Climate Change Related Migration in Bangladesh
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# Future migration in the context of climate change

**This briefing explores current and future changes in long-term migration in Bangladesh, in the context of flooding, storm surges and riverbank erosion at the upazila (sub-district) level. Based on a historical analysis of census data we show that areas prone to these shocks and stresses have significantly lower population growth rates than areas that are not affected by such climate-related hazards.**

**Drawing on information on spatial differences in population growth rates and research into the future economic impacts of population growth and climate change by the World Bank, we estimate that an extra 9.6 million people are likely to migrate out from the upazilas affected by inland flooding, storm surges and river bank erosion in the period 2011 to 2050. These figures do not include seasonal or temporary migrants.**

**Current and future government policies should take into account these flows. Government interventions should include the development of employment skills training in regions affected by climate-related stresses so that the migrants are better placed to economically take advantage of their movement. Besides, urban planning should aim at providing safe and sustainable housing and access to education and health services for migrants, including recent and short-term migrants.**

The decision to migrate is driven by a variety of social, political, economic, environmental and demographic reasons. Some people migrate due to a lack of employment opportunities at home; others to derive better incomes in distant locations; and still others migrate due to educational and family reasons. Climate change and variability influence migration behaviour through their impacts on these different drivers and the contexts in which the migration decision is made. According to UN studies differences in population growth rates result from differences in the natural increase (births – deaths) in a location and the net migratory movements. Assuming comparable natural increase rates across Bangladesh, the differences in population growth between different areas can therefore be considered as accurate measures for net migration.

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## Climate-related hazards

Lying at the terminus of several major South Asian rivers and with two-thirds of its land area less than 5 metres (m) above the mean sea level, Bangladesh is often cited as one of the world's most exposed countries to the impacts of climate change. Future climate-related shocks and stresses are predicted to result in increased flooding, drought, river bank erosion, and salinisation of water and land resources.

Past catastrophic flood events have left more than 60 per cent of the country inundated by flood waters. The economic cost of these events on Bangladesh is huge with estimated losses and damages from the 1998 flood event alone being over US$2 billion or 4.8 per cent of GDP. In Figure 2, the extent of flooding for the 1998 floods are shown along with upazilas affected by river bank erosion. It has been estimated that between 2,000 to 3,000 kilometres of river-banks experience major erosion annually.

Bangladesh is also affected by cyclones nearly every year, with severe cyclones striking on an average every three years. Storm surges associated with these cyclones lead to inundation by the sea water and the associated salinisation of land and water resources. In economic terms it has been estimated that a single event, Cyclone Sidr in 2007 , resulted in damages and losses of US$1.7 billion, or 2.6 percent of GDP.

While the temporary and often short-term displacement of populations affected by these hazard events has been acknowledged previously, less attention has been paid to quantifying the longer-term migration trends occurring in the context of these hazards. In this framing it is assumed that migration is not necessarily a process solely undertaken in terms of the loss of livelihood opportunity, but it is also an effective adaptation and a risk aversion strategy in response to a changing environment.

Meanwhile population growth rates across Bangladesh vary considerably in time and space and levels of urbanisation (see Figure 1). Additionally, areas affected by inland flooding have levels of urbanisation significantly different from those not affected. Taking the residuals of the relationship between levels of urbanisation and population growth in 2001 allows the determination of population growth at upazila level corrected for different proportions of urban and rural land. This calculation is carried out on the assumption that areas with larger proportions of urban land use are expected to have higher population growth rates due to non-climate-related trends in urbanisation.

## Population growth and climatic hazards

We assess the impacts of three types of climate hazards in terms of their relationship with population growth rates – namely inland flooding, river-bank erosion and storm surges. Only upazilas that were exclusively affected by each of these hazards were used in the study to ensure that the effects of each hazard were isolated. Our analysis shows that absolute and urban corrected population growth rates recorded in the 2001 census were significantly lower for upazilas affected by 90 per cent inundation during the 1998 flood event, compared to those areas affected by 10 per cent flooding, the figures being 44 and 76 per cent respectively. This indicates significant out-migration from these areas. Notably a statistically significant relationship with the absolute population growth rates is absent in the 2011 census data. This indicates the robustness of the relationship with the hazard events. While there were flooding events from 2001-2010 none of these were as extensive as the 1 in 90 year event of 1998.

Areas affected by riverbank erosion were also found to have absolute population growth rates reduced by 20 per cent. While the upazilas most affected by Cyclone Sidr were found to have 81 per cent lower absolute population growth rates in 2011 than areas less or not affected by the cyclone, indicating significant out-migration from these regions.

## Migration futures in a changing climate

As with the rest of the globe, climate models project temperatures to rise over Bangladesh during all months and seasons by 2050. Such a consistent signal of change is less evident in rainfall patterns with a range of change shown across climate models. However, overall models project annual and wet season rains will increase.

Taking a climate model that projects a wetter future for Bangladesh, the World Bank has quantified the economic impacts of climate change on inland flooding and storm surges. Ignoring the impact of any migration taken as a response to climate change, but including the impact of non-climate based urbanisation and population growth, the World Bank projects that a total of 21.1 million rural people will be at risk of inland flooding related inundation of depths of greater than 0.3m by 2050.

In terms of storm surges, the same World Bank study projects that in a changing climate without further adaptation measures, nearly 17 million people will also be exposed to coastal flooding-related inundation depths greater than 1m, and about 13.5 million to depths greater than 3m. Interestingly, by virtue of the assumption that there will be increased urbanisation in the future, the proportion of the population vulnerable to inland flooding in the future represents a 9 per cent drop in the number of people currently at risk, but an increase of 9 per cent of those at risk compared to a scenario in which climate change does not occur.

Based on the our findings, and using out-migration rates from the flood-exposed upazilas that have seen reduced population growth, we calculate an additional flow of 5.4 million migrants in the context of inland flooding over the period 2011 - 2050. The additional impact of increased inland flooding on migration from climate change alone is calculated over the same period as 316,000 people. Based only on the upazilas where population growth rate is currently significantly lower than climate change does not occur and assuming non-climate population changes in proportion to the median changes forecast for Bangladesh by the UN, we calculate the extra migration expected from storm surges for the period 2011 to 2050 to be 2.3 million people. The influence of climate change alone causes an extra 405,000 migrants at this time scale. While there are no estimates of changes in river bank erosion with climate change, based on the impact of current erosion on migration and using national median population trends, we estimate an extra 1.9 million out-migrants from the affected upazilas during the period 2011 to 2050. In short adding the three major flows described above, we project future long-term out-migration to be of the order of 9.6 million people from regions


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exposed to riverbank erosion, inland flooding and coastal storm surges for the period 2011 to 2050.

## Recommendations

The question whether people will adapt *in situ* or change their migration patterns in response to climate change depends on a number of factors, including policies currently in place in Bangladesh. Our findings show that while people migrate largely for economic benefits, climatic factors do play a role in such movements by affecting their livelihoods directly or indirectly. Therefore if supported properly migration can form a beneficial adaption strategy in itself.

Government interventions should include the development of employment skills training in regions affected by climate-related stresses so that the migrants can get better jobs. Besides, urban planning should aim at providing safe and sustainable housing, a healthy and hygienic environment and access to services such as education, health services and public transport for migrants.

A serious issue could be people moving into risk-prone parts of cities and/or living in habitats with inadequate safety and security. Rapid and unplanned urbanisation in hazardous areas could increase disaster risk. Besides there is a need for adaptation of infrastructure to meet potential climate extremes. The government and the local governance institutions have to get an idea of such dynamic situations and future trends for effective planning.

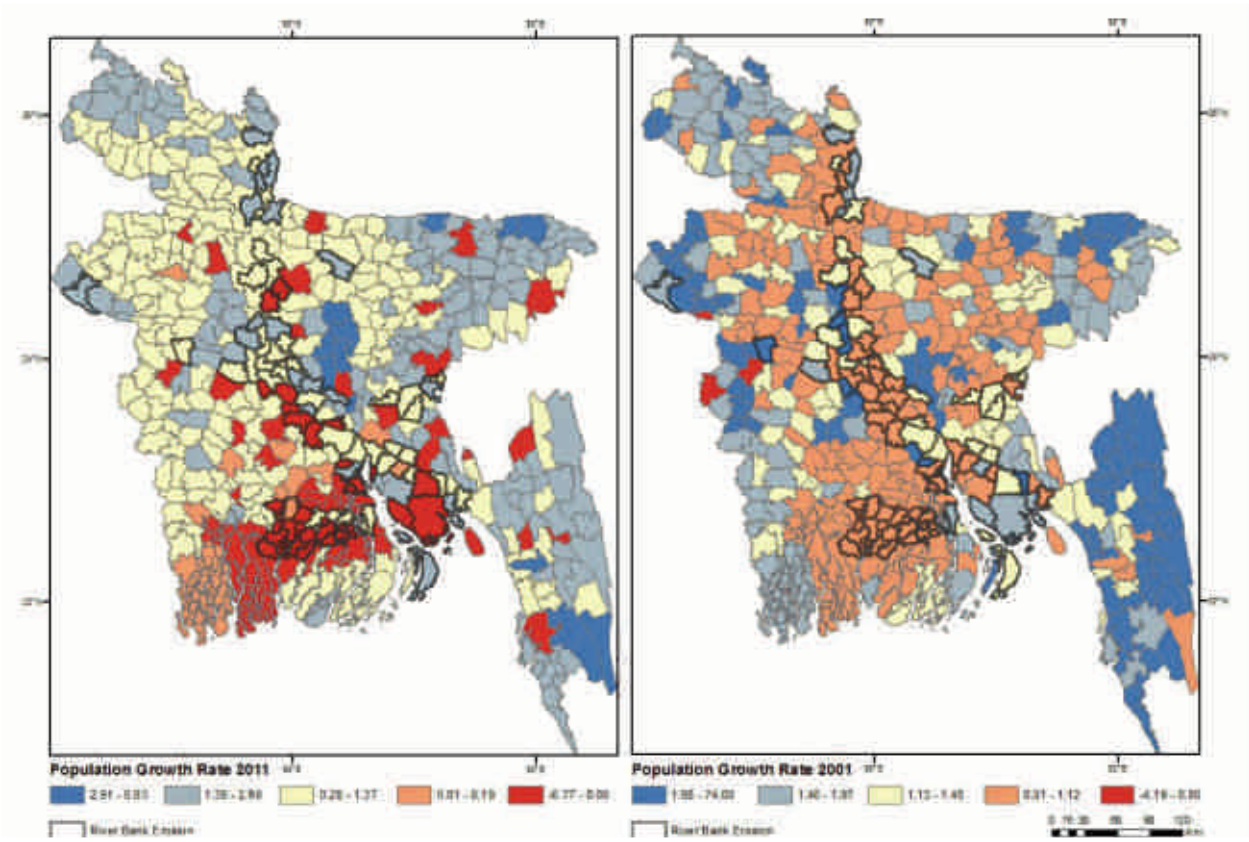


Figure 1. Upazila population growth rates for 2001 and 2011 censuses of Bangladesh. Upazilas affected by riverbank erosion and storm surge tend to report low or negative growth. The maps drawn by Pedram Rowhani are based on data from the Bangladesh Bureau of Statiand Haque and Zaman (1989)

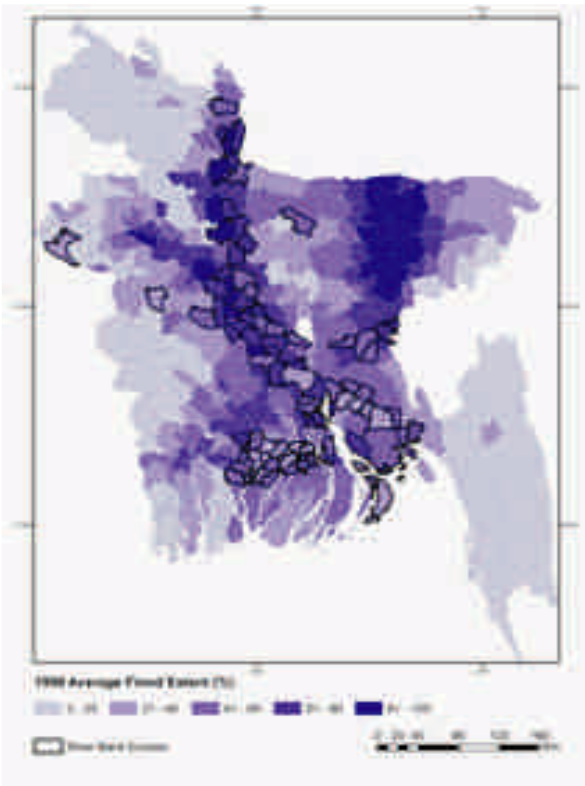

Figure 2. Districts of Bangladesh affected by 1998 flood and riverbank erosion. Courtesy: US Department of State.


Figure 3. Map showing affected districts of Bangladesh due to Cyclone Sidr, November 2007. Courtesy Humanitarian Information Unit, US Department of State

## References:

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## Climate-related migration in Bangladesh project

'Climate related migration in Bangladesh' is a project of the Sussex Centre for Migration Research, University of Sussex and Refugee and Migratory Movements Research Unit, University of Dhaka, funded by the CDKN. It aims to understand, plan for and respond to climate-induced migration. It seeks to reduce people's vulnerability and build resilience. The project will produce qualitative and quantitative evidence on climate change and migration in Bangladesh, identify policy gaps and make recommendations to minimise the costs and risks associated with such migration and maximise its contribution as an adaptive measure. The Government of Bangladesh is a key stakeholder in it. This briefing paper was written by Dominic Kniveton, Predam Rowhani and Maxmillan Martin at the Department of Geography, University of Sussex. For more information please contact : d.r.kniveton@sussex.ac.uk. @rmmru.org.

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