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The Socio-Economic Impacts of the 1998 Flood in Dhaka City

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Abstract

This paper presents the results of a study that was undertaken to analyze the socio-economic impacts of the 1998 flood in Dhaka city. The study indicates that the flood affected the people of different income groups in different parts of the city. The low-income people living mostly in low-lying areas, however, suffered more heavily than the middle or upper-income people. The flood caused heavy damage to housing, health, job and business income. Overall damage to households has been found to be dependent on income. Statistical analysis has shown that there is a positive correlation between the level of income and the extent of damage, but a negative correlation between the level of income and the burden of such damage. The study also indicates that majority of the people tried to make up the losses or repair the damages with their own savings while the poorer sections of the people had to depend on others to cope with the flood damage. In their efforts to cope with the disaster, the low-income people, however, received more help from friends, relatives and voluntary organizations than the governmental or non-governmental organizations.

INTRODUCTION

As a natural hazard, floods are common phenomena in Bangladesh. About 18 percent of the land area is flooded during the monsoon season every year. The problems of flood in Bangladesh came to the forefront after the two consecutive floods of 1954 and 1955. Since then a large number of flood studies were completed and quite a few flood control measures implemented. But the

devastating floods of 1987, 1988 and 1998 gave rise to a feeling that much more needed to be done.

An analysis of flood damage statistics indicates that the extent of damage has increased along with the increase in the intensity of flooding since 1954. Table 1 presents the estimated damages due to severe floods during 1970's, 1980's and 1990's. In 1988 about two-thirds of the country were inundated, affecting 50 million people and killing 1600 of them. This catastrophic flood hit the greater Dhaka area 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 km. of roads were damaged. From the estimates of JICA for an area of 137 kms^2 which includes the major built-up part of greater Dhaka, flood damage was estimated in the order of Tk. 500 millions to Tk. 1000 millions.

The 1998 flood was an unprecedented event of its kind in terms of duration, inundation of areas and damages (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. km. of 52 districts affecting more than 30 million people. Total economic damage amounted to nearly 3 billion dollars (see Table 1).

Table 1: People affected and overall damage by the severe floods in Bangladesh since1970

Year	**People affected** (Millions)	**Overall damage** (Millions Tk.)
1974	30	600
1980	20	120
1984	20	130
1987	41	1000
1988	50	1200
1998	30	2900

Source: Elahi(1988), DMB(1998)

Dhaka city was also severely affected by the 1998 flood. Seventy out of ninety wards of Dhaka City Corporation went under water of various depths, which lasted for more than eight weeks. The flood affected almost all aspects of human life. It affected not only the physical assets of the people, but also their

income, health and occupation. People of various income and occupation groups suffered in varying degrees due to the flood. There were also significant spatial variations in the impacts 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 various socio-economic groups in Dhaka city and the mechanisms through which people coped with the flood. More specifically, the aims of the study were: (i) to investigate the extent of damage to lives and properties, income, job, health etc. across income groups; (ii) to study the coping mechanism of the people during the disaster; and (iii) to determine the help and assistance received by the affected people from governmental and non-governmental organizations and private individuals.

The study was carried out in four areas in the eastern part and one area in the southern part of the city. The areas in the eastern part were Meradia, Basabo, Anandanagar and Gulshan while in the southern part the area was Kamrangir Char. Data were collected from a total of 294 households out of which 66 were in Kamrangir char, 73 in Meradia, 32 in Basabo, 96 in Anandanagar and 27 in Gulshan. For the purpose of questionnaire survey, each area was divided among 8 groups of investigators. Each group was then assigned with a small cluster within each sub-area. Households were then selected from each cluster following a systematic sampling procedure.

The questionnaire was designed to collect information so as to fulfil the objectives as mentioned above. The questionnaire, therefore, included such aspects as the socio-economic and demographic characteristics of the people affected by the flood, level and duration of the flood, coping mechanism of the people during the disaster phase, sufferings of the people, extent of damage in terms of housing, health, income, occupation, clothing, furniture etc, the extent of recovery after the flood, and help and assistance received from different sources.

SOCIO-ECONOMIC ATTRIBUTES

A total of 294 household heads were interviewed from five different areas. About 95% of them were males. Majority of the 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.

Nearly 31 percent of the respondents were illiterate, 9.2 percent passed SSC or HSC 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 the respondents were engaged in various other types of jobs

including professional activities, and factory work. Nearly 7 percent were unemployed**.**

The flood affected people of different income groups. Figure 1 presents the distribution of people by income groups. It shows that 19.4 percent of the respondents belonged to the lowest income group having income upto Tk. 2999. Largest number of respondents (40.8%) belonged to the group having income between Tk. 3000 and Tk. 5999 while the respondents earning Tk. 12000 or more constituted 17.6% of the total number of respondents.

There were also spatial variations in income as is evident from Figure 2. The highest average income was recorded in Gulshan, while the lowest was in Meradia. Average income in Kamrangir Char and Ananda Nagar areas were found to be almost the same while the average income in Basabo was a little bit higher than these areas.

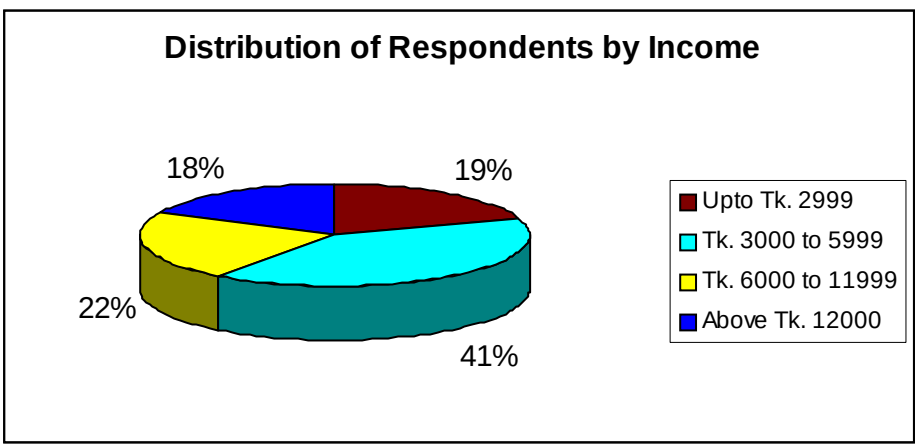

Figure 1: Percentage distribution of respondents by income

LEVEL AND DURATION OF FLOOD

People in the flood–hit areas were affected in varying degrees depending on the level of flooding. More than 80 percent of the houses went under 3 ft or more water. The water level reached the roof in about 19 percent of the houses and up to half the dwelling height in about 31 percent of the houses.

There were, however, variations among the areas in terms of water level. In Gulshan area the maximum height of water was 3 ft above the plinth level of dwelling units, while in Kamrangir char, water level reached the roof of about 45 percent of the houses. In other areas proportions of houses submerged up to the roof varied between 10 to 17 percent.

The duration of the 1998 flood was one of the highest in recent history. Majority (60%) of the respondents mentioned that their houses remained submerged for more than 60 days while the houses of about 25 percent of the respondents were under water for about 51 to 60 days. Only 10 percent of the respondents mentioned that the duration of the flood was 30 days or less.

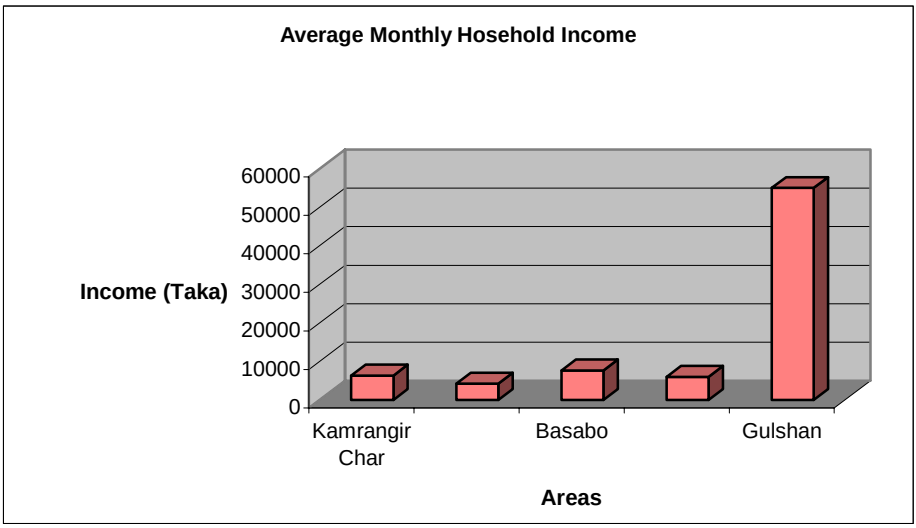

Figure 2: Average monthly household income in different areas

EXTENT OF EVACUATION

Although more than 80 percent of the houses went under 3 ft or more water, majority of the people did not leave their houses. The present survey indicates that nearly 32 percent of the people left their homes along with other family members and took shelter in relative's houses, nearby high–rise buildings or schools or madrashas. Majority (50%) of those who left their homes took shelter in relative's houses in and outside the area they live in. Most of them used boats for the purpose of evacuation.

About 68 percent of the people did not leave their houses. Nearly 34 percent of those who did not evacuate stayed on the roof of their houses while about 60 percent stayed on an elevated platform inside the house. For the rest (about 6%), the floodwater did not pose serious problems to make such arrangements. People gave different reasons for not evacuating. Majority of them (51%) stayed back home to guard their properties. About 18 percent of the people mentioned that there was no shelter nearby or the available shelter was not suitable for staying. The remaining 31 percent gave various other reasons such as that the house was flood-resistant, problems were not too serious, the family members were ill, etc.

LIVING CONDITION DURING THE FLOOD

People suffered heavily due to the flood. They faced many problems while struggling for survival. The problems such as shortage of drinking water, getting wet by rainwater, shortage of food, possibility of snakebite etc. hit the people quite hard. Most of the people (86.8%) mentioned the shortage of drinking water as the main problem followed by shortage of food (62.5%) and getting wet by rainwater (56.6%). Rain posed serious problems for those who stayed on the roof of their house.

There were, however, spatial variations in the problems faced by the people who did not evacuate. In Kamrangir Char area rainwater and shortage of food were considered as serious problems by 80% and 82% of the people, respectively. This, however, was not unexpected given the fact that Kamrangir Char is a low–income and flood–prone area where most of the houses were submerged. Most of the people here are daily labourers, rickshaw–pullers or low–paid factory workers. Consequently, their jobs and income were badly affected.

Various types of diseases also broke out during the flood. About 76 percent of the respondents mentioned that one or more of the family members suffered from diseases like diarrhea, dysentery, virus fever, jaundice etc. Diarrhea was widespread and nearly 24 percent of the respondents mentioned that one of their family members suffered from this disease. Families of about 17 percent of the respondents had 2 or more members suffering from this disease. There were also an epidemic of virus fever and at least one member of nearly 51 percent of the families suffered from this disease. Dysentery or jaundice also affected about 31 percent of the families.

People also suffered heavily due to increases in household expenditures during the flood. Expenditure on flood, medicine and transportation was considerably higher during the flood than before. Average household expenditure on housing, food, medicine and transportation together was Tk. 7568 during the flood compared to Tk. 6367 before the flood (Table 2) indicating that there was nearly a 19% increase in household expenditure during the flood. The increase in expenditure, however, was not uniform across different items. Transportation expenditure registered the highest increase. The reason for this increase was that people who moved on foot before the flood could not do so during the flood. They had to take rickshaws or boats for moving. Rickshaw fair also increased during the flood as the rickshaw-pullers in most cases could not ply through floodwaters and had to pull the rickshaws by hand. The increase in medical expenditure was about 62% mainly because of the various diseases, which broke out in the flood-affected areas. The increase in food expenditure was, however, modest (15%) compared to transportation and medical expenditures.

Table 2: Average monthly expenditure before and during flood

Items	Average Monthly Expenditure		
	Before Flood (Tk.)	During Flood (Tk.)	Difference (Tk.)
Housing	1586	1526	-60*
Food	3811	4368	557**
Medicine	278	451	173**
Transport	202	1223	1021**
Total	6367	7568	1201**

* Not significant; ** Significant at .01 level

COPING WITH THE DISASTER

The increase in household expenditures and reduction or loss of income during the flood put many people in a precarious situation. They were compelled to borrow for survival. Nearly 36 percent of the respondents had to take loan for various purposes. Buying food was the main reason for nearly 86 percent of those who took loans. About 28 percent of the people borrowed money for the purpose of medical treatment. People also borrowed money for instant repair of the house (12.1%) during the flood or for renting a house when they had to move to a flood-free area.

The main sources of borrowing were relatives (38.7%), neighbors (22.6%) and friends (11.3%). People (23.6%) also bought food and daily necessities on credit from shop–keepers. It is interesting to note that the proportion of people taking loan from NGOs or *Mahajans* was very insignificant. Only 6.6 percent of the borrowers got money from the NGOs while another 6.6 percent went to the *Mahajans*. The results of the study confirm previous findings that largest proportion of the affected people received financial help and credit during and after flood from non-institutional sources such as friends, relatives and neighbors (Elahi, 1988; Hossain, 1990). Some people also sold or mortgaged jewelry mainly to buy food. 8.16 % of the people surveyed sold jewelry while 3.4% mortgaged the same. Almost all of those who sold jewelry mentioned that they did not receive fair price.

Many organizations, however, came forward to provide the flood-affected people with material help. About 34 percent of the people received relief goods from Government (GOs), Non-Government (NGOs) and Voluntary organizations (VOs) as well as various other sources. Figure 3 presents the percentage distribution of people by relief materials received and by sources of such

materials. The materials they received included food, clothing, medicine and water purification tablets. Some people also received money. It is interesting to note that largest number of people received food, medicine and water purification tablets from voluntary organizations. More people received medicine and water purification tablets from NGOs than from GOs, but the number of people receiving food from GOs was higher than the NGOs. The data once again indicate that flood-affected people received more help from sources other than Governmental and Non-Governmental Organizations.

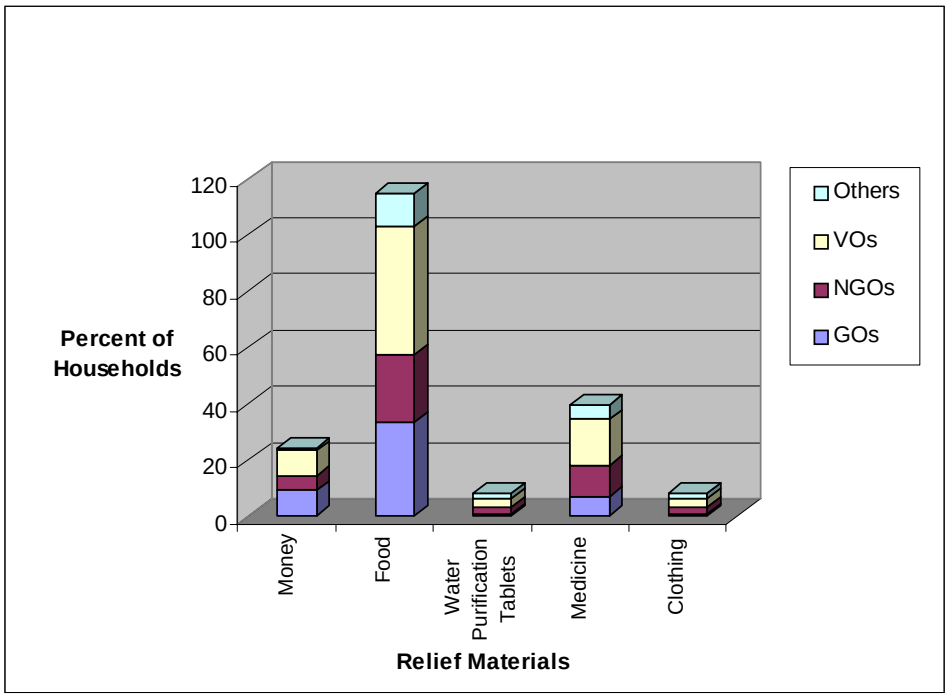

Figure 3: Percentage distribution of respondents by relief materials received and sources of relief materials

EXTENT OF FLOOD DAMAGE

The 1998 flood caused extensive damage to lives and properties throughout the country. Almost all sectors of the economy were affected. The people in the flood–affected study areas suffered heavily due to the damage to housing, clothing, furniture, job, business, health etc. Table 3 presents the average household damage due to the flood.

Table 3: Average food damage in different study areas

Item	Average damage (Tk.)	Kamrangir Char (Tk.)	Meradia (Tk.)	Basabo (Tk.)	Ananda Nagar (Tk.)	Gulshan (Tk.)
Food	285	480	243	275	191	38
Clothing	455	383	428	226	610	1
Health	694	1238	419	436	626	538
Housing	6277	14514	4143	3616	3277	7186
Furniture	2126	2737	1385	1734	2483	3223
Job	1396	1382	1140	2022	1419	75
Business Income	4253	4930	3946	3688	4313	4040
Overall	15486	25664	11704	11997	12919	15101

The flood caused extensive damage to housing averaging about Tk. 6277 for a household. Loss of business income, damage to furniture and loss of jobs were also quite significant and amounted to Tk. 4253, Tk. 2126 and Tk. 1396 per household, respectively. There were also spatial variations in damage. Households in Kamrangir Char suffered the heaviest damage where average damage was nearly twice that of Meradia, Basabo or Ananda Nagar.

Table 4 presents the distribution of the people by the extent of house-damage and the level of income while Table 5 presents the distribution of people by the extent of income-damage and the levels of their income. About 25 percent of the lowest income people had their houses fully damaged by the flood compared to only 5 percent of the highest income group whose houses were fully damaged. Similar is the picture in case of income-damage. About 43 percent of the lowest–income people suffered total loss of income during the flood compared to about 4 percent of the highest-income group.

Table 4: Distribution of respondents by income-group and extent of housing-damage

Level of Income	Extent of Damage*			
	Fully	Partly	No Damage	Total
Up to Tk 2999	14 (24.60)	28 (49.10)	15 (26.30)	57 (19.60)
Tk 3000 to Tk 5999	24 (20.30)	72 (61.0)	22 (18.60)	118 (40.50)
Tk 6000 to Tk 8999	4 (8.20)	28 (57.10)	17 (34.70)	49 (16.80)
Tk 9000 to Tk 11999	4 (26.70)	11 (73.30)	0 (0.0)	15 (5.20)
Tk 12000 and Above	3 (5.80)	38 (73.10)	11 (21.20)	52 (17.90)
Total	49 (16.80)	177(60.80)	65 (22.30)	291 (100.0)

***** Number within the bracket represents the percentage.

Table 5: Distribution of respondents by income-group and extent of income-damage

Level of Income	Extent of Damage*			
	Fully	Partly	No Damage	Total
Up to Tk 2999	24 (42.90)	18 (32.10)	14 (25.0)	56 (19.20)
Tk 3000 to Tk 5999	45 (37.80)	51 (42.90)	23 (19.30)	119 (40.90)
Tk 6000 to Tk 8999	8 (16.0)	25 (50.0)	17 (34.0)	50 (17.20)
Tk 9000 to Tk 11999	3 (20.0)	6 (40.0)	6 (40.0)	15 (5.20)
Tk 12000 and Above	2 (3.90)	20 (39.20)	29 (56.90)	51 (17.50)
Total	82 (28.20)	120 (41.20)	89 (30.60)	291 (100.0)

***** Number within the bracket represents the percentage.

Chi-square tests were performed to determine whether flood damages were independent of income. The results of the tests are presented in Table 6. The results of the chi–squre tests are highly significant for damages to housing, furniture, business income and job but insignificant for food, clothing and health damages indicating that housing, furniture and income damages could be estimated in terms of income.

Table 6: Results of Chi–square tests of independence between income and damages.

Types of Damage	Chi-sqare Value	Degrees of Freedom	Significance Level
Business Income*	59.0372	24	.00009
Food	26.5032	20	.14983
Furniture*	43.2893	24	.00922
Clothing	25.9242	24	.35702
Housing*	48.58131	24	.01110
Job*	43.0825	24	.00973
Health	25.9076	20	.16888

***** Significant

ESTIMATING HOUSEHOLD DAMAGE

For estimating the curve relating household damage to income, total household damage was obtained combining all types of household damages. It was hypothesized that there existed a positive correlation between total household

damage and household income but a negative correlation between the burden of such damage and household income. The burden of damage was obtained by calculating total household damage per Taka of household income. Computation of Pearson's correlation coefficients confirmed the hypothesis. The Pearson's correlation coefficient between total household damage and household income was found to be 0.24 and significant at 99.99% confidence level while the correlation coefficient between the burden of household damage and household income was found to be .20 and significant at 99.7 % confidence level.

For estimating the equation three functional forms were considered: linear, logarithmic and inverse. On the basis of 'R-square' and confidence level, logarithmic form was found to be most appropriate for estimating total household damage while inverse functional form was found to be most appropriate for estimating burden of damage. The estimated equations are as follows:

$$THDAM = -47390 + 7676 \ln (THINCOME)$$

where, *THDAM* = Total household damage in Taka
THINCOME = Total household income in Taka
ln = Natural Logarithm

$$BHDAM = 1.5057 + 8466 / THINCOME$$

where, *BHDAM* = Burden of household damage in term of Taka per Taka of Income
THINCOME = Total household income in Taka.

The first equation indicates that total household damage increases with increase in income but at a decreasing rate while burden of damage decreases with increase in income. Estimated curves relating flood damage and burden of flood damage to income are presented in Figs. 4 and 5.

EXTENT OF RECOVERY

The present survey was carried out about 3 months after the flood. The respondents were asked if they recovered from various types of damages inflicted by the flood. Table 7 presents the distributions of respondents by the extent of recovery from various types of damages. Majority of the households did not recover even after three month of the flood. In case of housing, only about 25 percent of the respondents recovered completely while nearly 26 percent indicated that they could not do anything about their damaged houses. Percentage of respondents recovering completely from job loss and loss of business income was higher but still less than 50 percent. The situation with respect to health was also not much better, indicating that people needed more help.

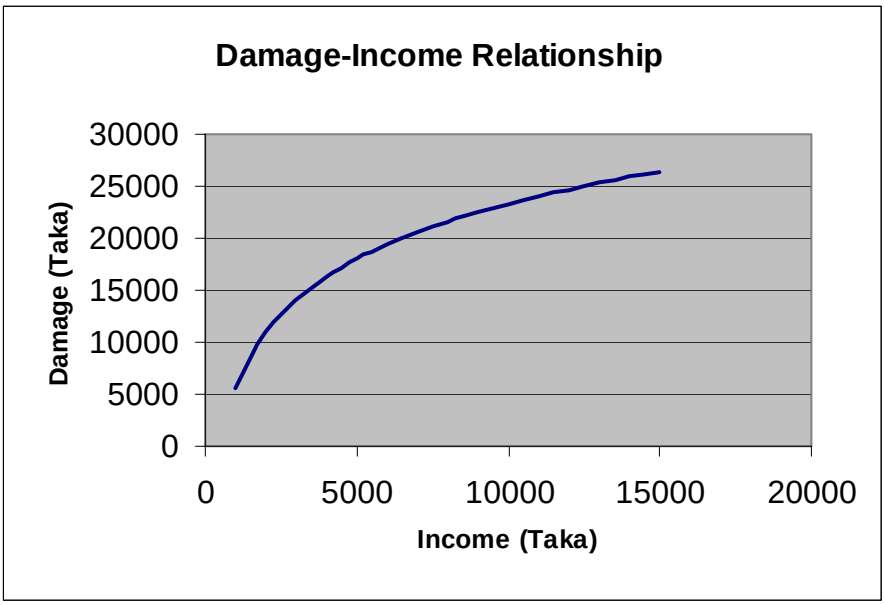

Figure 4: Estimated curve relating flood damage and income

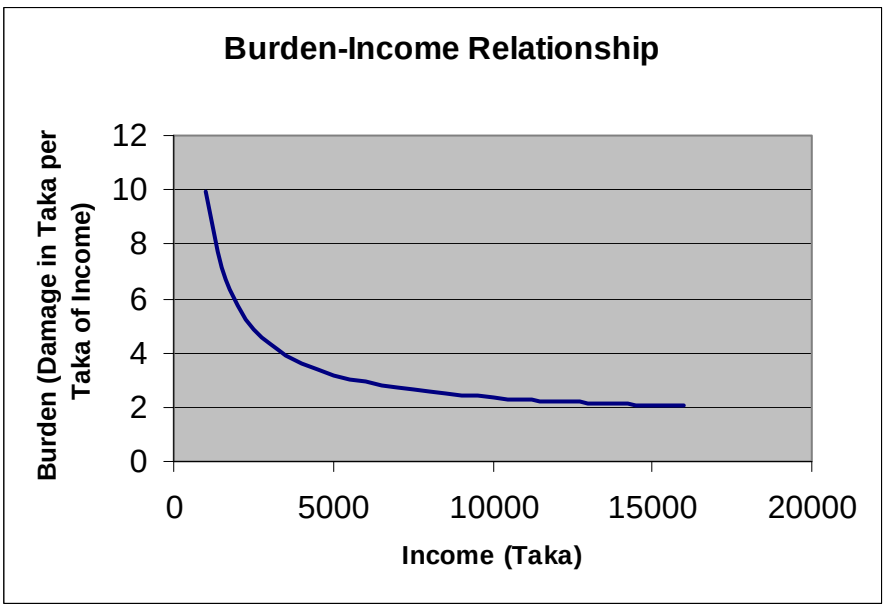

Figure 5: Estimated curve relating burden of flood damage and income

Table 7: Percentage distribution of respondents by the extent of recovery from flood damages

Extent of Recovery	Housing	Business Income	Job	Health
Completely	26.85	38.09	48.53	51.06
About 75%	10.36	17.76	12.10	24.73
About 50%	18.39	22.28	15.16	15.50
About 25%	17.02	9.89	10.07	3.61
Not Recovered	27.38	11.98	14.14	5.10

An attempt was made to assess how people tried to cope with the flood damage. Majority of the respondents mentioned that they tried to face the damage without taking any help from others (Table 8). About 9 percent of the respondents took help of relatives to recover from damage to their houses while about 12 percent of the respondents took help of relatives to make up the loss of business income. People received very little help from the government or the NGOs in their efforts to recover from flood damage.

Table 8: Percentage distribution of respondents by sources of help for recovery

Sources of Help	Housing	Business Income	Job	Health
Own Resource	61.04	63.00	73.68	78.00
NGO	1.96	2.84	0.0	0.0
Neighbours	1.96	2.27	2.63	3.63
Relatives	9.13	12.37	3.95	6.69
Government	0.70	0.0	1.31	3.06
Others	25.21	19.52	18.43	8.62

Nearly 20 percent of the respondents borrowed money from various sources after the flood. Majority of them borrowed from relative (38.1%). Friends (19%) and neighbors (14.3%) were other major sources of credit. Repairing the damaged house was the main reason for borrowing for nearly 43 percent of the respondents who borrowed money. Nearly 34 percent of the borrowers needed money for buying food reflecting the fact that many people could not recover from the loss of jobs or income. Other reasons for borrowing were treatment of patients, repairing of house etc.

CONCLUSIONS

The 1998 flood has left considerable socio-economic impacts in Dhaka city. It has not only damaged houses and infrastructure but also caused considerable

damage to business, job and health. The findings of the study indicate that the burden of flood damage was borne more by the poor than by the non-poor. The poor suffered heavily due to the loss of employment, housing and property. In many cases, they sold their assets or borrowed heavily for survival.

The study has also shown that the people tried to cope with the damage on their own but the weaker sections of the community had to take help from others as they lost their jobs and income due to the flood. The study reveals that the largest proportion of flood-affected people received material help and credit from non-institutional sources such as friends and relatives, neighbors and voluntary organizations. The results of previous studies carried out in rural areas also corroborate the findings of the present study.

From this study it appears that poverty or low income is a major determinant of flood damage at the household level. Improvement in income and living condition of the people, therefore, would greatly reduce the vulnerability of the population to natural disasters like flood. The government should also play a more active role at different stages of the flood. Post-flood rehabilitation measures assume special importance in view of the fact that poor people need help and assistance to recover from the flood damage. In the absence of any financial assistance or credit facilities from institutional sources, the poor become compelled to depend on friends and relatives. From this study it is evident that financial help or credit from such sources is not sufficient; majority of the affected people could not recover from the flood damage despite getting help from friends and relatives. The vast majority of the flood-affected poor people would suffer more unless the government and non-government organizations come forward to their assistance.

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