
Re-imagining-Resilience using Micro-migration

Preface

This book contains the results of my graduation project in the Global Housing Studio.

This project has tested my perseverance and significantly contributed to my personal development.

I would like to express my gratitude to the tutors of the studio for all their guidance. I thank the teachers and students of Shahjalal University of Science and Technology for their amazing energy during the field trip. I would also like to thank my studio mates who made this last year easier: Anna, Christina, Hyosik, Kaspar, and Niki. Success to you all! Lastly, thanks to the beautiful residents of Shonatola for their warmth and acceptance.

Genora Jankee

Re-imagining Resilience using Micro-Migration: Applying Traditional Knowledge and Migratory Patterns to New Housing Solutions in Flood-Affected Sylhet

Author: Genora Jankee | 6094627

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Delft University of Technology
Faculty of Architecture and the Built Environment
Global Housing Graduation Studio
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Design Tutors:
Main: Ir. Rohan Varma
Prof. Marina Tabassum
Prof. Dick van Gameren
Dr. Nelson Mota

Research Tutors:
Main: Ir. Frederique van Andel
Ir. Antonio Paoletti

Building Technology Tutors:
Main: Rocio Conesa Sánchez
Ludovica Cassina

Palki : grandmother

Fahim : community leader

Ahnaf : tailor and father

dedicated to the people of Shonatola

Content

Research plan

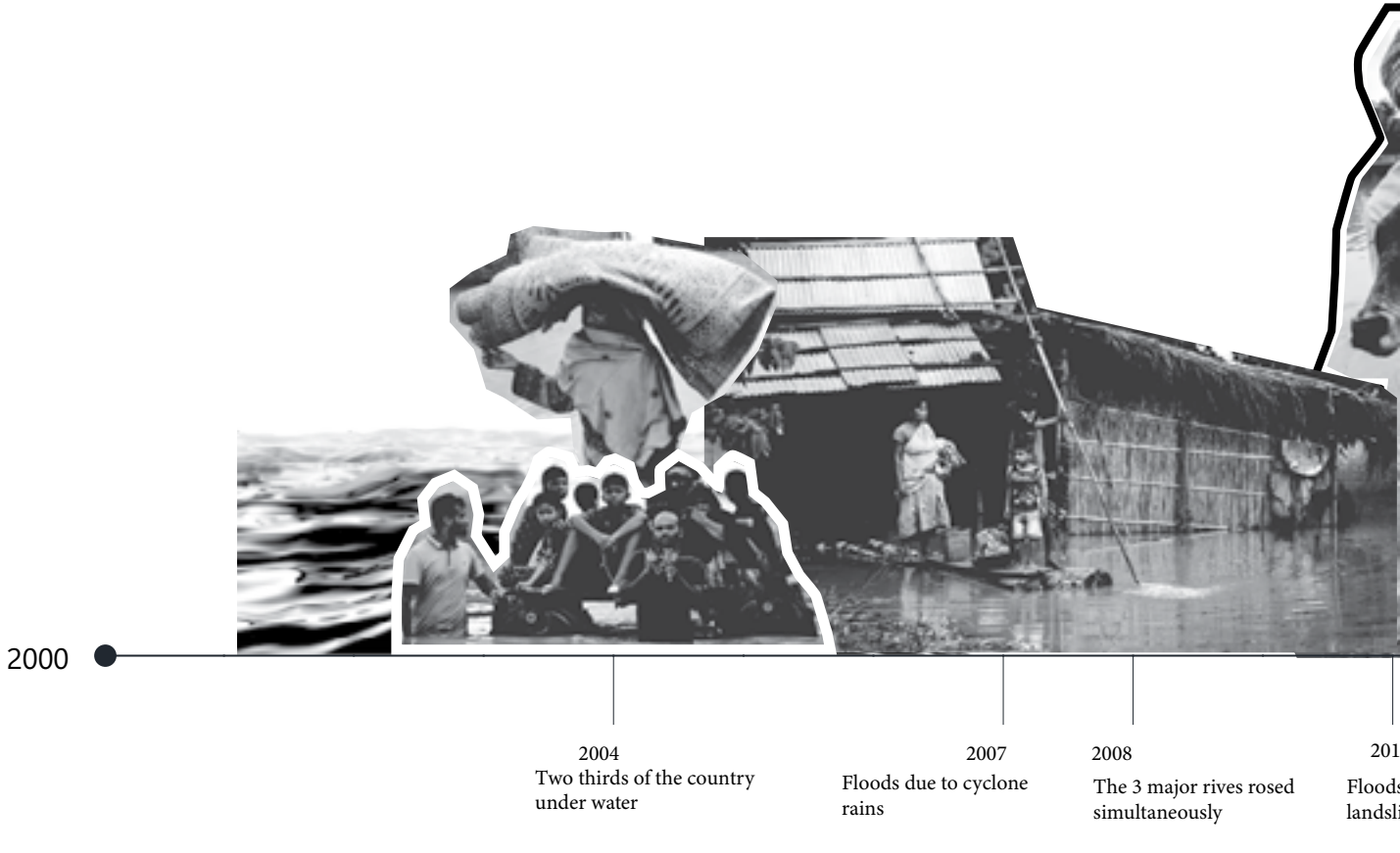
Introduction

In Bangladesh, like in all other countries climate change is causing significant changes to weather and climatic conditions. Bangladesh and more specifically the Sylhet region face adverse effects such as tidal flooding and riverbank erosion among other natural disasters. Besides endangering communities, these natural disasters destroy agricultural lands and infrastructure important to the continuation and advancement of a community. Another growing phenomenon in Bangladesh is migration as a form of resilience. Bangladeshis in flood-prone areas practice climate-induced micro-migration to deal with the situation (Mustari & Karim, 2017).

This project looks to the indigenous communities in Bangladesh and other wet land areas to find solutions to the problem. Research has shown that indigenous adaptation techniques and knowledge practices have been used by indigenous communities in Bangladesh and other regions to mitigate the effects of climate change and stressful environmental conditions (Amin, Asaduzzaman, Kabir, Snigdha, & Hossain, 2021).

The objective of this research is to design a housing solution that responds to flooding in the Sylhet metropolitan area. For this reason, it is important to study the effects of flooding on the target group as well as their homes, the migratory patterns of the displaced people and the indigenous strategies and technologies that may be used to mitigate these effects.

This research is imperative to the livelihood and sustainability of communities in the low-lying areas of Sylhet and to the new methodology of technology where indigenous wisdom is seen as a necessary technology rather than primitive techniques. The research will aim to answer the question “How can indigenous and traditional knowledge systems inform resilient housing solutions that support micro-migration as a climate adaptation strategy in Bangladesh?”



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s and
ides

2012
Floods and
landslides

2017
8 million people
affected

2022
Floods due to heavy
rains in the Haor
areas

2024
75% of Sylhet
inundated

Fig1. Major floods of the 21st century

Literature review

Although climate change is a global issue, non-western countries like Bangladesh are more susceptible because they lack the financial, technical, and institutional capacity to tackle the impacts of climate change (Garai, Ku, & Zhan, 2022). Sylhet, located in the northeastern region is different from the rest of Bangladesh, which is predominantly flat and low-lying, the landscape is a blend of mountains, valleys, wetlands and rivers making it ecologically rich but vulnerable to natural disasters like flooding.

The United Nations International Strategy for Disaster Reduction considers natural disasters a serious disruption to the functioning of a community or a society, involving widespread human, material, economic or environmental losses. While ordinary seasonal floods in Bangladesh are beneficial for cultivation and fisheries, climate-induced flooding causes detrimental disasters and significant loss, destabilizing settlements. With this type of natural disaster, people not only lose their land and homes people almost always lose their source of income. These people become defenceless, face social discrimination and are less likely to seamlessly integrate back into society (Karim & Hamide, 2017). A person is considered displaced if he or she experiences a minimum of one migration move because of erosion in their lifetime (Karim & Hamide, 2017).

The Shylet basin part of the larger Hoar basin, is a wetland ecosystem that receives run off from two larger rives and the Meghalaya hills for half the year and has a slow drainage period. Although there is no clear evidence of when the first settlers came to the Hoar region, in the great Indian epic (Indian mythology) it belonged to the king of the Herambha kingdom whose people come from a non-agrarian background. They were fisherman and boatman communities; nomadic indigenous people called Jalik Dasa, who choose this area because of their way of life (Chowdhury, 2022). Only later did agrarian tribes settle in this area.

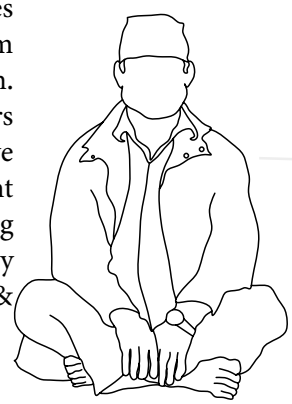
Similarly in living cultures of today, the indigenous Bede people of Bangladesh practice an aquatic semi-nomadic lifestyle. They travel along the rivers of Bangladesh working as mystical healers, snake charmers and entertainers. As a result, they have developed a characteristic boathouse that is synonymous with their lifestyle and identity (Schoenmakers, 2024).

In recent years, researchers have discussed that a bottom-up approach for disaster management may be more effective than top-down approaches (Garai, Ku, & Zhan, 2022). This may lead to the consensus that people affected by climate change may already have the answers. In a lecture given at ETH Zürich in 2023, Julia Watson says,

“What if our most sustainable technologies were rooted in cultures who figured out solutions to climate extremes a millennia ago?”

The accumulated and experienced knowledge of indigenous people make them excellent observers of environmental change and its impacts. For centuries, indigenous people have adapted to climate conditions through cultural adaptations. Only 1% of the total population in Bangladesh is indigenous, but their populations still find ways to combat climate change. The indigenous people of Rangamati Sadar of Rangamati district in Bangladesh have employed numerous ways to deal with the changing climate. They plant trees surrounding their houses to protect them from the cyclone winds, they build their houses high enough in the hills so that they are not inundated during flash floods, their houses are elevated with pieces of bamboo etc. (Garai, Ku, & Zhan, 2022). Similarly, the Khasi people of Sylhet have adjusted their traditional hill typology and building techniques to build in the low-lying area of Sylhet (Shahidul Islam, 2016). Although Bangladesh is one of the first countries to use indigenous strategies in their “community adaptation project” on a nation-wide scale, they only looked at the agricultural and fishing techniques (Amin, Asaduzzaman, Kabir, Snigdha, & Hossain, 2021). However, it is worth wild to also adapt the architectural techniques of indigenous people.

Studies show that Bangladeshis use migration as a form of resilience against natural disasters. This migration does not occur freely but is a form of voluntary micro-migration. However, researchers considered this to be a positive factor and an important contributor in fostering resilience for a climatically vulnerable society (Mustari & Karim, 2017).



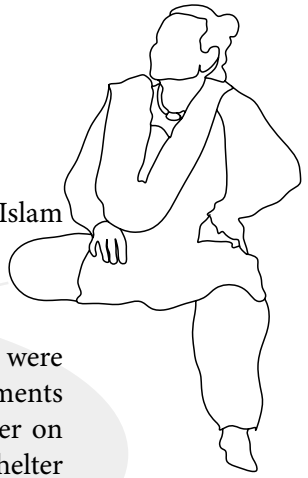
Karim and Hamide discussed that when flooding is sluggish people in the affected areas can move with their household materials and when erosion takes place quickly, they can disassemble their households themselves and relocate (Karim & Hamide, 2017). Usually, this form of migration does not mean relocating to another village. Rather, it is found that many of the villagers migrated temporarily within their own village. Unfortunately, a lack of space and resources often make this form of temporary relocation challenging and, in some cases, impossible. In the case of Shonatola, a village at the rural to urban transition, residents prefer to migrate temporary to a nearby school, however, with almost 2000 people this small primary school does not fit the needs of the community. Residents stay at the school until the flood resides and necessary home repairs are made, they then return to their land because of the historical and emotional connection to it.

Interviews done in the coastal village of Napitkhali revealed realistic migration patterns of climatically displaced people (Mustari & Karim, 2017).

Shahidul Islam commented on his temporary migration and said:

"We experience natural disasters and its effect in all the aspects of our daily life. As I lost my homestead land in riverbank erosion, I needed to think of the alternative. My necessity bounds me to look for the alternative. So, from that time we made a temporary house on the embankment. Now we are continuing to stay in that point till now."

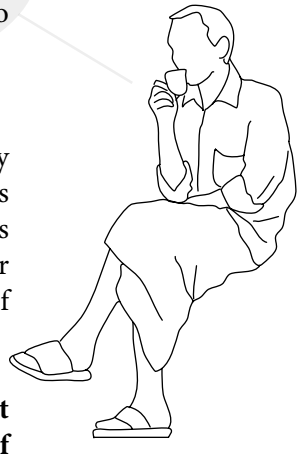
In the same way, another villager named Rofiqul Islam also talked about his internal migration:



"My house was flooded during the Aila, and we were unable to stay in our house. Even the embankments were also flooded. So temporarily we take shelter on the boat. Once the water went down, we took shelter on the embankments and stayed there as long as our homeland became usable."

Shahid Shardar commented:

"We lost our homestead land in riverbank erosion. From that time, we made a temporary house on the embankment. Now we are continuing to stay in that point. This land is considered as khas land. I made two rooms here."



Though the migration of these displaced people may be somewhat voluntary and a form of resilience, it is often under harsh conditions. Looking to indigenous patterns of living may inform new living systems for the challenges faced in the flood-affected areas of Sylhet.

"With environmental and societal collapse imminent in the coming decades, design at the intersection of anthropology, ecology and innovation is the most pressing discussion of our time (Watson, 2023)"

Problem statement

Sylhet is experiencing severe flooding due to climate change, causing the displacement of thousands of people annually. The reoccurring migration from residential plots to temporary squatting locations with poor living conditions causes social, economic and environmental challenges, including loss of economic activity and a source of income.

Despite the frequency and intensity of floods, many People prefer to stay near their homestead this is because of familiarity and emotional connection to the land. Migration is often short-term and involves short distances. For example, 88 per cent of agricultural workers in Bangladesh were found to remain within two miles of their previous residence following a flood. This is because of cultural ties, economic dependence on agriculture, and a lack of viable alternatives (Martin, et al., 2013). This is the case with Shonatola, a small village at the urban to rural transition of about 250 houses on the outskirts of Sylhet. The constant micro-migration of Bangladeshis is seen as a form of resilience against natural disasters.

Indigenous communities have dealt with environmental changes for years. Their living traditional ecological knowledge and practices have proven to be resilient towards different challenges. Indigenous and local vernacular knowledge are both born over years of experience with environmental challenges. Could the architectural techniques of indigenous people and migratory patterns of displaced people in Bangladesh be combined to help support this phenomenon of disaster related migration in the flood prone areas of Bangladesh?

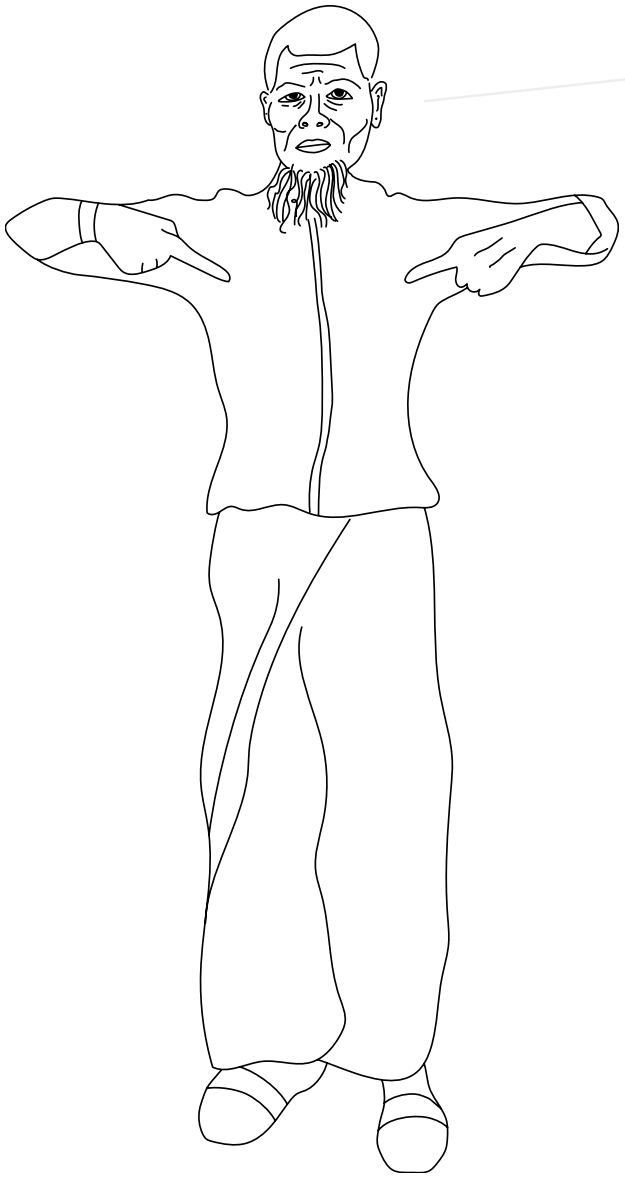


Figure 2. Testimony of Fahim, a community leader

"Last year (2023) the waters came up to my chest. - We have made "kola velas" for generations, we use them to move and take shelter at the school on the highway. The school is at a higher level than the village so it does not get flooded badly. We take important things with us, when the water recedes we return home."

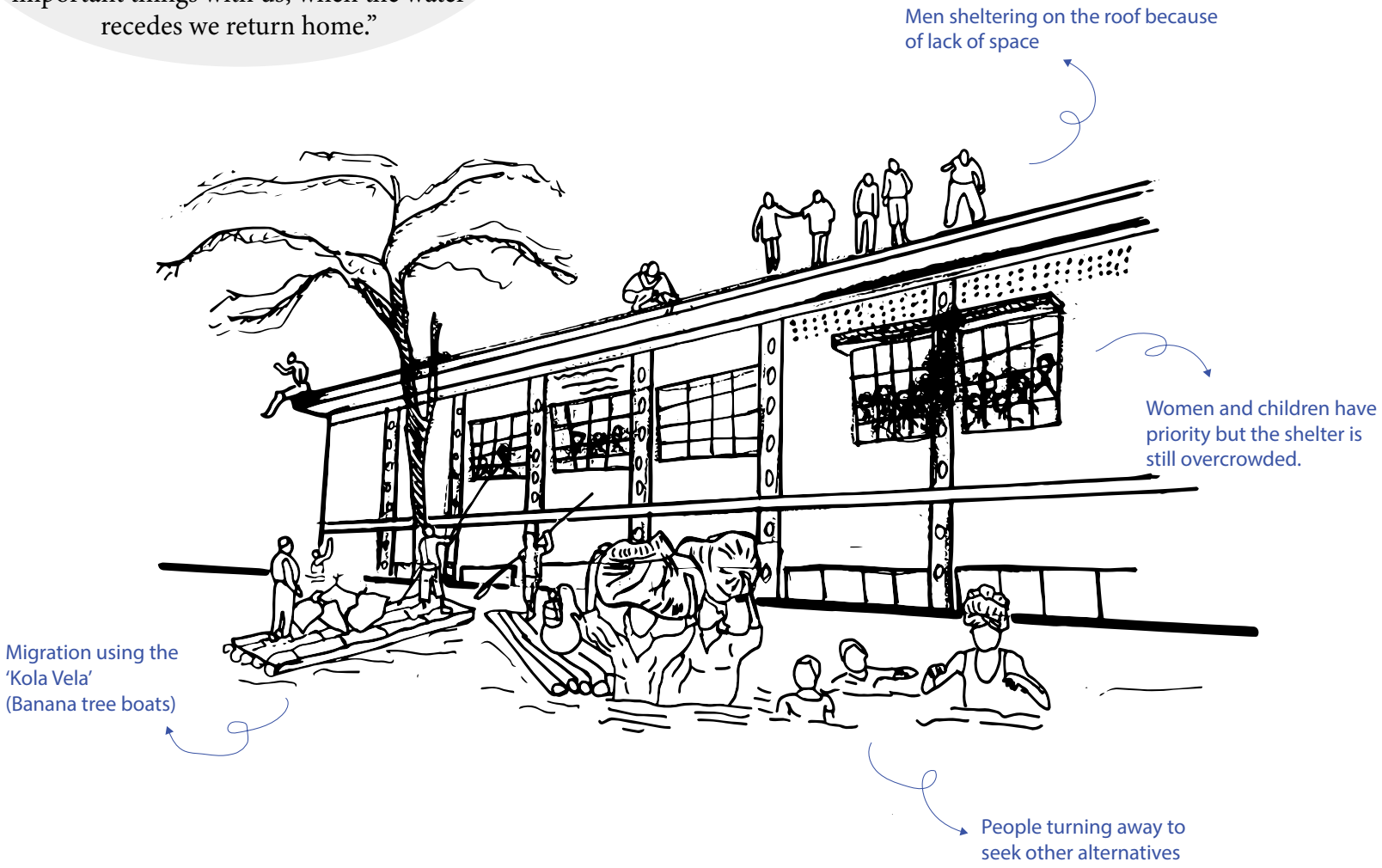


Figure 3. Visualization of the primary school on the highway during flooding season (based on oral accounts).

Theoretical framework

This thesis is grounded in concepts of indigenous knowledge systems and migration as resilience as key strategies for addressing the challenges associated with climate-induced migration due to severe flooding.

Indigenous Knowledge

Indigenous technologies advances Charles Darwin's theory of "survival of the fittest" to "survival of the most symbiotic" (Watson, 2023). Indigenous communities in Bangladesh and all over the world have developed sustainable living practices and technologies that not only makes them resilient to climate challenges but helps them to survive in constantly changing environments. The term Lo-TEK (Local Traditional Ecological Knowledge) coined by Julia Watson explores the intersection of design and Radical Indigenism, which advocates for the rebuilding of knowledge and philosophies of indigenous people. The study aims to apply these practices to housing solutions, positioning Indigenous knowledge as a critical resource for designing flood-resilient housing in Sylhet.

Migration

"The link between climate change and increased human mobility is widely recognised, as are the gaps in legal protection for people who move in the context of climate change" (Nishimura, 2022). Migration in the context of climate change can be understood through the theory of adaptive mobility. Karim and Mustari (2017) suggest that displacement is not just a crisis response but a strategy for resilience for displaced people. However, adaptive mobility requires planning and action to address foreseeable risks. Nishimura (2022) puts people at the centre of the argument that action must be taken to ensure access to basic human rights and resources for these displaced people. The thesis aims to help improve the conditions under which displaced people migrate and live.

Resilience

Resilience theory argues that it's not the nature of adversity that is most important, but how it is dealt with. In relation to the topic of this thesis, resilience theory emphasizes the ability of community and architecture to adapt in response to environmental challenges. As mentioned above in the context of Bangladesh's flood-prone regions, people are using migration as a form of resilience. Resilient architectural design must go beyond building techniques incorporating adaptive strategies and help with the issue of micro-migration. This thesis seeks to explore how housing can be designed to support community migration while creating the proper legislative frameworks to make this possible, thus enhancing long-term social resilience.

This framework will guide the research focusing on how traditional migratory practices and technologies can lead to resilient housing solutions for the displaced people in Sylhet.

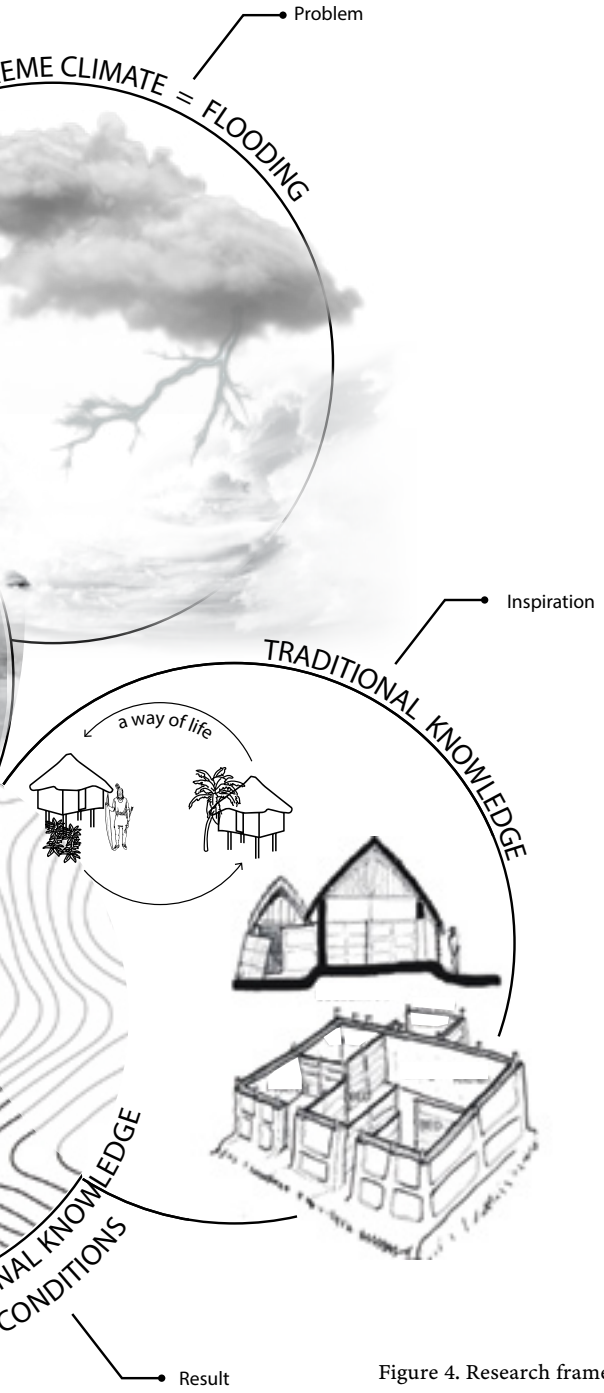


Figure 4. Research framework

Research question

This thesis seeks to investigate how the strategies and living conditions and patterns of Indigenous communities can be useful in developing innovative, contextually and culturally sensitive housing solutions for the areas affected by flooding in the Sylhet. The research question reads:

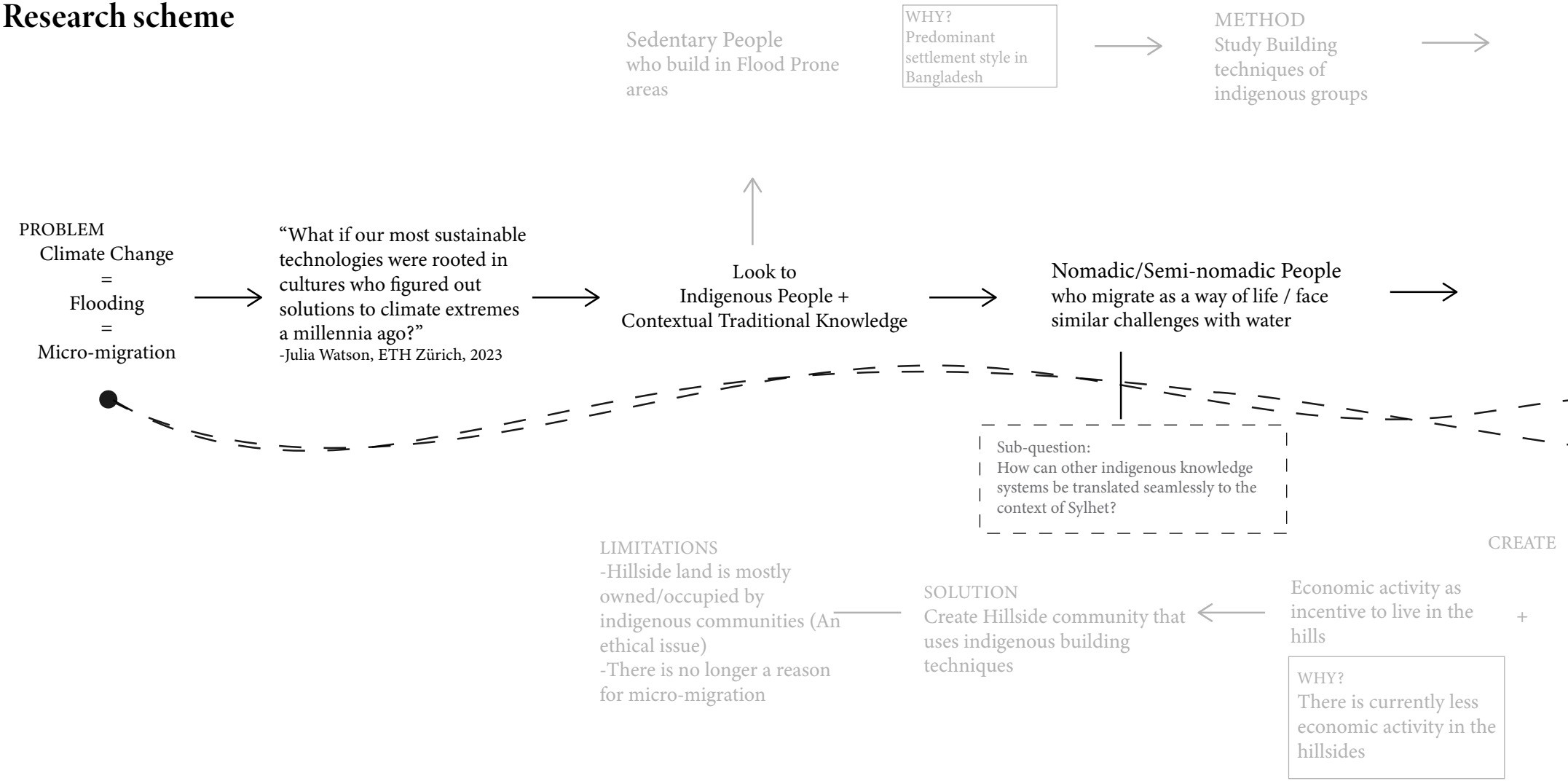
How can indigenous and traditional knowledge systems inform resilient housing solutions that support micro-migration as a climate adaptation strategy in Bangladesh?

The decision was made to include indigenous people from regions outside of Sylhet because there may be examples more parallel to the situation in other parts of the world. However, the designs in other scenarios will probably be very specific to that culture and context. Vernacular and indigenous architecture, historically have an inherently synergetic relationship with nature (Shahidul Islam, 2016). **How can other indigenous knowledge systems be translated seamlessly to the context of Sylhet?**

Approximately 75 per cent of Bangladeshis live in loam or bamboo houses, because these materials are highly accessible (Heringer, 2020). However, the people of Sylhet might be reluctant to indigenous adaptations as materials like bamboo and mud are seen as primitive and no longer desirable. The influence of European enlightenment structured a methodology of technology that deems indigenous materials, knowledges and techniques as primitive (Watson, 2023). More recently, the introduction of rapid industrialization and the increase in popularity of brick and concrete has aided in this perspective. A study done in India shows that it is neither the construction technique nor the performance that makes earth houses undesirable but rather their image (Kulshreshtha, Vardon, Mota, van Loosdrecht, & Jonkers, 2019). Thus, a sub question may be: **How can the image of indigenous building materials and techniques be improved in Sylhet?**

A housing project is never only about houses. Housing is always supported with economic incentives, social spaces and civic spaces. Agriculture is a large industry in Bangladesh and Shylet. However, the flooding is causing severe damage to agricultural lands, thus not only displacing people but leaving them jobless. Besides the environmental problems, approximately half a million people move to cities every year from coastal and rural areas (Martin, et al., 2013). One of the major drivers for this group of migrants is the search for jobs to increase their income. The question could be asked: **How can a housing design built in a flood prone area invite employment and economic prosperity?**

Research scheme



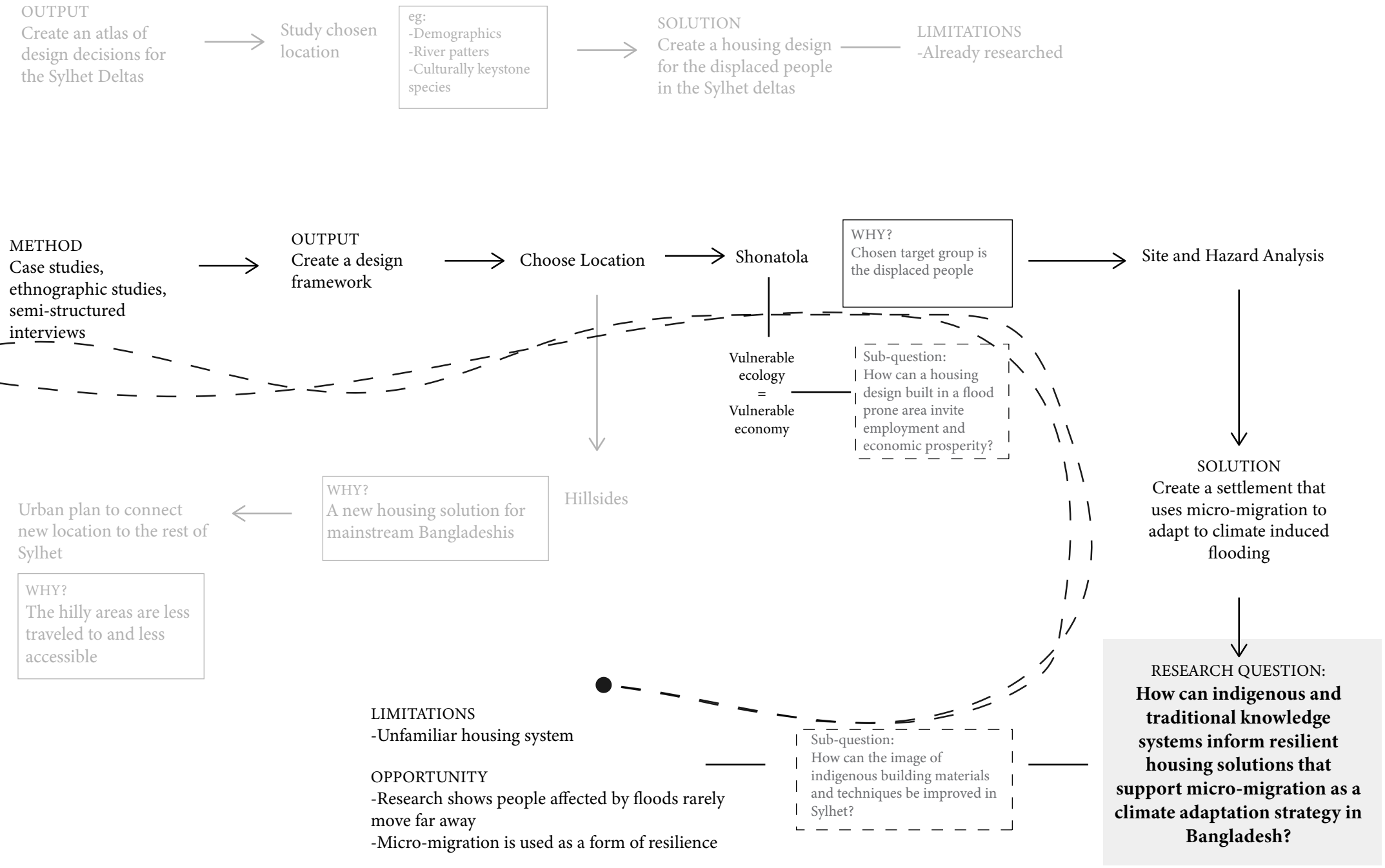


Figure 5. Research scheme

Design Hypothesis

This thesis suggests that resilient housing solutions for flood-displaced communities in Sylhet can be developed by integrating the concept of resilient migration and traditional knowledge of Indigenous communities facing similar challenges.

Context-specific housing to accommodate severe flooding and reduce the negative connotations associated with climate induced migration can be designed by studying the adaptive responses of indigenous communities, specifically their spatial organisation, sustainable practices, building techniques and traditional engineering for coping with extreme weather conditions.

As previously mentioned, Bangladeshi people are using migration as a form of resilience against flooding and this quality is to be explored further in this thesis. Arifur Rahman (Rahman, 2017) describes a future Bangladesh where people living near or in wetland ecosystems look forward to the flood seasons.

Rather than consolidated urban areas and peri-urban areas this thesis will focus on villages located at the rural-urban transition. The future design could have qualities like dynamic architecture capable of adapting with flood patterns and qualities that allow easy migration between site locations and explore regulatory frameworks that allow this to happen. This approach will explore flexible housing materials, and modular layouts that allow residents to respond to fluctuating environmental conditions and riverine changes, thus increasing long-term resilience for displaced populations.

Aim

TThe goal is to develop housing designs that are adaptable, sustainable, and contextually and culturally relevant, addressing both the immediate needs and long-term challenges. The design should respond to flooding in Sylhet by implementing traditional ecological knowledge.

I intend to explore the ways in which techniques can be translated in the site-specific context while respecting the local customs and investigating the correlations between housing and new economic opportunities. This project will emphasize using migration as a form of resilience and will explore improving the image of traditional building materials and regulatory frameworks that facilitate easy migration of a community.

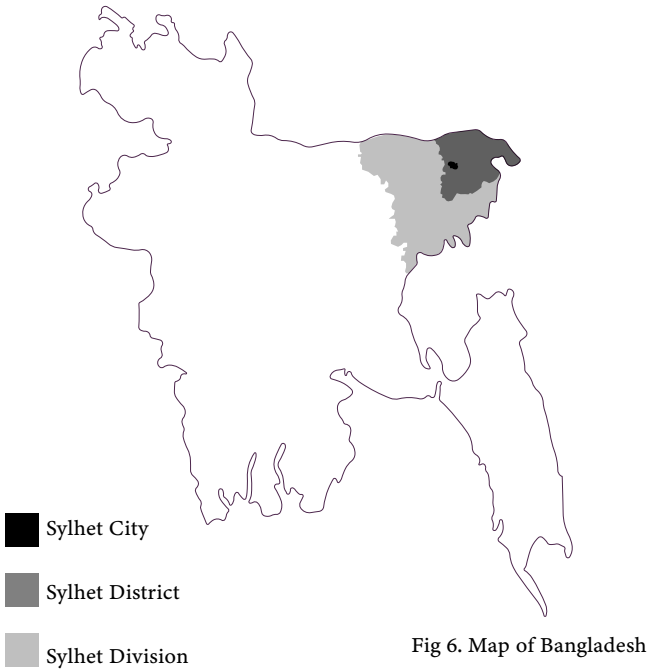


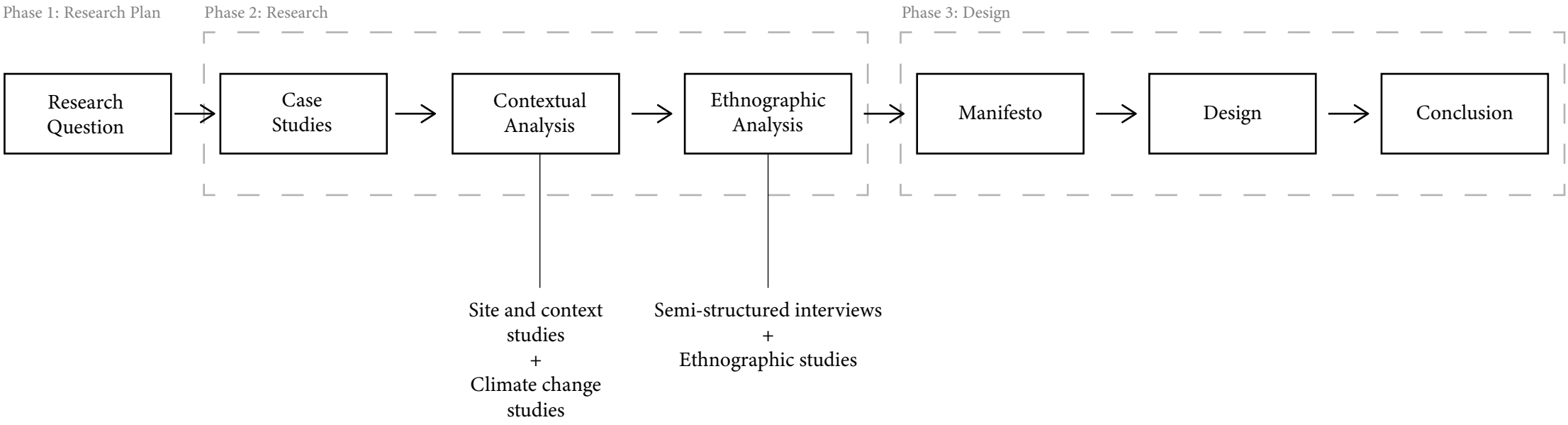
Fig 6. Map of Bangladesh

Methodology

Case Studies both in Bangladesh and around the world will be chosen to analyse the techniques and knowledge used by indigenous people in similar circumstances. The environmental conditions and terrains in the lowlands of Sylhet differ to that of the indigenous people in the country. For this reason, case studies can be taken from other regions with similar geographical conditions and with similar challenges. Across the globe in Peru, the Uros people of Lake Titicaca have dealt with environmental issues in their floating community. Other case studies in wetlands and near water ways will be used as an example on how to successfully live near water systems. The case study can produce a detailed report comparing housing projects and indigenous practices, that can highlight successful strategies and design principles. It will help to inform the question on the translation of outside indigenous knowledge systems to Bangladesh.

Before the site visit to Bangladesh, questions and gaps in the prior research will be identified in order to find key areas or questions to be answered during the trip. In Bangladesh semi-structured interviews will be conducted. This can produce a design brief that explains the preferences, aspirations and concerns expressed by the interviewees. The questions on the image of traditional materials, ways to increase economic prosperity and flexible land ownership systems can be informed here.

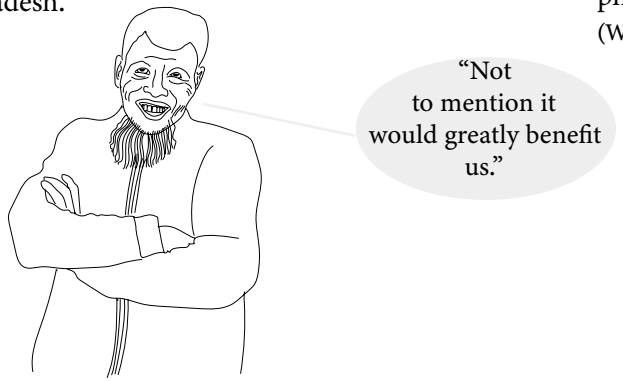
Ethnographic fieldwork creating observational sketches, photographs capturing daily life and building techniques of the target group will be documented. Together these methods should create a design framework consisting of guidelines to help inform the final design.


Phase 1: Research Plan
Phase 2: Research
Phase 3: Design
Research Question
Case Studies
Contextual Analysis
Ethnographic Analysis
Manifesto
Design
Conclusion
Site and context studies + Climate change studies
Semi-structured interviews + Ethnographic studies

Relevance

Floods occur annual in Bangladesh. The people who are usually displaced as a result of flooding and are usually poorer and have no other alternative than to resettle in similar or worse conditions. These people usually work in the agriculture industry and play a major role in the economic stability of Bangladesh. However, because of reoccurring destruction to their homes and agricultural lands the economy also falls subsequently (Rahman, 2017). This is then not a problem only related to the flood prone areas in the country but to all of Bangladesh.

Bangladesh signed to the Ramsar Convention on Wetlands in 1992. The convention is the intergovernmental treaty that provides the framework for the conservation and wise use of wetlands and their resources. Goal three of the four goals of Ramsar's 4th Strategic Plan (2016-2024) is the wise us of all wetlands, beyond Ramsar Sites, including through integrated river basin management and restoration. Under this "respecting and using traditional knowledge and practices" is listed as a way to achieve this, further emphasising the need to look towards indigenous techniques to help develop culturally appropriate and flexible housing designs addressing this major problem in Bangladesh.



Definitions

Indigenous -
inhabiting or existing in a land from the earliest times or from before the arrival of colonists
Oxford Languages. (2024). Indigenous. In Oxford English Dictionary.

Indigenous adaptation techniques and knowledge practices -
Indigenous adaptation techniques are the structural measures e.g. intercropping, rainwater harvesting, and knowledge practices are the non-structural measures e.g. appropriate fishing scheduling by fishermen, changes in farming practices, diversifying alternative livelihoods.
(Amin, Asaduzzaman, Kabir, Snigdha, & Hossain, 2021)

Lo-TEK (Local Traditional Ecological Knowledge) –
A design movement to rebuild an understanding of indigenous philosophy and vernacular architecture that generates sustainable, climate-resilient infrastructure.
(Watson, 2023)

Radical Indigenism
(by Professor Eva Marie Garoutte) - argues for the rebuilding of knowledge and explores indigenous philosophies capable of generating new dialogues
(Watson, 2023)

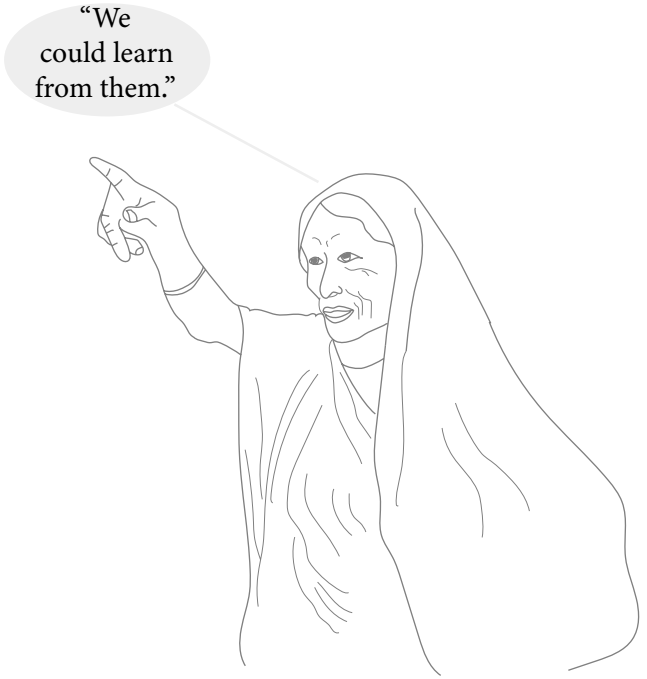
Research: Case Studies

Figure 7. Location of chosen case studies

Chosen Case studies

In this chapter, case studies of three indigenous groups were chosen to be studied. The groups include the Bede people found across Bangladesh, the Khasi people of the Sylhet region and the Uros people in Peru.

Despite the contextual differences, these three groups face similar challenges surrounding water. They offer valuable insight and potential solutions that can possibly be translated into the context of Sylhet.
The culture and building techniques of each group were analysed and the results were used to help answer the first sub-question: *How can other indigenous knowledge systems be translated seamlessly to the context of Sylhet?*

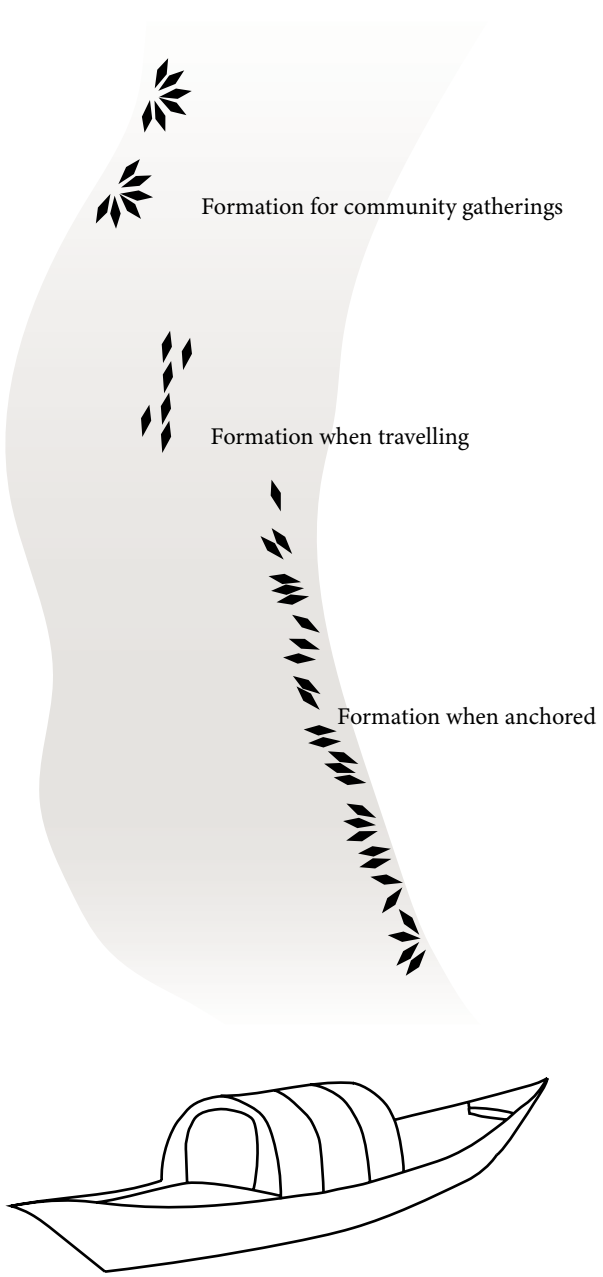


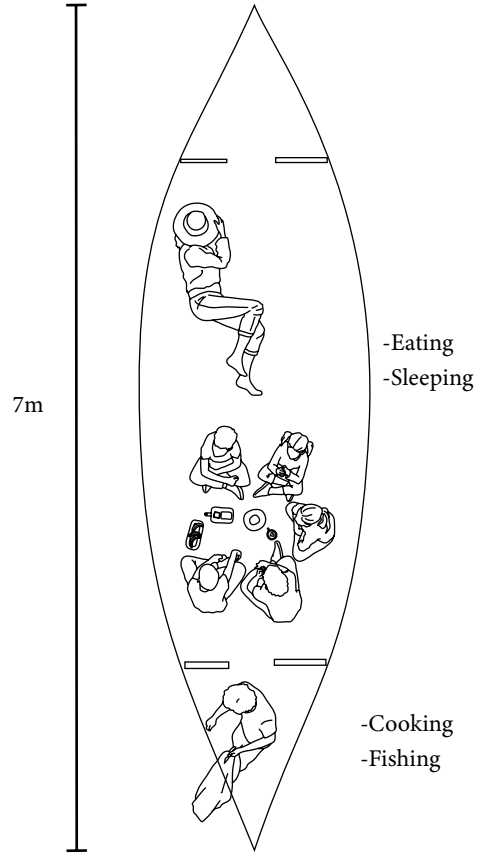
Bede People

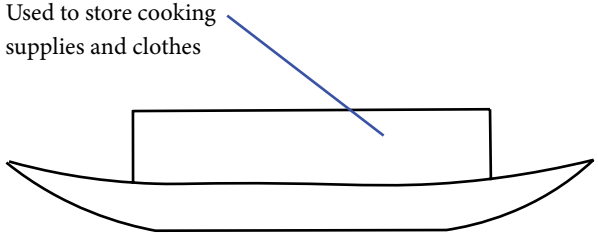
Location: Bangladesh
Lifestyle: Nomadic people
Housing type: House boats
Technology: Floating Houses

The Bede are descendants of the ethnic group of Mong–tong, a nomadic group that originates from Myanmar, Arakan. In the 1600s, the Mong-tong tribe settled in Bikrampur and Musiganj, near Dhaka. They later migrated to Bengal and Assam. The Bede people are perceived as mystic healers in Bangladesh.

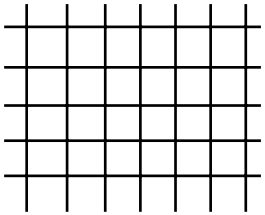
There are estimated around 500,000 Bede, consisting of 10,000 nomadic groups roaming around Bangladesh and in 2010 it was reported that 90% of the Bede community were still pursuing a mobile lifestyle. However, because of modernisation and modern medicine, the demand for their occupation is declining causing them to not generate enough income to sustain their life. The Bede primarily live on boats. Recently they seem to also build tents and even small houses. The Bede that still pursue a nomadic lifestyle usually have one boat per family, which consists of 4 to 8 people. A few families that live and travel together make a fleet, belonging to one of the tribes. The fleets usually move places every 1 or 2 days, but these periods are becoming longer, their settlements can now last up to a few months.



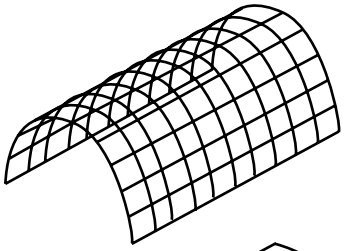




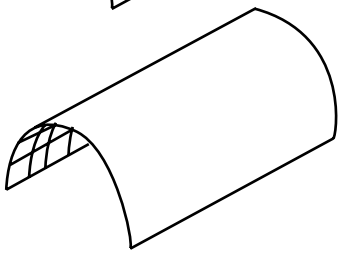
Schoenmakers, K. (2024). Floating Heritage: designing a boat home for the Bede community in Bangladesh (thesis).
https://resolver.tudelft.nl/uuid:2d72d248-1afb-4523-838d-bb2c99945242



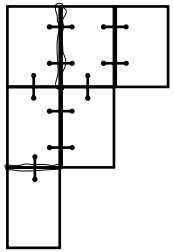
Weave Bamboo strips together



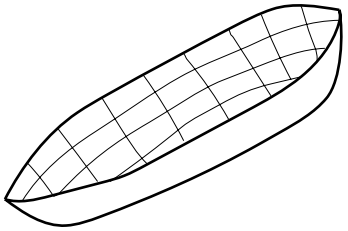
Shape the lattice into a semi-circle



Cove the structure with bamboo, polythene or steel sheets



Staple wooden planks together and fill the gaps with cotton

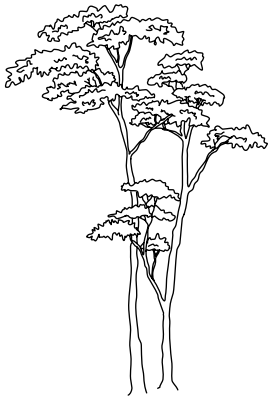


Plaster with coaltar and torch to seal the wood.

- Excellent resistance to water
- water insoluble
- harmful compounds
- Safer alternative = bitumen

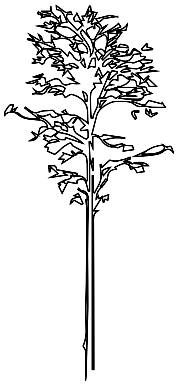
Timber for boats are from local trees:

jarul tree

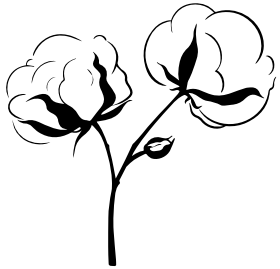


sal tree

sundari tree



burma teak tree



- Cotton resists water but are not completely resistant
- readily available in Bangladesh
- Lightweight and easy to use
- natural thermal and sound insulator

- versatile and sustainable material
- readily available
- strong and flexible
- Cultural significant to Bangladesh

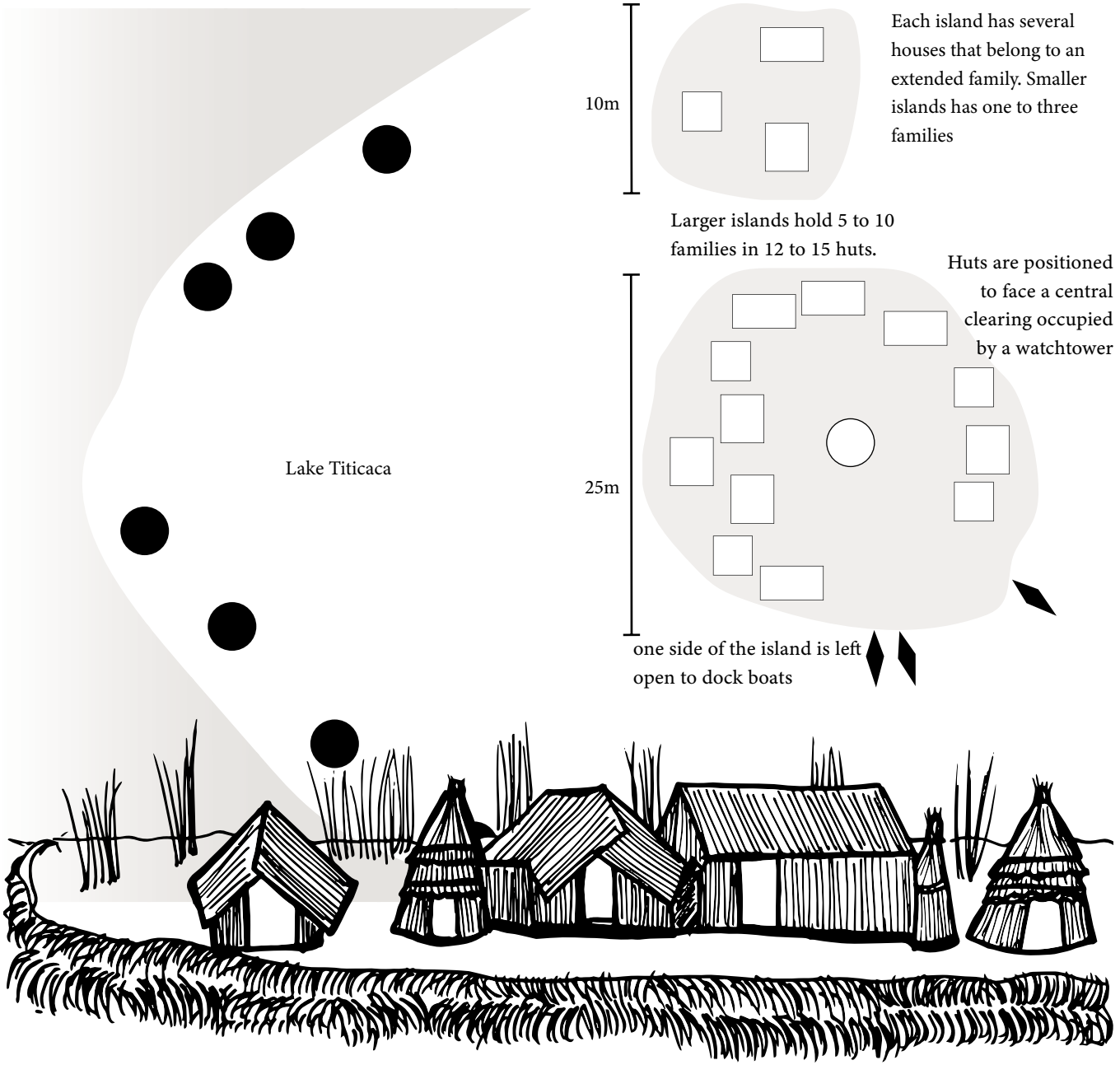
Uros People

Location: Lake Titicaca, Peru
Lifestyle: Sedimentary people
Housing type: Thatched reed houses
Technology: Floating Islands

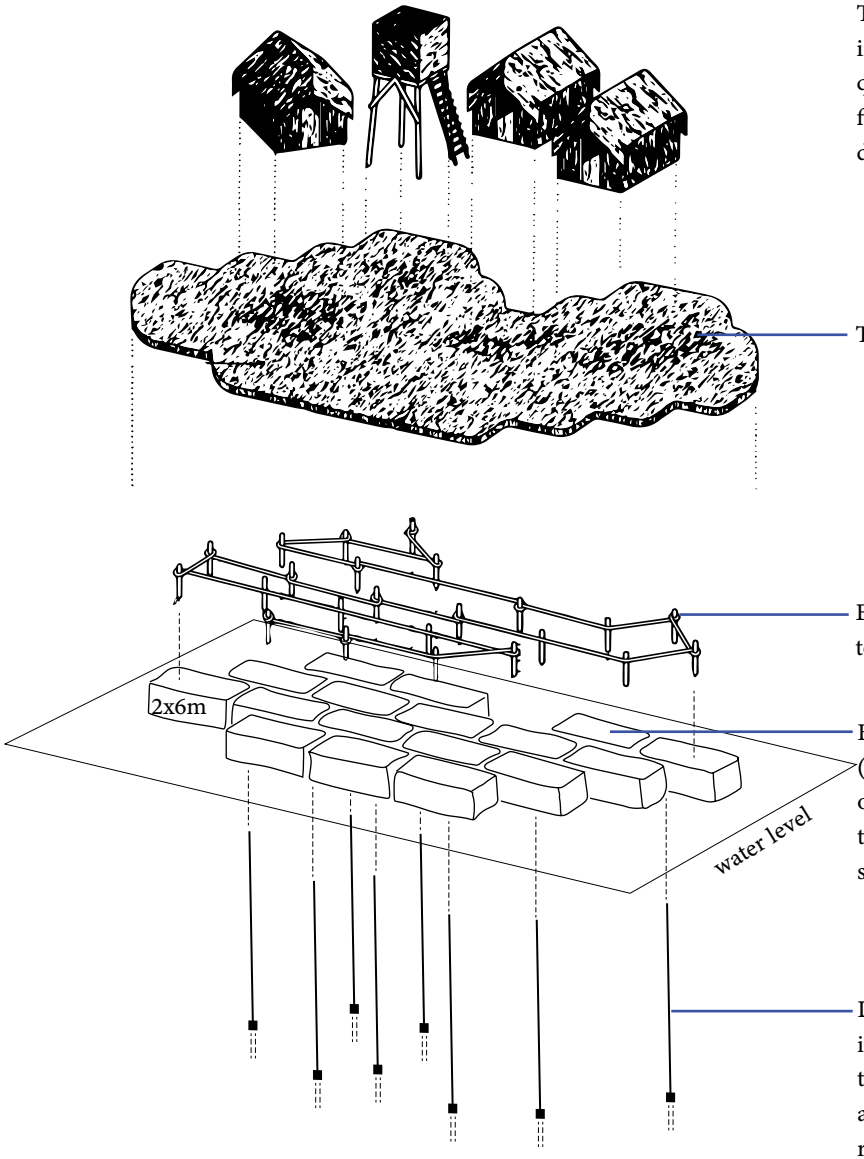
The 4500-year-old Uros are one of the oldest and most unique tribes in South America. They live directly on Lake Titicaca in the Andes Mountain range. To escape other tribes, they created houseboats and later floating islands on the lake. Their pursuit of isolation led to the construction of a unique floating world built from Totora reeds, a local organic material from which their islands and all structures are built.

An island is simultaneously a floating village, an aquaculture farm and an artificial wetland synthesized into a single living infrastructure. To build an island, families harvest the Totora reeds from the shoreline. The island floats because of the decomposition of organic materials. Continuous maintenance of the islands have become an intricate part of the physical and cultural sustainability of the community. New reed layers need to be added every two to three months to replace the submerged and rotten layers. This ensures that the foundations last 20 to 25 years.

The Uros call themselves 'kot-suna', meaning people of the lake, and consider themselves the owners and protectors of the lakes' water and biodiversity.



Watson, J. (2023). Lo-TEK Design by Radical Indigenism. Cologne: Taschen.



The floating islands improve the water quality of the lake by filtering polluted water discharging from the city.

Totora reed layer

-Plant tissue containing air spaces support island buoyancy
-New layers of reed are added every 2-3 months as bottom layers decompose

Eucalyptus stakes roped together

Brick modules (mud +peat) over time brick grow together forming a single living base

-Oxygen bubbles in the pleat tissue make the bricks less dense than water
-anaerobic decomposition produces bio-gas and supports island buoyancy

Designed for mobility, islands are secured to the lake-bed with anchors of rock and rope, but are able to migrate to deeper water locations.

Khasi People

Location: Sylhet, Bangladesh
Lifestyle: Semi-nomadic people
Housing type: Elevated houses
Technology: Lightweight structures

The Khasi are a tribe in north-eastern India and in parts of Bangladesh, however it is not clear when the Khasis came to Sylhet. Traditions mention that about five hundred years back a devastating flood occurred in Assam or China, because of which the Khasis left Assam and settled down in Meghalaya and Sylhet. It is assumed that Bangladesh has about 90 Khasi villages with a population of about twenty thousand. Although most of this matriarchal society's settlements are isolated in the hilly areas. Some Khasi villages can be found in the flat lands, this study will focus on the houses in the flat lands.

The traditional Khasi house, called 'ingtrep' or 'hut' is generally large in scale. There are two types of Khasi families, one is nuclear family (consisting of parents and children) and another is the joint family (including youngest daughter, now married). Both these types of family organizations constantly determine the shape and pattern of their houses. The Khasi's were considered a semi nomadic people because traditionally they move around the same areas. When the resources in their current environment can no longer sustain them they leave and may return when the forests has replenished itself. However, it is the people that move and not their houses.

Islam, S., Rahman, M., Hasan, M. T., & Mowla, Q. A. (2016). A Study on the Settlement Morphology of Indigenous Khasi Community in Sylhet, Bangladesh. Pratnatattva, 22.

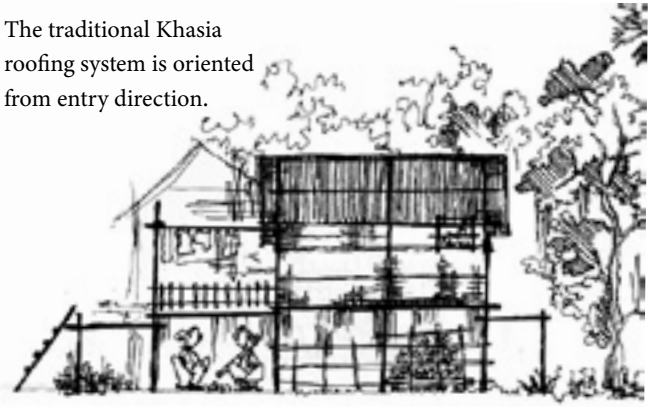
Khasi's built their ritual space adjacent to or at the periphery of the village (Punji).

Houses follow a linear cluster pattern.

Circulation space is utilitarian for their group-living and act as community space

Rectangular houses face the linear circulation space or courtyard

The traditional Khasia roofing system is oriented from entry direction.



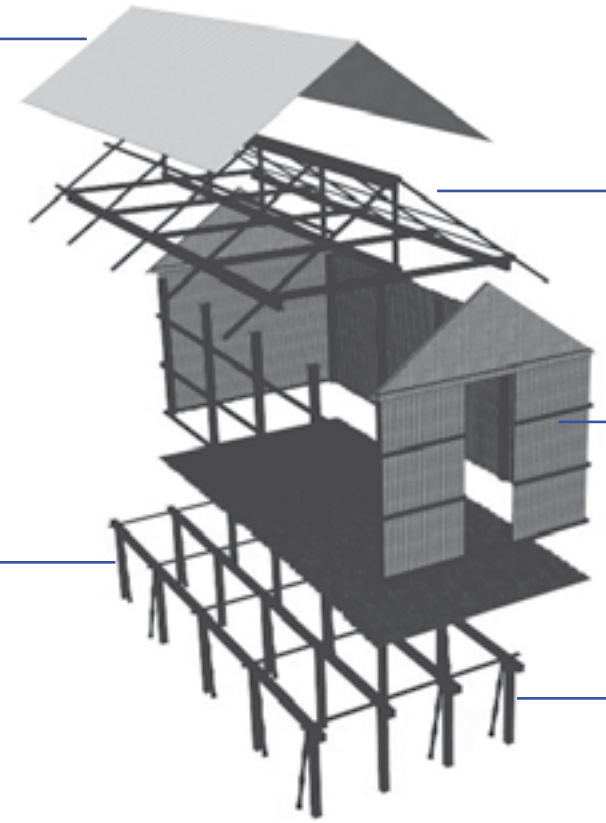
The angles of the roofs are found to be of approximately 30 to 35 degrees.

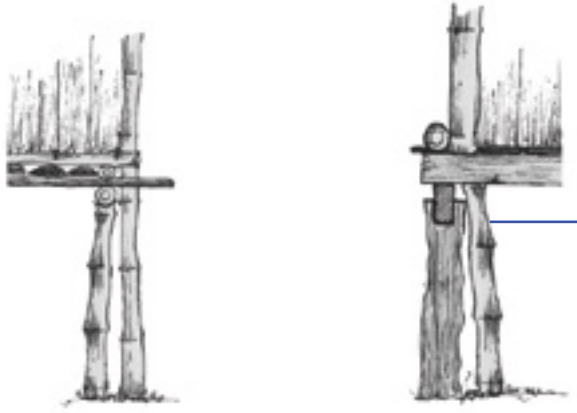
Khasia try to make the entrance of their house on the elongate side. And rectangular houses face the linear circulation space

Windowless houses are their long tradition. indows are only seen on the kitchen side of the facade.

Khasia houses have no foundation as these are light weight structures on stilts. Raising the floor by about 1.5-1.8m from the ground protect them from floods, landslides and wildlife.

The porch is often shaded where the elders sit and it always opens towards the village street.





Khasis follow a 'traditional' construction system which exists for generations through verbal and practical transmission.

The traditional Khasia house roof is made up of a straw/thatch cover built with bamboo. Currently it is being replaced by tin sheets with wooden frame and bamboo bracing.

The walls are made of bamboo mats or timber and in most cases, it is covered with mud plaster at the exterior surface.

Base Isolation with (Double Supported) Timber Posts

Nails are traditionally not used in construction, all joints are fixed together with bamboo.

Usually, bamboo and timber posts are to be replaced within 2-3 years

Research: Contextual Analysis

Geography

Shonatola is a small village at the rural–urban fringe outside Sylhet city. The village is part of a larger chain of rural communities that run along a small river connecting two larger rivers, namely the Shari-Goyain and the Surma river.
The village is the closest in the chain to a newly built highway and has approximately 1850 people. Along the highway are various amenities as well as commercial and industrial buildings. Two prominent developments include the New Central Jail opened in June 2018 and the Marine Academy inaugurated in May 2021. It is expected that these two establishments will generate jobs and draw people out of the city centre into the surrounding peri-urban villages like Shonatola.
The drive to Sylhet City centre is about 20 minutes with a distance of approximately 7km. Professionals also believe that in the next 10-15 years Sylhet city will have grown large enough that Shonatola will be part of the city.

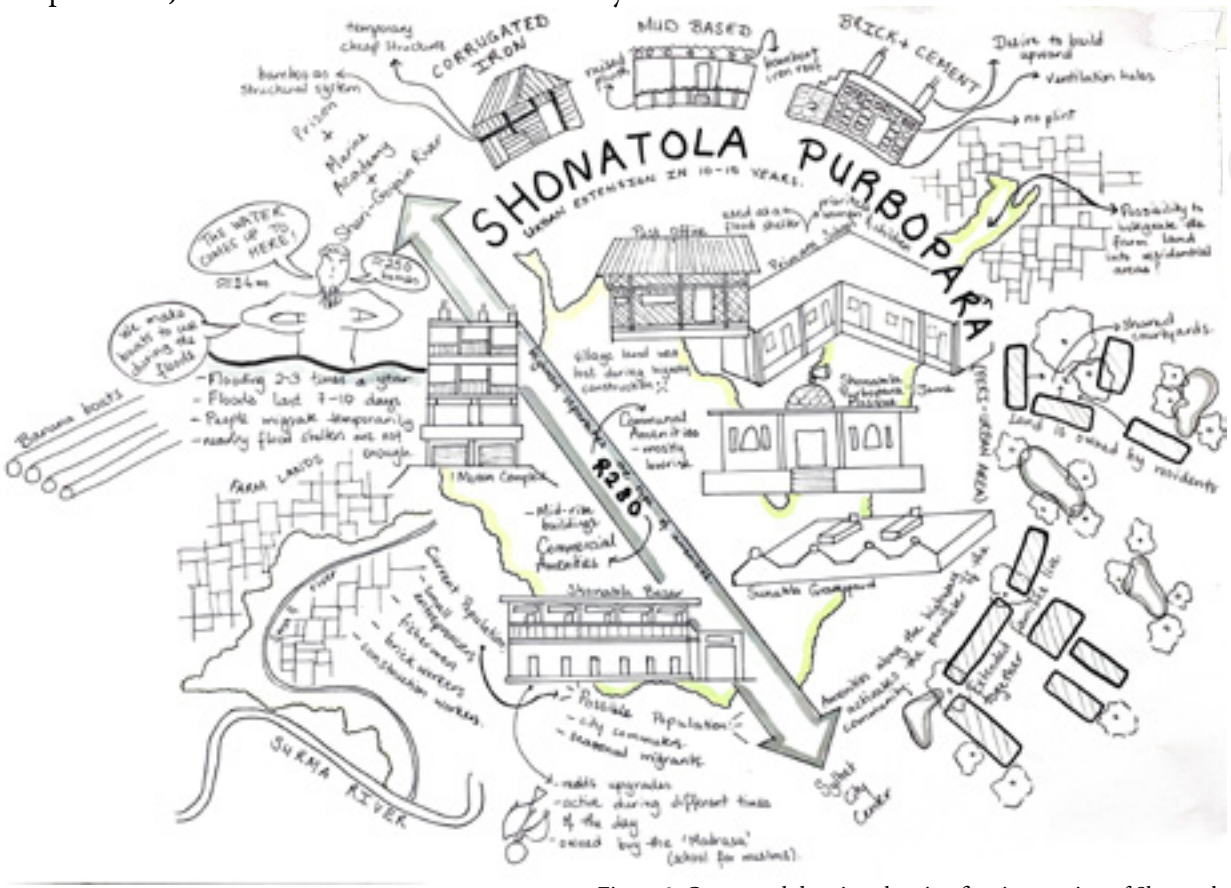


Figure 8. Contextual drawing showing first impression of Shonatola

Figure 9. Ahnaf and his son

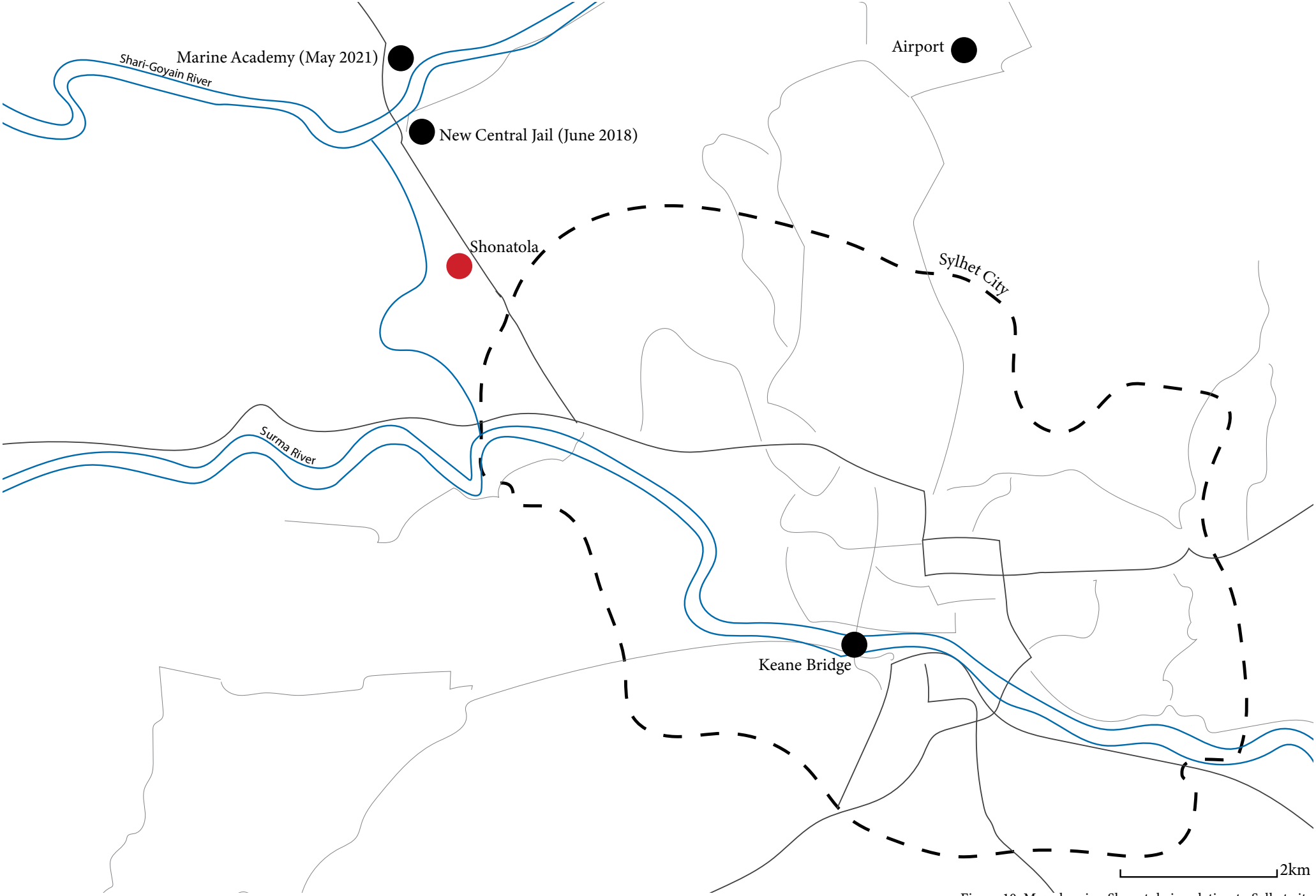


Figure 10. Map showing Shonatola in relation to Sylhet city

Site Analysis

Figure 11. Map of Shonatola

Density:

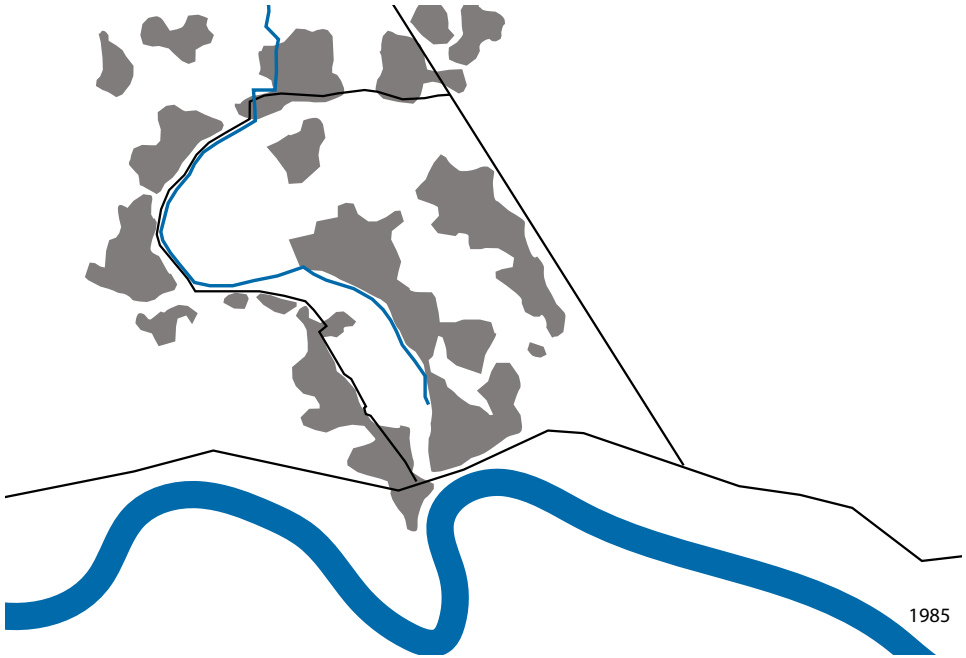
≈6 people per House
≈1841 people
≈220 People per Ha

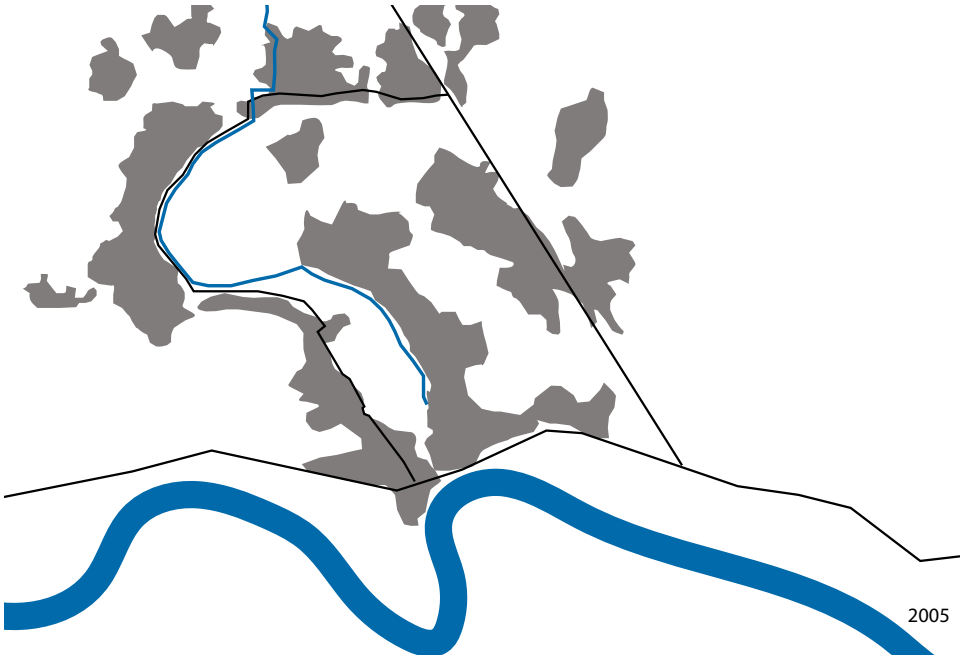
≈ 8.4Ha
≈263 houses
≈32 houses per Ha

Site Analysis

Shonatola is part of a larger group of villages. The villages gradually grew larger, denser and closer together from 1985 to 2025.

Thus, an area between two villages was chosen as the new development site. It is believed that this area would have been the next occupied space. This is supported by the fact that some houses are already encroaching this space from the south.





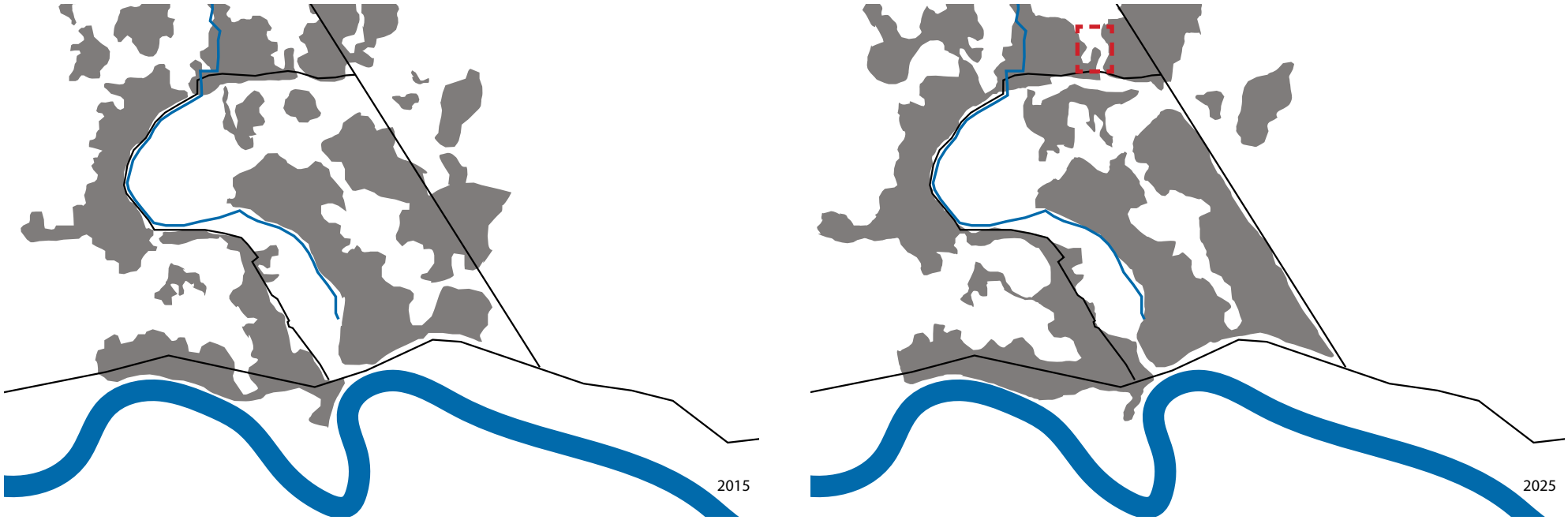


Figure 12. Growth of chain of villages from 1985-2025

Chosen Site

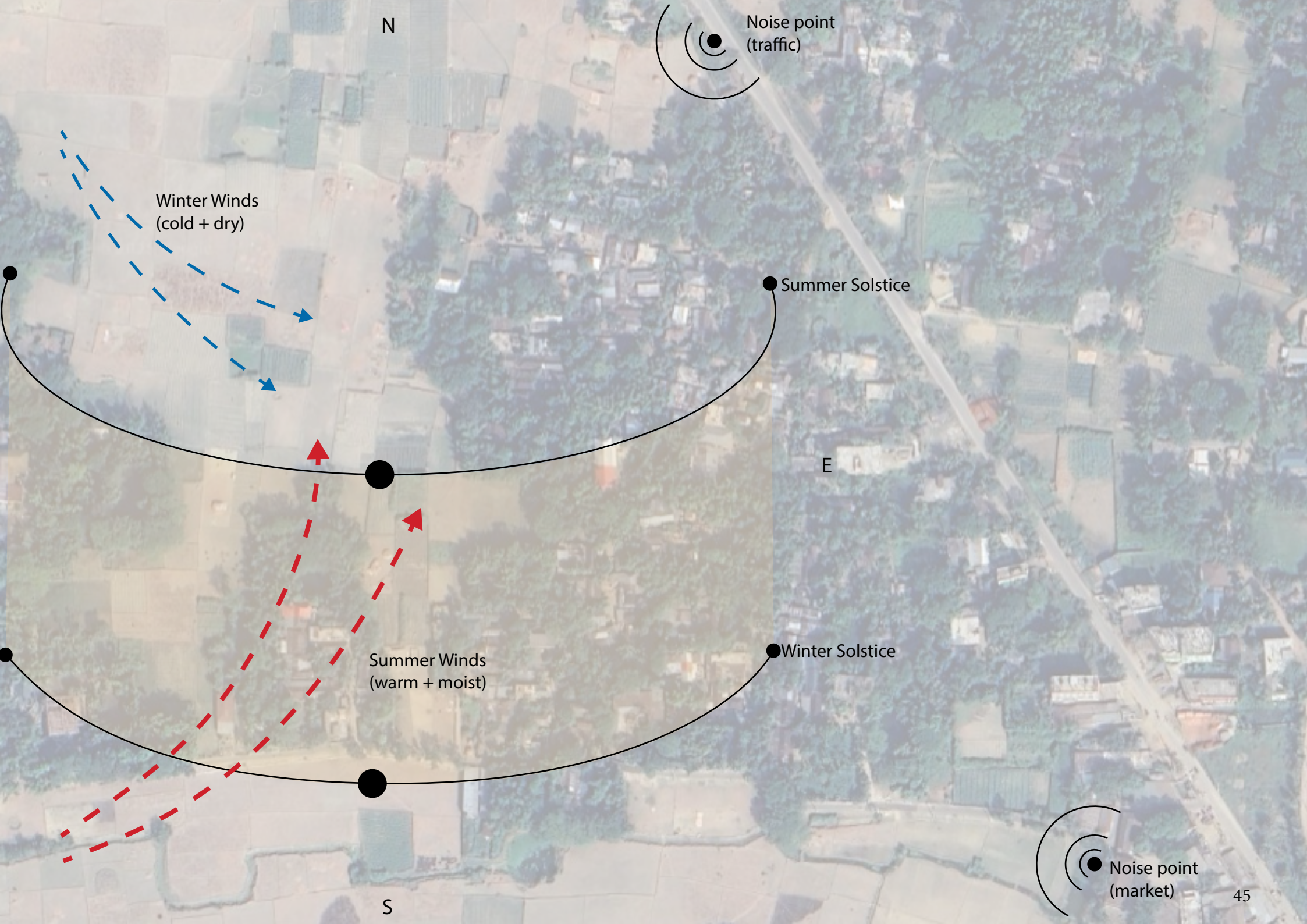
≈ 5.8Ha

Figure 13. Chosen location

Site Analysis

The chosen area is found to the left of Shonatola, a bit further away from the highway so there is minimal sound pollution, and the predominant winds come from the south-west of the site.

Figure 14. Site analysis of chosen site


N
Noise point
(traffic)
Winter Winds
(cold + dry)
Summer Solstice
E
Summer Winds
(warm + moist)
Winter Solstice
S
Noise point
(market)

Climate Analysis

Climate

Bangladesh has a subtropical climate with seasonal variations in rainfall. The country faces increasingly heavy rainfall and severe weather events like floods, cyclones, and tidal surges.

The average temperature is 26.1°C, but can vary between 15°C and 34°C throughout the year. The warmest months occur during the rainy season, while the cooler months receive less rainfall.

The climate is categorized into four main seasons:
dry season (December-February),
summer (February- June),
rainy/wet season (June- October),
autumn (October- December).

Flooding

Over 71% of yearly rainfall happens during the rainy season. Heavy rainfall, upstream or in the catchment areas, triggers overflow downstream, breaking riverbanks and flooding nearby regions. Bangladesh's particularly flat topography hinders natural drainage making it susceptible to flooding. Proximity to the Himalayan mountains, where melting snow and glacial movements contribute to rising river levels further worsens the circumstances. The Sylhet Division, and thus Shonatola is severely affected by flooding.

Predicted Flooding

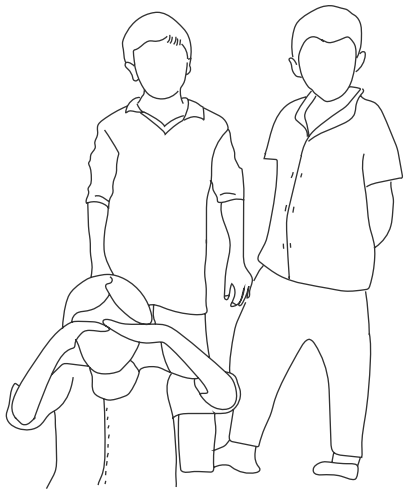
Recent estimates suggest a <5 percent increase in monsoon rainfall by 2050 (Brammer, 2009). Accounts of the people of Shonatola suggest that currently (2025) flood waters can get as high as 1 meter in the village. Considering that the average ground level in Sylhet is 26 meters and the average life span of a residential home is between 50-80 years **we can estimate that by 2075 (50 years from now) flood waters can reach up to 2.65 meters in Shonatola.**

1.
Assuming the total increase over 41 years (2009-20050) = 5%
The annual rate of increase is=5%/41 ≈ 0.122%

Total Increase from 2025–2075 (50 years)
=0.122%×50≈ 6.1%

2.
Assuming:
-Ground Level = 26 meters.
-Current Flood Peak = 26 +1 =27 meters (as floodwaters currently rise 1 meter above ground).
-Projected Increase: 6.1% from 2025 to 2075.

3.
Future Flood Peak =27m×1.061≈28.65m
Flood height above ground in 2075=28.65m-26m =2.65m



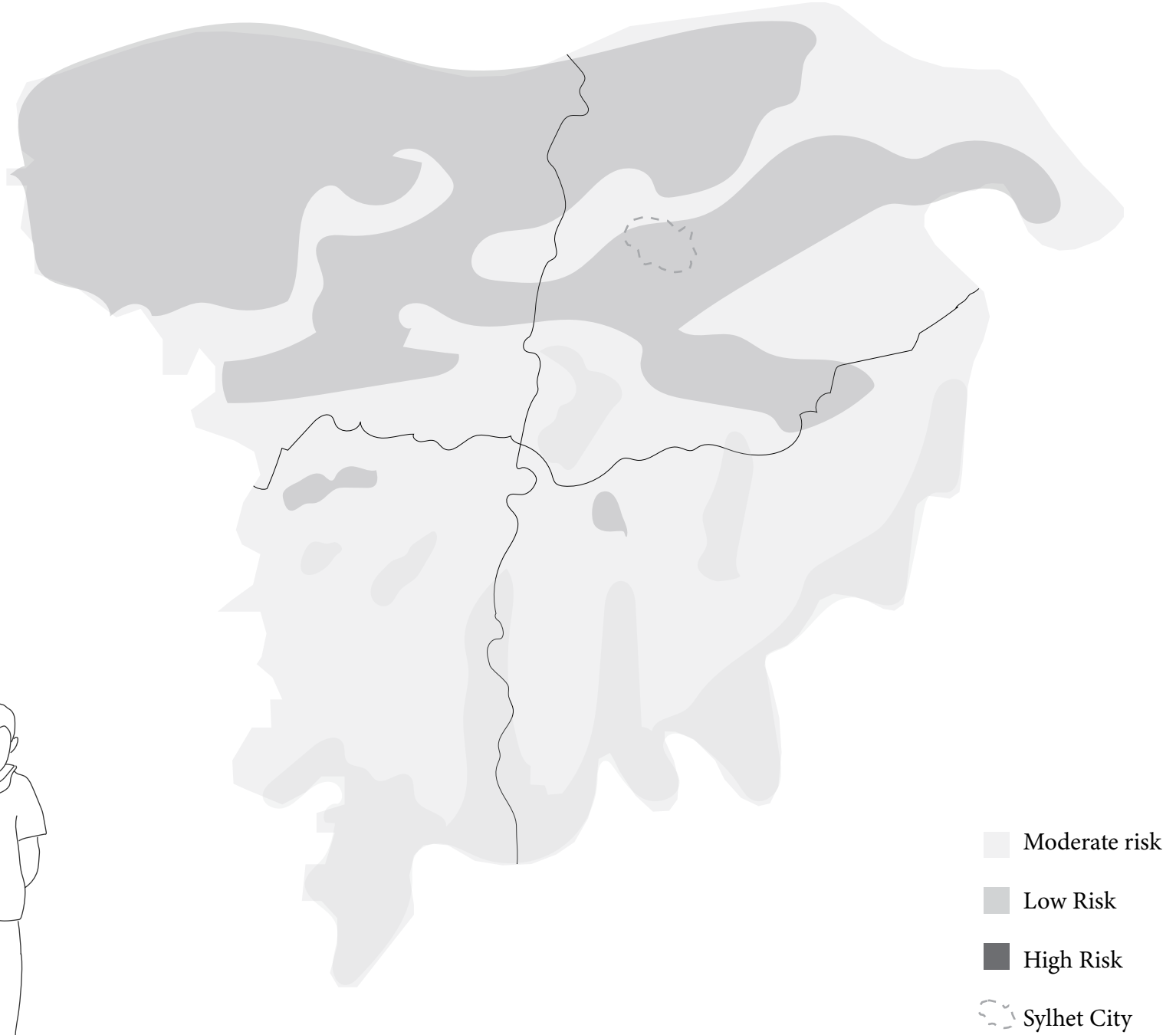


Figure 15. Zoning map of flash flood risk in Sylhet basin (adapted from Howlader et al, 2024)

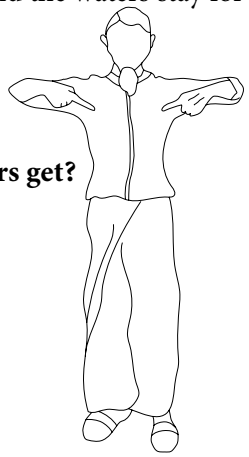
Research: Ethnographic Studies

Interview

Shonatola Village Representative (interviewee)
12 December, 2024 – Genora Jankee (interviewer)

1. How long have your people lived here and approximately how many people live in the village now?
We have been here since after the British colonial rule, around 1947. We have inherited this land from our forefathers, this is our home. About 250 families live here now.

2. How often does it flood in the village and how long do the floods last?
It floods about 2-3 times a year and the waters stay for 7-10 days.



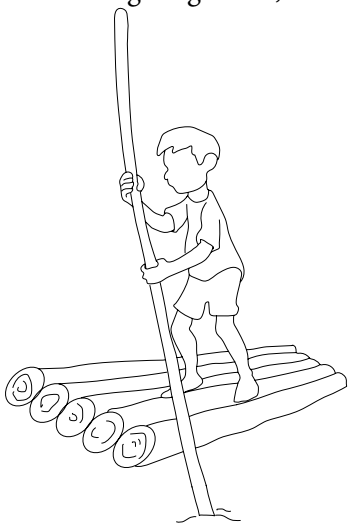
3. How high does the flood waters get?
The water sometimes goes all the way to my chest (approximately 1.5 meters).

4. What do you do when the flood comes?
We make boats with the banana trees - "Kolar Vela". We use them to move and take shelter at the school on the highway. We have made these boats for generations. The school is at a higher level than the village. We take our goods and other important stuff with us. When the waters recedes, we return home.

5. What happens to the boats after you have used them during the floods?
The boats are usually made from the trunks of old banana trees, so they are discarded after we use them.

6. Who has priority in terms of taking shelter in the primary school?
Women and children, have priority. Sometimes women and children sleep standing up because of lack of space. Of course, everyone cannot fit in the school, so men sometimes sleep on the roof top, or they stay in their homes, or make temporary shelters close by. When absolutely necessary families travel to the inner city of Sylhet to take shelter with other family members.

7. What happens to your livestock and crops during the floods?
We try our best to move with our animals or move them to higher ground, but our crops are lost.



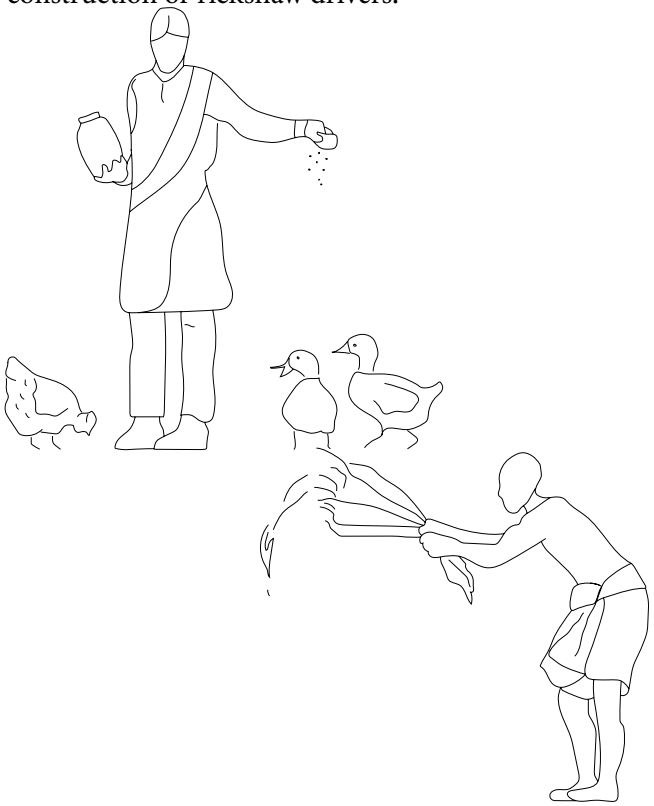
8. What happens to your house during and after the floods?
We must make repairs and, in some cases, reconstruct our homes.

9. Why are most houses one story, do you not want to build upward to help with the flooding?
We do not have enough money to build up but if we get the opportunity we would.

10. What types of materials do you mainly use in construction?
In the past we used mud, then we started using bamboo. Now after the horrible flood of 2004 we try to build with concrete to make stronger houses to better deal with the floods. We sold some land and got extra jobs to be able to get the money to do this.

11. How do you get your water?
We all use ground water and there are about two wells per household.

12. What are the main jobs of people in Shonatola?
We are farmers, we farm cows and ducks, we also grow crops like rice and jute. Many women are either farmers or home-makers. Men are often farmers, carpenters, in construction or rickshaw drivers.



Observations

Though houses in Shonatola are made from different materials, there is a pattern in the use of space. There are three types of rooms, the living room that also doubles as a bedroom in most cases and the kitchen. Homes do not have hallways, new spaces are defined by entry ways. Only more modern homes have bathrooms, in other cases they are detached from the house.

Figure 16. Map of Shonatola

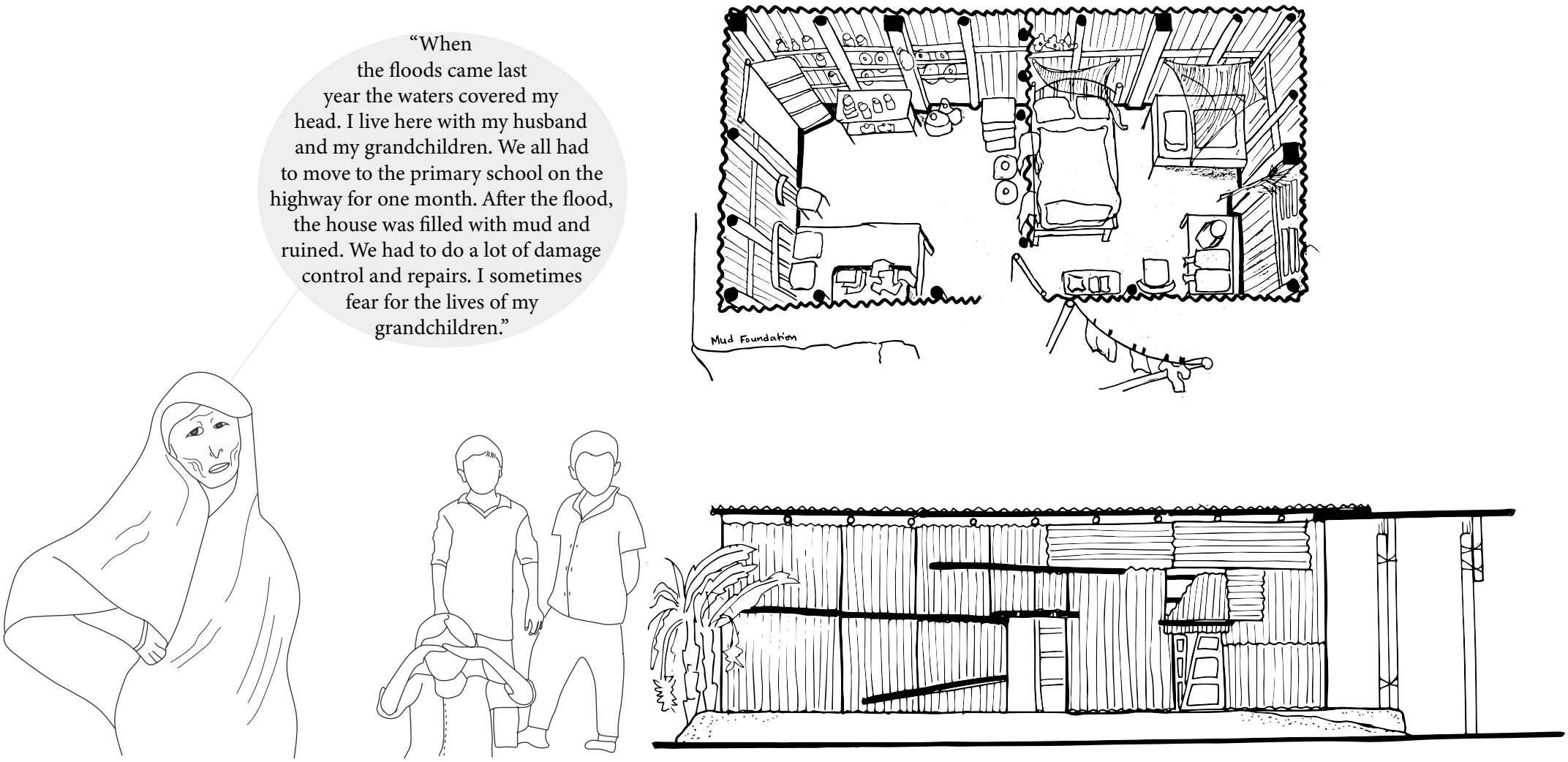


Figure 17. Palki's testimony and tin house

"Last year (2023) the waters came up to my chest. - We have made "kola velas" for generations, we use them to move and take shelter at the school on the highway. The school is at a higher level than the village so it does not get flooded badly. We take important things with us, when the water recedes we return home."

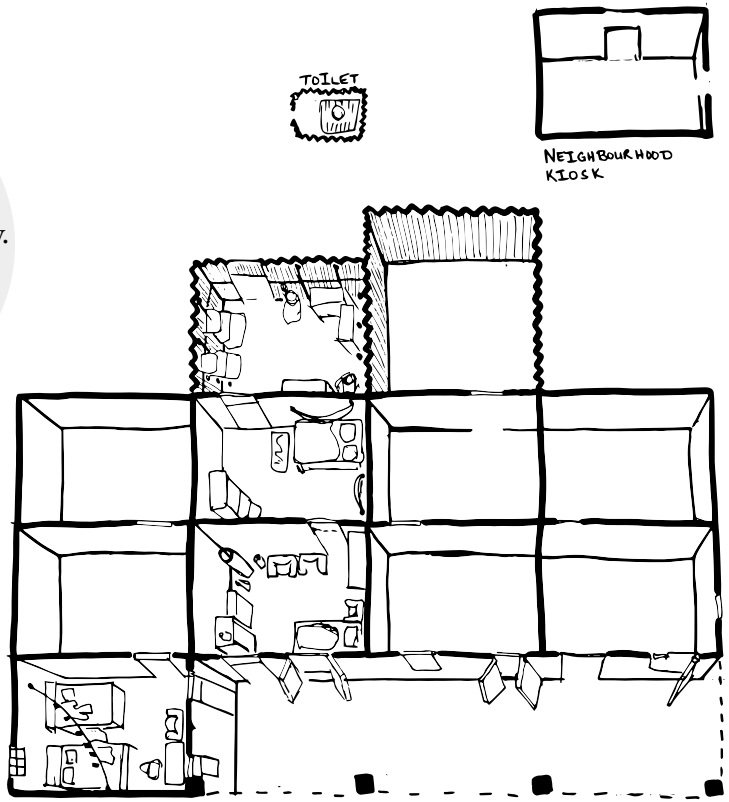


Figure 18. Fahim's testimony and brick house

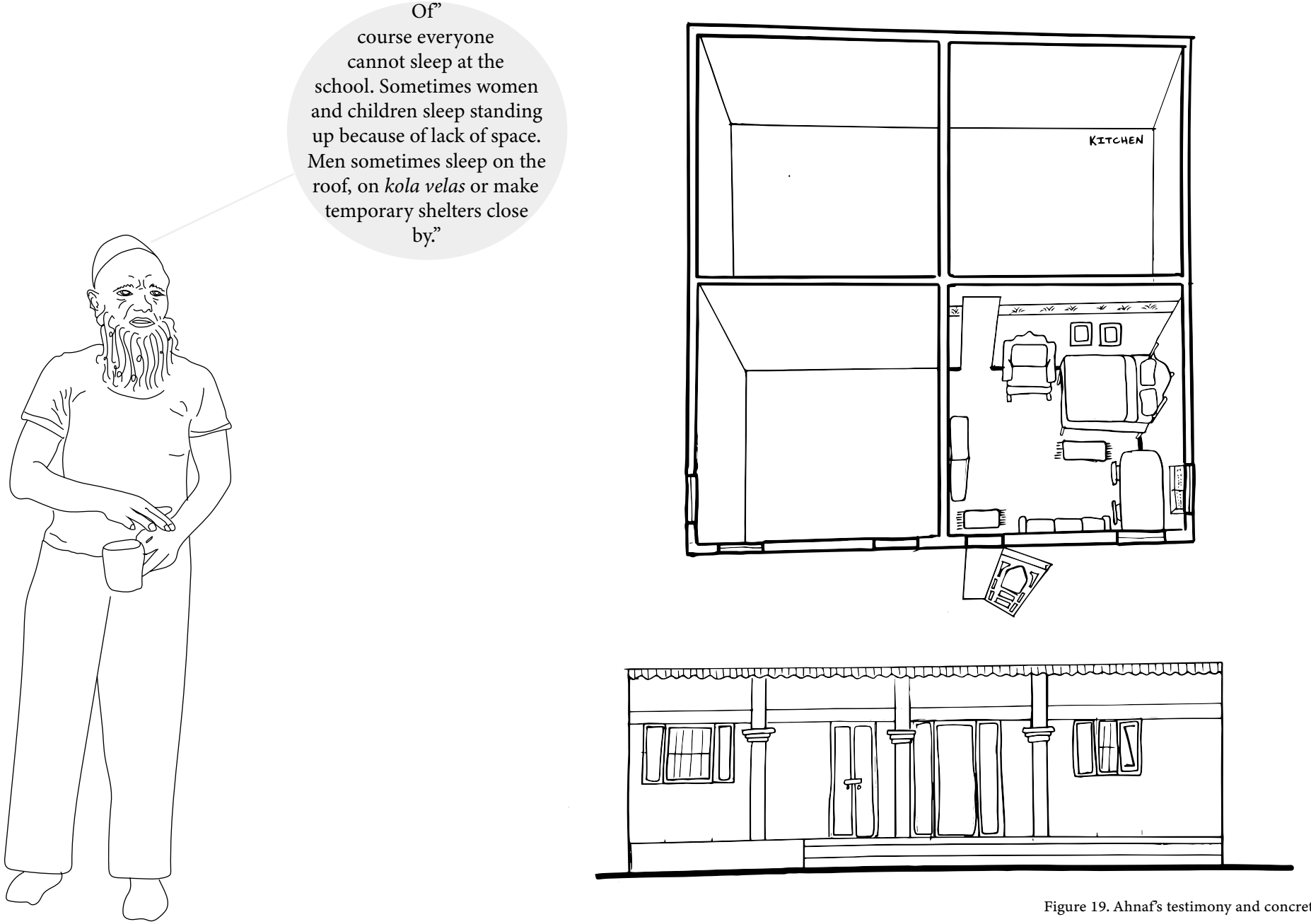
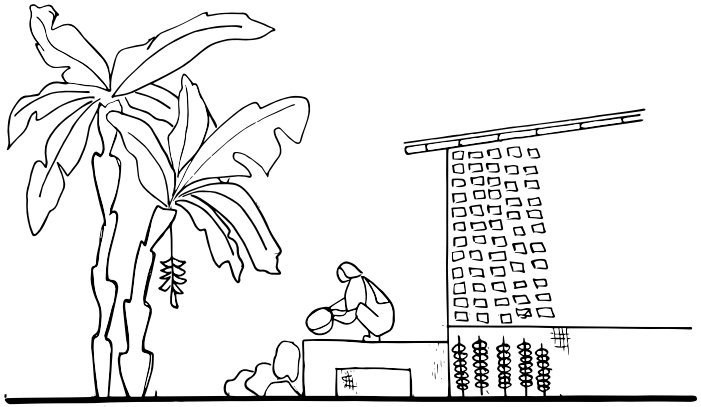


Figure 19. Ahnaf's testimony and concrete house

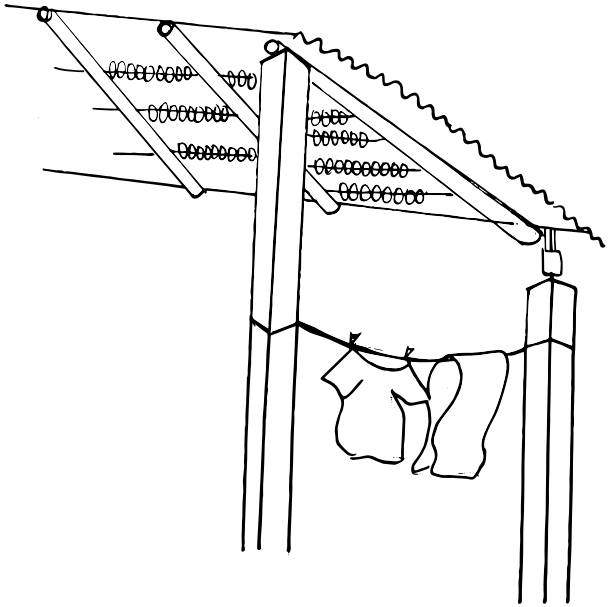
The stoop



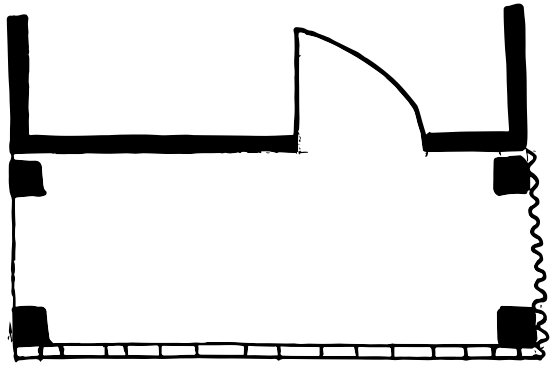
The stoop is an extension to the house that is useually made of compact earth, stone or concrete.

The veranda

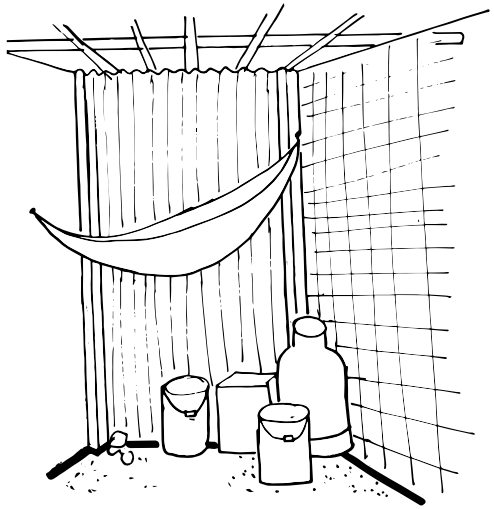
When possible stoops are complimented by a covering creating the veranda, used as an every-day space for domestic and socal activities.



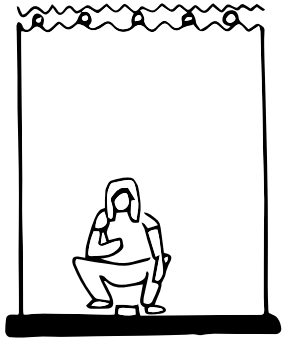
The 'outside room'

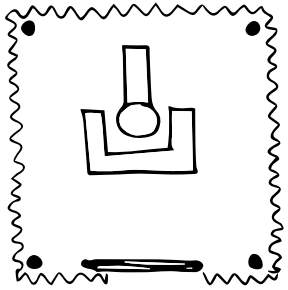


Sometimes 1 or two sides of the veranda may be blocked off for privacy creating the outside room. Domestic and social activties still take place here but the room is also used for storage and semi-private relxation.

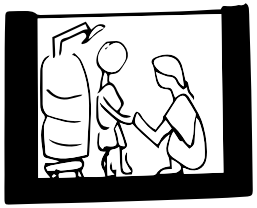


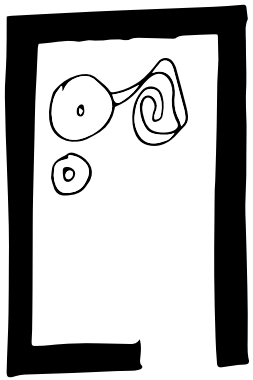
Toilet



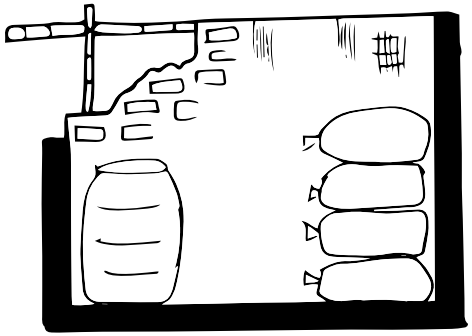


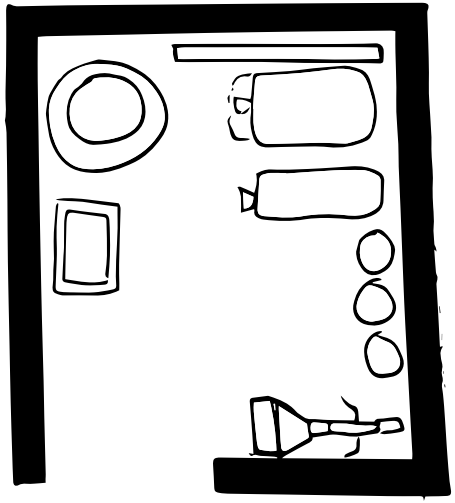
Shower



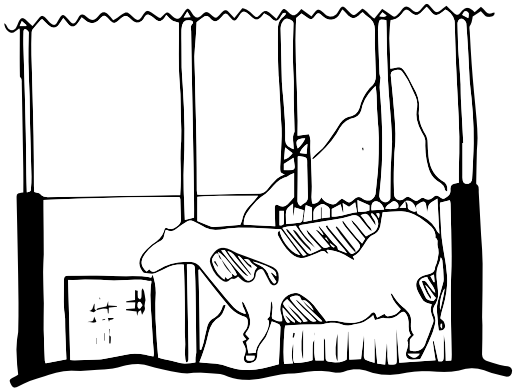


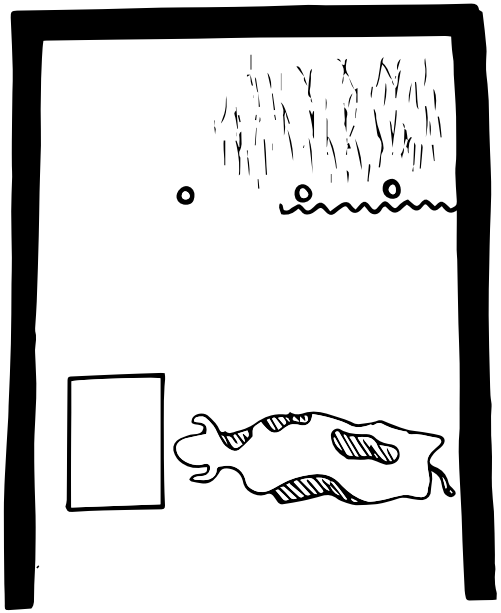
Storage room

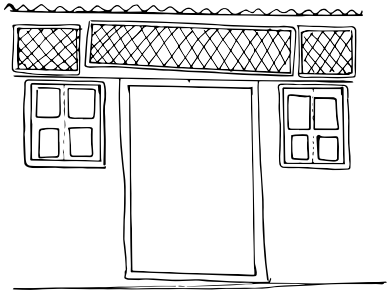


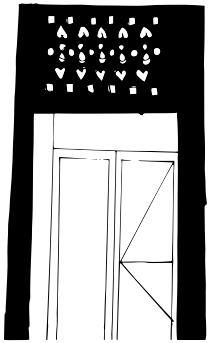


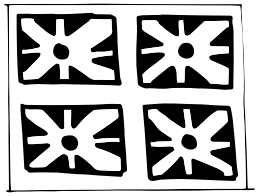
Animal shed

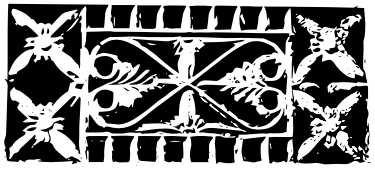




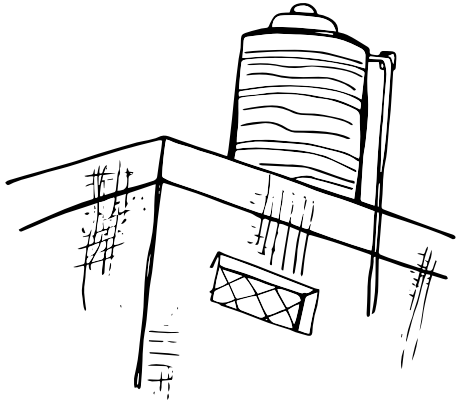




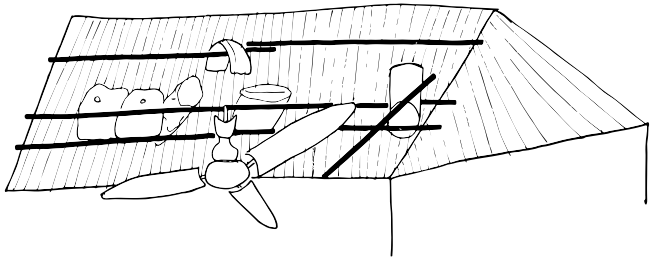




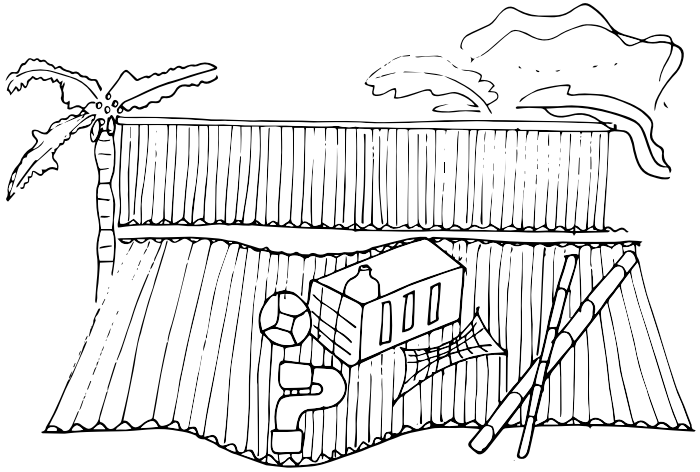
Natural ventilateion through the use of decrative wall prefarations are a common feature in the typical Shonatola home.



Water tanks store ground water for use in times of sparity.

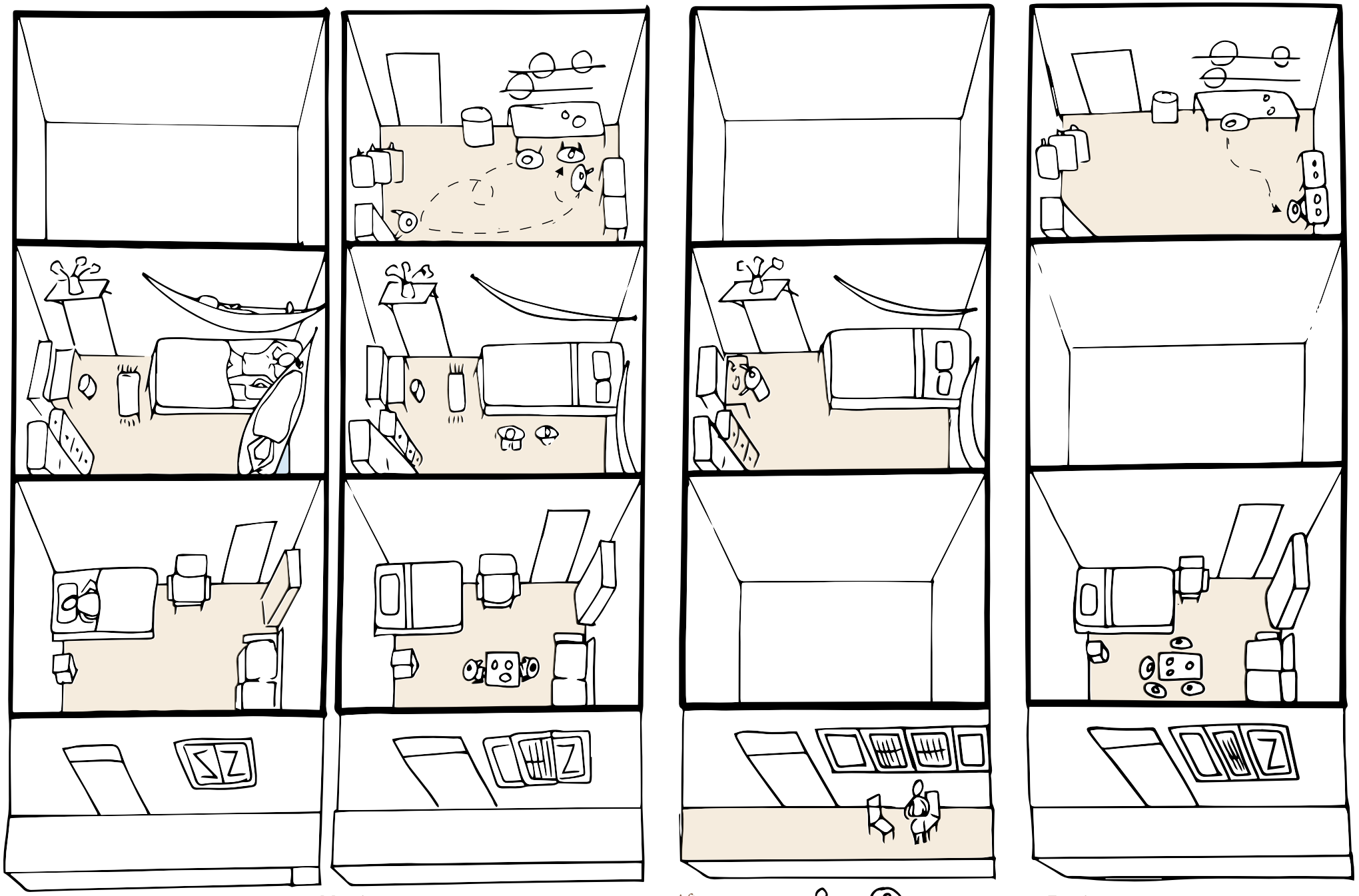


Storage in interior ceiling



Storage on outer roof.

Lack of space and storage is an issuse in the village. Residents have found ways to deal with this by storing necessities on the interior roof battons and also out the outside of the house usesually on the veranda where things are easily accesible.

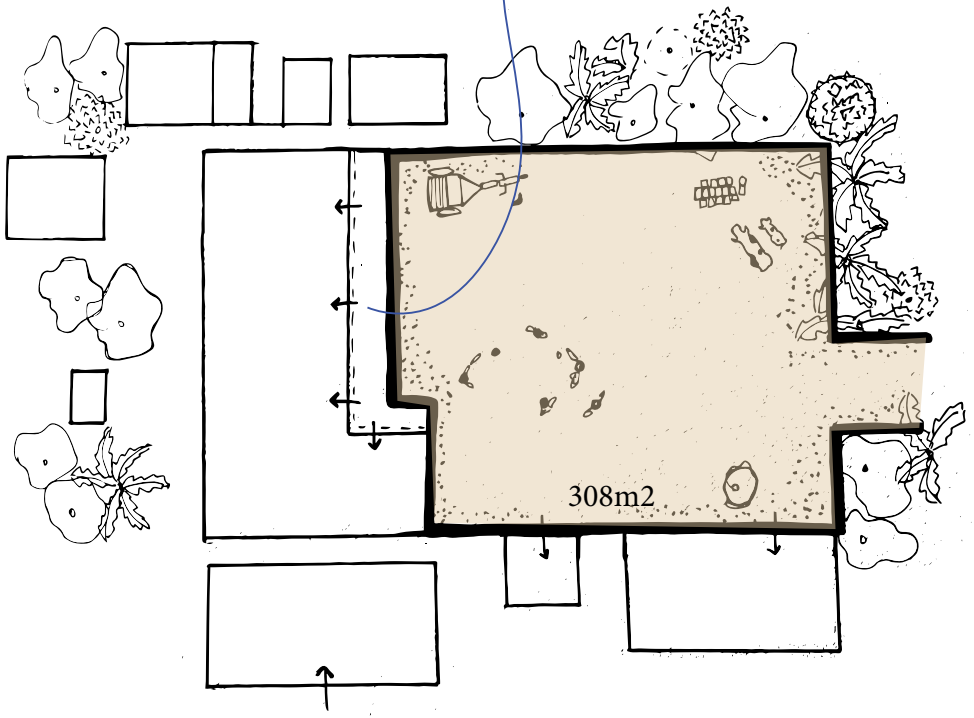


Dawn

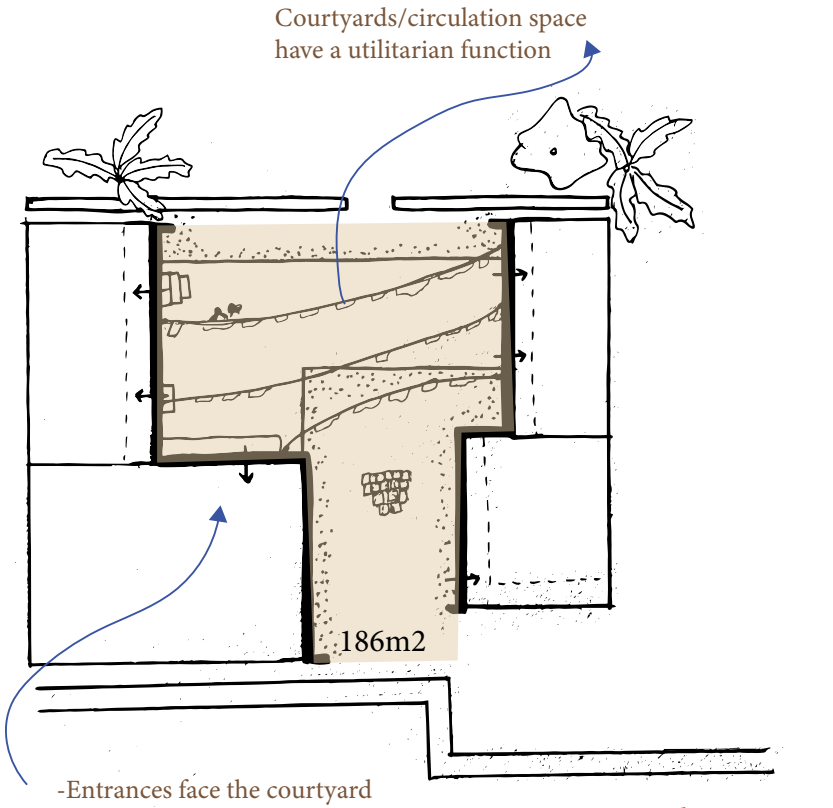
Morning

Afternoon

Evening

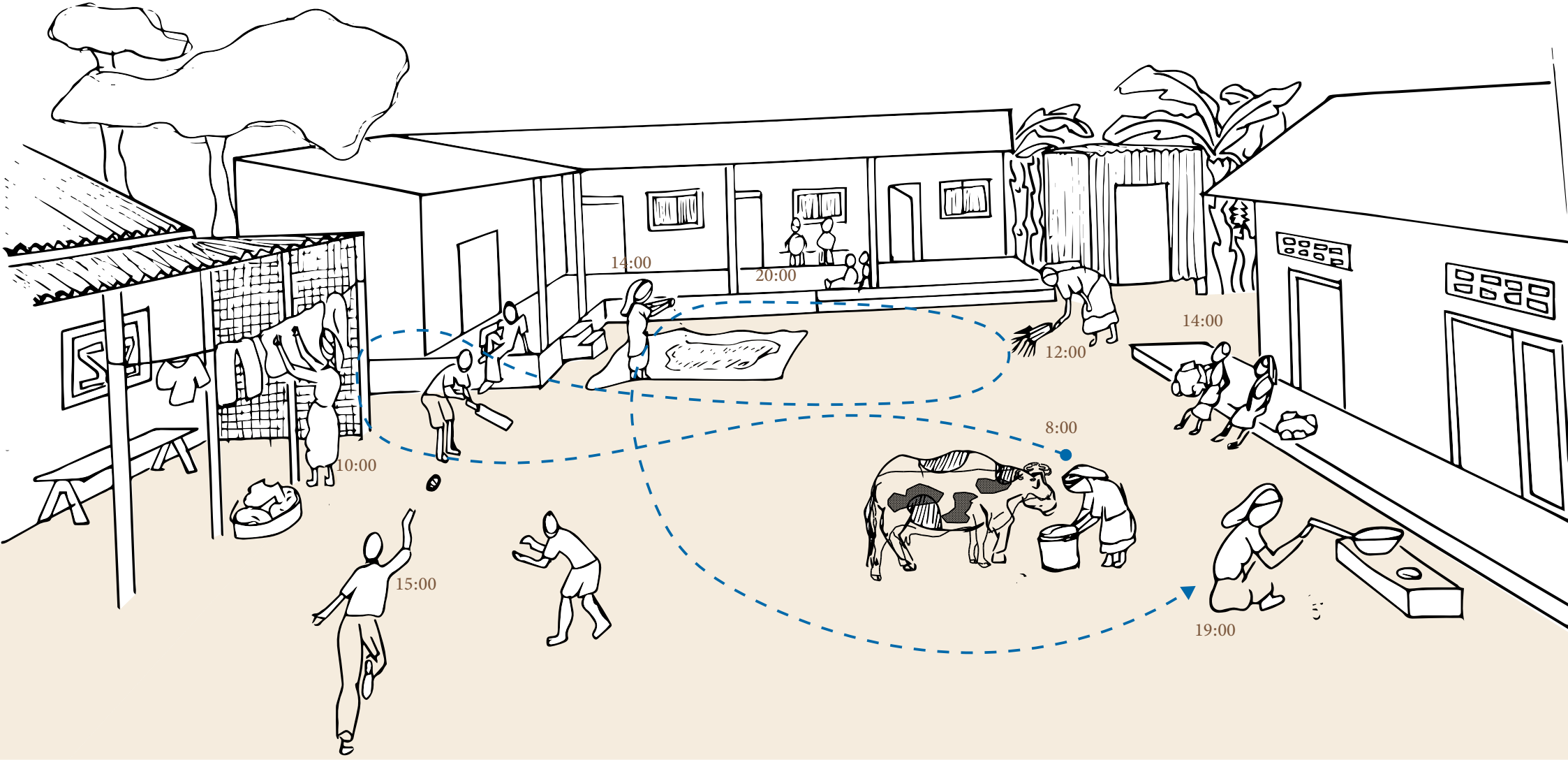


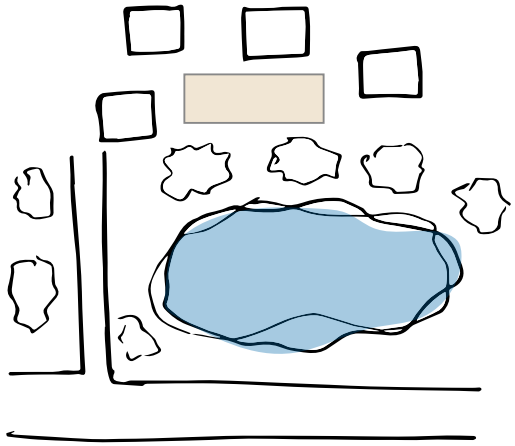
-2 open sides
-3 houses
->=7 families
approx. 2 families/house



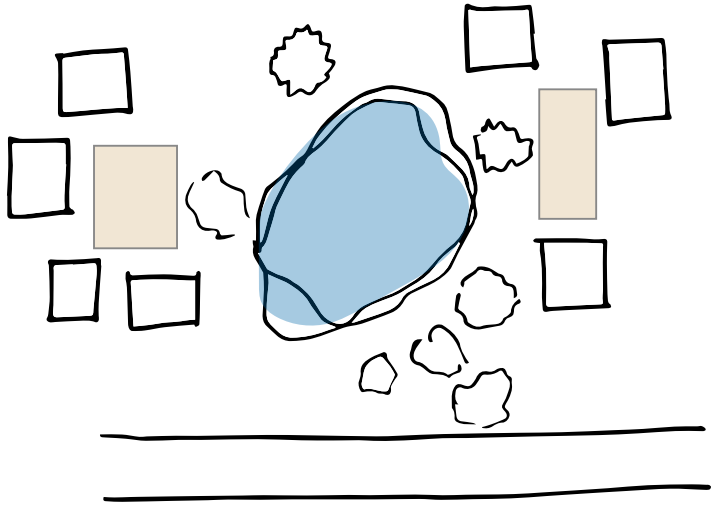
-1 open side
-4 houses
->=6 families
approx. 2 families/house

Activities in the Courtyard

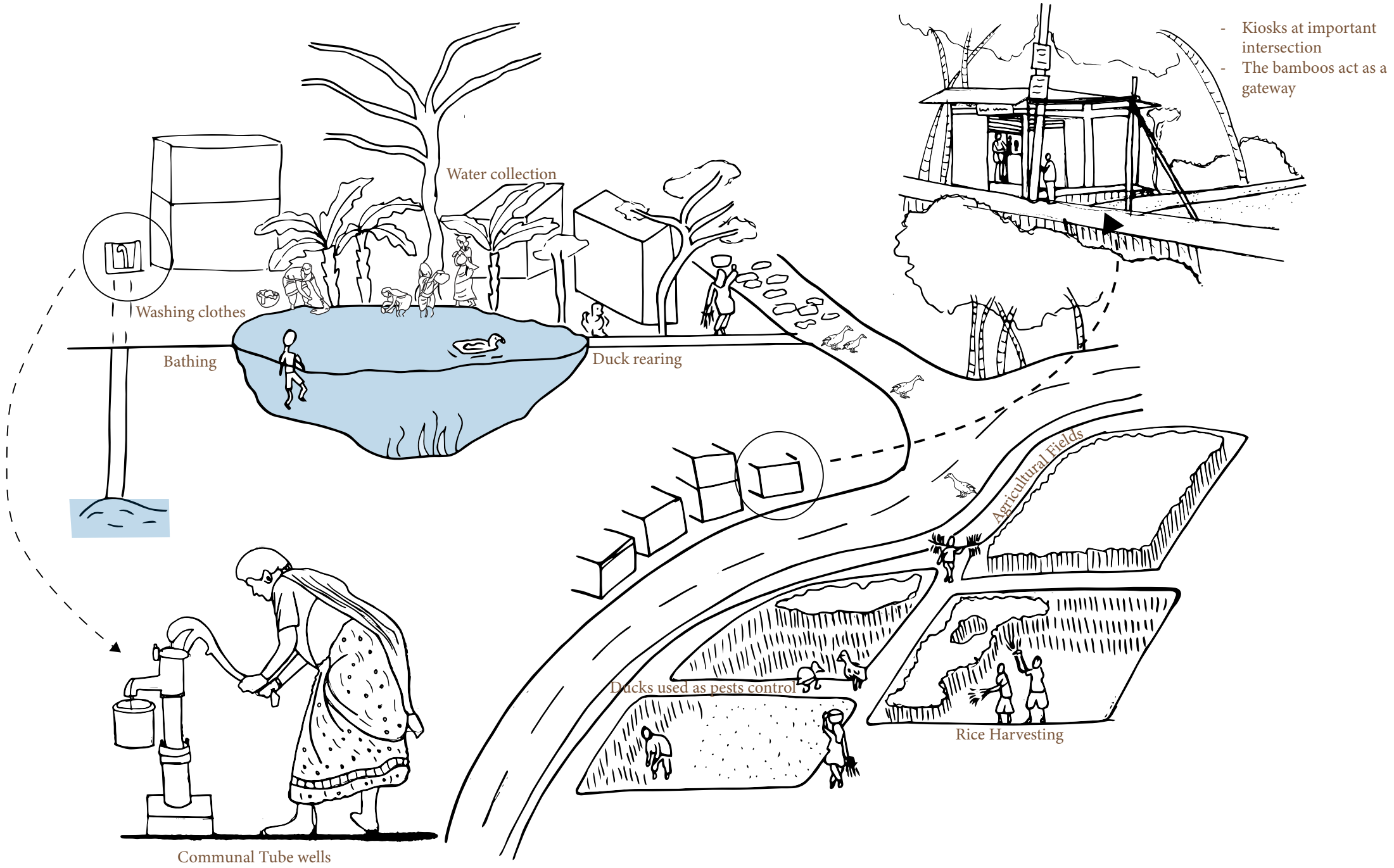




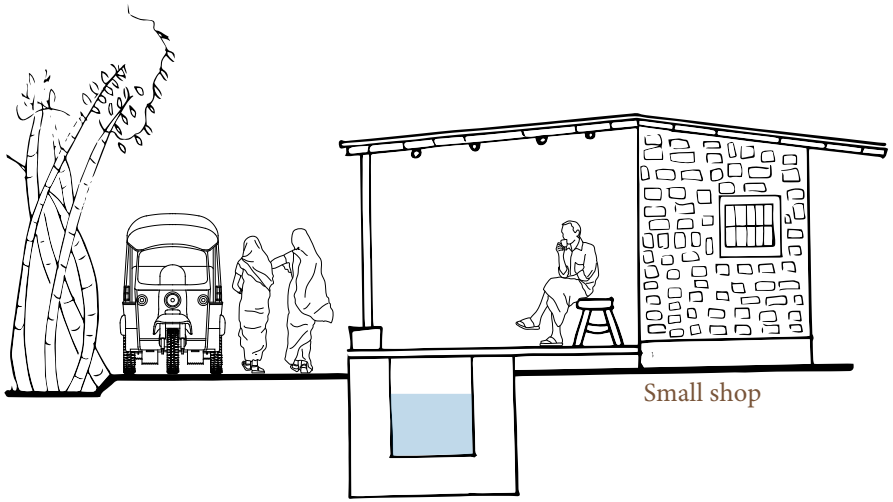
Providing privacy

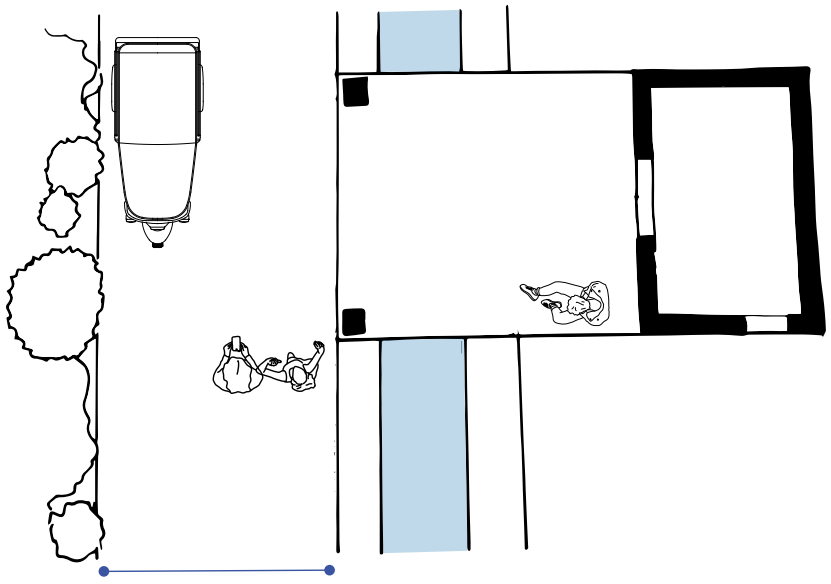


Servicing two clusters

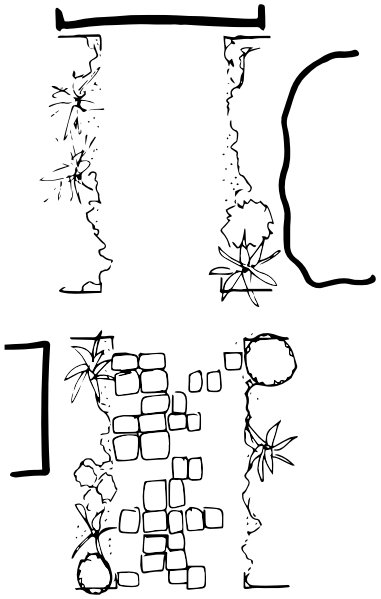

- Kiosks at important intersection
- The bamboos act as a gateway
Water collection
Washing clothes
Bathing
Duck rearing
Agricultural Fields
Ducks used as pests control
Rice Harvesting
Communal Tube wells

Main Street





Narrow roads

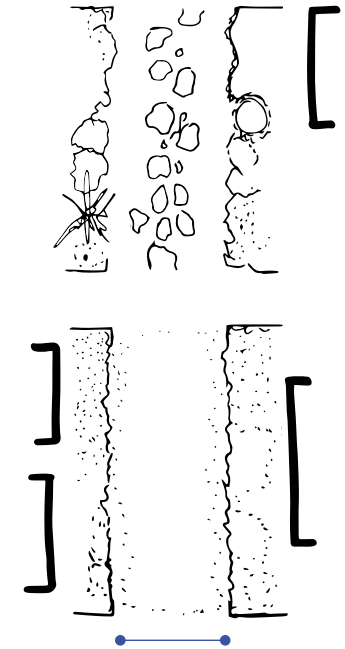


Paved

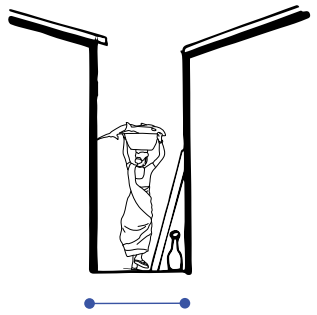
Brick

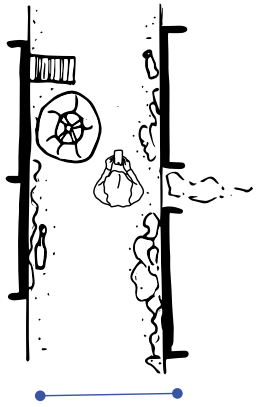
Stone

Earth



Alleyways





Lessons Learnt

-Residents lack storage
-Streets follow a hierarchy
-Location of water is important
-Semi-private spaces are important
-Courtyards are the centre of cluster life.
-Shared spaces between clusters are important
-Connects between water, the courtyard and agricultural fields are important
-People are not only adjusting when it comes to floods they are also adjusting within the space that they occupy.

Sub question 1:

How can other indigenous knowledge systems be translated seamlessly to the context of Sylhet?

Answer:

Research has shown that indigenous adaptation techniques and knowledge practices have been used by indigenous communities in Bangladesh and other regions to mitigate the effects of climate change and stressful environmental conditions.
Because of this the researcher looked at 3 indigenous groups both in and outside Bangladesh that faced similar challenges with water as Shonatola. The Uros people in Peru, built on the water creating a new landscape. The Bede people migrate and the Khasi people have interesting building techniques.

After looking at Shonatola and their relationship with water, a pattern was observed. There was a big boat culture. People use the *Kola Vela* to travel to a nearby primary school and take shelter there. **The adaptation technique of Shonatola is micro-migration.**

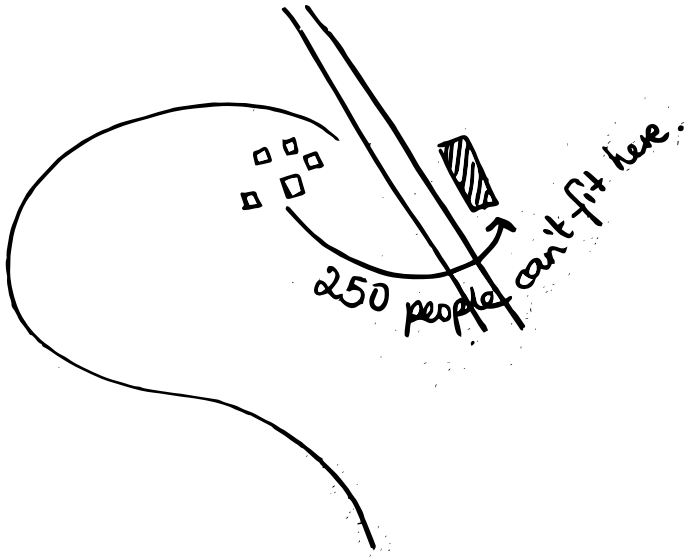
Studies showed that Bangladeshi people use migration as a form of resilience against natural disasters. This migration does not occur freely but is a form of voluntary micro migration. However, researchers found this to be a positive factor.

Even though a lot was learnt from the indigenous groups it is probably not necessary to implement their ideas into Shonatola because there are already adaptation techniques in Shonatola and there is a lot to be learned from the people themselves.

Design

Scenario

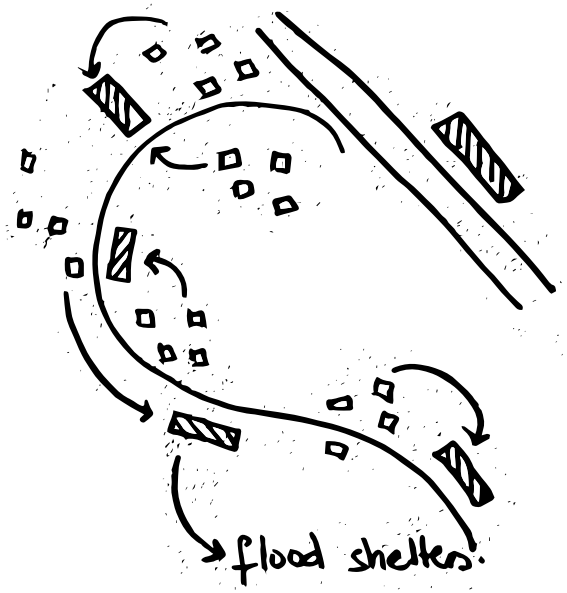
Currently, Shonatola experiences flooding about twice a year and the flood waters remain stagnant for two to three weeks each time. The people of Shonatola are forced to migrate temporarily to a nearby school that takes the role of a flood shelter during the rainy season. This reoccurring natural disaster causes delays in the infrastructural and economic development of the village.



Shonatola suffers from severe flooding annually and is unable to develop further because of constant economic loss

Manifesto

The aim of the new development is to facilitate the phenomenon of micro-migration that takes place in Shonatola by creating multiple flood shelters for the people affected by the foods as well as creating a new housing types that can withstand the climatic challenges while still remaining true to and respecting the culture and norms of the residents.

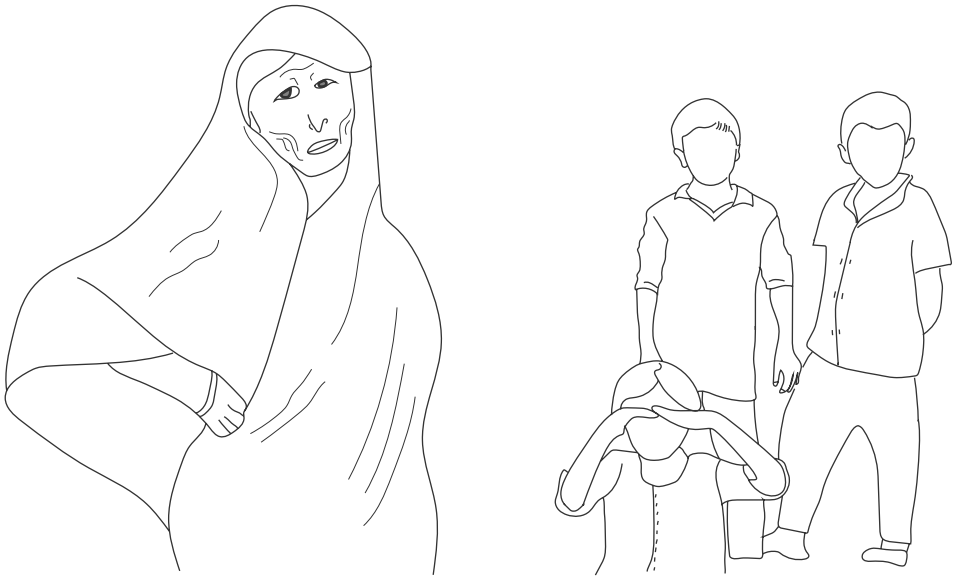


1. Families are prepared before floods
2. Employment and economic development in Shonatola
3. Better living conditions

Figure 20. Image showing current situation and manifesto

Target group

Flood affected families of Shonatola



People from Shonatola who cannot afford to move and need to use flood shelters like Palki and her family.

Economically stable households of Shonatola

People from Shonatola who can afford to move to the new development like Fahim, a community leader and farmer who has some savings...

... and Ahnaf's family because his son got a job at the new jail.

Urban to rural migrants

People migrating from the city to rural areas because of the gradual expansion of the city or people who are attracted by the new developments (marine academy and jail) like young students.

Figure 21. The target groups

Program of requirements

Neighbourhood

Public ponds
Farm land
Connecting bridges/walkways

Compound

Connected Clusters
Communal ponds
Communal Farmland
1 shelter/community center per compound — 3-4 stories

Shelters

Dry Season
(Community Space)

-Cultural /event space
-Educational space
-Medical Space
-Workshop space
-Play space for children
-Commercial stores

Wet Season
(Flood Shelter)

-Boat docking area
-Sanitation facilities
-Cooking facilities
-Garden for food supply
-Cattle space

Cluster

Communal courtyards 80-150m2
Semi-public, semi-private, private space
Rain water collection and storage

-Stilt structure
-Ground floor access
-Flood resilience

Dwelling

Low income type 20-40m2
Middle income type 40-70m2
High income types 70m2 +

Wet areas, living space, sleeping space, storage

-Context sensitive
-Affordable housing
-Culturally relevant

Architecture

Figure 22. New development during dry season

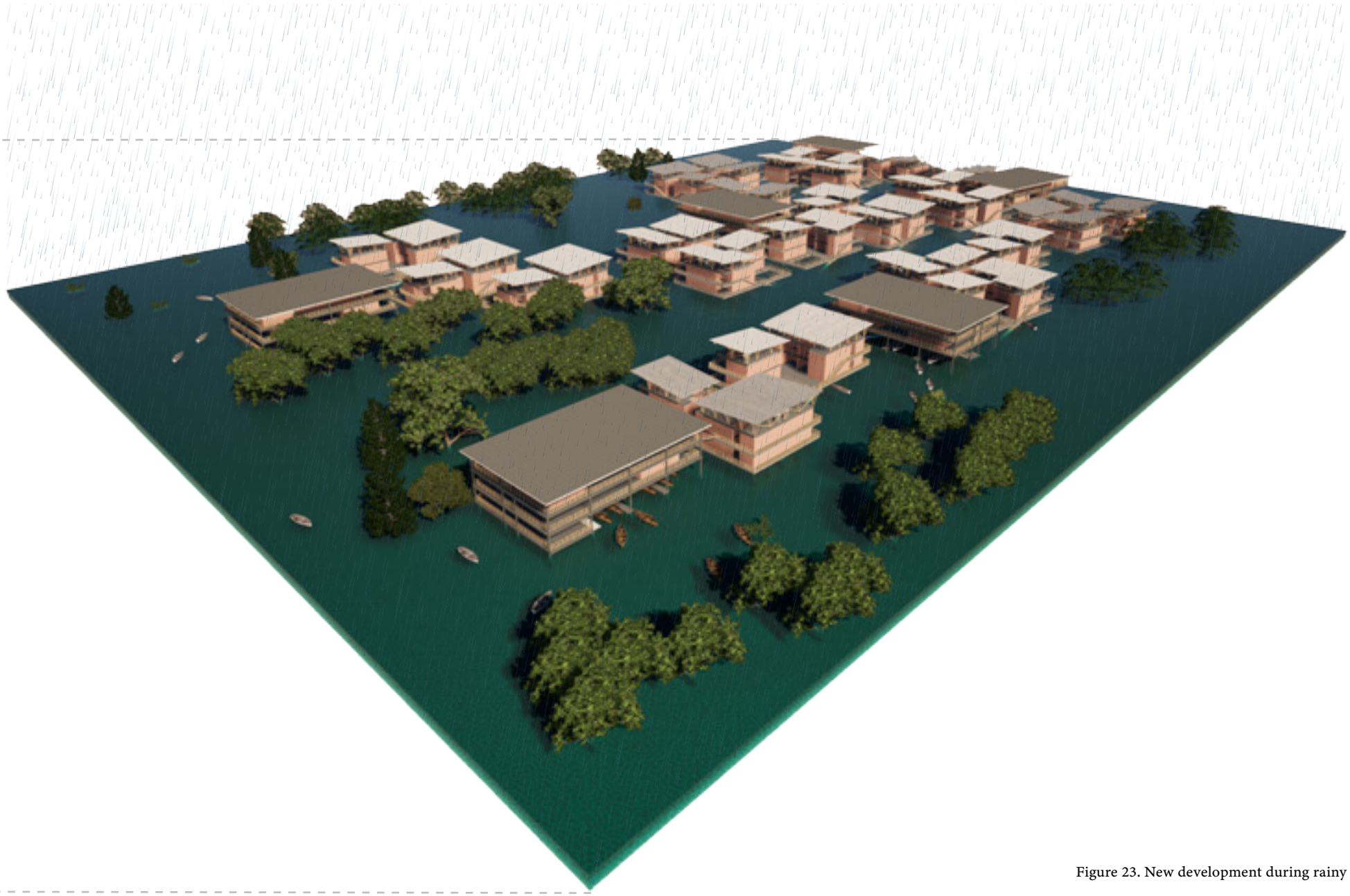
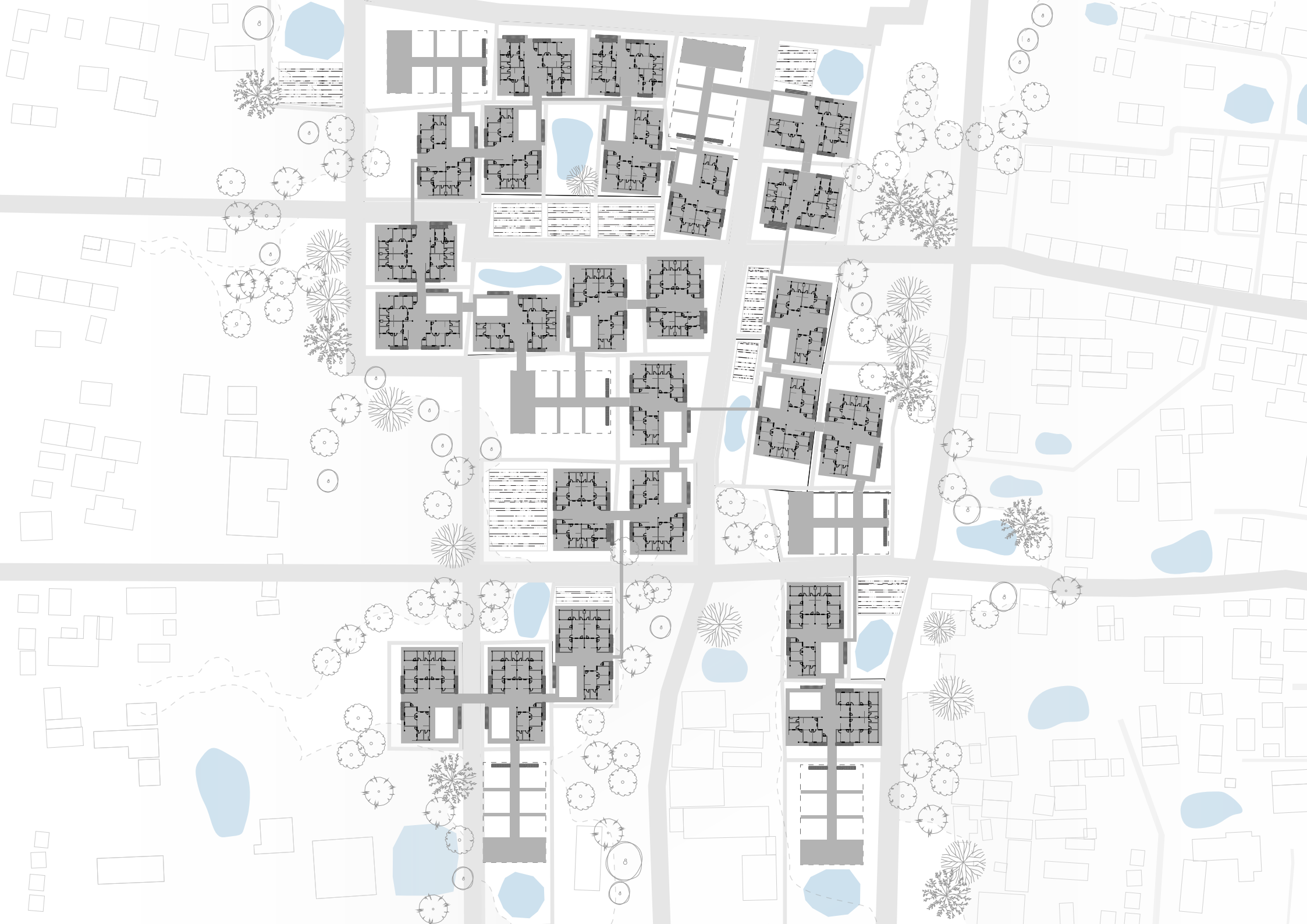


Figure 23. New development during rainy season



156 new dwellings
FSI: 0.3

Figure 24. Urban Strategy

Neighbourhood Strategy

The chosen site is mostly unoccupied land with clear site divisions. Analysing the size and shape of the divisions and comparing them to the size and layout of the existing clusters in Shonatola, we can assume that the clusters in Shonatola grew from the order of previous plot divisions. This gives us incentive to use the plot divisions as the base for the new cluster development.

Plots that were smaller than usual were combined and those that were larger were divided to mirror the shape and size of the typical plot. The neighbourhood strategy is derived from the resulting plots.

Six shelters are found at the intersections of the six main roads. The shelters act as landmarks drawing on the principle of the landmark that was observed in the village.
The six main roads are extensions of already existing prominent roads, that now connect Shonatola, the new development and the village to the left. These streets are widened to implement new infrastructural interventions. Next in the hierarchy are the paved pathways on the ground level that connect all clusters in the new development and then there are two types of bridges. Larger bridges that connect clusters and shelters in one compound as well as smaller bridges that connect all platforms in the new development.
Ponds are strategically placed to create privacy and to service multiple clusters. Multiple clusters and a shelter come together to create a compound.

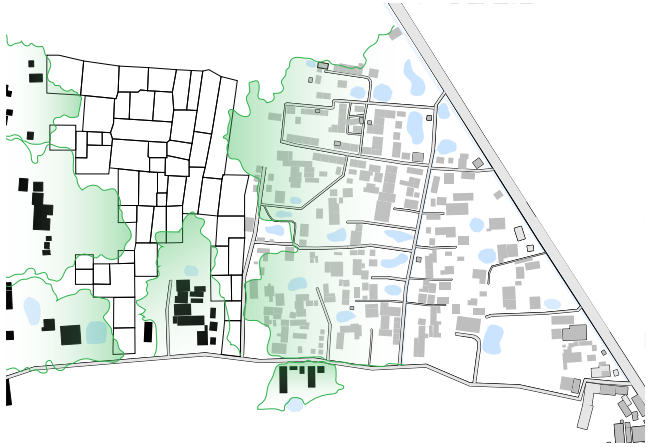


Figure 25. Existing plot divisions

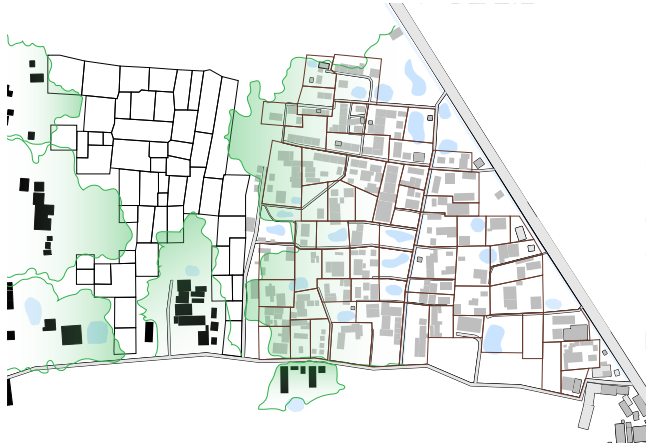


Figure 26. Hypothesised previous plot divisions

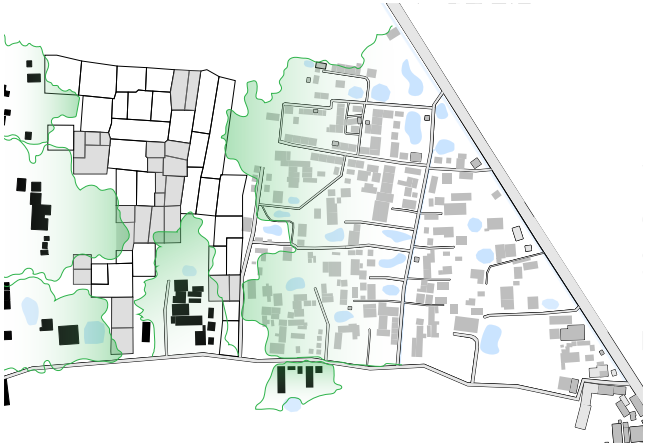


Figure 27. Smaller, irregularly shaped plots

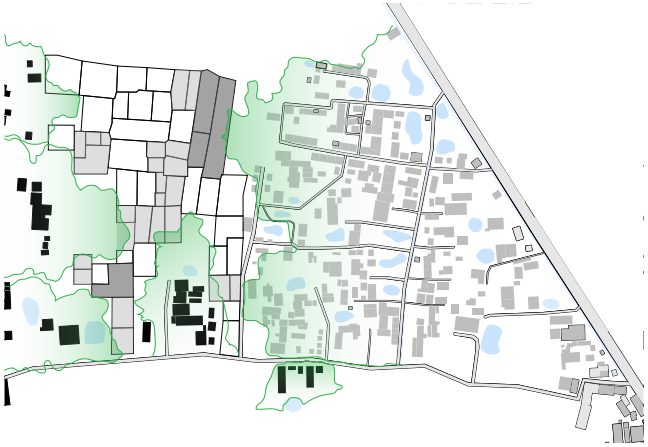


Figure 28. Larger, irregularly shaped plots

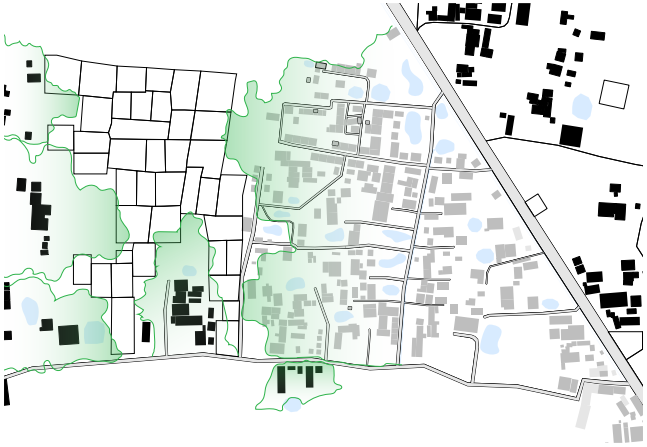
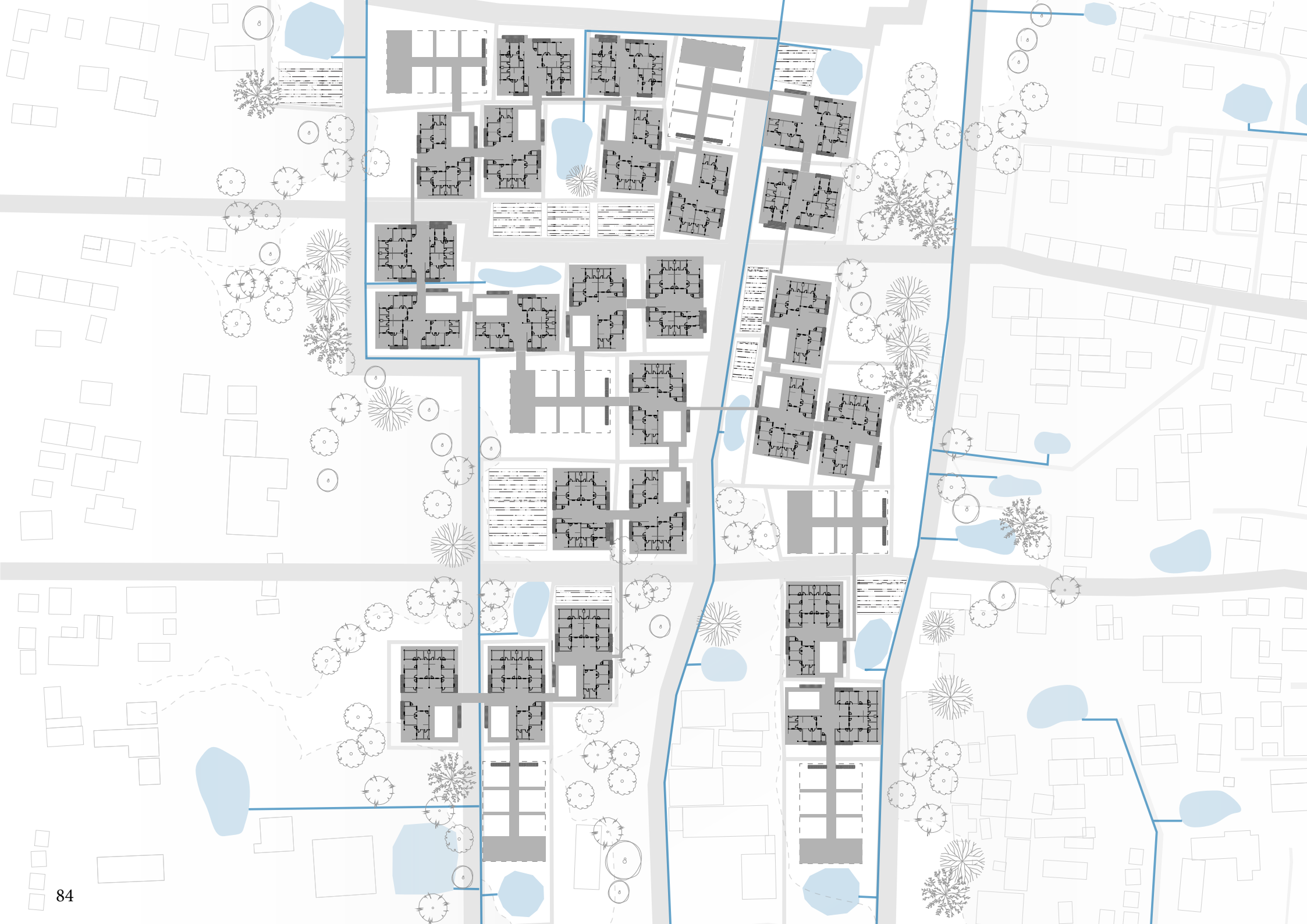


Figure 29. Modified plot divisions



Water Management Strategy

Existing as well as newly created ponds are connected through underground gutters to gutters along the main roads. In this way ponds also act as water reservoirs during the rainy season. When the ponds get full the water is then dispensed to the agricultural fields to the north and south of the site through this drainage system.

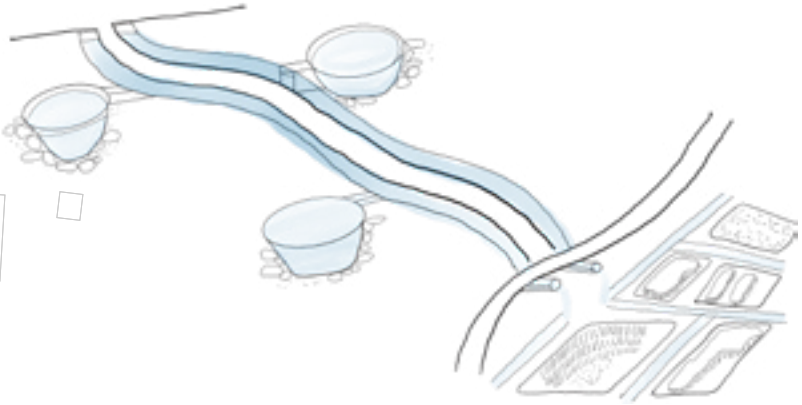
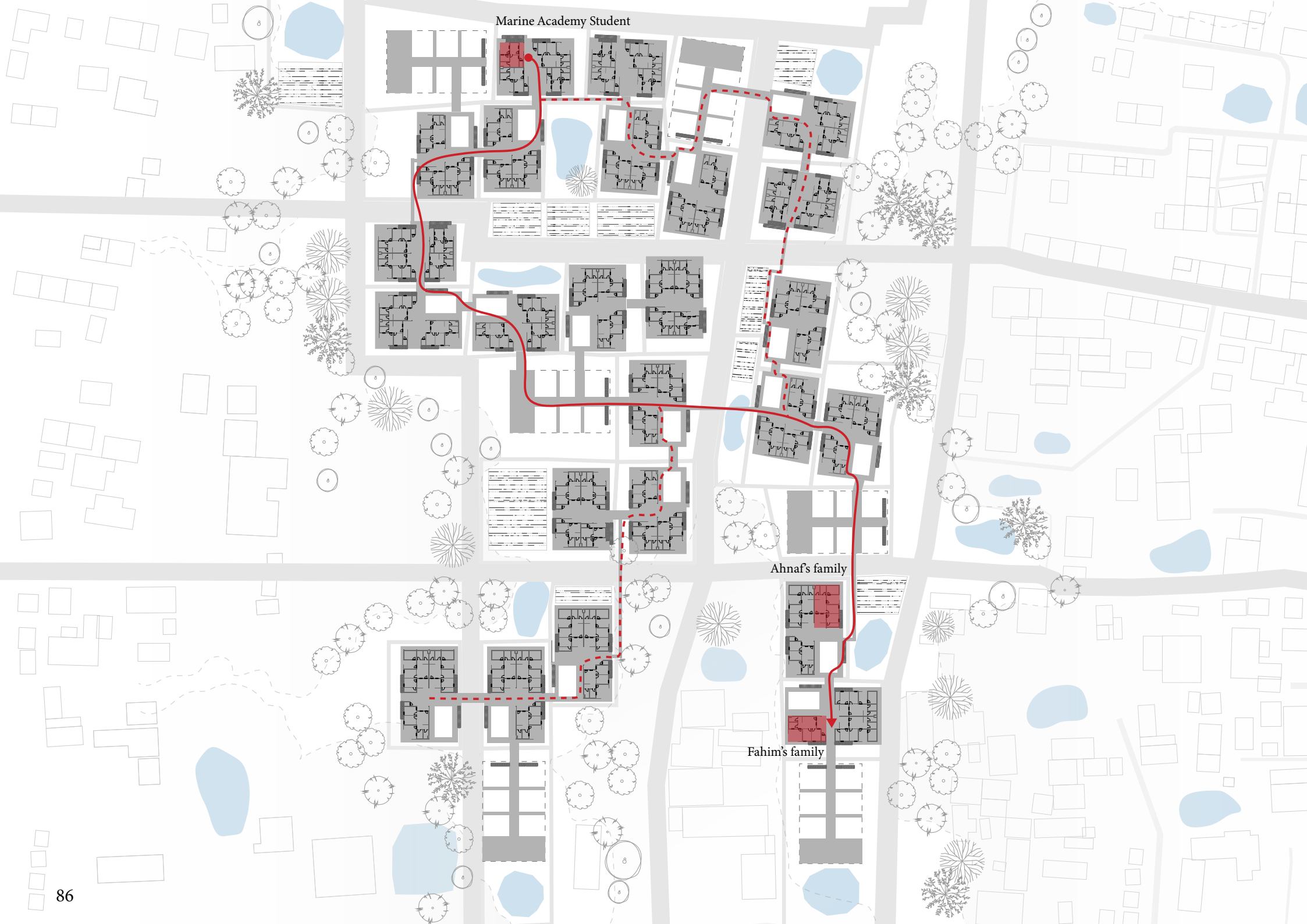


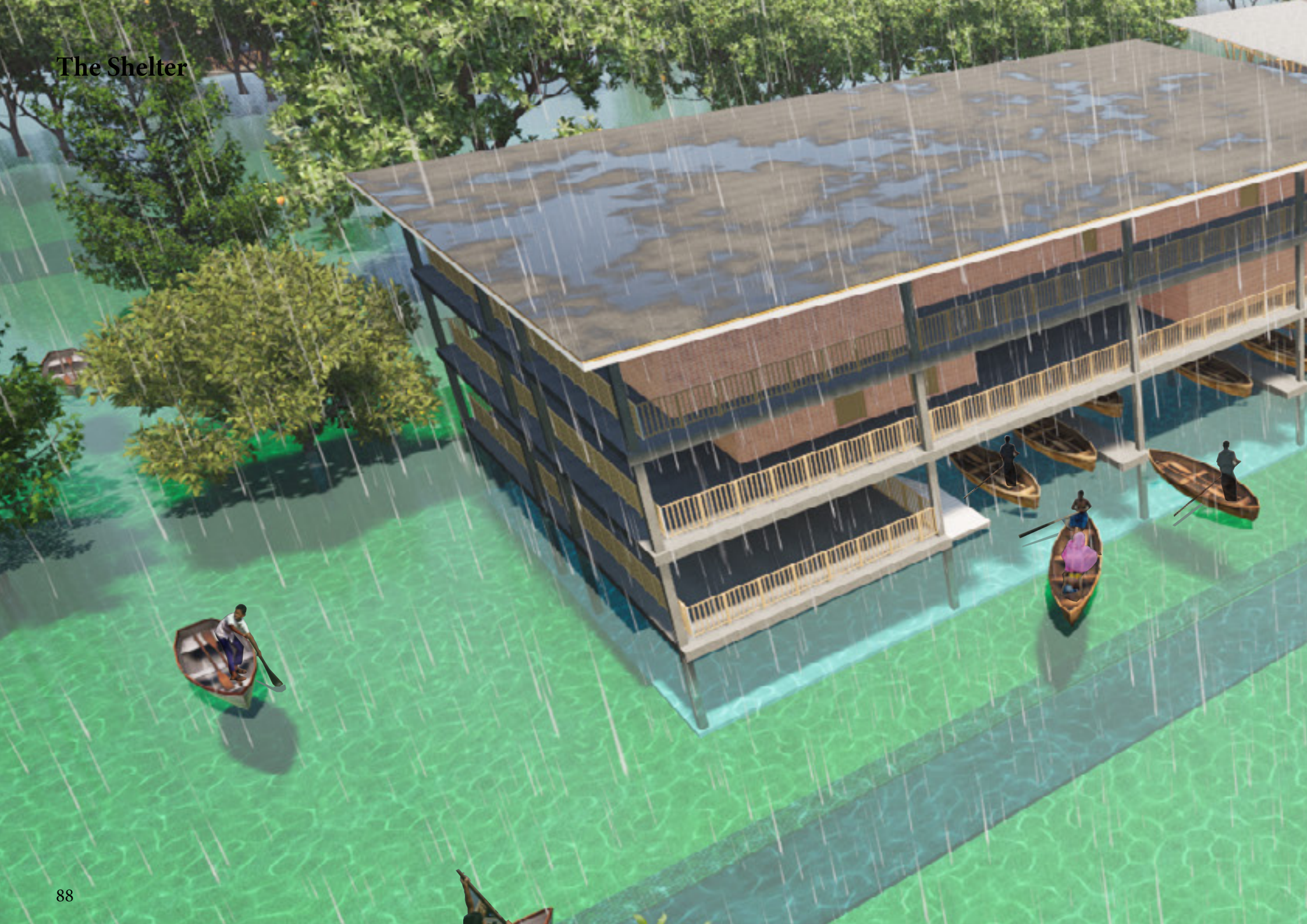
Figure 30. Water strategy drawing

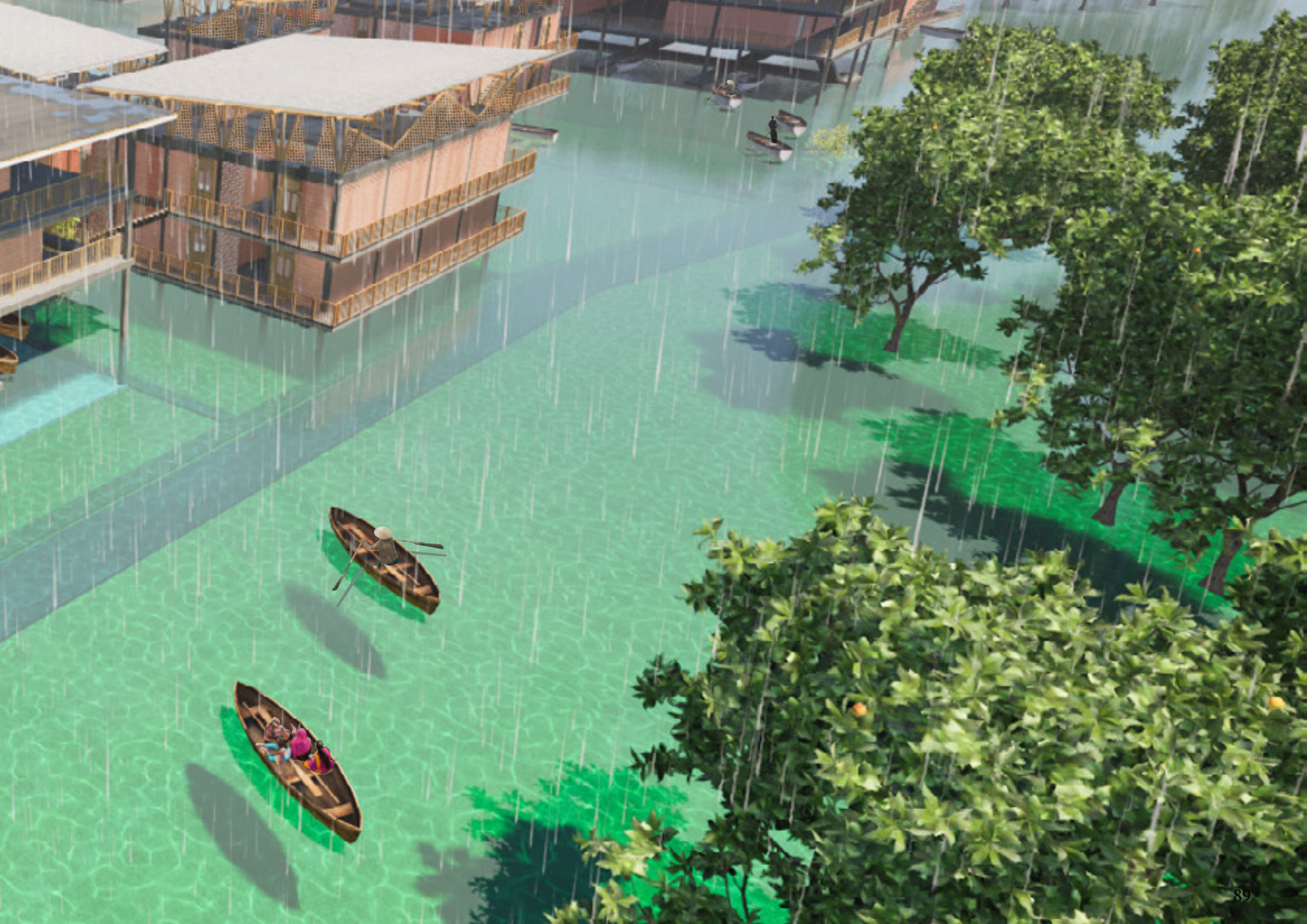

Marine Academy Student
Ahnaf's family
Fahim's family

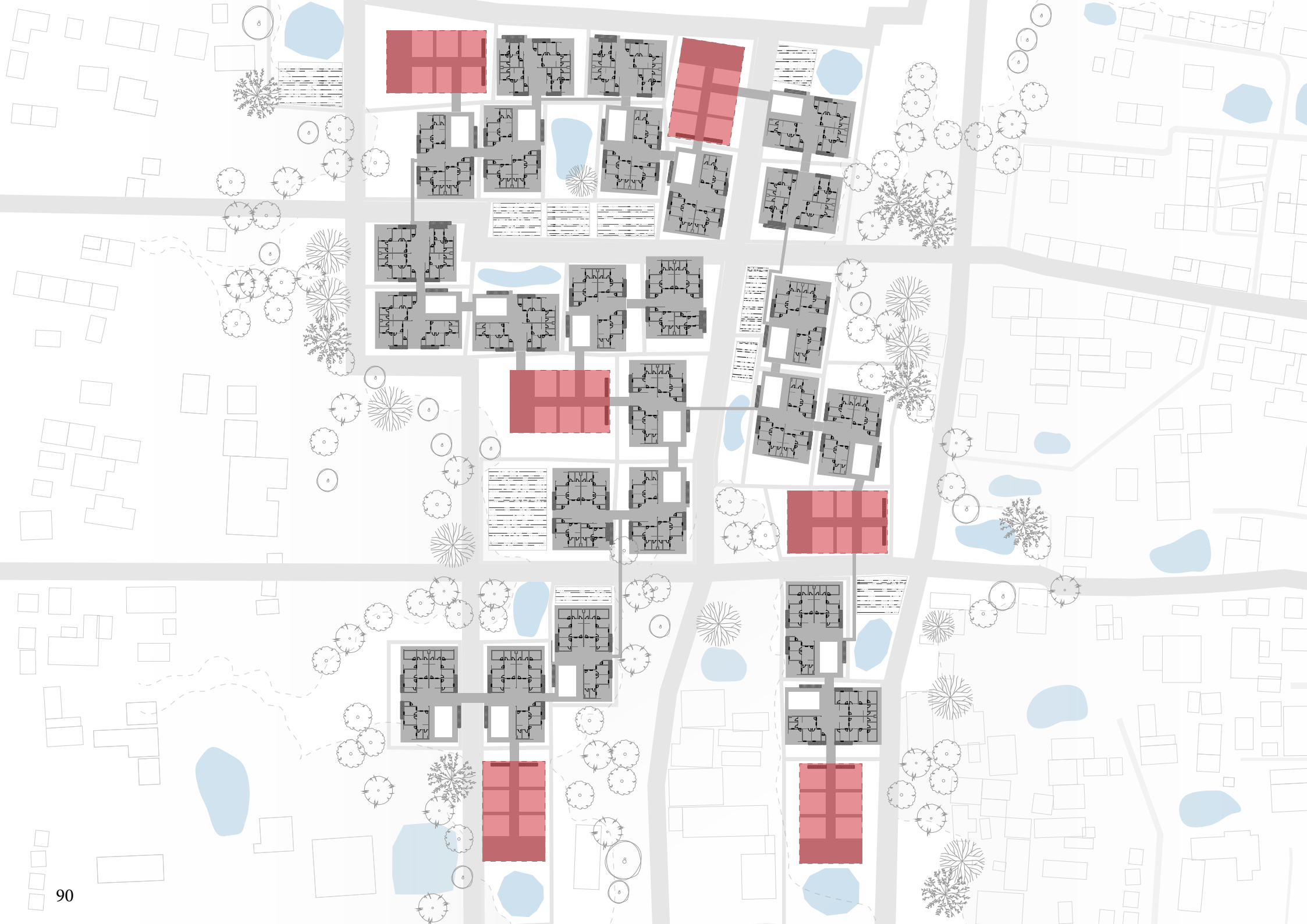
Connection Strategy

A series of bridges connect all new buildings. There are two types of bridges. Larger bridges, 3 meters in width that connect clusters in a compound and smaller bridges 1.5 meters wide that connect compounds. The placement of the smaller bridges help define the boundaries of the compounds.

Figure 31. Routing using the elevated bridges


The Shelter





The Shelter

During the dry season the shelter acts a community centre on the upper floors and community space on the ground floor. It includes an open floor plan with undefined spaces that can act as workshops spaces, play areas, or spaces for small stalls and cultural events. There are also defined educational spaces, a medical office and commercial stores.

During the wet season it transitions into a flood shelter including sanitation facilities, and a cafe that turns into cooking space.

Most importantly on the first level there is a boat docking area and cattle space. It was important to respect the norms and values of the people of Shonatola. They have an impressive boat culture used during micro-migration when they take their cattle and other necessities with them to their temporary settlement. The docking area and space for animals on the first floor creates space for this tradition.

Sub question 1:

How can a housing design built in a flood prone area invite employment and economic prosperity?

Answer:

The shelter creates space for small entrepreneurship opportunities and community engagement. This would create jobs not only to build, but maintain the shelter. Hopefully these activities and new business invite people from Shonatola and the nearby villages to take part in this new endeavour, creating a new economic hub.

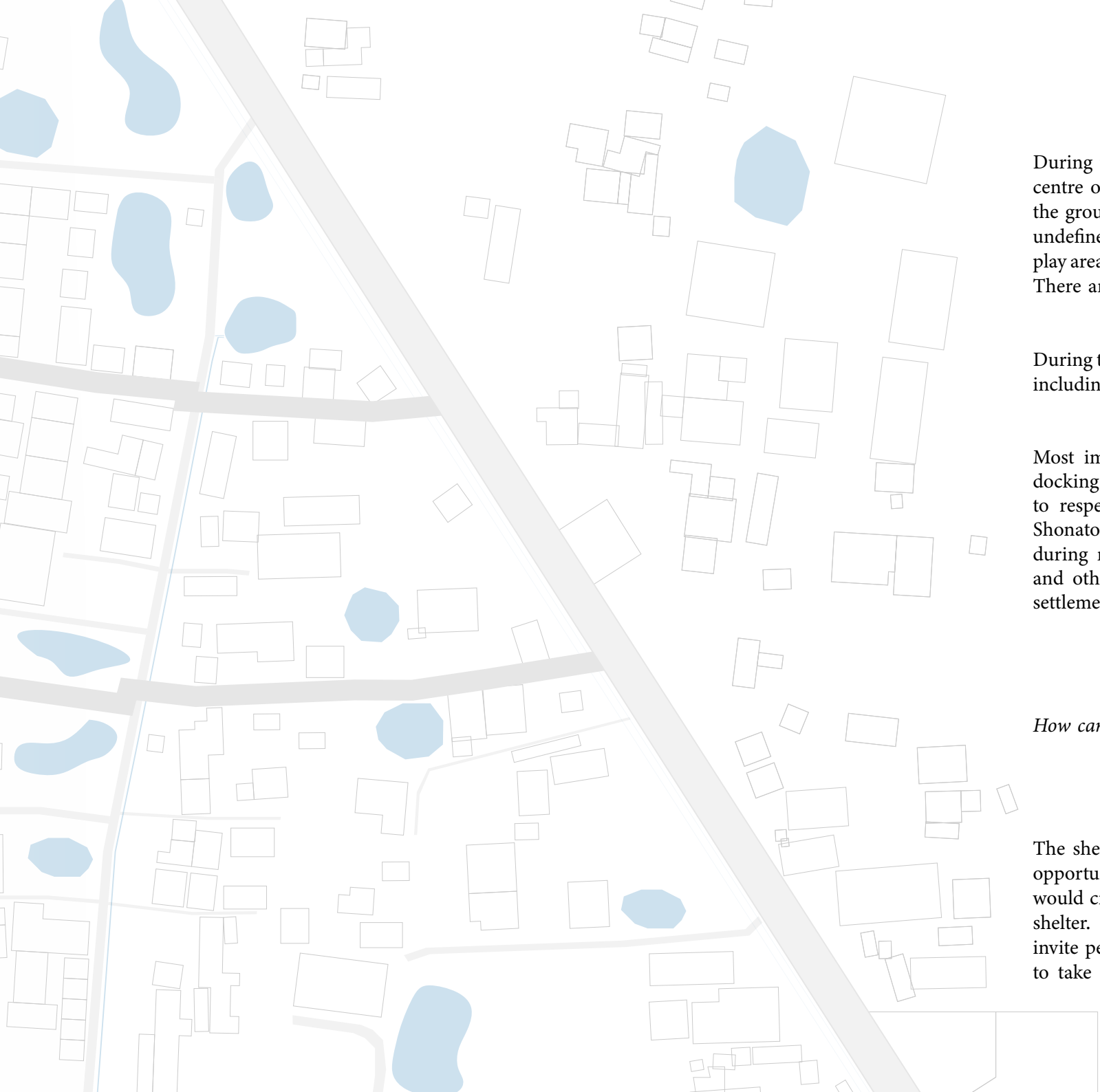
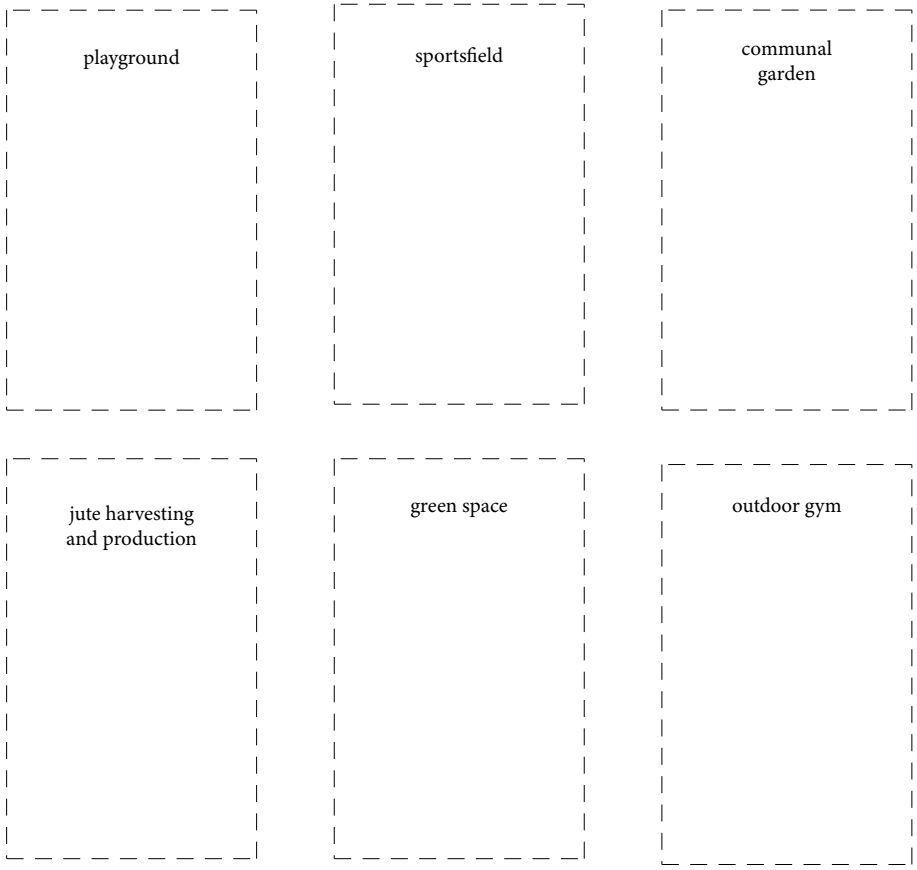
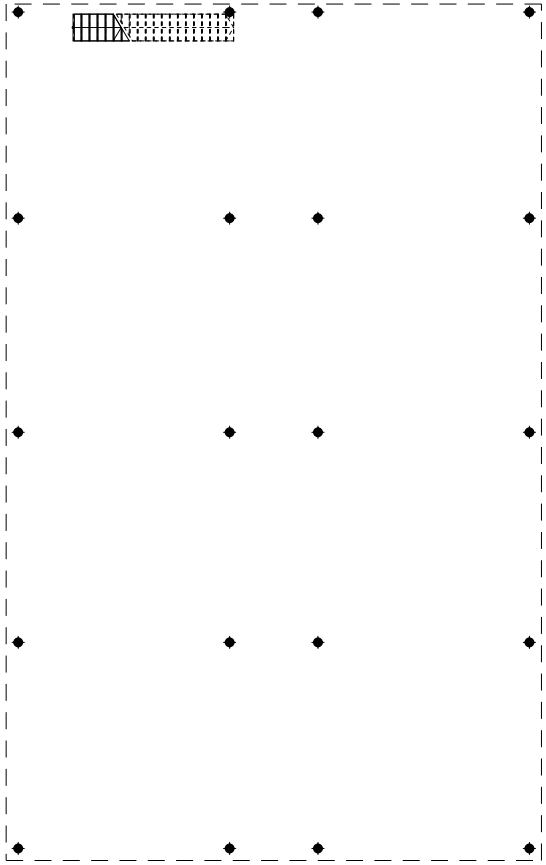


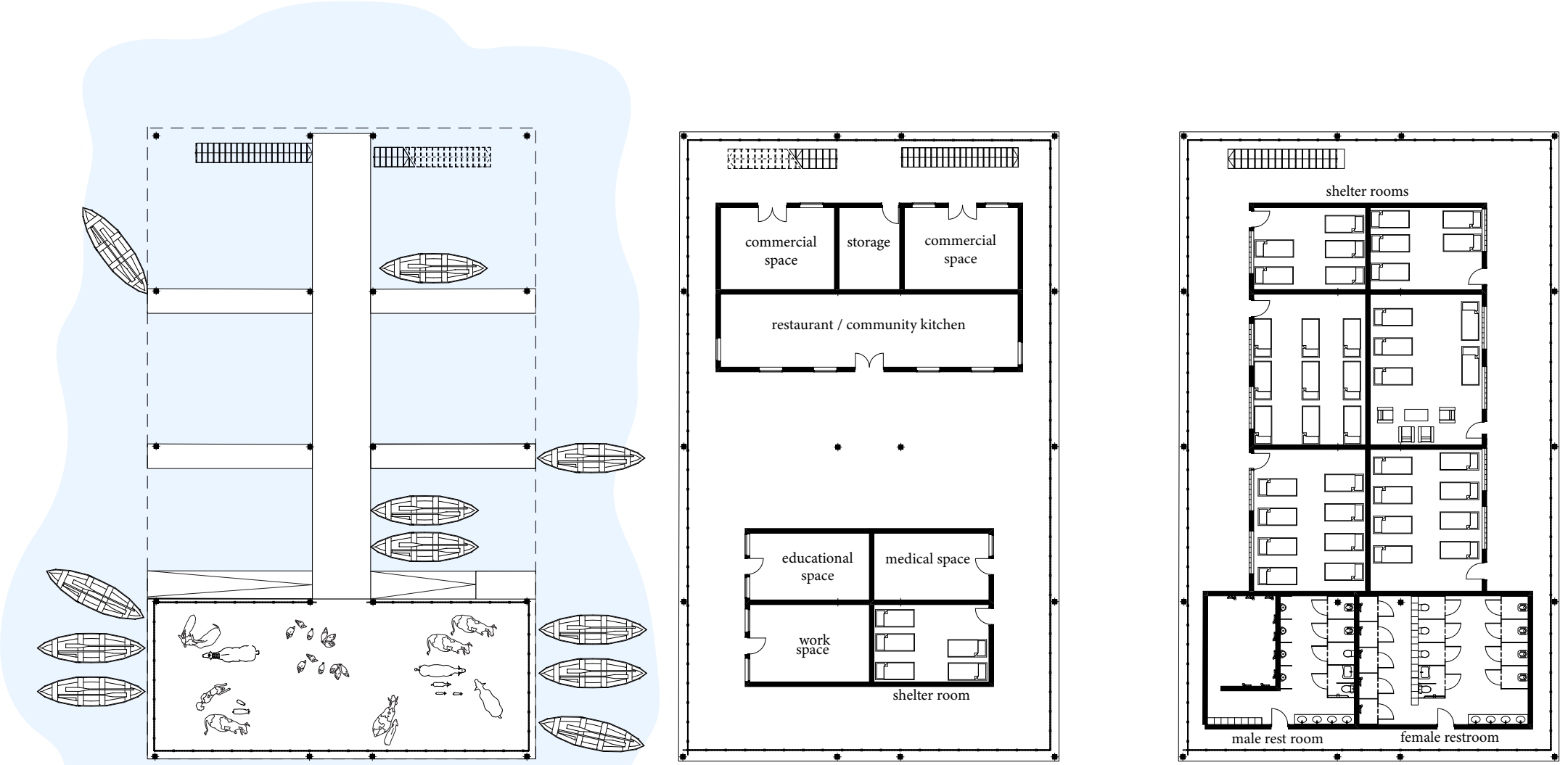
Figure 32. Neighbourhood plan highlighting shelters



Ground floor functions per shelter



Ground floor

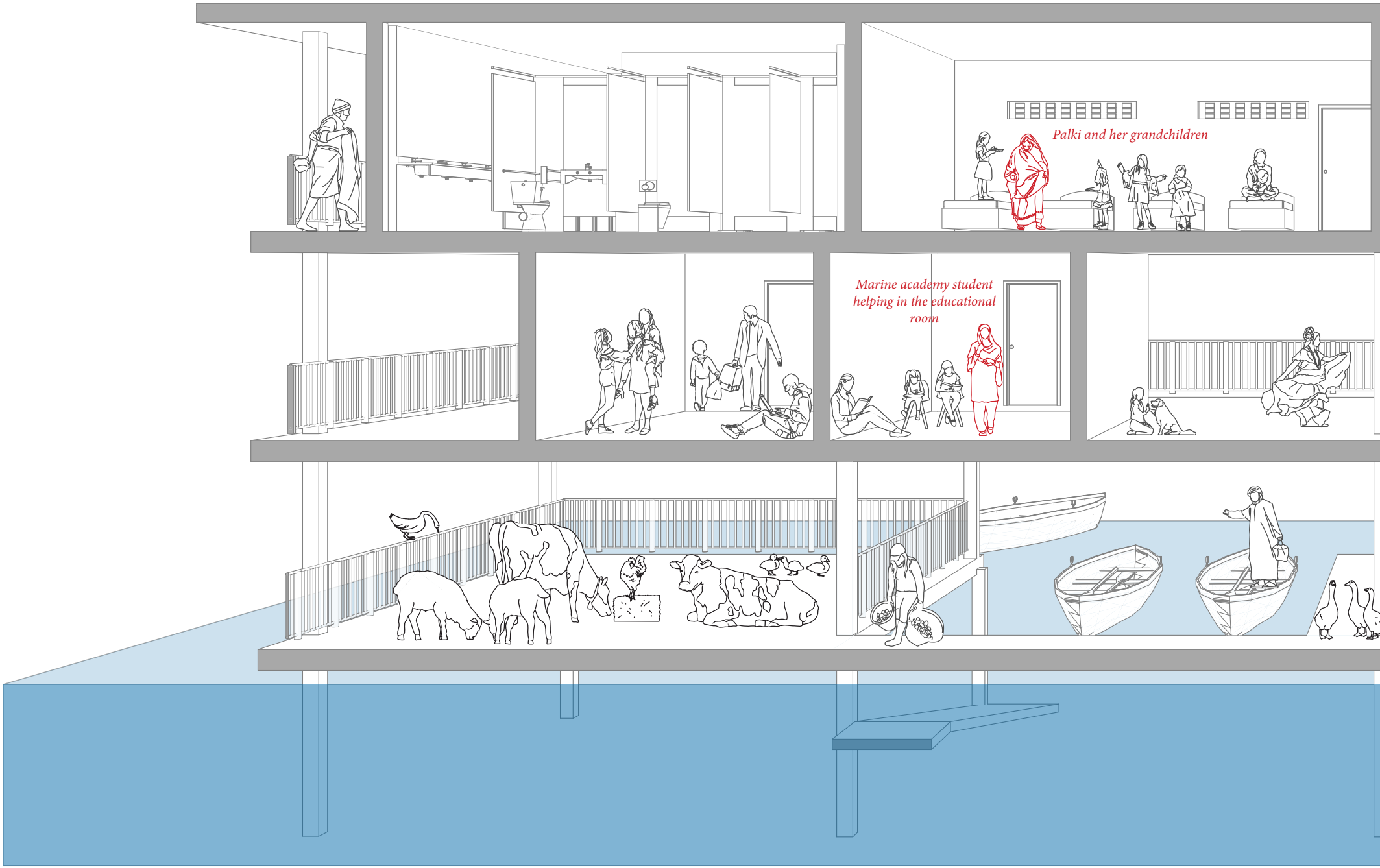


First floor

Second floor

Third floor

Figure 33. Floor plans of the shelters


Palki and her grandchildren
Marine academy student helping in the educational room

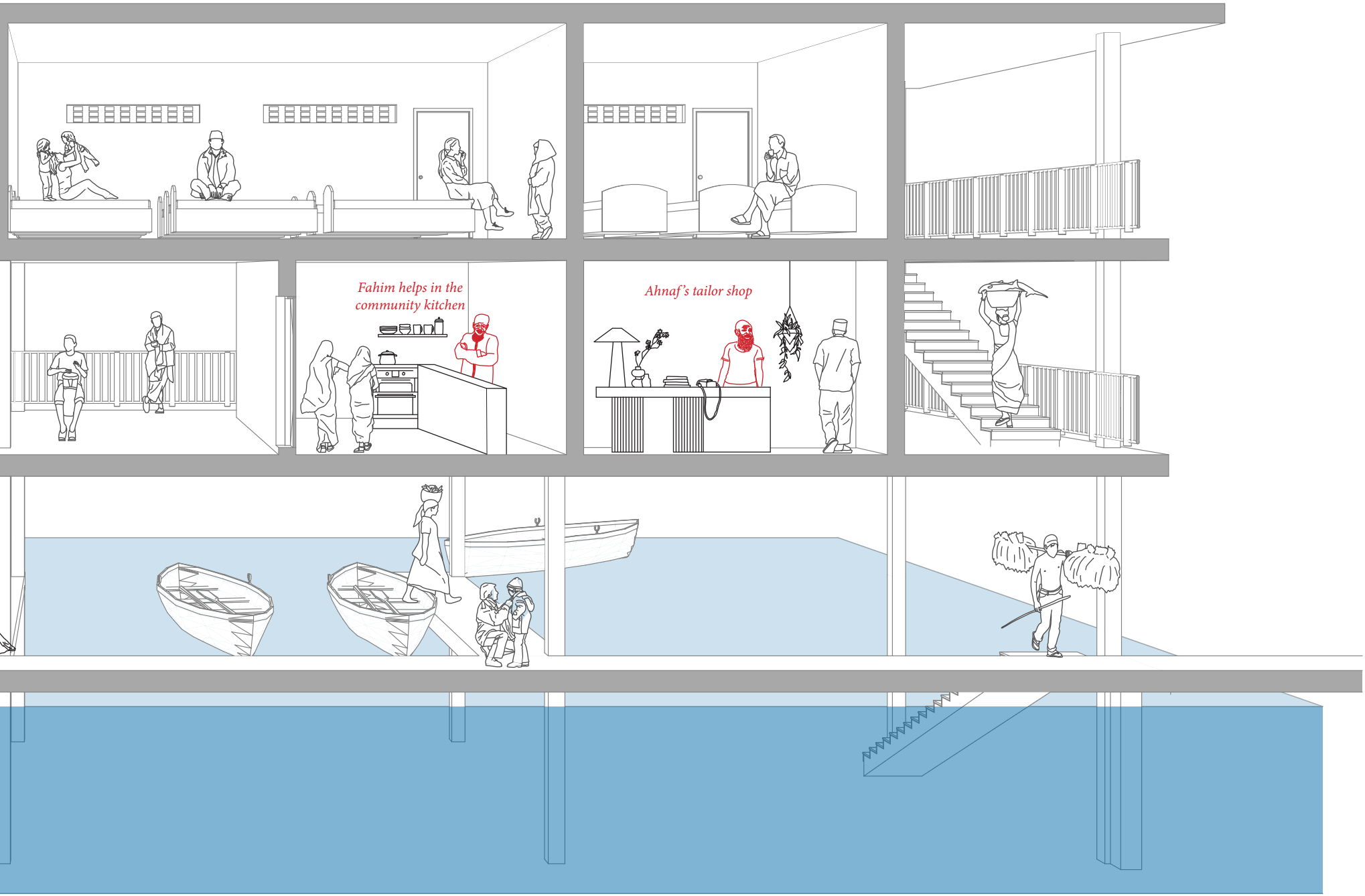
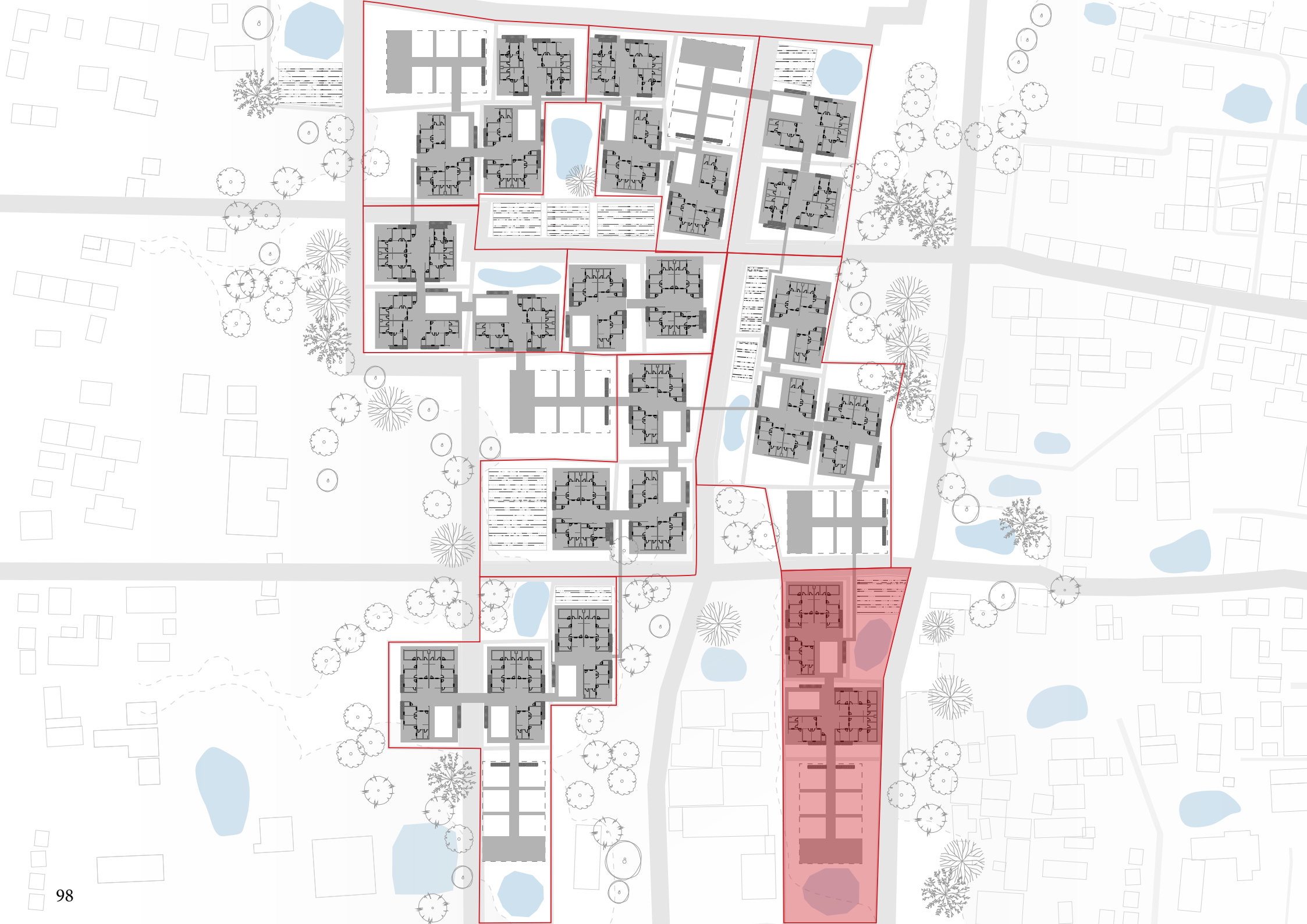


Figure 34. Section of shelter during the wet season



The Compound

The clusters along with a shelter form 9 large compounds. On the ground level the previous plot divisions are the blueprint for paved pathways used as walking paths connecting the entire village.

The compounds typically have two or three clusters. These form a mini community of around 150 people, that are encouraged to commune together.

Figure 35. The 9 compounds

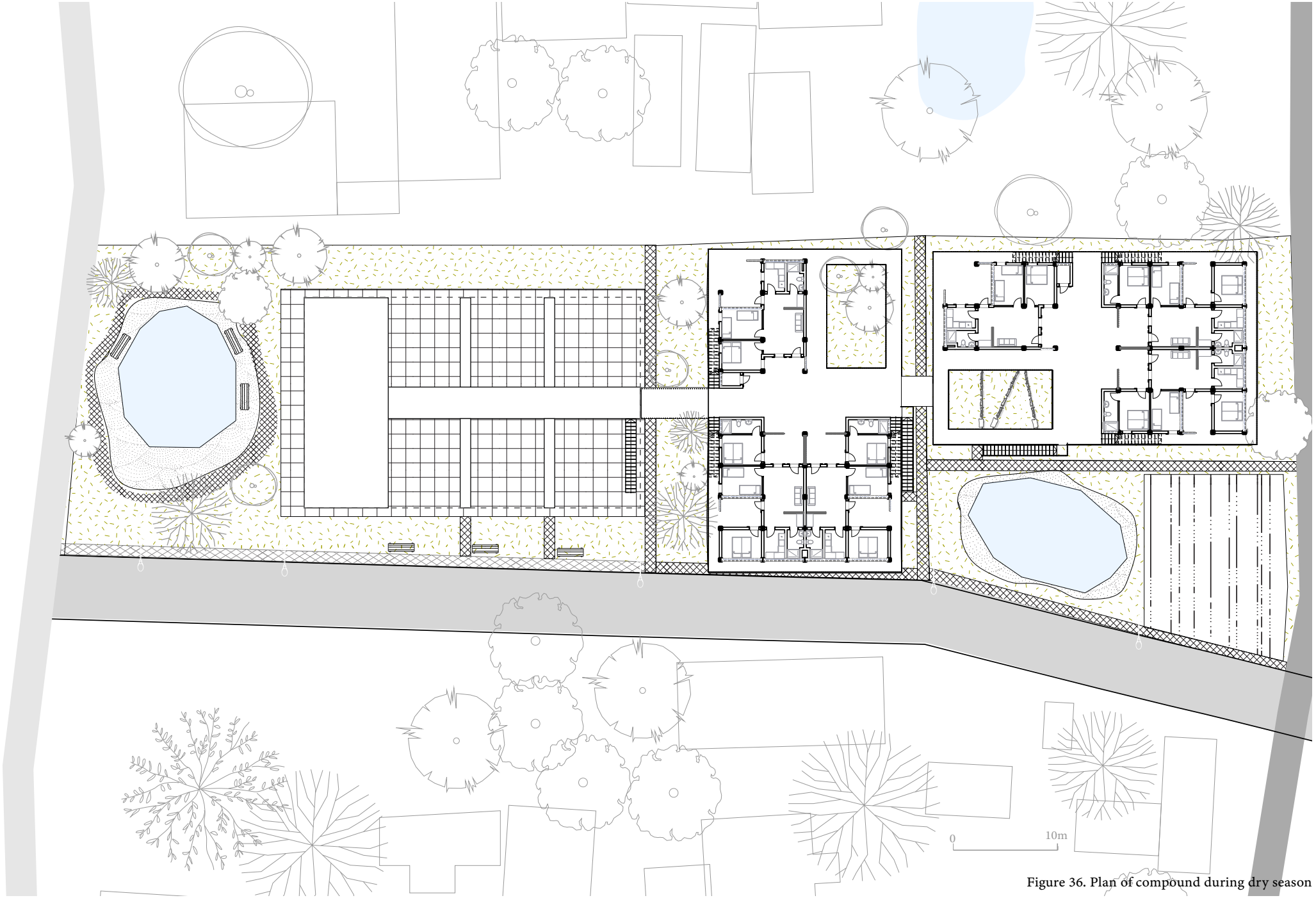


Figure 36. Plan of compound during dry season

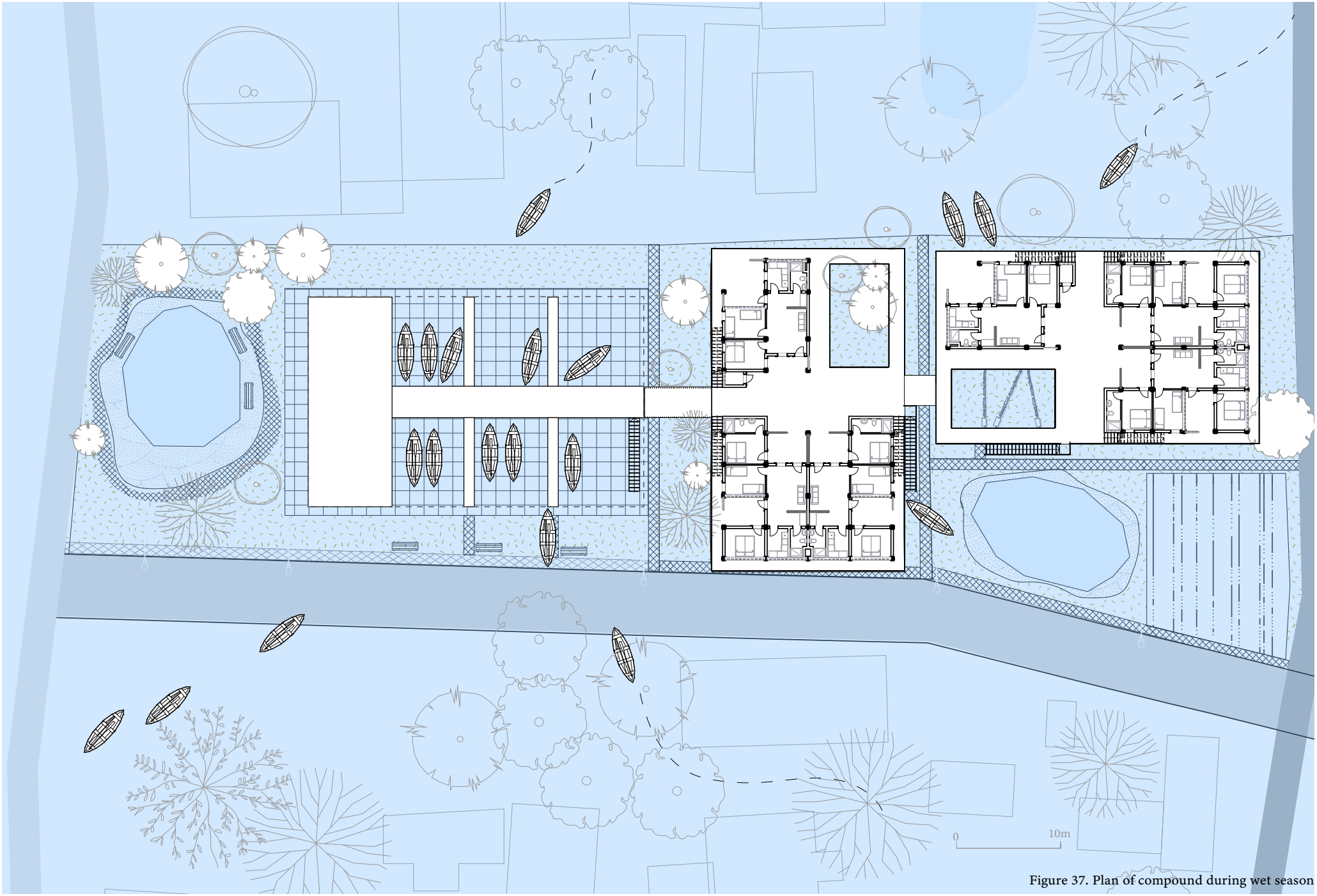
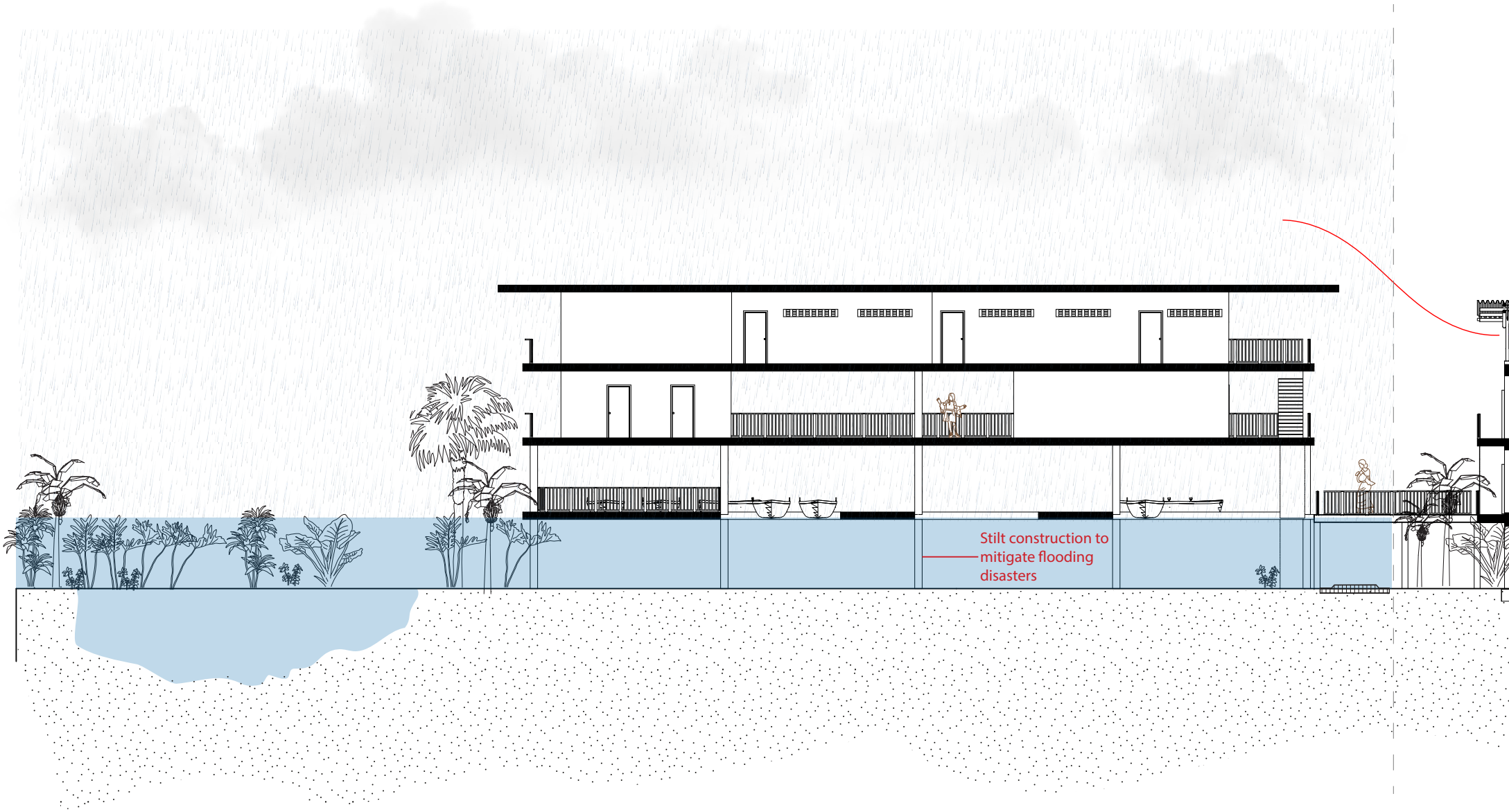


Figure 37. Plan of compound during wet season


Stilt construction to
mitigate flooding
disasters

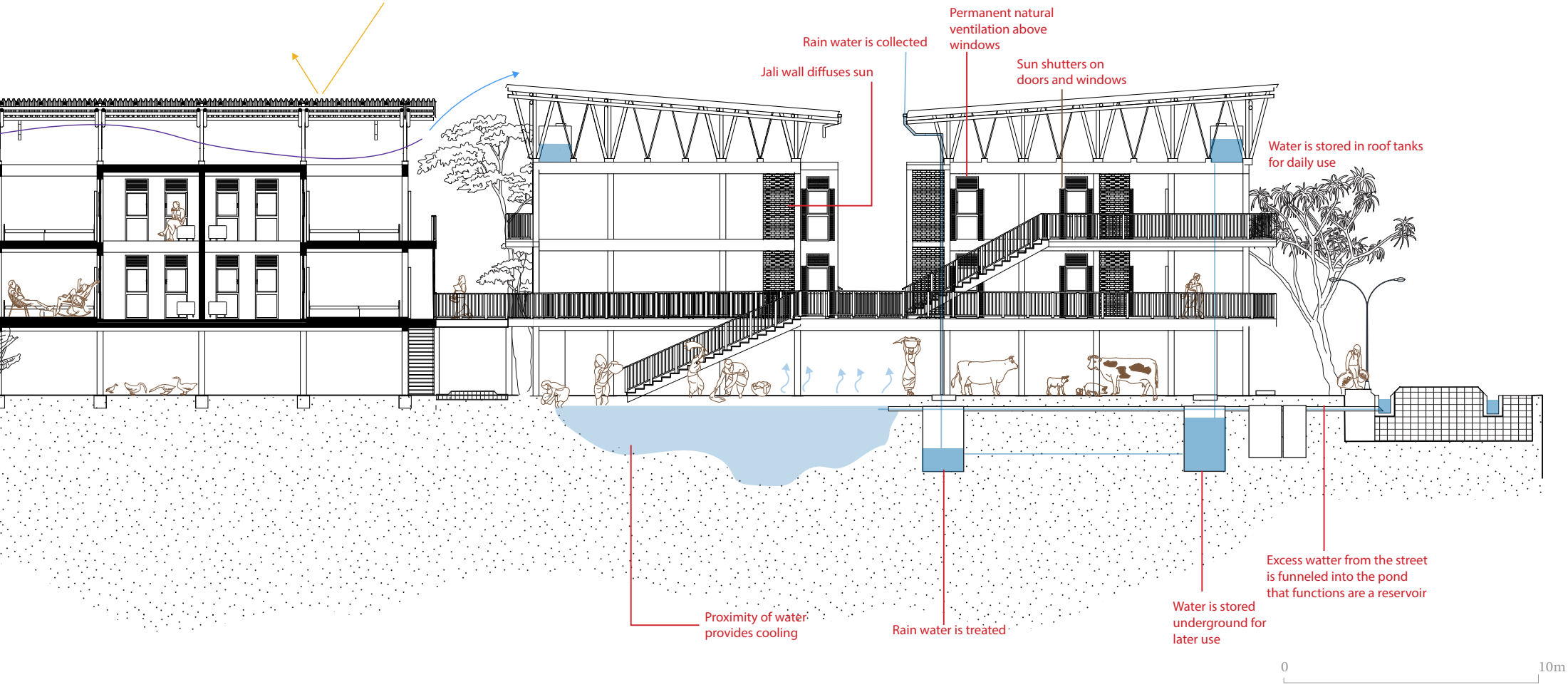


Figure 38. Climatic and sustainable design

The Cluster

Each cluster has three levels and are made of 3-4 dwelling units. The ground floor where animals are kept along with some other courtyard activities, the first floor with the housing and courtyard space, that is expected to be encroached upon similarly to what was observed in the village. This courtyard space also serves as circulation space connecting to the bridges that connect clusters and compounds. The second-floor has more dwelling units that can be accessed from stairs on either side. On this floor entrances are towards to back with the semi-private spaces, now verandas towards the courtyard.

The clusters follow the principle of the hierarchy of spaces. The platform as well as the space that it covers on the ground floor are semi-public spaces. The 'outside rooms' that are created are semi private spaces and the units themselves are private.

In some cases, there is a void on the first floor, then the structure changes slightly. The void allows for sunlight to get to the ground level where some courtyard activities take place.

In the ethnographic analysis we observed activities that take place in the courtyard. Some of these activities can now take place on the ground level, while more domestic and social activities take place on the raised platform. This way the courtyard remains the centre of cluster living.

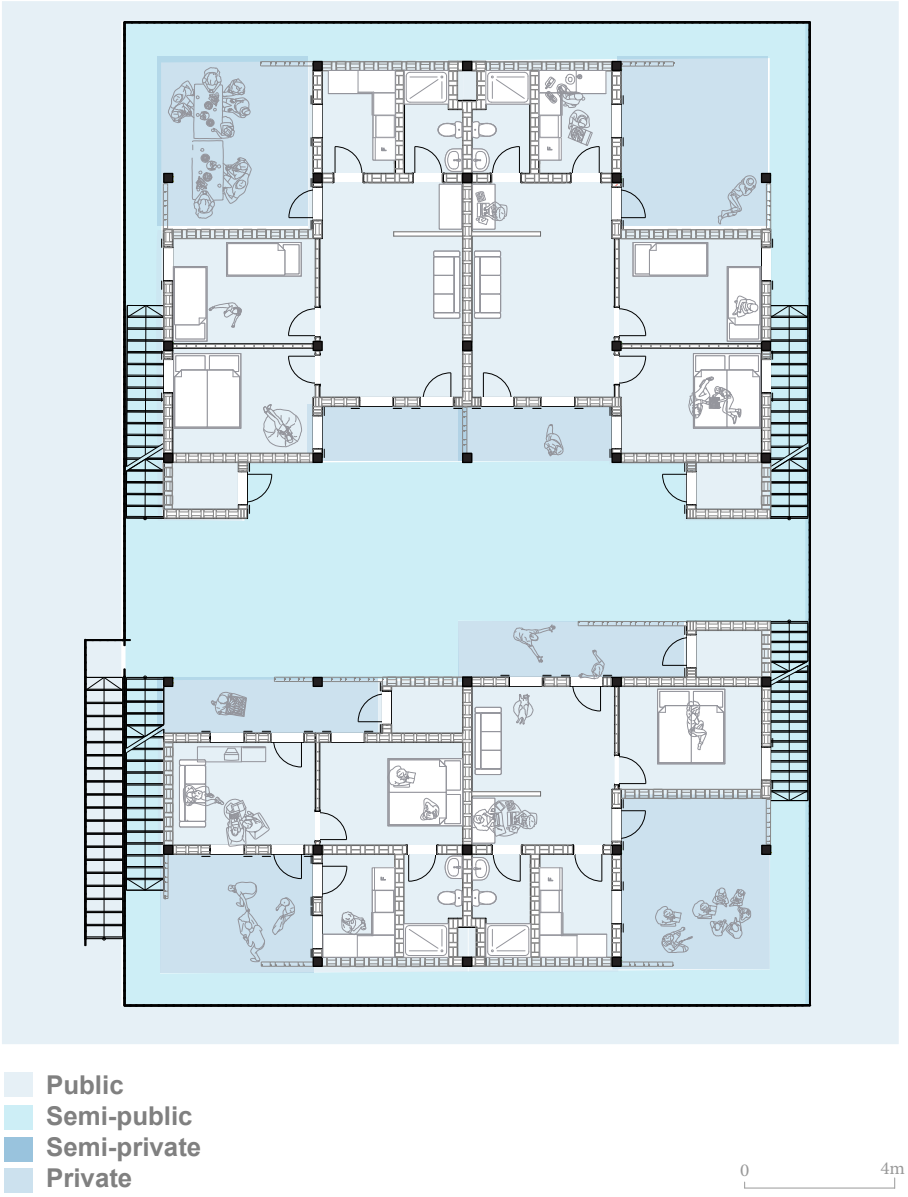


Figure 39. Hierarchy of privacy on first floor of cluster 2

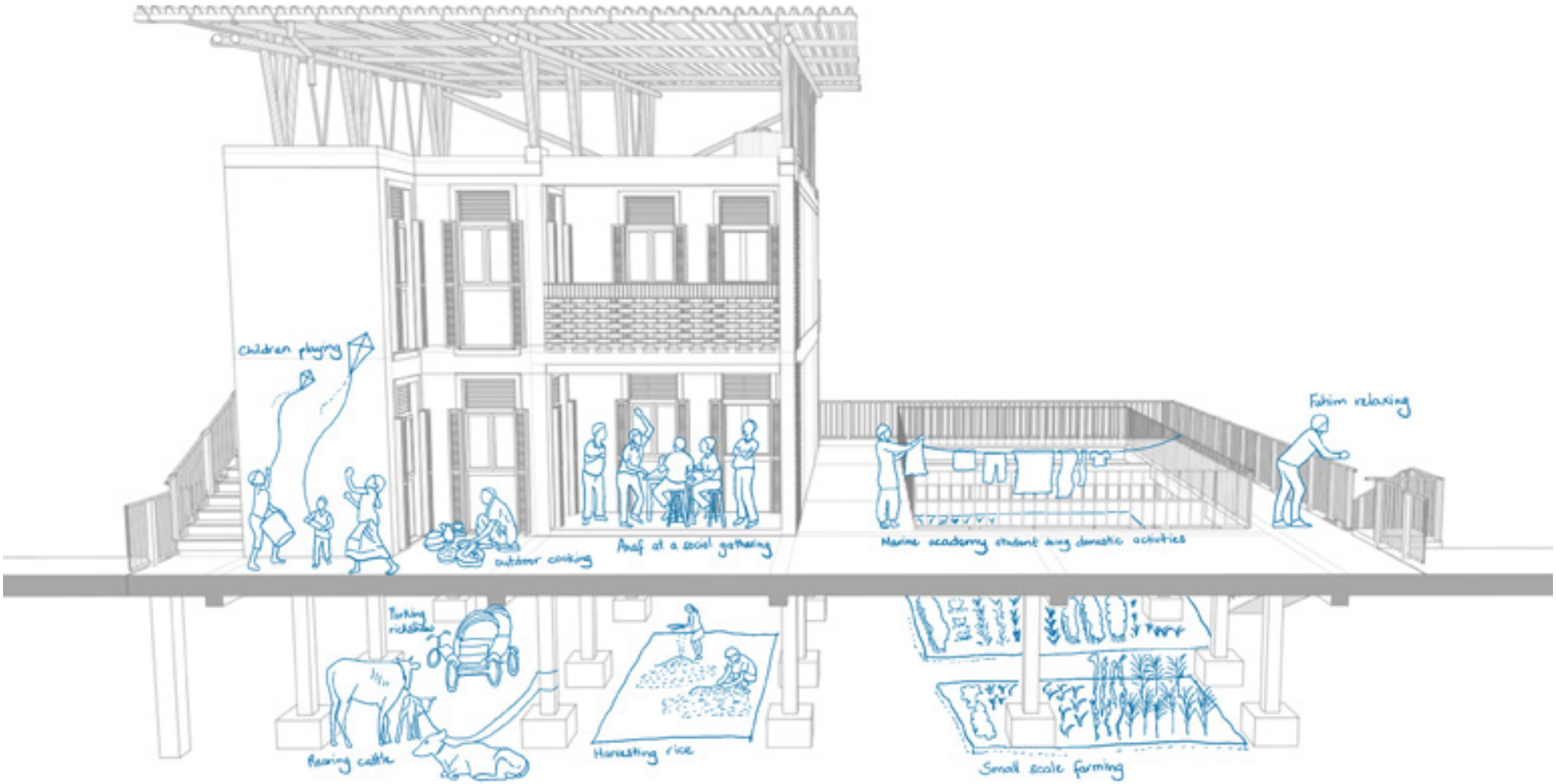


Figure 40. Division of courtyard activities in new design

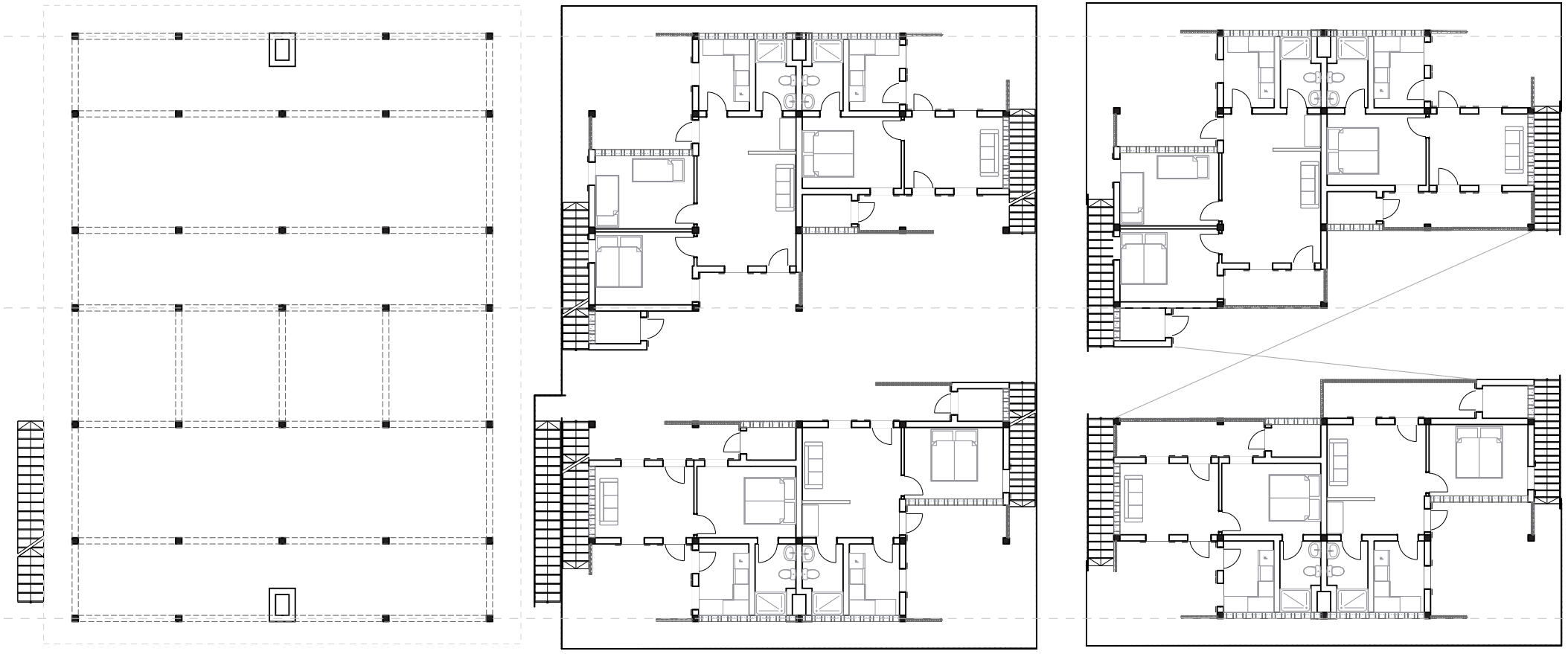


Figure 41. Cluster 1 - Low income

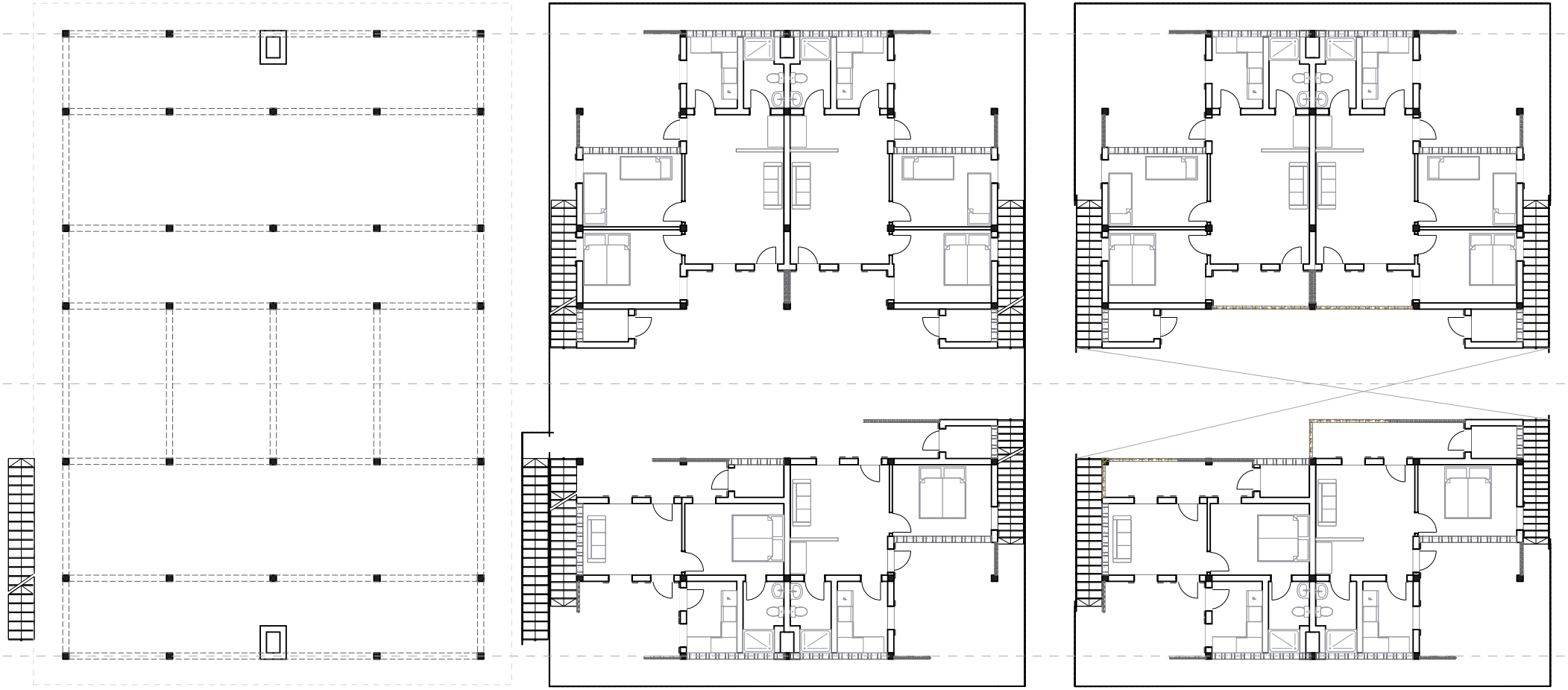


Figure 42. Cluster 2 - Middle income

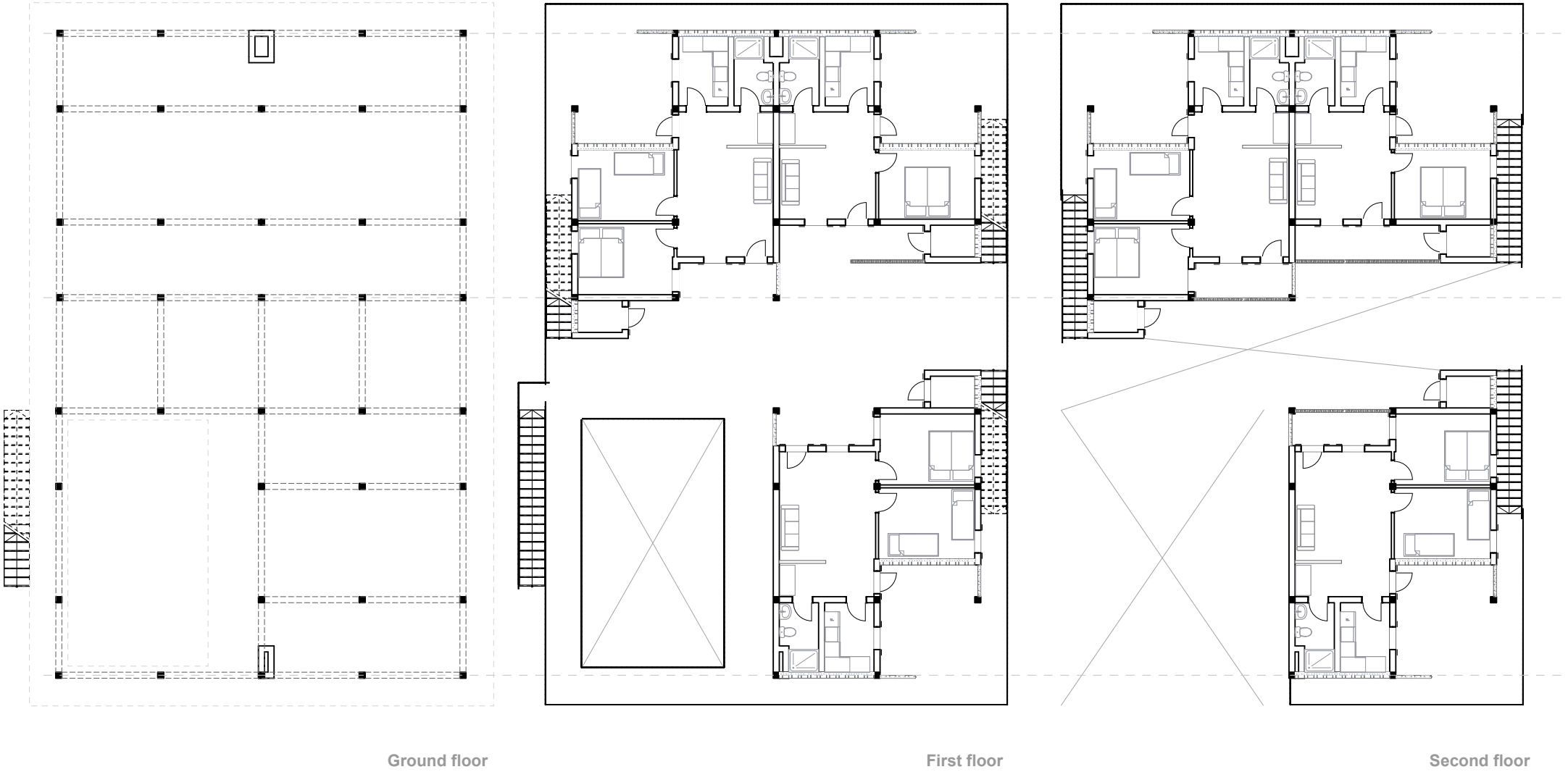


Figure 43. Cluster 3 - Middle income

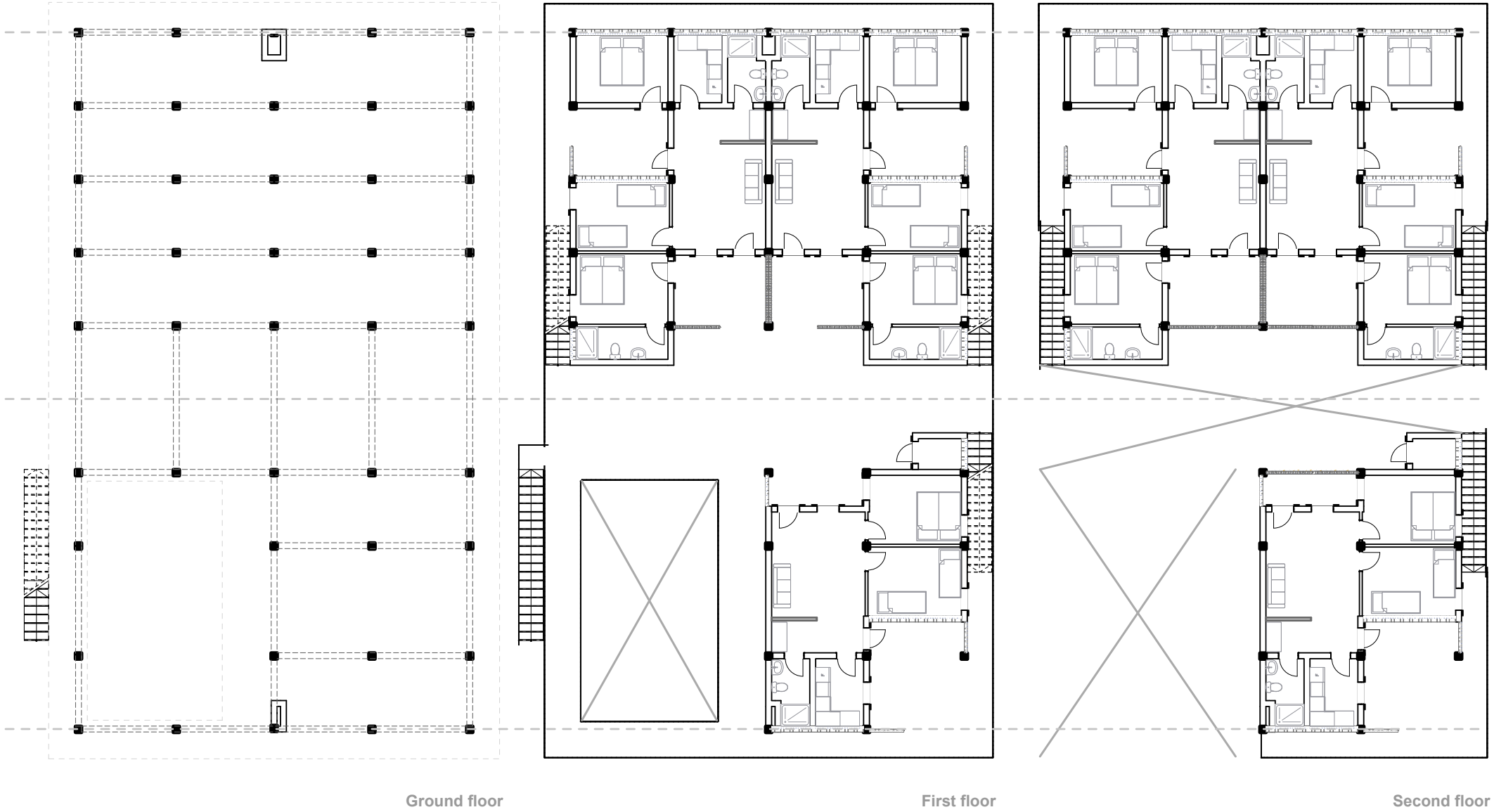


Figure 44. Cluster 4 - Middle income

The Cluster - Details

The sloped roof covers four units (two on the first floor and two on the second floor) and features a gutter which carries rainwater to the underground storage. The roof in made of bamboo elements that are supported by a steel plate that carries its weight to the rest of the structure. It is supported by rafters and purlins and there is water proofing on the floor of this level to protect the covered area from rain. This roof structure creates a double roof that reduces heat in the dwellings below. While also giving residents a space to use. The idea is that this space will be used similarly to how many roofs are used in Bangladesh; for plants, hanging clothes and relaxing. Later, it is expected that the spaces can be used for incremental expansion.

There is a 'threshold panel' that operates as either a door or a window when and where necessary. The framing of the window continues from the outside to the inside to emphasize the threshold along with the sill and board. It was important to differentiate between spaces using the threshold because of the absence of hallways in the dwelling design. The panel is made of timber bamboo and glass, it takes the height of the entire floor, with permanent natural ventilation at the top.

The bridge has its own structure, separate from that of the cluster. This is because the placement of bridges differ to accommodate the organization of each compound. It has a concrete base and bamboo railings to mimic the language of the cluster.

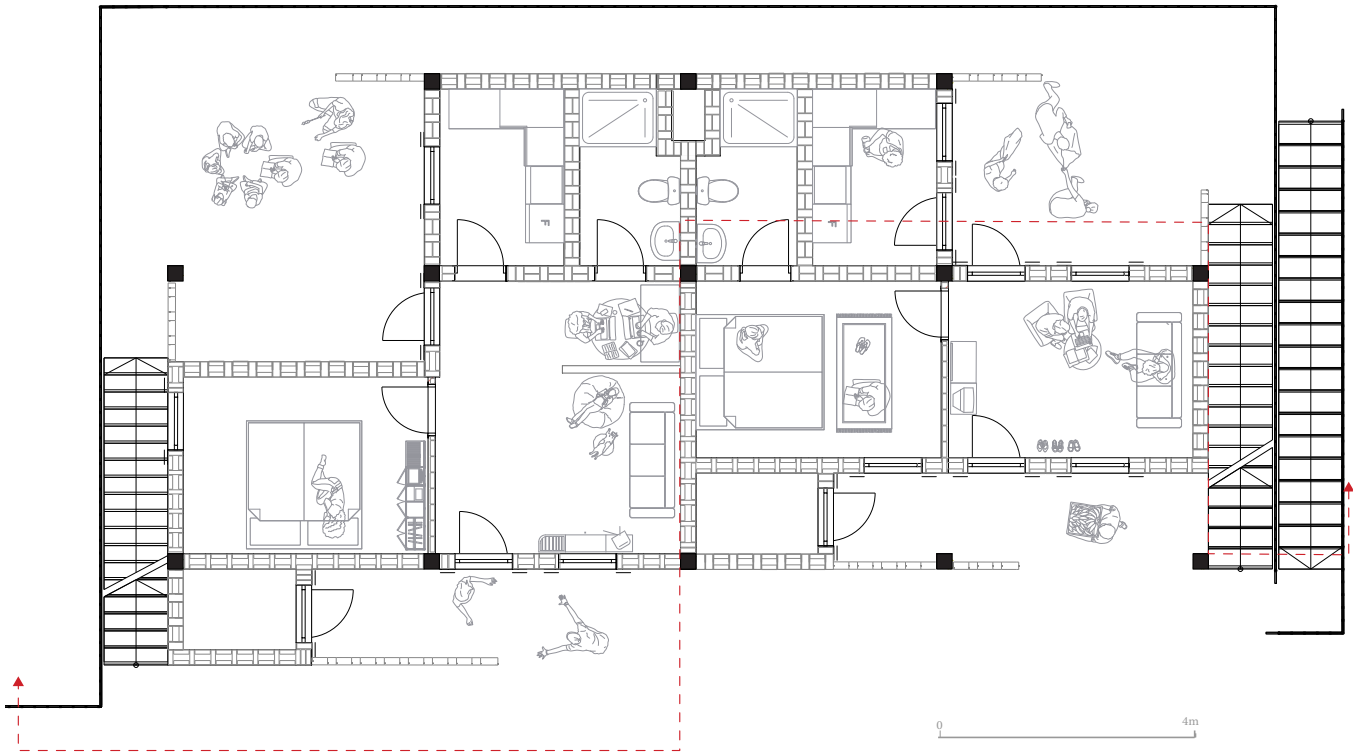


Figure 45. Detailed plan

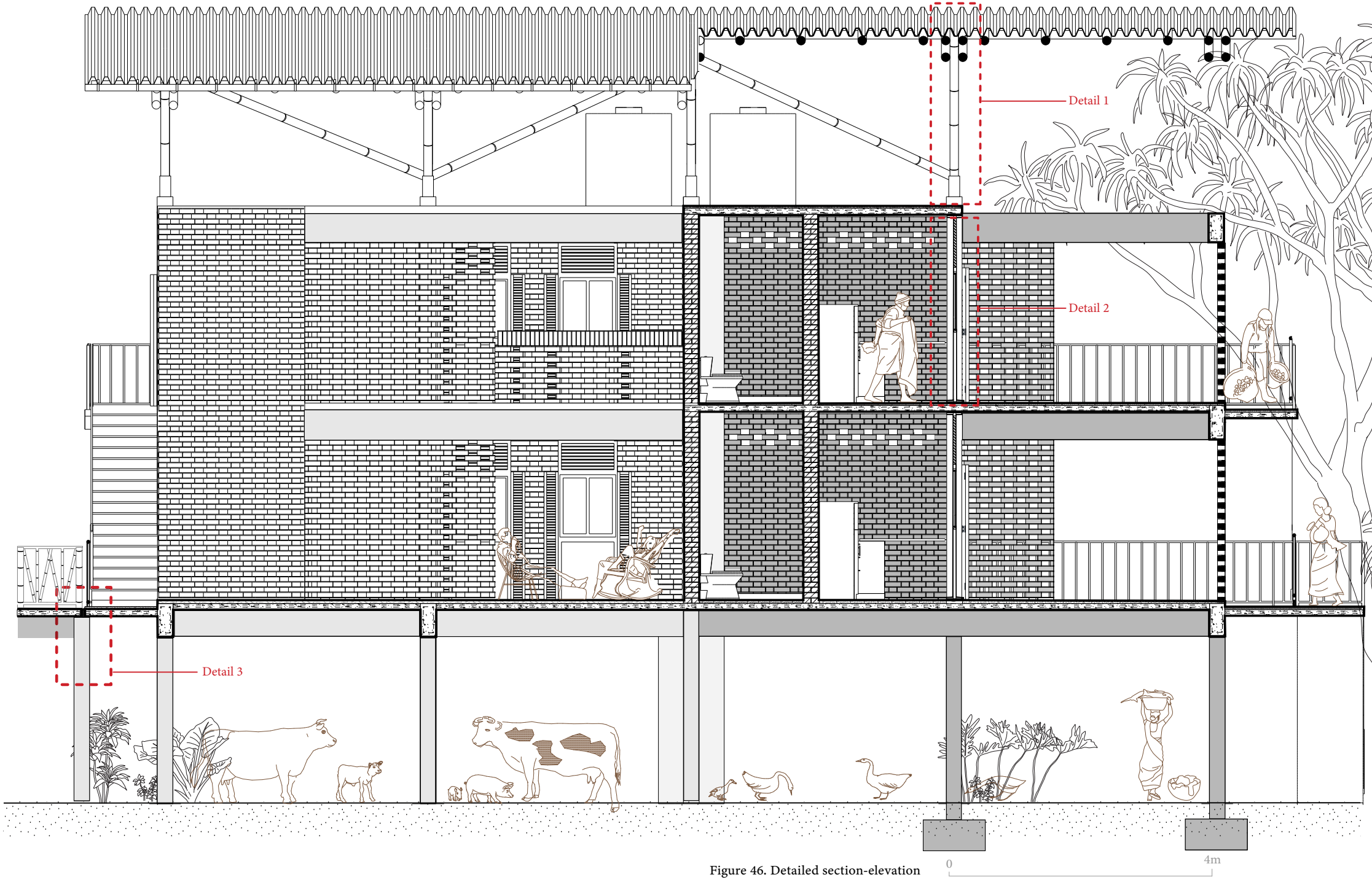
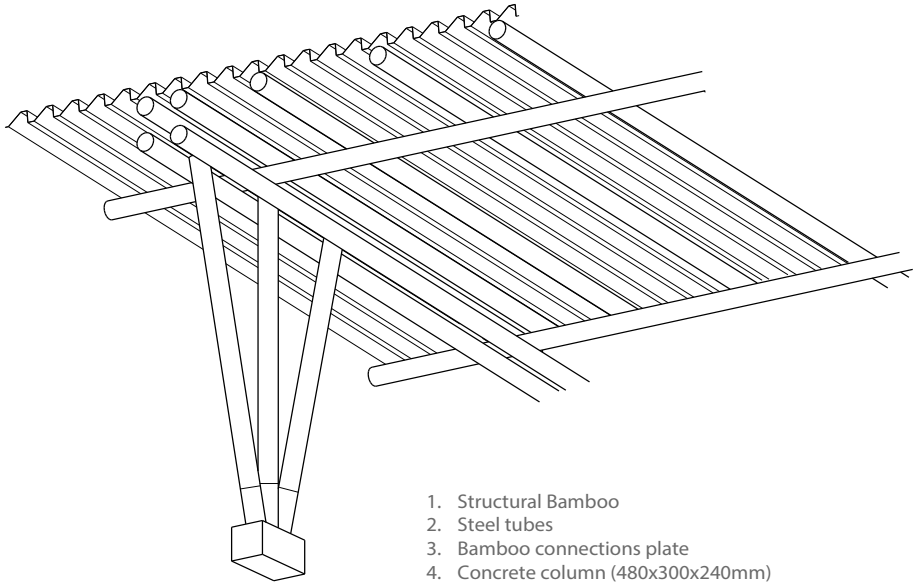
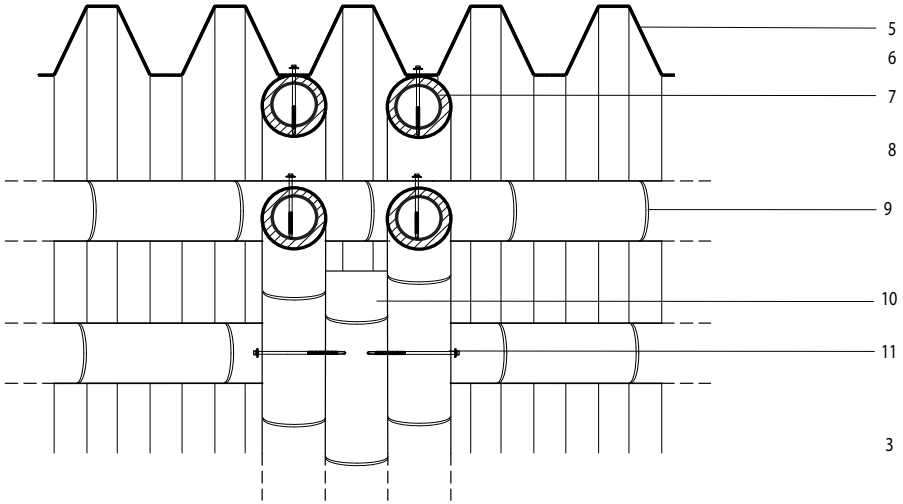


Figure 46. Detailed section-elevation



1. Structural Bamboo
2. Steel tubes
3. Bamboo connections plate
4. Concrete column (480x300x240mm)
5. Galvanized steel sheet
6. Asphalt layer for water proofing
7. Purlin
8. Concrete beam
9. Rafter
10. Structural Bamboo
11. Bolts



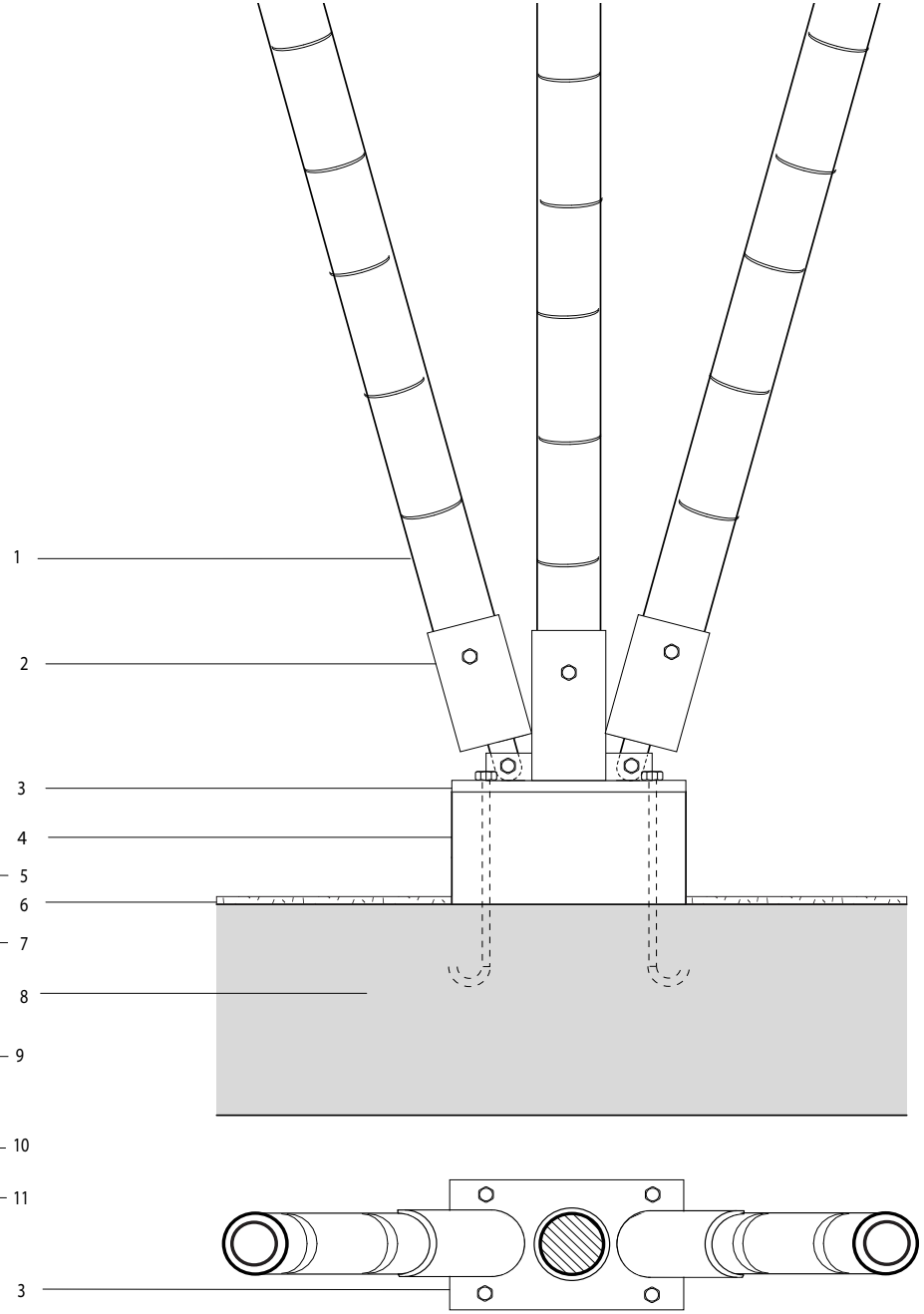


Figure 47. Detail 1- the roof

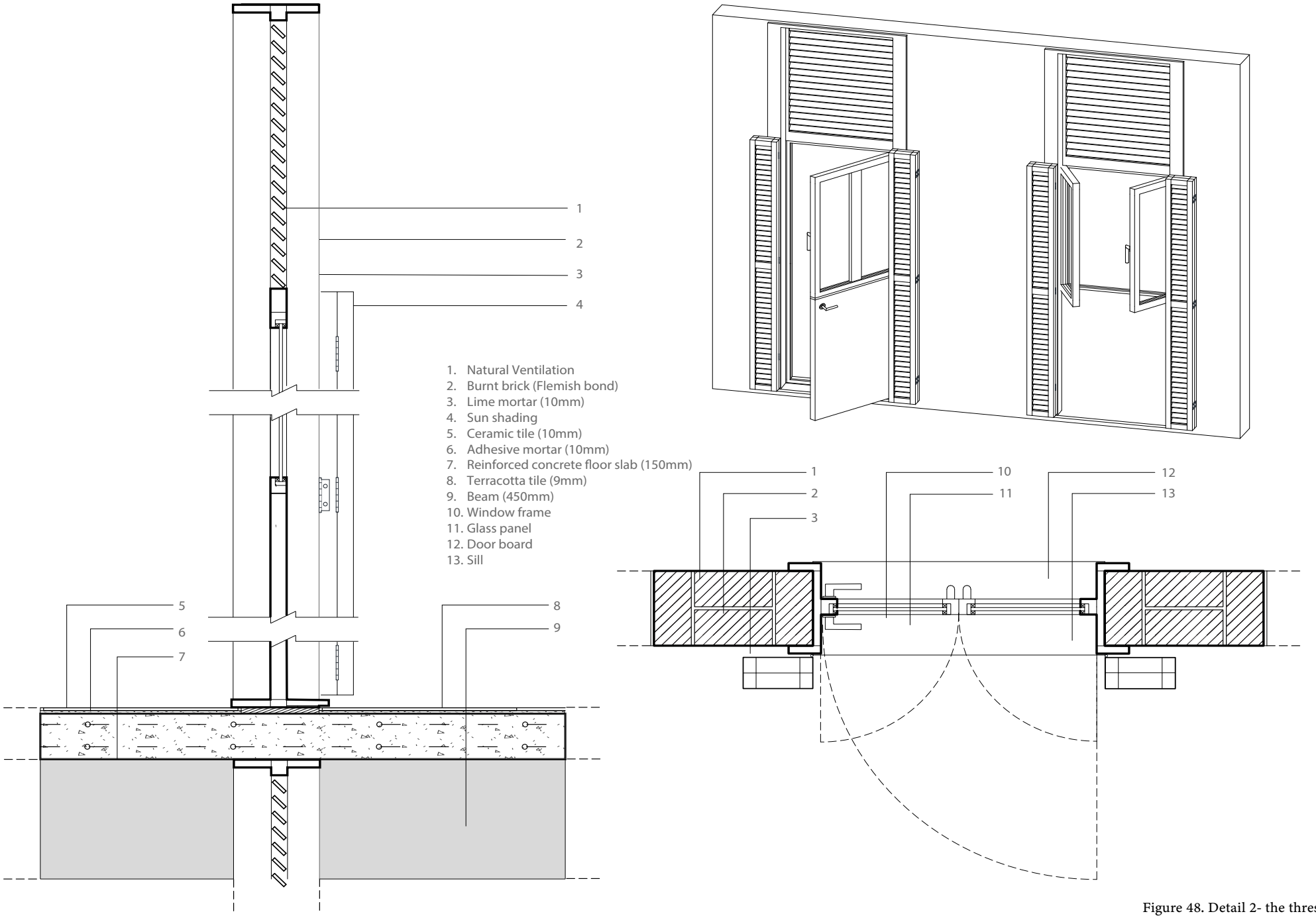


Figure 48. Detail 2- the threshold

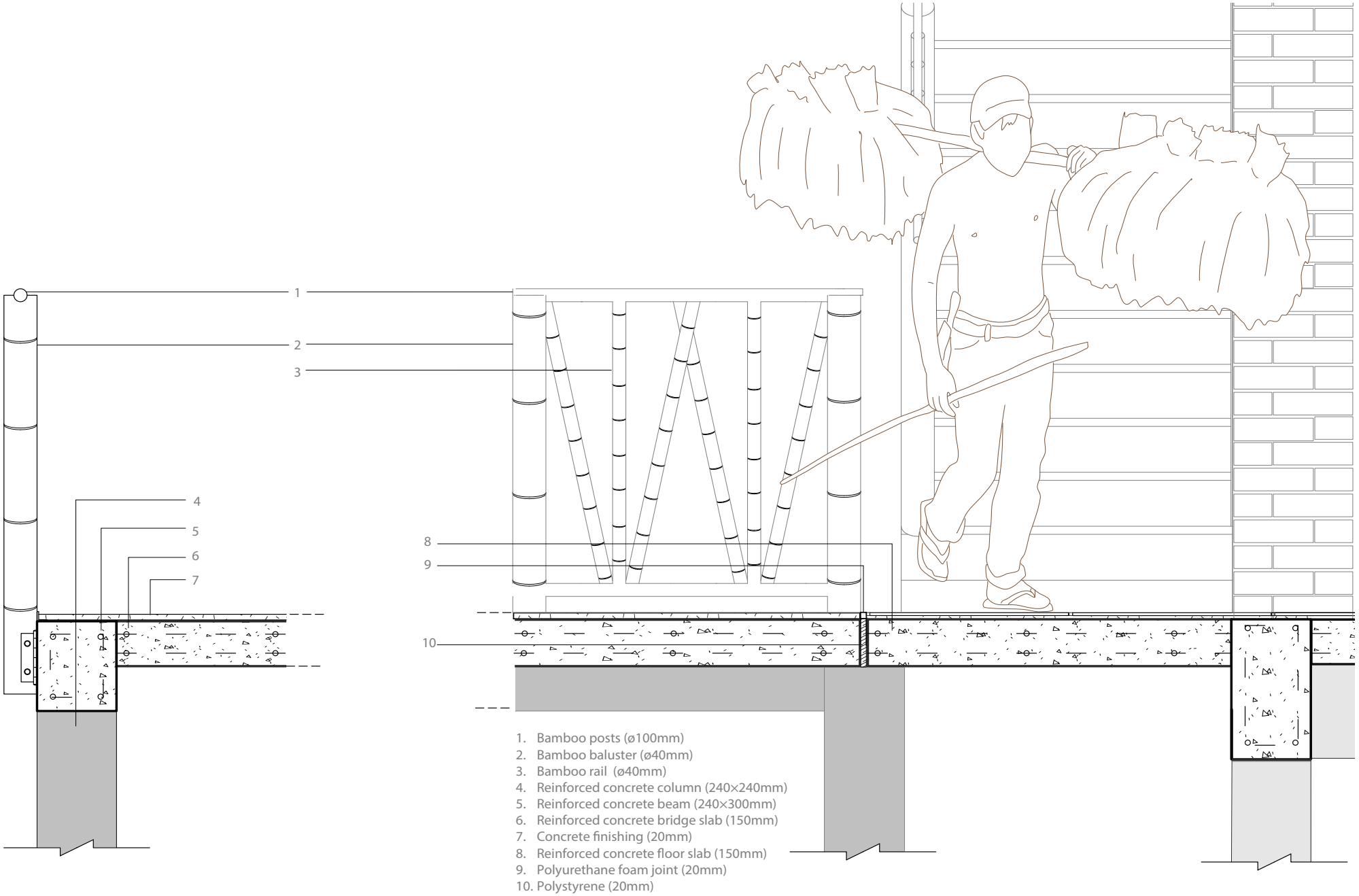
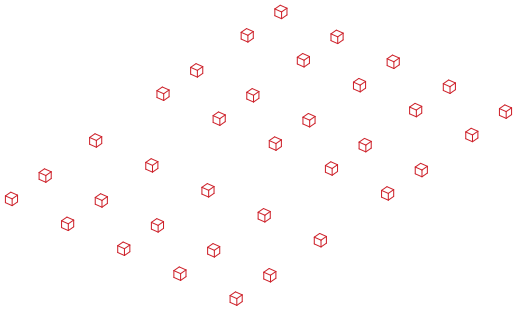


Figure 49. Detail 3- the bridge

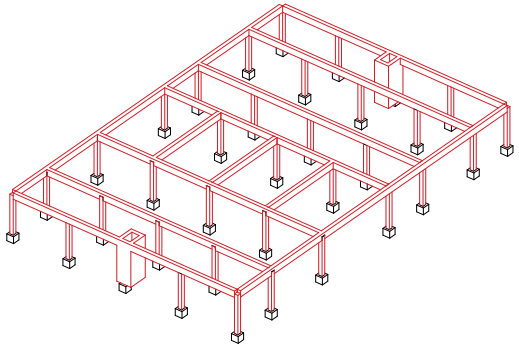
The Cluster - Construction

The clusters are built on stilts and have a double roof. They follow a beam and column structure that mostly spans in one direction. Beams in the other direction are only found around the edges and in the centre for stability. This minimises the material use and decreases the cost of the building.

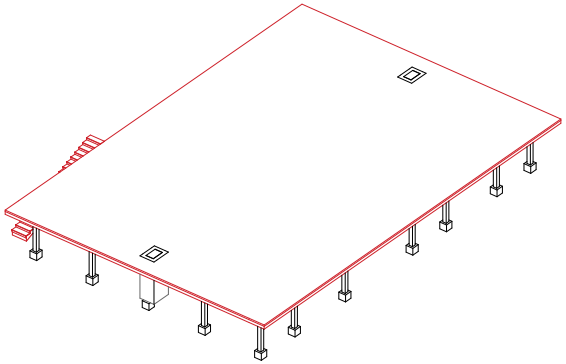
Figure 50. Partial structure of a cluster



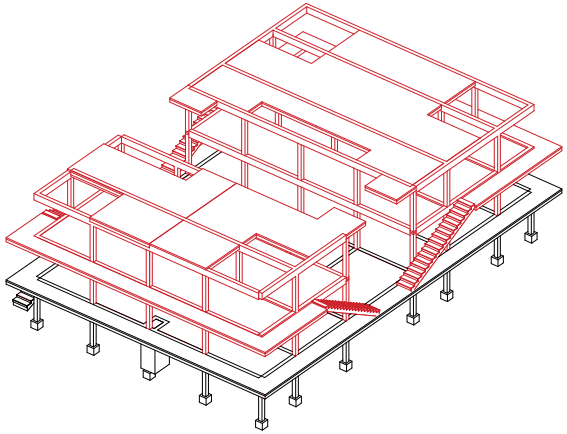
1. Foundations piles are laid



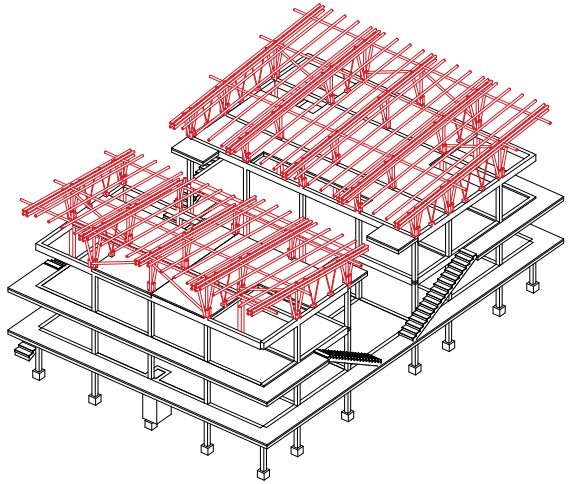
2. Column and beam structure is built



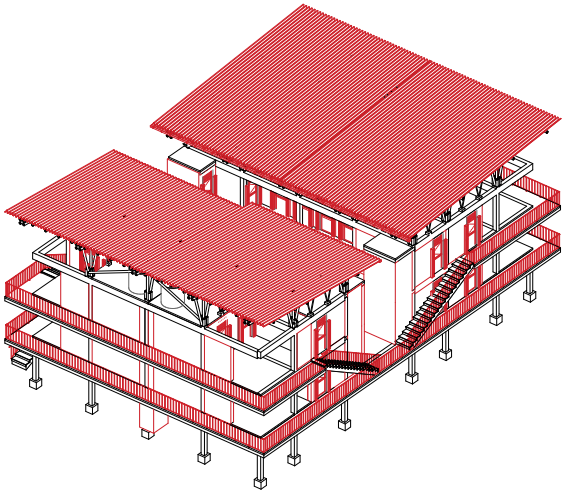
3. First floor slab is constructed



4. Complete structural system is completed



5. Roof structure is built



6. Finishing walls, roof shell, windows/doors and railings are assembled

Figure 51. Construction process

The Dwelling

Four units differing in size to accommodate various income groups are created. They possess the same principles and are inspired by the homes that were visited and analyzed in Shonatola. There are no hallways, instead spaces are defined by thresholds and are all accessed through the central living room. The wet areas are found to the back of the unit. Each unit also has storage space that was thought to be necessary after the ethnographic analysis. Semi-private spaces, 'the outdoor rooms' (verandas) are found to the front and the back of each unit. This allows space for various social and private domestic activities. The units follow a grid of 4m by 3m and 4.5m.

Cross ventilation was prioritized in the design. There are different wall types, the rat-trap bond walls as well as the flemish bond walls found in the wet areas make up the solid walls. There are also ventilated flemish bond walls in wet areas and storage rooms, perforated walls (jali walls) that define the 'outside rooms' and perforated railings used in the verandas on the second story.

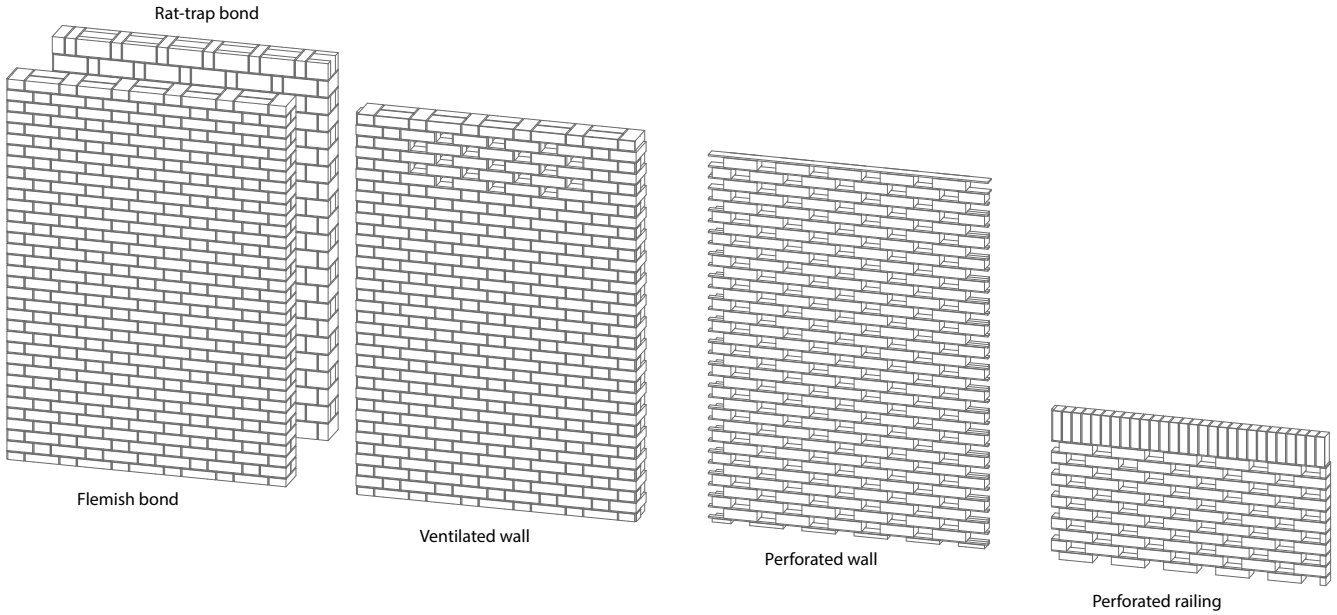


Figure 52. Wall types

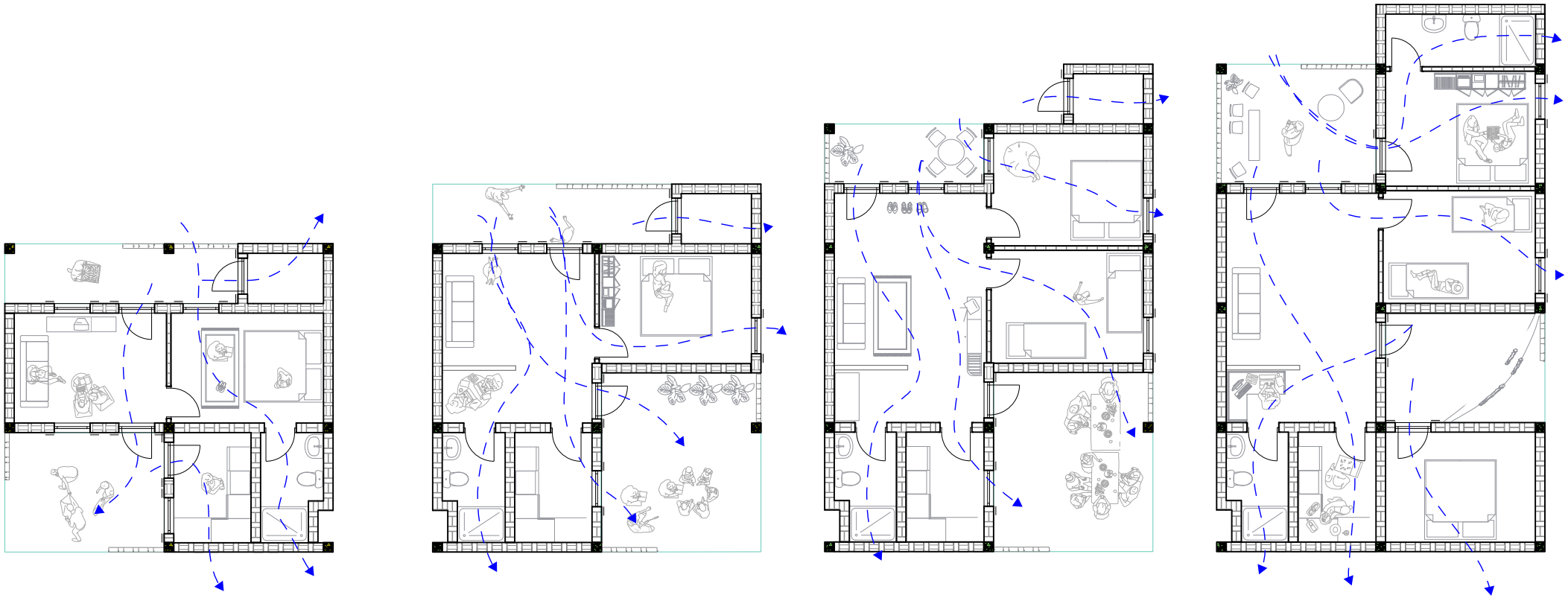
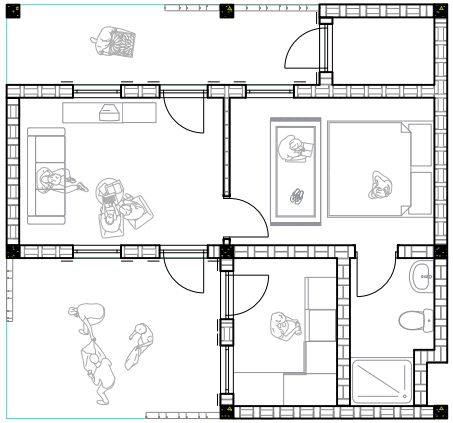
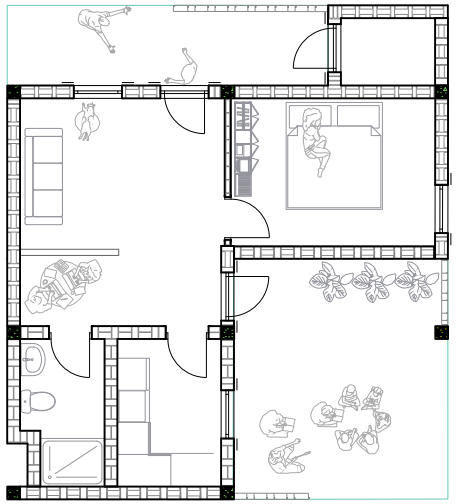


Figure 53. Dwelling units

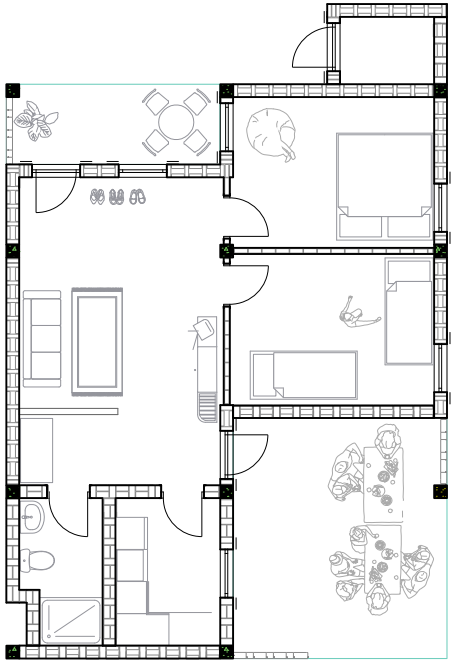


"This type one unit is just the right size for me as a student and young adult starting my life!"
-Marine academy student

43m2
Type 1 Low Income



49m2
Type 2 Low Income



68m2
Type 3 Middle Income

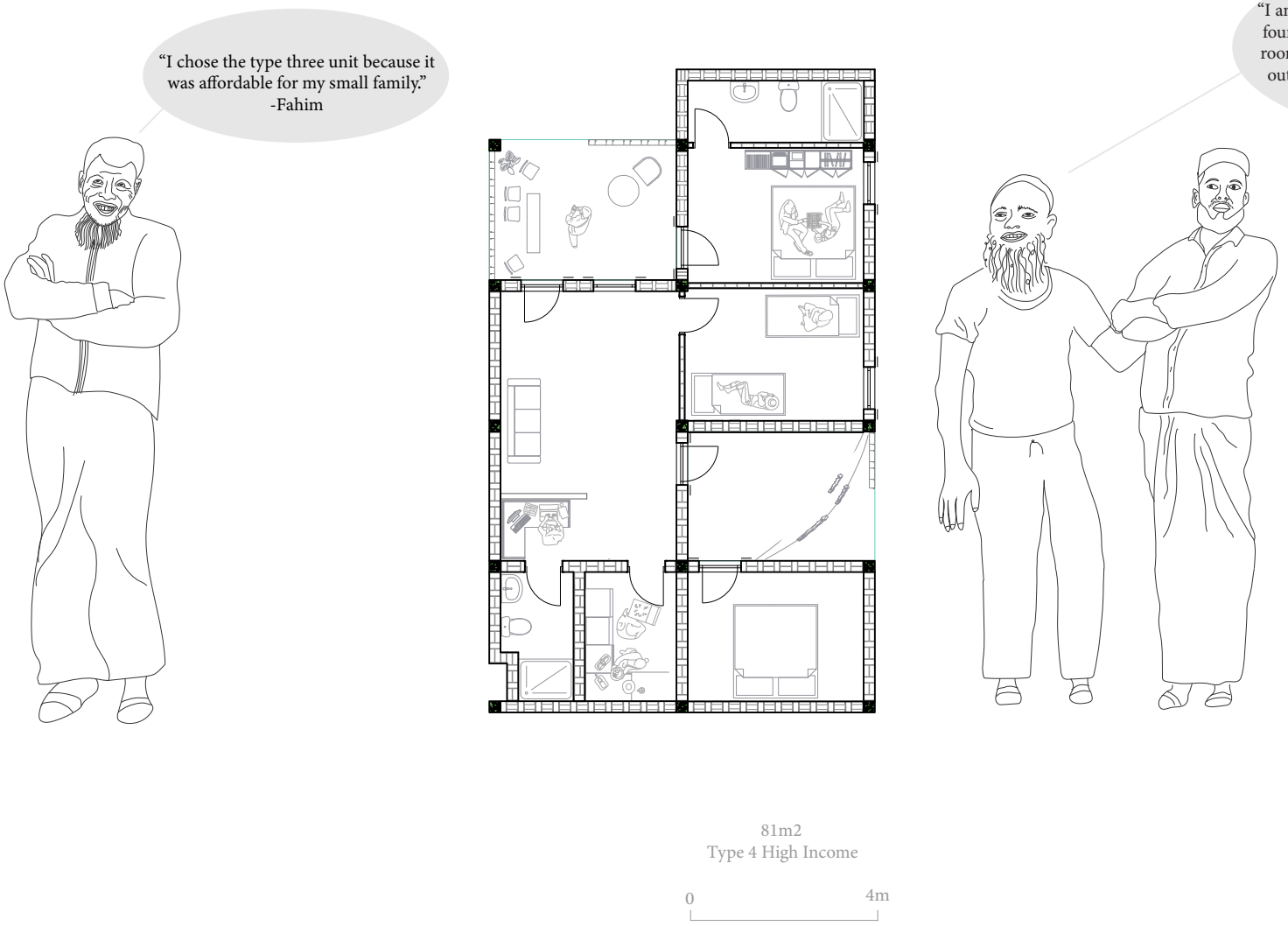


Figure 54. Dwelling units and target groups

The Dwelling - Materiality

Sub question 2:

How can the image of indigenous building materials and techniques be improved in Sylhet?

Answer:

The people of Shonatola might be reluctant to the use of traditional or indigenous materials like bamboo as they are seen as primitive and no longer desirable. More recently, the introduction of rapid industrialization has aided in this perspective. A study done in India shows that it is neither the construction technique nor the performance that makes traditional materials undesirable but rather their image (Kulshreshtha, Vardon, Mota, van Loosdrecht, & Jonkers, 2019).

It is not only important to make use of sustainable materials, it is important to use materials that are familiar to the target group and are easily accessible. For this reason brick and concrete are the two main building materials. Materials like bamboo is also used in a more complex way.

Woven jute panels are added at various places in the roof structure. Jute is grown in large fields to the south of Shonatola and many villagers are skilled in weaving jute. This is an affordable and functional way to create a barrier or railing for safety as well as sustainable sun shading.

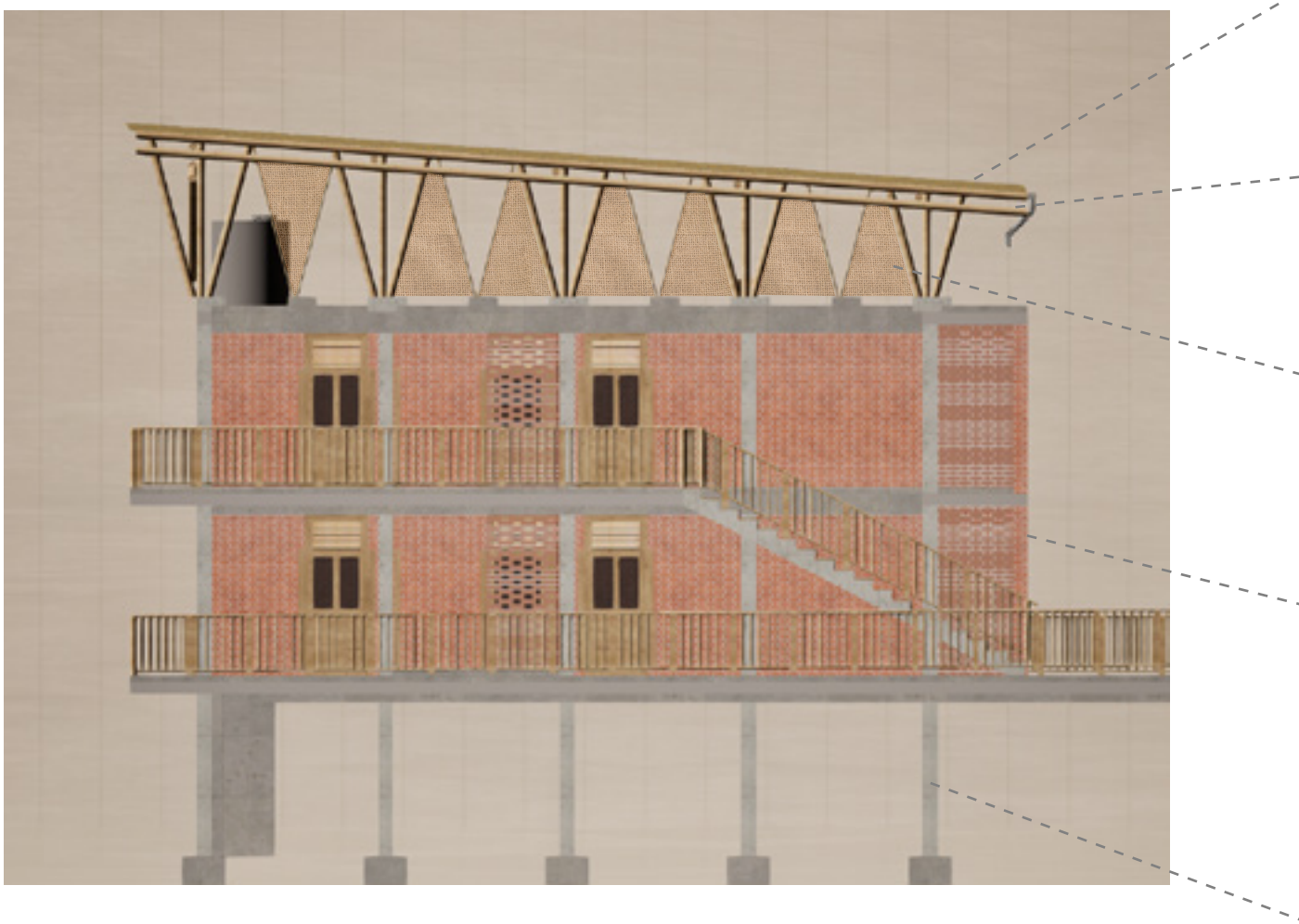
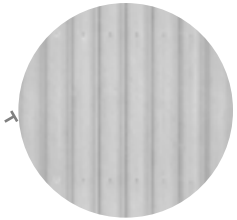
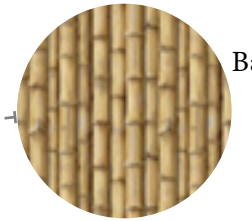


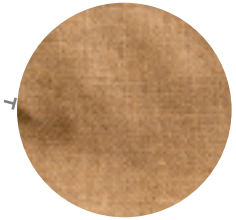
Figure 55. Materiality of the dwelling unit



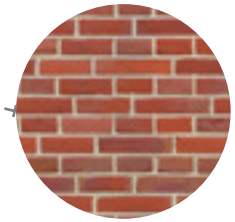
C.I sheets



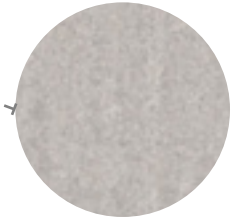
Bamboo roof structure
+ bamboo railings



Woven jute panels



Fired brick



Concrete structure

Managerial Framework

Stakeholder Analysis

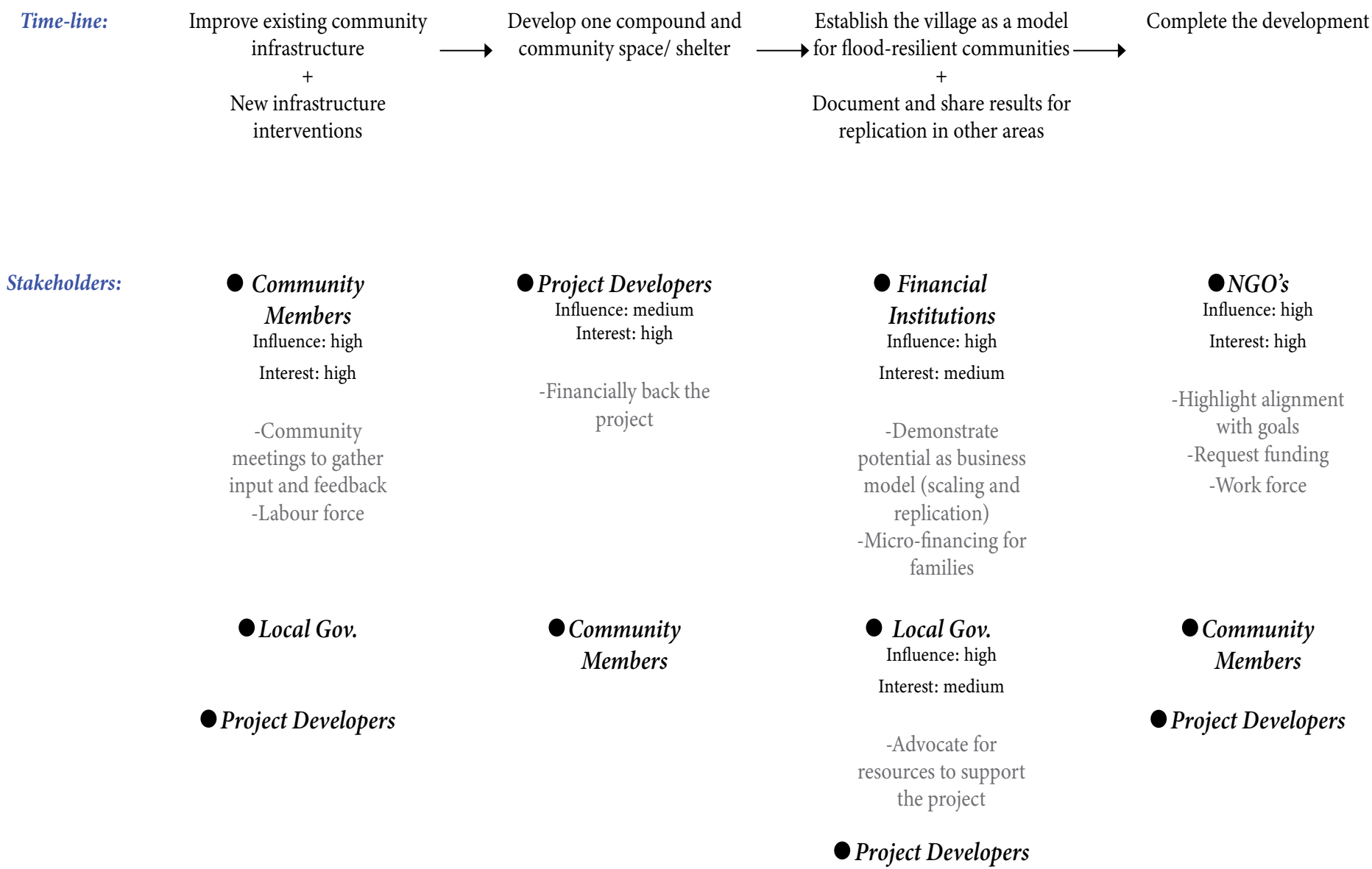


Figure 56. Development time line and stakeholder analysis

Managerial strategy

Who builds?

The skilled villager

Dwelling
Cluster
Compound
Neighborhood

-Skilled villages with supervision of professional contractors

-In the future cluster members can buy out/build upward together.

The professional contractor

-The government will construct new roads and gutter infrastructure

The architect

Who designs?

Dwelling
The architect follows the masterplan created to the left of Shonatola

Cluster
The architect along with building technologists and structural engineers

Compound

Neighborhood
The architect and developers plan the placement of compounds and neighborhood infrastructure by following the existing patters, norms and culture of Shonatola

The building technologist and structural engineer

Adaptable

Available

Affordable

Acceptable

Accessible

Who pays?

Dwelling
-Micro financing institutions can work along with developers to partially cover initial cost of dwellings

-Residents can then take part in rent-to-own scheme

Marine academy student: the resident

Cluster
-Government grants leveraging disaster resilience and rural development can invest into building the stilt structures.

Compound
Residents will invest in a 'Compound management fund' where each household contributes a small amount monthly to keep the clusters and the shelter running.

Residents like Ahnaf who has a store in the community center will pay rent as contribution

Neighborhood
The government as well as the developers

Ahnaf: the entrepreneur

Dwelling
Residents manage their own dwelling units

Cluster
Residents of the cluster take care of all issues together

-Local contractors can share knowledge

Compound
The compound leader (most likely also the shelter manager),like Fahim represents the compound in the neighborhood board.

Neighborhood
A 'community development board' comprising of compound leaders, the developers and NGO members can manage the neighborhood

Fahim: the compound leader

Who manages?

Figure 57. Managerial strategy and the 5 A's of housing

Reflection

Reflection

Motivation

For my thesis proposal the idea of learning from indigenous cultures and vernacular building practices was the frontrunner for all my ideas. I have always been interested in low-tech, vernacular architecture and after learning about the resiliency of Bangladeshi people who have been living with the challenge of flooding for years it was easy to see that they had already developed a system of defence, that could be strengthened with some architectural interventions.

Understanding the How and Why?

Bangladesh is experiencing severe flooding due to climate change, causing the displacement of thousands of people annually. Recent studies have shown that micro-migration is used as a form of resilience against natural disasters. This migration is often short-term and involves short distances. Despite the frequency and intensity of floods, many people prefer to stay near their homestead, this is because of familiarity and emotional connection to the land. The reoccurring migration from residential plots to temporary squatting locations with poor living conditions causes social, economic and environmental challenges, including loss of economic activity and a source of income.
Shonatola, a small village in Sylhet at the urban to rural transition, experiences flooding about 2-3 times a year. Most people are forced to a nearby school acting as a flood shelter that can hardly occupy the number of visitors during the flood season. This community has dealt with the challenge of flooding for years. Their living traditional ecological knowledge and practices have proven to be somewhat resilient towards this environmental challenge.
My question was: Could the migratory patterns of the displaced people along with architectural interventions create a viable solution to support this growing phenomenon of disaster-related migration in the flood prone areas of Bangladesh, specifically the village of Shonatola?

Research and design

This thesis suggests that resilient housing solutions for flood-displaced communities in Sylhet can be developed by integrating the concept of resilient migration and traditional knowledge of Indigenous communities facing similar challenges.
Initially the idea was to take ideas from other indigenous communities and implement them into Shonatola. However, I came to the realisation that much can be learnt from the people of Shonatola themselves. The design stepped away from looking outside and really focused on the traditions and culture of Shonatola.
This thus changed the design direction. Rather than qualities like dynamic architecture capable of adapting with flood patterns and modular systems, the project has a more permanent quality that allow easy migration between site locations focusing on increasing long-term resilience for the flood affected population.

Approach

Case Studies both in Bangladesh and around the world were chosen to analyse the techniques and knowledge used by indigenous people in similar circumstances and for typological studies in Bangladesh. The cases studies taken from other indigenous groups both outside of Sylhet and Bangladesh were perfect for understanding successful ways to live with, near and on water. While the typological research and material research in Bangladesh produced great insight into what is typically Bangla and what are the aspirations of a Bangladeshi household.
In Bangladesh semi-structured interviews were conducted with professionals in the field of the built environment and indigenous studies. Field trips were also made to various villages including Shonatola. Talking to residents and observing their everyday life over several days resulted in observational sketches and photographs capturing their way of life, an ethnographic study that later directed the design. Together these methods created a knowledge base to help inform the final design.
Overall, I think initially working with case studies created a good foundation to go to Bangladesh and the interviews gave me so much more information that I could not have gotten from desk research.

Feedback and its Translation

The feedback provided by my research, design and building engineering mentors at every stage of the project helped my design greatly. At my P2 presentations there were concerns about how much I let my research question direct my design. My tutors felt like I could have done more in this aspect. I took a step back from designing and deeply analysed the notes and photographs from my trip, this created the sketches which later created the knowledge base that drives my design. At the P3, my urban plan got some constructive criticism, with some minor changers and reworking, it really changed for the better.

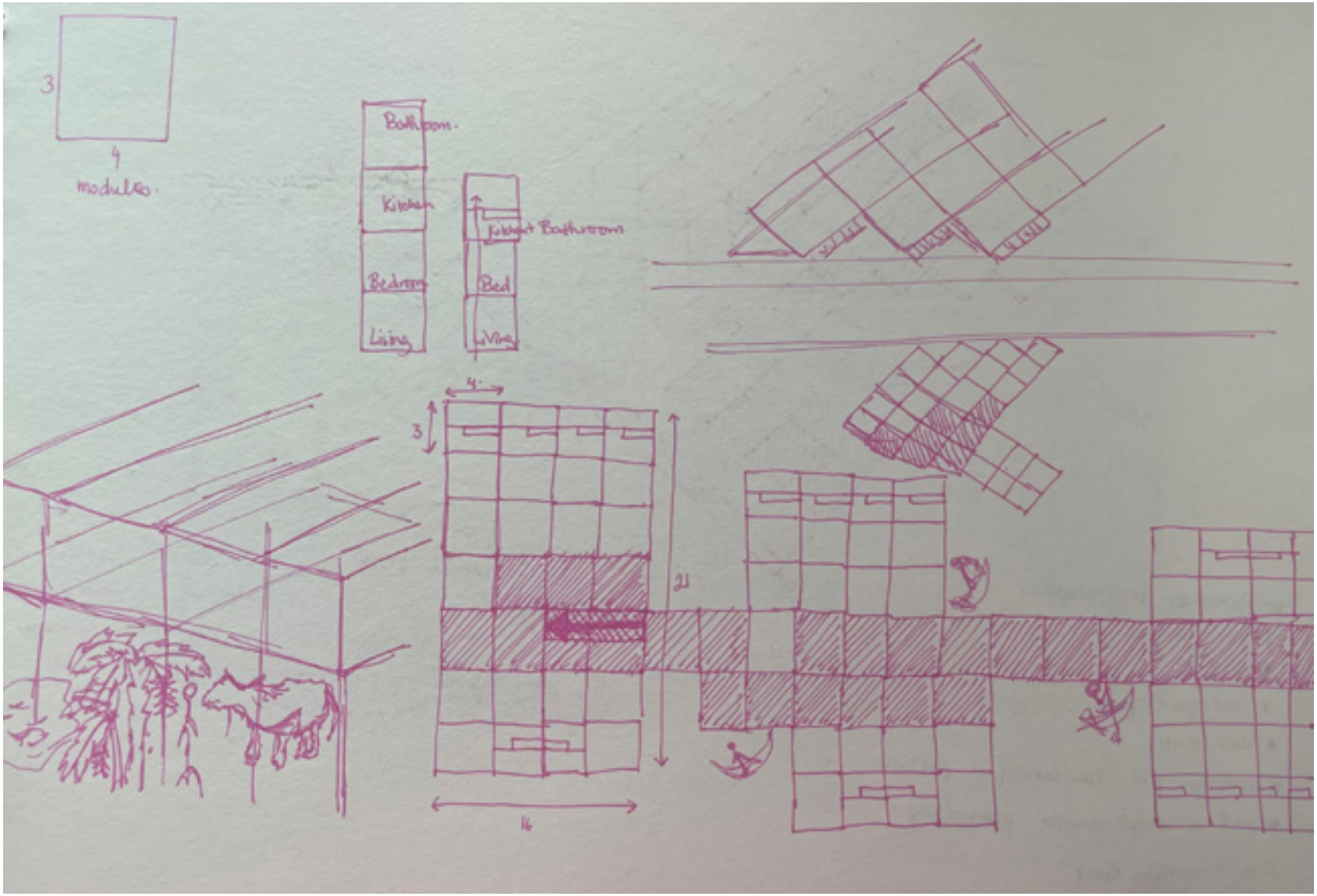


Figure 58. Initial sketches of circulation space

Continued Learning

For the MSc 1 and MSc2 I worked in studios that were focused on projects outside of the Netherlands (Turkey and Argentina) with similar focuses on natural disasters and low-tech building. Although, I found them very interesting and thought they had done a great job at preparing me for this graduation studio, I have come to realize that all projects are different. Location, motivation and especially culture make all projects unique. I enjoy working on these types of projects. I will take what I learnt with me and look forward to learning more and having more cultural experiences in my professional career.

Relationship between Graduation Topic and Master Track

The aim of the studio is to develop a housing design that produces innovative responses to a socio-environmental challenge, the design should respond to cultural and environmental factors. To do this, ethnographic explorations into the living spaces of the people of Shonatola and the indigenous building practices of indigenous people was conducted.
The project addresses a community problem and therefore must be designed on a neighbourhood scale; thus, it combines architectural design with urban planning by creating a master plan that supports micro-migration as a form of resilience. The housing itself will also be worked out resulting in details and technical drawings.

Academic and Societal Value

The people who are usually displaced because of flooding are usually poorer and have no other alternative than to resettle in similar or worse conditions. These people usually work in the agriculture industry and play a major role in the economic stability of Bangladesh. However, because of reoccurring destruction to their homes and agricultural lands the economy also falls subsequently. This is then not a problem only related to the flood prone areas in the country but to the financial stability and development of Bangladesh on a whole.
Bangladesh signed to the Ramsar Convention on Wetlands in 1992. The convention is the intergovernmental treaty that provides the framework for the conservation and wise use of wetlands and their resources. Goal three of the four goals of Ramsar's 4th Strategic Plan (2016-2024) is the wise us of all wetlands, beyond Ramsar Sites. Under the wetlands decree "respecting and using traditional knowledge and practices" is listed as a means to achieve this. This further emphasises the need to look towards indigenous techniques to help develop culturally appropriate and flexible housing designs addressing this major problem in Bangladesh.

Transferability of Results

Addressing the issue of poor living conditions in an environmentally vulnerable neighbourhood embodies the program's mission to address a global housing crisis.
In my opinion the basic principles of this design can be transferred to other countries or flood prone areas seamlessly. When necessary minor changes can be made to the layout to meet new environmental, societal or cultural needs.

Self Developed Reflection Questions

What ethical considerations had to be taken as an aspiring architect from the west working in a non-western country?
As an architectural student from Europe going to South-Asia I had to prepare myself for the difference in realities. It was important to remember that I was going to Bangladesh to deal with an environmental issue that could truly happen anywhere else in the world. I think that the position taken for my thesis, 'looking to indigenous and vernacular methods' already helped prepare me. With that ideology I was already going to find information to learn from and not as a 'saviour'.

What key lessons were learnt working in a non-western country and how can they be transferred to future designs?
This project thought me about the importance of resource mapping. Many materials that may be deemed sustainable from one perspective might not be as sustainable in another setting because of how it is sourced.
Also, I think that low-tech, passive designing is something that is often associated with cheap, non-western building, however as the climate continues to change globally is becoming more important to design buildings as low-energy and as self-sufficient as possible. This was taken very seriously in the Bangladeshi context and is something I would take with me for future designs.

Looking Forward

As I prepare for the P4, I appreciate the journey that my project has taken. I see how an initial idea gradually changed but the project remained rooted in the ideas of learning from, appreciating and innovating traditional and vernacular architectural techniques. In the weeks that I must prepare for the P5 I look forward to giving my project a more personal feel, communicating the lives and the stories of the people in met in Bangladesh that inspired me to work even harder. I want to focus on communication through beautiful diagrams, adding final architectural touches and strengthening the building technology aspects of the project.

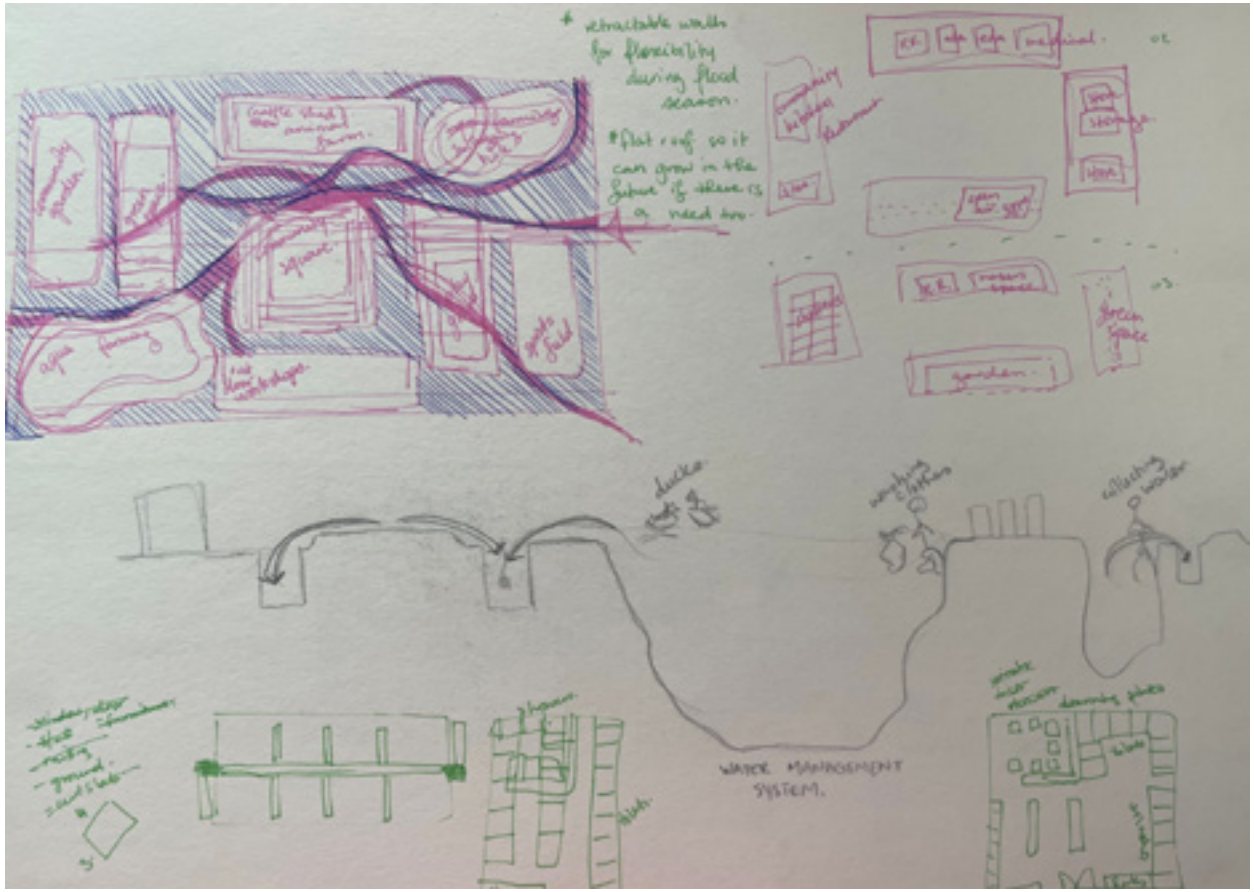


Figure 59. Initial sketches of

Appendix

Appendix

Before the researcher designed *Re-imagining Resilience,* the Global Housing studio of 2024-2025 completed a number of small projects. Firstly, Project 1 included individual research on existing urban projects. The researcher was given Community 4 in Tema, Ghana.
The pilot project included using multiple urban plans to create an arbitrary urban plan in a 1Ha block. Collectively, the studio also produced two bodies of works.

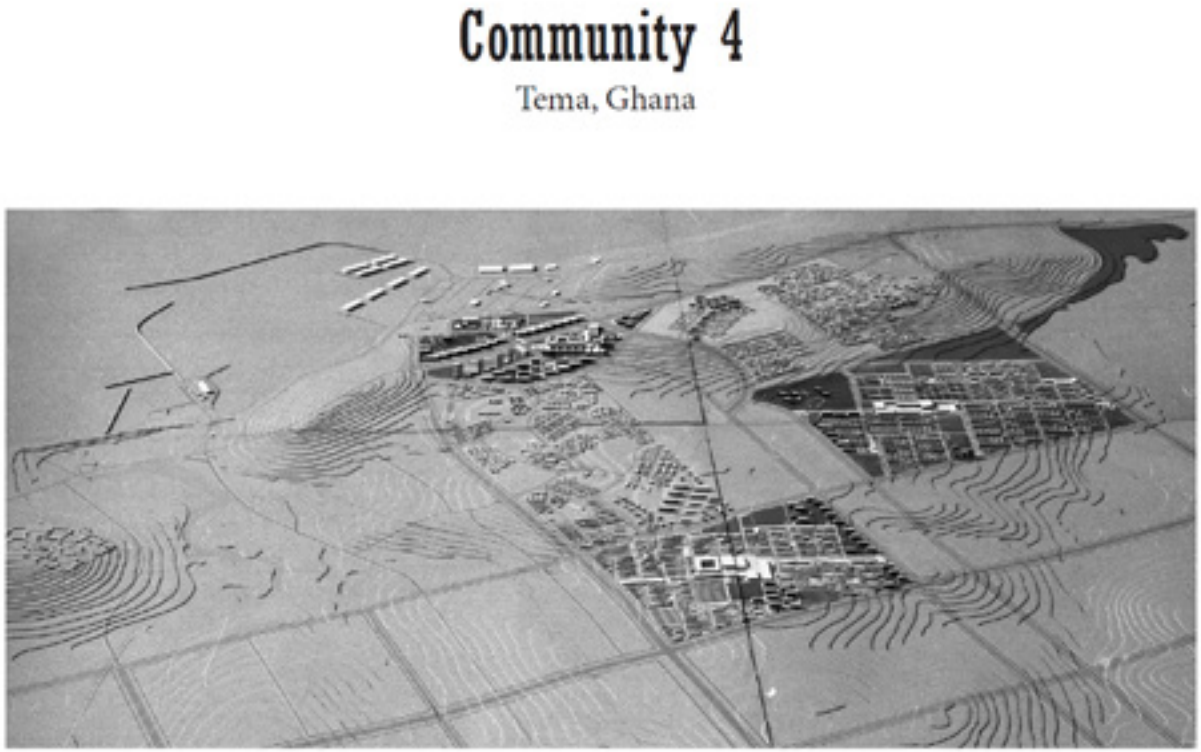
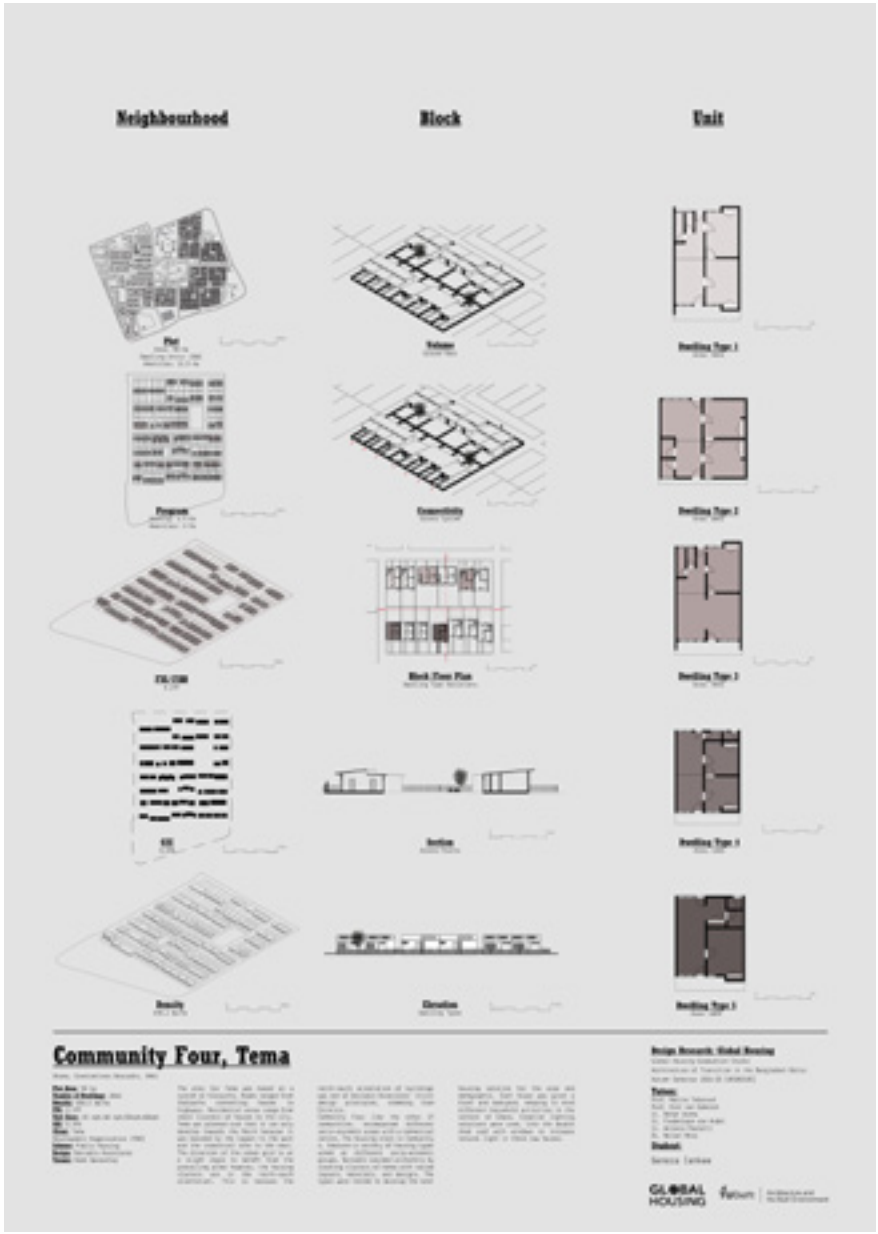


Figure 60. Cover page of project 1



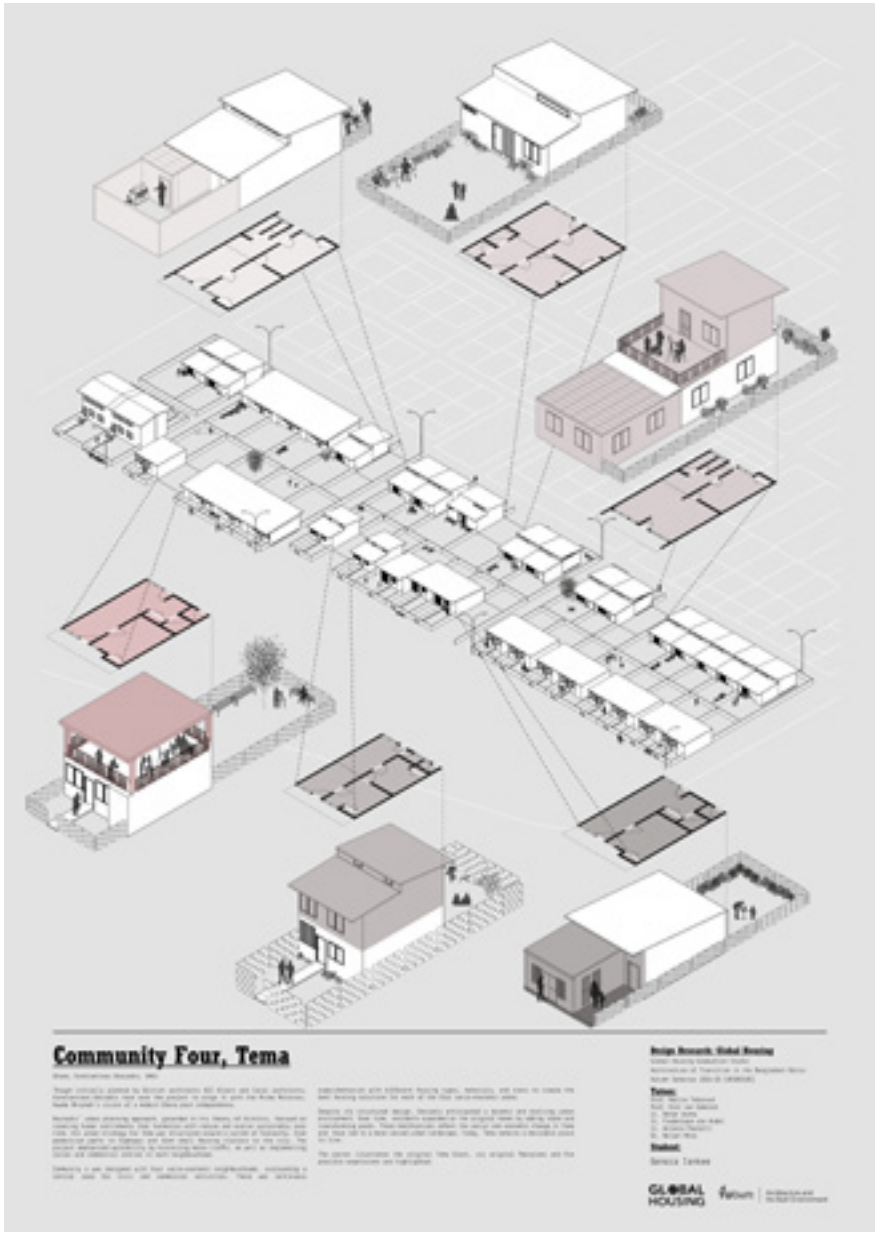
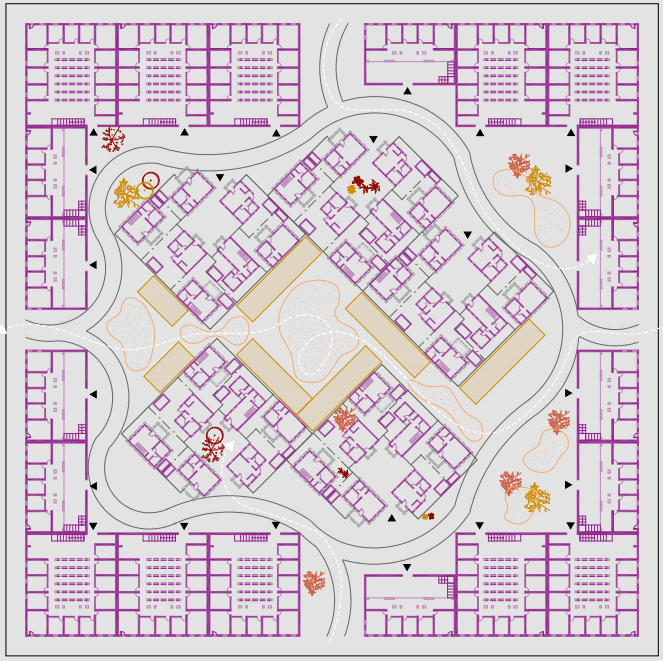
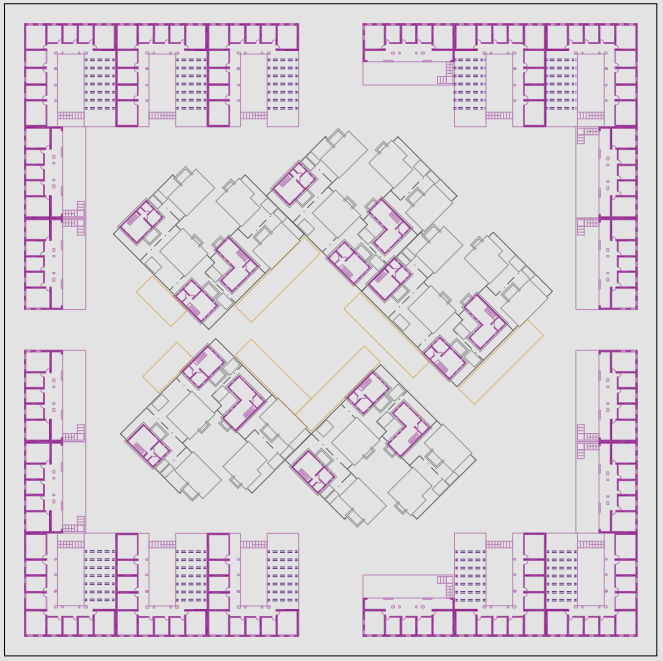


Figure 61. Final posters of project 1

Ground Floor Plan
1/500



Typical Floor Plan
1/500

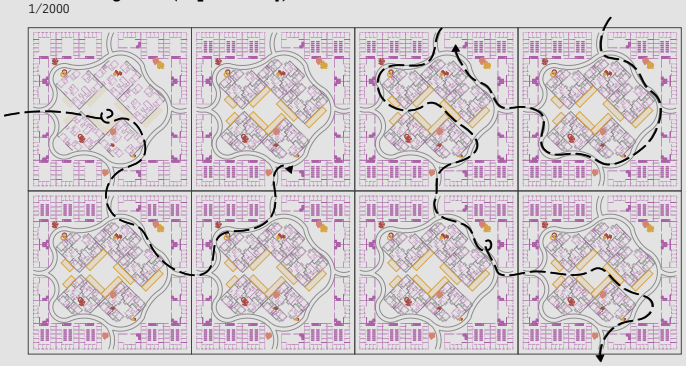


Typological References

Tema Manhean
Jane Drew & Edwin Maxwell Fry
Ghana
1952-1960
FSI 0.19

Belapur Housing
Charles Correa
India
1983
FSI 0.5

Urban Fragment (Replicability)
1/2000



The Density Challenge
0.5 FSI Low-rise

Student:
Genora Jankee | 6094627

Global Housing Graduation Studio

Architecture of Transition in the Bangladesh Delta
Autumn Semester 2024/25 [AR3AD105]

GLOBAL HOUSING
TU Delft Architecture and the Built Environment

Figure 62. Resulting poster of Pilot project

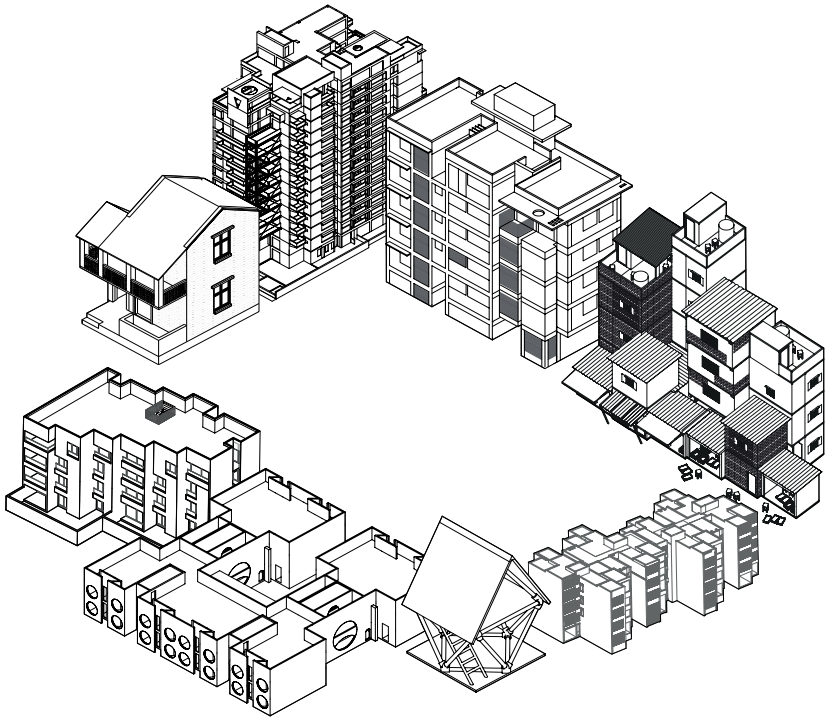
Figure 63. Resulting Atmospheric poster of Pilot project

Figure 64. Models of all studio participants

HOUSING IN BANGLADESH

This booklet provides a collective analysis of housing strategies present in Bangladesh, compiled by students of the Global Housing Studio of the TU Delft. The assembled knowledge offers a broad overview of the variety of living qualities provided by the built environment of Bangladeshi cities while also offering insights into the characteristics of present vernacular architecture. While the analysis is structured by categories that differenciate between housing typologies, scales and target groups, the collection enables a comparison of aspects like fsi, number of dwellings and density.

- HOUSING FOR STUDENTS
- HOUSING FOR WORKERS
- SMALL-MIDDLE URBAN HOUSING
- LARGE APARTMENT COMPLEXES
- SELF-HELP HOUSING
- VERNACULAR HOUSING
- MODULAR HOUSING
- TYPOLOGIES OF SYLHET



HOUSING IN BANGLADESH

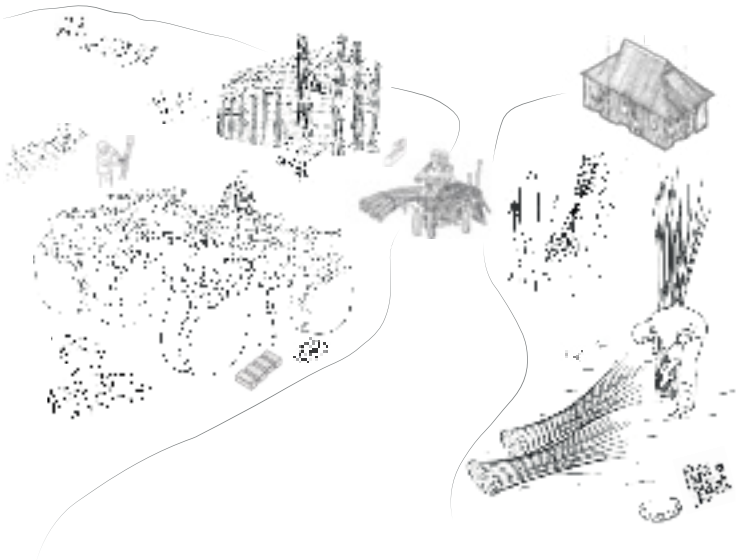
Figure 65. Book 1 cover and back page

GLOBAL HOUSING: AVAILABLE BUILDING MATERIALS IN BANGLADESH

This booklet compiles analytical documentation of building materials in Bangladesh, created by students of the Global Housing Studio at TU Delft. It serves as a collective knowledge base, offering a comprehensive overview of available materials and building techniques, influenced by the unique human and physical geography of Bangladesh. Within eight chapters, the booklet showcases a diverse range of local building methods and gives an overview over harvesting and preparation processes.

MATERIALS IN BANGLADESH

GLOBAL HOUSING



GLOBAL HOUSING

MATERIALS IN BANGLADESH

Figure 66. Book 2 cover and back page

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