

Vol 3 Issue 2 Nov 2013

ISSN No : 2249-894X

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*Monthly Multidisciplinary  
Research Journal*

*Review Of  
Research Journal*

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RNI MAHMUL/2011/38595

ISSN No.2249-894X

Review Of Research Journal is a multidisciplinary research journal, published monthly in English, Hindi & Marathi Language. All research papers submitted to the journal will be double - blind peer reviewed referred by members of the editorial Board readers will include investigator in universities, research institutes government and industry with research interest in the general subjects.

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## **BANK EROSION OF THE RIVER GANGA AND ITS ASSOCIATED PROBLEMS: A CASE STUDY OF PANCHANANDAPUR VILLAGE, DISTRICT MALDA, WEST BENGAL.**

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### **Abstract:**

*The general wasting and washing of the rock materials by river action initiating the process of denudation is a common feature along a river valley. Bank erosion becomes vigorous in the lower reach of the river valley where general characteristics of the river have been seriously disrupted. Here in this paper a brief attempt has been taken to give some measuring steps against the dangerous effects of bank erosion, specifically the case of the village panchanandapur (kaliachak-2).*

### **KEY WORDS:**

Bank Erosion, Ganga river, Bengal Alluvium, Over population, Pilot Channel.

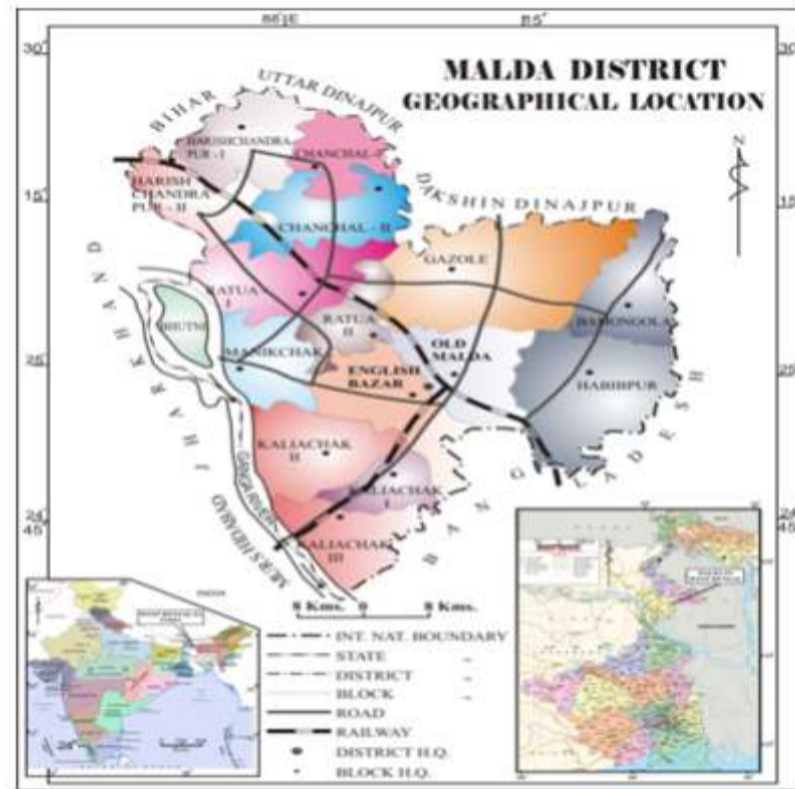
### **INTRODUCTION**

Once, Panchanandapur was really the place of "panchanandam". But now one-third of it is under the grasp of river Ganga. People of Manikchak, Bangitola, Khaskol and a large portion of Kaliachak block are in great threat due to bank erosion. The district of Malda comprises an area of 3566.17 km<sup>2</sup>. The latitudinal extent of district is 24° 40'20" to 25°32'08" and the longitudinal limit is marked 88°28'10"E.

### **HISTORICAL PERSPECTIVE**

In the early sixteenth century the Europeans started to come Saptagram which was the small port of Bhagirathi-Hugli. But before this, Bhagirathi was bifurcating remain Ganga and was stated to be dried up due to scarcity of water. In the summer season, before the construction of Farakka barrage 61 cusec water was coming into Bhagirathi. Jalangi and Churni contributed 100 and 350 cusec flow respectively. But the actual fact was that this flow was coming from base flow on effluent seepage. The main tributaries from Chotanagpur plateau feeded through rainwater could contribute 80% of the total annual flow within the period from June to September. According to Prof. W. Heasco die construction of Farakka Barrage was completed in 1971 so that 40000 cusec water could be regulated through a 38 km long canal to Bhagirathi-Hugli for the washing of entire load at the mouth of Bhagirathi-Hugli. More than four years were taken for the making of the Feeder canal to regulate water from Bhagirathi to Calcutta Port.

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**FIG. 1**

**MAJOR CAUSES OF BANK EROSION.**

a) Geology of Bengal basin and Coarse Change of Bhagirathi-Hugli : The area of Ganga Brahmaputra basin is 150000 km<sup>2</sup>. In a depressed synclinal shield region the accumulation of silt and clay during a prolonged period of 70 lakhs years such a basin was formed. Geologists named this basin, "Bengal Basin". Here each km<sup>2</sup> area receives 1030 lakh cubic meter water through rainfall in a year. Keeping Meghalaya Plateau at the east and Chotanagpur Shield at the west the 200 km long passage Bengal facilitates the rivers of U.P., North Bengal, Nepal, Tibet and all the rivers of northern India to pass. But the rivers are not sufficient strengthful to carry the huge quantity of 85000 cubic meter water through this Rajmahal-Meghalaya Gap. The general slope of the District Malda is not more than 2-3. Such a gentle slope includes stagnancy of rainwater in the Channel.

During the last two century due to both Orogenetic and Eperogenetic forces the Geologic Stratas of the basin are slanting from the north middle India to wards the Bay of Bengal direction. To respond this, the channels have left their previous channels and are starting to receive newly developed eastward channels.

b) Mechanism of river action of the Ganga in Bengal Alluvium: Streams do more than shift sediments by repeated scour and fill along the bed. They actively erode by-

- 1.Channel deepening or by down cutting of the streambed,
- 2.Channel widening through bank curving or under cutting, and
- 3.Channel extension, that is head ward or regressive erosion by streams and gullies.

This erosion is of two basic types in the case of river Ganga.

Firstly, valley floor over plain of Bengal consists of river laid sediments where the river shifts her channel and readjusts her bed by a little erosion and deposition

As a new channel is formed and older channel is abandoned filled erosion bank of the meandering mighty Ganga collapse the river shift in direction and accretion follows on the opposite bank. Such erosion in alluvium is fundamental in development of alluvial plains being a mechanism where by the Ganga short or long term adjustments.

Secondly, streams cut their way into upland where they usually erode into pact rocks. But the mechanisms

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and rates of erosion in bed rock are and the ultimate effect is to sculpture the interfluves. This factor is less effective in the case of the river Ganga.

Bank collapse occurs also as the river banks of the mighty Ganga are under In the case of the Ganga bank collapse is also aided by ground water seepage or effluent seepage towards the river in the dry months.

Pipelines of natural origin make the bank sidewalls weak and thereby create fissures and notches, which in future will aid bank slumping by striking currents.

Silty banks loose their cohesiveness as they become saturated at times of high water as long as the water level remains high. Hydrostatic pressure may support bank, however when the water drops the bank may cave in.

c) Over population: The total population of Malda District is 39, 97,970 according to 2011 census. Out of which a population of 100,000 roughly live in Bhutni Diara and nearly 45,000 in Duania Char. In past flood-waters could spread these areas but now the construction of circuit embankment of Bhutni re the free spreading of water consequently an unwanted pressure exerts over banks resulting into Bank Erosion.

d) Role of Embankments: With the construction of the embankments from 1 the problem of meandering at the eastern bank of river Ganga has increased a lot. In the year 1999 sixth retired embankment was constructed. During 2000 the sixth retired embankment was eroded away. All these evidences the fact that with the making embankments excessive siltation takes place in I river bed and causes reduction in the cross sectional area of the river and excessive water pressure during rainy season very readily create flood and the bankline cracks on the embankments.

e) Role of Farakka Barrage on the fluvial system of Ganga : Farakka was completed in 1975. The course of Ganga from Rajmahal hills to Farakka was more or less straight in 1922 to 1923. From 1948 to 1950 the course started to be curved. At the time of making the barrage by preparing Koufar Dam the free flow of the river was obstructed which created various reactions in the fluvial system like immeasurable silts started to be deposited in the riverbed.



**Ganga Bank Erosion A Major Problems of Malda District**

#### **A CASE STUDY ON PANCHANANDAPUR :**

Panchanandapur is located in the Kaliachal Block II. The total population of Panchanandapur-Birodhi area is 133. Out of which total male population is 64 and female is 69.

At Panchanandapur-Birodhi 129 bighas land has been abolished by bank wasting. Most of the families lost 6 bighas to 8 bighas land property on an average including both dwelling places and agrarian fields. But relief works and restoration activities have done irregularly. At Panchanandapur-Birodhi 8 families out of 22 said that they have received relief articles during flood 1998. But 14 families did not receive any help. The activity of different NGO's and Panchayat Samities has been parallel. About 20 families got cooked food from Ramakrishna Mission, Malda. About 15 families have received 50-100 rupees as contingency help.

The amount of land lost and amount of land reoccupied exhibits an unnatural relationship. In the case of Panchanandapur-Birodhi about 60% families have regained their land after 2 or 3 years of the passing of the incident of slumping. According to field investigation, 22 families out of 36 have shifted their houses for 3 times.

Economy affected by Bank Erosion deserves great importance now-a-days in Malda. At two sites at Panchanandapur repairing work is being taken. The first one is the repairing of the marginal embankment from spur no. 17. The second one is the building of the 8th retired embankment. The main economic work

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here is the loading of big boulders for the tagging of embankments. Generally boulders come from Tinpahar-Rajmahal belt. A big country boat can contain 600-2500 boulders in a single trip. A boat can perform a maximum of 8 trips. A labour who unloads boulders from the boat and keep them at reserve ground can carry 80-100 boulders per day. The value of each boulder is Rs.7.50. Daily 15000 boulders are brought approximately at Panchanandapur Ghat. A turnover of nearly one lakh rupees per day is done when full time work is performed. Who bring boulders from the hills demand 38 paise for the carriage of 1 or 2 boulders at a time for 30 m. distance. A labour for the reconstruction of the Bundh alongside Ganga Bhaban demand 600 rupees for the digging of 100 cft of area.

#### **REMEDIAL MEASURES:**

##### **i) Future River Training Works:**

Based on the study of CWP and PRS and recommendations of Pritam Singh Committee we can say that building of two long spurs at a distance of 28 & 29 km upstream of Farakka Barrage with a view to deflect the main river flow from the left to the right bank and protect the left marginal embankment.

##### **ii) Pilot Channel:**

A pilot channel through the center of Bhutni Char can be proposed to reduce the curvature of the river Ganga between Bhutni Char and Rajmahal.

##### **iii) Flow Diversion:**

###### **[a] Inter-Basin Flow Diversion :**

It has been observed that upto a flow of about 28000 cumec (10, 00,000 cusec), the river banks remain stable. It is, therefore, prudent to divert the excess flow through diversion channels upstream of Farakka Barrage.

###### **[b] Intra-Basin Flow Diversion:**

One of the main reasons of meandering of Ganga towards left bank is the presence and continuous growth of Bhutni Char. Now, most of the flow of Ganga is along the right channel side (west of Bhutni). If the main Ganga flow can be diverted through the Fulhar Branch, the pressure on the left bank will be reduced.

#### **IV) Dredging of Sediments Deposited Upstream of Farakka Barrage :**

Dredging of the sediments particularly near the head of the Bhutni Char will be highly effective in controlling the growth of the Char.

##### **v) Introduction of Curved Submerged Vanes:**

Submerged Vanes have been successfully used (Odgaard-1983, 1991) in the developed countries. Placed at an angle varying from 15°-25° with the average flow, these inclined Vanes with their pressure (Stagnating) side towards the outer bank of meander and suction side towards the inner bank neutralize the secondary current responsible for bank-slump. Vanes will move and settle the sediments little to develop Char formation.

##### **vi) Substitute Measures**

24 lakhs people now live along side Ganga-3 Blocks of Malda and 11- Blocks of Murshidabad. The 5 main states like UP, Uttaranchal, Punjab, Bihar and parts of MP contribute 91% areas of Ganga-Brahmaputra basin including West Bengal, Nepal and parts of Bangladesh These states can make a master plan. A reservoir of 100m length, 100m width and 10-20m depth can contain 1,00,000 cubic meter water. So by building 10,88,640 dams of this size in the entire basin, we can control the over pressure of 28000 cumec water in the present course of Ganga. We need not only to dig the reservoirs just right now, rather we can use the natural Bills, small ponds, paleo-channels etc.

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**CONCLUSION**

Within a brief span of description, we can't discuss such a vast topic so easily. The present situation of the district, in this regard is full of agony and with the passage of time, the condition is deteriorating by leaps and bounds. The need is to feel the problem seriously and to proceed together to solve the problem for the survival of our district from the grasp of the mighty river Ganga.

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