SEASONAL ADAPTATION THROUGH VERNACULAR STRATEGY IN VULNERABLE WATER NOMAD COMMUNITY IN BANGLADESH

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Abstract: Bangladesh's extensive riverine landscape hosts communities whose livelihoods are directly linked to water channels. Among them are the Water nomads or Bede (in Bangla) constitute a distinct socio-cultural group. Historically originating from the Arakan empires' ethnic lineage, they travelled river channels, temporarily settling near village market or urban peripheries. Traditionally engaged in fishing, trading and culturally embedded practices such as unconventional medicine, snake charming and performative arts, they have faced social marginalization for long in Bangladesh . Economic shifts and the decline of their traditional occupations have gradually compelled them to rely on conventional jobs, i.e.- fishing, irregular wage labour etc. Seasonal flooding, especially during monsoon, submerges their surroundings, disrupts regular livelihoods and limits access to water, sanitation, and hygiene (WASH). While isolated initiatives have addressed either safe WASH or additional income generation, no integrated and sustainable strategy has addressed year-round accessibility alongside the community's multifaceted vulnerabilities. The study aims to understand the current socio-economic and spatial vulnerabilities faced by the community and propose a contextually grounded strategic framework that adapts vernacular approaches to enhance physical accessibility during water level fluctuations, resulting improved quality of life, safeguarding livelihoods and enhancing socio–economic resilience across the seasonal cycle.

Keywords: *Water-Nomad, Bede, Delta, Resilience*

1. Introduction

The river of Bangladesh originates from the Himalayas, flows through the sediment rich deltaic landscape and empties into the Bay of Bengal. Bangladesh have over 200 rivers, forming a river network of 24,000 km of water channel leading into the Bay of Bengal (Rashid,1989). There are multiple tributaries associated with each river. These fertile land offers livelihood for millions of rural people. They mostly depend on the diverse species of fisheries and agricultural produces. Among these communities Water nomads are vastly dependent on the river channels. According to an estimate Bedes are 800,000 in number and they roam around Bangladesh dividing in around 5,000 nomadic groups. (Maksud & Rasul 2006)

1.1. BACKGROUND

1.1.1 History, Socio-Economic Identity and Marginalization

According to khan (2006) the Water nomad community belongs to the Mong-tong (Mangta) of Arakan, who accompanied Ballal Raja, the fugitive king of Arakan and later settled in Bikrampur area near Dhaka. They later spread out to remote areas of Bengal and Assam. The Mangta people became recognized as Bede (originated from Baidda meaning village doctor). They mostly relied on the unconventional medical practices pretending the knowledge of healing which was a major source of their income. Besides snake charming and snake catching became another stream of livelihood for them.

They have their own language Thetor Ther, and most of them are now converted to Islam over time (Khan, 2006). The water nomad community mostly lives on Boat and nearby stilt houses. These boats are roughly around 3m long and 1.2m wide in the middle tapered at the end. The boat has a shelter made of recycled plastic, tin sheets, bamboo mat, polythene and structured by bamboo ribs. The stilt houses are mere shelters made of the same materials built on an elevated platform structurally supported by bamboo or recycled wood sourced locally. They don't have access to electricity. Some comparative solvent families have access to solar energy. And their children don't usually go to school. Because of limited income sources, especially lack of year-round sustainable income stream, they mostly suffer from poverty leading to low standard of living and obstruction of child education. A family can earn up to an average income of 700-800 taka daily during peak fishing season working as a part of fishing crew known as malla/vaaghi (M. Mahmudul, 2018). Then there are fishing bans spanning around 60 days on average during breeding period in the rivers which obstruct the main sources of this day-to-day income generation. Thus, leading them to rely on various professions such as door-to-door crockery selling, part time jobs in the adjacent local market, as a wood worker or day labourers, even driving rental rickshaws to earn livelihoods.

Due to advancement of medical sciences, they had to shift from the unconventional medical practices. Those who were engaged with snake charming, entertaining and snake catching are gradually moving toward more conventional jobs.

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DOI: https://doi.org/10.31705/FARU.2025.26

Widespread of media and access to internet in root level of society and awareness of basic medical processes in the remote areas of Bangladesh are the main reason of this occupational shift. Yet the society marginalised the Water nomad community due to their controversial past, and they are treated as a social taboo. This social exclusion hinders their child to getting admitted into regular educational institution nearby and deprives them from basic education and playful childhood. Also, adults are treated unfair securing regular jobs and without having an educational background they are behind on social equity.

1.1.2 Challenging Landscapes

The community mostly settles in land which have no private owner. As they once heavily relied on the water channels of Bangladesh to travel from one place to another during different festivities and season, they tended to settle on accreted river side land (Char land) which are mostly owned by government and BIWTA (Bangladesh Inland Water Transport agency) and are hard to settle for their tidal responsive nature. They don't have any land rights, but those who can save a substantial amount of money they buy lands and homesteads in nearby or faraway places as convenient. They try to be economically solvent to afford a stilt house and upgrade from their boat shelters. The stilt houses are elevated to a minimum height where the water doesn't reach them during peak monsoon.

But as unpredictable monsoon goes in Bangladesh, sometimes the water level breaks the safety margin reaching their stilt platform during peak downpour or sudden floods. It is evident for all river side nomadic communities that the monsoon season along with the risen water level stays for 3 months from mid-June to mid-august (Ashar, Srabon and Vadro in Bengali month) and another additional month to dry up the flooded plains for land-based activity. During this one third of the year the regular livelihood and accessibility is disrupted confining both adults and the children in their respective stilt houses or boats. The land allows very limited seasonal agricultural farming during winter and summer. Additionally, sudden threats from riverbank erosion and government-led displacement have contributed to the temporary and precarious nature of the community's settlement pattern and architectural style.

1.2 RATIONALE BEHIND THE SELECTED LOCATION

For developing the strategic solution, a specific location was chosen. Having no land of their own, the community frequently moved around the river coastline. Some of these families or tribes relocated temporarily in the inland barren areas with new scope of livelihood. They stay in any area as long as the business is good. And most of them had to relocate frequently as scope of business dries out quickly (Philip,2019). The site which has been selected to strategize the proposal is Ghat No 10, which is adjacent to Pal Bazar, one of the main commercial market areas of Chandpur Sadar. The community lives on the bank of Dakatia River, a tributary of the Meghna River and in a very close proximity (1.41km) to the delta of Meghna and Padma.

This deltaic region is the most vulnerable and prone to natural disasters, especially during monsoon. The unique geographical position makes the people living on boats across Chandpur are among the most prone to climate impacts (Rahman, 2019). The in-person interview reveals that they have been mostly settled in this exact spot for last 15 years. And not all of them are from the Mangta origin of Arakan, some families are climatic refugees or lost their land due to river erosion, some fled from their hometown due to personal or family reasons. They ended up with the Water Nomad Tribe and started living on the Fishing boats converting them into living quarters with bare minimum space available. According to OXFAM poll in Chandpur, the socio-economic condition of the Water nomad community is insufficient to ensure decent quality of life. The illiteracy rate is very high, and almost half of the respondents were not enrolled in formal education (OXFAM Bangladesh, 2023). Without fulfilling the basic human need, education became a luxury for the affected community.

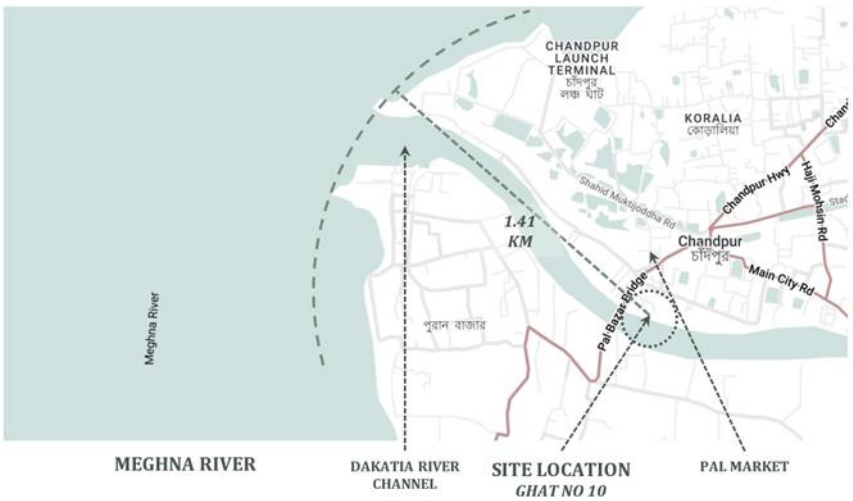

Figure 1 – GHAT NO 10 Location in CHANDPUR City Map

1.3 RESEARCH QUESTIONS

Several questions were explored through this study. The quality of life for the community is very temporary and uncertain. Also, there is a significant financial shortcoming to lead a basic fulfilling life. The proposed strategy should not become an additional burden rather a sustainable solution for the community's advancement. The guiding questions are –

1.3.1 What are the current socio-economic and spatial vulnerabilities faced by the community?

This question focuses on understanding physical and social challenges experienced by the community, climatic impacts, effects on livelihood, children's development, community aspirations and issues related to health and hygiene.

1.3.2 What strategies can address the community's vulnerabilities through the integration of multi-functional usability?

This question aims to strategize an approach that overcomes socio-economic barriers, responds to spatial and climatic constraints and provides a viable pathway forward for resilient community development.

2. Research Aim & Objective

This study aims to understand the challenges faced by a water nomad community of Ghat no 10 of Chandpur and strategize a solution to overcome the challenges faced by them. To address the aim this research has following objectives.

a) To explore the socio-economic and climatic challenges through interviews.
b) To identify spatial vulnerabilities using mapping and passive observations.
c) To recommend a strategy that can facilitate and sustain year-round activities and climatic conditions with an aim to overcome the existing challenges informed by community insights.

3. Literature Review

The review specifically focuses on several topics. Such as: Socio-spatial evaluation for the marginalized water nomad communities dissecting the social exclusion scenario across the Chandpur; Existing barriers to access WASH (Water, Sanitation and Hygiene), education and accessibility challenges throughout the year, especially during monsoon; & the current practices for the flood resilient architecture that are sustaining through climatic challenges in the Bengal delta.

3.1 SOCIO-SPATIAL EVALUATION FOR THE MARGINALIZED COMMUNITY OF CHANDPUR

The water nomad community has gone through range of challenges including poverty, environmental degradation and displacement sue to climatic disasters such as floods, cyclones, river erosions. As they are nomadic and traditionally water centric community, they don't have any control over the land ownership (IAB & OXFAM Bangladesh, 2023). They didn't have any opinion about the local or national political power. After many years, in 2007 many members of the water nomad community were enlisted as a voter with the help of NGO and development workers (Nayeem, 2020). According to Zobaidur R. a journalist and climate activist, the water nomad community people are trapped in a never-ending struggle of being acknowledged as a fishing community. Since they are not recognized as "Fisherman", at the same time fisherman communities living on the mainland do not acknowledge the boat resident communities (water nomads) and consider them as low caste (OXFAM Bangladesh, 2023).

The housing circumstances are very nonviable. In Chandpur 41% of dwelling are just a temporary shelter of one room, 28% lives in the boats with their family and 15% living in temporary shelters. Their earnings are not sufficient to cover the basic living standard. Whereas 54% of the family has a debt or paying their monthly instalment. 12% only can save up some fund at the end of the month. (IAB & OXFAM Bangladesh, 2023).

3.2 WASH, EDUCATION, AND MOBILITY BARRIERS

Access to basic facilities like WASH is crucial for health and immunity. A recent survey on water nomad communities by OXFAM across Chandpur defines approximately 38% of the family is dissatisfied with their water supply system. 63% of the respondent's family get their drinking water from unsanitary pond/canal/river/surface water. And approximately 80% of homes obtain cooking water from these untreated sources. And almost 90% obtain hygiene water from untreated sources (IAB & OXFAM Bangladesh, 2023).

The illiteracy rate is roughly 45%. Almost 70% of the member are not enrolled in a conventional or formal schooling system. The level of schooling is deplorable (OXFAM Bangladesh, 2023). According to the survey by Grambangla Unnayan Committee, a non-profit organization that works closely with Water nomads, An overwhelming percentage live below the poverty line. Very few children are vaccinated. As they change locations often, they do not avail any government family welfare schemes or health assistance. Although they belong to the poorest of the poor and are landless, they hardly get Khas (Unconditional) land for settlement. Their access to safety net programs such as old age allowance, VGF cards, disability allowance, flood relief etc. is minimal. (Gain P, 2019)

3.3 FLOOD-RESILIENCE IN ARCHITECTURE IN BENGAL DELTA

The term resilient can be defined as the ability to withstand or fast recover without any or minimum damage. Flood resilience can be achieved through several techniques such as Elevated Building, Wet proofing, can float (Amphibious) building, Floating Building (Barker, R. & Coutts, R, 2016). The design itself can be designed to be sensible to flooding, the feature allowing themselves towards passive mitigative solutions, to adapt flooding events such as elevated floors or floating structures (Simona et al., 2022). There were a lot of current practices attending the deltaic flood issues in their separate ways. Marina Tabassum and team FACE planned "Khudi Bari" considering the elevated plinth used in the rural household so that flood water doesn't reach the living quarters in the Char Hijla of Chadpur. The materials used here is Bamboo and corrugated metal sheet as roof, the most common material used in Bangladesh. And this piece of architecture can be assembled and disassembled within very short period considering the unpredictable nature of the deltaic landscape. Saif Ul Haque Sthapati's Arcadia education Project is another example to a response for flood resilience. South Kanarchor, Bangladesh by the Dhaleswari river is flooded for several months every year. This elementary school with a hostel, nursery and training centre is an amphibious architecture that doesn't disrupt the river landscape rather adapts in flood response during monsoon. The flotation became possible due to light weight material such as bamboo and straw with the help of floating drums underneath the structure. To promote education, child safety, healthcare Architect Mohammad Rezwan with his Shidhulai Swanirvar Sangstha a non-profit organization has established floating boat schools in the flood prone northern zones of Bangladesh. Operating a fleet of boats encourages parents to send their child to school while raising awareness on women's decision-making power and mobility and sustainable livelihood opportunities for the underrepresented.

1 2 3

Figure 2: Kudi Bari by Architect Marina Tabassum (*Source: MTA*)[1], Arcadia Education Project by Saif Ul Haque Sthapati (*Source: AKDN*)[2], Floating School of Shidhulai Swanirvar Sangstha by Architect Mohammed Rezwan (*Source: afili*) [3]

4. Research Methodology

The research aims to explore and develop strategic responses to the challenges imposed by rising water levels and flood induced vulnerability affecting the Water Nomad community throughout the year. This study adopts a mixed method approach where field data inform a strategic intervention. The process consisted of (1.) Questionnaire survey with 9 Households (6 on Stilt household and 3 Boat resident Community). and 5 semi-structured audio recorded focus group discussion (2.) spatial mapping validated through on-site observations along with secondary data from literature and institutional sources. The interview and survey data were used to extract socio economic and climatic challenges. The spatial data were analysed to explore lived experiences with physical constraints. These research frameworks serve as a foundation for the proposed intervention. The socio-economic analysis is entirely collected information driven, extracting on the insights from first-hand interviews. The proposed strategy is formulated from literature Study, Site Survey, Questionnaire Survey, Thematic Analysis towards a design strategy formulation.

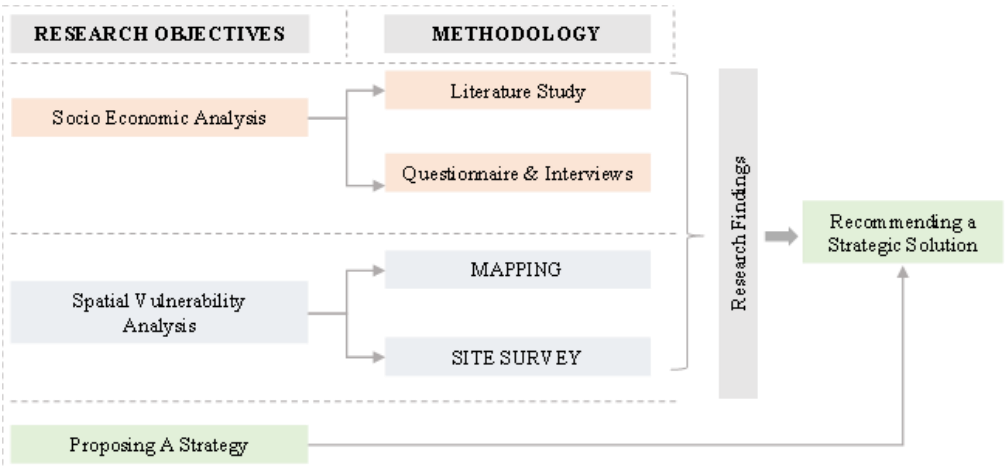

Figure 3 – Research Methodology Framework. (*Source: Authors*)

4.1 SOCIO ECONOMIC ANALYSIS

4.1.1 Literature Study

Bengal delta has both giving and treacherously unpredictable nature. The research draws upon exemplary works in Bengal delta to sustain the flood and creating a resilient community. The literature study focuses on how the sustaining projects responded with this challenging landscape. Alongside exploration is done through material preferences, the prevailing environment friendly vernacular practices. The socio-economic and cultural tendencies have been followed up through available empirical data from secondary sources such as active NGOs like OXFAM and Grambangla Unnayan Committee continuing their operations in Bengal delta and particularly in Chandpur. These findings were validated through passive observation during site survey.

4.1.2 Questionnaire & Interviews

The community people were verbally engaged from both the stilt house and boat dwelling residents during visits. The questionnaire was tailored to a more conversation-based interviews. 9 families (6 from the Stilt household and 3 from the Boat residents) were interviewed informally. Further interviews covered informal focus group styled conversations comprising 6 to 10 participants within everyday social settings. Participants were included in groups according to gender, age groups and context to capture diverse perspectives. With a mixed gender of adults and youth engaged in casual discussion at community tea stall, adult men gathered under shed playing carrom, women and mothers socializing on the front porches of their homes in the leisure evening, children (age 3-10) Playing under the stilt house with makeshift swings and adolescent (age 10-18) participating in cricket, football at char land area. The discussions covered their daily routines, education level, aspiration for self and the younger generations, difficulties faced during water level rise, uncertain nature of the landscape, income generation scopes and challenges, health and hygiene, access to WASH, cohesion with other neighbouring communities. These various answers were recorded through field notes and later analysed and categorized into key thematic challenges faced by the community.

4.2 SPATIAL VULNERABILITY ANALYSIS

4.2.1 Site Survey

The selected site is in Chandpur District along the coast of Dakatia river, a tributary leading to the estuary of Mighty Padma & Meghna (Fig - 1). Though it is 1.41 km(approx.) far away from the confluence, yet it is directly affected by the calamities created by the river. The site survey was accompanied by a local representative of OXFAM and the community leader (Sarder). The site is accessible through the pal Bazar Road (a nearby market). Video and photographic documentation were conducted. Passive observations were made regarding their standard of lifestyle, accessibility, standard of amenities with respect to population, used building materials and practising architectural styles.

4.2.2 Spatial Mapping (Land Use, Flood Levels, Seasonal Change)

Using site map provided by OXFAM and satellite imagery from google, the basic amenities and the Stilt house settlement patterns were identified and the land use by the community, the affected area during water level rise were analysed. Seasonal activity patterns were mapped for both dry and wet periods. Survey observations and interview data played a key factor in identifying these parameters into spatial analysis. The site map revealed the main circulation axis and the secondary circulatory access to different household and zones. It also revealed the access towards water and usable Char land (Accreted land) area during dry season. Site Section across the site towards river were created to understand the land and water relationship and water level rise with respect to the stilt houses during monsoon.

5. Findings

5.1. SOCIO-ECONOMIC PROFILE

5.1.1 Livelihood

Based on interviews, the community people, particularly in the ghat no 10 are fishermen. They catch fishes during the monsoon and sell in the local bazar. On the contrary in a neighbouring community at Ghat no 5, some of the stilt house residents, who are in better financial conditions have tea stalls in front of their houses. Some members of the ghat 10 community work in local bazar, some sell household utensils door to door in the neighbourhood. A few of them also live on riding rental auto rickshaw. Women assist their husbands in daily work. Usually, they go for fishing early in the morning with the husband. After that, the wives come back home and cook for the family, take care of their children while the husband sells the fish in the local market.

5.1.2 Income Gaps

Scope of income for the Bede people are very limited. The informal focus group discussion revealed due to social exclusion and education gap, the people of the community generally struggle finding a job to earn for a living. For the same reason, the children don't get educated and later pursue a good job. They face discrimination in workspace as well. They don't get any permanent job because of their lack of land rights and travelling nature. There is a gap in respect to the sustainable income source compared to the people living on land.

5.1.3 Children's Needs

Children are the most vulnerable in their community. Field visit observation shows during dry seasons, they play in the char land of the river. Adolescent children normally play football, cricket by themselves. Parents let their toddlers to play in hammock attached to their house. Sometimes, the space below the stilt house is used as a play space for the children. From focus group discussion it is evident that Their parents usually fear sending them outside because of the possibility of hate crime and social exclusion.

Further household interview revealed during monsoon, all the options for play are hampered. Those who could go to school earlier are also confined to their house because the entire area is flooded with water. Whereas the stilt house residents have some space available in their house, the boat residents have no space inside the boat. The children have nothing to do but sit idle inside at that time. Infants and toddlers aged 0-5 years often crawls towards the water and fall there due to lack of supervision by the elders.

From the discussion with community leader and mothers, it was apparent that children face significant challenges getting admission or continuing class in nearby schools due to heavy marginalization. Prevailing societal convention leads other children to make them feel unwelcomed in their study or in play. So overall, their mental growth is hampered.

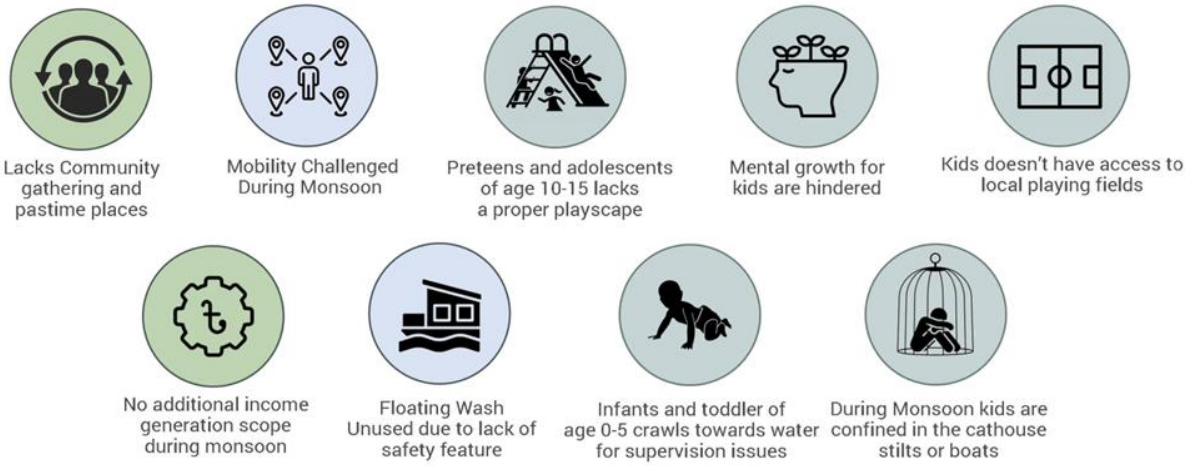

Figure 4: Major challenges faced by the community
(*Source: Authors*)

5.2. SPATIAL USE AND AVAILABLE AMENITIES

From OXFAM's database (2023) In Chandpur ghat no 10, there are more than 90 houses. Approximately 40% live on boat whereas 60% at temporary stilt houses at land. Site visit reveals apart from these residential spaces, 3 terrestrial WASH unit made by KOICA (Korea International Cooperation Agency) and two floating wash units made by OXFAM. The floating wash units are not currently used by the community people. Upon further investigation the community leader mentioned, since not being properly anchored with the land, they float away and attacks the boat houses on stormy days. In addition to that, community people are not properly trained how to use these specially designed floating wash units. Therefore, currently the units are not in use. There is one tubewell and two other toilet facilities made by abovementioned NGOs. These toilets are not enough for this huge number of residents of the area. The terrestrial wash units get flooded during wet season creating an unhealthy environment. These units also have hygiene issues since a huge number of people use them. All these facilities are connected through a central 3 feet wide road which developed organically over the time. This is not a paved road and gets flooded over the rainy season.

Figure 5: Exiting Condition of the Ghat No 10, Chandpur Water Nomad Community
(*Source: Authors*)

5.3. SEASONAL CHALLENGES (DRY VS WET)

Through the comparison of spatial mapping analysis and passive observation during site visit it can be inferred that during dry season, the char area of the river line works as a play space for the children of the community. Working on fishing net and all other activities that need an open space is done in the char area. The wash units are also accessible by the main circulation spine or the 3 feet wide road. Whereas interviews revealed that in monsoon or wet season, the Charland gets flooded with water and the children are confined in their boat/stilt houses. There is limited to no scope of play. The wash units are only accessible through boats. The terrain level wash units get submerged in water. As a result, accessibility to major fundamental facilities get very limited.

Figure 6: Dry and Wet Season Activity Mapping of the Ghat No 10, Chandpur Water Nomad Community
(Source: Authors)

5.4. FINDING DISCUSSION

The findings brought out several interconnected challenges affecting the Chandpur water-nomad community. Accessibility issues are persistent with limited WASH facilities, in adequate anchoring for floating units and the main circulation which is flood prone during monsoon restricting their access to basic amenities. Lack of safe play space and leisure opportunities leaves children confined to risky or insufficient spaces specially for the boat residents. Seasonal hindrances intensify the vulnerabilities by cutting of mobility, schooling and outdoor activities. This condition creates a non-favourable environment for children's physical, social and cognitive development and adult's income generation possibilities. Over time this contributes to broader social backlashes, reinforcing marginalization, limiting income generation opportunities and sustaining poverty cycles.

6. Recommending a Strategic Solution

A community axis is proposed to ensure access for all, connecting the community needs, households and WASH and to ensure mobility even in monsoon season.

6.1. MULTI-DIMENSIONAL FUNCTIONALITY

From analysis, seasonal vulnerability is evident in the ghat no 10 area. Where the monsoon brings challenges to accessibility and livelihood, it also confines children in their houses which barely meet the minimum capacity of accommodation. This hinders the mental growth of the children along with safety issues such as falling into water from the stilts or boats. The design solution must address the multi-dimensional challenges that are faced by the community.

6.1.1 Seamless Connectivity during dry season

The strategy should address connectivity during the dry season without hindering/ challenging its normal activity. It must not be a barrier for day-to-day functioning in the dry season rather than harbor community activities.

6.1.2 Accessibility During Water Level Rise at Monsoon

During monsoon or sudden downpour for few days the water level rises submerging their usable lands. This disrupted connectivity is recovered through this access spine ensuring safe access to livelihood sources, WASH, neighborhood communication for both the stilt houses and boat residents.

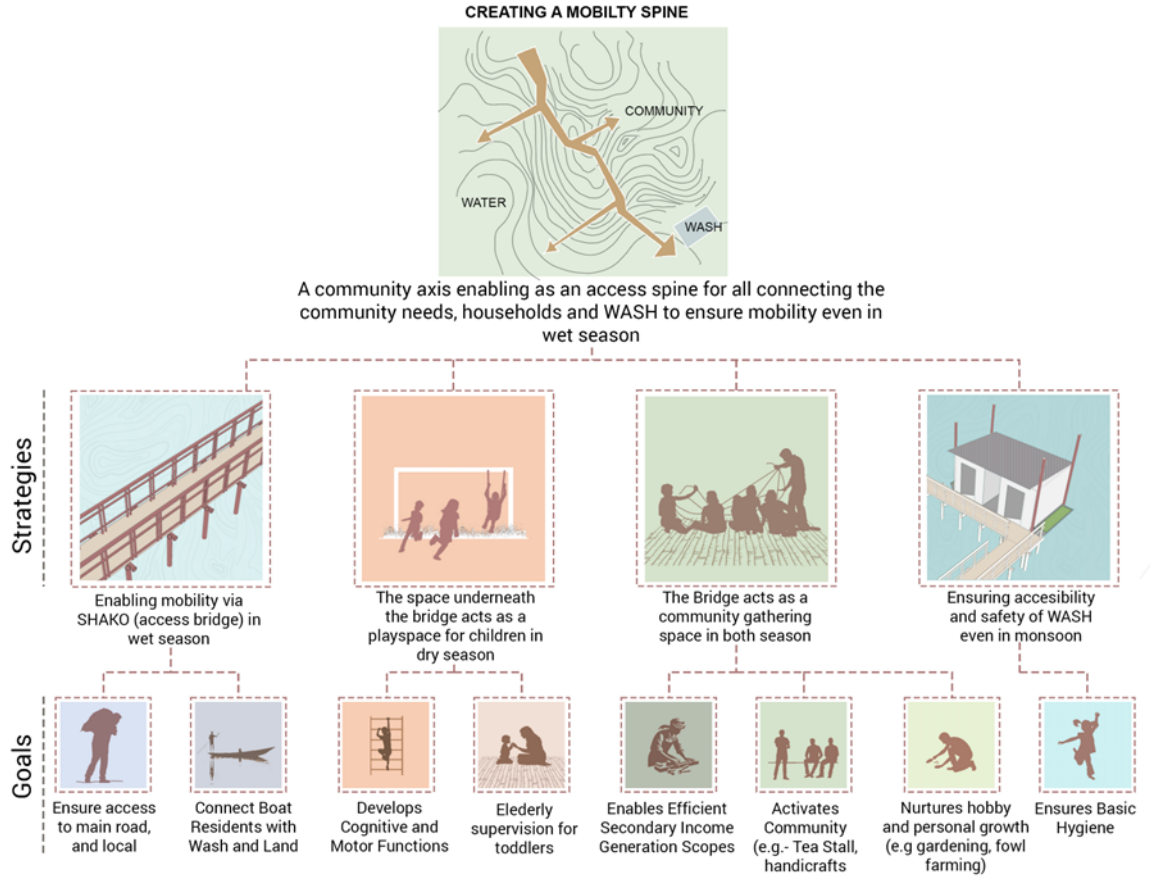

Figure 7: Strategic Framework for Achieving Goals
(Source: Authors)

6.1.3 Creating a safe Play space for the children
Since access gets limited in the wet season and children are bound to stay at home, the design must ensure a play space for the children that encourages the child's growth and other activities. In wet season the play can be ensured on an elevated platform whereas in the dry season, the place underneath the platform can work as a play-space for children. This will ensure the cognitive and motor functions of the children despite the seasonal challenges. Besides that, the toddlers can have an elderly supervision in the wet season.

6.2. VERNACULAR APPROACH
The local materials and architectural styles were identified during site visit and the most feasible and well-used material is proposed for the intervention.

6.2.1 Use of Local Materials and Construction techniques
The mobility spine is made from bamboo, a very cheap local material. Bamboo is easily available material in Bangladesh and has a minimal impact on environment. Due to its semi-permanent character, it can serve a long time and serve its purpose of transporting people. In the villages of Bangladesh, Shako (a structure made of bamboo) is used for transporting people in short water body. Most of the stilt house structures are made from bamboo. It's a local practice of this community and can be made by the community people with minimum supervision because of simple construction techniques.

6.2.2 Minimal Environmental Impact
Bamboo is biodegradable material. It can be recycled and reused in many ways. On the other hand, there is nearly zero carbon footprint to construct with this locally available material.

6.2.3 Structural Resilience and Flexibility
The proposed solution is easily deployable and removable considering the uncertainty of landscape's nature. Bamboo is also a proven material sustaining water level rise. The modular nature resonates with the temporary and moving lifestyle of water nomads.

6.3. ENGAGING LOCAL COMMUNITY
For harnessing belonging, our proposal focused its program and construction solely on its user community. This would promote adaptability and easy maintenance ideas along with reducing the labor cost.

6.3.1 Community Dialogue and Focus Group Discussion
The program of our proposal is versatile. In our strategy we have shown a single type of possibility. But to finalize the whole plug and play combination for the proposed access spine a thorough focus group discussion with participatory process is much needed. This would nurture more belonging and cultural appropriation.

6.3.2 Integrated strategy for community led construction
The existing Sarder led hierarchy of water nomad community provides an effective structure for volunteer mobilization. By operating through his chain of command, each group of community members with supervision support from skilled bamboo construction workers can execute planning and construction phase. The support system will handle more technical aspects such as bamboo curing, joinery techniques etc.

6.3.4 Capacity Building for Future Adaptation and Expansion
After the whole construction process the community will be enough skilled and empowered to adapt for any demanding program in the future. Also, bamboo is very cheap thus maintenance work would be easy to execute due to their gained knowledge and would be passed on for generation.

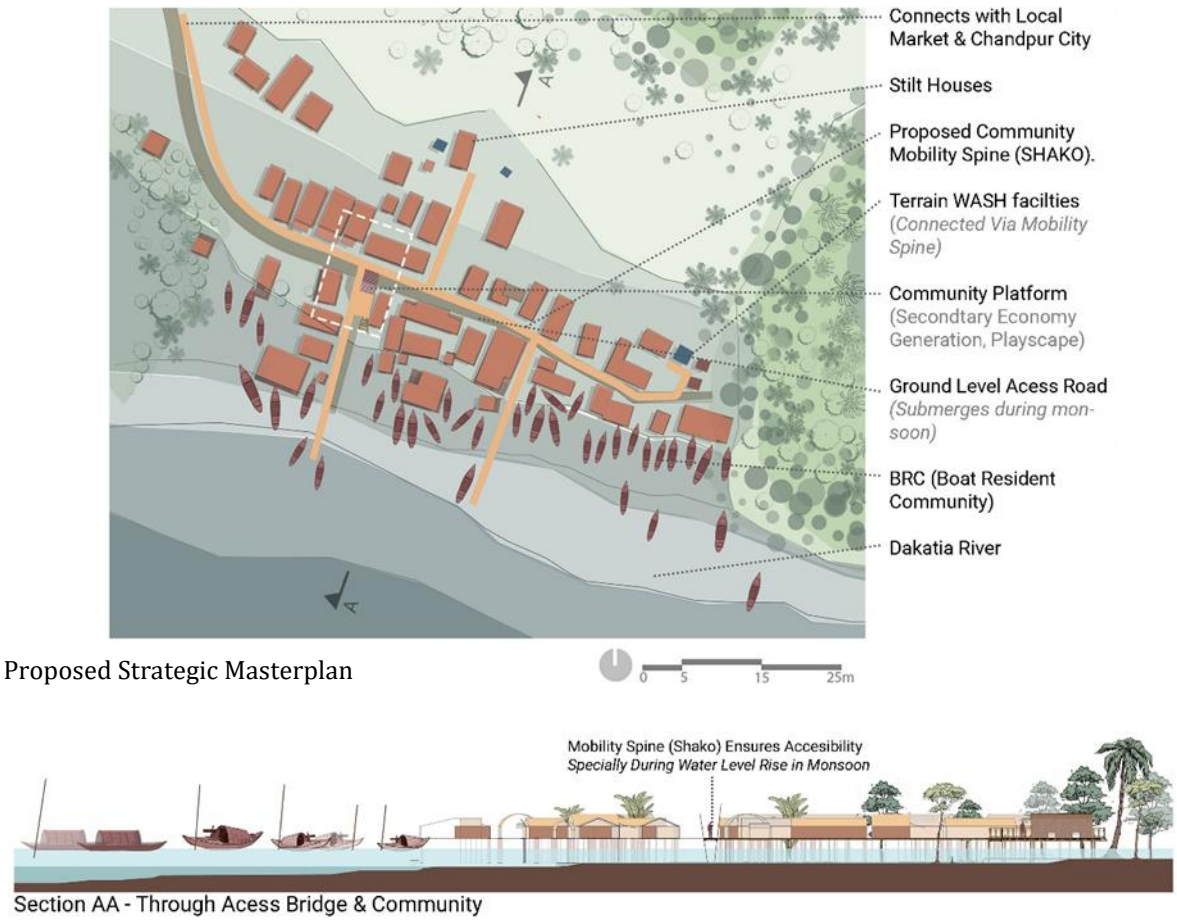

Figure 8: Strategic Intervention at Masterplan & Site Section Level
(Source: Authors)

7. Conclusion

The proposed strategy is envisioned as an adaptive, community-led system which can evolve with changing demands and climatic circumstances. By improving year-round accessibility it ensures safer mobility during monsoon, expands access to WASH facilities and provides equitable conditions for both stilt houses and boat residents. Beyond tangible access, this strategy strengthens social bonding, supports income generations scopes and facilitates communal activities, gradually bridging the socio-economic disparity between water nomads and land-based communities.

As the solution relies on locally sourced materials, vernacular practices and flexible spatial strategies, the approach has a strong potential for replication across other flood-prone deltaic landscapes in Bangladesh and beyond. Climate change intensifies water level rise in many global regions. Such adaptive, user driven solutions offer a scalable path towards resilient, water centric community building. Leading to a long-term resilience for vulnerable riverine populations.

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