XL Reinsurance

Disaster Recovery Case Studies Bangladesh Floods 2004

In cooperation with

Centre for
Risk Studies

UNIVERSITY OF CAMBRIDGE
Judge Business School

2004: The Bangladesh Floods

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Introductory Commentary

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The important role of (re)insurance in the speed of physical and economic recovery after a major disaster, especially when there is little to no coverage due to unavailability, insufficient capacity or lack of take up (predominantly because of economic reasons), has not really been studied in detail. The (re)insurance industry tends to focus on the potential for future events and events in the immediate past. However, there is a need for a deeper understanding of the aftermath of disasters over a longer time frame, as well as an understanding of the impact that insurance penetration has on the pace of economic recovery.

Working with Cambridge Centre for Risk Studies at the University of Cambridge Judge Business School (CCRS) we have been examining more than 100 catastrophes across the world over a three-year timeline to compare and contrast outcomes and establish conclusions and recommendations. A consolidated report will be released later in 2020 but the case studies (this one covers 2004 Bangladesh Floods) produced by CCRS were so interesting and of such quality we thought it would be beneficial to share these as they became available. In the future we intend to make available publicly all of the detailed work from all of the case studies in an open source database whilst also establishing a template to study and collect data from future catastrophes in a more structured way.

Our aim is for this work to be used as a tool by policymakers and governments worldwide when evaluating disaster preparedness and seeking to fully understand, from the lessons learned by others, the impact of displacement of populations; increasing personal debt levels; change in economic mix of industry; political upheaval and overall time to recover, among other things. Intuitively, we know the speed and scale of protection the (re)insurance industry provides dramatically reduces the recovery time for communities which have suffered through extreme catastrophes. However, we believe that it is imperative that this be demonstrated in more detail with evidence and placed in front of the right people to effect change – particularly governments.

We also want to explain the marginal increased cost in relation to the value of rebuilding with resilience – what we call “building back better” – over and above the cost of replacement. The (re)insurance industry needs to provide extra limit and contractual stipulations for “building back better” to minimize the impact of future disasters. In addition to this, we want to demonstrate the importance of "building better before", that is encouraging our partners, including governments, through funding with NGOs, banks and other bodies to retrofit properties and strengthen vulnerabilities to avoid losses in the first place. This should result in savings on future insurance costs which would more than finance the initial upfront investment.

We are starting to see good progress in terms of the increased role of governments in closing the gap between economic loss and insured loss – since we started these papers we have seen the FEMA program in the US placed in the market for the first time; Flood Re in the UK become fully operational and the California Wildfire Fund established by the State of California and managed by the California Earthquake Authority (CEA), at least initially. The current pandemic is another unfortunate example of the difference between economic risk and insurance coverage with many businesses not prepared and not covered for what is a foreseeable peril. The enormous exposure made clear in the COVID-19 pandemic is far greater than the (re)insurance industry’s capital base and future coverage can only be provided with Governmental assistance. AXA XL Reinsurance are formulating ideas for possible future structures based on our work understanding government Pools in 2018 and will be sharing this work in due course.

There are discussions happening in numerous countries within the industry about working with government to provide some form of pandemic coverage. This work together with the more recent schemes where governments are de-risking are encouraging and signs of the partnerships being built up between governments and the industry. We will continue to support these initiatives with reinsurance and by sharing our findings from studies such as these.

The views, findings and opinions in this case study are those of the researchers at CCRS and not necessarily those of AXA XL. Notwithstanding this, we are proud to be associated with this project and are sure that by gaining a greater level of understanding, we will ultimately develop more catastrophe reinsurance solutions and, more importantly, show the world the true value and social benefit of (re)insurance.
AXA XL is the Property & Casualty and Specialty division of AXA Group: providing products and services through three business groups: AXA XL Insurance, AXA XL Reinsurance and AXA XL Risk Consulting.

Contents

Research Approach

The Cambridge Centre for Risk Studies conducted extensive research into the impacts of tropical storms and the characteristics of storm recovery. This case study is informed by secondary literature sources.

Abstract

Bangladesh is a land of rivers; the deltas of the Ganges, Brahmaputra, and Meghna rivers occupy 79% of the country. The country suffers frequent natural disasters and is highly vulnerable to flash, riverine, coastal floods and tropical storms, but also relies on water to sustain life and livelihoods. Between July and September 2004, the country was widely affected by riverine floods, which at their peak inundated 50% of the country. More than 36 million people were affected, and total economic losses were estimated at over US $2 billion. The floods displaced many settlements and impacted livelihoods, agriculture, and infrastructure, including in the capital Dhaka. This case study examines the impacts of flooding during this event in Bangladesh – a lower-middle income developing economy with low non-life insurance penetration – and the subsequent socioeconomic recovery.

The riverine floods of 2004 had disastrous consequences for people, property and the economy of Bangladesh. They also exacerbated the underlying problems of poverty, unemployment, food insecurity, fresh water supply, health and communication problems. The lack of development in the private insurance markets in Bangladesh has impeded a timely recovery of large industries after the floods. Furthermore, weakness in the institutional capacity of regulators has prevented expansion of the sector and has encouraged a fragmented insurance sector. Consequently, the central government is responsible for a major share of post-disaster costs to provide immediate relief. Recurring major floods and storms have crippled the finances of the country and therefore the economy, which slowed recovery and undermined the prospects of building back better and improving resilience. Measures are proposed to strengthen the insurance sector; however, their success will only be known in time.

Bangladesh is among the countries most exposed and vulnerable to climate change. Bangladesh's flat topography means that projected sea level rise is expected to inundate vast areas of low-lying land, while the country's dense population and weak infrastructure make it extremely vulnerable to extreme weather events. Climate change has already been found to exacerbate extreme rainfall in the monsoon season, and is likely to affect the frequency and severity of tropical cyclones, floods, and droughts. Bangladesh is expected to be challenged by vast numbers of climate change refugees – people who can no longer farm on drowning lands and are forced inland to the nation's already-crowded cities or across borders. Therefore, the need for effective disaster management and risk reduction is critical.

Section 1: Event Context

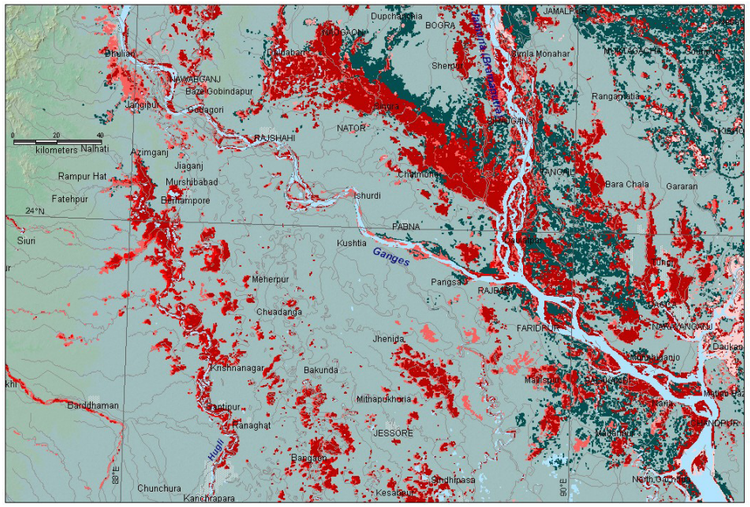


Figure 1: Extent of flooding Lower Ganges and Hugli Rivers Bangladesh and West Bengal June-October 2004

Event Overview

The floods of 2004 in Bangladesh affected the North Eastern and Central regions of Bangladesh. The event began in July with the onset of the monsoon and lasted some months, taking many urban residents by surprise. The flood hit 45 districts in Bangladesh and more than 36 million people were affected, inflicting severe damage to the poor and marginal groups in the country. The floods displaced many settlements and impacted livelihoods, agriculture and infrastructure. Furthermore, it exacerbated the underlying problems such as unemployment, low-income levels, food insecurity, water supply, medicine, and communication issues.

This riverine flood event unfolded in multiple phases:
- Early phase (mid-April): there were flash floods in some regions of the country, outside the typical monsoon season
- Initial phase (23-28 June): the water levels in most regions were as normal annual floods and therefore were not of major concern
- Aggravating phase (8-14 July): the water levels passed danger levels at many points in the country, indicating an increase in the likelihood of flooding
- Devastating phase (15-28 July): the floods were triggered by torrential rain and cascades from hills across the border and water levels reached their highest level at many points in the country
- Receding phase (28 July – mid August): the flood water receded in the Northern and Central regions of Bangladesh, which led to a rise in water levels in the Southern region and some coastal districts of the country.
- Renewal phase (mid-September): a localised depression caused a continuous torrential downpour that resulted in renewed flooding to Central parts of Bangladesh and in other areas that were not usually affected by annual floods.

Figure 1 shows the areas affected due to the 2004 floods in Bangladesh. It is interesting to note that areas closer to the river basins were more affected than other areas in the South and that some areas in the North were drought hit at the same time as the floods were at their peak in the rest of the country.

Socioeconomic Context

Bangladesh is a desperately poor country and about a third of the population lives in slums.[1] Yet despite widespread poverty, low per capita public social spending, and poor governance of service delivery systems, Bangladesh has, in recent years, achieved rapid improvements in many human development indicators, including girls' school enrolment, child mortality, and rates of modern contraceptive usage. Over the past 20 years, poverty in Bangladesh has declined substantially.[2] Moderate poverty decreased from a high of 78% to only 28%, while extreme poverty declined from 65% to only 14%. Poverty has declined substantially over the past 20 years and extreme poverty declined from 65% in 1996 to only 14% in 2016. The Bangladesh economy sustained strong growth in 2019 led by rising exports and record remittances that grew by 10%, reaching a record US$16.4 billion. Foreign direct investment increased by 43% with investments in the power, food, and textile sectors.[3] As in many other places in the world, the urban population of Bangladesh is rising while the rural population is falling. Urban areas have experienced a tremendous increase in size and population since the 1970s.[4] Today, more than 53 million people live in urban areas, representing about 34% of the total population.[5] The capital and largest city, Dhaka, is home to almost 15 million people and is one of the most densely populated cities in the world with a density of about 20,000 inhabitants per square kilometre.

Floods are both a blessing and a curse for Bangladesh. Too little water may cause drought, threatening crop failure; too much water may cause flood disasters.[6] Floodwaters engulf a third of the country for four or five months every year. Bengali has two words 'varsha' (normal beneficial floods of the rainy season) or 'banya' (harmful floods of abnormal depth). Floods bring invaluable benefit. During the peak season (July, August, September) most of the rivers overflow their banks and deposit silt on the flood plains providing vital moisture and fertility to the soil, which makes Bangladesh one of the world's most fertile countries. Floods recharge underground water supplies, replenish soil nutrients, and provide breeding and feeding ground for fish, an important source of animal protein.[7] However, floods also bring loss and

hardship to millions of people. Displaced people experience substantial socioeconomic impoverishment and marginalisation as a consequence of involuntary migration. Most try to stay close to their place of origin, which for many people is on floodplains, or 'chars'[8]; they lack the financial means to move to the city, want to stay close to their social networks, and they hope to reclaim their land.[9]

River overflows deposit mineral-rich silt on land. Nitrogen-fixing algae grow in the submerged fields and the alternating cycles of oxygen-reduction and oxidisation in soil make the land highly fertile. Weeds, leaves, and unharvested crops decompose in the submerged fields and augment soil fertility. Floodwaters replenish the underground water table.[10] All these factors work together to improve agricultural productivity, and areas that are flooded see the highest annual crop yields in years of 'normal' flood, while the lowest are in drought years. This pattern of agroecology is relevant in the design of flood hazard mitigation. Structural measures of flood control, including river embankments, that are designed to stop the floodwaters from reaching the fields, will also stop the natural annual process of replenishment of moisture content and fertility of soil[11] and non-structural measures, such as emergency preparedness and relief provisions, play a more helpful role.[12] An optimal solution would garner the positive impact of flooding, while providing adequate institutional support to the affected population to help smooth consumption and income streams during disasters.

Risk Landscape

Several indices have ranked Bangladesh among the countries worst affected by natural disasters. The World Bank's Global Risk Analysis in 2005 placed Bangladesh on a list of 60 countries that endure multiple hazard events per year, while the UNDP's Disaster Vulnerability Index of 2004 placed Bangladesh among the most vulnerable countries to natural disasters. A third of the total population is exposed to extreme weather hazards, namely tropical cyclones, floods, and drought, as well as earthquakes. The Cambridge Global City Risk Index 2020 developed by the Cambridge Centre for Risk Studies (CCRS) ranked Dhaka, the capital of Bangladesh, the first in the world in terms of its GDP@ Risk metric due to floods. It was estimated that US$1.3 billion of Dhaka's annual GDP was at risk from catastrophic floods. This is compared to the 2004 flood economic loss of US$2.3 billion.

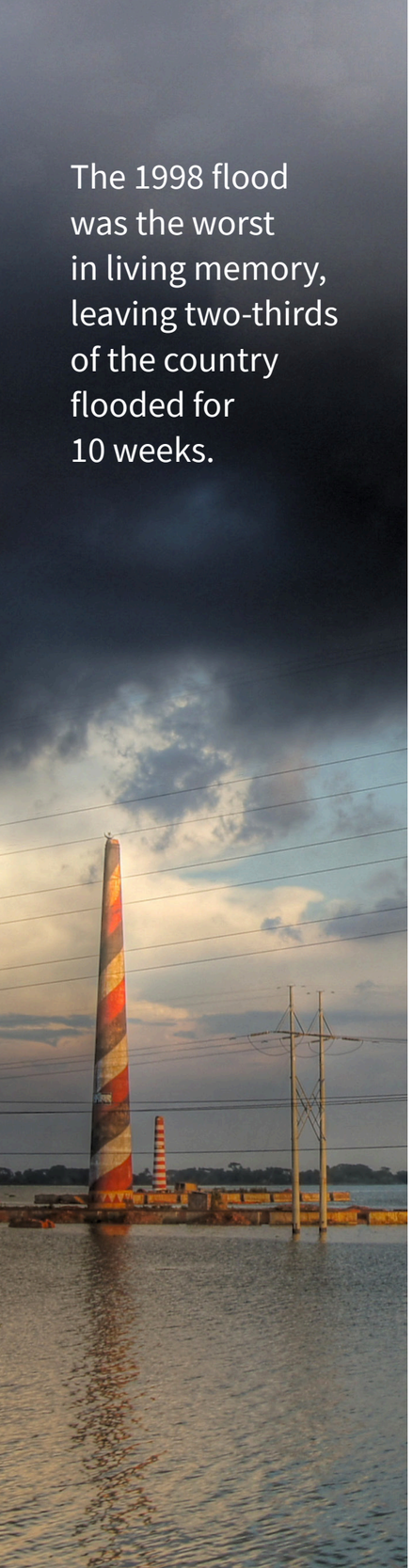
Floods are of particular concern, since major individual events can affect vast areas of land and affect significant portions of the population. Bangladesh is a land of rivers: there are about 230 major and minor rivers in the country.[13] The majority of the land mass consists of floodplains and the geography is such that approximately 60% of the country is less than 6 metres above sea level. As a result, about 21% of the country (three million hectares) is flooded every year and this figure goes up to 60-70% in extreme floods.[14]

Bangladesh faces four main types of flood:

1. **Flash floods:** that occur in the eastern and northern rivers, resulting from exceptionally heavy precipitation occurring over neighbouring hills
2. **Riverine floods:** that occur from the overflowing of major rivers and their tributaries
3. **Rain floods:** that are caused by high-intensity local rainfall of long duration in the monsoon season
4. **Storm surge floods:** that occur in the coastal area of Bangladesh, which consists of large estuaries, extensive tidal flats, and low-lying islands

Bangladesh is the drainage route of the fluvial flows of the Ganges-Brahmaputra-Meghna (GBM) river delta systems; the nature of fluvial floods in the region depends on the flooding patterns from these major rivers.[15] A major portion of the country is affected by the annual floods, but some years have more intensive flooding than others. July to September is the peak monsoon season in Bangladesh, which affects most of the country in terms of agricultural crops and landmass. Highlands are typically at risks during peak monsoon season and can be subjected to flood risk due to unusually high precipitation. Furthermore, there are some parts of the country that are permanently wet.

1 Rahman 2015
2 Khandker et al 2016
3 World Bank 2019b
4 Walter 2016
5 World Bank 2015
6 Banerjee 2010
7 Rob 1990
8 Char-lands: areas surrounded by water
9 Mutton and Haque 2004
10 Hofer and Messerli 2006
11 Brammer, H. (1988) Floods in the agroecology of Bangladesh. Mimeo, Relief and Development Institute, London.
12 Rashid and Paul 1987
13 Alexander 1989
14 Majumder 2013
15 Haque and Nicholls 2018



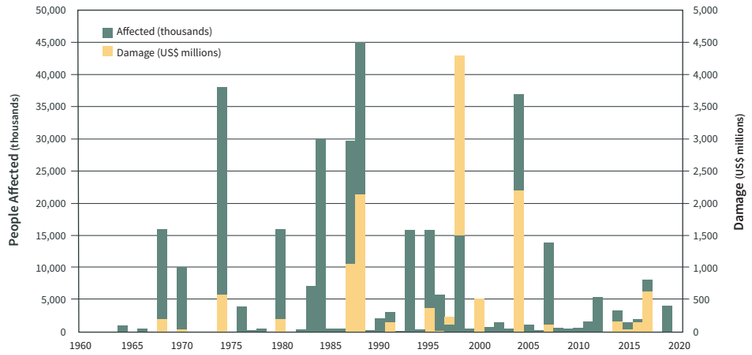


Figure 2: Flood victims and economic damage 1960-2019[19]

Figure 2 shows the total number of people affected and the economic damage caused by floods in Bangladesh.[16] There have been nine exceptional floods in the past 70 years. As well as in 2004 there were major floods in 1954, 1955, 1974, 1984, 1987, 1988, 1998, 2007 and 2017.[17] It is clear from both of these figures that 1998 was one of the worst years of flooding that Bangladesh has faced in several decades. Flooding has been less severe in the 16 years since 2004. The 1998 flood was the worst in living memory, leaving two-thirds of the country flooded for 10 weeks. Although a large portion of the aman (winter) crop was destroyed, the agricultural sector saw increased yields due to a good boro (spring) crop; and the construction industry grew by 8% in the following year. Manufacturing and private investment, however, showed a significant downturn, although it is difficult to disentangle the effects of the floods from more general patterns of disinvestment, partly caused by political uncertainty in Bangladesh.[18]

Further, Bangladesh is among the countries most exposed and vulnerable to climate change. The country's flat topography means that projected sea level rise is expected to inundate vast areas of low-lying land, while the country's dense population and weak infrastructure make it extremely vulnerable to extreme weather events. Climate change has already been found to exacerbate extreme rainfall in the monsoon season[20], and is likely to affect the frequency and severity of tropical cyclones, floods, and droughts. The potentially serious effects of climate change on the hydrology and water resources of the GBM delta that might lead to serious floods in Bangladesh were already being signalled twenty years ago.[21] These changes may lead to changes in the occurrence of flooding with a certain magnitude. Extreme flooding events will create a number of implications for agriculture, flood control and infrastructure in Bangladesh. Climate change will also have a negative impact on food production.[22] Bangladesh is expected to be challenged by vast numbers of climate change refugees – people who can no longer farm on drowning lands and are forced inland to the nation's already-crowded cities or across borders. Dr Rajendra Pachauri, the Nobel-prize winning previous chair of the IPCC has warned that Bangladesh is likely to generate such refugees on a scale never seen before.[23]

16 EM-DAT 2020
17 FFWC/BWDB 2017
18 Beck 2005
19 EM-Dat 2020
20 Rimi et al. 2018
21 Mirza 2002
22 Yu et al 2010
23 Prasad (2008)

Section 2: Disaster Impacts

Overview

The 2004 floods lasted from July to September and, at their peak, covered 50% of the country while 40% of Dhaka was under water. 730 deaths were reported and 30 million people were made homeless. Rural areas suffered and the rice, jute and sugar crops were devastated. The floods had severe socioeconomic impacts. Economic activity was affected by infrastructure damage and loss of capital. Bridges were destroyed and the airport and major roads were flooded which hampered relief and recovery. The total loss was estimated to at US$2.28 billion.[24] The damage to schools and hospitals was estimated at over US$100m. Homes and property were damaged and washed away, stressing poverty levels further. The floods increased unemployment, which affected landless poor the most. Daily wage rates fell and household debt levels increased, due to lack of savings and safety nets such as insurance. There were, however, no dramatic changes to commodity prices. The government adopted measures to boost aggregate demand through increased fiscal deficit and borrowing but the increased government spending on relief and reconstruction resulted in stresses in the budget allocation process. Furthermore, government revenues fell as the economy shrank and there was a short-term reduction in exports due to damage to the fisheries sector and to flooding of major factories that destroyed inventories and equipment. There was an increase in imports due to relief and reconstruction activities supporting post-flood rehabilitation.

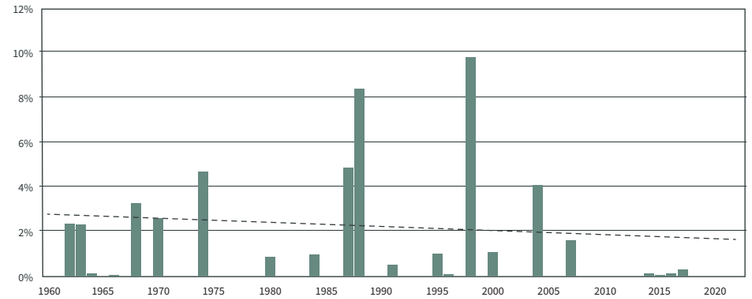


Figure 3: Loss due to flood damage as proportion of GDP 1960-2019[27]

Past floods in Bangladesh have had far ranging with negative impacts on macroeconomic variables, typically leading to migration, loss of agricultural production and failures of business continuity. Poorer households with lower income and less access to productive natural assets face higher exposure to risk of flooding.[25] And industries affected by flooding showed high 'linkage effects' compared to developed.[26] On average Bangladesh incurs losses equivalent to 1.5% of GDP annually due to floods (US$2.2 billion). Figure 3 shows that 1974, 1987, 1988, 1998 and 2004 were exceptional years when losses exceeded 4% of GDP. The trend line shows a slight fall in losses over the past 60 years.

Table 1 compares the 2004 floods with extreme events in 1988 and 1998. It is clear that the loss and damage from flooding in the two previous events was even greater than in 2004. For example, almost half the population of Bangladesh was directly affected by the 1988 flood, compared to a quarter in 2004.

Table 1 Comparison of losses 2004 floods with major floods in 1988 and 1998[28]

Loss	1988	1998	2004
Deaths	2,300	1,100	747
Proportion of total population affected	45%	25%	25%
Homes damaged/destroyed (million)	7.2	9.8	4
Economic losses (US$ billion)	2.1	4.3	2.3
Loss as a percentage of GDP	8.3%	9.8%	4.0%
Livestock killed (millions)	172	27	8
Crops damaged (million ha.)	2.1	1.7	1.3
Rice production losses (million metric ton)	1.7	2.1	1.0
Roads damaged (km)	13,000	15,927	27,970
Percentage land inundated	61%	68%	38%

24 Beck T
25 Brouwer et al. 2007
26 Islam 2013
27 Ozaki 2016; EM-Dat 2020; World Bank 2020
28 Banerjee 2010

Physical Impacts

There was widespread infrastructure damage, mainly to rural roads (over 14,000 km), bridges, culverts and embankments, which hampered efforts to respond to and recover from the flood.[29] Affected Districts needed major assistance to rebuild the local infrastructure, provide employment opportunities, restore livelihoods, and reduce vulnerability and environmental degradation. Every district needed area-specific plans for the work that had to be carried out. The impact of the floods varied by region. Table 2 shows how Dhaka and Sylhet were disproportionally hit by the floods.[30] This suggests that the interior regions of Rajshani, Dhaka and Sylhet are more vulnerable to monsoon driven riverine floods than are coastal regions. Rajshahi was also disproportionally affected by the 2007 floods.

Table 2. Damage by Region

Region	Loss (US$ million)	Share of Damage	Population 2011 (131 million)
Dhaka	938	43%	38%
Rajshahi	374	17%	14%
Khulna	3	0%	12%
Sylhet	535	24%	7%
Barisal	61	3%	6%
Chittagong	285	13%	22%
Total	2,196	100%	100%

On average, 0.9 ha of land per household was lost between 1962 and 2016. About 10% of households lost all their land and 20% of households lost more than 80% of their land. Analysed by socioeconomic status, the poorest households have lost the most.[31]

... widespread infrastructure damage, mainly to rural roads (over 14,000 km), bridges, culverts and embankments ... hampered efforts to respond to and recover from the flood.

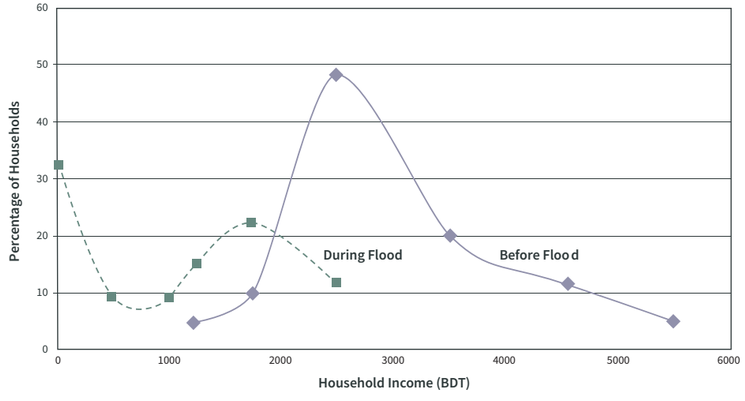
29 GoB 2004
30 Haque and Jahan 2015
31 FFWC/BWDB 2017

Socioeconomic impacts

The occurrence of regular flooding events, associated with eroding land, forces families to relocate every two to three years and because of a growing population, finding new places to live and farm has become increasingly difficult. Bank erosion victims tend to relocate to nearby land, hoping that they can recoup their land in the near future. In the meantime, they either change their occupation from farmer to day labourer, fisherman, or temporarily migrate to cities. However, recovery is hard and income loss and asset loss recovery is difficult even for rich people. Furthermore, due to the lack of employment, many people take loans at high interest during the flood season in an attempt to increase their loss recovery capacity. People try to put money aside for the flood season; however, their savings evaporate rapidly during the flood season when monthly expenses can be higher than incomes. As a result, people get poorer.

During the 1988, 1998 and 1999 floods in Bangladesh hundreds of industries, especially garments factories went under water, which destroyed raw materials, machineries worth millions of dollars and some factories never recovered.[32] The impact of the 2004 floods on industry was not so severe, but the impacts on the labour market resulted in shifts in occupation, which challenged people's adaptability and survival skills. About a third of the labour force in the region lost their livelihoods and nearly half (47%) of the regional workforce changed their occupation. The majority of people dependent on agriculture faced large losses and in the agriculture sector about a quarter (23%) became jobless. Huge areas were inundated, which led to a quarter (23%) of the workforce shifting to a water-based occupation such as boatman and fisherman. About 13% of people became day labourers, rickshaw or van pullers in a nearby city. Businessmen and day labourers were severely affected by disruptions in transportation and markets whilst those in the urban service sector were the least impacted.[33] The absence of agricultural work and day-labour opportunities dramatically increased unemployment, which had the heaviest impact on the landless poor, who rely entirely on day-labouring, and on marginal farmers. This has resulted in significant reduction of wage rate in the affected areas. The majority of household incomes fell below the poverty line (World Bank International poverty line US$1.90/day). Before the flood almost two-thirds (63%) of respondents to a survey said that they earned less than BDT 3000 per month (US$39). During a flood, household income dropped dramatically and a third of the households said they had no income at all during floods and were completely dependent on external finances – borrowing money, or liquidating assets – for funding their survival and recovery. Figure 4 illustrates this dramatic fall in household incomes.

Figure 4. Household income before and during the 2004 Floods



32 Dewan 2015
33 Parvin et al. 2016
34 Parvin et al 2016

Section 3: Disaster Management and Resourcing

Sectoral Impacts

Table 3 details the impacts of the 2004 floods and associated recovery costs by sector. Flood disasters lead to a change in consumer spending and public/private investments. Production losses reduced supply of essential goods and contributed to inflationary pressure, which led to reduced purchasing power of people and lowered the standard of living. However, commodity prices did not increase dramatically in 2004, but the lack of employment meant that staple items were out of the reach of low-income families. CPI inflation, which was 5.7% in 2003, increased to 7.6% in 2004 and dropped to 6.7% in 2006. Investment in construction showed a big increase, consistent with the need for higher reconstruction capacity required for a successful recovery. In contrast, data from floods in 2011 suggest that staple foods such as Atta (wheat) and lentils increased in price by 39% and 23% respectively and overall food prices of all commodities increased by 14% due to shortages of supply and the need to import at higher prices to meet the demand.[35]

35 IFRC 2011

Table 3. Damage, loss and reconstruction cost by sector (all values US$ M) (NEDA, 2013)

	Damage	Loss	Total	%	Estimated recovery cost	%
Agriculture	709	698	1,407	11%	423	5%
Industry, services	906	1,722	2,628	20%	1,604	20%
Housing	6,885	485	7,370	57%	4,150	51%
Education	491	50	542	4%	688	8%
Health	71	55	126	1%	156	2%
Local government	91	7	97	1%	97	1%
Social protection					417	5%
Transport	141	1	142	1%	169	2%
Roads, bridges etc	96	7	104	1%	117	1%
Electricity	155	197	352	3%	225	3%
Water and sanitation	68	105	173	1%	130	2%
Total	9,613	3,327	12,941	100%	8,177	100%

Disaster Management

Disaster management is largely the responsibility of individual families and local communities, many of which are completely cut-off by the floodwaters. Bangladeshi people use multiple strategies to live with flooding events and associated riverbank erosion – they relocate, evacuate their homes temporarily, change cropping patterns, and supplement their income from migrating household members. In this way, they can reduce the negative impact of floods on their livelihoods. However, these societal responses also have negative outcomes, such as impoverishment.[36]

Major rivers in the country face erosion and, along with heavy rainfall in catchment areas, could lead to floods during the monsoons, especially near flatlands, such as low-lying areas in the Sirajganj district. Flood protective structures are not well maintained due to a lack of funding. Flood control embankments, if not maintained beyond 5-10 years, become vulnerable to extreme floods. Beneficiaries are not made responsible for maintaining and managing the structures and there is no well-accepted damage assessment procedure in place.[37]

Authority

The government set up the Disaster Management Bureau (DMB) under the Ministry of Disaster Management in 1993 to promote disaster prevention, mitigation and preparedness and provide guidelines, organise training and awareness for the concerned people and stakeholders to mitigate impacts of disasters. DMB has initiated a change in policy, strategy and programmes and some of their projects are yielding good results in building capacity for disaster preparedness. The government of Bangladesh is aware that investment should be directed towards restoration of livelihoods and housing services at the recovery and reconstruction phase using a ‘build back better’’ approach but finds great difficulty applying this principle.[38] Food control and irrigation measures often prove ineffective because of the poor quality of riverbank protection works. The Bangladesh Water Development Board adopts a “patch and mend” approach to rehabilitating flood protection works.[39] Contractors are required to replace defective work but, typically, material intended to deter riverbank erosion has been washed away and is not replaced. Sluice gates become ineffective because earth embankments surrounding polders[40] were destroyed during the 2004 floods. This causes water to flood rice paddies during the rainy season and critically needed water to escape during the dry season.

36 Ferdous et al 2019
37 Hassan 2005
38 GOB 2008
39 Murray 2006
40 A polder is an area enclosed by an embankment with sluice gates to control the water inside the embanked area.

Financing

The primary factor that affects disaster management is the availability of funding and in terms of livelihoods, the most important factor in the 2004 floods was insufficient credit during the recovery period. This vulnerability of poorer households to floods keeps people in poverty. An opportunity for households and communities to escape this poverty trap is to receive credit to buy productive assets. This is an area in which donors could usefully concentrate greater activity during the recovery phase. The Flood Response Preparedness Plan of Bangladesh (2014) presents a resource mobilisation strategy and lists government sources of finance for disaster relief and recovery. The annual budget in 2014-15 was US$4.3m as cash support plus 80 million metric tons of rice. It also lists possible non-government sources. In 2013 the GoB response to floods was two-thirds (65%) of total resources mobilised; NGOs provides 22%, UN 6% and the IFRC 7%.[41]

Disaster reconstruction largely involves reallocation of expenditure from the Annual Development Plan to relief and recovery. Figure 5 shows all monetary flows into Bangladesh since 2000. It indicates that government revenue, the bulk of which comes from sales tax, has been steadily rising from US$6 billion in 2000 to nearly US$30 billion in 2018. Remittances are also a key source of income and kept pace with government revenue until 2013. Other international resources include foreign investment (10% of total resources in 2106) and borrowing (8% of total resources in 2016). International development assistance has remained fairly constant at about US$2-3 billion per annum or 14% of total in 2016 over the 20-year period (14% of total resources in 2016). Declared Government support for all recovery efforts was US$60 billion.[42] How much of this was actually spent on recovery is unknown. Bangladesh is one of the most corrupt countries in the world, ranked 149 out of 180 countries on the 2019 Corruptions Perceptions Index[43] and has a score of 26 out of 100 on the GINI Corruption Index.[44]

The graph also shows international aid as a histogram. (Note: these sums are US$ million and not billion). Aid rose to US$168m in 2008 and has been fairly steady at about US$100m per annum since 2012. This is an insignificant amount given the population of Bangladesh and the challenges it faces. For example, in 2005 and 2006, the years after the floods in 2004, total international aid was only US$54m compared to a loss in 2004 of over US$11 billion. This humanitarian aid is essentially for immediate emergency response rather than recovery and reconstruction.

Bangladesh has four primary internal sources of funding for disaster recovery: government reserves, central bank, private insurance and microfinance (Table 4). Of these only the microfinance sector provides significant funding and the microfinance sector in Bangladesh is one of the world's largest. Microfinance programs in Bangladesh have been running for nearly 30 years, primarily with the social goal of outreach to the rural poor to enhance nonfarm employment and income generation in order to lift the poor out of poverty. More than 90 percent of microcredit borrowers in Bangladesh are women. Since the mid-1980s, after the government opened up insurance markets, 12 life insurers and two general insurers (health and flood) offer micro-insurance. Microfinance meets the financial needs of a relatively poor clientele by offering temporary loans, loan forgiveness, rescheduling of loan, asset replacement, housing loans, and loans for starting new activities. There are currently 742 registered MFIs with the Microcredit Regulatory Authority with 26.4 million members and 19.7 million borrowers. As of 2014, sanctioned loans were US$3.3 billion and total savings were US$1.2 billion.

These internal funds are clearly insufficient to fund relief and major reconstruction and Bangladesh has relied on external funds to finance recovery. External funding for post disaster recovery and development in Bangladesh is mainly in the form of international loans from development banks.

The World Bank was among the first development partners to support Bangladesh following its Independence, having committed more than US$30 billion in grants, interest-free, and concessional credits to the country. Bangladesh currently has a World Bank program totalling US$12.2 billion. Typically, these loans have a 30-year term, including a five-year grace period, and carry a service charge of 0.75 percent and an interest of 1.25 percent.[47] The Asian Development Bank (ADB) has also been a development partner of Bangladesh since 1973 and currently has a pipeline of 31 projects worth US$4.3 billion largely aimed at modernising the railways. Cumulative loans from the ADB total US$14.2 billion.

Figure 5: Total financial resources 2000-2018[45]

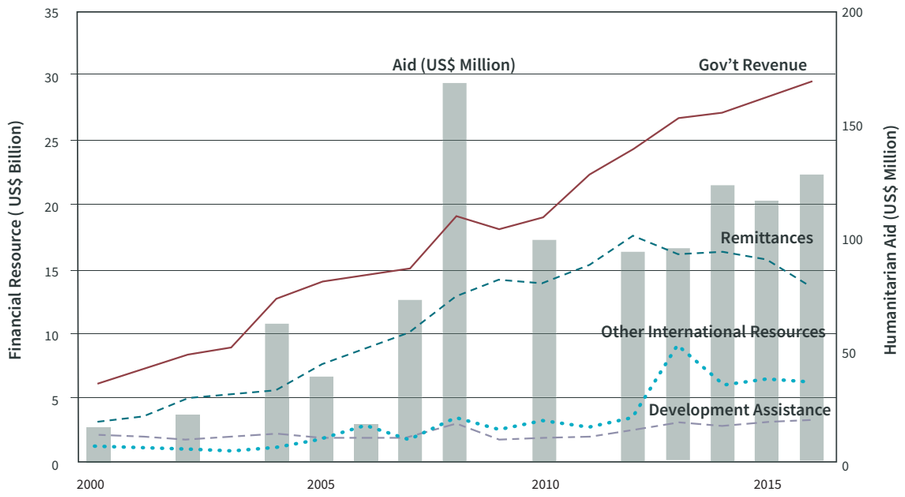


Table 4. Internal sources of disaster recovery funding[46]

Source	Amount
Government	
Disaster Risk Reduction Fund	modest
Emergency Fund Disaster Management	small
Fund for Unforeseen Incidents	US$14.3m/yr
Central Bank	
Fund for disaster risk management and capacity building	US$64.3m
Insurance	
State-owned Sadharan Bima Corporation (SBC) for general insurance	small
Private: 31 life and 46 general insurance companies operate in Bangladesh	insignificant
Microfinance Sector	
Temporary loans, housing loans and loans for starting new activities	US$3.3 Billion

The microfinance sector in Bangladesh is one of the world's largest.

...after the government opened up insurance markets, 12 life insurers and two general insurers (health and flood) offer micro-insurance.

41 GoB 2014
42 Guha-Sapir et al. 2016
43 Transparency International 2019
44 World Bank 2019c
45 Development initiative 2019
46 Ozaki 2016
47 World Bank 2019a

Section 4: Recovery and Resilience

Overview

Recovery is defined as a return to normality and an attempt to bring the post-disaster situation to some level of acceptable performance. However, a post-disaster 'normal' may not be a return to the same status as before the event, especially if safety and amenity can be improved to enhance resilience and achieve a new normal. Recovery from disaster can therefore be viewed as a process of resilience building, whereby the capacity of a community to spring back after the initial shock of a disaster is increased. Although there is a strong imperative to recover quickly and get people back home and business back in operation, a balance must be achieved between speed and enhanced resilience.

Speed of recovery

Floods are not short-term events; the impact of a flood on livelihoods can last for a considerable time and floods may leave lands waterlogged for several months.[48] A survey after the 2004 floods found that on average, construction work started at the earliest 12 months after the floods had receded, and the restored infrastructure's benefits could not be made available before 18 months. People with access to resources were more likely to reconstruct their houses faster than people with limited access to resources.[49] The next rainy season interrupted the work and delayed implementation further. About 65% of the people said that they could recover from the flood in less than one year, 25% said they needed two years, and 10% said three years or more.[50] Social and economic activity, including the return of children to school, was not fully restored to pre-flood levels until roads were repaired and bridges restored. However, people said that the impact would have been greater without rehabilitation after the 1998 floods.

The role of adaptability played an important role in the survival after floods in Bangladesh, particularly for agricultural workers who shifted to non-agricultural jobs after the event witnessed a lower percentage reduction in short-term wages.[51] Ironically, it was also true that those who faced the highest risk of flooding in Bangladesh were the least well prepared.[52] To exacerbate this, the poorer citizens live closer to river due to the nature of their job and thus faced higher risk of flooding and thereby were more vulnerable. Also, individual preparedness before the event and community-level relief after the event were lower. All of these factors affected the recovery process after major floods.

This overview of the literature on post-flood recovery patterns in Bangladesh has permitted an estimate of the speed of recovery shown in Table 5 and Figure 6. Housing was the fastest sector to recover and we imagine that over 90% of homes were rebuilt within 12 months. The majority of people live in low-cost primitive structures which are quick to repair as soon as the waters recede and as long as materials are available.[53] We imagine that farming mirrored this pattern of recovery and that 90% of agricultural production had recovered within 18 months. About 20% of households cultivated fast growing crops after the severe flood in 1988, and about 15% of households did so after the flood events in 2007 and 2015.[54] However, floods bring benefits in terms of higher crop yields in the season following a major flood. For example, after the 1998 flood agricultural economic performance was even better than expected: a growth rate of 4.9% in 1999 compared with a pre-flood projection of 2.4% growth and initial post-flood assessments of a 10-11% decline in output.[55] Micro-enterprises also show fairly quick recovery and that about 50% of them recovered within a week after floods.[56]

This speedy recovery is not the case with capital and resource intensive industries. Heavy industry, for example brick making, and industries using plant and machinery, for example fish processing, are much slower to recover. Only private insurance would allow industries with heavy and expensive machinery to re-equip quickly after disasters. Businesses said that profits fell severely because damaged roads made markets inaccessible, and business ventures were abandoned and jobs lost. A case study of the impact of road condition on the brick manufacturing industry illustrates this point. The brick making industry was badly hit. One kiln owner was obliged to sell his bricks for 12% less than cost because none of the potential buyers was willing to bear the extra transport costs of carrying bricks to Dhaka. The survey team counted more than 20 kilns along the project road facing similar problems. The garment industry is also heavily dependent on road transport. During the 1998 floods, some factories could not fulfil their export commitments because of lack of access to the nearest port, while some managed to fulfil part of their commitments by using water transport. Upgrading roads to flood-proof is crucial for industry to continue to operate in a sustained manner.

The speed and quality of infrastructure reconstruction is a major issue in Bangladesh. Our estimate is that it took over four years for roads, bridges, culverts, sluice gates and embankments to be repaired.

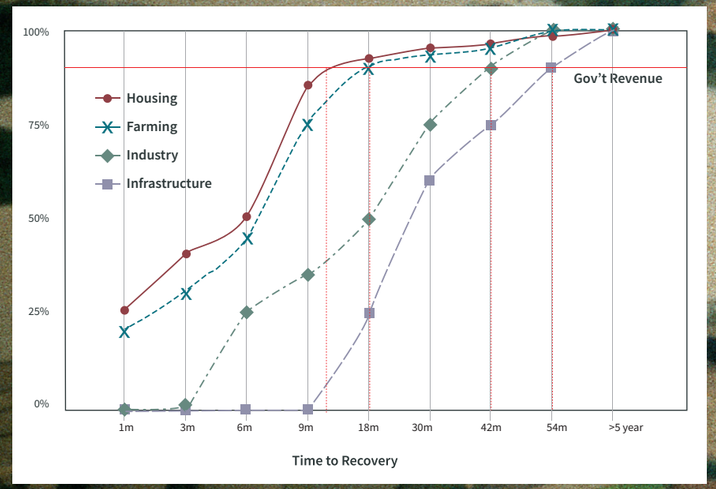
48 Cosgrave 2014
49 Islam 2018
50 Murray 2006
51 Mueller and Quisumbing 2011
52 Brouwer et al. 2007
53 Hasan et al 2000; Uddin 2008
54 FFWC/BWDB 2017

55 Benson and Clay 2002
56 Khan and Ahmed 2013

Table 5. Speed of recovery (months to recover ≥90%)

Sector	Months to recover ≥90%
Housing	10
Agriculture	18
Industry	42
Infrastructure	54

Figure 6: Speed of recovery



The speed and quality of infrastructure reconstruction is a major issue in Bangladesh.

Quality of recovery

Government led assistance projects have consistently rehabilitated infrastructure to pre-flood levels to restore normal economic activity as quickly as possible. However, the restored facilities remain prone to, and are generally damaged by, subsequent floods.[57] A consensus is emerging that rehabilitation after floods should consider upgrading the infrastructure rather than merely restoring it to pre-flood levels. The 1998 floods were handled better than earlier major disasters by government and NGOs, with support from the international community.[58] Improved and timely assessment of losses facilitated these responses. Some critical areas of vulnerability were exposed, including the garment industry's production and exports and the microfinance sector. Many continuing weaknesses in disaster management were underscored.

After the 2004 floods there were some improvements in safety. The Asian Development Bank's emergency assistance after the 2004 floods included assistance to enhance early-warning systems.[59] Communities become more resilient once they have more social capital. If people have others to fall back on post disaster they are better able to recover. However, for char-people in Bangladesh it is very hard to build resilience because most of them are living under poor circumstances so that they cannot easily bounce back after a flood or erosion has destroyed their homestead.[60] Individual households cope with floods in different ways, for example by building their houses on the highest land available. Food and other valuables are stored on platforms, in order to keep it dry during the annual inundations.[61] In advance of the monsoon season many households sell their livestock at low prices rather than risk of losing their entire investment if their livestock is killed by the flood. People have developed their own coping strategies and resilience to live with floods and other natural disasters in Bangladesh.

A consensus is emerging that rehabilitation after floods should consider upgrading the infrastructure rather than merely restoring it to pre-flood levels.

Local people require information, encouragement and support from government and NGOs during disaster events. Bangladesh has the most active NGO sector in the developing world, with over 6,000 registered organisations and NGOs bottom-up development with poor and disadvantaged communities contrasts with the centralised, top-down approach which characterises the government's approach.[62] A study of the 2017 floods in north-eastern Bangladesh found, paradoxically, that poor households are more adaptive than wealthy and middle-income households as poor people do not hesitate to take up any kind of jobs whereas middle-income households are generally reluctant to get flood relief or support from government; and rich households lack drive or motivation for devising any adaptive strategy as the general perception is that they are resilient in recovering quickly from economic losses because of wealth.[63]

57 Nadiruzzaman and Paul 2013
58 Benson and Clay 2002
59 ADB 2004
60 Debele 2012
61 Sarker et al 2003
62 Mallick et al 2005
63 Maksud Kamal et al 2018

Section 5: Discussion

Repeated floods slow development and confine the majority to poverty. Productivity gains are deferred because capital intended for the development of new industries, and for the construction of roads, bridges, and other growth-support infrastructure, has to be dedicated to disaster recovery.[64] However, changes in consumer spending and public/private investment during reconstruction, potentially reduces the loss by up to 1% of national output.

The Government of Bangladesh faces a dilemma in deciding where best to invest its limited financial resources in order to provide the country's present and future populations with a more secure and satisfactory quality of life.[65] The Flood Action Plan conceived over 30 years ago after floods in 1987 and 1988 had the objective of fully embanking the country's major rivers.[66] The plan arose out of the Flood Policy Study,[67] which envisaged that flooding behind embankments along the main rivers would be managed by sluice gates (controlled flooding) and, additionally, by secondary embankments (compartmentalisation).[68] These policy and plan objectives were not achieved. In part, this was because studies showed that economic returns from protecting agricultural land against periodic damaging floods were, at best, marginal and at worst damaging for the productivity and sustainability of the whole agricultural sector. Yet floods bring significant disruption and damage to Bangladesh's economic and social activities, affecting daily activities, water supplies and sanitation, washing away crops, polluting groundwater stocks, and destroying the buildings.[69] Flood management in Bangladesh is considered to be crucial to poverty reduction initiatives within the country.[70]

Considerations for the Insurance Sector

Bangladesh on average incurs a financial loss of over US$3 billion (about 2% of GDP) annually from cyclones and floods the total funding available for relief, rehabilitation, and reconstruction in the period 2000-2013 was only US$2 billion.[71] Despite this funding gap, insurance penetration is virtually zero and risk aversion does not affect the take-up of insurance. Formal insurance is understood very little by rural farmers, who are badly impacted by natural disasters and Bangladeshi households currently rely on informal risk-coping mechanisms such as savings, credit and loans in the absence of well-developed insurance markets.[72] Rural communities undertake self-insurance by forming a small network of neighbours or extended families to diversify risks by pooling resources to smooth consumption.[73] Designing cost-effective insurance products and creating efficiently functioning markets in Bangladesh are therefore challenging for the administrators and regulators.

Mainstream insurance companies, microfinance institutions (MFIs) and professional organisations such as the International Network for Alternative Financial Institutions (INAFI) offer "microinsurance" products. Most of these do not satisfy criteria for micro-insurance, except that they target the poor, and about 80% of contracts do not conform to any legally binding guidelines. Most insurers focus on life insurance and do not provide insurance for loss of property or livelihood, which would aid recovery.

The sensitivity of micro-credit to disasters is another indication of the need to incorporate insurance into all formal lending to the rural sector. At a national level the scale of reallocations by government and short-term borrowing at high cost after the 1998 floods suggest the need for risk spreading, including disaster-earmarked contingency reserves and, possibly, market-based instruments for risk spreading. Although index-based flood insurance has a theoretical appeal (i.e., no moral hazard or adverse selection and low transaction cost), high economic cost is associated with complex practical implementation. Regardless of the type of insurance model (standard or index-based) or the type of supply provision (partner-agent or full service), it is evident that rural households in Bangladesh are unlikely to be able to afford weather microinsurance at full cost.

64 Haque and Jahan 2016
65 Brammer 2010
66 World Bank 1989
67 UNDP 1089
68 Choudhury et al 2004
69 Shima et al 2010
70 Hossain 2003
71 Ozaki 2016
72 Clarke et al. 2015
73 Park 2006

The market for standard, stand-alone weather microinsurance in Bangladesh is characterised by low demand, poor governance, and lack of prospects for commercial viability.[74] The current regulatory arrangements for microinsurance fail to guarantee accountability and protect clients' rights. Regulatory reforms are needed to ensure good governance and to foster market efficiency through low-cost delivery and product innovation. Most health and life insurance policies work like a bond and buyers typically receive financial return at regular intervals during the life of the policy while the face value is returned upon maturity. Weather insurance offers compensation only when damage is caused by a natural disaster and fails to attract many purchasers. Private insurers also tend to prefer clients with regular incomes and do not generally offer insurance to people with low or irregular incomes. In contrast, in India, there is a legal obligation to provide insurance without such discrimination. To make matters worse, the power struggles between the objectives of providers such as NGOs (social cause) vs. private (profit maximising) do not always lend itself to a smooth insurance market in Bangladesh. Therefore, a private insurance market for property damage risk due to natural disasters in Bangladesh does not exist and furthermore insurance companies are reluctant to create a market.[75] The costs of re-insurance are very high or the scope of providing reinsurance is limited which have resulted in obstacles for entry for private insurers. On the demand side, there is lower demand and willingness to purchase insurance due to limited access to credit, lack of information, and/or affordability.

Unless microinsurance products are designed specifically to address the needs of the poorest population groups through market segmentation to allow cross-subsidisation, there is very little hope that the most vulnerable people of Bangladesh can be brought under microinsurance coverage. The success of microinsurance in reducing environmental risk–induced vulnerability, however, depends to a large extent on a population's willingness and ability to pay. This is problematic in Bangladesh, where a lack of awareness or willingness to pay for insurance has limited the incentive to supply insurance and hindered the expansion of a private market.

An estimate of rural household willingness-to-pay (WTP) for micro-insurance aimed at reducing extreme flood risks found that 64% of the respondents were willing to pay for flood insurance.

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An estimate of rural household willingness-to-pay (WTP) for micro-insurance aimed at reducing extreme flood risks found that 64% of the respondents were willing to pay for flood insurance. For property and health insurance, there only exists a positive WTP for insurance sums greater than BDT 20,000 (US$236). There was also interest in crop and unemployment insurance at all coverage sums, thereby revealing their priorities. The demand for property and health insurance was found to be significantly higher in unembanked areas – outside of flood defences – than in embanked areas, whereas the demand for crop insurance was the opposite. Ex-post disaster relief did not affect demand for micro flood insurance, which points to the inertia around moving away for reliance on government for aid. Finally, the central government was the most preferred insurance provider.

On the positive side, the insurance sector in Bangladesh has been growing and the number of policies written and number of policyholders have grown almost in-line with the annual growth rate of Bangladesh's economy, which is approximately 6-7%. This is consistent with the average expectations on insurance growth. However, the current rate of growth may not be sufficient to close the protection gap any time soon if another major flood were to hit the country. In the macroeconomic context, insurance penetration has been found to have bi-directional causation with economic growth.[76] In other words, higher insurance rates implied higher economic growth and higher economic growth which in turn implied increased rates of insurance. The more developed the economy, the more likely insurance markets are developed in the country. Furthermore, a causal relationship was observed between these variables, and, by definition, they are stronger than correlation. However, rapid economic development and reforms in the financial sector have not resulted in an increased insurance penetration in Bangladesh.

74 Aker 2012
75 Brouwer and Akter 2010
76 Pradhan et al. 2016

Section 6: Key Findings

Of all the natural disasters faced by Bangladesh, floods have had disastrous consequences to people, property and economy due to their high frequency and severity, yet floods also bring positive benefits of soil fertility and higher crop yields and to Bangladeshis, floods are a part of life.

It would be useful to develop an approach to recovery from floods, based on the actual livelihoods of poorer households. Many of the households most vulnerable to floods are in a semi-permanent relief phase and the sustainable livelihoods example may be of limited use. Instead, the starting point for interventions should be a clearer understanding of the livelihoods of these households and how these might be supported. Areas close to poor people's livelihoods – such as agricultural wage rates, access to natural resources and productive assets, and access to non-exploitive credit – may be useful starting points.

The following are key areas of that would improve livelihood support for poorer households after major floods like those in 2004.

- Access to reliable sources of credit at low interest rates
- Replenishing the asset base of the poor, in particular provision of seed and small livestock
- Cash and food for work programs that involve rehabilitation of local infrastructure
- Reconstruction of education and health facilities with local materials and labour
- Support in reconstructing housing that is based on indigenous design and adaptable to flooding
- Provision of information about recovery resources available from the GOB and NGOs.

Private insurance markets are underdeveloped in Bangladesh. The weakness in institutional capacity of the regulators has not allowed for high-quality expansion in the sector but has led to a proliferation of low-quality insurance providers due to low barriers to entry. The current insurance penetration rates are very low, and the government has to shoulder most of the post-disaster expenses and liabilities regarding raising adequate funds to meet immediate relief demands and to facilitate recovery. The role of insurance in Bangladesh is likely to increase due to the increasing investments in fixed assets in the manufacturing sector during the last 10 years. On the positive side, new initiatives are underway to develop the insurance sector in Bangladesh, although their desired outcomes will take time to materialise.

6-7%

Insurance sector growth is in line with the annual growth rate of the Bangladeshi ecomony

Areas close to poor people's livelihoods – such as agricultural wage rates, access to natural resources and productive assets, and access to non-exploitive credit – may be useful starting points [for an approach to recovery from floods].

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