SALT-MARSH DEGRADATON

Salt-marsh degradation can occur at peninsular landscape where urban sprawl and expansion of human activities meet with coastal areas. To mitigate such ecosystem deterioration, current conditions need to be fully understood by data analysis and visualization, then could followed by bottom-up methods that can increase public's awareness and involvement.

LINDA DENG
SELECTED WORKS
COLUMBIA UNIVERSITY

COMPUTATIONAL DESIGN

ECO SOCIAL

SOCIALSOCIALSOCIALSOCIALSOCIALSOCIALSOCIALSOCIALSOCIALSC

NATURAL MATERIAL

NET-ZERO

SOCIALSOCISOCIALSOCIALSOCIALSOCIALSOCIALSOCIALSOCIALSOCIALSOCIALSOCIALSOCIALSOCIALSOCIALSOCIALSOCIALSOCIA

ECO SOCIAL

CARBON EMISSION

during building construction and operation can be reduced by using negative carbon material, such as biochar, which requires not only the research and improvement of new materials, but also correspondent systematic design strategies. Collaboration between scientists, engineers, and architects will contribute to the problem.

ENERGY CONSUMPTION

in future truck stops will dramatically increased and transform the economy along the transportation industry. Technologies capturing natural sources could be designed as a landscape that make people be aware of the issue, while incorporating with human activities to improve the truck stop experience responding to the increasing charging time.

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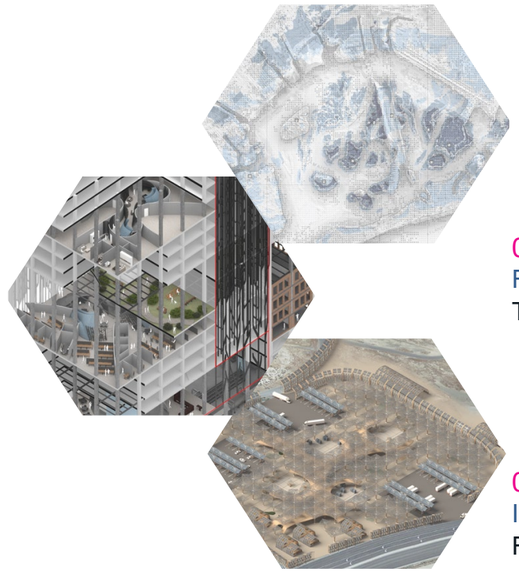
CONTENTS

RESEARCH-BASED DESIGN STUDIOS



ELECTIVES

01

The Proxy Landscape: (UN)SPONTANEOUS WALK

Jamaica Bay Water Path Park

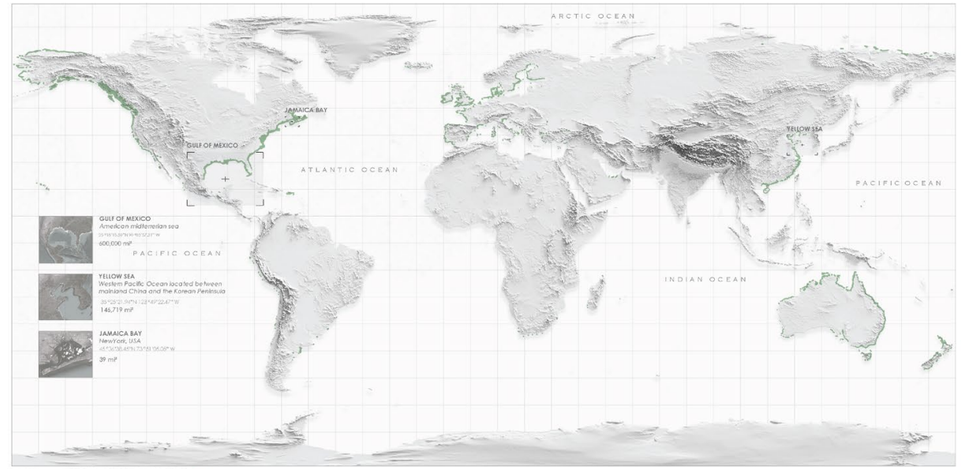
Jamaica Bay, NYC

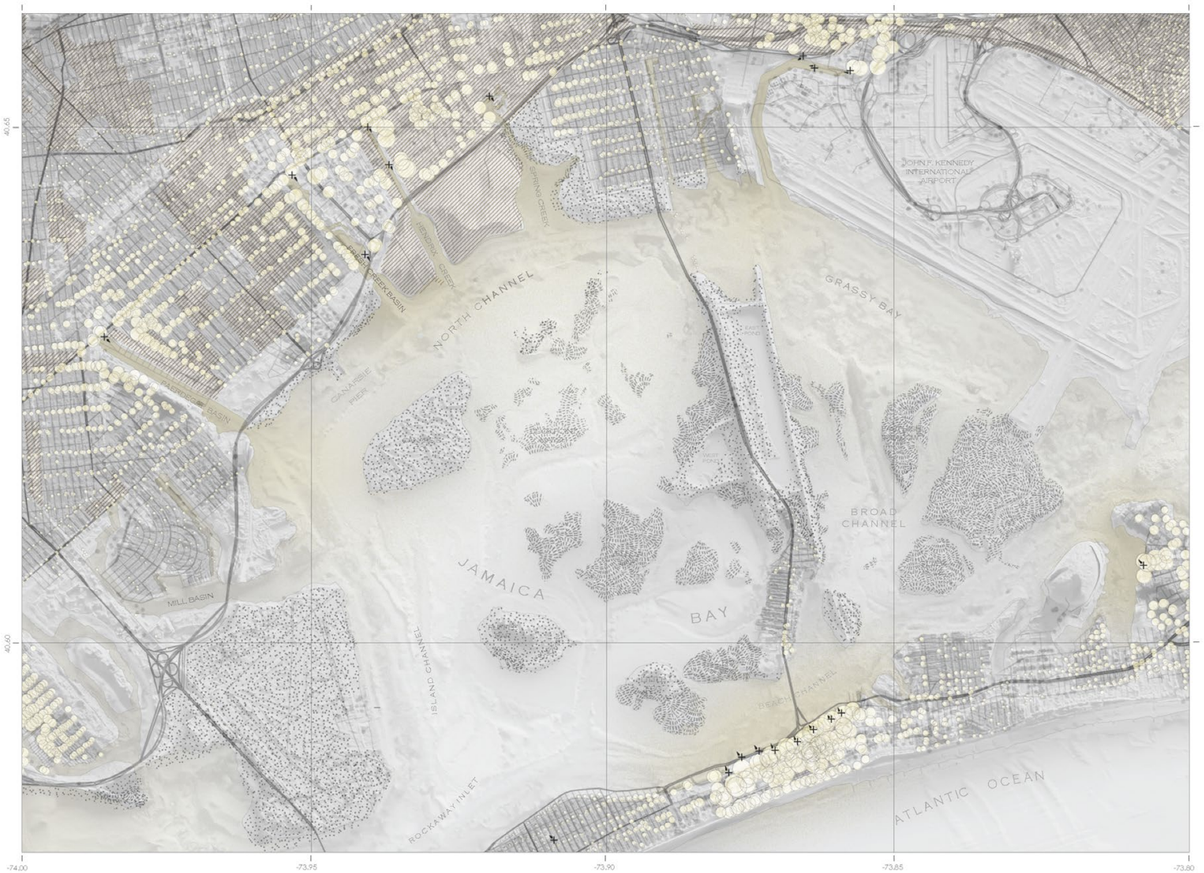
Columbia University Studio Work, Sm2022
Instructor: Marco Ferrari and Elise Hunchuck
Group Work: Xiangyi Deng, Weiyu Xu, Jiyoon Hwang

The project focused on the mix of natural and artificial watershed systems and their influence on the coastal urban context in Jamaica Bay. It studies a certain geological condition shaped by water - the salt marsh degradation in urban vicinity Data-driven analysis for related landscapes is combined with graphic mapping visual design to convey the overlapping effects of the hybrid water system.

The projection of this hybrid ecosystem is a sequence of playful water machines that deal with different problems in dalt marsh degration - pollution, sea level rise, and erosion. By combining low-tech machines and architectural research, they filtrate, replace, mix, splash, and capture water in a theatrical way, while also increasing human awareness and daily involvement at a community scale. The condition is a proxy to understand other coastal cities with similar problems around the world for possible further developments.

Humans invent machines to produce labor, profits, and values. However, machines in the project are invented as imaginations for a different kind of labor on landscapes. Instead of exploting the landscape, the "labor" becomes a playful way for humans and all species to experiment and interact with the landscape , building an intimate relationship between coastal ecosystem and human.





UNSPONTANEOUS WATERSHED

Jamaica bay's spontaneous watershed contains external forces, such as capturing, pumping up, and dumping out water, which move water from urban environments to coastal areas.

catch basin
The Larger the circle, the higher the amount of water, closer to designated outfalls.

CSO contamination
Soil
Salt Marsh
NYC road
Polluted Area by Runoff
CSO Outfalls
Building

geology of saltmarsh

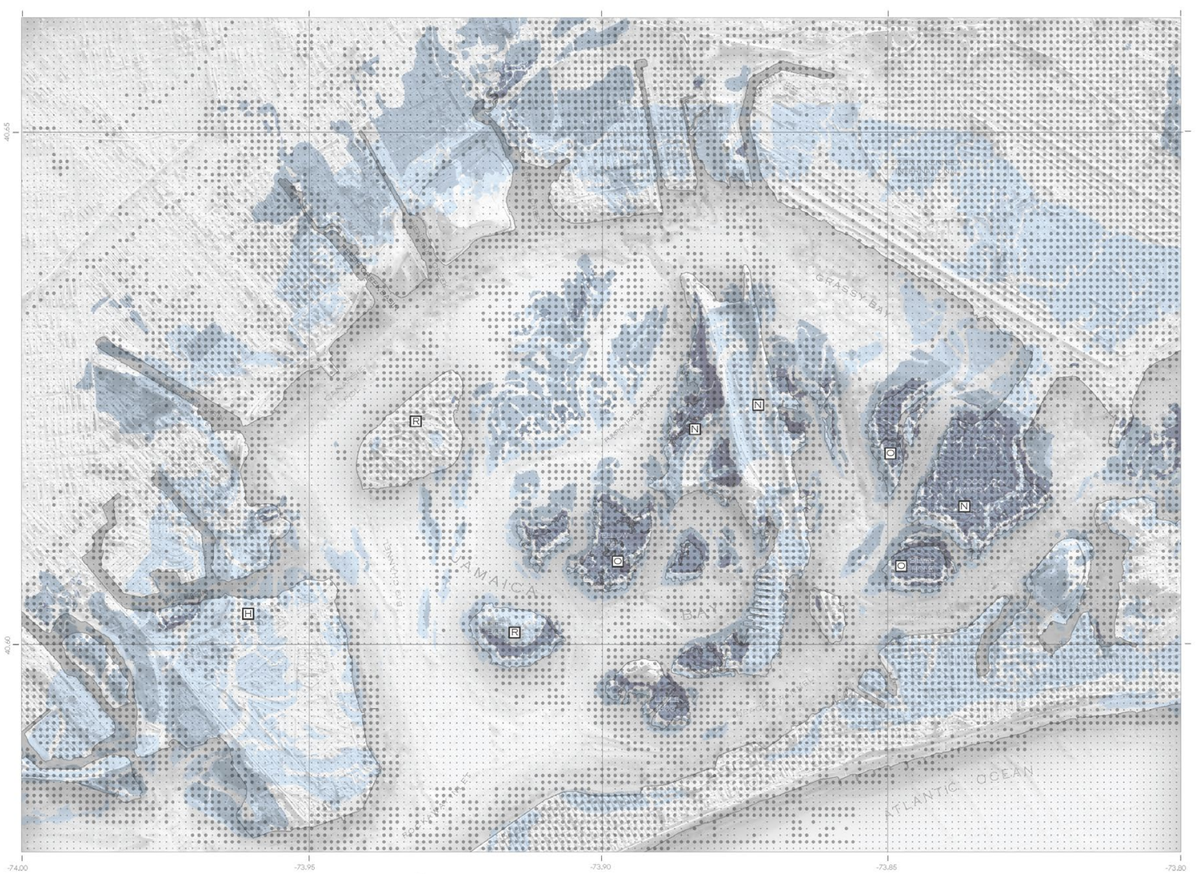
GULF OF MEXICO
American mediterrian sea
25°19'15.00"N 90°03'37.37" W
600,000 m²

YELLOW SEA
Western Pacific Ocean located between mainland China and the Korean Peninsula
35°25'21.94"N 123 °49'22.47" W
146,719 m²

JAMAICA BAY
NewYork, USA
40 °36'38.40"N 73 °51'05.05" W
39 m²

DATA VISUALIZATION AND GRAPHIC DESIGN

Unspontaneous watershed contains external forces which move water from urban environment to coastal area. The velocity and volume of water changes and reach the peak at the 5 CSOs. Dots represent catch basins, marked by diameters to indicate differences in amount of water and distance to designated CSO outfalls. The contamination around creek areas uses nitrates as indicator.

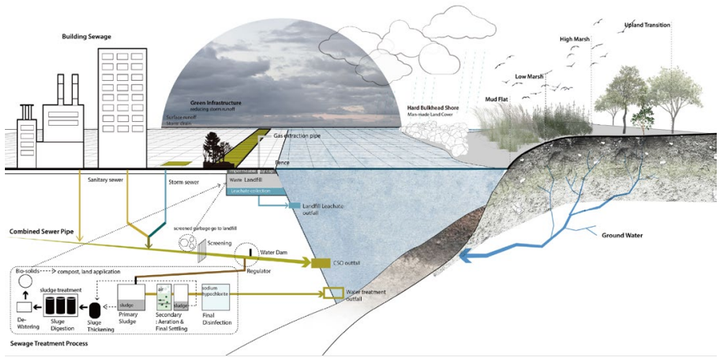


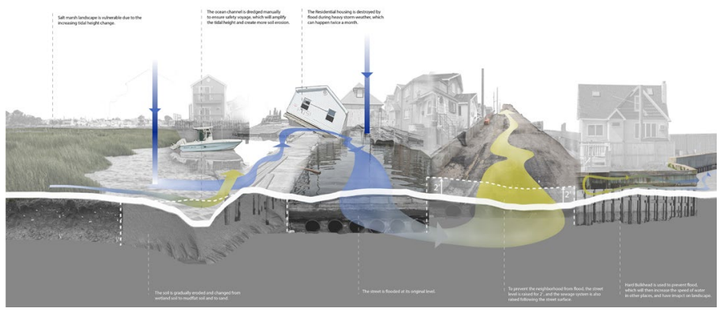
SPONTANEOUS WATERSHED

Jamaica bay spontaneous watershed shows flow of water through different media of surfaces under the influence of gravity, wind and etc., basically water flows more freely without an intentional or human-desired direction.

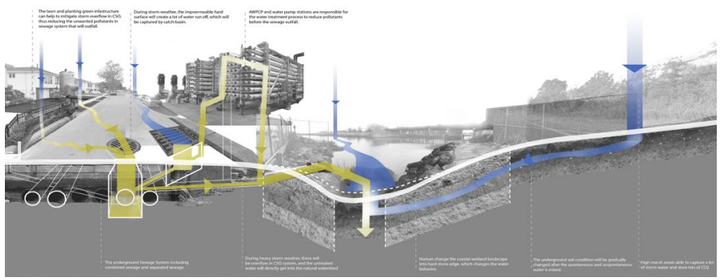
Soil Depth
Bird Nesting and Migration site
Saltmarsh
1879 1948 2011
Rookery
Osprey platform
Watershed boundaries
Herp reintroduction area

Spontaneous Watershed is a watershed where water flows on different media of surfaces under the influence of gravity, wind and etc. basically water flows more freely without an intentional or human-desired direction. Water disperses on different land cover and topography, both in urban environment and marshland environment. The circles in the map indicate the depth of soil, indicating depth by diameters. Blue areas show the historical salt marsh degradation under the influence of this mix of unspontaneous and spontaneous water systems.

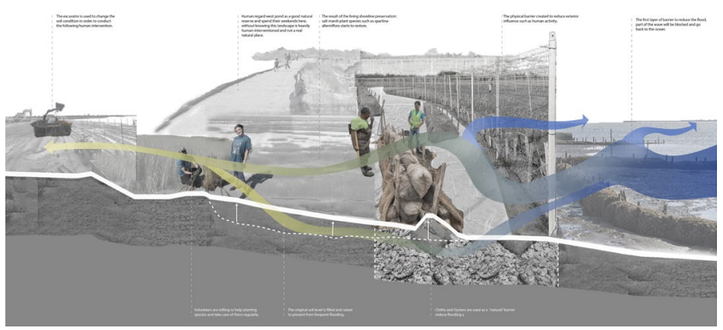




Neighborhoods adjacent to the ocean

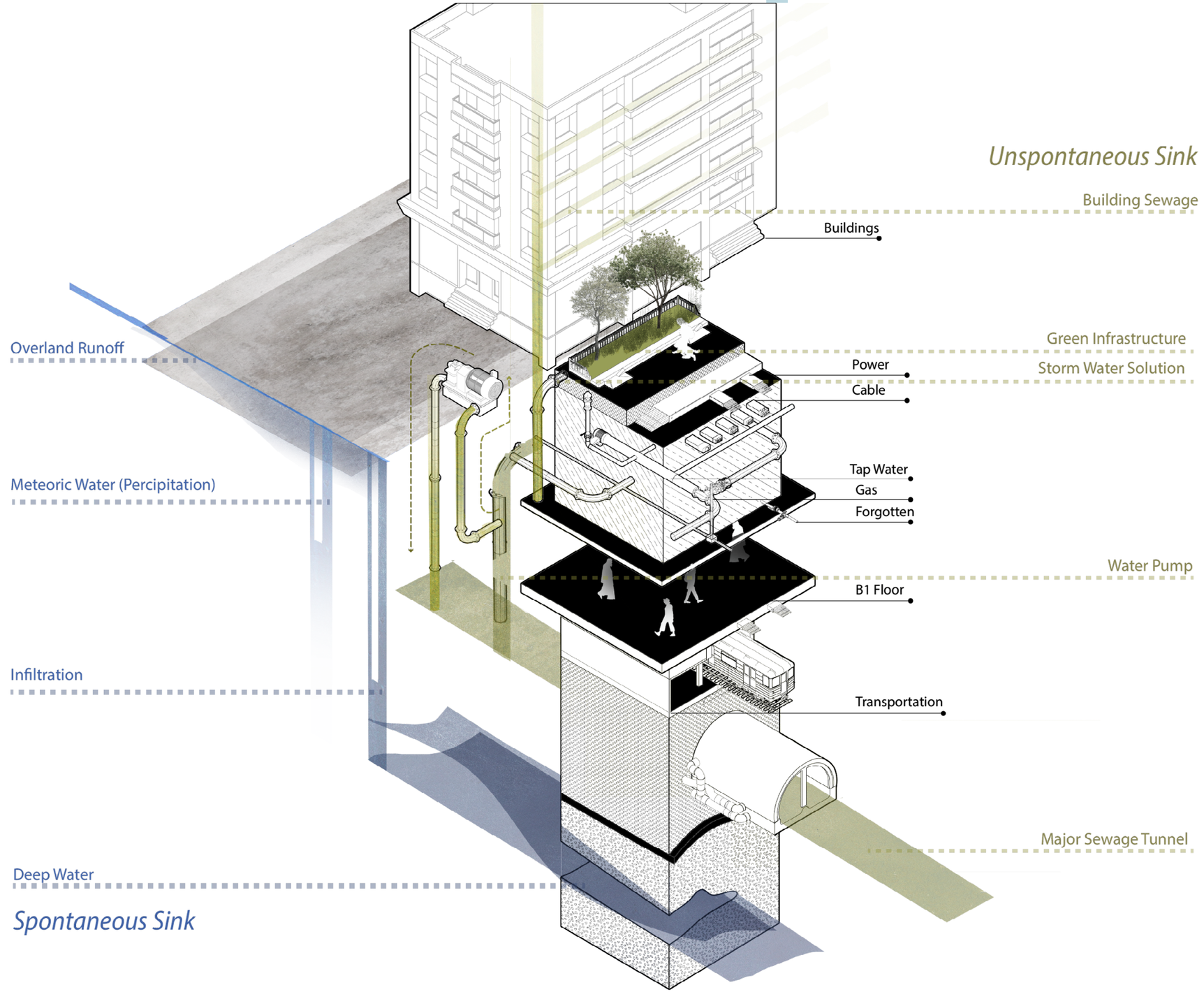


Urban condition near creeks



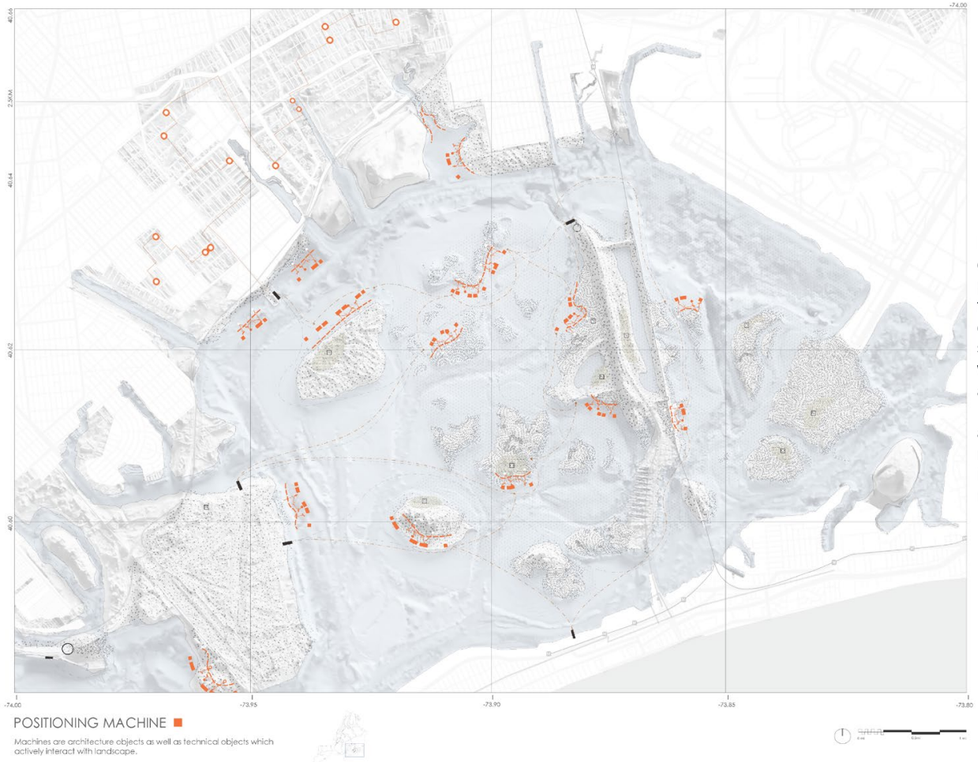
Coastal “Natural“ Preserved Landscape

MIX OF WATER SYSTEM COLLAGE



Spontaneous and Unspontaneous water are running across the city at different levels, but sometimes they will converge in systems like CSO without special treatments.

VERTICAL ANATOMY OF WATER SYSTEMS UNDERGROUND

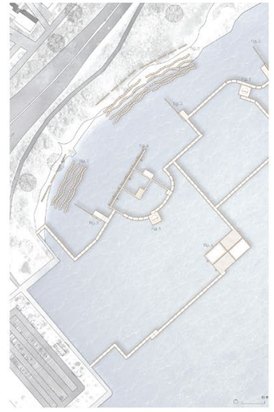


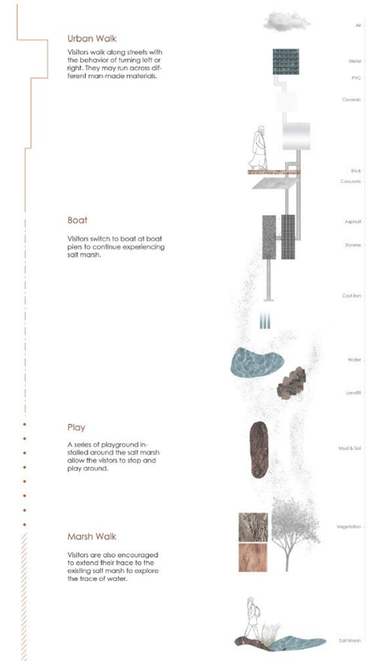
Each location of invertion contains a sequence of playful machines, which together form a water-control system to deal with salt marsh degradation, while raising people's awareness of the problem. Locations are distributed along exsiting tourism routes in Jamaica Bay, including cruise trip, metro, and bike routes.

WATER MACHINE INTERVENTION SITE PLAN


Zoom-in Map


Site Plan - Location A


Site Plan - Location B

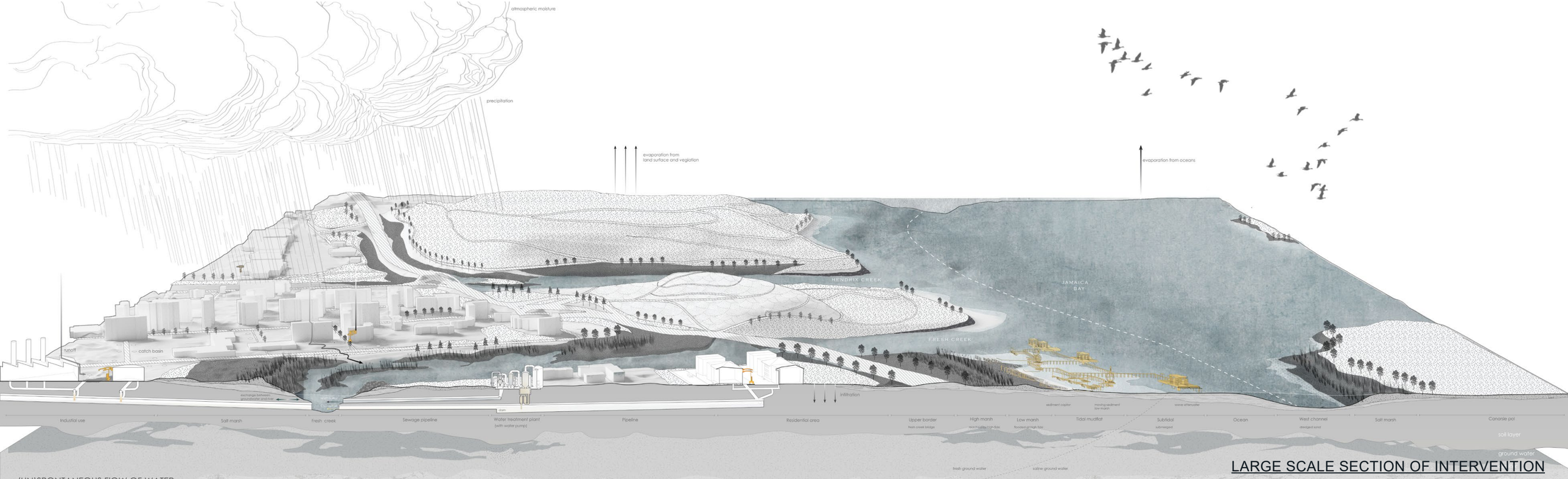


Bahavior Trace

Material Trace

Six types of machines will work in a specific order from far to close to the shoreline: wave attenuator will reduce large wave power, captors with reduce marsh erosion, seesaw will accelerate marsh accumulation, purifier will improve water quality. Each machine aims to make the invisible water process visible to the public.

DIFFERENT TYPES OF CIRCULATION IN THE WATER PARK



(UN)SPONTANEOUS FLOW OF WATER
Hybrid watershed machines for Jamaica Bay

LARGE SCALE SECTION OF INTERVENTION

WATER MACHINE 1

RUN-OFF FITNESS MACHINE

PURIFIER

Sewage pollution starts before the sewage.

This interactive machine purifies roof run-off water when citizens exercise on the rotatable paddles. Attachable to roof drainage pipes, it is both a recre-ation facility but also a public art to raise people's awareness of run-off pollution.

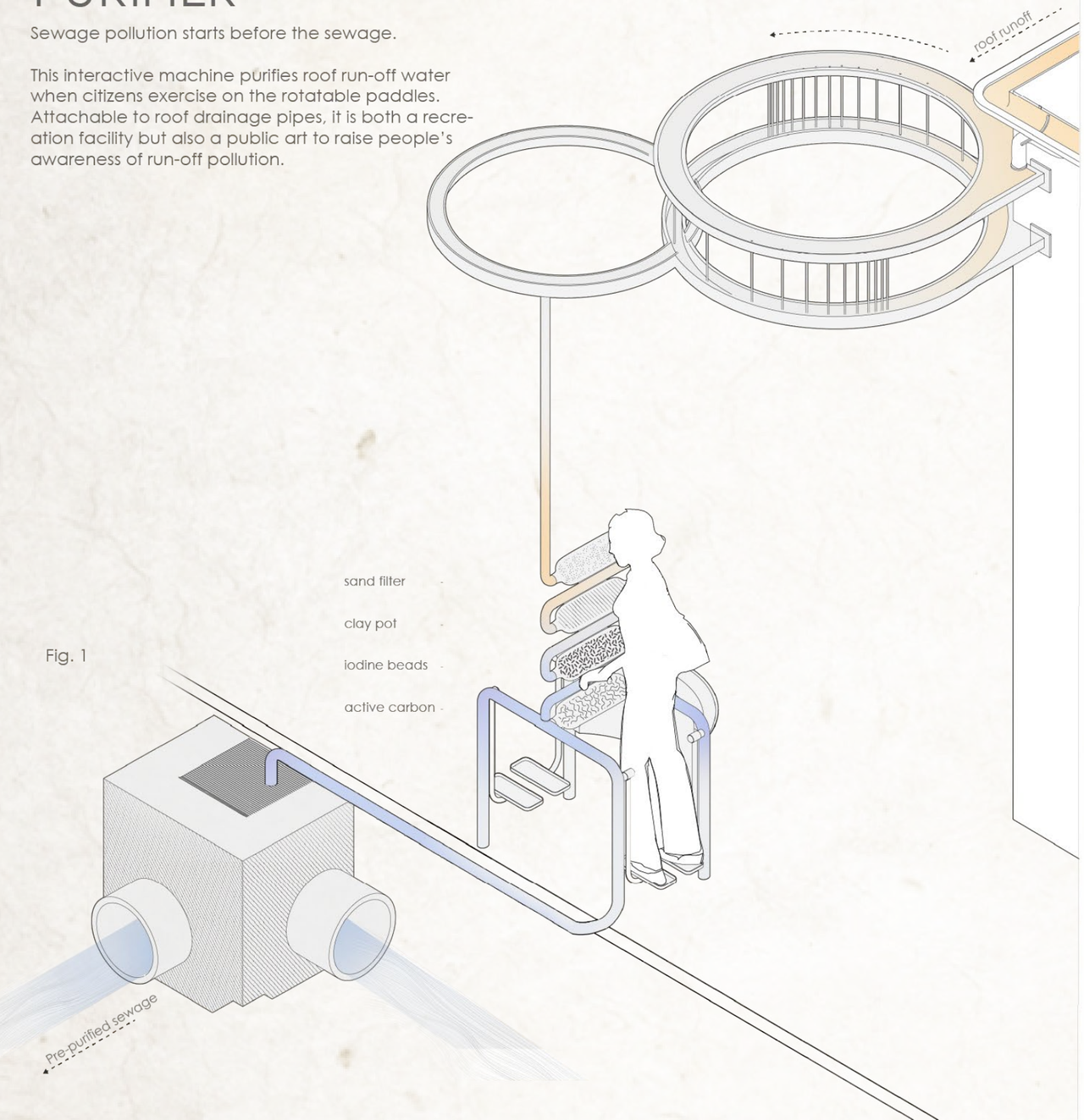
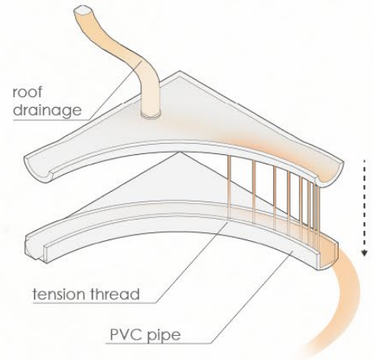


Fig. 1

Power Source

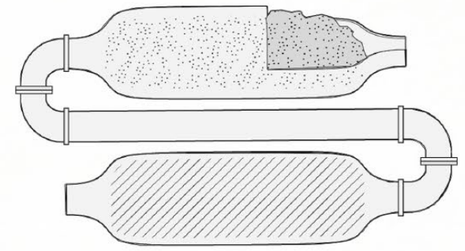
1. Gravity
By exaggerating the action of falling, this series of pipe art act as a ever- functioning land installation.



2. Body movement
Paddle rotaters can become a way for public exercising.

Mechanism

The movements of human body act as pump to drive water move through fank filters, which are filled with diffent material to filter and purify water.



Sand
remove particles

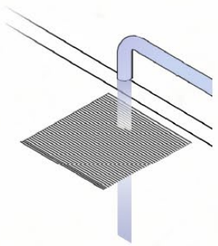
Clay
remove surface active surfactants

Iodine bead
disinfection

Active Carbon
trap contaminants

Impact

1. Prepurify sewage
Reduce precariousness of overflow pollution

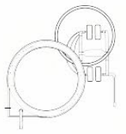


2. Public access
Purified water can be accessed by the public to wash their hands.

front view

right view

top view



WAVE REDUCTION AND
SEDIMENT CAPTUREING MACHINE

CAPTOR

This is a barrier machine that can reduce soil brought away by tidal change, capture them behind, and make them accumulate to reform a salt marsh boundary. The form comes from biomimicry of mangrove root, which is an effective natural barrier preventing soil erosion.

The real mangrove root system

POWER

These sticks are easy to assemble, which can involve publics in the process of construction, like adding or subtracting sticks to change the porosity, and thus change the performance.

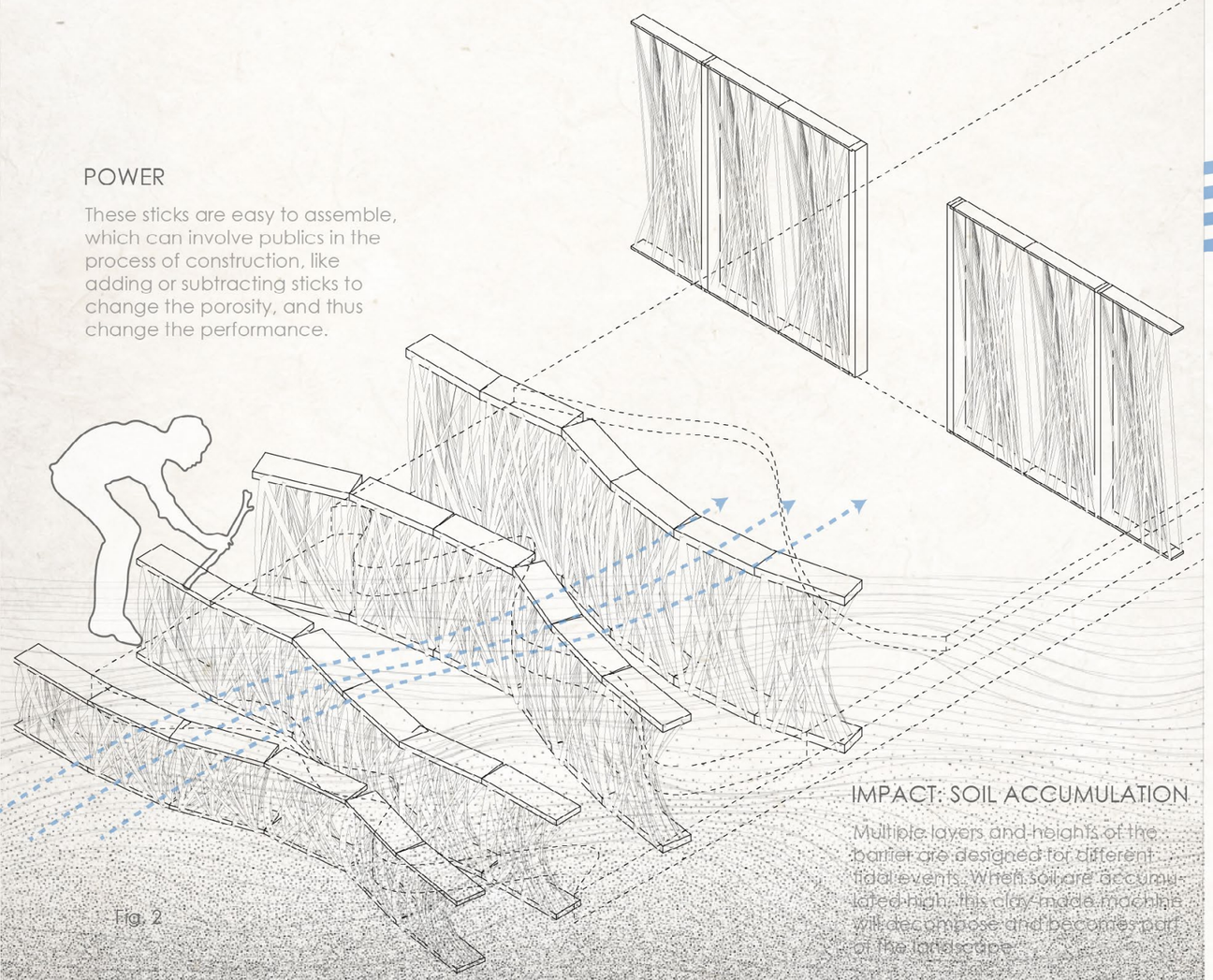
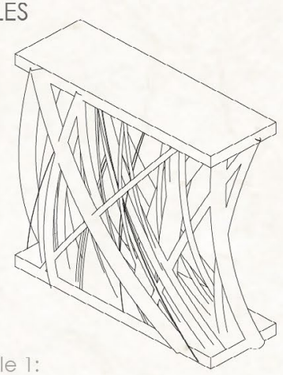


Fig. 2

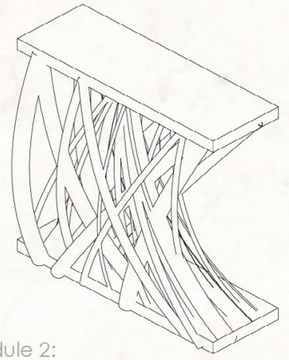
IMPACT: SOIL ACCUMULATION

Multiple layers and heights of the barrier are designed for different tidal events. When soil are accumulated high, this clay-made machine will decompose and becomes part of the landscape.

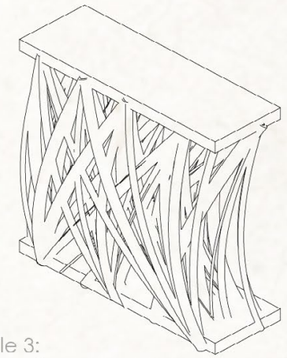
MODULES



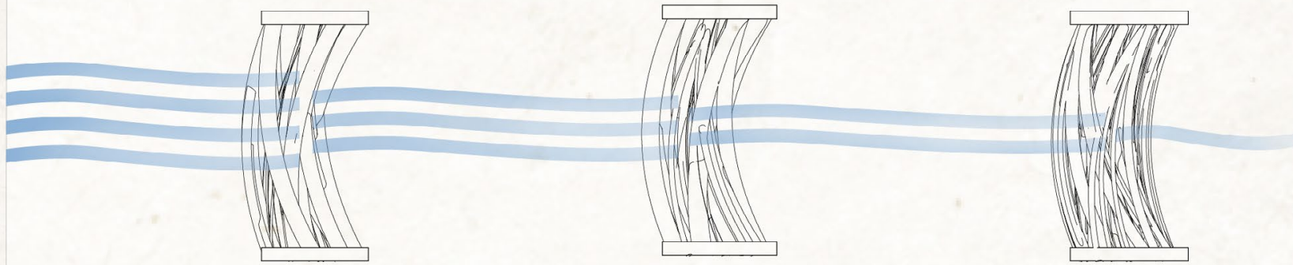
module 1:
high porosity
reduce less wave energy



module 2:
mid porosity
reduce less wave energy

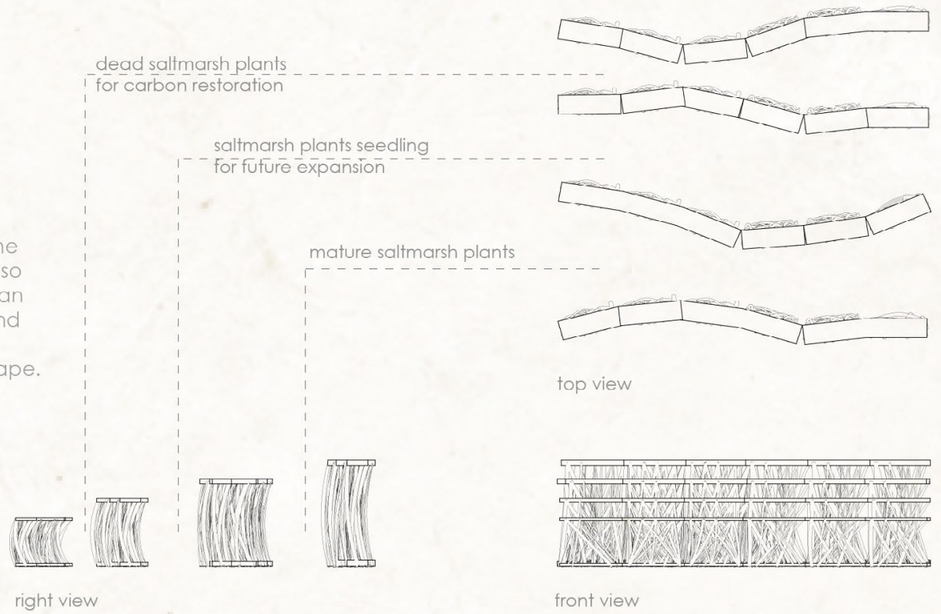


module 3:
low porosity
reduce much wave energy



MATERIAL

Using clay as the main material, so this machine can decompose and merge into the natural landscape.



WATER MACHINE 3

SEDIMENT REPLACEMENT MACHINE

SPLASHING PUMP

Splashing seasaw is a pump system utilized during playing seesaw. By suctioning the sediment from the mud flat and splashing to the low marsh, this machine helps to lift the salt marsh above sea level rise.

Suction dredging pump machine on marsh

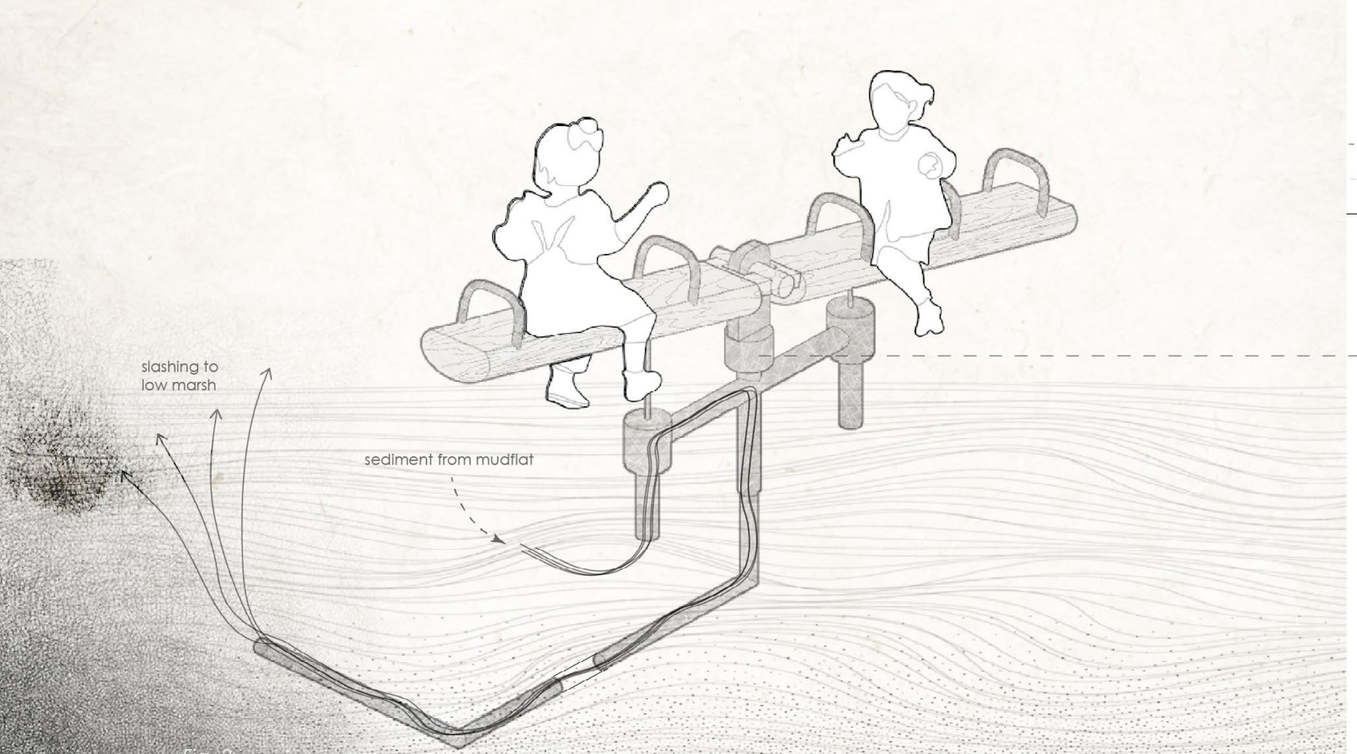
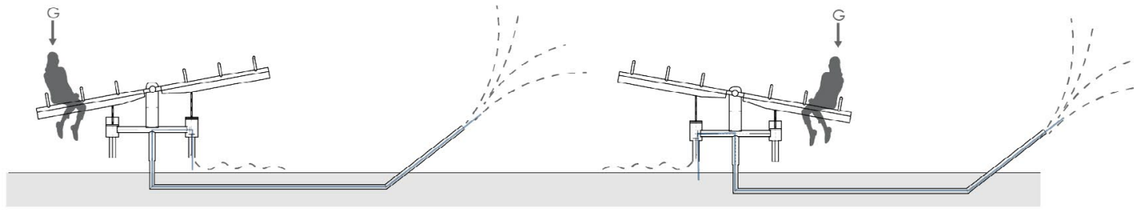
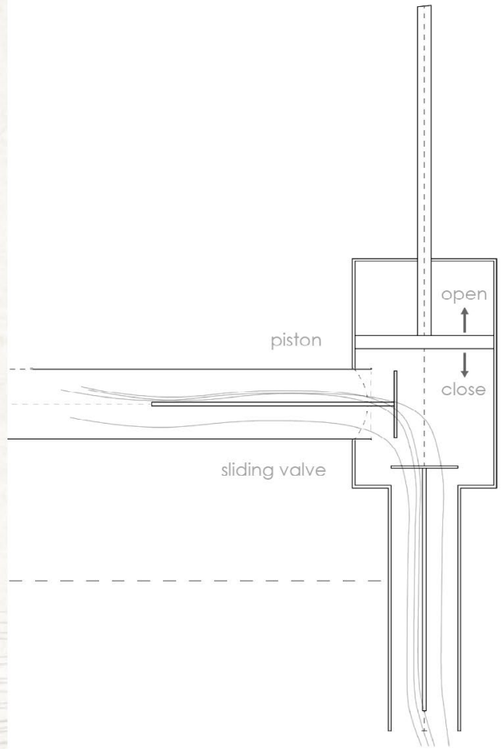


Fig. 3



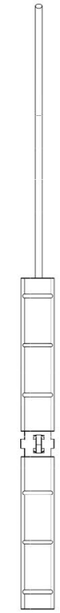
POWER SOURCE

Gravity from human weight make a pressure to the pump tank. Water sediment can be moved to low marsh through pipe from other site.

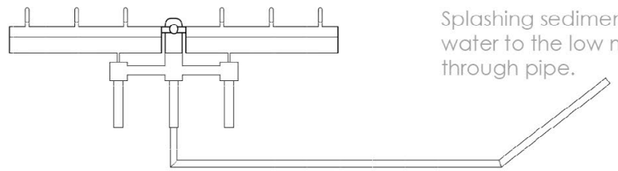


WATER PUMP

Human weight comes from playing seesaw and make low pressure inside the tank, then the valve opens to let water in and moves through the pipe.



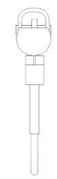
top view



front view

SPLASHING

Splashing sediments and water to the low marsh through pipe.

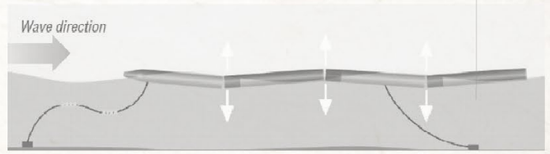


right view

LARGE WAVE REDUCTION MACHINE

WAVE ATTENUATOR

This is a floating machine serves as wave attenuator. It includes 3 modules for plants, human, and birds. Locating 100' away from shore, when two or more modules are connected, they will fluctuate to reduce large wave and reduce soil erosion at shoreline.



Normal wave attenuator diagram

POWER SOURCE

wave energy
wind energy

MODULES

module 1: huamn island
fishing
meditation
experiencing wave

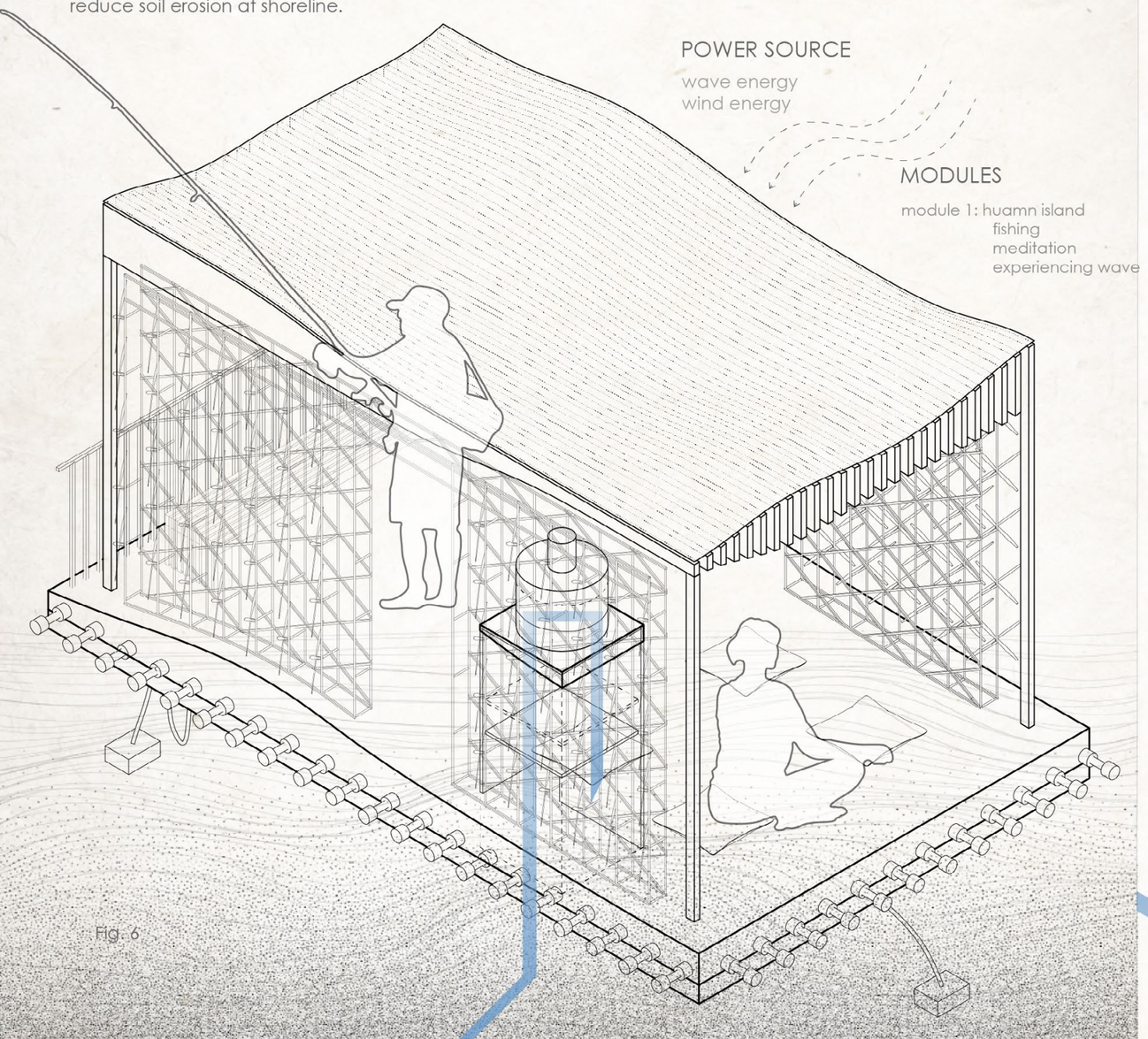
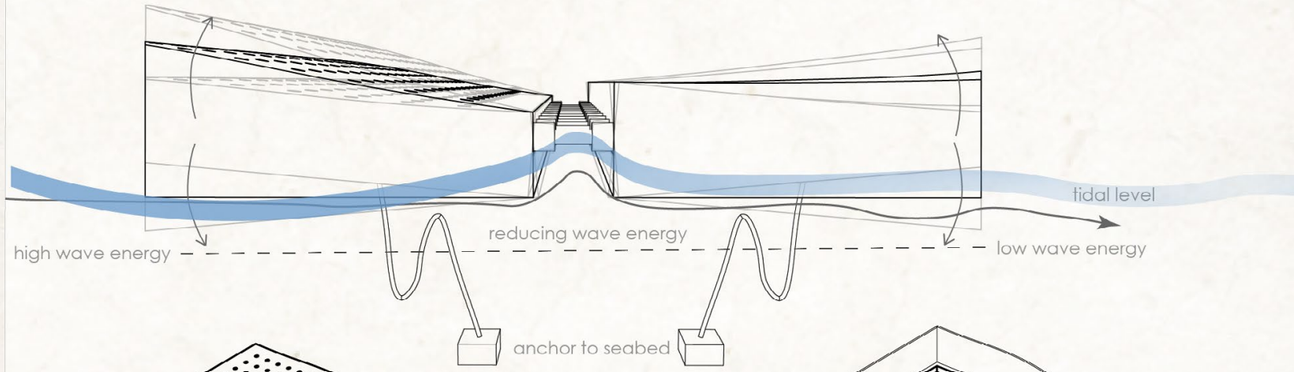
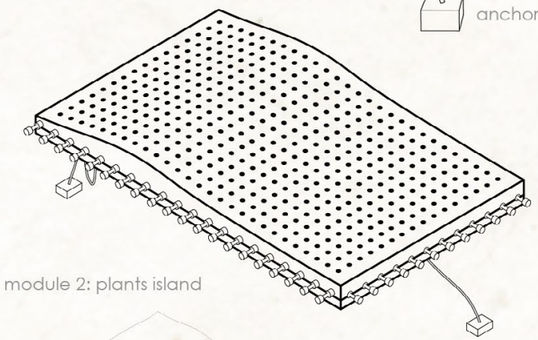
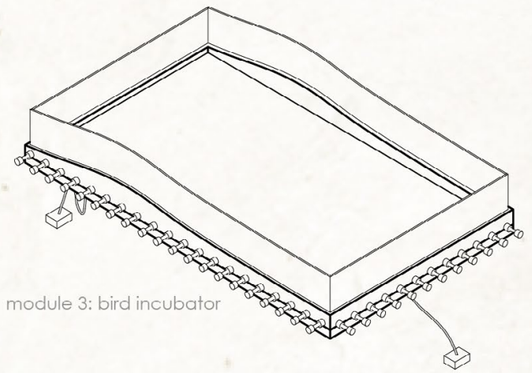


Fig. 6

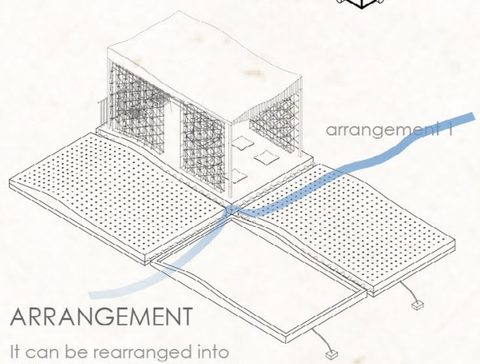


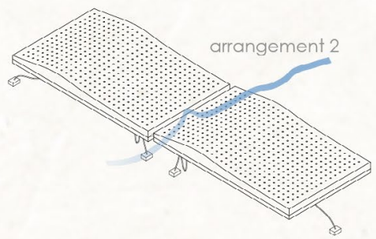


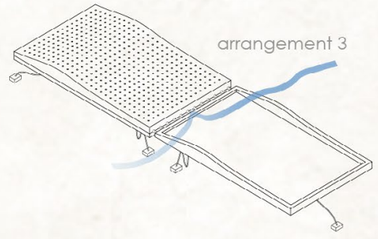
module 2: plants island



module 3: bird incubator



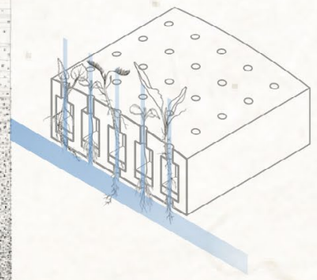


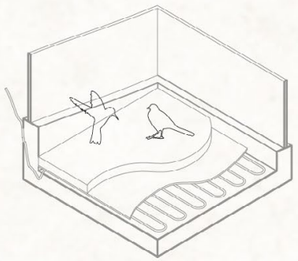


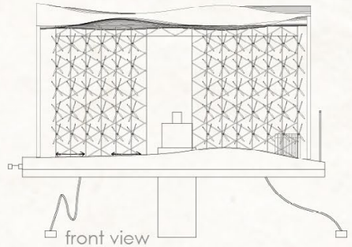
ARRANGEMENT

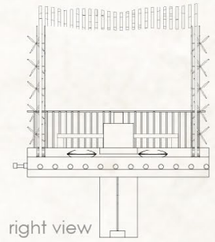
It can be rearranged into different configurations to form micro-ecosystem between human and nature.

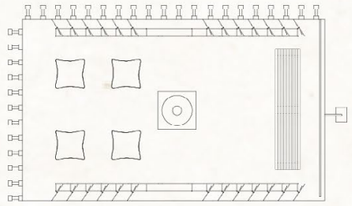
CONSTRUCTION DETAILS



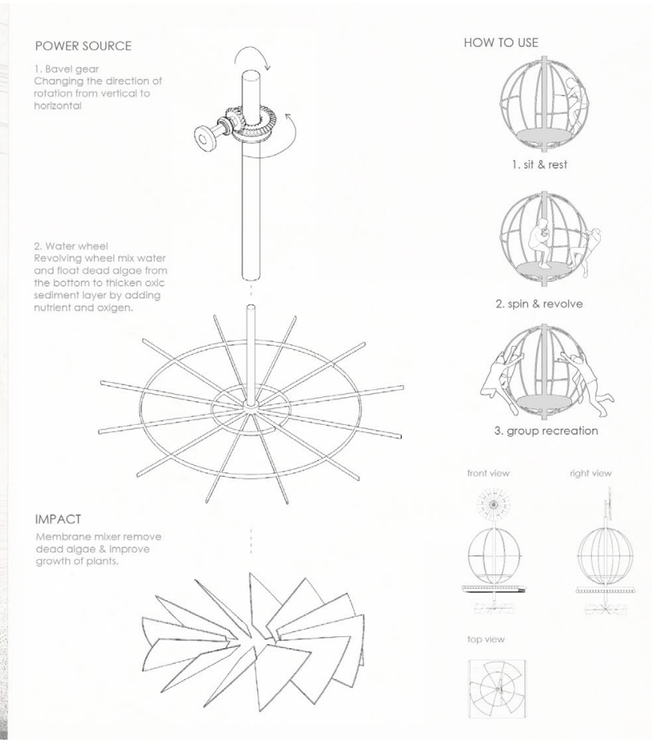




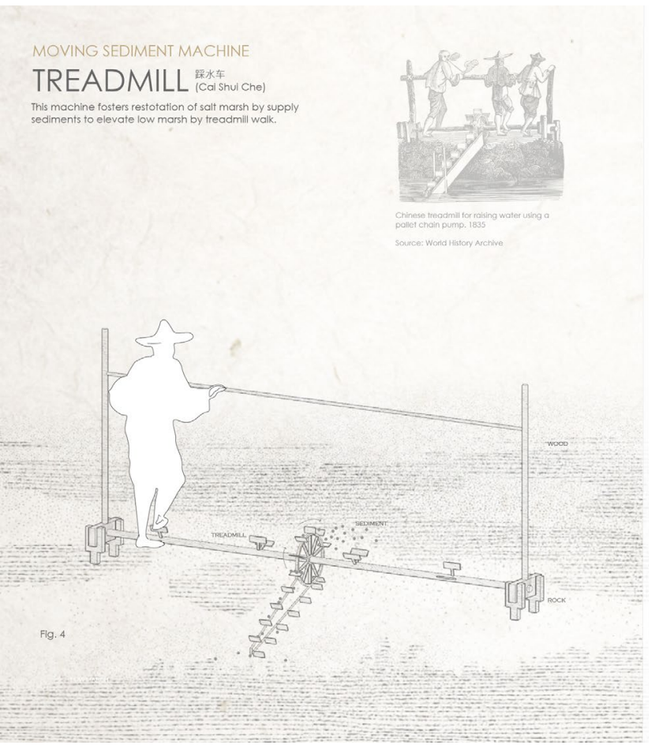


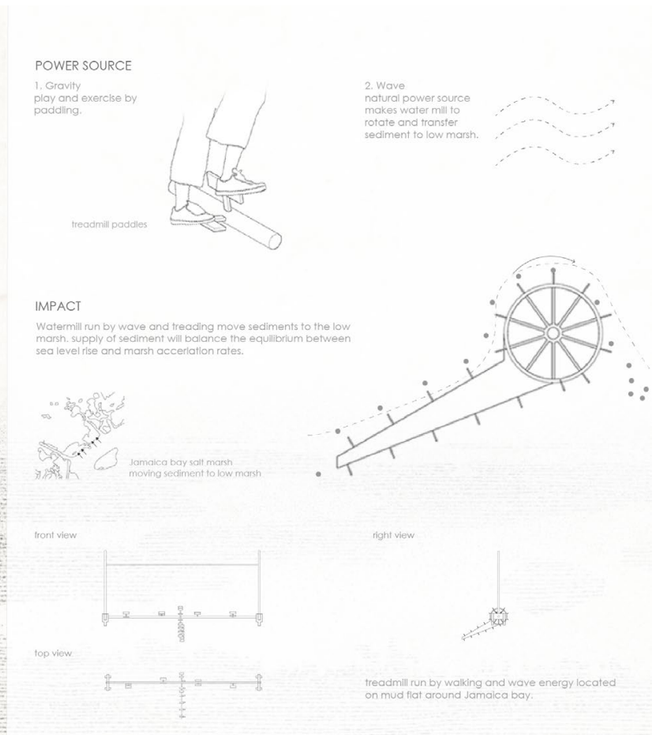


WATER MACHINE 5



WATER MACHINE 6





Purifier

The pipe system will bring the underground water up, purify them to form a small fountain like installation.

Mixer

The mixer machine is playful that childrens from from both local neighborhood and tourism can enjoy them and provide power for the machine to mix nutrients in the water, which can help to form marsh soil.

CAPTORS

Captors are formed by layers of bio-mimic barriers with different density that can be controlled and changed by normal people. During both high-tide and low-tide period soil can be captured.

SEESAW

A soil pump system is installed under the seesaw machine, and during it’s played by people, soil from shallow water area will be splashed to marsh area as a counter force against marsh erosion.

TREADMILL

Treadmills is a traditional low-tech machine that make use of human labor. Here it helps to generate small wave that can help soil to accumulate.

WAVE ATTENUATOR

They function similar to normal wave attenuators to reduce big wave. The difference is the machine forms a micro-biosystem in its limited space that creatures including human, animal, and plants can all step on it and feel the natural force of water.

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02

Below Zero: FROM URBAN, FEED URBAN

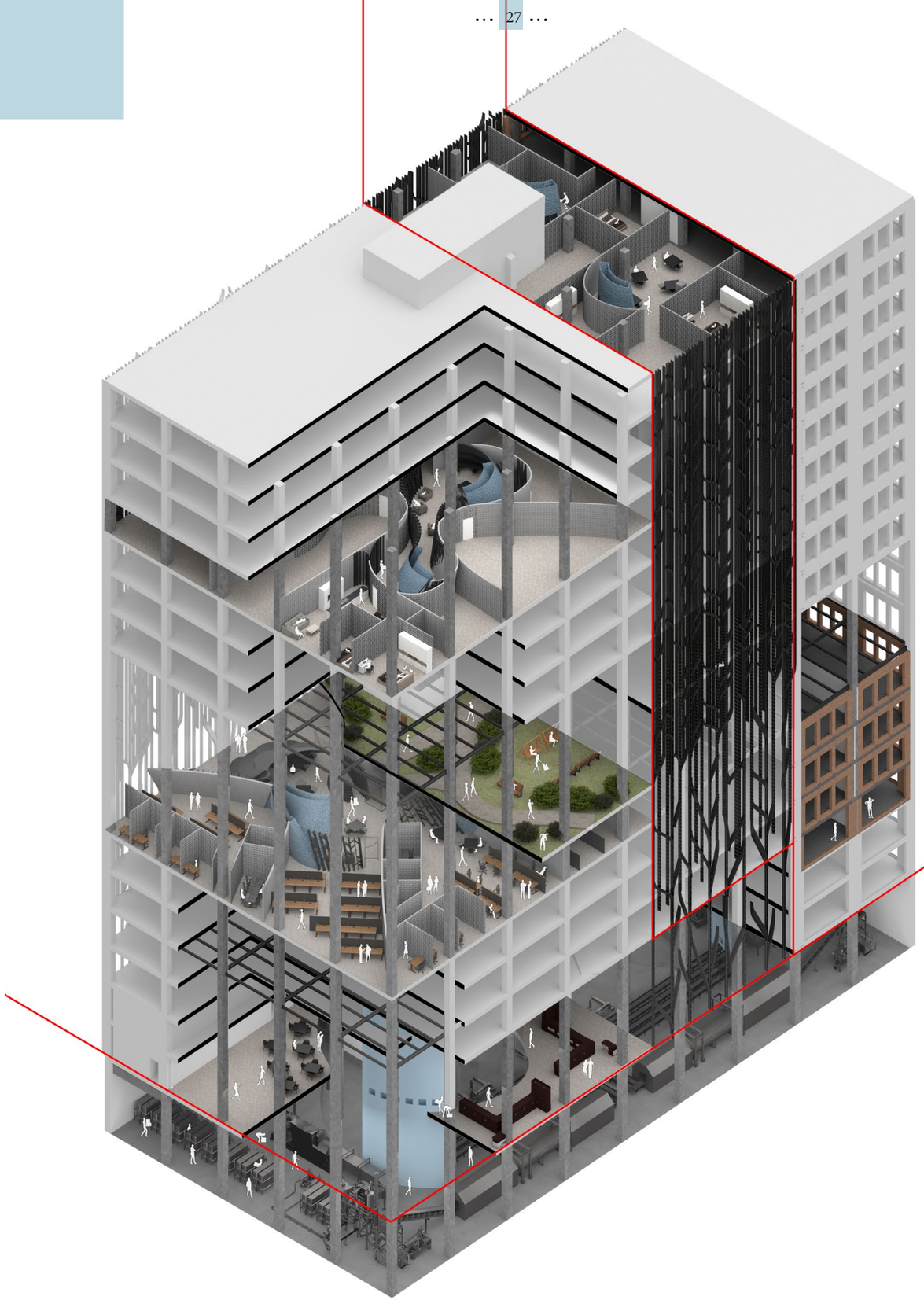
The Biochar Metabolism in A New Building System

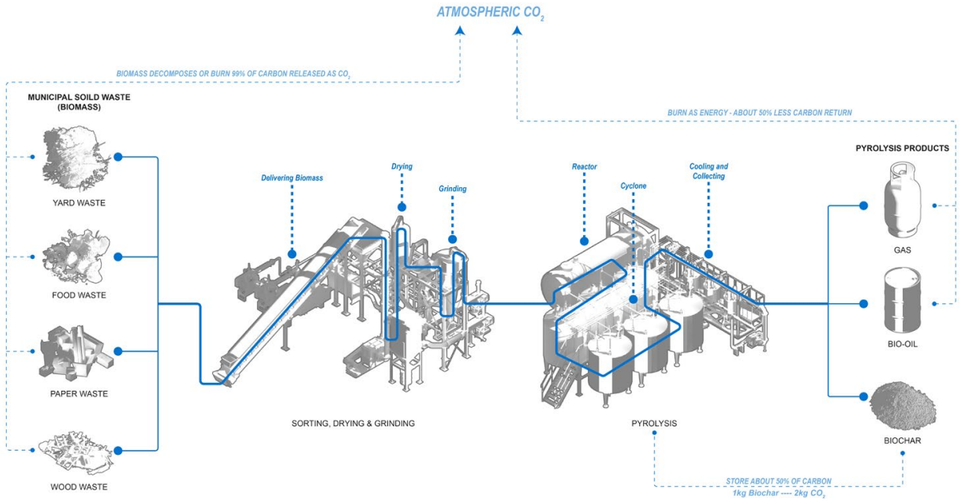
7 Penn Plaza, NYC

Columbia University Studio Work, Fa2022
Instructor: David Benjamin
Group Work: Xiangyi Deng, Junzhi Deng

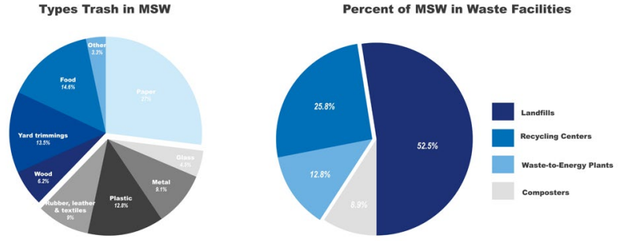
Municipal Solid Waste *can be converted into* ***biochar****, the* ***negative carbon additives****, and its unique advantage include avoiding carbon emissions from* ***waste transportation and burning*** *while* ***permanently storing carbon*** *inside. Combining it with different* ***building materials*** *can lead to the possibility of a* ***self-repairing*** *building that* ***redefines metabolism****.*

The project will design a ***new trash chute system*** *that* ***collects and converts wastes*** *during the operation of buildings into biochar-included materials as products, which forms a closed loop* ***circulation*** *economy around MSW that encourages a* ***new lifestyle*** *about trash sorted and shared living. MSW collected from surrounding buildings will be* ***re-exported*** *as biochar products to make a bigger influence. This* ***infrastructural system*** *works both at* ***building-scale*** *and* ***urban-scale****, connecting buildings, forming* ***public skywalks****, and leading to new types of* ***aesthetic spatial qualities*** *around the trash chute system.*



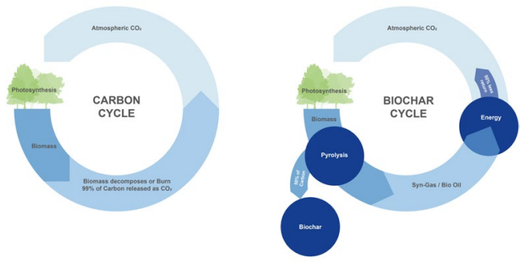


BIOCHAR PRODUCTION PROCESS



WASTE ANALYSIS

MSW contained biomass can be converted to biochar, which means great potention of waste reduction and biochar production.

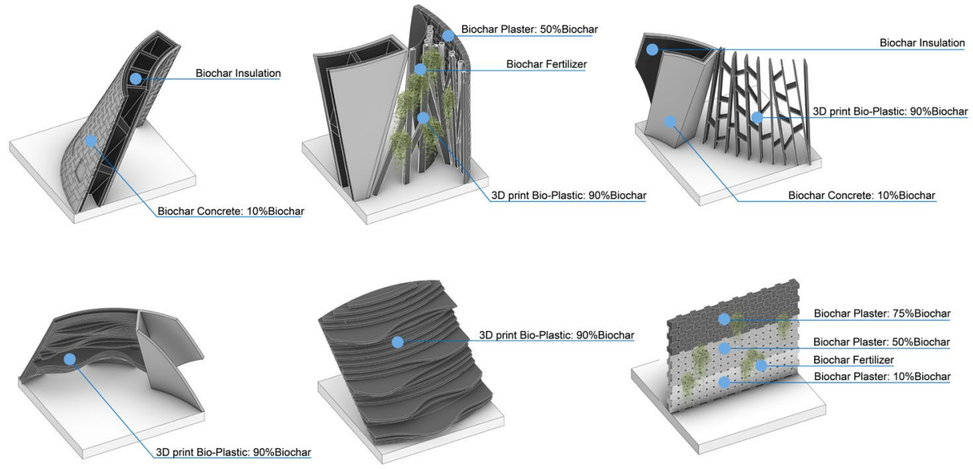


CARBON CYCLE

The comparison between normal biomass carbon cycle and processed biochar carbon cycle.

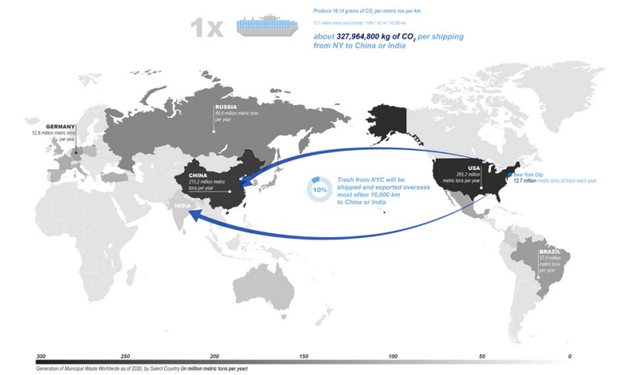
BIOCHAR BUILDING MATERIALS

Biochar powder can be added into different building materials to change qualities such as absorption, weight, and strength. Those biochar-included building products can be developed into applications in various forms.

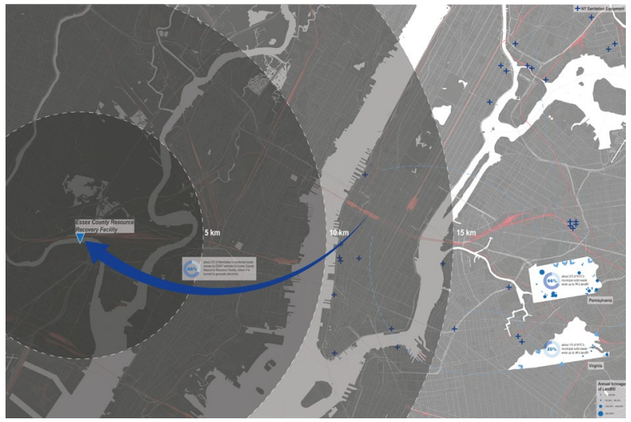


BIOCHAR PRODUCTS

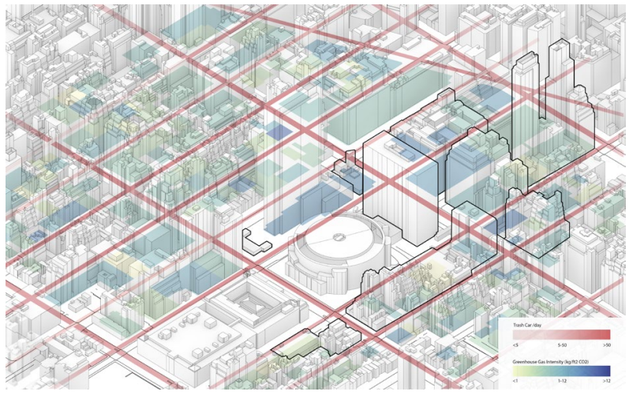
Biochar-included materials can be 3D-printed into more complicated form and manually selected by people. It also makes possible to modulize components, which are easy to assemble. Forms like geometrically interlocking arrangement can improve structural strength.



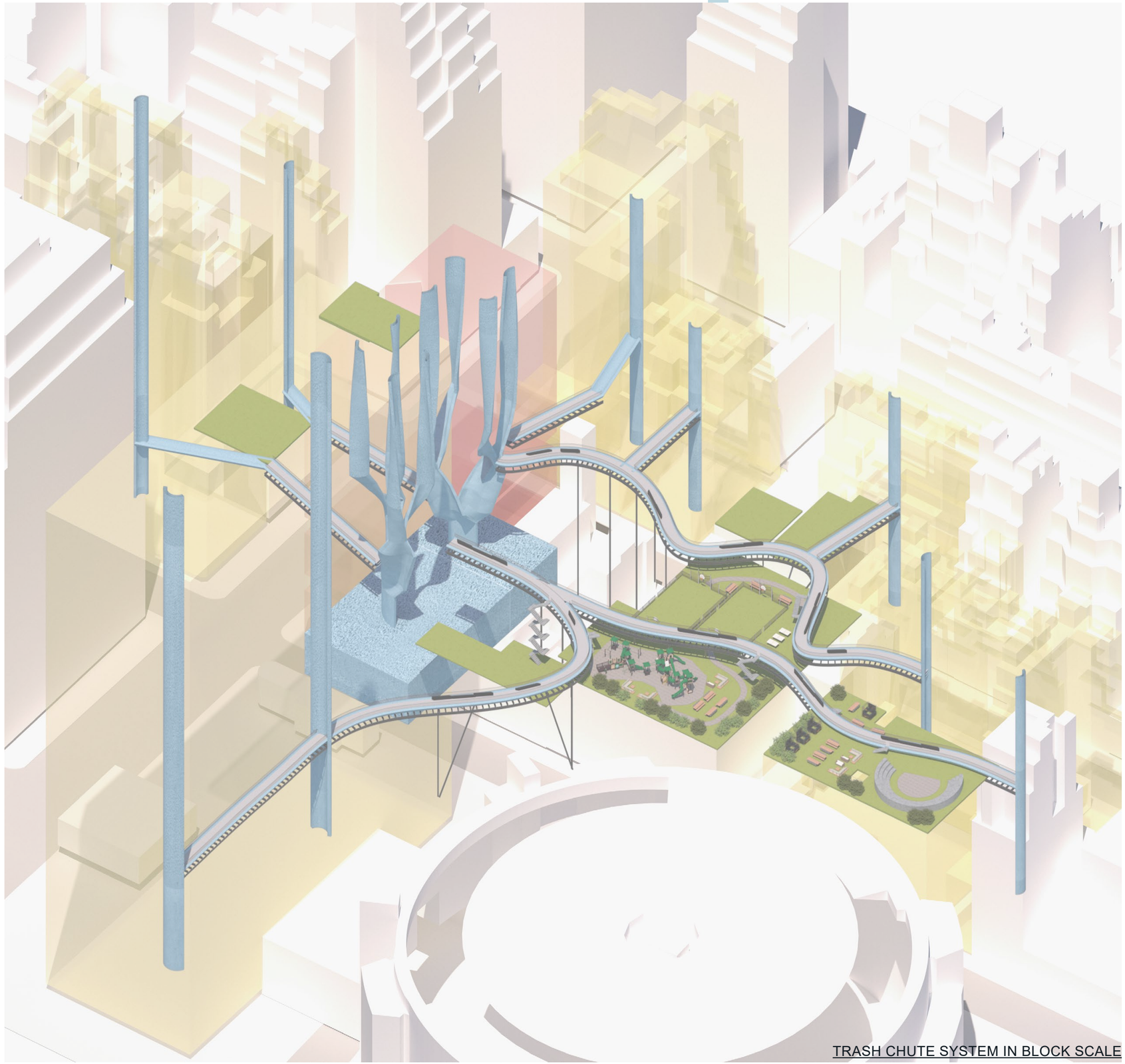
MSW TRANSPORTATION EMISSION CALCULATION 1



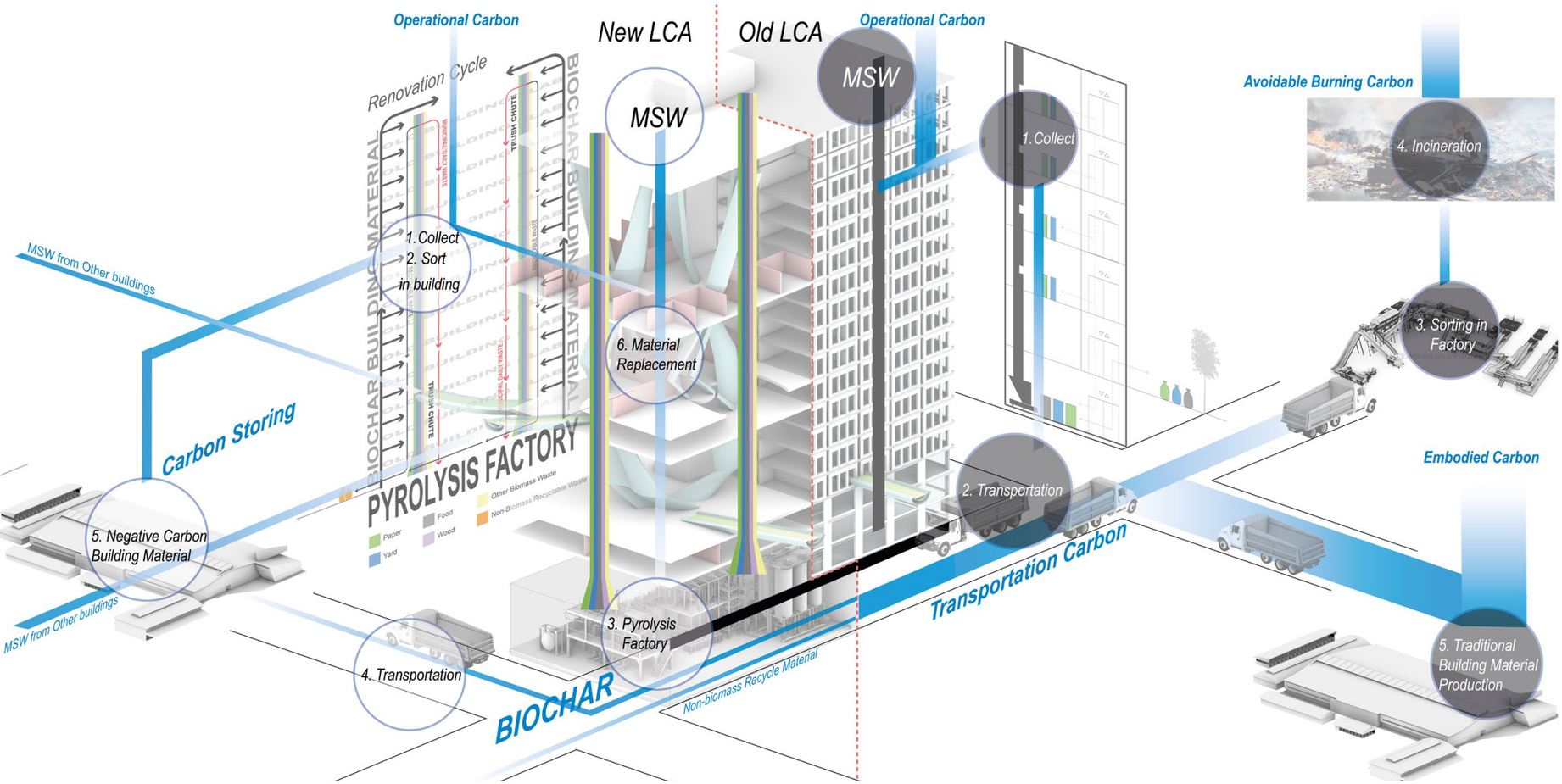
MSW TRANSPORTATION EMISSION CALCULATION 2



SITE ANALYSIS FOR TRASH TRUCK TRANSPORTATION AND BUILDING CARBON EMISSION



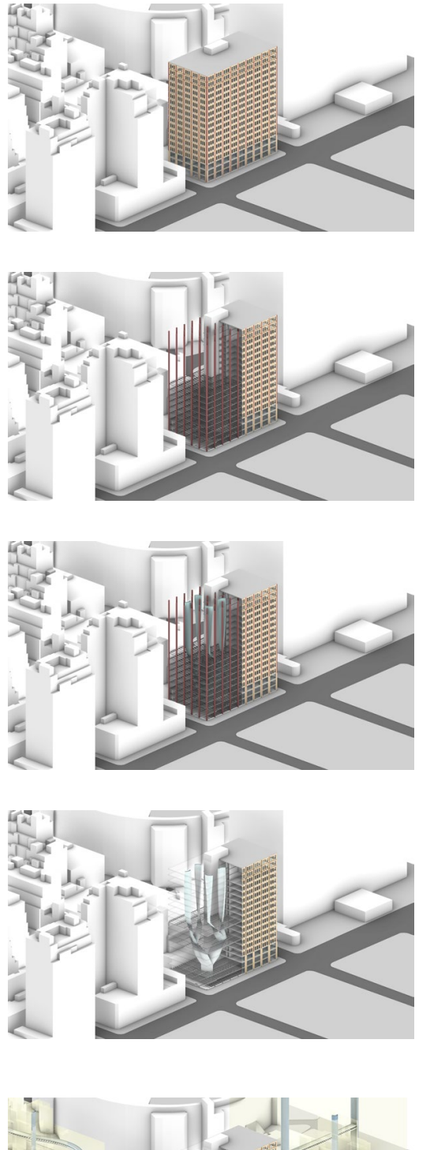
TRASH CHUTE SYSTEM IN BLOCK SCALE



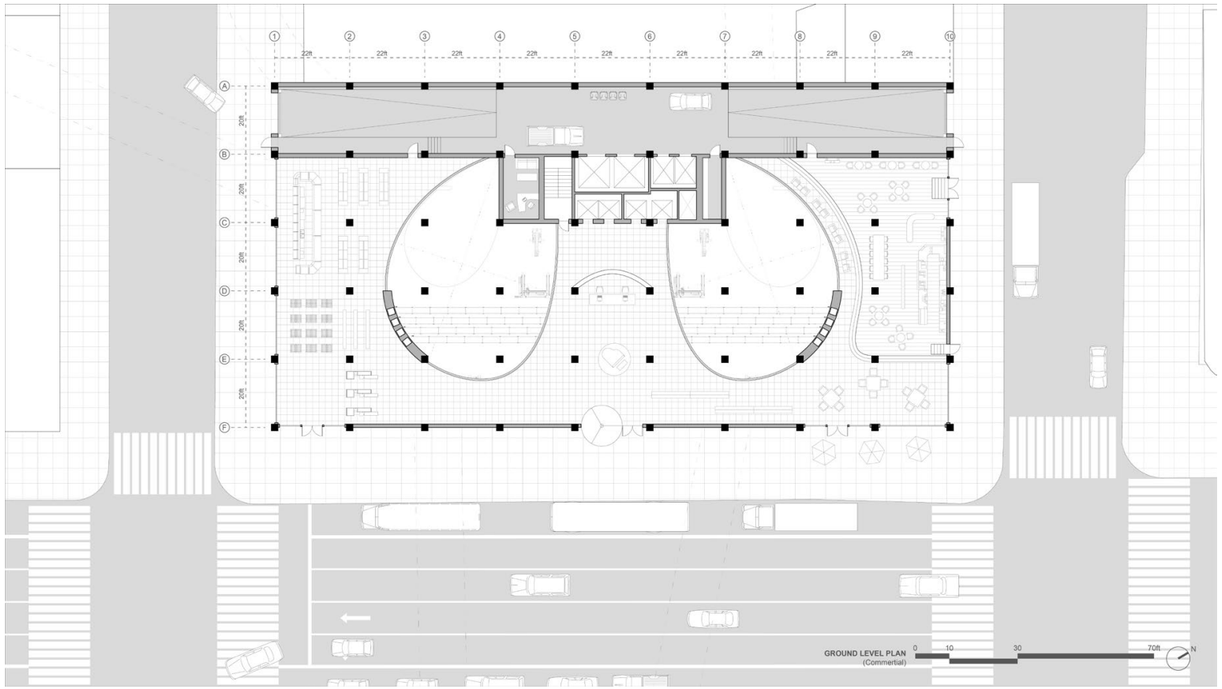
LCA ANALYSIS COMPARISON

The left side is the old building and its lated trash management steps, which results in large amount of carbon emission.

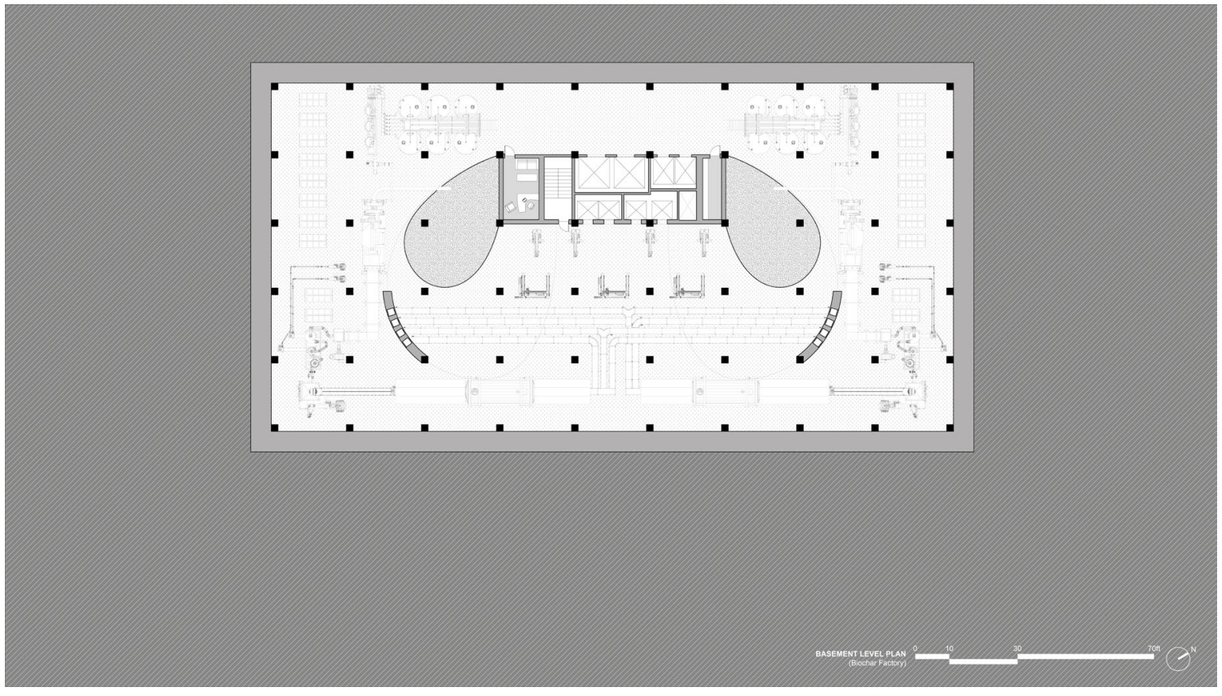
The right side is the new building with the designed trash chute system, which will form a circular built environment that stores most carbon.



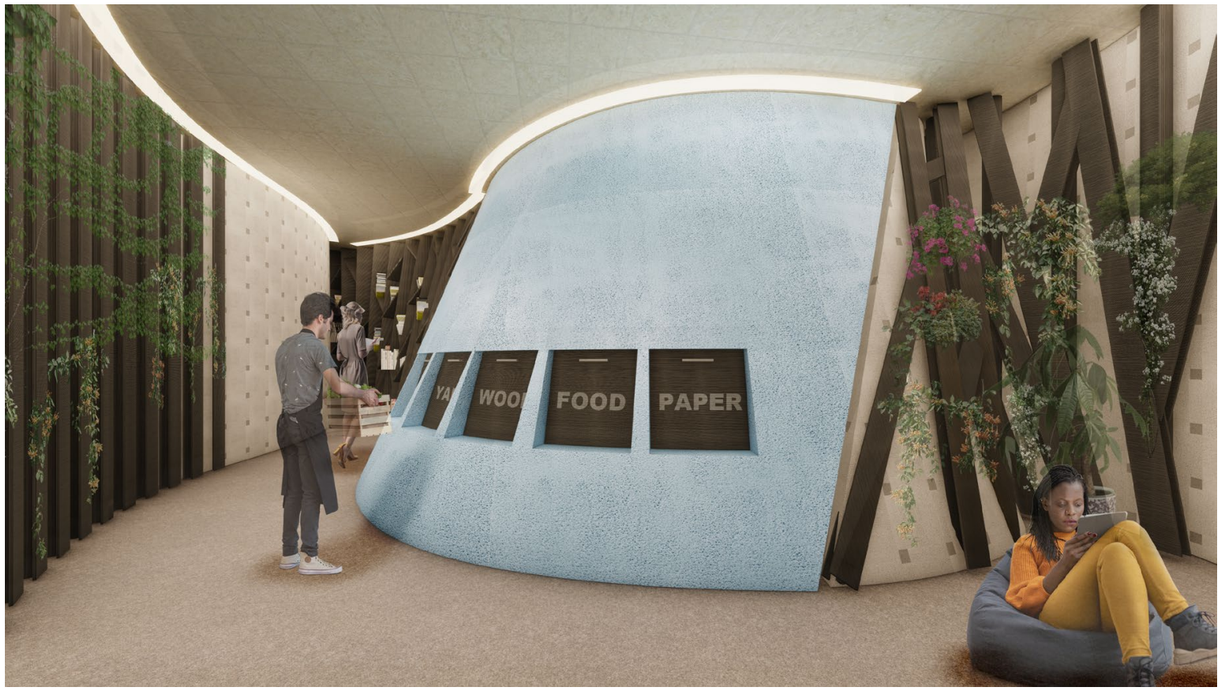
RENOVATION STEPS



GROUND FLOOR PLAN

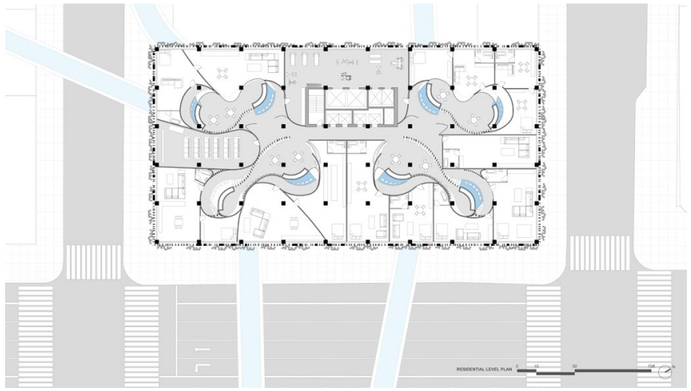


BASEMENT FLOOR PLAN

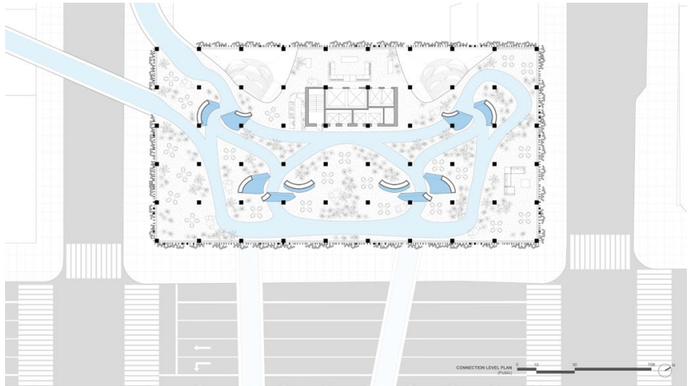


DAILY SCENE OF TRASH COLLECTION

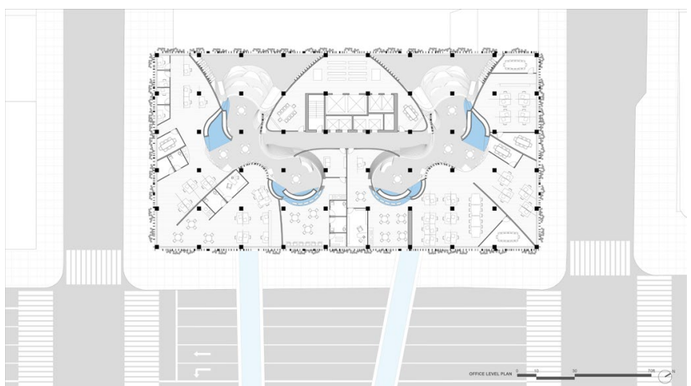
The trash collected in the whole building is converted into products that can be used and shared by all people, which forms a circular economy that encourages a shared living lifestyle. And also because the middle of the floor plan doesn’t receive much light, those spaces around trash walls are designed to be communal spaces shared by surrounding offices.



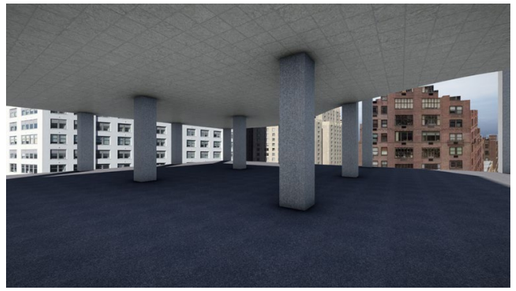
RESIDENTIAL FLOOR PLAN

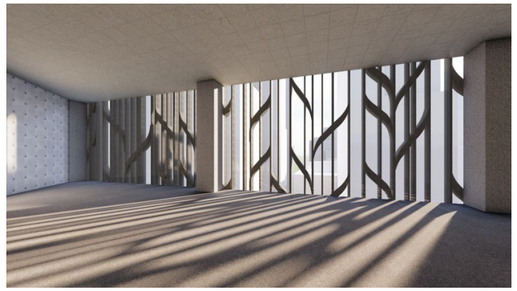


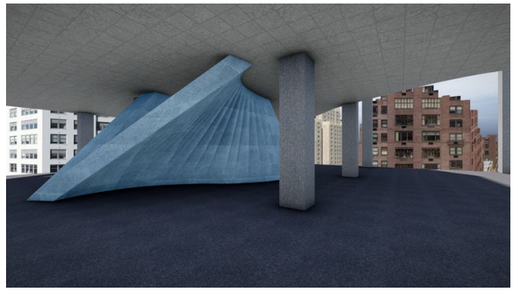
SKY GARDEN FLOOR PLAN

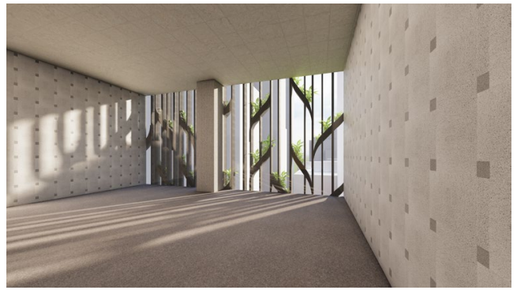


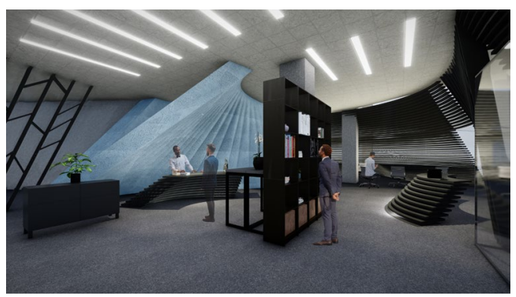
OFFICE FLOOR PLAN



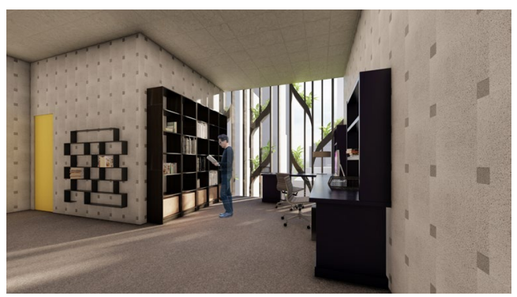








METABOLISM: FLEXIBLE BIOCHAR FURNITURE



METABOLISM: FLEXIBLE BIOCHAR PLASTER WALL

METABOLISM: MANUALLY DEFINED FURNITURE

METABOLISM: SKYWALKS AND EXTRA PUBLIC GREEN SPACE IN HIGH DENSITY CITY

03

Intertwined Energy and Human Activities

Future Truck Stop

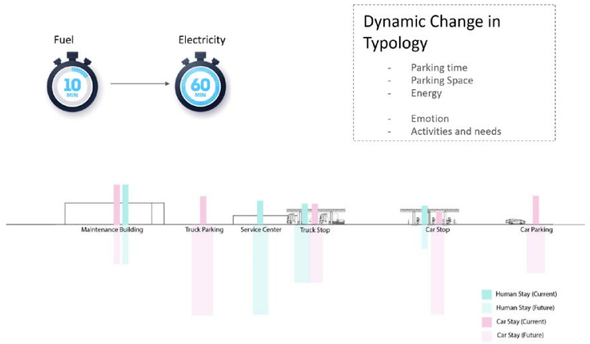
Tahoe, Reno

Columbia University Studio Work, Sp2023
Instructor:Michael Bell

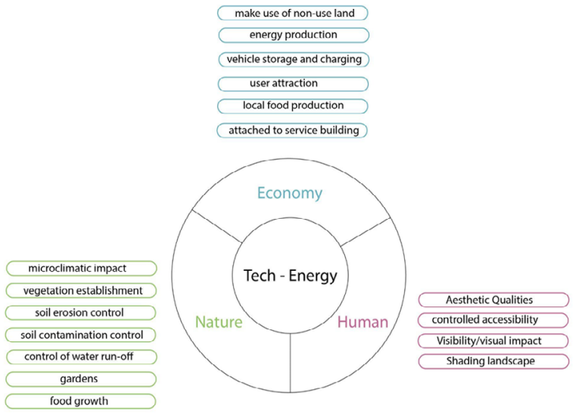
This project aims to transform current truck stops from fuel-based to electricity-based systems, which will result in longer driver stays and require expanded program offerings to meet their needs. However, implementing this change for long-haul heavy transportation will face economic resistance. To address this, the design must be adaptable to predictable changes over several years instead of being built to last for decades. Responding to the dramatic increase in electricity consumption to charge EV trucks, natural energy capturing technologies will be the primary design strategy to achieve sustainability, with technology working in harmony with nature to create microclimatic impacts, establish vegetation, and control soil and water. Human experience will also be considered, with shading, aesthetic qualities, controlled accessibility and visibility, and other elements designed to influence drivers' physical and mental conditions. The design strategy consists of two parts: the creation of energy-capturing and user-centric modules that can adapt to fast changes, and a phase-by-phase installation and expansion process on site. Ultimately, this new design strategy will allow conventional truck stop land to be used not just for transportation and energy production, but also for serving human activities.

USC Studio Work
Instructor: Gary Paige

Lincoln Heights, Los Angeles

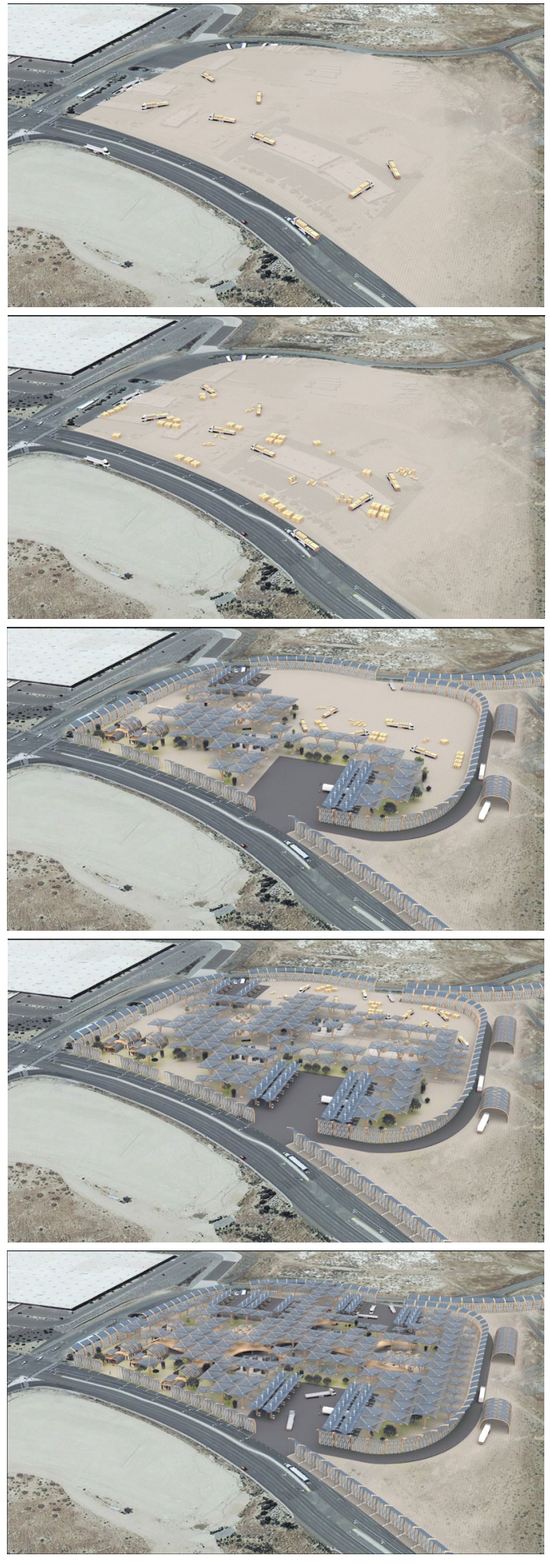


STAYING TIME RETENTION WHEN CHARGING

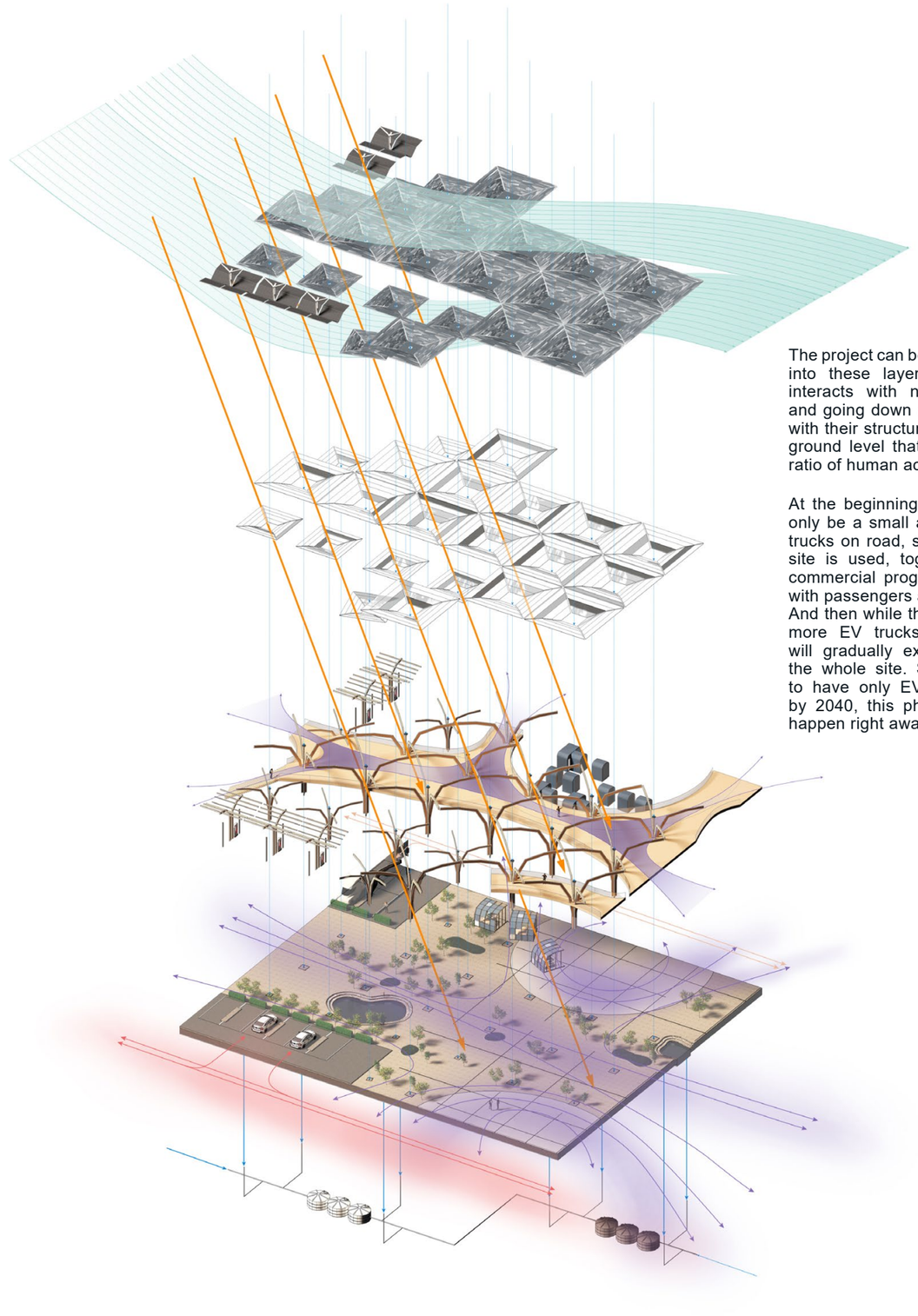


INTERTWINED DIAGRAMS

SITE INFLUENCES



SITE EXPANSION PHASES



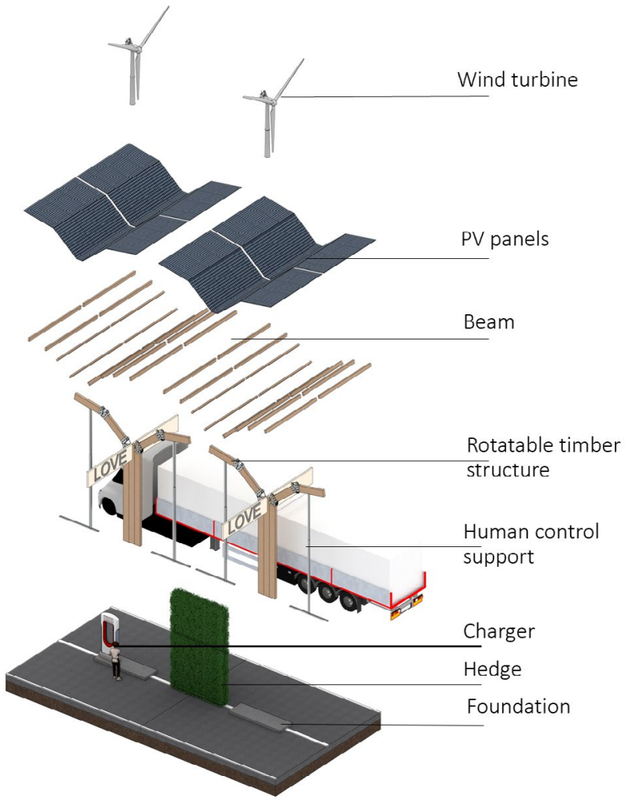
The project can be vertically divided into these layers: the top layer interacts with natural resources, and going down are canopy layers with their structures, as well as the ground level that contains a large ratio of human activity zone.

At the beginning phase, there will only be a small amount of electric trucks on road, so only part of the site is used, together with some commercial programs also shared with passengers and local workers. And then while there are more and more EV trucks, those modules will gradually expand to take up the whole site. Since the goal is to have only EV trucks on route by 2040, this phase change may happen right away.

PLANS

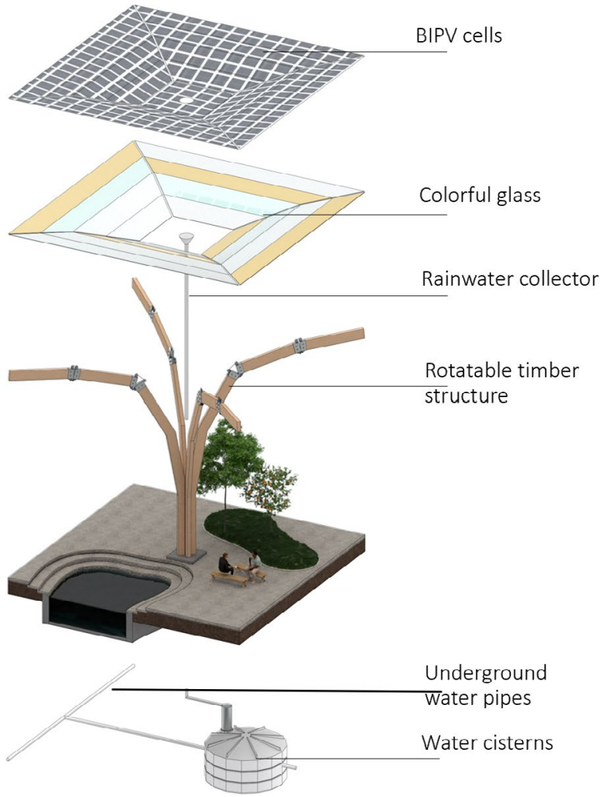
The horizontal programmatic distribution includes three zones. Vehicle services zones with barrier modules on the periphery, free walking zones for users, and the gathering zone for people and movable modules. Vehicle circulation and human circulation are fully separated to reduce the conflictS.

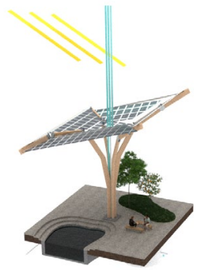
As the project is designed for both truck drivers, passengers, and local workers, those movable modules can be redistributed, while leaving enough space for gathering events for groups of people. The second layer includes a bridge that provides a different view of the site, as well as the observation deck. The top view is pretty much a landscape of energy collection systems, which looks tight and intense, but actually with transparency that connects the environment and users.



MODULE 01

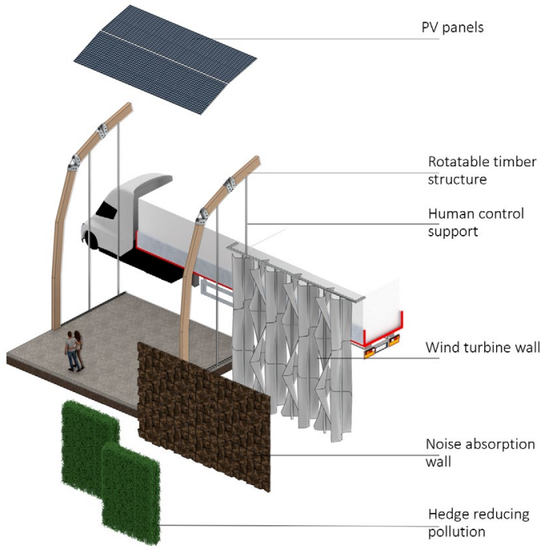
This module is the charging and parking canopy. It also primarily serves as an energy collection system that has rotatable photovoltaic panels and small wind turbines.

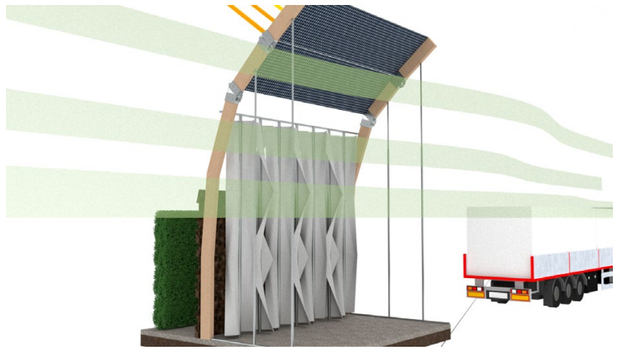




MODULE 02

The module is the shading canopy that collects solar energy and rainwater. The BIPV layer is inserted in-between glass panels, so part of the light can still penetrate through. The center pipe transports water to the water cistern that feeds local small ponds and vegetation. So it contributes to water retention that can help to improve the soil condition in the long term.



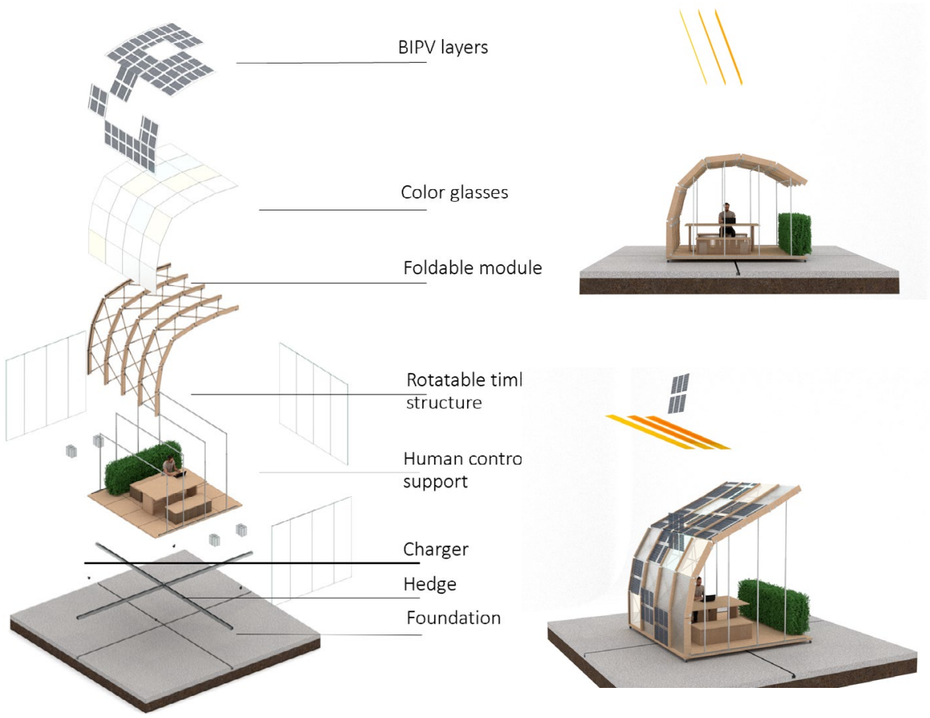


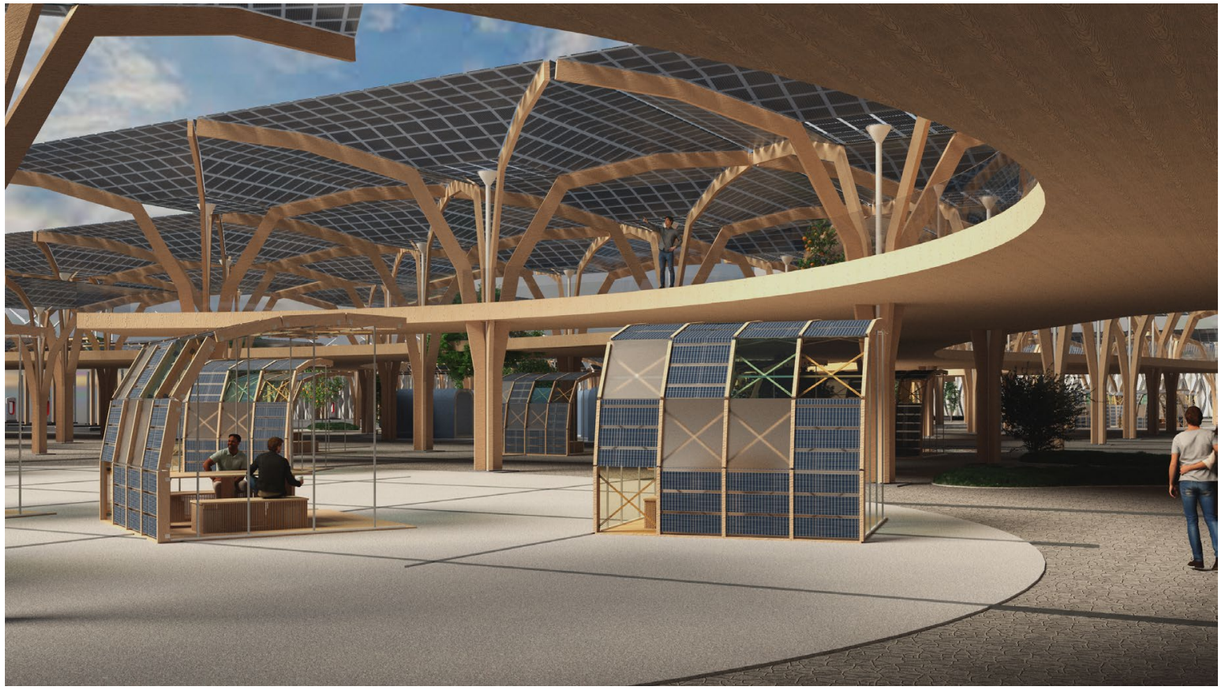
MODULE 03

This barrier module is designed to reduce noise and pollution from transportation. There's the layer of acoustic absorption wall, and also hedge wall to filter pollution, which helps to increase user experience for those who want to get out of their vehicles.In addition, when truck is passing by the barrier, the wind energy produced by the vehicle will be collected by the wind turbine wall, which is not only designed for energy, but also for a dynamic aesthetic performance.

MODULE 04

The last module is a working and rest station, located outdoor for truck drivers to use. It's a highly customized module. The vertical supports can be adjusted manually and respond to solar energy during different periods. The canopy has two layers that can also be manually inserted in or out. The module is sited on a group of tracks which allow users to pick a location they like in the surrounding area, such as under trees, near a pond, or even closer to the truck parking area.



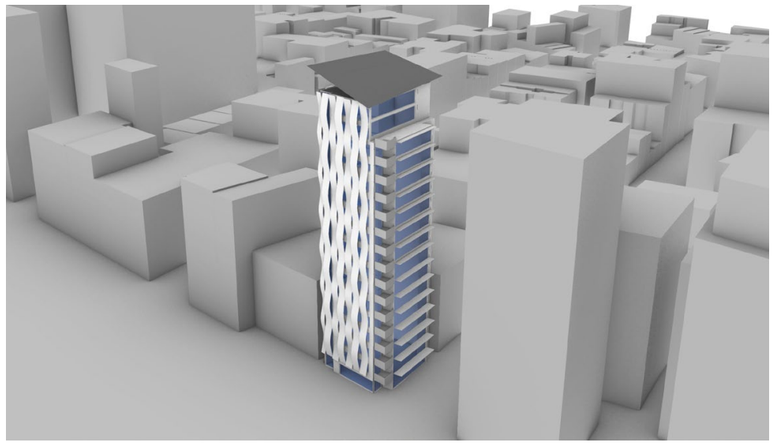


Building Envelope Performance Analysis

Net Zero Housing

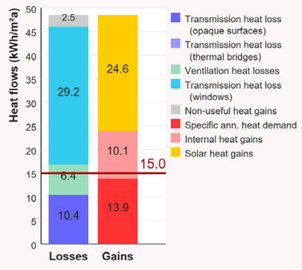
Columbia University Elective Work, Fa2022
Instructor: Andreas Benzing

The project redesigned the envelope of an existing building, 145 Perry St. apartment designed by Richard Meier. The original building's glass facade and material use led to poor thermal performances. By using DesignPH tool, thermal performance after adding the new second layer facade is evaluated. According to the calculation, in an ideal situation, the heat loss and heat gain of the building can achieve net-zero.



Overview | Results | Heat balance | Climate | Vent.

Heat balance



ue editor | Assemblies | Components | Shading

Project overview

EDUCATIONAL LICENCE, NOT FOR PROFESSIONAL USE (expires in 268 days)

Climate	New York	change
Building type	Dwelling	change
Annual heat demand (Q_h)	13.9 kWh/m²a	details
Treated Floor Area (TFA)	2700 m² (Direct entry)	details
Thermal envelope area	4610 m²	details
Heat Loss Form Factor	1.71	
Projected building footprint	-.-- m²	
Number of windows	55	details
Number of thermal surfaces	45	details
Number of thermal bridges	None defined	details

Thermal envelope checks
The thermal envelope appears to be incomplete!
This may be caused by incorrectly assigned non-thermal surfaces, reversed faces, a hole, glued components, or unintersected faces in the envelope!

Projection along Blue axis:	43.9% variance
Projection along Red axis:	1.9% variance
Projection along Green axis:	1.9% variance
Render mode	Render by Area Group

Transmission heat loss (opaque surfaces)

Area group	Total area (m²)	Area weighted U-value (W/m²K)	Av. temp. factor	Ann. htg. degree hours (kKh/a)	Transmission heat losses (kWh/a)	Q_t (kWh/m²a)
7 - External Door	0.00			64.00		
8 - External Wall - Ambient	2457.23	0.15	1.00	64.00	23589.41	8.74
9 - External Wall - Ground	0.00			64.00		
10 - Roof/Ceiling - Ambient	469.80	0.15	1.00	64.00	4510.08	1.67
11 - Floor slab / Basement ceiling	0.00			64.00		
12 -	0.00			64.00		
13 -	0.00			64.00		
14 - Temperature zone X	0.00			64.00		
18 - Partition Wall to Neighbour	0.00			64.00		
	2927.03				**28099.49**	**10.41**

Transmission heat loss (windows)

Area group	Total area (m²)	Area weighted U-value (W/m²K)	Av. temp. factor	Ann. htg. degree hours (kKh/a)	Transmission heat losses (kWh/a)	Q_t (kWh/m²a)
2 - North Windows	374.39	0.77	1.00	64.00	18568.04	6.88
3 - East Windows	0.00			64.00		
4 - South Windows	819.19	0.66	1.00	64.00	34698.35	12.85
5 - West Windows	489.43	0.81	1.00	64.00	25474.04	9.43
6 - Horizontal Windows	0.00			64.00		
	1683.01				**78740.42**	**29.16**

Transmission heat loss (thermal bridges)

Area group	Total length (m)	Average Psi-value (W/mK)	Av. temp. factor	Ann. htg. degree hours (kKh/a)	Transmission heat losses (kWh/a)	Q_t (kWh/m²a)
15 - Thermal Bridges Ambient	0.00			64.00		
16 - Perimeter Thermal Bridges	0.00			64.00		
17 - Thermal Bridges Floor Slab / Basement Ceiling	0.00			64.00		
	0.00				**0.00**	**0.00**

Ventilation heat losses

	Energy effective air change rate (1/h)	Ventilation volume (m³)	Heat capacity of air	Ann. htg. degree hours (kKh/a)	Ventilation heat losses (kWh/a)	Q_v (kWh/m²a)
Ventilation system	0.0752	6750.00	0.33	64.00	10725.64	3.97
Infiltration	0.0462	6750.00	0.33	64.00	6586.27	2.44
	0.1214				**17311.92**	**6.41**

Solar heat gains

Area group	Win. area (m²)	Glazing area (m²)	g-value	Reduction factor	Radiation "G" (kWh/a)	Solar heat gains (kWh/a)	Q_s (kWh/m²a)
2 - North Windows	374.39	327.06	0.50	0.29	115.11	4363.10	1.62
3 - East Windows	0.00	0.00				0.00	0.00
4 - South Windows	819.19	738.92	0.50	0.21	568.48	49090.30	18.18
5 - West Windows	489.43	420.29	0.50	0.19	279.14	12994.27	4.81
6 - Horizontal Windows	0.00	0.00				0.00	0.00
	1683.01	**1486.27**				**66447.67**	**24.61**

Internal heat gains

Treated Floor Area (m²)	Internal heat gain rate (W/m²)	Heating period (days/a)	Heating period (kh/a)	Internal heat gains (kWh/a)	Q_i (kWh/m²a)
2700.00	2.40	175.00	4.20	27174.00	10.06

Museum Reorganization - Route and View Analysis

Generative Design

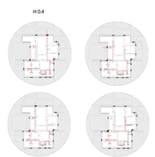
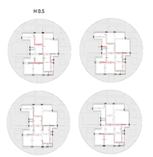
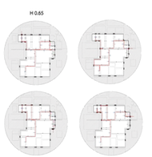
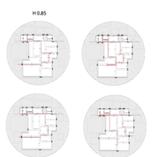
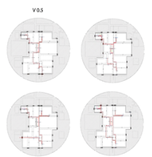
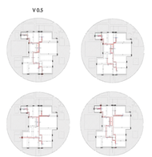
Columbia University Elective Work, Sp2023
Instructor: Danil Nagy
Group Work: Xiangyi Deng, Ze Meng, Shuhan Fang, Zijian Hao, Que Zhang

Grasshopper Python Script Editor

File Edit Tools Mode Help

```
import rhinoscriptsyntax as rs
import ghpythonlib.treehelpers as th

# convert z datatree into a nested list
MyDataTree = z
groupList = th.tree_to_list(MyDataTree)
print groupList

ptUseList = []

count = 11
while count > 0:
    ptList = []
    distList = []
    for drPt in y:
        ptList.append(drPt)
        dist = rs.Distance(x, drPt)
        distList.append(dist)

    # Sort the points and distances lists by increasing distance
    sortedLists = sorted(zip(distList, ptList))
    sortedDistList, sortedPtList = zip(*sortedLists)

    # Find the closest point and distance
    closestDist = sortedDistList[0]
    closestPt = sortedPtList[0]
    #print closestPt

    ptUseList.append(closestPt)

    for n in groupList:
        for m in n:
            #print n
            if m == closestPt:
                throwGroup = n
    #print throwGroup

    throwItems = []
    for i in throwGroup:
        throwItems.append(i)
    #print throwItems

    y = [pt for pt in y if pt not in throwItems]
    #print y
    x = closestPt
    count = count - 1

a = ptUseList
```

The Kanazawa Art Museum's open layout provides visitors with the freedom to explore and discover exhibits at their own pace. However, irregular exhibition area boundaries and random tour paths can present challenges for visitors. Our project aims to explore the qualities of such layouts and how we can enhance visitors' experiences. Specifically, we will focus on the layout of exhibit areas and their qualities when exhibition area boundaries are irregular and the area of the rooms does not change. In this paper, we outline our approach to achieving this goal, which includes obtaining entrance locations and exhibition layouts, planning optimal navigation routes, generating possible routes, analyzing visual effects, identifying areas with poor visual effects, adjusting exhibit layouts to improve them, and proposing dynamic and variable space layouts that allow for periodic reorganization. Through this research, we hope to improve the museum experience for visitors and provide valuable insights for museum owners and designers.

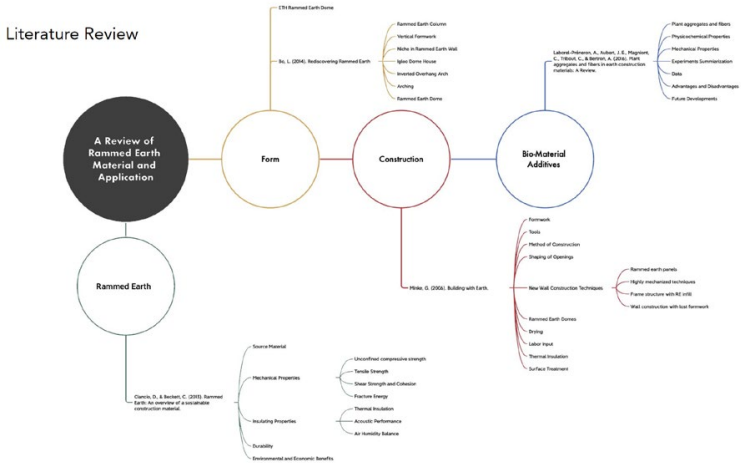
First Divider	H 0.4	H 0.5	H 0.65	H 0.85	V 0.5	V 0.8
Plan Layout						
Tolerance	2.55%	2%	2%	2.19%	2%	2%
4 Shortest Routes						
Total Distances of 4 Shortest Routes	3054.4 ft	3253.68 ft	2998.36 ft	2716.7 ft	3152.67 ft	3515.73 ft

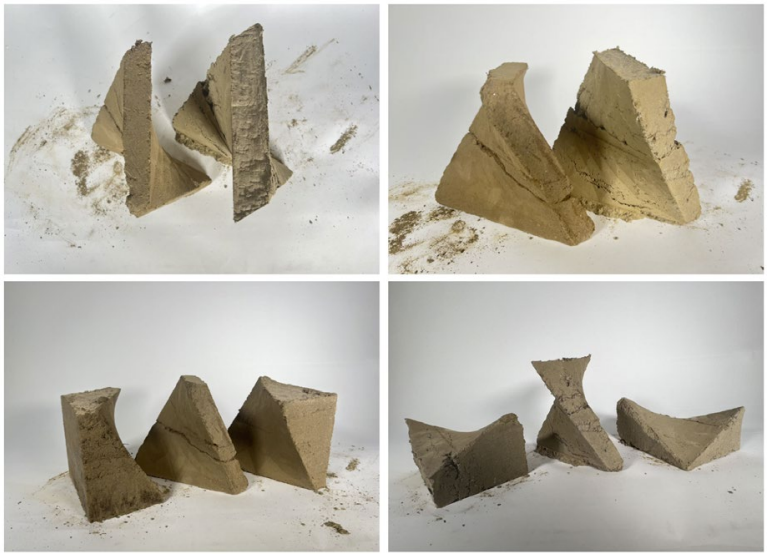
Rammed Earth Brick Experiments

Making With Earth

Columbia University Elective Work, Sp2023
Instructor: Lola Ben Alon
Group Work: Xiangyi Deng, Sixuan Chen, Runxin Fu

Literature Review





Workflow Diagram