



A governance perspective for climate change adaptation: Conceptualizing the policy-community interface in Bangladesh

M. Anwar Hossen^{b,*}, Corinna Netherton^a, David Benson^c, Mohammad Rezaur Rahman^d, Mashfiqus Salehin^d

^a University of British Columbia, Canada

^b Department of Sociology, University of Dhaka, Dhaka 1000, Bangladesh

^c College of Social Sciences and International Studies, University of Exeter, United Kingdom

^d Institute of Water and Flood Management (IWFM) Bangladesh University of Engineering and Technology (BUET), Dhaka, Bangladesh

ARTICLE INFO

Keywords:

Climate change adaptation
National policy
Bangladesh
Reactive Approach of Limited Action (RALA)
Proactive Approach To Adaptation (PATA)
Government decision-making processes

ABSTRACT

Climate change adaptation is currently an important community concern in developing countries like Bangladesh. The conceptualization of adaptation within the government system matters for the promotion of activities such as employment generation for local communities. The lesser the gap between government policy and the local community's needs for adaptation the more effective outcomes are for ensuring policy success and promoting sustainable community livelihoods or vice versa. This interface between policy and community is important for climate change adaptation which is explored in this paper along with the findings of the research project, DELtas, vulnerability and climate change: Migration and Adaptation (DECCMA) conducted during 2014–2018 in Bangladesh, Ghana, India, and the United Kingdom. The data from Bangladesh was collected from 1384 survey respondents, 19 Focus Group Discussions (FGDs), 3 workshops, and 43 Key Informant Interviews (KIIs). The findings of the paper show that government adaptation activities mainly reflect the Reactive Approach of Limited Action (RALA) perspective rather than the Proactive Approach To Adaptation (PATA). The RALA perspective is characterized by piecemeal and top-down approaches to adaptation which fail to recognize a community conceptualization of climate change, policy perspectives for coping with local concerns, and governance approaches for effective adaptation. In response, the government needs to focus on the PATA in policy, programs, and projects with the governance approach implemented from the bottom-up or, in other words, from the local perspective. Community participation in decision-making processes is characteristic of this bottom-up governance model. Local community participation, consultation, and representation are essential parts of PATA in adaptation policy formulation and execution, providing important lessons for Bangladesh.

1. Introduction

Climate change is a reality and coastal people in developing countries like Bangladesh are the frontline victims of sea level rise and related climatic abnormalities (Findlay, 2021a; Khan et al., 2011; Barbour et al., 2022). Major factors such as geographic location, low elevation, population density, lack of proper infrastructure, weak institutions, and dependency on natural resources make the country less resilient in coping with climatic change (Agrawala et al., 2003). In Bangladesh, the total geographic area is 15,7566 square kilometers, and the total population is about 160 million with an average density of about 1015 per square

kilometers (although the density in major cities like Dhaka is higher: about 34,000 per square kilometer) (Alam et al., 2018: xi). An estimated projection shows that 97% of coastal areas of Bangladesh and over 35 million people are vulnerable to multiple climatic events including floods, droughts, cyclones, river bank erosion, and increased salinity (Shamsuddoha and Chowdhury, 2013). For example, the extreme flood in 1998 affected 67% of the total area in Bangladesh, lasted for 65 days, caused 1100 deaths, rendered 30 million people homeless, and damaged 500,000 homes and 700,000 ha of cultivated land (Aich and Rashid, 2018). The total post-harvest loss of rice was about 20% of total production and for vegetables it was 30%, resulting in US\$ 4 billion losses

* Corresponding author.

E-mail addresses: anwar_sociology@du.ac.bd (M.A. Hossen), cnethert@hotmail.com (C. Netherton), D.I.Benson@exeter.ac.uk (D. Benson), rezaur@iwfm.buet.ac.bd (M.R. Rahman), mashfiqussalehin@iwfm.buet.ac.bd (M. Salehin).

<https://doi.org/10.1016/j.envsci.2022.08.028>

Received 9 May 2022; Received in revised form 29 August 2022; Accepted 31 August 2022

Available online 8 September 2022

1462-9011/© 2022 Elsevier Ltd. All rights reserved.

(Karim and Islam, 2018). The International Monetary Fund IMF (2019) forecasts that over one-third of total future population displacement in Bangladesh will be due to climate change effects such as flooding, droughts, and coastal erosion.

Problematically, while the mitigation of greenhouse gas emissions is the most important political preference promoted globally for combating climatic change (Winkler, 2005), as a policy prescription it does not address the urgent needs of some developing countries, reflecting wider concerns over distributive climate justice for the Global South (for example, Okereke, 2010). In this respect, Bangladesh contributes to less than 0.36% of total emissions globally (Ministry of Foreign Affairs, 2018). However, the country was ranked seventh as the most climate change affected country in the period between 1999 and 2018, according to the 2020 Global Climate Risk Index (Eckstein et al., 2020). When faced with the growing severity of climate change impacts, Bangladesh consequently has to prioritise adaptation practice to save the lives and livelihoods of poor and marginalized people who are most at risk.

Thus, adaptation has become a policy emergency in Bangladesh, in order to cope with climate change effects. The concept of ‘adaptation’ is largely defined as adjustment in human and natural systems, including structures, processes and practices, to climate change impacts (Heller and Zavaleta, 2009). Adaptation can involve institutional, structural/technological and social approaches, solutions and measures within government policy responses to ensure such socio-ecological adjustment (IPCC, 2014: 27). In practice however, the effects of climate change on marginalized people often do not get consideration in policy (Agrawala et al., 2003; Findlay, 2020a). The Bangladesh government has to date made significant efforts to reduce climate change impacts and promote adaptation specific policies and programs, such as the 2009 Bangladesh Climate Change and Action Plan (BCCSAP 2009) and the 2022 National Adaptation Plan of Action (NAPA), with the support of international donors (Ayers and Huq, 2009; Khan et al., 2011; Manuamorn et al., 2020). The major question however is whether these policies are able to accommodate the needs of local people to overcome climatic impacts and ensure that adaptation policies are effectively implemented. Similarly, gaps in government policy for supporting the needs of local communities are a concern (Abedin et al., 2019; Agrawala et al., 2003; Bahaiddin et al., 2016; Hossen, 2017; Haque and Zaman, 1993; Stock et al., 2021; Sultana and Thompson, 2017; Uddin et al., 2014; Verschuur et al., 2020).

Grounded in the argument for a paradigm shift that facilitates socio-economic justice for climate change, this paper comprises four major parts. The next section initially provides an overview of the literature relevant to the main argument of the paper. It shows why the Proactive Approach To Adaptation (PATA), rather than the Reactive Approach of Limited Action (RALA) evident in the government system, is important for climate change adaptation of local communities in Bangladesh. The next section presents the methodology by outlining the data sources used for the analysis and providing evidence to support the main themes of this paper. The third section describes the research findings, which are divided into three sub-sections: (i) the socioeconomic context of climatic concerns of coastal people in Bangladesh, (ii) local conceptualizations of climatic concerns, and (iii) the RALA approach in the adaptation policy of Bangladesh. Finally, the last section discusses the governance approach to climate change adaptation and the government-

policy interface in Bangladesh.

2. RALA versus PATA in adaptation governance

Two main types of adaptation governance models relevant to Bangladesh are RALA and PATA (Table 1). The Reactive Approach of Limited Action is understood in this paper as a government policy strategy that focuses on government activities using a top-down, hierarchical and paternalistic mode of governance often implemented before or after a climatic event such as a flood or cyclone. In Bangladesh, when a climatic impact occurs at the local level, the government provides some financial relief without assessing the level and types of problems of local people. Many localized climatic events such as river bank erosion or embankment failure are consequently ignored in government responses (Sultana and Thompson, 2017) while no influential person communicates to a high level of the government regarding their effects on local communities. The government system does not consequently have effective institutional mechanisms for determining local concerns and the total number of vulnerable people who need specific types of support to resume their normal life.

For climate change adaptation, the main RALA intervention focus of Bangladesh government policy responses is on strategic adaptation planning combined with funding for adaptation programs and projects, primarily aimed at economic growth (Ayers and Huq, 2009; Huq et al., 2022; Manuamorn et al., 2020). However, these responses are often responsible for creating social inequality and environmental degradation. For example, in the Ganges-Kobodak project, funded by the government, local rivers were blocked leading to saline waterlogging of coastal land after cyclones. The Bangladesh Delta Plan (BP 2100) 2022 was also formulated by the government to support long term economic objectives alongside adaptation, without meaningfully considering the negative socio-environmental effects on communities of past development ‘mega’ projects based on engineering solutions, such as the Flood Action Plan (FAP) 1990. In this development perspective, moreover, the government is more accountable to international donor agencies (Khan et al., 2011), which undermines local democracy. State-society interactions are typically exclusive within the RALA governance paradigm, with government actors largely determining policy outputs with only limited input from local communities. As a result, the participation and representation of marginalized groups in formulating adaptation policies such as the National Adaptation Plan 2022 has not occurred.

Within RALA type governance, the scope for adaptation by marginalized people is also constrained due to the gap between local people’s understanding of climate change and the government’s top-down solutions, which are often based solely on technical or economic growth paradigms. This cognitive gap results in sub-optimal adaptation. Hoffman (2010), for example, argues that resolving climate change impacts cannot only involve focusing on techno-economic models since social problems and their solutions are governmentally and culturally rooted. The local adaptation practices of farmers in Bangladesh, for example, do not get proper attention in government responses (Paul and Hossain, 2013). As a result, the socio-ecological dynamics of climatic concerns and adaptation measures also need to be emphasized in policy (Anna et al., 2012; Jones and Boyd, 2011; Sultana and Thompson, 2017). For example, variability in temperature and rainfall causes major challenges for agricultural practices (Mertz et al., 2009; Uddin et al., 2014). This

Table 1
The RALA and PATA approaches to climate adaptation governance.

Governance approach	Mode of governing	Main policy responses	Adaptation policy focus	State-society interaction	Use of local knowledge
RALA	Top-down, centralized	Planning and funding for programs and projects	Techno-economic growth	Exclusive	Limited
PATA	Bottom-up, decentralized and multi-level	Planning and funding for programs and projects	Local community and environment needs	Inclusive and collaborative	Extensive

seasonal dynamic requires consideration of human (knowledge, technology and economy), social (normative, cognitive and institutional) and natural (physical and ecological) aspects and their relationships to climate adaptation (Findlay, 2020b; Haque and Zaman, 1993).

To counter these deficiencies, a Proactive Approach To Adaptation (PATA) may be more appropriate for the Bangladesh context, particularly in supporting adaptation of marginalized communities through prioritizing their welfare. In this context, we argue that PATA is characteristic of a bottom-up, collaborative policy approach, which is important for representing local community voices in climate policy-making and implementation processes. These arguments reflect Ayers : 65) (2011), who calls for greater 'local inclusiveness' in government adaptation policy in Bangladesh, through wider public deliberation. For this inclusive approach, Turnhout et al. (2019) recommend a stronger focus on the relationship between science, policy, and society.

As part of PATA governance, adaptation planning and funding should be focused on local community and environmental needs within government policy rather than just economic development. Here, policy responses should consider numbers of affected people and their types of losses such as field crops or domestic animals, in order to inform adaptation. Local government in Bangladesh is already supposed to establish institutional mechanisms to monitor, evaluate and execute decisions related to, for example, river bank erosion or embankment failure but implementation is generally poor. Such evaluations can also be utilized in long term adaptation planning through determining agricultural loan requirements or subsidy levels.

For achieving PATA governance, the government also needs to hear the voices of local people related to their past experiences. Such recognition can be helpful in understanding the reasons for growing social inequality and environmental degradation, and developing more effective adaptation policy perspectives. Meaningful participation and representation can ensure that infrastructural development projects (see Agrawala et al., 2003) such as the Ganges-Kobodak are more environment-friendly: for example, river systems can be preserved to help reduce climatic effects such as soil and water contamination, while long term adaptation planning recognizes past experiences. For this purpose, under a PATA approach, government must be accountable to local people alongside international agencies such as the World Bank.

In support of the PATA adaptation approach described above, this paper therefore considers the inclusion of local communities as an ethical approach to governance (Sultana and Thompson, 2017), in conjunction with multi-level governance (Stock et al., 2021). A local community perspective can be the foundation to creating a paradigm shift for changes in how decisions are made that will counter climate change (Netherton, 2021; Sultana and Thompson, 2017). Governance systems with community networks have strong communication and dialogue capacities, thereby increasing participation and representation (Findlay, 2021b). Local governance as a starting point for decision-making is therefore essential in multi-level circular networks, as described by Fritjof Capra (1996), that support PATA as a local governance system. As such, Amundsen et al. (2010) focus on planned adaptation to foresee the impacts of climate change based on coordination between bottom-up and top-down decision-making approaches. A bottom-up or local approach for collaborative decision-making is appropriate for sustainable practices utilizing informal public and private networks (Masud-All-Kamal and Nursey-Bray, 2021; Van Kersbergen and Van Waarden, 2004). Similarly, De Loë et al. (2009) suggests that collaborative and local decision-making is flexible in adapting to changing needs. Consultation with local knowledge holders is therefore key to governing climate adaptation (Klenk et al., 2017).

In this context, Corfee-Morlot et al. (2011) assert that a multilevel governance framework can advance the broader understanding of adaptation policy and institutional capacity development. Multi-level governance is characteristic of a dispersed and horizontal approach to decision-making, from the local to higher levels (Csehi, 2017; Khan et al., 2011). Collaborative relationships within multi-level

organizations are essential to work with communities in equal partnerships (Agrawala et al., 2003; Henderson, 1994; Turnhout, 2018; White, 2002). Multi-level governance can therefore integrate with PATA to respond to major climatic events with the participation of multiple stakeholders including representatives of poor and marginalized groups of people that are usually excluded under RALA.

3. Methods

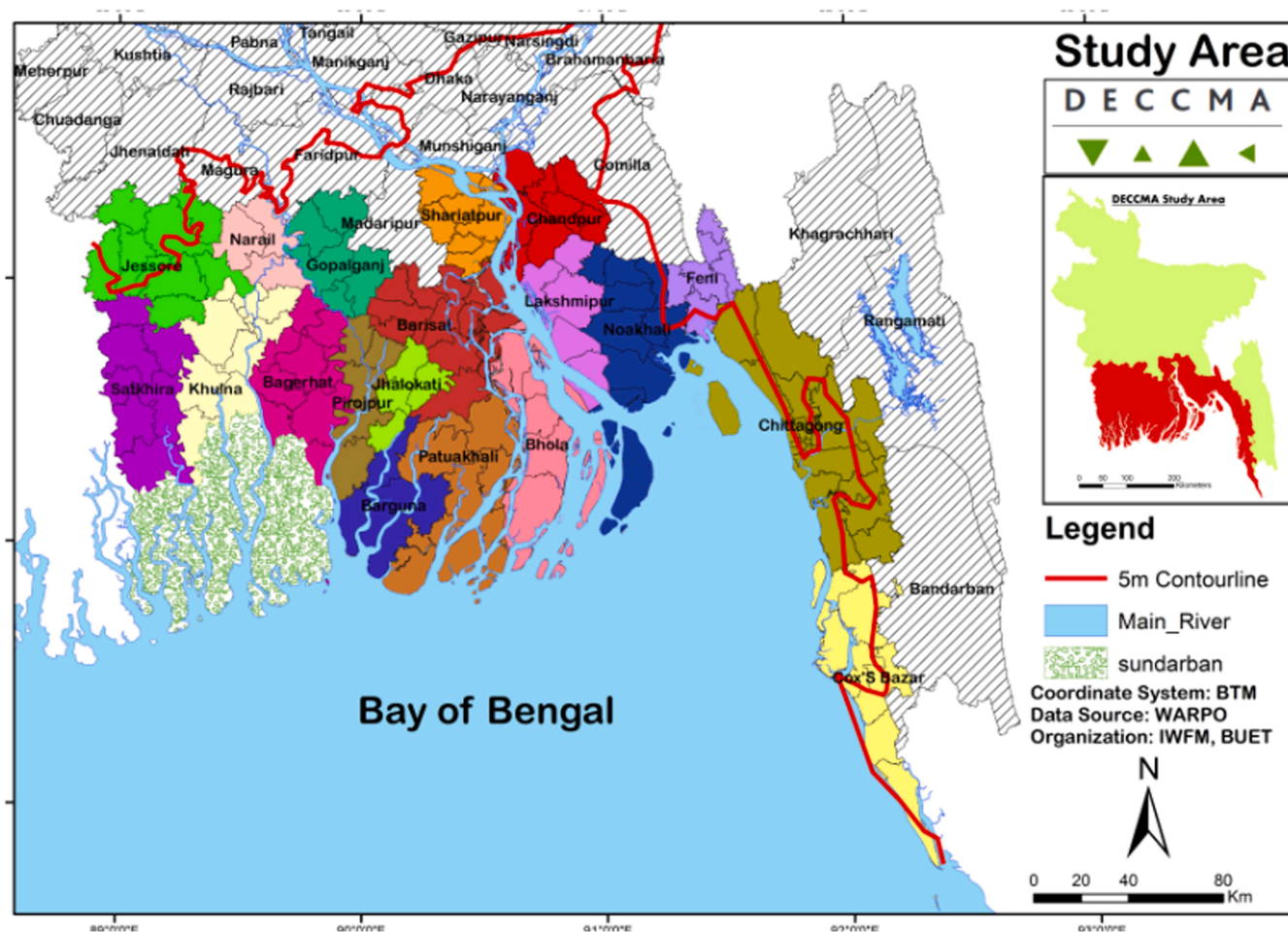
The study follows a mixed methods research approach including social surveys, Focus Group Discussions (FGDs), and workshops conducted in Bangladesh based on the research project, DECCMA (DELtas, vulnerability and Climate Change: Migration and Adaptation). In this research, social surveys were conducted with 1384 respondents in several study areas in Bangladesh from 2016 to 2017. Additionally, 19 Focus Group Discussions (FGD), 3 workshops, and 43 Key Informant Interviews (KIIs) were completed. The survey, FGD, and KII data were collected from 14 coastal delta districts: Bagerhat, Barguna, Bhola, Chandpur, Teknaf, Cox's Bazar, Gopalganj, Jessore, Khulna, Lakshimpur, Noakhali, Patuakhali, Pirojpur, and Satkhira, as shown in Map 1.

This paper focuses primarily on the qualitative sources of data derived from the FGDs conducted in the different villages of the coastal districts, as discussed below. The data source was gender and geographically balanced with the inclusion of males and females in FGDs in three major districts of Laxmipur, Bagerhat, and Patuakhali. Among the three workshops, two were at a public university and the Ministry of Disaster Management (MoDM) in Dhaka and one was at the district level. At the university, a total of 62 participants from 22 organizations attended the workshop, representing government, donors, and civil society. At the MoDM, the 52 participants were from different government ministries, departments, and bureaus. At the district level in Khulna, 85 participants from different governments, non-government, and community organizations attended the workshop. In addition, 43 Key Informant Interviews (KIIs) with government and non-government organizations were conducted. Among the KIIs, 15 and 28 were conducted at the national and coastal level respectively, including respondents from the United Nations Development Programme - Bangladesh (UNDP Bangladesh), Association for Land Reform and Development (ALRD), Bangladesh Bureau of Statistics (BBS), British Council, Center for Environmental and Geographic Information Services (CEGIS), Center for Global Change, and Government of Bangladesh, in order to acquire a broader understanding of governance. All of the FGD and KII respondents are referred to with pseudonyms, to ensure their privacy and protect them from any potential harm, as specified under the project research ethics protocol. The research mainly focused on the KIIs in conceptualizing the government and community interface on climate change adaptation.

4. Research findings

4.1. The socioeconomic context of climatic concerns of coastal people in Bangladesh

Lower socioeconomic conditions in coastal areas are the leading cause of the inability of households to combat climate change. According to Siddiqui et al. (2017) about 21% of the total respondents have no schooling while 22% have very nominal primary schooling, and attended a primary school for one or two years. In the study, 50% of the total respondents have a permanent job and, therefore, have a better standard of living while the remainder of the local people work temporarily or seasonally and have less income and a lower standard of living. The average minimum monthly income of coastal people is Bangladesh Taka (BDT) 14,140. An average minimum monthly expenditure is BDT 18,969, which is not enough to support a household and therefore not enough for people to even consider climate change. About 80% of the respondents were male supporting a household. The average family size



Map 1. The Fieldwork Area at the Coastal Zone in Bangladesh.

is 4.6, who mainly depend on the head of the household for income support. One major reason for this dependency is about 44% of the female respondents work as unpaid home care in taking care of the family. Temporary employment makes it difficult for households to make a living (and even think about climate change). Many do not have any alternative sources of employment to earn a living. The majority of people have no land or do not have enough land to support themselves. Most people depend on natural resources such as freshwater and the sea for employment opportunities but these resources are depleting on a daily basis due to environmental degradation. Thus, most of these poor people live ‘hand to mouth’ and are unable to secure employment opportunities often resulting in malnutrition, death, and family problems. The lower level of socioeconomic conditions is the cause of poverty. Social service programs in Bangladesh are not developed with the PATA, as most follow the RALA perspective.

4.2. Local conceptualizations of climatic concerns

Coastal people in Bangladesh have their own conceptualization of climate change and related effects based on their individual experience. For example, FH-1 from Shudhirpur, in the Patuakhali District, informed us during the FGD that the seasonal weather cycle has changed dramatically from that experienced twenty years ago. Similarly another FGD participant, FM from Khazua suggested both cities experience severe drought and rainfall. FH-2 from Southkhali in Khulna, mentioned that it rains during the summer and drought occurs during the rainy season, which is seasonally abnormal. FM and FH-2, two other FGD respondents, expected normal rainfall in the Bengali months of Ashar,

Srabor, and Vadro (June, July, and August) but it did not happen. Currently, they do not get rain after Boishakh (April-May). Only Srabor (July-August) can now be considered as the rainy season. Sometimes coastal people in Bangladesh encounter this rain in the winter season and this is unprecedented. Another FGD respondent, FH-3, elaborated that the seasonal rain abnormality is the same as having six seasons condensed into three seasons.

Fashiatola had a major flood in 2007 as a result of above average rainfall. In 2009, the area experienced Cyclone Aila (confirmed by FGD respondent FM-2). FK-1 from Pasharburnia in Patuakhali reported that the city has encountered higher temperatures after Cyclone Sidr in 2007 but he did not understand the reasons for this type of climate change. He further mentioned that droughts are getting longer: sometimes five months in a year. FH-3 attributed the prolonged droughts to geographical factors such as those in Fashiatola in coastal Bangladesh. In addition, FH-3 reported a higher number and intensity of cyclones.

Climate change brings an increase in lightning strikes during the rainy season, which is a new concern for communities. In only four years, from 2011 to 2015, Bangladesh encountered approximately 5777 lightning strikes or severe thunderstorms (Farukh, 2018). In 2018, lightning flashes caused the deaths of 275 people and 30 livestock, and 126 injuries (Farukh et al., 2020). FK-4 from Shudhirpur in Patuakhali said that every year they encounter multiple severe climate events such as rainfall, lightning flashes, cyclones, and droughts, making living difficult.

FH-3 described climate change based on sea level rise and its effect on higher water levels marked by a residential building or tree. Local people use this type of marker to measure the difference between the

previous and current water level. He further described the higher level of water in local rivers and other water bodies and how it is jeopardizing local habitats. Nielsen and Reenberg (2010) suggest communities understand better the need for such local adaptation responses to cope with environmental changes.

Another FGD respondent, FK-1 from Pasharbunia in Patuakhali, described seasonal weather irregularities based on the challenges in producing crops. Field crops grow best in Ashar, Srabor and Vadro due to the availability of rain in the rainy season, otherwise drought conditions are the norm. One female FGD respondent, FK-2, from the same region, described the cracks in soil characteristic of prolonged droughts. FK-4 from Shudhirpur in Patuakhali reported that every year there are multiple climatic events such as heavy rainfall and storms. In 2019, Cyclone Fani hit Kalapara and Mirzaganj Upazila in Barishal destroying local dams and embankments and causing severe flooding in 20 villages. Cyclone Fani resulted in the loss of field crops for 250 villagers, also damaging household properties (Anon, 2019). FH-3 aptly summed up the destruction from the cyclone: “we live in panic. Fear is in every step of life. We have no idea how destructive a cyclone can be for life and property. People died in Sidr, property was destroyed. They lost their relatives in Sidr. They fear now they might lose their whole family. Many leave their residences to take refuge in the shelter even if it is a danger signal number one.” The unpredictability of cyclones and other climatic events result in severe socio-economic hardships.

4.3. The RALA approach in the adaptation policy of Bangladesh

Climate change variability such as droughts, flooding, storm surges and sea level rise are concerning for local communities, as already mentioned. The irregularity of seasonal weather cycles is a concern and is a focus for government climate change mitigation policy at international levels. The government has also played a major role in developing adaptation measures in climate prone coastal areas in Bangladesh. However, the government and donor roles in dealing with climate change is limited to utilizing the Reactive Approach of Limited Action (RALA) (Ayers and Huq, 2009; Huq et al., 2022; Manuamorn et al., 2020). For example, the government allowed development of infrastructure for ecotourism in critical ecological zones such as the Sundarbans that causes further vulnerability of this mangrove forest to climate change (Agrawala et al., 2003). They also established a coal power plant close to this forest that causes further concerns over climate change adaptation. Similarly, government policy emphasizes shrimp aquaculture that depletes local freshwater ecosystems and increases threats to the Sundarbans. Natural resource depletion, environmental degradation and biodiversity loss caused by agricultural inputs such as chemical fertilizers, inappropriate development programs such as the Flood Action Plan (FAP), and climatic impacts such as salinity are growing concerns but no meaningful review of these factors are conducted in developing climate change adaptation policy (Hossen, 2017). Policy-makers are losing their local knowledge of climate change adaptation due to the growing domination of the RALA top-down system. Again, the government does not communicate their adaptation policies, plans, programs and interventions effectively in order to raise awareness (Bahauddin et al., 2016).

Currently, adaptation policy formulation and implementation are technocentric and top-down, and fail to include the voices of local people and local government agencies (Stock et al., 2021). At the central government level, the relevant ministries dominate the decision-making of local government agencies. This adaptation perspective causes sociopolitical challenges (Stock et al., 2021) and ecological vulnerabilities (Haque and Zaman, 1993). Limited consideration of the geographical and class specific vulnerabilities of climate change is one major policy constraint in Bangladesh (Agrawala et al., 2003). The government uses 22–37% of the total Official Development Assistance (ODA) of more than one billion US dollars for climate affected sectors. However, this funding fails to focus on local social and environmental dimensions. For

example, coastal embankment projects and polders lack appropriate monitoring and maintenance (Agrawala et al., 2003). Thus, river salinity in the southwestern region of Bangladesh has increased by 45% since 1948 but no effective policy measures are in place to address it (Khan et al., 2011).

After a specific event such as a cyclone or flood, the government provides some relief in the form of rice or saline water for poor people. Relief efforts are publicized in national print and electronic media to inform the public that the government is taking all necessary measures to ensure the safety of vulnerable people. In terms of policy, the local government conforms to the interventions implemented by the federal government (Stock et al., 2021). However, local and federal governments fail to adequately specify the total number of affected people needing disaster aid. Despite the visibility of cyclone destruction, the government tends to maintain a ‘business as usual’ approach and leaves it up to the individual to deal with the impacts of natural disasters. The local cropping calendar has been behaving erratically for decades but no policy documents or development projects focus on this concern when considering climate change effects (Uddin et al., 2014).

Locally contextualized natural resource governance for climate change adaptation is given lesser importance in the government system of Bangladesh (Sultana and Thompson, 2017). Floodplain ecosystems and agro-ecological landscapes are ignored in this governance perspective. After the construction of the Ganges-Kobodak irrigation canal, local wetlands dried up and poor farmers are facing challenges in managing livelihoods (Rasul and Chowdhury, 2010). Investments in water infrastructure do not recognize an ecosystem perspective, causing water insecurity, local conflicts and adaptation concerns for the majority of local people (Sultana and Thompson, 2017). In policies such as the National Adaptation Plan (NAP) 2022, the government failed to recognize many of these concerns such as asset and welfare loss caused by climate change (Verschuur et al., 2020).

No major stakeholders such as Non-Government Organizations (NGOs), civil society organizations, or local governments consider utilizing adaptation measures. Non-Government Organizations (NGOs) follow the guidelines of bilateral and multilateral donors in planning and implementing their activities for community empowerment. NGOs promote globalization and neoliberalism by exploiting the most vulnerable people in Bangladesh (Karim, 2008). More specifically the current development buzzword of women’s empowerment with micro-credit supports the capitalist interests of Multi-National Corporations (MNCs). Due to the RALA top-down perspective, NGO interventions fail to promote social justice and sustainable adaptation practices (Karim, 2008; Masud-All-Kamal and Nursey-Bray, 2021). For example, micro-credit causes indebtedness responsible for malnutrition, asset loss and debt default (Banerjee and Jackson, 2017; Jordan, 2020).

One of the KII respondents, KB from the Center for Global Change, pointed out that the top-down approach toward adaptation activities is one of the major obstacles for helping climate-impacted victims in Bangladesh. He elaborated that when a top-level government official has an agenda, the government has a legal mandate or responsibility to initiate and support policy. In this context, there is no need to understand the requirements of local communities. Many adaptation measures such as building a cyclone shelter or dredging a river can create negative consequences for those communities impacted. When a cyclone shelter does not have road connections, encounters maintenance problems, or is controlled by rich people, local people fail to provide shelter services. Similarly, the government’s river dredging program is ineffective when it fails to ensure good governance, community participation and representation.

Adaptation politics matters in the broader domain of public policy. In coordination with their global partners, a ruling government directs decision-making and policy development, as described by Clar et al. (2013). The UNFCCC supported Bangladesh in establishing its Climate Change Strategy and Action Plan (BCCSAP) that provides the guidelines for managing the Bangladesh Climate Change Trust Fund (BCCTF), and

Bangladesh Climate Change Resilience Fund (BCCRF) with the support of donors. The World Bank monitored the implementation of associated projects and submitted the progress reports to the donors (Khan et al., 2011). In addition, the Official Development Assistance (ODA) of the OECD and the World Bank Creditor Reporting System (CRS) reviews the performance of their loans in Bangladesh. This review helps to provide feedback for assessing new loans (Agrawala et al., 2003).

In this way, politics shapes adaptation policy in composition and implementation. Coordination with influential political leaders and donor agencies is critical to meet the needs of communities impacted by disasters. Climate finance under the UN Framework Convention on Climate Change (UNFCCC) is not working effectively in most climate vulnerable countries such as Bangladesh (Ayers and Huq, 2009; Manuamorn et al., 2020). KK of ALRD was critical of negative government influences on decision-making and argued that the government and international development partners need to recognize local community conceptualizations of climate change impacts and their adaptation mechanisms. KK's concern over the lack of coordination echoes civil society organizations and NGOs coordination of adaptation policy with public policy in Bangladesh. As described by KK, the Bangladesh Delta Plan 2100 is one example where the government sets priorities without recognizing local community voices which causes further challenges for climate change adaptation.

KK expressed frustration with the Delta Plan 2100 (DP2100) and the lack of inclusion of communities. Professionals in specialized fields of construction and development including KK attended a two-day convention in Bangladesh. According to KK there was little local knowledge of the Delta Plan and its effectiveness in constructing mitigation measures according to local expertise in Bangladesh. One successful example of a country using the Delta Plan Approach is the Netherlands, which has exported it to Bangladesh (Hasan et al., 2020). The Netherlands government consequently provided their technical support for the Delta Plan 2100. According to the Bangladesh government, the Plan will get more than two percent of the total national budget for development. A high-level delegation with a number of influential ministers visited the Netherlands to learn from their implementation for the Delta Plan 2100 and appreciated their contribution to its development. The socioeconomic conditions, hydro-ecological patterns, and geographical context of the two countries are however different (see van Alphen et al., 2021) and thus while the policy is successful in the Netherlands it may not produce a similar outcome in Bangladesh.

In response to the Netherlands government's support for DP2100, KK therefore argued that the differing conditions in Bangladesh need to be understood in policy. Adaptation policy should recognize the local embedded reality of the different issues and concerns, especially climate change effects. Hoffman (2010) confirms that technical approaches are mainly focused on adaptation that ignores social dimensions. The result is further challenges in developing effective adaptation. In the Netherlands, dams, roads and railways are constructed without major negative impacts on local communities, riverine systems and biodiversity, that are important components for coping with climatic concerns, especially storms and sea surges. The Netherlands provides an example of adaptation that respects local communities. It is however important to understand that local infrastructure development in Bangladesh is based on past experiences and how they impact the present.

In 2015, the collapse of an embankment flooded 15 villages and 12,000 residents at Kalapara and Mirzaganj Upazila in Patuakhail District (The Independent, 2015). Three years later, in 2018, the same region experienced similar weather events. For example, tidal waters inundated 12 villages and their 15,000 residents by destroying an 8 kilometer long embankment - but no disaster relief was provided by the government for weeks (The Independent, 2018). Extreme events such as these affect people and their ability to earn an income. Sometimes the effects are inter-generational. For example, fish farms were washed away, educational institutions were closed, and water sources

experienced salinity build up that will impact the livelihoods of future generations. Other immediate and long-term impacts include: unemployment, poverty, violence against women, divorces, and displacement (Hossen, 2022). Government coordination with development partners promotes their own understanding of RALA adaptation measures that counter the effectiveness of local policies. Better negotiation at the international level with governments such as the Netherlands or with the United Nations would be beneficial in negating climate impacts and policies in Bangladesh.

As already mentioned, public policy fails to reflect the needs of local communities. Foreign influences in the global economy are reflected in how and what policies are implemented (Ayers and Huq, 2009; Huq et al., 2022; Manuamorn et al., 2020). The RALA approach consequently has three major outcomes on the ground that are unhelpful for marginalized people. First, local people experience negative economic and social impacts from salinity, erosion, water stagnation, and arsenic contamination resulting from cyclones and floods (Haque and Zaman, 1993). Second, the government has constructed large-scale embankments and conducted dredging and barraging under DP2100. Foreign governments keep financial promises with budgets focused on technical knowledge and expertise instead of utilizing local expert knowledge (Khan et al., 2011). Third, government budget constraints and priority spending results in little or no money spent on communities in need and often creates more problems (Sultana and Thompson, 2017).

One KII respondent, KB-2, a Government official, reported more than 300 construction projects in Bangladesh including those in the coastal zone. These projects are undertaken using BCCSAP policy guidelines. The Bangladesh Climate Change Trust provided approximately US\$ 400 million for construction and mitigation projects. One KII respondent, KK of ALRD, informed us that some of the Trust's funding is distributed to 63 NGOs for agriculture projects such as crop diversification and land reclamation but the funding was only for a limited time. Government policy decisions and financing initiatives appear to be disconnected with local interests and the need for economic stability. Although 75% of national export earnings are generated from agriculture (Department of Environment, 2009), environmental degradation causes growing concerns.

Another KII respondent from the British Council, KJ, based in Dhaka, asserted that the Government of Bangladesh did not have any entity dedicated to deal with issues and concerns related to climate change and displacement. The major reason was that climatic concerns were designated as an environmental issue under the Ministry of Environment remit until 2014. According to KJ, regardless of a change in government ministry employees generally had minimal knowledge and interest in climate issues and adaptation policy. Currently, the Ministry of Planning and Ministry of Finance are taking the lead in combatting climatic issues by coordinating with the Ministry of Foreign Affairs in dealing with international mitigation and adaptation, which supports the arguments of Stock et al. (2021).

The lack of effective government organizational structure and financial support are key factors contributing to the ineffective implementation of adaptation policy. KII respondent KB-2, from the Government of Bangladesh, informed us that he reviewed 10 annual development programs that are listed as promoting climate change adaptation. According to KB-2, about 25% of the total population in Bangladesh live in the coastal area but less than 10% of the national budget is allocated to these areas. The government's inability to understand the gravity of the community's financial needs is concerning.

Insufficient financial support results in limitations in climate change adaptation policies in the coastal area (Ayers and Huq, 2009; Manuamorn et al., 2020). FR from Fasiatola in Bagerhat District did not get any specific agricultural support to mitigate drought effects. FR also described how the government's attempts at mitigating river bank erosion failed. According to FR, in 2012 the government reinforced the river embankment but it failed to protect them from further erosion. The bank eroded three more times after the reconstruction. The government

however did coordinate with the World Bank to build a cyclone centre in Fasiatola, according to FR. But another FGD respondent, FH-2, from Southkhali in Bagerhat District expressed her frustration about the lack of early warnings before cyclones. Cyclone Sidr hit the area in 2007. The local government did not warn the district of the impending cyclone and it caused substantial losses. Another example of the inadequacies of government decision-making is described by FH-3 from Southkhali Union: the government's temporary solution to local water stagnation was the installment of a tube pipe under the road to drain water. Higher levels of water occurred due to heavy rains associated with the cyclone that then undermined the pipe. Furthermore, the government only built a few cyclone shelters, which did not help other communities in need. FG from Fasiatola expressed her frustration with emergency support from the government: a deep tube-well and water tanks did not help during the cyclone.

Although KK of ALRD had extensive experience working on climate change adaptation activities, she did not know the government expenditure for climate change adaptation. The government fails to use a significant amount of the climate change fund for what it is intended – adaptation activities. Therefore, there is a surplus of donor funds that remain unused and are often sent back to the donors. Sometimes, a specific department of the government uses the fund for purposes not associated with adaptation measures. The budget year starts in July in Bangladesh. Some projects get budget approval decisions only after six months and they then get less than six months to begin projects. The short turnaround time for projects diminishes the quality of the results and is a questionable use of time and money spent under budget constraints.

Another KII respondent, KP from the Bangladesh Bureau of Statistics (BBS), described the practices of community involvement for resettlement. When the Chairman of a Union Council submits a list of climate refugee or homeless people, the authorized staff of local governments visits every village and discusses their place on the list. One major point discussed is if there are any people who need to be added or excluded from the list. In this decision-making process, the participation and inclusion are confirmed with local communities.

Community involvement in the decision-making process was described by another KII participant, KP from the BBS. KP reported that the decision-making process does not recognize the minimum participatory requirements such as inclusion of local community representatives. KP's statement raises some major questions for understanding the participatory approach, justifying the use of the approach, and the level of training government staff have in using it. Based on these questions, it is assumed that local people are increasingly being divided as heterogeneous groups by their activities. Related to community engagement in climate change adaptation, FM-2 from Fashiatala suggested that there were two concerns: individualism and sustainability. Individualism is explained where local people are not united anymore, as they focus more on individual interests and pay less attention to their collective interests. Again, some people base their own initiatives on adaptation measures such as river bank protection instead of a collective measure such as river bank reinforcement.

Resettlement is a governance approach concerned with incorporating local knowledge into policy and including community representatives in the implementation process (Haque and Zaman, 1993). The inclusion of community members in the implementation of the decision-making process of the state did not happen in DP2100 development. Community representation in climate change adaptation is described as a 'community perspective' (Mertz et al., 2009). The participatory decision-making process is focused on the community perspective as it applies to local practices.

Participatory decision-making is essential for making decisions that positively impact the community (Agrawala et al., 2003). Free, prior and informed consent by communities in decisions affecting them specifically applies to local communities. The United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) is an internationally

established mechanism supporting human rights and provides minimum standards including such informed consent. Here, the UNDRIP recognizes the rights to "proper management of the environment" (United Nations UN General Assembly, 2007: 9), and rights to mitigate environmental impacts (Cramer et al., 2020). The universal nature of UNDRIP articles suggests that they pertain to all people and can be applied to policies made to mitigate climate change domestically, nationally and globally. Alternatively, Jeff Corn tassel (2008) cautions that global human rights initiatives may divert attention away from the local community in this process. Bangladesh has abstained from endorsing UNDRIP but it could help support local initiatives for climate change adaptation.

Local people are not interested in relief based on RALA, given the top-down authoritative approach that attempts to exclude them. Communities are interested in job creation in natural resource-based activities. Local people have traditional ecological knowledge that is helpful to generating opportunities in different sectors such as fishing and eco-centric agricultural practices in rural Bangladesh. If these types of opportunities are not available and do not provide the incomes necessary to support households, adaptation will not be effective. Similarly, unemployment will create more social problems such as displacement and violence against women (Hossen, 2022). KK of ALRD made a good point about local communities and their perspective on climate change adaptation: for generations, local people have learned how to respond to seasonal weather patterns for agricultural activities. Community-based knowledge is transmitted from one generation to another based on 'learning by doing'. Given this traditional community-based approach, adaptation policy needs to be developed from the local perspective so livelihoods in coastal areas of Bangladesh are sustainable and consequently reflect the Proactive Approach To Adaptation (PATA).

5. Discussion: a governance approach to climate change adaptation

Human adaptation to a changing environment is not a new phenomenon but there is a sense of urgency for researchers, policy makers, and civil society due to the many climatic concerns and the higher level of vulnerabilities of a greater number of people and institutions that require government intervention to deal with climate changes. Climate change causing biodiversity loss including habitat degradation, soil loss, nitrogen enrichment and acidification requires major adaptation measures in the short to long-term. In this way, the focus shifts away from precautionary to deterministic modes in securing livelihood activities like agricultural production and fisheries. Furthermore, land and environmental policies need to promote conservation activities in coordination with local communities (Heller and Zavaleta, 2009). For example, a local community perspective also supports land-centered governance from an ecological perspective. Any potential harm to the land and ecology (living and non-living) should be considered in decisions made by a local community. In this way, the community participates in long-term decisions that consider the impact on generations into the future. These factors are important in promoting successful adaptation planning, developing institutional structures, organizational cultures, and policy making procedures that are effective governance practices (Anna et al., 2012).

The Proactive Approach To Adaptation (PATA), is needed to support different sectors such as agriculture and health care: different groups of people such as day laborers and disabled people will benefit from PATA for employment and education opportunities and other socio-ecological concerns (Jones and Boyd, 2011). Socio-economic issues should be addressed in adaptation policy related to climatic concerns such as flooding (Agrawala et al., 2003; Haque and Zaman, 1993). In Sathkhira, for example, more than 80% of local people expressed concerns over drinking water and waterborne sources but freshwater ecosystems are also impacted by development programs such as the FAP and shrimp aquaculture (Abedin et al., 2019). Again, the different hydrological

zones have different types of socio-ecological concerns that need to be considered in policy decisions (Haque and Zaman, 1993). Different sectors or groups of people encounter various types of shocks that require appropriate adaptation mechanisms. Only inclusive and equitable policies can ensure effective climate change adaptation by local people (Stock et al., 2021). In this context, local government must be equipped with proper official guidelines, and supported with vertical and horizontal coordination among government, organizations and communities. This vertical and horizontal flexibility is characteristic of a multi-level governance structure that can be supported by PATA.

The water crisis negatively affects agricultural production and other livelihood activities. To alleviate the impact of the water crisis, the government should develop water policy in conjunction with climate change adaptation (Sultana and Thompson, 2017). Alternative water sources are currently being sought by locals to protect freshwater ecosystems, maintain crop production and vegetation and help support the livelihoods of marginalized groups of people such as FK-1 and FK-2. Local adaptation knowledge is important to developing more effective policy to cope with climatic events such as landslides and flooding at the individual, community, and government levels.

FH-3's income insecurity due to climate change factors is experienced by other groups of people. Future policy should prevent generational impacts to ensure people have proper institutional support. In this context, data collection on local community knowledge is an important component in this governance perspective. As already mentioned, adaptation policy related to a specific climatic concern needs to incorporate both the technical and social components of local community knowledge in developing the interface between government and local communities (Huq and Khan, 2006). Otherwise, the coastal area will be gradually deserted creating more population movement, displacement and social problems in other areas of Bangladesh and beyond. The frequent crop loss caused by salinity problems creates unemployment that in turn increases violence against women, displacement and exploitation which needs to be recognized in the National Adaptation Plan (NAP) (Hossen, 2022).

Local people have their own knowledge and understanding of climate concerns and adaptation measures based on their socio-economic and geographic background (Agrawala et al., 2003). Factors include class position, employment patterns, and environmental drivers that can be mitigated by the Proactive Approach To Adaptation (PATA). Again, specific knowledge should be incorporated into the policy formulation and implementation process so that programs and projects can be effective in addressing concerns. For example, FK-4 from Shudhirpur expected some emergency support from the government; the city needs a deep tube-well because it has no pond for drinking water. They also need more cyclone shelters for the population that are connected with road networks, well-managed, and ensure the proper accessibility of local people irrespective of their social and political identity. Cyclone activity has resulted in many people losing land due to erosion and other related factors. In this context, another KII respondent, KAJ, from a quasi-government organization, CEGIS, described the importance of resettlement which the government is not addressing. For example, the government acquires land for road construction, or builds hospitals, and exclusive industrial zones. In addition, the government fails to help climate refugees. KAJ argued that the government did nothing related to resettlement except provide relief support for floods or cyclones.

The government should then have a specific plan for projects such as crop diversification to help people with adaptation measures such as the BCCSAP (Uddin et al., 2014). Amundsen et al. (2010) refers to this foreseeable approach as 'planned' adaptation. However, KK of the ALRD suggested that the differences between law and policy in securing livelihoods under climate change has affected people, militating against a planned approach. Policy provides principles for promoting the adaptation contribution of local people. In the context of Bangladesh, policy is not enough to make the government responsible for securing the life and livelihood of climate victims, as suggested by KK. She emphasized a

requirement for legal measures for climate refugees inside Bangladesh to ensure that there are opportunities for their survival. More specifically, from a legal perspective the government should, it is argued, provide compensation for lost land for every displaced household. Land reclamation is also an option for redistributing land to displaced people.

To expedite the most effective adaptation policy, the government needs to incorporate local understandings of adaptation measures, as suggested by Sultana and Thompson (2017). Local people experience climate risks and specific preparation is required to cope with damage and loss, as suggested by Grebowicz (2014). For example, another research participant, FH-3 from Southkhali, planted trees to reduce the effects of cyclones. In the case of flood preparations, he described how locals store dry food, water, firewood and other supplies underground. Immediately after a cyclone begins, women then take a leading role in retrieving these reserves from the ground. FH-1 from Shudhirpur collected three or more banana trees and roped them together so that people could grab onto the trees to avoid being swept away in a cyclone. She also survived Cyclone Sidr in 2007 by clapping onto a banana stockpile to stabilize herself in high winds. In the context of adjustment in human and natural systems, respondents in Bangladesh described their understanding of climatic concerns and also provided their in-depth adaptation perspective, an approach previously discussed by Heller and Zavaleta (2009).

Furthermore, FH-1 from Shudhirpur described the environmental dimensions of the government's intervention measures for ensuring livelihood security. The Department of Forests, part of the Ministry of Environment, provided salinity tolerant plants like sofeda, coconut, rain tree, and plums. As described by Haque and Zaman (1993), rather than supporting technological fixes, the Ministry could take more steps in ensuring the sustainability of the environment. Local people depend on natural resources to sustain themselves. Traditionally people depend on wild fish, etc. given the riverine system that originates in the Himalaya Mountains and passes through the Ganges-Brahmaputra basin. The rich fertile land of the basin makes the riverine system successful for agriculture (Hossen, 2017). However, climate changes cause major disruptions to the ecosystem that local communities are dependent upon (Hossen et al., 2021). The result is local communities are further marginalized due to lower incomes from lower yields from agricultural products (Salehyan, 2008).

In this respect, the government needs to focus on climatic specific measures for adaptation policy (Agrawala et al., 2003). Another research participant, FR, expressed his dissatisfaction with drought and erosion measures. For example, to mitigate drought, the government needs to ensure there is the availability of water systems supported by adaptation policy. As mentioned by FH-3, the temporary arrangement with the RALA is not effective and the government should develop water governance approaches incorporating climate change adaptation. As the seasonal calendar on rainfall, temperature and the intensity of warm or cool seasons changes, food security is threatened. For example, wild food harvesting, food production and food businesses are reduced. Adaptation policy, according to Jones and Boyd (2011), needs to identify the different types of social challenges such as irregular harvest times and new crop species through stakeholder involvement in discussions at local and national levels to ensure effective adaptation governance.

Locally contextualized understandings of adaptation are based upon community ethics that are deeply embedded in human's relationship with the land specific to a place (Agrawala et al., 2003). In this way, local knowledge holders are important in passing down ecological land practices that could contribute to mitigating climate change (Bahauddin et al., 2016). Peter (Knudtson and Suzuki, 1992: 8) explain the connection between humans and ecology as a "deeply rooted sense of place and relationship with the entirety of the natural world". From a local perspective, relationships are vital and all-encompassing of the individual, family, community, nation and natural world (Armstrong, 2000; Brandt-Castellano, 2008). Fritjof Capra and Pier Luigi Luisi (Capra

and Luisi, 2019: 308) further elaborate on the importance of community relationships as it pertains to knowledge where communities: “produce a shared system of beliefs, explanations, and values – a common extent of meaning – that is continually sustained by further communications” that complements community decision-making. In the context of climate change adaptation, community resilience, transition, and transformation is needed to support social justice (Masud-All-Kamal and Nursey-Bray, 2021). Climate change policy requires a bottom-up governance approach for adaptation methods to work with an ecologically centered ideology (Haque and Zaman, 1993).

The interface between science, politics and civil society can provide an effective role in adaptation policy (Turnhout et al., 2019). Gillard et al. (2016) suggest that focusing on the sociotechnical perspective can be helpful for setting strategic (objectives and approaches to achieve future goals), diplomatic (developing a plan with cooperative agreements), practical (observation and project implementation) and spontaneous (regular audit, assessment and learning from the results) goals to ensure the proper function of socio-ecological systems in the inter-relationship of communities and ecology.

The government therefore needs to develop effective mechanisms for adaptation policy that track specific adaptation expenditures and their outcomes on how climate affects people (Abedin et al., 2019; Agrawala et al., 2003; Bahauddin et al., 2016; Hossen, 2017; Haque and Zaman, 1993; Stock et al., 2021; Sultana and Thompson, 2017; Uddin et al., 2014; Verschuur et al., 2020). In terms of expenditure, the government could develop effective financial planning for budgets used by institutions. Proper execution of the PATA would ensure maximum positive outcomes of adaptation projects. In this context, the appropriate department or Ministry can take necessary preparations one year ahead of a climate event so that the execution of the projects or programs can be completed on time.

Incorporation of local practices can also be part of forming an effective adaptive policy to cope with environmental changes. The documentation of the different types of damage and loss of a previous climatic event like Cyclone Aila can help develop effective policy for the future. In this context, categorization of the different elements and the level of sensitivity and resilience can create scope for better preparation by institutions, societies and cultures. Categorization is defined by elements such as: groups of vulnerable people and their level and types of damage and loss, and the sensitivity and resilience to cope with the effects of cyclones. In addition, FH-2 mentioned that local government needs more effective financial contributions for its adaptation measures. KB-2 from the Government of Bangladesh supported FH-2's call for more financial resources and mentioned the regional disparity of budget allocations that needs to be addressed to develop effective financial plans for climate change adaptation. This multi-level approach for financing public policies (Clar et al., 2013) can be more effective in the adaptation process.

The coordination between the different policies and their implementation can provide the results that local people require including a wide range of local interventions with coordinated effort, creative management, and related shifts in resources use and institutional roles (Haque and Zaman, 1993; Sultana and Thompson, 2017). For example, land policy can be an important component in overcoming unemployment problems. Land ownership matters for employment, income and livelihoods but local people are facing growing land inequality and associated unemployment in Bangladesh. In 1962, landless people comprised 17.5% of the population, a figure that increased to 33% in 1982 (Rahman, 1985). Land reform can promote social justice that can result in land equality and associated livelihood opportunities. Every person should have a parcel of land that they can develop for agriculture to support employment opportunities, income, domestic animals, and housing facilities - all important components for effective adaptation. In the context of resilient adaptation measures, land policy needs to address the concerns of land erosion and displacement, land reclamation, and redistribution. These components are described as ‘sectorial

coordination’ by Anna et al. (2012). Again, land inequality is another major problem in localities where 75% of the rural population is landless or own less than 0.5 acre of land and the number is increasing (Anon, 2010) due to climate change effects, poverty, and inappropriate development projects.

KAJ from the CEGIS emphasized the importance of an integrated approach to climate change adaptation to ensure coordination among different government levels and organizations for transportation and communication, embankment protection, functional markets, livelihood activities like income generation, water and sanitation, health, and education, and funding sources like micro-credit. In this context, the different ministries including the Ministries of Transport, Agriculture, Land, Social Welfare, Health, Education, and Environment need to work in a coordinated approach, as suggested by KAJ. Coordination and collaboration work well with multi-level governance systems supported by PATA.

To understand all of the factors involved both scientific and community knowledge should be consulted in formulating policy. KSI from the UNDP focused on the importance of adaptation innovation based on multiple stakeholder involvement, including scientists, farmers, fisher folk, and local governments. This innovation is important given the changing reality of the environment, livelihoods, and society. Due to top-down government domination over innovation, the traditional perspective is excluded in meeting the needs of local people to cope with climatic vulnerability. For this purpose, the government needs to provide research funds as well as ensure researchers’ freedom to contribute. A multi-level governance collaborative approach among stakeholders needs to be established in Bangladesh adaptation policy in promoting social and cultural transformation.

According to one KII respondent, KSI, adaptation innovation can be developed through adaptive tracking. KSI described adaptive tracking as defining some major characteristics for assessing the success of social, economic, cultural, and political life based on government efforts. Although this approach is new to the government in Bangladesh, it has a global focus as KSI suggests. According to this expert, global indicators can be used as a baseline to compare indicators important in understanding local socio-economic and ecological concerns. The comparison between global and local characteristics can be helpful in directing adaptation activities. This approach can promote climate public expenditure for local people and policy-making processes. As donor funding is a major initiative in Bangladesh to promote climate change adaptation, it can include adaptive tracking components to understand the areas of success and those needing revision. This approach could be helpful in record keeping using qualitative and quantitative measures of people benefitting in a specific geographic area. In this context, the government and NGOs are supposed to be accountable to local people rather than the current practices of donor performance review (Agrawala et al., 2003; Khan et al., 2011).

Rather than the current unstable institutional practices under several ministries such as the Ministry of Finance, climate mitigation and adaptation should have one specific ministry or at least a department at national and international level. The Ministry is supposed to provide people with in-depth practical and theoretical knowledge to fulfill their obligations and the expectations of local people, researchers, civil society, and business organizations. Educational curricula and the socialization process promoting this form of governance must be established with consideration for science, climate, and societal change. This ministry or department also requires employees who have knowledge of both technical and social perspectives as they should provide an interface between science, politics and civil society (Gillard et al., 2016). Decolonizing NGO practice in terms of ensuring freedom from the donor guidelines and allowing a meaningful bottom-up approach can also support climate change adaptation (Masud-All-Kamal and Nursey-Bray, 2021). The estimation of assets and welfare loss is a prerequisite for better adaptation policies (Verschuur et al., 2020). Community participation in decision-making processes is essential for their needs to be

addressed by governments. Local participation in governance provides more flexibility to support culture, especially local practices, where decisions are made by the community and for the community. A flexible governance approach supports co-management decision-making among various stakeholders including domestic, national and trans-boundary governments for critical responses to events such as climate change.

6. Conclusions

Coastal people in Bangladesh conceptualize climate change effects such as irregular seasonal patterns, flooding, droughts, riverbank erosion, salinity intrusion, and cyclones based on their lived experiences. Problematically, the government in Bangladesh has different policies and programs aimed at mitigating the effects of these events to promote adaptation using the RALA approach. When a climate change event such as cyclone Aila or Sidr hits the coastal zone in Bangladesh, some relief is provided by the government and affected people take refuge in a shelter for a limited time. The government also has other programs such as resettlement that are very limited in scale, to help people rebuild, but RALA fails to incorporate major characteristics of climatic change. In this way, RALA is focused on a top-down, narrow approach, and is exclusionary when ensuring the adaptation of marginalized groups of people.

Alternatively, PATA can be more effective in promoting the needs of climate vulnerable people as a governance approach from the bottom-up. Local people develop their own strategies to cope with specific climatic events such as floods, erosion, or cyclones to support their socioeconomic needs. This perspective was strongly supported by the FGD and KII respondents during the data collection process. The governance approach that was considered most effective in supporting local communities is one based on coordinating among multiple stakeholders such as coastal populations, local governments, civil societies, researchers, policy makers, and business associations. This governance approach can effectively support these groups in finding solutions to adaptation barriers. In-depth case studies and consultation with the diverse stakeholders will also be beneficial for adaptation planning. Coordination should be respectful of the multi-governance approach by actively engaging in dialogue with various stakeholders. In addition to this participatory approach, it is also important to maintain vertical and horizontal coordination between the different agencies in government, non-government, and private sectors which involves effective dialogue and communication. Cultural diversity is also supported by multi-level governance and collaborative relations with stakeholders. In this way, the government needs to share information related to local climatic patterns, local community vulnerabilities and support, the local government's role in developing policies, and additionally develop collaborative programs and projects for more effective adaptation activities and institutional development. This governance approach can reflect the different dynamics of PATA based on the negotiated understanding of these multiple stakeholders. In this context, it is important to create the scope for supporting more research from both the technical and social sciences to increase a greater understanding of adaptation governance based on the PATA. The government also needs to incorporate experiences from past climatic concerns in current and future management practices. It is this approach of 'learning by doing' that needs to be incorporated into adaptation for achieving better results in mitigating the impacts on coastal people in Bangladesh. This approach could then provide an example for learning by other communities and countries globally.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data Availability

The data used in this article are mostly qualitative in nature and this has complexity to share with others.

Acknowledgements

This work was carried out under the DELtas, vulnerability and Climate Change: Migration and Adaptation (DECCMA) project which is part of Collaborative Adaptation Research Initiative in Africa and Asia (CARIAA), with financial support from the UK government's Department for International Development (DFID) and the International Development Research Centre (IDRC), Canada. The IDRC Project Number is 107642. The views expressed in this work are those of the creators and do not necessarily represent those of DFID and IDRC or its board of governors.

References

- Abedin, M., Collins, A.E., Habiba, U., Shaw, R., 2019. Climate change, water scarcity, and health adaptation in southwestern coastal Bangladesh. *Inter. J. Dis. Risk Sci.* 10 (1), 28–42.
- Agrawala, S., Ota, T., Ahmed, A.U., Smith, J., Van Aalst, M., 2003. Development and climate change in Bangladesh: focus on coastal flooding and the Sundarbans. OECD, Paris, pp. 1–49.
- Aich, A.C., Rashid, M.A., 2018. Baseline Study: 12 Land Resources Management. Volume 3, Part A. Ministry of Planning, Dhaka.
- Alam, S.J., de Heer, Choudhury, G., 2018. Bangladesh Delta Plan 2100: Baseline Studies on Land Use and Infrastructure Development. Volume 3, Part A. Ministry of Planning, Dhaka.
- Amundsen, H., Berglund, F., Westskog, H., 2010. Overcoming barriers to climate change adaptation—a question of multilevel governance? *Environ. and Plan C Gov. Policy* 28 (2), 276–289.
- Anna, G., Natasha, K., Pierre, M., 2012. Cross-scale barriers to climate change adaptation in local government, australia. *Institute for sustainable. Futures* 1–31.
- Armstrong, J., 2000. Let us Beign With Courage. *Ecoliteracy: Mapping the Terrain. Learning in the Real World*, Center for Ecocliteracy, Berkley, CA.
- Ayers, J., 2011. Resolving the adaptation paradox: exploring the potential for deliberative adaptation policy making in Bangladesh. *Glob. Environ. Policy* 11 (1), 62–88.
- Ayers, J.M., Huq, S., 2009. Supporting adaptation to climate change: what role for official development assistance? *Dev. Pol. Rev.* 27 (6), 675–692.
- Bahauddin, K.M., Rahman, N., Hasnine, M.T., 2016. Public perception, knowledge, and participation in climate change adaptation governance in the coastal region of Bangladesh using the social ecological inventory (SEI) tool. *Environ. Pract.* 18 (1), 32–43.
- Banerjee, S.B., Jackson, L., 2017. Microfinance and the business of poverty reduction: critical perspectives from rural Bangladesh. *Hum. Relat.* 70 (1), 63–91.
- Barbour, E.J., Adnan, M.S.G., Borgomeo, E., Paprocki, K., Khan, M., Salehin, M., Hall, J. W., 2022. The unequal distribution of water risks and adaptation benefits in coastal Bangladesh. *Nat. Sustain.* 5 (4), 294–302.
- Brandt-Castellano, M., 2008. A holistic approach to reconciliation: insights from research of the Aboriginal Healing Foundation. In: Castellano, M.B., Archibald, L., DeGagne, M. (Eds.), *From Truth to Reconciliation: Transforming the Legacy of Residential Schools*. Aboriginal Healing Foundation, Ottawa, pp. 383–400.
- Capra, F., 1996. *The web of life: a new scientific understanding of living systems*. Anchor Books, New York.
- Capra, F., Luisi, P.L., 2019. *The systems view of life: a unifying vision*. Cambridge University Press, Cambridge.
- Clar, C., Prutsch, A., Steurer, R., 2013. Barriers and guidelines for public policies on climate change adaptation: a missed opportunity of scientific knowledge-brokerage. *Nat. Res. Forum* 37 (1), 1–18.
- Gillard, R., Gouldson, A., Paavola, J., Van Alstine, J., 2016. Transformational responses to climate change: beyond a systems perspective of social change in mitigation and adaptation. *Clim. Change* 7 (2), 251–265.
- Grebowicz, M., 2014. Glacial time and lonely crowds: the social effects of climate change as internet spectacle. *Environ. Hum* 5 (1), 1–11.
- Haque, C.E., Zaman, M.Q., 1993. Human responses to riverine hazards in Bangladesh: a proposal for sustainable floodplain development. *World Dev.* 21 (1), 93–107.
- Hasan, S., Evers, J., Zwarteveen, M., 2020. The transfer of dutch delta planning expertise to Bangladesh: a process of policy translation. *Environ. Sci. Policy* 104, 161–173.
- Heller, N.E., Zavaleta, E.S., 2009. Biodiversity management in the face of climate change: a review of 22 years of recommendations. *Biol. Conserv.* 142 (1), 14–32.
- Henderson, J.Y., 1994. Empowering treaty federalism. *Sask. Law Rev.* 58 (2), 241–330.
- Hoffman, A.J., 2010. Climate change as a cultural and behavioral issue: addressing barriers and implementing solutions. *Organ. Dyn.* 39 (4), 295–305.
- Hossen, M.A., 2017. *Water policy and governance in Asia: empowering rural communities*. Taylor and Francis Group, New York.

- Huq, S., Khan, M., 2006. Equity in national adaptation programs of action. In: Adger, N., Paavola, J., Huq, S., Mace, M.J. (Eds.), *Fairness in Adaptation to Climate Change*. MIT Press, Cambridge, MA.
- Intergovernmental Panel on Climate Change (IPCC), 2014. *Climate Change 2014: Impacts, Adaptation and Vulnerability*. IPCC, Geneva.
- Jones, L., Boyd, E., 2011. Exploring social barriers to adaptation: insights from Western Nepal. *Glob. Environ. Change* 21, 1262–1274.
- Jordan, J.C., 2020. Climate shocks and adaptation strategies in coastal Bangladesh: does microcredit have a part to play? *Clim. Dev.* 1–13.
- Karim, L., 2008. Demystifying micro-credit: the Grameen Bank, NGOs, and neoliberalism in Bangladesh. *Cul. Dyn.* 20 (1), 5–29.
- Karim, Z., Islam, F., 2018. Baseline study: 15 agricultural and food security. Volume 4. Ministry of Planning, Dhaka.
- Khan, A.E., Ireson, A., Kovats, S., Mojumder, S.K., Khusru, A., Rahman, A., Vineis, P., 2011. Drinking water salinity and maternal health in coastal Bangladesh: implications of climate change. *Environ. Health Pers.* 119 (9), 1328–1332.
- Ministry of Foreign Affairs, 2018. *Climate change profile Bangladesh*. Government of the Netherlands, The Hague.
- United Nations (UN) General Assembly, 2007. *General Assembly adopts Declaration on Rights of Indigenous Peoples*. New York, UN. Retrieved July 19, 2013 from (<http://www.un.org/News/Press/docs/2007/ga10612.doc.htm>).
- USAID, 2010. *USAID Country Profile: Property Rights and Resource Governance Bangladesh*. Washington DC, USAID. Retrieved from ([https://www.land-links.org/country-profile/bangladesh/#:~:text=GOB%20MOA%202006\).-,LAND%20DISTRIBUTION,own%20more%20than%207.5%20acres.&text=The%20remaining%2089%25%20of%20landowners,nine%20percent%20have%20less%20than%20](https://www.land-links.org/country-profile/bangladesh/#:~:text=GOB%20MOA%202006).-,LAND%20DISTRIBUTION,own%20more%20than%207.5%20acres.&text=The%20remaining%2089%25%20of%20landowners,nine%20percent%20have%20less%20than%20)).
- International Monetary Fund (IMF), 2019. *Bangladesh Prepares for a Changing Climate*. September 18. New York, IMF. Available at (<https://www.imf.org/en/News/Articles/2019/09/18/na09182019-bangladesh-prepares-for-a-changing-climate>). Accessed on 22 December 2021.
- Bangla Tribune, 2019. Patuakhali villages flooded by cyclone Fani's impact. Accessed at (<https://en.banglatribune.com/country/news/44389/Patuakhali-villages-flooded-by-cyclone-Fani-s>) 7 December.
- Corfee-Morlot, J., Cochran, I., Hallegate, S., Teasdale, P.J., 2011. Multilevel risk governance and urban adaptation policy. *Clim. Change* 104, 169–197.
- Comtassel, J., 2008. Toward sustainable self-determination: rethinking the contemporary Indigenous –rights discourse. *Alternatives* 33 (1), 105–132.
- Cramer, W., Guiot, J., Marini, K., Secretariat, M., Bleu, P., 2020. *Climate and environmental change in the Mediterranean basin –current situation and risks for the future: First Mediterranean Assessment Report*. Marseille, MedECC (Mediterranean Experts on Climate and Environmental Change). Union for the Mediterranean, Plan Bleu, UNEP/MAP.
- Csehi, R., 2017. Horizontal coordination in federal political systems – non-centralization in the European Union and Canada compared. *J. Eur. Publ. Policy* 24 (4), 562–579.
- De Loë, R.C., Armitage, C., Plummer, R., Davidson, S., Moraru, L., 2009. *From government to governance: a state-of-the art review of environmental governance*. Final report. Prepared for Alberta Environmental. Environmental Stewardship, Environmental Relations. Rob de Loë Consulting Services., Guelph. Retrieved December 12, 2019 from. (<http://environment.gov.ab.ca/info/library/8187.pdf>).
- Department of Environment, 2009. *Environment Cost for Climate Change*. Climate Change Cell, DoE, MoEF; Component 4b, CDMP, MoFDM. Month 2009, Dhaka.
- Eckstein, D., Kunzel, V., Schafer, L., Wings, M., 2020. *Global Climate Risk Index 2020*. Bonn, Germanwatch.
- Farukh, M.A., 2018. The lightning and the death magnitude of the lightning. *The Daily Ittefaq*. Retrieved from: (<https://www.ittefaq.com.bd/print-edition/options/2018/05/05/274964.html>).
- Farukh, M.A., Alahe, A.N.M.T., Yamad, T.J., 2020. Extreme lightning events and exploration of lightning casualties in 2018 in Bangladesh. Paper presented at the Fifth Annual Conference on Social Research in Bangladesh. Bangladesh Institute of Social Research (BISR) Trust., Dhaka.
- Findlay, A., 2020a. Documenting climate change. *Nat. Clim. Change* 10 (10), 882–887.
- Findlay, A., 2020b. Drivers of adaptation. *Nat. Clim. Change* 10 (6), 492–492.
- Findlay, A., 2021a. Indigenous knowledge. *Nat. Clim. Change* 11 (7), 559–559.
- Findlay, A., 2021b. Slipping into seawater. *Nat. Clim. Change* 11, 719.
- Hossen, M.A., 2022. *Decolonizing Sociology for Social Justice in Bangladesh: Delta Scholarship Matters*. *Crit. Socio*, 08969205221085687.
- Hossen, M.A., Benson, D., Hossain, S.Z., Sultana, Z., Rahman, M.M., 2021. Gendered perspectives on climate change adaptation: a question for social sustainability in Badlagaree village, in Bangladesh. *Water* 13 (14), 1922.
- Huq, S., Rozario, S.R., Bodrud-Doza, M., 2022. Are Bangladesh's development measures leading to climate change readiness or maladaptation? (commentary). 18 August. Available at (<https://news.mongabay.com/2022/08/are-bangladeshs-developmen> t-measures-leading-to-climate-change-readiness-or-maladaptation-commentary/?fbclid=IwAR1SAu5deRVtN0tOwV3HV17eMR0aqEXLRmh_XOdhw4tSPj3ecYvBz_OXQ).
- Klenk, N., Fiume, A., Meehan, K., Gibbes, C., 2017. Local knowledge in climate adaptation research: moving knowledge frameworks from extraction to co-production. *Wiley Inter. Rev. Clim. Change* 8 (5), 475.
- Knudtson, P., Suzuki, D., 1992. *Wisdom of the Elders*. Stoddart Publishing Co, Toronto.
- Manuamorn, O.P., Biesbroek, R., Cebotari, V., 2020. What makes internationally-financed climate change adaptation projects focus on local communities? A configurational analysis of 30 Adaptation Fund projects. *Glob. Environ. Change* 61.
- Masud-All-Kamal, M., Nursey-Bray, M., 2021. Socially just community-based climate change adaptation? Insights from Bangladesh. *Loc. Environ.* 26 (9), 1092–1108.
- Mertz, C., Mbow, C., Reenberg, A., Diouf, A., 2009. Farmer's perceptions of climate change and agricultural adaptation strategies in rural Sahel. *Environ. Man* 43, 804–816.
- Netherton, C., 2021. *Nation-to-nation Governance Between Indigenous Nations and the Canadian Government*. Unpublished manuscript. The University of British Columbia Okanagan, Kelowna.
- Nielsen, J.O., Reenberg, A., 2010. Cultural barriers to climate change adaptation: a case study from Northern Burkina Faso. *Glob. Environ. Change* 20 (1), 142–152.
- Okereke, C., 2010. Climate justice and the international regime. *Wiley Inter. Rev. Clim. Change* 1 (3), 462–474.
- Paul, S.K., Hossain, M.N., 2013. People's perception about flood disaster management in Bangladesh: a case study on the Chalan Beel Area. *Stam. J. Environ. Hum. Habitat* 2, 72–86.
- Rahman, M., 1985. Poverty and inequality in land holding distribution in rural Bangladesh. *Indian J. Agric. Econ.* 40, 513–523.
- Rasul, G., Chowdhury, A.J.U., 2010. Equity and social justice in water resource management in Bangladesh. IIED., London.
- Salehyan, I., 2008. From climate change to conflict? No consensus yet. *J. Peace Res* 45 (3), 315–326.
- Shamsuddoha, M., Chowdhury, R.K., 2013. *Climate change induced forced migrants: in need of dignified recognition under a new Protocol*. *EquityBd, Bangladesh [online]*. Available from: (<https://www.mediaterrre.org/docactu,Q0RJJUwtMy9kb2NzL2NsaW1hdGUtbWln cmFdC1wcmcludGVkLXBvc2l0aW9uLWRIYy0wOQ==,1.pdf>), 2009.
- Siddiqui, T., Bhuiyan, M.R.A., Kniveton, D., Black, R., Islam, T., Martin, M., 2017. Situating migration in planned and autonomous adaptation practices to Climate change in Bangladesh. In: Bhagat, R., Rajan, I. (Eds.), *Climate Change Vulnerability and Migration*. Routledge, London.
- Stock, R., Vij, S., Ishitque, A., 2021. Powering and puzzling: climate change adaptation policies in Bangladesh and India. *Environ., Dev. Sustain.* 23 (2), 2314–2336.
- Sultana, P., Thompson, P.M., 2017. Adaptation or conflict? Responses to climate change in water management in Bangladesh. *Environ. Sci. Policy* 78, 149–156.
- The Independent, 2015. *Tidal waters swamp 15,000 residents of 12 villages in Patuakhali*. Available at (<http://www.theindependentbd.com/home/printnews/13856>). Accessed on 7 December 2015.
- The Independent, 2018. *15 villages flooded due to dyke collapse in Patuakhali*. Available at (<http://www.theindependentbd.com/home/printnews/160397>) Accessed on 7 December 2018.
- Turnhout, E., 2018. The politics of environmental knowledge. *Conserv. Soc.* 16 (3), 363–371.
- Turnhout, E., Halfman, W., Tuinstra, W., 2019. *Environmental Knowledge in Democracy*. In: Turnhout, E., Tuinstra, W., Halfman, W. (Eds.), *Environmental Expertise: Connecting Science, Policy and Society*. Cambridge University Press, Cambridge, pp. 247–256.
- Uddin, M.N., Bokelmann, W., Entsminger, J.S., 2014. Factors affecting farmers' adaptation strategies to environmental degradation and climate change effects: A farm level study in Bangladesh. *Climate* 2 (4), 223–241.
- van Alphen, J., de Heer, J., Minkman, E., 2021. Strategies for climate change adaptation: lessons learnt from long-term planning in the Netherlands and Bangladesh. *Wat. Intern.* 46 (4), 477–504.
- Van Kersbergen, K., Van Waarden, F., 2004. Governance as a bridge between disciplines: cross-disciplinary inspiration regarding shifts in governance and problems of governability, accountability and legitimacy. *Eur. J. Pol. Res.* 43, 143–171.
- Verschuur, J., Koks, E.E., Haque, A., Hall, J.W., 2020. Prioritising resilience policies to reduce welfare losses from natural disasters: a case study for coastal Bangladesh. *Glob. Environ. Change* 65.
- White, G., 2002. Treaty federalism in Northern Canada: aboriginal-government land claims boards. *Publius: J. Fed.* 32 (3), 89–114.
- Winkler, H., 2005. Climate change and developing countries. *South Afr. J. Sci.* 101, 355–364.