

Climate Change and Migration in Bangladesh: Golden Bengal to Land of Disasters

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Abstract: *This paper focuses on the relationship between climate change and migration in Bangladesh. The country is expecting 49 million, 63 million, and 78 million displaced people in 2010, 2015, and 2020 respectively due to climate change. Bangladesh is the most vulnerable country in the world because of frequent floods. The country becomes the third and the sixth most vulnerable country in terms of tsunami and cyclones. Drought will affect eight million people by 2050. In future, the combined effect of high population growth and displaced population will make the country more vulnerable to social and economic underdevelopment. With increasing climate change vulnerabilities, people will consider taking an advantage of international migration if resources became exhausted. For resolving the problems of many more environmental migrants in upcoming years, this is high time to think about future floods of environmental migrants and the adaptation measure necessary for the survival of many.*

Key words: Climate Change in Bangladesh, Migration, Flood, Cyclone, Drought, River Erosion, Sea Level Rise

Introduction

The much acclaimed Stern Review (2007) narrates that Bangladesh will be one of the most vulnerable countries in the world due to climate change. The review also describes that both sea-level rise and climate change would force many more to leave their homelands in the future (Stern, 2007). Current estimate suggests that the temperature of Bangladesh will increase up to one to five degrees by the year 2100. Increasing temperature will affect production of some crops negatively. The two major crop productions (Boro Rice and Wheat) will reduce to a one-third if temperature increases by a four degrees and moisture stress increases by sixty percent (World Bank, 2000). If precipitation increases, which is more likely in the case of Bangladesh, she will receive more water during monsoon and less water during winter causing floods and droughts respectively. Both will lead to a significant reduction in food production, a vital threat for the food security and survival of people (Ahmed et al. 1999). If this is the case, migration induced by climate change is more likely to occur. This paper is an attempt to explore the relationship between climate change and possible impact on the migration process. The ultimate result of climate change can transform once famous Golden Bengal in to a Land of Disasters.

Stern Review also mentioned that both sea-level rise and other climate-induced changes could submerge one-fifth of the current territory of Bangladesh (Stern, 2007). Sea level rise has already caused land erosion, increased salinity in coastal areas, and affected biodiversity leading to reduction of food production and fisheries in Bangladesh. Current sea-level rise trend suggests that 1meter increase in sea level will submerge around 18 percent of the country's coastal belt (Stern, 2007; Sarwar and Khan, 2007). In fact, more than one million people have already lost their homes - 70 percent of these people became landless due to river erosion. Initially, these

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people stayed in nearby areas. Now days, affected people have adequate knowledge that slow siltation process and high population pressure will make their condition worse and ultimately force them to move to somewhere safe especially to the urban areas (RMMRU, 2007).

In Bangladesh, severe flooding caused three-thousand people to leave their residences daily, heading to Dhaka, the capital (Black et al., 2008). Afsar and Baker (1999) argued that these moves are temporary and mostly internal in nature. International Strategy for Disaster Reduction reported that Bangladesh is the most vulnerable country due to flood (cited in Akter, 2009:9). The country becomes the third and the sixth most vulnerable country due to tsunami and cyclones. Moreover, in the future, frequent flood will force another six percent to move out, compared to two percent due to cyclones. With this background, the country is expecting 63 million, and 78 million displaced people by 2015, and 2020 respectively and climate change will cause all these massive environmental displacements (Akter, 2009).

However, climate change affects some regions more than the others. Northwestern and Southwestern Bangladesh are more vulnerable to the climate change induced environmental disasters as North gets severe droughts and South gets floods, cyclones, tidal surges, and saline intrusion (Akter, 2009). Bangladesh went through six severe floods in last 25 years causing 45 million people to be internally displaced (International Organization for Migration, 2010).

Table 1: Primary Environmental Disasters in Bangladesh

Common Environmental Disasters	Geographical Spreads
Sea Level Rise and Flood	One fourth of the total area inundated annually on average. May increase to 36% in case of severe flooding. Half of Bangladesh is less than 12.5 meters above the mean sea level.
Cyclone	On average, 1-3 severe to moderate storm every year. Some travel as far as 200 Km inland.
Drought	Common, despite the presence of abundant water resources, western regions are particularly vulnerable to drought.
River Bank Erosion	Recurrent in 35 sub-districts of Bangladesh.

Source: Sharma and Hugo, 2009:4, Alam, 2003:432, Bangladesh Water Development Board, 2010:6, International Organization for Migration, 2010:28

Several primary environmental disasters (Table 1) may enhance the vulnerability of the country due to climate change. Many scientific literature mentioned floods and cyclones as major concerns for Bangladesh. However, droughts and riverbank erosion also caused human sufferings aggravated by the climate change.

Against this backdrop, migration worked as an adaptation strategy and a safety net for the affected families experiencing climate change vulnerability (International Organization for Migration, 2010). Myers (2001) estimated that Bangladesh alone would produce 26 million

climate refugees in the future. Alam (2003) reported that high population growth, climate change, and frequent disasters would cause millions to enter the neighboring country of India. However, he failed to provide any concrete evidence on the migration from Bangladesh to India.

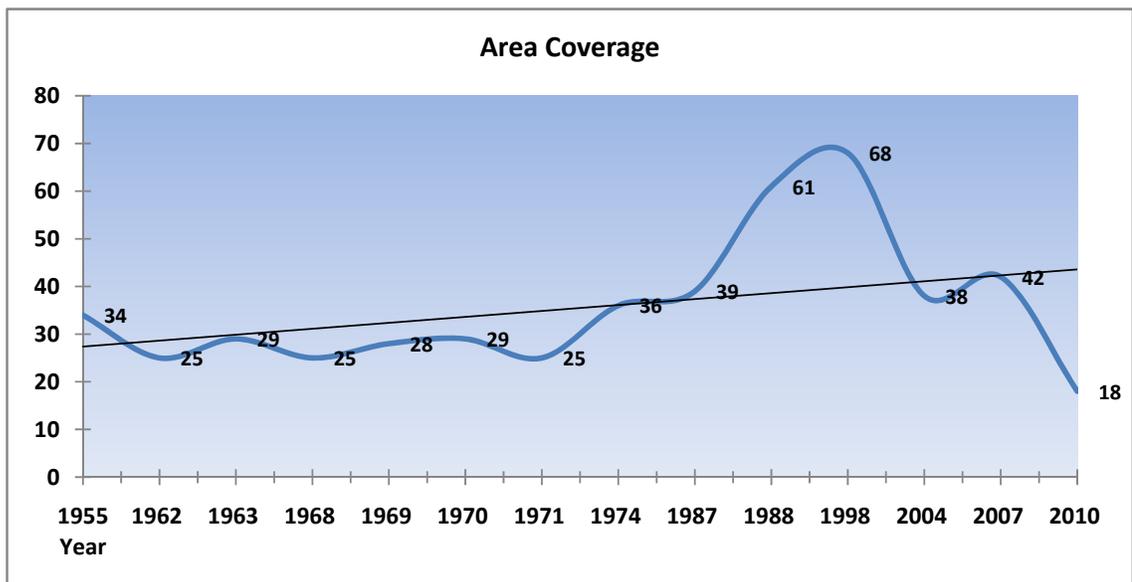
Some studies found that there is a positive association between asset loss and the decision to migrate (Rayhan and Grote, 2007; Paul, 2003). Some claimed that population pressure, landlessness, and unemployment in the rural areas forced people to settle down in the risky areas, which in turn made them more vulnerable to the climate change and environmental degradation (Islam, 1992). However, people move out of dire necessity, moving from home is the only option left for them (Lein, 2000). Both people and government use migration, as an adaptation strategy because the process could potentially lower down the population pressure where eco-system is quite vulnerable along with the fact that resettlement is an essential step for the vulnerable people (Martin, 2009).

In general, the poor households are more vulnerable to the climate change and lack both social and financial capital to undertake the long-distance movements. In some cases, they want to move to nearby areas but the risk is higher if they do so. However, prior knowledge and social network present at the place of destination make migration easy for some displaced persons. If they know they would be getting financial assistance from their social networks, migration decision is quick. Even then moving to the other place is not a panacea either, as they seek help from the people of the same socio-economic status. Moreover, their skill, training, and lack of proper education make it difficult to get jobs when they arrive at the place of destination (Kartiki, 2011).

Golden Bengal to Land of Disasters: Migration as an Adaptation

Flood and Migration: Flood is one of the main reasons people migrate from one place to another in Bangladesh. The overall situation is not in a good shape because of the climate change. Climate change affects the flood situation in three different manners. In the recent past, climate change has altered the timing of the monsoon, which caused severe floods in the country. Climate change has increased precipitation and number of wet falls. It has also increased the number of strong cyclones responsible for producing unexpected floods (Mirza, 2011). Forty-eight small to big floods struck Bangladesh since 1954 (Planning Commission, GOB and UNDP Bangladesh, 2009). This low-lying delta experiences several different types of floods – flash, riverine, rain, and storm-surge. The last flood in 2007 affected 16 million people, damaged 85,000 households and 1.12 million hectares of the cropland. Three main causes of the frequent floods in the country are excessive precipitation, low topography, and the flat slope. These three factors intensify the flood situation because of the current geographical location, the pattern of climate, the unification of three major river systems in to one, construction of the embankment, the influence of tides and cyclones, and the long-term environmental changes of the country.

Annual Flood Report by Bangladesh Water Development Board stated that the combination of all these factors would influence the magnitude of the flood. This report also mentioned, “A higher sea level will inhibit the drainage from the rivers to the sea and increase the impact of the tidal surges. Deforestation in hilly catchments causes more rapid and higher runoff and hence more intense flooding (Bangladesh Water Development Board, 2010: 5).” Figure 1 shows the major floods and inundated areas from 1954-2010. In general, at least one-fourth of the country submerged during the flood. However, both 1998 and 2004 floods inundated 61 and 68 percent areas of the country respectively. The trend line shows that on average 25 to 40 percent areas go under water even if the country gets low to moderate flood.



Source: Bangladesh Water Development Board, Annual Flood Report 2010

Figure 1: Major floods and area inundated, 1954-2010

The inundation map (Figure 2) shows that virtually all parts of the country are vulnerable to moderate to high floods. Bangladesh had received floods every three years for the last twenty years, affected people do not defer their decision to migrate because risk becomes higher if repeated flood occurs in the same land (International Organization for Migration, 2010). Rayhan and Grote (2007) reported that at least one member migrated permanently from one-fourth of the households. Out of five households, four households' members left their home because of unemployment due to repeated flood, which took place in the area. Majority of them migrated to the urban areas (89 percent). Only a few, six percent migrated to other rural areas and five percent migrated to another country. However, new prediction reveals that the situation would further deteriorate due to climate change by the end of the century. Some argued that poor people would be the potential migrants as they live in the flood-prone areas. In fact, poor live in the char areas (low-lying islands). People can live in the char lands without buying land or paying rent to anyone. Decision to live in the char areas made them extremely vulnerable to floods (Asian Development Bank, 2008).

More and more flash floods become part of the daily life with the changing nature of climate because of intensified precipitation (Mirza et al., 2003) (Figure 2). Average discharge of three major river systems will increase due to climate change leading to the severe floods in Bangladesh.

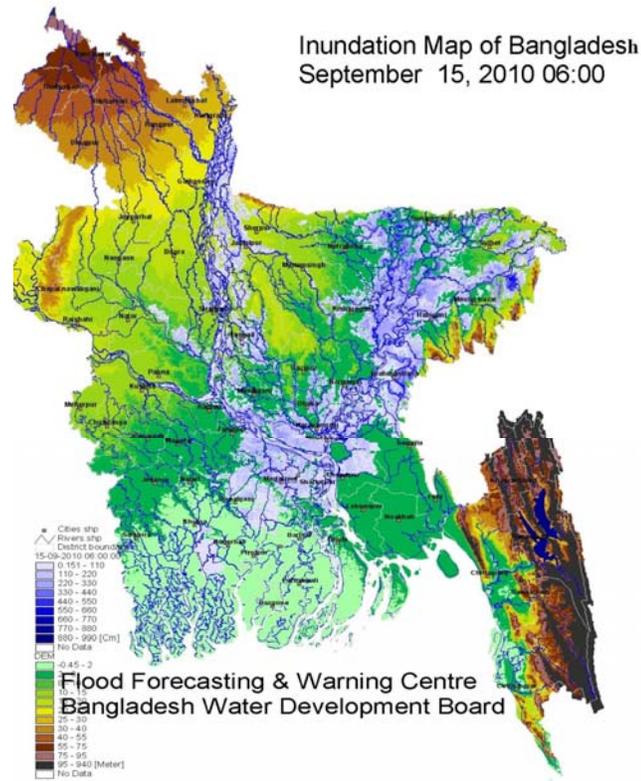


Figure 2: The Inundation Map of Bangladesh

Central and Northeastern part of the country will see more changes in depth and spatial extent of flood produced by peak discharge of the Brahmaputra and Meghna rivers. However, an increase in low temperature will cause more flash floods than an increase in high temperature. A two-degree change in temperature will bring more floods than a six-degree change because of increase in the peak mean discharge of three major river systems, namely Ganges, Brahmaputra, and Meghna. Moreover, severe floods will strike half of the flood prone areas. Even places that have never experienced flood at all and have experienced moderate flood will go through severe changes in receiving flood. Ultimately, this will hamper the crop production, especially the rice production (Mirza et al., 2003).

Cyclone, Storm-Surge and Migration: In Bangladesh, cyclones and storm surges are the two important causes of migration. Over the years, Bangladesh has developed a very good warning

system helping to minimize the impact of cyclone and storm surge. However, the country faces frequent cyclones and storm surges where a significant regional difference exists (Figure 3). Twenty-six cyclones hit Bangladesh since 1970 (Akter, 2009). The two major cyclones killed 500,000 and 140,000 persons in 1970 and 1991 respectively. A very strong cyclone named SIDR struck the country in 2007 but still people managed to take refuge in shelters. Therefore, compared to previous cyclones, death toll was low (3,500 persons) yet displaced more than a half million people (650,000).

However, the fourth assessment of the Intergovernmental Panel on Climate Change (IPCC) reported that the wind peak intensity and the precipitation would be higher whenever tropical storms hit Bangladesh in the near future because of climate change (International Organization for Migration, 2010). Some studies found, “increases in the frequency and intensity of tropical cyclones in the last 35 years can be attributed in part to global climate change” (Emanuel 2005, Webster et al., 2005 and Bengtsson, Roger and Roeckner 2006 cited in World Bank, 2010:4). World Bank projected that another 7 million coastal people will confront cyclones by 2050 because of the changing climate. With this, total number of damaged houses will increase to 1.6

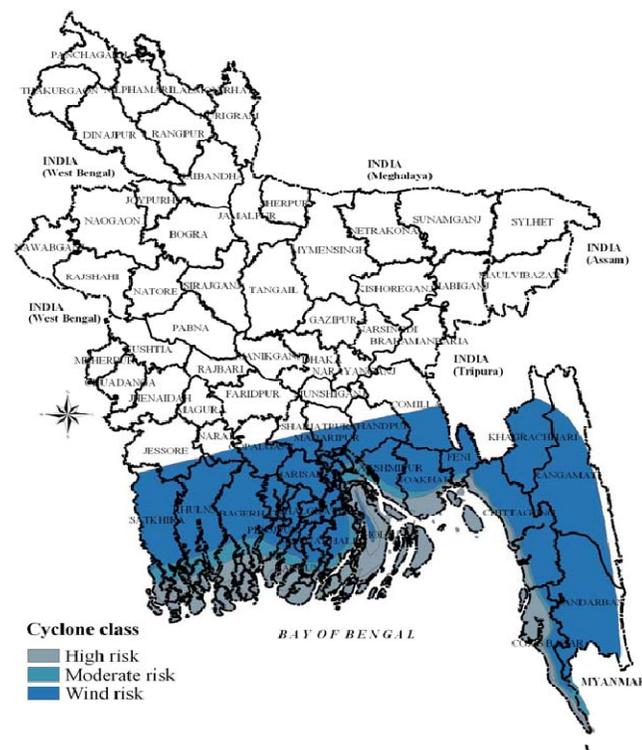


Figure 3: Typical Cyclone Affected Areas of Bangladesh

Source: Climate Change Cell, Comprehensive Disaster Management Project, 2006

million because of cyclones induced by the climate change. The reason Bangladesh will continue to encounter climate change is the rising sea level and the melting ice caps (ice mass consisting less than 50,000 square-kilometers). Moreover, Warmer Ocean will bring in more intense cyclone activity (World Bank, 2010).

Some predict that the overall number of storms may decrease but the intensive tropical cyclones will increase in the future. Cyclone Bijli displaced 200,000 people. The last devastated cyclone Aila, that hit the country in May 2009, displaced 76,478 families of Satkhira and Khulna districts (International Organization for Migration, 2010). However, the New York Times reported, "In coastal Bangladesh, emergency officials moved about 500,000 people to temporary shelters after they left their homes to escape tidal waves churned by high winds (May 25, 2009)." Nine-months after Aila, around 200,000 people were still reported to be homeless. Initially, people moved out to the nearby areas, returned after a while to their homes. A vast majority became seasonal migrants, as they feared no employment opportunities would be available for them in the surrounding areas (International Organization for Migration, 2010). Nevertheless, the long distance migration took place between rural and urban areas. In most cases, Dhaka and Chittagong become the preferred areas as places of destination because of the job availability. City offers all kinds of jobs for almost everyone regardless of their skill and background. Because of this, urban slums have been growing at quite a fast rate of 4% per year, which accounted for 86% of the total urban population. However, even after coming to the urban areas they have settled in places that made them further vulnerable to climate changes (Black et al., 2011). Table 2 provides summary of types of migration that have taken place due to climate changes, major destinations, and factors associated with migration.

Table 2: Migration variants and relationship with climate change

Type of Migration	Area of Origin	Destination	Main factors	Sensitivity to Climate Change
Localized displacement	All affected regions	Cities (Dhaka)	Flood risk, monsoon	High-but depends largely on other factors too
Localized displacement	River communities	Often inside own or in neighboring communities, sometimes urban areas	River erosion	High-but in some cases people move back to land after event
Seasonal moves to urban areas	Rural areas	Nearby cities, capital	Need to diversify livelihoods, often main source of income	Medium-decline of productivity possible, risk of saturation of cities
Long-term rural-urban	Rural areas	Mainly Dhaka and Chittagong	Difference in labor demand, security of employment	Low-as climate related effect outweighed by other factors

Source: Black et al., 2011: 444

Droughts and Migration: The IPCC assessment narrates that droughts will affect 8 million people by 2050 (Huq, 2011). FAO (2007) reported that the droughts in Bangladesh are products of two related factors: climate change and lack of surface water. In general, drought is “absence of moisture or large-scale downward movement of air within the atmosphere, which suppresses rainfall” (FAO, 2007:10), but in case of Bangladesh, the definition of drought involves the latter attribute (Chowdhury, 2010). Climate change can make any of these factors to go wrong (FAO, 2007). However, droughts pose threats to livelihoods of the affected areas, agricultural production, and economy of both the rural and urban areas. Even though the droughts caused more devastation than the floods, for some reason droughts received less attention from policy makers and researchers. Recent information confirms that the land use changes in Bangladesh made the country more vulnerable to droughts (Shahid and Behrawan, 2008). So far, Bangladesh has experienced quite a few droughts since 1973 (Table 3).

Northwestern part of the country encounters more droughts than the other parts of the country (Figure 4). This has an enormous impact on the crop production as the production of all winter crops goes down with the arrival of droughts. Droughts also come with land degradation, low livestock population, unemployment, and malnutrition (Chowdhury, 2010). Drought prone inhabitants of North Bengal took a different strategy for their survival. They did not consider migration as an alternative option believing that they had survived many droughts and droughts do not last forever. In general, however, an obvious response to droughts is migration to the other rural areas or urban areas because jobs are available there (Paul, 1998).

Approximately, droughts, which hit the country between 1961 and 1991, affected 47 percent areas and 53 percent of the people. Evidence suggests that each drought affects 3 percent of the total population (Akter, 2009). Like other disasters, drought is a recurrent event in Bangladesh.

One of the most vulnerable districts to droughts in Bangladesh is Rangpur. Around 5 percent of the slum population living in Dhaka comes from Rangpur, affected by severe drought called Monga. Another 20 percent of this region used seasonal migration as a survival strategy. One-fourth of the chronic poor also took advantage of droughts by becoming seasonal migrants. However, their migration decision did not change even after they have received cash assistance and information assistance about how to cope with the droughts (International Organization for Migration, 2010).

Table 3: Major droughts and its impact in Bangladesh

Year	Impact
1973	Drought responsible for the 1974 famine in northern Bangladesh, one of the most severe of the century.
1975	Drought affected 47 percent of the country and more than half of the total population.
1978-79	One of the most severe droughts in recent times with widespread damage to crops reducing rice production by about 2 million tons, directly affecting about 42percent of the cultivated land and 44 percent of the population.
1981	Severe drought adversely affected crop production
1982	Drought caused a loss of rice production of about 53,000 tons while, in the same year, flood damaged about 36,000 tons.
1989	Drought dried up most of the rivers in Northwest Bangladesh with dust storms in several districts, including Naogaon, Nawabganj, Nilpahamari and Thakurgaon.
1994-95 & 1995-96	The most persistent droughts in recent times, caused immense crop damage, especially to rice and jute(the main crops of Northwest Bangladesh)and to bamboo clumps, a main cash crop in the region.

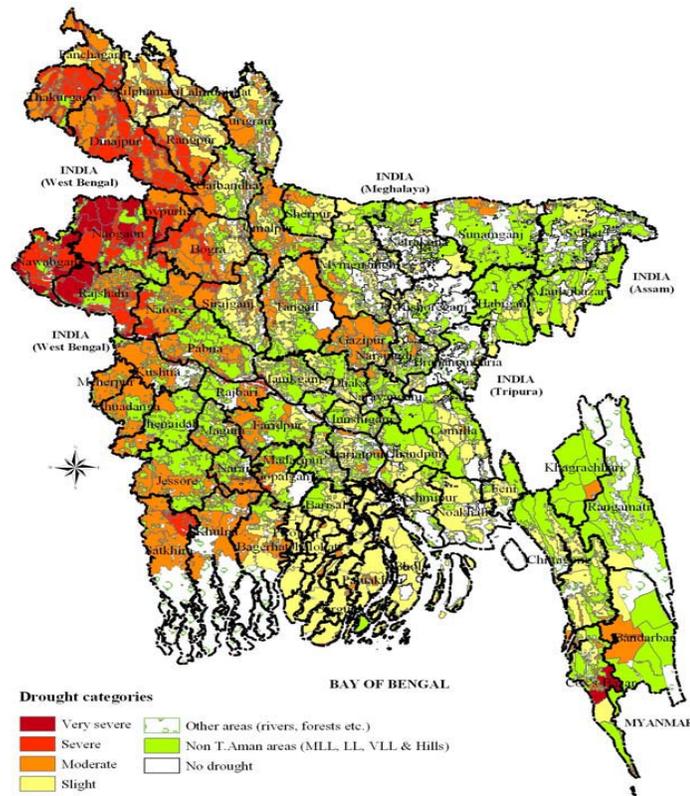
Source: Food and Agriculture Organization of the United Nations, 2007:15

In future, with the changing climate droughts will bring more dry years suggesting,

“a year with a certain percentage of below average rainfall. Temperature increase of 1.3⁰C and precipitation decrease of 9% would reduce runoff into the Ganges, Brahmaputra, and Meghna rivers by 27%, 21%, and 15% respectively. If runoff drops to 22% in kharif season, drought-prone areas would expand to include north-western to central, western and south western regions” (Planning Commission, GOB and UNDP Bangladesh, 2009:36).

Countless people will leave their homes, need shelters, and assistance from the government with the changing climate condition.

River Erosion and Migration: River erosion is still high in Bangladesh, which is a threat to livelihood for many. Increasing monsoon generating heavy rainfall may escalate river erosion. Recent evidence suggests,



Source: Climate Change Cell, Comprehensive Disaster Management Project, 2006

Figure 4: Drought affected Areas of Bangladesh

“as a result of the Green House Gas (GHG) emission, the atmospheres are getting warm day by day resulting the glaciers liquefy. The huge quantities of melted water from Himalaya are speeding up through the Ganges and Brahmaputra and crashing to the coastal estuaries of Bangladesh. The intensity of tidal waves causes erosion in the south-Western coast of Bangladesh”. (Equity and Justice Working Group, 2007: 1-2).

Moreover, unpredictable changes in the tidal surge also cause river erosion. The following table shows the overall affected areas and population by river erosion from 1996 to 2000.

Table 4: River Erosion in Bangladesh, 1996-2000

Year	Affected Areas (acres)	Affected Population
1996	71,680	10,103,635
1997	7,756	173,090
1998	41,519	321,000
1999	227,755	899,275
2000	219,310	415,870

Source: Equity and Justice Working Group, 2007:1

Some families have experienced displacement as many as seven times due to river erosion. Resource rich people can avoid migration by relocating themselves to the nearby areas where they have more land. Resource limited people have to rely on the relatives and the social networks for moving out to an unknown place. However, they chose two different options to cope with river erosion. They move in to the other rural areas during harvesting season and sowing season to make more money. However, their long-term plan motivates them to go to the urban areas. If the river erosion becomes severe, they prefer group migration and settle down in the different parts of the country as a group (International Organization for Migration, 2010). A recent research shows that each year over 0.1% people become homeless due to river erosion (Akter, 2009). CEGIS (2005) evaluation report mentioned that the riverbank erosion is higher along the coast of the Jamuna River (87,790 hectares) compared to the Padma River (29,390 hectares) (Ministry of Food and Disaster Management, 2007). Hutton and Haque (2004) found out that more than 40 percent of their study respondents had left their homes at least three to four times, 36 percent moved between 5 to 10 times, and 14 percent displaced at least 10 times. Only a few reported displacement once or twice (5 percent and 8 percent). Figure 5 depicts the areas affected by riverbank erosion in Bangladesh.

On average, cyclones displace 3 million and floods displace 39 million people. River erosions displace 50,000 and drought displaces 5 million. In future, the combined effect of high population growth and displaced population will make the country more vulnerable to social and economic underdevelopment (Akter, 2009). Akter also estimated that the flood, drought, and cyclone would displace 47 million people by 2009. The figure will rise to 78 million by 2020 (Figure 6).

Conclusion

The evidence from Stern Review shows that the developing countries cause a little damage to climate but they are currently experiencing or will experience more environmental hazards because of their limited capacity for adaptation (Stern, 2007). With her current economic growth and social development, it would be extremely difficult for Bangladesh to cope with the climate change vulnerabilities. Affected people mostly use migration as an adaptation strategy. The

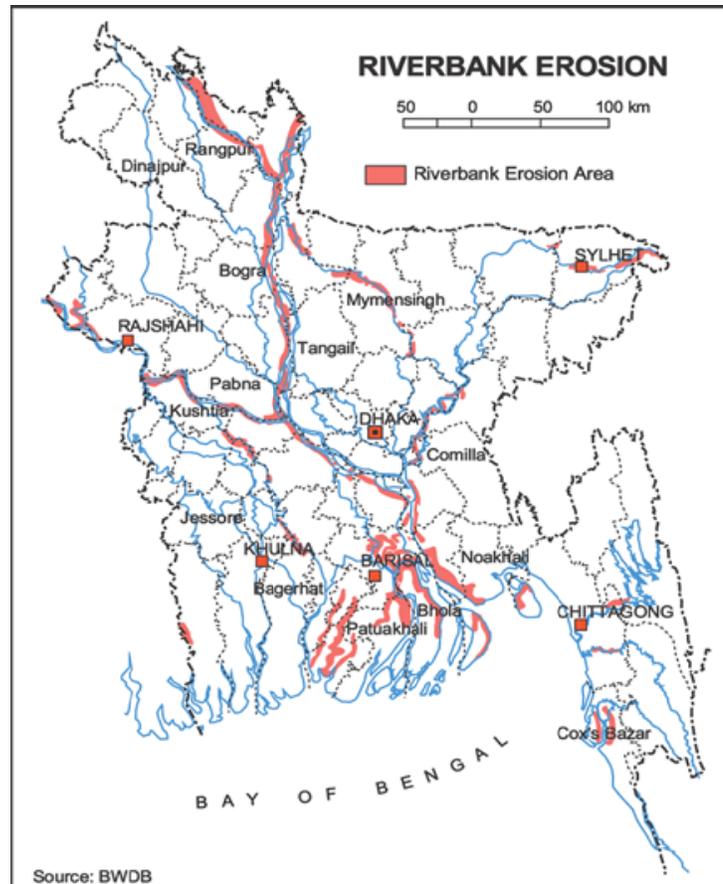
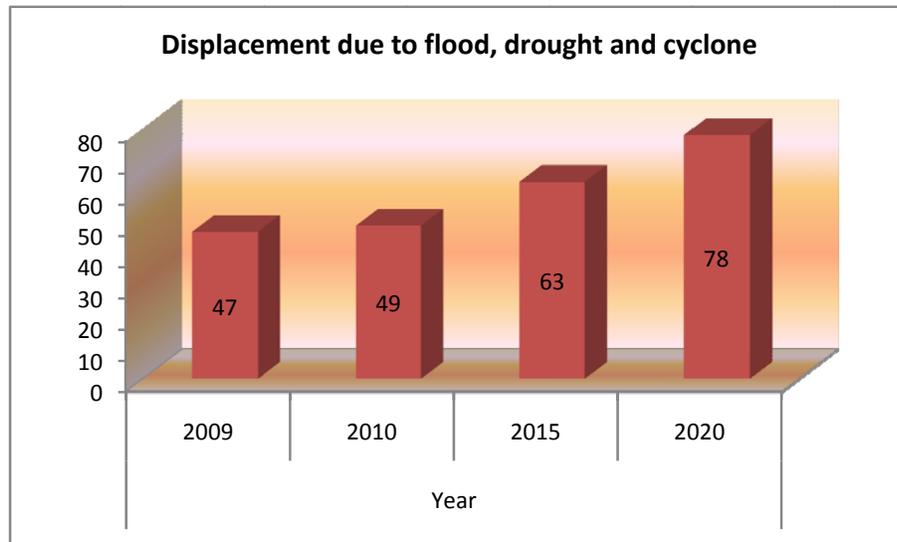


Figure 5: Riverbank Erosion

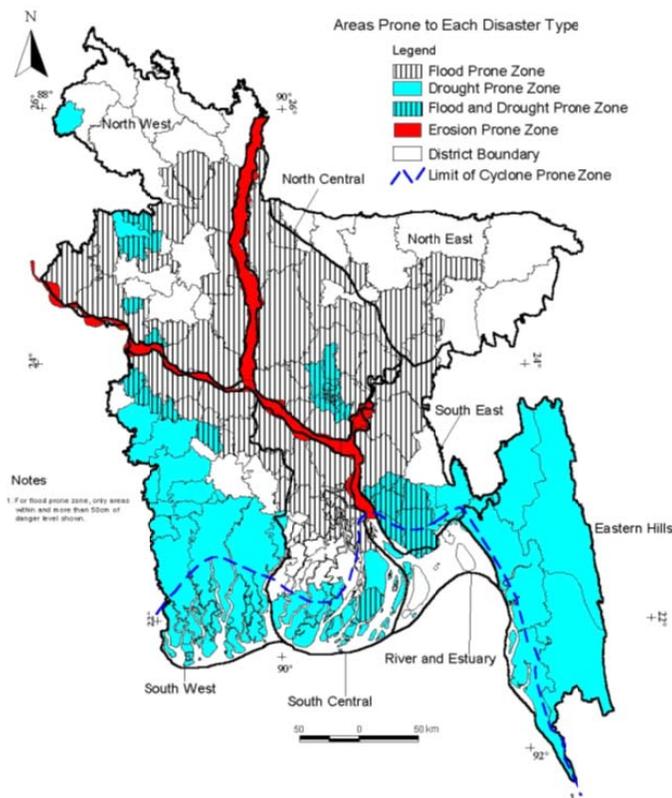
predominant pattern of migration is internal in nature, mostly from rural to urban areas. Until now, international migration did not play any role in helping displaced persons whose displacement is caused by the climate change related factors. One popular misinterpretation about them is that the displaced persons experience displacement because of their poverty. This last statement made them economic migrants but not environmental migrants. In contrast, these people often become poor after they lose their households, croplands, and other valuable assets encountering flood, drought, cyclone, and erosion. Figure 7 provides a picture of the overall vulnerable areas due to any of the above factors. There is no escape from these factors inducing high rural to urban migration. A fisherman once described, "The sea has been coming closer and closer. God only knows what will happen. Everything will come to an end (Warner et al., 2009:13)."



Source: Akter, 2009:9

Figure 6: Projected total displacement due to flood, drought, and cyclone

As a viable adaptation process, international migration is still not an option for many who do not want to leave their homes. Increasing climate change vulnerabilities causes many to consider taking advantage of international migration if resources became exhausted. Climate changes make some parts of the world more vulnerable than the other parts. A large majority will have no homes due to climate changes. By the year 2050, one out of every ten people will be environmental migrant. Bangladesh alone will produce 26 million environmental migrants in future (Myers, 2001). This huge number of environmental migrants will need food, shelter, jobs, education, transportation facilities, and so on. These people will leave their



Source: Ministry of Food and Disaster Management, 2007: 20

Figure 7: Vulnerable Areas of Bangladesh

homes for the places, which they believe, are safe from the calamities of climate change. “If climate change makes our country uninhabitable, we will march with our wet feet into your living room”- Atiq Rahman, a fellow Bangladeshi Environmental Scientist, warned global communities at the 1995 Berlin Conference (cited in Roberts and Parks, 2007:2). Most Bangladeshi will take the same course of action as the most Tuvaluans are doing right now: leaving home and migrating to the developed neighboring countries like New Zealand and Australia. For resolving the problems of many more environmental migrants in upcoming years, this is high time to think about the future floods of environmental migrants and the adaptation measure necessary for survival of many.

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