



Reviving Tradition

Designing Climate-Resilient Homes for a Changing Bangladesh

Research proposal by Jasper Ambogts

colophon

Jasper Ambagts | 5089506

Research Plan
TU Delft | Faculty of Architecture and the Built Environment
MSc 3/4 Graduation studio (AR3AD105)
Architecture of Transition in the Bangladesh Delta
2024/2025

Prof. Marina Tabassum
Prof. Dick van Gameren
Dr. Nelson Mota
Ir. Rohan Varma
Ir. Frederique van Andel
Ir. Antonio Paoletti

Dr. Rachel Lee



contents

5	introduction
8	literature review
11	problem statement
13	theoretical framework
19	research question
22	(design) hypothesis
23	goal/aim
25	methodology
30	research scheme
32	relevance
33	definitions
34	references
36	bibliography
37	illustration credits

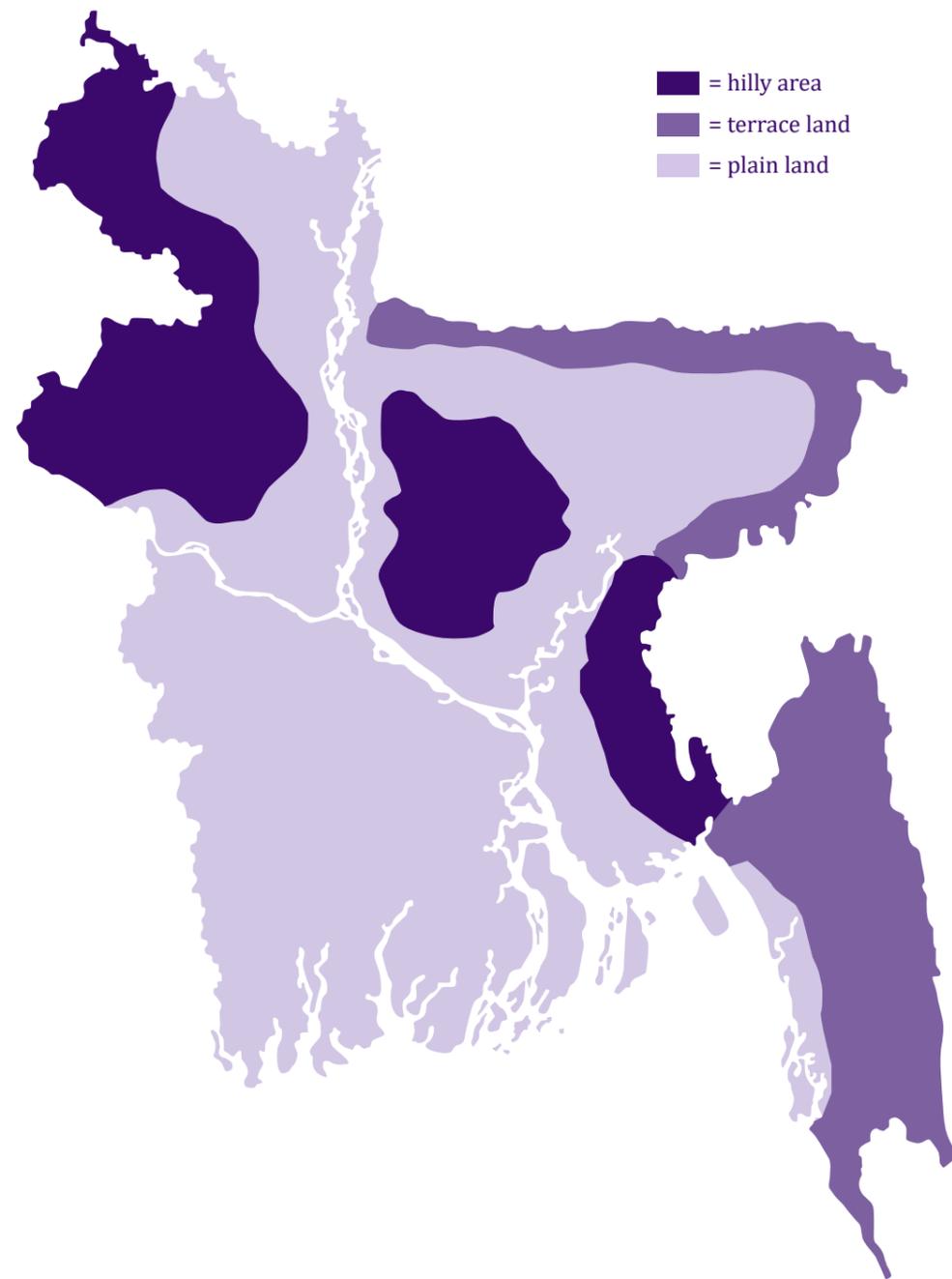


Figure 1: Broad Physiographic Units, Bangladesh

introduction

Bangladesh is widely recognized as one of the most densely populated countries in the world, with over 170 million people living in just 130,170 square kilometers (Worldometer, n.d.). This results in a population density exceeding 1,300 people per square kilometer (World Bank Open Data, n.d.). In addition to its population density, Bangladesh is known for its rich tradition of vernacular architecture, which historically reflected a deep connection to the local environment and climate. Vernacular houses in Bangladesh are more than just functional structures; they are cultural symbols that embody local values, traditions, and craftsmanship. In Bangladesh, vernacular architecture varies significantly across different geographic regions, adapting to local environmental conditions and challenges.

In flood-prone plains, houses are built on raised platforms called bari, often created by excavating ponds or channels to protect against flooding. These homes are arranged around courtyards and constructed with materials like bamboo and mud, which allow for natural ventilation and cooling. The steep, chouchala or dochala roofs are designed to facilitate rainwater runoff, ensuring protection during heavy rainfall. The use of bamboo and thatch contributes to the breathable, climate-adaptive nature of these structures, which remain cool in the hot and humid climate (Banti, 2021).

In terrace lands, such as the Barind and Madhupur tracts, homes are compact and built with thick mud walls, providing thermal insulation. These walls absorb heat during the day and release it at night, helping to regulate indoor temperatures in the hot, dry climate. The houses, often called Do Mahela, are typically arranged around enclosed courtyards that create a cool microclimate (Banti, 2021).

In hilly areas, like the Chittagong Hill Tracts and parts of the Sylhet division, homes are elevated on stilts to protect against flooding and wild animals, while also promoting natural ventilation. These lightweight structures, often made of bamboo, are designed to withstand the region's harsh monsoon climate. The absence of courtyards and the elevated design reflect the extroverted nature of these communities, accentuating interaction with the surrounding landscape (Banti, 2021).

However, the built environment in Bangladesh has struggled to adapt in recent years, as the

traditional, climate-resilient characteristics of its vernacular architecture have been eroded by foreign influences and contemporary trends (Bhattacharya & Biswas, 2023).

Beyond its population density and architectural heritage, Bangladesh is also considered one of the most vulnerable countries to the impacts of climate change. The country's high vulnerability is attributed to a combination of hydro-geological features and socio-economic challenges. Bangladesh is ranked among the most climate-vulnerable nations in the world. Bangladesh faces significant risks from climate change, including rising sea levels that cause coastal flooding, soil erosion, and saltwater intrusion, threatening agriculture and livelihoods. The country is also vulnerable to more frequent and intense cyclones, leading to widespread damage, displacement, and loss of life. Regular flooding, worsened by changing monsoon patterns, disrupts communities and increases health risks. Additionally, altered rainfall patterns are contributing to water scarcity and prolonged droughts, while rising temperatures and heatwaves strain human health and agricultural productivity. Climate change is also intensifying river erosion, leading to land loss and further displacing vulnerable populations (Hossain & Alam, 2020).

Sylhet's Vulnerability

Sylhet, located in northeastern Bangladesh, experiences a tropical monsoon climate and, in higher elevations, borders on a humid subtropical climate. Its dramatic hills and basins make the region particularly vulnerable to flash flooding, which is triggered by intense rainfall overwhelming rivers and streams in a short period (DhakaTribune, 2024). Sylhet's geographic and topographic characteristics emphasize the need for resilient architectural solutions to counter the increasing climate-related hazards.

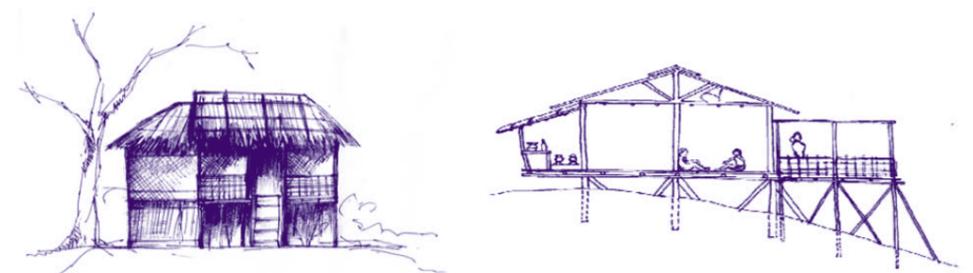


Figure 2: Housing unit at Hilly Area



Figure 3: House with bamboo slit in Hilly Area

literature review

The literature on vernacular architecture in Bangladesh and its climate adaptability reveals that traditional housing has been shaped by geo-climatic factors over generations, evolving to withstand natural disasters and harsh environmental conditions. In her master's thesis "How Vernacular Architecture Affects the Global: Lessons from Bangladesh," Anindita Laz Banti (2021) explores the lasting importance of vernacular architecture in Bangladesh and its relevance to contemporary global architectural practices. Her study examines how traditional forms can inform and influence modern design, focusing on sustainability, cultural identity, and community engagement.

Similarly, professors Fatemi and Islam (2011) from the University of Asia Pacific in Bangladesh underline the importance of understanding the diverse types of vernacular architecture across the country. In their conference paper, they discuss how each form of vernacular architecture in Bangladesh is adapted to its specific environmental and cultural context, offering valuable lessons for contemporary architecture, particularly in sustainability and community-based design. The authors advocate for a balance between modern construction methods and traditional practices, arguing that integrating the two can result in more resilient and culturally relevant buildings. The paper further examines case studies from countries like Rwanda, Costa Rica, and Germany to demonstrate how vernacular principles have been successfully incorporated into modern architectural designs.

Fatemi and Islam (2011) also stress the importance of preserving vernacular architecture as a way to safeguard cultural heritage in an increasingly globalized world. They suggest that modern architects should consider elements of vernacular design, such as passive climate control and the use of local materials, to create buildings that are both sustainable and contextually appropriate. An example of vernacular architecture's sustainable approach can be found in the mud houses of Mawna village, in the Gazipur District of Bangladesh. The study "The Inherent Thermal Comfort Provision in Mud Houses Regarded as Climate Responsive Vernacular Practice of Village Mawna at Gazipur District, Bangladesh," by architects Sayed Ahmed, K. Ansar Hossain, and Nahain Zobaid (2017), examines the thermal performance of these mud houses. The study demonstrates how they provide effective thermal comfort using minimal energy and resources, reinforcing the idea that modern architects can draw from these traditional practices to create eco-friendly and sustainable solutions.

While much of the literature focuses on the current climate-adaptive qualities of vernacular architecture, fewer studies address the impact of worsening climate change. The paper "Resilience of Vernacular and Modernising Dwellings in Three Climatic Zones to Climate Change" (2021) examines how climate change affects the ability of vernacular dwellings in India to maintain comfortable indoor conditions. It also explores how the transition from traditional to modern materials impacts their resilience to climate change. This study highlights the need for modern building practices to be reassessed in light of climate change and, like the other literature, advocates for preserving traditional construction techniques. However, it also points out the need to adapt these techniques to meet the challenges posed by a changing climate.

In conclusion, the literature on vernacular architecture in Bangladesh (and India) underscores its sustainable, climate-adaptive qualities, shaped by centuries of local knowledge. Studies by Banti, Fatemi & Islam, and Ahmed et al. show that traditional practices, such as using local materials and passive climate control, offer valuable lessons for contemporary architecture. Vernacular buildings are highly resilient to environmental conditions and resource-efficient. However, the literature also highlights the need to adapt these traditional practices to address the growing challenges of climate change. Integrating vernacular wisdom with modern innovations can help create sustainable, resilient buildings that meet both environmental and cultural needs in the future.



Figure 4: Flooding in the district of Sylhet, Bangladesh, in June 2022.

problem statement

Climate change poses a significant threat to Bangladesh, one of the most vulnerable countries in South Asia. With its geographical location and socio-economic conditions, Bangladesh faces numerous climate-related hazards, including floods, cyclones, and rising sea levels. These hazards have devastating effects on both infrastructure and livelihoods, leading to large-scale displacement (Displacement Solutions, 2012). In 2019 alone, 4.1 million people were displaced due to climate-related disasters, and projections indicate that by 2050, this number could rise to 13.3 million, with coastal regions experiencing permanent submersion (Ministry of Environment, Forest and Climate Change, Government of the People's Republic of Bangladesh, 2023).

The increasing severity and frequency of natural hazards place immense pressure on Bangladesh's built environment, particularly in vulnerable areas such as Sylhet. Despite having a rich tradition of vernacular architecture known for its climate-resilient and sustainable features, modern architectural trends in Bangladesh have shifted towards contemporary designs influenced by global styles. These modern approaches often prioritize aesthetics over practicality and resilience, leading to buildings that may be less effective in withstanding the harsh impacts of climate change (Bhattacharya & Biswas, 2023). Vernacular architecture are strongly influenced by culture, while modern architecture often lacks this cultural symbolism (Rapoport, 1969).

While some architects, like Mazharul Islam, have attempted to revive the climate-responsive nature of traditional Bangladeshi architecture, the country's construction practices remain largely disconnected from its vernacular roots (Bhattacharya & Biswas, 2023). This disconnect raises an important question: how can traditional architectural practices be effectively reintegrated into contemporary housing designs to improve resilience against climate change, particularly in areas most at risk?

Problem Statement: The challenge lies in addressing the growing impact of climate change on vulnerable regions like Sylhet, where contemporary housing design often overlooks the proven adaptive qualities of traditional Bangladeshi vernacular architecture. There is a pressing need to explore how these traditional practices and values can be integrated into modern housing to create climate-resilient, sustainable solutions.

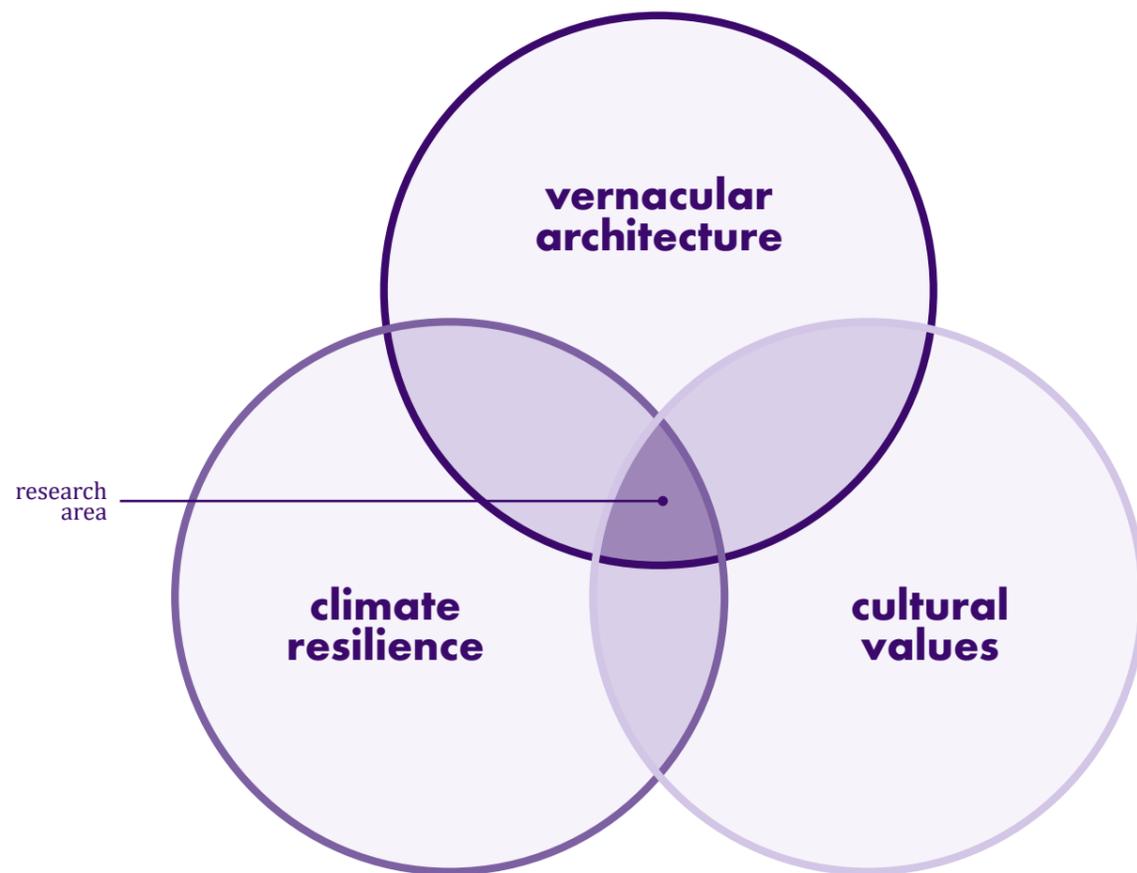


Figure 5: Conceptual model, overlap of themes

Theoretical framework

The theoretical framework for this research provides a foundation for understanding the interconnected themes of vernacular architecture, climate resilience, and cultural values or lifestyle. These themes form the conceptual basis for exploring how traditional architectural practices contribute to sustainable and climate-resilient living environments, while remaining deeply rooted in the cultural identity and lifestyle of communities.

Vernacular Architecture

Vernacular architecture refers to adaptive and practical designs that address human needs through architecture rooted in regional identity, local resources, and environmental conditions. Banti (2021) highlights that vernacular architecture is deeply connected to the culture, heritage, and history of specific communities, fostering a sense of belonging. It integrates natural and cultural elements by using local construction materials and techniques that are both energy-efficient and sustainable. Despite being overlooked in contemporary architectural practice, vernacular structures offer valuable insights into resourcefulness and ecological adaptability. This architecture highlights the importance of creating spaces that align with the local climate, culture, and traditions, maintaining a balance between modern needs and cultural values.

According to Rapoport (1969), vernacular architecture embodies a “folk” approach, directly reflecting a culture’s practical needs and symbolic meanings. In this perspective, the form of a building is not merely functional but also symbolic of the worldview, traditions, and social structures of the community. Vernacular buildings are adaptive and evolve to suit their immediate environment, both climatic and cultural. They work harmoniously with the landscape, employing locally available materials and traditional construction methods that inherently provide climate resilience.

Climate Resilience

Climate resilience refers to the strategies and measures that empower communities and regions to adapt to climate change and mitigate associated risks. Southeast Asia’s geographic and climatic challenges, such as rising sea levels, severe weather events, and natural disasters like typhoons and flooding, demand targeted adaptive strategies. Freeman and Green (2010) stress that Southeast Asian countries have implemented various adaptation strategies,

particularly in housing and urban planning, to bolster climate resilience. These measures focus on reinforcing structures and urban layouts to withstand environmental risks, ensuring that communities can recover and adapt to changing climatic conditions. Rapoport's (1969) theories suggest that it is essential that climate resilient structures are created with a low level of "criticality," allowing for flexibility and adaptability in response to environmental needs. This adaptability is evident in traditional designs that incorporate local materials and climate-responsive features, which help maintain comfortable indoor environments naturally.

Cultural Values and Lifestyle

Cultural values and lifestyle contain the shared beliefs, practices, customs, and behaviors that define a community or society's identity. Cultural values serve as guiding principles for social interactions, decision-making, and community contributions. Rooted in traditions, religion, and social norms, they influence aspects such as family structures, social practices, and rituals. Ahmed (2009) states that lifestyle refers to the way individuals live their daily lives, which is shaped by their cultural values. Lifestyle includes habits, routines, and social interactions, all of which are influenced by cultural beliefs and societal norms. These values and lifestyle choices are fundamental to understanding how communities adapt to their environments while maintaining their unique identity.

Overlap of themes

The intersection of these themes demonstrates how traditional architectural practices can be adapted to meet modern climate challenges while respecting cultural significance. Each theme interacts with and informs the others, offering a comprehensive approach to understanding the resilience and sustainability of vernacular architecture in the context of climate change.

Vernacular Architecture + Climate Resilience:

Vernacular architecture is inherently tied to climate resilience due to its reliance on local materials and construction techniques that are well-suited to the specific environmental conditions of a region. In Bangladesh vernacular structures are designed to withstand natural elements. Such designs demonstrate a deep understanding of how architecture can work harmoniously with the natural landscape, providing protection and comfort while minimizing environmental impact (Banti, 2021).

Researches have tried to define this relation between vernacular architecture and climate resilience. As Rapoport (1969) notes, vernacular buildings maintain a close connection to their environment through construction methods that highlight resilience and adaptability. This approach can be seen in traditional buildings that use thick mud walls, for example, to insulate interiors from extreme temperatures, reflecting the community's deep knowledge of climate-responsive design (Ahmed et al., 2017). Therefore it is important to research to what extent vernacular architecture and its related local resources and practices can be used to improve the climate resilience of Bangladesh's architecture.

Vernacular Architecture + Cultural Values:

The connection between vernacular architecture and cultural values lies in the deep relationship between human societies and their built environment. Vernacular architecture reflects not only the practical responses to local environmental conditions but also the cultural, social, and spiritual values of a community. It is shaped by the customs, traditions, and way of life of the people who create it, fostering a sense of identity and place. Zare and Kazemian (2015) underline that vernacular buildings embody the community's social practices, such as privacy, social interaction, and reverence for nature, serving as living representations of cultural identity. Brown (2021) asserts that while much of the focus in vernacular architecture studies has been on its formal qualities and functional purposes, less attention has been given to the cultural and social forces that shape these structures. Rapoport (1969) further emphasizes that vernacular architecture is molded not only by environmental factors but also by the cultural, social, and spiritual values of its creators. These structures prioritize privacy, community interaction, and respect for shared spaces, encapsulating the identity and beliefs of the community. In Rapoport's view, vernacular architecture is a community-driven process that integrates local traditions and social norms, resulting in spaces that reflect the community's way of life and values. This process supports a flexible design approach, allowing buildings to evolve with cultural changes while preserving ancestral traditions, ensuring continuity between past and present. Ahmed (2009) underscores that adaptations to residential spaces must maintain both symbolic and functional roles, creating environments that not only fulfill practical needs but also uphold cultural integrity. This blending of heritage with modernity keeps the essence of communal and religious life intact, fostering continuity that respects ancestral values while adapting to contemporary needs.

Climate Resilience + Cultural Values:

Understanding the relationship between climate resilience and culture reveals that cultural values significantly influence a society's ability to adapt to environmental challenges. Cultural beliefs and practices often incorporate traditional ecological knowledge, nurturing a profound respect for nature that translates into sustainable, adaptive ways of living. This strong cultural connection encourages communities to create systems that are both resource-efficient and adaptable to shifting climatic conditions. Cultural frameworks thus foster practices that stress harmony with the environment, embedding resilience within everyday social norms and routines. As a result, culture serves as both a guiding principle and an adaptive tool, empowering communities to effectively face and respond to climatic changes (Zare & Kazemian, 2015).

Rapoport (1969) supports this perspective, highlighting that the fusion of cultural values with environmental adaptation in vernacular architecture provides an exemplary model for sustainable living. Traditional practices serve not only as expressions of cultural heritage but also as valuable repositories of practical knowledge for climate resilience, demonstrating that the time-tested building methods of communities can inform both present and future strategies for sustainability.



Figure 6: Vernacular architecture in the form of a traditional Bangladeshi homestead



Figure 7: Climate-resilient home in Bangladesh

research question

The effects of climate change on Bangladesh are becoming increasingly severe, with more people expected to be affected each year. One of the most significant ways climate change impacts people's lives is through the vulnerability of their homes to environmental threats. At the same time, it is crucial to preserve and respect the values embodied in Bangladesh's vernacular architecture, which reflects deep cultural heritage and traditional practices. These concerns lead to the following research question:

"How can the traditional practices and values of Bangladeshi vernacular architecture be integrated into contemporary housing design to enhance resilience against climate change hazards in vulnerable areas like Sylhet, Bangladesh?"

This main research question leads to several important sub-questions. To explore effective integration strategies, it is essential to define and study the characteristics and significance of Bangladeshi vernacular architecture. Understanding its cultural and architectural value will form the basis for any adaptations or modernizations. Additionally, identifying the existing features of Bangladeshi vernacular architecture that already contribute to climate resilience is crucial for their incorporation into contemporary housing design.

At the same time, it is important to avoid significantly altering the core values of Bangladeshi lifestyles during this process. By studying the daily lives and housing needs of local residents, researchers can uncover the essential elements of what constitutes a home in Bangladesh. This ensures that future architectural adaptations remain respectful of cultural expectations and preserve the traditional practices embedded in the Bangladeshi lifestyle.

"What are the cultural values and traditions embedded in Bangladesh's vernacular architecture and lifestyle, and how can they be preserved and integrated into contemporary housing design?"

"What key features of Bangladesh's vernacular architecture contribute to its adaptability to the current climate, and how can these be incorporated into contemporary housing design?"

Second, it is necessary to identify the primary challenges posed by climate change in Bangladesh, particularly in regions like Sylhet. Analyzing these threats will shed light on how contemporary housing can be designed to be more resilient against issues such as flooding, cyclones, and rising temperatures.

“How has climate change influenced the frequency and severity of natural hazards in Sylhet, Bangladesh, and how are these trends expected to evolve?”

Finally, there is much to learn from previous projects and studies. Examining similar case studies can provide insights into how vernacular architecture has been successfully modernized to enhance climate resilience in other regions.

“How can past projects that have attempted to implement (Bangladeshi) vernacular architecture into contemporary housing design to enhance climate resilience contribute to develop strategies for merging traditional building principles with contemporary housing design ?”

These questions will help identify successful strategies and potential pitfalls in balancing modernization with the respecting of the cultural architectural identity of Bangladesh.

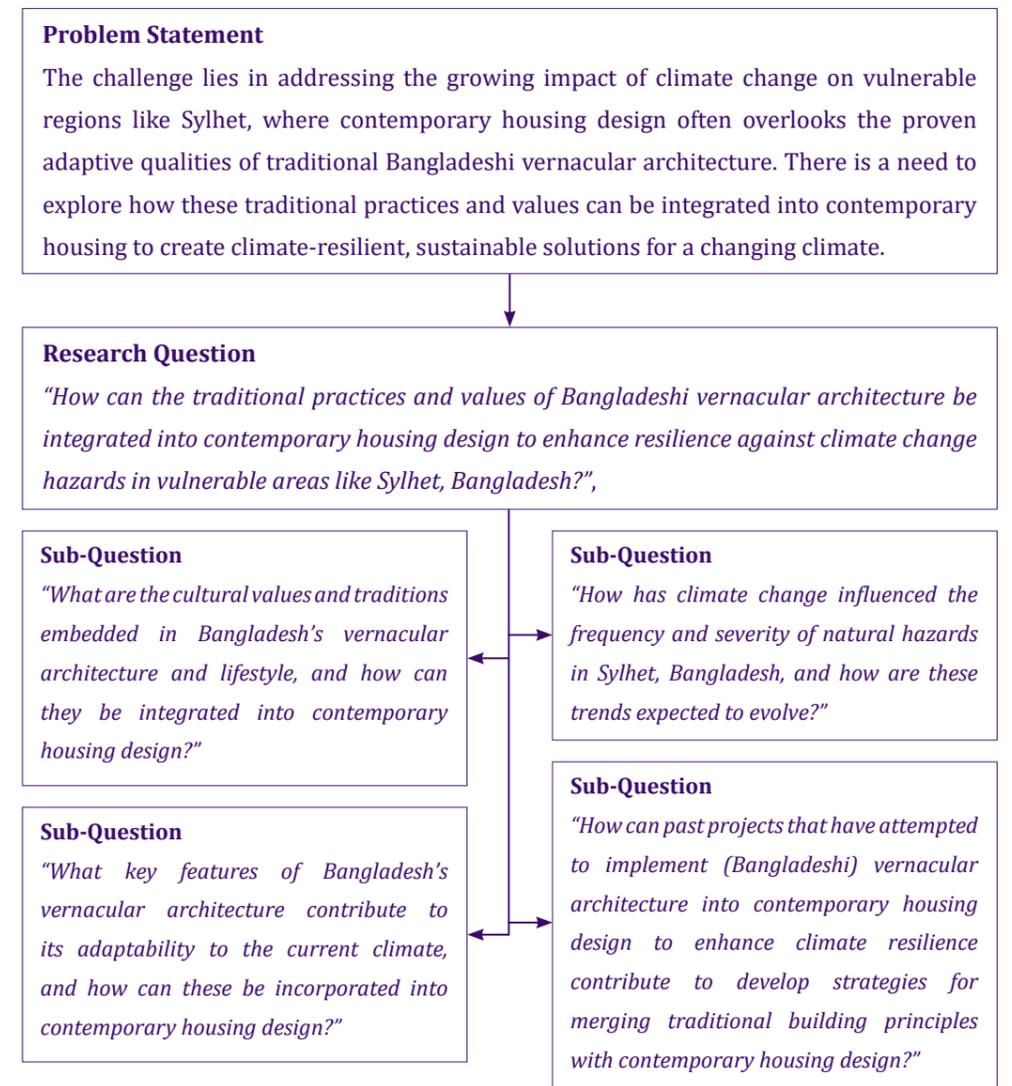


Figure 8: Research question diagram

(design) hypothesis

In response to the research question, *“How can the traditional practices and values of Bangladeshi vernacular architecture be integrated into contemporary housing design to enhance resilience against climate change hazards in vulnerable areas like Sylhet, Bangladesh?”*, a design hypothesis is proposed that aims to predict the outcomes of such integration.

Hypothesis

By integrating traditional features of Bangladeshi vernacular architecture, such as climate-adaptive materials, and spatial configurations into contemporary housing design, it is possible to significantly improve resilience against climate change hazards in vulnerable areas like Sylhet. This integration will not only provide enhanced protection against floods, cyclones, and heat but also preserve the socio-cultural identity of the local communities.

This hypothesis rests on the idea that vernacular architecture in Bangladesh, which has evolved over centuries in response to the local environment, contains valuable lessons for designing resilient structures in the face of climate change. Historically, Bangladeshi vernacular architecture has incorporated specific techniques and materials to deal with the region’s extreme weather conditions.

The design hypothesis presents a approach to addressing climate change challenges in vulnerable areas of Bangladesh like Sylhet. By predicting that traditional architectural practices, when (adapted and) integrated into contemporary housing designs, can enhance climate resilience and preserve cultural values, this hypothesis establishes a clear path for investigation. Through the architectural design process, this hypothesis can be tested, verified, or refined, contributing valuable insights into the future of sustainable and resilient housing in Bangladesh

goal/aim

The aim of this research is to examine how traditional practices and values from Bangladeshi vernacular architecture can be adapted and integrated into contemporary housing design to enhance resilience against climate change hazards. This goal revolves around three interconnected concepts: vernacular architecture, climate resilience, and the integration of traditional cultural values into modern living. Together, these guide the research in exploring how age-old architectural wisdom can be harnessed to create climate-adaptive housing solutions while preserving cultural identity. The study is structured around three core research objectives:

- To investigate the traditional architectural practices of Bangladesh, focusing on elements that have historically contributed to resilience in the face of climate hazards.
- To assess the limitations and potential for improvement in these vernacular techniques to meet the demands of contemporary housing in vulnerable areas such as Sylhet.
- To analyze the impact of climate change on the frequency and severity of natural hazards in Sylhet, Bangladesh, and to project how these trends are likely to evolve in the future.
- To develop strategies for merging traditional building methods with contemporary housing design, ensuring that both climate resilience and the preservation of cultural values are prioritized in the design of contemporary housing solutions.



Figure 9: Flood in the northeastern part of the country, in Sylhet, Bangladesh,

Methodology

The research methodology incorporates qualitative research methods aimed at answering the sub-questions derived from the main research question. Each method is linked to a specific sub-question, with clear outputs defined for each approach. This will ensure that the methods directly contribute to answering the research questions while also generating valuable outputs such as data, case studies, drawings, and observations.

Semi-Structured Interviews

Research sub-question addressed:

“What are the cultural values and traditions embedded in Bangladesh’s vernacular architecture and lifestyle, and how can they be preserved and integrated into contemporary housing design?”

“What key features of Bangladesh’s vernacular architecture contribute to its adaptability to the current climate, and how can these be incorporated into modern homes?”

Method:

Semi-structured interviews will be conducted with residents in vulnerable regions of Bangladesh, such as Sylhet. These interviews will be flexible to allow the participants to express their views on the cultural significance of their homes and their awareness of climate resilience. Specific topics will include how they perceive their living spaces, the importance of traditional architectural practices, and their understanding of climate change impacts.

Expected Output:

The primary output of this method will be qualitative data in the form of interview transcripts. This data will provide insights into local perceptions of climate change, cultural values, and architectural traditions. The analysis of this data will reveal the cultural elements that need to be integrated into contemporary housing designs.

Field Observations

Research sub-question addressed:

“What are the cultural values and traditions embedded in Bangladesh’s vernacular architecture and lifestyle, and how can they be preserved and integrated into contemporary housing design?”

“What key features of Bangladesh’s vernacular architecture contribute to its adaptability to the current climate, and how can these be incorporated into modern homes?”

“How has climate change influenced the frequency and severity of natural hazards in Sylhet, Bangladesh, and how are these trends expected to evolve?”

Method:

Field observations will be conducted in selected regions to document the characteristics of vernacular architecture that contribute to climate adaptability. Observations will focus on architectural features such as elevated structures, natural ventilation, local materials, and flood-proofing techniques. Additionally, the integration of homes within the landscape and community will be examined to understand how architecture reflects cultural and social values. Adaptations made by communities in response to recent climate changes will also be recorded.

Expected Output:

The output of this method will include visual documentation (photos and sketches) of the vernacular homes and detailed observational notes on architectural and cultural features. This information will provide a basis for identifying key elements of traditional architecture that are climate-resilient and can be applied to modern housing design. Drawings and diagrams produced from these observations will serve as potential design models.

Literature Review

Research sub-question addressed:

“What are the cultural values and traditions embedded in Bangladesh’s vernacular architecture and lifestyle, and how can they be preserved and integrated into contemporary housing design?”

“What key features of Bangladesh’s vernacular architecture contribute to its adaptability to the current climate, and how can these be incorporated into modern homes?”

“How has climate change influenced the frequency and severity of natural hazards in Sylhet, Bangladesh, and how are these trends expected to evolve?”

Method:

A literature review will be conducted to supplement the field data. Sources will include journal articles, books, reports, and news articles that discuss Bangladesh’s vernacular architecture, climate resilience strategies, and local lifestyle. This will provide background knowledge on traditional architectural practices, the impact of climate change in the region, and current climate adaptation efforts.

Expected Output:

The literature review will generate a synthesis of existing knowledge on vernacular architecture and climate change in Bangladesh. It will help identify gaps in knowledge and areas that require further investigation during fieldwork. The output will also provide theoretical context to interpret the findings from interviews and observations, ensuring the study is grounded in current research.

Case Studies

Research sub-question addressed:

“How can past projects that have attempted to implement (Bangladeshi) vernacular architecture into contemporary housing design to enhance climate resilience contribute to develop strategies for merging traditional building principles with contemporary housing design?”

Method:

A comparative analysis of case studies from regions with similar climatic conditions will be conducted. These case studies may include examples from Southeast Asia, South Asia, or Africa, focusing on how traditional architectural practices have been modernized to address climate challenges. The analysis will look at strategies employed, cultural sensitivities considered, and challenges faced in balancing modernization with tradition.

Expected Output:

The output from this method will include a detailed comparison of strategies used in similar regions to enhance climate resilience while learning from vernacular architecture principles. The analysis will result in a set of design recommendations or a toolbox of strategies that can be applied to the contemporary Bangladeshi housing. These recommendations will inform the design guidelines developed in later stages of the research.

Research Design

The research design is primarily qualitative, with an focus on exploratory and descriptive methods. These methods are particularly suited for examining the intersection of architecture, culture, and climate resilience, which is central to this study. By focusing on qualitative methods, the research allows for a deeper understanding of the cultural values, architectural practices, and local perceptions needed to answer the key research questions.

In sum, each method not only addresses a specific sub-question but also produces tangible outputs such as interview data, visual documentation, comparative case studies, and design recommendations. All these outputs will form a useable toolbox to be used while designing climate-resilient homes for a changing Bangladesh.

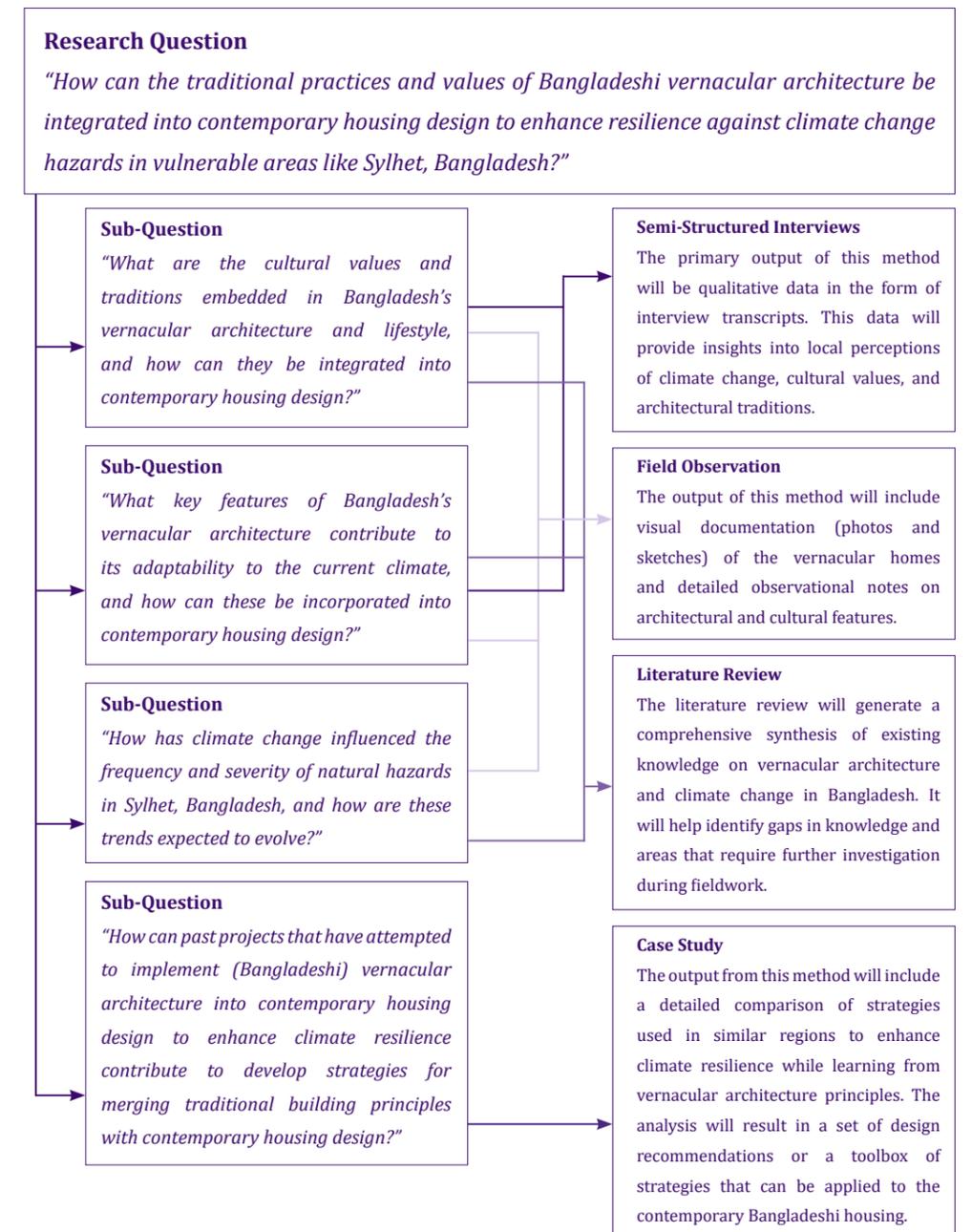


Figure 10: Methodology diagram

research scheme

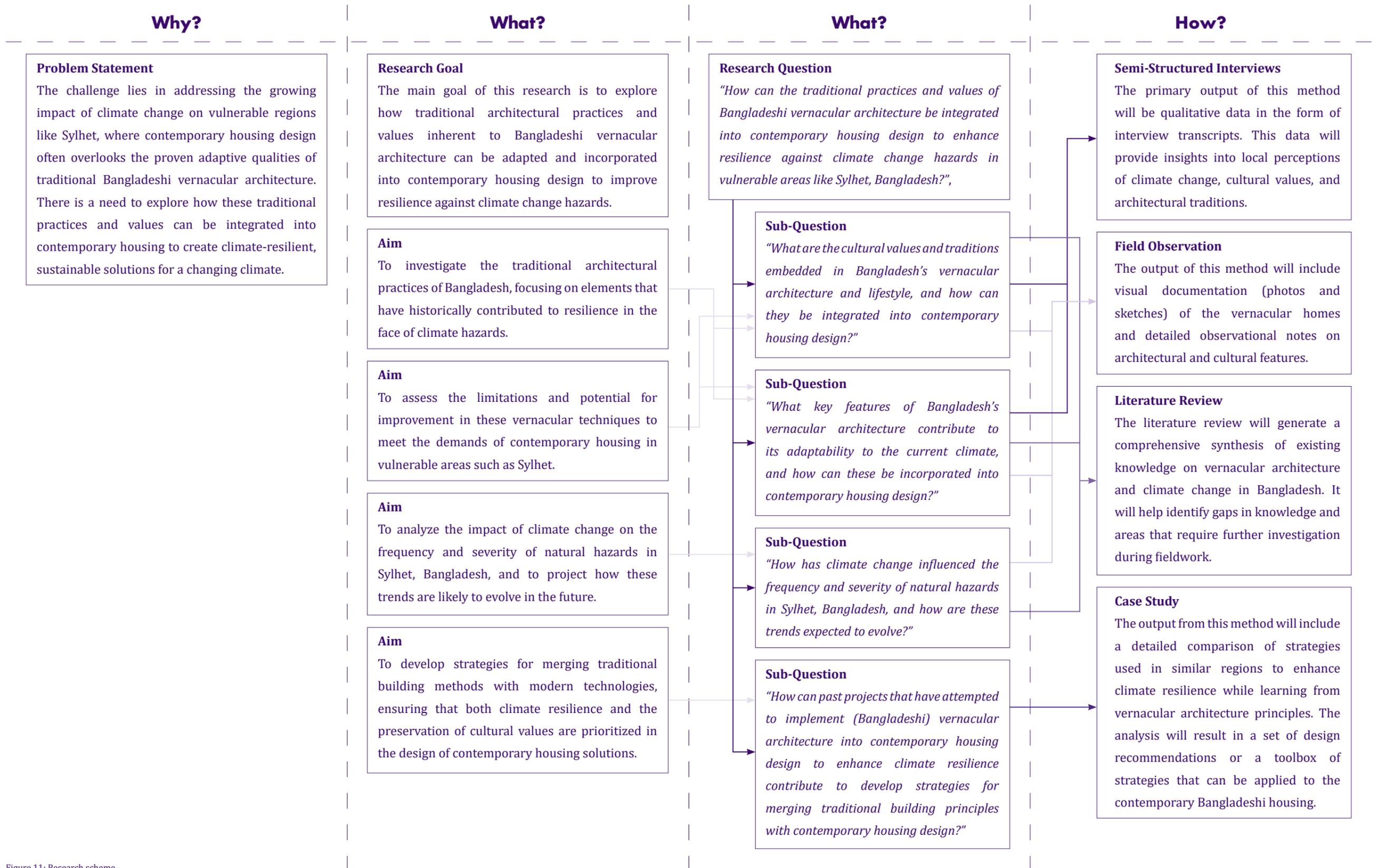


Figure 11: Research scheme

relevance

The research question, “How can the traditional practices and values of Bangladeshi vernacular architecture be integrated into contemporary housing design to enhance resilience against climate change hazards in vulnerable areas like Sylhet, Bangladesh?”, addresses several critical global and local issues, making it relevant in both academic and practical contexts.

Climate Resilience

Bangladesh faces increasing threats from climate change, such as floods, cyclones, and rising sea levels (Displacement Solutions, 2012). This research is vital for exploring how traditional architecture can be adapted to withstand these environmental challenges. By focusing on local solutions, the study contributes to sustainable and climate-resilient building practices, particularly in vulnerable areas.

Cultural Preservation

Vernacular architecture in Bangladesh reflects deep cultural and social values. The study’s emphasis on maintaining these values while adapting to climate challenges is crucial for preserving the country’s cultural heritage in a modernizing world. It seeks to find a balance between resilience and cultural continuity.

Sustainable Development and Impact

This research aligns with global sustainable development goals. It contributes to both academic discourse in architecture and climate adaptation, and practical applications for architects, policymakers, and planners in Bangladesh.

In summary, this research is relevant for addressing climate challenges while preserving Bangladesh’s cultural identity, offering valuable insights for both academic and practical applications in sustainable architecture and development.

definitions

Climate change

Climate change refers to long-term shifts in temperatures and weather patterns.

United Nations. (n.d.). *What is climate change?* United Nations. Retrieved October 28, 2024, from <https://www.un.org/en/climatechange/what-is-climate-change>

Climate Resilience

Climate resilience refers to the ability of an ecosystem, society or business to anticipate, prepare for and respond to the impacts of climate change.

IBM. (n.d.). *Climate resilience.* IBM. Retrieved October 28, 2024, from <https://www.ibm.com/think/topics/climate-resilience>

Contemporary housing design

Contemporary housing design refers to modern architectural practices that emphasize the use of current building techniques, materials, and aesthetics to create homes that meet present-day standards and preferences.

Rodriguez, J. (2022). *What is contemporary architecture?* The Spruce. Retrieved October 28, 2024, from <https://www.thespruce.com/what-is-contemporary-architecture-4769079>

Cultural Values and Traditions

Cultural values are socially constructed beliefs and norms that guide the behaviour of individuals within a particular group.

Smolicz, J. (1981). Core values and cultural identity. *Ethnic and racial studies*, 4(1), 75-90.

Vernacular Architecture

Vernacular architecture is a category of architecture based on local needs, construction materials and reflecting local traditions.

Arboleda, G. (2006). What is vernacular architecture. *Ethnoarch: Indigenous and Vernacular.*

references

Ahmed, S. A., Hossain, A. H., & Zobaid, N. Z. (2017). The inherent thermal comfort provision in mud houses regarded as climate responsive vernacular practice of Village Mawna at Gazipur District, Bangladesh. *Specialty Journal Of Architecture And Construction*, 3, 31–53

Ahmed, Z. N. (2009). Globalisation and architecture: Reflections of shifting lifestyles in Bangladesh. *Protibesh: Journal of the Dept. of Architecture, BUET*, 13(1), 17–28.

Banti, A. L. (2021). *How Vernacular Architecture Affects the Global: Lessons from Bangladesh*. <https://sc.lib.miamioh.edu/handle/2374.MIA/6759>

Bhattacharya, P., & Biswas, M. (2023) Design Approaches for Local Materials and Climate Change Adaptation in Vernacular Architecture of Bangladesh. *Southeast University Journal of Architecture*, 3(1), 46-66 https://seu.edu.bd/seuja/downloads/vol_03_issue_01_June_2023/SEUJA-Vol03Issue01-6.pdf

Brown, R., & Maudlin, D. (2012). Concepts of vernacular architecture. *The SAGE handbook of architectural theory* (pp. 340–355). SAGE Publications.

Dhaka Tribune (2023). *Why does the Sylhet region see repeated flooding*. Retrieved on 18 october 2024 from <https://www.dhakatribune.com/bangladesh/nation/352004/why-does-the-sylhet-region-see-repeated-flooding>

Displacement Solutions. (2012). *Climate displacement in Bangladesh: The need for urgent housing, land and property (HLP) rights solutions*. Displacement Solutions.

Fatemi, N., & Islam, N. (2011). *Sustainability and eco-adaptability in vernacular housing in Bangladesh*. International Conference on Society, Technology & Sustainable Development (ICSTSD 2011), Amrita Vishwa Vidyapeetham, India. Retrieved from <https://www.researchgate.net/publication/268524329>.

Freeman, C. W., & Green, M. J. (2010). *Asia's response to climate change and natural disasters: Implications for an evolving regional architecture*. CSIS. http://www.indiaenvironmentportal.org.in/files/Freeman_AσίαςResponse_WEB.pdf

Henna, K., Saifudeen, A., & Mani, M. (2021). Resilience of vernacular and modernising dwellings in three climatic zones to climate change. *Scientific Reports*, 11, Article 9172. <https://doi.org/10.1038/s41598-021-87772-0>.

Hossain, M. A., & Alam, M. J. (2020). Design approaches in vernacular architecture of Bangladesh: A study on the integration of local materials and modern strategies for climate change adaptation. *Sustainable Cities and Society*, 46, 101472. <https://doi.org/10.1016/j.scs.2019.101472>

Ministry of Environment, Forest and Climate Change, Government of the People's Republic of Bangladesh. (2023). *Nationwide climate vulnerability assessment in Bangladesh*. https://doe.portal.gov.bd/sites/default/files/files/doe.portal.gov.bd/page/936c9ced_0267_48bf_87d0_4e0c43168

[cf0/2024-02-05-03-29-f398d77decfd50ca32aa4aee14f17029.PDF](#).

Rapoport, A. (1969). *House form and culture, Foundations of Cultural Geography Series*. Englewood Cliffs.

World Bank Open Data (n.d.). *Population density (people per sq. km of land area) - Bangladesh*. Retrieved on 7 october 2024 from <https://data.worldbank.org/indicator/EN.POP.DNST?locations=BD>

Worldometer (n.d.). *Bangladesh Population*. Retrieved on 7 october 2024 from <https://www.worldometers.info/world-population/bangladesh-population/>

Zare, M. H., & Kazemian, F. (2014). Reviewing the role of culture on formation of vernacular architecture. *European Online Journal of Natural and Social Sciences*, 3(4), Special Issue on Architecture, Urbanism, and Civil Engineering. <https://european-science.com/eojnss/article/view/2519>

bibliography

Ahmed, A. U. (2006). *Bangladesh climate change impacts and vulnerability: A synthesis*. Climate Change Cell, Department of Environment.

Ahmed, S., & Ahmed, F. (2015). The maxims of Khona: A contextual study of sustainability over vernacular architectural practice of Bangladesh. *Journal of Modern Science and Technology*, 3(1), 1–19.

Ahmed, Z. (2009). Architecture: Adapting to climate change. *International Conference on Climate Change Impacts*. https://www.researchgate.net/publication/307597929_Architecture_adapting_to_climate_change

Banti, A. L. (2021). *How Vernacular Architecture Affects the Global: Lessons from Bangladesh*. <https://sc.lib.miamioh.edu/handle/2374.MIA/6759>

Banti, A. L. (2023). Learning from Vernacular Architecture: The Essence of Remakri Area in Bangladesh. In *Sustainable development goals series* (pp. 279–305). https://doi.org/10.1007/978-3-031-36554-6_19

Bhattacharya, P., & Biswas, M. (2023) Design Approaches for Local Materials and Climate Change Adaptation in Vernacular Architecture of Bangladesh. *Southeast University Journal of Architecture*, 3(1), 46–66 https://seu.edu.bd/seuja/downloads/vol_03_issue_01_June_2023/SEUJA-Vol03Issue01-6.pdf

Brown, R., & Maudlin, D. (2012). Concepts of vernacular architecture. *The SAGE handbook of architectural theory* (pp. 340–355). SAGE Publications.

Das, S., Rahman, M. A., & Hossain, M. S. (2021). Change in adaptability of residential architecture: Spatial analysis on traditional and contemporary houses of Bangladesh. *Journal of Architectural Environment & Structural Engineering Research*, 4(4). <https://doi.org/10.30564/jaeser.v4i4.3865>

Khan, M. R., Huq, S., Risha, A. N., & Alam, S. S. (2021). High-density population and displacement in Bangladesh. *Science*, 372(6548), 1290–1293. https://www.researchgate.net/publication/352498656_High-density_population_and_displacement_in_Bangladesh

Rahman, S., Wah, L., & Nargis, N. (2023). A study of vernacular building materials in Bangladesh based on embodied energy and environmental performance. *IOP Conference Series: Earth and Environmental Science*, 1274(1), 012041. <https://doi.org/10.1088/1755-1315/1274/1/012041>

Rapoport, A. (1969). *House form and culture, Foundations of Cultural Geography Series*. Englewood Cliffs.

image list

Figure 1: own work

inspired by Sultana, S. (1993). *Broad Physiographic Units, Bangladesh*. Rural settlements in Bangladesh: Spatial Pattern and development, Graphosman, Dhaka

Figure 2: Banti, A. L. (2023). Learning from Vernacular Architecture: The Essence of Remakri Area in Bangladesh. In *Sustainable development goals series* (pp. 279–305). https://doi.org/10.1007/978-3-031-36554-6_19

Figure 3: Banti, A. L. (2023). Learning from Vernacular Architecture: The Essence of Remakri Area in Bangladesh. In *Sustainable development goals series* (pp. 279–305). https://doi.org/10.1007/978-3-031-36554-6_19

Figure 4: Das, S.K. (2022). *Flooding in the district of Sylhet, Bangladesh*. Dialogue Earth. <https://dialogue.earth/en/climate/4-innovations-that-can-be-part-of-india-bangladeshs-flood-defences/>

Figure 5: own work

Figure 6: Grill, A. & Inan, B.K.S. (n.d.). *Colours and fine surfaces as sensitive sensual counterpart to the arhaic walls and shapes*. Anna-Heringer. <https://www.anna-heringer.com/projects/desi-centre-bangladesh/>

Figure 7: GCA. (2022). *Climate-resilient home in Bangladesh*. Global Center on Adaptation. <https://gca.org/rethinking-shelter-bangladeshs-new-approach-to-protecting-lives-and-livelihoods/>

Figure 8: own work

Figure 9: REUTERS. (2022). *People move a boat in a flooded area during a widespread flood in the northeastern part of the country, in Sylhet, Bangladesh*. Reuters. <https://www.reuters.com/world/asia-pacific/millions-bangladesh-india-await-relief-after-deadly-flooding-2022-06-20/>

Figure 10: own work

Figure 11: own work

