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Climate Change and Current Adaptation Strategies in the Haor Areas

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Abstract

The haor fishers in Bangladesh may face significant negative effects due to the significant changes in the country's climate; yet, there have been very few research specifically focused on this professional group. Through focus groups and interviews, an effort was made to understand the impact and adaption strategies of the users of the harbor resource. A total of 120 respondents were chosen at random from the Dekharhaor of the Sunamganj District. Climate change vulnerabilities included variations in rainfall and temperature, frequent natural disasters, and the emergence of debilitating diseases. Initially, fishermen were found to be able to support themselves through earnings from illicit fishing, government assistance, and quick loans from non-governmental organizations in the event of disaster. The resource consumers have also changed how they work, lost their jobs, and become more reliant on their family members. Fishermen's perspectives yielded several recommendations for effectively addressing the vulnerabilities caused by environmental changes.

Keywords: Climate Change, Adaptaion; Fishers; Haor; Bangladesh.

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Introduction

A significant and ecologically sensitive wetland in Bangladesh, Dekharhaor is situated on the SunamganjSadar, DaskhinSunamganj, Chatak, and DawrabazarUpazila of the Sunamganj district. Essentially, the haor is submerged during the monsoon and nearly dry for half the year (Sunny et al., 2021a). The residents of these areas make a living by farming. In the dry season, paddy is grown on haor land, and during the monsoon, fishing is conducted (Kuddus et al. 2021). In the nation's industrial, cultural, socioeconomic, ecological, and economic contexts, haor is

also essential (Ali et al., 2010; DoF, 2018). DekharHaor provides thousands of people in northeastern Bangladesh with employment opportunities, irrigation, food and nutrition, fuel, fodder, and transportation. It also supports a diverse assemblage of aquatic biodiversity and helps to build a sustainable socio-economic life (Kuddus et al., 2020; Sunny et al., 2021b). Bangladesh's economy and GDP both benefit greatly from the haor fishery (Shamsuzzaman et al., 2017). However, it's unfortunate that the rate of fisheries exploitation in harbor areas is greatly increasing due to the fact that economic, social, political, and cultural exploitation is a common occurrence for people who depend on the haor (Sultana, et al., 2022). Their financial difficulties and lack of access to healthcare facilities severely harm them (Alok et al., 2018). However, they represent the most tragically vulnerable group to the effects of climate change. People in the materially dependent society face several natural disasters and tragedies (Islam et al., 2023; Mithun et al., 2023).

In particular, the coastal and northeastern regions of Bangladesh have suffered greatly as a result of the country's changing climate during the past few decades (Milton, 2010; Kuddus et al., 2022). According to Islam et al., 2016a and Sunny et al., 2021a, the haor dependent fishing community in northeastern Bangladesh now has to deal with the climate catastrophe and flash floods. Their susceptibility to flooding, storms, and droughts increased, disrupting their fishing, crops, homes, and means of subsistence (Islam et al., 2018a; Bari et al., 2023). (Faruk et al., 2023; Ferdous et al., 2023; Mithun, 2023b) The nation's fishermen are involved in climate change both directly and indirectly. One of the country's most important disaster-prone areas is DekharHaor. Finding the shocks and pressures brought on by the climate that make fishermen susceptible as well as their coping mechanisms for survival may help to mitigate the negative effects (Chakma et al., 2022; Ahmed et al., 2023a). Effective coping mechanisms ought to be implemented to mitigate the negative consequences (Islam et al., 2018b; Ahmed et al., 2023b). However, the susceptibility of fishing communities and their reliance on the industry present certain challenges when it comes to embracing the adverse effects of climate change (Sunny, 2017; Chakma et al., 2022). The community's ability to cope may be hampered by another abrupt change in the environment, which could affect the physical environment (Islam et al., 2016; Sunny et al., 2021b).

Again, the estimated yearly temperature increase in Bangladesh owing to climate change brought on by global warming is expected to increase by 0.4 degrees Celsius, which will cause the sea level to rise by 4 millimetres annually (Allison, 2005; Chowdhury et al., 2007; Hasan et al., 2023;Tufael et al., 2023). Islam et al. (2018a) cited that resource shortages and unstable employment markets brought on by climate change cause a rise in migration. Since the vulnerability of fishing communities has not received enough attention, it is imperative that more thorough research be done on climatic variability and change in these communities. To evaluate the effect of climate change on livelihood systems centred on agriculture, several researches have been carried out. Therefore, by exposing the situation of this extremely vulnerable fishing community, this study seeks to close this gap. Given that the study's objectives included

determining the current state of climate change on DekharHaor, as well as its trends, threats, and coping mechanisms, it is important to recognize how these mechanisms damage efforts to conserve aquatic biodiversity by putting more strain on fishing communities. Given its international recognition as a climatic hotspot and its highly susceptible fishing population, DekharHaor was chosen (Pandit et al., 2015; Sultana et al., 2022).

Materials and Methods

Two fishing communities in the Sylhet division were used for the study. The villages were selected according to how well-organized their livelihoods were and how abundant the natural resources were. The villages were UttorThandargaon and DakkhinThandargaonin the Dekhar haor of the Sunamganj District. Oral narratives, focus groups (FGD) with various stakeholder groups, individual and key informant interviews (KII) with experts, and focus groups (FGD) were some of the qualitative and quantitative methods used for primary data collection. To create the secondary data, a variety of reports, newspapers, and local and international articles were consulted.

The survey was designed to collect data on fatality rates, depression and cyclone duration, kinds, frequency, wind speed and casualties, as well as demographics (such as basic community information). In accordance with the study's aims, a well-defined and pre-tested questionnaire was used to collect primary data, both quantitative and qualitative, from each location utilizing the survey method. Secondary data were gathered from several government offices (GOs) including the Upazila Fisheries Officer, the Bangladesh Bureau of Statistics (BBS), and non-governmental organizations (NGOs) like TMSS, ASA, and BRAC. With the use of MS Excel and SPSS version 16.0, a statistical tool for social science, descriptive statistics were generated to characterize the characteristics of the data set.

Results and Discussion

The socioeconomic makeup of fishermen

Fishermen in Bangladesh's rural areas had a different sociodemographic status than those of any other profession. Nearly 700 individuals resided in 98 households (HH) on average within the areas under investigation (Table 1). The family sizes of the households were as follows: 6 to 7 in the case of the nuclear families and 8 to 10 in the case of the joint families. Of the households, 72.2% did not have children and 27.8% had children. 80 HH (mean ± standard deviation) were heavily involved in fishing, with 18 HH (mean ± 3.3) involved in both fishing and a small business. In essence, a substantial portion of fishermen (78%±2%) have joined others as hired laborers and lack their own boats and fishing equipment. Based on the field experience, it was determined that they were below the marginal poverty line. In various ways, the percentage of extremely poor people, poor people (land size <4 decimal), and modest poor people (land size >4

decimal) was 29%±3%, 47%±4%, and 20%±1%. The percentage of people who were not literate was not satisfactory: 43% were illiterate, 32% were signed, 13% were in primary school, and 12% were in secondary school. Women in fishing communities had few possibilities to make decisions on various matters and were mostly dependent on men. More over half of the population (82%) can obtain high-interest loans from nearby non-governmental organizations. Natural disasters put the community's residents in danger and limit their opportunities for employment and income, which has a significant impact on the sustainability of their livelihood. In contrast, a livelihood describes the assets, resources, and operations necessary to make a living (Mohammad &Wahab, 2013; Islam et al., 2017).

Table (1): Socioeconomic makeup of fishers

Variable	Criteria	Mean ± SD
Family pattern (%)	Nuclear	72.2± SD
	Joint	27.8± SD
Family structure (in number)	Nuclear 6 to 7	5 ±1.2
	Joint 08 to 10	10 ± 3.3
Poverty scenario (%)	Highly poor	27±3
	Poor	49±4
	Modest poor	20±1
Education (%)	Illiterate	43±SD
	Signed	33± SD
	0 to 5	13± SD
	5 to 10	12± SD
Profession (%)	Only Fishing	80 ± 2
	Fishing and other	13 ± 3.3
Public & private subsidies (%)	Yes	38± SD
	No	62± SD
Access to credit (%)	Yes	82± SD
	No	18± SD

Livelihood status of climate vulnerable fishers

Specifically, livelihood assets based on the Sustainable Livelihood Approach (SLA) could be classified as human capital, natural capital, social capital, physical capital, and financial capital as reported by Rana et al. (2018) in order to provide a fruitful socioeconomic status of extreme marginalized climate vulnerable fishers lifestyle. The age distribution, poverty ratio, marital status, and literacy rate of the investigated area were used to determine its human capital. The primary causes of extreme poverty were early-stage fishing activity and extremely poor socioeconomic status. 50% of the communities' members were married, 13% were divorced, and 37% were single. The age distribution of the population revealed that 40% of fishermen were between the ages of 41 and 50. Additionally, it was found that 31%, 28%, 9%, and 7% of

fishermen were between theages of 21 and 30, 31 to 40, 51 to 60, and 61 to 70, respectively. Eighty percent of fishermen were members of nuclear families, while just twenty percent were members of joint families.

Fishing accessories such as kunijal, dubajal, teta, koach, current jal, patijalberjal, chai, tuna jal, koiajal, thelajal, chip/borshi, and moiyajal were identified in this area based on the physical capital of the fishermen. Additionally, two different building styles inhabited by fishing populations were discovered: semi-pucca houses (18%) and kutcha houses (82%). The majority of the fishermen (80.2%) used tube-well water for drinking, while the remaining 19.8% used pond water for other purposes. The community's hygienic conditions were relatively excellent (Islam et al., 2016).

Fish resources and land holdings within the communities are explained by natural capital. However, they only own a small number of land properties, are primarily landless, and have less than five decimal places, whereas the modest poor have more than five decimal places, with a salinity of less than five points. The wetlands of Chatak were home to 71 fish and prawn species linked to 11 orders and 25 households, according to Pandit et al. (2015). Sunny et al. (2020) listed 75 species from Dekharhaor and Tanguarhaor, of which 53% were Cypriniformes, 4% Clupeiformes, 7% Channiformes, 15% Siluriformes, and 14% Perciformes.

The fishers' income and earning potential are demonstrated by their financial capital. Even though they are classified as the poorest of the poor, their earnings (Islam et al., 2017) account for their insolvency and low socioeconomic standing in the current community. Fishing communities in South and Southeast Asia had the lowest average income, calculated at between 5500 and 8500 BDT (Alok et al., 2018). Nevertheless, there was a lack of migration among fishermen to other occupations and forced engagement in activities other than fishing and selling (Sunny et al., 2020). Intriguingly, women from this group have begun to raise ducks and poultry in specific locations. Fishermen have recently become agricultural laborers.

Networking, credit operations, and relationships with different stakeholders were all indicators of the fishermen's social capital. The research findings indicate that fishermen encounter significant challenges when applying for institutional or bank loans because they are unable to pledge resources, which are typically required (Sunny et al., 2021a). In order to handle loans and pay exorbitant interest, they should go to the local moneylender, Mahajan, who occasionally even forces them to sell them the fish they have caught. Furthermore, during the field data collection, fishermen reported that nearly (48%) of them felt obligated to work for them at a low labor rate, and they continued to do so year after year 3.

Drivers influencing fishers' vulnerability

Temperature

Global climate change changed rapidly and this is directly connected to the temperature which gradually ups and down at any moment and is growing every day. During the summer period, the

temperature becomes excessively hot and the coldest in the winter season which eventually demolishes working ability, losing potency, reducing earnings and various out breaking diseases. Besides, the fisher uses detrimental fishing gears like *current jal* (monofilament gill net) to catch more fish within the earliest time to avoid hitting the hot sun.

Rainfall and flash floods

Daily variations in the pattern of rainfall have made one year's scarcity of rain seem like an abundance the next. The cause of extreme floods and droughts, which eventually regress the usual pattern of fishing, is this episodic norm of rainfall (Figure 01). Due to the frequent flash floods in Bangladesh's northeast, the fishermen's livelihoods were increasingly precarious in June of 2022. The community of fishermen suffered much as a result of it, as their fish were ruined in the pond, health and sanitary risks were created, communication was disrupted, and the whole issue was linked to the debt cycle of nearby moneylenders. The community of fishermen is particularly vulnerable due to the slow occurrence of flash floods, various current and tidal surges, cyclones, strong winds and waves, and bad weather that intensifies thunderstorms (Islam et al., 2017). In addition, fishermen were unable to go fishing during the flash floods and lost out on earnings; nonetheless, household expenses rose, placing further strain on debt repayment to lenders. As previously reported, Bangladesh recently experienced several natural catastrophes and severe flash floods. Particularly in the northeastern area of Bangladesh, these natural disasters had an impact on severely vulnerable fishing communities (Kuddus et al., 2022).

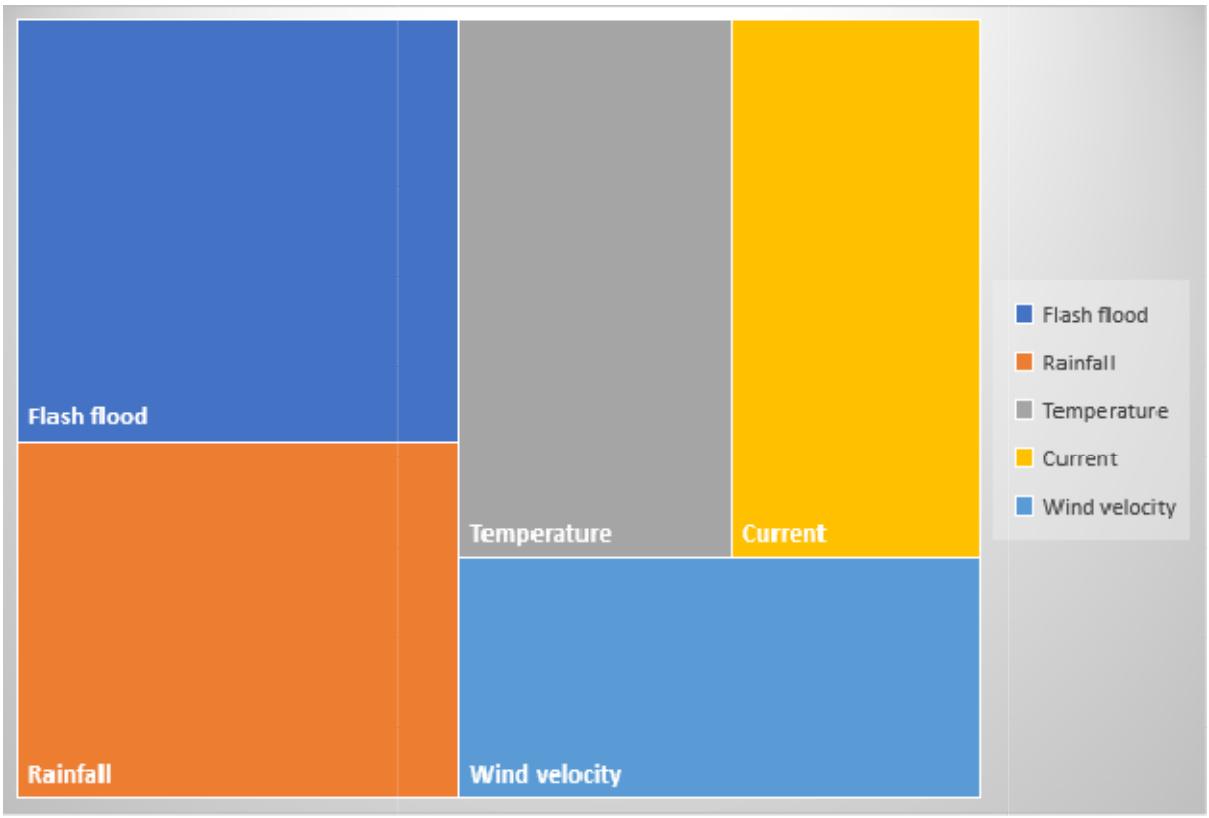

Figure 01: Drivers influencing fishers' vulnerability

Adaptation measures against climate change

As a result of the shifting work environment, 52% of respondents to the current survey changed careers (Figure: 02). Ten percent attempted to cultivate rice, fish, and crops using methods for climate resilience, while about three percent stated that family members had moved to the town. Homestead gardening (4%) and fish drying (3%), together accounting for about 7% of women's labor force participation. Due to the distinctive features of the haors, traditional lifestyles were largely well suited. Human habitation was erected on elevated platforms, and during the monsoon, farmers farmed rice that was flood tolerant (Kuddus et al., 2020. Additionally, betel leaf was successfully grown as a cash crop. As a result of climate change, pests and illnesses impacted betel leaves (Kuddus et al., 2021). Fishers became losers and were in danger as a result. Ladies knew there was a species that thrived in inundated environments. They planted saplings of palm, betel nut, sofada, etc., which brought in very little money for the family. Depending on their specific skills, women also participated in handicrafts.

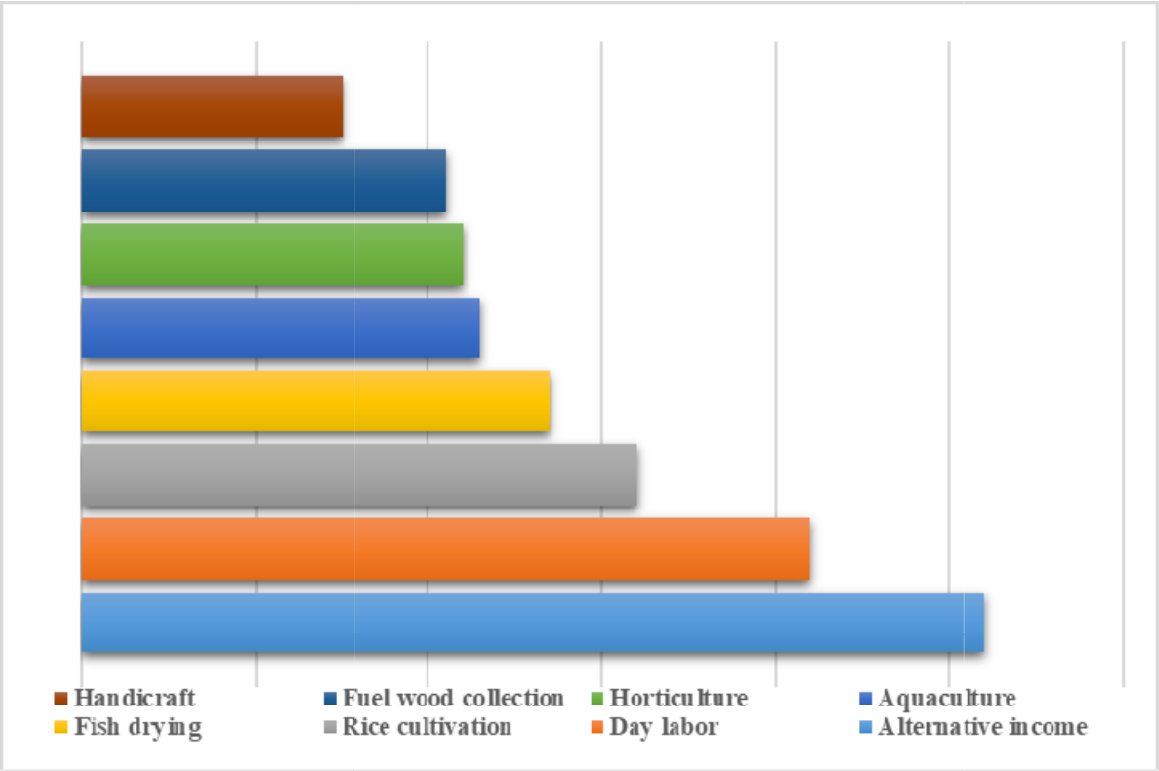

Figure 02: Adaptation strategies of haor communities

Research revealed that 39% of people adopted adaptation strategies to deal with cyclones, 30.3% with floods, 3% with droughts, 10.3% with river erosion, and 17.4% with flash floods. In order to prepare for flooding, flood-prone individuals raised the house's plinth and built flood-resistant dwellings. As alternative crops, the resource users also produced barley, carrots, sugar beets, and chilis (Mithun et al., 2023a).

Conclusion

The residents of the haor region, particularly the fishermen, are among the most vulnerable groups since they depend mostly on natural resources and are less resilient overall, which leaves them open to potentially disastrous environmental dangers. It is obvious that coastal mangrove habitats are severely impacted by climate change. As a result, the loss brought on by the climate should be minimized, and the rehabilitation process should take the local community's views into consideration. Some suggestions and recommendations could be implemented in order to build a scenario with fisheries that are dependent on hares. To strengthen institutional flaws and networking, a few training and demonstration initiatives must be addressed. Both the public and commercial sectors of the nation could contribute significantly to the improvement of the vulnerable fishing community by boosting operations related to dams and embankments and encouraging livelihoods. Economic soundness is essential to minimizing losses in the event of natural or climatic disasters, but obtaining loans from banks and other financial institutions might be challenging for them. Fishers need simple access to credit because without it, they will

inevitably turn to NGOs or mohajon, or money lenders, for high-interest loans that will negatively impact their ability to cope and their way of life.

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