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Research Paper

Flood and Its Effects: A Case Study of Ghatal Block, Paschim Medinipur, West Bengal

Geography

KEYWORDS : Natural disaster, Flood, Silabati River, Physiographic location, devastating effects

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ABSTRACT

A natural disaster is a major adverse event resulting from natural processes of the Earth. Ghatal subdivision in Paschim Medinipur district under West Bengal is considered to be the most vulnerable place to a climatic disaster that is flood. The frequency and magnitude of floods in Ghatal subdivision has increased considerably with the changing time. The study area (Ghatal block) under Ghatal subdivision is one of the most effective areas. Ghatal block is a closed area by the river Silabati, old Kangsabati and Dwarakeswar including Jhumi a distributary of Dwarakeswar River those are non perennial in character. Critical physiographic location of Ghatal block makes severity of floods and its effects. Climatic variability in terms of rainfall distribution considerably increased flood effects. Primary data from field survey and the secondary data source including maps and satellite images could help to properly interpret the objectives. By the qualitative and quantitative analysis, the paper explores the effects of on natural and human resource in Ghatal block. The paper concludes the devastating effects of floods on natural, human and also man-made resources in form of destruction of human settlements, agricultural products, transport communication and also commercial activities which ultimately effects on peoples livelihood, both occupationally and geographically.

INTRODUCTION

In earth system most of the environmental hazards such as volcanic activity, earthquake, cyclone, landslide, flood, drought etc are affects the human habitation and their livelihood system over a large areas causing loss of lives and properties. Therefore natural hazards are potentially dangerous of humans causing injury, loss life and disrupting social and economic condition. Flood is one of them of all environmental hazards. Generally high level water that overflows the natural bank along any portion of a stream is called flood. In fact flood is an attribute of physical environment and thus is a component of hydrological cycle of a drainage basin (Singh S., 2009). Flooding is a normal part of river behavior (Chapman D., 1996). Thus floods are commonly associated with a stream or river.

Flood is the causes of singly or jointly interconnected by a number of factors. Common natural factors are: intense storm precipitation, high antecedent basin, soil moisture, rainfall over areas covered with snow, occurrence of medium to major storms in quick succession and failure of dams resulting in a very rapid release of large quantities of water (Chapman D., 1996). But sometimes physiographic location of river basin and intervention of people also cause of flood. Natural factors which cause river floods, important are prolonged high intensity rainfall; meandering courses of the rivers; extensive flood plains; break in slope in the long profile of the rivers; blocking of free flows of the rivers etc (Singh S., 2009).

Study Area: The state of West Bengal which occupies 2.7% of India's land mass and supports 7.86% of its population is one of the most flood prone states in India. More than 42% of its geographical area is identified as flood prone while and about 22% is under high flood and high tide respectively. Large part of the Ghatal subdivision and its adjoining areas in the districts of Paschim and Purba Medinipur, are of the most flood prone region of the state. Attitudinally the study area Ghatal block falls between 22°47'37" N to 22°35'05" N and longitudinally between 87°49'08"E to 87°36'22" E. the total area of Ghatal block is 229.98 sq.km., in which the cultivated land is 17900 hectors and irrigated area is 11450 hectors. The numbers of marginal farmers are 3026 out of 216971 populations (census 2001). The Ghatal block consists with 2 municipalities and 12 gram Panchayet.

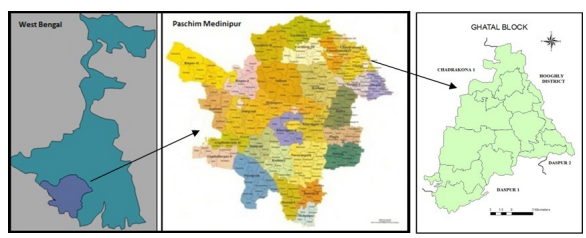

Fig 1: Location map of the study area

Geomorphological Setting:

The height of the vast area of Ghatal and Daspur block is 5-15m. Geologically the crust is made by alluvium soil with little phosphate and potash composition. Some area of this block is covered by clayey soil which is poor permeable to water, causing water stagnant. Most of the area of this block is covered by sediments of Silabati River and its tributaries. The study area comes under the sub-tropical warm and humid climate with monsoonal heavy rainfall. Silabati, Kangsabati and Dwarakeswar are the important river in this area including Chandeswar khal, Ketela khal, Donai Khal, Buriganga, Pananl khal etc.

MATERIALS AND METHODS

The present study examines the causes of flood in Ghatal block and assesses the effects of the flood in human life and their livelihood pattern. The study based on primary data from filed survey in different G.P. in the Ghatal block and also different secondary data source which have been collected from different gram Panchayet office, Ghatal S.D.O. office, department of irrigation, census record (2001) and district statistical handbook. Quantitative and qualitative both methodological principles are adopted for this study. Firstly the primary data have been collected by filed survey and tabulate those data using different statistical techniques. Base map of the study area, landuse map, flood duration map etc are to be prepared by using ERDAS 9.1 and ArcGIS 9.3 software. ISRO LISS-III and LANDSAT data also used to prepared landuse map.

RESULT AND DISCUSSION

Critical physiographic location is the important cause of flood in Ghatal block but also the climatic situation is another important cause of this flood. So the causes of flood in Ghatal block are categories into two that are 1. Climatic causes 2. Physiographic causes.

Climatic cause: The study area Ghatal comes under monsoon

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climate. Therefore maximum rainfall (>90% of total annual rainfall) is concentrated in a sudden period. If we observed the yearly rainfall distribution (2000-2008) (Fig 2) the maximum rainfall is occurred in between 4 months (June to July) and another 7-8 months very less amount of rainfall. The month wise rainfall distribution of 2011 (Fig 3) collected from irrigation department shows that the concentration of rainfall in a sudden period. This rainfall concentration for few months in a particular year may cause of flood because each river have some capacity to carry the volume of water. But huge amount of water in a sudden period is the cause of overflow in the Silabati River and its tributaries. The poor availability of water in summer season is the cause of river water scarcity.

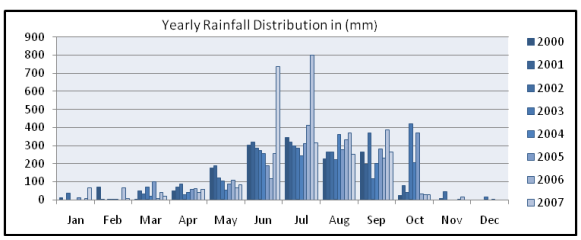

Fig 2: Yearly rainfall distribution in mm of 2000-2008

Table 1: Month wise rainfall distribution

Month	Rainfall (mm)
Jan	0
Feb	37.7
Mar	132.6
Apr	58
May	147.3
Jun	339.1
Jul	1109.8
Aug	361
Sep	498.6
Oct	69
Nov	39
Dec	0

Source: Irrigation department, Ghatal

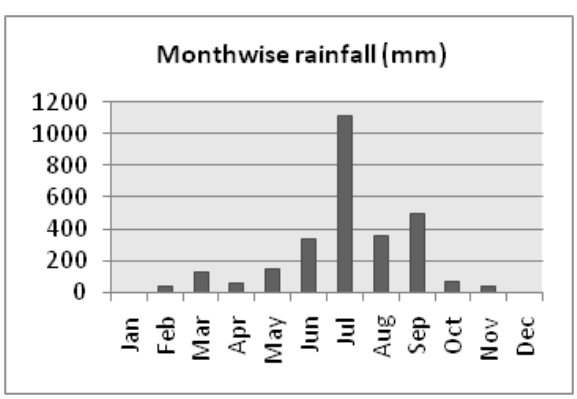

Fig 3: Month wise rainfall distribution in mm

Because of maximum rainfall concentration in rainy season (June to September) that is shows that in river water depth curve (Fig 4). The peak amount of water flows in river on this period which leads to flood hazards in Ghatal block.

Table 2: Month wise river water depth

Month	River water depth (feet)
Jan	0
Feb	0.7
Mar	1.45
Apr	1.78
May	2.1
Jun	6.5
Jul	13.5
Aug	19.5
Sep	14.85
Oct	4.75
Nov	1.8
Dec	0.65

Source: Irrigation department, Ghatal

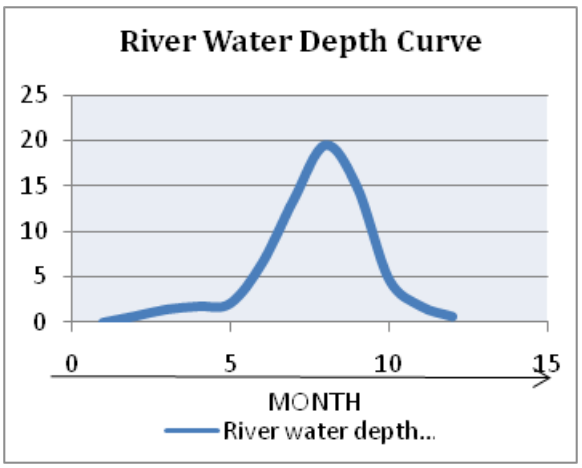

Fig 4: Month wise river water depth

Fig 5: Seasonal variation of Jhumi River in the northern part of Ghatal block

Physiographic causes: Critical physiographic location of Ghatal block is another important cause of flood. The main river of the study area is Silabati passes through the south eastern part of Ghatal block and the huge number of tributaries and khals are joints with Silabati River in a certain place (Fig 6). Therefore during monsoon huge amount of rainfall has been occurred in a certain period and the Silabati and its tributaries are carrying huge amount of rainwater from upper catchment and concentrated on this certain place. For the shortage of 'basin lag time' the river Silabati could not capable to carry this huge water, causes of river over flow in the Ghatal block. Sometimes this huge water pressure may cause of embankment breaching.

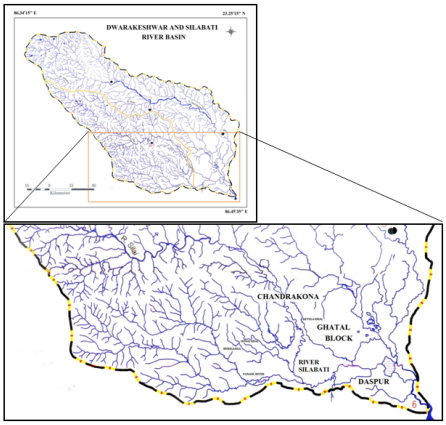

Fig 6: Critical drainage pattern of Silabati River

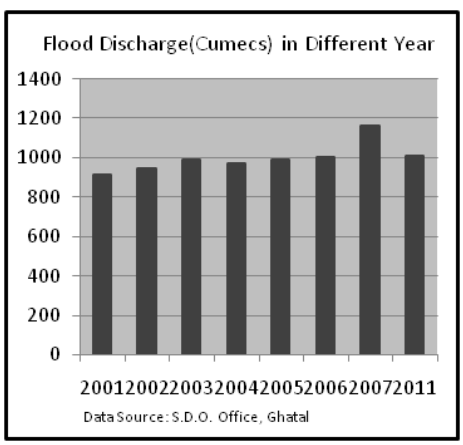

Fig 7: Flood discharge in different year

Effects of flood in Ghatal block

Generally flood affects the any type of structure, including buildings, bridges, sewerage systems, roadways, and canals as a primary effects and water contamination, crop damages, communication disturbance etc as a secondary effects. In the study area those effects are critically observed. Agricultural loss is the main affects of flood in the Ghatal block. About 75% Agricultural lands (Fig 8) are located in low lying areas where water logging condition prevails about 3 months. So huge amount of crop damages (mainly paddy) (Fig 9) are found to occurred for flood.

Fig 8: Landuse map of Ghatal block

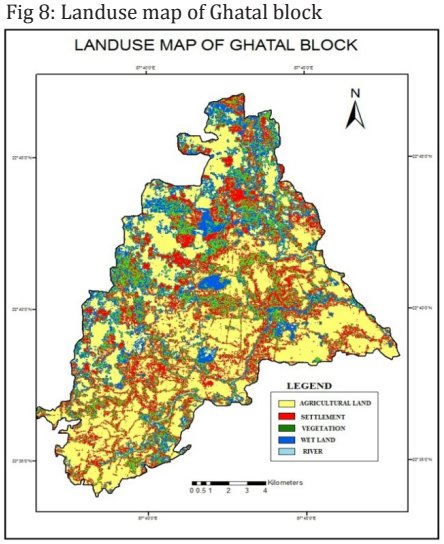

Fig 9: Paddy fields are under water due to flood

Mud built houses (Fig 10) is completely damaged by flood in village areas and concrete houses go under water and sediment deposited over it by flood water. During flood, high speed water flow washes away roads (Fig 11, 12) in different locations in Ghatal block and the communication system also breaks down for few days. The important state high way Ghatal-Chandrakona road totally disconnected during this time. Therefore boat is the only way of transport for people and goods also (Fig 13).

Fig 10: Effects of flood on dwelling units

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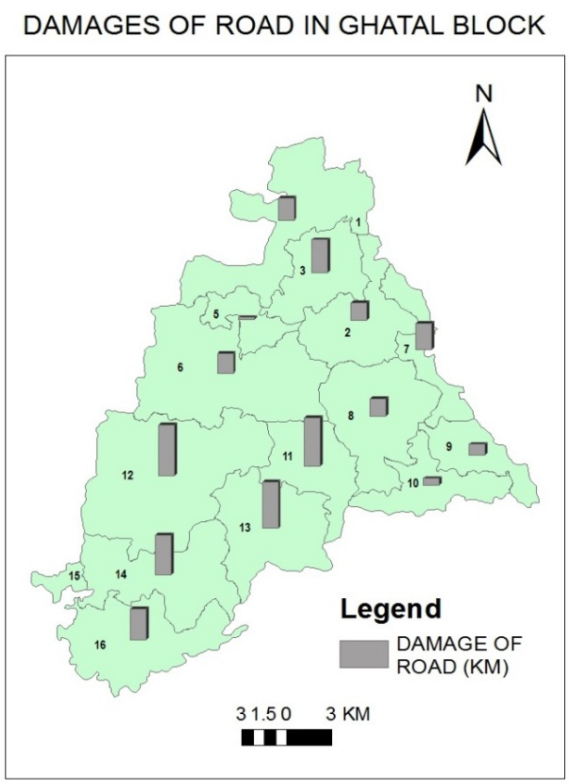

Fig 11: Damages of Road in Ghatal block

Fig 12: Break down of transport communication

The central market of Ghatal municipality is the main commercial centre of this area which has also gone under water during flood for few days. Thousands of people not only Ghatal block but also from surrounding Daspur-1, Daspur-2, Chandrakona-1 and Chandrakona-2 block are directly or indirectly depends on this market in different purpose. Those people sale their agricultural products in the Ghatal market every day. So the break downs of transport and marketing system, people are suffered from their daily livelihood. There are 12 Gram Panchayet and 2 municipalities in Ghatal Block. More than 80% villages are inundated (Fig 14) by flood water in about all the Gram Panchayet and about 8 G.Ps and Ghatal municipality remains under water for about 2-3 months (Fig 15). More than 15 villages are inundated during flood of some Gram Panchayet, mainly Mohanpur, Ajobnagar, Irpala and Dewanchak 1 and 2. People lose their own habitat in flood as they have to settle temporarily over the river embankments.

Fig 13: Boat as a way of transport

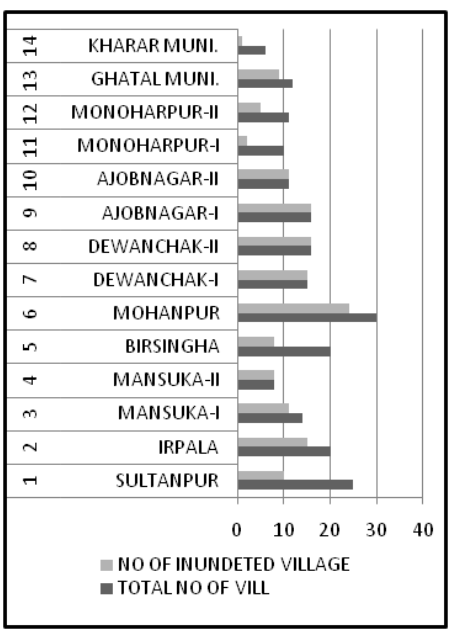

Fig 14: Showing inundated village of different G.P in Ghatal block

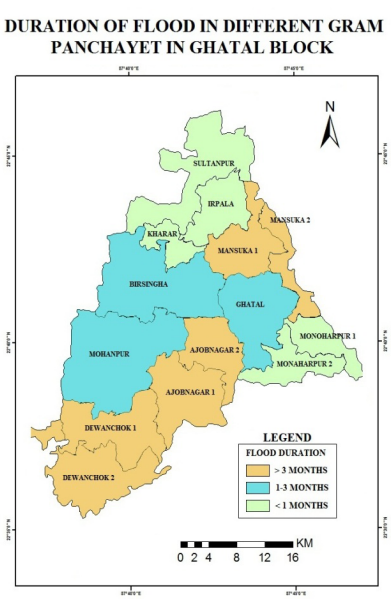

Fig 15: Duration of flood in different G.P in Ghatal block

CONCLUSION

The flood is one of the most effective events of environment. Ghatal subdivision is one of the flood prone areas in West Bengal. Therefore Ghatal block is very vulnerable for flood hazards. Critical drainage pattern of river Silabati and monsoonal climatic fluctuation are the main cause of flood in Ghatal block, which may affects not only sudden devastating damages but also affects for long time as water contamination and unhealthy environment. During rainy season in this area affects by structural damages including house damages, crop failure and loss of production, damage of road and communication system. Therefore people suffered for a long time for economic loss and unhealthy environment in the study area. Local people are also suffered from their daily life and due to this people are adapted with an alternative livelihood system against flood during this situation. State government takes some important management proposal like "Ghatal Master Plan", but it is not a full solution of this problem. So hydrological and Geomorphologically including local people participation and awareness, is the way to manage the effects of flood in Ghatal block, which may interested field for future study.

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