Rivers are an integral part of Bengal’s ecology and shaped its civilization and culture. This dynamic river system regarded as nature’s gift to Bengal became the victim of modern civilization. Irreversible changes have occurred in the river system due to laying of railways, construction of dams and barrages and ever-increasing density of population in the state and resulted into choking and congestion in the natural drainage system. It is certain that West Bengal has become one of the most flood disaster prone areas in the country. As a result, the people of West Bengal are becoming extremely vulnerable to flood hazards with the horrifying fact of inundating 500 to 20000 square kilometers of land 40 times since 1960s. Further, these caused the inundation of nearly 25 per cent of the land area of the state has occurred for 6 times in 40 years (SSUP Study, 2000).

Floods have differential impacts on property and human beings. This differential impact is attributed to various geographical, socio-economic
and political factors. A number of studies have been conducted to assess the impacts of floods in various aspects of life. However, in most of the cases, the focus had been on assessment of damages to property, infrastructure, economy & human lives. The losses that are tangible in nature have always attracted both the researchers and disaster-managing authorities to work upon, may be because of its direct relationship with the cause. Over and above, the approach has always been based on economics and outcome has been interpreted in terms of monetary value.

The other kinds of impacts like deterioration in living conditions, impact on community health, changes in employment patterns, impact on social structure, changes in agricultural practices etc. did not draw much attention. Impacts of flood on health are the least studied, except for counting the number of lives lost, that too have been studied in a narrow perspective of statistical data collection. Although floods leave a dreaded impact on both the mental and physical health of its victims, a very small number of studies that exclusively deal with this issue are available. These kinds of studies are scarce in the context of developing countries. So far, while dealing with issues of health impact of floods, the approach has been to identify and classify the impacts into Direct/Indirect, Tangible/Intangible, and Primary/Secondary impact. Nonetheless, as discussed in chapter 2, these classifications were found to be overlapping and conceptually unclear. Application of these classifications was difficult and limited in the present study. Need was felt to reclassify the flood impacts in a comprehensive and non-overlapping manner. In this study, the impacts of flood on health were categorized into **Proximate Impacts and Consequential Impacts**. Based on this classification, a model for health impact assessment of floods was conceptualized in Chapter 2 and was titled as "**Composite Health Impact Assessment Model**".
Figure: 7.1.F Composite Health Impact Assessment Model

**Flood Health Impact Assessment Model**

**Defining Parameters**

- Originating after the buffer time and generally effect continues for very long duration
- Triggered by flood but not necessarily directly related or caused by flood
- Secondary factors like socio-economic, cultural, geographical factor aggravate the situation

**Key Variables**

- During the flood and a buffer time before returning to normal hydraulic condition
- Presence of flood water and its physical contacts with human beings
- Duration of Inundation
- Speed of Flood Water
- Depth of Flood Water
- Duration of buffer time for aftermath impact

**Proximate Impact**

**Consequential Impact**

**Non-Health Impacts**

1. Recharging Ground Water Table
2. Revitalisation of soil fertility
3. Loss of live-stocks

**Health Impacts**

1. Death
2. Injury
3. Diseases
   a. Water borne
   b. Vector borne
4. Mental Health problems

**Non-Health Impacts**

1. Employment Pattern including out migration
2. Agricultural Practices
3. Changes in Social Structure

**Health Impacts**

1. Disease triggered by change in social composition/structure
2. Aggravating existing health conditions of people
3. Disease triggered by economic degradation of certain class within the community

**2nd Generation Proximate/Consequential Health Impact**

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This model was further applied in analyzing the empirical data, which have been elaborated in Chapter 6. The key components and flow chart of the model is displayed in the previous page.

However, some of the components of the model were not studied in-depth in this research study. Issues covered under the study and analyzed based on this model included outbreak of diarrhoeal diseases during flood, forced migration and diseases acquiring due to hazardous occupational and living conditions and aggravation of the existing diseases associated with certain socio-economic conditions. In the study, the following impacts were categories as proximate health impacts & consequential health impacts and were studied:

- **Proximate health impacts:**
  - Injures
  - Accidental deaths
  - Water borne diseases occurred at the time of flood

- **Consequential health impacts**
  - Malnutrition
  - Migration induced health problems
  - Unemployment related health problems

There was no injury related death reported from the families of the respondents. This shows a relatively low level of injury related deaths at the time of the flood. However, there were three deaths cases among the most vulnerable sections of the community namely children and senior citizen. The respondents felt that they have lived with flood and so death in flood is what they expect the least. A deeper analysis of the duration of the flood and its correlation with accidental deaths needs further examination. One earlier study showed there were 7.5 deaths per lakh population in West Bengal in the flood of 2000.
There were mainly four different types of health problems reported during the flood days. The class differential of the suffering of the disease shows that morbidity due to fever, cough and cold had been the highest across all the classes, which was followed by diarrhoeal diseases. However, diarrhoeal disease among the 'very poor' class had been very high, there is a general increase in the reported cases of diarrhoea during the rainy season. The conclusion has been drawn from the above observation that, with the arrival of monsoon the cases of diarrhoea increases, however, flood is a definite reason that triggers an abnormal rise in the incidents of the disease in the affected area.

A possible association between the consumption of drinking water and suffering from diarrhoeal disease could be observed from the data collected. The study showed that almost 70% of the 'well off' and 31% of the 'not so poor' class people could take precautionary measures in terms of keeping proper drinking water in reserve and accessing those for the consumption during the period of emergency. 'Well Off' class households were better prepared with water purification tablets and maintained a precaution. In contrast to that, majority of the 'very poor' class people had no access to the drinking water, and consumed unpurified floodwater. This resulted into larger number of diarrhoea cases among the 'very poor' and 'not so poor' class of households.

The disease reporting at health centre in the study area showed a general increase in cases of diarrhoea during rainy season, i.e. from May-June, to September-October every year. Floods had increased the diarrhoeal cases by 5 times compared to the trend shown in different years. This was observed in the year 2000 when exceptionally high intensity flood hit the study area. Further, the reported cases in year 2000 were almost 2.5 times more than the cases reported in the same month of the
previous year, i.e. 1999, having a lower intensity flood. This can be stated as proximate health impacts of flood in the area.

Recurrent flooding leaves a definite impact on livelihood of the people if economy of the place is depending upon agriculture and related activities. The study has shown the recurrence of flood makes poorer households economically unstable and provides little scope to recover from the losses. Eventually, a majority of the ‘very poor’ households have lost their lands and turned into landless labourers. The situation became further complicated since agriculture related jobs became scarce and the people now earn their livelihood as migrant labourers. The migrant labourers are generally exposed to poor living conditions and suffer from variety of health problems like malaria, typhoid, jaundice, gastric disorder and Sexually Transmitted Infections. All the cases interviewed for this study have suffered from either of these diseases at various points of time while on migration. Although the flooding has no direct relation with the disease and sufferings of the migrant labourers, but definitely the recurrent flooding has been instrumental in pushing the people on migration, which further caused health problems to them. This is termed as Consequential health impacts of flood.

However, floods also had some positive impact in terms of recharging of ground water tables. In the study area it was observed that depleted water tables (caused by over extraction of ground water for the agricultural purposes) were recharged by the floods and provided people better quality water for some months in the year.

In the recent times, there has been increased concern about the social causes of vulnerability rather than the physical causes. The proponents of ‘social causes of vulnerability’ have emphasized on various components of vulnerability viz. the initial well being, self-protection, social
protection, livelihood resilience and social capital that determines the condition of vulnerability or resilience to the flood disaster.

The present study has shown that the economic status of the households had primarily determined the vulnerability or resilience levels of the community / individual to the flood hazard. The magnitude of flood losses was highest among the economically ‘very poor’ class of households. There had been multiple impacts over them. On the one hand they lost their livelihood due to loss of agricultural lands, on the other, the loss of dwelling place, unstable occupational opportunities, poorer nutritional intake and higher disease load made their conditions precarious. All these factors collectively multiplied the vulnerability levels of these class of households.

Human beings have responded to the flood problems in different ways. Out of all possible measures to deal with the flood situations, structural measures have been most commonly applied and dominated till twentieth century. However, the structural solutions could not bring a concrete solution to the flood problems. In fact, the structures like dams, embankments and channel modifications have actually aggravated the problems by preventing the positive impacts of flooding. At times these deprived the community from recharging the ground water table, revitalizing the soil fertility and rejuvenate the floodplain ecological balances.

The other alternatives were non-structural measures that include ‘Loss Sharing’ through insurance and distribution of relief, and ‘Loss Reduction’ through initiating early warning, preparedness of the community as well as authorities. Nonetheless, the most important aspect is the community’s response to the eventuality that comes from within. The study showed that the community had the capability of predicting and
dealing with the floods, when the phenomenon was recurrent. However, the community could not take measures to minimize the impacts of flood hazards due to its poor socio-economic conditions. The respondents identified that at the household level the minimum required coping instrument would be a pukka house with a concrete flat roof, which most of the households could not afford due to the poor economic conditions.

In post disaster scenario, the study showed a differential requirement of items by the different class of households at different points of recovery period. There has always been a mismatch between the requirements and demands of the flood victims and the relief provided by the voluntary organisations and government authorities. The most immediate authority, located within the community, was the panchayat. However, the panchayat failed to fulfill the need of the most deserving flood victims. Also there has been a gross mismatch between the people’s perception on panchayat’s role in reducing flood related sufferings and the actual role played by them in such conditions. The respondents had shown a general distrust on the partial functioning of the panchayats and their nepotism. At the same time there had also been hope among them that situation could be changed if the panchayats started functioning impartially.

There are certain coping mechanisms that evolved in which the community started providing food and health service security to its members, particularly to the members of male absentee households (family of the migrant labourers) by providing food items on credit at the time of emergency. This not only provided required nutritional intake to the flood victims, but also gave a sense of security among the females and children in the household in the absence of their male members.
The loan requirement of the flood-hit community is absolutely high, particularly when it has been observed that the regular savings by majority of the households are not possible. This is characterized by the high vulnerability of certain section of population, whose basic demands of food, health and housing are not met.

The study has also observed differential health seeking behaviors during and immediately after the flood situation. The 'very poor' households had either waited till the subsidence of the floodwater or went to the locally available RMPs who generally provide the services on credit. The situation with the 'not so poor' group had also been no different. This was due to the irregular delivery of health care services and non-availability of doctors in the PHC for a very long time. However, the economically better off people were more particular in securing the services from the secondary level govt. hospitals where specialist health care services were available through out.

The general, government health facilities in the area failed to provide any health services during the days of emergency, firstly, due to the inundation of the PHC and SC buildings and secondly, the health workers themselves were badly hit by the flood. This resulted into a complete shut down of the government health facility for about a month following the inundation of the area.

The NGOs too could not provided the expected health services at the time of emergency. However, the community's response in restoring the drinking water sources had been prompt. This establishes the need of involving the community into the disaster management process.
7.1 Policy Implications of the Study

The study has shown the differential impacts of flood disaster and its management process. The economically poorer sections are more vulnerable in flooding and take more time in recovering the losses incurred. Therefore, this section of people needs to be given more care both in the pre and post flood period. The government officials, panchayat members and the volunteers of the community based organizations and NGOs, who generally play the key role in relief distribution and organizing rehabilitative measures need to be sensitized in this regard.

Vulnerability analysis, which was one of the major objectives of the study showed the economically poorest class, having very low per capita annual income are most susceptible to loosing the agricultural lands. A considerable 34 per cent of the households attributed their loss of lands to the poorer economic condition due to recurrent flooding. This resulted into more vulnerable situation for the landless households while facing the flood in terms of inadequate food intake, out migration of the family members, feeling of insecurity at the period of recovery and rehabilitation. The data further showed that the adversely located agricultural lands, which are more expensive to do cultivation and insufficient area of land holding, which are not optimum for rotating crops are belonging to the people who are both economically and socially backward. This aggravates the condition of vulnerability during the flood situation. Poor housing condition is yet another problem area for economically weaker sections along with their larger family size that makes more number of people vulnerable to flood. Therefore, the disaster mitigation plans should be made in such a way that it takes into account the socio-economic factors of disaster vulnerability and the weakest section of the population is positively discriminated.
The recurrent flooding in the area followed by loss of agricultural lands and employments related to it have manifested into the large number of out migration from the affected villages. Further, because of the poorer educational qualifications and lack of technical skills these people eventually take up unskilled jobs. These lowly paid migrants also find very poor quality living condition at their work place. The harsh working and living conditions take toll on their health. The study has found majority of the migrant workers suffered from variety of diseases like jaundice, malaria, gastric ulcer, tuberculosis and sexually transmitted infections (STIs). Survey conducted for this study found that most of the malaria cases detected by the clinical laboratories around the study area were migrant labourers. There have also been number of tuberculosis patients who attributed their health conditions to the extremely unfavourable living conditions while on migration. A Family Health Survey conducted by the state government health services in February 2002 revealed that considerable number of women in the area started suffering from STIs, transmitted by their counter parts who were on migration. Therefore, the issue of out migration and health problems related to it needs to be addressed with more seriousness and attention in the consequential period (refer P).

Collapse of the general health services in the flood-hit areas prevents flood-affected victims from accessing the health services and this may lead to breaking out of the epidemics. Therefore, the government should be more careful in planning and provisioning of the basic health care during the proximate and consequential phase of the flood. A proactive and coordinated role from the government and the NGOs in this regard will certainly help reducing breaking out of certain diseases. Making people aware through panchayats and SHGs regarding the precautions to be observed during and immediately after the flood will also help improving the situation.
Panchayat needs to be strengthened to deal with flood disaster in more comprehensive way since its members are the part of the community and often they themselves become victims of the flood. Hence they need to be given prior orientation and training to become prepared and adopt a proactive role during the period of emergency.

The recent literatures and Flood Contingency Plans published by concerned government departments at the state and district levels do recognize the need for empowering communities. However, at the grass root level there has been lack of coordination between the development works and flood disaster preparedness and livelihood strategies as long-term activities. At all the levels there should be coordination among development agencies and government departments for implementing various disaster preparedness programmes in a better way.

Some structural measures like creating reservoirs on the riverbed; re-excavation of the silted ponds available in the area and excavation of the new ponds will channelise the excess floodwater and ease the pressure on underground water. This will in turn reduce the chances of deterioration of the quality of ground water table.

Considering the quantity of land holdings by the majority of households carrying out crop rotation is grossly insufficient and offers high cost of cultivation. An arrangement of community cultivation may offer a multiple solution to the problem described above.

Pre-flood interventions by government authorities and NGOs in terms of forming SHGs, strengthening the community through non-structural capacity building and better livelihood options would help in enhancing resilience of the community against flood.