Chapter 1
Introduction: Bangladesh Responds to Climate Change

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Abstract Bangladesh is a country that is highly vulnerable to the impacts of climate change, and a broad range of practices have emerged to adapt to these impacts. The book presents a range of sectors that are affected by the impacts of climate change, such as agriculture, water and health, as well as covering thematic areas relating to responses to climate change, such as governance and finance, communication and gender. Measures to adapt to climate impacts in the agricultural sector range from hard engineering measures like construction of polders, to soft socio-economic measures, such as changes in cropping patterns. In the water sector, non-structural approaches to risk reduction include community-based disaster management initiatives. Across all practice areas there are barriers and challenges to confronting the impacts of climate change, including knowledge gaps. The chapters of this book emerged as part of the Gobeshona initiative in Bangladesh, a knowledge sharing platform for climate change research on Bangladesh.

Keywords Bangladesh · Adaptation · Climate · Impacts · Poverty

Bangladesh is a low-lying agrarian country located in the Ganges-Brahmaputra Delta, which is highly vulnerable to the impacts of climate change. A broad range of practices have been identified to adapt to these impacts, some of which are already taking place. The chapters of this book, which emerged out of the

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Gobeshona initiative, present a range of sectors affected by climate change as well as thematic areas relating to responses to climate change in Bangladesh. In particular, agriculture is a sector which is affected by increased temperature and unpredictable rainfall patterns in Bangladesh (Mondal et al. 2012). As explained in Chap. 2, the agricultural sector employs around half of the civilian workers in Bangladesh and plays an important role in poverty reduction. The range of measures to adapt to climate impacts in the agricultural sector identified by Mondal et al. in this volume range from hard engineering measures like construction of polders, to soft socio-economic measures, such as changes in cropping patterns. Mondal et al. (2012) find that the majority of the identified adaptation practices in agriculture are for the purpose of implementing actions which reduce hazards, enhance production, and bring direct, tangible benefits. However, the agriculture chapter outlines a number of barriers in relation to these practices including a lack of capital, lack of access to resources, lack of knowledge and information, and lack of institutional capacity. In the coastal zone, the government is the primary provider of the identified agricultural adaptations, while Mondal et al. (2012) explain that the role of the private sector as an adaptation provider is not studied or well documented within adaptation literature.

The water sector and availability of freshwater both face the threat of loss and damage due to current and expected climate change impacts. As outlined in Chap. 3, Bangladesh's population of nearly 160 million relies heavily upon its hydrological systems and is therefore vulnerable to events that will be exacerbated by climate change, such as floods, storm surges, drought, sea level rise, and salinity intrusion, as well as loss of fish spawning grounds and reductions in agricultural production due to changes in the hydrological regime. As Mukherjee et al. explain in Chap. 3, the wetland systems of Bangladesh – known as "haor" regional rivers are susceptible to flash flooding which can affect harvests, and during the 2004 flood, more than two thirds of the boro production was lost due to an early flash flood event coinciding with the harvest (CEGIS 2012). However, while efforts have been made to adapt, it is noted in this volume that some initiatives may be maladaptive despite having claimed benefits over the short term. For instance, while river embankments have been constructed as adaptation measures these can also restrict the sediment inflow to the flood plain, reducing the nutrient availability of the topsoil (Brouwer et al. 2007). Mukherjee at al. explain that other non-structural approaches to risk reduction include early warning systems and community-based disaster management initiatives.

In Bangladesh, forests and wetlands are at risk from climate impacts, but protecting forests can also be considered as an opportunity to respond to climate change. As outlined in Chap. 4, mangrove forests are coastal forests that can help reduce damage from sea level rise and erosion (FAO 2007). However, as detailed by Chow et al. (in this volume) greenbelts can only provide the role of protecting against intense storms if they are appropriately designed and managed. The forest chapter describes major adaptation initiatives which have taken place for the conservation of the Sundarbans forest, which is the largest contiguous mangrove ecosystem in the world and is a UNESCO World Heritage Site. As explained by

Chow et al. (in this volume), many important knowledge gaps remain that require continued investigation; for example, we do not know the width of mangrove plantation that will provide adequate storm protection, as currently these plantation widths are set almost arbitrarily. This demonstrates that further research is required to enhance the impacts of forests and wetlands for adaptation. Relatedly, plantation of mangroves can be considered as an example of *ecosystem-based adaptation* (EbA), which refers to the use of biodiversity and ecosystem services as part of a climate change adaptation strategy, as examined in Chap. 5. Among other ecosystem services, Saroar et al. explain in this volume that mangroves can provide a line of defence against cyclonic storm surges, erosion, and salinity intrusion for coastal communities, infrastructure, and livelihood assets, and can also provide pollution control, water purification, and improvement of drainage.

The chapter on Governance and Finance in this volume explains that in the initial stages, policy concerns for environmental protection in Bangladesh were reflected for the first time in the Fourth Five Year Plan (1990–1995), and have been included in other five-year plans since then. Since the signing of the Kyoto Protocol, Pervin et al. (in this volume) explain that the governance of climate change in Bangladesh has been characterised by specific interventions, such as the creation of policy provisions, research and technological innovations, and the establishment of funding entities. Bangladesh was the one of the few *Least Developed Countries* (LDCs) to develop a National Adaptation Programme of Action (NAPA) in 2005, and this was then revised in 2009. The Government of Bangladesh also unveiled the *Bangladesh Climate Change Strategy and Action Plan* (BCCSAP) in 2008. The chapter describes the various funding windows in Bangladesh including the *Bangladesh Climate Change Trust Fund* (BCCTF) established in 2009, the *Bangladesh Climate Change Resilience Fund* (BCCRF) established in 2010, and the *Pilot Programme for Climate Resilience* (PPCR).

Chapter 7 explains that media and education systems can play an important role in alerting and preparing people for climate-related disasters as well as empowering them to minimise risks, which means that raising public awareness and understanding of climatic risks through disseminating accurate information is an important part of building long-term resilience. At the global level, the Sendai Framework for Disaster Risk Reduction emphasises the utilisation and strengthening of all kinds of media to support successful disaster risk communication. The chapter on media and communication provides examples of different forms of communication interventions which are relevant to adaptation in Bangladesh. For example, in 2007 before the powerful Cyclone Sidr struck Bangladesh, the Bangladesh Government began to broadcast warnings five days in advance on radio and television (Paul/Dutt 2010). Emergency evacuation orders were also issued almost twenty-seven hours before landfall of the cyclone, which the authors argue helped reduce the death toll. The Government of Bangladesh has recognised the role of the media in the National Broadcasting Policy of 2014 (GoB 2014), which makes a provision for telecasting emergency weather bulletins and producing climate change awareness programmes, as Afroz et al. (in this volume) explain in this volume. Chapter 7 explains that there is a wealth of traditional knowledge that has

been preserved for generations alongside locally adaptive mechanisms for survival, so this local knowledge can be being integrated within media interventions to appropriately support resilience.

Gender inequalities in Bangladesh often mean that women are more affected by climate change than male counterparts. The gender chapter highlights a few of these gender inequalities from the perspective of rights. It begins with a boxed text outlining international gender and climate change policy, followed by a section on the Bangladesh context and specific gender inequalities and discriminations that contribute to women's vulnerability. For example, a study by Neumayer/Plümper (2007) found that women and children are 14 times more likely to die or be injured in a disaster than men. Reggers explains in Chap. 8 that the decision-making over resource use, as well as buying and selling of land before or after climate-related events often rests with men. Finally, Reggers notes that women's relative lack of mobility in public spaces can result in women not receiving early warning signals before cyclones. The author finishes by providing examples of national and community level efforts to address the gender dimensions of climate change.

The health sector is another sector particularly affected by climate change in Bangladesh. The Intergovernmental Panel on Climate Change (IPCC 2014), cited in Chap. 9, affirms that "recent decades have seen warming air and ocean temperatures, changing rainfall patterns, variations in the frequency and intensity of several extreme events including droughts, floods and storms and rising sea levels" and that the changing climate will adversely affect the health of human populations. The chapter explains the three basic pathways by which climate change affects health: primary or direct impacts (such as heat stress), secondary or indirect impacts (such as shifts in diseases), and tertiary or long-term implications (mediated by social, political and economic systems). Rahaman et al. argue in this volume (Chap. 9) that the increasing frequency of extreme climatic events such as floods can affect health infrastructure like hospitals, clinics and healthcare facilities, while climatic events that result in reduced food production can affect nutrition due to the declining food quality and quantity. As for other impacts, women, children and the elderly are often particularly vulnerable.

Chapter 10 explains that climate-related events such as cyclones, land erosion and flooding can also contribute to displacement and human migration. In the context of Bangladesh this can either lead to increased risk or create new opportunities. As Saha et al. explain in this volume, those who are forced to leave their homes often take shelter in places where they lack legal rights or social services, but there are also examples where settling in a new location offers opportunities for coping and resilience. Internal displacement and migration in Bangladesh is also linked to the movement of people to cities. Urban areas are also expanding in Bangladesh, partly in response to rural environmental and climate hazards. Taking the case of Dhaka, Chap. 11 finds that flooding poses a significant threat and the city lacks proper mechanisms to counter flooding, due to the combination of Dhaka's climatic and geographical conditions, as well as weak political and economic capacity to address the situation. Unregulated housing developments in low-lying areas can exacerbate the problem by preventing natural drainage

(Morshed 2013). The authors identify solutions such as the need for flood warning systems and well-managed and equipped flood shelters.

Finally, in the energy sector, solar home systems have emerged as a widespread technology enabling electrification to reach remote rural communities. As Muzammil and Ahmed explain in Chap. 12, the Solar Home System (SHS) programme in Bangladesh has grown to be one of the largest off-grid electrification initiatives in the world, and has also been described by the World Bank as the fastest growing SHS programme in the world (World Bank 2014). The final chapter reflects on the benefits of solar home systems for low carbon, resilient development opportunities in Bangladesh, as well identifying emerging challenges and lessons for other countries. It is noted that the SHS programme in Bangladesh benefitted largely from a strong pre-existing network of competitive microfinance institutions with a broad reach in rural areas (Sadeque et al. 2014). Overall, Muzammil and Ahmed note that increased support from donors allowed the programme to reach the poor, as well as enhance market development and catalyse finance for smaller players, providing an innovative funding model with lessons for other countries.

The chapters of this book all emerged as part of the Gobeshona initiative in Bangladesh, a knowledge sharing platform for climate change research on Bangladesh that aims to bring together the national and international research community to encourage sharing, enhance research quality and make climate change research on Bangladesh more effective (ICCCAD 2017). Some chapters address sectors that are particularly vulnerable to climate change, including agricultural, coastal zones, water, while others address particular thematic issues of relevance to adaptation in Bangladesh, including governance, communication and gender. The aim is to connect researchers with other stakeholders, with the hope that the resulting publications can be used in response to climatic impacts in Bangladesh.

References

Brouwer R, Akter S, Brander L, Haque E (2007). Socioeconomic vulnerability and adaptation to environmental risk: a case study of climate change and flooding in Bangladesh. Risk Analysis 27: 313–326.

Center for Environmental Geographic Information Systems (CEGIS) (2012). Master plan of haor areas. Dhaka: Bangladesh Haor and Wetland Development Board, Ministry of Water Resources, Government of the Peoples Republic of Bangladesh.

Food and Agriculture Organization of the United Nations (FAO) (2007). The World's Mangroves 1980–2005. FAO Forestry Paper 153. FAO, Rome, Italy.

GoB (2014). Bangladesh Gazette. Bangladesh Government Press, Dhaka, Bangladesh.

IPCC (2014). Climate Change 2014: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1039–1099.

International Centre for Climate Change and Development (2017). Available at: http://www.icccad.net/gobeshona/, accessed on 29 November 2017.

Mondal MS, Islam AKMS, Modhu MK (2012). Spatial and temporal distribution of temperature, rainfall, sunshine and humidity in context of crop agriculture. Comprehensive Disaster Management Program, Ministry of Food and Disaster Management, Dhaka.

Morshed MM (2013). Detailed Area Plan (DAP): Why It Does Not Work? Planned Decentralization: Aspired Development: Souvenir published on World Habitat Day. Available at: http://www.bip.org.bd/SharingFiles/journal_book/20140128161651.pdf.

Neumayer E, Plümper T (2007). The gendered nature of natural disasters: the impact of catastrophic events on the gender gap in life expectancy, 1981–2002. Annals of the Association of American Geographers, 97(3), 551–566.

Paul BK, Dutt S (2010). Hazard warnings and responses to evacuation orders: the case of Bangladesh's cyclone Sidr. Geographical Review 100 (3):336–355.

Sadeque Z, Rysankova D, Elahi R, Soni R. (2014). Scaling up access to electricity: the case of Bangladesh. Live Wire 2014/21, World Bank Group. Available at: https://openknowledge.worldbank.org/bitstream/handle/10986/18679/887020BRI0Live00Box385194B00PUBLIC0.pdf?sequence=1, accessed on 6 September 2016.

World Bank (2014). http://www.worldbank.org/en/news/press-release/2014/06/30/bangladesh-receives-usd-78-million-to-install-an-additional-480000-solar-home-systems, accessed on 6 September 2016.