COMMUNITY RESILIENCE
OF RIVERINE COMMUNITIES

*An exploration of how housing design may enhance community
resilience after climate disaster in northern rural Bangladesh*

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CONTENT

INTRODUCTION

Context

In recent decades, climate change has emerged as a major global concern. Studies indicate that this is likely to intensify the global water cycle, leading to increased rainfall and reduced evapotranspiration, resulting in higher river flows worldwide (Parvin et al., 2016). This shift is expected to result in more frequent floods in many regions around the globe (Parvin et al., 2016). Flooding poses a major challenge to the sustainability of riverine communities globally. Between 1995 and 2015, floods claimed over 157,000 lives and impacted more than 2.3 billion people worldwide (Mondal et al, 2020). Despite Asia being the most severely affected by the floods, reports suggest that flood-related deaths are also rising in other parts of the world (Gotham et al., 2018).

Developing countries, particularly Bangladesh, face the most significant challenges related to climate change, including flooding (Parvin et al., 2016). Bangladesh, as a low-lying developing country, is considered as one of the most disaster-prone countries in the world and highly vulnerable to climate change (Gros et al., 2019). The combination of the country's geography, dense population, and widespread poverty makes the people of Bangladesh highly vulnerable to natural hazards (Parvin et al., 2016). The most frequent natural hazard in Bangladesh is flooding, threatening 60 percent of the country where areas below six meters above sea level are at risk. Each year, approximately 20,5 percent of the country experiences flooding, and in extreme cases, flood waters can cover up to 70 percent of the country (Paul et al., 2010). While flooding can be detrimental, it is also associated with economic and environmental benefits, such as increased soil fertility, leading to an increase in agricultural production. However, severe floods can lead to widespread crop damage and the destruction of homes, livelihoods, and social cohesion (Paul et al., 2010).

An example of such a river flood occurred in august 2017 and severely affected the northern region of Bangladesh, impacting 6.9 million people, destroyed over half a million houses and took the lives of over a hundred people (Mondal et al, 2020). Floods have the most severe impact on poor and landless families, also referred to as riverine communities, who often settle on temporary islands known as chars; riverine sand and silt landmasses that are formed but also washed away by the river (Gros et al., 2019). The August 2017 flood was particularly impactful for riverine communities, as it followed two earlier floods in March and July of the same year (Mondal et al., 2020). Food security was affected by the timing of the August flood, as it disrupted the year's agricultural production and led to a record price of rice. Additionally, many areas were inaccessible to emergency relief efforts because of damaged roads, railways, and bridges, and in the post disaster period, thousands of waterborne diseases were reported (Mondal et al, 2020). While riverine communities have adapted to regular flooding and developed a level of resilience, extreme floods like the one in 2017 exceed their ability to cope, resulting in loss homes, crops and assets (Gros et al., 2019).

PROBLEM STATEMENT

Aftermath floods

Bangladesh is home to over 200 rivers, with three major ones; the Brahmaputra, Ganges and Megha, merging within its borders to form one of the largest rivers in the world by flow volume (Roy et al., 2016). Since 1830, the Brahmaputra River, the primary branch of the most water-rich river in Asia originating from the Himalayas, has been widening and shifting its course. It has transformed into a braided river that has expanded by approximately 128 meters annually since 1973, when satellite imagery first became available landscape (Penning-Rowsell et al., 2013). As the river erodes its banks, sediment is deposited in the channel, forming shoals that gradually develop into riverine islands known as 'chars'. These islands are often settled by farmers but are underwater during normal floods. While many chars are washed away after a few years, some become permanent, allowing trees to grow and houses to be built on them (Roy et al., 2016). Consequently, residents in these areas are increasingly resorting to permanent migration to adapt to the shifting landscape (Penning-Rowsell et al., 2013).

The rivers in Bangladesh cause almost all land types in Bangladesh to be subjected to flood, except the highlands which cover about 29 percent of the country (Penning-Rowsell et al., 2013). Most floods are not considered disasters and are a natural part of the country's ecology. However, the three major rivers have distinct catchment areas and its own rainfall and snowfall patterns. These factors, combined with Bangladesh's own variable rainfall causes every flood to be different (Roy et al., 2016). Bangladeshis use two distinct terms for floods; 'barsha' for monsoon conditions that include inundation, and 'bonna' for the less frequent but more destructive floods that occur approximately once or twice a decade (Roy et al., 2016). During monsoon season, barsha floods typically inundate 20 to 25 percent of the country for three to five months, with peak water levels lasting only one to two weeks (Roy et al., 2016). In contrast, bonna floods can inundate 40 to 70 percent of the country, sometimes even affecting the capital, Dhaka (Penning-Rowsell et al., 2013).

Individual flood resilience

As previously mentioned, riverine communities have adapted their way of living and developed resilience to regular flooding. Over generations, the Bangladeshis have a set of risk reduction skills learned, such as building houses on the highest ground available, often with high earth plinths and platforms (Dasgupta et al., 2011). Farmers employ flexible management systems, adjusting their crops according to rainfall and flood patterns. They grow extra rice seedlings as a safeguard against potential losses from drought or floods and store short-season crop seeds to plant in moist soil after floods. A common strategy evolves planting both aus and aman rice simultaneously, allowing for the harvest of aus before flood waters rise too high and aman after the waters recede. This approach increases the likelihood of a successful crop, even in challenging years. To further minimize risk, even small farmers maintain multiple plots with different soil types and elevations (Roy et al. 2016).

Brahmaputra

Ganges

Megha
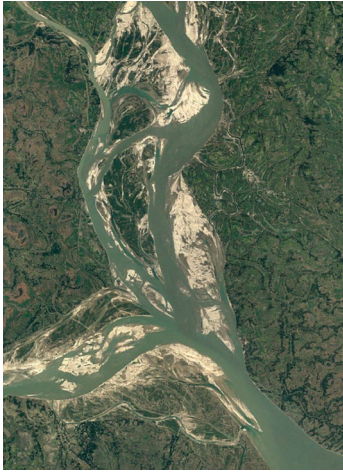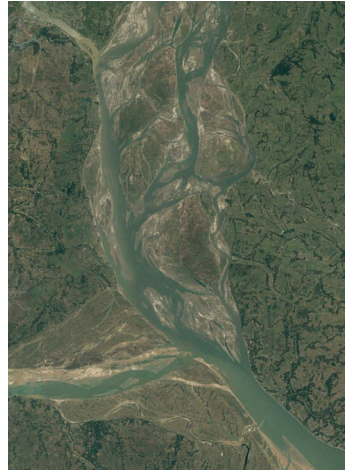
1984   1994

Larger scale flood resilience initiatives

On a larger scale, the government has initiated several flood resilience measures, including the construction of dams along the banks of the Boral River. While these efforts prevented destructive flooding, they also caused Chalan Beel, one of Bangladesh's largest wetlands, to dry out, eliminating both harmful and beneficial floods. In response, farmers protested in 2013, demanding the removal of the cross dams and road embankments built in the 1970s that had disrupted the natural flow of water (Roy et al., 2016).

Various flood management measures have been implemented in Bangladesh, including improved flood forecasting and warning systems, relief and rehabilitation efforts, and river modelling to predict erosion. The Flood Forecasting and Warning Center (FFWC) now provides flood forecasts up to eight days in advance using satellite data, with warnings disseminated through mobile networks and local centres that have links with local communities, NGOs and news media. NGOs help share flood warnings from the FFWC with local communities. However, challenges remain. While predictive models have advanced, their warnings are sometimes ignored, leading to preventable issues like resettlement along eroding riverbanks (Roy et al., 2016).

In case of cyclones, the United Nations Development program constructed over 9.000 disaster-resilient houses, targeting the most vulnerable populations in the areas most affected (Penning-Rowsell et al., 2013). In 2010, Bangladesh had more than 2.400 emergency shelters of various types (Dasgupta et al., 2010). Additionally, the World Bank agreed to provide loans for the rehabilitation of 350 existing shelters and the construction of 110 new ones, which could serve as schools during non-disaster periods (Penning-Rowsell et al., 2013). However, field research conducted by Penning-Rowsell et al. (2013) revealed that not all villages have nearby shelters, and that many people take shelter in the more robust houses within their communities.
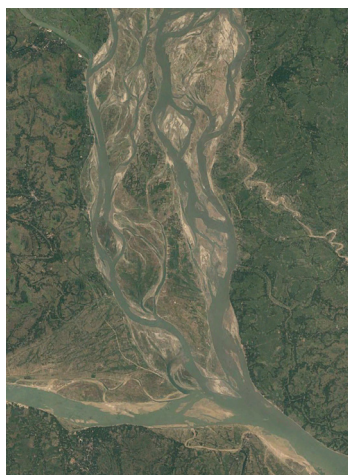
2004   2014   2024

Migration response after climate disaster

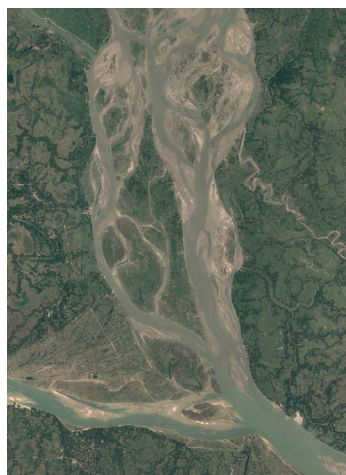The movement response to climate-related disasters varies depending on the type of disaster. During cyclones, people typically choose to stay in their houses, temporarily relocate to the safer houses of neighbours or relatives, or seek refuge in designated shelters, after which they move back to their own houses. In contrast, the movement response to erosion is fundamentally different, as it involves the long-term or permanent loss of land along with immovable property. Victims of riverbank erosion often resort to short-term solutions, such as moving in with nearby relatives or occupying public land. Those who lose both their homes and arable land may establish a homestead on someone else's' property or public land near their original homes, hoping that the riverbanks will eventually accrete, allowing them to reclaim their land. During severe (bonna) floods, if the raised platforms within their homes are inadequate, a part of the population seek shelter on boats. When both homestead and land are eroded for long periods in the chars, entire villages may relocate to new areas. They often retain their original village name, even if the new location is some distance away (Penning-Rowsell et al., 2013).

As a result of lost agricultural income in regions affected by climate disasters, another significant portion of the rural population migrates to overcrowded cities like Dhaka, Chittagong, Sylhet, and Comilla in search of work (Kamal et al., 2018). Although many of these individuals would prefer to stay, they often feel they have no choice. Dhaka attracts people due to job opportunities, where women can find work in garment factories and men often take jobs as rickshaw pullers. Unfortunately, living conditions in the slums are unhealthy and overcrowded, often situated in hazardous areas with a lack of basic services, sanitation, and hygiene. Additionally, these rural-urban migrants lose their traditional way of life, including their land and community, making the move to cities feel often feel like a last resort. (Roy et al., 2016).

Problem statement

Despite the resilience and adaptability of the Bangladeshi people, even they cannot cope with the destructive bonna floods, which continue to destroy people's assets and livelihoods (Roy et al., 2016). Various flood management efforts have been implemented, yet significant gaps remain in addressing the needs of riverine communities. While dams prevent destructive floods, they also disrupt the normal flood cycle, drying out wetlands like Chalan Beel and harming farmers who depend on seasonal flooding for soil fertility. Improved flood forecasting provides early warnings, but these are often ignored, leading to preventable damage and forced
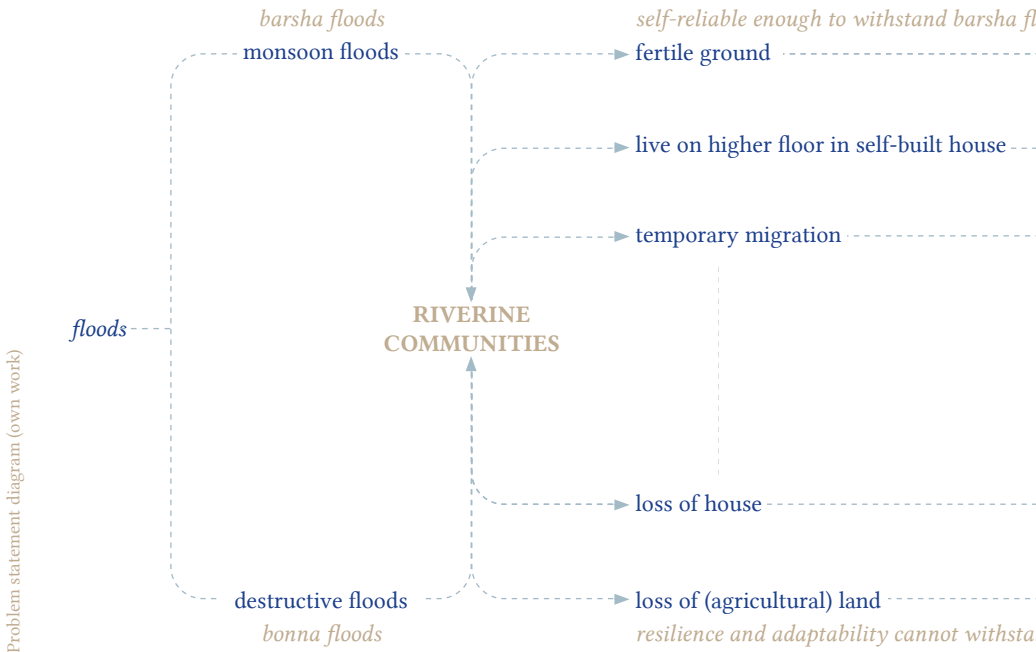
resettlement along eroding riverbanks. Multi-purpose shelters, though valuable, are insufficient in number and often too far for many communities. Lastly, migration to the already overcrowded cities, often seen as a last resort, brings new challenges like unsanitary living conditions, and loss of traditional livelihoods.

This raises the question whether the existing flood resilience of riverine communities in Bangladesh can be up scaled through design, using gentle adjustments that respect their traditional ways of life, allowing communities to cope with larger floods without losing their income.

loods

agricultural income

living in slums
lack of houses

lack of hygiene / sanitary

lack of space

loss of income move to overcrowded cities

loss of community

loss of traditional way of living
day labour work to survive

nd all bonna floods
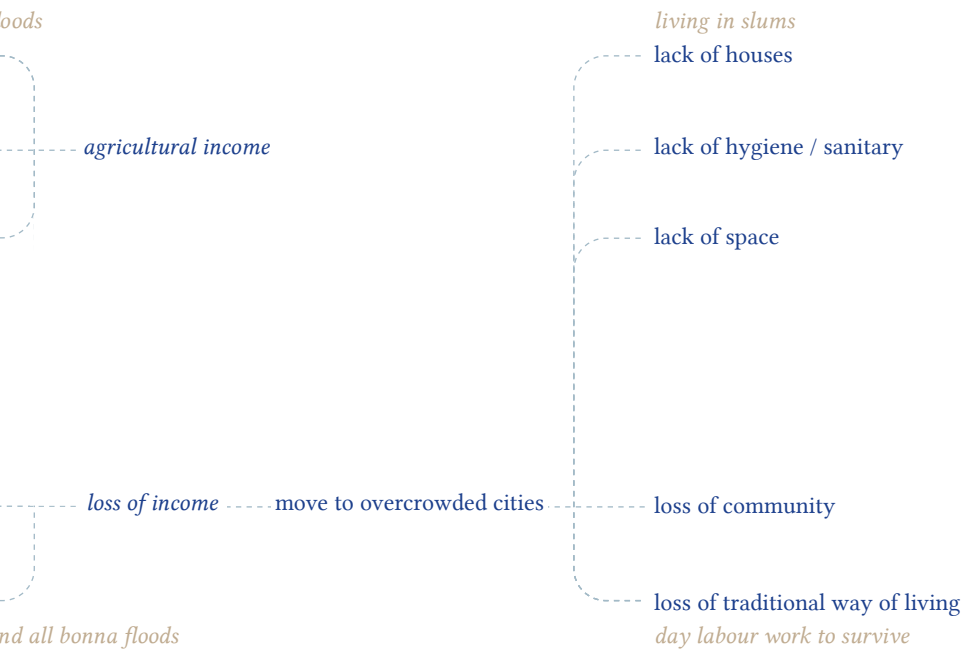
Project position

As this research acknowledges the position of being an outsider to the lived experiences and rooted knowledge of riverine communities, it seeks to learn from the resilience these communities have already developed in coping with flooding. These communities have not only adapted their ways of living but also their way of farming to ensure they can continue generating income. The aim is to learn from their established practices and respectfully build upon these traditions to design housing solutions that align with their existing ways of life, while enhancing their capacity to withstand more destructive floods without compromising their livelihoods or way of living.

field of analysis

barsha floods
monsoon floods

self-reliable enough to withstand barsha fl
fertile ground

live on higher floor in self-built house

temporary migration

RIVERINE COMMUNITIES

field of design

floods

loss of house

loss of (agricultural) land
resilience and adaptability cannot withsta

destructive floods
bonna floods

field of design

Research and design area within problem statement
(own work)
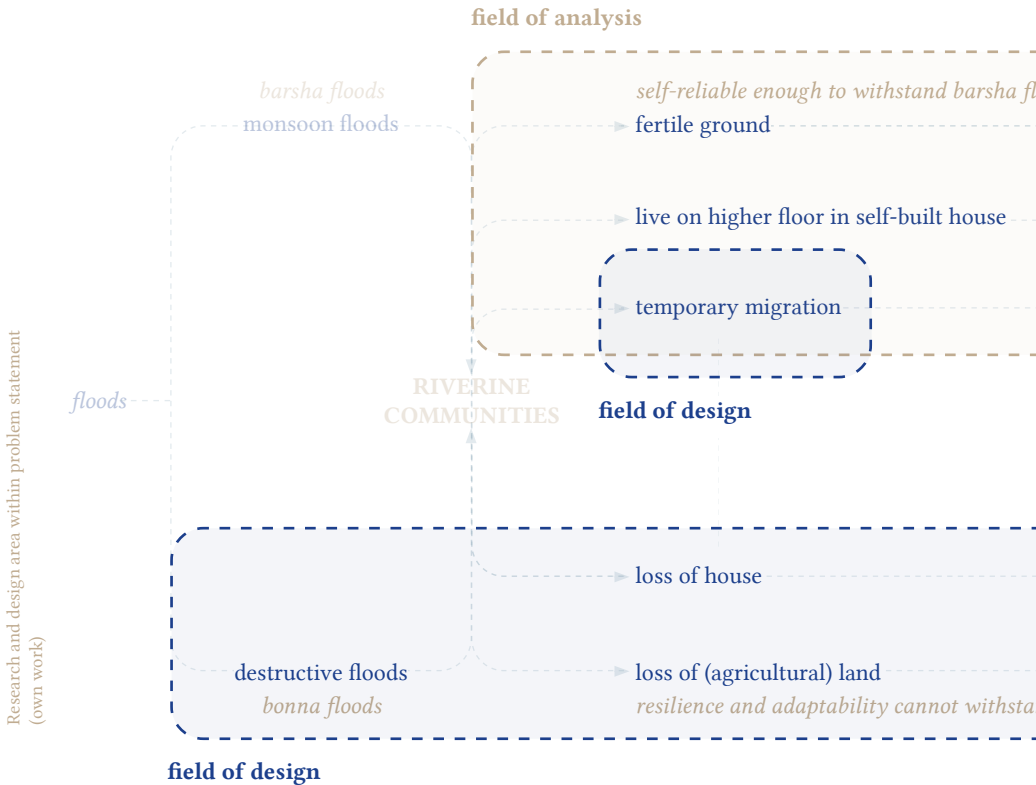
To achieve this, the research takes the communities' adaptation to monsoon floods as the primary area of analysis to learn from. These existing methods of flood resilience will serve as a foundation to design, which will focus on finding a housing solution that reduces the impact of destructive floods that lead to the loss of homes, agricultural land, and income. The objective is to explore whether the existing practices can be scaled up or adapted to help these communities cope with the more extreme, less predictable bonna floods that exceed their current capacities in dealing with floods.

loods

agricultural income

living in slums
lack of houses

lack of hygiene / sanitary

lack of space

loss of income — — — move to overcrowded cities — — — — loss of community

nd all bonna floods

loss of traditional way of living
day labour work to survive
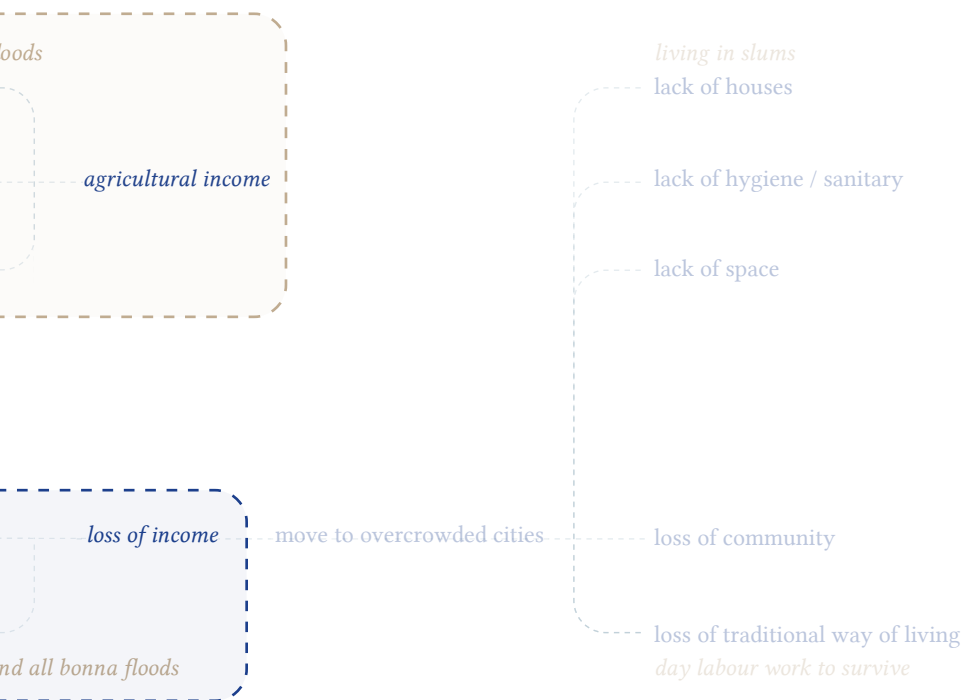
Agriculture along the Boral river
(photo by Mumnun, 2011)

RESEARCH QUESTION

Main research question

How can the resilience strategies of riverine communities in rural Sylhet, Bangladesh, developed for coping with monsoon floods, be scaled up to design housing solutions that enhance their ability to withstand more severe floods without compromising their livelihoods and traditional ways of living?

Sub-questions

To address the main research question, the research is divided into two parts: analysing what currently works well for these communities during monsoon floods and exploring why those same strategies fall short during more severe flood events. Additionally, the research will examine external solutions that could be integrated into the communities' practices to enhance their resilience to extreme flooding.

First, the research will investigate the current flood-resilient strategies under regular flood conditions and what can be learned from this that can be integrated into the design.

(1)   **What can be learned from the current flood-resilience strategies of riverine communities in rural Sylhet during monsoon floods regarding economic stability, social cohesion, and housing?**

Next, it will analyse the factors that cause these strategies to not work during extreme floods and how these events disrupt the communities' economic stability, housing, and social structures.

(2)   **Why do the current resilience strategies of riverine communities in rural Sylhet fail during more severe floods, and how do these events impact economic stability, social cohesion, and housing?**

Lastly, the research will look at solutions from other flood-resilient solutions that have been effective in different contexts. It will explore how these solutions can be adapted and integrated into the communities' existing strategies to enhance their ability to withstand more destructive floods.

(3)   **What can be learned from other flood-resilient solutions, beyond those of riverine communities in rural Sylhet, that can be integrated into their existing practices to enhance their ability to withstand severe floods?**

RESEARCH AIM

Relevance

This research addresses a critical challenge faced by riverine communities in Bangladesh, where climate change is amplifying the frequency and severity of floods, threatening both livelihoods and traditional ways of life. Although these riverine communities have generations of experience in adapting their homes and agricultural practices to withstand regular seasonal floods, their strategies are increasingly overwhelmed by the scale and unpredictability of extreme flood events, such as the river flood in August 2017, which displaced millions and destroyed homes and farmland.

Previous flood management interventions seem valuable, such as dams, improved flood forecasting, and multi-purpose shelters, but do not connect to the specific needs of riverine communities. Dams have disrupted natural flood cycles, affecting agriculture-dependent wetlands, flood warnings are often not acted upon and multi-purpose shelters remain too scarce and distant. This research aims to bridge the gap between these existing flood management interventions and the lived circumstances of riverine communities by exploring housing solutions that build upon their own resilient practices while addressing the challenges posed by extreme floods.

Research aim

In alignment with Sustainable Development Goal 11: Sustainable Cities and Communities (United Nations, n.d), this research aims to learn from established flood-resilient practices of riverine communities and respectfully build upon these traditions to design housing solutions that align with their existing ways of life, while enhancing their capacity to withstand more destructive floods without compromising their livelihoods or way of living.

Design hypothesis

Existing flood management interventions in Bangladesh operating on a larger scale, fail to meet the specific needs of riverine communities during severe flooding that exceeds their resilience and adaptive strategies. This leads to destroyed homes, loss of livelihoods, significant amount of displaced people, and loss of income, forcing many to move to overcrowded cities and live in slums. Consequently, the design hypothesis is;

Housing solutions that integrate local knowledge, materials and resilient practices to enhance flood resilience in riverine communities with long-term adjustments, thereby reducing the risk of impoverishment and preserving traditional livelihoods. *

* This study explores the scaling of existing strategies that could either result in a flood-resilient rural housing design or temporary urban housing for seasonal migrants, depending on the findings after site visits and fieldwork.

THEORETICAL FRAMEWORK

Literature review

To explore how the existing resilience strategies of riverine communities can be scaled up to address flooding while preserving their traditional ways of living, this research builds on various studies that have already been conducted. Earlier studies document the coping strategies of communities facing frequent flooding in Bangladesh. Research on riverine floods, riverbank erosion, and urban slum floods highlight a range of strategies that help households manage the immediate challenges they face during flood events (Mondal et al., 2020; Sultana et al., 2021; Ferdous et al., 2019; Chanda Shimi et al., 2010). Common strategies include elevated construction, seasonal migration, crop modification, and income diversification to buffer economic impacts (Dasgupta et al., 2011; Ferdous et al., 2019; Roy et al. 2016). Additionally, temporary relocation and reduced food consumption are used by some households, though these can lead to impoverishment as people lose income and assets with each flood, from which they can only partially recover (Ferdous et al., 2019). Among communities living on chars, migration to urban centres for work has become a common strategy, allowing people to sustain their agricultural livelihoods by returning after floodwaters lower (Sultana et al., 2017). As most of these strategies remain short-term, Ferdous et al. (2019) critically questions the assumption that Bangladeshis have successfully adapted, arguing that while communities may cope, they experience recurrent asset losses, leaving communities poorer and less capable of making structural, long-term adjustments.

While less literature focuses on enhancing resilience to severe floods, some studies emphasize shifting from short-term coping mechanisms to sustainable, adaptive strategies (Shimi et al., 2010; Ferdous et al., 2019). Ferdous et al. (2019) discusses the need to move from 'hard' engineering approaches to 'soft' methods that allow communities to live with floods rather than fight them. The polders built in the 1970s in Bangladesh, illustrate the drawbacks of rigid flood control, as they have disrupted ecosystems and constrained socio-economic growth. Instead, researchers recommend approaches that enhance livelihoods without using engineered flood controls. For instance, Mondal et al. (2020) suggests livelihood diversification, such as livestock rearing and non-farm self-employment, to improve economic resilience. Their study also notes that temporary migration, chosen by communities over consumption reduction, has proven more effective in mitigating flood impacts. This shift aligns with Sultana et al. (2017), who finds that seasonal migration to urban centers for work is essential for floodplain households, especially char communities dependent on temporary relocation due to erosion and shifting river sediments.

Despite some agreement in the literature on enhancing resilience, there is no unified approach to scaling these coping strategies effectively. While 'soft' approaches that support living with floods are gaining traction, there is no standardized solution yet. This study explores the scaling of existing strategies that could either result in a flood-resilient rural housing design or temporary urban housing for seasonal migrants. This research aims to propose a housing solution that aligns with 'soft' adaptation frameworks and reflect the traditional lifestyles of rural Bangladeshi communities.

Theoretical framework

Based on the literature review, flood management strategies can generally be categorized into 'hard' and 'soft' approaches. Hard approaches, such as technical solutions, use infrastructure like embankments and polders to control or prevent floods. While these engineered interventions aim to protect communities from immediate harm, they often disrupt ecosystems and limit local economic activities (Penning-Rowsell et al., 2013; Ferdous et al., 2019). In contrast, soft approaches prioritize living with floods by working with natural processes and enhancing community adaptability. These include economic, ethnographic, and ecological approaches.

The economic approach strengthens financial resilience without altering flood dynamics, focusing on strategies like livelihood diversification and forecast-based financial support. This approach mostly helps with food security, less dept and less stress (Mondal et al., 2020; Gros. et al., 2020). The ethnographic approach emphasizes adapting to floods through local practices, social networks, and migration patterns. Communities living on chars, for instance, rely on seasonal migration and flexible social networks to maintain their livelihoods amidst frequent environmental changes (Sultana et al., 2017). The ecological approach promotes sustainable coexistence with floods, using integrated floodplain management to preserve ecosystem health, which in turn supports agriculture and fisheries (Ferdous et al., 2019, Sultana et al., 2017).

This study positions itself within the soft adaptation frameworks. The proposed design should respect the natural flood dynamics and enhances community resilience by learning from local practices and migration patterns, without relying on disruptive structural measures.

hard approaches

Penning-Rowsell et al. 2013

Kamal et al. 2018

Sultana et al. 2017

technical approach

ethnographic approach

housing design

Ferdous et al. 2019

Heringer et al. 2022

ecological approach

economic approach

Mondal et al. 2020

Gros et al. 2021

Sultana et al. 2017

soft approaches

Different approaches from literature on enhancing flood resilience (own work)
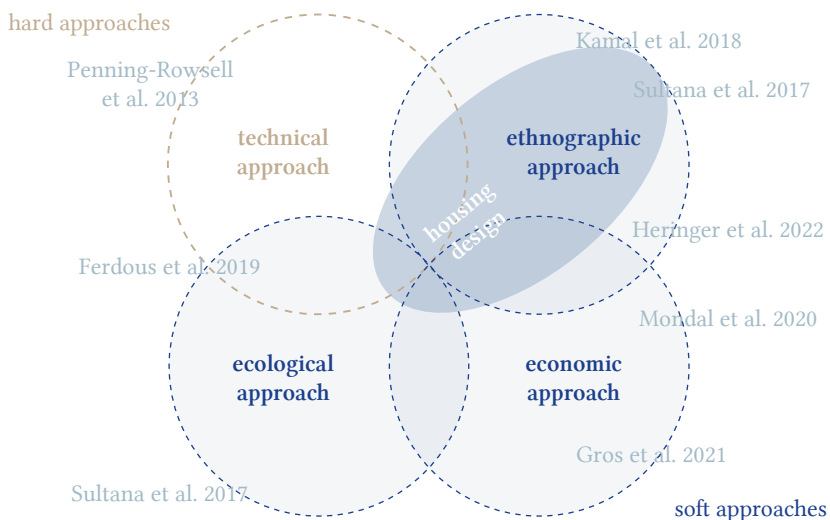
METHODOLOGY

As mentioned in the research question, the research will be structured into two parts.

Part I - Learning from current practices (monsoon floods)

Part I analyses riverine communities during normal floods, and takes a learning-from perspective to find out how the communities currently deal with flooding. It also analyses how they live, how they use their spaces and what can be learned from this.

Part II - Critical gaps and solutions (severe floods)

Part II looks at riverine communities during severe, destructive floods. It investigates why their flood-resilient strategies do not work during these floods and what the consequences are. This part will identify critical gaps, and look at solutions from other flood-resilient solutions that have been effective in different contexts.

Scales

To structure the research, Part I and II will both be analysed through three different scales; village, community cluster, and dwelling.

 Village   - flood patterns, agriculture

 Community cluster   - social cohesion, economic stability,
                                                 outdoor spaces, migration patterns

 Dwelling   - use of space, layout, construction, material

Fieldwork

In December, a three-week field trip to Bangladesh will include visits to Dhaka and Sylhet to study the culture, environment, and collaborate with the students from Shahjalal University of Science & Technology. Various sites will be explored, from which a suitable design location will be selected. Observations will be documented thoroughly through photographs, sketches, and interviews. Ethical considerations are essential, as homes will be visited which are private, intimate spaces that must be approached with respect (Pink et al., 2020). Consent will be obtained from residents before photographing their environment, and if individuals appear in photos, they will be shown the images and asked for permission to use them in the research.

Literature review

Since the field trip will be limited to three weeks of observation, the literature review will supplement insights gained during the visit. It will examine flood frequency and levels, as well as how local populations successfully adapt in areas such as agriculture, economic stability, migration patterns, and construction. The review will also explore the impacts on these areas when current adaptation methods prove insufficient. Research papers, local news sources, and books will be consulted to gain a deeper understanding of existing practices.

Mapping

Mapping will be used to organize observations of riverine communities coping with floods during fieldwork, inspired by How the Other Half Builds (Rybczynski et al., 1984), which provides a framework for understanding and analyzing informal urban settlements in developing countries. This mapping will explore themes of everyday life across three scales: village, community cluster, and dwelling.

Interviews

In addition to observations and documentation during fieldwork, interviews will be prepared and conducted if possible. Since the continuous flow of daily life can be difficult to capture through observation alone, interviews offer valuable context and detail (Pink et al., 2020). To explore the area through multiple scales, e Moura et al. (2023) propose a method called 'scaling stories', which investigates the social and spatial layers of an urban neighbourhood. This approach uses three scales: 1:10 (dwelling, eg., a resident), 1:100 (community cluster, eg., a local teacher) and 1:1000 (village, eg., a mayor). These scales reflect both spatial and social dimensions, as each scale represents the influence and reach of individuals within their environment.

Case studies

Part II will include case studies both from Bangladesh and globally to illustrate how similar projects address critical gaps outlined in the problem statement and expanded upon in the analysis of Part II. Specific case studies will be selected once a site is chosen during the field visit to ensure relevance to the study.

MAIN RESEARCH QUESTION

How can the resilience strategies of riverine communities in rural Sylhet, Bangladesh, developed for coping with monsoon floods, be scaled up to design housing solutions that enhance their ability to withstand more severe floods without compromising their livelihoods and traditional ways of living?

Which parts work? | Which parts do not work? | Case studies solving similar issues

SUBQUESTION 1

What can be learned from the current flood-resilience strategies of riverine communities in rural Sylhet during monsoon floods regarding economic stability, social cohesion, and housing?

SUBQUESTION 2

Why do the current resilience strategies of riverine communities in rural Sylhet fail during more severe floods, and how do these events impact economic stability, social cohesion, and housing?

SUBQUESTION 3

What can be learned from other flood-resilient solutions, beyond those of riverine communities in rural Sylhet, that can be integrated into their existing practices to enhance their ability to withstand severe floods?

PART I - Monsoon floods
Learning from current practices

	literature	interview*	observation	casestudies
Village scale				
flood patterns	●	○	○	○
agriculture	●	●	○	○
Community cluster scale				
social cohesion	○	●	●	○
economic stability	●	●	●	○
outdoor spaces	○	○	●	○
migration patterns	●	●	○	○
Dwelling scale				
use of space	○	○	●	○
layout	○	○	●	○
construction	●	○	●	○
material	○	○	●	○

result

*Overview of **what** of the current practices **should be integrated** into the design*

PART II - Severe floods
Critical gaps and solutions

	literature	interview*	observation	casestudies
Village scale				
flood patterns	●	○	○	○
agriculture	●	●	○	●
Community cluster scale				
social cohesion	●	○	○	●
economic stability	●	●	○	●
outdoor spaces	○	○	○	○
migration patterns	●	●	○	○
Dwelling scale				
use of space	○	○	○	●
layout	○	○	○	●
construction	●	○	●	●
material	●	○	●	●

*Overview of the **critical gaps** in current practises and **solutions through case studies***

* if possible, interviews are conducted to supplement the research

Village scale

Flooding analysis - part I & II

What is the impact, frequency and water height of floods in rural areas *in the specific area of research*? (both monsoon and severe)
Method = literature review, Output = Background research

Agriculture - part I & II

What is the impact of floods on agriculture in rural areas *in the specific area of research*?
Method = literature review, Output = Background research

Community cluster scale

Social cohesion / outdoor spaces - part I

How and where do people interact? What do these outdoor / communal spaces look like?
Method = observing / sketching, Output = understanding of how and where people connect within their community, sketches or photos of these places

Social cohesion - part I / Migration patterns - part I & II

How do communities rebuild after (temporary) displacement? Where do people go?
Method = literature review / (interviews), Output = understanding of the way of living of communities regarding temporary and permanent migration

Economic stability - part I & II

What do people do to earn money? What spaces are used? What alternatives do people find in case flooding causes initial source of income to fail?
Method = literature review / (interviews) / observing, Output = overview of ways to earn money by rural communities

Dwelling scale

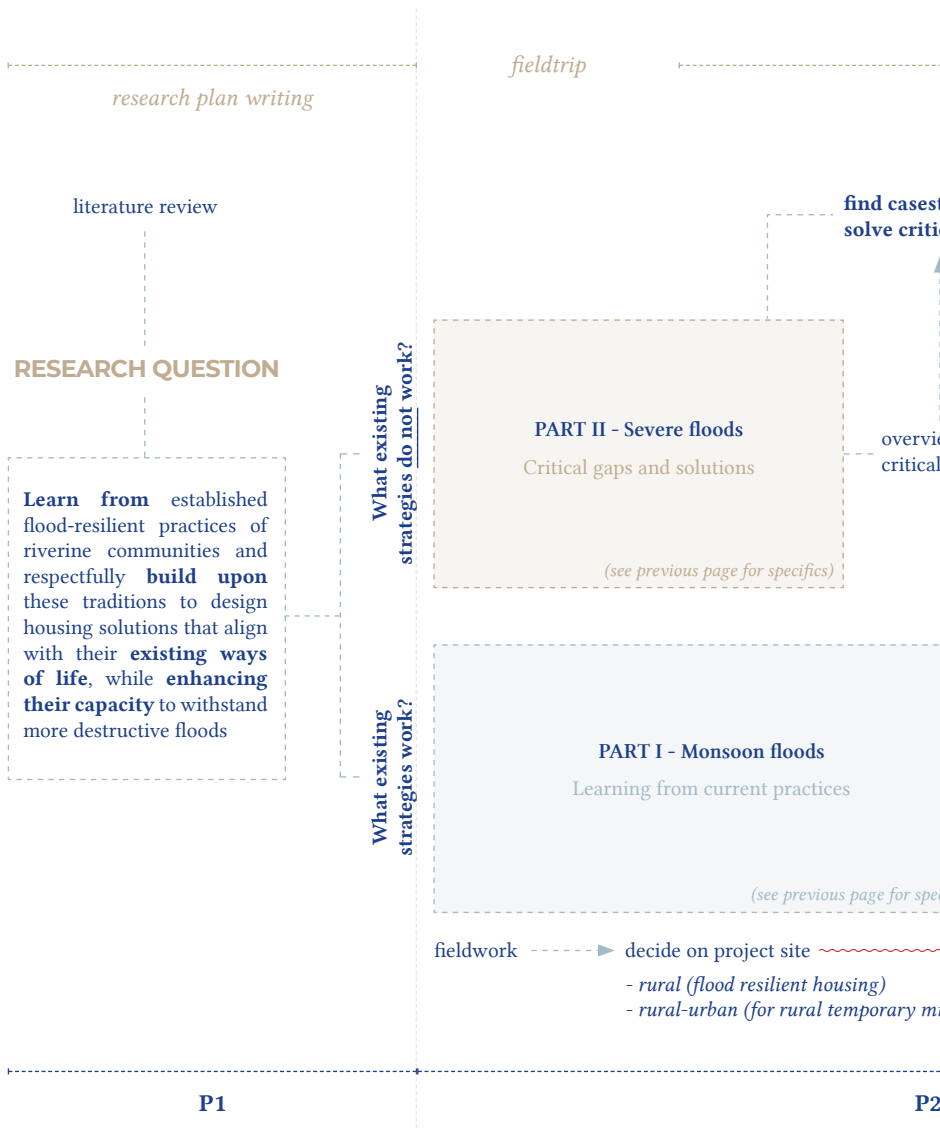*Use of space / layout / material / construction - part I*

What is the current housing situation of rural residents? What characterizes their floor plan? Which spaces and what sizes are important? What materials and construction techniques are used?
Method = observing / sketches / photographs, Output = floorplans including notes, sketches of use of space, photographs of material and construction of houses

Use of space / layout / material / construction - part II
What can be learned from existing housing designs that deal with changing tides and / or floods? What are local construction techniques exist using locally available materials? How can these materials be used to create adaptable housing?
Method = literature review / observing / case studies, Output = overview of local materials and techniques, overview of existing solutions

fieldtrip

research plan writing

literature review

**find casest
solve criti**

RESEARCH QUESTION

**What existing
strategies <u>do not work?</u>**

PART II - Severe floods

Critical gaps and solutions

overvie
critical

(see previous page for specifics)

Learn from established
flood-resilient practices of
riverine communities and
respectfully **build upon**
these traditions to design
housing solutions that align
with their **existing ways
of life**, while **enhancing
their capacity** to withstand
more destructive floods

**What existing
strategies work?**

PART I - Monsoon floods

Learning from current practices

(see previous page for spec

fieldwork - - - - -▶ decide on project site ∿∿∿∿∿∿∿∿∿

 - rural (flood resilient housing)
 - rural-urban (for rural temporary m

P1 **P2**

thesis writing

tudies that
cal gaps

ew of
gaps

overview of how to
solve existing issues

combine to key concepts

preliminary design

design phase

final design proposal

creating final models and drawings

overview of what to
integrate in the project

cifics)

igrants)

P3   **P4**   **P5**

DEFINITIONS

Riverine communities

Riverine communities are settlements located along the rivers (in Bangladesh), either in the rural areas or on chars. The riverine residents rely heavily of the river's resources, including fishing and agriculture, but are also often vulnerable to flooding, erosion and other natural changes in the river's behaviour.

Resilience

Resilience comes from the Latin verb 'resilire', which means to rebound. The theory examines the capacity of systems, whether individual, community or environment, to anticipate, adapt, recover and learn in the context of major threats, surprises, and disasters (Masten, 2014).

Seasonal / monsoon / barsha floods

The seasonal (monsoon) floods are referred to as barsha floods by Bangladeshis (Roy et al., 2016). These are normal inundation, and crucial for the production of aus and aman rice. The barsha floods rise about 8 feet above the broadcast aman fields, but do not overtop the village land (Paul, 1984).

Severe / destructive / bonna floods

The less frequent but more destructive floods that occur approximately once or twice a decade are called bonna floods (Roy et al., 2016). These abnormal floods go beyond the ability of farmers to cope and causes widespread damage (Paul, 1984).

Chars

Riverine islands, known as 'chars,' form gradually as rivers erode their banks and deposit sediment in the channel, creating shoals that slowly develop into inhabitable land. These islands are often settled by farmers but are underwater during normal floods (Roy et al., 2016).

Riverbank erosion

Riverbank erosion is the process where flowing water gradually wears away riverbanks, displacing soil and sediment, often reshaping the river's course and impacting nearby communities and landscapes (Islam et al., 2011).

Livelihood

Livelihood involves activities that sustain people's lives. Rural livelihoods largely depend on natural resources, income opportunities, asset access, and governance support (Rahman et al., 2023).

Riverine communities living close to a city
(photo by Mari Margil, 2020)

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