

Perception of climate change in Bangladesh: local beliefs, practices and responses



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Abstract

There is a clear need for an understanding of the perceptions of climate change among those whose lives are most affected to inform national discourse and in particular, development and implementation of adaptation strategies. The paper is the outcome of a qualitative study among the local people of Charhajari, Anuliya and Nitpur unions of Bangladesh. The key informant technique, along with in-depth interview, had been exploited for gaining holistic perceptions on climatic scenario in the localities, while focus group discussion and case study were used for mapping out collective social consensus on the subject. The study has elucidated the threats climate change poses to established long-term beliefs, practices and perceptions by instigating erratic changes in weather patterns, shifting seasons, and questioning efficacy and authority of traditional interpretation of local weather. Local inhabitants have their own way of internalization and symbolic interpretation of climate induced debacles. Of the indicators demonstrating the impacts of climate change on local communities, seasonal diversity decline is central for affecting every aspects of socio-economic life including rituals and festivals. Apart from these, inhabitants have explored a number of independent and dependent climatic hazards they are under exposed. The paper concludes that experience of climate change impacts is for most cases ecosystem based but perception appears to be culturally specific.

Keywords Climatic change · Perception · Seasonal diversity · Ecosystem · Belief · Ritual · Bangladesh

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Introduction and background

Climate change is no longer an abstract phenomenon in Bangladesh. The coastal country is the seventh most climate vulnerable country in the world (Eckstein et al. 2018). Detrimental effects of climate change, as projected by the world expert community, have already been locally observed, costing about \$16 billion in the last three decades (The Asia Foundation 2012; Oxfam International 2011). Its topography, geographical location, and climatic features make Bangladesh vulnerable to various hydrological, geological and meteorological catastrophic events in the form of droughts, cyclones, floods, river erosion, salinity intrusion, and so on. Combined with high population density and poor socio-economic condition, these debacles result in enormous loss of life and economic damage (BBS 2016). Far from being benign, climate is bestowing much more sufferings upon the nation.

MoEFCC (2007) predicted 70 million people of Bangladesh would be affected by climate change in the near future (as cited in Islam and Uddin 2017). As a densely populated country with 160 million people living in 147,570 square km area (Uttom and Rozario 2019; Oxfam International n.d.), Bangladesh has to endure vicious impacts of global climate change in every aspects of its socio-cultural and economic activities. Yet, not all sectors of the population experience same type of exposure to climatic hazards (MoEF 2014). The high degree of base vulnerabilities subsequently corresponds with the subsistence and settlement pattern in local ecosystem they live in. Climate change adversely affects people whose livelihoods directly depend upon susceptible natural resources (Bharali and Khan 2011; Islam and Uddin 2017). Perception of these people has led to an appreciation for their knowledge which is situated in cultural and ecological contexts (Salick et al. 2009; Turner and Clifton 2009).

Broadly, national discourse about climate change in Bangladesh has three aspects. For some, climate change is viewed as an international agenda demanding national political attention, with little belief in local climatic anomaly. A second group view climate change as a developmental issue (sector of NGO) and a third perspective is held among those with a greater awareness of local impacts of climate change. This group seeks climate justice (The Asia Foundation 2012). Adaptation as an essential component of any response to climate change is targeted at local stakeholders, and they are fundamental to the process of developing and implementing strategies because of their relevant knowledge and ideas (Conde et al. 2005). There is evidence from other contexts that the incorporation of traditional knowledge when developing new approaches to the pressing challenges of climate change can benefit adaptation (Ramos n.d.). What local people think and feel about climate change, how they observe and interpret the erratic climate behavior, and what cultural practices they undertake to adapt to the shocks, all potentially matter in developing relevant and effective adaptation strategies.

The perception of climatic risk comprises fundamental beliefs about society and nature, and is framed by social interaction and cultural worldviews (Mcnealey

and Lazrus 2014). Deep understanding of elderly people about weather, climate and environment is crucial resource in climate study (Mahmud and Uddin 2017), that explains why global climate is changing, what impressions climate change have on locality, and how people response to this change. These narrative stories explain facets of global climate change on local lives. Henceforth, climate change perception study in Bangladesh is viewed potential because ‘knowledge of local perceptions is fundamental for gaining a better understanding of the impact of climate change’ (Byg and Salick 2009). Current research on perceptions of climate change in Bangladesh is very limited. A large-scale countrywide survey, (BBS 2016) reported geographic variation in perceptions of climate change: 21% of households in Dhaka division believe that climate is changing and the figure was lower in all other divisions: 19% in Barisal, 15% in Khulna, 14% in Rajshahi, 11% in Rangpur, 10% in Chittagong, and 9% in Sylhet division. A small number of studies have collected qualitative data on perceptions towards climate change but they are limited to ‘yes/ no’ analysis. Human perceptions comprise a collection of views, beliefs, and practices that are very difficult to capture in structured frame of quantitative analysis. Public perception to date in most parts are accounted on emphasizing quantitative approach which further calls for narrative elaboration with qualitative insights. In this regard, present study aims to explore local people’s perception of nature and indicator of climatic change focusing on impacts and vulnerabilities, and cultural responses.

Statement of the problem and rationale

There is a clear need for an understanding of the perceptions of climate change among those whose lives are most affected to inform national discourse and in particular, development and implementation of adaptation strategies. Regrettably, literature to date on this topic in Bangladesh is in dire need of more in-depth and narrative exploration. In fact, ‘perception’ study to take account on sufferers’ views of climate change never flourished in the country except a few individual maneuvers. This qualitative study is such a kind of effort that aims to elucidate local people’s testimonies about climate change from the prism of different socio-cultural and ecological milieu. It strives to collect climatic data using various lens, tools and strategies for the better reliability and credibility of the information gathered. It distributes its focus in three culturally and ecologically diverse areas that are susceptible to climate change.

Means, methods and location

Present study used three qualitative methods of data collection (Table 1): key informant interviews (KII) and in-depth interviews (IDI) were used to gain a holistic picture of the climatic scenario in the study locations, and focus group discussions (FGD) were used to map out collective social consensus. The village Charhajari of Noakhali district, Anuliya of Satkhira district, and Nitpur of Naogaon district were selected as study locations based on two factors; a)

Table 1 Methods and respondents

| Methods | Location | Number of Respondents | Types of Respondents |
|---------|------------------|-----------------------|--|
| FGD-1 | Charhajari | 7 | Mixed group (inclusion of people from different age, educational and professional group) |
| FGD-2 | Anuliya | 6 | |
| FGD-3 | Nitpur | 8 | |
| KII | Two in each site | 6 | One male from community leader and one female from occupational group |
| IDI | Two in each site | 6 | One male from peasant and one female from teacher |
| Total | | 33 | |

ecosystem, and b) history of climate change impacts and vulnerability. Charhajari was selected for its geographic location in sea delta, complex riverine ecosystem, and history of climatic impacts (river erosion, cyclone, livestock disease, hailstorm, and thunderstorm) in the last decades. Anuliya was selected for its coastal location, brackish ecosystem, distinct subsistence activities, and experience of fighting against climate-induced disasters (salinity ingress, drought, river erosion, sweating, cyclone, hailstorm and thunderstorm). The first two villages lie in aquatic (both lentic and lotic) ecology while the third village, Nitpur, belongs to Barind ecosystem and was selected because of drought, water scarcity, sweating, hailstorm, thunderstorm, cold wave, fog, livestock disease, and different land zone. Religion plays a pivotal role in the socio-cultural and economic activities of first two sites. Agriculture is the maiden economic activity in each site and only Anuliya persists a different kind of subsistence, namely shrimp farming.

As climate change observation requires living in a locality for long times, present study created three groups on ground of the participants' settlement duration in the locality. People who have been living in the study region for more than 40 years are categorized as *key respondents* (57.58%), for less than 40 but more than 20 years are *potential respondents* (18.18%), and for less than 20 years are *ambivalent respondents* (24.24%). Case study supplemented data collection in a different way. It had been dealt with when any interesting piece of information came out from other methods that demanded further detailing out. Following stratified purposeful sampling approach, a total of three FGDs, six KIIs and six IDIs were conducted. Selection of the respondents highly focused on ensuring representations from ethnic, religious, occupational, educational and gender sects.

Of the respondents, only 15.15% belong to under twenty age group, 63.63% are members of above fifty age group and the ages of the remaining participants are between above 20 and less than 50 years. 27.27% respondents passed primary, 18.18% with secondary school certificate, 9.09% passed higher secondary, 3.03% completed graduation and the remaining (42.43%) have no formal schooling. This study includes people from various occupations: farmer (crop producer, horticulturalist, herdsman) 36.36%, day labor 18.18%, shrimp and crab farming 18.18%, teacher 9.09%, date sap collector 3.03%, fishermen 9.09%, van puller 9.09%.

Therefore, fieldwork for data collection took place in two phases, between February to August 2019.

Results and discussion

Perception of climate change

Occupants have testimonies about climatic change, indigenous knowledge, and a set of practices to act on tackling the challenge by adaptation and coping. Multi-dimensional climate change perceptions predominantly exist in all three traditional societies where local people ascribe some reasons behind every environmental phenomenon. Thundering, for instance, is considered a threat of or warning from Allah in Charhajari against human sins. All participants from coastal Charhajari and Anuliya firmly reported that climate has deteriorated gradually, however a few respondents from Barind Nitpur hold skeptical beliefs. Taking account the existence of hazard and disaster before climate change came into light, an ‘ambivalent respondent’ from Nitpur argues in the FGD-

“Cyclone, thundering and nor’wester are now happening likewise before. We found nor’wester in our childhood more devastating than nowadays. It blew up tin and Chan (thatched) roof of the kutchra houses, spoiled the mango bud, fallen down roadside tree and electricity carrying pillars. Now, nor’wester is weaker than past. But recently, we see more frequent thundering with bursting sound. We are not sure whether it is happening because of climate change.”

Despite being located in two distant districts and experiencing dissimilar hazards to some extent, respondents from Charhajari and Anuliya tend to be homogenous in terms of perceiving climatic change. Religious beliefs and cultural values are strong catalysts in shaping perception in these villages, whereas understanding of climate change among Nitpur people tends to center around the dynamics of livelihood and production. Intensive land use, overexploitation of natural resources (trees, rivers, and canal), chemical fertilizer use, deforestation and mass destruction of forest, pollution, and cutting down of hills are blamed for climate change by people from Nitpur. With the exception of these, Charhajari and Anuliya people assign responsibility for climate change to human irreligiousness, social dissonance and deviance, village factionalism, modernization and digitalization, low environmental ethics, decreased cohesion and solidarity, and motorization of life. Nevertheless, the impact of climate change is more visible in Anuliya; harsh saline horizon, scorching heat of sun and tree-less ecosystem epitomize reverse imagery of stereotypical greenish landscape of the country.

Local interpretation of six seasons: unpredictability and uncertainty

Bangladesh is called the country of six seasons (Banglapedia 2014). Seasonal variety makes Bangladesh abound with rivers, fruitful trees and cereals. According to

local perception in all study areas, timings and characteristics of all seasons vary from past to present. Climate experts assert that the debate of how many seasons prevail in Bangladesh is clear, as evidence of disappearance of some seasons is obvious (Dhaka Tribune 2017). A study conducted by Islam and Kotani (2013) reports that Bengali calendar is changing from six to four seasons. Farmers of Barind Nitpur detailed the direct impacts of seasonal diversity decline on the entire agricultural cycle, the essence of which includes changes to crop harvesting times, hazard timing transformed and low chance for preparedness. But contrarily, traditional farmer communities of coastal Charhajari and Anuliya mentioned exceptional pest and virus outbursts. Therefore, the repercussions of seasonal diversity decline are not limited to production but over stretching impacts on human understanding of nature. Subsequently, people loose capacity to read weather and make prediction about what is going to happen in the natural milieu, and can merely make harvesting decisions by dint of traditional environmental knowledge.

According to Bengali calendar, *Baishakh* and *Jaishtha* form summer season which differs from past patterns. Earlier, during these months there was a pleasant breeze that would blow away the dust. Now, inhabitants report a warmer summer than in the past. A farmer from Anuliya explains that in the IDI-

...but now we see only three seasons existing here: summer, monsoon, and winter. Now the atmosphere seems warmer than previous, as heat has been felt in eight months of the year since two decades. There are rains in the monsoon but temperature merely comes down. Hot atmosphere along with augmented humidity make the environment suffocating....

Summer is becoming hotter in Bangladesh (United Nations n.d.). Summer temperature used to start from the month of *Baisakh* in the past, which now begins in *Chaitra*. According to the observation made by natives, the receding of summer by a month produces multisectoral uncertainty and breaking down of traditional seasonal cycling. Daily commodity business of summer produces, eating habits and food chains, and overall socio-cultural life are impeded. On the other hand, monsoon is more uncertain than ever. Usual/timely precipitation is essential for keeping the cycle of lives and livelihood dynamic, making ecology green, and for bestowing the environment with resources. Respondents from all three areas strongly believe that precipitation pattern is now erratic and sometimes it starts before scheduled months (*Ashar* and *Sraban*) colliding with summer. Heavy rainfall in pre and post monsoon, insufficient rainfall during the usual monsoon period, and downpours in a short time, all contradict the traditional monsoon. Moreover, prolonged monsoon until autumn and late autumn has been prevalent for the last few decades. Local communities discuss the prolonged monsoon to *Bhadro* and *Ashwin* months. A 'key respondents' and senior member of the Charhajari explains that in the KII-

“...rainfall amounted excessively during the last monsoon, as two consecutive weeks had experienced endless raining without halt. The monsoon now lasts a long time. In addition, there is continuous rainfall in the Bhadro and Ashwin months. For the last two to three years, it has been raining even in Kartik month as well. We see rain even in winter nowadays.”

Autumn and late autumn seasons have the least evidence of presence in the communities. Beautiful scenery of autumn is engulfed by monsoon in some parts and by summer in other. Only a distinct feature of autumn season, ‘catkin flower’ flags its existence. Salient features of late autumn are also endangered by erratic drought and hot weather. Scorching sunlight in the daytime is unusual to its customary traits of droplets and mild weather. The season of vegetables — winter consists of *Poush* and *Magh* months that also comes late and ends late. Local people use thickness of blankets to describe how cold the weather is- if winter night requires thick blanket it is heavy cold, conversely if thin blanket covers up then it is warming cold. Community perception asserts that thick blanket replaces thin blanket over winter nights. A local hearsay- *magher shite bag kape* (tiger shivers in winter cold) demonstrates heavy cold in the last month of winter season that ‘key and potential respondents’ believe occasionally happens now. However, late arrival and exit of winter season significantly influences the taste and quality of seasonal vegetables; early harvest of winter crops is hampered, more insect pests for lacking of sufficient cold, and prolonged maturity time of *Aman* paddy cause late harvesting of *Irri/ Boro* paddy in response.

With the charming southern breeze, sweet sunlight, and temperate weather, the transitional season of spring between winter and summer is the king of all seasons. Senior members of the communities express worry about its existence due to the difficulties in differentiating the first half of spring from winter and the second half from summer. Traditionally, by the end of winter, a fresh new spirit comes to nature to announce the arrival of spring refurbished with new green leaves. With the passage of time and changing global climate, spring has been losing its spontaneous exquisiteness, and becoming more uncertain and unpredictable, as claimed by participants. For example, instead of spring breezing, chilly wind prevails during *Falgun* month. Local people say that still flowers bloom, new leaves grow, birds sing in spring but there is a lack of animation.

Understanding impacts and vulnerability

Climate change influences human understanding of environment. An intimate interaction between human and nature molds the way people perceive any change in the local climate and weather pattern. Any incongruity in the local climate system significantly influences people’s capability to read weather. Resultantly, people rarely can forestall coming hazards. A ‘key respondent’ from Charhajari elaborated this during FGD-

“We used to read weather in our childhood without modern technology. There had some signs by which we could predict about the upcoming catastrophic events: dog’s crying at night, Jhom kuli (a bird) calling at deep night, increased temperature of pond and river water, atypical jumping of fishes. These symbols are no longer available. Before the great cyclone of 1991, we observed fishes to jump out of the water, and water temperature was high. However, we could not anticipate about its severity and high tidal surge that resulted in enormous loss of lives and resources.”

Fire leaves ashes but river erosion takes away everything (agune chai pawa zai nodir vangon sob niya jai), a local proverb used to indicate the cruelty of river erosion in Charhajari and Anuliya that makes people pauperized in all aspects. River does not erode soil, in fact it washes away dreams. Countless mesmerizing houses, mosques, temples, centenarian banyan trees vanished into river-heart, nothing left for destitute people, except melancholic memories and wretched dreams. It is considered as the most damaging hazard in terms of financial losses (Alam et al. 2017; Alam 2017; Penning-Rowsell et al. 2013; Makenro 2000). Of the reasons, heavy precipitation in a short time, riverbed siltation, and chopping down the bank's trees are core to riverbank erosion as mentioned by affected people. Apart from salinity ingress and mass loss and damage, it aggravates price hike of farmable and habitable lands to twice the original cost. This results in sufferings for both land-loser and other inhabitants in response.

Increased temperature, heatwave and sweating are interconnected hazards. An increasing trend in the annual number of hot days and warm nights has been prevalent in Bangladesh over the last few decades (UNICEF 2016). Locals talk about more dramatic increases in temperature than are measured by the weather office. Over sweating is a recent climatic hazard reported by locals. Critical summer heat, associated with increased humidity and hot wind favors sweating. Earlier, sweating was more likely during daytime which now distracts concentration whether it is day or night, and contributes to physical weakness and fatigue. That searing warmth and scarcity of water in summer and early monsoon make it impossible to harvest crops in the due time. Fish production is hampered by virus attack amid the hot weather.

Bangladesh experiences agricultural drought in terms of water scarcity for crop production (ICIMOD 2017). The lack of rainfall and late arrival of precipitation causes drought in many parts of Bangladesh (Pender 2008). The northern parts of Bangladesh, — the '*Manga*' affected Barind Tract is familiar for its historical combat of malnutrition, and food and drinking water scarcity generated by drought. Drought is a well-known jeopardy in Nitpur, but shockingly it is becoming a major issue for the individuals of Anuliya. In fact, drought situations and their management strategies have very long-term effects on intergenerational social sustainability of underground water. Impacted groups describe the availability of underground water around fifty to sixty feet in depth during the first installation of deep tube-wells in 1980s, but now it is difficult to extract even from one hundred feet down. The more extraction of underground water to meet irrigation demands, the higher the risk of running out. Drought outbreaks when there is a lack of precipitation for a significant time. During the dry spell, the water bodies, for example, rivers, ponds, wells and so forth get evaporated and usable water becomes scarce. River flow is hampered, crops are scorched, and the underground water level decreases.

The inhabitants of brackish ecosystem in Anuliya have viewed that regular interruption of saline water has become destructive for their territory. Cyclone-driven tidal surges, and excessive tides in the days of the new moon and full moon together with feeble embankments contribute to saline water ingress. It takes years to wipe out salinity naturally from arable lands and the harsh subsistence reality does not permit local people to keep the land fallow for long periods. In this circumstance, more saline water is welcomed into the affected and

surrounding lands for lucrative shrimp cultivation as an immediate coping strategy. Along with trees dying, a crisis in the availability of drinking water, skin itching and darkening, the upshot of salinity intrusion is that subsistence agriculture is turned into cash shrimp production. Hence, on one hand, salinity is a social hazard with indescribable social impacts on the ecosystem, water, infrastructure and trees, on the other hand, it is also an economic resource that generates more cash than any of the other local livelihood options.

Cyclone is the name for a deadly climatic hazard in Bangladesh. There is, on average, an event every 3 years (MoEF 2009) and 40 % of total global cyclone hit Bangladesh (Murty, 1984, as cited in Haque et al. 2012). Formed in the Indian Ocean and the Bay of Bengal, many of the world's deadliest cyclones (*Sidr, Aila, Mohasen, Nargis, Titli, Rashmi*) have smashed Bangladeshi communities in the last 50 years (Quadir and Iqbal 2008). Residents of Charhajari and Anuliya agree that climate change is aggregating cyclonic events in their locality. The strength and number of cyclones has increased dramatically, however, resultant loss and damage is decreasing because of awareness raising and mass social response.

Hailstorm is a dependent hazard that cannot occur independently of a nor'wester and/ or rainfall. As per the interpretation of local people, hot weather together with increased humidity proliferate the possibility of nor'wester and hailstorm in the dry season. Elderly people reported anomaly in the nature, intensity and size of hailstorm over time. The amount of damage and loss a hailstorm can produce depends on its size and the time it occurs. It has the most detrimental impacts on mango and surface crops. Respondents reported that historically, hailstorms were most likely to happen during summer whereas more recently they are also occurring during the monsoon season. During key informant interview (KII), a farmer from Nitpur said that-

"...hailstorm is very fascinating to touch! It was not an impacting hazard, besides picking up hailstorm was lot of fun. We have tasted it in the childhood. It is now big as ice tennis ball which once was marble sized and used to melt just after dropping at the ground. Hailstorm holes the tin/ thatched roof and injures human when falling directly on their body, particularly on head. Thus, its changing motives, seasonality, and size have turned it into a harmful hazard for the community people."

Bangladesh faces a quarter of worldwide deaths caused by thunderstorms (USNLSI 2016, as cited in Farukh et al. 2017). Individuals egregiously state that thunderstorms are becoming stronger than ever and having a bursting sound with a gigantic capacity to cause everything in range to tremble. Furthermore, the area a single storm can reach is extending gradually; now a single thunderbolt can engulf an area much larger than in the past. People believe there is a connection between tall trees and the severity of thunderstorms; tall trees like *Gojari, Segun and Tal* endure thunderstorms to keep people safe. It is believed that the more deforestation that takes place, the higher the incidence of thunderstorms. *Joto gorom toto gorjon-* a local proverb indicates that thunderstorms take place after much heat. Deforestation due to climate change driven salinity intrusion is believed to intensify thunderstorms in the locality. Therefore, a story of theft of

grounded farmland boundary pillars (lightening conductors) installed by colonial British is common to people.

According to the understanding of herdsmen, erratic rainfall, hot and cold weather increase the spread of livestock diseases, such as mumps, *jagega*, allergy, diarrhea, cold, cough and fever. Traditional healing practices get priority over biomedical treatment. In case of *Jagega* disease, for example, pig's legs are massaged with the paste prepared from the leaf of *Banlshil* tree for 3 days. Unfortunately, one consequence of the destruction of the local ecosystem due to climate change, development intervention and modernization process has been the disappearance of many local herbs and ethno-medicinal plants. Without access to the trees, herbs, medicinal plants, and creepers, the efficacy of *Kabiraji* medicine (one kind of ethno-medicine) is reported to decrease. A local *Kabiraj* (folk healer) of Nitpur demonstrated that in the FGD –

“Kabiraji is our hereditary profession. My father and grandfather used to collect particular creepers from graveyard to feed the cow for curing of diarrhea and cholera. People had deep trust in folk treatment system. The habitat of medicinal herbs and creepers such as abandoned jungle, forest, side of muddy road, antique graveyard has been damaged by less rainfall, excessive heat, population increase, and lots of development works.”

Cold waves and fog, two life-threatening meteorological hazards, are common almost every year in Nitpur. According to the respondents, the number of cold waves and density of fog both are rising simultaneously now more than ever. Cold waves are reported in the area up to five times a year, and each occurrence usually lasts for 4 to 7 days and is accompanied by a dense fog. Showers are the recent addition to the sufferings produced by cold waves and fog. Occupational groups of Nitpur accuse climatic capriciousness for all of these perilous events. A variety of human diseases, including cold, cough, asthma, pneumonia, arthritis, and fever, outbreak during cold waves, which contribute to the high death toll of senior members of the community. In the case of potato, paddy, cauliflower, cabbage and other winter vegetables, the most damaging effects of cold waves and fog (i.e. decomposition, virus and pest attacks, low maturity and quality) are caused by the lack of sunlight.

A good number of festivals triggering social cohesion including *Nabanno*, *Jatra-Pala*, *Jari Gan*, *Sari Gan*, *Kabi Gan* etc. were widely celebrated by peasants after paddy collection. Regardless of high yields comparing to last 30 years, peasant can hardly make profits now as the climate change along with other socio-economic catalysts worsen natural productivity and cost. Agrarians did not need to use chemical fertilizer and pesticides as much as recent times, yet outcome was high by dint of natural fertility of lands. Nowadays, farmers are gaining more yields than previous years, but expenditure and yield both are so high that farmers can barely make profits like in the past. That is why local farmers gossip about ‘high yield but low satisfaction’. The disappearance of festivals is just the example.

Cultural practices and responses

Local responses to climatic threats are informed by cultural beliefs and values held in that particular ecosystem. People embark on a number of cultural strategies to minimize the loss and damage caused by climate change. Believing that the *la haola dua* (an Islamic prayer) protects them from thunderstorms, most Muslim participants of Anuliya and Charhajari reported that they recite this during lightning events. With the intention of halting the storm or cyclone and nor'wester, adult males repeatedly announce *azan/ adhan* (Islamic tradition of calling followers to prayer). During droughts and heatwaves, the Barind people of Nitpur store drinking water in clay made pitchers to keep water cool and help to reduce the likelihood of heatstroke and over sweating. Additionally, farmers of coastal Charhajari eat *Panta Bhat* (fermented rice) to keep the body cool amid hot periods. *Keora* (*Sonneratia apetala*), a brackish and mangrove ecosystem centric wild fruit, is widely eaten for treating diarrhea, dysentery and anorexia caused by hot weather in Anuliya. In the case of insect pests that destroy crops, the practice of sprinkling ashes is widely common in all three regions. Low height rooves made from thin polythene are installed over seedbeds to protect saplings from damage by hailstorm in all communities. Poor peasants make cost efficient thatched/straw roof for the same purpose. People blame local climate for being less responsive to rituals and prayers performed for protection from dangers. Once important rituals, such as *Isteska Namaz* by Muslims, '*Barun Puza*' by Hindus and *Amani and Fog Marriage* rituals for rainfall, are perceived to lose their effectiveness because of erratic behavior of climate. Furthermore, *Hirali* (a shamanic practice) was believed to have the ability to defend nor'wester and hailstorm. All these rituals had seasonal relevance and have become ineffective and irrelevant as seasonal diversities no longer exist in the way they used to.

Conclusions

It is recognized that to develop a qualitative frame of understanding of climate change, intensive interaction with locale is required through 'being there' (Roncoli et al. 2008). In this study, three methods of qualitative research have been used to understand local beliefs and perception about climate change in the locality. The study elucidated the threats climate change poses to established long-term beliefs, practices and perception by instigating erratic changes in weather pattern, shifting seasons, and questioning efficacy and authority of traditional knowledge on weather reading. Of the indicators demonstrating the impacts of climate change on local communities, seasonal diversity decline is central in affecting every aspects of socio-economic life including rituals and festivals. Harvest variety is greatly linked to seasonal diversity. The repercussions of climate change are that many traditional species, indigenous fishes, and herbs face extinction because of seasonal diversity loss. Changes in the arrival and departure time of each season influence both the yield of crops as well as the associated social beliefs, festivals and rituals.

Being a land of versatile ecological hotspots, climate change unevenly affects Bangladeshi people relying eloquently on fragile topography. Under the broad

ecological categorization of Bangladesh's landscape, each single individual of traditional occupational group owns distinct story of climate change influence. This study demonstrates that peasants of Barind ecosystem understand climate change in a very different way than their fellow beings of littoral ecosystem in Charhajari and Anuliya. Alternatively, it has been observed that people entitle same worldviews on climate change notwithstanding inhabiting in the same kind of ecosystem of two distant regions because of sharing same cultural values. Such as, people of riverine Charhajari and Anuliya have divergent experience of climate change impacts and vulnerabilities, but they seem identical in terms of their belief and perception regarding climate change. The examples state that experience of climate change impacts is for most cases ecosystem based but perception appears to be culturally specific.

In conclusion, this study found that local participants have a rich and deep understanding of how climate change is impacting the ecosystem on which they depend. This understanding along with the meanings prescribed to these changes and the adaptations that are already taking place are vital tools for those seeking to understand and develop interventions targeting climate change impacts among those most affected in Bangladesh. Participant's demonstrated detailed knowledge of local changes which can guide adaptation interventions. The study documented a number of strategies people have developed to adapt to these problems, which may be of use to other communities facing similar challenges. The study also documented impacts where solutions have yet to be found, for example, the destruction of herbs may form the focus for interventions by NGOs etc. Moreover, beliefs and perception held by local people may provide crucial insights for policy makers to make informed policies on climate change and disaster.

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Author's contributions Singe Author- Full contribution. The author(s) read and approved the final manuscript.

Authors' information Md. Borhan Uddin has recently completed his M.Phil. from the Department of Anthropology, University of Dhaka, Bangladesh. He is the author of a number of books and article. Over the last six years, he has been engaging in climate change research. Besides, his research interests are gender, environment, education, social development, migration etc. He can be reached at robi_borhan@yahoo.com

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Declarations

Ethics approval and consent to participate This article is the outcome of author's M.Phil. research under the Department of Anthropology, University of Dhaka, Bangladesh. Admitting in the M.Phil. Program under the Department of Anthropology, University of Dhaka by maintaining all academic standard procedures necessarily indicates ethical clearance to conduct research. Here, process is — students can admit into the program once their research proposal and protocol is found sound by the board of review com-

mittee and then approval for admission is given. Though, no ethical approval letter is provided from the university to research degree candidate.

The study was conducted in very remote areas. Consent was taken from the study participants in oral form. Because, many rural people do not prefer and able to sign in consent paper. Here, informed consent from was used. Consent form was read out in case of illiterate person, and conversation started once participants agreed. Participants were explained about the purpose of the study, why their voice is important, and how their opinion/speech/ words would be used in various platform. They were assured that their names will not be used in any stage of the research. Research report, findings and articles generated from the fieldwork, will also be shared with them or they will have access to this kind of outcomes.

Competing interests Not applicable.

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