



## Inclusive waters

Investigating the Catalyst Role of Urban Ponds  
in Mitigating Housing Challenges Amidst Rapid  
Urbanization in Sylhet

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Architecture in Transition in the Bangladesh Delta







# **Inclusive waters**

Investigating the Catalyst Role of Urban  
Ponds in Mitigating Housing Challenges  
Amidst Rapid Urbanization in Sylhet





# Contents

## Chapter 1 - Problem statement

|                                       |    |
|---------------------------------------|----|
| 1.1 Rapid urbanization in Bangladesh  | 9  |
| 1.2 Research question and methodology | 14 |
| 1.3 Relevance                         | 18 |

## Chapter 2 - Research

|                               |    |
|-------------------------------|----|
| 2.1 Fieldwork                 | 23 |
| 2.2 Ethnographical research   | 53 |
| 2.3 Architectural research    | 65 |
| 2.4 Managerial research       | 81 |
| 2.5 Water management research | 85 |

## Chapter 3 - Design

|                         |     |
|-------------------------|-----|
| 3.1 Design goals        | 95  |
| 3.2 Site analysis       | 97  |
| 3.3 Urban strategy      | 105 |
| 3.4 Managerial strategy | 123 |
| 3.5 Cluster strategy    | 125 |
| 3.6 Unit strategy       | 139 |

## Chapter 4 - Building Technology

|                       |     |
|-----------------------|-----|
| 4.1 Material research | 155 |
| 4.2 Facade design     | 169 |
| 4.3 Watermanagement   | 175 |

## Chapter 5 - Reflection

180

## Bibliography

191



# 1

## Problem statement





# 1.1

## Rapid urbanization in Bangladesh

### Problem statement

Urban areas in developing nations are rapidly growing, often at a rate exceeding the overall population growth, and this trend is intensified by waves of distress-driven migration from rural regions as they are unable to support their growing populations due to inadequate farmland (Correa, 1989).

With a population density of 1265 people per square kilometer and a total population approaching 170 million, Bangladesh is among the most densely populated lower middle-income countries (Hayes et al, 2015). The proportion of individuals residing in urban areas surged from 5.1% in 1974 to 32.8% in 2013, and projections suggest that by 2040, over half of the population will be living in urban areas (World Development Indicators, 2019). The country's rapid urbanization is characterized by inadequate housing and a critical deficiency in infrastructure, water supply, and sanitation systems (Hayes et al, 2015).

According to Rana and Ilina (2021), the future of urban development and planning is crucial in addressing climate migration in Bangladesh for three key reasons. Firstly, because of its flat land, dense population, poverty, and lack of proper environmental management, Bangladesh is at high risk of natural disasters like floods, cyclones, storms, saltwater intrusion, hailstorms, droughts, and landslides. The impact of

natural disasters on migration is notable. Bangladesh experiences frequent natural disasters, resulting in hundreds of thousands of climate migrants annually (Priovashini & Mallick, 2022). Climate change is expected to make these disasters even worse, which forces more climate induced migrants to leave their land and move to another place. Looking ahead, projections indicate that by 2050, over 35 million individuals residing in the coastal regions of Bangladesh, spanning 19 coastal districts and areas along major riverbanks such as Padma, Meghna, and Jamuna, will face compelled migration due to their pronounced susceptibility to disasters (IDMC, 2022).

In light of these challenges, Anik and Khan (2012) also emphasize the critical need for proactive measures, since their study in the low lying areas of North Eastern Bangladesh revealed that the majority of the people (41.67%) had no clear idea about climate change and their effects on the urban environment. Bangladesh's vulnerability, attributed to factors such as low elevation, high population density, poverty, and strong reliance on the natural environment, necessitates the development and implementation of robust adaptation policies. These policies should incorporate indigenous knowledge and resilience strategies to navigate the complex terrain of climate change.

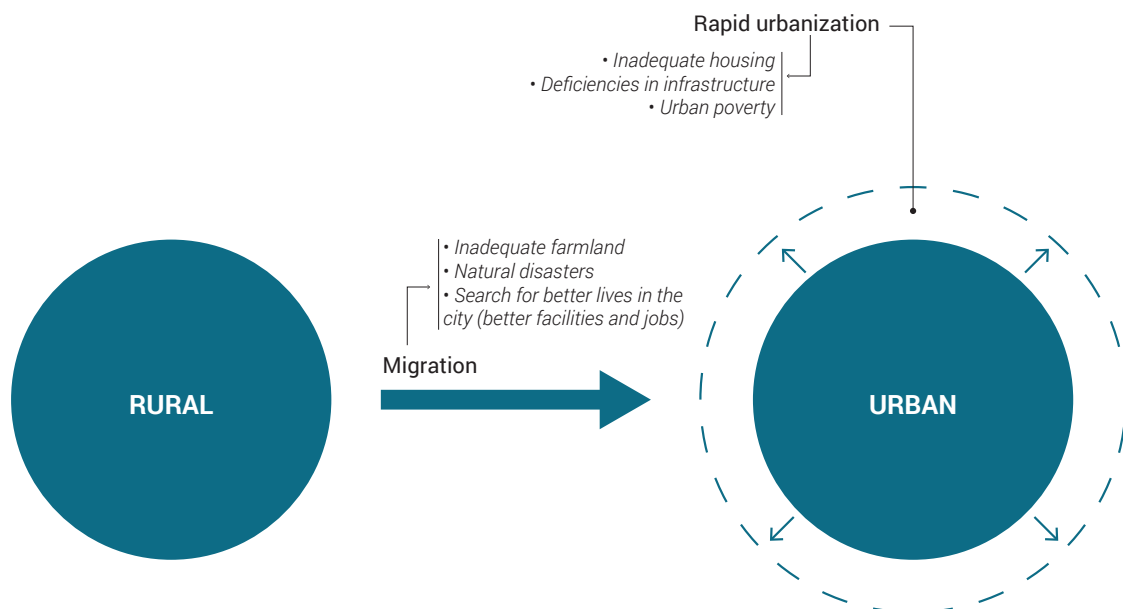


Fig. 1: Rural to urban migration

Source: Own infographic

Secondly, cities are hubs of economic growth and opportunities. As more people move from rural areas to cities in search of better lives, urban poverty increases. Additionally, climate-vulnerable villages push more migrants into cities, putting extra pressure on resources and making urban poverty worse (Rana & Ilina, 2021). The government of Bangladesh has been unable to fulfill its primary duty of ensuring the welfare and basic rights of its citizens. Rural inhabitants lack the same rights and amenities as their urban counterparts, driving rural residents to migrate to urban areas in pursuit of better facilities and job opportunities (Ahmed & Islam, 2014).

Thirdly, urban authorities in Bangladesh find it challenging to offer sufficient assistance, such as housing and environmental services, to climate migrants who turn to cities as their

final refuge. This deficiency leads to the expansion of slum areas in urban areas and the rise of an informal economy, which significantly burdens urban governance and available resources (Rana & Ilina, 2021).

The effects of urbanization in Bangladesh also effects Sylhet city in specific, as this is one of the most prominent cities in Bangladesh (Das & Das, 2022). Sylhet, situated in the northeastern part of Bangladesh, is a swiftly growing urban center and ranks among the largest business hubs in the nation. The Sylhet City Corporation was founded in 2001, covering an area of 26.50 square kilometers and hosting a population of nearly 3 million. (Population & Housing Census, 2011).

The city is expanding at an unprecedented rate which causes the raise of pressure

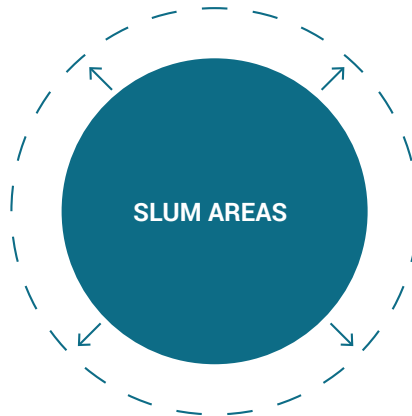


Fig. 2: Expansion of slum areas  
Source: Own infographic

on building density. The effects are threatening the lives of city dwellers, particularly urban poorest dwellers, who receive only basic shelter without considerations for landscape elements. Sylhet city residents grapple with significant environmental issues such as the improper disposal of waste in nearby drains and low-lying areas, the discharge of wastewater into open roadside drains, the prevalence of pit latrines in low-income neighborhoods, annual flooding, noise pollution, and the keeping of livestock and poultry (Ahmed & Islam, 2014). Social crimes like ransacking, robbery, and toll evasion are also prevalent in the city due to unplanned urbanization.

In the low income settlements, many areas lack community garbage containers, and municipal waste disposal is not effectively managed. Additionally, the high population density, along with

the use of wooden-bamboo housing structures and inadequate electrical wiring, increases the risk of fire hazards. Moreover, housing in the urban poor settlements has not adequate public space for recreational activities and walking, which is essential for a healthy public environment (Arefin, 2021).

According to Cornea et al (2016), urban ponds play a diverse and pivotal role in the urban areas of Bangladesh. These ponds are not just sources of water; they also provide urban land and communal spaces. They serve as cultural and small-scale aquaculture sites for the middle class and are essential for daily tasks, livelihoods, and social interactions for the less privileged (Cornea et al, 2016). However, the relentless expansion of urban areas, coupled with limited available space, has placed these urban ponds in jeopardy. Nowadays, they are

at risk of being filled in to make way for new housing developments (Das & Das, 2022).

As stated by Suchana et al (2012), Dhaka has undergone a substantial transformation in the last four centuries. It has transitioned from its historical identity as the 'Venice of the East,' characterized by numerous water channels, to its current status as a 'City of Concrete.' This urban evolution has had a profound impact on Dhaka, notably diminishing its ability to withstand floods and its overall quality of life. Given that Sylhet is also susceptible to the impacts of climate change, including increased flood risk, it becomes imperative to restore and protect urban ponds. This action is crucial to prevent Sylhet from facing a similar fate of becoming a 'City of Concrete' like Dhaka.

Public spaces are essential for building community, connecting diverse individuals, and promoting shared identity, which enhances social cohesion and residents' well-being (Francis et al., 2012). Additionally, Sepe (2017) highlights that well-designed public spaces contribute to urban happiness and sustainable development, emphasizing the importance of urban planning that prioritizes public spaces to enhance the overall quality of life in cities. According to non-formal research conducted by ECDO, around 30 diverse indigenous communities reside in the Sylhet region. The Manipuri and Khasi communities stand out as the most populous, with each group having unique linguistic and cultural traditions (Pal et al, 2017). The

selected site is situated around an urban pond, featuring a diverse environment. Various communities inhabit the area, such as the Muslim group residing in informal settlements and the Hindu population. Additionally, there is a notable diversity in building structures, ranging from single-story residences to newly constructed 4 to 5-story buildings established within the past 2-5 years. The site is distinguished by its diverse characteristics, making it a compelling location to promote inclusivity and adapt to the varied surroundings.

Since rapid urbanization is threatening the urban lives of residents in the city due to the raising pressure on the building density, the lack of attention to public space in Sylhet is a growing concern, which causes increased segregation. Given the abundance of urban ponds in Sylhet that serve as communal spaces for residents, there is potential for these environments to offer solutions for designing a more inclusive urban setting. This research aims to investigate the qualities of the urban ponds as a catalyst for an inclusive urban environment, and what lessons can be learned to design a new inclusive housing project, including adequate public space.



Fig. 3: Woman doing the dishes at Laladighir Pond, Sylhet  
*Source: Own photograph*



# 1.2

## Research

The question and methodology

The urgent concern of rapid urbanization in Sylhet and thereby the increasing pressure on housing, combined with the environmental consequences in the future due to climate change, prompts the question:

***What lessons can be learned from the urban ponds in Sylhet, serving as a catalyst for inclusivity, to address the inadequacies in housing and increased segregation due to rapid urbanization in a growing second-tier city like Sylhet?***

To tackle this research question, it has been sub divided into two main aspects; the social aspect and the environmental aspect.

The social aspect delves into the various demographic groups present at the chosen design site, exploring the current activities and uses surrounding the urban ponds and their impact on fostering or impeding social cohesion among residents. This raises the following sub questions regarding the social aspects:

*How do the current uses and activities around urban ponds contribute to or hinder social cohesion among residents with diverse demographic backgrounds in Sylhet?*

*What valuable lessons can be learned from case studies on urban pondscapes,*

*including those in West Bengal and Chongqing, regarding the significance of urban ponds in fostering inclusivity among diverse communities?*

The environmental aspect explores the ramifications of climate change on the future environment and its impact on Sylhet. It is crucial to examine whether urban ponds mitigate the effects of climate change and why preserving them is essential for environmental sustainability. Therefore the subsequent sub-questions related to the environmental aspects are formulated as follows:

*How does the presence of urban ponds in Sylhet contribute to the environmental sustainability and resilience of the urban ecosystem?*

*How can lessons from case studies, such as 'the City of 1,000 Tanks' project in Chennai, with its focus on decentralized Nature-Based Solutions for water balance and resilience, inform the environmental aspects of preserving urban ponds in Sylhet to address climate change impacts and potential flood risks?*

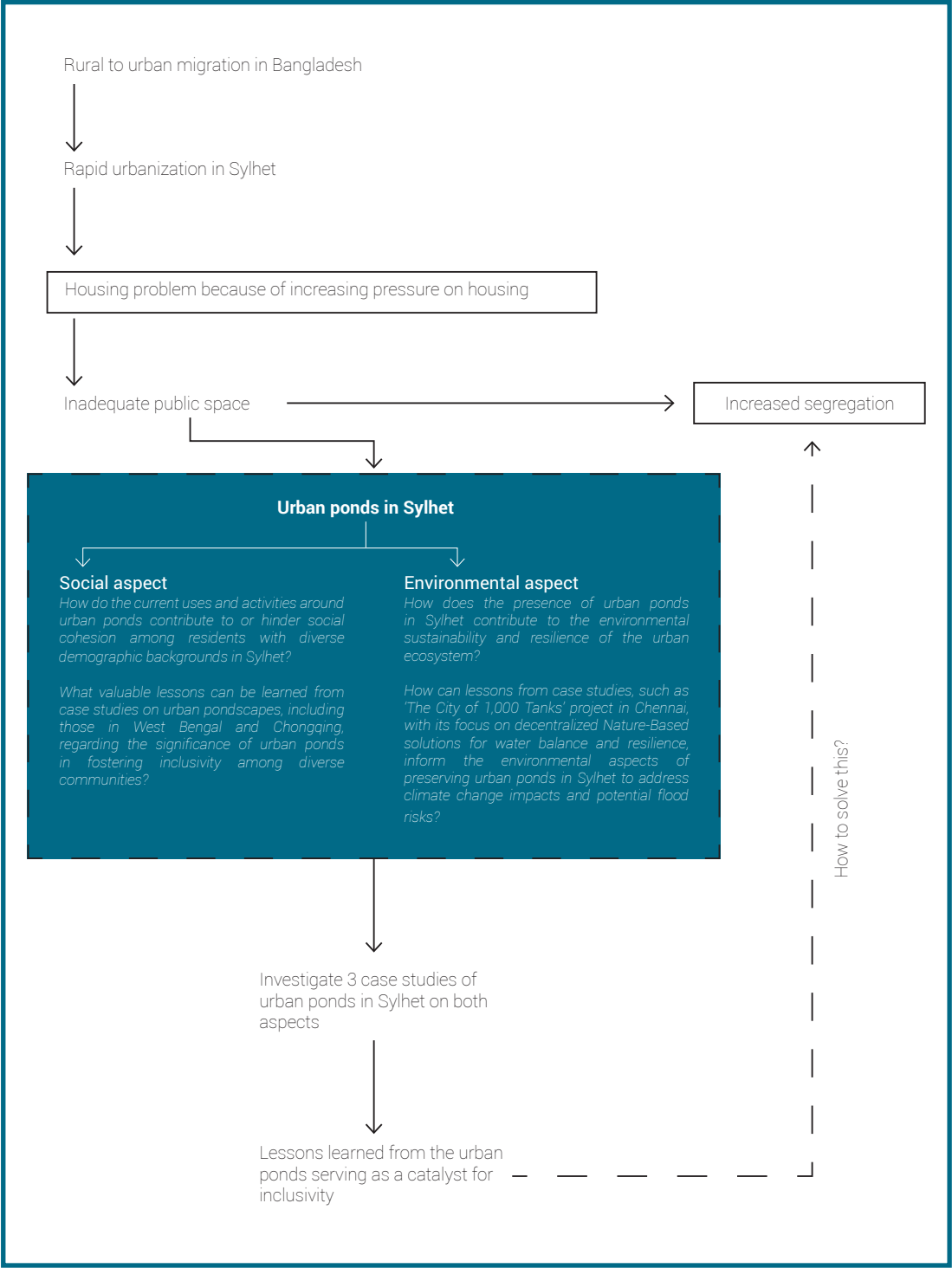


Fig. 4: Research diagram  
Source: Own work

This research employs a combination of qualitative and quantitative research methods to comprehensively address the issue of urban pond preservation and revitalization in Sylhet, Bangladesh, within the context of rapid urbanization and climate change.

### **Literature review**

A thorough literature encompasses an extensive exploration of global and local academic discussions and research concerning urbanization, public spaces, and climate change. By critically reviewing existing scholarly works, this research gains a comprehensive understanding of the current state of urbanization, public space and climate change consequences on global and local level.

### **Case study analysis**

Incorporating a case study approach, this research conducts in-depth investigations of urban ponds in different locations, such as Chongqing and the small city of Bardhaman, but also in Sylhet, and project initiatives in cities facing the same challenges to create a water resilient city, such as Chennai in India. These case studies are instrumental in gaining practical insights into the urban qualities but also the challenges of designing within an environment facing pressing environmental issues, including the heightened risk of annual flooding due to climate change. The case studies offer valuable empirical data and real-world examples of architectural interventions, both within the specific context of Sylhet and globally.

### **Field research**

Field research constitutes a critical aspect of this methodology, contributing unique and context-specific knowledge that cannot be derived from literature alone. This approach involves a multi-faceted strategy, including:

### **Ethnographical Observation**

By immersing in the research area, ethnographical observations are conducted to understand the social and cultural practices of residents within the chosen site. This immersive approach allows for a more profound comprehension of how urban ponds are embedded in the daily lives and rituals of the local community.

### **Interviews**

Interviews with local residents and the councilor within the chosen site are conducted to gather first-hand insights into daily life activities and the community's perspective on the built environment. These interviews serve as valuable sources of qualitative data and provide a genuine representation of the aspirations of the local community.

### **Context analysis**

Physical exploration has been done by on-site investigations, which includes walking, documenting, and making visual records such as photographs, videos and sketches. This method offers a tangible understanding of the immediate environment of the chosen site.



Fig. 5: Interview with the councilor in Sylhet  
*Source: Own photograph*

# 1.3

## Relevance

Local and global importance

Beyond its local importance, the research carries global relevance in the face of widespread urbanization and climate change challenges. The issues faced by Sylhet are emblematic of the struggles many urban areas encounter worldwide. Rapid urbanization and climate change are universal phenomena that demand innovative and sustainable solutions. The neglect of adequate public space, a common consequence of rapid urban expansion, is a shared concern among cities globally.

Rapid urbanization is a global phenomenon, and it poses one of the most significant challenges of the 21st century. According to the United Nations estimates, the proportion of the world's population residing in urban areas increased from about 20% in 1910 to 51.7 %in2010, with a projected further increase to 68.4% by 2050 (UNDESA, 2019). The majority of this urbanization is occurring in the Global South. Looking ahead, the global urban population is anticipated to grow by approximately 793 million people from 2015 to 2025, with an overwhelming 93.9% of this increase concentrated in the Global South (UNDESA, 2019). This rapid urbanization underscores the urgent need for comprehensive strategies to address the associated challenges and foster sustainable development (Smit, 2021). As urban areas grow and populations increase, the pressure on

urban resources, public spaces, and community well-being intensifies.

Furthermore, the escalating concern of climate change is evident as the world witnesses more frequent extreme climatic events, including storms, flooding, and extreme temperatures. The global South, with its low-lying geography, high population density, limited resource access, lack of preparedness, and insufficient infrastructure for coping strategies, faces heightened vulnerability to climate change impacts (Roy, 2018).

Additionally, with the rising threat of floods attributed to climate change, the conservation of urban water bodies becomes imperative to withstand such floods. Therefore, the neglect of urban ponds due to rapid urbanization is a growing concern not only in Sylhet, but in many urban areas across the globe, such as Chennai in India. As urbanization intensifies, cities worldwide are confronted with the complexities of safeguarding vital public spaces, fostering community well-being, and fortifying resilience to climate impacts.

The challenges faced by Sylhet are not isolated; they mirror the difficulties cities worldwide encounter. Therefore, the findings and solutions derived from this research can serve as a blueprint for other urban areas confronting similar issues,



fostering a global dialogue on sustainable urban development, climate resilience, and the importance of preserving communal spaces within cities.



Fig. 6: Global Trends of Urbanization  
*Source: Morphocode, n.d.)*



# 2

## Research



Group photo at National Parliament House of Bangladesh

*Source: Student's photograph*

# 2.1

## Field work

Main findings of the field trip

As part of the Global Housing studio, we embarked on a field trip to Bangladesh to observe the challenges of rapid urbanization faced by the Global South. We visited the busy capital, Dhaka, and the growing second-tier city, Sylhet. Over the course of one week, we explored a variety of environments, ranging from dense urban areas to nearby wetlands. Each area presented unique characteristics and challenges. In the wetlands, the primary issue is flooding during the monsoon seasons due to rising water levels, whereas in the urban areas, the high demand for housing and increasing densification result in inadequate housing, especially for the urban poor.

As students, we were asked to choose one of these environments to develop our own research topic and design challenge. I chose to focus on the urban area of Sylhet, specifically an urban site adjacent to an urban pond, which a common waterbody in Bangladesh. This site includes an informal settlement, providing an opportunity to explore design principles that can integrate this urban poor community while offering them adequate housing and public space.

During the trip to Bangladesh, I took photographs and observed the architecture and daily life in the urban areas. At the specific design location, I conducted an interview with the local councilor with

other students who chose this location, which provided valuable insights.

In this chapter, photographs taken during the field trip are carefully collected and presented to show the daily life in the urban areas in Bangladesh, both in Dhaka and Sylhet.





Women in a slum in Dhaka  
*Source: Own photograph*





Living conditions in the slum in Dhaka  
*Source: Own photograph*



Women in the slum in Dhaka  
*Source: Own photograph*





Women standing in doorstep of living  
*Source: Own photograph*



Vegetable selling on the streets in Old Dhaka  
*Source: Own photograph*





Chicken selling on the streets in Old Dhaka  
*Source: Own photograph*





Street conditions in Old Dhaka  
*Source: Own photograph*



Ginger selling on the streets in Old Dhaka  
*Source: Own photograph*





Open sewage in Old Dhaka  
*Source: Own photograph*



Inadequate living space with minimum daylight entrance and no fire safety  
*Source: Own photograph*





Kean bridge, Sylhet  
*Source: Own photograph*



Street conditions at Kean bridge, Sylhet  
*Source: Own photograph*





Design plot in Laladighir Par, Sylhet  
*Source: Own photograph*



Laladighir Pond, Sylhet  
*Source: Own photograph*





School in Laladighir Par, Sylhet  
*Source: Own photograph*



Shop facilities around Laladighir pond  
*Source: Own photograph*



Trash collecting bicycle at Laladighir Pond, Sylhet  
*Source: Own photograph*





Entrance into Laladighir Pond, Sylhet  
*Source: Own photograph*





Woman doing the dishes in the Laladighir Pond, Sylhet  
*Source: Own photograph*



Street condition at Laladighir Pond, Sylhet  
*Source: Own photograph*



Housing in informal settlement in Laladighir Par, Sylhet  
Showing the water level marks during floodings in the monsoon season  
*Source: Own photograph*





Street in informal settlement in the informal settlement

No public space

*Source: Own photograph*



Inadequate daylight entrance in the informal settlement  
*Source: Own photograph*



Living conditions in the informal settlement  
*Source: Own photograph*





Mandapa of the Manipuri group  
*Source: Own photograph*



Mandapa of the Manipuri group  
*Source: Own photograph*



Street conditions in the Manipuri neighbourhood  
*Source: Own photograph*





Group photo at the cricket field next to the design plot

*Source: Own photograph*

*"Contemporary architecture should seek  
a greater understanding of local culture  
if it is to be sustainable"*

- Guy and Farmer (2002)

## 2.2

### Ethnographical Research

Major religion groups in Sylhet

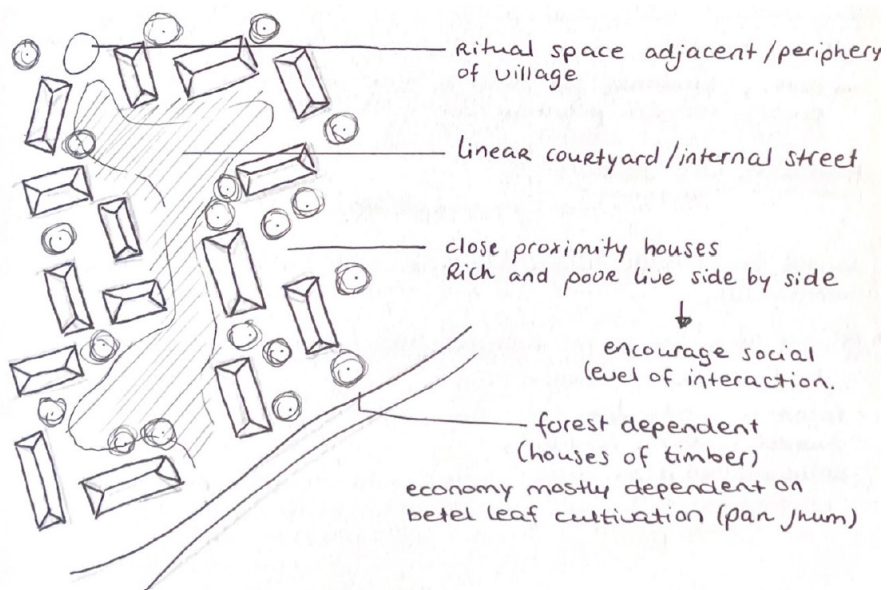
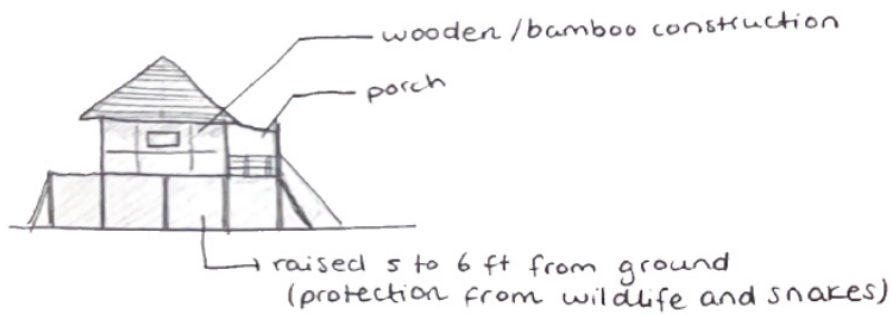
Bangladesh accommodates more than 54 tribal communities throughout the nation (Monzur and Jany, 2022). The location for the design assignment is Sylhet, which is a growing second-tier city in Bangladesh, and it is popularly known as the spiritual capital of Bangladesh (Saha et al, 2020). The city's urban fabric has been significantly shaped by two major religious influences: Hinduism and Islam. Sacred spaces are integral to the daily lives of ordinary people, adding profound significance to cities and communities (Sahe et al, 2020).

Given Sylhet's renowned cultural diversity, it's crucial to understand the distinct lifestyles of its various cultural groups. This understanding is essential for designing a meaningful housing project where different cultural communities can coexist harmoniously. Their need for sacred spaces must be respected to prevent disruptions to their way of life caused by rapid urbanization and thereby increased segregation in Sylhet's urban environment.

Therefore, research on ethnographic groups in Bangladesh has been conducted to compile a list of design considerations that must be addressed during the project's design phase to preserve the sacred identity of Sylhet. A

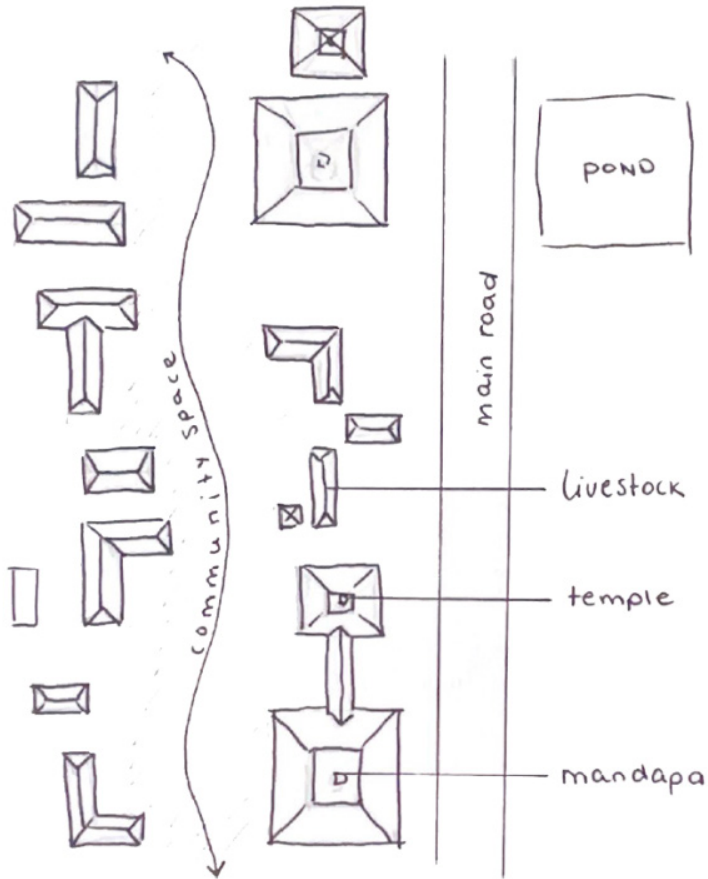
particular focus was on the Hindu and Muslim lifestyles, as those are the most common religious groups in the design area.





## **Khasi community**

The Khasi community is an indigenous group, living in the hilly area of Sylhet. Their house is mostly built out of a wooden or bamboo construction which is raised 5 to 6 feet from the ground for protection from wildlife and snakes (Islam et al, 2016). For the Khasi's, the kitchen is the most important place of the house, as it is used as a decision making space for the community. Because of the prevailing wind in the hills, only a window is placed in the kitchen area. The housing layout exhibits a linear arrangement, with residences of varying economic statuses situated in close proximity. This layout fosters social interactions across those different income groups.





## **Manipuri community**

The Manipuris represent one of the prominent ethnic groups in Bangladesh, having migrated from the Indian state of Manipur during the 17th century (Saha and Chowdhury, 2021).

The lifestyle of the Manipuri community in Bangladesh is characterized by a strong emphasis on their cultural traditions and practices. They typically engage in social activities, while also participating in cultural events and religious ceremonies that are integral to their identity. Additionally, their close-knit community structure fosters social cohesion and mutual support among its members (Saha and Chowdhury, 2021).

Based on research findings by doing literature review, the following list of lifestyle aspects has been compiled to serve as a design manifesto for the Manipuri group:

## DESIGN MANIFESTO

### Manipuri Community



Prefer to live near a source of natural water, or they dig community ponds (key element for ritual purposes)



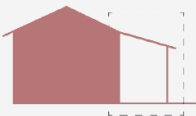
Prefer to live together in their territory, making small neighbourhood of 10-20 families



Semi-private space forms the transition space from private to public



Entrance on the east to pray and bow to morning sun



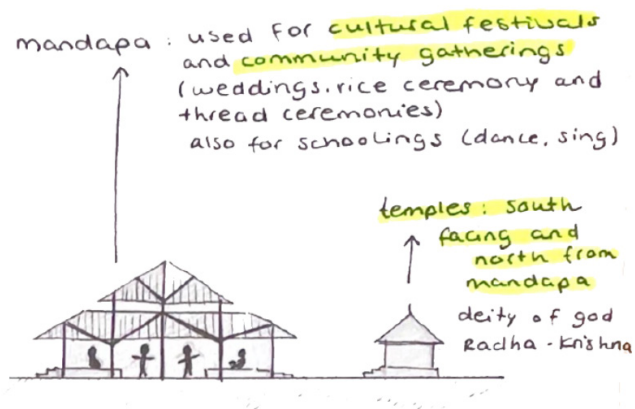
Verandahs for sun and rain barrier



Every community has a Mandapa and temple for cultural festivals and community gatherings

The Mandapa is considered as the most iconic element of the Manipuri Settlement. It serves as an element for social inclusion and gives unique cultural identity to the community (Saha and Chowdhury, 2021).

This research shows the importance of cultural spaces in an urban fabric in the setting of Sylhet. It is crucial that the design assignment will take into account this significance of religion. The design manifesto will serve as a guideline for design decisions in the design phase.



*"A house is the place in which an individual protects himself from the climatic impacts and in which he finds freedom from the restrictions and pressures of society"*

- Dr. Yousuf Al-Qaradawi (n.d)



## Muslim community

The Islam is together with the Manipuri and Kashi communities, one of the major religious streams in Sylhet.

Islam embraces a family-centric ethos, emphasizing close relationships among family members and the elderly as the wise pillars of the family unit (Al Surf, et al, 2013). Privacy is considered one of the main themes, as the house is a place for strengthening family relationships. Religion is also an important aspect of this culture, as the mosque should be the focal point in the urban area (Al-Mulla Hwaish, 2018). Islamic housing is distinguished by the courtyard design principle. The inward-facing courtyard reflects the desire to shield the internal aspects, such as the family and inner life, from external influences and intrusions.

Based on research findings by doing literature review, the following list of lifestyle aspects has been compiled to serve as a design manifesto for the Muslim group:

## DESIGN MANIFESTO

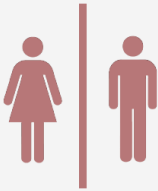
### Muslim Community



Mosque is focal point of neighbourhood, maximum walking distance from residential area is 250 meters



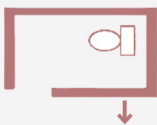
There is a clear separation between public and private life



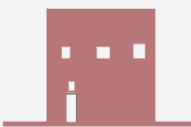
Within the house, there is a division between male and women area



Women have given equal opportunity to enjoy the natural views through Mashrabiya by maintaining their privacy



Alignment of toilet is not allowed to face the Qiblet while using it



Exterior of the house has a modest appearance

The inner courtyard serves as an iconic element for muslim housing, where family live is protected from the outer environment. It is characteristic for the importance of privacy of this culture.

This research shows the importance of privacy in both urban fabric and floorplanning. It is crucial that the design assignment will take into account this significance of religion. The design manifesto will serve as a guideline for design decisions in the design phase.

*"The room (the box) is only one element  
in a whole system of spaces which a  
family needs in order to live in a city"*

- Charles Correa (1999)



## 2.3

### Architectural Research

Architect's ideals and inspiring projects

One of the most inspiring architects who has influenced my work is Charles Correa. Through multiple books and articles, such as "A Place in the Sun" (1983), "The New Landscape" (1985), and "Housing and Urbanization" (1995), I have explored his ideas on rapid urbanization in the Global South.

A defining feature of Correa's projects is the open-to-sky space, which allows natural daylight and ventilation into buildings. He observed that religious ceremonies in Asia often emphasize movement through open-to-sky spaces, so why not incorporate this concept into housing design?

Today, building complexes are often box-like structures stacked without consideration for the hierarchical importance of different spaces. Correa argues that a dwelling is only a part of a larger system, and a room without its

associated spaces is not sustainable. He notes that the poor are often forced to live in environments that do not meet their needs, which is both inhuman and uneconomic. Correa advocates for low-rise, high-density configurations that make extensive use of terraces and courtyards, providing the communal spaces necessary in the hierarchy of spaces (Fig. 7).

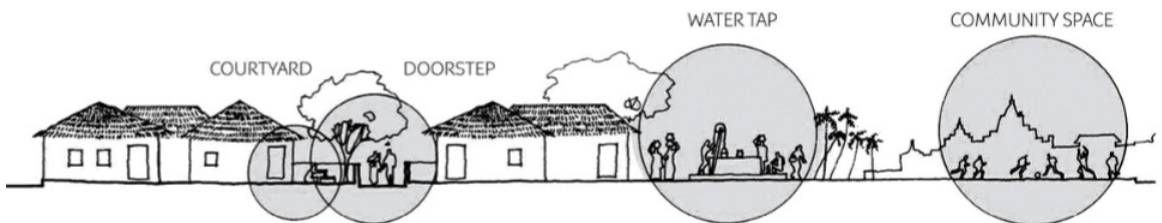


Fig. 7: Hierarchy of spaces  
Source: Charles Correa (1995)

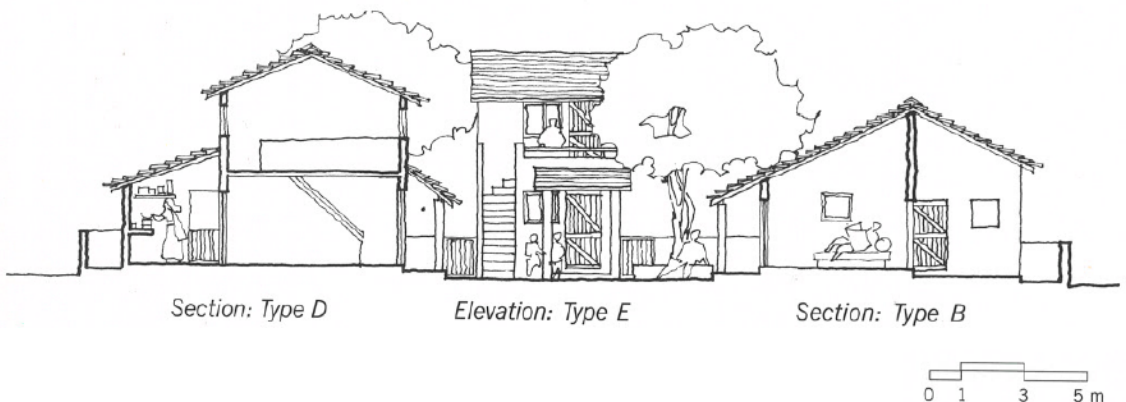
## Belapur Housing

Year: 1983-1986  
Architect: Charles Correa  
Location: New Bombay



This project serves as a demonstration how high population densities can be attained within the framework of low-rise architectural design. It also adds the issue of Urban Equity. The houses are incremental, which means that a low-income house (single lean-to roof) can grow to urban town-houses. Each house has its own piece of land and is freestanding, which makes it truly incremental.

The layout of the site is organized according to a system of community spaces with varying levels of importance.





*Basic unit*

Shared courtyard of 8m x 8m  
7 houses around courtyard



*Cluster*

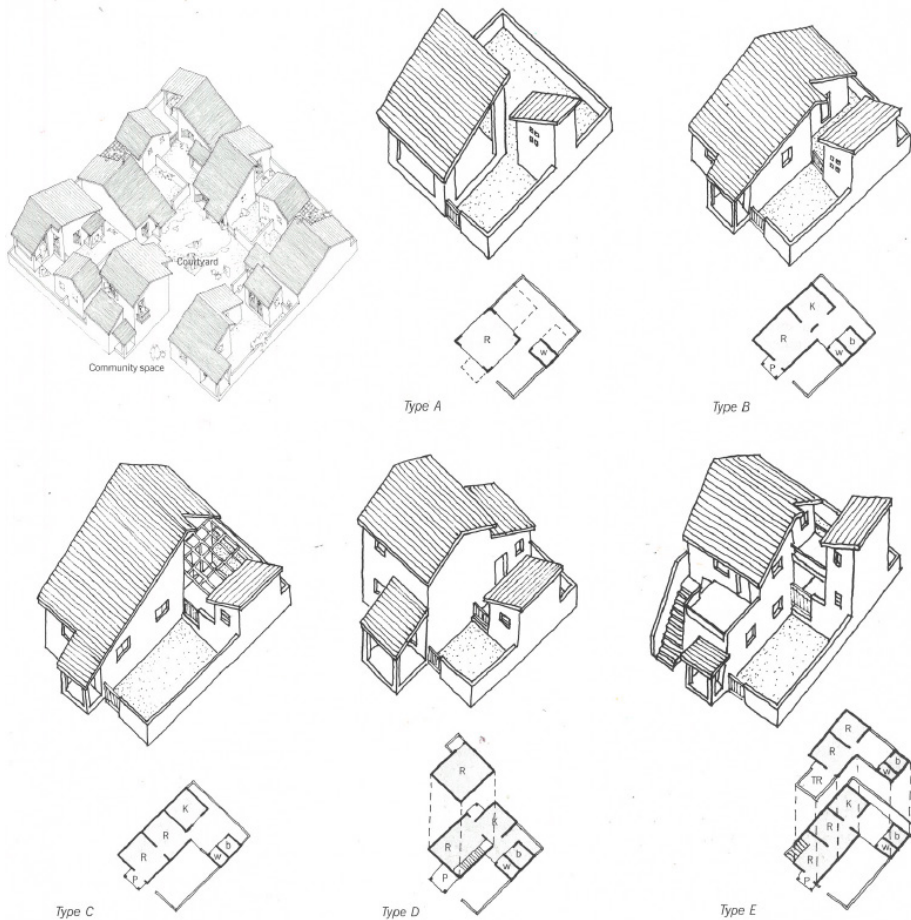
Three such basic units are grouped in a cluster  
of 25 houses (adding 4 houses at the open  
corners)



*Community space*

Cluster is repeated to form larger community  
spaces



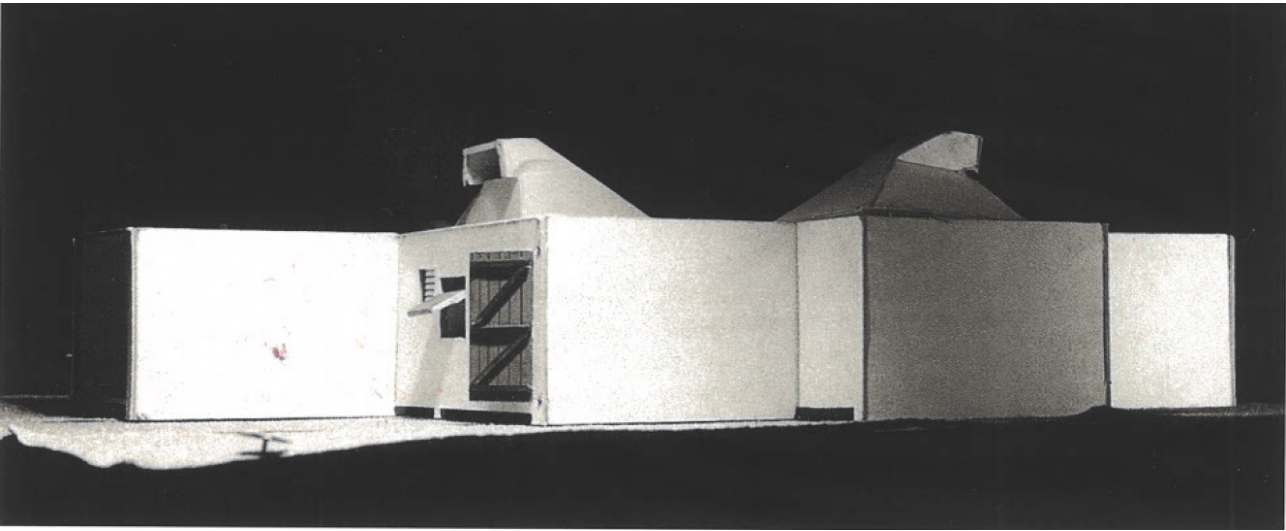


The designs of the homes are kept simple, allowing them to be constructed and expanded by traditional masons and artisans. By doing so, job opportunities are created within the Bazaar Sector of the urban economy.

Over time, families will incorporate their own color schemes and symbols, thereby colonising the habitat with their unique values and cultural identity.

## GHB-2

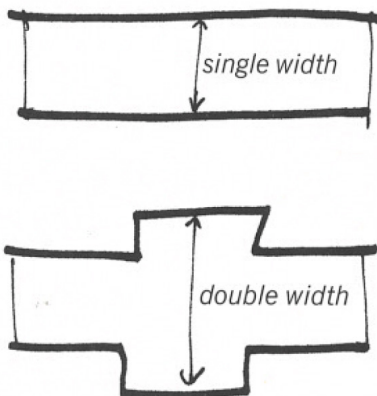
Year: 1961  
Architect: Charles Correa  
Location: Ahmedabad



This project by Charles Correa is a development of the Tube House, known for its linear layout. To vary the narrowness of this typology, Correa experimented with doubling its width in a portion of the plan. This adjustment creates a compact internal courtyard within one bay, enhancing the adaptability of the living spaces. The 'cannons' on the other bay creates convection currents.

Because of the cruciform plan, it enables the layout of the units to be easily adjusted to fit the site's boundaries seamlessly.

The cruciform plan has the advantage of making a flexible interlock, so that the layout of the units on the site can be easily adjusted to follow the site boundaries.



## Mhada

Year: 1999  
Architect: Charles Correa  
Location: Bombay

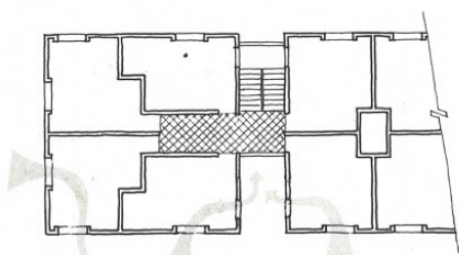




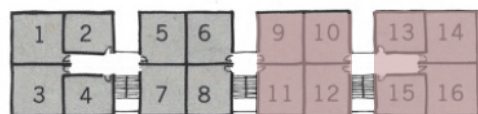
This project shows an example of high density housing in the heart of Bombay. The accommodation serves as transit camps for old buildings under repair so it is only transitory. Therefore the area per family is 20.9 m<sup>2</sup>, including a room, cooking area and a bathroom.

Since elevators are expensive for these small rooms, and an access corridor would interrupt privacy and cross-ventilation, the architect came up with a different design solution regarding the circulation.

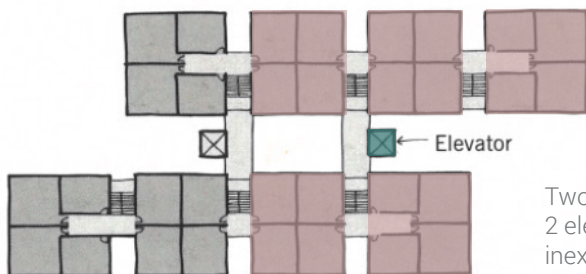
This project has a strong focus on cross-ventilation, since it is designed in a hot and humid climate.



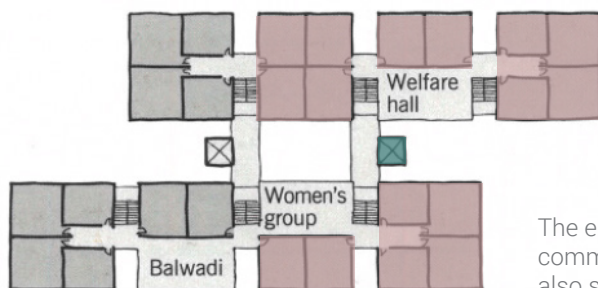
The units are grouped in sets of four, ensuring that each unit functions as a corner unit to facilitate cross-ventilation.



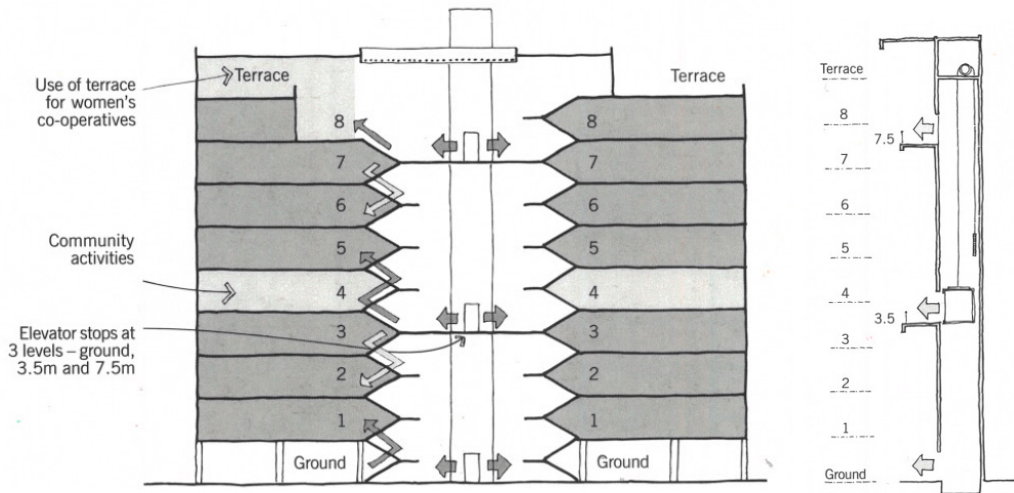
Three staircases provide access to 16 units per floor in each sequence.



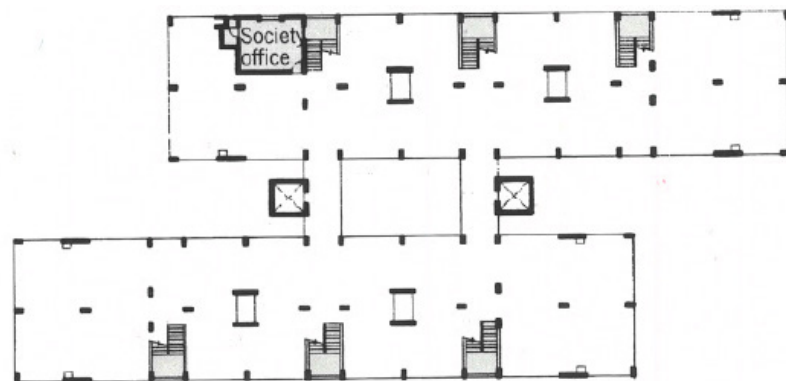
Two facing sequences can be connected to 2 elevators. With this pattern, it is relatively inexpensive and highly efficient.



The elevator stops at level 3.5 and 7.5, where community activities are located. These floors also serve to connect all six sets of staircases.



The buildings are 8 stories high. With elevators stopping only at three levels (ground, at 3.5, and at 7.5), waiting times at each stop are significantly reduced, and installation costs are also minimized.



*Ground floor*

## Udaan

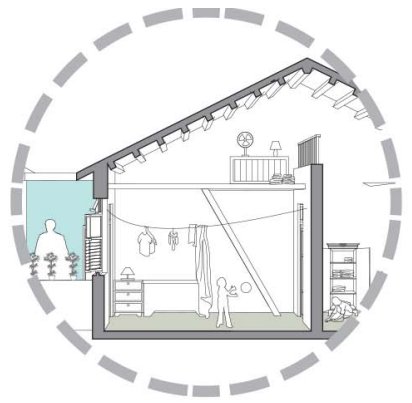
Year: Unbuilt  
Architect: Sameep Padora  
Location: Karjat, Maharashtra



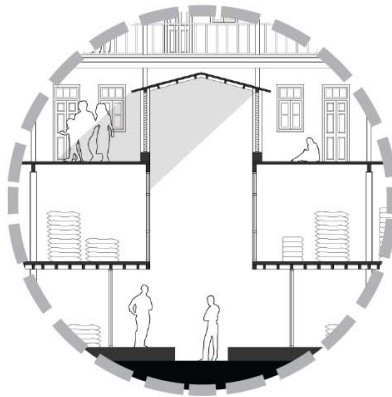


This project features staggered corridors that enhance cross-ventilation within the building. The narrow open spaces between buildings benefit from natural daylight and ventilation, while accommodating facilities that foster a rich and vibrant social fabric in the continuous void space. These design elements create visual connections among residents on different floors, promoting interaction and community cohesion.

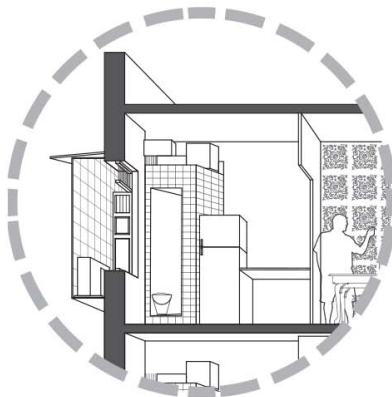




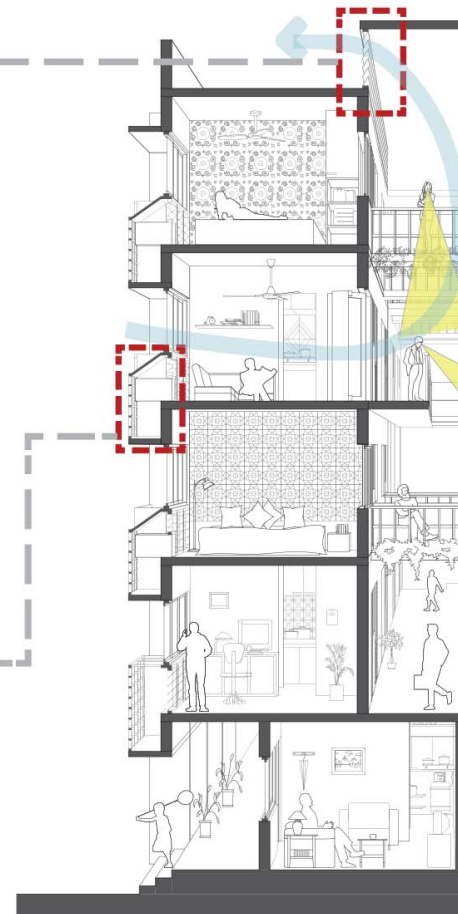
6. ADDED MEZZANINE SPACES ARE SEEN IN MOST TIGHT HOMES ADDED AS THE NEED FOR EXPANSION PERSISTS. THE SLOPING ROOF IS INTENTIONALLY PROVIDED TO CARRY SOLAR CELLS AS WELL AS TO ALLOW FOR MORE HEIGHT FOR A MEZZANINE IF AND WHEN NEEDED.



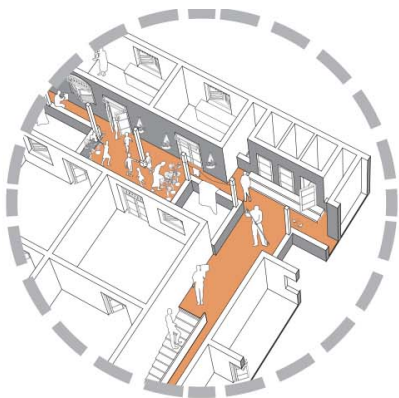
1. VENTURI EFFECT VENTILATION SYSTEM ALSO EMPLOYED IN CHAWLS, ALLOWS FOR HOT AIR RISING THROUGH OUR VERTICALLY STAGGERED CORRIDOR SPACE TO ESCAPE OUT FROM LOUVERS IN THE ROOF.



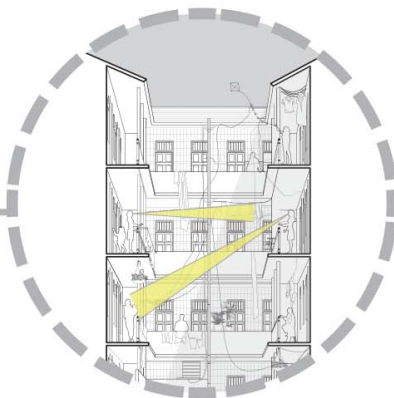
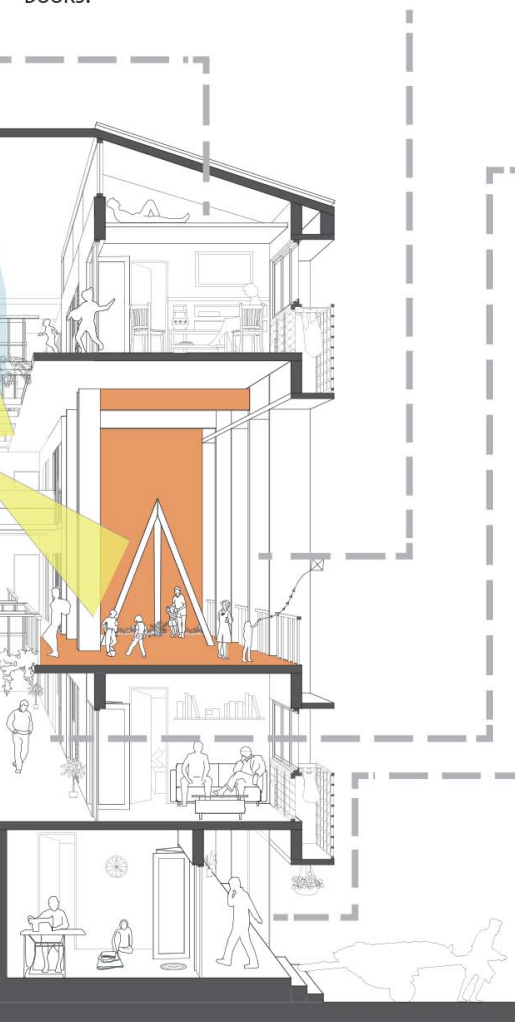
2. INGENIOUS DETAILS OF STORAGE AND FLEXIBLE FURNITURE SYSTEMS AS EVIDENT IN MOST TIGHT LIVING SPACES.



SECTIONAL PERSPECTIVE



5. AS SEEN IN CHAWLS IN MUMBAI, THE CORRIDORS ARE NOT ONLY POTENTIAL SOCIAL SPACES BUT ALSO AN EXTENSION OF THE INTERIOR SPACE OF THE HOME, BLURRING THE BINARIES OF PUBLIC AND PRIVATE. WE ACHIEVE THIS BY MAKING THE ENTIRE WALL TOWARDS THE CORRIDOR AS COLLAPSIBLE SLIDING FOLDING DOORS.



3. REFERENCING THE CHAWL COURTYARD AND THE ABILITY OF ITS PROPORTIONS AND ARCHITECTURE TO CREATE A RICH AND VIBRANT SOCIAL FABRIC, OUR CORRIDORS STAGGER IN SECTION CREATING A CONTINUOUS VOID SPACE. THIS ALLOWS FOR VISUAL CONNECTIONS BETWEEN RESIDENTS OF DIFFERENT FLOORS.



4. VARIABLE USAGE OF LIVE/WORK UNITS AS SEEN IN MOST HOUSING TYPOLOGIES IS FACILITATED BY VERANDAH EMBEDDED GROUND FLOOR UNITS THAT ALLOW FOR LIVELIHOOD GENERATING PROGRAMS IF NEEDED.

*“By 2030, ensure access for all to  
adequate, safe and affordable housing  
and basic services and upgrade slums”*

- Sustainable Development Goal 11.1  
Bangladesh



# 2.4

## Managerial Research

Housing policies of the urban poor

Due to the rapid population growth in urban areas of Bangladesh, the supply of housing is struggling to keep up with the surging demand. Housing policies face obstacles in improving conditions because of an inequitable social structure and ineffective public policies. Over 90% of urban housing units in Bangladesh are provided by the private sector, while the remaining portion is supplied by various government, semi-government, or autonomous institutions (Islam, 1996). The exclusive focus on promoting private homeownership has resulted in the urban poorest residents living in low-quality housing (Smets et al, 2014).

### Slum clearance

In this strategy, slums are demolished and the residents are relocated to medium-rise blocks in alternative locations. This approach allows the government to unlock the development potential of well-located land parcels (Mukhija, 2003). However, it also leads to confrontations and political conflicts with the slum dwellers, who prefer to stay in their current locations. According to the influential critic John Turner (1963), slum dwellers would struggle to adapt to the “alien lifestyle” imposed by modern apartment blocks, as these housing typologies differ significantly from their current way of life.

### Slum upgrading

Another approach is the slum upgrading strategy, where the state grants slum dwellers legal titles to their properties, transforming squatters into legal owners. This alleviates their concerns about demolition, displacement, and relocation, making them more willing to invest in their homes and settlements (Mukhija, 2003). However, most slum dwellers have already consumed the allowing FAR on their lots, which means that they cannot even invest in their homes. In other words, tenure legalization as a slum upgrading strategy may not be effective for improvements in existing housing (Mukhija, 2003).

### Slum redevelopment

With the rise of the “enabling” strategy by the late eighties, international development agencies determined that advancing the housing sector required closer collaboration with market actors and a further reduction in state involvement (Mukhija, 2003). Slum dwellers were even more interested in this strategy than in the slum upgrading strategy. The enabling paradigm allowed participation of non-governmental organizations (NGOs) and the for-profit private sector in the management of projects. The state government revised land development regulations to enhance

encumbered areas by increasing the maximum permissible floor area for development. This adjustment enabled the construction of additional floor space that could be sold on the open market, making it more financially feasible to cross-subsidize housing for slum residents and thereby generating higher profits for developers (Mukhija, 2003). With NGOs permitted to participate in housing projects, they advocate strongly on behalf of both rural and urban poor populations to improve their living conditions. This is advantageous because the poor typically lack bargaining power and are often unorganized (Islam, 1996).

### **The Markandeya Cooperative Housing Society (MCHS)**

A case where slum redevelopment was the strategy, is the Markandeya Cooperative Housing Society (MCHS) in Mumbai. An NGO (SPARC) and a cooperative of slum dwellers have initiated this project in 1987. A private developer was invited to invest in their project and develop it as a Slum Redevelopment Scheme (SRD) project. The developer agreed, as he was expecting to build additional floorspace to sell the extra space in the free-market. The cooperative would be able to build larger housing at a lower cost, by keeping the project low-rise, which would be culturally and socially more suitable to the lifestyle of the low income slum dwellers of Markandeya.

*"...multi-storied buildings are not suitable for the average Dharavi dwellers who are fisherman, vegetable vendors and tannery workers who can't carry his or*

*her working equipment to upper floors... Such multistoried flats are middle-class concepts,"* (Independent, September 30, 1989).

During the designing of the units, SPARC had promised the MCHS new housing with a carpet area of 26 m<sup>2</sup>. Since this was not according to the guidelines which were only allowed for 17 m<sup>2</sup>, a new typology was introduced. It was a typology where the extra floor space was realized in a loft floor inside of the housing unit, which was possible because of the 4.3 meters high floors.

However, the redevelopment was a slow process, and SPARCS and the MCHS blamed the contractor. This resulted in the introduction of a new contractor during the process. In other words, the slum redevelopment strategy is an resource-intensive and time-consuming process. A lack of trust in the private sector developers might limit the interest of slum dwellers (Mukhija, 2003).

When considering a slum redevelopment strategy, several factors must be taken into account, including the project's scale and property values, as these factors influence the potential for cross-subsidization. Throughout the construction of the redevelopment project, certain private developers may offer compensation to slum dwellers for temporary housing. However, some residents perceive this offer as risky and prefer to remain at their original sites. Nonetheless, this may not always be feasible, particularly in densely populated and small cities. But in larger and less densely populated areas,

residents may be able to stay on-site while redevelopment starts on a portion of their land.

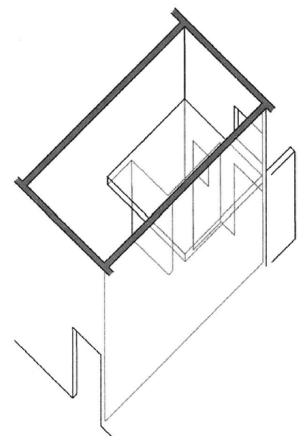
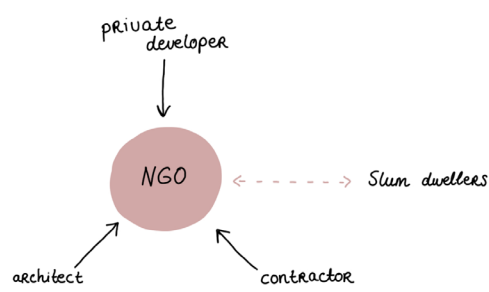


Fig. 8: Unit design, Markandeya CHS 1988  
Source: Mukhija (2003)

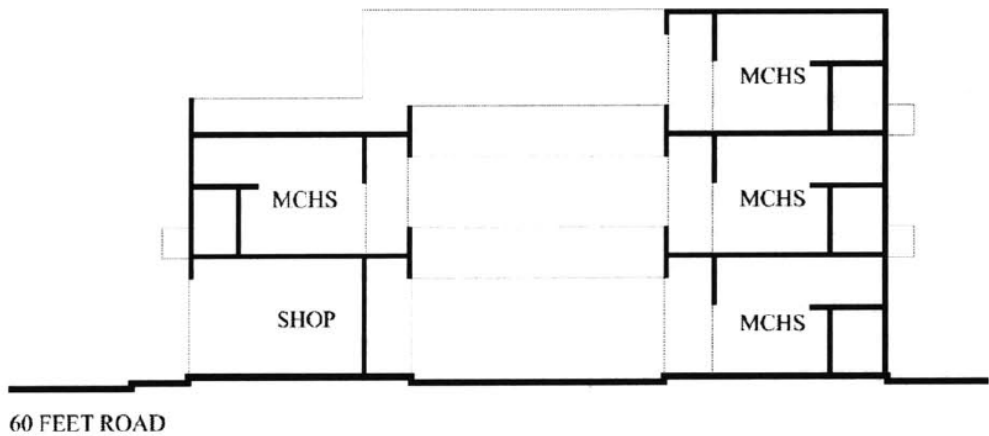


Fig. 9: Section, Markandeya CHS 1988  
Source: Mukhija (2003)

*"We have to be ahead of the game. We  
have to work pre-disaster. We have to  
look at the future, not the past"*

- Henk Ovink (2019)



# 2.5

## Water Management Research

Water as leverage in Asia

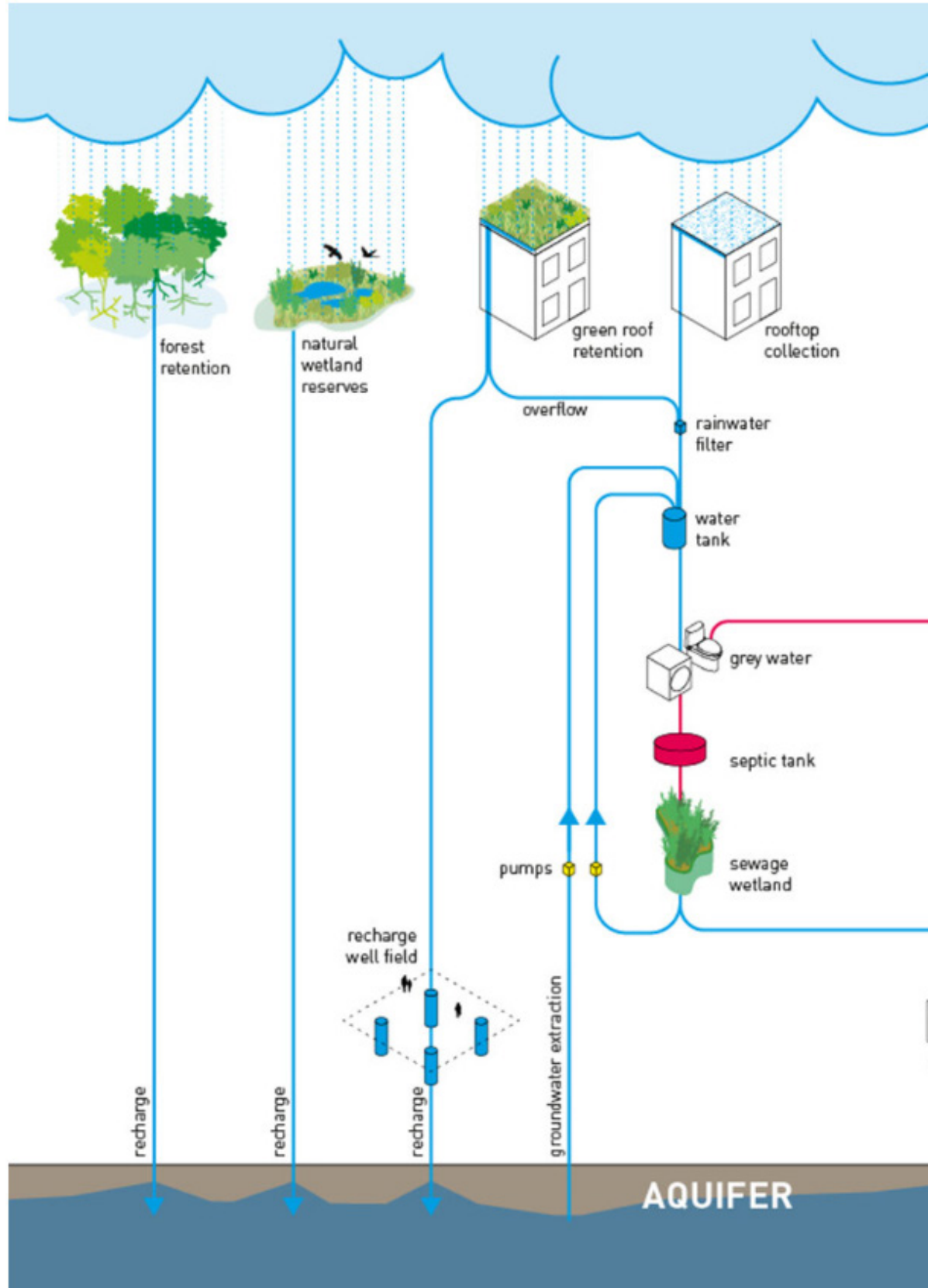
Water is becoming more a problem in the future due to climate change, as there are periods of floods but also extreme droughts. Bangladesh is at a high risk because of its flat land and high density of residents. Several initiatives have already been taken to develop innovative approaches to tackle the climate and water challenges in Asia. One of these is the City of 1,000 tanks initiative in Chennai that is led by Ooze Architects.

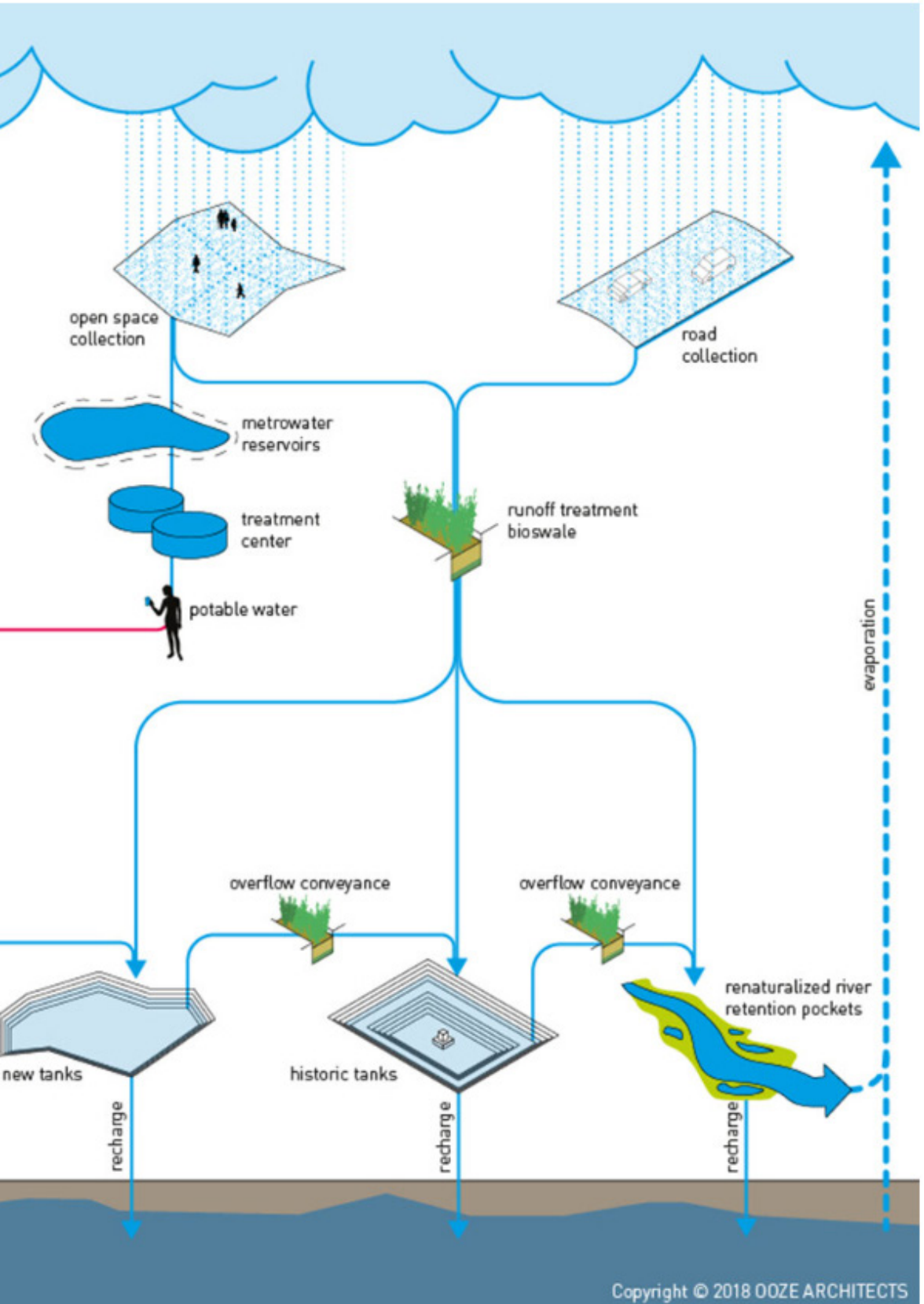
As wetlands and urban ponds are disappearing in Asia due to rapid urbanization, a significant amount of the surface water is contaminated to such extent that it is not drinkable. Urban ponds lost their function of irrigation, as people dump their waste in those waterbodies. Pollution of waterbodies is a huge threat when it comes to the periods of droughts and the groundwater is not good enough to use.

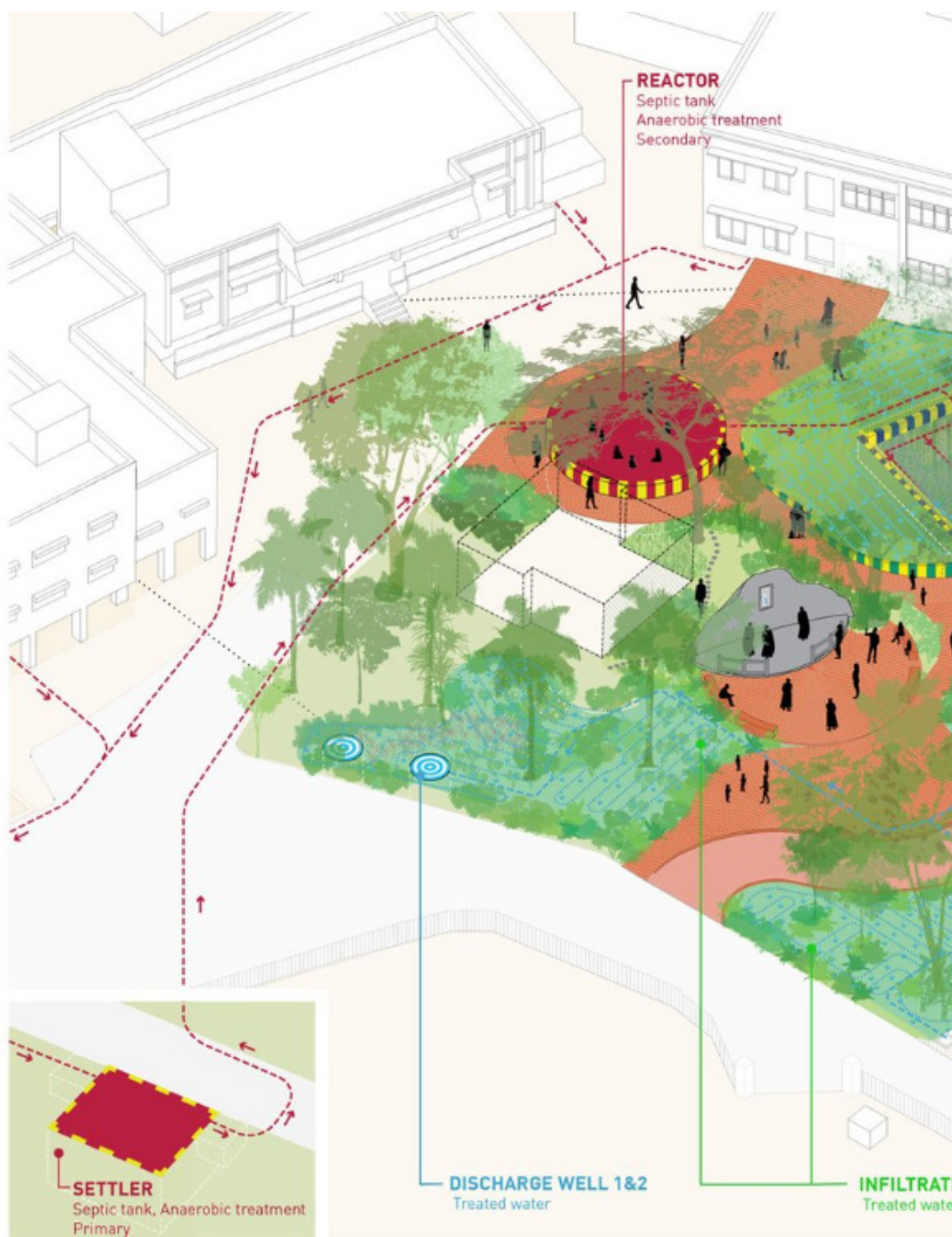
The City of 1,000 Tanks has developed a water balance pilot project at the Little Flower Convent School for the Blind and Deaf, experimenting with a water treatment system using septic tanks and constructed wetlands. This system collects and treats water, infiltrating the cleaned water into the soil to recharge the groundwater. This closed-loop system ensures clean groundwater is available during droughts.

This projects seems to reflect the kind of problems that Chennai is having on a much larger scale. So if the problem could be solved on a small scale, it can serve as a demonstration model to help scale up in other parts of the city as well on a larger scale.

By using this nature based solution to mitigate the impacts of climate change, the living quality would increase (City of 1000 Tanks, 2019). In my project, the urban pond is a significant public space and serve as a reservoir during the monsoon season. Unfortunately, urban ponds are in jeopardy of being filled up due to rapid urbanization, and waste is dumped into these waterbodies. By doing so, the urban pond has not its original functionalities and Sylhet is facing the consequences of it. When water is treated by implementing a nature based solution like the one proposed in the water balance pilot project in Chennai, the used water in the residential project can be treated and guided to the urban waterbody. It will also serve as an educational element as the majority of the residents (41.67%) had no clear idea about climate change and their effects on the urban environment (Anik and Khan, 2012).







Aerial view of the Water Balance Pilot © 2023 OOZE architects





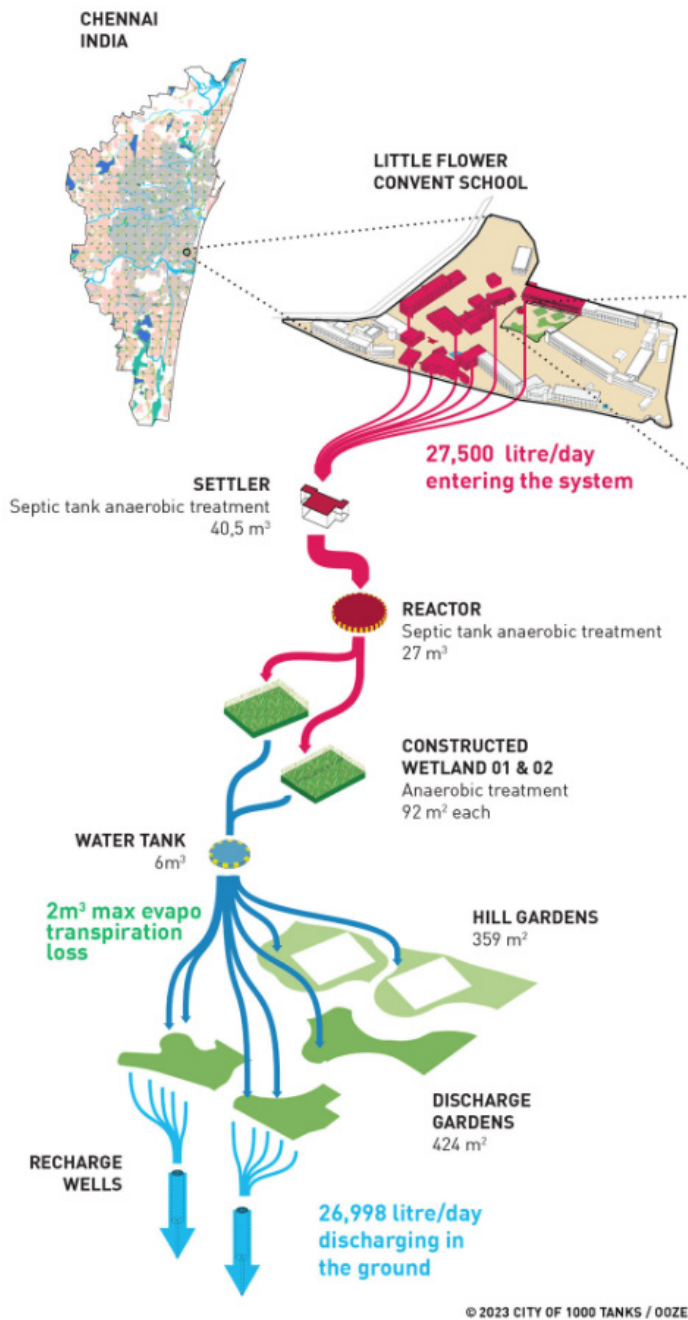


Fig. 10: Water Balance pilot project, Chennai  
Source: City of 1,000 tanks (2019)

For my project, the water treatment system is relying on the information given by the City of 1,000 Tanks water balance project in Chennai. For 500 students at the Little Flower Convent school, 27,500 Litre water is produced. As the use of water is different for a residential area, estimations have been done. Calculations have been done and show that the area of constructed wetlands for the residential project should be around 600 sqm.

According to Abedin and Rakib (2013), the reuse of water brings several advantages to mitigate the consequences of climate change. Water is continually and consistently produced on site and it minimizes the reliance on municipal water, conserving potable water.

In a research on the amount of water used by families in Bangladesh, it has been found that middle class families use around 200 to 300 Liters per day per capita (Abedin & Rakib, 2013). Almost 17-18% of potable water is used for toilet flushing which can be saved by using reused greywater. This could save almost 45 Liters per capita per day.





3

Design

The project aims to

**Provide adequate living space** for all income groups to **prevent the marginalization of the urban poor,**

foster **inclusivity** by utilizing the urban pond as a focal point,

promote harmonious **co-existence among diverse income and cultural groups,**

create space for **income generation,**

**keep the cost low** for low income housing,

and **mitigate flood risks** due to climate change,

which all together create an inclusive, sustainable living environment where water is the central theme

# 3.1

## Design Goals

What the project has to achieve

The project seeks to address multiple challenges faced by the urban area of Sylhet due to rapid urbanization. The urban poor are not actively participating in Bangladesh's housing market, resulting in inadequate housing that adversely affects both their physical and mental health. One of the key reasons for their lack of participation, is insufficient income generation. Living in inadequate circumstances brings more stress and less positive relations which in turn hinders work options and work efficiency.

Therefore, one of the project's objectives is to provide adequate living spaces for all income groups to prevent the marginalization of the urban poor and offer them opportunities for income generation simultaneously.

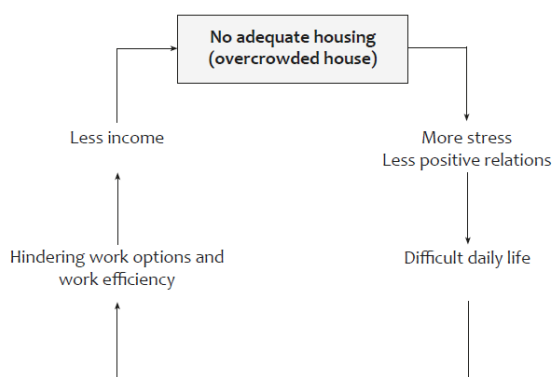
Since investors predominantly focus on middle and high-income housing, the urban poor are left without access to adequate housing. Therefore, the project aims to foster harmonious coexistence among diverse income and cultural groups by including the urban poor. This can be achieved through cross-subsidization and cost recovery methods, ensuring that investors receive a profit while low-income groups can obtain housing at an affordable cost.

By utilizing public spaces, such as the urban ponds which are characteristic for

the urbanscape of Sylhet, inclusivity can be promoted by using this public space as a focal point. The chosen design location, situated at an urban pond in Sylhet's urban area, would be advantageous for this purpose.

Lastly, Bangladesh experiences extreme rainfall during the monsoon season, leading to increased flood risks. Climate change is expected to worsen these risks in the future, necessitating action in both urban planning and architecture to make housing resilient and mitigate flood risks.

By pursuing these design goals, the project will create an inclusive, sustainable living environment.





## 3.2

### **Site Analysis** Laladighir Pond, Sylhet

Laladigir Pond, is an urban pond in Laladighir Par in Sylhet. It is located in the urban area of Sylhet which is a growing second-tier city of Sylhet. Religion is very important in this city, and urban waterbodies have shaped the urban fabric together with the sacred spaces. This paragraph will explain the site characteristics.



## Urban waterscape

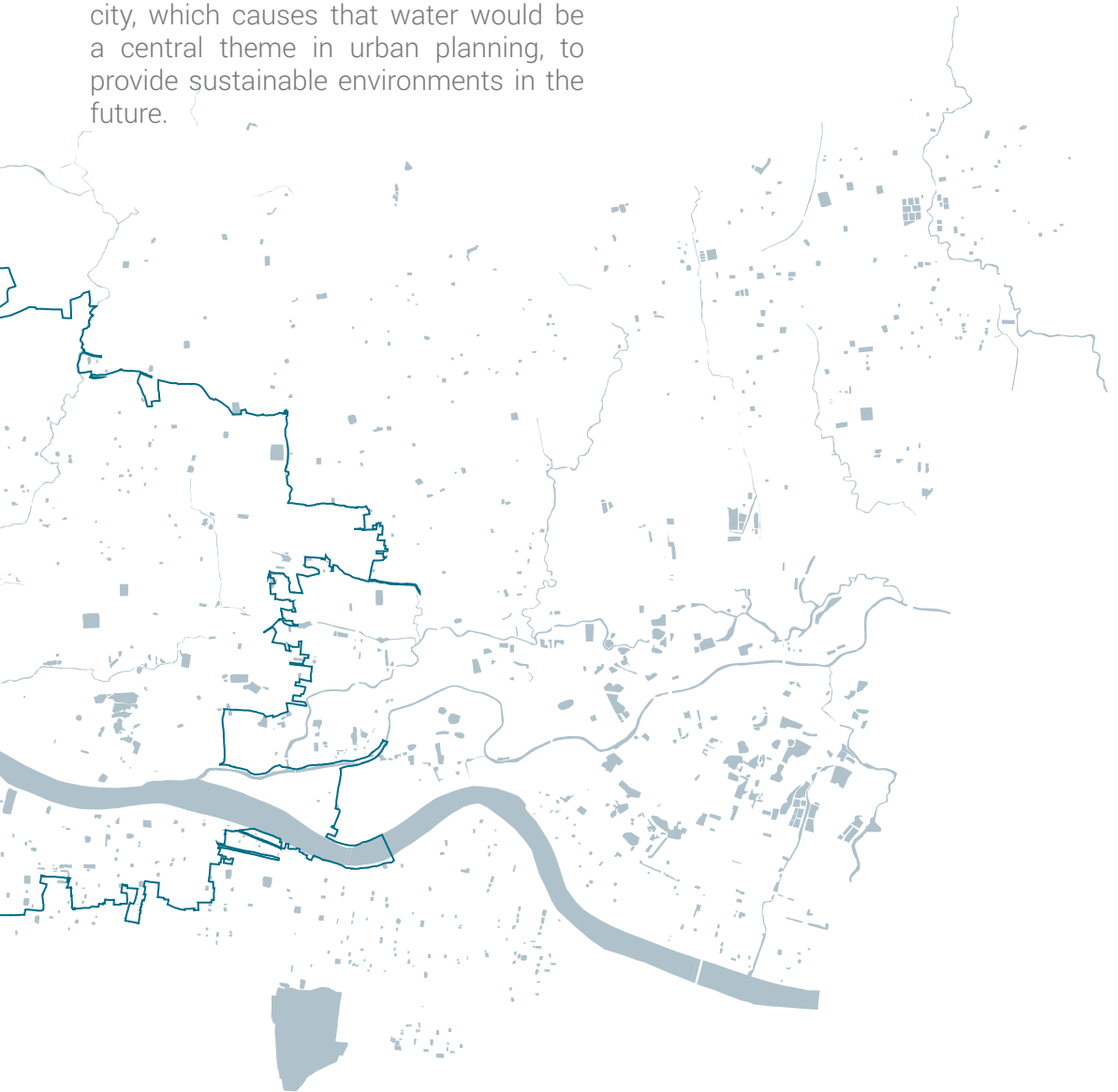
Sylhet



Sylhet is a growing second-tier city in the north-east of Bangladesh. The topography is characterized by its urban water bodies, which play a significant role in the city. It has various purposes, including social activities as fishing, swimming, daily tasks like washing and serve as public spaces. Urban ponds are scattered throughout the city of Sylhet and are intertwined with its urban morphology (Das & Das, 2022). However, due to the rapid urbanization, urban ponds are being filled up to make way for new

housing projects. By doing so, residents are losing their traditional way of life, and the city is facing more extreme climatic events, as the natural water reservoirs are decreasing.

The urban waterbodies in Sylhet play a diverse and significant role in the city, which causes that water would be a central theme in urban planning, to provide sustainable environments in the future.



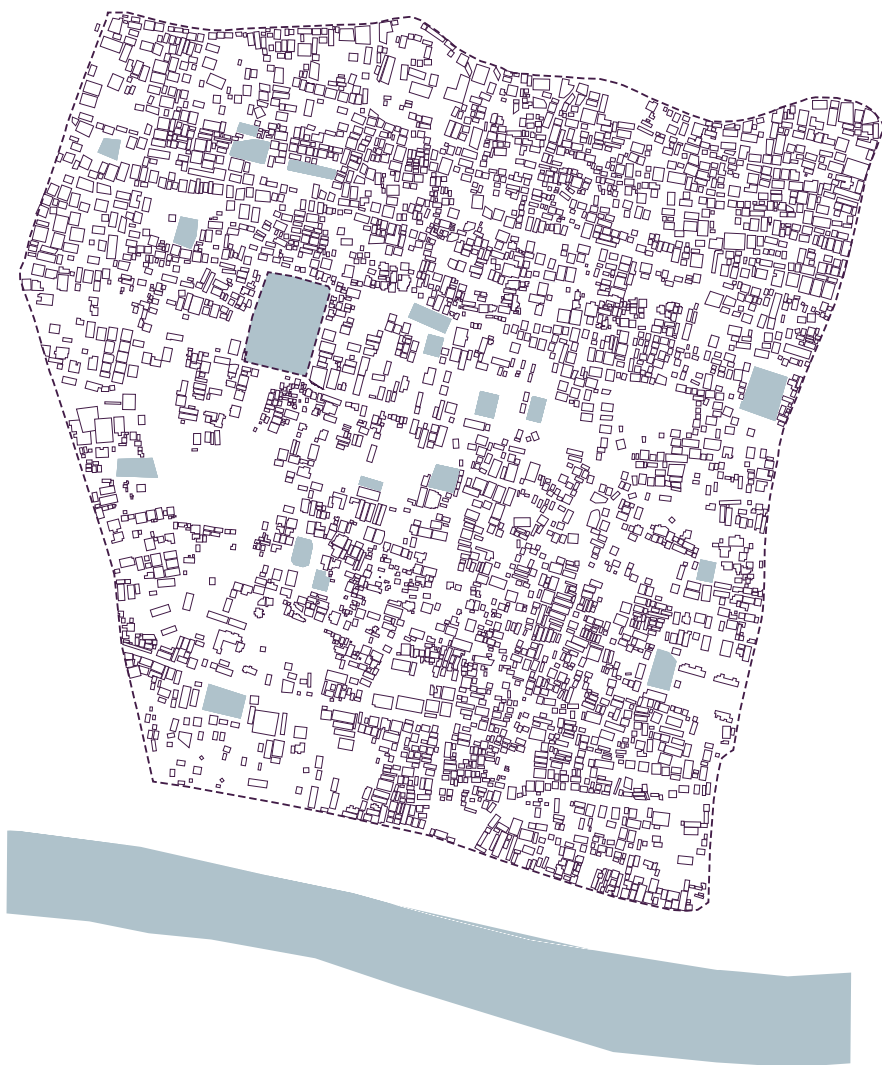


Fig. 11: Urban waterbodies Sylhet

## Urban waterbodies

Laladighir pond is part of a bigger urban waterbody system, which is characteristic for Sylhet and other cities in Sylhet. The Surma river is in close proximity of the design location, and serves as the lowest point where water overflows in the urban area will flow towards to. Due to rapid urbanization, urban ponds are disappearing as they are being filled up for building purposes. As Sylhet is facing flood challenges due to the climate change consequences, it is important to know the significance of those urban waterbodies to serve as a reservoir in periods of excessive rainfall. At the same time, those urban ponds serve as social and communal spaces for the residents. It is part of their daily lives. Therefore, those urban waterbodies should be protected to serve as buffer zones for water overflows, but also to not destroy the cultural lifestyles of the residents.

## Built environment



Fig. 12: Noll map



## Open space



Fig. 13: Open space



Fig. 14: Main roads

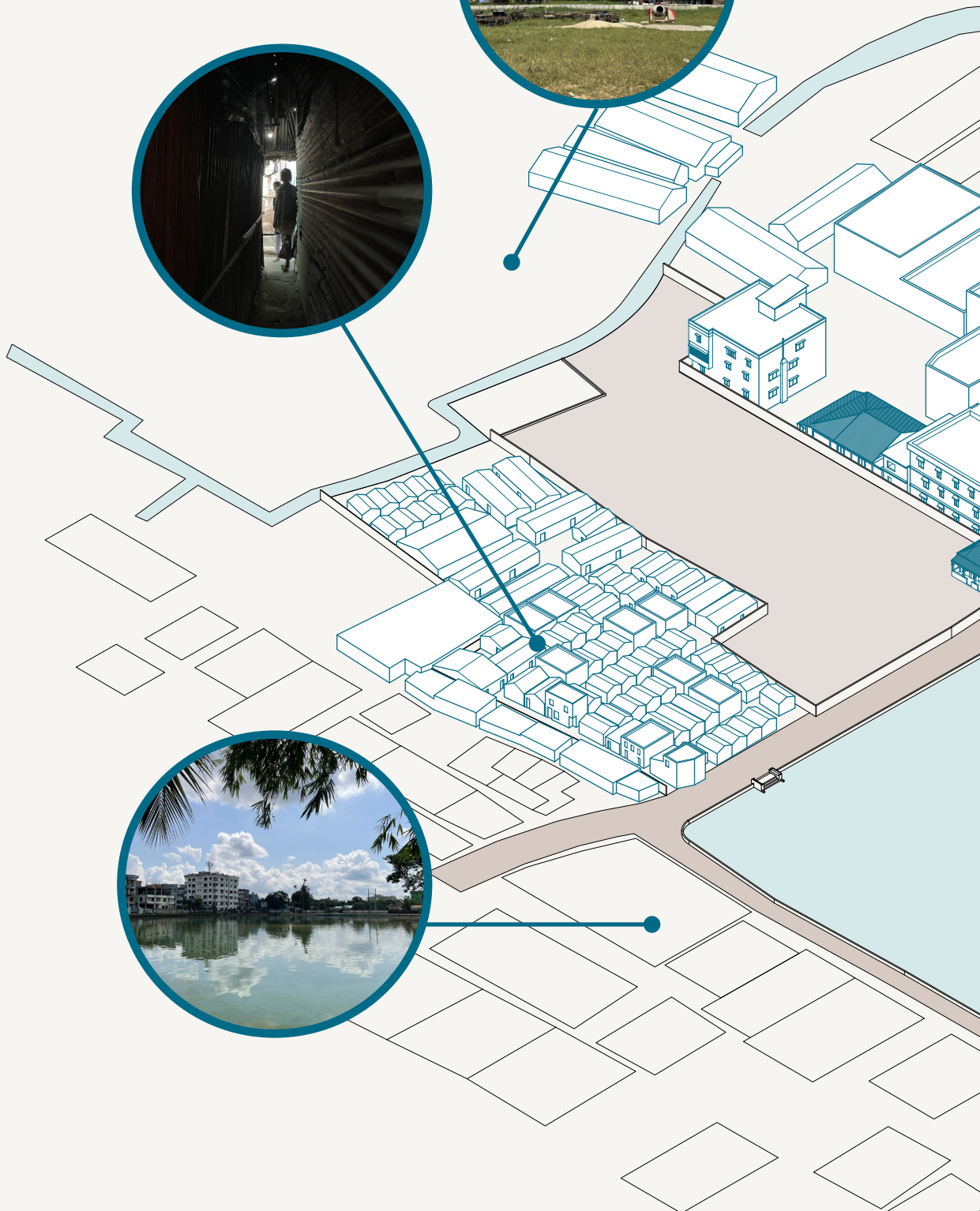
# 3.3

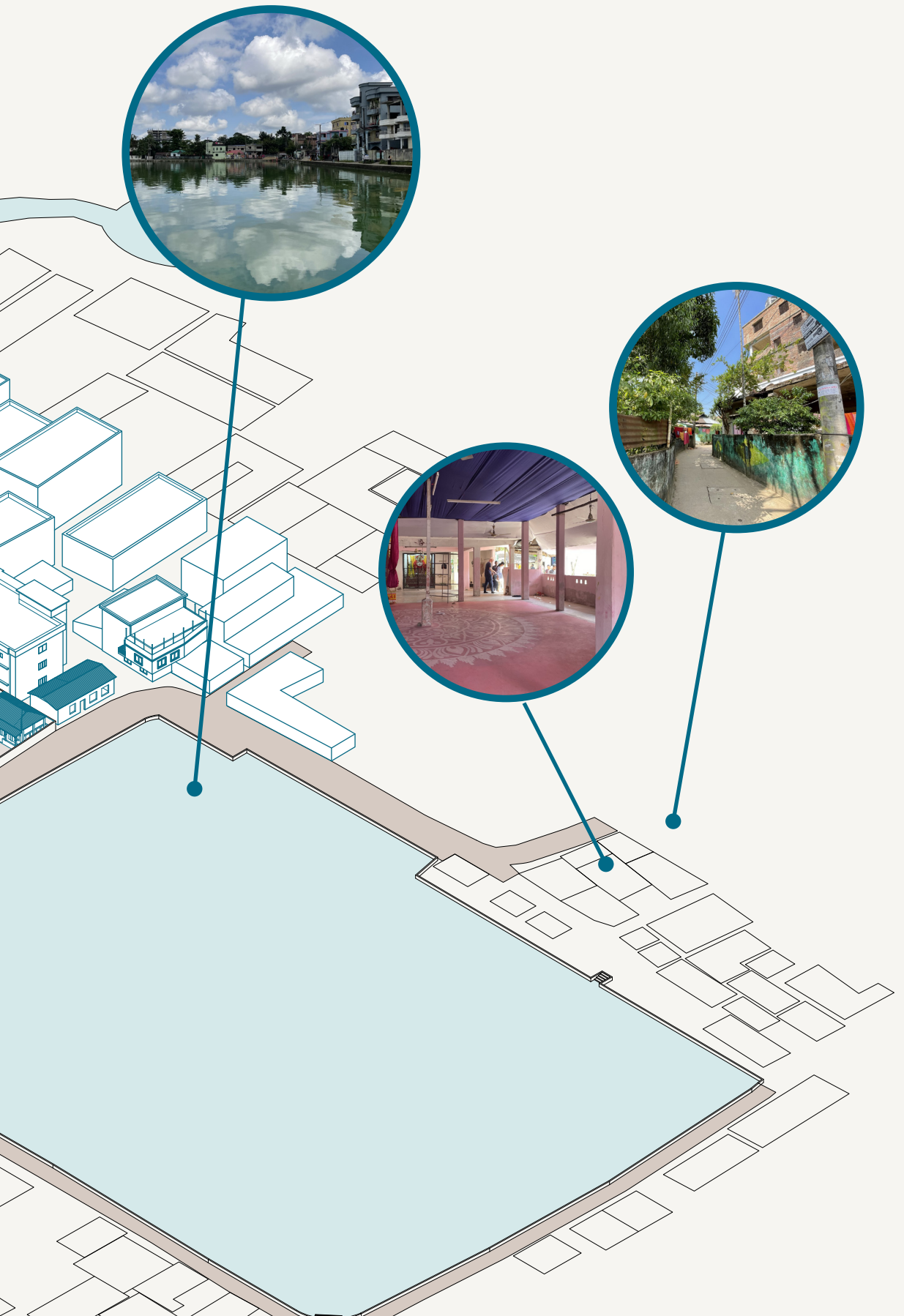
## Urban strategy

Construction, clustering and hierarchy of spaces

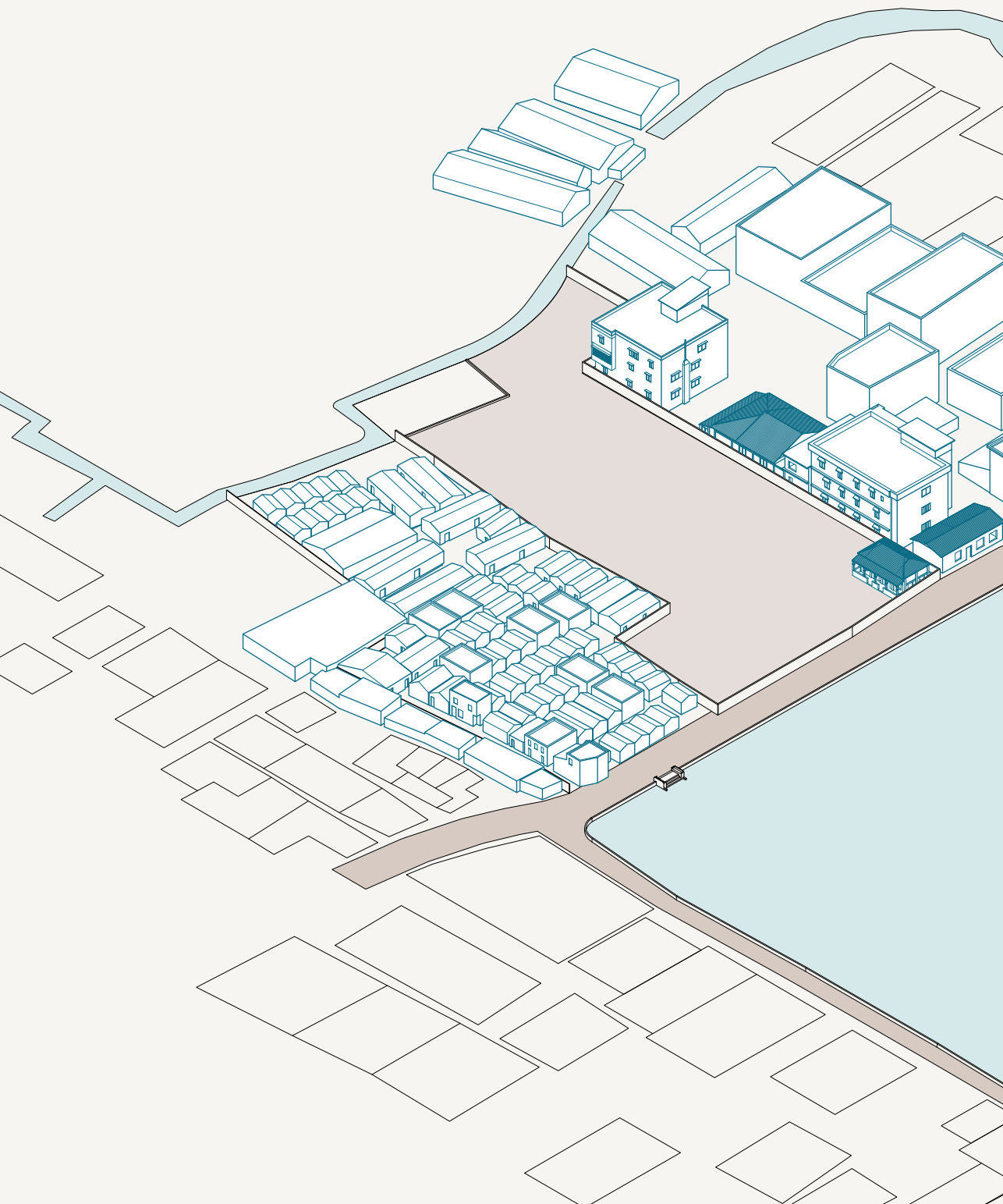
Given the diverse cultural and income groups on the design plot, it is essential to establish clear design principles that address clustering and hierarchical space allocation. These principles must carefully consider the varied design preferences of different groups.

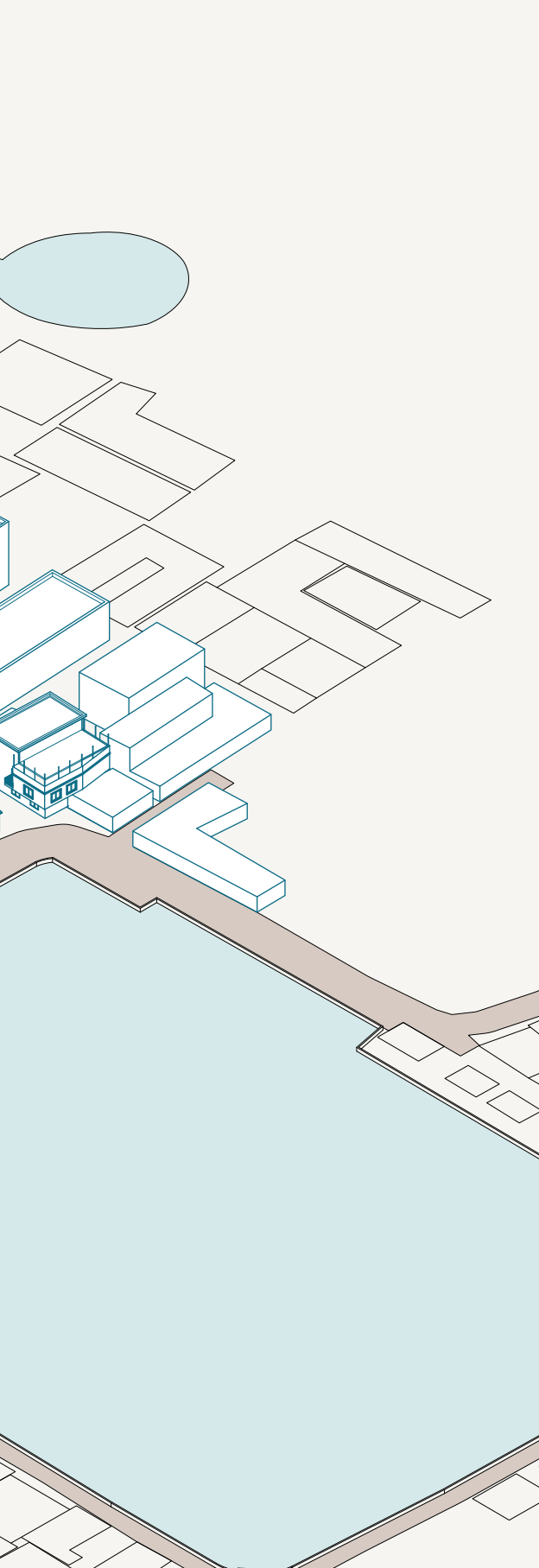
This paragraph will examine the current situation, the construction phasing, and the clustering of religious and income groups.











## Current situation

### Informal settlement

The current situation involves an informal settlement housing approximately 390 residents in 65 units. The living conditions in this settlement are inadequate, with poor access to daylight and air. Additionally, there is no public space, preventing residents from gathering and children from playing safely together. During the monsoon season, families suffer from rising water levels, which will become worse in the future due to climate change. The new project could present an opportunity to address these issues and create an inclusive environment where people from different income groups can live together harmoniously in adequate living conditions.

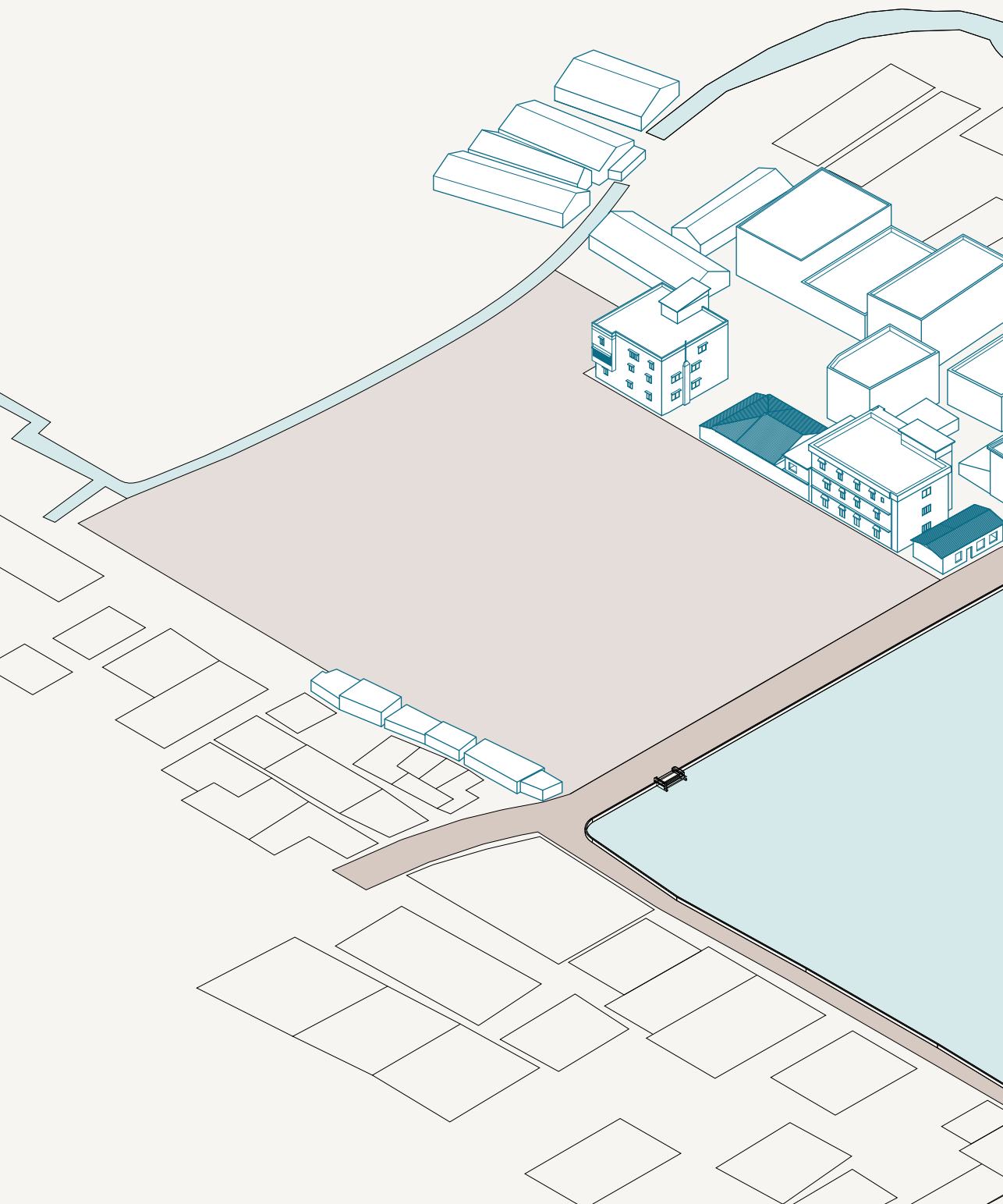
#### **Plot**

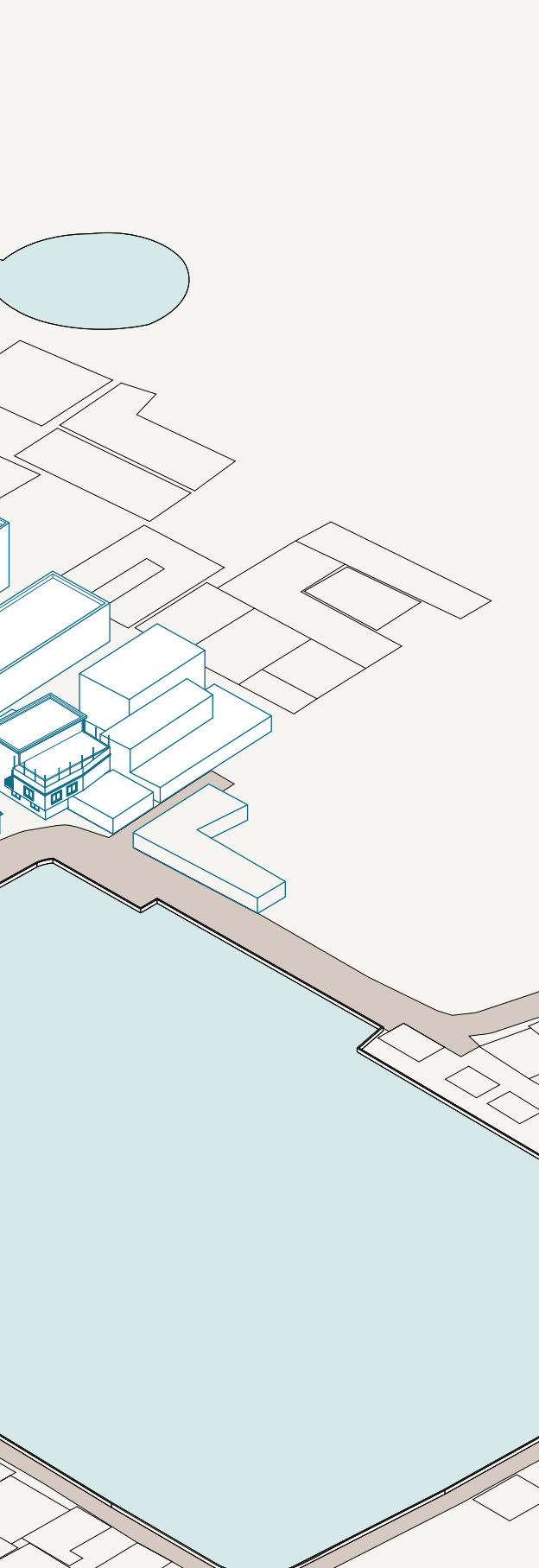
|      |           |
|------|-----------|
| Area | 6,040 sqm |
| FSI  | 0.39      |
| GSI  | 0.34      |

|                      |        |
|----------------------|--------|
| Low income dwellings | 65     |
| Dwellings/ha         | 39     |
| Area/dwelling        | 40 sqm |

#### **Informal settlement**

|                     |              |
|---------------------|--------------|
| Amenities           | -            |
| Open space          | 14.8%        |
| Open space/resident | 1.5 sqm/res. |





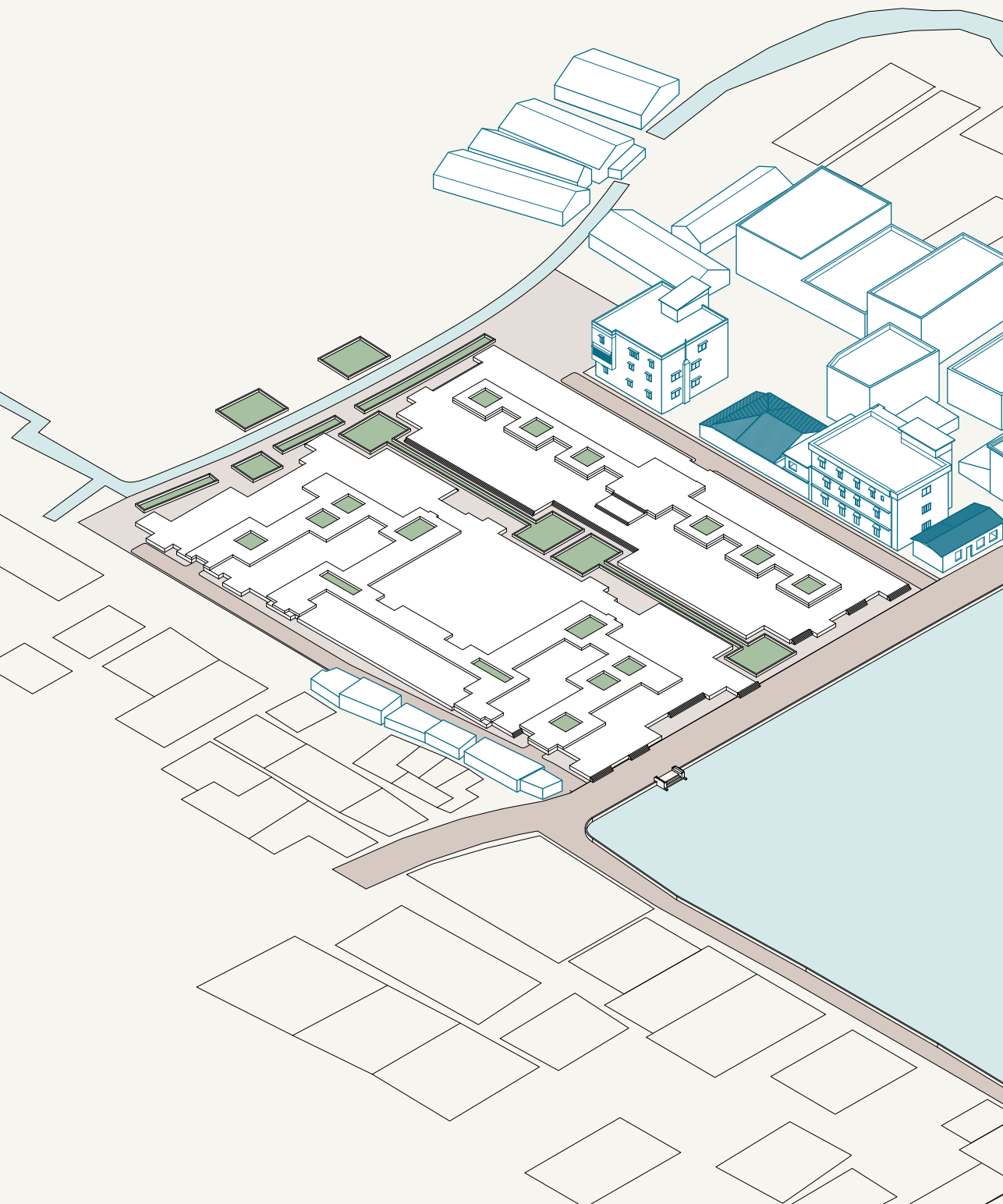
## New situation

### Demolition of informal settlement and plot expansion

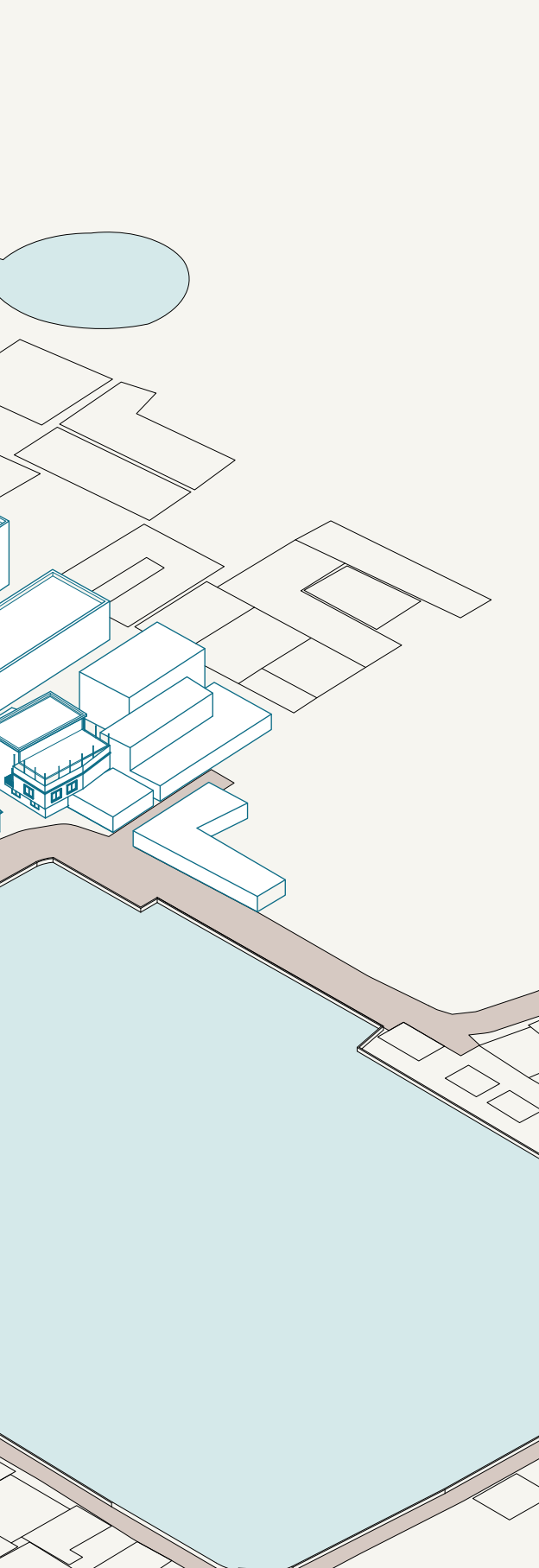
In Bangladesh's current housing market, investors are primarily focused on middle and high-income housing, excluding the urban poor from participating. Therefore, a slum redevelopment strategy has been selected for this project, involving the demolition of existing housing units for the urban poor and the construction of new buildings to accommodate all current residents in a new project. Given the high property value at the Laladighir Pond location, there is significant potential for cross-subsidization, allowing investors to profit by including middle and high-income units. During the redevelopment project's construction, the private developer should provide temporary housing compensation to the slum dwellers, as the project's small scale necessitates efficient execution. To avoid increased costs due to inflation, the private investor aims to complete the construction of all new buildings simultaneously, minimizing both compensation and construction expenses.

**Plot**  
Area

7,374 sqm







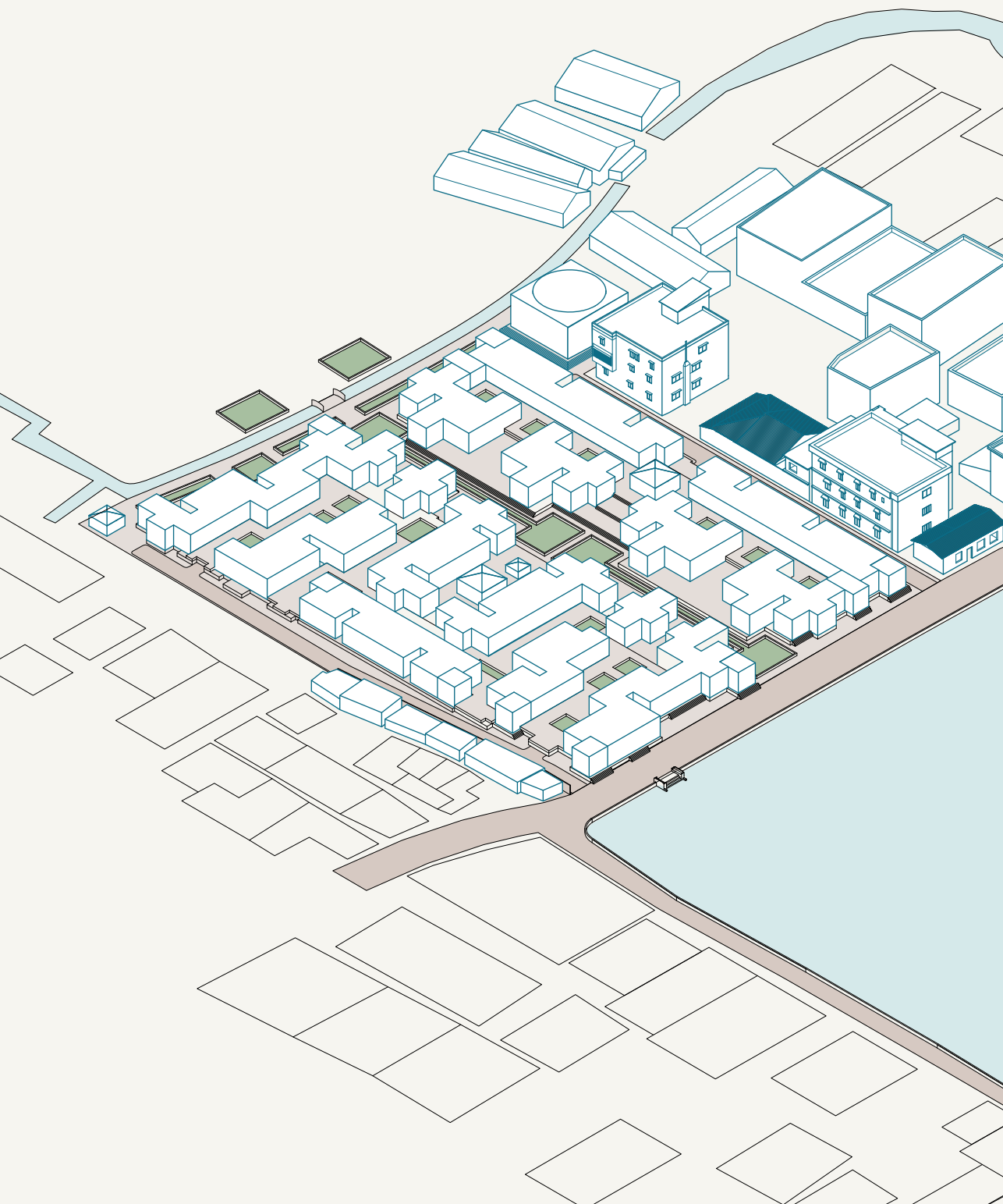
## Infrastructure

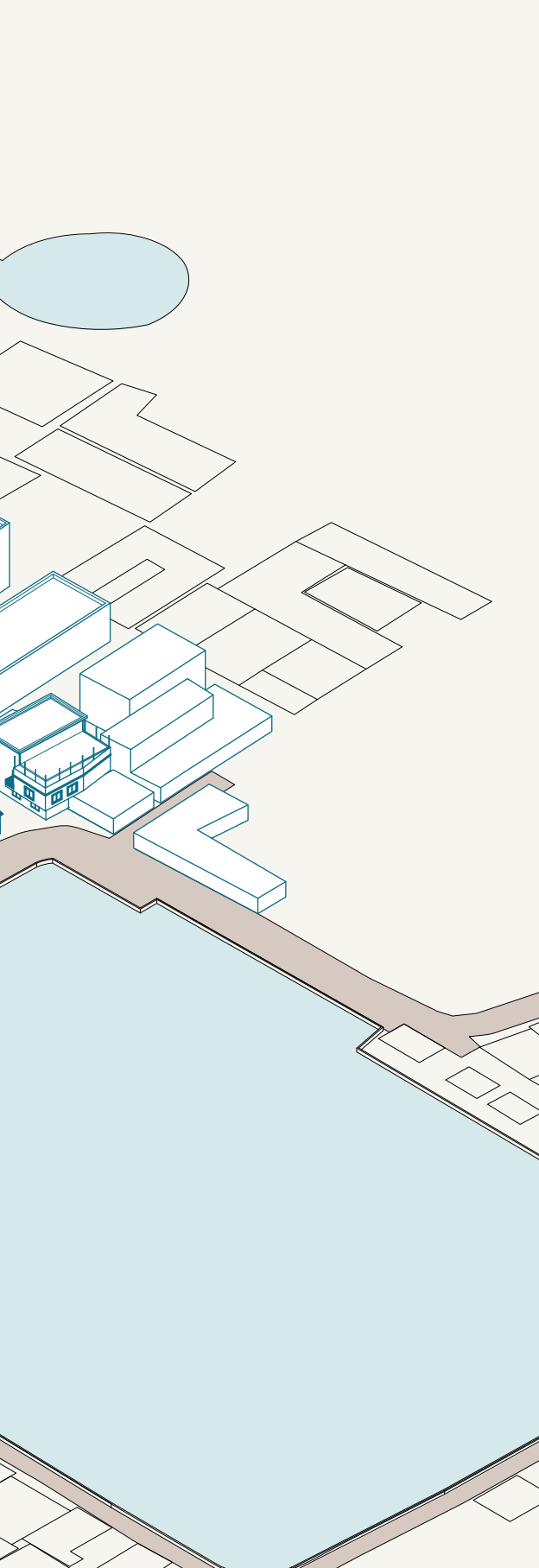
Construction of parking garages and building platforms

Given that water levels rise to about half a meter during the monsoon season, the new housing project should incorporate raised plinths to prevent water from entering the living spaces. Additionally, there is an overflow of water during the monsoon season but a scarcity during the dry months. The current practice of dumping used water directly into the ground leads to groundwater pollution. Treating this water could mitigate water scarcity during dry periods. Therefore, the project includes a water treatment system, with constructed wetlands as a key element in the urban design. These wetlands would act as buffers during the wet months and treat water to ensure a supply of clean water during the dry months while educating residents about water treatment and the impacts of climate change. The raised platforms for the buildings would also create space underneath for a parking garage and facilitate water flow to the lowest point, where several constructed wetlands are located.

### **Plot**

|                      |           |
|----------------------|-----------|
| Area                 | 7,374 sqm |
| Platform height      | 750 mm    |
| Constructed wetlands | 630 sqm   |





## Ground floor

### Construction of low income housing

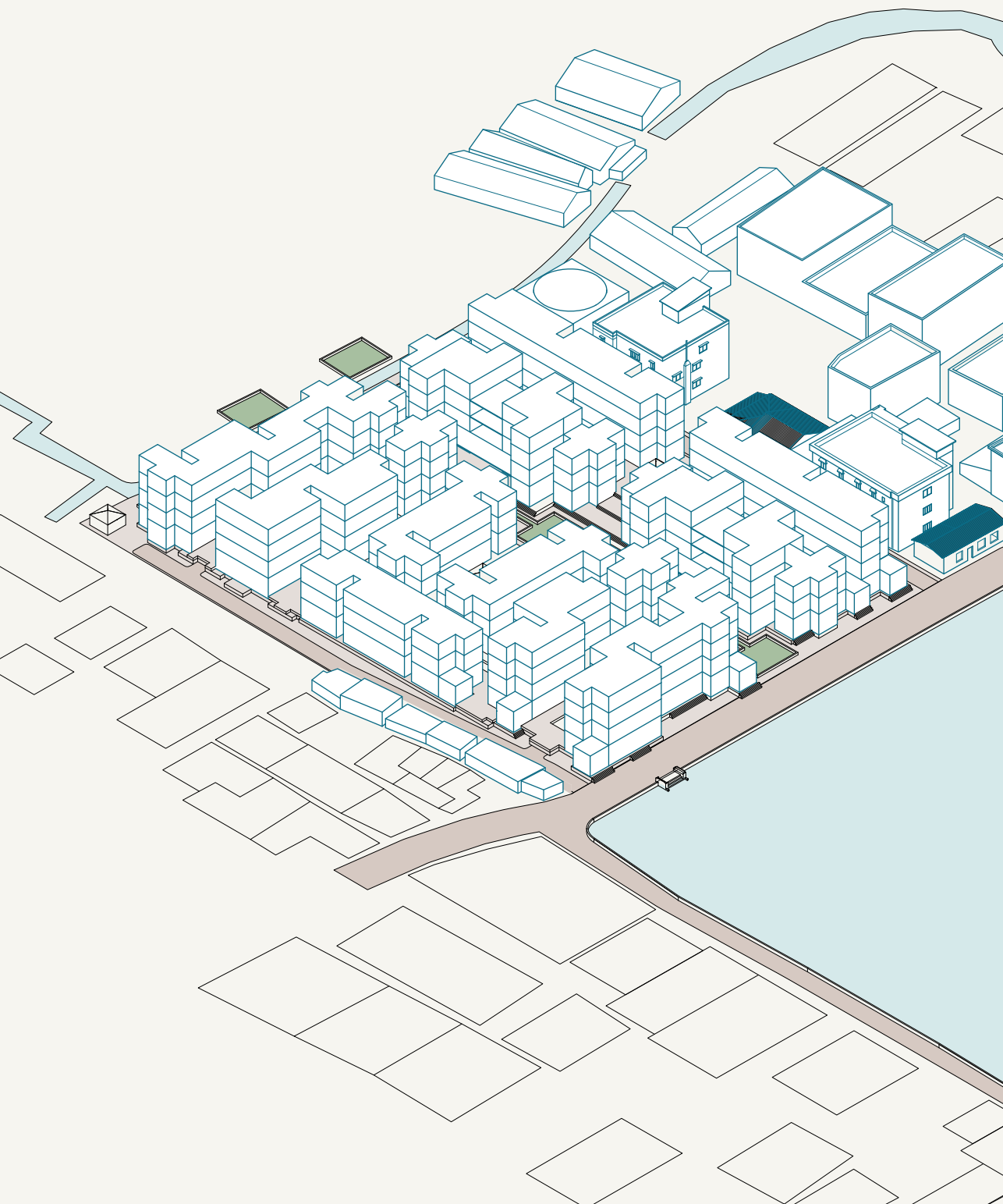
One of the main design goals is to enable low-income units to generate income, so all low-income housing should have direct street access to facilitate this. Consequently, all ground-floor units are designated as low-income housing. Units on public streets have integrated workshop spaces with a loft for storage or extra sleeping space, while those on less public streets trade off workshop space for additional living space. The current informal settlement has 65 dwellings, and the new project includes 66 low-income units, ensuring all current residents can resettle in the redeveloped area.

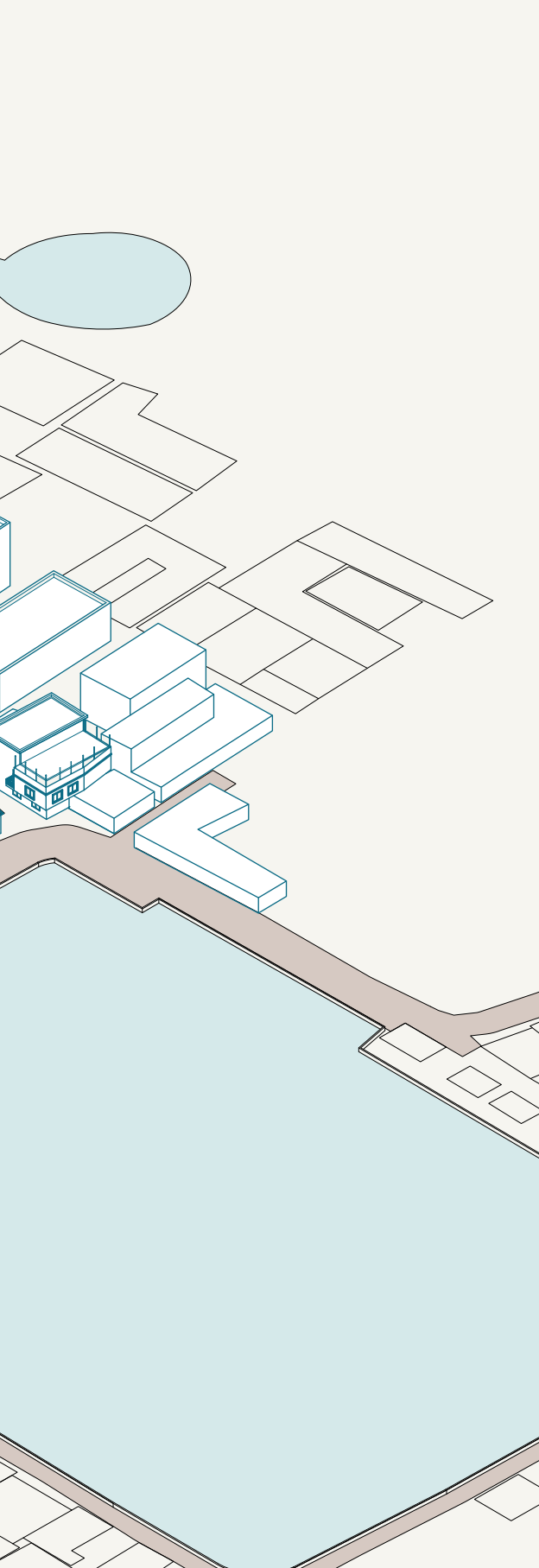
#### ***Plot***

|                    |           |
|--------------------|-----------|
| Area               | 7,374 sqm |
| Low-income housing | 66        |

#### ***Old informal settlement***

|               |    |
|---------------|----|
| Housing units | 65 |
|---------------|----|





## Upper floors

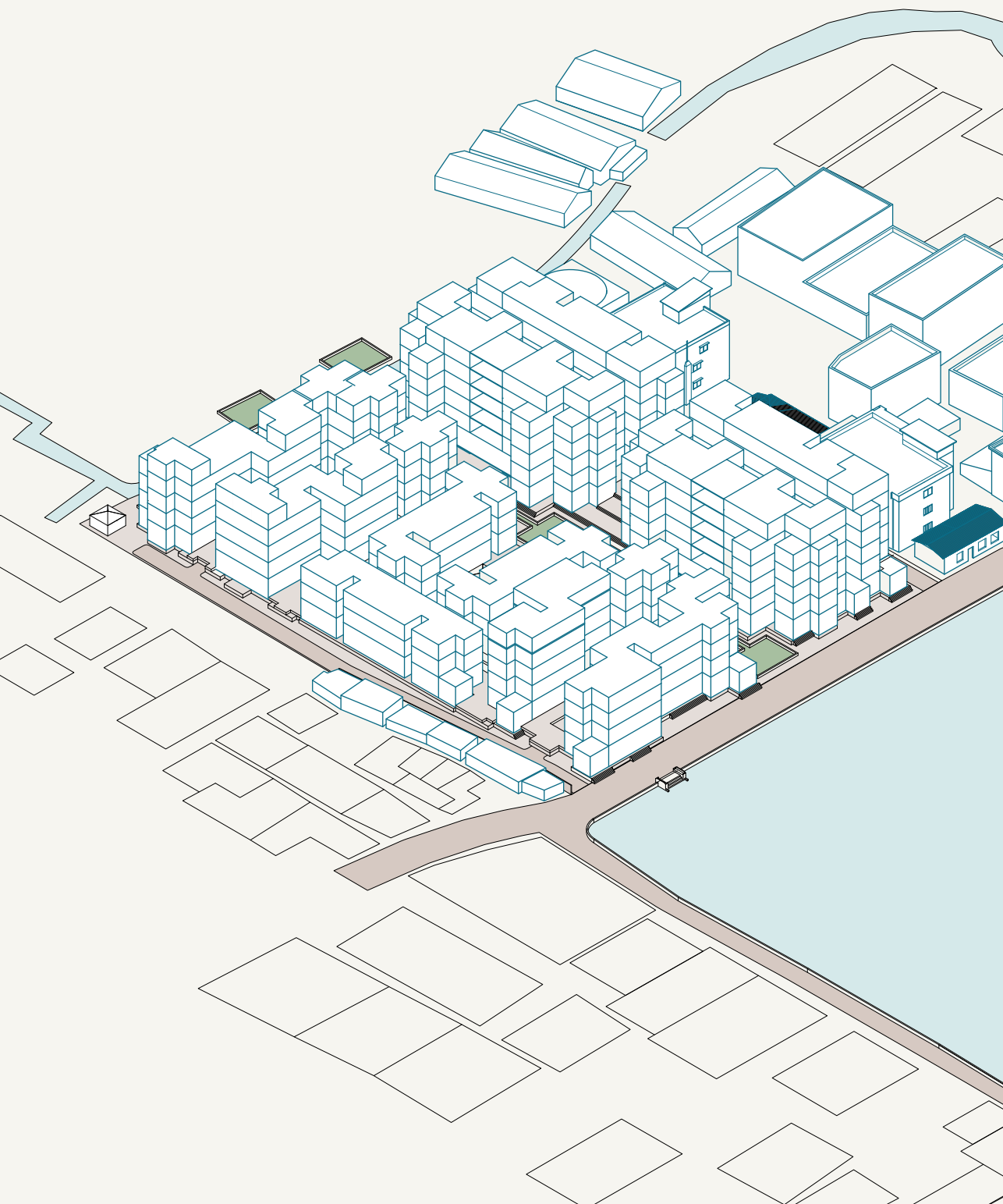
### Construction of middle income housing

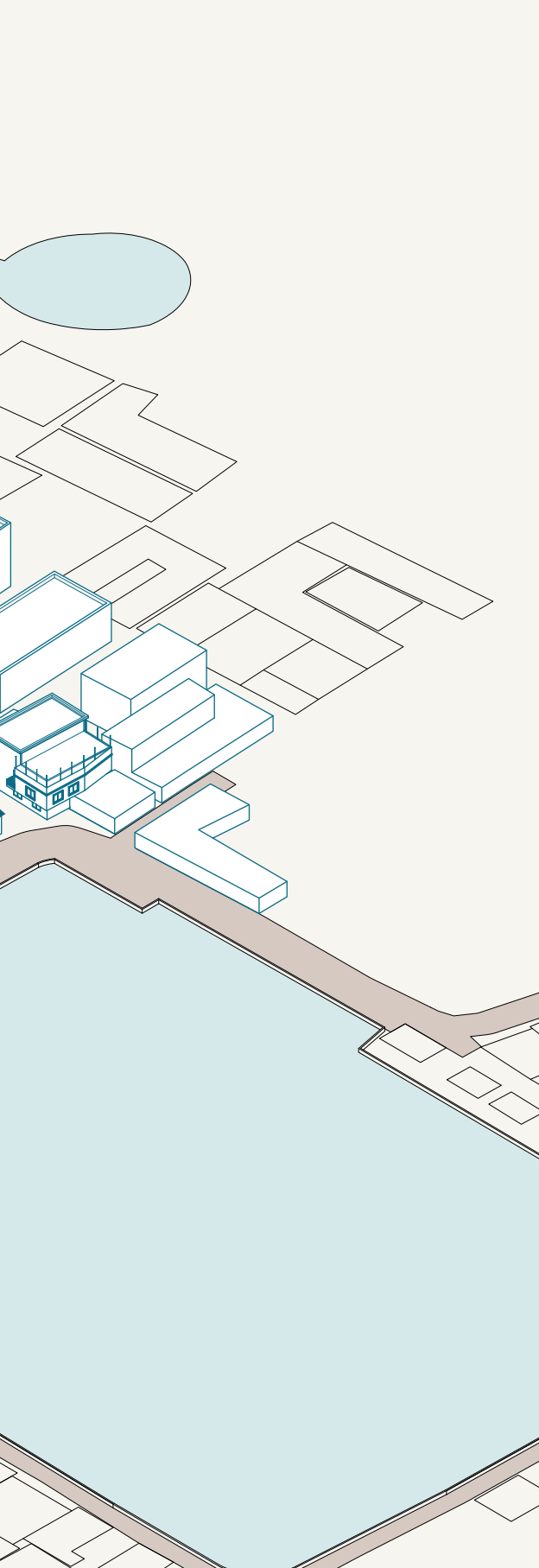
The middle-income group has different design concerns compared to the low-income group. They prefer higher floors for greater privacy and better views rather than needing ground floor access. In the plan, middle-income units offer attractive views of the cricket field, the urban pond, and the central point of the urban design. Additionally, commercial facilities are conveniently located on the ground floor, ensuring easy access for residents.

#### **Plot**

|                       |           |
|-----------------------|-----------|
| Area                  | 7,374 sqm |
| Middle-income housing | 64        |







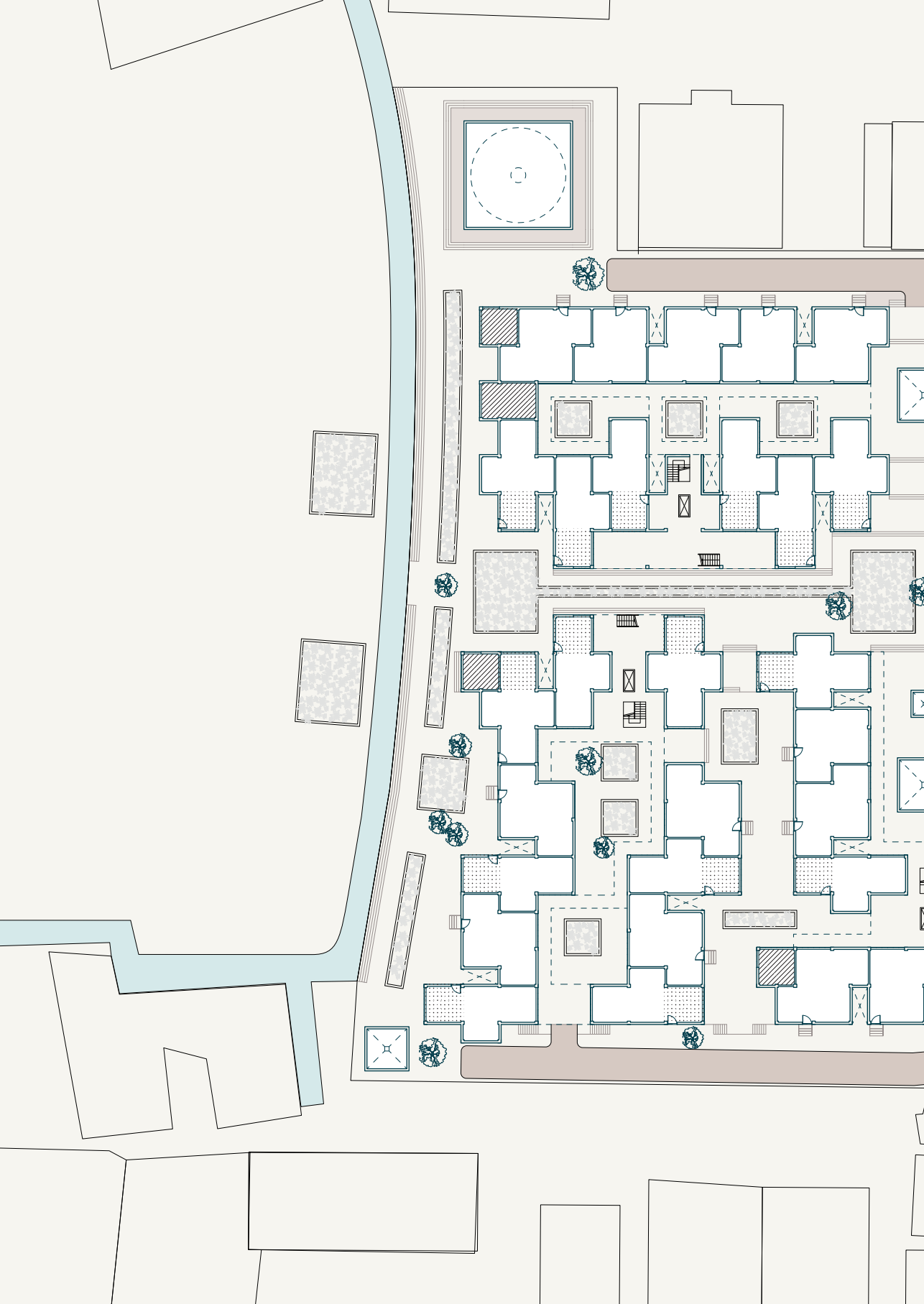
## Upper floors

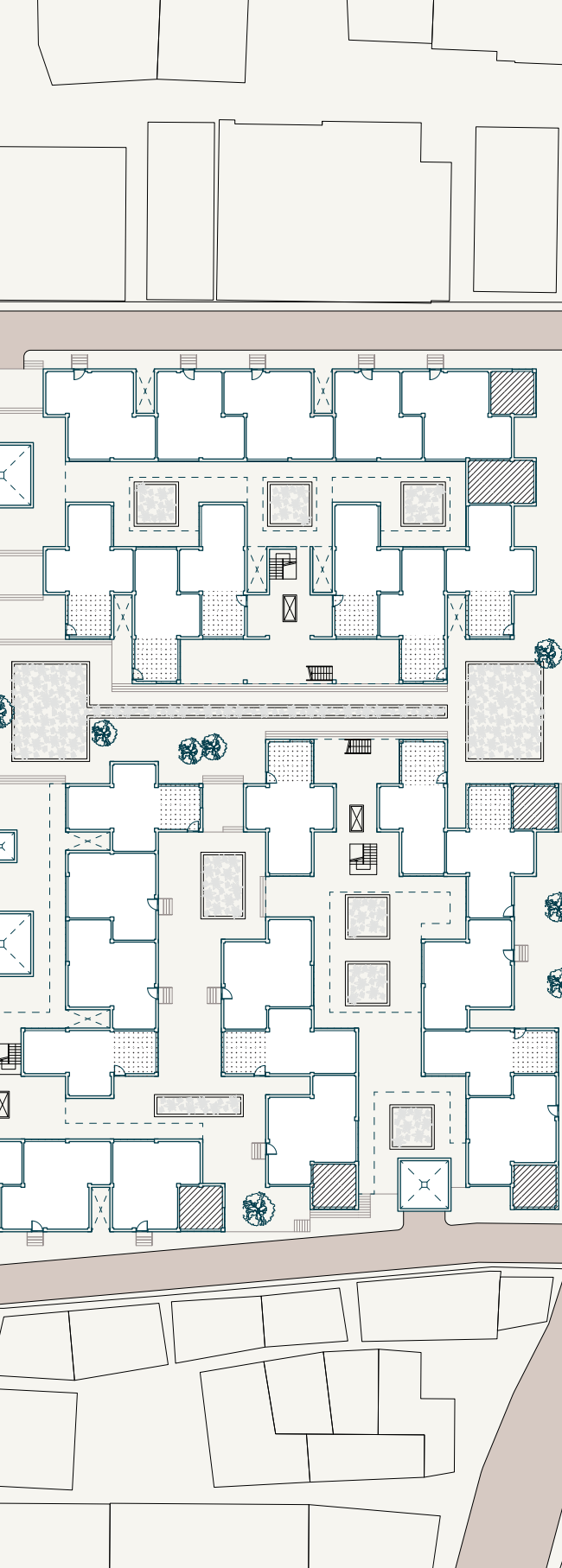
Construction of high income housing

The high-income groups occupy the top floors of the building units, providing them with panoramic views of the surroundings. They share similar design preferences with the middle-income group, which is why they are situated on the uppermost floors. Community spaces for both the middle and high-income groups are provided on the roof terraces.

### **Plot**

|                     |           |
|---------------------|-----------|
| Area                | 7,374 sqm |
| High-income housing | 18        |





Workshop space



Commercial space for rent

|      |           |
|------|-----------|
| Area | 7,374 sqm |
| FSI  | 1.48      |
| GSI  | 0.32      |

|          |    |
|----------|----|
| LI units | 66 |
| MI units | 64 |
| HI units | 18 |

|                 |       |
|-----------------|-------|
| Total dwellings | 148   |
| Residents       | 888   |
| Residents/ha    | 1,251 |
| Dwellings/ha    | 208   |

|                           |         |
|---------------------------|---------|
| Amenities                 |         |
| mosque                    | 1       |
| Religious buildings       | 4       |
| commercial space for rent | 120 sqm |

|                     |         |
|---------------------|---------|
| Open space          | 68%     |
| Open space/resident | 4.7 sqm |



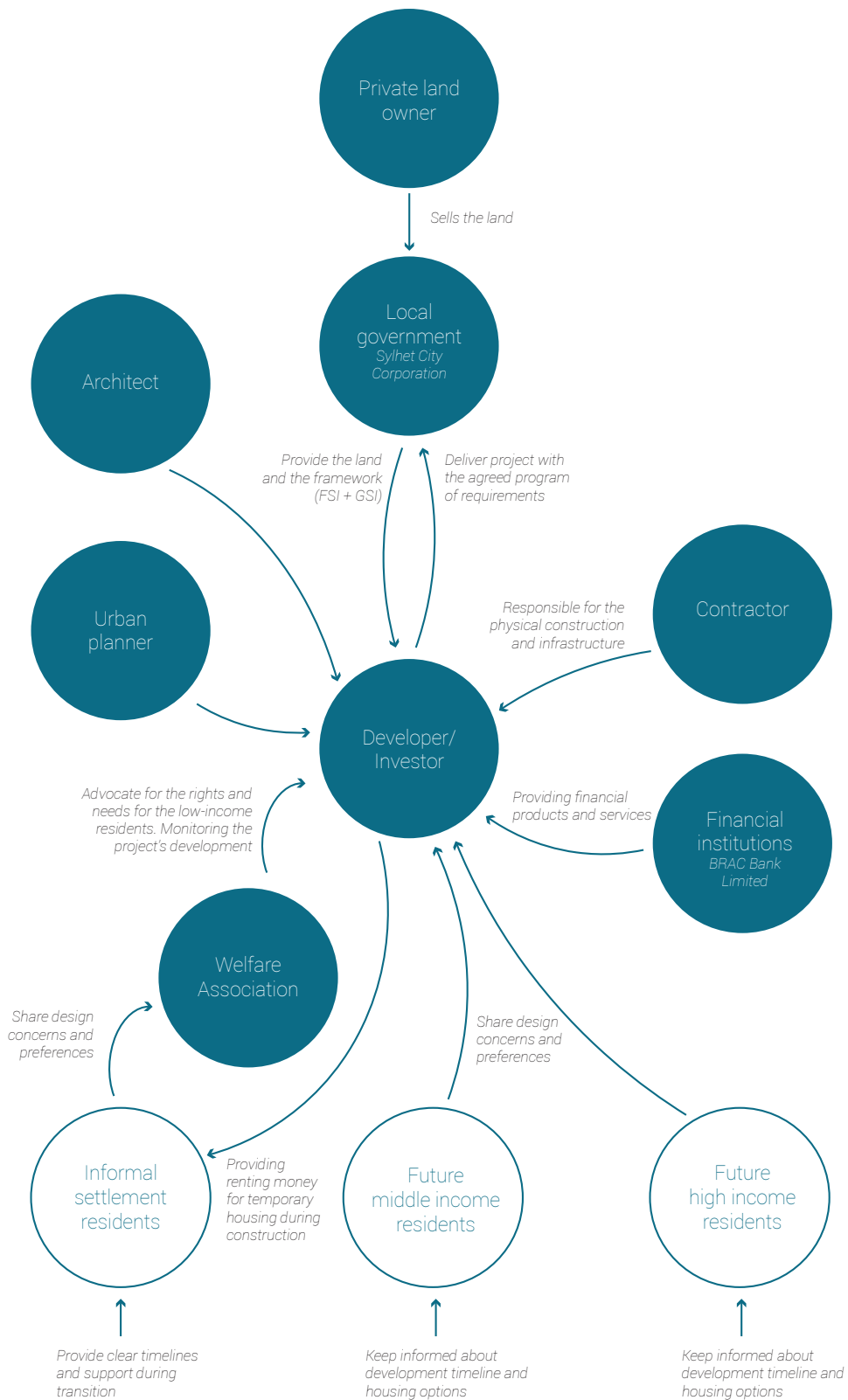


Fig. 15: Stakeholder map



# 3.4

## Managerial strategy Stakeholders

The Laladighir pond area holds significant value as a potential central public space for community gatherings. It also serves as a crucial location for demonstrating how urban ponds can be integrated into residential designs, potentially inspiring other developers to preserve such spaces amidst rapid urbanization.

Currently, the plot of land around Laladighir pond is privately owned and should ideally be acquired by the local government of Sylhet City Corporation. The government would then allocate the land and establish a framework that specifies the Floor Space Index (FSI) and Ground Space Index (GSI) for interested private developers. Given that private developers typically prioritize investments in middle and high-income housing for greater profitability, a welfare association would oversee and advocate for ensuring that current low-income residents on the site can be accommodated in an inclusive housing project.

During construction, the developer should compensate current residents for temporary housing and ensure they have a place in the new development. Due to the project's small scale, developers aim to minimize delays to avoid potential profit loss from inflation. Affordable housing for low-income groups is facilitated through cross-subsidization, where the higher costs of middle and

high-income housing help subsidize affordable units while still yielding profits.

Throughout the project, ongoing communication and transparency with both current low-income residents and future middle and high-income residents are essential to ensure informed participation and smooth development progress.

A stakeholder map of this strategy is shown in Figure 15.

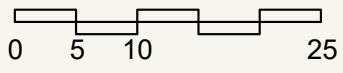


# 3.5

## Cluster Strategy

Organization of an inclusive environment

In the urban plan, a central axis connects two prominent public spaces: the cricket field and the urban pond. Along this axis, various clusters with diverse configurations and densities are situated. These clusters exhibit a mix of religious groups and include a range of housing types from low-income to high-income residences. This paragraph will detail the characteristics and arrangements of these different clusters.



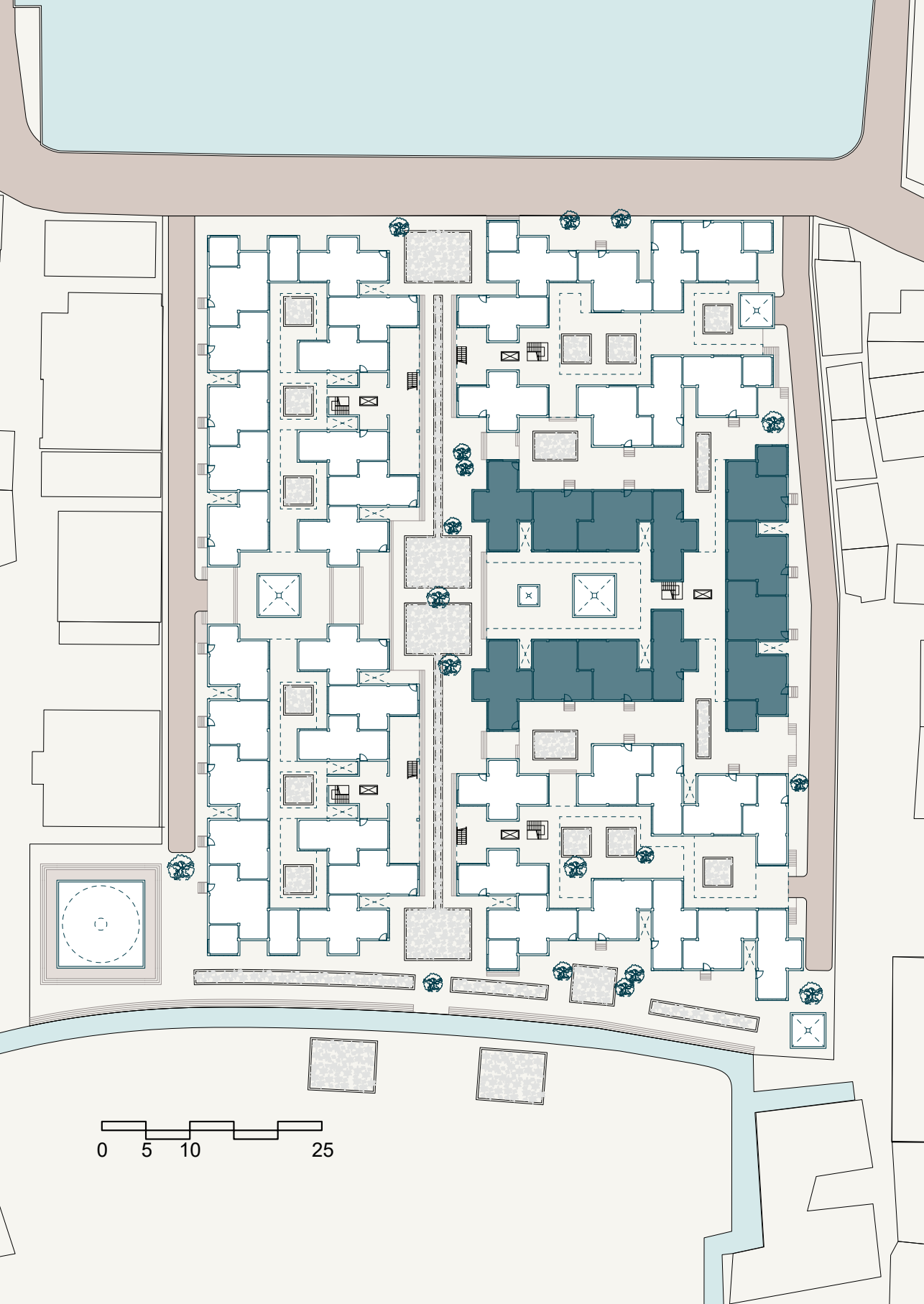
## Religious groups

### Muslim

The majority of the clusters are Muslim clusters. The main design concerns for the muslim groups is privacy and the courtyard concept is a characteristic feature in housing design. The clusters have direct acces to the public street on one side, and on the other side a more semi-private courtyard space, which allow the muslim people to meet with their cluster group. This courtyard space also enhances cross ventilation through the building units, which creates a comfortable inside environment.

A mosque is centrally located within the urban plan, serving as a focal point for the Muslim community in the neighborhood. Additional religious spaces are allocated to serve one or two clusters each, providing intimate cultural venues where Muslim residents can pray and celebrate their festivals.





0 5 10 25

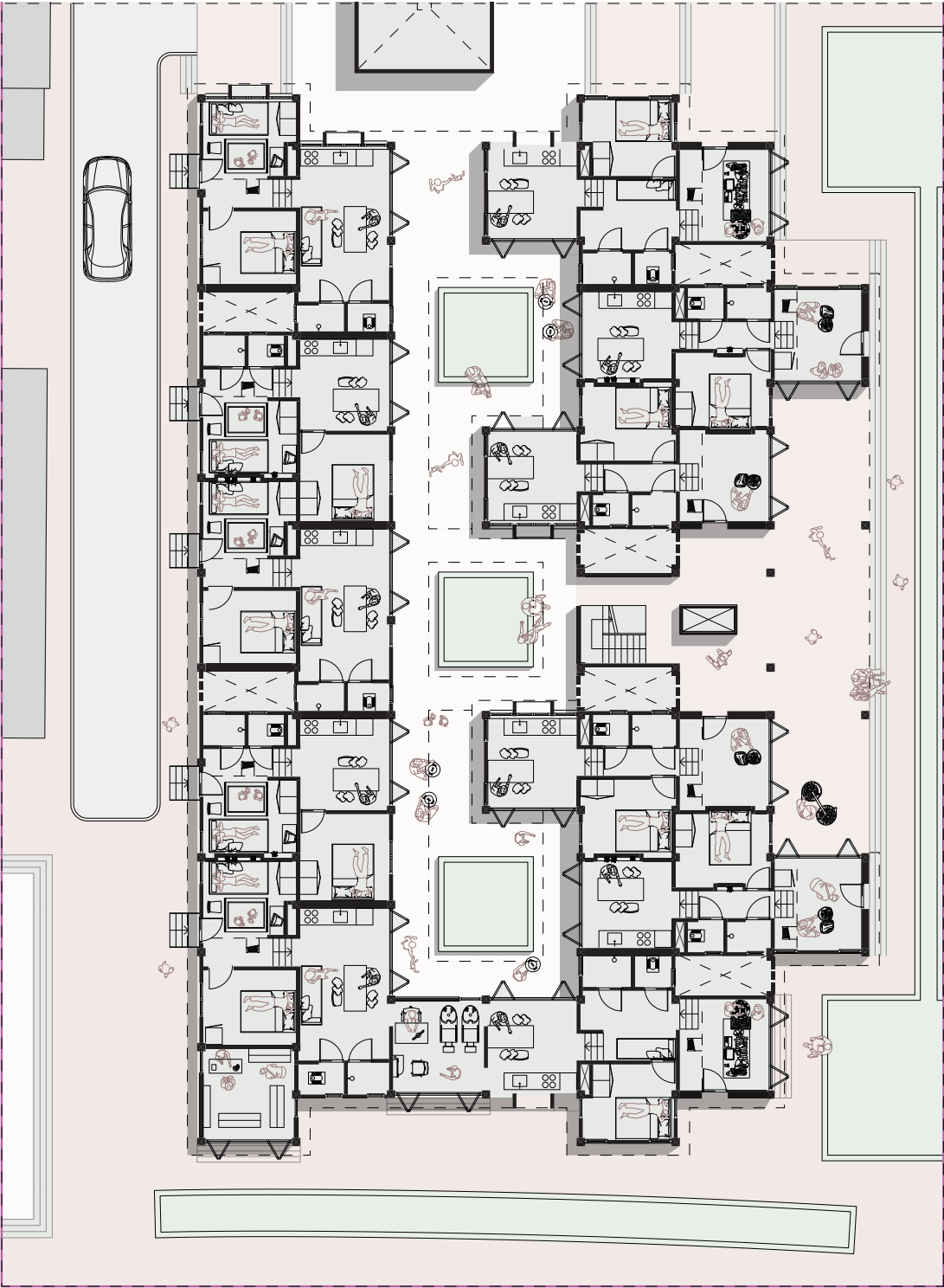
## Religious groups

### Manipuri

A small cluster is designated for the Manipuri community, accommodating approximately 10-20 families. This building complex has the lowest density, reflecting the community's preference to reside in their own small territory. The Manipuri people favor living near natural water sources, making the urban pond an ideal location for their settlement.

The Mandapa and temple serve as central communal places for this community, emphasizing their significance within the cluster.

Unlike the Muslim group, privacy is less of a priority for the Manipuri community. Therefore, this cluster is positioned in a vibrant central location within the urban design, facilitating interaction with other residents and the surrounding community.



## **Muslim cluster**

### Courtyard concept

The courtyard serves as a private space for the low-income group residing on the ground floor within the Muslim clusters. Facing the public street, shophouses are strategically placed to engage with the bustling public realm. Conversely, within the building block where the courtyard is situated, a more intimate environment is fostered. Here, kitchens are positioned to facilitate ventilation and encourage interaction among families, enabling communal cooking activities.



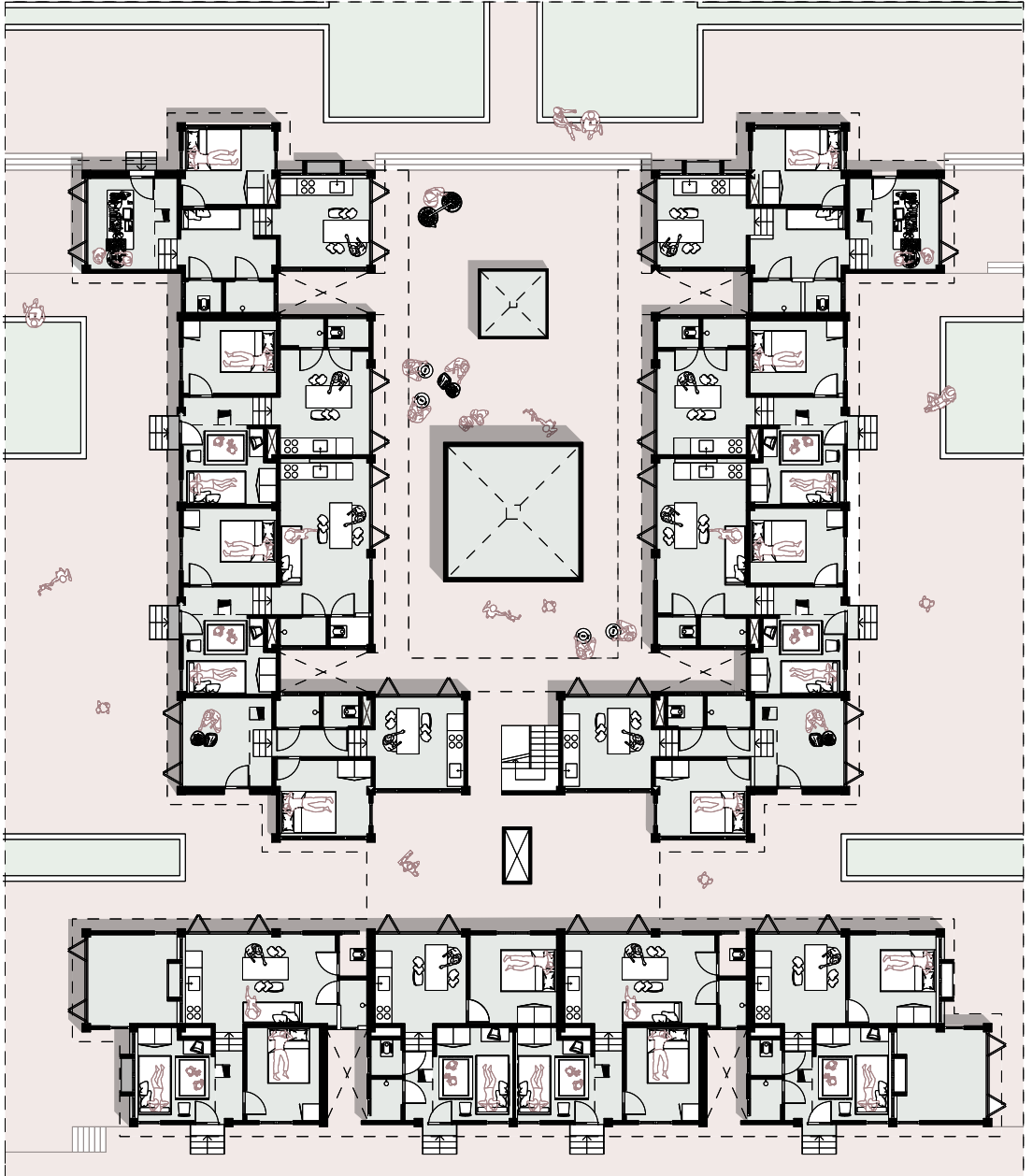


## Muslim cluster

### section

On the ground floor, units with increased floor height are designed to include loft spaces that can serve as storage for shophouses or as additional sleeping areas. This design provides an incremental element, allowing the low-income group to decide whether to maintain their shop or expand their living area in the future.

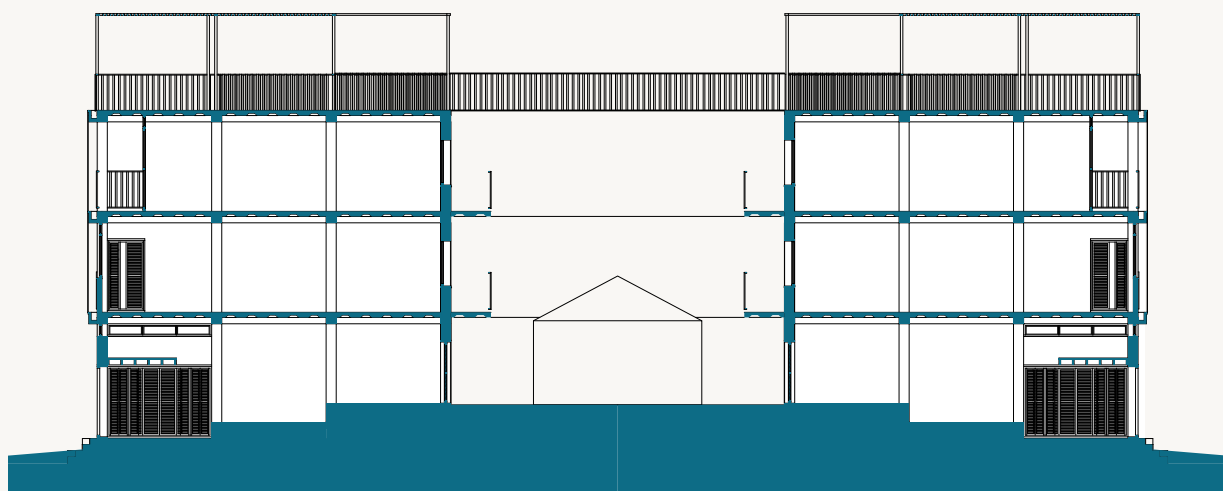
The middle and high-income groups are situated on the upper floors and have separate access systems to ensure minimal interference with the low-income group on the ground floor. Additionally, they have exclusive communal spaces located on the rooftop terraces.



## **Manipuri cluster**

Small group with central Mandapa

Similar to the Muslim clusters, shophouses are strategically positioned along the side facing the public street to interact with the lively public realm. In contrast, within the building block where the courtyard is located, an intimate environment is cultivated. Kitchens are strategically placed to promote ventilation and foster interaction among families, encouraging communal cooking activities. The Mandapa and temple serve as the focal point of this cluster, resulting in a larger inner courtyard space.



## Manipuri cluster

### Section

On the ground floor, units with increased floor height are designed to include loft spaces that can serve as storage for shophouses or as additional sleeping areas. This design provides an incremental element, allowing the low-income group to decide whether to maintain their shop or expand their living area in the future.

The middle and high-income groups are situated on the upper floors and have separate access systems to ensure minimal interference with the low-income group on the ground floor. Additionally, they have exclusive communal spaces located on the rooftop terraces.





# 3.6

## Unit Strategy

### Housing typologies

In each cluster, there is a mix of different income groups. All low income groups are located at the ground floor to have direct street access, as they would like to generate income, whereas the middle and higher income groups are located on the upper levels.

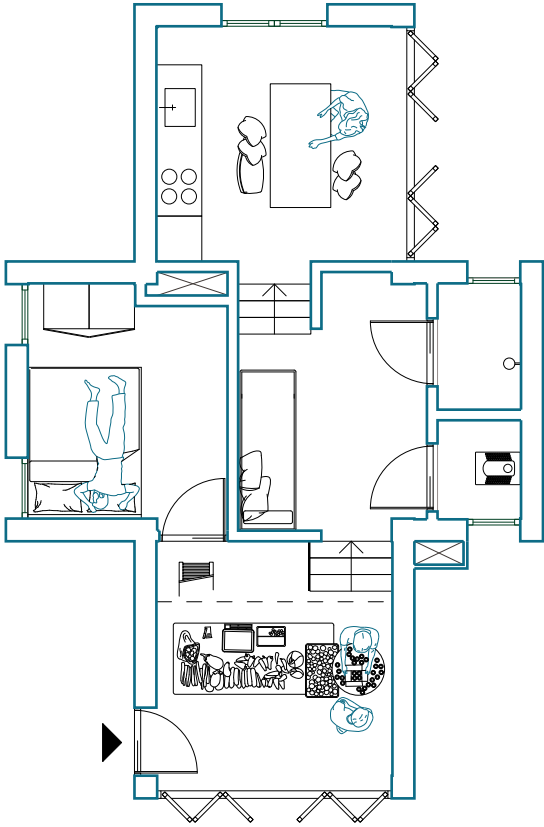
As the design is located in a warm climate in the global south, certain design principles in that area need to be taken into account. For example, natural ventilation and daylight is needed in the bathroom, so these areas should be positioned carefully. And another thing is that the kitchen is seen as an individual space where privacy is very important.

Different case studies have given me insight in housing design in Asia, and made me aware of those different design principles.

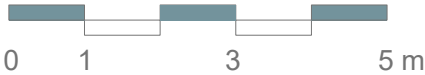
Ultimately, this led to complex shapes in my design to ensure efficient use of space within the unit and to meet the need for natural daylight and ventilation in the wet zones. A cruciform shape and a Z shape emerged as the primary configurations, interlocking to form the cluster designs.

In this paragraph, the unit typologies for each income group will be discussed.

**Low income housing**  
Cruciform shape

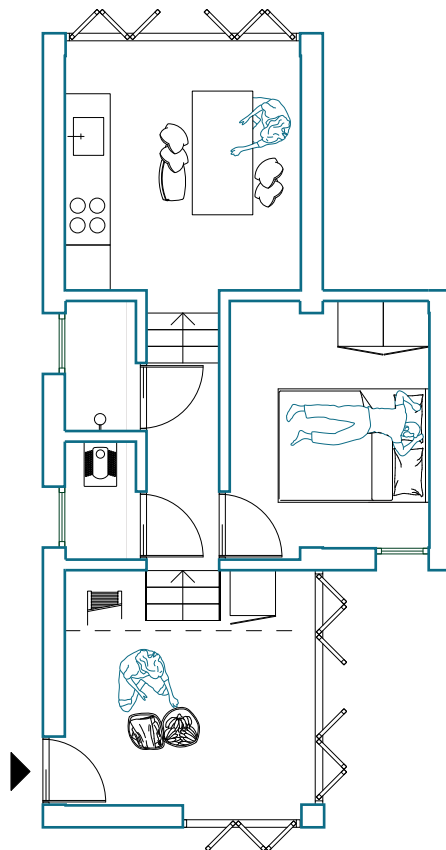


48 m<sup>2</sup>  
Shophouse  
1 bedroom

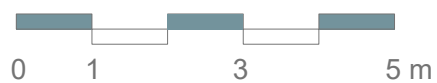


## Low income housing

Cruciform shape

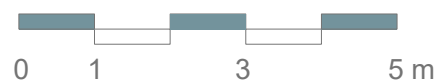
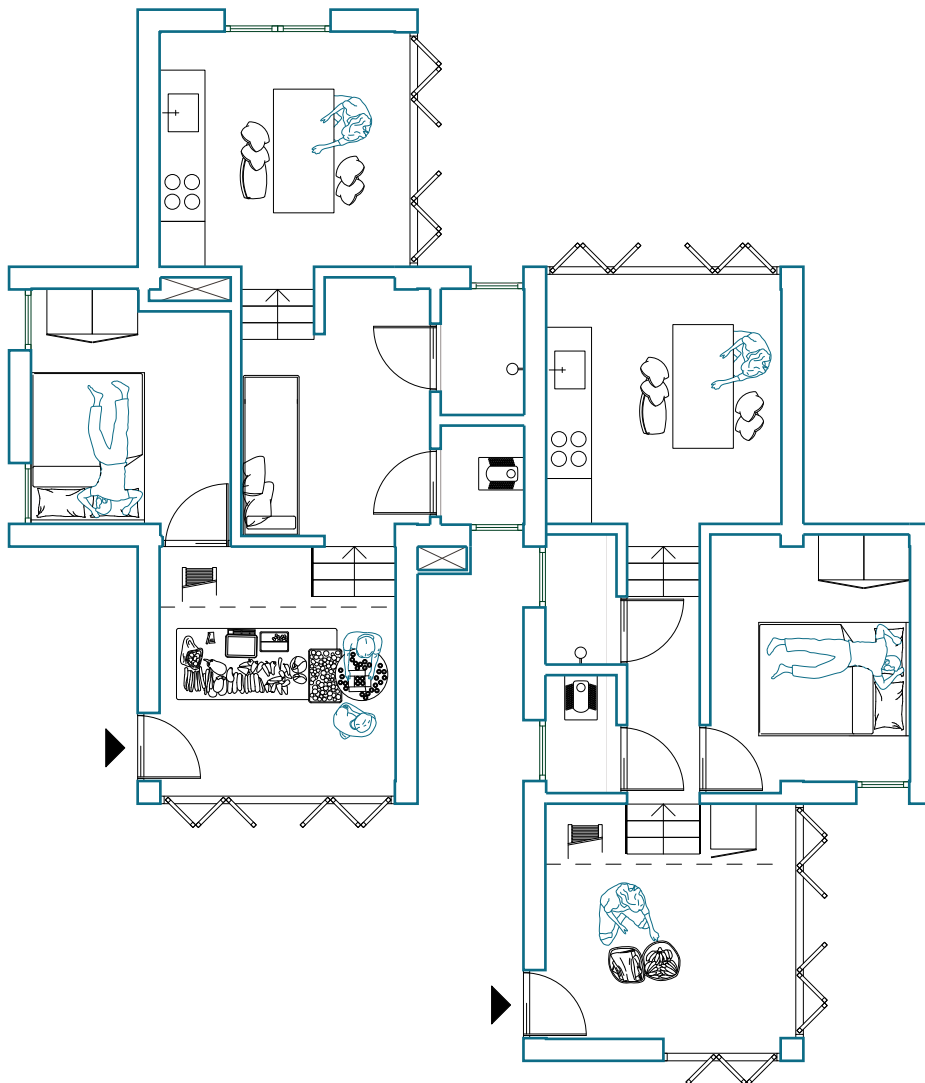


42 m<sup>2</sup>  
Shophouse  
1 bedroom



## Low income housing

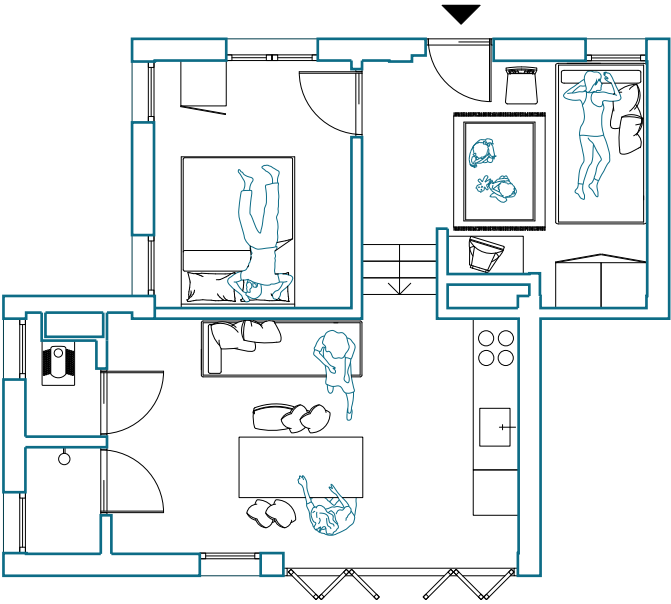
Interlocking cruciform shapes



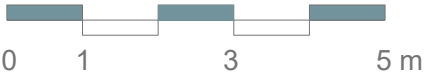




**Low income housing**  
Z shape

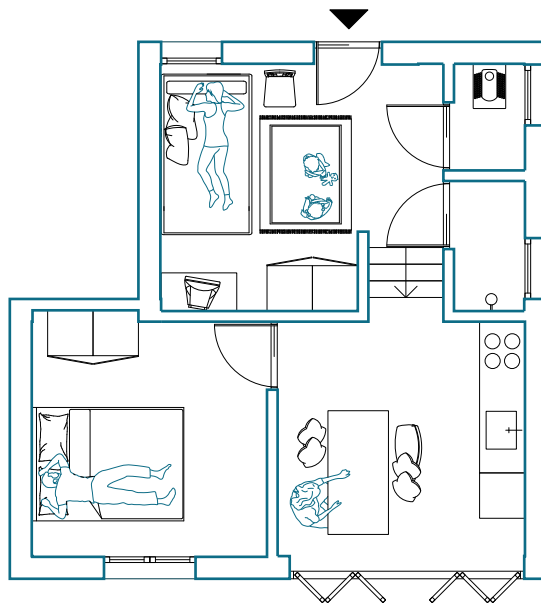


48 m<sup>2</sup>  
Extra living space  
1 bedroom

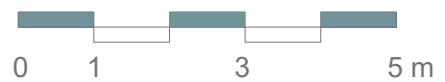


## Low income housing

Z shape

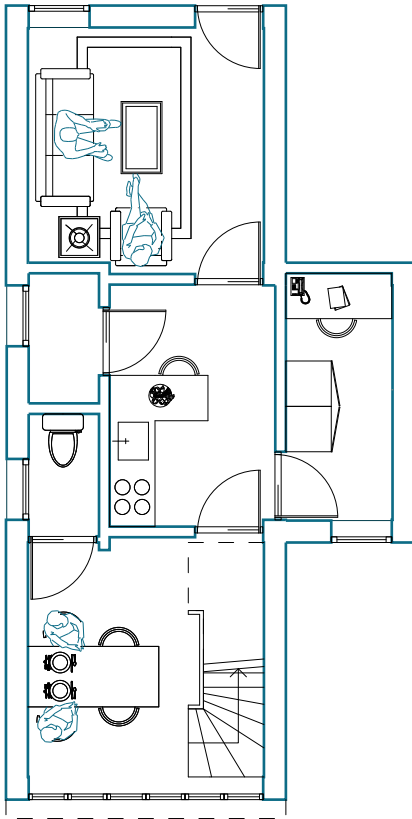


42 m<sup>2</sup>  
Extra living space  
1 bedroom

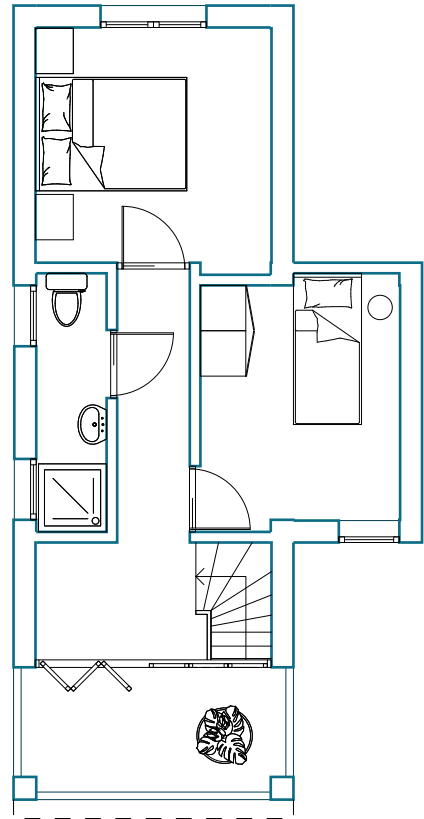


## Middle-income housing

Cruciform shape

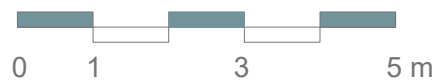


Maisonette MI-1  
Ground floor



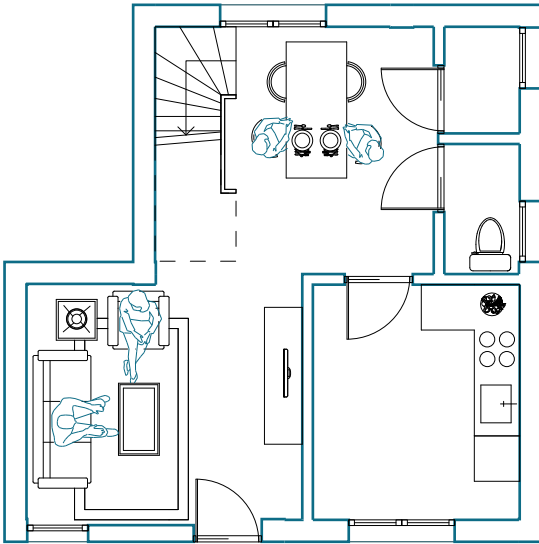
Maisonette MI-1  
1st floor

84 m<sup>2</sup>  
2 bedrooms

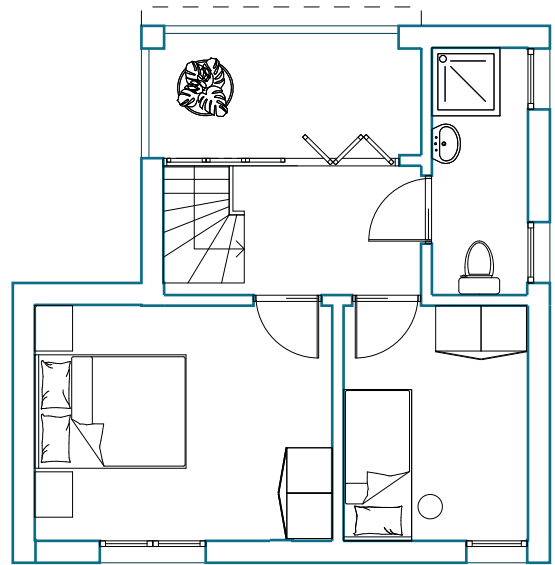


## Middle-income housing

Z shape

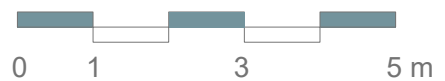


Maisonette MI-2  
Ground floor



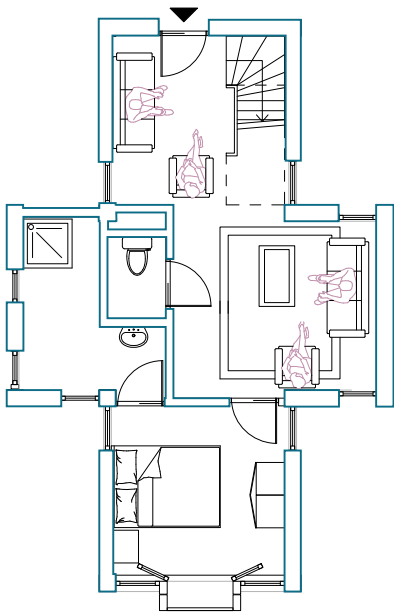
Maisonette MI-2  
1st floor

84 m<sup>2</sup>  
2 bedrooms

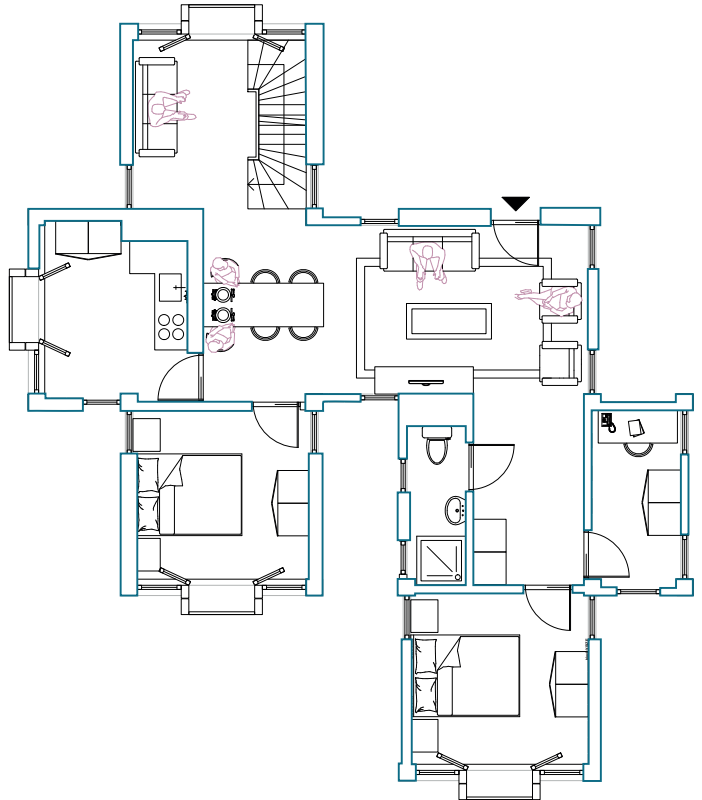


## High-income housing

Cruciform shape

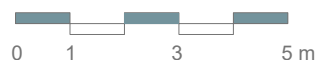


Maisonette HI-1  
Ground floor



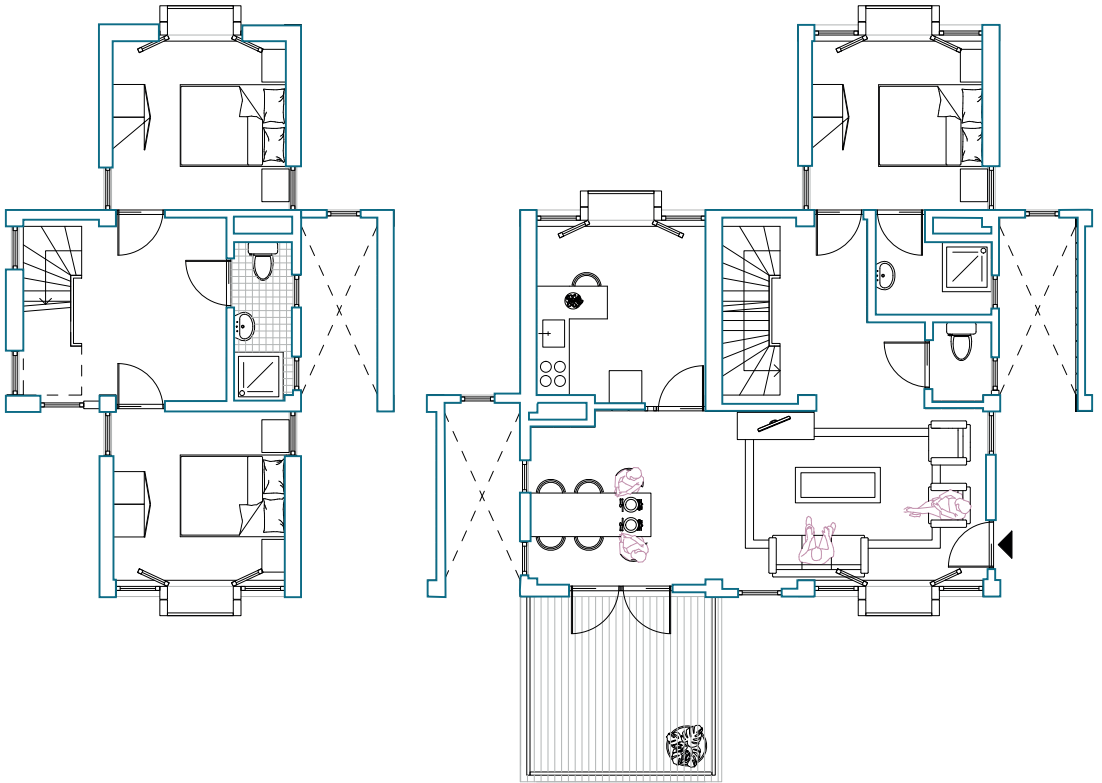
Maisonette HI-1  
1st floor

138 m<sup>2</sup>  
Extra living space  
3 bedrooms



## High-income housing

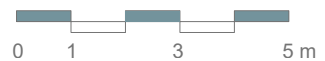
Cruciform shape



*Maisonette HI-2*  
Ground floor

*Maisonette HI-2*  
1st floor

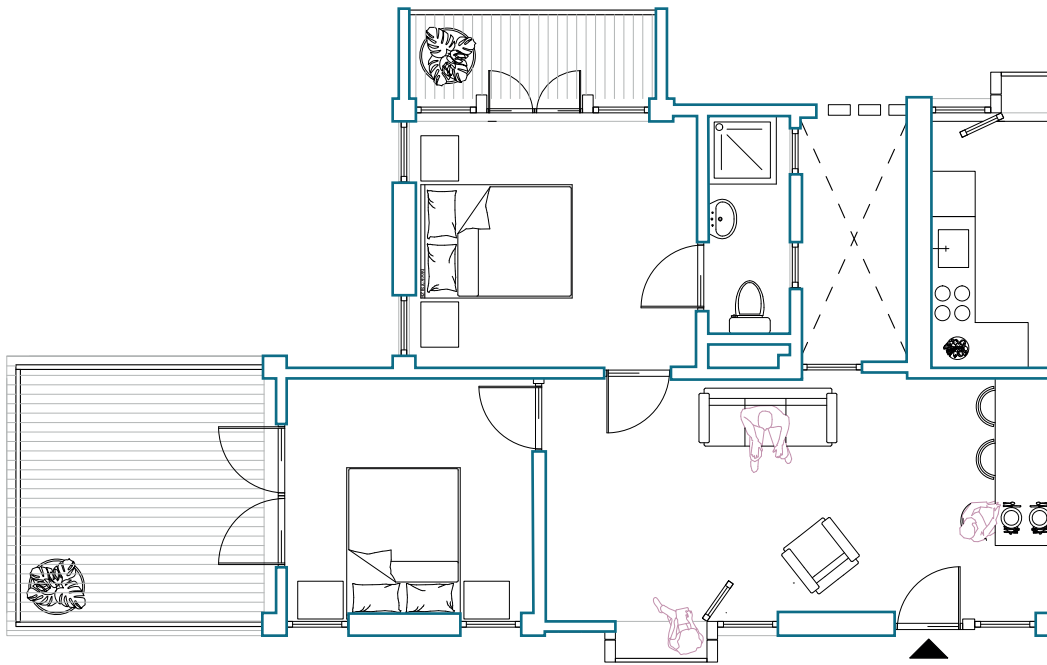
126 m<sup>2</sup>  
Outside space  
3 bedrooms





## High-income housing

Z shape



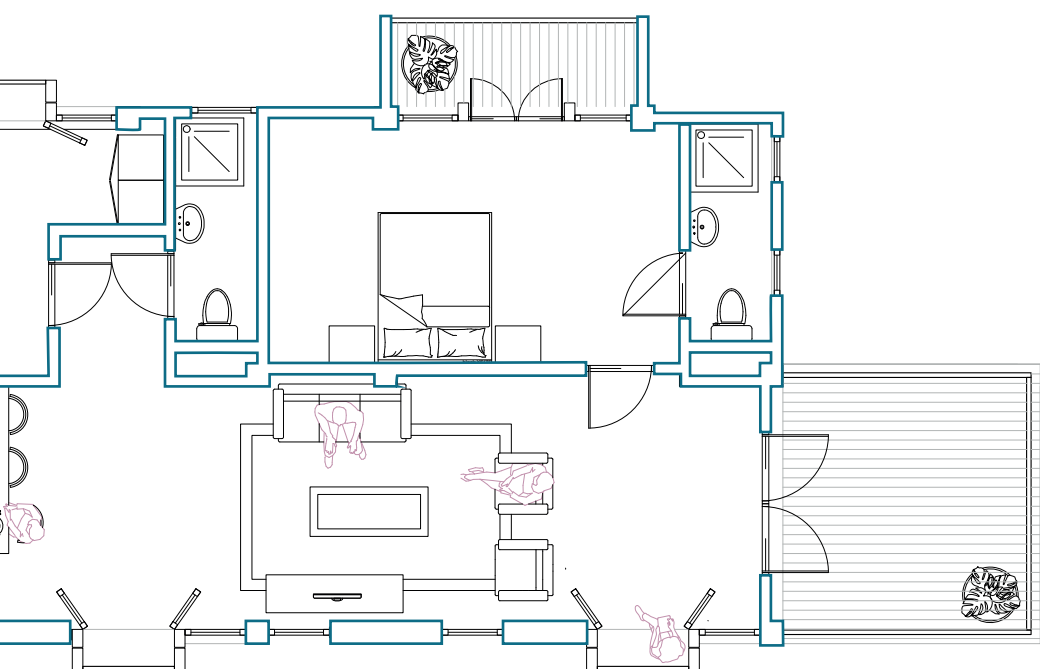
*Apartment HI*

*138 m<sup>2</sup>*

*Extra living space*

*Outside space*

*3 bedrooms*



0 1 3 5 m



# 4

## Building Technology



# 4.1

## Research

### Materials and construction

As Bangladesh has a flat topography and a dense population, it is one of the most vulnerable countries to the impacts of climate change (Shams et al, 2011). Building industries have a large impact on greenhouse gas emissions. With fired bricks as the most popular building material in Bangladesh, the building sector has a significant effect on the environment (Akhter & Mahmud, 2018).

The choice of materials significantly influences the reduction of climate change impacts caused by emissions, as it can lower the carbon footprint. Several scholars already discuss the options of alternative building materials with a lower carbon footprint, but the lack of awareness among residents about the effects of high carbon emissions from material pollution makes them hesitant to adopt alternative building materials (Shams et al, 2011). Currently, there is a preference for materials with high aesthetic value and widespread use, often imported from abroad, rather than utilizing local materials.

Given the importance of sustainability at TU Delft and its necessity for the future, this project aims to explore alternative materials instead of the commonly used concrete and fired bricks. Research has been conducted to examine various options, and this chapter will summarize the findings and explain the material

choices. The project can serve as an eye-opener for the people of Bangladesh, demonstrating that alternative materials can positively impact climate change.



## Vernacular materials

In vernacular architecture, Bangladesh utilizes natural, locally sourced materials such as wood, bamboo, and straw. Tin is often used for roofing due to its affordability and rain resistance. Mud and clay are also prevalent, especially in rural areas. Vernacular architecture is renowned for its adaptability to the environment, with designs tailored to the hot and humid climate. Features like overhangs and porches are commonly incorporated to enhance comfort and functionality.

On the right, various housing projects utilizing locally sourced materials are displayed. These examples demonstrate how Bangladeshi people construct buildings that align with the climate characteristics, embodying the principle that “form follows climate.”

**Location:** Khasia Palli,  
Nakshiorpuryi, Jaflong, Sylhet  
**Age:** 100 years



**Location:** Meduary, Bhaluka  
village in Mymensingh  
**Age:** 65 years



**Location:** Botiaghata, Khulna  
**Age:** 30 years



## Commonly used vernacular materials in Bangladesh



Mud

**Source:** from nearby land  
**Place of processing:** on building site  
**Construction period:** 6-7 months  
**Maintenance:** overlapping with mud coat on the walls once every year  
**Durability:** 20-30 years  
**Limitations:** heavy rain may cause damage and needs to be coated with mud every year  
**Transportation mode:** nil  
**Thermal conductivity\*:** 0.837 W/m K

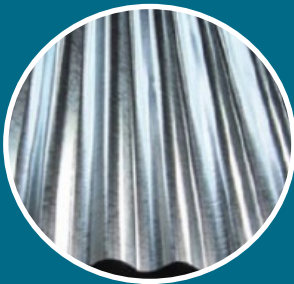
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Bamboo

**Source:** Nearby market place  
**Place of processing:** in community space or courtyard space  
**Construction period:** around 5 days  
**Maintenance:** needs to be replaced when damaged or infected  
**Durability:** 15-20 years  
**Limitations:** Require preservation and if not treated well it gets attacked by fungi  
**Transportation mode:** Rickshaw/van  
**Thermal conductivity:** 0.55-0.59 W/m K (longitudinal) and 0.39-0.43 W/m K (radial)

---



Tin

**Source:** Local Bazar  
**Place of processing:** Pre-manufactured  
**Construction period:** around 10-12 days  
**Maintenance:** Repair or replace after specific period  
**Durability:** 40-50 years  
**Limitations:** corrosion occurs easily  
**Transportation mode:** Van  
**Thermal conductivity:** 204 W/m K

---



Wood

**Source:** From self-property  
**Place of processing:** in community space  
**Construction period:** around 10-15 days  
**Maintenance:** Repair of reframe after specific period  
**Durability:** 25-35 years  
**Limitations:** Can easily rot and be impacted by woodworm  
**Transportation mode:** Boat/van  
**Thermal conductivity:** 0.14-0.19 W/m K



Nipa Palm

**Source:** Nearby market place  
**Place of processing:** courtyard of the house  
**Construction period:** around 2 days  
**Maintenance:** repair or replace after 4-5 years  
**Durability:** 4-5 years  
**Limitations:** Need skilled labors  
**Transportation mode:** Rickshaw/van  
**Thermal conductivity:** 0.066 W/m K

---



Unburnt Brick

**Source:** From land beside the house  
**Place of processing:** courtyard of the house  
**Construction period:** around 6-7 days  
**Maintenance:** overlapping with mud on the walls once every year  
**Durability:** 30-40 years  
**Limitations:** needs to be coated with mud every year  
**Transportation mode:** nil  
**Thermal conductivity:** 0.837 W/m K

---



Straw/thatch

**Source:** from self-property  
**Place of processing:** at home/in courtyard  
**Construction period:** around 1-2 days  
**Maintenance:** repair or replace after 1-2 years  
**Durability:** 1-2 years  
**Limitations:** need skilled labors, need to maintain properly  
**Transportation mode:** not needed  
**Thermal conductivity:** 0.066 W/m K

---

\*The lower the thermal conductivity, the greater the thermal resistance, which means materials with lower thermal conductivity will have better building performance



## **Sustainability**

### Alternative building materials

The production of building materials for the urban area of Bangladesh, mainly involves the production of concrete and clay fired bricks. With around 7,000 brick kilns active in Bangladesh (Cullen, 2020), brick is one of the most popular building materials in Bangladesh. As Bangladeshi people are reluctant to any new innovative materials, it is difficult to introduce new materials on the market.

Brick production relies on coal and wood as fuel for the firing phase, releasing large quantities of carbon dioxide into the atmosphere and contributing to air pollution and health issues among the local population. Additionally, working conditions in brick kilns are often poor. The use of agricultural topsoil for fired bricks depletes fertile land, prompting rural migrants to move to urban areas. This creates a vicious cycle where increasing urban populations drive greater demand for building materials like bricks.

The following pages will detail the brick-making process in Bangladesh step by step, highlighting its harmful impacts and encouraging consideration of alternative building materials.



## Brick-making process



The alluvial deposits and silt come from the Himalayas carried downstream by rivers during monsoon season

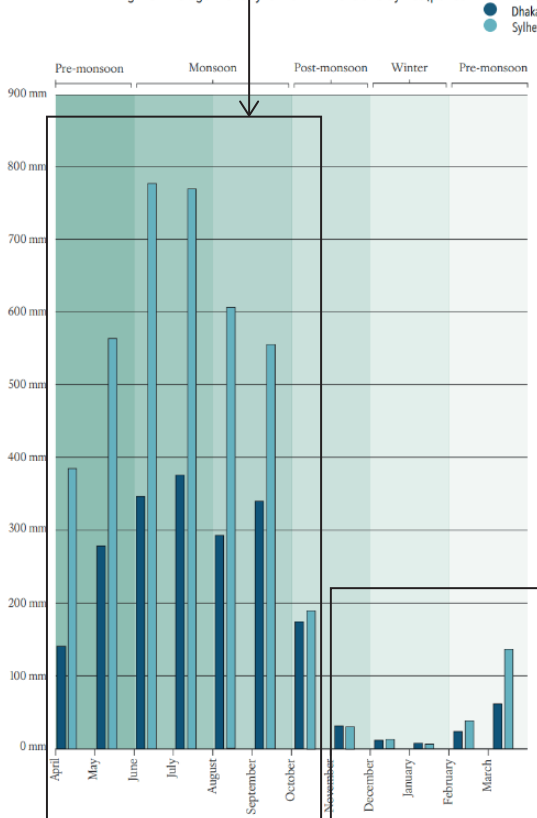
80% of the soils in Bangladesh are alluvial deposits from rivers

**Collecting clay-rich soils from rivers**

Soils fertil

Remov

Fig. 26: Average monthly rainfall in Dhaka and Sylhet (period 1981-2010)



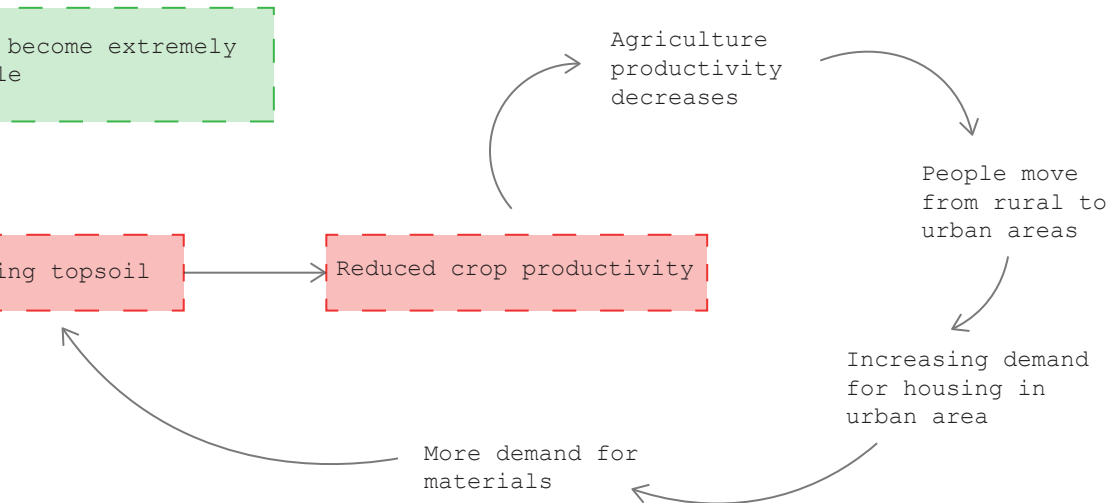
Brick price increase during wet season (economical advantage)

Increased depth of waterways, enabling smooth passage of boats with bricks towards urban area

Wind, rain and air help to homogenize the clay

Brick kilns only operate in dry season due to:

- Frequent rains
- High atmospheric humidity
- Reduced sunlight affecting the drying and firing of bricks



### Preparing clay

Adding sand for  
plasticity and  
workability by  
hand



### Pressing clay into molds

Done by hand



### Sun drying

Dependent on dry  
season (november  
- february)



### Brick kilns

7,759 active brick kilns

Produce 34 billion bricks annually

Expected demand:  
60 billion bricks annually  
(Cullen, 2020)

Workers are exposed to the red dust, which causes bronchitis and irritates the eyes and throat



Particulates from the brick fields constitute an estimated 30 to 40 percent of ambient PM2.5 pollution over the Dhaka Metropolitan Area (Cullen, 2020)



### Firing

Heat imparts strength and hardness to the brick, into a durable weather resistant form



### Cooling

After firing the bricks are cooled



### Brick grading

Evenness of firing  
Color  
Strength  
Cracks/breaks

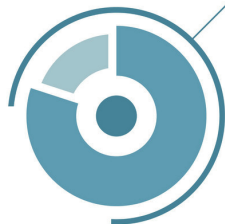




Workers earn according to how many bricks they produce or carry. For fast worker, a week's salary may be around 1500 taka

Millions of workers are unemployed during the remaining five to six wet months

80%



### Used as building material

80% of the bricks are of good quality and used as building material

20%

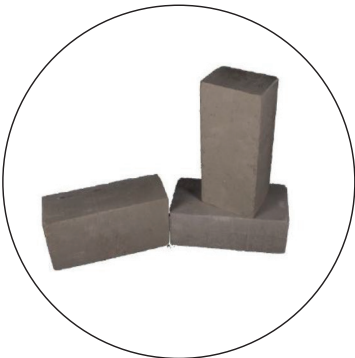


### Used in road construction

Overfired bricks are broken into small pieces called pickets and used in road construction

**Alternative building materials**

**Compressed Stabilized Earth Block (CSEB)**



**Interlocking CSEB**



**Sand Cement Hollow Block**

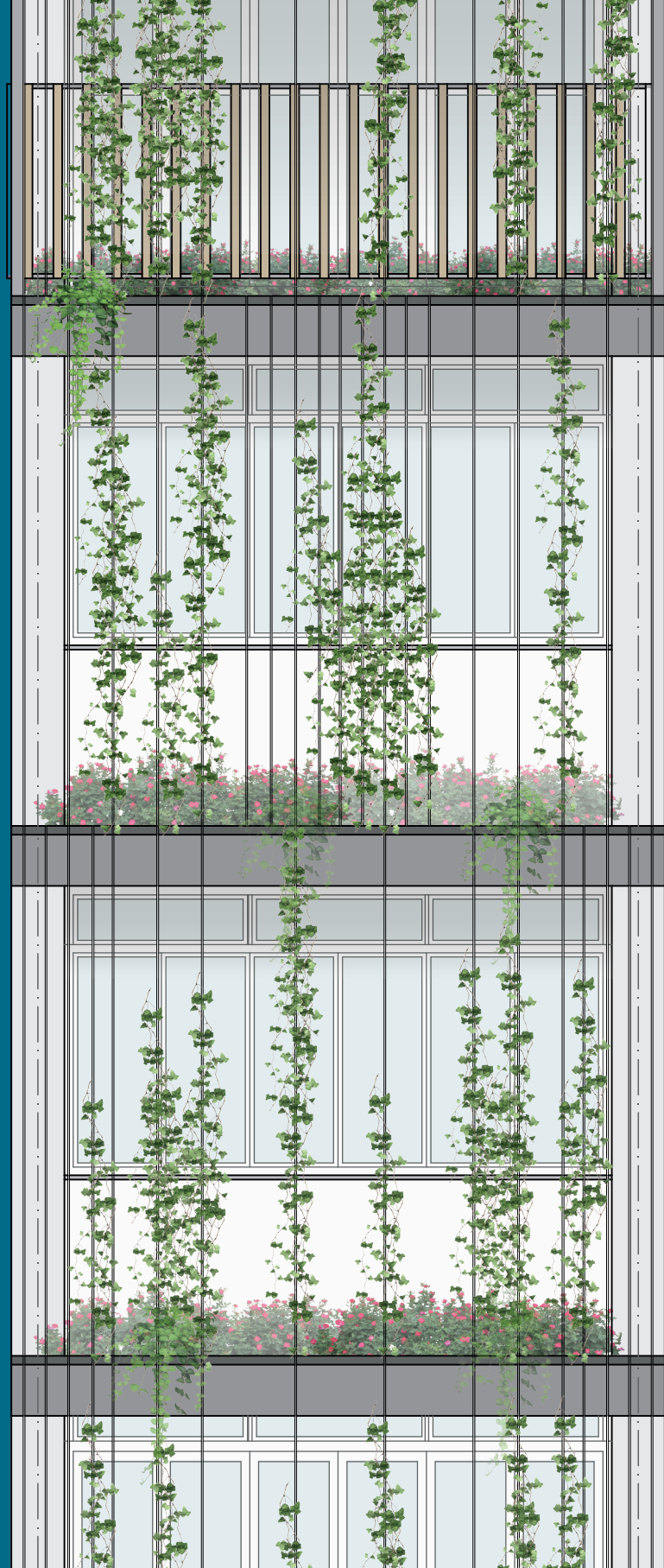


**Thermal Block**









# 4.2

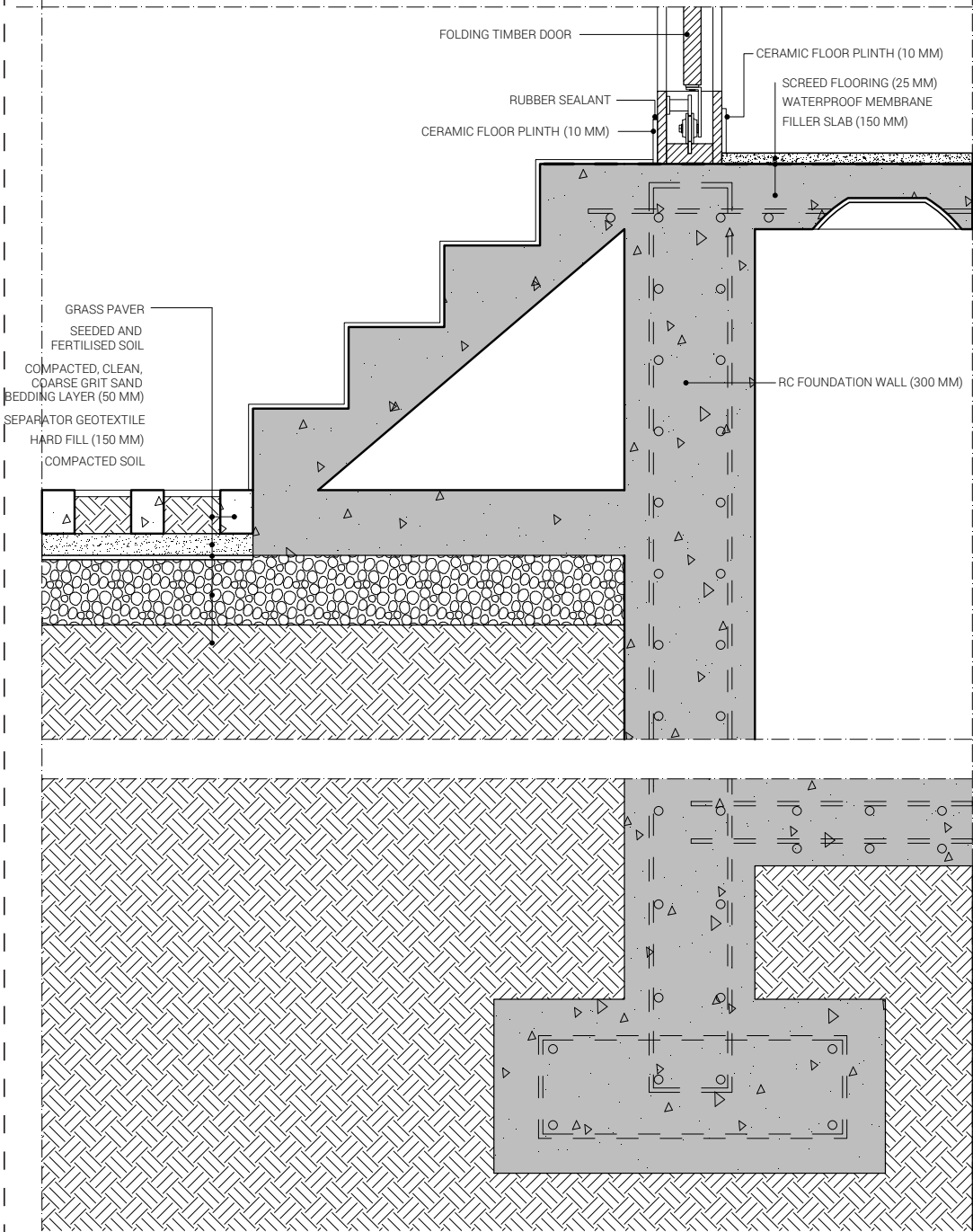
## Facade design Fragment 1:50 and details 1:10



# Ground connection

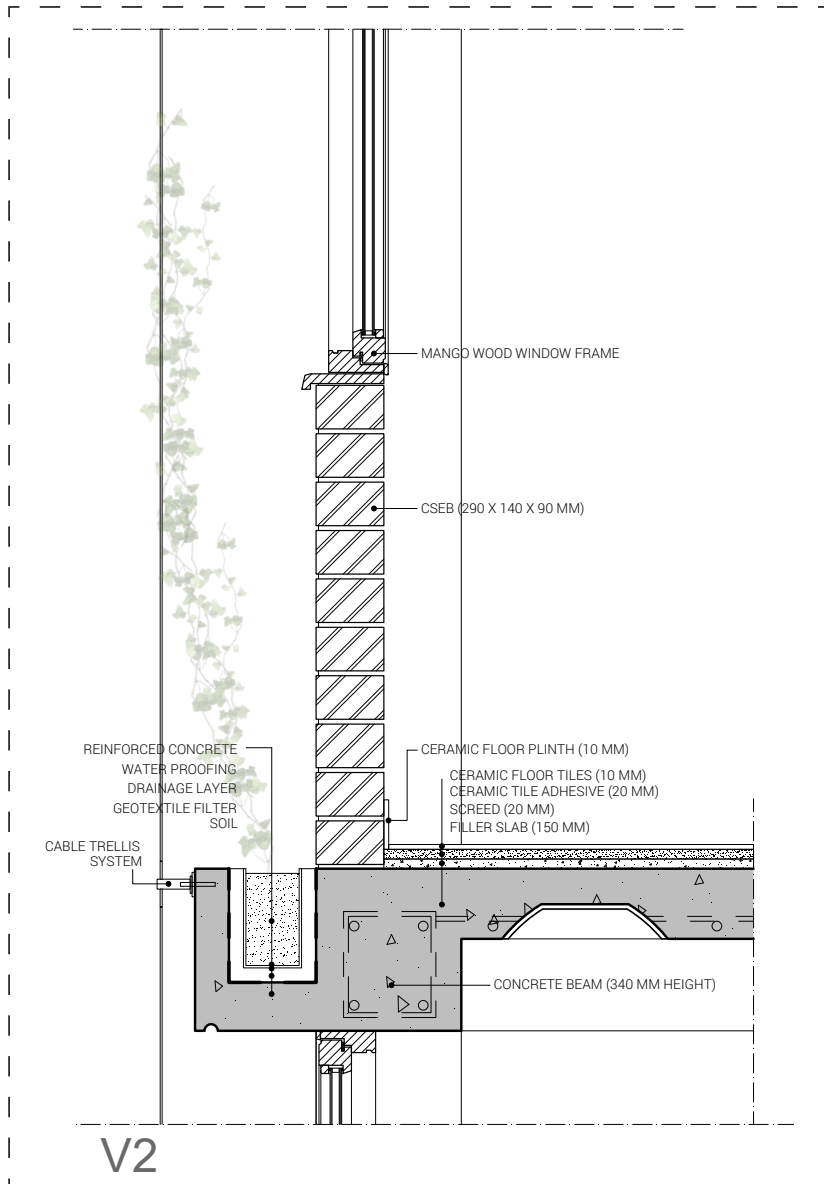
Detail 1:10

V1



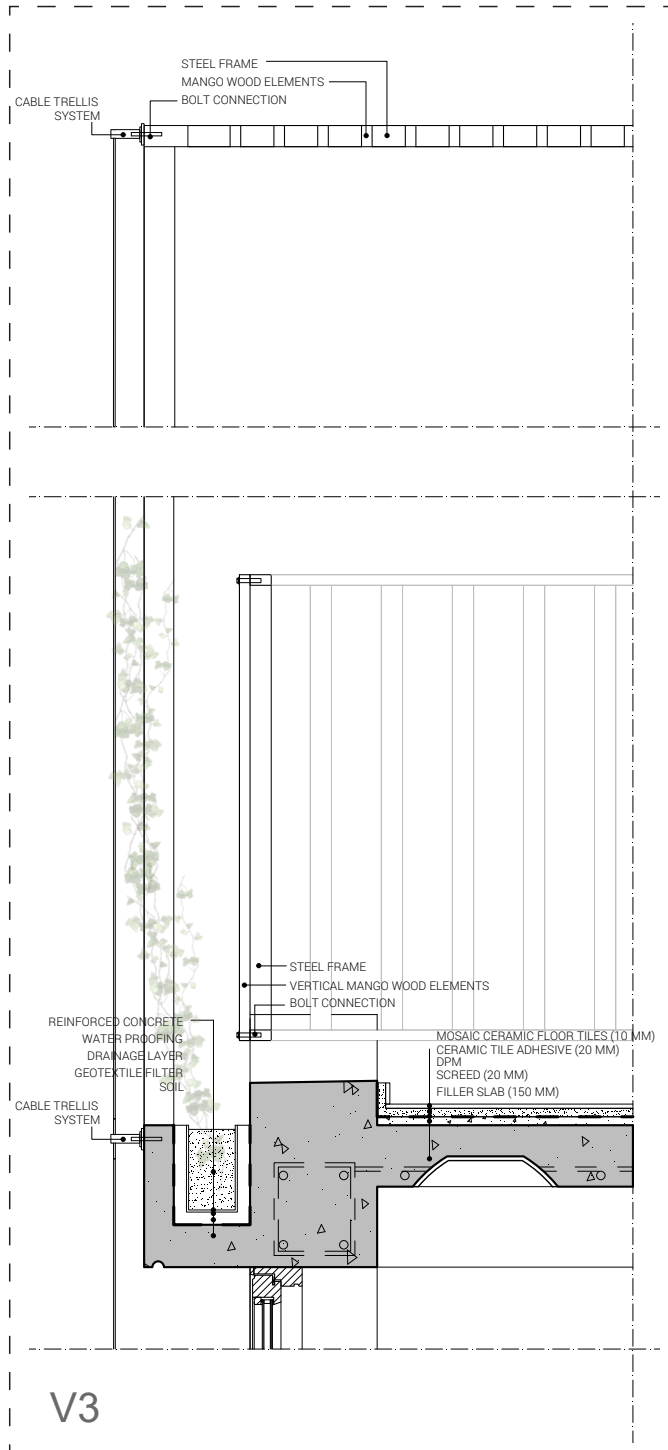
# Floor connection

Detail 1:10



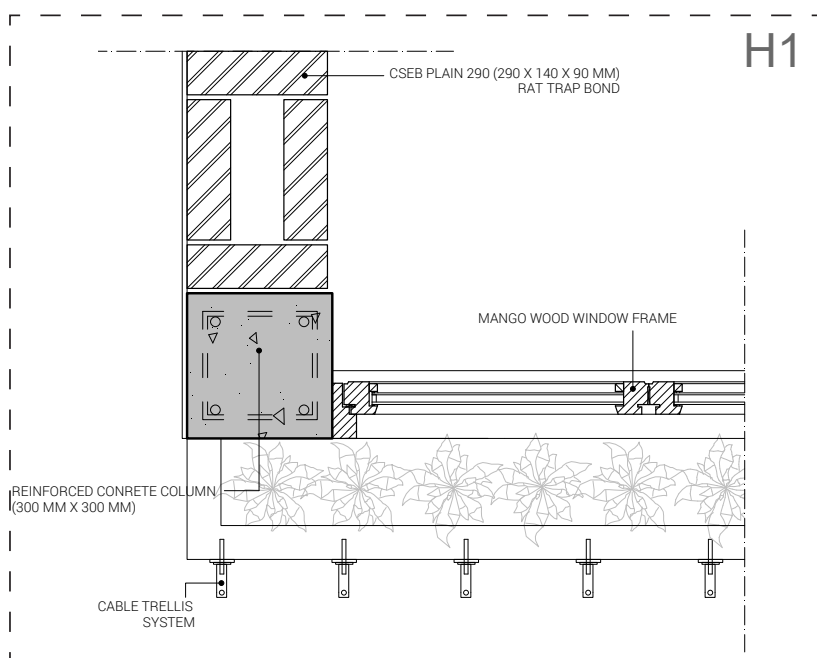
# Roof connection

Detail 1:10

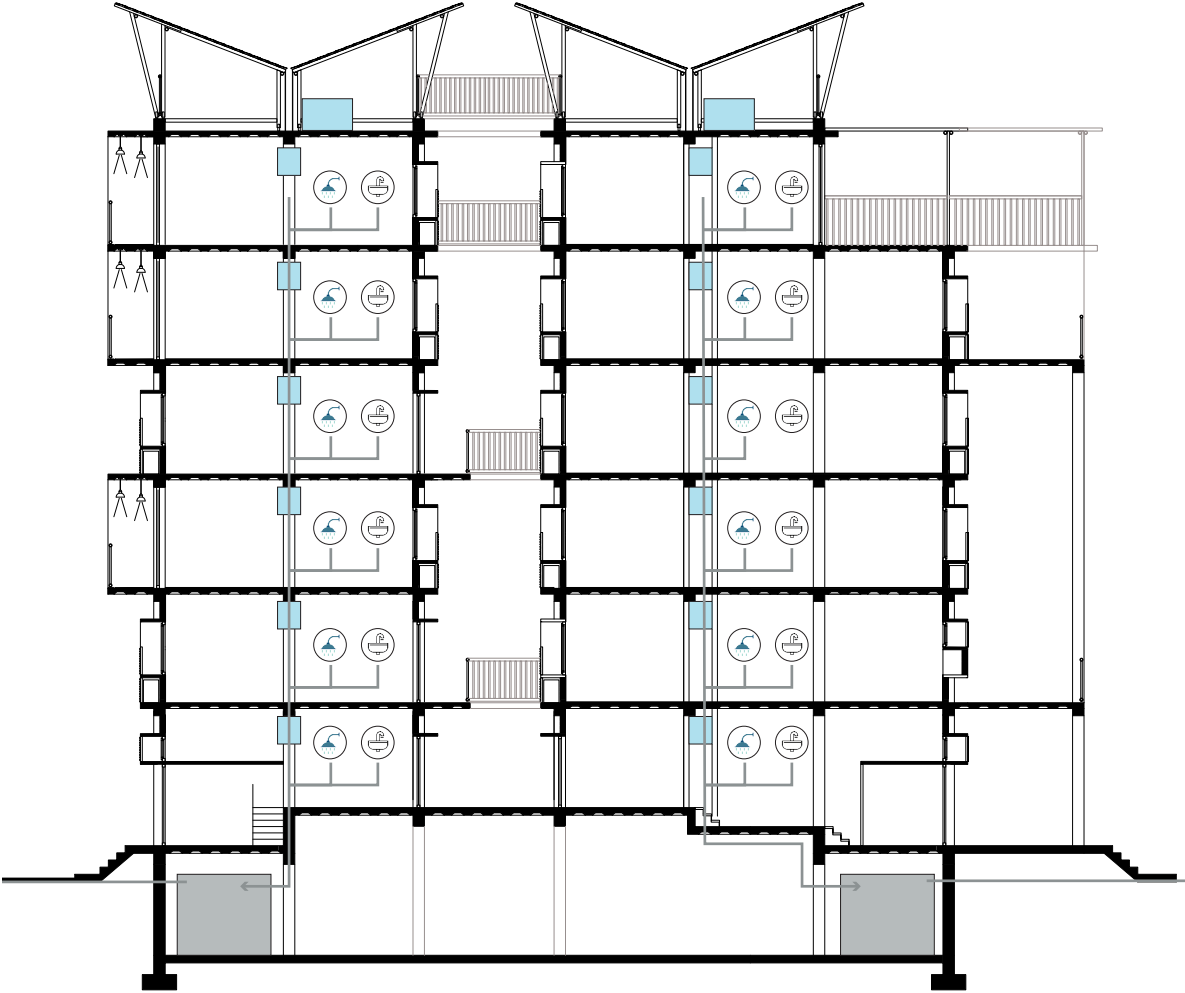


# Cable trellis system

Detail 1:10







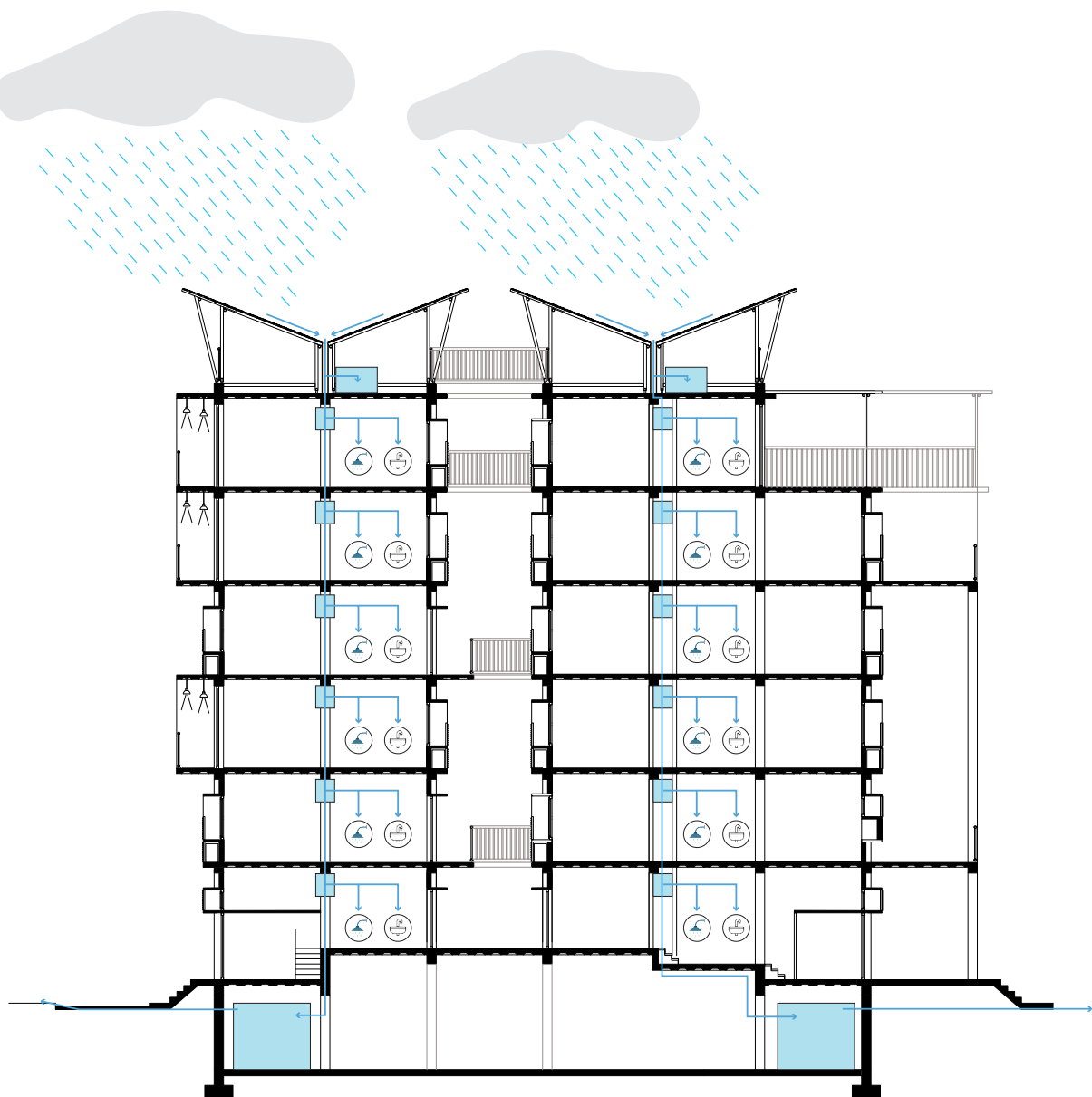
# 4.3

## Water management

### Water treatment and water reuse system

Water used in the building will be collected and treated within the urban system. A collective septic tank located underground in the parking garage will separate solids from liquids in the wastewater. The liquids will then flow to constructed wetlands in the urban design, where the water will be treated. Height differences in the urban design will allow water to flow to the constructed wetlands, which are located at the lowest points. This treatment system ensures the water is clean before infiltrating the groundwater, preventing groundwater pollution and stopping wastewater from being directly dumped into natural waterbodies like the urban pond, which is a current issue.

This system also serves as an educational tool for residents, highlighting the importance of water treatment. It underscores the necessity of using waterbodies as reservoirs during heavy rainfall instead of dumping grounds, which diminishes their ability to function as reservoirs. Implementing this system introduces a cleaning step between water use and exposure to the ground aquifer, thus preventing groundwater pollution during droughts.



## **Water reuse system**

During the monsoon season, Sylhet experiences excessive rainfall, which can be reused for showering and toilet flushing in buildings, accounting for 17-18% of a family's water use (Abedin & Rakib, 2013). Reusing rainwater reduces reliance on municipal water, thereby conserving potable water.

Rainwater will be collected in a large tank on the ground floor, with smaller tanks provided on each floor for individual living units to minimize the energy required for pumping. Water will be periodically pumped to upper levels. During peak rainfall months, any overflow from these tanks will be directed to the urban plan's water treatment system, where it can be recharged into the groundwater.



# 5

## Reflection



## **Problem**

Currently, Bangladesh is facing challenges in the production of affordable housing because of the rapid urbanization which is a global phenomenon. The majority of this urbanization is occurring in the Global South, and it poses one of the most significant challenges of the 21st century (UNDESA, 2019). Rural residents migrate to urban areas in search for job opportunities and improved living standards, while the consequences of climate change also contribute to the influx of climate migrants relocating to cities (Correa, 1989) (Fig. 1). As housing policies in Bangladesh are not paying enough attention to social housing, developers prioritize middle and high-income housing to maximize profits. Local governments are lagging in their efforts to provide affordable housing initiatives, resulting in low-income communities being forced to reside in slums with inadequate facilities and no assurance of tenure security (Smets et al, 2014). Nevertheless, the government does focus on slum rehabilitation efforts. However, those are located far away from their workplaces in the city, and the living conditions remain poor, exemplified by overcrowded dwellings, inadequate ventilation and natural light, and a lack of sufficient public space (Farzana, 2020). The concept of housing affordability often revolves solely around economic feasibility, neglecting other crucial factors like sustainability and the quality.

In Bangladesh, housing is recognized as one of the constitutional rights, imposing a duty on the state to refrain from actions that harm the life, body, and property of any individual (Farzana, 2020). This conflicts with the state's past efforts to evict slums.

The lack of attention to public space in Sylhet is a growing concern, which causes increased segregation (Cornea et al, 2016).

Furthermore, the escalating concern of climate change is evident as the world witnesses more frequent extreme climatic events, including storms, flooding, and extreme temperatures (Priovashini and Mallick, 2022). In Sylhet, the biggest concern is the extreme rainfall during the monsoon season, followed by the dry months. With its low-lying geography and close proximity of Cherrapunji (the wettest place on earth), Sylhet faces heightened vulnerability to climate change impacts. Hence, future housing initiatives must account for the substantial rainfall and its consequential impacts, as well as the dry spells, while also addressing social factors and enhancing the quality of the living environment.

## **Significance of site**

The design location, Laladighir, is located at an urban pond in the urban area of Sylhet. Those waterbodies play a diverse and critical role in the urban areas of Bangladesh, since they are not just sources of water. They also provide urban land and communal spaces and serve as cultural and small-scale aquaculture sites for the middle class and are essential for daily tasks for the less privileged (Cornea et al, 2016). However, due to the rapid urbanization, urban ponds are at risk of being filled up to make way for new housing developments.

Given that urban ponds offer public

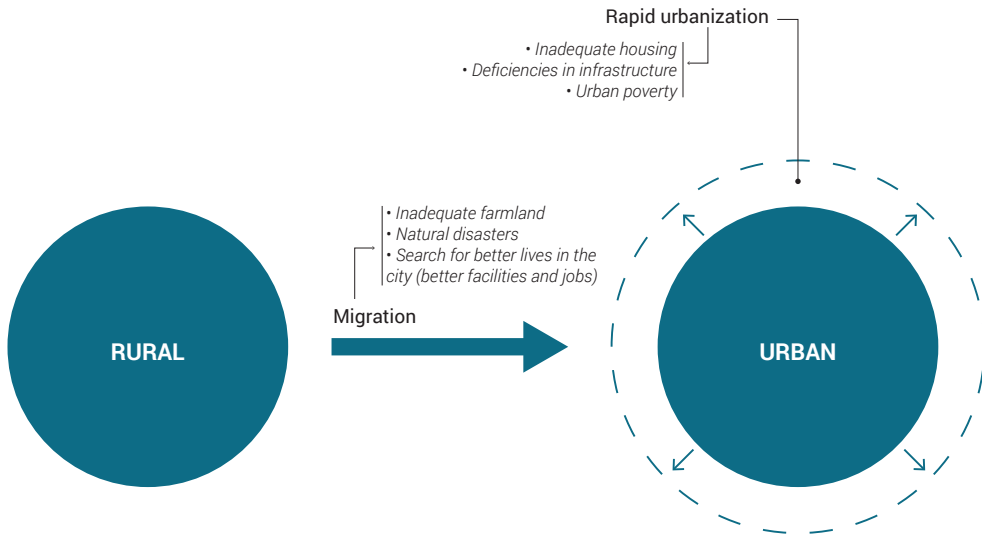


Fig. 1: Rural to urban migration  
Source: Own infographic

spaces and contribute positively to water management, it is imperative to appreciate and prioritize these urban waterbodies in the design process.

Besides, the design location is situated in a diverse environment, encompassing various cultural and income groups. The area is inhabited by both Muslim and Manipuri communities, with one Muslim group residing in an informal settlement located on the designated plot for the design. Therefore, it is a compelling location to promote inclusivity. By looking at the different design concerns of each target group, it becomes feasible to design a cohesive and vibrant housing project, where diverse social groups coexist harmoniously.

### **Goal**

The goal of the Master studio Global Housing is to address the current challenges in the production of affordable housing in Bangladesh, and to come

up with a housing design project which tackles this challenges.

Addressing the challenge of increased segregation requires designing solutions that respond to the complexities mentioned earlier, aiming to create sustainable communities where people are eager to reside and work, both now and in the future. Such efforts align with the Sustainable Development Goal to "make cities and human settlements inclusive, safe, resilient and sustainable" for the year 2031 (Farzana, 2020).

In my design, the aim is to create an inclusive living environment within a densely populated urban area, seeking to address the prevalent issue of marginalization faced by the poorest urban dwellers in the current context. I focused on the different concerns of the social groups inhabiting the area, considering both cultural and social aspects, to come up with a design concept where all these groups can coexist. It also investigates how the urban

pond's location can be utilized as a focal point to foster inclusivity. At the same time, the design should take into account the excessive rainfall during the monsoon season and the consequences of this for the future.

**The relation between your graduation project topic, your master track (A, U, BT, LA, MBE), and your master programme (MSc AUBS)**

In my MSc AUBS program, which focuses on sustainable development through innovative architecture, the concept of sustainable architecture involves intelligent design principles that minimize harmful effects on ecosystems and communities, contributing to the durability of structures.

The Architecture master track within this program emphasizes this sustainable approach, encouraging students to tackle technical, social, and spatial challenges in the built environment through creative and innovative building projects.

The studio topic closely aligns with both the master track and program objectives, as it delves into ways architecture can contribute to a society transitioning to a new ecological paradigm. The emphasis on designing meaningful spaces for populations in transition, considering typology, materials, and technology, mirrors the principles embedded in the master track program.

My graduation topic seamlessly integrates



Fig. 2 :Woman doing dishes at the Laladighir Pond, Sylhet  
Source: Own photograph

with these aspects by investigating the technical, social, and spatial challenges specific to the assigned location in Bangladesh. Through in-depth research into different demographic groups and their lifestyles, I aim to incorporate contemporary social challenges into my design concept. Furthermore, understanding the climate characteristics and the consequences of climate change in Bangladesh allows me to explore innovative design concepts with a technological focus, such as water treatment systems. By leveraging this knowledge gained through research, my goal is to propose a new approach that fosters an inclusive environment, where diverse groups coexist within a well-developed spatial design and the design decisions on the urban and building scale responds to the extreme climatic events.

### ***Method and approach***

The graduation process started with an in-studio literature review delving into the broader context of urbanization in the Global South and its effects, as well as the impacts of climate change to migration and climate adaptation. It also focused on the more localized perspective of vernacular housing and indigenous housing and settlement patterns, aiming to gain insights into the daily lives of the people residing there. As a group, we continued doing research on aspects such as geography, topography, climate, history, politics, economy, design, and technology. Collectively, we collected all the findings in an extensive research booklet, which we carried along during our field trip to Bangladesh.

The second phase after the collective research period was the field trip to Dhaka and Sylhet. This gave us the opportunity to observe the actual way of life in both the rural and urban areas. With the studio group, we explored various design sites, ranging from wetlands to peri-urban and urban areas. Our visits to multiple informal settlements have provided me with insight into the inadequate living conditions experienced by their residents. I consider the field trip as one of the most important research tools, as witnessing the living conditions, especially for the urban poorest dwellers, significantly influenced my design concepts.

Additionally, interviews conducted at the designated design site, Laladighir pond, with both the local councilor and neighborhood residents, provided invaluable insights into community aspirations for the future. These interactions highlighted the importance of urban ponds in facilitating social activities, which is a crucial element for fostering an inclusive and healthy environment. These interviews serve as valuable sources of qualitative data and provide a genuine representation of the aspirations of the local community.

After choosing a specific design location, physical exploration has been done by on-site investigations, which includes walking, documenting, and making visual records such as photographs, videos and sketches. This method offered a tangible understanding of the immediate environment of the chosen site. Furthermore, ethnographical observations are conducted to understand the social and cultural practices of residents within

the site.

Following the field trip, I refined my research question and focused on further literature reviews to enhance my understanding of the diverse social and cultural groups within Sylhet. Additionally, I explored the significance of urban ponds in the region, particularly in light of worsening climate change impacts. During this phase, I encountered case studies like the City of 1,000 Tanks water balance project led by Ooze Architects, which offered insights into innovative urban solutions for cities like Chennai.

### **Relationship between research and design**

During the period from P2 until P5, there was a cyclical process of alternating between research and design. First, I had to come up with a masterplan and floorplan design for a housing unit in a hot and humid climate, in the global south. To inform my design approach and understand cultural values, I extensively studied the works of Indian architects such as Charles Correa, Balkrishna Doshi and Sameep Padora. I was fascinated by Charles Correa's visionary approach and his emphasis on designing architecture deeply rooted in local cultures. His focus was on reintroducing outdoor spaces and terraces as integral elements of his style. Statements such as: "People starve not because they don't know how to cook - but because they are denied the necessary ingredients." (Correa, 1999) inspired me to come up with a design which is more than just a shelter space, but actually a place where people want to live, do their social activities and meet each other in

an inclusive and healthy environment. Studying the work of Charles Correa and other Indian architects equipped me with a valuable toolkit of knowledge to create enriching living environments, both for the lower income groups and the higher income groups. A key take-away is that "the room (the box) is only one element in a whole system of spaces which a family needs in order to live in a city" (Correa, 1983).

Additionally, literature review was conducted to comprehend the design considerations of various cultural groups. It was notable that both the Manipuri and Muslim communities have distinct concerns. Privacy between men and women is highly valued by the Muslim community, whereas the Manipuri community places great importance on communal cohesion, expressing a desire for a dedicated community temple area to celebrate festivals.

As I designed the masterplan following architectural research, my focus turned to utilizing the design plot to link the cricket field and the urban pond, which are two prominent public spaces in the area. Initially, I envisioned connecting them by introducing a smaller pond at the center of the urban plan. However, during feedback sessions with my building technology tutor, I recognized the potential for more extensive water management integration, given Bangladesh's susceptibility to heavy rainfall during the monsoon season. This prompted me to conduct a literature review on water treatment and water reuse systems, aiming to develop a project that addresses water overflow on both

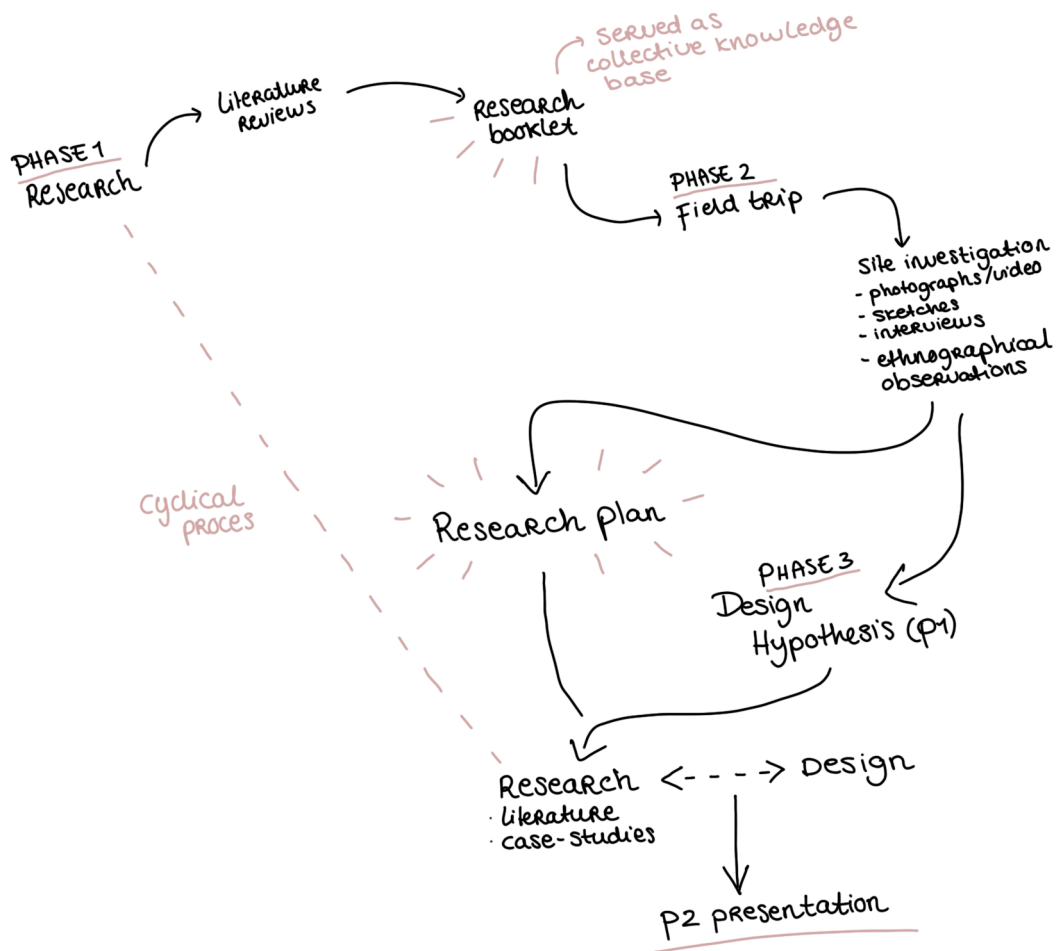


Fig. 3 :Workflow towards the P2



architectural and urban scales.

By doing so, I have developed a new urban design concept, with water management as a central theme of my graduation project.

Since Bangladesh is experiencing rapid urban growth, the production of housing lags behind the demand, especially for the lower income groups (Smets et al, 2014). There is inadequate political attention to the financing of social housing by governments, which asks for special attention to the managerial strategy of this project since an informal settlement is part of it. I studied multiple managerial strategies on slum development, such as slum clearance, slum upgrading and slum redevelopment. By doing so, I gained insight into the different managerial strategies and their consequences. An important finding is that the enabling paradigm prompted the state government to decentralize and privatize slum redevelopment, which enabled slum dwellers, NGOs, and the for-profit private sector to engage in the management and implementation of these projects (Mukhija, 2003). This makes it financially viable for to cross-subsidize housing for slum dwellers, which makes it attractive for project developer as they might get greater profits out of the projects. It could be argued that applying the slum redevelopment strategy to the designated design plot would be advantageous, given its location near an urban pond which is a significant public space. This slum is adjacent to areas with high property values, creating a substantial financial incentive for redevelopment due to the considerable increase in land value that would result after.

Throughout the graduation process, there were moments when I felt uncertain about the strength of my design concepts and worried that I was lagging behind. However, my mentor and other tutors consistently supported me, encouraging me to persist and reminding me that design is an iterative journey. They emphasized that with a solid foundation of knowledge gained from literature research and case studies, a cohesive design would eventually emerge.

In the weeks leading up to the P5 presentation, my focus will be on addressing the human aspects of the project (Fig. 4). One of the challenges I face is effectively communicating the narrative of my graduation journey along with the technical details to an who have not seen my work before. It is crucial to craft a compelling narrative and embrace the role of a storyteller to humanize my project. To provide insight into the atmosphere of Bangladesh for those who have not experienced it firsthand, I plan to use tools such as models and drawings. Furthermore, given the complexity of my design concept, I recognize the importance of stepping back to create clear and informative diagrams that will guide my story through the presentation.

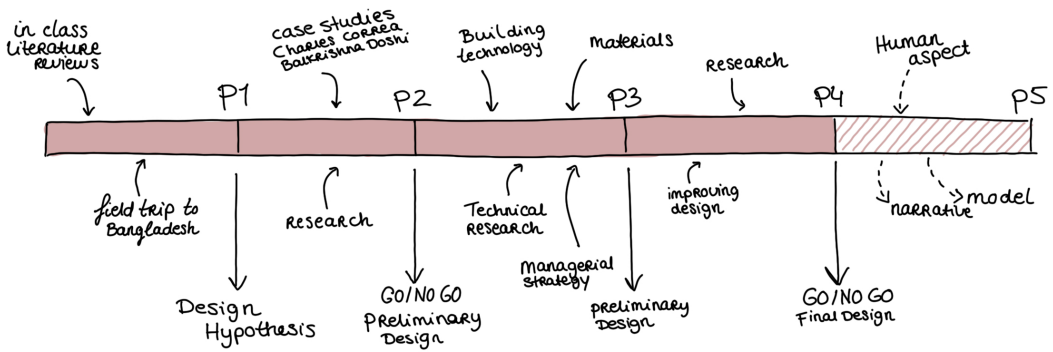


Fig. 4: Timeline of graduation process

### **Relationship to wider context**

This project is not a one-time initiative. Several other locations in Sylhet share similar characteristics, such as proximity to urban ponds and informal settlements. To prevent the displacement of slum dwellers, my design project aims for inclusivity. This approach demonstrates the potential to integrate various typologies into a single housing project, using public space as a unifying element. By implementing cross-subsidization, the government can gain insights into the economic sustainability of the project and recognize the financial incentives for redevelopment due to the resulting increase in land value. Moreover, integrating a water treatment system by using constructed wetlands and the presence of an urban waterbody, will

highlight the significance of urban ponds for water management and addressing future climate hazards due to climate change. In this way, this project could act as a pilot initiative for other areas situated near urban ponds, working to safeguard these vital water bodies from the threats posed by rapid urbanization.

Beyond its local importance, the research carries global relevance in the face of widespread urbanization and climate change challenges. The issues faced by Sylhet are emblematic of the struggles many urban areas encounter worldwide. Rapid urbanization and climate change are universal phenomena that demand innovative and sustainable solutions. The neglect of adequate public space, a common consequence of rapid urban

expansion, is a shared concern among cities globally.

Rapid urbanization is a global phenomenon, and it poses one of the most significant challenges of the 21st century. According to the United Nations estimates, the proportion of the world's population residing in urban areas increased from about 20% in 1910 to 51.7 % in 2010, with a projected further increase to 68.4% by 2050 (UNDESA, 2019). The majority of this urbanization is occurring in the Global South. Looking ahead, the global urban population is anticipated to grow by approximately 793 million people from 2015 to 2025, with an overwhelming 93.9% of this increase concentrated in the Global South (UNDESA, 2019). This rapid urbanization underscores the urgent need for comprehensive strategies to address the associated challenges and foster sustainable development (Smit, 2021). As urban areas grow and populations

increase, the pressure on urban resources, public spaces, and community well-being intensifies.

Furthermore, the escalating concern of climate change is evident as the world witnesses more frequent extreme climatic events, including storms, flooding, and extreme temperatures. The global South, with its low-lying geography, high population density, limited resource access, lack of preparedness, and insufficient infrastructure for coping strategies, faces heightened vulnerability to climate change impacts (Roy, 2018). Additionally, with the rising threat of floods attributed to climate change, the conservation of urban water bodies becomes imperative to withstand such floods. Therefore, the neglect of urban ponds due to rapid urbanization is a growing concern not only in Sylhet, but in many urban areas across the globe, such as Chennai in India. As urbanization



Fig. 5: Global Trends of Urbanization

Source: Morphocode, n.d.

intensifies, cities worldwide are confronted with the complexities of safeguarding vital public spaces, fostering community well-being, and fortifying resilience to climate impacts.

The challenges faced by Sylhet are not isolated; they mirror the difficulties cities worldwide encounter. Therefore, the findings and solutions derived from this research can serve as a blueprint for other urban areas confronting similar issues, fostering a global dialogue on sustainable urban development, climate resilience, and the importance of preserving communal spaces within cities.

### **Ethical issues and potential application of the results**

As a response to the increased segregation in a second-tier city like Sylhet, due to the rapid urbanization in Bangladesh, my graduation projects introduces an inclusive environment where different cultural and social groups should co-exist harmoniously. Every family should be provided with adequate housing, including the accessibility to public space where they can experience social activities. Since rapid urbanization is a global phenomenon and possible architectural and urban solutions are being discussed in academic debates nowadays, my graduation project is considered relevant.

However, some ethical concerns must be addressed in my design project. First is ensuring informed consent from the informal settlement residents, as they are being moved from their current inadequate

houses, to a new inclusive neighborhood with adequate dwellings. It should be ensured that they fully understand the project's implications and freely consent their participation. Secondly, equity and fairness are paramount, necessitating fair access to housing and resources for all residents, irrespective of socio-economic status. Moreover, cultural sensitivity is crucial to respect the traditions and values of the diverse communities, ensuring the housing designs are inclusive and culturally appropriate. Finally, the adoption of the sustainable building material CSEB (Compressed Stabilized Earth Block) instead of clay-fired bricks can impact the working conditions during CSEB production, given its labor-intensive nature. It is imperative to ensure that these workers are not subjected to health risks, particularly since one of the reasons for opting for CSEB, besides the lower carbon footprint, was to alleviate the poor working conditions and health hazards associated with clay-fired brick production.

By navigating these ethical considerations, the project can strive to create a sustainable, inclusive, and socially responsible housing solution for both Sylhet's informal settlement residents and middle to higher income families.



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