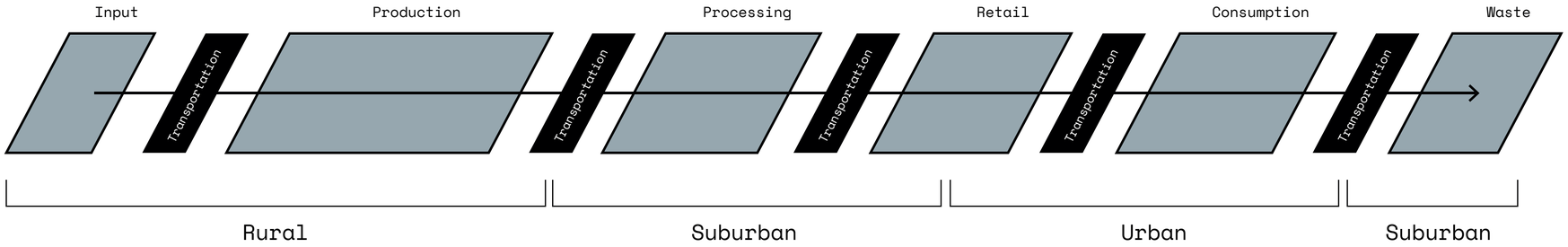
Past - is Rural

Agriculture was mainly done on farms in close proximity to the village. Food was consumed locally with minimum transport.



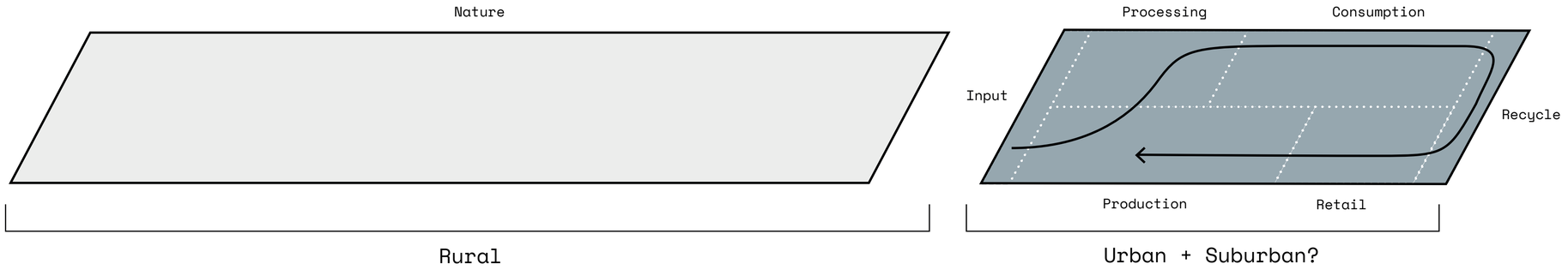
Present - is Split

Today, agriculture is globalized and farms are all over the world. This breaks up the processes and adds transportation inbetween steps.

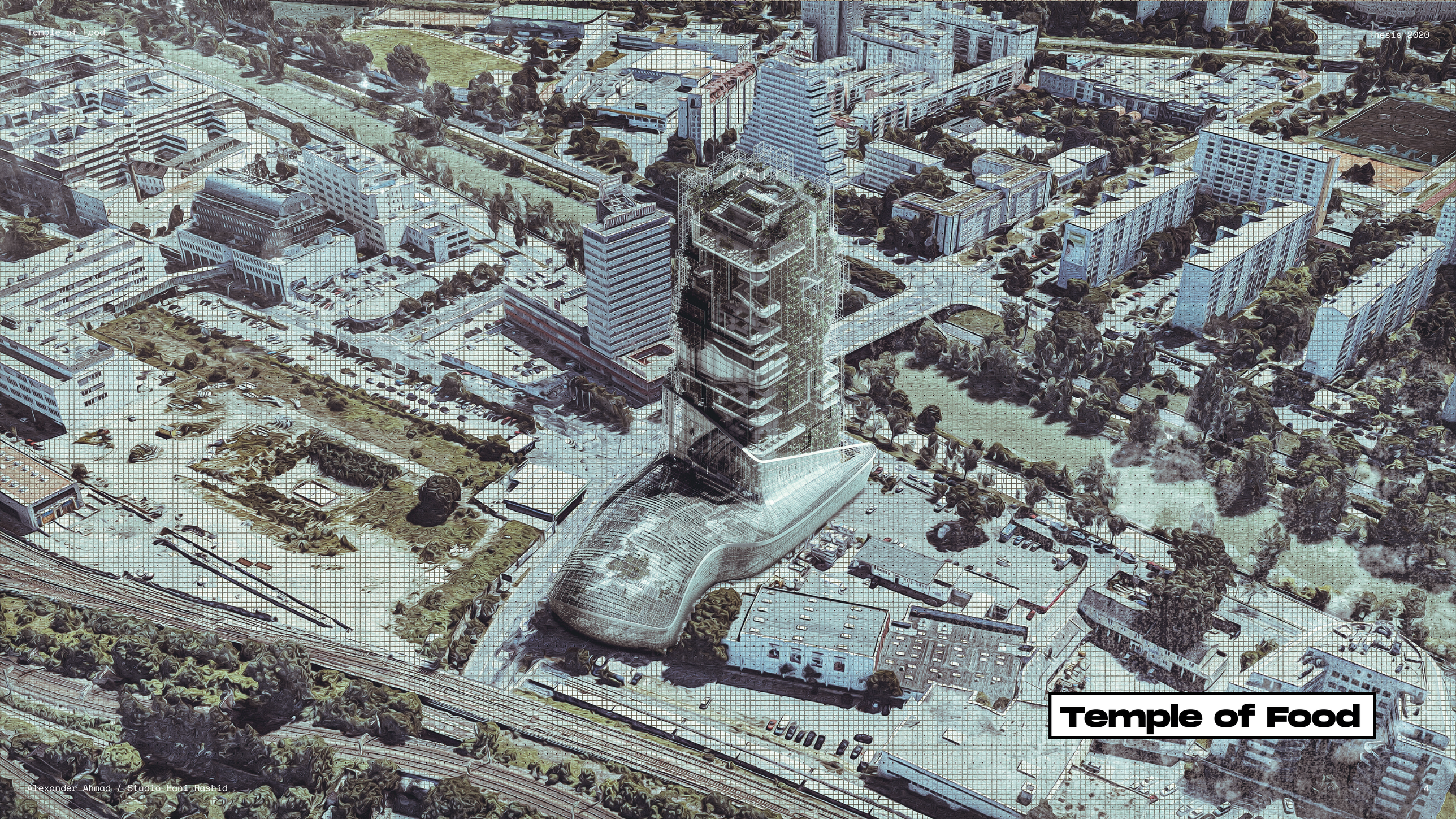


Future - is Urban

By moving agriculture into our cities we can create an on demand system that generates less foodmiles and a smaller carbon footprint.



Why does the food production need to come to our cities?



Temple of Food

The Future of Farming

Vertical Farming

90~99%
Less Water Use

90~99%
Less Land Use

90~99%
Less Fertilizer Use

Zero
No Pesticides



Aeroponics

Aeroponic systems nourish plants with nutrient-laden mist. The concept is based on hydroponic systems, in which the roots are held in a soilless growing medium, such as coco coir, over which nutrient-laden water is periodically pumped. Aeroponics simply dispense with the growing medium, leaving the roots to dangle in the air, where they are periodically puffed by specially-designed misting devices.



Hydrophonics

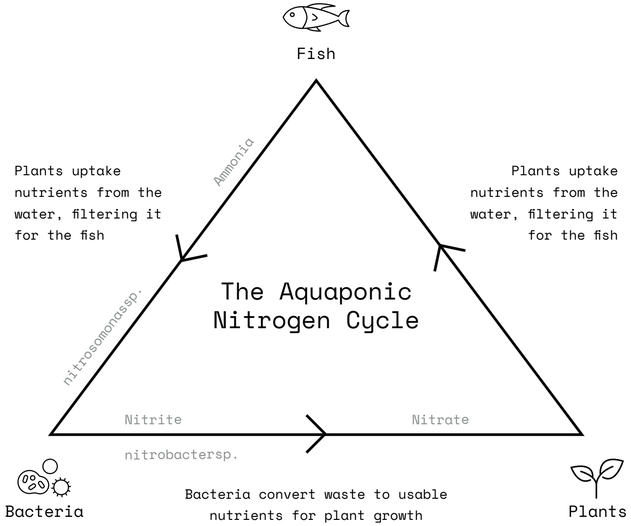
Hydroponics is a growing technique that uses a nutrient-enriched, water-based solution in place of soil. Rather than harvesting nutrients from soil, plants are provided with all their essential nutrients via a water-based solution. This streamlined form of nutrition allows them to grow taller and fuller at an accelerated speed.

Aquaponics

Aquaponics is a combination of Aquaculture (farming fish) and Hydroponics (growing plants in water, without soil) integratd in one system. The fish waste provides organic food for the growing plants and the plants naturally filter the water in which the fish live.

The third and fourth critical actors in this symbiotic world are bacteria and composting red worms. The beneficial bacteria exist on every moist surface of an aquaponic system. They convert the ammonia from the fish waste that is toxic to the fish and useless to the plants, into nitrites and subsequently into nitrates.

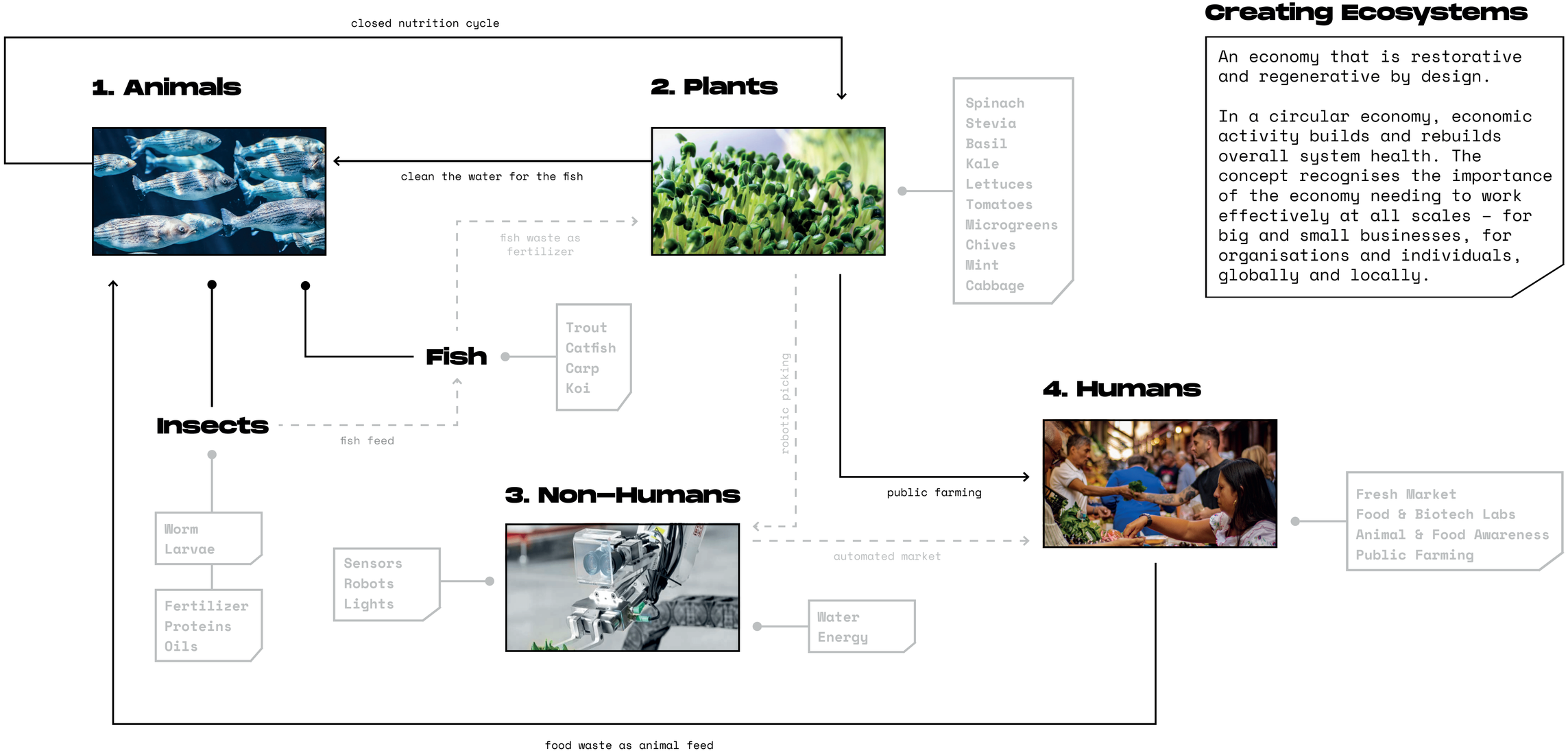
The nitrates are relatively harmless to the fish and are a great nutrient for plants. At the same time, the worms convert the solid waste and decaying plant matter in the aquaponic system, into vermicompost.





Closing the Nutrient Cycle

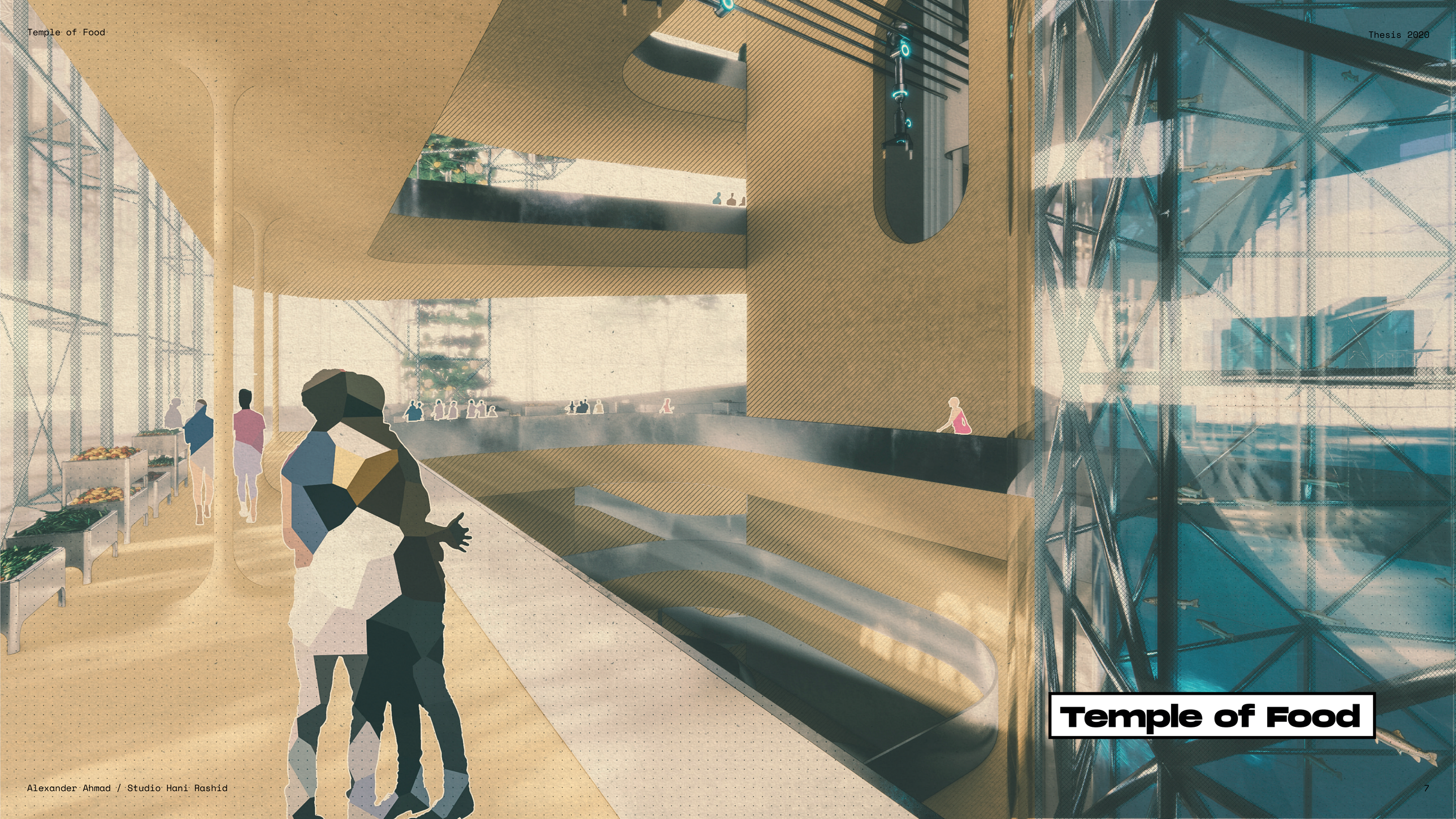
Ecosystem Architecture



Creating Ecosystems

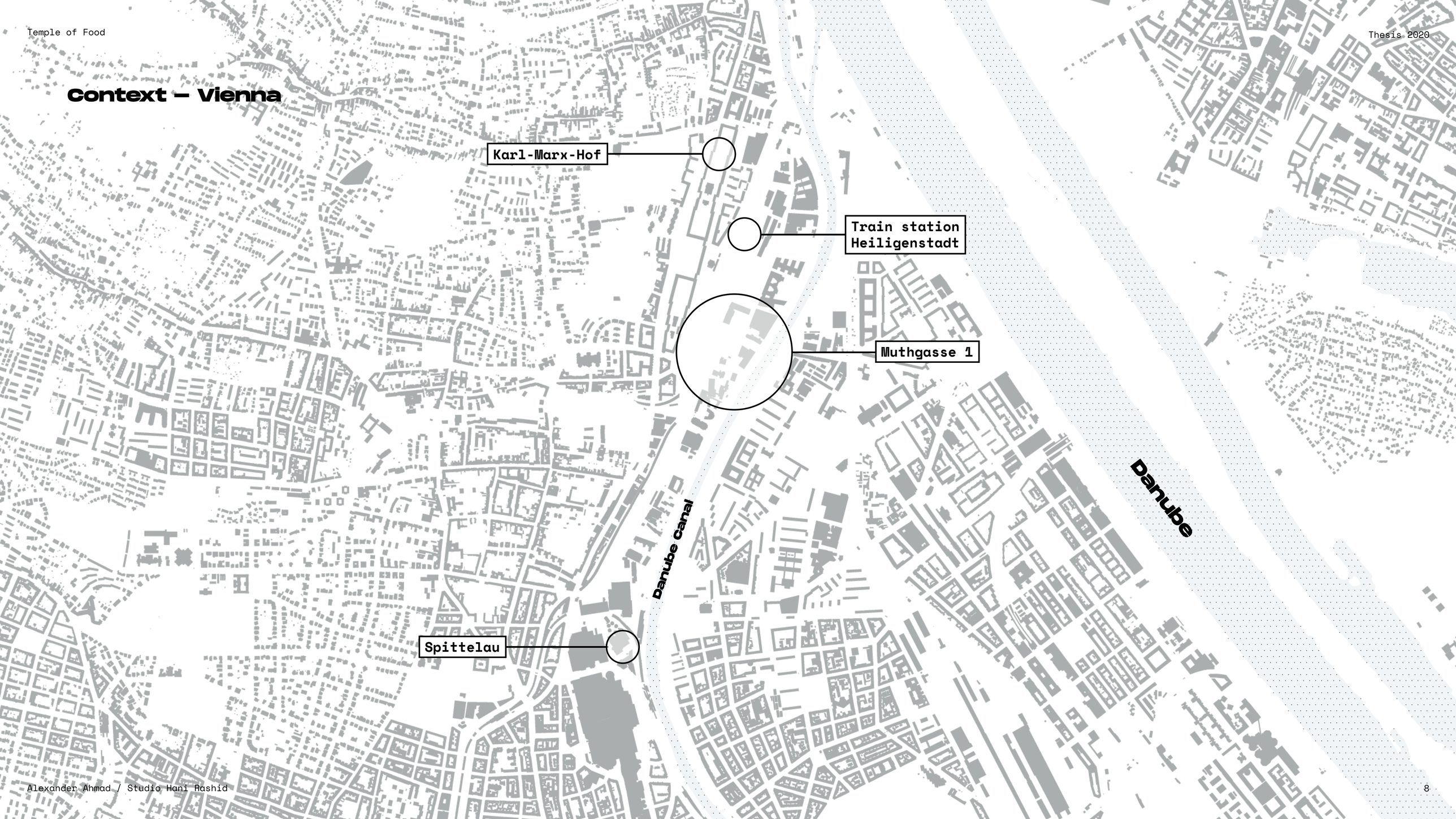
An economy that is restorative and regenerative by design.

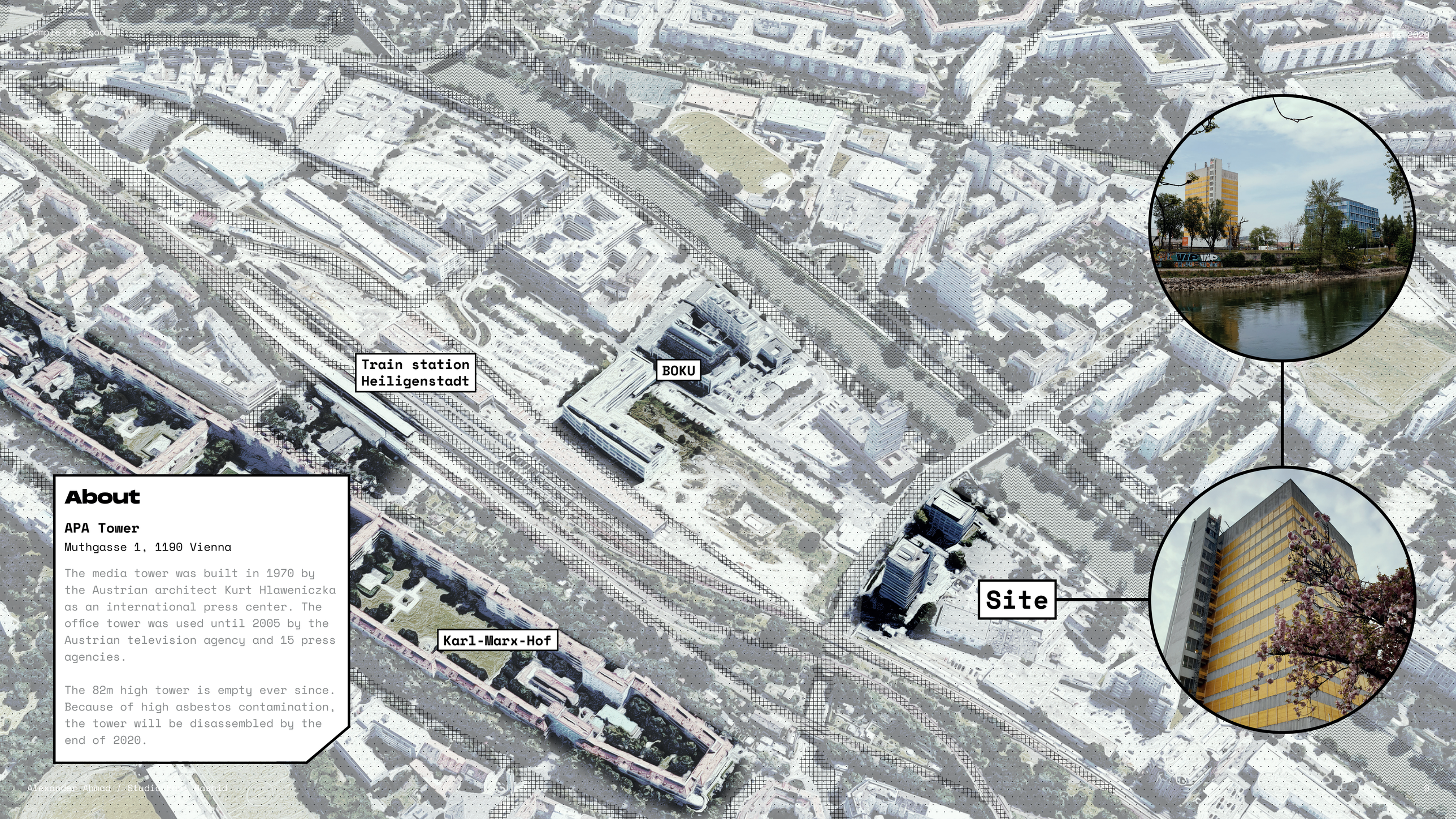
In a circular economy, economic activity builds and rebuilds overall system health. The concept recognises the importance of the economy needing to work effectively at all scales – for big and small businesses, for organisations and individuals, globally and locally.



Temple of Food

Context — Vienna





About

APA Tower

Muthgasse 1, 1190 Vienna

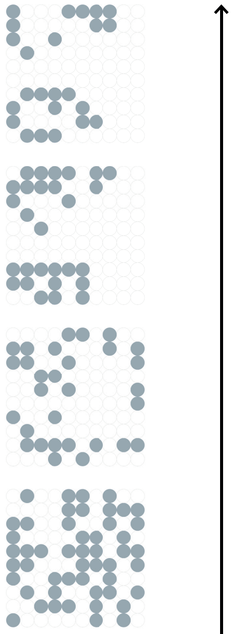
The media tower was built in 1970 by the Austrian architect Kurt Hlaweniczka as an international press center. The office tower was used until 2005 by the Austrian television agency and 15 press agencies.

The 82m high tower is empty ever since. Because of high asbestos contamination, the tower will be disassembled by the end of 2020.

The Farm

Game of Life

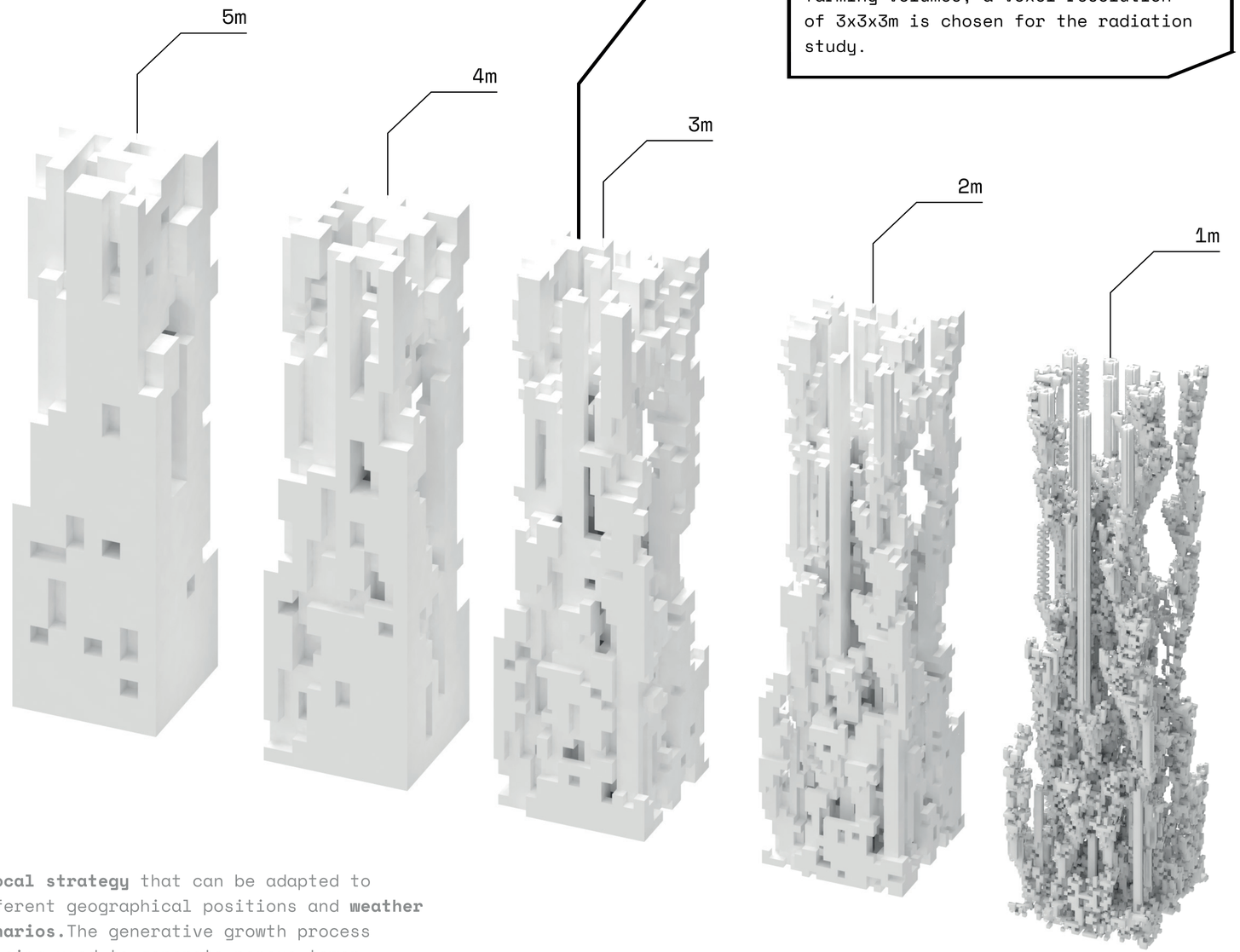
The Game of Life is a simple Cellular Automata developed by John Horton Conway in 1970. The system consists of alive and dead states of a cell. First, an initial alive/dead cell state is set. This state can be random or based on a meaningful pattern, icon or symbol. Next, a set of rules is applied to every cell, alive or dead. These rules determine what the cells alive/dead state will be in the system next generation. The rules are typically based on each cells relationship to its neighbours.



Initial Cell State

Selected Voxel Resolution

In order to generate a porous structure that can be inhabited but also used as farming volumes, a voxel resolution of 3x3x3m is chosen for the radiation study.



A **local strategy** that can be adapted to different geographical positions and **weather scenarios.**The generative growth process is being used to generate porous tower structures that can be filled with plants as an urban vertical farming solution.

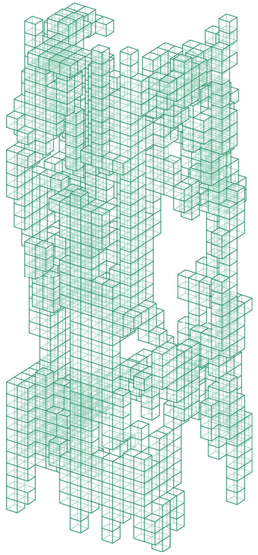
Evaluation by Radiation

By evaluating the radiation of the tower a functional seperation between plant and human spaces can be made

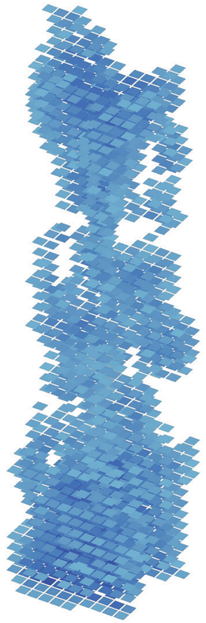
Evaluated radiation



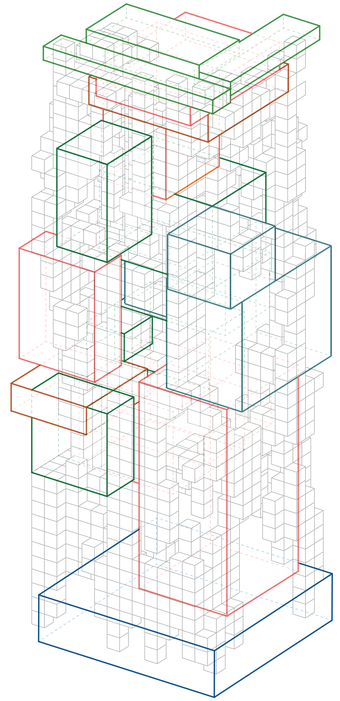
Warm spaces for plants



Cooler areas for public spaces



Space between the farm for public areas

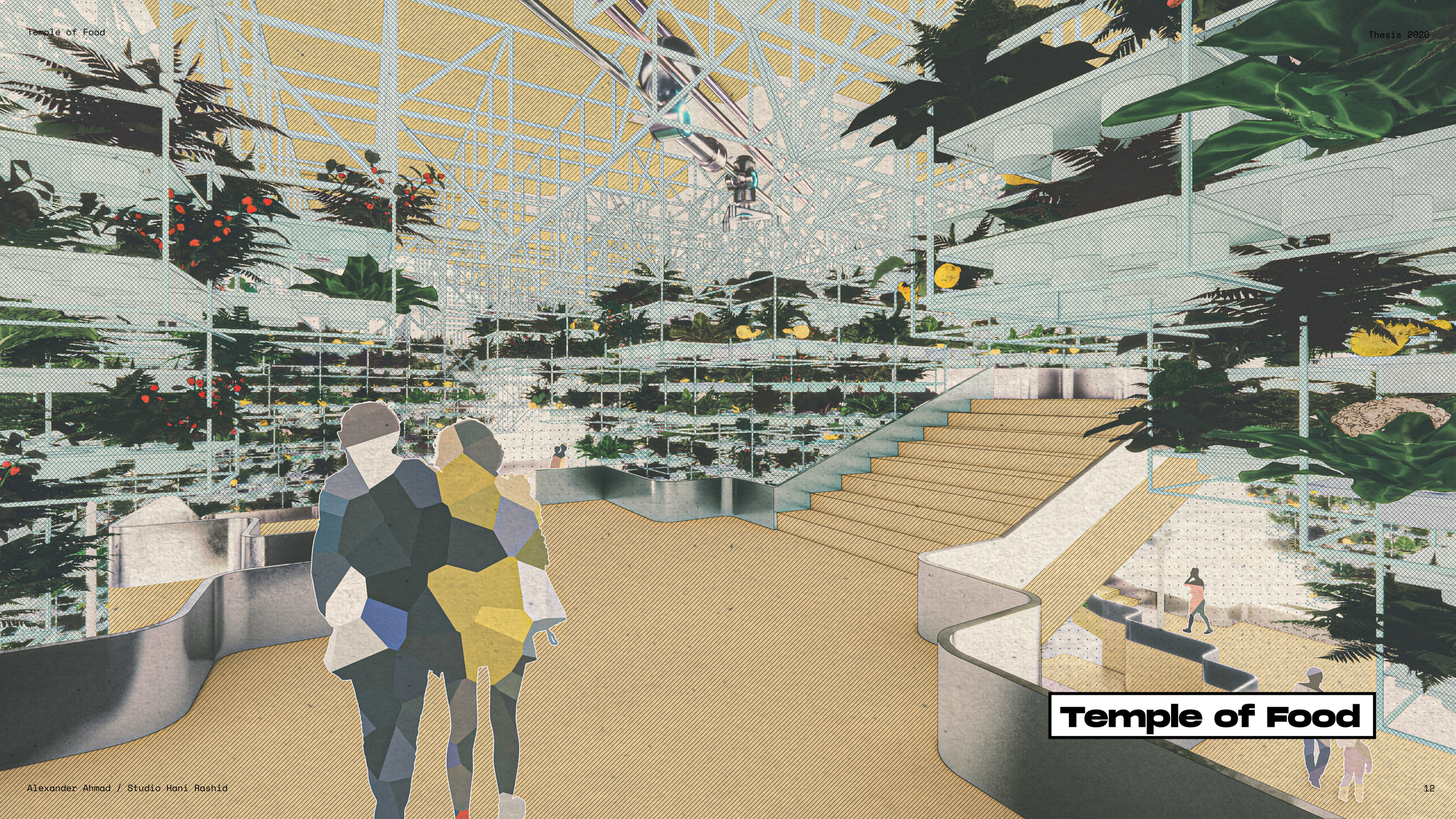


Skypark
Public Gardening
Restaurant/Cafe
Public Space
Lab Spaces
Aquaculture

Production Data

Input
- 150 mWh / Day
- 50001
- Nutritions from Fish

Output per Week
- Feeds 20,000 People
- Can produce up to 400,000 Crops

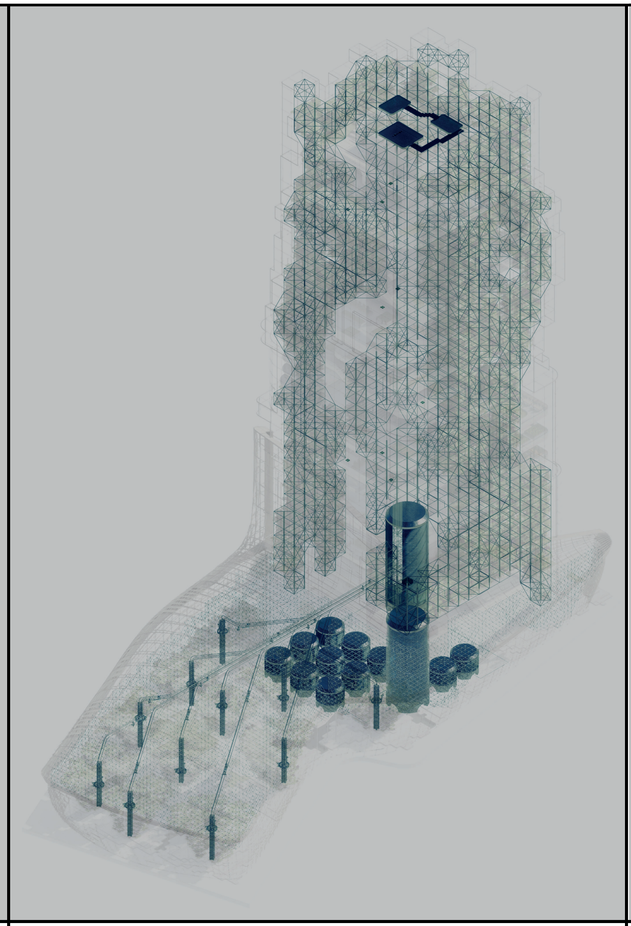


Temple of Food

Components



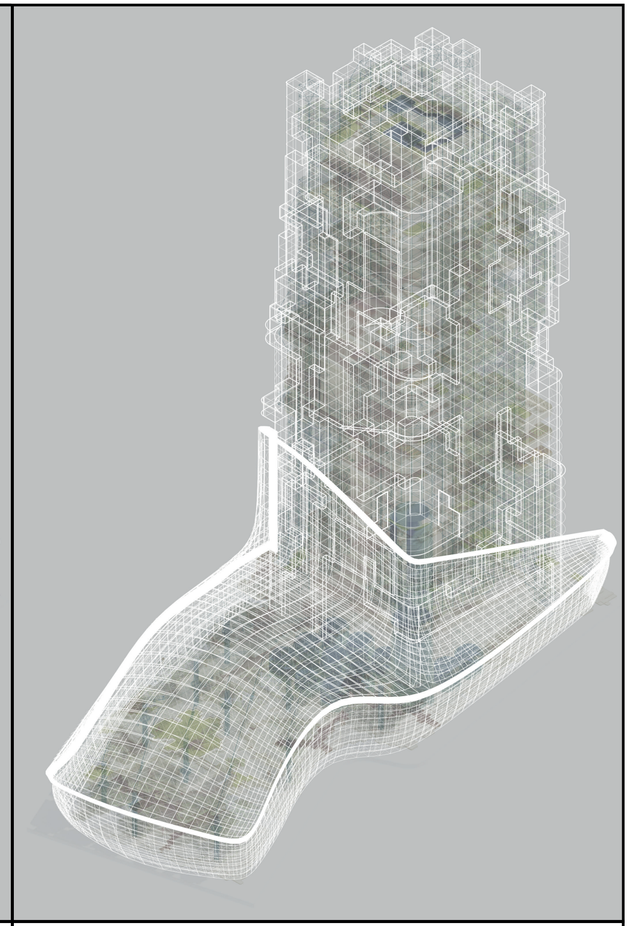
Levels



Water & Robots



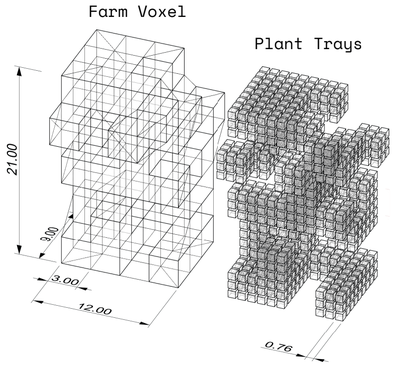
Farm

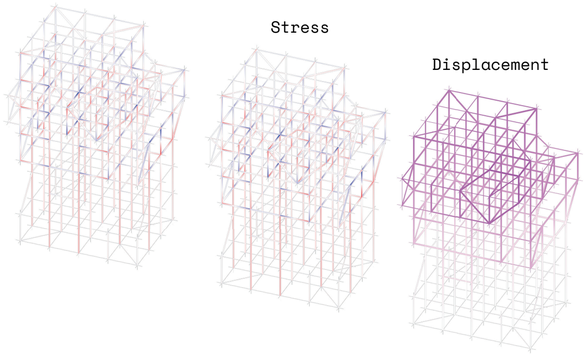


Facade

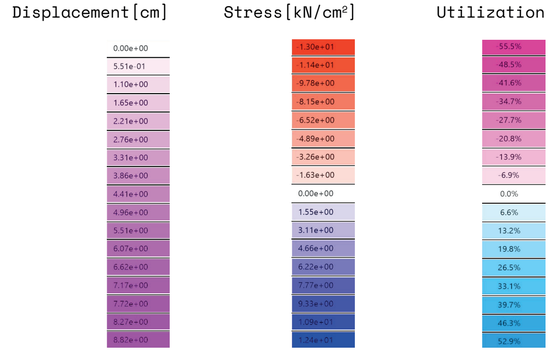
Farm Structure

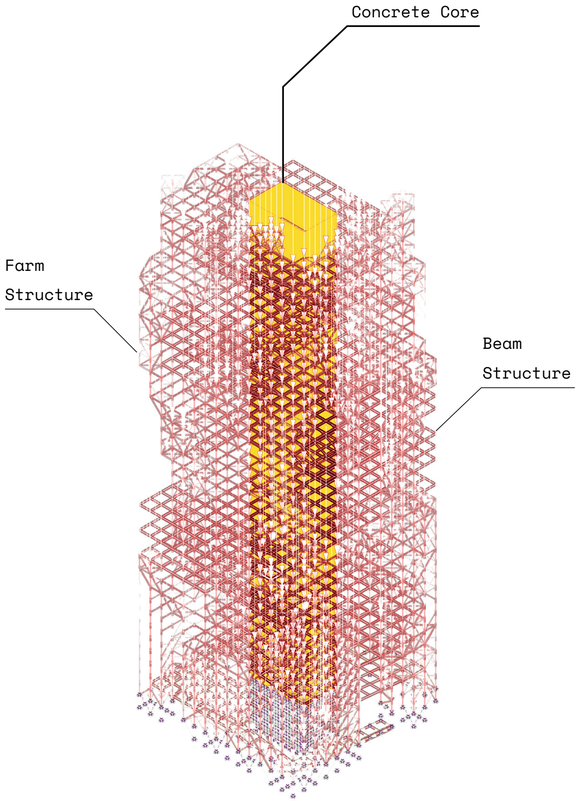
The tower is based on a 3x3m grid.
In its center a 15 x 9m core houses
the elevators, emergency staircases
and the vertical robotic circulation.
The floorslabs are connect through a
horizontal beam structure to the core
and the farming structure creates extra
support for the cantilevering elements.

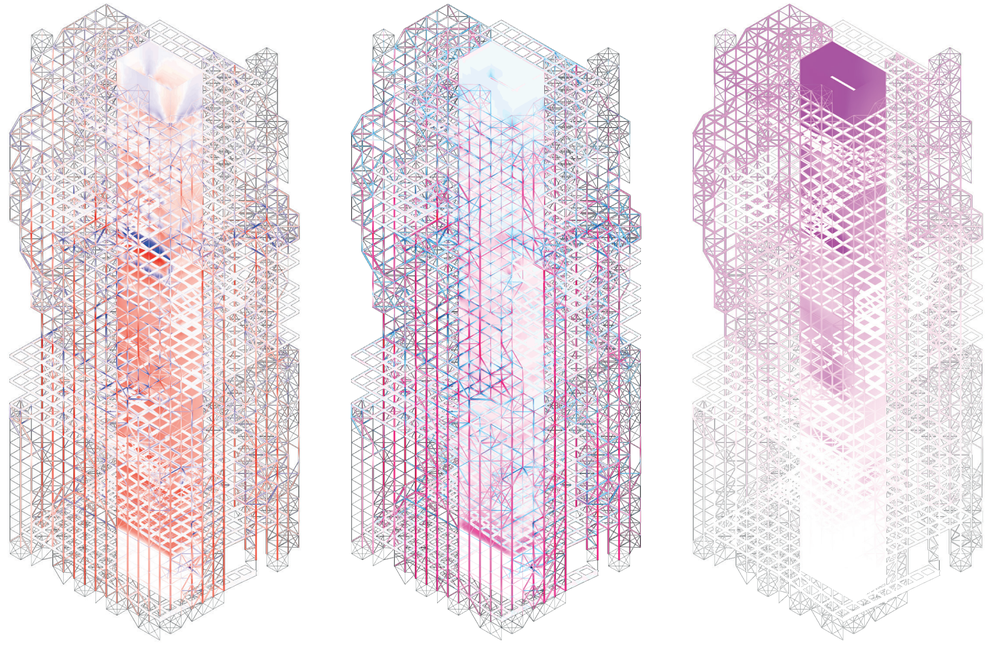




Beams

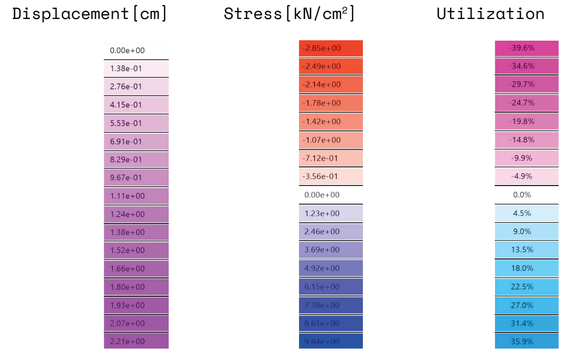






Utilization Stress Displacement

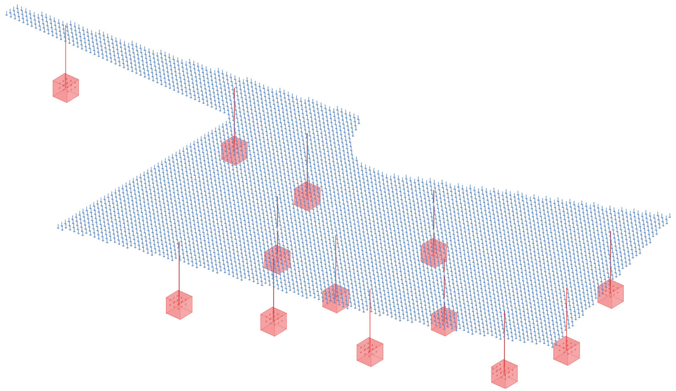
Core



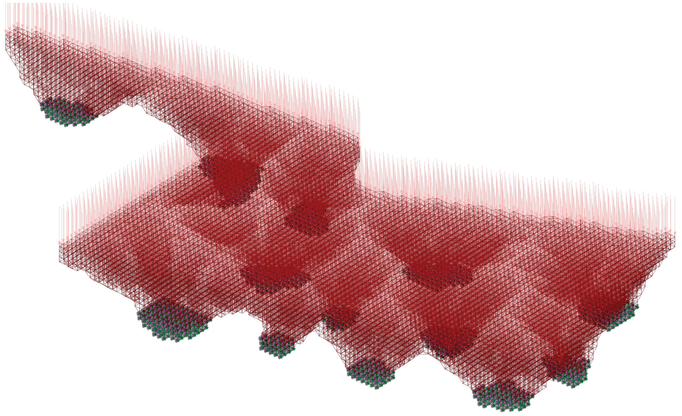
Market Structure

After finding the optimal column positions the endpoints are used to calculate a vertical structure to hold the market roof.
The column structure generates volume for circulation and indoor market spaces.

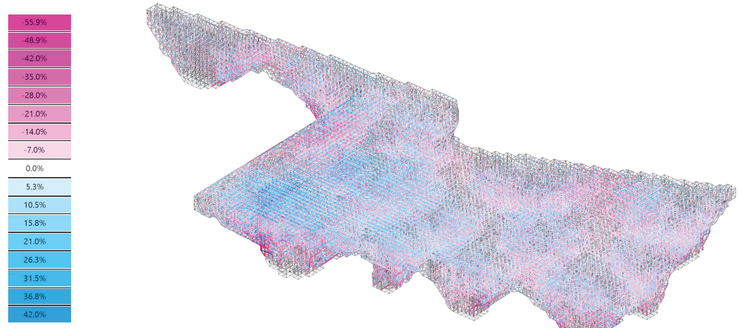
Setup - Supports



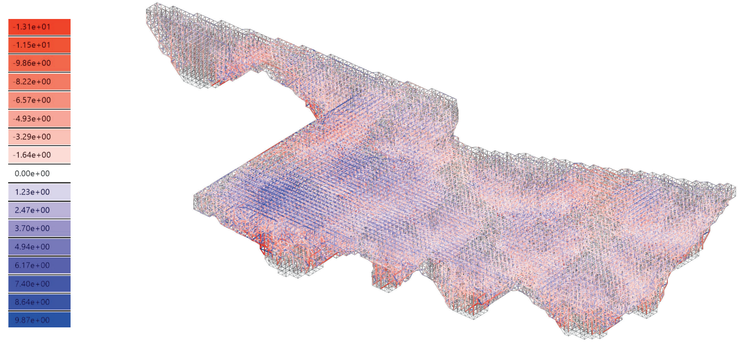
Loads [3 kN/m²]



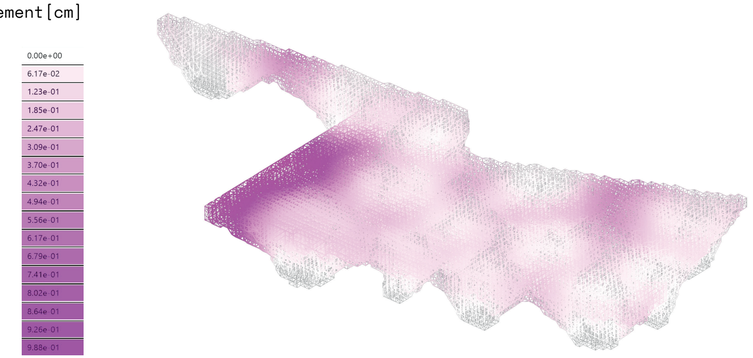
Utilization

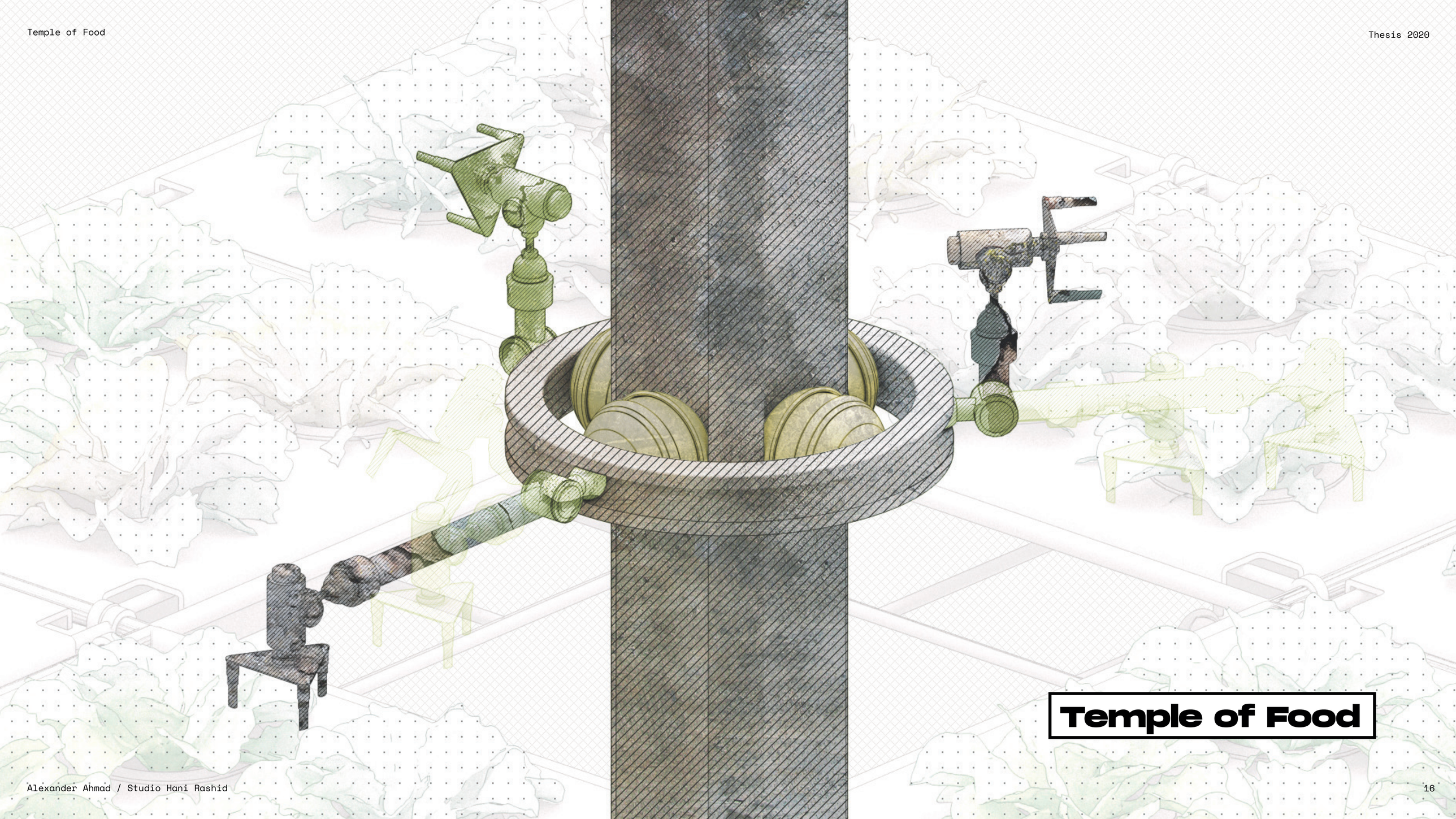


Stress[kN/cm²]



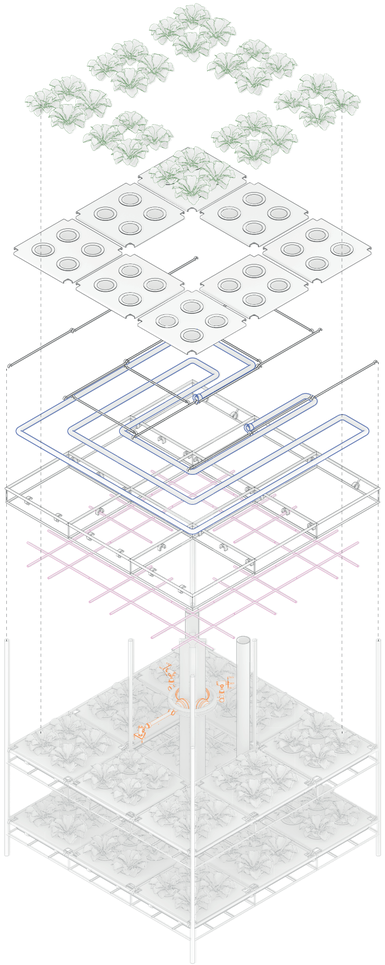
Displacement[cm]





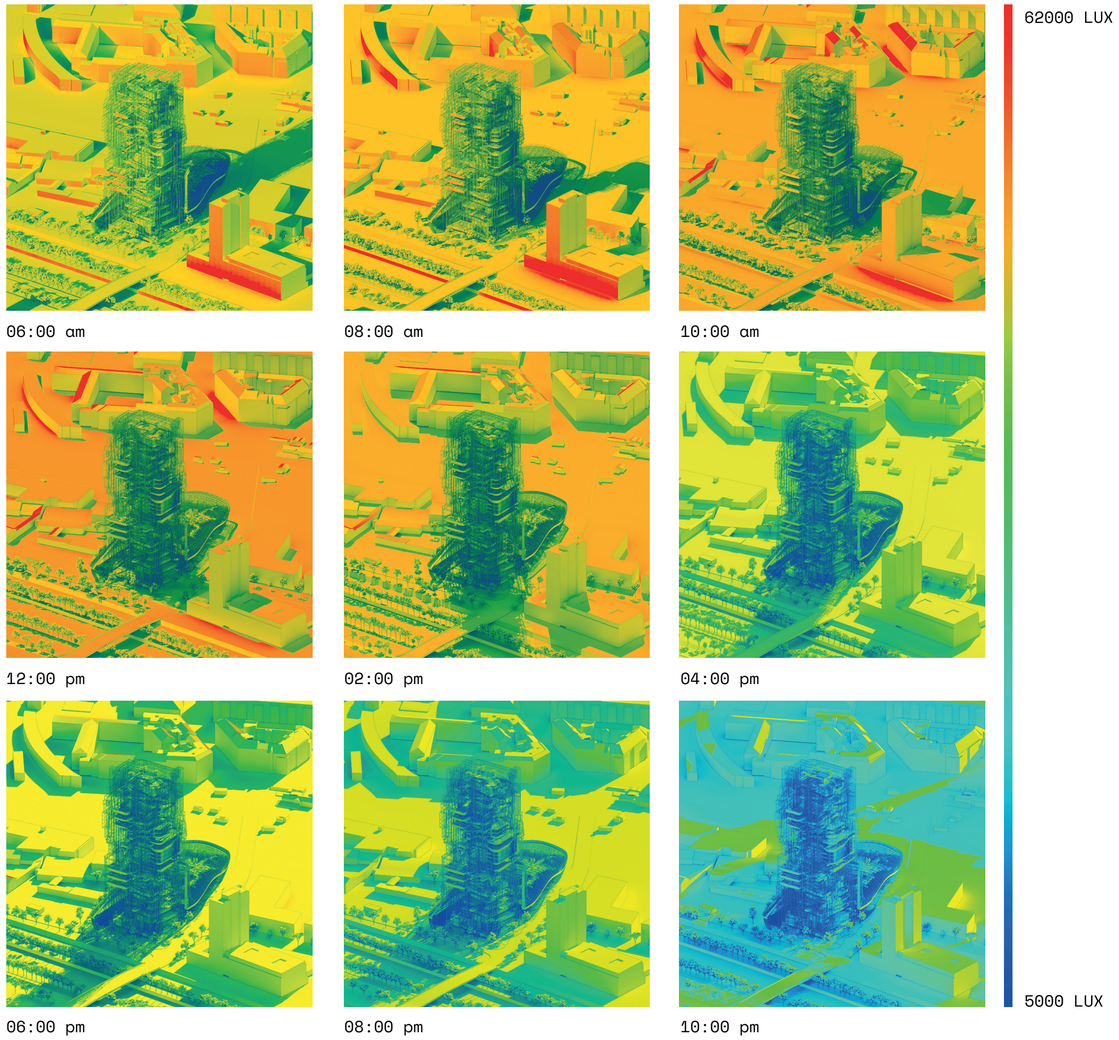
Temple of Food

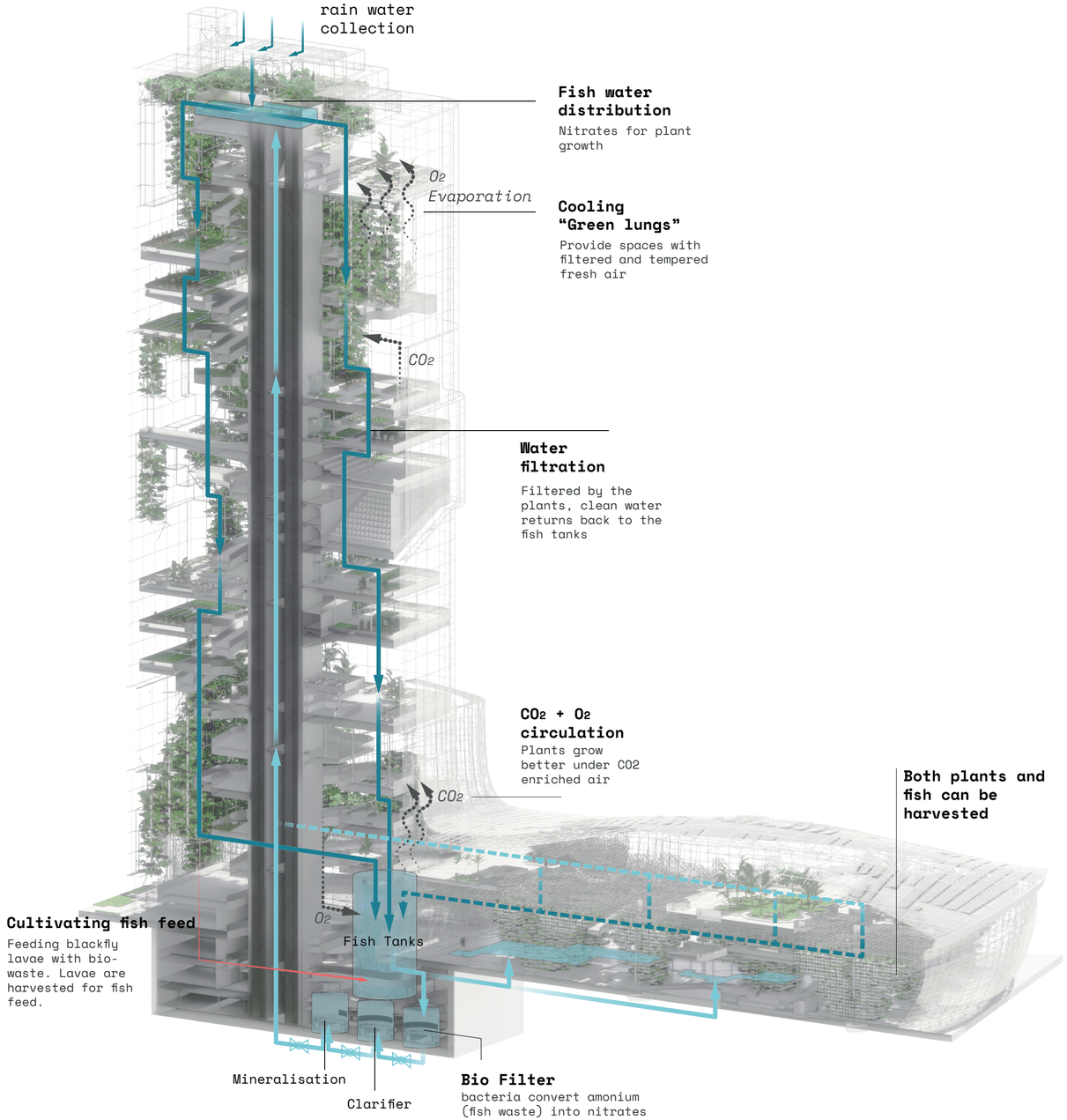
Crop Circulation

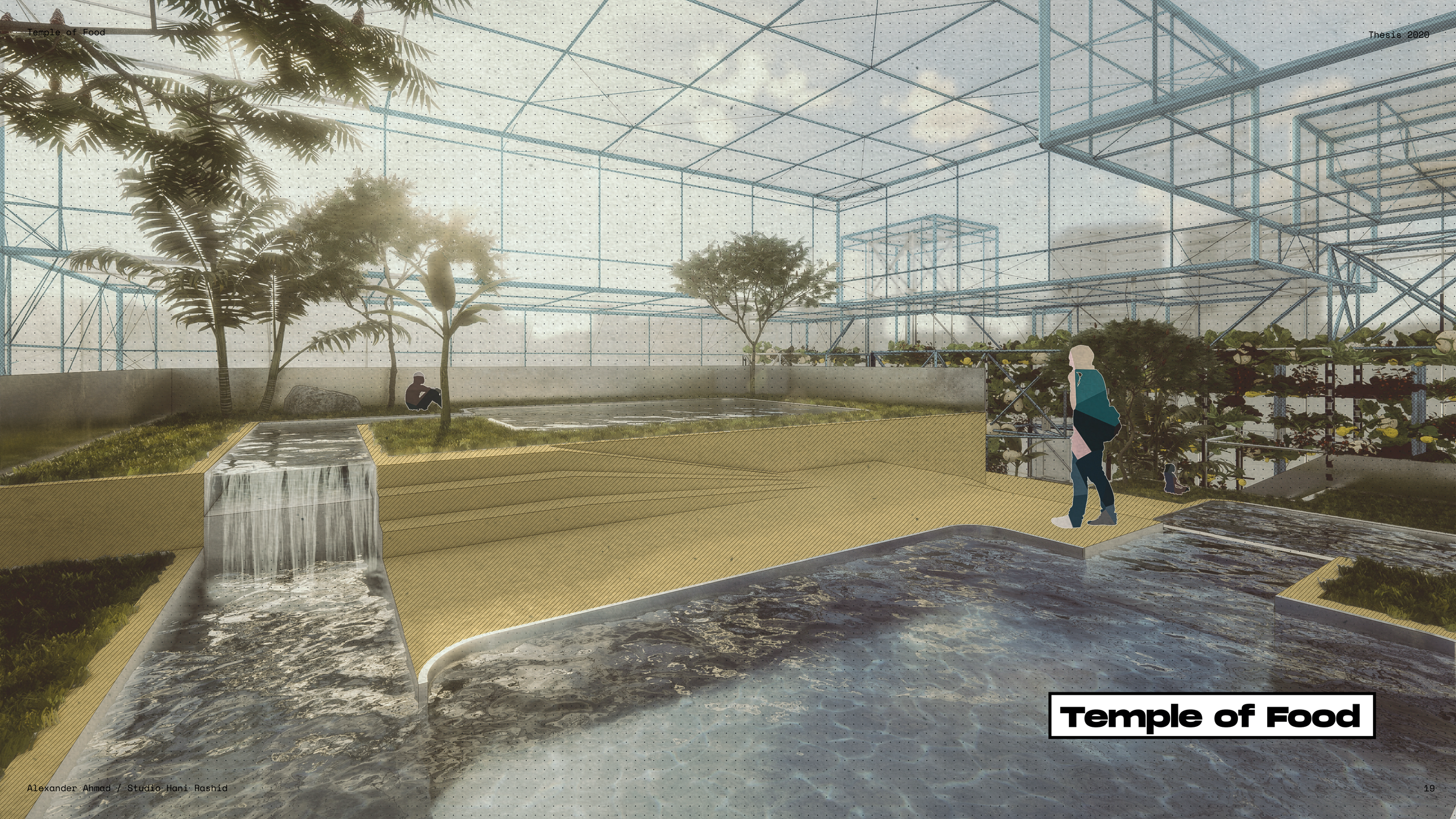


Ecosystem

Lux Analysis





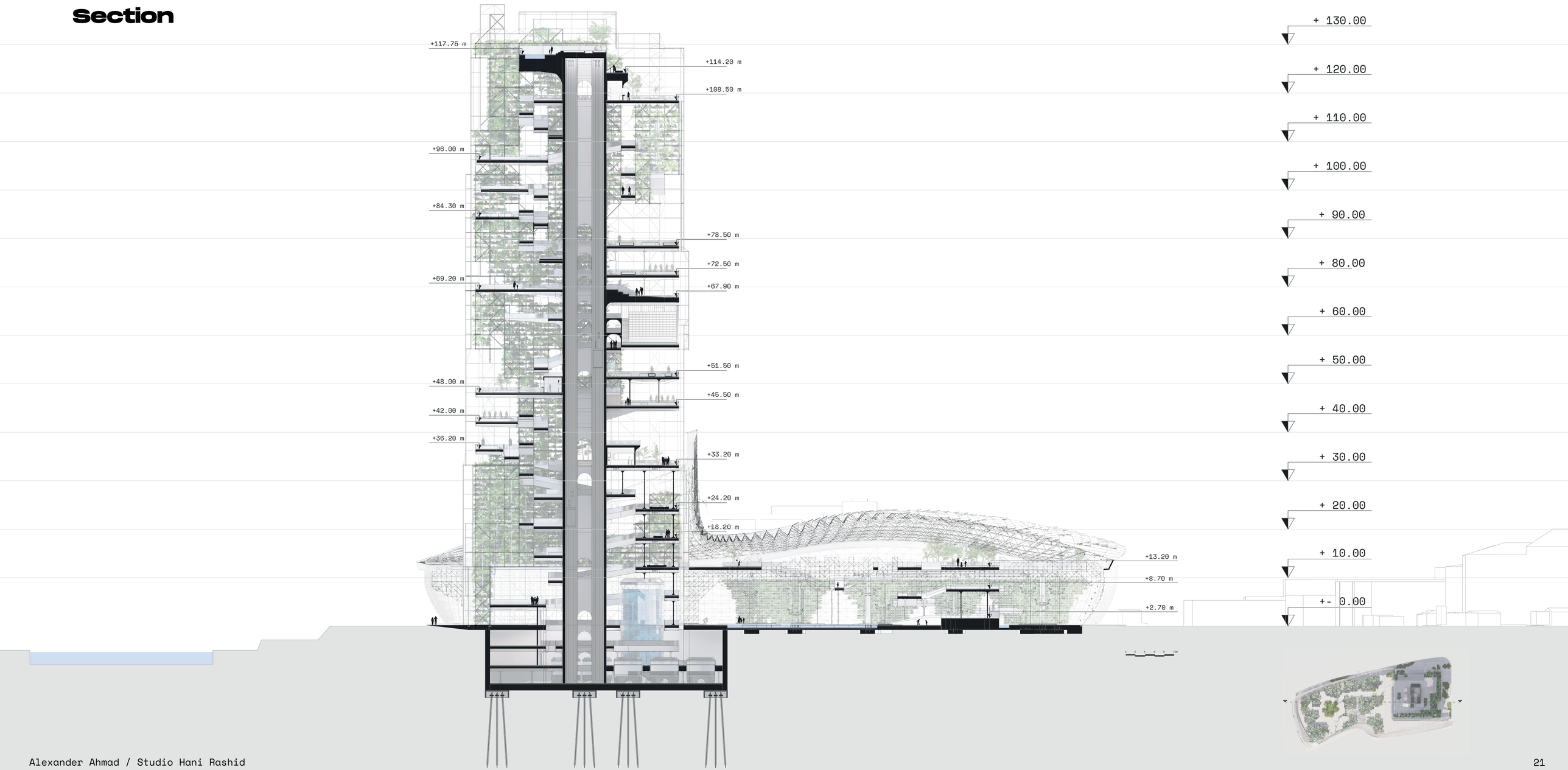


Temple of Food

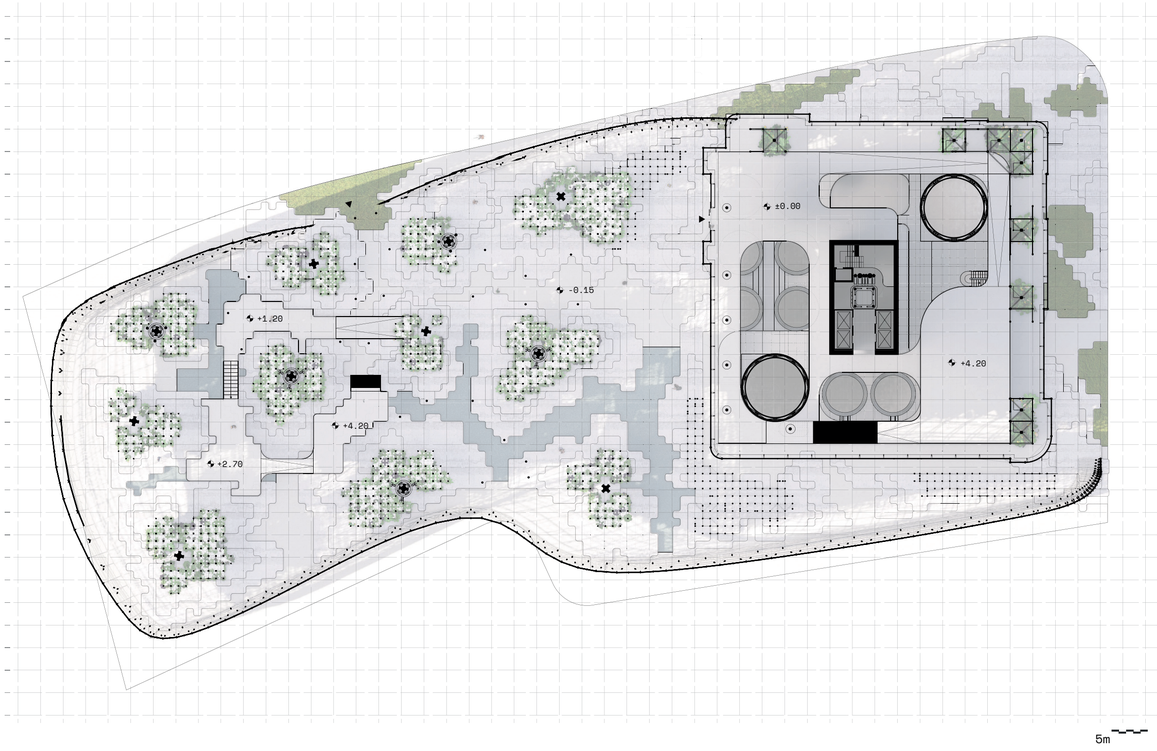
Site Plan



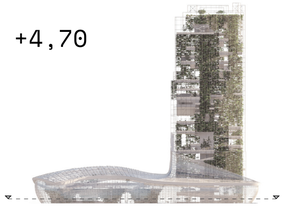
Section

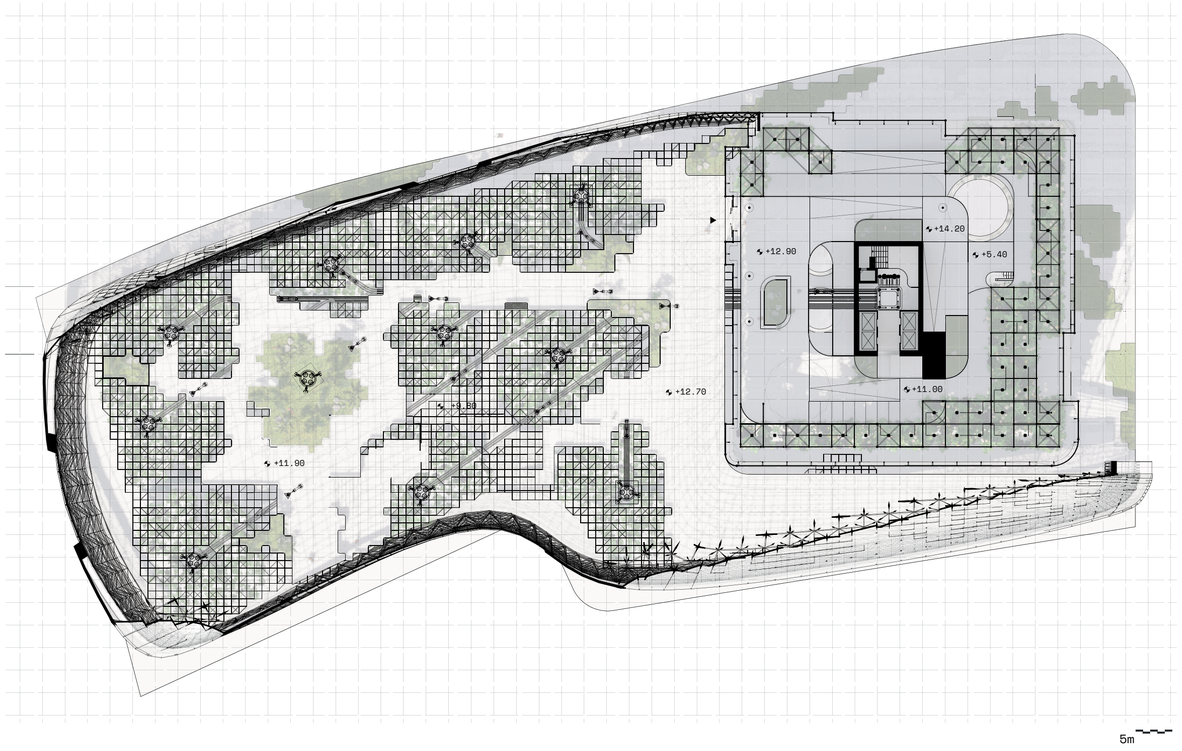

+117.75 m
+114.20 m
+108.50 m
+96.00 m
+84.30 m
+78.50 m
+72.50 m
+69.20 m
+67.90 m
+51.50 m
+48.00 m
+45.50 m
+42.00 m
+36.20 m
+33.20 m
+24.20 m
+18.20 m
+13.20 m
+8.70 m
+2.70 m
+ 140.00
+ 130.00
+ 120.00
+ 110.00
+ 100.00
+ 90.00
+ 80.00
+ 60.00
+ 50.00
+ 40.00
+ 30.00
+ 20.00
+ 10.00
+- 0.00

Floorplan Market

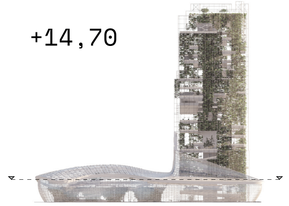


Market Floor

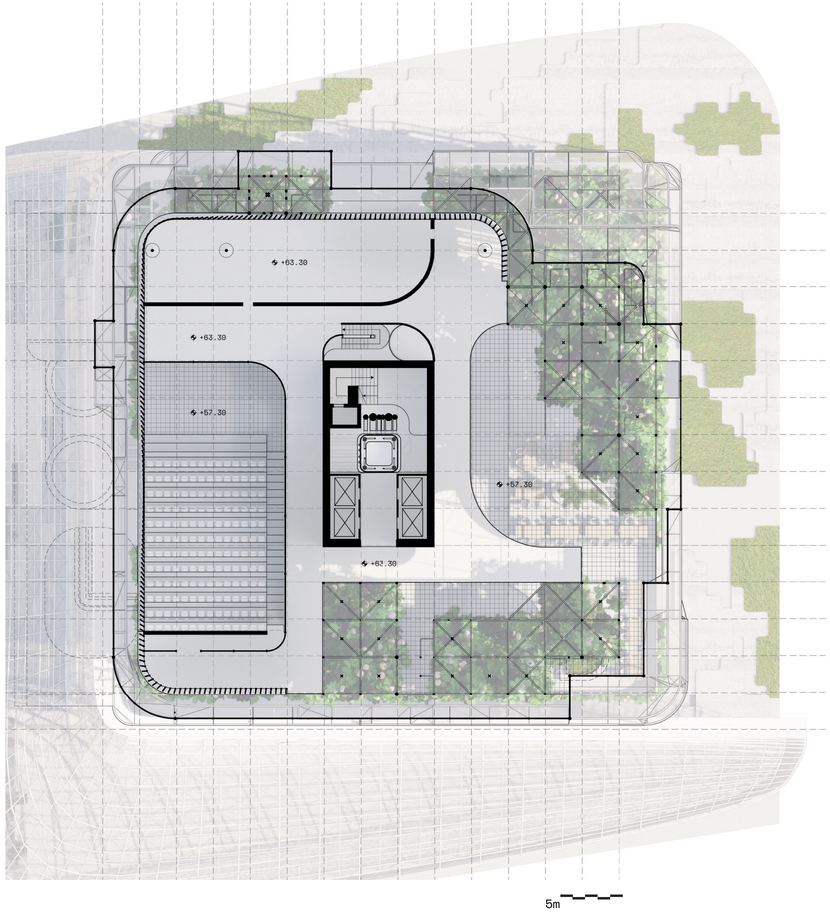




Market Garden

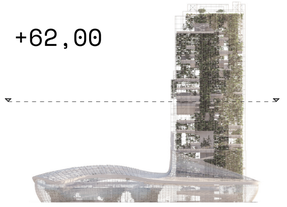


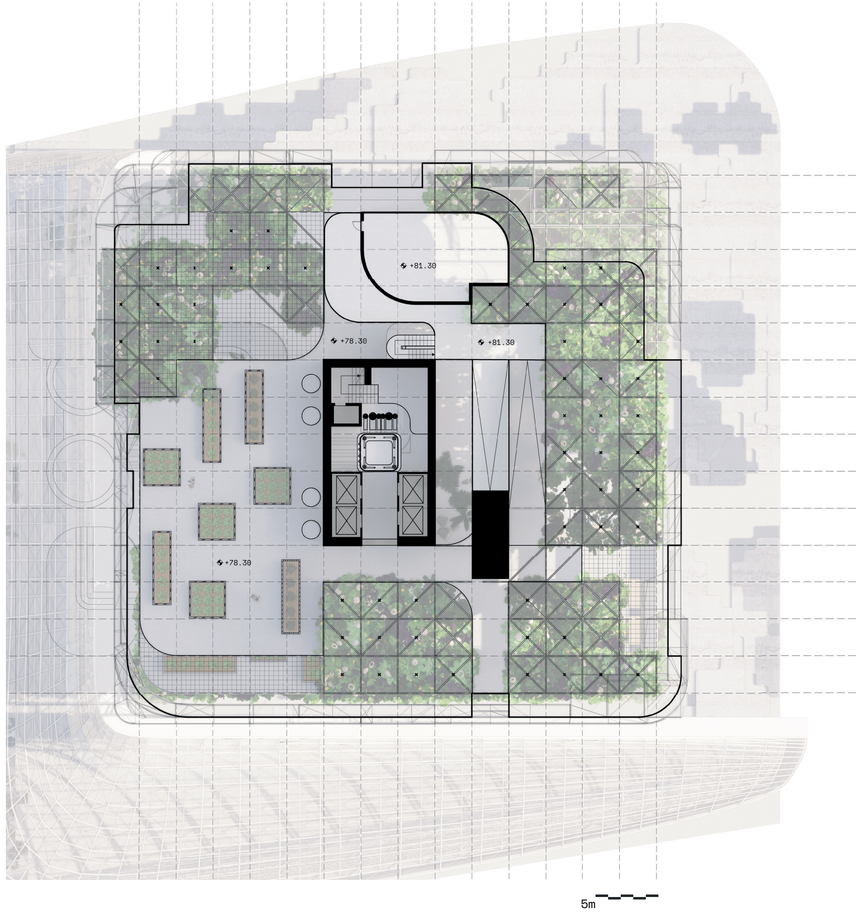
Floorplan Tower



Auditorium

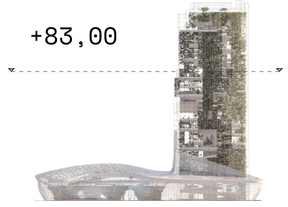
+62,00



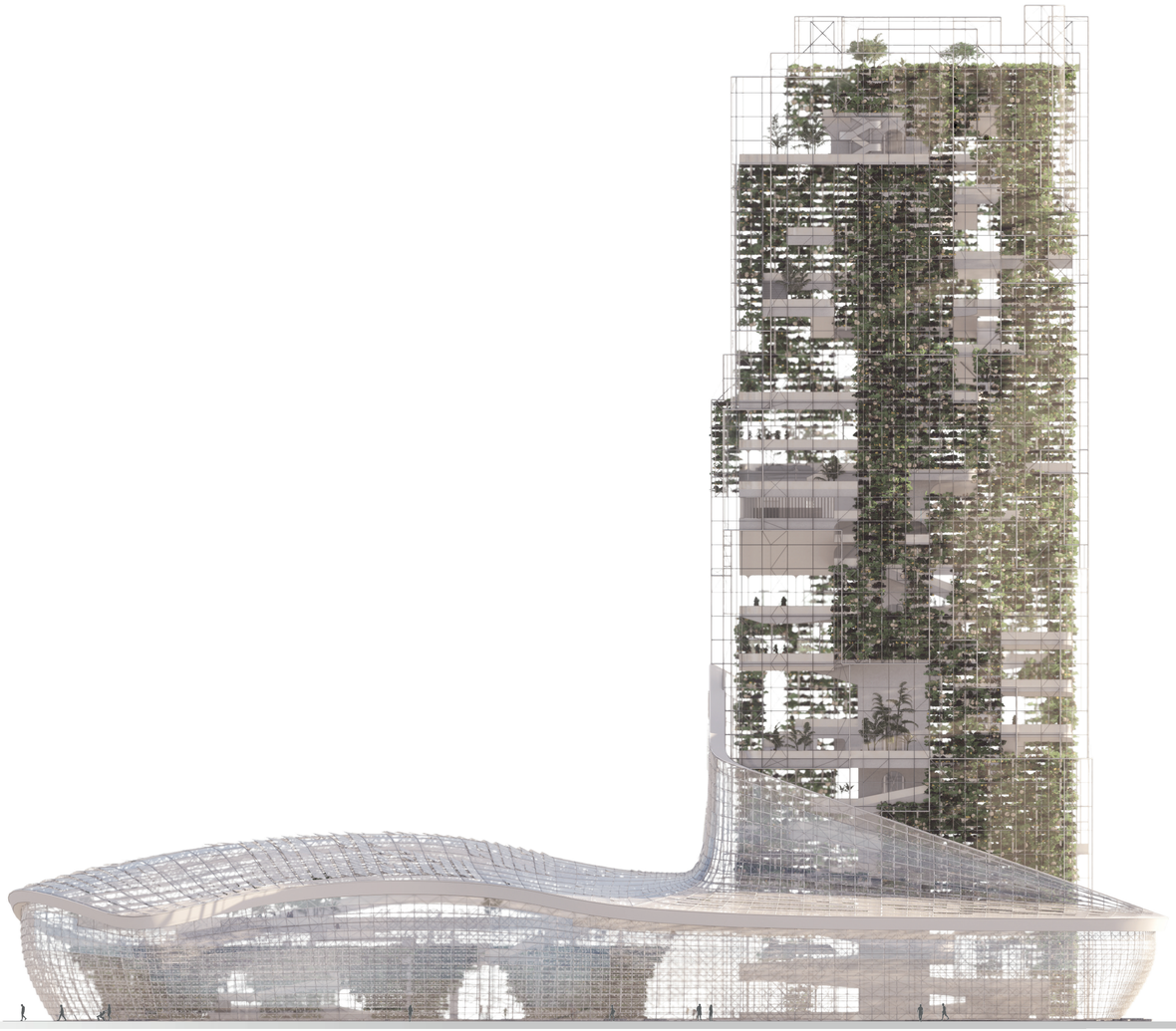


Public Farming

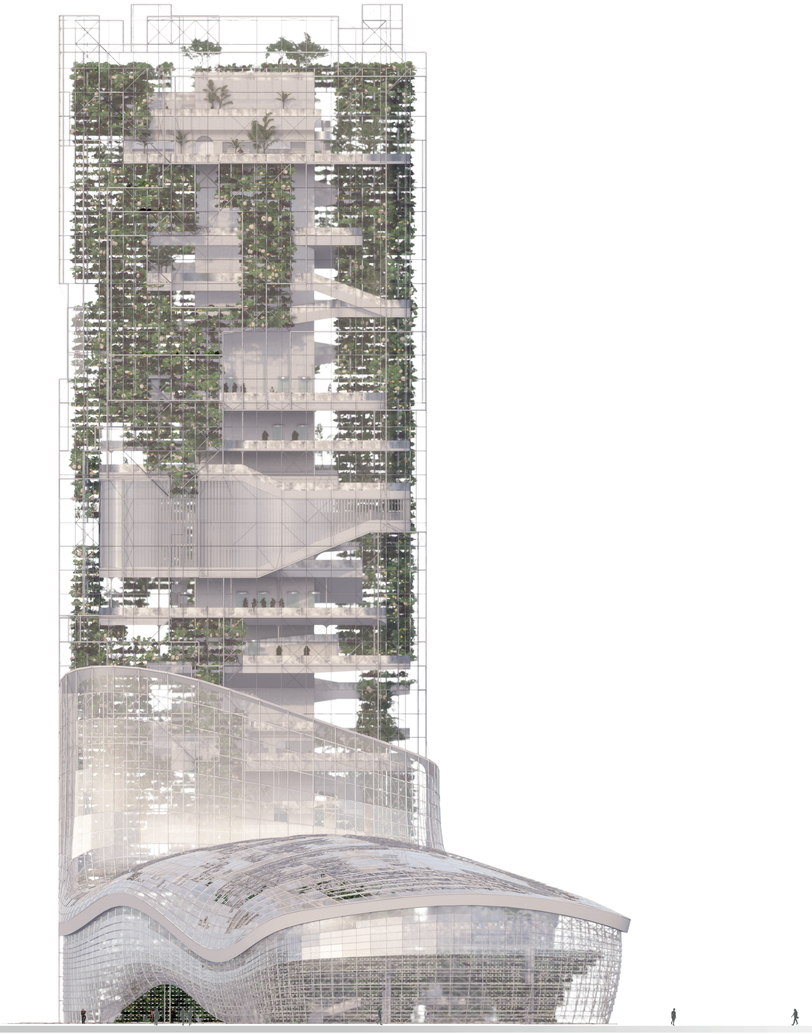
+83,00



Elevations 01



SOUTH

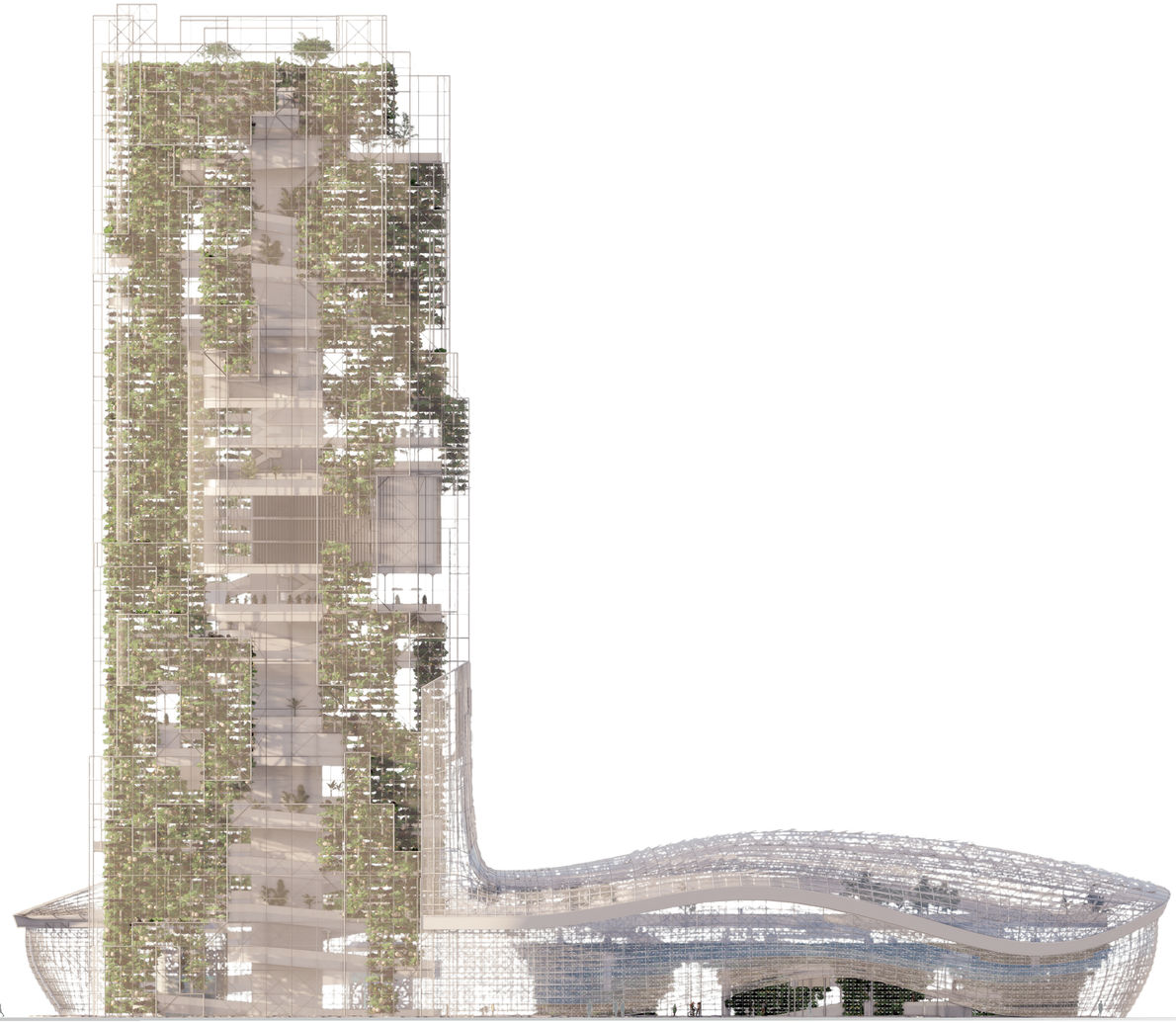


WEST

Elevations 02



EAST



NORTH

Special Thanks to:

Adriana Boeck
Gakku Jumaniyasova
Jade Bailey
Max Klein
Silvia Nanu
Simon Weißhäupl
Zhiyi Zhang



Temple of Food