



Indigenous knowledge and community disaster resilience to cyclones: Evidence from the south-central coastal region of Bangladesh

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Abstract

The coastal region of Bangladesh is highly vulnerable to climate change and climate-induced disasters, particularly cyclones and storm surges. Coastal communities experience various disasters almost every year. Over generations, local people have developed indigenous knowledge and traditional practices to reduce disaster risks and cope with environmental challenges. These locally developed practices play an important role in strengthening community resilience and supporting disaster adaptation. The main objective of this study was to identify, assess, and document indigenous knowledge practices used for cyclone and storm surge disaster risk reduction in the coastal region of Bangladesh. The study was conducted in Dashmina Upazila of Patuakhali District in the south-central coastal region of Bangladesh. Both primary and secondary data were collected through Focus Group Discussions (FGDs), Key Informant Interviews (KIIs), direct observations, case studies, and literature review. The study identified several important indigenous practices for disaster risk reduction and climate adaptation. These include keeping valuable items under the soil during cyclone warnings, wearing mobility-supportive clothing during cyclones and storm surges, planting disaster-resilient trees along embankments, collecting rainwater for future use, storing cooking fuel on raised platforms, exchanging food support through social relationships during crises, using portable clay stoves during floods, drying and storing cow dung as fuel, hanging valuable items and food from house crossbeams, and using local fish conservation techniques during flooding. The findings indicate that indigenous knowledge provides simple, low-cost, locally available, and environmentally sustainable solutions for disaster preparedness and resilience in coastal communities. The study suggests that indigenous knowledge and local practices should be recognized and integrated into disaster risk reduction planning, climate adaptation programs, and development initiatives to enhance community resilience in coastal Bangladesh.

Keywords: Indigenous knowledge, disaster risk reduction, disaster resilience, cyclone, storm surge, coastal Bangladesh

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1 Introduction

Indigenous knowledge (IK) refers to the knowledge, skills, and practices that local people develop through long-term experience and pass from one generation to another. This knowledge is closely connected with local culture, traditions, beliefs, and the natural environment (Macnight Ngwese et al., 2018). Indigenous knowledge is mainly based on practical experience and observations gathered over many years. Local communities preserve and share this knowl-

edge through social practices, traditions, and cultural activities (Senanayake, 2006). Researchers have shown that indigenous knowledge plays an important role in reducing disaster risks and protecting people's lives and property during natural hazards. Many successful disaster management practices are based on the use of local and indigenous knowledge (Kurnio et al., 2021). Communities living in hazard-prone areas have developed their own coping strategies and adaptation techniques over generations,

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which help them respond to different natural disasters and environmental changes (Pokhrel et al., 2021). These traditional practices are important for strengthening community resilience (Dhungana and Yamphu, 2016). In this study, the term indigenous knowledge refers to locally developed knowledge and practices of rural Bengali coastal communities rather than the knowledge systems of officially recognized Indigenous Peoples. This knowledge has evolved through long-term experience of living with cyclones, storm surges, floods, and other coastal hazards and is transmitted across generations through observation, practice, and community learning.

Bangladesh is one of the most disaster-prone countries in the world due to its geographical location and changing climate (Dastagir, 2015; Biswas et al., 2015; Saha et al., 2024; Faisal et al., 2024a; Shamsuzzoha et al., 2025; Faisal et al., 2026a). The coastal region of Bangladesh is especially vulnerable due to its low-lying land and proximity to the Bay of Bengal (Barua et al., 2016; Biswas et al., 2016). This area frequently experiences cyclones, storm surges, floods, riverbank erosion, salinity intrusion, waterlogging, droughts, lightning, heatwaves, and other climate-related hazards (Mallick et al., 2017; Mukherjee et al., 2020; Faisal et al., 2021; Faisal et al., 2024b; Faisal et al., 2025; Canete et al., 2025; Faisal et al., 2026b). These disasters seriously affect the livelihoods of coastal people, especially farmers who depend on agriculture for their income (Islam et al., 2019; Saha et al., 2019). Poverty, low literacy, unemployment, and limited access to healthcare further increase the vulnerability of coastal communities and create challenges for disaster risk reduction and sustainable development.

Due to limited financial and technical resources, many rural communities in Bangladesh still rely on indigenous knowledge to prepare for and cope with disasters. Community-based initiatives and indigenous practices have been found effective in improving local resilience in many parts of the world (Sharma, 2021). However, indigenous knowledge is often ignored in formal disaster management and climate adaptation planning by governments and institutions (Petzold et al., 2020; Seddikiy et al., 2020). Despite this lack of recognition, local people continue to depend on their traditional knowledge systems to manage environmental changes and disasters. Indigenous knowledge also supports local decision-making and helps communities respond quickly to environmental risks (Smith et al., 2017). Many researchers have emphasized the importance of integrating indigenous and scientific knowledge to improve disaster resilience and climate adaptation (Gratani et al., 2011; Makondo and Thomas, 2018). Integrating these two knowledge systems can help communities develop more effective, practical, and sustainable adaptation strategies (Makate, 2020; Mudemba et al., 2021). Indigenous knowledge also contributes to sustainable resource management, biodiversity conservation, and community resilience (Fabiyyi and Oloukoi, 2013; Saylor et al., 2017). In many developing countries, rural people rely heavily on local coping strategies due to limited access to modern technology, formal education, and disaster-related information. Studies from different regions of the world have highlighted the value of traditional knowledge in natural resource management and

disaster preparedness (Tiwari et al., 1998; Coppolillo, 2000; Byers et al., 2001).

This study is guided by the concepts of community resilience and community-based disaster risk reduction (CB-DRR), which recognize that local communities possess valuable knowledge and capacities developed through long-term interactions with their environment. The study also adopts the Multiple Evidence Base (MEB) approach, which considers Indigenous Knowledge and scientific knowledge as complementary systems that can jointly support more effective disaster risk reduction and climate adaptation. Rather than viewing one knowledge system as superior to another, the MEB approach encourages mutual learning, respect, and knowledge co-production to strengthen resilience in hazard-prone communities.

Although previous studies have highlighted the importance of indigenous knowledge in disaster risk reduction and climate change adaptation, most have focused on documenting traditional practices or discussing their general importance. Limited attention has been given to the systematic evaluation of indigenous practices using an analytical framework and to identifying practical strategies to improve and integrate them into formal disaster risk reduction planning. Furthermore, there is relatively little empirical research on cyclone- and storm-surge-related indigenous knowledge in the south-central coastal region of Bangladesh. This study addresses these gaps by identifying, assessing, documenting, and proposing improvements to indigenous practices to strengthen community disaster resilience.

Therefore, preserving and documenting indigenous knowledge is important for both disaster risk reduction and sustainable development. Indigenous practices often provide low-cost and nature-based solutions that help communities survive and recover from disasters, especially in coastal areas. This study focuses on Dashmina Upazila of Patuakhali District in the south-central coastal region of Bangladesh. The main aim of the study is to identify, analyze, document, and improve indigenous knowledge and local practices for managing cyclone and storm-surge risks. The study also aims to raise awareness of the importance of indigenous knowledge and to encourage its integration into formal disaster management and resilience-building programs. To achieve this aim, the study addresses the following research question: What indigenous knowledge and traditional practices do coastal communities use to reduce the impacts of cyclones and storm surges? What are the strengths, weaknesses, opportunities, and threats (SWOT) of these indigenous practices? How can these indigenous practices be improved and integrated into community-based disaster risk reduction and climate adaptation planning? By highlighting the experiences of local communities, this research seeks to support policymakers, researchers, and practitioners in recognizing the value of indigenous knowledge for building disaster-resilient communities.

2 Methodology

2.1 Study Area

This study was conducted in Dashmina Upazila of Patuakhali District, Bangladesh (Fig. 1). The total area of the

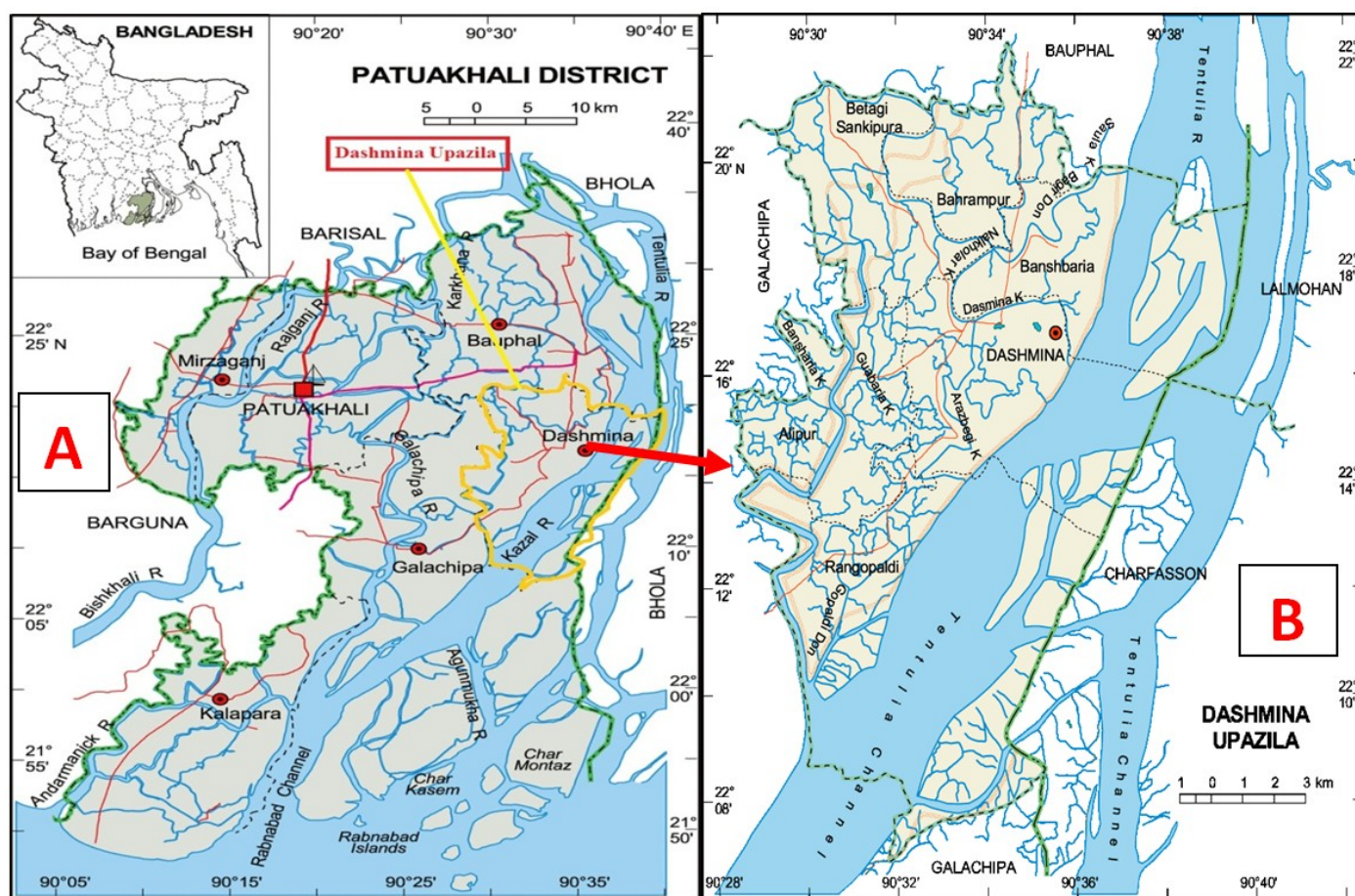


Fig. 1. Map (A) shows Patuakhali District within Bangladesh and highlights Dashmina Upazila; Map (B) provides a closer look at Dashmina Upazila (Source: [Faisal et al., 2024a](#)).

upazila is about 351.87 square kilometers. Geographically, Dashmina is located between $22^{\circ}02'$ and $22^{\circ}18'$ north latitudes and $90^{\circ}29'$ and $90^{\circ}40'$ east longitudes. The upazila is bordered by Bauphal Upazila in the north, Char Fasson Upazila in the east, and Galachipa Upazila in both the south and west ([BBS, 2012](#)). Dashmina Upazila consists of six unions: Betagi-Sankipura, Bahrapur, Bansbaria, Alipur, Rangopaldi, and Dashmina. The postal code of the upazila is 8630. According to the Bangladesh Bureau of Statistics ([BBS, 2012](#)), the total population of Dashmina Upazila is 123,388, with a population density of 351 persons per square kilometer. There are 28,490 households in the area, and the average household size is 4.3 persons. Among the total population, 49% are male, and 51% are female. The majority of the people are Muslim (93%), while about 7% are Hindu. The average literacy rate of the upazila is 29.6%. Agriculture and fisheries are the main sources of livelihood for the local people. The major crops grown in the area are paddy, potato, pulse, chilli, and watermelon. Common fruits include banana, jackfruit, and papaya ([BBS, 2012](#)). Due to its coastal location and exposure to cyclones and storm surges, Dashmina Upazila was selected as the study area for investigating indigenous knowledge and community disaster resilience.

Although these communities are not recognized as Indigenous Peoples under national or international classi-

fications, they possess rich, locally developed knowledge and traditional practices that have evolved over generations through continuous interaction with the coastal environment. Throughout this paper, the term "indigenous knowledge" refers to this locally developed, intergenerational knowledge system.

2.2 Data Collection on Indigenous Knowledge

To achieve the study objectives, both primary and secondary data were collected. Primary data were obtained through Focus Group Discussions (FGDs), Key Informant Interviews (KIIs), direct observation, and case studies. In contrast, secondary data were collected from books, journal articles, reports, websites, and other relevant documents. Participants were selected through purposive sampling and included community leaders, elderly residents, farmers, fishers, women, teachers, local government representatives, NGO workers, religious leaders, and members of community-based organizations who were knowledgeable about traditional disaster management practices. A qualitative research design was adopted because Indigenous Knowledge is context-specific and experience-based. Multiple data collection methods were used to achieve methodological triangulation, thereby enhancing the credibility and trustworthiness of the findings.

2.2.1 Focus Group Discussion (FGD)

Focus Group Discussions (FGDs) were conducted to collect detailed information on Indigenous Knowledge and local disaster management practices. Each FGD included 6–10 purposively selected participants with relevant knowledge and experience. Participants included farmers, women, older adults, landless households, and other knowledgeable community members, most of whom were over 40 years of age. A total of ten FGDs, involving 76 participants, were conducted using a predesigned discussion guide. Discussions were held in Bangla, audio-recorded with participants' consent, and supplemented by field notes. Both men and women participated, and efforts were made to ensure women's active participation during the discussions.

2.2.2 Key Informant Interview (KII)

After conducting the FGDs, Key Informant Interviews (KIIs) were carried out to validate and further analyze the identified indigenous knowledge and local housing practices. KIIs were conducted with individuals who had good knowledge and long experience regarding local disaster management and indigenous practices. The key informants included present and former social leaders, school teachers, Union Parishad representatives, members of Community-Based Organizations (CBOs), NGO workers, and religious leaders. Most participants were between 40 and 70 years old, except for some women Union Parishad members and teachers. These individuals were selected for their knowledge of local conditions and indigenous practices. A predesigned interview questionnaire was used to guide the interviews, and responses were recorded in an exercise book. In total, 15 KIIs were conducted for this study.

2.2.3 Direct Observation

Direct observation was conducted following the FGDs and KIIs to validate the information collected and to gain a better understanding of indigenous practices in the study area. Transect walks were conducted at different locations to observe local housing patterns and indigenous technologies used for disaster risk reduction and climate adaptation. During the observation process, the researcher carefully examined practices at both the household and community levels, considering questions such as what, when, where, who, why, and how (Yin, 2018). This method helped to understand the practical use of indigenous knowledge in daily life. Photographs of indigenous housing technologies and practices were also taken during the field observation.

2.2.4 Case Studies

Case studies were conducted to gather detailed information from a small number of selected households and individuals who represented the larger community. These case studies provided an in-depth understanding of how indigenous housing technologies help people cope with cyclones and other disasters. The case studies also explored local histories and changes in housing patterns and adaptation practices over time (Cavestro, 2003). In total, four case studies were conducted for this research.

2.2.5 Secondary Data Review

Secondary data were collected and reviewed from different published and unpublished sources. These included books, journal articles, research papers, reports, maps, websites, theses, and baseline reports from different governmental and non-governmental organizations (NGOs). The review of secondary data helped support and compare the findings obtained from the field study.

2.3 Assessment of Indigenous Knowledge

2.3.1 Attribute Assessment

The study assessed indigenous knowledge of the local communities to cope with cyclones and storm surges. The assessment focused on traditional coping practices, particularly asset protection, gender-sensitive safety and evacuation, ecosystem-based protection, water security, energy and cooking continuity, social resilience, and livelihood protection. It evaluated their contribution to household and community disaster resilience by examining their effectiveness, strengths, and role in reducing disaster risk.

2.3.2 SWOT (Strengths, Weaknesses, Opportunities, and Threats) Analysis

A SWOT analysis was conducted to evaluate indigenous knowledge and practices from a disaster risk reduction perspective (Chang and Huang, 2006). This method helped identify the strengths, weaknesses, opportunities, and threats related to local indigenous practices (SAARC Disaster Management Centre, 2009). The SWOT analysis included two main dimensions: Internal factors (strengths and weaknesses) and External factors (opportunities and threats). Different strategies were developed based on the SWOT analysis, including: SO strategies: using strengths to take advantage of opportunities; WO strategies: reducing weaknesses by using opportunities; ST strategies: using strengths to reduce threats; WT strategies: minimizing both weaknesses and threats simultaneously (Sevkli et al., 2012).

The SWOT analysis was conducted in several steps. First, a SWOT discussion session was organized with community members and relevant stakeholders. Then, strengths, weaknesses, opportunities, and threats were identified through brainstorming and discussion. After that, a SWOT matrix was prepared and compared with internal and external factors to develop appropriate strategies. The researchers prepared the preliminary SWOT analysis based on the field data and relevant literature. The findings were then discussed with key informants and community participants to verify that the identified strengths, weaknesses, opportunities, and threats accurately reflected local experiences. Finally, the strategies and their possible outcomes were reviewed and updated when necessary.

2.4 Strengthening Indigenous Practices

After identifying the indigenous knowledge and local practices, efforts were made to improve and scale up these valuable practices through discussions and brainstorming

sessions with community members. The purpose was to make indigenous practices more effective and better suited to disaster resilience in coastal Bangladesh. Community opinions and local experiences were considered during this improvement process.

This study recognizes indigenous knowledge as a legitimate knowledge system developed through generations of local experience and environmental interaction. The researchers do not assume that indigenous knowledge requires replacement or correction by scientific knowledge. Instead, the study adopts a collaborative perspective in which indigenous and scientific knowledge can complement one another. Therefore, the recommendations presented in this study are not intended to modify indigenous knowledge itself but to strengthen the effectiveness, safety, and wider applicability of existing community practices through dialogue with community members and relevant stakeholders.

2.5 Data Analysis

The study adopted a thematic analysis approach to analyse the qualitative data collected through Focus Group Discussions (FGDs), Key Informant Interviews (KIIs), direct observations, and case studies. Audio recordings and field notes were first transcribed and reviewed several times to ensure familiarity with the data. Relevant statements related to indigenous knowledge and disaster risk reduction were then coded and grouped according to their similarities. These codes were subsequently organized into broader themes representing different indigenous knowledge practices used by coastal communities for cyclone and storm surge risk reduction. To improve the credibility of the findings, information collected from different sources was compared and verified through methodological triangulation. The findings from FGDs, KIIs, direct observations, case studies, and secondary literature were cross-checked to ensure consistency and reliability. Each identified indigenous practice was then analysed using two complementary analytical frameworks consisting of thematic analysis. First, each practice was assessed based on its attributes, required resources, purpose, and local application. Second, a SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis was conducted to evaluate the potential contribution of each practice to disaster risk reduction and community resilience. This analytical framework provided a systematic basis for comparing different indigenous practices while maintaining their social, cultural, and environmental contexts. This combination of analytical approaches enabled a systematic assessment of indigenous knowledge and its contribution to community disaster resilience.

Microsoft Excel 2010 was used to organize the coded data and prepare summary tables. The qualitative findings are presented descriptively to explain the indigenous knowledge practices and their role in strengthening disaster resilience in the study area.

2.6 Documentation

Different documentation methods were used during the data collection process, including note-taking, audio recording, and photography. Researchers carefully recorded all important information collected from the field. Before leaving the study area each day, the researchers checked whether all necessary data had been properly collected and documented. Documentation was carried out regularly throughout the fieldwork period to avoid data loss and to ensure the accuracy and reliability of the collected information.

2.7 Ethical Considerations

Ethical principles were followed throughout the research process. Before data collection, all participants were informed about the purpose of the research, the voluntary nature of their participation, and their right to withdraw from the study at any stage without consequence. Verbal informed consent was obtained from all participants before conducting interviews, focus group discussions, observations, and case studies. Participants' identities were kept confidential, and personal information was anonymized during data analysis and reporting.

3 Results and Discussion

3.1 Keeping Valuable Items Buried During Cyclone Warnings

The study found that many people in Dashmina Upazila follow an indigenous practice of burying valuable items under the soil after receiving cyclone warnings. This practice is mainly used to protect important belongings from cyclone damage, flooding, and theft. Valuable items include land deeds, important documents, money, ornaments, dry food, drinking water, candles, matchboxes, and gas lights. When community members receive a cyclone warning and expect a severe cyclone, they dig a hole either inside their house platform or in the courtyard. The valuable items are usually stored in plastic containers, pots, or waterproof boxes before being buried in the soil. After the cyclone ends and people return home from cyclone shelters, they recover the buried items. The study also found that some households prefer to bury their valuable belongings inside the house instead of the courtyard. This is mainly because they fear theft during their absence while staying in cyclone shelters. They believe that thieves may steal the buried items if they are hidden outside and someone becomes aware of the location. Therefore, the location of burying the valuables mainly depends on the importance and value of the items, as well as the security concerns of the household. This indigenous practice reflects the local community's practical knowledge and experience in coping with cyclone-related risks. It is a low-cost and locally developed strategy that helps reduce the loss of valuable household assets during disasters.

Case Study 1

S. C. (48 years old), a farmer from Rangopaldi Village in Dashmina Upazila, keeps important land deeds and documents at home. Before evacuating to a cyclone shelter during a severe cyclone warning, he packed his land deeds, money, candles, a gas light, and dry food (e.g., puffed rice, flattened rice, and molasses) in waterproof plastic containers. He then buried them in a hole inside his house. After the cyclone, he returned and found all the items safe and undamaged. This case illustrates how a simple indigenous practice can effectively protect valuable documents and emergency supplies from cyclone impacts, thereby reducing household losses and strengthening disaster resilience.

Source: S. C., 48 years old, Rangopaldi Village, Dashmina Upazila.

3.1.1 Assessment of the knowledge

- a. **Attributes:** This practice is a form of technological indigenous knowledge used to protect valuable household items during cyclones and storm surges.
- b. **Resource needs:** A spade or khonta (digging tool) and waterproof plastic containers or plastic sheets.
- c. **Purpose of the Practice:** To protect important documents, money, food, and other essential household items from cyclone and storm surge damage, thereby reducing disaster-related losses.
- d. **SWOT Analysis**

Strengths	Weaknesses	Opportunities	Threats
Simple, low-cost practice that can be adopted by most households.	Digging may be difficult for women and older people, and buried items may be affected by erosion or flooding.	Waterproof containers and community awareness can improve the practice and encourage storage of emergency supplies.	Theft and severe flooding or storm surges may compromise the safety of buried items.

3.1.2 Strengthening Indigenous Practices

This practice can be strengthened by using durable waterproof containers, promoting community awareness through courtyard meetings, and storing emergency supplies (e.g., *muri*, *chira*, candles, and matches) in sealed containers buried at safe locations within the household for emergency use.

3.2 Wearing Mobility-Supportive Clothes during Cyclones and Storm Surges

The local community reported that traditional clothing worn by women, especially sarees, creates difficulties during cyclones and storm surges. According to the participants in the Focus Group Discussions (FGDs), sarees make it difficult for women to move quickly to safe places during

evacuation. They also mentioned that sarees create problems for swimming or moving through flood and storm surge water during emergencies. Community members explained that women often have to carry children while evacuating to cyclone shelters, which further limits their movement and increases their vulnerability during disasters. Participants believed that uncomfortable clothing was one of the reasons for the high number of female casualties during major cyclones such as the Bhola Cyclone of 12 November 1971 and Cyclone Sidr of 15 November 2007.

During the focus group discussions, community members explained that the traditional sari worn by many women can restrict movement during cyclones and storm surges, making it more difficult to run, climb, or swim. Therefore, they recommended wearing salwar-kameez, a traditional South Asian outfit consisting of loose-fitting trousers (salwar) and a long tunic (kameez), during emergencies because it provides greater comfort and freedom of movement. This finding shows how local experiences and indigenous understanding can help identify simple but effective ways to improve disaster preparedness and reduce disaster-related risks for vulnerable groups, especially women.

Case Study 2

S. M. (65 years old), a fisherman from Bansbaria Village, recalled his experience during the 1970 Bhola Cyclone, when his family lived on Char Federation, an island in the Tetulia River. At that time, there was no early warning system, radio communication, or cyclone shelter on the island. When the cyclone struck, all houses were destroyed and the storm surge rose to about 20 feet above the household yard. Residents climbed trees to survive, and many family members became separated during the night. While taking shelter in a banyan tree, S. M. rescued a woman who was struggling to swim because her saree restricted her movement in the floodwater. After encouraging her to remove the saree, she was able to survive. The following morning, many people, particularly women and children, were missing or had died. According to S. M., several women became trapped because their sarees were caught on trees or damaged house structures during the storm surge.

Based on this experience, he recommends that women wear salwar-kameez (a loose-fitting tunic and trousers) during cyclones and floods to improve mobility and reduce physical vulnerability during evacuation and survival.

Source: S. M., 65 years old, Bansbaria Village, Dashmina Upazila.

3.2.1 Assessment of the Knowledge

- a. **Attributes:** This practice represents cultural indigenous knowledge. Although women traditionally wear sarees in the study area, the community recommends wearing salwar-kameez during cyclones, storm surges, floods, and high tides to improve mobility and safety.

- b. Resource Needs:** An emergency set of mobility-supportive clothing (e.g., salwar-kameez) for women.
- c. Purpose of the Practice:** To reduce women's physical vulnerability by improving mobility, facilitating evacuation, and enhancing safety during cyclones, storm surges, floods, and high tides.

d. SWOT Analysis of the Practice

Strengths	Weaknesses	Opportunities	Threats
Mobility-supportive clothing improves women's mobility for running, climbing, and swimming during emergencies.	Some women may be reluctant to change from traditional clothing or may feel uncomfortable wearing salwar-kameez during disasters.	Most women are already familiar with wearing salwar-kameez, and awareness programs can promote preparedness by encouraging emergency clothing.	Cultural norms and the potential risk of harassment in crowded cyclone shelters may discourage adoption.
It is a low-cost, long-term safety measure that can reduce women's physical vulnerability during cyclones and storm surges.			

3.2.2 Strengthening Indigenous Practices

This practice can be strengthened by encouraging women to keep mobility-supportive emergency clothing (e.g., salwar-kameez) ready for disasters, promoting awareness through community, religious, and NGO leaders, incorporating the practice into preparedness training, and ensuring women's safety and privacy in cyclone shelters.

3.3 Plantation of Disaster-Resilient Trees along Embankments

The local community in the study area believes that forests and trees provide important protection against cyclones and strong winds. According to community members, cyclonic winds first pass through roadside forests, social forests, and other vegetation before reaching homestead forests and houses. Therefore, trees help reduce the speed and strength of cyclonic winds and protect settlements from severe damage. Community people observed that some tree species traditionally planted along embankments for boat construction purposes are weak against strong cyclonic winds. Trees such as chambul tree, rain tree, and korai tree are easily uprooted during severe cyclones. For example, local people reported that a farmer lost his life during Cyclone Aila after a chambul tree fell on him during the storm. Based on their long-term experience, the local community identified date palm tree, palm tree, akashmoni tree, shisu tree, and loha tree as more wind-resistant and safer tree

species. These trees are considered stronger and less likely to be uprooted during cyclones. As a result, community people plant these trees on both sides of embankments (veribadh) to reduce the pressure of cyclonic winds and increase protection for nearby settlements. This indigenous practice reflects the community's local ecological knowledge and their understanding of suitable tree species for disaster risk reduction in coastal areas.

3.3.1 Assessment of the Knowledge

- a. Attributes:** This practice is a form of social indigenous knowledge. Roadside and embankment tree plantation requires strong social cohesion, cooperation, and mutual support among community members. The success of this practice depends on active participation and collective action by local people.
- b. Resource Needs:** The following resources are needed for this practice: Nurseries of deep-rooted and wind-resistant trees such as date palm tree, palm tree, and loha tree; Community labor for planting trees along embankments and roadsides; Community participation and labor for protecting trees from cattle and other damage.
- c. Purpose of the Practice:** The main purposes of this indigenous practice are: to reduce the direct impact of cyclonic winds and storm surges; to protect embankments from erosion and damage; to increase environmental protection and community safety during disasters.

d. SWOT Analysis

Strengths	Weaknesses	Opportunities	Threats
Environment-friendly, low-cost, and strengthens community resilience through tree planting and social cooperation.	Benefits take time to develop and depend on active community participation.	Government and NGO afforestation programs can support expansion and improve long-term environmental resilience. Trees can provide alternative income through nurseries and serve as emergency shelter during cyclones and storm surges.	Riverbank erosion, illegal tree cutting, and cattle grazing may damage or reduce tree survival.

3.3.2 Strengthening Indigenous Practices

This practice can be strengthened by assigning community members to protect trees so that cattle and children cannot damage them, integrating local plantation efforts with government and NGO afforestation programs, promoting community participation, and raising awareness through courtyard meetings.

3.4 Collecting Rainwater for Future Use

In the study area, most households depend on deep tube-wells for drinking water, but many are located far from homes, making water collection difficult, especially for women who are primarily responsible for this task. During the monsoon, muddy and slippery roads further limit access to tube-wells. As an indigenous adaptation strategy, many households harvest and store rainwater for drinking and domestic use. Rainwater is mainly collected from rooftops using plastic containers, drums, or earthen pots. Some households also use a simple rainwater harvesting system made of bamboo poles and a plastic sheet to channel rainwater into storage containers. Others attach 2–3 “moski” (local triangular tin channels) to the roof edge to direct rooftop runoff into containers. This low-cost and locally developed practice provides a reliable source of safe water during the rainy season, reduces the burden of water collection, and demonstrates how indigenous knowledge supports household water security in coastal communities.

3.4.1 Assessment of the Knowledge

- a. **Attributes:** This practice is a form of technological indigenous knowledge for harvesting and storing rainwater for household use.
- b. **Resource Needs:** The main materials required for this practice include: “Moski” (a triangular tin structure used to direct water flow), Plastic sheets, Bamboo poles, Rope, Water storage containers, Simple water filters.
- c. **Purpose of the Practice:** To collect and store safe drinking water through rainwater harvesting, especially during the rainy season when access to safe drinking water becomes difficult.

d. SWOT Analysis

Strengths	Weaknesses	Opportunities	Threats
Simple, low-cost technology using locally available materials.	Water quality may be affected by contaminated roofs, limited storage capacity, and difficulties in long-term preservation.	NGO support, improved storage systems, and training on water purification can enhance the practice.	Contaminated rainfall and poor system maintenance may reduce water safety.

3.4.2 Strengthening Indigenous Practices

This practice can be strengthened by installing larger rainwater harvesting systems on household and public buildings particularly by using the rooftops of schools and other public institutions, introducing improved storage technologies such as large underground or concrete water storage tanks, promoting alternative catchment methods like ground catchment systems, and raising community awareness on safe water collection, purification, and storage through courtyard meetings and educational materials.

3.5 Storing Firewood, Jute Stalks, and Dry Cow Dung on Raised Platforms for Future Use

The study found that local people in Bansbaria Union of Dashmina Upazila use an indigenous practice to protect cooking fuel during the rainy season, floods, and cyclones (Fig. 2). Community households store firewood, jute stalks, and dry cow dung on raised bamboo platforms and cover them with plastic sheets to keep them dry for future cooking needs. Usually, the raised platforms are made of bamboo and are about three to five feet high. The fuel materials are arranged in a sloping shape, where one side remains higher than the other. In some cases, the middle part is kept higher than the surrounding sides. This design helps rainwater drain quickly and prevents water from accumulating on the stored fuel. After arranging the fuel, the entire structure is covered with plastic sheets for additional protection from rain and floodwater. Households located near embankments or large roads often build these storage platforms on the slopes of embankments or raised roadside areas to reduce the risk of flooding. According to community members, storing fuel in this way helps keep the materials dry even during heavy rainfall and waterlogging. The study also found that this indigenous practice has been passed down from older generations to younger family members. It reflects the community’s practical knowledge and local adaptation strategies for maintaining cooking fuel supplies during disasters and extreme weather conditions.



Fig. 2. Storing firewood, jute stalks, dry cow dung on raised platforms.

Case Study 3

H. H. lives in the Bansbaria Launch Station area of Bansbaria Union in Dashmina Upazila. He practices an indigenous method of storing cooking fuel to protect it from rain and floodwater. In his household yard, he builds a bamboo platform approximately three feet high and stores firewood on it. The stored fuel is then covered with plastic sheets to keep it dry during the rainy season and flooding events. According to H. H., the raised height of the platform helps protect the fuel from floodwater and waterlogging. He learned this practice from his father and has continued using it for many years. This case study demonstrates how indigenous knowledge is transferred from one generation to another and how simple local technologies help rural households preserve essential cooking fuel during disasters and extreme weather conditions.

3.5.1 Assessment of the Knowledge

- a. **Attributes:** This practice is a form of traditional technological knowledge passed down through generations to protect cooking fuel during the rainy season and disasters.
- b. **Resource Needs:** The main materials required for this practice include: Bamboo, Rope, Plastic sheets, Axe, Shovel.
- c. **Purpose of the Practice:** To keep cooking fuel dry by protecting it from rain, flooding, and moisture, ensuring fuel availability during emergencies.
- d. **SWOT Analysis**

Strengths	Weaknesses	Opportunities	Threats
Low-cost, easy-to-apply practice that keeps large amounts of fuel dry and reduces fire risk.	Bamboo platforms require maintenance and may weaken over time.	Platforms can be upgraded with durable materials and promoted as a community disaster preparedness measure.	Outdoor storage is vulnerable to theft and damage from strong winds or floods.

3.5.2 Strengthening Indigenous Practices

This practice can be strengthened by replacing bamboo platforms and plastic covers with more durable concrete and tin structures, and by promoting safe fuel storage through community awareness programs, interactive sessions, and educational materials like posters and visual materials can be used during community awareness programs.

3.6 Using Social Relationships to Exchange Food Support during Crisis

The study found that food scarcity is a common problem during and after disasters in the study area. Many families face serious difficulties in managing food after cyclones, floods, and other climate-related hazards. To cope with this situation, households in Gachani village under Dashmina Upazila practice a traditional system of sharing and exchanging food with relatives, neighbors, and other community members during times of crisis. Community people reported that affected families often receive food assistance, money, and other necessary support from nearby households and relatives. In many cases, money is shared without interest or formal conditions. This mutual support system helps vulnerable families survive during emergency periods when external assistance is limited or delayed. The study also found that local people maintain strong social relationships and regular communication with neighbors and relatives to continue this traditional support system. These social connections strengthen community bonding, cooperation, and collective resilience during disasters. This practice is not limited to Gachani village only; similar forms of mutual support and resource sharing are widely practiced throughout Dashmina Upazila. The findings suggest that social relationships and community cooperation play an important role in strengthening local disaster resilience and reducing food insecurity during emergencies.

Case Study 4

S. B. (42 years), a housewife from Dokkhin Daspara Village, Bansbaria Union, depended on her husband's daily labor income. After Cyclone Sidr in 2007, her husband lost his job, leaving the family without sufficient food or savings. During this period, neighbors and relatives provided food and financial assistance, helping the family cope with the crisis. This case illustrates the importance of social networks and mutual support in strengthening household food security and community resilience during post-disaster recovery.

Source: S. B., 42 years, Housewife, Dokkhin Daspara Village, Bansbaria Union, Dashmina Upazila.

3.6.1 Assessment of the Knowledge

- a. **Attributes:** This practice is a form of social indigenous knowledge based on trust, mutual support, and strong community relationships.
- b. **Resource Needs:** Relatives, Neighbors Strong social relationships and community networks.
- c. **Purpose of the Practice:** To improve household food security and provide emergency support during and after disasters through mutual assistance.

d. SWOT Analysis

Strengths	Weaknesses	Opportunities	Threats
Strengthens household food security through trust, mutual support, and rapid local assistance without additional financial cost.	Informal and dependent on social relationships, cultural norms, and community willingness; cannot ensure long-term livelihood security.	Can be replicated in other disaster-prone areas and integrated with government social safety net programs.	Long-term dependence may create client–patron relationships and affect local market systems

3.6.2 Strengthening Indigenous Practices

This practice can be strengthened by promoting mutual support through community awareness programs, integrating local support systems with government social safety net programs (e.g., food-for-work, cash-for-work, and food assistance), and organizing courtyard meetings with educational materials to improve community preparedness and food security during disasters.

3.7 Storing Portable Clay Stoves for Emergency Cooking

The study found that most households in the study area traditionally use clay stoves for cooking (Fig. 3). Usually, families have separate kitchens where they install the stove and store dry firewood for daily cooking activities. However, people living outside the embankment frequently face

difficulties during the monsoon season because floodwater and high tides often enter their kitchens. When kitchens and fixed stoves become submerged under water, households experience serious problems in preparing food. To cope with this situation, many families keep an additional portable clay stove for emergency use. The main advantage of this traditional stove is its portability, as it can be easily moved from one place to another when necessary. During flooding, if water enters the house and submerges the floor, the portable stove can even be placed on a bed or raised platform to continue cooking safely. Community members reported that this indigenous practice is particularly useful during floods, high tides, cyclones, and nor'westers when kitchens are damaged or become unusable. The portable clay stove helps households maintain cooking activities during emergencies and reduces disruption to daily life. This practice reflects the adaptive capacity and practical knowledge of coastal communities in managing disaster-related challenges through simple, low-cost, and locally available technologies.



Fig. 3. Portable clay stove.

Case Study 5

R. B., a 40-year-old housewife from Bansbaria village in Dashmina Upazila, shared her experience during Cyclone Sidr in 2007. According to her, the cyclone severely damaged her kitchen, and her traditional clay stove was destroyed and submerged under water. As a result, she faced serious difficulties in cooking food for her family after the disaster. During this crisis, R. B. borrowed a portable clay stove from her nearby neighbor to prepare food. This experience helped her realize the importance of having an extra portable stove for emergency situations. After the cyclone, she made two portable clay stoves and stored them in a safe and elevated place along with dry firewood for future emergencies. This case shows how disaster experience encouraged the adoption of a simple, low-cost indigenous practice that improved household preparedness and resilience.

3.7.1 Assessment of the Knowledge

a. Attributes: This practice is a form of traditional technological indigenous knowledge that enables cook-

ing during floods, high tides, and other water-related disasters because it allows households to continue cooking even when kitchens become flooded or damaged.

b. Resource Needs: Sandy or silty clay soil for making the stove, or a portable clay stove costing approximately 100–150 BDT.

c. Purpose of the Practice: To ensure continued cooking when kitchens and fixed stoves are flooded or damaged during disasters.

d. SWOT Analysis

Strengths	Weaknesses	Opportunities	Threats
Simple, low-cost, portable, and enables cooking during floods and high tides.	Requires more cooking time and fuel than improved stoves.	Locally available materials and the introduction of improved stoves (e.g., Bondhu Chula) can enhance efficiency and durability.	The stove is fragile and can be damaged during transport or by water exposure.

3.7.2 Strengthening Indigenous Practices

The effectiveness of this practice can be improved by mixing rice husk, cow dung, or boiled rice starch with clay to increase stove durability, storing the stove on raised platforms to prevent water damage, introducing improved stoves such as Bondhu Chula for greater fuel efficiency, and promoting the practice through community awareness and courtyard meetings.

3.8 Drying Cow Dung in the Sun and Storing it on “Macha” for Fuel Use

The study found that dried cow dung is widely used as an alternative cooking fuel in the study area, especially among households with limited access to firewood and trees (Fig. 4). Families who rear cattle also collect cow dung and dry it in the sun for future cooking purposes. Women mainly perform these activities because they are primarily responsible for fuel collection and household cooking in the community.



Fig. 4. Drying cow dung in the sun.



Fig. 5. Hanging the valuables and food on the crossbeam of the house.

Community people use several traditional methods to prepare and dry cow dung fuel. In the first method, cow dung is attached around dry wood stalks or jute stalks and then dried in the sun. In the second method, a round structure approximately two feet in diameter is made using rice straw and then covered with cow dung before drying. In the third method, small round balls are made from cow dung and dried under sunlight. After drying, the cow dung can be preserved and used as fuel whenever needed. The study also found that community people consider dried cow dung to be an environmentally friendly fuel because it produces less air pollution compared to some other traditional fuels. In addition, the use of cow dung as fuel reduces dependence on forest resources and decreases the demand for firewood. For storage, local households commonly build a “Macha” (raised storage shelf) using bamboo and wood above the cooking stove inside the kitchen. However, because kitchen storage space is often limited, some households also build separate outdoor “Macha” structures in open spaces. These storage platforms are used to keep dried cow dung and other fuel materials dry and protected, usually by covering them with plastic sheets.

The study further observed that some financially capable households build separate small storage houses specifically for preserving fuel throughout the year. This indigenous practice helps ensure the availability of cooking fuel during floods, heavy rainfall, cyclones, and other disaster situations when normal fuel sources become difficult to access.

3.8.1 Assessment of the Knowledge

- a. Attributes:** This practice is a form of traditional indigenous knowledge that promotes the preservation and use of cow dung as an alternative household fuel.
- b. Resource Needs:** Cow dung, dry wood stalks, rice straw, sunlight, bamboo, wood, and plastic sheets.
- c. Purpose of the Practice:** To preserve cow dung as an environmentally friendly fuel, reduce dependence on firewood, and ensure fuel availability during disasters.
- d. SWOT Analysis**

Strengths	Weaknesses	Opportunities	Threats
Cow dung is a locally available fuel that can be stored for year-round use, especially during disasters.	Cow dung also serves as organic fertilizer, and its preparation, drying, and storage require time and space.	Widespread cattle rearing, locally available materials, and improved storage methods can enhance fuel availability.	Cultural beliefs and damage from heavy rainfall or flooding may limit the use and preservation of cow dung fuel.

3.8.2 Strengthening Indigenous Practices

This practice can be strengthened by encouraging households with surplus cow dung to share it with fuel-poor families, constructing improved storage spaces to protect dried cow dung and wood fuel from rain and flooding, and promoting awareness of the environmental and economic benefits of using cow dung as an alternative household fuel.

3.9 Hanging Valuable Items and Food from the Crossbeam of the House

The study found that most houses in the study area are constructed with tin and wood, while the floors are mainly made of soil. Houses located outside the embankment are highly vulnerable to flooding, tidal surges, and cyclones. During the monsoon season and periods of high tide, floodwater often enters the houses and submerges the floor. Similar conditions occur during cyclones and storm surges, creating difficulties in protecting household belongings stored on or near the ground. To cope with this problem, local people use an indigenous practice of hanging valuable household items and food from the crossbeams of their houses (Fig. 5). Community members commonly use a traditional hanging structure locally known as “Chika,” which is made from hogla leaves or jute fiber. In some cases, plastic ropes are also used for hanging items safely above floodwater level. The study observed that households use this method to protect important documents such as land deeds and official papers, clothing, quilts, seeds, preserved food, cooked food, cooking materials, and even incubating hens. By keeping these items above the ground level, families can reduce damage caused by floodwater and moisture during disasters.

This indigenous practice is widely used throughout the study area and represents a simple, low-cost, and locally adapted strategy for protecting essential household resources during floods, cyclones, and storm surges.

3.9.1 Assessment of the Knowledge

- a. Attributes:** This practice is a form of traditional technological indigenous knowledge used to protect household items from water, moisture, and pests during floods and high tides.
- b. Resource Needs:** Strong house crossbeams, hogla leaves, jute fiber, and plastic rope.
- c. Purpose of the Practice:** To keep valuable household items above floodwater level and protect them from water damage, to preserve cooked food and stored food from domestic animals such as dogs and cats, to protect incubating hens from animals such as foxes, civet cats, and other predators, to make effective use of limited flood-free space inside the house during disasters.

d. SWOT Analysis

Strengths	Weaknesses	Opportunities	Threats
Low-cost, simple practice using locally available materials that effectively protects household items from floodwater.	Limited storage capacity, and some households avoid the practice for aesthetic reasons.	Locally available materials, skilled community members especially women are skilled in making “Chika,” reducing the need for additional expenses and stronger designs can improve the practice.	Rats, moisture, insects, and strong cyclonic winds may damage stored items or hanging structures.

3.9.2 Strengthening Indigenous Practices

This practice can be strengthened by using steel or wooden cupboards (almirahs) and elevated shelves for safer storage, applying rat control measures to protect stored items, and promoting improved household storage practices through community awareness and courtyard meetings.

3.10 Placing Tree Branches and Fish Feed in Specific Areas of Ponds during Flooding

The study found that during the monsoon season, heavy rainfall often causes ponds in the study area to overflow and become flooded. Although fish farmers usually install net fences around ponds to prevent fish from escaping, rising floodwater frequently damages or overtops these barriers. As a result, fish may escape from the ponds during flooding events. To reduce this problem, local fish farmers use an indigenous practice of placing tree branches in a specific area of the pond and regularly dropping fish feed in

the same location. The fish feed commonly includes wheat bran, rice bran, cooked rice, or commercial fish feed purchased from local markets. According to community members, fish become accustomed to gathering in the selected feeding area because of the regular supply of food and shelter provided by the submerged branches. Farmers believe that this method helps keep fish concentrated within the pond even during periods of flooding, thereby reducing fish loss. The study suggests that this indigenous practice represents a simple and low-cost strategy for fish conservation and pond management during heavy rainfall and flood conditions. It also reflects the practical ecological knowledge of local communities in adapting fish farming practices to seasonal environmental challenges.

Case Study 6

S. B., a housewife from Adompura village under Bahrampur Union in Dashmina Upazila, practices fish cultivation in her household pond. Her family mainly cultivates white fish for household consumption and income generation. According to S. B., during the previous monsoon season her pond became flooded due to heavy rainfall, creating a risk of fish escaping from the pond. To reduce fish loss, she applied a local indigenous technique by placing fish feed like wheat bran, rice bran, and boiled rice in a specific area of the pond instead of spreading the feed throughout the entire pond. She reported that the fish regularly gathered in the selected feeding area, which helped keep them within the pond during the flooding period. As a result, she was able to reduce fish loss and successfully retain most of the fish in the pond. This case demonstrates how simple indigenous knowledge can reduce fish loss and strengthen livelihood resilience during flood events in coastal communities.

3.10.1 Assessment of the Knowledge

- a. Attributes:** This practice is a form of economic indigenous knowledge that helps reduce fish loss and protect household livelihoods during floods.
- b. Resource Needs:** Fish feed and tree or bamboo branches.
- c. Purpose of the Practice:** To retain fish in ponds and reduce fish escape during flooding, heavy rainfall and pond overflow.

d. SWOT Analysis

Strengths	Weaknesses	Opportunities	Threats
Simple, low-cost practice that can be applied by all household members.	Its effectiveness is uncertain and may not prevent fish loss during severe floods.	Can be combined with improved pond management and promoted through farmer awareness programs.	Severe flooding, pond embankment damage, and predatory fish may reduce its effectiveness.

Table 1. Indigenous knowledge practices and their contributions to community disaster resilience.

Resilience Function	Indigenous Practices	Contribution to Disaster Resilience
Asset protection	Keeping Valuable Items under the Soil during Cyclone Warnings; Hanging valuable items from roof crossbeams	Protects important household assets, documents, food, and clothing from floodwater, storm surges, and theft.
Gender-sensitive safety and evacuation	Wearing mobility-supportive Clothes (salwar-kameez for women) during Cyclones and Storm Surges	Improves women's mobility, evacuation, climbing, and swimming during emergencies while reducing physical vulnerability.
Ecosystem-based protection	Plantation of Disaster-Resilient (wind-resistant) Trees along Embankments	Reduces wind speed, protects embankments from erosion, supports biodiversity, and strengthens ecosystem resilience.
Water security	Collecting Rainwater for Future Use (Rainwater harvesting)	Provides safe drinking water when tube wells become inaccessible or contaminated after disasters.
Energy and cooking continuity	Raised fuel storage; Portable clay stove; Drying and storing cow dung fuel	Ensures continued cooking during floods, high tides, and cyclone emergencies.
Social resilience	Food sharing through relatives and neighbours	Strengthens social capital, mutual support, and food security during disaster recovery.
Livelihood protection	Fish conservation practices in flooded ponds	Reduces livelihood losses and supports household food security and income after flooding.

3.10.2 Strengthening Indigenous Practices

This practice can be strengthened by raising pond embankments above flood level, installing net fences to prevent fish escape, placing tree branches in different parts of the pond to provide shelter, and promoting the practice through farmer awareness programs and extension materials.

3.11 Indigenous Knowledge and Community Resilience Functions

Although the indigenous practices documented in this study appear diverse, they collectively contribute to several interconnected dimensions of community disaster resilience. Rather than functioning as isolated household strategies, these practices strengthen preparedness, response, recovery, and long-term adaptation through multiple resilience functions. The functional grouping demonstrates that indigenous knowledge contributes to disaster resilience across multiple dimensions rather than addressing only a single hazard. Several practices protect physical assets, while others strengthen food security, water security, ecosystem resilience, household energy security, and social capital (Table 1). Collectively, these strategies increase the capacity of households and communities to prepare for, respond to, and recover from cyclones and storm surges. This systems perspective illustrates that resilience emerges from the interaction of household behaviour, community cooperation, and environmental management rather than from individual adaptation measures alone.

3.12 Policy and Practical Implications

The documented indigenous practices are low-cost, environmentally sustainable, and based on locally available resources, making them relevant for disaster risk reduction and climate adaptation in other coastal areas facing similar hazards. However, scaling up these practices requires supportive governance rather than simply promoting individual techniques. Government agencies, local authorities, and development partners should systematically identify, docu-

ment, validate, and disseminate indigenous knowledge for wider use. The findings also emphasize the need to integrate indigenous and scientific knowledge through participatory approaches. Local communities should be actively involved in hazard assessment, disaster planning, early warning, preparedness, and recovery to support the co-production of context-specific and effective disaster risk reduction strategies. Although these practices were developed for the study area, they may be adapted to other regions with similar environmental and socio-economic conditions. Careful adaptation to local cultural, ecological, and institutional contexts can strengthen community resilience and support sustainable disaster risk reduction.

4 Conclusion

Coastal communities in Bangladesh are highly vulnerable to climate change and climate-induced disasters, including cyclones, storm surges, floods, and heavy rainfall. This study documented key indigenous knowledge (IK) practices used in Dashmina Upazila to reduce disaster risk and support climate adaptation. The identified practices include protecting valuables by burying them, wearing mobility-supportive clothing during evacuation, planting wind-resistant trees, harvesting rainwater, storing fuel on raised platforms, sharing food through social networks, using portable clay stoves, preserving cow dung as fuel, hanging household items from roof beams, and applying local fish conservation techniques during floods. The findings show that these practices are low-cost, locally available, environmentally sustainable, and developed through long-term community experience. They play an important role in strengthening household preparedness, disaster response, and community resilience. However, many indigenous practices remain poorly documented and are rarely incorporated into formal disaster risk reduction and climate adaptation planning. Therefore, systematic documentation, validation, and integration of indigenous knowledge into disaster management policies and community-based programs are essential. This study contributes to the literature by systemat-

ically documenting and evaluating indigenous practices using thematic analysis, attributes assessment, and SWOT analysis. The findings highlight the value of indigenous knowledge as a dynamic and context-specific system that complements scientific approaches. Future research should evaluate the effectiveness of these practices under changing climate conditions and explore their adaptation and integration into disaster management systems in other hazard-prone regions.

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Conflicts of Interest

The author declares no conflict of interest.

CRediT Statement

Md. Faisal: Conceptualization, Data collection, Data curation, Formal analysis, Methodology, Resources, Software, Validation, Visualization, Writing – original draft, Writing – review & editing.

Data Availability

Unavailable due to ethical restrictions.

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References

- Barua, U., Akhter, M.S., Ansary, M.A., 2016. District-wise multi-hazard zoning of Bangladesh. *Natural Hazards* 82, 1895–1918. <https://doi.org/10.1007/s11069-016-2276-2>.
- BBS (Bangladesh Bureau of Statistics), 2012. *Community Report Patuakhali Zila*. Statistics and Informatics Division Ministry of Planning.
- Biswas, A.K.M.A.A., Sattar, M.A., Hossain, M.A., Faisal, M., Islam, M.R., 2015. An internal environmental displacement and livelihood security in Uttar Bedkashi Union of Bangladesh. *Applied Ecology and Environmental Sciences* 3, 163–175.
- Biswas, A.K.M.A.A., Sonia, N.J., Nahar, L., Hossain, M.A., Faisal, M., 2016. Women's vulnerabilities to climate induced hazards and their coping strategies in Chandradip Union of Southern Bangladesh. *British Journal of Education, Society & Behavioural Science* 14, 1–15. <https://doi.org/10.9734/BJESBS/2016/22763>.
- Byers, B.A., Cunliffe, R.N., Hudak, A.T., 2001. Linking the conservation of culture and nature: a case study of sacred forests in Zimbabwe. *Human Ecology* 29, 187–218. <https://doi.org/10.1023/A:1011012014240>.
- Canete, R.M., Lisay, S.K., Mahmud, M.N.S., 2025. Project DINGGIN: Empowering communities through risk-based and inclusive cash transfer in disaster-prone areas in Bangladesh and Philippines. *International Journal of Disaster Risk Management* 7, 339–366. <https://doi.org/10.18485/ijdrm.2025.7.1.20>.
- Cavestro, L., 2003. *PRA – Participatory Rural Appraisal Concepts, Methodologies and Techniques*. Padova University, Padova, Italy.
- Chang, H.H., Huang, W.C., 2006. Application of a quantification SWOT analytical method. *Mathematical and Computer Modelling* 43, 158–169. <https://doi.org/10.1016/j.mcm.2005.08.016>.
- Coppolillo, P.B., 2000. The landscape ecology of pastoral herding: spatial analysis of land use and livestock production in East Africa. *Human Ecology* 28, 527–560. <https://doi.org/10.1023/A:1026435714109>.
- Dastagir, M.R., 2015. Modeling recent climate change induced extreme events in Bangladesh: A review. *Weather and Climate Extremes* 7, 49–60. <https://doi.org/10.1016/j.wace.2014.10.003>.
- Dhungana, R.K., Yamphu, I.M.R., 2016. Indigenous ways of knowing in Nepal: exploring indigenous research procedures in Shamanism. *Journal of Indigenous Social Development* 5, 38–55.
- Fabiyyi, O.O., Oloukoi, J., 2013. Indigenous knowledge system and local adaptation strategies to flooding in coastal rural communities of Nigeria. *Journal of Indigenous Social Development* 2.
- Faisal, M., Saha, M.K., Biswas, A.M.A.A., 2024a. Risk analysis of climate induced disaster in coastal Bangladesh: Study on Dashmina Upazila in Patuakhali district. *International Journal of Disaster Management* 6, 355–368. <https://doi.org/10.24815/ijdm.v6i3.36483>.
- Faisal, M., Biswas, A.M.A.A., Saha, M.K., 2024b. Climate smart disaster risk reduction: indigenous knowledge practiced for housing technology in coastal zone of Bangladesh. *International Journal of Disaster Management* 7, 107–128. <https://doi.org/10.24815/ijdm.v7i1.36786>.
- Faisal, M., Biswas, A.M.A.A., Saha, M.K., 2026a. Climate smart disaster risk reduction: Indigenous knowledge practiced for early warning in coastal Bangladesh. *Interaction, Community Engagement, and Social Environment* 3, 122–138. <https://doi.org/10.61511/icese.v3i2.2026.2420>.
- Faisal, M., Prokash, J., Saha, M.K., 2026b. Measuring natural hazards resilience of coastal community in Kalapara Upazila, Patuakhali, Bangladesh. *Journal of Hazards, Risk and Resilience* 1, 12. <https://doi.org/10.53941/jhrr.2026.100012>.
- Faisal, M., Saha, M.K., Biswas, A.M.A.A., 2025. Climate smart disaster risk reduction: Indigenous knowledge practiced for agriculture sector in coastal Bangladesh. *International Journal of Disaster Risk Management* 7, 87–112. <https://doi.org/10.18485/ijdrm.2025.7.2.6>.
- Faisal, M., Saha, M.K., Sattar, M.A., Biswas, A.M.A.A., Hossain, M.A., 2021. Evaluation of climate induced hazards risk

- for coastal Bangladesh: a participatory approach-based assessment. *Geomatics, Natural Hazards and Risk* 12, 2477–2499. <https://doi.org/10.1080/19475705.2021.1967203>.
- Gratani, M., Butler, J.R., Royee, F., Valentine, P., Burrows, D., Canendo, W.I., Anderson, A.S., 2011. Is validation of indigenous ecological knowledge a disrespectful process? A case study of traditional fishing poisons and invasive fish management from the Wet Tropics, Australia. *Ecology and Society* 16. <https://doi.org/10.5751/ES-04249-160325>.
- Islam, M.A., Shamsuzzoha, M., Rasheduzzaman, M., Ghosh, R.C., Faisal, M., 2019. Assessment on climate change adaptation: a study on coastal area of Khulna district in Bangladesh. *Australian Journal of Engineering and Innovative Technology* 1, 14–20. <https://doi.org/10.34104/ajeit.019.014020>.
- Kurnio, H., Fekete, A., Naz, F., Norf, C., Jüpner, R., 2021. Resilience learning and indigenous knowledge of earthquake risk in Indonesia. *International Journal of Disaster Risk Reduction* 62, 102423. <https://doi.org/10.1016/j.ijdr.2021.102423>.
- Macnight Ngwese, N., Saito, O., Sato, A., Agyeman Bofo, Y., Jasaw, G., 2018. Traditional and local knowledge practices for disaster risk reduction in Northern Ghana. *Sustainability* 10, 825. <https://doi.org/10.3390/su10030825>.
- Makate, C., 2020. Local institutions and indigenous knowledge in adoption and scaling of climate-smart agricultural innovations among sub-Saharan smallholder farmers. *International Journal of Climate Change Strategies and Management* 12, 270–287. <https://doi.org/10.1108/IJCCSM-07-2018-0055>.
- Makondo, C.C., Thomas, D.S., 2018. Climate change adaptation: Linking indigenous knowledge with western science for effective adaptation. *Environmental Science & Policy* 88, 83–91. <https://doi.org/10.1016/j.envsci.2018.06.014>.
- Mallick, B., Ahmed, B., Vogt, J., 2017. Living with the risks of cyclone disasters in the south-western coastal region of Bangladesh. *Environments* 4, 13. <https://doi.org/10.3390/environments4010013>.
- Mudemba, R., Taruvinga, A., Zhou, L., 2021. Determinants of adoption of Indigenous Knowledge (IK) based technology in handicrafts among rural women of Amathole, South Africa: A double hurdle model approach. *African Journal of Science, Technology, Innovation and Development* 13, 407–414. <https://doi.org/10.1080/20421338.2020.1799535>.
- Mukherjee, A., Faisal, M., Saha, M.K., 2020. Measuring resilience of urban slum to climate induced disasters: A study on Barishal City Corporation, Bangladesh. *International Journal of Disaster Management* 3, 34–47. <https://doi.org/10.24815/ijdm.v3i2.17815>.
- Petzold, J., Andrews, N., Ford, J.D., Hedemann, C., Postigo, J.C., 2020. Indigenous knowledge on climate change adaptation: a global evidence map of academic literature. *Environmental Research Letters* 15, 113007. <https://doi.org/10.1088/1748-9326/abb330>.
- Pokhrel, K.P., Khatiwada, S.P., Paudel, N., Dhakal, K.R., Chidi, C.L., Timilsena, N.P., Mahat, D.K., 2021. Innovative practices for the promotion of local/indigenous knowledge for disaster risk reduction management in Sudur Paschim Province, Nepal. *Journal of Geographical Research* 4, 1–11.
- SAARC Disaster Management Centre, 2009. *Indigenous Knowledge for Disaster Risk Reduction in South Asia*. SAARC Disaster Management Centre, New Delhi.
- Saha, M.K., Biswas, A.A.A., Faisal, M., 2024. Livelihood vulnerability of coastal communities in context of the climate change: A index-based assessment. *World Development Sustainability* 4, 100152. <https://doi.org/10.1016/j.wds.2024.100152>.
- Saha, M.K., Biswas, A.A.A., Faisal, M.D., Meandad, J., Ahmed, R., Prokash, J., Sakib, F.M., 2019. Factors affecting to adoption of climate-smart agriculture practices by coastal farmers in Bangladesh. *American Journal of Environment and Sustainable Development* 4, 113–121.
- Saylor, C.R., Alsharif, K.A., Torres, H., 2017. The importance of traditional ecological knowledge in agroecological systems in Peru. *International Journal of Biodiversity Science, Ecosystem Services & Management* 13, 150–161. <https://doi.org/10.1080/21513732.2017.1285814>.
- Seddiki, M.A., Giggins, H., Gajendran, T., 2020. International principles of disaster risk reduction informing NGOs strategies for community based DRR mainstreaming: the Bangladesh context. *International Journal of Disaster Risk Reduction* 48, 101580. <https://doi.org/10.1016/j.ijdr.2020.101580>.
- Senanayake, S.G.J.N., 2006. Indigenous knowledge as a key to sustainable development. *The Journal of Agricultural Sciences* 2, 87–94. <https://doi.org/10.4038/jas.v2i1.8117>.
- Sevcli, M., Oztekin, A., Uysal, O., Torlak, G., Turkyilmaz, A., Delen, D., 2012. Development of a fuzzy ANP based SWOT analysis for the airline industry in Turkey. *Expert Systems with Applications* 39, 14–24. <https://doi.org/10.1016/j.eswa.2011.06.047>.
- Shamsuzzoha, M., Biswas, A.A.A., Hasan, M.M., Faisal, M., Hazra, P., Ghosh, R.C., Shaw, R., 2025. Determination of constraints in existing DRR coordination mechanisms among different humanitarian actors of coastal Bangladesh, in: *Two Decades from the Indian Ocean Tsunami: Key Challenges and Advancements*. Springer Nature Singapore, Singapore, p. 379–409. https://doi.org/10.1007/978-981-96-2669-4_21.
- Sharma, R., 2021. Community based flood risk management: Local knowledge and actor's involvement approach from lower Karnali river basin of Nepal. *Journal of Geoscience and Environment Protection* 9, 35–65. <https://doi.org/10.4236/gep.2021.96003>.
- Smith, B.M., Chakrabarti, P., Chatterjee, A., Chatterjee, S., Dey, U.K., Dicks, L.V., Basu, P., 2017. Collating and validating indigenous and local knowledge to apply multiple knowledge systems to an environmental challenge: A case-study of pollinators in India. *Biological Conservation* 211, 20–28. <https://doi.org/10.1016/j.biocon.2017.04.032>.
- Tiwari, B.K., Barik, S.K., Tripathi, R.S., 1998. Biodiversity value, status, and strategies for conservation of sacred groves of Meghalaya, India. *Ecosystem Health* 4, 20–32. <https://doi.org/10.1046/j.1526-0992.1998.00068.x>.
- Yin, R.K., 2018. *Case Study Research and Applications* (vol. 6). Sage, Thousand Oaks, CA.