

CLIMATE AND ARCHITECTURE

المنزلة والعمارة

BISHER TABBAA

بشیر الطباع

GSAPP M.ARCH 2022

The built environment is responsible for 40% of Greenhouse Gas Emissions on Earth. This book is a collection of designs, essays, studies, experiments, and conversations about architecture and its entanglements with climate. Climate justice is a mission that operates along the socio-political, material, and cultural parameters. As we face an existential threat, it is imperative that we approach architecture through the lens of climate. While issues of climate change are closely entangled, this book artificially segments them based on each project's main focus.

CLIMATE AND SOCIETY

THE FARM POST AGRICULTURE

ADV VI Studio
Design Studio
Gary Bates
Spring 2022

THERMAL AUTONOMY

Core III Studio
Design Studio
Erica Goetz
Fall 2019

OPEN BRONX

Tech III + IV
Architectural Technologies
Stephen Potts
Fall 2019

RE-WILDING GREENPOINT

Tech V
Architectural Technologies
Scott Demel
Fall 2019

THE FARMING SCHOOL

Core II Studio
Design Studio
Gordon Kipping
Spring 2020

COURTYARDS IN AMMAN

Modernism and the Vernacular
History and Theory
Mary McLeod
Fall 2019

CLIMATE AND MATERIAL

A NEW VERNACULAR

Advanced V Studio
Design Studio
David Benjamin
Fall 2021

733'S NEW ENERGY

Net Zero Housing
Architectural Technologies
Andreas Benzing
Fall 2021

GROUNDLED CHAIRS

Natural Materials Lab
Research Assistantship
Lola Ben Alon
2021

THE 8 AXIS MODULE

Building Technology
Advanced V Studio
Joshua Jordan
Fall 2021

CLIMATE AND CULTURE

TECTONIC RESISTANCE

Advanced IV Studio
Design Studio
Robert Marino
Spring 2021

VERTICAL SCULPTURE GARDEN

Core I
Design Studio
Amina Blacksher
Fall 2018

ARCHITECTURAL PHOTOGRAPHY

From Models to the Built World
Visual Studies
Michael Vahrenwald
Spring 2021

CLIMATE AND POLITICS

HOUSTON'S PROBLEM

X-Information Modelling
Architectural Technologies
Snoweria Zhang
Fall 2021

THE AMERICAN SUBURB AND ENERGY

Housing After Scarcity
Michael Bell
Spring 2022

MASAHA

Student Organization
Ziad Jamaledine

HETEROTOPIA OF DEVIATION

Arab Modernism
Yasser Elsheshtawy
Fall 2020



THE FARM POST AGRICULTURE



THERMAL AUTONOMY



OPEN BRONX



RE-WILDING GREENPOINT



THE FARMING SCHOOL



COURTYARDS IN AMMAN

CLIMATE AND SOCIETY

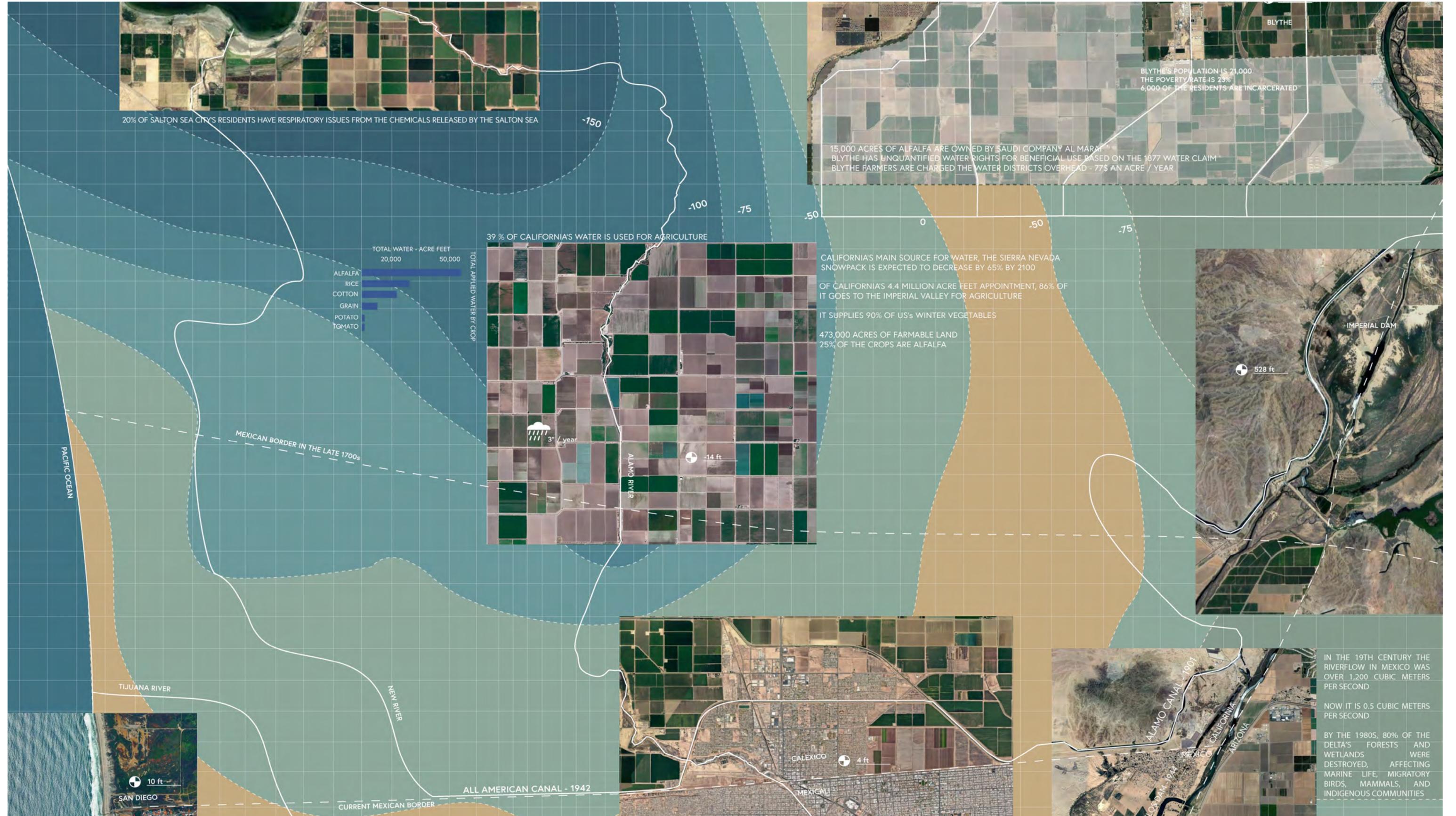
Climate change has already impacted millions of lives, and will continue to do so as long we keep emitting greenhouse gases. Climate justice ultimately means that we relieve the burdens of climate change equitably, and strive for better welfare for all societies. This chapter is focused on the relationship between climate, architecture, and people.



THE FARM POST AGRICULTURE

COURSE:	ADV VI
SEQUENCE:	DESIGN STUDIO
PROFESSOR:	GARY BATES
LOCATION:	BLYTHE, CALIFORNIA

The Farm has the potential to play a huge role in reducing our global carbon footprint. What are we to learn as we hope to move into a post anthropocene world? How can we move past agriculture and simultaneously dismantle our binary interpretation of nature? The hoticultural farm in Blythe is set out to allow us to question what nature is, and bring industry, biophilia, and wildlife closer together. By lifting the food production spaces above, a ground floor can serve as a shaded park that is kept at a comfortable thermal level due to its proximity to the Colorado River.



The Farm Post Agriculture

Design Studio

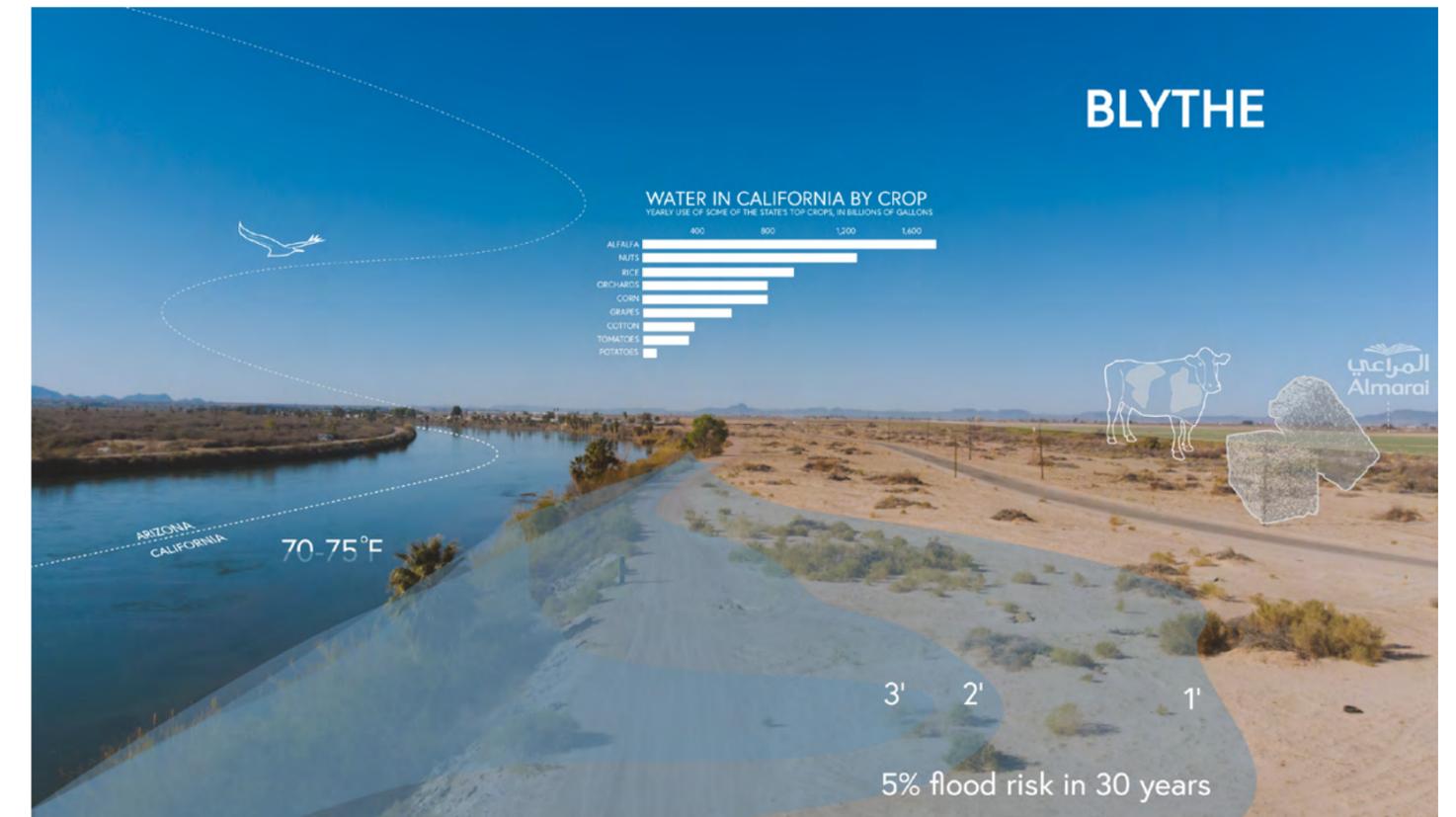


The complex network of water infrastructure in the American Southwest that is fed through the Colorado River which 40 million people rely on. Following the route of the river between California and Arizona, you reach the Palo Verde Valley, which is one of the largest agricultural regions in California. The US relies on the Palo Verde valley to provide most of its winter vegetables. However, inefficient and outdated farming practices, as well as growing water intensive crops has only exacerbated the crisis. Agriculture uses 80% of all the water used in California.

seep through the soil and pollute the Salton Sea.

Furthermore, California's cattle industry is responsible for 5% of the state's Greenhouse Gas emissions. Blythe has a population of 20,000 is one of the small cities in the valley and is reliant on agriculture and tourism for its income. Despite having a yield of 65,000 acres, it is considered as a food desert due to the fact that it exports all of its crops, as well as mostly growing alfalfa. Alfalfa is the main crop that is used to feed cattle which are responsible for 11% of carbon emissions in the world.

The two main issues are that the water is incredibly scarce, and with the little water that is available, it's used inefficiently. The chemicals used in fertilizers in agricultural land



TRADITIONAL AGRICULTURE

CARBON FOOTPRINT: 1,800 ton CO₂e/yr
WATER CONSUMPTION: 200 Mil gallons/yr
AREA: 3,500,000 sqm
YIELD: 800,000 Harvests/yr

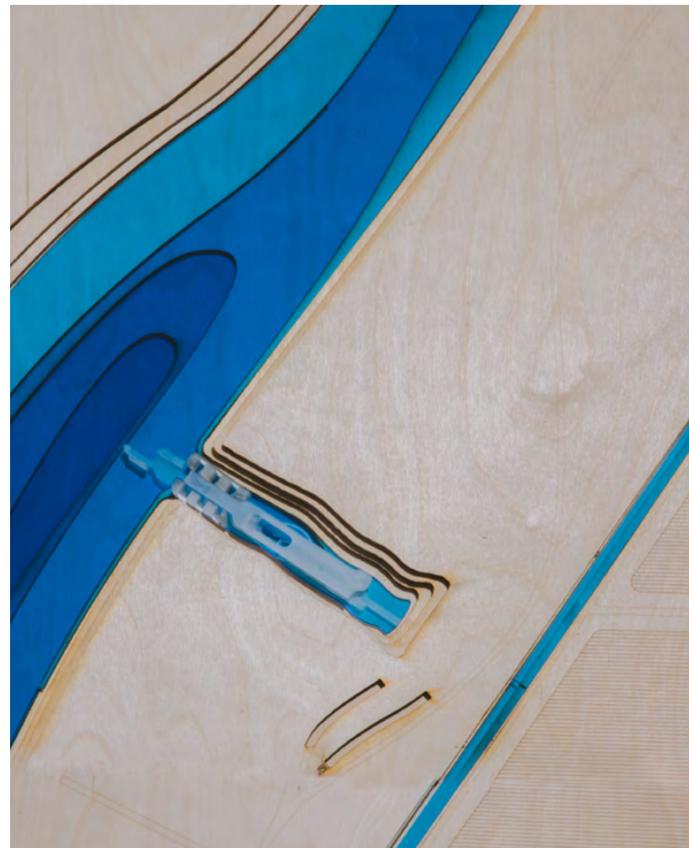
THE FARM POST AGRICULTURE

CARBON FOOTPRINT: 1.3 ton CO₂e/yr
WATER CONSUMPTION: 1 Mil gallons/yr
AREA: 3,000 sqm
YIELD: 800,000 Harvests/yr



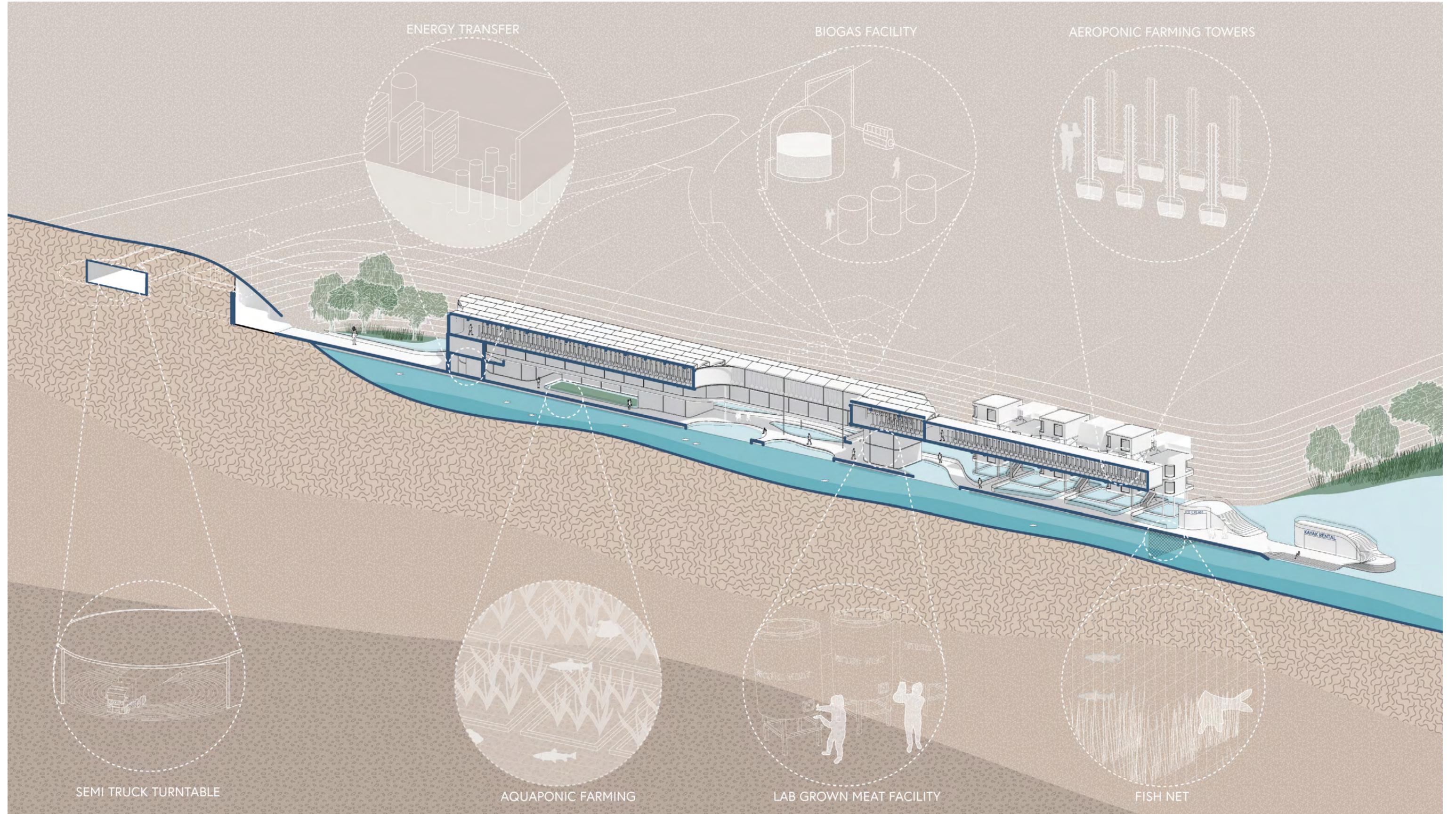
Design Studio

The Farm Post Agriculture



Removing alfalfa from the equation by introducing a lab grown meat facility, as well as having new sustainable farming practices, the hoticultural farm proposed which has an area of 3,000 sqm can produce yield as much as as 3.5 million sqm. Furthermore, the crops that are being grown are plants for human consumption. When comparing the two practices, The Farm Post Agriculture uses 99% less land, 98% less water, and 90% less energy. Blythe imports 80% of its food, and residents in the Palo verde Valley have to frequently travel to other cities to buy groceries.

Working with the Colorado River rather than against it, the design uses its thermal mass, and its steady temperature as a climate control mechanism in the harsh dry and arid climate. Water, which has twice the thermal mass of common materials such as concrete, will mediate the changing temperature in the desert. The river also plays a structural role in carrying the building and allowing it to float, which means that as the water level rises in the future, the new facility will adapt to the changes



ENERGY TRANSFER

BIOGAS FACILITY

AEROPONIC FARMING TOWERS

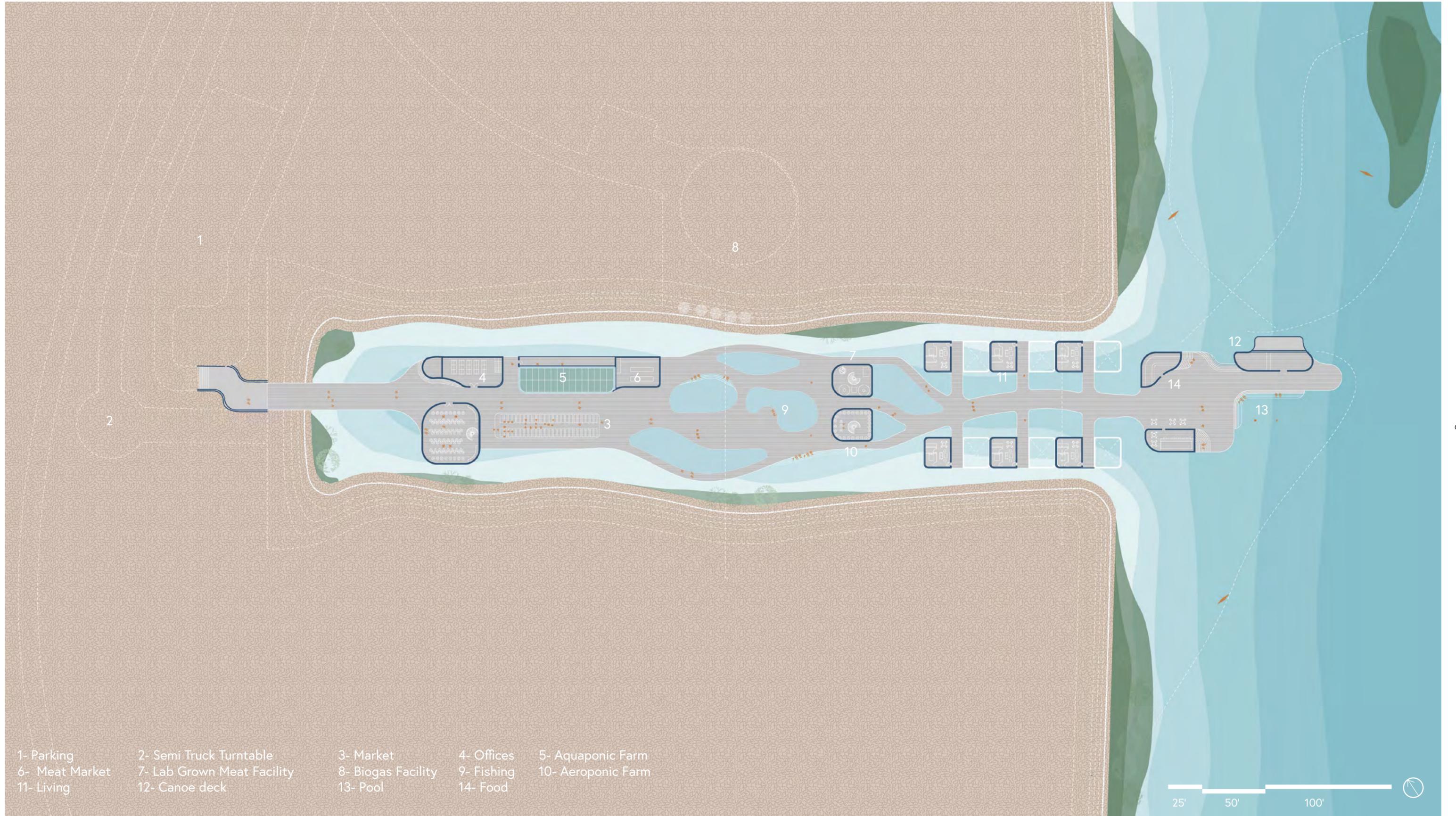
SEMI TRUCK TURNTABLE

AQUAPONIC FARMING

LAB GROWN MEAT FACILITY

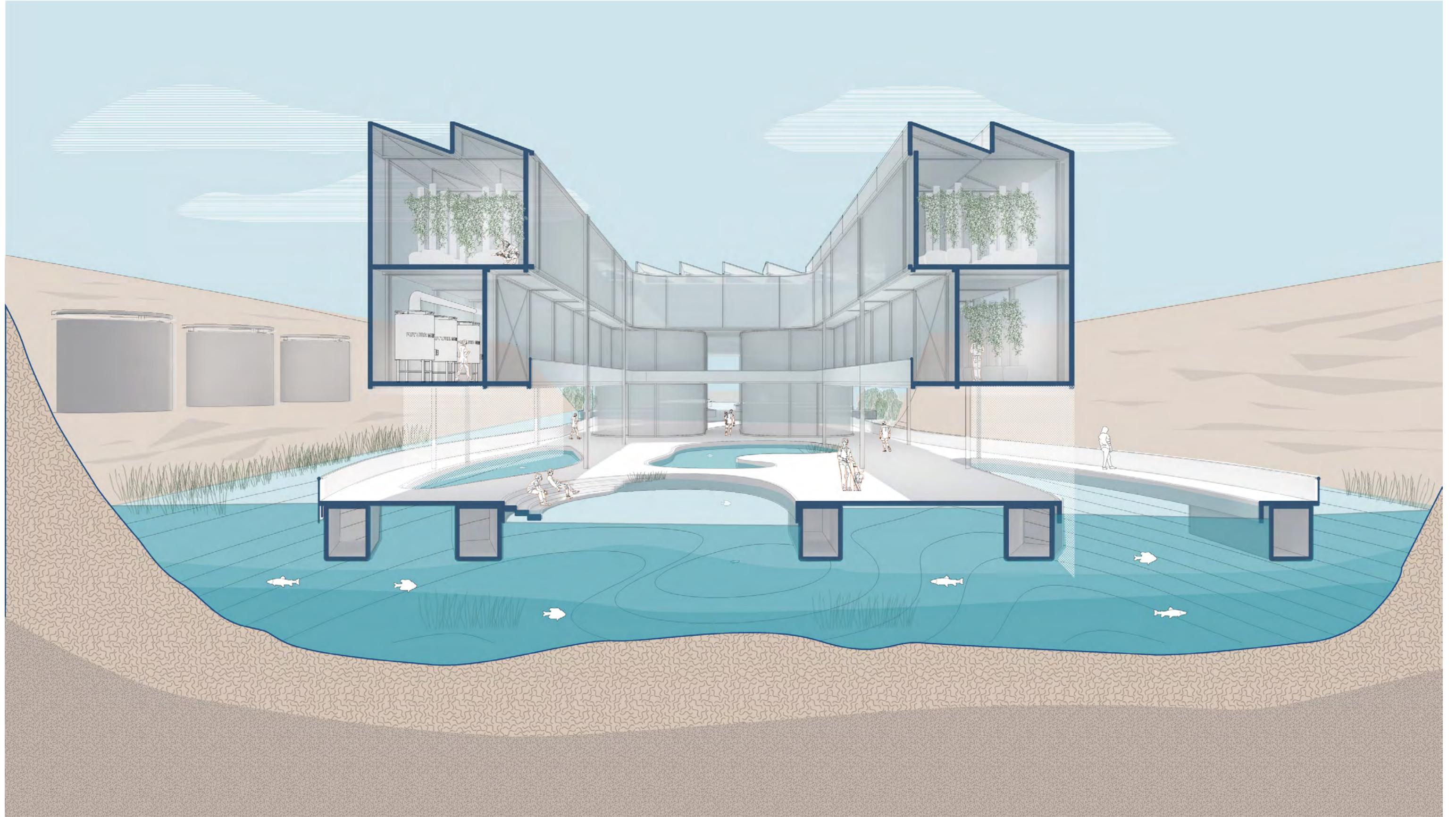
FISH NET

The Farm Post Agriculture



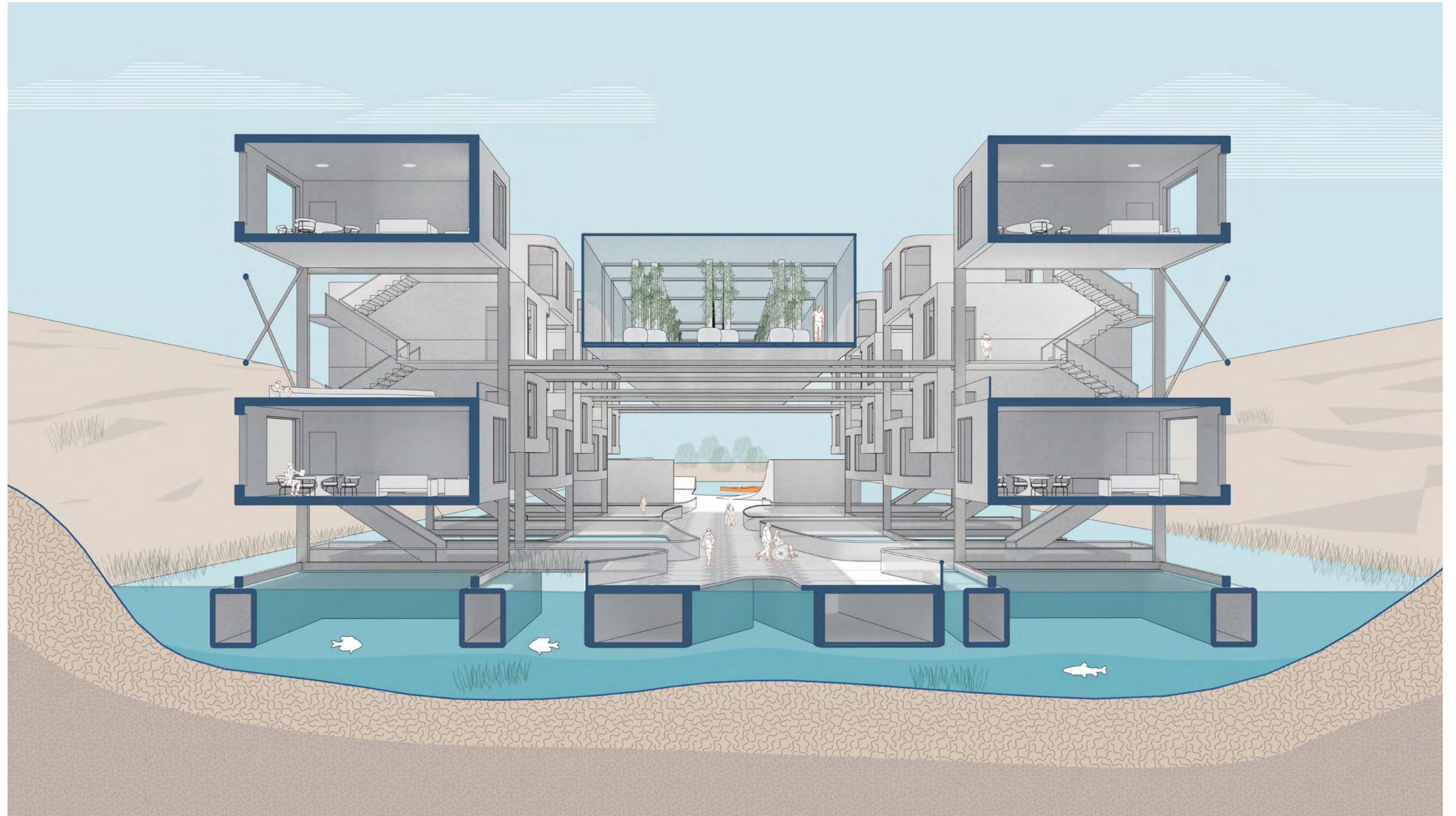
- 1- Parking
- 2- Semi Truck Turntable
- 3- Market
- 4- Offices
- 5- Aquaponic Farm
- 6- Meat Market
- 7- Lab Grown Meat Facility
- 8- Biogas Facility
- 9- Fishing
- 10- Aeroponic Farm
- 11- Living
- 12- Canoe deck
- 13- Pool
- 14- Food





Design Studio

The Farm Post Agriculture



Design Studio

The Farm Post Agriculture



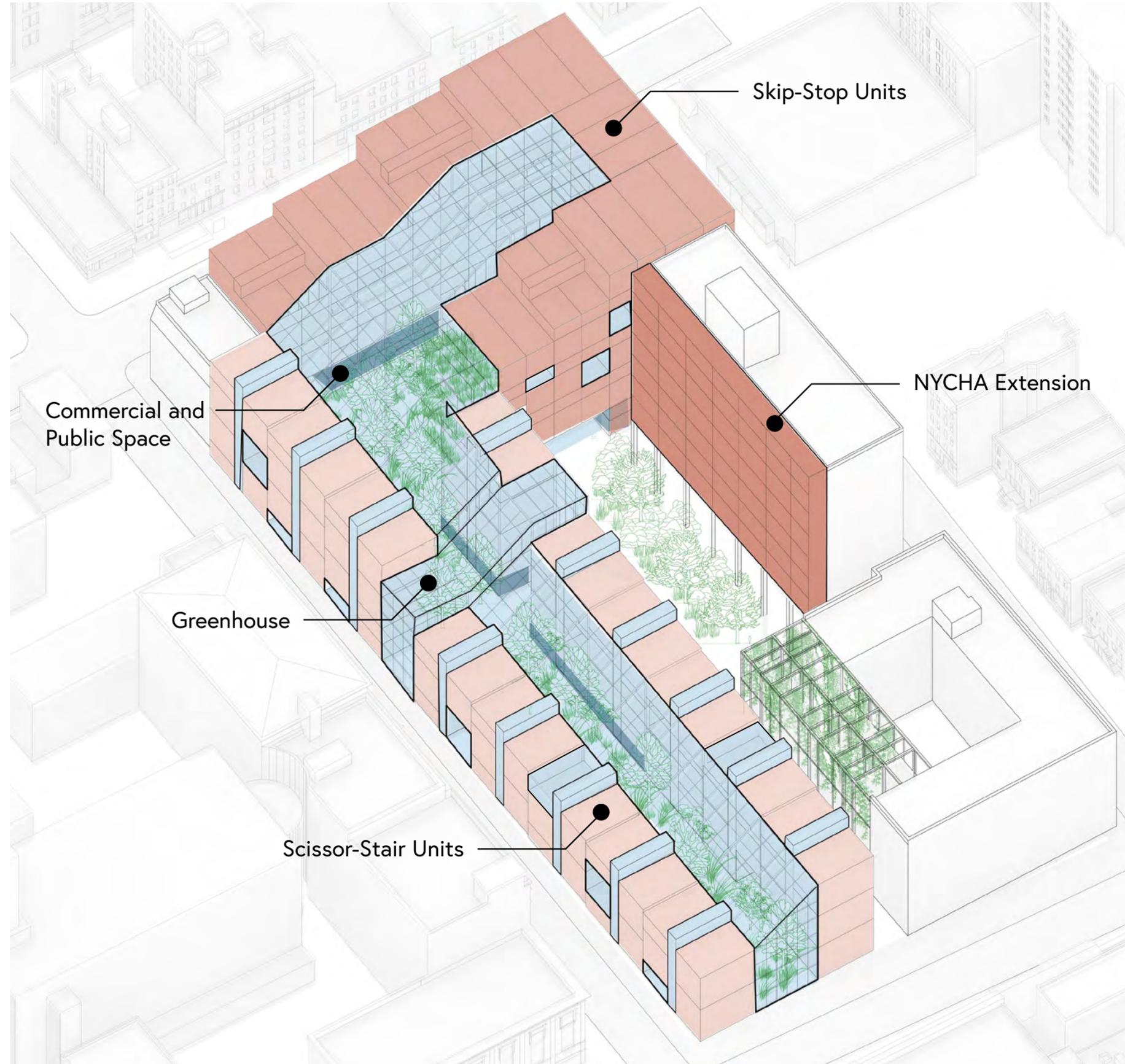
The living aspect works symbiotically with the aeroponic farming so that the units are offered peeks through the farm, which in turn creates intimate courtyards surrounded by vegetation. The project ultimately allows us to imagine how sustainable farming, biodiversity, recreation, and equitable space can coexist



THERMAL AUTONOMY

COURSE:	CORE III + FACADE DETAILING
SEQUENCE:	DESIGN STUDIO
PROFESSOR:	ERICA GOETZ
LOCATION:	BRONX, NYC
COLLABORATORS:	ALLISON SHAHIDI

A reconsideration of the limited understanding of comfort is needed. Thermal Autonomy challenges the static notion of comfort, and gives authority to the residents to control their microclimate. Our site strategy focuses on creating an environment which establishes comfort by utilizing the breezeway to respond to the climate of our site with a particular focus on sun, light, and wind. Voids and negative spaces are used as public space which, while serving both programmatic and functional purposes, also serves as the main component used to establish comfort. We are thinking about air as a tool which can be leveraged to sustainably provide comfort, providing both a means for heating when confined and natural ventilation when allowed to flow freely.



Commercial and Public Space

Skip-Stop Units

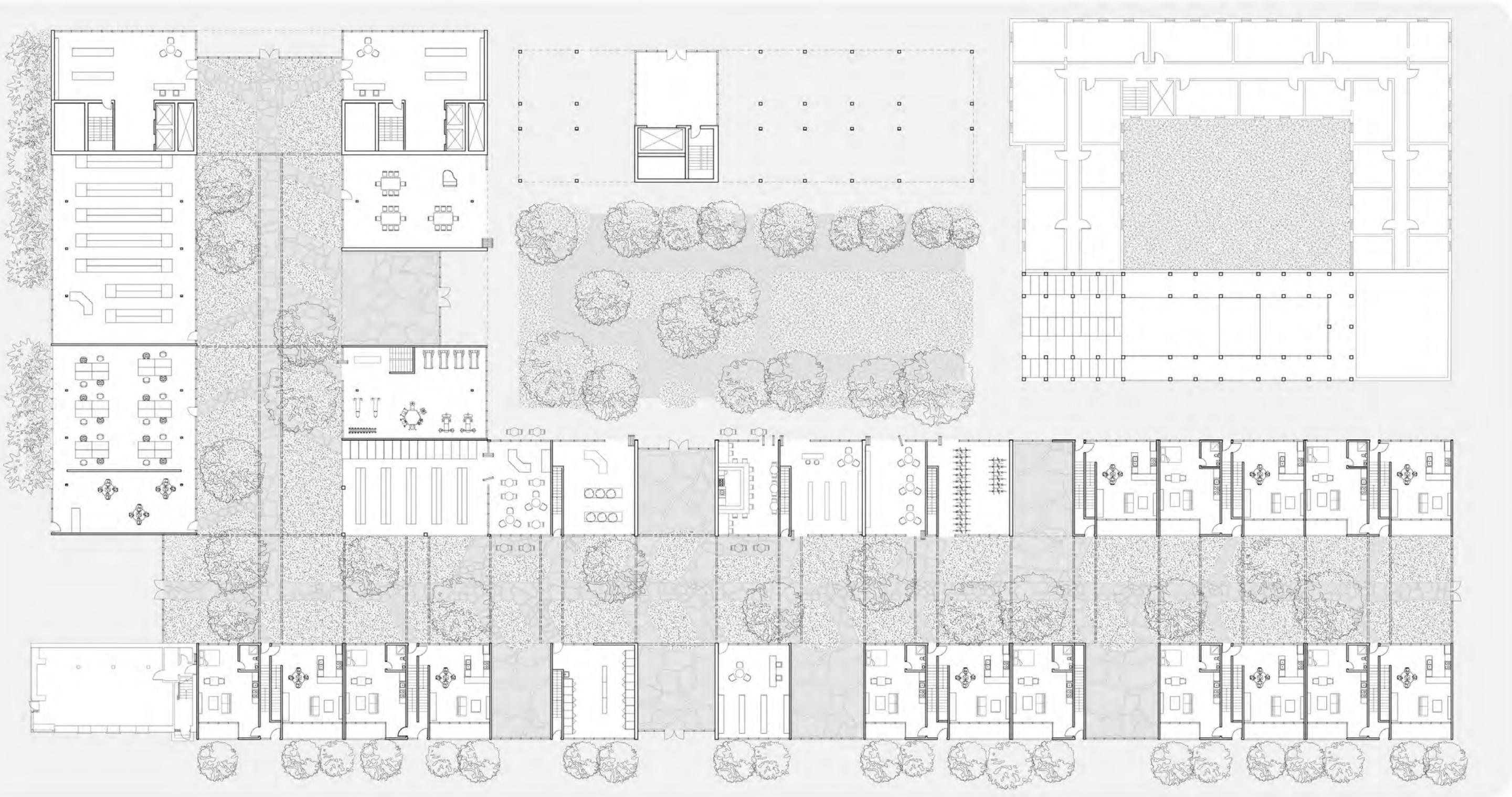
NYCHA Extension

Greenhouse

Scissor-Stair Units

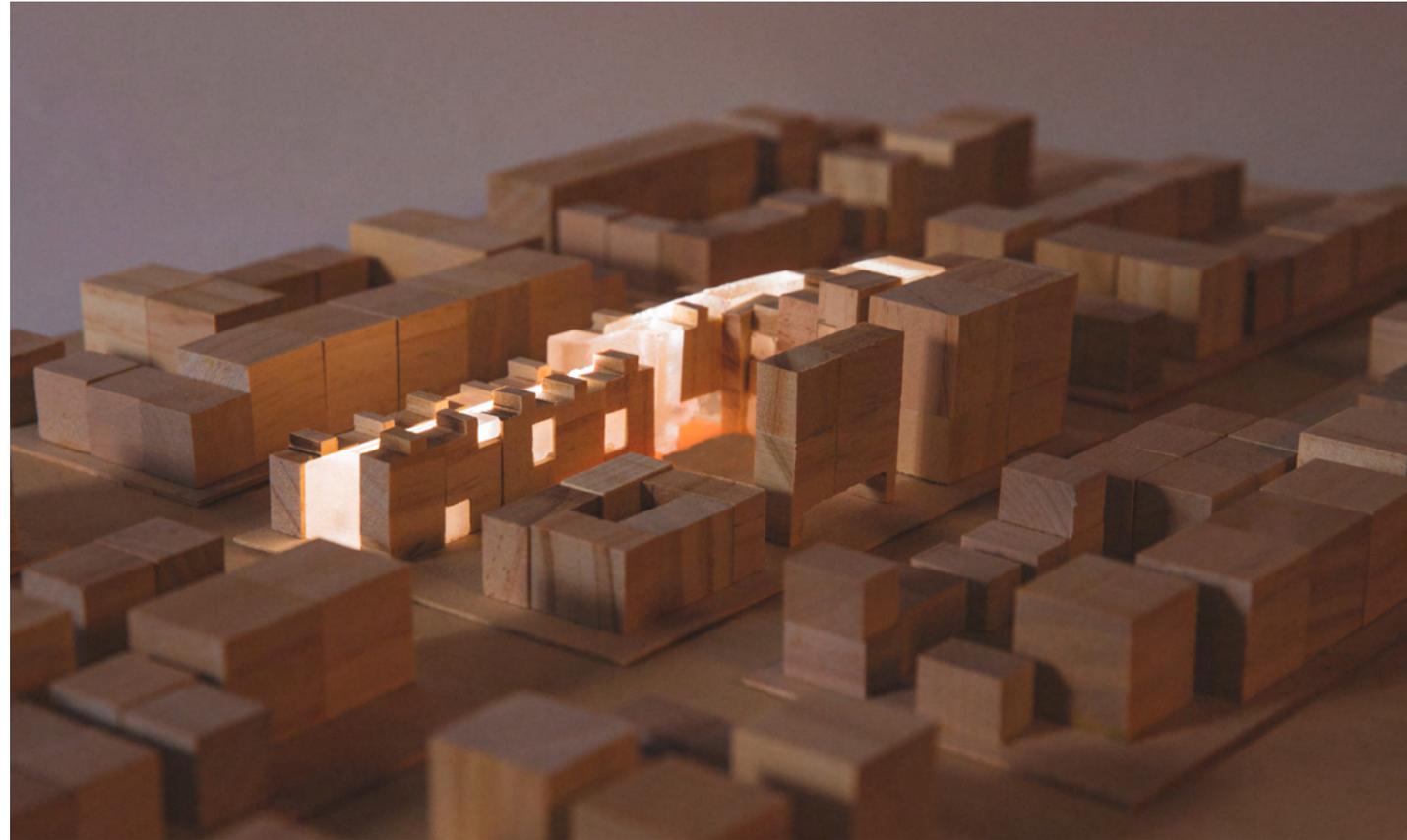
At the site scale, the breezeway serves as a public atrium which is naturally ventilated in the summer and serves to provide heat to the adjacent masses in the winter. At unit scale, careful attention to the relationship between the unit and the breezeway allows for the establishment of comfort.

Design Studio



Thermal Autonomy

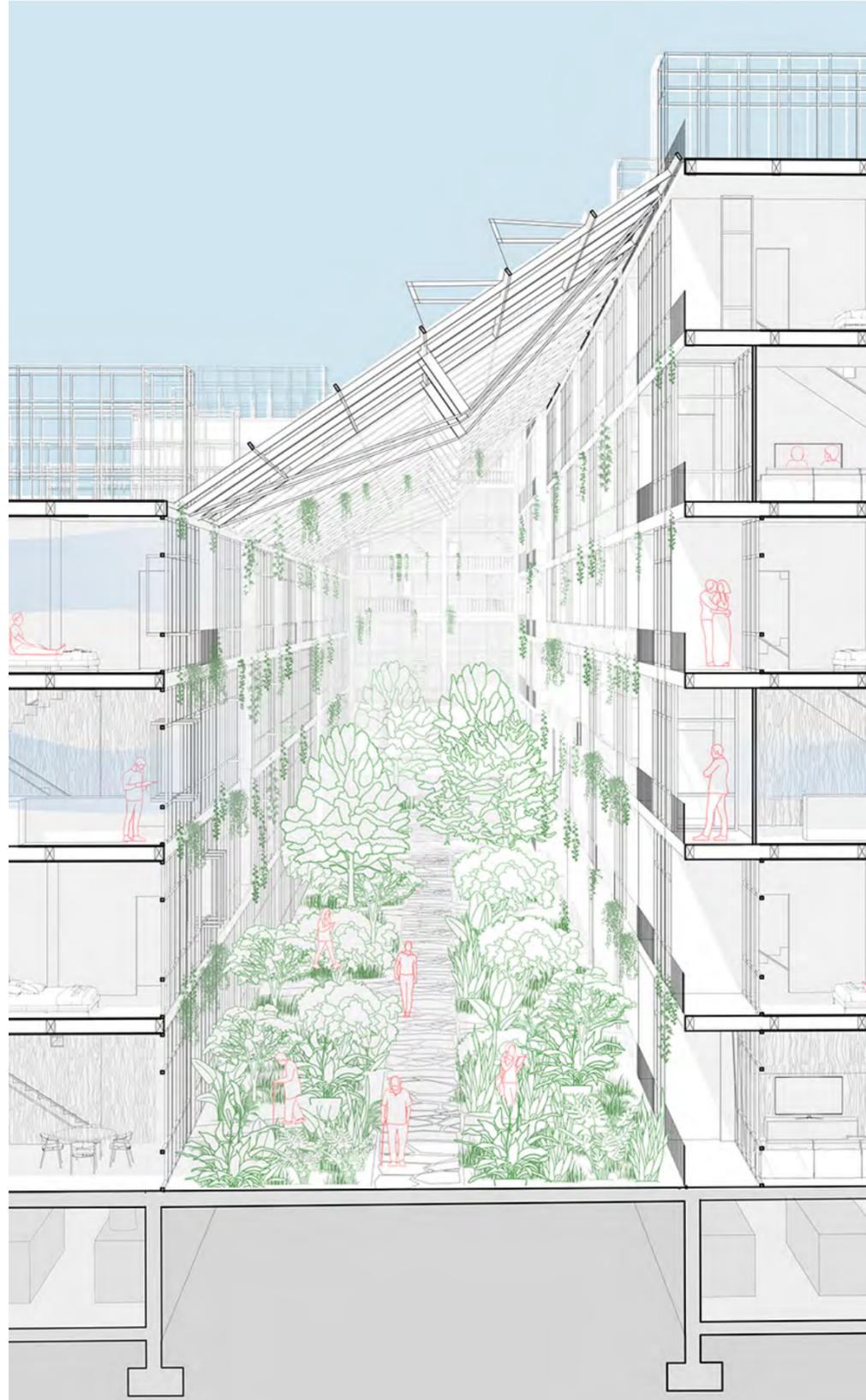




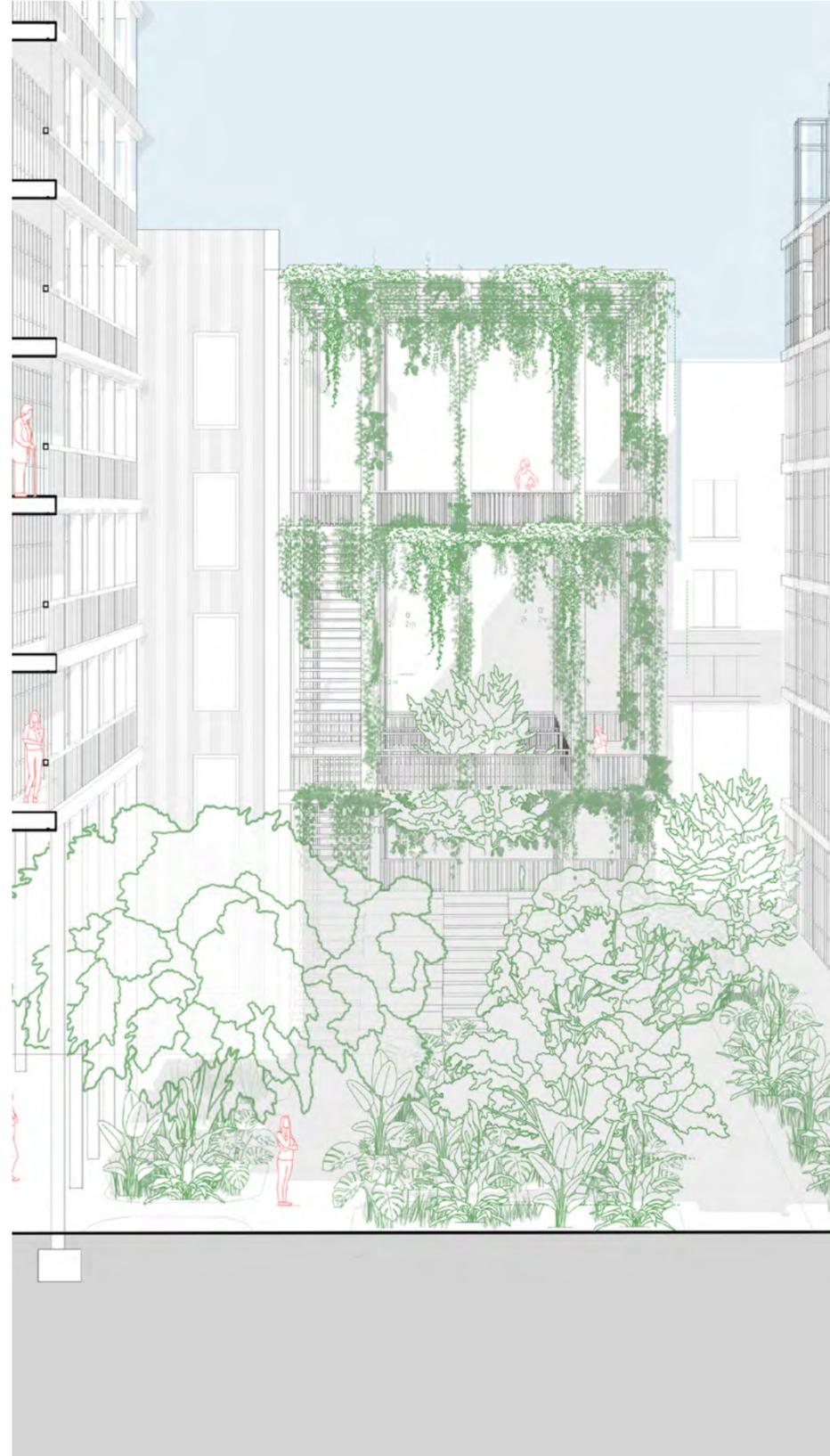
Access to exterior and atrium facing terraces as well as control of operable windows which allow for both natural lighting and cross ventilation in the scissor-stair and skip-stop units allow the resident to take control of their comfort. The atrium as a negative space that extends between the units to create small pockets of public space.

The embodied cultural and environmental energy of the site are preserved by restoring and adding to the existing structures. The careful additions to the existing buildings carry the same design strategies and language that is used in the new buildings, and these strategies are also incorporated at an urban scale to create a new park. The project aims to provide residents with a holistic meaning of sustainability.

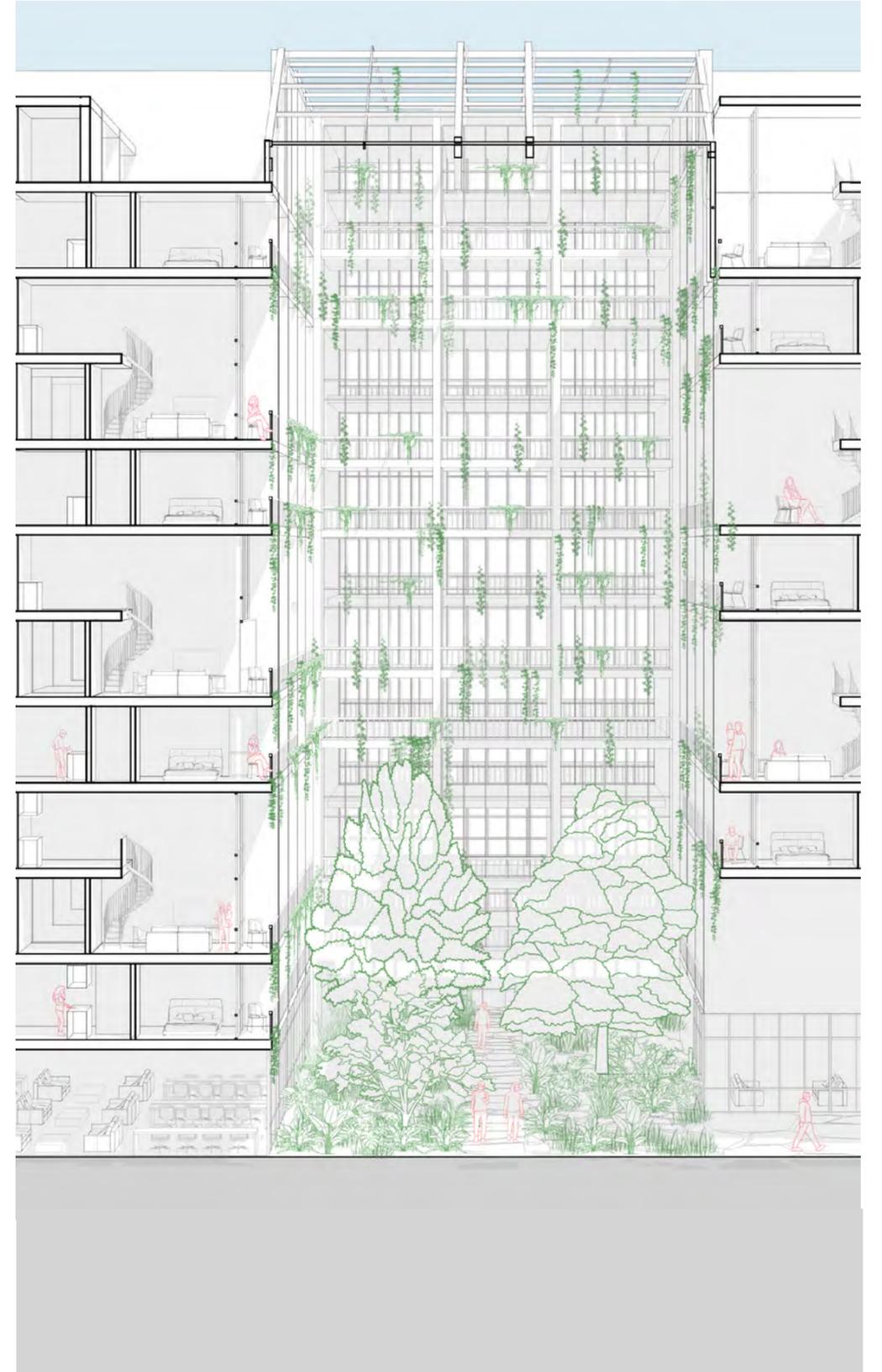
SCISSORS STAIRS TYPE: 80 UNITS



NYCHA EXTENSION: 120 UNITS



SKIP STOP TYPE: 130 UNITS





[CLICK HERE TO WATCH](#)

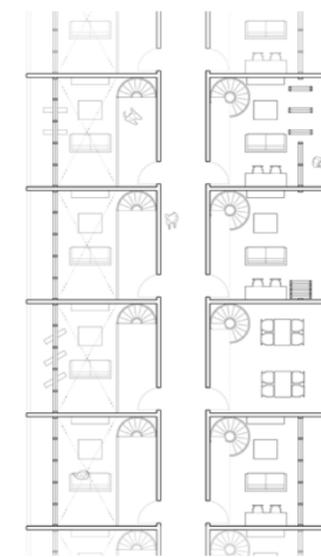


Design Studio

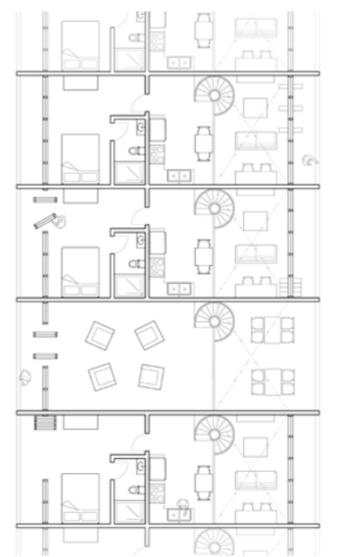
Thermal Autonomy



Type: Skip stop



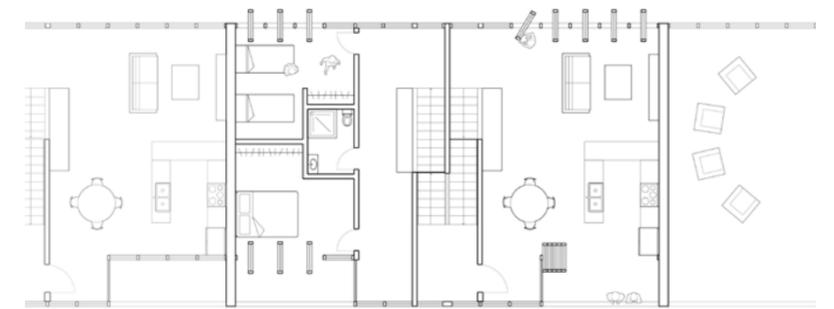
Third Floor



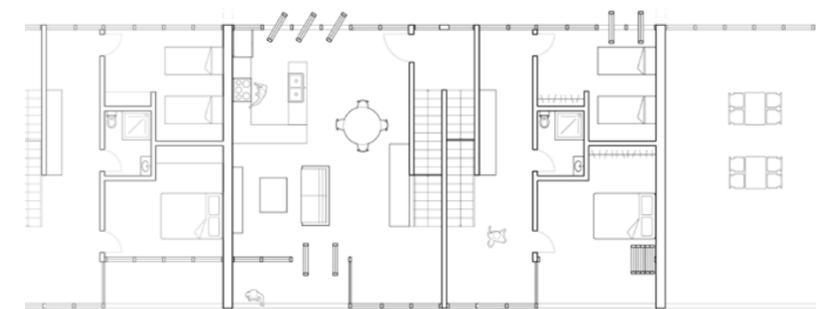
Fourth Floor



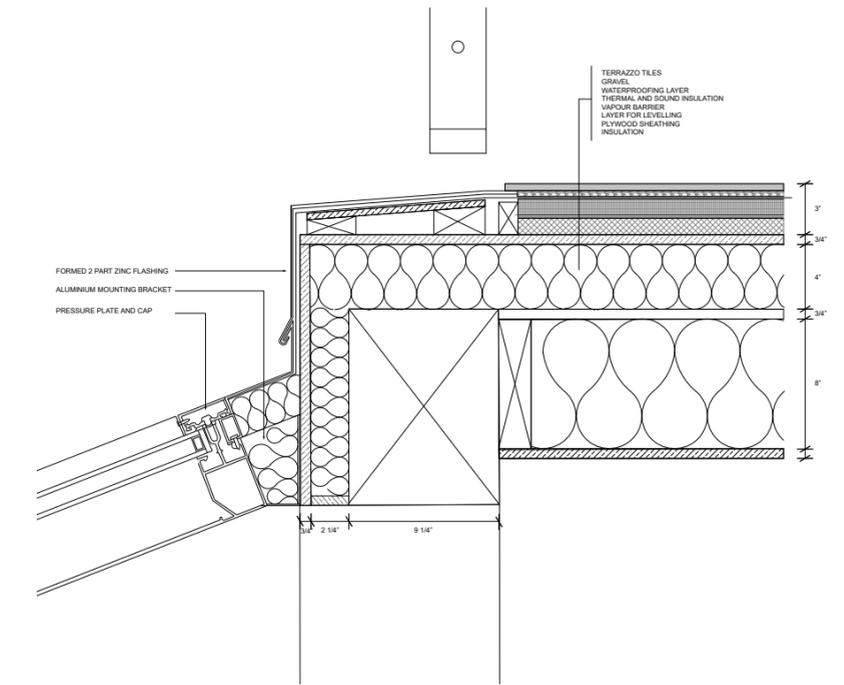
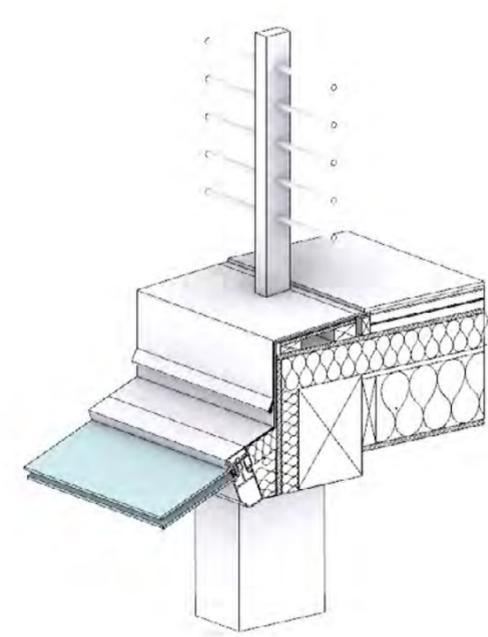
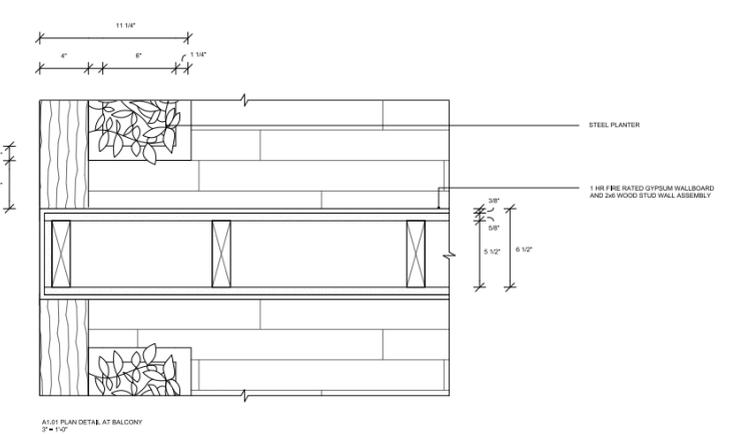
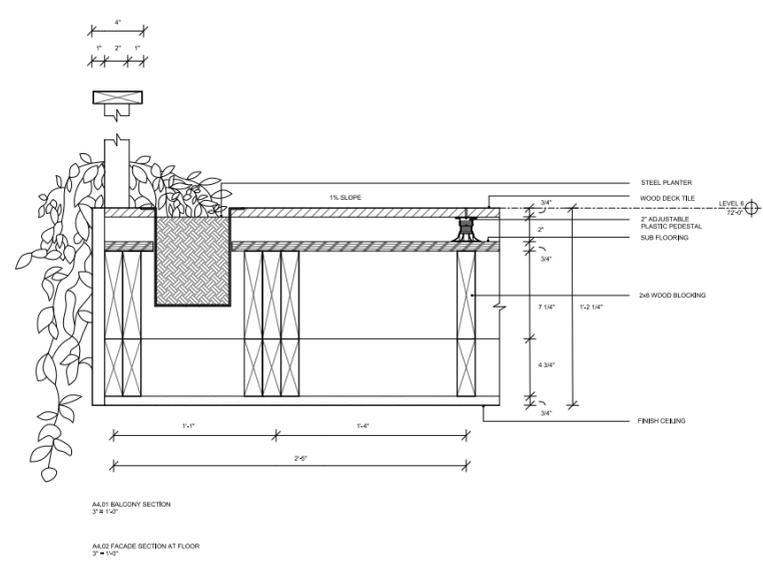
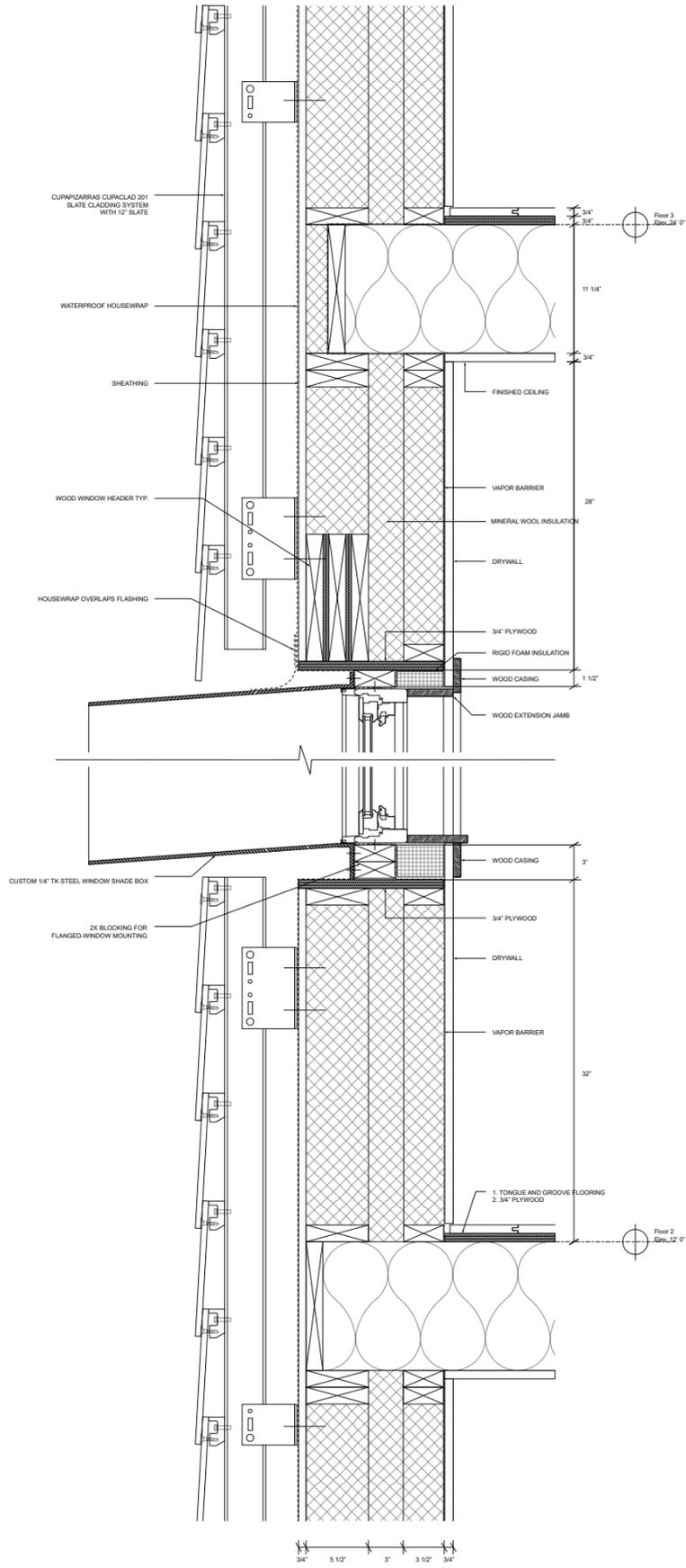
Type: Scissors Stairs



Third Floor



Second Floor

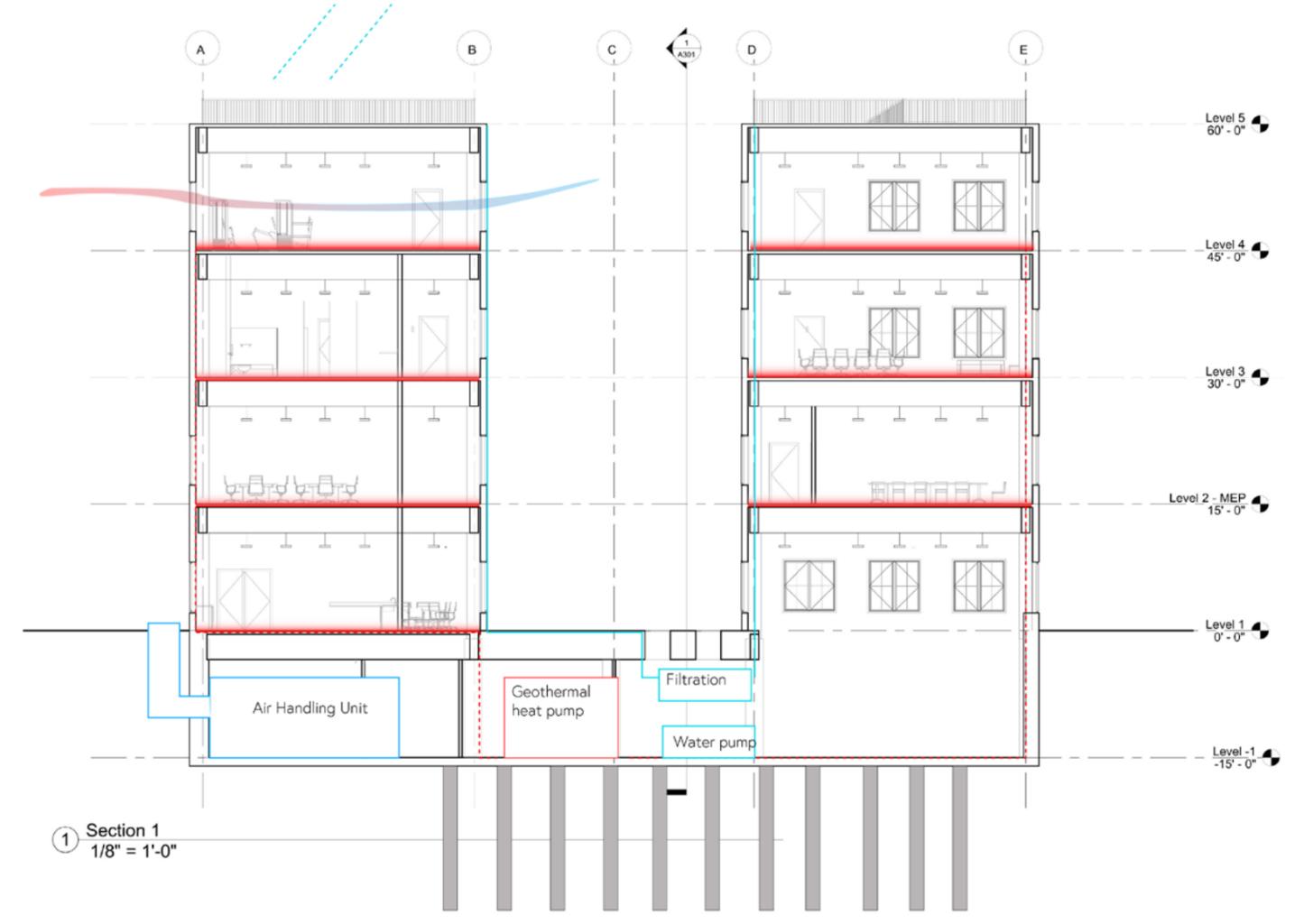
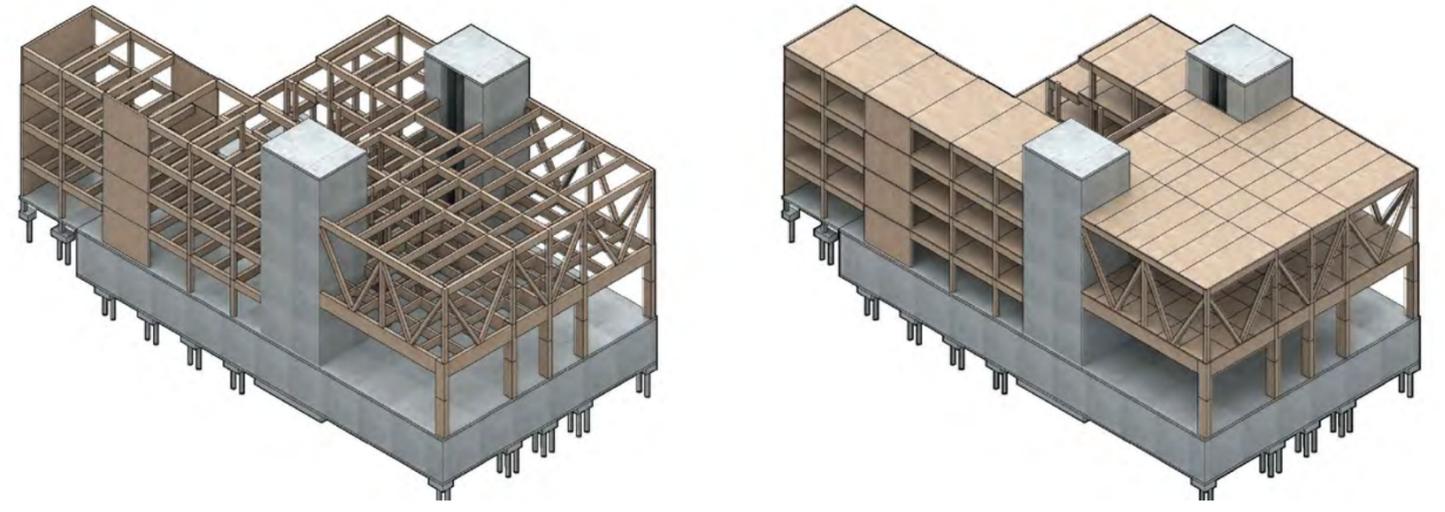
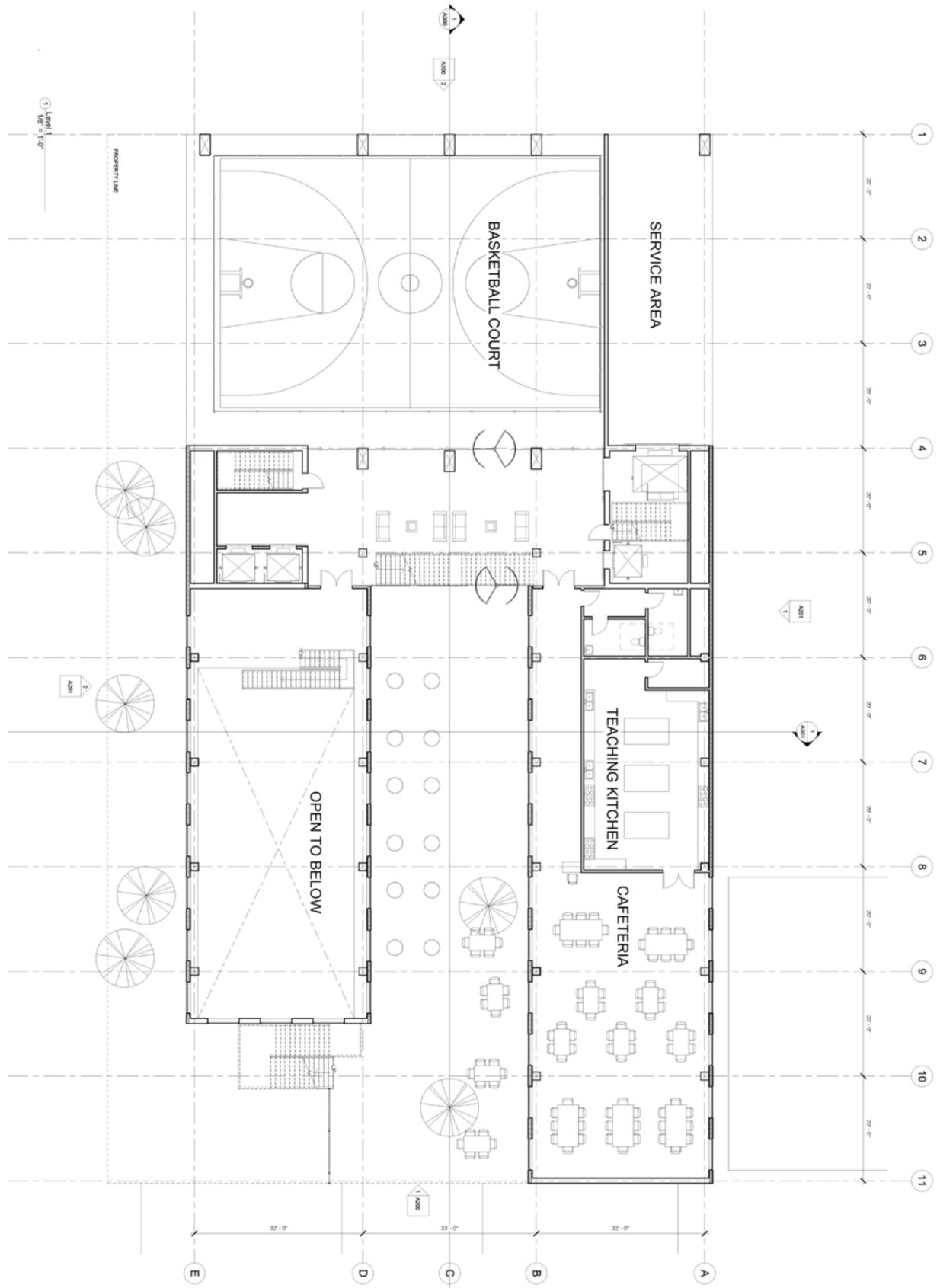


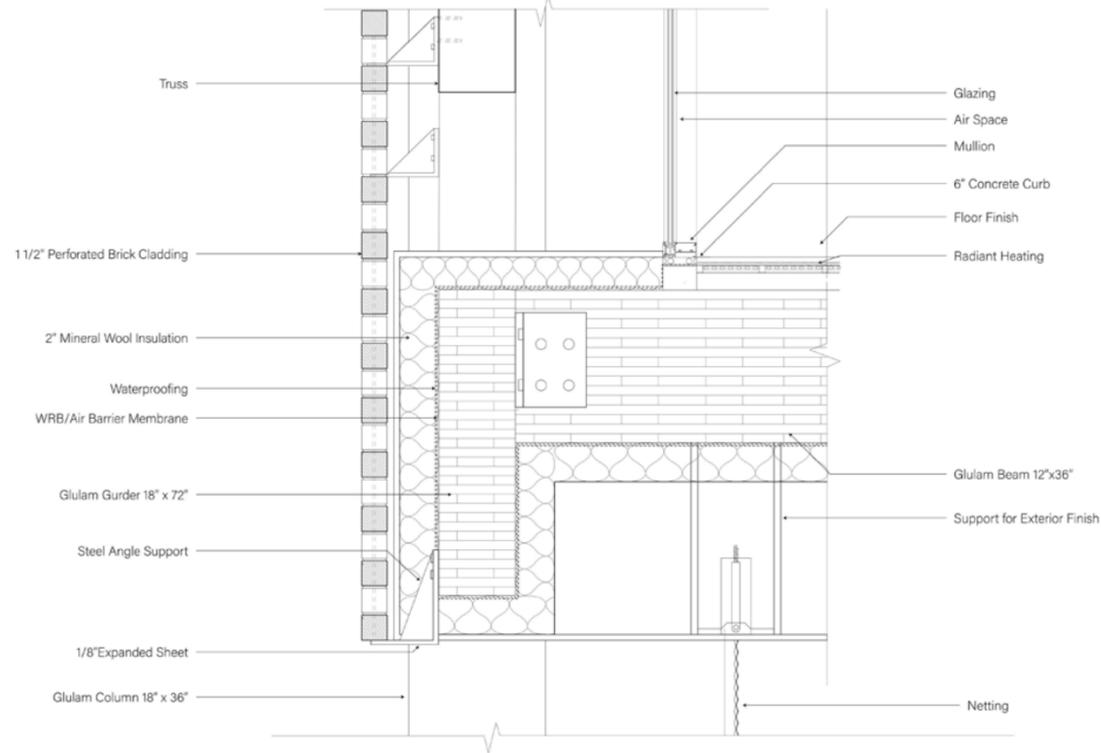


OPEN BRONX

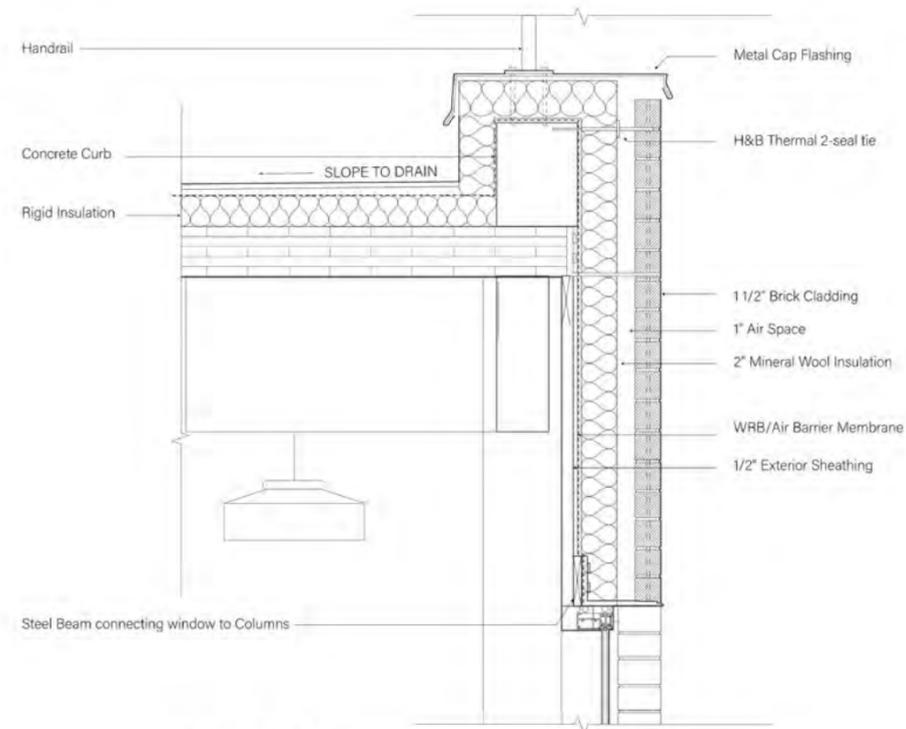
COURSE:	TECH III + IV
SEQUENCE:	BUILDING TECHNOLOGIES
PROFESSORS:	STEPHEN POTTS, AARON CABELL BERRARDO MATALUCCI, TEEL RIGGS
LOCATION:	BRONX, NYC
PARTNERS:	AYA ABDALLA, NAYEF ALSABHAN, YONGYOEB KIM

Openness was the key driver to the Open Bronx Community Center in Melrose. By lifting and moving masses that are adjacent to the street, the community center invites the neighbourhood into the Center to participate in all of its programs. The South wing is terraced to allow light enter and illuminate the courtyard as well as the North wing. Their thin form, and their connection to the atrium allows natural ventilation during the summer, as well as solar heat gain during the winter. Furthermore, bringing aspects of the program to the outside, such as the ground floor basketball court, not only creates a direct relationship between the Center and the street, but also reduces the building's reliance on mechanical climate control.

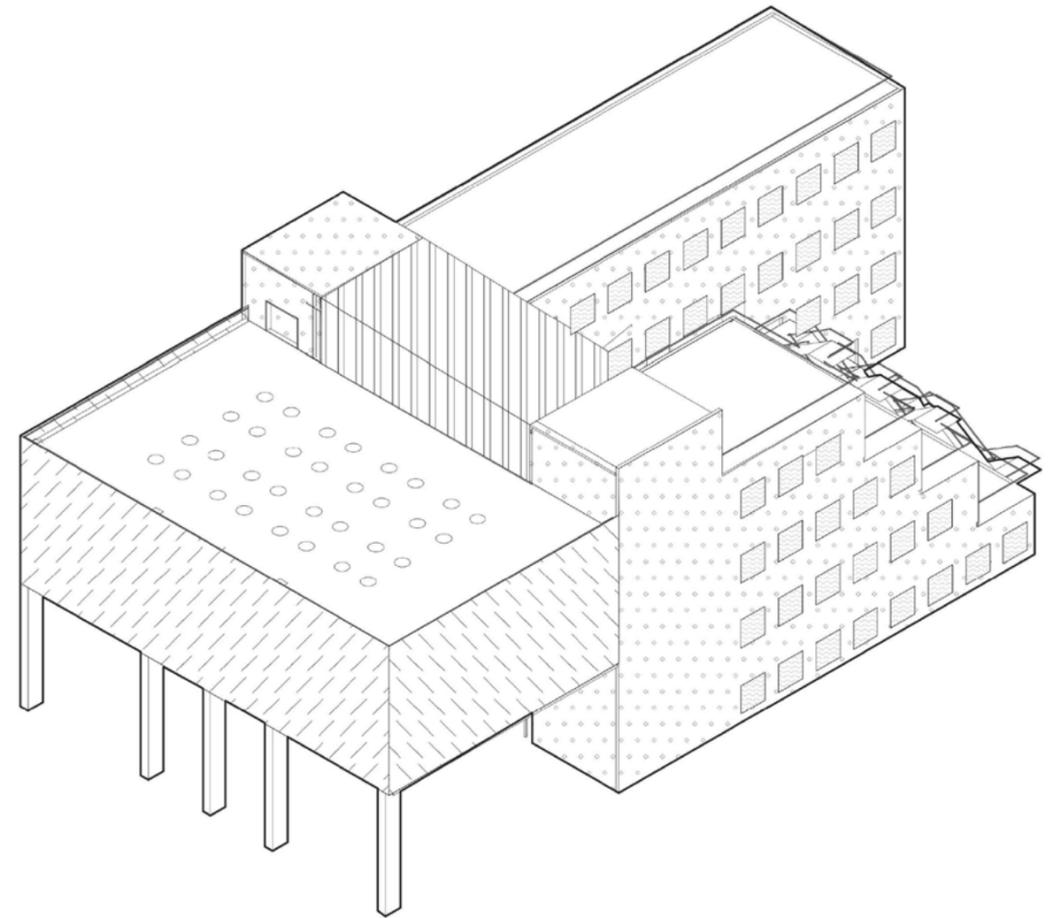




1 Detail Section
1" = 1'-0"



3 Section Detail
1.5" = 1'-0"



1 Section 1
1/8" = 1'-0"

- WT - 01
Brick Cladding
- WT - 02
Perforated Brick Screen
- WT - 03
Aluminum curtain wall IGU System. Vertical and Horizontal mullions attached to WT-01
- WT - 04
Punched Windows

MATERIAL SCHEDULE

MATERIAL	DESCRIPTION	LOCATION
MT - 01	Peterson Kolumba K21	WT - 01
MT - 02	Peterson Kolumba K21	WT - 02 Int. Basketball Court
MT - 03	Aluminium	WT - 03 Curtain Wall Atrium

GLAZING SCHEDULE

MATERIAL	DESCRIPTION	LOCATION
GL - 01	IGU	WT - 01 Punched Window on Brick Cladding Facade
GL - 02	IGU	WT - 03 Central Atrium Space

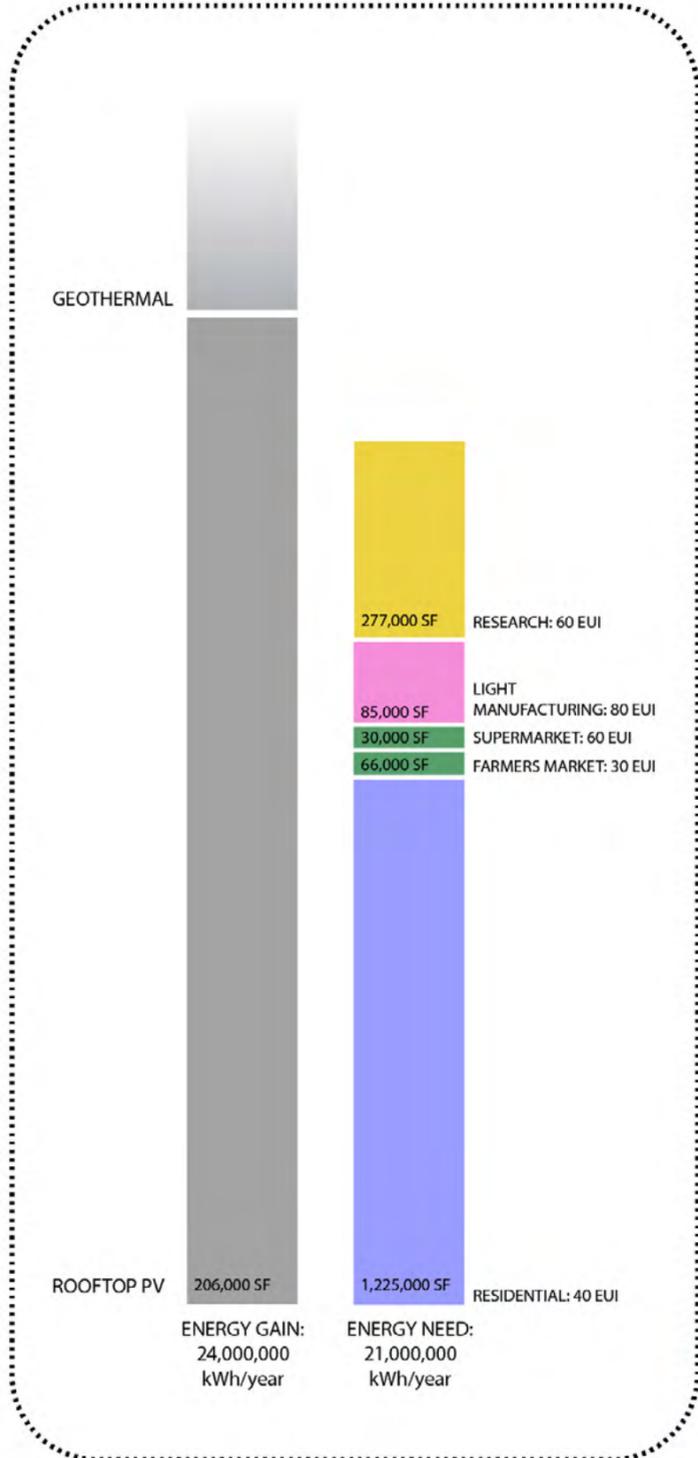


RE-WILDING GREENPOINT

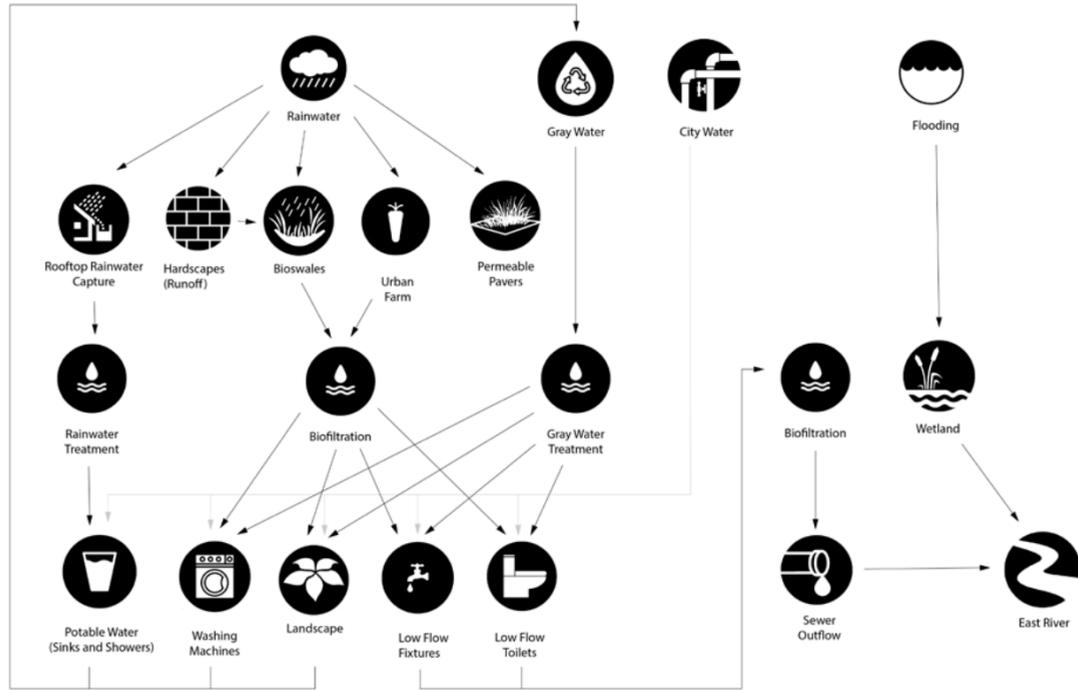
COURSE: TECH V
SEQUENCE: BUILDING TECHNOLOGIES
PROFESSORS: SCOTT DEMEL, AARON CAMBELL
BERRARDO MATALUCCI, TEEL RIGGS
LOCATION: BROOKLYN, NYC
COLLABORATORS: ALLISON SHAHIDI, NAYEF ALSABHAN, RYAN HANSEN

Rewilding Greenpoint attempts to reintroduce nature and allow it to become the forefront to Greenpoint's inlet park. On masterplan level, the sensitive intervention integrates the existing community and works with the existing program to build on it and adaptively re-use some buildings. Two new structures were added, a mixed use building that includes residential units, and a farmer's market. The farmer's market is supplied by the terraced farms on the building. The other new structure is a water research facility. Both of these buildings contribute to the system's overall efficiency by creating a net zero water, and energy system.

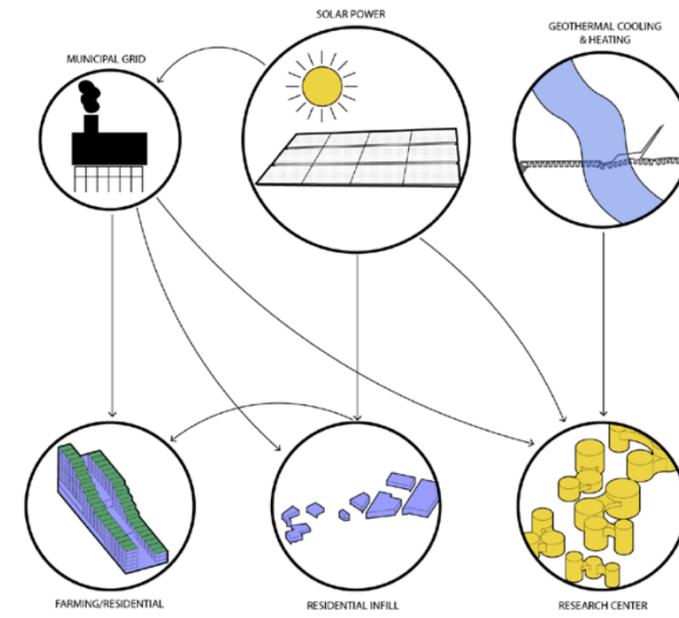
The park is designed to flood and act as a detention basin to accommodate the rising sea levels and the risk that it poses on the area. Furthermore, the masterplan redesigns the mobility of the area by creating 3 green axes that prioritize shared mobility.



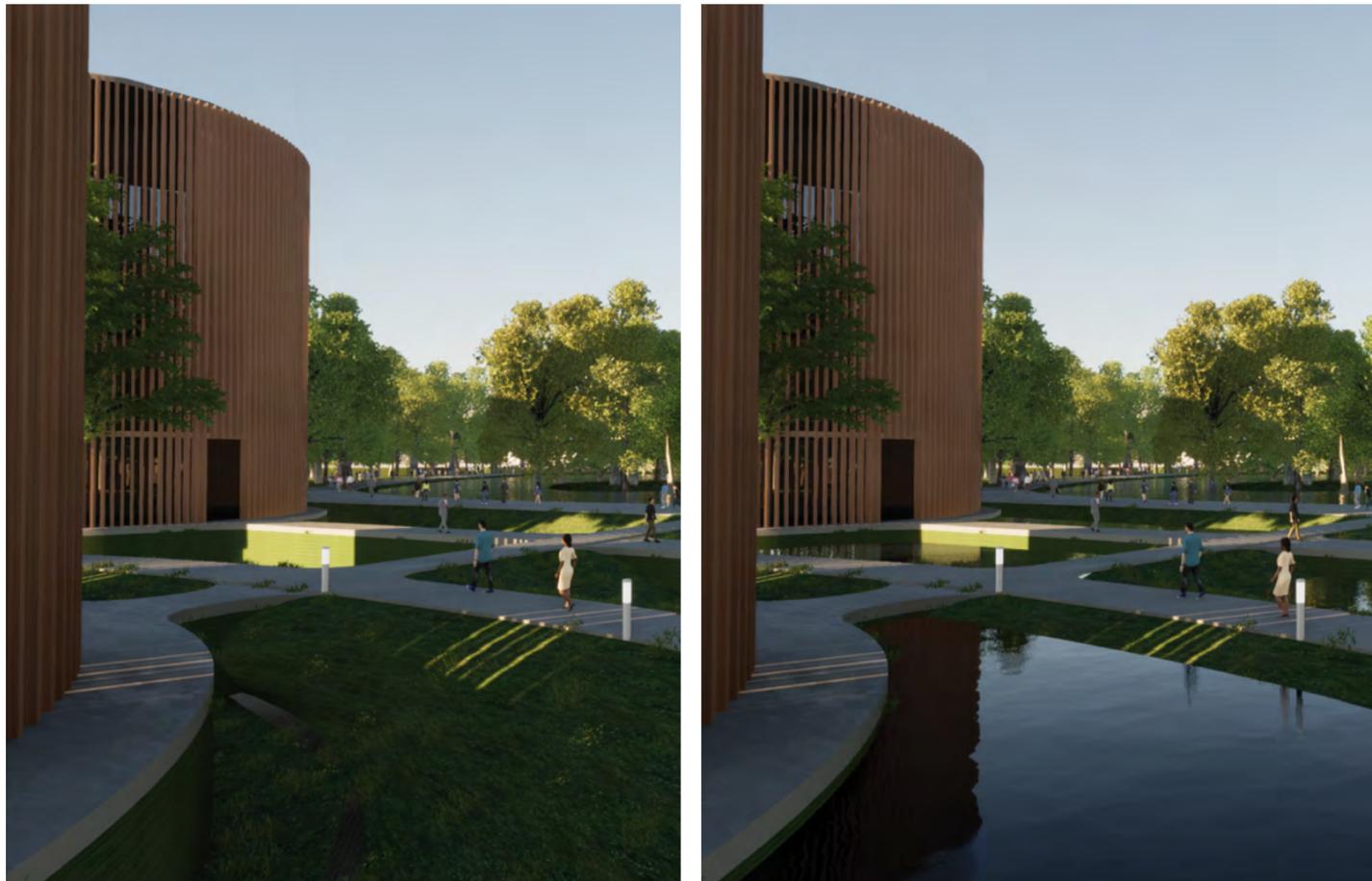
Water Site Strategy



ENERGY SOURCES



Building Technologies



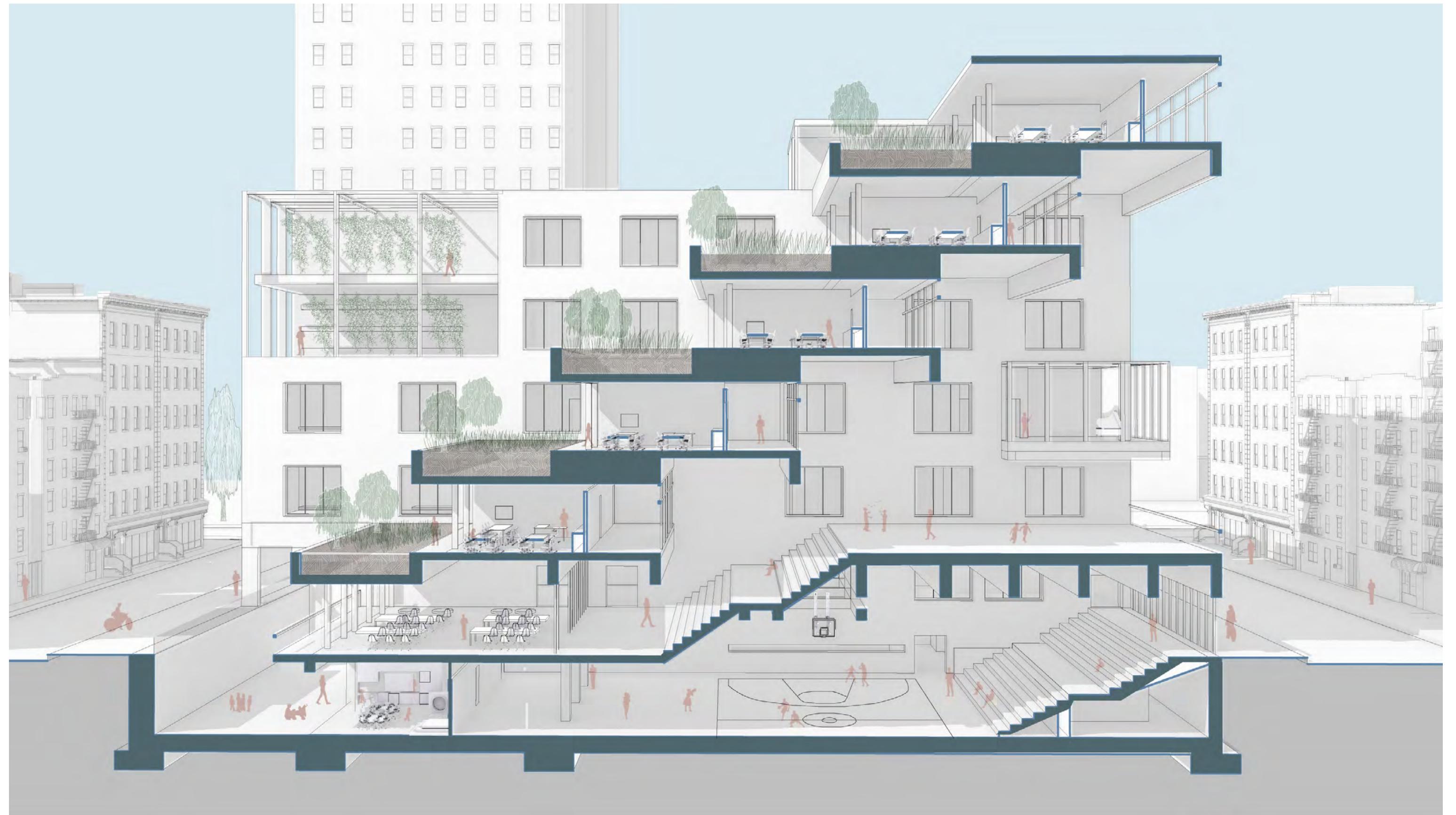
Re-wilding Greenpoint



P.S 64 THE FARMING SCHOOL

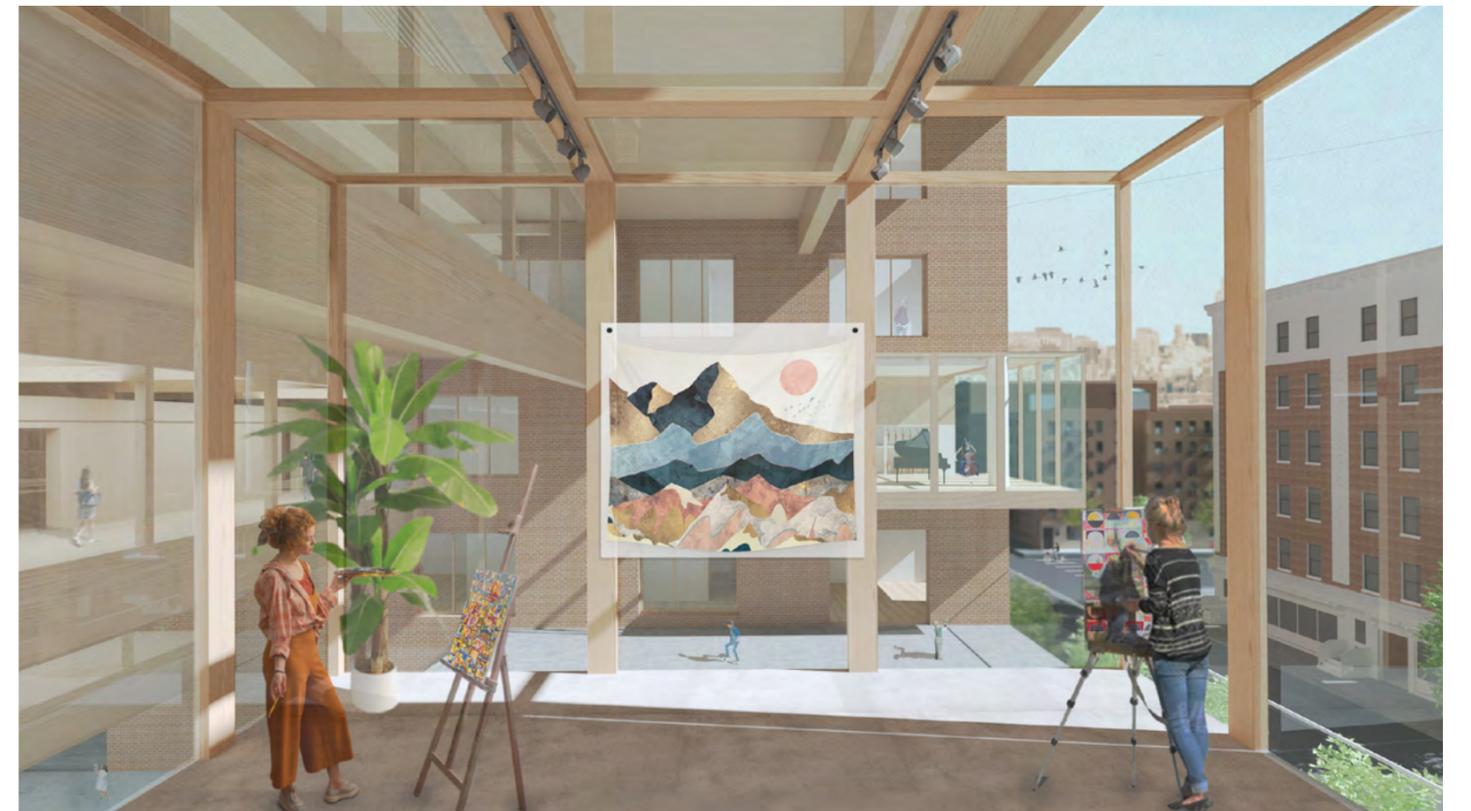
COURSE:	CORE II
SEQUENCE:	DESIGN STUDIO
PROFESSOR:	GORDON KIPPING
LOCATION:	MANHATTAN, NYC

The Farming School passively responds to the climate to create a relationship between farming and pedagogy. The classes are laid as staired terraces where the rooftop of each class is used for planting creating a non hierarchical urban farm that impacts both the environmental, and social aspects of the neighbourhood. The trays which act as both the facade and roof open to the air and filled with vegetation, the low embodied carbon school reduces the temperature of the microclimate of the neighbourhood and reduces the urban heat island effect while reviving the urban farming citizen activism of the East Village.



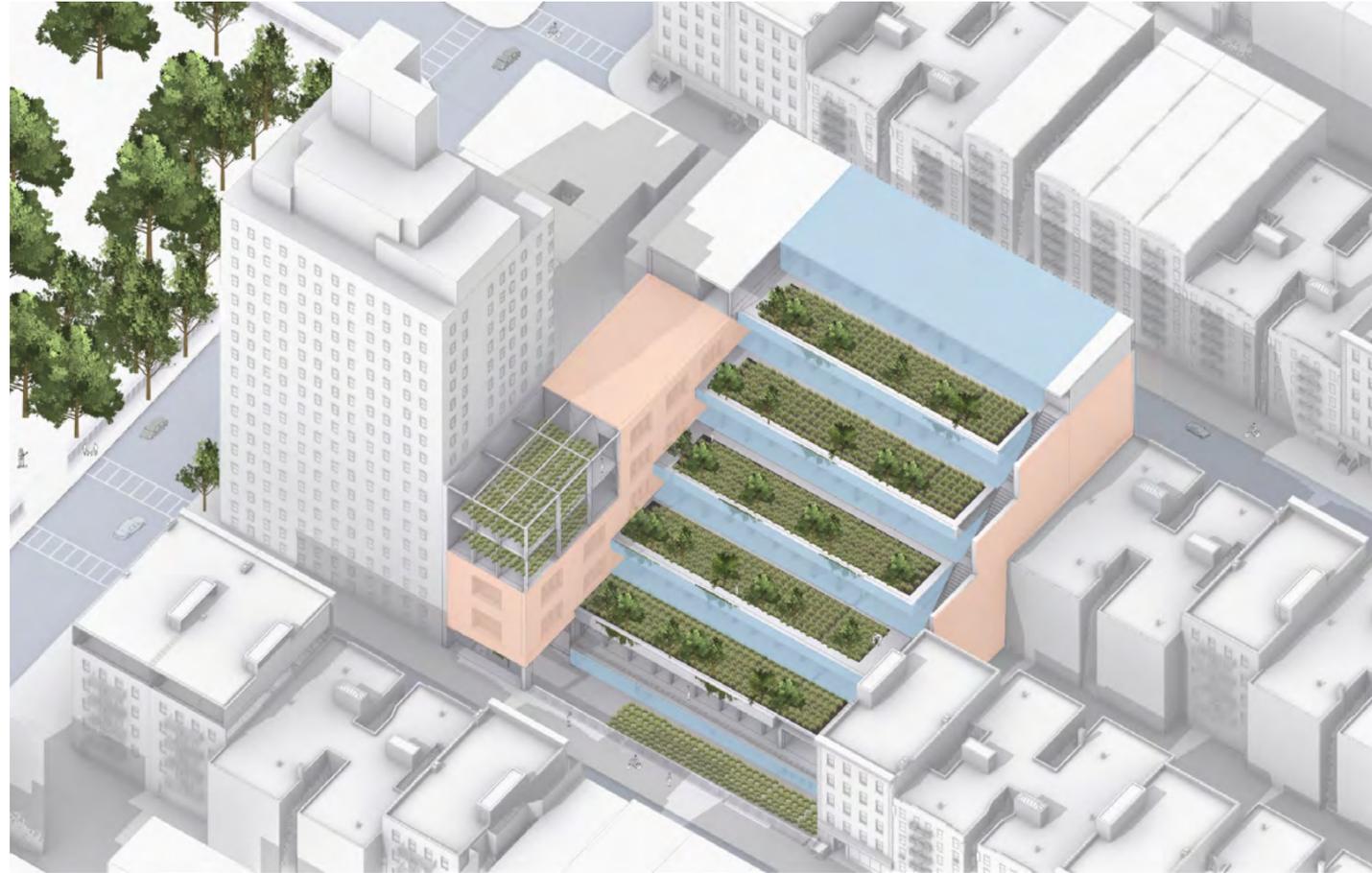
Design Studio

The Farming School

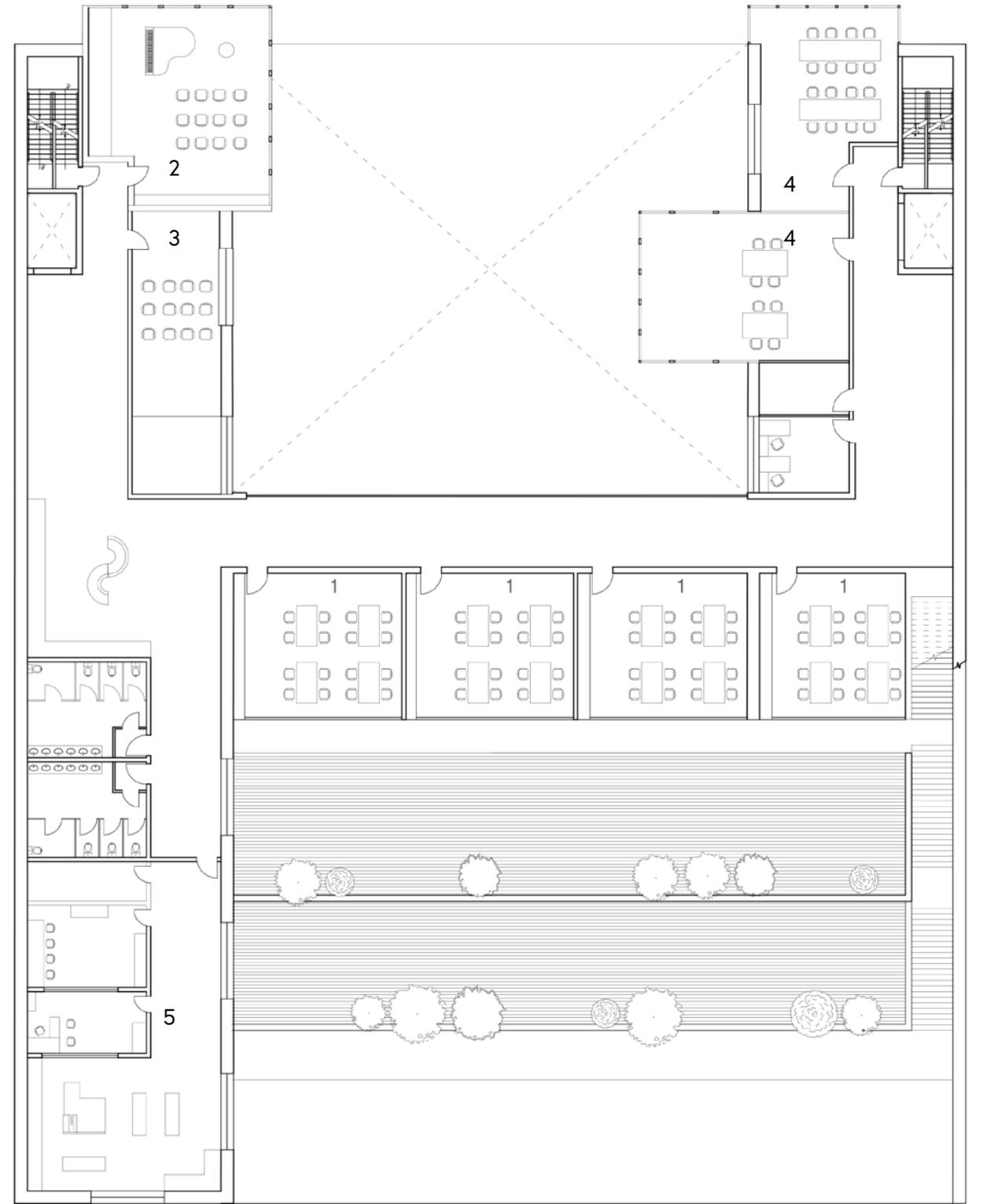


Design Studio

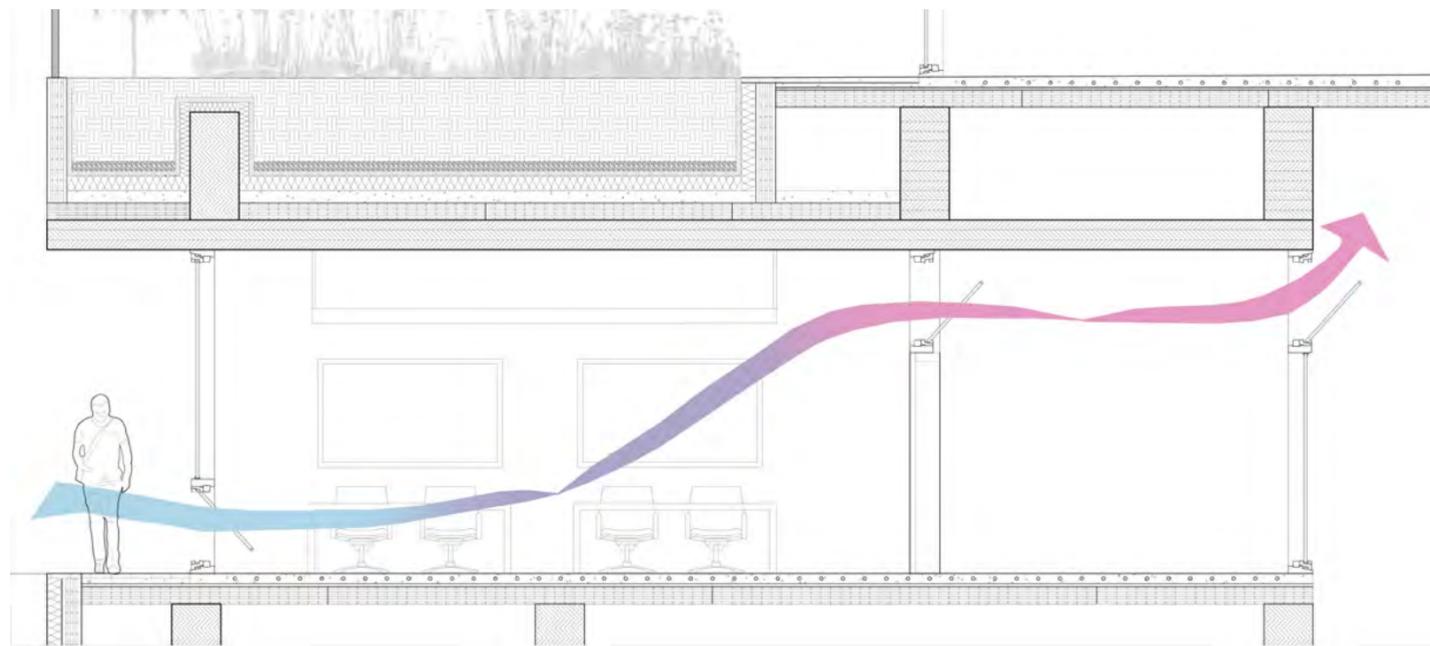
The Farming School



3rd Floor



1- Classrooms 2- Music Room 3- Drama Room 4- Visual Arts Studio 5- Fabrication Lab



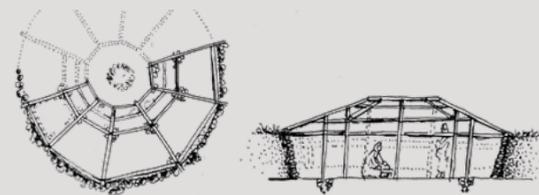
COURSE: MODERNISM AND THE VERNACULAR
 SEQUENCE: HISTORY/THEORY
 PROFESSOR: MARY MCLEOD

THE TRANSFORMATION OF THE COURTYARD IN MODERN DAY AMMAN

Abridged version

As early as 10,000 BCE people in Mallaha - which is now part of modern day Jordan - used whatever materials they had to build their homes. The dwellers used wood, stone, and animal skins to create circular forms embedded in the ground with an opening at the center of their dwelling. This is the earliest documented courtyard not only in Mesopotamia, but possibly the world. Later in 9600 BC, rectilinear forms were built from mud on stone foundations in Jericho, Palestine. These rectilinear forms were clustered around an open space in which people would gather. Since then, from Roman, to Greek, Persian to Islamic, the courtyard as a spatial organization has existed in the Middle East regardless of the reigning empire. This paper aims to demystify the courtyard as a spatial typology and attempts to understand the forces that helped shape it, and allowed it to live to this present day.

The Middle East since the earliest times, but especially in the last century, has been a ground where local and imported ideologies were meeting and resulting in both a clash, and oftentimes, harmony. In response to the imported ideologies, some architects have relegated our architecture to alibaba-esque and orientalist images of our region and possibly self-orientalized the region. Others, both foreign and local, simply wanted to orientalise it. It is important to understand then that architecture in the Middle East used both local and imported architecture to come up with innovative solutions. The exchange of cultures was also evident in Islamic architecture, however, nowadays, some architects reduce elements of Islamic architecture and use it in a pastiche and superficial manner. The harmony and exchange of cultures that existed set out to produce architecture that would improve the wellbeing of people, rather than the false notion of clash of civilizations and ideologies of East vs West which is evident today.



Early Amman

While some of the earliest human-built habitats from the Neolithic period were built in Amman, Jordan, the paper will focus on the evolution of the courtyard of Amman as a modern city, which had its first permanent inhabitants in the 19th century. The Circassians

who emigrated to Amman in the late 19th century were considered the only permanent inhabitants then, since the bedouins were a transient population and moved continuously. They settled in Amman among its many ruins that belonged to the Roman Empire. There, the Circassians dismantled classical ruins and used the stones to build huts that had simple orthogonal forms. The early Circassian houses were built out of mud brick, claimed stone, and wood beams that had to be of a considerable size to accommodate the load of the roof. However, finding these wood beams and columns was not easy given the arid climate of Amman. Towards the early years of the 20th century another permanent housing typology appeared. The Arab Rural house which was built mostly by Palestinian farmers had one large space that accommodated all of the programs of the house. It was built by the residents themselves who were often skilled masons. The house structurally worked by a series of vaults that spanned parallel to each other, and as a family's income rose, they extended their house by adding rooms which resulted in a courtyard.

The courtyard does provide privacy which was important to all of the cultures that existed in the Middle East, but also, it is a multilayered spatial typology and showcases endless structural and artistic innovations that are integral to the archetype of the medina. While still in its infancy in Amman, the courtyard and the medina were already on their decline in other established cities in the Middle East such as Damascus, Cairo and Baghdad. "The courtyard as an inner geometric spatial ecosystem structured neighborhoods of the medina by assembling its individual houses around organic dead end alleys where facades are blind in order to retain privacy and optimize thermal comfort within a compact and hierarchical urban fabric." The courtyard and its extensions helped generate an urban system that grew relatively informally according to the needs of its inhabitants. The typology was working for its residents across different geographical locations and programmatic needs with very minimal urban planning. "The building was thus a microcosm within the macrocosm of the intricate fabric of the medina."

As these houses began to increase in number, the British mandate felt they needed to impose their authority and introduced some of the earliest planning and regulations implemented in Amman to establish order. The Britians imposed an arbitrary use of Islamic motifs and were inspired by regional references such as the Cinili Kosk in Istanbul. Circassians and Palestinians who were now living in Amman started to ornament their houses with patterns that were imported from Syria and Palestine and denoted the social standing of its residents.

The Three Bay House

In the early years of the twentieth century, around the time when the CBR Residence was built, we see very early versions of the Three Bay House. While much earlier in other Levantine cities, the Three Bay House was itself a result of the new Land Law under the Ottoman Empire, and the amalgamation of architectural styles that started to occur as a result of the increased trade between the Ottomans and the Europeans. It is interesting to note here that there is a striking resemblance between the three bay house with the Cinili Kosk. Although the new three bay houses and the older rural houses shared similarities with the Cinili Kosk, they had differed considerably. The rural house consisted of just one single space, and was poorly lit, the townhouse had an inner courtyard which created a private space secluded from the city. The Sharif Shaker House in Jabal Amman was one of those early and rare examples

of a three bay house that contained an exposed court at the center of the house. However, the court was different from traditional Arab courts, instead of a large open space at the center where the program would stem from it functionally, the exposed court in the Sherif Shaker house is rather similar to the Iwan houses in Syria and Lebanon. Other than these few rare examples, the Three Bay House became more extroverted and "was not arranged around courts, but often stood detached in a garden". The Three Bay Houses allowed more light to enter the space than the previous dwellings and often had balconies. While some may argue that the central courtyard of the three bay house had evolved from the traditional court, "the hierarchical differentiation between the two types of closed spaces, the hall and the rooms, was a new concept." This new extroverted character was a result of many changing factors, partly due to the increased sense of security, societal and behaviour openness, but also the beginnings of new urban planning codes. The city grew with an inherent level of sustainability that met the needs of the residents, whether it was privacy or comfort.

The Courtyard and Post-modern Architecture

Influenced by the need to construct an identity for the relatively new country as well as being influenced by Postmodern architectural theory, Rasem Badran constantly references architecture, or culture that had existed in the Arab world at some point in history, and more specifically, a historical element that is tied to Islamic culture. In many of his architectural, and especially residential projects, he created a required level of privacy through a relationship between what he describes as closed and open volumes. The "inner court" was what he describes as one of the "first contemporary attempts to incorporate (the courtyard) for private homes". Other than referencing cultural aspects of Bedouin life, he was formally influenced by Palestinian village architecture of clusterization. He believes that his projects emphasized the relationship between interior and exterior to highlight some of the shortcomings of urban planning. This relationship led him to expand on his concept of the courtyard when working with the Hatahet family who had a Damascene descent and fully embraced the courtyard. In the Hatahet residence, we see a traditional representation of the courtyard which hadn't existed in Amman before.



As has been presented in the paper so far, the courts in the Arab Rural houses were a result of family expansion, in the three bay houses and the CBR Residence house they were similar to a central Iwan, and were more of a forecourt or an atrium rather than a centralized court. However, the Hatahet house is different as it utilizes that Damascene courtyard which was part of the medina typology. The courtyards that we saw in Amman so far have been more of Roman atrium houses (atrium compluuiatum), "the atrium did not evolve from the courtyard, which was successively surrounded by by rooms on all four sides, but rather a hall that was

increasingly opened to the sky." So it could be argued then that the three bay houses were more derived from the Roman Atrium than the Damascene houses. A lot of the Damascene courtyards would be in the center of the house, and were at the end of a dark corridor (dahliz) and they would have a garden, and a small fountain that helped in cooling the house. The Hatahet house was similar in that respect, despite the house being detached on a single plot, Rasem designs the house with a courtyard that is reached in that narrow corridor that leads to a garden.

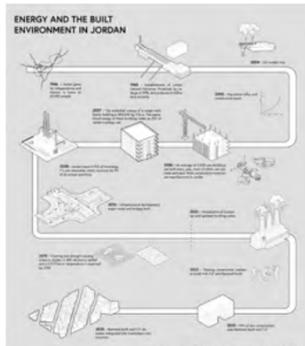
Conclusion

The courtyard is an archetypal space that creates different typologies across the world, it crosses boundaries of time, geographies and cultures. During the courtyard's early years in Amman we saw it as a result of family expansion in the early twentieth century, being more of an Iwan, or atrium and acting as a forecourt. Rasem Badran aided in modernizing the forecourt and used modern construction techniques to spatialize it, as well as linked it to Islamic architecture. Afterwards more contemporary architects, who were not restricted by historicist tropes, explored the courtyard experientially and rationally.

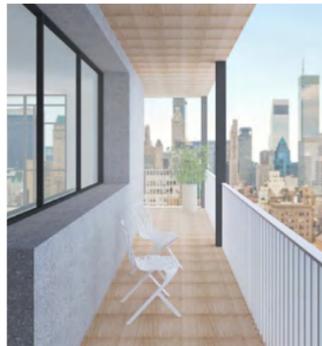
In this short period of two centuries that is explored in this essay, we have seen many variations of the courtyard and show the infinite potential interpretations of the courtyard as a spatial typology. While Islamic culture has no doubt played a role in shaping the culture around family ties and privacy, the relationship between the courtyard and Islam is more anthropological than architectural. The use of the term "Islamic architecture" in its broadest sense puts the spaces and buildings under an incredible amount of scrutiny, which most often ends up reviewed and assessed against traditional and more historical buildings. This dynamic urges us to question what "Islamic architecture" is, and how it categorizes and miscategorizes contemporary architecture especially when the contexts are widely different. The courtyard has existed as a spatial typology since the earliest of times to meet the needs of its residents, be they social, environmental, or cultural, and it will no doubt continue to be shaped by external forces to showcase its infinite possibilities.

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A NEW VERNACULAR



733'S NEW ENERGY



GROUNDED CHAIRS

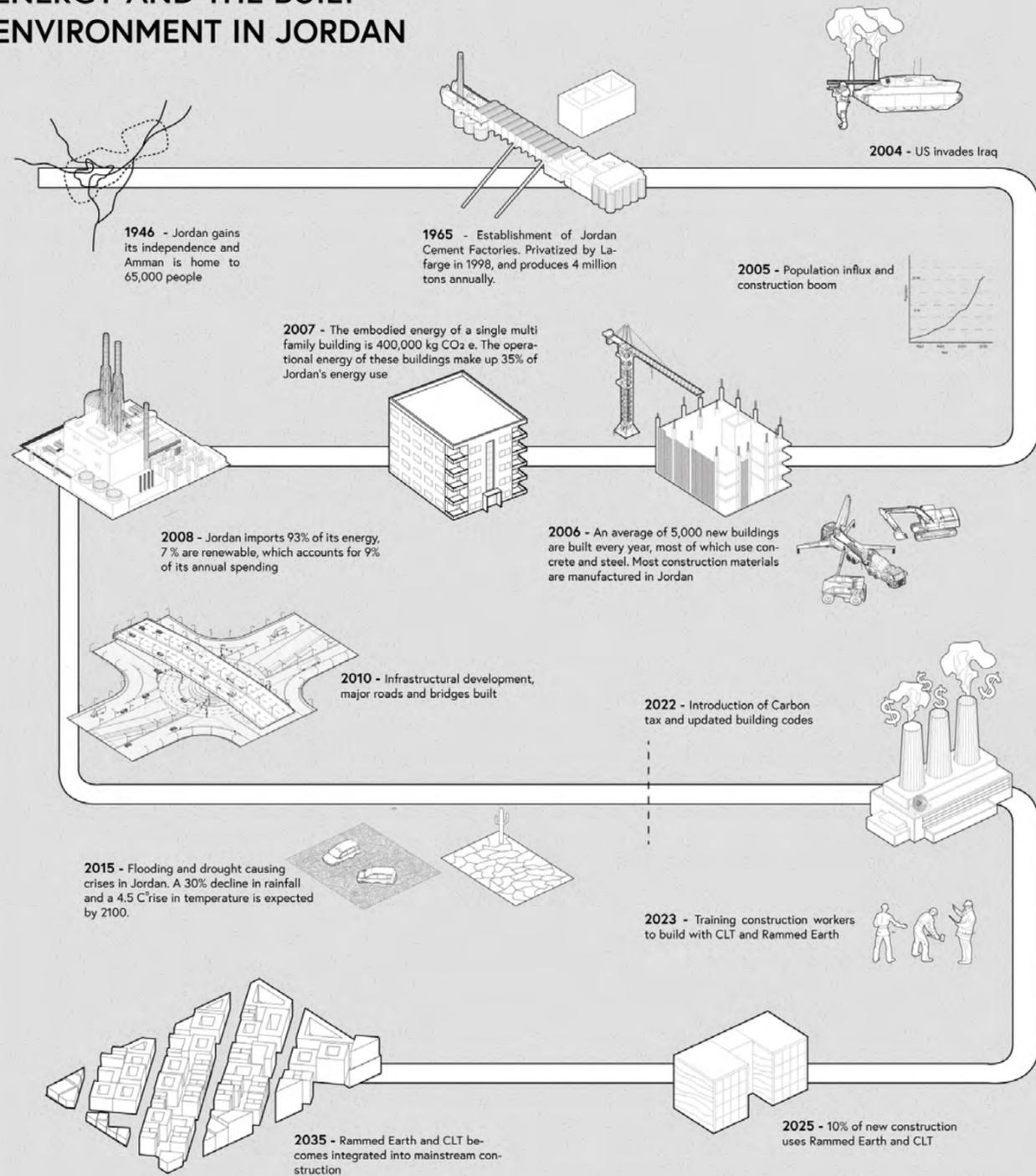


THE 8 AXIS MODULE

CLIMATE AND MATERIALS

The world will add 2 trillion square feet of buildings by 2060, which is the equivalent of building a New York City every month. It is therefore imperative that both the embodied and operational energy of buildings are key drivers of design. This chapter is a collection of material explorations, adaptations, and experimentations in the world of climate and materials.

ENERGY AND THE BUILT ENVIRONMENT IN JORDAN

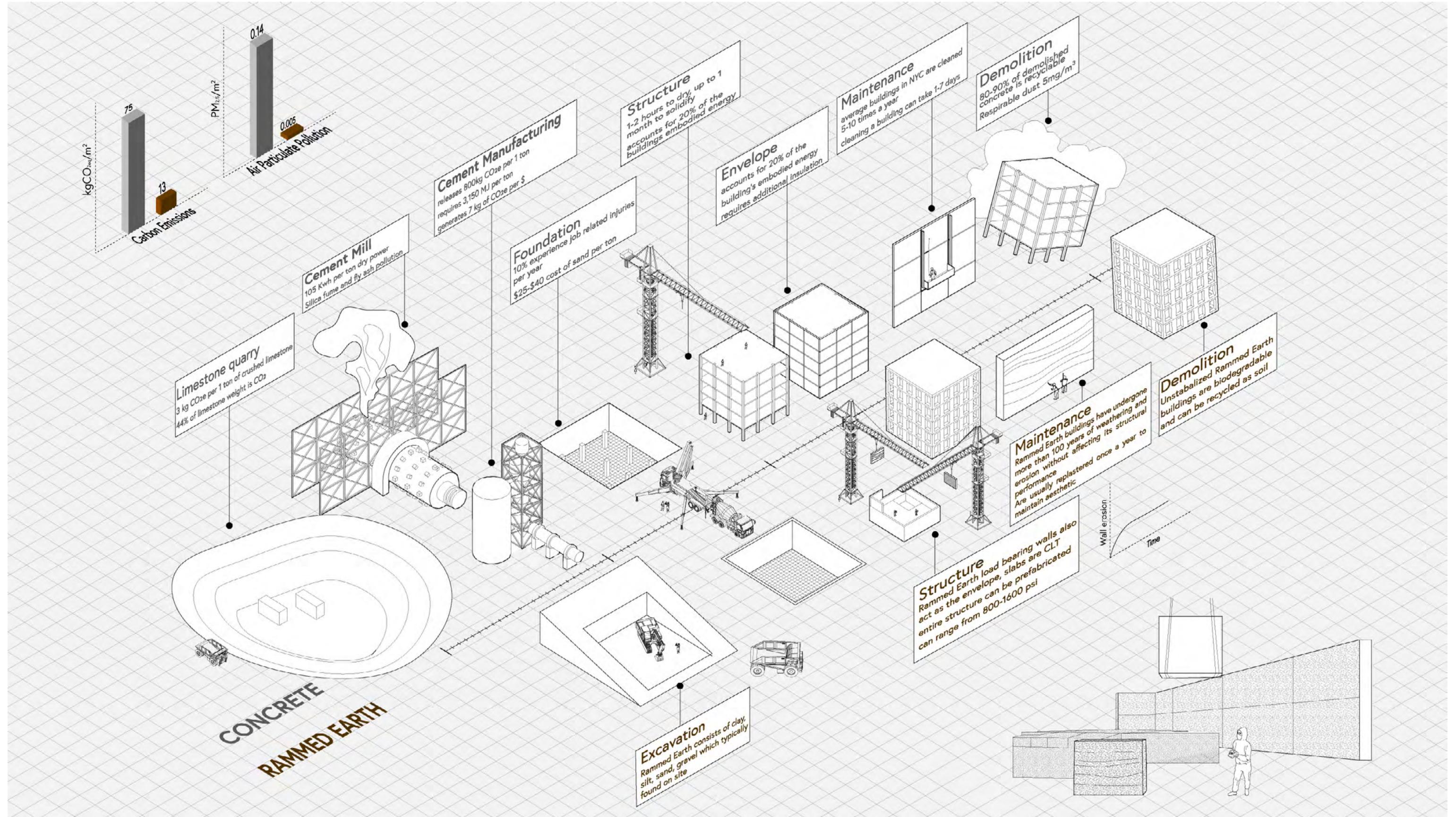


Jordan imports 93% of its energy, yet manufactures concrete and steel which are the primary construction materials used, furthermore, the residential building stock consumes 35% of Jordan's energy. A carbon tax and an updated building code that allows the use of Rammed Earth for multi-family housing can significantly reduce Jordan's reliance on the importation of natural gas, lower its carbon footprint, as well as create more resilient energy reform.

A NEW VERNACULAR

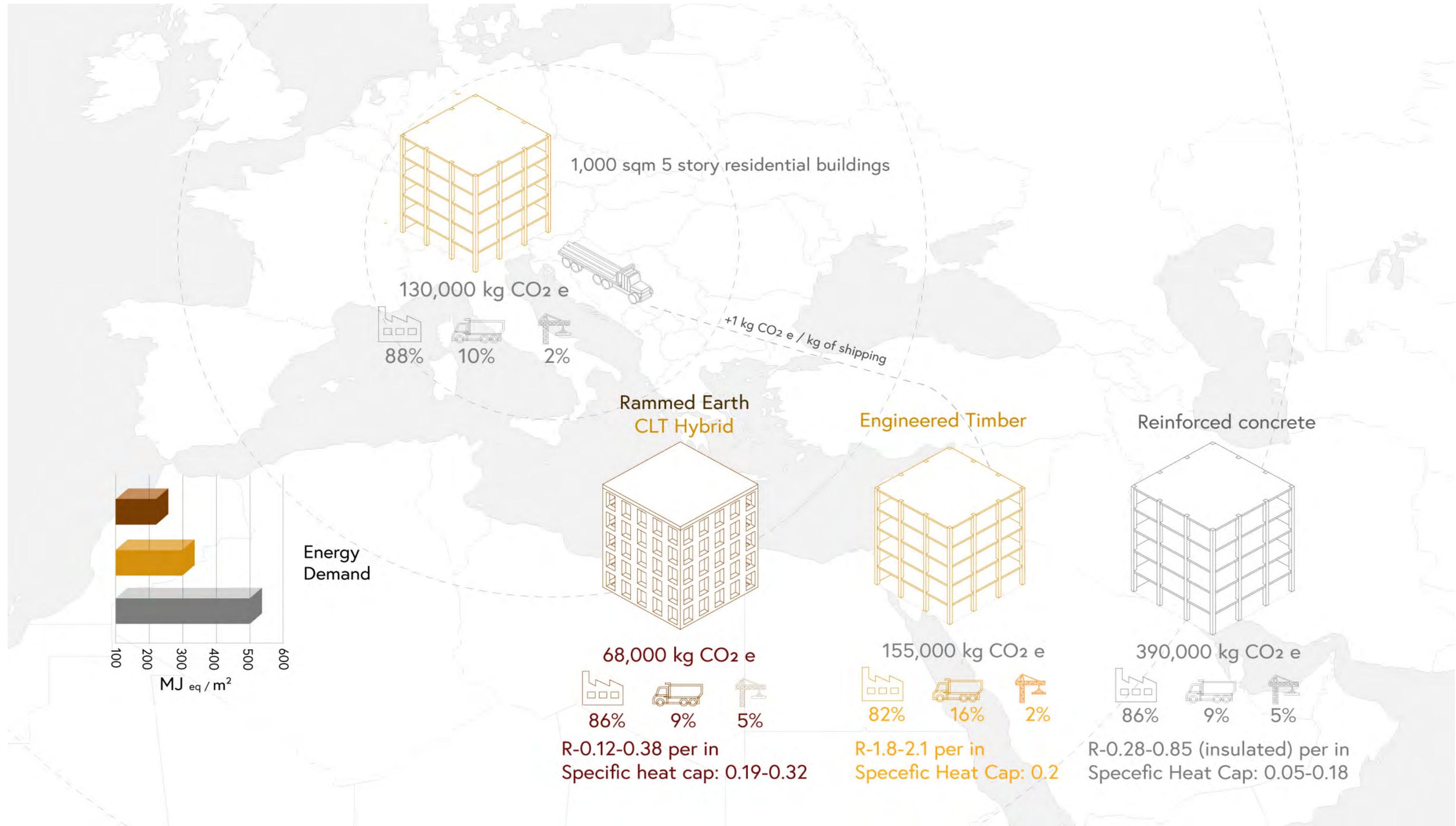
COURSE:	ADVANCED V
SEQUENCE:	DESIGN STUDIO
PROFESSOR:	DAVID BENJAMIN
LOCATION:	AMMAN, JORDAN

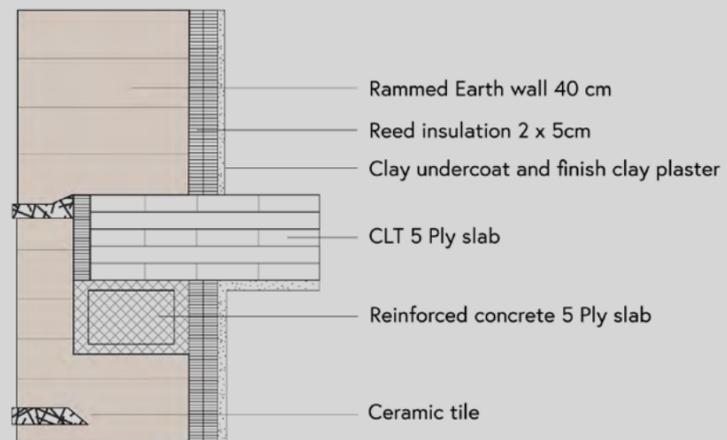
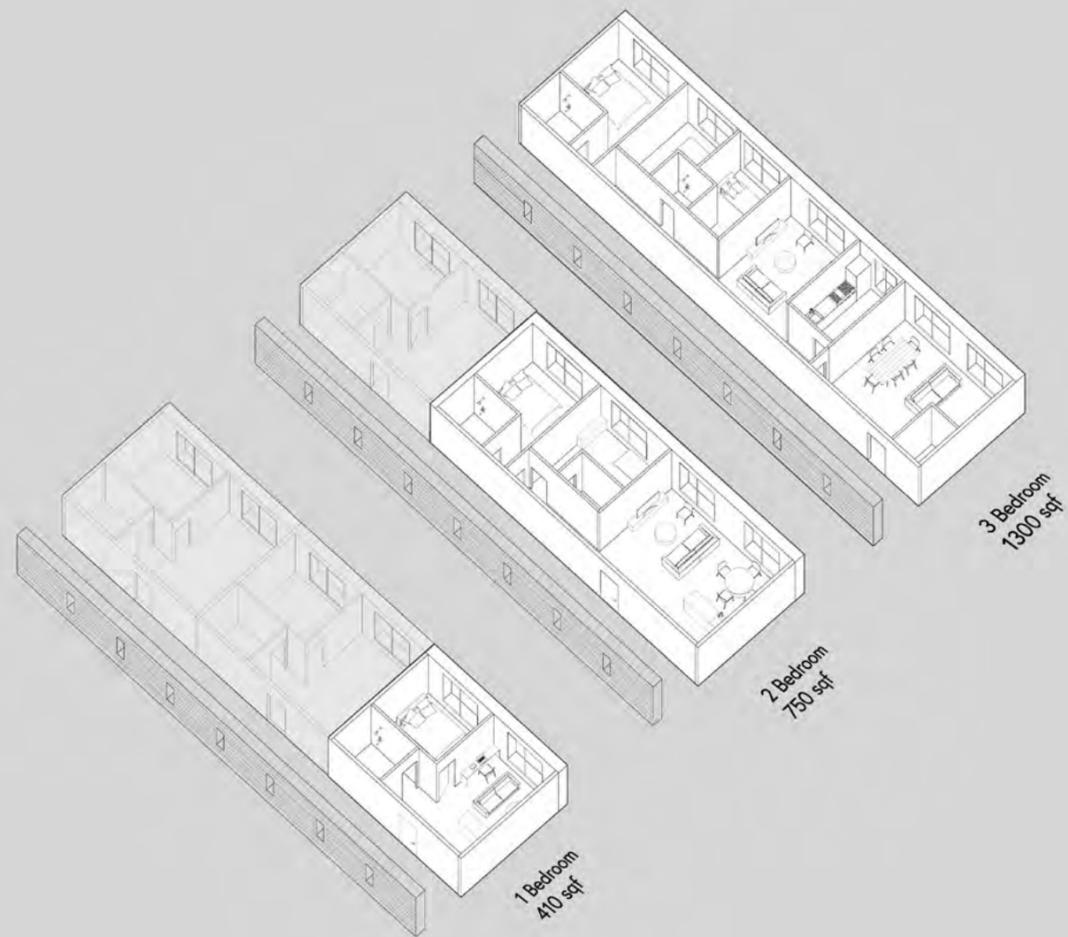
The research investigates the possibility of scaling Rammed Earth construction to provide affordable housing with low embodied, and operational energy. The pilot project in Amman, Jordan will set precedent to countries that are in similar climate zones which will change the global narrative around Rammed Earth construction in urban settings. This will introduce International Building Codes as well as public perception to recent technologies in Earth construction that allow it to become an alternative to traditional construction in medium to high density urban settings. A Rammed Earth, CLT hybrid structure has the potential to meet the urbanization and housing demands in specific regions that meet the goals of the Paris Climate Accord.



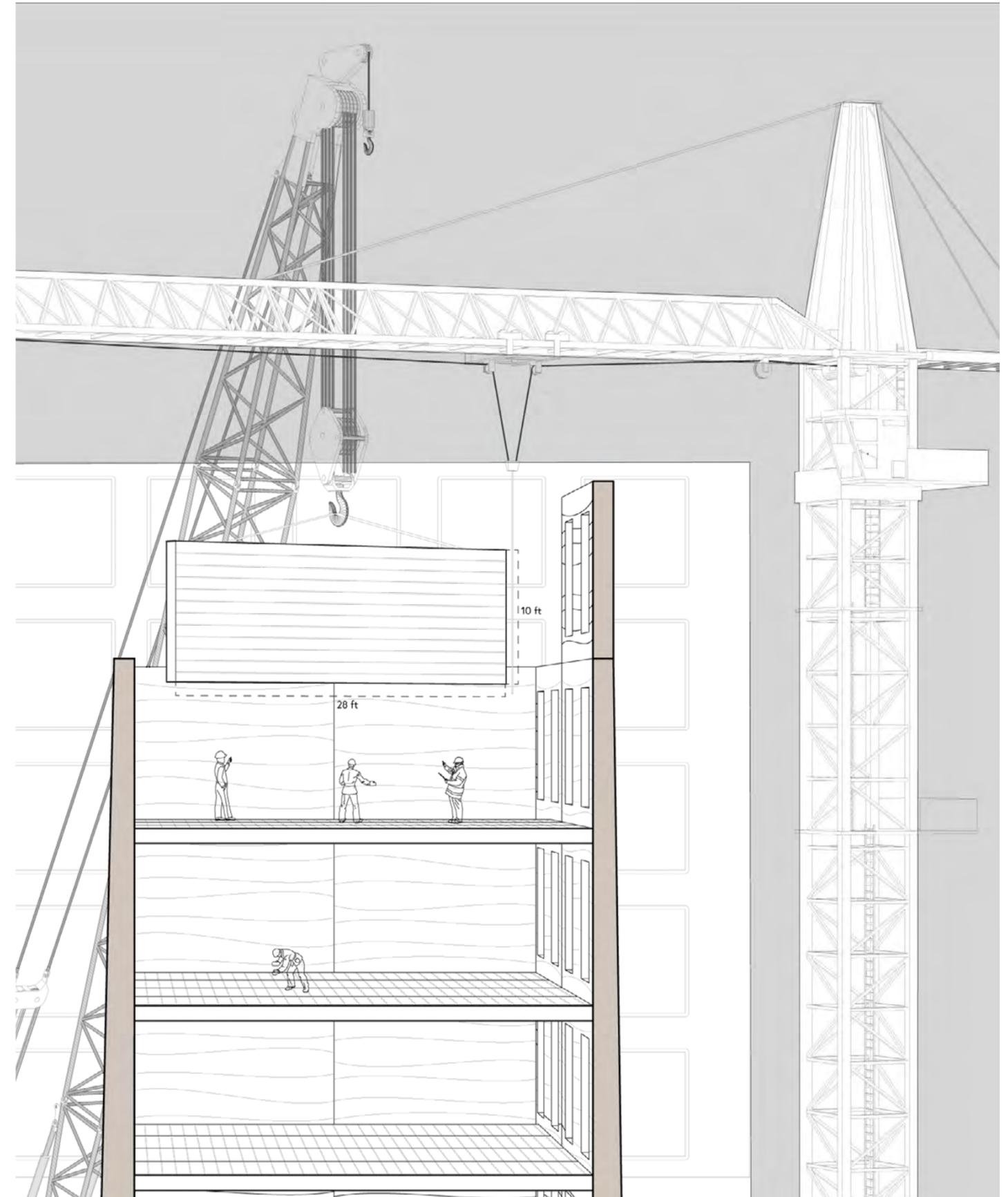
Design Studio

A New Vernacular



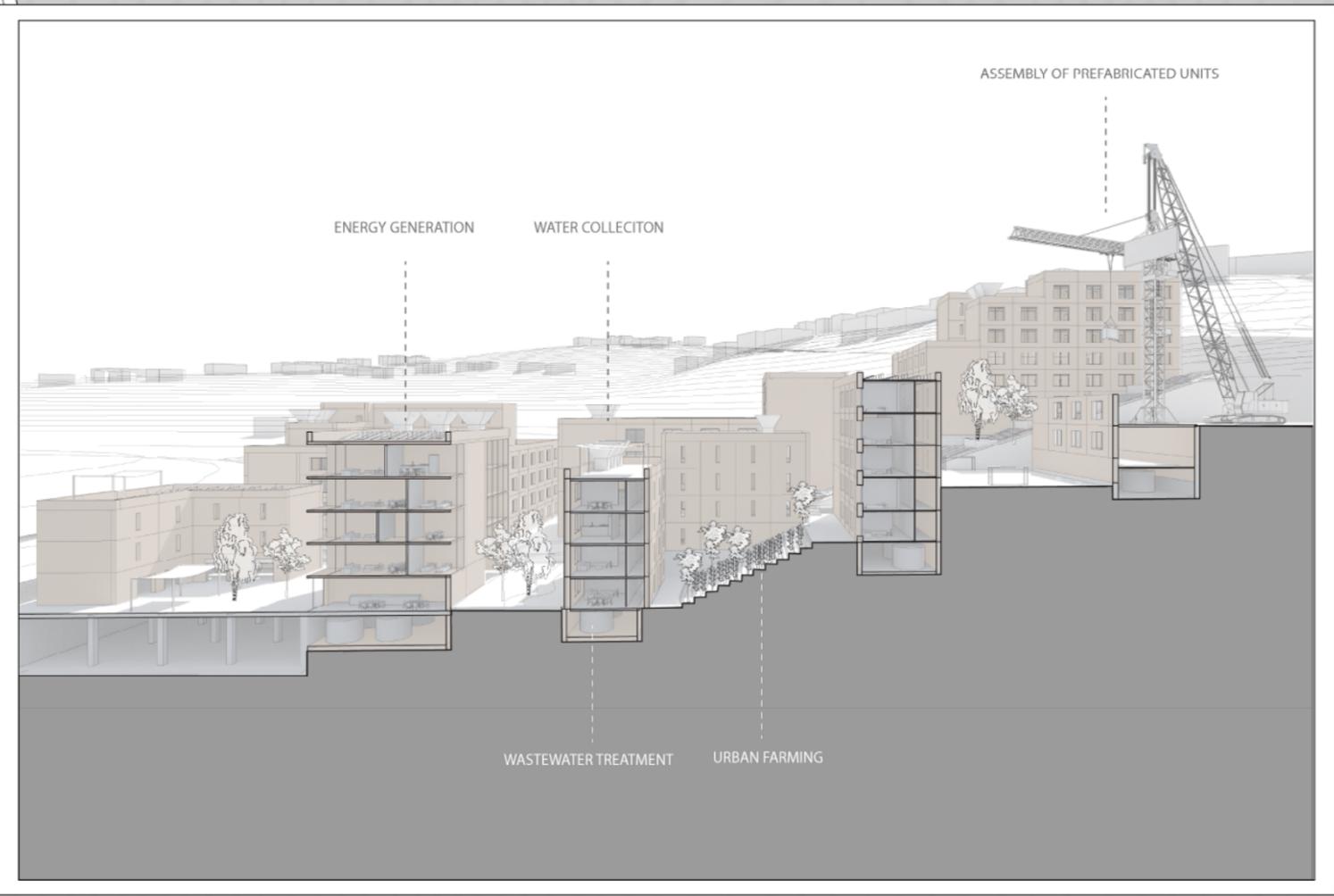
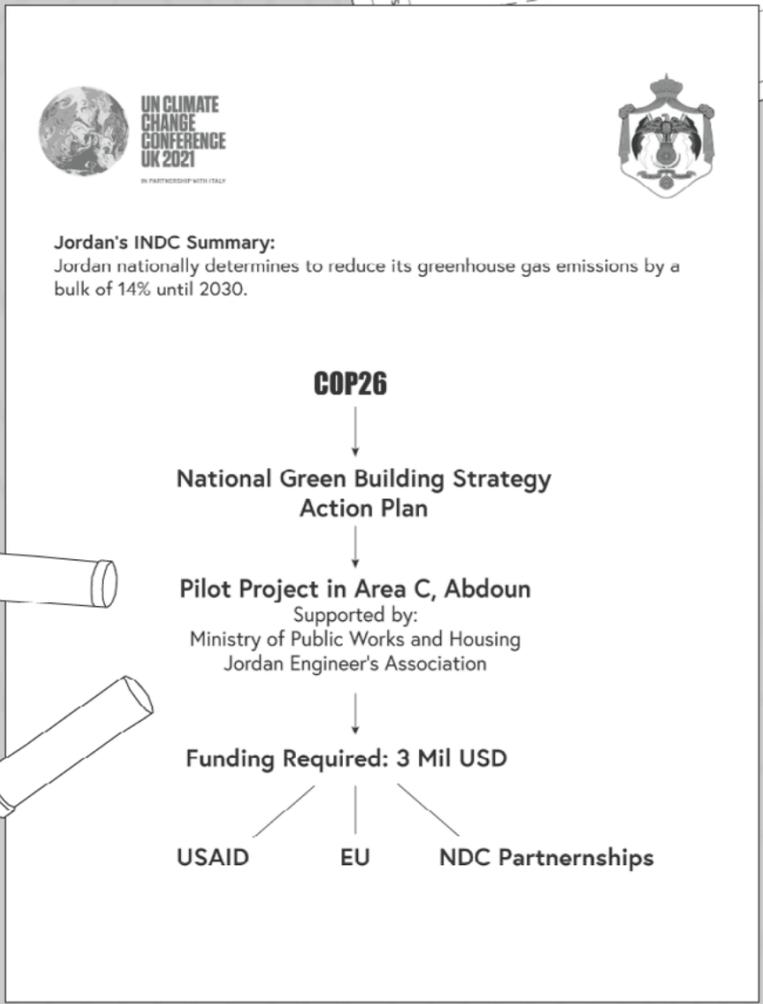
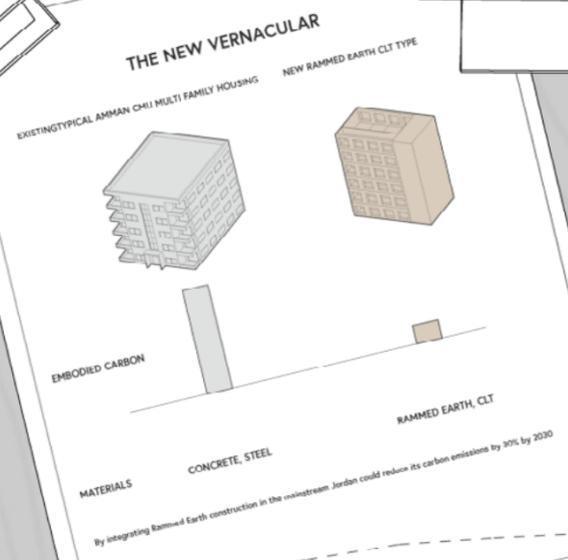


The structural CLT slabs span between the load bearing Rammed Earth walls, which creates a column free typology that can be changed and altered based on any need.





Rammed Earth construction is unique in its circular life process, which means that the prefabricated panels are not mixed with any additional materials, so the soil can be reused over and over again, whether material for a new building, or back into the landscape. Studies have shown that stabilized rammed earth with cement does not produce large structural advantages, while at the same time breaking the circular life process of rammed earth.



Design Studio

A New Vernacular

REPURPOSING THE LAFARGE FUHEIS CONCRETE FACTORY TO A PREFABRICATED RAMMED EARTH FACTORY

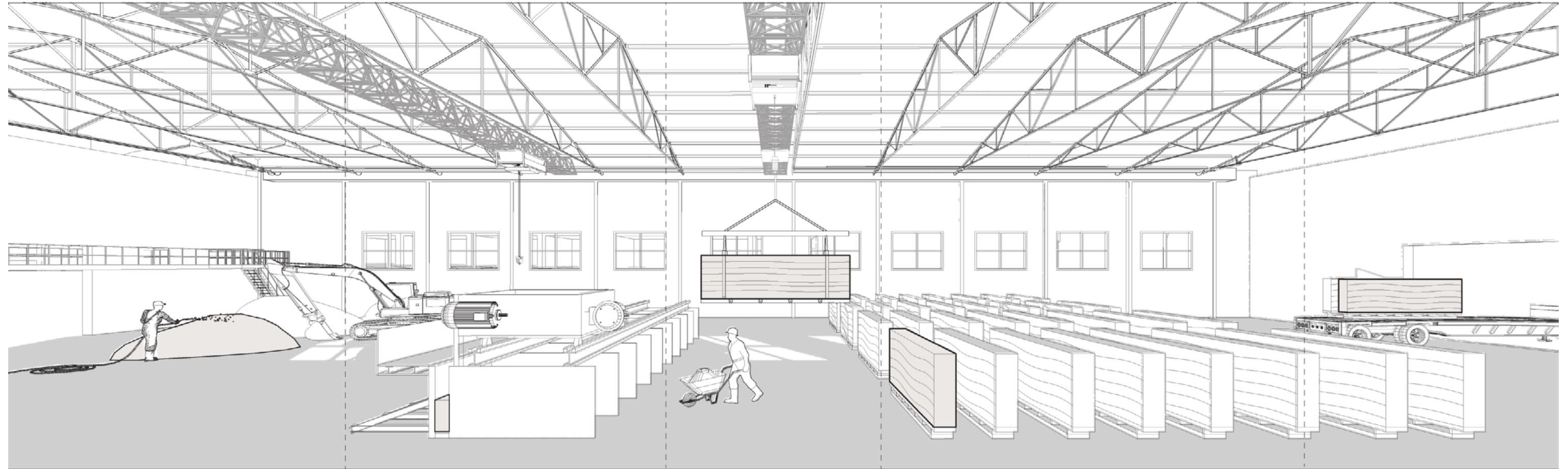
MIXING AND WETTING SOIL

AUTOMATED RAMMING

MOVING

STORING AND SORTING

TRANSPORTING

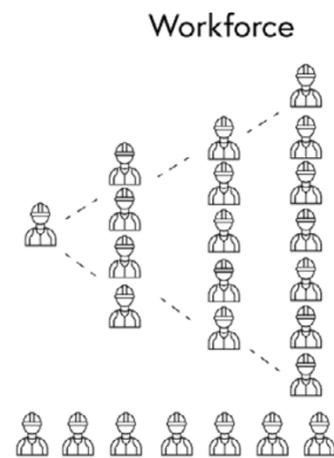


Design Studio

A New Vernacular

Integrating automation

Manual labor intensive



Integrating automation requires only 1 expert on site, however, this expertise can be passed along and the rest of the construction workers can become supervisors on future projects

Timeline

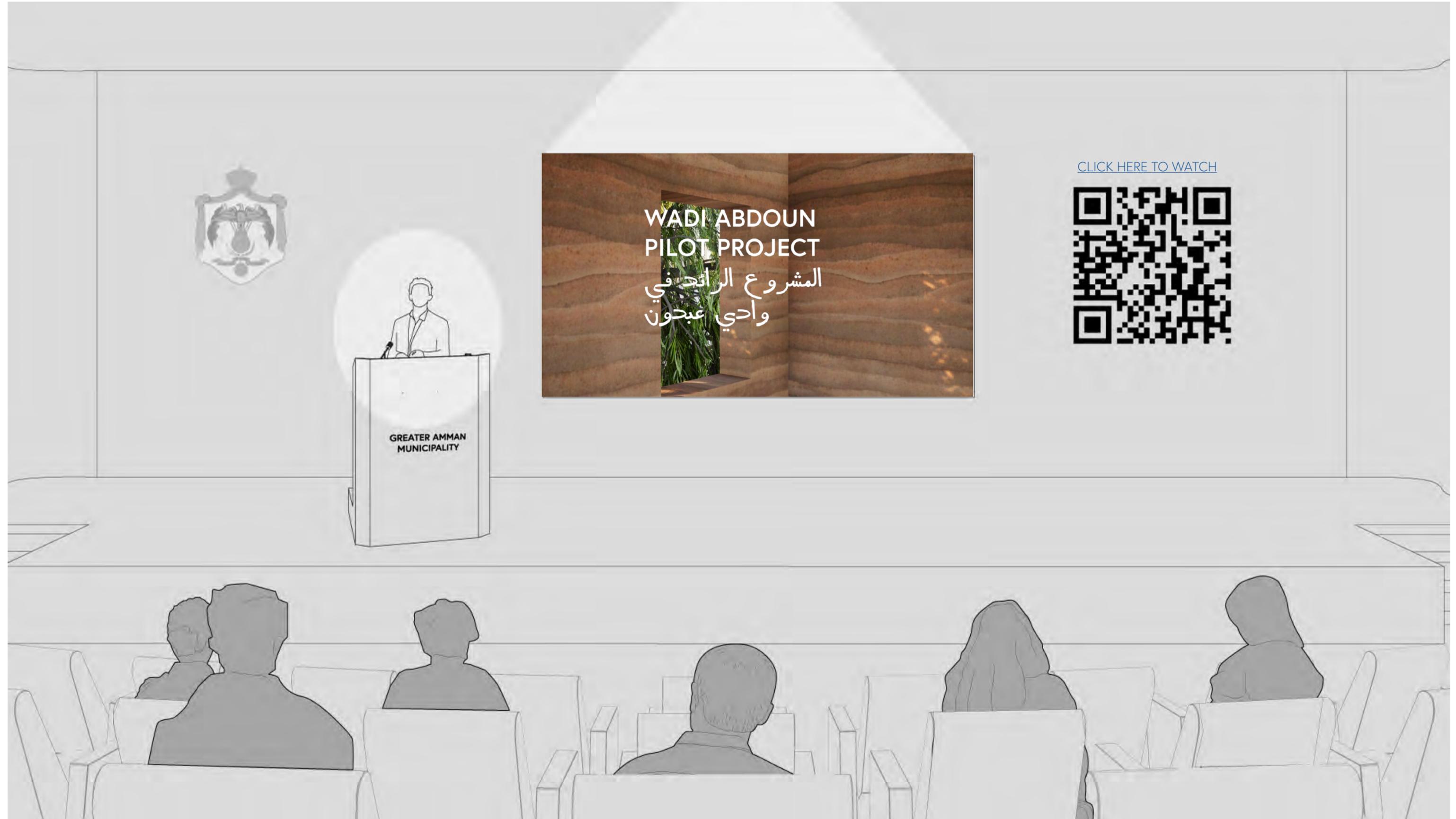


Integrating automation removes the long, labour intensive and tiring work of manually ramming the walls. This means production time can be reduced by a factor of 5.

Affordability



Integrating automation significantly decreases so the cost and makes it affordable to be adopted at a mass scale





Labor impact:

The partial automation of Rammed Earth construction will make the construction less labor intensive, and allow the workers to become technical experts in Rammed Earth construction.

Government Policy:

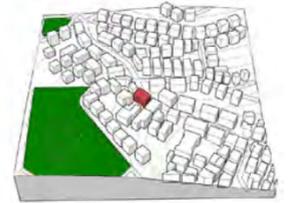
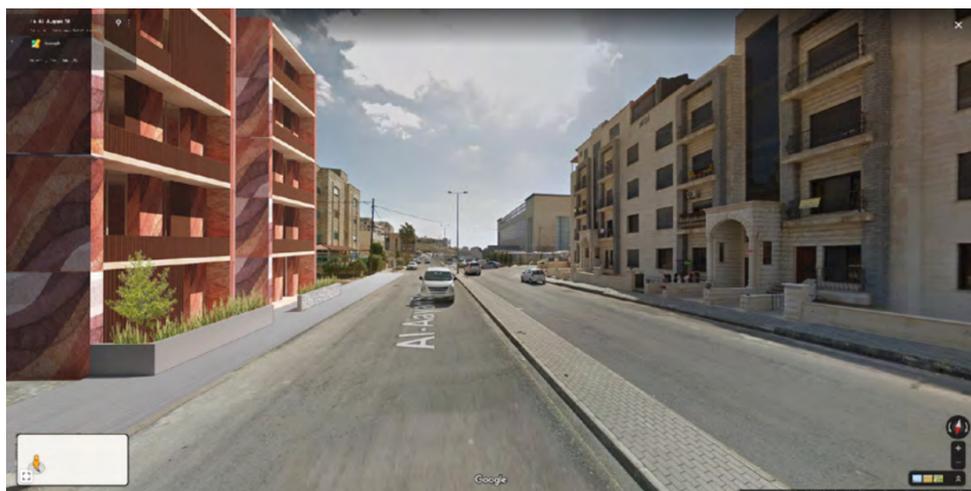
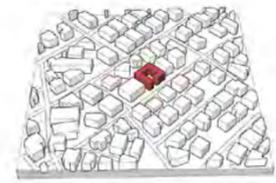
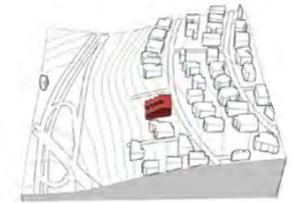
To facilitate the transition, the government should Implement the pilot project -as promised at COP26- to allow its construction, update the building code to allow the construction of Rammed Earth, apply a carbon tax on building materials and subsidize the technology in the first few years.

Carbon impact:

The embodied Carbon of the proposed building system is 13kgCO₂e / m², compared to conventional concrete buildings which is 75kgCO₂e / m². The new system will also decrease the operational energy.

Through incentives by the government to use rammed earth as a building material, engineers, contractors, and builders will become more familiar, driving the cost down and making it

more affordable. As Rammed earth buildings will become more prevalent through a shift in public perception of natural materials, and its affordability, this can become a new vernacular.



Design Studio

A New Vernacular



733'S NEW ENERGY

COURSE:	NET-ZERO HOUSING
SEQUENCE:	BUILDING TECHNOLOGIES
PROFESSOR:	ANDREAS BENZING
LOCATION:	MANHATTAN, NYC

80% of the buildings that will exist in 2050 already exist. By understanding the tectonic principles and redesigning the building envelope and system, we are able to improve the energy balance of the 28 story 733 Park Avenue building to become net-zero. The building's energy performance was improved by adding a new skin to the building that seals it, preventing any energy deficiencies, introducing active solar gain on the south elevation, integrating PV cells into the energy system, and adding balconies on its west elevation. The balconies not only serve as a social space and increase the average time for humans spent outside, but also prevents excessive solar gain from the setting sun during the summer.



▼ Transmission heat loss (opaque surfaces)

Area group	Total area (m²)	Area weighted U-value (W/m²K)	Av. temp. factor	Ann. Htg. degree hours (KWh/a)	Transmission heat losses (KWh/a)	Q _t (kWh/m²a)
7 - External Door	0.00			64.00		
8 - External Wall - Ambient	5662.51	0.02	1.00	64.00	7328.26	0.92
9 - External Wall - Ground	0.00			64.00		
10 - Roof/Ceiling - Ambient	406.54	0.15	1.00	64.00	3902.75	0.49
11 - Floor slab / Basement ceiling	375.69	0.25	0.60	64.00	3806.66	0.45
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		
Total	6444.74				14837.68	1.85

▼ Transmission heat loss (windows)

Area group	Total area (m²)	Area weighted U-value (W/m²K)	Av. temp. factor	Ann. Htg. degree hours (KWh/a)	Transmission heat losses (KWh/a)	Q _t (kWh/m²a)
2 - North Windows	499.46	0.80	1.00	64.00	25643.95	3.21
3 - East Windows	0.00			64.00		
4 - South Windows	626.82	0.77	1.00	64.00	30987.72	3.87
5 - West Windows	719.23	0.73	1.00	64.00	33613.91	4.20
6 - Horizontal Windows	0.00			64.00		
Total	1845.52				90245.58	11.28

▼ Transmission heat loss (opaque surfaces)

Area group	Total area (m²)	Area weighted U-value (W/m²K)	Av. temp. factor	Ann. Htg. degree hours (KWh/a)	Transmission heat losses (KWh/a)	Q _t (kWh/m²a)
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3 - East Windows	0.00			64.00		
4 - South Windows	626.82	0.77	1.00	64.00	30987.72	3.87
5 - West Windows	719.23	0.73	1.00	64.00	33613.91	4.20
6 - Horizontal Windows	0.00			64.00		
Total	1845.52				90245.58	11.28

▼ Transmission heat loss (thermal bridges)

Area group	Total length (m)	Average Psi-value (W/mK)	Av. temp. factor	Ann. Htg. degree hours (KWh/a)	Transmission heat losses (KWh/a)	Q _t (kWh/m²a)
15 - Thermal Bridges Ambient	455.22	0.49	1.00	64.00	14275.68	1.78
16 - Perimeter Thermal Bridges	0.00			64.00		
17 - Thermal Bridges Floor Slab / Basement Ceiling	0.00			64.00		
Total	455.22				14275.68	1.78

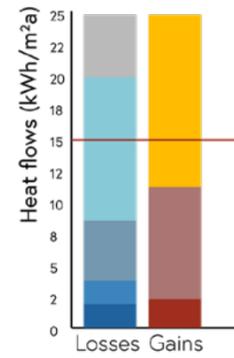
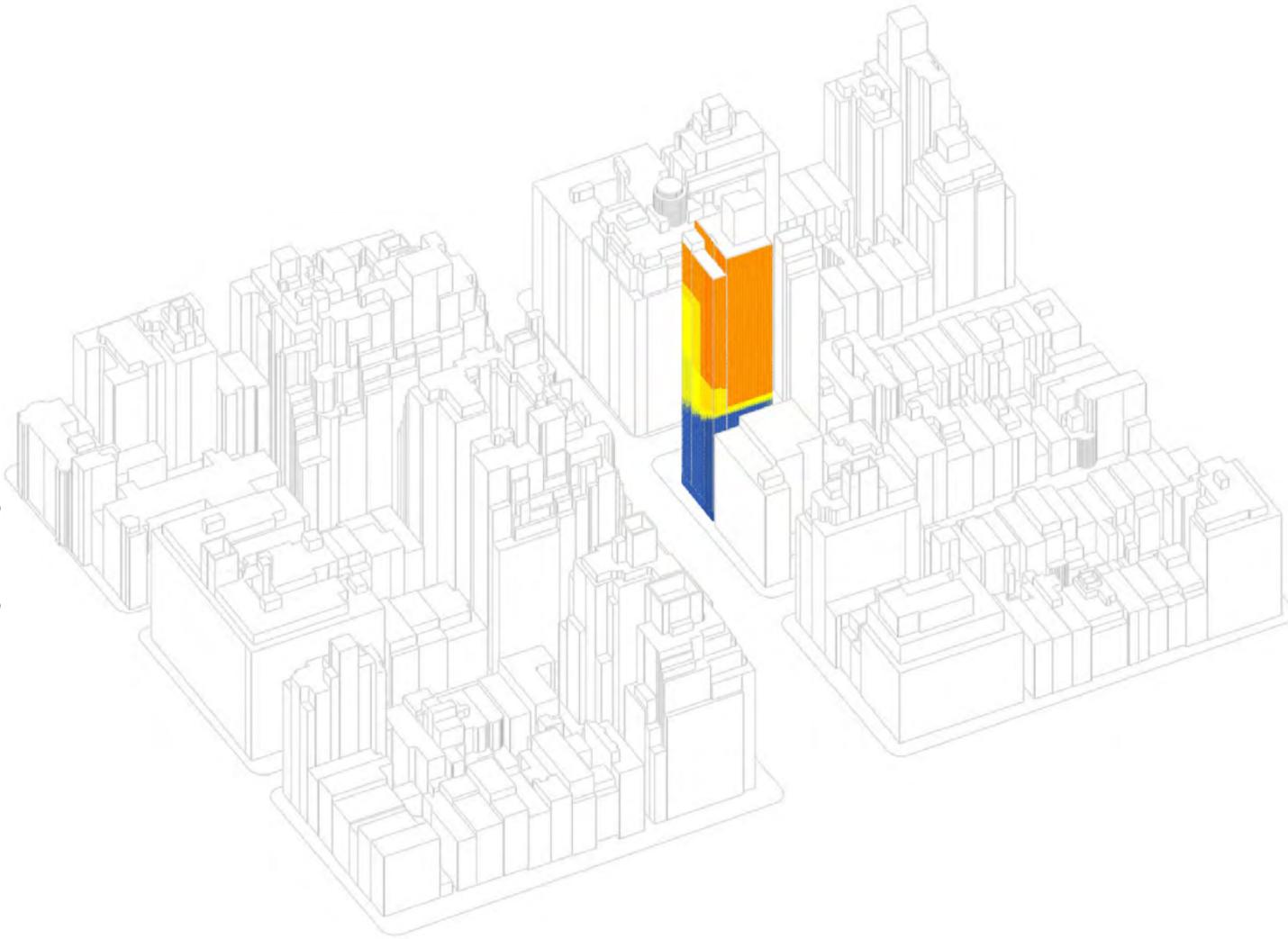
▼ Ventilation heat losses

Ventilation system	Energy effective air change rate (1/h)	Ventilation volume (m³)	Heat capacity of air	Ann. Htg. degree hours (KWh/a)	Ventilation heat losses (KWh/a)	Q _v (kWh/m²a)
Infiltration	0.0451	20000.00	0.33	64.00	19053.00	2.38
Infiltration	0.0482	20000.00	0.33	64.00	19514.88	2.44
Total	0.0913				38567.88	4.82

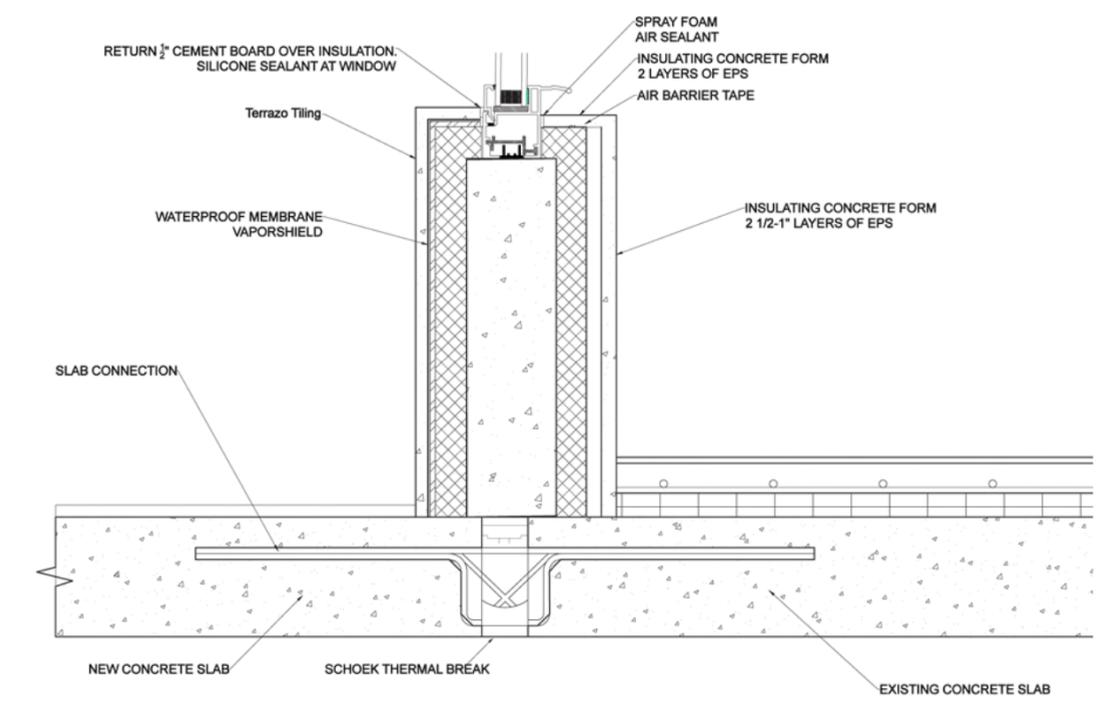
▼ Solar heat gains

Area group	Wm. area (m²)	Gazing area (m²)	g-value	Reduction factor	Reduction G _s (KWh/a)	Solar heat gains (KWh/a)	Q _s (kWh/m²a)
2 - North Windows	499.46	349.75	0.60	0.34	136.15	13672.79	1.71
3 - East Windows	0.00	0.00				0.00	0.00
4 - South Windows	626.82	465.31	0.60	0.40	528.24	79970.00	10.00
5 - West Windows	719.23	581.06	0.60	0.18	189.72	14471.93	1.81
6 - Horizontal Windows	0.00	0.00				0.00	0.00
Total	1845.52	1396.11				108114.72	13.51

Building Technologies



- Non-useful heat gains
- Transmission heat loss (windows)
- Ventilation heat losses
- Transmission heat loss (thermal bridges)
- Transmission heat loss (opaque surfaces)
- Solar heat gains
- Internal heat gains
- Specific ann. heat demand



733's New Energy

Material	In	R-Value
Inside Air Film	0.0	0.68
Gypsum Board	0.625	0.56
LW Concrete Block (6" filled)	6.0	3.03
Insulation Board	8	40.0
Plywood	1.0	1.25
Terrazzo	1	0.08
Outside air film	0.0	0.25
Total	16.63	45.85



GROUNDED CHAIRS

NATURAL MATERIALS LAB

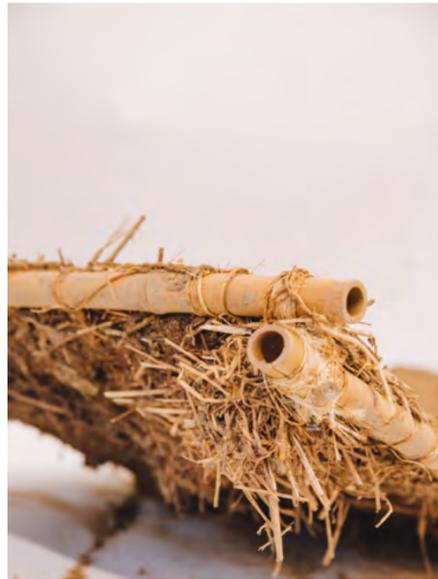
ROLE: RESEARCH ASSISTANT

PROFESSOR: LOLA BEN ALON

COLLABORATORS: SARAH HEJAZIN

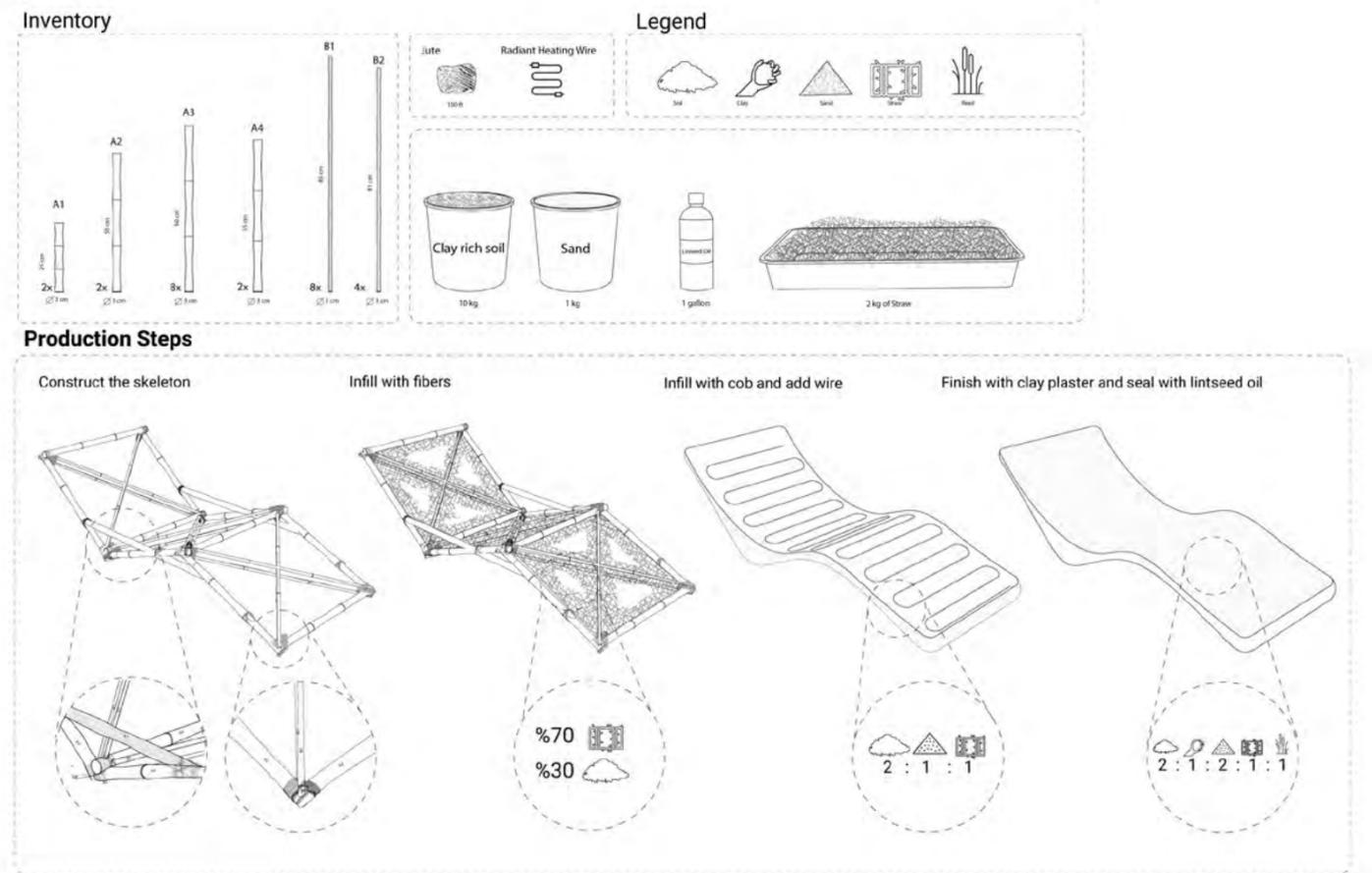
The Natural Materials Lab at Columbia GSAPP developed Grounded Chairs, a 100% organic biodegradable low-carbon seating system. The Grounded Chairs series aims to use natural building materials such as clay, sand, fibers, and bamboo, to provide a new interpretation of seating sculptures.

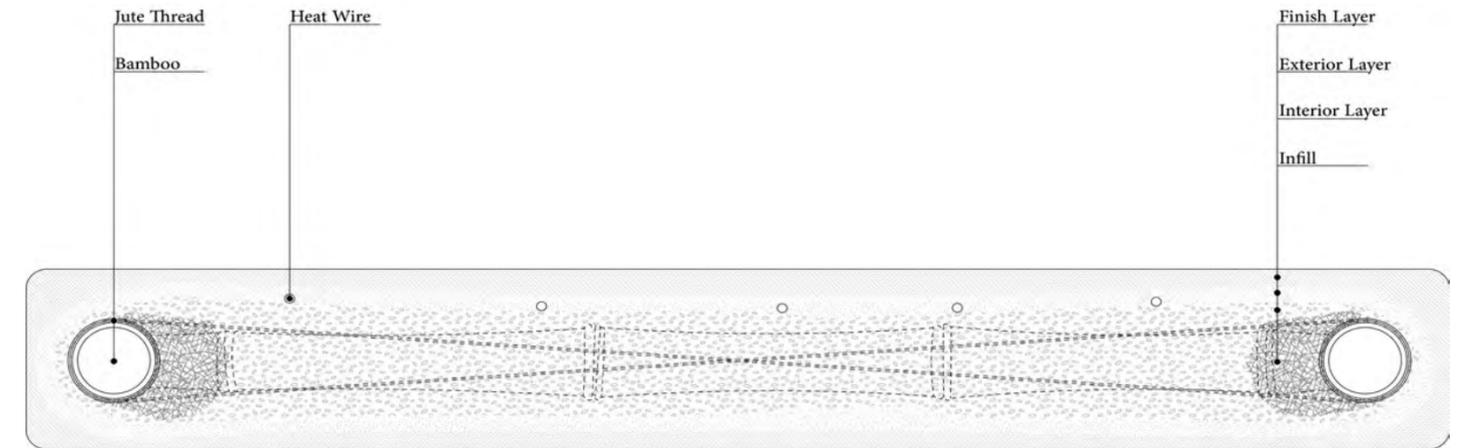
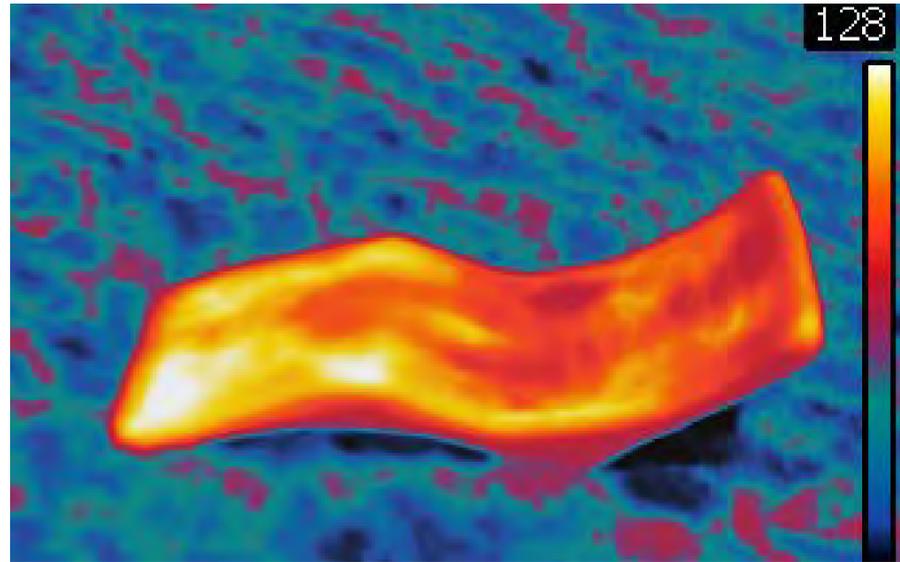
By using the thermal advantages of naturally driven mass materials and experimenting with electric heating wires, Grounded Chairs provide sculptural comfort seating that can store heat and absorb moisture to provide optimal thermal comfort while having sustainability at its core. Our first iteration of Grounded Chairs is "Jandug", a structurally sound cob chaise with an internal bamboo skeleton and a radiant heating system to further enhance the user's thermal experience.



Limiting ourselves to the amount of bamboo that we would need, we created a structural truss skeleton containing three triangular diagrids that would respond to the ergonomics of the human body, a section for each; the shank, the thighs, and the torso. The thin bamboo structure was then joined by lashing biodegradable jute rope to provide the necessary strength to sustain the tension within the earthen mass material.

After having built the bamboo structure, we create a jute rope net between the diagonal bamboo members to act as a surface for the infill mixture. Once the weaving was done, the infill layer was placed in between the bamboo members and on the joints to give the skeleton more rigidity and strength. The density of this layer is very low and would make the chair less heavy.





Soil mixture tests



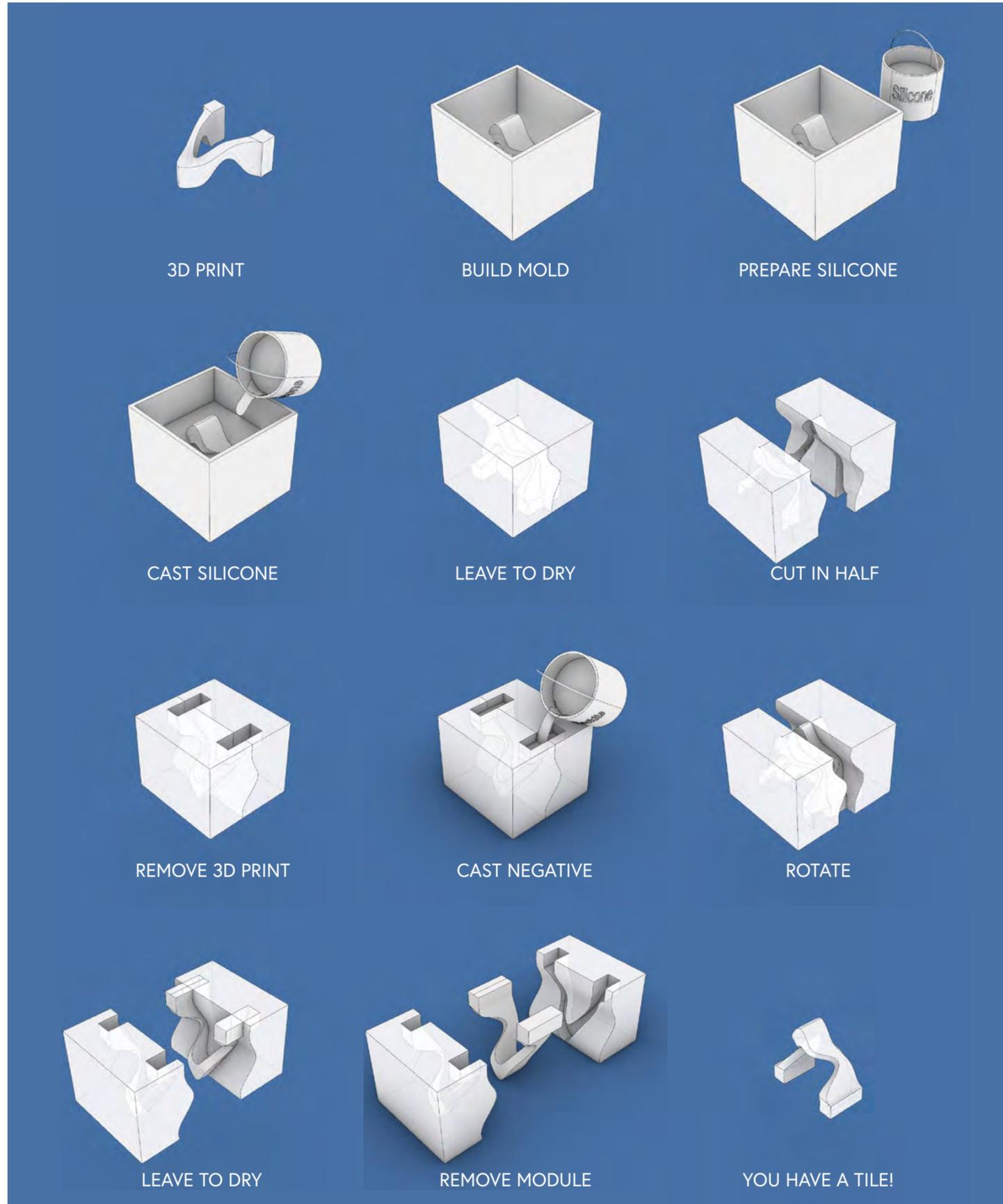
Jandug consisted of many different mixtures each with its own ratio of clay to sand to water to straw, and each with its own physical properties and role. For instance, the outer finish consisted of mostly finely sieved clay to ensure that it appears very smooth, and work well against cracking.

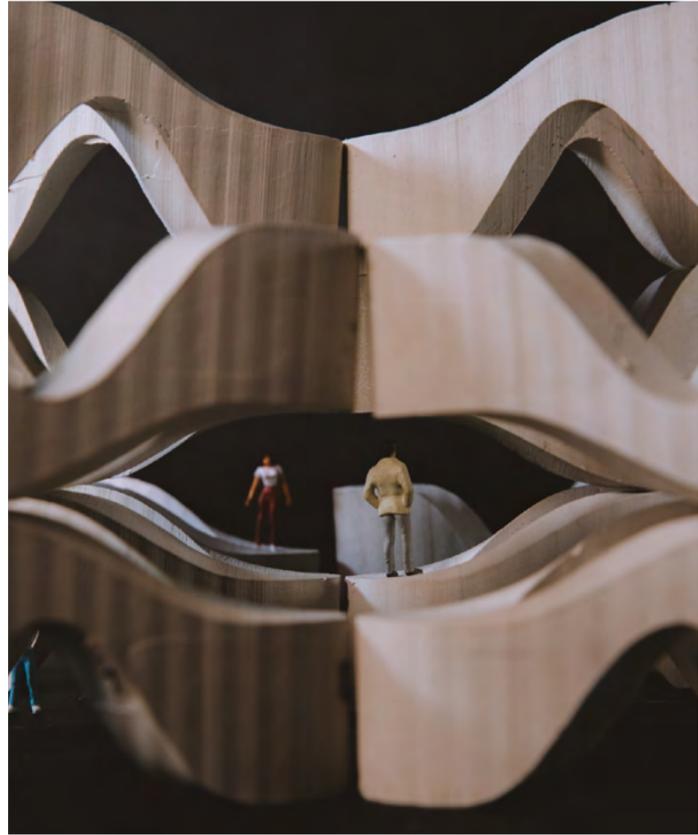


THE 8 AXIS MODULE

COURSE:	TRANSITIONAL GEOMETRIES
SEQUENCE:	BUILDING TECHNOLOGIES
PROFESSOR:	JOSHUA JORDAN

The 8 axis module is a research in three dimensional tiling and the exploration of organizational, experiential, and aesthetic performance of a single module. The tile is designed to be rotated on any axis, combined, and to give a new architectural form and system in every way that it is rotated. The process included digital and physical exploration of tiling systems, the physical fabrication through 3D printing, mold making, and casting.



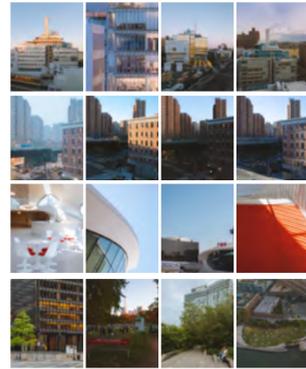




TECTONIC RESISTANCE



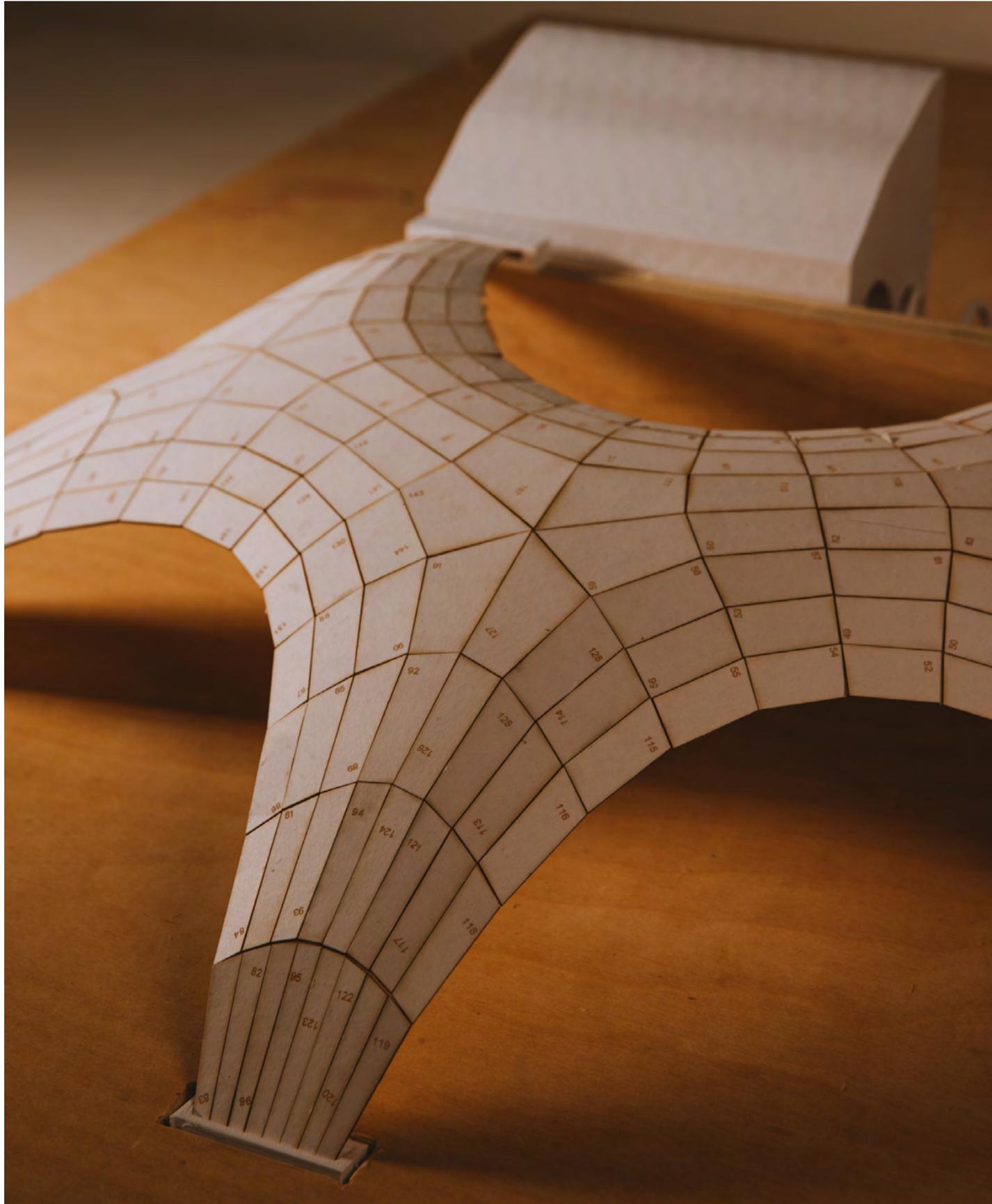
THE VERTICAL
SCULPTURE GARDEN



ARCHITECTURAL
PHOTOGRAPHY

CLIMATE AND CULTURE

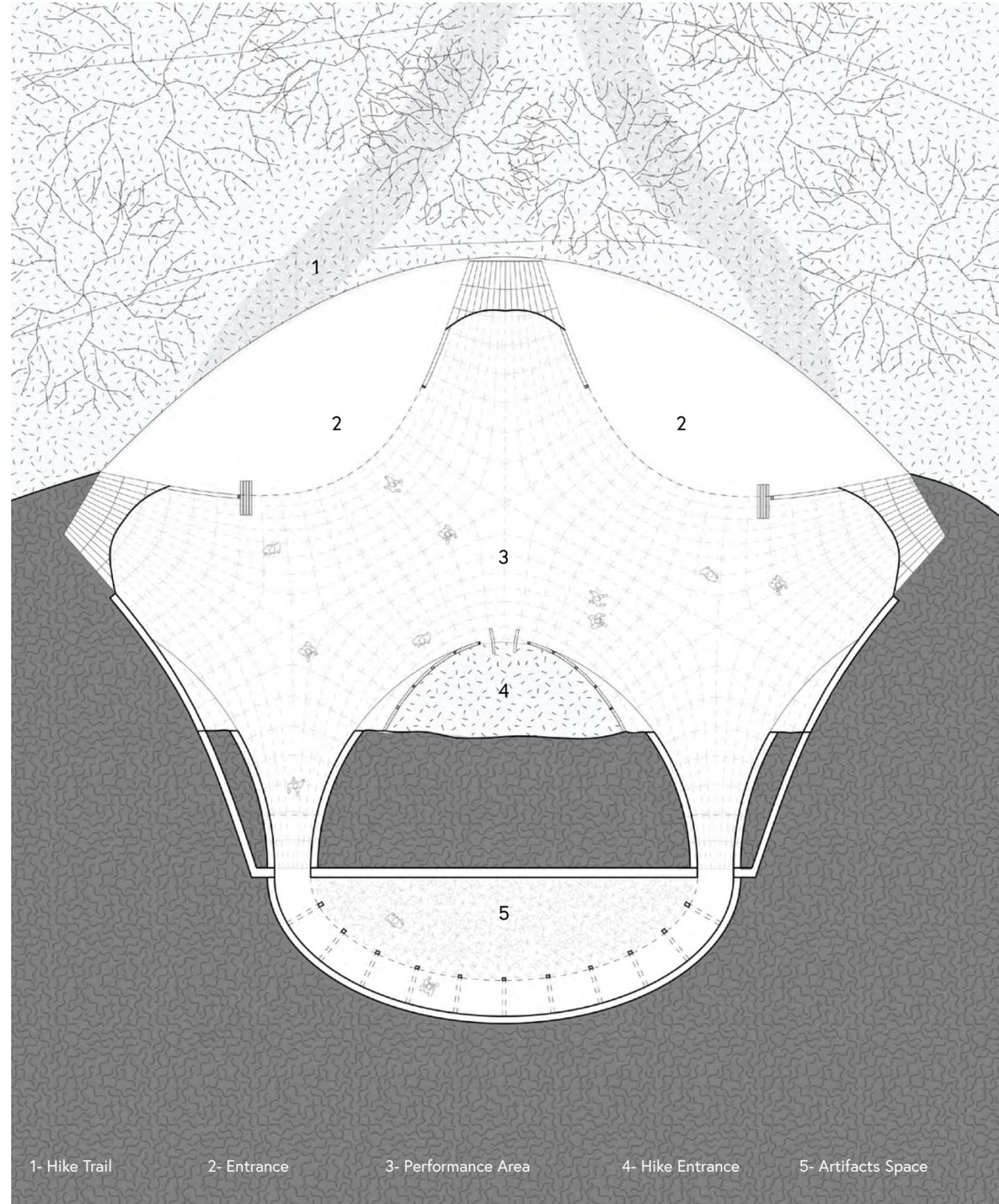
How is culture influenced by climate change? How do you design for culture in the anthropocene? This chapter is a collection of designs and documentations of culture's relationship to climate, the environment, and architecture.



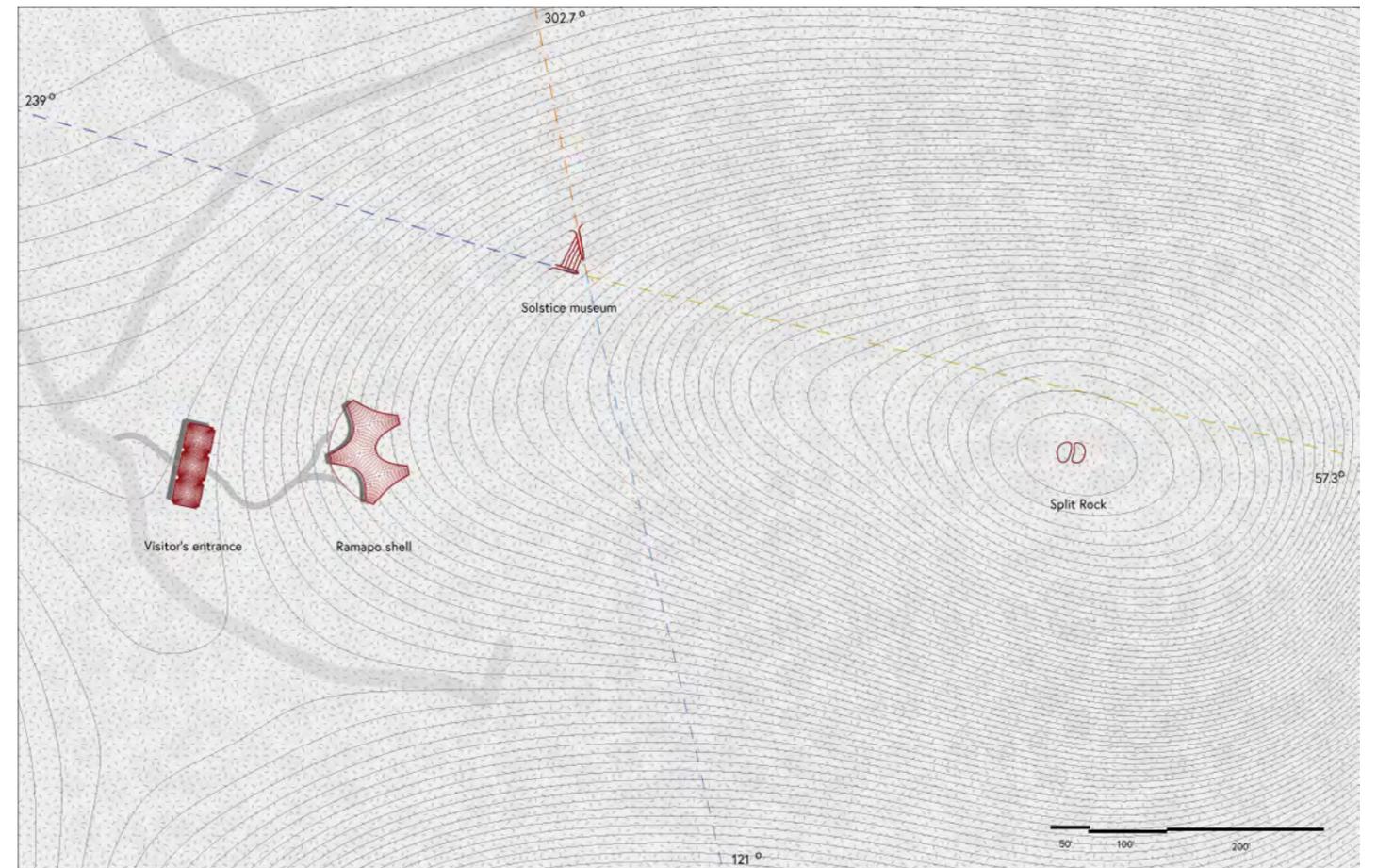
TECTONIC RESISTANCE

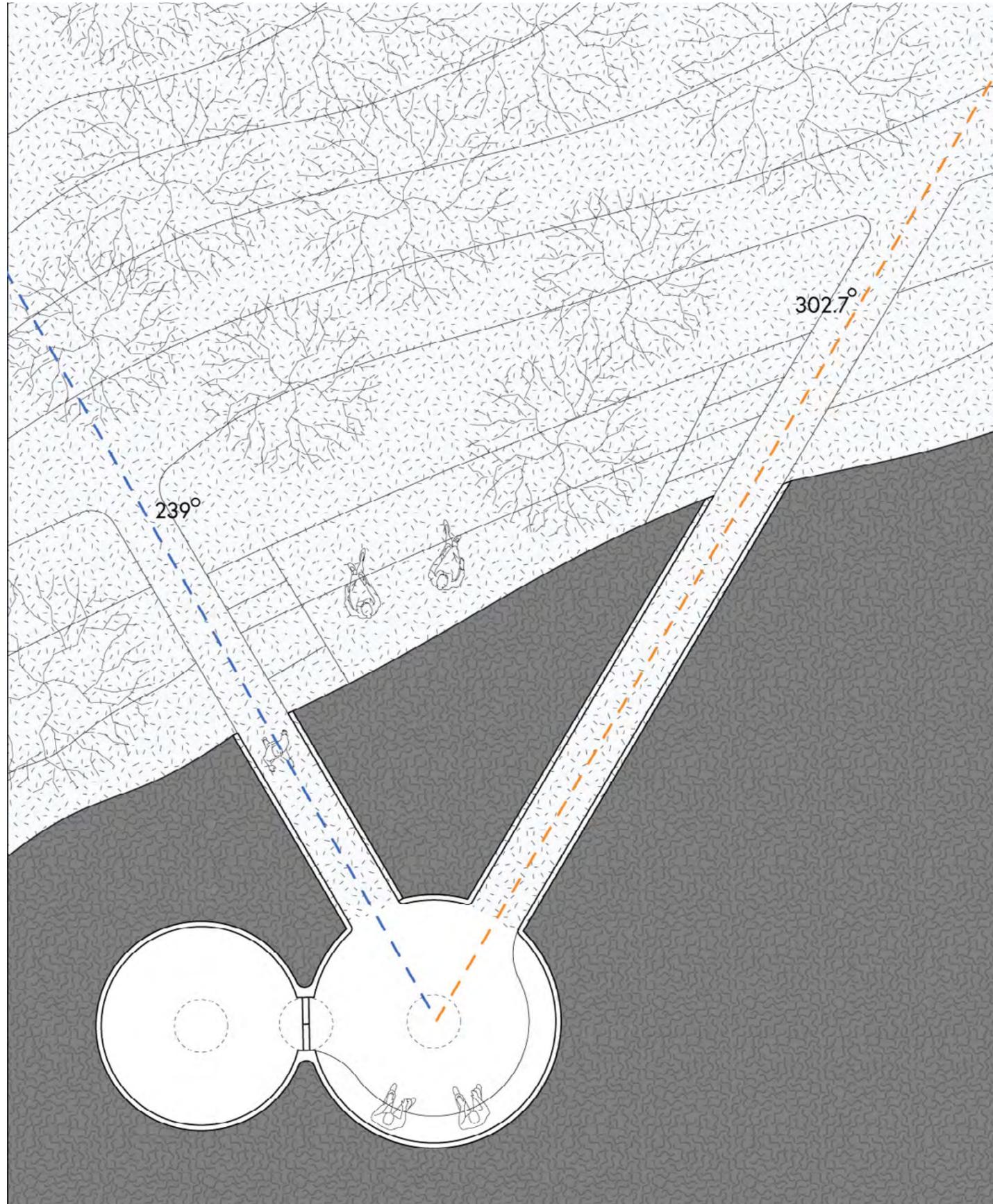
COURSE:	ADV IV
SEQUENCE:	DESIGN STUDIO
PROFESSOR:	ROBERT MARINO
LOCATION:	MAHWAH, NEW JERSEY

Granite rocks carefully balanced on top each other and cearns are scattered around Stag Hill, a Ramapo Lenape historic ground. These feats prove their lineage to the land thousands of years ago and resist their erasure. "Tectonic resistance", the Ramapo museum attempts to continue the material legacy through new Granite structures that are situated within the landscape. These new structures are unreinforced compression only tiled granite shells that are built without having the need for any mortar or concrete, much like the cearns that the visitor will encounter while hiking the site.

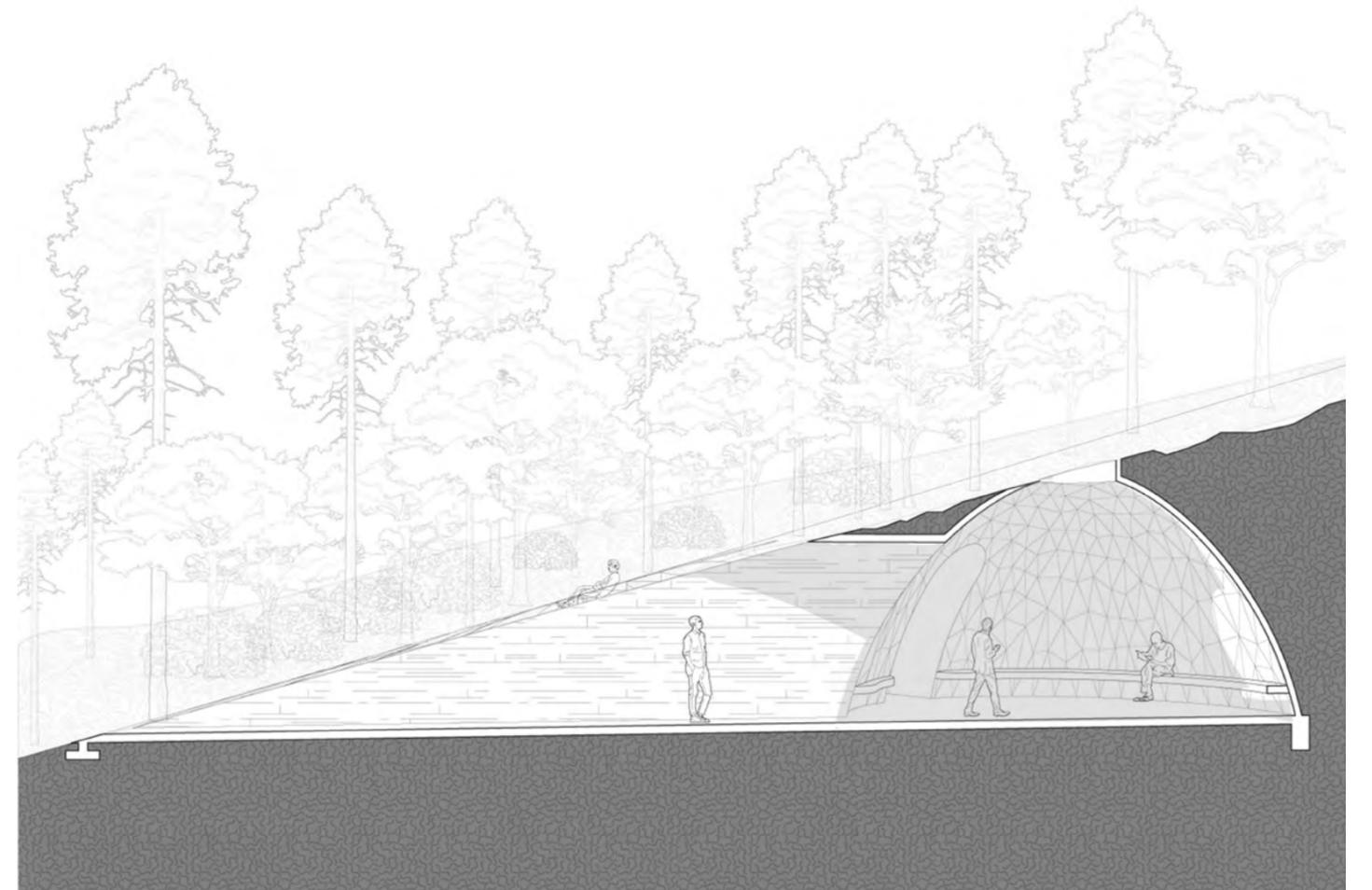


The museums would be fragmented onto the site each housing a different program, the entry next to the parking lot has administrative work and toilets, the main public museum is located on the bottom of the hill that would act as a gateway to the spiritual world. Afterwards there is a gradual change in the level of privacy that the program hosts, such as the solstice space, which is designed to be for more intimate and private ramapo rituals such as solstice rituals, as well as the recitation of oral history.



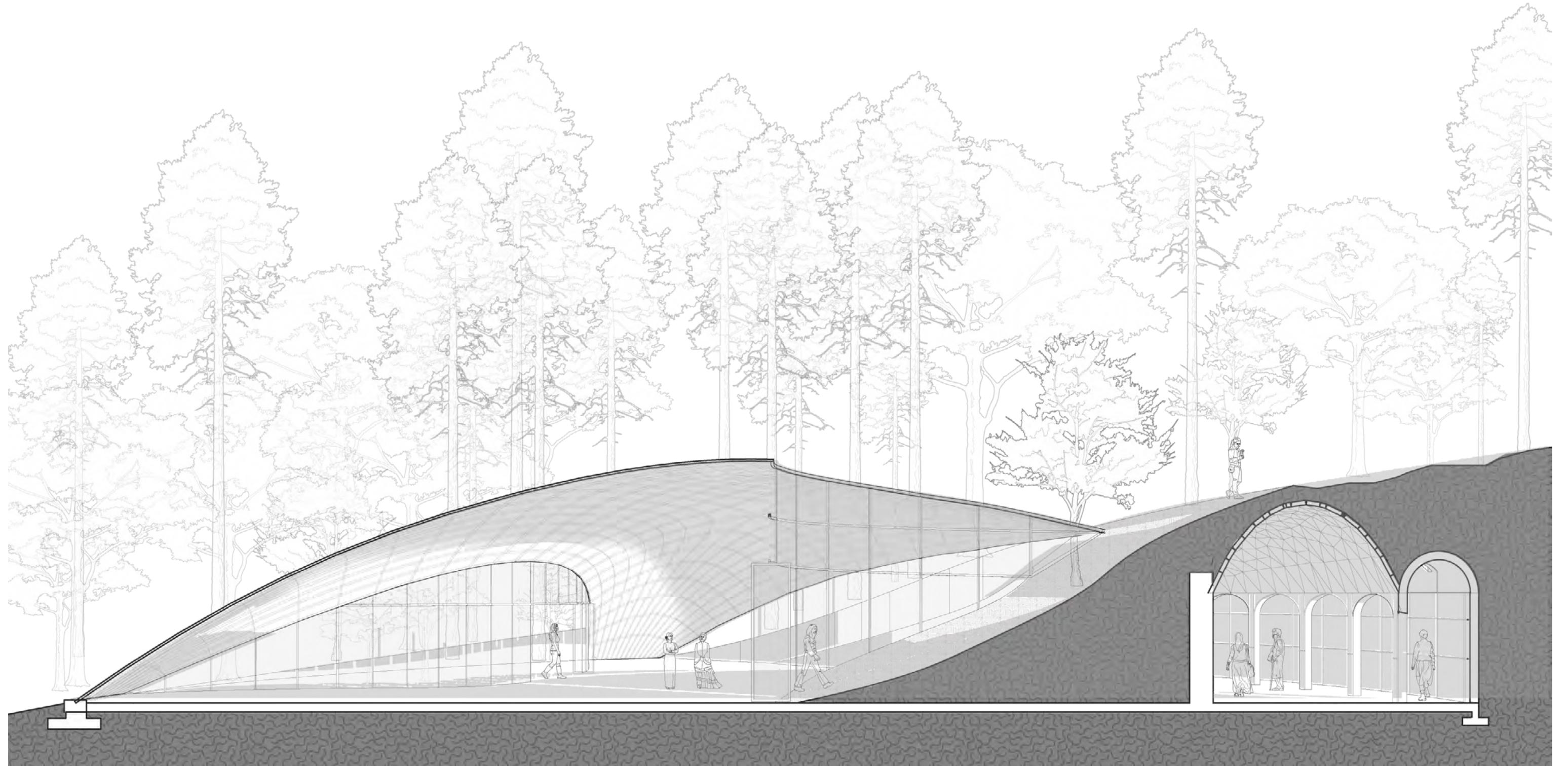


The Solstice Space was designed for the annual celebrations that happen during the sunsets on the day of the Winter and Summer solstice. As the sun sets, it perfectly aligns with one of the two entrances to shine the center of the shell, marking the start of the solstice rituals.

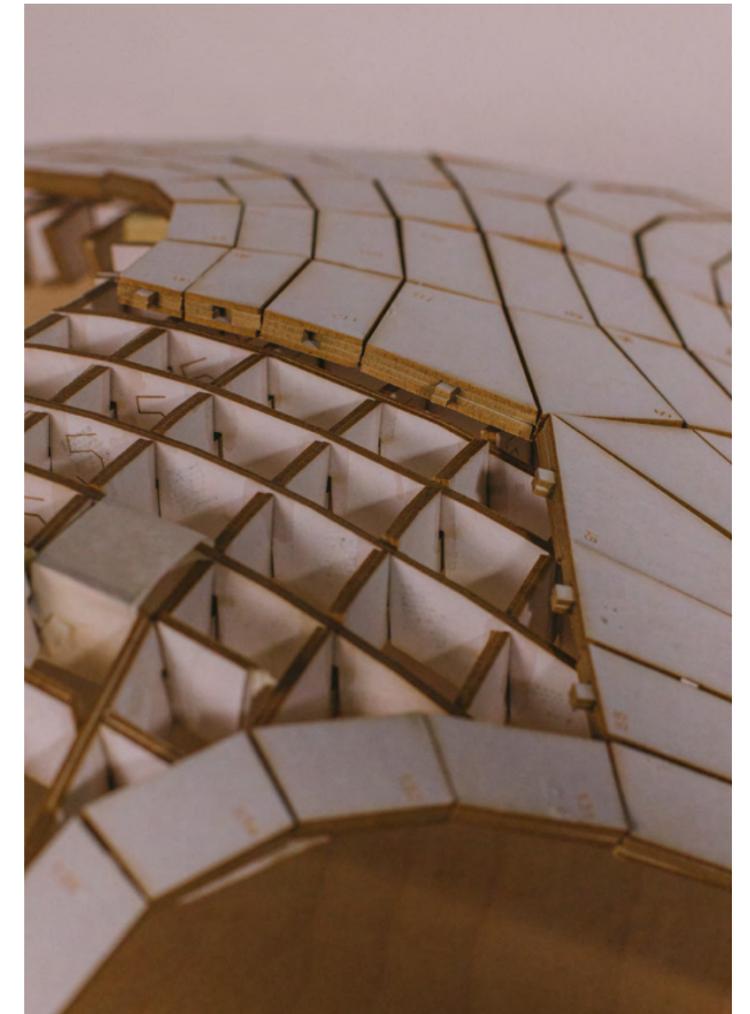
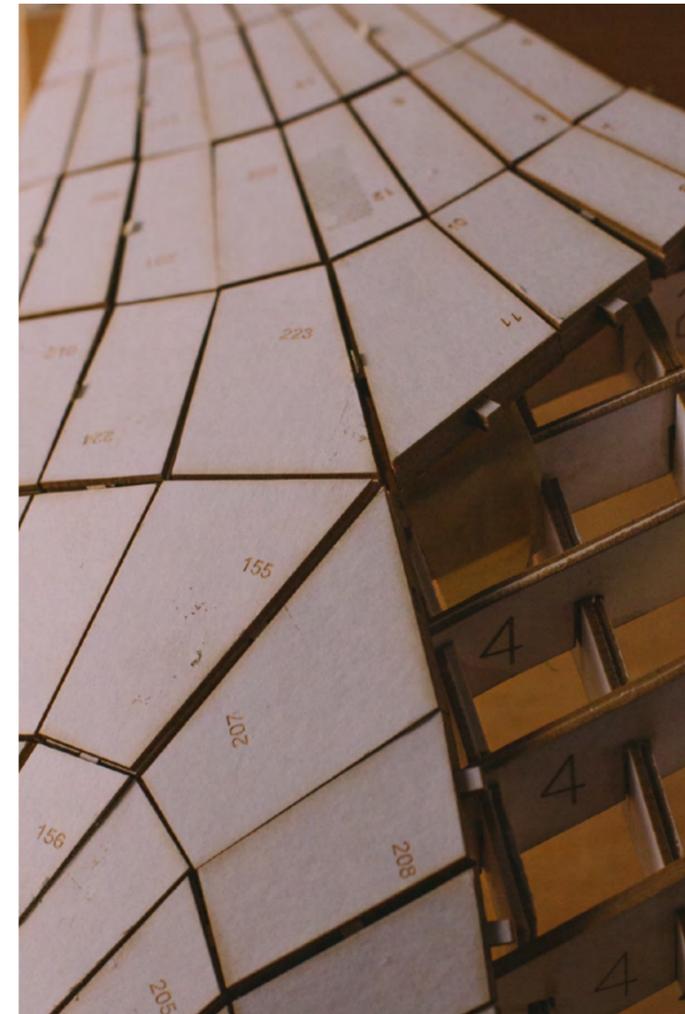
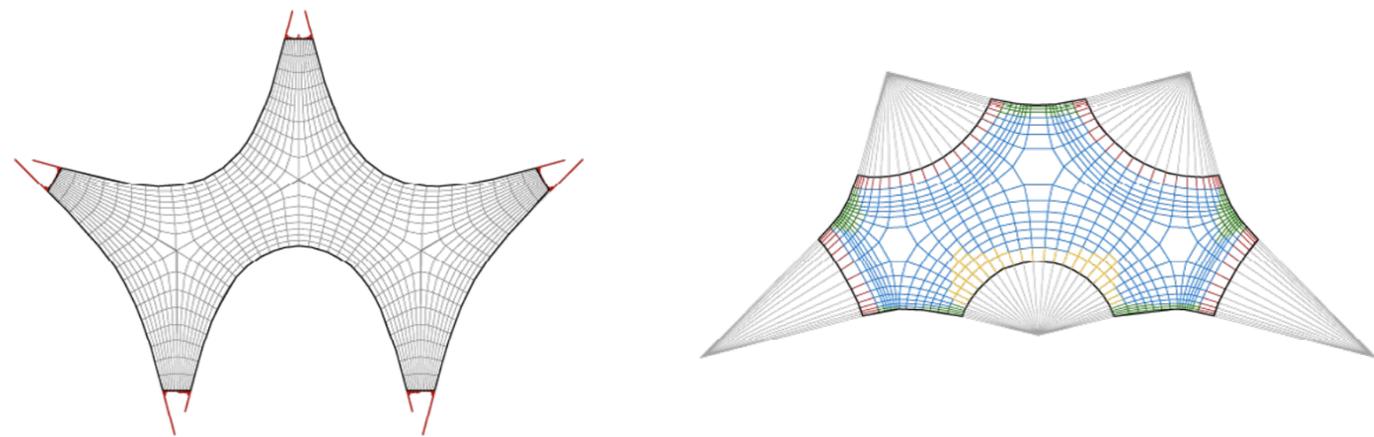


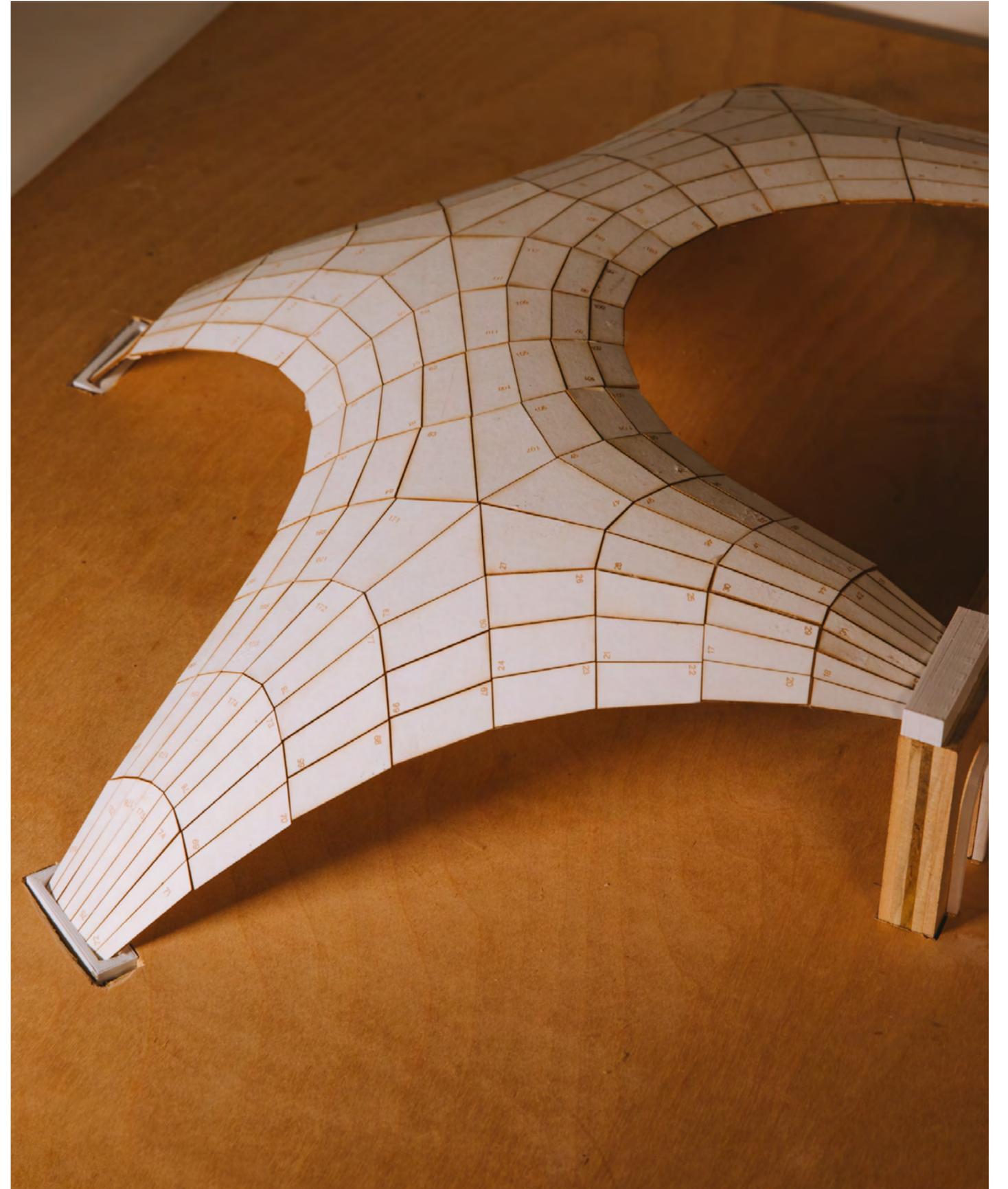
Design Studio

Tectonic Resistance



224 unique tiles make up the shell, numbered based on their corresponding edges. Each tile has positive and negative joints that slot in together without needing any mortar, adhesives, or concrete. The compression only shell is self supported by its geometry and by relying on its strength through computational geometry, the thickness of the shell can be reduced to 1/3 of what is normally needed to achieve that span. This means that less material is needed which aids in reducing the embodied carbon of the building.





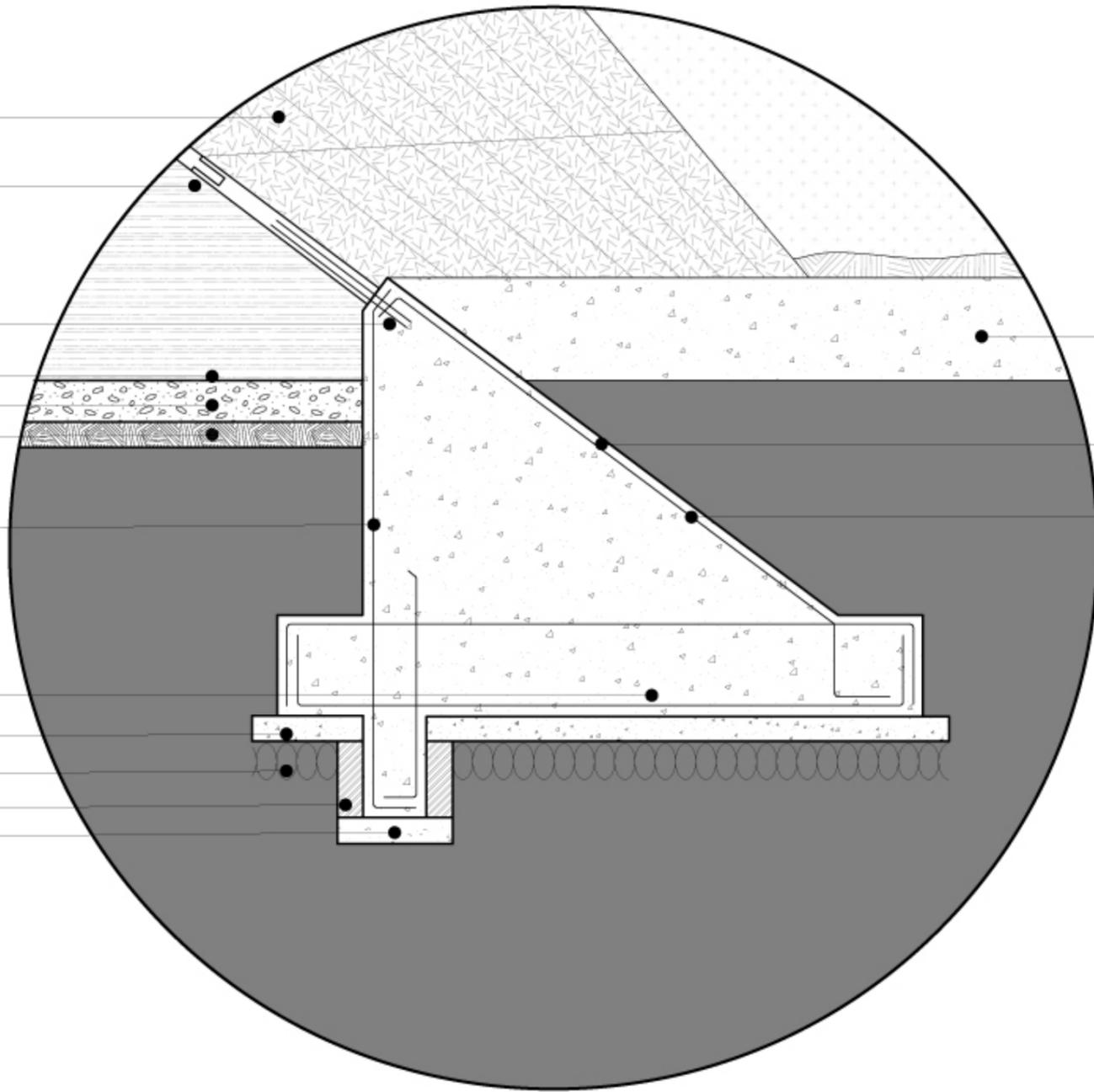


One layer of 7cm thick Granite Stone
 Tiles laid as per diagram
 without adherence
 Male Female Joinery system

P.R Dowels
 Ground Level
 250 mm Thick Rubble Packing
 Rammed Earth

16 mm DIA Reinforcement at
 1000 mm c/c

12 mm DIA Reinforcement at
 1000 mm c/c
 P.C.C 1:4:8
 Rubber Soiling
 Brick on both sides
 P.C.C 1:4:8



Plinth Level PCC

RCC Pedestal

16 mm DIA Reinforcement
 at 100 mm c/c

Tectonic Resistance



The private museum which is hidden from the public eye and only has a visible entry. the visible part of the museum decreases in size until the most private space which is completely embedded in the ground. A path between them was deliberately not drawn or designed to mimic the nature of those rocks that are scattered around the hill with no clear delineation to them.



[CLICK HERE TO WATCH](#)

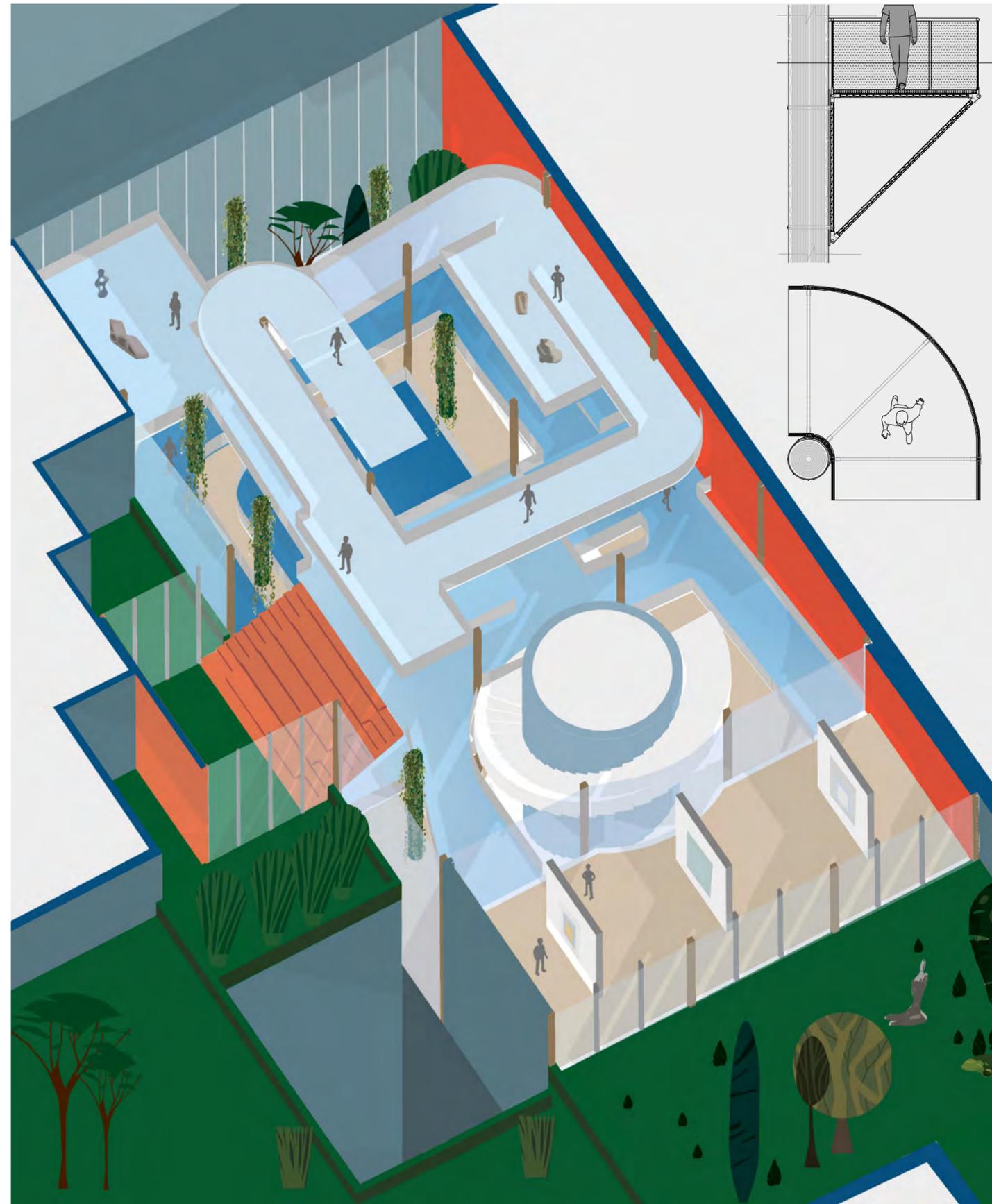


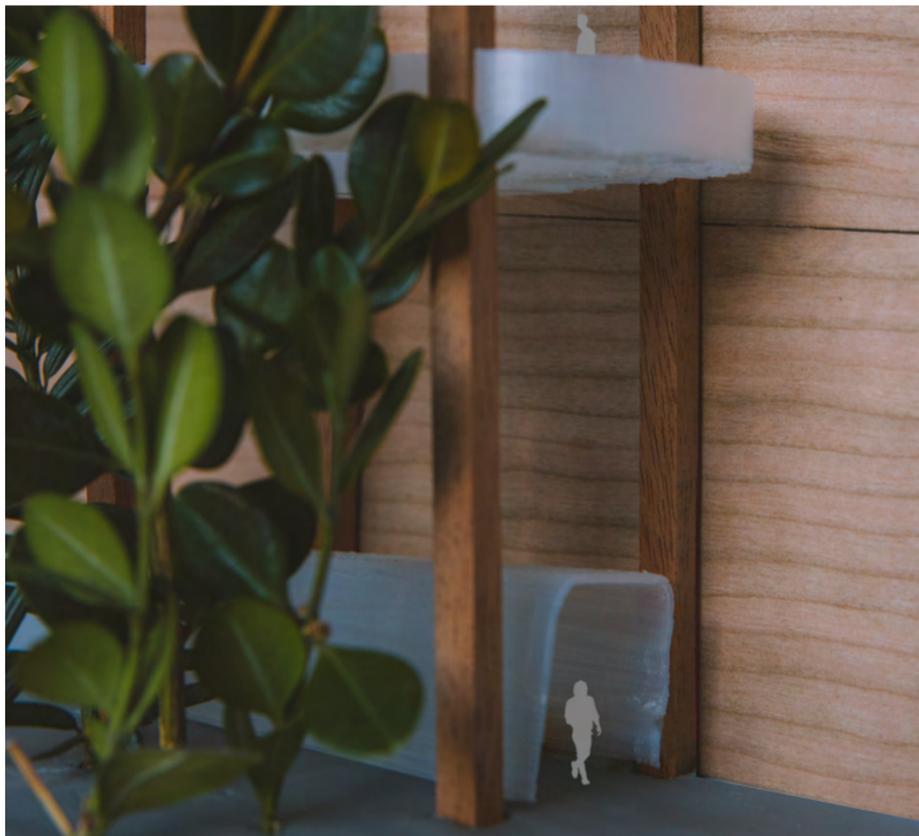
VERTICAL SCULPTURE GARDEN

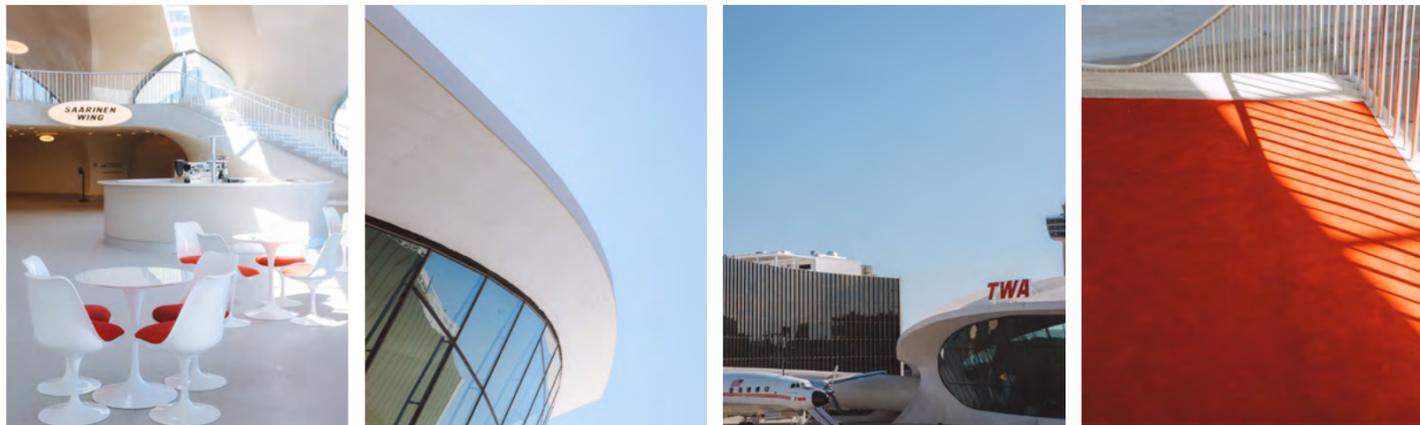
COURSE:	CORE I
SEQUENCE:	DESIGN STUDIO
PROFESSOR:	AMINA BLACKSHER
LOCATION:	MANHATTAN, NYC

While Union Square and Madison Square Park are engaged during the year, the harsh winter climate of New York makes them relatively inactive during a certain period of the year. The Vertical Sculpture Garden uses that temporality and creates an enclosed park such that the neighbourhood has a public space occupiable in the Winter as well. The vertical park is experienced through ramps that meander through the space where users contemplate the relationship between nature and sculptures.

The phenomenological journey through the space spills out onto adjacent buildings appropriating their rooftops that expand the public garden to an exterior one as well.







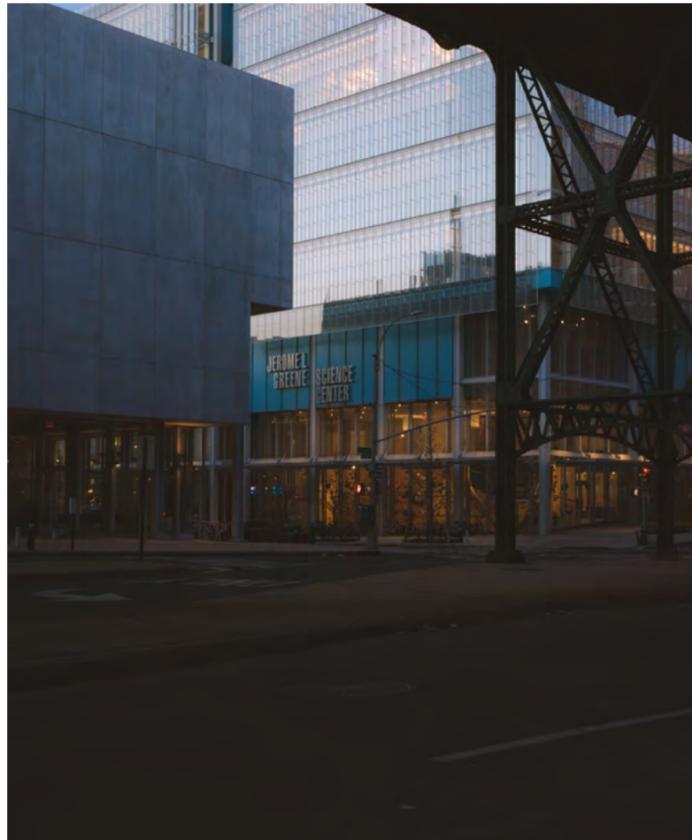
ARCHITECTURAL PHOTOGRAPHY

COURSE:	FROM MODELS TO THE BUILT WORLD
SEQUENCE:	VISUAL STUDIES
PROFESSOR:	MICHAEL VAHRENWALD

Photography is a medium that can be used to document the built environment both objectively, and expressively. Our time at GSAPP was largely shaped by the Covid-19 pandemic who's effects were felt in the built environment. Four photographic series captured the built environment in this critical time, whether through issues of deglobalisation, equity in public space, lockdown measures, and gentrification.

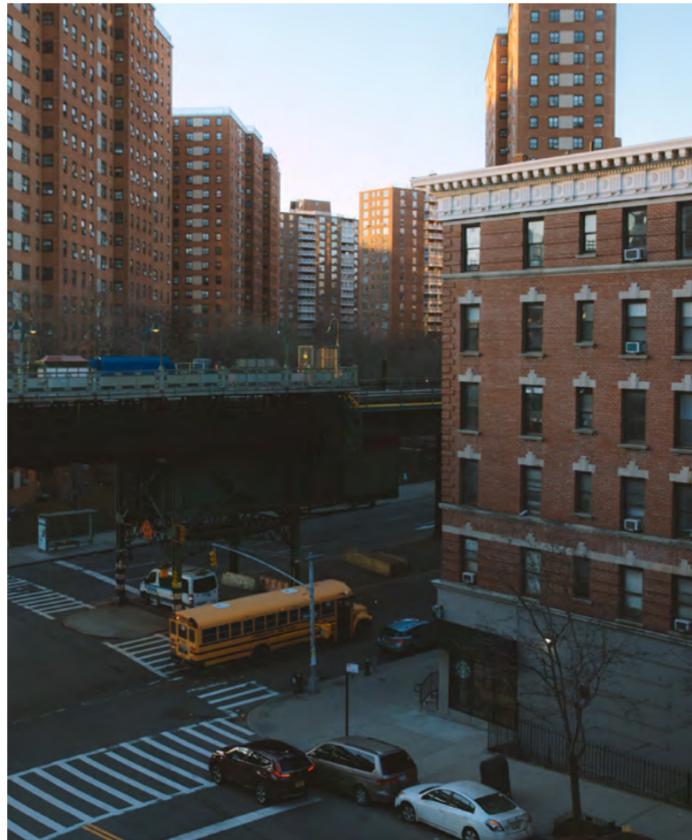
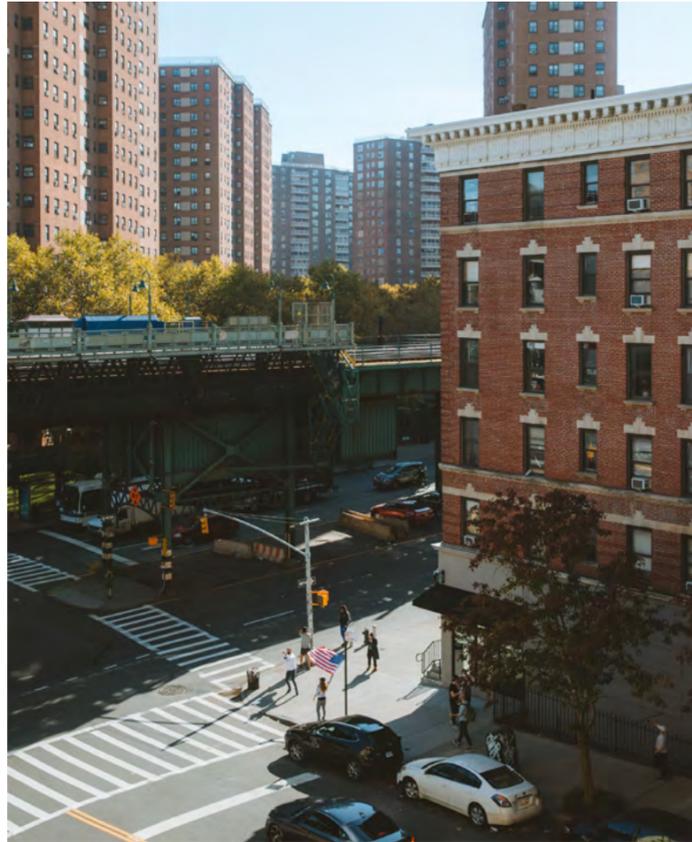
Harlem Expansion

Columbia University's expansion and encroachment towards Harlem continues to be a contention point between the university, local officials, and residents. The photography series shows the Jerome Greene Science Center not as a solitary building, but situated within a larger context.



Broadway and Tiemann Pl:

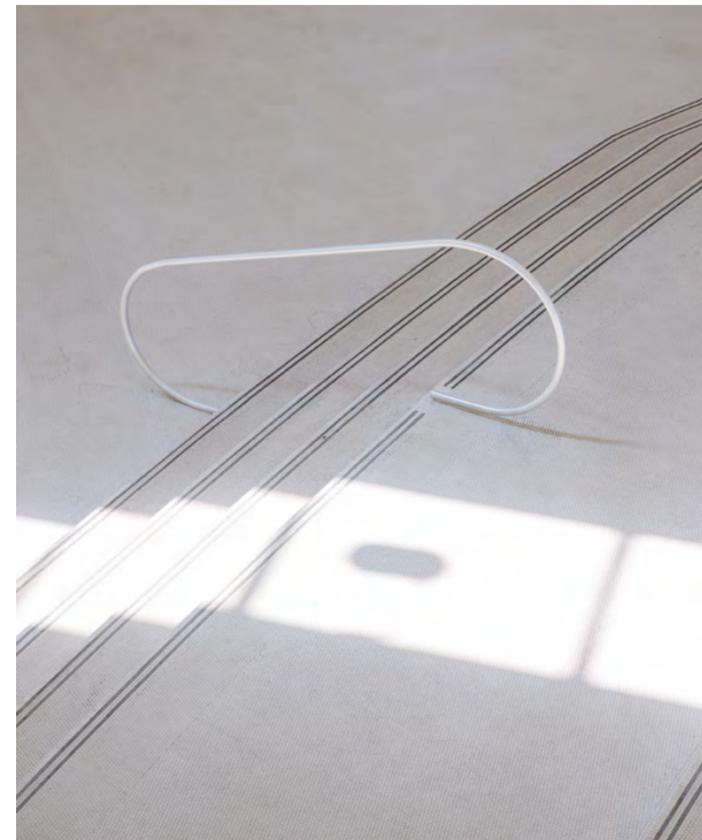
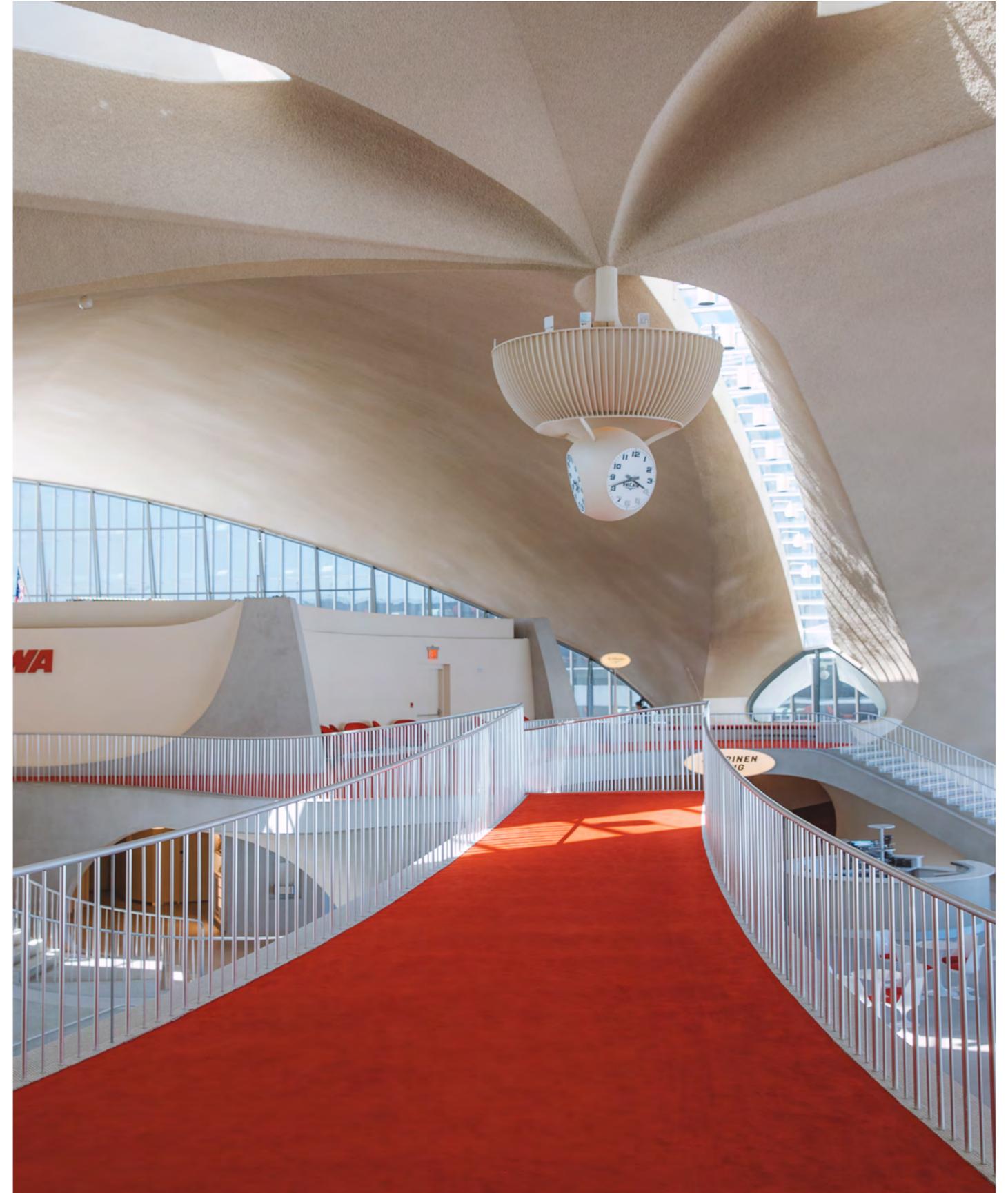
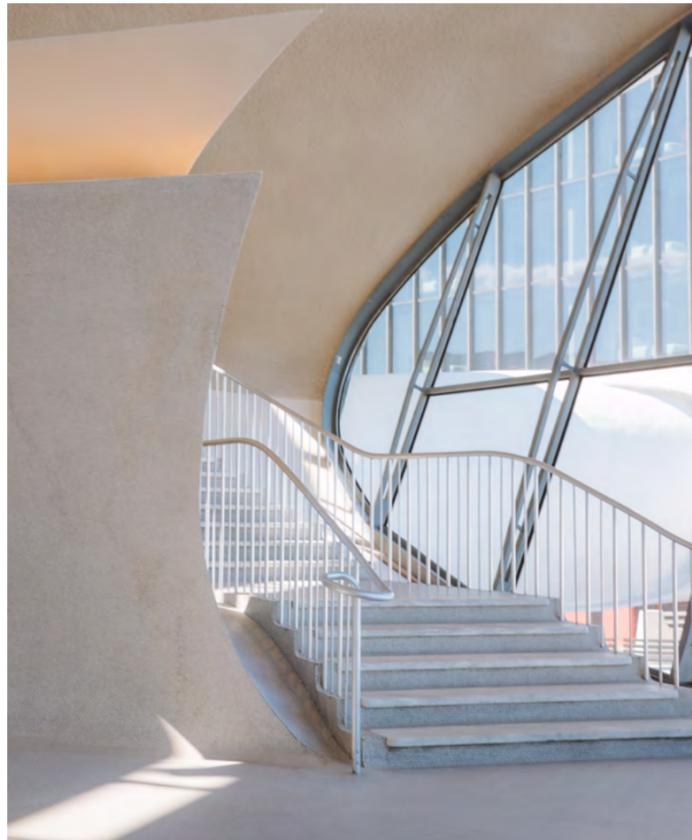
The series which began during the lockdown period as New Yorkers were confined to their apartments, *Broadway and Tiemann* has expanded as a documentation of the junction of Broadway and Tiemann Place. The South facing window overlooks the junction with its unique position where the 1 train is elevated above the ground and all of the idiosyncracies of human behaviour, social habits, and season change.



Transient Deglobalization:

John Glenn orbited the Earth in 1962, which was at the same time that the TWA Terminal was being designed and built. Glenn's orbit, the advent of the golden age of air travel, the futurism of the TWA terminal, these were events that advocated globalisation. It seemed that the whole Earth was connected and accessible.

In 2021, as the world is battled, and is still battling the covid-19 pandemic, the TWA terminal (now hotel) lives in a duality, a capsule, that is in tension between globalization and deglobalization. The futuristic shell that celebrated the connectivity of the world is clashing with a timeline in which the world saw a rapid, and perhaps transient shift to deglobalization to halt the spread of covid-19. This series explores this unique point in time where this duality is embodied in a building.

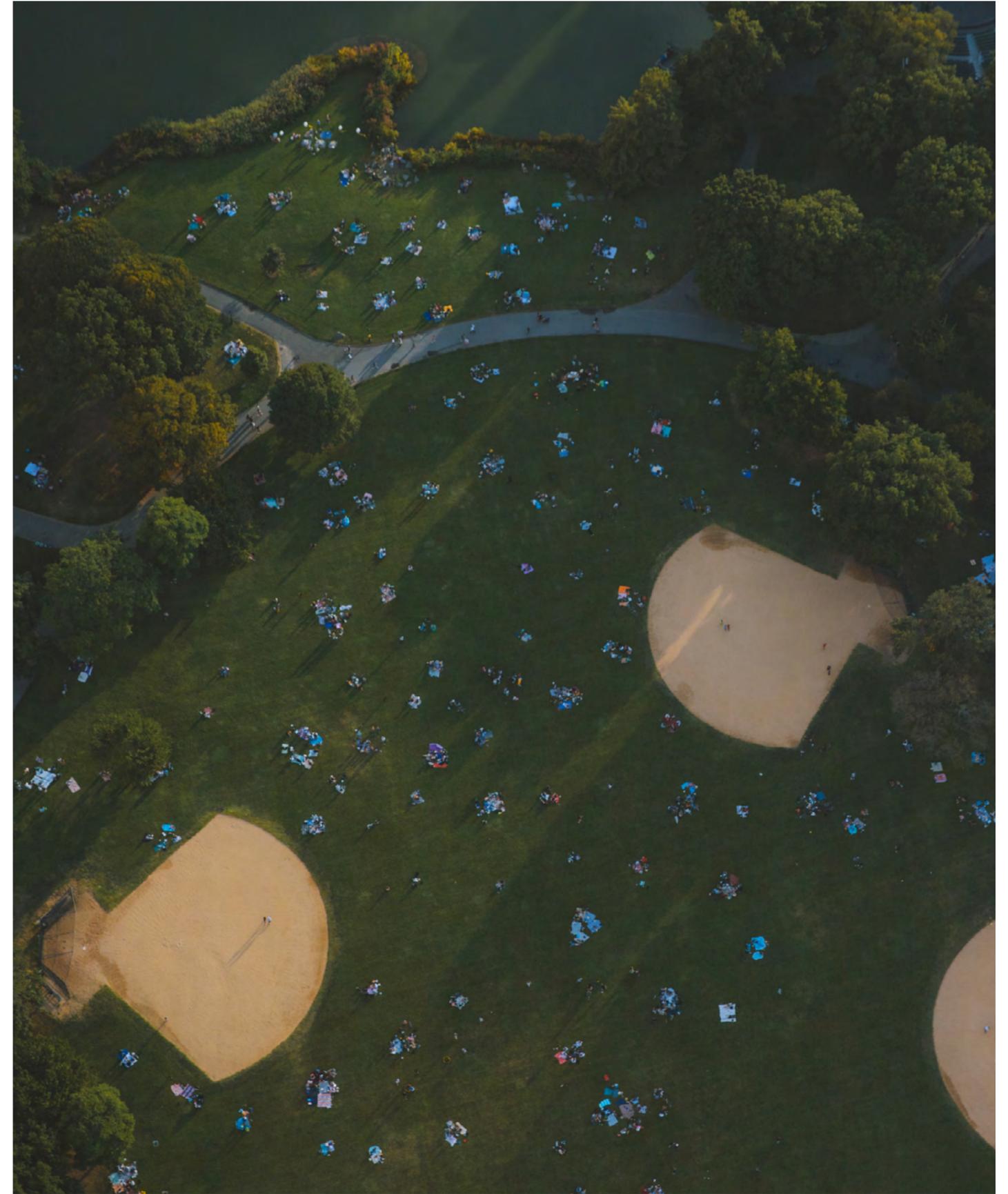


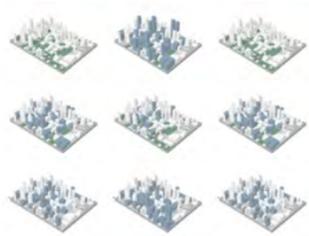
The Sacred Space:

As New York City was easing its lockdown measures, the emergence of the sacred unit of 6 ft was introduced into our collective imagination as medical experts continuously preached this unit as the safe bubble that we must abide by to stay safe. The Sacred Space is indicative of a privileged lifestyle where people bathe in the sun and enjoy the summer, rather than having to queue for basic necessities such as water, food, or medicine.

The exploration broke the two dimensionality of the ground and further navigated in the z plane to document the Sacred Unit through drones and helicopters.

The photo essay which explores New York City's vital public life in this critical time invites us to consider the relationship between our collective behaviour and representations of the Sacred Unit.

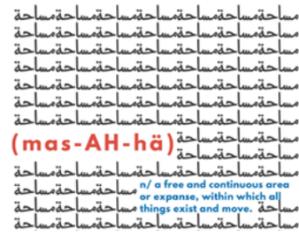




HOUSTON'S PROBLEM



HETEROTOPIA OF DEVIATION



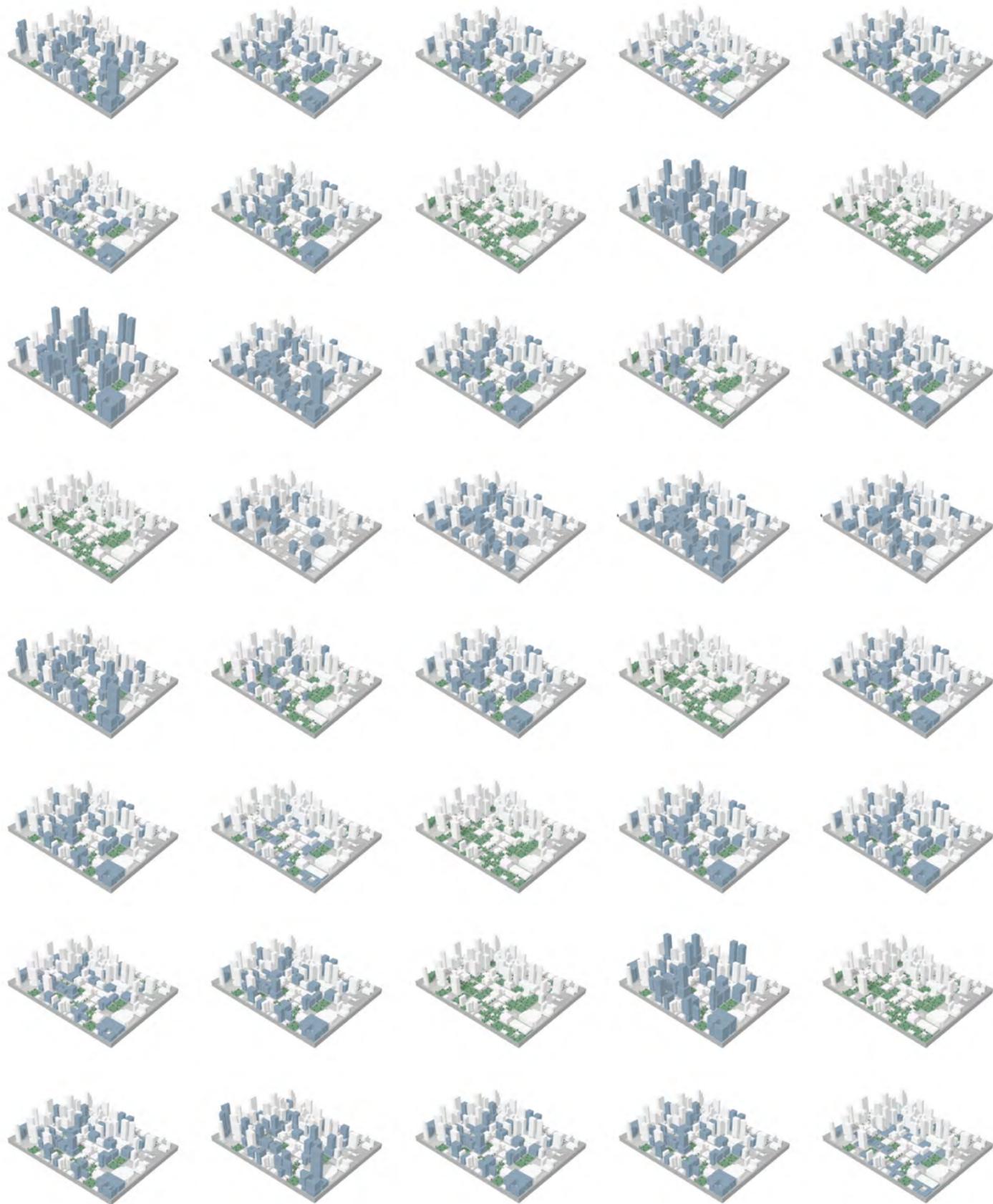
MASAHA



THE AMERICAN SUBURB AND ENERGY

CLIMATE AND POLITICS

The environment is constantly shaped and reshaped by policy. These political decisions have massive impacts on societies and climate. In this chapter, we research, have conversations, and try to understand the implications of politics on climate.



HOUSTON'S PROBLEM

COURSE: X-INFORMATION MODELLING
SEQUENCE: BUILDING TECHNOLOGIES
PROFESSOR: SNOWERIA ZHANG
LOCATION: HOUSTON, TEXAS
COLLABORATORS: FARAH AHMED, NAYEF ALSABHAN, VINAY AGRAWAL

Downtown Houston which does not have any zoning laws is filled with empty parking lots. This has led to a district that is unwalkable and does not utilize its space efficiently. The scale and concentration of commercial buildings does not lend itself to an inhabitable cohesive neighborhood.

Studies show that decreasing the number of parking spots is a crucial step towards walkability. The project is a tool that allows people to re-design downtown Houston's empty parking lots and decide how to reprogram them to create a more livable downtown.

INPUTS

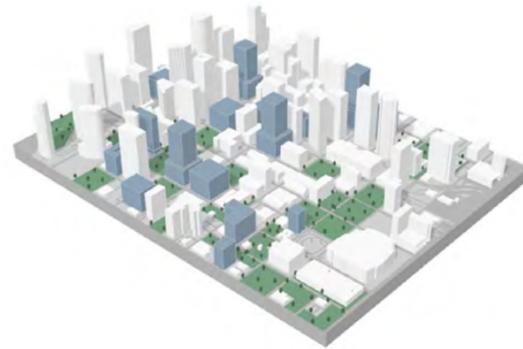
Percentage of Parking Lots Changed

35% 70% **100%**



Green Space Percentage

0% 35% **70%** 100%



Building Program Selection

Mix 1	Mix 2	Mix 3
60% Mixed-use	60% Residential	60% Parking
30% Residential	30% Mixed-use	30% Mixed-use
10% Parking	10% Parking	10% Residential



Density Distribution (FAR)

1.0 3.8 4.5 **6.0** 7.5

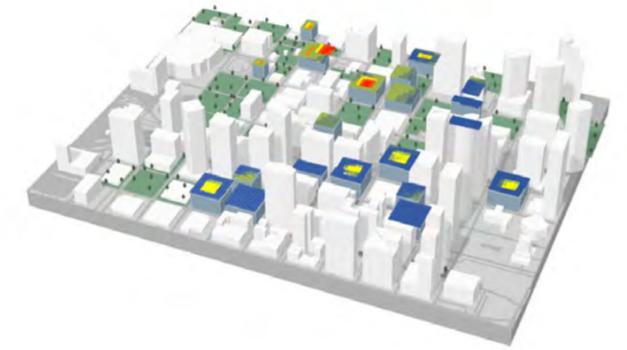


METRICS

Solar Energy - kWh/m²



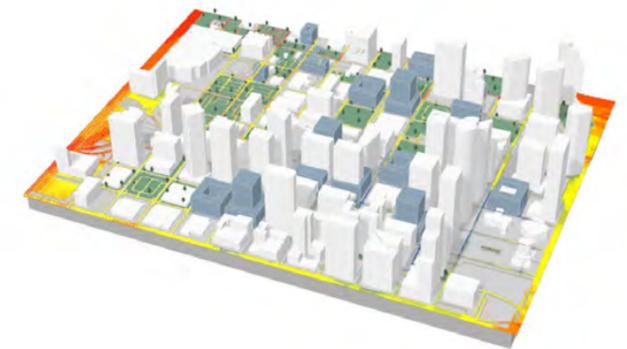
Measurement of the ratio of estimated annual energy use on the site (assuming an average of 120kWh/m²) covered by PV generated electricity on roofs



Shade - kWh/m²



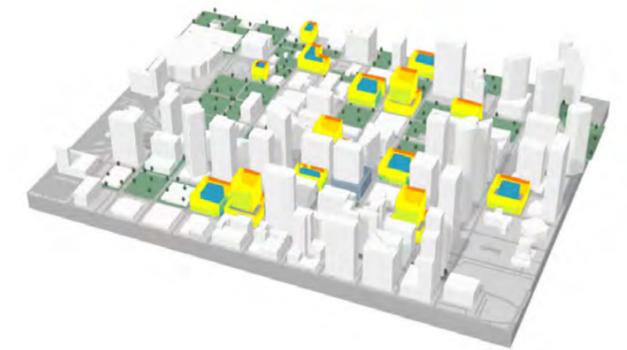
Measurement of the ratio of shade on the ground level

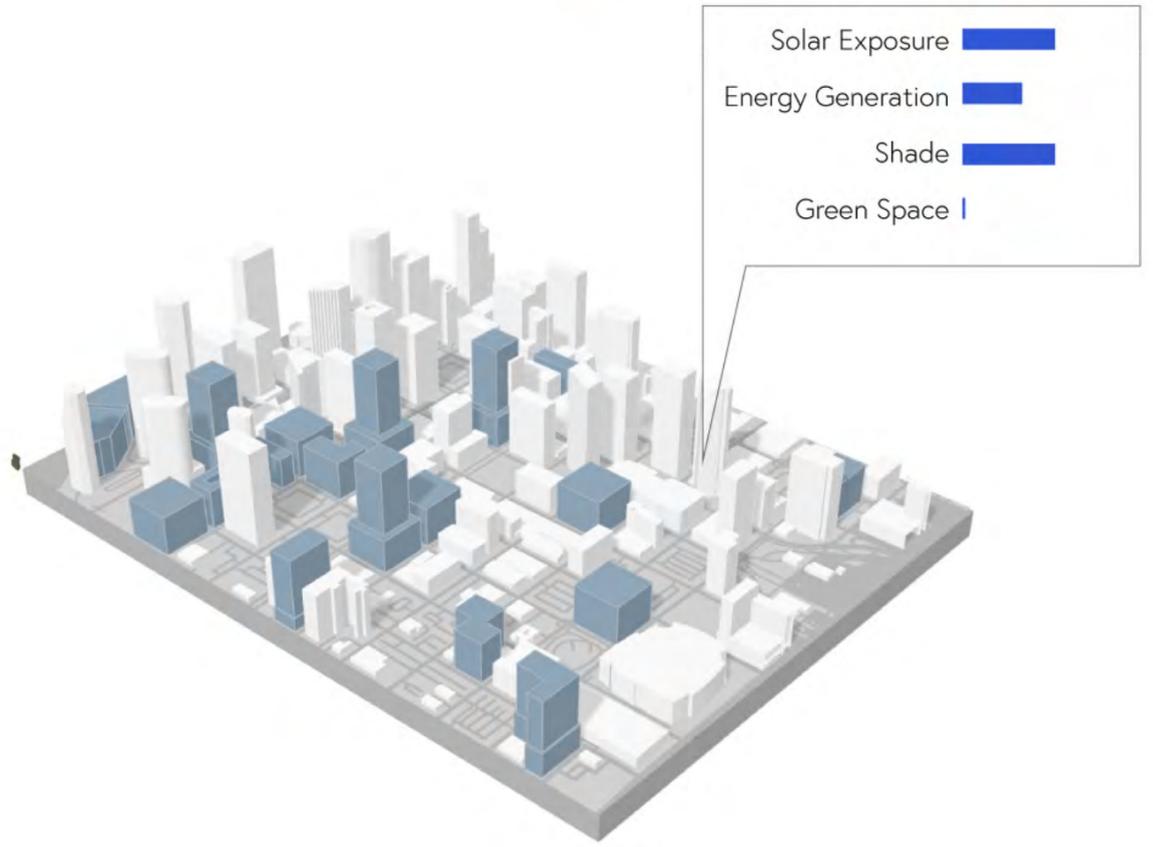
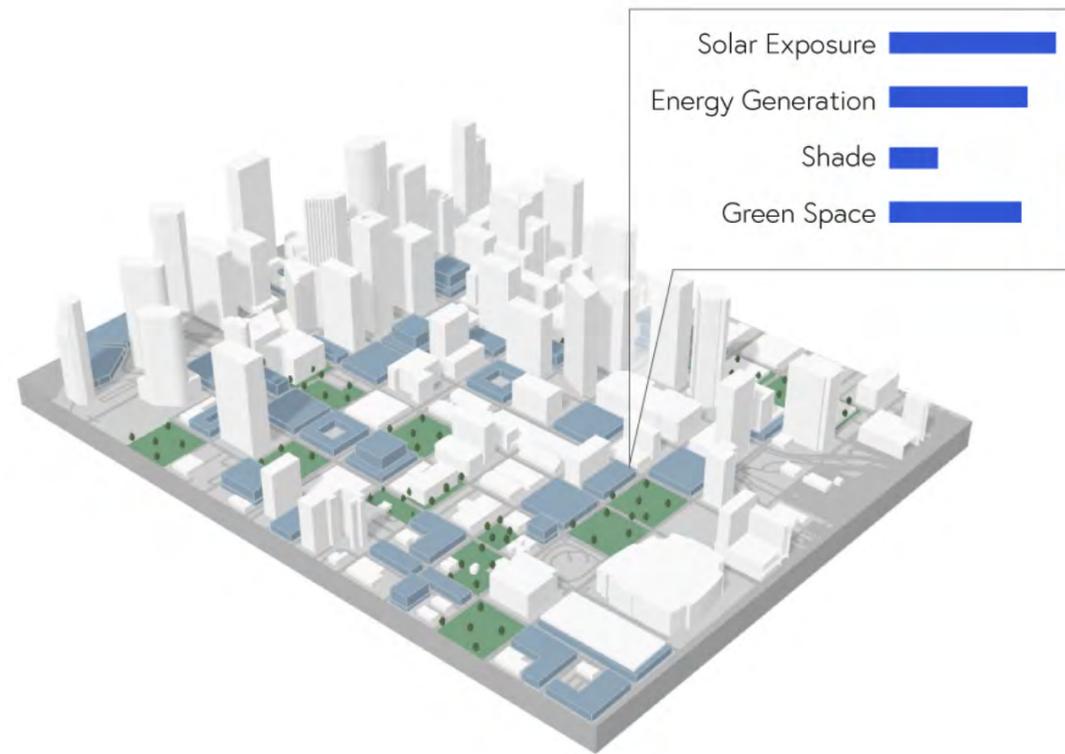
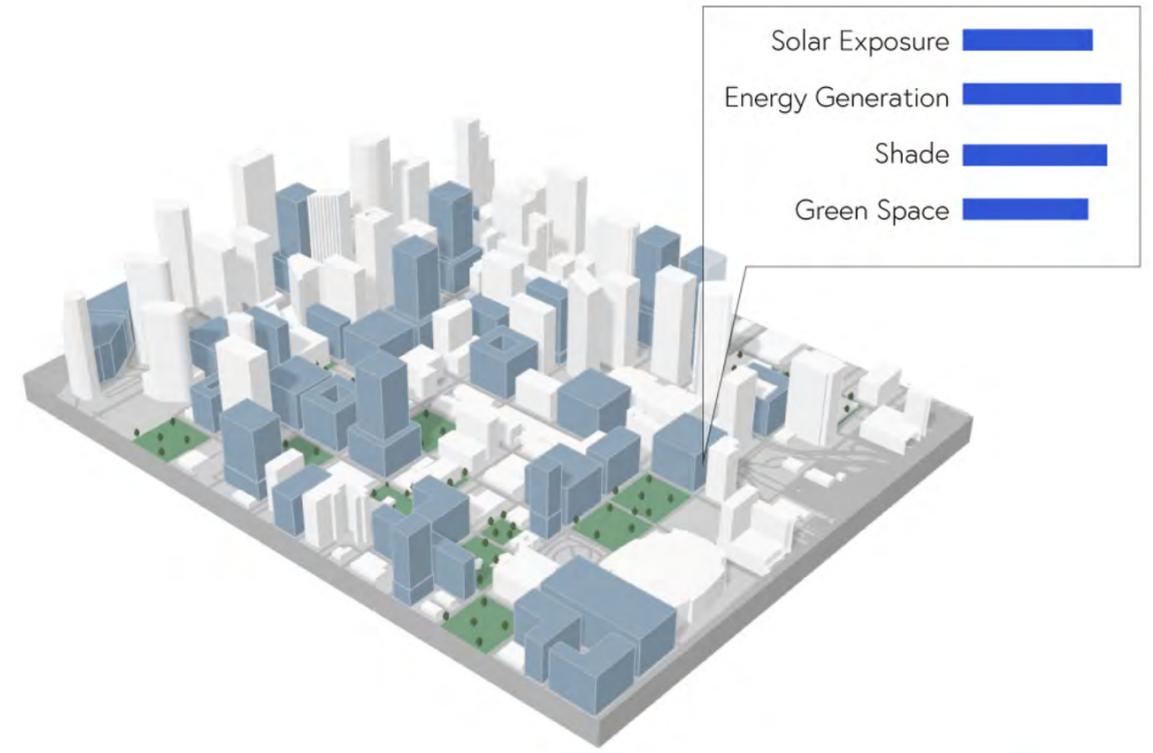
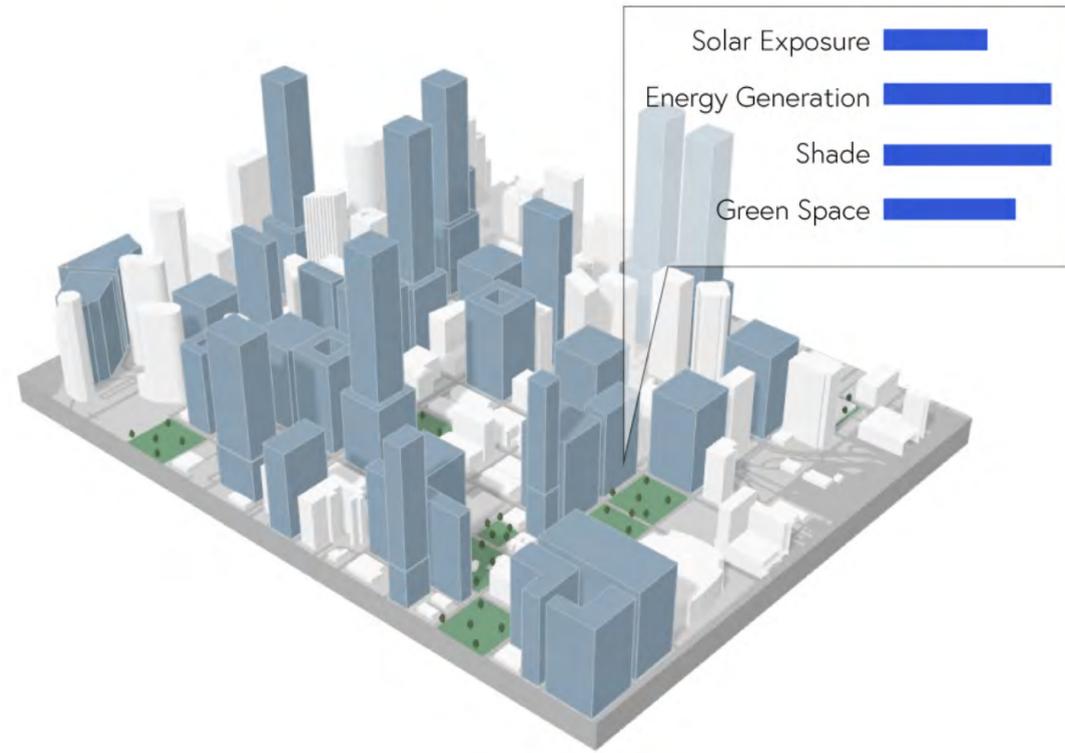


Solar Exposure - kWh/m²



Measurement of the solar exposure on the building envelope





COURSE: ARAB MODERNISM(S)
 SEQUENCE: HISTORY/THEORY
 PROFESSOR: YASSER ELSHESHTAWY
 COLLABORATORS: AYA ABDALLAH, SARAH HEJAZIN

HETEROTOPIA OF DEVIATION: ANALYZING BEIRUT THROUGH ITS MARGINS CAPERNAUM AS A CASE STUDY

Abridged version

As many cities around the world are dealing with issues of urbanization, rising inequality, and marginalization, Beirut is no different. In fact, many Arab cities, which are often said to be exceptionalized from global development, have been wrestling with these same issues. Joseph Fahim, the Egyptian film critic who is optimistic about the profile of Arab film points to how recent movies such as Capernaum and In the Last Days of the City are poignant films that have rightly received recognition across the globe.

"The situation in the Arab world now is difficult, But, for me, that means there is fertile ground for great cinema - for creators to try and work around the system to create great stories".

While film-makers and artists should not be joyous that the situation breeds great stories, shedding light on these issues can possibly lead to change. Labaki's Capernaum, whether successful or not, tries to do just that in Beirut.

Tires as makeshift roofs, dilapidated neighborhoods, broken windows, garbage filled streets and slums that don't seem to end. These are the first few minutes of the movie Capernaum that starts with the absence of dialogue, but we are greeted with one of the main characters of the movie; the city. A city where deviation of heterotopia exists as the marginalized citizens of Beirut are crowded, neglected and pushed to the edge. In these marginalized spaces, we witness a duality between the housing conditions of Zein, the undocumented Lebanese young boy, and Rahil, the Ethiopian migrant worker. This duality makes clear the neoliberal policy of Beirut, that despite some differences that we will highlight in this paper, both are victims of policy in Beirut that abandons lower income communities. The movie is about Zein who comes from a large family living in Bourj Hammoud that is a victim of the exclusionary system that is happening in Lebanon. Zein is suing his parents for giving him life in a world that doesn't seem to be working. But what we come to realize throughout the movie is that he shouldn't be suing his parents, but the system, which his parents are also victims of. The movie follows Zein and we meet many characters who are victims of this exclusionary system that are struggling to stay alive, whether they are Syrian immigrants, Ethiopian domestic workers, or simply Lebanese citizens who have been neglected by their government.

Capernaum can be categorized as a docudrama, where fictional form is combined with documentary content. It is not filmed in a set, but in the actual locations that are seen in the movie, with a large number of the cast being non professional actors. Furthermore, the director Nadine Labaki adopts the filming method "a slice of life", that are clips that show the city and the people, which allows the city to become a character in the movie. Labaki attempts to achieve realism by not having a script but a vision, where the actors are given the freedom to express themselves. Nonetheless, the movie, or any movie, is not immune to

the inherent bias that the directors and producers have and many have critiqued Labaki for the movie as being "poverty porn". However, she hits back saying:

"It's very easy to write a cynical review in a cafe in London or in Paris, sitting in your own bubble, not understanding what's going on in the world. Unfortunately the reality is much harsher than what they see in the film. So if they think this is poverty porn, I don't know what they will do when they see the reality of it".

Through this tension between the screen and reality, the paper will examine the relationship between the characters of the movie in their interaction with the built environment, and the degree to which the movie is a reflection of reality.

The movie was filmed in Beirut in three main locations; firstly, Bourj Hammoud and its vicinity which includes Sin il Fil, the Sunday Market, and Karantina, secondly, Raouche, and finally Roumieh Prison. The framework of the paper was determined based on these locations and segmented them as the following: Zein's family's house in Naba'a, Rahil, the Ethiopian worker's house in Karantina, and what we're calling the in-between spaces in the movie. These spaces are scenes where we see how marginalized communities occupy public space, such as the Souk Al Ahad, and Roumieh Prison.

The overarching theme of the movie emphasizes how poverty is more than monetary deficiency, as the world bank definition confirms. But rather, it is a multifaceted issue that makes it difficult to have any social advancement.

In Labaki's Capernaum, Zein's family live in one of the many slums that are scattered around Beirut. These scenes were filmed in the East Beirut neighborhood of Bourj Hammoud even though it is not explicitly mentioned in the movie. However, Bourj Hammoud represents many of the neighborhoods that are neglected by the government and investors due to a number of reasons. These reasons could be attributed to the fact that many residents are not voters either because they are refugees, immigrants who cannot vote, or undocumented people. Furthermore, the neglect is also due to the low environmental quality of urban space and being a low-income neighborhood with no significant purchasing power. As a result, many of these neighborhoods suffer from lacking proper infrastructure to public space, and often, segregation.

Media in Beirut has had many different views of Bourj Hammoud in the past, and continues to do so. While some romanticize it and see it holding "old traditions that are seen in the countryside" by having for example "laundry lines hanging from balconies", other media outlets spew and ignite the division that has been part of Bourj Hammoud. These media outlets feed on dividing the diverse population of Bourj Hammoud and Nabaah that has residents from different backgrounds such as Christian Syriac, Armenians, Orthodox, Catholic, Shiite Muslims, Sunni Muslims, and Druze. However, this division is mostly created between Syrians and Lebanese, as some media outlets write "it [Bourj Hammoud] has many unruly Syrians that go out at night to rob and riot... and are distributed all around the area which means it is only a time ticking bomb".

To understand this division, and to be able to assess it against Capernaum, we briefly look at the history of Bourj Hammoud which started under French rule where Naba'a became a camp

for Armenian refugees after they were transferred from Karantina to Bourj Hammoud. The transfer of properties that are adjacent to Naba'a into camps led to a decrease in real estate prices in Naba'a which allowed the owners of these properties to divide and rent or sell them to the displaced. Throughout the fifties, most of the houses added floors without permits and appropriated the neighbourhood without any planning from the governments, which led it to become deprived of goods, services, and proper infrastructure to accommodate a population that were mostly low income Shiites. Naba'a's demographic and urban fabric changed after the events of "Tal al Zaatar " under which it was besieged which led to many residents leaving the areas and the Kataeb occupying it. After the end of the civil war, the Ministry of the Displaced wanted to return the homes to their original owners, however, it was not in their interest so they rented their apartments to working migrants from Syria and Ethiopia.

Today, 61% of the population of Naba'a are Syrians, 35% Lebanese, and 4% being from other nationalities. The large number of Syrians in Naba'a is partly due to the fact that some homeowners rent out their homes to Syrian refugees who are able to pay higher rent since in some cases more than one family shares the house. This allowed some owners to either evict or raise the rent on some Lebanese residents which also fueled the division and the belief held that the Syrians are responsible for the degradation of Naba'a. The unfortunate image that Syrian refugees have had to bear not only in Naba'a and Beirut, but also across the world, is that they pose an economic burden. In order to allow independence for many Syrian refugees is that they have repeatedly requested from the Lebanese government not to establish camps that are formed spontaneously. And especially since Lebanon lacks concrete policy regarding refugees and slums, the UN and Mona Fawaz believe that the best solution would be to allow refugees to integrate into the society by providing them with financial assistance to participate in society such as renting apartments. However, the tenants, whether they are Syrian or Lebanese are suffering from increased prices due to monopolistic practices by the small number of owners that control the real estate market. Nonetheless, both Syrians and Lebanese in Naba'a are neglected and live in impoverished conditions that are characterized with overcrowding, and poor services experience social exclusion regardless of their ethnicity, age, or gender.

This neglect by the government seems to a certain extent to be on purpose because the municipality of Bourj Hammoud has proven its ability to create successful infrastructures and neighbourhoods but are missing from Al Naba'a. After raising this issue with the municipality, they claim that "the houses are in contravention of the law and there is no limit to those who are registered" which vindicates them by blaming the residents.

Mona Fawaz points out the duality in hardship by both the Lebanese, and the Syrian population and proposes to provide both the host community, as well as the refugees with financial aid to allow them to grow together, given that both are suffering from economic hardships. Fawaz also urges the Lebanese state to "enter the slums through conscious development policies instead of isolating them from their surroundings, and waiting for the explosion of extremism, by notifying the residents of these areas that they are part of the community".

Fawaz's insight rings true to what we saw in Capernaum in how Naba'a was represented. While some aspects of ethnic tensions between Syrians and Lebanese were not glaring, the

viewer can pick up on the fact that the underlying issue for their difficulties is neglect from the government, which only feeds the predatory lifestyle of survival of the fittest. One of Zein's main difficulties that we see in the movie is the fact that he is undocumented, which means he isn't able to go to the hospital, to vote, or to be recognized by the government. And that is evident in the municipality's refusal to contribute saying that tracking the registration is difficult. Furthermore, Zein's father was under the control of his predatory landlord living in difficult conditions, which forced Zein into child labor, and his sister Sahar into child marriage which lead to her tragic death. The cycle of poverty which is seen in the movie coincides with Mona Fawaz's concerns about the future of such neighborhoods that result in extremism as a result of poverty. The issues of undocumented, neoliberalism, and exclusion that are a reflection of the reality in Naba'a lead to one of the main plots of the movie, Zein's eventual breakdown and resort to violence.

Many Lebanese movies such as "In the Battlefields (2005)" were heavily censored and banned due to their criticality towards security institutions. Despite this, Capernaum is celebrated with pride as a Lebanese achievement by the Ministry of Culture as they nominate it to represent Lebanon at the Oscars. Which makes us wonder why did the Lebanese state promote it while burying more critical ones? Labaki claims that the movie sheds light on the systemic and systematic structures of exclusion, marginalization, and dehumanization in Lebanon, but how can that be true if manifestations of power and control which produce these structures are not in fact addressed in the movie? Lebanon is a fractured country with endless blurred lines. Distinguishing between public and private, formal and informal responds to the interests of the various authorities and people involved. The movie shows a topical view of that reality, where misery is portrayed as a result of people's negligence, not the state's. And while Capernaum intricately captures the long-neglected housing and infrastructure crisis that is eating up Beirut, we believe that Nadine Labaki took the conscious decision not to capture the system of marginalization that is behind it which is a decision undoubtedly related to the economies of its production.

Keeping all of that in mind, we ask ourselves a realistic question; which can be a better catalyst for change: an affecting work that raises international attention but only captures a slice of reality or a local documentary that is censored and buried in the archives of unseen works?

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(mas-AH-hä) مساحة مساحة

n/ a free and continuous area
or expanse, within which all
things exist and move.

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MASAHA

GSAPP STUDENT ORGANIZATION
FACULTY ADVISOR: ZIAD JAMALEDDINE

Masaha is a student association that investigates contemporary issues facing the Arab world. Using the historic Saha as precedent, Masaha creates a platform where diverse perspectives coexist to question and redefine the many Arab identities. The association aims to connect creative students across disciplines to contribute to the improvement and development of scholarship that focuses on the Arab world. In an existential time where we are witnessing cities being flattened to the ground, while others ascend vertically and unsustainably, we offer this platform for people who are interested in learning about our past, present, and future issues that continue to shape our cities and shape us. Masaha is a non-profit, non-religious professional organization that is open to all GSAPP students.

RESEARCH TOPICS

CLIMATE CHANGE:

The increasing environmental volatility as a result of the anthropocene is impacting the world. The contribution to climate change is seen through resource extraction and exploitation that is happening in areas throughout the Arab world and is already challenging the wellbeing of societies. Research will consider the roots of its problems, the current and future repercussions of our relationship to the environment.

CONFLICT:

Researching the many forms of conflict that take place in the Arab world, whether that conflict is urbanization warfare through the politics of space, or war and violence. Masaha aims to research the many forms of conflict, and their impacts on refugee crises, the built environment, and everyday life.

PUBLICATION

Post-Pandemic, Postcolonialism, Post-Carbon, Post- etc. How can we examine the architectural entanglements shaping the world that are in a state of constant flux. Masaha invites submissions of original research from students, scholars, practitioners, researchers to speculate the indefinite period of "Post" and its role in

ARCHIVING



Wadi Abdoun Pilot Project - Bisher Tabbaa



War as Wasteland - Farah Alkhoury



Heterotopia of Deviation - Aya Abdallah, Sarah Hejazin and Bisher Tabbaa



Archipelago of US Borders - Farah Alkhoury

NATION STATE AND THE ISSUE OF REPRESENTATION:

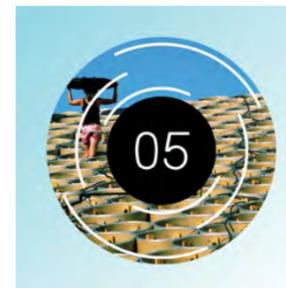
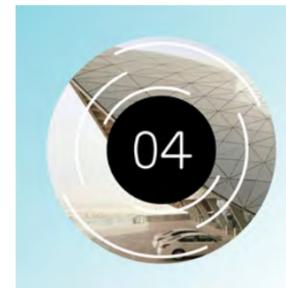
Understanding the ability of arhitecting to embody meaning, and to represent people. This is particularly relevant in the false notion of "local" and "global", which leaves architects, societies, leaders, searching for representation through the built enviornment. In a region that is often reduced to cliches and pastiches, how does the built environment reckon with the notion of representation.

LABOR, GLOBAL NETWORKS, AND ARCHITECTURE:

While many Arab cities in the last century have had building booms, we question to what extent have these come at human cost. Masaha will research and aim to understand the connection between architecture, labor, and the global networks that revolve around building.

the Arab World. From theoretical and empirical research, to case studies and critical reviews, Masaha's inaugural open call welcomes work that aims at examining the critical areas of research in the broad spectrum of architecture and urbanism.

[CLICK HERE TO LISTEN](#)



PODCAST SERIES: CLIMATE CHANGE IN THE ARAB WORLD

EPISODE 2: DIMA ASSAF AND NOCHI MOTOHARU

In kicking off the mini-series, MARCH student Bisher Tabbaa speaks with Deema Assaf (TAYYÜN) and Nochi Motoharu (Midorization Project). They discuss forest creation as a means to help restore urban ecosystems. Their work extends to protecting the genetic diversity of native plants through seed harvesting and native plant production with different nurseries. (This conversation was recorded remotely in March 2021.)

EPISODE 2: YASSER EL-SHESHTAWY

In the second episode of the Climate Change in the Arab World mini-series, MARCH student Bisher Tabbaa speaks with GSAPP faculty Yasser Elsheshtawy about pandemic urbanism in Arab cities. While discussing deglobalization, decentralization, and humanization efforts, Elsheshtawy explains how policy making and urban design during the pandemic can act as an opportunity to tackle other grave issues such as climate change.

EPISODE 3: AISHA AL-SARIHI

In the third episode of the Climate Change in the Arab World mini-series, MARCH student Bisher Tabbaa speaks with Dr. Aisha Al-Sarihi about energy politics and post-COVID sustainability in Arab cities. The conversation not only highlights the importance of economic diversification as it coincides with climate action, but also Saudi Arabia's (both government and citizen)attitude toward climate change.

EPISODE 4: GÖKÇE GÜNEL

In the fourth episode of the Climate Change in the Arab World mini-series, MARCH student Bisher Tabbaa speaks with Gökçe Günel about utopian city projects, sustainable futures, and social justice with a specific focus on Masdar City in the UAE. While speaking about her book (Spaceship in the Desert: Energy, Climate Change, and Urban Design in Abu Dhabi), Günel explains how Masdar City is a status quo utopia.

EPISODE 5: AMALE ANDRAOS

In the season finale of the Climate Change in the Arab World mini-series, Masaha speaks to Dean Amale Andraos about climate, pedagogy, and practice. In this episode, students Bisher Tabbaa, Sarah Hejazin, and Aya Abdallah discuss how the relationship between climate and pedagogy has developed over Dean Andraos' tenure at GSAPP. They also explore its adjacency with practice and identity issues in the Arab world.

COURSE: HOUSING AFTER SCARCITY
 SEQUENCE: HISTORY/THEORY
 PROFESSOR: MICHAEL BELL

How can the removal of restrictive zoning laws and the introduction of energy credits provide a better alternative to the most energy and financially inefficient form of housing; the suburbs?

In the next 30 years, America's population is expected to expand by 100 million people. If the current housing model, which mostly consists of single family detached houses that fill up suburbia, remains as the standard mode of living, this means that millions of acres of land will be converted into inefficient urban sprawl. As it stands, it is illegal to build any form of living other than single family detached homes in 75% of cities in the US. Thousands of studies show that higher density housing reduces energy usage, reduces traffic, and provides increased access to services. Due to restrictive laws that were tied to societal segregation - whether based on race or class - and passed decades ago, housing developers are often not allowed to build anything but single family detached houses. As the US population is constantly expanding, while at the same time trying to avoid climate disasters, major reform has to happen on a federal, state, and local level.

The New Deal by President Franklin D. Roosevelt included the National Housing Act of 1934, which established brand new home ownership tools for low income families such as the 30 year mortgage and low interest loans guaranteed by the government. This however was embedded in systemic racism and red lining which prevented non whites from home ownership. This was essentially what led to suburban sprawl, the invention of the American car dependent suburb, white flight, and eventually urban renewal.



Urban sprawl

Fast forward 90 years in the future and the American suburb is the most prevalent form of living, which is a massive strain on the country financially, and environmentally. The fact that 75% of all residential land is zoned for only single family detached homes leads to a real problem in trying to curb the carbon emissions. Suburbs represent 25% of the US population, yet, they account for 50% of all household greenhouse gas emissions. Furthermore, it leads to hidden carbon emissions that are tied to this urban planning model. These carbon emissions

come from automobiles, as well as more gas piping, which increases the rate of fugitive emissions from having to provide gas to every single house separately. For instance, the construction of a single mile of asphalt road in the US adds more than 4500 tons of carbon dioxide into the atmosphere. This leads to more cars on the road, and higher emissions from transportation due to the fact that public transportation is extremely difficult to implement in the suburbs. Paving and building on natural land also removes the inherent quality of soil to absorb water, causing more floods. If developers are allowed to build other than single family homes, we could potentially have more diverse forms of housing that are more efficient, and do not encourage sprawl. Due to the fact that only 25% of all residential zoned land is allowed to be anything other than single family house zoning, developers often fight over the remaining land, which is usually expensive. This would make sense for the developer to build and go through all of the bureaucracy of red tape and land rights only if they would build high end expensive housing that does not cater to most people who live in the US.

Many US cities are reliant on aging infrastructure in dire need of repair, and upgrading. The Build Back Better bill proposes to upgrade infrastructure and design them to be resilient to climate change. The bill would drastically improve the built environment across the country, be better suited to deal with climate disasters, and reduce greenhouse gas emissions. Nonetheless, the American suburb is in need of fundamental change due to the fact that suburbs are not only environmentally unsustainable, but they are a massive financial burden on the city, state, and country. Due to the low density sprawl and zoning laws such as minimum parking requirements, setback rules, and so on, low density buildings generate far less revenue than densely populated mixed use buildings. When it comes to housing, the suburbs are dependent on growth to remain financially stable. The second these cities stop growing due to any external factor, whether it's a financial crisis, a natural disaster, or any other factor, the suburb starts to fall apart. This phenomenon is referred to as "The Growth Ponzi Scheme" by Strongtowns.

After the prosperity of the Second World War, average Americans were financially strong enough to purchase their own land, home, and car. However, suburbs across the country are struggling right now because of how suburban growth is financed. Towards the birth of the suburbs, the Federal and state governments allocated large amounts of money for cities to build their suburbs, which is still prevalent today. Typically, when a city builds a new road most of the funding comes from the state which the department of transportation falls under. A large portion of the funding also comes from the federal government, but only a small percentage is financed by the city. This means that cities don't have a big financial obligation to pay for large infrastructure, but they do get a big influx of tax revenue from the new developments that spring up. This financial model encourages cities to build lots of new developments even if it doesn't make any financial sense. However, while cities get to build these new infrastructure projects for relatively cheap, they are financially responsible for maintaining and upgrading this infrastructure forever. It seems like a win-win situation for the city and the government; the state invests in cities which create economic growth, and cities would collect taxes from new developments that would finance the maintenance. Problems for the city would start when they are not generating enough money from tax revenue and cannot afford to cover the replacement costs of infrastructure. Throughout the period of the suburban experiment, many cities have fallen bankrupt as a result of this, and it is getting more prevalent as every city is bound to reach a period of degrowth. Cities also require far

more infrastructure than just roads, whether its treatment plants, water infrastructure, and so on. The reality is that suburbs are too expensive for cities as they only collect a small fraction of the tax revenue that is required to maintain them, and upgrade them to become climate resilient.



The above economic MRI map shows how much each plot of land generates tax revenue. The black spikes are not representing buildings, but represent dollars. However it is no coincidence that the value the buildings generate are closer to downtown, given that they are usually denser. In other words, dense traditional downtowns that are walkable and full of mixed use buildings, will be more economically efficient for the city. Dense urban areas that have medium to large housing developments have a far greater potential in reducing its carbon emissions when compared to low density housing. With today's technologies, it is not uncommon to find housing developments that are extremely energy efficient and have a net-zero energy balance. Many states such as California and New Jersey are creating state subsidized incentives to encourage the installation of solar panels which can play a large role in meeting the energy demands of medium size housing. Solar Renewable Energy Certificates are credits that represent energy generated by renewable sources. These credits are usually sold by individual buildings to utility companies that have to meet a certain quota of renewable energy per year. Solar energy is now affordable enough for developers to invest in generating their own energy and becoming far more energy efficient. SRECs have great potential in creating affordable, energy efficient housing. This can play a factor in the overall cost of housing, which means that they can become more affordable to build and maintain. This would be particularly effective when community land trusts can develop the building for lower than a for profit developer would, making it more affordable, and can use the money generated from selling the SRECs to utility companies to maintain the buildings. Adding the quota on utility companies to generate their energy from renewable sources would only encourage people to benefit from the government programs and invest in renewable energy, which in turn could potentially provide more affordable housing.

The removal of a restricting single family residential zoning, as well as the implementation and encouragement of states to create SRECs are only two plans that could have a large impact on the availability, quality, affordability, and energy efficiency of the housing sector. As the majority of infrastructure spending in the US is the responsibility of the state, local governments and cities are having to rely on the private sector on the delivery of these projects. Governments are not always equipped to handle the delivery of large scale projects, or the technology to embark on climate resilient projects. However, policy measures should be implemented to facilitate the relationship between the state government and the private sector to ensure that energy and climate goals are being met. An updated building and energy code should be implemented to ensure that new buildings are being built to the highest energy standards, and old buildings are renovated to become better performing. Tax policies should also be updated to "support tax equity financing and accelerated depreciation on resilience driven assets", especially when dealing with marginalized communities that have suffered from previous housing and infrastructure bills.

There are small victories in upgrading our infrastructure to become more energy efficient and emitting less greenhouse gasses. For instance, on the 2nd of May 2022 for 15 minutes, California's electricity was generated from 100% renewable energy. Nonetheless, as I have outlined in this paper, fundamental change needs to happen in the majority of the restrictive US zoning law, and the creation of new policies that encourage the implementation of sustainable strategies to have any chance of surviving the ongoing climate crisis.

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WE CANNOT AFFORD NOT TO HAVE CLIMATE AS
THE BASELINE OF ALL ARCHITECTURAL THOUGHT.