

## Socio-economic vulnerability to flood risks in Bangladesh: How do poor people cope?

### Overview

Bangladesh is a highly flood prone country, situated in the deltas of the rivers Ganges, Brahmaputra, Jamuna and Meghna. These large rivers fill up with melted snow from the Himalayas, while heavy rainfall during the monsoon season (June to October) combines to bring extensive floods. Nearly half of all people in Bangladesh live below the poverty line, many of whom are dependent on natural resources found in the floodplains of these rivers. Flood disasters once every ten years or so can mean a total loss of livelihoods: families are made homeless, fish farms are destroyed, fodder for livestock is lost and cattle and poultry drown. Drinking water becomes scarce as a result of contamination, while cases of diarrhoea, cholera and other waterborne diseases increase dramatically during and after floods.

Climate change during the past decades has exacerbated the problem. Increased monsoon rainfall and a speeding up of the melting of Himalayan snows has meant that annual floods are now even more serious. Nearly 35 million people in Bangladesh are affected (25% of the total population) every year. Some of these people are better able to cope with floods than others. Those people most likely to be the hardest hit by flood disaster are the poor, who lack adequate means to take protective measures, and usually have little capacity to cope with the loss of property and income after a flood.

This study aims to assess vulnerability to flood risks and comprehensive adaptation mechanisms to reduce flood damage by different socio-economic groups in rural Bangladesh: how are different groups of people and communities affected by flooding, and how do they cope with the impacts of floods? This study tests the effectiveness of different coping strategies in reducing flood damage costs. As expected, poor households are more at risk of flooding, but somewhat paradoxically, the people facing the highest risk of flooding are the least well prepared, both in terms of taking household preventive measures and having access to community level flood relief.



### Issues facing policy-makers:

- Who are most vulnerable to the risk of flooding?
- What are the characteristics of those households who are able to successfully cope with flood damage? Which adaptive coping mechanisms do they employ?
- Are existing social networks and institutional arrangements capable of providing effective flood disaster relief, medical health care and micro-credit systems? If not, how can such networks be implemented or improved?



### Study Area

Bangladesh is situated in Southern Asia, bordering the Bay of Bengal, between Myanmar and India. The case study area is located 70 km south-east from Dhaka in a severely flood prone area in the sub-district Homna, part of the district Comilla. The floodplain delta covers 13,000 hectares and is bordered by the Meghna River. Nearly a quarter of a million people live here, most of whom are small-scale and landless farmers. Rice is the main crop. Other crops include wheat, vegetables, pulses, oil seeds and maize. There are also communities of fishermen found along the rivers and creeks.

For nearly half of the monsoon season, two thirds of the area is submerged under six feet of water. As a result, employment opportunities decrease dramatically, with around eighty percent of the labour force becoming unemployed. During the 2004 flood, Homna was identified in the Rapid Flood Assessment as one of the most severely affected areas in Bangladesh in terms of percentage of area inundated, inundation depth ( $\geq 2$  meters) and percentage of people affected.

### The approach

Trying to understand vulnerability and adaptation to environmental risk such as flooding is complex and multidimensional, so it is important to use the right mixture of qualitative and quantitative research methods to collect and process information. A large-scale household survey was conducted in the study area to collect information regarding individual vulnerability. Vulnerability is a relative term, and within any society, wealthy or poor, some people are likely to be more vulnerable than others. Although a community may face the same risk, all people will not be equally vulnerable. Around 700 floodplain residents who live without any flood protection along the river Meghna were asked about their flood risk exposure, flood problems, flood damage and coping mechanisms. In addition, in-depth interviews with key informants including fishing community leaders, health workers and agricultural extension officers provided information about collective vulnerability. The model used to analyse the associations and relationships between flood risk, poverty and vulnerability in the case study is shown in Figure 1.

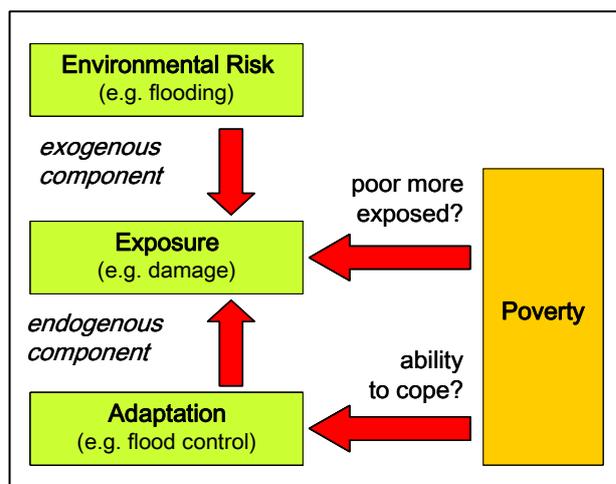


Figure 1: Analyzing socio-economic vulnerability to flood risk expos

### Key findings

#### 1. Poor households are more at risk from flooding

As in previous studies in Asia, our findings confirm that poorer households live closer to the river, that is, face a higher risk of flooding and are thus more vulnerable. Average flood damage costs can be as high as one fifth of annual household income (US\$190 per household per year). The poor suffer more from flooding in relative terms: the share of annual damage costs is significantly higher for those living under the poverty line than for those living above this threshold. However, in absolute terms average damage costs are significantly higher for



wealthier households for the more a household has, the more that can be lost or is at stake to be lost. Farmers and fish cultivators suffer most damage, both in absolute and relative terms. Approximately one third of their annual household income is lost due to flooding. Another indicator of risk exposure is the inundation depth as a result of flooding that families are exposed to. For example, this can vary in severity between flooding which only reaches up to the yard and flooding in the house reaching depths of three feet or more. Those families with a low household income and little or no access to productive assets such as land, crops and fish farms are more at risk from flooding and face higher inundation levels than wealthier households (see Figure 2).

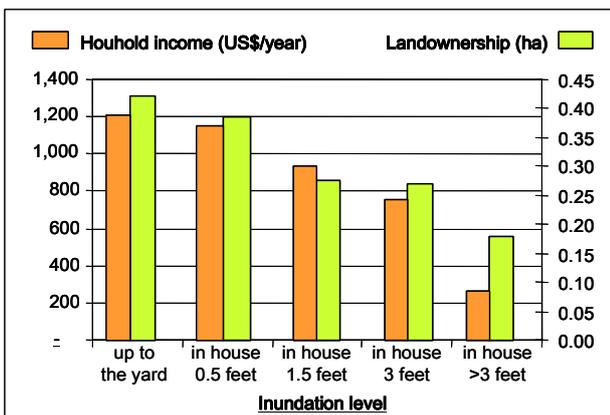


Figure 2:: Relationship between inundation depth and household income (US\$/year) and inundation depth and landownership (ha)

### 2. Wealthy households are more able to cope with flooding

Households and villages employ a range of coping mechanisms to deal with flood damage. These can be preventive and put in place before flooding happens (ex ante) or they can deal with the effects of the flood after it has happened (ex post). One type of ex ante coping mechanism is income diversification. This is the increase in the number of

income sources coming into a household each year. For example, a household may earn money from rice farming, selling livestock, working as a labourer and selling fish. In the study area, income diversification appears to be an effective coping strategy, but one that is primarily followed by wealthier households (see Figure 3). Households living further away from the river have more income as well as more diverse sources of income.

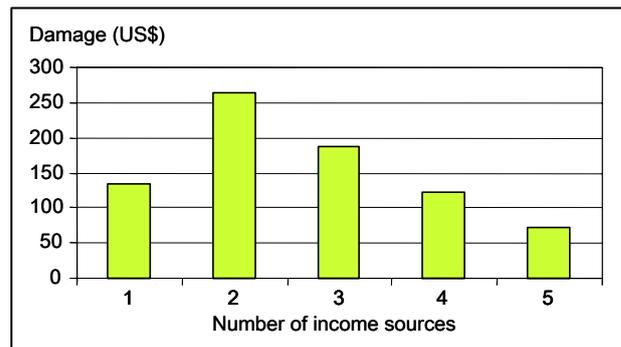


Figure 3: An increase in household income sources goes hand in hand with lower flood damage costs

An ex ante coping mechanism employed primarily by wealthy households is land elevation work. Households who put preventative measures such as these in place earn significantly higher incomes and have significantly lower flood damage costs. Poor households do not have the money to undertake such measures. At least one third of households furthermore do not know what type of measure to take and believe flooding is a natural process, which cannot be prevented.

### 3. Collective coping strategies are almost non-existent

There seem to be few social networks or institutions in the area, formal or otherwise, that exist to help villages cope ex post with flood damage on a collective scale.



Flood affected poor families are allowed to take shelter in village schools for the duration of the floods, or move to district flood relief camps managed by the local government. However, once flooding subsides, no formal supporting network exists. Flood affected families have to rely on family, neighbours and friends, or informal micro-credit systems such as buying food from the local shop on credit. Many families are unable to mitigate their income and asset losses by selling land and livestock as they just do not have enough to sell in the first place. Villages that face higher flood risk exposure also have more unequal income distribution, and as a consequence are less likely to be able to fall back on community level coping mechanisms.

### Policy recommendations

Vulnerability and poverty alleviation go hand in hand. In the long term, poverty alleviation in rural Bangladesh will enable poor households to employ more effective coping strategies against flood damage. Increasing household income will enable the poor to implement preventive measures and mitigate their land and income losses, thus recovering from the costs of flood damage more easily. Effective ex ante and ex post pro-poor flood coping strategies, targeted at and differentiated across different segments in society have to be part of a more comprehensive sustainable development policy strategy. This research provides some clues as to how to achieve this:

**1. Ex ante protection** through controlled flooding, which is the preferred option among the floodplain residents who participated in our study. A submerged embankment in the river allows regular flooding and cultivation of floodplain rice, but protects the area from disaster floods. Such a

preventive structure furthermore avoids damage costs as a result of water logging in the case of a fully closed embankment or erosion of fertile floodplain soils. Although the construction of flood protection infrastructure has always been a task and financial responsibility of the central government, floodplain residents are willing to contribute to the costs of such an embankment, either in cash or in kind (for example by labor input or giving up part of their harvest).

**2. Ex post provision of flood relief** through the implementation of a formal and effective support network. This needs to provide affected families with access to formal health care and micro credit both during and after the flood. This could be facilitated by one or more of the NGOs that currently operate micro credit schemes in the study area. Another option investigated in more detail in a follow-up PREM project in Bangladesh is the introduction and design of different insurance schemes, targeting different occupational groups, focusing on material damage, health and unemployment.



### PREM: In brief

The Poverty Reduction and Environmental Management (PREM) programme aims to deepen and broaden the exposure of economic researchers and policy advisors in Africa and Asia to the theory and methods of natural resource management and environmental economics. It is anticipated that this will encourage policy changes that address both poverty reduction and sustainable environmental management.

This policy brief is based on the PREM Working Paper, 'Socio-economic vulnerability and adaptation to environmental risk: a case study of climate change and flooding in Bangladesh'.

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