

Exploring the population – environment nexus: understanding climate change, environmental degradation and migration in Bangladesh

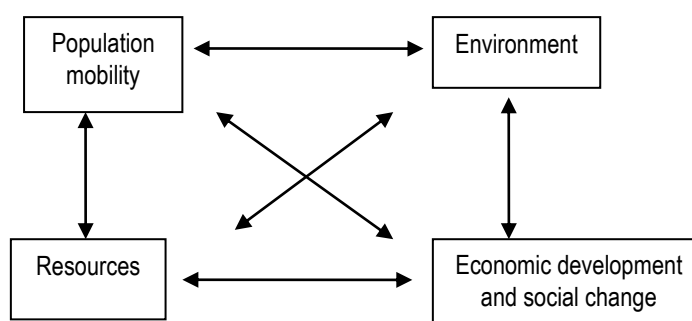
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Introduction

This paper brings together the important but sensitive issues of climate change and its impacts on population within the context of a developing country such as Bangladesh. It considers the nexus between people and their natural environment through the lens of current and future climatic changes. In doing so, the paper draws together arguments that highlight several direct and indirect impacts of deteriorating environmental conditions on daily subsistence and livelihood of diverse groups and communities. The paper focuses on migration as a phenomenon that binds together both population and environmental changes in a complex cause and effect relationship (see Figure 1 below). Migration not only contributes to varied changes in environmental resource availability but may also be argued as an important adaptive strategy for large sections of the society in coping with climate-induced environmental degradation (Hugo 1996; Intergovernmental Panel on Climate Change (IPCC) 2007; Warner, Dun et al. 2008; Barnett and Webber 2009).

Figure 1: Migration, environment and development in a complex interrelationship



The primary objectives of this paper include, a) examining the extent to which past, present and future anthropogenic climatic changes may play a significant role in

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causing migration within Bangladesh; b) exploring the possible nature of these migratory patterns in the context of established migration networks within and outside Bangladesh; and finally c) informing policy to facilitate a range of adaptation options to address climate-induced environmental degradation in a timely and efficient way. The paper is organised as follows: the next section presents a brief overview of the processes that link climate change, environmental degradation and human displacement. This is followed by a detailed discussion of various existing and likely threats to the local and regional climatic conditions in Bangladesh and their influence on the degree and nature of population movements across the affected areas. The paper then discusses important policy issues that need consideration in climate change and migration related discussions at the regional and sub-regional level. Finally, the paper concludes with important findings from the discussion.

Examining the link between climate change, environmental degradation and migration

There have been several attempts in the past to establish the link between climate change-induced degradation in natural environment and population displacement. The Stern report (2006) has argued the possibility of climate change impacts leading to population displacement within and between countries and regions. In the Asia-Pacific particularly, there is a general lack of emphasis on environmental factors in explaining and identifying the possible causes of increase in migration across the region. In the context of climate change, it is important to move beyond the narrow interpretation of 'forced displacement' as the only possible migration response to environmental degradation. Instead, migration needs to be acknowledged and understood as an efficient adaptive and coping mechanism for communities facing climate-induced natural hazards.

Figure 2 below conceptualises the link between changes in environmental conditions and resulting hazards and patterns of migration. Different forms of environmental hazards can affect human displacement in very different ways – while some hazards are gradual and the risks build over time (eg. desertification), others are more sudden and sporadic (eg. cyclones). The frequency and intensity of these hazards will thus establish whether migration responses from the affected region will be permanent or temporary in nature.

Figure 2: Relationship between migration and hazard risk

	Gradual environmental Change risk	Environmental hazard risk
Linear changes in migration	Sea level rise, desertification, river bank erosion, drought, changing climatic variability, salinity, & construction of development projects such as dams	Cyclonic activities, storm surges, floods, landslides.
Non-linear changes in migration		

Changes in local and regional climatic conditions in the form of sea level rise, heat stress, desertification, flooding and drought may severely restrict livelihood options for large groups in developing countries. On the one hand, these changes may directly challenge basic subsistence of already disadvantaged communities in the region, thereby further increasing their vulnerability across social, economic and institutional settings. On the other hand, increasing local vulnerability could potentially trigger large-scale displacement and migration particularly from rural to other rural and urban regions in search of new avenues for employment and/or settlement (Reuveny 2007).

The literature refers to the groups of people and communities that are at the risk of being displaced – across varied temporal and spatial scales – as ‘environmental migrants’ or to be more specific, ‘climate change migrants’, since the primary reason for their displacement remains climate-induced changes in the natural environment (Adamo 2008; Barnett and Webber 2009; Tacoli 2009). The International Organisation for Migration (IOM) defines climate change migrants as:

persons or groups of persons who, for compelling reasons of sudden or progressive changes in the environment as a result of climate change adversely affect their lives or living conditions, are obliged to leave their habitual homes, or choose to do so, either temporarily or permanently, and who move either within their country or abroad (Kniveton, Schmidt-Verkerk et al. 2008, p.31).

Although migration is a complex phenomena and may not necessarily be associated with purely environmental reasons, past experiences do suggest nevertheless, that changing environmental conditions can combine with existing socio-cultural and economic adversities to lead to various kinds of migratory patterns – temporary, permanent, or circular (United Nations 2005). Furthermore, migration triggered due to degrading environmental conditions is mostly restricted to displacement within national boundaries (Corlett 2008). It is in this context that the extent of social networks combined with the spatial reach of a community play a

significant role in deciding popular routes and places of destination (Srivastava and Sasikumar 1995; Curran 2002; Intergovernmental Panel on Climate Change (IPCC) 2007). As a result, in cases where basic subsistence of communities and families is threatened due to constant deterioration in natural resource conditions, people and communities that have widespread networks within or outside the local region have a higher propensity to migrate than those who lack such strong social links (Haque and Zaman 1994).

Climate change and environmental migration in Bangladesh

Bangladesh, the world's most densely populated country, is also environmentally one of the most vulnerable regions due to its geographical and spatial location (Ministry of Environment and Forests 2002). While the country's average population density is 947 people/km² (Karim and Mimura 2008), the density on the floodplains is more than 1000 people/ km² (Rashid and Paul 1987; Ministry of Environment and Forests 2002). In cases of floods, cyclones and other environmental disturbances, it therefore gets extremely difficult to organise temporary or permanent resettlement options for the affected population (Alam 2003; Nasreen, Hossain et al. 2006). Table 1 below highlights some of the most serious environmental disasters in Bangladesh along with their geographical spread.

Table 1: Primary environmental disasters in Bangladesh

Type of common environmental disasters	Geographical spread
Cyclone	On average, 1-3 severe to moderate storm every year. Some travel as far as 200 kilometres inland
Sea level rise and flood	20% of the total area inundated annually on average. May increase to more than 36% in cases of severe flooding. Half of Bangladesh under 12.5 m above the mean sea level.
Drought	Common, despite the presence of abundant water resources
River bank erosion	Recurrent in 35 upzilas (subdistricts) of Bangladesh

Source: (Lein 2000; Mirza, Warrick et al. 2001; Ministry of Environment and Forests 2002; Alam 2003; Karim and Mimura 2008)

Bangladesh has witnessed several floods in the past that have constantly challenged its social and economic development (Corlett 2008). According to the Bangladesh Centre for Advanced Studies, a one meter rise in the sea level will cause approximately 17.5% of the country's total land area to be inundated, thereby

permanently displacing close to 11% of the total population – over 15 million people (Alam 2003; Corlett 2008). Lately, the sea level along the coast has been rising due to global changes in sea level and the subsidence of the Ganges delta (Mirza, Warrick et al. 2001; Karim and Mimura 2008). The latter has led to an increasing number of abnormal floods which – combined with high population growth, weak structures of governance, and widespread poverty – have significantly reduced the local community’s adaptive capacities, thereby increasing their vulnerability to short- and long-term changes in the environment. Figure 3 below presents some important features of the environmental conditions in Bangladesh. Increase in global warming may further exacerbate some of these conditions, thereby impacting the country’s social and economic life by varying degrees.

Figure 3: Possible climate change impacts on Bangladesh

- With rise in sea level, 65% of the existing population that is vulnerable to floods may increase to over 90% of the total population. Approximately 5 million people will be severely affected;
- The intensity of floods in Bangladesh is considered the worst in the world with respect to the total social and economic losses incurred;
- In terms of reducing human vulnerability, Bangladesh is ranked 101 out of a total of 122 countries – the only Asian country in the group of 22 most vulnerable countries worldwide;
- Increasing global warming may lead to coastal damages to the tune of 12% of the country’s GDP by 2010;
- The country’s coastal areas are increasingly becoming saline. Approximately 1.47 million hectares of coastal and offshore areas affected by salt water intrusion have already lost their agricultural productivity by about 30%;
- Future global warming may lead to changes in precipitation. Since floods in Bangladesh are a result of intense monsoon precipitation, this may have several repercussions on flooding patterns in Bangladesh including, inter alia, changes in the timing of occurrence of floods, increase in their magnitude, frequency, depth, extent and duration, and subsequent changes in land-use patterns in the country. The latter may, in turn, lead to greater crop damage and food insecurity; and
- Out of the total of 35 cyclones worldwide with death toll greater than 5000, 16 have occurred in Bangladesh alone, contributing to 53% of the total world deaths. It is further argued that with greater warming, cyclonic intensity will increase, thereby worsening livelihood opportunities in the region.

Source: (Ali 1999; Environmental Sustainability Index 2001; Mirza 2002; Alam 2003; Nasreen, Hossain et al. 2006)

The country’s vulnerability to environmental changes is further compounded by the fact that its areas most vulnerable to climate changes are also the poorest (United Nations 2005). This further impedes local and regional capacities to develop suitable adaptive mechanisms and therefore, address climate change on a long-term basis. Given existing high levels of socio-economic poverty among a large proportion of Bangladesh’s population, combined with over dependence on agriculture as the

primary source of livelihood, the possibility of some groups migrating internally in cases of sea level rise, floods and cyclones has been highlighted by IPCC in its latest report (United Nations 2005). It is suggested that erosion due to floods and sea level rise-induced land inundation particularly will be 'key drivers of migration from Bangladesh' (ibid, p.11; (Swain 1996)).

According to several authors, between 64, 000 and 1 million Bangladeshis are rendered homeless every year due to riverbank erosion alone (Haque and Zaman 1994; Lein 2000; Siddiqui 2005). In their study of climate change and associated risks, McGranahan, Balk and Anderson (2007) have established that 40% of the total land area and 46% of the total population in Bangladesh is currently in the Low Elevation Coastal Zone (LECZ) and remains therefore, at risk of inundation. The LECZ is defined as the "land area contiguous with the coastline up to a 10-metre rise elevation" (McGranahan, Balk et al. 2007, p 21).

An extensive study of relevant literature suggests that large population size, constantly widening socio-economic inequality, and degrading natural environments comprise the three most important reasons that force people across various socio-economic groups to relocate permanently or temporarily to other areas within and outside Bangladesh (Alam 2003). Having said this, the nature of climate change and migration as inherently complex processes combined with the lack of any suitable empirical studies linking environmental degradation to human displacement renders it difficult to ascertain which groups are the most likely to move. On the one hand, it may be argued that the poorest sections – particularly those in the North of the country – may be the first to migrate as, 'they have nothing to lose' (Haque and Zaman 1994; United Nations 2005). On the other hand, this statement may be counter-argued thus: owing to their weak economic conditions, the poorest groups will have minimum resources at their disposal to facilitate migration and enable their survival through the transition period (from leaving their homes to moving to newer areas and finding suitable employment, accommodation etc.) (Curran 2002). In light of such observations, Siddiqui's (2005, p.72) argument regarding the complex but assertive nature of migration in Bangladesh's context is helpful:

Migration has been an important livelihood strategy for the people of Bangladesh... both poor and better-off people pursue migration as a livelihood strategy... choice of destination and levels of benefits and risks, however, vary significantly, according to the economic and social power of the migrant.

Identifying local and regional hotspots

A wide array of relevant literature has been consulted to identify hotspots most at risk from climate change hazards (see Table 2 below). Figure 4 below illustrates climate change hotspots in Bangladesh. As can be observed from the map, the three most likely climate change impacts in Bangladesh will be in the form of coastal flooding and inundation due to sea level rise, riparian flooding, and cyclones and/or typhoons. In the process of identifying local and regional hotspots of climate change-related population displacement in Bangladesh, two issues need significant attention: a) identify existing and potential internal as well as international migration corridors, and b) establish the nature and extent of likely climate change impacts in and around Bangladesh. This section discusses both in some detail.

Figure 4: Likely climate change impacts and hotspots in Bangladesh

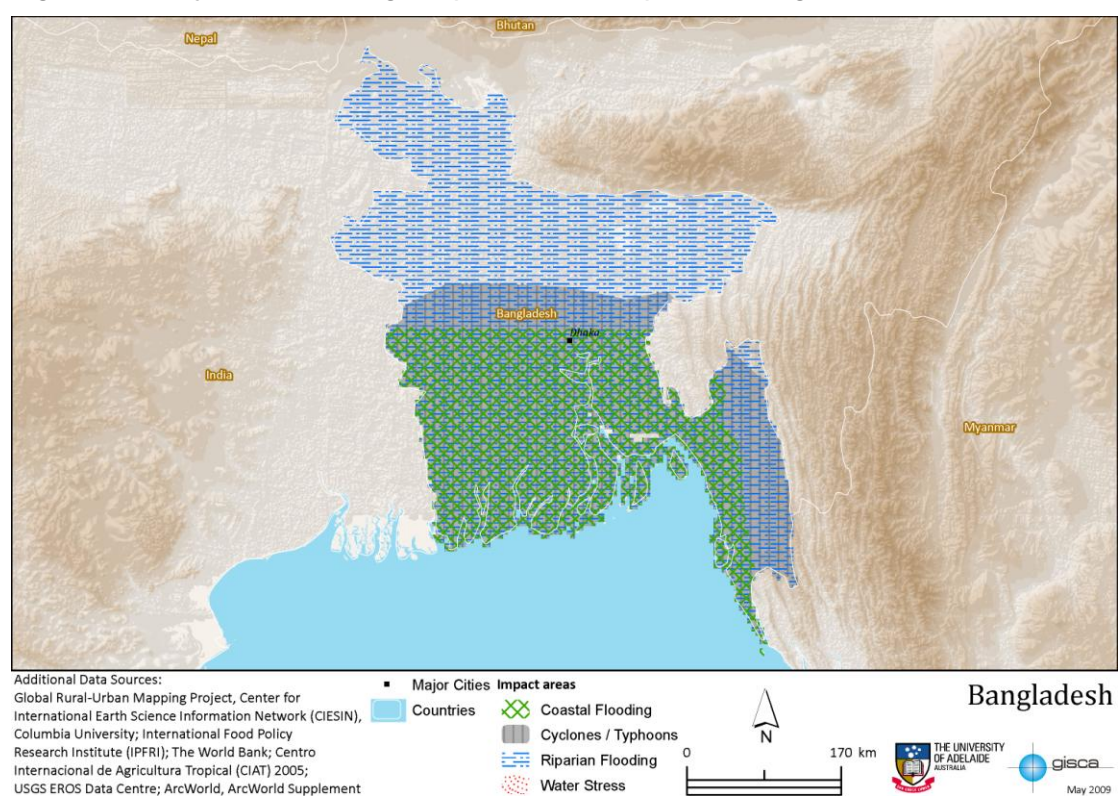


Table 2: Sources consulted in delimiting climate change impact hotspots in Bangladesh

Climate Change Impact	References used
Coastal Flooding	(Dilley, Chen et al. 2005; Ericson, Vörösmarty et al. 2006; Preston, Suppiah et al. 2006; Cruz, Harasawa et al. 2007; Meehl, Stocker et al. 2007; Levy, Anderson et al. 2008)
Cyclones/Typhoons	(Dilley, Chen et al. 2005; Webster, Holland et al. 2005; Cruz, Harasawa et al. 2007; Meehl, Stocker et al. 2007; Vecchi and Soden 2007)
Riparian Flooding	(Dilley, Chen et al. 2005; Preston, Suppiah et al. 2006; Cruz, Harasawa et al. 2007; Meehl, Stocker et al. 2007)

With regard to internal displacement within Bangladesh, rural to urban migration remains a predominant corridor. An increasing number of people from economically weaker rural areas migrate to urban cities in search of better livelihood opportunities (Mortuza 1992). The average annual urban growth rate in Bangladesh for 2002 was recorded at 4% - significantly high for the region (Skeldon 2003). Table 3 below highlights existing internal migration corridors within Bangladesh with approximate numbers of total migrants.

Table 3: Internal migration corridors in Bangladesh

Preferred cities/locations	Primary reason for migration	Existing approximate numbers	Data source(s)
Dhaka and suburbs	Ready Made Garment (RMG) industry	Total: >1.5 million Female migrant workers: approx 65% of total	(Alam 2003; Afsar 2005; United Nations 2008)
Other urban areas and south eastern Chittagong Hill Tracts	Government sponsored migration	Total number displaced: 80,000 – 400,000 (1970s – 90s)	(Hazarika 2001; Reuveny 2007)
Urban centres	Droughts, floods, water scarcity, overpopulation	n/a	(Reuveny 2007)

Although a study conducted by Begum (1999) among the pavement and slum dwellers in Dhaka suggested that economic reasons provided the primary motivation for their migration to the city, physical reasons – such as river erosion, drought, floods, storms and salinity – played an important part, particularly for slum dwellers, in their decision to permanently migrate to Dhaka (see Table 4 below). Another study that examined how poor rural migrants coped with urban life observed somewhat similar results (Hossain 2005). It suggested that river erosion (14.6%), insufficient income in rural areas (20%), greater and better employment opportunities in urban cities (20%) were some of the most significant reasons influencing the decision to migrate to Dhaka (Hossain 2005).

Table 4: Reason for urban migration among Pavement and Slum dwellers in Dhaka

	Reasons for migrating to Dhaka (%)					
	Economic	Social	Physical	Psychological	Political	Educational
Pavement dwellers	46	43	9	2	--	--
Slum dwellers	60	17.1	18.1	1.9	1	1.9

Source: (Begum 1999)

While internal displacement in Bangladesh is mostly rural to urban in nature, the country maintains several international migration corridors (see Table 5 below). Of these corridors, cross-border migration to India – particularly to the bordering states of West Bengal and Assam – comprises one of the most discussed international migration pathways from Bangladesh (Swain 1996a; Rahman and Huq 1998; Samaddar 1999; Lein 2000; Ramachandran 2005; United Nations 2005). The overwhelming presence of both documented and undocumented Bangladeshis in West Bengal and north-eastern Indian states continues to threaten national and local security and wellbeing (Rai 1993; Samaddar 1999; Datta 2004; TOI 2009).

Table 5: International migration corridors in Bangladesh

Major destination locations	Push factors	Existing approximate numbers
India (particularly, West Bengal, Assam and Tripura)	Droughts, water and land scarcity, storms, erosion, salinity, India' upstream diversion of the Ganges, overpopulation	12-17 million + 65,000 (from CHT)
UAE, Saudi Arabia, Kuwait, Qatar, Libya, Bahrain, Malaysia, South Korea, Singapore, Hong Kong, Brunei	New (temporary) employment opportunities	3.3 million (1976 – Jan 2002)
UK, USA, Australia, Canada, Italy, Japan	Colonial ties, better standard of living	1.1 million (2004)

Source: (Samaddar 1999; Hazarika 2001; deBruyn and Kuddus 2005; Lorente, Piper et al. 2005; Siddiqui 2005; Reuveny 2007)

With regard to migration from Bangladesh to India, a range of 'pull' factors exist, of which historical alliances play a particularly important role (Mortuza 1992; Swain 1996; Curran 2002, p.104). Figure 5 below highlights several factors that lead to one-way population migration from Bangladesh to India. While lack of data makes it difficult 'to estimate the extent of unauthorized migration between the two countries' (Lahiri-Dutt 2004. p.480) several cultural, regional, lingual similarities and the likelihood of improved economic opportunities in India continue to motivate the poor in Bangladesh to consider migrating illegally to India (Samaddar 1999; Alam 2003; Lahiri-Dutt 2004). 'Anecdotal evidence suggests that substantial numbers of Bangladeshis cross into the Indian province of West Bengal ... every day to work as daily wage labour, returning routinely to their Bangladeshi villages near the border at the end of the day or after a short period' (Ramachandran 2005, p.5).

Figure 5: Primary causes for unidirectional migration from Bangladesh to India

- Greater economic opportunities: availability of various kinds of permanent, temporary and seasonal employment opportunities across India
- Frequent environmental disasters: natural and human-induced frequent riverbank erosion, flooding, droughts and cyclones displace several poor Bangladeshis. Proximity to India leads to several affected groups migrating across the border
- Historical, cultural ties: several people from Bangladesh moved into India in the early 1950s. Their social networks and strong linguistic and cultural ties with people still residing in Bangladesh often encourage the latter to seek refuge in India
- Demographic issues: Bangladesh has the world's highest population density. A constantly high population growth and a wide presence of numerous slums in urban cities like Dhaka further result in land and resource scarcity. The latter thus motivates people to cross borders into India's neighbouring states of Tripura, Assam and West Bengal
- Religious insecurity: Bangladesh is an Islamic state. This has resulted in the marginalisation of Hindu and other tribal minorities, thereby forcing these groups to move to India permanently

Source: (Rai 1993; Swain 1996; Curran 2002; Stojanov 2008)

In his study of the linkages between climate change-induced migration and violent conflict using 38 cases from different parts of the world, Reuveny (2007) observed that Bangladesh outscored the others in terms of the largest number of migrants per episode, mainly to India. Development projects such as dams and other similar multi-purpose large-scale activities have further contributed to involuntary displacement of several Bangladeshis internally and also to neighbouring India (Swain 1996a; Alam 2003). Swain (1996a) suggests that India's Farakka barrage has caused a permanent 'ecological disaster' in Bangladesh, thereby causing involuntary displacement of several poor Bangladeshis to India, mostly illegally (Datta 2004). The latter has led to violent conflicts between native Indians and Bengali Muslim migrants in various regions of Assam, Bihar, Mumbai and New Delhi. Swain (1996a, p.117-8) argues thus:

The crippling consequences of the Farakka caused environmental destruction over an extensive area and mammoth populace in the south-western part of Bangladesh... water diversion at Farakka has led to the loss of source of living of a large population... mainly due to agricultural loss, reduced fish catch, massive river-bank erosion and increasing number of devastating floods. The sufferings of the people of this area have been further exacerbated due to reduced navigational facilities and industrial production, deforestation, and drinking water problems. All these have resulted in the migration of nearly two million people... to India.

Finally, given the enormous complexity of both climate change and migration, although it is neither realistic nor responsible to predict population numbers affected by climate change with any certainty, it is important nevertheless to develop some indicative projections of climate change induced mobility in Bangladesh to enable

informed and context-specific policymaking and intervention strategies. Tables 6 and 7 below provide estimates of the population currently living in the hot spot areas and total numbers at risk of multiple climate change hazards in Bangladesh respectively.

Table 6: Bangladesh: estimated population in hot spot areas, 2000

Total population ('000s)	Population (% of total) in hot spot areas		
	Coastal flooding	Riparian flooding	Cyclones/Typhoons
136,947	48	99.9	60.4

Table 7: Projected population in Bangladesh at risk of multiple climate change hazards

	2000	2020	2030	2050	% change (2000-50)
(000's)	136,946	193,332	217,930	254,082	85.5

Policy implications and recommendations

Although difficult to establish a direct nexus between climate change and migration, several authors have argued nevertheless that rural-urban migration within Bangladesh and cross-border movement into India is a response strategy adopted by several disadvantaged Bangladeshis to address deteriorating socio-economic and environmental conditions (Haque and Zaman 1994; Chakrobarty, Gupta et al. 1997; Lein 2000; Datta 2004; Ramachandran 2005; United Nations 2005). Having said this, migration is only one of several adaptation options available locally. There is growing evidence that several affected communities prefer in situ adaptation to temporary or permanent displacement (Black 2001; Adamo 2008; Barnett and Webber 2009). In view of this observation, this paper suggests that policy to address climate change-induced migration should consider the following:

- Develop a new system of institutional governance that considers local needs and context in identifying climate change adaptation and mitigation strategies;
- Encourage pro-active and early action for effective management of migration and climate change adaptation;
- Strengthen the link between internal and international migration processes from a regional perspective;
- Deliver programs to build local capacity and empower disadvantaged sections of society (such as women, children, elderly and the poor) as these will be

some of the groups most severely impacted by changes in the natural environment;

- Improve internal and international migration data collection systems; and
- Create regional platforms for bilateral and multilateral cooperation through transfer of financial, technological and other resources.

While the options discussed above are not exhaustive with regard to developing policy to tackle both short- and long-term climatic changes and resulting impacts on migration, they do however outline critical issues that, if acknowledged at the institutional level in framing policies for climate change adaptation, will effectively address in situ as well as displacement-related challenges. Finally, to reiterate what Kniveton, Schmidt-Verkerk, Smith and Black (2008, p.57) have argued recently:

The answering of the question of how climate change impacts migration depends on understanding: the socio-cultural-political-economic environment that communities exist in; the cognitive processes of the people experiencing the impacts of climate change; the individual, household and community attitudes to migration and migration outcomes; and the type of climate stimulus that migration may be responding to.

It is therefore best to integrate the above elements to frame policies that will tackle climate change and its impacts on human displacement in Bangladesh locally and regionally.

Conclusion

This paper has examined climate change impacts in Bangladesh with particular reference to the extent to which changes in natural resource conditions may impact people's vulnerability and their decision to migrate within or outside national boundaries. It is clear that Bangladesh is likely to be significantly impacted by a range of changes to its climate, including extreme cyclonic events; drier winters and wetter summers; greater flooding; increased landlessness; reduced water availability in summer; salinisation; and sea-level rise and accompanying storm surges. The discussion has also suggested that communities of varying socio-economic status will increasingly accept and employ migration as a coping strategy to address both short- and long-term changes in the local environment and resulting natural resource availability.

Considering that people with least adaptive capacities primarily inhabit areas most vulnerable to these environmental disasters, any further changes to natural resource conditions locally and regionally will further exacerbate the risks that these poor and socio-economically disadvantaged communities face. The paper has not

only highlighted the significance of both in situ and ex situ adaptation strategies but has also made important suggestions that will better inform policy in addressing climate change impacts on migration in Bangladesh.

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