THE INTERNATIONAL JOURNAL OF HUMANITIES & SOCIAL STUDIES

Fluvio-Historical Evolution of a Moribund Channel & Historical Background: Case Study Sunti River, 24 Pgs (N), West Bengal, India

Sovan Chattopadhyay

Research Scholar, University of Calcutta Assistant Professor, Department of Geography, Sarada Ma Girls' College, India

Abstract:

River can be conceptualized as a part of history as maximum civilization and historical evidences were developed and expanded along the banks of rivers. Any of the moribund channels or rivers of a region existing today could have fossilized history. As the evolution of a river is important from the aspect of fluvial morphology it is also significant for re-excavating history. Sunti River was a spill channel of Jamuna River that was an important branch of Bhagirathi River in 15th century. The evolution of the Sunti River is Significant because; a part of the fluvial set up of lower Bengal was dependent on the river. More specifically the Western branch of Bidyadhari River was fed by this spill channel until there was sufficient discharge from Jamuna River. This Sunti River helped to discharge excessive water from the Jamuna River and surroundings through Bidyadhari River, then through Matla System and finally into Bay of Bengal. So the evolution of Bidyadhari River was also related with Sunti River. Except this the river has witnessed number of important chapters of contemporary history also. Representing the evolutionary history of a moribund channel like Sunti River and the historical incidents related with it is basic the objective of this paper.

Keywords: moribund channel, spill channel, fluvial history

1. Introduction

Moribund channels or Dead Rivers are one of the most important components of the history as well as in fluvial geomorphology. To study the paleo geomorphic condition of the lower west Bengal the moribund rivers should taken under consideration. The spill channels like Churni, Jamuna, Bhairab, always predominated at different time and also had some striking effect on local as well as on regional history. These spill channels & creeks are always very important for the regional fluvial history also. It's true that the morphometric study and other types of fluvial research on a moribund channel are always important; simultaneously the historical evolution and paleo-environment of a moribund channel could make the research more valuable. Sunti River is most significant one of these rivers. It is an important river of Bidhyadhari-Raymangal system. According to the residencies of the area once upon a time the river has been used extensively for the business purpose. And the Great Merchants used the river for the voyage'. Some of the local people of the area have informed that the segmentation of the channel has been done by the local people. From then the river lost its discharge capacity abruptly. But in its flow path it has fabricated a number of amplitudes, meanders that gives the perception about the discharge capacity, width and depth status of the river which could portray a great fluvial history. The objective of the paper is to reveal the feasible fluvio-historical importance of the river.

2. Study Area

The study area includes three river basins of north 24 pgs. They are Nawi River /khal basin (82 sq miles), Sunti river basin (89 sq miles) and a very small portion of Nonagong basin. Between these three in this paper Sunti River has been highlighted. The all total coverage of the basin is 89 sq miles .Maximum portion of the Sunti river basin lies within 88° 30' E to 88° 33'45' E and 22° 37'30'' N to 23° N.The basin of Sunti R is bounded on the north by the Bagher khal basin, on the east by Nonagong and Pankhali Basin. The basin is mainly rural in character except about 3 sq miles of urban area near Barasat town. The average distance of Sunti River from the main Hugli River flowing to west is 15 km. The Sunti River is flowing almost parallel to the Hugli River. The ground levels vary from RL 26 to RL 5. The formation of the plain has been influenced by the salt marshes extending from Kolkata to Faridpur (Bangladesh). The moribund and mature parts of the Gangetic delta generally terminate at the northern margins of these salt marshes. So the marine estuarine agencies have produced the southern alluvial plain. The land building was incomplete at the time of the first recession of the sea. Afterwards the riverine deposition and estuarine land building formed the plain. The geological structure shows the development of the plain in a transition zone between shield and geosynclines. Most significantly this is a plain developed between the marine agencies and southern boundary of riverine delta. According to Chakraborty. S "much of the land surfaces of the south Bengal basin has formed by the alternate or complementary depositional activities of marine and fluvial agencies is beyond any reasonable doubt" (Chakraborty. S, "Some consideration of the

physiographic evolution of Bengal", A.B Chatterjee (edited), West Bengal, 1970, The geographical institute, presidency College, Calcutta, First publication, pp-26). There we can find out some of the preexisting channel now in their moribund status.

3. Objectives

- Heilighiting the historical importance.
- Field observations to supplement the study.
- Find out the nature of the channel & its deviation from its past condition.
- To find out the possible river course and its nature of diversion.

4. Methodology

The area selected is full of depressions and channel segments are a part of mature delta. Basically the main objective is to depict the historical analysis of the moribund channel like Sunti. Both Survey of India topographic maps of 1972 (79B/5, 79B/6, 79B/9and 79B/10) and the degree sheet of the area published THE ARMY MAP SERVICE (NSS&H), CORPS OF ENGINEERS, U.S ARMY, WASHINGTON D.C has been used for this purpose .Google images of 2009 have been used to evaluate the present status. Some of the important books on Bengal river system like Rivers of the Bengal Delta by Satishchndra Majumder (1942), The Changing Face of Bengal by Radhakamal Mukherjee(1938), Ganges Delta by Kanan Gopal Bagchi (1944), Rivers of Bengal vol.2 by Kumud Ranjan Biswas(reprint ver:-2001) etc have been used. Except these An Account of Ganges and Bramhaputra river by J.runnel(1781), On the courses of Ganges through Bengal by R.H.Coalbrooke (1801), Report on the Hoohgly river and its headwaters by Stevension -moor-committee report is also important to depict the case study. Some of the old maps like Gastaldi's map of Asia 1561, Descripcao do raino de bengalla 1615 by Joao de Barros, Crate de l'inde by D'Anville 1752, Rennels map 1780, tassins map, 1841 etc. helped to analyze and understand the primeval fluvial set up of lower bangal and its significant change with time . Basically maximum of the literatures was written on some of the main rivers like Hooghly, jalangi, saraswati, as the rivers had a great importance as water routes of business. So the descriptions were planned and concentrated on the changes of Bhagirathi Hooghly River, deltaic rivers their changes, modifications done by the British authorities and engineers etc. Except this at that time the Bengal Rivers like padma, Brahmaputra also got enormous importance. That's why some of the vital tributaries of Bhagirathi Hooghly system as well as Bidhyadhari system are not got enough space in research. Only some information is mentioned in historical books. Historical importance of study region is used to illustrate the view about the channel of the historians which is now in its moribund stage. Direct conversation method with the local people played a major role to supplement the historians view and present status. Lastly field observations have been done to check the present condition of the channel.

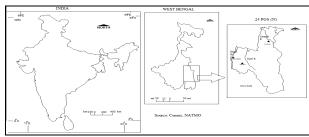


Figure 1: Location map

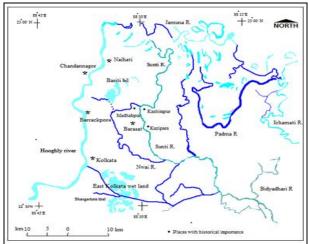


Figure 2: Fluvial set up of Sunti River and surroundings and locations with historical importance

5. Fluvio-Historical Importance of Sunti River and Evolution

The Sunti River is an important river of Bidhyadhari- Raimangal system. The river is well demarcated as an outfall channel for the storm water and sewage of the adjoining areas. The river course has been influenced by the segmentation and stagnation by local peoples. This anthropogenic control over the river changed its configuration. As a result the course of the river now exists as a chain of ponds, tanks. A thin portion beside the tanks or ponds left constantly to provide the chance for the storm water and sewage water to flow. In the upstream many segments are used as agriculture field as the bed of the river silted completely.

Different approaches & statement on the character of Sunti River could give a concept about the river and its present status. In 24 pgs gazetteer the river course has been identified and noted mainly as old creek of Pleistocene which at now mainly used as a drainage out let "The other wards are drained by the Sunthi nadi, an old creek which passes southward to join the Bidhyadhari River near Bhangor" (pp.210). *Bengal district gazetteers* by L.S.S o'Malley. There exists a controversy on the nature of Sunti River. Lack of literature and articles became a main limitation of the research. As mentioned by L.S.S O'Malley in Bengal district gazetteers that Sunti was an old creek of lower deltaic system. The evolution of the lower deltaic environment and its change with time has been portrayed in number of old maps used as reference. In a dynamic deltaic environment bifurcation of main rivers into distributaries and existence of tributaries were common. Among the tributaries of bidyadhari raymangal system sunti is most important. Before 18th centuries the Bidhyadhari River was divided into two branches at "Tehotto". The western branch was active up — to last seventeenth century. After that this particular branch decays. Now only the eastern branch is active.Rudra.K in his book *Banglar Nadikatha* opined that Bidhyadhari was the most important waterways from 300 B.C to 500 A.D. Chandraketugarh was the eminent port of that time. The contemporary deltaic structure was different and the rivers existed at that environment were characterized by strong tidal influence. This branch was the eastern branch of Bidyadhari River flowing in N-E direction. Therefore Sunti and Nowi, two most important tributary of western branch of Bidyadhari River also had significant discharge influenced by the fluvio-dynamic set up to maintain that status.

Before the distraction of Padma the Bhagirathi was diverted into three main divisions named Saraswati, Jamuna and main Bhagirathi. In fifteenth centuries the jamuna (flowing north easterly direction) was one of the most important distributaries of left bank of Bhagirathi, threw off number of spill channels. Sunti River was one of them. A quotation from the book *River System of Bengal* can supplement the statement. "When Jamuna was active in the fifteenth century, it threw off many spill channels. The first spill channel it threw off is the Nowi, the second is the Sunthi and the third one is the Nonagong." (pp.209) .Nonagaon is also known as Bidyadhari River.

It is difficult to judge the Nowi as a main spill channel of Jamuna, because the course of the river displayed in the map shows its origin from barite bil. Basically after the diversion of Padma the serious lack of discharge at Bhagirathi became a significant cause of the decay of Jamuna River. The spill channels like Sunti, Nawai started to decay. The rivers influenced by tides have a specific condition to decay. The tidal influence on Hooghly River is active up to nabadwip. Nabadwip is 72 kms from Tribeni is the particular place where the main Bhagirathi is divided into three divisions named jamuna, saraswati, and the Hooghly (local ganga) itself; as Bhagirathi's channel was unable to carry forward the excess waters from "Rurh rivers" (Damodar, Ajay, Darkeswar, Mayurakshi etc.), confluenceing upstream. As the Hooghly River its other distributaries are influenced by tides. So their change of nature from active to moribund is also a result of the tidal processes. Basically a huge quantity of sediments carried by the strong tidal current from the confluence to the river upstream is a common phenomenon. But the quantity decreases, when it retreats as a slow tidal back current. In this way the river bed gets filled with sediments and in effect decays with time. The deterioration of the bidyadhari system was influenced by the shifting of Bhagirathi river course also. Rudra.K in his book Banglar Nadikatha mentioned about the shifting of Bhagirathi River near Haringhata towards west. (pp. 50-51). According to him this could be an important cause of decay of Bidyadhari River. After referencing some maps of Ganga delta it can be noted that once Nowi River had a tendency to be fed by the Bhagirathi itself with the help of Ichapore khal. The two rivers Nowi and Sunti meet with each other and at last confluences with the western branch of Bidyadhari River. Piyali River another important river of Matla-Raymangal system originates from this western branch of Bidyadhari River. This Piyali River meets Matla River at a place named Kultali.

The Kultigong River a river system of recent origin of Bidyadhari and Matla system is basically considered as a tidal creek also received flood waters from Jamuna River by the Sunti River. The importance of Sunti River for Kultigong system has been explained in the following way -"The Kultigong is a tidal creek extends in the north-easterly direction from the Raymangal estuary ends ultimately in the two channels viz, nowi and sunti". (Pp-210)

The anticipation about Sunti River's connection with Matla system was mentioned in former regional fluvial research also. Mr.S.C.majumder also opined that the upland supply of water for Matla system was from Jamuna River and was carried by spill channels like sunti. The Sunti River as a spill channel fed the Matla system flowed through the Bidhyadhari khal or the western boundary of Bidyadhari River. The decay of Bidyadhari River was a result of the decay of Jamuna and its spill channels.

We should note the contemporary deltaic environment to understand the probable causes behind the decay of the Sunti River. First of all tide influenced rivers always have a self destruction mechanism by nature. When the tidal current enters the channel, it carries huge quantity of suspended sediments. But the back tidal current retreats slowly relative to the entering tidal current. This inequality of tidal current encourages sediment deposition in the river bed and fills the channel. By this continuous process the river bed gets filled up and decays in a course of time. Decay of Sunti River was influenced by another mechanism also. As mentioned earlier near Tribeni the Bhagirathi-Hooghly River was divided into three distributaries. At that time the western branch of Bidyadhari could have been fed by the Bhagirathi. (Rudra K. Bangalar Nadikatha, pp.50). The contemporary tidal environment was strong than now and had a great impact. The tidal current entered through these three rivers and collides at Tribeni. This enormous impact had form a major bar in the channel of Bhagirathi-Hooghly River. This became the factor that obstructed the discharge outlets. In this way the Jamuna started to decay and Bidyadhari was also lost its discharge from upstream. Only the tidal

set up has influenced the western branch of Bidyadhari River to be alive for some decades. According to Majumder.S.C "The western most of the channel of the bidyadhari which were originally the spill channel of Jamuna and now functioning as the carriers of local drainage(after they served from their present stream) are the Nowi and the Sunthi.their combined discharge used to pass into the sea ,through the Bidyadhari Khal or the western Bidyadhari which in its lower reaches streamed from near Balighata bridge(Barasat Basirhat light railway) in the south western direction to Taradah (the present meeting place of Tolly nullah and Bidyadhari river) then via Banar, flowed and is still flowing into Matla at port canning". (Pp-199) The eastern branch of Bidyadhari River was active as it got un-obstructed tidal flow through it. That's why Kultigong is also important as it was navigable. According to the local resource persons Sunti River was totally navigable before two hundred years ago. A supportive view on the nature of navigability of Sunti River is mentioned in the book entitled (Uttar Chabbish Parganar Sekal Ekal-vol-4 edited by Kanai pada Roy, pp.80). Sunti River was important to keep Bidyadhari River in Flow. The Decay of Jamuna and its spill channels has been considered as one of the important cause of decay of Bidyadhari River. The gradual rise of the salt water lake and surroundings due to siltation by the silts carried by the Bidyadhari tides also an important cause of decay of the spill channels like Sunti. This is because primarily the storage capacity of the spill areas was reduced and the rise of elevation also became an obstruction of tidal encroachment.

To understand the nature of evolution of Sunti River from its active nature to its decay, a brief look on the surrounding river system and their changes should keep in mind. As mentioned before the Jamuna, Bidyadhari, saraswati, Hooghly are four most important contemporary rivers. So change in the nature of the rivers affected the tributaries like sunti also, very significantly it may be stated that until Jamuna was active with a specific hydrodynamic set up & other rivers like Saraswati, Bidyadhari was also maintained their discharge, these spill channel or creek like sunti river were active.

The first description of Jamuna was portrayed in the 33rd &34th "Sloka" of "Pavanduta", written by Dhyoie (the court-poet of King Lakshmen Sen) at last of twelfth century. In Manasha-mangat³ the description of Jamuna was given by the author Bipradas Piplai in 1495. So the total fluvial set up was active in fifteenth century also. In 1612 a ship-war between the Pratapaditya & Mughala was held in the confluence of Jamuna & Ichamati River could be a significant evidence of Jamuna's active nature. (Rudra, K., Bangalar *Nadikatha*, pp.48). In the Rennell's map (1764-1767) river Saraswati River was represented as a moribund river and specifically the term "Small Creek" was used to depict its nature. In the book A Statistical account of Bengal (1875) Hunter depicted the Jamuna as an active river. S.C. Majumder in his book Rivers of Bengal Delta written concerning to the decay of Jamuna River;

"Deterioration of Jamuna probably set in soon after the diversion of main volume of Ganges flood towards the end of the 15th century. But it seems probable that it still continued to receive, at least during rains, a shear of the Damodar flood which had one of its outfall into Hooghly near kalna till 1660 and near Noasarai till about middle of the 18th century, both places being above the offtake of Jamuna at Tribeni" (Bangalar Nadikatha, pp-49).

In eighteenth century the eastern branches of Damodar named Gangoor and Behula decayed and the flood water of Damodar selected another of the channel for its discharge. The major shifting of Damodar flood water from Kalna, Noasarai to Falta in south encouraged the decay of Jamuna and Bidhyadhari River. So lack of discharge in Jamuna River slowly made the river insignificant and simultaneously the dependency on Sunti River to discharge excess water was also become needless. This lack of discharge from upstream made the Sunti River discharge less. Only in rainy seasons the river acted as the outlet to discharge excess rain water from the surrounding areas. The western branch of Bidhyadhari River was decayed partially before eighteenth century. The tidal influence was also become poor. So there was no chance of flushing out the deposited sediments in the channel bed. The metropolitan development in Kolkata and surroundings also had a great impact on the local drainage network. Some of the important canal system was introduced to modify the local drainage condition. These canals like Bagjola, Bhangor, S.w.d, etc of Kolkata & surroundings were directed towards east, across the channel bed of the western branch of Bidyadhari River. This ultimately stopped or obstructed the southward flow of water and throws the tributaries of the western branch of Bidyadhari system to decay. More over there was no further tidal influence to rejuvenate or maintain the active nature of the rivers. The Sunti River, Nowi, and Sonai River are those three main tributaries. Among these three rivers only the course of Nowi can be identified as an uninterrupted one. This course is used as a main drainage outlet to discharge excess water from barite bil in rainy season. This is also an outlet to carry sewage water of Brasat-Madhyamgram region. The Course of Sonai River is completely vanished at many places due to urbanization. Only near Sodpur, and Barrackpore it exists as chain of pond and canal. Sunti River is also in the same condition but in better state than Sonai River. We can still find the course of the Sunti River as the larger part of it runs across the rural areas and agricultural fields. But the course is nothing but the chains of ponds owned by the native peoples mainly used for fishing purpose and livelihood.

6. Relation with Local and Regional History & Present Condition

The river course has been influenced by the segmentation and stagnation by local peoples. This anthropogenic control over the river changed its configuration. As a result the course of the river now exists as a chain of ponds, tanks. A thin portion beside the tanks or ponds left constantly to provide the chance for the storm water and sewage water to flow. In the upstream many segments are used as agriculture field as the bed of the river silted completely.

The Sunti River and its surroundings carry number of historical evidences. There had been no maintenance of the river system from British period to till now. This has made the river moribund also. But significantly number of ancient evidences are scattered

¹ A couplet of Sanskrit verse, especially containing sixteen syllables in each line

² A kavya was written by kavi Dhyoie. Kavya is a Sanskrit term for poetry and poetical works.

³ This is a kind of mangal kavya featuring Manasa the serpent goddess.

along two banks of Sunti River. This river played a valuable role in past fourteenth, fifteenth & sixteenth century. Some of remarkable evidences can supplement the context. For instance there was a significant exposure and expansion of 'Buddha Dharma' (Buddhism) in this region and its surroundings at the time of Pal era. At the time of Devpala (810-850 a.d.), the maximum expansion of the dynasty was occurred. At the contemporary period this region was well known for its water routes and business. Numbers of settlement, markets were developed in these regions.

Madhabpur village is located beside Sunti river at north of Barasat town. Few years ago an earthen pitcher shaped pot with sculptured face of Lord Buddha was unearthed at Madhabpur village. (Roy.K.P, Uttar *Chabbish Parganar Sekal Ekal-vol-4*, pp-80). That was an excellent old instance representing magnification and extension of Buddhist culture or Buddhism in this area at once.

Kashimpur village is located at a distance of few kilometers from Madhabpur village. In this village an embodiment made of black basalt locally named as "Shiver Hati" is well known for puja purpose. According to the specialists this was a hand of thousand year's old embodiment of Lord Buddha.

The native place of Barasat named Kazipara located at the bank of Sunti River also had historical importance. In the 14th century this place was a hermitage of the great "Pir" Hazrat Ekdil Shah, Who was one of an eminent pir among twenty two "Pirs". (Roy.K.P, Uttar *Chabbish Parganar Sekal Ekal-vol-4*, pp-80). Not only that according to the native peoples and historians the river was navigable enough just before two hundred years ago.

At the rule of warren Hastings (1772-1774) Barasat was the capital of contemporary Bengal is also located beside Sunti River. Warren Hastings built a Bunglow⁷ at Barasat .The place is known as "Duck bungalow" now. In 15th & 16th century the Barasat town was surrounded by Sunti River.

To explain the present condition of the river its stagnation has been highlighted. The anthropogenic impact on a moribund paleochannel can be understood from the following statement "The northern portion of the Nawai and sunthi have been 'bounded' up, i.e., blocked by dams or embankments, and transformed into tanks or brought under cultivation." (*Bengal district gazetteers*, pp-214).

Between all these channels the Sunti River has a noteworthy contribution to discharge the excess water from the Jamuna River and from the areas surrounding and releasing in the Bihyadhari River. The more emphasis has been given on the river as it flowed through suburban to urban infrastructures and also fast growing town like Barasat.

Once the river has been carried a necessary portion of the spill water of Jamuna (Jaboona) river and storm water from surrounding to lower estuarine drainage system of lower Bengal area and finally into bay through deltaic river set up. Mac aurthers study on arsenic contamination in the water of mature deltaic track, specializing on the Moyna region of Barasat(Barasatthe head quarter of 24 pgs north, west Bengal) shows the existence of deposition named sunti clay member of 20 m thick at a depth ranging between 49 to 70 mbgl approximately. The sunti member has been overlain by the barasat formation, joypur formation respectively. After studying the TOC and TS percentage⁶ and calculating Wt %⁷ ratio of the gray clay deposited at a depth of 48.7 to 69.6 mbgl depth ,Mac Aurther concluded a remark on the origin of sunti clay member referencing *Berner and Raiswell 1984 and woolfe et al,1995*. According to the reference the sunti clay was deposited at or below sea level. So the evidence supports the estuarine environment at the lower course of Sunti River. To develop and rejuvenate the condition of the river numbers of steps are taken. The irrigation and water ways directorate of the government have already been prepared some schemes. The committee have however, had the estimate recast an account of the change in drainage index from ¾" less 25% per day to ¾" per day and tide lockage . Rs/-150.00 lakhs has been introduced as the modified estimate amount.

According to the committee the implementation of the schemes will be as soon as possible after its sanction. The schemes will have to be executed in phase. As stated by the assistant chief engineer of Bidhyadhari sub division in 1990-92 and 1995-96 some of the schemes have been taken to make the river wider and for its re-excavation. In 1990-92 the sluice has been given at 7.8 km distance from its confluence. Afterwards a scheme on river widening has been taken. 14 km length has been taken under consideration. The 34 m width has been increased to 40-50 m. Some important steps have been taken from Kuberpur to Nalkara. The Investigation and planning circle 1 has been taken to study the river condition in detail and for its further improvement.

But the assistant chief engineer is genuinely worried about the involvement of the local people and their support as the projects on Sunti development is stopped previously due to the legal and political hindrance given by the local people.

The proper Barti bill and other low pockets in the Sunti basin get submerged in case of heavy and sudden rainfall by run-off from higher areas of the basin over burdening the drainage channels of adjoining basins. Those are mainly the Nawi and the Ichapore basin. Except these some other common problems can be identified also.

Now the total course is subdivided into number of segments, in many cases existing as ponds, and in few cases as public property. Another major problem is the unauthorized land capturing. Though the local people know about the importance of the river but the revival of the river bed area in some parts of its course became impossible because of some politico-social influence. This is a major obstruction in drainage development schemes on the channel.

³ Elephant dedicated to the lord Shiva.

⁵ A title for a Sufi master used equally in nath tradition. Or a Muslim Saint. They referred as Hazrat also.

⁶ TOC: TS refers to the ratio of total organic carbon (TOC) percentages to total sulfur (TS) percentages in sediment.

⁷ Parentage of weight.

7. Conclusion

Fluvio morphological set up of lower Bengal is most complicated one. Change of river courses with time on the deltaic environment always has been considered as an important area of research. A river in its moribund stages has no importance in contemporary social-economic set up from the aspect of nostalgia. But all civilized set up always needed a water course to explore. So the evolution of a river with time and related history with that may explore the historical importance of the river as well as the surroundings of small and large scale. Sunti River as a spill channel of Jamuna River helped to keep the fluvial systems like Bidyadhari, Raymangal, Matla active till a specific historic period. From the fifteenth century onwards the Sunti River was active with Jamuna River and maintained its identity as a spill channel. The actual decay of Bidyadhari was related with the decay of Jamuna River. As the Sunti was the main spill channel of Jamuna River also decayed after the decay of Jamuna River. This contemporary period was evidenced number of historical incidences related with Pala Era, Sen Era and colonial periods in Bengal. So Sunti River existed in the contemporary time, also witnessed this complete regional history. The life cycle of Sunti River and its contemporary fluvial set up displays the evolution of history and evolution of a river coexists side by side. So correlating the evolution of history with the evolution of a river from the aspect of fluvial research may explore number of micro level historical incidents that ultimately enriches regional history.

8. References

- 1. Bagchi.K.G, (1944): The Ganges Delta, Calcutta University press.pp-1-157
- 2. Bagchi.K.G,edited, (December, 1972), The Bhagirathi-Hooghly Basin, Kolkata,pp-3-8,59-100,143-197.
- 3. Bangiyo Bhugol Mancha (2009), Barnamay nadnadi, (first publication), Kolkata, pp-22-57.
- 4. Biswas.K.R, (2001) Rivers of Bengal, a compilation, volume II, Part I report on the Hooghly River and Its head waters, Stevenson committee report With Addendum C.Addams-Williams, Reprint:, Published by K.R.Biswas, IAS, State Editor. West Bengal District Gazetteers, Higher Educational Department, Government of West Bengal, Bikash Bhawan, North Block: 8th Floor, Salt Lake City, Kolkata-091.
- 5. Mitra, B (Director), (January 1969) River System of West Bengal: River research institute West Bengal. (pp-199-203).
- 6. Mukherjee. R. K., (1938) the Changing Face of Bengal, Calcutta University.
- 7. Mukherjee,S (first pub-1999),A dictionary of Indian literature: one beginning -1850, ISBN-81-250-1453-5, published by Orient Longman limited, New Delhi, (p- 175,222).
- 8. O' mally, L.S.S, , (2009), 24- Parganas Bengal District Gazetteers, ISBN-13:978-81-7268-193-7, ISBN -10: 81-7268-193-3, Published by- logos press, (p-2-10&212-214)
- 9. Roy, Niharranjan (1980): Bangalir Itihas-Adi parva, Saksharata prakasani. 88-109.
- 10. Roy.K.P, (2007), Uttar Chabbish Parganar Sekal Ekal-vol-4, Prava prakashani, Kolkata, pp-80
- 11. Rudra.K, Banglar nadikatha, (2nd edition) January 2010, ISBN: 978-81-7955-141-5, published by: Sishu Sahitya Sangsad.Kolkata. Pp-45-51.
- 12. Chakraborty. S, "Some consideration of the physiographic evolution of Bengal", edited by , A.B Chatterjee , West Bengal, 1970, The geographical institute , presidency College, Calcutta, First publication, , pp-26.
- 13. http://www.oxforddictionaries.com/definition/english/sloka
- 14. http://en.wikipedia.org/wiki/Pir_(Sufism)
- 15. http://www.ozcoasts.gov.au/indicators/sediment_toc_ts_ratios.jsp
- 16. http://archive.org/search.php?query=subject%3A%22pavanaduta%22