

# Climate Change and Flow of Environmental Displacement in Bangladesh

Tahera Akter



House-19/A, Road-16 (New), Dhanmondi, Dhaka, Bangladesh

Tel: + (88-02) 8158274 Fax: +(88-02) 8159135

Email: [info@unnayan.org](mailto:info@unnayan.org)

Web: [www.unnayan.org](http://www.unnayan.org)

# Climate Change and Flow of Environmental Displacement in Bangladesh

## Acknowledgement

The research paper on climate change and flow of environmental displacement in Bangladesh provides evidence of increased frequency and intensity of natural disasters and its influence on environmental displacement. This phenomenon of climate change is considered to be a burning issue for Bangladesh and the research paper is an output of Environment Unit of Unnayan Onneshan, a multidisciplinary Policy research Centre. Also, the relevant Unit of the organization forms a focused, interdisciplinary programme of research and advocacy to integrate rigorous natural and social sciences with policy, education and socially responsible conservation action. The research paper is prepared by Tahera Akter with the guidance of Rashed Al Mahmud Titumir.



The Unnayan Onneshan is a progressive think-tank that undertakes research for advancing ideas and building constituencies for social transformation. The Institute advances critical scholarship, promotes inter-disciplinary dialogue and amplifies grassroots perspectives. The public-interest research institute works in collaboration with national partners, international organizations and leading universities. The internal professional staffs and external fellows are grouped into five function-based operational units- Economic Policy, Social Policy, Ecology and Environment, Working Lives & Social Protection and Perspective Building and Policy Literacy.

## ©Copyright 2009-Unnayan Onneshan-The Innovators

The content of this publication may be reproduced for non-commercial purposes with proper citation (please send output to the address mentioned below)

Any other form of reproduction, storage in a retrieval system or transmission by any means for commercial purposes, requires permission from Unnayan Onneshan-The Innovators.

For orders and request please contact

Unnayan Onneshan-The Innovators  
House-19/A, Road-16 (New), Dhanmondi, Dhaka, Bangladesh  
Tel: + (88-02) 8158274 Fax: +(88-02) 8159135  
Email:info@unnayan.org  
Web: www.unnayan.org

## **Table of contents**

	Acknowledge	1
	Table of contents	2
	Executive summary	3
1	Introduction	4
2	Evidence in Bangladesh: trends and patterns	5
3	Future displacement	9
4	Exposure to augmented poverty, gender vulnerability and insecurity	10
5	Policy gap, recent debates and international negotiation	11
6	Conclusion	12
	Reference	14

## **Executive Summary**

This study depicts environmental displacement with the premise of increased frequency of natural disasters and the adverse impacts of climate change. Bangladesh is already experiencing recurrent floods, severe cyclones, water logging, salinity intrusions, droughts and river bank erosion which induce mass population displacement. There is no generally agreed definition and scientifically developed methodology to estimate environmental displacement. Proper development guidelines are yet to be adopted to protect the lives and livelihoods of the displaced people who have the right to expect safe lives, livelihoods, and a sustainable and prosperous future. The research findings reveal that on an average 25%, 3% and 2% populations are displaced from different natural calamities like floods, droughts and cyclones. The estimation of future displacement reveals that approximately 49 million, 63 million and 78 million people might be displaced in 2010, 2015 and 2020 respectively. The growth of environmental displacement is likely to be closer to about half of total populations in 2020. This is very alarming for Bangladesh. To avert future crisis, the study proposes to adopt and update policy guidelines including action plans with a timeframe to keep track with the changing climate. Increased coordination among relevant organizations is also given emphasis to combat the dire consequences of environmental displacement.

## 1. Introduction

A lot has been discussed about climate change and how it affects Bangladesh. The country is expected to be among the worst affected climate change. Bangladesh is often exposed to severe natural disasters because of its very flat topography and low land above sea level. Therefore, almost every year, a huge portion of the population is displaced, both temporarily and permanently, due to these calamities. Approximately 500,000 people were displaced when the Bhola Island was permanently inundated by the floods of 2005<sup>1</sup>. In addition, recent occurrences of major cyclones like Sidr, 2007, and Aila, 2009, may be an indication of more frequent and severe climatic catastrophes. But, there is still a lack of awareness among the public about climate change and also, little consensus among the concerned bodies about the existence and the types of environmental effects of climate change and the numbers of environmental displacements. Lack of coordination among the organizations makes the situation even more difficult to tackle. As a result, it is impossible to properly address the number of people displaced by natural phenomena and to protect their rights.

Many terms and concepts such as environmental or climate change migrants, environmentally induced or forced migration, ecological or environmental refugee or climate change refugee, and environmental displacement are used in literature. However, there is no generally agreed definition on environmental displacement to pinpoint the issue (Warner and Ehrhart, 2009). This study uses the definition put forward by David (2004). He defines environmental displacement as persons who are initially forced to migrate due to environmental effects. It is assumed that in Bangladesh a huge population movement may occur in future as it is one of countries most vulnerable to climate change. It is hard for Bangladesh to handle this momentous problem alone, as developed countries are mostly responsible for this crisis. Climate change is a global phenomenon. Therefore, environmental displacement is not only a national problem but also an international one.

In Bangladesh, the coastal area is particularly susceptible to various disasters like cyclones, tidal surges and floods. The population of the area is about 35.08 million (BBS, 2003), and is expected to grow to about 41.8 million in 2015 and 57.9 million in 2050 (Falguni, 2009). The percentage of people under the poverty line is also higher in the southern (Khulna, Barisal) and the northern (Rajshahi) parts of Bangladesh. It is more than 45%, followed by Chittagong and Dhaka<sup>2</sup>. Environmental degradation is one of the main reasons behind the greater poverty in this region. People there are mainly small farmers, agricultural laborers and fishermen whose livelihoods depend on natural resources. Moreover, a combination of poverty, lack of resources, population growth and institutional inaptitude make people more susceptible to natural disasters, resulting in population displacement.

As there is no generally agreed definition and scientifically developed methodology, proper guidelines are yet to be adopted to protect the rights of environmentally displaced people. Thus, this study proposes a method to approximate the numbers of environmentally displaced people with the assumption that Bangladesh is already facing an increased frequency of natural disasters and the adverse impacts of climate change in the form of recurrent flood, severe cyclones, water logging, salinity intrusions, droughts and river bank erosion. In this regard, past records of some major events widely documented in literature are considered to determine the frequency of disasters and to estimate number of displaced people. Some case studies in the southern coastal area are mentioned to make explicit the impacts of climate change and population displacement. In addition to the evidence present from the trends of natural disasters, this study explores the possible relationships between poverty and natural

---

<sup>1</sup> <http://www.climatechangecorp.com/content.asp?ContentID=5871>

<sup>2</sup> <http://bangladesheconomy.wordpress.com/2008/11/24/bangladesh-could-halve-poverty-by-2015/>

disasters according to the divisions. Gender vulnerability to climate change and rights of the displaced people are also highlighted. Existing gaps within the policy interventions are also explored to find out thrust areas which may facilitate climate change negotiation in Copenhagen (December, 2009). This analysis on climate change and environmental displacement is based on secondary data over the past few years. The process of approximating environmental displacement is given below.

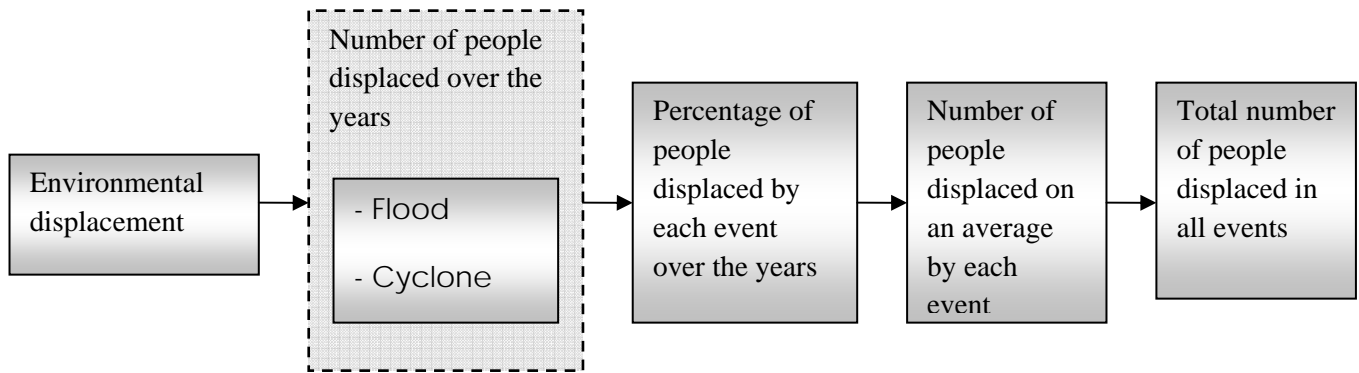


Figure 1: Framework of approximating population displacement

This study would be helpful to make environmental displacement explicit as a response to increased frequency and severity of disasters in a Bangladesh context. This study also aims to assist in setting up possible courses of action which will rightly address the problem as well as protect the rights of the displaced people.

## 2. Evidence in Bangladesh: trends and patterns

Bangladesh is about 80% flatlands, and 20% land of the land is 1 meter or less above sea level. Coastal Bangladesh is particularly vulnerable to sea level rise as 12 out of its 19 districts are directly exposed to the sea. The exposed coast has a population density of 570 persons/ sq. km. while the inland coasts has a density of 1200 persons/ sq. km. It is a critical zone in terms of frequent coastal floods, cyclones and tidal surges (Figure 2). IPCC’s fourth assessment report, 2007, depicts that a 1 m sea level rise will displace 14.8 million people by inundating a 29,846 sq. km. area. According to a World Bank report, sea level rise is currently recorded at 4-8 mm/year<sup>3</sup>.

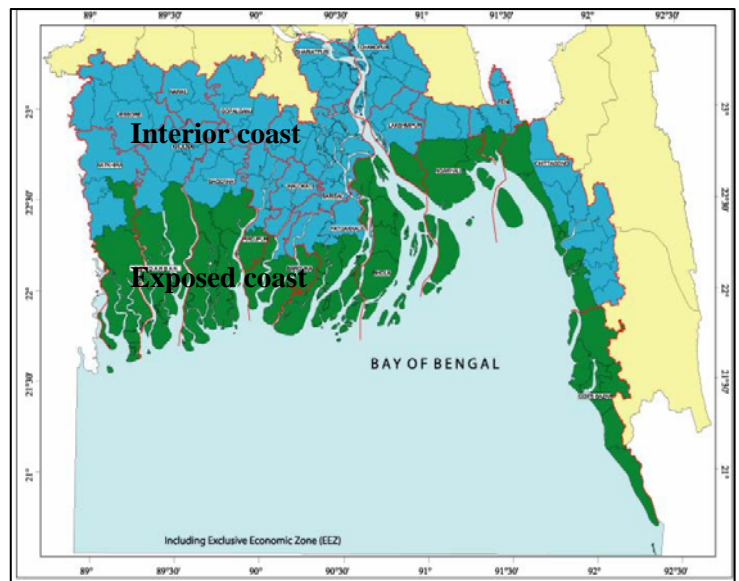


Figure 2: coastal zone in Bangladesh, Source: (Islam, 2006)

<sup>3</sup> [http://www.indiawaterportal.org/data/climate/globalimpact/Sea\\_level\\_rise.html](http://www.indiawaterportal.org/data/climate/globalimpact/Sea_level_rise.html)

From 1970 to 2009, the total number of major cyclones striking Bangladesh was 26, where the number of occurrences increased significantly since 1990. It should also be noted that the highest number of affected people has been recorded after 1990. In 2007, the country was ravaged by Cyclone Sidr, which displaced 650,000 people and killed 3,447 (official record). In the year 2009, two cyclones hit (cyclone Bijli, April 2009, and cyclone Aila, May 2009). About 200,000 people were displaced by cyclone Bijli. The intensity of the damage caused by the cyclones in 2009 might not be as high as cyclone Sidr, but though the country was hit twice in the same year.

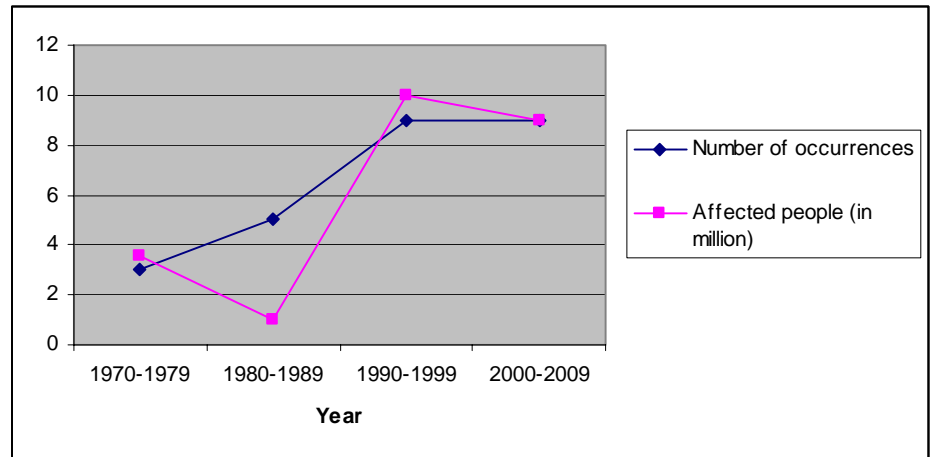


Figure 3: Frequency of major cyclone and number of affected people (Source: BBS, 2007)

The year of 1970, 1985, 1991, 1997, 2007 and 2009 are well-known because of devastating cyclones which caused massive damages in terms of life, livelihoods and properties. Most of the landfall areas of these cyclones are Chittagong and Khulna-Barisal. The wind speed (223 kph) and the tidal surge (15 ft) were highest for Sidr in the 10 years' occurrences. To estimate the number of displaced people, the total number of fully damaged houses, total population of the country and coastal area as well as average household size of corresponding year of major cyclone incident is taken into account. Major natural events are considered, as it is expected that the severity will increase due to climate change. Therefore, the findings reveal that on average, between 2% and 6.5% of the people were displaced with respect to the total population of the country and of the coastal area respectively (Figure 4).

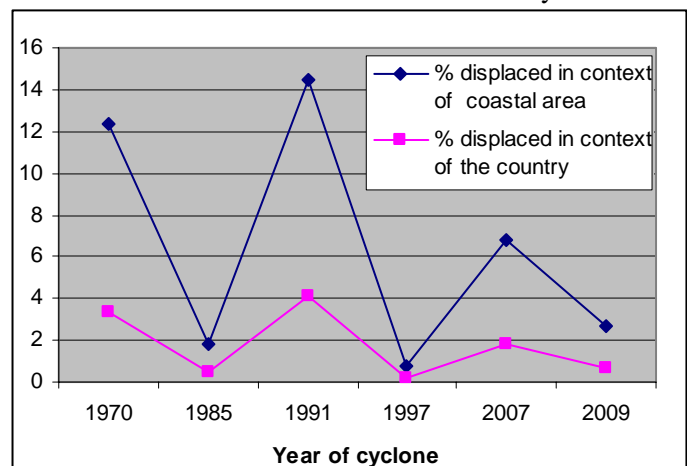


Figure 4: Percentage of displaced people with respect to total population in coastal area and the country

Recurrent floods are being widely mentioned as an impact of climate change, alongside frequent and severe cyclones. The country tends to have more devastating floods because of higher sea levels. This is due reduced gradient of rivers, higher rainfall in the Ganges-Meghna-Brahmaputra river basins and melting of glaciers in the Himalayas (Pender, 2007).

Bangladesh is facing floods almost every year due to heavier rainfall inside and outside the country. Further, the frequency of floods has become increasingly unpredictable and extreme. After citing major flood occurrences in Bangladesh from 1970 to 2009, it can be inferred that the frequency of major flood occurrences has increased since 1990 (figure 5).



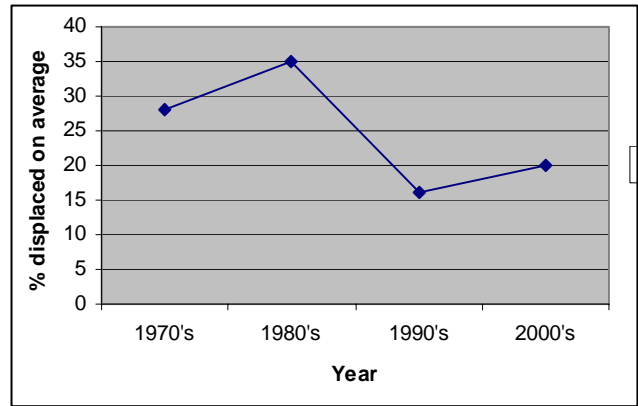
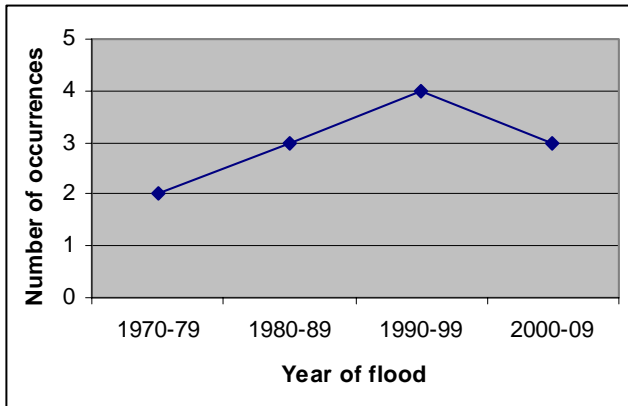


Figure 5: Number of occurrences of floods since 1970      Figure 6: Average displacement by flood since 1970

Major flood events are selected on the basis of the percentage of inundated area (above 20%) and the amount of displaced people. Therefore, it observed that 25% of the population (39 million) have been displaced, on average, by floods since 1970 (figure 6). In 2000, about 3 million people became homeless due to inundation of 5 coastal districts. In 2004, 39 districts were affected, leaving 36 million people homeless. The following figures depict the spatial extent of the floods before and after occurrence. 44,000 sq. km was flooded, according to satellite imagery (figure 7b).



Figure 7: (a) normal view before flood (May, 2007) Source: MODIS satellite image, 2007

(b) Spatial extent of flood in 2007 (Source: CEGIS, 2007)



In addition, the prolonged floods affecting Bangladesh in 3 phases indicate that the intensity and frequency of floods are on the rise. As changing rainfall patterns indicate, delays in rain, no rain or sudden heavy rainfall are remarkable symptoms of climate change. After a long delay in rainfall, about 290 mm continuous rainfall in 6 hours in July 2009 (a record in 60 years) might be a warning from climate change.

Water logging in and out of Dhaka city as a secondary impact of cyclones and flood is becoming a common phenomenon in recent years. The spatial extent and intensity are much more spontaneous than before. A survey conducted by Kushol et. al. 2009 in the cyclone Aila affected district of Khulna depicted that coastal water logging resulted in a huge population movement to nearby safer elevated places. Approximately 106,000 people were displaced from water logging in the area to nearby safer, dry places and other distant districts and in some cases, even to India (Kushol et. al. 2009). Water logging because of heavy rainfall is also causing indescribable sufferings to city dwellers in recent years (figure 8a).



Figure 8: (a) Heavy rainfall causing water logging in Dhaka city, July, 2009



(b) Cyclone Aila causing water logging in coastal area, Khulna, 2009 (Source: Kushol et. Al., 2009)

Massive amounts of melted water increases the downward flow of rivers. As the flow speeds up from the Himalayas to Bangladesh through the Ganges-Brahmaputra and into the coast, it is expected that climate change will worsen river bank erosion. Rising intensity of tidal waves will influence severe river bank erosion (Chowdhury et al. 2007). According to the Centre for Environment and Geographic Information Services (CEGIS), a research study found that every year 0.1 million people become homeless because of river bank erosion. This conception has been taken into account to estimate the average percentage of people affected over the past years. It should also be mentioned that 0.1% people are displaced every year on an average because of river bank erosion (Table1).

Table 1: People displaced by river bank erosion

2008	151	0.1	0.1
2009	156	0.1	0.1
2004	135	0.1	0.1
2005	141	0.1	0.1
2007	147	0.1	0.1

The risks of environmental degradation for the north and the south of Bangladesh can be characterized by droughts and salinity intrusions. It has been observed, from data of the last 100 years, that the surface temperature has increased by between 0.4 °C and 0.8<sup>0</sup>C (New Age, 2007). The average temperature rise in Bangladesh has been predicted to be 1<sup>0</sup>C by 2030 and 1.4<sup>0</sup>C by 2050. Such increased temperatures will intensify droughts in the future in susceptible areas. A total of 19 droughts occurred over the 31 year period from 1960 to 1991. They affected about 47% of the areas and 53% of the population of the country (Ali, 2007). Therefore, past data reveals that approximately 3% of the population was affected in each drought. On average, the country is hit by one drought every two years. In the future, more drought prone areas are expected towards south-western part of Bangladesh instead of the existing north-western part due to its proclivity to increased salinity intrusion.

To sum up, the findings reveal that on average 2% (3 million) in cyclone, 25% (39 million) in flood, 0.1% (50,000) in river bank erosion and 3% (5 million) in drought respectively are displaced over the years. It is evident that flood is the major natural threat that induces huge population displacement, followed by droughts, cyclones and river bank erosion. In the future, environmental displacement might be very upsetting for Bangladesh because of high population growth and the effects of frequent exposure to severe disasters. Such insights into future incidents provide guidance to formulate policies and action plans.

### 3. Future displacement

The trend of major flood occurrences indicates that one major event has been hitting the country every 3 years from 1990 to 2009. This used to hit every 4 years between 1970 and 1989. Data over the last 20 years (1990-2009) reveals that Bangladesh has been experiencing major cyclones almost every year since 1990, which was used be every 3 years between 1970 and 1989 (Source: BBS, 2007).

According to the ranking of International Strategy for Disaster Reduction, in terms of human exposure, Bangladesh is the most vulnerable country to floods, the third most to tsunami and the sixth most to cyclones. Flood is the biggest disaster, displacing one-fourth of the total population. The rate of increase over the years is about 6% of the total population on average. With respect to human exposure to cyclones, the percentage of displacements is low (about 2% of the population). Future displacement has been estimated on the basis of population growth (UNPD, 2008) and the proportions of displacement. Floods being the dominant contributor in population displacement, they have been considered to estimate future displacements. In this case, proportions of displacement by cyclone and drought are kept constant, considering lower proportions compared to flood.

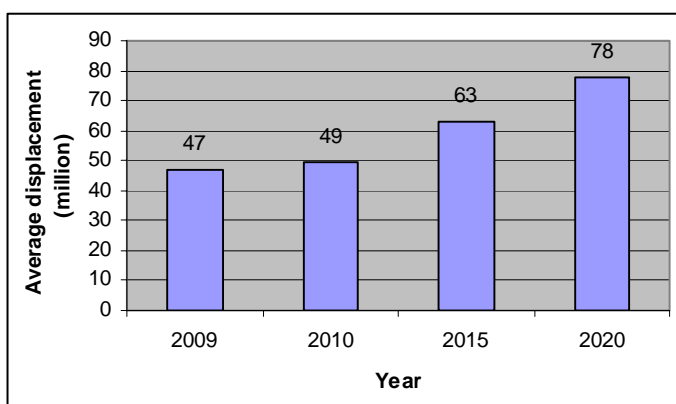


Figure 9a: Total displacement in all events (flood, drought, and cyclone)

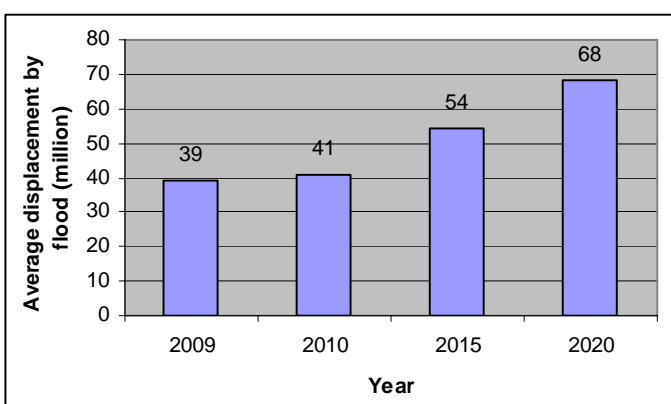


Figure 9b: Total displacement by flood

Therefore, Bangladesh is expected to have massive environmental displacement, which is calculated to be about 49 million, 63 million and 78 million in 2010, 2015 and 2020 respectively. The growth in environmental displacement is found to be 42% of the total populations in 2020, a startling fact indeed.

Bangladesh has already been facing 1 or 2 severe disasters every year. For instance, 2007 is well recognized for the impact of two disasters, floods and Cyclone Sidr. A dire outcome for Bangladesh with a combination of 3 or more major natural events in the future may not be a total surprise for Bangladesh. Such environmentally displaced people are not only becoming homeless, but their livelihoods are also being threatened. These circumstances make them economically vulnerable, leading to increased poverty and insecurity.

#### **4. Exposure to augmented poverty, gender vulnerability and insecurity**

Environmental adversity of an area is related to the poverty level of the people in same area. Northwestern and southwestern Bangladesh are well known for their susceptibility to environmental disasters. In this regard, the Northwestern zone (Rajshahi) is known as a drier zone, which attributes to lower vegetation, less soil moisture and lower rainfall than the national average. Thus, drought is a regular phenomenon in this area. The Southwestern zone (Khulna, Barishal) is vulnerable to multiple adversities (flood, cyclone, tidal surge, salinity). Consequently, the poverty level of these areas is found to be higher (52% in Barisal, 51% in Rajshahi and 46% in Khulna) compared to other areas of Bangladesh (BBS, 2007).

Prevalence of higher poverty of these areas might also be connected to poor livelihood patterns alongside higher environmental adversity. Livelihoods in these areas are mainly based on local resources (e.g. forest) and its extraction (e.g. agriculture, fishing). However, sudden and slow onset of disasters puts such people into growing hardships. In most cases, women are more likely to die or suffer injury during disaster as they cannot swim or leave the house alone (FMR, 2008). Pregnant women, lactating mothers and disabled women find it most difficult to move quickly during cyclones and floods (Baten and Khan, 2008).

A study conducted by Chowdhury (2007) on gender issues in climate change in southwestern Bangladesh depicts that 85% of the women in coastal area are engaged in various works of shrimp farming. Most of the women are engaged with the collection of shrimp larvae from nearby coastal rivers and marshes. Increasing salinity of river water threatens the traditional way of living in such communities. Agricultural land also becomes less productive due to salinity intrusion. The lives of the poor, especially the women, are at risk because of lack of national and community support and encouragement for their productive role. In addition, women are more marginalized because of limited working opportunities and restricted mobility. Moreover, development activities with women participation are not only undermined through socio-economic norms but difficulties of changing environment make them more vulnerable as well. Dhaka's ever growing slum settlements is a physical manifestation of displaced people. According to the women living in slums in Mohammadpur, Dhaka, the majority of them want to return to their roots.

If people have access to facilities and information, they may be less vulnerable to disaster. Lower levels of education among the poor and limited access to information reduces their ability to deal with disasters. Investigations have been carried out into whether people in disaster prone areas have access to facilities in spite of poverty and poor livelihood pattern. Though, literacy rate is higher in coastal divisions like Barisal and Khulna than Rajshahi, accessibility to facilities and information technology (e.g. electricity, telephone, mobile phone and

computer) in these areas which are known to be disaster and poverty prone areas in Bangladesh is lower than in other areas (figure 10).

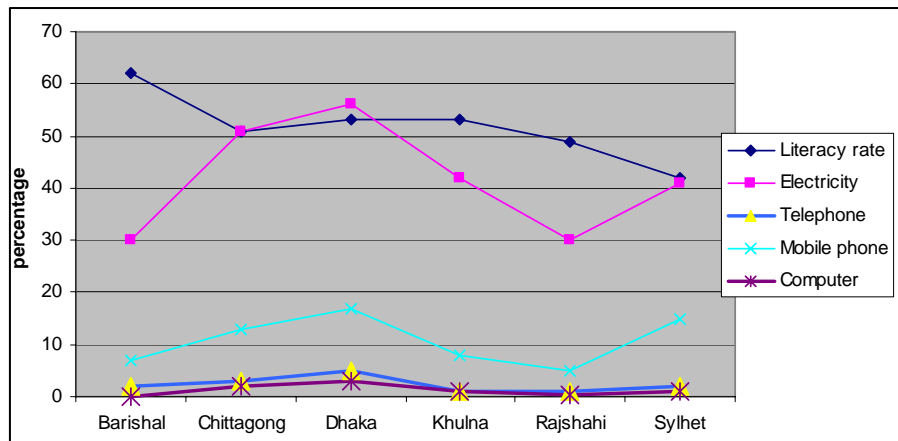


Figure 10: Literacy and access to facilities (Source: HIES, 2005)

Previously discussed issues on augmented poverty driven by disaster and gender vulnerability due to natural disasters represent human insecurity, spatially and non-spatially. Human insecurities are defined as the lack of the rights to safe life, food, safe water, health, home, land, properties, livelihoods, employment and development (Rahman, 2009). Rahman says that the poor are particularly deprived in securing basic rights. Frequent and severe disasters degrade human rights. Leckie (2008) found human rights issues relevant to climate change induced displacement, and also he mentioned right to housing, secured tenure, right to land, right not to be evicted arbitrarily, right to property, right to security of person and compensation of forced displacement. Thus, people ought to be able to live safely and securely on their land. However, a check of ground realities of human rights in developing countries like Bangladesh reveals that these are being violated by the actions of developed countries which are primarily responsible for inflicting climate change.

## 5. Policy gap, recent debates and international negotiation

Previous findings depict that huge populations are displaced environmentally from major natural occurrences. It is expected that the frequency and the severity of these occurrences will only increase due to the effects of climate change. However, as coastal populations consist of 28% of its total population (Ahmad, 2005), if the sea level rises by about 88 cm, approximately 43 million people from coastal area might be dislocated in the future. This huge population displacement will pile on extra pressure on the remainder of the land. Disasters also make people poorer, therefore raising the national poverty level. This rising population displacement, poverty and population growth will create immense pressures on the government's development programs. To address susceptibility of such environmentally displaced people to drastic environments, an adequate development guideline is a pressing demand on decision makers.

National Environment Policy (1992), the coastal zone policy (2005), and the NAPA (2005), Bangladesh climate change strategy and action plan (2008) talk about this phenomenon, but there is no clear indication about the problems of population displacement. For instance, it is written in coastal zone policy, 2005 that susceptibilities of coastal communities will be addressed as these people are very dependent on natural resources for their livelihood. However, how will their sufferings be addressed? There is no action plan with a timeframe in the national policy to address the problem.

As some of the policies are very old with respect to the changing environment, public debates in this regard continue to draw the attention of decision makers. In this case, there is still contradiction that increasing the frequency and intensity of natural calamities is due to the effect of climate change, which induces the population displacement in search of a secure life.

Population displacement is increasingly becoming a national security issue, while the effects of climate change will continue to threaten people's lives and property significantly. However, there is a lack of coordination among organizations to effectively address the problem of the environmentally displaced people. The total number of displaced population by multiple natural disasters is yet to come out. In this regard, a study conducted by Norman Myers can be mentioned, according to which 25 million people were estimated to be environmentally displaced in 1996 and this figure is predicted to double by 2010 and will continue on to be 150 million by 2050 (cited in Burton T. and Houghkinson, D, 2008). However, this forecast population displacement is a global figure. There is no national estimation and prediction on environmental displacement. Such an estimate is required for the government to take necessary steps like rehabilitation of a specific number of people.

Some argue that developed countries are responsible for environmental degradation in developing countries like Bangladesh. As a result to such degradation of human and animal life, it is the responsibility of the international community to provide enough assistance to these vulnerable people. Questions on the form of international assistance as a response to climate change such as financial assistance or aid also arise. Also the issue of international migration is gaining priority among the right activists as one of ways out, alongside other concerns like adaptation, mitigation, technology transfer and financing.

International negotiation on climate change in Copenhagen (December, 2009) is an important opportunity for Bangladesh to address climate change related complexities. In this regard, climate induced population displacement can be considered as one of the key negotiating topics among others (e.g. adaptation, mitigation, technology development and transfer, financing). The following issues to substantiate environmental displacement during negotiation can be focused on.

- Evidence on already increased frequency and intensity of disaster
- Approximate number of environmental displacement and predictions for the future
- Problems associated with huge population movements within the country such as pressure on existing limited resources or living in environmentally hazardous areas which can be a humanitarian issue
- Increased human insecurity demanding international laws to protect their rights
- Gender vulnerability to climate change while the poor have rights to expect safe lives, livelihoods, and a sustainable and prosperous future
- Additional funds to accelerate adaptation measures within the country such as planned migration considering longer/shorter time, longer/shorter distance and more permanent solutions when required
- International migration as an adaptation option to be incorporated into negotiation

## **6. Conclusion**

Despite the government's initiatives to respond to the effects of climate change, there is still a lack of coordination among the concerned bodies to operationalise its policy and action plans. There are also contradictions on how to address environmentally displaced populations and the government's role in negotiating with the international community regarding what have already lost and what is going to be at risk. Thus, effective adaptation measures with international assistance are yet to be put into action. Some of the possible courses of action are proposed to meet the challenges that lie ahead.

Deeper understanding of local environments and changes associated with it as well as the development programs already under way and its management systems will help identification of the gaps in the existing system. Climate change induced degradations in ecosystem creates conflicts among the uses of limited natural resources and disagreement among people. Building consensus is a significant indicator that climate change is real and it influences a massive amount of population displacement. And such population movements may turn into an additional disaster which is difficult for a developing country like Bangladesh to handle alone.

The poor suffer most because of frequent exposure to disaster and their limited capacity to cope with the changing environment. Livelihoods of the poor are mainly based on natural resources which are susceptible to environmental degradation due to climate change. For instance, salinity increase or long lasting water logging destroys crops and soil fertility, therefore, threatening livelihoods and biodiversity. To secure livelihoods is the utmost necessity and the demands of the local poor that can be ensured through improving dissemination of knowledge. Therefore, ensuring economic stability through alternative livelihoods can contain people in their homeland. Access to information and proper training along with greater participation of women will facilitate capacity building. Gender vulnerability to climate change should be handled with due importance in all development programmes, while the poor should be able to withhold their rights to expect safe lives and livelihoods, and a sustainable and prosperous future. Environmental displacement should be incorporated into national strategies by addressing the problems of displaced people and to minimize the impact on local ecosystems.

Redundancy or duplicity of work among the Ministries in dealing with the same issues may often generate misunderstanding or a lack of coordination. Such complications hamper implementation of development activities. Negotiation skills with international communities should also be strengthened. It will facilitate substantive focus on financial assistance in the form of compensation for global warming. It helps to deal with some big issues like proposal of international migration as well as technical assistance to prevent and mitigate environmental impacts and to adapt to the changing environment. Implementation of climate change adaptation measures such as flood control and land erosion with improved embankments as well as salinity and high temperature tolerant crop production and floating cultivation will contain the problem within our borders. In this case, adaptive capacity of the poor to frequent and severe disasters can be considered.

National policies should have an action plan with a timeframe. In this regard, the MDGs and targets can be mentioned, which indicates a time frame to achieve the specific targets. A monitoring cell for operationalization of the guiding principles developed by national policies should be on the ground to protect environmentally displaced people.

Role of policy and the Research and Development (R&D) sector is important to identify and combat environmental degradations and also reduce impacts of environmental displacement. However, this cannot be accomplished without a big enough budget allocation to strengthen the R&D sector. The sector can be modernized by the application of high end technologies like remote sensing and GIS which enhance the understanding of the spatial patterns and the extent of the disaster by real time monitoring of disaster prone areas. It is also possible to compare pre and post disaster conditions.

## References

- Ahmad, M. 2005. Living in the coast: urbanization. Program development office for integrated coastal zone management plan project, water resource planning organization.
- Ali, M. S. 2007. Desertification: Slow onset of an irreversible disaster, The Daily Star.
- Bangladesh Bureau of Statistics, 2007
- Bangladesh Bureau of Statistics, 2003
- Bangladesh climate change strategy and action plan, 2008
- Baten, M. A. and Khan, N. A. 2008. Gender aspects of climate change, The Daily Star.
- Burton, T. and Hodgkinson, D. 2008. Climate change migrants and unicorns: a discussion note on conceptualizing climate change displaced people.
- Chowdhury, N. A. 2007. Men, women and the environment gender issues in climate change, Unnayan Onneshan, Dhaka.
- Chowdhury, R. K., Maruf, B. U. and Chowdhury, A. I., 2007. Climate change would intensify river erosion in Bangladesh, Impact of climate change in Bangladesh.
- Coastal zone policy, 2005
- David, K. 2004. Environmental causes and consequences of migration: A search for the meaning of "Environmental refugees", Georgetown international environmental law review.
- Falguni, A. 2009. Aila after Sidr, The Daily Star.
- Ferris, E., 2007. Making sense of climate change, natural disasters and displacement: A work in progress, Brookings-Bern project on internal displacement, Calcutta research group.
- Forced Migration Review (FMR), 2008. Climate change and displacement, Refugee Studies Centre.
- Hossain, M. 2008. Sea level rise, natural disasters and threats to human security in Bangladesh, South Asia: Environment and human securities conference, Canberra, Australia.
- Islam, R., 2006. Pre and post tsunami coastal planning and land use policies and issues in Bangladesh, Proceedings of the workshop on coastal area planning and management in Asian tsunami-affected countries, Bangkok, Thailand.
- Inter-Governmental Panel of Climate Change (IPCC), 2007. Fourth assessment report.
- Kushol, R., Kumar, U., and Mehedi, H. 2009. Cyclone Aila, Initial Assessment Report, with focus on Khulna district, Unnayan Onneshan, Humanity Watch and Nijera Kori, Dhaka.
- Leckie, S. 2008. Human rights implications, climate change and disaster, Forced migration review, Refugee studies centre.
- National Environment Policy, 1992



National Adaptation Programs of Actions, 2005

Pender, J. 2007. Climate change and displacement, Community led adaptation in Bangladesh, 2<sup>nd</sup> International workshop on Community based adaptation to climate change, Dhaka, Bangladesh.

Rahman, A. 2009. Climate change and human rights, The Daily Star.

Report of Household Income and Expenditure Survey, 2005

United Nations Population Division (UNDP), 2008. World population prospects, The 2008 Revision.

(<http://esa.un.org/unpp/p2k0data.asp> )

Warner, K. and Ehrhart, C., 2009. In search of shelter, mapping the effects of climate change on human migration and displacement, UNU-EHS, CARE.

This Scientific Briefing Paper Series on Climate Change and Development is a regular publication of Unnayan Onneshan as a part of the organization's research and dissemination activities to raise public awareness. This publication is supervised and published by Mr. Rashed Al Mahmud Titumir

Unnayan Onneshan- The Innovators is an independent non-profit registered trust aimed to contribute to innovation in development through research.



উন্নয়ন অন্বেষণ  
Unnayan Onneshan  
The Innovators  
centre for research and action on development



