



## IDENTIFYING THE PATTERN OF FLOOD PRONE AREA IN LOWER AJJOY RIVER BASIN, WEST BENGAL

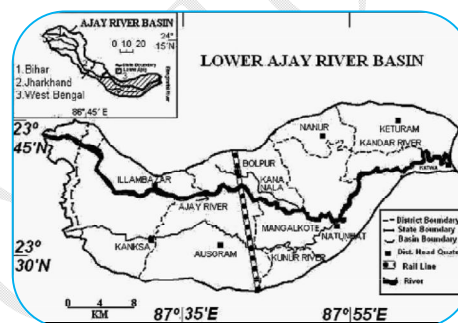
Dr. Hasibur Rahaman Molla<sup>1</sup> and Pradip Chandra Patra<sup>2</sup>

<sup>1</sup> Assistant Professor, Department of Geography, Sivanath Sastri College, Kolkata.

<sup>2</sup> Assistant Professor, Department of Geography, Sivanath Sastri College, Kolkata.

### ABSTRACT:

Lower Ajoy River Basin is one of the most flood prone regions of West Bengal. This paper deals with the demarcation of flood prone areas of the Lower Ajoy river basin giving emphasis on the basis of zonation, their type and characteristics, etc. Frequent inundation of the flood plain brings havoc to the people as well as forced them to transform their traditional livelihood. The basin area has been categorized into four zones i.e. High/severe flood prone zone, medium/moderate flood prone zone, Low flood prone zone, and Flood free zone. The delineation of flood plain zoning is very important aspect for the installation of sustainable planning.



**KEYWORDS:** flood prone, inundation, traditional livelihood, Sustainable planning, flood management

### 1. INTRODUCTION

Flood is a serious hazard in West Bengal particularly in monsoon period. From geographical perspective, flood can be defined as a body of water which rises to overflow the land which is normally not submerged (Ward, 1987). The Lower Ajoy river basin is a well known flood prone area in West Bengal. Almost every year a large tract of the river basin gets inundated and brings about great geomorphic and socio-economic consequences. Directorate of Irrigation and Waterways

Department, Govt. of West Bengal, has made attempts to control flood problems by embanking the river. But floods continue to occur defying the embankments or other engineering constructions. The flood hazard comprises many aspects including structural and erosional damage, loss of life and other materials, disruption of socio-economic activities including transport and communication system and spoiling of agricultural land and so on (Hewitt and Burton 1971). Flood plain zonation and delineation of flood prone area may be an important measure to mitigate the flood hazard.

### THE STUDY AREA :

The study area i.e. the Lower Ajoy river basin, geographically extends from 23°30' N to 23°45' N latitudes and from 87°20' E to 88°15' E longitudes. It occupies an area of about 2816.65 sq.km. The river Ajoy is a right bank tributary of the Bhagirathi river. It originates near Chakai hill (30.5 km west of Deoghar) at an elevation of 346.3 metres above mean sea level in Bihar and confluences with Bhagirathi at Katwa in West Bengal. The average slope of the basin is 1 in 750 from the source region to Pandabeswar

(West Bengal), and from Pandabeswar downward the slope drops down to about 1 in 2250 . From Pandabeswar to the confluence i.e. Katwa , the basin is demarcated as the Lower Ajoy river basin ( Mukherjee , 2002 ). The total length of the Ajoy river is about 299 km but only 145 km fall under the study area. The Lower Ajoy river basin covers 7 blocks in Burdwan district and 5 blocks in Birbhum district (W.B.). there are 619 moujas in under 12 C.D. blocks and out of the total 493 moujas are flood prone.

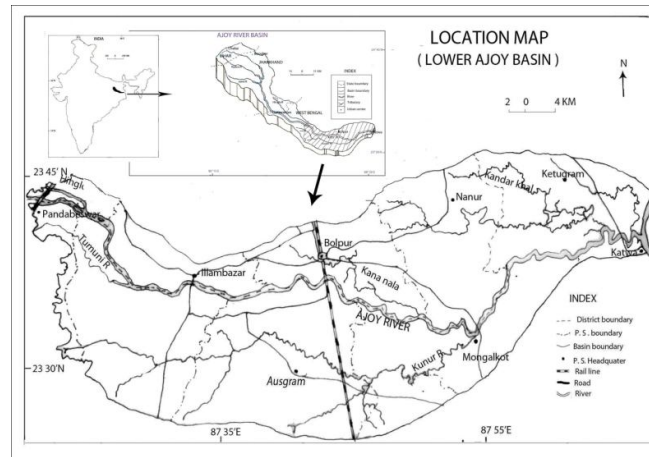


Figure 1

### OBJECTIVES:

- To understand the flood intensity , periodicity , seasonality , and its spatio-temporal variations
- To delineate the zonation of flood prone area according to magnitude.
- To find out mitigation alternatives.

### METHODOLOGY:

In the present context the methodology for mapping is shown though visual interpretation using two season satellite data. The major sources which have helped to identify the zones are the Survey of India toposheets ( 73 M<sub>6</sub>, 73 M<sub>10</sub>, 73 M<sub>11</sub>, 73 M<sub>14</sub>, 79 A<sub>2</sub> ), flood demarcation maps of the Irrigation and Waterways Directorate , Govt. of West Bengal , multi-seasonal Remote Sensing data (IRS - IC & ID, LISS - III ).

### BASIS OF DELINEATION OF FLOOD PRONE AREA :

In the Lower Ajoy river basin ten major floods have been occurred since 1956 ,which occurred in 1956 , 1959 , 1970 , 1971 , 1973 , 1978 , 1995 , 1999 , 2000 and 2002 . The individual maps for the major floods have been prepared. All the maps have been superimposed over each other in two sets (five year each) to identify the area under maximum, moderate and minimum number of occurrences. By this way four final zones have been demarcated on the basis of frequency of flood occurrences.

- High / severe flood prone zone (F1).
- Medium / moderate flood prone zone (F2).
- Low flood prone zone (F3).
- Flood free zone (F0).

### CHARACTERISTICS OF FLOOD PRONE ZONES:

#### HIGH / SEVERE FLOOD PRONE ZONE:

It covers an area of about 624.46 sq. km, which accounts 22.17 % of total Lower Ajoy basin. This is highly flood affected zone and runs almost parallel to the river basin. But in the right bank it extends

up to 8 km (in Ausgrsm block). In Ketugram block this zone is broadened towards the east and extends 3 to 4 km from the river bank. It is estimated that out of the total 619 moujas 144 moujas are highly flood prone, which faced flood almost in every flood occurrences. The frequency of occurrences of flood in this zone is more than 60%. Sands plays, Ox-bow lakes, Meander scrolls, etc. are the major geomorphic features in this zone. The river in this zone is predominantly characterized by elevated river banks (levee). This is a result of either manmade intervention in the form of embankment or built up natural levees by sediment laden water. Multiplicity of abandoned channels, decadent rivers and depressions due to fluvial erosion are the natural consequences. In this zone the danger level of flood height at some gauge stations like Beta, Satkahonia, Maliara, Gheropara and Nutanhat are 57.90, 51.75, 41.70, 39.41, and 19.19 metres respectively but the actual flood height in 2000's flood were 61.50, 54.90, 45.86, 42.79, and 23.21 metres respectively. The loss of agricultural land and crops due to sands play caused by breaching of embankment becomes a great threat to the dwellers living in highly flood prone zone.

**Table : 1**  
**HEIGHEST FLOOD LEVEL IN DIFFERENT GAUGE STATION (1956- 2000)**

Gauge station	Danger Level(m etres)	Actual flood height ( metres ) in different flood year										
		1956	1959	1970	1971	1973	1978	1995	1999	2000	2002	2007
Beta	57.90	61.05	No spilling	No spilling	59.60	No spilling	61.14	59.75	60.70	61.50	61.19	No spilling
Satkahonia	51.75	54.41	No spilling	53.50	53.10	53.48	55.44	54.42	54.68	54.90	No spilling	No spilling
Maliara	41.70	45.37	45.58	44.17	44.47	43.16	45.71	45.72	44.46	45.86	44.76	43.10
Gheropara	39.14	40.89	41.31	40.51	40.29	40.63	42.82	42.50	43.22	42.79	41.10	No spilling
Nutanhat	19.19	21.02	21.84	20.40	20.62	20.00	22.42	22.30	22.89	23.21	21.34	20.21

**Source :** Irrigation and Waterways Directorate, Mayurakshi South Canal Division, Govt. of West Bengal – 2008

#### **MEDIUM / MODERATE FLOOD PRONE ZONE :**

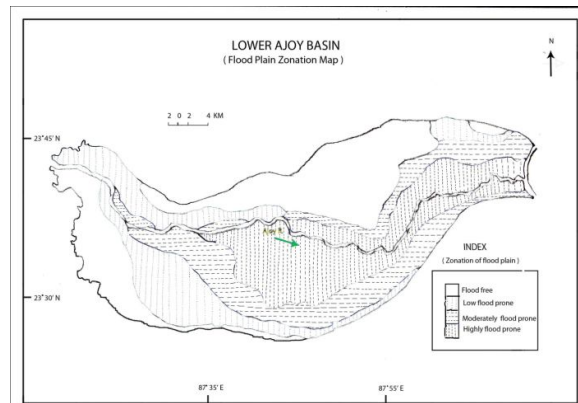
This zone occupies 528.00 sq. km and covers 18.75 % of the total Lower Ajoy river basin area. Out of total 619 moujas 130 falls under this zone. In this zone the frequency of occurrences of flood is 40% - 60%. The predominant geomorphic features of this zone are abandoned channels, cut-off channels, back swamps, etc. Gradual depositions of silt on the back swamps have turned them into shallow swampy and 'beel' areas. During the rainy season over-flooding of areas adjoining the 'beels' become a common feature. The coverage of medium flood prone zone is more on the right bank of the river than the left bank. In this zone the houses, livestock's and other assets have been lost more than agricultural crops.

#### **LOW FLOOD PRONE ZONE:**

This zone extends between the medium flood prone zone and the flood free zone. It occupies 576.30 sq.km, which accounts 20.46 % of the total Lower Ajoy river basin. It is estimated that about 219 moujas are located in this zone. It is characterized by less than 40 % of frequency of occurrences of flood. The geomorphic features are slightly varies from western part to the eastern part of the basin particularly on the left bank side of the river. In this zone particularly in the western portion, there is appearances of isolated terraces and highland flood plain. Some old channels courses are found in the form of abandoned and morbid channels which are now filled with water, forming basins, swamps and beels. Many of these old courses are full of vegetation and reeds, and certainly do not deserve to be called as beels. In this zone the flood induced devastation is quite less.

**FLOOD FREE ZONE :**

Next to low flood prone area, there is an another zone which is totally free from flood. This zone covers 1087.89 sq.km which accounts 38.62 % of the total Lower Ajoy river basin. About 126 moujas are located in this zone. Beyond this zone in the north, there is Mayurakshi river basin and in south, there is Damodar river basin. The flood free zone consists of micro-geographic characters like terraces, slight dissected land, highland features. This zone is having a marked characteristics of high relief, undulations, rolling and gently level topography with the preponderance of rills, sheet wash, and gullies which are typical in its landform pattern.



**Figure 2**

**Table - 2: (STATUS OF FLOOD AFFECTED ZONES IN LOWER AJOY BASIN)**

Sl No.	Zone	Area (km <sup>2</sup> )	No. of affected mouja	% of the basin area	Frequency of occurrences (%)
1	High/severe flood prone	624.46	144	22.17	>60
2	Medium/moderate flood prone	528.00	130	18.75	40 - 60
3	Low flood prone	576.30	219	20.46	<40
4	Flood free	1087.89	126	38.62	-----

Source: District Census Handbook, Burdwan and Birbhum, -2001 & Laboratory Analysis.

**CONCLUSION:**

The study area is inundated during flood and its surface is normally formed from sediments deposited by the river and its tributaries. In detail flood plains possess some relief in the form of levees, abandoned channels, back swamps, etc. In the study area the flood plain has a very gentle undulating relief. Most of the time the river flows within its normal course but during monsoon period because of the hydrologic factors like heavy runoff and geomorphic factors like plain and low lying area, it overflows beyond the normal channel and thus causing great harm to human activities and properties. It can be mentioned that extent of flood prone area is more on the right bank of the river than the left bank. However it can be concluded that the flood damage is a function of the extent of flood affected area ; depth of inundation ; duration of submergence ; frequency of flooding ; standing crop area affected and its value ; value of public and private properties and utilities affected ; and non-physical damages.

In the study area flood control is being practiced since centuries. As flood can not be totally controlled and it is not possible to provide protection against all magnitude of flood, we have to adjust with the flood and implementation of proper flood management programmes become very much necessary. Along with the structural measures like construction of reservoirs, embankments, detainion

basins, river channel and drainage improvement diversions of flood water etc., proper weightage must be given to the non-structural measures like flood forecasting and warning system, flood plain zoning, disaster preparedness, relief and rehabilitation, etc. Thus the traditional sectoral planning approach for complete flood control should be changed to sustainable flood plain development policy (Haque et. al. 1993). Preparation of floodplain zoning map is an important non-structural measure to mitigate flood hazard. Degree of vulnerability of flood can be identified by demarcating the high, medium, and low flood prone zone and proper planning of land-use of the individual zone can be made accordingly. Government may launch different insurance packages for the people living in different flood prone zone. Instead of making trifle attempts to protect floods, we should try to adjust with floods keeping the view that flood is a natural phenomena and our relationship with rivers should be reciprocal in nature.

## REFERENCES

- Bhattacharjee , N.G., 1995. Mitigation of Flood Problem in West Bengal , Directive Initiative, Calcutta.
- Haque ,C. Emdad and Zaman, M.Q. , 1993. Human Response to Riverine Hazard in Bangladesh A Proposal for Sustainable Flood Plain Development , World Development, vol-21,
- Hewitt, K. and Burton, I., 1971. The Hazardness of place : A Regional Ecology of Damaging Events, University of Jorants, Dept. of Geography , Research publication.
- Kar , S.,1999. The Flood Situation in West Bengal , Agenda for Action , Directive Initiative, Calcutta.
- Kazi ,Md. F. Haq and Bhuiyan R.H., 2004. Delineation and Zonation of Flood Prone Area : A Case Study of Tangail District , Bangladesh , Indian Journal of Regional Science, vol. XXXVI.
- Magura,L.M. and Wood D.E., 1980. Flood Hazard Identification and Flood Plain Management on Alluvial Fan, Water Resources Bulletin.
- Mukherjee ,M., 2002. Flood of Lower Ajoy River Basin: A Spatio-temporal Analysis Since Independence.
- Niyogi, M., 1987. Flood Frequency and Management Analysis of Lower Ajoy Basin, Indian Journal of Landscape system and Ecological Studies, vol. 10 Calcutta.
- Smith, K. and Tobin, G.A., 1979. Human Adjustment to the Flood Hazard , Longman ,London.
- Ward, R., 1978. Floods, A Geographical Perspective, Macmillan Press Ltd. London .



**Dr. Hasibur Rahaman Molla**

**Assistant Professor, Department of Geography, Sivanath Sastri College, Kolkata.**



**Pradip Chandra Patra**

**Assistant Professor, Department of Geography, Sivanath Sastri College, Kolkata.**