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Climate justice for the southwestern coastal region of Bangladesh

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Climate change is considered a moral, ethical and social issue, which makes it different from other developmental issues. The foremost instance of lack of justice regarding climate change is that the worst impacted areas are the ones with the lowest contribution to greenhouse gas emissions, such as the southwestern coastal region of Bangladesh (SWCRB). Climate change is principally triggered by the presence and eventual spread of industrialization. This study employed the mixed method, combining qualitative and quantitative methods of data collection and analysis for development of a framework for climate justice. Data and information were obtained from both primary and secondary sources. In primary sources, quantitative data were collected from climate vulnerable community households using a structured close ended questionnaire and interactive sessions such as focus group discussions, in-depth interviews, key informant interviews, workshops, and case studies. This study explored the perceptions of people in the SWCRB, currently experiencing devastating effects of climate change and sea level rise including extreme natural disasters, seasonal changes, flooding, salinization, riverbank erosion, and waterlogging. These climate-induced changes are causing loss of housing, livelihoods, and land to the natives, in addition to a lack of access to proper nutrition, potable water, and healthcare thus exacerbating social injustice. A capability-based approach to climate justice is introduced in this paper, which allows for residents of this region to prepare and rebuild their own communities and create adaptive mechanisms based on their specific capabilities. This approach requires compensation (funding) from the global community, in addition to organizational connection between local people and other stakeholders. The people in the SWCRB are increasingly opting for community-based disaster management and inclusion in policy making. Persistent issues faced by these communities require sustainable development of embankments and infrastructure, as well as affordable and sustainable access to potable water. Industrialized nations should provide this compensation for climate change, in addition to acting promptly to reduce greenhouse gas emissions and opt for renewable energy to avoid worst-case scenario. Lastly, involuntarily displaced climate refugees must be provided rights, compensation, and relocation assistance.

KEYWORDS

climate change, climate justice, capability-based approach, carbon dioxide emissions, risk assessment and disaster management, southwestern coastal region of Bangladesh

Introduction

Greenhouse gases (GHGs) such as methane and carbon dioxide are naturally present in the Earth's atmosphere; however, their concentrations have been anthropogenically increased through burning of coal and natural gas, increasing animal husbandry, and deforestation. Since pre-industrial times, humans have contributed to 2,500 billion tons of CO_2 emissions, which exceeds the average natural levels in the past 650,000 years (IPCC, 2013, 2021; Chancel, 2021). Additionally, 10 nations have contributed to ∼69% of the global GHG emissions and 20 nations have generated ∼82% of the global CO_2 by 1990 to 2019 (Crippa et al., 2020; Olivier and Peters, 2020; Ritchie et al., 2020). The increase in GHGs after the industrial revolution is responsible for increased average global temperature, ocean acidification, contributing to melting of polar ice caps and rising sea level, causing climatic variability (Garcia-Soto et al., 2021). Although the 50 least developed countries contribute to <1% of global emissions (IPCC, 2013; Liu et al., 2019), climate change disproportionately affects the developing countries and especially the marginalized populations.

Besides, Bangladesh a low-lying South Asian country is highly susceptible to the adverse impact of global climate change particularly to sea level rise due to its unique geographical settings and poor socio-economic conditions of the vulnerable communities. Scientific projections showed that sea level rise ranged from 0.53 to 0.97 m in 37 coastal stations at the Bay of Bengal for the year of 2100, where the predicted global sea level rise is 0.09–0.88 m (Haque A. et al., 2019). World Bank assessed that 1.5 to 1.54 million people would be affected by 2070 by sea level rise of 1 m causing permanent relocation of 13 million people. Therefore, this study investigated the potential impacts of SLR in Bangladesh along with the climate justice. Bangladesh comprises of 19 coastal districts (among 12 districts exposed to the sea and lower estuaries) consisting of 710 km coastline, which makes the country one of the most disaster-prone and climate vulnerable countries in the world (ibid). The coastal area is ∼1.5–11.8 m above the mean sea level. The estuarine islands constantly change shape and position due to river erosion and new alluvial deposition. These areas are subject to flooding in the monsoon season and waterlogging in parts of the basin areas in the dry season (Feist et al., 2021). Scholars have analyzed risks of climate change and sea level rise (CCSLR) in Bangladesh from different perspectives like human security risk (Rashid and Altaf, 2020), adaptation, and mitigation (Islam M. A. et al., 2020), the involvement of local institutions (non-governmental organizations (NGOs), civil society organizations (CSOs) and community-based organizations (CBOs) (Rahman, 2019; Prabhakar and Shaw, 2021); however, limited studies discussed the issue of CCSLR vulnerabilities and climate justice in the coastline of Bangladesh.

Due to the large population density, reliance on natural resources, geography, and socioeconomic status, Bangladesh is considered the second country most vulnerable to the effects of climate change but in the context of CO_2 emissions in 2020 was 108.504 megatons; ranking Bangladesh is the 148 out of 181 countries for contribution to global CO_2 emissions (URL-1; Eckstein et al., 2019). The coastal zone of Bangladesh was assaulted by a razing cyclone in 1970, in which more than 300,000 lives perished (Eskander and Barbier, 2022). Subsequently, the nation suffered from another food crisis in 1974 causing the demise of 27,000 lives (Currey, 1979). In 1991, cyclones affected almost 100,000 lives. The consequences of climate change are causing the nation to be impacted in an extreme intensity, placing the inhabitants in a sorry state with compromised ability to adapt to the situation. This vicious cycle of repression, catastrophe and paucity is preventing the advancement in Bangladesh. Predictions reveal that within 2050, one in 45 individuals globally (Brown, 2008; Davis et al., 2018) and one in seven individuals in Bangladesh will lose shelter due to climate change (Ahmed et al., 2019).

People of the southwestern coastal region of Bangladesh (SWCRB) are already trying to adapt to the effects of CCSLR, such as saltwater intrusion, agricultural loss, and high intensity cyclones. The most vulnerable people are the most susceptible to the effects of climate change, such as people inhabiting areas with compromised security, poor financial conditions, limited awareness of human rights, areas at a geographical disadvantage, and those that contributed the least to climate change (Didar-Ul Islam et al., 2015; Dasgupta et al., 2017; Khanam et al., 2022). Environmental disasters caused by climate change cause stress on these developing countries and lead to social and economic stresses including lack of access to clean water, food, employment, and loss of homes and farms (Alam et al., 2020).

Climate justice is a complex issue involving social, economic, and political aspects. Due to the social inequities presented by climate change, current political debates on policy frequently focus on climate justice at the regional and global level; however, specific focus is currently needed to the environmental policy priorities of people in impoverished and lower-emitting nations (Byrne et al., 2002; Dryzek et al., 2011; Adel, 2020). Additionally, a core topic of climate justice is that of the causative nations assuming liability for creating and then confronting CCSLR by legitimately restoring the developing countries and/or providing refuge for involuntary climate refugees (Dryzek et al., 2011; Ahsan, 2019). Although the government of Bangladesh (GoB) and NGOs provide some relief to the SWCRB after disasters occur, more assistance is required to create resilient communities, and each phase of the planning and implementation processes must include matters of equity and justice (Hossain, 2020). Many challenges arise as implemented measures that are intended to combat injustice are not always equitable and may even harm the groups of people they are meant to uplift.

Study area

The considered zone encompasses Shyamnagar Upazila (sub district) of Satkhira locality within the southwestern coastal region of Bangladesh (Figure 1). Shyamnagar is situated between 21°360′ and 22°240′ N latitude and 89°000′ and 89°190′ E longitude, which is exceptionally near to a mangrove forest and the Bay of Bengal. The region was regarded as vulnerable to CCSLR due to its geographical setting (the foremost southwestern portion and its conical form) and topographical aspects (largely flat regions). The mean sea level extended from 1 to 5 m from the years (Didar-Ul Islam et al., 2015; Rezaie et al., 2019). This region was secured by the Ganges floodplain, which was for the most part formed by sedimentation (Rashid et al., 2019). The overall population of the Upazila was 313,781 in the year 2010 (Abedin et al., 2019). The Sundarbans, along the Shyamnagar, are sections of the planet's biggest delta created by the GBM rivers (Whitehead et al., 2015). The Ganges and Brahmaputra rivers originate from different basins in the Himalayas and converge in the Bengal Basin of Bangladesh, where they form one of the largest deltas in the world. Delta sediments form a shallow area that extends about 200 km south from the coastline, i.e., GBM rivers (Kuehl et al., 2005; Masood et al., 2015; Whitehead et al., 2015). The Shyamnagar sub-area is near a mangrove forest and the Bay of Bengal and is vulnerable to climate change and SLR due to its low-lying topography. This region was formed by sedimentation of the Ganges floodplain and has a moderate population density. The mean height above sea level (MASL) ranges from 1 to 5 m, with 45% of the study area having a high chance of inundation from a 1 m storm surge (ibid). High Mountain Asia (HMA) adjoining the Tibetan Plateau feeds the fluvial system of the Indus, Ganges, Yangtze, Irrawaddy, and Mekong with seasonal glacial melt (Azam et al., 2018; Wester et al., 2019). The HMA acts as a freshwater reservoir, crucial to ecology, cultivation, and hydropower, as well as being essential to more than a billion people (Masood et al., 2015; Pratap et al., 2015). The retreat of glaciers will cause a series of effects as these provide a steady source of water to South Asia where the population is dense. Political and social issues will arise with the increasing scarcity of water and flash floods (Harrison et al., 2018). Along with this, ice in the Himalaya vicinity alone would raise sea level by 1.5 meters (Pratap et al., 2015; Maurer, 2020). However, considerable breaches in understanding the dynamics and linked climate triggers in HMA exist (Azam et al., 2018). Around 36% of landscape ice will undergo the melting process by 2100 even if states fulfill the determined 2015 climate accord goal to limit heat release increase to 1.5 C (Wester et al., 2019).

Methodology

This study uses the perception of people in the SWCRB to develop a framework for climate justice as defined by the people themselves. Quantitative data was obtained from this region between 2017 to 2019 with a set of questions used for quantitative analysis, which was also involved with a disaster risk assessment and qualitative data was obtained from 2017-2021 such as case studies, focus group discussions and workshop which is done by field work as well as due to Covid-19 through skype, massager, over telephone. The capability-based approach to climate justice was then applied to this data as a specific productive pathway for realizing the concerns of susceptibility and consequence, which aids in effectively conceptualizing the precise adaptive methods to climate change. Such an approach to climate change could be utilized as a normative rule for climate policies and is a comprehensive solid benchmark to quantify improvement. The normative theories of climate justice are the main basis behind these frameworks that can ground global climate policies. The crucial point is that how those can be made relevant to the real-life scenario and requirement of adaptation.

The geographical region selected for this study was SWCRB, an area extremely vulnerable to the detrimental consequences of climate change and socioeconomic progression obstacles. In FGD, case studies, and participating individuals' scrutiny, we employed open and close ended instructive queries "what," "how," and "why" ones. Such queries are connected with the epistemic hypothetical building block of information utilizing social and technical means rooted within ethnography (Flyvbjerg, 2001; Yin and Davis, 2007). With real life issues in what are conversed by social science research as constructing context of trusting clarification (Flyvbjerg, 2001).

Qualitative method

To conduct the study, both primary and secondary data were accumulated. Key informant interviews (KIIs), (Edwards and Holland, 2013) case study (Johansson, 2007; Hennink, 2013) workshops, and 26 focus group discussions were organized at Shyamnagar Upazila, which included the members from local neighborhood, and the innovators during the field visit. Case study allows qualitative analyses of data and helps to explore the real-life scenario regarding the vulnerability of people in the SWCRB; at the same time, it explains the complexities of real life to the face of climate change.

In workshops, seven meetings were organized with school students, college students, and a mix of participants (local government officials, journalists, NGOs) with the purpose to benefit from their knowledge and experience regarding climate change. In focus group discussions, open discussions usually of 60–90 min (Hennink, 2013) on climate change, sea level rise, and climate justice are encouraged and are guided by a moderator. The group is called a focus group as well as the discussions are tape-recorded, transcribed and analyzed. The focus group discussion and the meetings were held at a convenient place like school, youth club, community organization where the concerned respondents were able to discuss issues and express

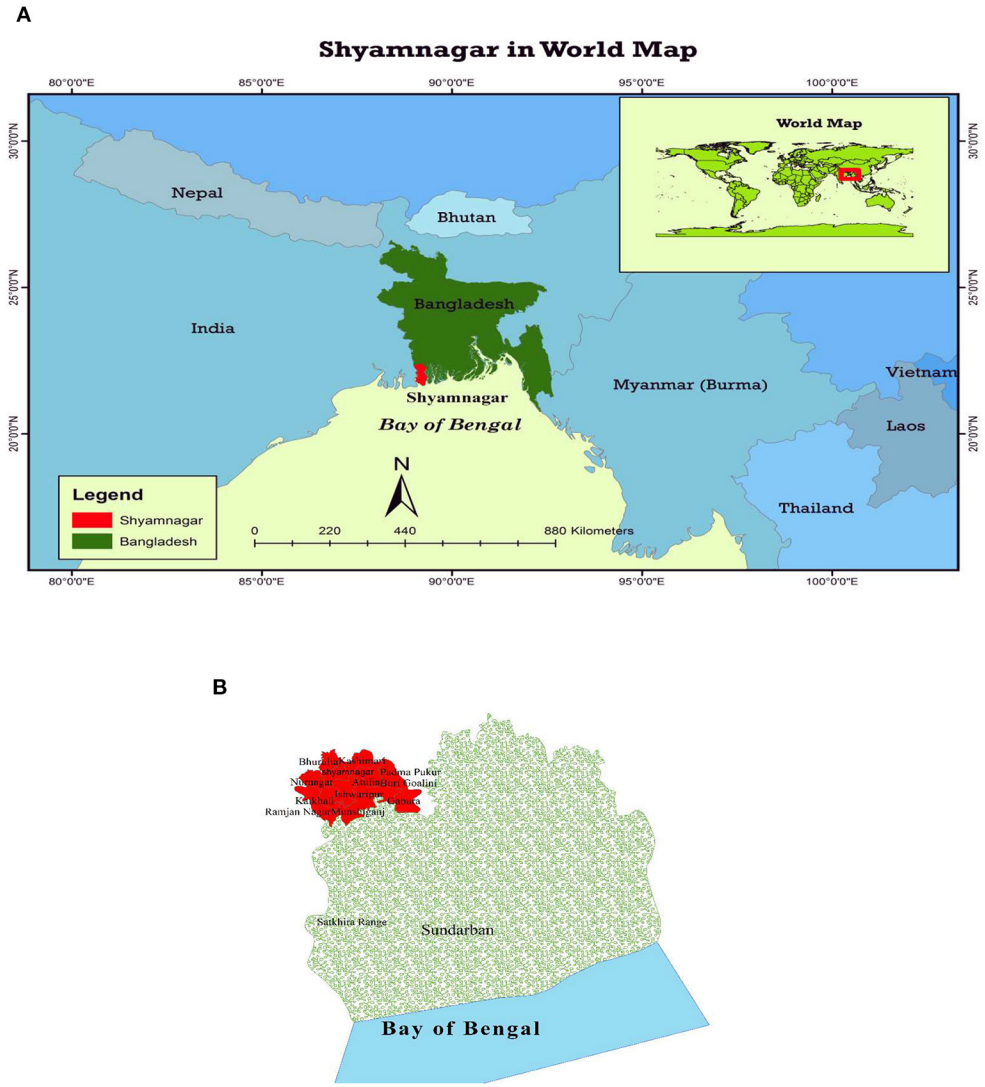

FIGURE 1
(A) Bangladesh and Shyamnagar in World Map; **(B)** Study area.

their idea and concerns independently. The recorder was used by the author for writing the discussion, at the same time we took their consent to record the discussion and explained them to purpose of the research. They were well informed that the participation is completely voluntary and they also had the right to refuse to answer any questions, if needed. The participating members of the community established a respectful appreciation by providing their valuable contribution for this research. All members were encouraged to talk freely and ask questions at any time during the session and each participant's consent were recorded using predetermined format. Then, with the consent of the participants, climate change, climate justice checklist was used demonstrating other benefits. This driven a guided discussion helps that one single respondent cannot dominate the discussion and everyone gets an opportunity to contribute in the discussion session to develop the exposure factor of climate change for the climate justice issues. The respondents of the focus group discussion, IDI, KII were, UP Representatives, women respondents, local school teacher, male and female farmers, member of civil society, doctor, member UDMC, member WDMC, poet, NGO practitioners, journalist etc.

A detailed close ended questionnaire all-inclusive of economic, social and environmental aspect of the current justice protocol was used for data collection. Along with literature review and initial desk study, a broad range of Participatory Rural Appraisal tools were used, which included detailed

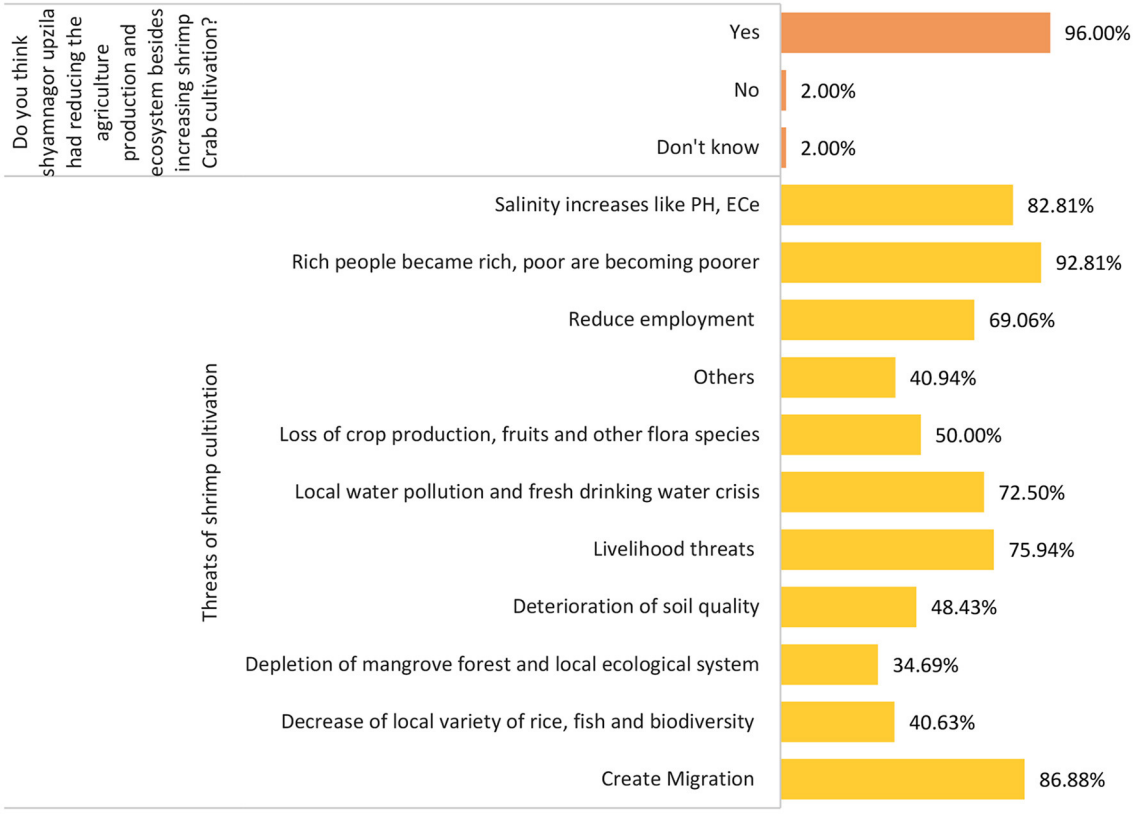

FIGURE 2
Figure represents that the threats of shrimp cultivation to the coastal area of Bangladesh. Multiple Response: $N = 320$ (Source: Field Survey, 2017–2019).

interviews of the key informants. Numerous community meeting with multi-stakeholders were conducted at all the unions under the scope of the study, where stakeholders were asked to present status of climate change. Following participatory approach, Bryman (2016), Jull et al. (2017) the hazard risk in the exposed SWCRB were identified through 387 respondents voting. We ensured the collection of comprehensive idea and qualitative information from all types of participants including under-privileged and vulnerable communities, government, and non-government actors.Some of the key research findings we got in our research from the FGD, IDI, KII, PRA, Works shop which is provoked climate justice, which is given below.

Quantitative method

Quantitative analysis was performed *via* a field survey in 2017 and 2019 for 320 households to obtain 95% confidence level ($p < 0.05$). The household survey was carried out through close-ended structured questionnaires to capture the response of respective respondents for capturing risk and hazard, social vulnerability. In the present study, a representative sampling approach was undertaken. The following sampling approach and statistical formula were applied for the sample design:

$$n = \frac{z^2.p.q.N}{z^2.p.q + (N-1)e^2} = (1) \quad (1)$$

Were,

n = Sample size

N = Targeted Population size

e = Admissible error in the estimate

p = Proportion of defectiveness or success for the indicator

q = 1-p

z = Standard normal variable at the given level of significance

For ensuring representative sample size from each Union equal proportion of sample size was selected. The details of the quantitate sample size distribution have been provided in SI Table 1. Respondents reported their perceptions of CCSLR by responding "yes," "no," or "I do not know."

TABLE 1 The detail of quantitative sample size distribution.

Type of respondents	Union coverage	*N*	*n*	Female numbers	Male numbers	Percentage of youth
Hazard analysis	12	318,254	387	189	198	35.5%
Social vulnerability, adaptation and Justice analysis	09	242,392	320	98	222	25.5%

Climate justice theory

Despite the political debate, the people who are directly impacted with continuous consequences of climate change (increasing warmth, rising sea levels, and intense weather conditions) must immediately develop adaptive mechanisms (IPCC, 2013, 2021; Hoogendoorn and Fitchett, 2018). The core topic of climate justice debates is the fundamental evenhandedness of the climate conformity, meaning those industrialized nations who created the problem undoubtedly suffer less than developing countries, and must bear the responsibility of this injustice. Strategies based on this concept support an original polluter payment standard, which places the load evenly on heavily industrialized countries (Byrne et al., 2002; Dryzek et al., 2011; Schlosberg, 2012; Pellow, 2017). The rule of equity must be applied to the measures used by humans to adapt to increasing consequences of climate change (Schlosberg, 2012).

Several approaches exist in climate justice theory, two of which include the allocation- or rights-based approach and the capability-based approach. The allocation- or rights-based pathway to climate justice highlights fundamental human rights, rights for advancement, and environmental rights. Caney (2010) asserts that all inhabitants have a moral justification not to endure climate impacts that weaken their fundamental concern and debates that climate change breaches human rights to life, wellbeing, and survival (Caney, 2010). Vanderheiden (2008) reformulates the right to advancement as an ethical justification to have the fundamental environment in which human progress is a possibility, which necessitates a more stable climate. Following Shue (1999), Vanderheiden argues that developed nations are obligated not only to not deter underdeveloped nations from development but also to compensate the full charge of their own actions (Shue, 1999; Vanderheiden, 2008). This rights-based approach to climate fairness has two significant drawbacks: (1) this approach overlooks other significant notions of justice, such as social and political appreciation, and necessities (that the capability-based approach encompasses), and (2) it articulates ethical urging for global strategy to avoid or diminish climate change and its diverse rights outcome (Sen, 1999; Lafontaine and Sipowo, 2013).

The recognition-based approach to climate justice is problematic as non-recognition, mis-recognition, or mal-recognition of inhabitants, population groups, and situations cause unfair treatment. Discrimination triggered by organizational control and coercion could be the center of this unfair allocation (Dryzek et al., 2011; Young, 2011; Schlosberg, 2012). Identification of the problem itself is the main drawback that causes unfairness and poor distribution (Young, 2011; Fraser, 2014). Specifically, cultural supremacy, non-appreciation, and lack of respect are exclusively included (Fraser, 2014). Simply realizing unfair allocation and dearth of appreciation is not enough for justice. Aside from denial, other issues that cause destruction are abuse, lack of attention, and undervaluing people or their neighborhoods (Honneth, 1996). For example, the Alliance of Small Island States (AOSIS) presented their fears of being inundated by sea level rise in 1991, but the UN Framework Convention on Climate Change (UNFCCC) failed to acknowledge this. Acknowledgment of loss and damage was denied by developed nations until 2007 when it was discussed at the COP 13 (Conference of the Parties) but did not gain true momentum until COP 16 in 2010 (Shamsuddoha et al., 2018; Toussaint, 2021). Therefore, this denial by developed nations caused a lack of action for nearly two decades.

Additionally, recognition of the connection between the environment and cultural distinctiveness to a group is heavily missing or overlooked in the UNFCCC, even with the Convention on Biological Diversity and the Universal Declaration on the Rights of Indigenous Peoples. It is a matter of frustration for many indigenous social workers and organizational entities that in contemporary strategic discussions on climate change, none of the cultures, practices, or ecosystems that create belongingness to groups of indigenous people is documented or appreciated (Dryzek et al., 2011; Raftopoulos and Short, 2019). According to Fraser (2014), the downfall of recognition is that it is often used to attain authority over those who are already being discriminated, ridiculed, or ignored.

Contrarily, a capability-based approach acknowledges different social and political circumstances and allows for differences in regional susceptibilities and fundamental necessities of humans in different places (Holland, 2008). The logic in this regard is that a capability-based pathway to justice can aid in addressing a host of worries caused by climate change, such as allocation of susceptibility, fundamental privileges, and acknowledgment of individuals, localities, and their correlation. Sen (1999) and Nussbaum (2006) believe the focus of justice should move toward people's ability to

develop free and dynamic lives designed by them. To have the communal platform of self-esteem and honor is the main essence of a capability-based relationship.

The two key methods of broadening the capability-based approach are either developing a visible policy of recognizing the ecological reinforcement of human abilities that already exist or proposing a broader view of capabilities. Holland (2008) proclaims that a viable environment is a "meta-capability" and it eventually enables all others. Mainly, when our focal point moves from the concepts of preventing and mitigating to the practical nuances of adaptive mechanisms, impacts to natural earth must be central to a capabilities-dependent pathway to climate justice (Holland, 2008; Dryzek et al., 2011; Schlosberg, 2012). This direct approach to climate justice offers a portrayal of climate justice that admits and includes the human engagement in the non-human domain. Therefore, the gap between the concrete theory of climate justice and real-world adjustment strategy is addressed by the capabilities approach. According to Sen and others, to obtain the exact environmental capable limits similar to their previous generation is the right of the upcoming generations of human race (Sen, 1999; Anand and Sen, 2000).

Firstly, most recognized pathway to climate justice has two vital limitations, in the manner of failing to exploit two significant improvements in latest justice theory: firstly, the familiarity of social and political misrecognition as the vital causal state of the misdistribution of goods and threats (Schlosberg, 2012; Fraser, 2014) and secondly, the influence exerting pathway, which focuses on the precise series of fundamental necessity and capacity–recognition that human race needs to work on (Dryzek et al., 2011). These two options aid us understanding the aspects of politics, society, and culture, along with the physical ones, that give rise to and help to flourish susceptibility. Besides, the huge portion of the present propositions on climate justice are based on frameworks of preventing or mitigating, or on the allocation of the expenses of adapting to climate.

Second, adoption of a capability-based pathway to climate change justice links the void between the perfect as well as conceptual viewpoint of climate justice theory on the one end and the actuality of policy-formulation for adapting on the other. A capability-based pathway can place social and political acknowledgment of particular and regional susceptibility and the consequence of climate change on the fundamental requirements of human beings in different circumstances and with various situation. This pathway is based on how much capable we acknowledge the society and politics of particular and regional susceptibilities and the impacts of climate change on the fundamental necessities of human race in different places and under various circumstances (Holland, 2008, 2012). Holland also developed a competence approach in environmental and climate justice, although there are major differences between our efforts: Holland's work focuses more specifically on the environment as a tool support system to meet human needs, while current's work addresses broader concepts related to climate justice, the role of recognition and its application to communities and non-human areas. The capabilities approach makes an offer of a specific productive pathway of realizing the concerns of susceptibility and consequence, and thus aid us effectively to conceptualize precisely what adaptive method to climate change would be consisted of. Such an approach to climate change could be utilized as a normative rule for climate policies and makes an offer of comprehensive solid benchmark by which to fathom improvement.

The two key methods of broadening the approach of capabilities to include a range of risks and weaknesses resulting from climate change are either developing a visible policy of recognizing the ecological reinforcement of human abilities that already exists or proposing a broader wing of capabilities approach to the natural world. Here, first and foremost the focus will be on the first one, however, the most debatable concept of fairness to nature based on capabilities will be laid a hand on in brief (Thompson and Bendik-Keymer, 2012). The important thing is in both ways the capabilities approach recommends a method of encompassing the actual human dependency and their interest in the affected natural world by our actions. Democratic partaking in and manipulation over one's very own surroundings are vital for the realization of a capability-based pathway to justice and are an invariable requirement in climate justice actions (Anand and Sen, 2000). Local community members can be associated in dialogue about neighborhood susceptibility, as realized *via* a range of parties involved. Community members are required for complete engagement in both the mapping of their own susceptibilities and the planning of adaptive strategies. Such inclusive approach fulfills both acknowledgment and ability to participate (Dryzek et al., 2011; Heltberg and Bonch-Osmolovskiy, 2011; IPCC, 2013). Policy-making bodies can utilize the abilities data obtained from climate researchers, health organizations, emergency administration organizations, agricultural and parallel bodies, and other stakeholders to recognize mechanisms effectively, and then place very exact modifications to the tangible environment, which will influence the ability of those environments to maintain a particular human skill range (Heltberg and Bonch-Osmolovskiy, 2011). Additionally, threats and problems tend to accumulate, and there must be acknowledgment that people who are vulnerable to losing abilities are likely to undergo the loss of others, and authorities must work to disintegrate such accumulation (Chuang and Peterson, 2016).

In the immediate past tendency of premise of justice, the most important outlines for climate justice have been observed not to be connected completely. In regard of improving our realization regarding the concern of weaknesses, fundamental necessities and rights and human thriving, this kind of involvement is essential. Discrimination triggered by the organizational control as well as coercion could be

the determiner of unfair allocation which now is a major focus. According to Young (2011), Schlosberg (2012) the need of identification facilitates distributive biasness where cultural and political discrimination encourage weaknesses and economic discrimination.

At the national level, Bangladesh Climate Change Strategy and Action Plan (BCCSAP) was arranged in 2008 to emphasis on the long term and midterm objectives of the prior National Adaptation Programme of Action (NAPA) of 2005 (Bhuiyan, 2015). The amended BCCSAP 2009 record (Islam et al., 2009) predicts that countless individuals will be forced to relocate, particularly from coastal zones, due to diminishing income and farming efficiency and furthermore gauges that 6–8 million individuals could be dislodged by 2050. Furthermore, slums in large urban areas have been alluded to as a profoundly conceivable objective for the individuals who migrate. Confronted with the peculiarity of fast, impromptu urbanization in Bangladesh, this represents an approaching issue (Islam et al., 2009). However, in spite of the affirmation of critical movement because of climate change, clear strategy rules for such migrators have not been tended to in NAPA or the BCCSAP, and there are no rules for the public and local governments to confront the drawn out friendly and monetary outcomes of climate change. This approach gaps and the absence of comprehension of climate movement and its complex metropolitan effects are the vital restrictions of the local level current reaction to climate change and to ensuring social justice.

Global agreements and absence of climate justice

Overwhelming proof exists that we are reaching the upper limit to our capacity to emit GHGs without severe consequences (Ritchie et al., 2020). To stabilize GHG emissions in the atmosphere at a level that stops disastrous climate change necessitates an assessed 40% to 70% decrease in anthropogenic GHGs by 2050 from 2010 levels to deter CO_2 from exceeding 450 ppm by 2100, and reaching worldwide zero emissions since 2100 (Meinshausen et al., 2020). It has been argued that global warming has happened in the past and is thus not a concern; however, in the past, climate change occurred over thousands of years, allowing for flora and fauna to adapt. Currently, global warming is occurring in hundreds of years and is decreasing biodiversity on the planet and endangering human lives.

An argument is going to be put forward in regards to how climate change is prioritized without any political commitment which creates climate injustice. Many agreements and accords such as the Kyoto Protocol 1997, Copenhagen Protocol 2009, and the Paris Agreement, 2015 (Dessler and Parson, 2019) were of considerable importance. The United Nations Framework Convention on Climate Change summit that took place in Copenhagen protocol 2009 was considered one of the greatest moments in world politics although certain states could not come to a conclusive agreement after hours of negotiations. Therefore, this meeting in Copenhagen was viewed as a failure as there was no official agreement. The Kyoto Protocol, adopted in 1997, was first forced into action in 2005 with its legally binding treaty addressing climate change. The requirement of the Kyoto protocol was for developed countries to reduce carbon emissions on an average of 5% where a monitoring committee was put in to place to witness its progress. However, this treaty remained ineffective against developing countries that were major contributors of carbon in the atmosphere such as India and China (Aichele and Felbermayr, 2013).

The Paris Agreement became active in November 2016, with a target to not surpass a mean global temperature increase of 2°C, with an aspirational target of 1.5°C above pre-industrial levels (Zahar, 2020). A total of 160 participants, including the USA and China, who were responsible for generating ∼40% of global carbon emissions and signatories of the Paris Agreement, became active in November 2016 (Hardoon et al., 2016). Under the agreement, a Climate Fund was also established to support projects that empowered vulnerable nations to help them adjust to the consequences of climate change by setting up a requirement for industrialized nations to provide compensation to the nations impacted by climate change (Sovacool et al., 2017). To achieve this goal, CO_2 emissions from coal, oil, and natural gas must be limited to 36 gigatons; however, many researchers estimate that global carbon emissions will likely reach 41 gigatons in the next 20 years, which stresses the importance of prompt actions (The Economist, 2019).

Global agreements face extreme challenges due to the complicated relationship between politics and climate justice (Beauregard et al., 2021). For example, the Paris Agreement goal of 2°C was agreed to, although, this temperature increase is likely to immerse the coastal areas of Bangladesh, which is already undergoing life-altering effects of sea level rise (Lyster, 2017). Additionally, political issues have hindered this agreement as the USA discontinued its cooperation in the Paris Agreement in 2020, and then re-entered in 2021 accompanying the change in their presidency.

Additionally, this act by the USA to pull out of the climate accord is an example of privilege, which allows for people to deny or ignore climate change, and to even be immune to some of the effects (Mahaseth and Pandey, 2021). This also points to the general unfairness of climate change and the "denialism" mindset that is prevalent in developed nations; Klean highlights those ideologies in capitalism often create a materialistic and consumer-focused extractive mindset that perpetuates inequality. Additionally, Klean discusses the need to move away from this extractive mindset of humans having power-over nature, to a stewardship-focused mindset, which

is already common in indigenous populations (Klein, 2015). Experts suggest that the Paris Agreement cannot create an impact strong enough to keep the average temperatures decrease from 1.5 °C, giving rise to devastating consequences such as floods and heat waves (Kim et al., 2020).

Montreal Protocol 2016 addressed substances that harmed the ozone layer (Bergeson, 2017), with the Kigali Amendment with a focus on the gradual reduction of HFCs (Chen et al., 2021). In 2019, the developed countries started their reduction phase. Most developing nations are to freeze HFC consumption by the year 2024 and 2028 for some. By the year 2036, all developed nations are required to phase down the usage of HFC by 86%. Developing countries have to follow this same pathway by 2,047 (Roberts, 2017). Theoretically, both Kigali Amendment and the Paris Agreements are positive changes toward tackling climate change. However, in since there are no legal bindings, Paris Agreement has a stance of political encouragement with no accountability (Karlsson-Vinkhuyzen et al., 2018). A more effective and stronger enforcement of the agreement can help tackle climate change. Significant advances have been made in Glasgow to reduce greenhouse emissions, although financial support is required to help the vulnerable countries (Jacobs, 2021).

In 2021, a climate conference which was hosted by the UN, also known as the COP26, commitments were renewed by many governments. However, experts and activists believe that none of these renewed agreements is good enough to tackle the consequences of climate change that are the fast approaching (Arora and Mishra, 2021). A more effective and stronger enforcement of the agreement can help tackle climate change. Significant advances have been made in Glasgow to reduce greenhouse emissions, although financial support is required to help the vulnerable countries (Jacobs, 2021).

The United Nations state that meeting the objectives of the Sustainable Development Agenda for 2030 will require promoting policies that strengthen resilience to the risks of sea level rise responding to issues of poverty, social exclusion, and climate injustice (Aleksandrova, 2020). The differential impact of sea level rise on coastal populations in SWCRB can be better understood through disaster risk assessment and through social categories such as income or wealth, ethnicity, gender, life cycle, schooling, class, territory, or geography (Sultana, 2022), which in turn are expressive of the multidimensionality of climate injustice.

Effects of CCSLR on the SWCRB

In the SWCRB, the well-known effects of extreme weather events and sea level rise reflect asymmetries in the dynamics of regional development as well as issues of social justice (Mason and Rigg, 2019) effecting different dimensions of society, at social, cultural, and political levels (Adger et al., 2013). Extreme events have profound effects on agriculture, riverbank erosion, salinity, loss of natural ecosystems, gender vulnerability, poverty, migration, food security, fisheries, safe water resources, and public health factors that influence human development (Lázár et al., 2020); thus, leading to social injustices that are especially acute in the SWCRB.

The residents mentioned several cases of social injustice as an indirect impact of climate change. An infant was delivered by a housewife, an inhabitant of the locality of Machkhola Jhutitola Hrishipara of the upazila, with the aid of local residents in a van outside the Shatkhira Sadar Hospital as no physician was available at the time. The mother of the housewife, Participant-101 informed that her daughter X was refused admission at two hospitals due to fear of SARS-CoV-2 infection (Covid-19). This caused enormous sufferings to the baby as well as the mother. This is the usual scenario where the patients are being deprived of services by doctors due to the pandemic. This is the reason that general patients are refusing avail the medical facilities at hospitals. In most cases, village doctors and pharmacies are provided prescriptions to the rural patients. Many patients are dying without having any medical services.

Furthermore, a discussion of underprivileged groups of people (i.e., elderly, women, people with disabilities) within these regions is important. Gender is also an unaddressed area directly intersecting with other social areas. For example, the natural resources that women in rural areas of developing countries depend on for their livelihoods, such as water, agriculture, and forest products, make them particularly vulnerable to changes in supply and access patterns. It is widely expected that climate change will adversely affect all these aspects of women's lives (Peras et al., 2021). In addition to rural areas, poverty and sociocultural norms also lead to greater vulnerability of women (Table 2). For example, religious taboos often restrict women from going out. If women live in housing that cannot withstand environmental hazards, their restricted activities will make them more vulnerable, e.g., after the hurricane and flood hit Bangladesh in 1991, the death rate of women was almost five times that of men. As in many other Asian countries, women have never learned to swim due to religious orthodoxy and cultural norms, thus reducing their chances of survival in natural disasters (IPCC, 2013; Fakhruddin and Rahman, 2015).

Participant-102 mentioned that witnesses the women to be unevenly impacted by severe climatic actions, irregular cyclones. Additionally, gender customs may likewise limit women from acclimatizing to climate jeopardies. Due to unlike familiarities, viewpoints, and social capital, male and female livings and adjustment approaches are also probable to be dissimilar (Reggers, 2019). Apart from the differential admittance to possessions, the capability to determine income variation chances impacts the adjustable capacity of men and women (Partey et al., 2020). In the scenario of Bangladesh, particular gender disparities and biasness

exacerbate women's susceptibility to climate extremities (Reggers, 2019). Furthermore, gender variances in Bangladesh are decidedly exhibited in the acceptance to and the possession of all the living resources in all-purpose, and predominantly, to the possession of land. On average, women's authority over livelihood possessions is lesser, and consequently, the bearing of climate jeopardies on their living is assumed to be of high with men (Aryal et al., 2020). Women are at the lowest of the power setting and have the least supremacy, freedoms, and possessions; consequently, much of volume to risks and shocks differently exists. Because of their socio-economic and social transformations, women, get exposed to perils and bitter surprises in a different way; for instance, ferocity, early matrimonial boding, and absence of reproductive health care throughout and afterward catastrophes offer jeopardies for female groups throughout the calamities, Climate justice and gender equity are inseparably connected (Corcoran-Nantes and Roy, 2018). Climate justice emphasizes on the requirements of the most sidelined clusters who depend on natural possessions for their survival and incomes. Women dependent on agricultural activity progressively encounter the difficulties of having to adjust to their yield approaches in the milieu of climate change and natural reserve exhaustion. It's continuously altering, what (harvests and woods) flourishes where, which livestock and fish will be practicable, sea level rise and acid accumulation in oceans, whether water provisions can be continued, vector borne illnesses like malarial, dengue, and plant pests migrating into newly-warmer areas (Reggers, 2019; Aryal et al., 2020). These would have a sluggish effect than the intense weather incidents, and necessitate long period adjustment reactions. Without scrutinizing the gender components of these climate change effects, and without involvement and guidance of women, adjustment endeavors for these sluggish influences hold the danger of being insufficient. It's fairly obvious that women and girls are understated in evolving climate arrangements across all stages and segments, from national to communal phase arrangement, in the public segment, climate economics, or clean energy (Corcoran-Nantes and Roy, 2018). Presently, the Ministry of Environment, Forest and Climate Change is bringing itself up-to-date with the ccGAP, with backing from UN Women, expecting to put the plan into accomplishment. Critical moves have restricted the ability to standard orientation into strategies and activities, absence of interest in gender-responsive activities, and exceptionally restricted admittance to women associations and in decision-making (Haider, 2022). The adjustment strategies and tactics recognize the part of gender, but extenuation discourse rarely mentions gender facets. Momentous segments for climate change adjustment, such as farming, water reserves, or forestry plans and approaches do not provide importance to gender impartiality. Absence of looking after approaches or assessment outline and pointers merely prolongs gender insensitivity of the climate change adjustment and moderation undertakings (Haider, 2022).

During the precious era, Bangladesh has been exposed to the advent of periodic floods, powerful cyclones, water logging, salinity interference, and riverbank corrosion as the climatic push factors that have compelled highly unprotected and susceptible coastal societies to drift specifically from the southwestern region (Table 3) (Mishra et al., 2021). The effects of cyclone Ampan, which made landfall in the Sundarbans, a world heritage site, near the Munshiganj Union in May 2020, provides a vivid picture of the struggles faced by this area. Cyclones are often accompanied by excessive rain, high winds, and flooding, which causes riverbank erosion and embankment collapse in many areas of this region. This erosion is a huge issue in the area as many villages live on chars, or islands within the river, which can be easily eroded by flooding, leaving many residents homeless and landless (Mishra et al., 2021; Rafa et al., 2021).

Due to sea level rise, which pushes the coast further inland and creates salinity intrusion, freshwater is often obtained by collecting rainwater in ponds, or *via* groundwater tube wells; however, both sources often become saline during natural disasters, and some suffer from arsenic contamination (Table 3). Additional issues that occurred during Ampan included lack of electricity, improper garbage management, lack of access to healthcare, and halted employment. After several days without relief, NGOs provided one pitcher of water per family and the GoB provided 20 kg of rice per survivor (Key informant, 2017–2021). This assistance was helpful, but the amount of water provided by NGOs was insufficient for a family's needs; additionally, these people lost agricultural land and infrastructure (such as homes, schools, roads), for which they were not compensated. Many people become climate refugees and were involuntarily forced to migrate to larger cities, such as Dhaka, in search of housing and livelihood (McDonnell, 2019). Although most people did not die in Amphan, most people became homeless. This is an example of the social and economic losses caused by these devastating cyclones and other natural disasters.

Extreme weather events and natural disasters are particularly harmful to the rural poor areas in the SWCRB, as there is heavy economic reliance on natural resources. CCSLR is causing soil and water salinization, changing rainfall pattern, and increased extreme events (such as flooding, drought, and natural disasters), which puts great stress on resource-based livelihoods (Mallick et al., 2017). Agriculture used to be the dominant livelihood, but people here are already adapting to these difficulties by growing rice and other vegetables. However, even using salt-tolerant varieties of rice and crops, agriculture is still facing great challenges in this area, including the sheer destruction of cropland during extreme events and death of plants from salinization of water and soil. People here gain alternate livelihoods, such as fishing, shrimp farming, or

beekeeping (Islam S. et al., 2020) whereas shrimp farming turn into local context climate injustice.

In the areas near the coast of Bangladesh, the alteration of farming lands for marketable shrimp aquaculture has appeared as a crucial tactic pushed by donors and development agencies for climate change adjustment. This alteration transmutes the risks of increasing coastal susceptibility and increasing soil salinity into a prospect for market progress and export-led advancement. Consequently, suggestions for shrimp aquaculture as climate change adjustment illustrate a comprehensive image for technical resolutions to the social and ecological catastrophe of climate change confronting this area (Figure 2) (Kais and Islam, 2019). Nevertheless, the alteration of farming land for shrimp cultivation precedes the drive toward climate change adjustment: between 1980 and 2014, the land being utilized for shrimp aquaculture in this area extended over ten-fold (Abdullah et al., 2017). Shrimp aquaculture has itself been caught up in the prevalent dislodgment of many of the most helpless members of countryside communities in the coastal region, while transporting economic profits to the least susceptible (Deb and Haque, 2017). In this perspective, shrimp aquaculture thus provides a momentous instance of how this kind of a social scrutiny might advocate differing tactics to appreciating the science of and reaction to global ecological change (Castree et al., 2014; Kais and Islam, 2019).

Within the existence of insufficient resources and a range of goals, adaptation strategy options contain a trade-off between numerous strategy goals (Kabir et al., 2020). Although the trade-offs between tactics are focused on moderation and adjustment have been much argued, modifications among tactics to assessing what determines for fruitful adjustment, and for whom, have been less deliberated (Adams et al., 2020). Similarly prominent as discussions over who will recompense for adjustment (and in what way) (Ciplet et al., 2013) are queries of how these capitals are expended, and the types of social alterations that they may involve.

Shrimp cultivation in the area around coast of Bangladesh is a significant illustration of this type of adjustment options with disputed conclusions. Similar to numerous other sectors met with sea-level rise, SWCRB is endangered by increasing soil salinity and the wearing of land and shielding dams (Sovacool et al., 2017). Though climate change is not the sole reason of such alterations, the consequences and combatting techniques are related. Among countless choices for dealing with these worries are to adapt lands that have archaeologically been utilized to nurture rice farming and other crops into huge ponds for raising shrimp, which is handled and exported mainly to Europe and the United States (Ahmed et al., 2010; Afroz and Alam, 2013).

Nevertheless, the profits of marketable shrimp production are not for share amid all affiliates of these groups correspondingly. The greater part of proceeds is received by a tiny proportion of large segment of landholders who remain absent, and by urban-based processing unit proprietors (Deb and Haque, 2017). The salination of farming soils through the imposition of saline water employed in shrimp ponds has its own ecological significances and makes conciliations with the richness of the soil for continuing and imminent agricultural undertaking (Hasan et al., 2020). Furthermore, the awfully low volume of employment essential for shrimp production compared to rice farming pushes for a labor leftover that has the consequences of dislocation from agricultural livings, driving numerous landless laborers and previous sharecroppers to migrate to cities in pursuit of employment (Barai et al., 2019). New hiring created by the growing shrimp industry is restricted, and chiefly grounded in processing workshops situated in urban expanses. In this way, considerable rural populations become expatriate from their birthplaces in the non-appearance of substitute rural livings. Despite the fact that profits may be the derivative of more affluent inhabitants and the state balance-of-trade, the underprivileged (those who are greatest susceptible to environmental transformation in the initial phase), agonize unreasonably (Belton, 2016). As a consequence, there is substantial hostility to shrimp aquaculture among social drive groups and other local inhabitants, who view it as a hazard to their welfare and their sustained inhabitation of this locality (Belton, 2016).

The dispute over commercial shrimp farming in Bangladesh pitches two standpoints on its application as a climate change adjustment approach into plain respite. One standpoint suggest that it is a perfect adaptation tactic, signifying that social paybacks ensues from GDP progress through the extension of export markets, rotating the ecological jeopardies of sea-level rise and salination into a prospect (Sovacool and Linnér, 2016). The other perspective, which emphasizes the prevalent negative social and ecological influences of shrimp farming, proposes that the extension of shrimp aquaculture should not be viewed as an operative adaptation approach because of its unreasonably undesirable influences among the most underprivileged members of coastal groups. The scenario of shrimp aquaculture stresses the pathways in which considerations of climate change, reactions to it, and likely prospects in the context of it, are determined by sociocultural relations of supremacy (Barnes and Dove, 2015). The imminent phase of Bangladesh's coastal section and its inhabitants will be dictated not only by climate change, but also by climate change adjustment. The bearings of these interferences are reliant on their understanding to power disparities. Where technical adjustment approaches disregard investigation of such disparities, they put into jeopardy of exacerbating them. The worth of conceivable adaptation tactics should be measured relative to exactly this apprehension: their influence on prevailing socioeconomic discrepancies, and profits to the underprivileged and most helpless. These contending adjustment frames exemplify the crucial predicaments at the core of climate justice. How do authority and evenhandedness dictate the capability to adjust along with the capacity to

regulate what the upcoming time should appear like? The normativity of climate change adjustment suggest that an operative adjustment should aid some individuals. Nevertheless, even as some may be advantageous from specific adaptation tactics, all resolutions will be unproductive resolutions for some individuals. Discussions about climate change has the requirement to focus on these inconsistencies straightaway, or contain the hazard of prolonging disparities which have led to so many susceptible to the effects of climate change in the initial phase. When it boils down to climate justice, from the coast of Bangladesh to center of Manhattan and beyond (Wachsmuth et al., 2016), adjustment procedures which do not first and primarily deal with authority and justice are fragment of the problematic aspect, not the answer.

However, these alternate livelihoods are still resource-based and are in danger from the effects of CCSLR. For example, due to the loss of flora from natural disasters, bees have lost their habitat in the Sundarbans, and honey production has drastically decreased. Participant-103, aged 51 works for a private honey conservation company and reported that between April and May 2019, 602 kg of honey was collected, which reduced to 265 kg during the same timeframe in 2020. Participant-104, a honey trader aged 48, said that he sent beekeepers to the Sundarbans to harvest honey from loan and the amount of honey the present year was very low compared to that of last year. Participant-105 aged 39 said that the forest plants were destroyed due to the Bulbul storm. That is why honey is scarce as bees cannot find a place to build their hives. Talking to local Sundarbans researcher Participant-106 aged 40 about the shortage of honey in the Sundarbans, he said that bees are not able to collect honey from flowers as the vegetation in the Sundarbans has been destroyed due to natural calamities and bulbul storms.

Many believe that this reduction in honey by ∼44% from the previous year is largely due to hurricane Bulbul, which occurred in November 2019. Participant-107 mentioned that Bulbul damaged 48,000 unfinished houses in Satkhira. Of these, 16,000 houses were completely destroyed; 30,000 houses were partially damaged. In addition, 5,017 fish farms and 15,000 hectares of transplanted aman paddy were completely damaged, and 10,000 hectares of transplanted aman paddy were partially damaged in the cyclone. Two thousand hectares of land including vegetables, betel, mustard and other crops were damaged. According to the office of the District Relief and Rehabilitation Officer, most of the Upazilas including Gabura, Padmapukur, Burigoalini, Munshiganj, Ramjannagar and Kashimari in Pratapnagar, Anulia, Khajra and Shriula areas of Asashuni Upazila, most of houses were damaged. Fish farms and crop fields in these areas were damaged, and thousands of trees were uprooted (Haque M. et al., 2019).

In addition to providing livelihoods (such as beekeeping, firewood, pulp, fishing) the Sundarbans Forest also sequesters carbon, reduces the ambient temperature, provides habitat to many species including threatened and endangered species, supports biodiversity, reduces river erosion, and ameliorates the effects of extreme storms (Dasgupta et al., 2017). The Sundarbans are the largest global contiguous mangrove forests, span ∼10,200 km^2 in India and Bangladesh, and rely on a brackish water environment (Dasgupta et al., 2017). Although this forest provides numerous benefits to humans, animals, and its natural ability to combat the effects of climate change, deforestation continues and makes this area further vulnerable to CCSLR.

Shyamnagar is one of the notable towns in the Sundarbans. Most of the people of 12 unions of this Upazila depend on the natural resources of the Sundarbans. These unions are extremely poor, and 80% of the families, such as the Bawali, Mouali and fishermen in the Sundarbans, depend on the Sundarbans for their livelihood. Many members of these families have been attacked or killed by tigers and crocodiles. As of June 2009, a joint survey of leaders and union councils collected data on 326 tiger attacks in the Gabura Union, of which only 38 people survived. There are thousands of affected families in the entire Sundarbans. The native people are subject to belief that a man married to a particular woman is susceptible to death. It is from this belief that after a man is attacked by a tiger; the family begins to mentally and physically torture the widow. Additionally, many widows are victims of bullying and hatred by their own family, and are often blamed for their husband's death.

Table 2 shows that many widowed women from the three Unions in Bangladesh must seek refuge in their paternal house, in khas or government land, or on someone else's land to survive.

From the above case that gender inequality in local level affect to control over both material and non-material resources; it is because climate change is affecting gender relations in the context of local climate injustice.

Perception of people in the SWCRB

This study provides results of data collected during 2017 and 2019 in the 12 Unions in the Shyamnagar Upazila. Data was collected by talking to local communities to determine their perception of the effects of CCSLR in their areas. This data was presented as disaster risk assessment, case studies, focus group discussion, interviews, workshop discussion, and a quantitative analysis.

Results

Disaster risk assessment

To understand the risk of vulnerability in this study, a disaster risk assessment was completed in the 12 Unions of the Shyamnagar Upazila. Data was gathered by traveling to different areas in the concerned wards and discussing

TABLE 2 Widows living in the Gabura, Munshiganj, and Burigoalini Unions after their husband's death (NGO, 2009).

Location	Gabura Union	Munshiganj Union	Burigoalini Union
Husband's house	180	46	39
She took refuge in her father's house	60	42	24
Lives in khas or government land	20	20	8
Lives on someone else's land	31	10	7
Total	291	118	78

hazards and risks with the locals. So, the nature of jeopardy taking place in SWCRB because of climate change which we recognize through 387 response providers given their opinion below figure demonstrates that chief hazard mechanisms in SWCRB that also enhancing local climate injustice. The top six hazards and disaster risks, as determined by the assessment, are provided in Table 3 and include cyclone, salinity, waterlogging, riverbank erosion, thunderstorm, and drought. Different hazards prevail based on the location of each Union. Cyclone was the hazard reported most often. Salinity occurred as the most frequent #1 hazard, followed by riverbank erosion and flood.

FIGURE 3
Photograph of a UNICEF worker speaking to two brothers, waiting to swim with their mother (who is swimming in the background). Photo courtesy by Masum Billah.

Case studies

Participant-108 (aged 30), from the Tatinakhali Union in Burigoalini (ward no. 8), stated that developing countries like Bangladesh have suffered the most from the effects of CCSLR. The developed countries and people of the northern hemisphere are responsible for this, and the underdeveloped countries must be compensated.

Participant-109 (aged 52), who lives in the Chaulia village (ward 8, Nurnagar union, Chaulia mouza) with a monthly income of ∼25,000 tk (270$)has a shrimp enclosure on 10 acres and paddy on 4–5 acres of land. Drinking water issues are widespread in this area, and he collects rainwater for 2 months, and pays 1 tk per liter to collect 900 liters of water per month from Haripur, located 7 km away. The result of a broken dam caused to lose his land due to river erosion, and he did not receive monetary compensation for his loss.

Father Luise is a Catholic, whose religious leader, Pope Francis, declared a global "climate emergency" in 2015 (Harvey and Ambrose, 2019). Father Luise stated that many NGOs talk about climate change, but do not help with human rights, especially for the indigenous people of this area. He stated that he does not have much faith in the work of NGOs. He relocated 20 families of the Mundas from Datina Khali as the water level in the canal had increased, and the village was nearly submerged in the tidal waters. Soon, the Gabura and Padmapukur Upazilas will be submerged, which were submerged at the time of cyclone Ayla in 2009. However, he stated the NGOs do not typically discuss this rise in sea level.

Father Luise believes that the stakeholders must prioritize the lives of the people in these areas, and prepare proper areas for them to migrate. He stated that climate change cannot be prevented or controlled, especially in the southern portion of Bangladesh, which is expected to be submerged by sea level rise. International regions such as Venice, Italy, Jakarta, Indonesia are also experiencing sea level rise. He believes that the responsibility for climate change should be globalized, e.g., the presidential decision in Malta is that new cars will be electric, and petrol will be avoided.

Participant-110, aged 45 stated that the lives of children, the elderly, women, and the disabled become worse during natural disasters. Many of these population suffer from decreased or slowed mobility, which causes issues for taking refuge. Elderly persons are terrified and lose their memory or have a stroke. Additionally, livelihoods have changed and many resort to cutting down trees in the Sundarbans. The deforestation causing loss of animals and birds has been acknowledged. He stated that climate change has upset the balance of life in the region. He expects climate justice at the local and foreign levels, as well as increased cooperation in times of danger or disaster. By doing so, he believes that the quality of life of people in this area would be improved.

Participant-111, a resident of Ward 4 of the Kalbari village, has several domesticated animals including one goat and three ducks. Diseases such as dysentery, allergies, and

diarrhea are common in the area. Rainwater is stored as drinking water for 3 months, and during the remainder of the year, pond or river water is used; however, river or pond water often has high salinity, which causes disease and skin irritation (boils and rashes) in children. According to the general community opinion, salt water is essential for shrimp farming, but potable water must be available for drinking and cooking. Siltation in the river, combined with storms and sea level rise, leads to high water levels in the river. Due to the lack of cultivable land, the people here earn money by catching fish in the river to sell at the local market. An instance of the difficulty in this area can be seen in Figure 3, depicting two brothers and their mother, after a recent storm, who did not have access to food for days and took refuge on a high embankment without sleep due to lack of a proper shelter.

Participant-112, 113, 114 and 115 informed that there was acute paucity of potable water due to salinity. They tend to collect rainwater for 2–3 months during the year; for the rest of the year, they try to collect water from ponds and find themselves in a precarious situation due to salinity in the river water during the dry season. During the majority of time in dry season, the tube wells fail to provide water, the surface and subsurface soil is devoid of water. There is no source of potable water even below 1,200 ft since the sea level is higher here and the salinity increase has penetrated deep into the soil. This is why the inhabitants have to endure such chronic water dearth.

It was learned from the National Household and Agricultural Survey that a reverse osmosis. Plant has been used for desalination of water salty water in ward number 4 of Burogoalini. Among the 688 families in the ward, 400 families had cards, which enabled them to obtain water at 33 paisa (local cent have lower value against the US cent) per liter. However, for the ones without cards, it was 50 paisa per liter. Nevertheless, 10–15% of families continued to purchase water at 50 paisa per liter. From the group discussion it was learnt that despite having 2,300 people from 688 families, only 100 people could fetch water regularly. The rest collected water from the pond sand filter set up by NGO and the Government, and those living in the remote areas fetched water from places as far as 5–9 kms away through pond sand filters. As a jar of water of 25 liters sold at 35 taka (1tk = 1 cent), which was beyond the reach of the common people; besides, during the dry spell, potable water became scarce.

Former UP Member Participant-116 informed that the situation was the same in Chandipur, Golakhali—near

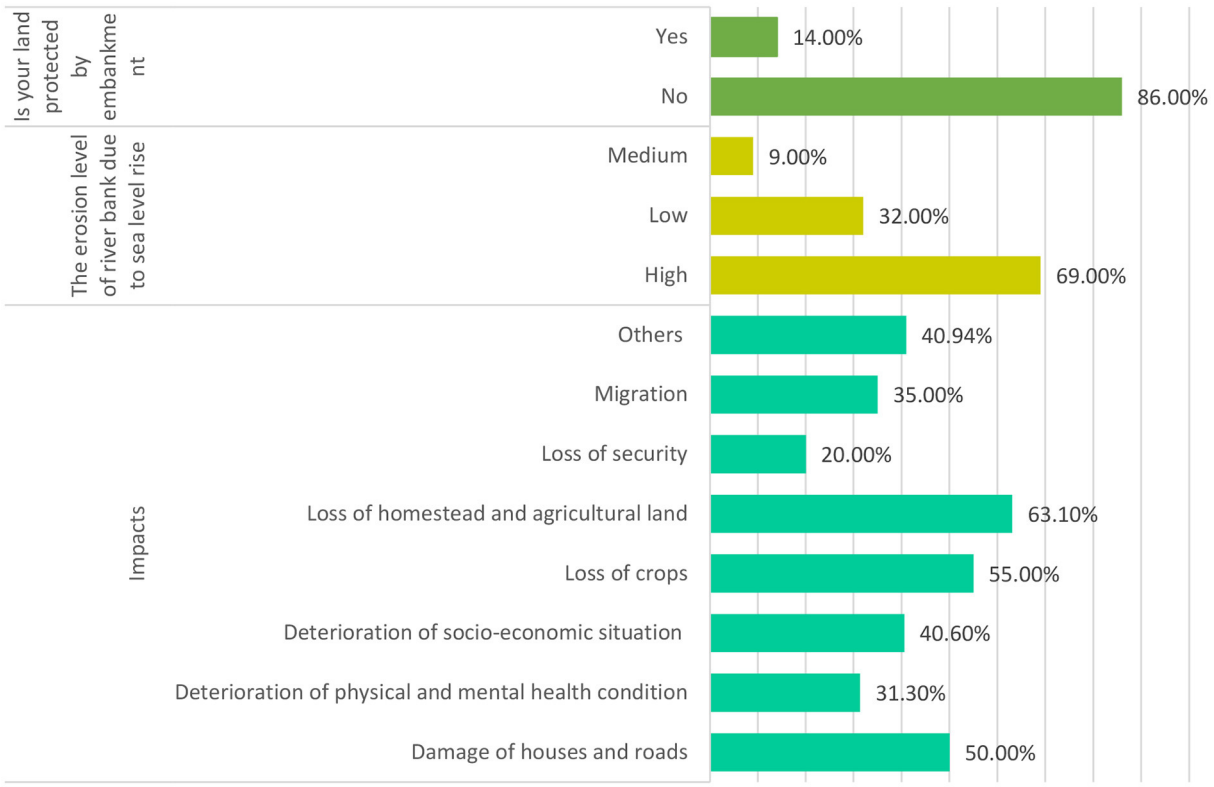

FIGURE 4
The negative impacts of river erosion. Multiple response: *N* = 320 (Source: Field Survey, 2017–2019).

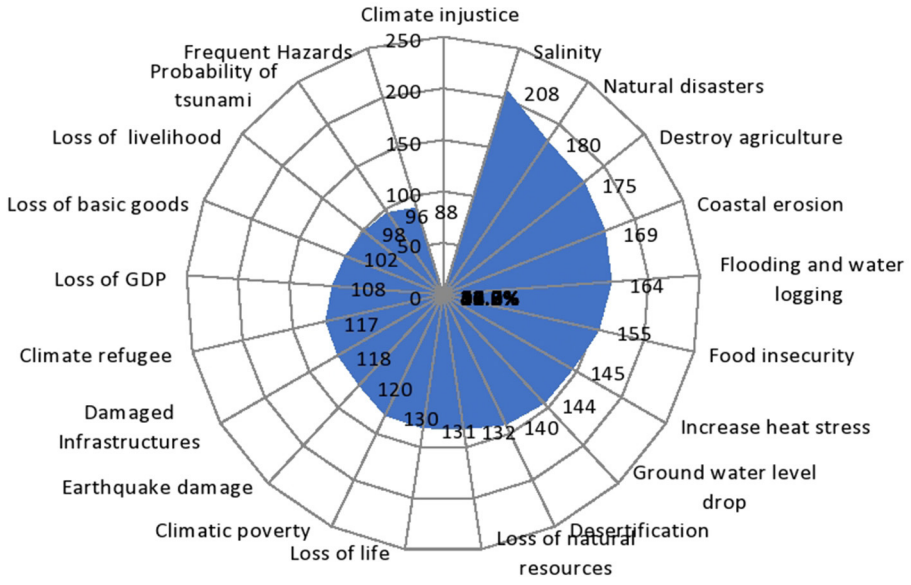

FIGURE 5
Issues that create climate injustice in the SWCRB multiple response responses: *N* = 320; Source: Field survey 2017–2019.

Sundarbans coast, Henchi and hundreds of villages in the coastal region. This acute water scarcity was due to the drying up of the waterbodies in the neighborhood before the summer set in and also for rapid consumption of water collected during the monsoon. Apart from that, the salinity intrusion in the coastal Region also worsened the water shortage problem. Participant-117, from Chandipur and Participant-118, informed that they were surrounded by saline water everywhere, and they had to literally struggle to avail a small amount of water. The Upalzila Assistant Engineer Participant-119, informed that 70% of the inhabitants of the region consumed this saline water. Being a saline-prone area, during the summer, the water level subsided, leading to acute shortage of water. However, an initiative was provided to meet the demand of water for the whole year for the local people through preservation of rainwater to be supplied to the government tanks.

Participant-120, from ward no. 8 of Chailiya Village, informs that they have to buy water for one paisa per liter from 6 km away. They have to purchase 30 liters water every day; however, this facility is not available throughout the year despite having to pay for it. As there is no option for storing rainwater, potable water and not having sufficient hand pumps in the village, 3,000 families form the village are undergoing severe water crisis and very soon this condition would worsen.

Participant-121 (aged 55) lives in Sora No. 9, where there has been much damage due a broken river dam and states that embankments and riverbank erosion are extremely dangerous in his area. The embankments are hardly wide enough for vehicles to travel and erosion from the river erodes the roads. During times of natural disaster, embankment collapse is inevitable. The destruction from this damage has caused house collapse, decrease in or disappearance of fish populations in ponds, destroyed agricultural land, and perished farm animals.

Focus group discussion, workshop discussions, and interviews

Out of the 19 coastal districts, the area most at risk to the effects of CCSLR in the SWCRB is Shyamnagar in the Satkhira district. River erosion is more pronounced in coastal areas, creating higher vulnerability. Due to sea line regression, salinity intrusion into the river and groundwater creates drinking water issues, compromises the health of trees, and causes loss of employment. Many people of this area have been working in brick kilns in childhood, which is an example of the cultural changes caused by CCSLR. Almost 99% of people in this area consider that global climate change is due to anthropogenic activities. Previously, people of this area cultivated fish, but this is more difficult now as freshwater fish cannot live in saline water. In this area, people still grow freshwater paddy crop. Also, those who live next to the Sundarbans can make a living, and the forest protects animals and humans from natural disasters. The forest also provides wood (for fuel), honey, and other essentials.

People here raise a red flag to alert others of high wind and swelling of water in the river. Most people have no buildings and must seek shelter during storms. If people can afford it, they keep dry food. During Hurricane Aila (2009), a respondent hid in his

home, and stated "everything floated away" from heavy rains and flooding. Luckily, Aila occurred during the day, otherwise fewer would have survived. Ayla killed 330 people, 6,208 people went missing and more than one million people became homeless.

After Aila, respondents stated that they traveled by boat, did not eat for 3 days, lived in poverty for 22 days, did not have wood for cooking, and some drank river water due to lack of potable water. People of this region suffer from diseases caused by drinking unclean river water or saltwater. Consuming saltwater causes widespread kidney problems for people of this area, and the average life expectancy of people has decreased to 50 or 60 years. Following natural disasters, some of the poor obtained grants for partial housing, and many of the wealthy were protected as they were less vulnerable to risks; however, the middle class could not work and were ineligible or had lack of access to receive grants.

Respondents stated that disasters like Aila are easily dealt with and are worse than historical disasters. For example, in the 1988 natural disaster, a respondents' house collapsed, and they were able to rebuild and had food from their vegetable garden; however, during Aila everything washed away, people had no access to food for 2 days, drank river water, and could not work for a month. The NGOs and GoB provided food and water after 2 days to the affected people.

The hurricane and the water retreated, leaving stench and diseases from fish rot, garbage, and loss of human life. Respondents stated that using the restroom was restricted after Aila because of the flooding, and they were forced to openly defecate. People of this region acknowledge their poverty as sometimes 5–6 families live together to survive.

Participant-122 and 123 stated that his daughter-in-law was pregnant during hurricane Aila. Difficulties arose due to lack of access to a doctor or clinic; she drank salt water and developed preeclampsia, anemia, blindness, and skin sores. Due to improper access to water, food, and healthcare, the pregnant mother and her child perished.

Participant-124 of the Atulia Union and Participant-125, of Chandipur village stated that they travel for ∼2 to 3 km four times a day to get drinking water for themselves and the animals (cows and ducks). As the saltwater of the pond is not suitable for long-term use, rainwater is harvested for cooking. People not just in this area, but from the entire Shyamnagar Upazila are in dire need of food.

Participant-126, (aged 60) and her husband with disabilities live in the family of their adopted son. When her daughter-in-law was ill, she walked for an hour to obtain water. She had to borrow rainwater from the neighbor for her family of five, which had to be repaid by collecting water in the afternoon and evening.

Participant-127 (aged 28) of the Gabura Union said that she fetches water from the pond for food and drinking and stores it for 3 months. Moreover, she uses it to harvest and conserve the rainwater. After the rains, she collects water from a nearby pond and uses it in the following months. Participant-128 stated that she collected water for 2 months during the monsoon season; however, much of this water had to be discarded due to the presence of insects in the water.

Everyone participating in the group discussion informed that they suffered from shortage of water for cooking purpose. They had to undergo enormous struggle to collect water throughout the year. As a result, they have to feel the heat of the effort. Participant-129, a teacher from Kupot village, informed that they fulfilled their requirement by purchasing a 40-liter drum for 50 taka. Participant-130 and Participant-131, two women from Durgabati village, informed that their husbands try to make their ends meet through day labor, although they still had to buy water for cooking purpose due to a lack of source of potable water. Water scarcity surfaced for 200 families due to increase in salinity in ward number 4 of Nurnagar Union resulting in Kultoli, Manikpur, Syed Alipur, Dormujkhali of wards number 5, 7, 8, and 9 not having stable levels of salinity, along with not having potable water sources no filtering system in the ponds, with no facilities for reformation or preservation.

Participant-132, from Romjannogor Union, claimed that the coastal belt was being attacked frequently by different natural catastrophes due to climate change. Due to the occurrence of cyclone Aila, the embankment got broken resulting in 3,000 ponds getting salinity intrusion leading to the damage of cooking water source ponds, culminating in acute scarcity of water for domestic use. Participant-133, from number 5 Kaikhlai Union, informed that due to WAPDA not being good, farming saline water fish in an unplanned way, not maintaining natural water sources, not digging normal water ponds, not having filter reformation and preservation, not facilitating rainwater harvest, not having desalinization option, 5,479 families from East Koikhali, Sayedkhali, Shoilkhali, West Koikhlai, Kathamari, Astakhali, Ghoshalpur, Purakhali, Noikathi,Ghagramari, Mendinagar, Shibchandrapur, Nidya, Jadabpur village were undergoing severe water crisis.

Gabura is located on an island surrounded by the Kolpetuya River; hence, saline water is a concern here. There is a tube-well in this neighborhood, which is drilled to 600–1,200 ft below the ground surface. Even at this depth, the water is saline and is contaminated by arsenic. This water is used for food, cooking, and bathing. The abundant saline water causes issues in afforestation the resulting tree quality. The absence of vegetation further leads to increased erosion and no sequestration sources for CO_2. Additionally, the GoB has stopped people in this area from entering the Sundarbans, due to the destruction of trees and animals. Some people were using poison to kill animals and birds. The abundance of deer, tiger, and birds in this area has decreased. Many people from different areas of the Upazila, including Napitkhali, Chandnimukha, and Talbaria, must begin walking for miles as soon as they wake up to fetch enough water to survive. The overseers demanded that the day laborers pay for drinking water as the water bodies

became salty during hurricane Aila. Participant-134, said that they are struggling to obtain drinking water as they cannot afford to buy water sold by ferry. Participant-135 and 136, said the drinking water crisis continued to intensify each day after Aila, as people cannot survive without drinking water. Participant-137, of Ramjannagar stated that cyclones have substantially changed the way of life and employment in coastal areas. Due to salt water, various types of water borne diseases, such as eczema, diarrhea, dysentery, stomachache, fever, itching, uterine problems and kidney problems, are prevalent. Most of our people here suffer from high blood pressure due to consumption of saltwater. Additionally, it appears that boys and girls are reaching puberty at a younger age (age 7 vs. ages 12–15), and many children are born early (6–7 vs. 9 months of gestation).

Quantitative analysis

The 96% of the respondents have mentioned that the inhabitants living in the coastal area have been started to cultivate Shrimp aquaculture instead of traditional crop varieties from 1980. More than 92.8% of the respondents have claimed that rich people became the rich and poor people becoming poor. The 86.88% of the respondents have mentioned that as a result of Shrimp cultivation factors poor people in the SWCRB turn into the migration. The 75.94 % mentioned that the livelihood pattern of respondents is hampered by shrimp farming. The 72.50 respondent mentioned that local water is being polluted, water quality is being hampered and fresh drinking water crisis is being created because of only shrimp cultivation. In shrimp cultivation, the salinity preserves in the soil and surface water for a long time due to the addition of extra salt to the logged water resulting in hampered both soil and water quality. This shrimp farming initiates salinity which is seriously making the study area vulnerable to unsafe drinking water. Water borne diseases and fresh drinking water crisis are obvious effects of salinity as well as shrimp farming. In addition, 48.43% of the total respondents have informed that soil quality is being deteriorated because of shrimp cultivation. The respondents have also mentioned that saline water is put into land for starting shrimp cultivation and this saline water holds for a long period in soil which changes soil chemistry, decreases soil fertility. About half of the respondents have highlighted that shrimp cultivation has an adverse impact on the agriculture, crop production, tree plantation and other flora species. Salt stress reduces the rice production and tress. Shrimp cultivation in one land makes the surrounding lands saline due to intrusion. As a result, the farmers have no alternative choice instead of shrimp farming. Moreover. Women living in the study are cannot continue their homestead gardening where they cultivate different types of seasonal vegetables due to saline intrusion. As a result, loss of vegetable production is leading to food shortage or the scarcity of foods which contains large number of vitamins, minerals, proteins and carbohydrate. Moreover 40, 69, and 34.69% of the respondents respectively have informe that cultivation of local variety of rice and fish is decreased and ecological system and mangrove forest are also depleted because of adding more salt in water during shrimp farming. The respondents have also registered that saline resistant crop are being practiced at small range instead of local variety of crops to ensure food security resulting in demolished local variety of crops. The saline water used for shrimp cultivation which runs into ponds, canals and rivers making the water of those water bodies saline which adversely affects aquatic species and its biodiversity. Even, the ecological system of local area and mangrove forest is getting damaged with degradation of soil quality due to saline intrusion caused by sea level rise and shrimp farming.

It is also apparent that people of this area (91%) believe that climate change relates to capitalism (Table 4). Additionally, 92% of people (Table 4) consider climate change a threat for future generations. The locals have also mentioned that economic development directly or indirectly affects the environment by expanding industrial works, increasing the use of motor vehicles, and deforestation rather than planting. Alternatively, 5% of the respondents are not conscious about the environment; 91% of people agree that CO_2 emissions cause global warming, and most emissions are produced by industries in developed countries. People here believe that developed countries need to reduce CO_2 emissions and focus on environmental issues. Additionally, 94.1% of people in this area are aware of the climate injustice to developing countries. Climate change and sea level rise have adverse impact on economic development, environment, social issues, and livelihood patterns of the people who live in Bangladesh, especially in the coastal regions. These risks, hazards, and increased vulnerability are more intense for indigenous communities and marginalized groups, which 84.1% of people of this area agree with (Table 4). For example, lives of the Munda indigenous people and others marginalized populations are quite different than other regions. The livelihood of these people depends on the Sunderban mangrove forests. These communities are not well recognized with politicians or other social stakeholders. Under extreme circumstances, they always struggle with the impacts of climate change. Thus, an inequality is formed between the mainstream people who get facilities to boost up their living capacity and those marginalized people who are deprived from the facilities which they need more. The Munda indigenous people house and others infrastructures are not durable fighting against natural calamities, and these peoples are not well recognized by the society and politicians. As a result, the governmental or other non-governmental donations are not distributed among the needy people.

Responses obtained for question 1 showed that 85.6% of people believed that existent social justice will cause issues related to climate change. In coastal regions, the human capacity,

TABLE 3 Ranking of hazard risk observed in the 12 Unions of the Shyamnagar Upazila during the disaster risk assessment e.g., the effects of such amplified hazards upon the SWCRB exemplify the concept of climate injustice (Holden, 2018) (Source: Field Survey, 2017–2019).

Union	Cyclone		Salinity		Waterlogging		Riverbank erosion		Flood		Thunderstorm		Drought		Total respondent
	Respondent vote	Ranking	Respondent vote	Ranking	Respondent vote	Ranking	Respondent vote	Ranking	Respondent vote	Ranking	Respondent vote	Ranking	Respondent vote	Ranking	
Atulia Union	102	1			73	3	87	2	66	4			59	5	387
Bhurulia Union	90	3	121	1	97	2					43	4	36	5	387
Burigoalini Union	94	1	91	2	55	3	53	4	48	5			46	6	387
Gabura Union	92	3	101	2	58	4	105	1			31	5			387
Ishwaripur Union	74	4	81	3	82	2			93	1			57	5	387
Kaikhali Union	93	2	103	1			66	4	71	3			54	5	387
Kashimari Union	96	2	109	1	73	3	57	4	52	5					387
Munshiganj Union	85	3	93	2	52	4	102	1			29	5	26	6	387
Nurnagar Union	77	3	112	1	91	2	52	5	55	4					387
Padmapukur Union	81	3	98	2	43	5	103	1	51	4	11	6			387
Ramjannagr Union	83	3	106	1	84	2	51	5	63	4					387
Shyamnagar Union	87	2	82	3	93	1	43	5			47	4	35	6	387

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TABLE 4 Responses to various questions from quantitative analysis.

#	Question	Yes	No	I do not know
1	Do you think that CC will influence the existent social justice issues and inequalities, and climate injustice?	85.6%	14.4%	
2	Do you think CC relates to capitalism?	91.0%	6.0%	3.0%
3	Do you think being climate victims is a threat for future generations and for the changing map of the country?	92.0%	5.0%	3.0%
4	If yes (above), Do you think developed countries need to reduce their CO_2 emissions?	91.0%	6.0%	3.0%
5	Based on your lifetime where you are faced/live with several climatic anthropogenically-caused disasters, do you think this represents justice for coastal Bangladesh and others who are facing same problem all around the world?	3.1%	94.1%	2.8%
6	Do you think coastal indigenous communities and marginalized persons are more vulnerable than others to CCSLR	84.1%	13.8%	2.2%

Source: Field survey 2017–2019.

financial conditions, infrastructure quality, and social status varied by location (Table 4). Therefore, inequality was formed between the mainstream residents with access to facilities to better their standards of living and those marginalized that are in dire need of facilities but are deprived from the same. It is worth noting that the majority of the respondents felt that the disasters faced by them were unjustified and that the developed nations need to be accountable for the direct/indirect impacts of climate change. This is a very important observation which builds on the concept of climate justice at both global and local level.

When we asked the respondents- Is your land of SWCRB protected by embankment, most of the respondents (86%) have mentioned that no their land is not protected by embankment. Only 14% perceived that the land is protected by embankment but the embankment is not able to protect severe flood and causing the loss of land and house, lack of food and pure drinking water etc. According respondents answer that Figure represents that the erosion level of river bank is due to sea level rise (Figure 4). More than half of the respondents (59%) have perceived that high level of erosion is occurred due to sea level rise. Over 63% of the total respondents have mentioned that the river erosion takes away not only the homestead land but also agricultural land. Moreover, 55% of the total respondents have perceived that the impact of river erosion on agriculture is massive. Again 40.6% of the total respondents have claimed that the river erosion has a great impact on socio-economic condition. the livelihood of the people of the study area mostly depends on day labor, fishing and agriculture. The income source of the people of the study area being changed significantly during pre- and post-erosion periods (Figure 4). Additionally, the respondents have difficulty to find a job and often turn out to be poverty and hunger. In this way, the socio-economic condition of the study area is being deteriorated gradually.

Figure 5 represents the respondents' replies about the specific impact of sea level rise, which creates climate injustice in the SWCRB. The most frequent responses were salinity (65.0%), high economic cost of natural disasters and lost resources (56.3%), destroyed agriculture and loss of agricultural land (54.7%), coastal erosion (52.8%), monsoon flooding and water logging (51.4%), and food insecurity (48.3%).

Discussion

This section summarizes some of the main recently formulated pathways about climate change justice with the view to clarify the contrasting aspects between the allocation-based and rights-based debate as a point to consider and the recommendation from this study for an appreciation and capabilities-based approach of perception about the subject on the opposite extreme (Agarwal et al., 2002). As discussed by (Thomas and Twyman, 2005), natural resource-dependent nations are typically more vulnerable to the effects of climate change and usually have a low adaptive capacity to deal with changes. The advocates of historical duties claim that those with more susceptibility in the third world will be greatly impacted by climate change in their eternal struggle to survive than their counterparts in the first world. From agricultural-supported livelihoods to those supported by resources in the Sundarbans (wood, pulp, honey, etc.), it is apparent that Bangladesh is an area highly dependent upon natural resources, with the locals having little access to those resources. The changes in livelihood (shift away from agriculture as the main livelihood and increase in shrimp cultivation) shows that the people here have already implemented adaptive strategies to the negative effects of CCSLR. Other examples include using floating gardens in flooded areas, combined aquaculture-agriculture techniques

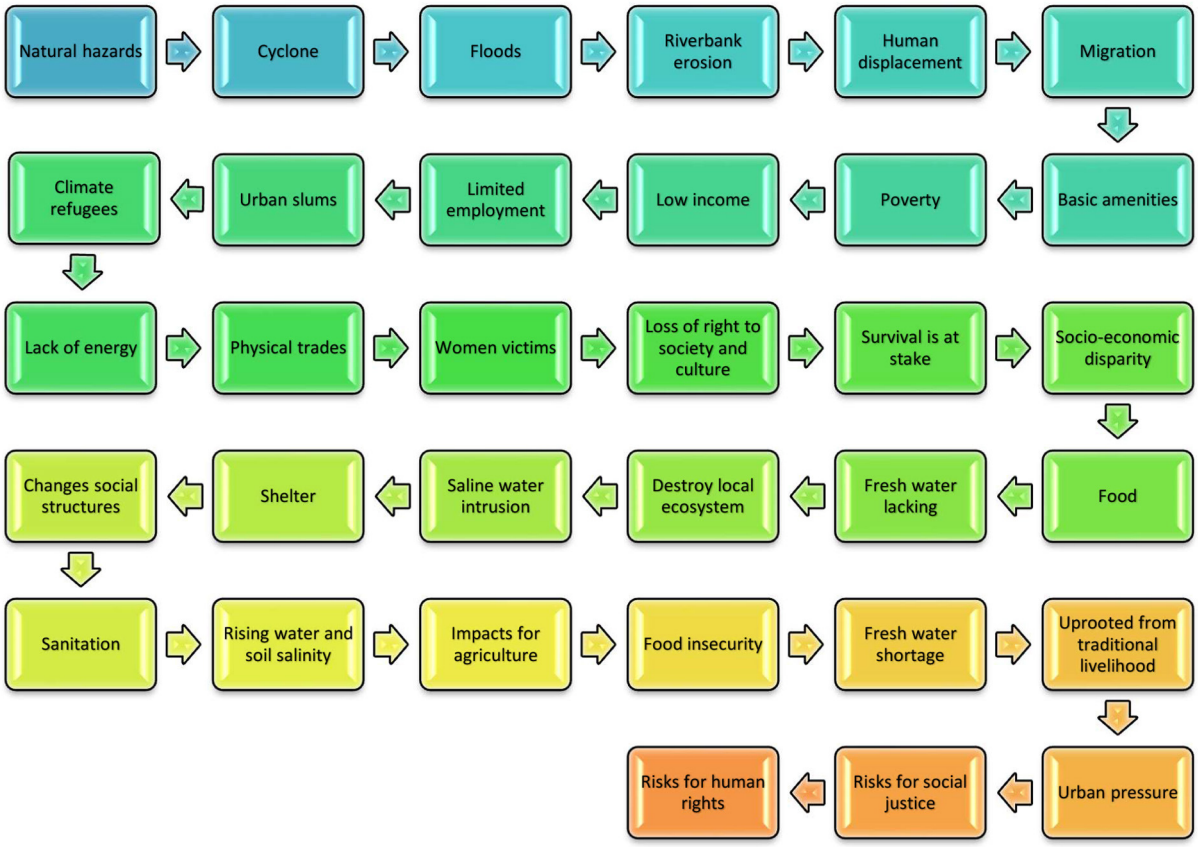

FIGURE 6
Figure shows key findings of climate justice through the respondent's viewpoint (Source: FGD, IDI, KII, PRA, Workshops, 2017–2019).

(e.g., fish and rice), and planting either salt-tolerant crops or rice with variable maturity times (Hossain et al., 2018). These coastal people are less in a state of adaptation and need compensation and reconstruction

It is apparent that a large-scale global effort is needed to reduce global emissions to zero, and likely requires a legally binding agreement (Collomb, 2014). The Paris Agreement and Global Climate Emergency declaration are helpful, but not sufficient. It is clear with the slow movement to action and, at times, downright refusal of the science behind climate change that developed countries must adopt a new mindset to the urgent need to decrease emissions for all living beings and the environment to survive and thrive (Table 4) (Collomb, 2014). The commitments set by the COP26 will not be fast enough to prevent disastrous events from taking place in the more vulnerable communities that already face major catastrophic climate crisis (Wilson et al., 2020). Even though there were significant advances made in Glasgow to reduce greenhouse emissions, people argue that the financial support that is required to help the vulnerable countries were the reason why the negotiation broke down in the final hours (Jacobs, 2021). Frank Bainimarama who is the prime minister of Fiji stated that the decisions that were made on the UNFCCC, the Kyoto Protocol and Paris Agreements, the Glasgow targets now become bruised and battered but not dead (Morgan, 2021). The only way out for the loss and damage which is now of top priority in the list of agenda in political terms, is to eventually deliver it. Developing nations and small island nations have debated for 2 weeks to commit toward phasing out of using fossil fuels, financial commitments for damage and loss which occurred to due to the devastating harm that took place from climate change, mitigation and adaptation (Hunter et al., 2021). While meeting these goals were held by promises of draft decisions, delegates were accepting of the decision to phase down while being in the spirit of compromising (Jacobs, 2021). Antonio Guterres who is the secretary-general of the United Nations stated that the summit was unable to meet the goals that were set such as reducing carbon emissions, eliminating fossil fuel subsidies. However he further pledged a $100 billion toward developing countries to tackle the adversities that are brought by climate change (Broom, 2021). Alok Sharma who is the COP president also expressed his frustrations toward the changes that he faced in relation phase out coal situation and almost became tearful expressing the process of how the whole thing unfolded

(Hayes, 2021). Besides, four issues have been pointed out by Bangladesh to tackle global warming and climate change. In the past seven years, Bangladesh doubled its expense toward climate related issues and are now in preparation for the National Adaptation Plan [(CVF (Climate Vulnerable Forum), 2021)]. Back in 2009, the "Bangladesh Climate Change Trust Fund" was created to provide funds toward climate related issues. Updated Nationally Determined Concentrations were also submitted. By the year 2041, it is aimed to have 40% of the energy sourced from renewable sources (Das et al., 2018). Coal based plans with foreign investments of $12 billion were scrapped by the country in an attempt to tackle climate change (Moazzem, 2019). A "Mujib Climate Prosperity Plan' will be implemented for resilience to prosperity from vulnerability (Mujib Climate Prosperity Plan Decade 2030, 2021). Other initiatives include knowledge gathered about adaptation and best practices and proposing a climate emergency pack,

Therefore, the primary focus and mindset should reduce emissions; alternative aspects of science such as carbon sequestration are also important, but it does not address the primary issue of continued large-quantity emissions release by developed countries. The halting of these emissions and conversion of all countries (developed and developing) to renewable energies (solar, wind and hydropower) is vital (Quaschning, 2019). This must be supported by the global government and private industries. Additionally, global policies and agreements must be cross-checked and held accountable to ensure that they are facilitating this switch to renewables and vastly cutting emissions (United Nations Geneva, 2020). For example, carbon offset allows for companies to reduce emissions by funding emissions reductions in a different location usually through the purchase of carbon credits (Henderson et al., 2020); this caveat could allow emitters to continue with their typical business without largely reducing their emissions. The largest driver of CCSLR is anthropogenic emissions, and reducing these to zero needs to be a main global focus and goal. Exploitative policies that are not actually helpful in this regard must be avoided (IPCC, 2018). Additionally, the carbon exchange is not accounting for the fact that a unit of carbon to the individual in a placid environment will make available a dissimilar stage of fundamental necessity than to the individual in a rougher setting (Gulluscio et al., 2020).

A substitute pathway for climate justice is on average fairness argument, or carbon egalitarianism (Williges et al., 2022). Instead of focusing on previous bindings for emissions, such a line of action looks for giving everybody the same share of the capacity of the atmospheric sink. Scheme made on the basis of the equity principle would demand a technical accord on the entire quantity of greenhouse gas emitting limit to be permissible; that total would be distributed with the whole global populace, and the consequence would be an equivalent emissions quantity for every individual on the globe (Singer, 2004). Moreover, Peter Singer has prescribed a cap-and-trade approach, in which nations with soaring release could purchase allowances from those with lesser release. In spirit, such a method would lead to both lesser release in general and a way to compensate countries that exploit lesser per head quota.

In addition to strict emissions decrease, consumers in developing countries must consume less. Many companies now are "green-washing" their products to convince consumers that their products are sustainable, when, these companies are often just re-branding the same ideas (de Jong et al., 2020). Consumers in developed nations often feel they are making an environmentally conscious choice by purchasing items with select words such as green, sustainable, cage-free, while, these people just need to consume sustainably. Global initiatives have also adopted this mindset such as "climate-smart agriculture," which was pushed heavily in 2010 and claimed to support sustainability, resilience, and reducing GHG emissions; However, the lack of organization, safeguards, clarity, or accountability caused 350 organizations to deny adapting climate-smart agriculture (Zhongming et al., 2013). Additionally, many companies such as Monsanto (Agrochemical Corporation) backed this idea, which supported the use of pesticides (Bonny, 2017). It is important to be aware of this widespread re-branding to ensure that global initiatives actually facilitate sustainability in an equitable and just way and contain detailed explanations and procedures to implement and conduct sustainability.

A global-scale effort to provide compensation to the communities at risk of CCSLR in tropical and sub-tropical coastal areas in developing countries is necessary. As discussed above, the Paris Agreement includes a Climate Fund meant to help vulnerable countries deal with the effects of extreme natural disasters (Scandurra et al., 2020). This is needed on a large scale, and proper organization and implementation of funds to certain regions is needed with greater urgency and organization. Providing the financial assistance to these areas is greatly necessary, as these people already know their biggest challenges and require funding and assistance to overcome their specific challenges (Sforna, 2019). Additional funding will likely be necessary to strengthen vulnerable communities; providing these countries with this compensation creates justice and allows the affected countries to tackle the issues in their own way and how they think is most beneficial. This approach is different to previous attempts by developed countries to provide assistance as it resembles a take-over and does not consult the local communities before implementing their idea of priority for these regions.

Compensation also comes in the form of a funding mechanism to climate refugees. One of the large unknowns is, where will the climate refugees go? Some argue that countries like the USA and China, who had a large responsibility in creating the problem (contributing to a combined 40% of the total carbon emissions) must accept climate refugees [IOM (International Organization for Migration), 2008; Ahmed, 2017;

Qayyum, 2021]. However, migration on a large scale from developing to developed countries is unlikely based on historical events and cultural differences (McLeman, 2018; Warner, 2018). Therefore, there is a need for legally binding international recognition and protection for these people. This would not only help in the case of migration to a different country, but also migration and compensation for those within the same country. Participant-138 mentioned that as climate refugees are involuntarily displaced, they are not currently recognized by the stakeholders and do not have any protections or rights. This causes increased suffering, and those who do migrate often continue to struggle for livelihood, food security, and housing.

The global conversation must acknowledge that sea level rise is creating very real and devastating impacts to people all over the globe at this moment, and in some cases, has been an issue since the 1990s or before (Klein, 2015; IPCC, 2021). Additionally, sea level rise is likely to continue regardless of reduced emissions, which means that many areas of coastal Bangladesh will be submerged due to anthropogenic ally-caused climate change (Table 3).

As suggested by the Case Study on Father Luise, local people are often wary of assistance by NGOs, and there is a perception that these organizations do not discuss the issue of rising water and the subsequent creation of climate refugees. By recognizing the undoubted fact that sea level rise will displace many more people, communities in the SWCRB may begin to build trust for NGOs. Additional trust-building could be found in inclusion of local people in the process and decisions made by these organizations. The funding mechanism for this could, again, be on the international as well as regional level to reduce vulnerability and support sustainable development.

One other principal pathway to climate justice highlights the rights issue fundamental human rights, rights for advancement, and more exact environment related rights and the distinguished responsibilities and bindings that emanate from them (Gonzalez, 2015). The novelty here is that this mode is susceptible to the environmental state essential for growth and operation while preserving that all human beings with these rights also have the load, obligation, and liability related with defending the rights of other stakeholders (Calzadilla, 2018). One of the critically remarkable facets of the rights-based approach is that they cross the boundary of the concept of climate justice assumed on equity solely to one stressed on the environmental and advancement situation that individual members, community members, and authorities feel the necessity to make a survival, progress, and remain functional (Toussaint and Martinez Blanco, 2020). For the cause of climate justice to include the individual civil liberties framework to cover this kind of essential needs is visibly attuned in regards of capabilities pathway that has been suggested here, however, these ideas of climate fairness concerning rights has two significant drawbacks. The same way it was recognized at the beginning, they overlook other significant notions of justice, to be specific, those focusing on social as well as political appreciation and the more subtle and detailed notion of necessities that capability-based pathway encompasses (Figure 6).

Sustainable development is necessary to create resilient populations in the SWCRB. As shown in Figures 3, 7, 8 people of this area are demanding sustainable embankments instead of relief. The ability for people to reduce flooding conditions and riverbank erosion would create an immense impact on the multitude of issues relating to salinization, human displacement, loss of homes and land, and other challenges (Table 3, Figures 4, 5). As identified through this study, often it is the voluntary efforts of community members themselves who volunteer their time to rebuild local dams and embankments. Additionally, corruption hinders proper dam construction by local districts, and it is almost inevitable for these structures to fail. In addition to embankments, sustainable infrastructure, such as roads, schools, homes, and healthcare facilities, is also necessary. It appears that homes in the rural areas of SWCRB are often built using mud and thatch; providing these people with the tools to build their infrastructure with more resilient materials such as brick and concrete would help immensely and reduce the amount of suffering after natural disasters. The funding allocation described above could help with this. Additionally, local and regional communication and organization of government, NGOs, stakeholders, and citizens is necessary to gaining properly constructed embankments that are capable of withstanding extreme events.

A news article published in Drishtipat on June 5, 2020 spoke of the youth climate protest in the Padmapukur Union of the Shyamnagar Upazila for climate justice and to protect the Sundarbans. This protest was part of the Fridays for the Future movement sparked worldwide by Greta Thunberg and in response to the destruction from cyclone Amphan (2020). Ampan hit Bangladesh on Wednesday evening, May 20, 2020 in Satkhira district. Cyclone Ampan entered Bangladesh mainly through the Sundarbans adjacent to Munshiganj, the southernmost locality of Shyamnagar in Satkhira (Figure 5) (Islam et al., 2021; Rafa et al., 2021). One of respondent mentioned that through skype- the four most affected Upazilas of Satkhira were Shyamnagar, Asashuni, Kaliganj, and Sadar of Satkhira. Out of these four Upazilas, the most affected was Shyamnagar Upazila. Gabura, Padmapukur, Kashimari, Burigoalini and Ramjannagar unions were inundated due to the cyclone Ampan. A few thousand fish enclosed. Hundreds of houses, power lines, and trees were destroyed. Thousands of people in five unions were without water. The storm caused extensive damage to power lines in Shyamnagar Upazila. A total of 40 electric poles, including 19 of 33 cable lines, were damaged in the storm. As a result, the entire Upazila was without electricity. Burigoalini, Munshiganj, Kalbari, South Porakatla, East Porakatla, North Porakatla, East Durgabhai,

West Durgabai, North Durgabai, Madia Arpangashia, Ampan storm flood-affected people were the worst hit. The locality was flooded with salt water for 1 week while being surrounded by garbage (Table 3, Figures 4, 5).

Participant-139, mentioned that at that time, there was a great crisis for fresh water all over the western coast of the country. The biggest problem in our coastal areas was the problem of drinking water. Due to the stagnant water in the storm, all the fresh water ponds and tube wells were submerged in water. The water in the tube well was salty and contaminated by arsenic. There was already a shortage of potable water in several areas, and the erosion of cyclone Ampan made the erosion situation even more complicated. Some of the residents collected water by renting a local Van for 7 to 8 miles. Most of the people were poor with no scope for employment or availability of food. The residents were looking forward to water aid distributed by NGOs or other voluntary organizations. These NGOs provide water to each family in a water jar/pitcher, which was not enough to meet the needs of a single family. The government availed 20 kg of rice per head and also provided food to the flood-affected people. As a result of the collapse of the river bank, our valuable agricultural land, houses, roads, educational institutions and markets were lost. Social and economic life was severely damaged. Excess water from the floods hit the banks of the rivers, causing severe erosion of the river banks during the floods (Table 3, Figures 4, 5).

Fifty protesters attended the climate strike near the Chandipur Beri Dam, which was organized by Youthnet with help from the Action Aid Bangladesh; they called for construction of sustainable dams in public partnership, immediate rehabilitation while maintaining human dignity, and quick preparation for the next cyclone, while accounting for the coronavirus pandemic (Figure 8). The Satkhira District Coordinator of Youthnet, SM Shahin Alam, explained negative impacts of the climate crisis on livelihoods of coastal people. The combined global pandemic and climate crisis are straining the Sundarbans, creating climate refugees, and causing loss of housing, human life, and crops. It is apparent that these people are calling for participation in the decision-making steps on adapting to and preparing for CCSLR.

The Padmapukur Union Chairman, Participant-140, expressed the importance of listening to the local people for the solution to the destruction after cyclone Amphan, including the public, agricultural farmers, fish farmers, teachers, and local political and NGO representatives in the area-based coordination committee in all government activities in the affected areas. This included marginalized groups such as youth, women, and persons with disabilities. Protesters called for dam repair to be organized by local people *via* public hearings, establishment of a Climate Commission and Coastal Development Board, and increase in the national budget allocation for the areas affected by the climate crisis. Additionally, to deal with the social distancing, there is a need

FIGURE 7
A young man standing waist deep in water with broken embankment behind him from river erosion, with the placard "We want sustainable embankments, not relief" (Khobor, 2020).

for increased shelters and personal protective equipment for health care workers to work safely. There is a clear emphasis expressed here on community-based disaster management. Based on historic event, natural disasters (hurricanes, cyclones, and other extreme storms) are highly likely to occur in the summer and fall months in this region, and communities here want rapid preparedness for these inevitable events (Table 3).

As determined by the disaster risk assessment, these communities are often facing similar issues, but not at the same level. For example, all areas are influenced by cyclones and salinity, but flooding or river erosion may be viewed as the highest hazard in some areas.

SWCRB is susceptible to shifting pattern in climate effect in its coastal regions and more specifically in its more densely concentrated population spread in the low-lying deltaic vicinity, which faces a looming danger with sea level increase conspicuously. The sufficiency of the legal adaptable mechanism in SWCRB to react to such climate susceptibility is evaluated with the result indicating limitation in appreciating the community stakes ensuing from the climate and sea level increase uncertain situations. A more thorough pathway for ensuring justice in the social domain requires helping government to react to the effects from such concerns and to their implicated susceptible segments. The country can have a better adaptation legal approach to deal with climate change consequences and raise the association of local inhabitants in climatic pattern adapting decisive action. Financial allocation is a must to help policy making body to include adapting mechanism deciding endeavor and this could expedite social fairness consequences for susceptible SWCRB community members. The Bangladesh Climate Change Strategy and Action Plan (Ministry of Environment and Forest, 2012), strategy arrangements highlight procedures intended at dealing with dissimilar physiographic sections inside the country, counting and with importance on the coastal zone. The effects of climate change on livelihoods and means of poor farmers are also dealt with, but stress on steps to

FIGURE 8
Climate strike near Padmapukur Union Chhota Chandipur Beri Dam on June 5, 2020 (Kantho, 2020).

lessen negative effects on women, specifically, are deliberated merely in comparatively rudimentary customs, with inadequate tangible recommendations for approaches in which strategies can be allied to provide backing for underprivileged groups, along with women rights, the option to decide in society and household, women land access, women's right to exercise them (Aryal et al., 2020). Our investigation outcomes offer additional perceptions that could be from NAPA, for instance, be taken into account in the devising of Bangladesh's Thirty 30-year plan for 2022–2052 which offers thorough direction for climate justice questions to sustain national growth. It is specifically critical for indigenous inhabitants and island regions, such as SWCRB, which are losing cultural identity and environmental balance to integrate recognition and capabilities in their adaptation strategies (Table 4). It is claimed by Figueroa (2011) that the initial environmental justice effort for such group of people is the acknowledgment of their environmental uniqueness and custom, instead of personal level acknowledgment. But the local or island communities are not only marked as susceptible communities; many neighborhoods and benefactor factions of those communities are also recognizing what climate change would bring for different facets of community operation from areas of public wellbeing, the losing of specific regional economic initiatives, to community indulgence explicit by relocation and asylum seekers' distribution, to risks to fundamental survival due to sea level rise or havoc created by stormy weather (Figueroa, 2011). The authorities must take initiatives to extend the probabilities of recognition and capabilities to communities to make aware the people against those looming risks and worrying issues.

This also supports the idea of community-based management as each area has its own unique challenges to overcome. The GoB must be instrumental in prioritizing the lives of these people, facilitating access to necessities (fresh water, food, livelihood, infrastructure, and healthcare), and creating a resilient community. It is known that several times, external assistance intended for certain marginalized populations does not benefit those intended; we can reduce this harm by compensating these people to allow them to create their own resilient communities through their own framework of sustainability. Climate change impacts diverse geographical zones and groups in a different way. As the most underprivileged countries and the most susceptible individuals within those nations, like women, girls, and gender diverse clusters agonize the maximum, and despite contributing the minimum to the climate predicament, climate justice is turning out to be a crying call for the developing nations (Table 2). Just saying climate justice is not enough; the underprivileged nations, and individuals should be aided by those who have played a role most to climate change.

Conclusion

With the industrial revolution, developed countries began utilizing resources such as coal, natural gas, and to build their economies and boost profit. The consequence of this emissions release of GHGs into the atmosphere was unintended warming of the temperature at the global level due to the greenhouse effect. Science has long supported this understanding, but the conversion of this understanding into true policy change and large-scale emission reduction has not occurred. Global agreements to reduce emissions are insufficient and must be ramped-up to reduce emissions to zero to not surpass a 2°C warming of the atmosphere; this is the anticipated point when warming will continue due to natural earth feedback loops. The SWCRB is unjustly affected by CCSLR *via* extreme events, coastline recession, and increased salinity,

which have affected all aspects of these people's lives including livelihood, infrastructure, food security, freshwater access, and healthcare. This climate injustice ensures that those countries that contributed least to global warming are likely to be impacted the most. Recently, Intergovernmental Panel on Climate Change (IPCC) has declared the crucial cause of global warming, climate change, and sea-level rise is the release of carbon dioxide (CO_2) and Bangladesh may face a shortage of freshwater due to the continuous melting of glaciers. This may lead people to use underground water resources to meet both their agricultural-industrial and domestic needs. Thus, it is important to reduce CO_2 release to ensure climate justice at the global or national level. The frequency and scale of extreme climatic events like cyclone, and storm surge causing deluge, have increased due to climate change. Ignorance in polders flow regulation at the upstream barrage, shrimp cultivation development, expansion of farming water supply, and extreme removal of groundwater may result in increased salinization and decaying freshwater quality. Polders in coastal regions are not secured which becomes the greatest risk of SLR in the SWCRB. Besides, the coastal people become conscious of their rights despite their little educational background and often request to the stakeholders to build embankments. Thus, climate justice can be ensured by the nation's government and the NGO's financial capacity both globally and nationally.

The southwestern coastal areas of Bangladesh, often experience extreme climatic events like cyclones associated with storm surges causing saline water intrusion. This soil and water salinity causes alteration in natural and anthropogenic processes which possess a threat to freshwater availability, health, agriculture, food security, etc. Due to salinization, the farmers are now more interested in converting agricultural land to shrimp cultivation. This may be economically beneficial for them but hampers the total agriculture farming, and destroy soil and water quality and the ecosystem in the long run. Also, shrimp cultivation needs low manpower compared to agricultural purposes resulting in a labor leftover which drives the agricultural living landless laborers to migrate to the cities for employment. There are two viewpoints proposed despite the disagreement regarding commercial shrimp farming in Bangladesh, as climate change adjustment approach into plain respite. The first one recommended it as an ideal adaptation strategy that ensues the rising of GDP through the expansion of export markets and minimizes the ecological damages caused by sea-level rise and salinization. The second viewpoint emphasized the negative social and ecological perspective of shrimp farming and proposed to consider the shrimp aquaculture extension as a non-operative adaptation approach because of its fondness among the underprivileged coastal people. Sociocultural relations of supremacy are considered to be the determiner that influences the scenario of the shrimp aquaculture stresses leads to the pathways of climate change, reactions to it, and likely prospects in the context of it. Recently health risks are increasing day by day due to anthropogenic climate change and are the greatest challenge for Bangladesh. Besides, medical assistance is a fundamental right as good health condition ensures the quality of human resources obtaining economic growth and social equality as well as national development. Furthermore, gender discrimination often seems prominent in climate change issues, SLR and adversity questions, planning, and agendas. Especially, when women receive lands inherently from their family or relatives, most of the time those lands are ceased from them as the relationship ends. Climate shifting patterns create gender inequality and women are more vulnerable to it due to their economic, social, and cultural norms and religious restrictions. Eventually, these climate changes have enormous influences on damaging agricultural land, decreasing yield, drinking water scarcity, food shortage, shrimp farming damage, amplified life risk, unemployment, migration, etc. According to the National Adaptation Program Action (NAPA), 2005 and the Bangladesh Climate Change Strategy and Action Plan (BCCSAP), 2009 in the development of two national strategies on climate change adaptation, Bangladesh has taken a lead among low- and middle-income countries. But again it is neglected in both the national and SWCRB's policy on justice and action for climate change.

This study mentioned that SWCRB has been considered one of the successful pioneers in the national context of climate change adaptation to protect people but it is not possible without reducing global carbon emissions and global political commitment to achieve climatic justice. The world politicians so far couldn't come up with an effective solution for Climate Justice even through the Kyoto Protocol 1997, the Copenhagen protocol (2009), the Paris Agreement (2015), Montreal Protocol (2016), and COP26. Mohammad Adow, the director of Nairobi-based think tank Power Shift Africa stated, that there is nothing to show for all the work the developing countries have done so far, and the damages and the loss suffered are nothing more than a political agenda. He also stated that it is the only last option to be delivered eventually (Newell and Adow, 2021). They are also hopeful that sustainable development and more meaningful support could be achieved for the vulnerable communities in the coming year to deal with the irreversible impacts of climate change from those who denied taking any responsibility (Broom, 2021). COP president, Alok Sharma expressed disappointment toward the whole coal situation and almost to tears describing the entire process (Hayes, 2021).

This paper supports climate justice theory for a capability-based approach rather than a rights-based approach, due to the inherent discrimination in recognition. The capability-based pathway can assist in addressing many of the matters like sharing weaknesses, identifying the individuals, areas and the link between them and many of the fundamental rights being at danger caused by the climate change is the dispute here. On top

of this, such steps can put an ease to the adjustment of confined inconsistencies in the outcomes and the understandings of the climate change and to the way how it responses, if it is necessary. The capabilities approach allows for the people of the SWCRB to facilitate and manage their own issues in their own way, while being compensated in the form of funding from developed nations. The focus here is on community-based disaster management, which includes local people in the conversation along with NGOs, government, and others involved. These people must be provided funding so they can prepare for the inevitable natural disasters while being safe from the added impacts of the COVID-19 pandemic.

An inclusive approach fulfills both acknowledgment and ability of residents to participate. The factor in this regard is to be more receptive in realizing discrepancies of perils and outcome, and to encompass those impacted *via* climate change in the realizing and preference of susceptibilities and the building up of adaptive strategies in reaction. This all-encompassing susceptibility mapping can be utilized both to demonstrate the precise exterior climatic and environmental prerequisites that warn fundamental competencies and to formulate strategies that tackle those susceptibilities. A capability-based pathway, in this case, provides a technique of examining the unique necessities of communities, of guiding adaptive strategy toward maintaining or reformulating the particular abilities within hazardous scope from climate change, and of fathoming the accomplishment, or not, of employed adaptive strategies. Both the rights-based and capability-based theories include a wide range of issues related to justice in their potential capability pathway counting equity in distribution, acknowledgment in the societal level and involvement of public. The climate justice theory for a rights-based approach can be considered as a future scope of this study and will be investigated subsequently.

Data availability statement

The original contributions presented in the study are included in the article/supplementary materials, further inquiries can be directed to the corresponding author.

Ethics statement

Ethical review and approval were not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent was obtained from the individual(s) and minor(s)' legal guardian/next of kin for the publication of any potentially identifiable images or data included in this article.

Author contributions

Conceptualization, methodology, software, formal analysis, investigation, resources, data curation, writing original draft preparation, and visualization: MA. Validation: MA and CG. Review and editing: MA, CG, and JG. Supervision: CG and JG. Both authors read and approved the final version of the manuscript.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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