Application of Indigenous Knowledge and Survival Strategies of Kutubdia Islanders during Natural Disasters

Mahima Ferdousy Mithila, Dhaka University, Bangladesh: Email: mahimaferdousy7@gmail.com

Abirr Hasan, Dhaka University, Bangladesh. Email: hasan.abirr111@gmail.com

Abstract

Historically, indigenous knowledge practice is common for the people of disaster-prone areas. In this paper, we have attempted to explore the indigenous knowledge-based strategies that are used in the management of disasters like cyclones from the micro perspective in a small island named Kutubdia, Cox's Bazar, Bangladesh based on a series of intensive fieldwork interviews. It reveals that Kutubdia islanders practice indigenous knowledge as their survival strategy at three levels of cyclone management, particularly in minimizing the potential damage of any cyclone, while technology-based information and knowledge rule the world. We use one theoretical perspective to interpret the matter, which is Appadurai's scape theory. The specific strategies derive from indigenous knowledge, which is practiced by Kutubdia islanders associated with frequent cyclones, including disbelieving in modern meteorological information and age-old practices. However, the empirical pieces of evidence show that the effectiveness of these pre-, during and post-disaster management strategies adopted from the existing indigenous knowledge is the reason for delaying the acceptance of modern meteorological information and the existence of this traditional indigenous knowledge practice in disaster management.

Keywords: *cyclone; indigenous knowledge; modern knowledge; natural disaster; strategies*

1. Introduction

> "We are the ocean people, we live on the ocean, and we die in the ocean, our grandfathers taught us to survive in the ocean."

That was the response of one of our participants when we asked about the indigenous knowledge-based strategies the Kutubdia islanders use to survive the many cyclones that are prevalent in that region. We could sense the hint of the application of this indigenous knowledge and its practice in this statement.

Indigenous knowledge, or local knowledge, is the specialized knowledge prevalent among the permanent inhabitants of a place with different natural characteristics (Luthfa, 2014). The indigenous knowledge of a community is one of the elements of that community's culture and it plays a unique role in facilitating their daily activities and coping with special situations. The main focus of this paper is to determine what strategies Kutubdia islanders follow which derive from their indigenous knowledge practice, and the effectiveness of those strategies in disaster management, particularly cyclone management. This paper showed how and to what extent the islanders are practicing these strategies during pre-disaster, mid-disaster, and post-disaster periods during the current era of modern technologies which produce the now available modern meteorological knowledge.

This paper focuses on the role of indigenous knowledge in disaster management in the Kutubdia Upazila of Cox's Bazar district, a natural disaster-prone area that faced massive cyclones in 1991 (Dove & Khan, 1995). The research will focus on one main question: what effective indigenous knowledge-based strategies do Kutubdia islanders use in disaster management?

To provide an answer to our research question, we have formulated two sub-questions to understand the research problem:

1. What are the existing strategies in pre-, during, and post-disaster (particularly cyclone) management, and how they are effective during this era of modern technology-based meteorological knowledge?
2. How do the people of Kutubdia Island respond to this experience-based (indigenous) knowledge and modern (technology-based) knowledge when it comes to disaster management?

1.1. Objectives of the Study

The main aim of this study is to explore the reasons behind the practice of indigenous knowledge-based strategies in predicting surviving disasters by the Kutubdia islanders. The objectives of this study are to identify the existing practice of indigenous knowledge and the reasons behind this, associated with disaster management and to explore how modern and traditional (indigenous) knowledge co-exist in Kutubdia island in the matter of disaster management

In this paper, there is a brief discussion on how the accumulation of data occurred, the existing literature that supports the main theme of this article, and finally the findings of the research with meaningful discussion. It includes the literature review, theoretical framework, methodology, results and discussion.

2. Literature Review

2.1. Indigenous Knowledge, Modern Knowledge

Indigenous knowledge encompasses the understandings, abilities and philosophies that local communities have formed through their long histories and interactions with their natural environment (Bag & Pramanik, 2012). They recognized the utilization of indigenous knowledge at many levels of communities, which is a longstanding tradition. Our paper discusses how Kutubdia islanders have developed survival techniques based on distinct indigenous knowledge practices to deal with natural disasters such as cyclones. Modern knowledge or scientific knowledge is considered more developed as it contains written documents and encourages the use of scientific technology in raising awareness about natural disasters like the “signal systems” before cyclones but it lacks relevance at the local level (Luthfa, 2014). Therefore, this paper examines how the Kutubdia islanders are practicing traditional or indigenous knowledge in preference to this modern knowledge

2.2. Disaster Prediction Strategies: Indigenous and Modern Methods

Hassan’s (2000) study on disaster management culture in Japan and Bangladesh's coastal regions reveals local knowledge of early warning signs of natural disasters. They highlight five indicators: changes in wind speed; sea water temperature; cloud colour; fish catch; sea wave sound and bird behaviour. Although some outsiders may understand some of the signs, understanding and recognizing them requires specific local knowledge. This paper helps fill the gap in Akhand's (2003) study on prediction strategies because it contains the survival strategies of Kutubdia islanders.

Alam and Jabed (2015, in his paper entitled “Cyclones and Causes of Cyclones over the South West Coastal Area of Bangladesh,” articulates some definitions related to the cyclone, anti-cyclone and gradient wind equation, which are in essence the types of cyclones that occur in the coastal areas of Bangladesh. Our paper on the other hand provides information on the cyclone-related management strategies.

2.3. Response, Survival, Adaptation

Roy and Kovordanyi (2015) examined the Bangladesh Meteorological Department's early warnings for cyclones and depressions in Patuakhali and Bagerhat regions. They found that some people followed the warnings, while others were dissatisfied due to their perceived lack of credibility. The article also explored the reasons behind this. Our article focuses more on the local response of the people during this disaster management process.

The authors in Zhou, Wang and Wang (2016) differentiate between tolerance and adaptation in disaster management for future extreme weather events in southern China, focusing on agricultural disasters in Hunan Province. In the case of Kutubdia, survival strategy is more important than the adaptation process because cyclones are not something people can adapt to, consequently, this paper provides information regarding indigenous knowledge-derived strategies rather than the adaptation process.

2.4. Theoretical Framework

The theoretical perspective used in this article is Arjun Appadurai's (2010) Scape Theory, which emphasizes the rapid pace of technology's movement from one region to another. This rapid pace of movement can lead to significant changes in social and cultural structures, potentially causing entire cultures to disappear. This paper highlights the importance of indigenous knowledge and the transfer of this knowledge, as the widespread development and spread of information technology are reducing the practice and importance of folk knowledge.

3. Methodology

The researchers went for several fieldwork trips and relied on both qualitative and quantitative methods to investigate the issue. Though we mainly focused on empirical pieces of evidence, we also reviewed some secondary sources (such as journal articles and books) for useful insights. We completed an empirical study between August, 2022 to January, 2023. We conducted a household survey among 150 inhabitants of three villages of Kutubdiya island, namely Uttar Boro Ghop, Matbor Para and Romai Para. We also collected 15 case study interviews from the village community members.

Moreover, we talked with three key respondents to have a clear understanding of the application of this traditional knowledge in issues like disaster management. We also used the snowball sampling method to include more respondents in the study. That is, during the interviews, we asked respondents about other people who could provide well-articulated perceptions about this local knowledge regarding cyclones.

However, we mostly relied on observation in our fieldwork as it entailed people’s actual behaviour and perceptions. We focused on the prevailing practice of indigenous knowledge practice and what is the actual difference between this indigenous and modern knowledge practice in the field of disaster management

3.1. Field Dilemma

At the primary stage of the research, the remoteness of this particular island made it a mysterious place which was not convenient to study. As we are from an urban background, it was quite difficult for us to build a connection with the islanders. While building a strong rapport with the community people, which was quite hard because of our socioeconomic background and presumptions about the island but was successful in the end, we began to challenge our assumptions which was very helpful in overcoming our inherent biases.

3.2. Detailed Description of the Study Area

We have selected Baraghope Union of Kutubdia Upazila (sub-district) of Cox's Bazar district as the fieldwork area. Kutubdia Upazila has been known for hundreds of years as a disaster-prone area and so this was a suitable area to investigate indigenous knowledge about disaster management.

3.2.1. Geographical Position:

Kutubdia is an island separated from the mainland by the Kutubdia Channel. The land area of Kutubdia Upazila is 215.8 square miles. Of the population overall, 93% are Muslims, 7% are Hindus and there are small minorities of Buddhists and people of other religions. The population is estimated to be a little over 125,000 in all (Hossein & Alam, 2023).

3.2.2. Island Access

It is possible to reach Kutubdia Island by means of Magnama Ghat via two main roads from Chittagong city to Banskhali Upazila, Baraitali or Chakaria bus stand. The sea is around Katardia but it is possible to reach Illaroyoga by speedboat. From Magnama Ghat, travellers can reach Baraghop Ghat by speedboat or trawler. Baraghop Bazar, with administrative facilities like a police station, hospital, court, weather office and cyclone shelters, is easily accessible from the market.

3.3. Data Collection and Key Variables

We used two types of questionnaires: for the household survey questionnaire, we prepared close-ended questions, whereas both open-ended and close-ended questions are used for key respondent interviews. On the other hand, checklists were useful for collecting case studies. All the interviews and case studies were collected in the local language (Bangla). Before the final data collection, we undertook a pilot survey to check the questionnaire. The average time for each interview was 25-30 minutes. For the three key informants, interviews were conducted and recorded with audio tape after getting permission from the people involved. The whole data collection process involved several fieldwork trips. We had to do two or three follow-up fieldwork trips to ensure we had obtained a comprehensive view. After every fieldwork trip, we noted the topics which were needed to be addressed later using a checklist system.

3.4. Data Analysis

We analyzed our acquired data and identified the gaps to fill for the next day. We also employed a mixed method approach to analyse the data in this study. We classified and organized all our data per the research questions and objectives. We used percentages to illustrate the socio-demographic information about the Kutubdia islanders. On the other hand, we chose case study and narrative analysis for qualitative data analysis where participants' points of view were explicitly presented. In light of these quotes, we tried to situate our analysis. We tried to take care of all the ethical boundaries and during translation from Bangla to English we took appropriate steps to ensure accuracy and sensitivity. To get a clear understanding of the theme of this paper, we incorporated a table of the research participants from whom we gathered the information and analyzed the following qualitative data analysis steps.

Types	Numbers	Gender
Fisherfolk and their spouses	70	Males and females
Retired Fisherfolk	40	Males
Others	40	Males and females
Total	150	

Table 1: Socioeconomic Profile of Research Participants (Including Key Informants); source: Fieldwork 2022

4. Results

4.1. Indigenous Knowledge and Pre-Disaster Survival Strategies

Cyclone threat to coastal communities in Bangladesh has been a significant issue, with over 25 major cyclones causing displacement, deaths, and missing persons from 1970-2022 (Fieldwork, 2022). However, some individuals have managed to survive these disasters, highlighting the role of indigenous knowledge and modern science.

4.1.1. Indigenous Knowledge in Cyclone Forecasting

Research in Kutubdia reveals that islanders can predict cyclones and take necessary precautions. They refer to cyclones as *tufan* in their language and observe natural signs such as wind direction, sky colour, sea water temperature, slow environment, rough sea, sparkling water, turbidity, drizzling rain, and bird movements. The 'northerly' winds usually start from the north and move towards the south. A reddish sky indicates a more severe cyclone, with rough seas and increased fish catch. These signs are known as *kurid* in the local language, meaning ominous.

4.1.2. Cyclone Preparation

Cyclones can be predicted early, so people prepare accordingly. Nearby shelters are visited with families, wrapped in polythene and tarpaulin, tied to trees, and provided with dry food. To reduce cyclone damage, people take carriable furniture and cash with them, they make *portals* (bag made of clothes) to carry their utmost necessaries, which is their protection strategy during cyclone weather events.

4.2. Traditional versus Modern Weather Signals

It has been observed that despite all the warnings issued by the Meteorological Department that are scientific in basis, people still do not have much faith in modern weather forecasting. It is another strategy derived from indigenous practice. The people of Kutubdia prefer their observations to weather reports. As a result, it can be seen that many times they cannot predict a major disaster very well and, at the last moment, they are forced to move to a safe place according to a government announcement.

> Respondent A, a retired fisherman from Kutubdia island, recounted the events of the devastating 1991 cyclone. He described the storm's magnitude, causing him to realise it had achieved full force. Despite radio warnings, he and his crew were unsure of the storm's severity due to it being the month of Baisakh [April-May]. The storm lasted three days, with drizzling being a significant sign. They did not believe radio warnings, as they did not see any other signs of a cyclone. Similar experiences occurred in 1997 and 2007.

Again, it is not the case that everyone is prioritizing traditional or local knowledge over modern science. Many of the younger generations are familiar with modern communication systems in disaster management

and attach priority importance to them. They feel that thanks to modern communication systems, weather conditions are received faster and more accurately than before, so they find it more effective.

> Respondent B, a graduate with a master's degree, argues that traditional knowledge, based on local knowledge, is no longer valid due to the advent of modern communication systems. With the availability of government weather stations, satellite television channels and social media, disaster early warning, preparedness and post-disaster management information are now easily accessible. While there is no need to deny the value of folk wisdom, the need for it is becoming increasingly scarce as the world becomes more modern.

4.3. Indigenous Knowledge and Strategies during the Disaster (Cyclone)

Cyclones pose a significant threat to coastal communities, with struggles varying based on location and situation. Kutubdia has 27 shelters (Fieldwork, 2022) but experiences vary due to proximity and distance of families and communities from them. Case studies are provided for each situation to better understand the challenges faced.

4.3.1. Survival Strategies during Shelter Stay

To prepare for a cyclone, begin by dismantling roofs, fences and large items of furniture, wrapping them in polythene and tying them to trees. Bring small amounts of dry food, water, money and valuables.

> Respondent C, a housewife, and her family, including her son, daughter-in-law and 15-year-old granddaughter, take shelter in the nearest cyclone centre. The higher the danger signal numbers, the more dire the situation. They keep themselves dry by using polythene and bring food, drinking water and valuables if needed.

4.3.2. Out-of-Shelter Survival Strategies

Cyclones often cause people to struggle to survive if they are not able to take shelter in a cyclone centre. They raise boats and houses away from the water’s edge, tie them up and climb up into tree branches to protect themselves. They eat pre-prepared and preserved dry food and various other fruits and food items.

> Respondent D, a dry fish trader, lost his boat and house in the 1991 cyclone and moved to his current address with his family. The cyclone was so terrible that most people died and many families were swept away by the tidal water. The number of government shelters was very low, and many families were far away from shelters. They took shelter in a mosque, where they faced a “snake issue.” Respondent D's family was constantly made aware of the horror of the cyclone.

> Respondent E, a cyclone centre manager, explained that the increase in cyclone centres makes it easier to take shelter. However, earlier, when there were not many shelters and people were far away, it was difficult to survive. Many families survived by collecting cans, coconuts and sweet potatoes which were floating in the water. They also took some dry food and drinking water with them when they went to shelter during the storm.

4.3.3. Survival Techniques at Sea

During a cyclone, survival at sea is challenging. Fisherfolk use special techniques like tying empty drums to their boats to prevent them from sinking and hold onto them if the boat does sink, hopefully thereby ensuring their safety.

> Respondent F (19) explains that when fisherfolk face storms while at sea, they try to control their boats with empty gallons [large plastic containers] tied around them. If the boat capsizes, they stay afloat with the gallons. When distress signals are broadcast, they avoid entering the sea.

4.4. Indigenous Knowledge and Post-Disaster Survival Strategies

After the disaster, people started to revive traditional knowledge and practiced local medical systems, using tree bark and golden vine juice for fever, diarrhoea and dysentery. This led to a reduction in the amount of bamboo used in construction. Post-cyclone rehabilitation was difficult due to delayed government relief and limited medical supplies. Previously, they used Arjuna (*Terminalia arjuna*) tree bark and Patharkuchi (*Alstonia scholaris*) leaf juice for fever and diarrhoea.

> Respondent G, a cyclone survivor, collected money and built a new house.

5. Discussion

This portion of the paper explores the data we obtained from the case studies and subjects them to narrative analysis. We will discuss how these survival strategies are impacted by globalization in Kutubdia island nowadays, how the effectiveness of these survival strategies help in the preservation of indigenous knowledge, and what might be the future of this practice

5.1. Indigenous Practice and Globalization

The age of globalization has been greatly influenced by the invention of the Internet and social media systems. The widespread use of smartphones has made the world a global village, in which the entire world can access news and activities instantly. This has led to a shift from traditional methods of communication, such as physical exchange or letter exchange, to the Internet, which allows for quick access to information. This has led to a decline in folk wisdom and the extinction of some forms of traditional knowledge. The Internet has transformed the world into a village, making it easier to access information and engage in daily life.

> Respondent B argued that the reliance on local knowledge and folk wisdom in modern communication systems is not logical as it lacks a scientific basis. With modern technology like weather stations, satellite television and social media, news is easily accessible, and disaster early warnings, preparedness and the need to take appropriate action are also available. While there is no need to deny the importance of folk wisdom, the need for it is running out as the world becomes more modern.

After a disaster, only the indigenous knowledge-based strategies cannot bring impactful results to the island. In these cases, Government relief for post-cyclone rehabilitation is arranged by government institutions like ASHA (accredited social health activities) and BRAC (Bangladesh Rural Advancement Committee) (Fieldwork, 2022).

5.2. Effectiveness of Indigenous Knowledge-Derived Survival Strategies

Indigenous knowledge is a valuable asset for a region, helping people survive in adverse environments. However, as modern technology advances, its importance seems to diminish in modern literature, which is not fully true because many people on the island still use this knowledge consciously. Traditional knowledge, which lacks written records and tested certificates, is less accepted than modern science. Coordination between indigenous knowledge and modern science is crucial for sustainable conservation

and development projects in the country. It will not be possible to understand people's response to these natural disasters without considering their local knowledge which includes such types of survival strategies.

6. Conclusion

This paper looks into the indigenous knowledge-derived survival strategies of natural disaster management among the inhabitants of Kutubdia from a micro perspective. The analysis employed both qualitative and quantitative methodologies and gathered data from multiple secondary sources. The study shows that those who live on Kutubdia island apply disaster prediction strategies, such as awareness of wind direction, sky colour, sea water temperature, fish capture and bird flight behaviour to anticipate cyclones and make necessary preparations. They use the during-disaster survival strategy by seeking refuge in Government Cyclone Centres during cyclones, storing dry food, and sustaining themselves by consuming floating food items with minimal reliance on modern technology. Another survival strategy during cyclones involves wrapping houses and furniture in polythene and securing them to trees to shield them from the water. Finally, the inhabitants of Kutubdia employ their indigenous medicinal expertise to expedite recuperation from any ailments resulting from the disaster as a survival tactic. This paper primarily focuses on the application of traditional knowledge in pre-, during- and post-disaster management strategies among Kutubdia islanders. It briefly touches on the residents' reactions to modern information systems and knowledge, which are becoming more prevalent on the island due to globalization.

6.1. Limitations and Recommendations:

Kutubdia is a small, isolated island that remains underdeveloped compared to other islands that offer more contemporary amenities and facilities. There is a lack of clear conflict between the utilization of indigenous knowledge and up-to-date weather-related information. Our paper only includes case studies relevant to the survival strategies of Kutubdia islanders during cyclones, so the perspectives of the younger generation on survival strategies in disasters are not discussed. This article is distinctive in its ability to provide a comprehensive understanding of applying indigenous knowledge in survival strategies. This paper is beneficial for readers and authors interested in indigenous knowledge preservation, climate change policymakers, government-led development projects and strategy planners focusing on natural catastrophe risk management.

7. References

Akhand, M.H. (2003). Disaster management and cyclone warning system in Bangladesh, in Zschau, J. & Küppers, A., eds., *Early warning systems for natural disaster reduction*. Berlin: Springer. DOI: https://10.1007/978-3-642-55903-7_8.

Alam, M.S. & Jabed, M.A., (2015). Cyclones and causes of cyclones over the southwest coastal area of Bangladesh. *Bangla Vision*, 15(1).

Appadurai, A. (2010). How histories make geographies, *The Journey of Transcultural Studies*, 1(1), 4-13. DOI: https://doi.org/10.11588/ts.2010.1.6129.

Bag, M. & Pramanik, R. (2012). Commodification of indigenous knowledge: Its impact on ethno-medicine, *IOSR Journal of Computer Engineering*, 7(4), 8-15.

Dove, M.R. & Khan, M.H. (1995) Competing constructions of calamity: The April 1991 Bangladesh cyclone, *Population and Environment*, 16(5), 445-71.

Hassan, S. (2000). Indigenous disaster management culture: A comparative study between the cyclone affected people of Bangladesh and Japan. *Journal of Human Sciences*. DOI: 10.18910/7158.

Hossein, M.R. & Alam, B.B. (2023). Saving lives on a remote island in Bangladesh, *World Bank Blogs*, available at: https://blogs.worldbank.org/endpovertyinsouthasia/saving-lives-remote-island-bangladesh.

Luthfa, S. (2014). Debunking the myths of indigenous knowledge: Towards a political ecology of the Mandi of Madhupur, Bangladesh. *Journal of the Asiatic Society of Bangladesh*, 59(1), 211-37.

Roy, C. & Kovordanyi, R. (2015). The current cyclone warning system in Bangladesh: Providers ' and receivers' views*, International Journal of Disaster Risk Reduction,* 12, 285-99. DOI: http://dx.doi.org/10.1016/j.ijdrr.2015.02.004.

Zhou, H., Wang, X. & Wang, J. (2016). A way to sustainability: perspective of resilience and adaptation to disaster, *Sustainability*, 8(8), 737. DOI: https://doi.org/10.3390/su8080737.