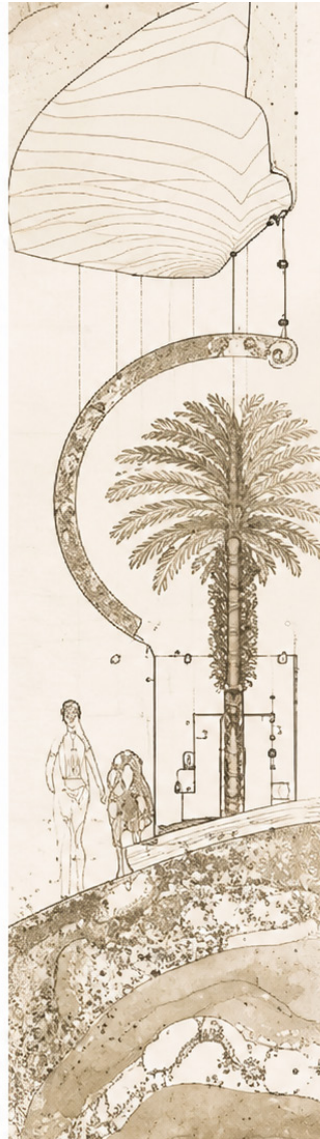




SYSTEMS OF MATERIAL, ECOLOGY, AND ARCHITECTURAL PRODUCTION

RIDHI SAWHNEY | MSAAD'26

This portfolio explores architecture as a system shaped by material flows, labor, ecology, infrastructure, and time. Across projects ranging from earthen construction in Brooklyn to carbon conscious housing in Ethiopia, ecological infrastructures in Dubai, and speculative platforms for architectural knowledge sharing, my work investigates how architecture operates beyond the scale of the isolated building.

Rather than treating buildings as fixed objects, these projects examine architecture through processes of extraction, assembly, occupation, adaptation, and transformation. Clay, bamboo, waste, carbon, and technical knowledge are approached as active systems that shape spatial, environmental, and social relationships over time.

My work also moves across scales, from tactile construction details to planetary systems of tourism, industry, and ecological change, while maintaining a consistent interest in lifecycle thinking and evolving forms of architectural production. Together, these projects propose an approach to architecture that prioritizes adaptability, material awareness, collaboration, and long term environmental integration.

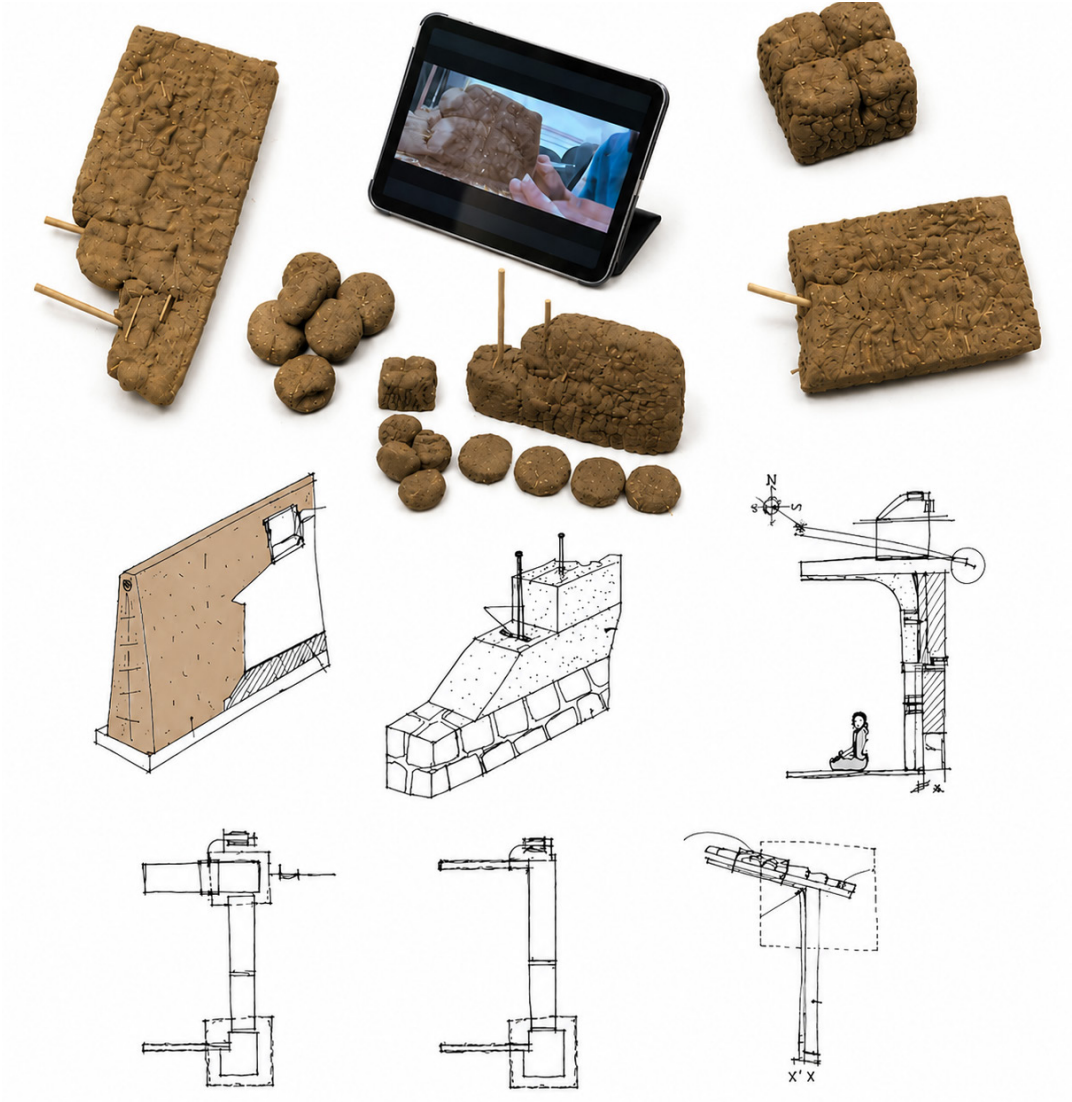
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1. SUMMER STUDIO -

ASSESSING ENDOGENEOUS BUILDING PRACTICES

This studio explored earth-based construction through the lens of localized material systems in Brooklyn. Focusing on clay and cob construction, the project investigated how earthen materials could operate as contemporary urban building systems rather than nostalgic alternatives. By mapping networks of extraction, reuse, labor, and transport, the work connected material sourcing to questions of acoustics, construction time, and environmental performance. Cob walls reinforced with recycled fibers became both spatial and acoustic devices, embedding labor and material cycles directly into the architecture.



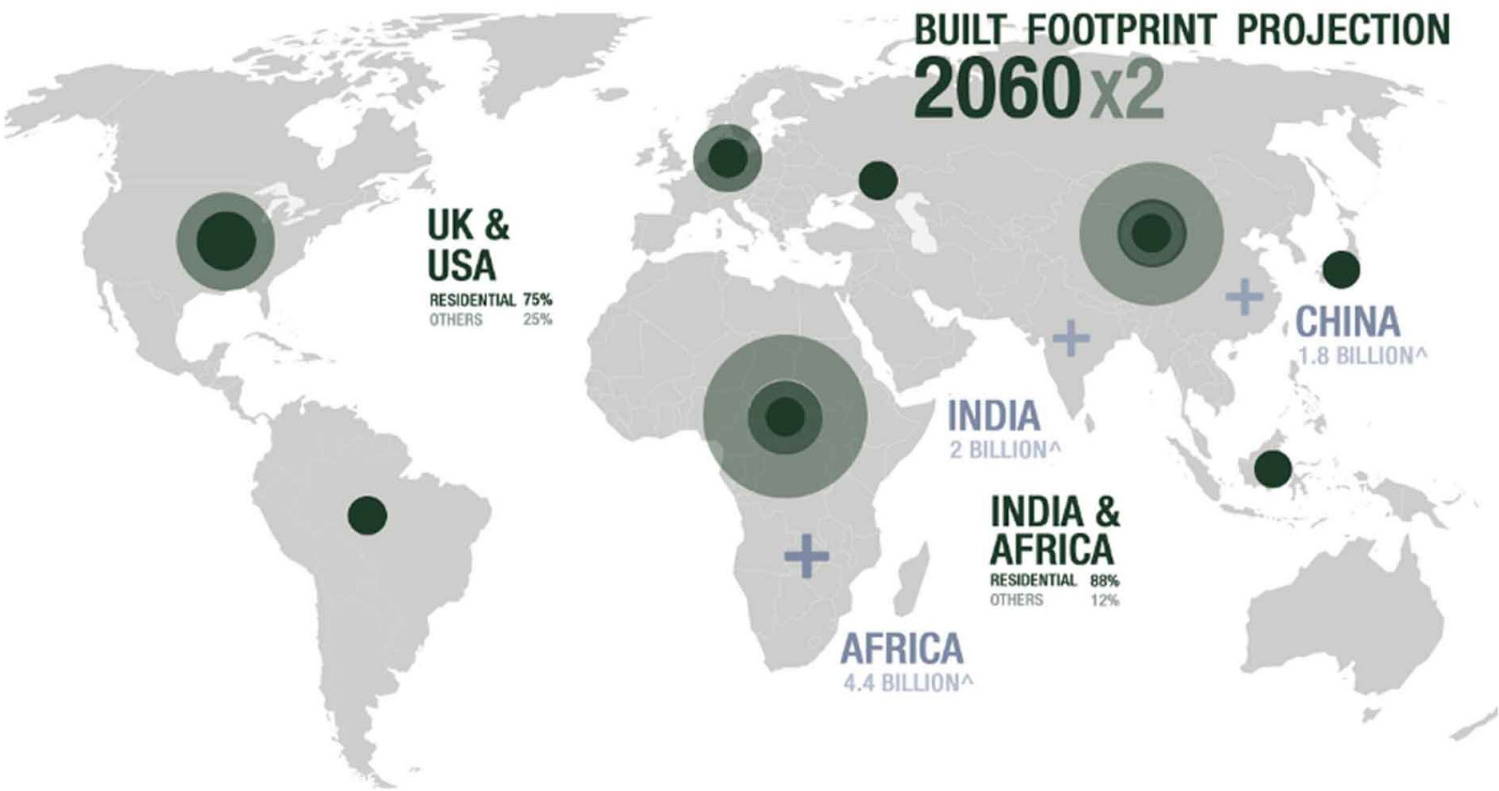
TESTS AND STUDIES



COLLAGE

2. FALL STUDIO - VITAL

This project, developed in collaboration with Neha Abraham, addressed the environmental impact of global construction through a housing proposal near the Lemi cement factory in Ethiopia. Combining carbon captured concrete with untreated bamboo, the work proposed a cyclical building system based on renewal and community participation. Bamboo structures were designed for periodic replacement, embedding maintenance into collective life while reducing embodied carbon. The project reframed housing as an adaptive system where carbon capture, material growth, and social infrastructure operate together over time.



POPULATION MAP

PEOPLE

AS OF 2023

600,000 PAX UNSHELTERED

RURAL

80% POPULATION

LEAST URBAN COUNTRY IN AFRICA

LEMI CEMENT
FACTORY

50%

CURRENT CEMENT DEMAND OF ETHIOPIA

DIRAMU

LEMI CITY

ADDIS ABABA
750 KM SOUTH

URBAN

GROWTH RATE 4%[^] ANUALLY
HIGHEST COUNTRY IN AFRICA

INDUSTRY

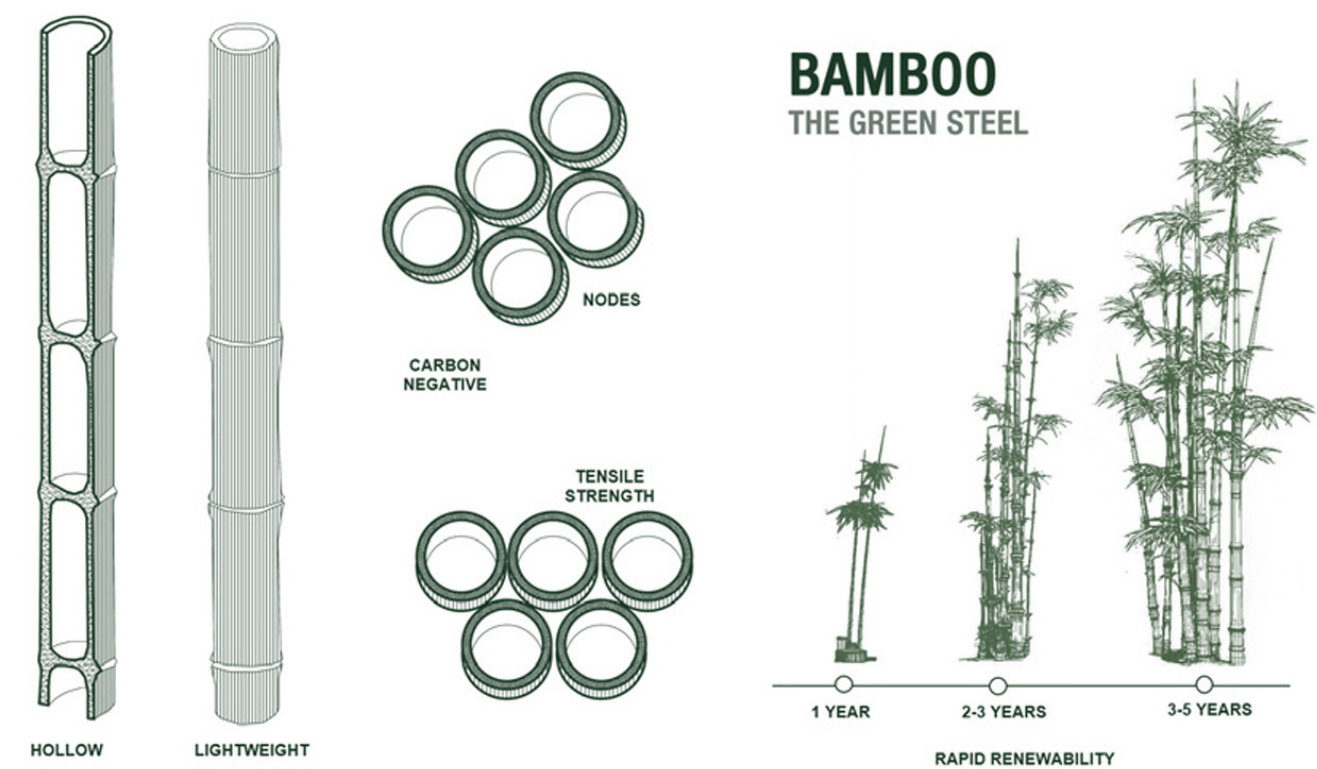
54% RESPIRATORY SYMPTOMS
FACTORY WORKERS

HOMES

AS OF 2023

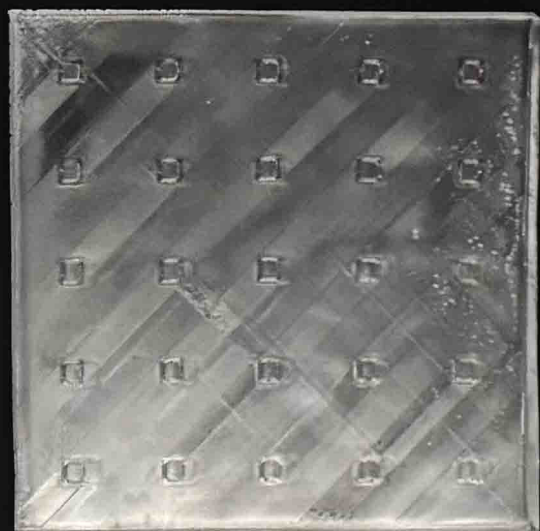
600,000 PAX UNSHELTERED

Bamboo was selected as the primary structural material due to its rapid growth cycle, carbon sequestration potential, and high tensile strength. Lightweight yet structurally resilient, bamboo offers an alternative to conventional steel and concrete systems while significantly reducing embodied carbon. Rather than relying on heavily processed or chemically treated bamboo, the project works with the material in its raw state, embracing natural variation in size, length, and form. This approach minimizes energy intensive processing while allowing construction systems to remain flexible, repairable, and locally maintainable. By treating bamboo as a renewable material that can be periodically regrown and replaced, the project positions structure as part of a continuous ecological cycle rather than a permanent assembly.



SLABS

132KG CO2 LOCKED IN
117 CUBIC FEET VOLUME



SLAB MOULD



CONNECTOR

16KG CO2 LOCKED IN
14 CUBIC FEET VOLUME



CONNECTOR MOULD

BAMBOO

45KG CO2 LOCKED IN
BEAMS



BAMBOO

60KG CO2 LOCKED IN
COLUMNS



PLATE MOULD

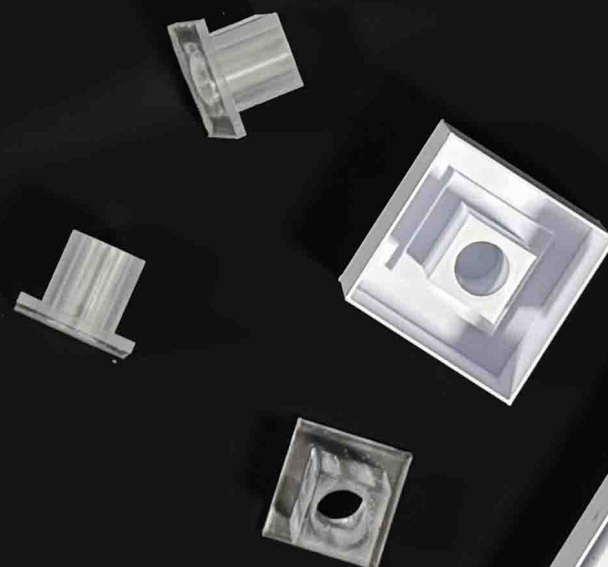
PLATES

12KG CO2 LOCKED IN
11 CUBIC FEET VOLUME



BEAMS

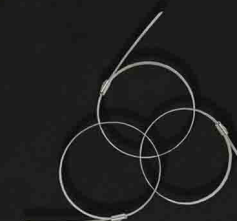
90KG CO2 LOCKED IN
80 CUBIC FEET VOLUME



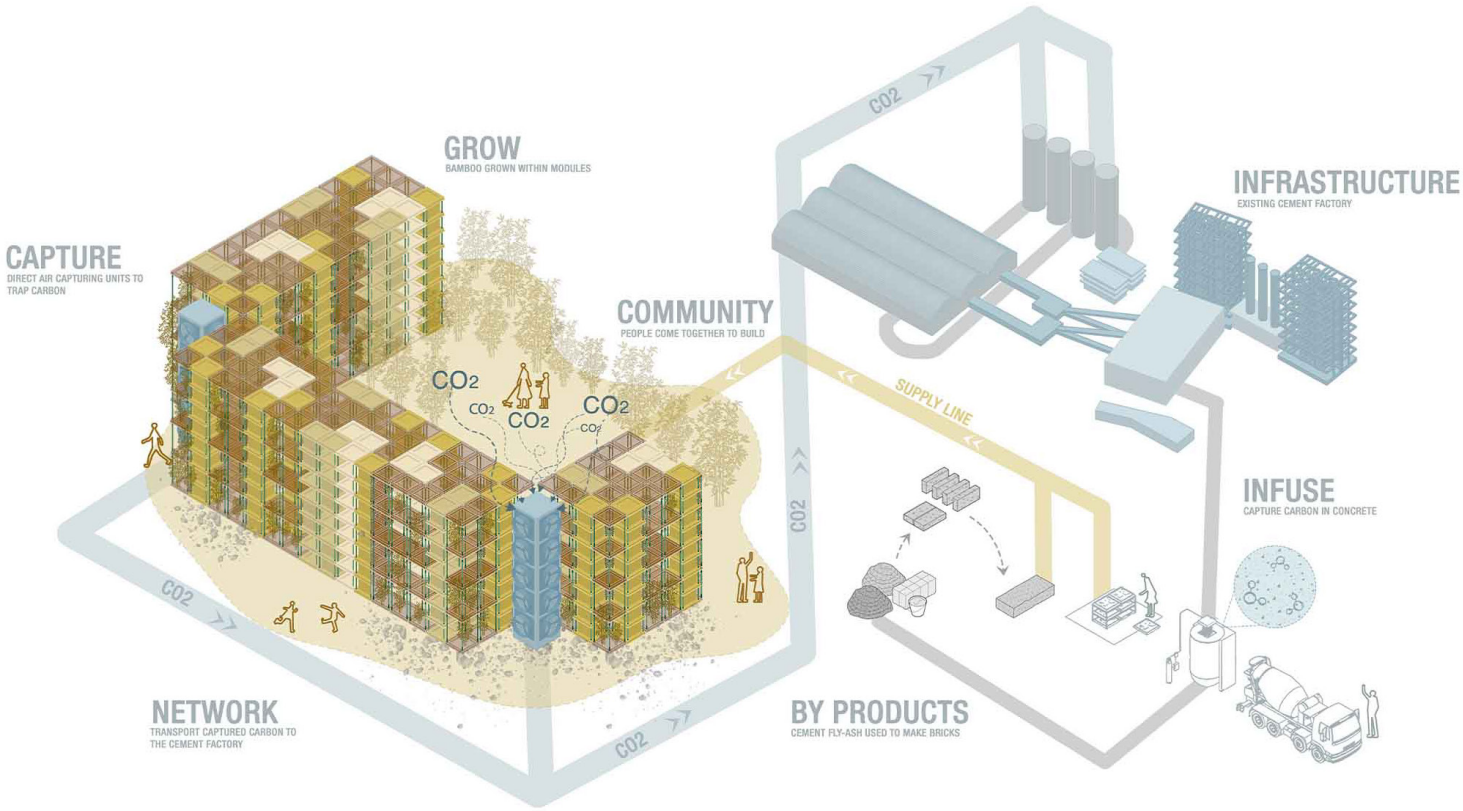
BEAM MOULD

TIES

90KG CO2 LOCKED IN
80 CUBIC FEET VOLUME



The project operates through an interconnected system of carbon capture, material growth, construction, and renewal. DAC units capture carbon dioxide from both the atmosphere and interior environments, redirecting it to the nearby cement factory where it is integrated into carbon captured concrete. This concrete forms the permanent structural core of the housing clusters, while untreated bamboo harvested from surrounding landscapes creates the adaptable structural framework above. Designed for periodic replacement, the bamboo system embeds maintenance and regeneration into community life, allowing housing to evolve alongside environmental and social change. Together, these systems establish a closed loop relationship between industry, material cultivation, architecture, and long term carbon storage.



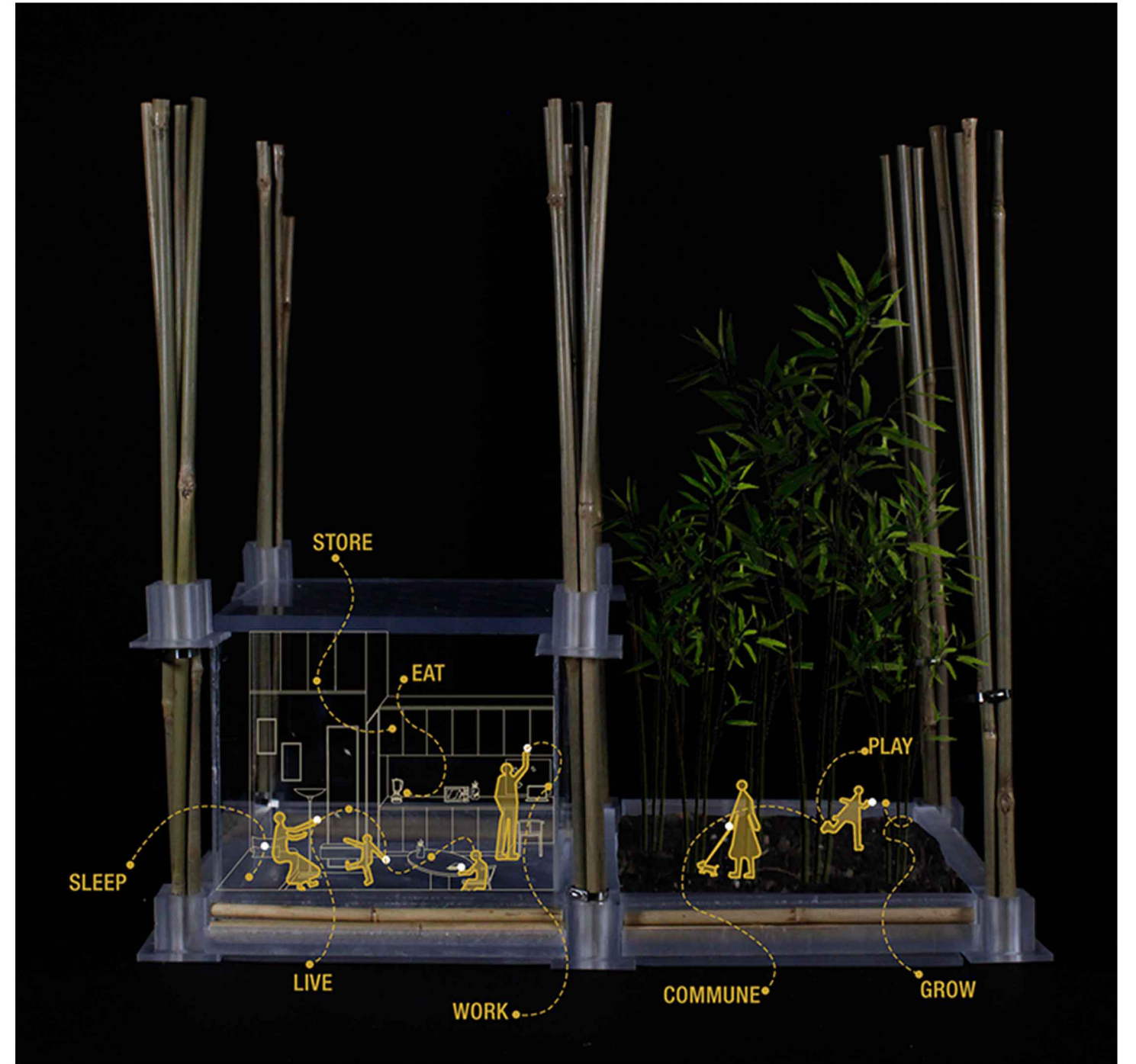
The shearing layers diagram reinterprets Stewart Brand's framework through the lens of carbon conscious and biogenic architecture. Each layer of the building is organized according to its lifespan, distinguishing between permanent systems and components that require periodic renewal. Long term elements such as the carbon captured concrete foundation remain fixed, while rapidly changing materials like untreated bamboo appear more temporary and cyclical. By mapping these layers alongside carbon flows, the diagram reveals how material lifespans, maintenance cycles, and environmental performance operate together over time, positioning the building as an evolving system rather than a static object.



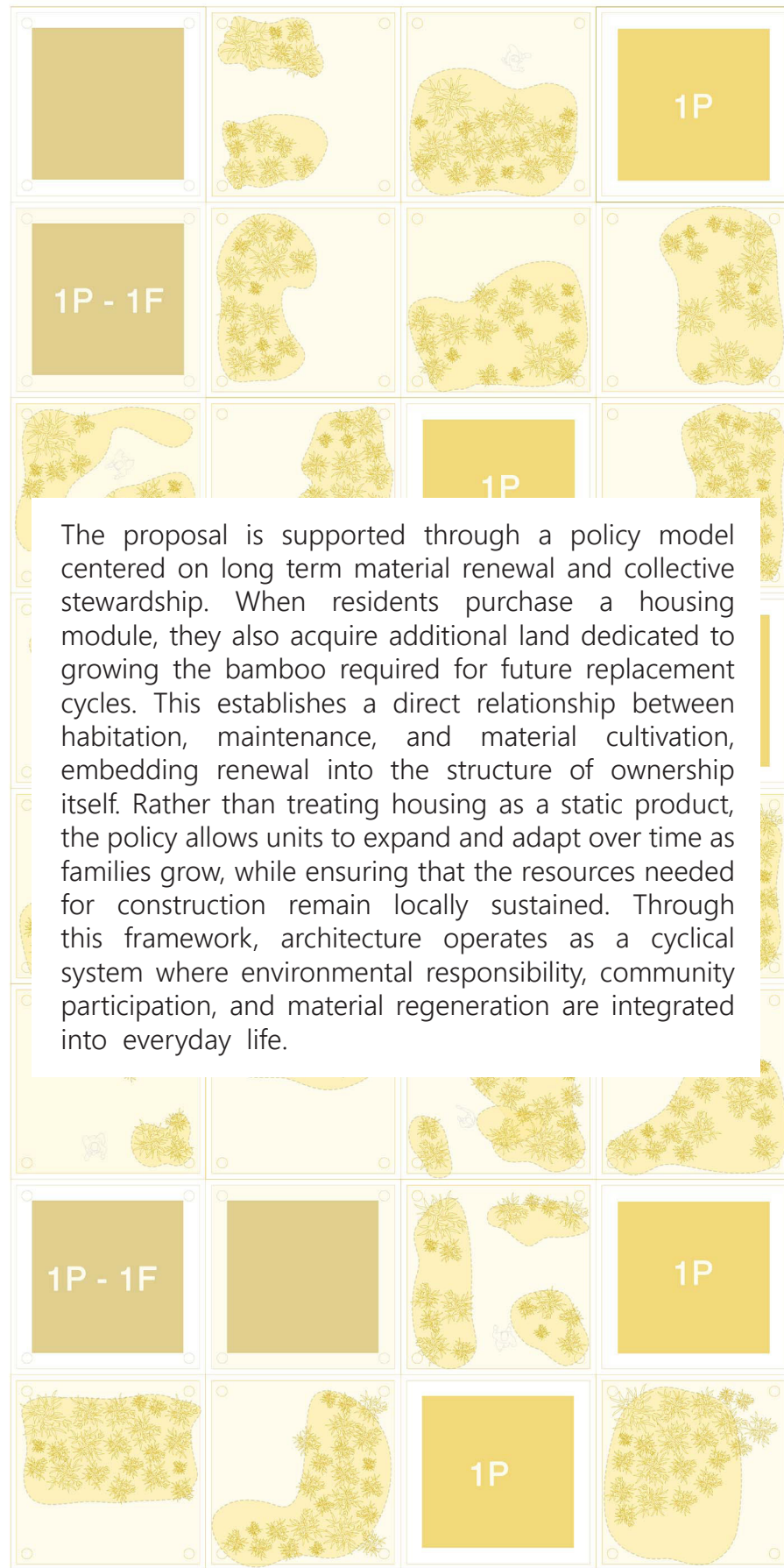
SHEARING DIAGRAM



COMMUNITY BUILDING



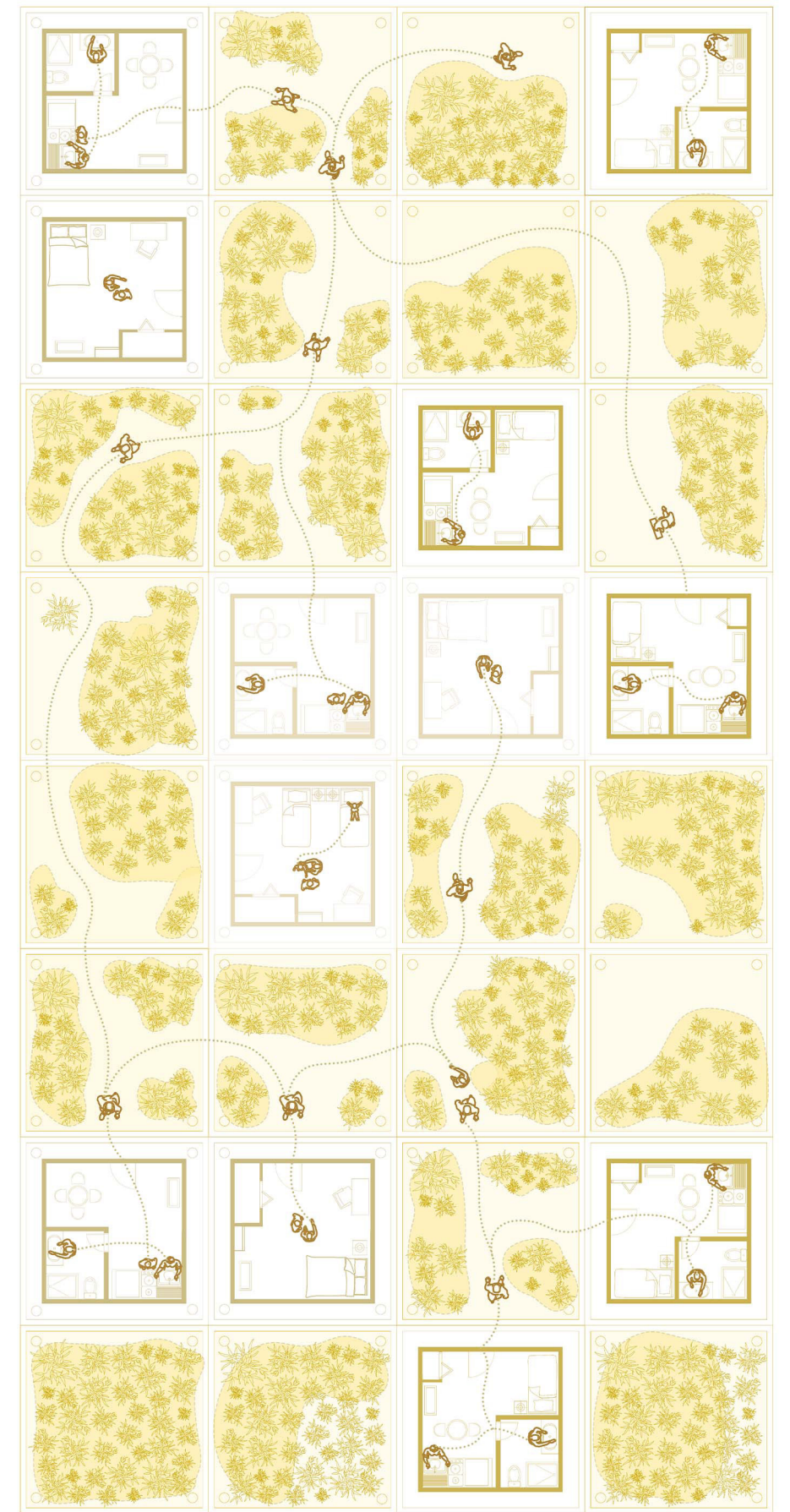
HOME LIFESTYLE



POLICIES



PHASE 1



PHASE 2



3. SPRING STUDIO - NO VACANCY

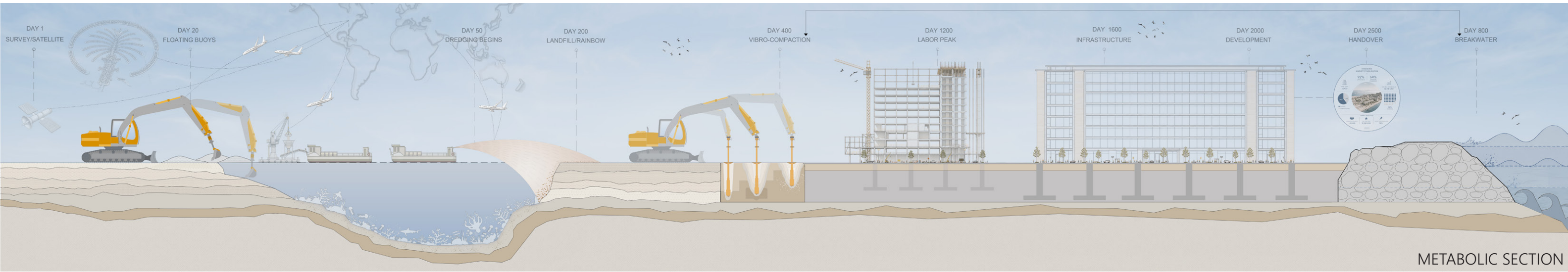
This studio examined Dubai as a planetary system shaped by tourism, labor, extraction, and ecological transformation. Using Palm Jumeirah as a case study, the project traced the island's construction through dredging, land formation, and breakwater infrastructure, revealing the environmental consequences embedded within artificial landmaking. In response to rising sea levels, the proposal transformed coastal infrastructure into ecological systems through porous reef structures and marine habitats made from reclaimed construction and hospitality waste. The work reimagined artificial islands as evolving environments capable of supporting long-term coexistence between humans and marine ecologies.

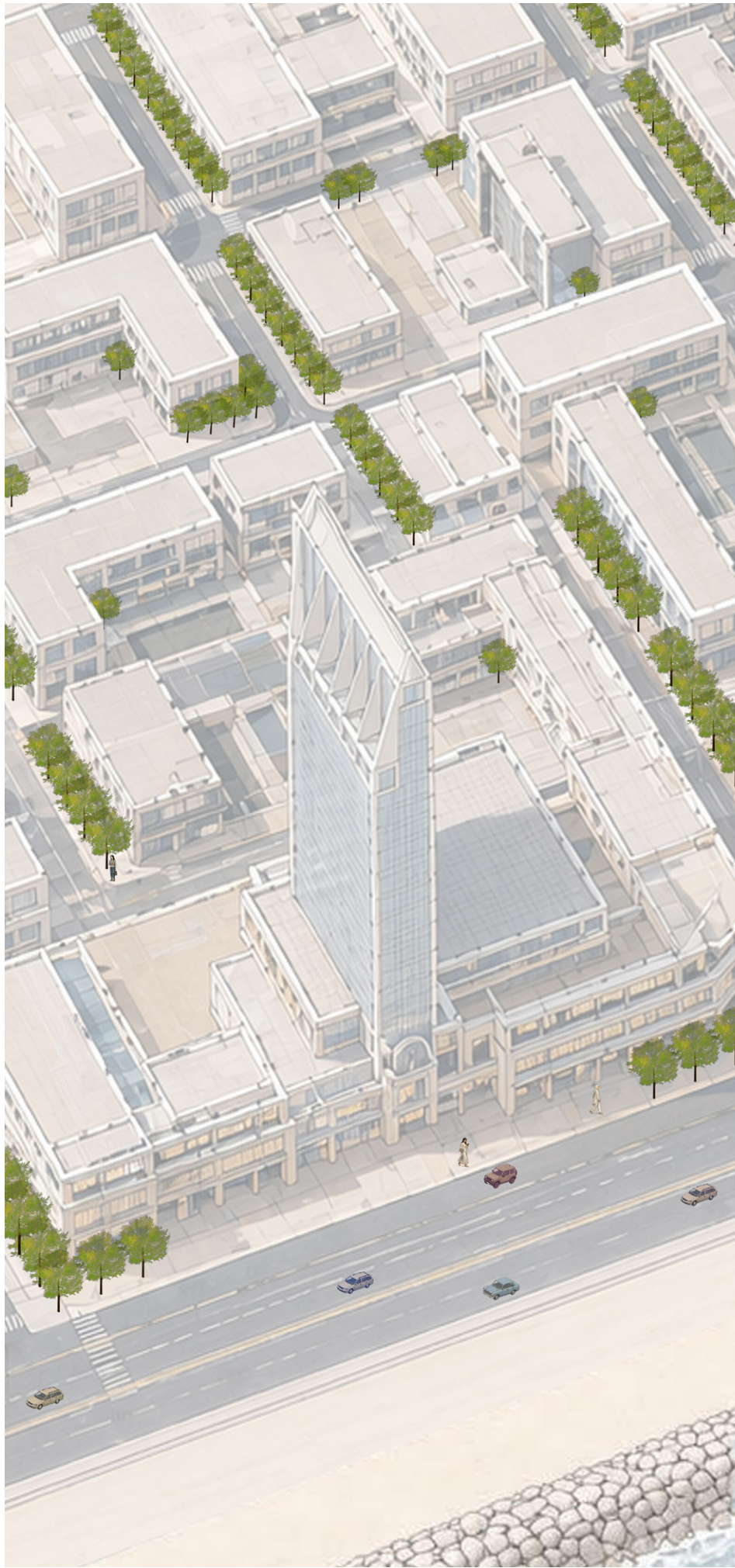


COSMOGRAM

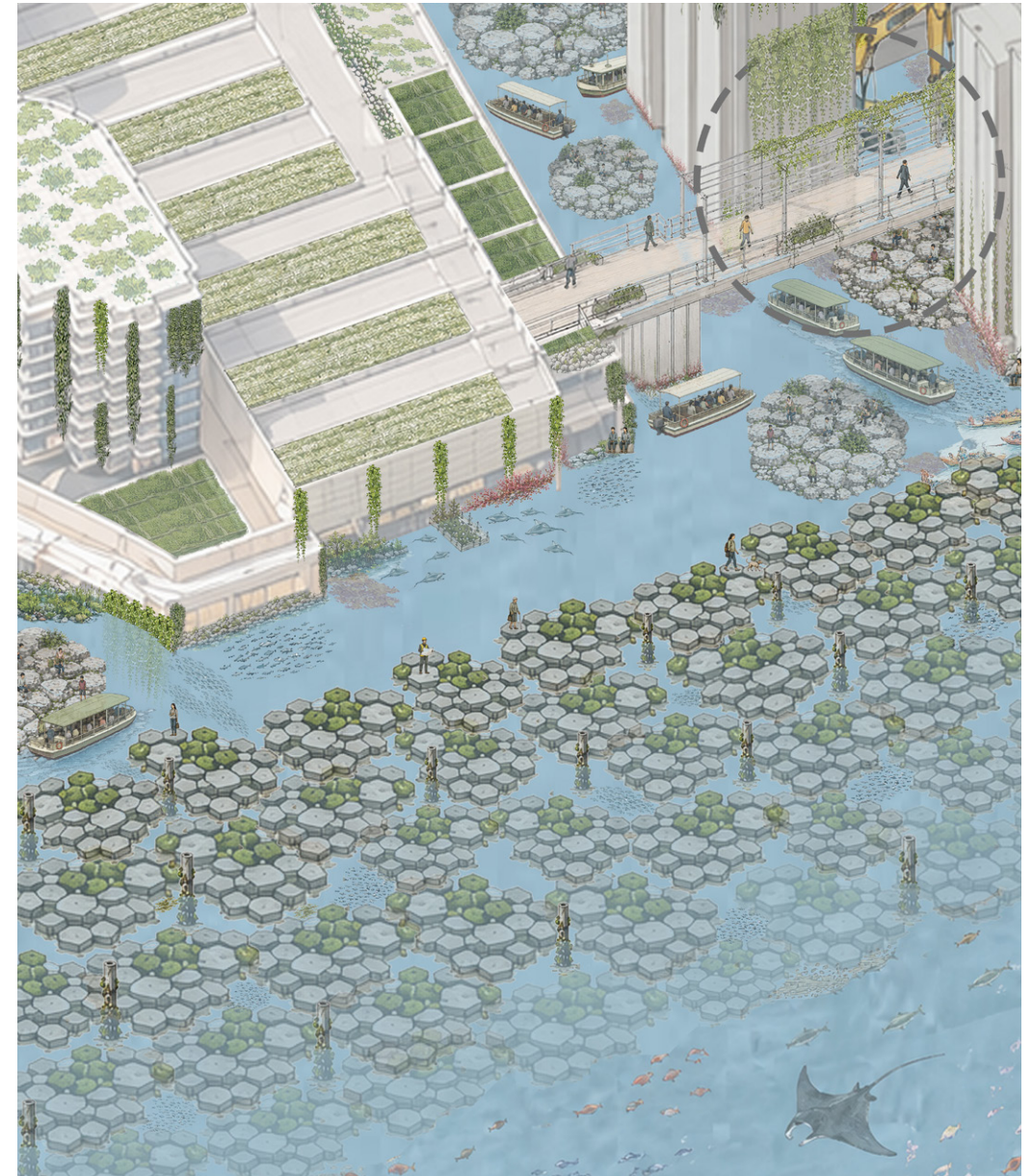
The metabolic section traces Palm Jumeirah as a large-scale process of extraction, engineering, and environmental transformation. Beginning with satellite mapping and seabed calibration, the island is formed through dredging and rainbowing millions of cubic meters of sand from the Arabian Gulf to construct the palm geometry. Once deposited, the land undergoes vibrocompaction, a densification process that stabilizes the loose sand using deep vibration probes and water pressure, allowing the artificial ground to support roads, utilities, hotels, and residential infrastructure. Simultaneously, the crescent breakwater is assembled from rock and quarry material to protect the island from wave action, while bridges, tunnels, sewage systems, desalination infrastructure, and transportation networks establish the island as a functioning urban extension of Dubai. The section reveals that the making of the Palm is not a singular architectural act, but an infrastructural and territorial process unfolding over approximately 2,500 days.

At the same time, these operations fundamentally reshape marine ecologies. Dredging disturbs seabed habitats and sediment flows, while the enclosed geometry of the breakwater alters tidal circulation and reduces oxygen exchange within the fronds. Water stagnation, increased turbidity, and limited marine attachment surfaces create conditions where ecological systems struggle to regenerate. Through the metabolic section, the island is understood not only as a tourism and real estate development, but as an environmental system whose construction reorganizes relationships between land, water, infrastructure, and marine life at a planetary scale.





Looking forward, the project examines how rising sea levels may gradually submerge portions of Palm Jumeirah over the next two centuries. Rather than resisting flooding through defensive infrastructure alone, the proposal prepares for a long-term transition where marine ecology and human occupation begin to coexist. Existing coastal systems are reimagined as ecological infrastructures through the introduction of porous, hexagonal reef blocks designed to support water circulation, marine attachment, and habitat formation over time. Produced from reclaimed construction and hospitality waste combined with calcium-rich additives, these modules operate as artificial reefs that encourage coral growth and ecological regeneration. As sea levels rise, roads and public spaces gradually transition into amphibious environments where boats replace cars and architecture adapts to fluctuating water conditions. The project ultimately reframes artificial islands not as static landforms, but as evolving environments capable of supporting both human and marine futures simultaneously.



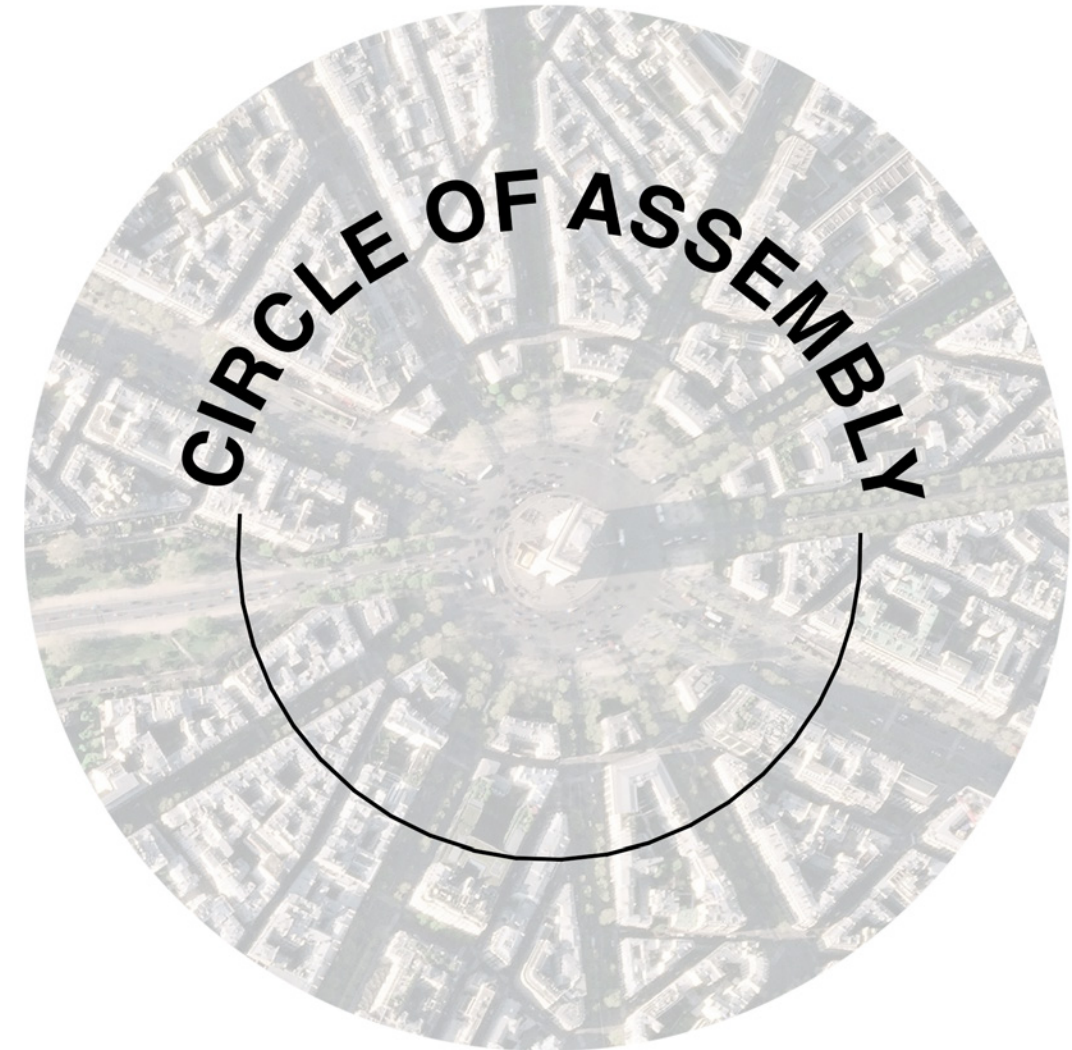
COEXISTING HUMANS AND MARINE LIFE



4. LIFECYCLE OF NATURAL MATERIALS

These projects explore architecture through the lifecycle of natural materials, focusing on how extraction, processing, construction, occupation, and decay shape the built environment overtime. Through research on structural bamboo and a speculative assembly game, the work investigates the environmental, labor, and infrastructural systems often hidden behind material production.

By tracing carbon impacts, reuse cycles, maintenance, and transformation, the projects challenge the idea of materials as static or inherently sustainable. Instead, architecture is framed as an evolving process shaped by continual assembly, adaptation, and change.

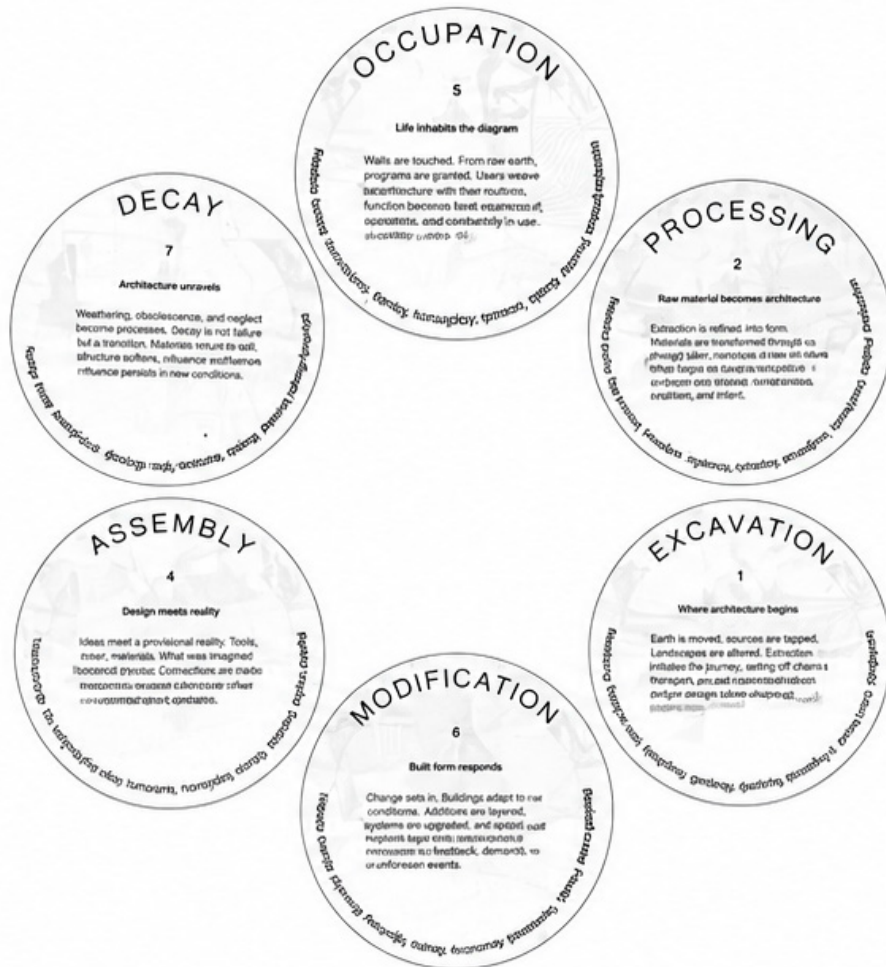


A. ARGUMENTS

The “Circle of Assembly” is a speculative card game that reimagines architecture as a non-linear process shaped by extraction, assembly, occupation, modification, and decay. Rejecting architecture as a fixed object, the game allows players to construct multiple pathways through material and environmental systems, emphasizing adaptability, reuse, and continuous transformation. The project positioned architecture as an evolving lifecycle rather than a singular authored outcome.







ITERATION 1



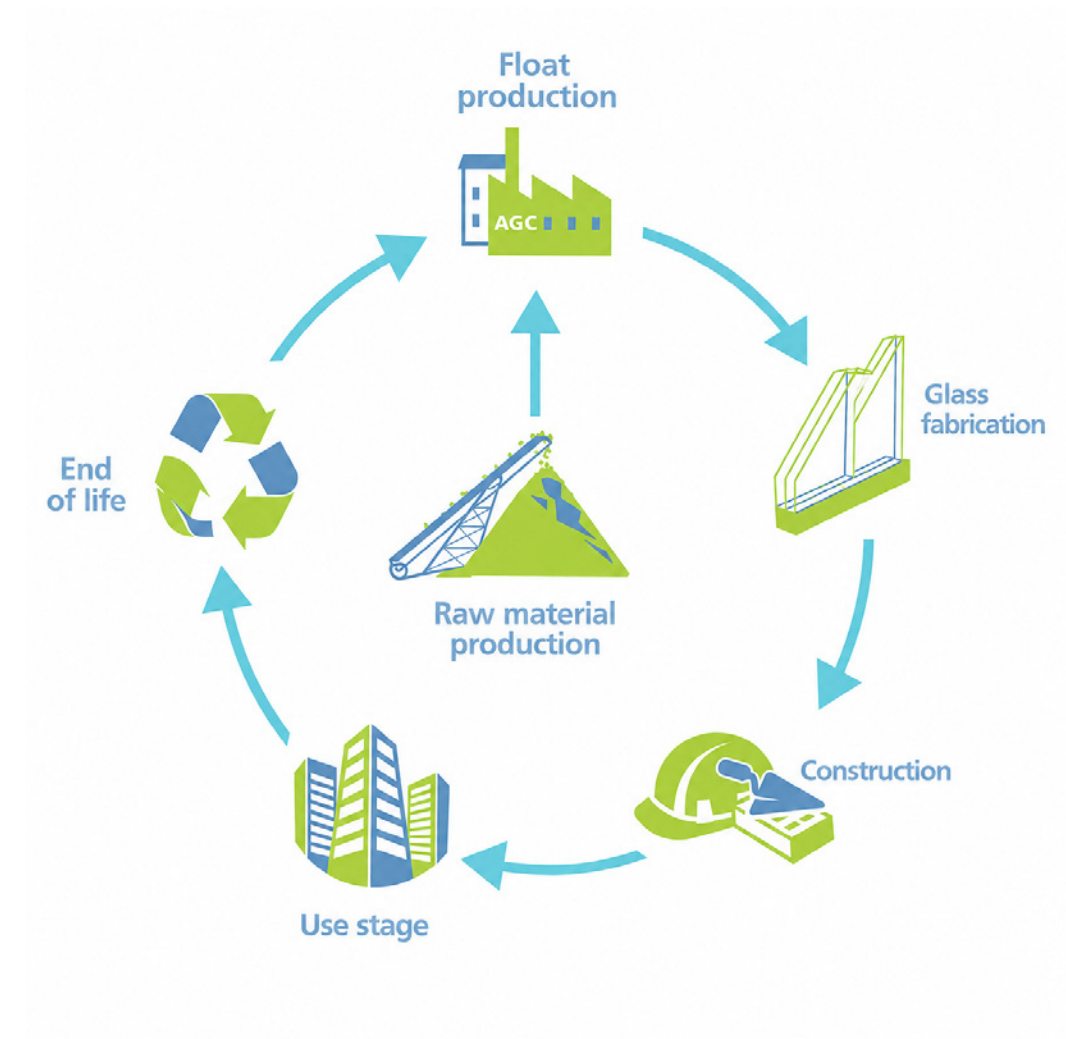
ITERATION 2

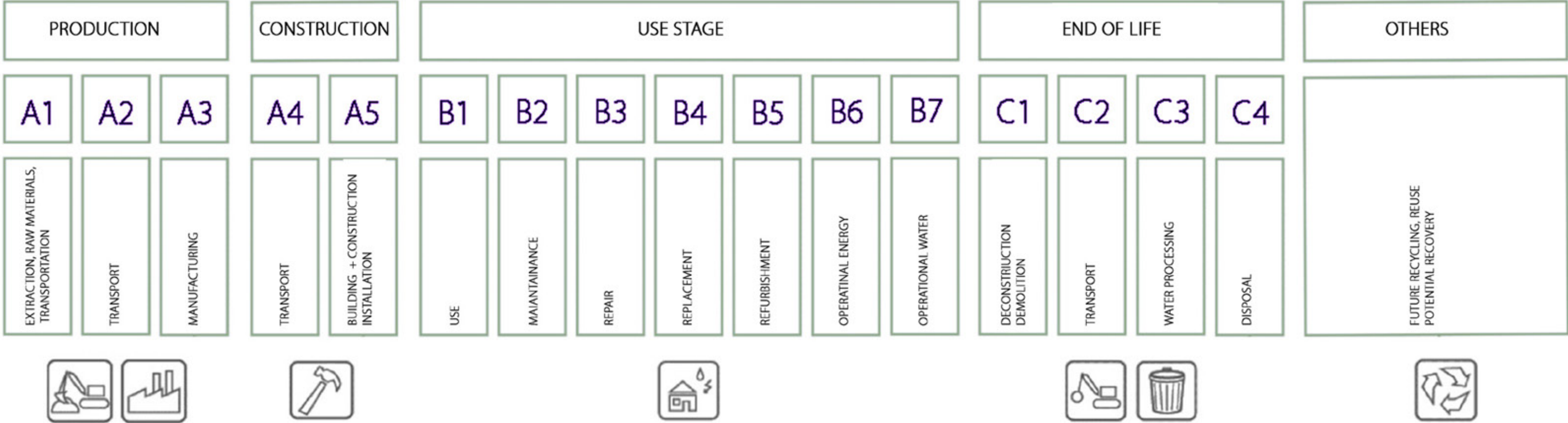


ITERATION 3

B. CONSTRUCTION ECOLOGIES

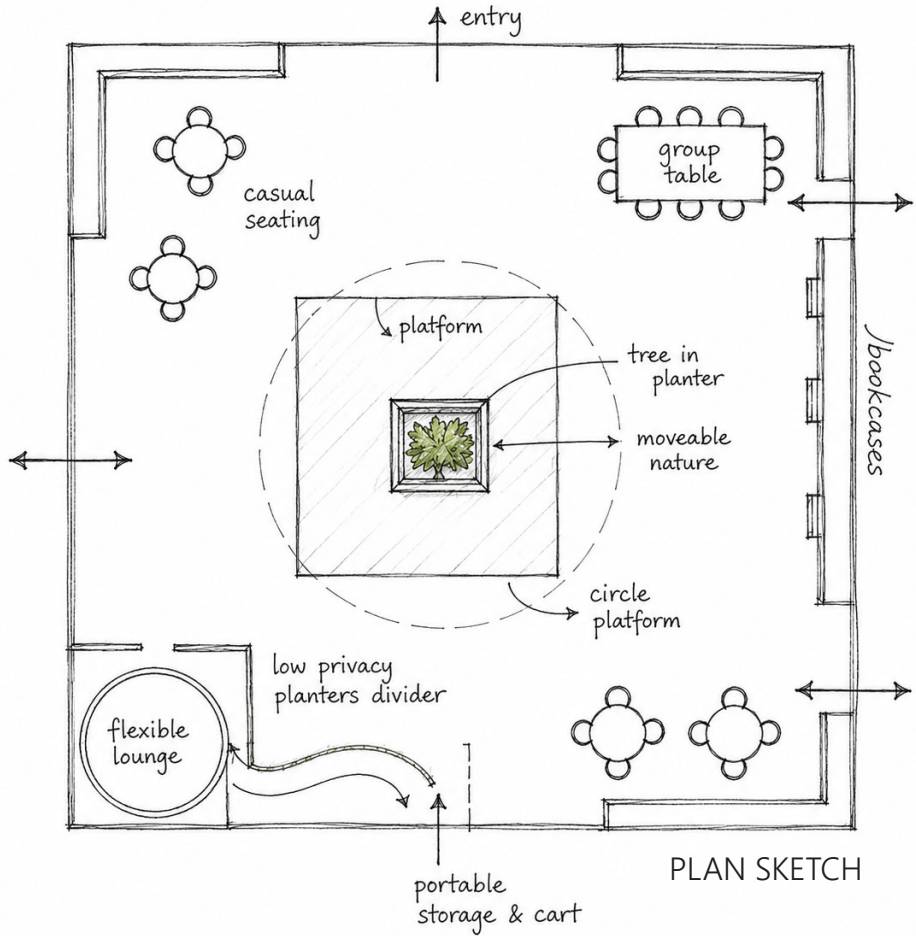
This research investigated the life cycle of structural bamboo through the framework of Environmental Product Declarations (EPDs). Focusing on *Guadua angustifolia*, the project examined the gaps and blind spots often hidden within sustainability metrics, including transportation, treatment, labor, and end-of-life disposal. By visualizing carbon impacts across sequential stages, the work challenged simplified notions of “green” materials and reframed sustainability as a broader infrastructural and temporal system.

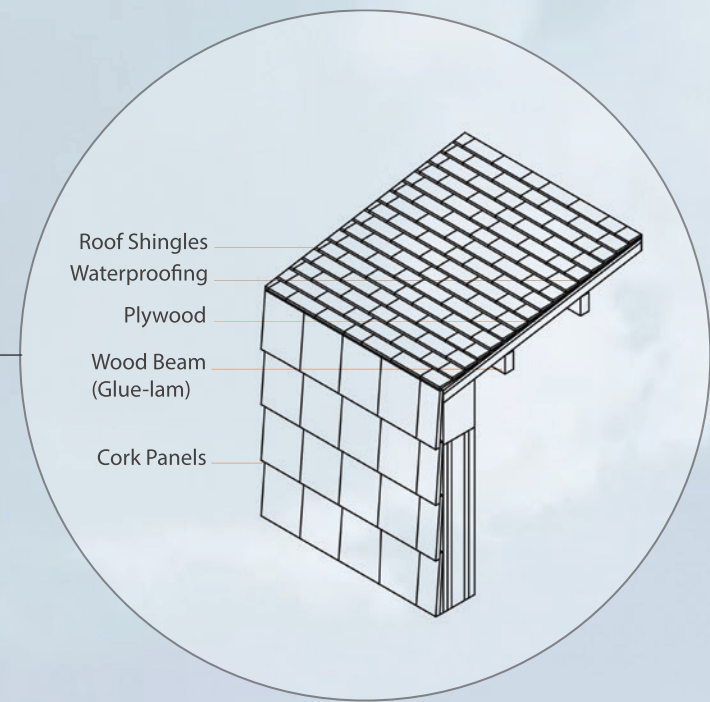




5. DESIGNING SPACES FOR CHILDREN

This project explores how spatial organization, light, and materiality can support early childhood development within a Montessori inspired daycare environment. Located in a residential neighborhood near a commuter rail station in Metuchen, New Jersey, the design responds to the rhythms of daily pickup and drop off while creating a safe and child scaled environment. Organized around a central atrium, the building encourages visual connection, movement, and interaction across different age groups while balancing independence and supervision. Warm timber structure, natural light, deep window sills, and soft interior color systems create an atmosphere that feels both educational and domestic, reinforcing comfort, curiosity, and play within the learning environment. Group work with Eugenia Lopez and Ellie Nolan





5 PM
EVENING SUN

2 PM
AFTERNOON SUN

12 PM
MIDDAY SUN

10 AM
LATE MORNING SUN

8 AM
MORNING SUN

BUILDING SECTION



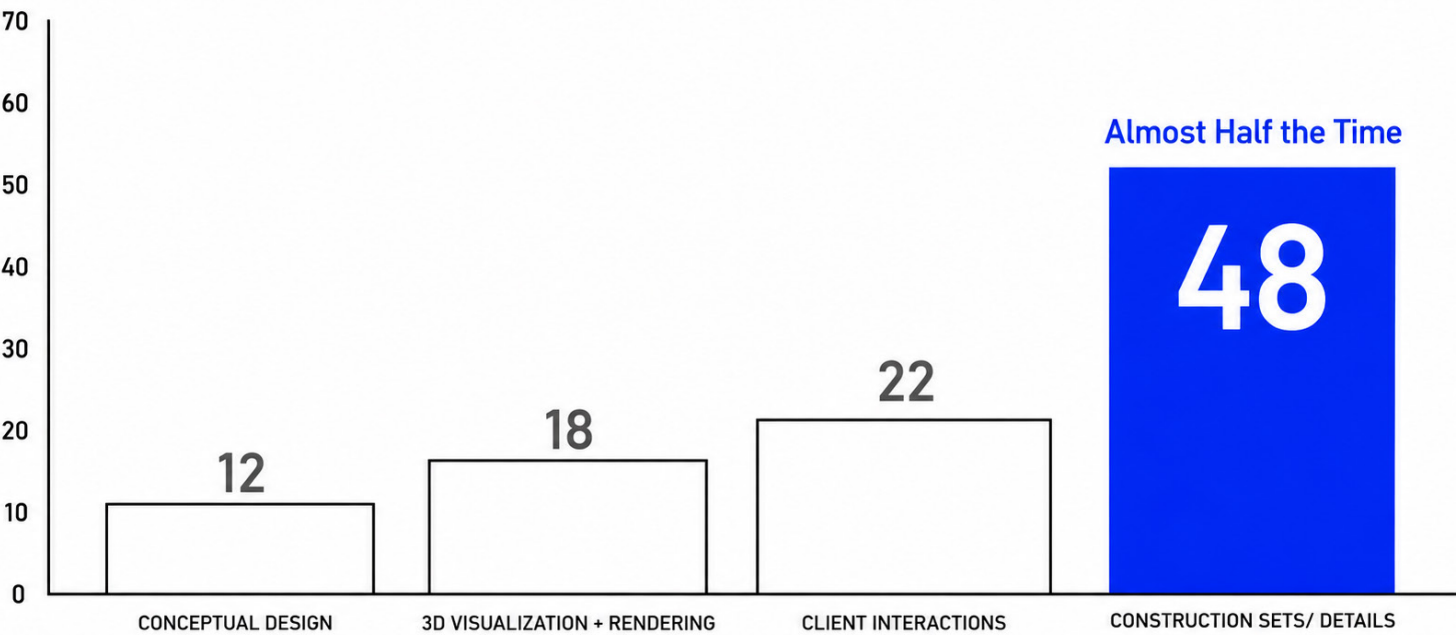
5. DEFECTORS OF ARCHITECTURE

DetailX is a speculative platform that reimagines how architectural technical knowledge is produced, shared, and valued. The project addresses the repetitive labor involved in creating construction details, where firms repeatedly redraw similar assemblies despite significant overlaps in technical information. Structured almost like a matchmaking or dating platform, DetailX allows users to browse, preview, and connect with technical details based on project type, material system, scale, or performance criteria. Instead of isolated archives hidden within offices, details become searchable and discoverable through a shared digital marketplace where architects, freelancers, and firms can upload, license, and access verified assemblies through subscription and pay per use systems. By transforming technical drawings into reusable and monetizable assets, the platform shifts architecture away from isolated production models toward a collaborative knowledge infrastructure, creating new economic opportunities while reducing redundant labor across the discipline.

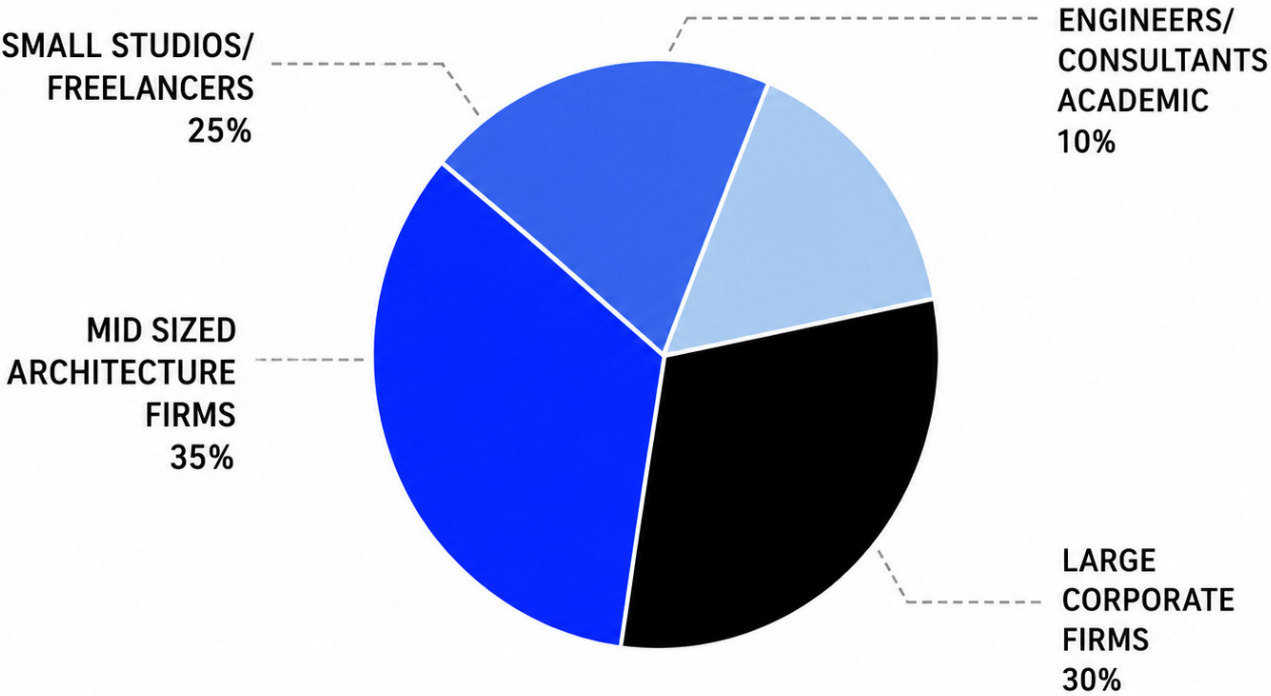


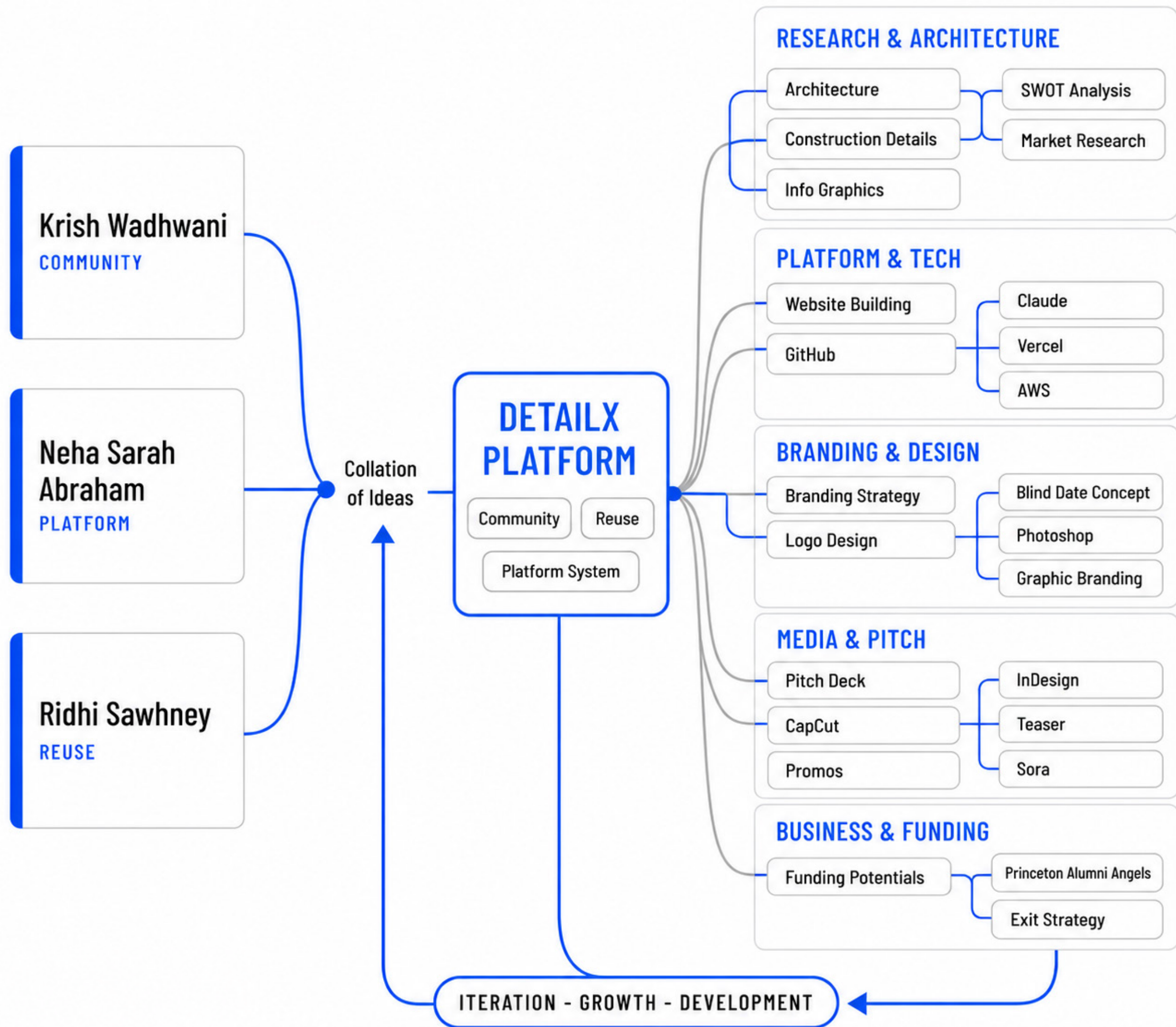
The platform allows architecture firms, consultants, freelancers, and manufacturers to upload verified construction details into a searchable library, reducing the repetitive labor of redrawing similar assemblies across projects. The website operates through subscription and pay-per-use systems where users can browse blurred previews before unlocking full CAD, BIM, and technical drawing files. Internal moderation teams review submissions for accuracy, constructability, and clarity, while AI-supported search tools help users discover relevant details based on material, building type, or performance needs. The platform targets architects, interior designers, students, contractors, and emerging practices looking for faster access to reliable technical information. By transforming construction details into reusable and monetizable assets, DetailX proposes a more collaborative and efficient model of architectural production.

Where do Architects Spend their Time?



Who is the Target Market?





drawings. architectural professionals. purchased. and more.

Featured Details

Recently added to the library.

View All →

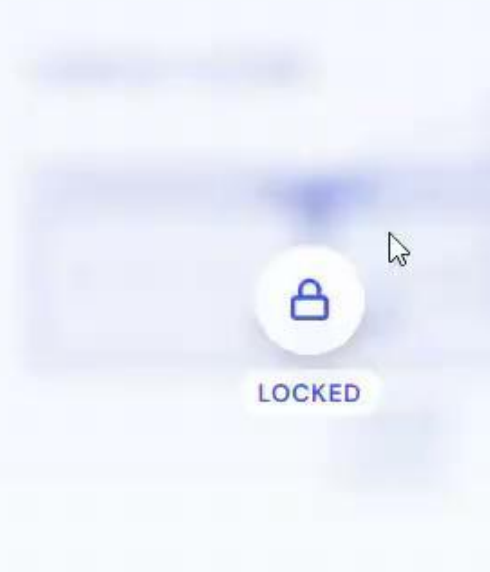




LOCKED

Insulation

mixed-use





LOCKED

Joints

commercial



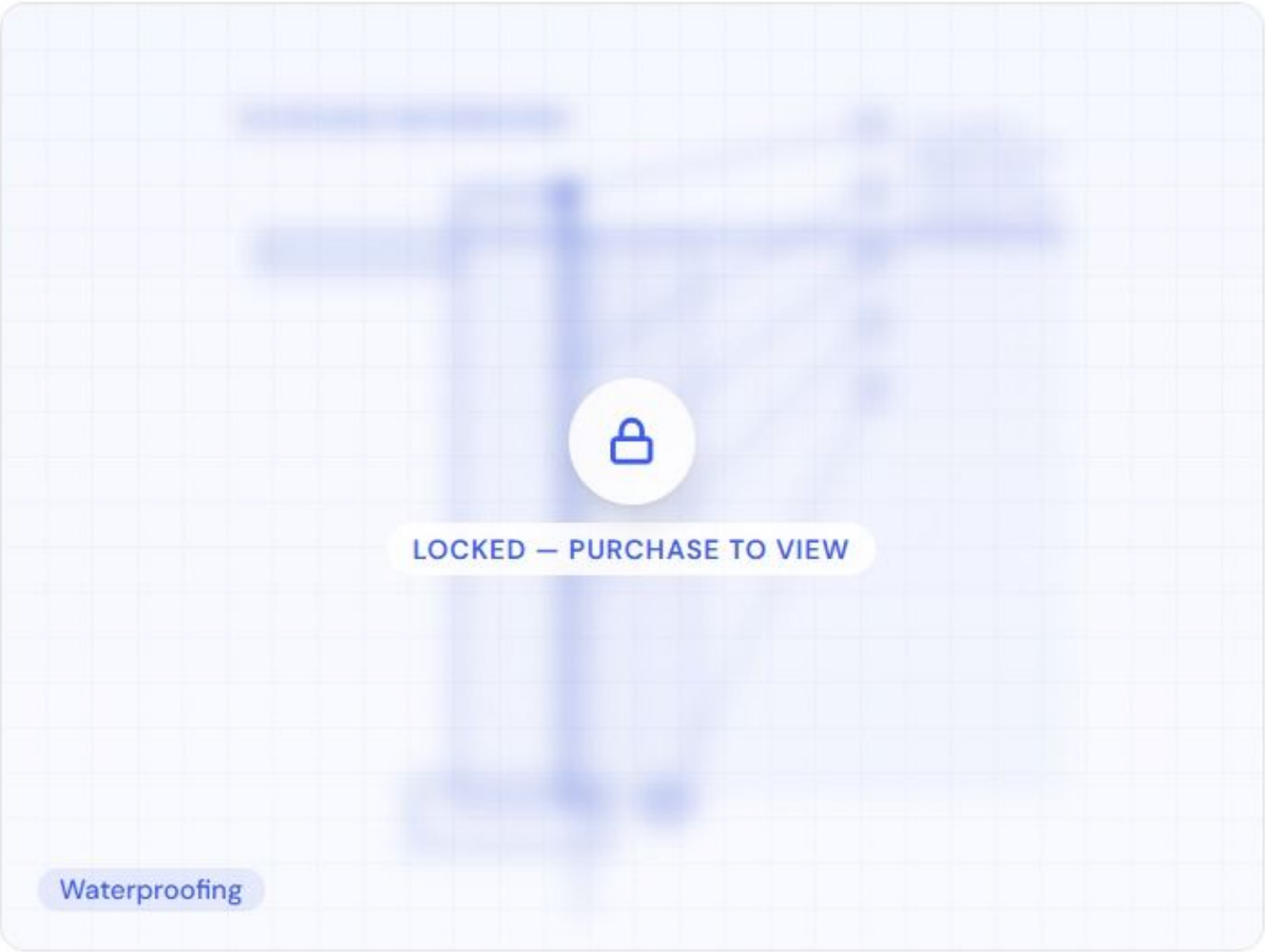


LOCKED

Waterproofing

residential

Back to Library



Preview of the technical detail — purchase to unlock.

Below-Grade Waterproofing with Blind-Side Membrane

residential

Waterproofing

Blind-side waterproofing for basement construction against retention walls. Includes bentonite sheet membrane, protection board, drainage composite, and tie-in to footing drain.

Submitted by

Modern Form Architecture

Price

\$45.00

2 files included

VERIFIED BY

WS

Waterproofing Specialist

✓

BE

Building Envelope Engineer

✓

MC

Materials Consultant

✓

This detail has been reviewed and approved by qualified specialists in each field.

Meet the Team



Krish Wadhwani
[Marketing Lead](#)

- Define platform vision, business model, and architecture-specific strategy.
- Manage content partnerships with architecture firms.
- Oversee community engagement and quality control.



Neha Sarah Abraham
[Operation Lead](#)

- Handle day to day operations, workflows, and platform coordination.
- Manage user onboarding, support systems, and community engagement.
- Coordinate internal teams to ensure smooth execution across functions.



Ridhi Sawhney
[Business Lead](#)

- Handle marketing, brand building, and user acquisition.
- Coordinate customer support, onboarding, and content moderation.
- Develop analytics and growth strategy.

Who's Next?



Sai Ajay
[Tech Support](#)

- **Accountant** : Track royalties, subscriptions, platform revenue, tax compliance
- **Legal/IP Advisor** : Draft license agreements and terms of use, IP Rights
- **Tech Support / DevOps**: Maintain server uptime, troubleshoot issues, and handle updates.

7. ACKNOWLEDGEMENT

Architecture here is explored through systems of material, ecology, and production. Across projects ranging from earthen construction and renewable housing to ecological infrastructures and speculative platforms, the work investigates how architecture is shaped by processes of extraction, assembly, occupation, and transformation over time. Rather than treating buildings as isolated objects, these projects position materials, labor, carbon, and environmental change as active forces that continuously shape spatial and ecological relationships.

I would like to sincerely thank the faculty whose guidance, critique, and conversations shaped the development of this body of work throughout my time at GSAPP. Their teaching continually challenged me to think critically across systems of material, ecology, infrastructure, and architectural production.

Mireia Luzarraga, David Benjamin, Nicolas Rondet, Nzinga Mboup, Lydia Kallipoliti, Thomas N. Schroepfer, Anna Knoell, Wendy Fok, and Mark Wigley.