SUSTAINING SYLHET

BRIDGING TRADITION AND GROWTH

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COLOPHON

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PREFACE

This booklet is the final product of the course AR3AD105 Dwelling Graduation Studio: Global Housing. It is a collection of the work I have done over the past year, both in preparation for and during my graduation project.

In September 2024, my graduation journey began: a full year of focus on Global Housing, specifically in Sylhet, Bangladesh. The absolute highlight of this year was the field trip to Bangladesh. It was an exciting prospect, especially since it's a country no one close to me had ever visited. That excitement turned into concern when political unrest broke out in the summer beforehand, with students playing a central role. The constant questions from family and friends about the safety of the country didn't exactly ease my nerves.

Fortunately, the situation calmed down, and we were able to go on the trip, a few weeks later than planned. And for that, I'm incredibly grateful. Because without the field trip, Global Housing wouldn't have been what it's meant to be. The experiences I gained in Bangladesh, related to architecture, but also to daily life, are irreplaceable. No theory or article at home in the Netherlands could have taught me what I learned walking through the neighborhoods of Sylhet, talking to local residents, and seeing how they live and build. These experiences have shaped me, and they will stay with me for a very long time, both in my professional path and personal life.

The trip also brought unexpected friendships. You don't often find yourself in a foreign country for two weeks with people you barely know. That kind of situation creates unique bonds. I'm thankful for that, and for the connections I formed with several people from the studio.

I also want to sincerely thank my personal mentors: Nelson Mota, Ludovica Cassina, Marina Tabassum, and Antonio Paoletti. Each of you helped me in your own way, through honest and constructive feedback, but especially by engaging in conversations that helped me think through the tough questions that come with designing in a context like this. Often, I would walk out of those conversations with more energy and enthusiasm than when I walked in.

Lastly, I want to thank my family and girlfriend for their support over the past year. For trusting that things would work out, for their mental support during stressful moments (like the P2), and even for helping me cut countless tiny sticks for model making. You were there when I doubted myself.

Now, in June 2025, this journey has come to an end. I'm closing it with this booklet as its final result. This graduation project is a reflection of what I've learned, what I value, what I still hope to learn, and what I aspire to contribute to the world of architecture.

- Jasper Ambagts



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RESEARCH PLAN

URBAN EXPANSION

Urban expansion, the physical growth of urban areas through the conversion of non-urban land, is one of the most significant spatial transformations of the 21st century.[1]

Globally, urban land is expanding at rates that exceed population growth, with cities growing at approximately twice the rate of urban population increases.[2] This expansion, often characterized by low-density development or "sprawl," brings with it complex challenges related to infrastructure, land use, equity, and environmental sustainability.[3]

Urban expansion occurs as cities accommodate growing populations and rising incomes, often accompanied by reduced transportation costs and changing lifestyles. This process transforms agricultural land and open spaces into built environments, commonly expanding beyond established city boundaries. It is frequently driven by market forces, demographic shifts, state planning (or its absence), and institutional structures.[4]

Cities in developing countries are particularly vulnerable to rapid and unregulated expansion. Between 2000 and 2050, urban land cover in developing countries is expected to increase from 300,000 to 1,200,000 km^2, outpacing infrastructural and governance capacities.[5]

While urbanization can support economic growth and modernization, unchecked expansion is often accompanied by severe consequences:

Environmental degradation
The loss of arable land, natural habitats, and increased carbon emissions due to land cover change and higher energy consumption.[6]

Inequity and spatial segregation
Sprawl tends to exacerbate social and spatial inequalities, pushing lower-income populations to peripheral areas with poor access to services.[7]

Informal development
In the absence of planning, cities experience occupation-first development, where slums and informal settlements emerge without basic infrastructure.[8]

Infrastructure strain
Transport congestion, utility shortages, waste management issues, and insufficient schools and hospitals are common in rapidly growing urban environments.[9]

Governance failure
Weak legal frameworks, lack of coordination, and absence of skilled planners hinder the development control necessary for orderly urban growth.[10]

THE UNPLANNED MEGACITY

Bangladesh is undergoing one of the fastest urban transitions in South Asia. Although the current level of urbanization stands at 28%, this is projected to double to 56% by 2050.[11]

Dhaka, the capital, currently ranks among the world's most densely populated cities and is projected to become the sixth-largest megacity by 2030, with a population exceeding 27 million.[12]

In the case of Dhaka, the consequences of rapid urban expansion are particularly severe. Over 30% of the city's population now lives in slums or squatter settlements, many of which are built on vacant government or private land without any form of legal tenure. [13]

These informal settlements often lack basic services such as electricity, and proper sanitation, creating conditions that are highly detrimental to public health. Diseases, illnesses, and poor maternal and child health outcomes are widespread in these communities, exacerbating the vulnerability of already marginalized groups.[14]

The environmental toll of this unregulated growth is equally alarming. Urban expansion in Dhaka has led to the destruction of vital wetlands, water bodies, and agricultural lands. The Buriganga River, a crucial lifeline for the city's ecosystem and economy, suffers from severe pollution due to the unfiltered dumping of urban runoff and industrial waste. This environmental degradation not only compromises biodiversity and food security but also intensifies the city's exposure to climate risks such as flooding and water scarcity.

Traffic congestion in Dhaka is another major consequence of unplanned expansion. The city's road network has not kept pace with the growing population and the increasing number of vehicles. This has led to severe daily gridlock, with commuters often spending hours stuck in traffic. The city relies heavily on rickshaws, both licensed and unlicensed, which further clogs narrow, poorly planned streets. The resulting economic losses, air pollution, and general inefficiency have become routine burdens for residents and businesses alike.





Land governance in Dhaka suffers from chronic institutional weaknesses. Rather than following the ideal sequence of planning, servicing, building, and then occupation, development typically unfolds in reverse. Settlements emerge first, and only later, often much later, are attempts made to provide services or enforce regulations. Urban authorities lack the manpower, legal tools, and political independence to control land use effectively. As a result, enforcement of development standards is inconsistent and often undermined by political interference and informal arrangements.[15]

Moreover, the cost and configuration of land further complicate urban development. Land in municipal areas is prohibitively expensive and fragmented into small, irregular plots. This fragmentation makes it difficult to enforce zoning laws or apply uniform construction standards. Consequently, developers and residents alike turn to informal or illegal construction practices, perpetuating the cycle of unregulated growth and spatial inequality.

Sylhet, though smaller than Dhaka, is one of the fastest-growing cities in northeastern Bangladesh. It has seen rapid expansion due to remittance-fueled construction, rural-to-urban migration, and increased investment in tourism and small industries. However, it faces parallel problems.

Sylhet's rapid, unregulated growth, driven by the absence of a proper urban plan, has led to unplanned expansion into farmlands and floodplains, threatening ecological stability. Its infrastructure is under strain, and planning is hindered by a lack of skilled local professionals and overreliance on national agencies.





PERCEPTION OF MATERIALS

There is a critical tension visible across Bangladesh today: the social aspiration for "hard" urban materials like concrete and brick, and the environmental and cultural value of vernacular ones such as bamboo and earth.

Concrete, bricks, and steel are increasingly viewed as modern, respectable, and permanent. Meanwhile, bamboo and mud are often dismissed as "poor people's materials", associated with informality, fragility, and the rural past.[16]

This perception shift has profound implications. As architect Anna Heringer observes:

"Villagers have an increasing desire to build homes out of bricks and concrete. This trend could have a serious impact on the environment. Another effect is the loss of cultural and regional identity."[17]

The project directly confronts this stigma. Rather than pushing for modernity through imported or high-emission materials.

The core strategy is simple but powerful: use the same natural materials, bamboo, compressed earth blocks, lime plaster, across all income levels. Whether it's a low- or high-income apartment block, the construction language is shared. In doing so, the project sends a clear message.

When residents see that even the wealthiest families live in bamboo-framed, earth-block houses, designed with care, quality, and elegance, the stigma begins to dissolve.



RESEARCH QUESTION

The objective of this project is not to romanticize the past or resist change, but to fundamentally rethink what sustainable urban expansion means in the context of cities undergoing rapid transformation. It challenges the assumption that progress must come at the expense of identity, and instead argues that tradition can be a powerful resource for innovation. It seeks to offer design, planning, and policy tools that honor local traditions while meeting the infrastructural and social needs of growing urban populations.

This leads to the central research question guiding this project:

"How can sustainable urban expansion strategies, incorporating vernacular architectural practices, be implemented to balance economic growth, environmental conservation, and cultural preservation in rapidly growing cities like Sylhet?"

By asking this question, the study positions itself at the intersection of architecture, planning, sustainability, and cultural continuity. It is not only about the physical form of the city, it is about shaping a future that is ecologically aware, socially just, and deeply connected to the identity of the communities it serves.

"HOW CAN SUSTAINABLE **URBAN EXPANSION** STRATEGIES, BE IMPLEMENTED TO BALANCE **ECONOMIC** GROWTH, **ENVIRONMENTAL** CONSERVATION, AND **CULTURAL** PRESERVATION IN RAPIDLY GROWING CITIES LIKE SYLHET?"

METHODOLOGY

The project adopts a multidisciplinary and layered methodology, combining urban analysis, vernacular architecture, material studies, and firsthand field research. The aim is to generate a spatial response to the rural-to-urban transition in the Sylhet region that is inclusive, sustainable, and grounded in local realities. Rather than relying solely on top-down planning or abstract typologies, the methodology focuses on integrating everyday practices, local aspirations and environmental risks.

Field Research

A one-and-a-half-week field trip to Sylhet formed the foundation of this project. On-site visits to both rural villages and urban neighborhoods offered direct engagement with the built environment, construction practices, and domestic routines. Notes, sketches, videos, and informal conversations collected during this period helped form a base understanding of the spatial, climatic, and cultural dynamics of the region.

Video documentation, captured by multiple group members, proved especially useful, enabling a broader review of spatial behaviors, details that may have been overlooked on-site.

Urban Mapping

Urban mapping was used to investigate how the city of Sylhet is expanding, with a particular focus on the Shonatola area, located on the periphery of the city center. By analyzing satellite imagery, existing development plans, and historical urban data, the mapping process helped identify key patterns of growth, densification, and land use change around Sylhet.

Material Studies

A core part of the methodology involved an in-depth study of local building materials, focusing on their availability, affordability, sustainability, and perception. Site visits to brick fields and traditional bamboo constructions in Sylhet, plus a CEB production workshop in Brussels allowed for a comparative assessment of different structural and finishing materials. Material life spans, ecological impact, embodied energy, and reuse potential were evaluated in relation to the environmental constraints and socio-economic realities of the region.

Literature Review & Case Studies

Relevant literature, particularly those focusing on vernacular architecture, flood-adapted housing, participatory planning, and incremental development, were reviewed to support the design framework. Case studies from Bangladesh and similar monsoon-affected regions were instrumental in identifying adaptable strategies that align with local building culture and economic patterns.

Daily Routines

A key component of the design process involved studying and understanding the living patterns and spatial needs of various income groups in Sylhet. Rather than generalizing housing demands, the project analyzed a range of existing dwelling typologies, from rural low-income houses to informal urban extensions, and more formal middle- and high-income homes. This analysis focused not just on form or size, but on how residents use space throughout the day. This understanding informed the design of adaptable, user-responsive housing that reflects the real needs of everyday life.



WHY IT MATTERS

As Sylhet undergoes rapid urbanization, the city stands at a critical turning point: development is accelerating, but at the risk of losing ecological balance and cultural heritage. This research is driven by the urgent need to question the current model of growth and propose an alternative path, one that does not treat sustainability and progress as opposing forces.

This study is important because it addresses a critical gap in contemporary urban development. While modern architecture and planning promise efficiency and modernization, they often disregard the value of local knowledge and vernacular practices that have evolved over generations. These traditional systems, whether in building techniques, material use, or spatial organization, are not just symbols of the past; they are living strategies for climate adaptation, social cohesion, and resource efficiency.

In Sylhet, and specifically in areas like Shonatola village, we see the physical manifestation of this tension. Traditional mud and bamboo homes, which have proven climate-resilient benefits, are being replaced by concrete structures that are ill-suited to the climate and landscape. Yet this shift is occurring not out of necessity, but out of aspiration, urban modernity is often equated with concrete and glass, while indigenous techniques are dismissed as outdated and poor.[18]

The relevance of this research lies in its challenge to that narrative. It proposes that true progress in urban development must embrace, not erase, vernacular knowledge. By integrating these practices into contemporary planning strategies, cities like Sylhet can develop in ways that are environmentally responsible, economically inclusive, and culturally meaningful.



RESEARCH

CLIMATIC PROFILE

In Bangladesh, climate is not a distant or abstract factor, it is a constant, determining force in daily life and national development. From when crops are planted to how homes are built and how cities grow, the country's climatic conditions influence decisions at every scale. With a landscape defined by low elevation, high population density, and exposure to seasonal extremes.

This chapter outlines the climatic profile of Bangladesh to explain how weather patterns shape both environmental risks and everyday realities. It focuses on core indicators, temperature, rainfall, wind, and sunlight, showing how they vary across regions and seasons. While this information may seem technical, it directly connects to the country's broader context: infrastructure failures during monsoons, energy demand in hot seasons, and the erosion of traditional weather-based knowledge systems.

Rainfall

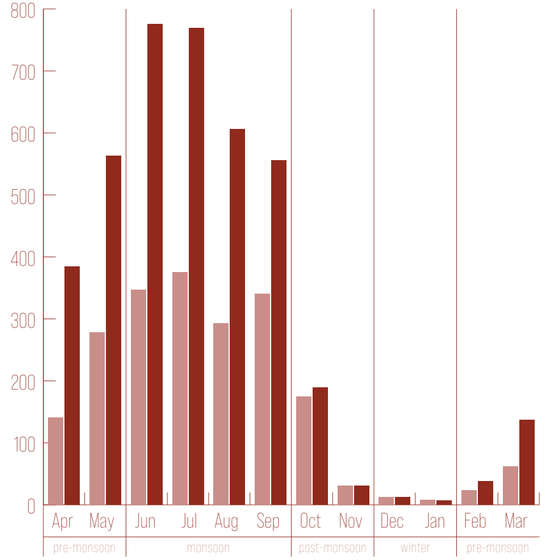
Bangladesh, located at the intersection of the Indo-Himalayan and Indo-Chinese subregions, experiences a subtropical humid climate marked by distinct seasonal rainfall patterns. High temperatures, humidity, and monsoonal circulation shape the country's weather, with significant variations during the pre-monsoon, monsoon, and post-monsoon periods.[19] Recently, heavy rainfall and extreme weather events have intensified, leading to more frequent floods, cyclones, and tidal surges.[20]

Bangladesh experiences a diverse range of seasons, with transitions occurring approximately every two months. This distinct climatic pattern has led to the country being known as "The Land of Six Seasons." These include summer, the rainy season, autumn, late autumn, winter, and spring, each defined by unique weather conditions. According to the Bengali calendar, summer is the first season of the year, beginning in April.[21]

However, recent climatic patterns suggest that these six seasons are merging, effectively transitioning into four broader seasons: a dry winter (December–February), a warm pre-monsoon summer (February–June), a wet monsoon (June–October), and a post-monsoon autumn (October–December).[22] The monsoon season is the most significant, accounting for over 71% of the country's annual rainfall.[23]

During the monsoon season, weak tropical depressions from the Bay of Bengal, carried by monsoon winds, drive most of the rainfall in Bangladesh. Over 71% of the country's annual rainfall occurs during this period. Sylhet receives significantly more rainfall than Dhaka, though both follow a similar pattern, with monsoon months being the wettest. Dhaka's highest monthly rainfall is 375 mm in July, while Sylhet peaks at 776 mm in June.[24]

■ = Sylhet
■ = Dhaka



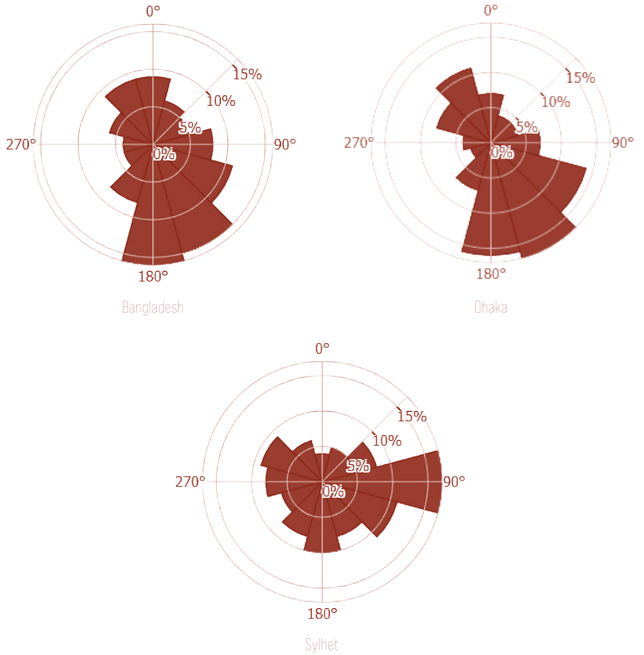
Average rainfall in Sylhet and Dhaka
Data from Khatun, M. A., Rashid, M. B., & Hygen, H. O. (2016). Climate of Bangladesh (MET Report No. 09/2016). Norwegian Meteorological Institute

Wind

During the monsoon season (March to September), strong south/southwesterly winds from the Indian Ocean move inland through the coastal regions of Bangladesh, bringing monthly average wind speeds between 3 m/s and 6 m/s.[25]

Wind patterns vary across regions. In Dhaka, the dominant wind direction remains southwest throughout the year, whereas in Sylhet, it predominantly comes from the east. Additionally, wind speeds differ between these areas. Dhaka experiences higher wind speeds than Sylhet, with peak winds reaching 8.7 m/s in July during the monsoon season. In contrast, Sylhet's maximum wind speed during the same period is 6.1 m/s.[26]

After the monsoon season, wind speeds gradually decline. Dhaka records its lowest wind speed of 4.1 m/s in November, while Sylhet's minimum occurs in November and December, dropping to 3.2 m/s.[27] These seasonal wind variations influence weather patterns, energy potential, and local climate conditions across Bangladesh.



Wind Direction in Bangladesh, Dhaka and Sylhet

Data from Global Wind Atlas (2024), operated by DTU and the World Bank. Retrieved from https://globalwindatlas.info/

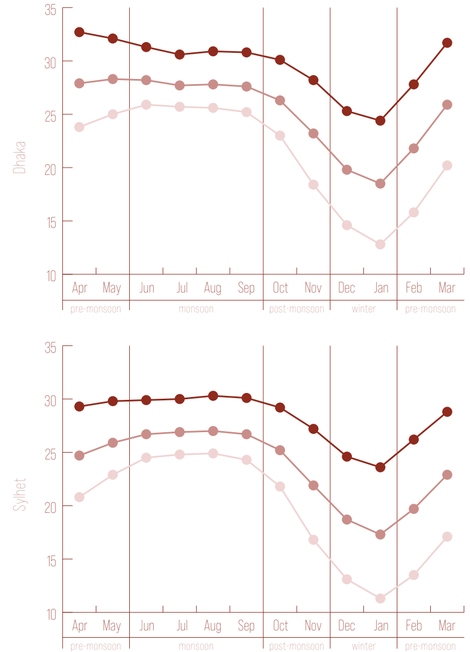
Temperature

In Bangladesh, temperatures range from 12.3°C to 28.1°C in winter and 22.8°C to 33.4°C in summer, with January as the coldest month and May as the hottest.[28] The pre-monsoon season is marked by high temperatures, peaking at 33.4°C, followed by the monsoon season, which brings both heat and heavy rainfall. The post-monsoon period serves as a transition, characterized by decreasing rainfall and gradually cooler nighttime temperatures. Winter is the coolest and driest season.[29]

Temperature variations exist across regions, with Sylhet, in the northeast, experiencing lower average temperatures than Dhaka, located centrally. In winter, Sylhet's minimum temperature drops to 11.3°C, while Dhaka's falls to 12.8°C. During summer, Sylhet's maximum temperature reaches 30.3°C, whereas Dhaka's rises to 32.7°C.[30] [31]

Overall, Dhaka tends to be warmer than Sylhet, likely due to geographical and topographical differences. Sylhet, near hilly regions, benefits from cooling effects, while Dhaka, situated in a flat, low-lying area, retains more heat.

■ = Max Temp (°C)
■ = Avg Temp (°C)
■ = Min Temp (°C)



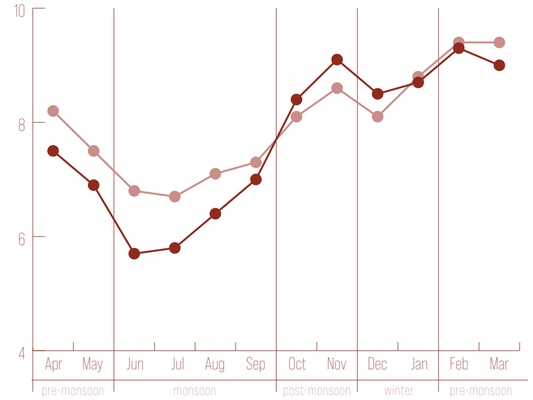
Average Temperature in Dhaka and Sylhet
Data from Climate-Data.org [n.d.]. Retrieved from https://en.climate-data.org/

Sunlight

Sunlight hours vary across different regions of Bangladesh, with Dhaka receiving more daily sunshine than Sylhet. Dhaka's peak sunlight hours occur in February and March, averaging 9.4 hours per day, while the lowest occurs in July, with 6.7 hours.[32]

In contrast, Sylhet experiences its highest average sunshine in February, with 9.3 hours per day, and its lowest in June, at 5.7 hours.[33] These variations closely align with monsoon rainfall patterns, as Dhaka receives its highest rainfall in July, while Sylhet's peak rainfall occurs in June.

■ = Sylhet
■ = Dhaka



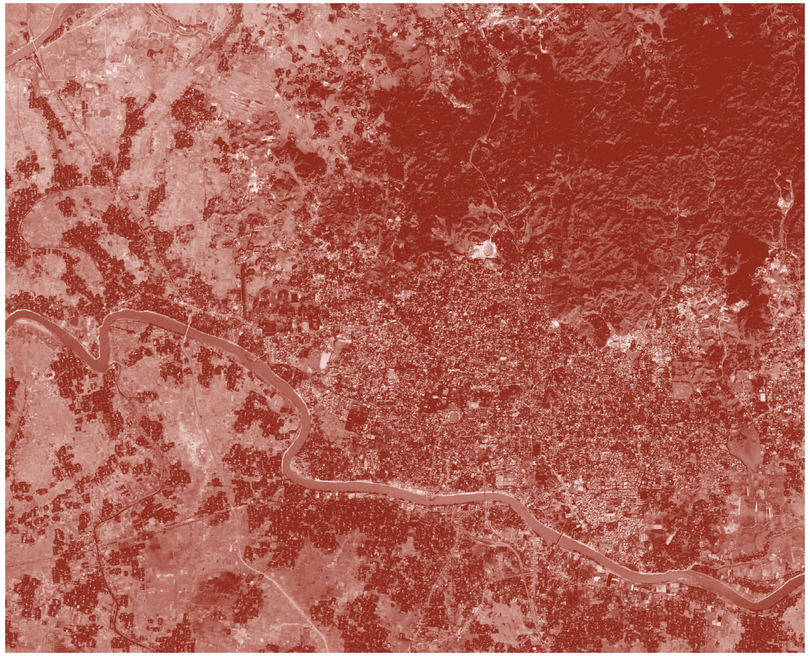
Average sunlight hours in Sylhet and Dhaka
Data from Climate-Data.org (n.d.). Retrieved from https://en.climate-data.org/

DEVELOPMENT OF SYLHET

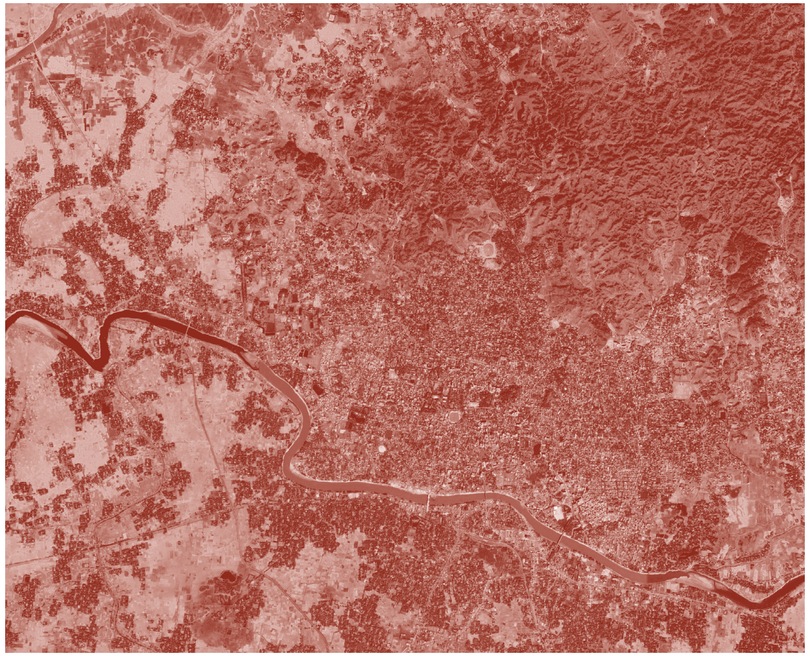
This chapter presents a series of satellite images that illustrate the spatial development of Sylhet over time. These visuals reveal how the city has expanded outward, gradually absorbing surrounding agricultural and semi-rural land. What was once a patchwork of rice fields, homesteads, and water bodies is increasingly being replaced by dense urban construction.

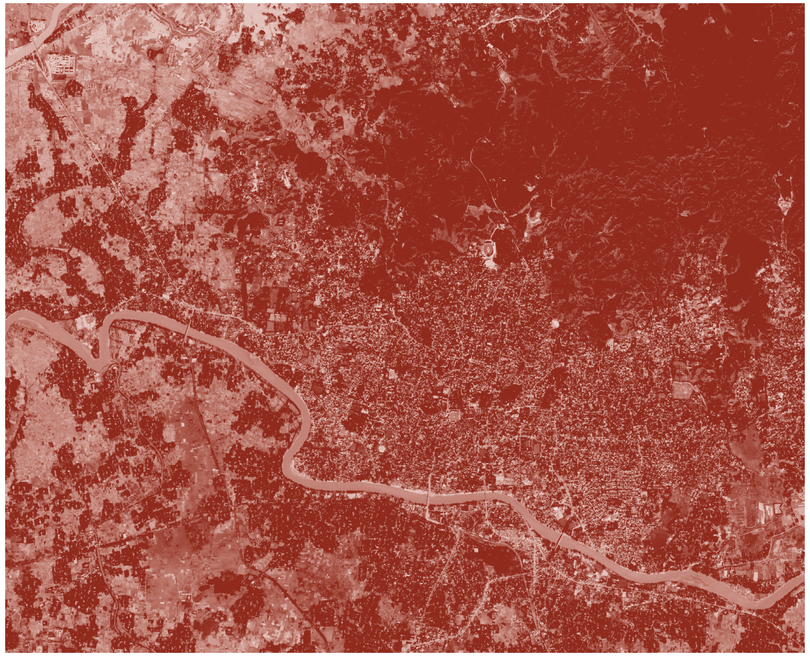
The transformation is not uniform. Some areas densify rapidly with concrete structures, while others remain in transition, caught between agricultural use and speculative development. The spatial pattern reveals a patchwork of growth driven more by market forces than by long-term planning or environmental awareness.

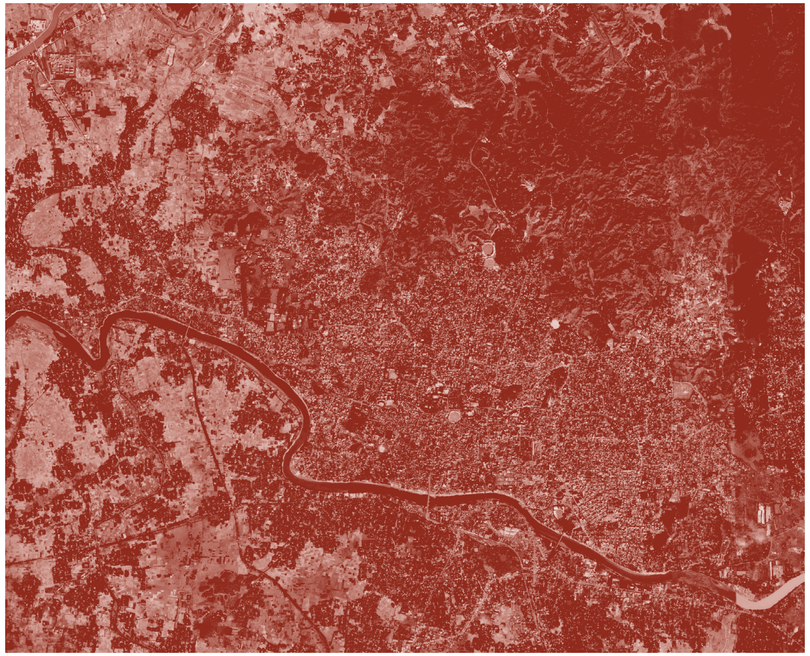
This urban footprint, once tied to topography and water systems, is increasingly defined by opportunistic development. The visual progression of the city over time reflects a broader trend seen across many fast-growing regions in South Asia: a city extending outward without a coherent strategy for integrating nature, agriculture, or heritage into its future form.

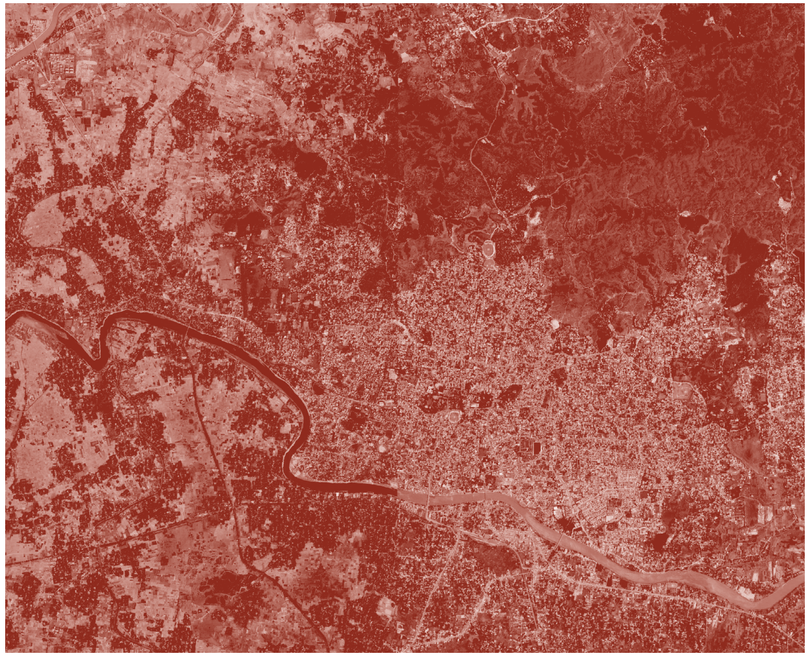


Satellite image of Sylhet, 2008
Image from Google Earth









SHONATOLA VILLAGE

Total area: 82,350 m^2 (8.24 hectares)
Total population: ≈ 1,850 residents
Population density: ≈ 225 people/ha

Total number of houses: 265
Housing density: ≈ 32 houses/ha
Average household size: 6-8 people

Nestled just beyond the expanding edge of Sylhet, Shonatola village sits at a critical threshold. Once a quiet agrarian settlement, the village is now at the front line of urban transformation driven by the rapid development of the Badaghat Road corridor. As Sylhet emerges as one of Bangladesh's most economically significant cities, the surrounding landscape is undergoing intense spatial and social change, and Shonatola finds itself caught in the middle.

With the upgrade of Badaghat Road into a four-lane artery, connectivity to key institutions and infrastructure, such as the Marine Academy, Central Jail, and the Shari-Goyain River, has increased dramatically. This has triggered a surge in land speculation and development activity along the corridor. What was once agricultural land and low-rise homesteads is now a patchwork of construction sites and emerging high-rise buildings. Developers are acquiring plots, clearing traditional homes, and building concrete structures at a pace that outstrips both planning and public awareness.

Shonatola, home to roughly 1,800 people, reflects the tension between past and future that defines Sylhet's peri-urban edge. Historically, the village relied on agriculture, and its homes were built from bamboo, mud, and other local materials, designed for flood resilience, ventilation, and affordability. These homes were not only practical but also deeply rooted in cultural knowledge and environmental adaptation.

Today, that model is rapidly eroding. Many villagers, seeking improved living standards and modern infrastructure, are replacing traditional structures with concrete buildings. For some, this shift represents progress, a step toward the urban lifestyle visible just kilometers away. However, these changes are happening without full awareness of their long-term consequences.[34] Concrete structures retain heat, increase energy demands, and disrupt natural drainage, making the area more vulnerable to waterlogging and environmental stress.

At the same time, the transformation of Shonatola is not being guided by a coherent urban or environmental plan. Development is taking place plot by plot, often driven by private investment rather than community needs or sustainable design. This uncoordinated growth risks severing the village from its ecological foundations, erasing not just traditional architecture but also the social structures and communal relationships that came with it.





Photo taken by A. Halleran (2024)

WEAKNESSES

Shonatola Village faces a number of critical weaknesses that make it vulnerable to environmental, social, and economic challenges, especially as it undergoes rapid transformation under pressure from Sylhet's urban expansion.

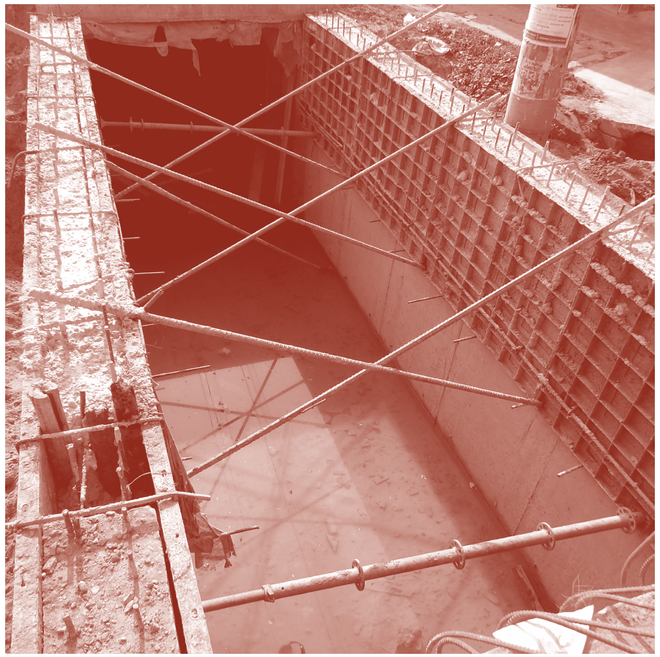
Flood Vulnerability
Flooding remains one of the most significant environmental risks for Shonatola. The village is situated in a low-lying area susceptible to seasonal monsoon floods, with water levels rising up to 1.0 meters in certain zones during peak periods. Existing drainage systems are fragmented, informal, and under-capacitated. Water tends to accumulate in courtyards and along footpaths, especially during prolonged rainfall, making daily movement difficult and damaging unprotected homes.

Despite the severity of this issue, there are few robust flood mitigation measures in place. Some elevated school buildings serve as informal flood shelters, but these are limited in number and accessibility. Most homes, especially those built with mud or bamboo, lack sufficient elevation or protective design to withstand flood conditions.

Climate data suggest that extreme rainfall events are becoming more frequent and intense in the region, which will only worsen the impact of inadequate water infrastructure.[35]




সোনাতলা সরকারি প্রাথমিক বিদ্যালয়
প্রতিষ্ঠা সন: ১২৫২ খ্রীঃ নির্মাণ: ১৯৯৯-২০০০ খ্রীঃ



Shift Toward "Hard" Materials

The material composition of homes in Shonatola is also undergoing a major shift. Traditionally, the village relied on locally available materials such as bamboo, mud, and thatch, materials that offered natural ventilation, low embodied energy, and adaptability to the wet climate. These vernacular construction methods, developed over generations, were inherently aligned with environmental conditions and resource availability.

However, this building tradition is increasingly being replaced. Driven by aspirations for modernity and a perception of permanence, villagers are turning to concrete, brick, and corrugated iron sheets for new construction. While these materials may appear more durable and desirable, they are not well-suited to Shonatola's climate or geography. Concrete structures, in particular, trap heat and reduce permeability, worsening waterlogging during monsoons and increasing indoor temperatures year-round.

The desire for "hard" materials is understandable, it represents upward mobility and aligns with the imagery of modern urban life. But the uncritical adoption of these materials comes with trade-offs. Not only do they contribute to environmental problems, but they also accelerate the loss of cultural identity and building knowledge. As noted in parallel studies, such as Anna Heringer's work in Rudrapur, the disappearance of vernacular construction often leads to increased environmental impact and reduced adaptability in vulnerable regions.[36]

■ = concrete
■ = brick
■ = tin
■ = bamboo



Variety of Housing Materials in Shonatola
1:3000



Economic Underdevelopment

The economic condition of Shonatola plays a major role in shaping its vulnerabilities. The village's economy remains largely informal, with many residents working as agricultural laborers, small traders, or in seasonal, low-paying jobs. There is limited access to financial services, formal employment, or education that could support economic mobility.

This underdeveloped economic base severely restricts the community's capacity to invest in resilient infrastructure, quality housing, or long-term planning. Instead, decisions are often reactive and shaped by immediate financial constraints. For instance, families may choose to rebuild with concrete not because it's the most suitable option, but because it signals status or promises reduced maintenance, even if it leads to higher long-term costs and environmental trade-offs.

In addition, economic vulnerability makes the community more susceptible to land speculation. As Sylhet's expansion increases land value in the area, residents without secure income or savings may feel pressured to sell their plots to developers. This dynamic accelerates urban sprawl, disrupts community cohesion, and replaces agricultural or mixed-use village plots with fragmented, speculative construction.

Photo taken by R. van Poppel (2024) | 53

BADAGHAT ROAD

The Badaghat Road, once a modest local route cutting through agricultural land and low-density settlements, has undergone a rapid and significant transformation. Now widened into a four-lane highway, this infrastructural upgrade is one of the defining drivers of urban expansion in Sylhet. It has drastically increased connectivity between the city and key regional points, including the Marine Academy, Central Jail, and the Shari-Goyain River.

What was previously a transitional edge between Sylhet's urban core and its rural surroundings is now a development hotspot. The new road infrastructure has triggered a surge in land speculation and construction activity along its corridor. Developers are quickly acquiring plots adjacent to the highway, often displacing traditional homesteads and agricultural land to make way for multi-story residential and commercial buildings. These new developments, while signaling growth and economic opportunity, are occurring largely in the absence of planning regulation or infrastructural coordination.

Moreover, the road itself is not just a transportation corridor; it has become a catalyst for socio-spatial change. It enables faster movement of people, goods, and capital, but it also accelerates informal and unplanned urbanization.





Transformation Badaghat Road
Left image from Google Earth (2022), Right photo taken by A. Halleran (2024)

PLOT-BASED DEVELOPMENT

Plot-based development is emerging as a dominant urbanization pattern in Bangladesh, Dhaka, Sylhet, but more specifically Shonatola, a rural-urban fringe in Sylhet. While this might signal economic opportunity, the current trajectory, with fragmented land sales and developer-led construction is laying the groundwork for a highly problematic urban future.

This type of development is characterized by individual landowners or small developers purchasing separate plots, typically with the singular goal of maximizing profit. Each parcel is developed independently, with little to no coordination regarding shared infrastructure, road access, or coherent land-use planning. As a result, plots in such settings become landlocked and undevelopable, with no direct access to public roads or utility corridors.

Shonatola is already beginning to mirror patterns seen in Dhaka, where plot-based urbanism has resulted in extreme densification and poor-quality urban fabric. In Dhaka, this process has led to the proliferation of mid- to high-rise buildings, on narrow or unserviced streets, creating chaotic environments that put massive strain on already fragile infrastructure systems.[37]

The consequences have been severe: inadequate drainage, traffic gridlock, poor air quality, and limited access to green space have all contributed to a deterioration in the quality of life.

The broader urban form that emerges from unregulated plot-based development is one of incoherence and inequality. With each plot developed in isolation, neighborhoods lack connectivity, consistency in scale, or provision for public amenities. As a result, open space per capita plummets, creating environments with limited opportunities for recreation, social interaction, or communal identity.[38]

In addition to spatial fragmentation, plot-based urbanization introduces legal and administrative complications. The plot is not just a spatial unit but also a economic entity.[39] Fragmented ownership leads to governance challenges, as small developers must be coordinated, infrastructure rights-of-way secured, and utility delivery negotiated, tasks that local planning authorities in Bangladesh often lack the capacity to manage effectively.





Satellite Image of Dhaka, 2025
Image from Google Earth





UNREGULATED SCENARIO

In the context of rapidly urbanizing areas in Bangladesh, especially on the urban periphery, development is often driven by individual landowners maximizing profit through plot-based apartment construction.

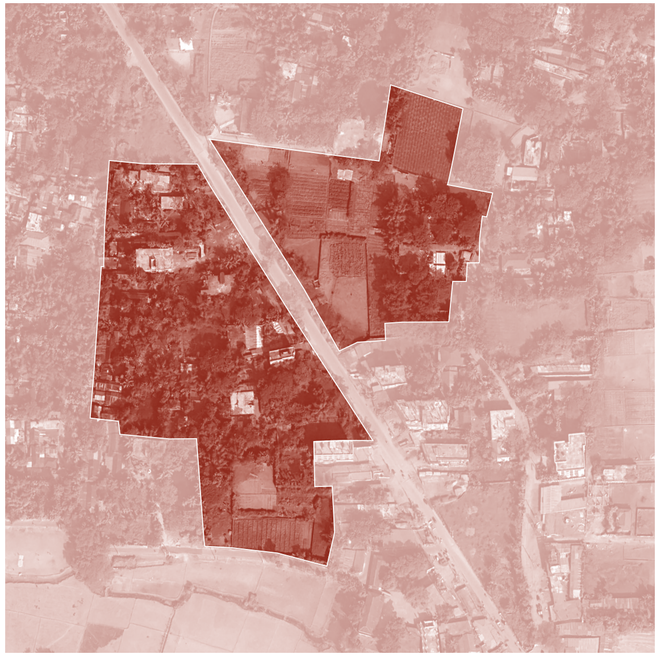
This leads to fragmented, incoherent urban fabrics where infrastructure, access, and open space are neglected.
The purpose of this scenario is to understand the long-term consequences of continuing unregulated, plot-by-plot development in the area. By simulating how the site might evolve without coordinated planning, the analysis reveals the physical and spatial challenges that emerge when individual landowners build independently to maximize profit, typically resulting in high floor space index (FSI) values, which benefit developers but strain the urban fabric.

This calculation helps visualize how the area could become fragmented, overcrowded, and inefficient, with blocked access, limited public space, and uneven development patterns. Establishing this "doom scenario" provides a critical baseline for comparison, allowing future stages of the project to demonstrate how a masterplan can offer a more equitable, accessible, and sustainable alternative.

To assess the long-term implications of such unplanned growth, a projection was made based on the current land division and ownership pattern of the site, divided into two distinct zones: Phase 1 and 2.

Phase 1 (1.75 ha): This area consists primarily of vacant or semi-developed plots and is subject to fast, speculative development. Construction practices typically involve maximizing floor area with multi-storey apartment buildings.

Phase 2 (1.98 ha): This is an existing informal village settlement. Due to socio-economic constraints, development in this zone is expected to remain slow, incremental, and low-rise for the foreseeable future.

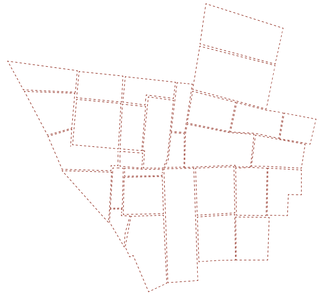


Satellite Image of Shonatola, Sylhet, 2025
Image from Google Earth

Phase 1 - Fast, Plot-Based Development:

- Only 70% of the land will be buildable, due to future landlocking from uncoordinated development.
- Of the buildable land, 65% will be covered by building footprints.
- A maximum building height of 5 storeys was assumed (based on realistic upper limits in similar Bangladeshi contexts).

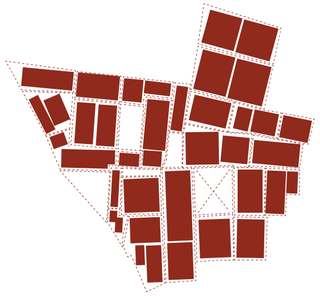
- Resulting built-up area: ~39,813 m²
- FSI (Floor Space Index): 2.27
- GSI (Ground Space Index): 0.46



Phase 2 - Slow, Village-Type Development:

- Development will gradually increase over time, with most buildings reaching 2 storeys, and only a few reaching 3.
- Average assumed height: 1.9 storeys
- Building footprint coverage: 40% of the land

- Resulting built-up area: ~15,048 m²
- FSI (Floor Space Index): 0.76
- GSI (Ground Space Index): 0.40



This unregulated development scenario illustrates how the absence of planning leads to an incoherent and imbalanced urban outcome.

Phase 1 rapidly densifies, with high FSI and GSI values that reflect intense, plot-based construction. While this may seem efficient in terms of floor area generated, it creates a chaotic built environment prone to infrastructure overload, poor accessibility, and landlocking, where up to 30% of plots become undevelopable due to lack of coordinated access.

Phase 2, by contrast, remains low-density and underdeveloped. Here, socio-economic constraints limit the capacity of residents to upgrade their homes beyond one or two stories. This results in a slow, incremental transformation, with minimal investment and stagnating urban potential.

Taken together, the site develops along two unequal trajectories: one pushing toward overbuilt intensity, the other falling behind.

The overall urban fabric becomes fragmented and socially unequal, with heavy pressure placed on infrastructure in high-density areas, and inefficient use of land in others.

This scenario demonstrates the risks of continuing without a coordinated planning strategy, reinforcing the need for a masterplan that balances growth, protects accessibility, and promotes inclusive, sustainable urban development.



Photo taken by R. van Poppel (2024)

VERNACULAR ARCHITECTURE

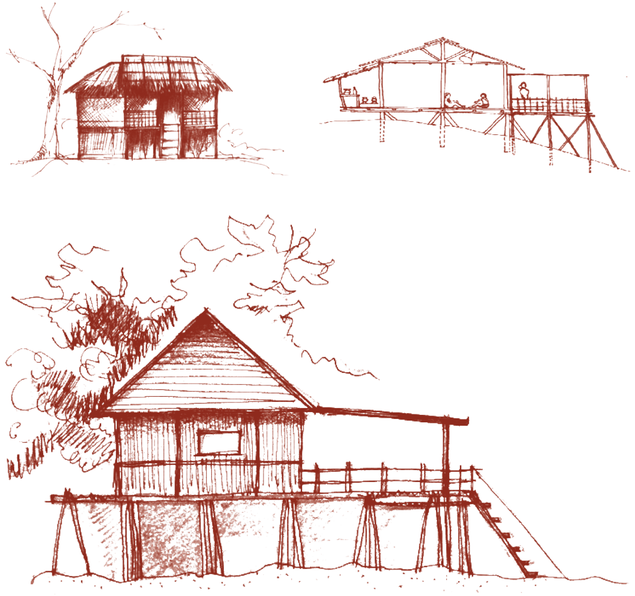
Vernacular architecture refers to adaptive and practical designs that address human needs through architecture rooted in regional identity, local resources, and environmental conditions. Vernacular architecture is deeply connected to the culture, heritage, and history of specific communities, fostering a sense of belonging. It integrates natural and cultural elements by using local construction materials and techniques that are both energy-efficient and sustainable. Despite being overlooked in contemporary architectural practice, vernacular structures offer valuable insights into resourcefulness and ecological adaptability.[40]

Vernacular architecture embodies a "folk" approach, directly reflecting a culture's practical needs and symbolic meanings. In this perspective, the form of a building is not merely functional but also symbolic of the worldview, traditions, and social structures of the community. Vernacular buildings are adaptive and evolve to suit their immediate environment, both climatic and cultural. They work harmoniously with the landscape, employing locally available materials and traditional construction methods that inherently provide climate resilience.[41]

Vernacular architecture in Bangladesh is a traditional form of building that has evolved over centuries through local knowledge, indigenous practices, and environmental adaptation. It is not designed by formally trained architects but by local artisans, mistris (carpenters), rajmistris (masons), and kamlas (laborers), who rely on inherited skills and oral transmission of techniques.[42] This architecture represents a spontaneous, culturally embedded response to the region's topography, climate, and social norms.

In rural Bangladesh, settlements tend to grow organically rather than through formal planning.[43] Most are situated on raised earthen mounds to avoid seasonal flooding, with buildings clustered around central courtyards. Homesteads (badis) are made up of several buildings (ghars) used by extended families, often including ancillary structures such as kitchens, granaries, and cowsheds. Settlement types vary from amorphous clusters to linear patterns along riverbanks, and in some regions homes are built on stilts to accommodate marshy or sloped terrain.[44]

Though the general layout of rural architecture has remained consistent for centuries, changes began occurring in the late 19th century with the introduction of industrial materials like corrugated iron sheets and bricks. Despite these surface-level changes, many traditional forms, materials, and spatial strategies continue to persist.



Drawing of Vernacular Houses in Bangladesh

Image from Banti, A. L. (2023). Learning from vernacular architecture: The essence of Remakri area in Bangladesh. In Sustainable development goals series (pp. 279-305).

DESIGN STRATEGIES

The design of vernacular architecture in Bangladesh is deeply rooted in ecological adaptation, social organization, and climatic responsiveness. Over generations, communities across the region have developed settlement patterns and housing forms that not only reflect cultural norms but also address the practical realities of living in a hot, humid, and flood-prone environment.

A key spatial feature of these traditional homes is the courtyard-based planning pattern, known locally as uthan. Typically rectangular or square in shape, the courtyard forms the heart of the homestead, around which several detached but closely placed buildings are arranged. These structures often serve different functions, sleeping quarters, kitchens, grain storage, or animal sheds, but are perceived collectively as a unified household.[45]

The open yet introverted nature of these settlements is a thoughtful response to both climate and culture. The arrangement allows for optimal ventilation and cooling, as large open spaces between the buildings facilitate airflow. Foliage surrounding and within the homestead provides further shielding from heat, significantly reducing thermal gain. Trees, vegetation, and ponds are not just decorative but integral components of the spatial design, enhancing thermal comfort and offering natural shading.[46]

Courtyards themselves are multifunctional spaces. On a practical level, they are used for cooking, drying crops, washing, and childcare. Socially, they serve as gathering places for families, hosting religious rituals, storytelling, and celebrations. In larger homesteads, multiple courtyards may exist, an inner one typically reserved for women and children, and an outer courtyard used by men or for receiving guests. This spatial segregation reflects cultural norms, particularly in Muslim communities where the concept of purdah influences domestic planning.[47]

The design strategies found in Bangladesh's vernacular architecture demonstrate a profound sensitivity to both nature and society. These spatial arrangements are finely attuned to the region's climate, while also mirroring the dynamics of family life, cultural practices, and a longstanding respect for the environment.

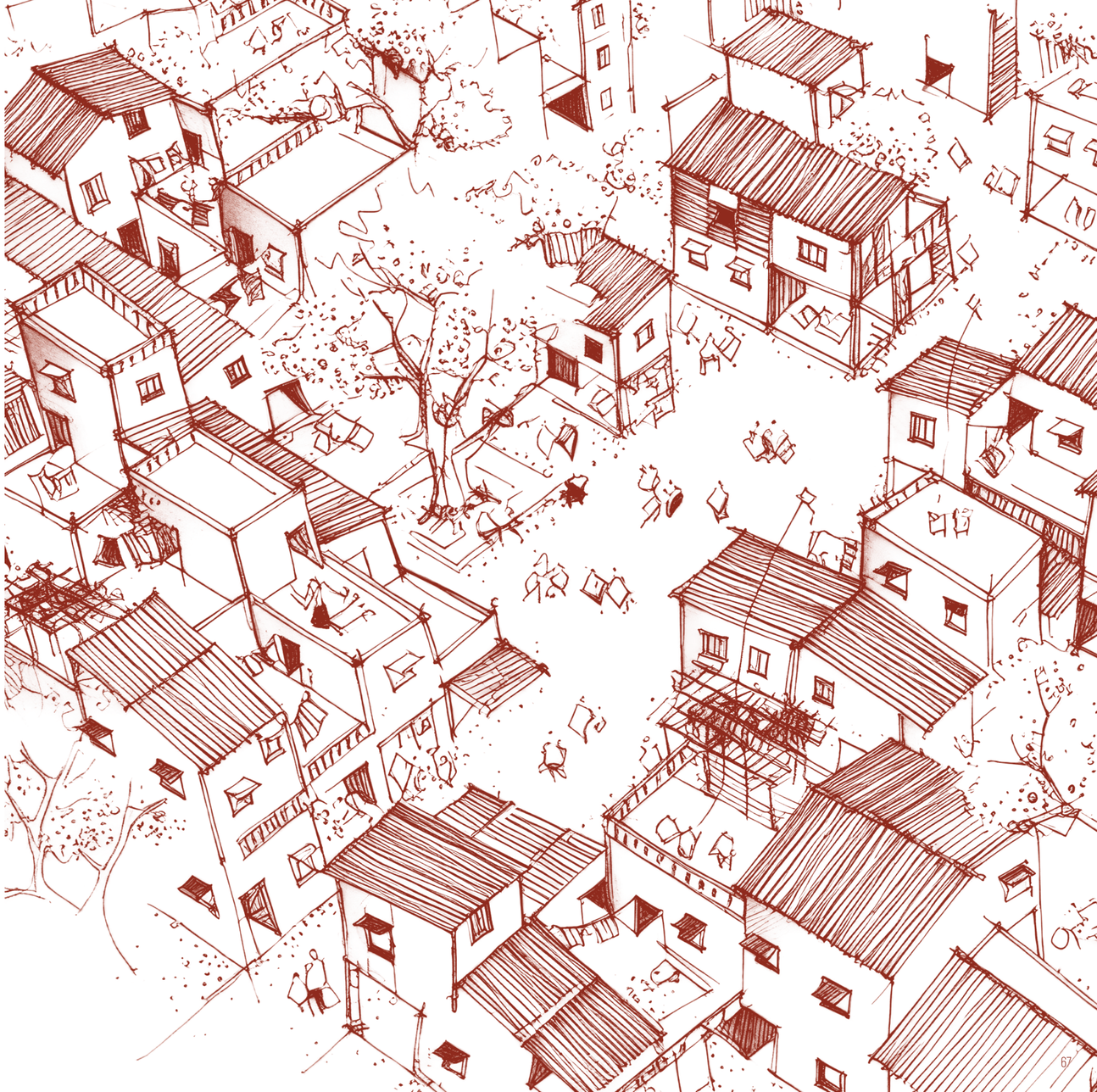


Image from Aman, J. et al. (2021). Optimizing container housing units for informal settlements: A parametric simulation & visualization workflow for architectural resilience. In CAADRIA 2021 (Vol. 1, pp. 51-60).

MATERIAL EFFICIENCY

One of the greatest strengths of vernacular architecture in Bangladesh is its material efficiency. Homes are constructed using locally available, low-energy, biodegradable materials that are well-suited to the region's climate and resource base.

Bamboo is one of the most widely used materials. Thick-walled bamboo is used structurally in posts and rafters, while thin-walled varieties are woven into screens and panels. It is lightweight, strong, and flexible, ideal for seismic zones and flood-prone areas. Bamboo's rapid growth also makes it a renewable and sustainable choice, though recent overuse has begun to reduce its availability. [48]

Mud and earth are common in drier or elevated regions. Thick mud walls provide excellent insulation, helping regulate indoor temperature throughout the year. Earth construction has low embodied energy, is easy to repair, and is often combined with other materials like bamboo to enhance resilience. In waterlogged areas, mud is less practical for wall construction but continues to be used for plinths. [49]

Thatch made from wild grasses, palm leaves, or rice straw is traditionally used for roofing. Thatched roofs are breathable, lightweight, and effective at shedding heavy rain. As natural vegetation declines, agricultural by-products like rice straw have become more common, though they are less durable.[50]

The shift to corrugated iron (CI) sheets and bricks has introduced more durable but less climate-appropriate materials. CI sheets increase indoor heat and are less responsive to environmental needs. However, they offer longer life spans and are often perceived as symbols of economic progress.[51]



Image from Re-thinking The Future (n.d.)









RESILIENCE AND FUTURE RELEVANCE

Vernacular architecture is deeply resilient. Raised plinths and stilt structures protect against floods and dampness. Bamboo's flexibility offers earthquake resistance. Thick walls and shaded courtyards provide natural cooling, reducing the need for artificial ventilation or air conditioning. Most structures are modular and easily repairable using community labor and traditional knowledge.[52]

Moreover, the architecture evolves incrementally. Families expand their homes by adding new rooms or buildings, ensuring that the homestead can grow with changing social or economic needs. This organic adaptability is a key strength rarely found in rigid, modern construction.

Today, Bangladesh's vernacular architecture faces significant challenges. The gradually decreasing supply of natural building materials, growing preference for industrial construction materials such as concrete and brick, and aspirations for "modern" lifestyles have changed the architectural landscape. However, this does not render vernacular practices obsolete. Instead, it makes their principles more important than ever.[53]

In the face of climate change, traditional techniques offer valuable lessons in resilience, sustainability, and community-driven design. Modern architecture can draw on these lessons by integrating passive design strategies, using low-carbon materials like bamboo and earth, and respecting the spatial logic of courtyard-based living.

A hybrid approach that combines vernacular wisdom with modern safety standards and materials could lead to more climate-resilient, socially inclusive, and environmentally sustainable built environments.

MASTERPLAN RUDRAPUR

Type: Urbanism masterplan
Location: Rudrapur, Bangladesh
Architects: Anna Heringer
Year: 2006

The Masterplan Rudrapur is a visionary architectural initiative by German architect Anna Heringer, focusing on sustainable development and community empowerment in the rural village of Rudrapur, Bangladesh. This master plan encompasses a series of interconnected projects that integrate education, vocational training, healthcare, and housing, all constructed using traditional materials like mud and bamboo. The overarching goal is to create a self-sustaining ecosystem that fosters local craftsmanship, promotes environmental stewardship, and strengthens community ties.[54]

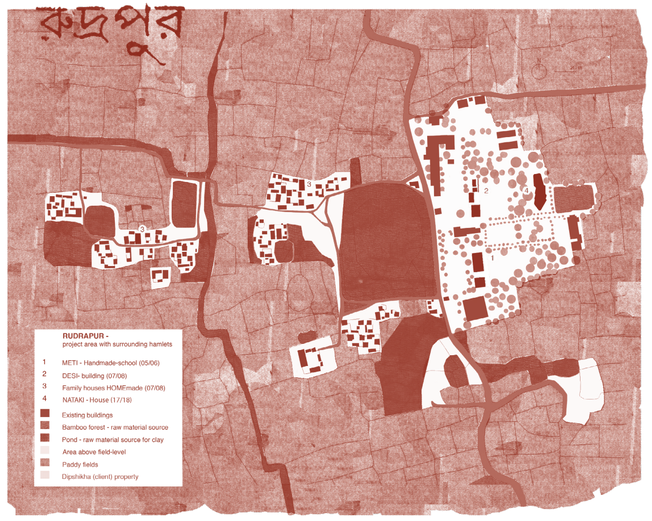
At the core of the Masterplan Rudrapur is an unwavering commitment to sustainability and community engagement. Each project utilizes locally sourced materials and traditional construction methods to minimize environmental impact and reduce dependence on external resources. Additionally, local artisans and residents are involved in the construction processes, helping to preserve cultural heritage and promote skill development.

One of the key early projects in the Masterplan Rudrapur is the METI Handmade School, completed in 2006 as part of Anna Heringer's diploma thesis. Built using locally sourced materials like rammed earth for the walls and bamboo for the frame, the school is both sustainable and climate-responsive, aligning with the local environment. This project highlighted the importance of integrating local materials into educational infrastructure, setting a precedent for future developments.[55]

In 2008, the DESI Training Center was built to provide vocational electrical training to the community. The building uses traditional wattle and daub construction with bamboo and earth, while also incorporating modern amenities like solar power and indoor plumbing. This blend of traditional methods and modern technology addressed the need for skilled labor, contributing to the village's long-term sustainability.[56]

The HOMEmade Housing Project, completed in 2011, aimed to address housing shortages in Rudrapur by building three model family homes using sustainable materials. Designed to optimize land use and promote vertical growth, the two-story homes allow for continued agricultural activities while providing comfortable living spaces, showing the potential of traditional techniques in meeting modern housing needs.[57]

The Anandaloy Community Center, completed in 2019, further benefited the village by serving as a therapy facility for people with disabilities and housing a fair-trade textile workshop for women. Designed to be inclusive, the building uses sustainable materials like mud and bamboo, with flowing curves and a prominent ramp symbolizing its mission of social inclusivity. It has become a hub for social interaction, empowerment, and skill development in the community.[58]



Masterplan Rudrapur
Image from Heringer, A. (n.d.). METI School, Bangladesh.







Images from Heringer, A. (n.d.). METI School, Bangladesh



QUINTA MONROY

Type: Social Housing
Location: Iquique, Chile
Architects: Alejandro Aravena + ELEMENTAL
Year: 2003

In Quinta Monroy, the staircases are external to the housing units to facilitate future expansion by residents. This design strategy was a key aspect of the project, which was developed by the architectural firm ELEMENTAL, led by Alejandro Aravena, as a response to the limitations of traditional social housing models.[59]

The project aimed to provide 93 families in Iquique, Chile, with affordable housing within a tight budget of $7,500 per unit. Given the constraints, ELEMENTAL adopted an incremental housing approach, constructing only half of each unit initially.[60] The remaining space was left open for residents to expand as their needs and resources allowed. By placing the staircases on the exterior, the design allowed for the upper floors to be added later without disrupting the interior layout. This approach not only reduced initial construction costs but also empowered residents to personalize and expand their homes over time.[61]

The external staircases also contributed to the project's integration into the existing urban fabric. They provided access to upper-level units without compromising the ground-level communal spaces, fostering a sense of community among residents.[62]

Image from Architect Magazine. (n.d.). Quinta Monroy Housing.





Masterplan Quinta Monroy

Left Image from ArchDaily. (2008, August 18). Quinta Monroy / ELEMENTAL. Right Image from Frearson, A. (2025, January 10). Quinta Monroy housing by Alejandro Aravena named one of the most influential buildings of the 21st century. Dezeen.

SAAL BOUCA

Type: Social Housing
Location: Porto, Portugal
Architects: Álvaro Siza
Year: 1978

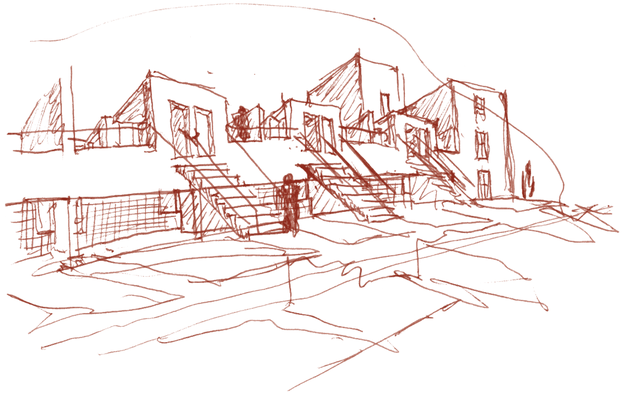
This housing project in Porto stands as one of Álvaro Siza's most politically engaged works, reflecting his thoughtful response to the urban context and his commitment to involving the community in the design process. Developed as part of the Serviço de Apoio Ambulatório Local (SAAL) initiative, established to address the housing crisis in Portugal after the 1974 revolution, the project was a response to the need for affordable and safe housing. Situated within a dense, historical neighborhood, the row of twelve houses adapts to its surroundings, offering a meaningful alternative to the tabula rasa approach to urban renewal.[63]

Siza's design for Bouça features stacked duplex units with external staircases that lead directly to upper-level kitchens and living areas. This arrangement reflects a deliberate choice to prioritize social interaction and community engagement. The staircases, often narrow and steep, serve as transitional spaces that connect private interiors with the communal outdoors, fostering a sense of belonging and visibility among residents. The act of ascending a staircase can been seen as a moment of pause and reflection, a transition from public to private space.[64]

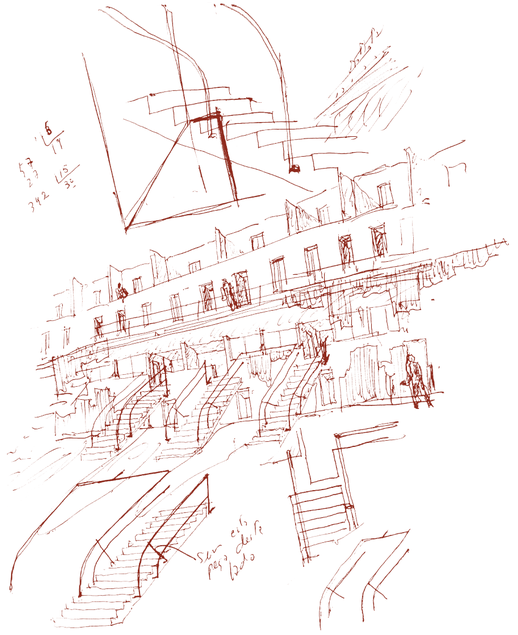
Bouça's layout is characterized by open courtyards and narrow passageways that encourage pedestrian movement and community interaction. This design approach not only addresses housing needs but also promotes a vibrant, interconnected community.



 Image from Amen, A. (2011). Conjunto Habitacional da Bouça - 4. Wikimedia Commons.



SAAL Bouça Housing Perspective Sketches
Drawing by Siza, Á. (1973). Bouça Housing, Porto, Portugal. via The Museum of Modern Art



Study sketch SAAL Bouça Housing by Álvaro Siza
Drawing by Siza, Á. (1973). Bouça Housing, Porto, Portugal. via Drawing Matter

BHUNGA HOUSES

Type: Vernacular Rural Housing
Location: Kutch, India
Year: Post 1800

The 1819 earthquake in the Rann of Kutch caused widespread devastation and over 1,500 deaths. In response, the people of Kutch designed the Bhunga houses, circular mud structures built to withstand seismic activity. These resilient homes have remained in use for over 200 years.[65] The Bhunga houses of Kutch are a remarkable example of vernacular architecture. Constructed primarily from locally sourced materials such as mud, stone, and thatch, the design of the Bhunga houses reflects a deep understanding of the local environment.

The circular form of the Bhunga houses is not merely aesthetic; it is a response to the challenges of the local climate, particularly the extreme heat and seismic activity. The thick mud walls provide natural insulation, keeping the interiors cool in the intense summer heat and warm during the chilly winter nights. The use of mud, a readily available material, is both cost-effective and environmentally sustainable.[66]

The domed roofs, often made from thatch or clay tiles, are designed to allow for efficient air circulation, which helps regulate indoor temperatures even during the hottest months. This passive cooling system minimizes the need for external energy sources. Additionally, the round shape of the Bhunga houses distributes the weight of the roof evenly across the walls, enhancing their earthquake-resistant qualities.[67]

The construction of Bhunga houses involves the collective knowledge of local artisans who use traditional building techniques. The walls are built from a bamboo frame, covered with mud and plaster, which gives the structure flexibility to absorb and adapt to the forces of nature.[68] This process not only preserves the traditional craft but also reinforces the sense of community as families and artisans work together to create homes that are both resilient and well-suited to the environment.[69]



Image from ETV Bharat. (2021, June 29). 105-year-old Bhunga house in Hodko village of Kutch.Commons.



VIKAS COMMUNITY

Type: Residential
Location: Auroville, India
Architect: Satprem Maïni
Year: 1998

The Vikas Community, built in Auroville between 1992 and 1998, is a notable example of integrating earth construction with modern design principles. This project was the first in Auroville to use Compressed Stabilized Earth Blocks throughout, from the foundations all the way to the roof. The use of CSEBs not only ensures durability but also highlights a commitment to sustainability, as these blocks are made from locally sourced soil, with minimal cement added for stabilization.[70]

The community consists of individual apartments, common facilities, and a collective kitchen. One of its key features is the use of earth for almost every part of the building process, from stabilizing the foundation with rammed earth to constructing walls, floors, and roofs using CSEBs. The design also incorporates vaulted and domed roofs, created using the "Free-spanning" technique, further emphasizing the innovative use of earth in multi-story construction.[71]

What makes this project stand out is its attention to sustainable practices. The development not only used earth from the site itself but also integrated renewable energy systems like solar and wind power. Water management was carefully considered as well, with techniques such as rainwater harvesting and biological wastewater treatment.[72]

Image from Auroville Earth Institute. (n.d.). Vikas Community (1991-1999).

LIBRARY OF MUYINGA

Type: Library
Location: Muyinga, Burundi
Architects: BC Architects
Year: 2012

The Library of Muyinga is a remarkable community-driven project, built and designed by BC architects in Burundi, using locally sourced materials and a participatory approach. The building is part of a larger initiative to create an inclusive educational space for deaf children and serves as a hub for the broader community in Muyinga.[73] Central to its design is the use of Compressed Stabilized Earth Blocks (CEBs), which are made from local soil, minimizing environmental impact while strengthening the connection between the building and its surroundings.[74]

The design process was deeply informed by the local architectural traditions of Burundi, with careful study of vernacular building practices. Construction of the library was an inclusive process, with community members and local labor involved at every step. The project emphasized a short-chain economy, relying on locally sourced materials like eucalyptus wood, baked clay roof tiles, and sisal rope. This approach not only supports the local economy but also stimulates skills transfer, as builders gained expertise in CEB production, adobe plastering, and other traditional techniques. [75]



 Image from BC Architects & Studies. (n.d.). The Library of Muyinga.









94| *Image from Shrestha, S. (2020, February 6). Pond restoration is not only reviving Thimi's water heritage but also its groundwater reserves. The Kathmandu Post.*

DUI POKHARI RESTORATION

Type: Water infrastructure
Location: Madhyapur Thimi, Nepal
Initiated by: Local Community
Year: 2014

The Dui Pokhari restoration, completed in Madhyapur Thimi, Nepal, is an example of how water infrastructure can be revived using indigenous knowledge and natural materials. Originally constructed centuries ago, Dui Pokhari, literally "Twin Ponds", served as both a communal water source and a groundwater recharge system. By the early 2000s, however, the ponds had fallen into disuse and disrepair, suffering from siltation, neglect, and urban encroachment. The restoration project zsought to not only repair the physical structure but to bring back the ecological and social functions of the ponds in a rapidly urbanizing town.[76]

The pond walls were rebuilt with traditional brick masonry, relying on geometry and earth backfill for structural strength. The restored ponds now serve as rainwater harvesting systems, slowly recharging the groundwater while preserving heritage and landscape.[77]

A defining feature of the project was its commitment to traditional building techniques and materials. The pond floor was reconstructed using a time-tested layering system: alternating beds of black cotton soil and coarse sand, topped with hand-laid brick paving. This sequence, 6 inches of clay, 3 inches of sand, and another 6 inches of clay, was carefully compacted before the final brick layer was added.[78] The use of black cotton soil, known for its swelling and self-sealing characteristics when wet, created a natural waterproofing layer that eliminated the need for concrete or plastic liners. The sand layer acted as a cushion and helped maintain moisture balance, while the final brick course provided surface protection and ease of maintenance.

Importantly, the project was community-led. Dui Pokhari was brought back to life by local masons, residents, and community leaders who valued the pond not just as a utility, but as part of their cultural landscape.[79]

TARGET GROUPS

The masterplan for Shonatola is built around the integration of three distinct income groups, low, middle, and high, within a single, cohesive community.

At the core of this approach is the principle of cross-subsidization, where higher-income residents pay market rates for land and housing, thereby offsetting the cost of deeply affordable housing for lower-income households. This financial mechanism allows people from different economic backgrounds to live side-by-side, sharing infrastructure, spaces, and opportunities, without creating visible or spatial hierarchies.

However, the integration of target groups is not just economic, it is also deeply material. In many contexts across Bangladesh, construction materials serve as coded indicators of class. Concrete, brick, and steel are often viewed as symbols of modernity, aspiration, and permanence, while natural or vernacular materials like bamboo, mud, and lime are dismissed as "poor people's materials," associated with fragility, informality, and rural backwardness. This perception has profound implications, not just for identity and status, but also for the environment. In the rush to replace earthen homes with concrete blocks, communities are losing centuries of climate wisdom, spatial sensitivity, and cultural continuity.

The project addresses this challenge head-on through a material strategy that uses the same construction language across all income groups. It directly challenges the assumption that earth is inferior or temporary. When the wealthiest residents of a neighborhood live in beautifully detailed, earth-based homes with bamboo frames and lime finishes, the stigma begins to dissolve.

In this way, the material strategy becomes inseparable from the social strategy. It supports the financial logic of cross-subsidization by keeping construction costs low. It supports the cultural logic of inclusion by erasing the visible differences that often separate income groups. And it supports the ecological logic of long-term sustainability by rooting the built environment in place-based intelligence rather than imported ideals.







LOW-INCOME

Low-income households typically live in conditions shaped by both environmental constraints and economic necessity. These structures are modest and primarily serve as shelters rather than fully enclosed, multifunctional dwellings. The interior space of the house is usually reserved for essential activities like sleeping, storing possessions, and cooking during the rainy season. Most daily routines, socializing, washing, preparing food, eating, and even some types of work, take place outside, in the courtyard, on the veranda, or under temporary shelters.[80] Housing often provides limited protection from floods, storms, and seasonal temperature changes. Sanitation facilities are frequently inadequate or nonexistent, and clean water access can be unreliable.[81]

Households tend to be large, often accommodating five to seven people, including multiple generations under one roof.

Rural livelihoods are rooted in informal, labor-intensive sectors. Agricultural laborers form the backbone of the rural workforce, often working on other people's land for low wages.[82] Many women are employed as domestic workers or involved in home-based activities such as hand weaving, basketry, or producing traditional handicrafts. Small-scale trading and hawking are also common, with people selling vegetables, fish, or household goods in local markets. These jobs are typically unstable, low-paying, and physically demanding, offering little in the way of security or upward mobility.

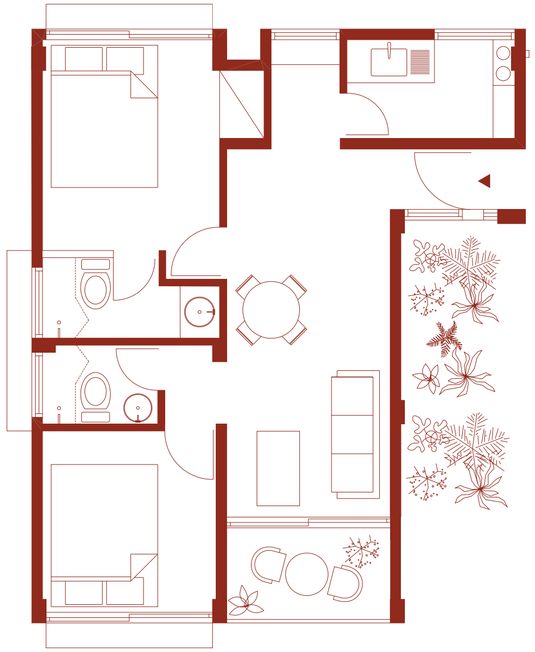












MIDDLE-INCOME

Middle-income households in rural and peri-urban Bangladesh typically have more stable and diverse income sources compared to low-income families. These may include small business ownership, salaried employment, skilled labor (such as carpentry or masonry), or remittances from family members working abroad.[83] This financial stability allows for investment in more durable housing and improved living standards.

Most middle-income families are nuclear, with four to six members. Unlike extended rural households, they tend to prioritize privacy and individual space within the home. Dwellings are usually constructed with more permanent materials such as brick, concrete, or corrugated metal, offering better protection from rain, storms, and heat. Homes are more formally organized, often with separate rooms for sleeping, cooking, and receiving guests.

There is also a noticeable improvement in hygiene practices and infrastructure. Many middle-income households have private latrines, access to clean water through tube wells or piped supply, and designated areas for washing.

The layout of the home begins to reflect a more structured and intentional approach to space. One noticeable shift is the emergence of the living and dining area as the central core of the dwelling. This space is no longer just for circulation or occasional use, it becomes the primary area for daily interaction, family gatherings, eating, and in many cases, hosting guests. It serves as the social and functional heart of the house.

Other key functions, such as bedrooms, kitchen, and bathroom, are typically arranged along the outer edges of the building. By placing these rooms along the facade, households can ensure better natural light and cross-ventilation. Bedrooms benefit from airflow and daylight, making them more comfortable during hot or humid weather. Kitchens and bathrooms are often located near external walls for easier ventilation and access to water lines, as well as to manage heat and odors.

1:50 | Image from Housing in Bangladesh (2025). University of Technology Delft, Faculty of Architecture. Urbanism and the Build environment. Department Of Architecture. Global Housing


GREE

HIGH-INCOME

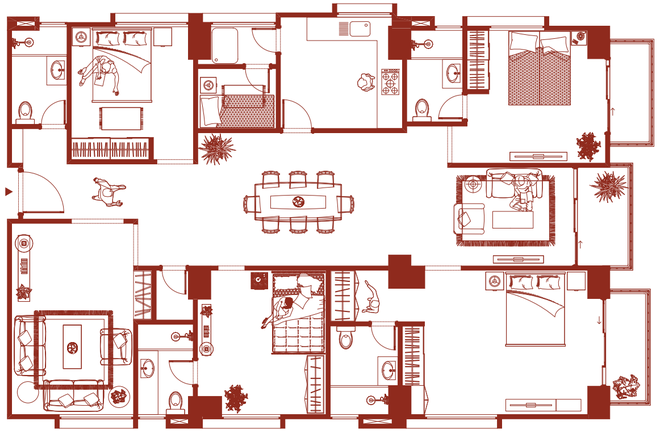
High-income households in rural and peri-urban Bangladesh typically consist of well-educated, nuclear families with four to five members. These families are supported by high-yield income sources such as large-scale land ownership, successful business operations, or stable professional employment in government or private sectors.[84] With greater financial capacity, these households are able to invest in more substantial and permanent housing, often multi-storied structures constructed constructed with modern materials.

Homes at this income level prioritize comfort, privacy, and social status. The layout becomes more defined and hierarchical, with a clear spatial division between semi-private and private areas. Spaces intended for guests, such as a formal sitting room or reception area, are positioned near the entrance, providing access without intruding on the rest of the house. Private zones, including bedrooms, study rooms, and family lounges, are placed deeper within the house.

The dining area takes on a more central and formal role in these homes. Often located at the heart of the layout, it serves as a focal point where the family gathers, not only for meals but also for informal conversation and shared activities. This space connects different parts of the house and often bridges the more public guest zones with the family's private areas.

In terms of spatial logic, high-income homes often follow the same basic layout principles seen in middle-income dwellings. Surrounding the central core, other rooms are carefully positioned to optimize natural light, ventilation, and views.[85]

These dwellings are typically equipped with a full range of modern amenities, including indoor plumbing, electricity, solar panels or backup generators, water filtration systems, and dedicated areas for appliances and storage.



High-Income Dwelling Dream Valley Apartment Building

Image from Housing in Bangladesh (2025). University of Technology Delft, Faculty of Architecture, Urbanism and the Build environment. Department Of Architecture. Global Housing. | 1:100.



Right image via Das, S. (2024)

DESIGN

COMMUNITY LAND TRUST

In this project, a Community Land Trust (CLT) is used as the core management model for delivering and maintaining affordable, inclusive, and well-governed housing. The CLT model provides a way to manage land collectively while ensuring long-term affordability and preventing speculative resale. It is particularly suited to this project's goals: supporting a mixed-income community, protecting the land from market pressures, and ensuring that residents have a say in how their neighborhood is run.

A CLT is a non-profit organization that owns the land and leases it to residents on long-term, renewable leases. Residents can own the houses or buildings, but not the land itself. This setup allows the project to keep land under community control while still allowing individual homeownership. If a homeowner decides to sell, the resale price is limited by a pre-set formula. This ensures that homes remain affordable for future residents, especially for low- and middle-income families.[86]

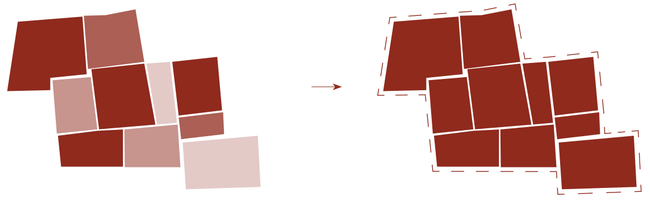
This is important in the context of Shonatola, where the masterplan includes households from different income levels. The CLT supports the cross-subsidization model used in the project: high-income families pay full price for their land leases and housing, and that income helps subsidize housing for lower-income residents. Because the land remains in collective ownership, these financial flows are easier to manage and more transparent.[87]The CLT can reinvest in maintenance, public spaces, or additional housing rather than allowing profits to leave the community. It helps ensure that quality stays consistent across the entire site, regardless of residents' income level.[88]

One of the most important aspects of the CLT is its governance structure. The trust is managed by a board of directors made up of three groups: residents who lease land, other community members who live nearby or have a stake in the neighborhood, and public or institutional partners (such as local government representatives or NGOs). This model ensures that decisions are not top-down. Instead, they reflect a balance of the interests of residents.[89]

In this project, the CLT is responsible not just for owning and managing land, but also for coordinating with other key actors. Local government helps with infrastructure and planning support. Financial institutions may provide microloans or affordable mortgages to help residents build or improve their homes. NGOs offer technical support, particularly in areas like sustainable construction, education, or community services. All of these players are linked through the CLT, which serves as a platform for cooperation and long-term planning.

Because this project emphasizes mixed-income housing and the use of natural, low-carbon materials like earth blocks and bamboo, the CLT helps maintain consistency and fairness. For example, it can ensure that low-income residents are not forced to compromise on quality or safety, and that high-income residents don't dominate decision-making. It also ensures that the project doesn't fall into the common pattern of rapid gentrification or uneven development.[90]

The goal is not to create a one-time intervention but to establish a system that can manage the land and serve its residents fairly over time.



SMALL AND **INDIVIDUALLY** OWNED PLOTS

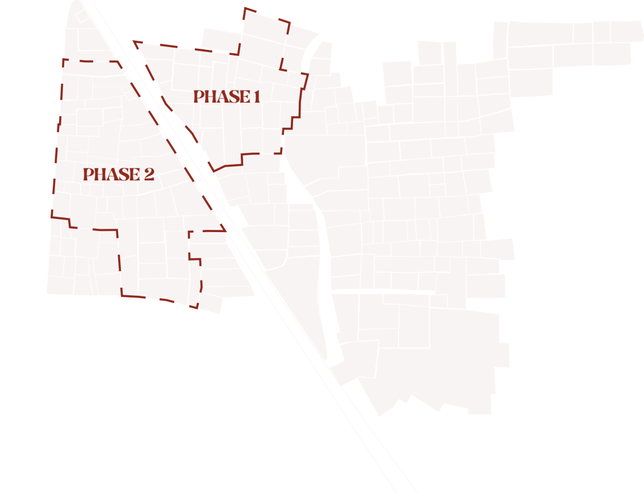
COMBINING INTO **1 SINGLE LANDHOLDING**
VIA **COMMUNITY LAND TRUST**

MASTERPLAN SITE

The area selected for the pilot masterplan is divided into two phases to strategically represent the diversity of conditions present in rapidly urbanizing rural settlements. This site was chosen not only for its location and potential for expansion but also because it offers a compelling narrative of transformation, from largely undeveloped land to organically grown rural communities. The masterplan seeks to demonstrate how a single, adaptable planning framework can accommodate both extremes: open land ready for structured development and tightly-knit village fabric in need of sensitive upgrading.

The total pilot area spans 3.90 hectares, with an average FSI of 0.10 and GSI of 0.09, indicating that even when combined, the site remains low-density and ripe for thoughtful densification. What makes Shonatola particularly valuable as a pilot is its representativeness: it resembles rural settlements on the verge of urban transition across Bangladesh. The dual conditions of emptiness and informal density make it the perfect testing ground for a masterplan that aspires to be both visionary and grounded.

By demonstrating success in both empty and built-up contexts within the same geographic frame, the Shonatola pilot offers an argument for scalable, inclusive urban transformation that respects existing communities while preparing for future growth.



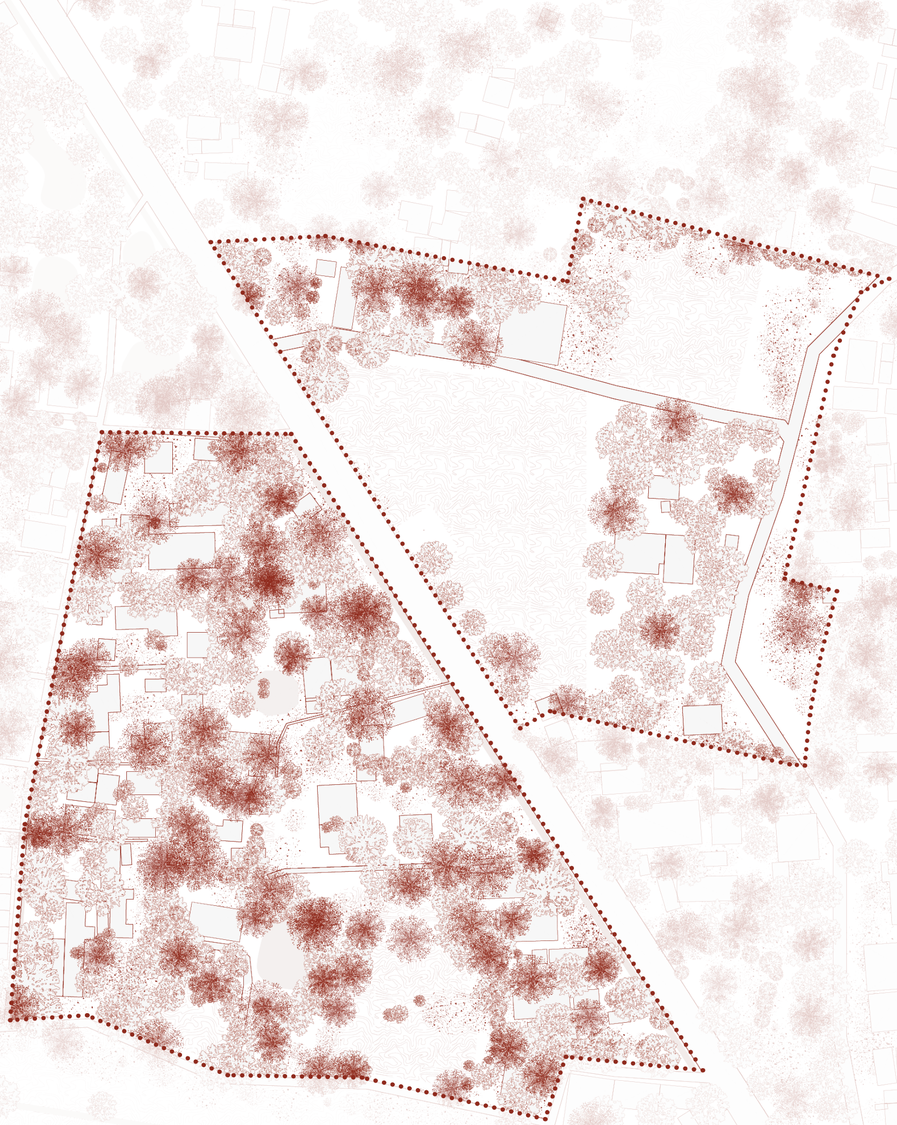
BASE PHASE

Before construction can begin, a number of important steps need to be taken to prepare the site and community for the implementation of the masterplan. In this Base Phase, the focus is on organization, communication, and groundwork, both socially and physically.

One of the first actions is to form a Community Land Trust (CLT). This group will be responsible for managing land ownership, guiding development decisions, and ensuring that future housing remains affordable and accessible to current residents. At the same time, plot boundaries must be reviewed and combined where possible. Many of the plots in the area are small and fragmented, making coordinated development difficult. Consolidating land into usable parcels will allow for the cluster-based structure of the masterplan to be properly implemented.

Another key part of this phase is community engagement. Residents should be clearly informed about the masterplan, how it will be carried out, and what it means for them. This includes explaining the phasing strategy, how relocation will be handled, and what kind of housing and services are planned. Another key part of this phase is community engagement. Residents should be clearly informed about the masterplan, how it will be carried out, and what it means for them. This includes explaining the phasing strategy, how relocation will be handled, and what kind of housing and services are planned.

Site preparation can also begin during this phase. This includes land surveys, soil testing, and early excavation work, especially for the planned water ponds. The excavated soil can be repurposed: if it meets the right quality, it may be used for compressed earth brick production; otherwise, it can be used as fill for raising the plinths on which future buildings will sit.



STARTING PHASE

Phase 1 spans 1.75 hectares of mostly vacant land, with minimal existing development, reflected in its very low Floor Space Index (FSI) and Ground Space Index (GSI) of 0.04. This makes it an ideal starting point for the masterplan. Here, the design can be implemented without the challenges of demolition, relocation, or community disruption. The blank-slate condition allows for clear and controlled implementation of the masterplan. Importantly, because no residents currently occupy this land, the development can move forward quickly and without resistance.

However, the true strength of this phased approach lies in how Phase 1 supports the transformation of Phase 2. This area is home to long-standing village residents living in informal low-quality housing. Redeveloping such areas is sensitive; without careful planning, it can lead to gentrification, forced displacement, and social fragmentation.

By first building in Phase 1, the masterplan creates new, affordable housing units that existing residents from Phase 2 can move into voluntarily. This ensures that when redevelopment begins in Phase 2, the community is not forcibly displaced or left without housing. Instead of being excluded from the benefits of urbanization, the villagers are made part of the process from the beginning. Their relocation is local, optional, and based on improved living conditions, not eviction.

it allows the masterplan to balance ambition with empathy, showing that even small rural settlements can urbanize without sacrificing their social fabric.

The developed area of 1.75 hectares reaches a Floor Space Index (FSI) of 1.14 and a Ground Space Index (GSI) of 0.26. It includes three high-income residential towers and five mixed-income clusters, containing a total of 15 low-income and 5 middle-income buildings.

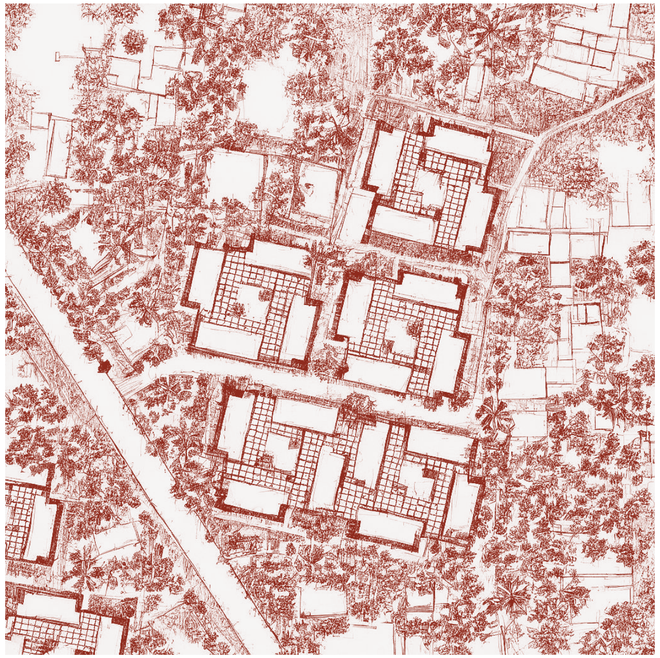


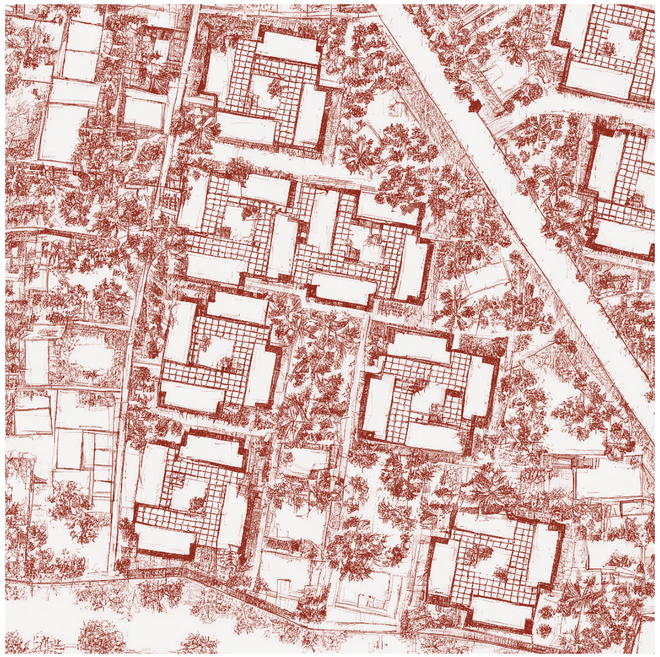
EXPANDING PHASE

Phase 2 builds on the foundation laid in Phase 1, extending the masterplan into the existing village fabric. Covering 1.98 hectares, this area is currently occupied by a dense rural settlement with informal housing and organic growth patterns. As redevelopment begins, the existing village structures will be gradually replaced by the new masterplan framework, allowing the planned urban form to integrate into and eventually blend with the broader rural context. This slow and deliberate transition enables the masterplan to expand naturally across the area, shaping a unified and structured village over time.

The transformation of Phase 2 is made possible by the relocation opportunities created in Phase 1, ensuring that no residents are displaced without housing options. As the masterplan progresses, this area will include four high-income buildings and seven mixed-income clusters, made up of 21 low-income and 7 middle-income buildings. The developed site reaches a Floor Space Index (FSI) of 1.40 and a Ground Space Index (GSI) of 0.29.





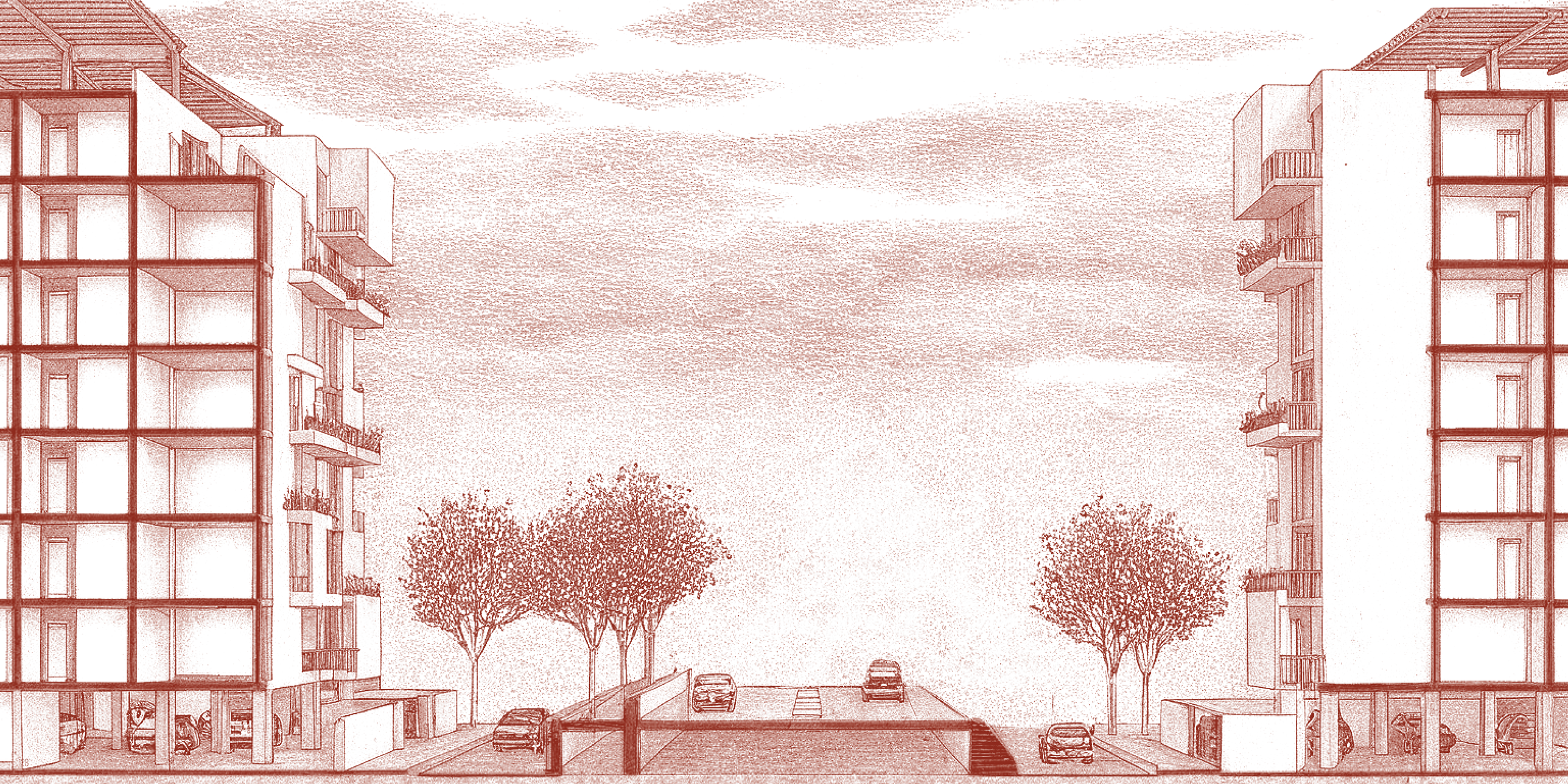


INCLUSIVE PLANS

The urban plan envisions an inclusive neighborhood that builds a strong sense of community while maintaining a deep connection to nature and the rural character of its surroundings. The design brings together a variety of shared spaces, cluster courtyards, green corridors, and connection streets lined with shops, to support daily interaction and create a lively, people-centered environment. The layout is carefully structured to balance urban density with generous open spaces, allowing for thoughtful growth without losing the human scale or natural qualities of the area.

A central part of this vision is the coexistence of people and nature. The plan includes water basins, ponds, green spaces, and planting areas as defining features of the public realm. These natural elements enhance the visual quality of the neighborhood while encouraging residents to engage with and value the surrounding environment. By blending compact urban living with access to nature and community spaces, the neighborhood offers a sustainable, inclusive, and adaptable model for future development.





ROAD HIERACHY

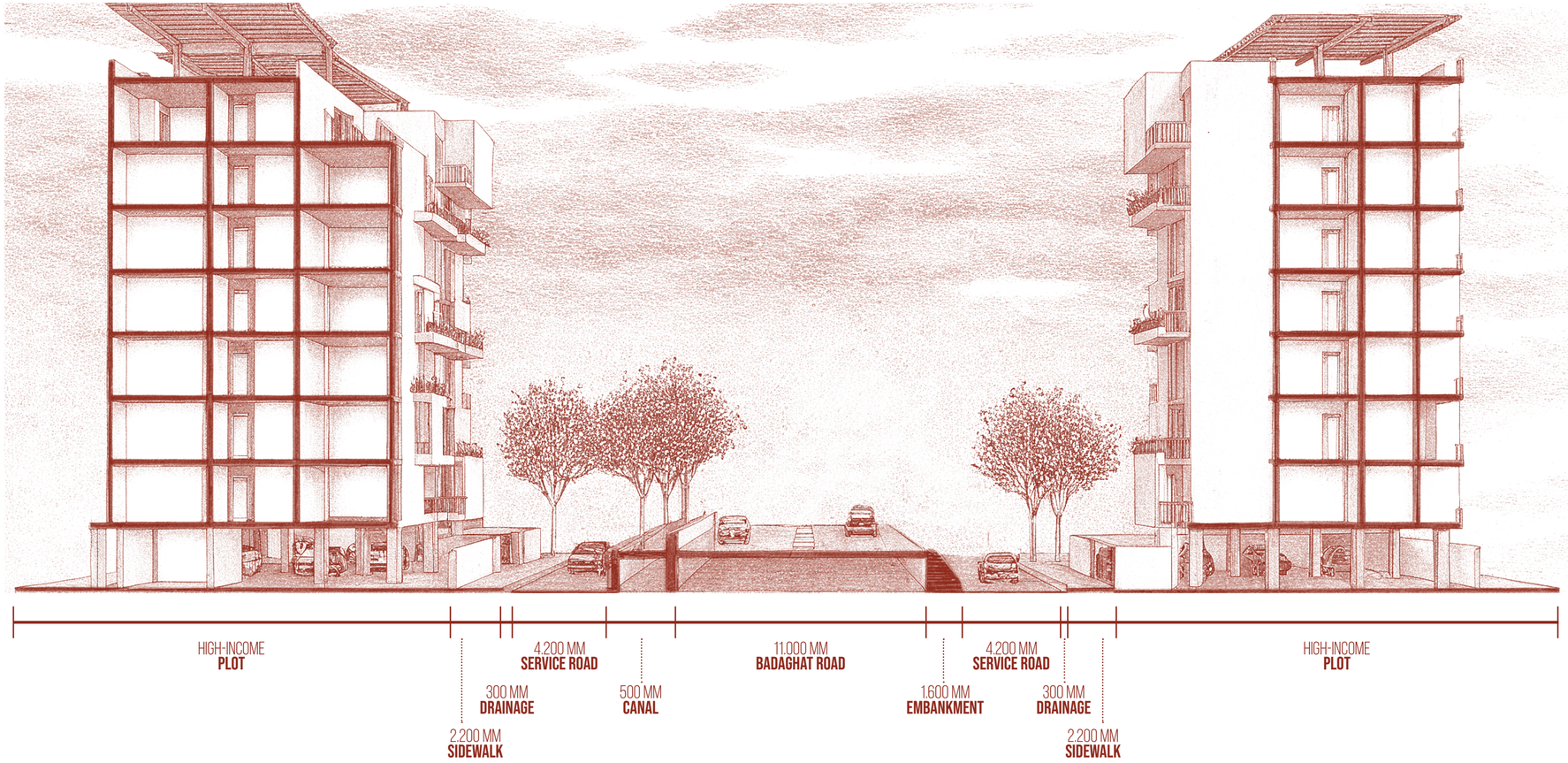
= Badaghat Road
= level 01
= level 02
= level 03

The masterplan features a layered road hierarchy. At the center of this system lies the Badaghat Road, a major existing four-lane highway that splits Phase 1 and Phase 2 of the site. While this road serves as a significant regional connector, the masterplan is intentionally designed to reduce reliance on it for local circulation.

To achieve this, a network of service roads is introduced along both sides of Badaghat Road, allowing internal traffic, especially local destinations and neighborhood movement, to function independently of the highway. This ensures that smaller vehicles such as CNGs, rickshaws, and pedestrians do not need to access or cross the highway for everyday activities, improving both safety and traffic flow.
The internal street network is conceived like the branching system of a tree. It begins with the widest and most prominent roads, classified as Level 01, which form the two main axes of the masterplan. These roads are not just conduits for movement; they act as spines of community life, lined with middle-income residential buildings that include commercial spaces on the ground floor, generating active street frontages and vibrant local economies.

From these primary axes, the hierarchy steps down into Level 02 streets, more residential in nature, providing access to clusters and courtyards, before further narrowing into Level 03 roads, which function as the final approach to dwellings or raised plinth clusters.





Badaghat Road Street Profile
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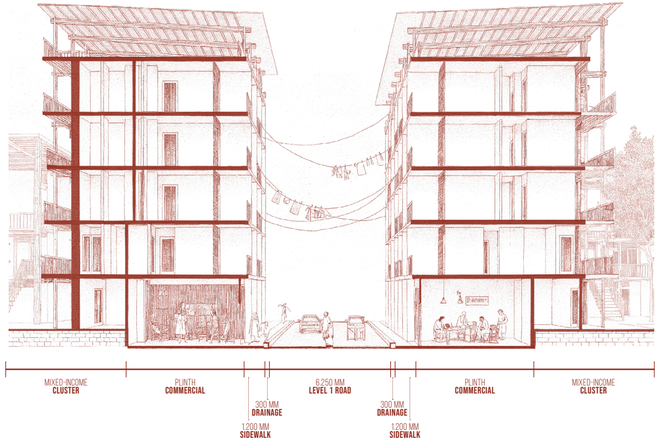
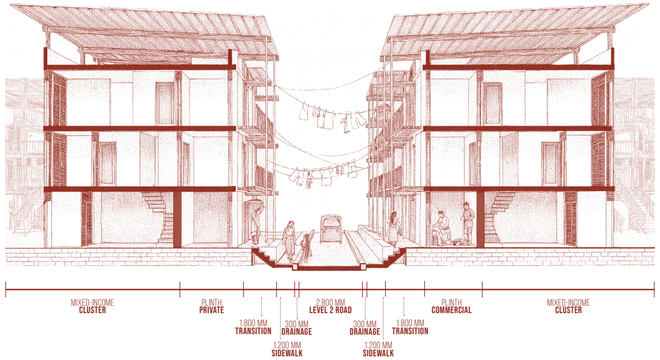

MIXED-INCOME
CLUSTER
PLINTH
COMMERCIAL
300 MM
DRAINAGE
1,200 MM
SIDEWALK
6,250 MM
LEVEL 1 ROAD
300 MM
DRAINAGE
1,200 MM
SIDEWALK
PLINTH
COMMERCIAL
MIXED-INCOME
CLUSTER


MIXED-INCOME
CLUSTER
PLINTH
PRIVATE
1,800 MM
TRANSITION
300 MM
DRAINAGE
1,200 MM
SIDEWALK
2,800 MM
LEVEL 2 ROAD
300 MM
DRAINAGE
1,200 MM
SIDEWALK
1,800 MM
TRANSITION
PLINTH
COMMERCIAL
MIXED-INCOME
CLUSTER

WATER MANAGEMENT

The water management strategy embedded in the Shonatola masterplan responds directly to the village's increasingly unpredictable flooding patterns and insufficient existing infrastructure. Currently, water control in the area relies on basic, disconnected systems that are not able to manage heavy monsoon rains.

Each housing cluster is placed on a raised plinth, constructed from a combination of earth, gravel waste, and brick bats, with a durable outer layer of fired bricks. This plinth raises the dwellings approximately one meter above ground level, offering protection against floodwaters even during peak rainy months. Within each cluster courtyard, a 2-meter-deep water pond is placed to collect and hold rainwater. These ponds serve as the first line of defense.

To prevent flooding of the raised plinths, emergency overflow drains are installed in the ponds. When water exceeds a safe level, it is diverted through street drainage gutters that guide the water toward a central canal system. This canal ultimately leads to the Shari-Goyain River in the north. However, to reduce the risk of overwhelming the canal during intense rainfall events, the masterplan introduces intermediate buffer ponds. These secondary retention areas temporarily hold excess stormwater from the clusters before it reaches the canal, easing pressure on the main outflow system.

In addition to their hydrological function, these ponds offer a material resource benefit. The soil excavated during pond construction can be reused on-site. If the quality is suitable, it can be used for compressed earth brick production, providing a sustainable building material. If not, the soil still serves a valuable role as filling material for plinth construction, minimizing waste and reducing dependence on imported materials.



MASTERPLAN ABACUS

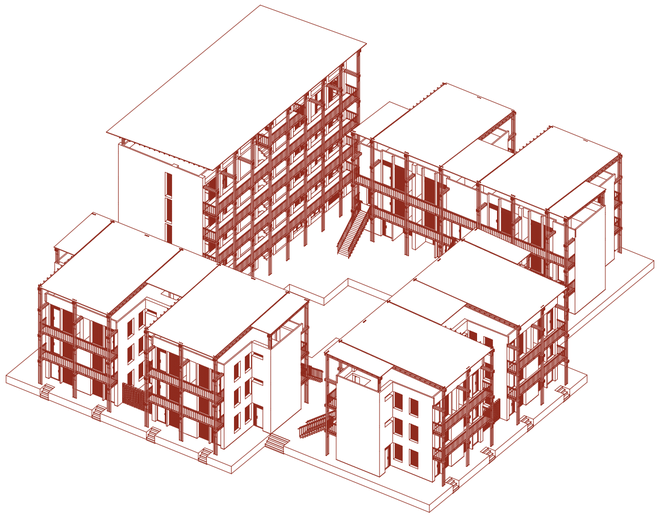
After establishing the doom scenario as a baseline for uncoordinated, plot-based growth, this chapter compares those outcomes to the projections of the proposed masterplan. While the doom scenario shows the negative consequences of speculative development, the masterplan demonstrates how a similar level of density can be achieved, but with far better spatial coherence, accessibility, infrastructure integration, and overall livability.

For developers, the doom scenario offers short-term profit through vertical growth, but at the cost of long-term value: blocked plots, inaccessible buildings, poor infrastructure, and declining desirability.

By comparing the two scenarios, it becomes clear that thoughtful urban planning does not require sacrificing development potential. The masterplan achieves comparable statistical outcomes (FSI, GSI, built-up area) while unlocking significant qualitative gains in spatial logic, access, public realm, and livability.

	PHASE 1	PHASE 2	TOTAL
AREA	1.75 HA	1.98 HA	3.90 HA
UNREGULATED SCENARIO - FSI	3.19	0.76	1.47
MASTERPLAN - FSI	1.44	1.40	1.62
UNREGULATED SCENARIO - GSI	0.74	0.64	0.72
MASTERPLAN - GSI	0.26	0.29	0.28

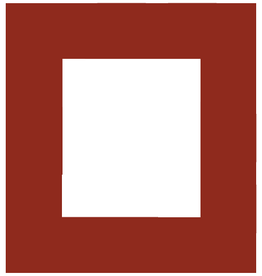


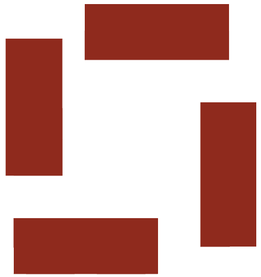


CLUSTER DEVELOPMENT

Step 1 - Courtyard
The design process begins with the establishment of a central courtyard, which serves as the heart of the cluster.

This space is envisioned as a shared communal area where residents can gather, children can play, and informal activities can take place. It sets the foundation for a layout that prioritizes community interaction.



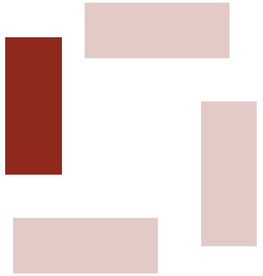


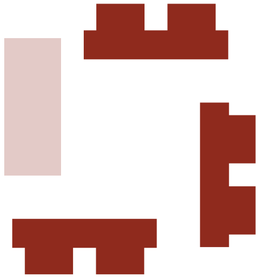
Step 2 - Turbine
The buildings are then arranged in a turbine-like configuration around the central courtyard.

This layout radiates outward, allowing each unit to benefit from natural light and ventilation while creating a sense of enclosure and definition around the communal space. The configuration also promotes visual connection across the cluster and creates dynamic spatial relationships between the built and open areas.

Step 3 - Define Middle Income Building
The next step introduces the middle-income building, typically larger in scale and higher in elevation than the surrounding units.

This structure is strategically positioned along key access roads. It includes ground-floor commercial or semi-public uses. The middle-income building is not isolated but woven into the fabric of the cluster, with its orientation and entrances carefully considered to contribute to the communal life of the courtyard and the surrounding pathways.



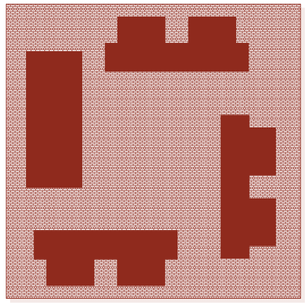


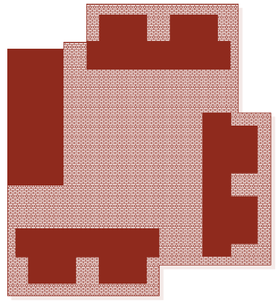
Step 4 - Define Low Income Buildings
Following the placement of the middle-income unit, the low-income buildings are introduced to complete the residential composition.

These are more compact in footprint and lower in cost, but they are given equal spatial importance in the cluster design. Their arrangement ensures that each dwelling maintains visual and physical connection to the courtyard. The layout avoids dead-end spaces or isolated corners, promoting social cohesion and safety.

Step 5 - Raise Plinth
To address environmental resilience a raised plinth is introduced beneath the residential buildings. This raised platform elevates the housing units slightly above ground level, creating a layer of protection from water ingress while also helping to define spatial thresholds.

It separates private living quarters from public space and creates opportunities for transition zones like steps, porches, and edges.



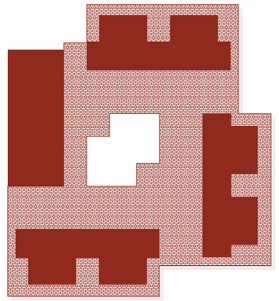


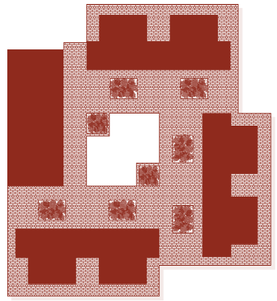
Step 6 - Adjust and Define Plinth
The plinth is then further articulated to respond to specific site needs, slopes, entry points, circulation flows, and social use. Adjustments are made to incorporate access ramps and stairways, that enable a smooth interaction between residents and the public realm.

In doing so, the plinth becomes more than a protective base; it transforms into a stage for daily life, where residents can sit, rest, socialize, bringing life to the threshold between public and private.

Step 7 - Add Water Pond
As part of the environmental strategy, a water pond is incorporated into the cluster layout. The pond acts as a retention basin, managing stormwater runoff during heavy rains and helping to mitigate the risk of flooding within the cluster.

Through the process of evaporative cooling, the water surface helps to reduce surrounding air temperatures, particularly during the hot, humid seasons. This contributes to a more comfortable and livable environment for residents.

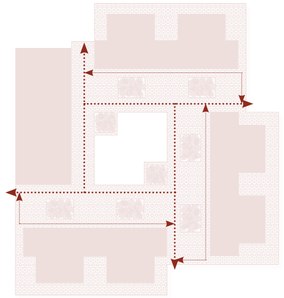


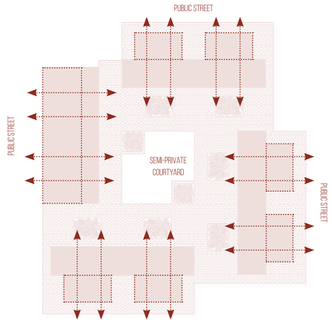


Step 8 - Add Vegetation Areas
Vegetation is strategically integrated throughout the cluster to act as a natural buffer between private and semi-private spaces. These green zones clearly define thresholds, offering privacy while enhancing the spatial structure of the cluster. In addition, they provide opportunities for small-scale local food production, allowing residents to grow herbs and vegetables, connecting daily life with the land and supporting self-sufficiency within the urban context.

Step 9 – Define Routing
With the addition of the water pond and vegetation areas in the previous steps, a natural system of routing emerges within the cluster. The water body acts as a central anchor, around which a semi-private circulation loop is formed, serving as the main path for local movement and casual interaction.

In contrast, more private routes develop between the buildings, shaped by the placement of vegetation and subtle barriers.





Step 10 – Private/Public Transition
Commercial functions, such as small shops or services, are placed along the outer edges of the raised cluster on the ground floor. The interior-facing sides of the buildings, which open toward the central courtyard are reserved for private or semi-private residential uses.

This creates a clear gradient of public to private, from outward-facing commercial activity to inward-facing domestic life.

THE CLUSTER

The cluster is the fundamental unit of planning, a carefully balanced ensemble that merges housing, livelihood, ecology, and culture. Each cluster is a self-sustaining micro-community, engineered to support mixed-income families while ensuring climate resilience and social equity.

At the core of the cluster are four buildings, with a thoughtful mix of three low-income blocks and one middle-income apartment block. This spatial arrangement creates diversity without hierarchy, ensuring all residents share the same architectural language and infrastructural amenities.

The low-income apartment blocks are designed with flexibility and incrementality in mind. Their ground floors can adapt to household needs, functioning as living spaces, shops, or workspaces. Crucially, these commercial functions are accessible from outside the shared courtyard, ensuring that domestic life remains private while still allowing for public engagement and livelihood generation.

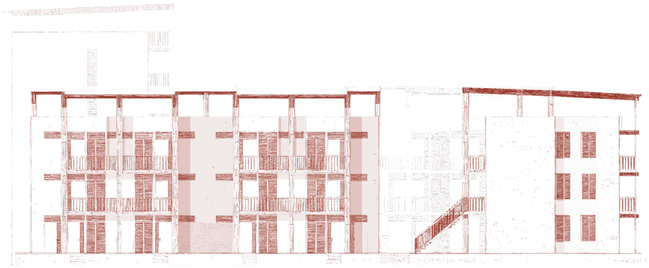
The middle-income block also includes ground-floor commercial spaces such as workshops or studios, supporting small businesses, skilled trades, or services that can economically uplift the community.

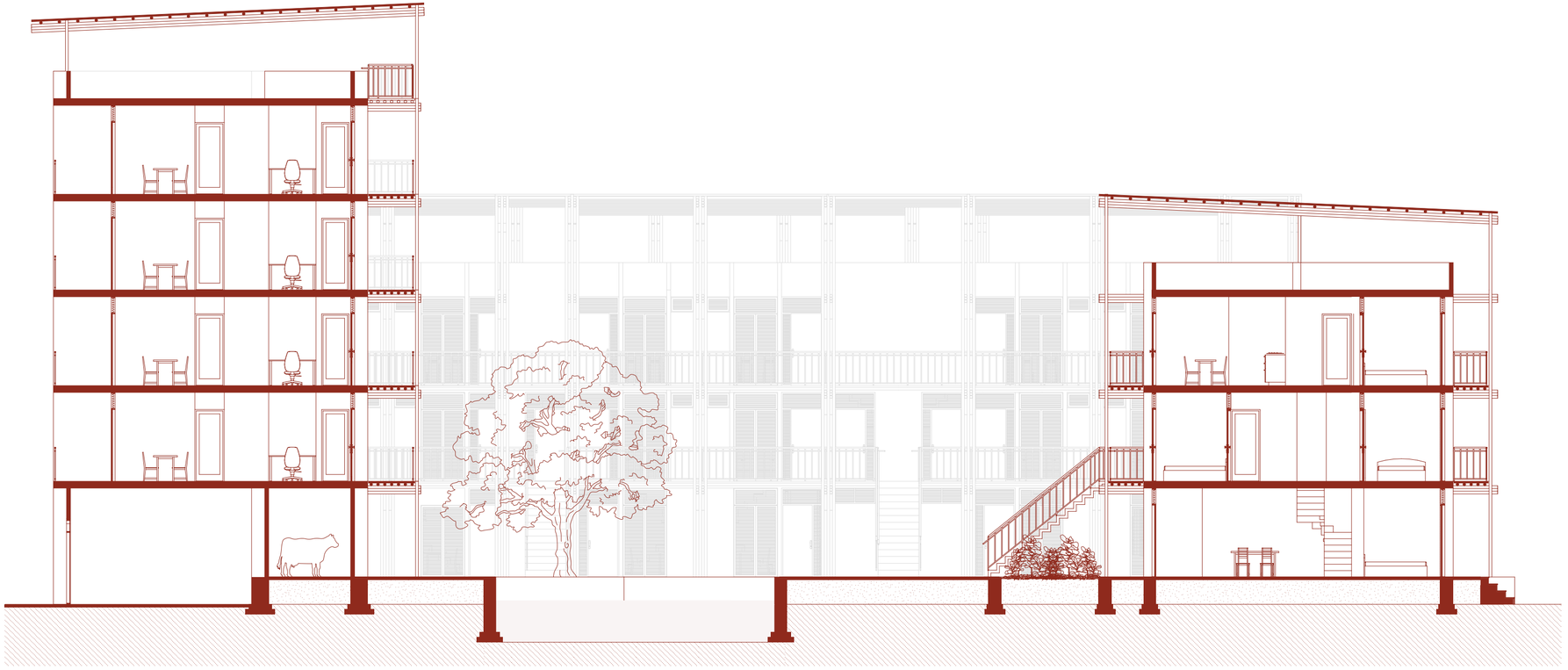
At the core of each cluster lies a water pond, which serves as the emotional, environmental, and social heart of the community. This feature is more than just a design gesture, it plays a multifunctional role that reflects both vernacular wisdom and modern sustainability thinking.

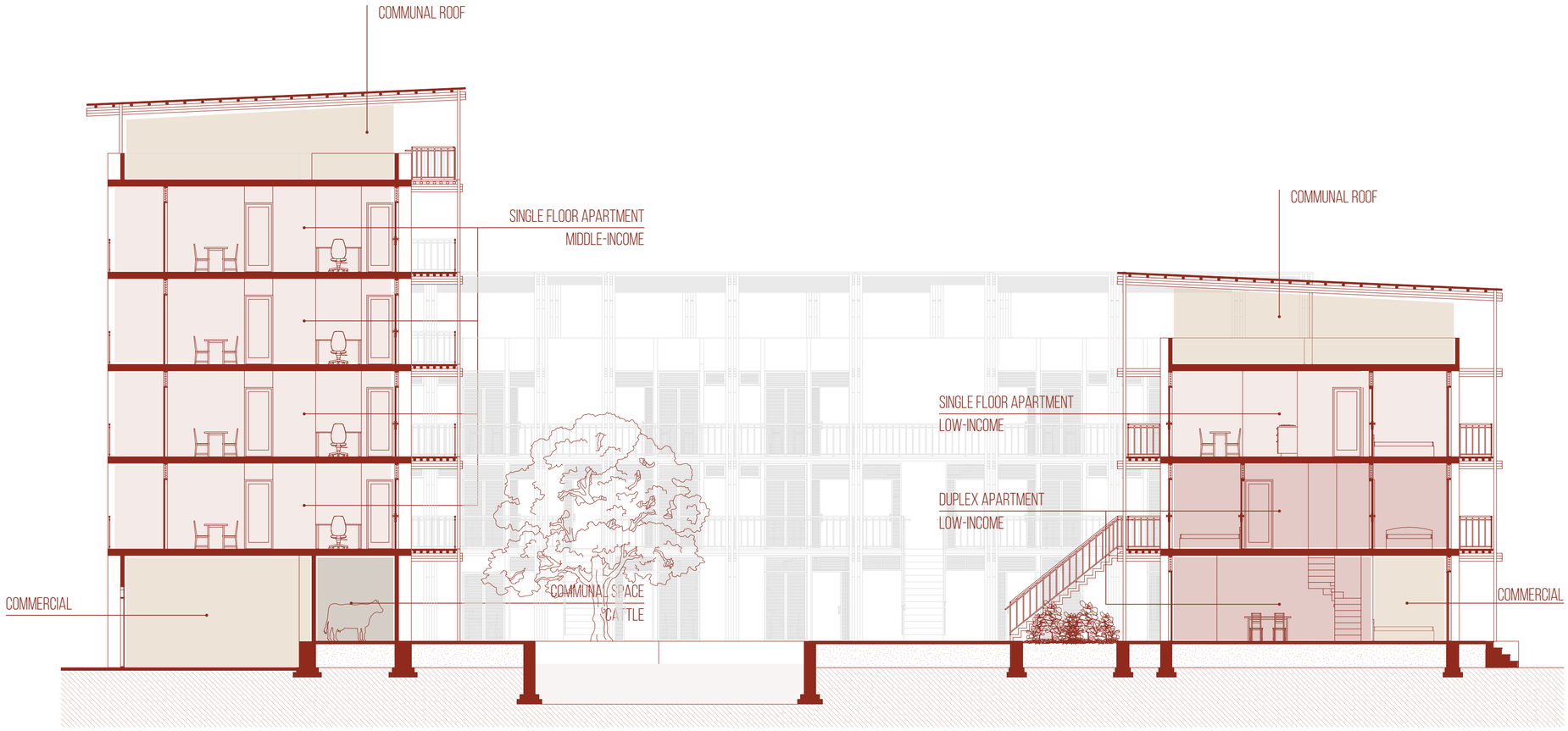


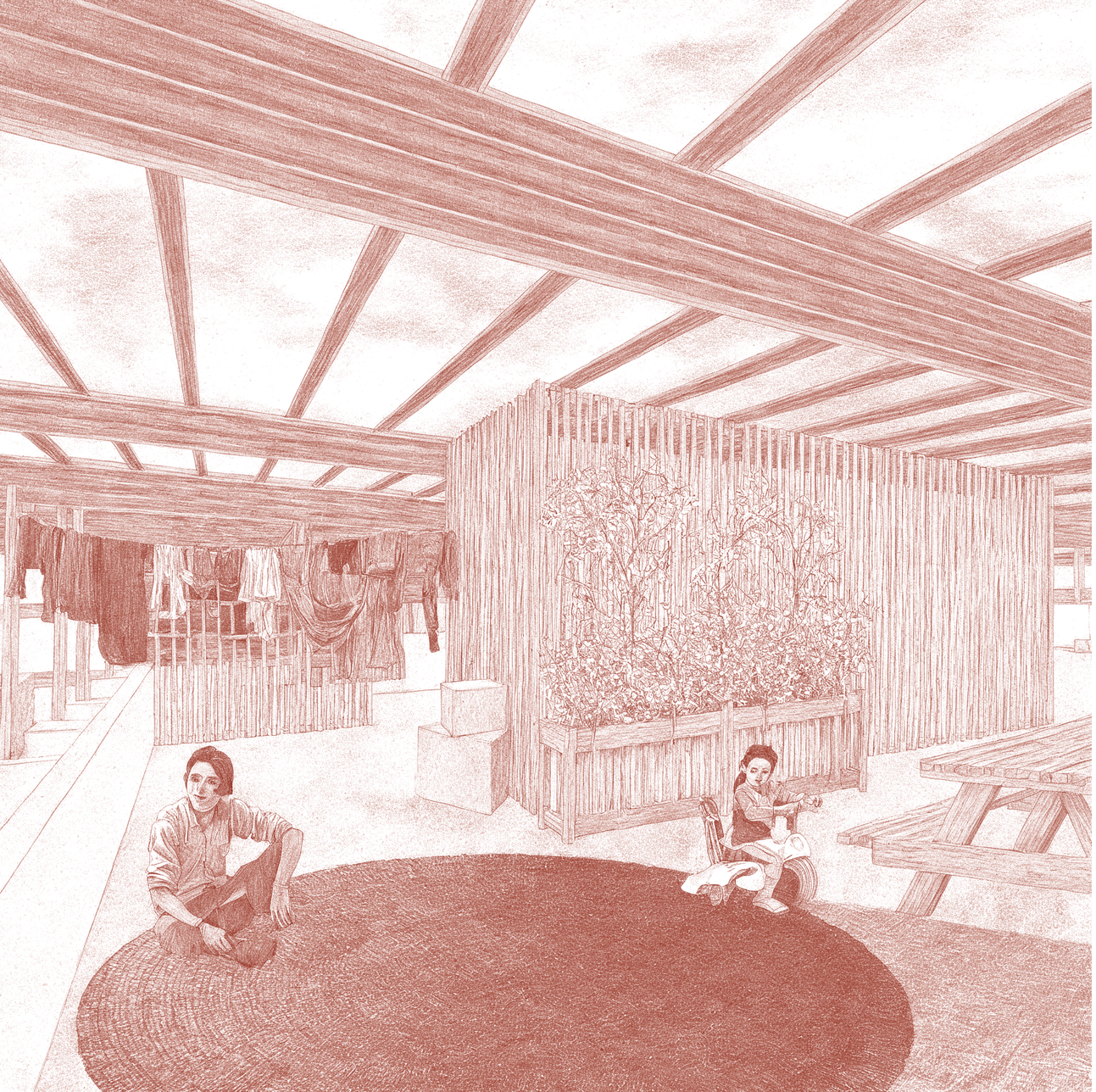
Ground floor Plan Cluster
1:300








COMMUNAL ROOF
SINGLE FLOOR APARTMENT
MIDDLE-INCOME
COMMERCIAL
COMMUNAL SPACE
CATTLE
COMMUNAL ROOF
SINGLE FLOOR APARTMENT
LOW-INCOME
DUPLEX APARTMENT
LOW-INCOME
COMMERCIAL



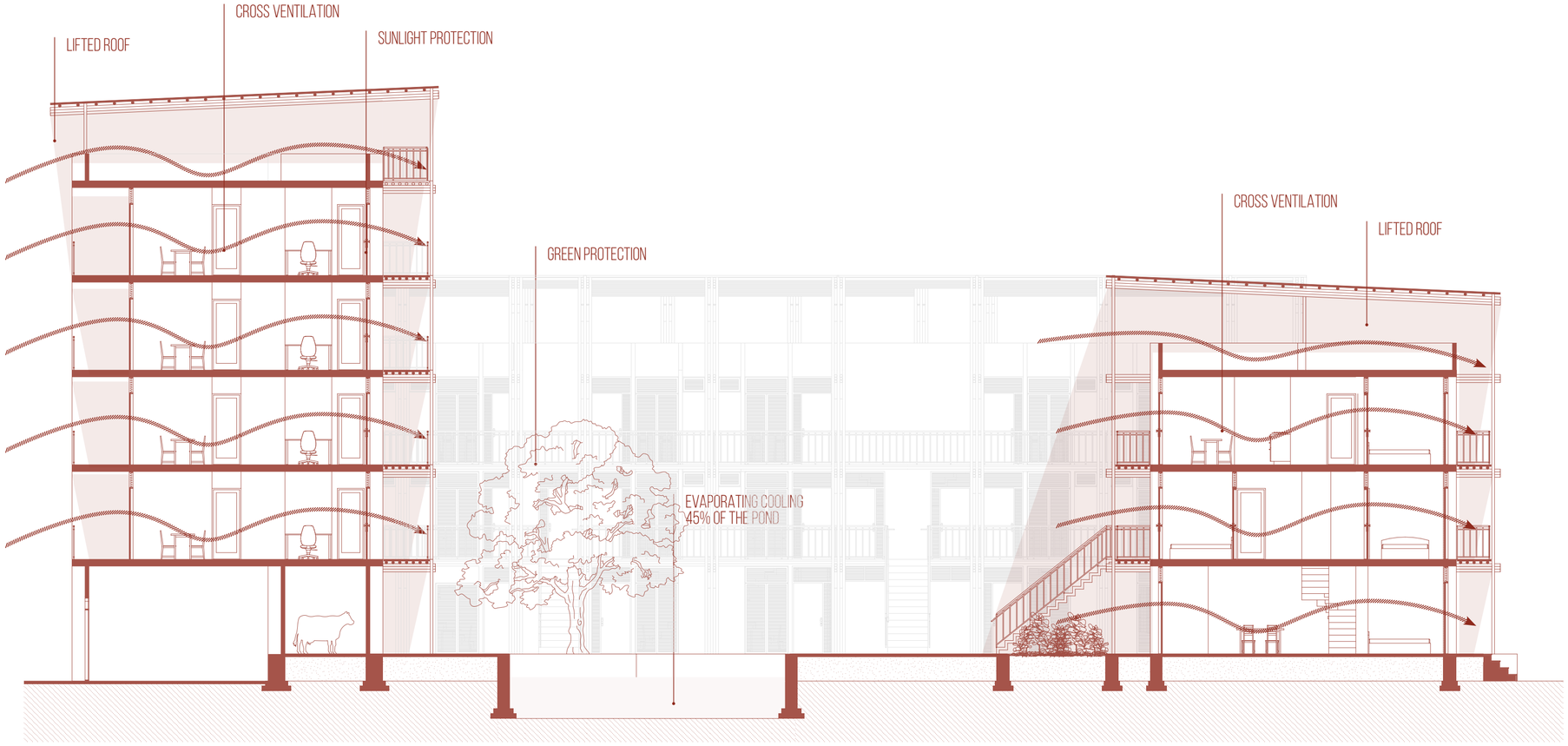
COMMUNAL ROOFTOPS

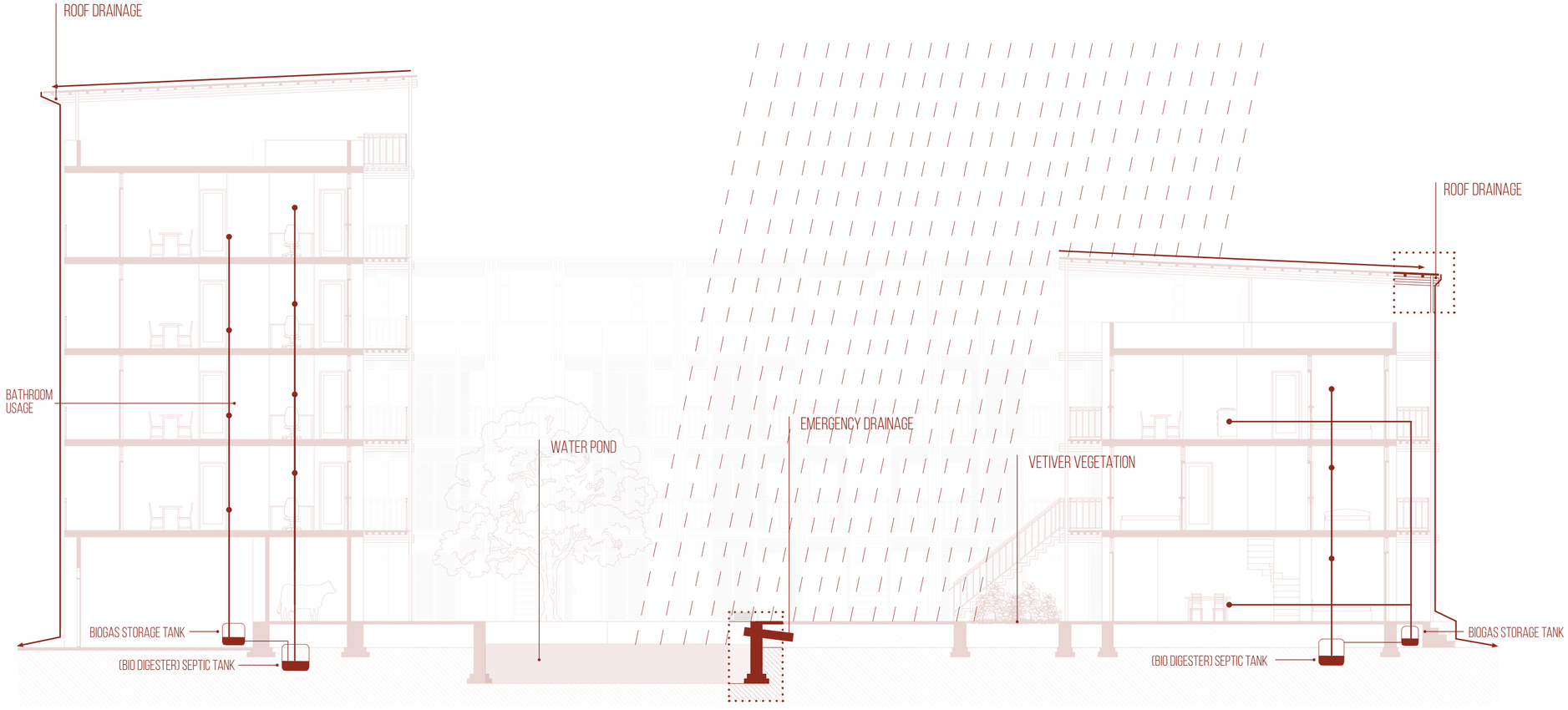
Rooftops in the project are designed to provide functional, shared outdoor space that supports daily life across all housing types. In the low-income housing clusters, each building includes ground-floor duplex units and single-floor apartments above. The rooftop is shared by the top-floor residents, acting as an outdoor extension of their homes, similar to how ground-floor residents share a private interior courtyard. This space can be used for drying clothes, gardening, sitting, or other everyday activities.

What makes the low-income rooftops especially valuable is their flexibility. Residents are free to decide how they use the space. Some may choose to partially or fully enclose part of the roof using lightweight materials like bamboo panels, turning it into a private extension of their dwelling for sleeping, storage, or additional living space. Others may prefer to keep the space more open, maintaining a shared rooftop environment for informal use among neighbors. This adaptability allows residents to respond to their own needs and living arrangements, and it supports a variety of uses over time.

In the middle- and high-income buildings, rooftops are communal for all residents, providing accessible open space regardless of floor level. These rooftops are designed to be simple, open, and functional, offering residents an extra shared area in an otherwise compact layout. The space can be used for a variety of purposes, such as small gatherings, evening tea, yoga, drying clothes, gardening in pots, or simply getting fresh air and enjoying views of the surrounding landscape.

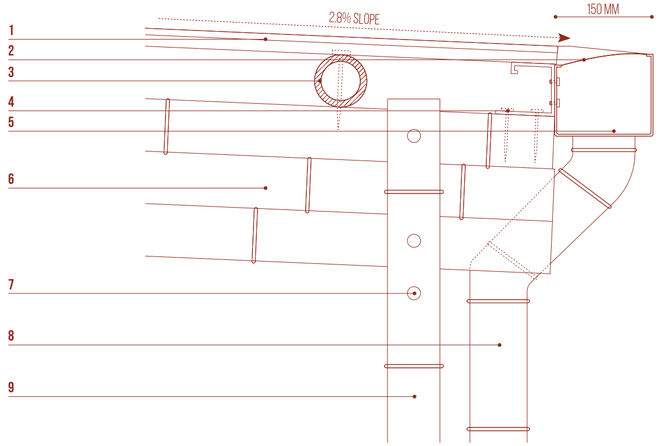
By aligning rooftop access with building type, the project ensures all residents have access to meaningful outdoor space. In low-income clusters, rooftops offer flexible extensions of the home, while in middle- and high-income buildings, they serve as shared areas for everyday use and interaction. In both cases, sharing the rooftop space strengthens the sense of community, encouraging regular contact and informal connections between neighbors.


LIFTED ROOF
CROSS VENTILATION
SUNLIGHT PROTECTION
GREEN PROTECTION
EVAPORATING COOLING
45% OF THE POND
CROSS VENTILATION
LIFTED ROOF


ROOF DRAINAGE
BATHROOM USAGE
WATER POND
EMERGENCY DRAINAGE
VETIVER VEGETATION
ROOF DRAINAGE
BIOGAS STORAGE TANK
(BIO DIGESTER) SEPTIC TANK
(BIO DIGESTER) SEPTIC TANK
BIOGAS STORAGE TANK

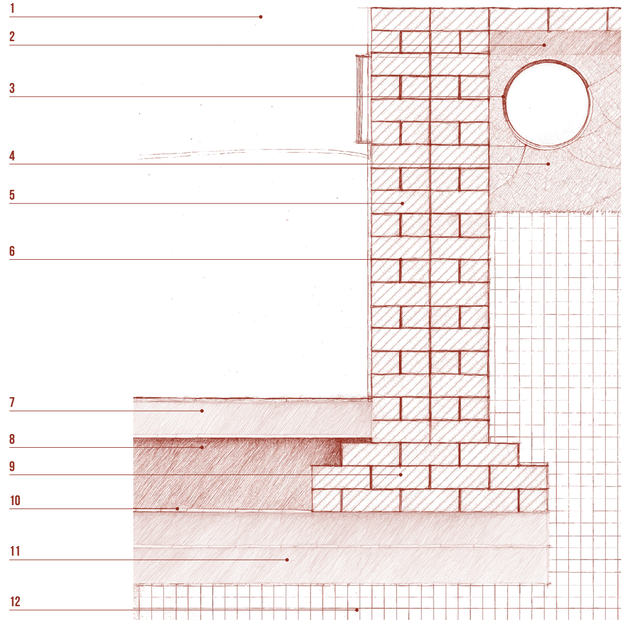
ROOF DRAINAGE

1.	corrigated iron sheet	
2.	galvanized metal mesh	
3.	horizontal bamboo underconstruction	ø 80 mm
4.	bolt	
5.	rain gutter - ci sheet	150 x 125 mm
6.	bamboo beam - 3 connected bamboo beams	3 x ø 80 mm
7.	bamboo wood nail	
8.	Galvanized Iron (GI) Pipe	ø 90 mm
9.	Bamboo column	ø 80 mm



WATER POND

1.	water pond	
2.	compressed sand	
3.	Pvc drainage pipe	ø 300mm
4.	gravel waste & brick bats	
5.	fired brick	90 x 240 x 115 mm
6.	lime mortar	
7.	compacted clay-sand mix 70% / 30%	150 mm
8.	compacted clay layer	300 mm
9.	fired brick foundation	
10.	geotextile (non-woven)	
11.	compacted subgrade	2 x 150 mm
12.	earth	





FLOOD SEASON

The masterplan is designed to adapt to seasonal flooding, a regular challenge in Shonatola village. Each housing cluster is built on a raised plinth, lifting homes safely above expected flood levels. This ensures that even during the heaviest rains, the dwellings remain dry and protected.

Rather than trying to prevent flooding entirely, the plan allows roads and spaces between the clusters to temporarily flood, creating controlled water channels throughout the site. These act like seasonal rivers, guiding water safely through the neighborhood without damaging homes or infrastructure. This approach builds on existing local knowledge, residents of Shonatola already navigate floodwaters using self-made banana tree boats.

(BIO DIGESTER) SEPTIC TANK

In the context of Bangladesh's rural development, sanitation and energy access remain two of the most pressing infrastructural challenges. The widespread absence of sewer networks, limited grid electricity, and overreliance on traditional biomass fuels such as firewood and cow dung create a severe burden on rural households. Against this backdrop, biodigester septic tanks have emerged as a technically appropriate and socially beneficial solution.

Biodigester technology is not new to Bangladesh. Since the 1970s, digesters have been introduced in rural households, primarily for managing animal manure and producing biogas for cooking. Over the decades, with support from the Bangladesh Council of Scientific and Industrial Research (BCSIR), NGOs like Grameen Shakti and BRAC, and infrastructure financiers such as IDCOL, more than 77,000 domestic biogas digesters have been installed across the country by 2015.[91] The overwhelming majority of these systems are located in rural areas and designed to be operated by small-scale livestock owners. These digesters convert cow dung (and to a lesser extent, poultry waste and kitchen scraps) into biogas, which is then used for daily cooking and lighting needs. The digestate, or bio-slurry, is retained and used as organic fertilizer for household gardens or small agricultural plots.

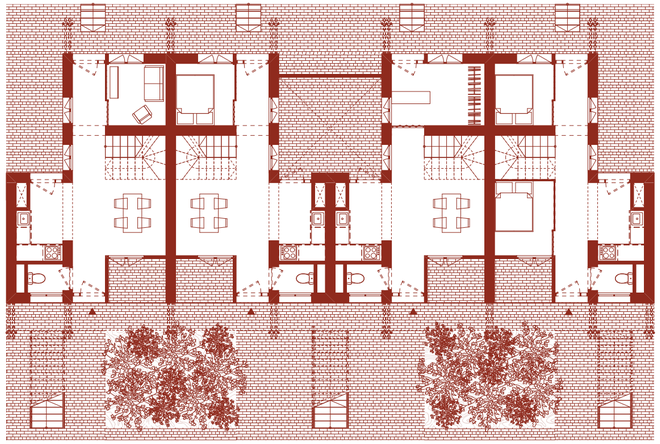
Firstly, biodigesters reduce reliance on firewood and other polluting fuels. For many rural women, this means spending fewer hours collecting wood and less exposure to harmful indoor smoke. In fact, switching to biogas has been shown to reduce greenhouse gas emissions.[92]

The second major benefit lies in the agricultural reuse of the digester by-product, bio-slurry. Unlike raw manure, which can carry pathogens or be difficult to manage, bio-slurry is more stable and nutrient-rich. Rural farmers report improvements in soil fertility and crop yield, especially for vegetables, fruits, and small-scale rice farming. In many cases, the slurry is also sold locally as fertilizer or used as fish feed in integrated farming systems, creating opportunities for income generation.[93]

Biodigester septic tanks are not only used in rural Bangladesh but are a proven and beneficial technology in that context. They reduce fuel poverty, enhance environmental health, improve soil productivity, and offer an appropriate wastewater solution where sewerage infrastructure is lacking.



Image from Cavton Media. (2022). How to construct a Bio Digester in Uganda to replace Septic tanks - Al-Hirah Holdings Ltd



LOW-INCOME BUILDING

The low-income building in the cluster consists of four duplex dwellings, spread over the ground and first floors, and four single-floor apartment on top.

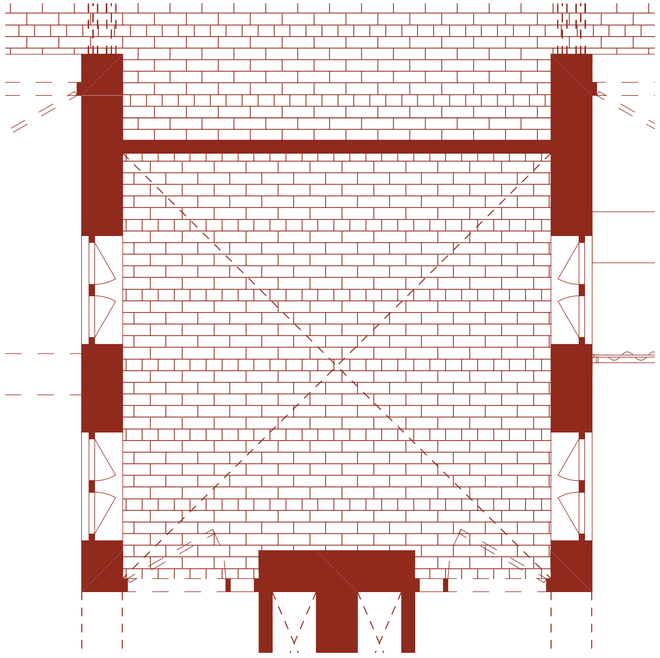
The upper unit is accessed via a bamboo gallery structure that wraps around the building. A direct staircase connects this gallery to the courtyard, ensuring that the resident of the top floor remains part of the shared communal space.

The duplex units are designed for flexibility and future growth. Their ground floors can serve as typical living spaces or be adapted into small shops or workspaces.

These commercial areas are oriented outward, accessible from the cluster's perimeter, which allows residents to generate income without compromising the privacy and calm of the internal courtyard.

In this layout, the two middle duplex units of each cluster share a smaller, internal courtyard. This courtyard is semi-private, used only by the two families living in the connected duplexes. In the context of Sylheti culture, where it is common for family members like siblings or cousins to live next to each other, this setup is particularly meaningful. It provides space for informal activities such as cooking, childcare, socializing.

Ground floor plan Low-Income Building
1:150





LOW-INCOME DUPLEX

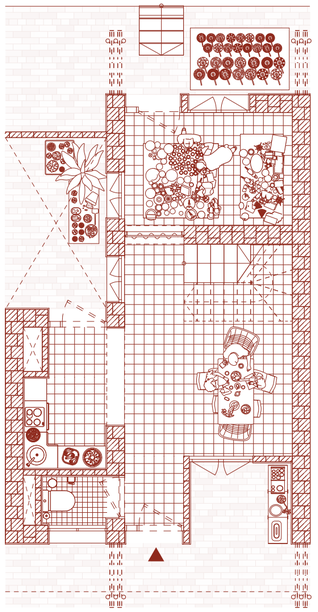
The low-income duplex is located on the ground and first floors of the cluster building. Its design takes into account the risk of flooding in Sylhet: if the ground floor becomes unusable during extreme floods, the first floor can function as a temporary flood shelter for the household.

The ground floor includes a toilet and washing area, an indoor kitchen, a dining area, and a shop space that faces the public street. This shop can either be used by the residents to run a small business or be rented out for extra income.

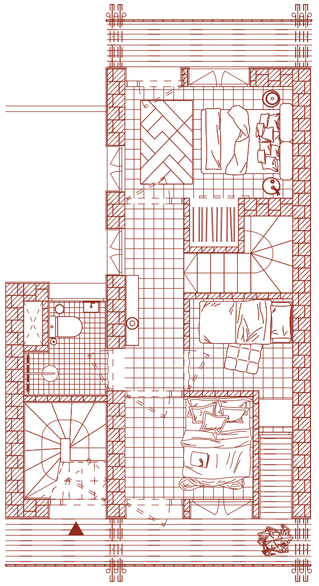
On both sides of the unit, there are verandas, the one facing the street can act as an extension of the shop, while the one facing the courtyard is more private and can be used for cooking or gardening, but also the interior shared courtyard could be used for this.

The layout is flexible. Depending on the household's needs, the shop space could be used instead as a living room, bedroom, or additional storage. This flexibility allows families to adjust the use of the ground floor over time, based on changing family sizes or income needs.

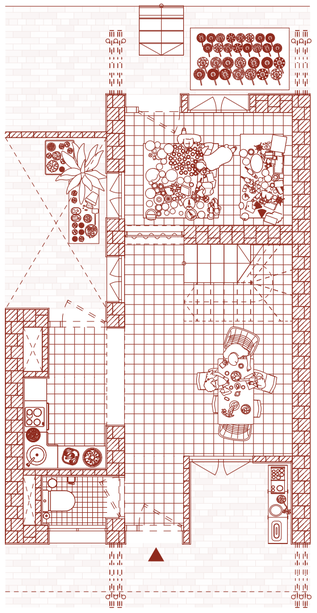
The first floor is mainly used for sleeping and storage, similar to layouts seen in rural homes. It includes three bedrooms and a bathroom. Surrounding the first floor is a bamboo gallery, which provides shade and rain protection, but also serves as an additional outdoor space. This area can be used for drying clothes, storing items, or for private outdoor activities that aren't suited to the more public ground-floor veranda.



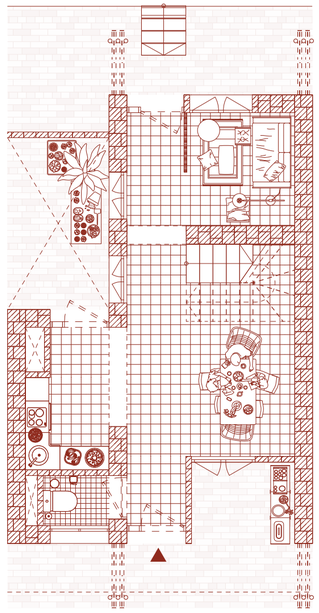
ground floor



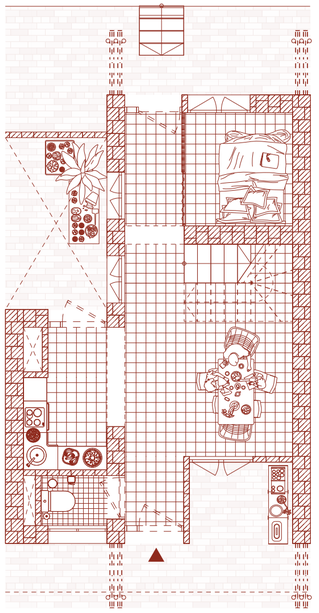
first floor



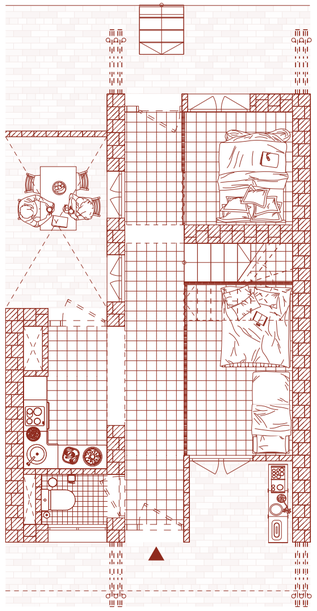
(work]shop variation



living room variation



extra bedroom variation



extra bedrooms variation

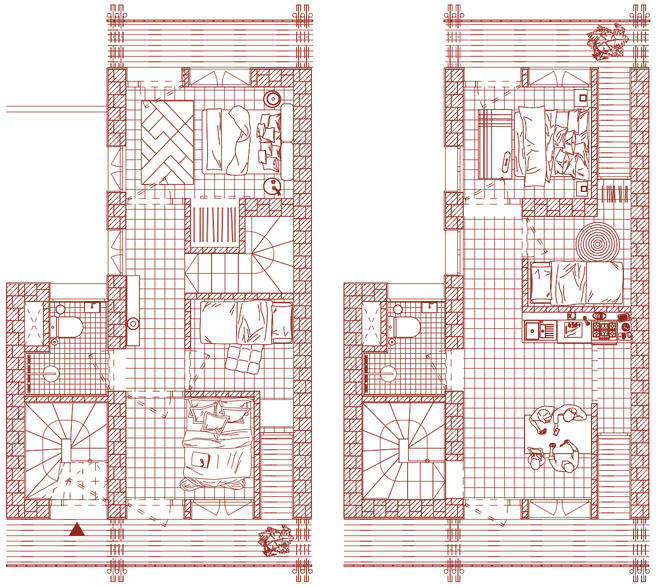
LOW-INCOME APARTMENT

The low-income apartment located on the top floor is accessed through a personal staircase that leads from the public courtyard to the bamboo gallery on the first floor. This approach is intentional: rather than using a tall, shared stairwell serving multiple units, each apartment has its own entrance, similar to the portiek housing entrances seen in The Hague. This layout helps maintain a direct relationship between the resident and the courtyard, reinforcing a sense of community connection despite being physically higher in the building.

Once inside, a private circular staircase leads up from the entrance to the living space. The staircase continues to the shared rooftop, which serves as a communal area for the residents of the top-floor apartments. This shared roof space provides an opportunity for informal social interaction and community building among neighbors who don't share a courtyard directly.

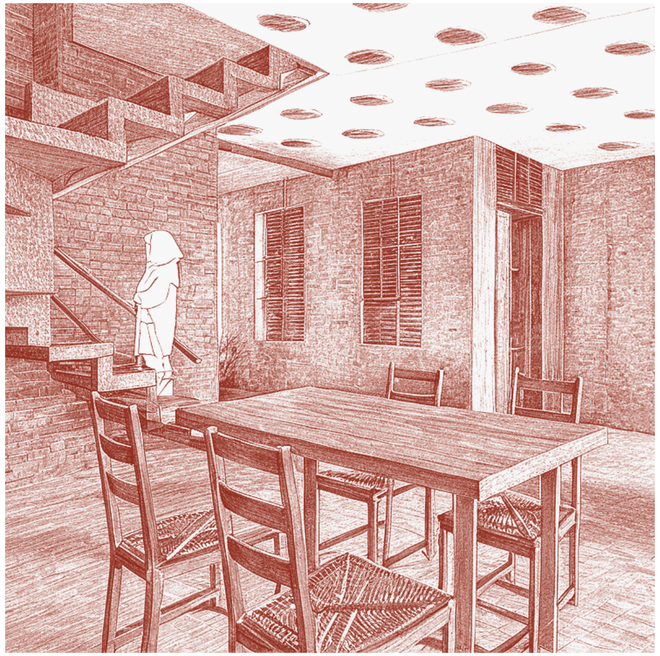
The apartment itself is a smaller variation of the duplex dwelling. It includes a compact living space combined with a kitchen, a bathroom, and two bedrooms. Surrounding the apartment is the bamboo gallery, consistent with the rest of the building. This extension of the living space offers shade, rain protection, and additional room for drying clothes, storage.

The overall design ensures that residents on the top floor remain part of the community, while also having access to private, comfortable living conditions and shared spaces that promote interaction and mutual support.



first floor

second floor

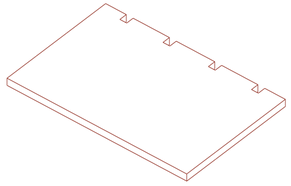


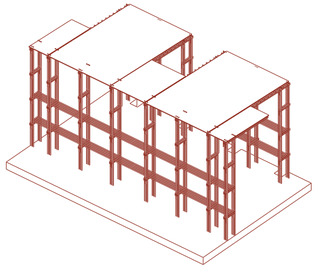


Low-Income Elevation (Courtyard)
1:200

LOW-INCOME CONSTRUCTION

Step 1 – Foundation & Raised Plinth
Construction starts with the digging of foundation trenches to the required depth below ground level. Solid brick foundation footings are laid in these trenches. Once the foundation has set, the surrounding embankments are built up with additional gravel waste and brick bats to create a base. On this prepared foundation, the fired-brick plinth is constructed, complete with retaining edges and access steps.

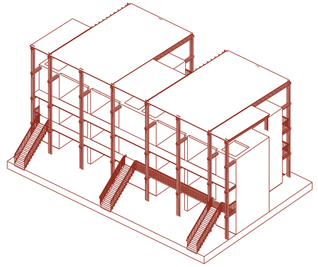


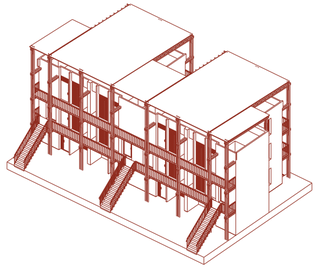


Step 2 – Protective Bamboo Envelope
Before any moisture-sensitive work begins, the bamboo shell must be in place to shelter the interior. Primary bamboo posts and beams are first anchored into the brick plinth to form the main frame. To stabilize this lightweight structure during assembly, temporary bamboo columns are placed around and within the shell. As soon as the frame is secure, corrugated iron (CI) roof sheets are installed atop the bamboo shell to shield subsequent work from rain.

Step 3 – CEB Construction & Protection
Under the cover of the now-weatherproof bamboo-and-CI roof shell, compressed earth blocks (CEB) can be laid without exposure to moisture. Each course of blocks is carefully aligned, and as soon as a wall section is completed, or at the earliest opportunity thereafter, it is coated with lime plaster.

This treatment renders the walls markedly more water-resistant, safeguarding the structural integrity of the CEB.





Step 4 – Interior Works & Finishing Touches
Once the CEB walls are stable and the roof fully weatherproofed, the focus shifts to internal fit-out and detailing. Stairs, floor structures, and any supplementary bamboo or timber elements are installed.

Windows and doors follow, along with ventilation slots and shading devices. Finally, a last lime-plaster coat is applied, all CI roof joints are fine-tuned for full sealing

MIDDLE-INCOME BUILDING

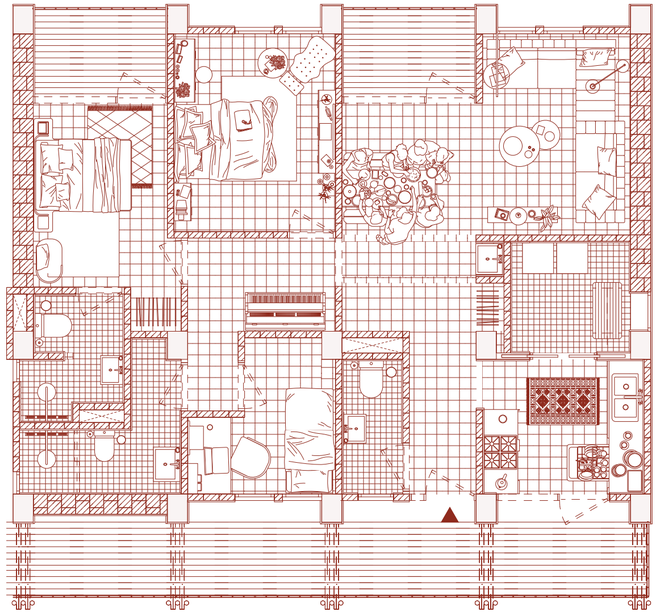
The middle-income building is designed to combine residential, commercial, and communal functions within one structure. On the ground floor, the building is split between commercial spaces facing the public street and communal functions facing the shared courtyard. The commercial areas are intended for small businesses or workshops, while the communal side is mainly used for livestock shelter, a practical, shared facility for the cluster. Other communal uses, such as a tea room or gathering space, can be added depending on the needs of the residents.

The upper floors each contain two apartments, one with two bedrooms and one with three. Though the layout is repeated from floor to floor for construction efficiency, the facade changes through the placement of bamboo panels, creating variation and visual interest without altering the structure.

Each apartment is accessed via the bamboo gallery that wraps around the building. The gallery serves not only as a circulation space but also as an extension of the dwelling, offering room for outdoor use, such as sitting, drying clothes, or storage. In addition to the gallery, each apartment has multiple balconies that provide private outdoor space and improve access to light and air.



Typical floor plan Middle-Income
1:150



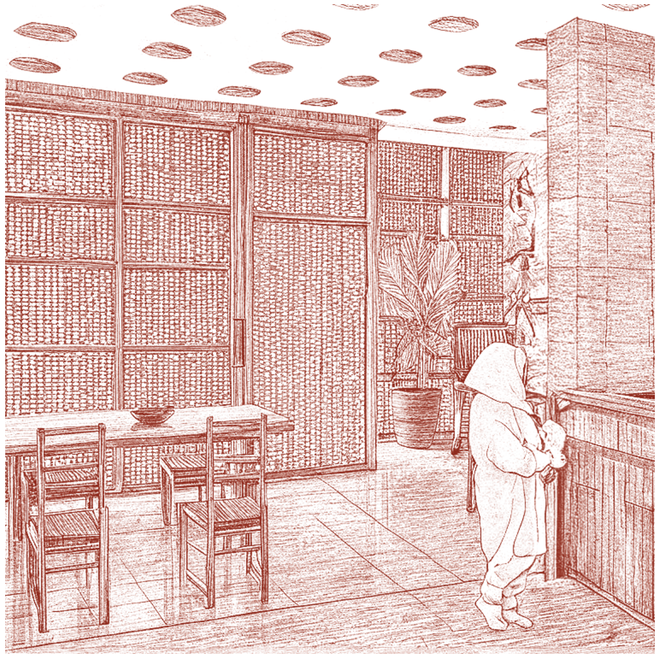
MIDDLE-INCOME APARTMENT

The three-bedroom apartment sits within the middle-income building. The building uses a concrete column structure with CEB (compressed earth block) infill walls. This combination was chosen because CEB alone isn't suitable for carrying loads beyond a few storeys.

Entry to the apartment is through the bamboo gallery, which also works as a semi-outdoor space connected to the dwelling. Inside, a small hallway leads to the living room and dining area, which are placed together as one open space. The kitchen is located next to the gallery, and the outdoor area right in front of it can be used for cooking or washing up, a practice common in many households. This part of the gallery is tucked into the corner, so it stays private and isn't used as a circulation space by others.

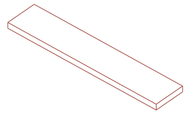
The apartment is arranged to keep shared spaces and bedrooms clearly separate. While the transition between the two zones is open, it can easily be closed off with a curtain or screen if more privacy is needed.

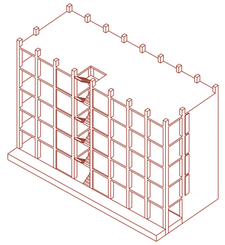
The master bedroom has its own bathroom, while the other two bedrooms share a second one. All bedrooms are placed along the outer edge of the building so they can get good air circulation and daylight.



MIDDLE-INCOME CONSTRUCTION

Step 1 - Foundation & Raised Plinth
Construction begins by excavating and leveling the site to the required depth. Brick foundation footings are laid in the trenches. Once the foundations have cured, embankments of gravel waste and brick bats are built up to form a sloping base. On this prepared sub-base, a fired-brick plinth is constructed with retaining edges and access steps.

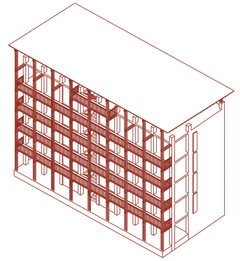


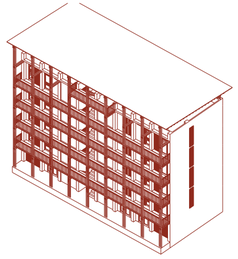


Step 2 - Concrete Frame
With the plinth in place, the reinforced-concrete columns are cast directly onto the brick plinth, establishing the primary load-bearing skeleton. Beams and ring beams tie the columns together at each floor level. Between these beams, lightweight filler-slab panels are installed to create the intermediate floor decks. This rigid concrete frame is inherently resistant to water exposure, so subsequent wet-works can proceed without risk to the structural integrity.

Step 3 – Bamboo Shell Envelope
Once the concrete frame and slab floors have achieved sufficient strength, the bamboo shell envelope is erected around the structure.

Primary bamboo posts are fastened to the plinth and tied into the concrete columns for stability. Temporary bamboo bracing ensures the shell remains plumb during assembly. Corrugated-iron (CI) roof sheets are then laid over the bamboo rafters to weatherproof the envelope.





Step 4 - Define Low Income Buildings
Under the shelter of the completed bamboo-CI shell, compressed-earth block (CEB) infill walls are laid between the concrete columns. Each infill panel is aligned carefully and, on completion, coated with a lime plaster to enhance its water resistance. Internal elements, stair flights, floor finishes, and any bamboo or timber joinery, are installed next. Windows, doors, ventilation louvers, and shading devices are fitted, followed by a concluding lime-plaster coat, and fine adjustments to the CI roof.

HIGH-INCOME BUILDING

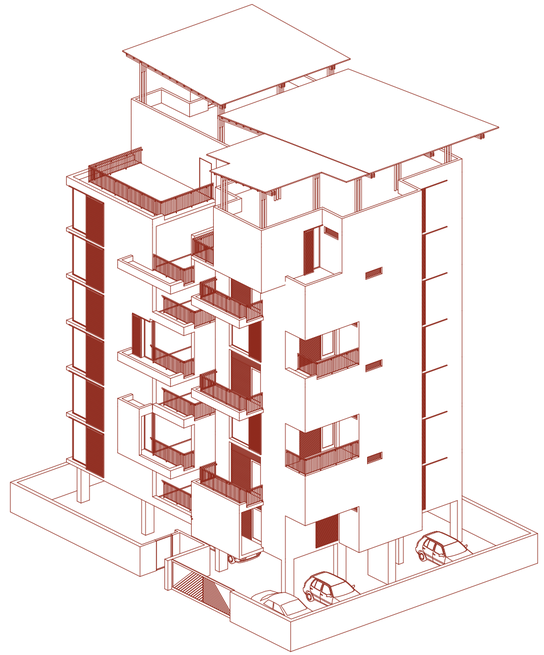
The high-income building forms part of an inclusive masterplan, but unlike the low- and middle-income units, it is not integrated into the mixed-income cluster layout. While the masterplan embraces income diversity, it intentionally avoids forcing high-, middle-, and low-income families to live within the same small-scale cluster. This is a strategic choice: placing all income levels in the same shared building or courtyard can lead to conflicts over use, expectations, or social dynamics.

The ground floor includes both a pedestrian and a vehicle entrance, leading to a parking area and the circulation core. A guard office and small security-related service spaces are located on the ground level.

To create visual variety and avoid repetition, the masterplan includes high-income towers in different heights, ranging from 7 to 10 floors. These are positioned along the edge of Badaghat Road, where they form a buffer between the high-traffic main road and the quieter, low-rise housing in the heart of the masterplan.

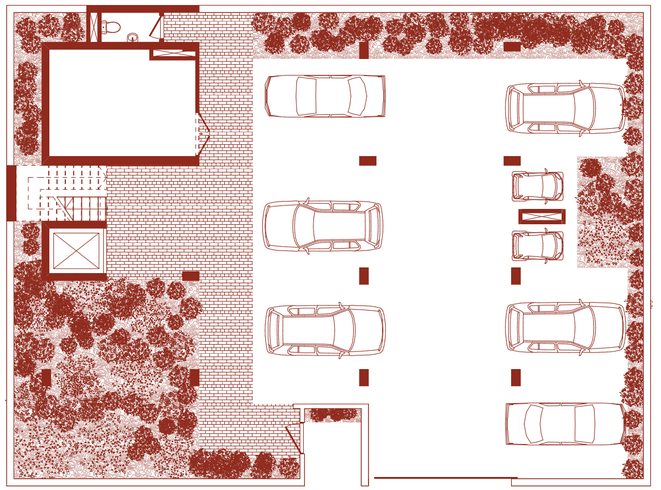
Each floor of the building contains a single apartment, with all units based on a consistent floor plan. The basic internal layout remains similar across floors for clarity and construction efficiency. However, variation is introduced through the balcony design, which alternates on each level to create a dynamic, shifting façade. The penthouse on the top floor has a slightly different, smaller layout, while the roof is accessible to all residents as a shared communal space, intended for informal gatherings or building-level events.

Materially, the high-income buildings are constructed using the same core materials as the low- and middle-income housing: a reinforced concrete frame, compressed earth block (CEB) infills finished with lime plaster, and a number of bamboo elements such as shutters or paneling. Roof designs are also consistent. This intentional use of shared materials creates visual and architectural continuity across income groups. It demonstrates that materials are not exclusive to one economic class, and can be universal.

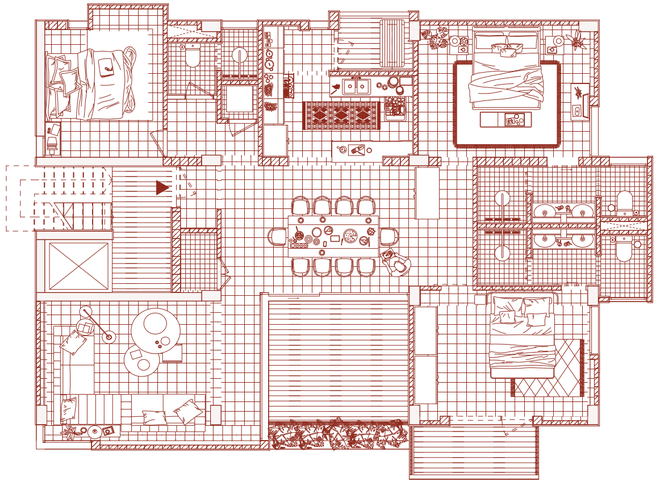








Ground floor plan High-Income
1:150



HIGH-INCOME APARTMENT

Each high-income apartment in the project occupies an entire floor, accessible through the building's circulation core, which includes both a staircase and an elevator. Entry into the apartment leads directly into a small entrance hall, designed to provide space for hanging coats and storing shoes. This entryway then opens into the central dining room, which acts as the heart of the home and the primary point of access to all other spaces. The layout follows a structure observed in local housing case studies from Sylhet and across Bangladesh, where the dining space often forms a social and spatial center.

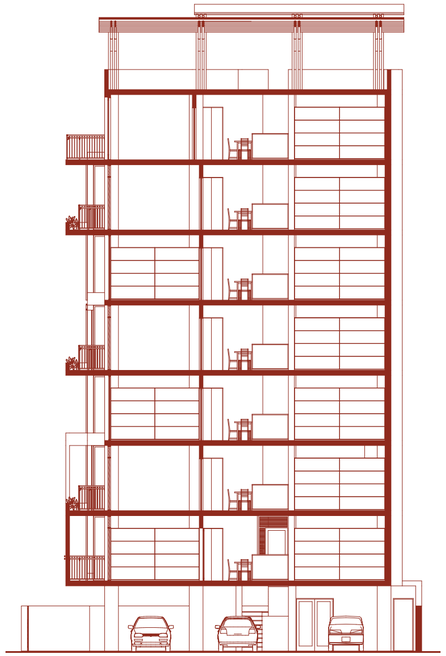
On the entry side of the apartment, the living room, a guest bedroom, and a shared bathroom are located. This area functions as the semi-private zone of the home, ideal for receiving visitors or hosting guests overnight. This layout supports guest use without interrupting more private areas.

The kitchen is placed along the Y-axis of the dining room, directly adjacent to it. This arrangement positions the kitchen as a transitional buffer between the semi-private and private zones.

The private area of the apartment consists of two large bedrooms, each with ensuite bathrooms. The entrance to this zone is left open by default to allow for adaptability: residents can choose to separate it using curtains, furniture, or light partitions, based on their privacy needs. This decision supports both spatial flexibility and user control, avoiding rigid internal barriers.

While the basic plan is consistent across all levels of the building, the balcony size and position change per floor. This not only gives each apartment a slightly different outdoor experience but also contributes to the dynamic, shifting facade of the building as a whole.





MATERIALIZATION

The project is grounded in a material strategy that prioritizes local resources, materials that are regionally available, economically accessible, and ecologically responsible. This approach ensures that the built environment reflects not only the culture of the place but also its climate, economy, and capacity for long-term resilience.

At the heart of this strategy is a carefully considered balance between availability, affordability, and sustainability. Materials such as bamboo, compressed earth blocks (CEBs), lime plaster, and fired bricks are sourced and produced locally.

This reduces transport emissions and supports regional supply chains, making construction more cost-effective and environmentally efficient.[84]

By using locally abundant and climate appropriate alternatives, the project reduces environmental impact. These materials also bring the added benefit of familiarity: local builders already know how to work with bamboo and mud. This reduces the need for specialized labor and empowers communities to build together but maintain, and expand their homes independently.

Ultimately, the material strategy is about building with the land, not against it. It promotes a future where architectural development is aligned with ecological realities, economic accessibility, and the skills and resources of the people who will inhabit it.

 Photo taken by J. Steendam [2024]

INTERIOR COHERENCE

One of the defining aspects of the masterplan is the shared material language used across all housing types. From low- and middle-income dwellings to high-income apartments, the interiors are unified through the use of the same core materials: compressed earth blocks (CEBs), bamboo, and filler slab ceilings with clay inserts.

This consistent material palette results in a visual and spatial coherence across the masterplan. CEB walls form the base of all units, giving interior spaces a tactile, grounded quality while maintaining breathable and thermally stable environments.

The exposed use of bamboo for details such as shutters, railings, or light partitions introduces warmth and texture while drawing from local construction traditions.

Filler slabs with clay pot inserts not only reduce the use of concrete but also contribute to a recognizable ceiling design visible in all unit types.

These materials are not treated as decorative or symbolic. Instead, they are used as practical, durable building components that perform well in the local climate and are familiar to local builders. Their appearance in all income groups reinforces the project's goal to remove the hierarchy often associated with material finishes. A resident in a low-income duplex and one in a high-income apartment will both encounter similar wall finishes, flooring systems, and ceiling treatments, highlighting that quality and comfort can be achieved without luxury materials.







BAMBOO

Bamboo is a common and important material in Bangladesh. People have used it for generations, for building houses, making fences, tools, baskets, and more. It's strong, lightweight, and grows quickly, which makes it useful, especially in rural areas.

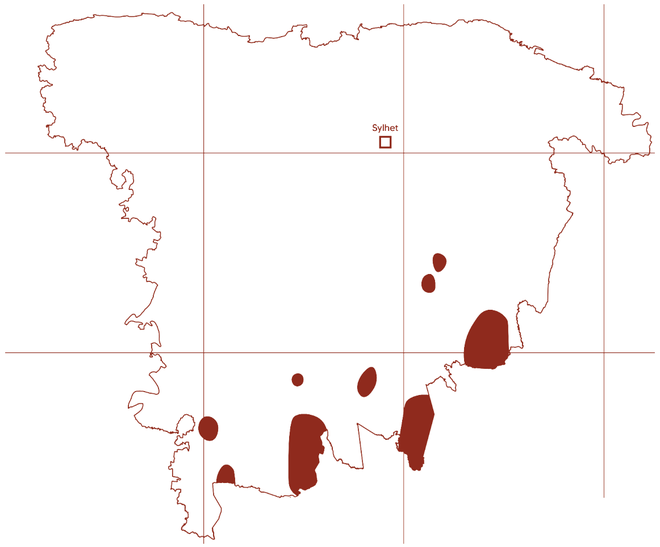
Bamboo is still widely used inside the country. Most of it goes into domestic use, including construction and craftwork. There's also a small but steady export trade in handmade bamboo items like baskets and furniture, with thousands of artisans, especially women and indigenous groups, working in this sector.

Bangladesh is home to nine genera and more than 33 species of bamboo. Out of these, seven species grow naturally in the country's forests. The most common and widespread type is Melocanna baccifera (locally known as Muli bansh), which makes up about 70–90% of the natural bamboo forests. Other species, like Bambusa tulda and Dendrocalamus longispathus, are found in smaller areas.[95]

Bamboo is essential for rural communities. It's used in house construction, fencing, agricultural tools, and craft-making. Its role in daily life is significant, and demand for bamboo poles has grown, especially in housing, high-rise scaffolding, and for use during festivals and events. But bamboo resources are under pressure. Forest bamboo is shrinking by about 3% each year, mainly due to overharvesting and increased demand. Industries like paper production and newer bamboo-based businesses also need a constant and reliable bamboo supply. This makes sustainable management more important than ever.[96]

In my project, bamboo is used in different ways, depending on the type. Two main species are part of the design: Bambusa balcooa and Melocanna baccifera.





Bamboo growth for construction Sylhet division 2023

Image from Building materials of Bangladesh (2025). University of Technology Delft. Faculty of Architecture. Urbanism and the Build environment. Department Of Architecture. Global Housing

BAMBUSA BALCOOA

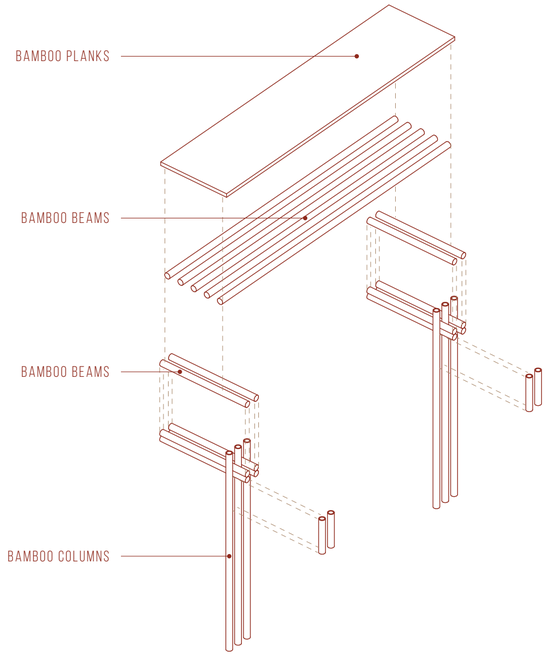
Construction and Scaffolding
Water Resistant
Extremely Durable

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^3
Thermal Conductivity: 0.165-0.20
Carbon capture (per ha): 12-18 tonnes
Life span: 25-30 years

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

Bambusa balcooa is one of the most widely used and commercially important bamboo species in Bangladesh, particularly valued for construction and scaffolding. Known for its robust structure and thick walls, this species stands out due to its high compressive strength, making it ideal for load-bearing applications. When treated properly, it has a lifespan of 25-30 years.[97]

The species also holds a significant share of the bamboo market, around 40%. Its strong demand is driven by its application in high-rise scaffolding, rural housing, and infrastructure projects.[98]





THE BAMBOO SHELL

The bamboo shell surrounding the buildings plays a key role in both the function and character of the housing. It is not just a design element, but a practical structure that responds to the local climate, supports daily use, and reflects familiar building traditions.

One of its main purposes is climate control. The gallery shades the building from direct sun, which helps reduce indoor heat and improves comfort in Sylhet's hot and humid conditions. It also allows for better airflow around the homes, which supports cross-ventilation and helps regulate temperature inside.

At the same time, the gallery acts as a semi-outdoor space between the home and the street or courtyard. In Bangladeshi daily life, many activities like cooking, sitting, socializing, or drying clothes happen in these kinds of in-between spaces. The gallery makes room for that, giving residents more flexibility in how they use their homes.

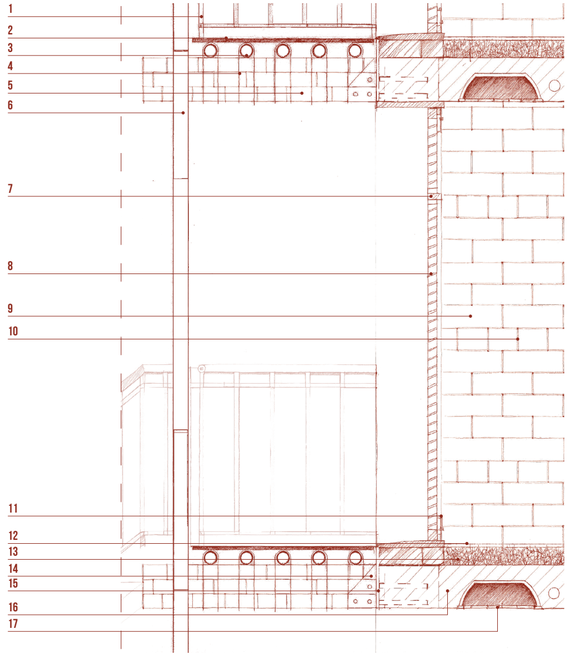
Because it wraps around the building, the gallery also supports social interaction. It encourages small moments of contact between neighbors, offering visibility and shared movement paths, without being intrusive. It works like a raised veranda, helping to keep the homes connected while still giving each family privacy.

Importantly, the use of bamboo as the primary material for this gallery takes on a symbolic role by using bamboo not only in low-income housing, but also in mid- and higher-income units.

By doing this, the bamboo shell becomes a visual identity for the entire project. It helps break the stigma attached to vernacular materials.

BAMBOO SHELL

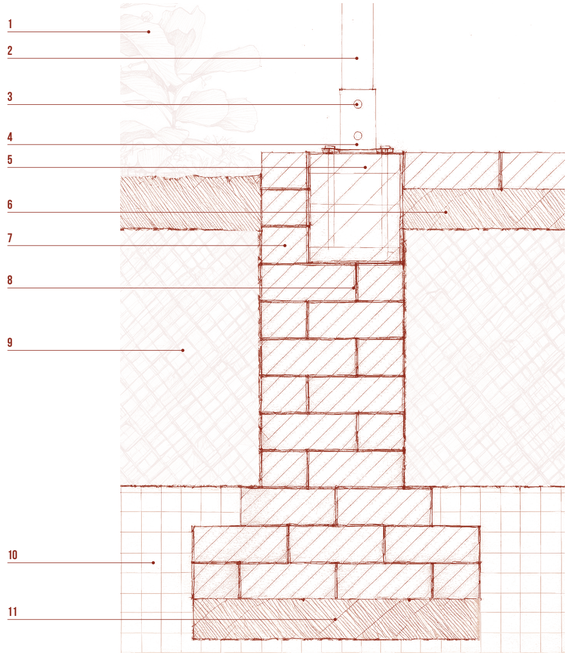
1.	bamboo railing	ø 50 mm
2.	bamboo planks	40 x 150 mm
3.	horizontal bamboo underconstruction	3 x ø 80 mm
4.	jute rope connection	
5.	bamboo beam - 3 connected bamboo beams	
6.	Bamboo column	ø 80 mm
7.	gamar timber frame	
8.	woven bamboo shutter panels	
9.	CEB	90 x 240 x 240 mm
	compressed earth block	90 x 240 x 115 mm
10.	earth mortar	
11.	hinge	
12.	oxide flooring	12 mm
13.	compressed sand	
14.	metal U-connection	
15.	Lime plaster	
16.	concrete filler slab	240 mm
17.	clay pots (filler elements)	ø 450 mm



Bamboo Shell Detail
1:25

BAMBOO CONNECTION

1. vegetation
2. bamboo column — ø 80 mm
3. metal bolt
4. metal base plate with anchor bolts
5. concrete element
6. compressed sand
7. fired brick — 90 x 240 x 115 mm
8. lime mortar
9. gravel waste & brick bats
10. earth
11. compacted subgrade



Bamboo Connection to Raised Plinth Detail
1:10

METI HANDMADE SCHOOL

Location: Rudrapur, Bangladesh
Architects: Anna Heringer + Eike Roswag
Year: 2006
Main Materials: earth and bamboo

The METI (Modern Education and Training Institute) School in Rudrapur, Bangladesh, designed by Anna Heringer and Eike Roswag, stands as a pioneering example of sustainable and culturally rooted architecture. Built primarily from local materials, rammed earth and bamboo, the project demonstrates how traditional construction methods can be elevated through contemporary design to create spaces that are not only functional and climate-responsive but also deeply integrated with the community's identity.[99]

A core principle of the METI School is its use of local labor and resources. The structure was constructed collaboratively with local villagers, artisans, and students, ensuring that the techniques and knowledge remained within the community. Rammed earth was used for the lower walls, providing excellent thermal mass and a stable indoor climate, while bamboo, locally harvested and treated, formed the upper structure and roofing system. This bamboo framework offers both structural integrity and visual lightness, creating a breathable and uplifting learning environment.[100]

By integrating traditional Bangladeshi craftsmanship with modern architectural thinking, the METI School not only minimizes environmental impact and construction costs but also empowers the local population. The building itself becomes a teaching tool, illustrating the value and viability of sustainable building practices.



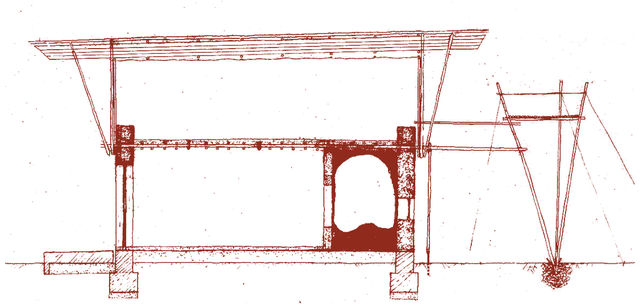


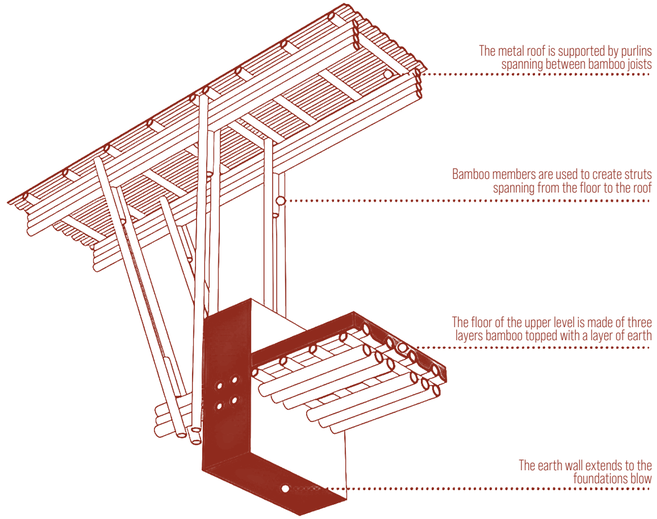
Images from Heringer, A. (n.d.). METI-School

The bamboo structure of the METI School is a core element of its sustainable and community-focused design. As shown in the construction diagram, bamboo is used both structurally and architecturally, showcasing its strength, flexibility, and renewability.[10]

Vertical bamboo members act as struts, running from the ground to the roof and anchored into thick rammed earth walls. This pairing combines earth's compressive strength with bamboo's tensile resilience, creating a stable, climate-responsive structure.

The upper floor is made from three layers of bamboo topped with a layer of earth, offering both structural strength and thermal insulation. Overhead, bamboo joists support purlins and a metal sheet roof, ensuring durability and protection during monsoon rains.





MELOCANNA BACCIFERA

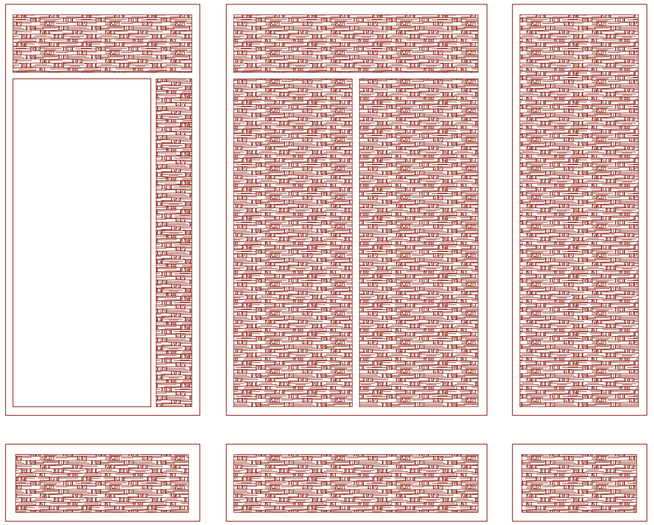
Non-Load Bearing Structures
Water Resistant
Durable

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

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

Melocanna baccifera, locally known as Muli bansh, is the most common bamboo species in Bangladesh, accounting for an estimated 70–90% of the country's natural bamboo forests. It's ideal for non-load-bearing applications, such as woven shutter panels, wall screens, and mats.[102]

Melocanna baccifera supports a small but stable export trade in handmade items. These industries involve local artisans, especially women and indigenous communities. By incorporating it into the project there's an opportunity to strengthen community engagement and support local economies.[103]



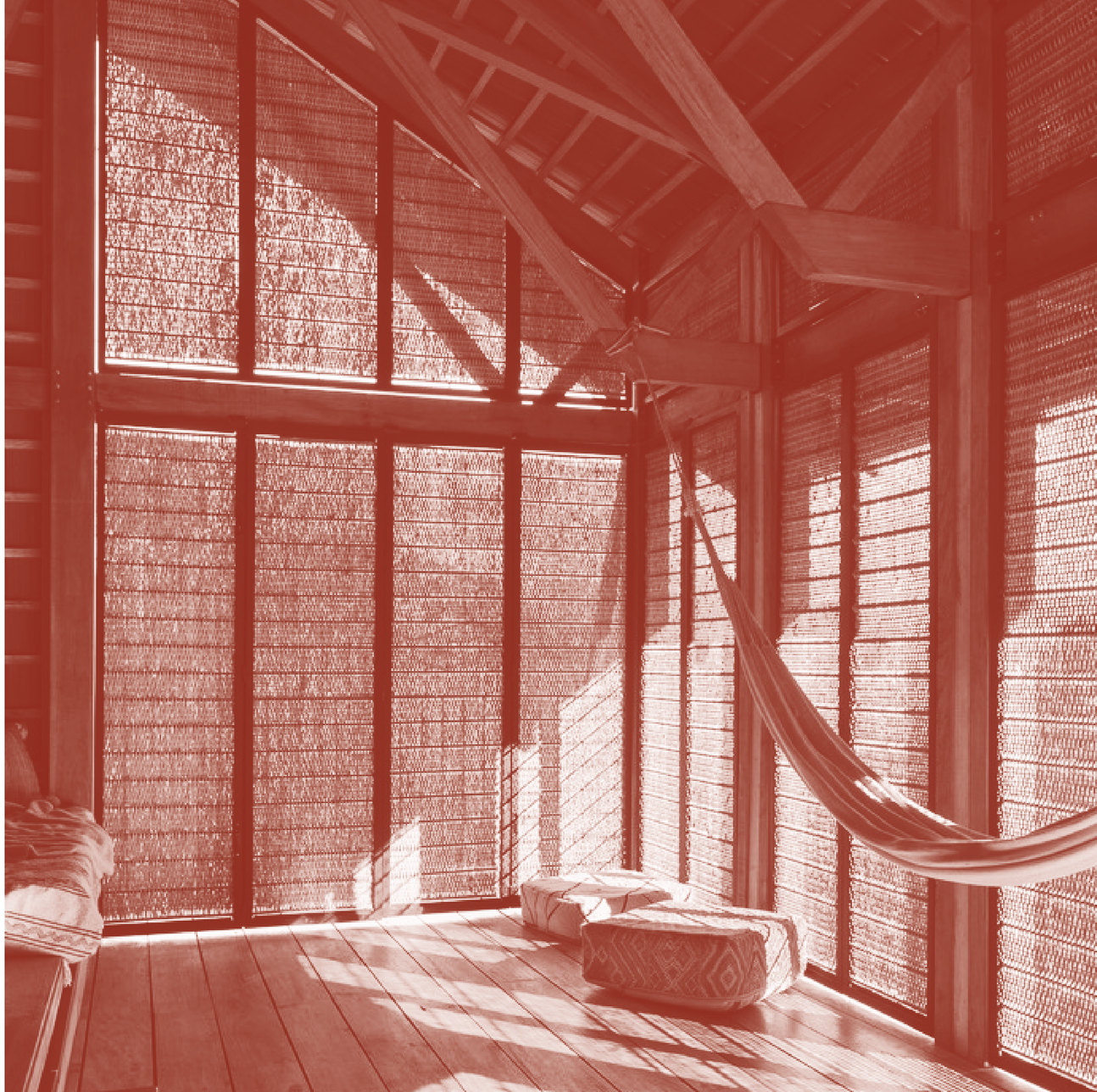
CASA TEJIDA

Location: Cundinamarca, Colombia
Architects: Santiago Pradilla + Zuloark
Year: 2019
Main Materials: Wood, metal, natural fibers

At the heart of the Woven House, *Casa Tejida*, is a deep commitment to local knowledge, craftsmanship, and collective creation. One of its most distinctive features is the woven façade, made from natural fibers and crafted in close collaboration with Maria, a local artisan whose work embodies the region's rich handcrafting traditions. These panels do more than provide shade and ventilation; they carry with them the textures, techniques, and cultural memory of the community, woven quite literally into the fabric of the home.[104]

Casa Tejida was not the result of a conventional architectural process. Instead, it unfolded as a collaborative endeavor that welcomed the participation of neighbors, craftspeople, and local builders alongside the architects. This inclusive design and construction process transformed the site into a shared space for dialogue, experimentation, and learning. Traditional methods and local materials met contemporary design ideas, producing a home that feels both rooted and innovative.[105]

By involving the community at every stage and engaging local artisans as co-creators rather than just labor, the project reinvested directly into the local economy. More importantly, it reaffirmed the value of regional craft in a modern context. In this way, the Woven House, Casa Tejida, is more than a home; it is a living example of how architecture can strengthen community bonds, preserve cultural practices, and create lasting social and economic impact.



ArchDaily. (2021, March 11). Woven House / Santiago Pradilla + Zuloark.





CEB BRICKS

Raw material: Subsoil (with sand and clay)
Compressive strength: 2–7 MPa (higher if stabilized)
Density: ~1,800–2,000 kg/m^3
Thermal conductivity: ~0.3–0.6 W/mK
Life span: 30–100 years

Cost: ~8–12 Tk per block
Equivalent cost: $0.08–0.12 per block

Compressed Earth Blocks (CEBs) are a sustainable and cost-effective material, offering a low-carbon solution for both load-bearing and partition walls. Made from a mix of local subsoil and sand, CEBs are pressed into uniform blocks using a manual or mechanical machine and then cured by air drying, eliminating the need for energy-intensive firing.[106]

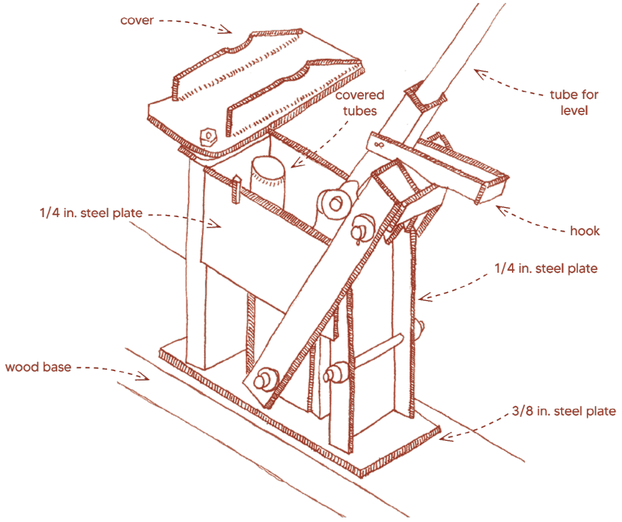
The process is highly adaptable. Block dimensions can be adjusted based on the mold. The air drying method requires minimal space and energy, further enhancing the environmental benefits.

While the technique is labour-efficient and well suited to local builders, who are often already familiar with earth-based construction, there is an initial investment required. A manual CEB press machine costs around 70,000 BDT, which can be funded due to the cross subsidization strategy.[107]

Overall, CEBs support a circular construction model that reduces dependency on imported carbon-heavy materials. By using locally sourced earth, the project reduces transportation emissions, and offers a resilient, thermally efficient, and culturally grounded alternative for long-term, sustainable housing development.

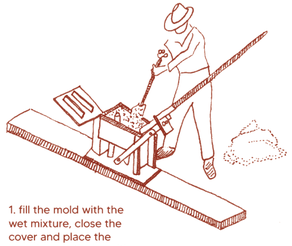


Image from biOn.eu (n.d.). Workshop on raw earth architecture.



Earth Block Compressing Machine (model: Inva-ram)

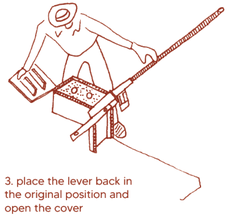
Image from Building materials of Bangladesh (2025). University of Technology Delft. Faculty of Architecture. Urbanism and the Build environment. Department Of Architecture. Global Housing



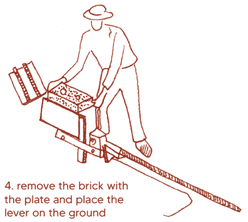
1. fill the mold with the wet mixture, close the cover and place the lever in a vertical position



2. remove the hook to free the level and lower the lever to press the mixture



3. place the lever back in the original position and open the cover



4. remove the brick with the plate and place the lever on the ground

Earth Block Pressing Process

Image from Building materials of Bangladesh (2025). University of Technology Delft. Faculty of Architecture. Urbanism and the Build environment. Department Of Architecture. Global Housing

LIME PLASTER AS A PROTECTIVE SOLUTION

A key design intention is that all income groups share the same material language, helping to dissolve the stigma often attached to earth-based construction. By using CEBs across both low- and middle-income housing, the project sends a clear message: earth is not a "poor material," but a climate-resilient, economically sensible, and culturally grounded solution.

However, the use of CEBs in Sylhet's wet, monsoonal climate presents real challenges. In their unstabilized form, earth blocks are highly susceptible to erosion and moisture damage. One way to address this is by adding cement as a stabilizer, which significantly improves durability and water resistance. But this comes at a cost, both financial and ecological. Stabilization raises the price of each block, reduces material recyclability, and increases embodied carbon, limiting the long-term sustainability benefits that make CEBs so appealing in the first place.

To retain the environmental integrity of unstabilized or lightly stabilized CEBs, the project relies on lime plaster as a protective finish. Lime plastering shields the earth walls from direct exposure to rain while maintaining the block's breathability, a crucial property in humid climates that helps regulate indoor temperature and moisture. This solution allows the project to benefit from the thermal comfort, low carbon footprint, and affordability of earth construction, while still meeting the performance demands of the local climate.

This approach enables the project to embrace vernacular knowledge without compromise, integrating tradition with technical innovation.



Image from Flegeal Craft. (n.d.). Plaster

FILLER SLAB

Typical thickness: 150–250 mm
Materials used: Concrete with clay fillers
Load capacity: ~3–5 kN/m^2
Compressive strength: ~20–25 MPa
Density: ~2,200 kg/m^3
Thermal conductivity: ~0.4–0.7 W/mK

Cement savings: ~25–35%
Steel savings: ~20–25%
Life span: 40–60 years

Cost: ~500–800 Tk/m^2
Equivalent cost: $4.50–7.50/m^2

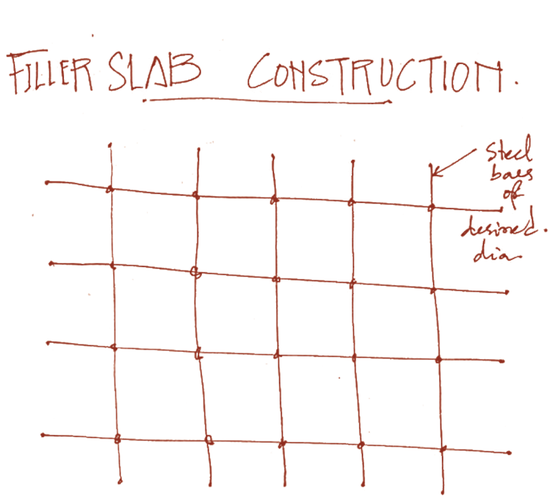
Filler slabs are a cost-effective and sustainable alternative to solid concrete slabs, designed to minimize material use while maintaining structural performance. Instead of pouring a full slab of reinforced concrete, the non-load-bearing lower portion is replaced with lightweight filler materials. In this case, locally produced clay pots are used as fillers, an ideal solution due to the abundant availability of clay in the region.[108]

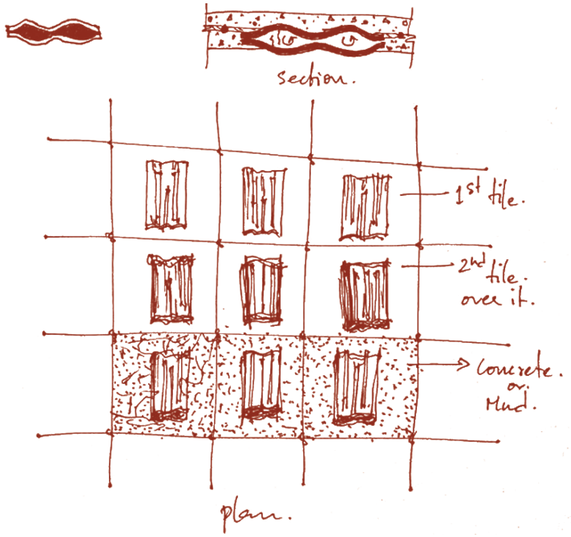
By integrating clay pots into the slab formwork and casting concrete around them, the design achieves significant material savings. This not only lowers construction costs but also reduces embodied carbon, supporting the project's environmental objectives.

Beyond sustainability, the use of clay pots introduces a unique visual quality to the ceiling, adding cultural character and architectural expression. While typically cast in place, filler slabs can also be prefabricated on-site. The technique is well-suited to local construction practices, requiring no advanced machinery and enabling builders to work with familiar materials and tools.



Image from Blurring Boundaries. (n.d.). Filler slab.


FILLER SLAB CONSTRUCTION.
Steel bars of desired dia.


section.
1st tile.
2nd tile. over it.
Concrete. or Mud.
plan.

FIRED BRICKS

Raw material: Clay (topsoil)
Firing temperature: 600–1100°C
Compressive strength: 10–20 MPa
Density: ~1,600–1,900 kg/m^3
Thermal conductivity: 0.6–1.0 W/mK
Life span: 30–50 years

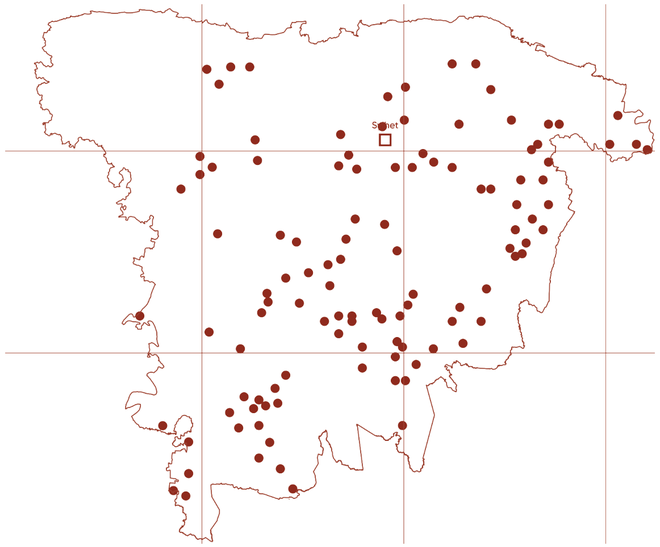
Cost: 6–10 Tk per brick
Equivalent cost: $0.06–0.10 per brick

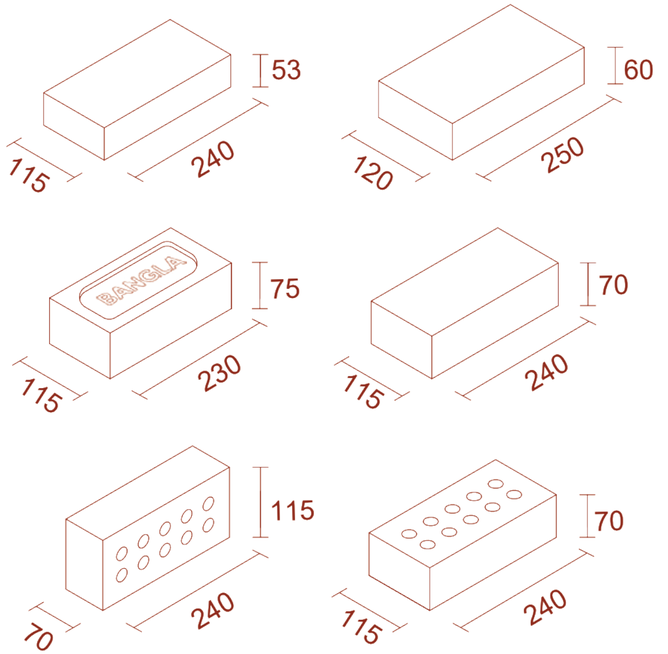
Fired bricks are one of the most widely used building materials in Bangladesh, deeply embedded in both the country's construction practices and cultural identity. With easy access to clay from riverbanks and floodplains, the brick industry has supported urban growth and rural development for generations. Used in everything from informal housing to major infrastructure, bricks remain essential for their availability, affordability, and durability. In the project, fired bricks are used selectively and purposefully, especially for bounding the raised plinths of buildings. This is a critical application, as the plinth serves as the primary barrier between the structure and Sylhet's flood-prone ground conditions. In this role, bricks are ideal due to their water resistance, compressive strength, and long-term durability. Additionally, they are readily available and economically viable, making them a practical choice for achieving structural stability in a challenging climate.[109]

While fired bricks do come with a significant environmental cost, especially when produced in traditional coal-fired kilns, their use in Sustaining Sylhet is minimized and reserved for locations where performance takes priority over sustainability.



Photo taken by J. Steendam (2024)


Sylhet


53
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BANGLA
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MAB
MAB

CEB VS. FIRED BRICKS

Choosing the appropriate walling material is a key decision in the development of climate-adaptive and inclusive housing in Sylhet's peri-urban context. Both Compressed Earth Blocks (CEBs) and fired bricks are commonly used in Bangladesh and offer different strengths. However, each comes with specific trade-offs related to cost, availability, environmental impact, and suitability for Sylhet's local climate and construction culture. This comparison outlines which material is better suited for implementation in the project.

Environmental Impact and Sustainability

From a global sustainability perspective, Compressed Earth Blocks (CEBs) are the better option. They are produced without firing, using only local subsoil and sand, and are air-dried, completely eliminating the emissions associated with coal-fired kilns. This low-energy process significantly reduces carbon emissions and supports long-term environmental goals, both locally and globally.

Fired bricks, in contrast, are among the most polluting materials used in Bangladeshi construction. Their production relies heavily on coal, and many kilns operate informally, contributing to widespread air pollution and carbon output.

However, it's important to recognize that global environmental impact is not a primary concern for many rural or low-income households. Their priorities are understandably focused on affordability, stability, and immediate survival, such as flood protection, income generation, and access to sanitation. The long-term environmental costs of brick production are often less visible or less relevant to people facing pressing everyday challenges.

Conclusion: CEBs are preferable in terms of environmental performance, globally and locally.

Indoor Climate and Comfort

CEBs offer excellent thermal mass and breathability. Their lower thermal conductivity (0.3–0.6 W/mK) helps keep interiors cooler during hot periods and warmer at night. When lime-plastered, they also gain water resistance without compromising breathability, enhancing indoor air quality.

Fired bricks have higher thermal conductivity (0.6–1.0 W/mK), meaning less insulation and thermal buffering. They absorb and radiate heat more quickly, which can lead to warmer indoor environments in Sylhet's humid, subtropical climate.

Conclusion: CEBs provide a more comfortable and climatically appropriate indoor environment, especially important energy efficiency in low-income housing.



Photo taken by J. Steendam (2024)



Water Resistance and Durability
Fired bricks are naturally water-resistant and durable, making them ideal for wet, flood-prone conditions. This is why they're used in the project for the plinth, a high-exposure zone that needs to withstand moisture over decades.

CEBs, when unstabilized, are vulnerable to water damage. However, in Sustaining Sylhet, they are lime plastered, creating a protective barrier while maintaining breathability. In protected or low-exposure applications, this solution performs well, though it may need periodic maintenance.

Conclusion: Fired bricks are still essential in high-risk or structural elements, such as plinths. But for general walling, CEBs with lime plaster offer a durable, low-impact solution.

Cost and Availability
Fired bricks cost slightly less (6–10 Tk per brick) and are widely available across Bangladesh. Their affordability and strong supply chain make them the go-to material for most builders. However, this lower cost comes with high long-term environmental and health costs.

CEBs cost around 8–12 Tk per block, which is slightly higher but can be offset by on-site production and machine sharing, enabled through cross-subsidization. Over time, local familiarity and training can also reduce labor costs and increase acceptance.

Conclusion: Fired bricks win on current availability and slightly lower cost, but CEBs are more cost-effective over the building's lifespan, especially when community-based production is introduced.

Cultural Familiarity and Perception
Fired bricks carry social status and are associated with modernity and permanence. For many villagers, they symbolize progress.

CEBs, in contrast, are sometimes perceived as "poor people's materials." However, the project directly challenges this stigma by showing they can be used in well-performing buildings across all income levels.

Conclusion: Fired bricks are more socially accepted, but the project uses design to elevate the image of earth-based materials.

Final Assessment
It is advisable to use Compressed Earth Blocks (CEBs) as the primary material for wall construction across all income levels. Their thermal performance, low environmental impact, and the fact that they can be produced locally make them highly appropriate for Sylhet's climate and economic context. To address concerns about water resistance CEBs should be finished with lime plaster. This not only protects the blocks from moisture but also maintains their breathability.

Fired bricks, while more durable in wet conditions, should be used selectively, particularly for vulnerable elements such as raised plinths or exposed lower walls. These areas demand more robust materials due to frequent exposure to flooding or standing water.

By combining both materials in a targeted way, the project can balance performance, cost, and sustainability. This strategy also reinforces the broader goal of creating inclusive, climate-adaptive housing that respects both local needs and long-term environmental concerns.

Image from BC Architects & Studies. (n.d.). The Library of Muyinga.

LONG-TERM USE

This chapter explores how the project is designed to perform and evolve over time. Beyond initial construction, the project considers how buildings are maintained, how they can adapt to changing needs, and how they may transform through everyday use. Housing is not static, families grow, routines shift, and materials age.

The following sections discuss three key dimensions: the maintenance requirements and responsibilities tied to material choices; the adaptability of spatial layouts and building elements; and the expected temporal evolution of the site as residents modify, personalize, and maintain their homes.

Maintenance

The project makes use of materials that are locally sourced, affordable, and environmentally appropriate, but many of these require regular care to ensure long-term performance. A clear maintenance strategy is therefore essential to the durability of the buildings and the success of the project over time.

Lime plastered Compressed Earth Block (CEB) walls, used on both the interior and exterior, are breathable and support a healthy indoor climate. However, they are vulnerable to erosion over time, particularly on the exterior. Reapplication of lime plaster is recommended every 5–10 years depending on exposure. This task is manageable for local masons or trained residents, supporting local employment and self-sufficiency.

Corrugated Iron (CI) sheet roofing is durable and well-suited to Sylhet's heavy monsoon rains. Though it requires less frequent maintenance, joints, fasteners, and overlaps should be checked regularly for corrosion or leaks. These inspections can be done at the household level, but more technical repairs may require the assistance of a trained community-level technician.

Fired brick plinths, used for raising buildings above flood level, require minimal maintenance due to their high water resistance and durability. Occasional repointing of mortar or checking for vegetation growth may be necessary, but these interventions are infrequent.

Woven bamboo panels used for shading, partitions, or cladding are more temporary in nature. Depending on treatment and exposure, they typically need replacement or repair every 5–7 years. These are lightweight elements and can be easily replaced or repaired by the residents themselves.

The bamboo gallery shell, which wraps around many of the buildings, is both architectural and functional. Treated bamboo can last 5–10 years, but must be inspected annually for signs of decay or insect damage. The Community Land Trust (CLT) board can coordinate shared maintenance for communal elements like the gallery shell, while residents are responsible for their own sections.

Responsibility for maintenance is shared: individual residents handle interior and small-scale exterior upkeep, while the CLT should organize inspections and coordinate group repairs or training workshops.





Adaptability
Adaptability is an important design principle in the project, allowing the project to meet the evolving needs of its residents over time. Various architectural and spatial elements are designed with flexibility in mind, enabling changes without compromising the integrity of the built fabric.

The ground floors of low-income duplexes are especially adaptable. They can serve as bedrooms, living rooms, workshops, or shops depending on household size and economic activity. The layout allows easy reconfiguration without structural alterations.

The bamboo gallery shell acts as a platform for informal adaptations. Residents can add bamboo screens, furniture, or planting systems to customize this buffer zone.

Partition walls and room connections are kept simple and open in many dwellings, allowing residents to divide or connect spaces using curtains, lightweight materials, or furniture. This supports changing family sizes or shifts between private and communal uses.

Shared courtyards are intentionally under-programmed, giving families freedom to use them for cooking, childcare, social events, or gardening. At the heart of each courtyard is a water pond, which plays an environmental role, such as evaporative cooling and rainwater collection, but may also become a social or aesthetic feature over time. Surrounding the pond, designated vegetation zones are included, yet their use is deliberately open-ended. Residents may choose to cultivate small food gardens here, potentially fertilized with compost or liquid by-products from the biodigester septic tanks.

The courtyard can also host seasonal festivals, relaxing areas, outdoor play zones for children, or spaces for drying produce or clothes. The design gives each cluster the freedom to define its own needs and to adapt the courtyard accordingly.

Temporality
It would be unrealistic to assume that the Sustaining Sylhet project will remain exactly as designed. Architecture, especially in a context of diverse and changing needs, does not stay fixed. What is drawn in plans and sections is only a starting point. Over time, buildings will adapt to how residents live, change, and maintain them. In 10 or 20 years, the project is expected to look different, not in overall layout or density, but in the way the spaces have been shaped by the people who use them.

The bamboo gallery shells around the buildings, for example, will likely evolve with added woven bamboo panels for privacy, informal enclosures, or shading fabrics. Some residents may grow plants along the bamboo frame, or use it to store household items or tools. These modifications will vary from household to household, gradually giving each dwelling a unique expression.

Lime plastered CEB walls will show natural signs of age, patched, repainted, or recoated depending on maintenance efforts and exposure. Some woven bamboo elements will be replaced or adapted, using new patterns or finishes that reflect availability and personal preference.

The courtyards will gradually take on new functions that reflect the habits and preferences of the people living around them. While initially designed with a water pond and areas for planting, these features are not fixed in purpose. Over time, residents might repurpose the space in informal ways, laying bricks for additional walkways, creating improvised play areas for children, or setting up benches and shaded corners for gathering. Some clusters may introduce washing areas or communal cooking setups; others might transform unused planting beds into drying zones, tool storage, or places for keeping poultry or livestock. The courtyard becomes less of a designed feature and more of a lived-in, evolving landscape, shaped by daily needs rather than pre-defined programs.

These forms of adaptation are not failures of design, but a reflection of success, evidence that the project is being lived in, maintained, and reshaped by its users. Temporality is a natural and expected part of the project's life. Buildings will mature, routines will shift, and the architecture will evolve in response. That evolution is part of what gives the project long-term relevance.



5 A'S OF ADEQUATE HOUSING

The "5 A Principles" for adequate housing, Availability, Accessibility, Affordability, Acceptability, and Adaptability, offer a practical framework for evaluating housing quality. Developed by Alonso Ayala, the model helps assess whether housing meets the basic needs of its users across physical, economic, social, and cultural dimensions.[110]

The following sections explain how each of the five A's is reflected in the project, and how they helped guide the design toward practical, context-specific solutions.

Availability
Availability in housing refers not only to the quantity of housing units provided but also to the capacity of these units to serve diverse groups in locations that enable access to livelihood and services. In the Sustaining Sylhet project, availability is addressed through a comprehensive masterplan that introduces housing for low-, middle-, and high-income groups in a structured, phased development. This approach avoids the pitfalls of unregulated urban sprawl and ensures that land is used effectively and equitably.

Importantly, the project also investigates the local availability of construction materials, such as bamboo, compressed earth blocks (CEBs), and fired bricks. This research into local sourcing is not incidental, it's an intentional effort to balance availability with sustainability and affordability. By selecting materials that are not only geographically accessible but also environmentally sustainable and economically viable, the project strengthens the long-term availability of housing solutions that can be replicated or adapted elsewhere.
Additionally, the Community Land Trust (CLT) model ensures long-term availability of land for housing without the threat of speculative development, preserving access for future generations.

Accessibility
Accessibility in this context goes beyond physical reachability to include economic and social access to land, infrastructure, and public services. The Sustaining Sylhet project reflects this by designing a connected, flood-resilient neighborhood that integrates water management, transport, schools and commercial spaces. Physically, the site design considers the frequent flooding in Sylhet and employs elevated plinths and water ponds to ensure year-round access.

Economically, the project is inclusive; through the CLT framework, residents across income groups can access secure tenure without being priced out by market forces.

Accessibility is further enhanced by mixed-use clusters, which allow different income groups to live in close proximity, sharing resources and infrastructure. The intentional urban fabric enables social integration and avoids the socio-spatial fragmentation often seen in conventional urban expansion.





Affordability
Affordability in the project is approached through a layered strategy that blends low-tech construction with innovative social financing. Instead of reducing costs by lowering quality, the project uses locally sourced, cost-effective materials like bamboo and CEBs, which not only reduce initial construction costs but also minimize long-term maintenance expenses.

The economic model includes cross-subsidization, where high-income households pay market rates to help subsidize housing for low-income residents. This allows for a mixed-income community in which affordability does not mean segregation. The emphasis on self-building techniques and easily repairable materials also empowers residents, particularly low-income ones, to maintain and adapt their homes without relying on expensive external services. Thus, affordability is achieved not as a static price point, but as a dynamic interplay of material choices, financial models, and social equity.

Acceptability
Acceptability refers to the degree to which housing meets the cultural, social, and aesthetic expectations of its users, while also offering safety and durability.

In this project, acceptability is deeply rooted in the vernacular architectural language of Sylhet. Through field research and community engagement, the design incorporates familiar elements such as courtyards, elevated structures, and materials that reflect traditional building practices. The houses are not just physically resilient to climate challenges, they are also culturally resilient, maintaining spatial hierarchies and communal layouts that resonate with local living patterns.

The project does not romanticize tradition but rather engages with it critically, selecting elements that enhance thermal comfort, flood protection, and social cohesion. In doing so, it avoids the common pitfall of imposing foreign architectural norms and instead promotes dignity and identity through design.

Adaptability
Adaptability refers to the ability of housing to respond to evolving needs, whether due to changing family structures, economic conditions, or environmental pressures. In Sustaining Sylhet, adaptability is embedded both in spatial design and material choice. Housing units, particularly for low-income groups, are designed to be incrementally expandable, allowing residents to build in phases as resources become available. Shared courtyards offer flexibility for communal activities, informal economies, or future extensions.

At the material level, the use of bamboo and earth ensures that dwellings can be easily modified, repaired, or extended using local knowledge and tools. Moreover, climate adaptability is addressed through flood-resilient design strategies such as elevated plinths and bio-based drainage systems. These features ensure that the housing is not static, but capable of growing and evolving in step with the lives and challenges of its inhabitants.

REFLECTION

The motivation for my graduation project stems from the urgent need to address the climate-related vulnerabilities faced by rural communities in Bangladesh, particularly in Sylhet. As the country faces recurring floods and environmental instability, there is an increasing reliance on unsustainable building materials like concrete, which, while perceived as resilient, often disregard the adaptability and cultural relevance of vernacular practices. My choice of the Global Housing Studio was based on its dual emphasis on environmental context and socio-cultural relevance, values that align with my architectural aspirations and which guided the direction of my graduation project titled "SUSTAINING SYLHET: Bridging Tradition and Growth."

Research and Design Interrelation
My research process began with a deep dive into the cultural and environmental dynamics of Shonatola, Sylhet. Through literature review, case study analysis, and interviews with local residents, I identified core values and techniques embedded in Bangladeshi vernacular architecture. These insights directly shaped the conceptual framework of my design process. The reciprocal relationship between research and design became evident when field findings on local perceptions of housing resilience prompted a re-evaluation of initially proposed materials and spatial layouts.

For example, while my preliminary design approach included hybrid housing models combining traditional and modern elements, the feedback from residents about material performance during floods influenced a shift toward more integrated vernacular typologies. Conversely, the limitations encountered in spatial configurations during design iterations encouraged me to revisit and expand my research on adaptive use of stilts, elevated plinths, and natural ventilation systems.

Methodology and Process Reflection
The structure of the graduation program at TU Delft is designed to begin with a research phase, followed by a design phase informed by the insights gained. In my own process, these phases were not strictly separated, they often overlapped and informed one another, but looking back, I now realize that a more integrated and simultaneous development of research, fieldwork, and design would have benefited the project significantly.

At the start of the studio, my understanding of the context, particularly the socio-cultural and environmental realities of the Global South, was still developing. This limited perspective made it difficult to frame my research in a way that directly aligned with the design challenges ahead.

As a result, much of the initial research felt disconnected from the real needs of the site and community. It lacked the specificity and grounded insight that only emerged later, once my design direction began to crystallize and the project's contextual demands became clearer. As a result, much of the initial research lacked direction and had to be revisited during the design phase. This created extra pressure and reduced the time I could devote to developing the design itself. A more integrated approach, where research and design evolve together, would have helped me set clearer priorities and build a stronger foundation early on.

My approach combined qualitative and comparative methods: field interviews, photographic documentation, literature analysis, and case study evaluation. This mixed-method strategy proved largely effective, particularly in forming a grounded understanding of local socio-environmental dynamics.

One of the strengths of my method was its adaptability, it allowed a flexible transition between abstract research themes and tangible design solutions. The process was iterative; research informed design, and design outcomes led to refinement in research focus. Nonetheless, I recognize that an earlier integration of design ideation during the research phase could have improved the cohesion and fluency of the final proposal.

Response to Feedback and Personal Learning
Throughout the graduation process, feedback from my first and second mentors, Nelson Mota and Ludovica Cassina, was pivotal, but also the less frequent talks with Marina Tabassum and Antonio Paoletti helped shape the project.

Early critique emphasized the need for clarity in framing vernacular knowledge not merely as aesthetic reference but as a climate-responsive system. In response, I deepened my exploration of thermal comfort, material performance, and spatial hierarchy in traditional dwellings. Later feedback encouraged me to critically assess the scalability and structural logic of my design.

This project taught me the importance of cultural humility in design and the value of local wisdom in shaping climate-resilient architecture. It challenged my assumptions about modernity and made me more sensitive to the socio-political dimensions of architectural practice. Engaging with local narratives not only grounded the design but also broadened my perspective on sustainability and ethical responsibility.

Academic and Societal Relevance
Academically, this thesis contributes to ongoing discussions on climate-adaptive architecture and the reintegration of vernacular strategies into contemporary design.

It also adds to the body of knowledge exploring how bottom-up, community-based solutions can inform resilient planning in the Global South. Societally, the project advocates for inclusive housing that respects cultural identity and empowers communities to co-



create their built environment. It highlights the ethical imperative of designing with rather than for vulnerable populations.

Transferability of Results

While rooted in the specific context of Sylhet, the principles derived from this research, modularity, participatory design, use of local materials, and responsiveness to climatic conditions, are transferable to other flood-prone or culturally sensitive regions worldwide. The strategies could be adapted in similar contexts across South and Southeast Asia, where climate adaptation and cultural preservation are critical.

Self-Developed Reflection Questions

How can vernacular architectural knowledge be systematically translated into contemporary architectural language without losing its cultural significance or environmental effectiveness?

This question arises from the challenge I encountered in bridging traditional building practices with modern design expectations. The concern is not only technical but also cultural, how to maintain the symbolic and community-based value of vernacular housing while adapting it for new construction methods, regulations, and material availability. I hope to explore mechanisms through which this translation process can be codified in future research or policy, possibly through guidelines, community toolkits, or adaptable building systems.

In what ways can climate-resilient housing systems developed for rural Bangladesh be adapted to support displaced populations or informal settlements in other regions facing environmental stress?

This question examines the scalability and applicability of my design research to global contexts. It acknowledges that while rooted in Sylhet, the architectural strategies, particularly those focusing on flood resilience, modular growth, and cultural adaptability, may serve as foundational models for other vulnerable or transitional housing environments around the world.

How do we balance the need for architectural innovation with the ethical imperative to preserve and respect deeply rooted cultural traditions in vulnerable communities?

This question is born from the ethical dilemmas encountered throughout my project, particularly in proposing design changes that alter traditional lifestyles. The reflection underscores the responsibility of architects to act not only as designers but also as cultural mediators who must tread carefully between progress and preservation.

Looking Back

Looking back on the development of my thesis project, I'm deeply appreciative of the experiences and insights I gained throughout the process. The impressions gathered during our fieldwork had a significant influence, not only on the direction of my project, but also on me personally. They helped root the work in reality and gave weight to the design challenges I was addressing.

The design process itself was demanding, especially since I could no longer rely on the familiar references and experiences that had guided my previous academic projects. Working within the unfamiliar context of the Global South required me to shift my perspective, confront assumptions, and approach architecture through a different cultural and environmental lens.

This change was challenging but hopefully ultimately rewarding. It expanded my thinking, deepened my sense of responsibility as a designer, and fundamentally changed how I see the role of architecture in diverse global contexts. The lessons I've learned extend beyond this project and will continue to inform both my professional development and how I engage with the built environment in the future.



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