

# Between Floods and Climate Change: Revisiting the Mishing Community of Majuli Island, Northeast India

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**Abstract:** The transformation of monsoon rainfall patterns in India, largely attributed to climate change, is leading to more frequent and severe floods. These escalating challenges underscore the imperative of prioritising adaptive measures, given the intrinsic link between humans and climate change. This research conducted in Majuli Island, a highly vulnerable region in India's northeast, aims to understand current adaptive strategies and assess potential risks from impending physical exposures. Empirical evidence was collected using purposive sampling in two flood-prone villages. The objective was to revisit the Mishing community's experiences with annual flooding and climate challenges. Thematic analysis interpreted the qualitative findings. Implications for community-based adaptation and sustainable practices are discussed for future flood and climate challenges. The study emphasises strengthening ecosystem-based adaptation through multi-sectoral networking in Majuli Island, Northeast India.

**Key words:** Floods, climate change, adaptation, sustainable development, Mishing, Majuli Island.

## Introduction

Flood adversities are significantly increasing as climate change intensifies the severity of rainfall and sea level rise (Bates et al., 2008). Floods are emerging as a substantial climate concern that ultimately challenges a nation's Sustainable Development Goals, globally (Writer, 2020). Asian nations are more vulnerable to floods due to numerous riverine terrains, geographic location, and climatic conditions (Writer, 2020). Similarly, India faces a susceptible situation, with floods frequently reported amid changing climatic conditions. Projected changes in India include a 40–50 mm increase in monthly rainfall by 2100, converting 0.071 million sq. km. of natural vegetation to built-up land. Severe flood-prone areas may rise by 122% (0.15 million sq. km) (Pal et al., 2022). Urgent action is needed to

establish effective land and water policies, especially for vulnerable populations with a history of catastrophic events (Guhathakurta et al., 2011; Pal et al., 2022).

Flood disasters in India have shown an escalating trend in both frequency and intensity, thereby causing adverse consequences for vulnerable and marginalised populations (India: Floods and Landslides, 2022). The Climate Vulnerability Index (CVI) and assessments presented by the Intergovernmental Panel on Climate Change (IPCC) emphasise that India is at risk of deviating from the prescribed IPCC guidelines if its policies neglect the imperative focus on climate change (IPCC, 2021; Singh, 2022). To institute effective measures for adapting to climate change within regions characterised by heightened susceptibility to floods, substantial collaborative efforts are indispensable. Such efforts require active engagement from governmental

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bodies, humanitarian organizations, academia, and civil societies alike.

Majuli Island in Northeast India, bordered by the Brahmaputra and Subansiri Rivers, faces annual monsoon floods, making it highly susceptible to climate change (Chetry, 2022; Das, 2014). The Island was declared the first island district in India in 2016, with 248 villages and over 167,300 inhabitants, it's one of the largest riverine islands globally (Majuli Taluk Population Jorhat, n.d). Despite being a contender for UNESCO World Heritage Site recurrent floods have led to substantial land loss, triggering migration and relocation of key public spaces. Focussing on the Mishing community, the study, explores their experiences, vulnerabilities, and coping strategies amid floods and climate challenges in Kamalabari and Ujani blocks. Highlighting the urgency for government and civil society collaboration, the study underscores the need for sustained support to ensure Majuli's sustainable development and the well-being of its residents.

### **Riverine Island and Emerging Challenges**

Riverine islands are particularly exposed to natural hazards due to their water-surrounded terrain, making them highly susceptible to floods and erosion (Sarma, 2014). Majuli Island is a case of a fragile and vulnerable river island (Das, 2014). Annually, the island faces severe flooding, causing significant damage to homes, infrastructure, and crops. The floods equally impact the island's rich biodiversity, with many species losing their habitats. The Brahmaputra and Subansiri Rivers' volatile nature and the encroachment of riverbanks are the major causes of the annual floods (Kalita, 2016).

### **Majuli Island and the Mishing Community**

Majuli is, a river island in Assam state, located at 27°00'N 94°13'E with an area of 352 km<sup>2</sup>. Demographically, Majuli has a diverse range of ethnic tribal communities, with the Mishings comprising the largest population. Mishings are a subgroup of the Mongoloid race and affiliate with the Tibeto-Burman group (Sarma & Choudhury, 2015). The Mishings have lived with floods as they have settled along the Brahmaputra plains for the most extended period (Pegu, 2021). The Mishings primarily rely on agriculture, with Ahu Paddy (Rice) being their main crop. Fishing serves as an additional household income source. Livelihood diversification involves livestock like pigs, poultry, and cattle. Weaving, pottery making, and handicrafts also contribute to their income.

### **Aim of the Study**

This research article aims to comprehensively understand the experiences of the Mishing dwellers in Majuli Island, Assam state, India, with a particular focus on their encounters with annual floods and climatic changes. The research questions of the study included:

- The experiences of the Mishings concerning annual floods and climatic changes.
- The ways people established adaptive measures in response to these changes.
- The alterations occurred in flooded settlements due to climate changes, particularly concerning land, forest, and water – essential components in the daily lives of the Mishings in Majuli.

### **Methods**

The research was undertaken in Majuli Island, Assam state, Northeast India. Majuli was chosen for its pronounced susceptibility to recurrent flooding and climatic variations (Das, 2014). Employing a qualitative approach, the study involved in-depth interviews, wherein respondents ( $n = 16$ ) were purposively selected from Mishing villages. Data collection was facilitated through the utilisation of an interview guide with samples gathered from Bonoria Chapori and Missamora, selected based on two criteria: impoverished economic conditions and susceptibility to floods and erosion.

The interview guide was designed to elicit fundamental information about the household and the respondents' encounters with annual floods and climate challenges. The questions focussed on the participants' experiences related to floods and climate changes, their adaptation and coping strategies, challenges in livelihoods, and government support encompassing policies and scheme implementation in the villages. Schedules were created for systematic qualitative data collection, and interviews were conducted via using Assamese language. Transcriptions were later translated into English. Each respondent participated in a single 30–40-minute interview.

Thematic analysis, as outlined by Braun and Clarke (2006), was adopted to identify recurring themes in the diverse experiences of the Mishing people. After an initial coding phase, codes (manifest and latent) were delineated into sub-themes and organised into emergent themes (Table 1).

## Results

### Indigenous Coping Mechanism

The Mishing people's ability to adapt to floods relies on their indigenous and traditional coping experiences. Their inclination to follow traditional wisdom, particularly in constructing flood-resilient houses called "Chang Ghars" (Figure 1), elevated 4-6 feet above the ground, has proven effective during floods. The roof, porch, and floor serve specific purposes in both ordinary circumstances and during floods. The wide front porch, "Tunggeng," provides additional space for household belongings or accommodation during floods. Mishing homes typically feature bamboo walls (Sibi), bamboo flooring (Tasit/Bero), and a mud-built fireplace (Kira) known as Merang (Figure 2).

The Mishing kitchen is distinct with bamboo shelves, or "Perab," hung directly above the fireplace. These shelves, secured with bamboo poles and jute ropes, play a crucial role in preserving and smoking various



Figure 1: Flood resilient house (Chang Ghar) of the mishings.



Figure 2: Traditional kitchen of the mishings.

meat and food products, especially during floods. Placed above the fire, Perab is used for smoking, contributing to extended preservation by preventing premature decay and keeping food products free of bacteria and fungi. These indigenous practices are vital for the Mishing people's survival during annual floods.

Apart from resilient house structures, the community observes nature's warning signs. Living in harmony with nature, they recognise indicators like soil sediments moving downstream before significant occurrences. Soil pouring into the river before the monsoon signals imminent floods. Another traditional indicator involves observing the moon and stars (thakar); fewer stars suggest approaching rainfall.

The Mishing community's rich history along the Brahmaputra valley has provided a catalogue of indigenous responses. Daily activities intertwine with nature, enabling them to endure floods. Early warnings, house building patterns, food preservation techniques, raft and boat-making skills, fishing, and collecting edible products from forest lands are integral elements of this indigenous repertoire.

### Navigating Climate Vulnerabilities, Socio-Ecological Dynamics, and Adaptation Strategies

Majuli, now a climate hotspot, faces severe vulnerabilities in its socio-ecological environment. Erosion of riverbanks and frequent flooding, driven by fragile topography, consistently endanger the island's survival. Climate challenges and extreme weather events heighten the risk, affecting livelihoods and well-being, and making the population more susceptible to impoverishment. To address these challenges, a proposed "regional land protection strategy" advocates



Figure 3: Flood waters in Missamora (accessibility to water-pumps disrupted).



sustainable, nature-based, and adaptive approaches through government-civil society collaboration.

Beyond physical challenges, Majuli grapples with geographic, economic, and cultural issues. Along with the Brahmaputra, the Subansiri River equally poses a significant threat, necessitating a protective program against rapid erosion and floods. Multiple flood waves transform a substantial portion of the island into wetlands during the monsoon. Land erosion prompts migration, affecting settlement distribution and livelihoods, particularly in the southern bank, such as the Kamalabari block. If erosion persists, villages along the southern bank may relocate to the less populated Ujani block.

Regular flooding in Majuli determines settlement trends, exacerbating poverty and declining the local economy, especially in remote regions with minimal government and NGO support. Despite challenges, participants along the Brahmaputra, driven by a profound connection with nature, are hesitant to migrate elsewhere.

Increased exposure from frequent floods and bank erosion amplifies vulnerability in the high-flood zone. Land degradation and prolonged flooding raise water levels, impacting households lacking adjustment capacity (Figure 3). The current adaptive capacity is considered insufficient, necessitating prompt actions to endure present or future exposure. Anticipated flood dangers, coupled with heightened susceptibility, could sharply escalate Majuli's disaster risk.

### **Erratic Trends in Rainfall**

In contrast to urban areas, the impacts of climate change are more conspicuous in rural expanses (Chetry, 2022). The latest Intergovernmental Panel on Climate Change report predicts increased frequency and severity of extreme wet weather, leading to heightened rainfall. Severe downpours significantly contribute to rainfall variability. A study by the India Meteorological Department reveals high temporal and geographic variability in rainfall due to climate change, altering patterns, frequency, and magnitude (ICC, 2021).

Majuli also faces pronounced consequences of climate change. Recent shifts, including erratic rainfall, extended flooding from June to September, and changes in rainfall patterns since May, have led to earlier and prolonged monsoons (Das, 2016). Farmers express concerns about rising and irregular rainfall causing both flooding and droughts, damaging crops. Notable climate change patterns in the last decade include hotter summers, prolonged monsoons, and colder winters.

With limited government support and heavy reliance on agriculture, the Mishing community bears the brunt of severe floods and a changing environment. Respondents indicate that rainfall is distributed over an extended period, occurring unpredictably in varying volumes. A vulnerability assessment found that while the high-flood zone is more vulnerable to climate change, the low-flood zones display an equal sensitivity to climate change (Saikia et al., 2020). Unpredictable and prolonged rainfall in recent years poses difficulties, leading to distress among farmers over increasingly erratic trends responsible for crop and asset destruction.

### **Risk to Forestry and Aquatic Species**

Natural resources play a crucial role in shaping the lifestyle of tribal communities, forming an integral bond between humans and the environment deeply rooted in cultural and religious traditions (Paulraj & Andharia, 2015). Forests and land are vital for managing the Mishings' livelihood on Majuli Island, providing essential resources like firewood and income through Non-Timber Forest Products (NTFPs). Forests serve as a source of income, supporting subsistence needs such as food, fuelwood, bamboo, and medicinal herbs. Indigenous herbs from the forest are utilised for personal consumption and medicinal purposes. A study reveals that 98% of households depend on the forest for their fuel requirements (Das, 2021).

Moreover, the Mishings' economy heavily relies on water resources, given their riverine settlements. Rivers, streams, ponds, and wetlands serve as primary sources for fishing, the community's second most important economic activity after agriculture. However, the study identifies a decline in fishing activities, with households discontinuing fishing due to a drop in fish capture. Perennial floods, erosion, and climatic changes have reduced forest areas, impacting fishermen and food gatherers. Respondents note that both forest and aquatic species are diminishing due to adverse effects like erosion, floods, infrastructural development, and environmental changes (Figure 4).

### **Agricultural Challenges**

Majuli Island's economy heavily depends on agriculture, serving as the primary livelihood for about 80% of its residents. However, the number of people engaged in agriculture has been decreasing annually due to recurring floods, leading to diminishing land productivity (Chetry, 2020). Many residents have shifted to seasonal farming or abandoned farming altogether, opting to migrate in search of employment.



**Figure 4: Flooded and contaminated waters of the Brahmaputra in Ujani Majuli hampering aquatic species.**

Agriculture remains crucial for the Mishings in Majuli, providing both revenue and sustenance. The study reveals that agricultural production has slowed due to perennial floods, prolonged flood periods, riverbank erosion, and insufficient conditions for cultivation during floods. Primary challenges include soil erosion and sand build-up after floods (Chetry, 2022). While Ahu Paddy (Rice) was the main crop, there's a recent shift to Jhum farming due to its perceived benefits for crop yield and earnings. The Brahmaputra's heavy silt has significantly decreased soil quality for growing essential crops.

Despite the economic growth of the island depending on agricultural advancement, the sector remains underdeveloped. Adequate use of irrigation, insecticides, fertilisers, pesticides, and HYV seeds has not been achieved. The lack of facilities for marketing local produce poses an additional challenge (Chetry, 2020). Annual floods threaten Kharif crops, emphasising the need for a well-designed agronomic program. Effective planning requires adopting the right technology, a timely supply of essentials, and proper marketing strategies.

The study highlights an Athi System among some Mishing farmers, where the produce is shared between the farmer and the landlords. The ADO collects an annual fee, and flood-damaged agricultural land victims receive compensation under government documentation (Figure 5). Climate change and natural disasters have significantly impacted agricultural productivity, with floods, riverbank erosion, and sand accumulation affecting the Mishing community. Some families have adopted growing vegetables on rafts, known as floating gardens, to address flood challenges (Figure 6). However, these gardens are only accessible to some families due to the additional investments required, making them expensive for low-income families.



**Figure 5: Submerged agricultural land in Missamora.**



**Figure 6: Floating gardening.**

## Discussion

### Adapting to Climate Change and Future Floods

Traditional methods employed by the Mishings for annual floods have proven effective, but climate change poses new challenges for the marginal and vulnerable population in highly exposed flood zones. A key concern is the progressive loss of natural habitats. Similarly, Majuli experiences an unprecedented surge in construction, particularly in support of its UNESCO World Heritage Site application (UNESCO World Heritage Centre, n.d.). This leads to parallel processes: riverside communities becoming more vulnerable, and development activities gaining traction, causing drastic environmental changes and the gradual impact of floods.

Health issues, including vector-borne illnesses, are significant challenges. Safe drinking water is scarce in flood-affected villages, despite government schemes like Jal Jeevan being implemented (Figure 7). Agricultural inputs and housing programs, initiated by the state and block Panchayats are some of the Govt. schemes.





Figure 7: Government Scheme, Jal Jeevan (Tap water connection).

However, respondents note limited benefits favouring households with significant political influence. Government and non-governmental organisations implement measures like early warning systems and



Figure 8: Broken bridge in Bonoria Chapori.

relief efforts, but addressing the scale of the issue requires considering all aspects of social, economic, and environmental challenges.

Emerging Climate Change Trends

Climate change challenges in Majuli demand corrective action. Perennial floods, erosion, and an expanding

Table 1: Themes emerged from the study

Themes	Sub-Themes	Excerpts
Indigenous coping mechanism	Resilient house structure Early warning system Food preservation	Our Chang Ghars have been an integral part of our lifestyle and culture. It has helped us during dense flood situations. Observing the moon and stars known to be as “Thankar” in our dialogue. The lesser the stars it is a sign that rainfall is imminent the next day. During times of flooding, the availability of food is a challenge; therefore, we smoke fish and meat (Namsing) just above the fire place (Perab). The meat can be stored for two months and the fish (dried fish) for almost a year. We do this so that we do not run out of food.
Navigating climate vulnerabilities, socio-ecological dynamics, and adaptation strategies	Loss of property Constant relocating Migration High ratio of settlements	Our village (Bonoria Chapori) has been pushed about a kilometre due to erosion in the last five years. Last year alone, around twenty families relocated to other districts while some families resettled elsewhere in Majuli, particularly towards Ujani (North) Majuli.
Erratic trends in rainfall	Early rainfall Longer floods (duration) Livelihood disruption	We have been facing early rainfall from May for the last two years. Usually, it starts in June. Most of the farmers are facing plantation problems due to erratic rainfall.
Risk to forestry and aquatic species	Birds migration Fish extinction Poor Water quality Habitat distraction.	Fishes have reduced remarkably due to heavy silts from the Brahmaputra. Birds are migrating to other places because the climate here has changed.
Agricultural challenges	Silt load Poor soil quality Low Soil fertility Low yields for Kharif crops	The soil is not fertile enough for us to practice shift cultivation. The silt from the rivers has ruined the quality of the soil. We need timely supply of fertilisers such as urea from the Government.

population strain the island's depleted natural assets (Figure 8). Traditional coping tactics equally need improvement to address the deteriorating habitat. The coping and adaptation techniques assure subsistence only in the short term, securing intra-stability but not intergenerational longevity.

Respondents acknowledge recent climate change, with high-risk flood areas experiencing erratic rainfall and warmer summers. Farmers and boatmen express concerns about irregular rainfall patterns leading to significant agricultural and aquatic losses. Complications from land fragmentation, over-reliance on forest resources, and declining fish catch pose imminent dangers to riparian villages like mishing.

A comprehensive strategy is essential, incorporating local knowledge and modern approaches. This includes afforestation, promoting sustainable land use, better water management, and advanced technologies (Longkumer & Kannan, 2023). Prioritising community engagement in flood risk management empowers locals and ensures context-specific and effective strategies. The focus should be on preserving and sustainably using Majuli's resources to mitigate risks associated with floods and other environmental factors.

### Implications

Climate-related hazards are emerging concerns in the highly exposed flood zones of Majuli Island. To prepare for future disasters, flood risk reduction policies in the context of Majuli need particular emphasis through climate and disaster adaptation community-based approaches. This includes fortifying early warning systems, providing livelihood opportunities, and promoting sustainable adaptation to changing environments. Urgent interventions or initiatives to address these challenges must be based on strengthening resilience to climate impacts in order to meet the global 13<sup>th</sup> Sustainable Development Goals agenda.

The socio-economic and environmental well-being of the Mishings and coexisting communities in Majuli must be addressed as part of comprehensive and coordinated measures to ensure their sustainability; including fostering inclusive development that respects cultural identity and knowledge systems.

### Conclusion

Climate change impacts on flood-prone villages in Majuli are increasingly problematic, emphasising the need to strengthen current policies and planning. A community-

based and nature-based adaptation approach is necessary to address multifaceted challenges. Stakeholders should emphasise climate change threats through consistent training, awareness campaigns, and safety measures for vulnerable communities. Facilitating discussions among NGO networks, government representatives, and civil societies is crucial. Promoting alternative and sustainable livelihoods is vital for affected communities in preparation for future flooding events. While recent progress has been made in community-based and natural adaptations, further exploration in the context of river islands is needed. Integrating adaptation techniques into overall development planning will enhance the resilience of socially vulnerable communities against climatic threats.

Inclusive studies through community participation are essential to address flood concerns in Majuli. Adequate research, regular assessments, and detailed investigations are required in target areas to strengthen long-term measures; for communities heavily dependent on the island's resources. Further exploration is needed to enhance prevention systems through adequate records and detailed investigations. In the long run, it calls for more effective governance and coordination carefully considered and appropriate to the local environment.

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