

Coping with flood: the experience of the people of Dhaka during the 1998 flood disaster

Introduction

The increase in human pressure on the environment, such as over-exploitation of resources and uncontrolled construction of buildings and infrastructures has, in the last few decades increased the effects of natural disasters in terms of human loss and damage to properties. Among the major risks, floods are considered to be of main importance with regard to their consequences.

Although flood is an annual event in Bangladesh with 18 percent of the land area flooding during the monsoon season every year, the loss of life and damage to property has increased quite significantly during the last few decades. The floods of 1988 and 1998 were particularly devastating.

In 1988, approximately two-thirds of the country was inundated, affecting 50 million people and killing 1,600. The greater Dhaka area was hit by this catastrophic flood during the months of August and September—about 56 percent of the greater Dhaka area was submerged affecting about 1.9 million people (JICA 1990). While no official figures of flood damages in Dhaka are available, the Dhaka city corporation estimated that some 400 kms of roads were damaged. From the estimates of JICA, an area of 137 kms² which includes the major built-up part of greater Dhaka, sustained flood damage estimated to be in the order of Tk. 500 millions to Tk. 1000 millions (US\$9.8–19.6, One US\$ = Tk. 48).

The 1998 flood was an unprecedented event of its kind in terms of duration, area inundated and damage sustained (DMB 1998). The overall duration of the flood throughout the country was 65 days while the longest duration was 73 days at a single point. The flood inundated nearly 100,000 sq kms, 52 districts, and affected more than 30 million people. Total economic damage amounted to nearly 3 billion dollars (US).

Dhaka city was also severely affected by the 1998 flood. Seventy out of ninety wards of the Dhaka city corporation were under water of various depths for more than eight weeks. The flood affected

by Sarwar Jahan, Professor of Urban and Regional Planning, Bangladesh University of Engineering and Technology, Dhaka

almost all aspects of human life. Not only physical assets, but also income, health and occupation. People of various income and occupation suffered in varying degrees, and there were also significant spatial variations in the impact of the flood.

This paper presents the results of a study that was undertaken to determine the nature and degree of impact of the flood on the various socio-economic groups in Dhaka city and the mechanisms through which people coped with the flood. The study was carried out in four areas in the eastern part and one area in the southern part of the city. Data were collected from a total of 294 households via a questionnaire survey. For the purpose of the survey, each area was divided among 8 groups of investigators. Each group was then assigned a small cluster within each sub-area. Households were then selected from each cluster following a systematic sampling procedure.

Socio-economic characteristics of the population

Heads of households from five different areas were interviewed—about 95% of them were male. The majority of respondents (30.61%) belonged to the age group 30 to 40 years, while 22.55% were in the age group 41 to 50 years or older. 17.68% were in the age bracket 51 to 60 years while the rest belonged to the age group 21 to 30 years.

Education and occupation

Nearly 31 percent of the respondents were illiterate, 9.2 percent passed Secondary School Certificate or Higher Secondary Certificate examinations while 15.6 percent earned Bachelor's or Master's degrees. The rest attended schools at primary or secondary levels. Business was the occupation of about 18 percent of the respondents followed by service (15%), petty business (13.7%), Rickshaw pulling

(13.3%) and daily labor (10%). About 23 percent of respondents were engaged in various other types of jobs including professional activities, factory work etc. Nearly 7 percent were unemployed.

Household income

People of different income groups were affected by the flood. 19.4 percent of households belonged to the lowest income group with monthly incomes of up-to Tk. 2999 (US\$58.97). The largest number of households (40.8%) were in the group having monthly incomes between Tk. 3000 and Tk. 5999 (US\$58.99- 235.96), while 22.1 percent of the households surveyed earned between Tk. 6000 to Tk.11999 (US\$117.99-235.96). Households earning more than Tk.12000 (US\$235.98) constituted about 17.7 percent of the total number of households. Average household income in the affected area were found to be Tk.10,679 (US\$210.01).

Depth and duration of the flood

The flood affected mainly the eastern part of the city. The western part was protected by the Dhaka City Flood Protection Embankment. The depth of water, however, varied in different parts of the affected area. In Kamrangir Char, which was the worst affected area, the water level reached the roofs of about 45% of the dwelling units. Overall analysis showed that nearly 83% of houses were under 3 feet of water or more. The water level reached the roofs of about 19 percent of houses and half the dwelling height of about 31 percent of the houses in the affected areas.

The duration of the flood was one of the longest in recent history, lasting for more than two months in many places. Sixty percent of houses in the affected areas of Dhaka City remained flooded for more than 60 days while nearly 25 percent of the houses remained under water of various depths for about 51 to 60 days. Only 10 percent of the households mentioned that the duration of the flood was 30 days or less.

Living with the disaster

Those affected by the flood tried to cope

with the disaster in various ways. Many moved out of the flooded area and took shelter elsewhere. Poorer people were severely affected, and many had to borrow money to survive. Some even sold assets or mortgaged their properties as they lost their jobs or incomes. Governmental agencies, non-governmental and voluntary organizations, and private individuals also came forward with relief materials.

Moving to safer places

Almost one-third (32.7%) of the flood affected households had to leave their houses and take shelter elsewhere. Nearly 56 percent of these households had to evacuate all of their members while about a quarter of the households (24%) had to evacuate women and children. The rest of the households left behind a servant or a member of the family to guard their property.

The majority of those who left their home took shelter in a relative's house. Nearly 19 percent of the evacuee households stayed with their relatives in the locality while about 33 percent of them stayed with their relatives outside the locality. A significant proportion of the households (22.2%) took shelter in high-rise buildings in the locality. Only a small percentage (10%) of the households took refuge in schools, Madrashas or other informal flood shelters. The remaining households rented houses in flood-free areas.

Facing the deluge

About 67 percent of those surveyed did not leave their homes. The majority (51%) stayed at home to guard their properties while about 17 percent of the households mentioned that they could not move out as there was no shelter nearby or the available shelter was not suitable. Nearly 19 percent of the households thought that the situation was not serious enough and did not pose any risk. Various other reasons were mentioned by about 13 percent of the households.

People, however, had to make alternative arrangements to remain in their houses, as there was water inside. The majority of the households (45.5%) had to live on an elevated platform constructed after the flood water entered their houses. Another 30 percent had to stay on the roof of the house since water almost reached the ceiling. The rest of the households, however, did not make any such arrangement since water did not pose any problem.

People faced various problems while staying in their flood-affected houses. These included a shortage of drinking

water, shortage of food, getting wet by rain water, the possibility of snake-bite etc. Most people (86.8%) mentioned shortage of drinking water as the main problem, followed by shortage of food (62.5%) and getting wet by rain water (56.6%). Rain posed serious problems for those who stayed on the roof of their house.

Various diseases broke out during the flood. Approximately 76 percent of respondents mentioned that one or more household members suffered from diseases like diarrhoea, dysentery, virus fever, jaundice etc. Diarrhoea was widespread with nearly 24 percent of respondents mentioning that one of their household members had suffered from this disease. Seventeen percent of households had 2 or more members suffering from this disease.

There was also an epidemic of virus fever with at least one member of nearly 51 percent of households affected. Dysentery or jaundice also affected about 31 percent of households.

People also suffered heavily due to increases in household expenditure during the flood. Expenditure on food, medicine and transportation was considerably higher than previously. Average monthly household expenditure on housing, food, medicine and transportation together was Tk. 7568 (US\$148.85) during the flood compared to Tk. 6367 (US\$125.21) before the flood indicating that there was nearly a 19% increase in household expenditure during the flood.

Confronting the challenge of income and job loss

The poorer sections of society, especially the rickshaw-pullers, day-labourers,

factory workers and petty businessmen were hard-hit as the flood lasted for nearly two months. Many used up their savings and even had to borrow to survive. Some people sold assets and mortgaged properties to buy food and daily necessities.

The study indicates that nearly 44 percent of households had to borrow money to survive, mainly to buy food. Thus nearly 86 percent of borrowers bought food with the money they borrowed. About 30 percent of households borrowed money for the purpose of treatment. Some households (11.8%) needed money to repair their house while others (10%) used the borrowed money to rent a house in a flood-free area.

Relatives, neighbours and local shopkeepers were the major sources of credit (figure 1). Nearly 36 percent of borrowers received credit money from their relatives. Nearly 23 percent of borrowers received money or goods on credit from local shopkeepers, and a significant proportion of households (22.2%) received credit from neighbours. Some households also borrowed from friends (10.2%), Mahajans (6.5%) and non-governmental organisations (6.5%). It is interesting to note that most people borrowed money from informal sources. The role of non-governmental organisations in providing credit was quite insignificant.

Quite a good number of households even sold assets like jewellery, furniture etc. They constitute about 19 percent of the households affected. Forty-one percent of those who sold assets sold jewellery, while 31 percent sold furniture. The remaining households sold various other things. Most of them (87%),

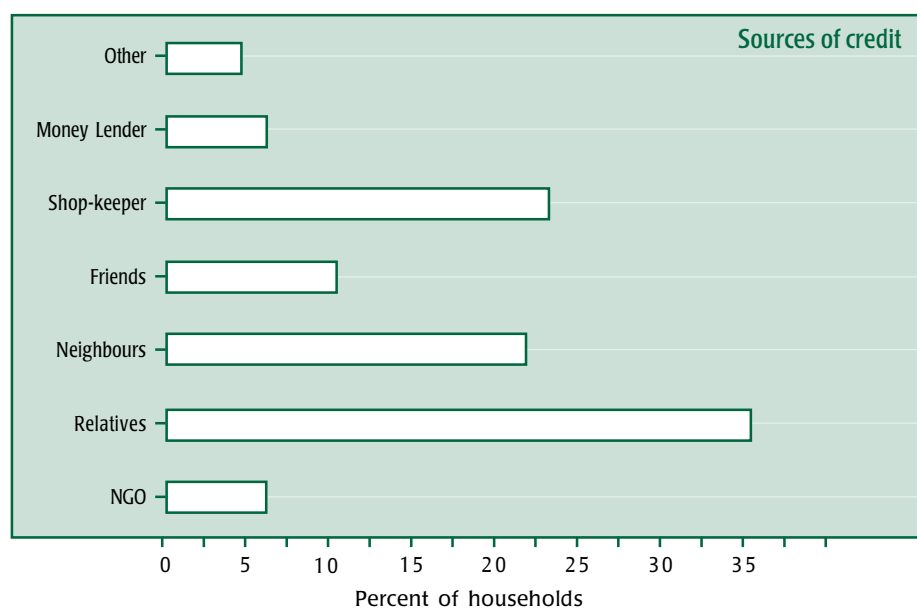


Figure 1: Distribution of households by sources of credit

Types of assistance	Governmental agencies	Non-Governmental Organisations	Voluntary Organisations	Other
Food	29.80	23.08	43.27	11.54
Clothing	0.96	1.92	2.88	1.92
Housing Materials	0.96	0.00	0.96	0.00
Medicine	6.73	10.57	15.38	4.81
Water Purification Tablet	6.73	8.65	13.46	2.88
Money	0.00	4.81	8.65	0.96
Other	0.96	1.92	0.96	1.92

Table 1 : Percentage distribution of households by types and sources of assistance

Damaged aspects	Nature of damage		
	Fully damaged	Partly damaged	No damage
Food	1.00	15.8	83.2
Clothing	3.8	26.3	70.00
Housing	16.8	60.8	22.3
Furniture	13.2	59.9	26.9
Income	28.20	41.20	30.60

Table 2 : Percentage distribution of households by nature of damage

however, did not receive the right price. The main reason for selling assets was to buy food and nearly 85 percent of households used the sale proceeds for this purpose.

About 35 percent of households also mentioned treatment of patients as a reason for selling assets. This was not unusual given the fact that various types of diseases broke out during the flood. Repairing the house or renting a house in a flood-free area were other reasons for which people needed to sell assets.

Help and assistance was also received from various public and private organisations in terms of food, clothing, housing materials, medicine, water purification tablets, money etc.

Nearly 35 percent of the households surveyed mentioned that they received such assistance. The percentage distribution of households by types of assistance and sources is presented in Table 1.

The majority of households received food from various sources. What is interesting to note is that more people received assistance from voluntary organisations than any other organisations including governmental agencies and non-governmental organizations. This is true not only for the total number of households receiving aid but also for the number of households considered separately for each type of assistance such

as food, clothing, water purification tablets, medicine etc.

Flood damage

People suffered extensive damage due to the flood. The flood affected almost all aspects of life and caused severe damage to food, clothing, health, housing, furniture and income.

Table 2 presents the distribution of households by damage type and the nature of damage. Damage to housing, furniture and income was found to be quite high in terms of the proportion of households affected. Damage to income was highest so far as the proportion of households suffering complete loss of income.

The proportion of households experiencing some kind of damage (complete or partial) was, however, largest in the case of housing. Figure 2 shows the average damage to various aspects in terms of money. The flood caused extensive damage to housing averaging about 6277 Takas (US\$123.44) for a household. Loss of business income, damage to furniture and loss of jobs were also quite significant and amounted to Tk. 4253, (US\$83.63) Tk. 2126 (US\$41.80) and Tk. 1396 (US\$27.45) per household respectively.

Recovery from flood damage

The survey was carried out about 3

months after the flood. Respondents were asked if they had recovered from the various types of damage inflicted by the flood. Figure 3 presents the distribution of households by the extent of recovery from flood damage. About 40 percent of households recovered completely while about 44 percent of households recovered partially. About 16 percent of households did not recover at all. The percentage of households recovering completely, however, varied across occupational groups. Fifty to seventy percent of businessmen, service holders and professionals (doctors, engineers, teachers etc) recovered completely from flood damage with professionals having the highest rate of recovery.

On the other hand, households recovering completely varied between 26 to 37 percent for petty businessmen, rickshaw-pullers, factory workers and day labourers indicating that low-income groups constituted the major victims of the flood.

The majority of households (67%) tried to fix the damage using their own resources and did not accept any outside help. They mainly used their past savings or resorted to borrowing. About 9 percent of households accepted the help of their relatives to recover from flood damage while 19 percent of households mentioned various other sources including friends, local influential people, local shop-keepers etc. What is interesting to note is that people received very little help from institutional or formal sources such as governmental agencies or non-governmental organisations (figure 4). This result confirms previous findings that the largest proportion of affected people received financial help and credit during and after the flood from non-institutional sources such as friends, relatives and neighbours (Elahi 1988; Hossain 1990).

Managing the flood disaster

Disaster management activities relating to flood involve both structural and non-structural measures. Structural measures aim to protect an area up to a certain level of flooding, while non-structural measures aim to reduce the social and economic adverse impacts through flood forecasting and flood warning systems, evacuation of people to safer places, food storage facilities, credit systems to recover from flood damage etc.

In Bangladesh, as elsewhere, the application of such measures and their implementation belong to different government agencies. The Bangladesh Water Development Board (BWDB) is the

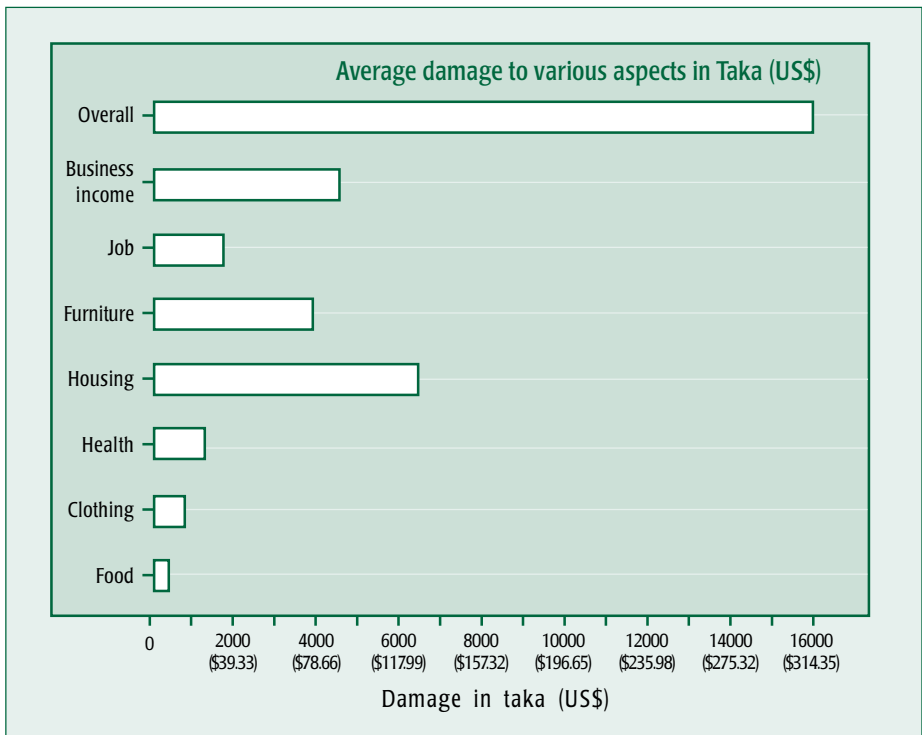


Figure 2: Distribution of households by sources of credit

key agency in planning and implementing flood control and other water related projects. There are about 332 flood control and drainage projects in Bangladesh with 6134 kms of embankments, 4521 hydraulic structures and 985 river closures (Shahjahan 1998). Many other projects are, however, currently under development. Existing projects provide flood protection for an area of 34 percent out of a flood vulnerable area of 59 percent. On completion of the on-going projects about 57 percent of the flood vulnerable area will come under flood protection measures.

Non-structural measures that are carried out by various Ministries and Agencies are mostly restricted to emergency relief and rehabilitation. Flood

preparedness and flood fighting capabilities are now very limited. There is a disaster management council under the chairmanship of the country's Prime Minister, that includes representatives of various ministries, agencies and professional groups and reviews the disaster situations from time to time. There are also governmental standing orders for disasters that specify the roles and responsibilities of all relevant ministries, departments and corporations, the Armed Services, and the District, Thana and Union-level administration in relation to disaster prevention/mitigation, preparedness, response and recovery or rehabilitation. However, there is no comprehensive disaster management plan with central coordination.

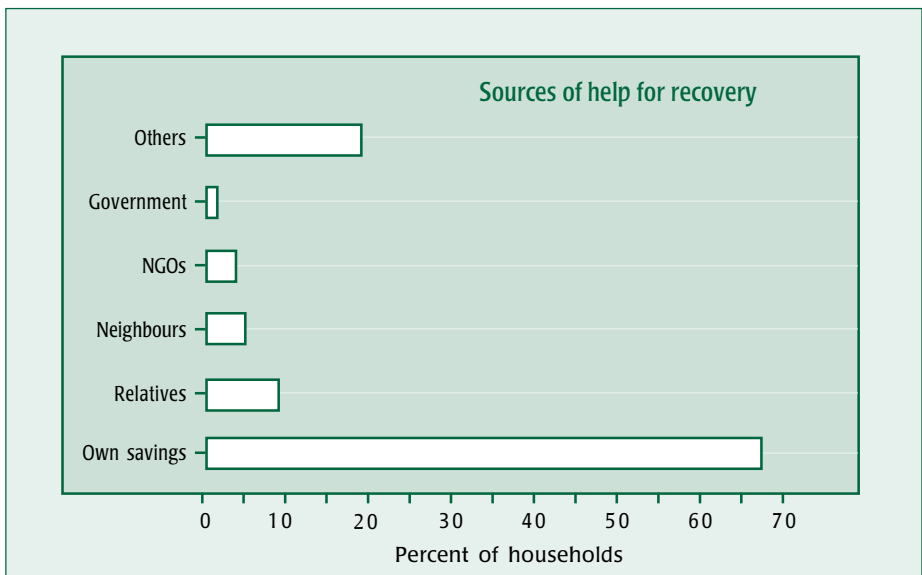


Figure 4: Percentage of households by sources of help for recovery

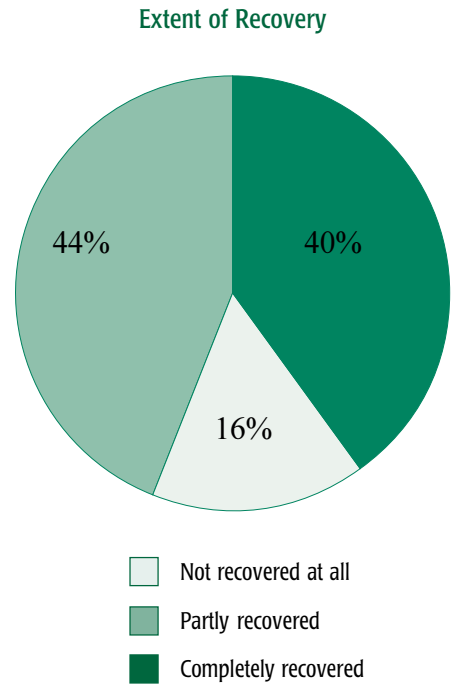


Figure 3: Distribution of households by extent of recovery

The necessity of a balanced approach

The Bangladesh Water Development Board has implemented quite a large number of flood control and drainage projects since 1960 and these projects provide flood protection to a significant proportion of the vulnerable area of the country. What is evident, however, is that such measures have not been able to reduce the extent of flood damage.

An analysis of flood damage statistics indicate that the extent of damage has increased along with an increase in the intensity of flooding during the last few decades (Jahan 1990). In 1954 about 55 percent of the whole country was affected by flood.

In 1974 the flood affected area as a proportion of the total area increased to about 58 percent. The devastating floods of 1988 and 1998 inundated nearly 70 percent of the whole country. Thus the proportion of the total area affected by floods has increased over the years despite the construction of thousands of kilometres of embankments that bring a substantial portion of the country under flood protection measures.

This, however, does not necessarily diminish the importance of structural measures; rather it points to the necessity of combining structural and non-structural measures in a way that minimises loss and achieves the best results. Special attention, therefore should be given to non-structural measure with an emphasis on floodplain regulation, flood forecasting and warning, evacuation of people from danger areas, flood fighting, public health

measures, emergency relief and recovery/rehabilitation.

The need for South-Asian cooperation

The main cause of flood in Bangladesh, as we know, is rainfall in the catchment areas of the major rivers of Bangladesh, namely, the Ganges, the Brahmaputra and the Meghna. Of the approximately 1.55 million square kilometres of drainage area of these rivers, about 93 percent lies outside Bangladesh, that is, in India, Nepal, Bhutan and Tibet (China).

Thus, though there may not be much rainfall locally, there may be heavy rainfall in the catchment area causing flood. Heavy rainfall in Bangladesh, however, would worsen the situation. In addition to heavy rainfall, melting snow, earthquake, deforestation and other human intervention with the natural environment in the upper catchment areas may also aggravate the flood situation in Bangladesh.

The very geographic location and physical setting of this flat alluvial country through which two of the largest rivers in the world drain into the Bay of Bengal, gives the flood problem of Bangladesh a multinational dimension. During the 1988 and 1998 floods we saw that about 80 to 90 percent of the total water that inundated Bangladesh came from across the borders because rainfall within the country did not surpass the normal limits for the period.

Thus, without the cooperation of its neighbours, particularly India, Nepal and Bhutan, Bangladesh cannot hope to manage its flood disasters.

The need for such cooperation was also emphasised before by water resources experts (Abbas, 1989; Hossain, 1989) who called for effective programs to:

- harness the water resources of the Ganges, The Brahmaputra and the Meghna basins for optimal economic use and for benefit to the peoples of this region
- promote a joint action plan by all co-basin countries to develop and manage water flow to mitigate floods
- undertake coordinated action for watershed management including checking deforestation, programming afforestation and construction of flood control reservoirs.

There is now a greater need for regional cooperation for a long lasting solution. Immediate steps, therefore, should be taken in this direction.

An important area where immediate action can start is the development of a cooperative network in the field of flood

forecasting and early warning.

In this age, both earth observation (EO) and telecommunications technologies are mature enough to help in the assessment and forewarning of a range of environmental risks and hazards whether man-made or natural. Such technologies may be particularly useful in combining satellite-derived and ground information for accurate forecasting of natural hazards.

In the case of flood, it is not just important to be able to monitor its evolution with EO technology. Information about land use, soil moisture, snow coverage in parts of the catchment area, weather forecast etc is also needed. All of these can be integrated in a GIS based disaster management system, to be able to model and forecast flood evolution and flood peaks in different locations. A cooperative network would be particularly useful for collection and sharing of real-time data to give the right input for modeling.

Conclusion

Floods in Bangladesh have important social dimensions. Poorer sections of society bear the brunt of the hazard and suffer heavily due to loss of employment, housing and property. Since poverty or low income is a major determinant of flood damage, improvement in income and living conditions would greatly reduce vulnerability.

As regards the flood control measures, the general view is that total flood control in Bangladesh is not possible. Bangladesh is an active delta where the entire land masses arose from flood-borne sediments.

Land formation is still taking place along the coastline as well as inland. Any structural solution to the flood problem based on the construction of massive embankments must be studied carefully since the consequences of tampering with the natural and dynamic process of land formation in Bangladesh is not yet known. In such a situation non-structural measures deserve special attention because of the advantages these have in terms of compatibility with the natural environment and acceptability by the people.

The South-Asian region, with three of the largest river system in the world, confronts serious problems due to the regular onslaught of devastating floods. Bangladesh, being the lower riparian of all the three river basins, is at a great disadvantage as it gives passage to the entire flood flow.

The individual efforts of a country in facing the challenge is not enough. There is, therefore, an urgent need for regional cooperation to develop a long-lasting solution to the flood problem.

References

Abbas A.T.B.M. 1989, 'Flood Management in Bangladesh', in *Flood in Bangladesh*, (ed.) Mohiuddin Ahmed, Community Development Library, Dhaka.

DMB (Disaster Management Bureau), 1998, *Report on Bangladesh Flood, 1998: Chronology, Damages and Response*, Dhaka.

Elahi K. M. 1988, 'The strategy for living with flood and flood rehabilitation', paper presented at the seminar on Floods in Bangladesh: Bangladeshi Views, held on January 24, 25 and 27, 1990 in Dhaka.

Hossain Mahboob 1990, 'Impact of the 1988 flood on the rural economy of Bangladesh', paper presented at the seminar on Floods in Bangladesh: Bangladeshi Views, held on January 24, 25 and 27, 1990 in Dhaka.

JICA (Japan International Cooperation Agency) 1990, *Updating study on storm water drainage system improvement project in Dhaka City*, Dhaka.

Khan A. H. 1989, 'International Cooperation on Flood Control', in Mohiuddin Ahmed (ed), *Flood in Bangladesh*, Community Development Library, Dhaka.

Jahan S. 1990, 'Flood Countermeasures and Rural Development in Bangladesh', in *proceedings of the IDNDR International Conference 1990*, Japan, held on September 27–October 3 in Yokohama and Kagoshima, Japan.

Shahjahan M. 1998, 'Flood Disaster Management in Deltaic Plain integrated with Rural Development' in Mir M. Ali *et al* (eds), *Bangladesh Floods: Views from Home and Abroad*, The University Press Limited, Dhaka.

About the Author

Sarwar Jahan is a professor of Urban and Regional Planning at the Bangladesh University of Engineering and Technology (BUET), Dhaka. He did his MURP degree from BUET and MA degree in regional planning from Waterloo, Canada. He obtained his Ph.D. degree from the University of Illinois at Urbana-Champaign, USA. His research interests include disaster management, spatial modelling and, urban and regional analysis. He published papers relating to these fields in the Journals and Proceedings in Bangladesh, India, USA, UK and Japan. This paper is based on the study "Socio-Economic Impacts of the 1998 Flood in Dhaka City". The author gratefully acknowledges the financial assistance provided by the Centre for Advanced Study and Research, BUET for carrying out the study.