

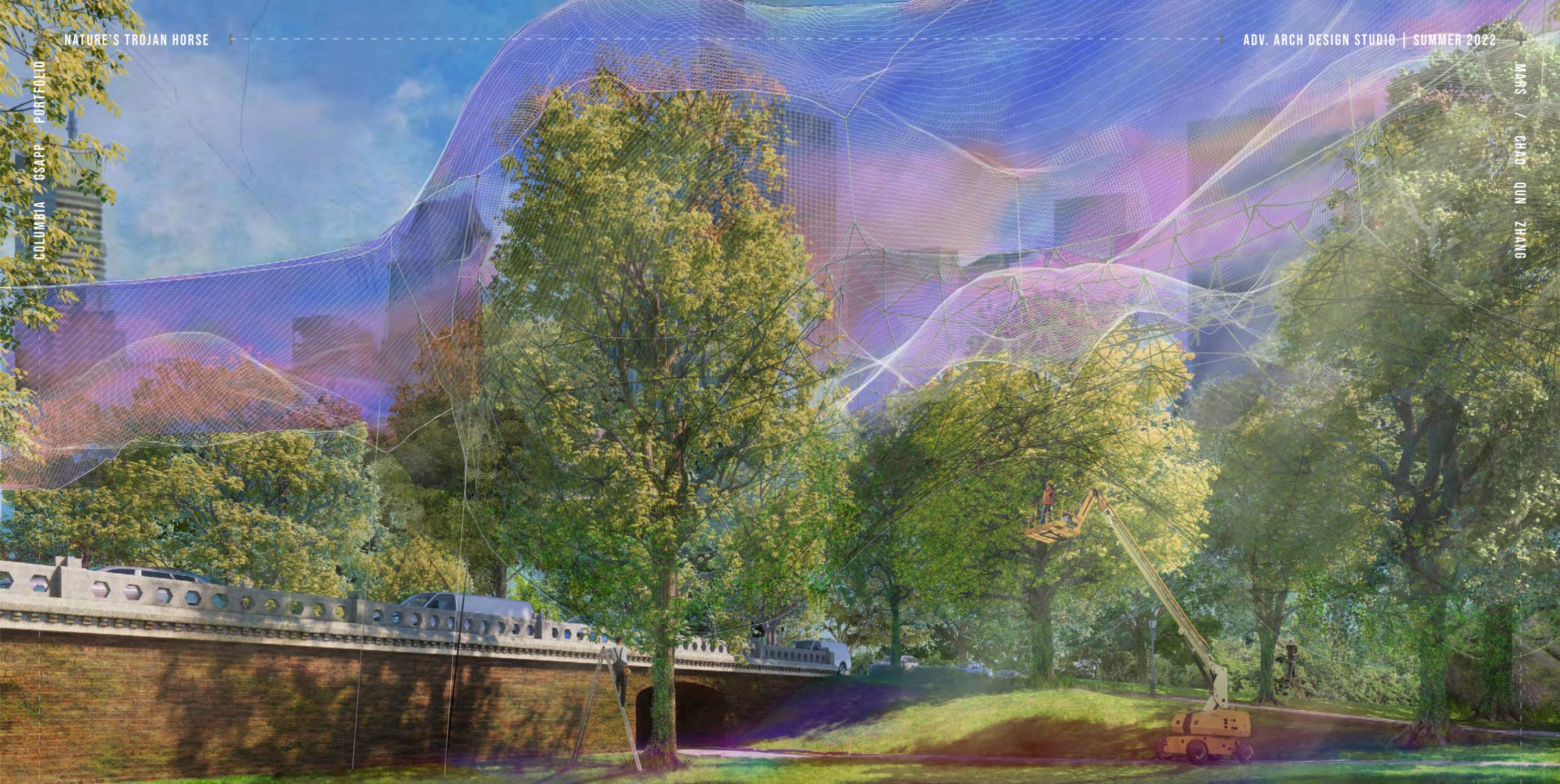
# PORFOLIO

SELECTED WORK 2017 - 2021

●  
CHAO QUN ZHANG

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## NATURE'S TROJAN HORSE

Camouflaged Ecosystem Revitalization

Program	Climatizer / Environmental Design
Studio	Advanced Arch Design Studio
Professor	Nerea Calvillo
Date	Summer 2022
Location	Central Park, New York, NY
Team Members	Chengxi Liu, Justin Wan

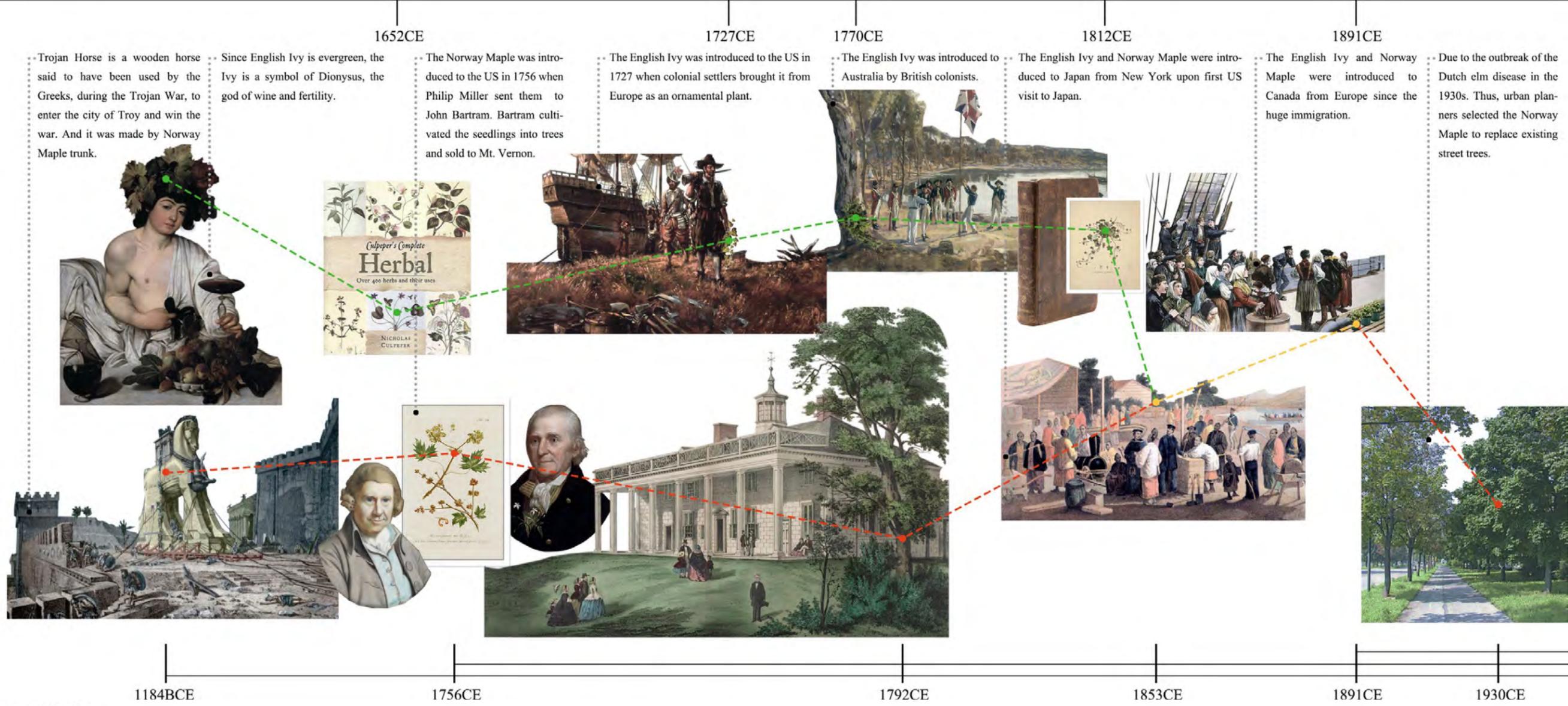
This project, "Nature's Trojan Horse: Nurturing an ecosystem for nature within the embellishment of human perception," aims to allow Norway Maple and English Ivy to re-engage nature through their so-called "invasive properties. This is an intervention that functions just like a trojan horse, using its appearance as camouflage to achieve the plant's own goals of absorbing the central park's invisible air pollutant and nourishing an ecosystem

friendly to many other species. It expands as Chipmunks, the resident of the system, germinate the maples and Ivy through its excrement in Central Park. The central drive that penetrates the central park also acts as another factor in distributing the mesh that reveals pollution from the cars immediately below. Thus, the "Nature's Trojan Horse" that is "Invading" the central park uses the plant's embellishments as camouflage to pursue their needs to absorb pollutants and

revitalize the ecosystem.

▲ TOP  
Spring Time Render

# English Ivy



Norway Maple

## GREEK TROJAN HORSE



Trojan horse as an **embellishment**

↓

**Invades** into the city of troy

↓

**Desire** to conquer

English Ivy and Norway Maple as **embellishment**

↓

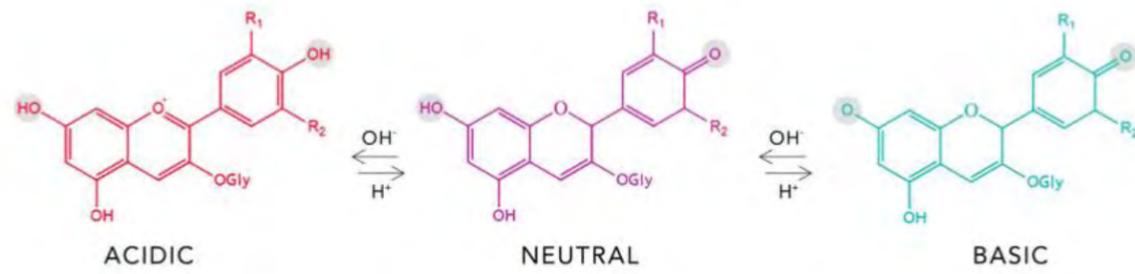
**Invades** into the city's central park

↓

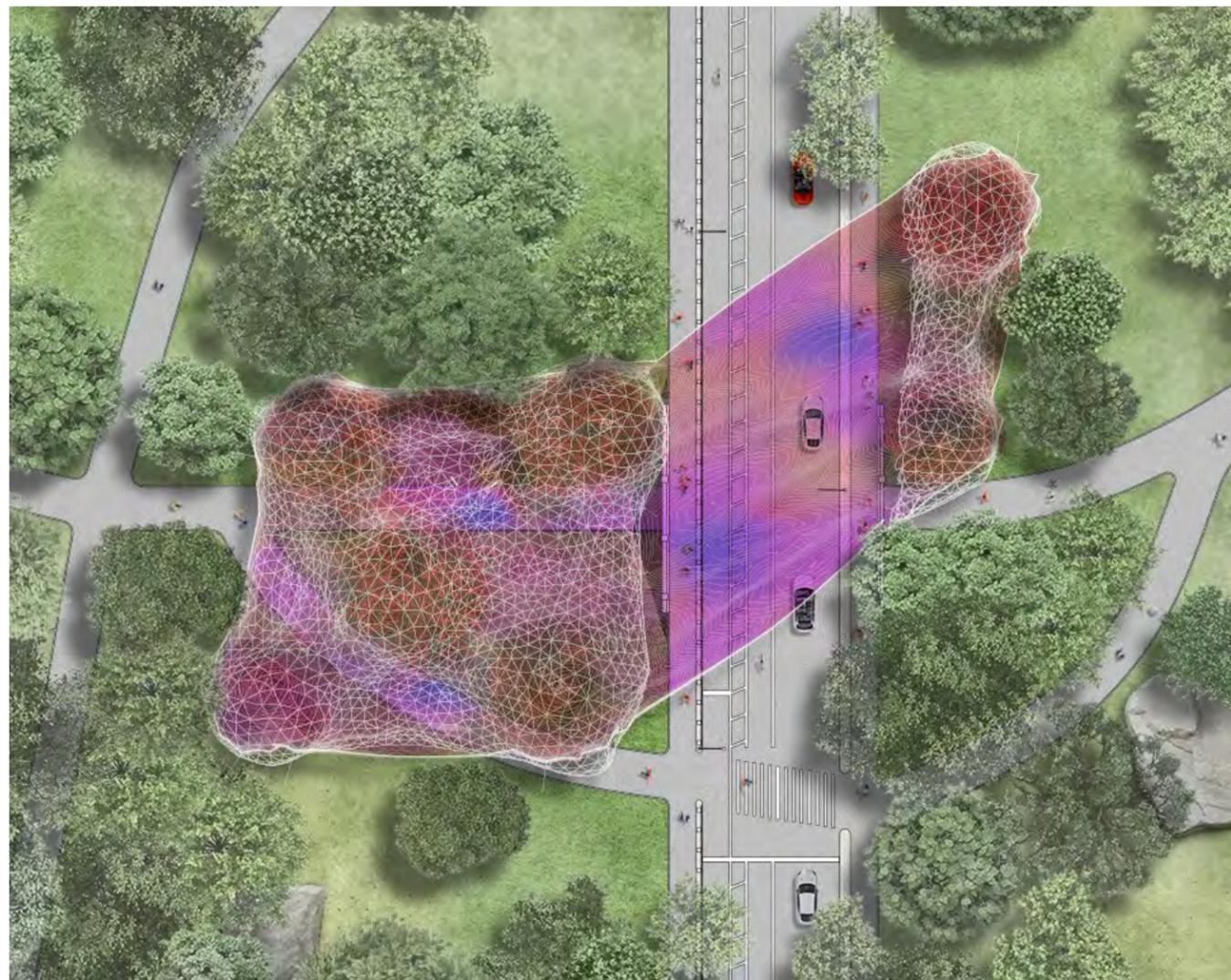
**Desire** to embrace nature

## NATURE'S TROJAN HORSE





The project features an HP indicator in the form of a fabric dyed with anthocyanin extract, which changes color in response to air pollutants such as VOCs and ozone. The indicator is tied to the Norway Maple and English Ivy lattice, revealing the invisible toxicity in Central Park's air through its vibrant colors. The color map shifts seasonally, with blue tones indicating alkaline pollutants in the spring and red tones indicating acidic pollutants in the fall. This innovative indicator highlights the need for pollution control and the potential for natural solutions in urban environments.



The project also involves a network of ropes tied to the mesh, which responds to the growing weight of the English ivy. As the ivy grows, it gradually increases the lattice's weight, and the ropes are designed to break off at a certain weight, forming a new landscape and a new ground surface below. Over time, this new landscape becomes a shelter space for animals, creating an ecosystem that protects and nurtures different species residing in the system.

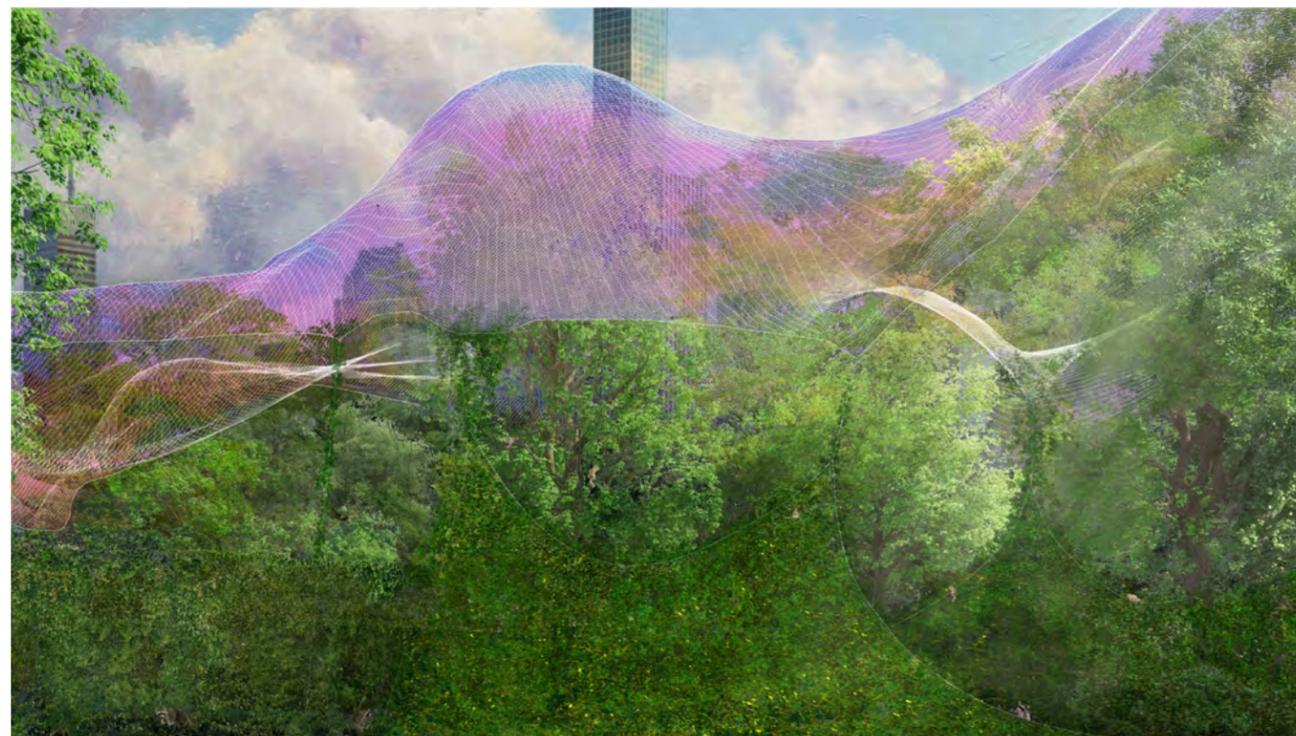


- ▼ **TOP LEFT**  
PH-Scale & Color Correlation
- ▼ **TOP RIGHT**  
Structural Rope Close Render
- ▼ **BOTTOM**  
Rendered Sections





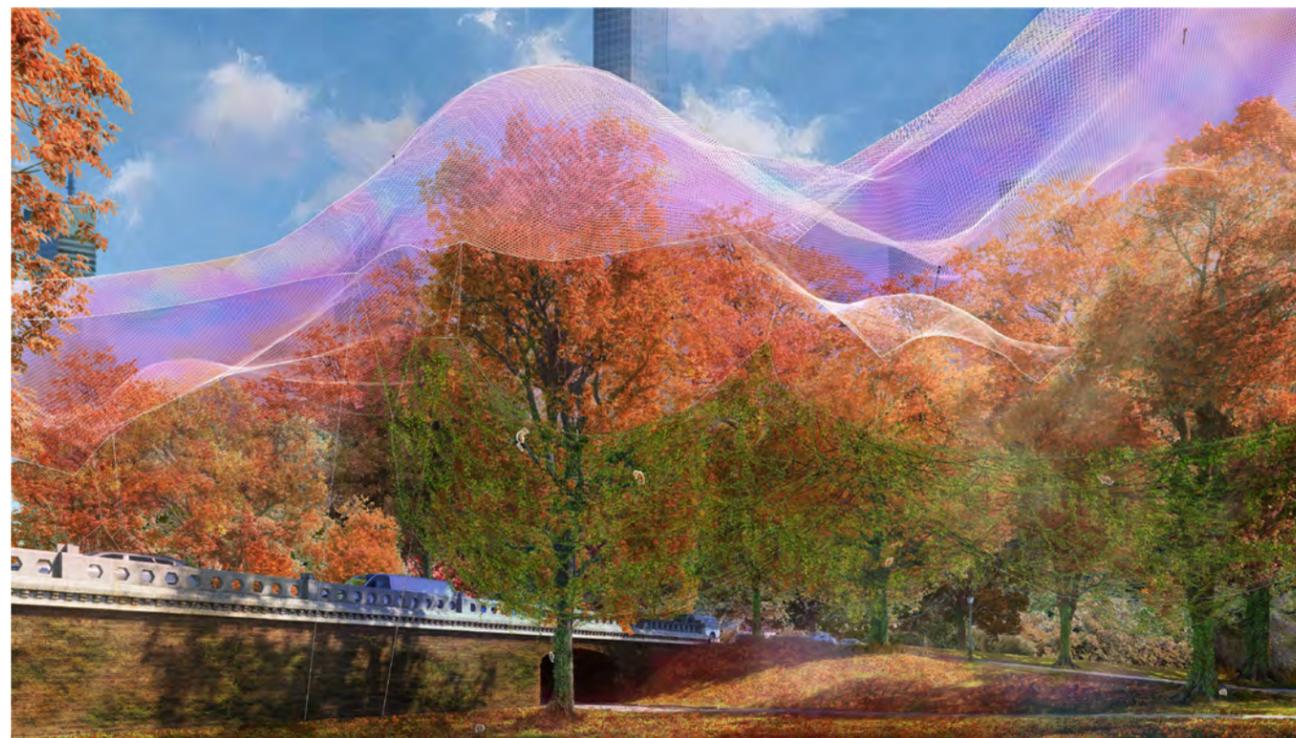
During the spring, the fabric covering the Norway Maple trees displays a blue tone, as the composition of pollutants in the air is more alkaline. This creates a color map that reveals the invisible pollution in the air through vibrant colors.



In the summer, the mesh canopy formed by the English Ivy provides shade and shelter for animals and small rodents such as chipmunks, which are attracted to the system.



As the seasons change, the pollutants in the air consist of more acidic elements, causing the fabric to display a red tone. This color map continues to reveal the invisible pollution in the air through vibrant colors.



Even during the winter, the English Ivy remains vibrant and evergreen, providing a canopy that protects and nurtures different species residing in the system.



The Nature's Trojan Horse project not only aims to create a new ecosystem within the Central Park, but also highlights the issue of air pollution and the impact it has on the environment. By using the Norway Maple and English Ivy as tools to absorb air pollutants, the project creates a visual representation of the invisible toxins in the air, and showcases the potential for nature-based solutions to address environmental challenges in urban areas. As the project evolves over time, it has the potential to inspire other cities and communities to consider similar interventions to address the growing concern of air pollution and its impact on our health and the environment. Ultimately, the Nature's Trojan Horse project serves as a reminder that nature and the built environment are not mutually exclusive, and that innovative approaches can be taken to bring them together in a way that benefits both.



## AERAINMA

A Year 2180 Future Indigenous Habitat

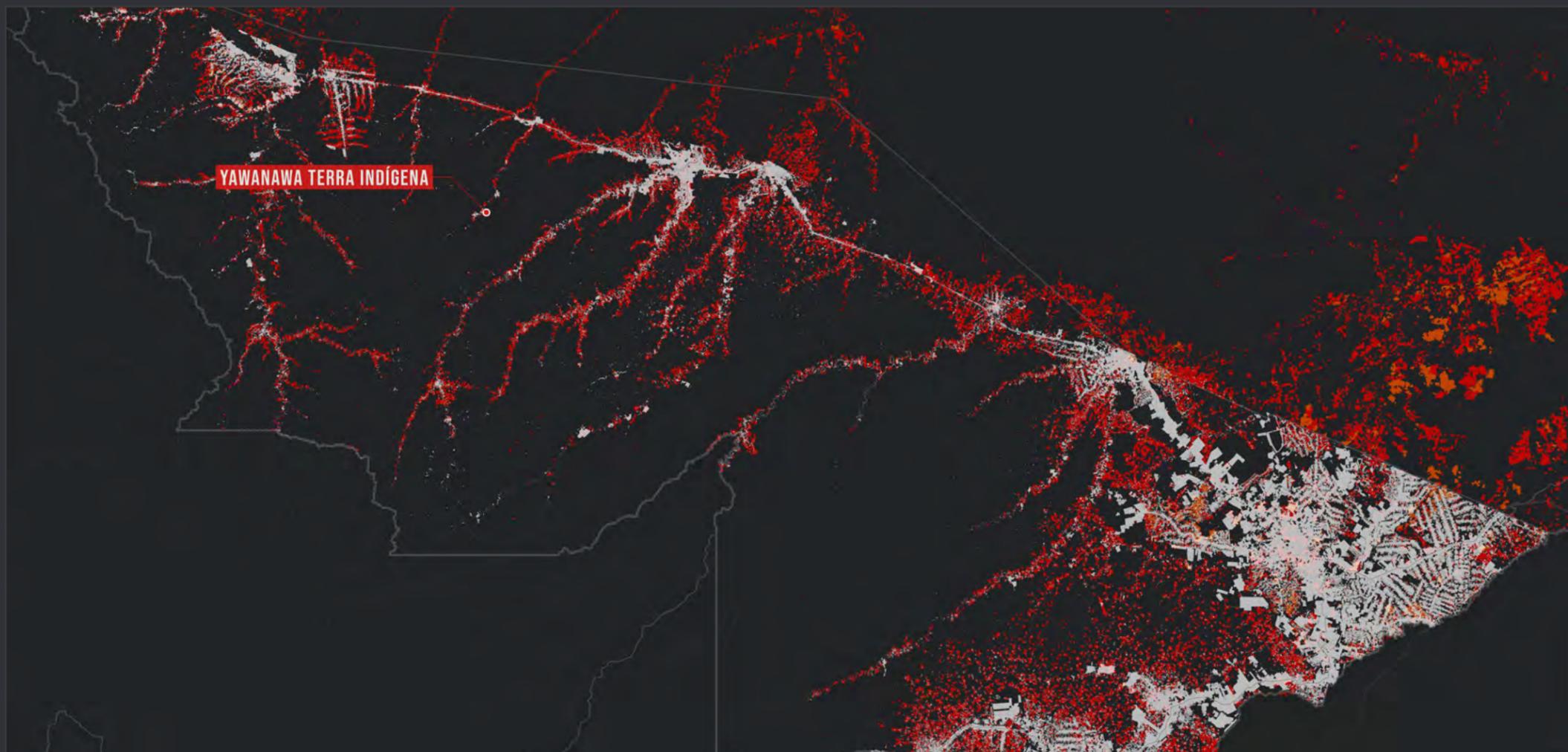
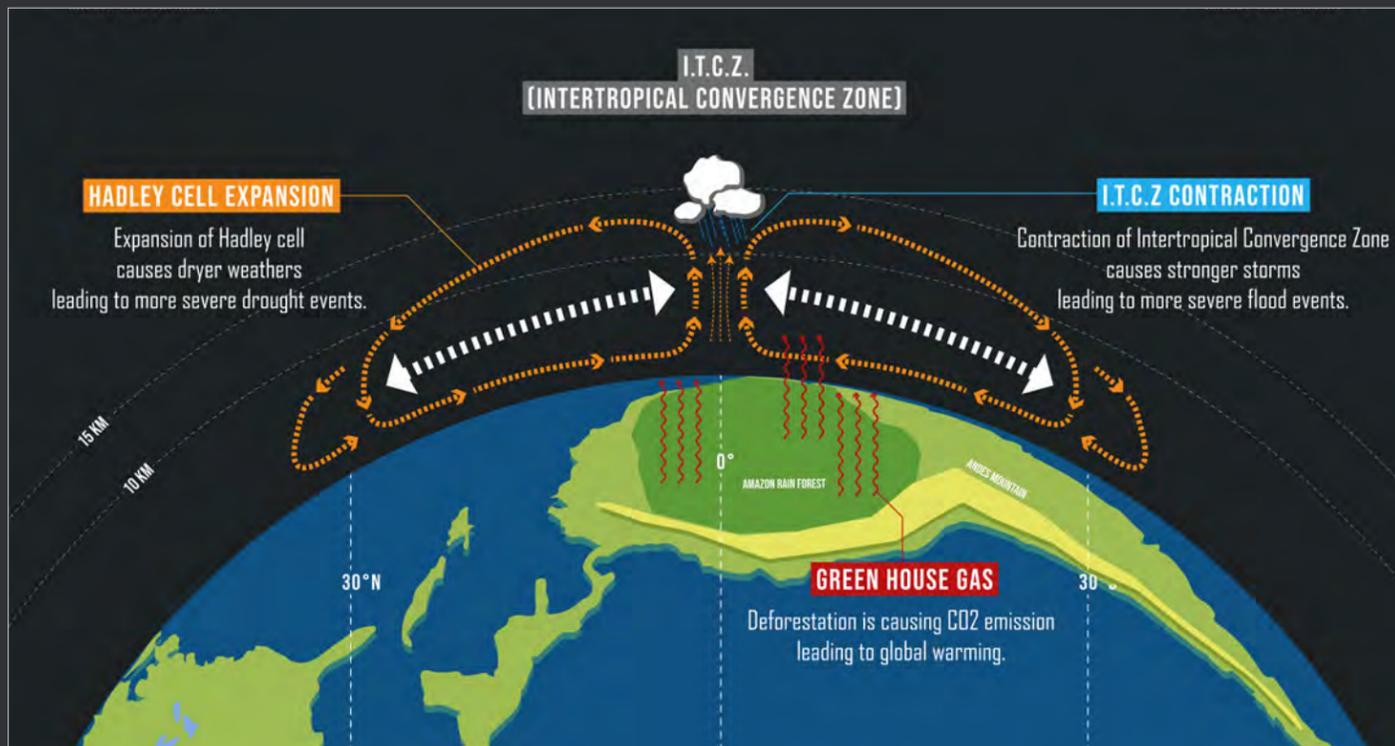
Program	Clean-Energy Future Indigenous Habitat
Studio	Advanced V Studio
Professor	Vanessa Keith
Date	Fall 2022
Location	Shukuvena Village, Brazil
Partner	Steven Fei

In year 2180, human is forming a positive symbiotic relationship with nature and constructing self-sustaining structures to build a more amicable environment. Ecological issues caused by climate change are no longer considered as challenges or disasters but as opportunities and fuels for the sustainable devices to help the society withstand environmental changes and improve environmental conditions. Deep inside the amazonian

forest, resides the Yawanawa Indigenous people. They cherish and celebrates their own culture by their nurturing river Rio Gregorio. In the past decades, deforestation has been accelerated causing more severe drought and flood events. The villagers living in the Yawanawa Terra Indegina are desperately in need of a solution for stable food, water, and energy sources for the future. With the ability to act right now, we projects a better future in 2180 where Yawanawa Terra

Indegina will host infrastructures and climate devices that help the villagers better preserve and celebrate their cultural heritage inside the jungle. Storm surge barriers and fresh water and clean energy collecting devices will be constructed to form a more capable habitat for the village to stand against the more and more extreme climate.

▲ TOP  
Shukuvena Sacred Tree Gathering Space

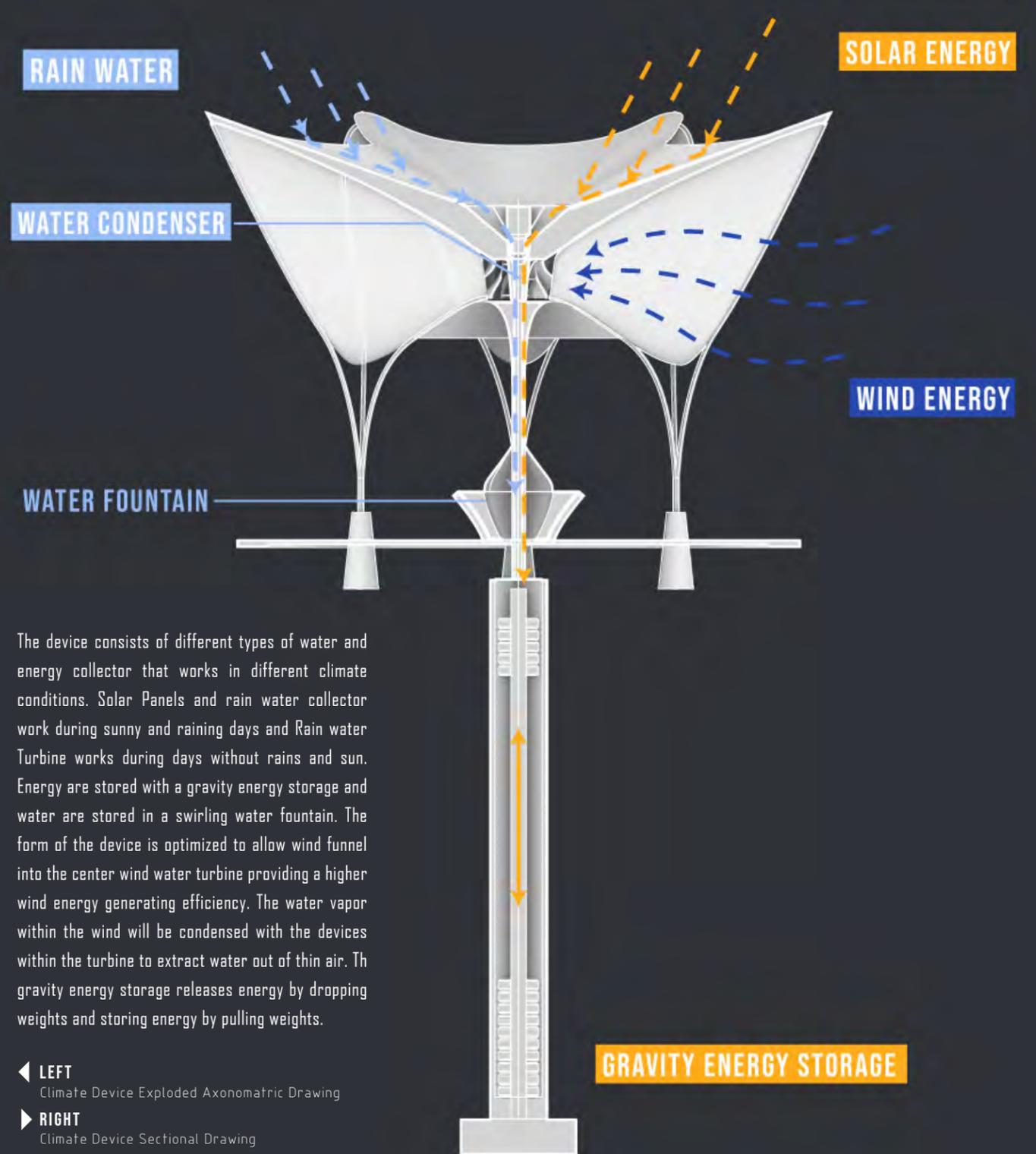
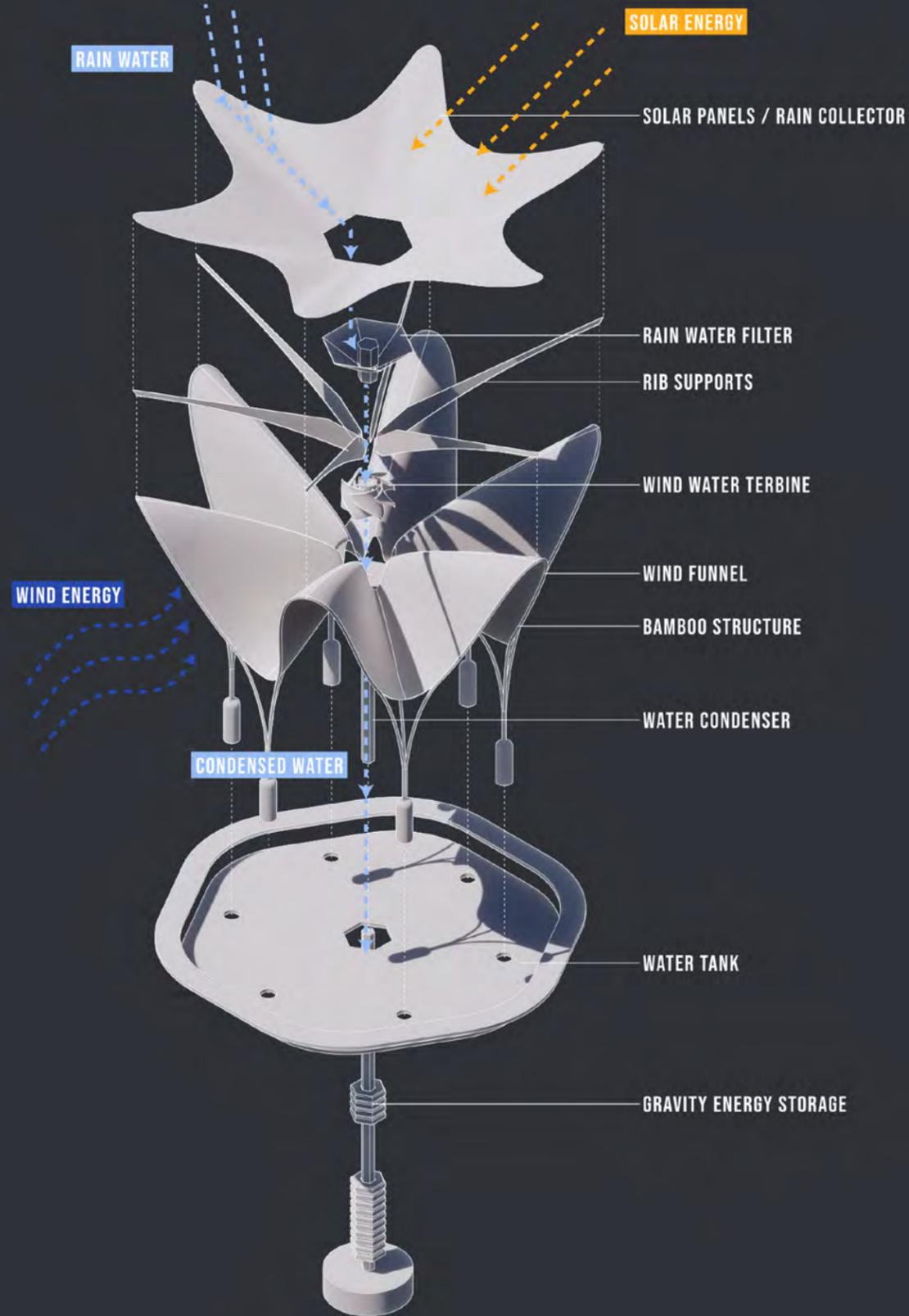


The Hadley Cell is expanding due to the rising climate change. This event causes the ITCZ zone to contract which leads to stronger storms at the equator and dryer weather at the Hadley cell zone.

Shown in the map above is the ITCZ and the flood and drought zones. Dissected by convergence zone, flood zones and drought zones emerges. These area are experiencing more extreme flood and drought events due to the expansion of Hadley cell.

The map shown on the right illustrates the clear direct linkage between the fires occurring inside the amazon forest and the deforestation due to human activities as the pattern of the fires match with the pattern of the deforestation. Farmers has been lighting fires in the jungles to clear land for farming purposes.

- ▶ **TOP LEFT**  
Hedley Cell Diagram
- ▶ **TOP RIGHT**  
Intertropical Convergence Zone Diagram
- ▶ **BOTTOM LEFT**  
Forest Fire & Deforestation Correlation diagram



The device consists of different types of water and energy collector that works in different climate conditions. Solar Panels and rain water collector work during sunny and raining days and Rain water Turbine works during days without rains and sun. Energy are stored with a gravity energy storage and water are stored in a swirling water fountain. The form of the device is optimized to allow wind funnel into the center wind water turbine providing a higher wind energy generating efficiency. The water vapor within the wind will be condensed with the devices within the turbine to extract water out of thin air. The gravity energy storage releases energy by dropping weights and storing energy by pulling weights.

◀ LEFT  
Climate Device Exploded Axonometric Drawing  
▶ RIGHT  
Climate Device Sectional Drawing



TOP LEFT  
Wind Flow Simulation Render

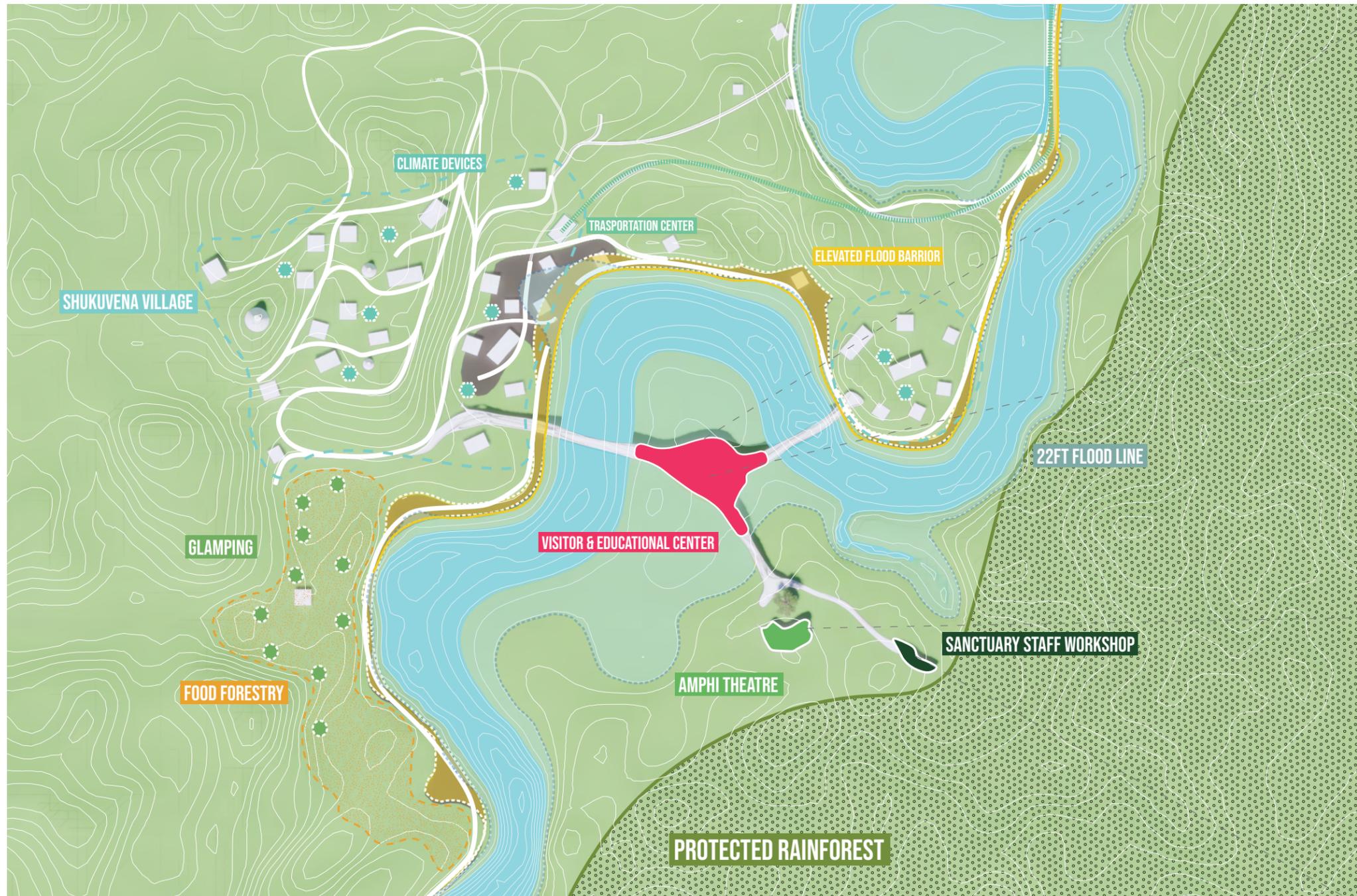
TOP RIGHT  
Wind Flow Simulation Close Render

BOTTOM LEFT  
Roof Photovoltaic Close Up Render

BOTTOM MIDDLE  
Pavillion Interior Render

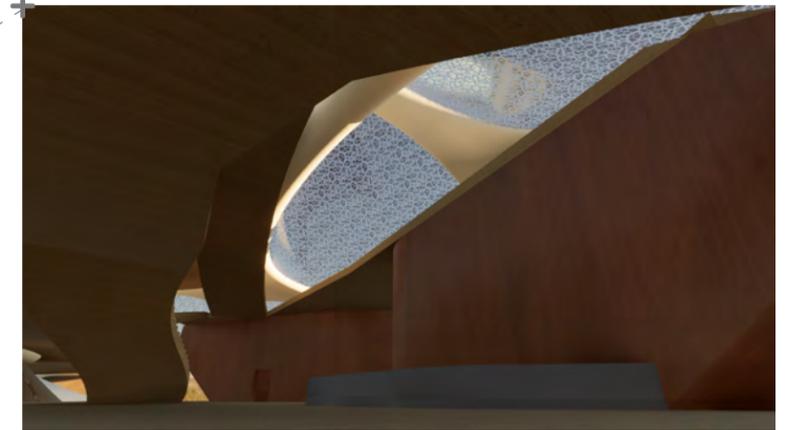
BOTTOM RIGHT  
Side View Render

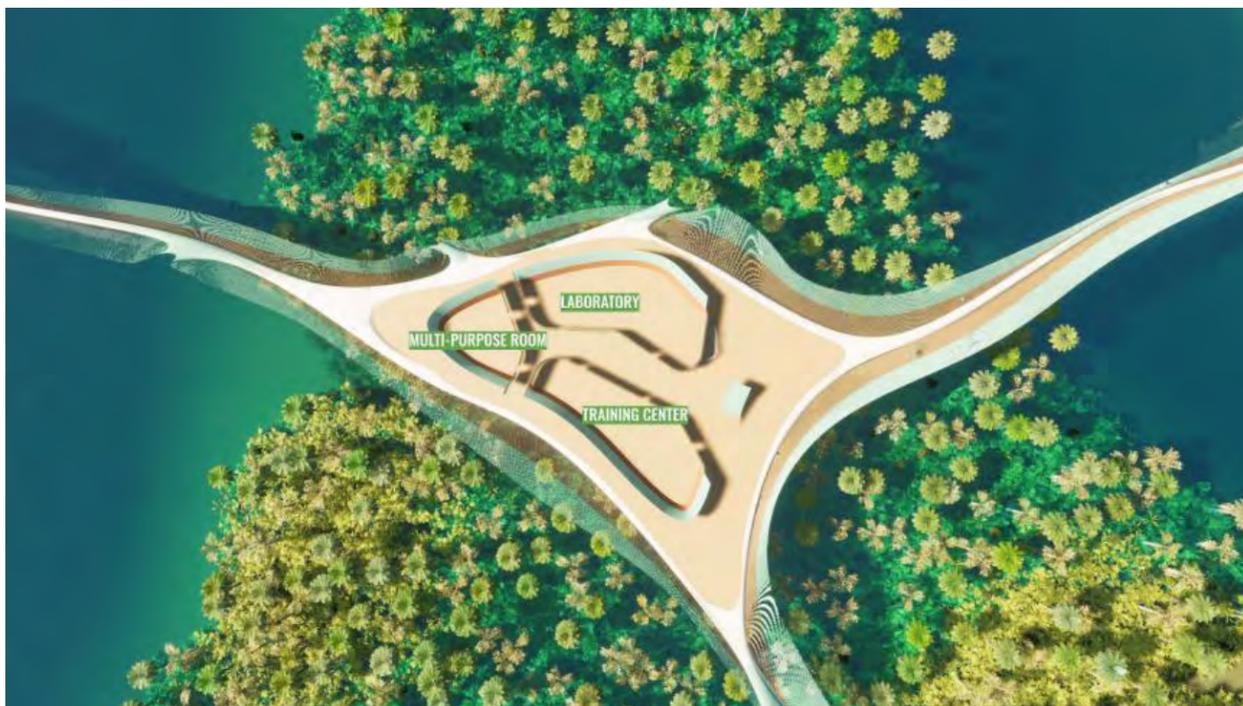
As shown in the wind flow simulation, the funnels would channel wind force and convert them into wind power as water are collected in the pavilion providing shelter space for the residents around. This pavillion would act as a gathering space for both water and energy.



A larger picture of the entire habitat is considered and redesigned to accommodate future expansion plans, flooding issues, and cultural celebrations. A visitor & Educational Center is located in the middle of the flood zone as a connecting point to bridge the two sides of the river even when flooded. The northwest side of the planned village would house glamping locations with food, forestry land for the villagers, and climate devices allocated around the town. On the east side of the city, located a sanctuary staff workshop adjacent to the protected rainforest and an amphi theater next to the sacred tree of Shukuvana, for the celebration of the indigenous culture.

- ▶ **TOP LEFT**  
Day Time Axonometric Rendering
- ▶ **TOP RIGHT**  
Night Time Axonometric Rendering





▲ INNER FLOOR



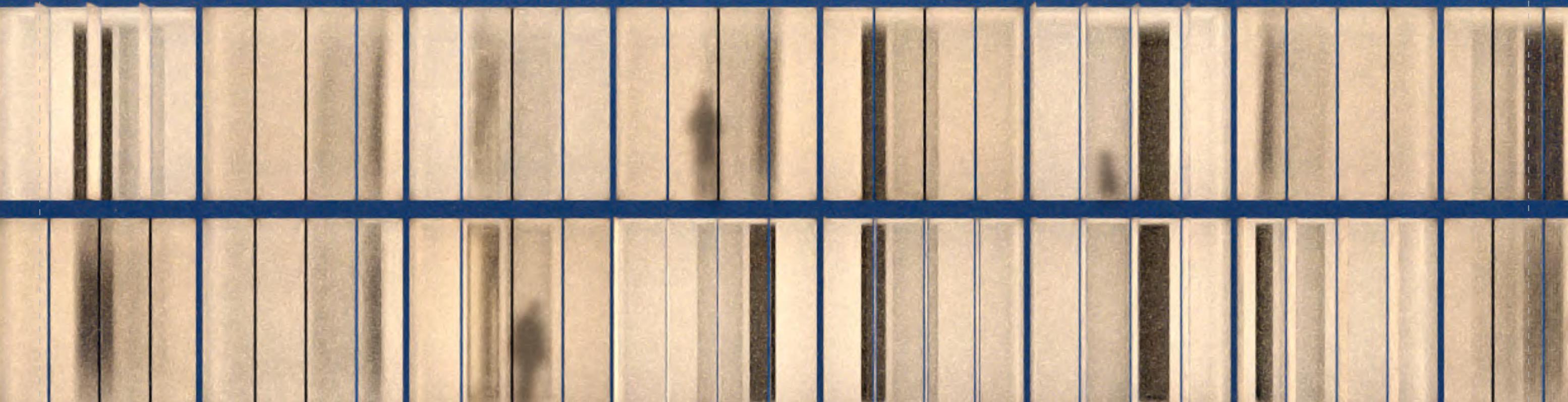
▲ BRIDGE FLOOR



▲ GROUND FLOOR



▲ TERRACE FLOOR



# F(R)YER

Sustainable Climate Solutions for a Resilient Future

Program	Communal Living / 3D Printing Facility
Studio	Advanced VI Studio
Professor	Patrice Derrington & Christoph Kumpus
Date	Spring 2023
Location	350 E 10th St. New York, NY
Partners	Isaac Zaslow

F(r)yer is a sustainable manufacturing and co-living project that aims to revolutionize the way we think about materials and their impact on the environment. Housed in the existing building at 350 E 10th St. and its expansion, the project will incorporate research and development facilities for recycling materials into 3D printing pellets and 3D printing facilities for creating unique products and components, such as printed furniture,

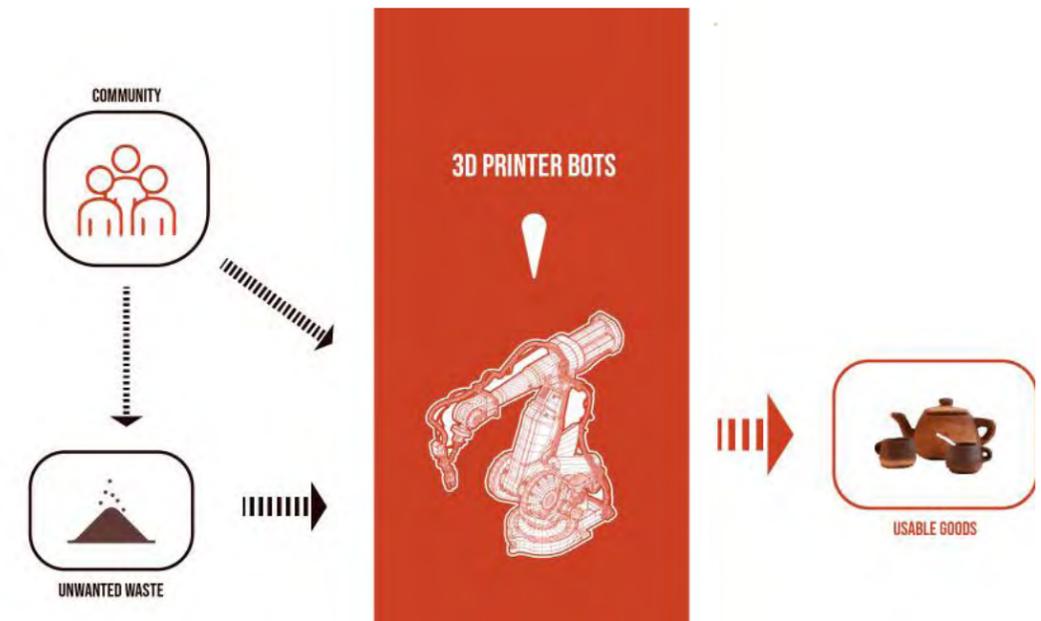
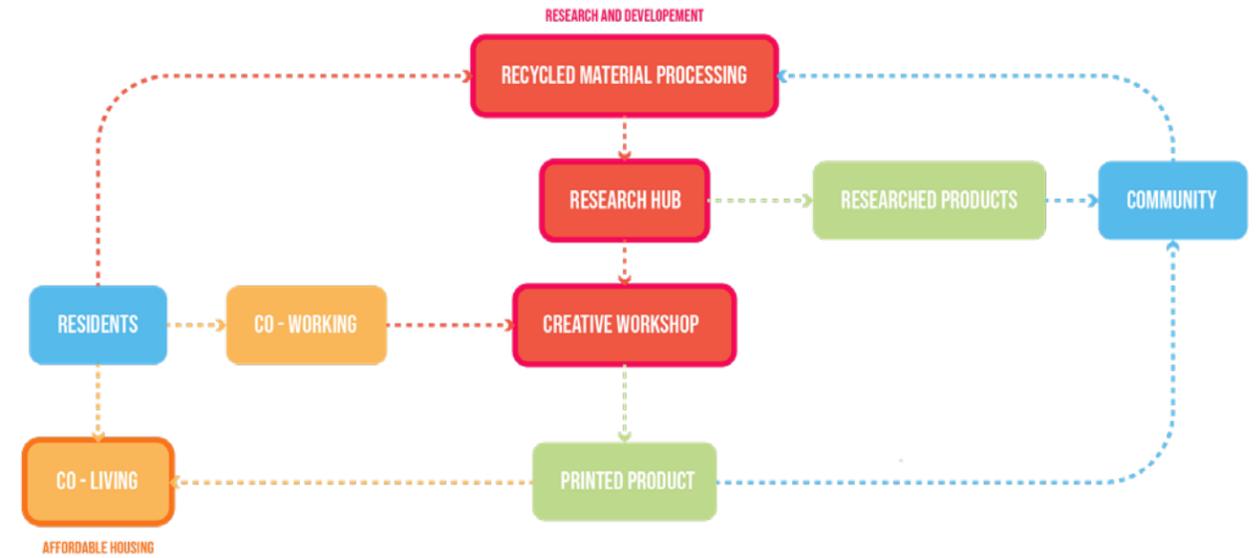
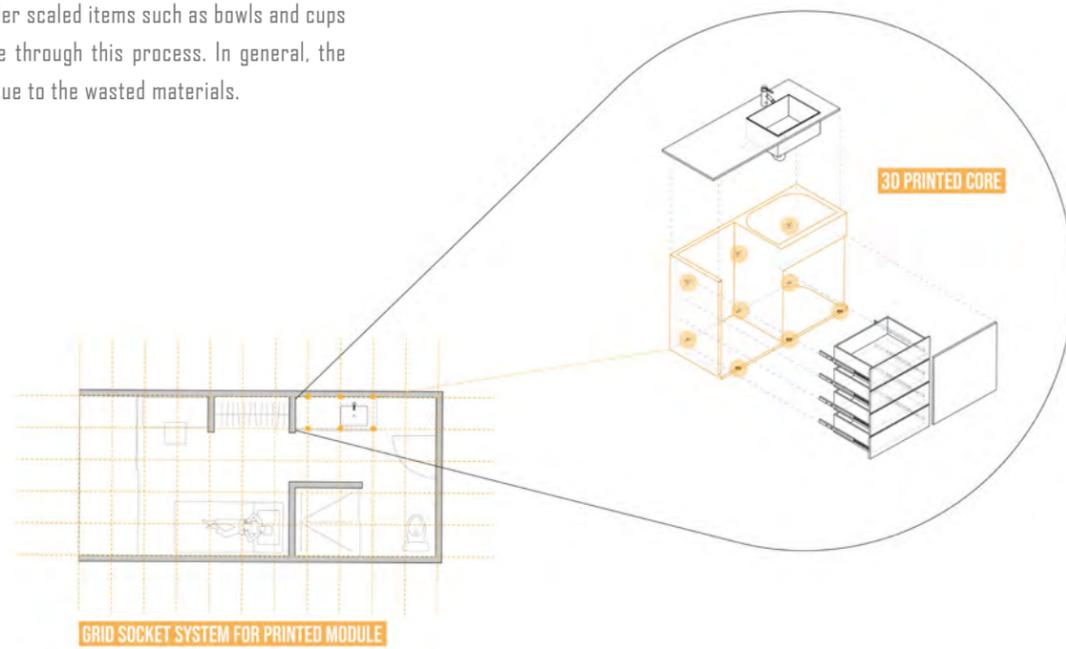
printed facades, etc. The printed products will be incorporated into the living spaces, showcasing the versatility and potential of 3D printing in the built environment. F(r)yer is not only a project aimed at sustainability but also a project that revolutionizes the way we interact with the built environment. By incorporating cutting-edge technology and community-focused design, F(r)yer creates a space that encourages collaboration, innovation, and sustainable living. The

six-floor expansion will be dedicated to communal living units with shared communal spaces, allowing residents to live in a sustainable, community-focused environment. The co-living space will also include amenities such as a communal kitchen, fitness center, and 3D printing Restaurant, designed to foster a sense of community and connection among residents.

▲ TOP  
Shukuvena Sacred Tree Gathering Space

In this project, project, the relationship between internal processing of materials and end products used for co-living spaces is crucial as the project is based on such concept. With the residents and community members gather material for the recycling process. Pellets of different materials would be turned into pelletized forms in order for 3D Printer Bots to melt and print reusable products. Interior furniture such as cabins or desks could be printed with a core and furnished with other components, as illustrated below. Smaller scaled items such as bowls and cups would also be easily made through this process. In general, the idea is to provide form value to the wasted materials.

- ▶ **MIDDLE LEFT**  
Internal Building Relationship
- ▶ **TOP RIGHT**  
Internal Building Relationship
- ▶ **BOTTOM**  
Material Processing
- ▶ **MIDDLE RIGHT**  
Material Processing Relationship



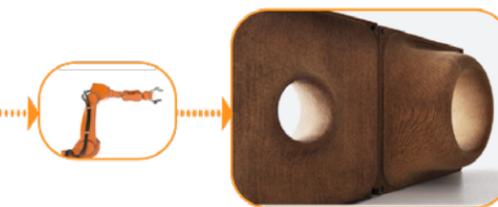
1. Raw waste is sold to development by local community (rubber, coffee, wood/sawdust, tea, concrete)



2. Waste is ground into fine material (ie. sawdust or concrete dust)



3. Cellulose powder is added to dust, and material is formed and stored as pelletized filament



4. 3D printers print pellets into items or component pieces of larger items (such as furniture)



5. Community members and residents assemble and decorate items



6. Finished products are utilized in development, given back to the community or sold to visitors in ground floor retail

**Prompt Input:**

Coral reef with schools of brightly colored fish swimming through and a sea turtle in the foreground

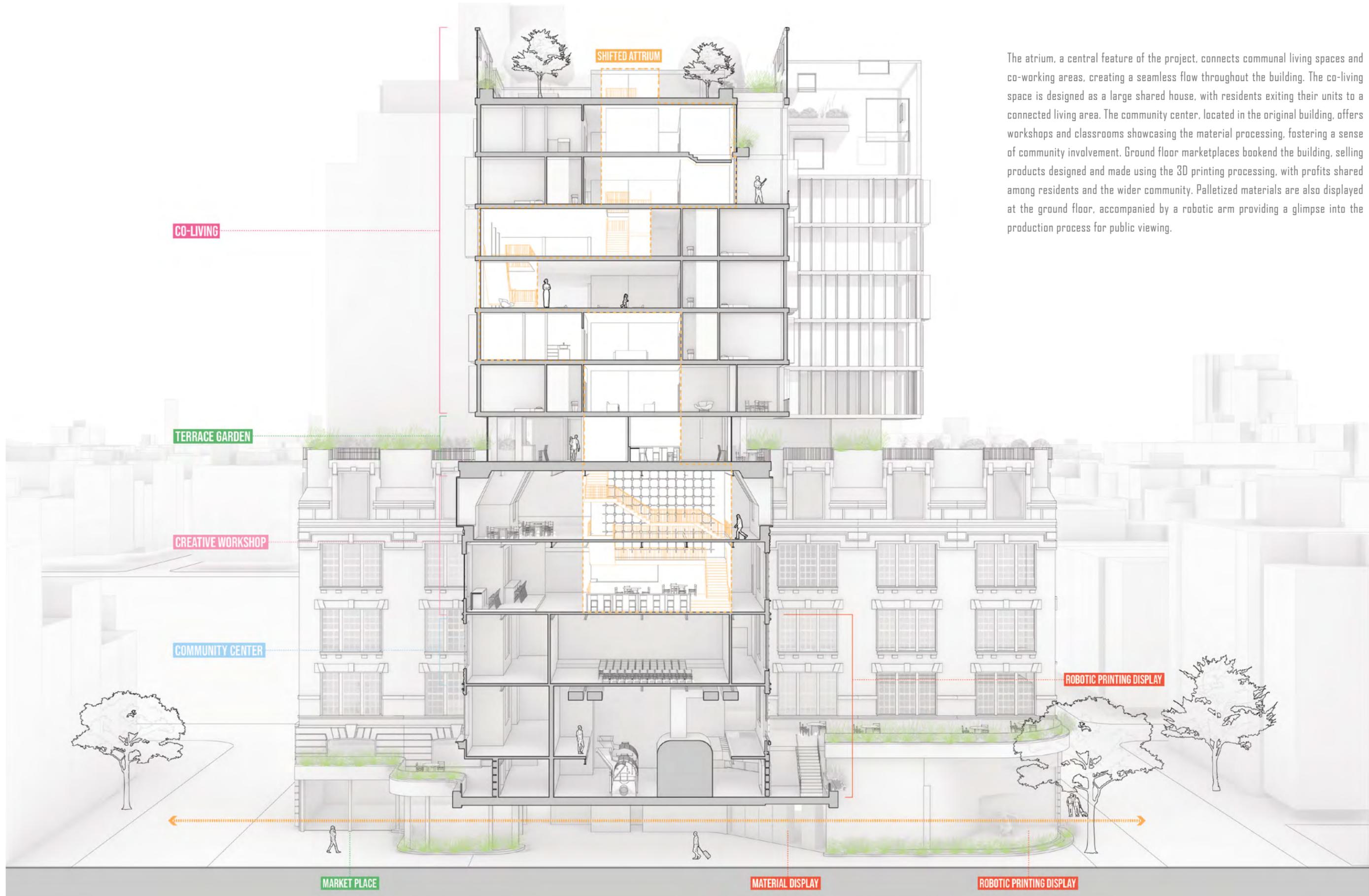


With the Text to Image AIs such as Midjourney or Dall E becoming available, the users of the building could create images simply based on their words and turn that into an idea for the facades to be printed.

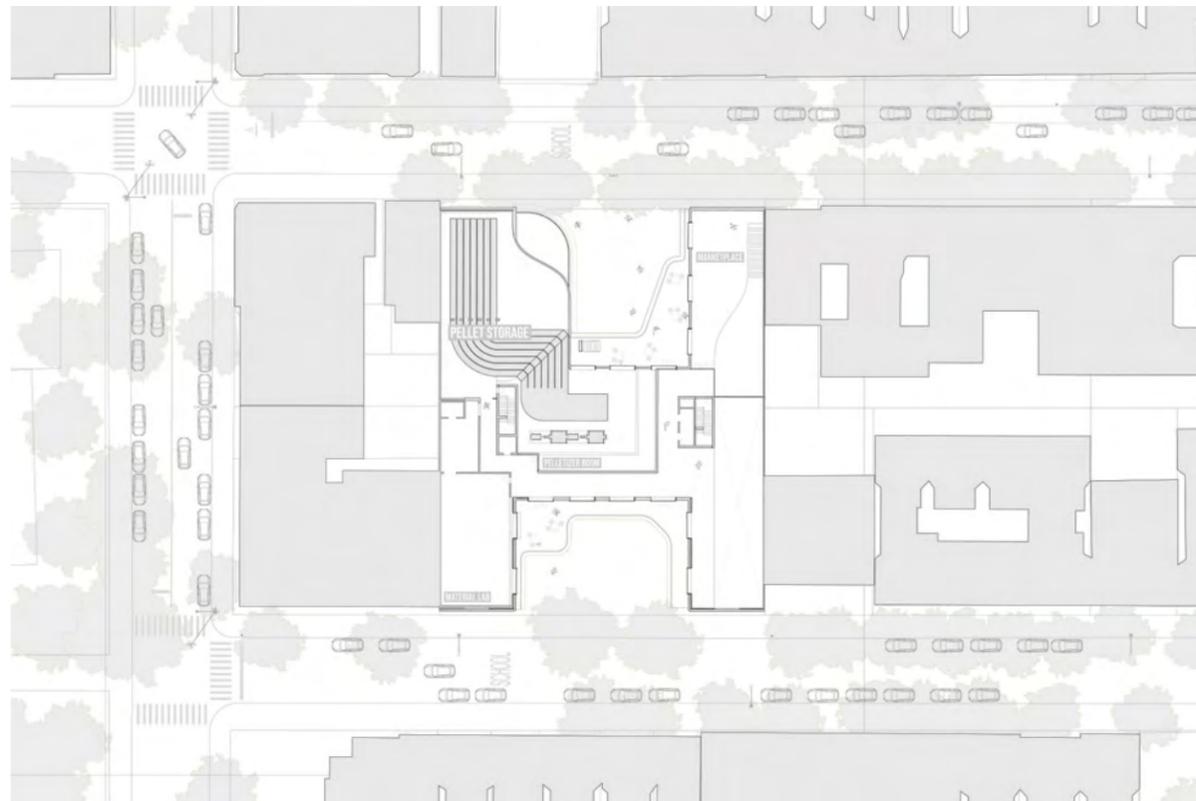


The images generated would be used for further processing for the bots to recognize the pattern visible in the architectural elements and finally be printed and installed on to the site.

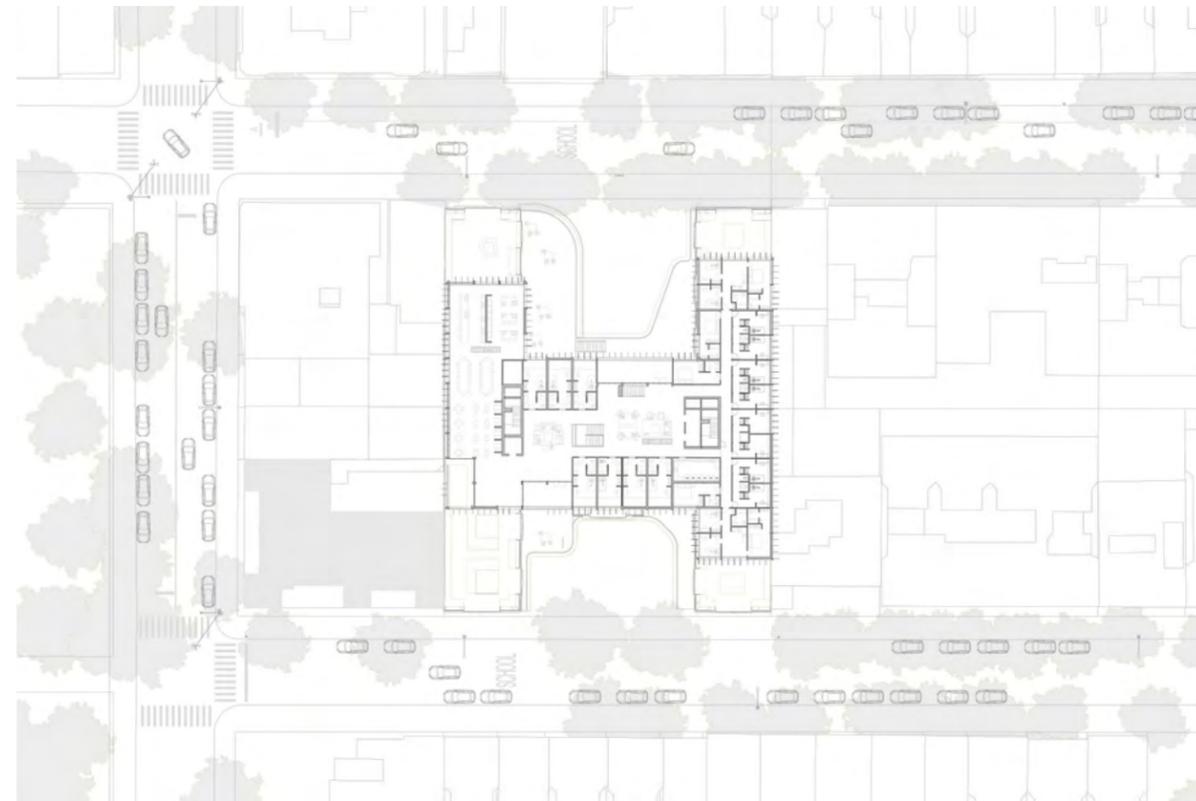




The atrium, a central feature of the project, connects communal living spaces and co-working areas, creating a seamless flow throughout the building. The co-living space is designed as a large shared house, with residents exiting their units to a connected living area. The community center, located in the original building, offers workshops and classrooms showcasing the material processing, fostering a sense of community involvement. Ground floor marketplaces bookend the building, selling products designed and made using the 3D printing processing, with profits shared among residents and the wider community. Palletized materials are also displayed at the ground floor, accompanied by a robotic arm providing a glimpse into the production process for public viewing.



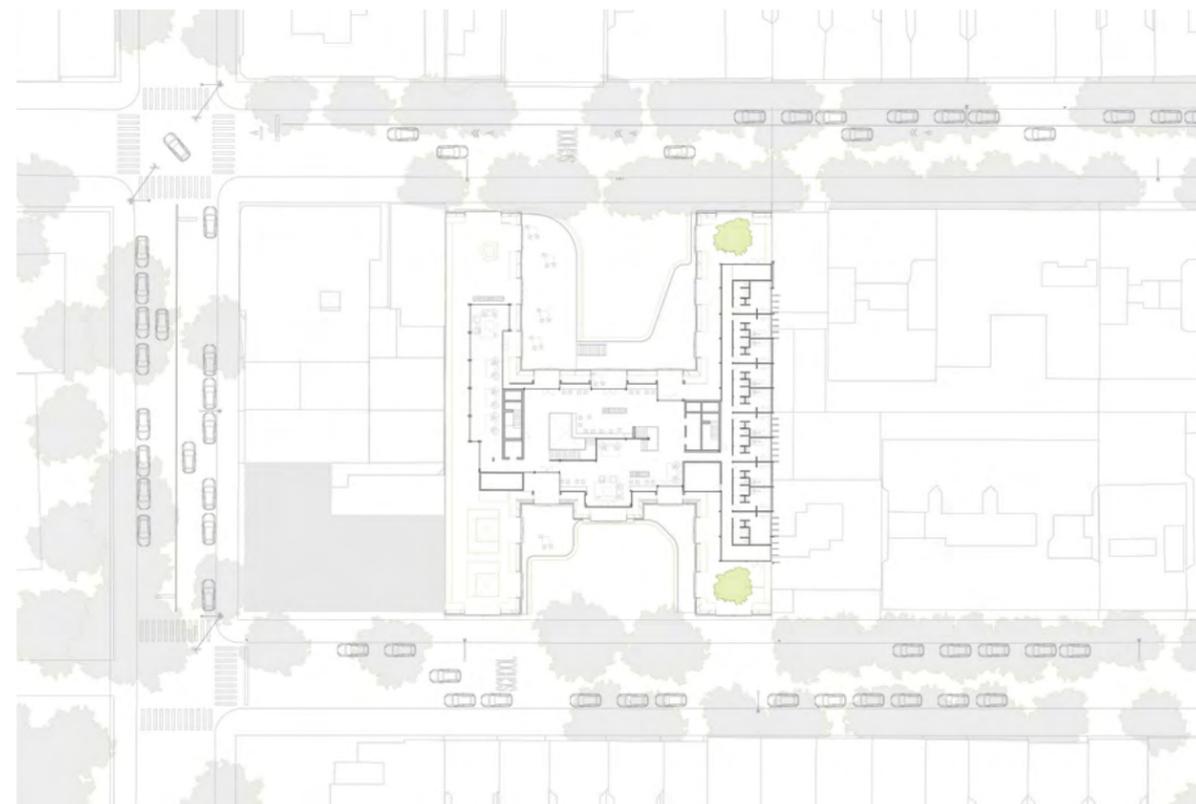
▲ 2ND FLOOR



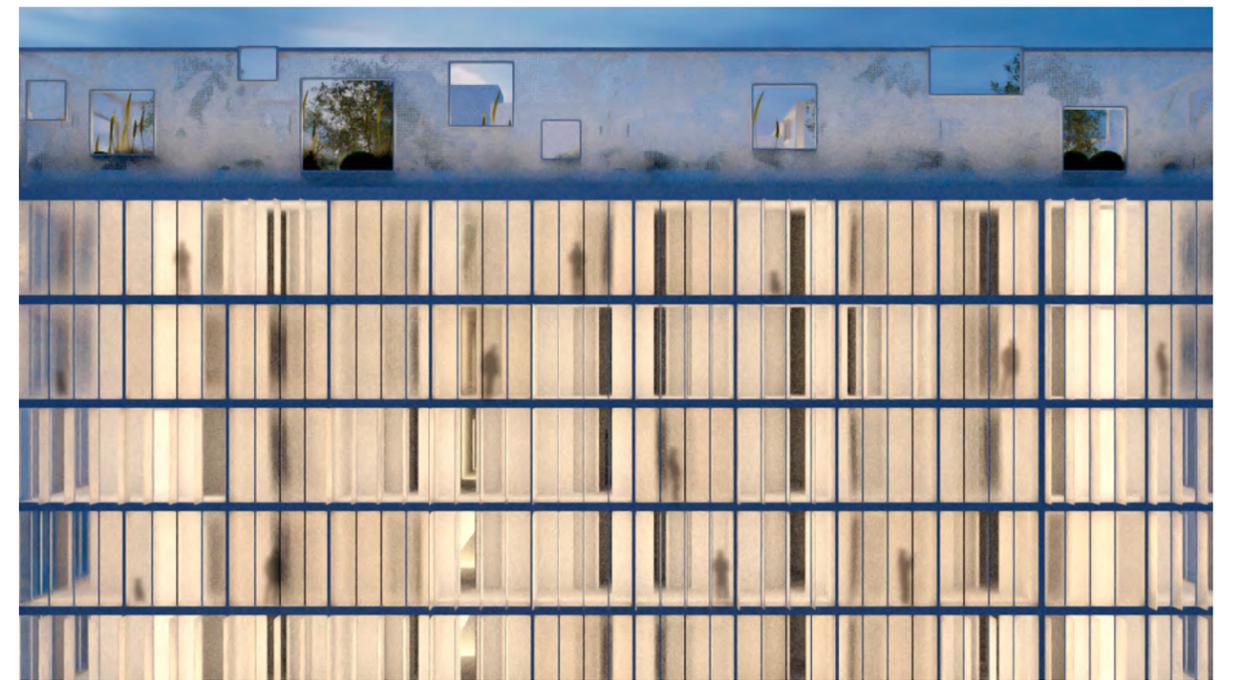
▲ TYPICAL CO-LIVING FLOOR



▲ GROUND FLOOR



▲ TERRACE FLOOR



The building serves as a physical manifestation of the potential of 3D printing technology in architecture. The facade is not only functional, opening and closing as needed, but also displays the possibilities of mass customization available to the residents. The use of translucent plastic created from recycled materials gives the building a luminous quality, like a beacon highlighting the values of sustainability and community. The building's design celebrates the idea of sharing and showcases the beauty of recycled materials in a modern architectural context.

- ▀ **LEFT**  
Night Time Render of the building
- ▴ **TOP RIGHT**  
Close up Render of the Roof Condition
- ▾ **MIDDLE RIGHT**  
Elevation render of the facade



## MICRO TO MACRO

Unfolding the Layered Landscape of Chinese Garden

Program	Virtual Scene Renders
Course	Techniques of The Ultrareal
Professor	Phillip Crupi
Date	Fall 2022
Team Members	Runxin Fu, Chenxi Liu, Weiheng Zhao

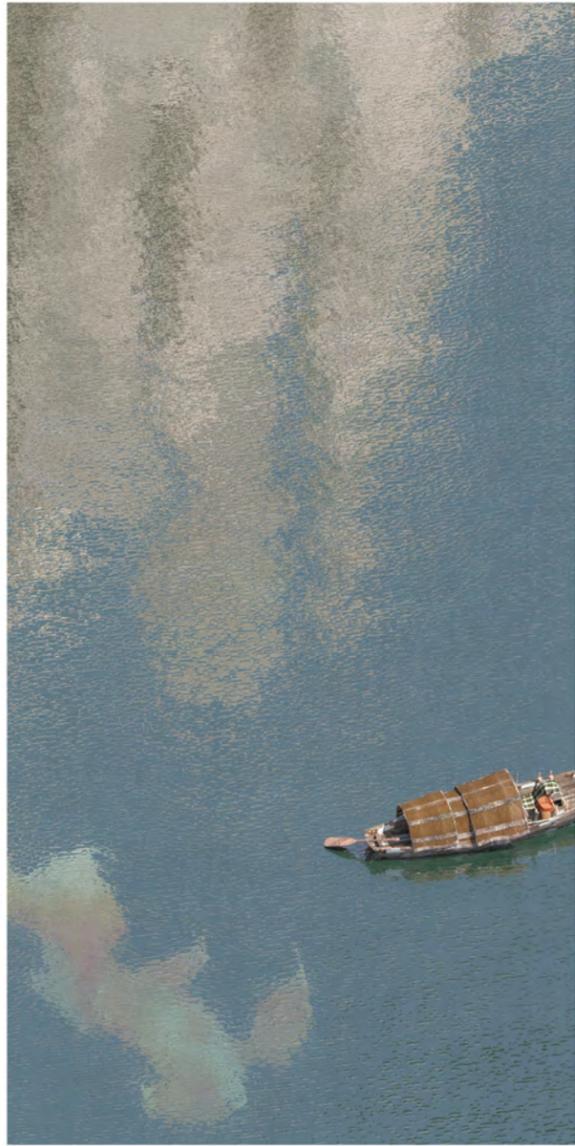
"Micro to Macro: Unfolding the Layered Landscape of Chinese Garden" is a tribute to the timeless elegance and tranquility of Chinese gardens, capturing the essence of their beauty through a unique fusion of technology and artistry. By blending photorealism with traditional elements, this project invites viewers to embark on a captivating journey through the layered landscapes of Chinese gardens, from the smallest detail to the grandest panorama.

Utilizing 3DS Max and V-Ray, this project presents a series of five ultra-realistic, vertical framed isometric renders, each offering a unique view into a beautifully crafted scene. The objective of this project is to showcase the artistic capabilities of 3DS Max and V-Ray by creating photorealistic images that immerse the viewer in the serene beauty of traditional Chinese gardens. Each render unveils a deeper layer of the landscape, inviting the audience to appreciate both the macro and micro perspectives. Key elements of Chinese gardens have been thoughtfully incorporated into the scenes, such as the Taihu Lake stone forming the mountain within the bowl, the iconic moon gate, and the graceful goldfish swimming through the waters. These features not only enhance the visual appeal but also pay homage to the rich history and cultural significance of Chinese garden design.

◀ **LEFT SIDE**  
First Scale Render & Last Scale Render

▼ **BOTTOM RIGHT**  
Layered Progression Thumbnail





1. GLIMMERING WATERS

This intimate scene captures the mesmerizing reflections of the mountain in the shimmering waters, where goldfish swim gracefully, inviting the viewer to appreciate the delicate details of the tranquil setting.



2. RISING PEAKS

In this close-up view, the Taihu Lake stone mountain's rugged beauty takes center stage, giving the audience a chance to marvel at the intricate textures and natural forms that embody the spirit of Chinese gardens.



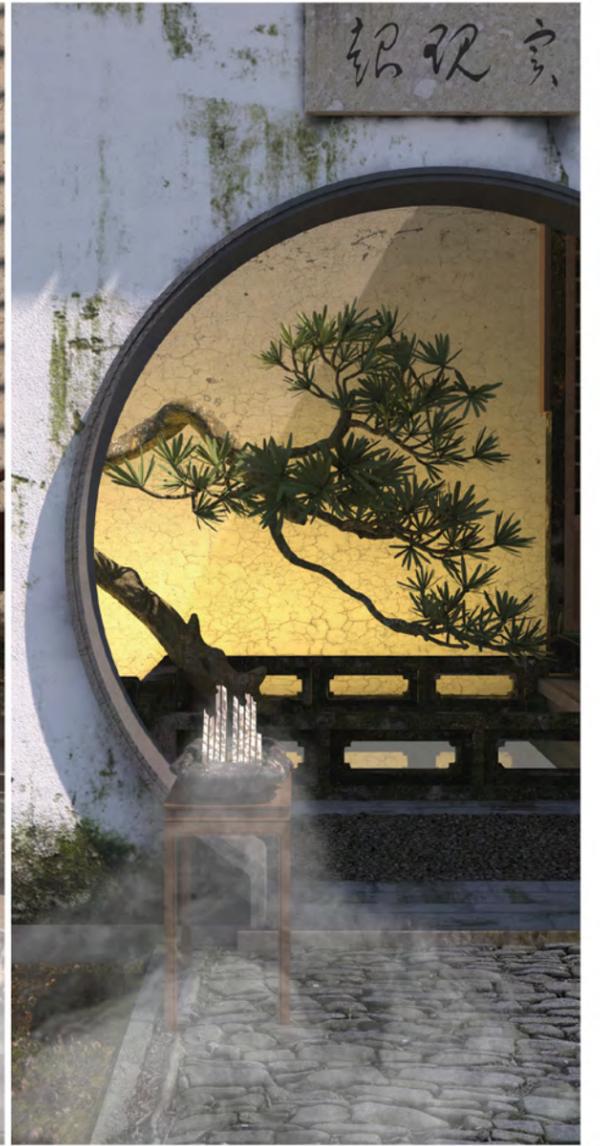
3. AERIAL SERENITY

This panoramic perspective reveals the full majesty of the mountain, enveloping the viewer in the awe-inspiring landscape and offering a breathtaking vantage point from which to admire the harmonious balance of nature.



4. DUAL REALITIES

This unique scene unveils the bowl's edge, while the other half of the image peeks into the classical Chinese interior, adorned with elegant furniture and casting the intricate shadows of a wooden door, creating an enchanting fusion of two distinct realms.



5. CELESTIAL HARMONY

The final scene unveils the entire composition, showcasing the harmonious relationship between the garden, the mountain, and the classical courtyard. The viewer is immersed in the serene beauty of this enchanting world, experiencing the full splendor of a traditional Chinese garden landscape.

THANK YOU



MARS

/

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