

# RISING GROUNDS

TIM SCHURMAN

# **RISING GROUNDS**

BUILDING THE FOUNDATIONS FOR THRIVING  
COMMUNITIES

**RISING GROUNDS** - 'BUILDING THE FOUNDATIONS FOR THRIVING  
COMMUNITIES'

TIM SCHURMAN

MASTER'S THESIS ARCHITECTURE - DWELLING  
STUDIO GLOBAL HOUSING  
TECHNICAL UNIVERSITY OF DELFT

03/07/2025

# ABSTRACT

This master's thesis explores how adaptive architectural strategies can help address recurring overspill flooding in the pre-urban areas of Sylhet, Bangladesh. These regions face growing challenges due to the combined effects of climate change and rapid, unplanned urban expansion. Based on in-depth fieldwork in Shonatola Village, the project identifies key vulnerabilities—including seasonal flooding, weak infrastructure, and rising land pressures—and proposes design solutions that support long-term resilience, affordability, and community self-reliance.

At the village level, the project introduces a phased development strategy that enables gradual transformation without displacing existing residents. A cross-subsidisation model ensures financial sustainability: higher-income households contribute more, helping to fund affordable housing for lower-income groups. Land security is managed through a Community Land Trust (CLT), which protects collective ownership and keeps housing affordable over time.

On the cluster scale, housing is arranged into three types tailored to different user groups: seasonal workers, low-income families, and mid-income households. These clusters are organised around shared courtyards and integrate existing ponds and drainage systems to manage water during floods. This layout promotes both social interaction and environmental resilience.

At the level of individual units, three modular housing types are designed using local materials and simple, low-tech construction methods. Features such as raised floors, flexible layouts, and bamboo wall panels help residents adapt their homes over time and stay safe during floods. Decentralised water systems—including rainwater harvesting, greywater treatment, and biogas production—further reduce reliance on external infrastructure and strengthen community.

The research combines literature review, case study analysis, fieldwork, and iterative design to develop a grounded and practical architectural response. By working across different scales and embedding local knowledge and participation into the process, Rising Grounds offers a replicable approach for flood-prone regions. The project demonstrates how architecture can move beyond short-term fixes to support lasting resilience and social equity in vulnerable communities.

# PREFACE

This booklet is the result of my master's thesis in Architecture, developed within the Global Housing Studio. This project has been a valuable opportunity to test and strengthen my skills as a designer. While the process was long and sometimes challenging, I learned a great deal and enjoyed the experience. It was one of the most rewarding and engaging projects I have worked on during my studies.

A key moment in this journey was the field trip to Bangladesh, which left a deep impression on me. Being in Sylhet and experiencing the local context helped me understand how important it is for architecture to respond to real-life conditions and challenges. Unlike previous projects, where the context often felt more distant, this experience made the connection between design and place very clear and meaningful.

I would like to sincerely thank my supervisors Dick van Gameren, Nelson Mota, Rohan Varma, Rocío Conesa Sánchez, and Marina Tabassum, for their guidance and support over the past year. I am also very grateful to the students and supervisors from Shahjalal University of Science and Technology (SUST) for their help during the fieldwork in Sylhet. Their insights and hospitality made an important contribution to this project.

# CONTENTS

01  
RESEARCH PLAN

02  
RESEARCH

03  
SHONATOLA VILLAGE

04  
DESIGN APPROACH

05  
VILLAGE STRATEGY

06  
CLUSTER STRATEGY

07  
UNIT STRATEGY

08  
BUILDING TECHNOLOGY

09  
MANAGERIAL STRATEGY

10  
REFLECTION

11  
REFERENCE LIST

# 01

## RESEARCH PLAN

### PROBLEM STATEMENT AND RESEARCH

#### INTRODUCTION

Bangladesh's geographical position and extensive floodplain topography render it uniquely susceptible to flooding, significantly affecting the lives and livelihoods of its inhabitants. Positioned at the intersection of major rivers including the Ganges, Brahmaputra, and Meghna, approximately 80% of Bangladesh comprises low-lying floodplains that regularly experience intense flooding during the monsoon season (Rana & Ilina, 2021). These seasonal inundations can submerge up to two-thirds of the country, severely disrupting community infrastructure and economic stability (Saha et al., 2021).

The situation has intensified notably in recent years due to climate change, resulting in increasingly frequent and severe flooding events. For instance, the floods of August 2024 alone displaced more than half a million people in Bangladesh, submerging nearly 300,000 hectares of cropland and causing approximately 1.2 billion USD in damage (2024 floods of Bangladesh, 2024). Sylhet, a pre-urban region particularly vulnerable due to its topographic and socio-economic characteristics, exemplifies these extreme vulnerabilities, facing chronic overspill flooding that significantly impacts its community resilience and economic self-reliance.

Given these critical challenges, there is an urgent need for architectural solutions designed specifically to address the unique flooding conditions of pre-urban areas like Sylhet. Conventional, static housing approaches are inadequate for the dynamic environmental realities in these areas, necessitating innovative architectural strategies that respond actively to rising water levels (Karim & Alam, 2022; Jahan, 2021). Thus, this research focuses on identifying and developing adaptive architectural solutions, utilizing local materials and sustainable building practices that aim not only to mitigate flooding impacts but also to foster resilience and enhance self-reliance within affected communities (Roy & Mahmud, 2018).

This study aims to explore practical, context-sensitive solutions that integrate community-led strategies, cross-subsidization models, and sustainable water management practices. By doing so, the research seeks to support Sylhet's pre-urban communities in achieving greater structural resilience and economic stability amidst intensifying climate-related flooding challenges.

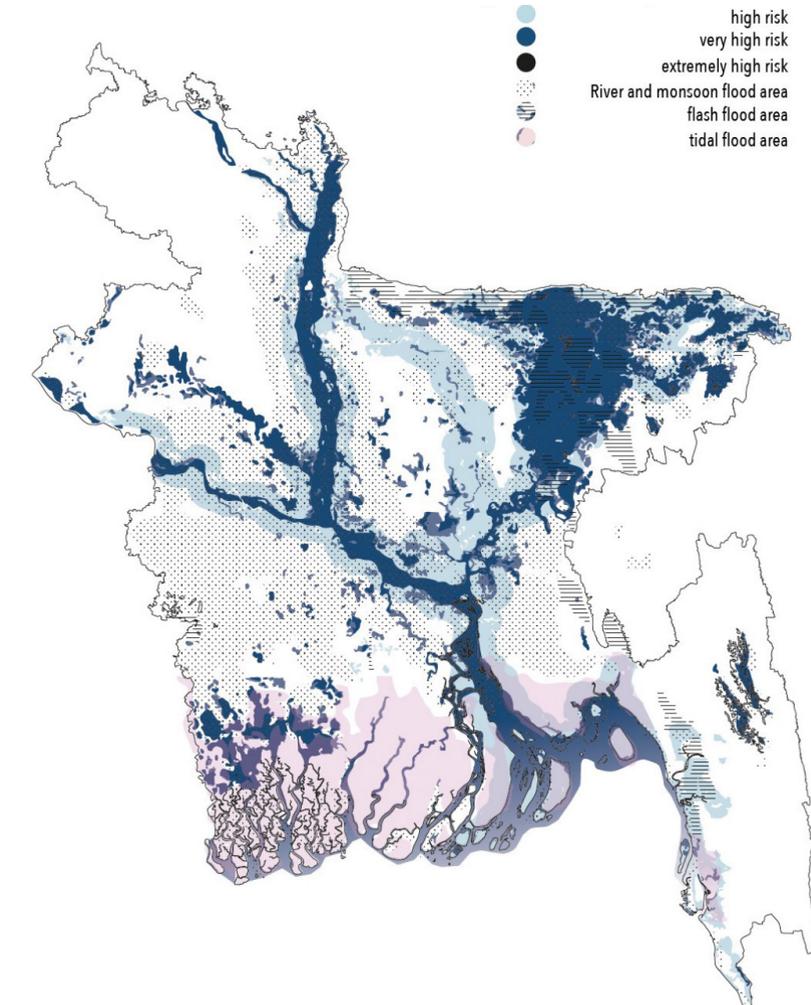


Figure 1: Floodrisk map of Bangladesh (Globale Housing Studio, 2023)

## GLOBAL PROBLEM

Our changing climate is intensifying the global water cycle, amplifying the frequency and severity of extreme weather—including floods. In 2024, record-breaking temperatures triggered massive floods worldwide, killing 8,700 people, displacing around 40 million, and causing over US \$550 billion in damages (Climate Central, 2024). Scientific analysis confirms that, in 2024, 15 of 16 studied flood events saw rainfall levels significantly increased by human-induced climate change (Carbon Brief, 2024).

This is part of a broader global trend: between 600–700 extreme weather events—including floods and storms—displaced over 800,000 people in 2024 alone, the highest annual total since 2008 (Internal Displacement Monitoring Centre [IDMC], 2024). In 2023, floods alone triggered nearly 9.8 million internal displacements, representing nearly half of all disaster-related relocations that year (IDMC, 2024).

Climate-driven flooding significantly impacts rural communities economically and socially, causing loss of farmland, habitat degradation, and disruption of community cohesion. Agricultural productivity often declines sharply following floods, pushing households into debt or forcing them to sell assets (Bangladesh Climate Change profile, 2023). Rural economies suffer profoundly as younger individuals migrate to urban areas, creating labor shortages and leaving behind older and vulnerable populations (Environmental shocks and migration, 2025).

This migration has considerable implications for urban areas, notably visible in rapidly growing cities such as Dhaka, which experiences annual population growth of approximately 3.3%, largely driven by rural-to-urban migration. Approximately 30% of Dhaka’s residents reside in slums or informal settlements, areas often susceptible to flooding and lacking essential infrastructure and services (Dhaka demographics, 2022; Dhaka slum statistics, 2016). These informal settlements expose residents to increased health risks, overcrowding, inadequate sanitation, and heightened flood vulnerability. Secondary cities such as Mongla and Khulna are increasingly adapting by enhancing flood defenses and developing infrastructure tailored to accommodate climate migrants, thus aiming to redistribute urban migration pressures and mitigate overall vulnerability (Wired, 2020).

These developments illustrate that flood-induced displacement has become a pervasive issue transcending regional boundaries. While high-income nations can often mobilize rapid emergency responses, resource-limited countries and pre-urban communities—like those in Sylhet—face disproportionate vulnerability. Their limited infrastructure and economic constraints compound the impacts of flood events, making long-term resilience essential.

## PROBLEM STATEMENT

Bangladesh faces escalating flood risks driven by climate change, with these hazards particularly acute in rural and pre-urban regions such as Sylhet. Bangladesh experiences frequent flooding exacerbated by increasingly intense precipitation patterns, which have amplified both flood severity and frequency (Mannucci et al., 2022). In peak flood years, nearly 90% of Sylhet has been affected by annual monsoon floods (Mannucci et al., 2022). In June 2024 alone, around 75% of Sylhet district was submerged, affecting over 825,000 people, displacing thousands, and damaging hundreds of schools and healthcare facilities (UNICEF Sylhet SitRep, 2024). In 2022 alone, six million people across Bangladesh were impacted by floods, resulting in extensive agricultural and economic losses (Sajid, 2016).

Sylhet's flood risks are further compounded by rapid and often unplanned urbanization. As population growth drives expansion into low-lying and flood-prone areas, natural water absorption capacity is reduced, while destruction of wetlands and drainage systems escalates vulnerability to overspill flooding (Alam, 2018). For instance, in urbanizing areas such as Dhaka, approximately 40% of natural drainage canals have been filled or blocked due to construction, exacerbating waterlogging and pluvial flooding (Sakib et al., 2023). This trend is increasingly visible in Sylhet, where encroachment on water bodies and inefficient drainage are contributing to more severe flood impacts (Sakib et al., 2023).

These environmental shocks contribute significantly to rural distress and migration. Climate-driven rural-to-urban migration in Bangladesh has surged, with approximately 300,000–400,000 individuals relocating annually to Dhaka alone in search of economic security (IOM Bangladesh Migration Report, 2024). The influx of climate migrants—estimated at 10,000 per year—places disproportionate strain on urban services and housing markets (IOM Bangladesh Migration Report, 2024).



Figure 2: Bangladesh's Battle Against Devastating Floods: Every year, Bangladesh faces devastating monsoon floods that cause widespread destruction. (Akash, 2024)

Dhaka’s urban morphology offers a cautionary example: rapid, unplanned growth has led to mega-slum proliferation, with nearly 30–40% of its population residing in vulnerable informal settlements highly exposed to flood risk and inadequate infrastructure (Dhaka Urban Report, 2024). Waterlogging, poor sanitation, and increased exposure to waterborne diseases have become endemic in these areas (Dhaka Urban Report, 2024). Property and critical infrastructure damage from floods has exceeded USD 1 billion in recent years, and flood-prone communities continue to face heightened poverty and limited access to recovery resources (Shafiq, 2023).

If Sylhet continues along its current path—marked by intensified flooding, agricultural collapse, and reactive rather than planned urban expansion—it is at high risk of mirroring Dhaka’s socio-environmental challenges. Without intervention, Sylhet may experience unregulated urban densification, widespread informal settlement growth, heightened flooding vulnerability, and deteriorating public health and social cohesion.

Given these challenges, there is an urgent need to transition from static architectural models to adaptive, resilient solutions. Conventional buildings are poorly suited to Sylhet’s dynamic and increasingly unpredictable flood conditions (Hemmati et al., 2021). Adaptive architecture, including kinetic and amphibious strategies, offers the potential to mitigate flood impacts while enhancing community resilience and enabling residents to remain safely housed during floods (Hemmati et al., 2021; Shafiq, 2023). Community-led, participatory approaches are essential to ensure these solutions are both sustainable and culturally relevant.

2. Learning from Global Successes

1. Understanding Local Challenges

“What architectural solutions can be designed to mitigate the impacts of overspill flooding in pre-urban areas of Sylhet, to enhance resilience and self-reliance for local communities?”

3. Adapting Design to Environmental Need

4. Building Community Resilience and Self-Reliance

## SUB-QUESTIONS

### **1. Understanding Local Challenges**

How do the specific flood dynamics and urbanisation trends in Sylhet's pre-urban areas affect current housing vulnerability?

### **2. Learning from Global Successes**

Which adaptive architectural and spatial strategies—derived from both global precedents and local knowledge—are most suitable for mitigating overspill flooding in the Sylhet context?

### **3. Adapting Design to Environmental Needs**

How can water-sensitive site planning and building design contribute to reducing structural and socio-economic vulnerabilities in flood-prone communities?

### **4. Building Community Resilience and Self-Reliance**

In what ways can community-driven and locally affordable building practices support resilience and self-reliance in adapting to increasingly dynamic flood risks?

## METHODOLOGY

To answer these research questions, this study adopts an experimental and design-based methodology, integrating literature review, contextual analysis, case study analysis, and iterative design research. This approach enables both a critical understanding of the underlying issues and the creative development of practical design responses.

The research begins with a comprehensive literature review focused on four key themes: the dynamics of flooding and urbanisation in Sylhet; adaptive architectural and spatial strategies for flood resilience; water-sensitive site planning and building design; and community-driven, low-cost construction practices. This review synthesises insights from academic publications, policy reports, NGO documents, and architectural precedents to build a robust conceptual framework.

Building on this foundation, a detailed contextual analysis of Sylhet's pre-urban areas was conducted through field visits, mapping, and photographic documentation. This included surveying existing housing typologies, settlement patterns, and water management practices, as well as observing community-led resilience strategies. The contextual analysis provides spatially grounded insights that inform the subsequent design explorations.

In parallel, the study examines a series of relevant case studies drawn from both local and international contexts. These include adaptive housing models, water-sensitive urban design initiatives, and participatory construction approaches. The case studies are analysed to extract transferable principles and design strategies suited to Sylhet's socio-environmental conditions.

Central to the methodology is an iterative design research process. Design proposals are developed through successive cycles of conceptualisation, testing, and refinement. Each iteration is informed by the insights gained from the literature, contextual analysis, and case studies, as well as feedback from expert consultations and peer reviews. The design process is structured around the four research themes, ensuring that each aspect of the problem is addressed holistically.

Throughout the project, particular emphasis is placed on the feasibility, affordability, and cultural appropriateness of proposed solutions. By integrating community perspectives and local building knowledge into the design process, the research aims to develop adaptive architectural strategies that not only mitigate flood impacts but also empower Sylhet's pre-urban communities to build greater resilience and self-reliance.

## RELEVANCE

The relevance of this research lies in its potential to contribute both to architectural practice and to the broader societal challenge of building resilience to climate-induced flooding in Bangladesh. Current approaches to flood mitigation in pre-urban areas such as Sylhet remain largely reactive, with limited integration of adaptive architectural strategies and community-driven solutions (Karim & Alam, 2022; Roy & Mahmud, 2018). Without proactive interventions, Sylhet risks following the trajectory of Dhaka—marked by unplanned densification, informal settlements, and heightened vulnerability to flooding (Dhaka Urban Report, 2024).

Architecturally, this research advances the understanding of adaptive design strategies for flood resilience. By exploring the potential of modular and water-sensitive solutions, the project offers new approaches for designing structures and settlements capable of responding dynamically to changing flood conditions (Hemmati et al., 2021). The iterative design process further contributes to developing context-specific, affordable, and buildable strategies that can inform architectural practice in Bangladesh and other flood-prone regions.

At the urban and landscape level, the research demonstrates the importance of water-sensitive site planning and phased master planning. Adaptive land use—through green-blue infrastructure, elevational zoning, and landscape terraces—can significantly enhance the resilience of both individual buildings and entire neighbourhoods. This approach complements conventional engineering solutions and fosters systemic thinking in flood management (Roy & Mahmud, 2018).

Finally, the research is relevant to policy and planning. As climate-related flooding intensifies, urban development in Bangladesh must shift towards proactive and adaptive models. This study contributes design-based evidence that can inform future urban policies and resilience strategies for Sylhet and comparable pre-urban regions.

# 02

## RESEARCH

### GLOBAL EXAMPLES AND ADAPTIVE ARCHITECTURE

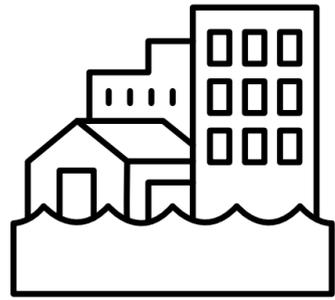
Climate-induced flooding is an escalating global challenge, driving displacement and reshaping settlement patterns in vulnerable regions. In Bangladesh alone, millions of people are affected annually by floods, with severe events contributing to large-scale damage, agricultural loss, and internal migration (Karim & Alam, 2022). Such dynamics are part of a broader pattern in which extreme weather events increasingly threaten the sustainability of both rural and urban environments worldwide.

At the intersection of these pressures lies a critical design question: how can architecture and spatial planning foster resilience, adaptability, and continuity for communities facing recurring environmental disruption? In Bangladesh, conventional shelter typologies are often unable to accommodate rising flood levels, leaving communities in a state of perpetual risk (Jahan, 2021). Moreover, the rapid urbanization driven by climate impacts compounds these vulnerabilities, as pre-urban settlements struggle to retain their cultural and social fabric amidst environmental and economic change.

This chapter explores how adaptive architectural and spatial strategies can address these challenges. Building on the research phase of this project—presented in *Rising Grounds*—it examines selected case studies that offer valuable insights into resilient design practices. These examples, ranging from vernacular traditions to innovative contemporary models, inform a design approach grounded in three key objectives:

- Enhancing the adaptive capacity of housing and settlement patterns in flood-prone contexts;
- Supporting community agency and social cohesion through participatory and culturally embedded design;
- Expanding a flood-resilient spatial identity that integrates environmental responsiveness with everyday life.

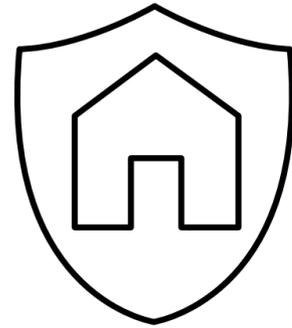




**CLIMATE-INDUCED URBANIZATION**

“**Floods** are a major driver of urban migration in Bangladesh, gradually eroding the viability of **pre-urban village settlements.**”

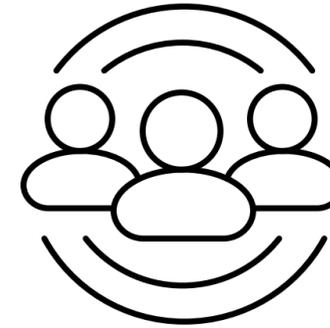
Karim & Alam, 2022



**RESILIENT HOUSING**

“**Existing shelter typologies** are **not designed** to evolve with **rising flood levels**, leaving communities perpetually at risk.”

Jahan, 2021



**COMMUNITY AGENCY & ADAPTATION**

“**Resilience in pre-urban** settlements must be rooted in **participatory, affordable,** and **culturally** embedded design frameworks.”

Roy & Mahmud, 2018

“**URBANIZATION** AFFECTS THE LOCAL PEOPLE NEGATIVELY. IT TRANSFORMED THE LAND **USE PATTERNS OF THE LOCALITY.** WE USED TO PRACTICE **AGRICULTURE** UP TILL THE BEGINNING OF 21ST AND IT **WAS OUR GENERATIONAL PRACTICE.**” “BETWEEN 1960 AND 2005, BUILT-UP AREAS IN GREATER **DHAKA INCREASED** APPROXIMATELY **15,924 HA,** WHILE **AGRICULTURAL LAND DECREASED 7,614 HA.**” “AUGUST 2024 FLOODS CAUSED **DAMAGES** ESTIMATED AT **TK144 BILLION (US\$1.2 BILLION),** SUBMERGING 296,852 HECTARES OF CROPS.” “IN 2024, OVER **5.8 MILLION PEOPLE** WERE AFFECTED BY **FLOODS** IN BANGLADESH, WITH MORE THAN **502,500 DISPLACED** INTO 3,403 EVACUATION SHELTERS.” “IN 2023, FLOODS CAUSED **9.8 MILLION DISPLACEMENTS** WORLDWIDE, ACCOUNTING FOR NEARLY **HALF OF ALL DISASTER-INDUCED MOVEMENTS.**” “IN AN AVERAGE YEAR, **ABOUT 25% OF BANGLADESH IS INUNDATED DURING THE MONSOON;** SEVERE **FLOODS** CAN COVER UP TO **TWO-THIRDS OF THE COUNTRY.**” “**URBANIZATION** AFFECTS THE LOCAL PEOPLE NEGATIVELY. IT TRANSFORMED THE LAND **USE PATTERNS OF THE LOCALITY.** WE USED TO PRACTICE **AGRICULTURE** UP TILL THE BEGINNING OF 21ST AND IT **WAS OUR GENERATIONAL PRACTICE.**” “IN 2020, NEARLY **4 MILLION BANGLADESHIS** WERE **DISPLACED** BY EXTREME WEATHER, WITH MOST **SEEK-ING REFUGE IN URBAN CENTERS** LIKE **DHAKA.**” “IN 2023, FLOODS CAUSED **9.8 MILLION DISPLACEMENTS** WORLDWIDE, ACCOUNTING FOR NEARLY **HALF OF ALL MOVEMENTS.**” “BETWEEN 1960 AND 2005, BUILT-UP AREAS IN GREATER **DHAKA INCREASED** APPROXIMATELY **15,924 HA,** WHILE **AGRICULTURAL LAND DECREASED 7,614 HA.**”

## AIMS & GOALS



**Urbanisation** continues to accelerate as rural populations migrate toward cities in response to worsening living conditions. In this process, pre-urban villages risk being gradually absorbed into the expanding urban fabric through unplanned and low-quality development. To counter this trend, it is essential to support and improve the spatial and living qualities of these rural environments. Strengthening local infrastructure and guiding development can help maintain the rural character of villages, providing a sustainable alternative to uncontrolled urban growth.



In many flood-prone rural areas, the absence of **flood-proof** housing forces families to repeatedly lose their homes, sometimes up to three times per year. This cycle of destruction and reconstruction undermines living quality and economic stability. There is an urgent need for permanent architectural solutions that can withstand regular flooding and reduce the burden on local communities. Designing flood-proof buildings offers a way to enhance safety, ensure continuity of life, and support long-term resilience in these vulnerable settings.



As flooding and uncontrolled urbanisation force people to leave their villages, the **identity** of rural living conditions and landscapes is slowly disappearing. Many families, however, hold a deep connection to the land where their ancestors built their homes and cultivated their lives. There is a strong wish among these communities to remain rooted in place. Protecting the rural setting and way of life therefore requires safeguarding both physical and cultural continuity, enabling residents to stay and thrive in their familiar environment.





Figure 3: Portrait of Jane Jacobs (Gopnik, 2016)

“THE SEMISUBURBANIZED AND SUBURBANIZED MESSSES WE CREATE IN THIS WAY BECOME DESPISED BY THEIR OWN INHABITANTS TOMORROW. THESE THIN DISPERSIONS LACK ANY REASONABLE DEGREE OF INNATE VITALITY, STAYING POWER, OR INHERENT USEFULNESS AS SETTLEMENTS.”

- JANE JACOBS, 1961 -





Figure 4: Portrait of Anna Heringer (Zabalbeascoa & Zabalbeascoa, 2022)

“SEVERE WEATHER ATTRIBUTABLE TO CLIMATE CHANGE, ESPECIALLY FLOODS, OFTEN WREAK THE GREATEST DAMAGE IN THE POORER COUNTRIES.”

- ANNA HERINGER, 2016 -





Figure 5: Portrait of Charles Correa (James Taylor-Foster | Author | ArchDaily, Page 20, 2014)

“SHELTER IS NOT JUST A ROOF OVER ONE’S HEAD—IT IS A PLACE WHERE THE SPIRIT IS NURTURED, WHERE CULTURE IS EXPRESSED, AND WHERE THE IDENTITY OF A COMMUNITY CAN BE SAFEGUARDED.”

- CHARLES CORREA, 1976 -



## BANGLA BATON HOUSES – SYLHET, BANGLADESH

The Bangla Baton Houses of Sylhet, Bangladesh, constitute a vernacular residential typology shaped by local climatic conditions, material availability, and cultural patterns of habitation. These dwellings typically feature a timber-framed structure, constructed with bamboo, timber, and earthen materials—resources well suited to the region’s monsoonal climate and frequent flooding. The typology demonstrates an iterative architectural process, wherein the original woven bamboo wall panels were progressively reinforced with clay plaster to enhance thermal performance and improve durability.

Set upon elevated plinths, the houses maintain a measured distance from the flood-prone ground plane, allowing seasonal water fluctuations to pass beneath. This strategy, combined with extended eaves and a deep roof overhang, ensures effective protection against driving rain and promotes passive cooling. Such climatic responsiveness is integral to sustaining habitable conditions throughout the year.

Equally significant is the spatial organisation of the Bangla Baton typology. Houses are typically arranged around courtyards, a configuration that supports communal interaction and anchors domestic life within an adaptable, open space. The courtyard serves as both a climatic buffer and a vital social arena, facilitating a fluid relationship between private and shared domains.

The incorporation of semi-outdoor verandas further mediates this relationship, providing transitional spaces that extend the thresholds of the home and reinforce patterns of ground-level living. These layered spatial strategies—combining environmental adaptability with a finely attuned social architecture—exemplify how vernacular forms can negotiate between landscape, climate, and community. The Bangla Baton Houses thus offer a compelling model of integrated design that remains responsive to both ecological and cultural imperatives.

### Key findings:

- Timber-framed construction
- Courtyard-centric spatial organization
- Gable-end detailing with evolved material layering
- Elevated plinths and extended eaves
- Integration of semi-outdoor verandas



## SOE KER TIE HOUSE – NOH BO, THAILAND

The Soe Ker Tie House, a refugee village along the Thai–Burmese border, is a small-scale housing project designed by TYIN Tegnestue Architects. Developed in response to the urgent need for dignified shelter for displaced Karen children, the project demonstrates how low-tech construction can deliver spatial, social, and environmental quality. The design leverages locally available materials—primarily bamboo, timber, and metal sheets—and is constructed by and with the community, ensuring the transfer of knowledge and the fostering of local agency.

The architectural strategy begins with a stilted foundation system, lifting the structure above the flood-prone ground plane. This elevation not only safeguards the house from seasonal inundations but also allows for passive cooling through underfloor air circulation. The open plinth, combined with a porous façade, maintains a visual and spatial connection to the ground level, facilitating everyday communal life beneath and around the dwelling.

Spatial organisation is anchored by a courtyard-oriented layout, reinforcing the social fabric of the community. This arrangement supports communal interaction and enables daily rituals to unfold in an adaptable, outdoor environment. Within the individual dwelling, a programmatic flood hierarchy structures the vertical arrangement of spaces: essential functions such as sleeping quarters are placed on upper levels, ensuring their protection during high-water events, while more expendable or communal functions remain closer to the ground.

Crucially, the design accommodates incremental modularity, allowing the dwelling to expand or adapt in response to evolving household needs. This flexibility is embedded in both the construction system and the spatial configuration. The project exemplifies how an architecture rooted in community practice, climatic intelligence, and modular growth can produce meaningful and enduring living environments under challenging conditions.

### Key findings:

- Stilted foundation system
- Courtyard-oriented spatial organization
- Programmatic flood hierarchy
- Open plinth and porous façade
- Incremental modularity



Figure 6: Photo of Soe Ker Tie House (Whelan, 2018)

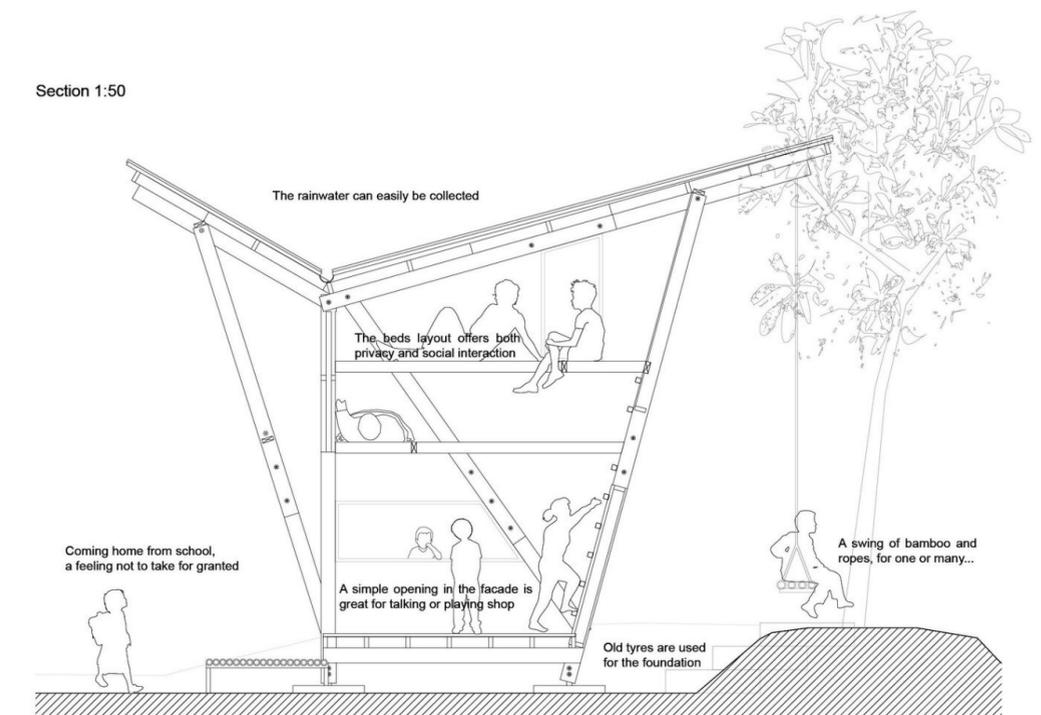


Figure 7: Section of programmatic hierarchy (Whelan, 2018)

## BELAPUR HOUSING – NAVI MUMBAI, INDIA

Belapur Housing, designed by Charles Correa in the 1980s, remains a seminal project in the discourse on low-rise, high-density housing in the Global South. Situated on the periphery of Navi Mumbai, the development was conceived to accommodate rapid urban expansion while preserving social cohesion and local identity. Through its cluster-based site planning, Belapur Housing offers an alternative to the anonymity of large-scale urban housing blocks, fostering a strong sense of neighbourhood identity.

The master plan organises dwellings into intimate clusters of 6–12 units, carefully calibrated to balance privacy with opportunities for communal interaction. Within each cluster, a hierarchical spatial structure connects private courtyards to semi-private shared spaces, and finally to larger public areas, supporting both individual autonomy and collective life. This spatial gradient encourages informal social exchanges and strengthens the communal fabric.

Responding to the natural landscape, the housing adopts a topography-responsive layout. Units are sensitively stepped along gentle slopes, maintaining the continuity of the terrain and minimising disruption to the site. This approach not only preserves the ecological character of the land but also allows each dwelling to enjoy varied views, microclimates, and a distinct spatial identity within the larger whole.

Architecturally, the project exemplifies a deep understanding of incremental growth and adaptability. The clustered typology provides a framework that enables residents to extend or modify their homes over time, accommodating changing family structures and needs. The reliance on ground-oriented living, with each unit directly accessible from the street or courtyard, reinforces patterns of domestic and social life that are deeply embedded in the local cultural context. Belapur Housing thus offers an enduring model for how urban housing can integrate with landscape, social structure, and vernacular patterns of life—principles that continue to inform contemporary approaches to resilient, community-based design.

### Key findings:

- Cluster-based site planning
- Hierarchical spatial structure
- Topography-responsive layout



Figure 8: Photo of alley to the courtyards (Housing, z.d.)

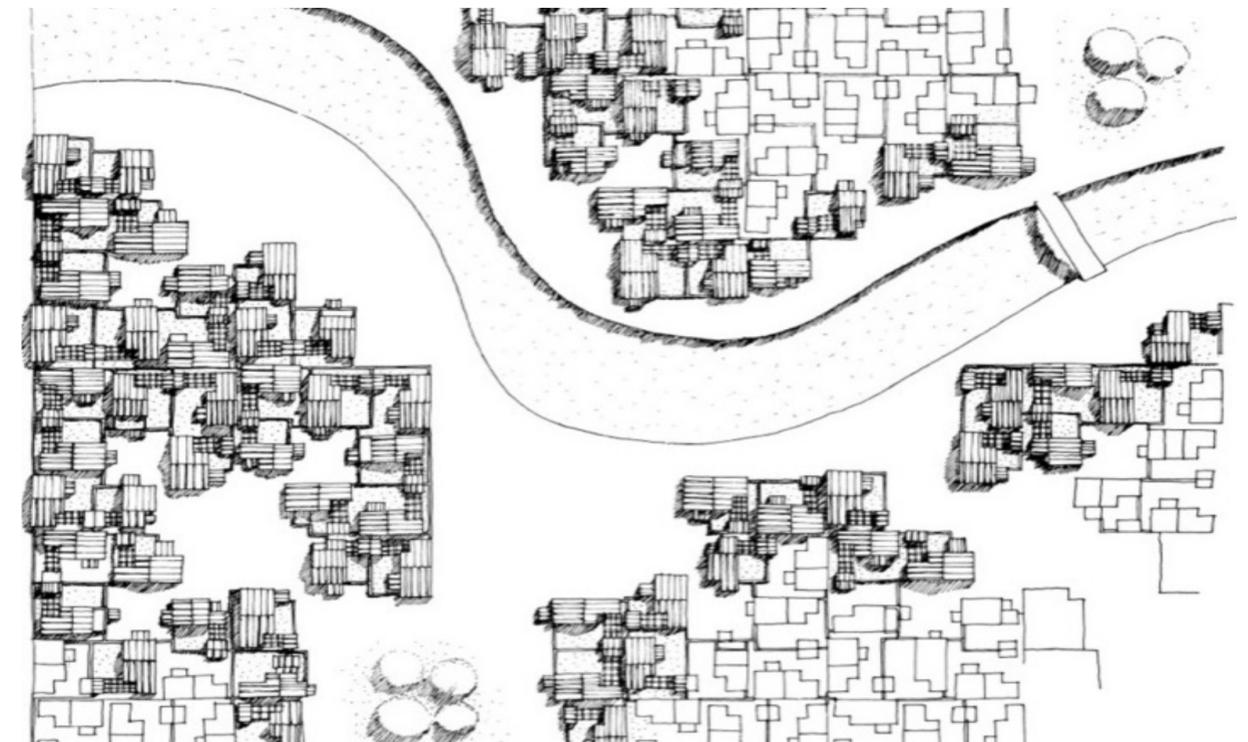


Figure 9: Hierarchical spatial structure of masterplan (Housing, z.d.)

## MATERIAL RESEARCH - BAMBOO

Bamboo is a traditional building material in tropical and subtropical regions, valued for its strength, lightweight, and renewability. It has long been used in construction, particularly for rural housing, as well as in making tools, bridges, fences, irrigation systems, and many other essential items. Recognized as a key non-timber forest resource, bamboo supports numerous socio-economic benefits through its vast applications. With over 1,200 species, primarily found in Asia, Africa, and Latin America, bamboo is one of the fastest-growing woody plants, capable of growing up to 1.2 meters per day in optimal conditions (Rai & Agarwal, 2012).

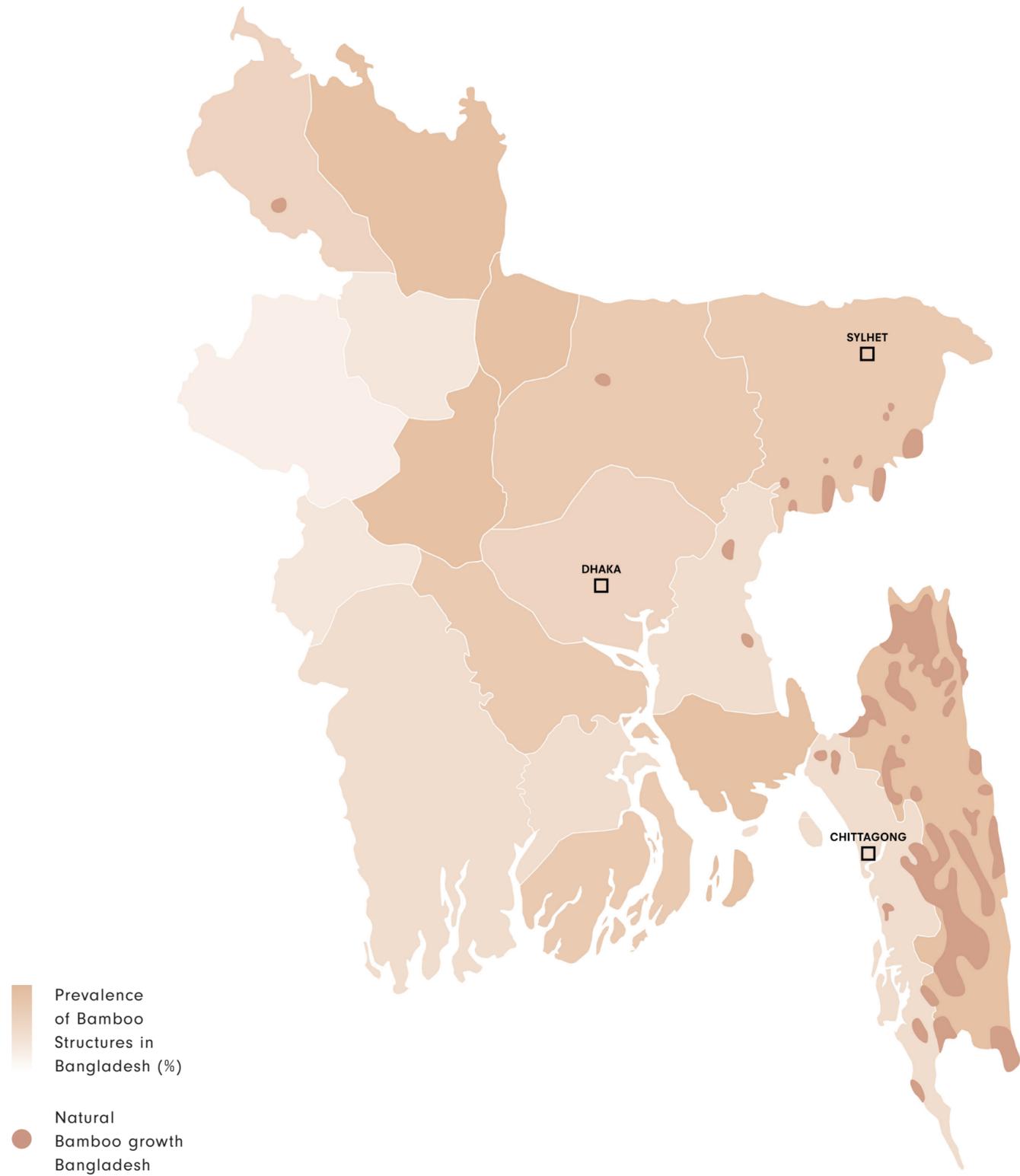
Its rapid growth, high biomass production, and ability to control soil erosion make bamboo an eco-friendly and sustainable building material. Given the rising costs of housing, bamboo offers a cost-effective alternative to steel, concrete, and masonry. Its flexibility, ease of use, and earthquake-resistant properties further enhance its value in construction (Rai & Agarwal, 2012).

Widely distributed across tropical and subtropical regions, bamboo is particularly abundant in Asia, Africa, and Latin America, with China leading in species diversity and cultivation. In Bangladesh, bamboo remains a vital economic and agricultural resource, supporting rural livelihoods and serving as a key material in housing and daily-use products. However, the country faces a growing shortage due to deforestation and gregarious flowering, necessitating urgent conservation efforts (Chowdhury, 2022).

Bangladesh primarily imports bamboo to supplement domestic shortages. India is one of the largest exporters of bamboo to Bangladesh. Trade data from 2018-2019 highlights that Bangladesh imported 2.87 million kg of bamboo from India, valued at USD 141,440 million. Other countries, including Myanmar and Vietnam, also contribute to bamboo imports, especially for industrial and craft-based uses (Chowdhury, 2022).

Though Bangladesh is rich in bamboo resources, its exports remain minimal. Bamboo-based handicrafts, including baskets and furniture, form the bulk of exports. More than 50,000 artisans, mainly women and indigenous communities, are involved in bamboo crafts, with exports reaching global markets. However, domestic demand largely consumes the country's bamboo supply, limiting its presence in the international bamboo trade (Chowdhury, 2022).





Bamboo in Bangladesh can be classified into forest bamboo species and village bamboo species, based on their natural habitat, growth patterns, and usage (Bamboo - Banglapedia, z.d.).

	<b>Forest Bamboo</b>	<b>Village Bamboo</b>
Growth	Natural forests	Villages & farms
Usage	Construction, pulp, scaffolding	Houses, crafts, fencing
Harvesting	Selective cutting	Regular harvesting

Bamboo Species Found in Forest Areas (Bamboo - Banglapedia, z.d.):

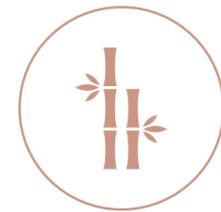
<b>Scientific Name</b>	<b>Vernacular Name</b>
Bambusa burmanica	Unknown
Bambusa polymorpha	Unknown
Bambusa nutans	Unknown
<i>Bambusa tulda</i>	<i>Mitinga bansh</i>
Dendrocalamus hamiltonii	Wappi bansh
<i>Dendrocalamus longispathus</i>	<i>Rupai bansh</i>
<i>Melocanna baccifera</i>	<i>Muli bansh</i>
Schizostachyum dullooa	Unknown

Common Village Bamboo Species:

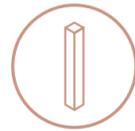
<b>Scientific Name</b>	<b>Vernacular Name</b>
<i>Bambusa balcooa</i>	<i>Barua bansh</i>
Bambusa cacharensis	Unknown
Bambusa comillensis	Unknown
Bambusa jaintiana	Unknown
Bambusa nutans	Unknown
Bambusa salarkhanii	Unknown
<i>Bambusa tulda</i>	<i>Mitinga bansh</i>
Bambusa vulgaris	Jai bansh
Thyrsostachys oliveri	Unknown



Figure 10



1. BAMBUSA BALCOOA



72-96 TK / M2



160-210 TK / CULM  
\$ 1.50-2.00 / CULM



330.201 TK / YEAR

**Annual Yield (per ha):** 10-30 tonnes  
**Growth period:** May - Nov  
**Harvest Cycle:** 4-6 years  
**Compressive strength:** 57.3 MPa  
**Density Loose:** 950 kg/m<sup>3</sup>  
**Thermal Conductivity:** 0.165-0.20  
**Carbon capture (per ha):** 12-18 tonnes  
**Life span:** 25-30 years



Figure 11



2. BAMBUSA TULDA



64-86 TK / M2



140-190 TK / CULM  
\$ 1.30-1.80 / CULM

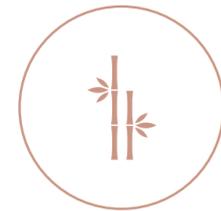


189.500 TK / YEAR

**Annual Yield (per ha):** 10-25 tonnes  
**Growth period:** May - Nov  
**Harvest Cycle:** 3-5 years  
**Compressive strength:** 62.0 MPa  
**Density Loose:** 850 kg/m<sup>3</sup>  
**Thermal Conductivity:** 0.15-0.18  
**Carbon capture (per ha):** 9-14 tonnes  
**Life span:** 20-25 years



Figure 12



3. DENDROCALAMUS LONGISPATUS



82-114 TK / M2



180-250 TK / CULM  
\$ 1.70-2.40 / CULM



... TK / YEAR

**Annual Yield (per ha):** 12-28 tonnes  
**Growth period:** April - Nov  
**Harvest Cycle:** 3-4 years  
**Compressive strength:** 60.1 MPa  
**Density Loose:** 780 kg/m<sup>3</sup>  
**Thermal Conductivity:** 0.14-0.17  
**Carbon capture (per ha):** 10-16 tonnes  
**Life span:** 15-20 years



Figure 13



4. BAMBUSA VULGARIS



45-73 TK / M2



100-160 TK / CULM  
\$ 0.90-1.50 / CULM



88.041 TK / YEAR

**Annual Yield (per ha):** 8-20 tonnes  
**Growth period:** May - Nov  
**Harvest Cycle:** 2-3 years  
**Compressive strenght:** 98.1 MPa  
**Density Loose:** 750 kg/m<sup>3</sup>  
**Thermal Conductivity:** 0.18-0.22  
**Carbon capture (per ha):** 8-12 tonnes  
**Life span:** 12-18 years



Figure 14



5. MELOCANNA BACCIFERA



36-64 TK / M2



80-140 TK / CULM  
\$ 0.75-1.30 / CULM



219.001 TK / YEAR

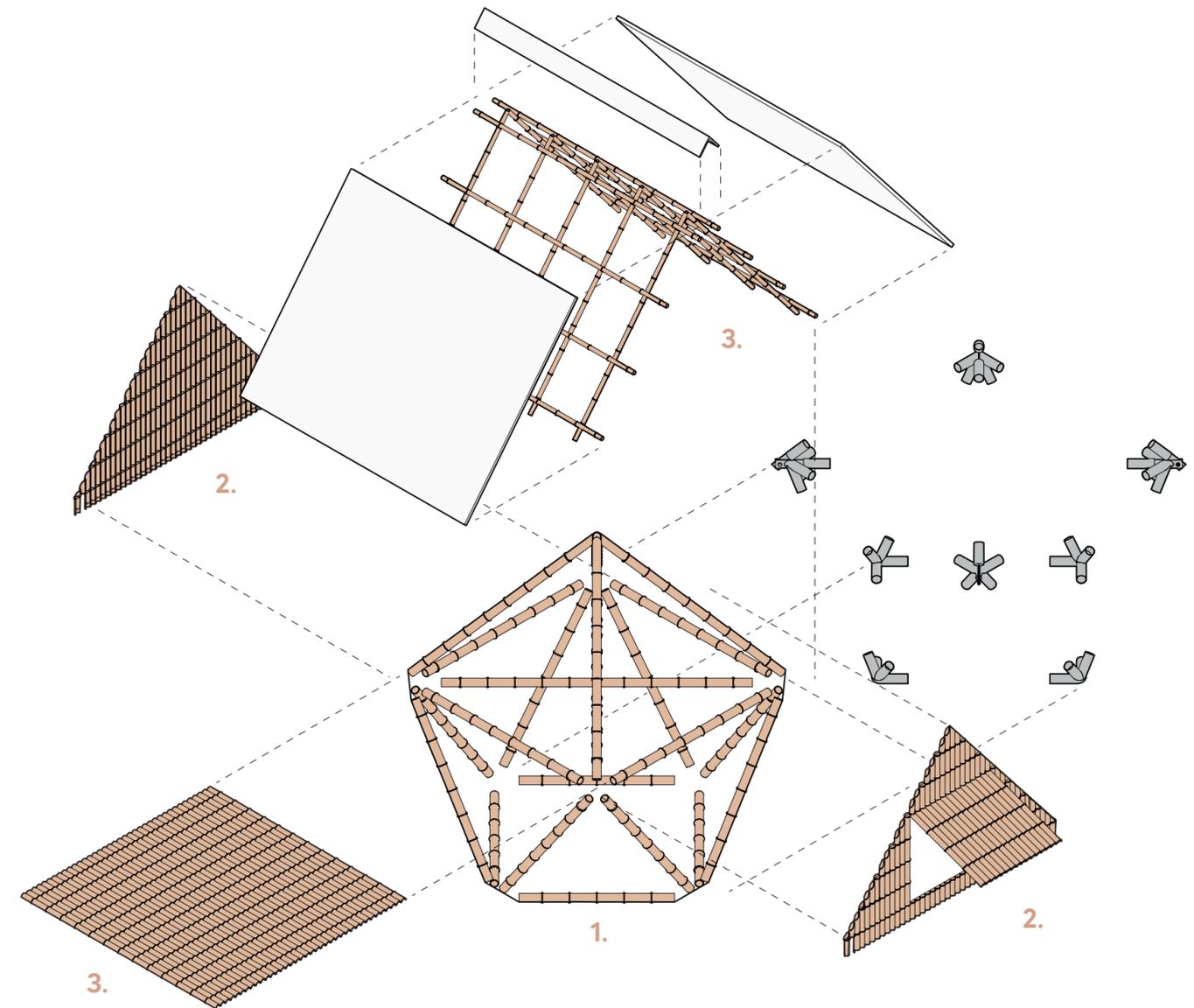
**Annual Yield (per ha):** 6-8 tonnes  
**Growth period:** May - Nov  
**Harvest Cycle:** 3-4 years  
**Compressive strenght:** 64.7 MPa  
**Density Loose:** 700 kg/m<sup>3</sup>  
**Thermal Conductivity:** 0.12-0.15  
**Carbon capture (per ha):** 6-10 tonnes  
**Life span:** 8-12 years

## KHUDI BARI BY MARINA TABASSUM

The Khudi Bari, designed by Marina Tabassum, is a modular, climate-resilient housing solution that leverages bamboo's structural versatility to create lightweight yet durable shelters for vulnerable communities in Bangladesh. Bamboo culms serve as the primary structural framework, ensuring stability, while split bamboo is integrated into flooring and walls, reflecting traditional craftsmanship. Complementing these natural elements, corrugated steel sheets protect the roof, and steel joints provide structural reinforcement. The Khudi Bari demonstrates how bamboo's adaptability allows it to function across multiple construction applications, from load-bearing structures to modular enclosures.

The Khudi Bari follows a modular construction system, allowing its basic unit to be repeated and expanded. The core structure is composed of bamboo, which serves as both a load-bearing and secondary structural element, reinforcing the design's flexibility and ease of assembly. The primary columns and beams likely use *Bambusa balcooa*, known for its high compressive strength and durability, making it suitable for load-bearing elements. The wall panels could align with *Bambusa tulda*, which is lighter and more flexible, facilitating modular enclosures. Additionally, *Dendrocalamus longispathus* may be used for roofing, flooring and bracing elements, as its thin-walled culms provide structural reinforcement without excessive weight. While this classification is based on suitability, the original design likely utilized a single bamboo species, sourced based on local availability and cost efficiency.

The Khudi Bari utilizes a modular construction system, incorporating steel corner joints that interconnect with bamboo poles to form a stable framework. These joints are designed for easy assembly and disassembly, allowing the structure to be relocated as needed. The bamboo poles are inserted into the steel connectors, creating a space frame that elevates the living area above ground level, providing protection against flooding. This design ensures that the shelter can be constructed quickly using locally available materials. The flooring system consists of split bamboo slats affixed to bamboo battens, forming a durable and flexible surface. This method leverages traditional building techniques, utilizing the natural strength and resilience of bamboo to create a comfortable living space. The use of split bamboo allows for efficient use of materials and contributes to the overall sustainability of the structure.



1. BAMBUSA BALCOOA



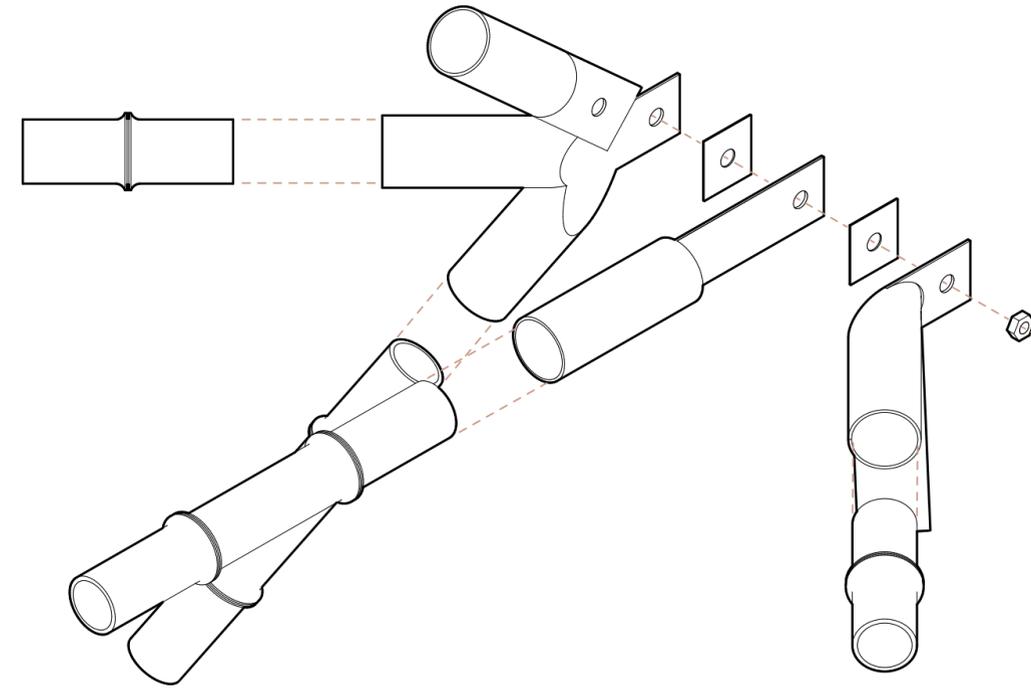
2. BAMBUSA TULDA



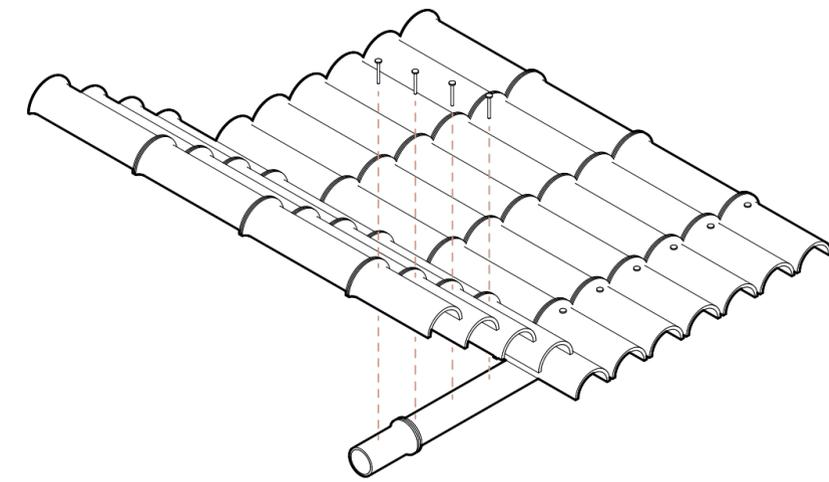
3. DENDROCALAMUS LONGISPATUS



Figure 15: Double Khudi Bari unit (Gallery Of Light, Empathy, And Silence: The Architecture Of Marina Tabassum - 5, z.d.)



1. BAMBUSA BALCOOA



3. DENDROCALAMUS LONGISPATUS

## ANANDALOY CENTER BY STUDIO ANNA HERINGER

The Anandaloy Center, designed by Studio Anna Heringer, exemplifies a community-centered architectural approach that integrates local materials and traditional construction techniques. The structure is built using a hybrid system of mud and bamboo, demonstrating an environmentally responsive design that prioritizes both sustainability and inclusivity. As seen in the construction diagram, *Bambusa balcooa* plays a critical role in the building's framework, supporting both the floor and roof structures, while a concrete foundation provides stability in the monsoon-prone terrain. The use of wooden floorboards over bamboo substructures enhances durability while maintaining a natural aesthetic.

In the Anandaloy Center, the balustrade on the first floor features a woven bamboo pattern that serves as a semi-permeable barrier, combining functionality with aesthetic appeal. This design comprises a 75x50mm wooden frame supporting 20mm flexible bamboo strips woven into intricate patterns, allowing light and air to permeate while ensuring safety and privacy. The choice of bamboo species is crucial for achieving the desired flexibility and strength in the weaving. *Melocanna baccifera*, commonly known as Muli bamboo, is particularly suited for this application due to its thin-walled, flexible culms, which facilitate easy splitting and weaving. This species is prevalent in Bangladesh, making it an accessible and sustainable material for local construction. The integration of traditional bamboo weaving techniques not only enhances the structural integrity of the balustrade but also reflects the cultural heritage of the region.

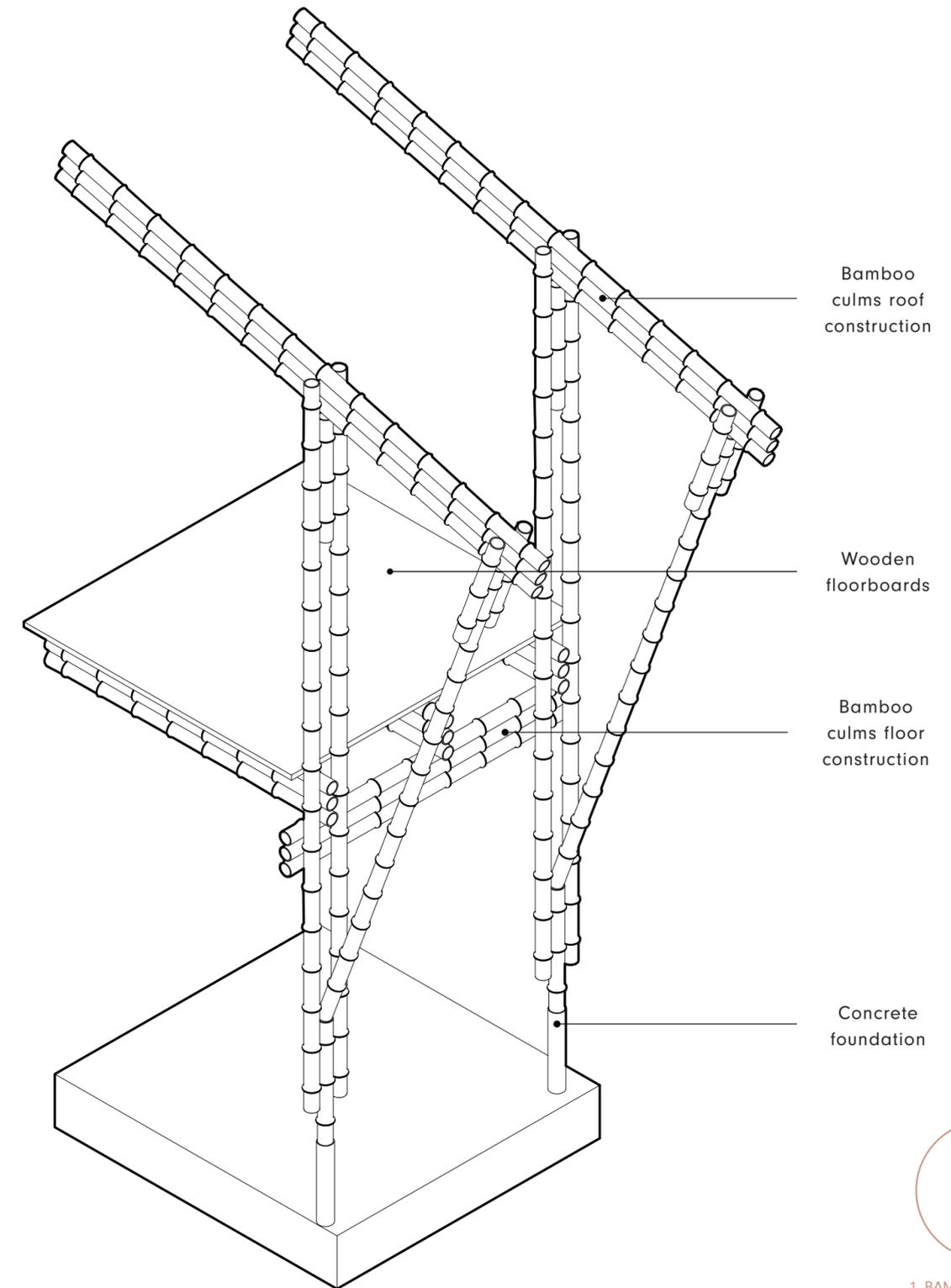




Figure 16: Anandaloy Centre first floor with shade panels (Viva, 2020)

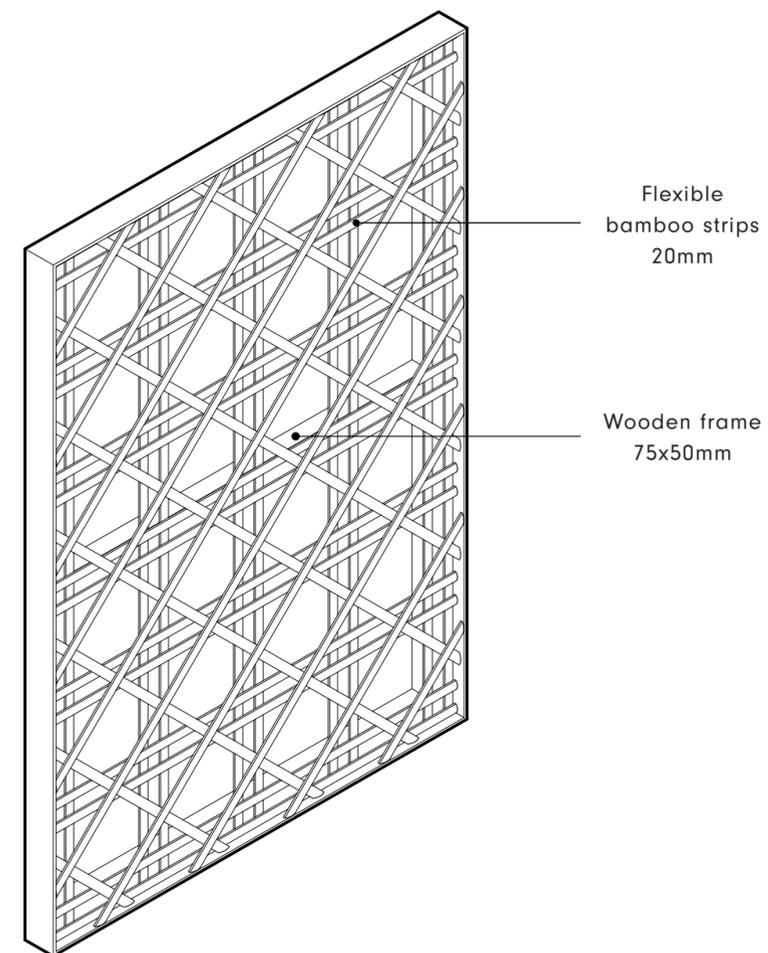
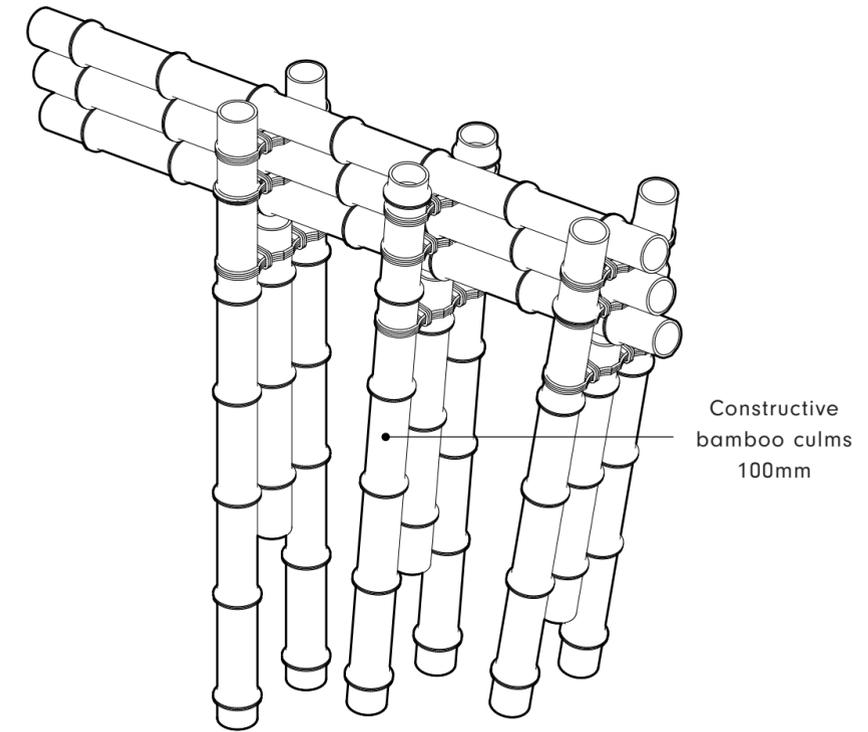
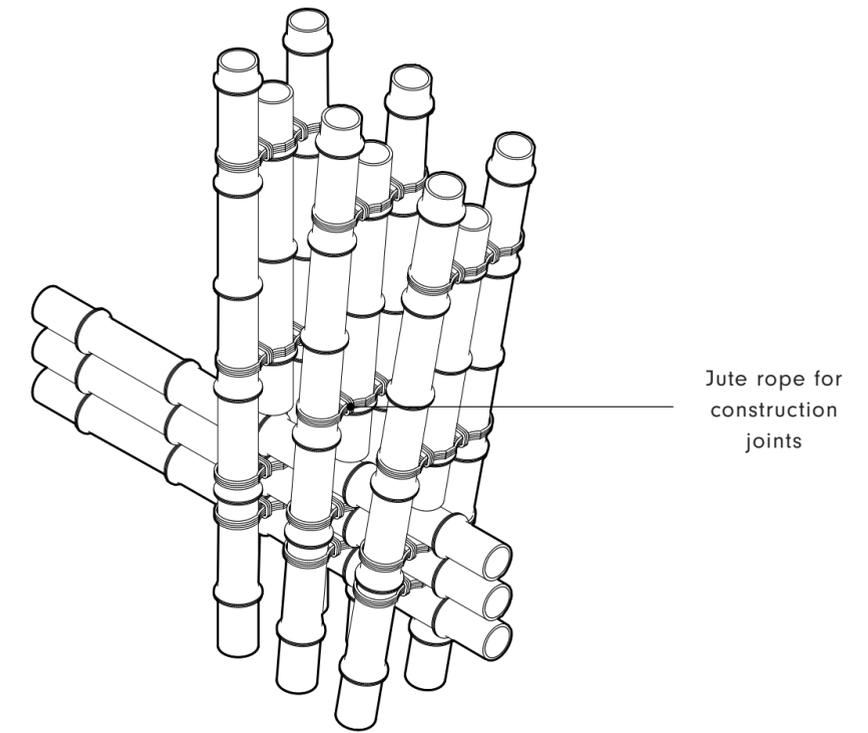




Figure 16: Anandaloy Centre facade structure (Lin, 2024)



1. BAMBUSA BALCOOA



1. BAMBUSA BALCOOA

# 03

## SHONATOLA VILLAGE

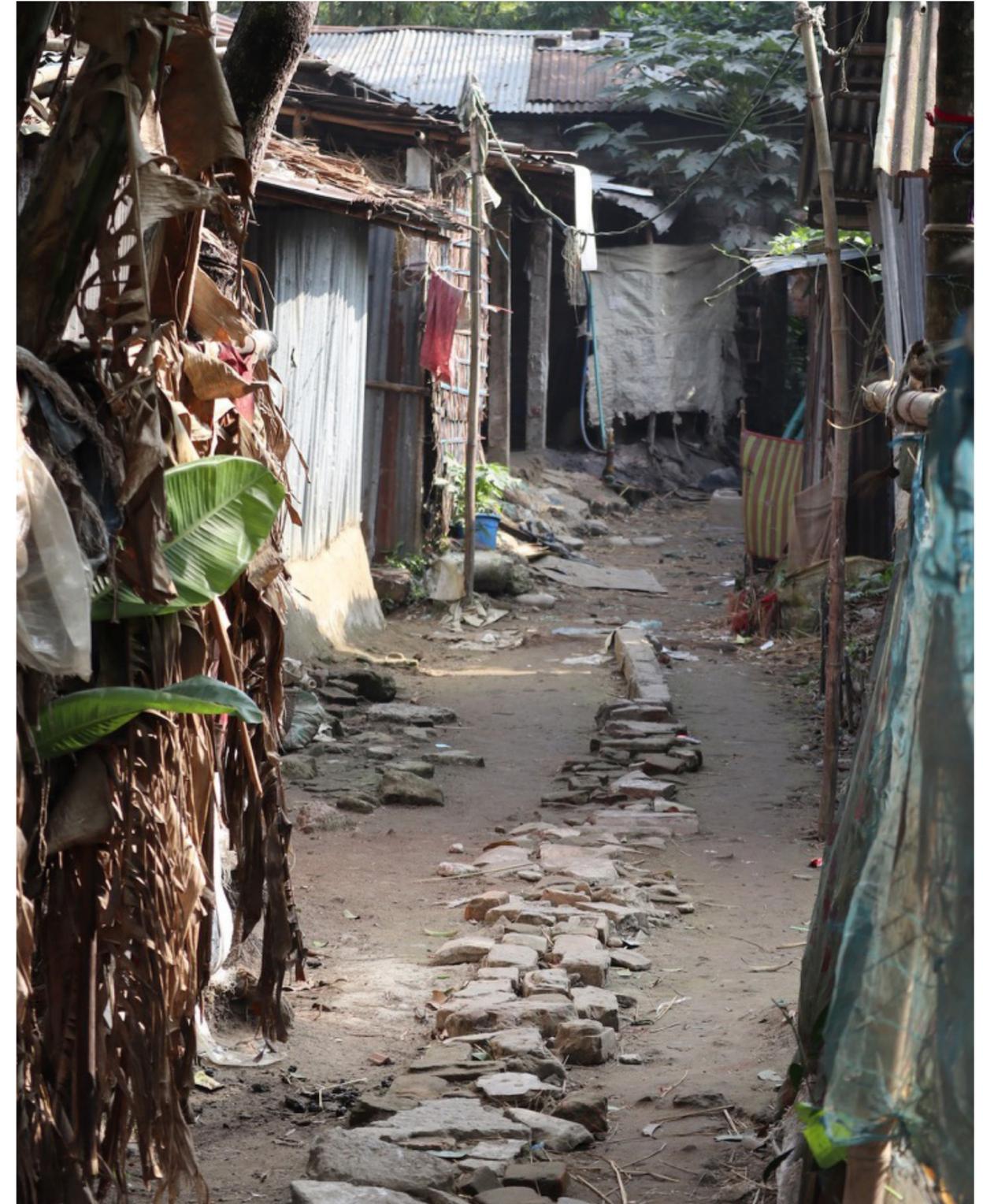
### SITE ANALYSIS

The village of Shonatola lies within the expanding pre-urban landscape of Sylhet, northeastern Bangladesh—a region undergoing profound spatial and socio-economic transformation. As the city of Sylhet extends northward along the Badaghat Road corridor, new institutional developments such as the Bangladesh Marine Academy and the New Sylhet Central Jail are reshaping land use and generating demand for housing in areas previously defined by agricultural and village life. Shonatola, positioned along this arterial route and between two major rivers, is emblematic of the tensions between urbanisation and environmental vulnerability.

The region's hydrological context is dominated by the Surma and Shari-Goyain Rivers, whose monsoon-driven overflow patterns regularly inundate the low-lying floodplain in which Shonatola is situated. Sylhet's subtropical monsoon climate compounds these risks, delivering more than 4,000 mm of annual rainfall and subjecting the settlement to recurring floods that profoundly shape its built environment and daily rhythms. Seasonal climatic variability—marked by extreme wet and dry periods—further influences local resilience strategies and infrastructure demands.

Shonatola itself presents a fragile spatial fabric. Comprising approximately 265 households, the village is characterised by a low-density settlement pattern (29 dwellings per hectare) and a modest floor space index of 0.22. Housing is predominantly constructed from bamboo and corrugated iron, providing little resistance to the seasonal floods that necessitate frequent reconstruction. Public amenities are sparse: a single flood shelter (the local school), an underdeveloped central bazar, and an inadequate drainage system that fails to protect internal pathways and public space from waterlogging.

An analysis of four interrelated challenges offers insight into the systemic vulnerabilities of the village. Unmaintained infrastructure results in unpaved paths and severely limited accessibility. A lack of public space constrains community life and safe refuge. Poor housing perpetuates cycles of material loss and rebuilding, while undeveloped water management exacerbates health and sanitation risks. Together, these factors underscore the need for adaptive spatial and architectural responses that can enhance both the physical and social resilience of Shonatola in the face of an increasingly volatile climate and accelerating urbanisation.



## SYLHET TO SHONATOLA VILLAGE

The city of Sylhet, located in northeastern Bangladesh, is undergoing rapid urbanisation, reflective of trends observed across the country. Sylhet exhibits an emerging city structure with uncontrolled growth patterns that risk mirroring Dhaka's unplanned sprawl. As infrastructure expands, surrounding pre-urban areas are increasingly drawn into the city's gravitational pull, transforming agricultural and village landscapes into prospective urban territories.

The Sylhet region is shaped by a distinctive hydrological setting. The city itself is divided by the Surma River, a major waterway influencing local land use and settlement patterns. A few kilometres north, the Shari-Goyain River similarly defines the landscape. These rivers, while vital for transportation and agriculture, also pose considerable risks. During the annual monsoon, both rivers overflow, inundating the low-lying land between them and exacerbating community vulnerability.

A prominent infrastructural feature is the Badaghat Road, a highway extending directly north from the Sylhet city centre. This arterial route crosses Shonatola Village, the project's focus area. Its linear trajectory connects the city with new institutions, including the Bangladesh Marine Academy and the New Sylhet Central Jail. These developments catalyse employment opportunities, driving demand for new and improved housing in areas such as Shonatola.

Shonatola Village presents a fragile built environment. The settlement comprises approximately 265 households, with 5-9 residents per dwelling. Structures are typically constructed from bamboo with corrugated iron roofs, offering minimal flood resistance. The lack of durable materials forces many residents to rebuild their homes annually. The village's single flood shelter is a local school, providing limited refuge. A small market (bazar) exists but is poorly maintained and unsanitary.

Flood management efforts centre on a drainage system flanking the highway, keeping the road accessible during floods. However, internal village roads remain unpaved, often little more than scattered stones. The village drainage infrastructure is inadequate, with informal construction frequently encroaching into gutters and hampering water management. These deficiencies underscore the urgent need for resilient, adaptive development in this vulnerable pre-urban context.



## CLIMATE SYLHET

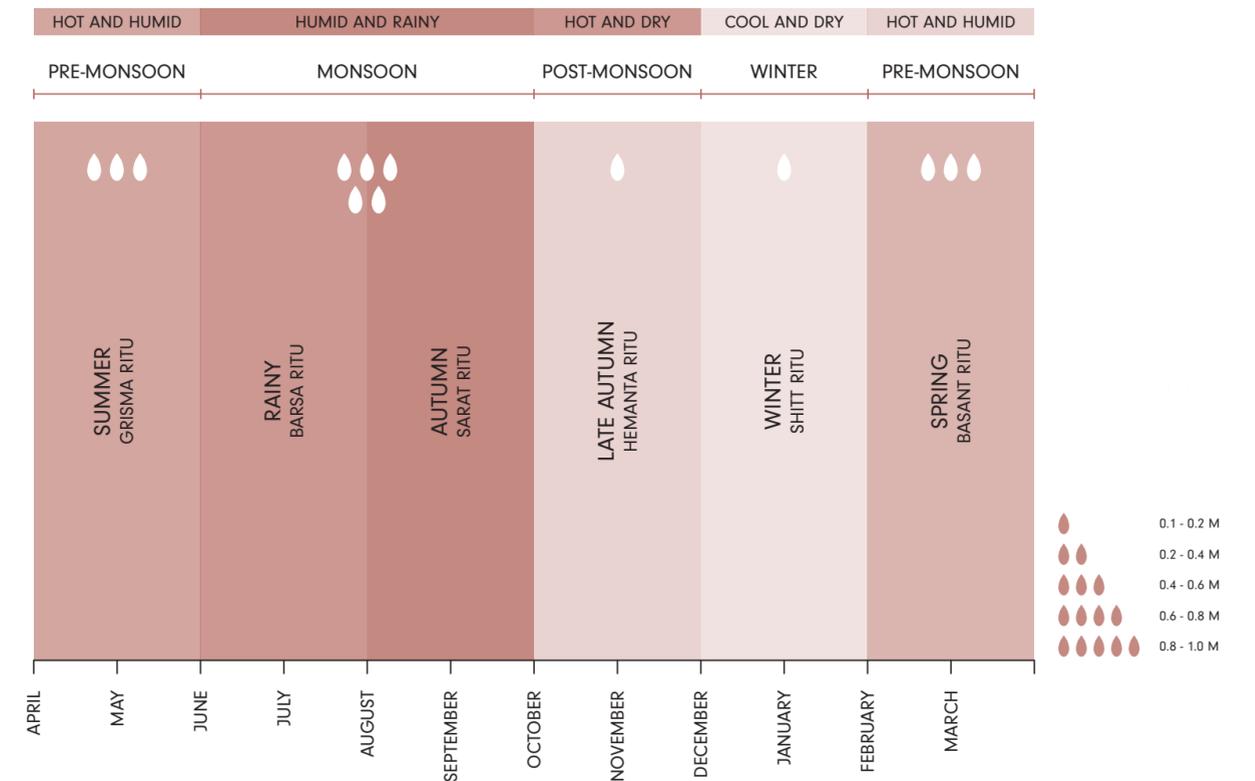
Bangladesh experiences a distinct and varied climatic pattern shaped by its subtropical monsoon climate. The country is traditionally known as “The Land of Six Seasons,” comprising summer, rainy season (monsoon), autumn, late autumn, winter, and spring (Uddin & Matin, 2021). These cyclical transitions govern agricultural rhythms, hydrological processes, and settlement dynamics, particularly in flood-prone regions like Sylhet.

Temperatures across Bangladesh fluctuate significantly throughout the year, ranging from 12–15 °C during winter to 33–36 °C during peak summer months (World Bank Climate Change Knowledge Portal, n.d.). Sylhet, situated in the northeastern part of the country, generally experiences slightly cooler and wetter conditions than central and western Bangladesh, due to its proximity to the Meghalayan hills and the regional river systems (Rashid, 2019).

The pre-monsoon period, spanning from March to May, is characterised by high temperatures, elevated humidity, and increasing convective rainfall. May typically registers the highest temperatures, with averages around 33–34 °C (Agrawala et al., 2003). This is followed by the southwest monsoon (June to September), a dominant climatic phase that brings 70–80% of the annual rainfall. In Sylhet, this season is especially pronounced; annual precipitation often exceeds 4,000 mm, making it one of the wettest regions in Bangladesh (Bangladesh Meteorological Department, 2023). The heavy rains cause the Surma and Shari-Goyain Rivers to overflow, regularly inundating adjacent floodplains.

Post-monsoon (October–November) marks a transitional phase characterised by declining rainfall and cooler nighttime temperatures. This period allows for a temporary recovery of water-logged land (Rashid, 2019). Winter (December–February) in Sylhet is comparatively mild and dry, with daytime temperatures averaging 22–25 °C and nighttime temperatures occasionally dropping below 12 °C (World Bank Climate Change Knowledge Portal, n.d.). The dry and cool conditions of this season offer a short respite from the hydrological stresses of the monsoon period.

However, the climate in Sylhet is becoming increasingly volatile due to climate change. Shifts in monsoon onset, increased rainfall intensity, and prolonged flood durations are affecting local livelihoods and built environments (IPCC, 2022).



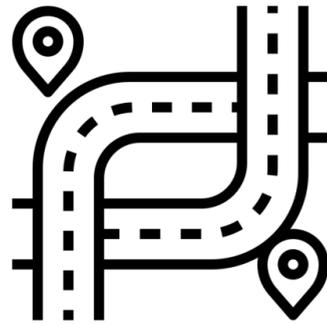






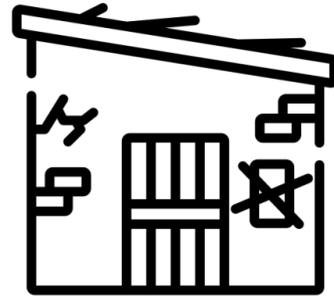


PROBLEMS SHONATOLA VILLAGE



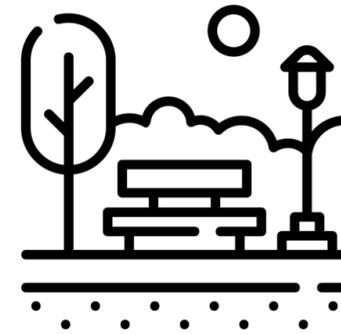
**UNMAINTAINED  
INFRASTRUCTURE**

Shonatola **lacks paved roads**; informal footpaths wind through vegetation. Residents navigate muddy, **uneven ground** to reach their homes, with accessibility worsening during floods and the monsoon season.



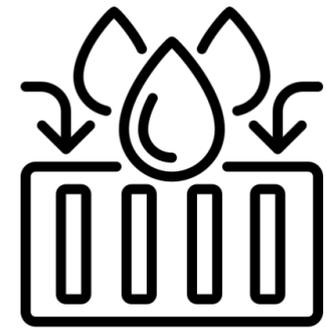
**POOR HOUSING**

Houses are built from **bamboo** and **corrugated steel**, offering little flood protection. Annual monsoon flooding forces residents to repeatedly **rebuild their fragile homes**, straining resources and resilience.



**LACK OF PUBLIC SPACE**

Shonatola offers **minimal public space**. The only communal areas—a small, **poorly** maintained **bazar** and **a flood shelter**—are inadequate for social life, gatherings, or safe refuge during floods.



**UNDEVELOPED WATER  
MANAGEMENT**

Village **drainage is inadequate**; gutters are blocked or built over. Water **stagnates during floods**, worsening sanitation and damage. Only the highway drainage keeps the main road passable.

# 04

## DESIGN APPROACH

### TARGET GROUPS & AIMS

Shonatola Village is undergoing a gradual but profound transformation as the forces of urbanisation reshape its social and spatial fabric. This shift presents both risks and opportunities: while new employment and housing demands emerge, longstanding vulnerabilities remain unresolved. Against this backdrop, the design approach seeks to develop adaptive strategies that address the diverse needs of the village's evolving population while fostering resilience, inclusivity, and cultural continuity. A key premise of the approach is that Shonatola is no longer a static rural village. Its population is increasingly heterogeneous, comprising not only established families but also a growing influx of new residents and seasonal workers. Each of these groups faces distinct challenges in accessing adequate housing, services, and public space, requiring differentiated but integrated design responses.

Seasonal workers form a transient and economically vulnerable segment of the population. With limited access to land or stable shelter, they often reside in informal, temporary accommodations highly exposed to environmental risks. For this group, lightweight, flexible housing solutions and communal facilities are essential to enhance both living conditions and dignity.

Existing families represent the socio-cultural foundation of the village. Deeply connected to inherited land, these households aspire to improve and expand their dwellings while maintaining cultural traditions. Architectural strategies that enable incremental upgrades, enhance flood resilience, and strengthen public space can help sustain these families' rooted presence in the community.

New residents bring both vitality and complexity to Shonatola's social landscape. Drawn by economic opportunity, they seek affordable, adaptable housing and reliable infrastructure. Designing modular, expandable dwellings and fostering community-building through public space provision supports their integration and long-term stability.

The design goals seek to strengthen the village's capacity to withstand future floods while supporting social cohesion and economic opportunity. Through integrated interventions, the approach fosters an adaptive spatial framework that enables all groups to thrive within a changing environment.

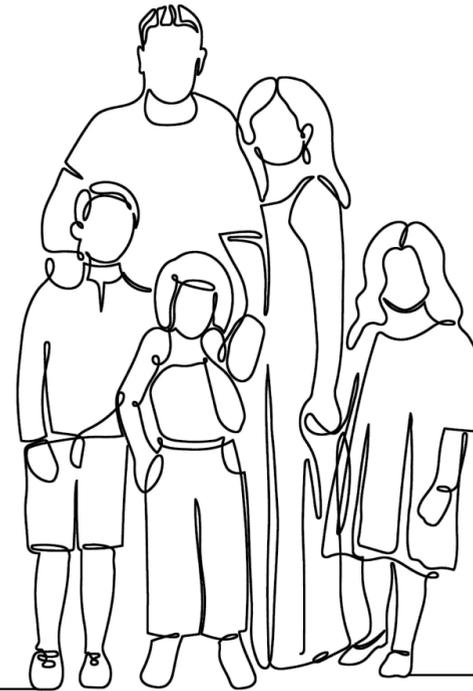


DIFFERENT TARGET GROUPS



**SEASONAL WORKERS**

Individual  
Low income  
Shared living space



**EXISTING FAMILIES**

5-8 member family  
Low to mid income  
Multiple generations, one unit



**NEW RESIDENTS**

1-8 member family  
Low, mid and high income  
Building there families



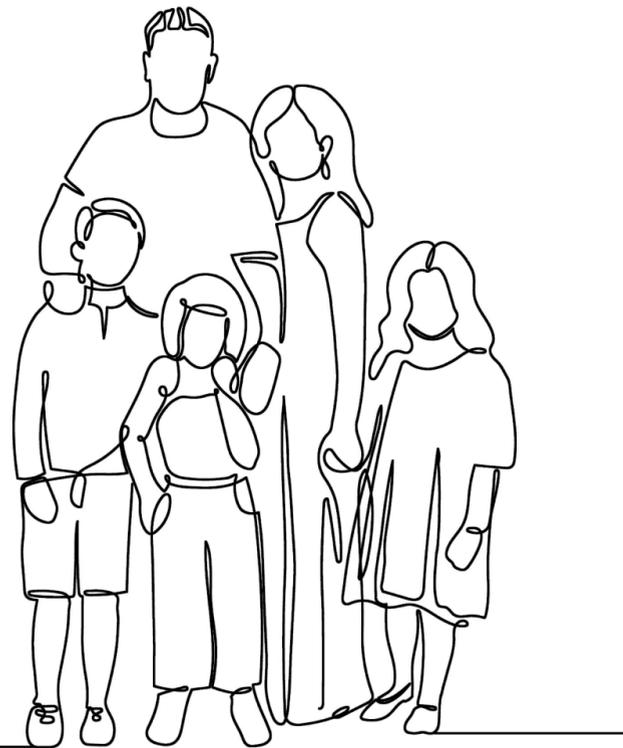
## TARGET GROUP - SEASONAL WORKERS

Seasonal workers constitute a highly mobile and economically vulnerable group within the local community. They engage in temporary and cyclical forms of employment, such as agricultural day labour, construction work, and hired assistance during planting and harvest seasons. The number of individuals in such households can vary significantly, typically ranging from one to eight, and they often rely on shared or employer-provided accommodations.

This group faces a precarious existence, marked by limited access to stable housing, sanitation, and essential services. Without ownership of land or property, they experience a constant state of transience, making long-term settlement unlikely. Their living conditions are typically informal, with makeshift shelters offering little protection against environmental hazards such as floods, storms, or extreme temperatures.

The design needs of seasonal workers are distinct from those of permanent residents. They require flexible, low-cost housing solutions that can accommodate fluctuating household sizes and short-term occupancy. Structures should be easily assembled, disassembled, or repurposed, and must provide basic protection from the elements. Access to communal facilities for water, sanitation, and cooking is essential to improve health and dignity within this group.

Additionally, seasonal workers value proximity to employment opportunities and transport links, facilitating their cyclical movement. While the temporariness of their presence precludes full integration into community life, thoughtful design can foster inclusivity by offering shared spaces that encourage social interaction. Ultimately, resilient and adaptable housing for seasonal workers not only addresses their immediate needs but also contributes to the broader social and economic sustainability of the community.



## TARGET GROUP - EXISTING FAMILIES

Existing families form the socio-cultural backbone of the local community. These are typically low- to mid-income households engaged in small-scale farming, livestock rearing, or local trades and crafts. They often live in large or extended household units, comprising five to eight members across two to three generations. Their strong familial and ancestral ties to the land foster a deep sense of place and continuity.

Despite this cultural rootedness, their living conditions remain vulnerable. Many existing homes offer limited protection against recurrent floods and storms, and often lack adequate sanitation infrastructure. Yet, unlike transient groups, existing families exhibit a pronounced aspiration to improve their surroundings. There is a strong interest in developing and densifying inherited land parcels, where ancestors have already established dwellings. This intergenerational connection to the land underpins their desire for permanence and resilience.

Design interventions for this group must therefore support both the preservation and evolution of the family plot. Flexible architectural solutions that allow for incremental upgrades and vertical or horizontal expansion are essential. Such adaptability accommodates growing or shifting family structures while honouring cultural traditions.

Moreover, improved flood resilience, sanitation, and communal facilities are key priorities, enabling these families to remain on ancestral land without compromising safety or well-being. Creating shared public spaces fosters intergenerational exchange and community cohesion, further strengthening the social fabric. Ultimately, supporting existing families in building upon their inherited land not only addresses their immediate needs but also anchors the long-term resilience and identity of the settlement.



## TARGET GROUP - NEW RESIDENTS

New residents represent an emerging and dynamic segment of the local population, drawn to the area by economic opportunity and affordable land. This group encompasses a diverse socio-economic profile, ranging from low- to high-income households. It includes young families, couples, and individual migrants working in city-linked occupations – such as commuters to Sylhet, remote workers, and early-stage entrepreneurs. Household sizes vary, typically ranging from one to eight members.

Unlike established families, new residents often arrive without strong local ties or ancestral claims to land. They seek to build a future in the area, driven by aspirations for affordable, adaptable housing and improved quality of life. Many begin by renting or constructing incrementally, balancing financial constraints with the desire for long-term stability.

Their living conditions are transitional, often marked by temporary or self-built structures. However, they place a high value on access to infrastructure – particularly reliable transportation, water, sanitation, and digital connectivity – which supports both livelihood and social integration. In addition, they seek proximity to future growth zones, positioning themselves strategically for economic mobility.

Design solutions for new residents must accommodate phased development and diverse household forms. Housing should be modular and adaptable, enabling residents to expand or upgrade as circumstances improve. Public spaces that foster community-building are equally important, helping to integrate this mobile group into the social fabric of the settlement. Ultimately, supporting new residents in establishing stable, connected homes ensures that the settlement can grow inclusively, fostering a balanced and resilient community over time.



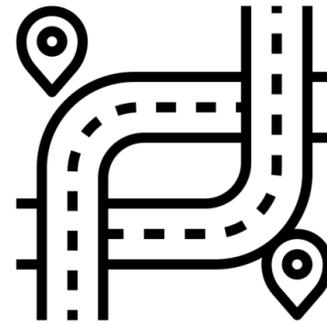
**TEMPORARY WORKERS  
HOUSES**

**Lightweight, flexible** shelters providing safe, hygienic, and easily deployable living spaces for **seasonal workers**. Designed for **short-term occupancy**, collective use, and resilience against floods and environmental exposure.



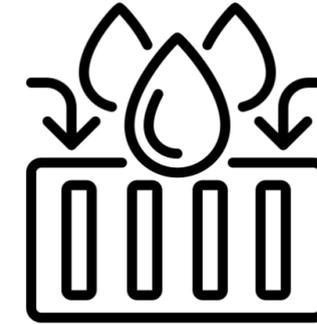
**FLOOD-PROOF  
HOUSES**

Robust, **adaptable dwellings** designed to withstand seasonal flooding. **Elevated structures** with resilient materials ensure long-term habitability, enabling families to remain safely rooted on their land **despite rising water** levels.



**IMPROVED  
INFRASTRUCTURE**

Raised, **durable road networks** designed for year-round accessibility. Enhances **mobility during floods**, supports economic activity, and connects homes, communal spaces, and key facilities within and beyond the settlement.



**IMPROVED WATER  
MANAGEMENT**

Integrated systems for **capturing, storing, and directing** water. Combines **elevated drainage**, retention basins, and permeable surfaces to reduce flood risk, **enhance water security**, and support agricultural and domestic needs.



**PRESERVE RURAL  
IDENTITY**

Design strategies that respect and **strengthen local cultural**, spatial, and material traditions. **Supports community** continuity by integrating familiar forms, public spaces, and **vernacular building** techniques into future development.

# 05

## VILLAGE STRATEGY

DESIGN OF THE MASTER PLAN

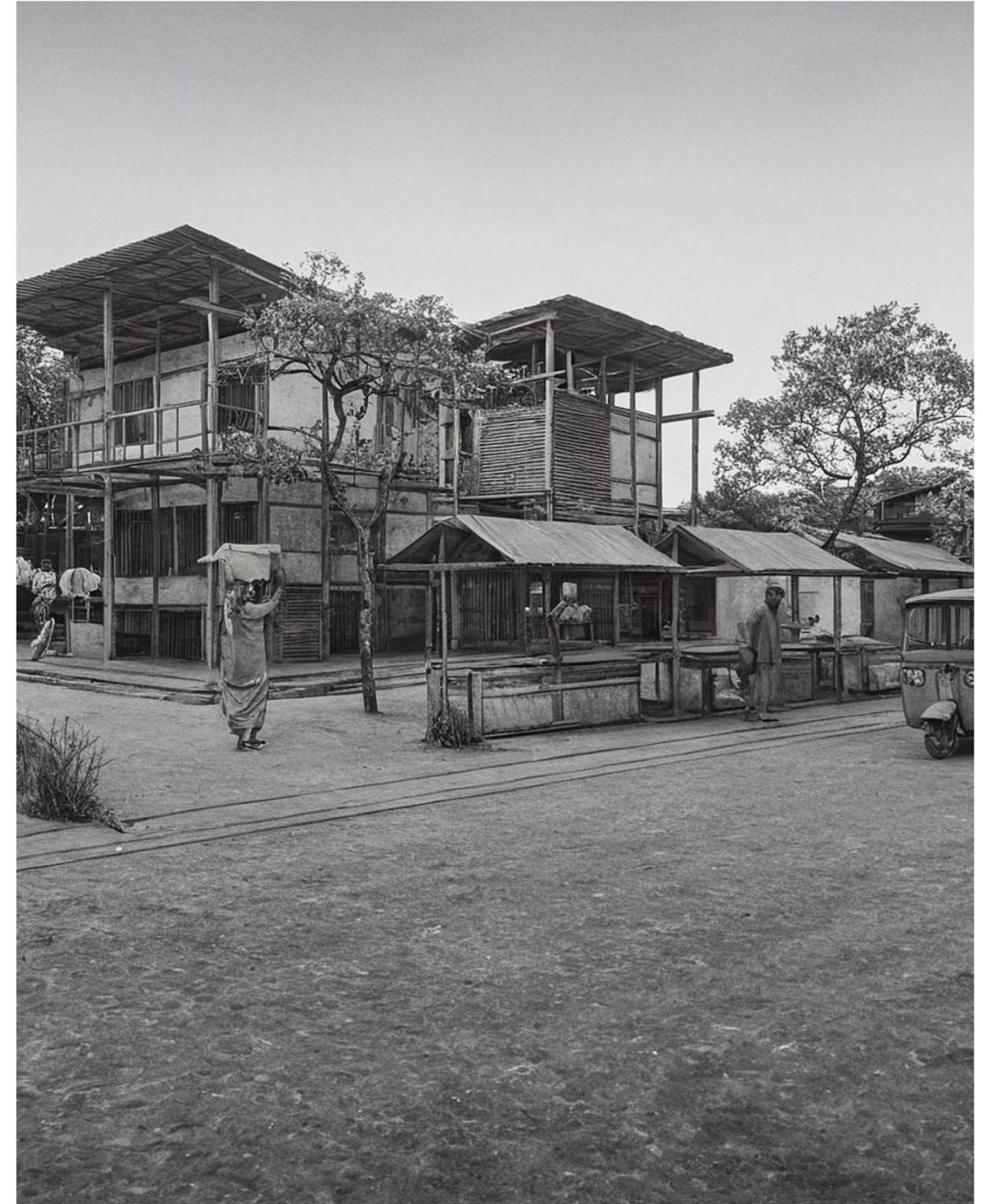
Shonatola Village is undergoing a process of gradual transformation toward a more resilient and inclusive spatial structure. Central to this process is a carefully phased village strategy that balances physical redevelopment with social continuity. In a context where existing built fabric, ancestral land ties, and informal spatial practices remain strong, abrupt interventions risk undermining social cohesion and cultural identity. A phased, adaptive approach enables the community to evolve organically while safeguarding these assets.

The strategy responds to both spatial and financial realities. Many of Shonatola's plots are fully built, leaving little space for large-scale redevelopment. To address this, initial phases focus on generating financial returns through the construction of villa districts and commercial spaces. These returns are then reinvested in affordable housing, ensuring an equitable distribution of benefits across income groups. At the same time, incremental relocation and redevelopment of existing clusters allow for infrastructure upgrades and the creation of quality public space with minimal disruption to residents' lives.

Spatially, the strategy promotes a layered street network that supports mobility, community interaction, and environmental resilience. At its core, an accessible primary road acts as the village's civic spine, concentrating public amenities and fostering vibrant street life. Secondary roads provide controlled vehicular access while integrating pedestrian pathways and green infrastructure. Within residential clusters, intimate courtyards centred on existing ponds preserve ecological features and promote neighbourly interaction. Finally, a parallel road along the regional highway acts as a commercial interface and protective buffer, mitigating traffic and noise impacts on the village interior.

The strategy also places emphasis on preserving Shonatola's ecological and cultural character. Existing ponds, a defining feature of the local landscape, are retained as community assets. The proposed spatial hierarchy accommodates a diversity of income groups, enabling both established families and newcomers to coexist within an integrated framework.

Through phased development and sensitive spatial design, the village strategy aims to foster long-term resilience, social equity, and a strong sense of place.



## PHASING OF SHONATOLA VILLAGE

A carefully considered phasing strategy is essential for the implementation of the Shonatola Village master plan. The village is an established community with many fully built plots, and the introduction of new housing and public spaces must respect existing patterns of life. Rapid or large-scale demolition would displace residents, disrupt social cohesion, and risk losing valuable cultural and social capital. Instead, gradual development allows the community to adapt organically and enables residents to be rehoused in a structured, minimally disruptive manner.

The phasing sequence addresses both logistical and financial realities. The early stages prioritize the construction of villa districts and commercial buildings. This approach generates early financial returns that can be reinvested in the later construction of affordable housing for lower-income groups. In contexts such as Shonatola, where public funding and external investment are limited, this self-sustaining financial model is critical for long-term project viability and social equity.

Phased construction also ensures flexibility and responsiveness. The first intervention relocates a small cluster of villagers to new units on the village outskirts, thereby creating space for infrastructure and optimized public spaces in the core. This gradual outward movement avoids the social and economic costs of large-scale relocations and helps maintain continuity of daily life. Moreover, the staggered timeline allows the project team to monitor impacts, adapt design strategies, and ensure spatial interventions remain aligned with community needs and aspirations.

Importantly, phased development supports community participation, transparency, and trust. Residents can see tangible benefits emerge step by step, fostering local ownership and resilience. It also allows for incremental improvements in public space, infrastructure, and essential services, avoiding the risk of unfinished interventions.

Finally, the sequence—from villa and commercial spaces to affordable housing and public space optimization—ensures that financial, spatial, and social dynamics evolve in a balanced, sustainable manner. The strategy thus supports not only the physical transformation of Shonatola Village but also the long-term resilience and thriving of its community.





1. EXISTING VILLAGE CONFIGURATION



2. BEGINNING CONSTRUCTION VILLA DISTRICTS



3. CONSTRUCTION OF COMMERCIAL BUILDINGS



4. FIRST VILLAGE CLUSTER, MOVE TO THE OUTSKIRTS



5. BUILDING RESIDENCE FOR SEASONAL WORKERS



6. START CONSTRUCTION OF SOUTH SIDE VILLAGE



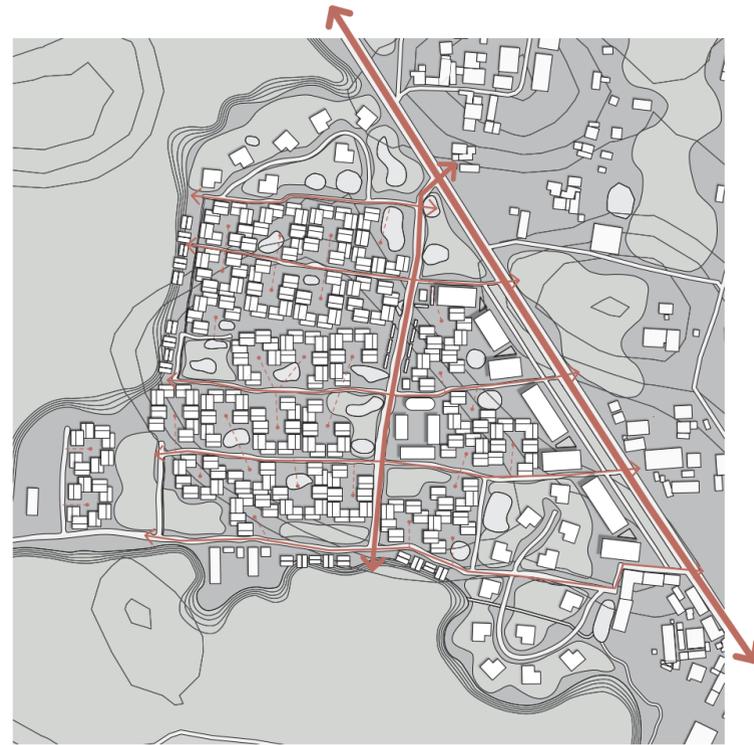
7. CONSTRUCTION NORTH SIDE OF VILLAGE



8. OPTIMISING PUBLIC SPACE



PRESERVE EXISTING  
POND STRUCTURE



STREET STRUCTURE BASED  
ON A CENTRAL MAIN ROAD



DIVERSITY OF  
INCOME GROUPS



PUBLIC SPACE & GREEN STRUCTURE  
AROUND CENTRAL ROAD

## STREET PROFILES

The street network in the Shonatola Village master plan is conceived as a layered system that integrates spatial hierarchy, accessibility, and social life. Four distinct street profiles structure the mobility and public space framework, offering varied degrees of permeability, activity, and environmental quality across the plan area.

At the most intimate scale is the **Courtyard Profile**, which defines the inner heart of residential clusters. These spaces, often organised around existing ponds, function as communal courtyards accessible only by foot. They embody a semi-private character, promoting neighbourly interaction, child-friendly spaces, and informal social life, while preserving the ecological and cultural value of the ponds. The exclusion of motorised vehicles here ensures tranquility and fosters a pedestrian-oriented environment at the doorstep.

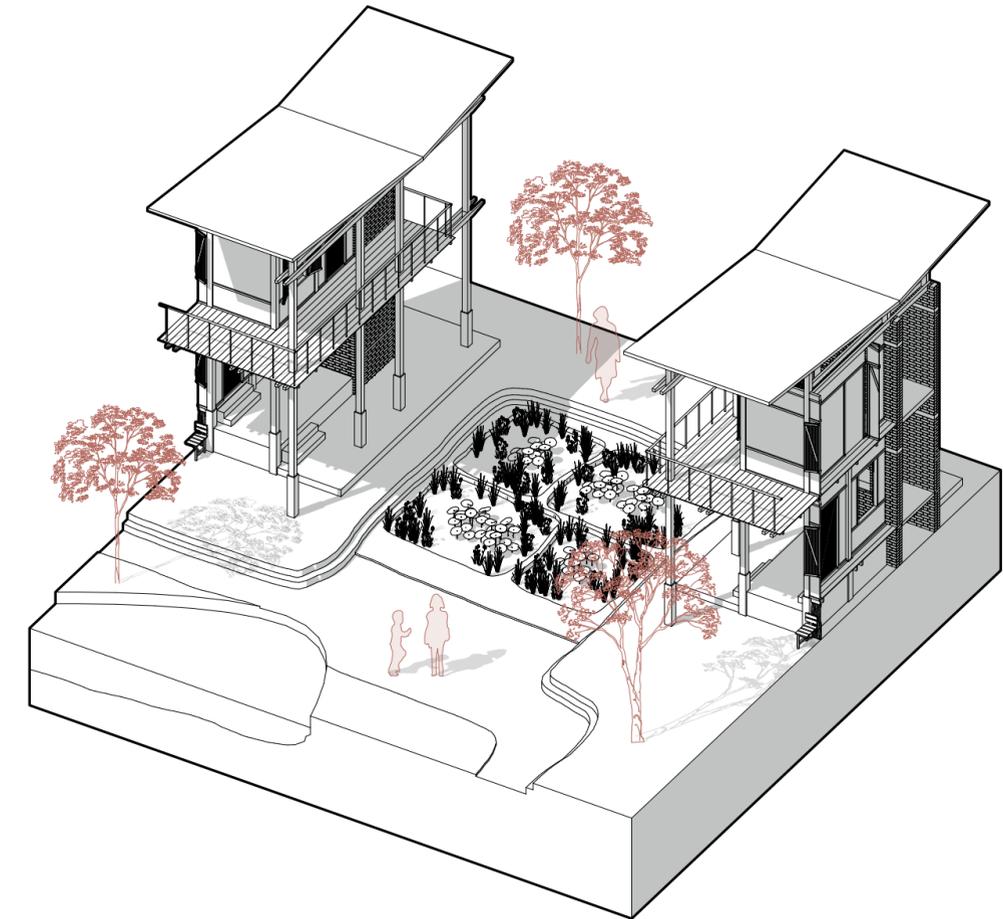
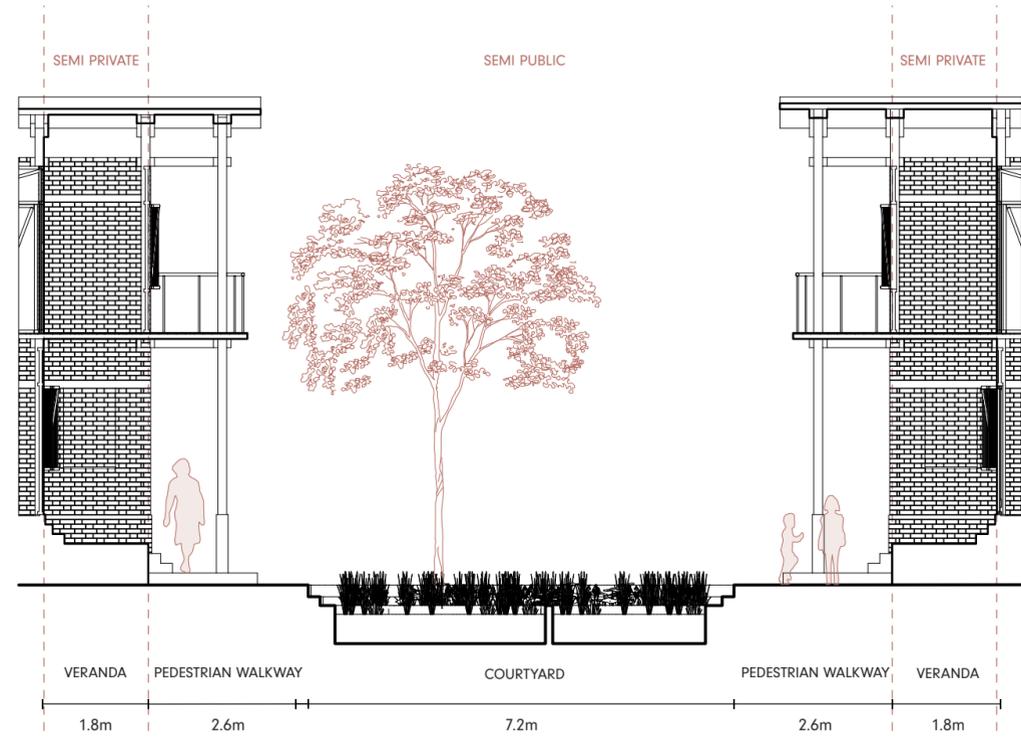
Encircling these clusters are the **Secondary Roads**. These paved streets provide controlled vehicular access, primarily for CNGs (auto-rickshaws), ensuring that residents and visitors can reach their homes without compromising the calm of the inner courtyards. The secondary roads are designed with integrated drainage infrastructure and pedestrian walkways, balancing mobility needs with environmental resilience. Their semi-public character encourages slow movement, informal encounters, and a human-scaled street atmosphere.

At the spine of the plan is the **Primary Road**, the main urban artery running north to south. This is the most vibrant space of the master plan, accommodating a concentration of public functions including a market, health clinic, community centre, and cricket pitch. The primary road is wider, facilitating a more intense flow of CNG traffic and accommodating diverse street life. Its design supports both movement and staying, acting as a linear civic space that fosters economic activity and social cohesion.

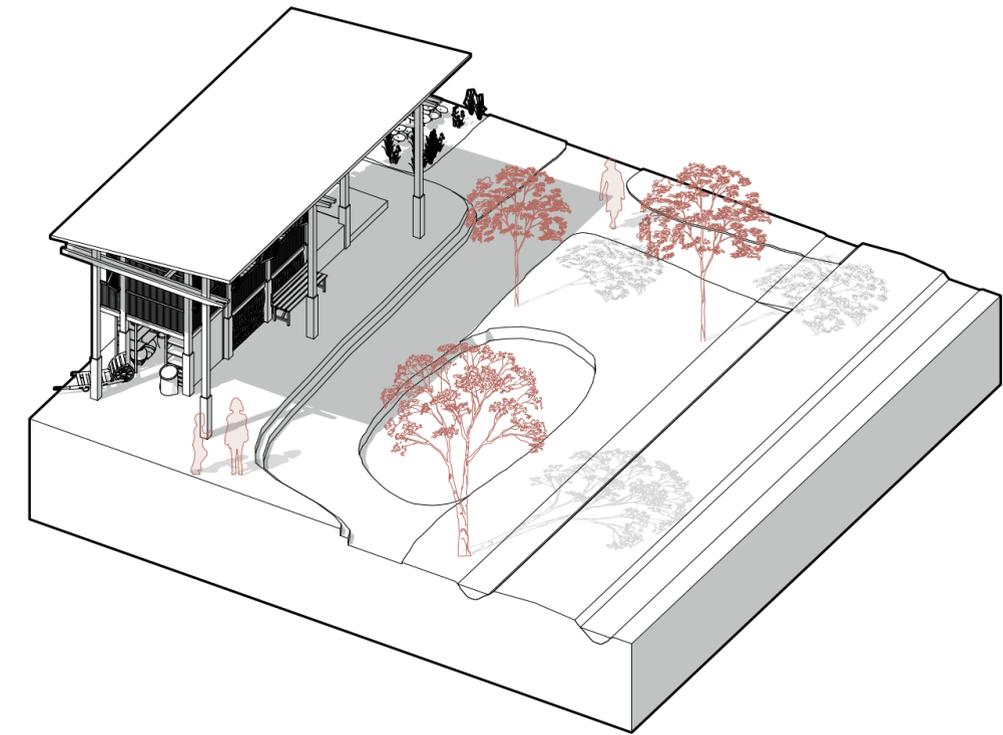
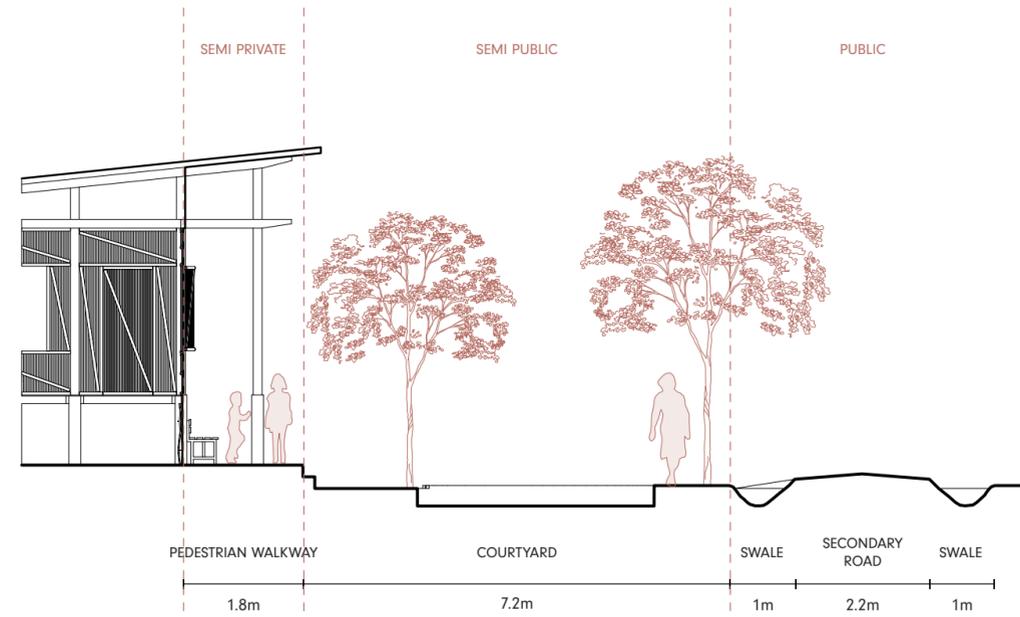
Finally, the **Highway Profile** addresses the interface with the regional road network. To protect the village interior from traffic and noise, a parallel road runs alongside the elevated highway, buffered by a substantial green zone. This corridor hosts commercial buildings and terraces, providing an active edge while mitigating the highway's environmental impact. The parallel road also serves as a sound barrier and transition space between the high-speed traffic and the slower-paced village fabric.



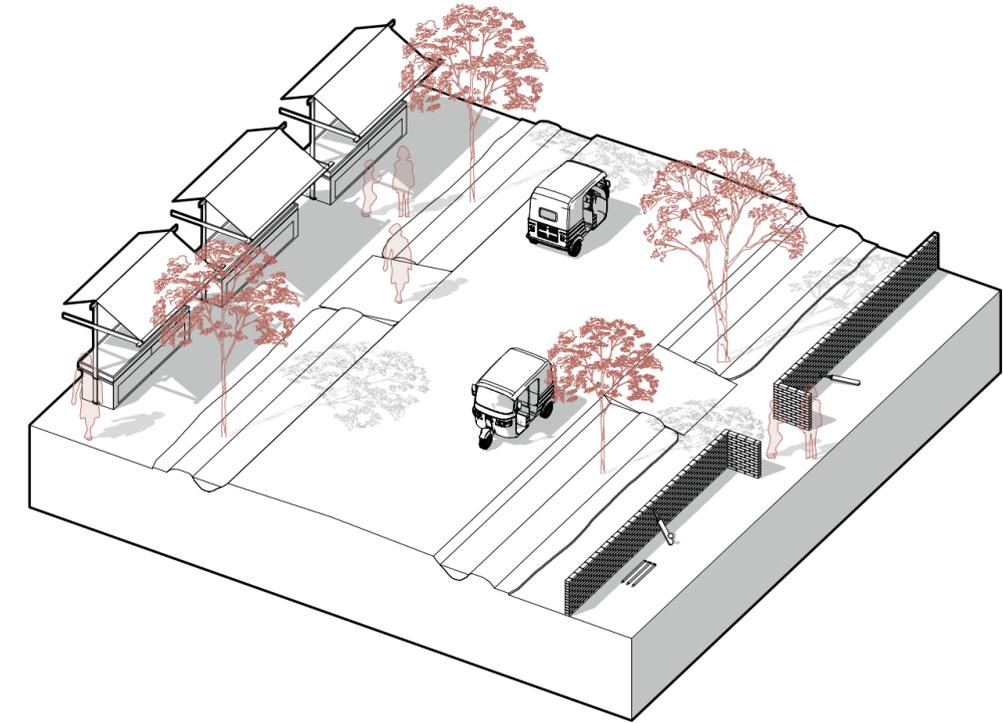
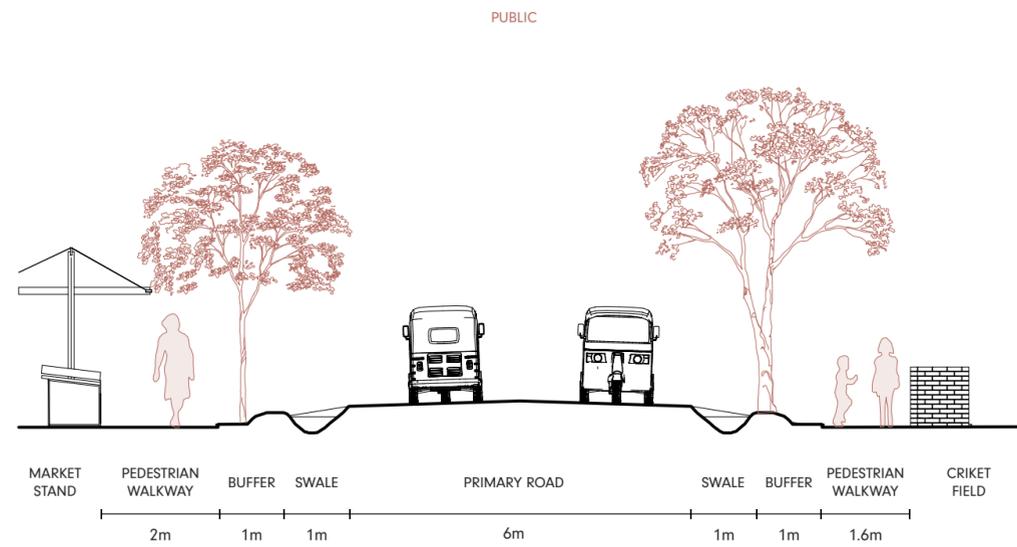
COURTYARD PROFILE



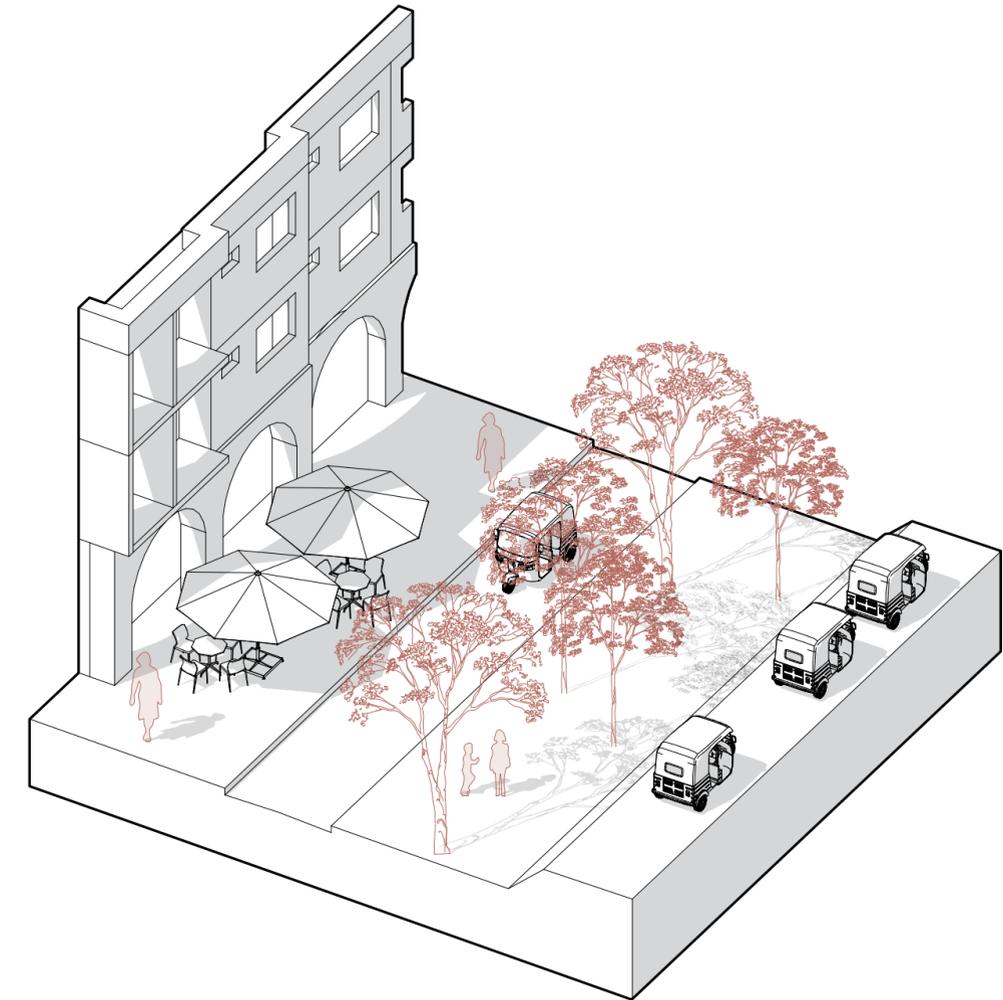
SECONDARY ROAD PROFILE

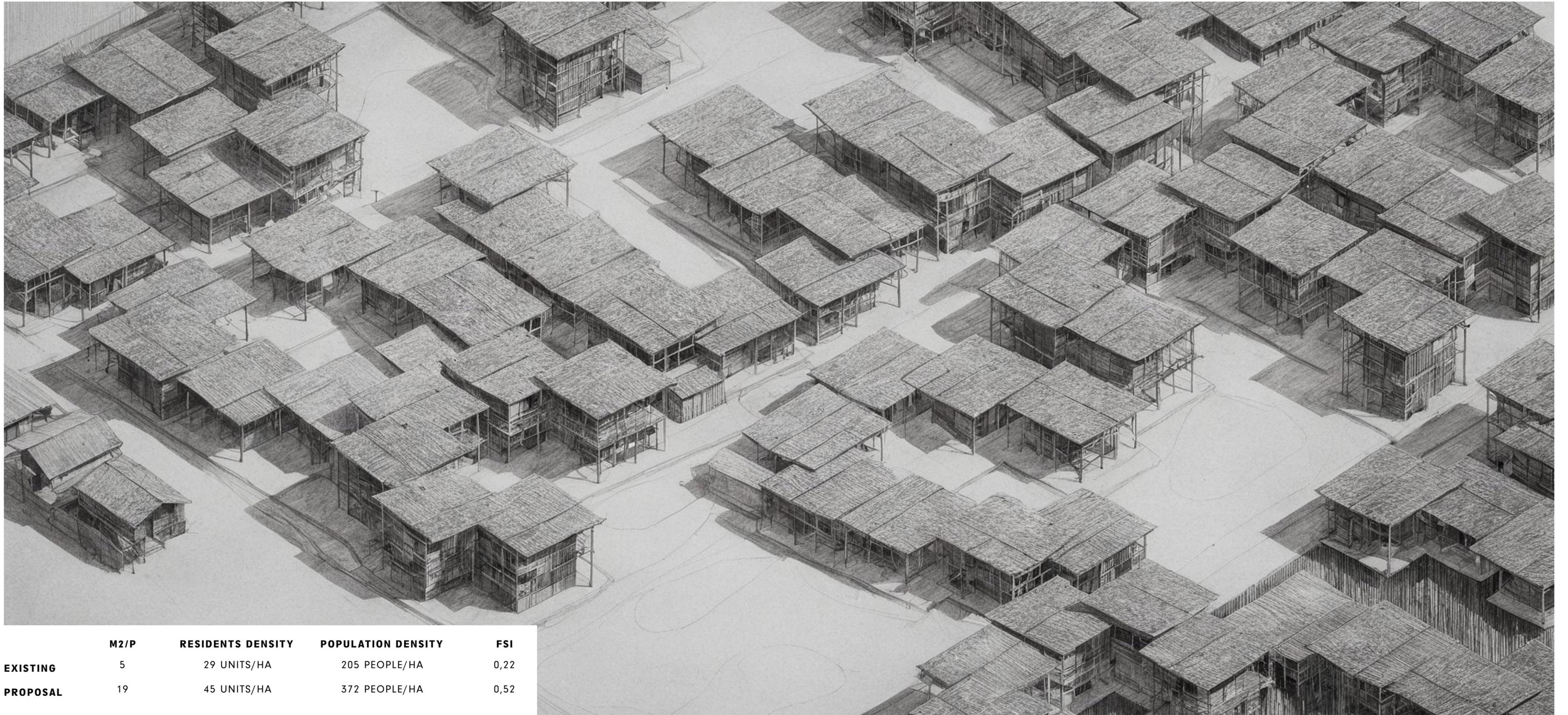


PRIMARY ROAD PROFILE



HIGHWAY PROFILE





	<b>M2/P</b>	<b>RESIDENTS DENSITY</b>	<b>POPULATION DENSITY</b>	<b>FSI</b>
<b>EXISTING</b>	5	29 UNITS/HA	205 PEOPLE/HA	0,22
<b>PROPOSAL</b>	19	45 UNITS/HA	372 PEOPLE/HA	0,52

# 06

## CLUSTER STRATEGY

COMMUNITY LIVING IN SHONATOLA VILLAGE

The cluster strategy provides a spatial and social framework for fostering inclusive, adaptive, and ecologically responsive living environments in Shonatola Village. Rather than approaching housing as a uniform solution, the strategy organises dwellings into diverse, carefully positioned clusters that reflect both the socio-economic composition of the community and the unique environmental characteristics of the site. This approach allows for a fine-grained urban fabric that accommodates different household types, supports communal life, and responds to contextual constraints such as flooding, access, and gendered spatial use.

Three cluster types—A, B, and C—form the foundation of the strategy. Type A clusters are located at the outer edges of the site and are specifically designed for seasonal and migratory workers. Their compact, low-cost arrangement includes 3 to 4 basic units centred around a shared toilet facility, combining material pragmatism with a collective social infrastructure. Positioned near agricultural fields and access roads, these clusters address the mobility, temporariness, and environmental vulnerability faced by this group.

Type B clusters are situated closer to the core of the village and provide affordable housing for low-income families. Composed of 5 to 8 dwellings around a central courtyard, these clusters enable social cohesion, shared responsibilities, and incremental adaptation. Public courtyards serve as informal living spaces—used for gathering, food preparation, and childcare—while adjacent pedestrian paths and secondary roads ensure connectivity and access to services.

Type C clusters, targeted at mid-income households, are oriented around existing ponds, integrating water management, passive cooling, and opportunities for small-scale aquaculture. Like Type B, they are built around courtyards but offer slightly more spatial flexibility and environmental quality. These clusters promote long-term investment and settlement while preserving local landscape features.

A critical yet often overlooked layer of the strategy lies behind the clusters: the shielded collective space. Accessible via narrow alleys, this zone provides privacy and functionality, especially for women's daily activities. It supports informal economies, care work, and cultural routines, turning what might be seen as residual space into a vital social infrastructure.



## TYPES OF CLUSTERS

The cluster strategy is grounded in a spatial and socio-economic logic that aligns housing typologies with the distinct needs and capacities of varied resident groups. This approach facilitates the integration of multiple income levels while responding to contextual factors such as hydrology, ecological features, and community structure. Three cluster types—A, B, and C—are distributed across the plan area to foster inclusivity, resilience, and local identity.

**Type A** clusters are positioned at the outer periphery of the plan area and are specifically tailored for seasonal and migratory workers. These compact groupings accommodate 3 to 4 units and include a shared toilet facility, reflecting both the temporary nature of occupation and limited access to private infrastructure. Their edge placement ensures proximity to agricultural fields and external connections, supporting the mobility patterns of this group while minimizing infrastructure investment. The low-density, flexible layout also allows for rapid assembly and disassembly in response to seasonal labor flows.

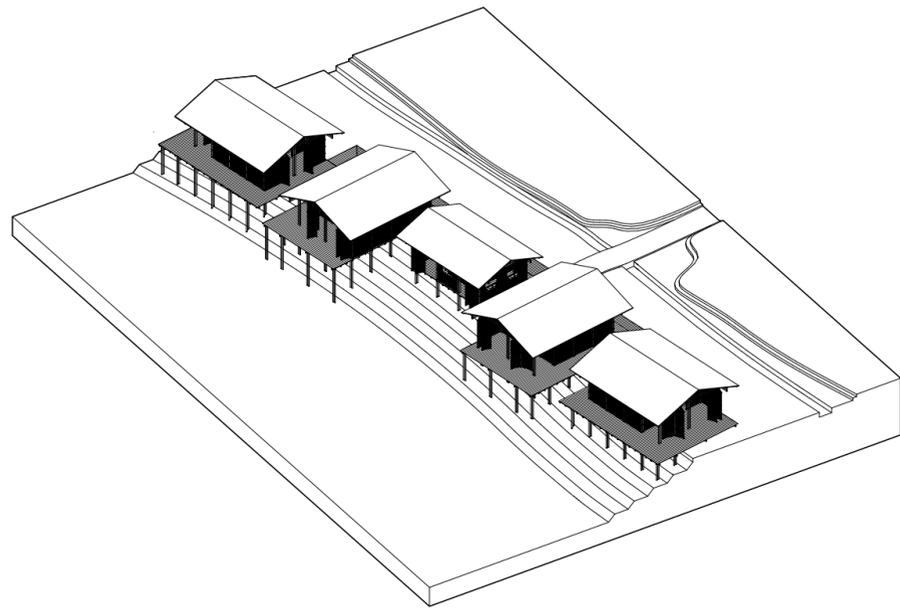
**Type B** clusters are distributed more centrally and designed for low-income families, consisting of 5 to 8 units organized around a small courtyard. This arrangement promotes mutual support, informal interaction, and a sense of communal responsibility. The repetitive layout of these clusters creates a horizontal social structure that supports incremental development, allowing residents to modify or expand their dwellings over time.

**Type C** clusters, designated for mid-income households, are strategically situated around the existing ponds in the area. Comprising 5 to 8 units as well, they integrate courtyard living with pond access at the center of the cluster. This configuration not only enhances environmental and aesthetic value but also contributes to passive climate control, water retention, and potential domestic or productive uses such as aquaculture. The pond serves as both a functional and symbolic anchor, reinforcing collective ownership and ecological awareness.

By alternating Type B and Type C clusters throughout the site, the plan achieves a deliberate social mix that encourages interaction between income groups while enhancing spatial equity. This layered cluster strategy enables a robust, adaptable, and inclusive settlement framework rooted in environmental and social responsiveness.

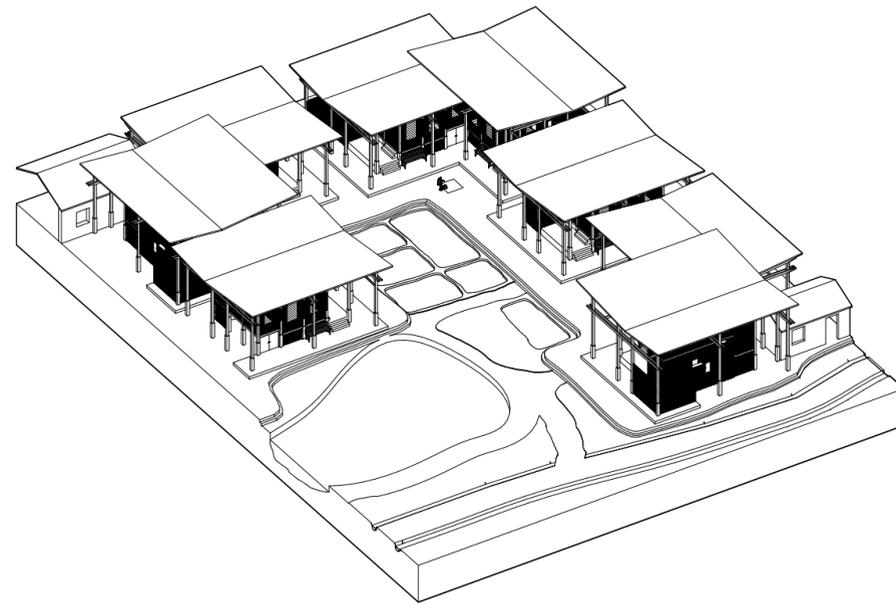


DIFFERENT TYPES OF CLUSTERS



**TYPE A - LOW INCOME**

3-4 units  
Shared Toilet building  
Seasonal Workers



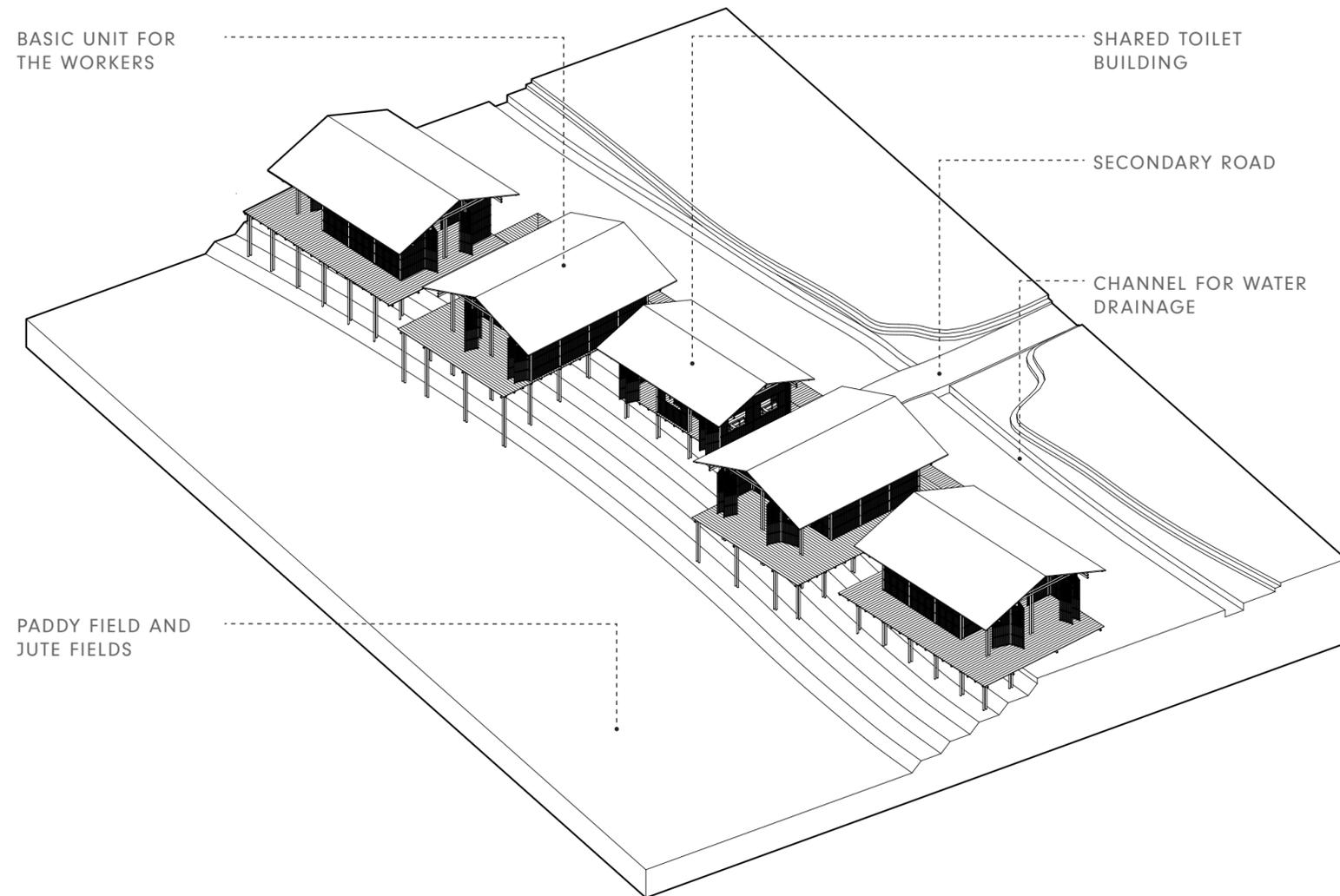
**TYPE B - LOW INCOME**

5-8 units  
Courtyard  
Existing Families & new residents



**TYPE C - MID INCOME**

5-8 units  
Courtyard + Pond  
Existing Families & new residents



## TYPE A - HOUSING FOR THE WORKERS

Cluster Type A is designed specifically to accommodate seasonal and migratory workers, offering a low-cost, resilient, and contextually responsive housing solution. Positioned at the outer edge of the planning area, these clusters are directly adjacent to paddy and jute fields, ensuring proximity to sources of labor while maintaining a degree of separation from more permanent residential areas. This spatial positioning enhances logistical efficiency and reduces potential social stratification, allowing workers to remain embedded in the local economy without exclusion from the overall spatial fabric.

Each Type A cluster comprises 3 to 4 basic units organized around a central shared toilet building. This shared facility plays a crucial infrastructural and social role: not only does it minimize construction and maintenance costs, but it also promotes collective responsibility and interaction among workers. In a context where individual sanitary facilities may be economically or spatially unfeasible, the communal toilet functions as a vital anchor for hygiene, dignity, and social organization.

The architectural language of the units emphasizes material efficiency and flood resilience. Construction relies on locally available materials, such as bamboo for structural framing and lightweight infill, which allows for modular assembly and future disassembly or relocation. Floor levels are raised above ground to mitigate flood risks, while basic pitched roofs provide necessary rain protection. Openings are strategically positioned for passive ventilation and natural lighting, supporting healthy indoor conditions with minimal energy input.

Accessibility is another key component of the cluster's design. Located near secondary roads, these units remain easily reachable for temporary inhabitants and service delivery. The adjacency to water drainage channels further underscores the environmental logic of the cluster, ensuring runoff is managed effectively during monsoon periods.

Importantly, Cluster Type A is not conceived as a residual or peripheral typology, but as a vital component of the larger plan. By acknowledging the presence and needs of temporary laborers in spatial terms, it promotes a more just and inclusive built environment. Through its material pragmatism, collective infrastructure, and adaptive layout, Type A exemplifies how design can serve both ecological realities and socio-economic diversity.

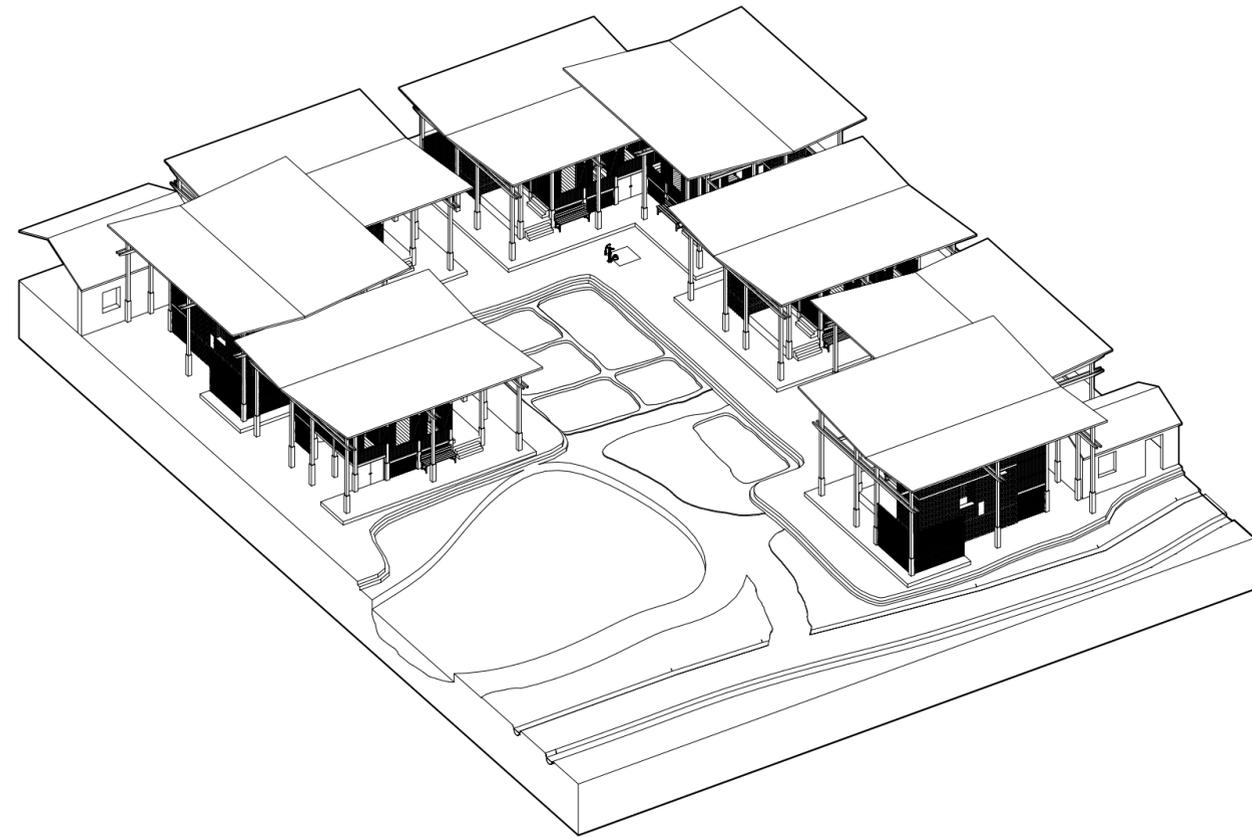


SCALE 1:250



SCALE 1:250

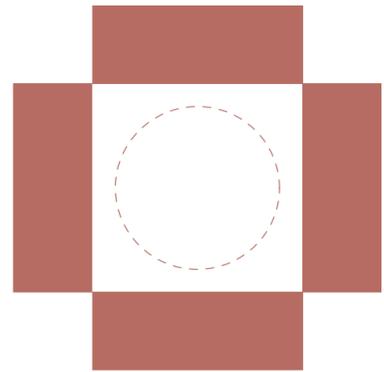




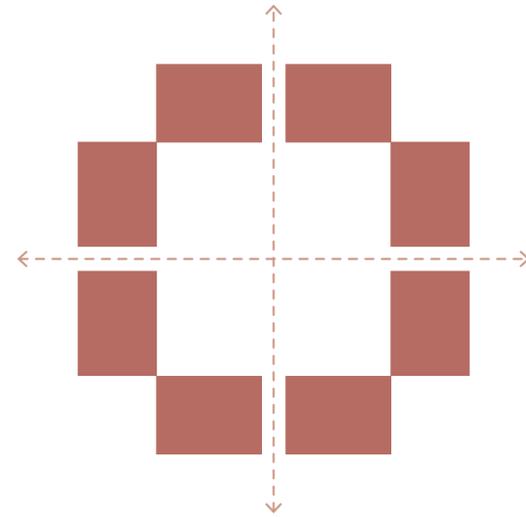
**TYPE B - LOW INCOME**



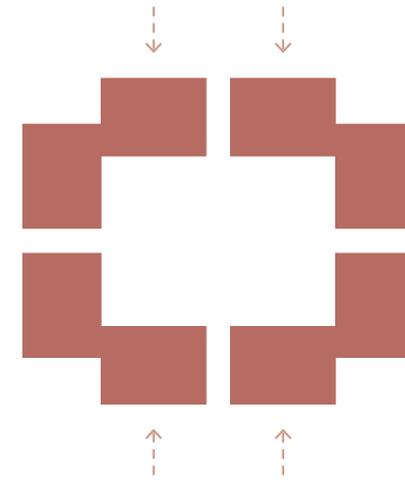
**TYPE C - MID INCOME**



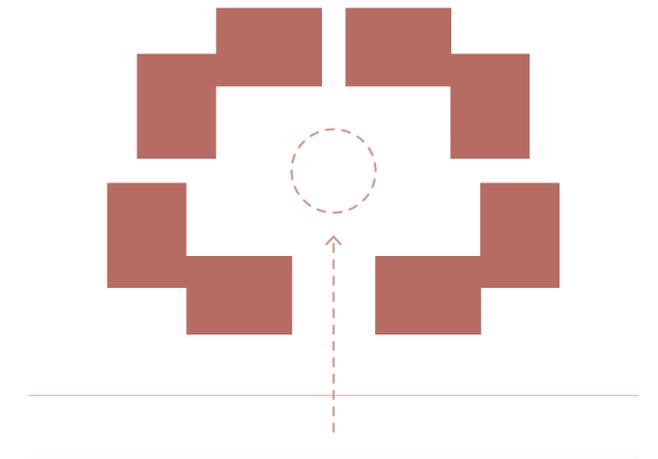
1. CLUSTER WITH COURTYARD



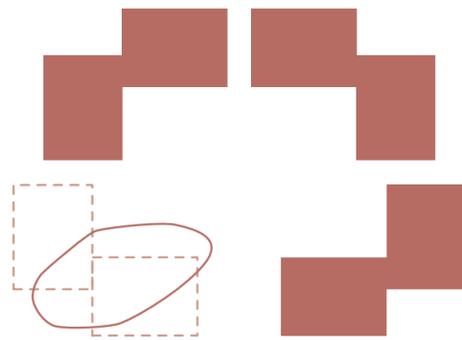
2. OPENING UP CLUSTER



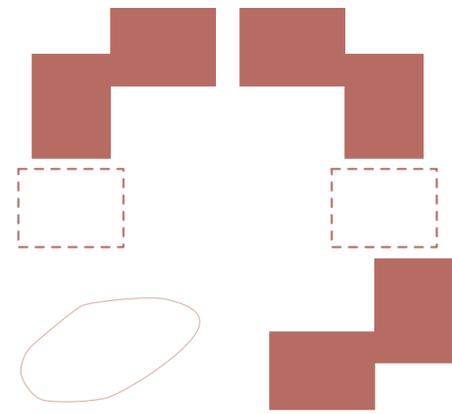
3. PAIRING UNITS AND SHRINKING COURTYARD



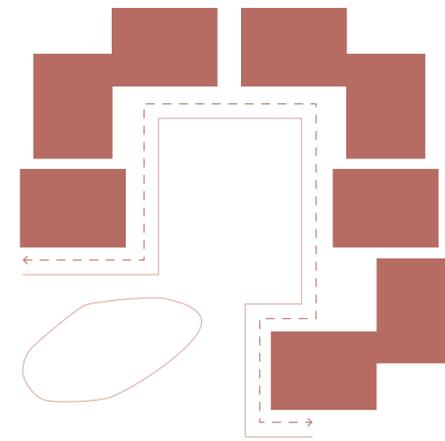
4. ACCESS FROM PUBLIC STREET



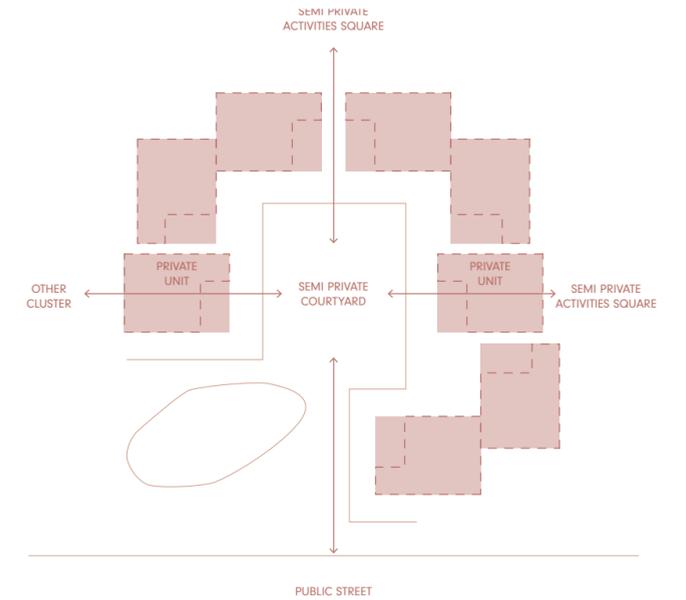
5. INTEGRATE EXISTING PONDS AND LANDSCAPE



6. MOVING UNIT FOR CLUSTER OF EIGHT



7. DEFINE MAIN ROUTING



8. PRIVATE/PUBLIC TRANSITION

## TRANSITION OF COLLECTIVE SPACE

Between the formally arranged courtyard clusters of Types B and C lies a more intimate and culturally significant spatial layer: the shielded collective space. While the courtyard serves as a semi-public interface fostering neighborly interaction and household-level cooperation, the space behind the buildings functions as a quieter, more secluded realm. Accessed via narrow alleys that subtly transition from the courtyard to the rear of the clusters, this in-between space operates as an essential socio-spatial buffer—one that especially accommodates the daily rhythms and collective presence of women in the community.

In this context, where gendered spatial practices shape the use and perception of the built environment, the shielded collective space becomes an enclave of informal autonomy. Unlike the courtyard, which remains relatively open to external gaze, the space behind the dwellings offers greater visual privacy. Here, women engage in social and domestic activities—washing clothes, preparing food, tending to livestock, or leaving produce and household items out to dry. It is also a space of informal childcare and shared storytelling, where knowledge and support circulate freely among generations.

Functionally, this area accommodates small-scale infrastructures such as bamboo clotheslines, water storage pots, composting bins, and shaded lean-to shelters for poultry or goats. The permeable ground, shaded by surrounding structures and trees, enables cooling and drainage, supporting both comfort and ecological performance. Low boundary elements—such as woven bamboo screens or raised earthen edges—help define individual household extensions without impeding the fluidity of the space.

Crucially, this rear space strengthens the spatial resilience and adaptability of the clusters. It absorbs overflow from the courtyard, functions as a service and transition zone, and facilitates social structures that remain otherwise invisible in formal planning. By designing with cultural sensitivities in mind, this layer of shielded collectivity not only enhances gender equity but also redefines what is typically regarded as 'residual' or 'leftover' space into something vital, lived-in, and productive.

In sum, the space behind the clusters is not merely a byproduct of architectural arrangement—it is a quietly powerful domain of social cohesion, care, and informal economy.



## TYPE B/C - VILLAGE HOUSING

Cluster Types B and C represent the primary residential configurations within the village fabric, forming the backbone of a socially inclusive and spatially adaptive settlement strategy. While both cluster types follow a similar formal logic—comprising 5 to 8 dwellings organized around a central courtyard—they differ in their socio-economic target groups and environmental integration, resulting in nuanced variations in function, layout, and atmosphere.

**Type B clusters** are designed for low-income families and focus on affordability, flexibility, and communal resilience. These clusters are positioned close to the secondary roads, ensuring easy access to public services and circulation while maintaining a buffer through internal pedestrian paths. The central courtyard acts as a shared living room: a place for cooking, gathering, play, and informal exchange. It is often activated with community gardens, fostering food security and cooperative maintenance among residents.

**Type C clusters**, by contrast, are oriented around existing ponds and are intended for mid-income households. The pond serves as a spatial and ecological anchor, supporting passive cooling, rainwater retention, and, in some cases, domestic aquaculture. This natural amenity increases the quality of life while offering a degree of prestige, making the cluster attractive for families with greater resources. The architectural character of these units may accommodate minor upgrades or extensions over time, encouraging long-term settlement and investment.

Both cluster types are connected by a fine-grained network of pedestrian alleys that lead from the public courtyards to the semi-private collective spaces behind the buildings. These narrow passages function as gender-sensitive thresholds, offering access to shielded zones where women gather for washing, drying, animal care, or informal socializing. These spaces support everyday life activities often overlooked in conventional planning, reinforcing both privacy and community cohesion.

The strategic alternation of Types B and C across the masterplan creates a layered mix of incomes, cultures, and functions. Their embeddedness in the natural landscape—through ponds, bamboo groves, and gardens—further supports climate responsiveness and spatial identity. Together, these clusters exemplify a settlement pattern that is incremental, inclusive, and deeply rooted in its environmental and social context.







# 07

## UNIT STRATEGY

ADAPTABLE HOUSING CONDITIONS

The unit strategy defines the architectural logic of housing in Shonatola Village by combining adaptability, affordability, and spatial dignity. It responds to the village's socio-economic diversity and climatic vulnerabilities by offering a range of housing types—Units A, B, and C—each tailored to specific user groups and levels of permanence. These typologies share a common goal: to provide resilient, low-tech housing that empowers residents to adapt their homes over time.

Unit A is conceived as shared accommodation for seasonal workers. Constructed entirely from bamboo, it reflects a lightweight, low-cost approach suitable for short-term occupancy. The open-plan layout, raised floor, and shared kitchen foster both collectivity and flood resilience, while a centrally located sanitation block serves multiple units. Designed for rapid assembly and disassembly, Unit A supports the mobility and economic precarity of its users, ensuring dignified living without long-term investment.

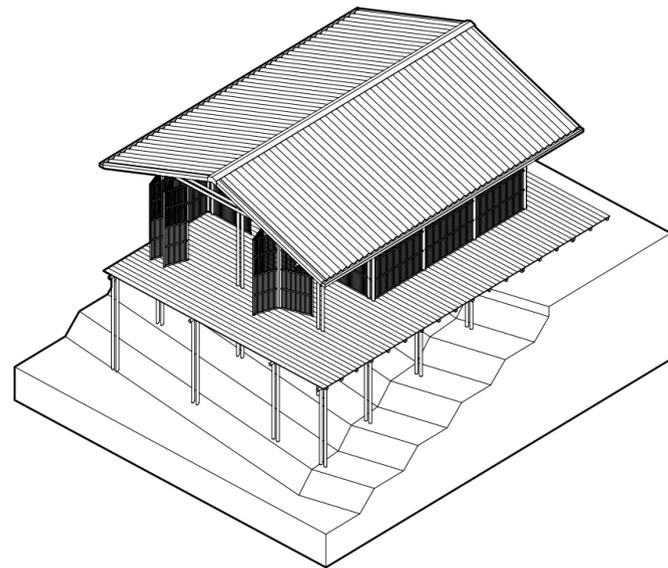
Unit B serves low-income families and is rooted in the architectural principles of Charles Correa. Built around a central brick core that houses wet functions, the unit allows flexibility in layout and climate-responsive use. Lightweight bamboo and timber elements form the shell, while operable panels enable passive ventilation and user control. A shaded veranda, elevated platform, and modular interior support both comfort and adaptation, turning a modest footprint into a capable and culturally grounded home.

Unit C introduces a second storey, offering expanded living capacity and enabling multi-generational occupation. It includes provisions for a second core, allowing phased development or semi-independent upper-level use. The modular clay-bamboo façade enhances insulation, longevity, and symbolic value—marking the unit as an aspirational step for upwardly mobile families. Generous shaded space beneath the elevated structure also provides room for semi-public activities, small enterprises, or communal gatherings.

Across all units, modular façades and flexible floor plans encourage user participation in construction, maintenance, and gradual upgrading. The ability to start small and expand over time supports both economic realities and household growth. Through elevation, breathable materials, and incremental logic, the unit strategy equips Shonatola's residents with tools for spatial agency, climate adaptation, and long-term settlement.

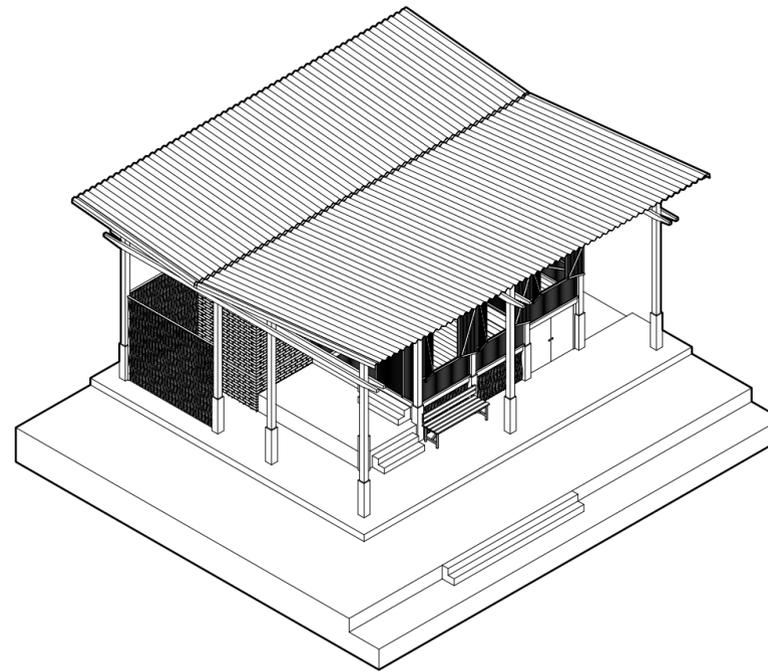


DIFFERENT TYPES OF LIVING



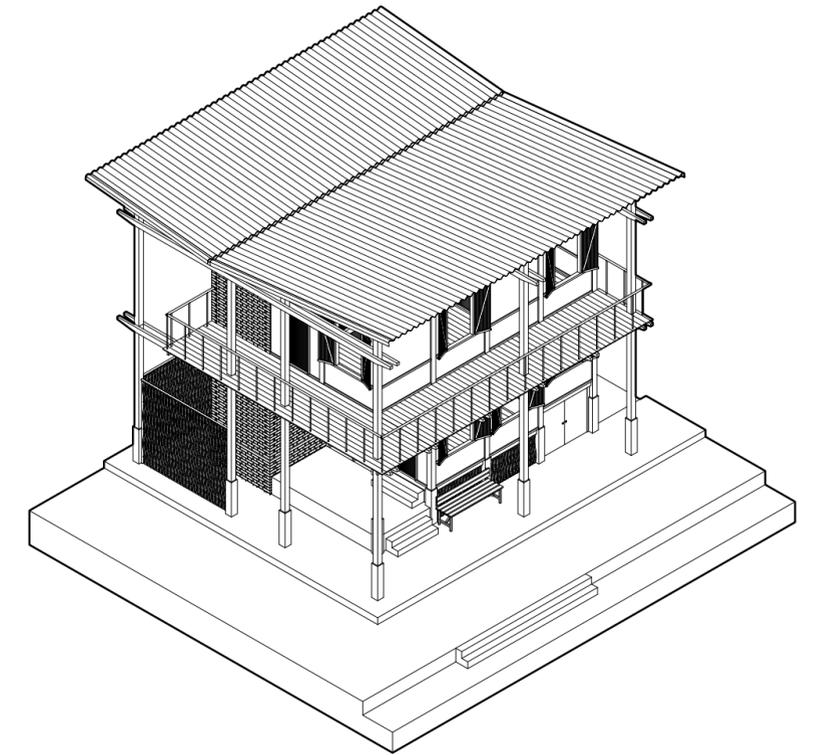
**TYPE A - LOW INCOME**

1 floors  
40 m2  
Seasonal Workers



**TYPE B - LOW INCOME**

1 floors  
35 m2  
Existing Families & new residents

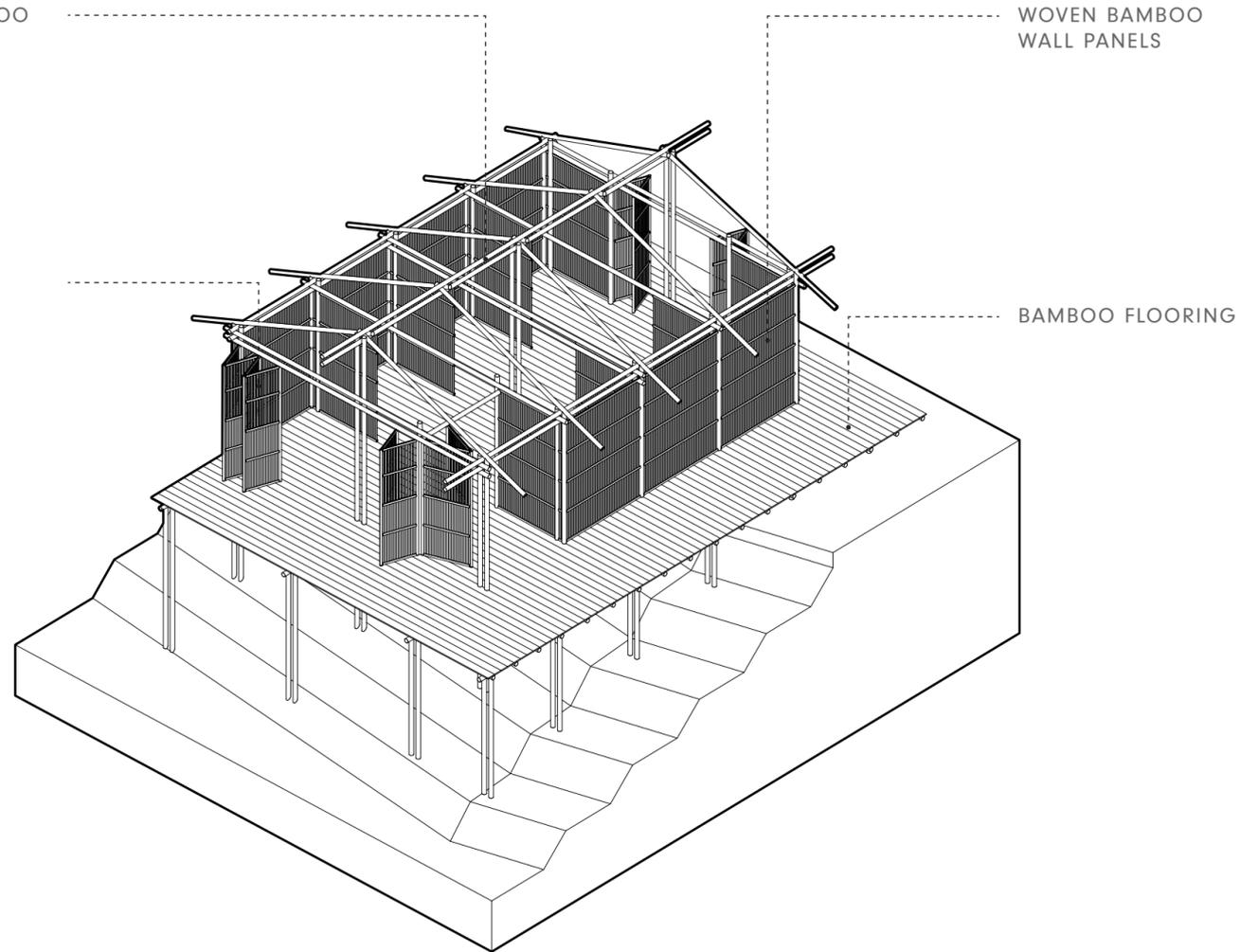


**TYPE C - MID INCOME**

2 floors  
75 m2  
Existing Families & new residents

LIGHTWEIGHT BAMBOO  
CONSTRUCTION

BAMBOO SLIDING  
PANELS



WOVEN BAMBOO  
WALL PANELS

BAMBOO FLOORING

## TYPE A - WORKERS HOUSING

Type A is a shared workers' dwelling designed to accommodate 6-8 seasonal or itinerant laborers within a rationalized and resource-conscious footprint. The unit is constructed entirely with locally available materials, with bamboo serving as the primary structural and spatial element. Lightweight yet durable, the bamboo frame supports a raised platform of bamboo flooring, ensuring ventilation and protection during seasonal flooding. The envelope features woven bamboo wall panels and operable bamboo sliding panels, offering both privacy and climate adaptability through modulated airflow and shading.

Internally, the layout is characterized by a large open dormitory space, divided into individual sleeping bays using low partitions or implied boundaries. This collective arrangement not only supports the practicalities of transient, low-income workers but also fosters a sense of community and mutual care. Each unit includes a simple shared kitchen with a modest dining area – a compact yet social core where basic meals can be prepared and shared communally.

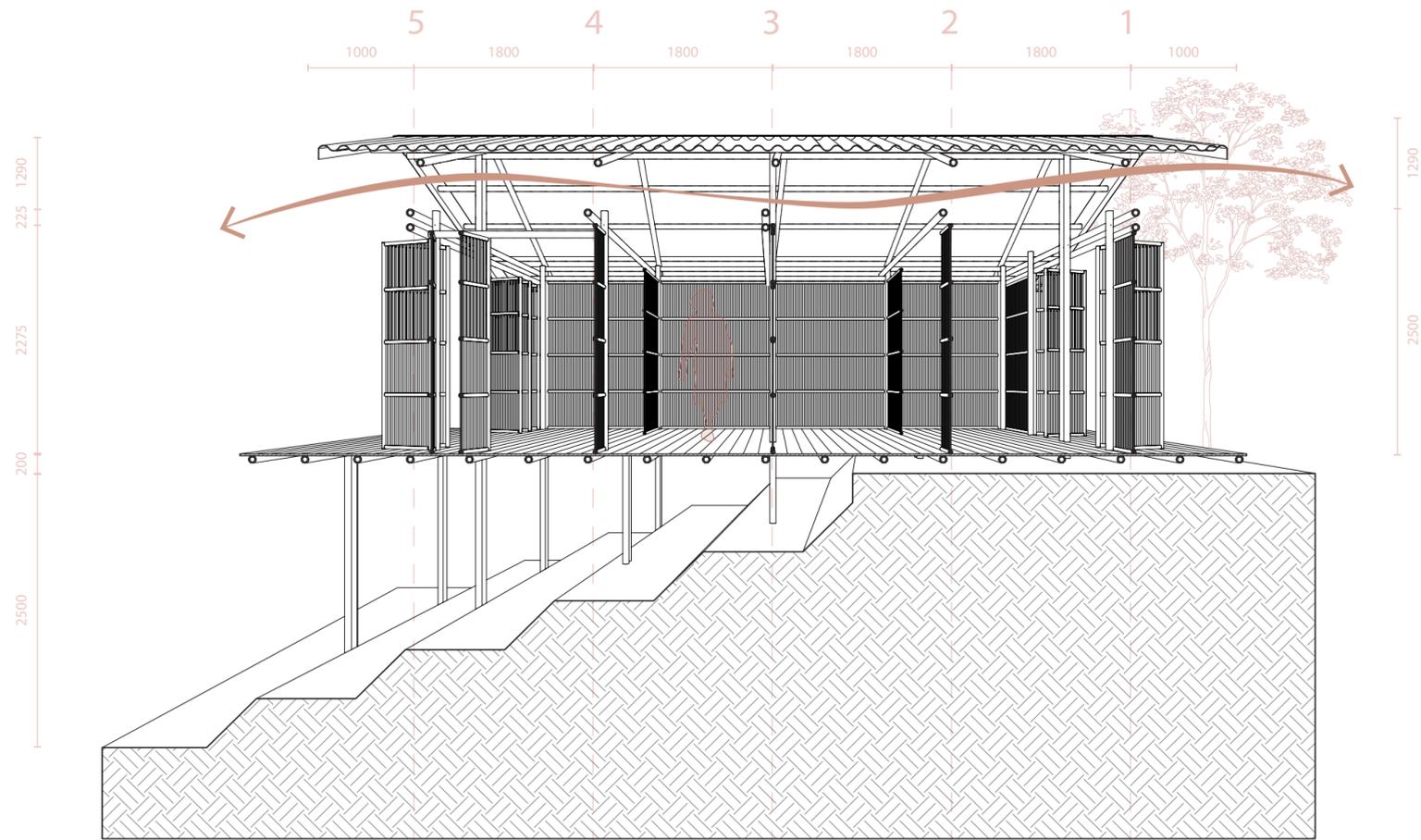
Sanitation is organized externally to reduce infrastructure complexity within the units. A shared toilet and shower block is centrally located within each cluster, serving three to four units. This modest sanitation facility helps consolidate plumbing and drainage while encouraging hygienic maintenance through collective responsibility.

The bamboo construction is expressive rather than hidden: joinery details, exposed framing, and the rhythmic repetition of poles lend the building a strong tectonic presence. Load-bearing members are spaced at regular intervals to accommodate prefabricated panel modules, ensuring ease of repair and future scalability. A raised floor system, elevated between +200mm and +700mm depending on terrain and flood risk, provides airflow beneath the structure.

Notably, the elevated form creates a shaded undercroft that becomes a valuable extension of daily life. This shaded space is used during the hottest hours of the day as a cool, ventilated area for rest and storage – reinforcing the unit's integration with its agrarian context.

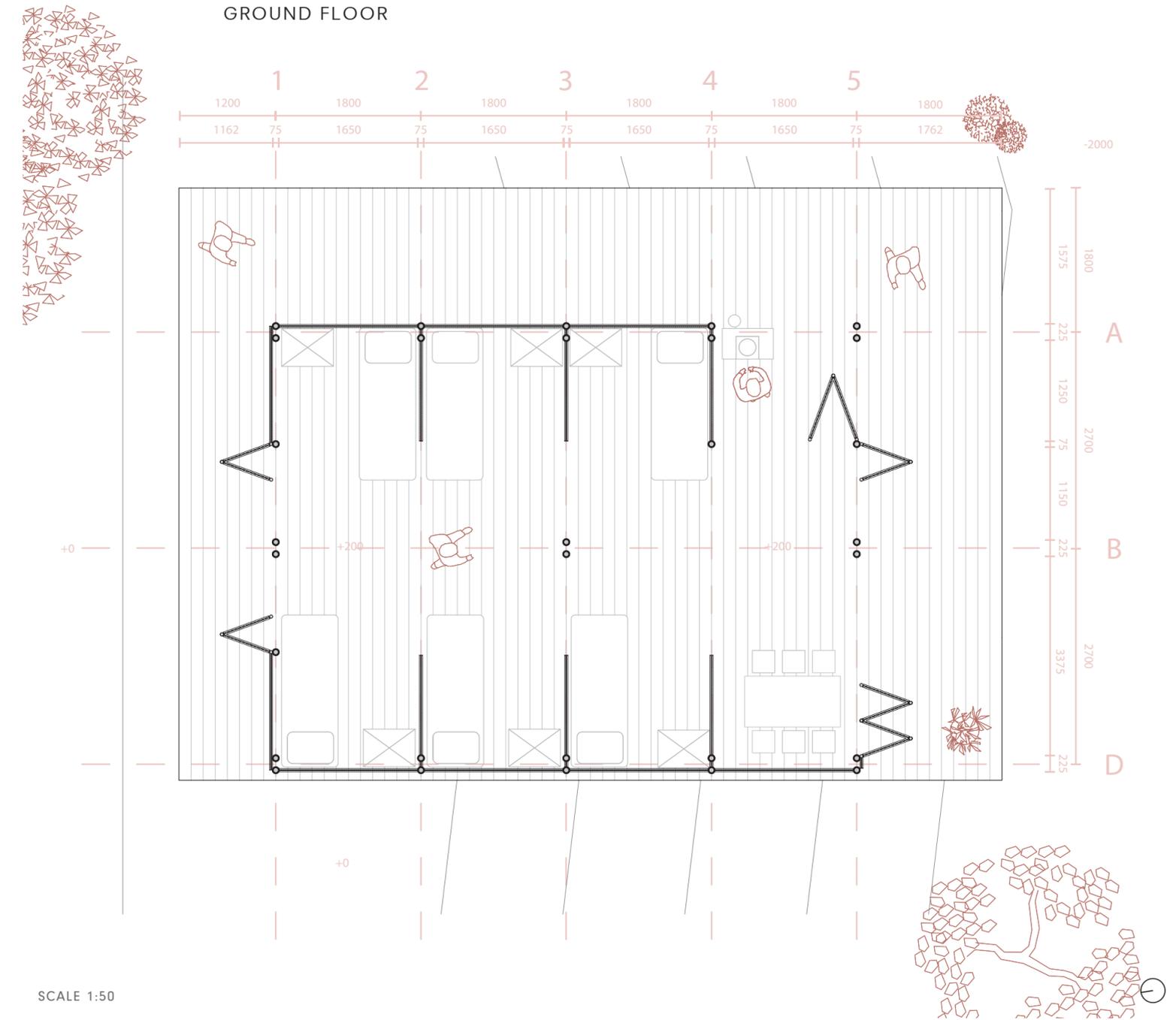
In both plan and section, the unit is direct, efficient, and resilient. Its collective structure, sustainable material logic, and modest yet intentional design reflect the project's broader ethos: building resilient foundations for thriving communities.

CROSS-SECTION UNIT A



SCALE 1:50

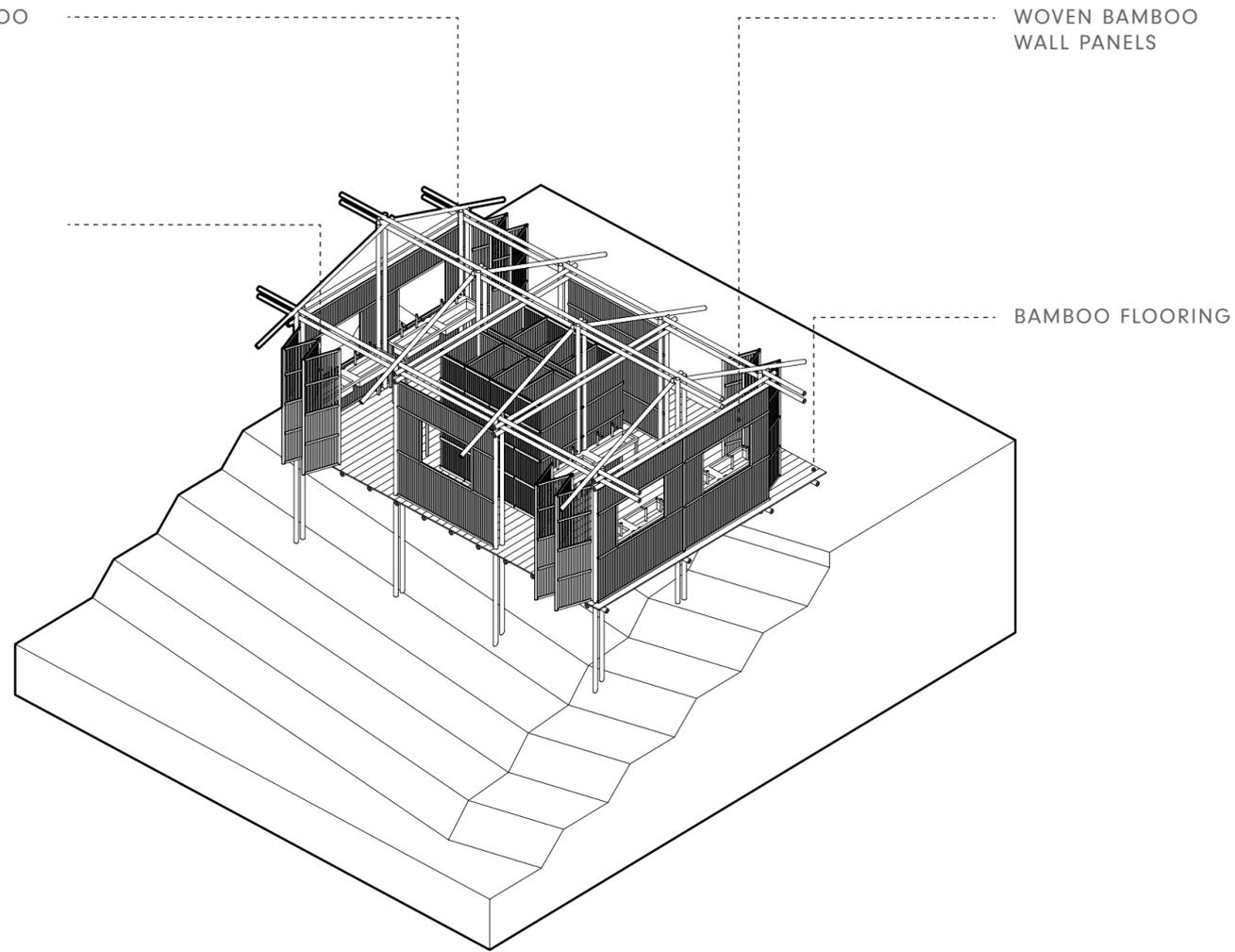
GROUND FLOOR



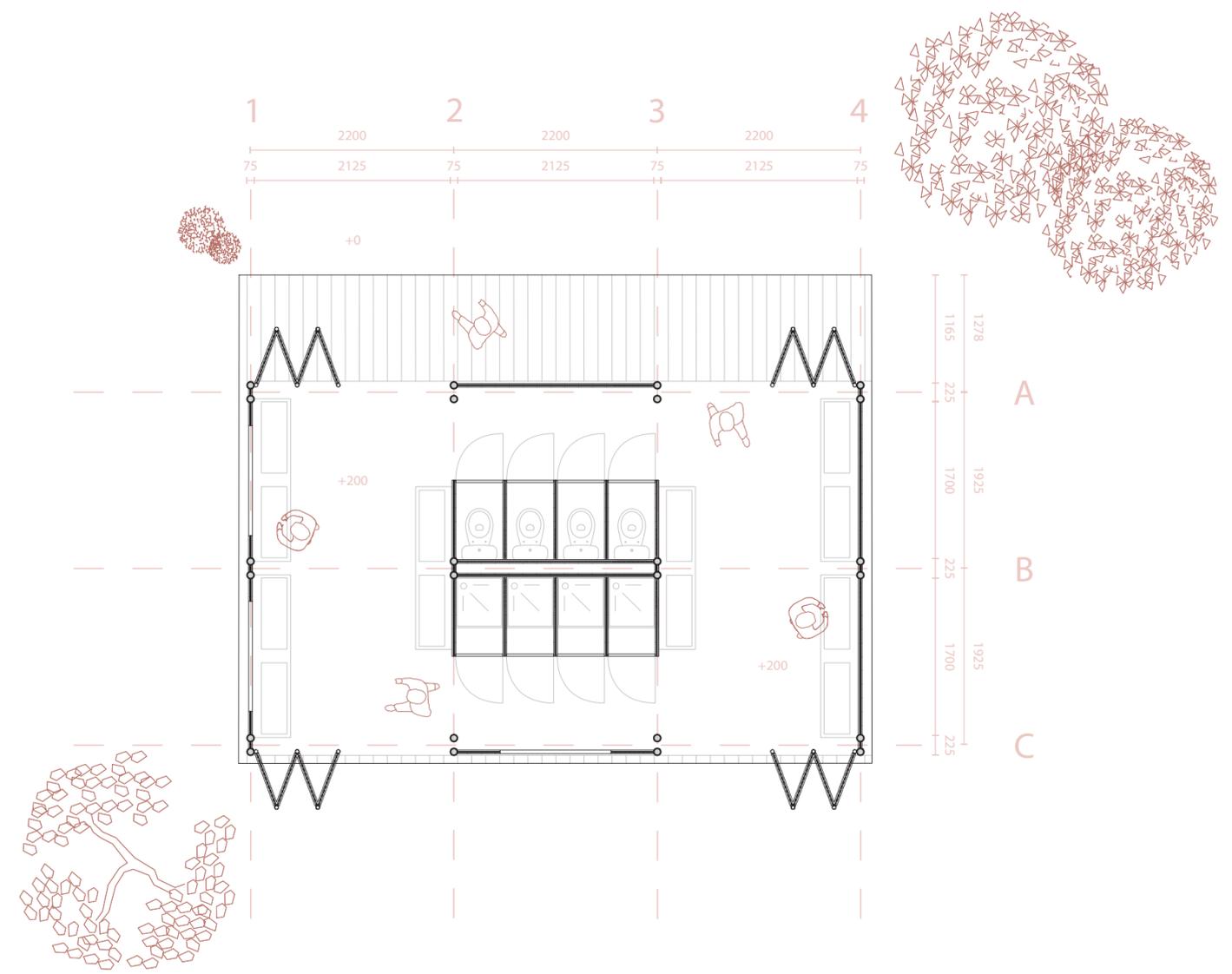
SCALE 1:50

LIGHTWEIGHT BAMBOO CONSTRUCTION

BAMBOO SLIDING PANELS

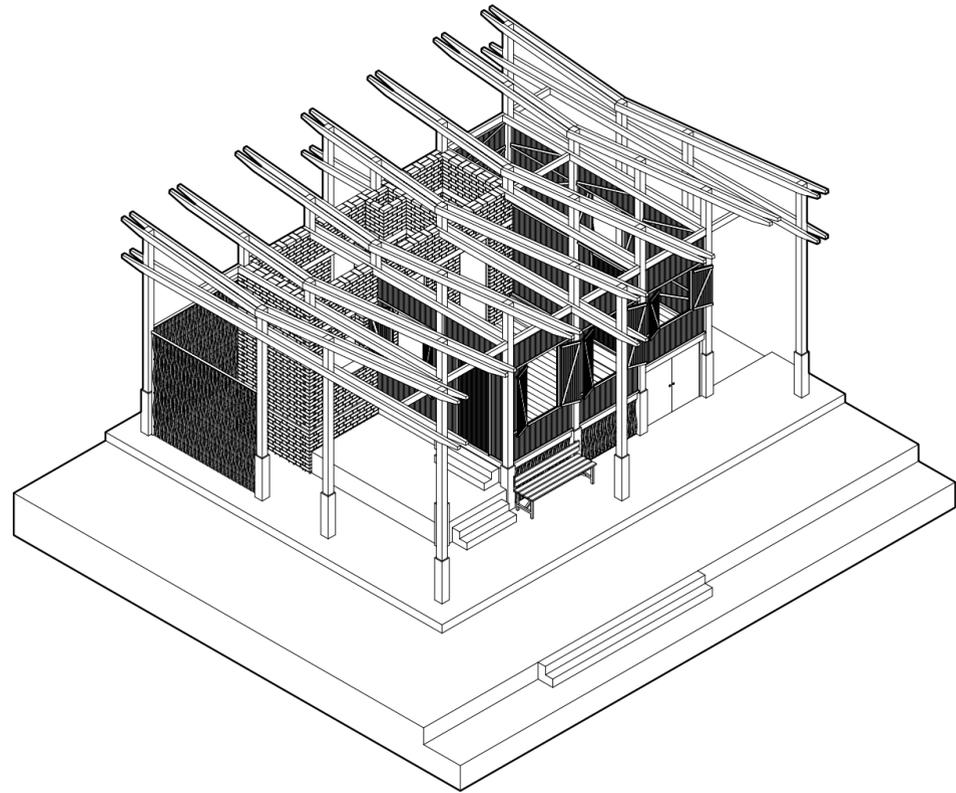


### GROUND FLOOR

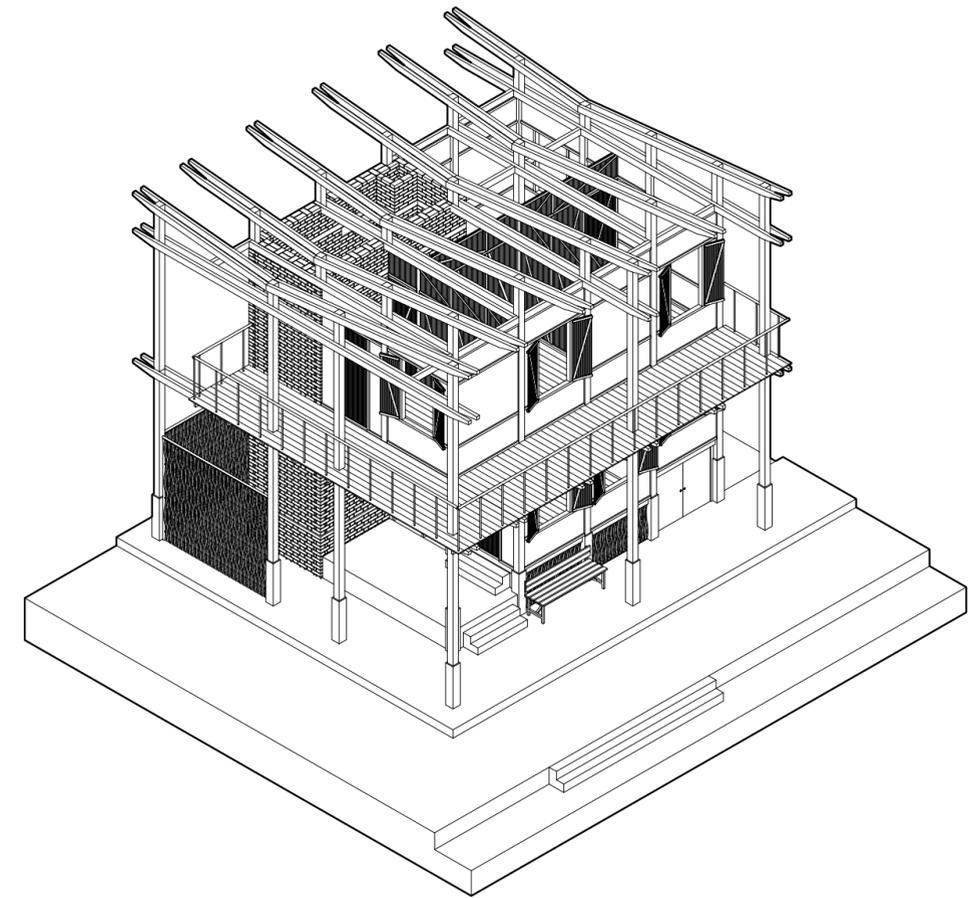


SCALE 1:50





**TYPE B - LOW INCOME**



**TYPE C - MID INCOME**

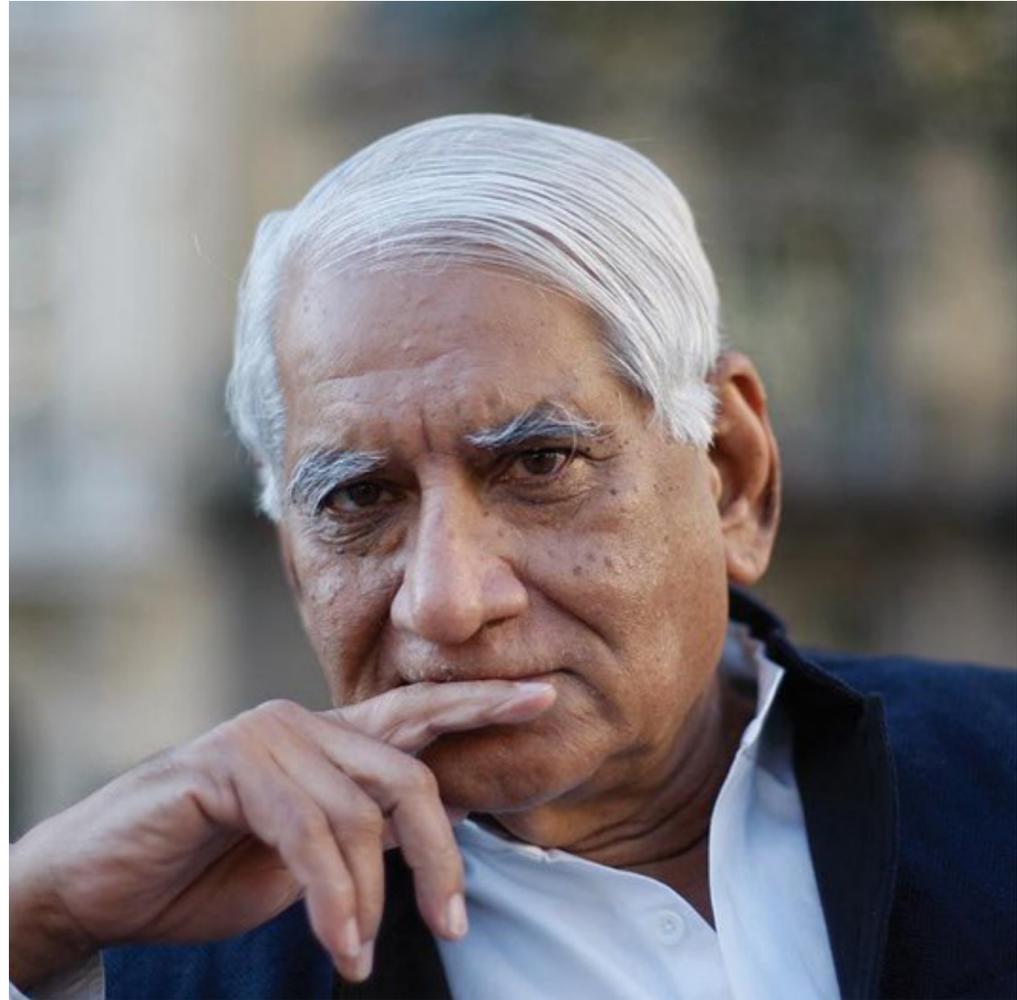
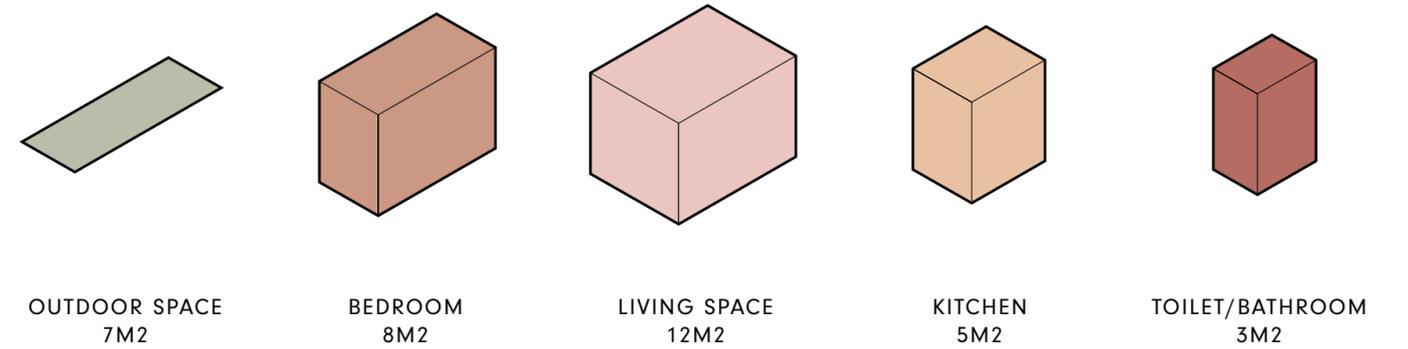
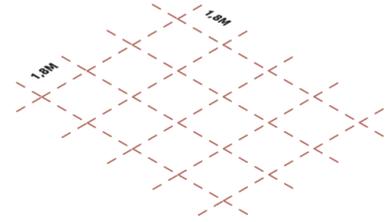


Figure 17: Portrait of Charles Correa (Okumus, 2025)

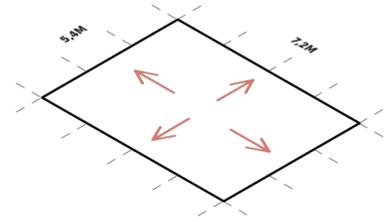
“A WELL-DESIGNED HOUSING UNIT, EVEN WITHIN A MODEST 25–30 SQUARE METERS, CAN INCORPORATE ALL THE BASIC AMENITIES—KITCHEN, TOILET, AND SLEEPING SPACES—WHEN INTELLIGENTLY PLANNED WITH EFFICIENCY AND DIGNITY IN MIND.”

- CHARLES CORREA, 1985 -

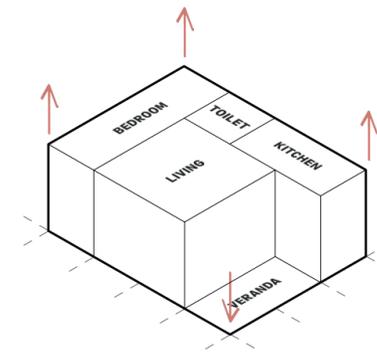




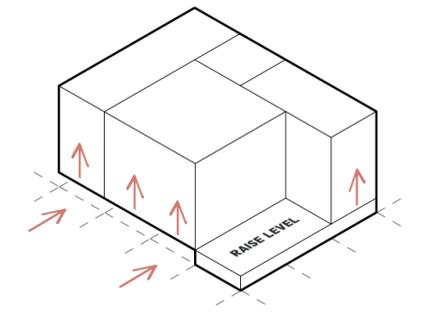
1. PLOTTING SMALL AND FLEXIBLE GRID



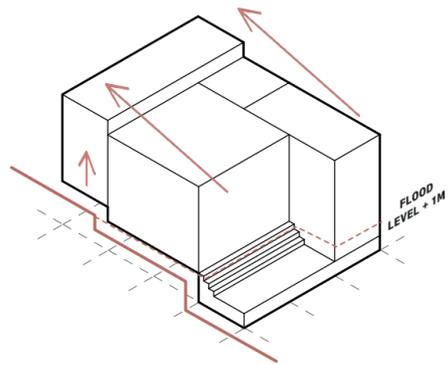
2. CREATING PLOT FOR LOW INCOME UNIT



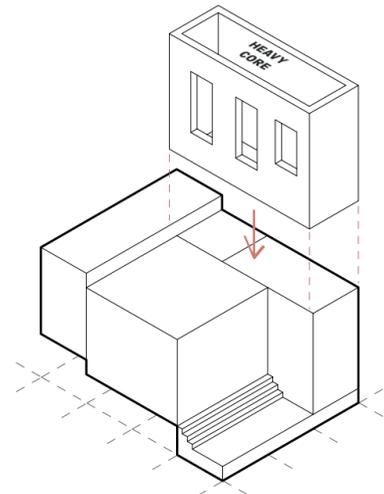
3. FUNCTION DETERMINATION ACCORDING TO PHILOSOPHY CHARLES CORREA



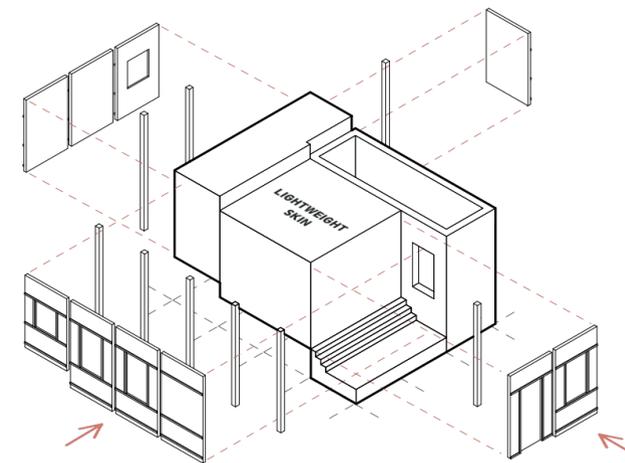
4. LIFTING FLOOR HEIGHT AND CREATING VERRANDA



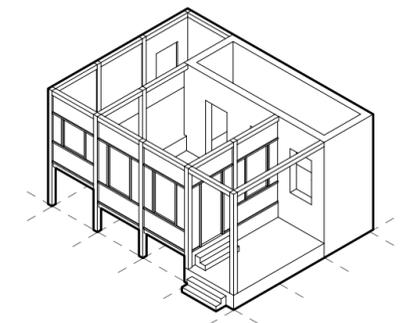
5. CREATE PROGRAMMATIC FLOOD HIERARCHY



6. ADDING HARD CORE FOR WET AREAS



7. PLACES LIGHTWEIGHT SKIN FOR VENTILATION



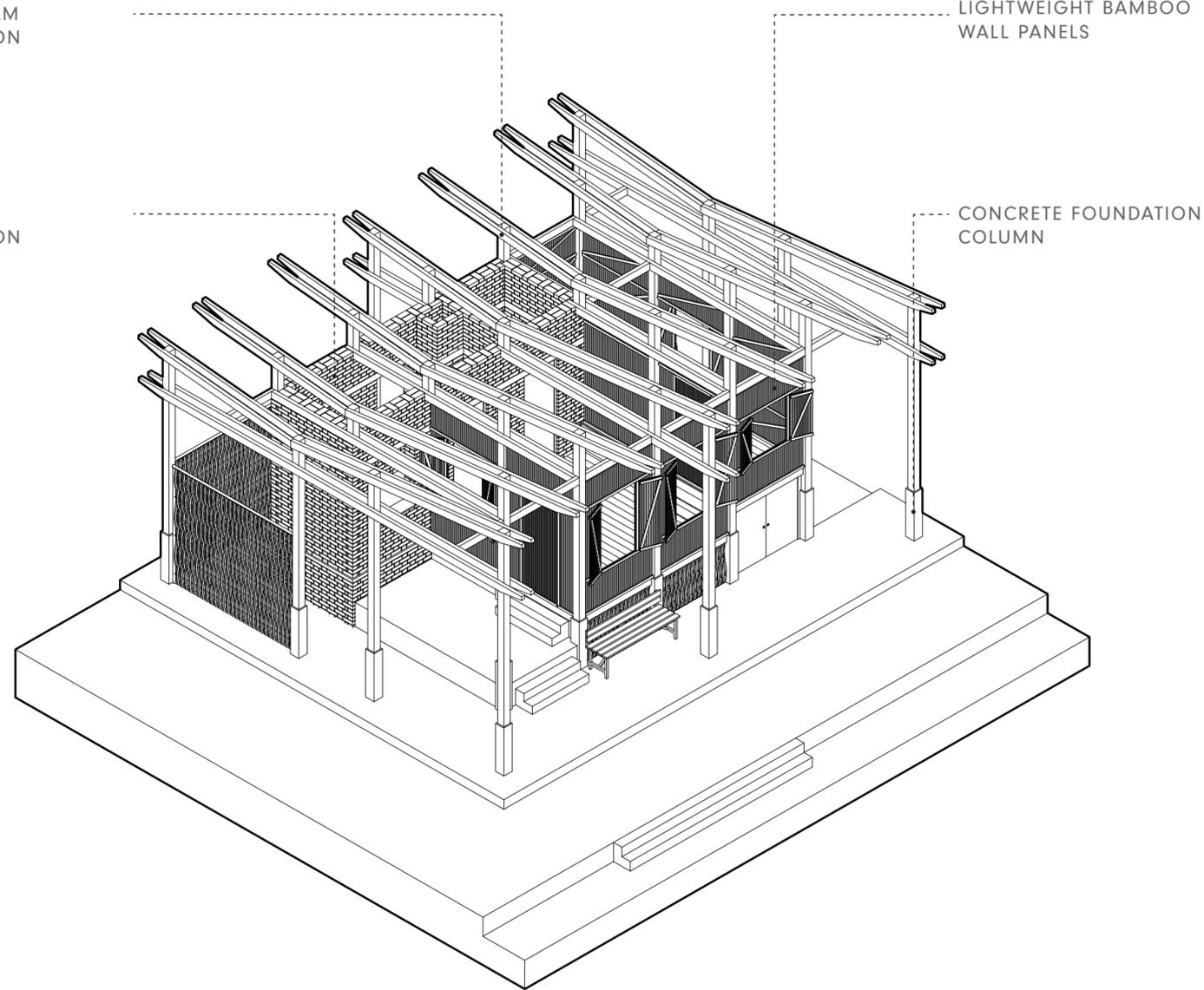
8. LINK TO IDENTITY OF BANGLA BATON

WOODEN BEAM  
CONSTRUCTION

BRICK CORE  
CONSTRUCTION

LIGHTWEIGHT BAMBOO  
WALL PANELS

CONCRETE FOUNDATION  
COLUMN



## TYPE B - HOUSING OF THE VILLAGER

Rooted in the architectural thinking of Charles Correa, the Type B unit embodies the belief that dignity in housing is not a question of scale, but of design intelligence and contextual sensitivity. As Correa articulated, even within 25–35m<sup>2</sup>, a unit can offer a complete and fulfilling living environment—so long as it is planned with clarity, climate sensitivity, and social relevance. The Type B design responds to this ethos by organizing spatial functions through a layered logic of core, shell, and skin, with attention to both structural resilience and daily comfort.

The 35m<sup>2</sup> unit is arranged around a robust brick core containing the toilet and bathroom. This 'hard core' offers watertightness and thermal mass, but also anchors the structure against climatic forces, lending long-term structural stability to the otherwise lightweight timber and bamboo construction. The wet core is placed on a raised plinth, ensuring that essential services remain protected above the rising flood line, which is expected to increase in the coming decades. Around this core, dry zones such as the kitchen, living area, and sleeping spaces unfold within a flexible modular grid – informed by Correa's principles of adaptable and climate-appropriate housing typologies.

Crucially, the design incorporates a programmatic flood hierarchy—a strategy derived from the Soe Ker Tie House case study in Noh Bo, Thailand—which informs the vertical arrangement of space. By elevating vital programmatic functions and assigning sacrificial roles to flood-exposed areas, the unit anticipates seasonal water levels without compromising dignity or functionality.

The façade features lightweight Bangla Baton infill panels, composed of woven bamboo. These panels are not only breathable and easily replaceable but also express cultural identity. Their textured patterns echo vernacular building traditions, enhancing both cross-ventilation and aesthetic value.

Supported by concrete foundation columns and framed with a wooden beam structure, the house is simple, robust, and contextually grounded. The shaded veranda, elevated floor, and layered envelope collectively produce a well-tempered and adaptive interior microclimate, aligned with the rhythms and risks of rural life in flood-prone Bangladesh.

## BUILDING PROCES

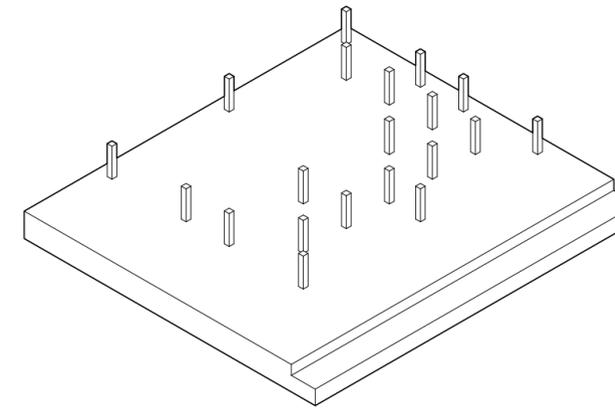
The construction sequence is guided by a clear architectural logic that responds directly to the physical and social conditions of flood-prone rural Bangladesh. It aims to create durable, climate-adaptive homes that can be assembled using locally available materials and skills. The process balances permanence and adaptability, combining a flood-resilient foundation and structural core with a lightweight, breathable skin. By prioritizing modularity and staged construction, the method facilitates maintenance, replication, and future growth.

The process begins with the installation of reinforced concrete column footings, which elevate the entire structure above seasonal flood levels and provide a stable base. The intermediate spaces are backfilled with a mix of gravel waste, sand, and recycled brick bats, forming a permeable and cost-effective subbase that reduces erosion and promotes drainage. Around this fill, a low brick perimeter wall defines the platform edge and supports the raised ground floor.

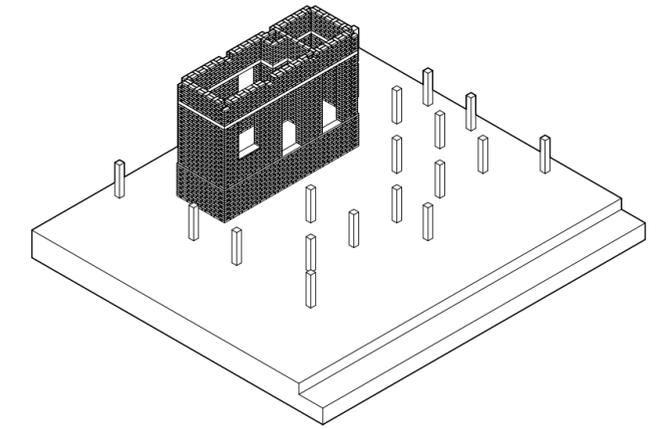
Central to the structure is a brick masonry core, which contains the kitchen and wet areas. This core introduces thermal mass, water resistance, and lateral stability to the overall composition. Above the compacted fill, a cement screed is poured to create a dry, level plinth, ensuring long-term durability and ease of cleaning in high-humidity conditions.

With the base secured, timber columns are fixed onto the concrete foundation pads, followed by the assembly of wooden beams and floor decking. These elements are lightweight, easy to install, and locally sourced. The roof structure, formed from timber rafters, is finished with corrugated steel sheeting, chosen for its affordability, weather resistance, and effective rainwater runoff.

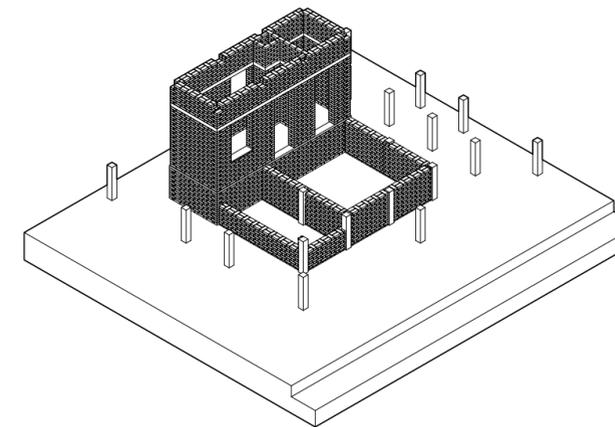
The building is enclosed with woven bamboo façade panels, which are modular, well-ventilated, and replaceable—offering both climatic comfort and a connection to local craft traditions. Interior partitions are then added to delineate rooms and shared spaces. In the final phase, residents are encouraged to personalize their units with built-in furniture, surface treatments, or external shading, fostering a sense of ownership and belonging. This user-driven adaptability is fundamental to the building system, reinforcing resilience not only in structure, but in community life.



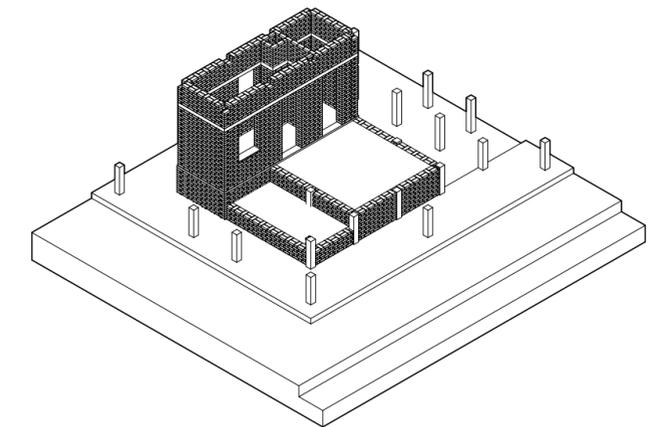
1. CREATE CONCRETE COLUMN FOUNDATION



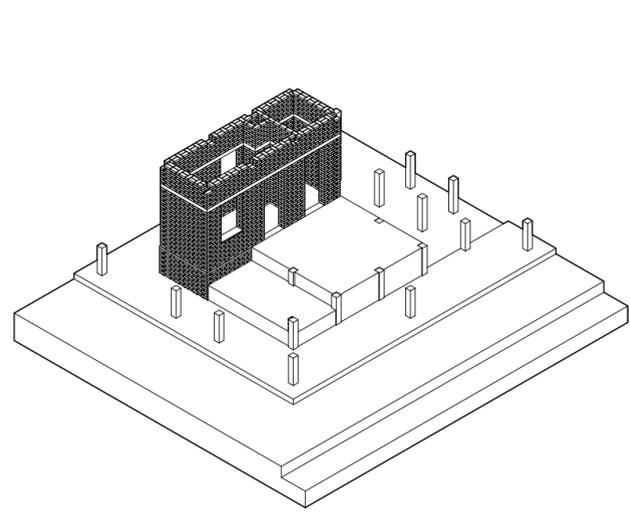
2. MASONRY OF FIRED BRICK CORE



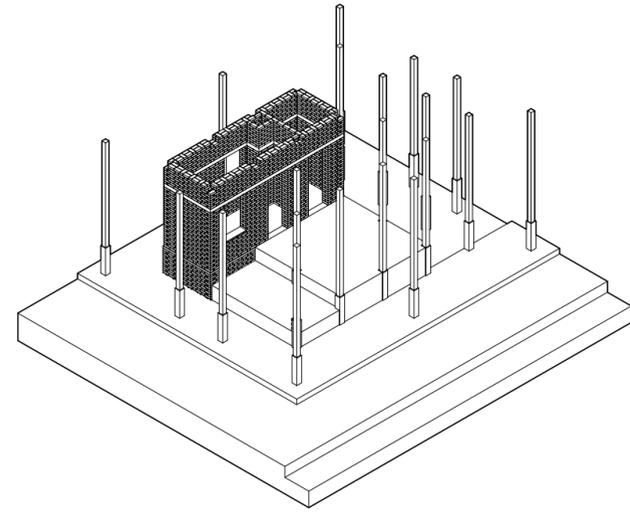
3. BRICK WALL FOR FLOOR CONSTRUCTION



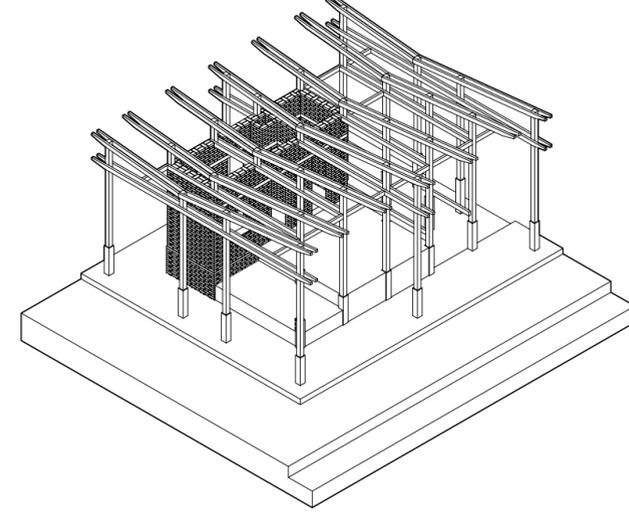
4. BACKFILLING WITH GRAVEL WASTE, BRICK BATS AND SAND



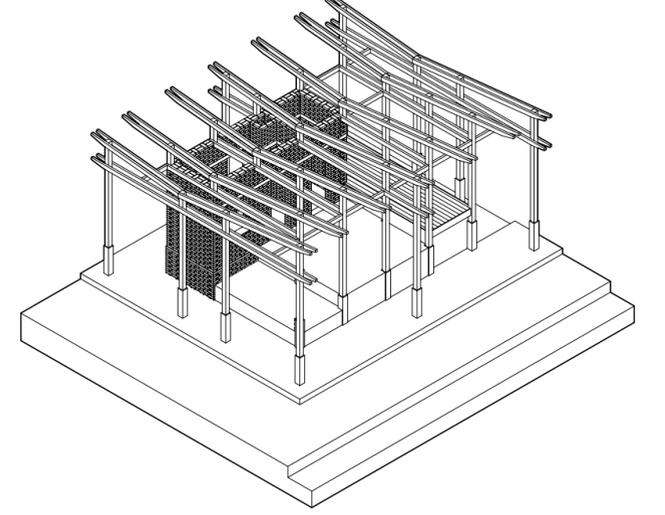
5. FINISH FLOOR WITH CONCRETE CEMENT LAYER



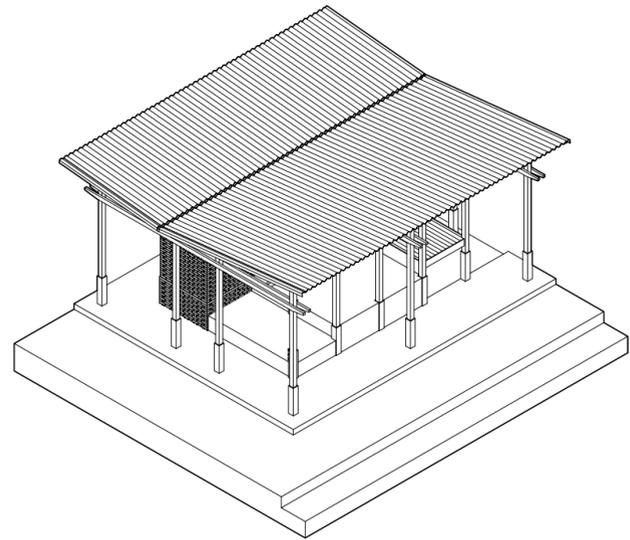
6. FIXING WOODEN COLUMNS ON CONCRETE FOUNDATION



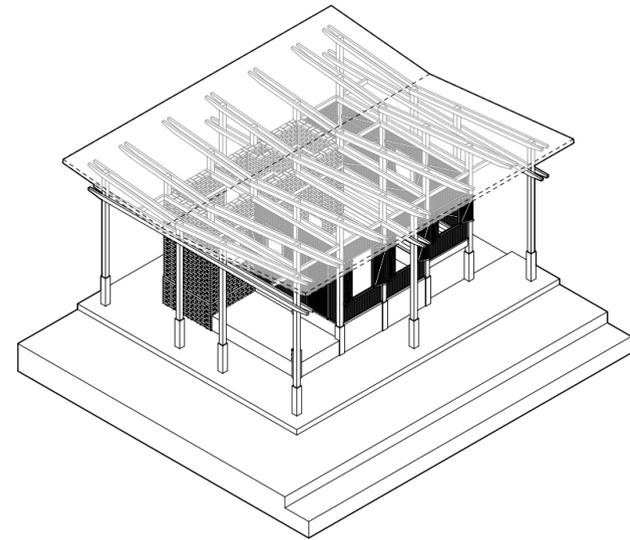
7. COMPLETE WOODEN BEAM CONSTRUCTION FOR ROOFSTRUCTURE



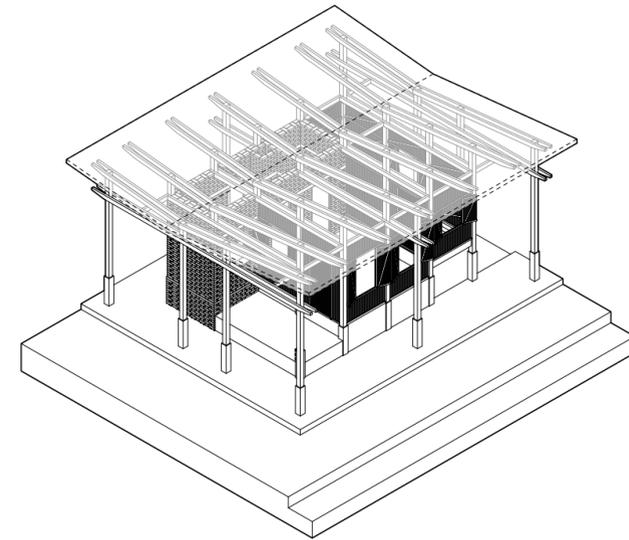
8. FIXING WOODEN FLOORING TO STRUCTURE



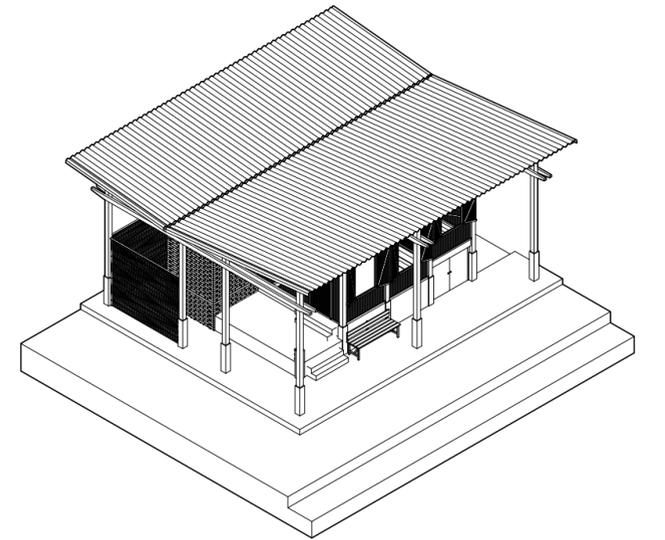
9. FIXING CORRUGATED STEEL ROOF



10. INSTALLATION OF BAMBOO WALL PANELS



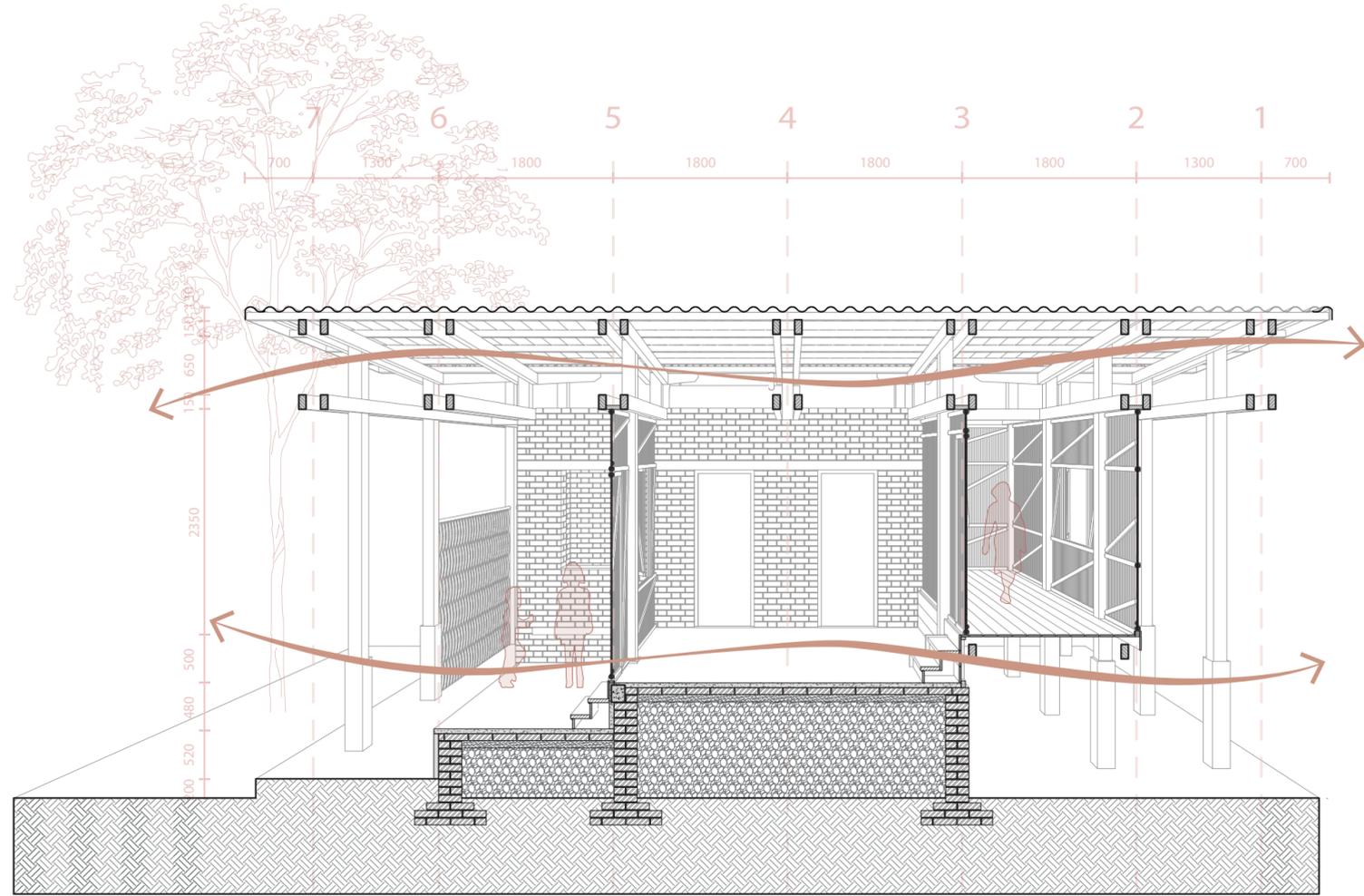
11. FINISH LAYOUT WITH PARTITION WALLS



12. PERSONALISATION OF USER

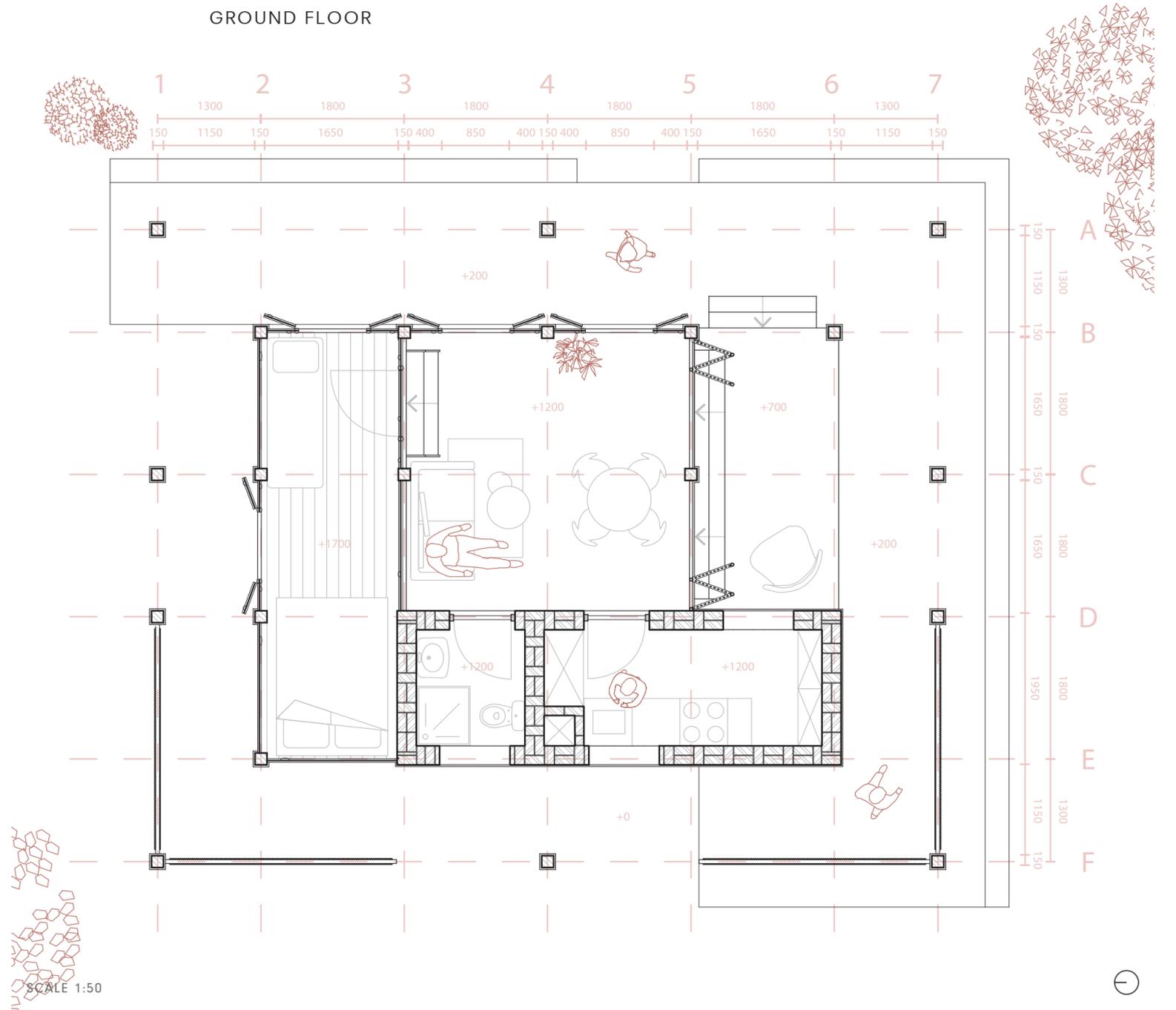


CROSS-SECTION UNIT B

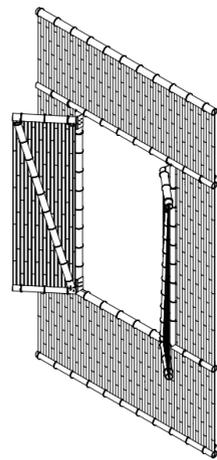


SCALE 1:50

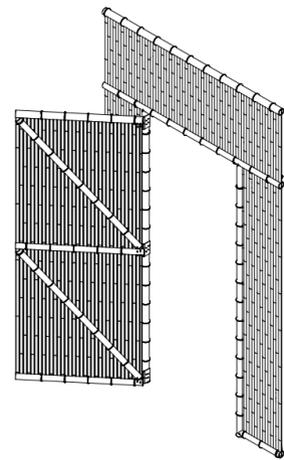
GROUND FLOOR



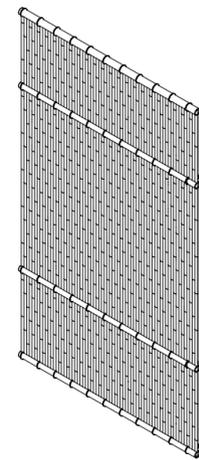
SCALE 1:50



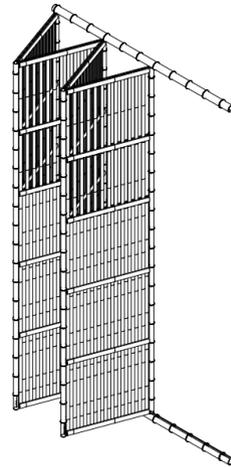
1. WINDOW PANEL  
BAMBOO



2. DOOR PANEL  
BAMBOO



3. CLOSED PANEL  
BAMBOO



4. FOLDING PANEL  
BAMBOO

## MODULAR SYSTEM

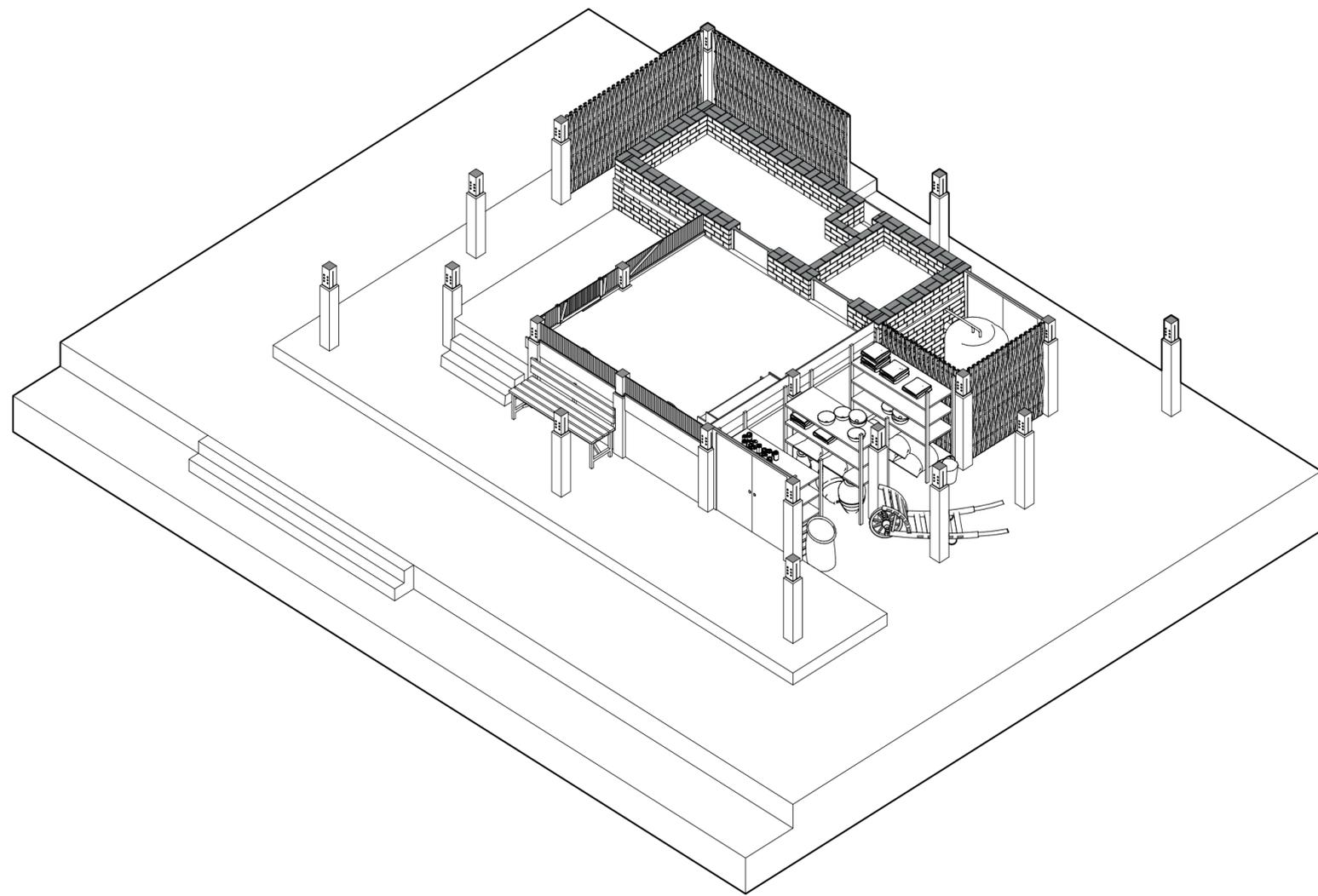
The modular façade system plays a central role in enhancing the adaptability, affordability, and self-sufficiency of the housing units. It consists of a standardized set of interchangeable bamboo panels—window, door, closed, and folding panels—that can be arranged in various configurations according to the specific spatial and climatic needs of each household. These panels are not fixed in a rigid pattern but are instead integrated into a flexible timber frame, enabling residents to determine where openings for ventilation, daylight, and views should be placed.

During the construction phase, future inhabitants are engaged in hands-on workshops where they learn how to assemble, maintain, and reproduce these façade modules. This participatory approach reduces long-term dependency on external builders and supports the development of local skills and agency. As a result, households gain not only the ability to repair or replace damaged panels but also the knowledge to adapt their dwellings over time—adding or rearranging openings, upgrading enclosures, or even expanding the structure incrementally.

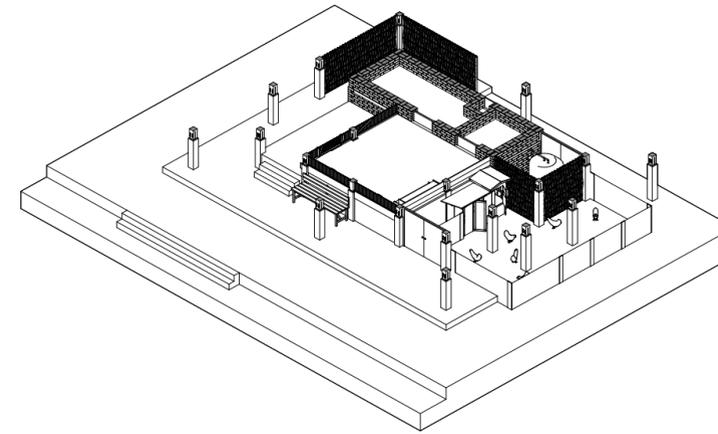
The modularity of the façade system facilitates individual expression and phased growth. For instance, families can initially close off unused spaces with fixed panels and later convert them into openings or extensions as resources or household needs evolve. This dynamic framework respects both economic constraints and cultural practices, while promoting environmental responsiveness through cross-ventilation and shading.

The elevated floor design further supports this flexibility. By lifting the living platform above the floodplain, a shaded undercroft is created that serves as a multifunctional extension of the home. This space is intentionally left open and adaptable, allowing for a variety of mobile, low-cost uses such as livestock shelters, drying racks, firewood storage, workshops, or tool storage. All of these functions are selected for their ease of relocation in anticipation of flooding events, making the space both practical and resilient.

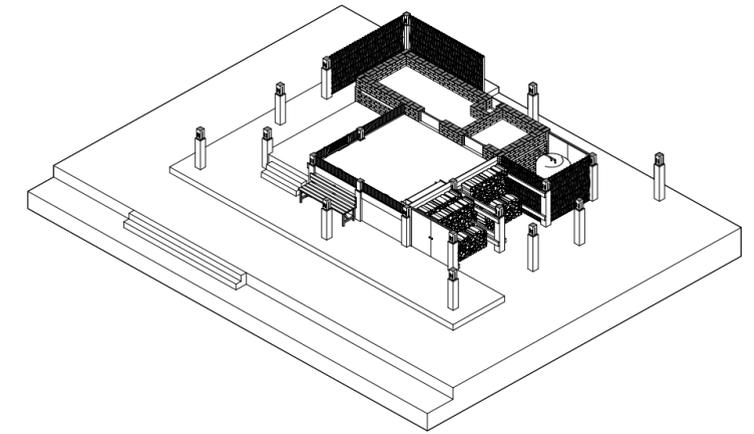
Together, the modular façade and elevated ground floor form a coherent system that integrates climate adaptation, spatial freedom, and community empowerment. It allows architecture to move beyond fixed typologies, embracing a logic of open-ended use and local stewardship as the foundation for dignified, flood-resilient living.



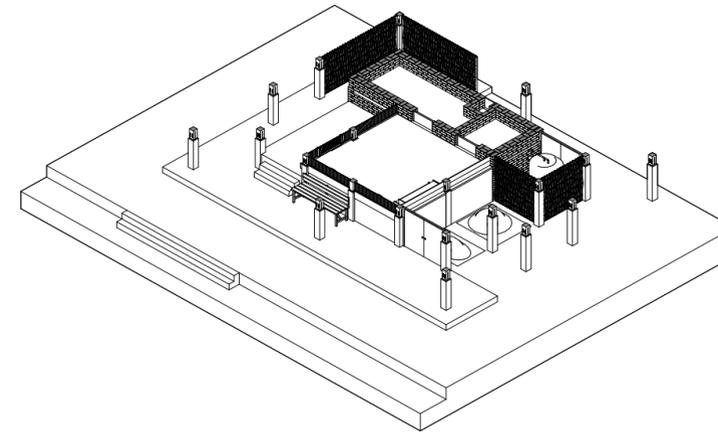
**STORAGE OF RESOURCES**



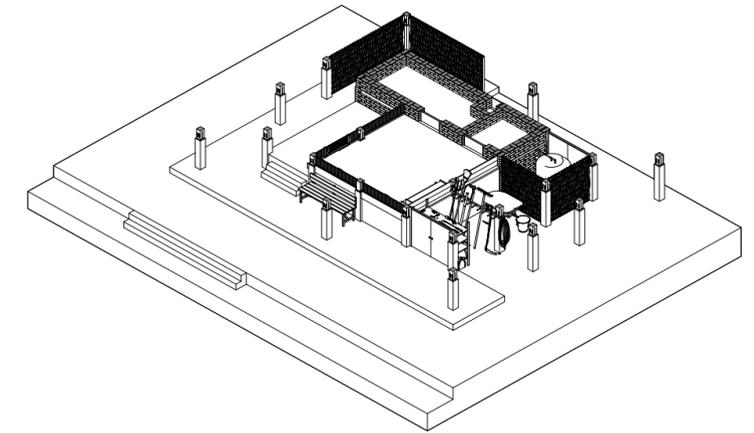
LIVESTOCK SHELTER



FIREWOOD STORAGE



DRYING SPACE

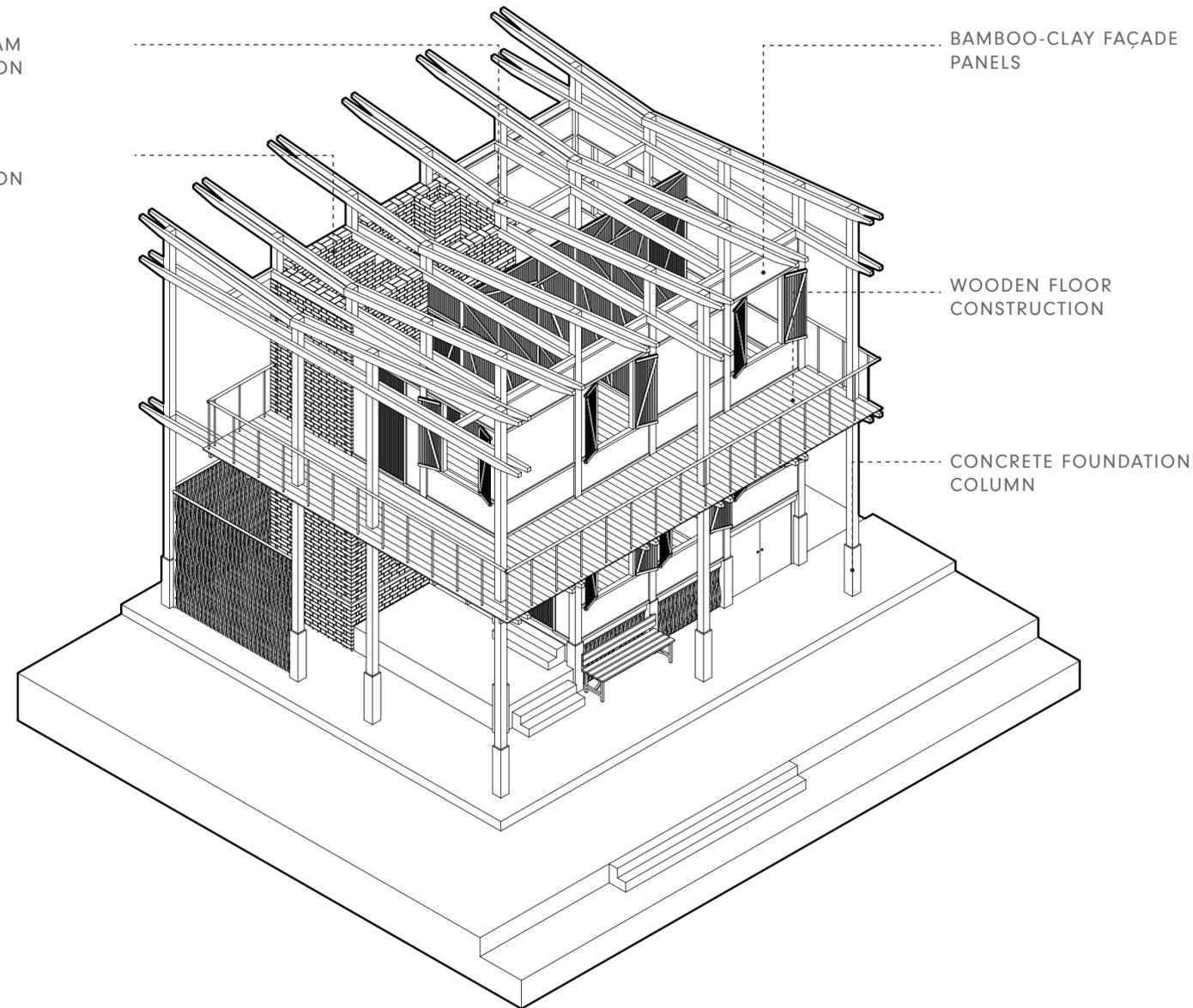


WORKSHOP AND TOOL STORAGE



WOODEN BEAM  
CONSTRUCTION

BRICK CORE  
CONSTRUCTION



BAMBOO-CLAY FAÇADE  
PANELS

WOODEN FLOOR  
CONSTRUCTION

CONCRETE FOUNDATION  
COLUMN

## TYPE C - HOUSING OF VILLAGERS AND NEWCOMERS

Unit C marks a significant step in spatial capacity and living quality, designed for middle-income families and upwardly mobile households. Its defining feature is the inclusion of a second storey, which not only doubles the usable floor area but also introduces possibilities for layered occupation, phased expansion, and intergenerational living. This vertical extension offers greater autonomy within families and enhances long-term adaptability—qualities that are absent in the more compact Unit A and B types.

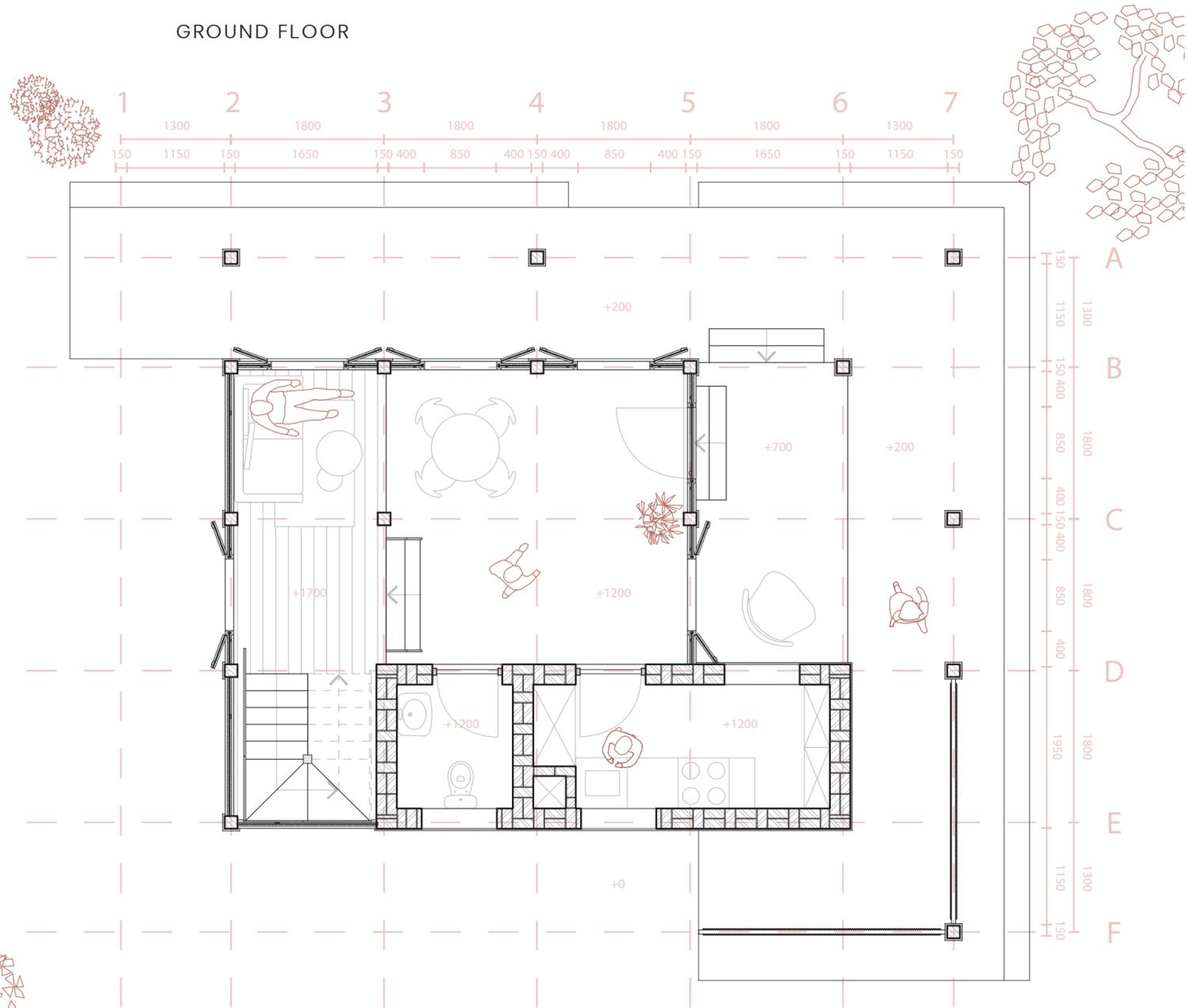
The unit is organized around a familiar brick core, yet distinguishes itself through duplicated service potential. An upper-level core can be activated when needed, enabling households to install a second kitchen and sanitary facilities, particularly when dividing the unit for extended family use. This is supported by the potential integration of external staircases, positioned at the periphery, allowing the two floors to function independently when desired.

While earlier units rely on woven bamboo facades, Unit C introduces bamboo-clay composite panels, offering improved insulation, greater durability, and a more refined aesthetic. These panels remain modular and interchangeable, preserving the principle of user-customized elevation design. Residents can continue to determine where and how to open the building envelope—adding folding panels to animate the façade, or adjusting shuttered openings in response to seasonal variations.

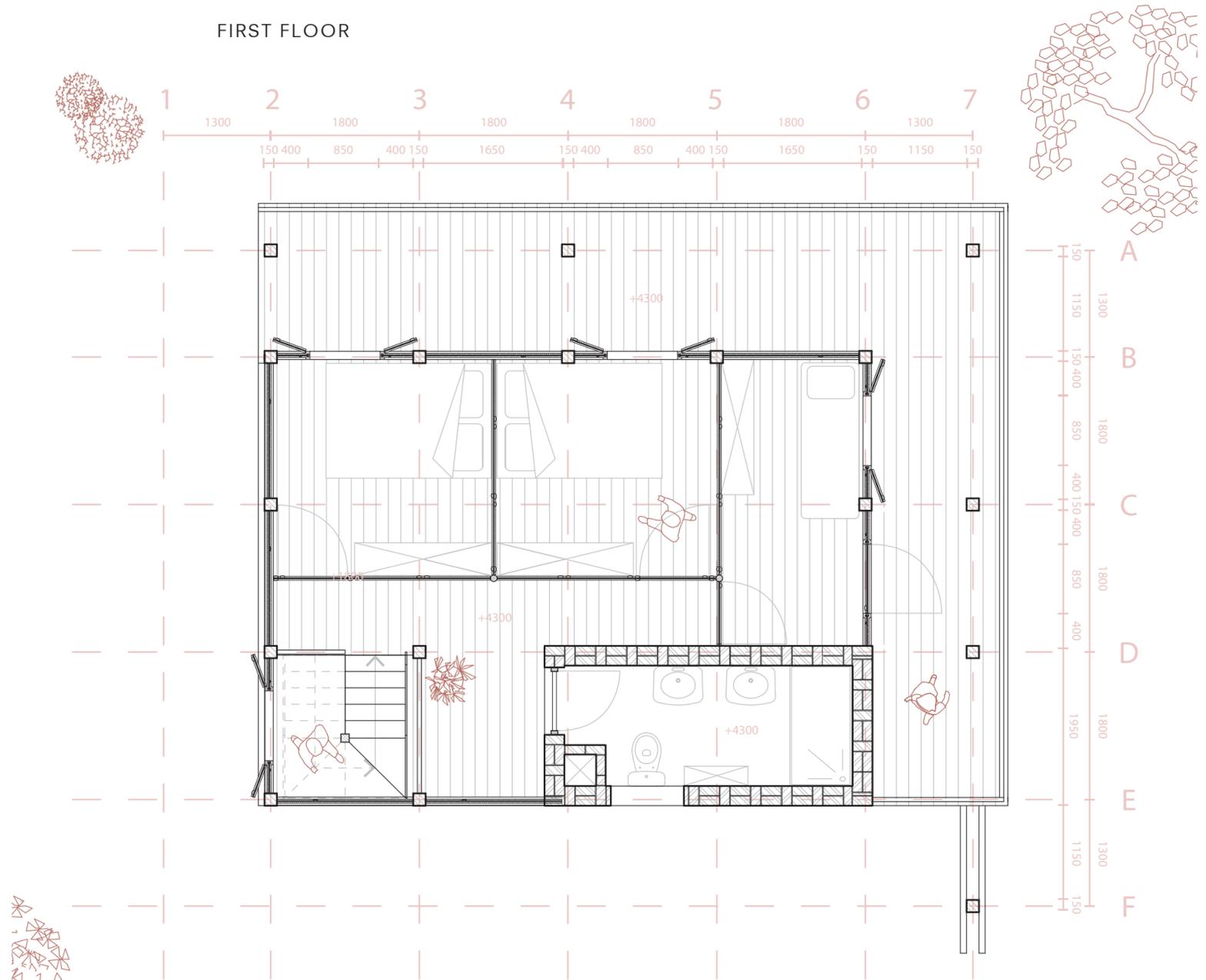
The expanded floor area also allows for more nuanced zoning—dividing spaces not just by function, but by time of use, gender, or privacy level. This supports a richer domestic life, including study areas, workspaces, and indoor-outdoor transitions, all within the same grid logic. The generous shaded space beneath the elevated ground floor becomes more than utilitarian: it can support small-scale enterprises, social gatherings, or semi-public functions, reinforcing the unit's civic dimension.

Moreover, Unit C anticipates future growth—not just physically, but socially. Its layered structure and enhanced material palette offer a symbolic and practical upgrade, reinforcing identity and pride of place for families on the threshold between rural tradition and economic mobility. It does not just shelter, but enables thriving.

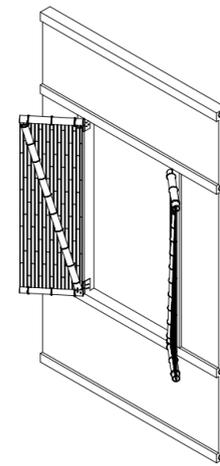
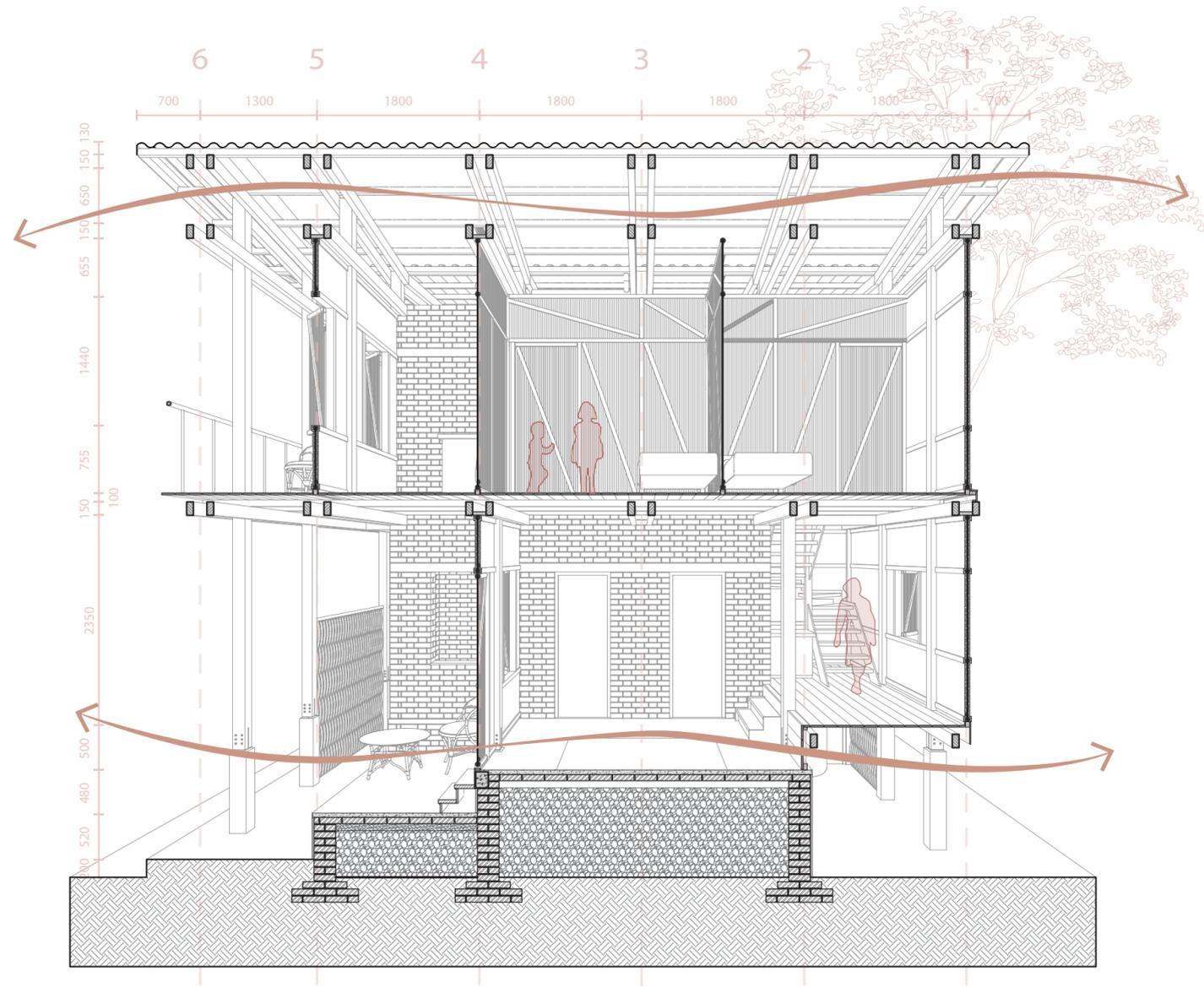
GROUND FLOOR



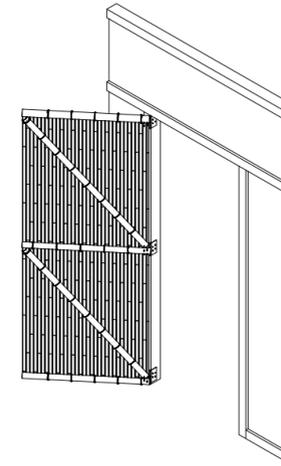
FIRST FLOOR



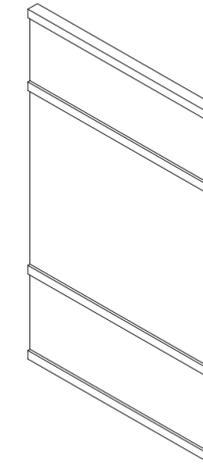
CROSS-SECTION UNIT C



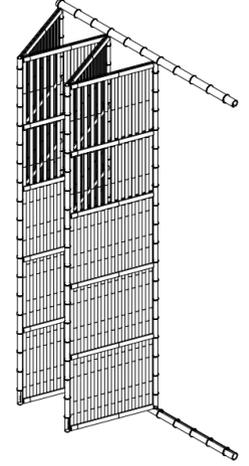
1. WINDOW PANEL CLAY



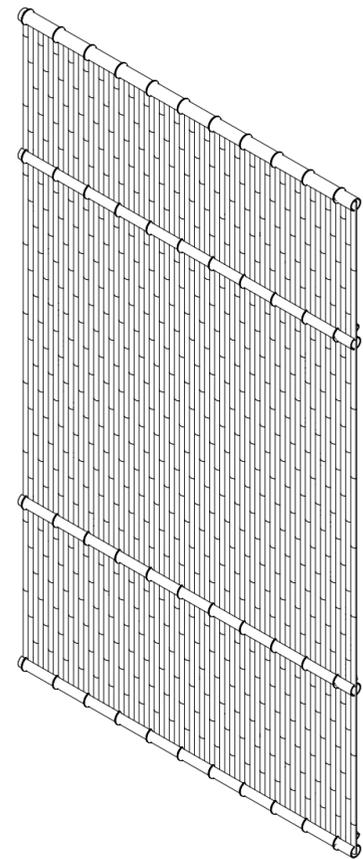
2. DOOR PANEL CLAY



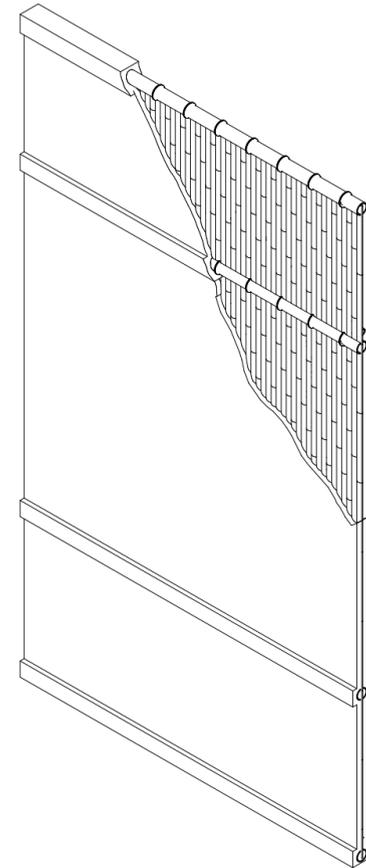
3. CLOSED PANEL CLAY



4. FOLDING PANEL CLAY



START WITH BASIC BAMBOO ELEMENT



UPGRADE OVER TIME TO CLAY FINISH

## IMPROVEMENT OVER TIME

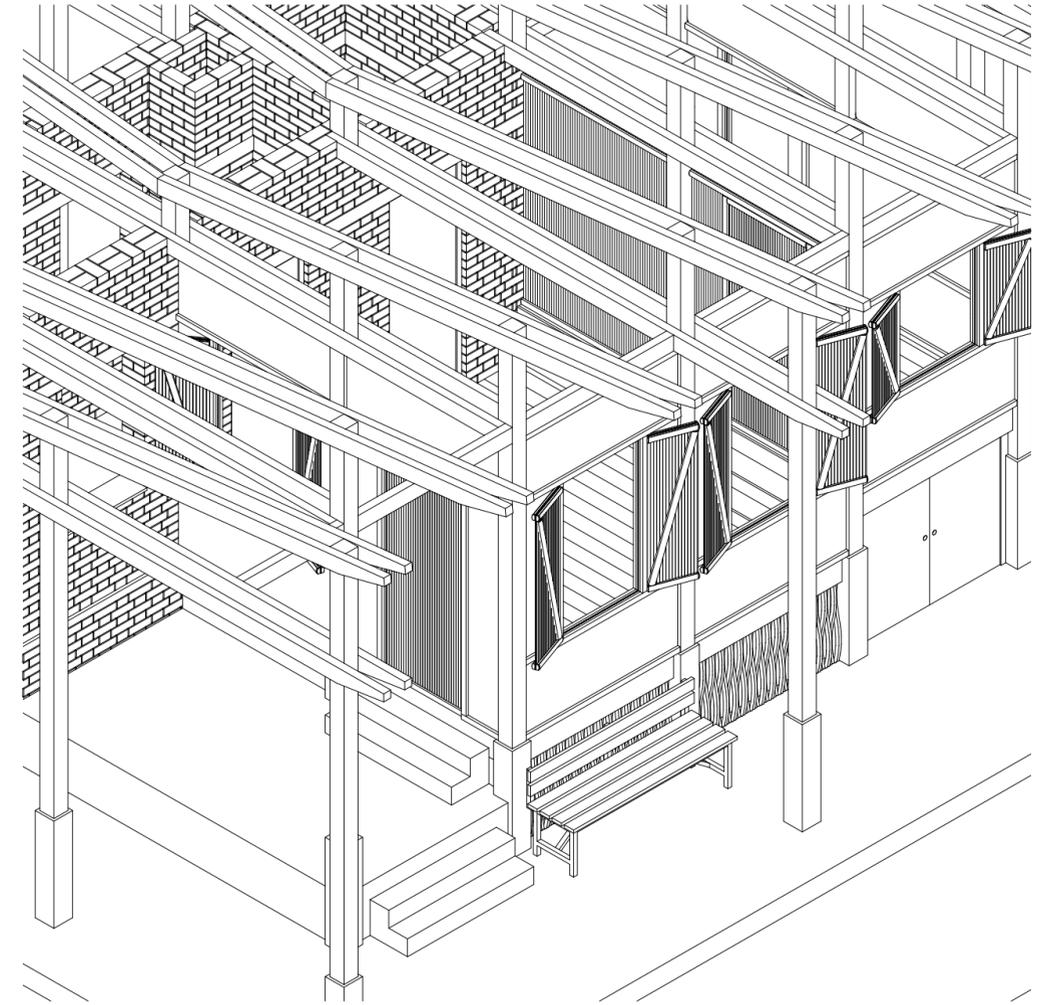
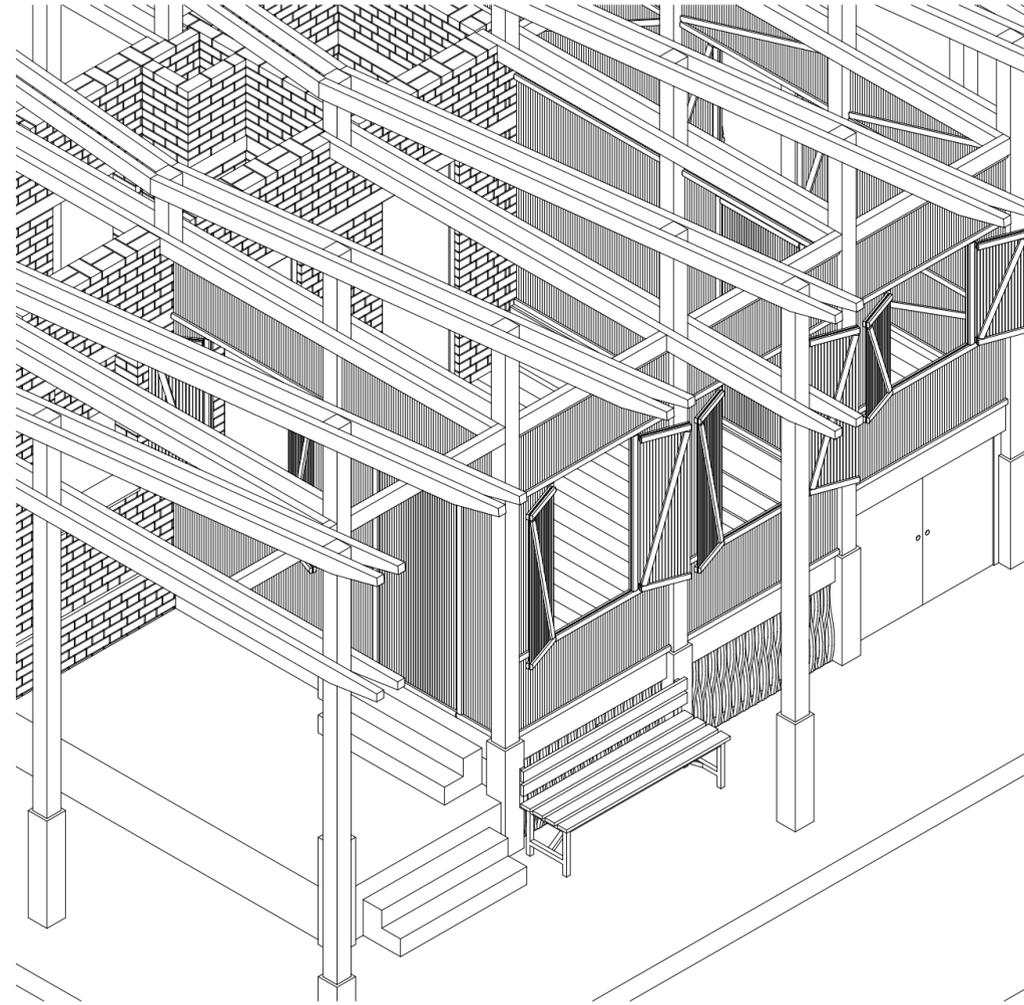
The housing system has been designed to allow for incremental upgrading, enabling residents to adapt their homes as their financial means and household needs evolve. This approach is particularly significant for lower-income families, who may initially begin with a basic configuration but retain the capacity to improve their dwelling over time without relying on external interventions.

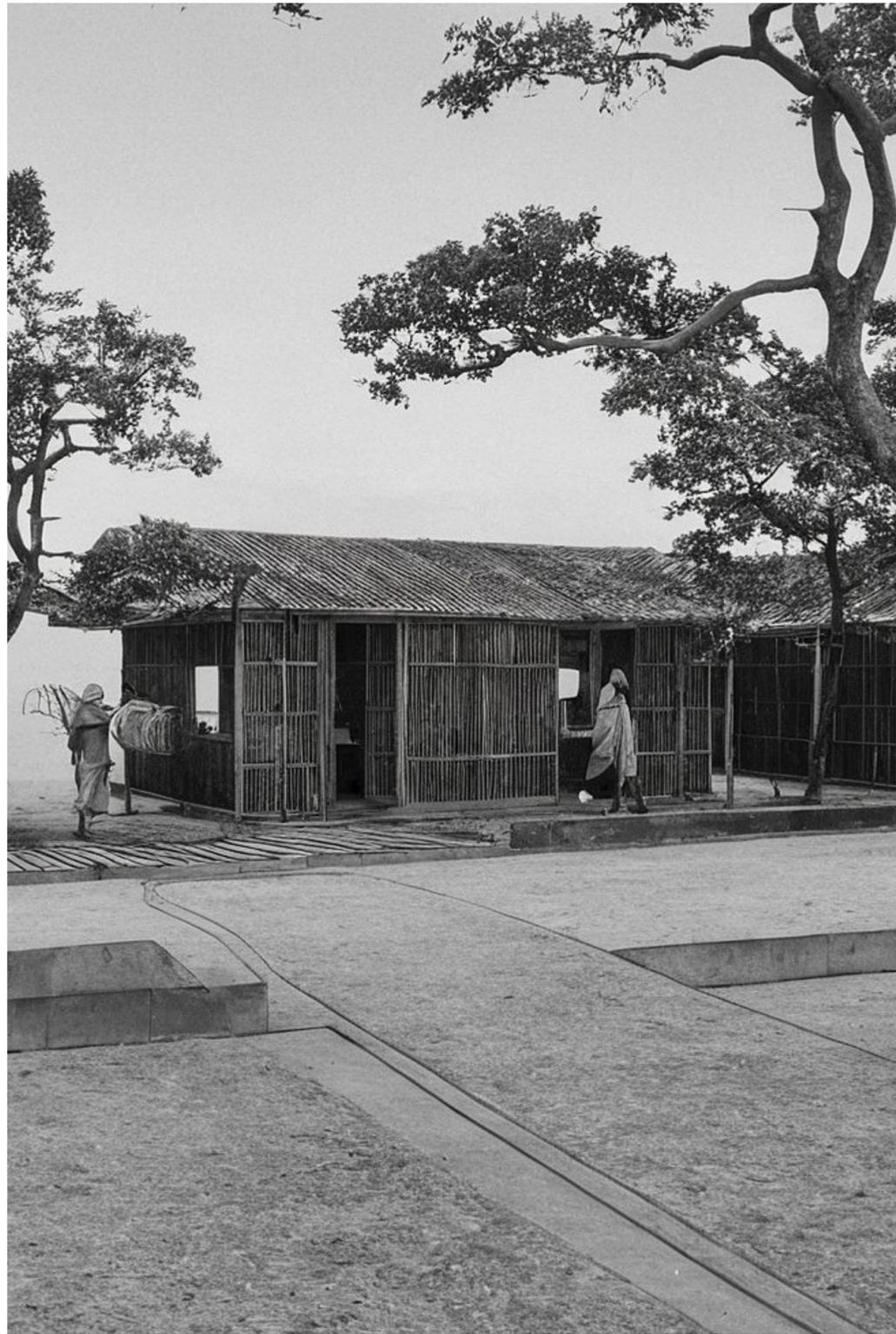
A key mechanism for this flexibility is the modular façade panel system, which consists of standardized bamboo panels—window, door, closed, and folding types—that can be placed freely within a structural timber grid. These panels are affordable and easy to produce, making them accessible to households at the point of first construction. Importantly, they are also designed to be upgradable: over time, residents are encouraged to replace the bamboo with clay-reinforced panels, improving insulation, robustness, and long-term durability.

This upgrading process is supported through on-site training during construction, where residents learn how to prepare and apply clay finishes to existing modules. This knowledge transfer not only builds technical capacity within the community but reduces long-term maintenance costs and strengthens residents' sense of ownership.

In addition to horizontal adaptability, the system supports vertical expansion. The structural logic anticipates the possibility of adding a second storey by dismantling the roof and building upward. This can be implemented when families grow, or when separate living quarters—for example, for a son's family—are required. A second kitchen can be placed within a newly constructed upper-level core, and an external staircase can be introduced for independent access.

The flexibility of the floor plan and façade allows residents to control spatial divisions, climatic responses, and the overall character of their home. These built-in options ensure that the architecture is not static, but capable of responding to time, growth, and aspiration—an essential quality for any housing system serving dynamic and resource-constrained communities.





# 08

## BUILDING TECHNOLOGY

### ADAPTABLE BUILDING PARTS

The building technology strategy for Shonatola Village is designed to address the climatic, economic, and material realities of a flood-prone rural region. It brings together low-tech, locally sourced, and context-sensitive construction methods with ecological infrastructure systems to create housing that is resilient, adaptable, affordable, and grounded in community self-reliance. Each component of the system is carefully integrated to respond to seasonal variability, ensure long-term durability, and promote local ownership of the built environment.

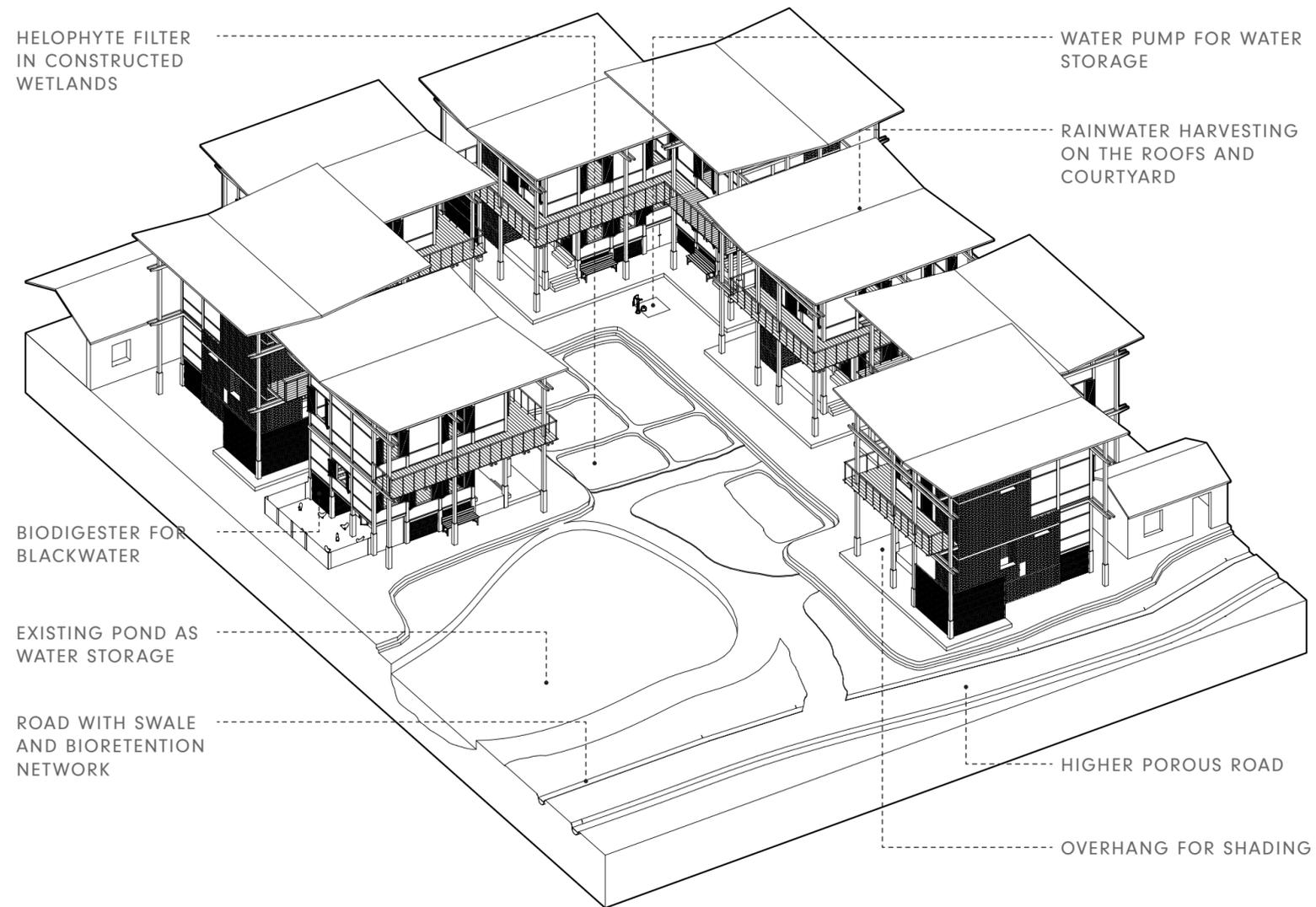
Water management forms the foundation of this technical strategy. Rainwater is harvested from rooftops and courtyards, stored for use during dry periods, and complemented by greywater treatment through constructed wetlands planted with helophytes. Blackwater is directed to individual biodigesters, enabling both sanitation and biogas production for domestic cooking. These decentralized, low-maintenance systems reduce dependency on centralized infrastructure, recycle resources, and turn waste into energy, while helping mitigate the destructive effects of monsoon-induced flooding.

Thermal comfort is achieved through passive architectural principles. Floors and roofs are lifted to encourage cross-ventilation and allow heat to escape through the upper eaves. Generous overhangs and shaded buffer zones reduce solar gain, enhancing comfort without mechanical cooling. Building orientation, façade composition, and material detailing further optimize indoor conditions in a region known for its hot and humid climate.

The material system combines durable timber framing with breathable bamboo panels and treated natural finishes. A robust wooden structure—anchored to concrete foundation posts using steel bolts—supports elevated floor beams and decking. Bamboo culms and slats form the modular, ventilated façade, which allows for filtered daylight and controlled airflow. Operable shutters and hinged panels give residents the ability to modulate both ventilation and privacy throughout the day and across seasons.

Construction methods prioritize modularity, manual assembly, and local skill development. Steel joints and bolted connections ensure ease of repair and replacement, while on-site workshops train residents in fabrication and panel construction. This fosters long-term structural resilience by embedding essential building knowledge within the community itself.





## CLIMATE DESIGN VILLAGE CLUSTER

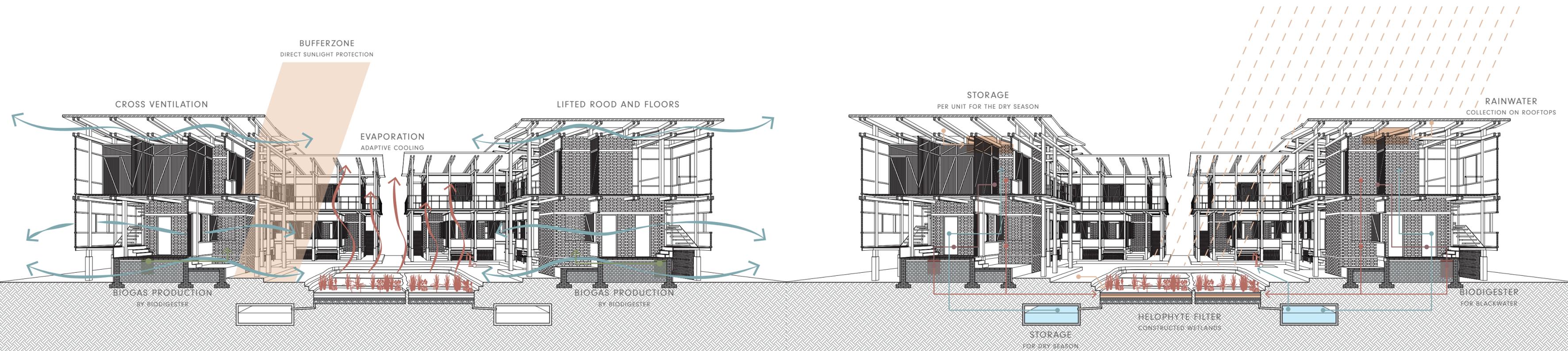
In response to the growing climate pressures in the flood-affected region of northeastern Bangladesh, the design integrates a series of climate-responsive strategies aimed at improving resilience, sustainability, and community self-reliance. Central to this approach is a comprehensive water management system that aligns with the region's seasonal rainfall patterns. Rainwater is harvested from rooftops and courtyards, then stored for use during the dry season, reducing reliance on external water infrastructure and supporting long-term water security.

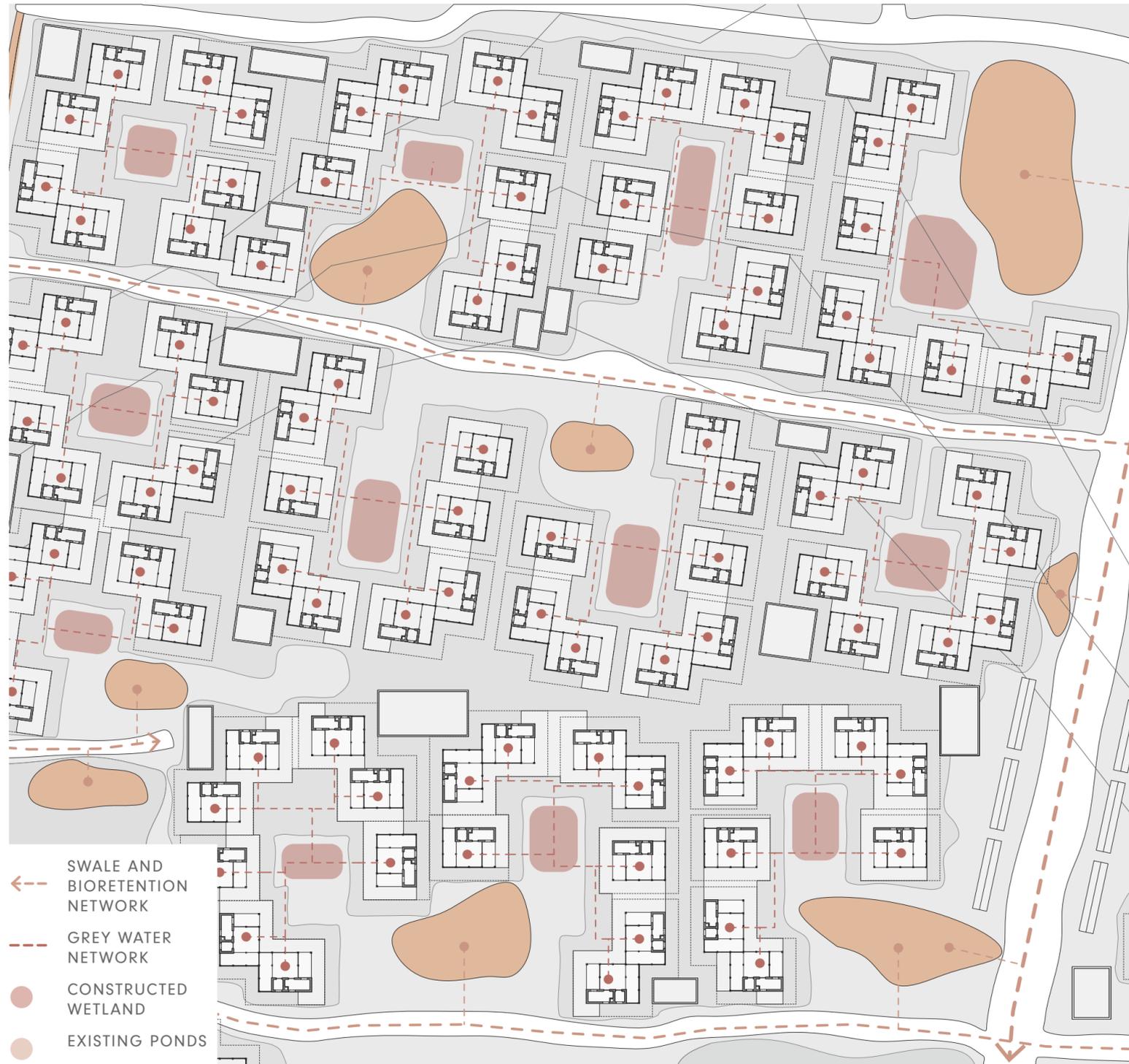
To ensure safe and efficient reuse of wastewater, the design employs decentralized treatment methods. Greywater is directed through constructed wetlands planted with helophyte vegetation, which purifies the water through natural biological processes involving root filtration and microbial activity. In parallel, blackwater is treated using biogas digesters, which not only address sanitation needs but also produce biogas—a renewable energy source suitable for domestic cooking. These systems promote circular resource use while minimizing environmental pollution.

Thermal comfort is addressed through passive design strategies adapted to the hot and humid local climate. Cross ventilation is facilitated by raising the floors and lifting the roofs, allowing air to circulate more effectively and enabling evaporative cooling. Architectural shading devices, such as generous overhangs and buffer zones, reduce solar heat gain and limit direct sunlight exposure, enhancing indoor comfort without the need for mechanical systems.

The surrounding landscape is designed to manage excess water while improving ground permeability. Roads are constructed using porous materials, encouraging natural water infiltration. A network of swales and bioretention zones channels and filters stormwater, mitigating the impact of heavy rainfall. Existing ponds are preserved and integrated into the overall water system, serving as storage reservoirs during both wet and dry seasons.

Together, these interdependent systems form a robust environmental framework that is both low-tech and context-specific. By combining passive architectural measures with ecological infrastructure, the design offers a replicable model for climate adaptation in regions facing recurring flooding and increasing climate uncertainty.





## WATERMANAGEMENT BETWEEN THE CLUSTER

Effective water management is a core principle guiding the spatial and architectural logic of the design, operating at both cluster and building scales to mitigate seasonal extremes and promote water self-sufficiency. The approach is grounded in decentralized systems that combine traditional water-holding techniques with ecologically informed treatment processes.

At the cluster level, the water infrastructure is designed to work with the natural hydrology of the site. Rainwater is harvested across roofs and open surfaces and is directed toward a network of swales and bioretention zones—shallow, vegetated channels that filter, and infiltrate stormwater. These systems not only reduce the risk of surface flooding during monsoon periods but also recharge groundwater. Swales are particularly effective in regions with high rainfall intensity, as they extend the detention time of runoff and facilitate infiltration into the soil.

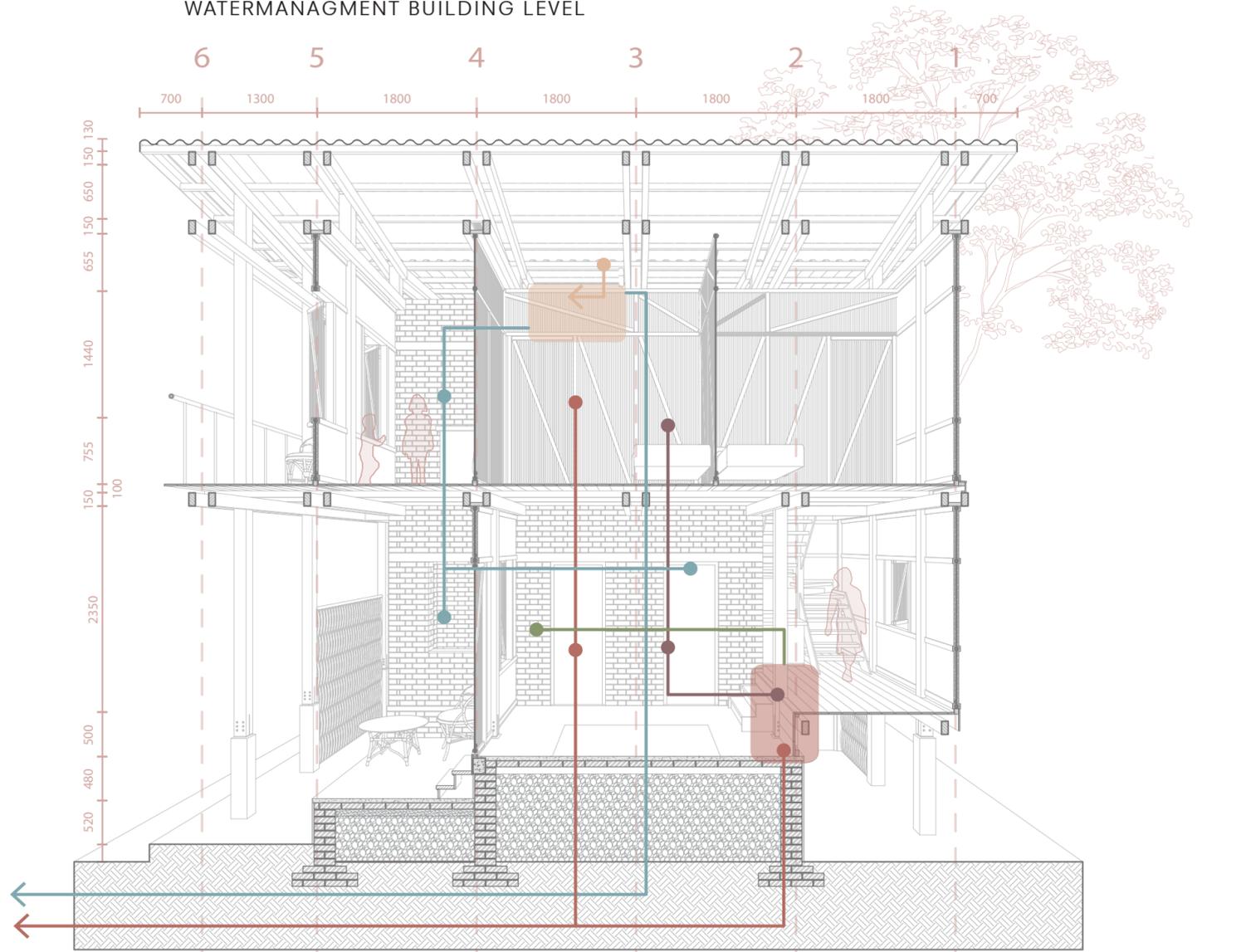
Complementing this surface-level system, constructed wetlands are employed to purify greywater. These wetlands use helophytic plants—species adapted to saturated conditions—to treat wastewater through sedimentation, microbial activity, and root filtration. Research has shown that such systems can remove up to 90% of organic pollutants, making the treated water suitable for non-potable reuse (Vymazal, 2011). Greywater is collected through a network and distributed to the wetland, after which it can be reused in agriculture or landscape irrigation.

The site’s existing ponds are preserved and integrated as multifunctional water bodies—serving as flood retention basins during heavy rains and as storage reservoirs during dry periods. These ponds act as climate buffers while also supporting biodiversity and local microclimates.

At the building level, rainwater is captured directly from the rooftops and stored in designated tanks for use during the dry season. Separate flows for blackwater and greywater are clearly defined. Blackwater is routed to individual biodigesters, where anaerobic digestion breaks down organic waste, producing biogas as a renewable energy source and a nutrient-rich effluent that can safely re-enter the soil.

Together, these systems create a layered, site-specific water management strategy that enhances resilience, reduces dependency on centralized infrastructure, and supports the sustainable coexistence of architecture and environment.

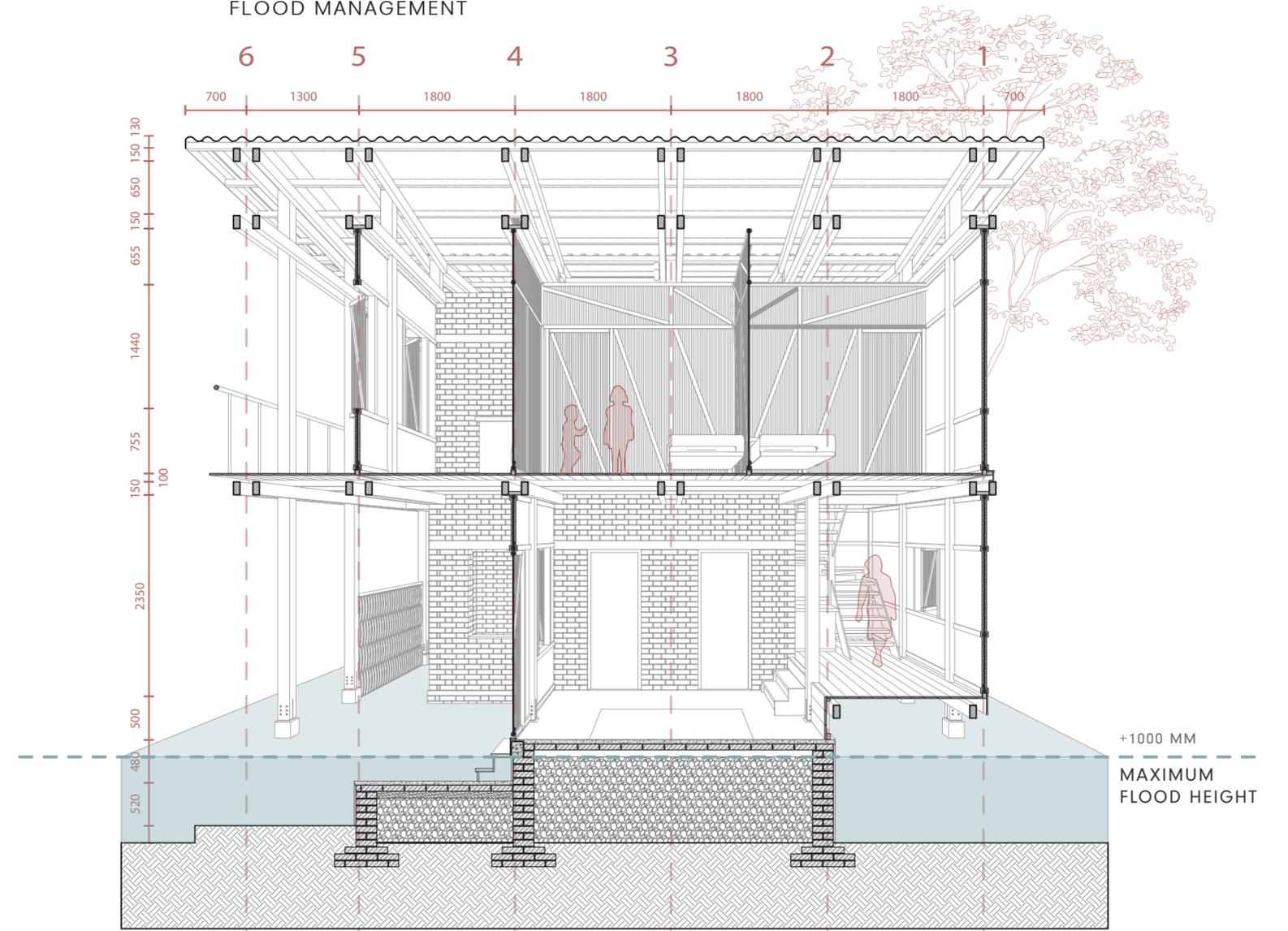
### WATERMANAGEMENT BUILDING LEVEL



SCALE 1:50

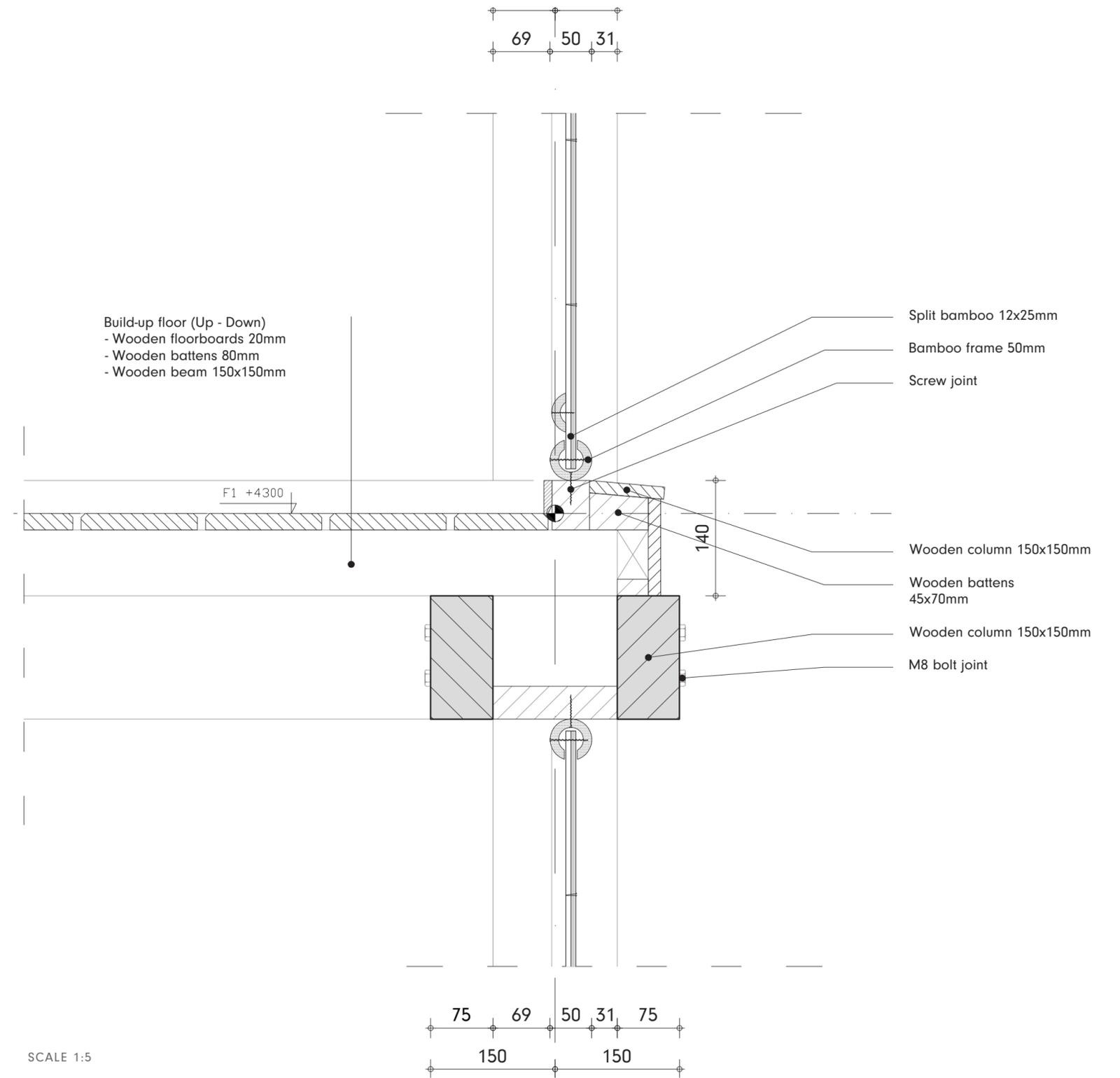
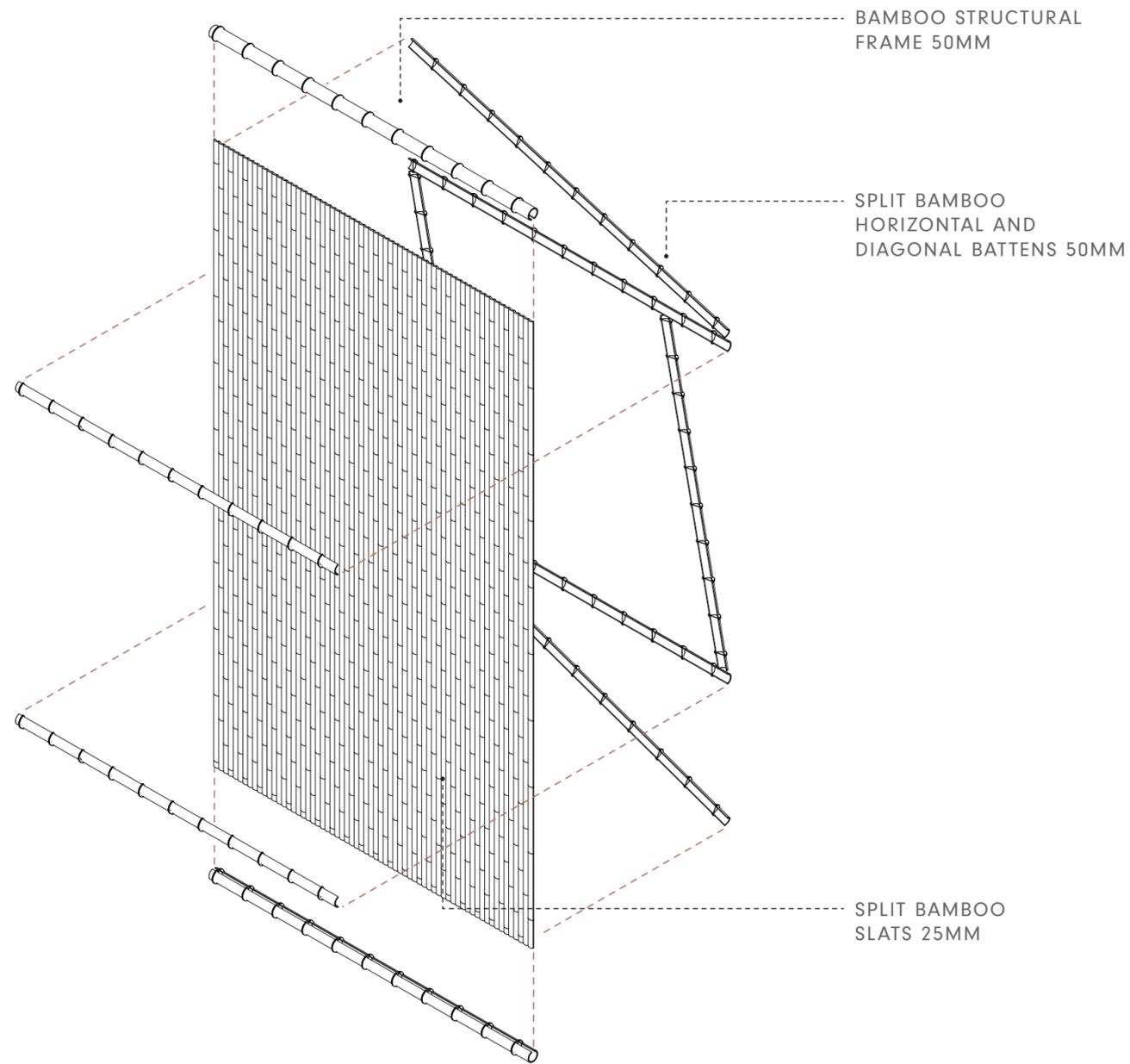
- RAINWATER HARVESTING
- BLACKWATER FLOW
- BIODIGESTER
- GREYWATER FLOW
- BIOGAS PRODUCTION
- WATER SUPPLY

### FLOOD MANAGEMENT

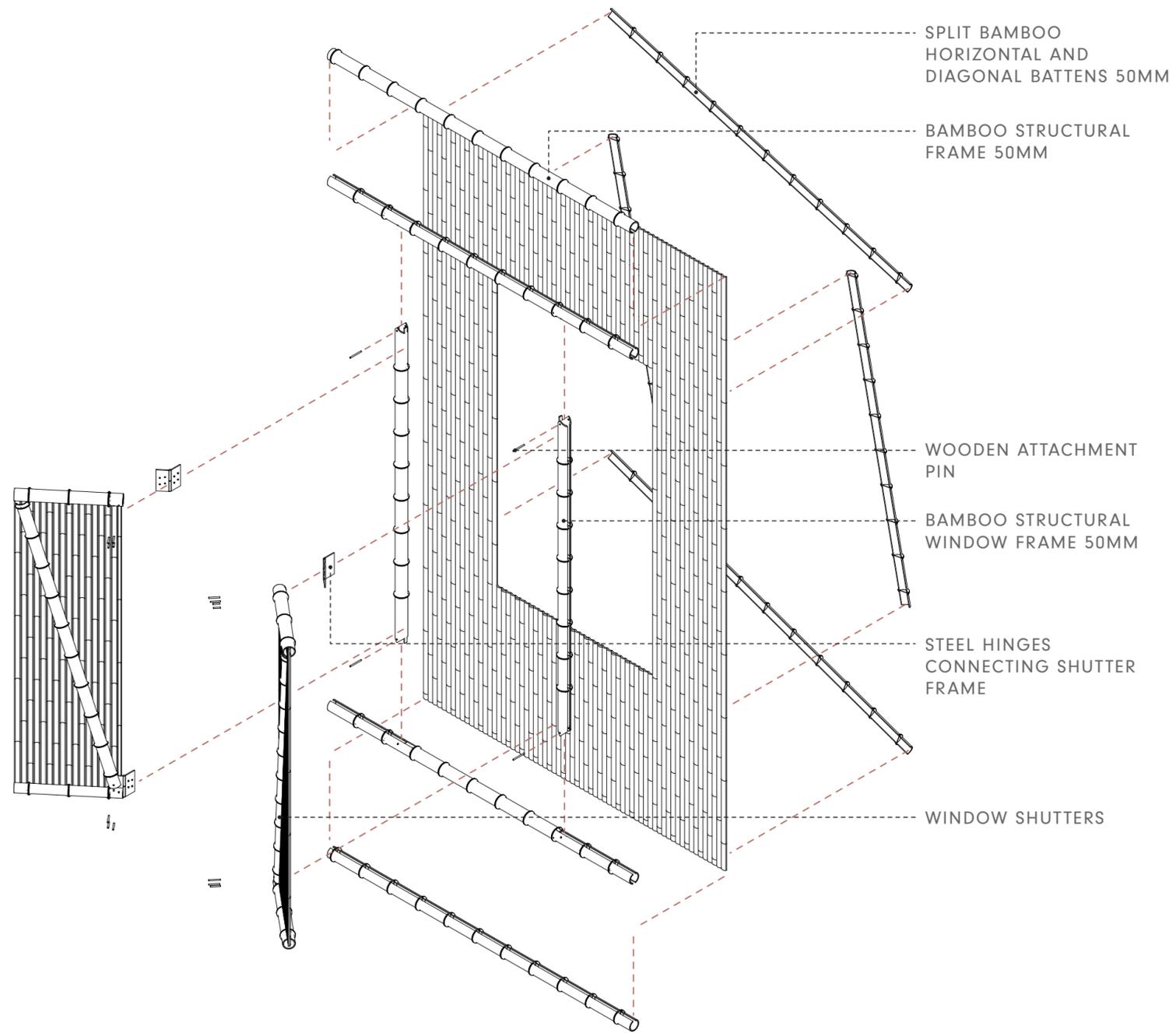


SCALE 1:50

+1000 MM  
MAXIMUM  
FLOOD HEIGHT



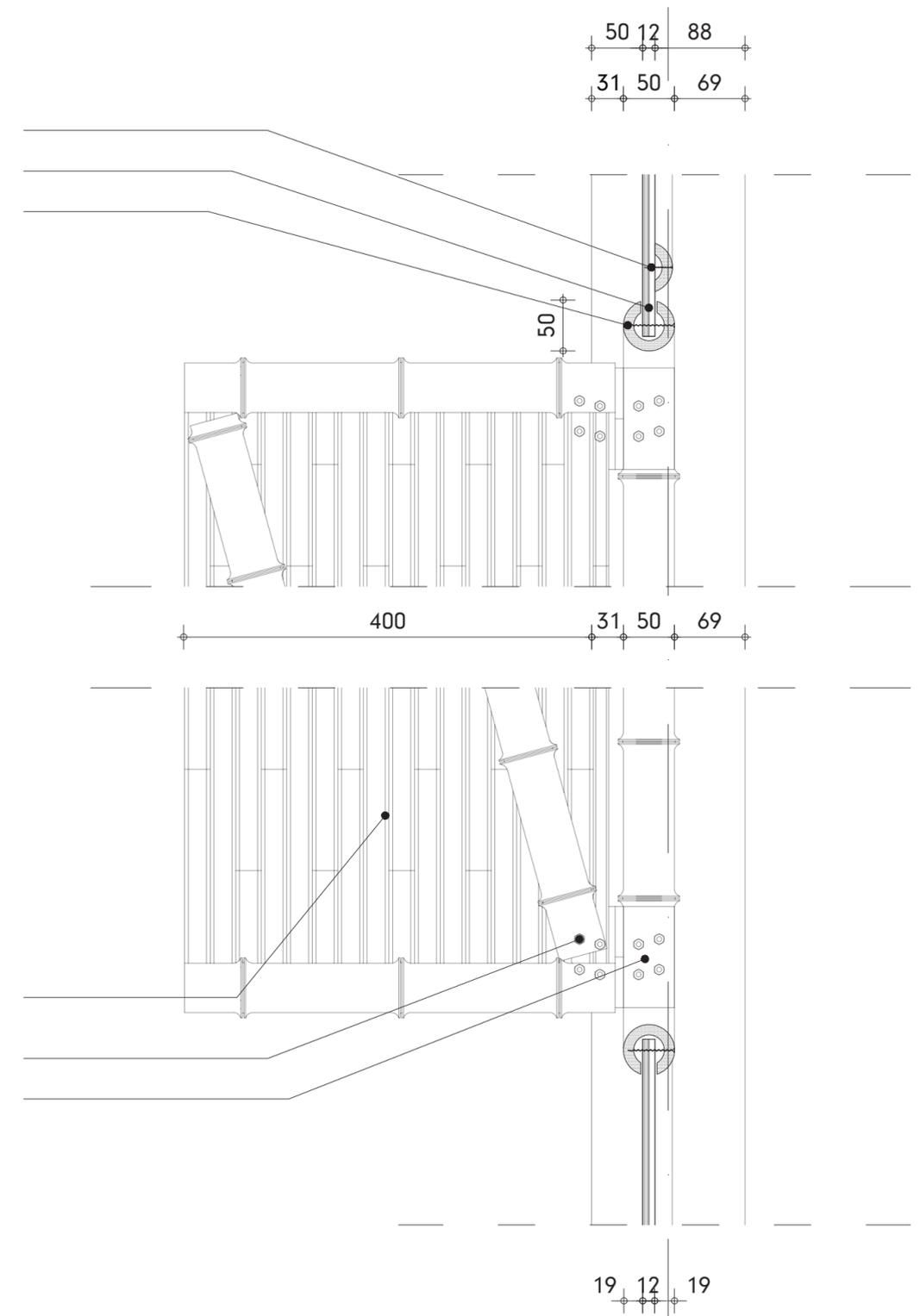
SCALE 1:5

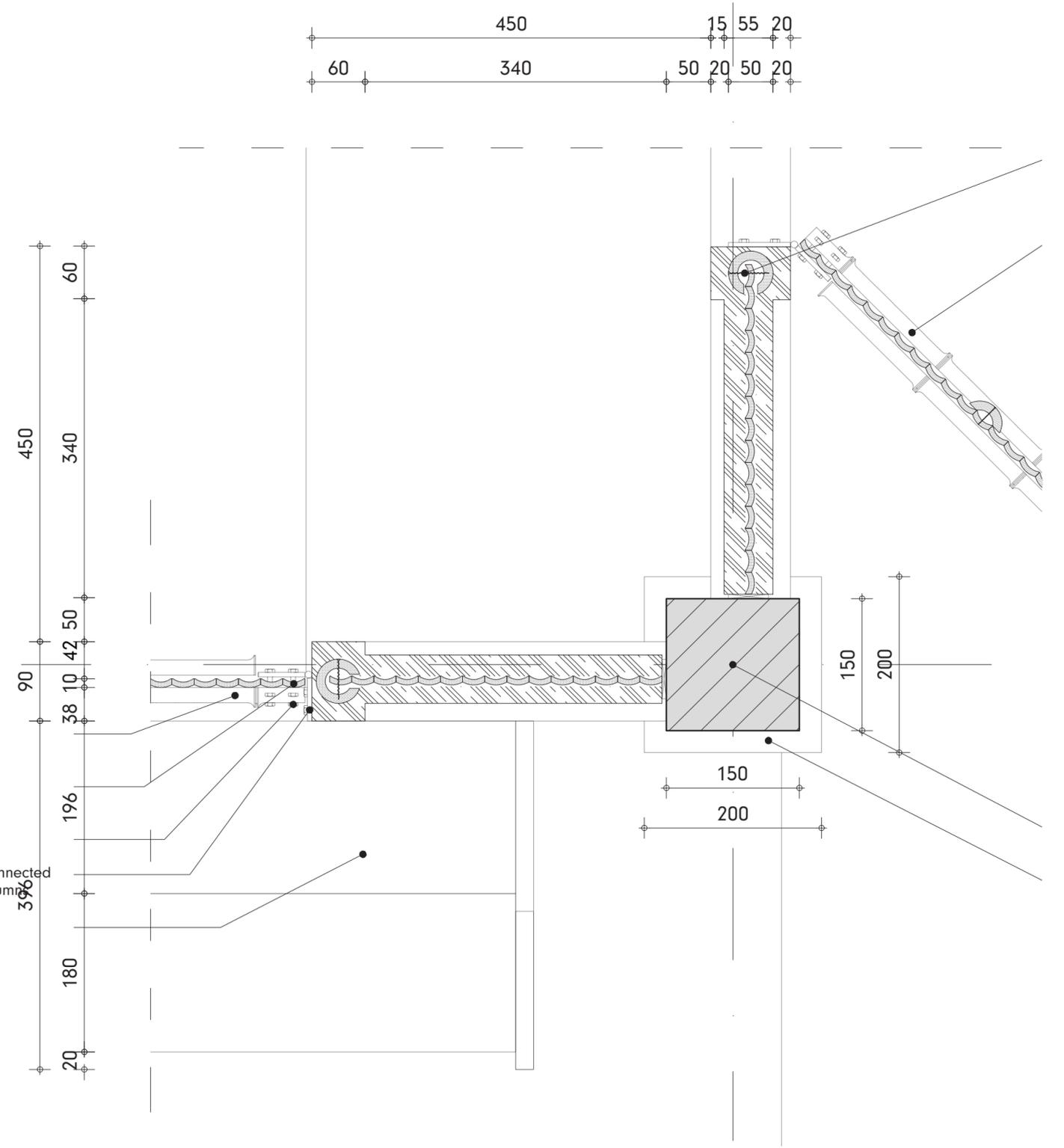
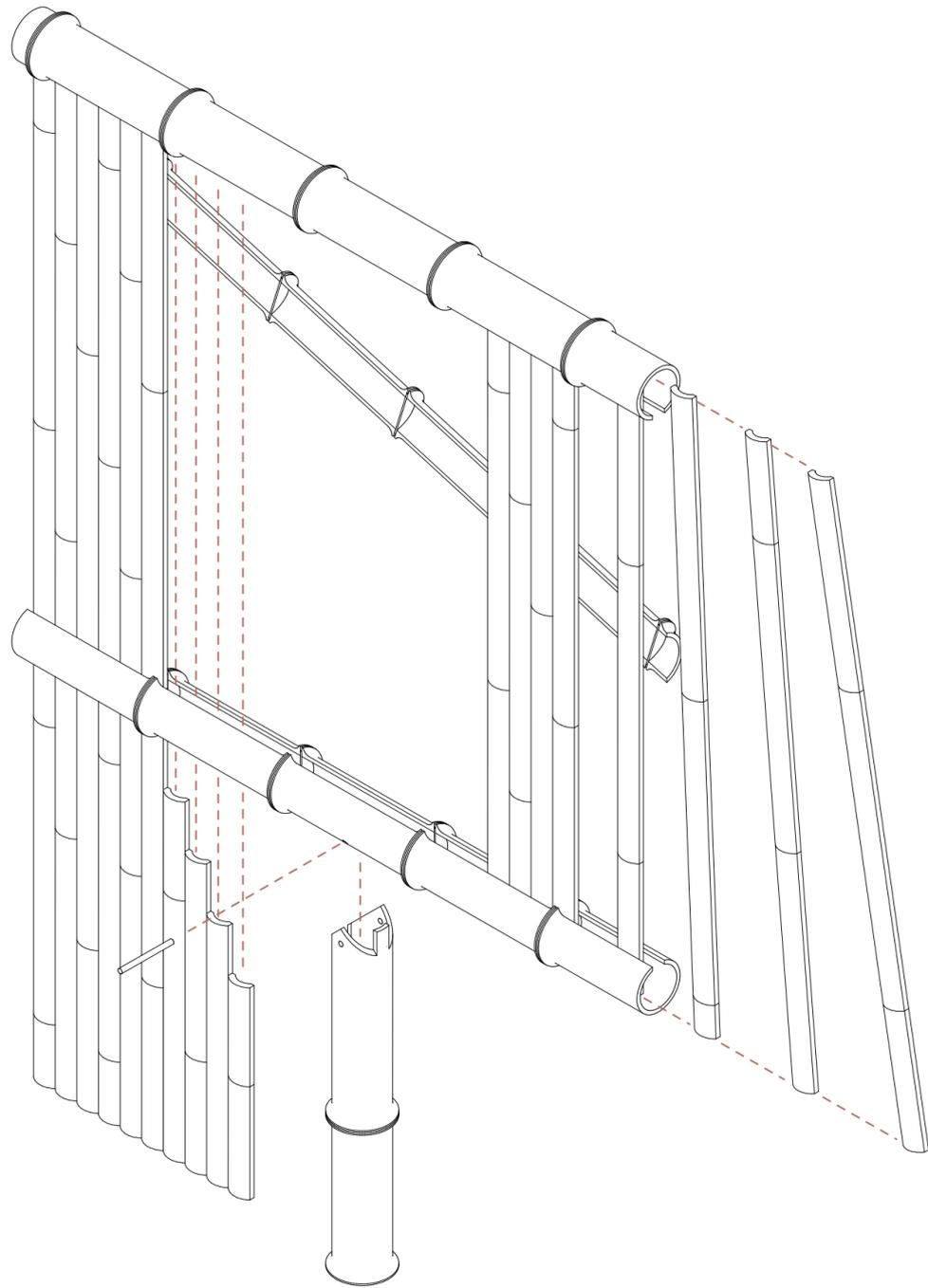


SCALE 1:5

Screw joint  
 Split bamboo 12x25mm  
 Bamboo frame 50mm

Elevation of window shutters  
 M4 bolt joint  
 Steel hinges connected to bamboo columns





## WOOD CONSTRUCTION & BAMBOO PANELS

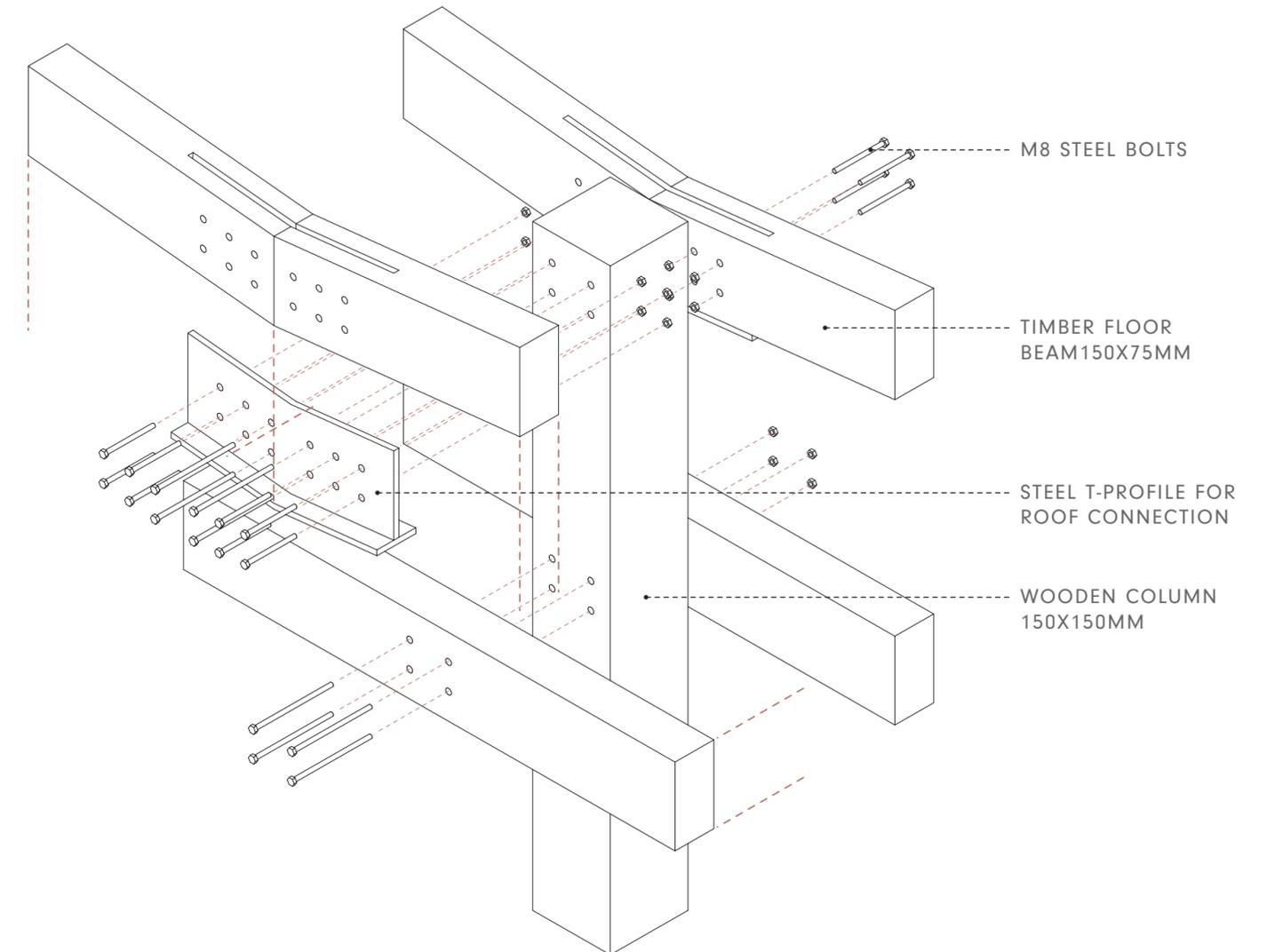
The construction system is characterized by a robust yet adaptable timber frame, which provides structural integrity while supporting a lightweight and climatically responsive façade. The primary structure consists of wooden columns measuring 150×150 mm, anchored to 200×200 mm concrete foundation posts using steel baseplates and M8 bolts. This ensures a durable connection between timber and foundation, capable of withstanding seasonal ground movement and moderate flood loads typical for the region.

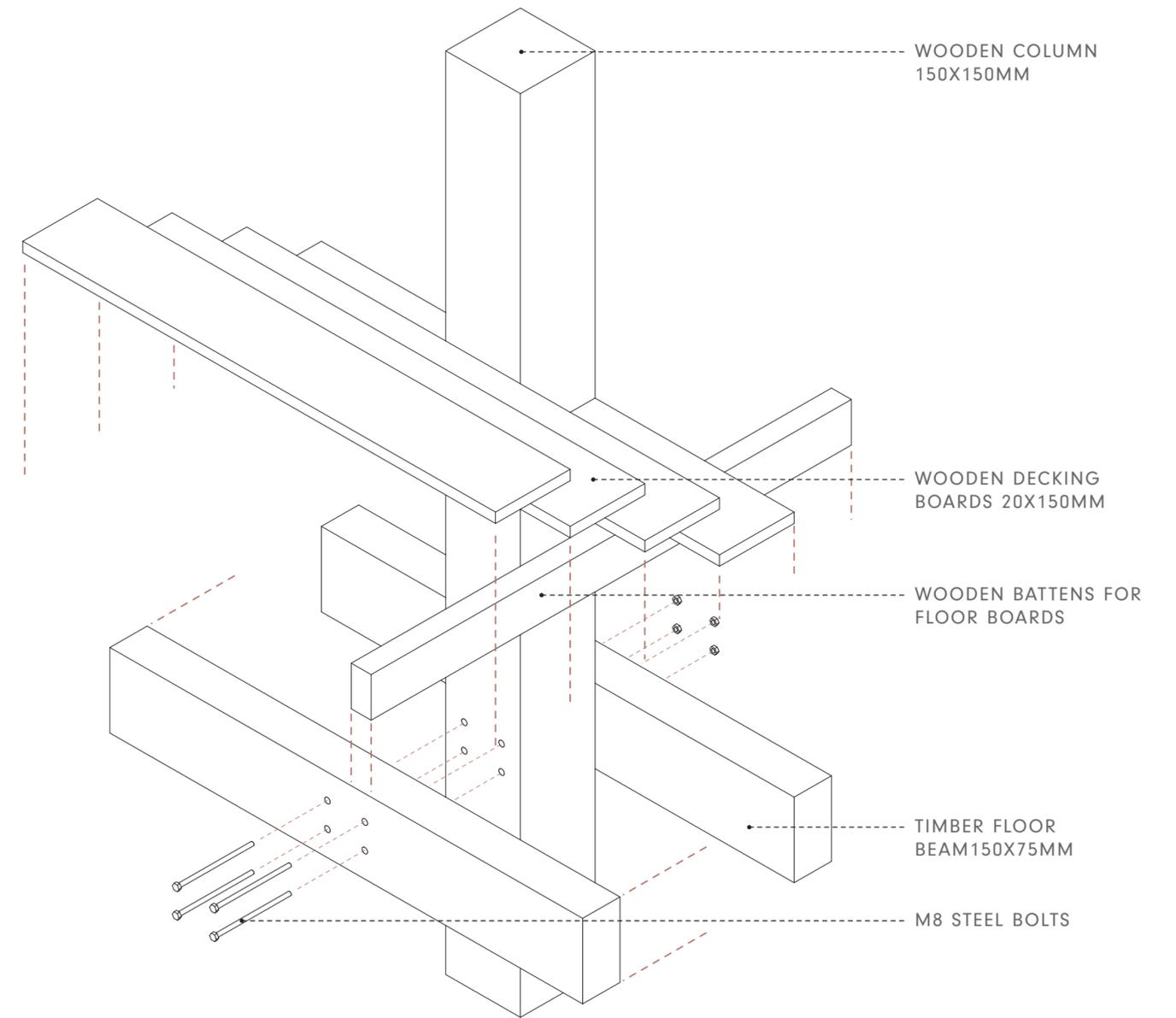
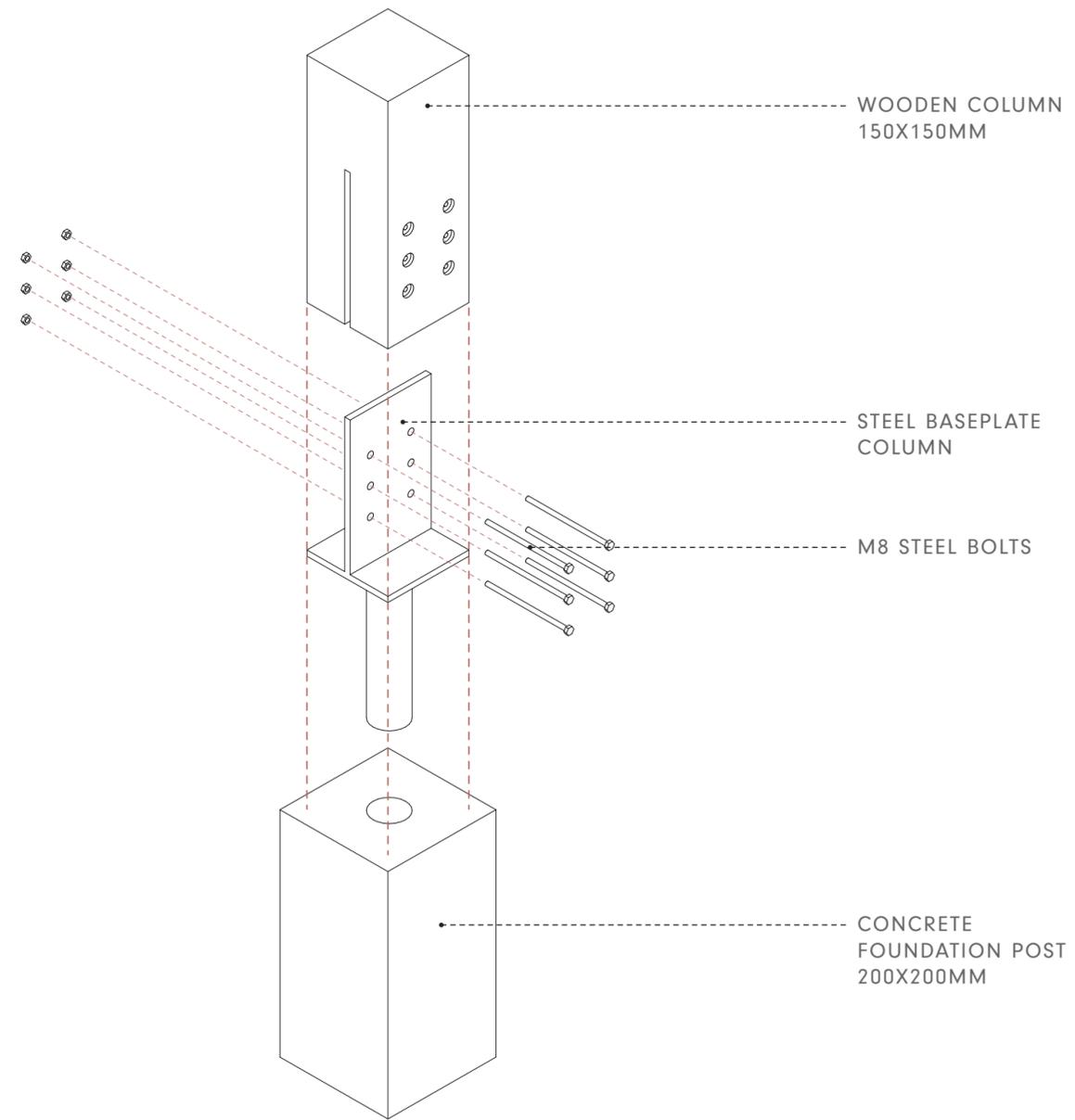
Floor beams (150×75 mm timber) span between columns and support a build-up of wooden battens (80 mm) and floorboards (20 mm), forming an elevated platform that promotes air circulation and protects against floodwater. All primary timber connections are made with bolted joints, particularly M8 steel bolts, ensuring ease of assembly, disassembly, and long-term maintenance. A steel T-profile is used at the roof-to-column connection, reinforcing structural stability and resisting lateral forces, particularly important during cyclonic conditions.

The façade system integrates seamlessly with the timber frame through a layered application of bamboo elements. A secondary bamboo structure—consisting of 50 mm diameter culms—is attached to the wooden columns using screw and M4 bolt joints. This subframe supports split bamboo panels (12×25 mm slats) arranged in horizontal and diagonal patterns. These panels provide partial shading, filtered light, and airflow, essential for passive thermal regulation in humid climates. The combination of slats and battens acts similarly to a breathable screen, reducing solar gain while maintaining interior ventilation.

Articulated façade elements such as operable bamboo shutters are connected using steel hinges fixed to the timber structure. These shutters are framed in 50 mm bamboo culms, braced with 12×25 mm split bamboo, and mounted with wooden pins for manual operation. Their detailing balances functionality with material efficiency, and their hinged system allows users to modulate airflow and daylight throughout the day.

Importantly, the construction process also serves as a platform for educating current residents in practical skills related to building, maintenance, and bamboo treatment, fostering local ownership and long-term resilience.





# 09

## MANAGERIAL STRATEGY

### PRESERVING COMMUNITY LIVING

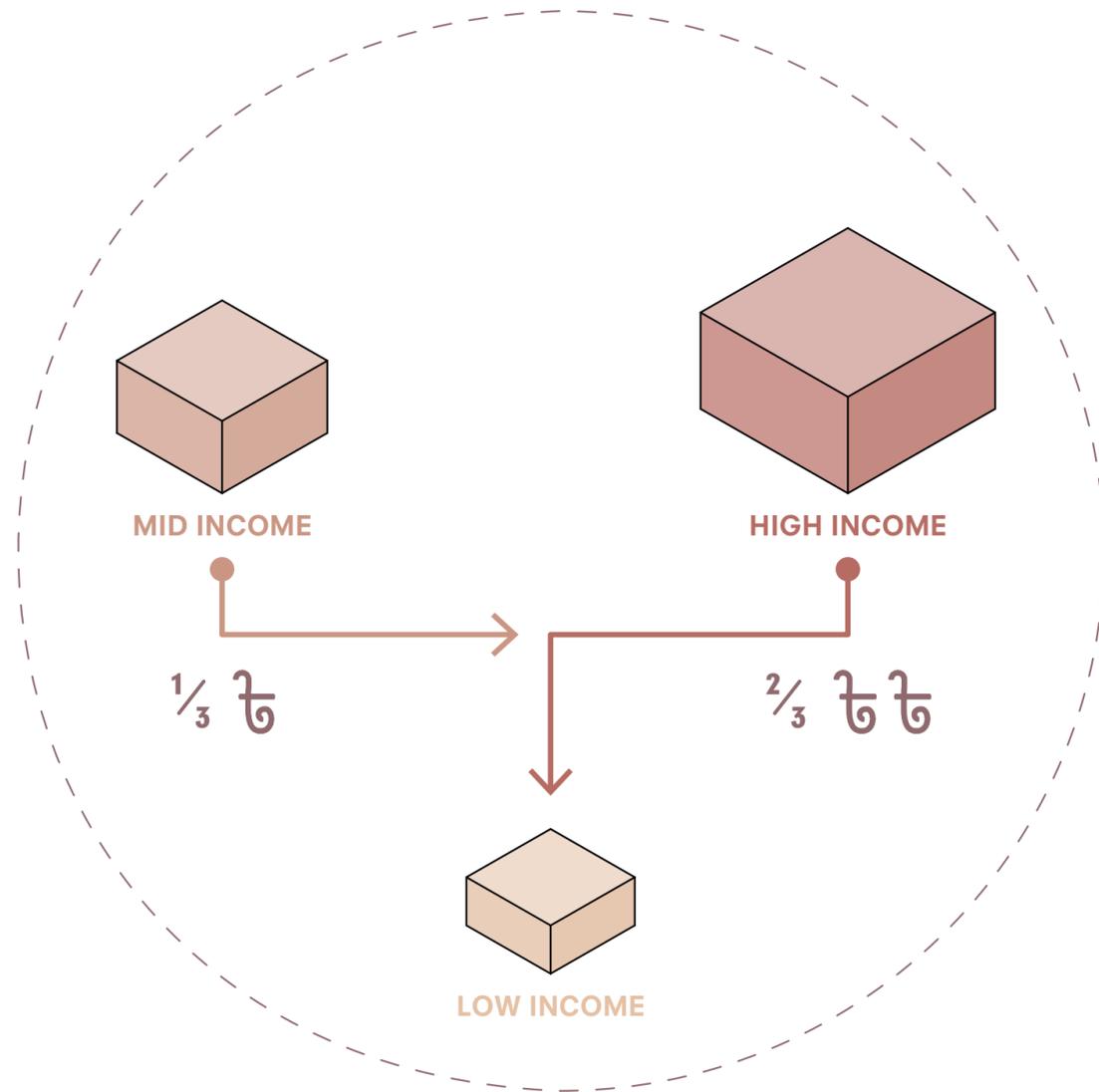
As urbanisation intensifies along the fringes of Sylhet, equitable land access and long-term housing affordability emerge as critical challenges. In the absence of coordinated planning, informal land division and speculative development risk deepening spatial inequality in peri-urban settlements like Shonatola. The managerial strategy outlined in this chapter addresses these issues through a combination of financial redistribution and collective land governance. It provides the organisational and legal foundations required to sustain inclusive, flood-resilient development over time.

At the core of the strategy is a cross-subsidisation model designed to facilitate affordability without external aid dependence. By integrating a mix of income groups within a unified development scheme, the model uses surplus revenue from mid- and high-income residents to offset the housing costs of lower-income households. Higher-tier residents pay premiums for location, space, or services, while standard-rate mid-income households contribute to partial subsidisation. This allows the lowest-income residents to access dignified housing at significantly reduced or no cost. Importantly, housing designs are intentionally free of visible hierarchies, preserving social cohesion and dignity across economic strata.

To secure the long-term viability and fairness of this system, the strategy introduces a Community Land Trust (CLT) structure. Under this model, individually owned plots are voluntarily transferred to a collective landholding governed by local residents, representatives, and technical experts. Residents retain lifetime use rights through long-term leases, ensuring secure tenure while enabling coordinated, flood-resilient spatial planning. The CLT prevents land commodification and speculative resale, stabilising housing prices across generations and protecting affordability into the future.

The CLT also functions as a financial and administrative platform. Revenues generated from lease agreements or surplus contributions can be reinvested into infrastructure, maintenance, or community services, reducing dependency on inconsistent external funding. Governance through a resident-led board enhances transparency, accountability, and community agency, ensuring that development responds to lived realities and long-term needs. Together, the cross-subsidisation and CLT strategies form a robust managerial framework that aligns financial sustainability with social equity.





## CROSS-SUBSIDIZATION

Cross-subsidization is employed in the Shonatola housing project as a financing and equity tool to ensure that low-income residents can access improved housing without displacement. The strategy operates by intentionally integrating households from diverse income groups into a single development model, where financial contributions from higher- and mid-income residents are used to offset the housing costs of lower-income families.

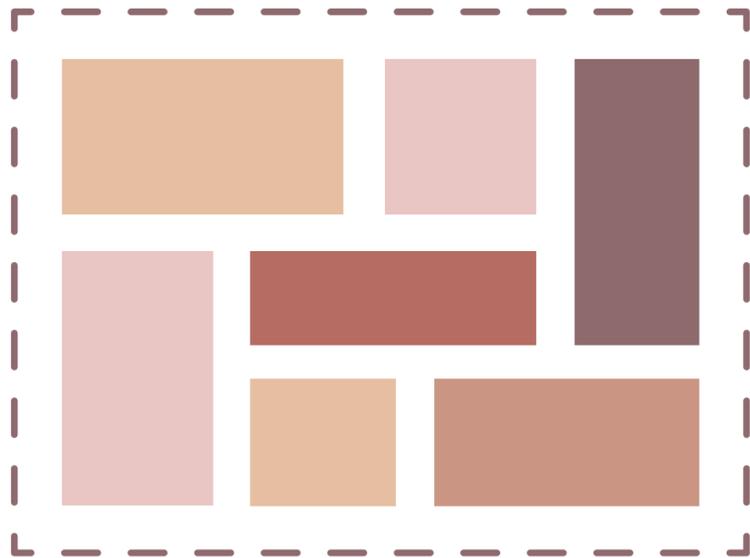
In practical terms, the approach functions through a tiered pricing model. Higher-income households are offered housing units at above-market prices. These units may include enhanced services, more favorable locations, or additional space, justifying the premium. Mid-income residents pay at or near market rates for standard units. The surplus revenue generated from both groups is then directed toward subsidizing the construction and long-term affordability of housing for low-income residents, who pay either significantly reduced rates or, in some cases, no financial contribution at all.

This redistribution mechanism not only provides access to adequate housing for vulnerable groups but also strengthens the project's financial viability without relying exclusively on external subsidies or aid. It encourages a socially mixed community, fosters upward mobility, and reduces spatial segregation based on income. By embedding affordability within the internal structure of the development, cross-subsidization offers a self-sustaining model for equitable growth.

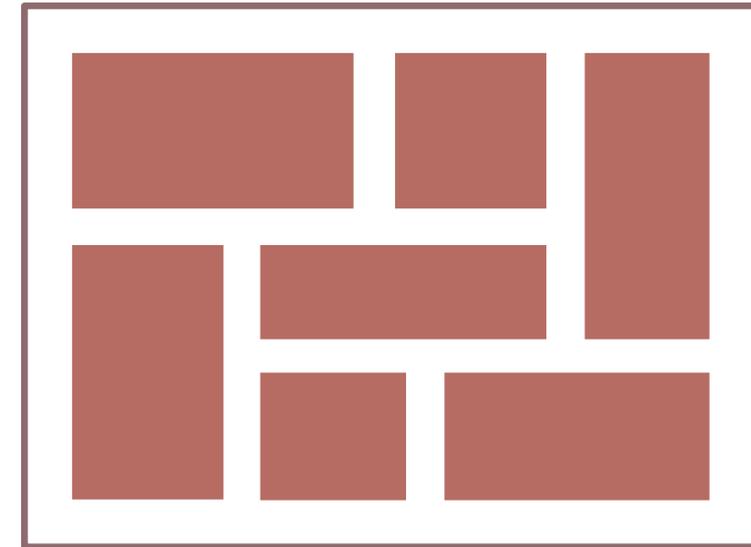
Importantly, the pricing structure is transparently communicated from the outset, and housing types are designed to avoid visible hierarchies, ensuring that income differences do not translate into social divisions. Through this mechanism, the project aligns social justice goals with economic pragmatism, creating a framework in which solidarity across income groups directly supports resilience and inclusion.

### Overview:

- **High income** - Pays premium for land/services/housing
- **Mid income** - Pays near-market rates that partially subsidize lower tiers
- **Low Income** - Access to affordable housing and community services



**CURRENT SITUATION**  
MULTIPLE INDIVIDUALLY OWNED  
PLOTS



**PROPOSAL SITUATION**  
1 SINGLE LANDHOLD,  
VIA COMMUNITY LAND TRUST

## COMMUNITY LAND TRUST (CLT)

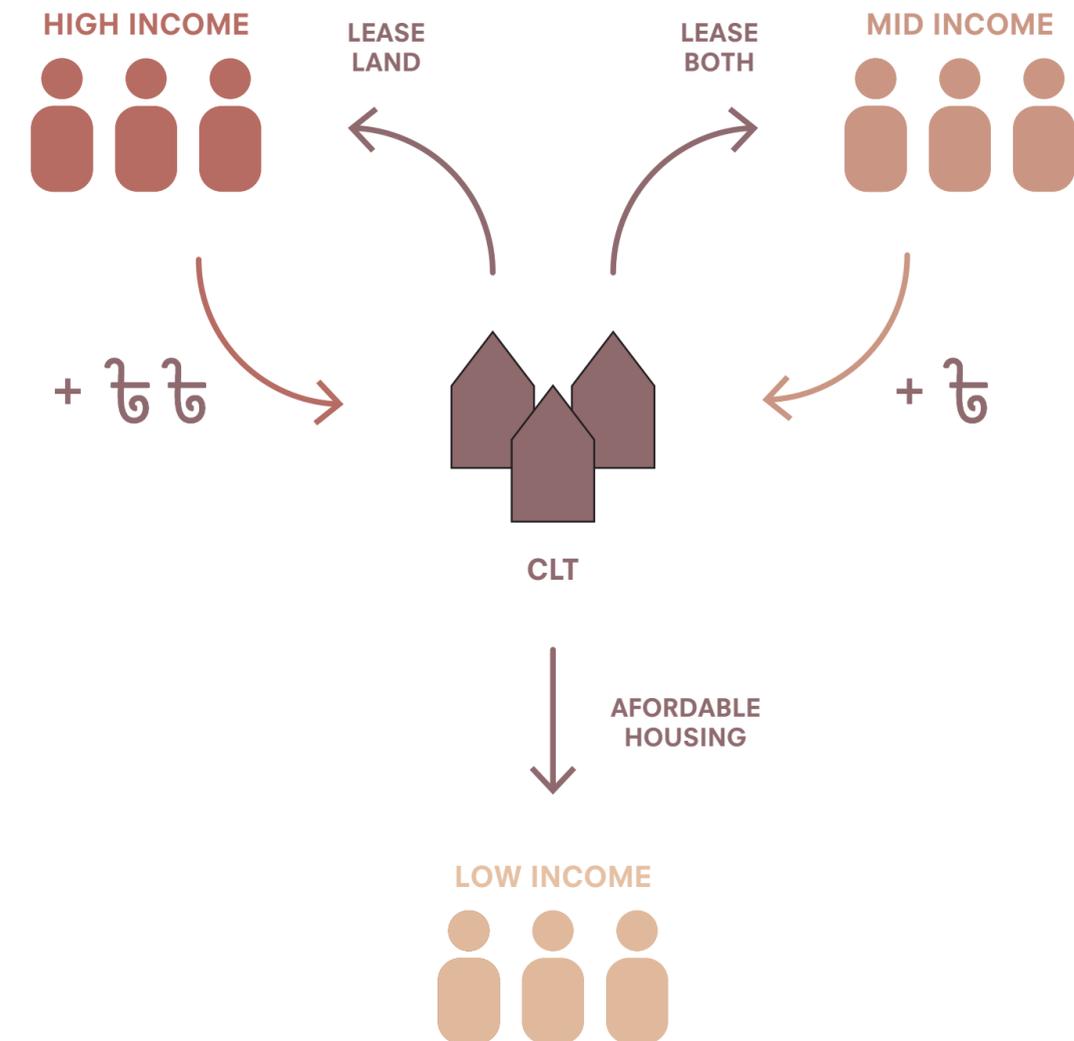
The Community Land Trust (CLT) strategy plays a key role in securing long-term affordability, community control, and fair development in the Shonatola housing project. Building on the earlier cross-subsidization strategy—which redistributes financial contributions across income groups—the CLT provides the legal and organizational structure needed to protect these efforts and keep housing accessible and non-speculative for future generations.

Currently, land in Shonatola is divided into many small, individually owned plots. While this gives residents a degree of autonomy and historical continuity, it also limits the possibilities for coordinated spatial planning and makes the area more vulnerable to land speculation, fragmented development, and unequal access to shared infrastructure. The CLT model addresses this by bringing all individual plots together under one community-owned landholding. Residents voluntarily transfer their land rights to the trust and, in return, receive long-term land leases and the right to remain in upgraded housing without risk of displacement, exclusion, or losing intergenerational rights to their land.

In the new model, people may own their homes or rent them, but the land itself is never sold. It is held in trust for the benefit of the entire community. This helps to keep housing prices stable and predictable over time, because the CLT can set rules about resale values, inheritance, and rental rates. These rules prevent future gentrification and ensure that public or cross-subsidized investments continue to serve the local population over time.

The trust is managed by a board made up of local residents, community representatives, and technical experts. This shared governance structure gives residents a strong and enduring voice in decisions and keeps the process transparent, inclusive, and accountable to their long-term needs. In addition to providing secure land tenure, the CLT also allows any extra income—earned through leases or surpluses from higher-tier residents—to be reinvested in infrastructure, maintenance, or community services.

By combining collective land ownership with inclusive decision-making and strong legal protections, the CLT strengthens the resilience, equity, and long-term self-reliance of the Shonatola community. It enables the project to respond to climate, economic, and social challenges in a way that is just, sustainable, and deeply rooted in the local context.



## REFLECTION

PROCESS TO P4 PRESENTATION

My graduation project, titled “Rising Grounds: Building the Foundations for Thriving Communities,” addresses the complex pressures facing rural areas in Sylhet. Frequent flooding, worsened by climate change, is a recurring threat that damages homes, disrupts daily life, and displaces families. At the same time, the expansion of nearby urban areas is reshaping the landscape, placing traditional village life under increasing pressure. These dual forces risk not only physical displacement but also the gradual erosion of local identity, customs, and community structure.

My motivation for this topic developed during the field trip to Shonatola village, where I could observe and speak with residents directly affected by these challenges. What left a lasting impression on me was the resilience and determination of the community to continue living in the place they call home, despite limited resources and recurring setbacks. This experience gave a human face to the broader issues I had studied and reinforced my desire to work on solutions that are grounded in local reality.

This project became an opportunity to explore how architecture can contribute to future-oriented solutions by designing with long-term resilience and self-reliance in mind. Rather than focusing only on buildings, I became interested in how space, infrastructure, and collective strategies can support people in remaining where they belong. It is this combination of practical urgency and human connection that continues to drive my work.

This direction also reflects why I chose the Architecture track within the MSc Architecture, Urbanism, and Building Sciences programme. The Global Housing studio, with its focus on socially and environmentally engaged design, offered the perfect context to deepen my understanding of architecture’s potential as a transformation tool. The blend of research, design, and field experience allowed me to apply architectural thinking to urgent global challenges while remaining attentive to the everyday needs of real communities.





## INTERRELATION OF RESEARCH AND DESIGN

My research critically informed my design process, particularly through extensive literature reviews and many valuable conversations with the residents of Shonatola. These exchanges helped me understand key socio-environmental vulnerabilities, such as recurring floods, aging infrastructure, and limited spatial flexibility within traditional dwellings. This insight directed my focus toward adaptable design strategies that use local resources, specifically; wooden frame construction with raised, adjustable flooring and bamboo-based wall panels.

In turn, the design process continued to influence the development of my research. One major challenge arose in designing the spaces between dwellings and clusters, how to balance privacy, social interaction, water flow, and circulation. Initially, I struggled to define these in-between spaces in a way that felt natural and functional. It was only after reflecting on what I had seen in Shonatola, how people informally used narrow gaps between homes to gather, store items, or guide runoff, that I began to understand the potential of these margins. This led me to rethink the spatial logic of the cluster layout and allowed me to introduce shared yet flexible open areas that respond both to seasonal water levels and social use. The continuous interaction between on-the-ground observation and iterative design helped ensure the project remained deeply rooted in local experience while advancing architectural ideas.

## METHODOLOGY AND PROCESS REFLECTION

The research and design methodology I adopted combined a literature review, global case study analysis, fieldwork in Bangladesh, and iterative drawing and modelling. Initially, I focused on understanding the wider environmental, social, and spatial context of Sylhet's flood-prone regions through academic sources and precedents. These included studies on adaptive architecture, community-based planning, and low-tech construction methods. I then selected relevant global case studies that offered insight into flood-resilient spatial strategies, which helped inform a set of initial design criteria.

The field visit to Shonatola became a central part of the research methodology. During this trip, I documented environmental conditions, observed spatial behaviour, and spoke with many residents about their everyday experiences with flooding. This provided nuanced and grounded insights that could not be derived from literature alone. These impressions directly shaped the design phase that followed, particularly in how I approached elevation, circulation, and shared infrastructure.

While the research methods were individually effective, in retrospect, the division between research and design in the early stages led to inefficiencies. I approached them as separate tasks by first doing research, then applying it, which caused delays and meant I had to revise design directions that weren't fully grounded in field observations. As the project progressed, I shifted toward a more integrated method: returning to literature with new questions from the design phase, and revisiting drawings based on what I had seen and heard in the village. This concurrent approach, once established, brought clarity and cohesion to the project. If I were to repeat the process, I would seek to blend research and design from the very start, allowing them to grow in dialogue and better inform one another.



## RESPONSE TO MENTOR FEEDBACK AND PERSONAL LEARNING

Throughout the graduation process, feedback from my mentors played a pivotal role in steering the project forward. My main mentor, Dick van Gameren, and engineering mentor, Rocio Conesa Sánchez, consistently encouraged me to push the architectural ambition of the project while grounding it in realistic and technically sound solutions. One of the main challenges I faced early on was developing a convincing master plan. While I had focused extensively on designing individual dwelling strategies, I initially failed to tie them into a cohesive whole that responded to the broader village layout and environmental context.

Dick van Gameren repeatedly pointed out the lack of spatial coherence and hierarchy in my early master plan proposals. I struggled most with how to organise the collective spaces, public pathways, and transitions between water-sensitive and dry zones in a way that felt both logical and responsive to the site's needs. These gaps became apparent as we discussed how daily life would unfold across the settlement, and how residents might move, gather, and adapt during floods.

Taking this feedback seriously, I revisited my assumptions and spent considerable time reworking the overall structure of the plan. I began by mapping observed village behaviours during my field trip, where people gather, how they circulate, and how they use space in wet and dry seasons. This informed the creation of clear zones for public, semi-public, and private use, and a better integration of water management and landscape strategies. Gradually, the master plan became not just a background for the dwellings, but a framework that actively supported resilience and community life.

This process reinforced the value of critical feedback, and showed me the necessity of zooming out and thinking systemically, especially when working in complex, layered contexts. It also taught me to embrace design as an iterative, evolving process, where moments of uncertainty often lead to stronger and more thoughtful outcomes.

## ACADEMIC AND SOCIETAL RELEVANCE

Academically, the project contributes meaningfully to the ongoing discourse on adaptive architecture and climate resilience. It brings forward a grounded, context-specific example of how architectural design can respond to recurring environmental risks using accessible, low-tech materials and community-based strategies. By incorporating both spatial design and socio-environmental thinking, it offers a valuable addition to literature focused on sustainability, resilience theory, and design in the Global South.

Societally, the project proposes an approach that is not only feasible within Shonatola but potentially applicable to many other flood-prone villages across Bangladesh and beyond. Its focus on flexibility, affordability, and local agency makes it relevant for comparable contexts throughout the Global South, where climate pressures intersect with limited infrastructure and rapid urbanization. As such, it can serve as a prototype or model for communities navigating similar challenges.

The project also carries ethical weight by respecting and building upon the social fabric and cultural identity of Shonatola. Rather than introducing top-down, one-size-fits-all interventions, it emphasizes participatory processes and design decisions rooted in community knowledge. This ensures that the outcomes are not only architecturally sound but socially just. In this way, the project recognizes architecture as a tool not only for protection but also for dignity, continuity, and empowerment.



## TRANSFERABILITY OF PROJECT RESULTS

The core strategies developed through this project, including the adaptable floor systems, phased housing clusters, and integration of water-sensitive infrastructure, hold value beyond the specific case of Shonatola. The challenges encountered in this village, such as seasonal flooding, informal development patterns, and infrastructural limitations, are common in many rural and peri-urban contexts throughout the Global South.

The strength of the project lies in its grounding in the actual situation and way of life observed in Shonatola. The design approach reflects local building practices, seasonal rhythms, and the social fabric of a village community. From the way spaces are shared between households to how pathways emerge from daily routines, the proposal seeks not only to address environmental issues but to support and reinforce a culturally embedded way of living. This makes the project more than a theoretical design.

Because of its use of simple construction techniques, accessible materials, and spatial flexibility, the project can be adapted in other geographies where similar pressures exist. As long as the core principle remains, designing with and for local conditions and communities, it can serve as an adaptable and replicable framework for flood-resilient development in vulnerable settings.

## PERSONAL REFLECTION AND EMERGING TOPICS

A key question that arose from the project concerns the long-term governance and maintenance of shared infrastructure and spaces in the village. While the design introduces collective systems, such as shared drainage routes, water catchment areas, and public gathering spaces, their effectiveness depends on sustained communal management. How can architectural design better support local structures of decision-making, care, and maintenance over time? This question touches on the social dimension of resilience and suggests that spatial strategies must be supported by resilient forms of organisation and stewardship. This aspect was only partially explored in the project and offers a valuable direction for future development.

Another reflection stems from observing how villagers balance routine, care, and community interaction in informal and adaptable ways. While my design allows for spatial flexibility and future expansion, I continue to ask how architecture can further support the everyday social practices that are less visible but deeply rooted, such as caregiving between households, informal education, or spontaneous gatherings that shift with the seasons. These patterns are not easily fixed in a plan but require open-ended spatial responses that evolve with use. This raises the question of: how architectural design can create spatial frameworks that not only accommodate informal and changing patterns of life but actively anticipate and support them as part of the design intention?

## LOOKING BACK AND FORWARD

This graduation project has given me the opportunity to deeply engage with a topic that I feel strongly about and to test how architectural thinking can respond meaningfully to real-world challenges. Looking back at the earlier drafts of my work, I see how far the project has come in terms of clarity, structure, and focus. The design now not only addresses technical and spatial issues, but also resonates with the everyday realities of the people in Shonatola. I have learned to embrace uncertainty, use feedback constructively, and let the process of research and design unfold in dialogue with one another.

In the next and final phase, I will focus on bringing all the elements of the project together into a coherent and complete whole. This includes refining drawings, detailing materials and construction strategies, and clearly presenting the spatial logic behind the masterplan. I will also begin assembling all the components into a comprehensive graduation book that communicates the project in both words and visuals. Ultimately, this will serve as the foundation for the P5 presentation, where the work will be shared as a cohesive story, one that connects site, structure, and community through design.

# REFERENCE LIST

## LITERATURE AND ILLUSTRATIONS

### LITERATURE REFERENCES

Agrawala, S., Ota, T., Ahmed, A. U., Smith, J., & van Aalst, M. (2003). *Development and Climate Change in Bangladesh: Focus on Coastal Flooding and the Sundarbans*. OECD.

Alam, M. (2018). Urbanisation and flood risk in Bangladesh: Challenges and solutions. *Environmental Planning Journal*, 35(2), 112-127.

Bangladesh Climate Change profile. (2023). *Bangladesh climate risk country profile*. World Bank Group.

Bangladesh Meteorological Department. (2023). *Annual Climate Report 2023*. Government of the People's Republic of Bangladesh.

Carbon Brief. (2024). *Climate change made record 2024 floods more likely*. Carbon Brief Climate Science Update.

Climate Central. (2024). *Global flooding events of 2024: Attribution and impacts*. Climate Central Reports.

Dhaka demographics. (2022). *Dhaka population growth and urbanisation trends*. Bangladesh Bureau of Statistics.

Dhaka slum statistics. (2016). *Housing and population census of Dhaka's informal settlements*. Urban Studies Centre, Bangladesh University of Engineering and Technology.

Dhaka Urban Report. (2024). *Dhaka's urban growth, infrastructure, and flood vulnerability*. Ministry of Housing and Public Works, Bangladesh.

Environmental shocks and migration. (2025). *The effects of environmental shocks on migration patterns in Bangladesh*. *International Migration Journal*, 59(1), 45-63.

Hemmati, M., Yazdani, M., & Alavi, S. (2021). Kinetic and amphibious architecture: Adaptive strategies for climate resilience in flood-prone areas. *Architectural Science Review*, 64(3),

310-325.

Intergovernmental Panel on Climate Change (IPCC). (2022). *Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the IPCC*. Cambridge University Press.

Internal Displacement Monitoring Centre [IDMC]. (2024). *Global report on internal displacement 2024*. Norwegian Refugee Council.

IOM Bangladesh Migration Report. (2024). *Climate migration in Bangladesh: Trends and responses*. International Organization for Migration.

Jahan, F. (2021). Building resilience through architecture: Lessons from flood-prone regions of Bangladesh. *Journal of Architecture and Society*, 14(2), 89-105.

Karim, M. F., & Alam, S. (2022). Flood mitigation and resilient housing in Bangladesh: A review of adaptive architecture. *Building and Environment*, 210, 108652.

Mannucci, A., Ghosh, A., & Rahman, S. (2022). Flood risk and urbanisation in Sylhet: Implications for climate adaptation. *Climate Risk Management*, 36, 100429.

Rana, M. M., & Ilina, S. (2021). Understanding Bangladesh's flood vulnerability: A geographical perspective. *International Journal of Disaster Risk Reduction*, 62, 102408.

Rashid, H. (2019). *Geography of Bangladesh (4th ed.)*. The University Press Limited.  
Uddin, K., & Matin, M. A. (2021). Climatic Characteristics and Seasonal Variations in Bangladesh. *Journal of Climate Studies*, 12(2), 45-59.

Roy, A., & Mahmud, S. (2018). Water-sensitive design and adaptive architecture in Bangladesh: Towards resilient urbanism. *Journal of Urban Design and Development*, 24(1), 67-84.

Saha, S., Khan, N. T., & Rahman, A. (2021). *Monsoon floods in Bangladesh: Patterns, impacts,*

and responses. *Asian Journal of Water, Environment and Pollution*, 18(3), 27–35.

Sakib, N., Islam, M. T., & Hossain, S. (2023). Urban expansion and drainage loss in Dhaka: Implications for flood risk management. *Environmental Monitoring and Assessment*, 195(1), 122.

Sajid, A. (2016). Flood impacts on agriculture and livelihoods in Bangladesh. Bangladesh Agricultural Research Council.

Shafiq, S. (2023). Post-flood recovery and community resilience in Bangladesh: Challenges and opportunities. *International Journal of Disaster Resilience in the Built Environment*, 14(2), 131–145.

UNICEF Sylhet SitRep. (2024). Sylhet floods 2024: Situation report. UNICEF Bangladesh.

Wired. (2020). Mongla and Khulna: Preparing for climate migrants. *Wired Magazine*, Special Report on Climate Cities.

World Bank Climate Change Knowledge Portal. (n.d.). Bangladesh Climate Data. Retrieved from <https://climateknowledgeportal.worldbank.org/country/bangladesh>

Vymazal, J. (2011). Constructed wetlands for wastewater treatment: Five decades of experience. *Environmental Science & Technology*, 45(1), 61–69. <https://doi.org/10.1021/es101403q>

## FIGURE REFERENCES

File: .jpg - Wikimedia Commons. (z.d.). <https://commons.wikimedia.org/wiki/File:%E0%B4%AE%E0%B5%81%E0%B4%B3.jpg>

Gallery of Light, Empathy, and Silence: The Architecture of Marina Tabassum - 5. (z.d.). ArchDaily. <https://www.archdaily.com/1017460/light-empathy-and-silence-the-architecture-of-marina-tabassum/6662a26b326528550d629ad1-light-empathy-and-silence-the-architecture-of-marina-tabassum-photo>

Gopnik, A. (2016, 19 september). Jane Jacobs’s Street Smarts. *The New Yorker*. <https://www.newyorker.com/magazine/2016/09/26/jane-jacobs-street-smarts>

Housing, B. (z.d.). Belapur Housing - CultureNow - Museum Without Walls. <https://culturenow.org/site/belapur-housing>

James Taylor-Foster | Author | ArchDaily, page 20. (2014, 22 december). ArchDaily. [https://www.archdaily.com/author/james-taylor-foster/page/20?ad\\_medium=categories\\_first\\_level&ad\\_name=flyout](https://www.archdaily.com/author/james-taylor-foster/page/20?ad_medium=categories_first_level&ad_name=flyout)

Lin, J. (2024, 11 november). Building with earth: Anna Heringer and Nripal Adhikary in conversation. *The Architectural Review*. <https://www.architectural-review.com/essays/profiles-and-interviews/building-with-earth-anna-heringer-and-nripal-adhikary-in-conversation>

Okumus, S. (2025, 6 januari). 6 Impressive Works of Charles Correa in India. PA | Architecture & Technology. <https://parametric-architecture.com/6-impressive-works-of-charles-correa-in-india/>

Viva, A. (2020, 19 november). ‘The Architect is Present’ at Museo ICO in Madrid. *Arquitectura Viva*. <https://arquitecturaviva.com/articles/the-architect-is-present-at-museo-ico-in-madrid-pjism>

Whelan, J. (2018, 24 september). TYIN tegnestue Releases Downloadable Guide to Design/Build in Underprivileged Areas. ArchDaily. <https://www.archdaily.com/507588/tyin-tegnestue-releases-downloadable-guide-to-design-build-in-underprivileged-areas>

Zabalbeascoa, A., & Zabalbeascoa, A. (2022, 29 april). Anna Heringer: “Nuestra sociedad da valor a lo que cuesta dinero y se lo quita a lo que cuesta poco”. El País. <https://elpais.com/eps/2022-04-29/anna-heringer-la-arquitectura-de-hoy-es-solo-rentabilidad.html>

Figure 10:

Loja online | Semences de bambu. (z.d.). [www.bamboo-seeds.com](http://www.bamboo-seeds.com). <https://www.bamboo-seeds.com/loja>

Figure 11:

Indiatodayne. (2023, 27 oktober). Types of Bamboos found in Northeast India. India Today NE. <https://www.indiatodayne.in/visualstories/webstories/types-of-bamboos-found-in-northeast-india-72552-27-10-2023>

Figure 12:

Loja online | Semences de bambu. (z.d.). [www.bamboo-seeds.com](http://www.bamboo-seeds.com). <https://www.bamboo-seeds.com/loja>

Figure 13:

Directplant. (z.d.). Bamboe kopen? Altijd goedkoop! <https://www.directplant.nl/tuinplanten/bamboe.html>

Figure 14:

Schröder, S. (2022, 21 augustus). Melocanna baccifera - Muli Bamboo. Guadua Bamboo - Experts in The World's Strongest Bamboo. <https://www.guaduabamboo.com/blog/melocanna-baccifera>

