CHANGING FLUVIO-GEOMORPHOLOGICAL ENVIRONMENT IN THE MATLA-BIDYADHARI INTERFLUVE- A MODEL UNIT OF ACTIVE & MATURE INDIAN SUNDARBANS

Jayanta Gour*

ABSTRACT
The Matla-Bidyadhari interfluve is a part of the world famous Ganga-Brahmaputra delta of Sundarban region which is drained by dense network of channels, khaps and creeks. It has an age old history from geological side also. Till the British invasion in Bengal, it had maintained its special entity as a forbidden land for humankind where wild life could roam freely along with the undisturbed ongoing natural saline delta building processes. Each and every small to large tidal rivers or khaps have a major role in the most complex hydro-morphological environment in Sundarbans People of this region has always tried to tame the major tidal channels which gave birth to this largest delta and tried to regulate and monitor the tidal circuits in different ways to close the chapter of bank erosion forever. But they forgot each time that bank erosion is a natural and inalienable activity in building of new and new floodplains in this region. Thus embanking the tidal channels year after year to protect the inhabited floodplains in the Sundarban delta people indirectly started closing the chapter of natural delta building processes in this region. This ultimately changed the natural flow which leads to the changing courses of those tidal rivers, khaps and creeks from time to time also. This article is an attempt to look back the changing fluvio-geomorphological environment in the interfluvces like- Matla-Bidyadhari interfluve- a model unit of the active and mature deltaic parts of the Indian Sundarbans.

LOCATION OF THE STUDY AREA
The research area stretches from 21º57’N to 22º45’N latitudes and 88º35’E to 88º53’E longitudes covering an area of 728.578 km² within the Dampier-Hodges Line in the South 24 Parganas District of West Bengal, India. The study area is an interfluve of River Matla (eastern bank) and River Bidyadhari (western bank) located in the centre of

![Location Map of Study Area in South 24 Parganas District](image)

Fig. 1: Location of the study area in South 24 Parganas, W.B.

Indian Sundarbans within Dampier-Hodges’s Line. It is 45kms (approx.) away from the Bay of Bengal to its south. It is situated both in mature and active deltaic parts of Sundarban Delta. This interfluve is bounded by the Payna Abad Bil, Hatiamari Khal and Tambuldaha Khal to the north, north-east and north-west respectively; R. Matla to the

*Research Scholar, Department of Geography, Visva-Bharati, Santiniketan, West Bengal
west and south; the R. Bidya or Bidyadhar to the north-east and east. The course of R. Bidyadhar to the north-east and east of this interfluve is called by different names like- Piprakhali Khal, Hatakhal Khal, Raktabir Khal, Dakshin Radhanagar Khal, and Durgamandal Khal which again in the name of R. Bidya flows to the south-west and joins the R. Matla near the Herobhanga Island. The Herobhanga Island, a reserved forest, demarcates the southern limit of this interfluve.

Administratively, the study area is situated in the middle part of the South 24 Parganas District of West Bengal, India envisaging the parts of Canning-II and Gosaba Block and entire Basanti Block. The Matla-Bidyadhari interfluve envisages total 24 Gram Panchayats (GPs) and total 124 villages of the 3 blocks mentioned. Out of the 24 GPs, 7 are in the Canning-II Block to the north of this interfluve viz. Athara Beki, Deuli-I, Deuli-II, Kalikata, Mather Dighi, Saranger Abad and Tambuldaha GPs. There are 13 GPs of Basanti Block viz. Amjhora, Basanti, Bharatgar, Chara Bidyarabad, Chunakhali, Jharkhali, Jyotishpur, Kathalberia, Mazidbari, Nafarganj, Phul Malancha, Ramchandranrakhali and Uttar Mokamberia which cover 2/3rd of the Matla-Bidyadhari interfluve. On the other hand, 4 GPs of Gosaba Block viz. Biprodsapur, Kachukhal, Pathankhal and Sambhunagar come under the eastern part of this interfluve. The interfluve is surrounded by the parts of Canning-II Block of South 24 Parganas and North 24 Parganas District to the north; Kultali and Gosaba Blocks to the south; North 24 Parganas District and Gosaba Block to the east; and Canning-I, Kultali Blocks to the west. The study area incorporates 39 villages of Canning-II Block, 67 villages of Basanti Block and 18 villages of Gosaba Block in South 24 Parganas District of West Bengal.

**GEOLOGY**

It is very much difficult to explain the origin of the Sundarban delta by only the infilling of the shallow continental shelf with the enormous amount of sediments carried down and settling down of those by the River Ganges and River Brahmaputra, as it is lying in a mio-geosynclinal area. Some seismic and geophysical investigations have further complicated the fact of building processes of this delta of West Bengal. Morgan and McIntire (1959) attributed the change in river courses of the Ganges and the Brahmaputra to faulting and resultant tilting of fault blocks and surmise that the faulting and structural uplift have continued into the recent epoch in the Bengal Basin. The slightly elevated crescent-shaped landmass made by lateritic or ferralitic materials along the Rurh, Barind, Bhawal, Madhupur to Lalmai; the transverse dunes parallel to the coastal area of East Midnapur; the fluvo-glacial depositional features of the foothills of the Himalayas to the North of Bengal (Kar, 1962); the e’chelon faults in Madhupurgarh, Bhardalgarh and Lalmai hills (Morgan & McIntire, 1959); the lineal alignment of the saltwater pools extending from Kolkata to Faridpur along the middle area of the Bhagirathi-Padma interfluve; all these features are the crude evidences to indicate the complicacy of the physiographic history of this region.

**RELIEF & DRAINAGE**

About 70% of the interfluve, particularly the entire northern half and some patches to the south of this region is flatland with an average height of 2mts above M.S.L. About 12.41% of the region particularly to the middle and eastern parts of this interfluve is a lowland area with an average height of about 3-6mts above M.S.L. About 5.82% area, particularly to the south-west of this interfluve is little bit elevated and not a monotonous floodplain with an average height ranging 6-8mts above M.S.L. About 12.41% this interfluve to the north-east and southern island part (Herobhanga Reserved Forest) is an active elevated estuarine area with an average height of more than 9mts above the M.S.L.

**DRAINAGE DENSITY**

The Matla-Bidyadhari interfluve has an average drainage frequency of 4 streams/km². Due to rapid decaying and abandoning of the channels, khals and creeks in the upper reaches, particularly in the mature Sundarbans, the drainage frequency is very low that is less than 2streams/km². On the other side, drainage frequency increases as we move towards the estuarine parts of the Matla-Bidyadhari interfluve where it is above 9 streams/km². Shiyalpheli-Bidya is the longest khal in Matla-Bidyadhari interfluve. Two most important interlinking channels between R. Matla and R. Bidyadhari are – (a) Hogol Nadi-Karatal Gang and (b) Bara Herobhanga Khal.

**TIDAL BORES**

Tides occur twice a day along this deltaic tract. Generally spring tides become more violent in the narrowing upper reaches of the tidal channels like Matla and Bidyadhari etc. in Sundarbans. One of the most striking phenomenon a in this interfluve as well as in the entire Sundarbans is the ‘Tidal Bores’. The tides in the Sundarbans are occasionally so strong that it gives rise to the phenomenon known as a bore (locally known as ‘Ban Daka’, Bengali meaning ‘calling the flood’). The name is given to the head wave formed due to the unusually high tide checked by the narrowing of the river channel. “The obstructed influx,” writes Hunter in The Indian Empire, “no longer able to spread itself out, rises into a wall of waters which rushes onward at a rate nearly double that of a storage coach. Rennell stated that the Hooghly bore ran from Hooghly Point to Hooghly town, a distance of about 70 miles, in four hours.” The average range of the tidal bore fluctuates within 4-5mts here during the last 4 years (2007-10).
In the year 2007, there was steep fall of the maximum range in tidal bore from March to June, 2007 and a rise in July, 2009. The range of tidal bores was comparatively higher during the post and pre-monsoon and lower during the monsoon period in 2007-08. There was 21.69 cm of annual rainfall during the year 2007 but this interfluve was least affected by the cyclone occurred during the month of July in 2007 which mainly entered the western parts of Bangladesh. Whereas, the range of tidal bore was maximum (Fig. 2) during (June-August) the monsoon period in 2009 and was affected by the prevailing low pressure just near the coast of West Bengal. The tidal range remained higher during (July-October) the monsoon period in 2010 as well.

Thus, the higher range of tidal bores during the monsoon periods and sometimes during the pre-monsoon and post-monsoon accompanied by the cyclonic storm originated by the intense low-pressure over nearby Bay of Bengal accelerates the damages caused either by storms or by bank tidal floods. The combined activities of the cyclones and tidal bores are important hydro-climatic phenomenon in this interfluve of Sundarbans.

HYDRO-MORPHOLOGICAL CHARACTERISTICS OF THE MATLA-BIDYADHARI INTERFLUVE

Erosional and depositional activities are common phenomena in a growing delta like Sundarbans. People of this region have been trying to stop these intangible erosional activities of the tidal channels in Sundarbans by embanking their courses since from the British imperial, where as deposition has always been encouraged to increase the land area for their socioeconomic activities. But from fluvio-geomorphological point of view, both the erosion and deposition are supplementary of each other and un-separable activities also. Thus, without having a sound knowledge on the erosional and depositional tidal dynamism happening in the interfluve of the Matla-Bidyadhari interfluve, the hydro-morphological characteristics of the entire Sundarban Delta will be ever unrevealed. Above all, why these tidal rivers and khals are becoming short in length or decaying rapidly and how are these managing to overcome their drainage problems by other natural means elsewhere through erosional and depositional activities has been analyzed as below.

Two major factors mainly decide the nature of shifting of the tidal rivers from time to time through the erosional and depositional activities in Matla-Bidyadhari. These are – (a) Morpho-hydrological factors and (b) Anthropogenic factors. Both are responsible for narrowing down as well as rapid decaying of the river beds of the tidal channels here.

(a) Morpho-hydrological factors
The morpho-hydrological factors incorporate the erosional and depositional activities working day and night in these tidal drainage basins in Sundarban
Delta since its very origin. But, we should also de-associate the factors responsible for the erosion and deposition normally occurring in the non-tidal channels and factors responsible for erosion and deposition occurring in the tidal fluvio-geomorphological environment, as these differ a lot from hydro-morphological point of view. Field observation, data analysis of the erosional and depositional activities and features and shifting courses of the major tidal rivers of this interfluve I have found the cyclic tidal-character of this interfluve. It has been observed that the upper reaches of the tidal rivers like- R. Matla and R. Bidyadhari face sufficient shortage of downstream water due to various reasons like- delinking with the major feeding drainage like khals and other non-tidal rivers, jacketing of the upper reaches by embankments since the British colonial period, geological disturbances like upliftmen or subsidence of the Bengal basin due to tectonic activities etc. the incoming high tide water passing through the narrow upper reaches cannot move properly and to accommodate the influx of tidal water diverts in various directions. It may be referred as the first stage of the tidal cycle when a tidal river like Matla deviates from its main course either by overtopping the banks or by eroding the astride banks. Thus, due to the bank erosion, the shifting of the tidal river courses takes place. But side by side, the sediment load transported by these tidal channels use to settle in shallower parts of the riverbeds which have too gentle slope to carry the sediment load further upstream. The point bar accretion or formation of shoal deposits takes place. So, at the upper reaches of the tidal channels experiences more depositional activities than the erosional activities as the channel gradient is smooth. But due to the formation of those point bars, mid-channel bars or shoal deposit here and there in the upstream, the incoming high tide water again faces obstacles in the next tide. Besides, resistance from the last ebb flow still leaving the river, causes the top of the advancing front to tumble forward, sometimes gives the bore the appearance of a travelling waterfall. It causes sudden change in the hydraulic pressure along the western and eastern banks of this interfluve and causes bank failure in particularly when certain vortex of the tidal dynamics takes place. For e.g.- the bank failure at Mazidbari village in Basanti Block during the year 2007. The undercutting process becomes more active after the sudden fall of the tide water after tidal bore. The cyclic tidal bore throughout the year loosens the compactness of the bank-wall of the tidal channels like Matla and Bidyadhari and during the dry periods the banks are cracked which again when any spring or neap tide comes, collapse along those cracks. Field experiences also found the fact that a single incoming andouting flow converts into multidimensional flow. The relatively deeper pools formed due the pressure of the feet of the villagers walking along the low water line accelerates the formation of small eddies also which in future accelerates the formation of whirling of river water underneath. In future, this small eddies form larger vortex flow along the riverbanks. Undercurrents generate the channel bed scouring as well as undercutting of the basement of the riverbanks. Scouring of the channel bed causes irregularity in the gradient of the thalweg leading asymmetrical flow. Field study has also found different pH value at different hydro-geomorphic areas. It also differs on either side of the banks along a single channel also. Along with that, the higher rate of evaporation after the offset of Monsoon, the dominance of mud can only be seen in the lower section of the levees. A thin layer of salt during the dry seasons as well as the stilt roots encourages the erosion by making numerous cracks and fractures and soil chunks. Continuous undercutting of the base of the riverbank results the sudden collapse along these cracks. This type of undercurrent erosional activities has been found particularly along the narrow interlinking channels like-Hogol Nadi and around the acute meanders like- the acute meandering course of the R. Bidyadhari near the Mammathanagar, Kakchikhal etc. The lower velocity and low downstream discharge at the upper course of these rivers cannot transport the eroded materials and they lay aside as the shoal deposits. Thus, continuous shortage of sufficient drainage water, forcefully arresting of the upper course and continuous increase of deposition of the river borne materials i.e. silt, clay and mud, raise the river bed even higher than the adjacent settlement areas. The huge volume of tidal water during the tidal bores again try to move further towards the source and accommodate itself by shifting its main course by bank erosion to find a new passage. So, bank erosion causes shifting of tidal channels in this interfluve and shifting of tidal channels causes’ bank erosion also. So, its a reciprocal or cyclic process through which a particular tidal channel behaves accordingly with the spatio-temporal changing nature of the drainage system in a delta like Sundarban.

b) Anthropogenic factors

(i) The tidal rivers in Sundarbans have always been misevaluated by the British Government in India. It is known to all that some of the British Officials tried to find out the navigation route through the intricate network of the tidal creeks and channels from time to time to exploit the natural wealth of the largest delta. Some of them made surveys to understand the complex drainage system in the wild dense mangrove forest. It was Lord Canning (Governor General of India from 1856 to 1858, and Governor General and Viceroy from 1858 to 1862) who first showed a keen interest in making the supplementary port of Kolkata and rival to Singapore. He tried his level-best to make this attempt a successful one in 1864. But, he was unlucky as the idea of developing a major port at Canning faded with the choking of the Matla River as a result of inadequate headwater supply. Rather in 1867, the Matla River surged its fury on the new port-town, reducing it to a “bleached skeleton” (Bhiman, 2004). In 1862, the Calcutta and South-eastern Railway opened a southward line from what was then known as Beliaghata station to Port Canning and it seems to be the key factor behind the continuous urban
agglomeration in 24 Pgs. (S) and the disclosure of the age old mysterious wild habitat and unknown wealth of
rare woods in this part of India or earlier Bengal (Chaudhuri, 1995).

(ii) Records say that rapid increase in number of Bangladeshi immigrants in the District of 24 Parganas after the
independence of India forced the growing population here to open new and new scopes of rural economic
activities for livelihood. The luxuriant growth of valuable timbers and rare valuable plants of the Sundarbans
attracted the people here. The collection of wax, honey, fishing, boat making, valuable hard woods for making
wooden furniture etc in the immature delta drained by sluggish tidal creeks and channels in Sundarbans were
unscientifically exploited and permanent settlements increased the other unplanned and illegal activities which
in turn increased the pressure of population on the immature land. People started spilling off the upper reaches
as the water is less saline suiting some indigenous crops. Thus, growing irrigational demand for agriculture and
inland fisheries, the rivers or khals in this interfluve started sluggish and decaying of their beds, raised the height
of them above the adjacent settlement areas.

(iii) The massive rehabilitation programmes for the refugees in the 24 Pgs. (S) from time to time since the 1770s
by the then British Government as well as the Bengal Government for both political and economic purposes led
to the higher density of population in this district. Thus, bank-ward growth of population and unplanned
fisheries, settlement and irrigational activities along the unstable bank-erosion prone areas along the age-old
embankments may increase the risk of sudden bank erosion. No new commission has been set up for integral
solution of the bank erosion in the Sundarbans. The traditional British methods of repairing the eroded or
breached embankment are followed by us also.

(iv) The illegal filling up of the decaying channel for new and new land area for settlements and for getting new
and new non-saline agricultural lands ultimately disturbed the natural outlet system of the high tide water and
increases the chances of water-logging during the low tides which in turn converts to marshes for prawn
cultivation. This intentional increase in marshy area ultimately calls the devastation during the tidal bores in
monsoons e.g. the increase in marshy area in the Bidyadhari-Matla- Karati Nadi area near Port Canning

(v) The rapid decaying of the upper reaches of R. Matla near Canning caused poor and sluggish drainage
condition of the earlier active khals and ox-bow lakes and ransacks the immature floodplain.

(vi) Running of generators on a regular basis as the source of electricity in the age-old un-electrified
Villages along some tidal channels and khals like-Hogol Nadi, Pathankhali Khal also weakens the resistance
power of the bank soil. De (2008) found the continuously running diesel generators along the riverbank of
Hogol Nadi near Basanti Bazaar practically playing the vital role to make the soils more fragile along the banks
and ensure bank erosions.

(vii) Besides this, the continuous walking along the banks by the local ‘Dhikars’ or ‘Jeles’ has led the basement
of the bank along the tidal channels to become very rough and full of holes. The very newly deposited silt
and clay by the tidal channels along the toe of the immature banks are when undisturbed remain smooth and tidal
water use to flow up and down without scouring the surface of the toe of the banks. But it is noticed that lots of
holes have formed by the pressure of the feet of the villagers who come down the bank at the river to catch the
shrimps and prawns. These holes are gradually enlarged both in area and depth and as a result whirling of water
or eddies are formed here during the high tides. These whirls energize the undercutting flow and the rate of bank
erosion becomes faster during tidal bores.

(viii) Another important factor of the undercutting process is the making of ‘Chouko’. These rectangular hollows
allow the origin of turbulent or whirling water for accelerating the rate of basement erosion of the embankments
along the tidal channels.

Bank erosion mainly takes place due to combined activities of man and nature envisaging – the
discharge, flow diversion, formation of shoals, migration of ephemeral bars near the bank, channel scouring,
cohesiveness of the texture of the banks, soil humidity of that area, bank configuration, bank failure,
anthropogenic activities like the making of the embankments and excavation of the bank side areas for different
purposes, the difference in sediment load in different seasons etc. These multi-functioning factors are working
day and night, here and there in Sundarbans without any rest. But the bank erosion caused due to tidal actions is
most common in Sundarbans and tides play most vital and versatile role amongst other factors in Sundarbans.

Hence, the major natural activities which are working day and night in shaping of this interfluve are the
erosional and depositional activities done by the tides and ebbs. Due to continuous erosion and deposition,
shifting of river courses is also a common phenomenon in the deltas like Sundarbans. Tidal channels in the
interfluves of Sundarbans have a continuous shifting tendency mainly due to widening or narrowing of the tidal
channels caused by the bank erosion or silt deposition along them. The Sundarban Delta is constantly being
changed, molded and shaped by the action of the tides, with erosion processes more prominent along estuaries
and deposition processes along the banks of inner estuarine waterways influenced by the accelerated discharge
of silt from seawater. The rivers in Sundarbans now carry little freshwater as they are mostly cut off from the
Ganges, the outflow of which has shifted from the Hooghly-Bhagirathi channels progressively eastwards since
the 17th century. The area of the interfluves like Matla-Bidyadhari interfluve in the Sundarbans has been
changed from time to time accordingly to the changing form of the length, width and depth of the tidal channels.
These channels are actually the distributing channels of Ganga and Padma Rivers and two major factors are responsible behind such intangible shifting of the tidal channels in the Sundarbans i.e. the continuous but slow subsidence of the Bengal basin towards east and the differential rate of erosional and depositional processes. Thus, unless or until there is clear understanding of the erosional and depositional activities working day and night in this region, the fluvio-geomorphological environment of this interfluve will not be understood properly. So, there is a need of detailed hydro-morphological analysis to understand the spatial differences between the shifting of the up-stream and down-stream separately in two different dimensions in different magnitude. For this, the researchers also found that there are many differences between the normal shifting of the non-tidal rivers and the intangible shifting nature of the tidal rivers particularly in case of the Sundarbans.

**SPATIO-TEMPORAL CHANGES OF RIVER COURSES**

River has changing nature since time-immorial but on the basis of the availability of proper map, 1924 has been taken as the base year. The mass embanking of lots of tidal rivers and khals in Sundarbans for arresting their course to reduce the saline water intrusion and prevent bank-erosion was initiated by Claude Russell in 1770. That unplanned implementation and malpractices of bunding the tidal channels and khals here and there in the entire Sundarbans led to rapid change in hydrological behavior of the major tidal rivers like R. Matla and R. Bidyadhar etc. as their natural drainage systems were severely hampered. Slowly they started delinked from their sources and their faded upper courses receded seaward and channels migration was started. Side by side, rapid decaying also raised their riverbeds leading outward.

![Fig. 3: Spatio-temporal shifting of river courses in Matla-Bidyadhar interfluve (1924-1972-2010)](image)

It has been found from the hydrological analysis that due to chronic shortage of the discharge in their upper reaches, some major tidal rivers or khals have been shortened too much and lots of channels and khals have also been abandoned during 1932-2010. It was also noticed during the research work by the researcher that rapid silt deposition has narrowed down some channels in an alarming rate and side by side sometimes their river-bed also raised above the adjacent settlements. For example- R. Matla, Karati Nadi, Amjhara Khal in the mature flatland of this interfluve had a length of 62.09kms, 16.8kms and 25kms respectively in the year 1932. But during the year 2010, the length of these tidal rivers or khals declined to 59.40kms, 9.81 kms and 6 kms accordingly (Fig. 3). The most disappointing one was the Amjhara Khal which was one of the major sources of irrigation and an important interlinking channel between the R. Matla to the west and R. Raimangal to the east via Rampur Khal. The length of this khal slowly is being reduced and now its length is only 6.00kms which was 25.97kms during the early 1930s. Earlier it was a major mode of water-transport for the people of the east with...
the people living in the west of the Bengal Delta. The water of this river was used for the Aman cultivation in the astride villages like – Hediar Abad, Daharani, Athara Beki, Gabbuni of present Canning-II Block and village Kumarkhali, Chara Bidyarabad, Titkumar, Khari Machan, Dhuri, Amjhara in Basanti Blocks. But field investigation denotes that, at present as it flows as a narrow tidal stream during the high tides only and only 5 villages along the western half of this khal is being poorly served by this khal. Likewise, it happened in case of Karati or Kuriabhanga Nadi which once played an active agent of tidal network of the recent Sundarbans. The Karati Nadi during the 1920s had a link with the R. Raimangal via R. Bidyaadhari in its upper reaches and once the Payna Bil used to get sufficient amount of water from this river. But, during the last 9 decades, due to the indiscriminate harnessing and mal-utilizing of the river water and river-bed of this tidal channel for fisheries and along with the rapid formation of large marshes near Canning where it meets R. Matla as well, the upper reach has almost been captured by the cultivators or fishermen. Earlier, up to the mid twenties, this Kuriabhanga river helped in both agricultural activities in its eastern part of its drainage basin and fishery in the western part of the river basin of this river. But at present both agriculture and fisheries are suffering from decreasing output.

CONCLUSION

It is of no doubt, Sundarban Delta or the Ganga-Brahmaputra delta is the product of the debris accretion by hundreds of sluggish and intricate distributing drainage systems whether tidal or non-tidal over the gentle continental shelf of the Bay of Bengal for thousands of years. The recession of the shoreline during different geological periods also gave rise to new and new micro and meso-drainage basins within the Bengal basin. These age-old migration and modification of the courses of the tidal and non-tidal rivers were done either by depositional activities or erosional activities or by river capture. From time to time, the length of the tidal rivers are also modified and shifted, narrowed or widened due the continuous change in the amount of erosion or deposition, direction, magnitude of discharge, amount of sediment load.

The spatio-temporal changes in the tidal channels were occurred either naturally or by human interferences like- early reclamation of the immature or juvenile floodplains of the interdependent interfluves of the Sundarban delta, rapid legal or illegal deforestation operations in the mangrove areas for making new and new habitable areas etc. Still now, no such fruitful programmes for floodplain protection or recovering of the illegally reclaimed immature floodplains have been noticed in this regard. What has been done is lengthening of the embankments, afforesting few parts of the inhabited interfluves. No such detailed records of the hydrological data of each and every inhabited and uninhabited interfluve can be found also. Although, several research works have been done and few have disclosed the hidden hydromorphological attributes in this matter but there is always a need for a micro-zoning of these interfluves and a detail interpretation of the fluvio-geomorphological analysis of the past and present conditions of these interfluves with the help of latest GPS and GIS techniques. Above all, the geographers must come in front and they must be incorporated in any action to be taken for the betterment of the deltaic environment. Last but not the least, people are moving towards the bank erosion-prone areas in the Sundarbans, not the former one and are also inviting the severe cyclones to move smoothly by clearing the mangroves during last few decades. Without having any basic hydro-morphological knowledge about the nature of these tidal channels, the nerves and veins of Sundarbans, any attempt for implementing proposed programmes in this environmentally degrading delta will become a fatal one.

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