

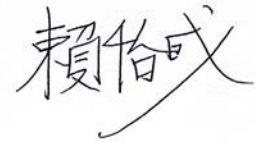
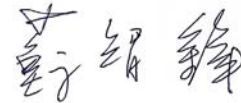
私立東海大學建築系碩士班
建築碩士學位論文

第三環境-
仿生反轉海港

研究生：鄭方哲
經審查及口試合格特此證明
論文考試委員會

00

THU
ARCHITECTURE
THESIS



指導教授：邱國維

系主任：邱浩修

中華民國 105 年 6 月

Biomimicry Urbanism

- The Third Environment: Place to Live 2016



鄭方哲

Byron F. Cheng

Tutor: 邱國維

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逢甲大學建築系學士
東海大學建築系碩士

01

仿生學是一個新的革命性科學，分析大自然的最佳創意。通過基於仿生學策略是一種可能的研究來觀察自然界存在現象隨後應用架構演化過程。仿生學的研究從生物中找到靈感來解決人類現今的許多問題。

從這個觀點演變可被理解為一個自適應過程。因此，未來階段或發展應該不被預設。每個階段將通過從小型到大型成長系統能夠適應未來的需求，從一個小建築大密度的系統。這個城市不再只有大行動，而是與能適應其未來要求的所有可能尺度建造。

Biomimicry is a revolutionary new science that analyzes nature's best ideas. Through strategies based on biomimicry it is possible to study evolutionary processes occurring in nature for subsequent application to architecture.

From this point of view evolution could be understood as an adaptive process. So the future phases or developments are not preset. The phases will adapt to future demands through a growth system from small to large scale, from a small building to a great density system. The city is not built anymore only with large operations but instead with all possible scales that can adapt to future requirements.

Main Design:

Biomimicry Urbanism 01



Supplementary Design:

Healing Market 02

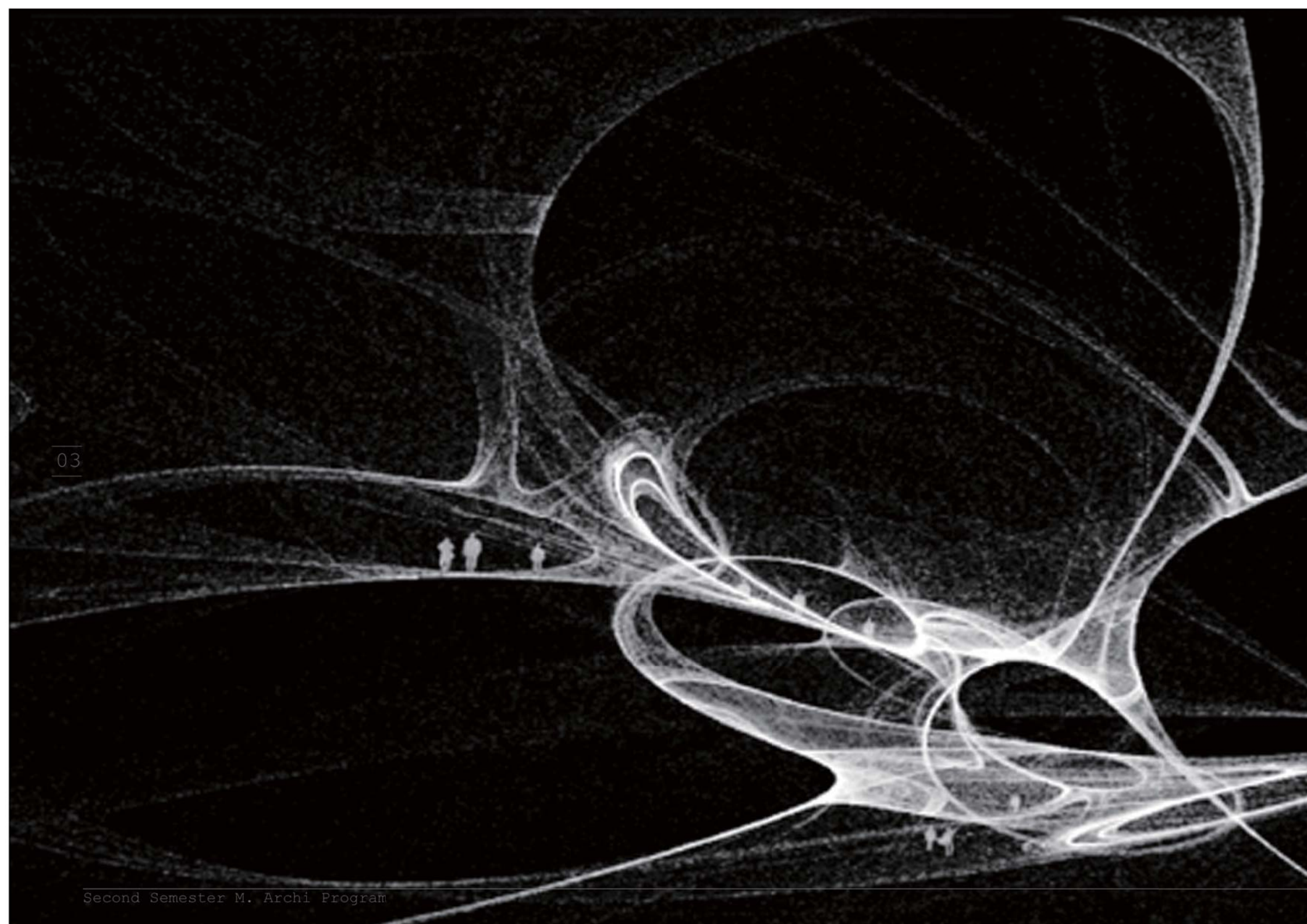


PAAU 03 Workshop 03

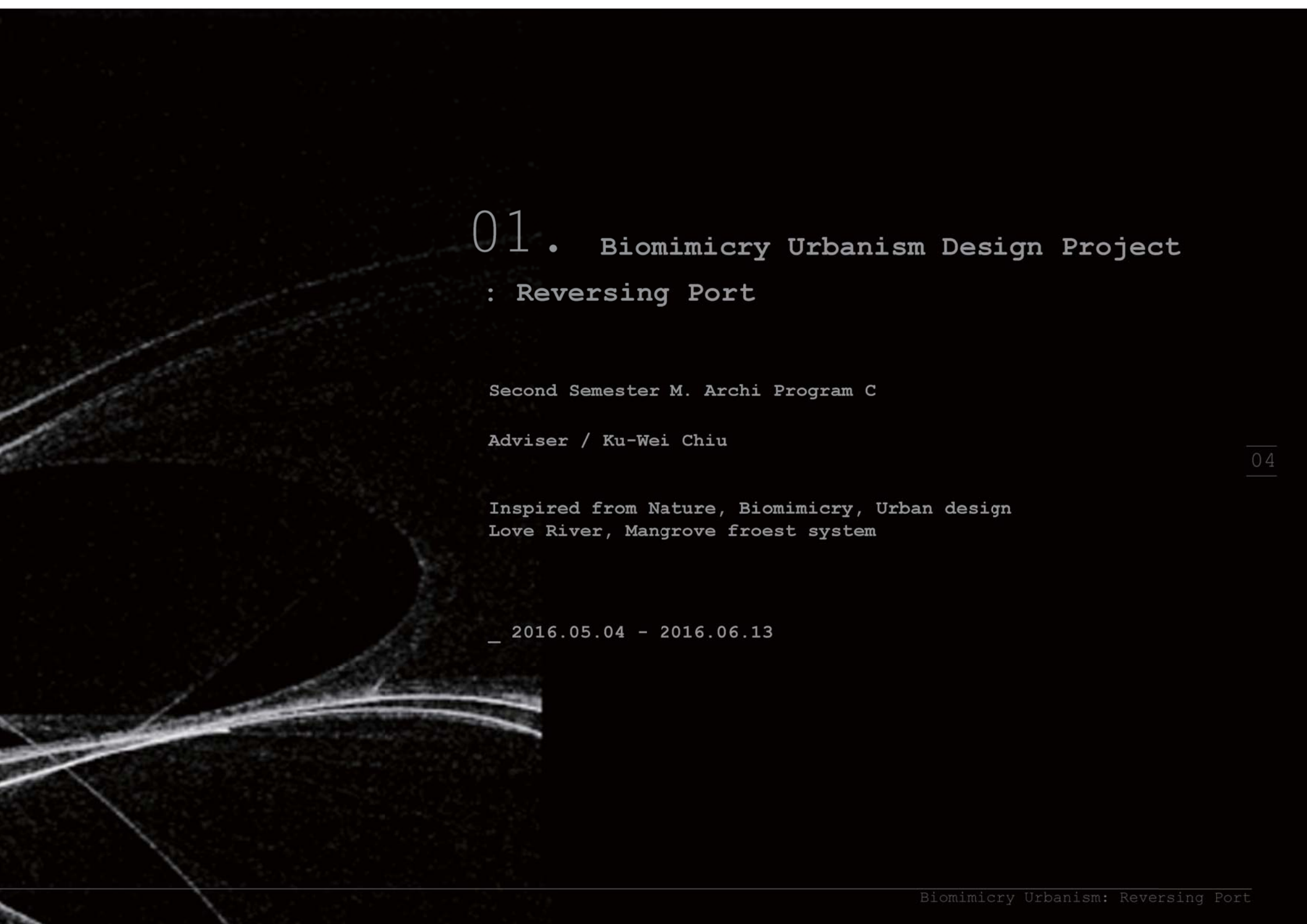


International Competition 04





03



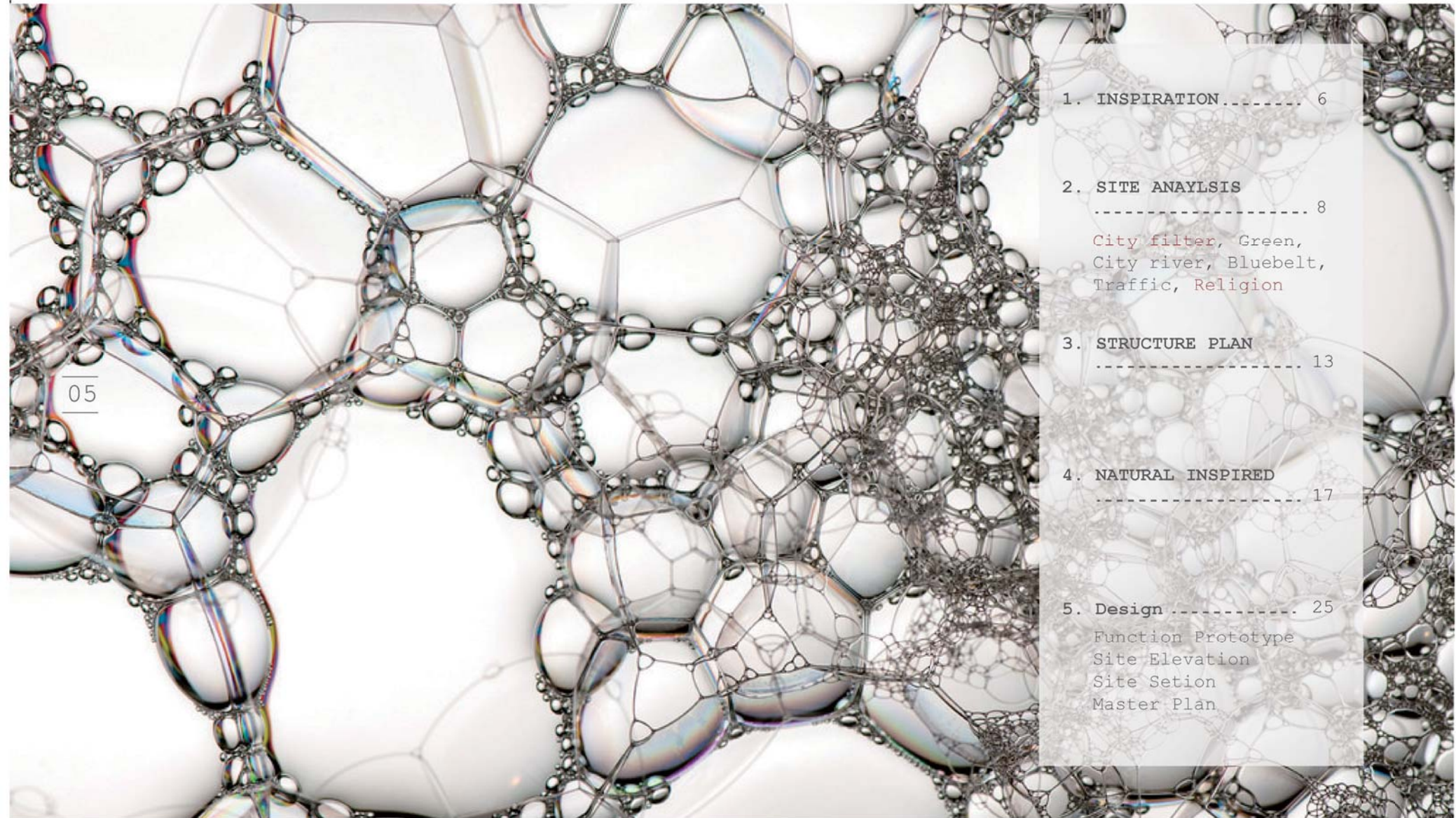
01 . Biomimicry Urbanism Design Project
: Reversing Port

Second Semester M. Archi Program C

Adviser / Ku-Wei Chiu

Inspired from Nature, Biomimicry, Urban design
Love River, Mangrove forest system

_ 2016.05.04 - 2016.06.13



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Function Prototype Site Elevation Site Setion Master Plan	



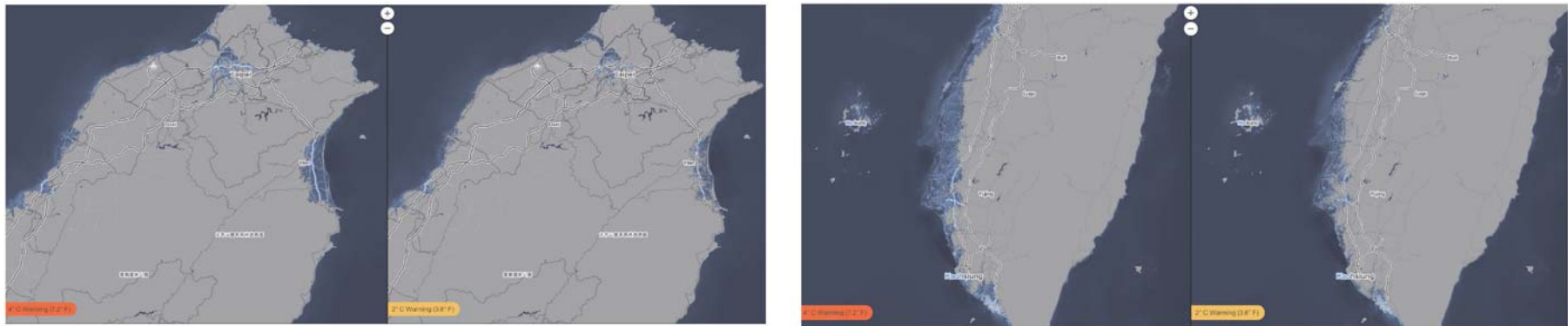
_1. INSPIRATION

: BIOMIMICRY

Biomimicry is an approach to innovation that seeks sustainable solutions to human challenges by emulating nature's time-tested patterns and strategies. The goal is to create products, processes, and policies—new ways of living—that are well-adapted to life on earth over the long haul.

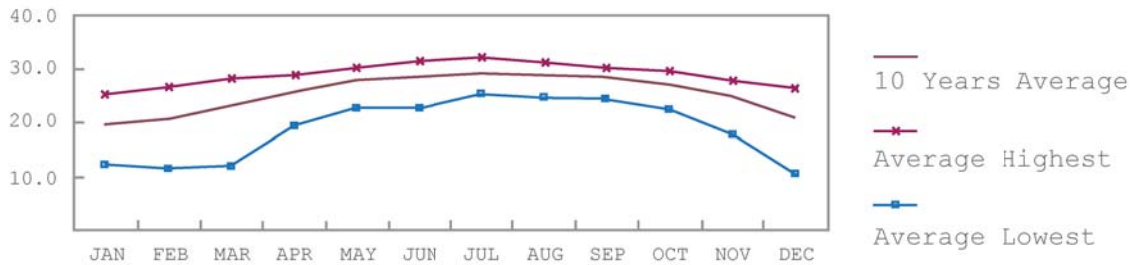
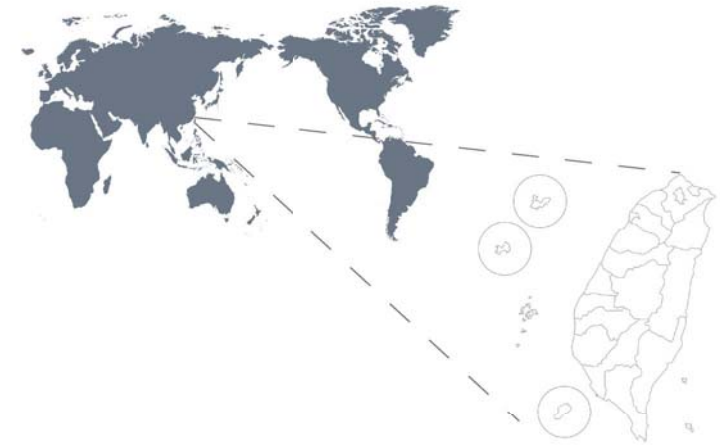
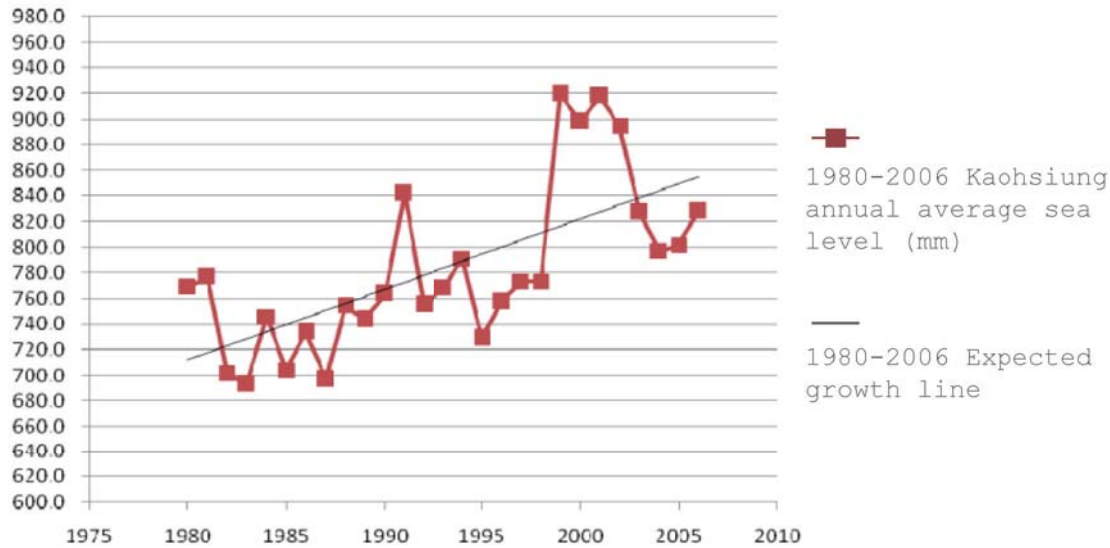
Biomimicry is an approach to innovation that seeks sustainable solutions to human challenges by emulating nature's time-tested patterns and strategies.

"I think the biggest innovations of the 21st century will be at the intersection of biology and technology. A new era is beginning." -Steve Jobs

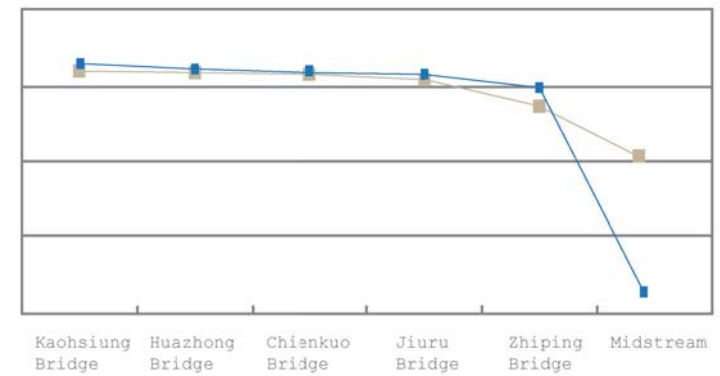


Context & Relevance

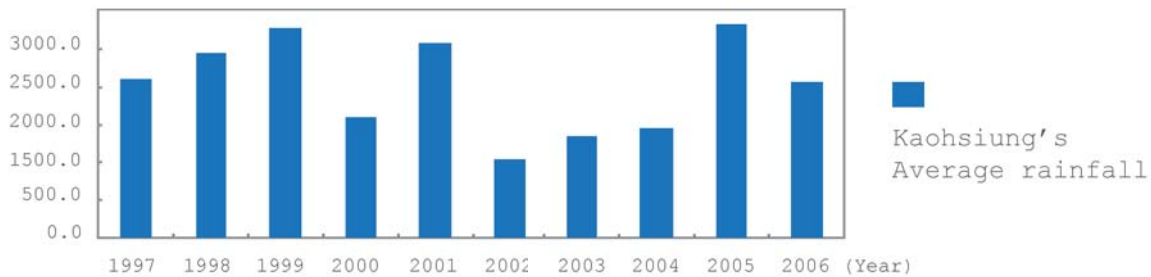
Long-term sea level rise set in motion by near-term carbon emissions threatens major coastal cities across the world. In the first image for each pair, we show projections of post-2100 sea level rise that could be locked in following 4°C of warming from carbon pollution in the coming decades.



_ Temperature Analysis



_ Salinity proportion %



_ Rainfall Analysis

/ Site Issues

1. Water pollution
2. Climate Change
3. Sustainable Development
4. Salt River



- _ City filter
- . The River side

Wastewater from urban areas and rainwater pooled into the rivers. However, the design of riparian area is lacked greenland and permeable paving design.



- _ Green Space
- . Walking gateway

The sunshine is strong and temperature is high in Kaohsiung. But the poor design of the greenbelt causes people to feel uncomfortable about the living space



- _ City River
- . Combine green&Blue

In urban areas, to be sort of the effective cooperation between rivers and green space would cause the broken link between urban fabric and environment.



- _ Blue Belt
- . Third environment

Start to make a connection between people and rivers, boat tours and bicycle industry can create more opportunities of business and experiences of space-used.



- _ Traffic
- . Ring Road Rethink

The large-scale ring road causes road and urban green belt can't connect effectively.



- _ Religion
- . Holy Rosary Cathedral

The Yan-cheng District is the old town which contains many historical meaning. The local Rose Catholic Church needs to reconnect with urban planning and needs new definition.



_2. SITE ANALYSIS

[+]
A

[+]
B

[+]
C

[+]
D

[+]
E

[+]
F



+ Location
Kaohsiung Love Pier

0 100 200 Meter



/ Urban Use

- Green Space
- River



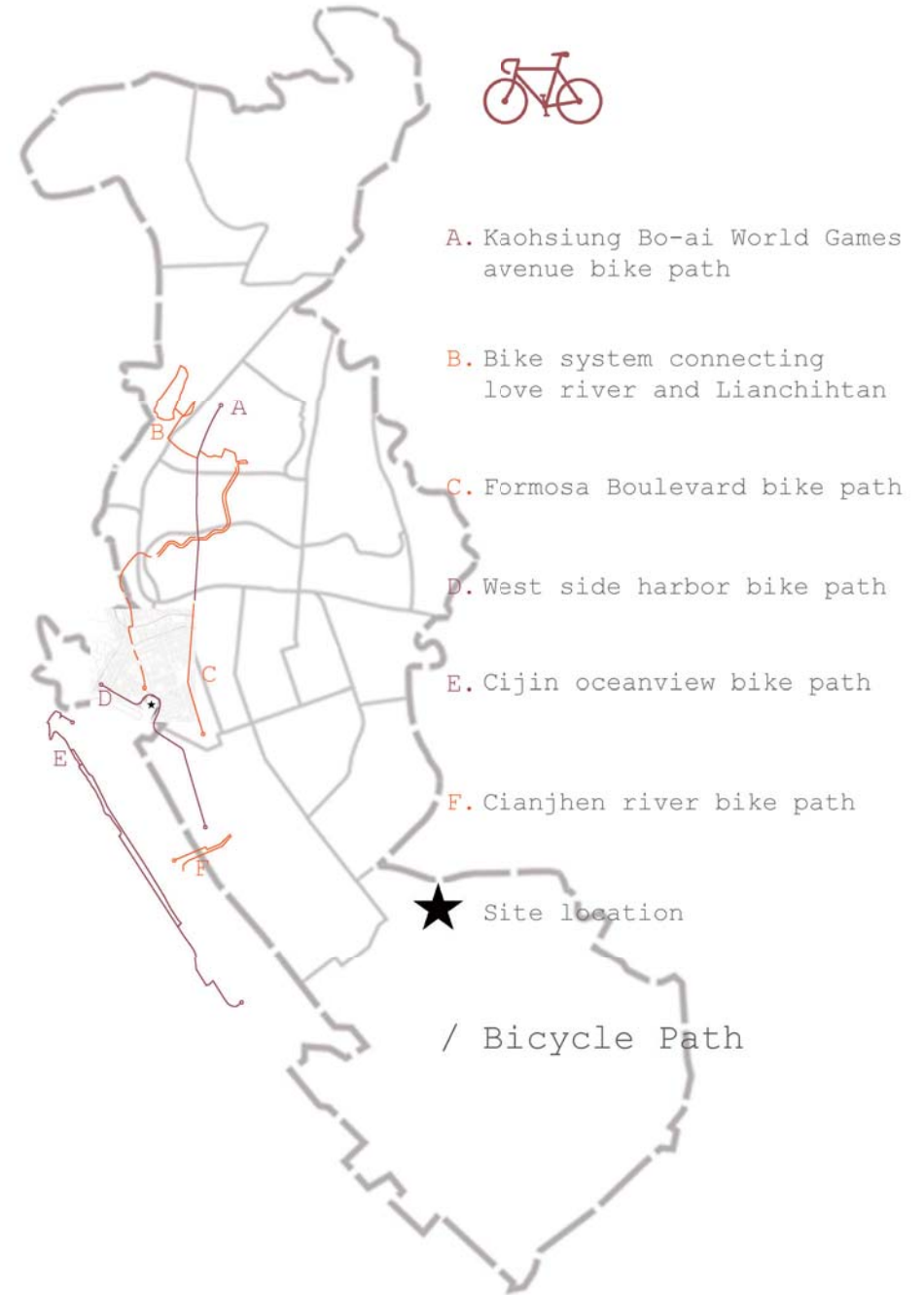
/ Traffic Mapping


- MRT
- MRT
- Railway
- Bicycle Lane



/ Land Use

- Government Areas
- Medical Institutions
- Education institutions
- Business Areas
- Residential



- 
- A. Kaohsiung Bo-ai World Games avenue bike path
- B. Bike system connecting love river and Lianchihtan
- C. Formosa Boulevard bike path
- D. West side harbor bike path
- E. Cijin oceanview bike path
- F. Cianjhen river bike path

★ Site location

/ Bicycle Path



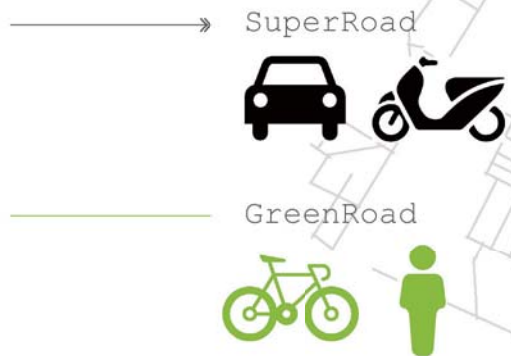
/ Green Space Design

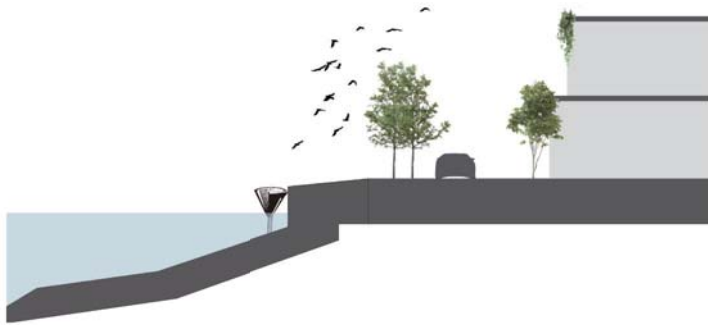
The urban heat island(UHI) effect following by the global warming is become more severe. Therefore, we should emphasize the point to use the urban riverbed space more efficient in order to make it to be a self-sustainable system. The system can reduce the side effect of the environment which is from the development of urban waterfront space.

2006	Taiwan	Kaohsiung	London	WHO
Urban planning (KM ²)	4096.51	145.55	1572.1	
City Population	19,627,747	2,277,547	7,855,256	
Related park per capita green (m ²)	5.51	4.88	27.3	9

/ Superblocks Program

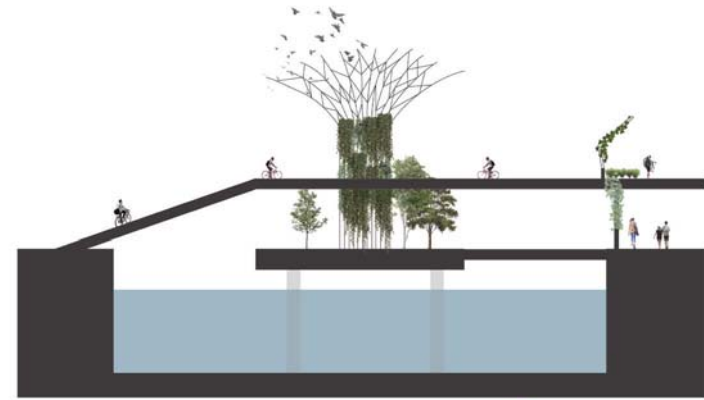
A new plan is about mixing six small residences to become a bigger super block. All of the cars, trucks, moto bikes, and buses can only travel in the superblock. The small stores and the green spaces in the superblock are becoming an eco-system.





_ City filter

[A]. The River side



_ Blue Belt

[B]. Third environment



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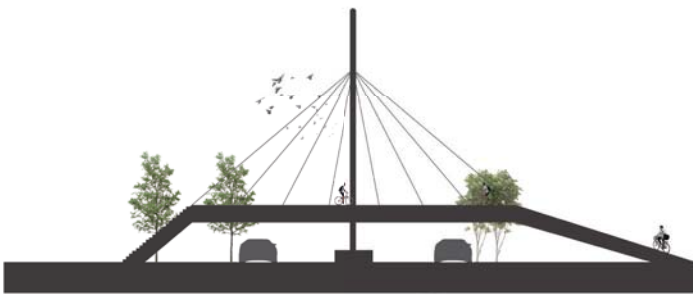
_ Green Space

[C]. Walking Gateway



_ City river

[D]. Combine green&blue



_ Traffic

[E]. Design roundabout



_ Religion

[F]. Holy Rosary Cathedral





[+] A

[+] B

[+] C

[+] D

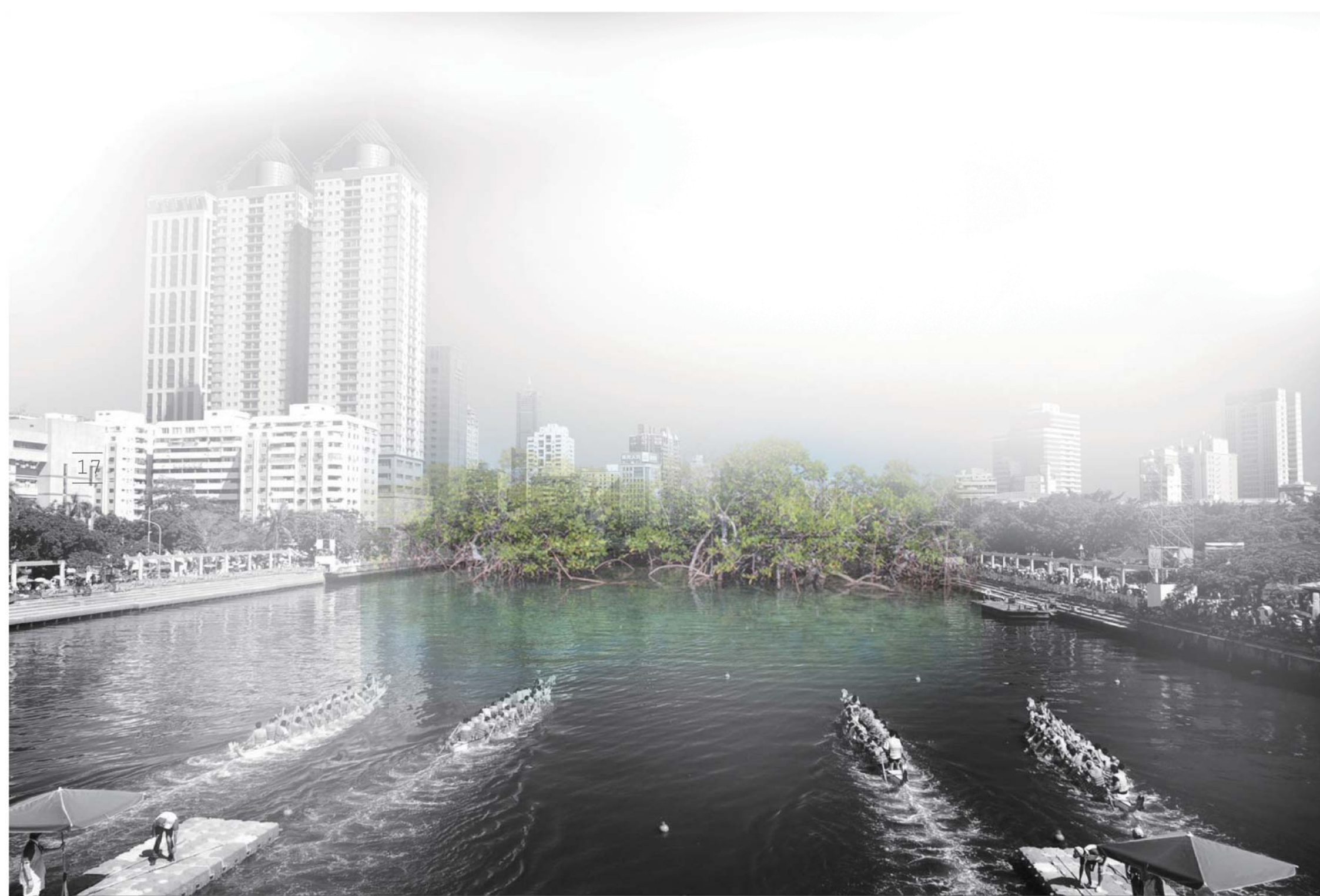
[+] E

[+] E

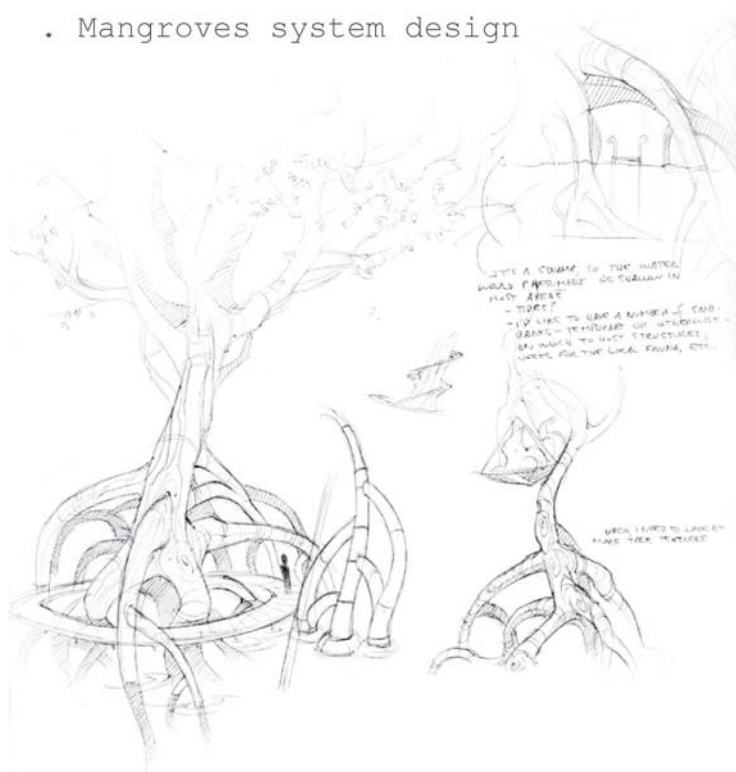
+ Location
Kaohsiung Love Pier

0 100 200 Meter

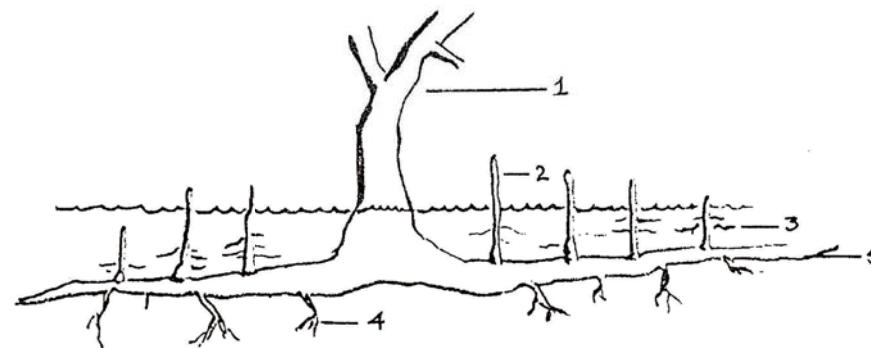
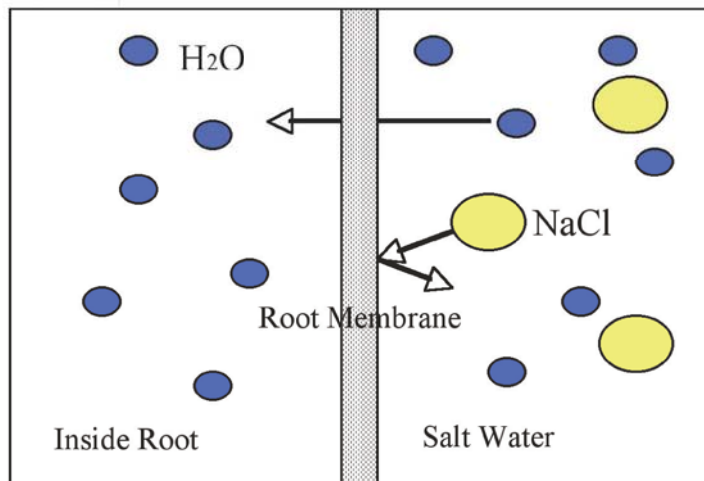




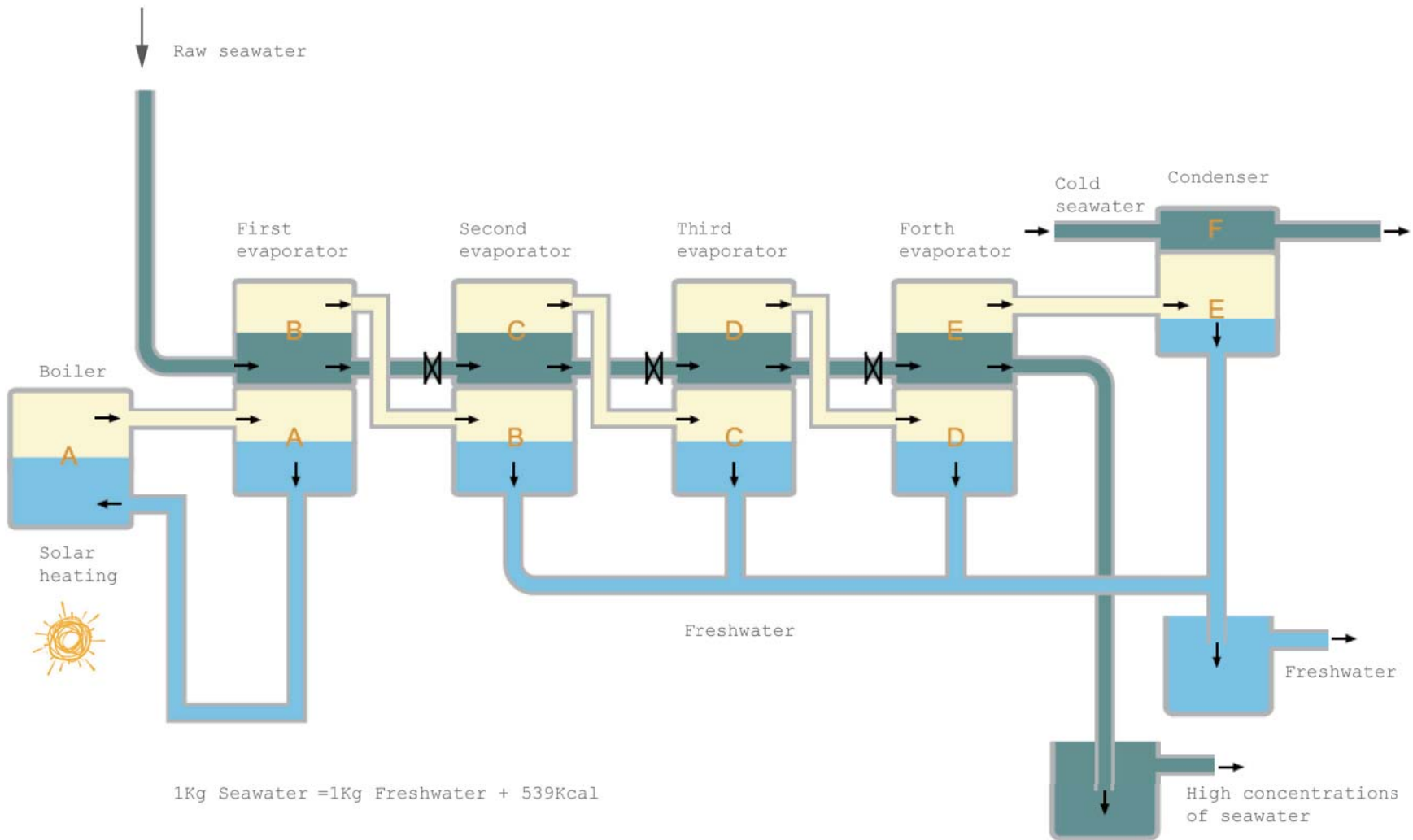
. Mangroves system design



The undisputed champion of saltwater living is the mangrove. These trees perch on stilts, their roots directly in the salty coastal ebb and flow. Twice a day, the tides wet their feet. It's not an easy lifestyle, but mangroves have figured it out more than once ('mangrove-ness' has evolved at least a couple of times in unrelated plants), with a few different strategies. Red mangroves use this neat energy-free trick to make their drinking water: evaporation wicks moisture from their leaves, creating a vacuum that sucks saltwater through their root membranes up through the tree, leaving salt behind.

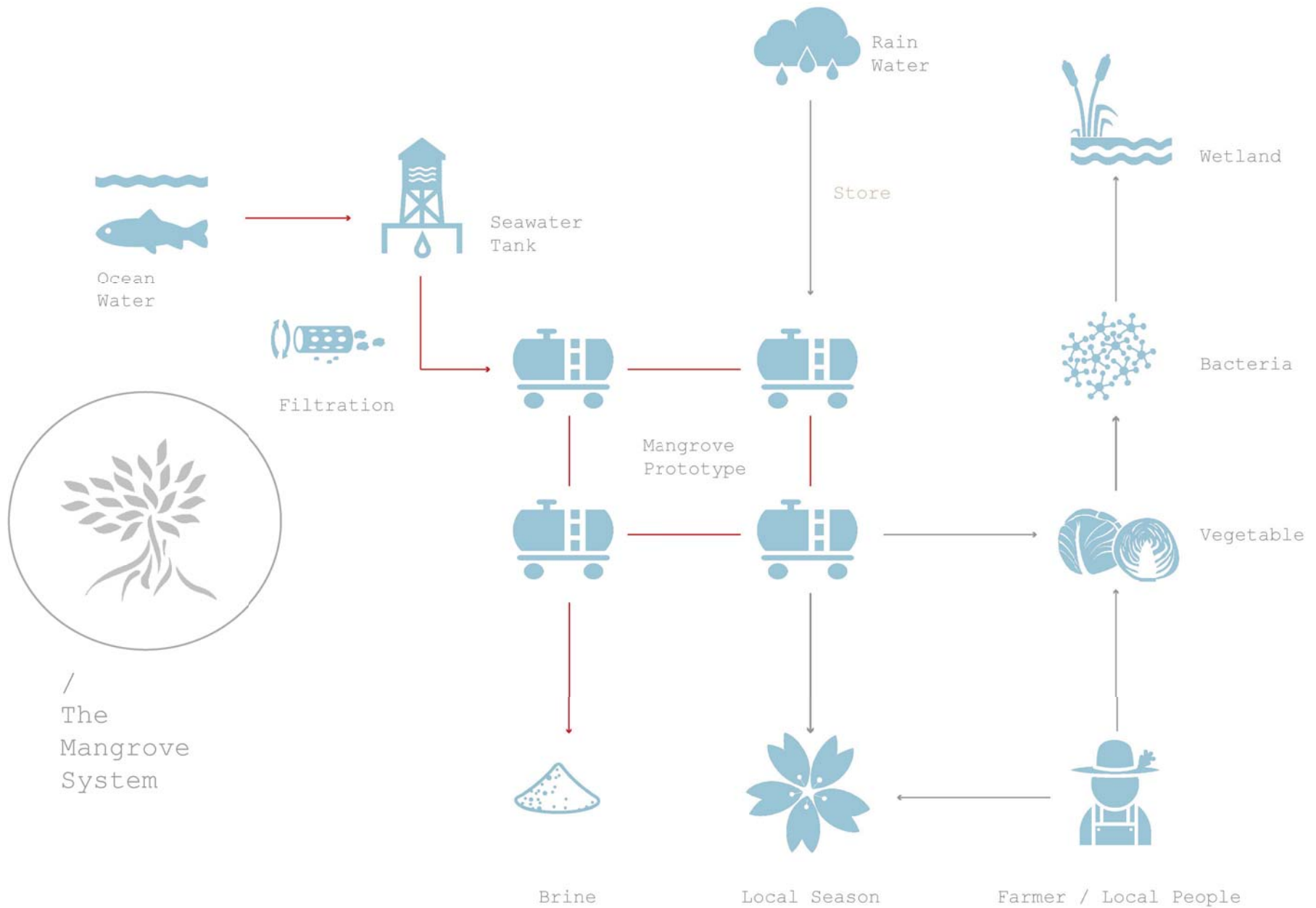


- 1. Main Trunk
- 2. Pneumatophors
- 3. Nutritive Roots
- 4. Support Roots
- 5. Cable Roots



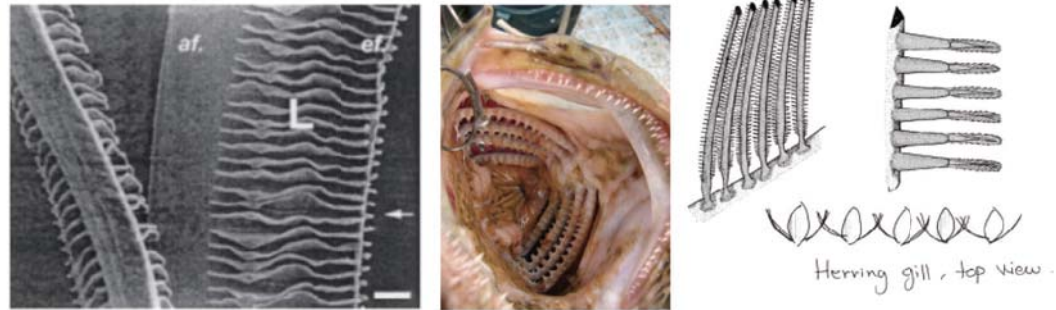
_ Multiple-effect evaporator

The generated vapours enter a separator where the brine droplets from the wet vapour are separated. The dry vapour is passing through the separator to the following effect where they condense. The remaining sea water which has been converted to brine, flows to the next effect as feed water. The brine is taken out and discharged overboard.

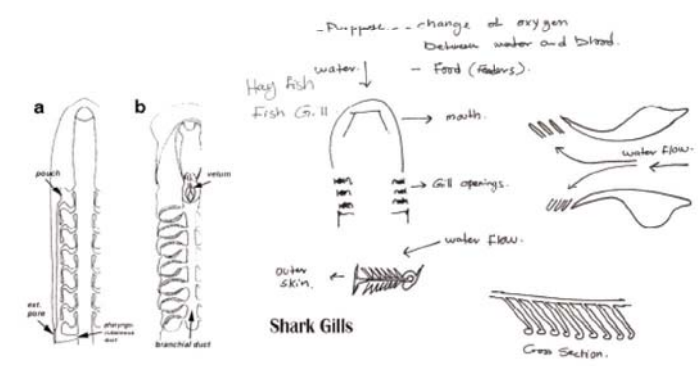
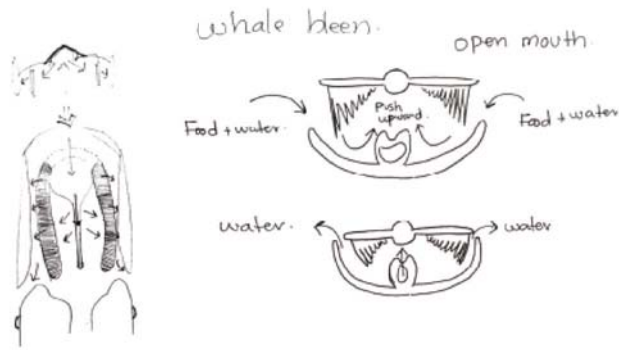


/ Natural model

. Fish gill filter



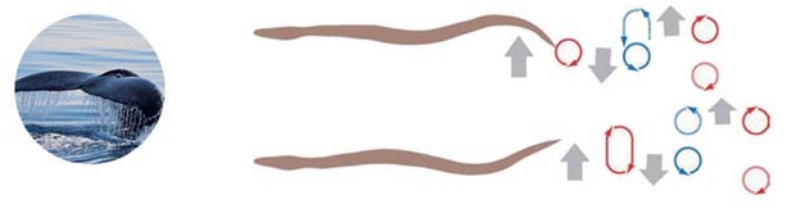
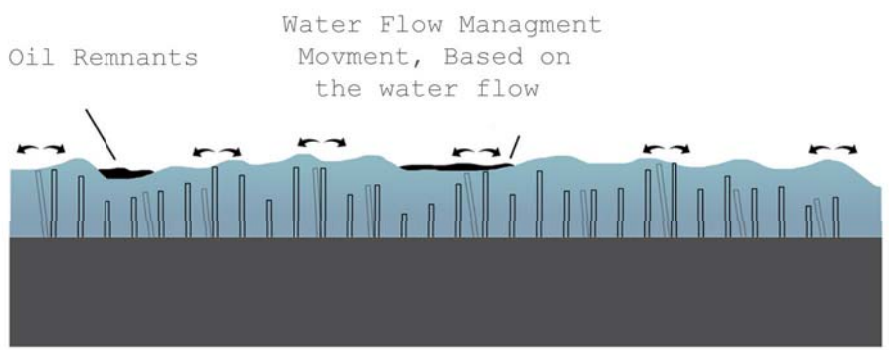
21



Fish mouths as engineering structures for vortical cross-step filtration.

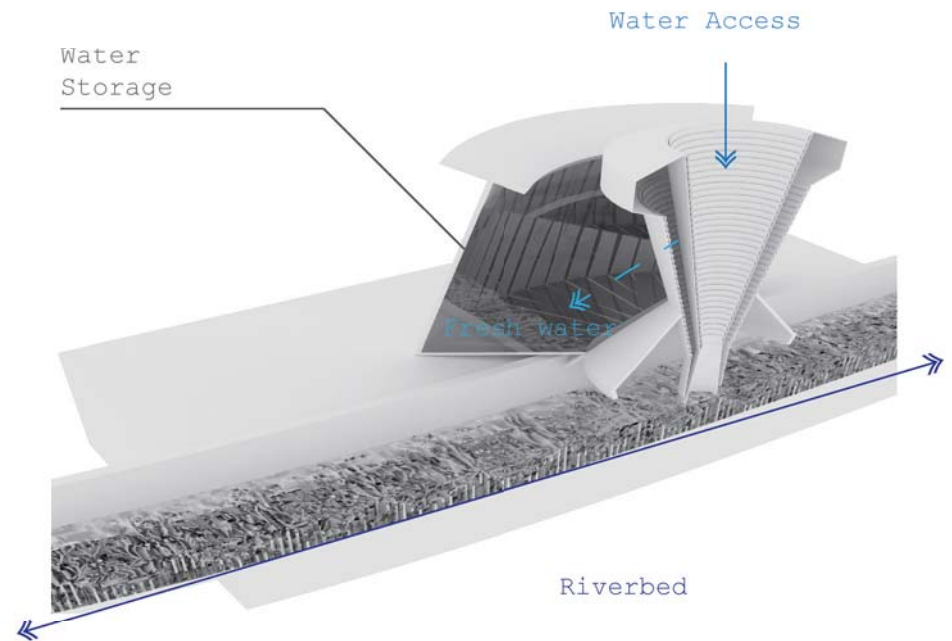
We developed a new mechanism, which is based on catching the particles in vortices, to prevent clotting.

The fish crossflow filter never clogs, even though industrial crossflow filters always clog.

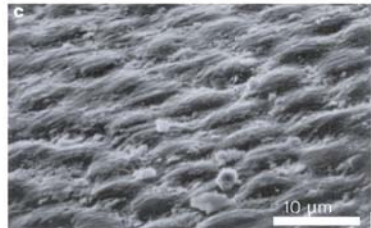
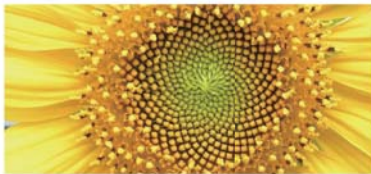


Design Diagrams

/ Filter Installation



Natural Inspired



Scanning electron micrograph of the textured surface of the depressed areas on *Stenocara* surface.

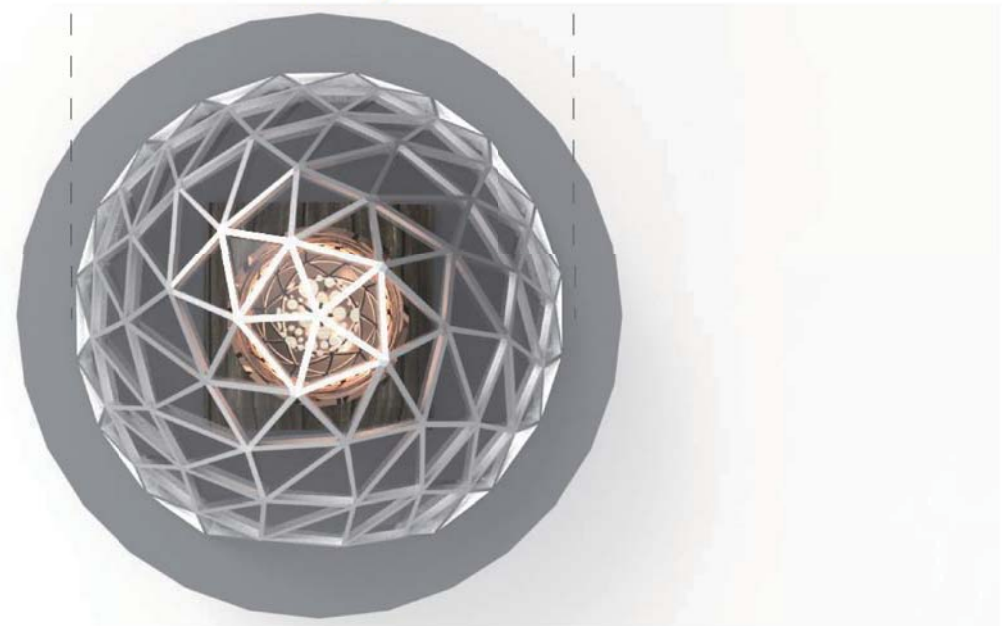
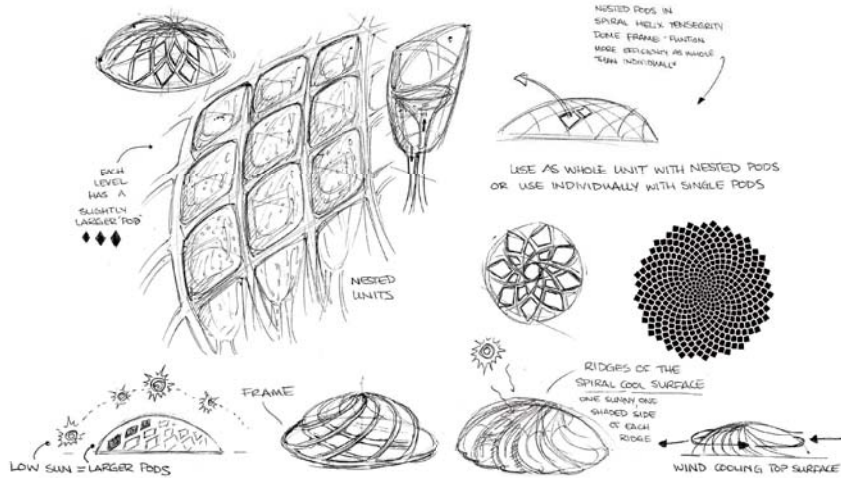
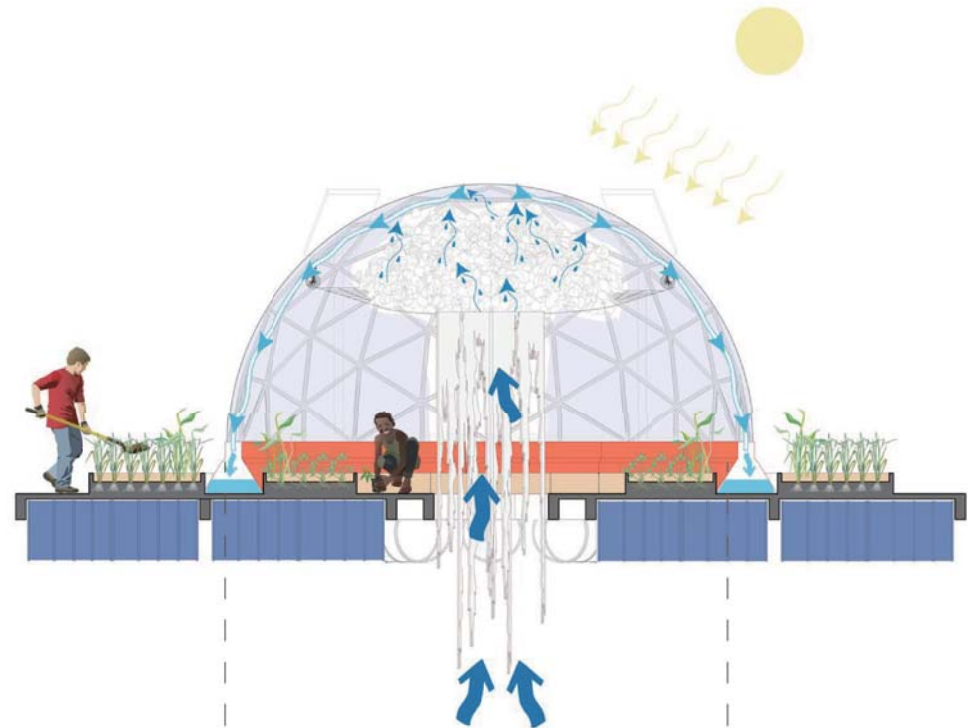
The sunflower-inspired pattern allows for a more compact layout, and minimizes heliostat shading and blocking by neighbouring mirrors.

Darkling beetles of the Namib Desert, located on the southwest coast of Africa, live in one of the driest habitats in the world. But some species of Darkling beetle can get the water they need from dew and ocean fog, using their very own body surfaces. Micro-sized grooves or bumps on the beetle's hardened forewings can help condense and direct water toward the beetle's awaiting mouth, while a combination of hydrophilic (water attracting) and hydrophobic (water repelling) areas on these structures may increase fog- and dew-harvesting efficiency. For certain species of Darkling beetle, the act of facing into the foggy wind and sticking its rear end up in the air (known as fog-basking behavior) is thought to be just as important as body surface structure for successfully harvesting water from the air.



Function Prototype

/ Solar energy sustainable ball

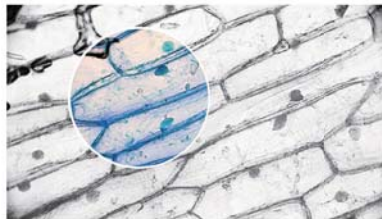




_ Beetle's structure



_ Sunflower pattern



_ Plant cell



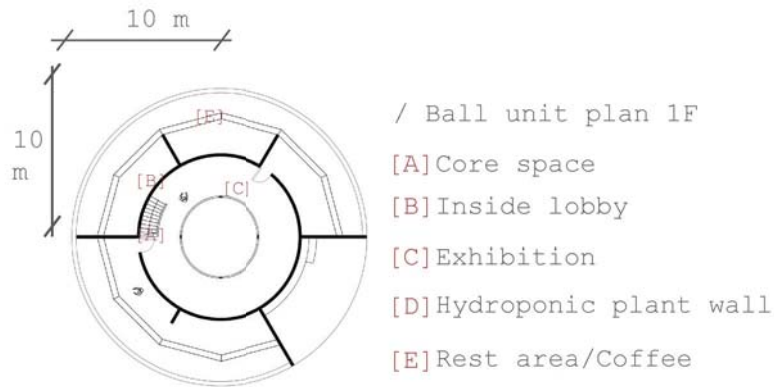
_ Tree trunk



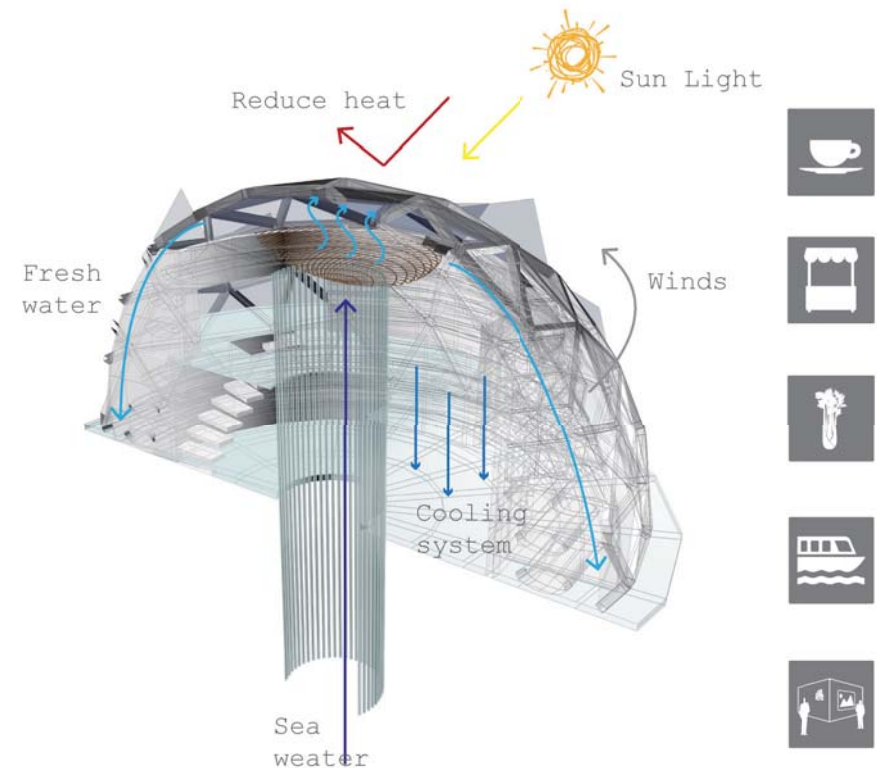
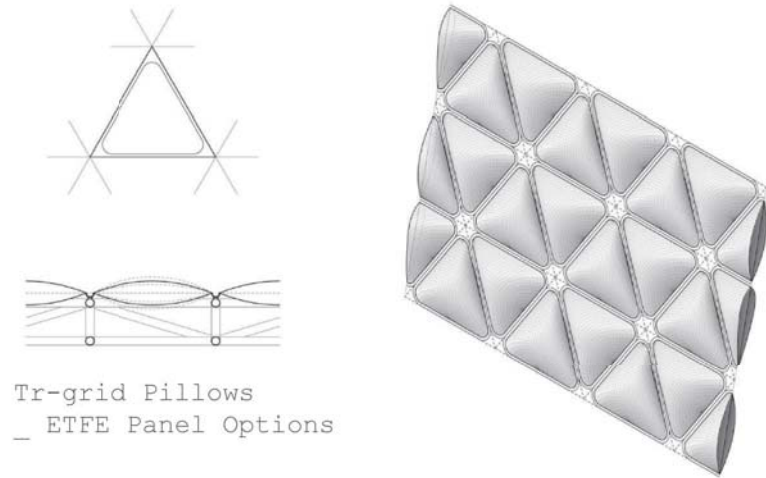
Design Diagrams

Exceptional Light Transmission -ETFE films can be highly transparent (from 90% to 95%) and allow for the passing of UVs which are responsible for the promotion of photosynthesis thus facilitating plant growth.

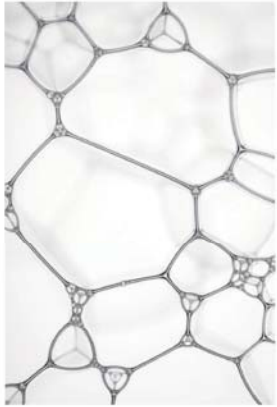
Construction Scale	Consumption of reverse osmosis desalination systems (kWh/m3)
1,000 m ³ /d	4.5-6.0



/ Bubble sunset image /



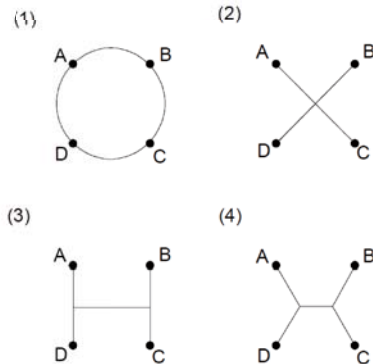
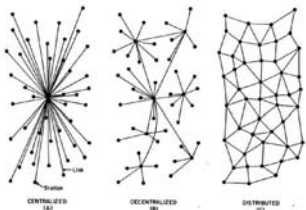
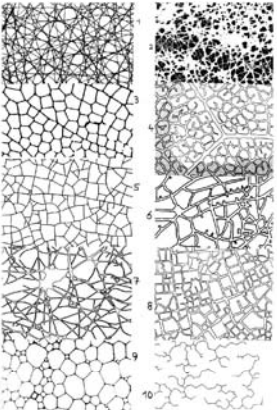
Natural strategies



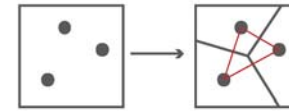
The pattern of bubbles is not random at all, it is instead based upon the precise geometry found in natural system like cells, molecular structures, and crystals. Replicating nature's existing patterns leads to the most effective subdivision of three dimensional spacing.

Christopher Alexander's article from 1965, "A city is not a tree", claims that the tree or centralized, hierarchical structure is simplistic, limited and limiting when applied to city planning. Alexander argues that our current needs embody a higher level of complexity than the tree structure permits.

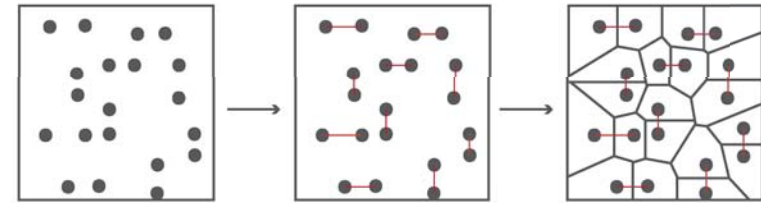
He proposes a three dimensional 'semi-lattice' network (not unlike distributed system above) which allows for multiple overlapping to occur, as well as provides non hierarchical means of connectivity.



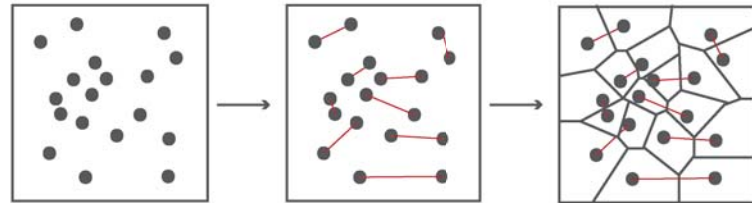
Bubble Geometry



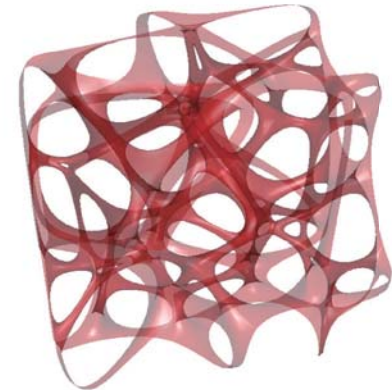
Voronoi Principle

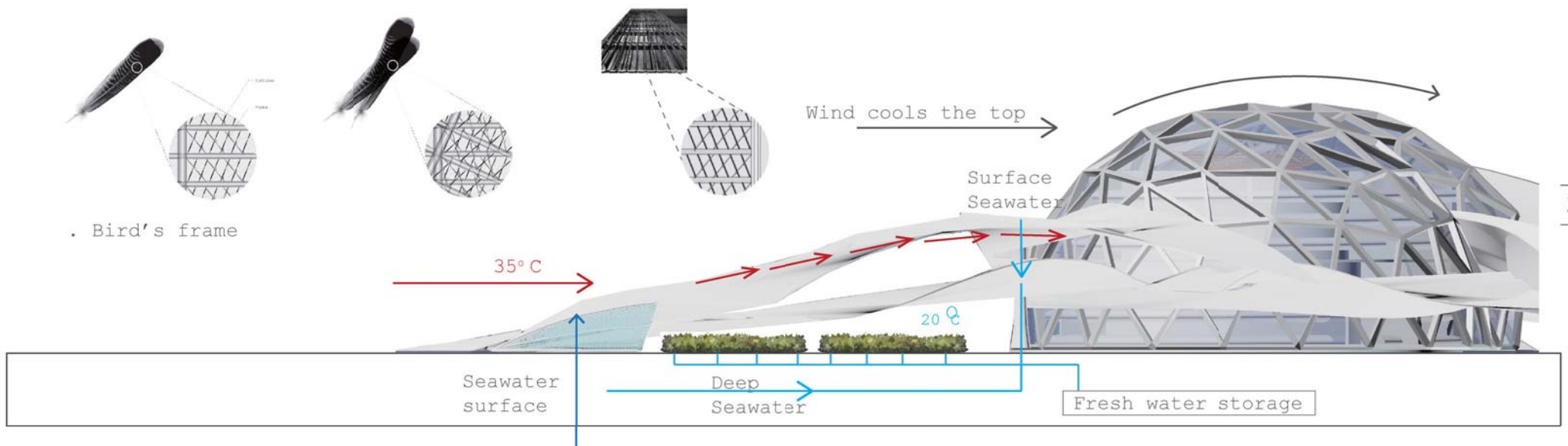


Classic Voronoi division



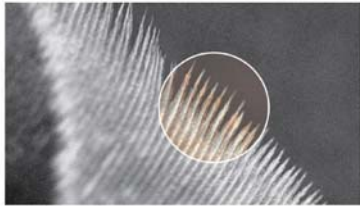
Semi-Orthogonal Voronoi division







_ Camel's nose



_ Bird's feather



_ Fish Gills



_ Bubble structure

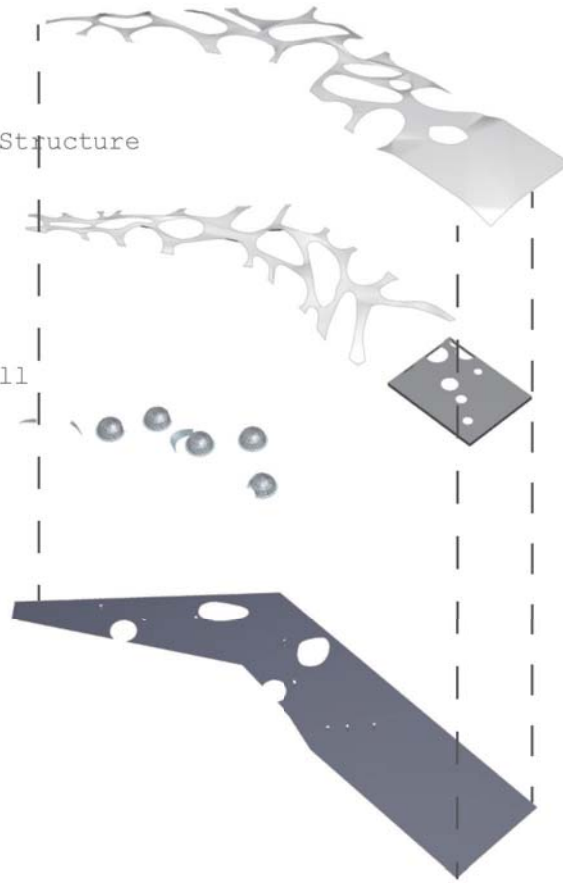
Second Floor Structure

First Floor Structure

Sunflower ball

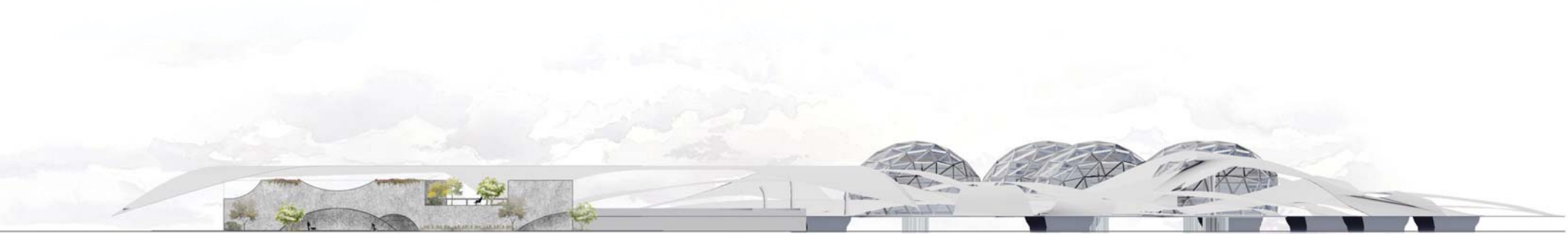
Based Bridge

Exploded view



Educational Activity Center

Site Elevation



Site east elevation scale 1:100

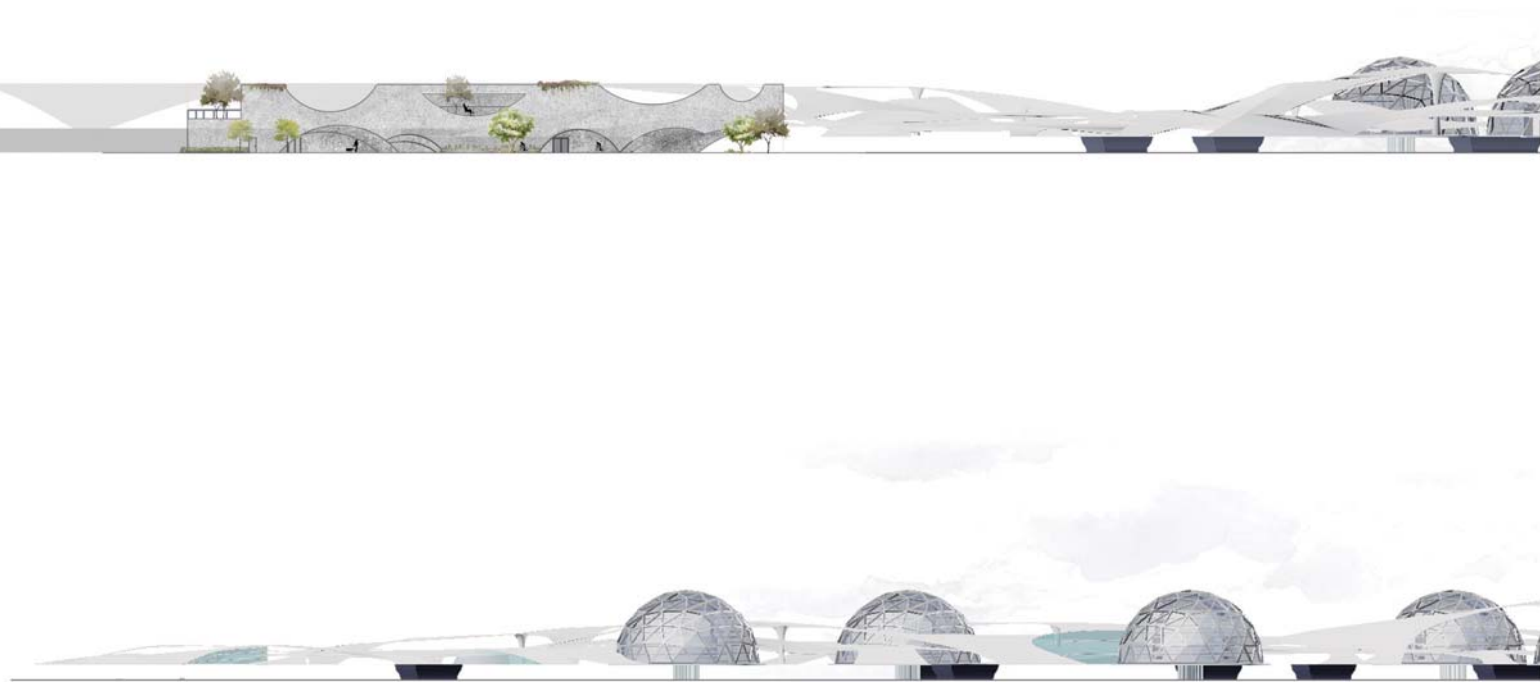


Site west elevation scale 1:100

Site Elevation

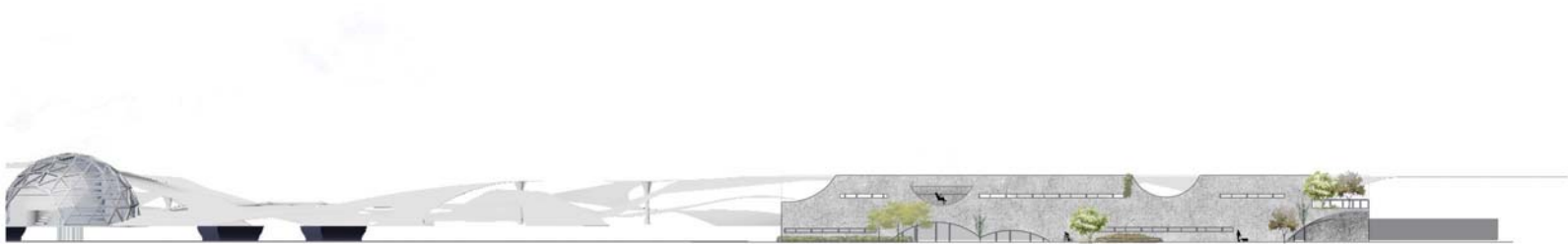


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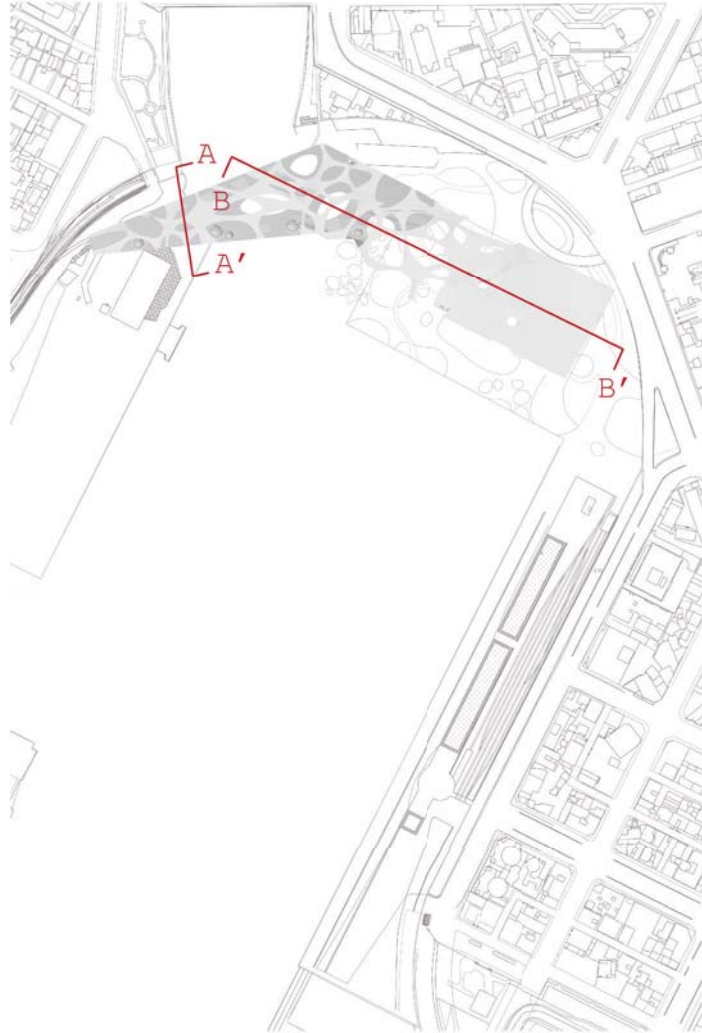




Site north elevation scale 1:200



Site south elevation scale 1:200



Site Section

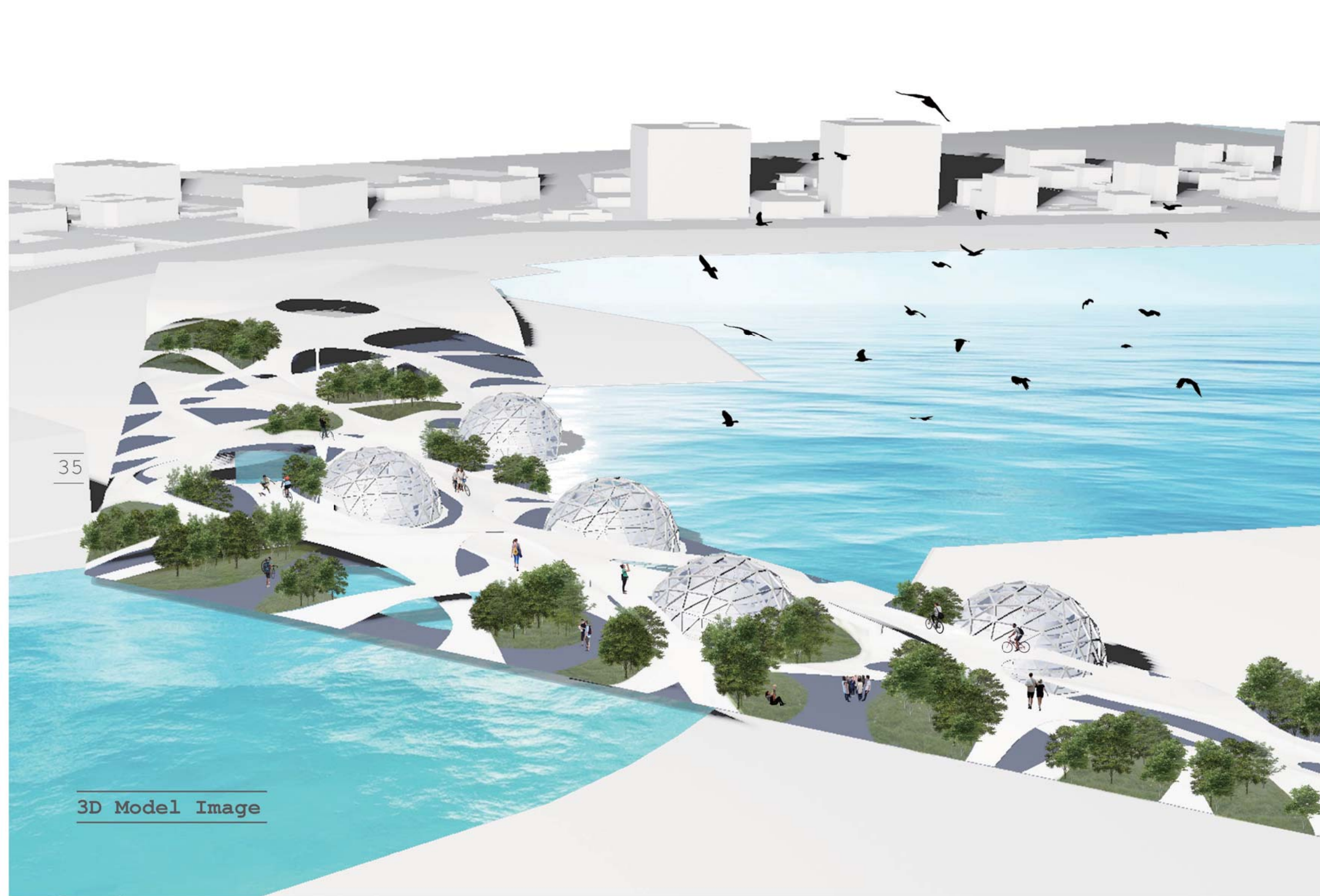




Site A - A' section scale 1:100



Site B - B' section scale 1:100



35

3D Model Image

- [A] Sunflower Pellet
- [B] Water Dance Plaza
- [C] Street Markets
- [D] Multifunctional exhibition
- [E] Locker Room
- [F] Paddling Pool
- [G] Coffee Shop
- [H] Interactive multimedia area
- [I] Massage
- [J] Office



First Floor Plan

/ Scale 1:250

- [A] Floating Garden
- [B] Bubble Restaurant
- [C] Teaching Area
- [D] Breathing Tree hole
- [E] Locker Room
- [F] GYM
- [G] Network Center
- [H] Bubble Cave
- [I] Massage
- [J] Office

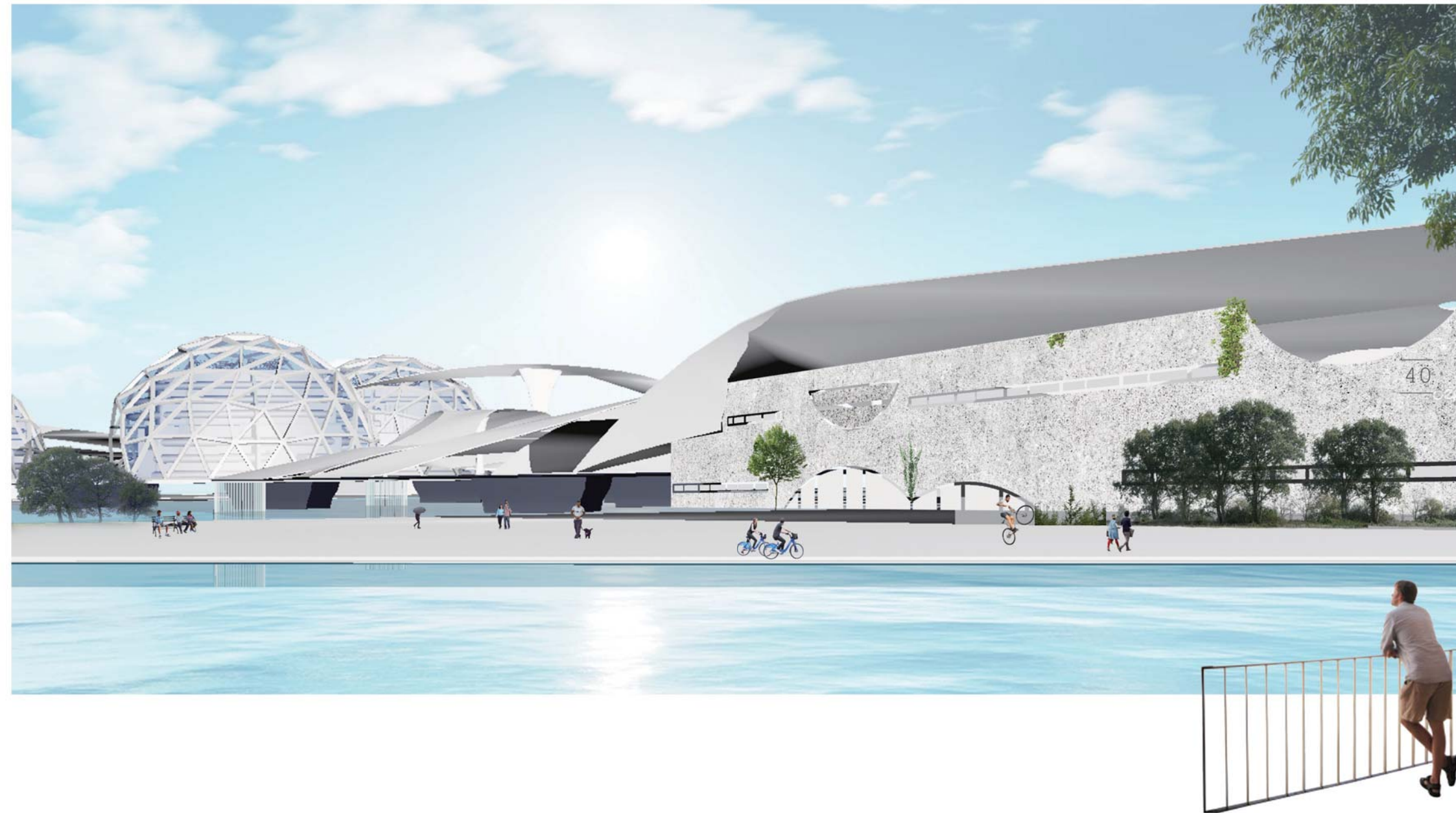
First Floor Plan

/ Scale 1:250





/ Bubble Cave image /





第二市場

02. Healing market : The food botanical garden

First semester M. Archi Program C

Adviser / Shu Chih-Feng

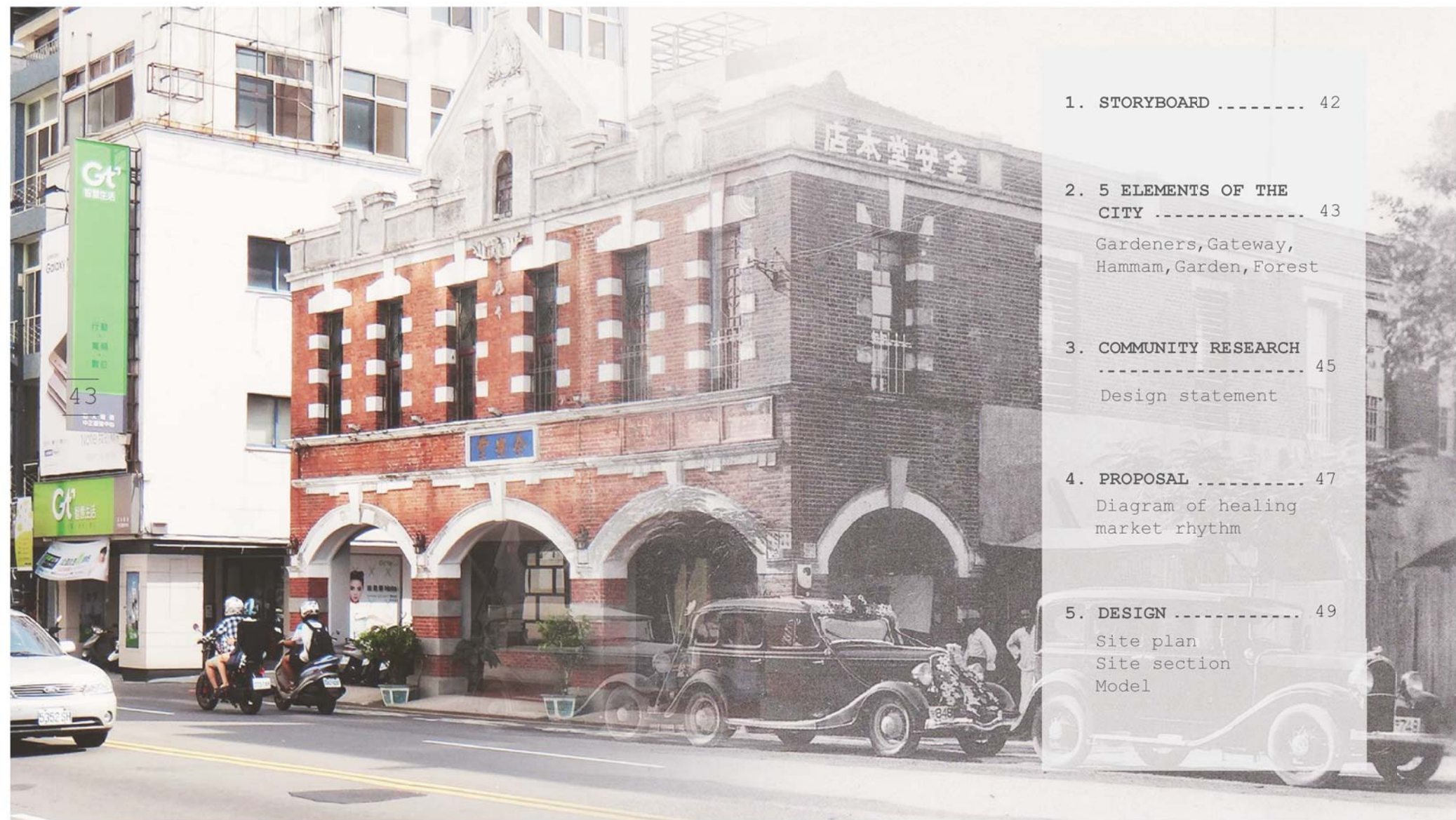
Healing path, Perception, Second Market,
Communitites, Arboretum

2015.09.14 - 2016.01.08

灰姑娘精品

第二零售市場

灰姑



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2. 5 ELEMENTS OF THE
CITY 43

Gardeners, Gateway,
Hamam, Garden, Forest

3. COMMUNITY RESEARCH
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Design statement

4. PROPOSAL 47

Diagram of healing
market rhythm

5. DESIGN 49

Site plan
Site section
Model



1. STORYBOARD

: HEALING MARKET

Taichung central area is an ill city which is gradually declined since several years ago. The most important issue is to create a new urban blueprint. The local ingredients is a great chance for Taichung.

Recently, the problems of food safety has been happened years and years. As mention above it, food safety is the biggest concern for every person.

If Taichung can provide healthy food to people, let people realize the source of the food, and even use healthy food to heal the body and mental problem, then may be great opportunity for central area to active again.



_2. 5 ELEMENTS OF THE CITY



GARDENERS Local living people
Take care about their own treasures, of the city.



GATEWAY City entrance
People who want to know the city started here.



HAMMAM 5 Senses
Use another perception to feel about food.



GARDEN Four season
Untamed nature activity place.



FOREST Botanical garden
The place full of diversity and different senses to heal and relax.



_2.5 ELEMENTS OF THE CITY

: Statement based on 5 elements
The idea of community
in taichung downtown



Walking is the most suitable way for visitors to explore Taichung central area. Thus I design two main walking routes, one is starting from the site to the hospital and then end at the Second Market. This direction of the route would make more people come to the market which facilitates the economy. Besides, the second route is extent from Taichung park to the base which combines unoccupied area and public space in order to facilitate the people to walk.



_3. COMMUNITY RESEARCH

: Taiwan food round solar terms

冬 WINTER	秋 AUTUMN	夏 SUMMER	春 SPRING
<p>十一月 N O V</p>  <p>立冬 小雪 甜柿、柿餅、草蓆、冬菇、 鱈魚...</p>	<p>八月 A U G</p>  <p>立秋 處暑 龍眼、咖啡、蘆筍、野蓮、 睡蓮...</p>	<p>五月 M A Y</p>  <p>立夏 小滿 蘆筍、佛手、魚麵、黃魚、 石狗公、地瓜較...</p>	<p>二月 F E B</p>  <p>立春 雨水 蔥、春盤、魚鮮、老酒...</p>
<p>十二月 D E C</p>  <p>大雪 冬至 烏魚子、烏魚、櫻花蝦 紅甘蔗、紅蘿蔔...</p>	<p>九月 S E P</p>  <p>白露 秋分 虱目魚、吳郭魚、芋頭 ...</p>	<p>六月 J U N</p>  <p>芒種 夏至 芒果、鬼頭刀、綠竹筍 楊桃、枇杷...</p>	<p>三月 M A R</p>  <p>驚蟄 春分 石蚶、韭菜、茼蒿、狗母魚、</p>
<p>一月 J A N</p>  <p>小寒 大寒 蓬蓽、仙草、黑糖、香米</p>	<p>十月 O C T</p>  <p>寒露 霜降 蚵仔、文蛤、高麗菜</p>	<p>七月 J U L</p>  <p>小暑 大暑 花生、綠瓜、小管、南瓜</p>	<p>四月 A P R</p>  <p>清明 穀雨 臭肉蛙、菜干、寬菜、番茄</p>




: 105






COMMUNITY RESEARCH





Analysis of the second market stalls (numbers)

_Commerce type

- 40  Regular Stall
- 14  Occasional Stall
- 51  Regular Store

_Product types

- 30  Clothing
- 06  Jewellery
- 12  Fruits & vegetables

- 07  Dry food & hardware
- 11  Seafood & Meat
- 22  Crafts
- 17  Others

_3. COMMUNITY RESEARCH

Design statement

: New healing area of season market

Consumption public space

User in the past



Nowadays, humans forget the nature of food due to the busy life. In the traditional market, People can realize more details of food and have a totally new experience through talking to each other about their own ideas or skills.

Stop the proliferation of market

Economic strategy symbol in japanese time

The management problems in japanese time

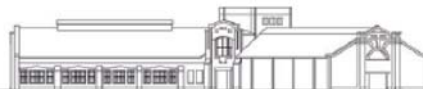
// Hexagon House Elevation //



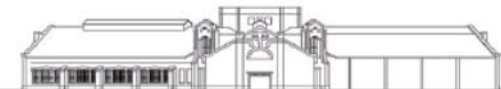
Site southeast elevation



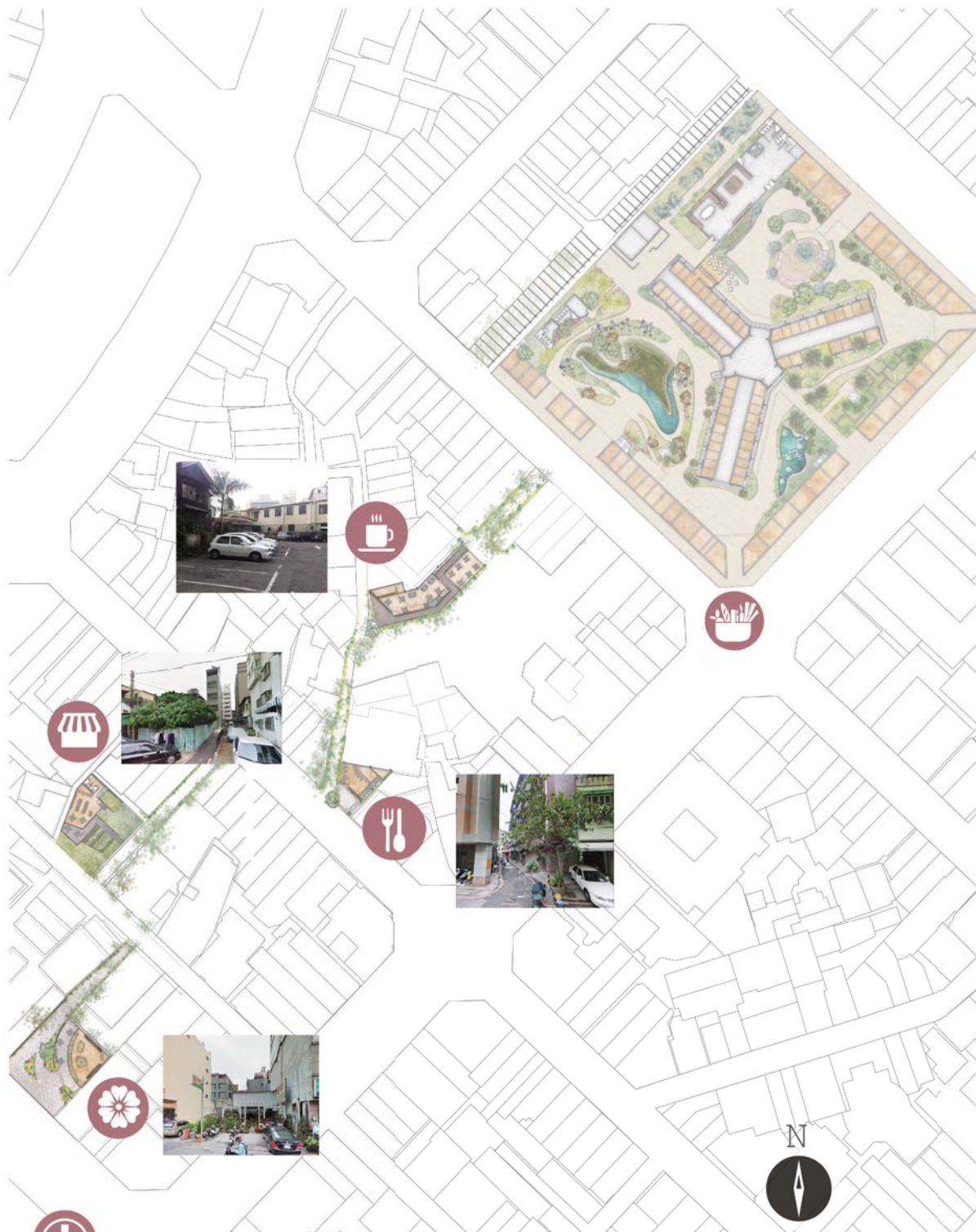
Site northeast elevation



Site southwest elevation



Site northwest elevation



4. PROPOSAL

: Design diagram
The Healing Market



Traditional food



Plants



Plants dye

: Healing process rhythm



.Season market / Explode
Five senses perception



.Coffee exhibition / To feel
Conect with local place



.Cook restaurant / Experience
Nature green path



.Organic shop / Comfortable
City empty area



.Flower shop / Curiosity
Original flower market

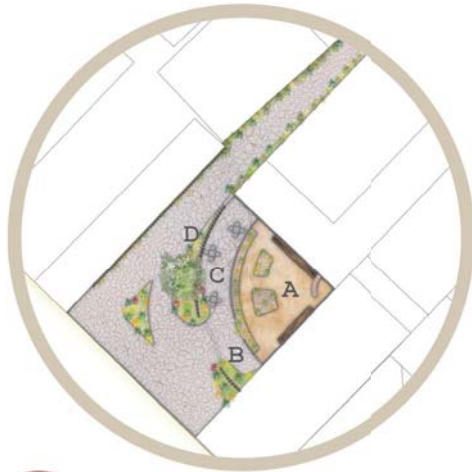


.Major hospital / Sickness
Start from here



5. DESIGN

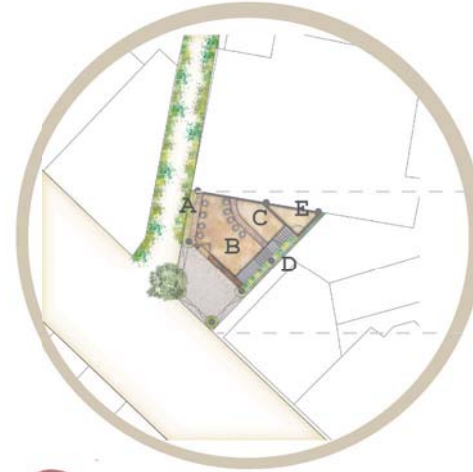
: The plan of healing path



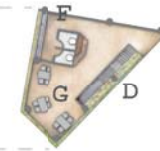
- A: Flower shop
- B: Smelling path
- C: Seats
- D: Green bamboo fence



Attractive flower shop
Scale :1/1000



- A: Visual bar
- B: Restaurant
- C: Kitchen
- D: Green wall
- E: Store



2F plan

- F: Toilet
- G: 2F seats



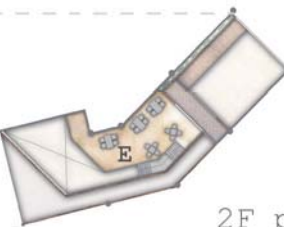
Good taste kitchen
Scale :1/1000



- A: Vegetables garden
- B: Outside seats
- C: Organic shop
- D: Green roof
- E: Toilet



Healthy organic shop
Scale :1/1000



2F plan

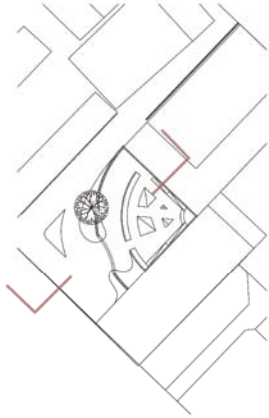
- A: Entrance
- B: Coffee shop
- C: Plants dye exhibition
- D: Kitchen
- E: 2F seats



Fragrant coffee shop
Scale :1/1000

5. DESIGN

: The section of healing path



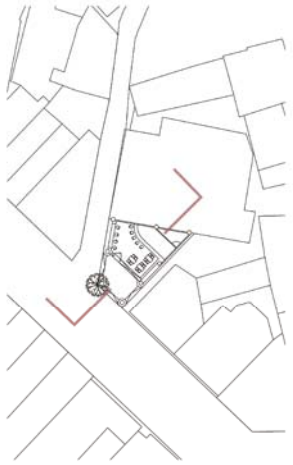
Attractive flower shop

Scale :1/200

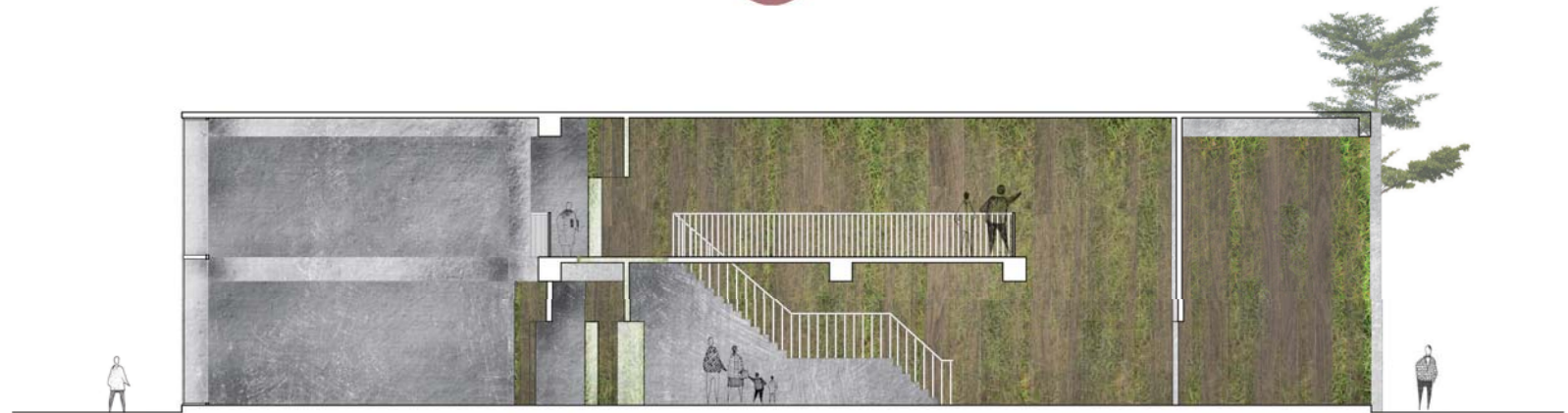


Healthy organic shop

Scale :1/200



Good taste kitchen
Scale :1/200



Fragrancy coffee shop
Scale :1/200



Planing the solar terms food in taiwan here, combine the market food and flower smell will got lots of different perception.



_5. Design

:Healing Market Section & Plan

New Second market Using zone

- A: Laboratory
- B: Main meeting room
- C: Open tree house
- D: Open-air cafe
- E: Hexagon House
- F: Market stall
- G: Green wall maze
- I: Local agriculture area
- J: Silence Gallery
- K: C-toilet
- L: Temple
- M: Flowers Street



This area is plan the plant dying common, most of the plant full of wide leaf. So we use the natural green roof to create the personal silence space.



Ground floor plan
Scale 1 : 1000



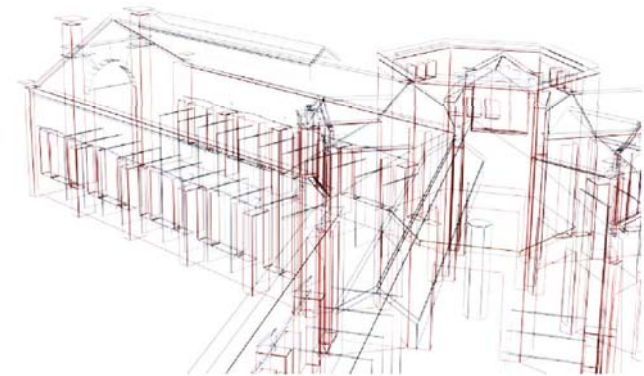
Second floor plan
Scale 1 : 1000

5. Design

:Healing Market Section & Plan

 New Second market
 Using zone

- A: Laboratory
- B: Main meeting room
- C: Healing garden (small)
- D: Open tree house
- E: Star restaurant
- F: Healing garden (major)
- G: Sky elevator
- I: Natural dye platform
- J: Workshop space

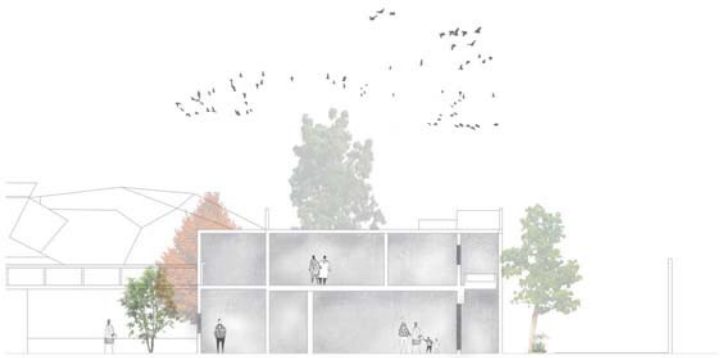


_5. Design

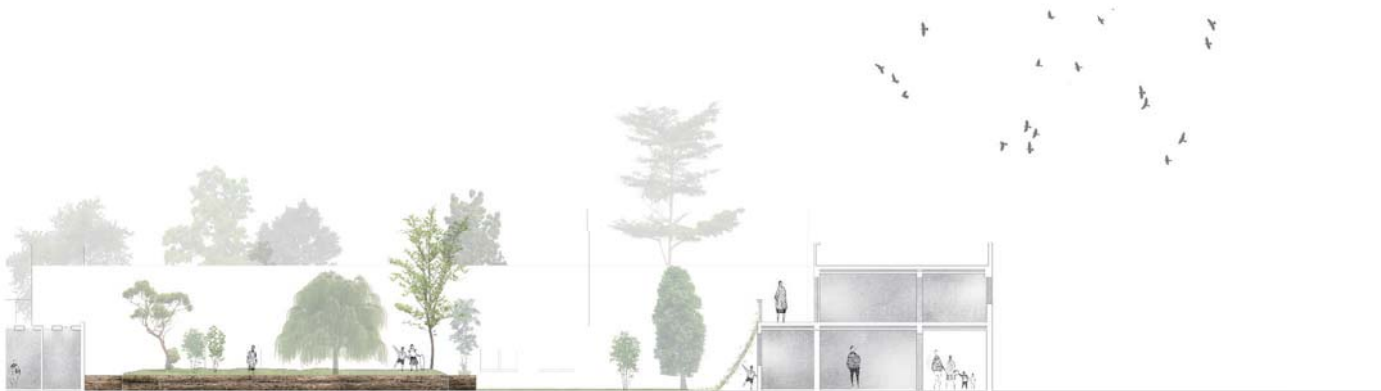
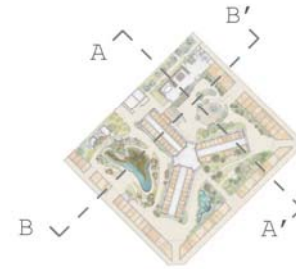


:Healing Market Section & Plan





A-A' Section
Scale 1 : 400



B-B' Section
Scale 1 : 400



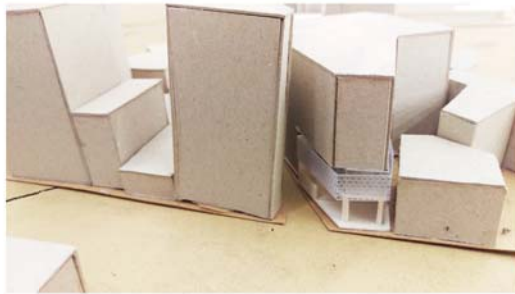
_5. DESIGN
: Design Model
Scale: 1 / 300



Attractive flower shop



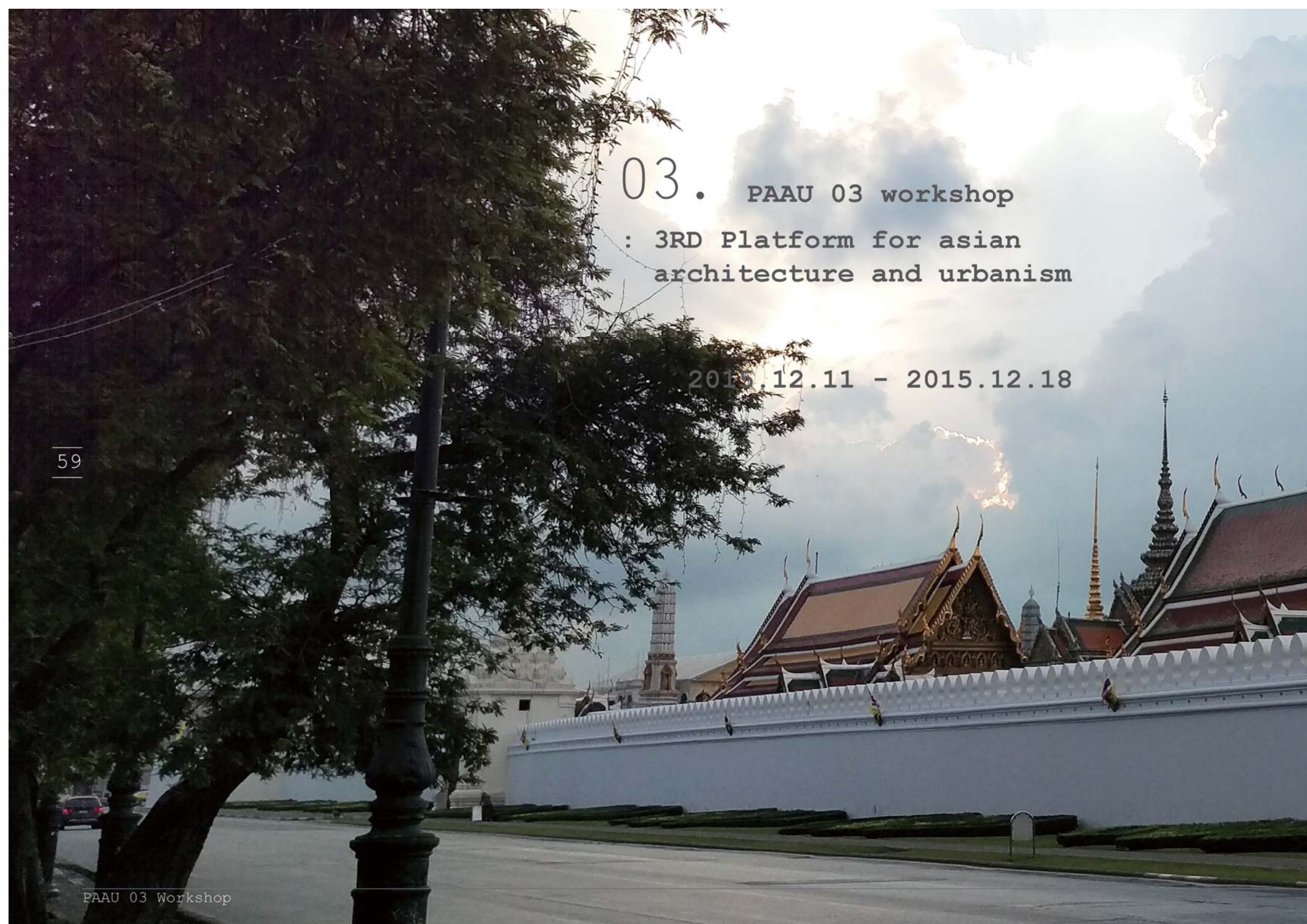
Healthy organic shop



Fragrant coffee shop



Good taste kitchen



03 . PAAU 03 workshop
: 3RD Platform for asian
architecture and urbanism

2015.12.11 - 2015.12.18

First semester M. Archi Program C

Adviser / Annika Grafweg / Wan Suphana Sophonpanich

Miss-matches, Selfie, Parasitical Ayutthaya

Ayutthaya in 2040

60

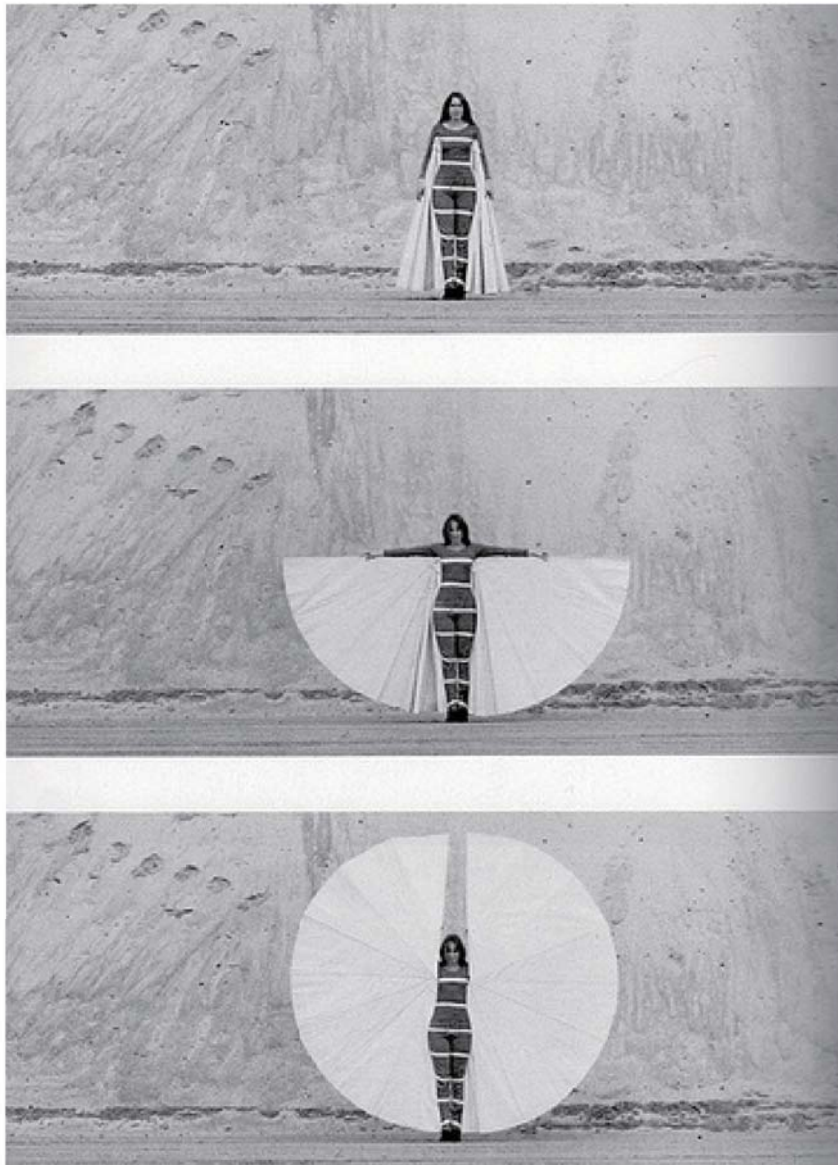
**AMBIVALENT
ADAPTATION**
A JUXTAPOSITION OF RUINS AND REALITIES

PAAU 03
1st PLATFORM FOR ASIAN
ARCHITECTURE AND URBANISM
11-18.12.15
BANGKOK THAILAND
FACULTY OF ARCHITECTURE
SILPAKASIT UNIVERSITY

PAAU 03
ARCH SU

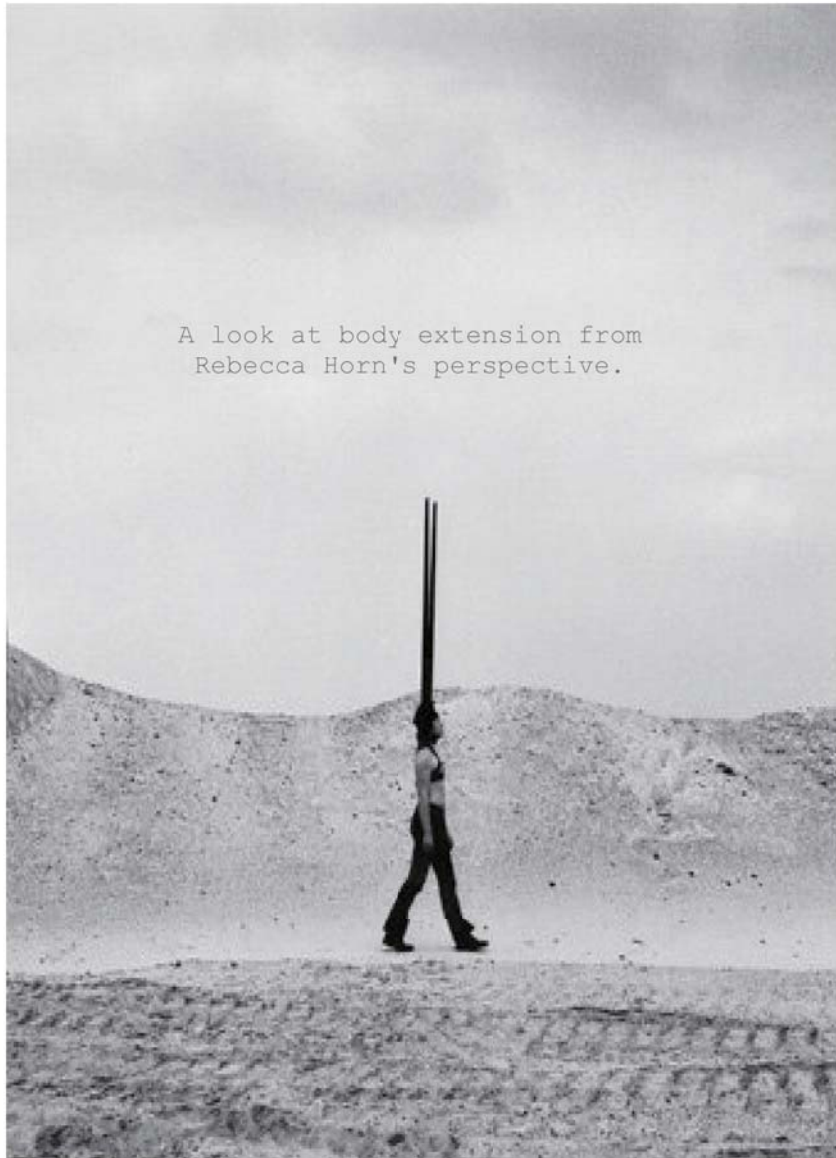
11-18.12.15
BKK, TH





« My Hand Can Fly »

White Body Fan @ Rebecca Horn. 1972



A look at body extension from
Rebecca Horn's perspective.

G5

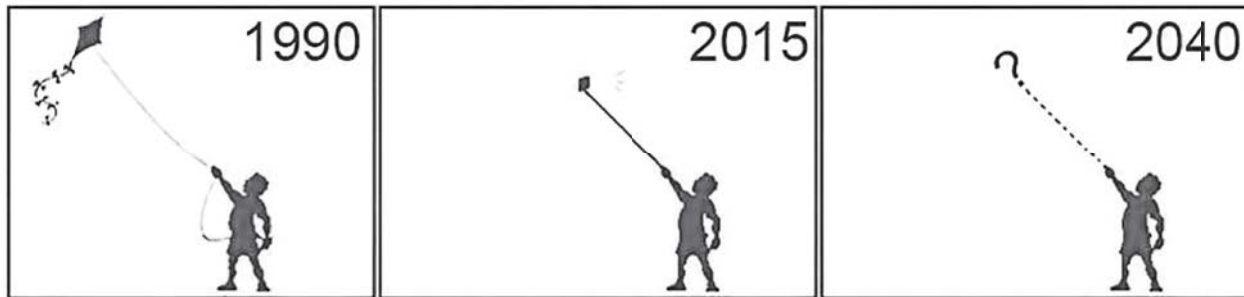
: Parasitical Ayutthaya

The workshop will explore the "mis-matches" and ruptures in the urban fabric of Ayutthaya that sporadically become visible exposing the juxtapositions of the contemporary reality of urban space and its glimpses of long forgotten glory. These rifts make a sectional cut through the complexities of contemporary urban landscape, uncovering multiple layers of vested interest and everyday use of place and time, exposing hidden conflicts, peculiar friendships and poetic associations.

Direct action and urban wandering will be used as the practice to explore the contemporary urban life of site by re-purposing the Selfies-Stick as a tool of investigation and recording; composing personal spatial narratives, which will be utilised to design and test a 1:1 parasitical intervention.

Selfie Sticks Extend Their Reach

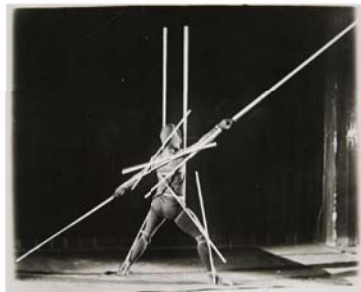
: The extension of body



based on image from funnystatus.com

63

The use of a stick to hold a camera at a distance for a self-portrait is not a new phenomenon, but the popularity of the new breed of extendable selfie stick has exploded over the past two years. So we throw a concept that human using tool as extension of the body. Since 1990 people fly the kites, in 2015 we use selfie sticks instead their hands to get the photo. So what tools will be the next perception of our body experience happened in 2040?



From Bauhaus costumes



From Joseph Malloch



From Emmanuelle Flauraud

Site brief : Ayutthaya kingdom

Ayutthaya (also spelled Ayudhya) was a Siamese kingdom that existed from 1351 to 1767. Ayutthaya was friendly towards foreign traders. In the sixteenth century, it was described by foreign traders as one of the biggest and wealthiest cities in the East. By 1550, the kingdom's vassals included some city-states in the Malay Peninsula, Sukhothai, and the parts of Cambodia.



AYUTTHAYA MAP

→ 2016

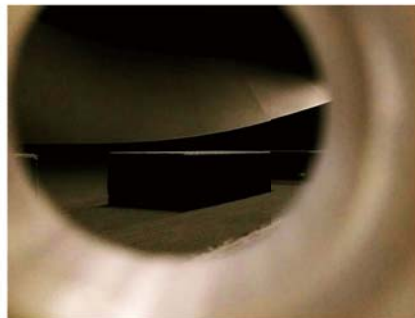


City mapping / Ayutthaya

Take anything on photo

: New vision Ayutthaya

Choose 15 photos that you find most interesting and best describe your narrative of "hidden conflict/peculiar friendship/poetic association". All photos in your series must have the same dimension (3x5, square, pano, etc.). Photoshop, crop, etc., as you need. Think about the order in which you want to use them to tell the narrative.



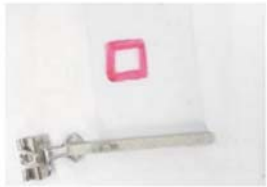
: Tools



_Seilfie stick



_Utility Knife



Red square filter



_Little explorer

: New vision Ayutthaya

Little explorer is an exploration kit that people can rent which provides them with tools and methods of seeing Ayutthaya with a completely new perspective allowing them to have a experience of the place. It adds more value to an otherwise conventional selfie. In a time when DIY and documentation is ubiquitous, this kit guides you and exposes you to a lot of new details which would otherwise be missed out.

: The mirror



_Reflector



_Seilfie stick



Position 1



Position 2



Position 3



Position 4

: Ponorama



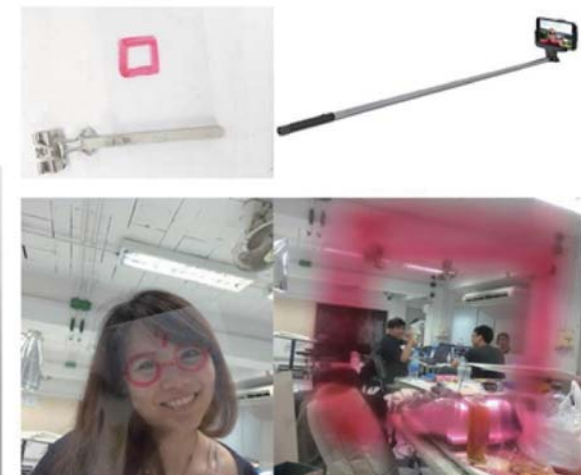
USING THE PANORAMIC THREAD



: Lens



: Filters



_ Self Navigator

: Collecting stirring moments and creating memories



- Summary Statement -

Selfie is an act of capturing oneself for social media updates. It really doesn't matter to people how and what the background is as far as they look beautiful... Why not make this act more interesting for the viewer also by helping people capture a real background background for the image.

Ayuthaya is an historically important place. It has hundreds of people visiting it and taking selfies everyday. Why not present Ayuthaya in a more poetic way by helping people frame a perfect picture for themselves, providing an indication to their selfies.

_ Experience

S
T
A
N
D

Index marker



Positive



Side face



Image result



S
I
T



H
I
D
E



_Curiosity boundary

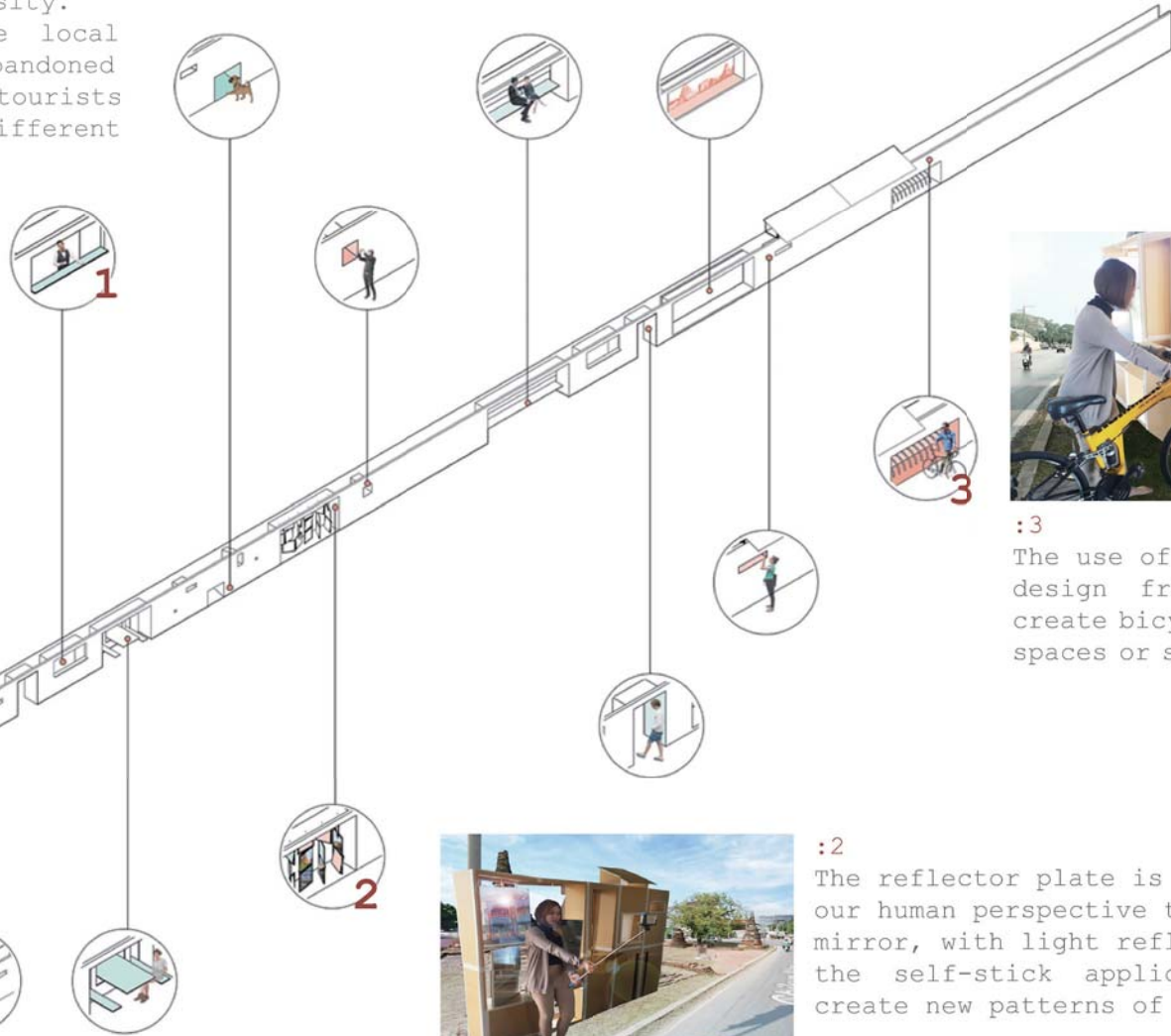
: Reflecting invisible screen

What we are going to do is to make and installation art to remind people how important the ruins is. There are two ways to induce people's curiosity. First one is reawakening the local people's concern about the abandoned ruins. Another one is to allow tourists to have more experiences and different ways to explore Ayutthaya.



:1

We combine the shop and the wall together to create a frame in order to generate a relationship with tourists.



:3

The use of multi-wall design framework to create bicycle parking spaces or storage space.



:2

The reflector plate is to explore our human perspective through the mirror, with light reflection and the self-stick applications to create new patterns of behavior.



Exploration





AYUTTHAYA 2040



04 • Biomimicry Global Design Challenge : Pale Blue Pot

International Competition

Adviser / Ku-Wei Chiu

Food System, Biomimicry, 2016 Taiwan
River pollution, Filter system

2016.03.29



- WU RIVER -



BIOMIMICRY
GLOBAL DESIGN
CHALLENGE
FOOD SYSTEMS



"The earth is the only world known, so far, to harbor life. There is no where else, at least in the near future to which our species could migrate. Visit, yes. Settle, not yet. Like it or not, for the moment, the earth is where we make our stand here."

Carl Sagan, Pale Blue Dot: A Vision of the Human Future in Space, 1997 reprint, pp. XV-XVI



Taiwan watershed

Not well managed
A lot of roads



NYC watershed

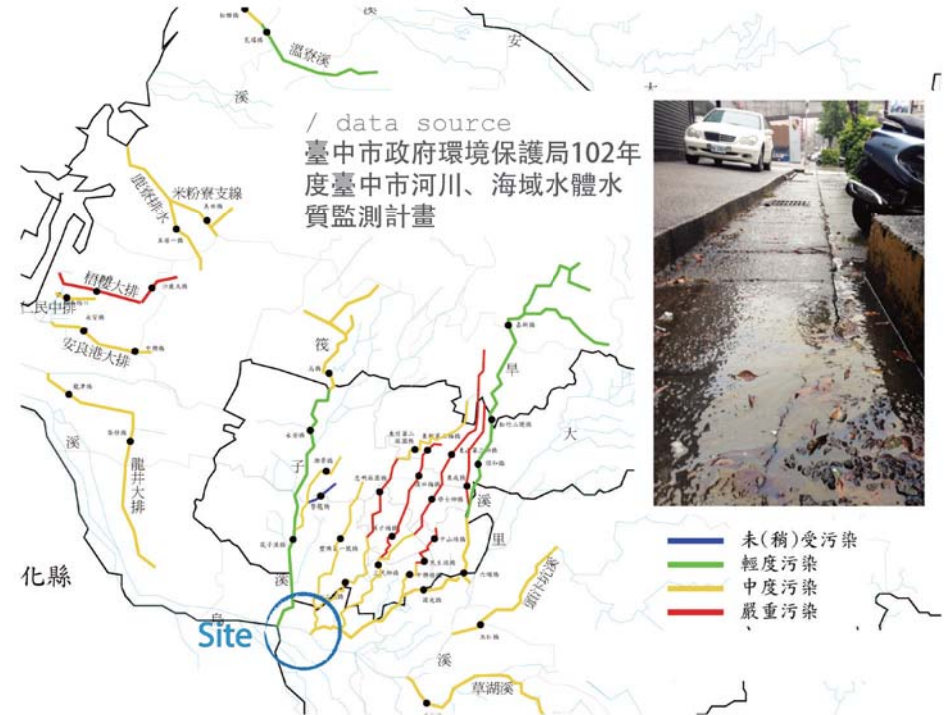
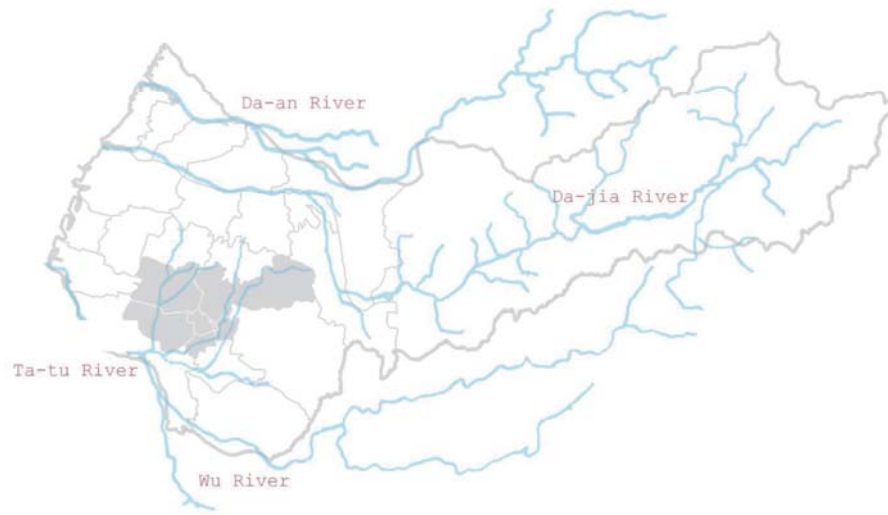
Well managed
very little roads

Watershed

: Analysis Taiwan&New York

New York City has set aside over 200,000 acres for the city and this land provides about 600 sq meters per person of untouched land to feed the cities water demand.

_ Taichung Main River



Site

: Analysis

The selected site is like the bottle neck, the water pollution will be collected at that point and run to the main river channel. All the down stream farming lands will effect with the downtown pollution.

Filteration



Baleen



Grill system



Mussels



Filter tissues



Feather



Stell Capture



Sponge



Air Bubble

_ Natural Model Chosen System



One Door Filter

Harvest



Beetles



Wax Skin



Earth worm



Poly Solution



Dog tick



Salt Solution



Vapor Collector



Cactus Spine



Wax skin Prussure change



Jelly fish



Vortex system



Water Control System



Tree Xylems



Prussure change



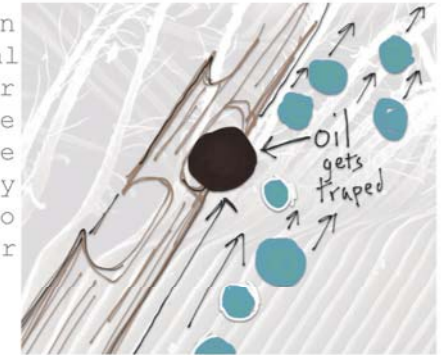
Water Transport

Function Analysis

Filtration



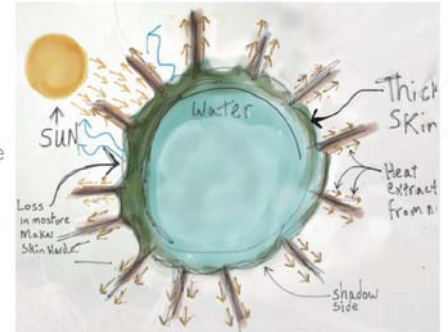
Keratin is the protein that protects epithelial cells from damage or stress that has more potential to kill the cell. It is the key structural material to make up the outer layer of human skin.



Harvest

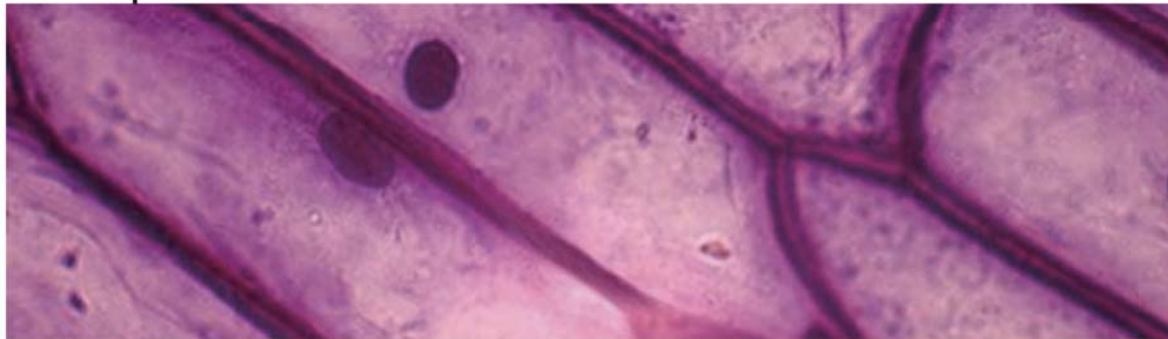


The lower temperature of the liquid, less liquid molecules evaporate to create the equilibrium, and hence cold air will contain less water molecules for equilibrium.

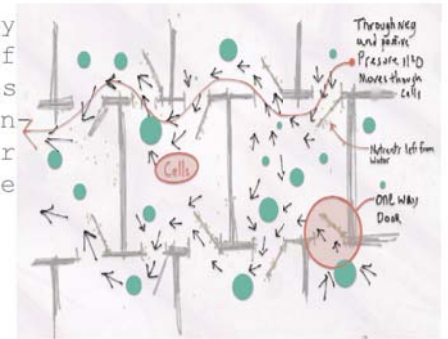


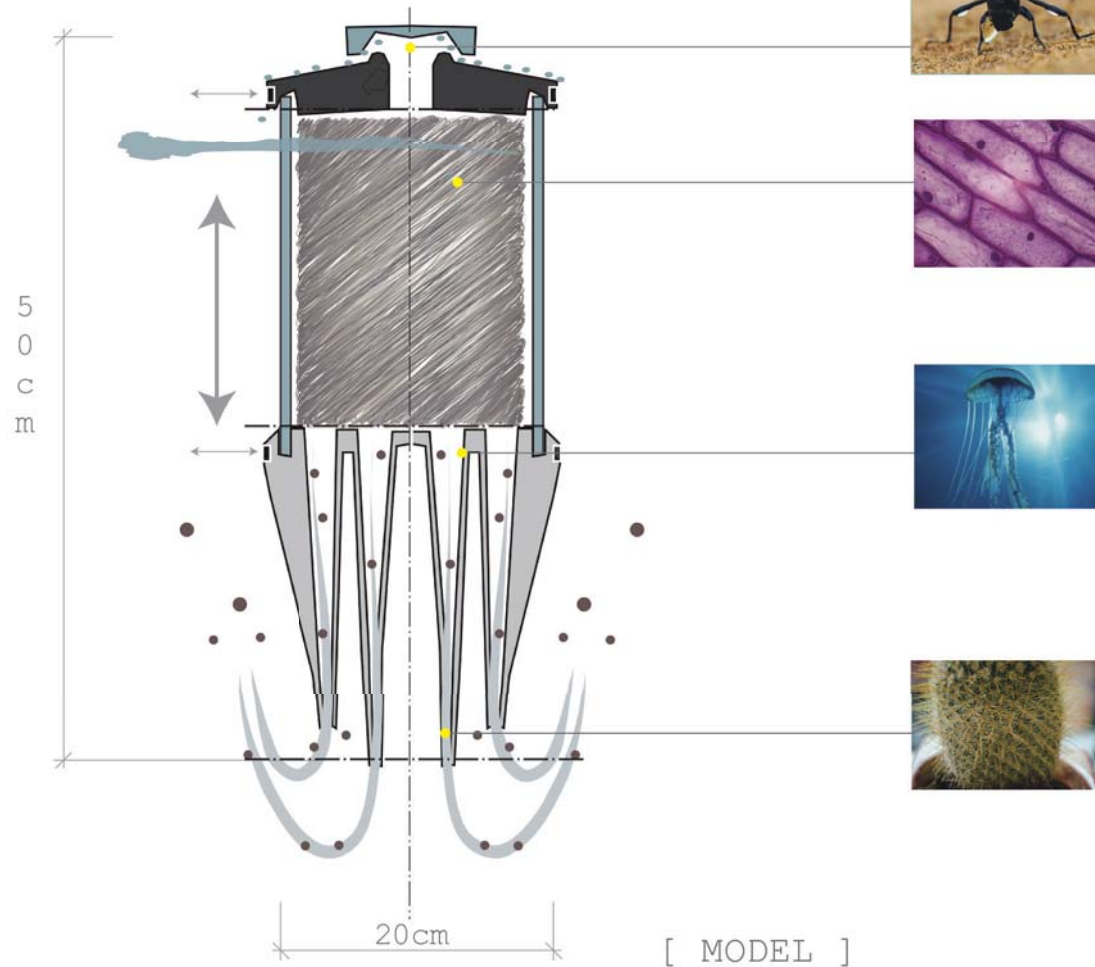
80

Transport



Nutrients or water may move into or out of cell at different rates depending on their concentrations of water inside and outside the cell.





Blue dot

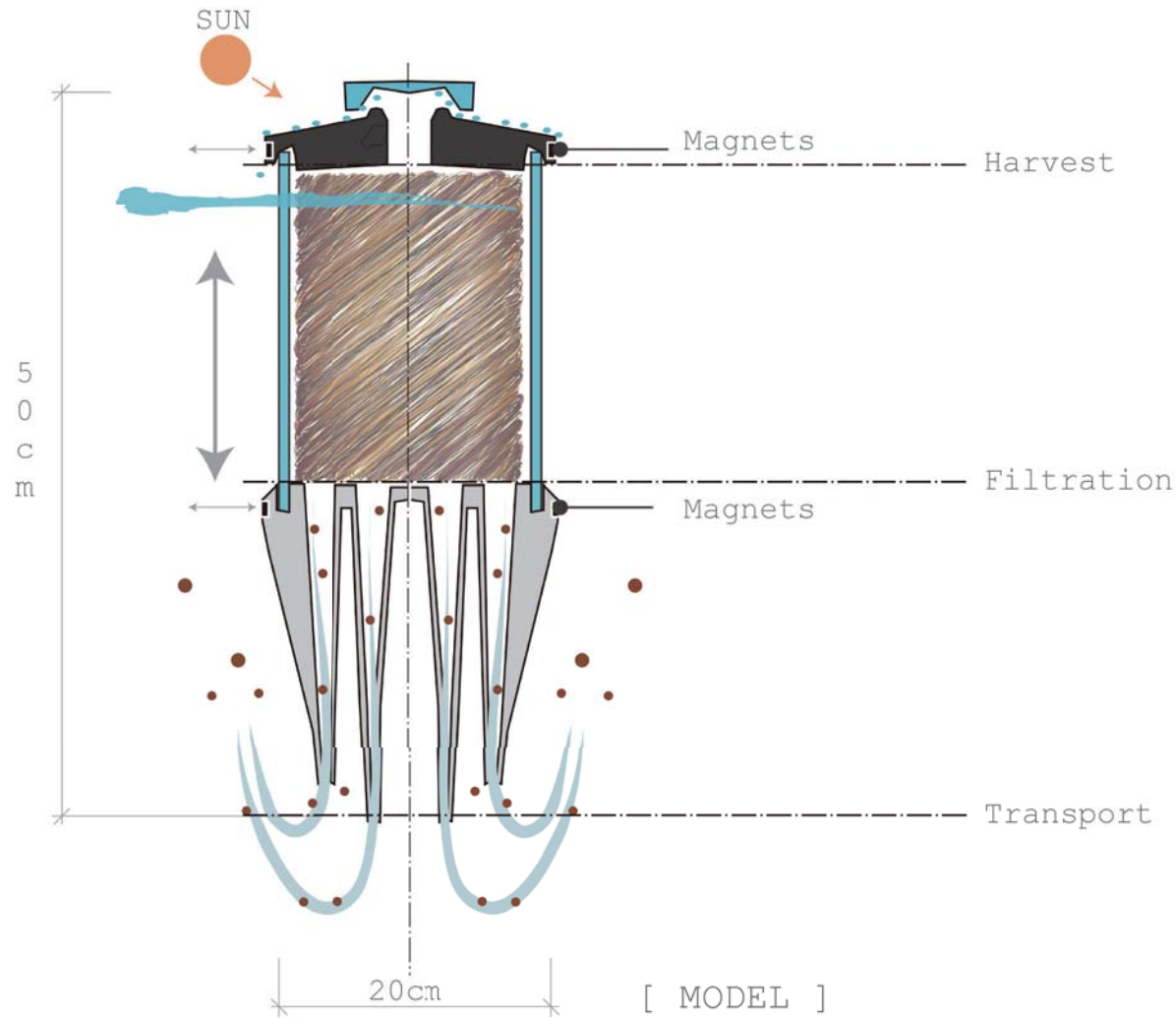
: Design

The basis of the design is using reverse osmosis. Thus is the same function of plant moving water. The water moves up the shaft utilizing evaporation.

As the super humid air reaches the top. It will condense into water droplets.

The movement of the system uses a vertex to help move water as per the function of a jellyfish. Jellyfish will use passive function to advance water.

The base is designed using the hydro droplet function as seen in cactus.



Build

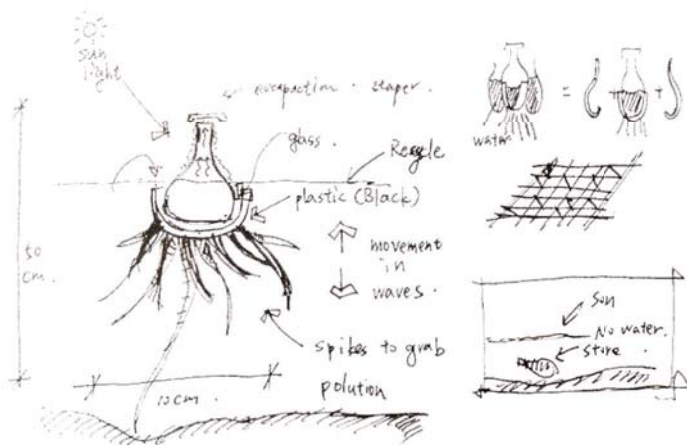
: Design

The blue dot is built in 3 components, the cap, the shaft and the base.

The harvest cap of the blue dot is where the dehumidification takes place using black color to collect heat.

The filtration shaft is the main filtration component collecting the pollutants and moving water through reverse osmosis.

The transport is the pumping system using vortex design to help move the water into the system.



_ Proposal

The blue dot is a biomimetic product that can harvest polluted water and in turn push clean water back into the environment. This system is very sustainable because it does not need energy to function.

The benefits will produce clean water that can be utilized by filters and also create a sustainable watershed from our cities.

References

: Design



Video Source

- 《看見台灣04》11月壯闊呈現
- 紀錄觀點【黑】(導演:柯金源)
- Managing Global Water Resources
- "Climate modeling" source: US Department of Commerce National Oceanic & Atmospheric Administration Geophysical Fluid Dynamics Laboratory nomads.gfdl.noaa.gov
- "environmental data" National Oceanic and Atmospheric Administration Office of Ocean Resources Conservation and Assessment Hazardous Materials Response and Assessment Division



Data Source

- 臺中市政府環境保護局102年度臺中市河川、海域水體水質監測計畫-期末報告 P.112-114
- 經濟部水利署中區水資源局-水資源利用現況,農田灌溉圖
- WIKIMEDIA COMMONS-Countries by population density
- Center on Food Security and the Environment-Climate Change and Agricultural Adaptation P.13
- Actualización Cambio Climático Global 2009
- World's Largest Aqueducts, Moving Billions Of Gallons Of Water Daily 2013



Natural Model data

- Article: A multi-structural and multi-functional integrated fog collection system in cactus
- Ryan Whitwam: Harvesting energy from humidity: Free, green energy from leaping water droplets
- Springer: Surface Nanoengineering Inspired by Evolution
- Article: Dew condensation on desert beetle skin
- Biomimicry Project: Tongji University
- In Praise of the Namibian Fog Basking Beetle
- Passive energy recapture in jellyfish contributes to propulsive advantage over other metazoans
- Critical relative humidity
- Water absorbed from humid air: Brown dog tick
- Built for Efficiency, Not Speed: Scientists Discover New Propulsive Mechanism in Jellyfish

— Tutor



THU M. Arch. Program C 2016



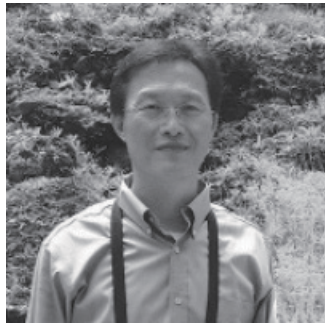
Chiu Hao-Hsiu

/ THU Architecture Chair /



Chiu Kuo-Wei

/ Biomimicry Urbanism Adviser /



Shu Chih-Feng

/ Experimental Design Studio /



/ Lain Satrusteui /

/ Design Research Project /



“Architecture is not about form, it is about many other things,”

– *Peter Zumthor*

PORTFOLIO THU ARCHITECTURE PORTFOLIO

THU ARCHITECTURE PORTFOLIO

THU ARCHITECTURE PORTFOLIO

THANK
YOU

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THE
THIRD
ENVIROMENT

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- P L A C E T O L I V E -

Thesis of Tunghai University architecture | Cheng Fang-Che



Adviser

/ Shu Chih-Feng / Chiu Kuo-Wei /

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/ Cheng Fang-Che /

Tunghai University

Department of Architecture

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