

BEYOND THE RIPPLE

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Research plan



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Fig. 02: Mother and child floating on bamboo during a flood.

INTRODUCTION

Bangladesh, a country located in the low-lying Ganges-Brahmaputra-Meghna Delta, is ranked the world's second most flood-affected country (Ozaki, 2016). The country is prone to annual flooding due to its peculiar geographical composition of predominantly flat landscapes interlaced with a complex network of constantly shifting rivers (Brammer, 2016). Intensified by its high population density and challenging economic conditions (Muhammad Mizanur Rahaman et al., 2016), the nation grapples with multiple natural disasters, including floods, perpetual rainfall, riverbank erosion, tidal surges, tropical cyclones, tornados, and thunderstorms (Alam, 2005; Ali et al., 2013). The annual floods stand out as the most devastating, impacting the lives of millions by displacing communities, destroying homes, livelihoods, agricultural resources, and unfortunately occasionally claiming lives (Few, 2003; Paul, 1997; Sultana and Rayhan, 2012).

The effects of the annual floods are staggering, with up to 20.5% (3.03 million hectares) of the country being submerged (Chowdhury, 2000; Mirza et al., 2005). During severe flooding, this figure can escalate to an alarming 70% of the nation's landmass, resulting in catastrophic damages nationwide (Mirza, 2002). Bangladesh has an extensive river network, comprising over 310 rivers, which not only

facilitates internal runoff but also receives substantial cross-border water from neighboring countries (Bangladesh Water Development Board [BWDB], 2017). Despite being a land of rivers, Bangladesh deals with the overwhelming challenge of managing its water resources, with an annual surface water runoff of approximately 12,000 billion cubic meters and a drainage area twelve times larger than the country's total landmass (Bangladesh Water Development Board [BWDB], 2017). 1,360,000 m³ of water originates from neighboring countries, with more than 80% being discharged during the monsoon period (Bhattacharya et al., 2016). Over the past 50 years, Bangladesh has endured seven major floods, and recent research suggests an escalation in the frequency and intensity of these occurrences (Humayaub Kabir & Nazmul Hossen, 2019).

While climate change undoubtedly plays a critical role, Bangladesh's vulnerability to floods is exacerbated by rapid population growth and poverty, which forces a significant portion of the populace to reside in flood-prone regions (Braun & Aßheuer, 2011; Dewan, 2015). Approximately a third of the population lives in slums, rendering them particularly susceptible during floods (Shimi et al., 2010). Insufficient infrastructure and inadequate protection further compound the damages, a



Fig. 03: Mother and child floating on bamboo during a flood.

difficulty commonly observed in developing countries (D. M. Khan et al., 2015). The repercussions of these floods are extensive, affecting crops, dwellings, livestock, infrastructure, education facilities, and other social facilities (Humayaub Kabir & Nazmul Hossen, 2019). Tragically, floods exacerbate societal issues, including an increase in violence and injuries against women and children, highlighting the profound socio-economic impacts beyond physical destruction (Biswas et al., 2010). Lowering the vulnerability of people to floods and creating more adaptation opportunities will essentially decrease the suffering and economic loss of people affected by floods (Humayaub Kabir & Nazmul Hossen, 2019).



Fig. 04: Flood waters at the Rohingya refugee camp in Kutupalong

THE PROBLEM

Flooding in the Haor

The Tanguar Haor, nestled in the northeastern part of Bangladesh near the Indian border, stands as one of the region's most expansive wetlands. Spanning over 9727 hectares, it forms an integral part of the Surma-Kushiyara river basins, deriving its primary water influx from the southern river system, supplemented by water streaming down from the Indian hills to the north (Muhammad Mizanur Rahaman et al., 2016). As a region characterized by heavy rainfall, approximately 80% of the annual precipitation deluges the area during the monsoon season from May to October (IUCN, 2014).

The Tanguar Haor's unique topographical features contribute to a distinct cycle of inundation, with the land remaining submerged for nearly six months each year (Das, 2016). Adding to the complexity, the rivers traversing the Haor trigger flash floods during the pre-monsoon period in April and May (Muhammad Mizanur Rahaman et al., 2016).

Bangladesh and its Haor regions are seen as some of the most vulnerable with respect to climate change, owing to their distinctive geographical setting, high flood susceptibility, dense population, and prevalence of poverty among the inhabitants (Muhammad Mizanur Rahaman et al., 2016). The

socioeconomically marginalized inhabitants of the Haor, predominantly reliant on agriculture, struggle with the seasonal floods, compelling many to shift occupations during the monsoon, either embracing fishing or seeking livelihood opportunities in urban areas (Alam et al., 2008; Pulla & Das, 2015).

Despite the recurrent challenges posed by annual floods, the resilient inhabitants of the Haor display an unwavering spirit, refusing to relinquish their homes and livelihoods, choosing instead to navigate the delicate balance between the water's adversity and its sustenance (Pulla and Das, 2015). The Haor represents a paradox, embodying both a curse and a blessing, testing the resilience and adaptability of the people who call this watery landscape home.

Children and Floods

Children emerge as the most vulnerable demographic during natural disasters, facing countless challenges that demand urgent attention and comprehensive support. In research by Martin (2010) it is emphasized that children, alongside the elderly and disabled, are the foremost victims of such calamities, suffering physical, emotional, and mental distress.

Addressing the needs of children during natural disasters goes beyond mere provision of basic necessities such as water, food, and shelter. The



Fig. 05: A woman with her kid wades through a flooded street in Chaktai during the tidal flood in Chittagong.

International Strategy for Disaster Reduction (ISDR, 1973) highlights the importance of holistic support, encompassing emotional, mental, and social development. In Bangladesh, where approximately one-third of the population is under 18 years old (Bartlett, 2008; [PopulationPyramid.net](http://populationpyramid.net/), n.d.), this vulnerable group experiences profound losses during natural disasters, particularly floods.

Research by Peek (2008) categorizes the vulnerabilities faced by children during floods into psychological, physical, and educational dimensions. These traumatic situations induce emotional distress, fear of hunger, loss of educational opportunities, restricted freedom, increased workload, and heightened risk of physical and sexual abuse (Martin, 2010). During floods, communities often flee to overcrowded shelters lacking sufficient clean water and sanitation, exposing children to water-borne diseases (Martin, 2010).

Drowning emerges as a critical risk, with more than a quarter of deaths in children aged 1 to 4 attributed to drowning, a risk that escalates during the monsoon season (Rahman et al., 2017). Shockingly, over 90% of the 816 deaths reported during the 2007 floods were children under the age of 5 (Martin, 2010). Annual statistics reveal that close to 14,000

children drown in Bangladesh, while nearly 68,000 experience near-drowning incidents (Unicef, 2022).

Families often delay seeking refuge until the last moment, reluctant to leave their homes and livestock, resulting in chaotic and rapid evacuations (Martin, 2010). Furthermore, there is a limited understanding of psychosocial support for children dealing with trauma from conflict, loss of family members, or displacement (Khan et al., 2020). The negative impact of toxic stress on children's well-being during and after floods is an aspect often overlooked (National Scientific Council on the Developing Child, 2010 & 2014).

Despite the evident challenges, the emotional and mental states of children during and after floods are frequently neglected. This oversight jeopardizes their long-term development. Recognizing and addressing the comprehensive needs of children during natural disasters are crucial steps in fostering resilience and ensuring the well-being of the next generation in the face of adversity.



Fig. 06: Children playing together

RESEARCH QUESTION

In regions prone to natural disasters, especially floods, the design of future housing within these communities becomes a pivotal factor in creating a safer living environment. This complex challenge demands a multi-faceted approach, placing a particular emphasis on the well-being of children who often endure trauma during such calamities. Focusing on the Tanguar Haor region, the question arises: **How can design create a safer living environment and mitigate the impact of trauma due to floods among the children in the Tanguar Haor region?**

This research question can be broken down to address the preceding problems and the effect it has on the children in the Tanguar Haor area. Firstly, understanding the mental and emotional effects of floods on children and exploring coping mechanisms are essential components. **What are the ways in which children can cope with trauma stemming from natural disasters like floods?**

Recognizing that floods not only impact the mental and emotional states of children but also disrupt their daily lives, it becomes crucial to delve into the specifics of these effects. **How are the daily lives of children in the Tanguar Haor region affected during floods?** This exploration aims to unravel the intricacies of their needs in the

aftermath of such natural disasters.

Furthermore, the ultimate goal is to create a safer living environment that is less prone to natural disasters, consequently reducing the number of children suffering from trauma during floods. The question arises: **How can housing design be employed to establish a safer living environment in relation to floods for children in the Tanguar Haor region?**

In short, the future of housing design in flood-prone regions like the Tanguar Haor area must be centered around a understanding of the challenges faced by children during natural disasters. Addressing the mental, emotional, and daily life aspects of their experiences, and implementing architectural interventions to create safer living environments strives to mitigate the impact of trauma on the youngest and most vulnerable members of these communities.

THEORETICAL FRAMEWORK

Given limited access to the project site, leveraging theoretical information becomes imperative for crafting a suitable design solution. The theoretical framework unfolds across three pivotal sections: understanding children’s trauma from floods, comprehending the daily activities of children in the Tanguar Haor region, and exploring flood resilience in housing design.

The first section delves into how children cope with traumatic experiences during floods, drawing insights from literature to inform an empathetic and trauma-sensitive design approach. The second section involves a meticulous investigation into the daily activities of children, employing mapping techniques to discern their needs during and after a flood, laying the foundation for a design that harmonizes with their needs. The final section delves into flood resilience, combining literature and case study analysis to gain insights into creating safe living environments that withstand floods. This comprehensive theoretical framework serves as a guide, ensuring a nuanced and informed design strategy for the unique challenges of the Tanguar Haor region.

RQ: How can housing design create a safer living environment and mitigate the impact of trauma due to floods among the children in the Tanguar Haor region?

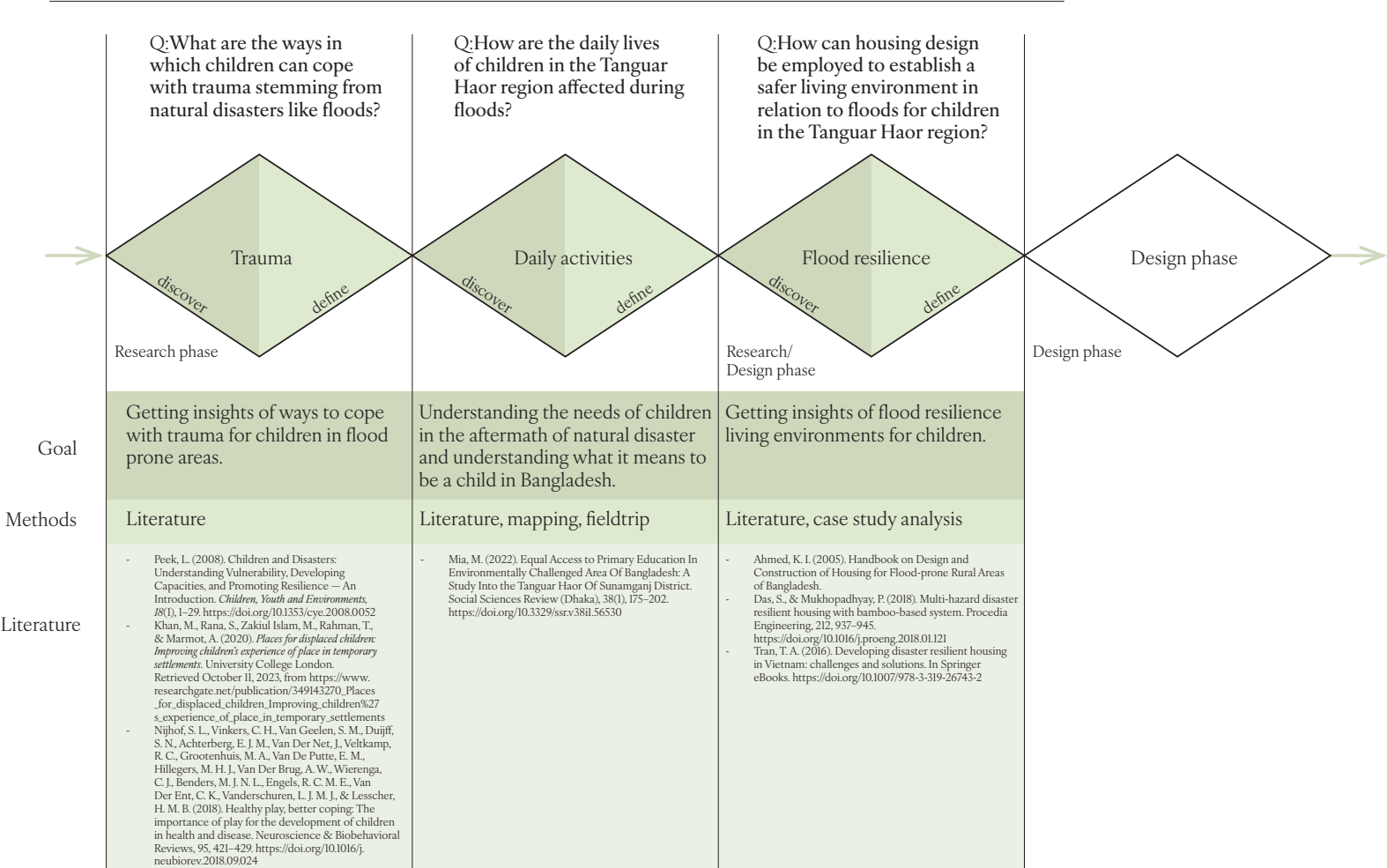


Fig. 07: Theoretical framework diagram



Fig-08. Children of a village in the Tanguar Haor region

METHODOLOGY

Embarking on a comprehensive research endeavor to address the impact of natural disasters on children and the flood resilience of housing in the Tanguar Haor region, the methodology of the research integrates various research methods, ensuring a holistic and nuanced understanding. The combination of literary research, mapping, case study analysis, and field research forms a robust framework for inquiry.

Literary Research

Given the limited fieldwork duration, literary research becomes pivotal for insights into post-disaster trauma in children. Reliable essays, books, news, and journal articles help comprehend the trauma and coping mechanisms. Literature also informs the necessity for enhancing flood resilience in housing, laying the groundwork for decision-making.

Mapping

The mapping research method plays a crucial role in providing a contextual analysis of the project site, with a specific focus on the daily lives of children before and after a flood. Utilizing visualization methods like modeling, photography, mapping, and drawing, these maps unveil the pre-existing conditions of housing in the Tanguar Haor area. They also shed light on the unique needs of children during

and after a flood, facilitating a visual understanding of the complex socio-spatial dynamics.

Case Study Analysis

Case study analysis becomes a valuable tool for scrutinizing precedents that have effectively dealt with flood resilience in housing and spaces designed to help children cope with trauma through play. Examining and contrasting these case studies can reveal innovative strategies and lessons learned, offering insights into how projects have addressed the challenges posed by floods and trauma. This method aids in synthesizing best practices for our research context.

Field Research

Undoubtedly, the most vital aspect of the research, field research employs an ethnographic approach to gain firsthand experience in the Tanguar Haor region. This immersive method goes beyond literature review and case study analysis, providing an in-depth analysis of socio-spatial factors influencing the flood resilience of low-income settlements. The field research unveils the intricacies of the community's response to natural disasters, offering a nuanced understanding of the challenges faced by children and the broader population.



Fig. 09: Child playing with a crate

RELEVANCE

Ensuring a safe and healthy living environment globally, especially in the face of rising natural disasters like floods, is an urgent imperative. The challenge intensifies with climate change projections indicating a significant increase in the frequency of 100-year floods by 2050. Arnell and Gosling's (2014) climate model predicts that such floods will occur at least twice as often across 40% of the globe, impacting around 450 million flood-prone individuals and 430 thousand km² of flood-prone cropland. Global flood risk is expected to surge by approximately 187%, highlighting the need for effective climate change mitigation measures.

To address this imminent crisis, global action is essential, focusing on flood resilience, climate change adaptation, affordable housing, and public space. This research aims to propose a sustainable strategy that transcends geographical boundaries, providing a comprehensive solution applicable to the specific context of the Tanguar region and serving as a blueprint for global implementation.

While existing literature and case studies extensively explore flood resilience and post-flood trauma coping strategies, a critical gap exists in integrated design approaches, particularly from the perspective of Bangladesh. This research endeavors to fill this void by proposing

an innovative, integrated strategy encompassing flood resilience, climate change adaptation, affordable housing, and public space, offering a solution for vulnerable communities.

At its core, this thesis leverages architecture and urban design research to confront the challenges associated with flood resilience and trauma among children. The approach centers on understanding the socio-spatial relationship between people and their environment. By redefining this relationship, the research seeks to formulate solutions that not only enhance physical infrastructure but also nurture the psychological well-being of flood-affected communities.

In conclusion, this research serves as a guiding beacon toward a future where communities can withstand the increasing threat of floods. Through an integrated design approach and a focus on socio-spatial dynamics, the aim is to propose a sustainable strategy transforming the vulnerability of the Tanguar region while offering globally applicable insights.

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