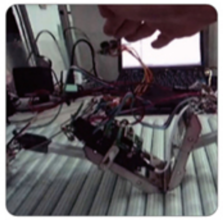
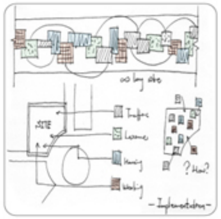
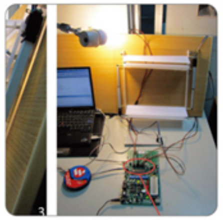
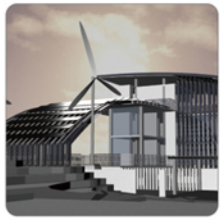



long site
SITE
Traffic
Leisure
Housing
Working
? How?
- Implementation -

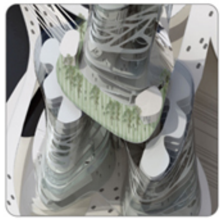
Application Environments
Compilers & Libraries
System call Interface
I/O System
Process Mang.
File System
CPU schedu.
TCP/IP
Memory Mang.
Interface to Hardware
Hardware
UNIX Operation System
kernel
- Monolithic Kernel Structure -

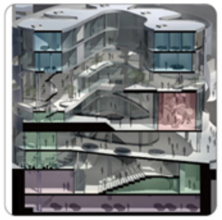


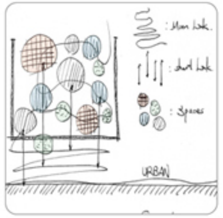


NCKU Architecture
+
NCKU Computer Science
Information Engineering

Housing
Meta-City
Working
Leisure
- City to Meta-City -






: Main link.
: short link
: Spaces
URBAN

DESIGNER
+
ENGINEER
許晏嘉 Yen-Chia Hsu
TAIWAN

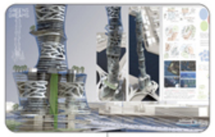
2008.9 - 2010.2 MICRO-CITY THEORY

Micro City Units

An Experiment Of A Portable Space System
2009 Graduation Design
The National Golden Award For Architecture In Taiwan
Students' Group - First Prize

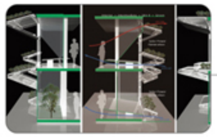
Green Dreams - Micro City

A Sustainable And Ecological Living System
2010 Skyscraper Competition



Dynamic Facade

An Intelligent Controlled System
Use Microchip And C++ Language



Actuatecture

Living Labs Workshop
Use BasicStamp And Basic Language

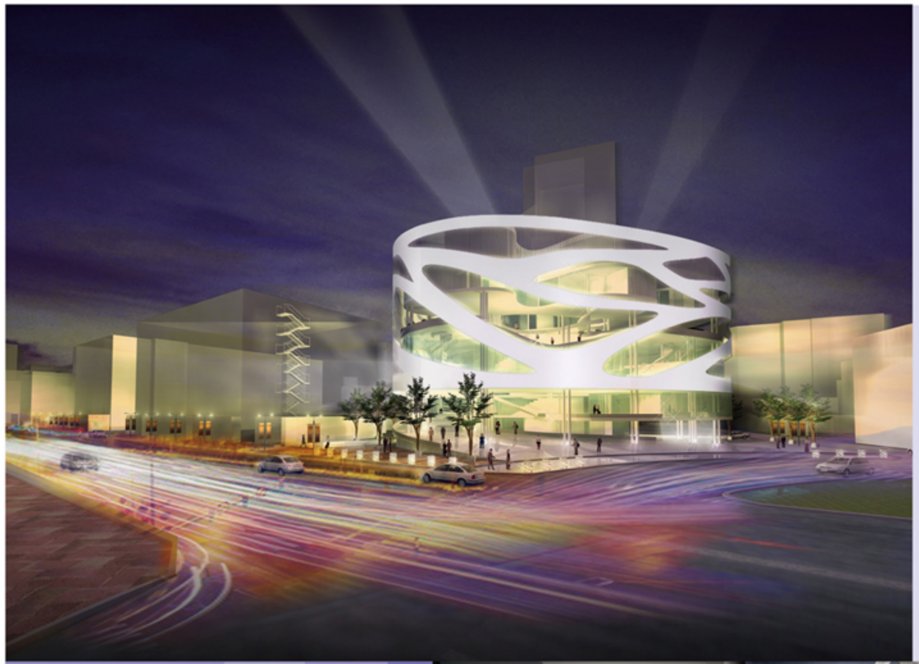
ENGINEERING
(COMPUTER SCIENCE)
+
DESIGN
(ARCHITECTURE)

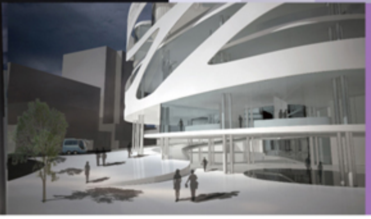
The time spent traveling between spaces increases as city grows. The speed of transport must also increase to answer traffic demands.The cost of commuting will be proportional to distance In my opinion, the concept of the micro-city may solve the endless problem of cost and distance,and save a considerable amount of time transiting between places.

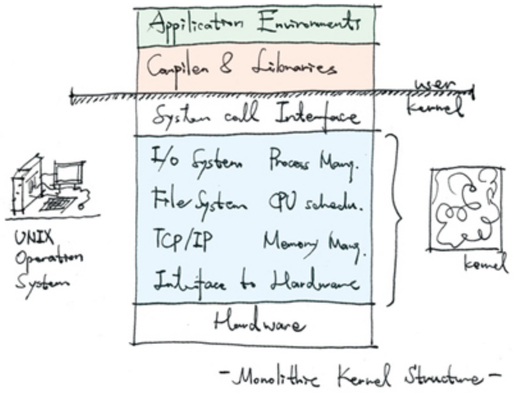
MICRO CITY UNITS

An Experiment Of A Portable Space System

2009 Graduation Design



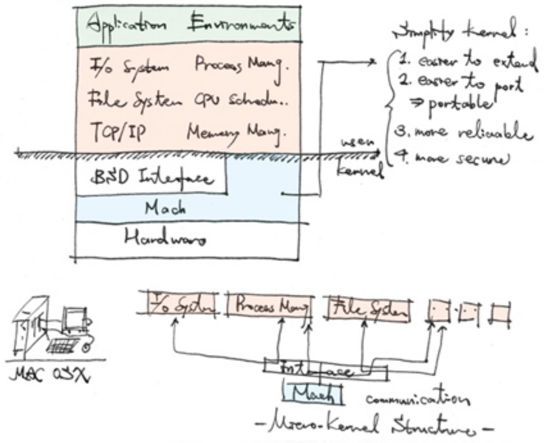



Appilication Environments
Compilen & Libraries
user
kernel
System call Interface
I/o System
Process Mang.
File System
CPU schedu.
TCP/IP
Memory Mang.
Interface to Hardware
Hardware
UNIX Operation System
kernel
- Monolithic Kernel Structure -

01

MONOLITHIC KERNEL STRUCTURE

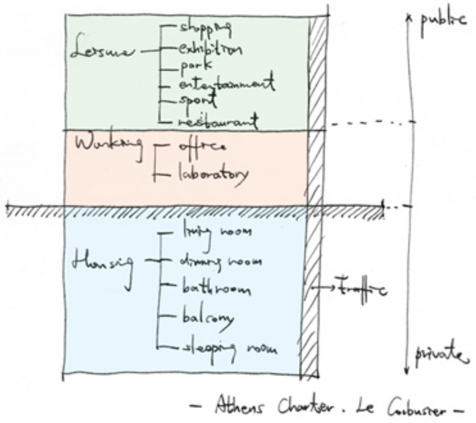
I came up with the idea when I took a class named computer operating system in department of computer science. The lecturer mentioned an early monolithic kernel structure of operating systems, such as DOS and Linus. The kernel structure is very complex and complicated. It contains computer programs such as TCP/IP, memory management, and I/O system...etc.


Application Environments
I/o System
Process Mang.
File System
CPU Schedu..
TCP/IP
Memory Mang.
BSD Interface
Mach
Hardware
user
kernel
Simplify kernel:
1. easier to extend
2. easier to port
⇒ portable
3. more reliable
4. more secure
MAC OSX
I/o System
Process Mang
File System
Interface
Mach
communication
- Micro-Kernel Structure -

02

MICRO KERNEL STRUCTURE

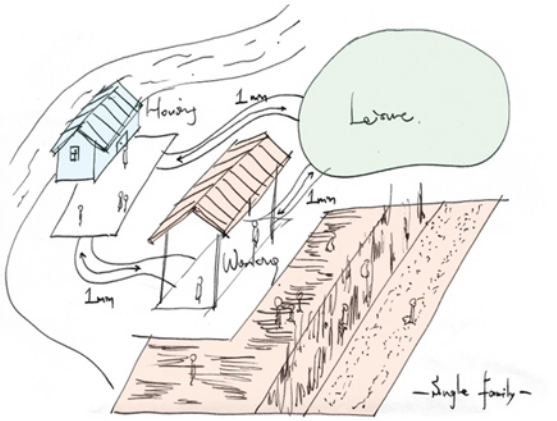
The lecturer also mentioned another kernel structure named micro kernel. It was used on MAC OSX. It moved these complex programs from kernel mode to user mode. It simplified kernel structure significantly and make it lighter. The micro kernel plays a communicating role and connects all devices by a BSD interface. It is more flexible, portable, reliable, and secure.


Leisure
shopping
exhibition
park
entertainment
sport
restaurant
Working
office
laboratory
Housing
living room
dinning room
bathroom
balcony
sleeping room
Traffic
public
private
- Athens Charter . Le Corbusier -

03

ATHENS CHARTER

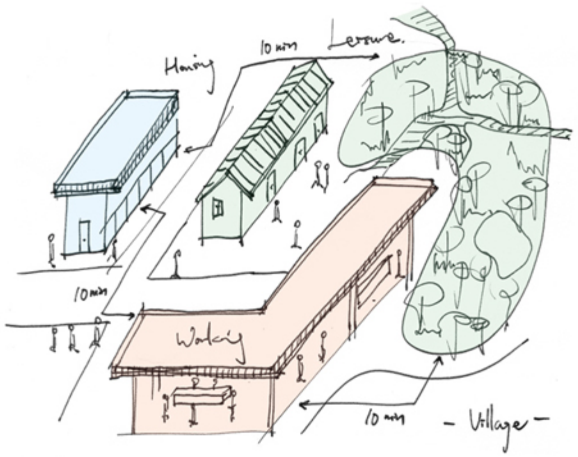
According to the idea of computer operating systems, the issue that I want to discuss is to establish a space system which is composed by distinct functions. I find Athens Charter by Le Corbusier. It indicates that four functions which compose a city are working, leisure, housing, and transportation. And I add a hierarchy from public spaces to private ones on it.


Housing
1 min
Leisure.
1 min
Working
1 min
- Single family -

04

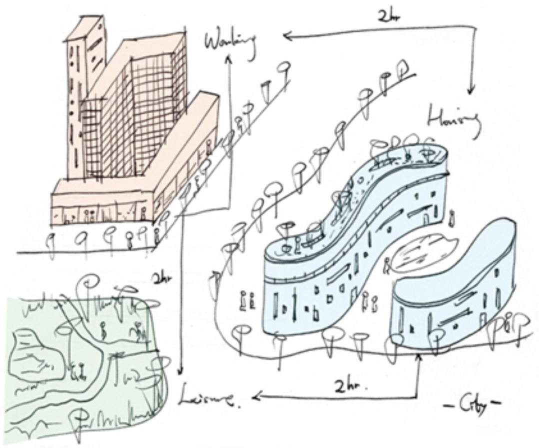
SIGLE FAMILY

I wonder how these four functions work in our daily lives. And I understand the relationship between them from a single family in early times. One thing that interests me the most is the average time that people spent in order to cross different functions. Assume that it takes 2 minutes.


Housing
10 min
Leisure
10 min
Working
10 min
– Village –

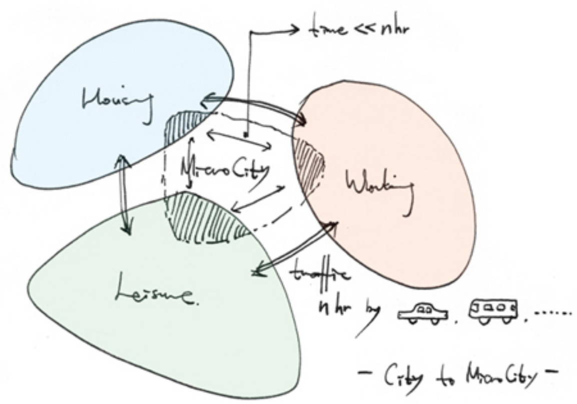
05
VILLAGE

As the population augments, villages are formed naturally. We can also find the new relationship between the four functions in villages. Assume that the time that people need to cross distinct functions increases to 15 minutes.


2hr
Working
Housing
2hr
Leisure
2hr.
– City –

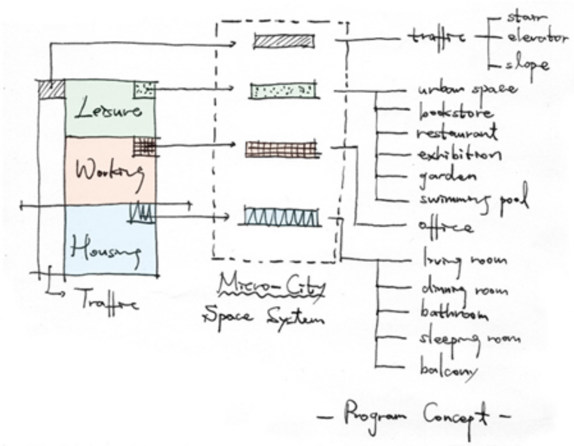
06
URBAN

As the population grows continuously, a city is formed. The average time that people cross different functions may increase to several hours. We cannot walk but have to use transportation systems such as MRT system.


time << nhr
Housing
Micro City
Working
Leisure
traffic
n hr by
– City to MicroCity –

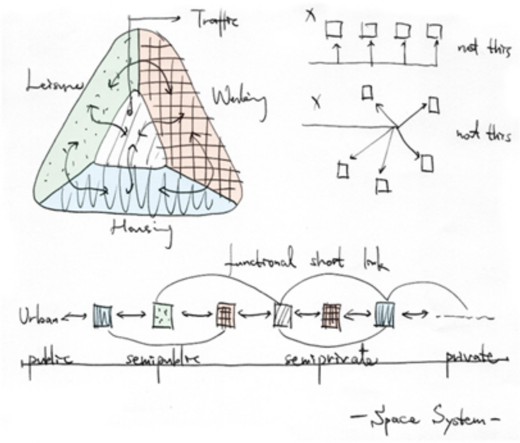
07
CITY TO MICROCITY

The average time that people cross different functions is in proportion to the scale of the city. The speed of transportation tools have to increase in order to meet the needs. And the cost that people spend on transportation tools is also increase. I think that the emergence of micro-cities can solve the problems.


traffic
stair
elevator
slope
Leisure
urban space
bookstore
restaurant
exhibition
garden
swimming pool
Working
office
Housing
living room
dining room
bathroom
sleeping room
balcony
Traffic
Micro-City
Space System
– Program Concept –

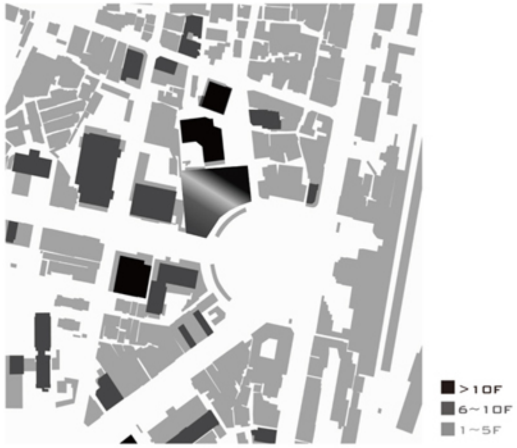
08
PROGRAM CONCEPT

My architecture program is a research center of Apple's productions and computer science. This micro-city includes housing, leisure, working, and transportation. The major purpose is to develop a space system theory and to implement it in architecture.


Traffic
Leisure
Working
Housing
not this
not this
functional short link
Urban
public
semipublic
semiprivate
private
– Space System –

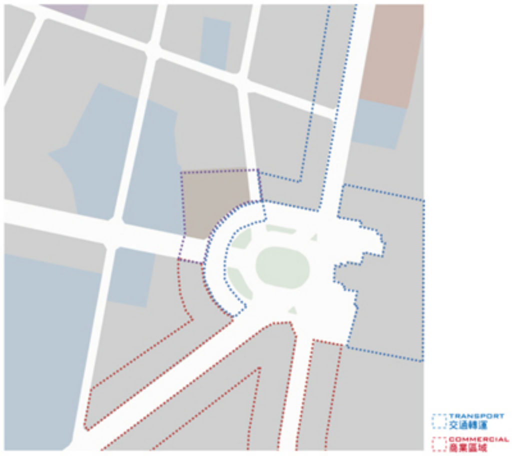
09
SPACE SYSTEM

I start to consider the relationship between the four major functions. I think that they have to communicate with each other and are not just linked by movements. According to the relationship, I build a serious of spaces and add a hierarchy from public spaces to private ones. Some shortcuts are also created.


>10F
6~10F
1~5F

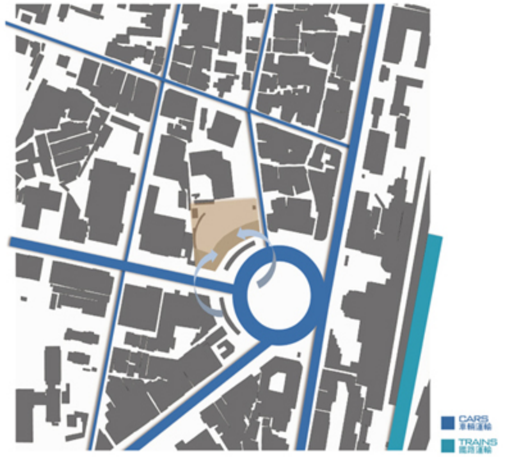
10
THE CONTINUITY OF SKYLINE

I think that the continuity of urban skyline is the first idea that I can add in my project. I distinguish the height of buildings which are near my site by different gray-scale colors and utilize the information to help me to define the morphology of the micro-city.


TRANSPORT
交通轉運
COMMERCIAL
商業區域

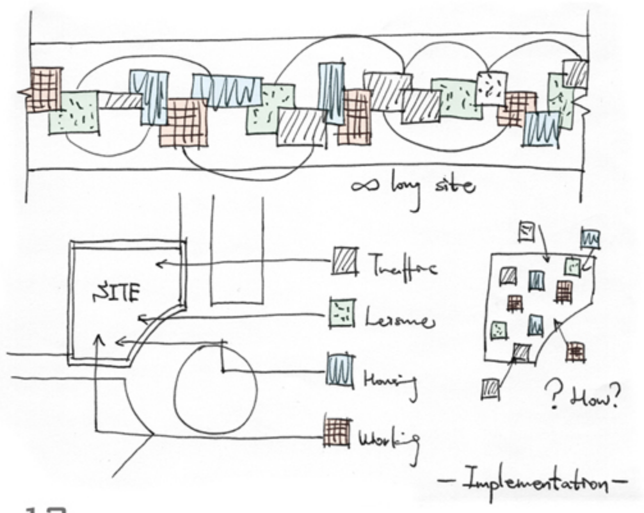
11
THE CONTINUITY OF FUNCTIONS

Then I come up with the second idea – the continuity of urban functions. The red dash line represents commercial activities. The blue dash line represents public transport interchanges. The site is at the intersection of the two functions. I use the information to help me to define the space typology of the micro-city.


CARS
車輛運輸
TRAINS
鐵路運輸

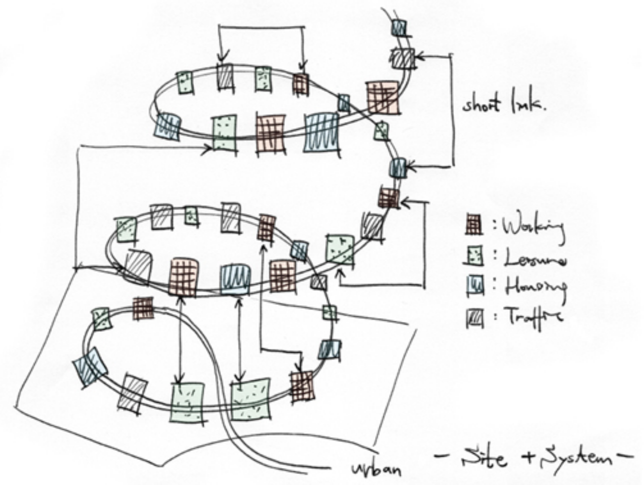
12
THE CONTINUITY OF ACTIVITIES

The third idea is the continuity of human activities near the site. The blue line represents the movement of cars. The cyan line represents the movement of trains. Both of them help me to define the movement of humans and the main entrance of the micro-city.


∞ long site
SITE
Traffic
Leisure
Housing
Working
? How?
– Implementation –

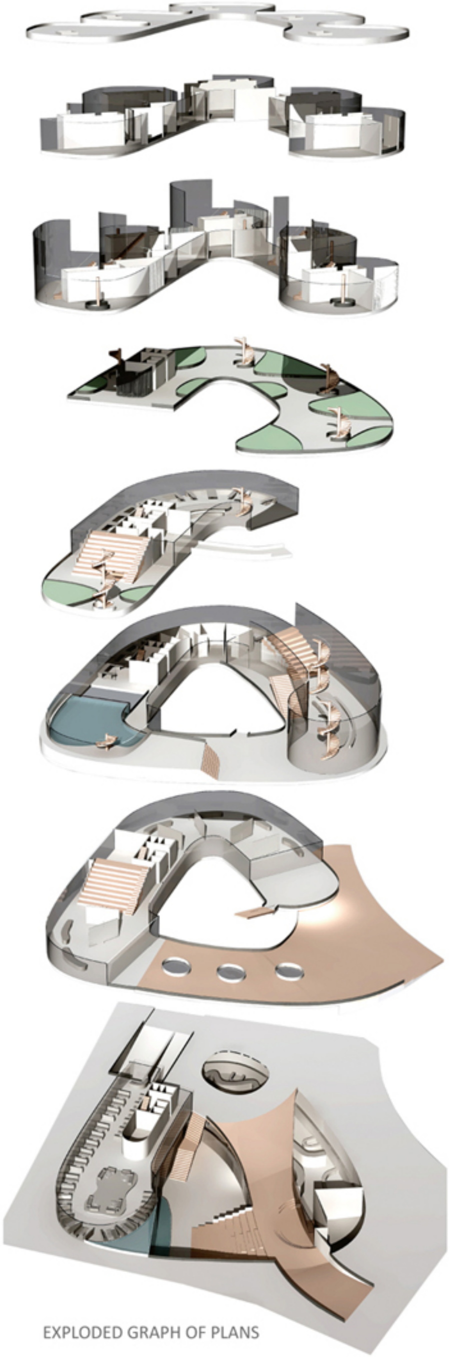
13
IMPLEMENTATION

I start to think how to implement the space system on the site. If I had a site with an infinite length, I would use a strip to link all the different types of functions together. In fact, the area of the site is limited and finite.

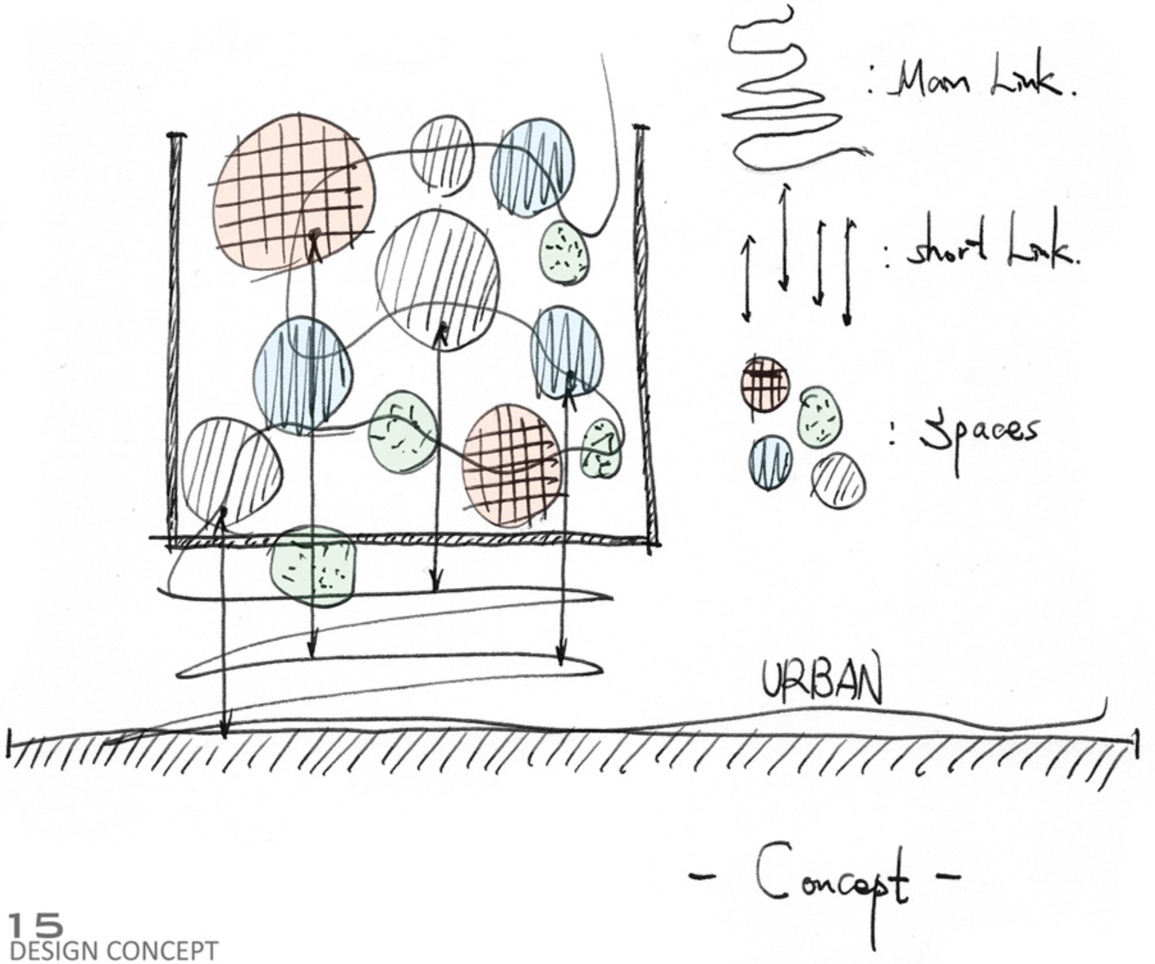

short link.
: Working
: Leisure
: Housing
: Traffic
urban
– Site + System –

14
SITE + SYSTEM

In order to implement the space system on a limited site, I roll up the strip of spaces. The system extends urban fabric and roll up. I also add shortcuts to link specific functions and a hierarchy from public spaces to private ones.

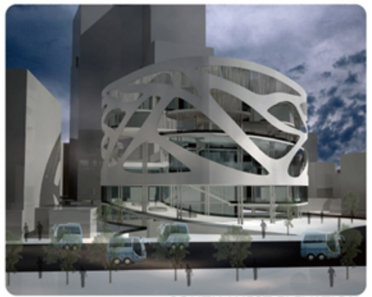


EXPLODED GRAPH OF PLANS

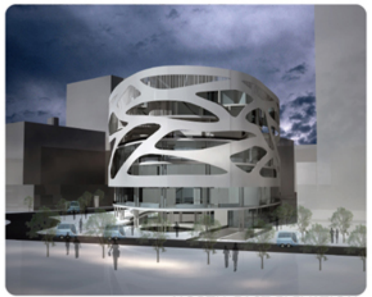

: Main Link.
: short Link.
: Spaces
URBAN
– Concept –

15
DESIGN CONCEPT

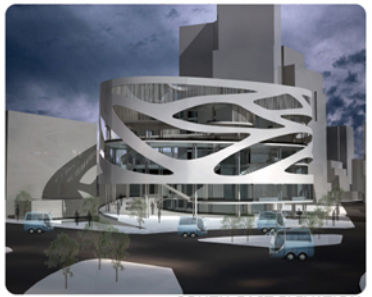
In lower floors, the space extends urban fabric. In higher floors, the space is enclosed by a special facade. The facade integrates the movement of spaces, the type of spaces, and shortcuts in order to reinterpret the design concept of Apple.



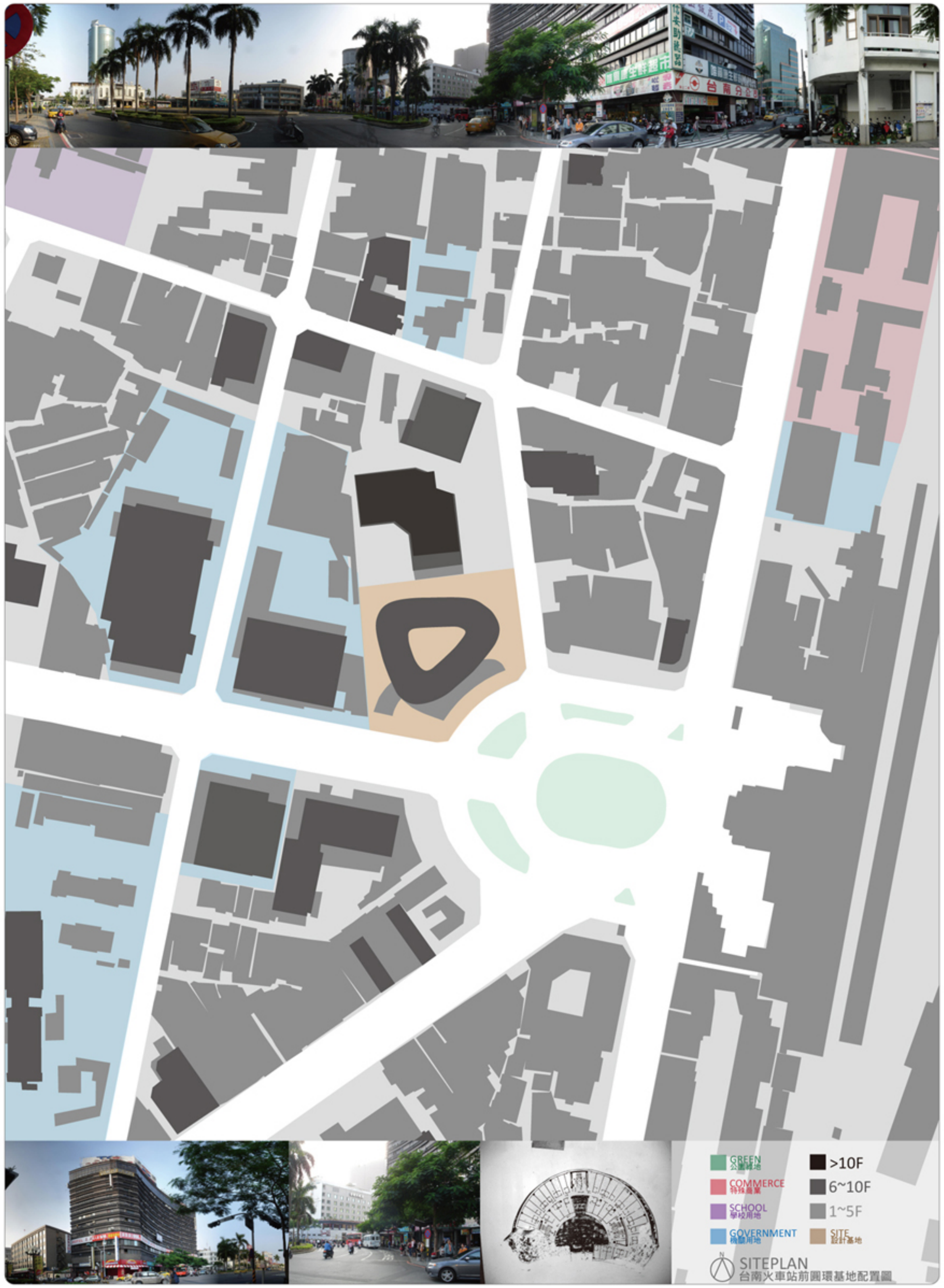
SOUTH-WEST ELEVATION



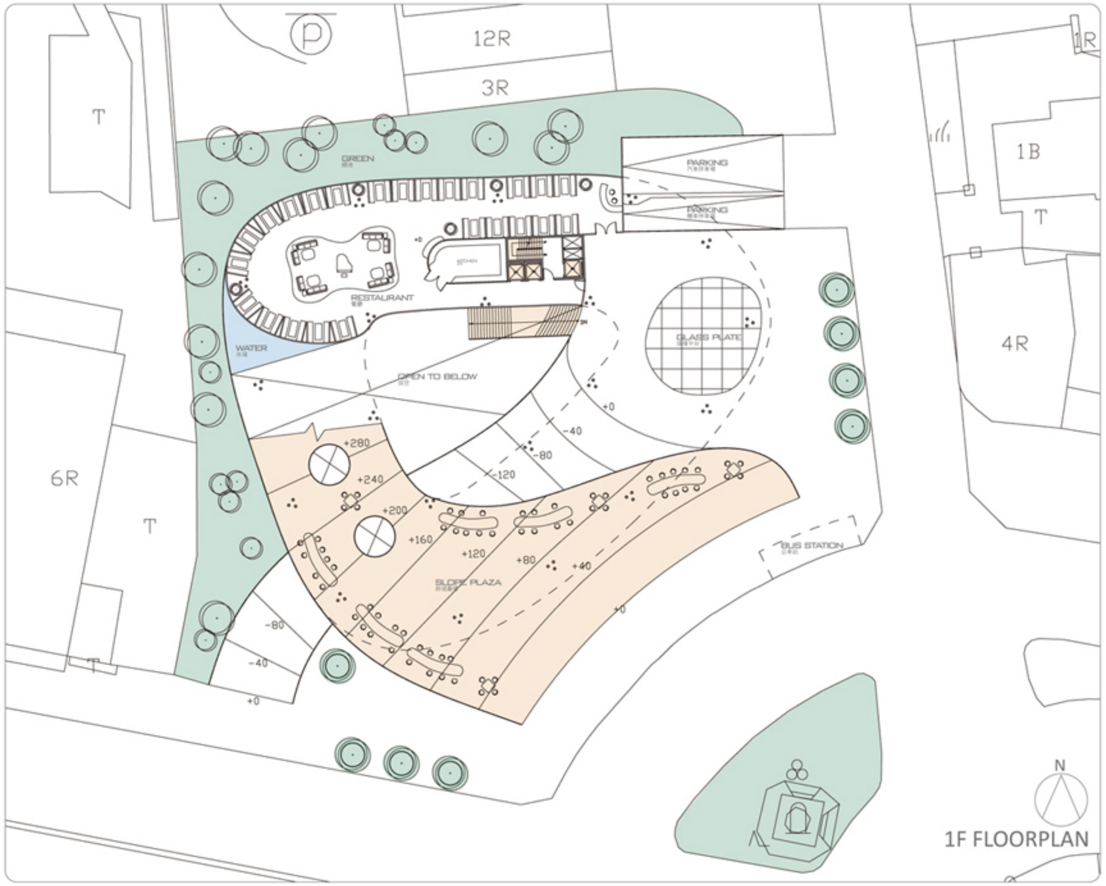
NORTH-EAST ELEVATION



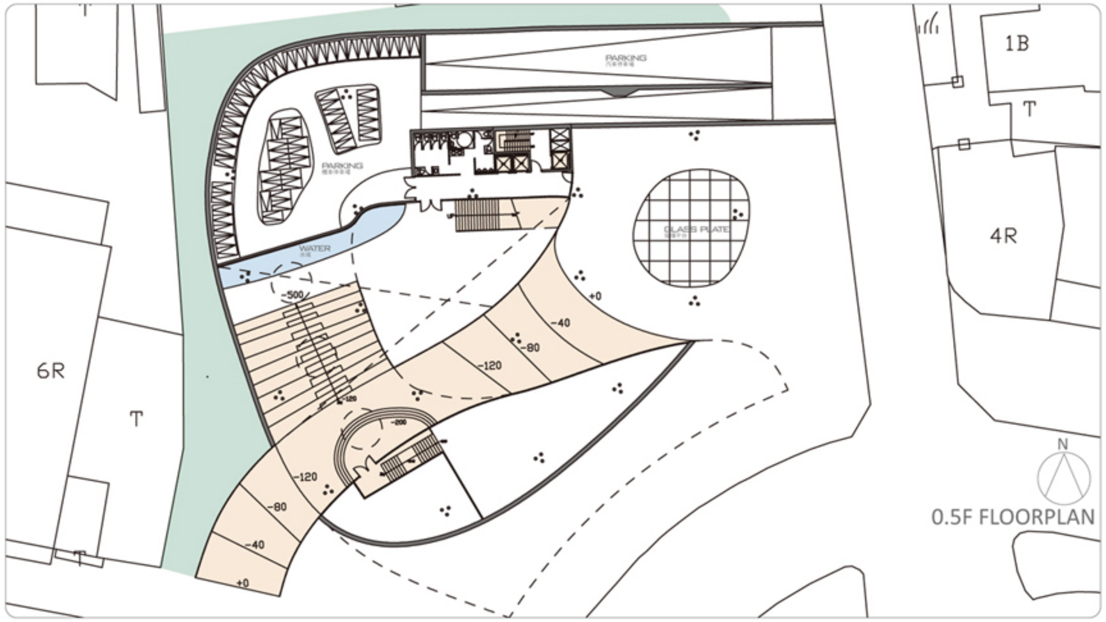
SOUTH-EAST ELEVATION


GREEN
公園綠地
COMMERCE
特殊商業
SCHOOL
學校用地
GOVERNMENT
機關用地
>10F
6~10F
1~5F
SITE
設計基地
N

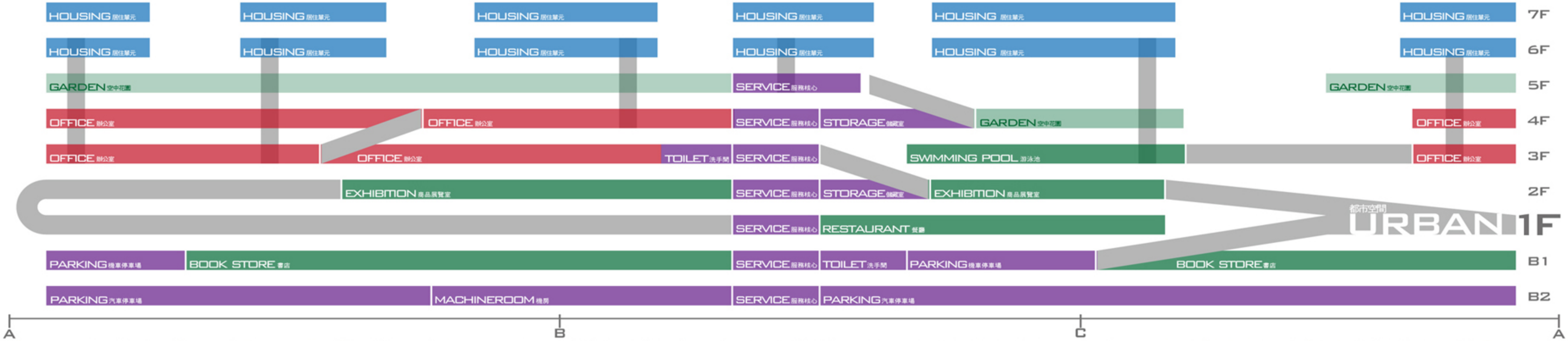
SITEPLAN
台南火車站前圓環基地配置圖


P
12R
3R
T
1R
1B
T
4R
6R
T
GREEN
PARKING
PARKING
RESTAURANT
KITCHEN
+0
WATER
OPEN TO BELOW
GLASS PLATE
+0
-40
-80
-120
+280
+240
+200
+160
+120
+80
+40
SLOPE PLAZA
BUS STATION
+0
-80
-40
+0
N

1F FLOORPLAN


1B
T
4R
6R
T
PARKING
PARKING
WATER
GLASS PLATE
-500
+0
-40
-80
-120
-120
-200
-120
-80
-40
+0
N

0.5F FLOORPLAN



7F: HOUSING 居住單元 · HOUSING 居住單元 · HOUSING 居住單元 · HOUSING 居住單元 · HOUSING 居住單元 · HOUSING 居住單元

6F: HOUSING 居住單元 · HOUSING 居住單元 · HOUSING 居住單元 · HOUSING 居住單元 · HOUSING 居住單元 · HOUSING 居住單元

5F: GARDEN 空中花園 · SERVICE 服務核心 · GARDEN 空中花園

4F: OFFICE 辦公室 · OFFICE 辦公室 · SERVICE 服務核心 · STORAGE 儲藏室 · GARDEN 空中花園 · OFFICE 辦公室

3F: OFFICE 辦公室 · OFFICE 辦公室 · TOILET 洗手間 · SERVICE 服務核心 · SWIMMING POOL 游泳池 · OFFICE 辦公室

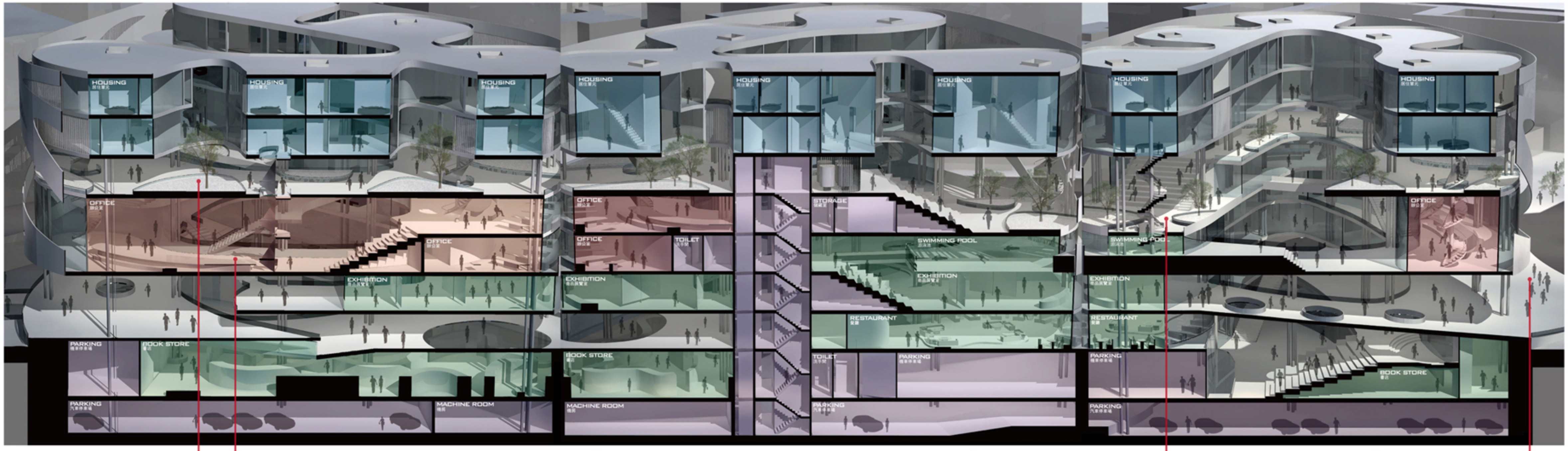
2F: EXHIBITION 商品展覽室 · SERVICE 服務核心 · STORAGE 儲藏室 · EXHIBITION 商品展覽室

1F: SERVICE 服務核心 · RESTAURANT 餐廳 · 都市空間 URBAN

B1: PARKING 機車停車場 · BOOK STORE 書店 · SERVICE 服務核心 · TOILET 洗手間 · PARKING 機車停車場 · BOOK STORE 書店

B2: PARKING 汽車停車場 · MACHINEROOM 機房 · SERVICE 服務核心 · PARKING 汽車停車場

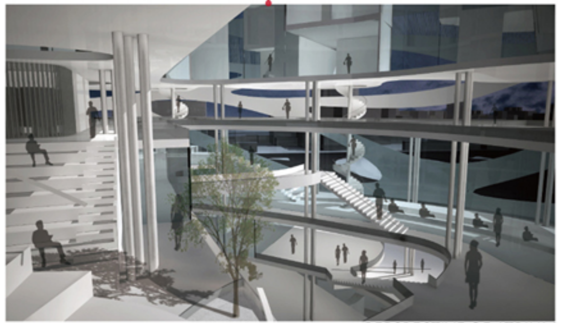
A
B
C
A



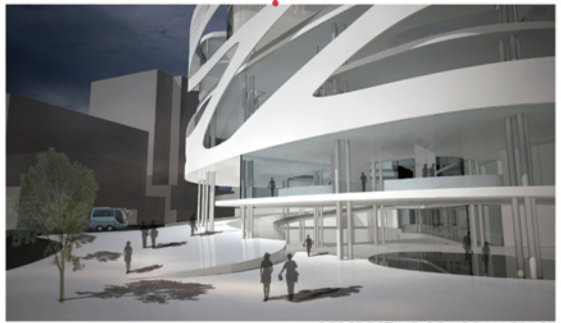
HOUSING
OFFICE
TOILET
STORAGE
SWIMMING POOL
EXHIBITION
RESTAURANT
PARKING
BOOK STORE
MACHINE ROOM

PERSPECTIVE OF GARDEN

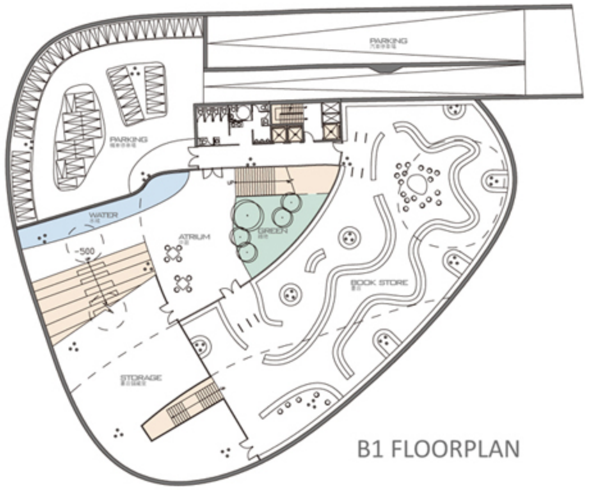
PERSPECTIVE OF OFFICE



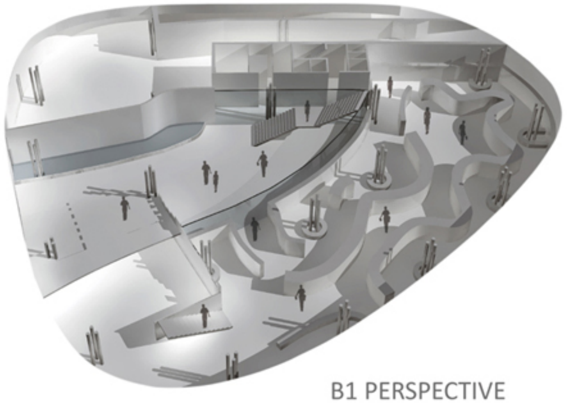
PERSPECTIVE OF ATRIUM



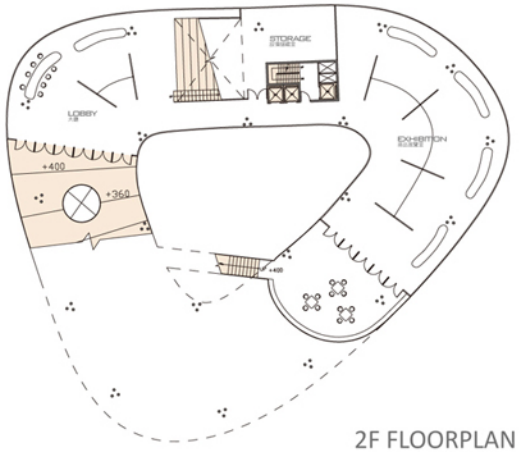
PERSPECTIVE OF URBAN SPACE


PARKING
PARKING
WATER
-500
ATRIUM
GREEN
BOOK STORE
STORAGE

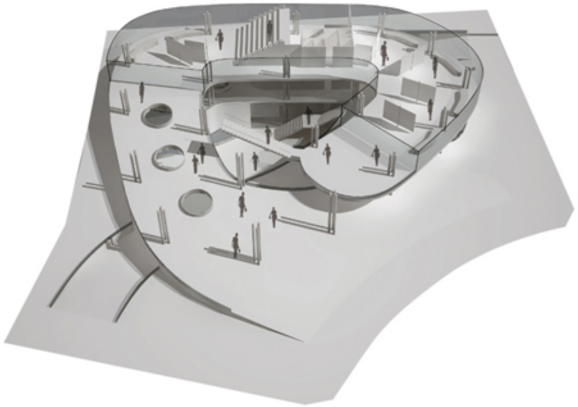
B1 FLOORPLAN



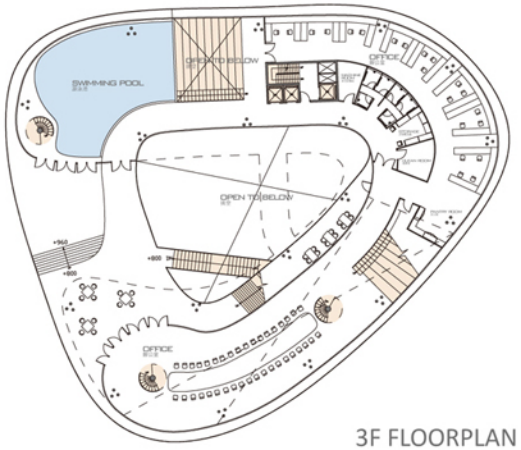
B1 PERSPECTIVE


STORAGE
LOBBY
EXHIBITION
+400
+360
+400

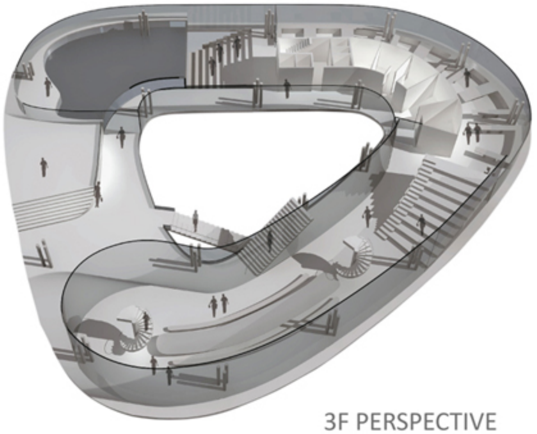
2F FLOORPLAN



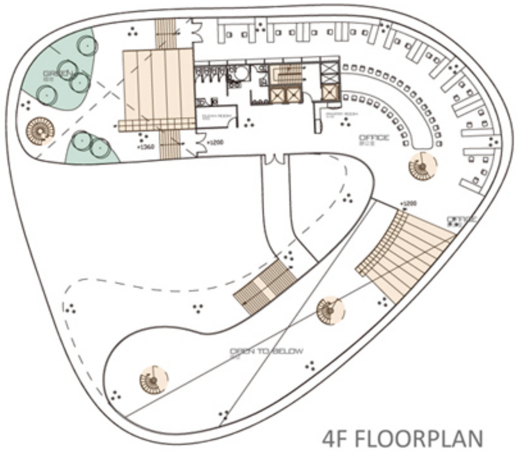
2F PERSPECTIVE


SWIMMING POOL
OPEN TO BELOW
OFFICE
OPEN TO BELOW
OFFICE

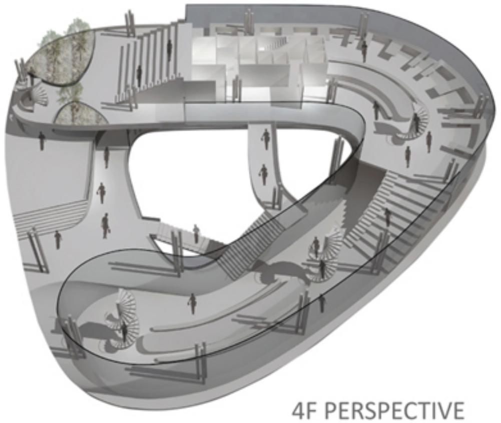
3F FLOORPLAN



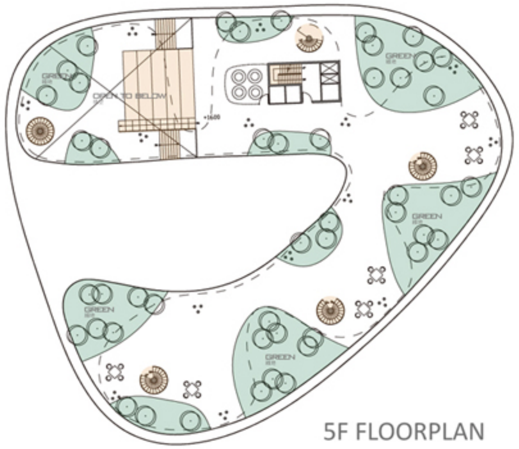
3F PERSPECTIVE


+1360
+1200
OFFICE
+1200
OPEN TO BELOW

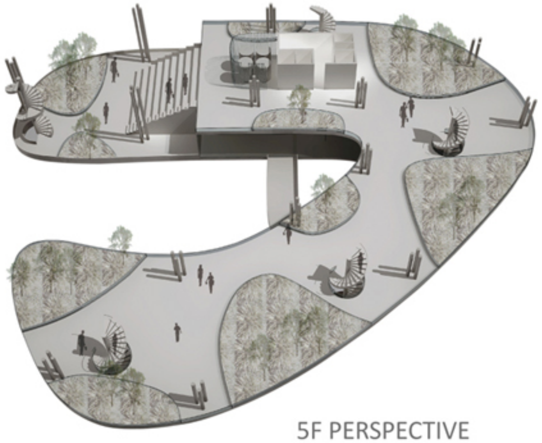
4F FLOORPLAN



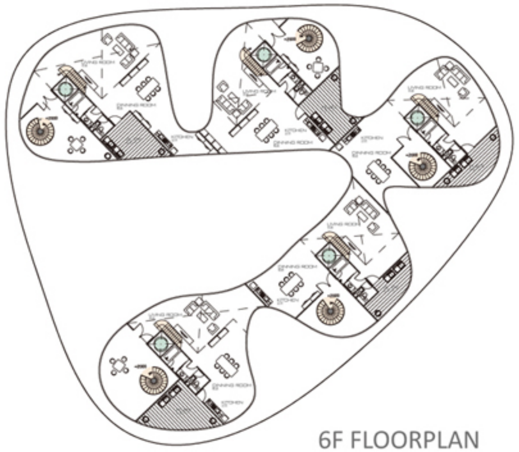
4F PERSPECTIVE


GREEN
OPEN TO BELOW
+1600
GREEN
GREEN
GREEN
GREEN

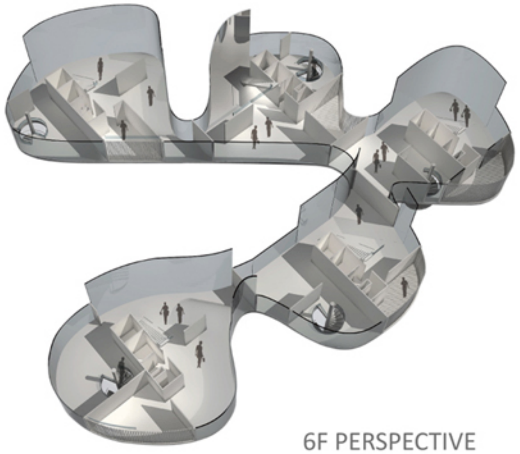
5F FLOORPLAN



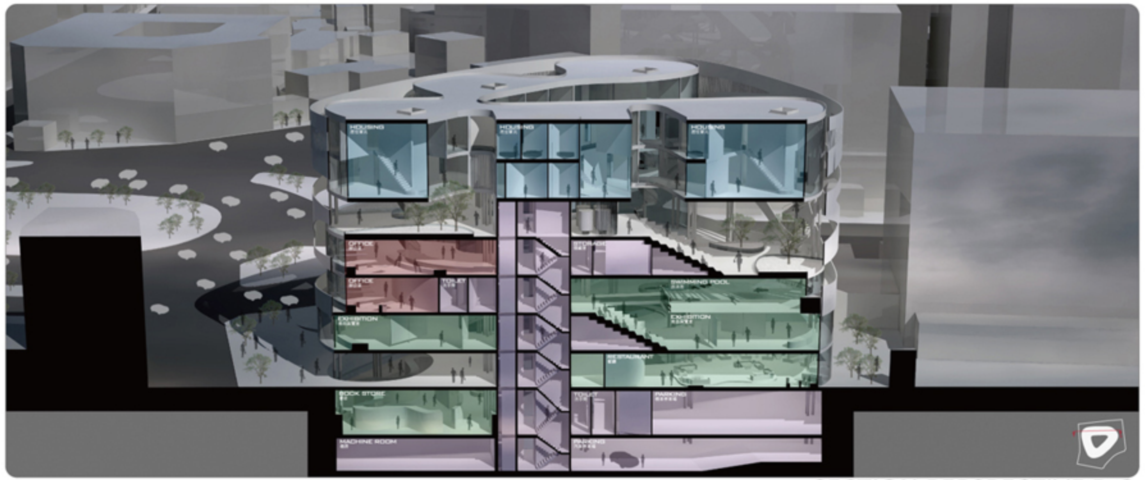
5F PERSPECTIVE


LIVING ROOM
DINING ROOM
KITCHEN

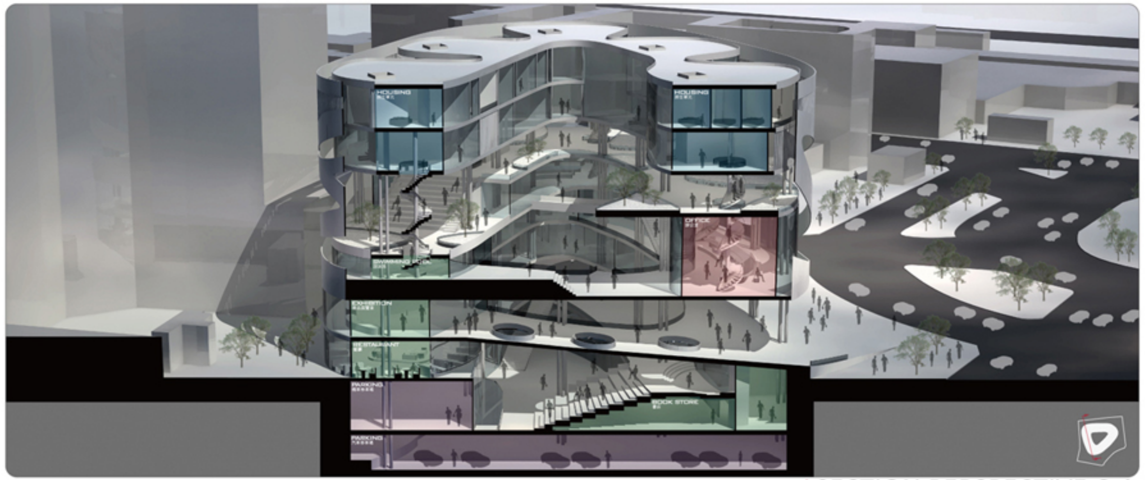
6F FLOORPLAN



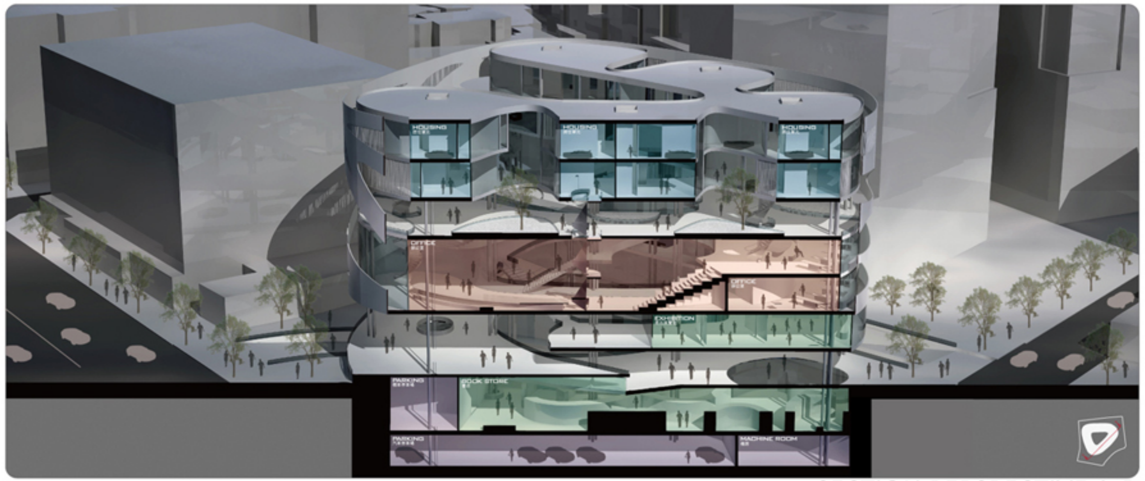
6F PERSPECTIVE



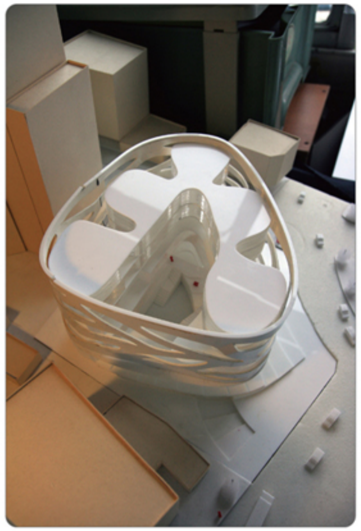
SECTION PERSPECTIVE B-C

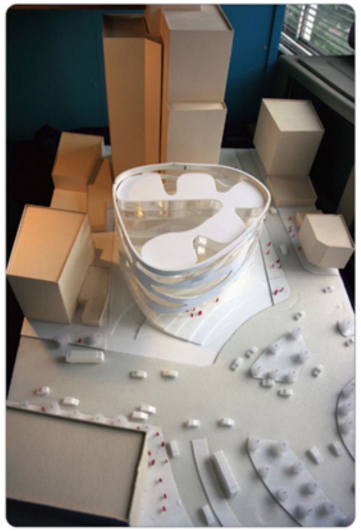


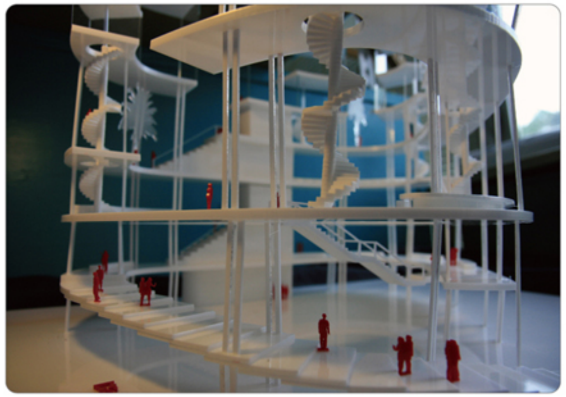
SECTION PERSPECTIVE C-A

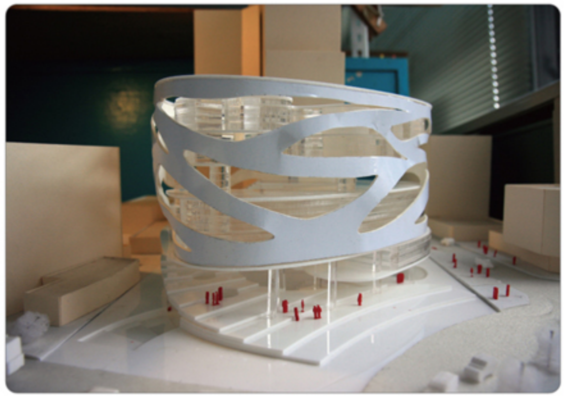


SECTION PERSPECTIVE A-B





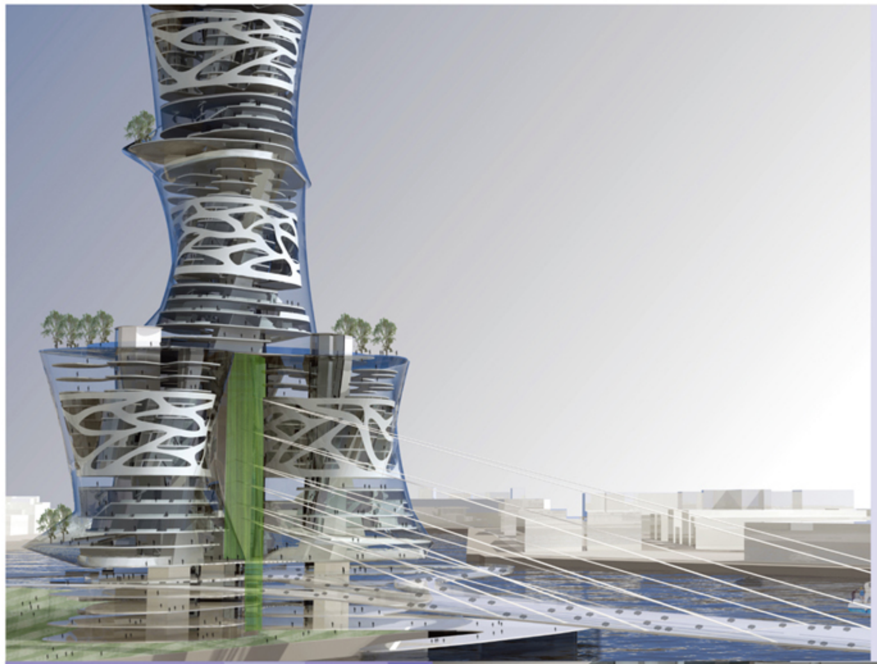


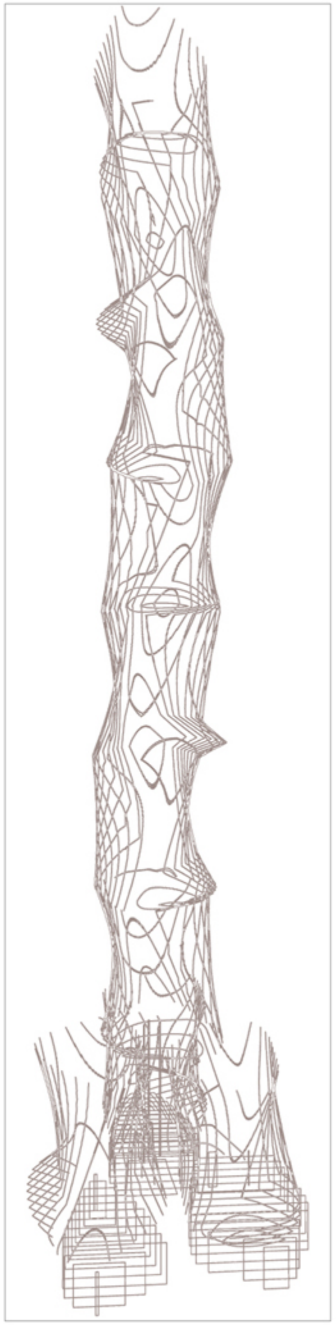


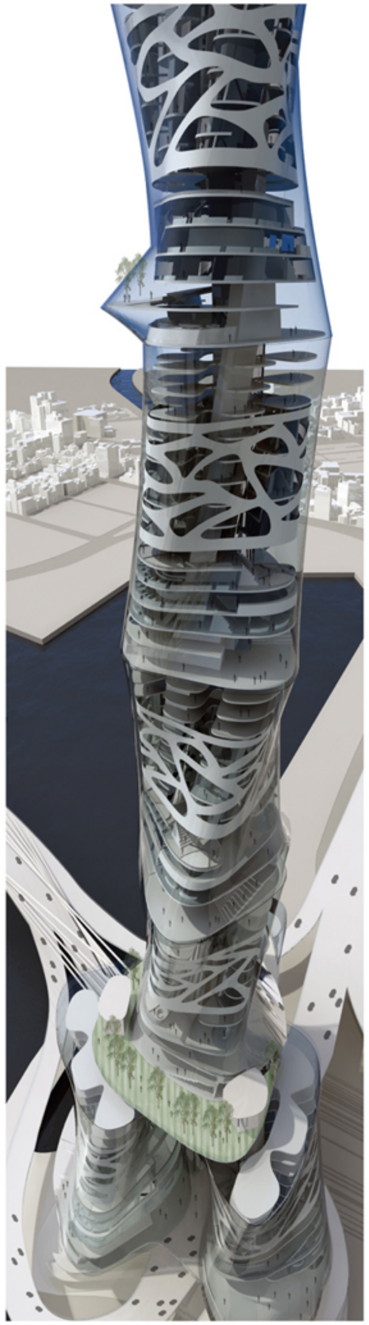
The increasing rate of metropolitan growth has led to serious issues about how a city can be formalized to minimize waste and transportation costs, and maximize sustainable energy and resource efficiency, and self-sufficiency while interacting with nature. The primary purpose of the design is to develop a distinctive site context in spatial typology which reacts to various physical environments in spatial morphology.

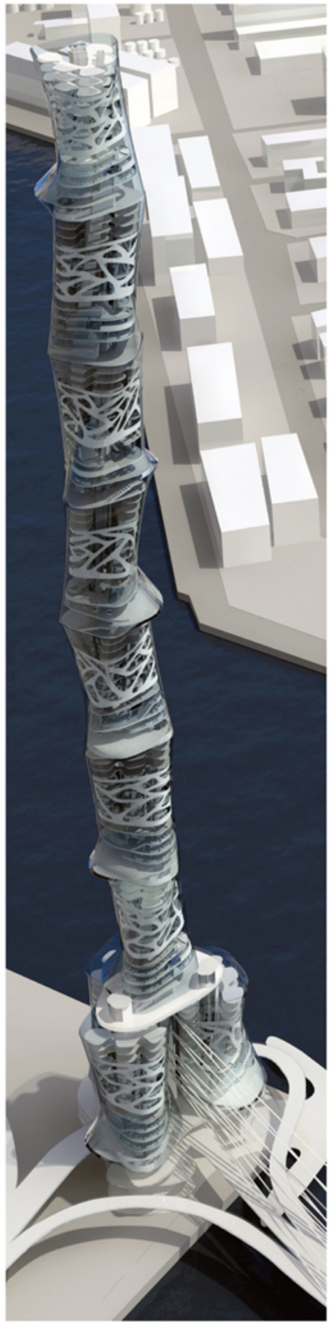
GREEN DREAMS - MICRO CITY

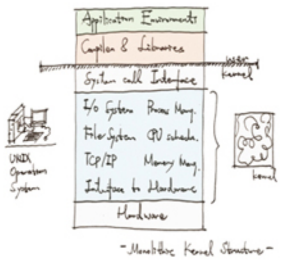
A Sustainable And Ecological Living System
2010 Skyscraper competition

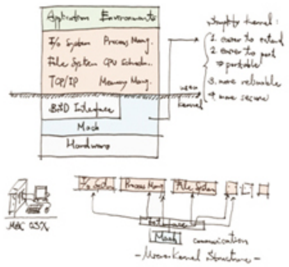


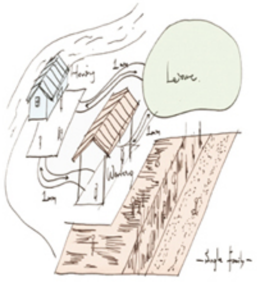


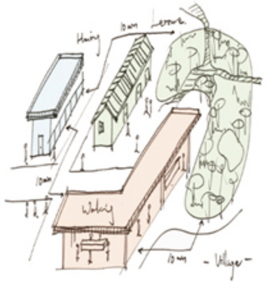




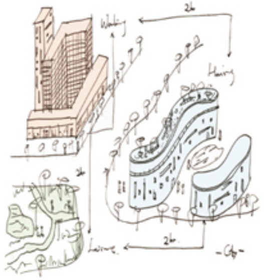

Application Environments
Compilers & Libraries
System call Interface
I/o System Process Mang.
File System CPU schedule
TCP/IP Memory Mang.
Interface to Hardware
Hardware
UNIX Operating System
kernel
-Monolithic Kernel Structure-

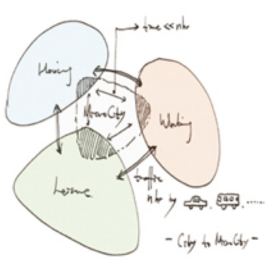

Application Environments
I/o System Process Mang.
File System CPU schedule
TCP/IP Memory Mang.
BSD Interface
Mach
Hardware
kernel
MAC OSX
communication
-Microkernel Structure-

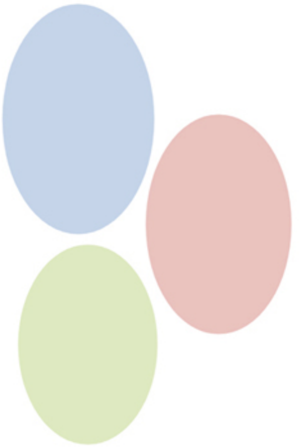

Leisure
Housing
Working


Housing
Leisure
Working
- Village -

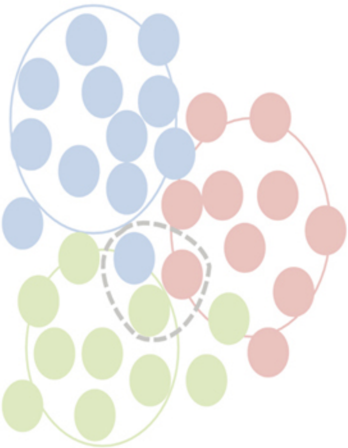
The idea arises from a Computer infrastructure - a Macintosh micro kernel structure streamlined from an early monolithic one which significantly improves the performance, portability and security of the operating system.


Working
Housing
Leisure
- City -

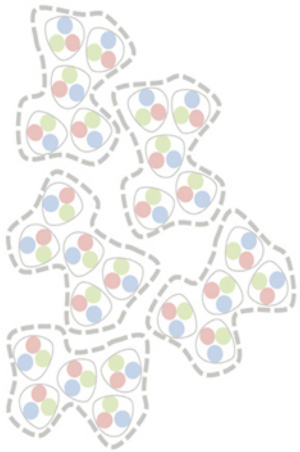

Housing
Working
Leisure
- City to MicroCity -



Scale Of The City Increases
Transportation Time Increases
Garbage, Pollution And Waste Increase
Resource And Energy Efficiency Decrease
Land Using Efficiency Decreases



Divide Into Small Functions
Select Functions
Combine Functions Into Micro City Units
Reorganize Units
Add Eco Living System



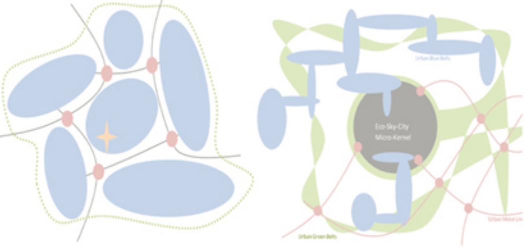
Maintain The Population Of Each Micro City
Minimum Transportation Time Cost
Minimum Garbage, Pollution And Waste
Maximum Resource And Energy Efficiency
Maximum Land Using Efficiency

Program Concept 01 -> Micro City -> Minimum Or Maximum Properties To Solve Problems

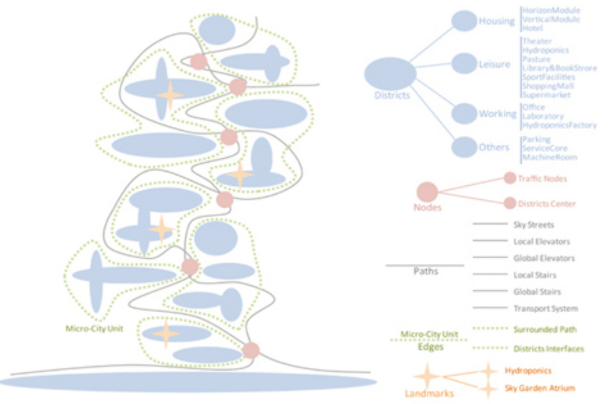
Program Concept 02 -> Micro City Unit -> Reorganize Micro City Units

Program Concept 03 -> Dynamic Green Facade -> Respond To Physical Environments

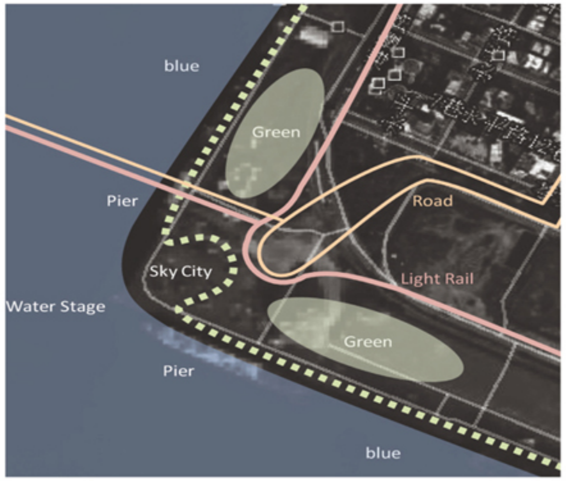
The divideand - conquer concept is utilized to design a skyscraper as a micro-city intending to divide large-scale urban functions into small-scale ones (micro-city units). They are reorganized into an eco-living system (a multi-functional micro-city), making it much easier to maintain than its large-scale counterpart.


Urban Blue Belts
Eco-Sky-City
Micro-Kernel
Urban Green Belts
Urban Move Un

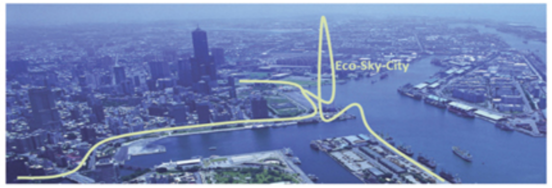
Paths = the streets, sidewalks, and other channels in which people travel;
Edges = perceived boundaries such as walls, buildings, and shorelines;
Districts = relatively large sections of the city distinguished by some identity;
Nodes = focal points, intersections or loci;
Landmarks = readily identifiable objects which serve as reference points;


Micro-City Unit
Districts
Housing
HorizonModule
VerticalModule
Hotel
Leisure
Theater
Hydroponics
Pasture
Library&BookStrore
SportFacilities
ShoppingMall
Supermarket
Working
Office
Laboratory
HydroponicsFactory
Others
Parking
ServiceCore
MachineRoom
Nodes
Traffic Nodes
Districts Center
Paths
Sky Streets
Local Elevators
Global Elevators
Local Stairs
Global Stairs
Transport System
Micro-City Unit
Edges
Surrounded Path
Districts Interfaces
Landmarks
Hydroponics
Sky Garden Atrium

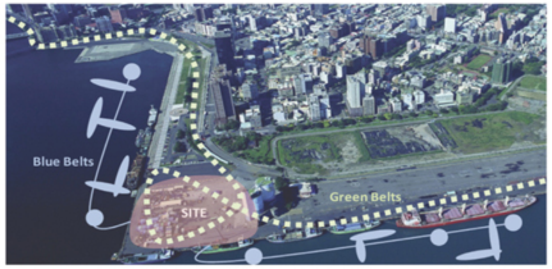
The micro-city is located in Kaohsiung City, a harbor city of Taiwan, which is situated on the boundary of the tropics and subtropics in Asia. Because of the local climate and environmental requirements, the micro-city involves a vertical and horizontal water transportation system at its core to regulate the micro-climate and transport citizens by water elevator from the microcity to the urban blue highway. To save energy, the core system desalinates sea water for the water supply to be electrolyzed to produce oxygen and hydrogen in fuel cell and algae power generation. A vertical farm with hydroponic mechanism in agriculture is placed in every micro-city unit to provide vegetables and fruit for citizens.


blue
Green
Pier
Road
Sky City
Light Rail
Water Stage
Green
Pier
blue

SITE
Move Unit
Blue Belts


Eco-Sky-City

Mac OS X Leopard


Blue Belts
SITE
Green Belts

Minimum Spanning Tree (MST)

A spanning tree in undirected graph G
Whose weight is minimum over all spanning tree

Minimum Spanning Tree Problem

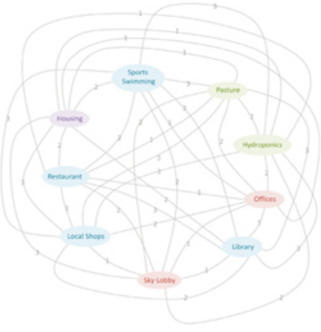
Undirected graph G = (V, E)
Weight w(u, v) on each edge (u, v) ∈E
Find T ⊆E such that
1. T connects all vertices (a spanning tree)
2. w(T) = Σw(u, v) is minimized
i.e.
Space linkage cost graph G
Edge weight = priority of two connected spaces
Find a linkage connect all spaces
And the cost of the linkage is minimum

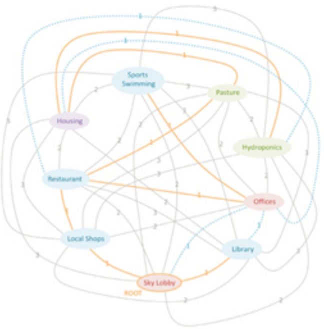
Graph Theory : Prim's Algorithm

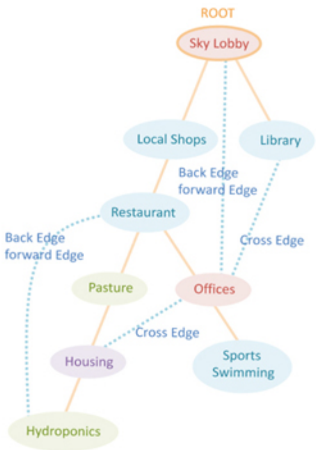
Builds one tree, so A is always a tree
Starts from an arbitrary "root" r
At each step, find a light edge crossing cut (Va, V-Va)
Va= vertices that A is incident on and add this edge to A

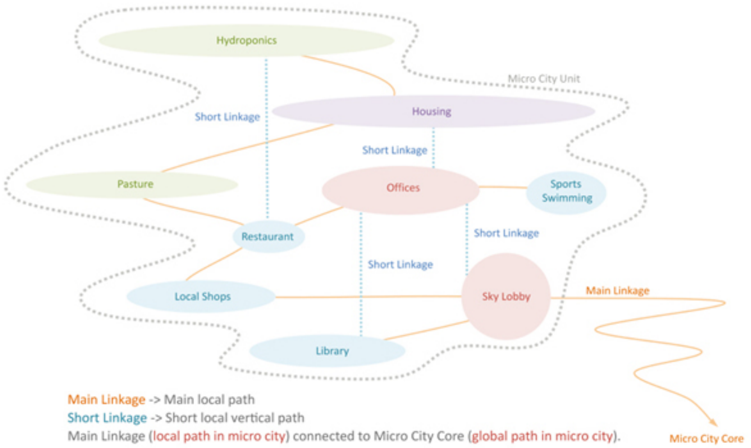
PRIM(V, E, weight, root)

```
Q <-Ø
for each u ∈V[G] //initialize
    do key[u] <-∞
    π[u] <-NIL //set predecessor
    INSERT(Q, u)
DECREASE-KEY(Q, r, 0) //priority queue
While Q ≠ Ø
    do u <-EXTRACT-MIN(Q)
    for each v ∈Adjacent[u]
        do if v ∈Q and w(u, v) < key[v]
            then π[v] <-u
            DECREASE-KEY(Q, v, w(u, v))
```


Sports Swimming
Pasture
Housing
Hydroponics
Restaurant
Offices
Local Shops
Library
Sky Lobby


Sports Swimming
Pasture
Housing
Hydroponics
Restaurant
Offices
Local Shops
Library
Sky Lobby
ROOT

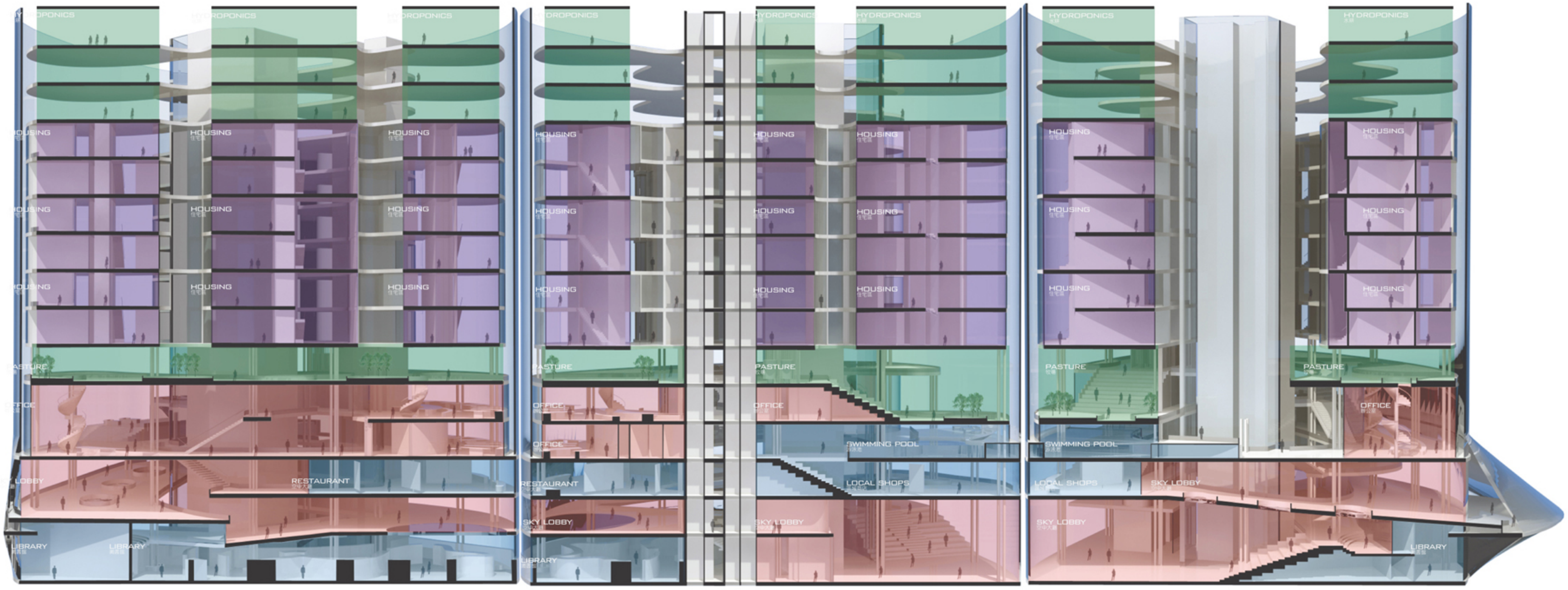

ROOT
Sky Lobby
Local Shops
Library
Back Edge forward Edge
Restaurant
Back Edge forward Edge
Cross Edge
Pasture
Offices
Cross Edge
Housing
Sports Swimming
Hydroponics

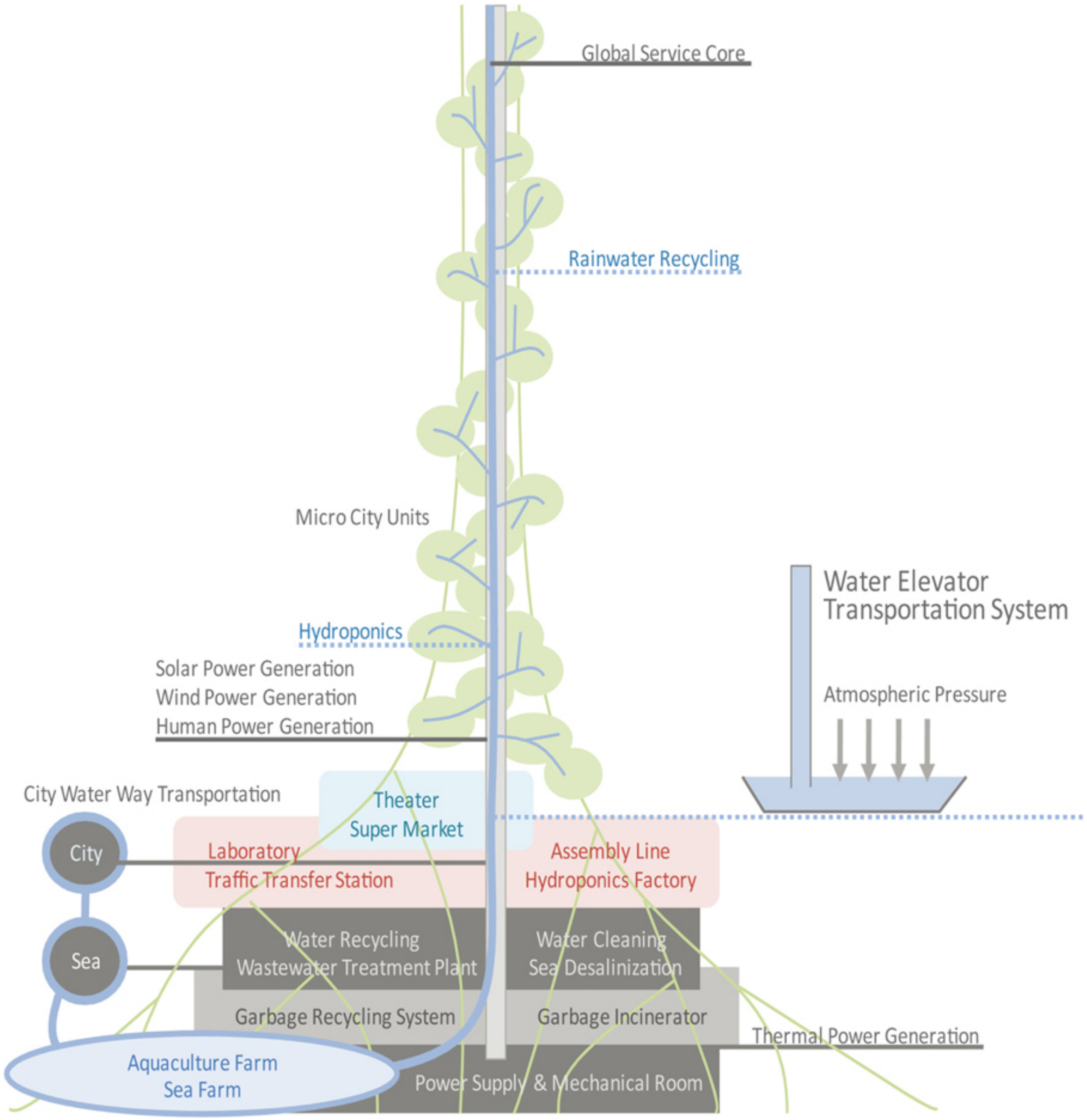

Hydroponics
Micro City Unit
Short Linkage
Housing
Short Linkage
Pasture
Offices
Sports Swimming
Restaurant
Short Linkage
Short Linkage
Local Shops
Sky Lobby
Main Linkage
Library
Micro City Core

Main Linkage -> Main local path
Short Linkage -> Short local vertical path
Main Linkage (local path in micro city) connected to Micro City Core (global path in micro city).

Every fundamental element of the micro-city is the taxonomic classification of spatial characteristics and is organized according to a hierarchical tree graph in the Graph Theory of computer science. A graph is an abstract representation of a set of vertices indicating distinctive spatial functions and edges with costs.

For instance, a lower cost edge connecting some pairs of functions demonstrates a stronger correlation than a higher one. Therefore, using Prim's Algorithm in the Graph Theory, the minimum spanning tree in which the sum of total edge costs is lowest is the best spatial system among all possible combinations of spanning trees.


HYDROPONICS
HOUSING
PASTURE
OFFICE
SWIMMING POOL
RESTAURANT
LOCAL SHOPS
SKY LOBBY
LIBRARY



Global Service Core

Rainwater Recycling

Micro City Units

Hydroponics

Solar Power Generation
Wind Power Generation
Human Power Generation

Water Elevator
Transportation System

Atmospheric Pressure

City Water Way Transportation

City

Sea

Theater
Super Market

Laboratory
Traffic Transfer Station

Assembly Line
Hydroponics Factory

Water Recycling
Wastewater Treatment Plant

Water Cleaning
Sea Desalinization

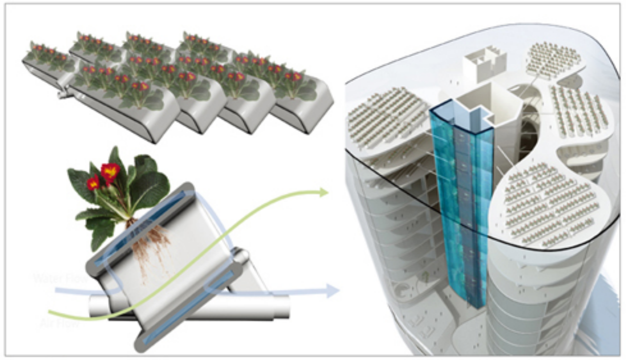
Garbage Recycling System

Garbage Incinerator

Thermal Power Generation

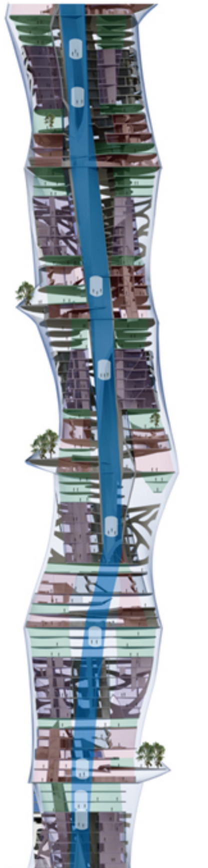
Aquaculture Farm
Sea Farm

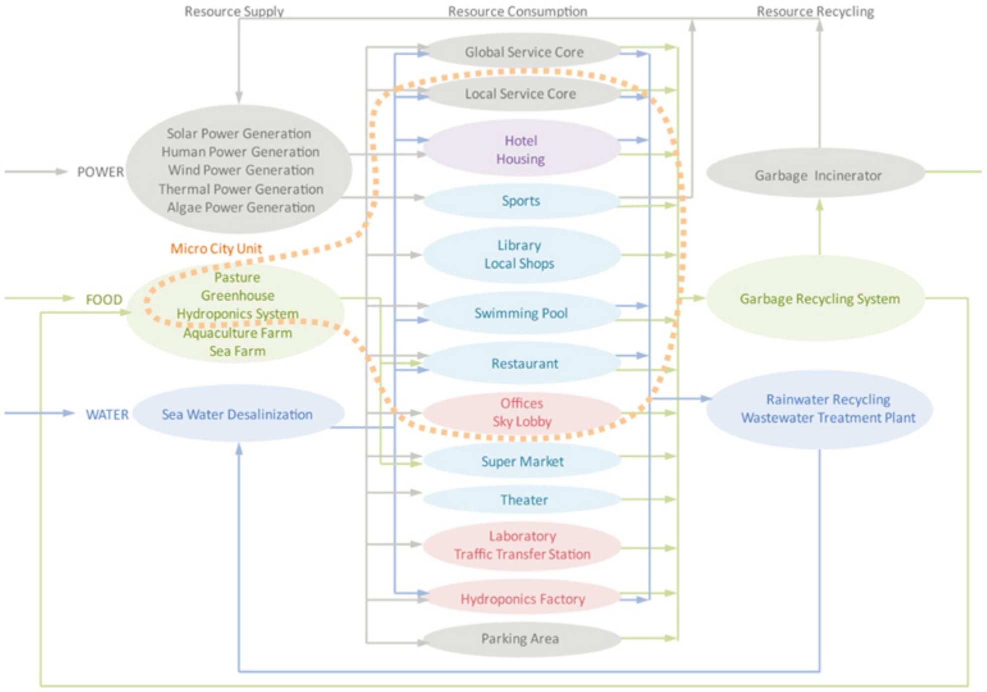
Power Supply & Mechanical Room



ALGAE POWER GENERATION

Algae grown in water pipeline.
Sewage wastes used as nutrient source for algae.
Potential Products :
Hydrogen (for fuel cells)
Lipids (for biodiesel)
Biosolids (soil amendment, livestock feed, combustible)





Resource Supply

Resource Consumption

Resource Recycling

POWER

Solar Power Generation
Human Power Generation
Wind Power Generation
Thermal Power Generation
Algae Power Generation

Micro City Unit

FOOD

Pasture
Greenhouse
Hydroponics System
Aquaculture Farm
Sea Farm

WATER

Sea Water Desalinization

Global Service Core

Local Service Core

Hotel
Housing

Sports

Library
Local Shops

Swimming Pool

Restaurant

Offices
Sky Lobby

Super Market

Theater

Laboratory
Traffic Transfer Station

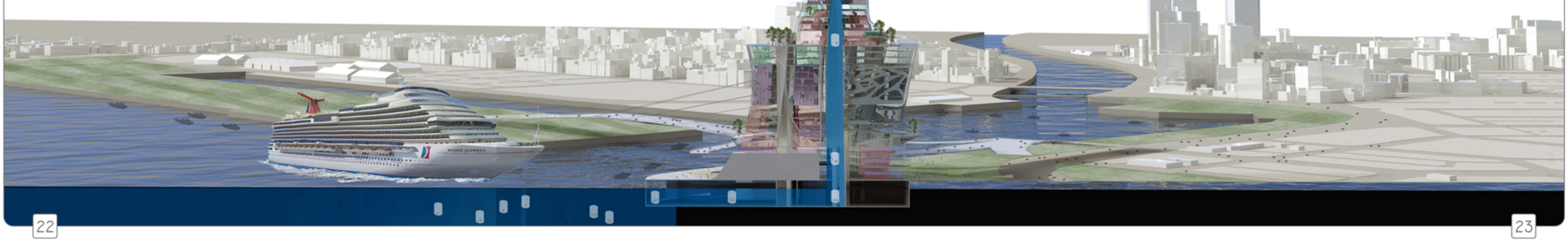
Hydroponics Factory

Parking Area

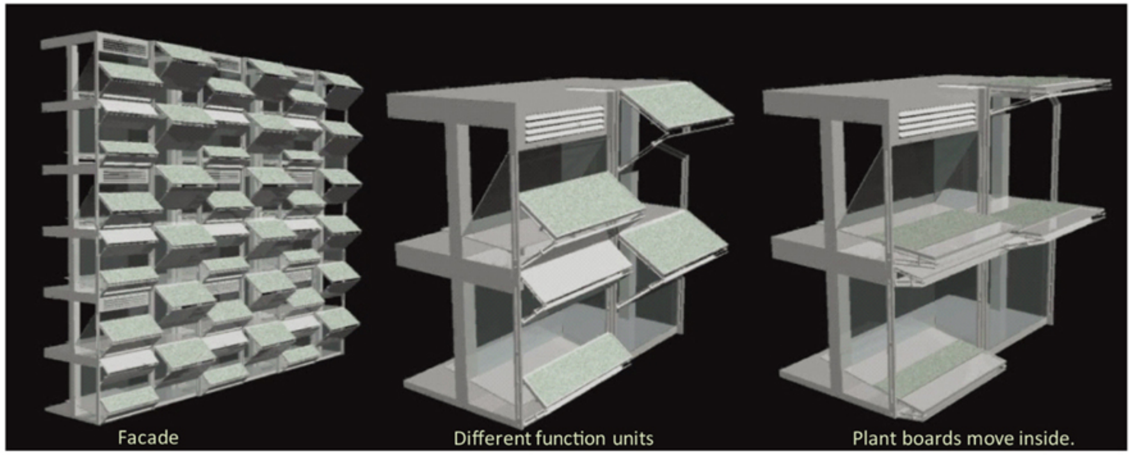
Garbage Incinerator

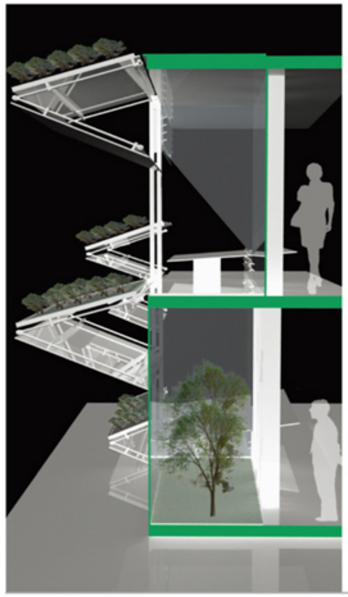
Garbage Recycling System

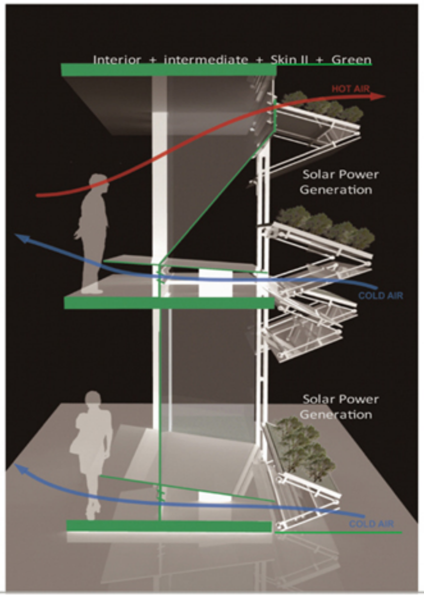
Rainwater Recycling
Wastewater Treatment Plant

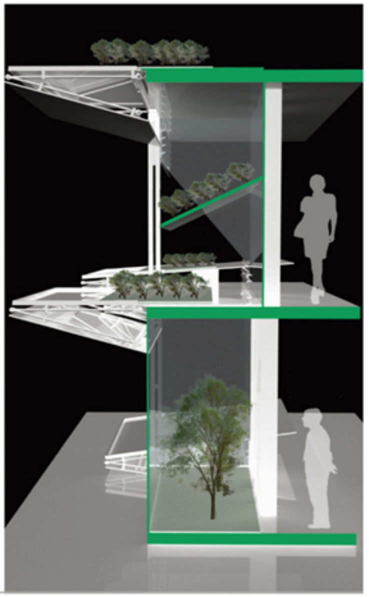


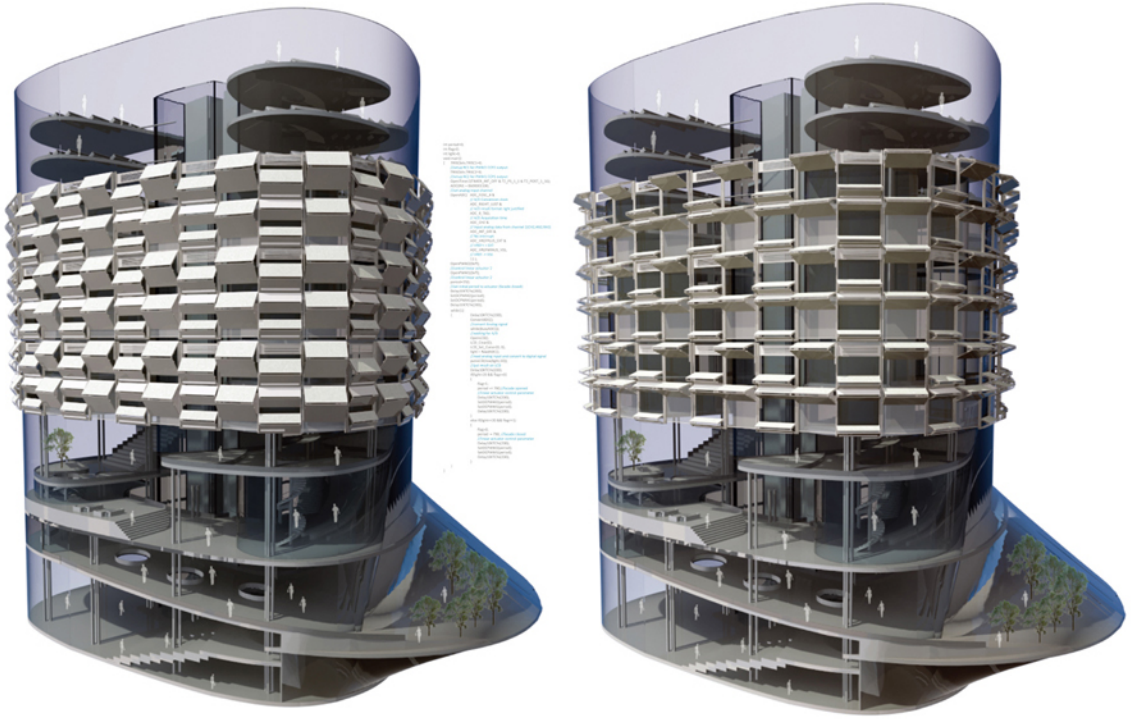
The micro-city also has specific requirements of deep eaves to avoid solar radiation and to prevent direct contact with the scalding sunlight in Taiwan. Therefore, dynamic green facades are invented to be dynamically adjusted by the data collected from the distributed sensor networks outside, and plant boards are placed on them to regulate the micro-climate. For instance, the facades could automatically open at noon to generate dynamic deep eaves, and close during the night in residential areas to obstruct the vision from the exterior. The facades can shelter flora by a mechanical structure which pulls the plant boards inside and closes them during tropical cyclones and storms. A prototype of the exterior kinetic facade has been implemented, embedding linear actuators in the kinetic structure to transform the shape of the facade. Photoresistors are installed to sense light. A control mechanism for the kinetic facade has been developed by writing a software program in Microchip Pic18 microcontroller. Ultimately, This intelligent and sustainable micro-city will fulfill our green dreams.

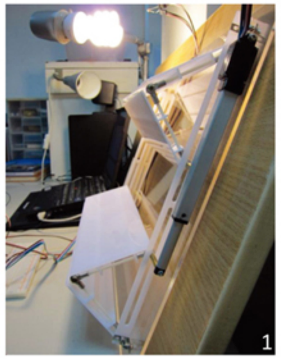

Facade   Different function units   Plant boards move inside.







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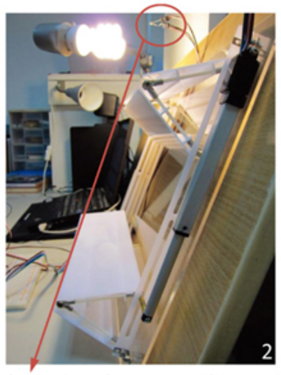
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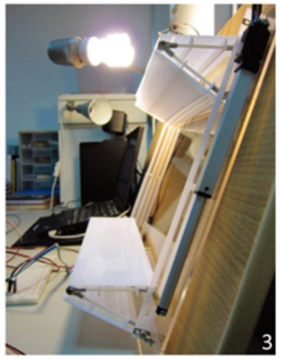
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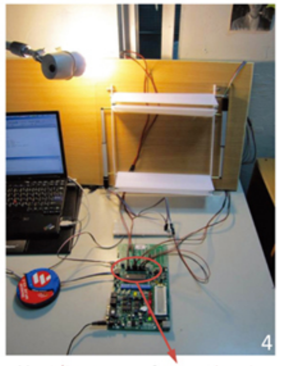
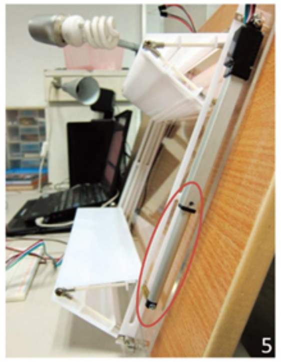

4

While turning on the light, the value of photoresistor changes. According to V=IR, voltage also updates and the value is read by A/D convertor from analog pin. The while loop in program detects input values and sets the pulse in Pulse-Width-Modulation mode to control the linear actuator to open the façade or close.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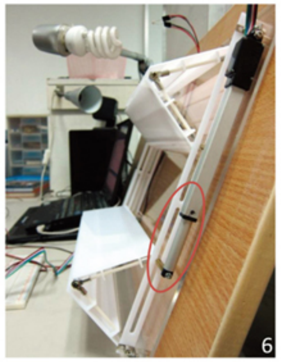
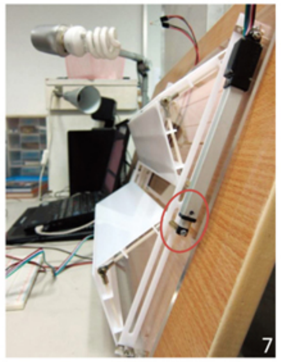

6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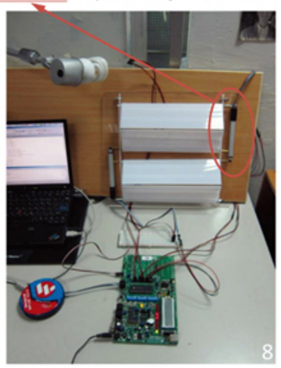

8

Interactive Architecture

Group I

Actua-tecture

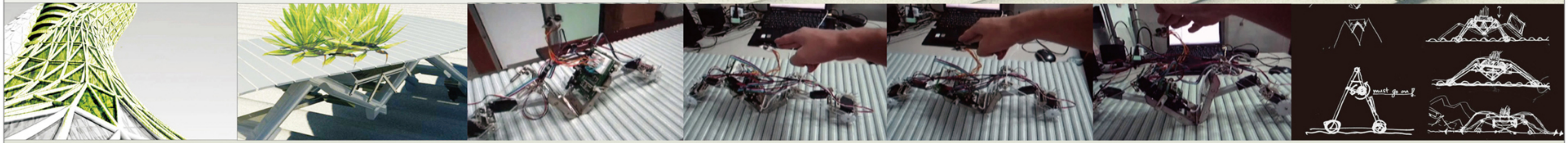
Skin that Acts
Skin of the building plays an important role in determining the ecological condition of a building. Innovative materials and intelligent system explore the opportunities for architecture. The building façade shall be responsive skin that acts properly in order to meet the changing requirement of environment.

Crowd Behavior
Actua-tecture is multilayered façade build with intelligent system of automatic robotics. It adopts the principle of swarm intelligence. Basic unit of Actua-tecture is composed of a green plant, soft pavement, one basement, two telescopic elements, a driving motor, and four wheels. Those construct a framing structure that can stretch and huddle. The folding behavior is the main propeller which gives robots broad range of movements. As an algorithm is embedded in the system, Actua-tecture robots distribute and assemble according to the needs of the inhabitants and conditions of the environment. The crowd wisdom is the hidden mechanism that controls the collective and collaborative behavior of Actua-tecture.

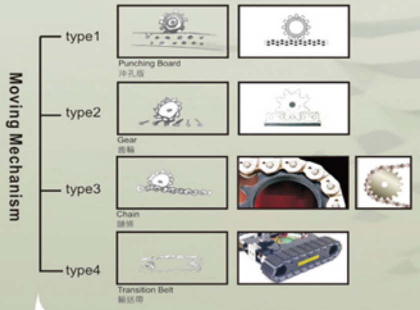
Eco-Dynamic Façade
The Actua-tecture is eco-dynamic. Actua-tecture façade constantly changes and adapts, with no permanent shape. It is the second-skin of architectural green wall. Aggregation of robots shapes various graphic patterns. For example, a tree pattern is the composition of robotic leaves that carry the green plant. Façade of the building is equipped with mechanism of air-purifier and solar power. It absorbs the solar energy and connects the electronic power system of the building. Aim of Actua-tecture is to build a self-sufficient mechanism for the buildings in the paradigm of sustainability.

The project is implemented in a living lab workshop which directed by Michael Fox, the former director of kinetic design group In MIT media lab. This is a group work and I participated in the process of concept development and coding. The concept of the machine is based on a worm. I analyzed the movement of a worm by using a math function. A special computer program is written in the microcontroller named BasicStamp to control the movement of the machine. And I also added a photoresister to detect light and to determine the moving direction of the machine.

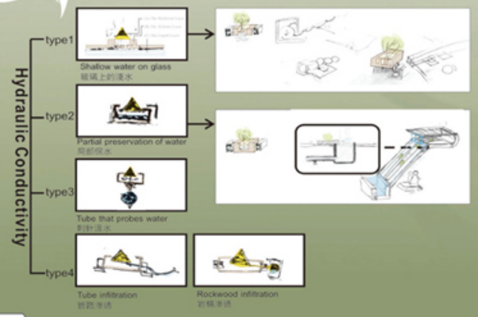
Group Members And Works:
Yen-Chia Hsu (Me) : Coding And Concept Development
Chang-An Pan : Mechanic Structure And Concept Development
Yang-Ting Shen : Mechanic Structure And Concept Development
Hsu-Tung Wang : Presentation And Concept Development
Shu-Chen Fu : 3D Models And Concept Development
Tien-Yu Wu : : 3D Models And Concept Development



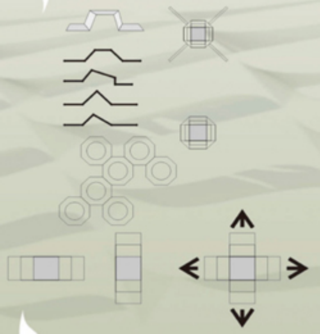
1.Moving Mechanism


Moving Mechanism
type1
Punching Board
沖孔板
type2
Gear
齒輪
type3
Chain
type4
Transition Belt

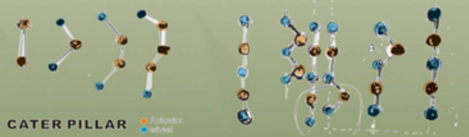
2.Hydraulic Conductivity


Hydraulic Conductivity
type1
Shallow water on glass
玻璃上的淺水
type2
Partial preservation of water
局部保水
type3
Tube that probes water
type4
Tube infiltration
Rockwood infiltration

3.Composition of Frame

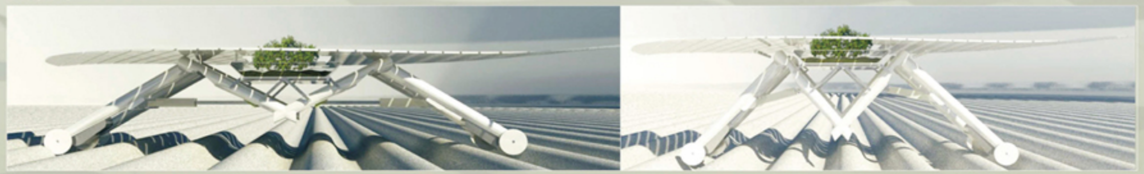


4.Self-Transformation

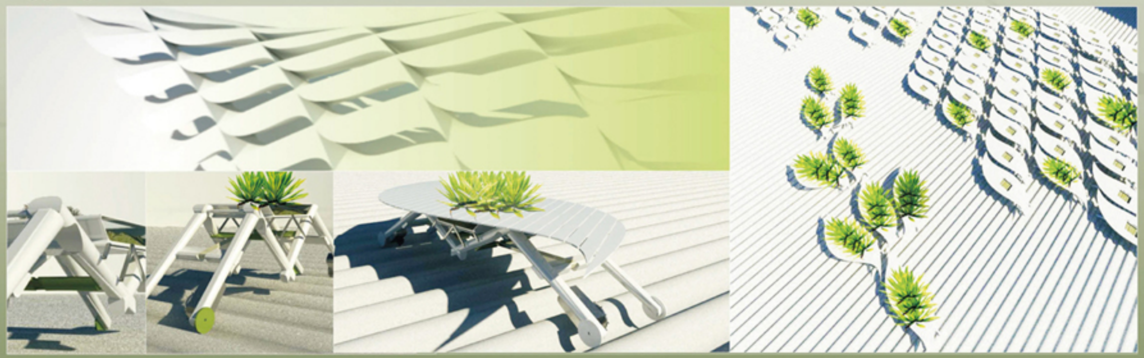

CATER PILLAR
Actuator
wheel

5.Robotic Morphology

move



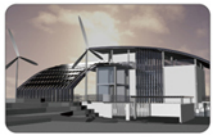
aggregate

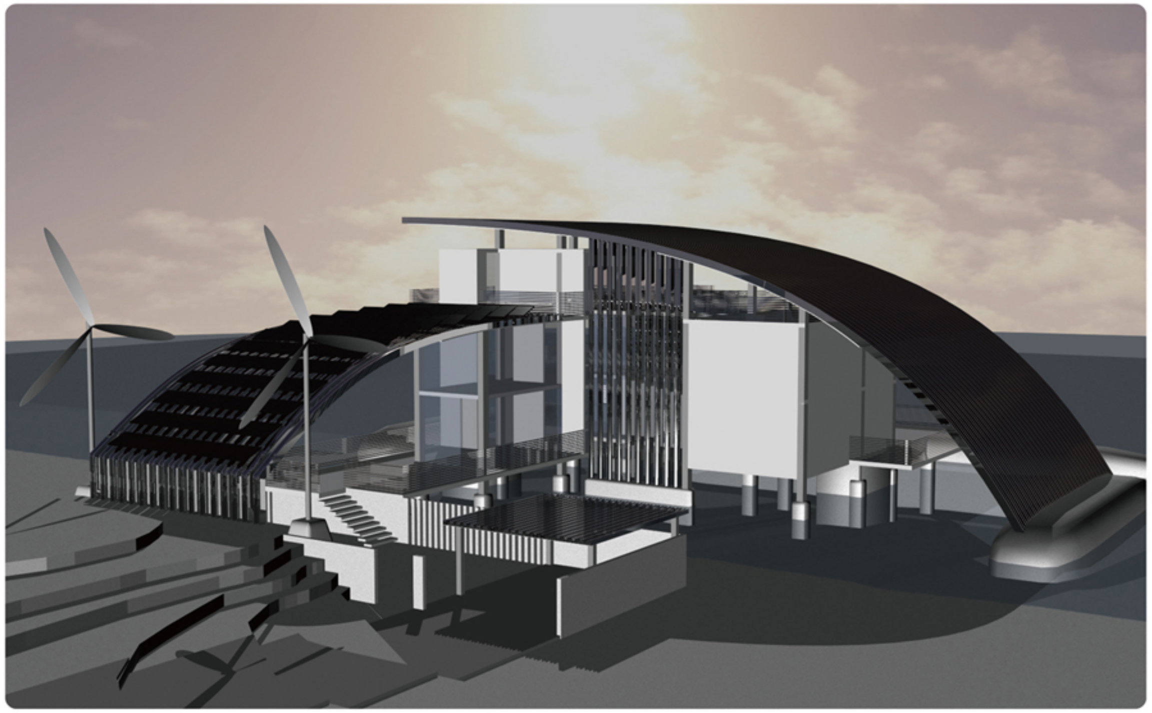


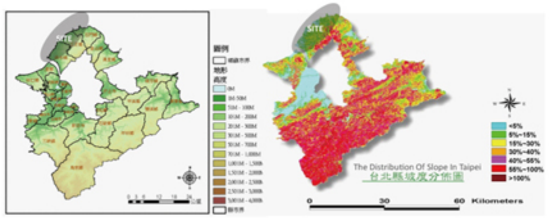
2007.9 - 2008.6 DESIGN PROJECTS

The Final Haven

Country House Design Competition
The Third Prize
Construction and Planning Administration, MOI, Taiwan






SITE
SITE
The Distribution Of Slope In Taipei
台北縣坡度分佈圖
0
30
60
Kilometers
15%~30%
30%~40%
40%~55%
55%~100%
>100%

- **Geography**

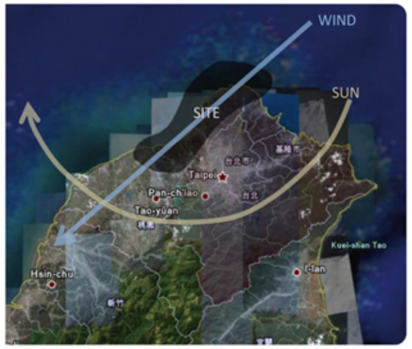
The geography is a gentle hill which slants to Taiwan Strait and is accumulated by pyroclastic rocks and volcano ashes. Many erosion grooves and coulees make the slope of the hill steep.

- **Climate**

The northwest corner of the coast is sub-tropical monsoon climate and is located on the outer edge of Taipei basin's wind axis. It is affected by violent north-east wind in winter and suffers problems of facing west.

- **The Properties Of Site**

The site is located on the north-west corner of the coast near several harbor villages in Taiwan. The axis of the site is north-east to south-west.


WIND
SUN
SITE
Taipei
基隆
Pan-ch'iao
Tao-yüan
桃園
Hsin-chu
新竹
Koei-shan Tao
I-lan

HISTORY

In year 2050, Earth's petroleum reserves are getting exhausted.

One meter sea level rise affected geography in Earth due to global warming and greenhouse effect.

The area of land diminishes and the climate is serious.

The inland population is saturated.

People have to build houses on coast as the final haven of human.

Sea level raise caused by global warming.
The inland population is saturated.
Pan-ch
Tao-yüa
桃園
Hsin-chu
新竹
Koei-shan Tao
I-lan

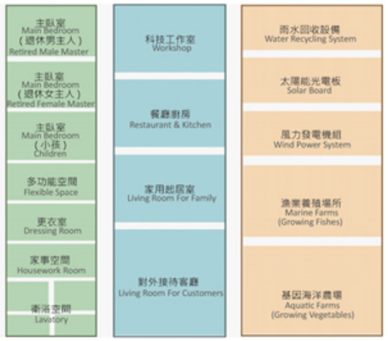
HUMAN

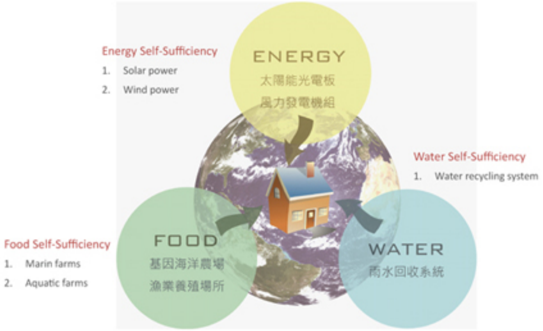
A retired couple who worked in a technological company before gets their retirement pension.

They build a sustainable house near the coast because of the saturation of inland population and the diminution of land.

They begin to research the techniques of marine farms and aquatic farms in order to be self-sufficient.

And their children also work with them in the workshop.


主臥室 Main Bedroom （退休男主人） Retired Male Master
主臥室 Main Bedroom （退休女主人） Retired Female Master
主臥室 Main Bedroom （小孩） Children
多功能空間 Flexible Space
更衣室 Dressing Room
家事空間 Housework Room
衛浴空間 Lavatory
科技工作室 Workshop
餐廳廚房 Restaurant & Kitchen
家用起居室 Living Room For Family
對外接待客廳 Living Room For Customers
雨水回收設備 Water Recycling System
太陽能光電板 Solar Board
風力發電機組 Wind Power System
漁業養殖場所 Marine Farms (Growing Fishes)
基因海洋農場 Aquatic Farms (Growing Vegetables)


ENERGY
太陽能光電板
風力發電機組
FOOD
基因海洋農場
漁業養殖場所
WATER
雨水回收系統

Energy Self-Sufficiency

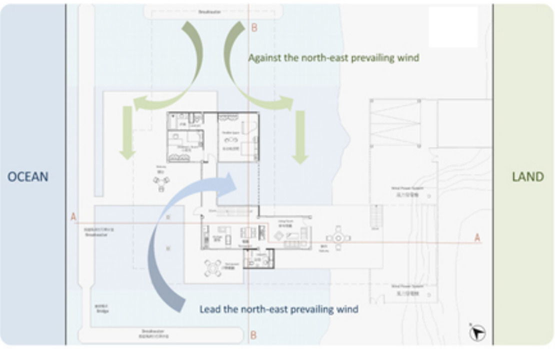
1. Solar power
2. Wind power

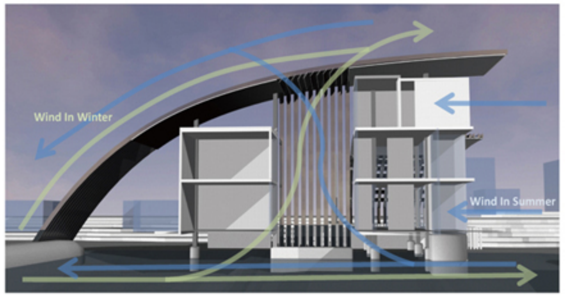
Water Self-Sufficiency

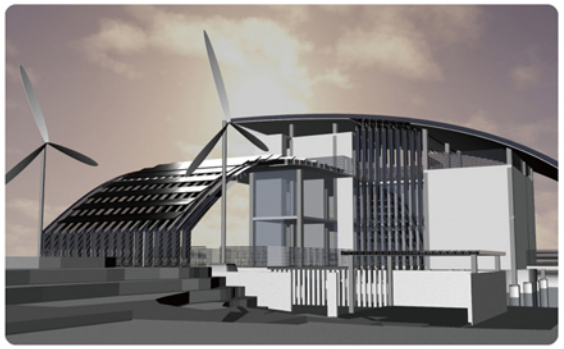
1. Water recycling system

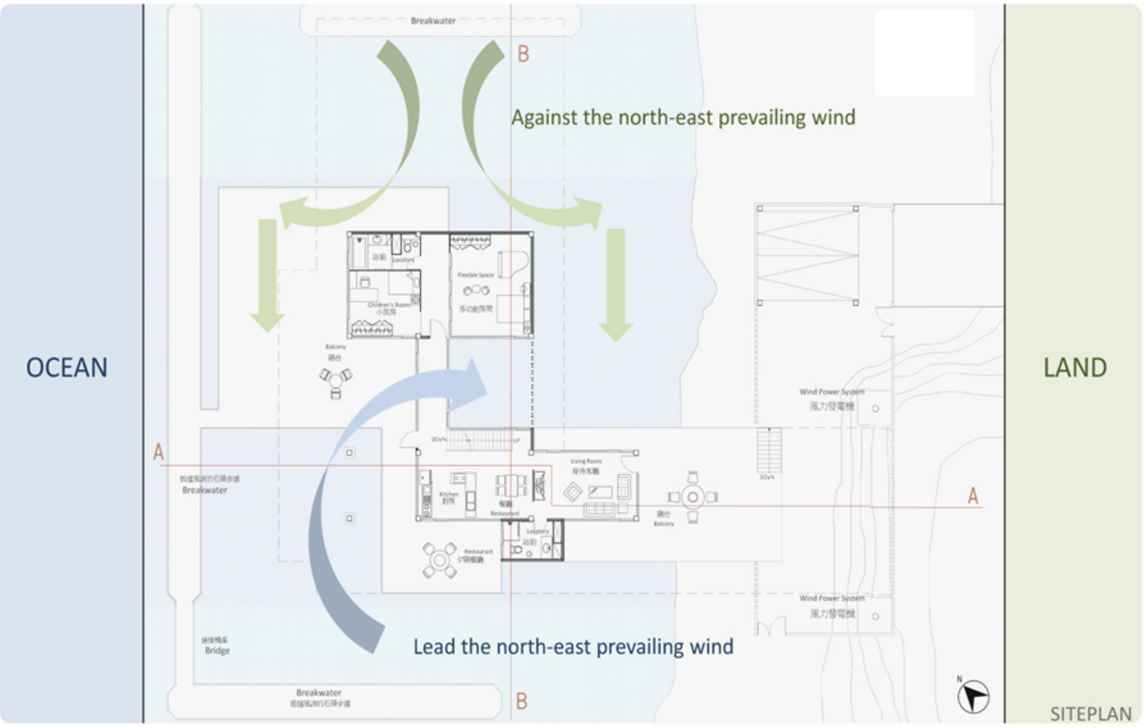
Food Self-Sufficiency

1. Marin farms
2. Aquatic farms


OCEAN
LAND
Against the north-east prevailing wind
Lead the north-east prevailing wind
A
A
B
B

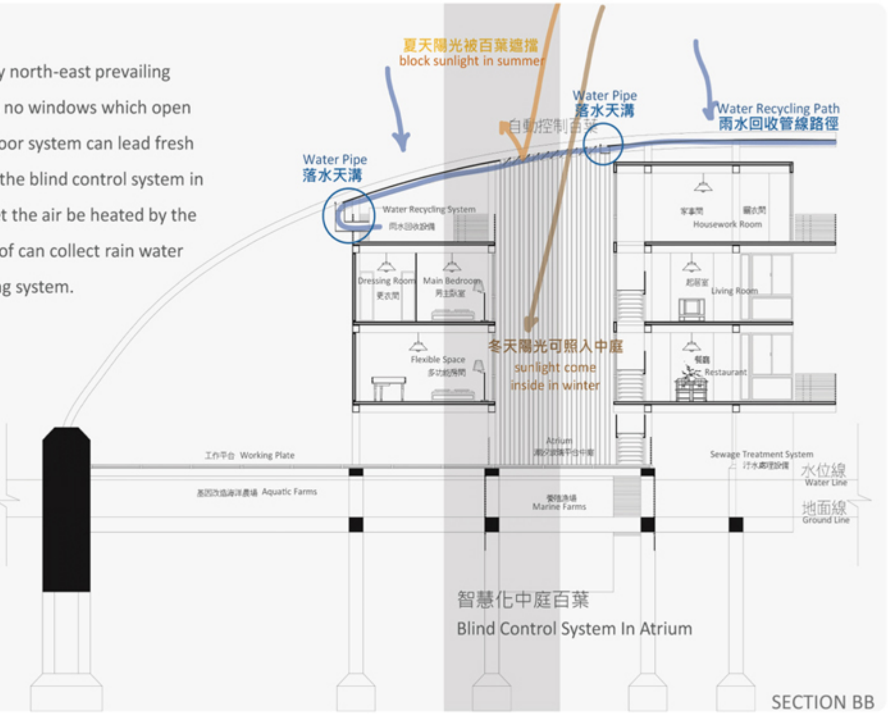

Wind In Winter
Wind In Summer




OCEAN
LAND
Breakwater
B
Against the north-east prevailing wind
A
A
Lead the north-east prevailing wind
B
Breakwater
Bridge
Wind Power System
風力發電機
Wind Power System
風力發電機
SITEPLAN

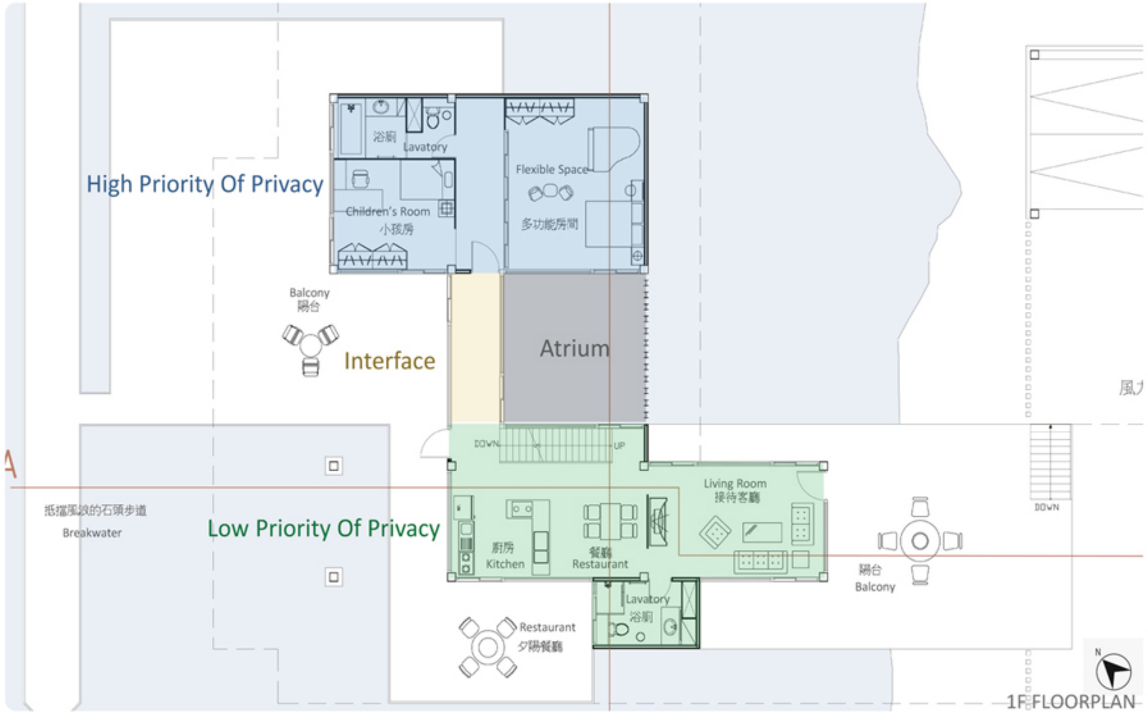
- **Atrium**

Because the site is affected by north-east prevailing wind seriously, the house has no windows which open to north-east. The elevated floor system can lead fresh air into the atrium. In winter, the blind control system in atrium can open blinds and let the air be heated by the sunlight. The water pipe in roof can collect rain water and lead water to the recycling system.

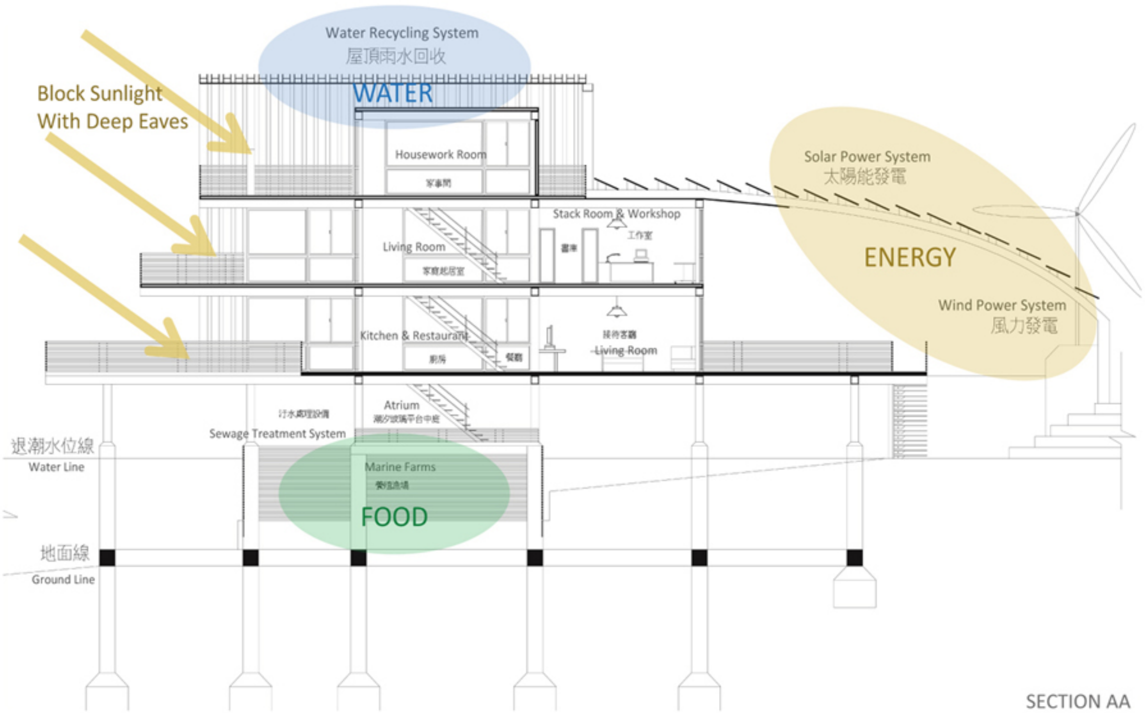

夏天陽光被百葉遮擋
block sunlight in summer
Water Pipe
落水天溝
Water Recycling Path
雨水回收管線路徑
自動控制百葉
Water Pipe
落水天溝
Water Recycling System
雨水回收設備
家事間
曬衣間
Housework Room
Dressing Room
更衣間
Main Bedroom
男主臥室
起居室
Living Room
冬天陽光可照入中庭
sunlight come inside in winter
Flexible Space
多功能房間
餐廳
Restaurant
工作平台 Working Plate
Atrium
Sewage Treatment System
汙水處理設備
水位線
Water Line
海洋農場 Aquatic Farms
養殖漁場
Marine Farms
地面線
Ground Line

智慧化中庭百葉
Blind Control System In Atrium

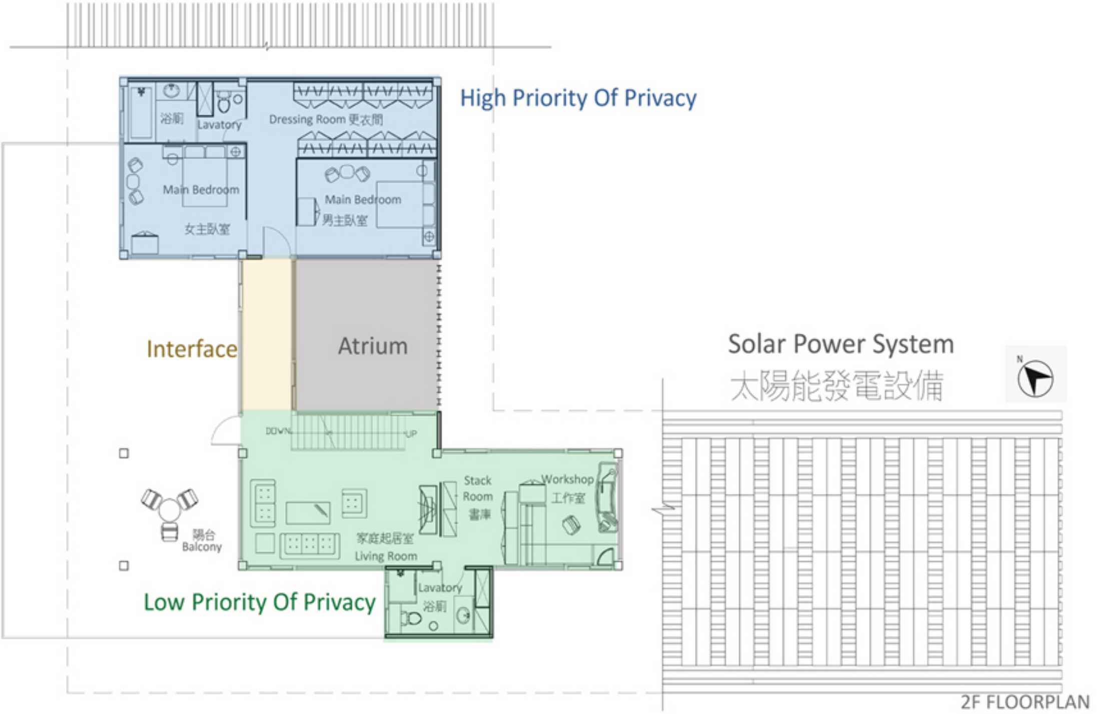
SECTION BB


High Priority Of Privacy
浴廁
Lavatory
Flexible Space
Children's Room
小孩房
多功能房間
Balcony
陽台
Interface
Atrium
DOWN
UP
Living Room
接待客廳
抵擋風浪的石頭步道
Breakwater
Low Priority Of Privacy
廚房
Kitchen
餐廳
Restaurant
陽台
Balcony
Lavatory
浴廁
Restaurant
夕陽餐廳
DOWN
N

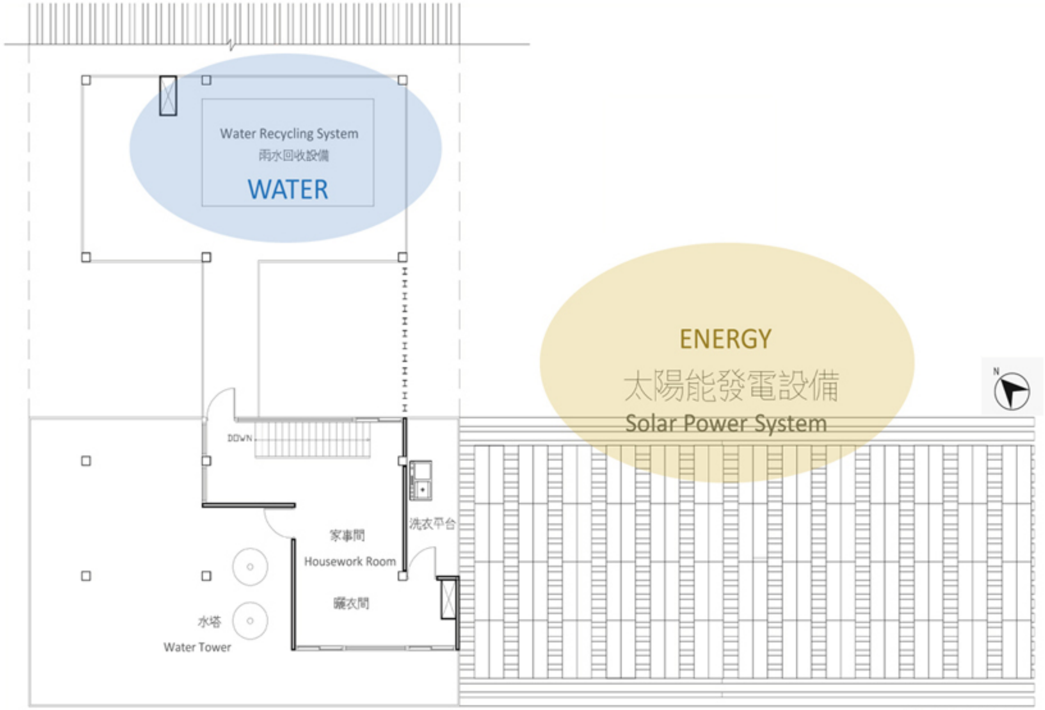
1F FLOORPLAN


Water Recycling System
屋頂雨水回收
WATER
Block Sunlight
With Deep Eaves
Housework Room
家事間
Solar Power System
太陽能發電
Stack Room & Workshop
工作室
書庫
Living Room
家庭起居室
ENERGY
Wind Power System
風力發電
Kitchen & Restaurant
廚房
餐廳
接待客廳
Living Room
Atrium
潮汐玻璃平台中庭
汙水處理設備
Sewage Treatment System
退潮水位線
Water Line
Marine Farms
養殖漁場
FOOD
地面線
Ground Line

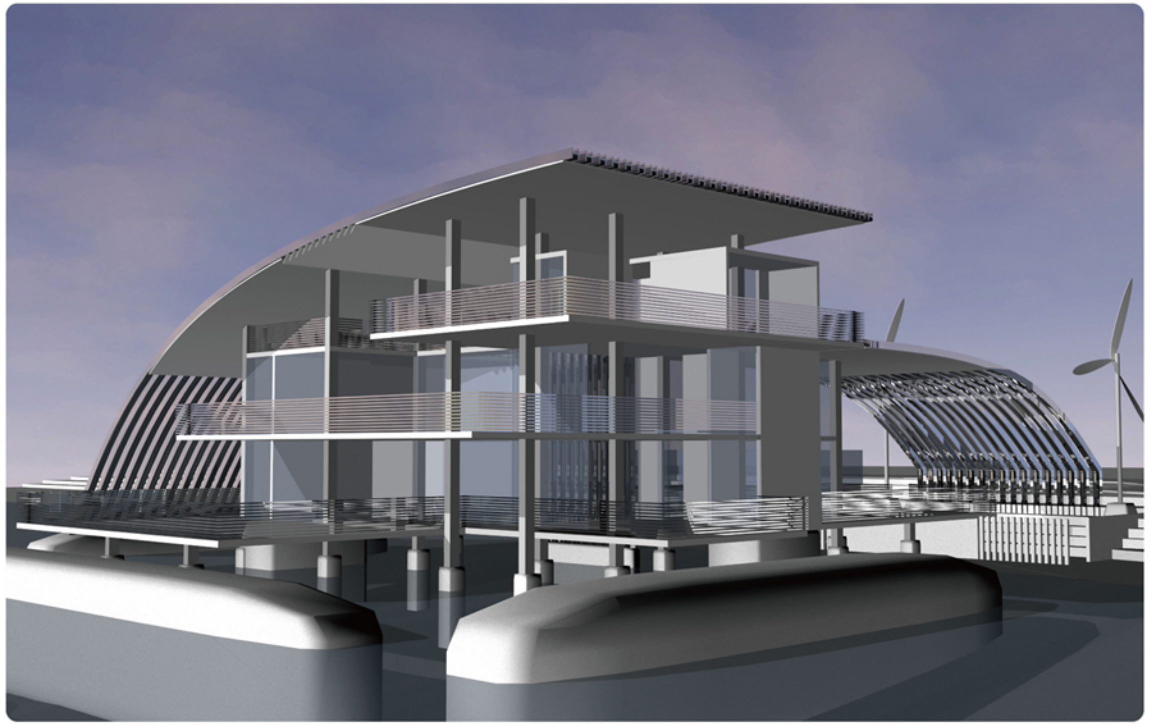
SECTION AA

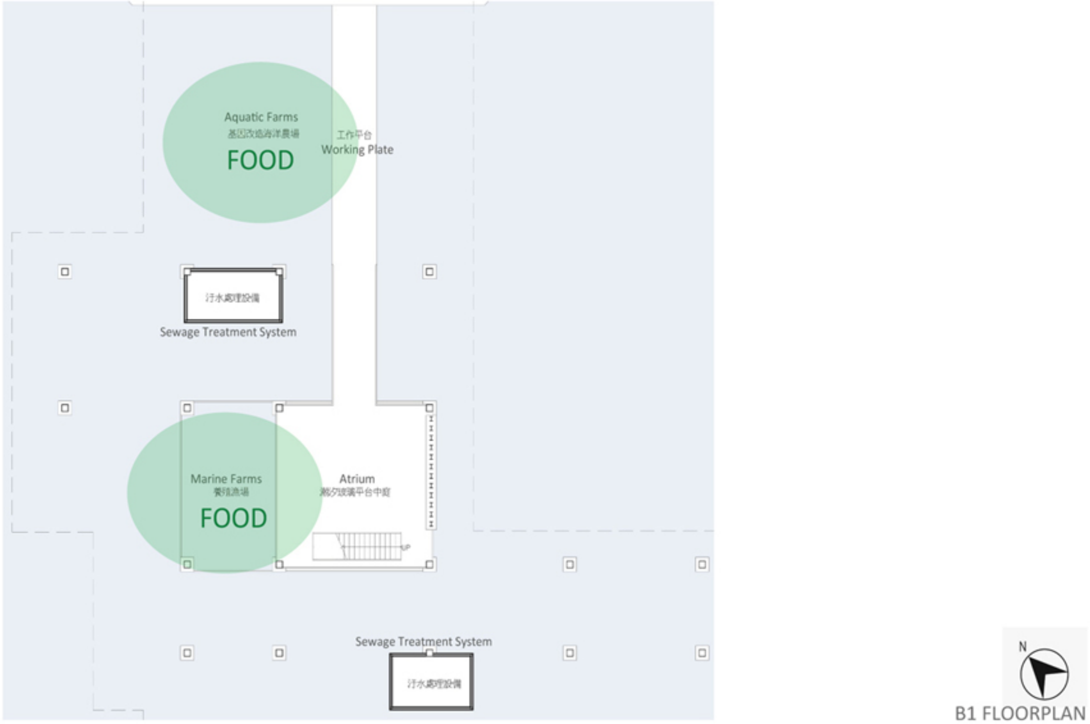

浴廁
Lavatory
Dressing Room 更衣間
High Priority Of Privacy
Main Bedroom
女主臥室
Main Bedroom
男主臥室
Interface
Atrium
Solar Power System
太陽能發電設備
N
DOWN
UP
Stack Room
書庫
Workshop
工作室
陽台
Balcony
家庭起居室
Living Room
Lavatory
浴廁
Low Priority Of Privacy

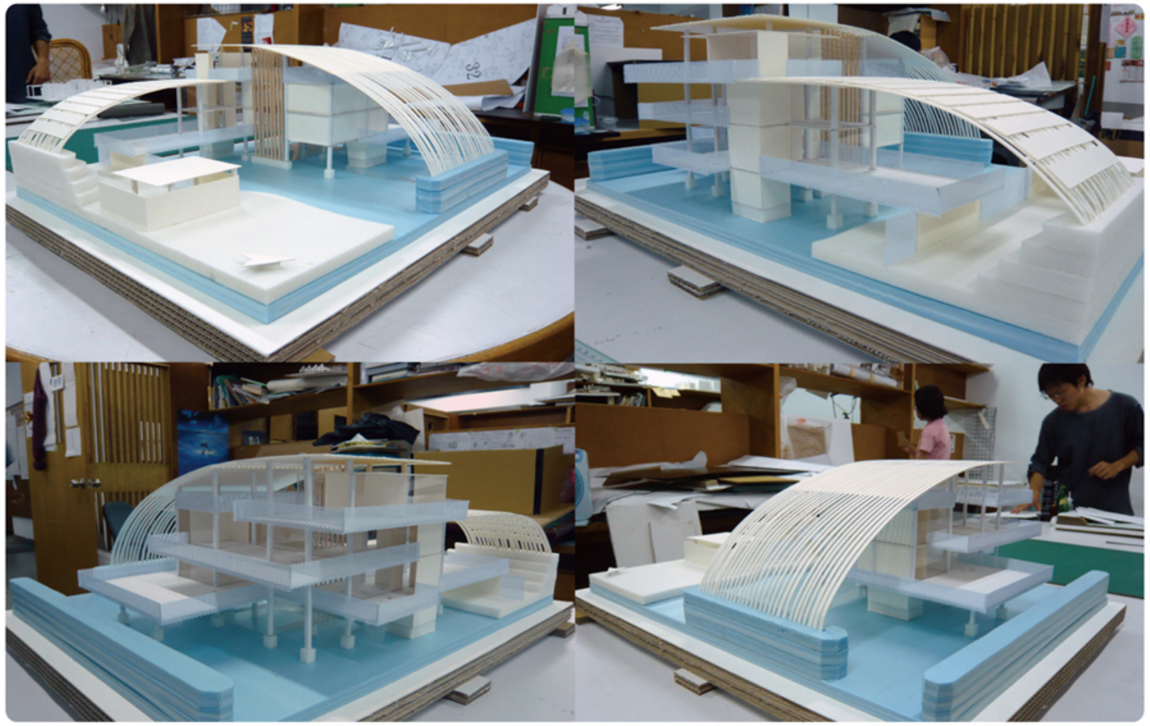
2F FLOORPLAN


Water Recycling System
雨水回收設備
WATER
ENERGY
太陽能發電設備
Solar Power System
N
DOWN
家事間
Housework Room
洗衣平台
曬衣間
水塔
Water Tower

3F FLOORPLAN




Aquatic Farms
基因改造海洋農場
FOOD
工作平台
Working Plate
汙水處理設備
Sewage Treatment System
Marine Farms
養殖漁場
FOOD
Atrium
潮汐玻璃平台中庭
UP
Sewage Treatment System
汙水處理設備
N

B1 FLOORPLAN