

**FLOOD MANAGEMENT IN THE SUB-HIMALAYAN NORTH BENGAL REGION: A
GEOGRAPHICAL STUDY**

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Abstract

Flood is a recurring natural hazard that strikes the Sub Himalayan region of North Bengal. It brings a disruptive impact on the community people who ultimately face the problem. Every year this particular region of West Bengal is affected by the flood hazards and it causes tremendous loss of life and property. The main objective of the present study is to find out the nature and magnitude of floods and its preventive measures. Based on secondary data the findings show that it is possible to minimize the severity of the impact and the damage potential through flood mitigation methods like structural and non- structural measures along with emphasis on Village level Flood Disaster Management Committee.

Key words: Flood magnitude, management, disaster committee

Introduction

Flood is an important component of hydrological cycle of a drainage basin. It is the most recurring, widespread natural calamity in India that brings serious social, economic and environment losses. Unlike the other parts of India, the Sub- Himalayan North Bengal region also experiences frequent floods during the monsoon period. This natural hazard is becoming more damaging in this area as their intensity and magnitude increases with the passage of time. Earlier the impact of floods was not as intense and widespread as it is now (Khullar, 2006). The bulk of North Bengal's population is concentrated in the riverine plains. Due to their topographic situation, these areas are often prone to floods. Floods have a very detrimental effect on the population of the present study area by destroying crops, property, human and animal lives. Moreover, studies of floods and their effects happen to be one of the most dynamic areas of geomorphology (Kale & Gupta, 2001). Thus, the present study first examines the frequency and magnitude of floods with its spatial variations in the Sub- Himalayan North Bengal region. Then it proceeds to reflect an overview of flood damage scenario of Teesta, the largest river of the study area. Finally, it outlines some flood management strategies and actions for improving flood hazard of the area with emphasis on village level flood disaster management committee.

Objectives

The present paper embraces the following objectives

- To measure and describe the spatial pattern of floods of the study area.
- To explain the frequency and magnitude of floods of the area
- To suggest to policy makers, planners and academics that flood damages can be minimized through river friendly and multipronged measures.

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Data base and Methodology

The present study is based on both primary and secondary data generated through researcher's field survey. In this study, the available flood data of the last 16 years from 1986 to 2001 have been studied for major North Bengal rivers and the results have briefly been discussed. The relevant flood data were obtained from the following sources- i) Weekly Flood News letter (WFNL), issued by the Central Water Commission, New Delhi, during the flood seasons of the period 1986 to 2001; ii) Flood data obtained from the regional CWC office of Jalpaiguri, and iii) Weather and rainfall data obtained from the relevant publications of the Indian Meteorological Department (IMD, 1986-2001).

However, all these collected primary and secondary information were later on systematically processed, arranged, tabulated and analyzed to have a clear view of the flood scenario of Sub-Himalayan North Bengal. The information collected from primary and secondary sources have been verified with the field experience.

Literature Review

The study of disasters and their management has become an important subject matter in recent times. Disasters may strike anywhere at any time and snatch away a number of lives. So, the scholars have directed their attention with great importance. Nambiar (2007) mentioned a detailed description about the disasters of India as well as the world. Satendra & Sharma (2004) have focused sustainable rural development for disaster management with suitable Indian examples. Chakraborty et. al(2006) pointed out the nature of different disasters and various management programmes. Ghosh, et al (2008) in his work highlighted the regional distribution of disasters in West Bengal. Again, Starkel (1972) explains in his work about the role of catastrophic rainfall in the shaping of the Lower Himalaya' (Darjeeling Hills). The work of Valdiya et al. (2006) is really noteworthy. He gives an outline of natural hazards and their remedial measures in Indian context. Above all, the information gathered from the National Disaster Management Authority, Ministry of Home Affairs, and Government of India has been very useful in the present study.

Study Area

North Bengal lies in the lap of northern part of West Bengal, comprising seven districts Darjiling, Jalpaiguri, Alipurduar, Koch Bihar, Uttar Dinajpur, Dakshin Dinajpur and Malda. The region is situated between 24⁰ 40' 20'' to 27⁰ 13' North latitude and 87⁰ 59' to 89⁰53' East longitude covering a geographical area of 21855 sq. km. The region embraces 17.20 million populations (2011 census).

However, the present study area -the Sub-Himalayan North Bengal region covers mainly two districts - Darjiling and Jalpaiguri. The area belongs to alluvial plains and wavy surfaces in monsoon climatic conditions. The main rivers that cause floods in North Bengal are Teesta, Jaldhaka, Torsa, Raidak & Sankosh.

Flood Frequency and Magnitude

The districts of Darjiling and Jalpaiguri receive heavy rainfall during the monsoon period. The district of Jalpaiguri receives highest rainfall in West Bengal. The annual average rainfall of this district is 3357mm. On the other hand; the district of Darjiling also sheds copious rainfall (2876mm) in the Sub- Himalayan areas. More than 75% of the annual rainfall is received in the four monsoon months of June to September. Thus, the prolonged, heavy and widespread monsoon rainfall cause floods. There are spatial variations of floods in this Sub-Himalayan part of West Bengal. The Dooars region, the eastern part of Teesta river is more prone to floods than the Terai region, the western part of Teesta. Table 1 reflects the flood prone areas of the region-

Table 1: Flood Prone areas of Sub-Himalayan North Bengal

Basin areas	Districts covered
Teesta	Darjiling, Jalpaiguri
Torsa & Raidak I	Jalpaiguri
Jaldhaka	Darjiling, Jalpaiguri
Raidak II & Sankosh	Jalpaiguri

Source: Field Survey by the author

The magnitude, frequency and duration of the floods determine the impact of the flood. Floods of various magnitudes have been occurring in different river basin areas of North India during the monsoon season. Dhar and co-workers (1966, 1975, 1981, 1986, 1992, 1994, 1998, and 2002) have carried out studies of these floods with the aim of knowing and understanding their causes and space-time distributions over the different parts of the country. In this study, the available flood data of the last 16 years from 1986 to 2001 have been studied for north Indian river systems and the results have briefly been discussed. However, from the above study, we get the information on the frequency and magnitude of flood of major Sub-Himalayan North Bengal rivers (Table 2).

The floods of Sub-Himalayan North Bengal rivers are generated by several factors. Heavy to very heavy rainfall during the monsoon season is generally associated with the floods (Ramaswamy, 1987; Dhar and Nandargi, 1998). Sometimes, cyclonic storms and depression associated with the prolonged monsoon produce exceptionally heavy rainfall over the basin they pass through. The flood of Teesta river during the period of 3rd to 5th October, 1968 occurred in this way that brought a havoc in Jalpaiguri area.

Table 2: Frequency and magnitude of flood of major North Bengal rivers from 1986 to 2001

River	Gauge site	Danger level(m)	Highest flood level(m)	Total number of major floods(i.e.>1m)
Raidak	Tufanganj	34.22	36.16	15
Torsa	Ghugumari(Kochbihar)	40.40	41.10	5
Jaldhaka	Mathabhanga	48.70	49.42	7
Teesta	Damohini Rd Bridge	85.30	86.15	5

Source: Valdiya, et al. (2006), p116

At Domohani area, on the left bank of the river Tista, the river rose to 292.8 ft. in the early hours of October 5 overtopping and breaching the embankments at two places and water rushed to Domohani Bazar, damaging Jalpaiguri town, and endangering transport on National Highway No. 31'(Newsletter of International Hydrological Decade ,India Published by C.S.I.R. New Delhi, No. 3, January 1969).

This heavy rainfall associated with the saturated conditions of the catchment area due to antecedent rains, caused the highest recorded peak flood discharge in the river. The peak discharge of Tista river at Jalpaiguri bridge had been estimated as 18,745 cumecs (6.62 lakh cusecs) which has a probability of about 3%. The peak discharge computed by area-slope-velocity method from flood marks also gave a similar figure.

Flood Management

Flood is an annual natural hazard of North Bengal and therefore, several flood management and control programmes have been undertaken in different densely populated areas. The basic principle involved in all the methods concerned with mitigation of floods is to keep flood waters away from the man and man away from the floodwaters. In this case, there are two recognized flood mitigation methods used at present to save communities from the ravages of floods. These methods are-

- 1) **Structural measures:** These include the construction of embankments, dams and channel improvement along the flood prone rivers.
- 2) **Non- Structural measures:** The basic aim of these measures is to keep away people from the floodwaters. Flood forecasting is one of the very scientific methods used to inform the concerned

people, well in advance about impending floods. Again the conventional means to record hydrological parameters of a flood often fail to record an extreme event. Remote sensing technology along with geographic information system (GIS) has become the key tool for flood monitoring in recent years. The satellite- derived data in the context of flood management are the following near real time flood monitoring and mapping; flood damage assessment; mapping of existing flood control systems; mapping of river configuration after floods; identification of eroded or erosion prone areas and drainage congestion and flood- risk zone mapping (Kulsheshta, 2000).

Formation of Village level Flood Disaster Management Committee is very important to minimize the flood havoc at local level (Fig-1). The committee should consist of the Panchayet of the village, elderly persons, school teacher, anganwadi worker, member of women group, youth club, NGOs and the official personnel of block and district levels. The committee will prepare a Disaster management plan of the village. This plan is a list of activities , the village decides to follow, to prevent loss of life, livelihood and property in case of an emergency and also mitigation measures to reduce the vulnerability of the society and make it more resilient to resist the adverse impact of natural hazards(Satendra & Sharma, 2004).

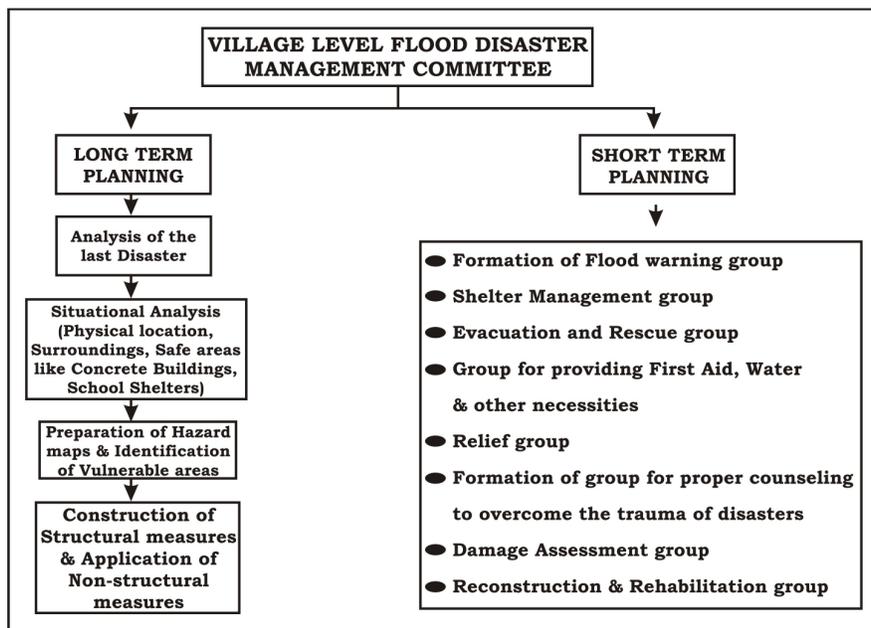


Fig-1: Village Level Flood Disaster Management Committee

The preparation of the disaster management plan of the village basically involves long term and short term planning. While the long term planning covers the mitigation and prevention aspects, the short term planning takes care to safe guard village society against the loss of life, property and livelihood in case of emergency.

Long Term Planning: The major steps of long term planning are as follows-

- Analysis of the experience of the last disaster, the village faced
- Situational analysis of the village such as physical location and surroundings of the village; its demographic details; safe areas like concrete RCC buildings, schools, flood shelters, other elevated and upland areas; drinking water facilities; transport and communication systems etc.
- Based on the experiences of the earlier disaster and other different hazards faced, the villagers should prepare hazard and risk maps to identify the most vulnerable areas as regard to destruction to life, property, infrastructure and economic activities. In this case, the data with Meteorological departments, Irrigation department and PWD must be under the control of Disaster Management Teams (Nambiar, 2007).
- Identifying the factors responsible for increasing vulnerability of the society such as deteriorated drainage systems, housing pattern etc.
- To overcome and safeguard village from adverse impact of hazards, various preventive measures such as structural measures (construction of embankments, dams and channel improvement along the flood prone rivers) are to be carried out by village action committee and panchayet under developmental programmes.

Short Term Planning:

- Formation of flood warning group
- Shelter management group
- Evacuation and Rescue group
- Group for providing first aid, food, water and other necessities
- Relief group
- Formation of a group for proper counseling to overcome the trauma of disasters
- Damage Assessment group
- Reconstruction and Rehabilitation group

Findings

The present study provides an overview of the frequency and magnitude of floods with its spatial variations in the Sub- Himalayan North Bengal region. Floods have a very detrimental effect on the population of the present study area by destroying crops, property, human and animal lives. The fundamental findings are that it is neither possible to totally stop flood hazards of the Sub-Himalayan North Bengal nor to completely eliminate the flood damages. Floods have occurred in the past and will continue to occur in future as well in this part of West Bengal. However, it is

possible to minimize the severity of the impact and the damage potential. Flood mitigation methods like structural and non- structural measures have to adopt along with emphasis on Village level Flood Disaster Management Committee. Regular monitoring should also be carried out for effective implementation of the functions of this committee.

Conclusion

The bulk of Sub-Himalayan North Bengal's population is concentrated in the riverine plains. Due to their topographic situation, these areas are often prone to floods. Consequently, large number of people and their livelihoods are seriously affected. Therefore, to ensure the minimum damages of human lives, it is necessary to follow the above mentioned flood controlling measures. Flood insurance schemes have to be encouraged with government subsidy in major flood prone areas of the Sub- Himalayan North Bengal.

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