

# Portfolio

Columbia GSAPP

Jooyoung Lim

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## **CONTENTS**

**IRRIGATING THE RESIDUE OF HUMAN ACTIVITIES WITH POTENTIAL**  
INFRASTRUCTURAL PROPOSAL TO RESTORE BALANCE OF EARTH SYSTEM

**CULTURE OF TRANSPORTATION**  
NEW TYPE OF LIFESTYLE CREATED BY UNPRECEDENTED DISTRIBUTION SYSTEM

**PEOPLE LIVING IN DELUSION**  
FUTURE OF PUBLIC HOUSING

**MAKE**

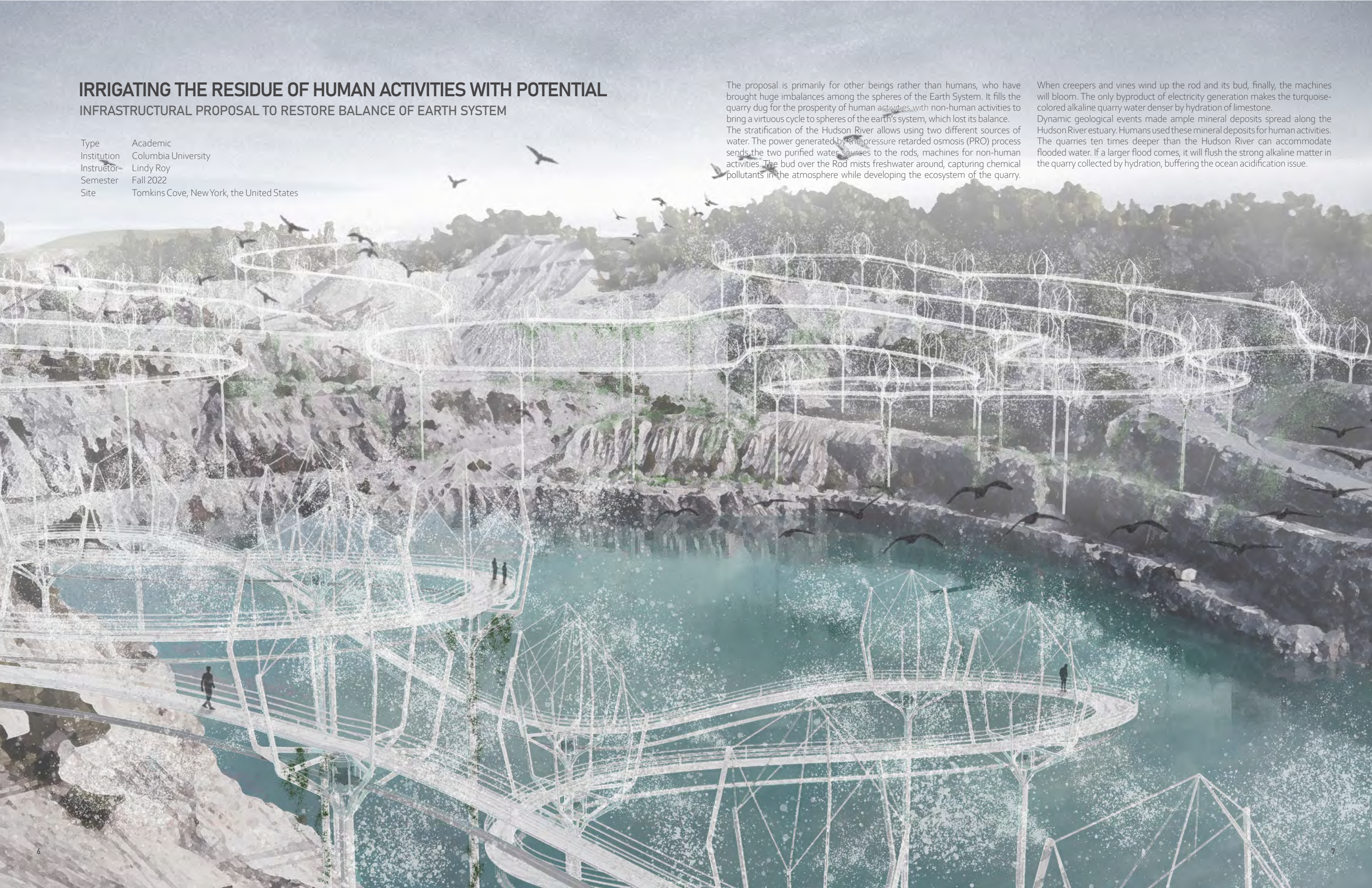
**PUBLIC SPHERE KNOT**  
UN CLIMATE COUNCIL

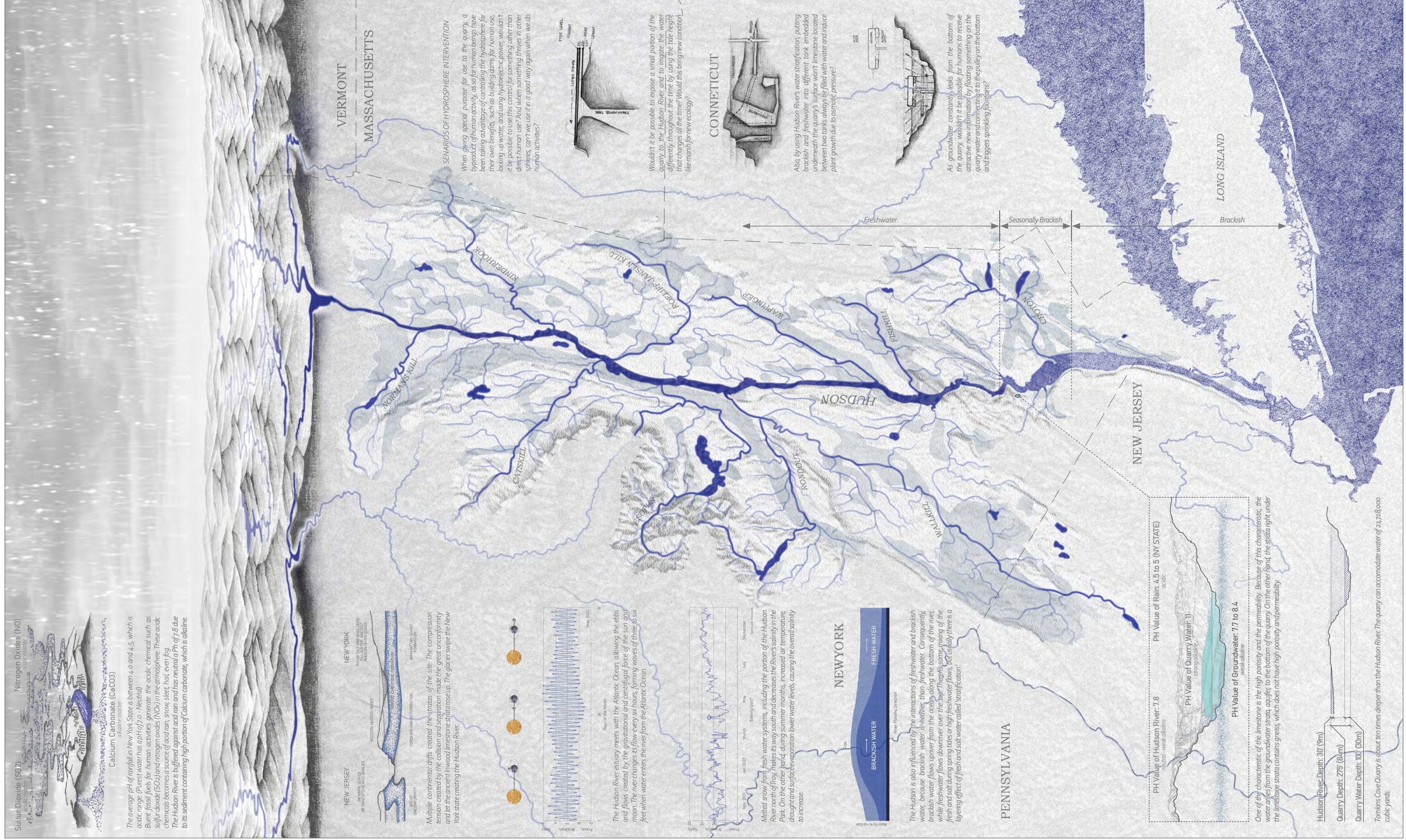
# IRRIGATING THE RESIDUE OF HUMAN ACTIVITIES WITH POTENTIAL INFRASTRUCTURAL PROPOSAL TO RESTORE BALANCE OF EARTH SYSTEM

Type Academic  
Institution Columbia University  
Instructor Lindy Roy  
Semester Fall 2022  
Site Tomkins Cove, New York, the United States

The proposal is primarily for other beings rather than humans, who have brought huge imbalances among the spheres of the Earth System. It fills the quarry dug for the prosperity of human activities with non-human activities to bring a virtuous cycle to spheres of the earth's system, which lost its balance. The stratification of the Hudson River allows using two different sources of water. The power generated by the pressure retarded osmosis (PRO) process sends the two purified water sources to the rods, machines for non-human activities. The bud over the Rod mists freshwater around, capturing chemical pollutants in the atmosphere while developing the ecosystem of the quarry.

When creepers and vines wind up the rod and its bud, finally, the machines will bloom. The only byproduct of electricity generation makes the turquoise-colored alkaline quarry water denser by hydration of limestone. Dynamic geological events made ample mineral deposits spread along the Hudson River estuary. Humans used these mineral deposits for human activities. The quarries ten times deeper than the Hudson River can accommodate flooded water. If a larger flood comes, it will flush the strong alkaline matter in the quarry collected by hydration, buffering the ocean acidification issue.





### Hudson River

The location of the Hudson River, which was formed after mankind appeared to the earth, is geologically special. The Appalachian Mountains in Northeastern America are created by multiple continental drifts caused by ancient continents including two major continents, Laurentia (proto-North American continent) and Baltica (proto-European continent).

As the crust underneath the sea created by the continent separation went thinner, the magma underneath the crust rose, making the in-between sea warm. While the earth has passed through multiple glacial and interglacial periods, single and multiple cell organisms, which were given birth by the warm sea, became dead bodies. The accumulated bodies of ancient organisms became limestone formation stratum. The porosity and permeability of limestone originated from the characteristics of organism body.

In the Appalachian Mountains, the pressure of continental rift caused the old strata, including limestone formation stratum, to be placed above the younger strata. Later, several glaciers slid down the Northeastern America continent scratching its surface, and the trace formed by the glaciers became rivers including Hudson River. Corresponding to this geological history, a lot of mineral deposits are located along the Hudson River estuary.

The Hudson River estuary meets with the Atlantic Ocean, allowing the ebbs and flows created by the gravitational and centrifugal force of the sun and moon. The river changes its flow every six hours, forming waves of three to six feet when water enters the river from the Atlantic Ocean. The tides from the Atlantic Ocean travel up the Hudson all the way to Troy dam.

The river has both brackish and fresh water because it meets with the river harbor connected with the Atlantic Ocean. Brackish water has a higher density than fresh water, which means that brackish water is heavier. Consequently, brackish water flows upriver from the ocean along the bottom of the river, while freshwater flows downriver over the top. There is some mixing of the fresh and salt during spring tides or high freshwater flows, but usually, there is a layering effect of fresh and brackish water called 'stratification'.

### Tomkins Cove Quarry

The Tomkins Cove Quarry was used to mainly dig for limestone, which has high porosity and permeability. Because of this characteristic, the groundwater arises from the ground layer exposed to the bottom of the quarry. The low porosity gneiss stratum underneath the limestone stratum sustains water from leaking out of the limestone stratum. Thus, the quarry water directly originated from the groundwater of the limestone stratum.

The turquoise color of quarry water can be illustrated by compounds of limestone. Limestone contains a crystal form of calcium carbonate called calcite with the other compounds. When calcium carbonate meets with water, chemical hydration occurs. The calcium carbonate of limestone in quarry gets hydrated by rain. These hydrated mineral deposits get refined over time, and only the light and refined crystals float on the surface of the water. The most refined calcite crystal on the surface of the water reflects the sunlight differently, making our vision receive its color as turquoise. Calcite, pure  $\text{CaCO}_3$ , is alkaline matter. Thus, turquoise water that contains hydrated calcium carbonate has strong alkalinity, which could be about the same pH as ammonia.

As the compounds from limestone get hydrated, it leaves good nutrients suitable for plant growth, such as iron oxide and aluminum oxide. As more limestone gets hydrated, more ingredients will be left on the surface of the quarry mixing with the soil from the upper ground.



The stratification of Hudson River allows to use two different sources of water. The water pump at the top of Hudson River will draw fresh water to the upper tank, and the pump at the bottom will draw brackish water to the bottom tank.

PRO electricity generation uses osmosis pressure generated on a semi-permeable membrane between freshwater and brackish water tank. The generated osmosis pressure turns the turbine, generating power. This electricity generation makes a small ecological footprint and does not need to carry the material for electricity generation.

For more proficiency in creating electricity, the membrane should not be contaminated by bacteria and others. So, the water needs to be filtered. The water passes through preceding three tanks, filtering silts, organisms, etc. After chlorination, the last tank will be filled up with refined fresh water and salt water.

After filtration, the electricity created by the osmosis pressure runs the water pump. The pump distributes the water to the containers of rods in the site. The rods are a generator and a machine for non-human activity. The rods are located where soil from the upper ground exists, where plants are already growing, or niches that birds may nest in. Marvelously, the quarry is a place where the various lives bloom by the limited human access. Rods are designed primarily for flourishing in presences other than humans. Just as the machine will flourish the existing natures in the quarry, the top of the rod has a similar form of bud that is about to bloom. Two containers under the buds will be filled up with salt water and fresh water from the water tanks through the pipes. The semi-permeable

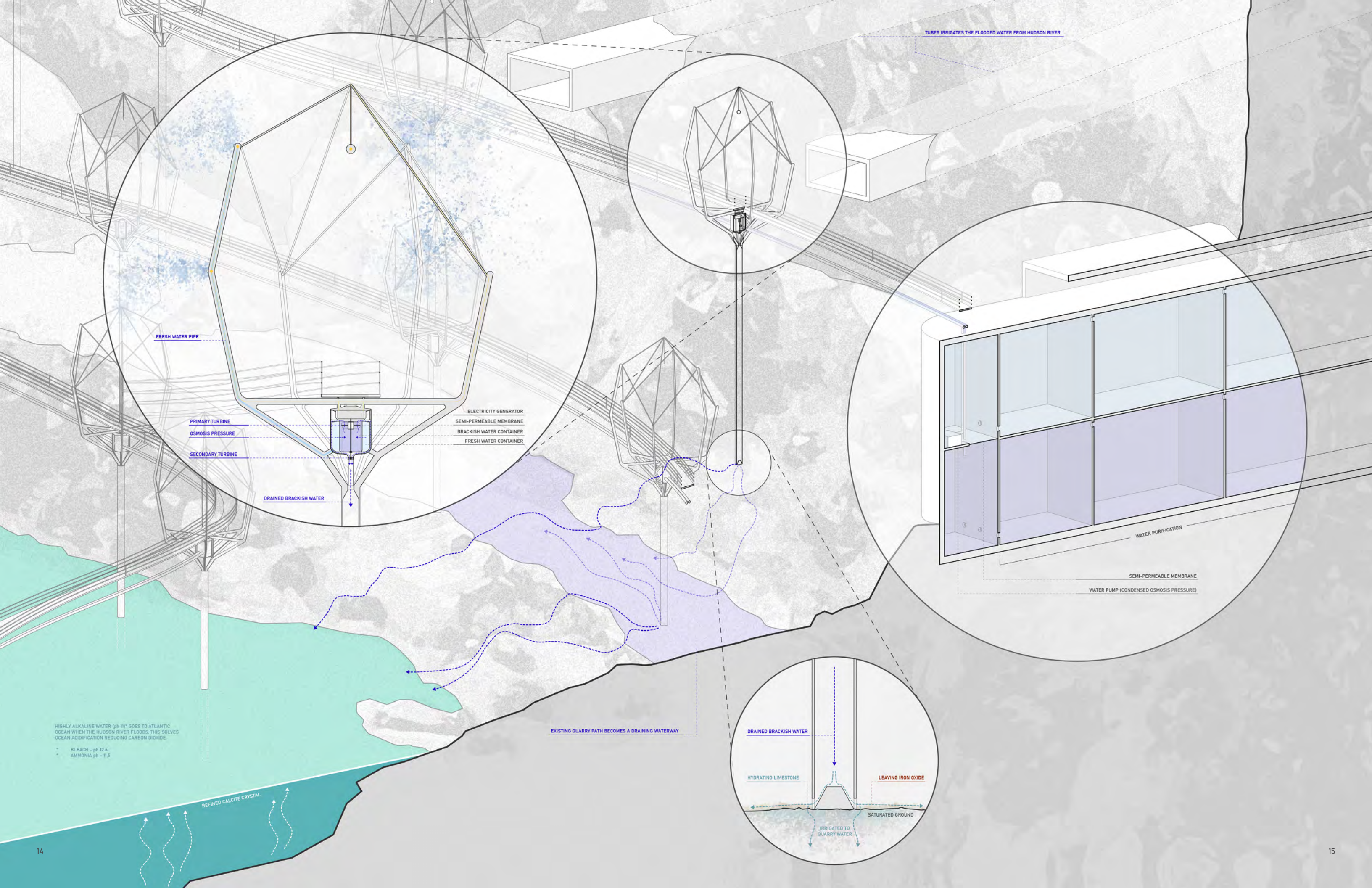
membrane between two containers generates osmosis pressure, and the pressure will discharge diluted salt water out of the containers. As the saltwater drains out, it rotates two turbines in the same direction. The byproduct left after electricity production, diluted salt water, will be drained to the bottom of the rod. The drained water will hydrate lime on the surface of the quarry and be drained into the quarry water, making it more alkaline. The byproduct of electricity generation will make the quarry water denser than alkaline water. The turquoise water in the middle of the quarry now becomes a drainage.

As calcite from the limestone gets hydrated from the surface of the quarry, it leaves good ingredients for plant growth, such as iron oxide. These components will be mixed with the soil from above, becoming a source for plant growth.

The generated electricity is used to pump the fresh water as mist through the tip of the buds. Mist takes two roles. First, this mist is sprayed in the atmosphere to the surface of the upper part of the quarry where lives mainly exist, promoting growth. Second, it purifies atmosphere condition by capturing dust and toxic chemical compounds drifted from the urbanized city.

Over time, the site will be filled up with various creatures and plants. When the creepers and vine wind up the rod and its bud, at last, the man-made machine will bloom. The path lightly placed on the buds allows humans to visit, hoping they could find value other than satisfaction from this architectural media.





TUBES IRRIGATE THE FLOODED WATER FROM HUDSON RIVER

FRESH WATER PIPE

PRIMARY TURBINE

OSMOSIS PRESSURE

SECONDARY TURBINE

DRAINED BRACKISH WATER

ELECTRICITY GENERATOR

SEMI-PERMEABLE MEMBRANE

BRACKISH WATER CONTAINER

FRESH WATER CONTAINER

WATER PURIFICATION

SEMI-PERMEABLE MEMBRANE

WATER PUMP (CONDENSED OSMOSIS PRESSURE)

HIGHLY ALKALINE WATER (ph 11)\* GOES TO ATLANTIC OCEAN WHEN THE HUDSON RIVER FLOODS. THIS SOLVES OCEAN ACIDIFICATION REDUCING CARBON DIOXIDE

- \* BLEACH - ph 12.6
- \* AMMONIA ph - 11.5

REFINED CALCITE CRYSTAL

EXISTING QUARRY PATH BECOMES A DRAINING WATERWAY

DRAINED BRACKISH WATER

HYDRATING LIMESTONE

LEAVING IRON OXIDE

IRRIGATED TO QUARRY WATER

SATURATED GROUND





MACROSCOPIC DESIGN - solution for flooding issue of New York and New Jersey states

Flooding is one of the significant environmental issues in Manhattan and New York. The submerged city by the overflowing Hudson River drains chemical compounds and pollution generated by human beings into the sea. The Tomkins Cove Quarry is about ten times deeper than the Hudson River. The capacity of the quarry is 21,718,000 cubic yards. If there are several tunnels connecting the Hudson and the Quarry above the river level, it will drain flooded water from the Hudson River, preventing the land from getting submerged. Furthermore, there are a lot of quarries located along the Hudson River estuary. Not only Tomkins Cove Quarry, but these are also all potential sites for this macroscopic infrastructure design proposal.

In another scenario, when a larger flood comes to the site, the quarry will be fully filled up with flooded water. And the alkaline matters in the turquoise quarry water, which

could accumulate a lot of alkaline matter due to non-human activity from the rocks, will be flushed out to the Atlantic Ocean. Once the gigantic amount of flooded water submerges the city, the water flushes all the chemicals and pollutants into the ocean, contaminating the Ocean. Alkaline matter from the quarry water will neutralize the chemicals and Ocean Acidification. Already, the United Nations and many countries, including the United States, have been working on Ocean Alkalinity Enhancement project since 2017. Literally, the Ocean Alkalinity Enhancement project operates by pouring alkaline matter obtained from mine or quarry into the ocean. The project reduces the significant amount of carbon dioxide generated in the ocean. However, the macroscopic design of the proposal is a concept using the disaster as a factor of a virtuous cycle of nature reversely.



Dynamic geological events made ample mineral deposits spread along the Hudson River estuary. Humans used these mineral deposits for human activities. The quarries ten times deeper than the Hudson River can accommodate flooded water. A larger flood buffers the ocean acidification by flushing strong alkaline matter in the quarry collected by limestone hydration into the Atlantic Ocean. / White spots are the quarry locations. Larger spots are more depleted quarries. As more human used the resources making trace their larger, the residues will accommodate the larger amount of flooded water.

# CULTURE OF TRANSPORTATION

NEW TYPE OF LIFESTYLE CREATED BY UNPRECEDENTED DISTRIBUTION SYSTEM

Type Academic  
Institution Columbia University  
Instructor Michael Bell  
Semester Spring 2023  
Site Shafter, California, the United States

The truck industry is going to be automated after proper infrastructure and social agreement is built. What I am presenting is the idea of Truckstop that could fix the complicated driving machine, and potential of creating new operations and job opportunity, and gets connected with the people and future transportation, drones.

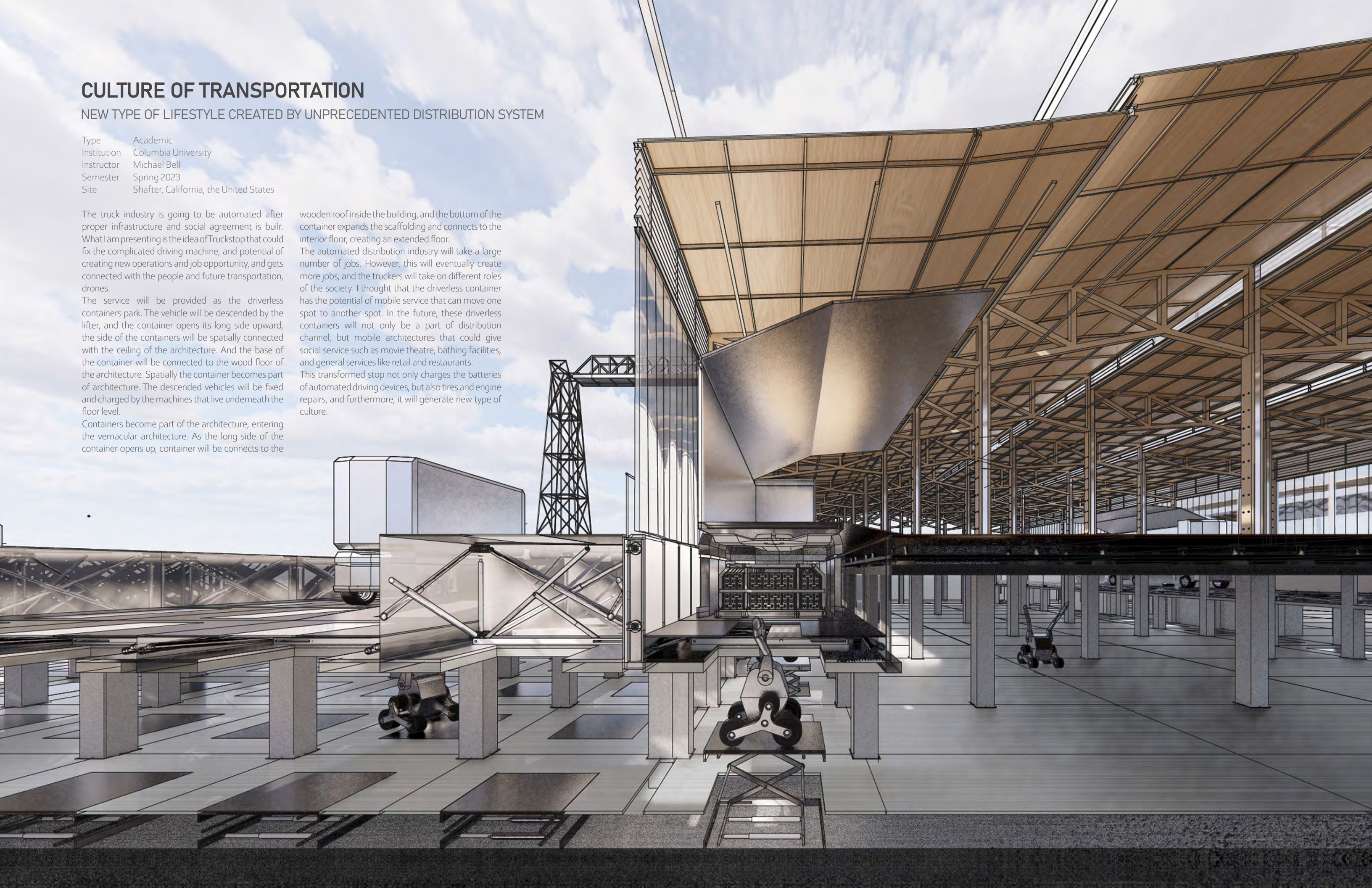
The service will be provided as the driverless containers park. The vehicle will be descended by the lifter, and the container opens its long side upward, the side of the containers will be spatially connected with the ceiling of the architecture. And the base of the container will be connected to the wood floor of the architecture. Spatially the container becomes part of architecture. The descended vehicles will be fixed and charged by the machines that live underneath the floor level.

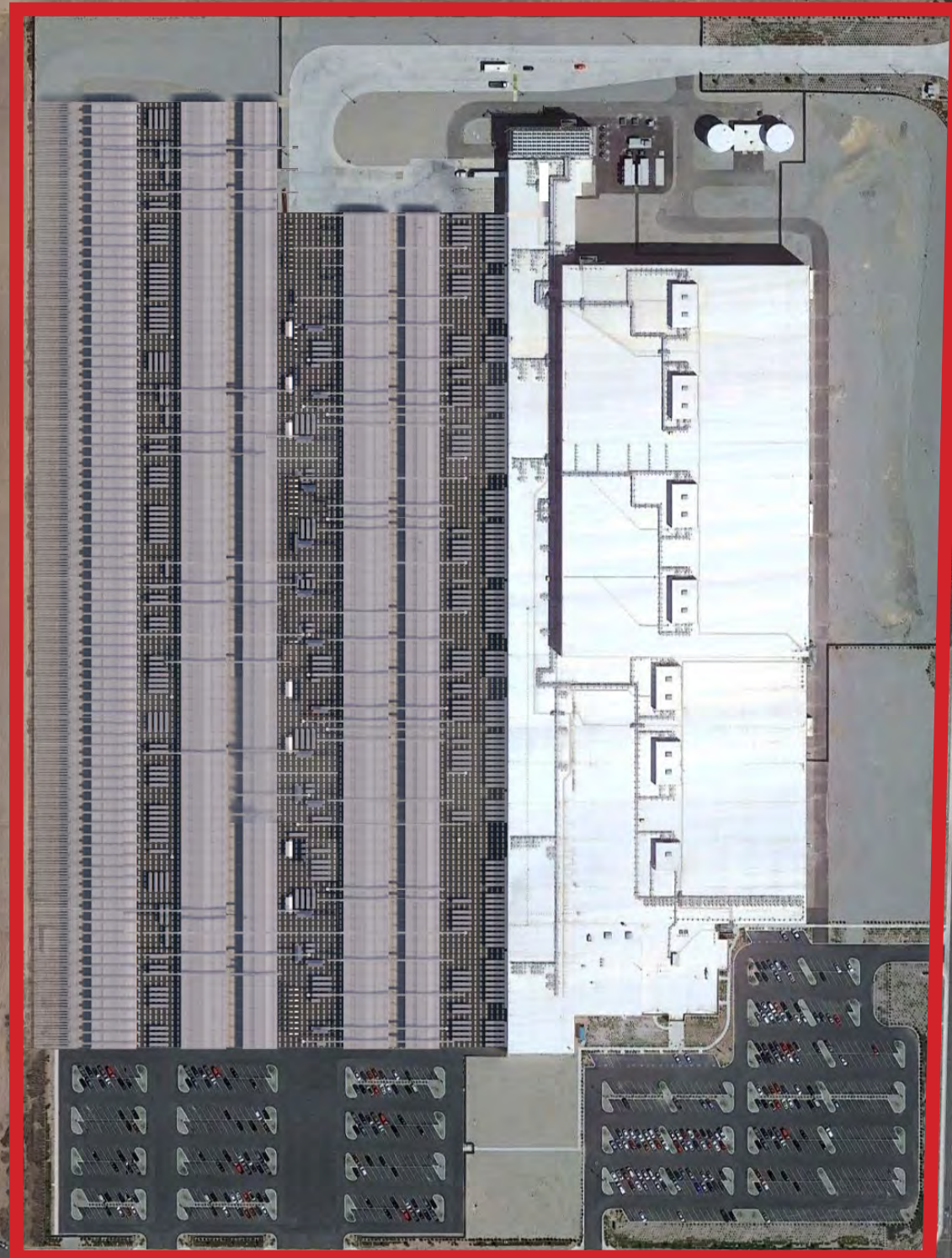
Containers become part of the architecture, entering the vernacular architecture. As the long side of the container opens up, container will be connects to the

wooden roof inside the building, and the bottom of the container expands the scaffolding and connects to the interior floor, creating an extended floor.

The automated distribution industry will take a large number of jobs. However, this will eventually create more jobs, and the truckers will take on different roles of the society. I thought that the driverless container has the potential of mobile service that can move one spot to another spot. In the future, these driverless containers will not only be a part of distribution channel, but mobile architectures that could give social service such as movie theatre, bathing facilities, and general services like retail and restaurants.

This transformed stop not only charges the batteries of automated driving devices, but also tires and engine repairs, and furthermore, it will generate new type of culture.

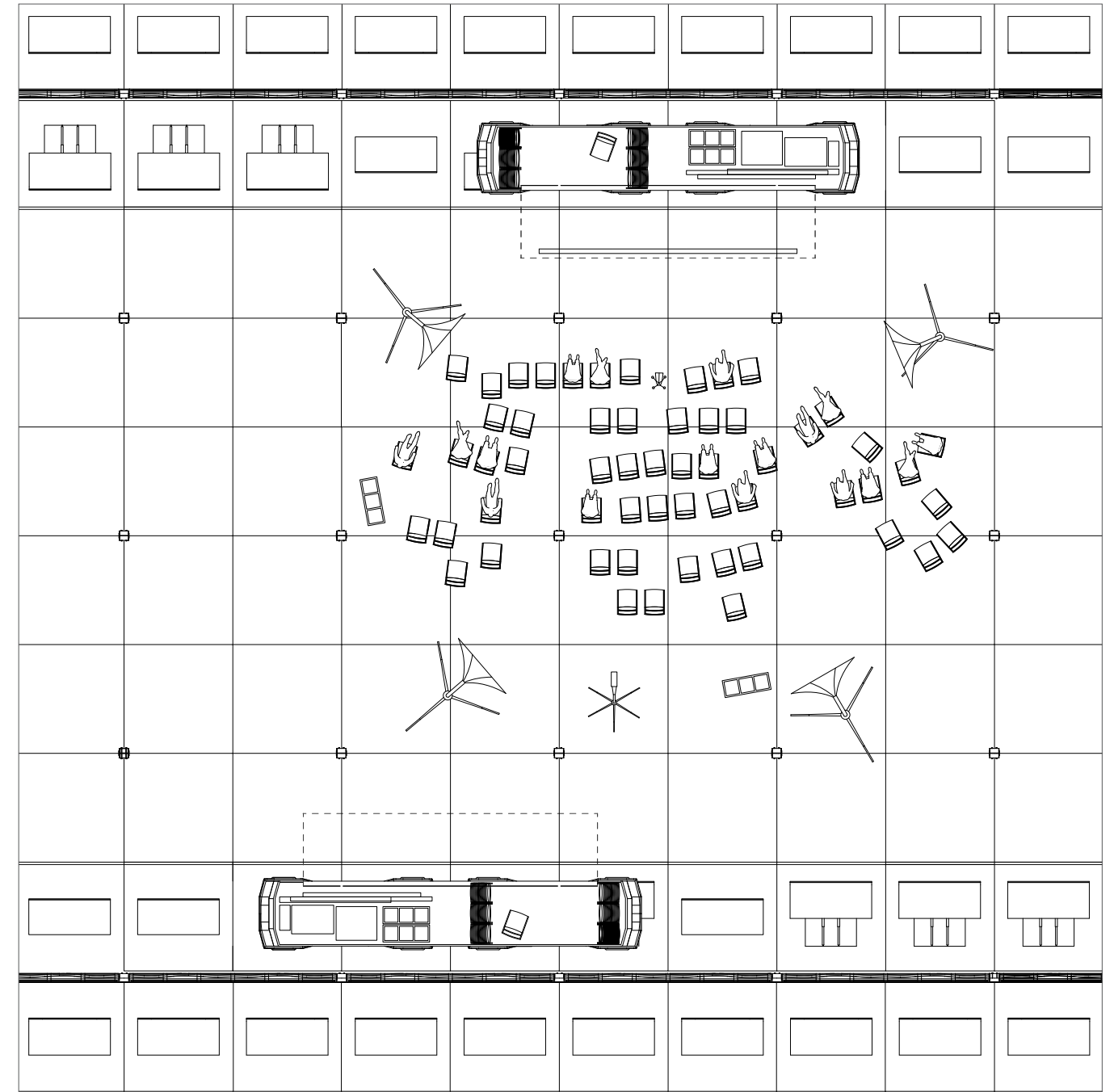
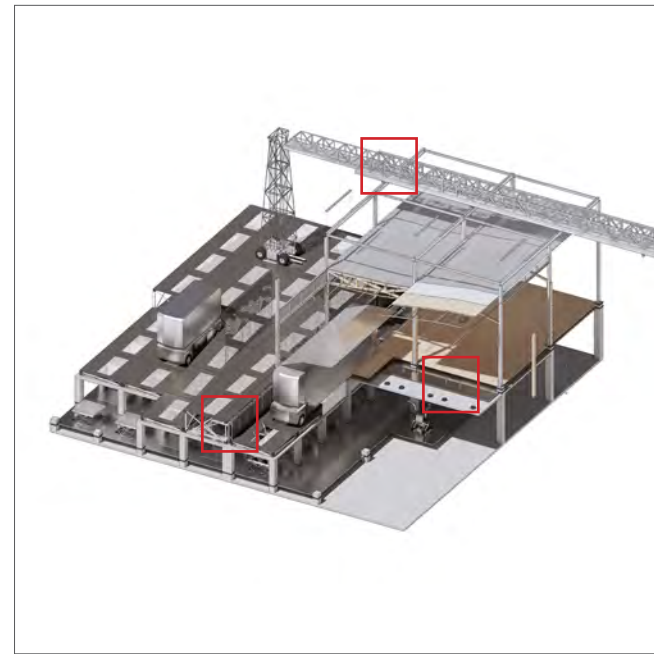
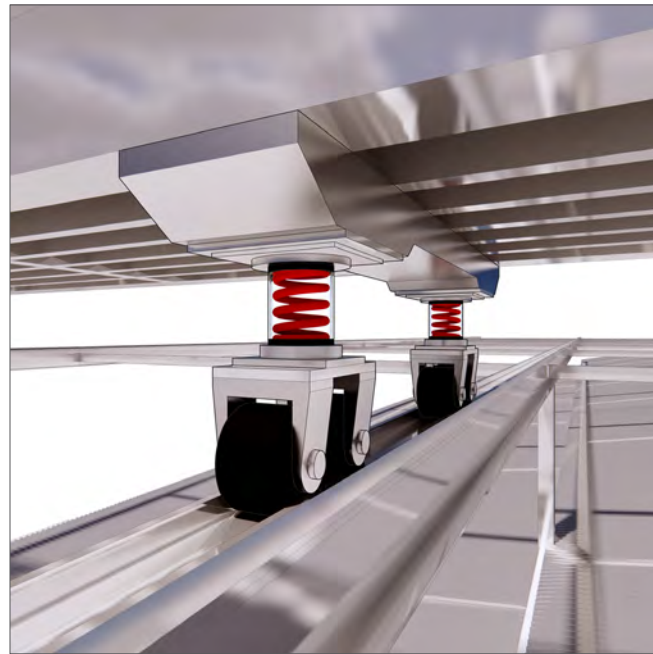




DISTRIBUTION CENTER  
**WALMART  
 DISTRIBUTION  
 CENTER**

I chose the location of the hub of new culture, truckstop nearby the Walmart Distribution Center at Shafter. Not only Walmart and Amazon, there are many fulfillment centers. The potential visitors of the site are people lives nearby the site, mainly families of workers, and the travelers. Without walls of restaurants or retails that divides preparing area and seating area, this long vernacular architecture of the site will provide all kinds of services from the parked trucks inside and outside. Not only this site, I thought all the stops like one small truck wash nearby LA can also be the potential site of the infrastructure.



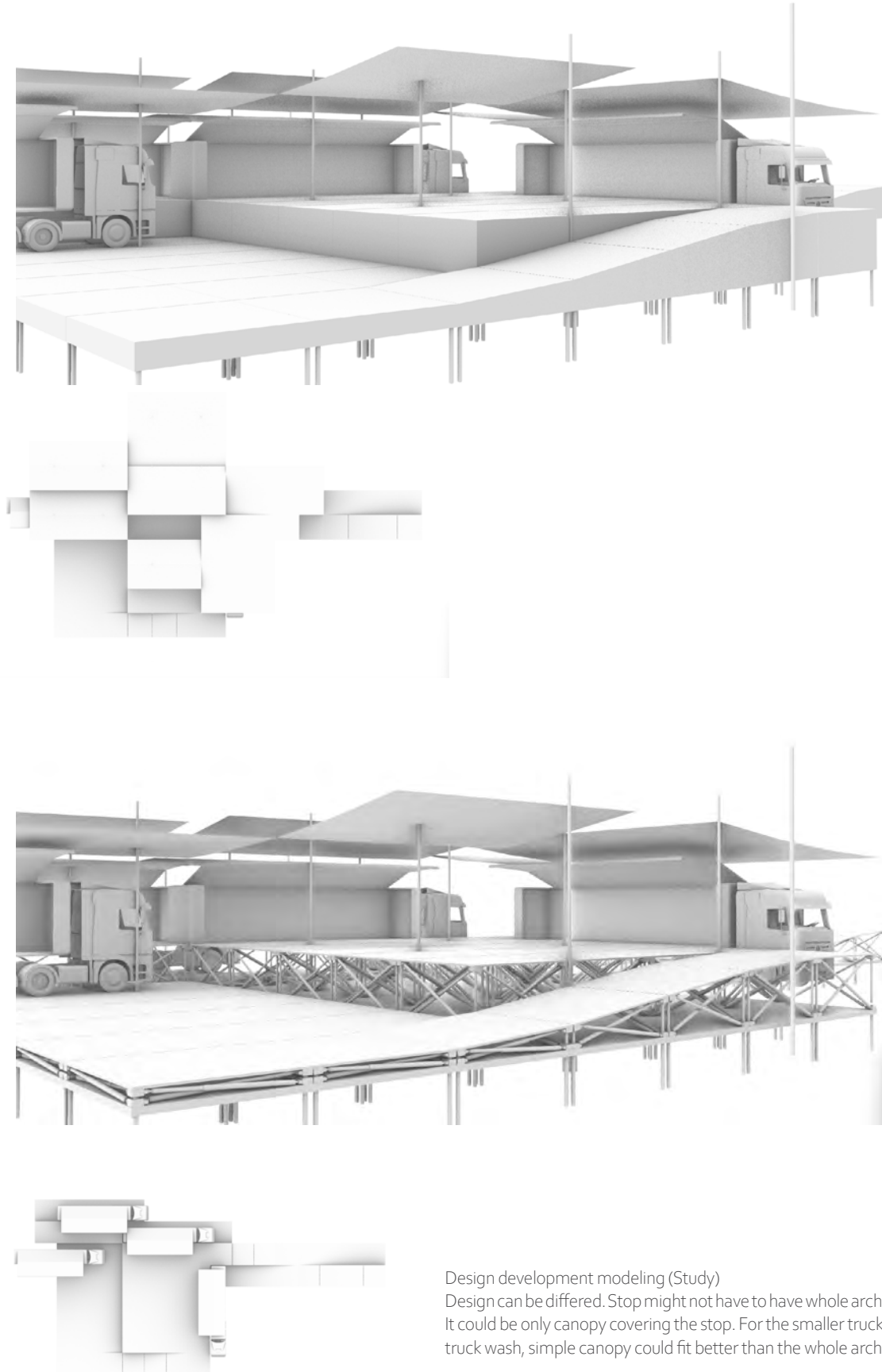


3 different materials are covering the floors of the design. Inside the building where people are mainly located, will be covered by the wood material floated by vibration reducers. The lifters will be covered by carbon fiber on the steel frame. The carbon fiber is lighter, stronger and less heat conductive material than steel and asphalt. And the underground space is covered by metal material that can reflect the electric signals without disturbance of magnetic field from the outside. To prevent interior of the architecture from the vibrance of the various devices including vehicles and lifters, several devices are installed inside the architecture.

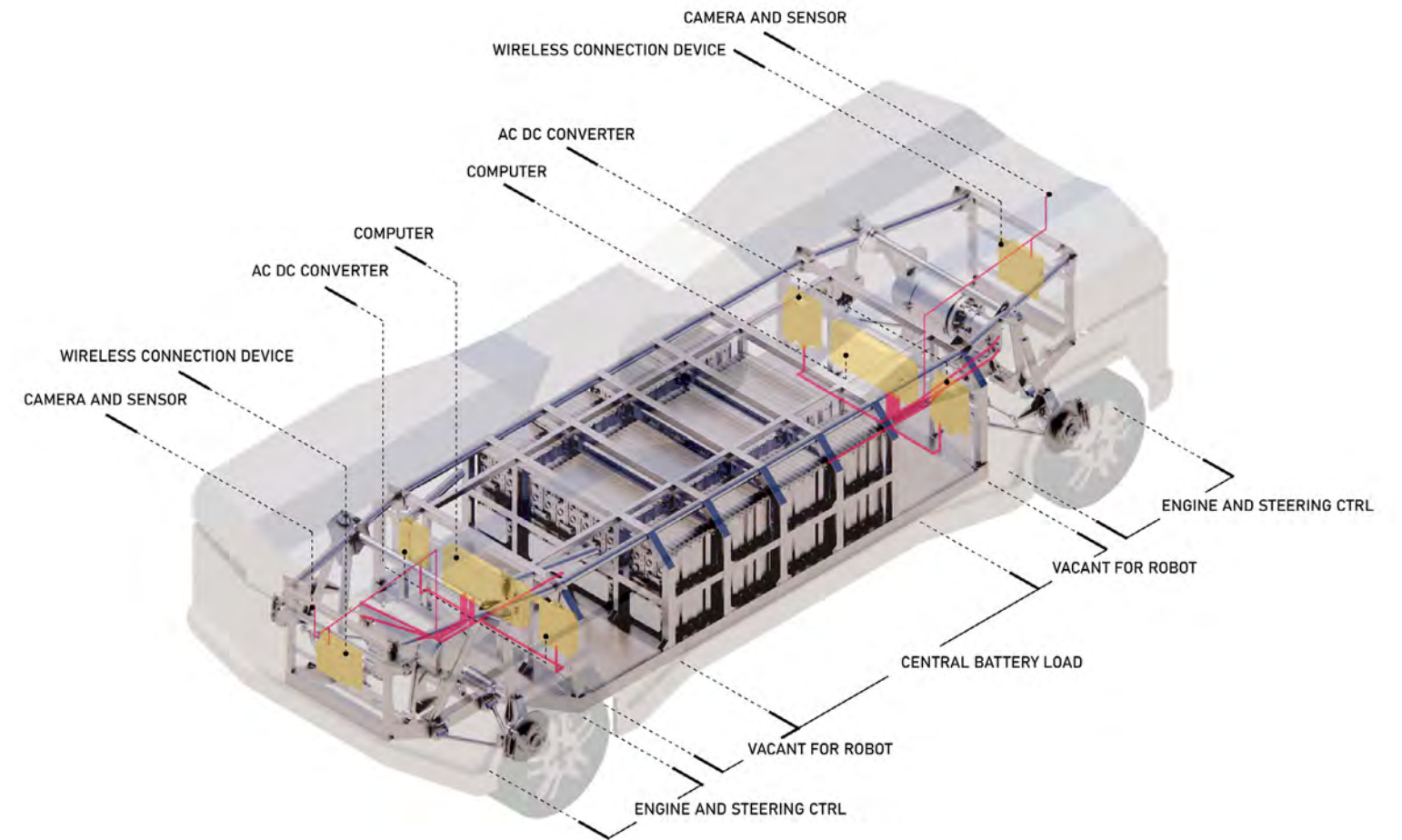
First, Ladders on the roof that move aligned with the row of the vernacular architecture has installed vibration absorber just as vehicle's suspension. The elevator vehicles in the site will lift the loads to the ladders, and the ladders will move the loads perpendicular way to the architecture. The drone station is located at the end of the ladders. The interior floor of the architecture is separated from the lifters by translucent rubber made sidings to minimize the large vibration caused by the vehicles. This reduce the vibration transmitted to the internal space where humans are located and at the same time allow some natural light into the underground space, which is the service

area occupied by the robots. With this also the floor is lifted by the vibrance reducers made by rubber and springs. The main design, lifter, can create an inclination for the car to move with a pneumatic pipe, and vertical movement is also possible. As the lifter descends, the guardrail will be risen by the tension of the cable and pulley connected in front of the double transparent pvc membrane and the siccor mechanism opens the cover of the lifter, and allows the robot put their arms into the vehicle to fix, charge and import or export data from the computer of the vehicle. As technology develops, the mass of the devices gets smaller. this

means that the same size truck in the futre can contain more contents in the future. Without walls of restaurants or retails that divides preparing area and seating area, this long vernacular architecture of the site will provide all kinds of services from the parked trucks inside and outside. on the roof of the architecture, the ladders will be moving along the row of the architecture. elevator cars and the ladder will move the packages. Also the packages will be distrubuted to the drone station on the west side.



Design development modeling (Study)  
 Design can be differed. Stop might not have to have whole architecture. It could be only canopy covering the stop. For the smaller truckstop like truck wash, simple canopy could fit better than the whole architecture.



The truck driven by truckers will gradually become a driverless container. The absence of the driver created more space to accommodate batteries. The heavy batteries will be stacked in the middle of the vehicle. This heavy load of battery will make more stable drive by locating its central gravity in the center of the vehicle. The driverless container does not have a front and back. The face of the vehicle is identical, and it can be steered from both sides of the heads. This doubled steering can create steeper turn angle, which could alleviate the large turn angle of current truck. This about 20 feet long vehicle can lift 20 feet long containers,

and wirelessly connected two vehicles can lift 40 or even far longer containers too.

Not only this site, I thought all the stops like one small truck wash nearby LA can also be the potential site of the infrastructure.

**Vernacular Architecture Platform**

**Rail**

Path for Horizontal Ladders

**Aperture**

Creates best interior environment for the events by controlling the amount of light. Also, function as Vent too.

**Drone Station**

It is the deadend of the Horizontal Ladders. The general design also considered future transportation, drone.

**Horizontal Ladder**

Ladders on the roof that move aligned with the row of the vernacular architecture has installed vibration absorber just as vehicle's suspension. The elevator vehicles in the site will lift the loads to the ladders, and the ladders will move the loads perpendicular way to the architecture. The drone station is located at the end of the ladders.

**Egress**

The access is located between the barns where trucks pass by. Wall E robots can climb up the slope of the staircase by their rotating triangular wheel frame. Also, the notch of the cover will maximize its visibility for safety.

**Canopy Door**

Same material used as curtain at Carwash. Air between two layers curtain works as insulation.

**Vibrance Reducing Device**

Same material used as curtain at Carwash. Air between two layers curtain works as insulation.

Pneumatic Pipes

Scissor Mechanism

Riser for Robot

Vibrance Reducing Device

**Lifter**

The main design, lifter, can create an inclination for the car to move with a pneumatic pipe, and vertical movement is also possible. As soon as the lifter subsides, the car will be repaired with the machinery in the underground space reaching out, and the container will be located close to the height of the ground floor. In addition, at the same time as it sinks, the lifter's string is placed in front of the pvc membrane on the face with tension through the pulley to prepare for safety.

Elevator Vehicle

**Transparent Rubber Siding Panel**

The panel reduce the vibration from the Lifters to the interior floor slab. It is a solution to combine vehicle into human occupied architecture. The Transparency allows certain amount of light for robots working underground.

**Vibrance Reducing Device**

Since various events hold and close Interiorly, using heavy devices from the container, Vibration needs to be solved. Springs and rubber lifters lift 1.2x1.2 plywood floor panels.

**Double Layered Transparent PVC membrane**

Same material used as curtain at Carwash. Air between two layers curtain works as insulation. It is continuous door for vehicle and human covering the whole design.

# PEOPLE LIVING IN DELUSION

## The Future of Public Housing

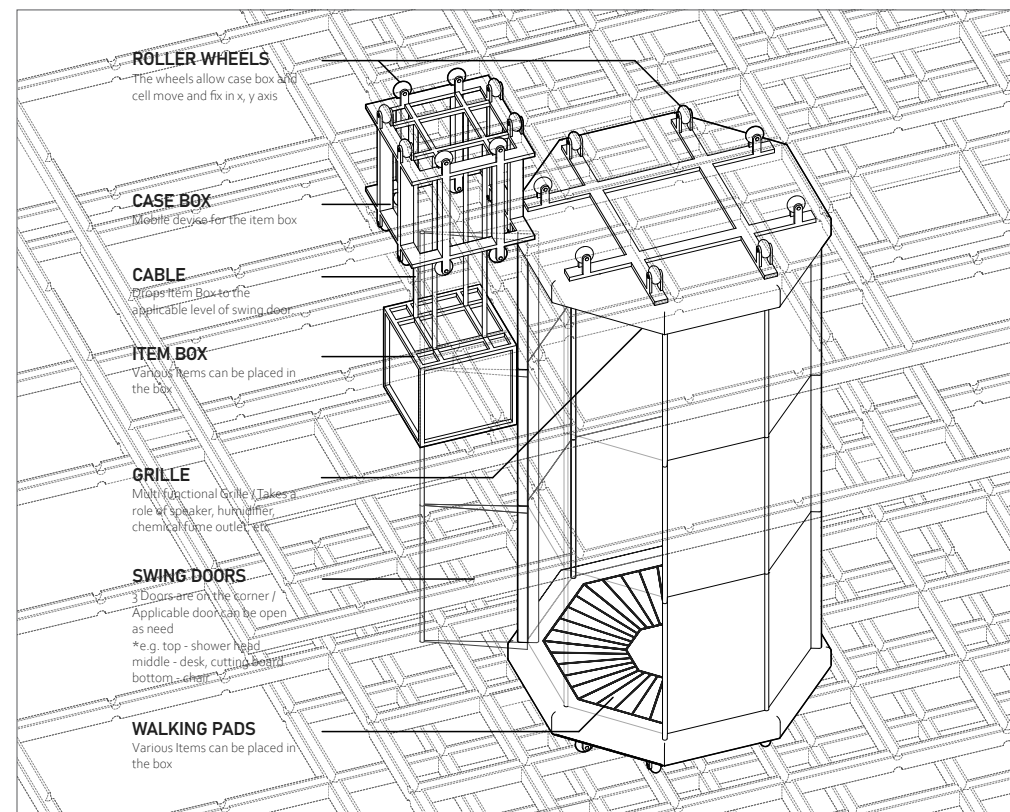
Type Academic  
Institution Columbia University  
Instructor David Eugene Moon  
Semester Spring 2023

In recent decades, people thought about justice and equality and planned to locate affordable housing in the middle of the city. The current design of public housing gives disparity to society by making wealth inequality more significant. Everything needs to be refined as technology is developed, and our standards have changed.

Distance working and education are now indispensable culture. Advanced technology will constantly change our lifestyle in the future. Virtual reality can now be perceived more realistically. Marc Zuckerberg presented Metaverse recently, elaborating on how life can expand its boundary in the future. If technological development can support virtual reality further, we may not distinguish virtual reality from the real world. The housing of the capitalists would get larger because the accumulated wealth would bring more significant revenue. On the other hand, each apartment in the socialistic public housing will get smaller because of the skyrocketing estate price.

Eventually, housing will be more like a cell with virtual reality goggles and a treadmill. The small cells of a small-elevator scale imprison people living in public housing. The octagonal plan of the cell allows people to engage with others socially. Cell can be opened in every direction, through folding its 12 doors. The small boxes in the floor slab will deliver furniture, food, a toilet, a chair, and a shower head. Residents in the cell can obtain items in the box by reaching one's body part to grab it. These boxes can contain various items compared to their scale because technology is making everything smaller and lighter with better performance.

Chemical matter creating hallucination comes from the grille on the ceiling of the cell. The grille can be speaker, humidifier too. The cells are the house of people living in hallucination, and the design can achieve the impossible communist equality by delusion. What makes it possible is advanced technology.



# Make

Type Academic  
Institution Columbia University  
Instructor Ada Tolla, Giuseppe Lignano  
Semester Fall 2022





# Public Sphere Knot

## Climate Council

Type Academic  
Institution Columbia University  
Instructor Eric Bunge  
Semester Summer 2022  
Site Manhattan, New York, the United States

The proposal designs a council as a new public sphere across the current UNHQ to replace the north lawn that lost its role. It reverses the current UNHQ design by letting the public occupy the new climate council and inviting UN staff to the council meeting. In this way, the United Nations would develop climate policies that reflect public opinion more actively. The design aims to re-invent the public sphere reminiscent of a French Salon, where the public can exchange their ideas with UN officials.

Programs like a gallery and library will draw the public to a series of exterior in-between spaces that have occupiable staircases. Just as with the opposing seating of the British Parliament, the direction of staircases will lead the public to face UN staff, encouraging public engagement. While UN staff can hear public opinion, they can also present lectures to the public in either interior or exterior spaces.

The translucent material allows the public to see inside the chamber, and people in the chamber can see the public's presence outside. These visual connections will encourage the public to have more interest in the UN, while making UN staff realize the importance of public opinion in their decision-making.







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