Managing Flood in Bangladesh 2004: Facts and Caveats

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I. Introduction

Flood is a general and temporary condition of partial or complete overflowing of normally dry land area. Collapse or subsidence of land along the shore of a lake or similar body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels result in a flood.

Bangladesh generally witnesses four types of floods: flash floods, riverine floods rain floods, and storm surge floods. Flash floods occur in the eastern and northern rivers, along the borders of Bangladesh. These are characterised by a sharp rise in water level and high water flow velocity, an outcome of exceptionally heavy precipitation occurring over neighbouring hills and mountains in India. Riverine floods stem from the spilling of the major rivers and their tributaries and distributaries generally rise and fall slowly over 10-20 days or more and can cause extensive damage to property and loss of life. Depth and extent of floods and associated damage are extensive when the major rivers reach their peaks simultaneously. Rain floods are caused by high-intensity local rainfall of long duration in the monsoon. Extent and depth of rain water flooding varies with monsoon from year to year depending on the amount and intensity of local precipitation and current water levels in the major rivers that control drainage from the land. Storm surge floods occur in the coastal area of Bangladesh, which consists of large estuaries, extensive tidal flats and low-lying islands. Storm surges generated by tropical cyclone cause widespread damage to property and loss of life in coastal area.[1]

Bangladesh is a land of many rivers and heavy monsoon rains. Therefore the country is subject to inundation by overflow from the riverbanks due to drainage

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1 Mirza, MMQ (2002): "Global warming and changes in the probability of occurrence of floods in Bangladsh and implications ", *Global Environmental Change* 12 (2002), pp 127-138.

congestion, rainfall run-off, and storm-tidal surges. Some 20 to 30 per cent of the total land surface is flooded every year during the wet monsoon. During the peak flow season, July to September, most of the rivers overflow their banks, and deposits silt on the floodplains. These normal floods are considered a blessing for Bangladesh as it provides vital moisture and fertility to the soil through the alluvial silt deposition. Only abnormal floods are considered disastrous, that is, the high-magnitude vents that inundate large areas, and cause widespread damage to crops and properties. In the years 1988 and 1998, two devastating floods inundated more than 65 per cent of the geographical area of the country. In the year 2000, Bangladesh witnessed an unusual flood over its usually flood-free southwestern plain, which also caused loss of life and massive damage to property. In the year 2004 the flood appeared as a devastating one. The causes of devastating floods are: Bangladesh's location in the downstream of Padma, Meghna and Jamuna river basins; excessive rainfall in the catchment area; synchronisation of the peak water levels of all the major rivers of Bangladesh; sometimes solar eclipse retards the outflow of water drainage by raising the tidal level; earthquakes cause tectonic anomaly in the Himalayan region and the Bay of Bengal; monsoon rainfall and melting of snow in hills in the upper basin area; and infrastructure development with inadequate drainage facilities.[2]

According to CPD (2004)[3], there are some other reasons that led to flood 2004: Deforestation and sedimentation, riverbank erosion, unplanned construction of bridges and dams, encroachment of flood retention areas, obstacles in flood-flow zone (*i.e.*, construction of various types, legal and illegal); and there are some incremental reasons as well: Excessive monsoon rainfall in the upper stream of the Brahmaputra basin combined with high tide, that induced higher water level in rivers, particularly in Meghna, contributed to the initiation of the Flood 2004. However, the intensity of flood 2004 was more severe than what is usually the case and was the most severe since the 1998 flood. Flood 2004, indeed, inundated a relatively large land area and caused significant damages to property and lives.

Given this context, the paper deals with some critical economic issues of management of flood 2004. After introduction, the second section deals with the conceptual and historical dimensions of flood and poverty in Bangladesh since it is the poor who are affected the most by floods and other natural disasters. The

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2 Many patriotic version of the definition of flood in Bangladesh incorporate the view that it is somehow imposed by our big neighbour India, which is not true.

3 Centre for Policy Dialogue (2004): *Rapid Assessment of Flood 2004*, Dhaka, available at, accessed on 21 September 2004.

third section deals with the salient features of flood in Bangladesh 2004. In the fourth section the role of state and non-state actors in management activities is discussed. Conclusion and policy options are suggested in the final section

II. Flood and poverty

As mentioned earlier, the poor are the prime victims of flood. Floods principally affected poor men, women, children and elderly people in the previous years in Bangladesh. Halving extreme poverty by 2015 is the first and foremost national objective set out in the Interim Poverty Reduction Strategy Paper (I-PRSP)[4]. In the thematic paper to finalise the PRSP[5] flood management is seen in the perspective of poverty reduction and social development goals. In this backdrop, the conceptual framework of the relationship between flood and poverty is depicted in Chart 1.

At a micro level, flood vulnerability and poverty are interrelated, and poor households are particularly vulnerable to floods. In national economy it creates severe budgetary and balance-of-payments difficulties. Both the aggregate demand and supply squeeze due to flood, but aggregate supply schedule contracts more creating short-term price hike and medium-term inflation. Both affect low income groups severely. The extent of crop damage depends on the timing of a flood. If the monsoon rain and resulting flood come before dry-season crops are harvested, the loss could be serious. Similarly, untimely flash floods in the northern and northeastern region can cause severe crop damage. Flood impacts at the micro-level are found to be more severe, compared to those at the macro level. Poverty is found to be fundamental to flood hazard vulnerability: the poorest of the poor have the most to lose in proportional (to asset value) terms. The poorer the household or firm or farm, the higher is the percentage of damage to their asset values. Thus they are worse off in proportional terms. They are also worse off in linkage terms. Price hikes compounded by abrupt fall in employment and real wages in the aftermath of floods hit the poor in the worst way. In effect, this causes malnutrition,[6] and the existing poor health of the poor further deteriorates,

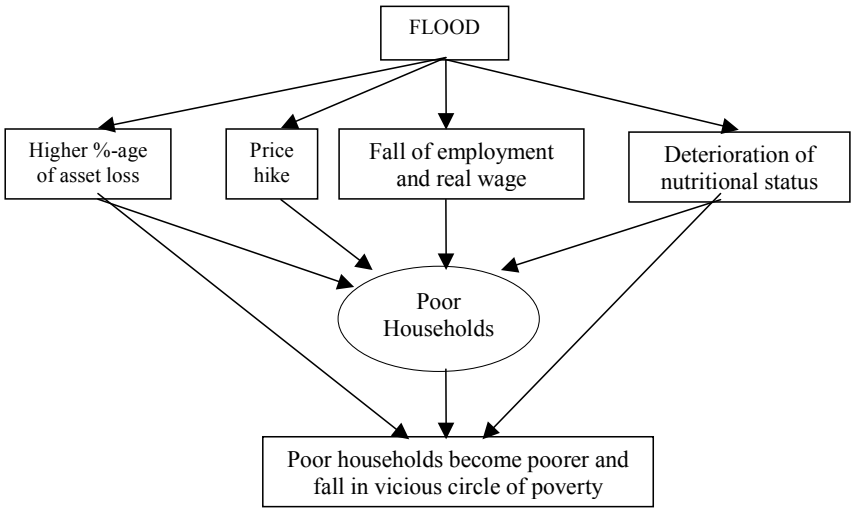
4 Economic Relations Division (2004): *Bangladesh: A National Strategy for Economic Growth, Poverty Reduction and Social Development*, Ministry of Finance, Government of Bangladesh. This is equivalent to I-PRSP is the context of other highly indebted poor countries (HIPCs).

5 Thematic paper 10 for final PRSP.

6 For details see: Paul Dorosh (2004): *Floods and flood security in Bangladesh: The 1998 experience and implications for 2004*, Presented in the seminar at BIDS, Dhaka, 25 September 2004.

with the likelihood of many becoming crippled in the long run. As the poor are not equipped to cope with floods, they become poorer because of their poverty, suggesting that disasters and poverty operate in a vicious cycle. Therefore, poverty, which is caused by the lack of access to resources, is a fundamental cause of hazard vulnerability.

Chart 1 : Flood and poverty in Bangladesh: A conceptual framework



The distributional effects of flood impacts are important because these are associated with sustainability of development. Different types of floods have different types of impact. Storm surge proves to be the most destructive, especially by causing huge human losses, particularly the less equipped poor that have fragile houses. Evidence suggests that floods deepen poverty and help widen the income gap between the rich and poor. For example, impact study on flood shows that on an average a poor household suffers (in terms of losses proportional to value) 4, 5 and 3 times as much, compared to that suffered by a rich household, in a river flood, flash flood and storm surge, respectively.

Thus, floods not only accentuate poverty but they may widen the income gap between the rich and the poor.[7] This problem poses questions regarding equity and sustainable development.

Chart 2 : Flood affected areas in Bangladesh over the years

Data source: Chowdhury (2002) and CPD (2004).

III. Flood 2004 and its management

Damage and costs of flood

As per the government estimates, 36 districts, 261 upazilas (sub-district) and 2,396 unions were affected by flood. Total affected area was 31,133 km^2. An estimated 6,847,077 families were affected, and reported deaths were 628. 20,674 livestock was dead; crops of 1,448,816 acres destroyed and 1,102,000 acres partially damaged. A total of 858,202 houses was destroyed and 3,159,235 partially damaged. 13,541 km road network was destroyed and 42,996 km

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7 However, there is also a close relationship between duration of flood and victims in Bangladesh. Analysis of data from 1974 to 2004 reveals that there is a positive and significant relationship between duration of flood and victim from food as follows:

$$\ln VICT_t = 12.68^{***} + 0.88^{***} DUR_t \qquad t = 1, \ldots, n;\ n = 28$$

$$se = (0.73) \quad (0.03)$$

$$r^2 = 0.26\ (<0.5),\ F = 9.25^{***}$$

Where, $\ln VICT_t$ = Natural log of number of victims of flood in year *t*; $á_1$, $á_2$ = Intercept and slope coefficients; DUR_t = Duration of flood (days) in year *t*. The simple semi logarithmic regression results show that if the duration of flood increases, the number (percentage of victim) increases. The regression is based on the data provided by the *Bangladesh State of the Environment Report 2001*, ed by QI Chowdhury, Forum of Environmental Journalists of Bangladesh, Dhaka, 2002, and CPD (2004), ibid.

damaged; 5,338 bridges and culverts, and 3,014 km embankment was damaged. Among the human development infrastructure 1,225 schools were destroyed and 23,439 was partially damaged.[8]

Cost of total damage is estimated to be Tk 42,000 crore by the UN World Food Programme (WFP) or 12.81 per cent of the current GDP at market price. But as per CPD's estimation it was Tk 11,419 crore or 3.4 per cent of GDP. However, as per a recent estimate by World bank and ADB it is about Tk 13,000 crore.

As per CPD's estimation the flood damage in agriculture, infrastructure, residential, industry, education and health sectors were Tk 2920, 3867, 3706, 531 and 48 crore respectively. Flood affected almost 25 per cent of the total population. It persisted for more than 45 days. It covered an area about 30582 km2, *i.e.*, 20.72 percent of Bangladesh's total land area. Mortality as percentage of total affected people was 0.002 per cent, and total mortality was 638 in 2004. In the flood of 2004, fifty one per cent of the districts were severely affected.

However, the cost estimated by CPD lacks human costs of flood, *viz*, cost of lost human lives and costs of sufferings both from diseases and daily life during flood, increased transportation cost, and cost of lost jobs and businesses.

Shelter and relief[9]

For an effective management of flood related crisis there has to be adequate number of temporary shelters with adequate safe water, sanitation, food and medicine as poor and marginalised people mostly take shelter in these places. Total number of shelters opened is 5,021, and number of people in shelters is 1,683,839. That is, on average about 335 men, women and children was in one temporary shelter during flood, and it seemed from the newspaper reports that there was overcrowding in the shelters. Moreover those shelters were not equipped with the required sanitation infrastructure. As a result, there was a serious threat of outbreak of disease in the affected areas. Many of the flood shelters had gone under water, and people had to suffer from the absence of proper facilities for toilets and cooking. Lack of access to safe drinking water was recurrent and people were able to manage pure drinking water from the tube wells far away from their shelters that had not been submerged by the flood water. In places where diarrhoea and other water borne diseases were frequent, there was

8 Source: http://www.angeltowns.com.

9 Relief is an instrument of flood-related crisis management, which may be treated as an integral component of flood management as it enhances short-term food security and nutritional status.

an urgent need for supply of medicine. The stock of medicine was also quite inadequate. Thousands of people also took temporary shelter on roads, footpaths, dams, and embankments as well.

However, as per CPD (2004) finding, there was a strong and significant positive correlation (0.86) between the amount of relief allocated for distribution and the number of flood affected people in the districts. In their interpretation, government had been "successful" in allocating higher amount of relief for districts where larger number of people were affected. However, some extreme situations were also observed, *e.g.*, per capita relief distribution was very high in Laxmipur (Tk. 628.09), and Kushtia (Tk. 283.82), high in Rangpur (Tk. 90.91), and very low in Gazipur (Tk. 7.60), compared to the national average per capita distribution (Tk. 19.97).

Normativity of relief distribution: Question of social justice

If we consider the distribution of relief as an economic problem, one of the three fundamental questions arises: for whom the relief is. The answer is, of course, that the districts in which more people are victims of flood will get higher amount of relief, and the amount of relief will be dependent on the severity of flood. That is, higher amounts of relief need to be distributed as the severity of flood increases, or higher weights need to be given to the highly affected regions (severely and very severely, respectively), which is consistent with the fundamental concept of distributional justice. However, CPD results mentioned above also justify it in the context of flood 2004. But in the following analyses the results are inconsistent with distributional justice.

Table 1 reveals that in terms of internal dispersion in the distribution of relief, coefficient of variation (CV) was very high within severely affected districts compared to other districts. That is, disparity in relief distribution was very high within that group. However, a high Gini coefficient also suggests that inequality in relief distribution was high within the flood affected districts.

Table 1 : Inequality in per capita distribution of relief

Region	Coefficient of Variation	Gini Coefficient
Low	0.66	
Moderate	0.63	
Severe	2.14	
Very severe	0.45	
All	2.15	0.60

The conceptualisation of distributional justice can be given in the relationship among per capita relief, victims and incidence of flood:

$$PCRLF_i = \hat{a}_1 + \hat{a}_2 VICT_i + \tilde{a}_1 D_{2i} + \tilde{a}_2 D_3 i + \tilde{a}_3 D_4 i + e_i \quad i = 1, \ldots \quad , n$$

Where, $PCRLF_i$ is per capita relief distributed among the flood affected districts; VICT is number of victims of flood (thousands); D_{2i} is dummy variable for districts moderately affected by flood (1 = moderately affected and 0 = otherwise); D_{3i} is dummy variable for districts severely affected by flood (1 = severely affected and 0 = otherwise); D_{2i} is dummy variable for districts very severely affected by flood (1 = very severely affected and 0 = otherwise); $\hat{a}_1$ is intercept coefficient; $\hat{a}_2$ is slope coefficient of number of victims of flood; and $\tilde{a}_1$, $\tilde{a}_2$, and $\tilde{a}_3$ are differential intercept coefficients of districts that are moderately, severely, and very severely affected by flood respectively.

The analysis of covariance (ANCOVA) regression results for all data (Regress 1 of Table 2) show that the low flood affected districts got an average of Tk 69.86 per capita relief, and the districts with higher number of victims got lower per capita relief. On the other hand, moderately, severely, and very severely flood affected districts got on average per capita relief of about Tk 83, Tk 146, and Tk 120, respectively. It should be noted here that average per capita relief received by severely affected districts is higher than that of severely affected districts.[10]

However, the first regression suffers from non-smooth distribution of error terms around the fitted regression line due to two outlying observations. Therefore, after removing the outliers the new results (Regress 2 of Table 2) show that low flood affected districts got an average of about Tk 49 per capita relief; and the districts with higher number of victims got lower per capita relief, which is apparent from the negative and significant (at less than one per cent level) magnitude of the coefficient of VICT. On the other hand, moderately, severely, and very severely flood affected districts got on average per capita relief of about Tk 37, Tk 25, and Tk 17, respectively. That is, the distribution of relief is undoubtedly inversely related to the intensity of flood.

The Lorenz Curve (Figure 1) demonstrates that there is an acute absence of distributional equity of per capita distribution of relief among the flood-affected districts, which justifies the above regression results.

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10 The regression results are based on CPD (2004), ibid.

Table 2 :

Results of estimation

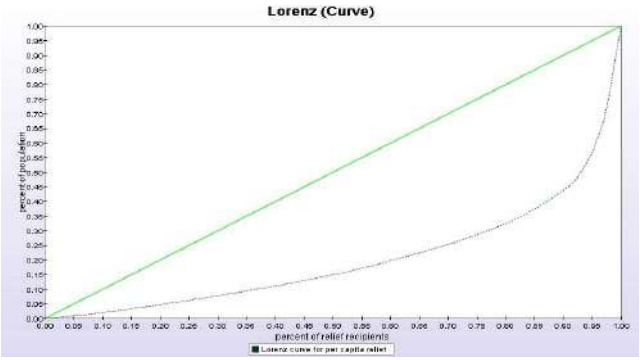
Variables	Coefficient		t-ratio	
	Regress 1	*Regress 2*	*Regress 1*	*Regress 2*
Constant	69.86**	49.31***	16.62	7.72
	(42.94)	(6.38)		
VICT	– 0.69	– 0.13***	– 2.65	– 3.16
	(0.03)	(0.004)		
D_2	13.67	– 12.03	0.23	– 1.39
	(58.29)	(8.66)		
D_3	76.52	– 11.15	1.48	– 1.38
	(51.89)	(8.57)		
D_4	49.61	– 8.58	0.76	– 0.88
	(65.13)	(9.79)		

Diagnostic Tests

		Regress 1	***Regress 2***
	R^2	0.22	0.41
Adjusted	R^2	0.12	0.33
	F	2.1*	4.99***
Multicollinearity	(VIF)	1.84 (10)	1.90 (10)
Heteroskedasticity [2]	(1)	46.18	13.59
Normality of residuals	(JB)	0.000	0.049
Model specification	($F_{3,28}$)	11.21	9.19

Note: Numbers of observation are 36 and 34 for Regress 1 and Regress 2 respectively. Figures in the parentheses are standard errors. The normality of residuals test is based on Jarque-Bera (JB) procedure with 2 degrees of freedom, model specification on Ramsey RESET test, heteroskedasticity on Breusch-Pagan test, and multicollinearity on Variance Inflation Factor (VIF). Statistical significance at one, five and ten per cent levels have been denoted by ***, **, and * respectively

Figure 1: Inequality in distribution of relief among the flood affected districts



Data source: CPD (2004).

IV. Roles of state and non-state actors

Flood management or flood loss mitigation constitutes an important component of water management. In the context of a developing country like Bangladesh the concept of a useful food management is provided by the Global Water Partnership's associated programme on flood management in 2001 (ADB 2004)[11]

Flood management is a broad concept that focuses on reducing flood hazards through a combination of policy, institutional, regulatory and physical measures, while recognising that floods can never be fully controlled. This takes into account the beneficial uses of floods, which are … difficult to quantify in human and economic terms but which sustain natural systems that also have economic, social, cultural and ecosystem values and functions. Consequently, when managing floods within IWRM[12], it is essential to minimise human suffering and property damage while maximising the efficient use of the resources of the river basin. Therefore, trends in national flood losses are not the only guide to the success or failure of the national flood management strategy and for this reason flood management must be considered as part of IWRM and of all the socioeconomic decisions related to floods.

However, PRSP Thematic Paper 10 identified two broad measures of flood management:

Structural measures

Flood protection helps in protecting rural and urban poor who live in the most vulnerable areas. Flood protection is provided to agricultural area and urban area. So two output indicators are net cultivable area (NCA) under flood protection and total area (rural and urban) under flood protection. Such protection results in less flooded area, reduced crop damage, increased crop production, less flood damage and better human environment. Therefore, the outcome indicators are flooded area, crop damage, crop production and flood damage.

Flood proofing and flood shelters are being constructed principally in rural areas in Bangladesh. Flood proofed area and number of shelters, therefore, are the output indicators. The outcomes of such interventions are that there will be less flood damage and deaths during a flood and cyclone. Therefore, flood damage and numbers of deaths are suggested as outcome indicators.

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11 ADB (2004): *Floods and the Poor: Reducing the Vulnerability of the Poor to the Negative Impacts f Floods*, Asian Development Bank, Manila, January 2004.

12 Inland water resource management.

Non-structural measures

Flood forecasting is an important non-structural measure in flood management. With increasing lead-time, people can save their life and property. Therefore, lead-time in flood forecasting is suggested as an output indicator for expenditure in flood forecasting and flood damage as an outcome indicator.

State of management

Both the government and NGO response in flood management was late. In some areas the NGO response came after the government programmes were initiated. Individual level and community level philanthropic and relief operations were extensive in many areas, and in many instances actually filled the vacuum left by the late response of the government and the NGOs. The UN system in Bangladesh took an active interest in flood. They initiated a mechanism to estimate flood damage on their own and coordinated with major international NGOs. A team from Geneva arrived on July 31, 2004 for conducting damage estimation and sent its report to Geneva for an international appeal for help.

NGO participation in relief was infrequent. Relief distributed by the local NGOs was mostly concentrated in their localities. In North Bengal some of the NGOs, which were not membership-based, distributed full package of relief in an organised manner. However, they were not able to distribute relief to all people who were in need for such support.

In most of the cases, the government responded first with relief activities, although, not always timely. Local MPs were found to play a very proactive role as they came forward on their own with relief for distribution among the flood victims. The amount of government relief was found to be much less than required in some areas as the distributing authorities wanted to maximise the numbers of families covered. Remote villagers often did not receive adequate relief from the Government.

Initiatives taken by individuals were noticeable during flood. Poor responses from the NGOs and government at the initial stage induced philanthropic individuals to fill the vacuum. Flood affected people were of the view that relief activities lacked proper management. Here were favouritism and pilferages, and politicisation was reported in the newspapers in a number of cases. Government allocation of rice, cash and clothes for the flood victims was not adequate compared to the number of affected people. Children were found to be suffering from lack of baby food. Health services from the local heath complexes were infrequent and insufficient due mainly to shortage of medicine and saline. Outreach of the relief was mostly poor and disorganised. Access of the affected people in the remote areas to the relief

programme was less than that of the people along the roadside and those who had taken shelter on embankments. Government relief was mainly being distributed to the people who have taken refuge in flood shelters. People residing outside shelters did not get adequate relief from the Government. As a non-structural measure of flood management, government forecasting system was virtually ineffective.[13]

In addition to the national initiatives, a number of international organisations including UNDP, WFP, WHO, UNICEF, DFID, OXFAM, CARE, Action Aid, YMCA, etc. were also active in monitoring of flood, distributing food relief and emergency medicines directly to the affected people.

V. Conclusion

Unplanned construction of public infrastructure, unplanned or absence of regular dredging of important rivers and canals, unplanned and rampant urbanisation, etc. were the major public-sector failures in the inland water resource management that led to over-duration of flood and innumerable suffering of the poor and marginalised groups of the country. Government machineries followed a "watchful waiting approach"[14] in initiating relief programmes. NGOs were also reluctant to initiate their "voluntary" relief activities. This created enormous vulnerability among the poor victim households. The donor community also channeled their funds limiting to a few international and national NGOs and agencies. This prohibited small and medium NGOs and CBOs to initiate relief and rehabilitation activities with full capacity that they have. The government relief was directed inversely to the actual needs of the flood victims of the different districts. This exhibits absence of proper public policy regarding support to the victims. Acute inadequacy of necessary medicines (especially oral saline) accelerated vulnerability of the poor during the early days of flood.

In the light of above discussion, some suitable policy options may be suggested below.

- Bangladesh needs to continue the search for an intervention that will allow the country to contain the flow of its major rivers. We also need to be ensured that our flood control interventions avoid the common causes of structural failures, *e.g.*, inadequate design at return periods, poor embankment materials and manual compaction, and inadequate operation and maintenance. Bangladesh

[13] Although government system proved to be ineffective during different floods, no non-government initiatives have still been established in this area.

[14] That is "let us see what happens".

also needs to regulate the development in floodplains. For this, we can use measures such as flood-risk mapping and floodplain zoning. Flood protection measures that protect the populace are the same ones that cause even greater damages when the infrequent, extreme floods occur. Many of the physical control measures employed impart a false sense of security that encourages even more intensive use of potentially dangerous areas. We must therefore re-evaluate our prevailing method of preventing or reducing flood damages.

- There is now a growing realisation that the predominantly engineering approach to flood control does not provide its intended benefits in terms of protection from floods. In spite of huge investments in flood control works, some countries are faced with the apparently anomalous situation in which both the flood risk and the damage caused by floods are increasing. This is partly a result of the success of earlier flood control measures, which removed, at least up to the limit of their design standard, the risk of flooding in formerly flood-prone areas. This encouraged further investment and development within the floodplain which, in turn, required ever-larger flood control works to safeguard the investment. When an exceptional flood occurs, as is inevitable, the scope for damage is accordingly huge. To overcome the spiraling costs of flood control works and damage caused by floods, Bangladesh may adopt a philosophy of flood management, incorporating the concept of living with floods, in place of flood control.

- As a means of protecting the assets and livelihoods of persons living in flood-prone areas and as a tool to discourage unreasonable levels of investment in such zones, flood insurance has enormous potential. Insurance helps raise people's awareness of flood risk and the need to manage floods for the greater safety of the community. Compulsory payment of premiums and inclusion of a cap on the amount of compensation that insurers are required to pay also act as disincentives to investment in high-risk areas. In doing this, premium rates should be determined in such a way as to provide incentives for appropriate levels and types of development in floodplains.

- All stakeholders, including both administrators and the general population, which benefit economically, socially, and culturally from the water resources of a river basin, must have a say in how these resources are to be used and conserved. Both must also have a say in how floods should be managed to minimise their adverse impacts while also maximising their beneficial impacts. The poor and marginalised groups need to be included in any decision-making process relating to flood control and management. Effective flood management requires a comprehensive approach that balances flood

mitigation, environmental conservation, and sustainable utilisation of available water resources for the benefit of all people of a nation.

- The conception and design of flood protection should be based on careful analysis of risk so that the passage of greater-than-design floods can be managed in a predictable and safe way. Capacity building of the organisations responsible for managing river basins and the raising of public awareness through better education are to be incorporated as effective means of reducing risks and loss of life from floods.
- Poor households should be given consumption credit during flood in order to ensure food security especially for female, elderly, and child family members, and shelter credit after flood. Government relief should be distributed according to the number of flood victims and severity of flood in the regions so that distributional equity and social justice can be ensured. Agricultural credit should be made sufficient to especially small and marginal farmers, and seeds of different crops (especially cereal crops) should be available to them at a reasonable price. The poor and small fishery and livestock as well as factory owners should also get this type of benefits. Price hike during flood should be arrested by any means to avert unnecessary vulnerability of the poor. Social safety nets (VGD, VGF, TR, etc.) should be strengthened. There should be planned distribution of foodgrains among the right groups. It appears from the media reports that government rehabilitation programme is inadequate to rehabilitate the agriculture sector and agro-based activities in the country. Big NGOs need to concentrate on this issue as agricultural production and food security are closely positively correlated, especially for the poor households.
- Government flood forecasting system should be made effective by enriching with modern sophisticated instruments and highly skilled human capital. Not-for-profit private sector should also build their capacity of the same. There may be an effective public-private partnership in this area.
- Big rivers and canals should be immediately dredged sufficiently to avert unnecessary over-duration of flood and inundation of unexpected areas. Finally, many of the water related problems in Bangladesh could be solved through regional cooperation among the countries in the basins of the Ganges, the Brahmaputra and the Meghna Rivers. For instance, problems of floods, increased dry season flows and salinity control in coastal areas may be taken care of by constructing storage reservoirs in the upper catchments of these rivers, which would minimise flood peaks and reduce both erosion and siltation. Bangladesh, therefore, needs to amplify its efforts toward promoting regional cooperation.