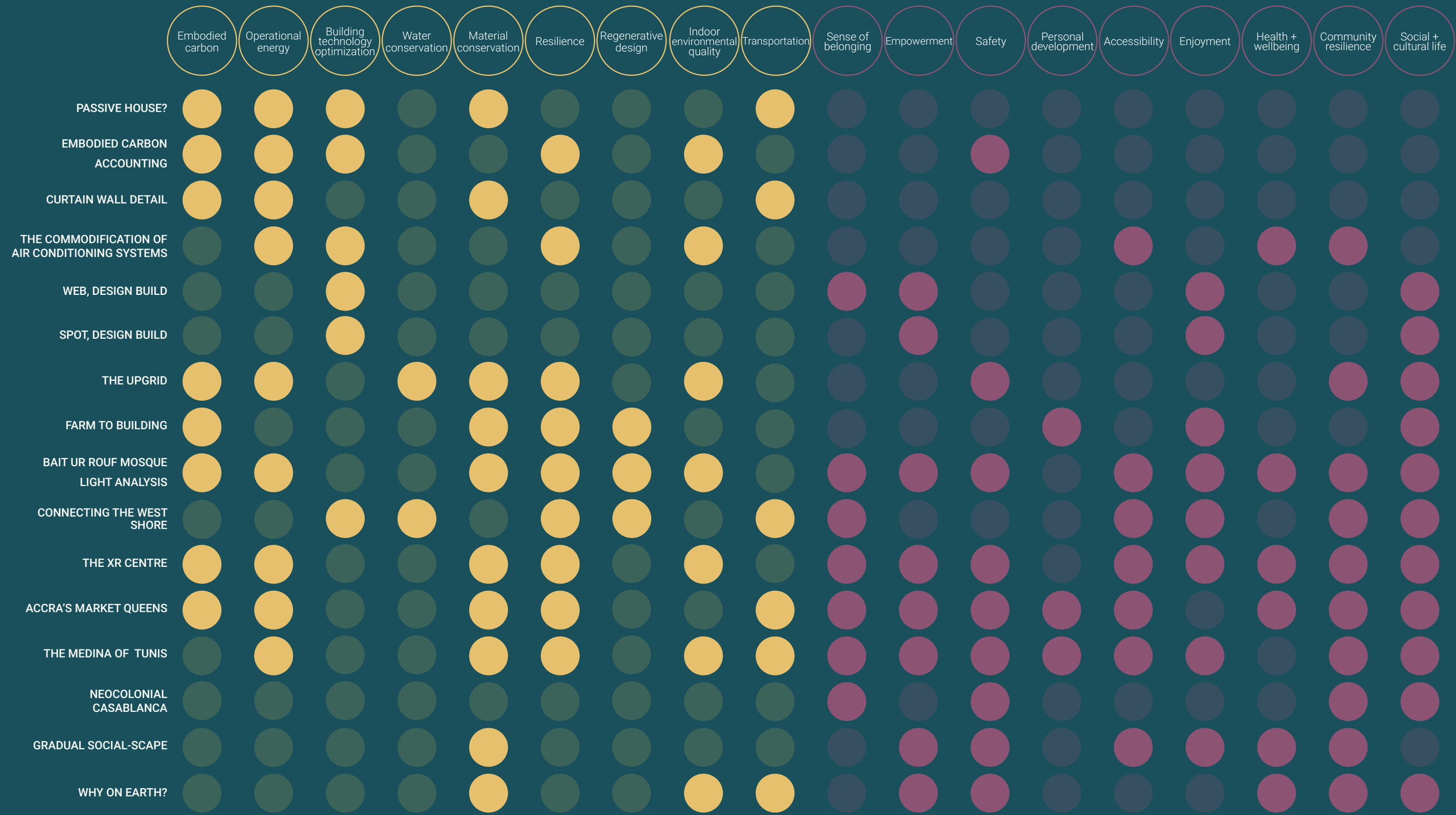
ENVIRONMENTAL SOCIAL JUSTICE

ZINA BERRADA


Embodied carbon
Operational energy
Building technology optimization
Water conservation
Material conservation
Resilience
Regenerative design
Indoor environmental quality
Transportation
Sense of belonging
Empowerment
Safety
Personal development
Accessibility
Enjoyment
Health + wellbeing
Community resilience
Social + cultural life
PASSIVE HOUSE?
EMBODIED CARBON ACCOUNTING
CURTAIN WALL DETAIL
THE COMMODIFICATION OF AIR CONDITIONING SYSTEMS
WEB, DESIGN BUILD
SPOT, DESIGN BUILD
THE UPGRID
FARM TO BUILDING
BAIT UR ROUF MOSQUE LIGHT ANALYSIS
CONNECTING THE WEST SHORE
THE XR CENTRE
ACCRA'S MARKET QUEENS
THE MEDINA OF TUNIS
NEOCOLONIAL CASABLANCA
GRADUAL SOCIAL-SCAPE
WHY ON EARTH?

FARM TO BUILDING

Summer 2022, GSAPP at Columbia University

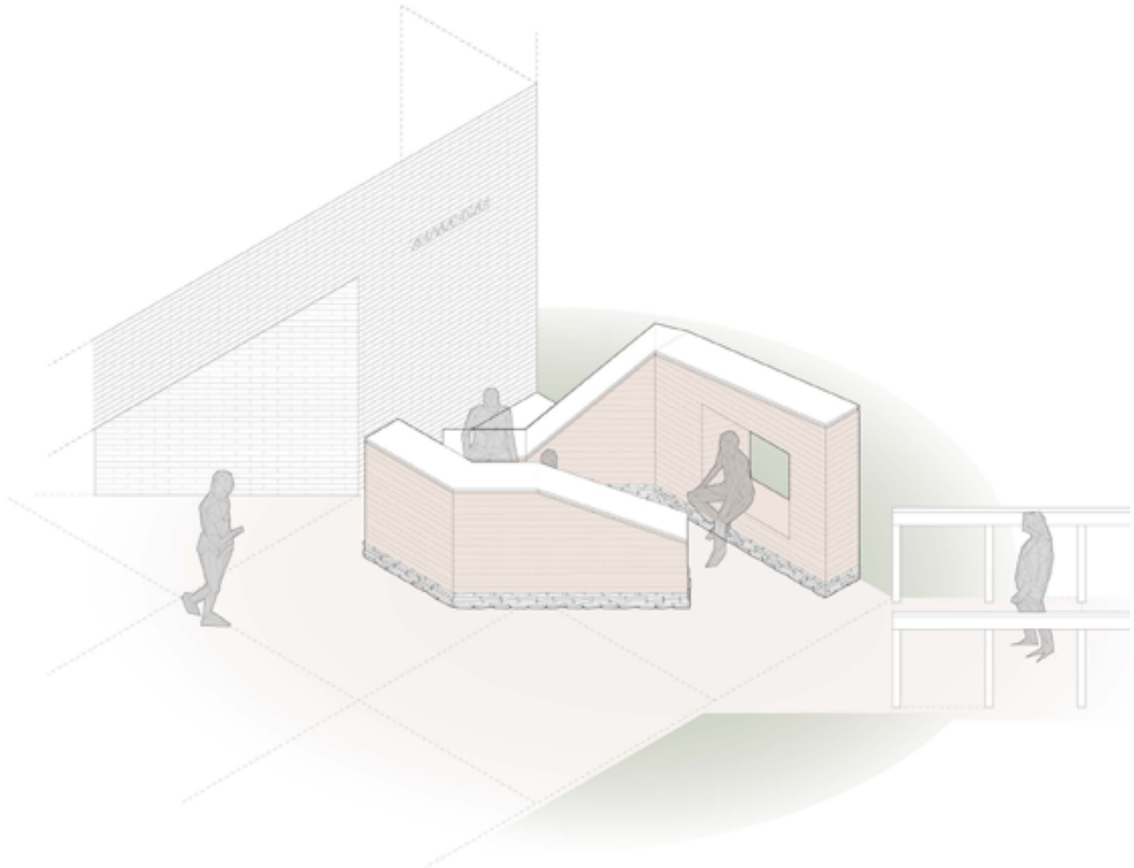
Location	Lamont Doherty, NY
Tutor	Lola Ben Alon, Tommy Shaperkotter
Collaborators	Shuyang Huang Wenjing Xue Fukunda Mbaru
Contribution	Design development and construction of the entire pavilion

By implementing Farm to Building materials and techniques, this project catalyzes the following inquiries: How might we rethink the act of building by not only consciously confronting ecological extraction and the capabilities of human labor, but by designing the means to ameliorate harmful effects of these metabolic flows? In doing so, can we see buildings and their construction materials not as static assemblages, frozen in time, but as unending flows of matter and energy?

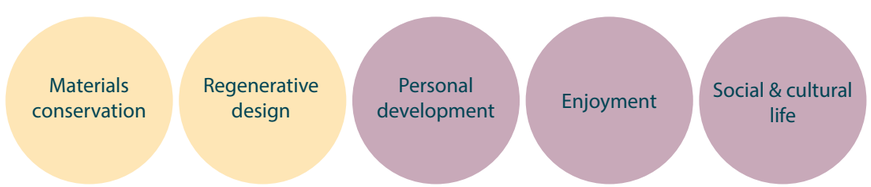
The earthen installation, located at the entrance to the Geoscience Building, was designed to provide insight during its construction, its occupation, and its dissipation. During fabrication builders and spectators alike were able to situate its movements of material extraction, procurement, and labor as metabolic flows in which extracted layers of earth were relocated, remixed, and returned to the earth as a habitable, exterior space on campus.

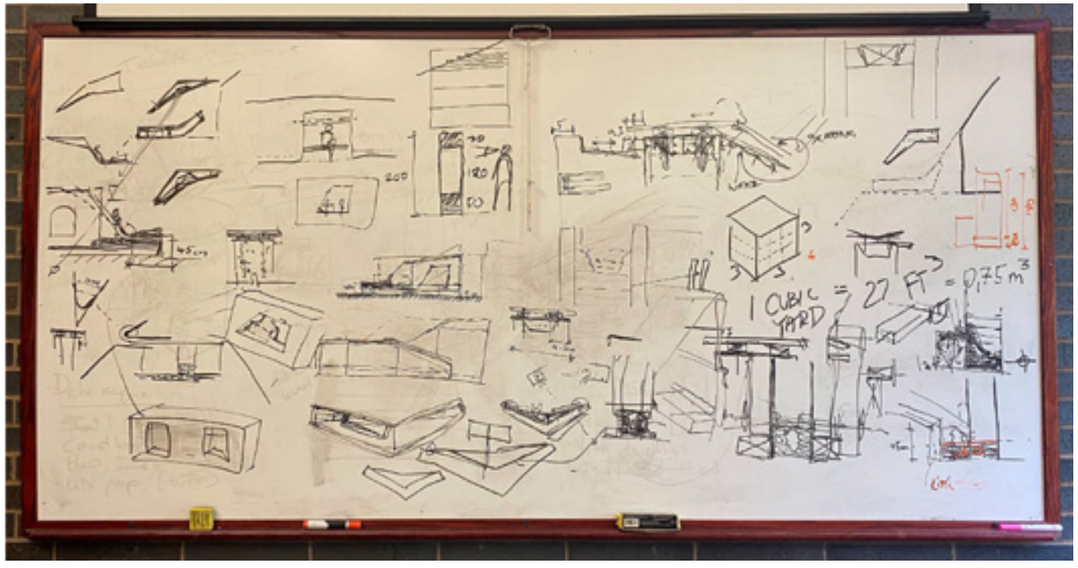
In its constructed state, the installation acts as an occupiable sitting area. While structures are typically considered to be something other than the earth, merely placed on top of it, this installation offers students, staff, and visitors a chance to inhabit the earth itself. The installation will continue to teach, perhaps most significantly, during its erosion. The solubility of the project provides an expedited simulation of how built environments dissipate over time, providing visceral and tangible lessons about maintenance and care.

The project offers insight into inherently terrestrial techniques of construction that are, in many ways, commensurate with and reflective of the ecological research undertaken in various fields at Lamont-Doherty. Ultimately, this short summer workshop offered students and faculty from both schools an academic playing field in which to watch and debate how we ought to make things in the world, and what might or should happen to them when they're gone.

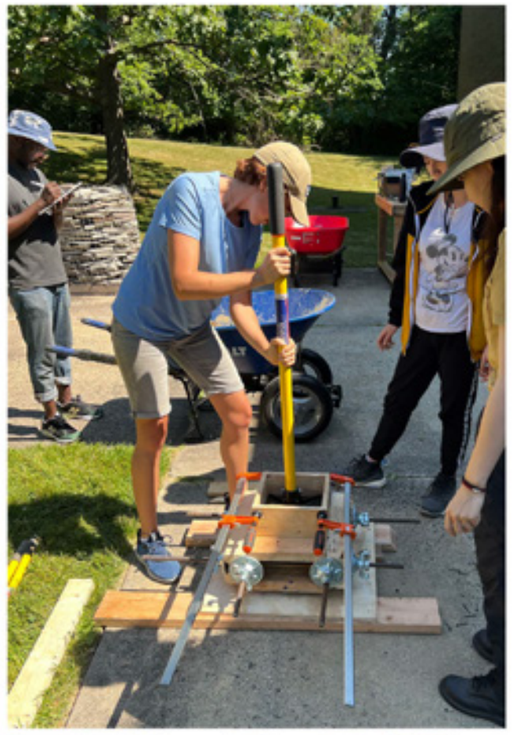


Axonometric view of the design | Tommy Shaperkotter

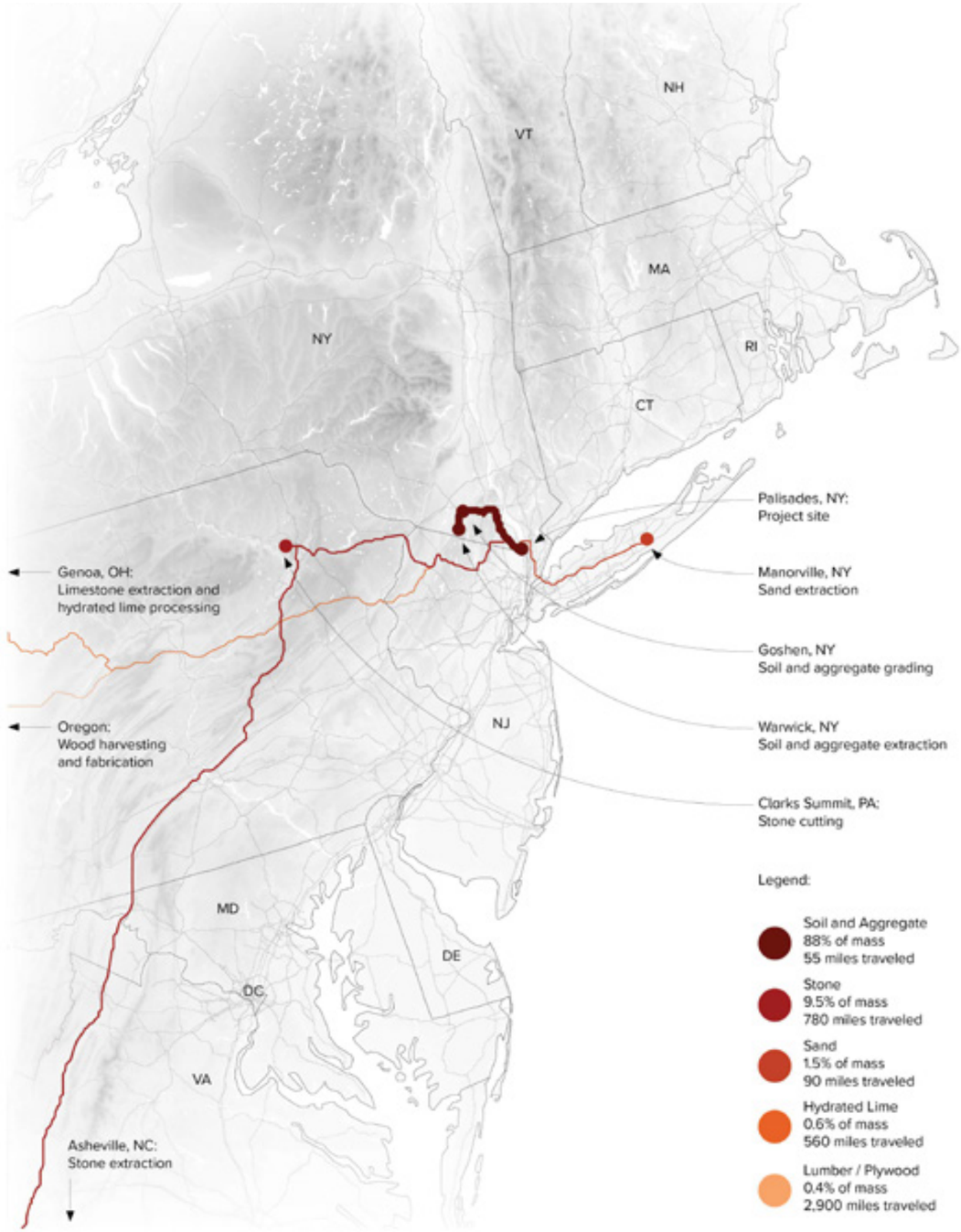




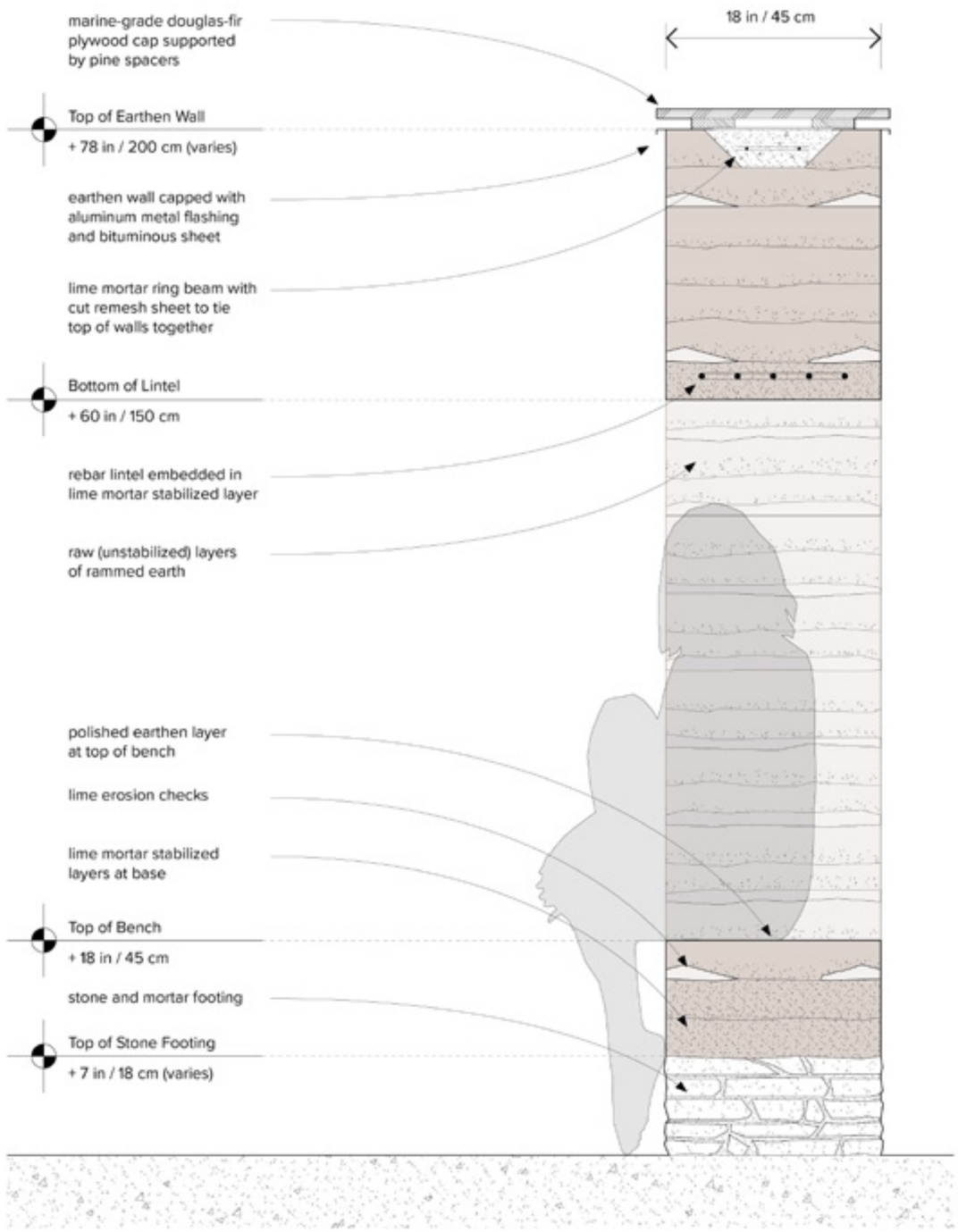
Design development



Material testing



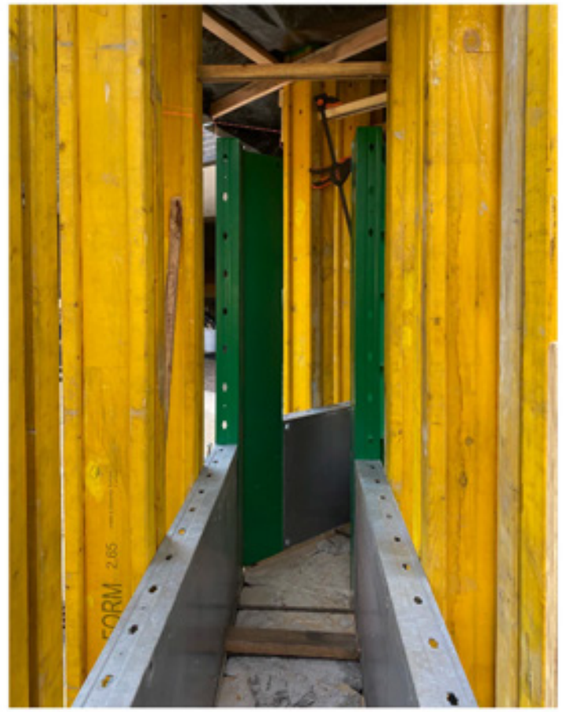
Material sourcing | Tommy Shaperkotter



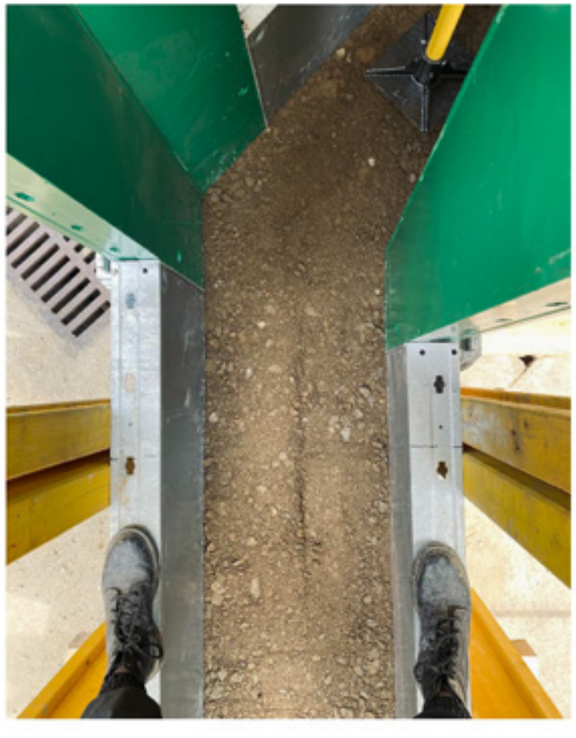
Wall details with additional reinforcement above opening | Tommy Shaperkotter

The footing for the installation was required not to penetrate the existing concrete slab on which it rests. Moreover, the school administration asked that the entire installation be removable and recyclable at some point in the future. Responding to these criteria, students designed a stone footing to be built with a minimal amount of lime mortar such that it is bound only to itself, but not to the existing concrete slab. The stone prevents capillary water intrusion into the raw earthen walls and also provides splash protection during heavy storms. The stone footing will one day be removed without damage to the concrete slab.

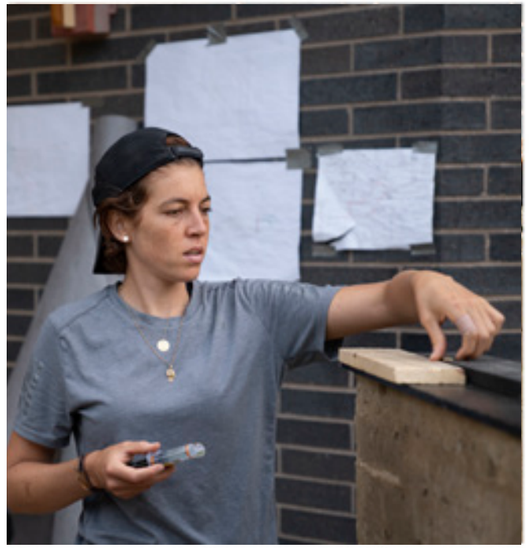
Footing masonry construction



Formwork assembly

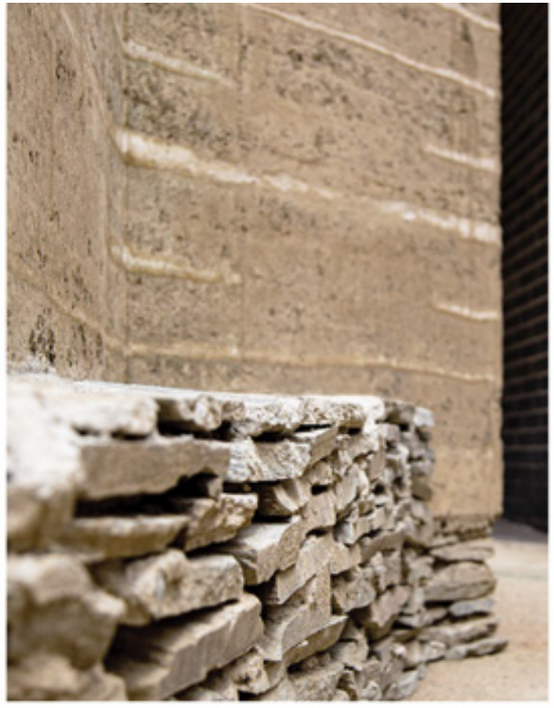


Steps for ramming process



Roof detail for wall protection

Details of finished project



Details of finished project

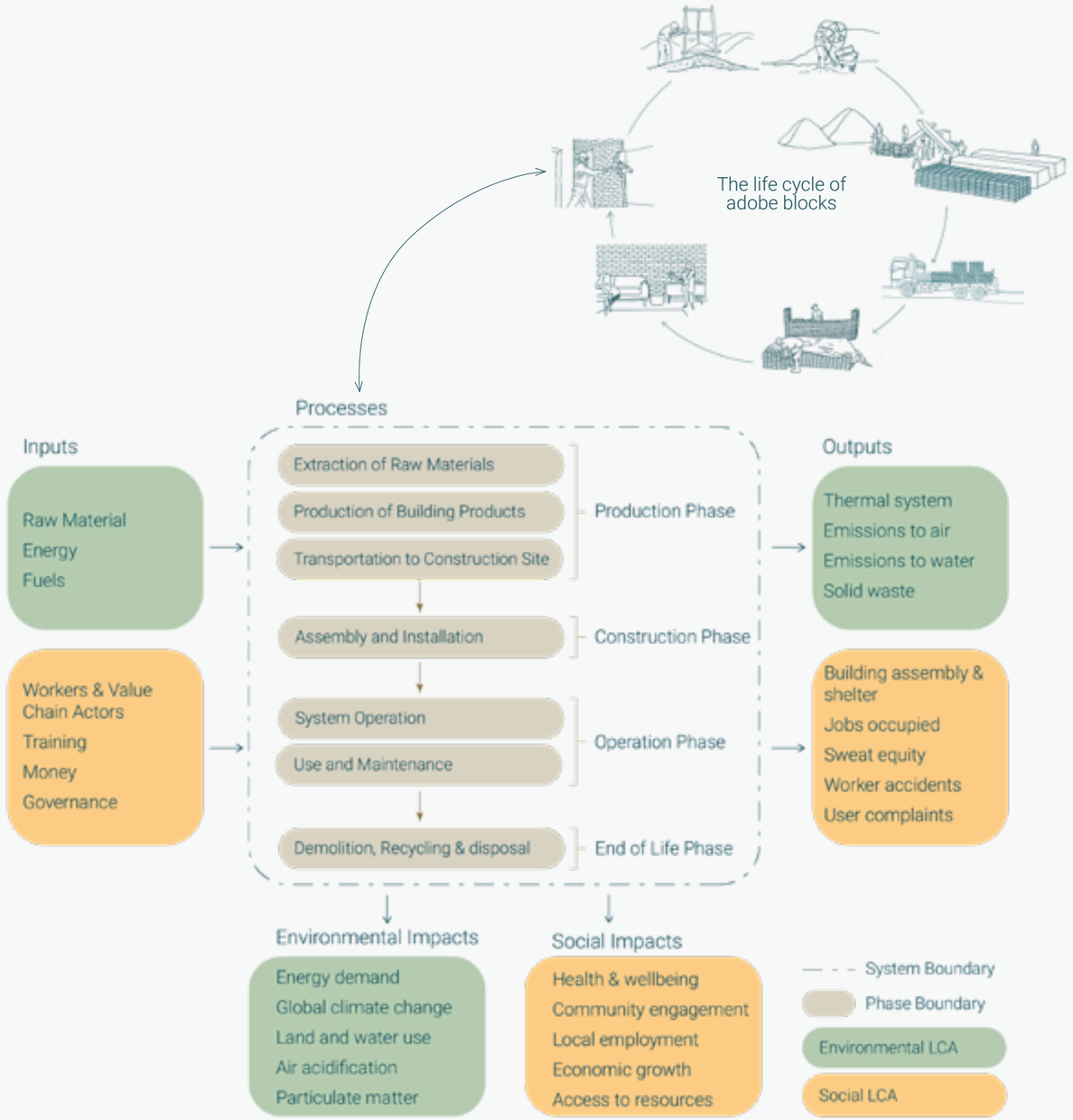
WHY ON EARTH?

The social life cycle of earth materials compared to conventional materials

In collaboration with Lola Ben Alon, as part of a Natural Materials Lab research

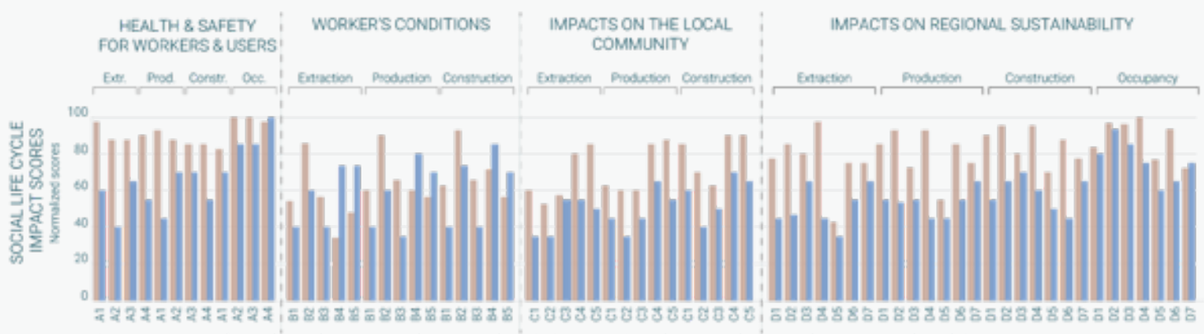
Presented and published at Earth USA 2022 conference

Earth materials are known for their self-sufficiency, community engagement, and vernacular nature. Building materials such as cob, light straw clay, and rammed earth are non-toxic and often provide local employment opportunities and enhancement of local economies. However, while there is a widespread consensus on the social benefits of earth materials, a systematic analysis that quantifies these benefits is currently lacking. To address this need, this study uses **social life cycle assessment** (SLCA), an increasingly robust methodology, to contribute to a **full triple bottom line life cycle assessment (LCA)** of earth materials by combining societal, environmental, and financial attributes for individuals and communities. This SLCA provides enumerated impact results from an **online survey of different stakeholders**, including manufacturers, designers, researchers, and homeowners of earth houses. Similar to an environmental LCA, this SLCA impact assessment is quantified using indicators across the entire life cycle of the building material while prioritizing areas of "hot spots" in the analysis to determine the significance of the social concern for the specific earth material or product. The results are provided in terms of **health and safety, worker conditions, regional impacts and community engagements, and regional sustainability.** They show that natural materials outperform conventional materials in almost all aspects of the SLCA framework, with the exception of the provision of social benefits and professional development opportunities for workers in extraction, production, and construction phases.



System boundary for SLCA study

Comparison of Earth and Bio-Based Materials VS Conventional Materials based on Spread of Responses



Comparison of Earth and Bio-Based Materials VS Conventional Materals based on Normalized Scores

S-LCA CATEGORIES & SUB-CATEGORIES

Based on the distribution of the online survey categories and questions

HEALTH & SAFETY IMPACTS FOR WORKERS & USERS
- A1 Leakages
- A2 Noise & Light Pollution
- A3 Accidents & Injuries

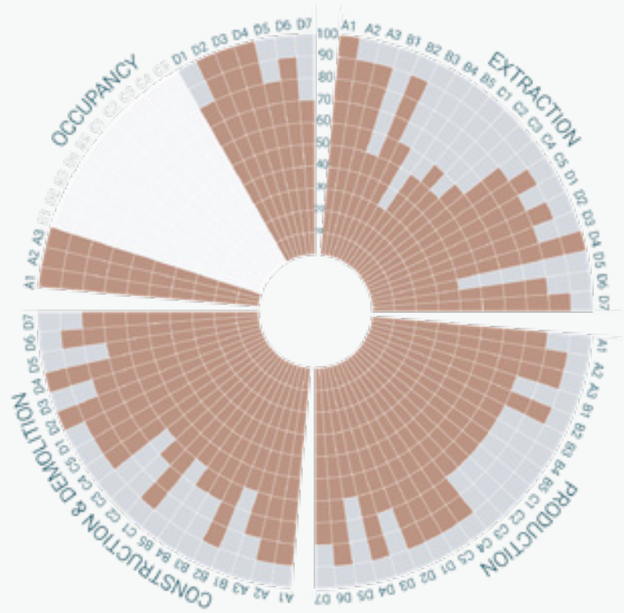
WORKER'S CONDITIONS
- B1 Fair Salaries
- B2 Abuse of Work Force
- B3 Diversity & Inclusivity
- B4 Training & Professional Development
- B5 Social Benefits

IMPACTS ON THE LOCAL COMMUNITY
- C1 Health & Safety
- C2 Local Water & Air Quality
- C3 Mobility & Traffic
- C4 Circular Economy
- C5 Small Businesses

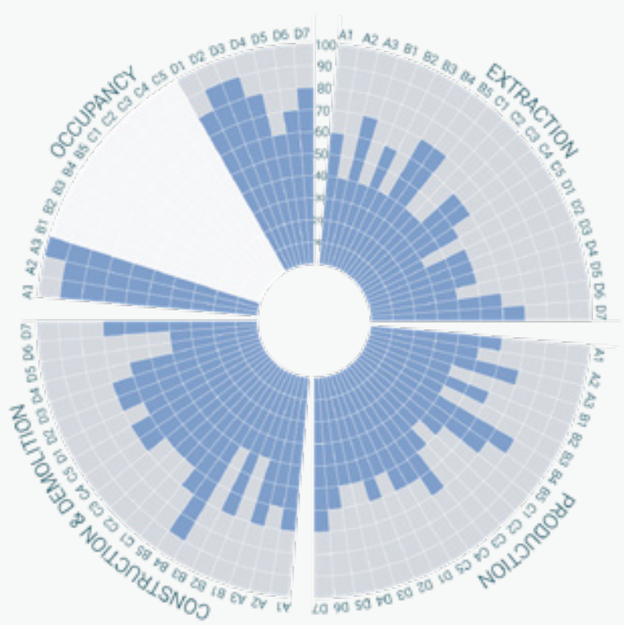
REGIONAL SUSTAINABILITY
- D1 Energy Consumption
- D2 Carbon Emissions
- D3 Water Consumption
- D4 Waste
- D5 Effects on Biodiversity
- D6 Overall Contribution to Sustainability
- D7 Public Acceptance

LEGEND
- Very Negative Impact
- Negative Impact
- No Impact
- Positive Impact
- Very Positive Impact
- Earth & Bio-based Materials
- Conventional Materials

LIFE CYCLE PHASES
- E Extraction
- P Production
- C&D Construction & Demolition
- O Occupancy



Earth & Biosbased Materials - Social LCA Score Map



Conventional Materials - Social LCA Score Map

GRADUAL SOCIAL-SCAPE

Core 1 - Fall 2020, GSAPP at Columbia University

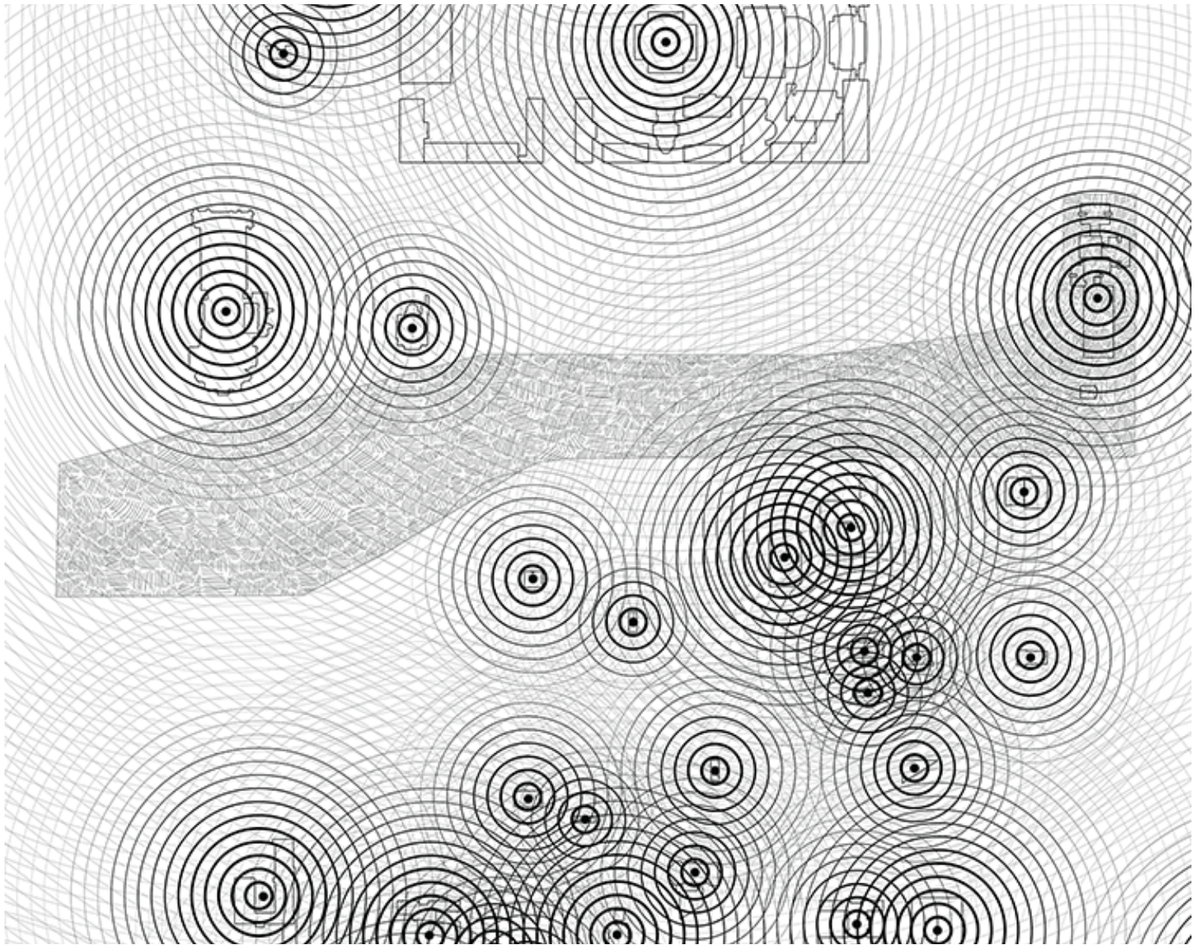
Studio	Core 1
Location	New York, US
Tutor	Lindy Roy
Collaborators	Individual

In light of the continual fight for **social justice,** it is essential to approach public spaces with lenses of **inclusivity and community resilience**. Amongst other public spaces in Manhattan, Morningside Park plays a critical role in showing the occurring tensions between two very distinct communities: the predominantly white community of Columbia University on the west side of the park, and the mainly African American and Hispanic communities on the east of the park.

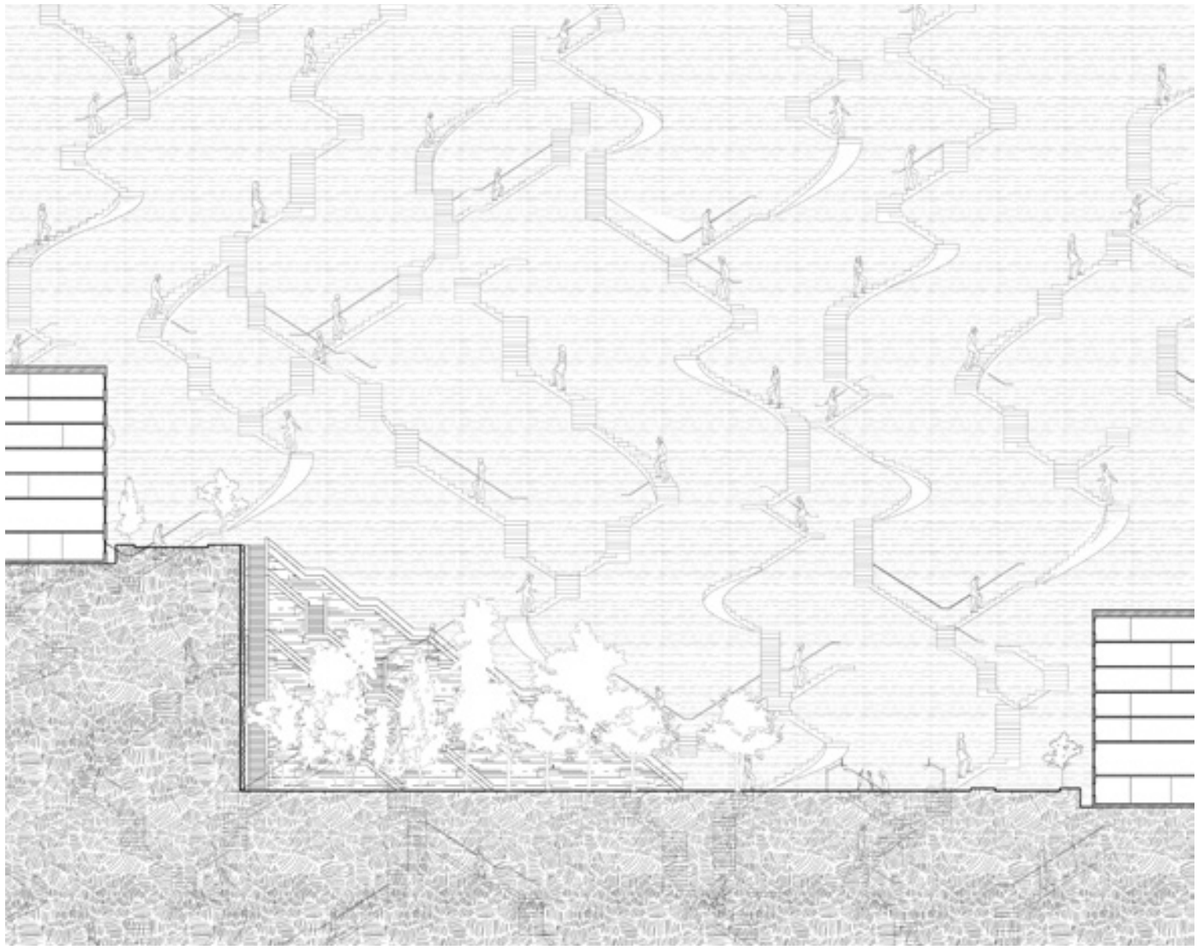
Gradual social_scape provocatively **reshapes Morningside Park** in order to make it a safe, inviting, and connecting public space. The intents of the proposal are to blur the clear **boundary between Morningside Height and Harlem**, address the park's accessibility, and provide a variety of programs that allow meaningful and inspiring interactions.

Gradual social-scape tries to answer questions like how do we heal the **apparent fracture** between Morningside Height and Harlem? How do we make better use of the topography to **bring people together**? How do we create visual and physical connections that **enable social interactions**?

Morningside Park | A landscape to enjoy, a park to avoid crossing

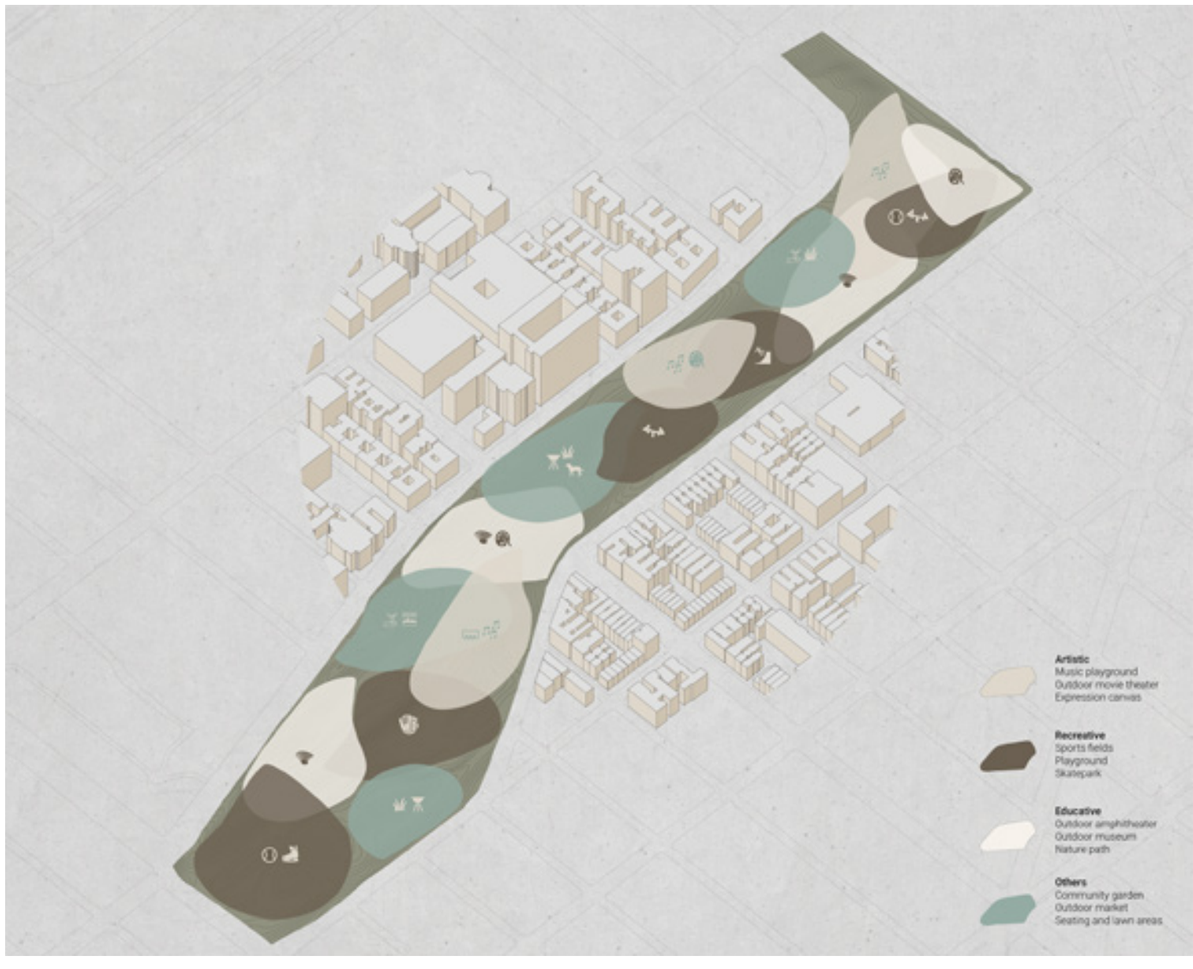


The magnitude of cultural & social events around Morningside Park

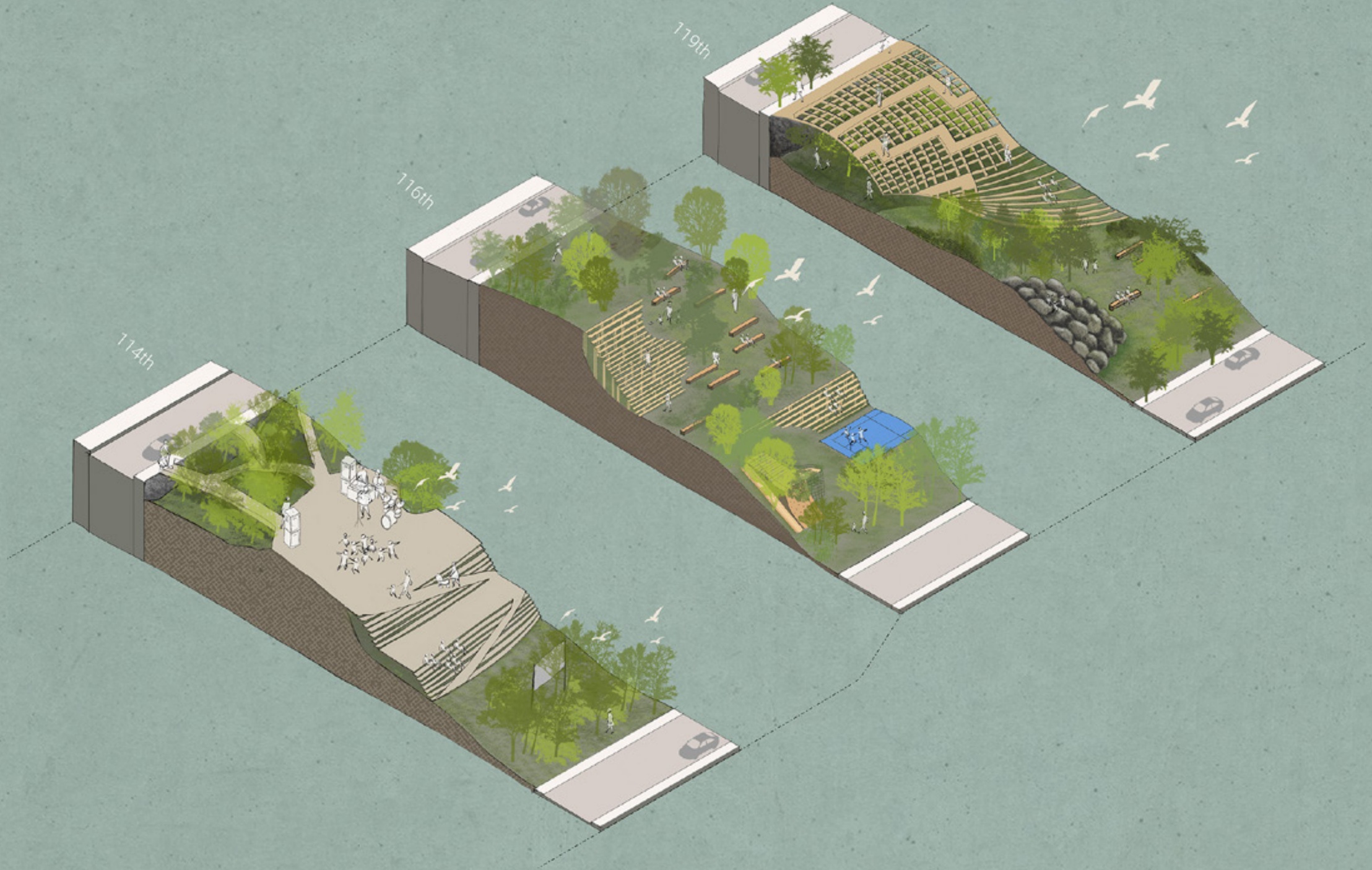


The thousand steps of Morningside Park

How to rethink the topography?



How to rethink the program?



Hand-drawing | 3 sections of the intervention

Models of intervention | how can ramps replace the stairs?

Models of intervention | who knows what the pond is there for?

Models of intervention | a new public market and outdoor movie theater

THE IMPACT OF THE FRENCH PROTECTORATE ON CASABLANCA AND ITS SOCIETY

History & theory - Architecture+ Development

Professor Ateya Khorakiwala

INTRODUCTION

When visiting Casablanca today, one cannot fail to notice the **French urban and architectural legacy** that both blends and **conflicts with the traditional urban and social fabric**. Professor Hassan Radoine described this pattern as "**an urban duality that has its own melody**" .
Although the last of France's colonial acquisitions (conquered and made a protectorate in 1912 until 1956), Morocco was amongst the few places where architects and planners "engaged their talents in the decision-making processes for **exploiting natural resources and social conditions**" . As Résident Général de France au Maroc, Louis Hubert Lyautey had a major impact in reshaping the country and reevaluating the economic, political and social importances of each existing city. This way Lyautey named Casablanca, then a chaotic -yet flourishing- urban center, the economic capital of Morocco. With that came a number of **planning interventions** that Lyautey led in order to increase the international presence of Casablanca, provide adequate public and administrative buildings, and bring forth an **optimized circulation network** that would cover most of the country. This paper focuses on the expansion of Casablanca throughout the Protectorate period and how different actors contributed to its development. Throughout the paper, it will be evident that Casablanca provided the ideal opportunity for French and other Western architects/planners to **experiment new designs at all scales**, from new urban layouts to specific residential typologies.
First, this paper will go over the conditions of Morocco and Casablanca pre-protectorate as well as Lyautey's intensions when arriving in Morocco. Second, we will discuss the major urban changes that happened at the beginning of the protectorate in order to make Casablanca a stronger urban center that reflected the power of French colonizers. Finally, this paper will cover the late addition of a new Medina in Casablanca in order to respond to the overwhelming need for Moroccan housing in Casablanca.

CONCLUSION

While General Lyautey heavily focused on ensuring that Morocco maintained its identity, the French Protectorate had an undeniably **large impact on the local culture and lifestyle**. The decolonization of Morocco left local populations with a substantial urban infrastructure that continued to encourage segregation and social hierarchy. In Casablanca, European quarters were taken over by wealthy Moroccan families while the old Medina were dedicated to the poor communities. These Medinas were no longer seen as the centers of the urban life, but rather only a residential neighborhood within a bigger city. Hassan Radoine referred to **Moroccan cities as "bipolar"** as he emphasized that they "have been **handicapped by the heterogeneous components forming them**" . Moreover, the centralization of power and economy into Casablanca and Rabat led to a clear deterioration of the inland historic cities that **"lost their raison d'être"** as their functional side was abandoned by Lyautey to "make them exotic touristic resorts" . After independence, Moroccan planners neglected to see the Medinas as a rich heritage from Morocco's past, leading to their **rapid deterioration** between the 1950s and the 1980s. As Historian Philip Naylor noted, "decolonization denoted much more than the expulsion of Europeans. It meant dealing with imported ideologies and **reconciling modernization with liberation**. To [Moroccans], decolonization also involved **consequential questions of personal as well as national identity.**" Nagging questions remained: did the decolonization clearly end the French influence on Morocco's architecture, planning, and culture? Was post-colonial Moroccan man somehow still colonized?

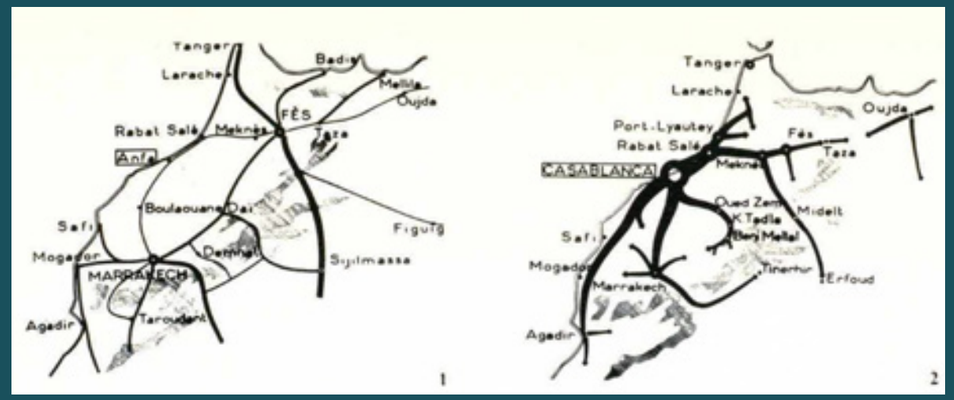


Figure 1 - Exchange routs before and after the establishment of the French Protectorate in Morocco
Source | TAYLOR, Brian Brace, Planned Discontinuity, Published in Lotus International, Milano, Industry Grafiche Editoriali, 1974, pp53-67

Figures 8 & 9 - Views of the Habous district, Casablanca, by Albert Laprade with Cadet & Brion, 1918 - 30
Source | TAYLOR, Brian Brace, Planned Discontinuity, Published in Lotus International, Milano, Industry Grafiche Editoriali, 1974, pp53-67

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Sense of belonging
Safety & security
Community resilience
Social & cultural life

CONNECTING THE WEST SHORE

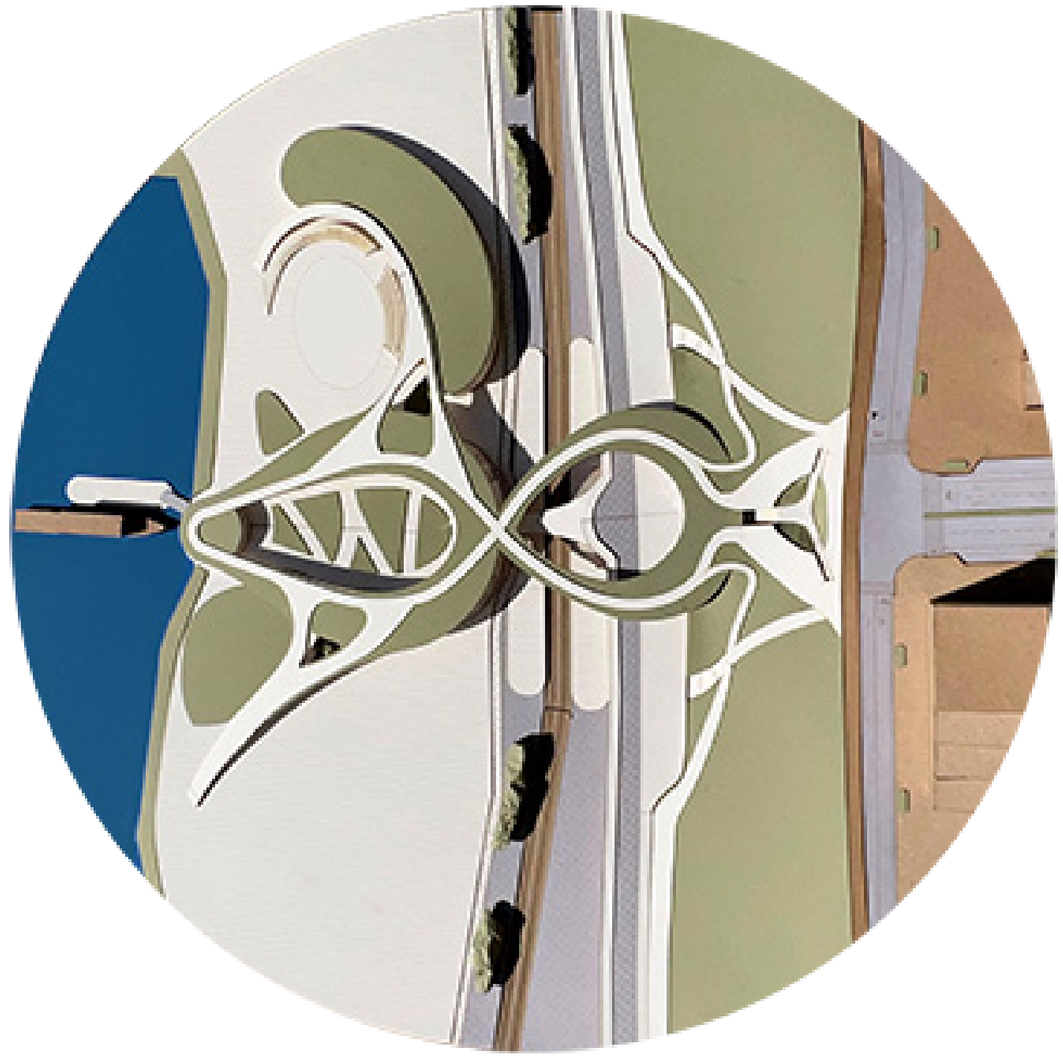
Spring 2022, GSAPP at Columbia University

Studio	Advanced IV
Location	Newburg, NY
Tutor	Pedro Rivera, Ubaldo
Collaborators	Sebastian Bielski

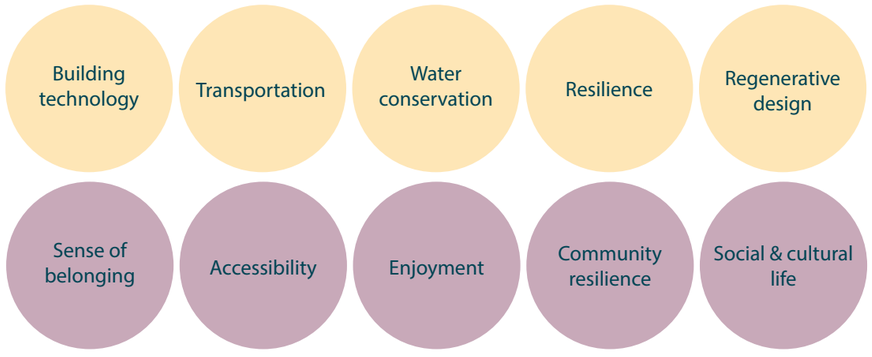
Decades of disinvestment into the regional transportation system has led to **intense transit based inequities** across the Hudson Valley. In order to **transform the accessibility of the valley's west shore**, this proposal looks at reactivating the historic western shore passenger rail line to **reconnect cities that are now disconnected**. This regional rail service would create a permeable transportation network, reduce the locals' carbon emissions through transitioning away from a car based region and **regenerate local economies** and foster opportunity through transit oriented development.

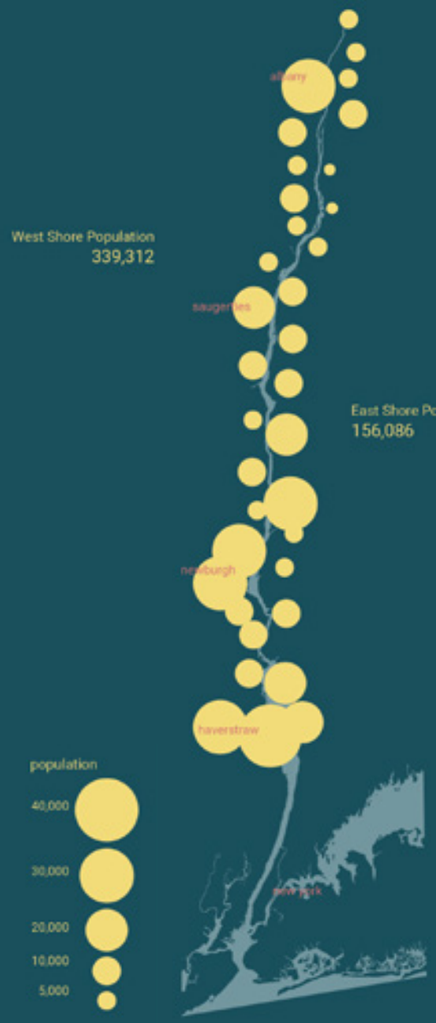
This proposal aims to establish a **sequence of mobility hubs** along the rail line that would serve as a critical connection between several transportation systems creating a more **cohesive and equitable** metropolitan system.

The Newburgh hub transforms the surrounding urban-scape to encourage the use of more sustainable transportation systems. By favoring public transit and human powered modes of transportation, the design of the Newburgh hub serves as a guide for communities in transportation transition.

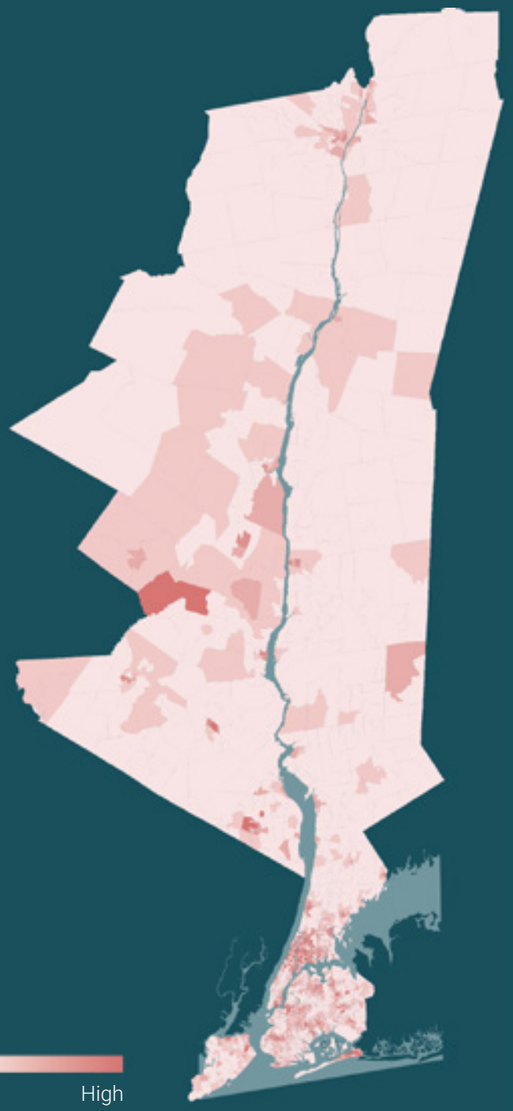


Plan view of project | physical model photographs





Populations along the Hudson river

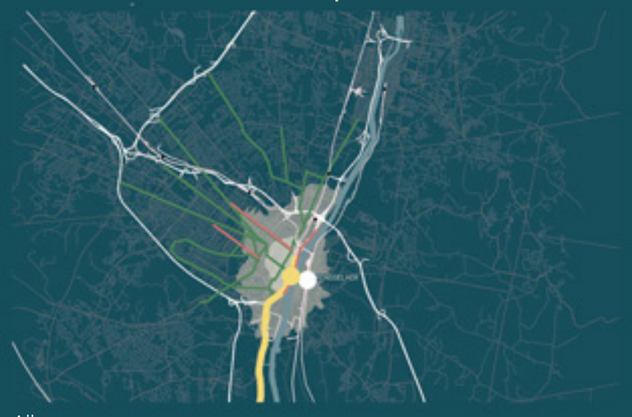


Population poverty along the Hudson river

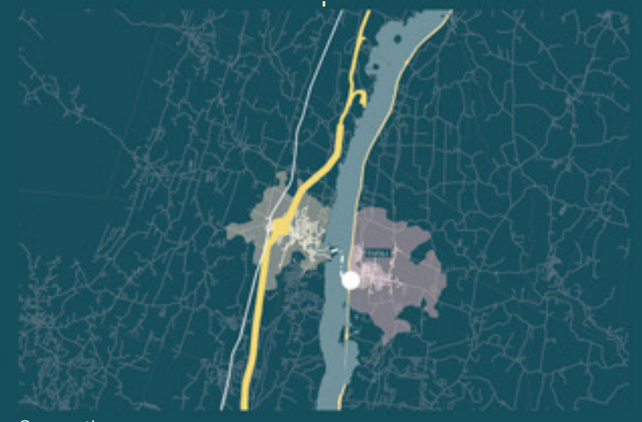
Existing railway on the east side of the river

Highway tolls on the west side of the river & bridges

Albany



Saugerties



Newburgh

Haverstraw

Mobility hub

Creating of mobility hubs

4 mobility hubs along the Hudson River

Socio-economic impact of the intervention

Dylan
Newburgh to Albany

Dylan, like other governmental workers, works between NYC and Albany. He just purchased a home in Newburgh as it is conveniently located between both New York City and Albany and he can continue to work hybridly from home and in both places.

Existing commute

Personal car	Public transit
1 hour 27 minutes	3 hours 12 minutes
$18.96 ($4.75 tolls)	$37
0.03 tons of CO2e	0.01 tons of CO2e

New commute
42 minutes (via express train)
$14
0.00 tons of CO2e

Linda & Larry
Newburgh to New York

Since they retired in 2010, Linda and Larry live in Newburgh to be more connected to nature and live in a less stress intensive environment. They often commute to NYC to see their kids and take care of their grandchildren.

Existing commute

Personal car	Public transit
1 hour 36 minutes	2 hours 26 minutes
$12.91 + parking	$24
0.05 tons of CO2e	0.00 tons of CO2e

New commute
55 minutes (via express train)
$10
0.00 tons of CO2e

Martha
Walden to Newark

Martha is a freelance consultant from Walden. Martha has clients all over the US, which requires her to constantly travel within the state and across the US. She usually drives to Newark and leaves her car at a parking there.

Existing commute

Personal car	Public transit
1 hour 17 minutes	2 hours 57 minutes
$15.59	$24.50
0.02 tons of CO2e	0.00 tons of CO2e

New commute
1 hour 10 minutes (via express train)
$12
0.00 tons of CO2e

145
miles
of new high speed rail

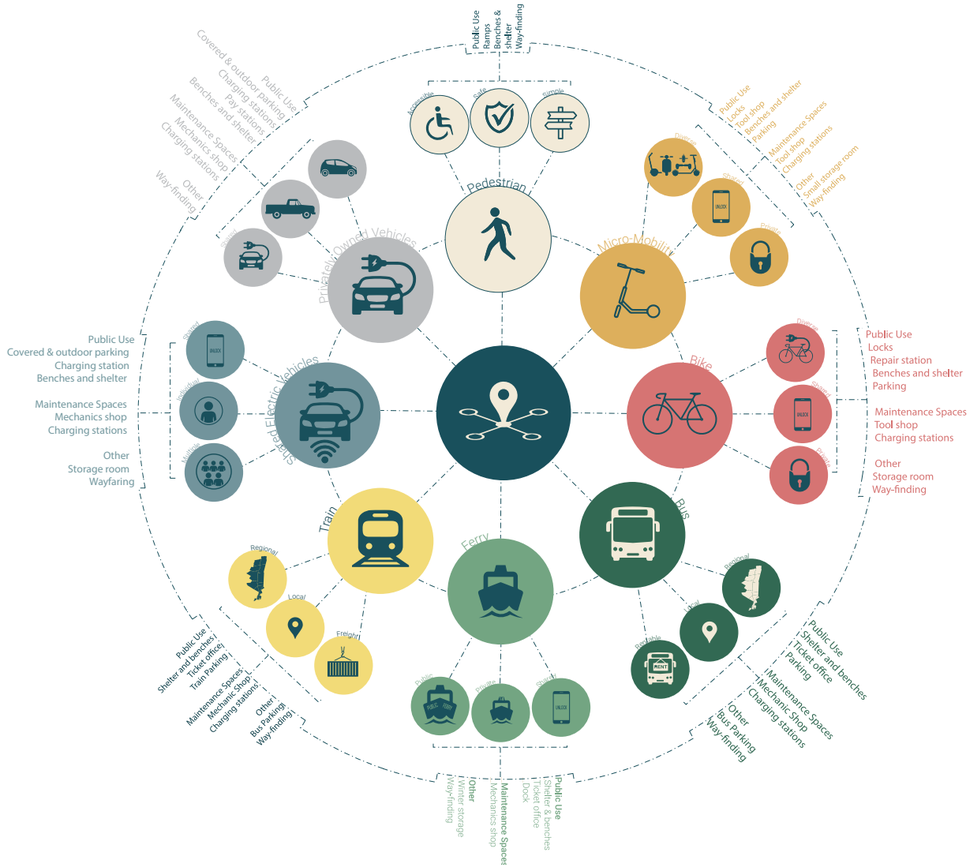
30,000+
jobs
created regionally

72.5
billion
in regional investment

32
new stations
and investment areas

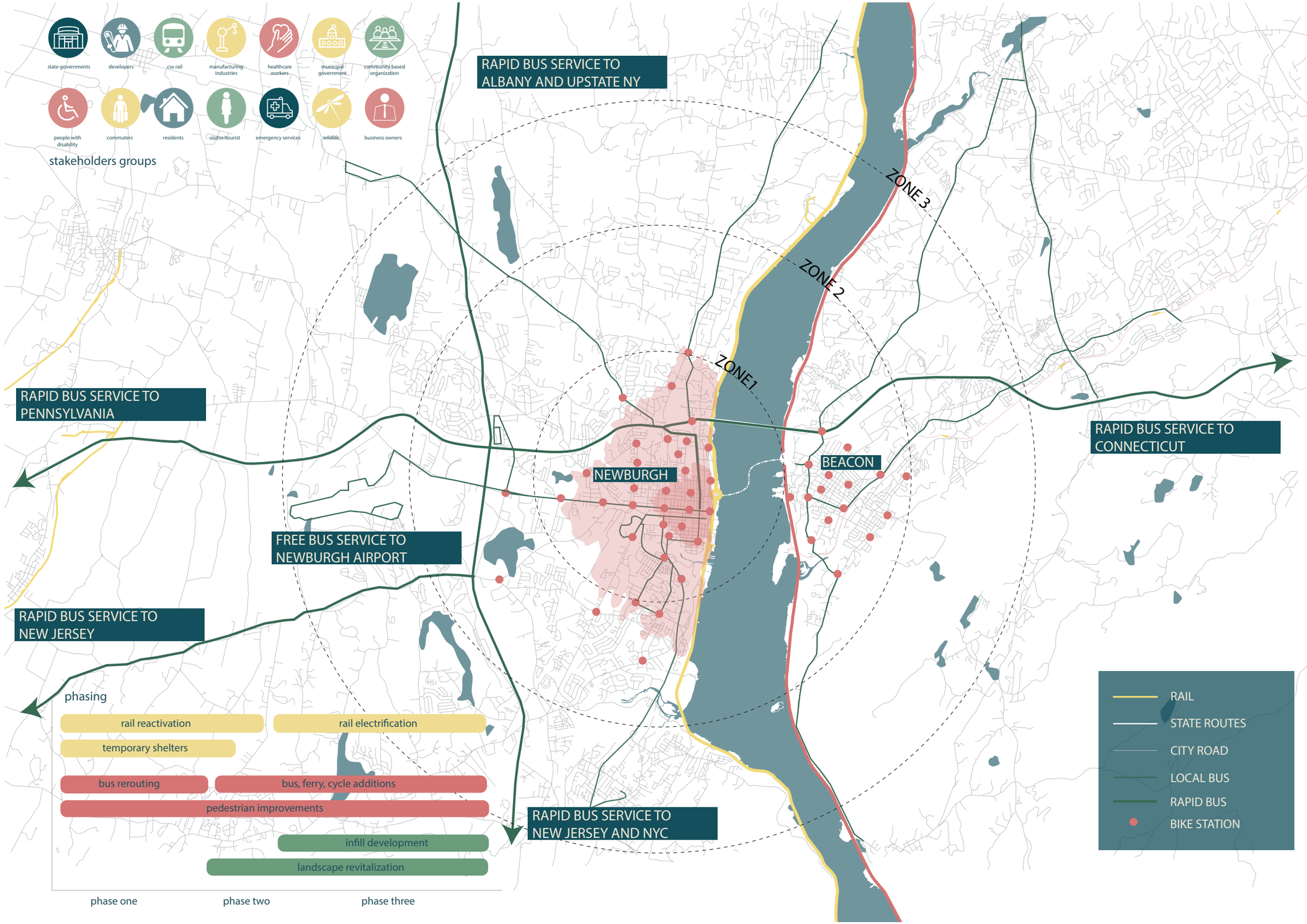
Proposal's socio-economic benefits

Proposed west shore rail line reactivation



Programming | Modes of Transportation

Programming | Community Empowerment



Newburgh proposed transportation system

Project development

01 | Current use

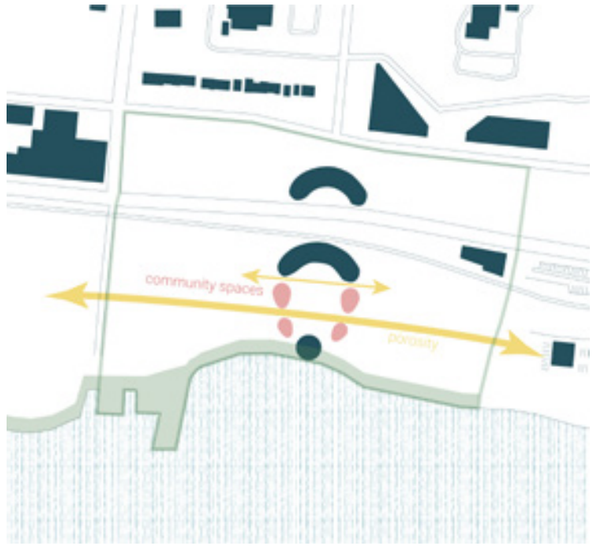
03 | Resiliency & Landscape revitalization

05 | Mobility Hub Layout

07 | Pedestrian walkway to the water level

02 | Road Reconfiguration

04 | Protected view & Broadway continuity



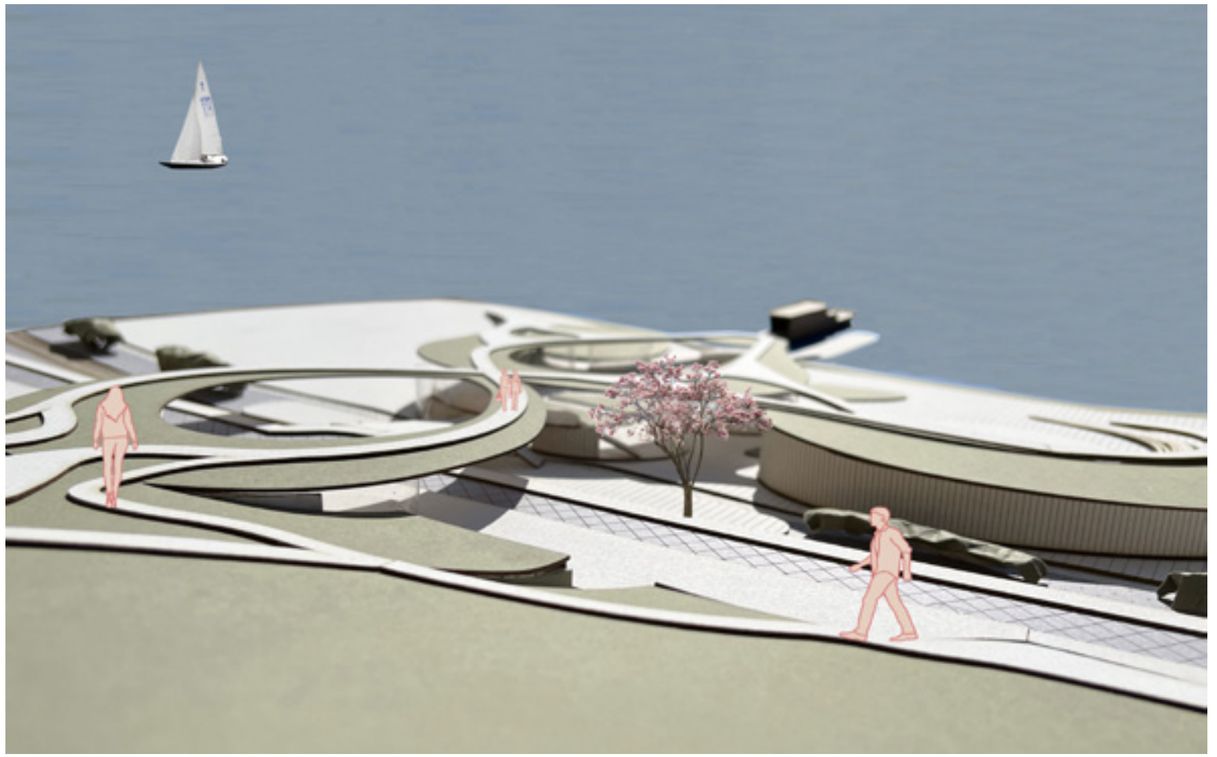
06 | Permeability, Active Living

08| Development invill on both sides of the hub

Site plan of the Newburg transportation hub

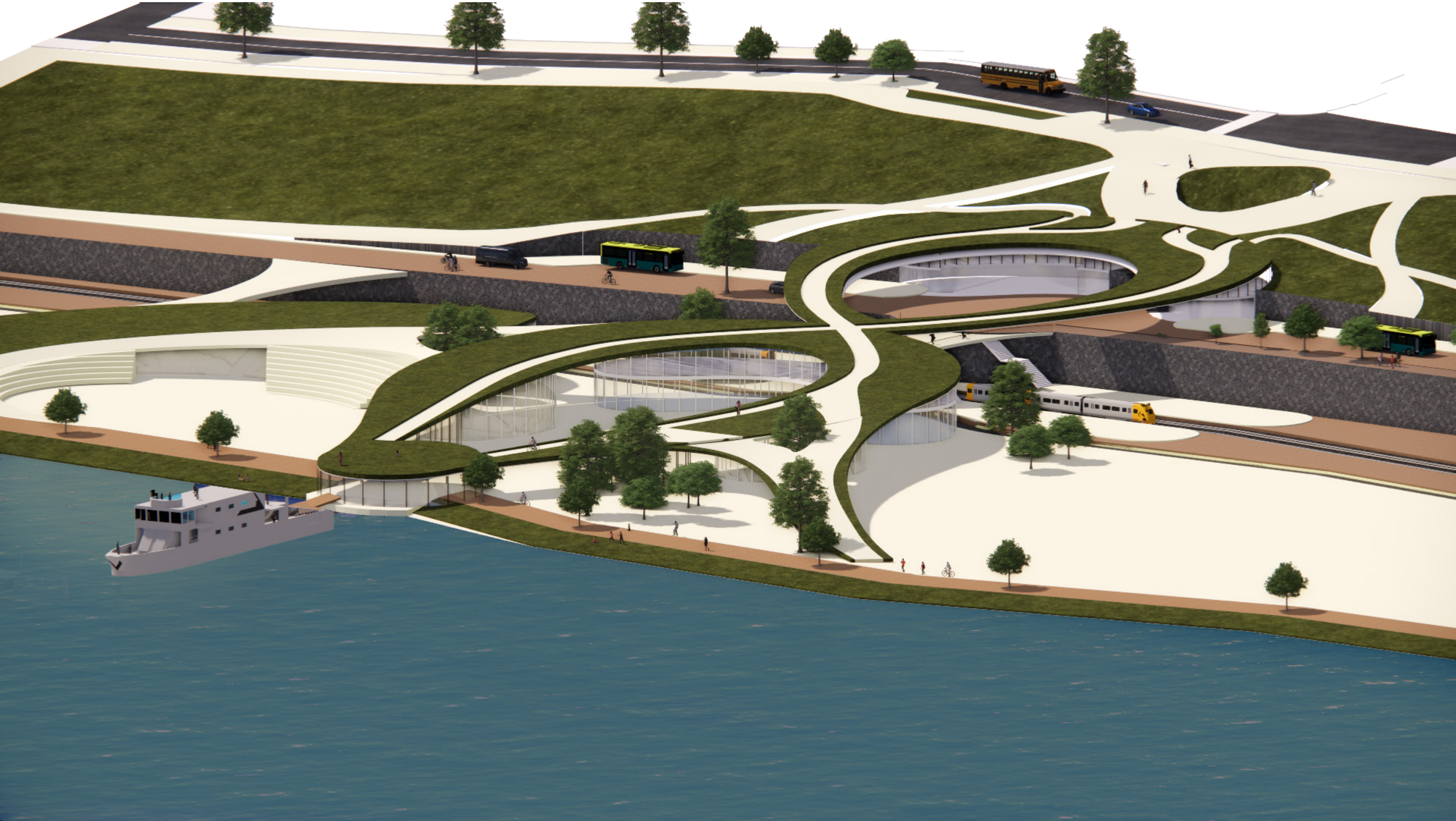
Ground floor plan of Newburg transportation hub

View from broadway towards the east | physical model photograph



Lateral view of project | physical model photograph

East-west section through the Newburgh Mobility hub showing the connection to the water



THE MEDINA OF TUNIS
between cultural continuity & neocolonial globalization

Fall 2022, GSAPP at Columbia University

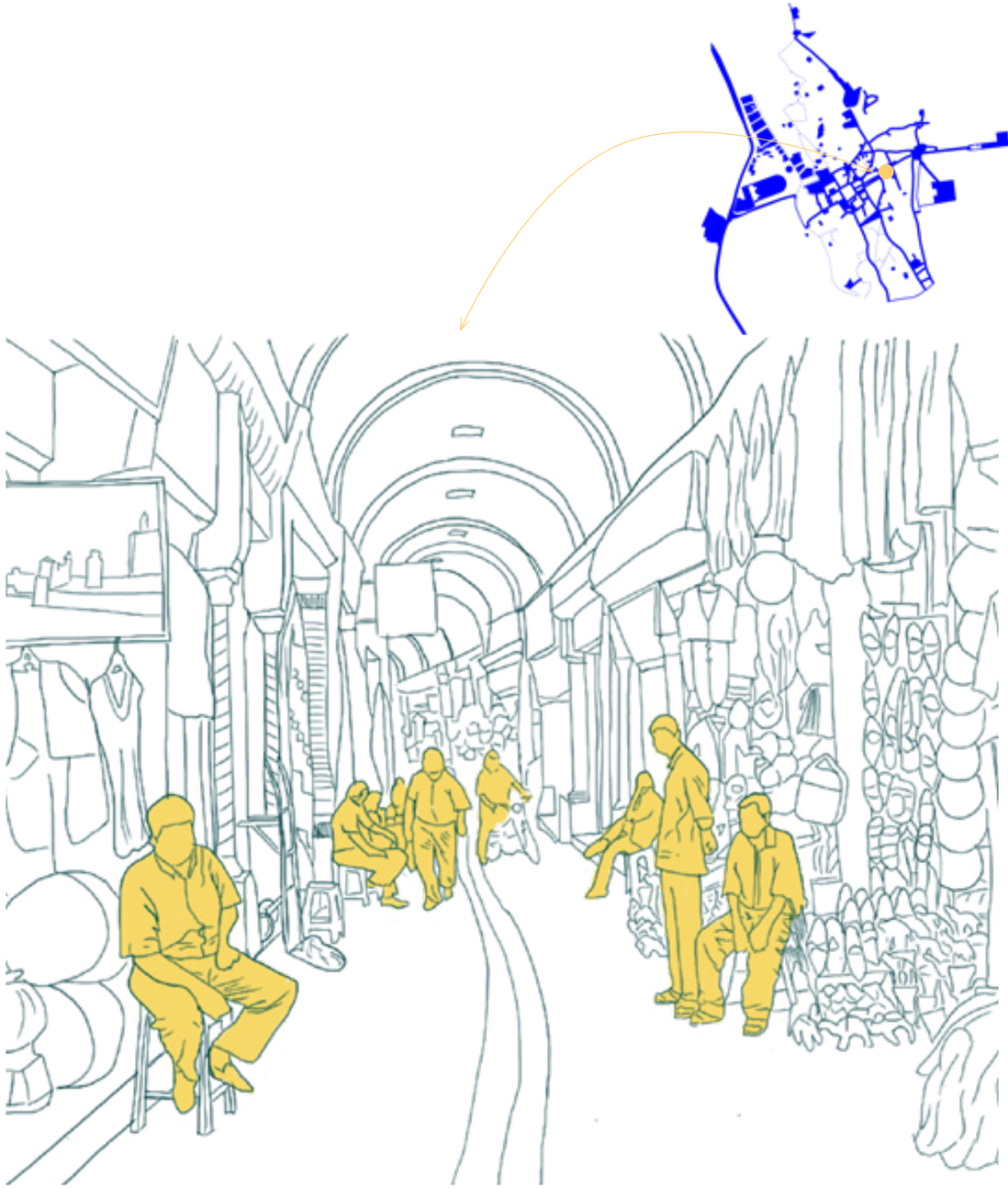
Studio	Advanced V
Location	Tunis, Tunisia
Tutor	Ziad Jamaleddine
Collaborators	Individual

As a means of enriching the local Tunisian culture, this project claims the property of either the street or rooftop of a network of cultural centers and educational institutions. These spaces either exist in ruined condition, with a lack of maintenance and/or localized social activity, given that they are separate from the interstitial spaces used by residents. This project also claims the object of the medersa — those that have been abandoned and left obsolete post colonization.

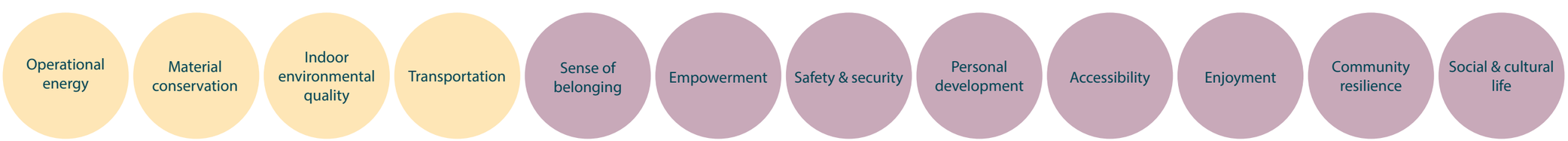
With the intention of providing a charitable resource for the indigenous local community, the project aims to **create a cultural translation** between Medina craftspeople and Tunisian students/graduates by subverting the occupation of streets and roofs to **celebrate the people's culture through making and fabricating**. In a similar manner, the project's claim of appropriated medersas gives agency back to the people of Tunis to decide how to treat the space — promoting a fluid functionality as a means of **embracing Tunis' cultural heritage** through spoken word, music, dance, and social gathering events.
In both cases, the project aims to bring these interstitial spaces and medersas to **develop a network of local cultural experiences**, organized and developed primarily through the input of local users, in order to avoid a linear experience and embrace the fragmentation that the colonial history produced.

Imagined future

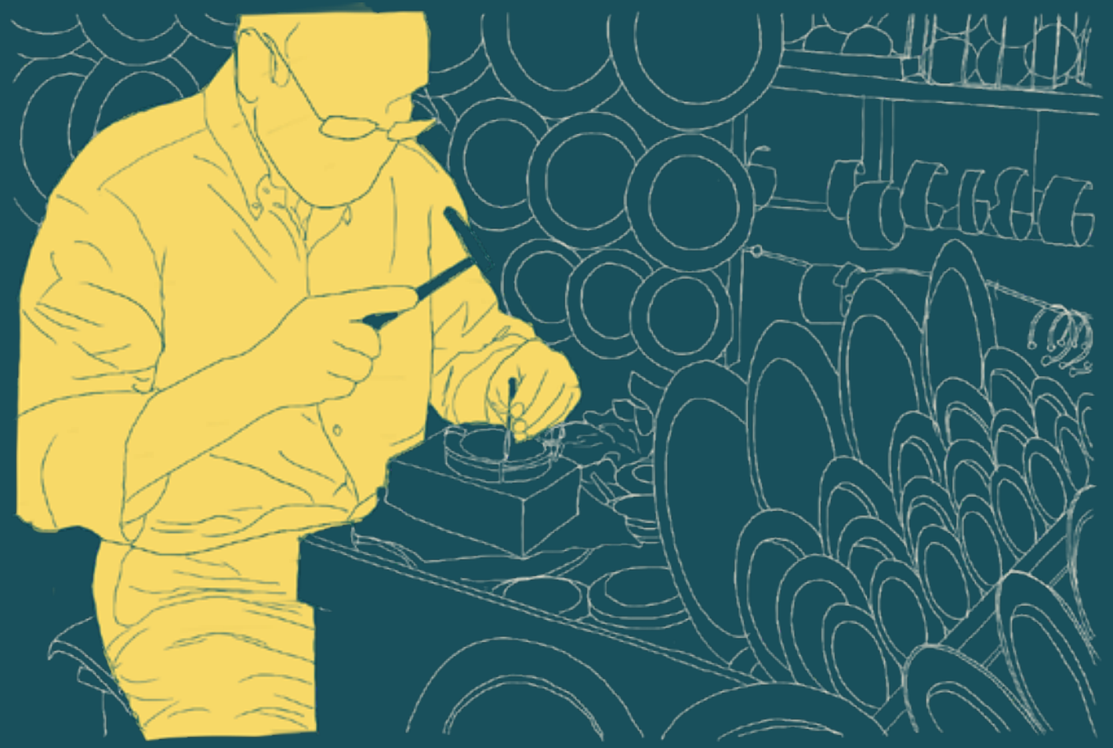
- The medina of Tunis is recognized as one of the **leading centers of craftsmanship**.
- Right at the **intersection between preservation and modernization**. The medina is a perfect example of catalyst infrastructure that promotes the **development of arts and culture** within the local community and beyond, regardless of social status, race and religion.
- Since its inauguration, a number of public workshops opened within the medina and beyond. The other MENA countries took example of this success and have started their own workshop network.



The Medina and its tourist centered economy



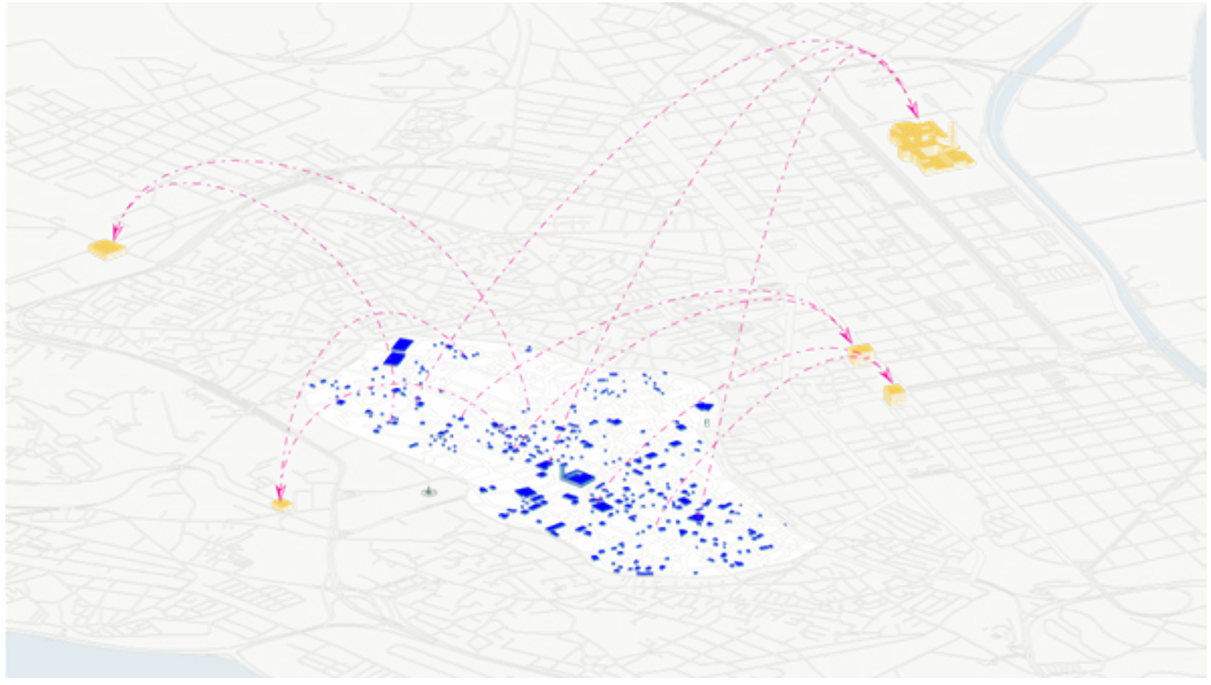
The lost craftsmanship of chia making



The lost craftsmanship of metal engraving

The lost craftsmanship of wood carving

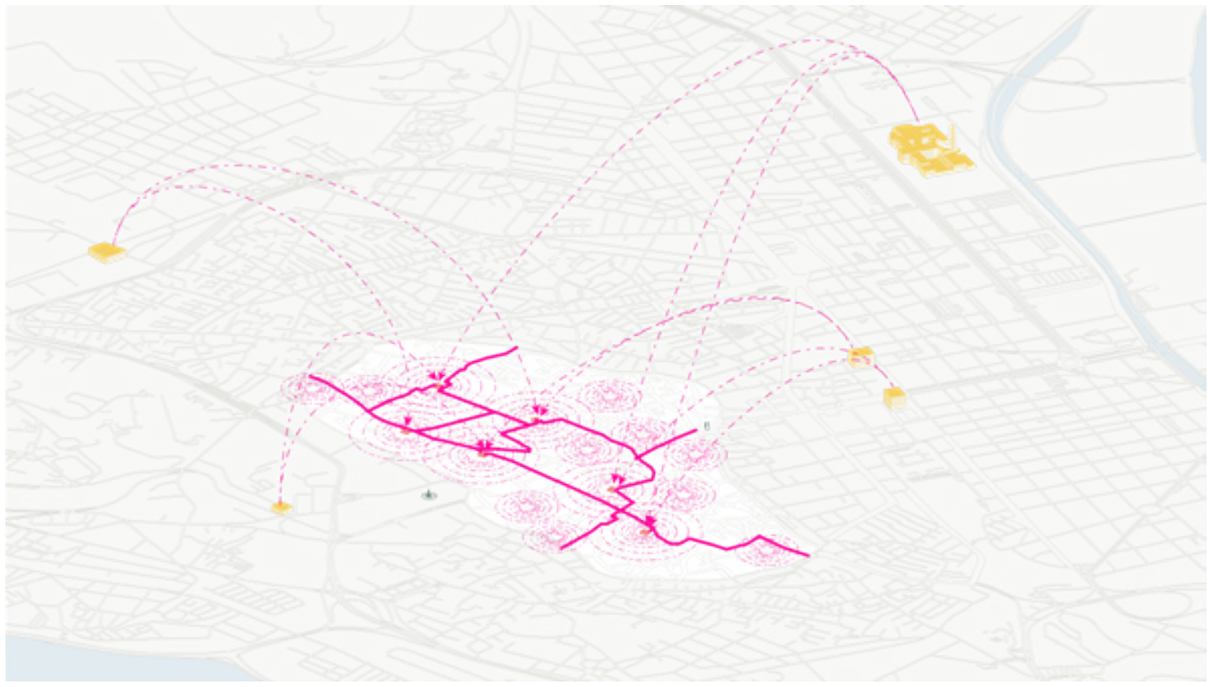
The lost craftsmanship of mosaic making



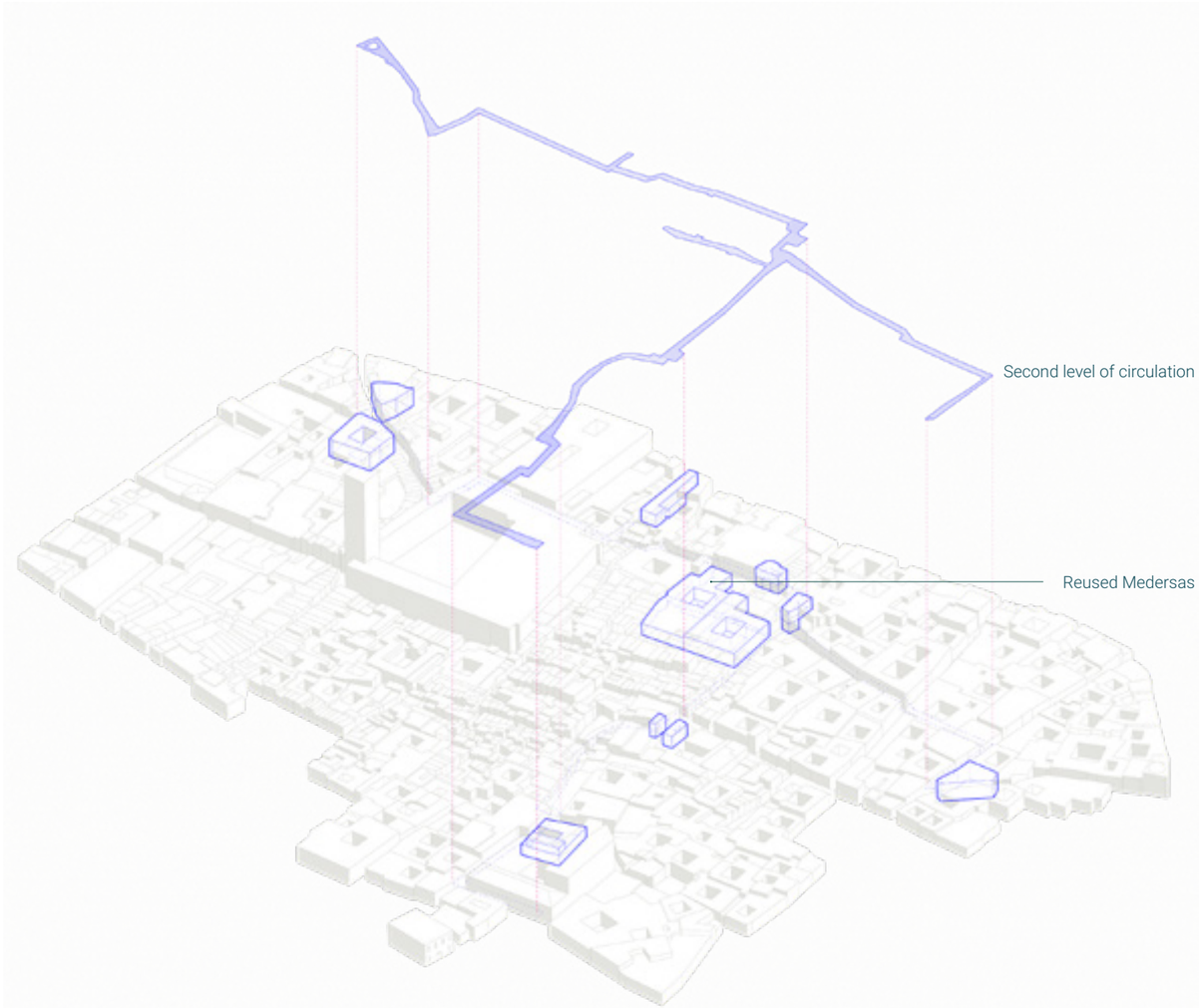
01 | Post-colonial Tunis - arts and crafts leave the medina for new modern infrastructures

02 | How can the arts and craftmanship return to the medina of Tunis?

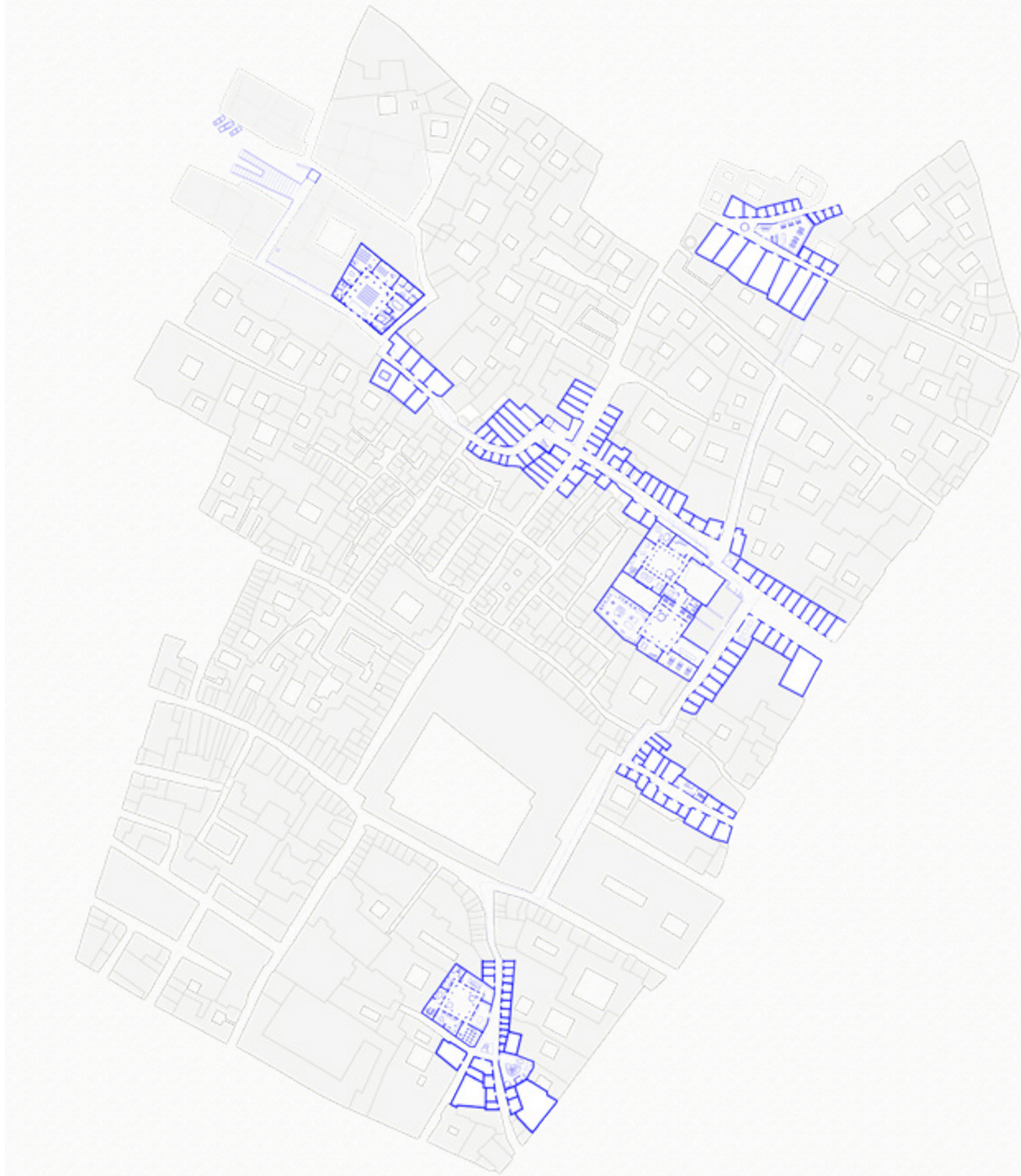
03 | How can the creation of main craftsmanship workshops empower others to do the same?



04 | How can all these new workshops be connected through a more accessible pathway?

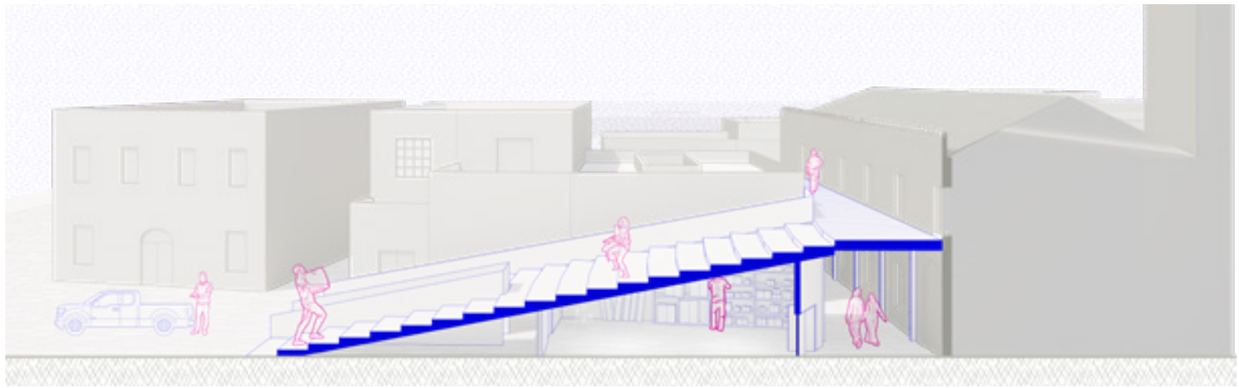


New craftsmen axis

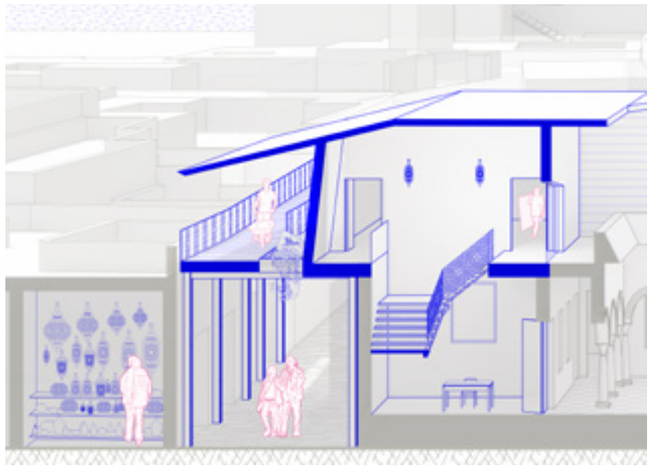


Ground floor | site plan

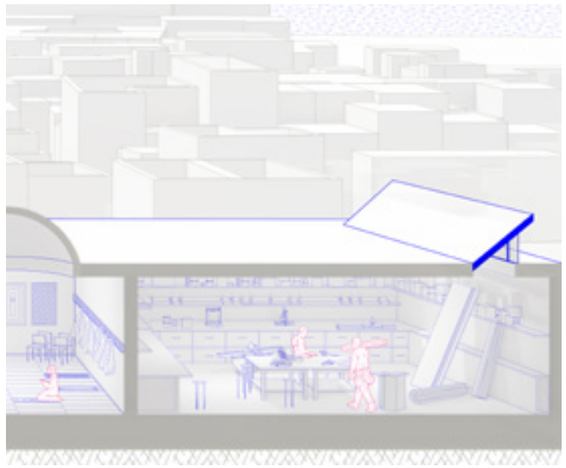
Wood & metal workshops | lower level



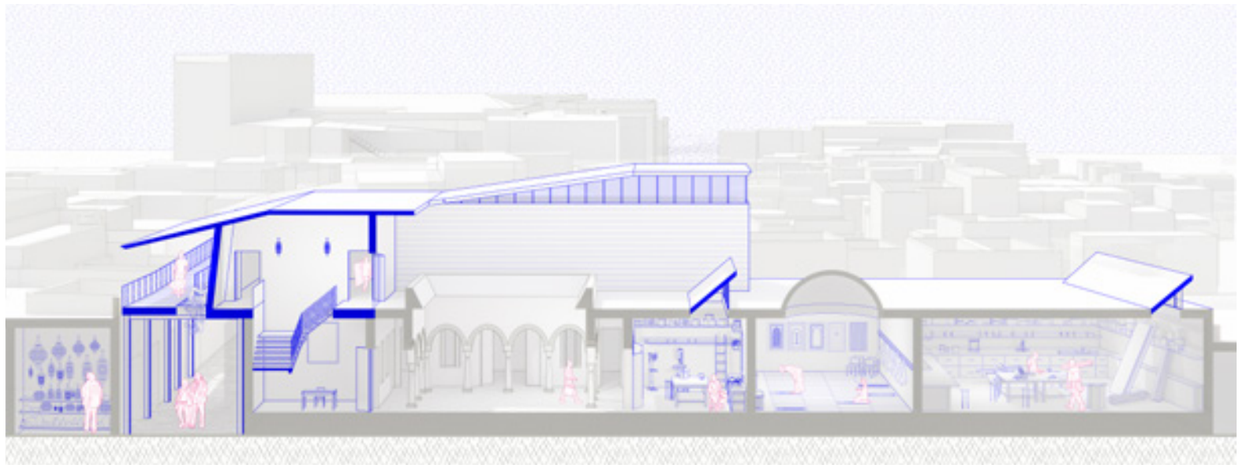
Main entrance of the crafts network | section



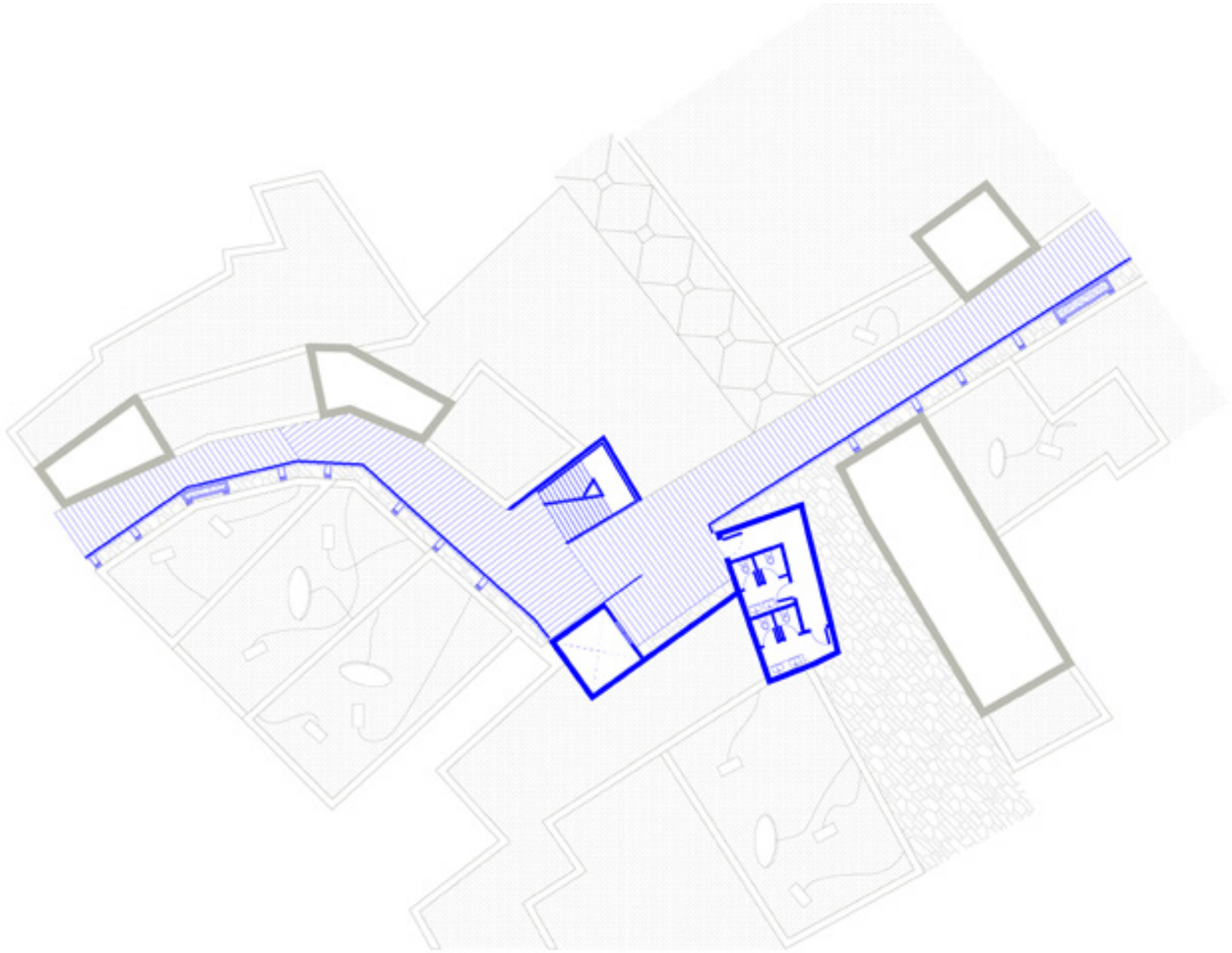
Connection between metal workshop & local shops



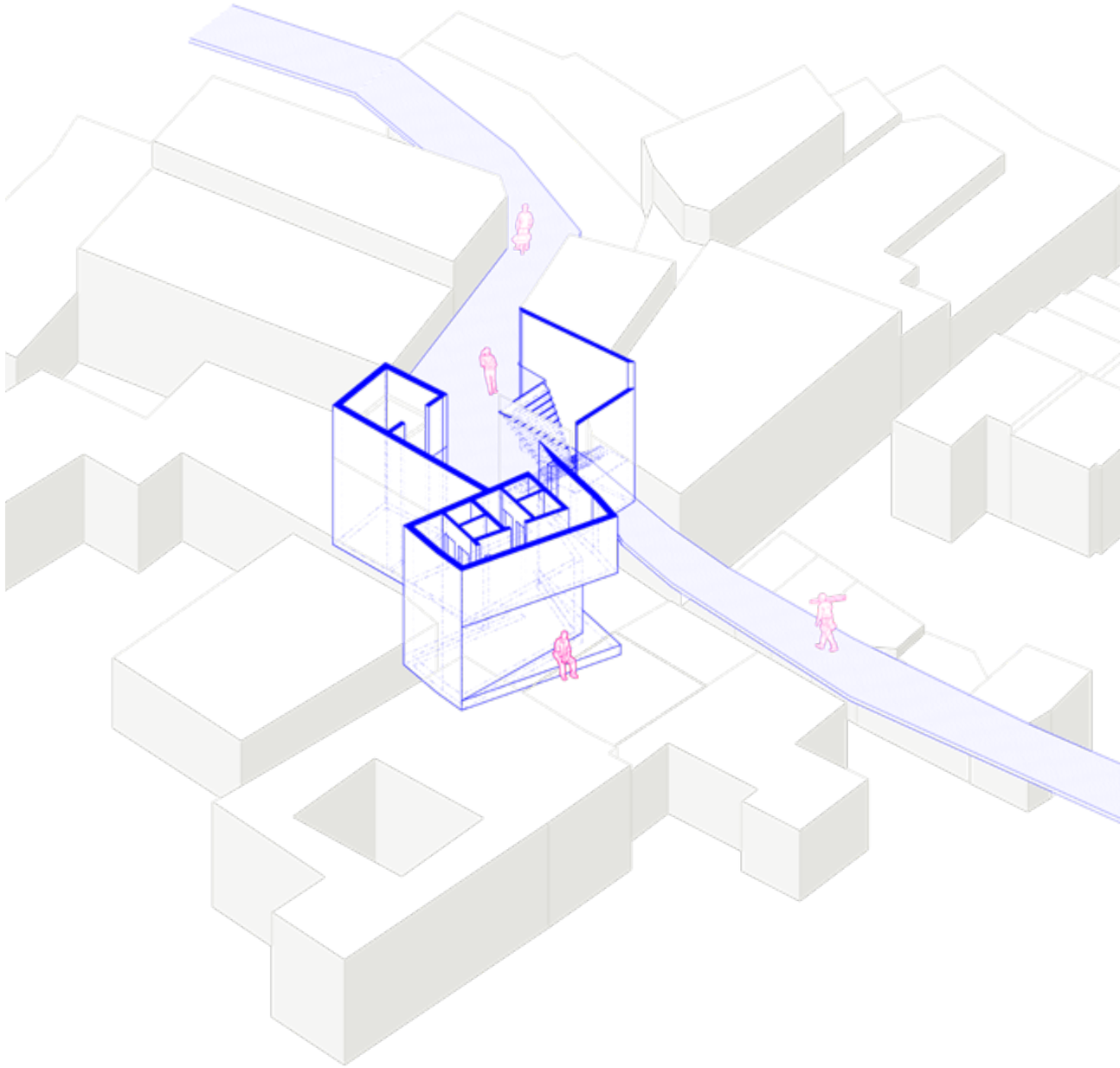
Connection between wood workshop & local mosks



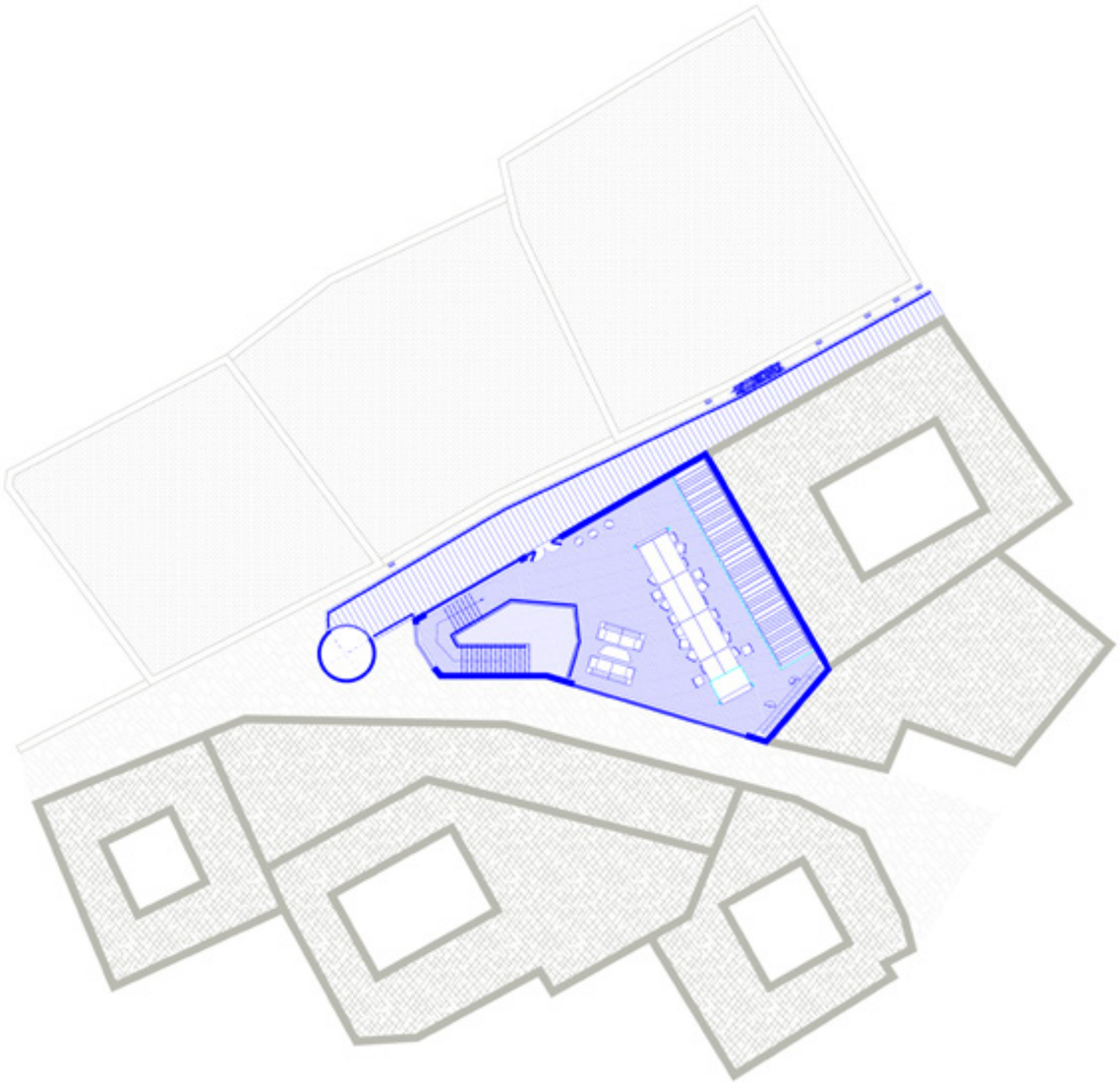
Wood and metal workshops | section



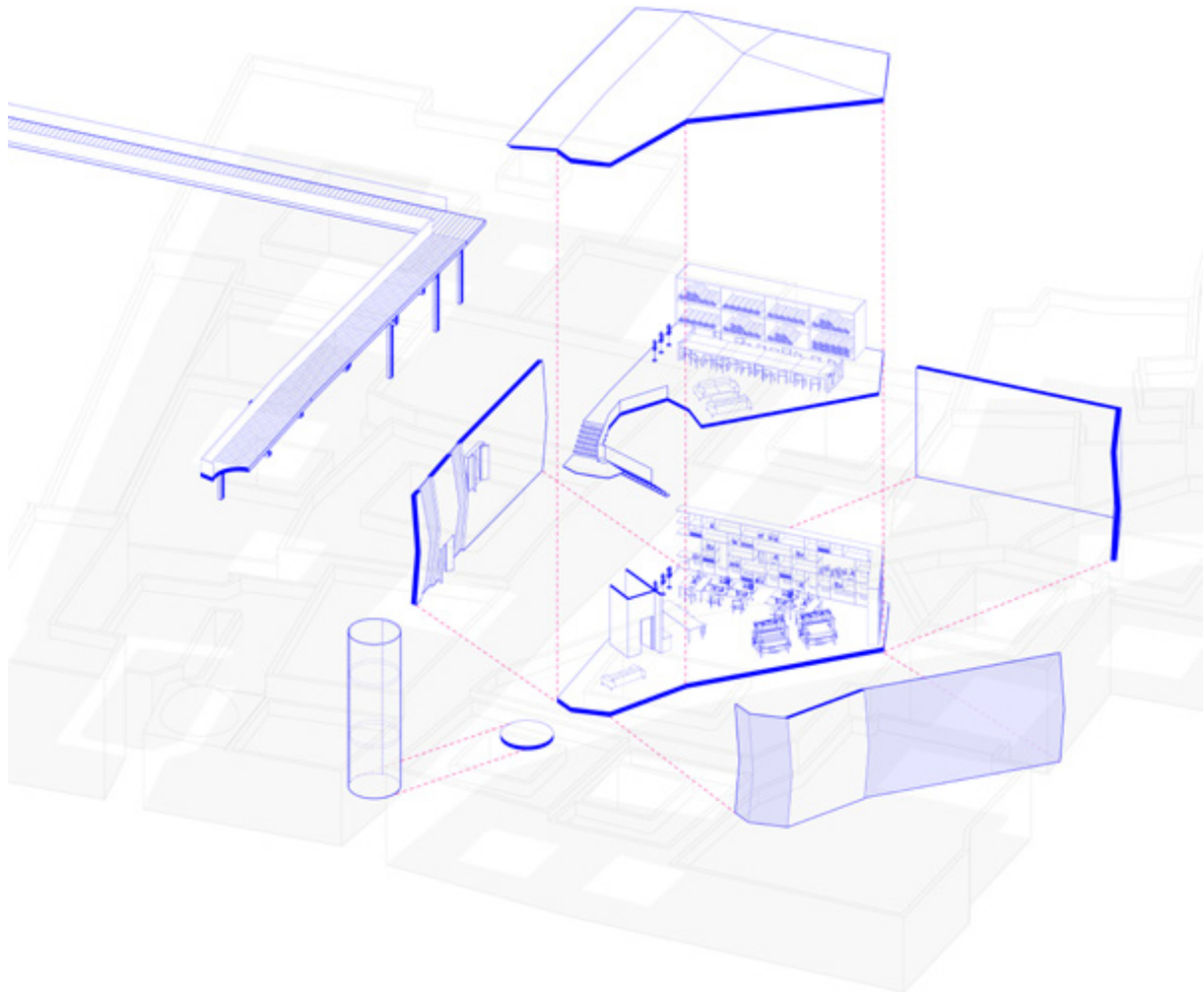
Pathway junction & vertical circulation | upper level



Pathway junction & vertical circulation | axonometry



Fabric & weaving workshop | upper lever



Fabric & weaving workshop | exploded axonometry

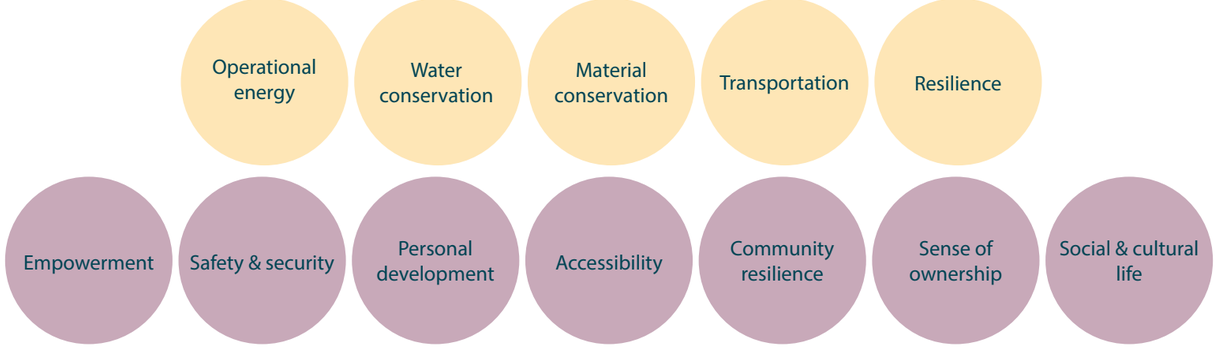
ACCRA'S MARKET QUEENS

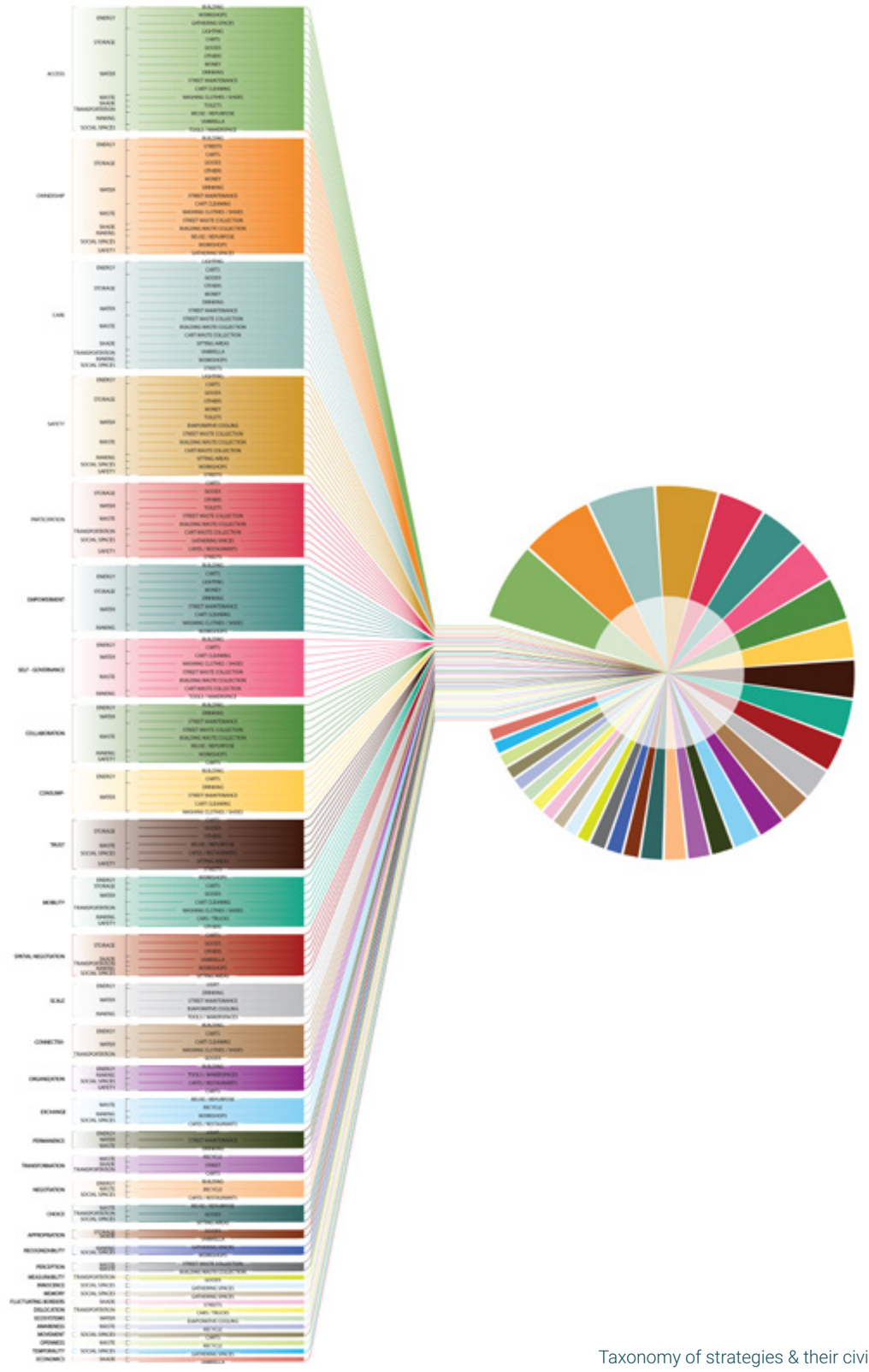
Spring 2023, GSAPP at Columbia University

Studio	Advanced VI
Location	Accra, Ghana
Tutor	Gary Bates
Collaborators	Ridi Chopra

Civic spaces and identities are not restricted to physical structures or buildings, but can exist in a variety of forms, including objects, time and measurability. The **civic-ness of a space or identity** can be assessed at the scale of the **human experience** and the various interactions that occur within it. Makola market, a critical part of Accra's economy, is the second largest informal market in the world. Trading within its boundaries, the market is home to a diverse array of vendors, selling everything from fresh produce to textiles, clothing and crafts. The government's attempts to construct large scale infrastructure for the market are facing opposition from the local population, indicating that **a top-down approach might not be the most effective strategy for the development of the space**. Given this understanding, how can we design for a segment of the society that **lives with the temporality** of everyday life? How can we create a **sense of ownership** over space and **provide agency to individuals** who want to have an identity within the common collective?

It is essential to the hypothesis that we design for stakeholders that face the brunt of the social hierarchy and support their needs in a way that allows them to **feel empowered** when they leave their homes. The aim is not to establish and heighten the stratification that exists today, but to offer opportunities for **improving conditions for traders**; and supplement that with developing organizational schemes that coordinate the provision, maintenance and use of the intervention. Our objective is to address the intricacies present in Accra by incorporating **trust, impermanence, adaptability and security** into the approach and creating prototypes that can be **duplicated and scaled** beyond the boundaries of problem solving frameworks.





Taxonomy of strategies & their civic meaning

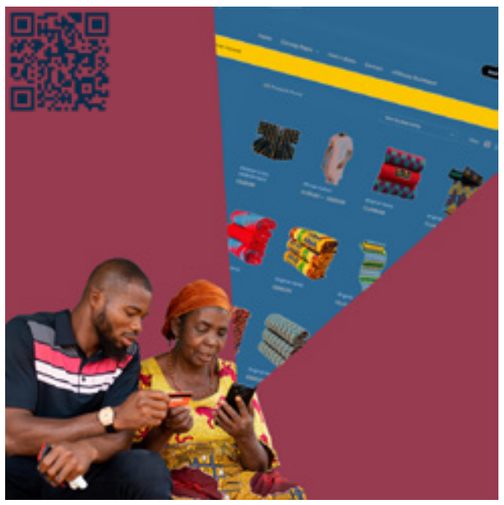




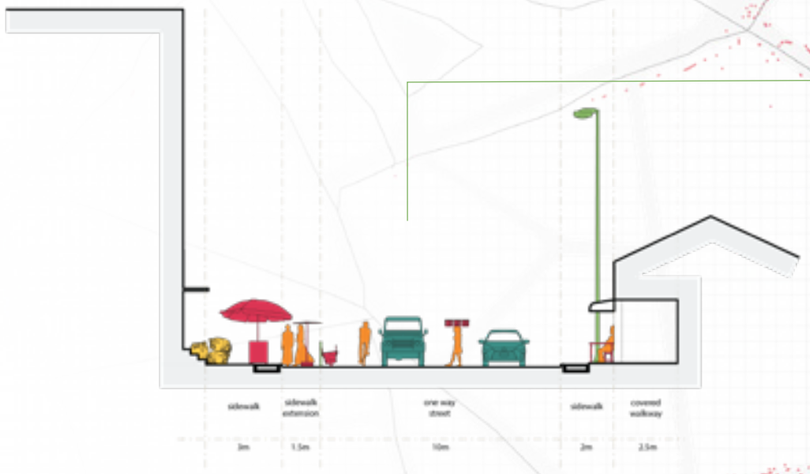








The evolution of Makola Market through collages



Sections showing existing conditions and appropriation of spaces

Analysis of current market density

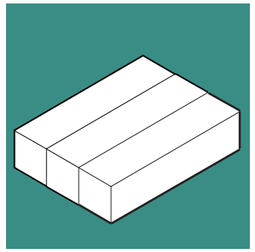
ENERGY | WATER | STORAGE | WASTE | SHADE | TRANSPORTATION | MAKERSPACES | SAFETY

NEIGHBORHOOD SCALE

BUILDING SCALE

CART SCALE

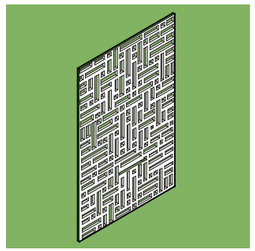
Taxonomoy of strategies to bring infrastructure to the Makola Market



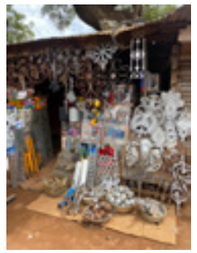

wood industry


scrapyards

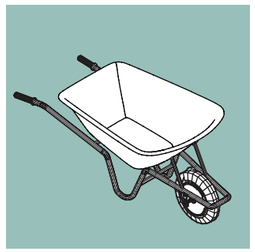

market streets




scrapyards


hardware stores

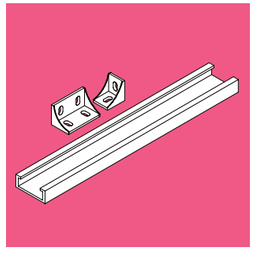

construction sites

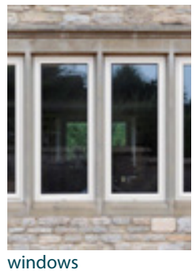


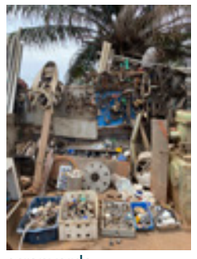

scrapyards


markets

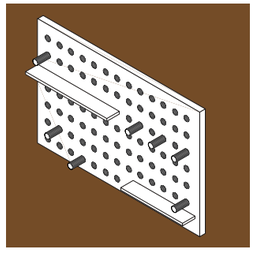

construction sites

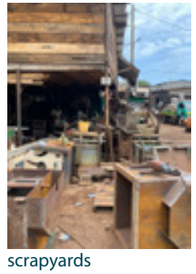


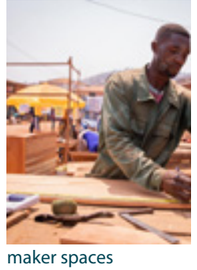

windows


scrapyards


construction sites

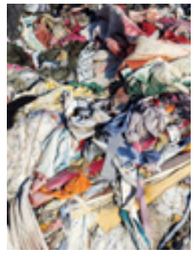



scrapyards

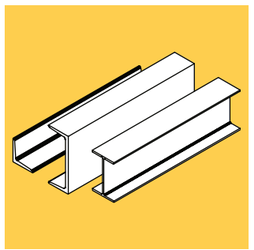

maker spaces


construction sites


umbrellas


landfills

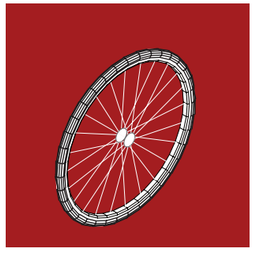

markets

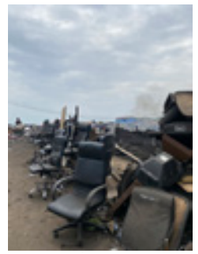



makers spaces


scrapyards

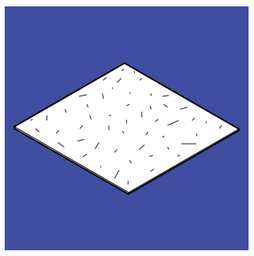

automobile shops

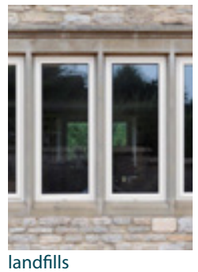


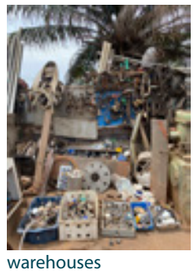

scrapyards


bicycles


scooters and bikes




landfills


warehouses

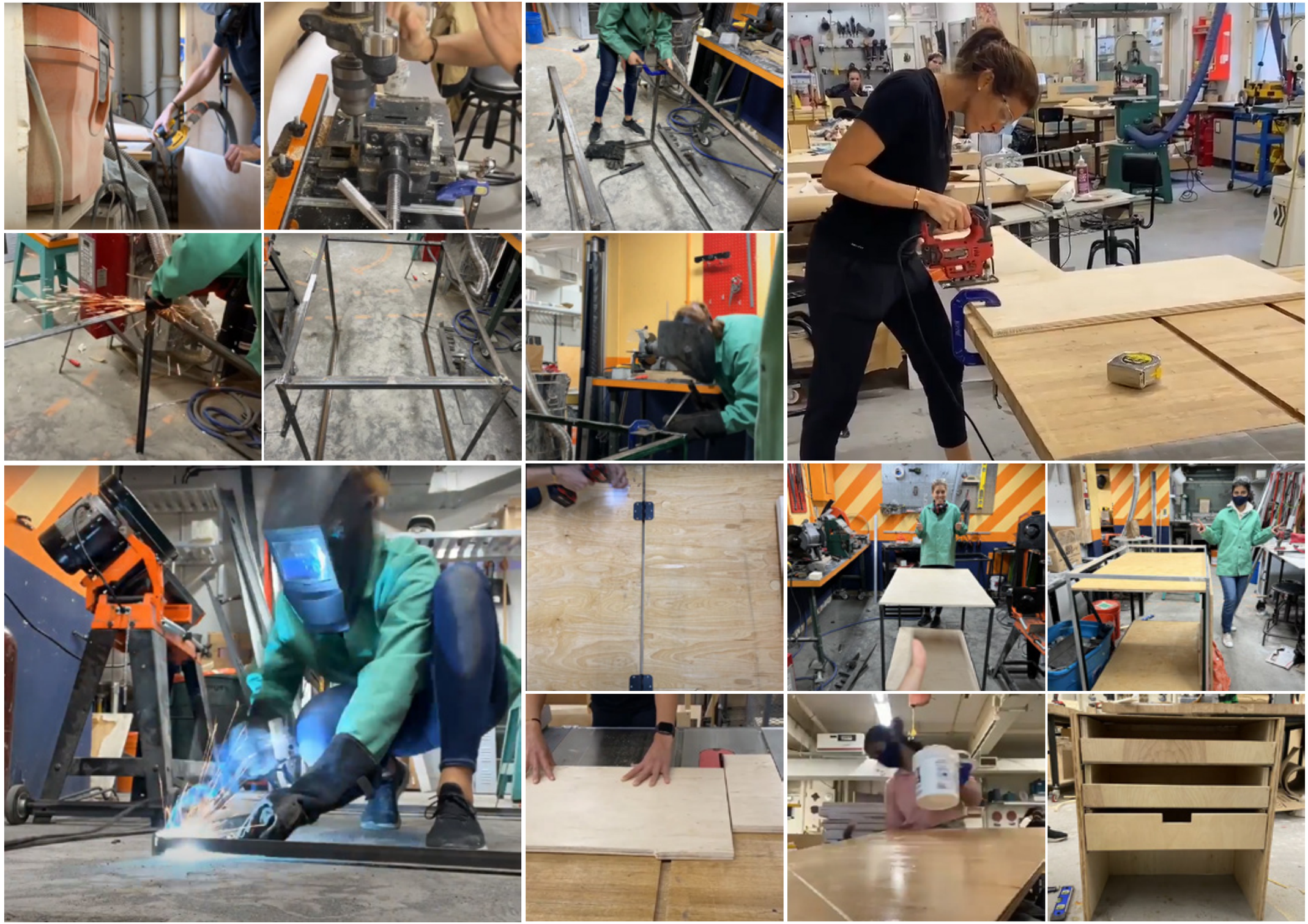

construction sites


construction sites


landfills


forest

Where to find materials to make your own cart?



Process of making our own cart

Final review held outside on Columbia Campus

cart made of

98%

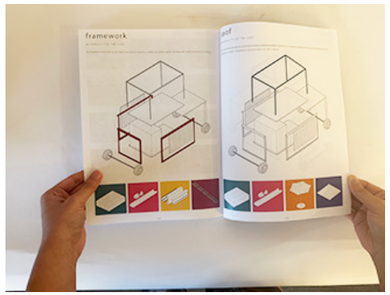
recycled/diverted from landfill material

70%

desassambleable

If we can make it with waste materials we find around Columbia University, they can make it with materials they find around Accra!

Photos of catalogue that shows a taxonomy of objects and spaces that are being appropriated by the locals

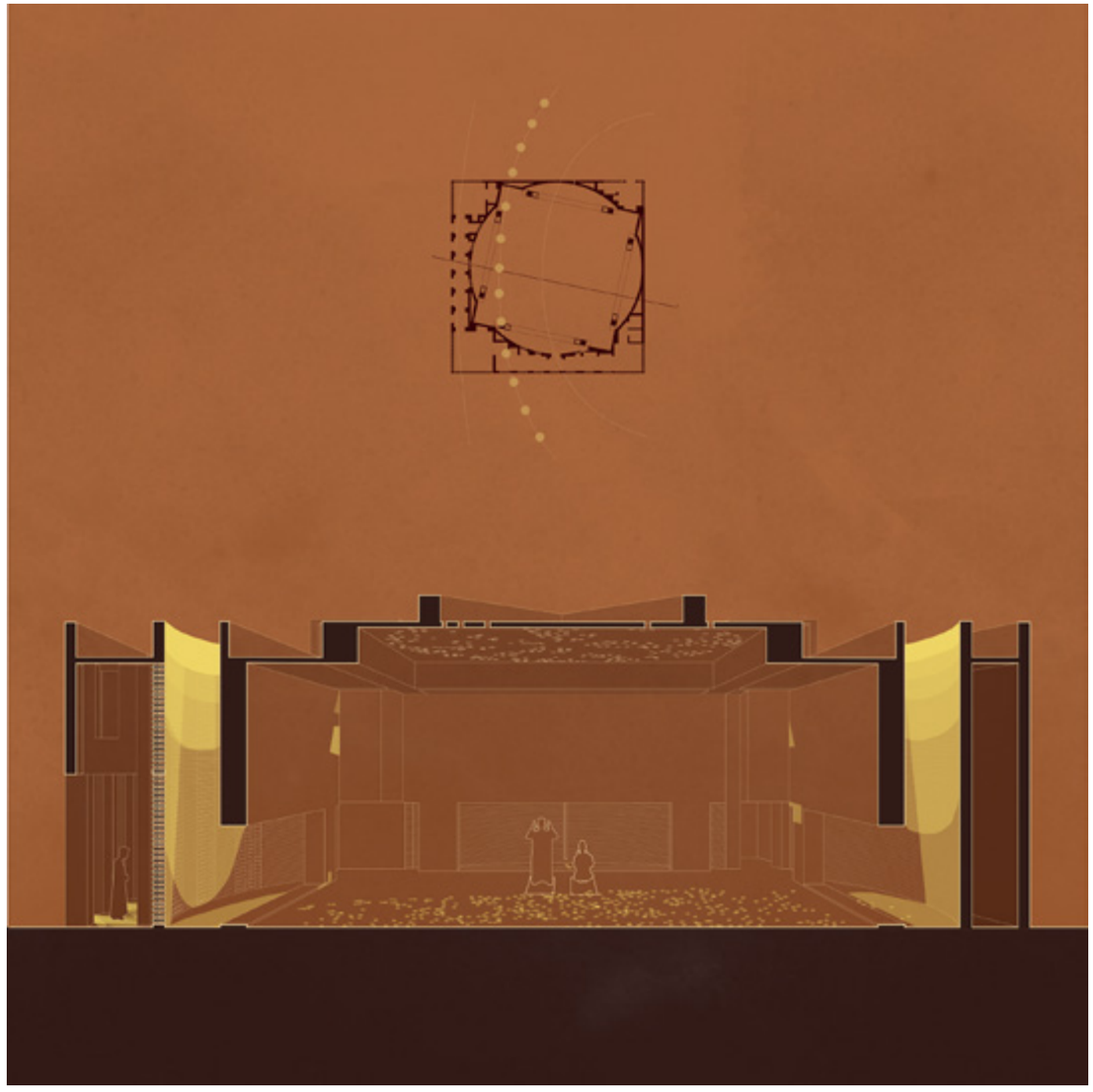


Fully functional cart retracted

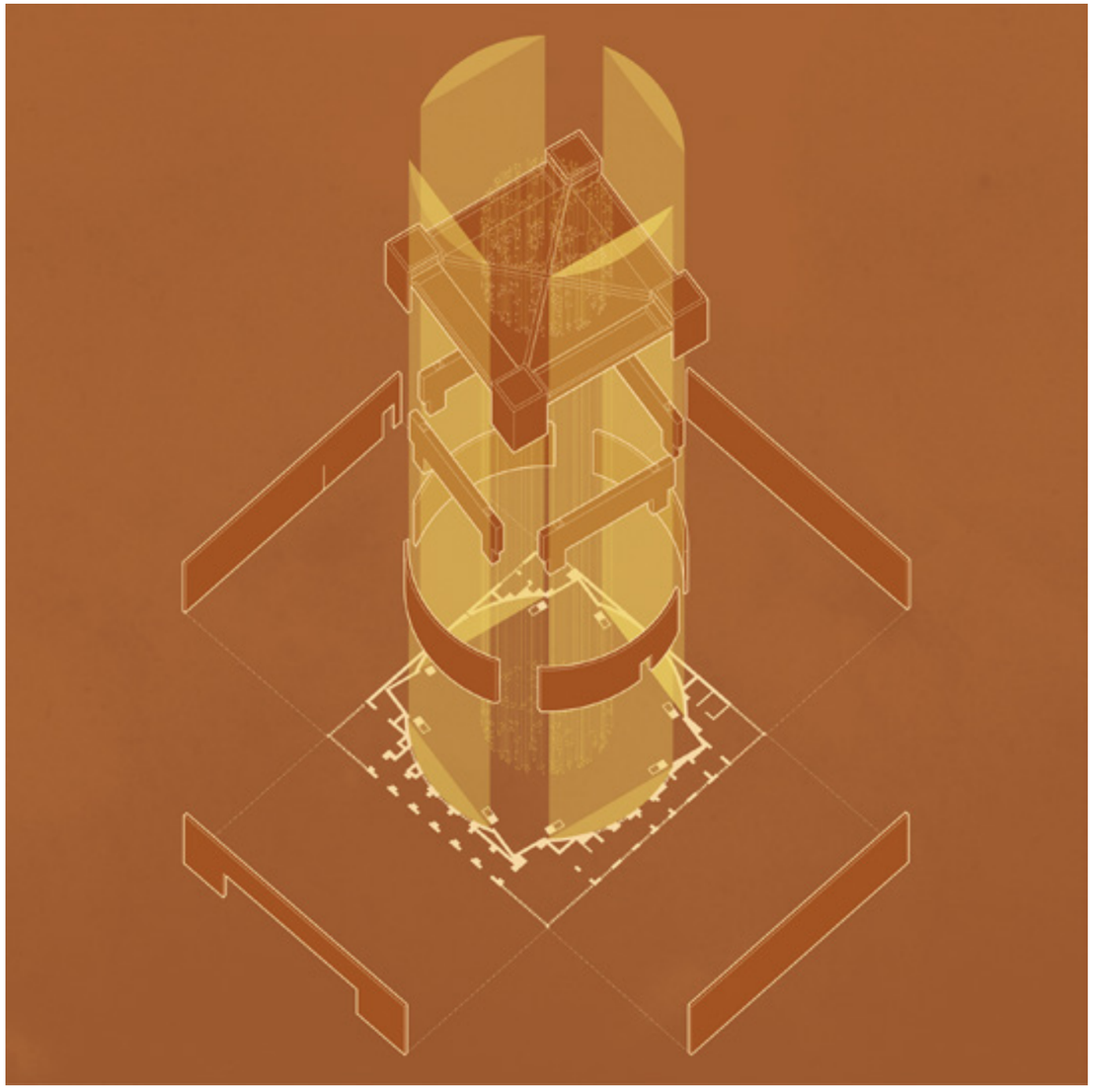
Bait Ur Rouf | Light Analysis

Marina Tabassoum Architects

ADR I - Joshua Ulh



Daylight though a day | June 21st



Noon Prayer | High Sun

Phisical Model | Noon Prayer

Physical Model | End of Day Prayer

THE UPGRID

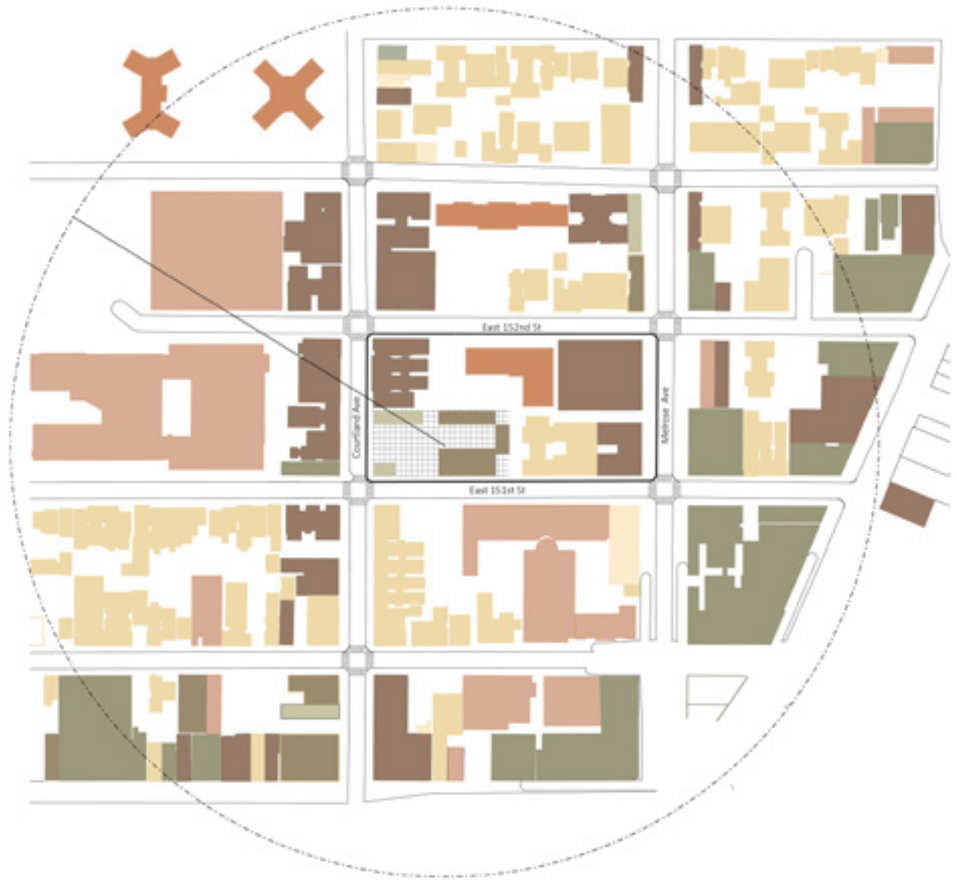
Fall 2021, GSAPP at Columbia University

Location	The Bronx, New York
Tutor	Michael Caton
Collaborators	Kerol Kaskaviqi

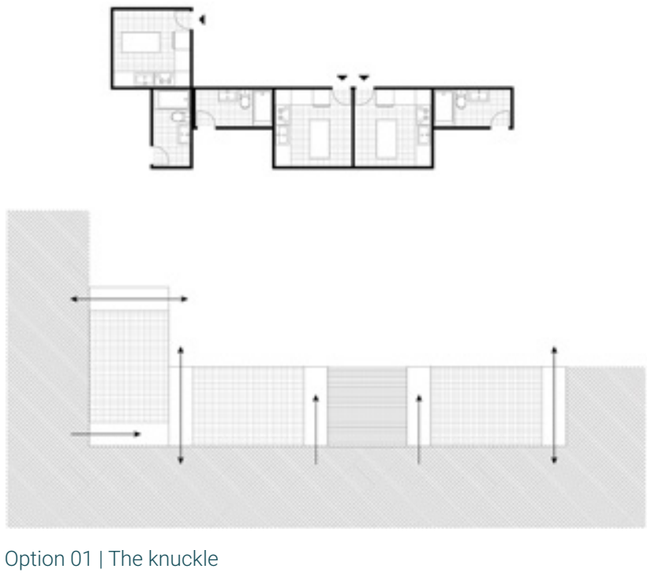
The UpGrid brings an innovative approach to manufacturing and construction of a mass timber system that not only offers **flexibility and scalability**, but aims to **upscale construction materials and reduce demolition waste**.

The UpGrid seeks to design affordable housing that relies on a **prefabricated 2D and 3D systems** that can easily be assembled, disassembled, and reassembled. The main assemblies are made out of **mass timber** in order to reduce the system's embodied carbon. Closely working with developers, manufacturers and designers allow for a **fully predicted kit of parts** which can be assembled on site and deassembled at the end of the building's lifecycle. The UpGrid is sensitive to context height, neighborhood necessities and green space accessibility. Located in one of the financially vulnerable areas of the Bronx, this project offers a variety of studios, one, two and three bedroom apartments to **accommodate all family sizes and intergenerational cohabitation**. It seeks to introduce means which could enhance the wellness and health of its inhabitants by providing **community spaces** throughout the ground floor and rooftop of the two main buildings. The green spaces feed into these programmatic ideas **accessible to the whole neighborhood** while the green terrace offers inhabitants a more private experience within the community which is also driven by wellness.

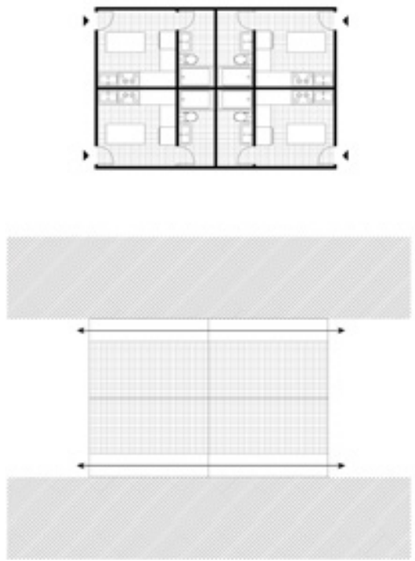
Not only does this project seeks to expand on the notions of **design for flexibility and deconstruction**, it pushes the boundaries of what co-living and **design for social empowerment** means.



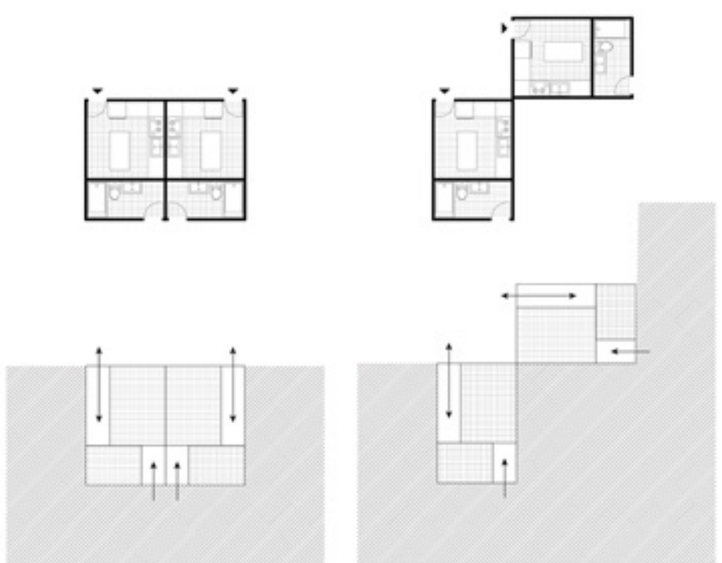
Site Analysis | Businesses, Residences, and Institutions



Option 01 | The knuckle



Option 02 | The back to back

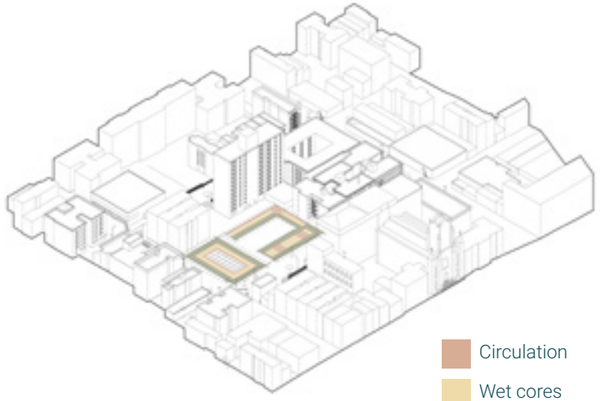


Option 03 | The egg yolk

Layout exploration

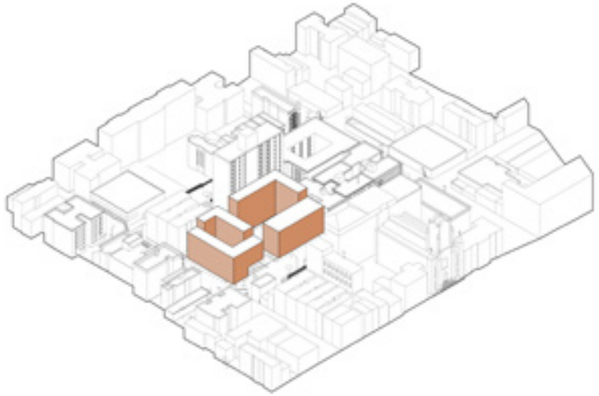
Zones layout on grid

Site plan



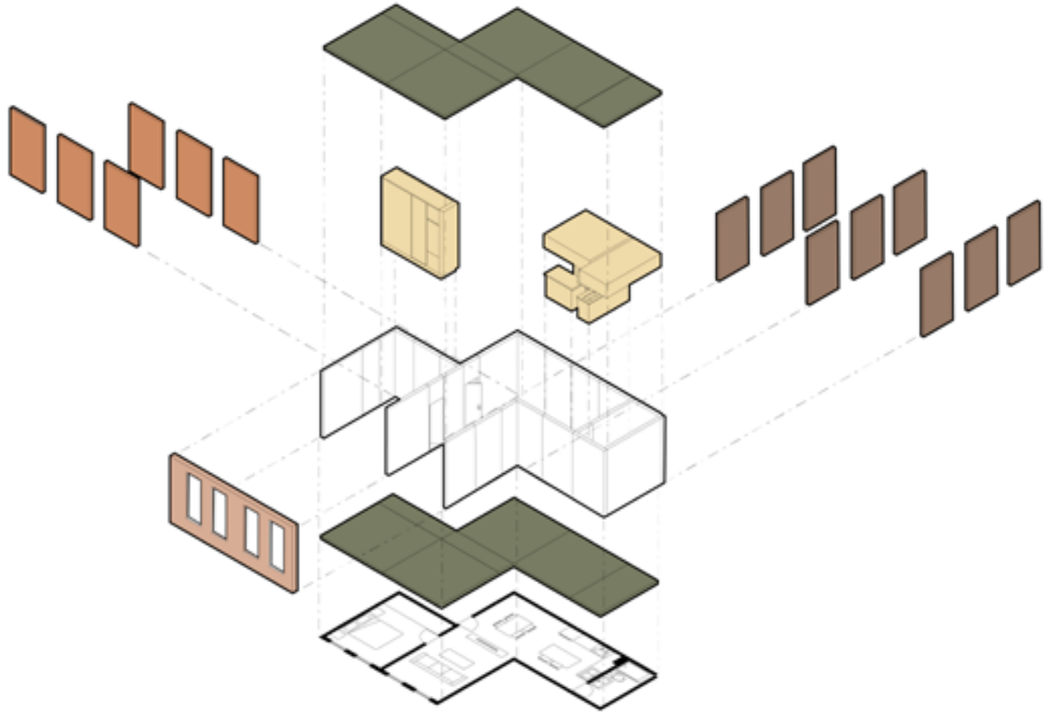
Zones layout on grid

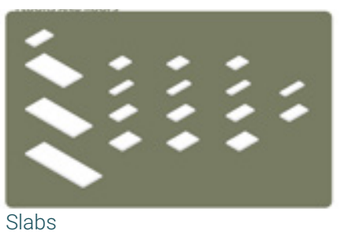
Circulation
Wet cores
Living areas



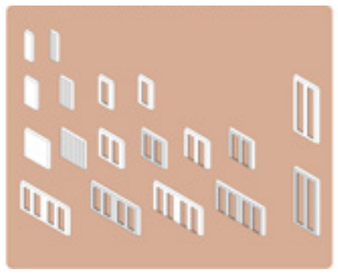
Massing

Business plan | design for disassembly and reuse

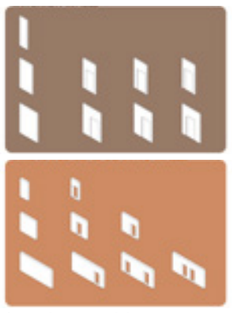




Slabs



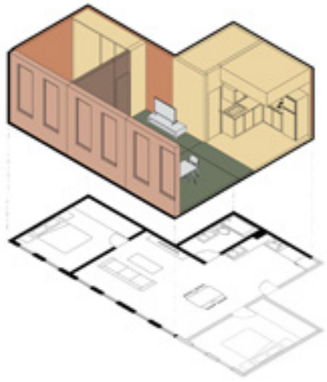
Envelope



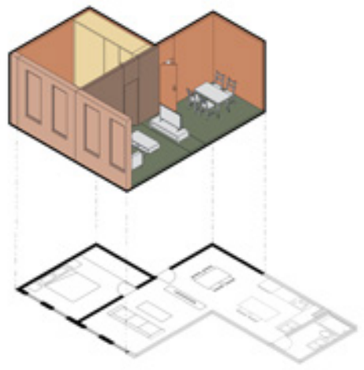
Interior partitions

3D modules

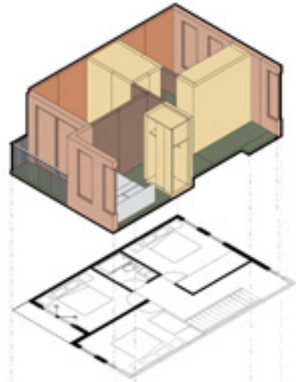
Components



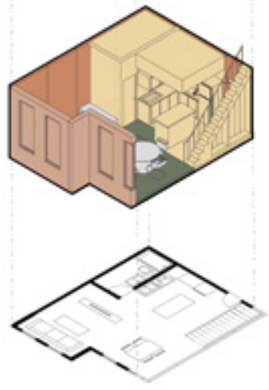
2 bedrooms apartment

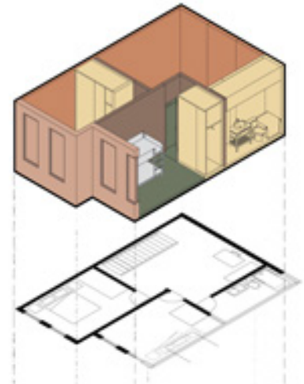


1 bedroom apartment

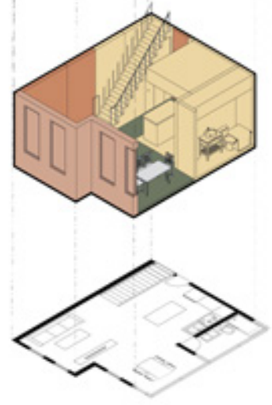


3 bedrooms duplex

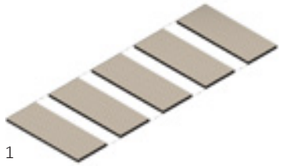




2 bedrooms duplex



Units floor plans & components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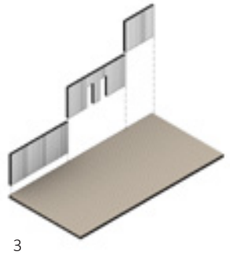
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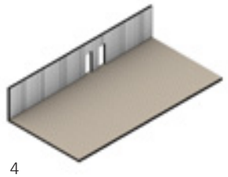
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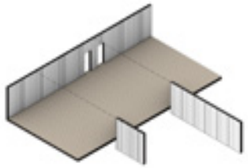
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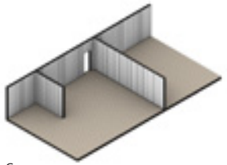
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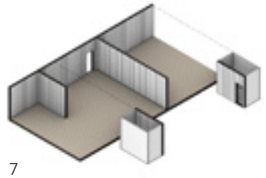
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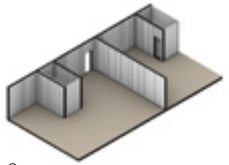
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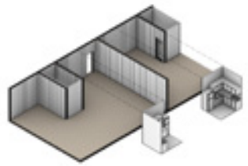
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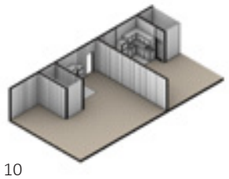
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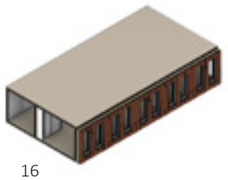
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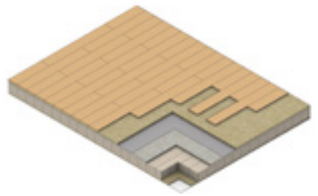
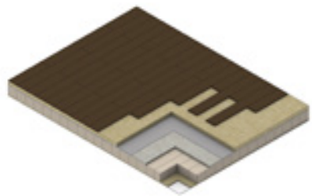
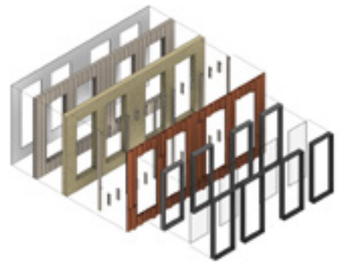
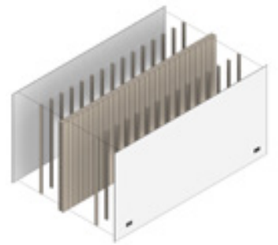
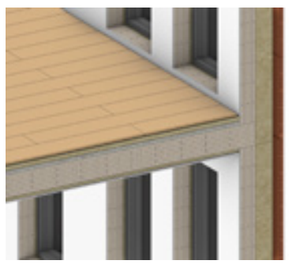
Construction process

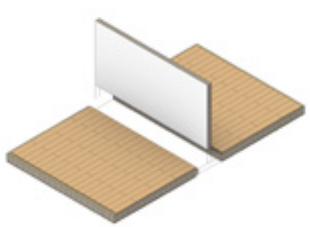


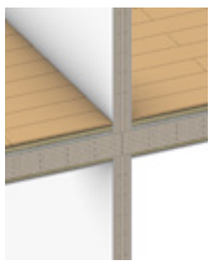




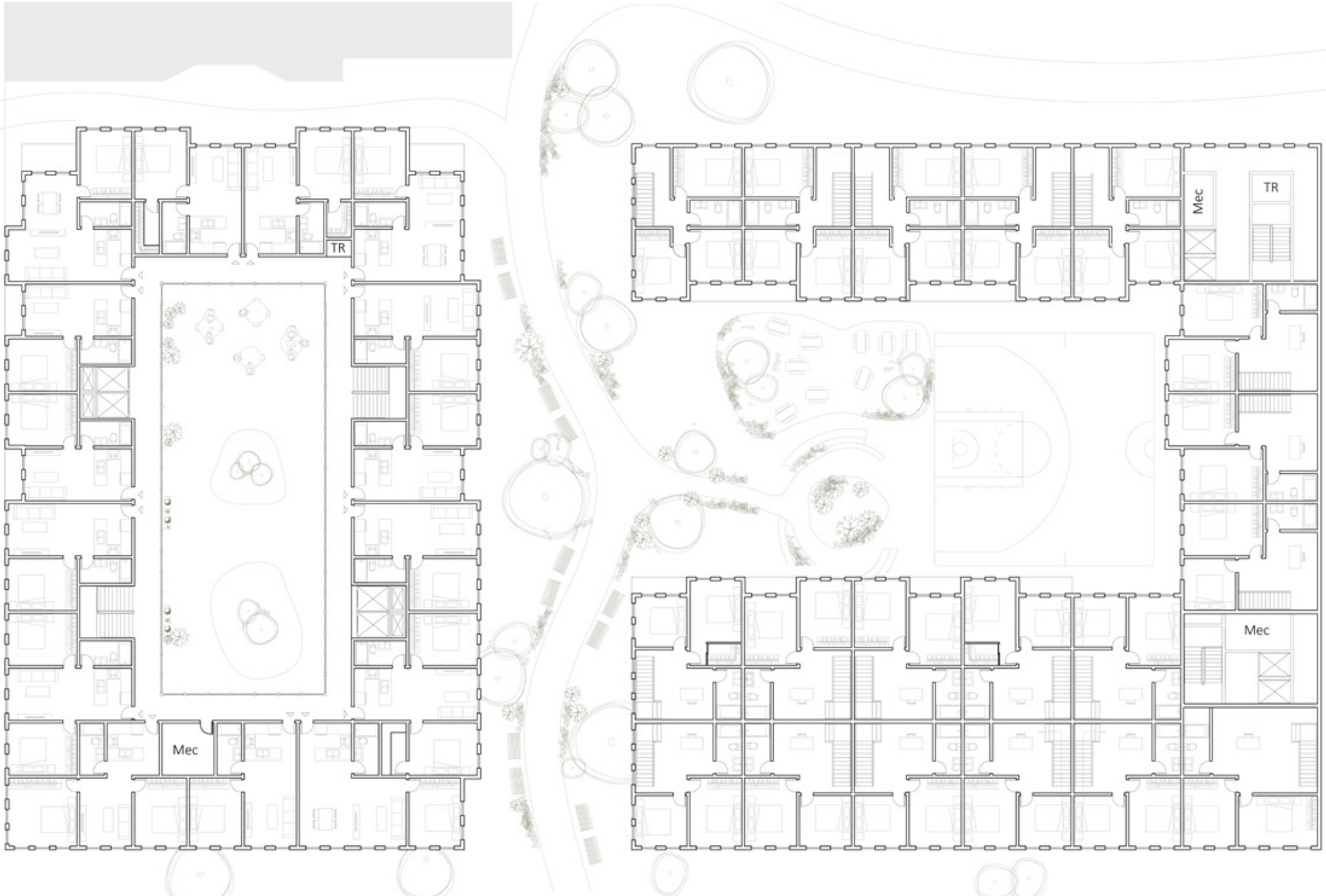




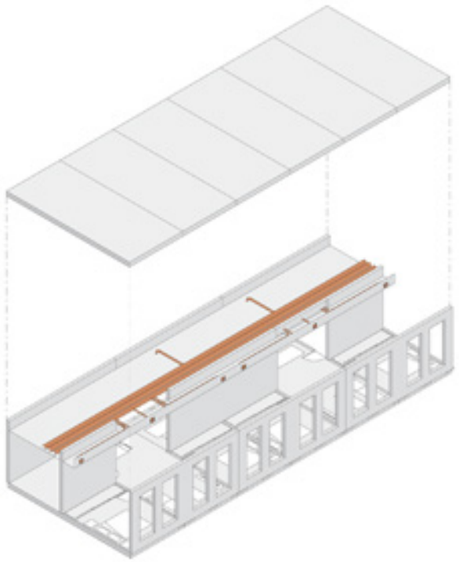


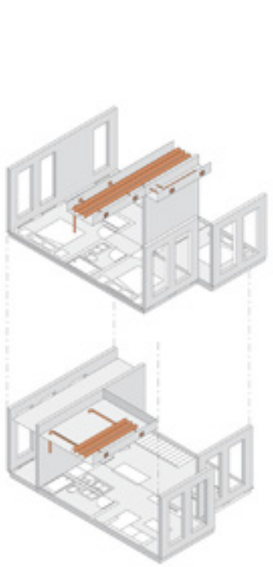


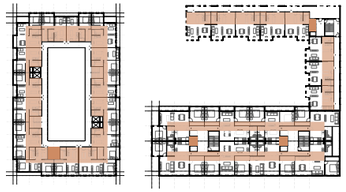
Components details & assembly



Floorplan | Level 3

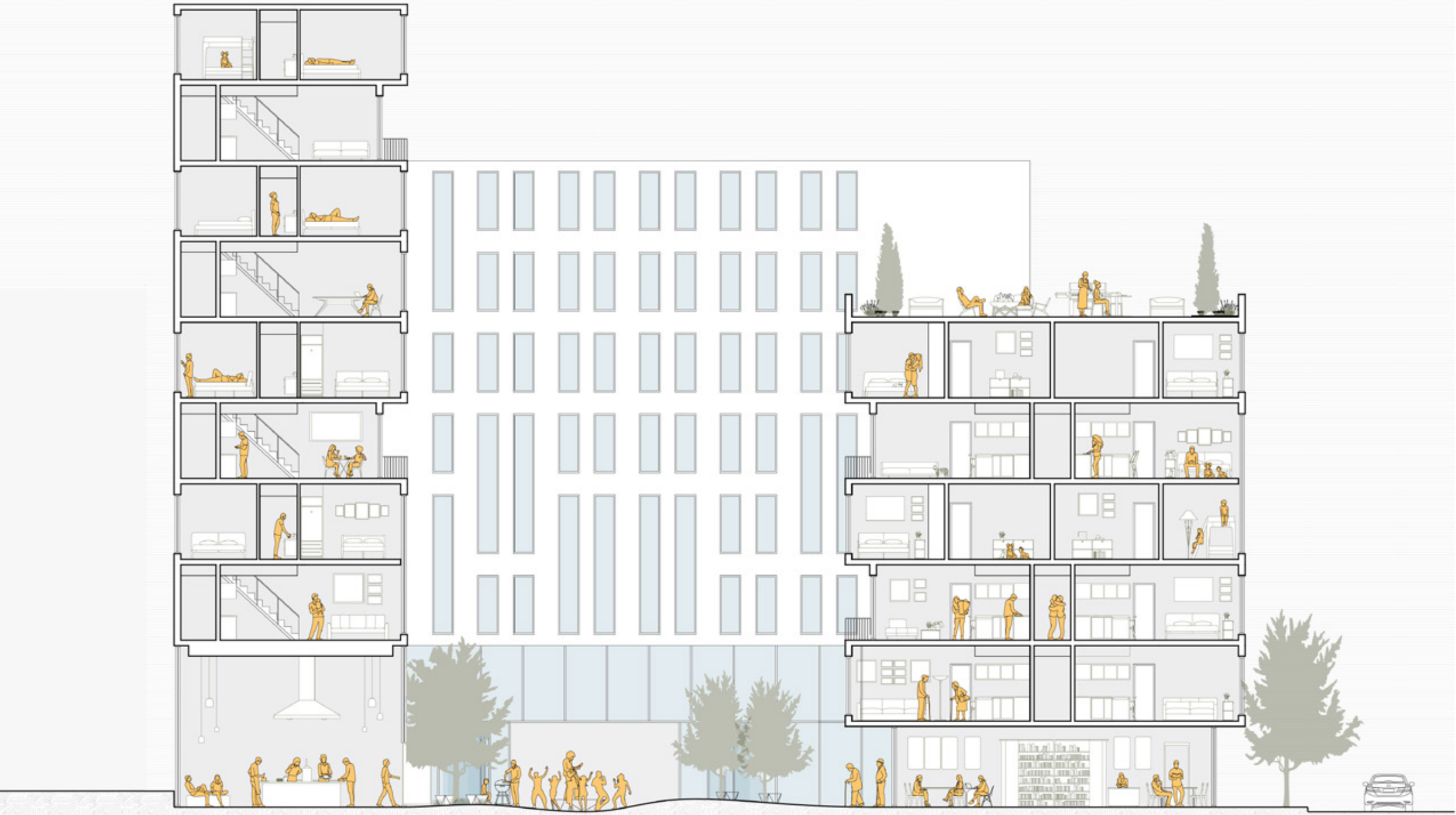




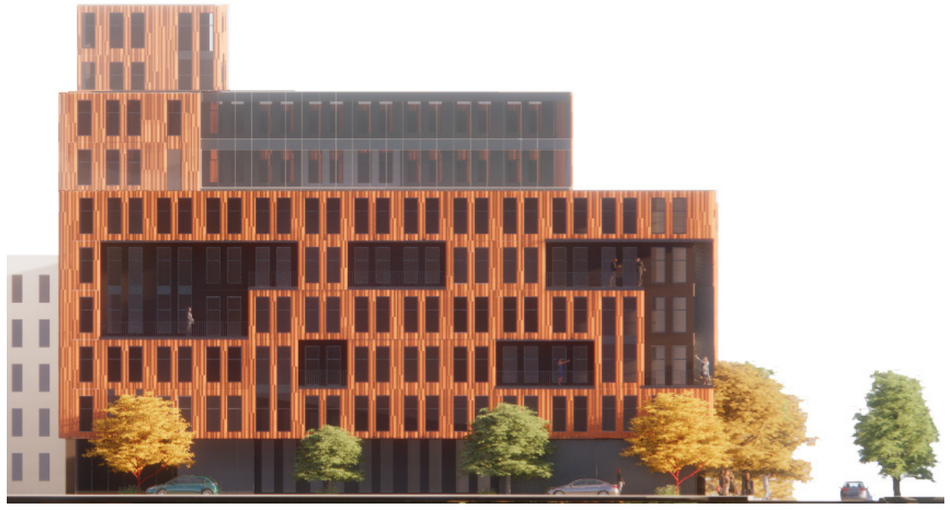


Integration of mechanical system

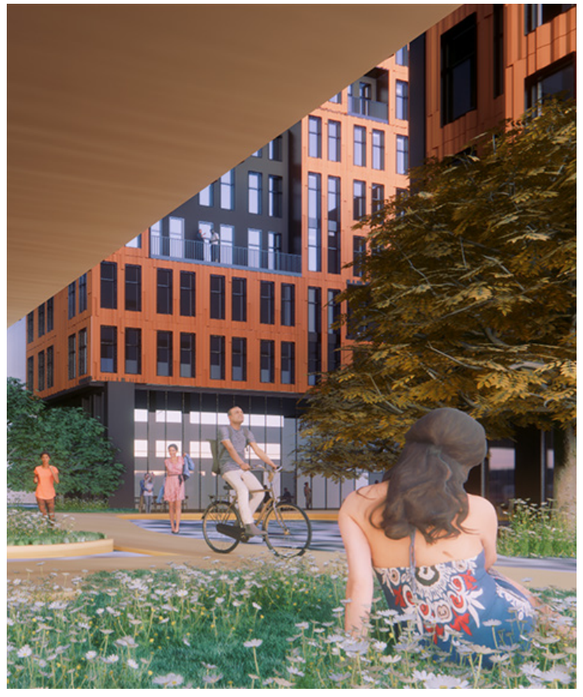
East-west section



North-south section

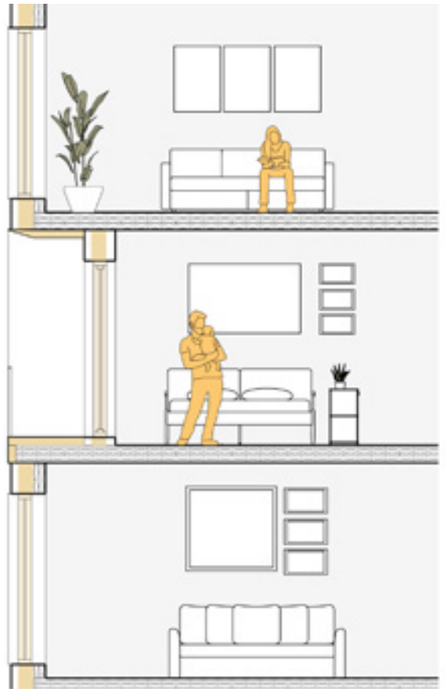


West elevation



Overall materiality and tectonic

Sun exposure on south facade



Insulation continuity through balcony condition

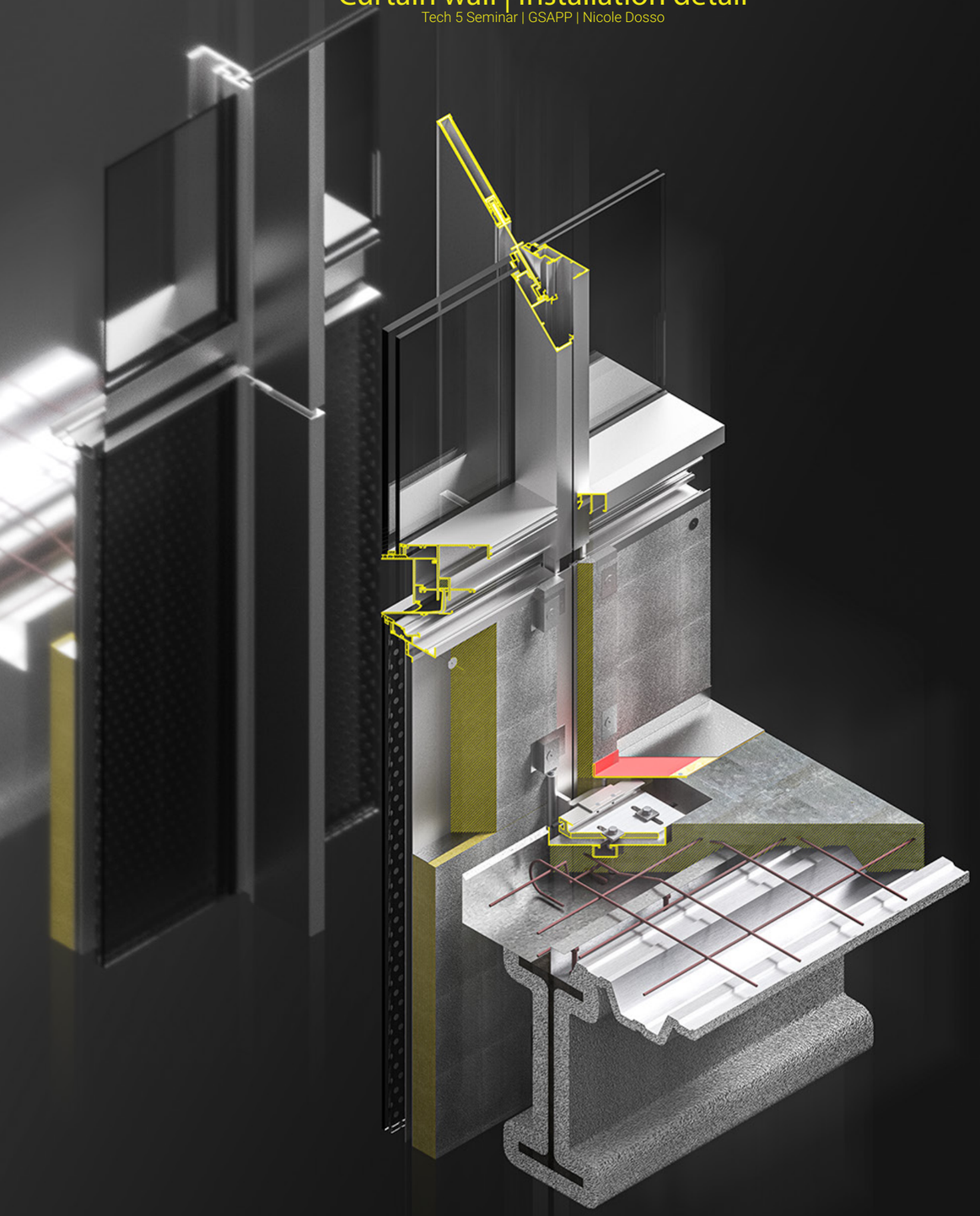
Terracotta detail

3D Printed model of preliminary massing

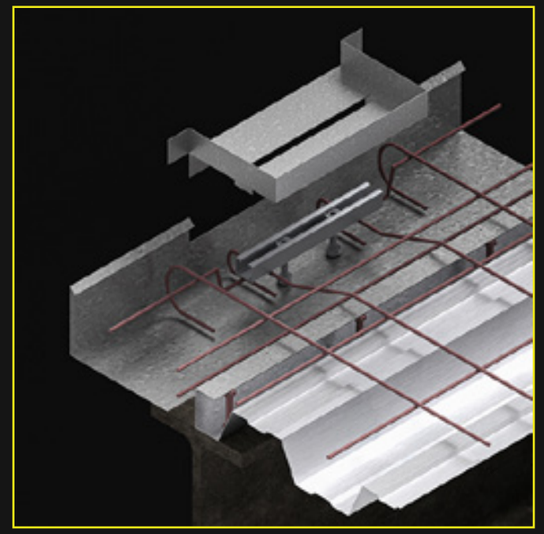
South west view

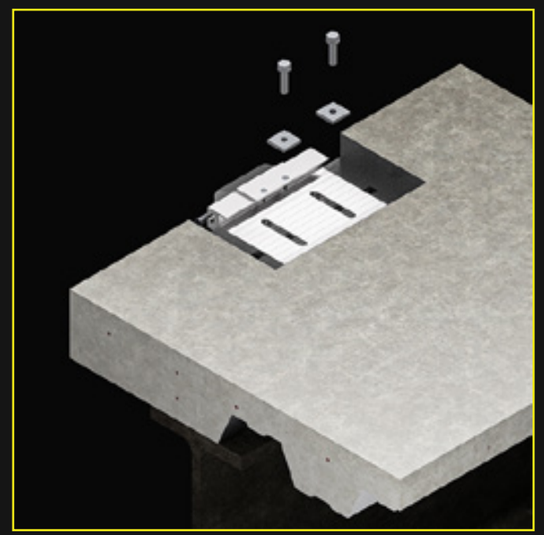
Curtain wall | Installation detail

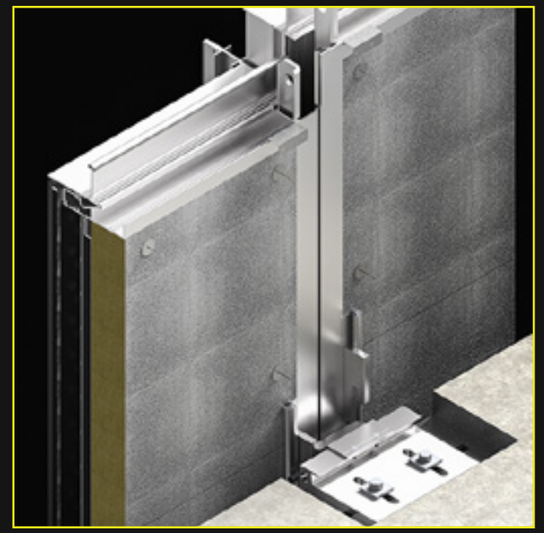
Tech 5 Seminar | GSAPP | Nicole Dosso

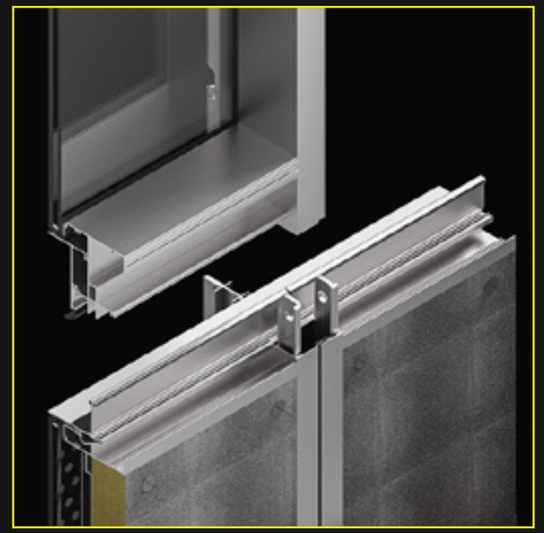


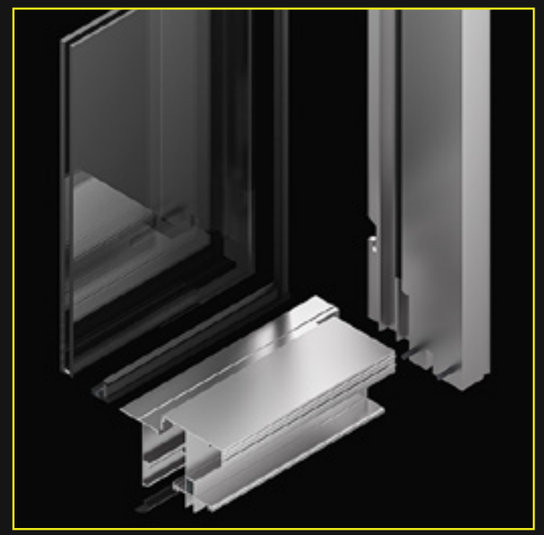
Axonometric section view of curtain wall installation

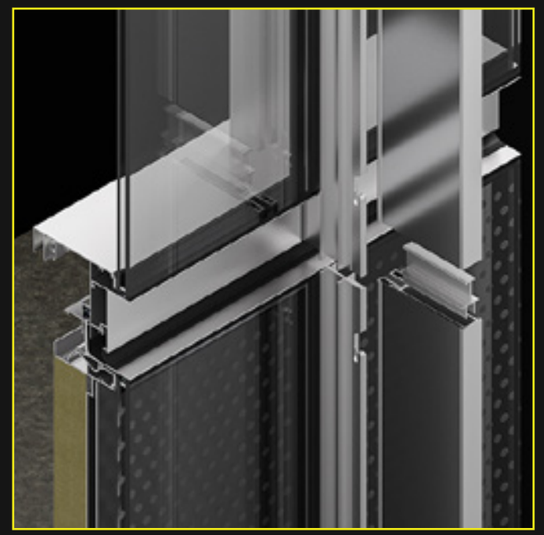


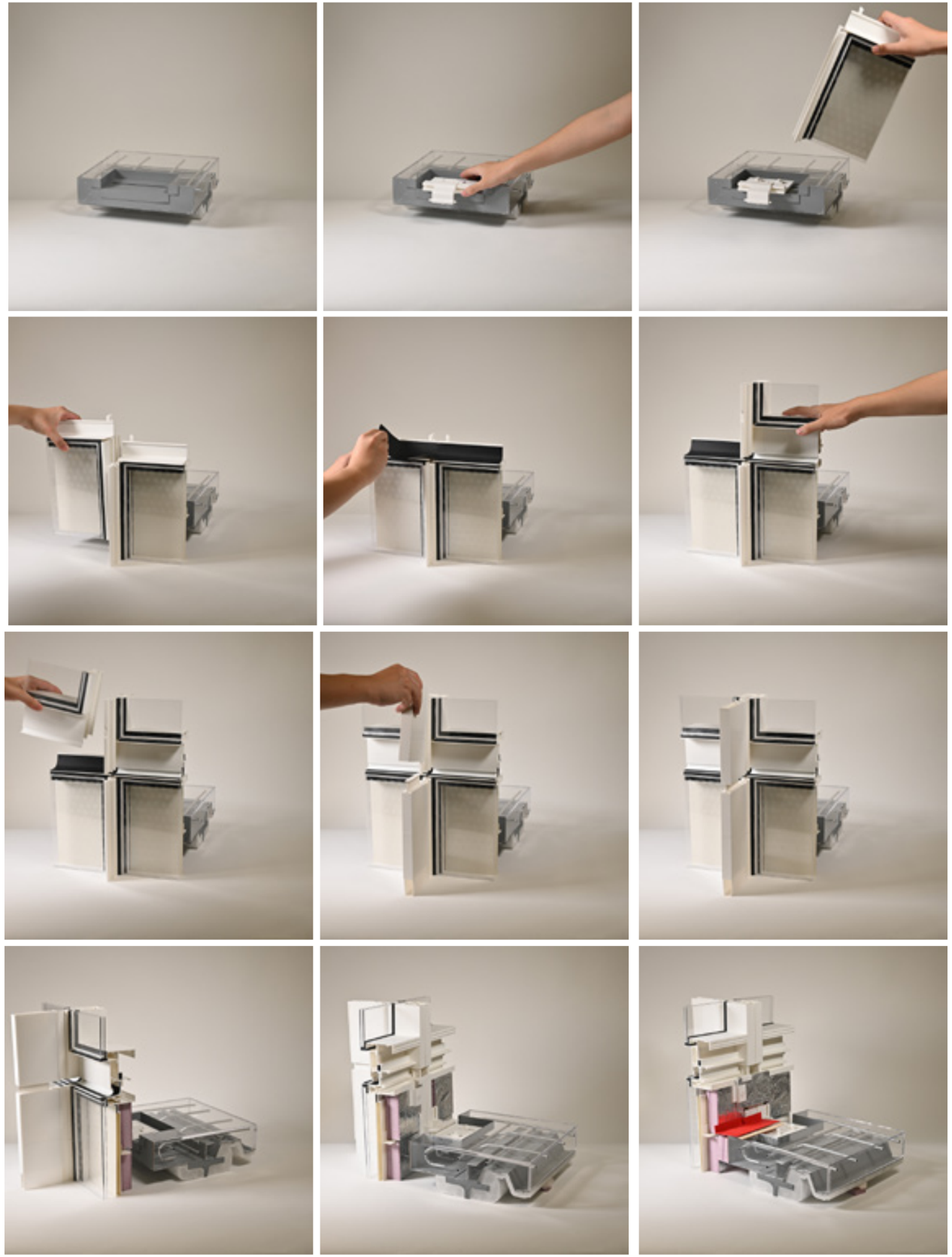












THE INTRODUCTION OF AIR CONDITIONING IN AMERICAN ARCHITECTURE

History & theory - Architecture+ Development

Reinhold Martin

Introduction

Today, air-conditioners account for five percent of the total electricity demand of the United States , and for twenty percent of the electricity demand of buildings around the world (based on the International Energy Agency). These figures validate that air-conditioning systems can be seen as one of the most dangerous technologies of our time having “one of the costliest effects of global warming” . Yet, since their invention, heating, ventilation and cooling systems are among the more poorly understood innovations by architects. For the American architecture historian Joseph M. Siry, this issue can be connected to the lack of representation of air conditioning systems in architectural records and in modernism historiography. For him, “modernist architects did not speak or write professionally or publicly on what they were doing mechanically” , even though these technologies were “essential for habitability and [were] an integral part of the development of modern construction” .

Originally, the invention of air-conditioning systems had a broad impact on human conditions, transforming all industries from food conservation to medicine and modern entertainment. In his book titled Cool, How Air conditioning changed everything, Salvatore Basil mentions that air-conditioning “has insinuated itself into the world’s day to day existence as a business aid, a therapy, and a plain necessity” . For him, air-conditioning “has saved countless lives… while causing countless deaths” . In the built environment, the introduction of air-conditioning since the end of the nineteenth century redefined the discipline of architecture, “its boundaries and its professional concerns” . Referring to the man-made environment as “central to many fictional accounts of an advanced society that reached beyond its natural and primitive beginnings” , Rosalyn Williams criticizes in a sense the metabolic rift that the creation of air-conditioners provoked.

This paper reflects on the gradual integration of air-conditioning systems in American architecture since the end of the nineteenth century. Through the analysis of a number of case studies, this paper highlights the intersections between technology and art, analyzes the then new collaborations between architects, mechanical engineers, equipment manufacturers and clients, and describes the integration/adaptation of air-conditioning in modernist architecture. First, this paper goes over the initial integration of air-conditioning systems into the industrial world of factories, through the examples of the Brooklyn’s Sackett Wilhelm’s Lithographic and Publishing company and the textile industry of the American South. Then this paper reflects on the introduction of mechanical systems in commercial typologies taking for example movie theaters across the country, from Balaban and Katz’s theaters in Chicago to Grauman’s Metropolitan in Los Angeles and the Broadway Rivoli theater in New York. Finally, this paper covers the impact that air-conditioning units had on the design of office towers, taking the examples of the San Antonio’s Milam Building and the Philadelphia Saving Fund Society Building.

Conclusion

As this paper highlights, the history and the emergence of modern architecture is inherently connected to the history of mechanical engineering. Whether in factory buildings, commercial environments or office towers, the integration of mechanical heating, cooling and ventilation required all stakeholders from architects to clients, and engineers to thoroughly work together to fully integrate new technologies into building structures.

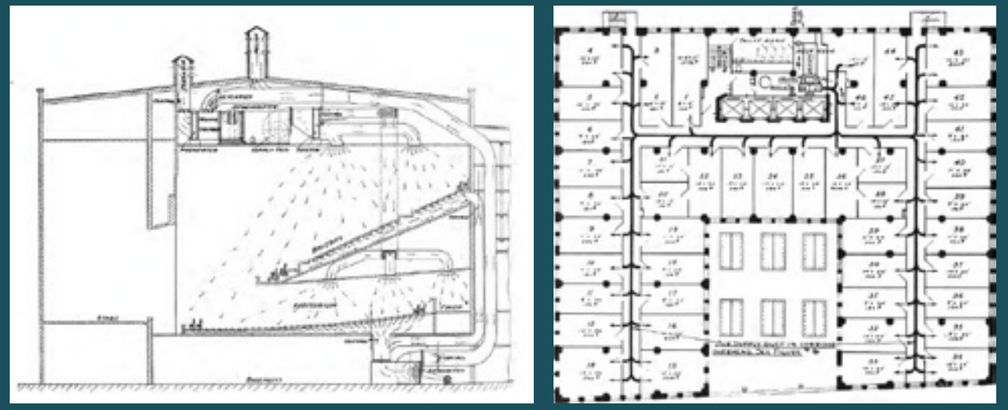


Figure 4 (left). Diagram showing the air system applied to theGrauman’s Metropolitan Theater
Image source: Siry, Joseph M. Air-Conditioning in Modern American Architecture, 1890–1970
Figure 6 (right). Typical floorplan of the Milam Building showing ventilation distribution
source: Banham, Reyner. 2009. The Architecture of the Well-Tempered Environment

In fact, “modernist architectural culture has long stressed creative genius, when even the most celebrated architects increasingly worked in teams of architects, engineers, suppliers, contractors and clients.” Through these collaborations, architects saw the potential for a new architecture style that represents a “more inclusive expression of modern functionality” . Therefore, as the different case studies of this paper inferred, modernist buildings transformed from being breathing machines that used passive and natural ventilation strategies to independent machines that worked separately from the outside environment utilizing heavy machinery and electrification. In its technological evolution throughout the years, air-conditioning started with the desire to run industrial factories year round, and developed into rectifying the environmental conditions that complex modernist architectural features generated.

To go back to the environmental impact issue described in the introduction of this paper, one can understand how the notions of energy intensity and global warming were not considered throughout the first half of the twentieth century when air-conditioning was exponentially growing. In fact, up until the 1960s, the little literature that described the use of air-conditioning systems in buildings barely touched on its massive energy demand. In the conclusion of his book, Siry seems to agree with the “many articles [that] sought to address what was perceived as general ignorance among architects about the scope and implications of the problems” , where “energy costs, although always of concern, had been secondary to issues of productivity and comfort” . For Salvatore Basile, he sees the technology as being “abused by many users” , to the point where “some experts see air-conditioning as a grievous fault of an invention, one that should disappear from the face of the Earth for the good of the planet” . In Air conditioning is not the enemy, Gernot Wagner believes that “the solution must involve all of us, for that to happen we’ll need appropriate policies at the city, state and federal levels: everything from building codes to energy efficiency appliance standards to caps or taxes on carbon pollution” . The reality is that human kind has adopted air-conditioning systems to a level that is not retractable. The mass production of air-conditioners and their worldwide integration into buildings today is out of control and it would be unimaginable to stop this spread. Just as an example, fifty million air conditioners are sold yearly in China since 2010 ; Mumbai’s metropolitan’s energy demand for cooling in 2009 was the equivalent of a quarter of the United States’ total energy demand . Ski Dubai and the soon to be built winter Olympic resort in the middle of the Saudi desert are two examples that demonstrate how far humanity has gone when uncontrollably implementing cooling strategies in the architectural realm. It is certain that cooling systems are needed across the world for the survival of billions of people, the question remains - how can we limit its use to the bare necessities?

SOMEONE SAID PASSIVE HOUSE?

Analysis of materials extraction and processes

Tech & Visual Seminar | GSAPP | Tommy Sheperkotter

Project targets

Vancouver, British Columbia, is aspiring to be the "greenest city in the world". To do so, the City uses its extended building portfolio to change the construction market and lead by example. The analyzed project was targeting a number of green building certi fications: passive house, net zero carbon in design (as defined by the CaGBC), and LEED v4 BD+C Gold.

Project challenges

Acting as a cooling center and a post-disaster building, the structural capacity and the mechanical systems thought of for this project were unique in complexity. Vancou ver is exposed to important seismic activity, which led the project team to design very deep foundation footings (close to 1.5m deep poured concrete foundation under the floor slab) and over engineered structural members throughout the building. As for the mechanical system, the design team opted to go with an extensive geothermal system assisted by electric heat pumps and highly efficient HRVs to achieve the stringent passive house requirements.

Project design

The design of the project was primarily driven by its function as a firehall. With a turnout time of 60s for the firefighters to be in trucks ready to leave, the layout of the project needed to be compact and efficient. Another key aspect that affected the design was the construction of a temporary firehall on site while the old one was de molished and the new one built.

System boundary

This study analyzes the environmental impact of some of the materials used in the construction of the firehall. It covers the building's envelope assemblies, its floors and roof, its structure, and its photovoltaic system. No mechanical systems, electrical sys- tems (other than PVs), interior finishes, and furniture were accounted for in this re - search. This analysis is based on the manufacturers list received in shop drawings during the building's construction.

Analysis

The first section looks at the location of extraction and manufacturing of each building material. For some materials, like wool insulation, Environmental Product Declaration forms explicitly list the places of extraction of their raw materials, but most manufac - turers still lack transparency when it comes to material sourcing.

Along with the location map are a grid cleanliness analysis and a list of processes that suggest how the environmental footprint of a material can greatly depend on the local grid of its production facility. Most of the listed information was extracted from governmental websites and Ansys Granta.

The mass analysis looks at the quantity of each material (in tonnes) within the project. The disproportion between concrete and the rest of the project materials is astound ing, mainly due to the very thick foundation needed in this post-disaster project.

The embodied carbon calculation was primarily done through Athena with some data ex tracted from Ansys Granta. The Carbon equivalence calculations were done using the Unites States Environmental Protection Agency's online Greenhouse Gas Equivalencies calculator.

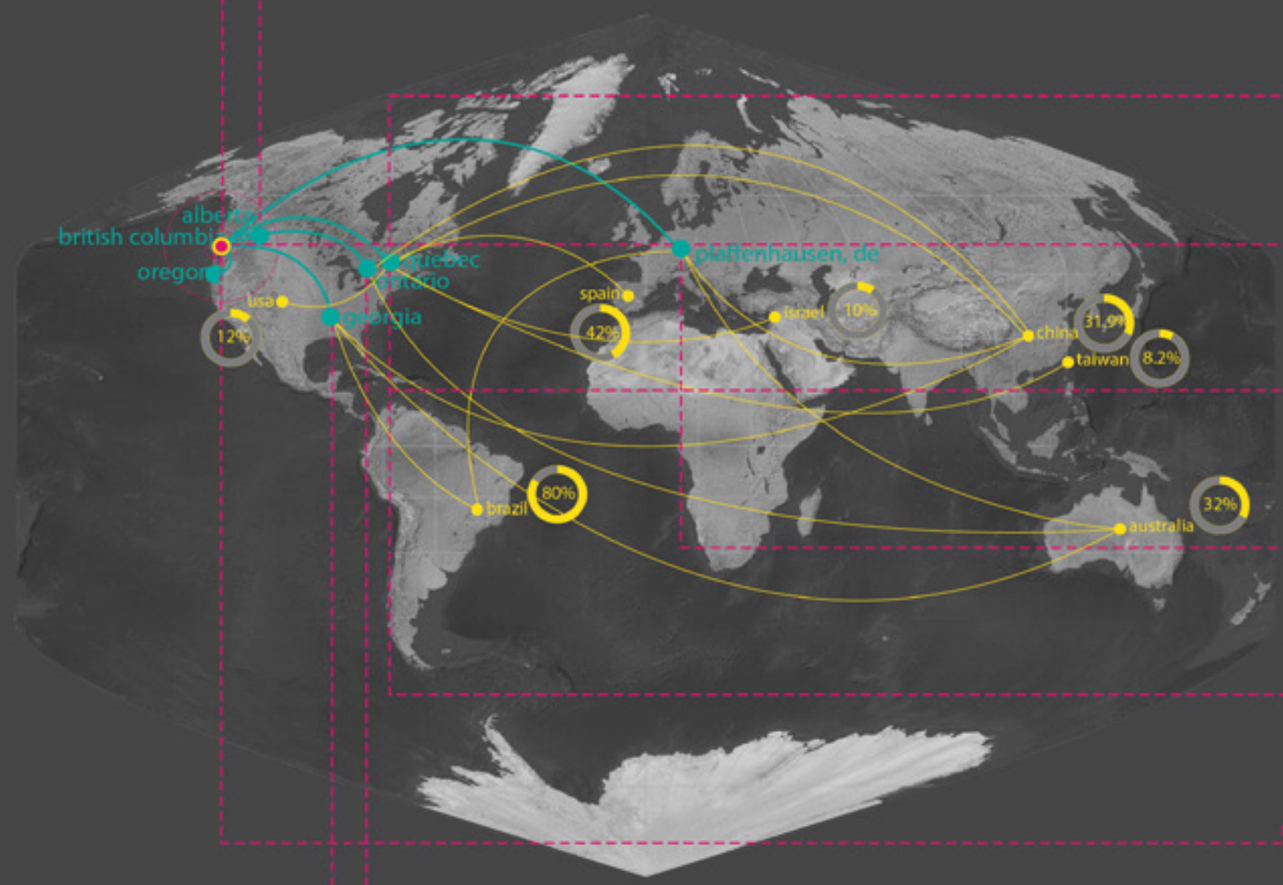
Outcome

One can question the need to achieve Passive House considering how clean the BC grid is. The amount of insulation added to the walls and the floors greatly impacted the final embodied carbon calcualtion.

The amount of concrete used in this project is undoubtedly excessive. More environ mentally friendly alternatives to concrete should be though of for structurally chal- lenging buildings like this firehall.

The PV system has a higher embodied carbon than the foundation of the building. How "clean" is the electricity generated by this array? Considering the cleanliness of the BC grid and its overall reliability, it is essential to re-consider the need to have ex - tensive solar arrays on buildings like this one.

EXTRACTION & PRODUCTION OF COMPONENTS



- project location
- main places of production/assembly
- main places of extraction [raw materials]
- % of clean grid

GRID CLEANLINESS

steel structure, rebbar, deck — british columbia 98%

concrete blocks, precast, and poored — alberta 11%

rigid insulation — quebec 99%

xps insulation — oregon 70.6%

wool insulation — quebec 99%

Openings — german 46%

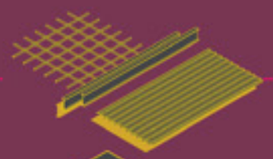
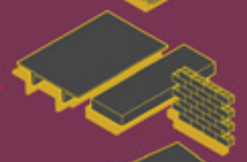
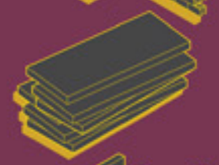
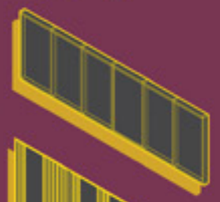
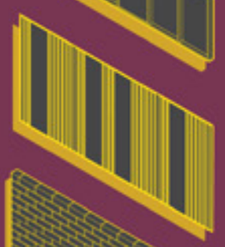
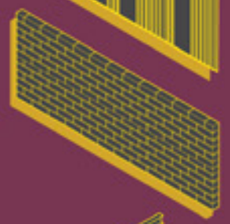
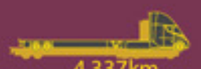
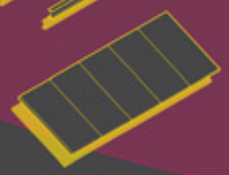
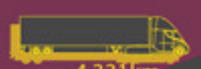
aluminum cladding — quebec 99%

masonry brick wall — british columbia 98%

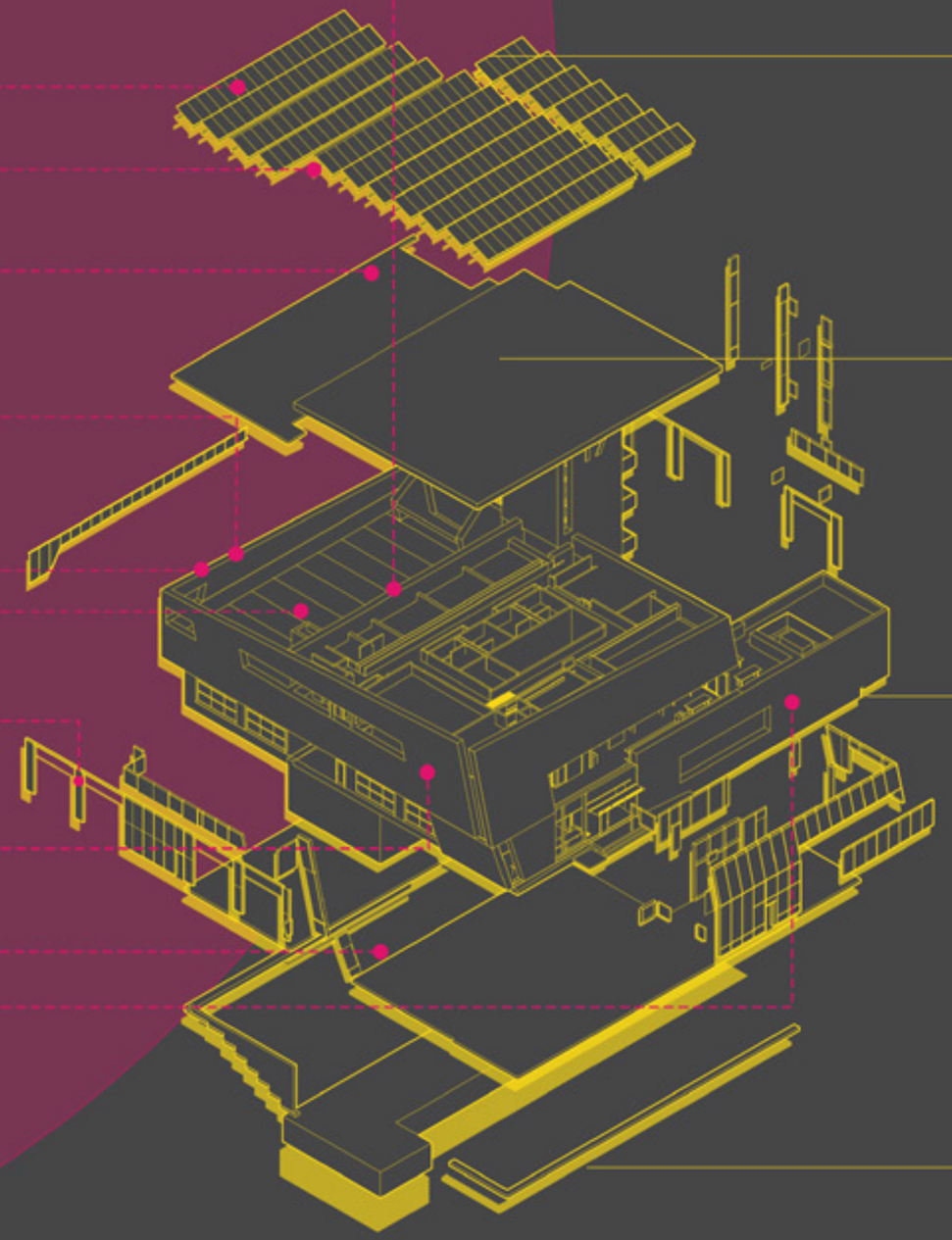
pv aluminum rack — ontario 92%

pv pannels — georgia 8.9%*

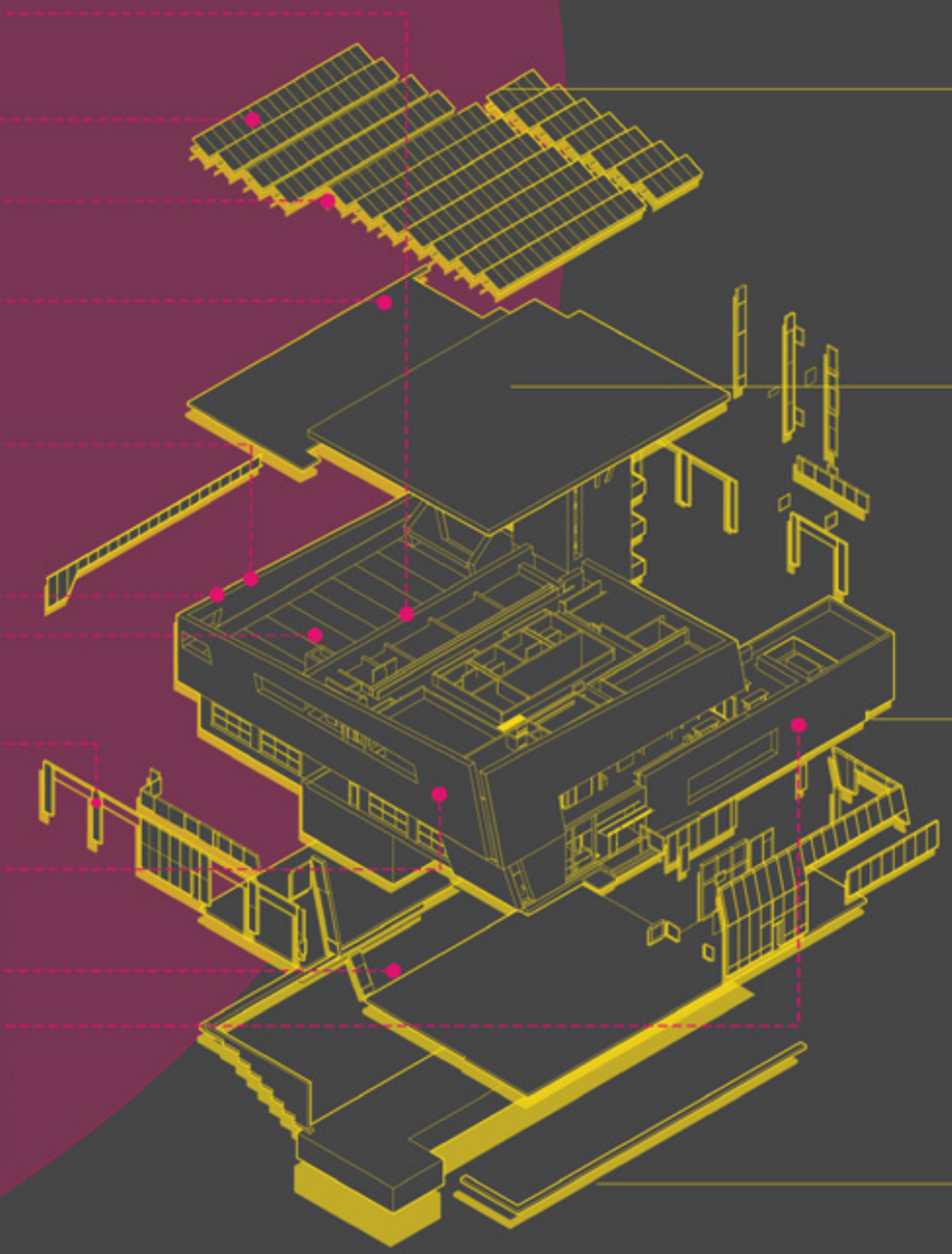
*not reliable source

PROCESSES	PRODUCT	MASS	TRANSPORTATION
deck: Extracting raw materials System feeding (iron, carbon) Forming, machining Heat-treating Joining Treating (galvanizing) Packaging, wrapping		91.2t	 72km
CMU: Extracting raw materials Batching aggregate, cement and admixture Molding Low pressure steam curing Drying Cubing and storing Packing		2502t	 1,160km
Extracting raw materials System feeding Extrusion Trimming, cutting Printing Packaging, wrapping		11.2t	 5,032km
Extracting raw materials System feeding Extrusion Shaping Printing Trimming, cutting Packaging		3.7t	 522km
Extracting raw materials System feeding (PS pallets, additives, reclaimed EPS PS) Extrusion Shaping Printing Trimming, cutting Packaging		9.2t	 5,032km
glass: Extracting raw materials System feeding (sand, soda, lime, water) Melting Forming & moulding Finishing Packaging		5.1t	 ≈10,000km
Extracting raw materials Crushing, drying, grouding (bauxite) Reducing of alunima Casting, forming Packaging		0.01t	 3,687km
Extracting of raw materials Screening Forming, cutting Coating, glazing, Drying Firing, cooling Packaging		43.9t	 72km
Extracting raw materials Crushing, drying, grouding (bauxite) Reducing of alunima Casting, forming Packaging		1.2t	 4,337km
Extracting raw materials Cutting, crushing, Slicing, cleaning Diffusing of phosphorus Wiring metal contacts Array on glass substrate Sealing with resin and film Packaging		4.1t	 4,331km

ASSEMBLY



ASSEMBLY



EMBODIED CARBON

PV system
192,000 kgC02eq)

Roofs
160,000 kgC02eq)

Floors
206,000 kgC02eq)

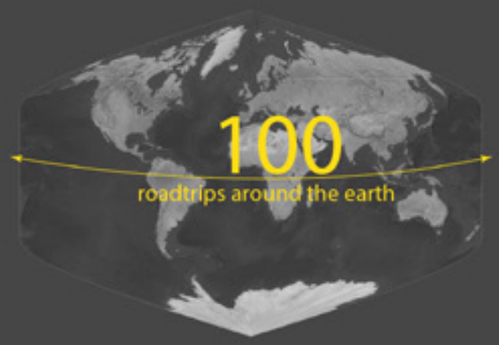
Walls
208,000 kgC02eq)

Foundations
177,000 kgC02eq)

Colums/beams
25,000 kgC02eq)

CARBON EQUIVALENCE

2,500,000
miles driven by an average gasoline-powered car



100
roadtrips around the earth

188
US homes' electricity use for one year

16,000
carbon sequenstration by tree
seedling grown for 10 years

THE XR SCHOOL

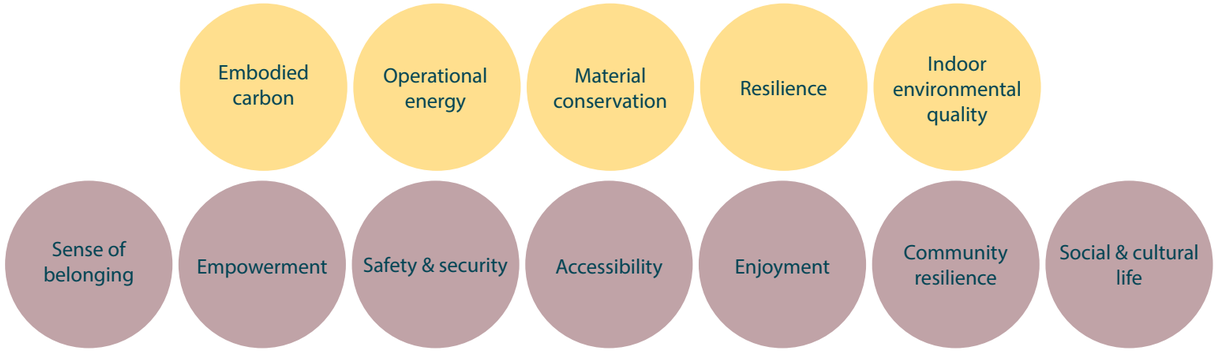
Fall 2021, GSAPP at Columbia University

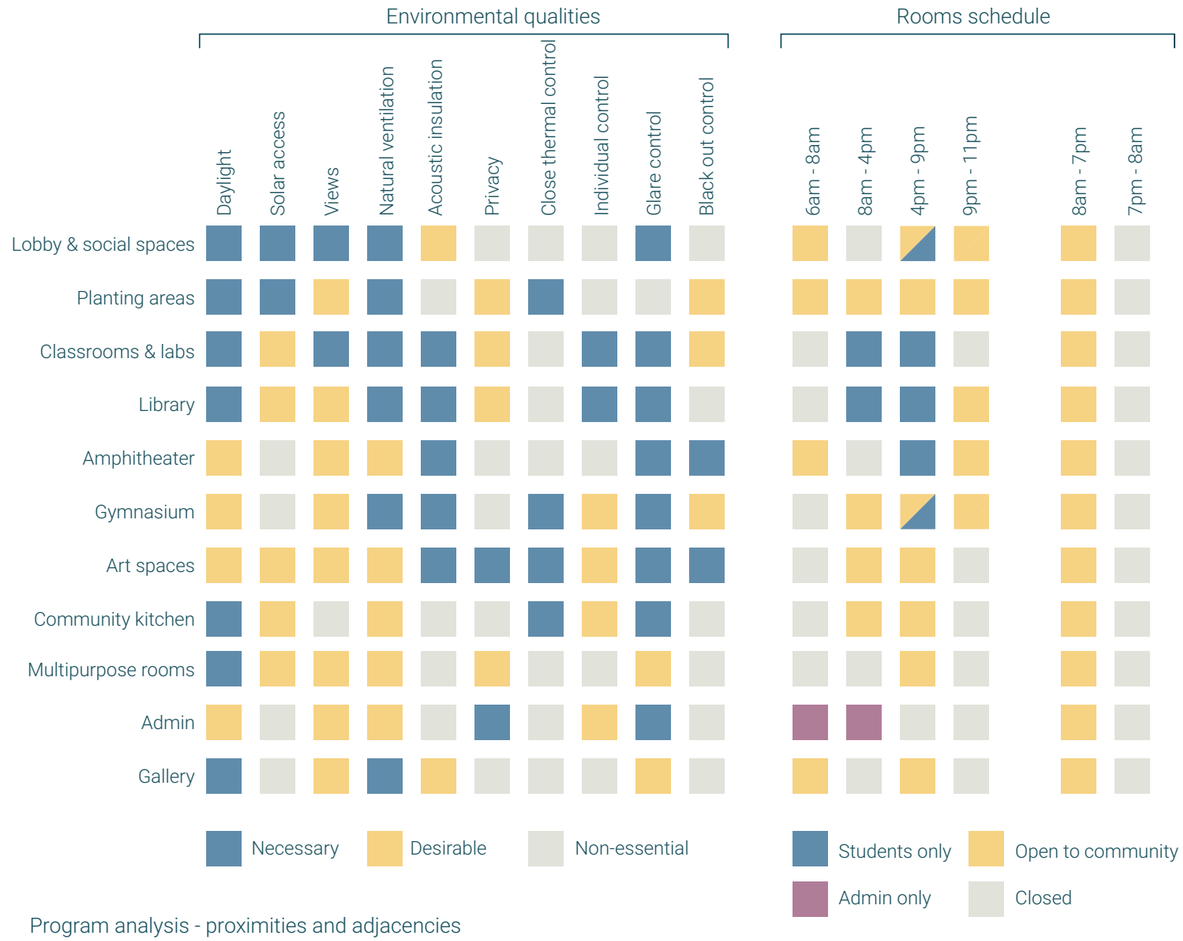
Studio	Core II
Location	New York, NYC
Tutor	Gordon Kipping

Looking at the important role the old PS64 played in the lower east side of Manhattan, this rehabilitation of PS64 looked at, first and foremost, giving the building back to its community. Between the 1960s and the 1980s, PS64 was an escape from reality to the lower east side community. It was used as a playground, as an artists studio, and as an exhibition space. It was heavily used by the local minorities to come together, feel safe and empowered. In the early 1990s, the school was locked by the local government and is since falling into ruins.

That's why, the XR Centre provides more than a school. This project looks at what the future of public school can hold. What if schools were more than just educational for kids? What if schools were community centers that bring different generations together? While grandparents are reading at the library, parents can go to the gym and kids to class. In the evening, they can all enjoy concerts together and play in the rooftop playground. To get to this level of comfort and enjoyment, the design development of this project relied heavily on a set of guidelines that respond to notions of personal development, empowerment, safety, accessibility, community resilience, energy efficiency and low embodied carbon, indoor air quality etc. The program throughout the buidling is fluid which allows it to be remain vibrant past school hours.

What if schools were much more than just classrooms? How can we design buidlings that serve more than one purpose? How can we start thinking about mutligenerational buildings?





Program analysis - proximities and adjacencies

Optimized orientation
Optimized window to wall ratio
Optimized envelope performance
Use of passive heating/cooling strategies
Efficient mechanical system
Efficient heat recovery
Efficient lighting & plug loads
Use of renewable energy

Low Carbon Building (Operational)

Optimized wet spaces layout
Efficient fixtures
Rainwater collection and reuse
Reuse of gray water

Water Efficiency

Reuse of existing structure
Use of recycled materials
Use of low embodied carbon
Materials for additional structure

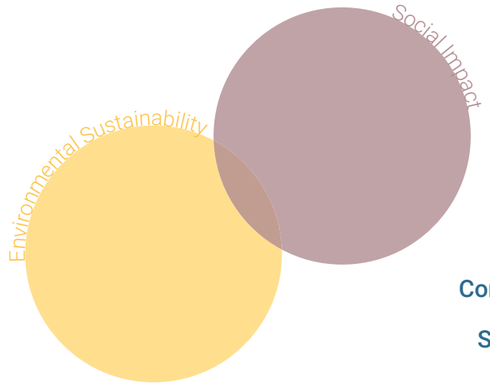
Low Embodied Carbon

Use of natural ventilation when possible
Use of low toxicity materials
Efficient mechanical system with
Optimized filters

Indoor Air Quality

Efficient daylight
Controlled glare
Opportunities to control light, temperature
and air movement

Indoor Environmental Quality



Offer space for meaningful and chance experiences
Provide a diversity of programs
Offer visual connections between different indoor spaces

Personal Development

Provide an inviting and welcoming environment for everyone
Support people in expressing themselves
Encourage Lingering

Sense of Belonging

Meaningful participation
Provide a diversity in uses ans ways to be
Provide opportunities to take ownership

Empowerment

Perceived and actual safety for all
Visibility and shared monitoring

Safety and Security

Minimize barriers for a more accessible and inclusive space
Easy to navigate with effective signage, color codes, and visual permeability
Integrate the building with the local context (program, access etc)

Accessibility

Enjoyment

Health + Wellbeing

Community Resilience

Social + Cultural Life

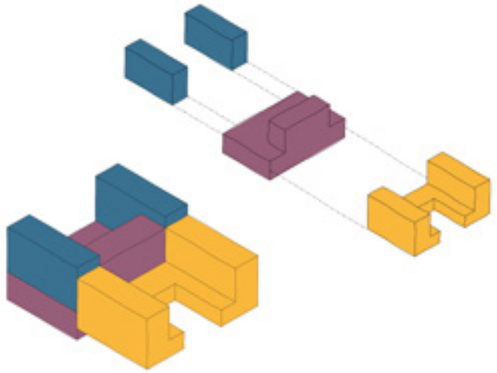
Engages our senses
Provide catered spaces for different moods and tempers
Provide a playful design for both children and adults

Promote active living to access the building and move throughout the building
Provide fitness and gymnastic
Connection to nature and natural light
Foster dense social networks

Adapt to local needs
Foster stewardship and sense of purpose
Offer a vibrant place for all to enjoy

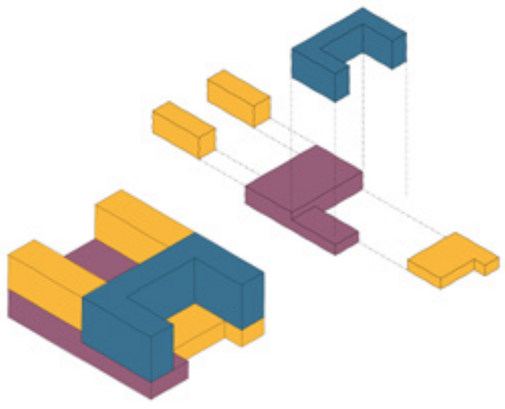
Catalyze social mixing
Encourage the wider community
Provide spaces for creation and

Design guidelines that guided the development of the XR School



Iteration 01 | Make it a community center first!

Iteration 03 | The Vis-a-vis



Iteration 02 | Make it a school first!

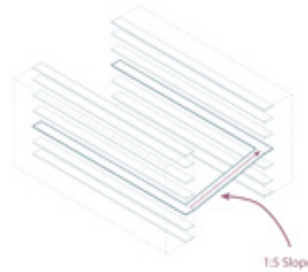
Iteration 04 | Let's all be together!

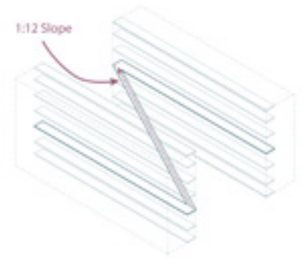
Shared spaces

School spaces

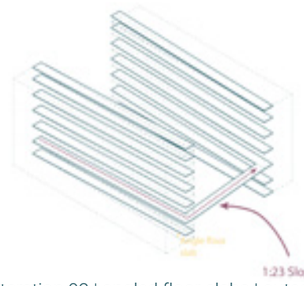
Community spaces

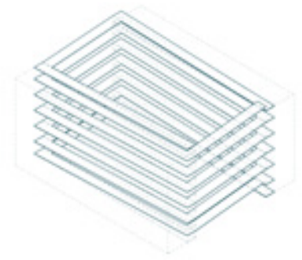
Iterative process for program layout



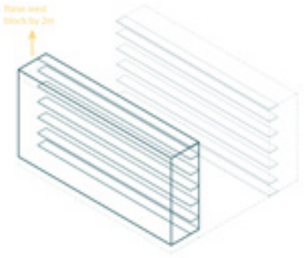


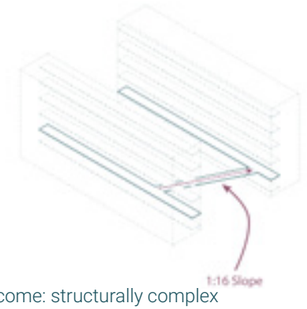
Iteration 01 | straight ramp | outcome: too steep



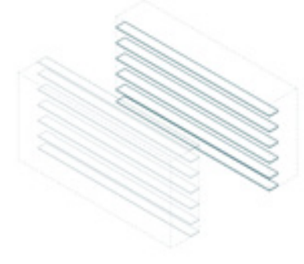


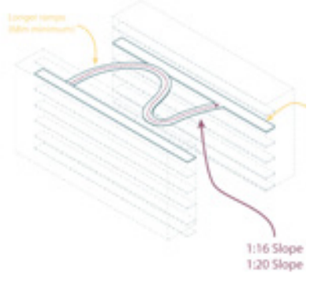
Iteration 02 | angled floor slabs | outcome: carbon intensive





Iteration 03 | raise one wing of the H building | outcome: structurally complex

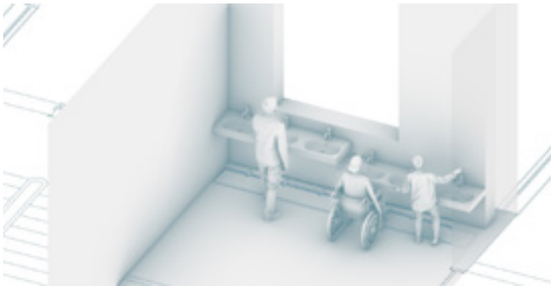




Iteration 04 | undulating ramps for greater length and less steepness

Iterative process for accessible circulation

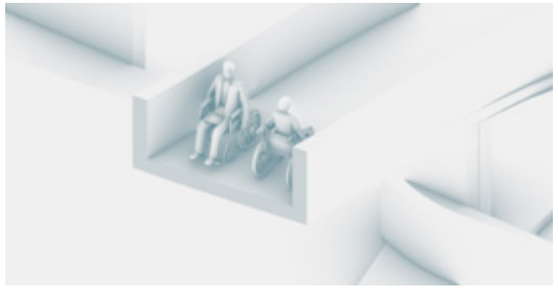
Floor plan level 2



universal bathrooms

Adjustable furniture

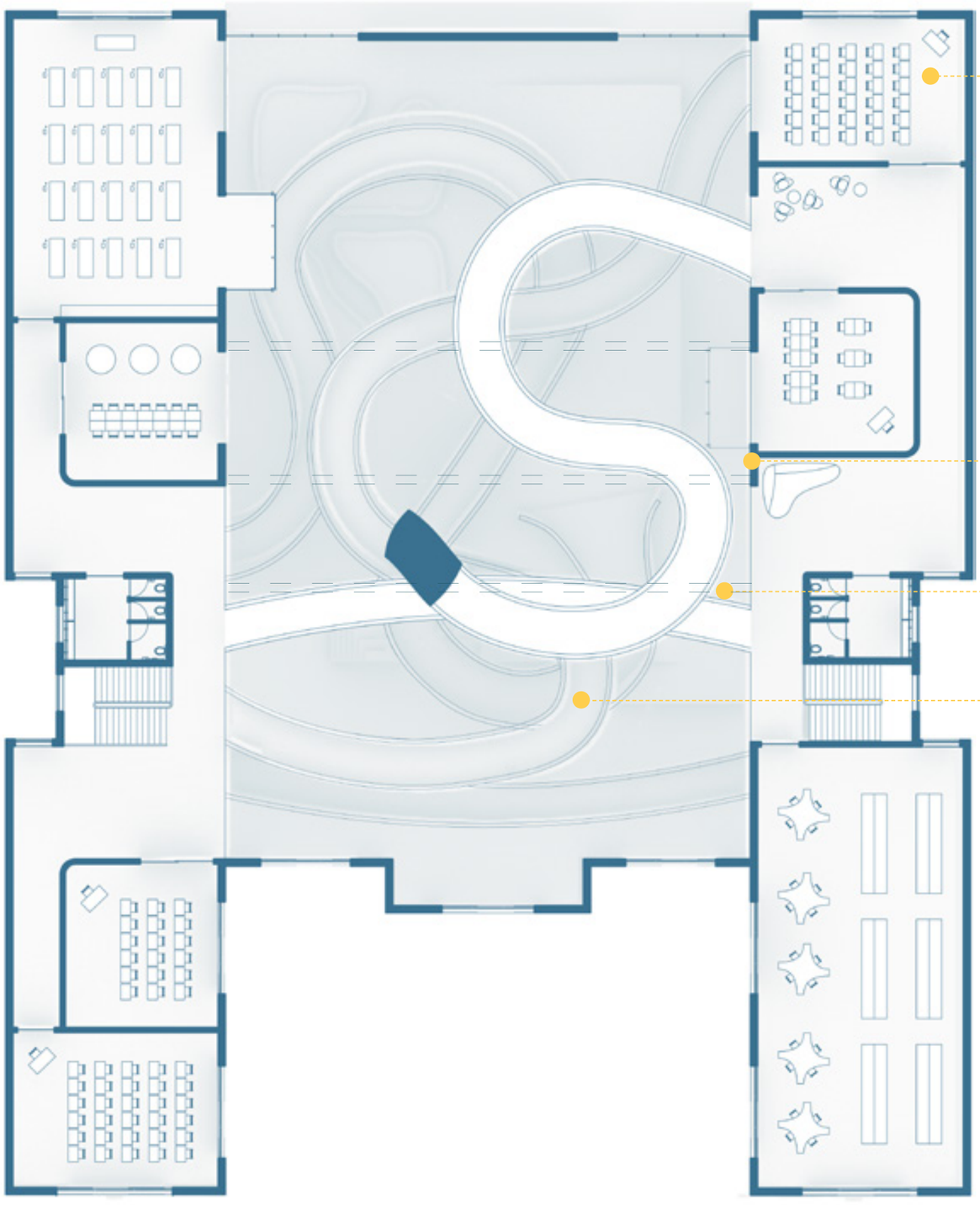
Sliding doors for accessibility



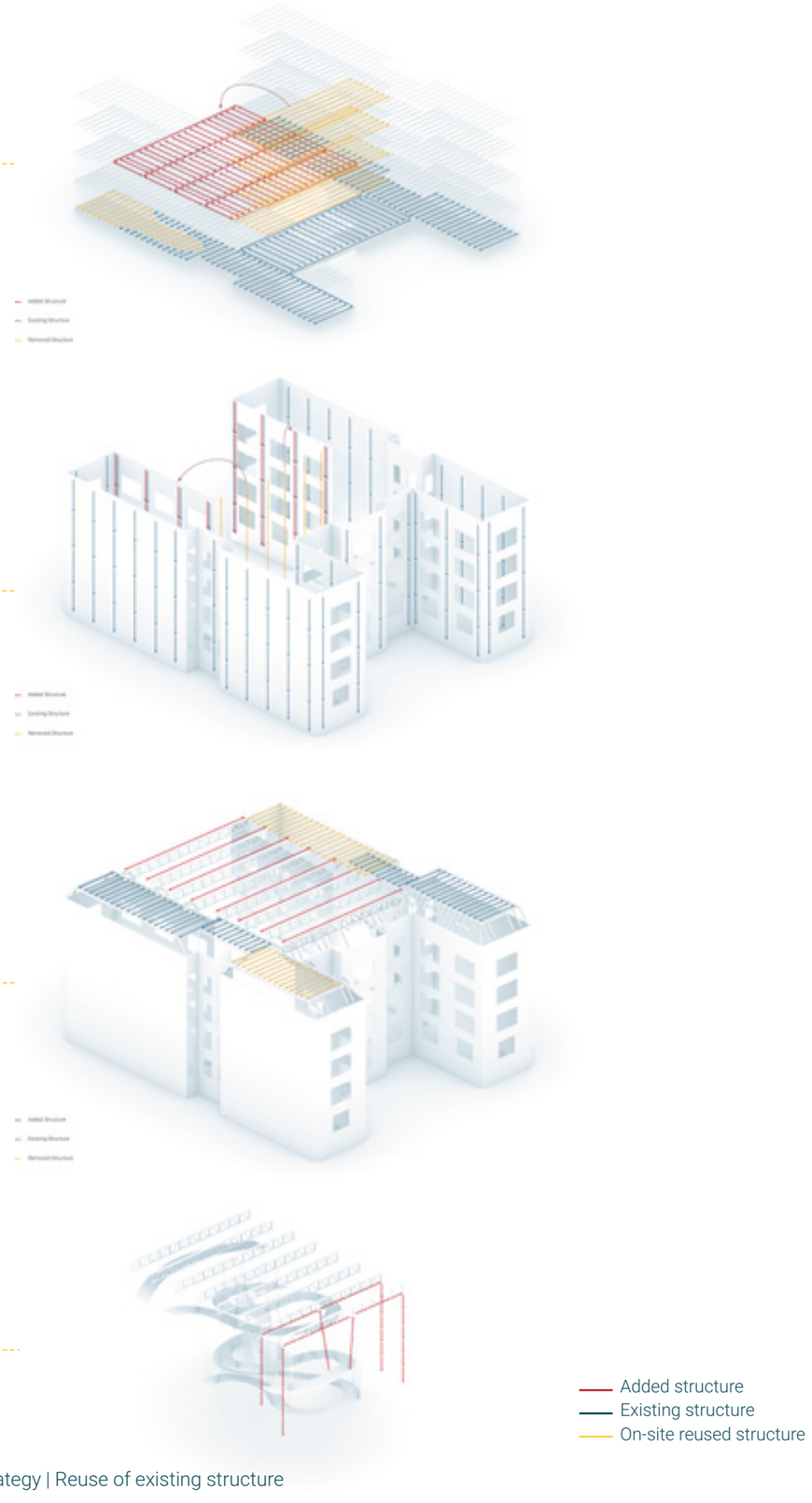
Wide ramps

Round corners for visually impaired people

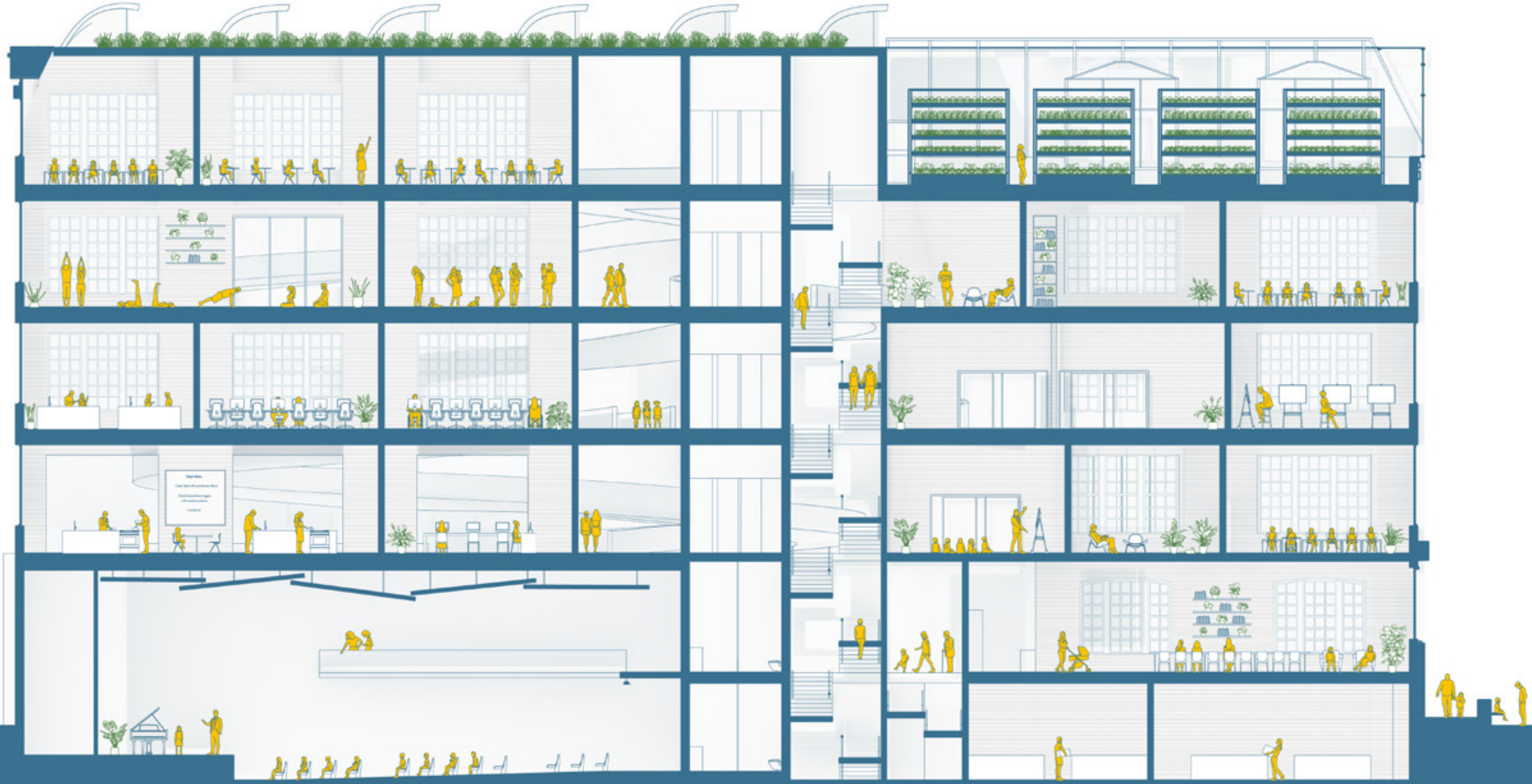
Accessibility & inclusivity strategies



Floor plan level 4



Low embodied carbon strategy | Reuse of existing structure



Section through the west wing showing the diversity of programs and uses

OPERATIONAL ENERGY & CARBON

PASSIVE STRATEGIES

1 Optimized Program Layout
High internal heat gain rooms in north (community kitchen, fitness, gymnasium) and classrooms and multipurpose rooms towards south

2 Temperatures Setpoints
WINTER
Classrooms and MPRs:
Atrium : no lower than 18C [transitional space]
Gymnasium: no lower than 18C

SUMMER
Classrooms and MPRs: no higher than 24C
Atrium : no higher than 24C
Gymnasium: no higher than 22C

3 Envelope Performance
Wall type 1: Nominal R-27.1
Wall type 2: Nominal R-27.1
Wall type 3: Nominal R-14.2
Roof type 1: Nominal R-42.0
Roof type 2: Nominal R-42.0
* See Enclosure drawings F100 / F101 for wall type references

4 Optimized Roof Design
Roof design developed with parametric tool to optimize sun entrance in the wintertime and block sunrays in the summertime

5 Entrance Vestibule and Revolving Door
Reduce heat losses through entrance in the wintertime

6 Natural Ventilation
Natural ventilation through atrium and most of the classrooms - reducing cooling loads in the summertime

7 Abundant Daylight throughout the building

MECHANICAL/ELECTRICAL STRATEGIES

8 Optimized Mechanical Zoning
* See Mechanical drawings M002 for zoning details

9 90% Heat Recovery Ventilation (HRV)

10 Geothermal System

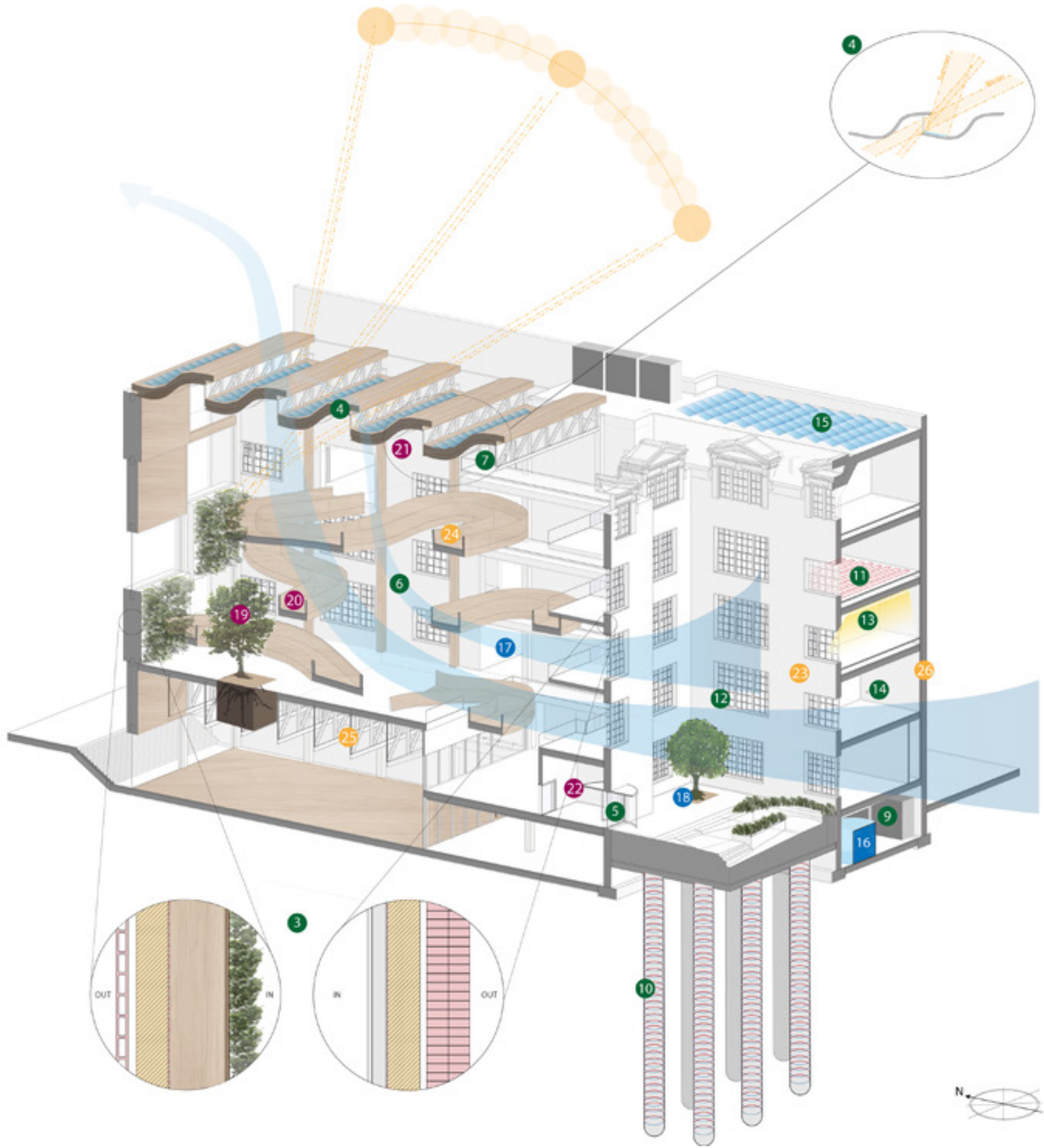
11 Radiant Heating/Cooling

12 Windows Sensors
HVAC system turns off when windows are open to reduce heating/cooling loads

13 LED Light Bulbs

14 Occupancy and Daylight Sensors
Lights turned off after 5min with no movement

15 Solar Photovoltaic System
175 solar panels installed on roof
Yearly generation estimated at XX



WATER CONSERVATION

16 Rainwater Collection
Maximum yearly rainwater collected-
603,104 Gallons
Water tanks in basement
Rainwater reused for toilet flushing

17 35.62% Indoor Water Use Reduction with Low Flow Fixtures
Dual Flush Toilets 0.8/1.6 GPF [Annual Flush Volume based on occupancy assumptions: 529,250.00 gallons/year]
Lavatories 1.2 GPM
Kitchen Faucets 1.2 GPM
Showerheads 1.5 GPM
* Calculations done using LEED BD+C v4 Indoor Water Use Reduction tool

18 Maximized Outdoor Landscaping for Infiltration
25% Outdoor Area Planted

HEALTH & WELLBEING (IEQ+)

19 Biophilic Design
Wood finishes in atrium [walls, ramps, ceiling]
Vegetation in atrium visible from most of the class-rooms [green wall, plants]

20 Design for Active Living
Ramps and stairs throughout the atrium to promote active living
Fitness and gymnasium accessible in the basement for physical activity

21 Ample Daylight and Connection to Out-doors [impacts Circadian Rhythm]
Abundant light entering the building through the atrium roof, the north facade, and all the punched windows on the facades

22 Indoor Air Quality
Abundant vegetation throughout the building to purify the air
Entry vestibule with grill/mat
HVAC system with high filtration efficiency

EMBODIED CARBON

23 Reused Existing Structure
Bearing walls preserved on 7 facades out of 8
Floor slab steel structure preserved on both wings

24 Timber Columns and Ramps in Atrium
Timber elements for most of the added structure of the building: atrium columns, roof glulam, ramps structure

25 Recycled Steel for Additional Structure
High recycled content in steel trusses for atrium roof trusses and gymnasium trusses

26 Low Embodied Carbon Insulation
Mineral wool insulation used throughout the building

Detailled environmental sustainability diagram

Plan perspective views of atrium

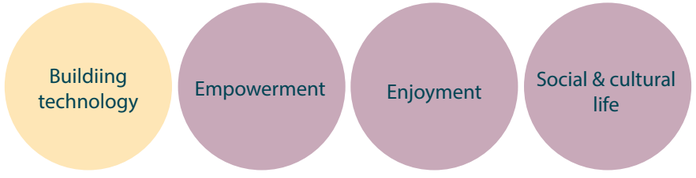
Front elevation [top] | Atrium [bottom]

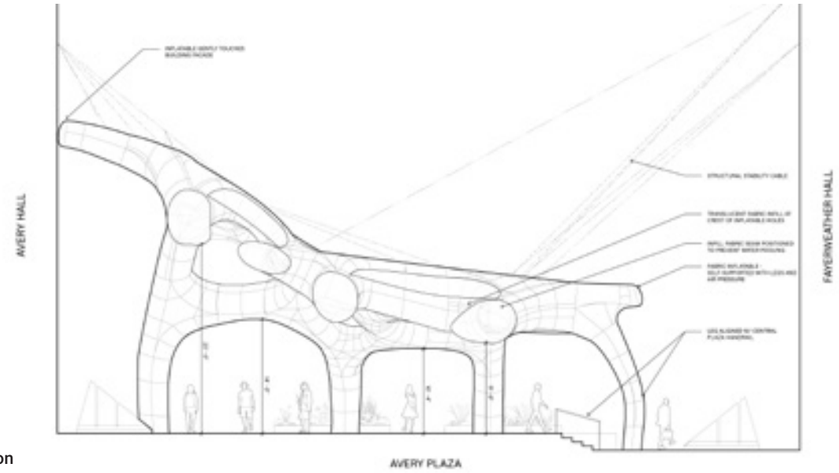
THE WEB

Spring 2022, GSAPP at Columbia University

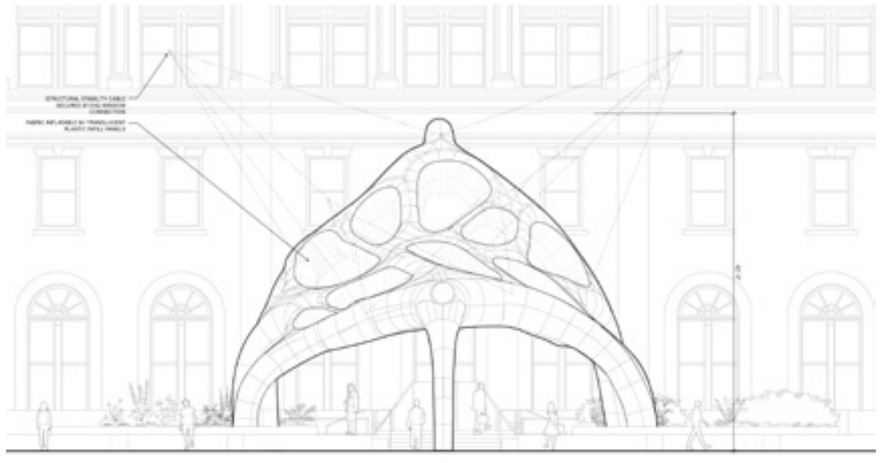
Location	New York, NY
Tutor	Laurie Hawkinson Galia Solonomoff
Collaborators	Abriannah Aiken, Ata Gun Aksu, Priscilla Auyeung, Omar Badriek, Aahana Banker, Rourke Brakeville, Ece Cetin, Kurt Cheang, Lucas de Menezes Pereira, Anoushae Eirabie, Ryan Hansen, Bisheng Hong, Sunghyun Kim, Yining Lai, Vasco Li, Gustavo Lopez Mendoza, Andrew Manion, Eugene Massey, Zakios Meghrouni-Brown, Risa Mimura, Keneilwe Ramaphosa Maria Ramirez, Hannah Stollery, Jordan Trager, Yusuf Urlu, Hazel Villena, Hyosil Yang
Contribution	Teachers' Assistant

Designed and constructed by students in the Spring 2022 seminar "The Outside Project", WEB is a temporary pavilion consisting of an inflatable structure and a collection of custom furniture installed at Columbia University's Avery Plaza. Anchored using a network of ropes and carabiners attached to adjacent buildings and weighted ballasts in each of its seven feet, WEB sustains its voluptuous form with the help of four blowers, constantly blowing air throughout the structure. The formal configuration elucidates a strong contrast between the campus's existing fabric and its new inflatable counterpart. WEB is an immersive installation that invites its participants to be introspective about architectural possibilities.

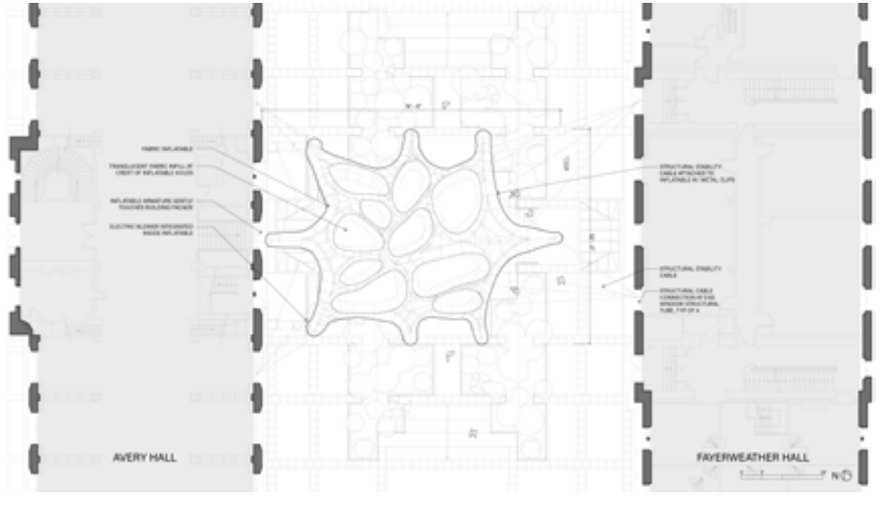




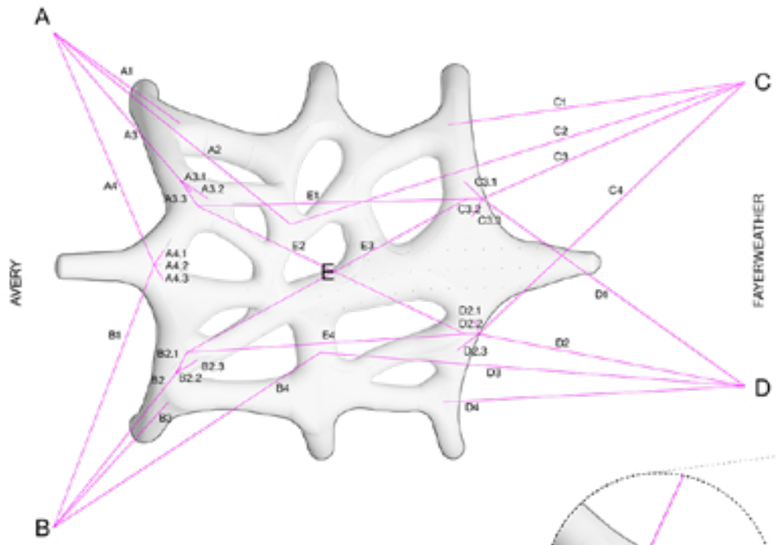
East - West Section

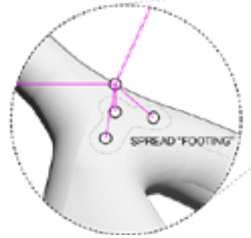


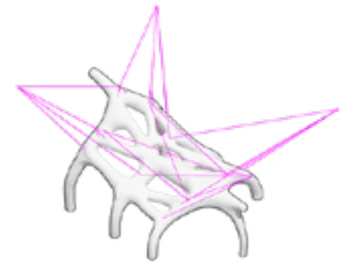
West Elevation

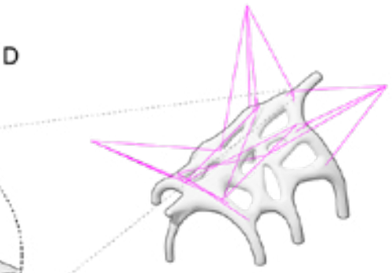


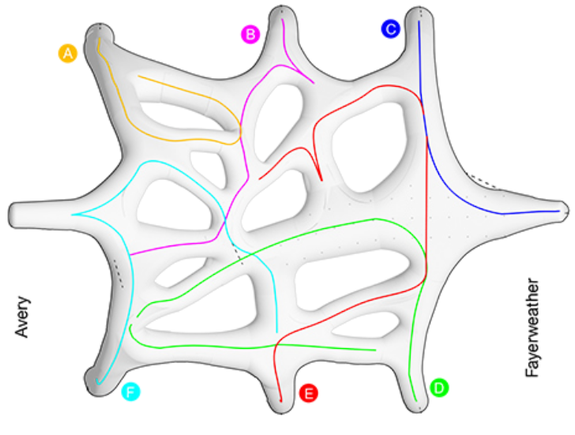
Plan



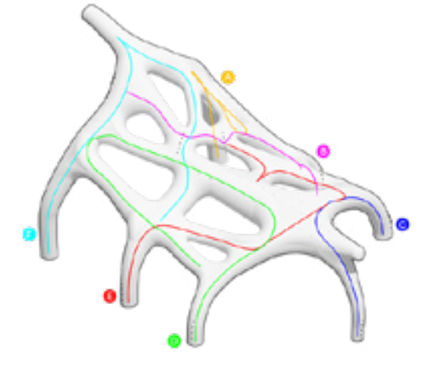


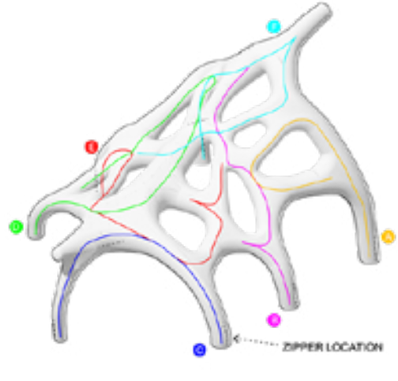


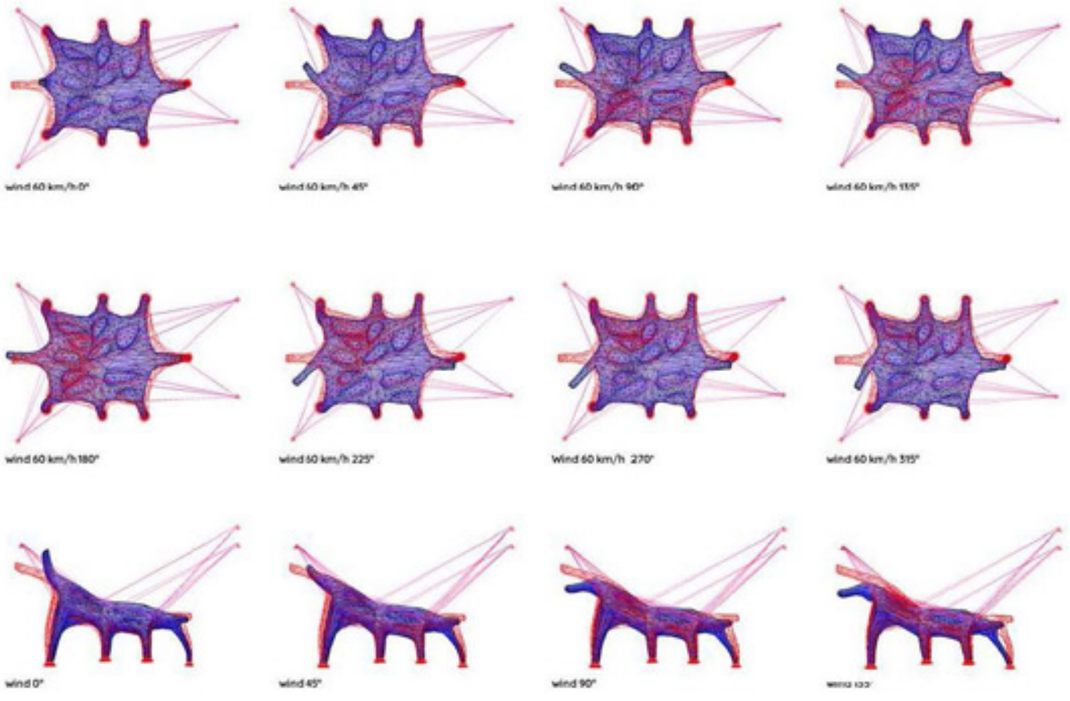




LED references for construction stage







Deformation of the inflatable with 60km/h winds

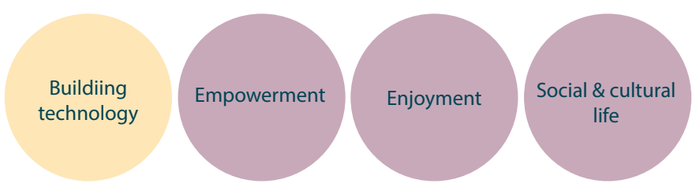
THE SPOT

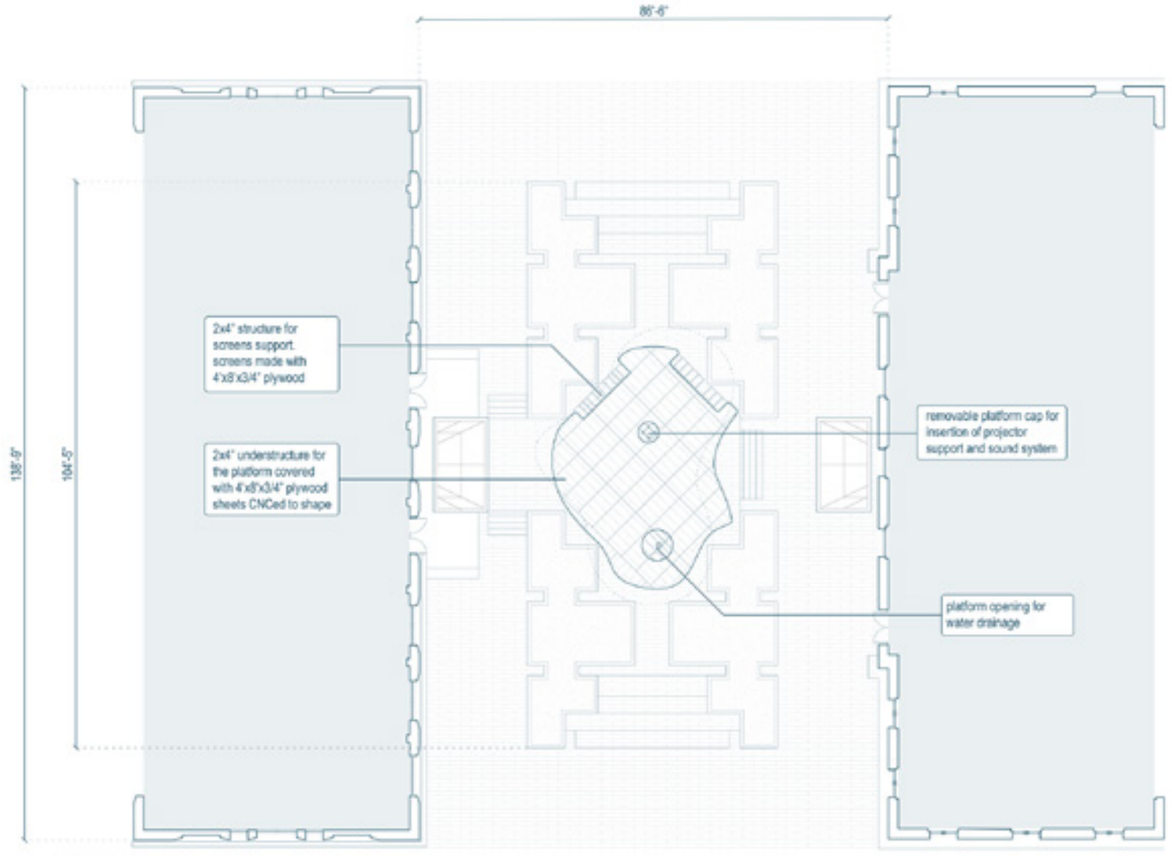
Spring 2021, GSAPP at Columbia University

Location	New York, NY
Tutor	Laurie Hawkinson Galia Solonomoff
Collaborators	Eleanor Birle, Jiyong Chun, Marie Christine Dimitri, Anays Gonzalez Sanchez, Lin Hou, Nanjia Jiang, Blake Kem, Cecile Kim, Kim Langat, Kassandra Lee, Xinyi Qu, Vera Montare Savory, Tristan Schendel, Lauren Scott, Kaeli Alika Streeter, Taylor Urbshott, Xindi Wang, Eunjin Yoo, and Elie Zeinoun
Contribution	Design development and construction

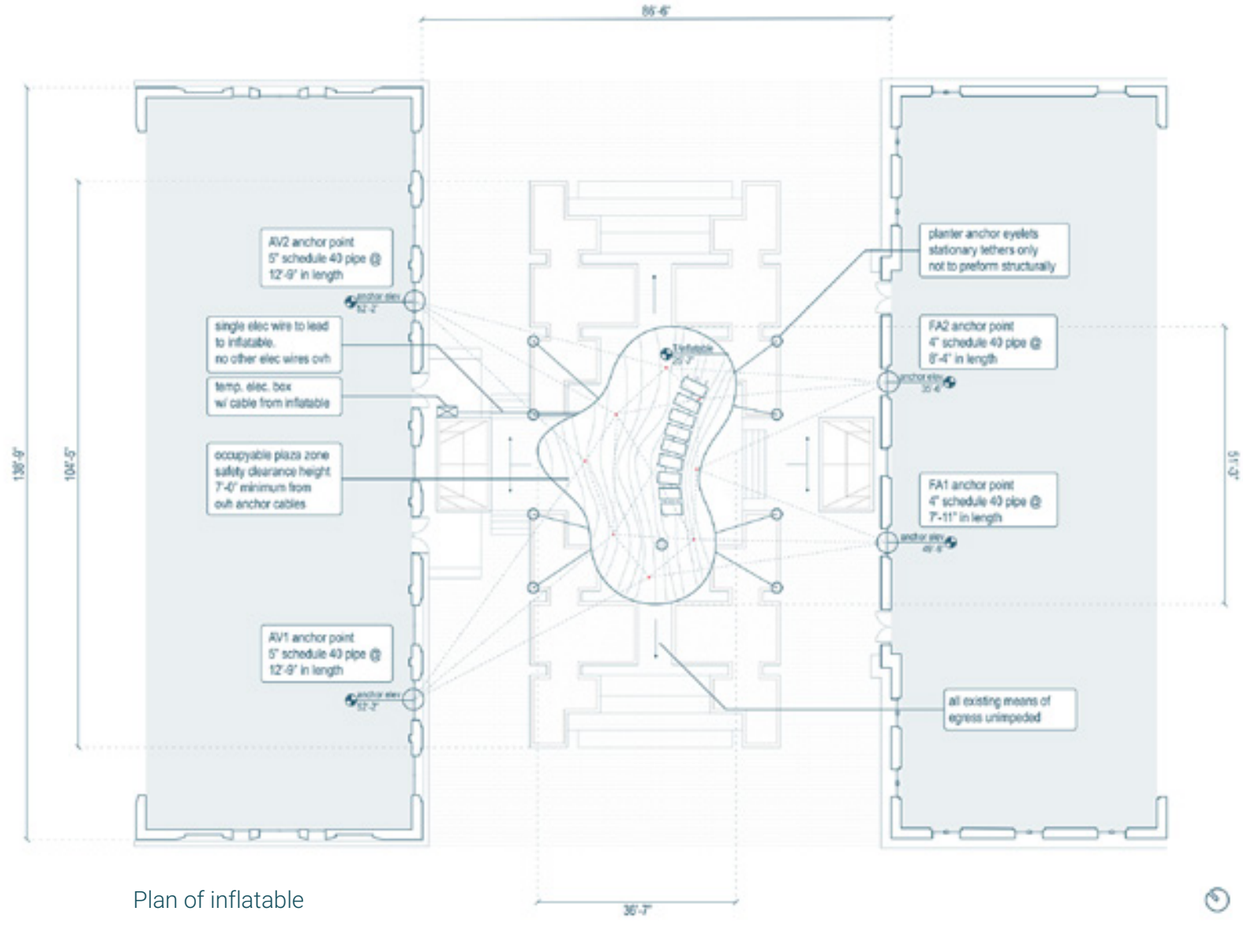
Designed and constructed by students in the Spring 2021 seminar "The Outside Project", SPOT celebrates the safe reunion of students and faculty on campus opening on April 29, 2021 for the Columbia GSAPP Commencement Ceremony. There were two principal components to completing SPOT: the inflatable canopy and hybrid digital/ in-person programming.

In the sky, anchored by four steel beams in Avery and Fayerweather Halls and four anchor points, a 600 pound inflatable canopy fabricated by areacubica hovers above Avery Plaza. During construction, students installed LED lights within the inflatable to establish an omnipresent glow below the canopy at night. LEDs are powered via solar panels located at the base of the pavilion.





Plan of platform



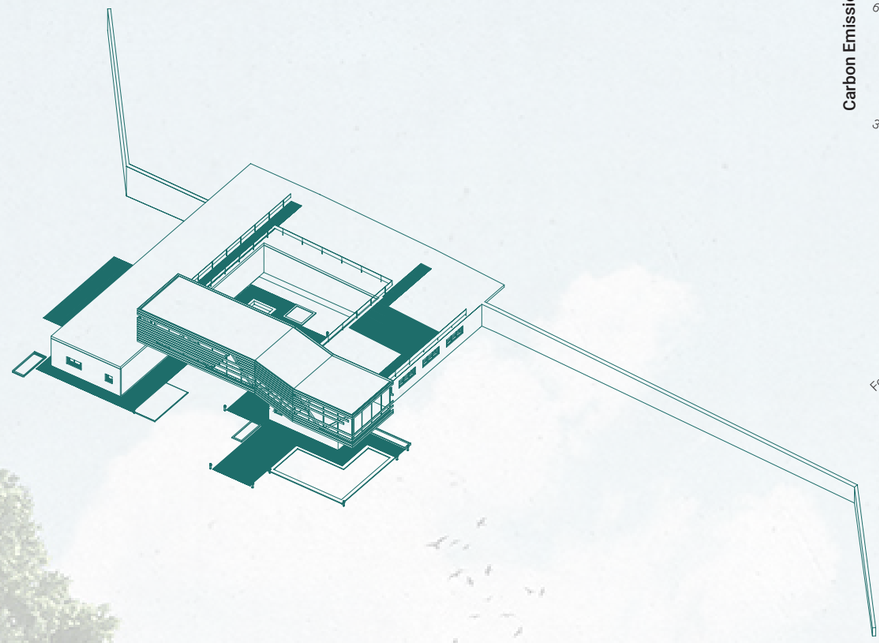
Plan of inflatable

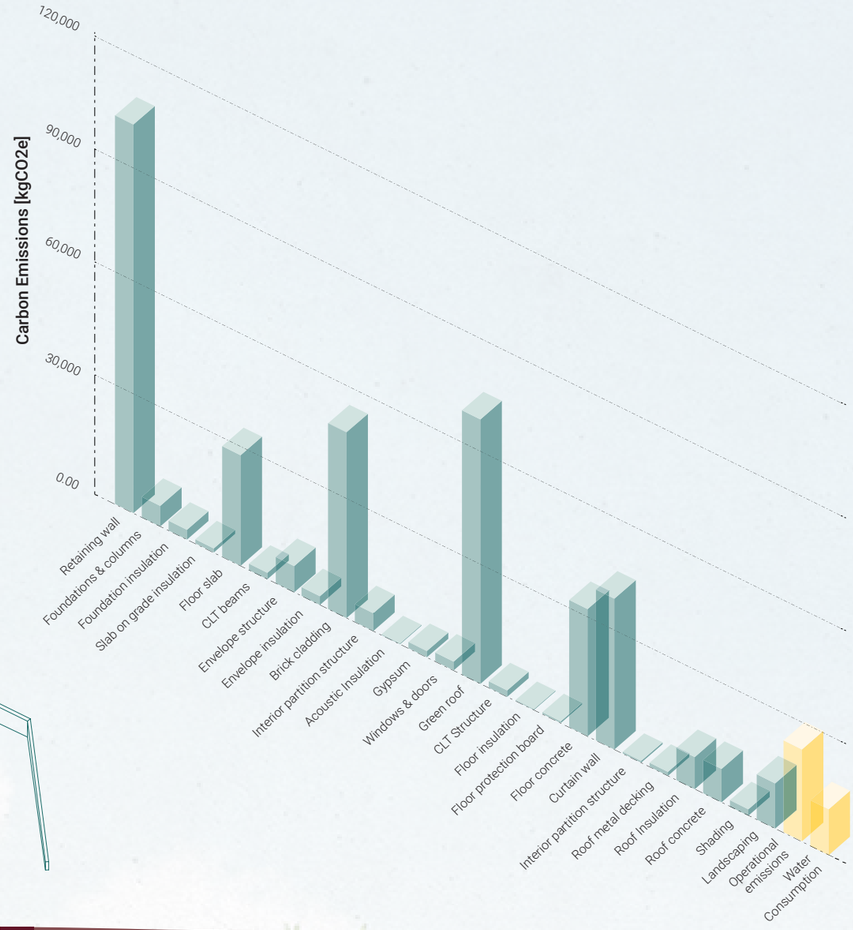

GSAPP

LIFE CYCLE ANALYSIS OF ECOLODGE
an undergrad *"net-zero"* project

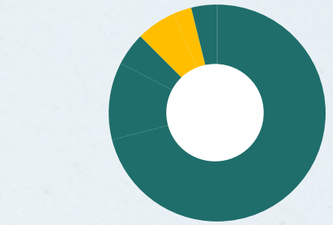
Tech Seminar | GSAPP | David Benjamin

How can a retaining wall contribute to 27% embodied carbon footprint? A design decision as simple as adding a retaining wall in one of my green projects of undergrad cost much more than I had ever imagined...





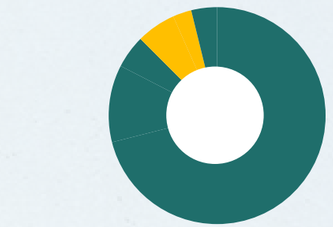
Global warming kg CO2e - Quebec



- Embodied carbon - 91.2% 399,881 kg CO2e
- Operational carbon - 8.8% 37,139 kg CO2e

Building life-cycle carbon footprint - 437 Tons

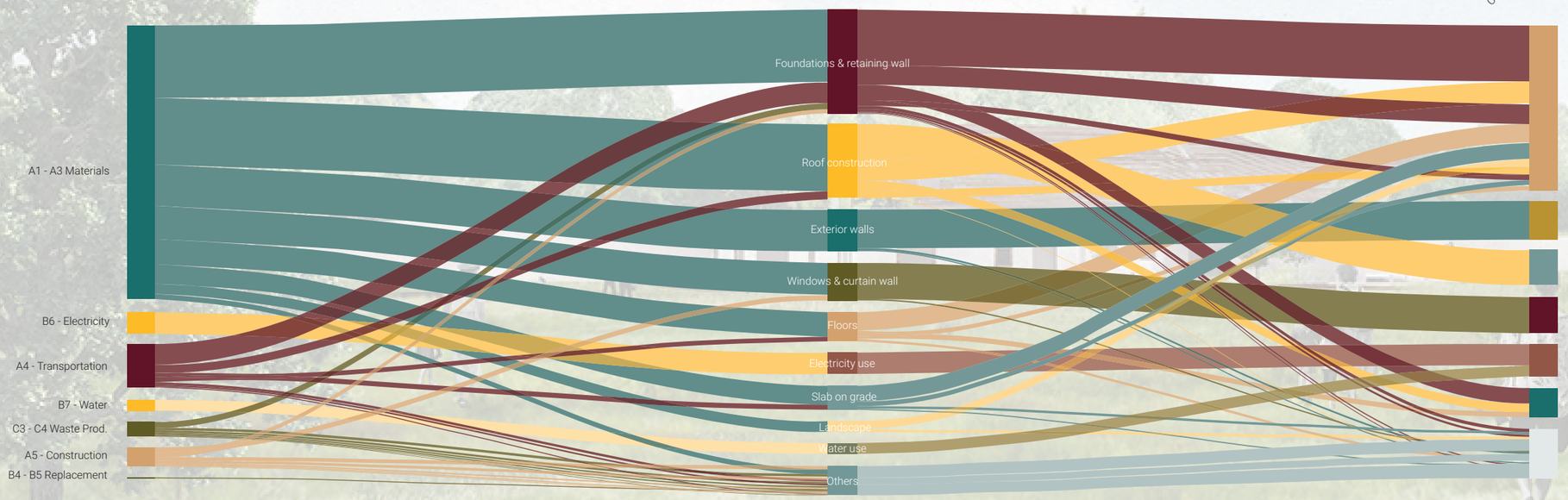
Global warming kg CO2e - Alberta



- Embodied carbon - 13.0% 399,881 kg CO2e
- Operational carbon - 87.0% 2,677,373 kg CO2e

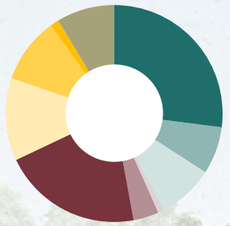
Building life-cycle carbon footprint - 3,077 Tons

Carbon emissions per building component [kgCO2e]



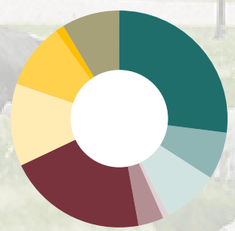
Sankey diagram - From life cycle stage ad resource type to construction assembly

Global warming kg CO2e - Construction assembly



- Retaining wall - 27%
- Beams - 8.4%
- Landscape work - 3.8%
- Exterior walls - 12.4%
- Interior partitions - 1.4%
- Slab-on-grade - 7.1%
- Columns - 0.9%
- Roof - 20.7%
- Windows and curtain wall - 9.8%
- Unclassified/other - 8.5%

Global warming kg CO2e - Resource type



- Concrete - 46.7%
- Insulation - 11.0%
- Glass - 9.4%
- Wood - 1.3%
- Doors & Windows - 0.5%
- Bricks & ceramics - 11.5%
- Metals - 10.2%
- Utilities - 8.5%
- Gypsum, plaster & cement - 1.1%
- Coatings & pastes - 0.4%

My work over the past three years has focused on **gaining a deeper understanding about the environmental and social footprint of architecture**. Through their creativity, architects have the agency to design places that have lasting impact on people and the planet. Unfortunately, it is common in our profession to **overlook the unintended negative consequences** of our designs. It is essential, going forward, to consider the **embodied labor, energy, carbon, and justice of architecture**. Seeing how our industry is a major contributor to the current climate crisis, providing **alternatives to nondescript globalized architecture** and brute force engineering is crucial. It requires a new understanding of the constituents of sustainable environment and the ways in which architecture can contribute to its support. I believe that it is the responsibility of architects to educate themselves on the **quantitative and qualitative data** surrounding the environmental and social impacts of architecture and to use this knowledge to build adaptable and resilient buildings that **respond to the needs, culture and climate of their surroundings and communities**.

ENVIRONMENTAL
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JUSTICE SOCIAL
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THANK YOU!
Zina Berrada