CHAPTER - II

Malda District: An Overview

2.1 Physical set-up

Malda district is the gateway of North Bengal as it generates the passage towards the hills of Darjeeling crossing the Farakka Barrage. The district is under the jurisdiction of Jalpaiguri Division of West Bengal. The district is demarcated by the state boundary of Bihar in the west and international boundary of Bangladesh in the east and the south western margin of the district are delineated by the mighty Ganga. It extends up to North Dinajpur district in the North and the southern boundary is akin to the Murshidabad district. The river Mahananda flowing north and south roughly divides the district into 2 equal parts, corresponding to the old boundary line of the ***Rarh*** and ***Barendra*** (Lambourn, 1918). The district has been subdivided into 10 police stations and is faceted into 2 subdivisions –Sadar having Englishbazar as headquarter and Chanchal having its headquarter at Chanchal itself. 15 Community Development blocks are namely–Gazole, Bamongola, Habibpur(in the east)old Malda, Englishbazar (in the central part) Manikchak, Kaliachak I, Kaliachak II and Kaliachak III (in the west and contextually covering the parts of study area)and Harischandrapur I, Harischandrapur II, Ratua I and Ratua II, Chanchal I and Chanchal II (in the North). All the northern blocks abide by the custody of Chanchal subdivision and the rest 9 blocks fall under the jurisdiction of Sadar subdivision.

2.1.1 Relief

The district slopes generally from the north to the south. The highest elevation of the district above sea level is 39.7 m at the place where the health centre at Pandua in the Police station of Gazole is situated. Elevations ranging between 30.0 and 39.0 m above sea level are found in the police stations of Bamongola and Habibpur. The other places of the district fall within the elevations between 23.54 m to 38.0 m. The slope is gradual as is proved by the meandering courses taken by the rivers flowing through the district (Sengupta, 1969). The physiographic make-up of the district is obviously an outcome of the gradual infilling of the North Bengal basin together with their juxtaposition with the neighbouring Pleistocene land surfaces (Morgan and McIntire, 1959, Sengupta, 1997). Changeable geomorphic associations generated by

the age old oscillation of the mighty Ganga, and which redistributes the silt over the western parts, result into spatial deformations of the physiography. Analysis of historical accounts of Bengal described 3 stage probable shifting of the Ganga, Ganga-Padma River from west to east up to 1,600 A.D. Possibly during 1,700 A.D the Ganga had changed its course considerably and shifted to its present course (to the west), miles away from the ruins of *Gauda*. Geographically the country land to the east of the Mahananda is called the Barind and the remarkable characteristic feature is the relatively high land of the red clay soil of the older alluvium. West of the Mahananda the country is again divided into 2 well defined parts by the Kalindri River flowing east from the Ganges. North of the Kalindri the distinguishing natural feature is the Tal land, the name applied to the land which floods deeply as the rivers rise and drains by meandering streams into swamps or into the Kalindri (Lambourn, 1918).South of the Kalindri lies the most fertile and populous portion of the district. It is seemed throughout by old course of the Ganges (Lambourn, 1918) upon the banks of one of which the city of Gour once stood. The most striking natural feature of the Diaras is the continuous line of islands and accretions in the bed of the Ganges. The word Diara is actually named for this reason meaning thereby low river banks. The *diara* is the low bank of a river and the *Karara*, the high bank. By extension these terms are commonly used to mean, land below and above flood level, respectively in the later alluvium (Lambourn, 1918).

Contextually the background history of the Bengal alluvium in the Bengal Gap keeping Meghalaya plateau at the east and shields of Rajmahal at the West should have been discussed here. Prior to Holocene or probably few later, the entire district was in long transgression and the mighty river Ganga poured into the Bay of Bengal near Gangasagar of present *Balurghat* in South Dinajpur district (Samad, 2005). Next incidents of earthquakes turned the course further south and took a sharp looping towards shields of Rajmahal in a south west direction and the new destination of the confluence became the *Jaluabadhal* of Kaliachak block (the then united Kaliachak block) and now this place is famous in Malda district by the name Gangasagar (Samad, 2005) in his monumental work, '*Natun Abiskarer Aloy Gangasagar: namkaran, Itihas, Nana Bishoy Prasongikata o tar Prakrito Abas sthan Katha*'). The evidences have been proved by analysing the salty marshy red older alluvium in this region which is locally called "*karkach*" which was also called "*chama mati*"

meaning thereby light and shallow layer of silts i.e. older alluvium of Ganges (Carter, 1935). Later the river transferred to further south with passage of time and recovery of the inundated parts ultimately conformed to the existence of the district and ultimate existence of the Ganga confluence with that of the upliftment of the basement of the North Bengal basin. The physiographic personality of the district is being discussed as below:

Barind

It is extending eastward from Mahananda River and is relatively upland tract. Barind is composed of mainly the ferallitic materials. In appearance Barind tract is undulating in character and presents a dissected appearance (Chakraborty, 1970, Sengupta, 1997). It extends to the far east of Mahananda and covers the parts of Dinajpur in West Bengal and Rajshahi and *Bogora* in Bangladesh. There are no hills in the district unless a few elevated tracts (Lambourn, 1918). Parts of these highlands have an elevation from 50 to 100 ft above the level of the Ganges, and being frequently intersected by deep water-channels; stimulate the appearance of small hills (Lambourn, 1918). Actually it covers an area of 1, 32,761 ha comprising the Blocks of Habibpur, Bamongola, Gazole and parts of old Malda. As quoted earlier 39.8 m is the absolute relief here. Barind is again subdivided into 3 sub terrain characters (Ghosh, 2004) (i) ***Danga***-relatively mound parts (ii) ***Ar-Kandar***-alternatively dry and wet low lands and (iii) ***Kandar*** – low lying marshy bogs in between *Dangas*. General pH value of the Barind soil is 5.1-7.1 and is identified as low fertile (Ghosh, 2004) areas and is also characterized by the presence of 20,000 ponds and *Kandars* (Ghosh, 2004).

The **ferallitic** components of the top and the sub soils have experienced rigorous exposures of sub aerial weathering stimulating the makeup of older '***Rarh***' i.e. red soils. Longer days of deposits of oxides of aluminum and iron (Al_2O_3, Fe_2O_3) have settled due to absence of efficient drainage (Chakraborty, 1997) at the time of its formation i.e. the periods of subsiding Garo-Rajmahal saddle. Rivers like Tangon and Punarbhaba in Malda reveals almost no imprint of entrenchment in their profiles, though the entire Barind zone had experienced withdrawal of (negative) sea level retreat at the time of reclamation of the North Bengal Basin basement from the sea. There was little land beyond Barind to support any drainage network at that time

(Chakraborty, 1970 & Sengupta, 1997). Due to surface coating by ferallitic or oxidized components Barind is suitable for water holding on the ground level depressions. More or less it is devoid of good vegetal cover and practices of agrarian purposes.

Tal

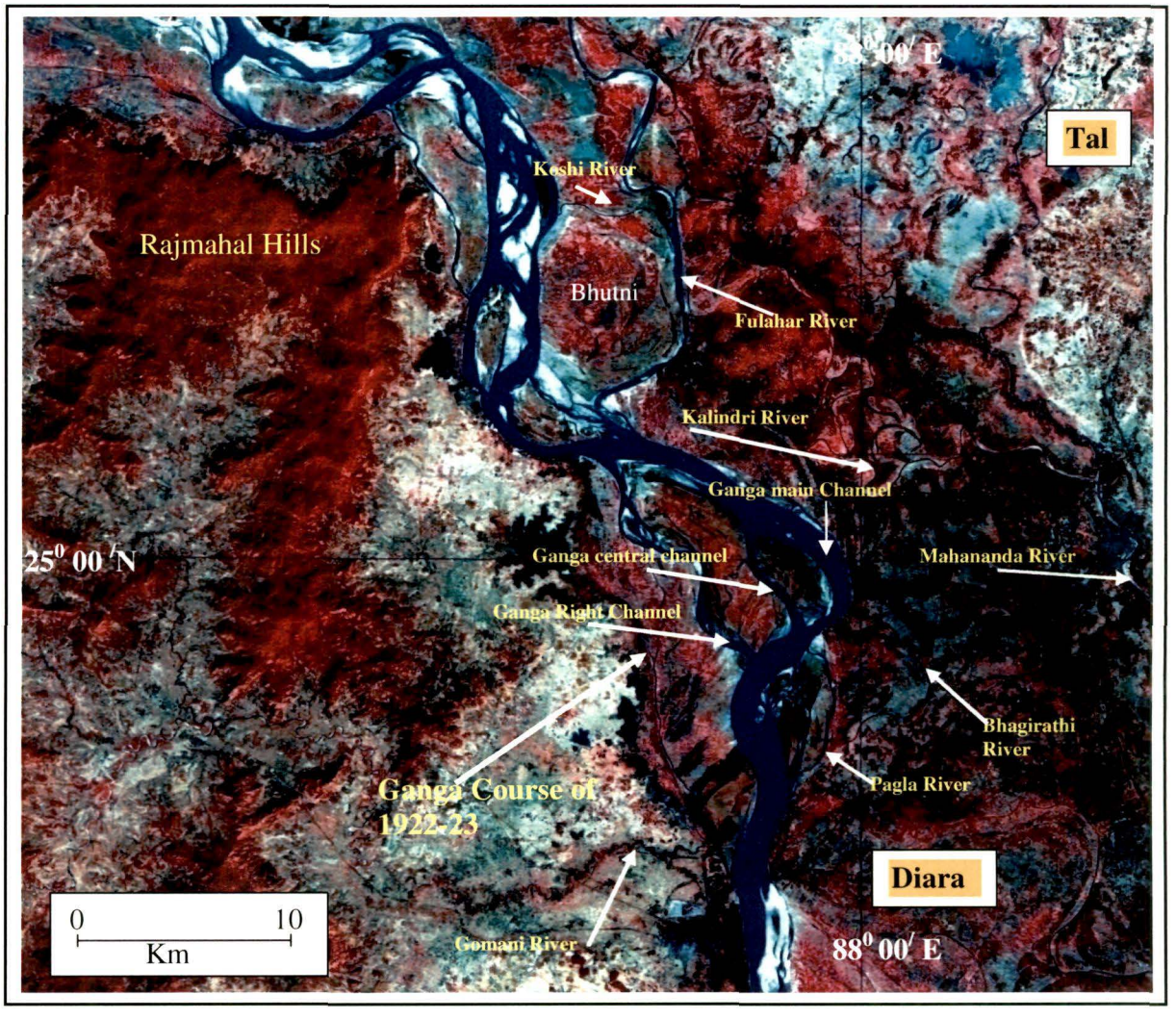
The Tal region is situated to the west of Mahananda River. It is a low lying area subject to inundation with the rise of rivers like the Ganges, the Mahananda and the Kalindri (Agriculture Annual Plan, 2001). The meaning of Tal is small lakes probably replaced by ponds, marshes and bogs (Carter, 1935 & Samad, 2003). All these Tal may have been the outcome of the abandoned spills of shifting Ganga. The beels (Tal or lakes) throughout the district are the direct or indirect result of fluvial actions, and are not due to earth subsidence, as is the case in *Rangpur* and other districts (Sengupta, 1969).There are approximately 29,500 tanks in the district. The steady and gradual down slope gradient of the entire Tal is from North to South and North to West. Occurrences of clayey flats merge with less compacted silts of Diara. Tal encompasses the CD Blocks of both the Harischandrapur (I & II), Ratua and both the Chanchal (I & II) covering wide areas of 1, 14,100 hectare (Agriculture Annual Plan, 2001).As because of low lying configuration, experiences of inundation is common by the rivers Mahananda and Kalindri. River borne silts, flood thrashed silts and mature beds of alluvium at the time of withdrawal of basement of North Bengal basin was the background story of physiographic evolution of the Tal. The important Tal tracts are as below:

(i) Sambalpur Tal (Ratua Police station)

(ii) *Bangarua Tal* (Harishchandrapur I Police station)

(iii)*Nunna Tal* (Chanchal I Police station)

(iv)*Vaknnia Tal* etc.



Source: Satellite Imagery,2007.

Figure 2.1 Physiographic and Drainage personality of Malda District.

Diara

The Diara consist of a strip of roughly eight miles in width along the western and southern parts of the District. Its formation is the result of centuries of fluvial action by the Ganges, the old channels of which can still be traced, beginning from the present course of the Bhagirathi River beside Gour and extending westwards by successive stages of replenishment (Agriculture Annual Plan, 2001). Diara is the result of the river laden siltation that occurred in the moribund beds of the older

Ganga or alongside *Mar Ganga* as viewed in the Topo-Sheet 72O/16 and 72O/13 published in 1970-1971. It occupies almost 30.70% of the district's total area covering an absolute area of 1,99,493 hectare (Agriculture Annual Plan 2001) and comprises the CD blocks of Englishbazar, Manikchak, Kaliachak I, II & III and fewer southern parts of Ratua adjoining Manikchak. Ganga has shifted westward from its old course and traces of old paleo-channels still be imprinted in the form of chains of beels demarcated by differential settlement lines. Still the existence of chain of beels located in the low lying marshy tracts between the Mahananda river and the main road from Englishbazar to Gaur. This had been caused by what may be described as indirect river action. A silt bearing river tends to build up its banks gradually by depositing silt on them, with the result that the strip along the river bank is often of a higher level than the interior. When this process has been gaining on for centuries, the effect is that the land lying between two rivers is formed like a shallow basin, and its level remains low unless it is regularly flooded by the rivers and receives deposits of silt. Now at the period when a considerable stream of the Ganges flowed southwards along the city's western walls, consequently the level of the land along this old bank of the river was high; and it is probable that any flooding further east was prevented by the ramparts of Gaur and further north by main road, which then ran northwards to Pandua' (Sengupta, 1969). Thus the entire country soil is a play-child of the joint action of Ganga and Kalindri which may be a spill channel taking abandoned course of old Ganga.

Bhutni, Gadai and many diaras (chars) i.e. islands are the creation of Ganges due to age old siltation and consolidation of layers after layers subjected to the formation of the silt bearing islands and thus about 11.28% of the cultivable lands of the diara tracts have elevated locations with reeds (Agricultural Annual Plan, 2001). Even seven decades before Diara was famous for fruit orchards (Carter, 1935). The 32 sq. miles areal coverage of *Bhutni Char* has been originated at the foot of Rajmahal hills. Previously the main stream of the mighty Ganga was at the east of Bhutni which turned to West of Bhutni from the 1920s (Ghosh, 2004). Historical annals reveal that these diaras are made by the hostile and crazy River Ganga were named locally as *Daridiara* (Kaliachak II), Narayanpur Diara (Manikchak) etc. (Samad, 2003).Till 1810 the master flow was opposite to Rajmahal facing Malda side. During 1875-1900 A.D it again shifted to the central mainland from where backed to west again leaving

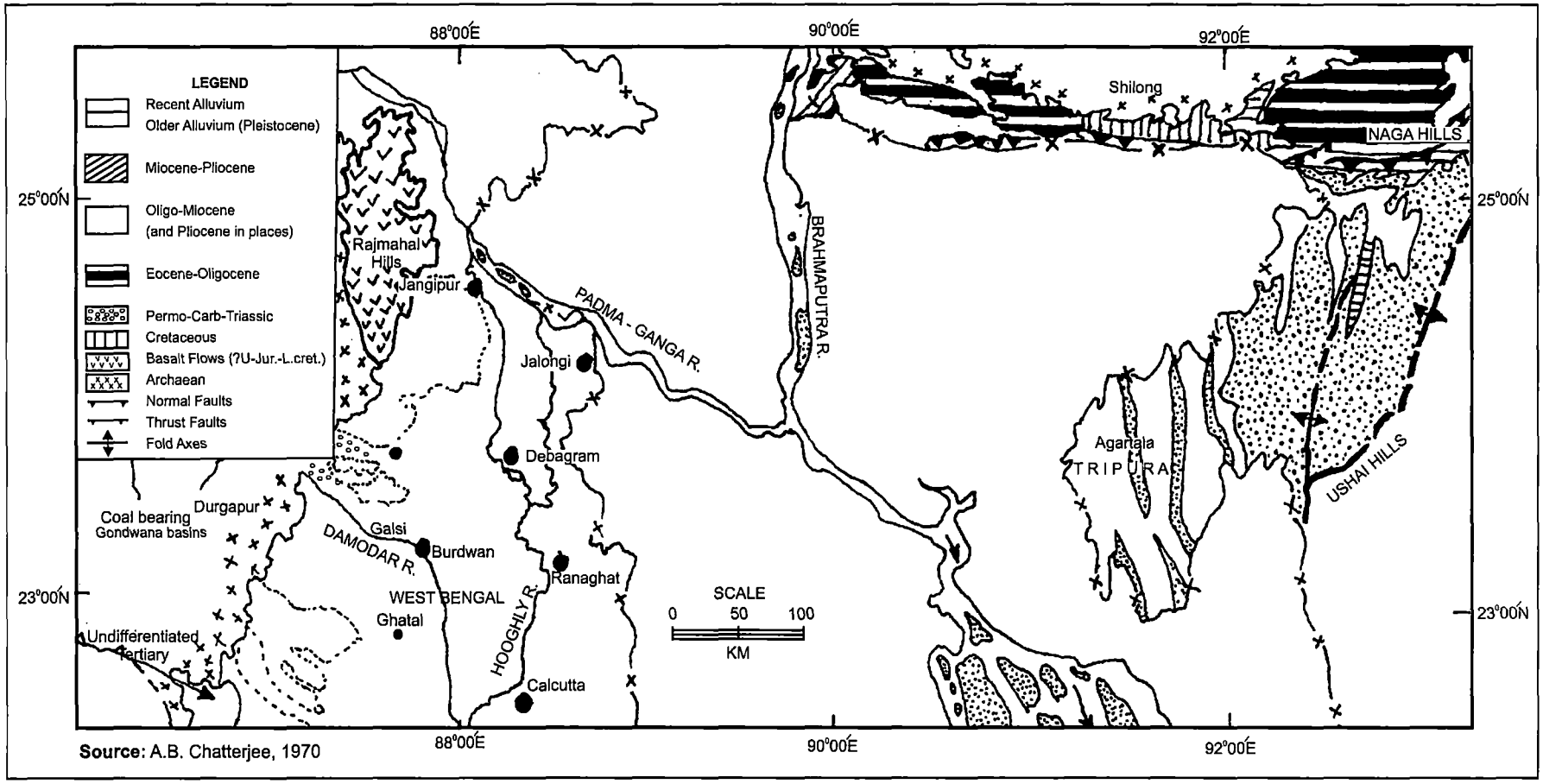
Kalindri and Pagla. Hunter W.W (ibid, pp., 23) documented that till the end of 1870 A.D the river was near *Hayatpur* and undoubtedly there was erroneous possibility of Ganga-Kalindri piracy resulting into vigorous deluges. Such statement again proves the further east location of the river in the late 1930s.Bhutni has its closest neighbour called Duani char. Diara tracts have been categorized into 2 physiographic units ***Poyosti*** or alluvial tracts meaning thereby new born charlands and ***shikosti*** or Diluvial tracts i.e. inundated fields. Further eastward shifting (Malda side) of the river has resulted deformation of the Diara tracts damaging acres of lands in Manikchak, Kaliachak II & III, few parts of Englishbazar and thereby reclamation of '***nayacharas***' or new charlands at Jharkhand side is a present-day issue in Diaras*(fig.2.1)*.

2.1.2 Geology

From the very outset Malda district is exhibiting a geological history of alluvial formation. The entire district is a part of Bengal basin extending between missives of Rajmahal in the west and *Garo-Lusai-Missives* of the Meghalaya plateau in the east. Most of the areas of the east of Mahananda is occupied by an old alluvium formation and is considered to have formed in the Pleistocene period. West of Mahananda is occupied by recent alluvium consisting of sandy clay and sands along the course of the river and fine silts consolidated with clay in the flatter parts of the plain.

To elaborate the nature and strategraphic sequence of deposition of sediments it is worth to discuss the long past history of geo-physiography of Bengal. Actually entire Bengal or the massive Bengal delta is located within the mio-geosyncline area (Chakraborty, 1970).The *echelon* faults in the *Madhupurgarh, Bhawalgarh* and ***Lalmai hills*** and at the same time the fluvio-glacial deposits in the valleys *(fig.2.2)* of the foothills of Himalayas, the elevated crescent shaped ferallitic-lateritic materials along *Rarh* and *Barind* etc. evident the complex origination of the final framework of *Bengal basin.*

GEOLOGY OF BENGAL BASIN



Source: A.B. Chatterjee, 1970

Figure 2.2 Comprehensive Geological Framework of Bengal Basin with location of Bengal Gap.

Parts of Midnapur and Purulia exhibit few formations dating back to about 900 millions year ago. But the Rajmahal volcanoes (Jurassic–early Cretaceous) are the most recent evidences of lithological aggradations (Biswas, 1963 and Chakraborty, 1970). According to the ongoing concepts this area forms a part of the Deccan shield and is the contiguous part of the northeastern promontory of the Deccan shield. Structural geology promotes to explain that it is separated by the alluvium of the Bengal plains and is linked with exposures of *Archalan land surface* in the Meghalaya-Assam hills containing missives of Garo-Khasi hills. These two blocks of ancient landforms had originated at the same time under the tectonic processes and may be continuous and connected below the deposits of alluvium. Studies on underneath geology reveal that the basement complex along the northern margin of the Deccan shields slopes to the north facing roots of Himalayas and thus the unexhumed hidden basement connects to Assam missives. Another slope direction of the basement has been discovered to the southeast i.e. facing the Naga-Lusai mio-geosyncline. Therefore we can assume that the configuration of the basement complex of the Garo-Rajmahal Gap is of the nature of a saddle means concave along the east-west axis and convex along the Northwest–southeast axis (Chakraborty, 1970). Evidently basement complex in the southern Bengal is associated with *lava balls* contemporary to the Rajmahal traps. During *Naga-Lusai* orogenesis the southern Bengal was subsided during Cretaceous times and which is indicative of chain of fluvial and tectonic actions operating over the mio-geosyncline of Bengal basin. To evident stratigraphically a section of the Upper Cretaceous limestone and calcareous shale overlies the upper Mesozoic basalt flows and associated trap wash. Granite washes rocks near *Ghatal, Debagram* and *Jalange* deposited under brackish, marshy estuarine lagoon or partially littoral environments (Biswas, 1963, Sengupta 1966, Sarkar, 2004). Not only the above said Orogenic phases the basin had experienced Himalayan orogenesis considerably long before and the two cycles twisted the basin to response to the sub crustal plasticity formations resulting upon Garo-Khasi-Rajmahal saddle with thin overlay of recent sediments. Along the southern part of this saddle between the Ganga and Brahmaputra river locations of Barind can be noticed having ferallitic formation with undulated and dissected configuration and is highly contrasted by the flanks of alluviums on the north and the south (Chakraborty, 1970). Field observations of the nodules of ferallitic rock wastes have been found exposed

over the Rajmahal foothills. Actually the prolonged eastern margin of the Deccan shield is characterized by lateritic terraces of various ages and separates the ancient Archaean formations and very recent coastal alluviums. In West Bengal through the districts of Midnapur, Bankura, Birbhum and Malda, we have similar lateritic terraces surrounding undulated land surfaces with dissected valley profiles (Chakraborty, 1970), but due to absence of general lateritic profiles and admixture of heterogeneous rocks the formation is questioned and controversial. On the other hand due to derivatives of the *Rarh* laterites transported by the rivers and were spreaded like long offshore bars along the Garo-Rajmahal saddle and probably this was the reason of such formation as the hinterland had no such rock formation structurally. The laterites date to Miocene formation (3 crore years back evident by the fossils in Midnapur and Burdwan. Concentration of Al_2O_3 (aluminum oxide) Fe_2O_3 (Ferrous oxide) decreases from SW to E i.e. along Rarh, Barind, Madhupur towards Lalmai and increment of clay to sands became obvious as found in the sandy texture of *Rarh*. During the middle Pleistocene age e'chelon faults started moving turning the basement self and by that age the final retreat of the Bay of Bengal took place withdrawing major parts of Bengal about 50 to 55 lakh years ago due to negative change of base level along the sea. Thus the scenario changed with the progress of the estuaries of the rivers that drained the ferallitic-lateritic landscape. That is why that the rivers flowing across the Barind did not put signs of entrenchment as there was little land beyond north of Barind to support any drainage network. During the late Pleistocene 3 sub tracts were created of their own local base levels of erosion and low inlets or connectivity. These ares- (a) The *North Bengal unit* located between the Himalayan foothills and the Barind, (b) *Sylhet unit* located between Assam hills, Naga-Lusai Hills and Madhupur-Bhawal-Lalmai tract (c) The *South Bengal Basin* having an open sea to the south (Chakraborty, 1970).

These shallow basins with their own local erosional basal surfaces put forward their existence with regional orientation of physiography of Bengal till the late Pleistocene.

Due to the ongoing gradational (erosional) activities few distinctive land surface associations with their distinctive features came into existence i.e. (a) *The Chotonagpur Archaean-Gondwana erosional surfaces* (b) *The Himalayan mountains*

(c) *Shillong Horst* (d) *Lusai Hills of Chittagong* (e) *The elevated self forming plains of Tippera and Noakhali.*

The North Bengal Basin is limited within Himalayas in the north and Barind tract in the south and Barind was somehow disconnected with the Bay of Bengal. The left bank tributaries of Ganga were not the members of *North Bengal Lake* rather swamps which used to drain north Bihar and plains of U.P. These rivers mainly contributed to the *Bengal Gap* keeping plateaus of Meghalaya at the east and plateaus of Chotonagpur at the west. A traverse from the foot of the Himalayas towards the Barind reveals the important land associations-

a) Boulder strewn undulating plains

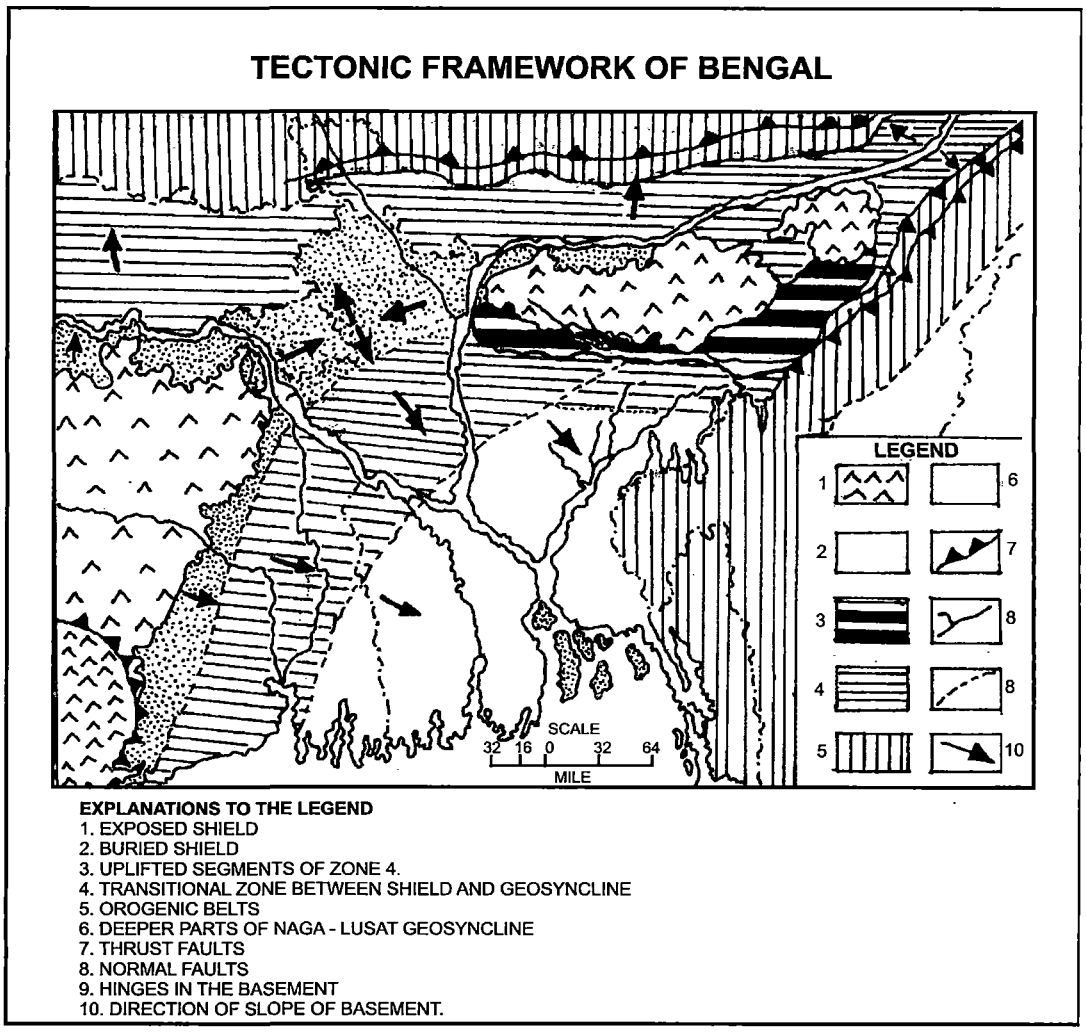
b) Sandy Duars

c) Clayey flats of Tal and

d) Slow risen Ferallitic Barind

The tectonic upliftment of the Himalayas caused upliftment of the lake of North Bengal Basement. To the north of Barind Tal tracts with evidences of Terra Rosa and anaerobic decompositions and surface swellings were present *(Fig. 2.3)*.

The formation of history of Bengal Gap is somewhat a combination of periodic outcome created age by age. The crumbled sediments found near Jalangi date back to about 07 crore years back during Eocene (Sarkar, 2004). A thick pile of fresh water sediment was deposited near Jalangi between two phases of extensive Eocene marine transgression that covered the whole of Bengal self (Sarkar, 2004).At the west of Bengal self there was pressure of estuarine conditions during Oligocene i.e. a 03 crore years back from Eocene. Whereas shallow marine environment existed towards the east (Sarkar, 2004).During late Miocene to Pliocene there was another sea water transgression and this sedimentation occurred towards southeast under a deltaic condition dating back to 1 to $1^1/_2$ crore years from Miocene. But during Pleistocene only shallow marine conditions prevailed in the deeper parts of Bengal basin and possibly in the late Pleistocene the culminating retreat of the sea found from the Bengal Basin better pronounced Bengal self. The recent age of *'Pleistocene sedimentation'* composing detritus of sands, silts and clayey particles deposited in the Bengal self during 50 lakh of years back is knows as Holocene and that is the most up-to-date record of formation.



[After A.B. Bhattacharya, 1970]

Figure 2.3 Tectonic Framework of Bengal with location of Transitional Geosyncline of Bengal Gap and Shields (Buried and Exposed).

Afterwards erosion started following peneplanation of the Bengal basin that was exposed in the Pliestocene. Later on river driven Holocene sediments rather alluvium varnished the erosional undulations of the Bengal Basin and the term applied for such deposition was '*Holocene alluvium*' which is the top-most layer of Bengal self. Actually starting from Eocene to Holocene was a combination of sub age or '*syaums*' under the Era or Period of Age of Quarternary plus Tertiary which accounts to about 7 crore years of existence. Thus the lithological matrix was formed by the huge thickness of Quarternary deposits, the upper part of which is truly fluviatile in origin. So the entire Pedogenesis was a product from alluvial parent materials and Bank erosion has found within the limit of flood plains of the alluvial channels in the district of Malda. The hydrologists, the geologists, the fluvial scientists, the geomorphologists, the environmentalists, all over the world are trying their best to

find the root cause of such natural menace (Bank erosion within Bengal Basin), and to formulate a definite way out for the cause of Humanity (Elahi, 1989; Khan & Rashid, 1985; Sarkar 1993, 1995; Schumm, 1977, 1981). To be specific it can be considered that the geology being the intrinsic parameter of the Bengla Basin *(table 2.1)* is really responsible for rapid bank erosion.

Table 2.1 Geological time scale and formation of rocks (Bengal Basin Area).

Period	Syaums	Representative Rocks	Approximate years
Quarternary	Holocene (Recent) Pleistocene	Sand, Clay, Pebbles	50 lakh
Tertiary or kainosoic	Pliocene, Miocene Oligocene, Eocene	Sand, Clay, Pebble lime and coal (lignite), igneous intrusions	½ crore, 3 crore, 4 crore, 7 crore
Secondary or Mesozoic	Cretaceous, Jurassic Triassic, Permian	Chalk, lime, clay, new reddish sandstone	11 crore, 14 crore, 19 crore
Primary or Paleozoic	Carboniferous, Devonian	Coal, stone grit carbonated limestone, sandstone	22 crore, 28 crore, 32 crore,34 crore, 39 crore
	Silurian ,Ordovician Cambrian	Old red sandstone mainly state and shale & some igneous rocks	50 crore
Azoic or Archaean	Algonkian or Pre-Cambrian	Mainly igneous and metamorphic rock and some sedimentary rock	Probably 200-250 crore

Source: Bandopadhayay, T, 1996 and Ghosh, 2004.

2.1.3 Soil

In connection to the Geology, the district having different physical and physiographic characters and is dominantly covered by alluvium of two different ages. Older alluvium dominates the Barind region. The southern portion of the district receives younger silts of Ganges. The Barind belongs to an older alluvial formation, which is usually composed of massive argillaceous beds of a rather pale reddish-brown hue, often weathering yellowish, disseminated throughout which occur *Kankar* and pisolithic ferruginous concentrations (Lambourn, 1918). Such soil is mostly acidic and pH of soil varies from 4.2 to 5.5. To the west of the district sandy admixtures start to dominate preferably up to a depth of 140 cm from top. The low lying country to the west of the Mahananda and in the south is of more recent formation, consisting of sandy clay and sand along the course of the rivers and fine silt consolidating into clay in the flatter parts of the river plain. In Diaras pH varies between 6.8-7.8.Whereas low lying Diaras are characterized by dark loam locally

known as *Matial* having higher admixture of clay. Diaras are the end product of further extensions of Holocene, a process of 50 lakh and onwards towards till date formation.

Table 2.2 Textural Classification of soil in Malda District.

Region	Block	Area in ha					
		Sandy	Sandy loam	Loam	Clay loam	Silt loam	Clay
Barind	Gazole	--	500	4060	12647	--	23382
	Bamongola	--	50	1578	4565	--	10070
	Habibpur	--	--	3123	10246	--	17861
	Old Malda	--	100	1607	6268	--	9097
Tal	Harishchandrapur I	--	680	3427	8915	--	690
	Harishchandrapur II	60	790	4374	9964	--	1680
	Chanchal I	100	436	3065	6937	--	1135
	Chanchal II	150	761	5350	11042	--	915
	RatuaI	1200	3270	8991	1168	2500	550
	Ratua II	1000	1971	6893	1368	2000	450
Diara	Englishbazar	--	933	2800	9199	--	5733
	Manikchak	2257	4788	13102	500	4500	--
	Kaliachak I	940	1500	5592	600	1500	--
	Kaliachak II	1518	2500	8541	500	2000	--
	Kaliachak III	2000	3151	8310	400	2000	--
		2925	21430	80813	83319	14500	71563

Source: Agriculture Annual Plan, 2001.

The characteristic have been presented regarding sand, silt and clay of Diara soil *(table.2.2)* above. In a nutshell it is being evident from the above table that the presence of hectare of soils having sands and silts and silty loam are high in comparison to Barind, where dominance of clay and loam of general mixture is more pronounced. Taxonomic classification under comprehensive system has done by the Department of Agriculture, Govt. of West Bengal. Diaras are predominantly featured by 95% coverage of 'Entisols' and 3 to 5% of 'Alfisol', but Tal(s) are characterized

by 'Inceptisol' covering almost 99 to 100%, and Barind(s) are featured by mainly 'Inceptisol' and a few proportion of 'Entisol – Alfisol' admixture. Now taxonomy wise nature and pedological personality of the 3 above said main types are being discussed through the table below *(table 2.3)*.

Table 2.3 Soil Orders and their characters.

Name	Formative element		Major Characteristics
	Derivation	Pronunciation	
Entisols	Nonsense symbol	Recent	Profile development(little),ochric epipedon, common
Inceptisol	L,.inceptum,begining	Inception	Embryonic soils with few diagnostic features, ochric or umbric epipedon cambric horizon
Alfisol	Nonsense symbol	Pedalfer	Argilic or natic horizon, high to medium base saturation

Source: Brady, 2001.

To assess the major diagnostic assertions with the horizons started from the epipedon (top soil layer) are being tabulated below *(table.2.4)*.

Table 2.4 Major features of Diagnostic horizons.

Sl. No.	Diagnostic Horizon With designation	Major feature
1	Umbric(A)	Thick, Dark coloured, high base saturation, strong structure
2	Ochric(A)	Light coloured, low organic content, may be hard and massive when dry
3	Subsurface Horizons Argilic(Bt)	Silicate clay accumulation
4	Natric(Btn)	Argillic,High in sodium,Columner or Prismatic structure
5	Cambric(B)	Changed or altered by physical movement or by chemical reactions

Source: Brady, 2001.

Diara-Entisols association

These are weakly developed and without natural genetic horizons. These are light coloured and low in organic content. Most have an ochric epipedon and a few have manmade anthropoid or agric epipedon (Brady, 2001). These are highly productive soils on recent alluvium. These are coarse loamy soils occurring on very gently sloping active alluvial plain. Loamy soils or loams contain a smaller

percentage of coarse and fine sand, but a larger proportion of silt and clay. They are less easily permeable but sufficiently so to allow the ample aeration of roots and to prevent water logging (Stamp, 1962). Sandy Entisols or silicic Entisols achieve high proportion of sands in the Manikchak and Kaliachak block II almost entirely. They usually contain more than 60% of coarse and fine sand and less than 10% of clay. Sample analysis in the blocks of Manikchak, Kaliachak blocks and very fewer parts of Englishbazar exhibit about 90% sub surface sand bands averagely at a depth of 90-100 m. In these blocks somewhere they are 'Orthents' i.e. medium to fine texture mainly along the bank of the Ganges. Actually it is associated with recent deposits of alluvium in which inert parent materials such as quartz, sand are present in abundance and lack of sufficient time has restricted the development of pedogenic horizons.

Inceptisol–Tal Association

As discussed previously that Tal regions are the result of dumping of Holocene-alluvium in the extended parts of Himalayan North Bengal Lake keeping Barind at the west lowlands of Diaras at the south and south east. They are taxonomically Inceptisol with thick, dark coloured highly base saturated and strongly embedded. Many a time these rocks are hard and massive with swelling surface when dry. Inceptisol have ochric or umbric epipedon and / or cambric sub surface horizons (Brady, 2001). Subsurface layers are associated with silicate clays, iron oxides and poor organic contents. Wet Inceptisol, or Aquepts (from Latin aqua, water), are found in areas along the Amazon and Ganges rivers (Brady, 2001). Here soil formation is active and mature. Soil texture is finer than loamy sand with moderate to high capacity of the clay fraction to retain waters for plants (Sengupta, 1997).

Inceptisol-Entisol-Alfisol-Barind Association

Barind is covering the blocks of Gazole, Bamongola and Habibpur where 95% areal coverage is falling under Inceptisols and only 3% in Bamongola and 2% in Habibpur fall under the Entisol-Alfisol category. Alfisols reveal moderately active soil forming process by translocation and without much depletion of base (Chakraborty, 1997). These are old fluventic and silt based. These occur on level to nearly level old alluvial plain with loamy surface and moderate flooding. These are ochric, umbric and also Argilic i.e. light coloured, organic and silicate clay accumulation and when characterized by Alfisol features occurring at 2-3% areas in

the Barinds. According to NBSS and LUP (ICAR), Nagpur entire Bengal Basin is an active alluvial plain in a broad view and is termed as Aa plains *(table.2.5)*. Ecological Sub Region wise study reveals that entire Bengal basin is a hot, moist; sub humid deep loamy to clayey alluvium (Sarkar, Nayak, Dutta, and Dhyani, 1992).

Table 2.5 Alluvial Plain (Aa) Active Alluvial Plain (AaA).

Map symbol	Description	Taxonomic name	Area (1000 ha.) and (%)
W010	Very deep moderately Well drained, coarse loamy soils occurring on level to nearly level active alluvial plain with loamy surface. moderately Flooding associated with very deep, poorly drained, fine loamy soils	Coarse loamy Aquic ustifluvents Fine loamy typic fluvaquents	58.7 (0.66)
W011	Very deep, moderately well drained, fine loamy soils occurring on level to nearly level active alluvial plain with loamy surface and moderate flooding Associated with very deep imperfectly drained, fine soils	Fine loamy, Typic ustochrepts Fine, typic ustochrepts	14.0 (0.16)
W014	Very deep, imperfectly drained, fine soils occurring on level to nearly level active alluvial plain with loamy surface and moderately Flooding	Fine, typic ustochrepts	29.8 (0.34)
	Associated with very deep, imperfectly drained fine loam soils	Fine loamy Typic ustifluvents.	
W015	Very deep, moderately well drained, coarse loamy soils occurring on very gently sloping active alluvial plain with loamy surface.	Coarse loamy Typic ustifluvents	62.1 (0.70)
	Associated with very deep, imperfectly drained, fine loamy soils	Fine loamy Fluventic ustochrepts	
W016	Very deep moderately well drained, fine silty soils occurring on very gently sloping active alluvial plain with loamy surface and moderate erosion	Fin silty Typic ustifluvents	198.7 (2.24)
	Associated with very deep moderately well drained fine loamy soils	Fine loamy Fluventic ustochrepts	
W017	Coarse loamy soils on level to nearly level, recent alluvial plan with loamy surface	Coarse loamy Typic ustorthents	88.5 (0.99)
	Associated with very deep, imperfectly drained fine loamy soils		
W021	Very deep, poorly drained fine soils occurring on level to nearly level recent alluvial plain with clayey surface and mod. Flooding	Fine Aeric Haplaquepts	121.3 (1.37)
W024	Very deep, imperfectly drained fine loamy soils occurring on very gently sloping recent alluvial plain with loamy surface and moderate Erosion	Fine loamy Fluventic ustochrepts	37.1 (0.42)
	Associated with very deep imperfectly drained, fine loamy soils	Fine loamy Typic ustochrepts	
W029	Very deep, poorly drained, fine loamy soils	Fine loamy Aeric	21.5

	occurring on level to nearly level recent alluvial plain with loamy surface	Haplaquepts	(0.24)
W027	Very deep moderately well drained, fine loamy soils occurring on level to nearly level recent alluvial plain with loamy surface	Fine loamy Typic ustifluvents	93.0 (1.05)
	Associated with very deep imperfectly drained fine loamy soils	Fine loamy typic ustochrepts	
W032	Very deep imperfectly drained, fine loamy soils[2] occurring on very gently sloping old alluvial plain with loamy surface	Fine loamy Typic ustochrepts	136.0 (1.53)
	Associated with very deep imperfectly drained fine loamy soils	Fine loamy typic ustorthents	
W033	Very deep, imperfectly drained, fine loamy soils occurring on level to nearly level old alluvial plain with loamy surface	Fine loamy Typic ustochrepts	38. (2)
	Associated with very deep moderately well drained, fine loamy soils	Fine loamy Typic ustifluvents	
W035	Very deep, imperfectly drained fine loamy soils occurring on level to nearly level old alluvial plains with loamy surface and moderately flooding	Fine loamy Fluventic ustochrepts	32.8 (0.37)
	Associated with very deep, poorly drained coarse loamy soils	Coarse loamy Aeric Haplaquepts	
W047	Very deep, poorly drained fine soils occurring on level to nearly level low-lying alluvial plains with clayey surface and severe flooding	Very fine Aeric Haplaquepts	102.4 (1.15)
	Associated with very deep, moderately well drained fine loamy soils	Fine loamy typic ustochrepts	

Source: NBSS & LUP, Govt. of India, 2005.

On the basis of the above table the following comprehensive framework *(table 2.6)* can be furnished.

Table 2.6 Block wise Distribution of AaA soils (Diara soils).

Physiographic Division	**Blocks**	**Map symbols**	**Taxonomy**	**Total Area**
Diara	Manikchak	W014	Fine Silty	4.28%
	Kaliachak I	W015	Coarse loamy Ustifluvents Fluventic Ustochrepts	
	Kaliachak II	W016	Do Ustifluvents	
	Kaliachak III	do	Do Ustifluvents	
	Englishbazar	do	--	

Source: NBSS & LUP, Govt. of India, 1997, 2005.

2.1.4 Drainage

The main rivers of the district are all of Himalayan and sub Himalayan origin and flow averagely in a southerly direction. Their rise is being controlled by the Ganges which forms two thirds of the western and the whole of the south western boundary of the district (Lambourn, 1918). The district of Malda is drained by the Ganga, the Kalindri, the Mahananda and the Tangan rivers (Chakraborty, 1997). There are also other rivers like Punarbhaba, Fulahar, Brahmani, Pagla, Buri Ganga, Chota Bhagirathi, Behula, Jalangi, Baromasia etc.

The Ganges

After completing its middle course the river touches the *Sakrigali ghat* opposite of Shibganj of Bihar and being compelled to be restricted by the Rajmahal massives, it takes a southward sweep turn and follows the Garo-Rajmahal Gap of Bengal Basin and first enters the district at Gaduri of Bhutni char (Manikchak) which is a length of 15 mile extensive right bank sides of diara. At this point the mighty river had been connected with the river Kalindri, though now the opening has been dried up as the river receded to the west *(Fig. 2.1)*. Doctor Buchanan Hamilton, indeed describes, the lower part of the Kalindri between this point and the town of Malda, as a branch of the Ganges. About 2 mile below Rajmahal the Ganges sends off a small stream, the Chota Bhagirathi which is presumably an old bed of the greater river itself and is still revered as at least equal in holiness to any other part of the sacred stream (Lambourn, 1918). It runs first to the east and then generally in a southerly direction, bordering for about 13 miles the ruins of the city of Gaur. Analysis of historical accounts of Bengal described 3 stages of probable shifting of the Ganga and Ganga Padma River from west to east up to 1600 A.D. He also mentioned that possibly during 1700 A.D. the Ganga had changed its course considerably and shifted towards its present course (to the west, miles away from the ruins of Gauda (Gour of Gastaldi, 1561 or 'Gorij' of Barros, 1550) leaving its former flood plain deposits and some spill channels as remnants (Rennel, 1976 and Sengupta, 1969). The reason of such shift was a result of incessant rain induced deluges and inevitable earthquakes. There were dozens of years of floods and earthquakes, i.e. 1772, 1784, 1897, 1934 as earth quake years and 1871, 1875, 1685, 1906, 1918, 1922, 1933, 1935, 1936, 1948, 1960, 1971 1980, 1986, till 2004, which caused steady westward shifting (Samad, 2005). A little

way further down, the Ganges sends off also to the east, a large branch, the Pagla, into which the Chota Bhagirathi ultimately flows. After their junction they flow into the Mara Ganga (Lambourn, 1918). During rainy season by the rain feeded '*danras*' of past day paleo channels Mara Ganga is connected with the main stream, Somewhere above the area where river Mahananda finally leaves the district, the Ganga lastly sends a river off to the southward direction retaining the name Bhagirathi. Returning to the context of Ganga shifting records it is assumed that the old alluvium of the tract in between Mahananda and city of Gour had seriously been done at the time of westward shifting of the mighty river (Ghosh, 2004). An historical instance of wider destruction is the complete obliteration of the town of *Tanra*, an important city of Mahomedan times situated near Gour. The town was 1 legue (1 Legue = 4.8km) distant from Gour (Ghosh, 2004 & Fitch, 1585). All these may had been resulted from bank erosion. Alluvia and Diluvia are perpetually taking place on the Malda bank, which is throughout of sand offering little resistance to the changes of the current. An ordinary incident in the life of a riverside dweller is the hasty removal of his lightly built houses to a new site and the complete disappearance of his land, which reforms as sandy charas miles away. Till 1773, as per Rennel's map the location of flowage was to the west conforming margins of Rajmahal up to the end of 1930s the shape of Bhutni was seriously threatened by the west swinging Ganga to hug the margins of Rajmahal hills and the shape of Bhutni reduced (Carter, 1935). But vigorous reversal of eastward movement occurred since 1940 to till date. Interestingly the river was also engaged during 1870s to entrench the channel of Kalindri and shifted to east well apart from Rajmahal and was supported by Buchanan Hamilton in 1870. The bank height is steep on the western side, and shelving on the eastern side. Thus taking ages long it is witnessed that the river is of the nature of east to west swinging for more than or couple of decades resulting into problems of the obliteration of civilizations and recurrent troubles of inter-state jurisdiction problem. The river has resulted in numerous jurisdiction changes and transfer of Khasmahal estates from one district to another (Carter, 1935). For this it was once decided by the Deputy Commissioner of Dumka that it might be simpler *to fix the inter-provincial boundary by adopting the limits of some villages, instead of the main stream.* After traversing a distance of 72 km it leaves the district at Par-Deonapur of Kaliachak III block (Agriculture Annual Plan, 2001).

The Mahananda

Mahananda rises in the lower slopes of the Himalayas from Mahaldhiram hill near Kurseong and flowing southwards through Purnea district it enters Malda district at the extreme north-west corner. It then flows eastwards, approximately along the district boundary as far as the limit of kharba Police station where it turns south and flows more or less straight through the central part of the district until it falls into the Ganges at Godagari *(Fig. 2.1)*. It flows for 88.6 km inside the district (Sengupta, 1969). During the flood 1938 surveys of government officials showed a high water level of 1,53,329 cusecs (Samad, 2005) and evident its great competency. The river has fitted to such a facilitative location that it determines the jurisdiction of the blocks of Chanchal (former Kharba), Ratua, Gazole Englishbazar and old Malda. Upto Malda the average width is from 50-100 yards. The bank of sand and clay are steep and of about the same height. But taking Kalindri it suddenly wides to about 200-600 yards. It is the main determinant of the boundary between Tal and Barind being conjugated with Kalindri. During the last century few changes have taken place in its course, but between the dates of Rennel's map it was flowing through the present Mara Mahananda along the western boundary of Kharba police station (Carter, 1935). At that time *Nagore* river came out from Mahananda. Buchanon Hamilton found its Regur junction with the river Tangon at *Aiho* of Habibpur block; from where it leaves the district (Carter, 1935). At the North of old Malda the river becomes narrower and shallower, as it is above the junction with the Kalindri. It is not a huge silt carrying river except to some extent during the rains (Carter, 1935). In the rains when the snows melt the river rises to 20 to 30 feet and even more in years of high flood. Thus subject to change the course is not pronounced. It is many a time characterized by loops, bends, in-channel bars etc. in its course through the district. Regular cuts and fill in one bank to another bank, it has abrupt steep bank on one bank side and shelving bank on other side. The maximum rise in the level of the river has been found to be 30 ft. Upto Old Malda it extends for 50-100 yards in width. During flood 1998 it was vigorous in Englishbazar crossing the Mahananda embankment.

The Kalindri

According to Rennel's map it is simply an offshoot of the eastern branch of the Ganges (Carter, 1935). It took off about 2 miles North West of Ratua and flowing

in a south eastern direction ultimately joins Mahananda at Nimasari of Old Malda traversing a zig-zag course. But in another belief it was found that being the tributary of Mahananda it came to the district from *Hatichapa* of Purnea of Bihar adjoining *(Fig. 2.1)*. In Hunter's account, evidently followed by the District Gazetteer, it is stated that the main body of water is brought down from the hills of Sikkim by the Ponor River which assumes the name Kalindri shortly before its entry into the district. Hamilton in 1810 believed it as an off shoot of Ganges proper. It empties itself into the Mahananda greater but in dry seasons it is simply a line of small pools. It takes off a few miles above Rajmahal from mighty Ganges. It follows being off shoot course almost east through silts of Ratua block and thereafter taking a sharp bend to the south follows a winding course. In the north it receives its tributaries like the *Kalkos*, *Kankar*, *kosa* and *Baromasia*, four small streams which drain the Tal. Due to the exotic erosion of Englishbazar-Mathurapur road the river altered its previous course before the period of the revenue survey i.e. before 1930s. The bank is high and steep where erosion has taken place with resulting into red clay or sandy soil. It forms a length of 53 miles (about 15.9km).Its bank with sand and clay are generally steep, but sloping banks are observed where proper imprints of *Alluvial* and *Diluvial* actions took place. It is nowhere fordable in the rains (Lambourn, 1918). From Carter's time it was found stagnant pool like water body and since then breeding fields of mosquitoes and brings about yearly Malaria. Once the river Fulahar poured into the River Kalindri near *Mihighat* (mouza 162) and the conjunctory could run up to Ratua, taking *Makaiya, Debipur, and Kahala* along its mighty bank. But this channel has now been a paleo channel and it has now the present course from *Mihighat through Bilaimari, Bhaluka Bazar, Banikantitola* villages and being joined with Fulahar again moves further passing through the villages like *Laskarpur, Kalitala, Suoormaraghat, Nurpurghat etc.* and thus the name has been assigned, Fulahar-Kalindri (Samad, 2005). It debouches into Mahananda near Nimasari opposite to the Old Malda block with darkish, silty and sluggish water. During dry season the reach between Ratua and Chandipur becomes almost waterless and is worth to even foot crossing. Between *Mirjadpur and Araidanga* it is somehow watered. But the *Milki-Amriti* reach is purely dried up and this way the river completes its course of 53 miles. Once, the proposal of entrenchment of the channel depth to activate regular flow through the river was tried

to be done but it was opposed by Adams Williams, the then British officer as because of reduction of deluge through Ganga-Kalindri System.

The Tangon

Tangon is the important tributary of Mahananda. It was risen at a junction of 26^0 $43'$N latitude and $88^0 31'$ E longitude and has been debouched into the Mahananda at a site of $24^0 57'$N latitude and $88^0 14'$E longitude (Thornton, and Ghosh, 2004). The source area of the river has been destructed by the natural calamities. Being originated in the district of Jalpaiguri it has passed through *Panbara* of Bangladesh and crossing through *Thakurgaon* and *Pirganj* area again entered to Hemtabad of North Dinajpur district and then flows downstream over the plains of Banshihari and Gangarampur of South Dinajpur district and has determined the jurisdiction of both the Banshihari and Gangarampur thana means police station (Hunter, & Ghosh, 2004). It has entered into the district at the boundary of Bamongola and Gazole police stations. The paleo-abandonment of the present Tangon had been found for more than the miles named Mara Tangon in the Gazole block, whereas the Chunakkhai nala of Old Malda block is the abandoned cut off of the original Tangon. The Tangon – Mahananda junction has been metamorphosed over the ages. The river junction with the Mahananda was at Ahiriganj, seven miles below the present junction (Buchanon, & Carter, 1935; Ghosh, 2004).The remains of a stone bridge near *Raniganj* on the side of the valleys are also considered to indicate that the river has changed its course to its present position which is further east .Thus it was assumed that Buchanon Hamilton was correct (Samad, 2005, & Ghosh, 2004). It can be stated that the river must have changed its course between 1767 and 1810 and later reverted to its original course, because in Rennel's map; its junction with the Mahananda is shown at 'Iyo" presently 'Ahoy' standing at the present junction. Virtually the confluence was observed for 05 years by me during my posting in a school at that place in the block of Habibpur. The river is a prominent example of in-channel deposition for the ages. The low lands at the confluence of Tangon and Punarbhaba having been created by later alluvium and is called 'Dub' i.e. submerging lands (Lambourn, 1918). The total length of the river inside the district is 30 miles.

The Punarbhaba

The river is the important off shoot of Teesta and the other two are *Karotoya* and *Atreyee.* These three make the form of Teesta meaning thereby 3 streams i.e. '*trisrota*' and Punarbhaba is the southern or better say western most off stream from Teesta. In the maps of Rennel Punarbhaba had been taken off from the River Karrotoya (Tabakat-e-Nasiri, Mughals period after Minhaz-e-Siraj and Md. Jakaria). During 1787 at the time of the revetment of new Teesta the river started to be suffering from regular flow of water. The river having being traversed the South Dinajpur district has entered into Malda district through the North-East corner of 136 no.Nababnagar mouza of Bamongola block. It has transected the Block of Bamongola of India and parts of Bangladesh for many a time. For the first time it left India at *Poali* mouza of Bamongola in Malda and has gone to Bangladesh and reappeared in the *Jot Kabir* Mouza (126) of Habibpur and after traversing, it has finally reached to Bangladesh by touching the *Anondopathor* mouza. The total length of the river in the district is 64.4 km or 40 mile (Samad, 2005).Abandoned paleo Channels of Punarbhaba still have imprints in the Bamongola and Habibpur districts. For example the shallow channel of *Nababnagar, Laxminarayanpur and Baturia* mouzas in Bamongola block still can be noticed. In the past census records and land reform maps it is called by name as River Haria or 'Punarbhaba–Haria' as proposed by A. Samad in 2005.Though commonly the river is known as '*Punarbhaba Khari*' or '*Mara-Punarbhaba*'.

The Pagla

Few miles downstream of Gaur one of the eastern distributaries of mighty Ganga had been originated and designated as Pagla by W. Hunter. The river Chota Bhagirathi has been embodied with Pagla and performs an annular or semi circular drainage pattern. The river is present in the Kaliachak II block through the mouzas *like Paranpur (18), Nayagram (30), Sultanganj (31), Sayer Tanra (155) and Kadamtala (185).* It joins with Bhagirathi at *Kadamtala* mouza at the 'Kadamtala Nash' site. During the period of 2003 flood the watershed between Pagla and Ganga has been totally obliterated and it has been captured by the grasps of mighty Ganga at Jot Kasturi and thereafter in the Birodhi mouza of Panchanandapur (Samad, 2005).

'*Jaharpur Danra*, i.e. the nala of Jaharpur which is a distributory of Ganga has debouched itself into Mahananda near Kansat of present Bangladesh.

The Fulahar

The river Fulahar extends itself for about 100 km or 70 miles more before being the important river of Malda. It was originated in the age of Ramayana, the great Hindu epic, and takes off from old Mahananda or Mara Mahananda near Bagjob and entered into the district. Actually the river has been traversed through Purnea of Bihar and near Miaghat of Harischandrapur (JL. No. 162) it has been renamed to be Kalindri.

Nowhere in English era has the name Fulahar been found. Both Buchanan Hamilton and Hunter told about Kalindri and Carter never evident the existence of the river. The confluence of Fulahar and Ganga is now at Narayanpur of Manikchak block after being traveled *Laskarpur, Kalitola, Shankartola* villages of Manikchak (Samad, 2005). But during the beginning of this century the river used to follow the abandoned channel of Kalindri and emptied itself into Kalindri near Mihaghat (JL. No. 162) of Ratua and could touch the villages of *Makaiya, Debipur, Ratua, Kahala* etc. that is why the river system between Miaghat and Shankartola was named to be Fulahar – Kalindri system. *Teljana, Kankhar, Baromasia, Kush, Kalokush* etc. are the main tributaries of Kalindri contributing huge turbulence into the river and not only Ganga herself rather the Fulahar individually and Fulahar-Kalindri jointly acted as one of the causative factors of vigorous bank erosion in Malda district.

The list does stop here regarding the frequency of names of rivers in Malda rather P. Ghosh, 2004 and A. Samad, 2005 have listed the existence of names of many rivers and 'Danras' i.e. abandoned paleo loops in the district. Gazetteer of Malda by Lambourn (1918) and J. C. Sengupta (1969) also, in many cases validated the existence of rivers in the ancient times. Rennel's map, reports of Hunter, Carter and Hamilton also light on the riverine physiography of Malda. A considerable list has been provided below.

Other Rivers

Some other rivers are quoted below. Most of them are historic, not existing presently or have reached to a moribund condition.

These are, Bhagirathi, Jahanabi Tulshi Ganga, Baromasia, Teljana, Kankhor, Buri Ganga Behula, Jalangi, Brahmani, and Srimati.

2.1.5 Forest Cover

Malda district attracts areas of forests as a small portion of drier jungles of the Barind formation. In general among the fruit bearing trees, the most common is the mango, for which the district is famous. According to M. O. Carter once there was forest association of 150 sq. miles in the Barind of undivided Malda district. Among the economic fruits date palm are the most common in the district after mango. Barind is also called 'Santhal-Barind' for its wise association of Jack fruits.

Irrespective of Blocks an analysis on main forested mouzas exhibit the following names–*Pathor Mahadevbati* received about 149.04 acre, *Tilasan* about 4.70 acre, *Pathor Banpur* receives about 157.91 acre, *Anandapather* about 45.28 acre, *Kariali* 263.84 acre, *Patharsivram* 13.20 acre, Adina receives 70.71 acre, *Saharole* 549.04 acre, Arazi Deherul 2.00 acre, *Khoncha Kandar* 17.01 acre, *Rajarampur* receives 49.15 acre, Rangamati 8.51 acre, *Saluka* 468.62 acre, *Bhalukkhola* 1.72 acre, *Karchadanga* 3.71 acre, *Abhirampur* 8.03 acre etc. But the new scenario has been distorted with the passage of time and with the growth of population. Old River beds, however ponds and marshes, and streams with a sluggish current have a copious vegetation of *vallisneria* and other plants (Lambourn, 1918).Tamarix and reedy grasses are highly abundant in the lands subject to inundation. Marshy lands are associated with *hijal* (*Barringtonia aculangula*). Mixed jungle of pipal, Bat, Simul Pakur and mipal bamboos are obvious in the district. Thorny bamboos known as *beurbans* are common in Pandua and Barind areas. Sal and Palmyra are common in *Pakurhat*. Historical annals reveal that upto 1951 total area under forest in Malda and West Dinjapur was 0.68% whereas 82.76% was under cultivation and the figures for same references in 1961 was 0.27% and 66.28% of agriculture with a decreasing nature. Both the districts had 7,192 sq. km and 8,951 sq. km geographical areas respectively for the years 1951 and 1961 (West Bengal Forest Directorate, 1964; Govt. of West Bengal). In the following two tables *(tables 2.7 & 2.8)* the broad land use distribution in Malda and West Dinajpur districts have been discussed below:

Table 2.7 Forest and Agriculture scenario in Malda and West Dinajpur Districts.

Year	Total Geograpycal area (sq.km)	Net area under agriculture (sq.km)	% of agriculture to geographical area	Area under forest (%)	Other land and water areas(sq.km)
1951	7192	5952	82.76	0.68	1191
1961	8951	5933	66.28	0.27	2994

Table 2.8 Forest Classes in Malda and W. Dinajpur.

Year	RFs.	PFs	Unclassed state Forest	Private PF.s	Tea Garden forests	Other private Forests	Total forest area (sq.km)
1951	-	-	1	-	-	48	49
1961	6	8	10	-	-	-	24
1964	6	8	10	-	-	-	24

Source: W.B. Forest, Forest Directorate, Govt. of W. Bengal, 1964.

According to the description found in the records of West Bangal Forests, Forest Directorate, Govt. of West Bengal (Centenary commemoration volume 1964) the composition and conditions of forests has been subdivided into 2 parts:

Dry deciduous Sal forest

In the well drained soils of this division following dominating types can be found. Like – *Bomax malabarica*, *Albizzia spp.*, *Amoora Wallichi*, *Terminalia belerica* and *Terminalia chebula* etc.On the other hand in the dry tracts of Diaras on semi-laterite areas *Madhuca latifolia*, *Schleichera trijuga* and *Diospyros melanoxylon* are also found do occur along with Sal. Undergrowths are also very common in these areas having understorey species like *Holarrhena antidycentrica*; *Millettia sp.* with *Phlogacanthus sp.* in the areas having higher rainfall (W.B.F., Govt. of West Bengal, 1966) and mature soil.*Indigo fera* has been noticed with Sal as undergrowth along with *Phlogacanthus sp.* Quality of teak wood and high density of production is too low.*Butea monosperma* has been found along the fringes of Sal forests which regularly get burnt as depicted by Directorate of Forest, Govt. of West Bengal, 1966. Such forest coverage is obvious in the Barind tracts of Bamongola, Gazole and Habibpur block.

Moist deciduous Hijal forests

Barringtonia acutangula is the dominant type of this forest which occurs in the fresh water swampy land (Beel) in Malda division (Divisional Forest

Officer,Planning and Statistical Cell, Writer's Building, 1964).The distribution of Hijal is copious in the lower Tal and Diaras with submergable tracts. Piralu i.e. *Randia Uliginosa* is the important species.Towards the fringes of such swamps *Ficus spp.*, *Bomax malabarica* and *Asshewra* are also common.The undergrowth consists of various grasses like *Saccharum arundinaceum* and *Desmostachya bipinnata. Phragmites Karka* are also found in some places. They remain submerged for two to three months of the year under flood water and none but Piralu and Hijal have been noticed to regenerate in such areas.

Mango orchards

Mango deserves great importance in Malda district. To be very much specific it is to be noted prior that bank level slumping and eroding away of mango orchards has economically threatened the previous mango production in Malda. Except rolling tracts of Barind mango gardens have been found all over the Tals and Diaras having replenished silts by the Ganga and its tributaries (Sarkar, 2000). Malda district receives 49150.38 acres of mango fields out of which the 4 Police stations of Barind have 4653.72 acres and Old Malda block acquires 3218.41 acres. Most of the orchards are located above the normal flood level covering adjacent high bankside fields of river Fulahar, Kalindri, Pagla, Bhagirathi and Mahananda (Sarkar,2000). Among them Pagla and Fulahar including the mighty Ganga are the most volatile rivers. During 1958 about 44,000 acres of mango orchards had been noticed and about 10,000 acres have been destroyed in the calamity of bank side slumping of the river Ganga. To be specific block wise break up of area share of mango orchards is being furnished below *(table 2.9)*.

Table 2.9 Block-wise areas under mango cultivation.

Sl. No.	Police Station	Agricultural area (ha)	Mango cultivation (acre)
1	Englishbazar	18,752	19339.72
2	Ratua I & II	31,700	8919.37
3	Kaliachaks I, II & III	59,207	6311.35
4	Manikchak	25,346	5459.59
5	Old Malda	16,534	3218.41
6	Harishchandrapur I & II	30,630	2249.47
7	Chanchal (Kharba) I&II	28,891	2217.16
8	Gazole	40,824	926.56
9	Habibpur	32,920	304.44
10	Bamongola	16,061	204.31

Source: Malda Merchants Chamber of Commerce, 2000.

2.2 Socio-Cultural Set up

Out of the important socio- cultural phenomena in this region the most prominents are Demographic setup and their changing economic lifestyle which are being analyed in the focus of the group of bankerosion affected victims and their economic stay of life.

2.2.1 Demography

According to the census 2001 the district receives 32,90,468 persons of which 30,49,528 (92.68%) reside in the rural area and 2,40,940 (7.32%) in the urban areas concentrating chiefly 2 sub divisions, Chanchal and Englishbazar*(table 2.10)*. The General demographic features as stated above was 26,37, 032 in total in 1991 where a share of 13,60,541 of males and 12,76,491 of females. (Census Hand book of Malda District, 1991). Out of the total 24,50,495 (92.93%) was in rural and only 1,86,537 (7.07%) in urban areas.The decadal change states that rural dwelling has become same or little bit decreased from 1991 to 2001 with a rate of 0.25% whereas urban dwelling has increased by 0.25% and signifies a shift of rural to urban population. Actually the district has experienced always a positive growth rate in population except 1921.

The following table is showing the time series data on population growth.

Table 2.10 Decadal change of Population Growth in Malda.

Year	No. of population	Variation	Rate of variation (%)
1901	6,03,649	-	-
1911	6,98,574	(+) 94,925	+15.72
1931	6,86,174	(-) 12,400	(-) 1.77
1931	7,20,440	34,266	+4.99
1941	8,44,315	1,23,875	+17.19
1951	9,37,580	93,265	+11.05
1961	12,21,923	+2,84,343	30.33
1971	16,12,657	+3,90,734	31.98
1981	20,31,871	+4,19,214	25.99
1991	26,37,032	+6,05,161	29.78
2001	32,90,468	+6,53,436	24.78

Sources: District Statistical hand book, Malda, 2001 (Bureau of Applied Economics and Statistics), Government of West Bengal.

Upto 1940 except 1961 and 1971, most of the years of enumeration showed a steady growth rate in percentage of population and from 1971 to 1981, there was a

reduction recurrence of percentage of rate of variation amounting to 5.99% (31.98-25.99=5.99) and which is attributed to the shifting and outward migration for occupational urge influenced by heavy toll and massacare of households in erosional hazards of Ganga mainly in the blocks of Manikchak, Kalichak (I, II, III) and fewer parts of Englishbazar.The block Manikchak is comprised of 89 mouzas out of which 19 have been affected by severe attacks of bank side erosion.Kaliachak I, II, and III collectively record 29 of severely threatened mouzas whereas the total numbers are 66,66, and 75 respectively i.e. a sum of 207 no. of mouzas.In Englishbazar block khaskol-Chandipur is the most threatened mouza. In Manikchak, Kaliachak I,II and III and Englishbazar about 21.35%, 14.01%, and 0.7% areas respectively have found under serial attacks of erosional hazard.

In the following table*(table 2.11)* a block wise depiction on the distribution of disastrous phenomena on erosion created by Ganga bank erosion has been provided.

Table 2.11 Report on erosion of affected blocks (1999-2001) in Malda District.

Block	No. of G.P*. effected	No. of villages affected	No. of families affected	No. of population affected	Area under erosion (sq.km)
Manikchak	03	13	1,131	3,500	7.0
Kaliachak II	01	08	2,720	13,400	3.0
Kalichaak III	04	06	300	1,500	5.0
Englishbazar	02	01	800	2,500	0.5
Total	**10**	**28**	**2,951**	**20,900**	**15.5**

*G.P. denotes Gram Panchayet.

Sources: Office of the District Magistrate (Disaster Management Cell).

About 15-20% of population in Manickchak block and about 8678.99 ha have been found under severe threats of erosion which actually shows a loss of 3556.87 ha areal loss from the total areal coverage of the block of Manickchak. On the other hand in Kaliachak II about 25-35% of population is under the effect of slumping and disruption of settlements and finally shifting of houses and in case of English Bazar about 3-5% population and 483.58 ha areal coverage have been found under erosional effects.All the erosion affected blocks actually receive heavy working population with prime occupation of cultivation, mango orchards, Sericultural rearing and worker as daily wage basis. The Total area of the district as supplied by the Surveyor General of India is 3,733.00 Sq. km which accounts for 4.21% of the total area of West Bengal (Census, 2001) and density of population is worked out as 881 persons per sq.km as

per census 2001. Among the 15 CD Blocks Kaliachak I is having the highest population of 3,10,935 (9.45%) and Bamongola is having the lowest population i.e. only 1,27,252 (3.87%).Demographic structure exhibit a total share of 51.34% of males and 48.66% of females.The densely populous blocks are Kalichak I, II and III. Sex ratio has been worked out 968/1000 i.e. ratio of female-male population which is obviously indicative of almost good percentage of sex structure. Out of the total working population 29.39% are main workers and 11.35% are marginal workers and a dependable plus non working population has been recorded of 59.26% (Census, 2001). Thus the demographic structure of the exhausted blocks should precisely be studied *(table 2.12)*.

Table 2.12 Population Scenario of affected blocks in Malda.

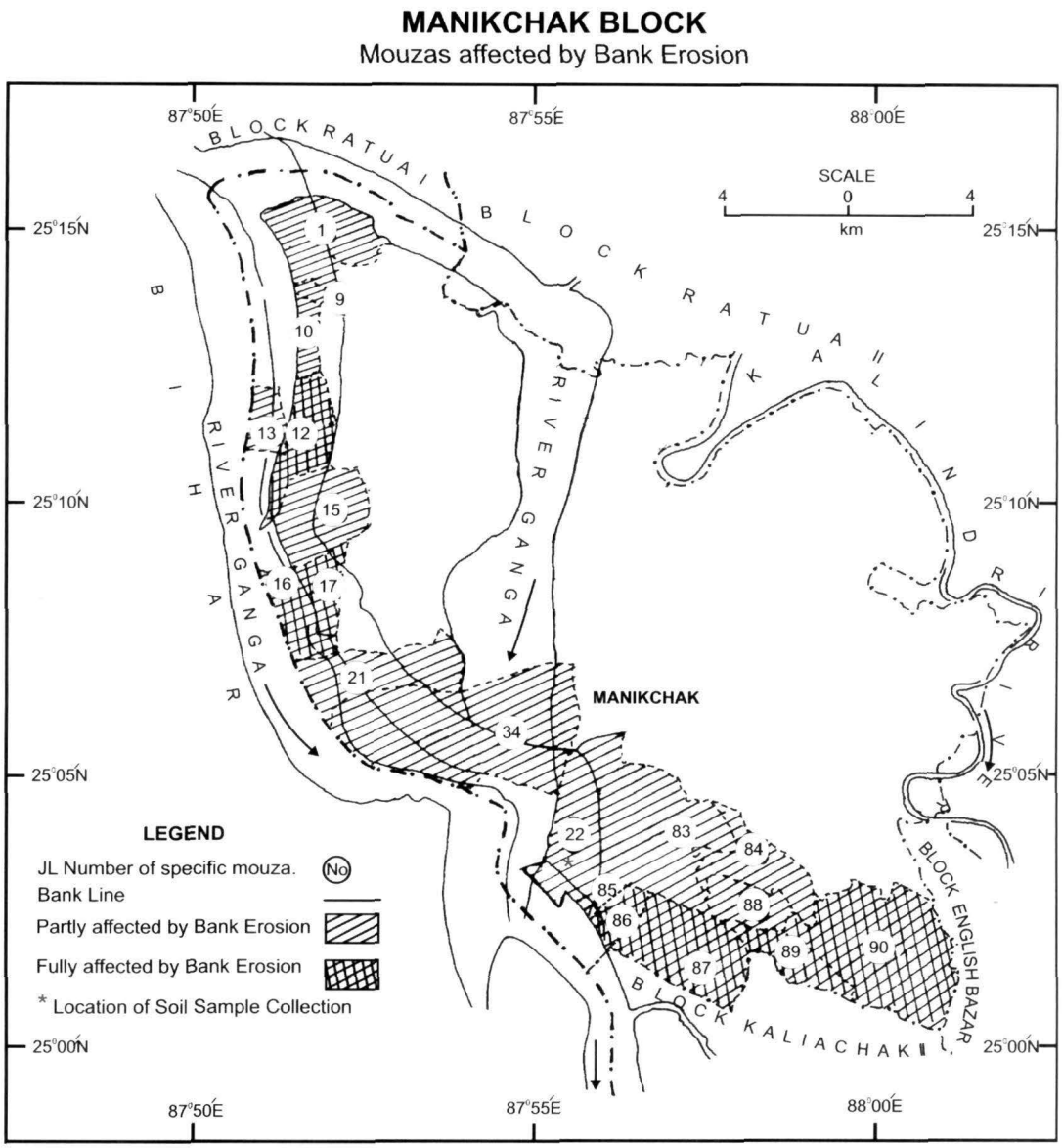
Block	Population	Sex wise population	
	2001	Male	Female
Manikchak	2,14,127	1,10,410	1,03,717
Kaliachak II & III	2,11,406 2,84,376	1,08,921 1,46,876	1,02,485 1,37,500
English Bazar	1,61,456	82,845	78,611

Source: District Census Abstract, 2001.

From ethnic point of view all these blocks receive a heterogeneous composition of the Hindu and Muslim community and Kaliachak II and III is mostly dominated by Muslims.In the following three tables here is a try to document a relationship of area lost and affected population and the decadal variation of severity in the associated blocks of Manikchak, Kaliachak II, III and Englishbazar *(tables 2.13, 2.14, 2.15 & 2.16)*.

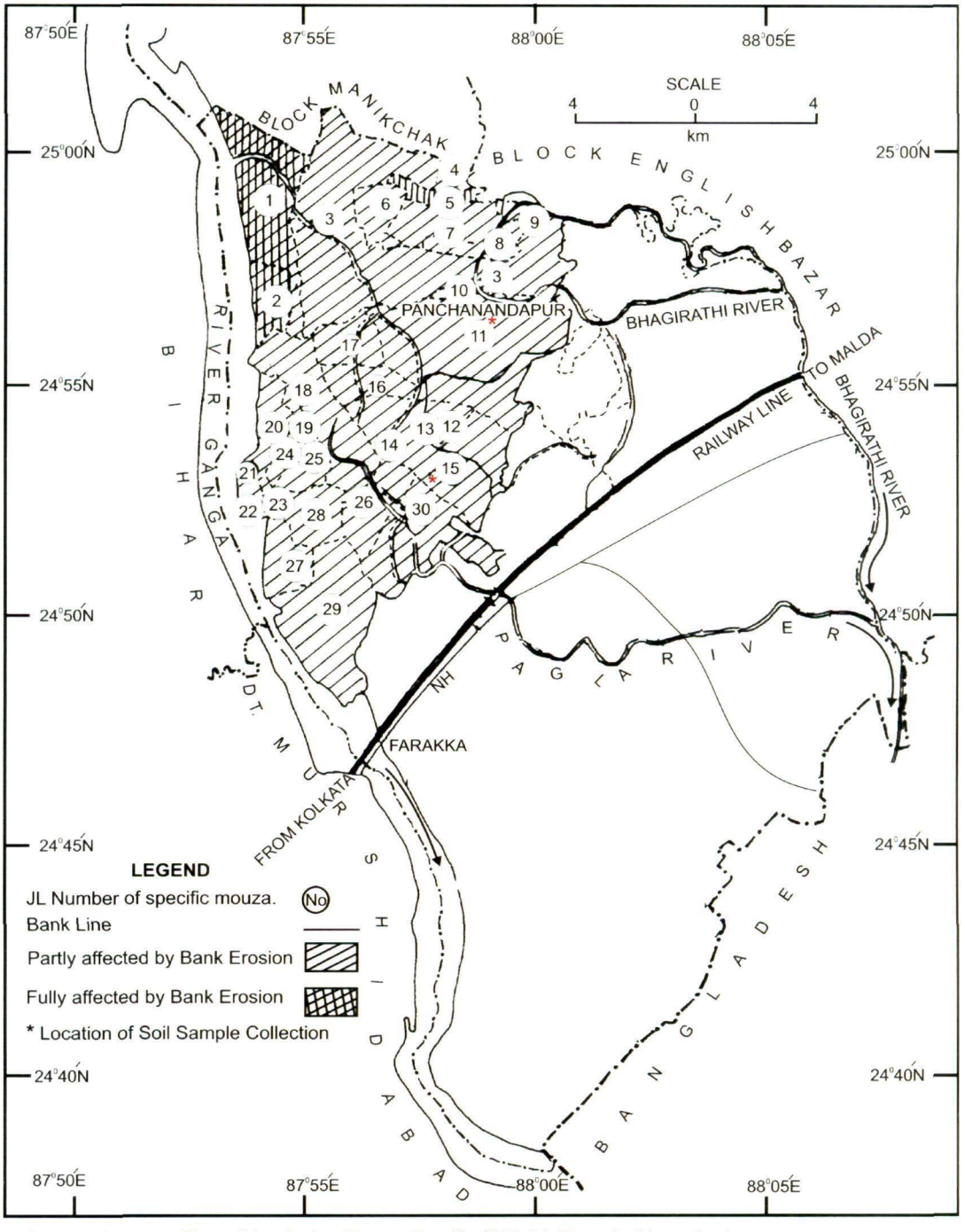
Irrespective of blocks and mouzas; the following demographic features have found:

(i) The mouzas have distinguished into two morphologial units namely known as diluvial and alluvial mouzas, locally called 'Sikasti' and 'Poyosti' (for example: JL Nos. 17 to 25 in Kaliachak II block).During the Census 1981 probably long period of inundations took place. It had been evident because no data available for the mouzas during 1981 census but 12,422 population had been enumerated during census 1991 and about 29,785 in 2001 after being realluviated and passing a long period of riverine transgression *(fig. 2.4, 2.5 & 2.6)*.



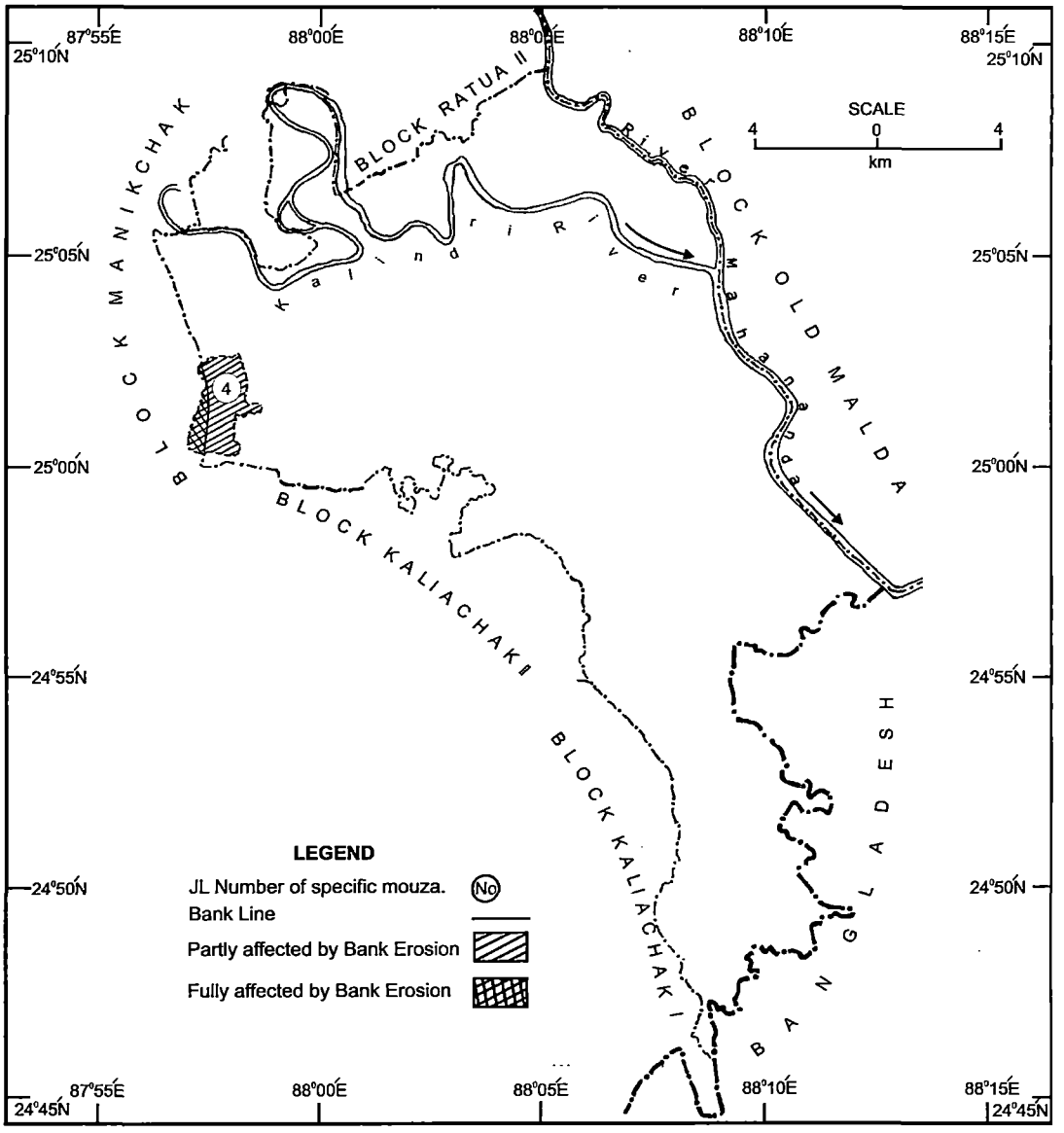
Source: Revenue Thana Map Series (Ratua Part II), 1930-31 (Compiled by Author),

Figure 2.4 Affected Mouzas in Bank Erosion of Manikchak Block (Census Years: 1981,1991 &2001).



Source: Revenue Thana Map Series (Ratua, Part II), 1930-31 (Compiled by author).

Figure 2.5 Affected Mouzas in Bank Erosion of Kaliachak(I,II &III) Blocks (Census Years: 1981,1991 &2001).



Source: Revenue Thana Map Series (Part I), 1930-31 (Compiled by Author),

Figure 2.6 Affected Mouza(s) in Bank Erosion of Englishbazar Block (Census Years :1981,1991 &2001).

(ii) One year of successful tillage is affected by inundation for the next year and thereby shifting of entire cultivator family resulting inot abnormal population drop and reappearance of population after prolonged dissipation for example Hakimabad in Kaliachak II block bearing Jl No. 23 featured by only 8 nos. of population in 2001 having been alluviated and was totally uninhabited during census 1981 and 1991.

Table 2.13 Mouza-wise distribution of Population and its Changing Pattern in Manikchak block during Census Years.

Sl. No.	Mouza	JL. No.	Area under threat (Ha.)	Calamity level (Partly & fully destroyed) as on 09-09-2003	No. of Families		No. of Population affected		
					1991	2001	1981	1991	2001
1	Gadai	1	1474.28	P	323	427	623	1,637	2,469
2	Dergram	9	91.12	P	X	X	Uninhabited	Uninhabited	Uninhabited
3	Rambari	10	656.81	P	X	X	Uninhabited	Uninhabited	Uninhabited
4	Hiranandapur	12	624.84	F	63	NA	414	327	215
5	Mashda	13	323.75	P	X	X	Uninhabited	Uninhabited	Uninhabited
6	Bagdukra	14	646.90	P	238	270	1,255	1,475	1,547
7	Samastipur	15	244.43	F	X	X	Uninhabited	Uninhabited	Uninhabited
8	Sahapur	16	190.20	F	X	X	Uninhabited	Uninhabited	Uninhabited
9	Duanitafir	19	612.29	P	80	08	NA	240	42
10	Paschim Narayanpur	20	1912.16	P	559	720	2,348	3,132	4,099
11	Narayanpur	21	712.66	P	272	373	1,228	1,720	2,299
12	Dharampur	82	678.75	P	1,334	523	5,638	8,882	2,798
13	Manikchak	83	1254.54	P	1,426	1,216	8,546	8,082	6,280
14	Gobindapur	85	116.08	F	uninhabited	211	913	Uninhabited	1,077
15	Raniganj	84	53.12	F	x	X	Uninhabited	Uninhabited	Uninhabited
16	Rostampur	86	725.20	F	x	X	10	Uninhabited	Uninhabited
17	Mirpur	87	315.73	P	79	-	3,173	479	NA
18	Rahimpur	88	309.21	F	84	NA	220	470	525
19	Gopalpur	89	1293.79	F	1,648	1,172	8,795	11,387	7027
	Total		ΣP=8678.99 Ha. ΣP=3556.87 Ha. ΣP+F= 12,234.86 Ha.		6106	4920	Blocks total = 1,49,981 Total effected population =33163 % of population affected =22.11%	Blocks total = 1,77,672 Total effected population =37831 % of population affected =21.31%	Blocks total = 2,14,127 Total effected population = 28378 % of population affected 13.25%

Table 2.14 Mouza-wise distribution of Population and its Changing Pattern in Kaliachak II block during Census Years.

Sl. No.	Mouza	JL. No.	Area under threat (Ha.)	Calamity level (Partly & fully destroyed) as on 09-09-2003	No. of Families		No of Population affected		
					1991	2001	1981	1991	2001
1	Palashgachi	1	593.68	F	1731	2163	NA	9,885	13,832
2	Piarpur	2	551.19	F	637	1954	uninhabited	3,911	12,802
3	Kakribandhajhowbona	3	2738.82	F	1035	988	-	5,587	5,604
4	Rejjakpur	4	50.59	F	99	-	515	558	NA
5	Kamalluddinpur	5	176.44	F	122	-	638	736	NA
6	Mahadevpur	7	535.00	P	818	244	3570	4,522	1,340
7	Jotkasturi	8	288.49	P	384	926	1980	2,094	4,491
8	Sakullapur	9	118.67	P	304	456	1389	1,609	2,282
9	Birodhi	10	99.90	P	1067	1279	4073	5,797	6,579
10	Panchanandapur	11	2301.87	P	2871	3975	14152	16,456	21,017
11	Dari Joyrampur	12	110.60	F	uninhabited	-	uninhabited	uninhabited	-
12	Das khatia	13	56.10	F	uninhabited	-	uninhabited	uninhabited	-
13	Islampur	14	121.55	F	uninhabited	-	uninhabited	uninhabited	-
14	Hamidpur	15	1364.21	F	567	972	3683	3,538	5,611
15	Nityanandapur	16	354.10	F	27	108	uninhabited	166	560
16	Jitnagar	17	398.62	F	768	-	2961	528	NA
17	Paranpur	18	1033.42	F	1302	1434	-	6,956	8,867
18	Ratanlalpur	19	84.81	F	70	96	-	403	604
19	Srighar	20	926.33	F	505	132	-	3,280	3,801
20	Kanchi Jodupur	21	75.27	F	185	200	-	985	1,254
21	Begamgachi	22	218.53	F	3	45	-	219	293
22	Hakimabad	23	62.32	F	Uninhabited	1	-	Uninhabited	08
23	Mangatpur	24	119.79	F	15	12	-	44	71
24	Hosenabad	25	290.16	F	82	113	-	535	692
25	Dogachi	26	475.92	F	Uninhabited	-	Uninhabited	Uninhabited	-
26	Gajiapara	27	466.20	F	Uninhabited	-	Uninhabited	Uninhabited	-
27	Charbabupur	29	513.01	F	Uninhabited	32	Uninhabited	Uninhabited	178
28	Nayagram	30	1022.80	F	913	1314	6960	5,041	6,148
29	Jotananta	97	300.91	P	905905	1604	3698	4,758	7,869

			ΣP=6977 ΣF=8471.96 ΣP PF=15449.3		13,718	16,385	Blocks total = 1,13,667 Total effected population =30,919 % of population affected =27.20%	Blocks total = 1,63,871 Total effected population =77,608 % of population affected =47.36%	Blocks total = 211406 Total effected population =1,03,903 % of population affected =49.15%

Table 2.15 Mouza-wise distribution of Population and its Changing Pattern in Englishbazar block during Census Years.

Sl. No.	Mouza	JL. No.	Area under threat (Ha.)	Calamity level (Partly & fully destroyed) as on 09-09-2003	No. of Families		No of Population affected		
					1991	2001	1981	1991	2001
1	Khaskol-Chandipur	4	393.93	P	1,105	1,779	4,736	5,839	8,793
2	Gopalpur	95	89.65	P	245	370	544	1,244	2,065
	Total		**ΣP=483.58**		**1,350**	**2,149**	Blocks total = 1,60,447 Total effected population =5,280 % of population affected =3.29%	Blocks total = 1,80,434 Total effected population =7,083 % of population affected =3.92%	Blocks total = 2,26,236 Total effected population =7,083 10,858 % of population affected =4.8%

Table 2.16 Mouza-wise distribution of Population and its Changing Pattern in Kaliachak III block during Census Years.

Sl. No.	Mouza	JL. No.	Area under threat (Ha.)	Calamity level (Partly & fully destroyed) as on 09-09-2003	No. of Families		No of Population affected		
					1991	2001	1981	1991	2001
1	Gobindorampur	28	1768.49	P	134	NA	1,038	636	NA
2	Babupur	33	65.29	P	405	345	2,154	2,052	1,799
3	Palgachi	34	357.44	P	1,234	1,319	5,581	7,014	7,197
4	Jagannathpur	NA	1039.30	P	830	2,437	deluviated	5,245	1,2241
			ΣP=3230.52		2,603	4,101	Blocks total = 1,44,543 Total effected population =8,773 % of population affected =6.07%	Blocks total = 2,14,721 Total effected population =14,947 % of population affected =6.96%	Blocks total = 2,84,376 Total effected population=21,237 % of population affected =7.47%

P means Partly Eroded, F means Fully Eroded.

Sources(For Table 2.14 to 2.15): Compiled Data

(i) Mouza names: D.L.L.R.O, Malda & field visit, 2011.

(ii) JL Nos. and Population (1981, 1991, 2001) : Census of Indian Union (District Census Abstract).

(iii) No. of Families affected: District Census Abstract, 1981, 1991, 2001.

(iii) In Manikchak as per Census 2001, 06 mouzas have been found totally uninhabited and inundation occurred mostly during 1970s to 1980s; for example Gobindapur mouza bearing Jl No. 85 was found as populous as 913 number of population in 1981 and afterwards found diluviated under the grasp of mighty Ganga.

(iv) Areal shrinkage and overburden of depending cum homeless dwelling is the feature of the severely affected block of Manikchak and Kaliachak II.

(v) Regarding the count of households during the two consecutive census years 1991 and 2001 in Manikchak block 1,240 households have been obliterated from the block map, may there be another reason but the impetus is mainly due to abolition of houses in river grasp. On the other hand the scenario is more or less stable in Kaliachak II, III and Englishbazar.

(vi) The following data base states that Kaliachak II block is much affected in connection to the number of population victimized and immediately comes Manikchak and Kaliachak III accounting to 2.83% year^{-1} and 1.03% year^{-1} and thereby Englishbazar accounting to 0.57% year^{-1}*(table.2.17)*.

Table 2.17 Block-wise statement of affected Population.

Sl. No.	Block	% of population victimized			Average	
		1981(a)	1991(b)	2001(c)	a+b+c	No. year^{-1}
1	Kaliachak II	27.20	47.36	49.15	41.24	6.19
2	Manikchak	22.11	21.31	13.25	18.89	2.83
3	Kaliachak III	6.07	6.96	7.47	6.83	1.03
4	Englishbazar	3.29	3.29	4.8	3.80	0.57

Source: Compiled data from District Abstracts 1981, 1991 and 2001.

The River Ganga associated with Fulahar is the main triggering reason in the Northern and North western blocks of Malda district *(table.2.18)*.A considerable number of villages in Manikchak, Englishbazar, Kaliachak II & III have been vulnerated.

Block	**Gram Panchyet**
Manikchak	Mathurapur, Dakshin Chandipur and Gopalpur
Englishbazar	Millky
Kaliachak II	K.B. Jnowbona
Kaliachak III	Birnagar-I & II, Lakshmipur, Par-Deonapur

Source: D.M. Office, Malda

Table 2.18 Block-wise statement on Impact of Erosion.

Block	No. of G.P. affected	No. of village affected	No. of families affected	No. of population affected	Area mutilated (sq. km)
Manikchak	3	13	1131	3500	7.0
Kaliachak II	1	8	2720	13400	3.0
Kaliachak III	4	6	300	1500	5.0
Englishbazar	2	1	800	2500	0.5
Total	**10**	**28**	**4,951**		**15.5**

Source: D.M. Office, Malda, 2003.

During the last 5 years as many as 34 nos. of villages in the district have been totally wiped out in erosion and the people have shifted to other places from their home. The total no. of familes affected is about 5,751 and the population affected is about 25,400 (Disaster Management Cell, District Callectorate Office, Malda). The total loss of area is about 18 sq. km for the last 3 years.

The Above proforma of statement*(table 2.18)* is worth to make out the mutilation of areas and people from their original areas for the last 3 years (1999, 2000, 2001).

On field estimations reveal that, out of the population under natural threat of erosion i.e. most of the homeless destitutes; about 60% have shifted their dwelling places for 3 times, 20% of them for 5 times and next 15% for 6 and 7 times respectively, mainly in the blocks of Manikchak and Kaliachak II.

2.2.2 Economy

The economy of the district is basically an agrarian one and it is one of the most underdeveloped districts in West Bengal. The backwardness is characterized by low per capita income,low yield per acre of land, backwardness in Industrialization, shortage of capital and entrepreneurship,and also the lack of infrastructure and large labour surplus. Being the main stay of the economy the agricultural products are paddy, Wheat, jute and Rabi crops. But the position of the district has been somehow dignified for raw-silk yarn production and gossamering amounting to about 85% of the states yarn output, if taken in term of money it amounts to 400 crores Rs.About 45,000 acres of land are still covered by mango orchards which in normal years

breadfruit to the extent of 3,60,000 tones.The value of which in moneytory terms is about Rs. 5.5 crore. Except fewer parts of Barinds almost entire the district is abundantly producing mango and the block Englishbazar is dignified for exceptional production of *'Langra', 'Gopalbhog' 'Fazli' 'Laxmanbhog' 'Khirsapati'* etc. i.e. famous members of mango family.It is followed by the other police stations like Ratua, Manikchak Kaliachak, Chanchal (I,II), Old Malda and Harishchandrapur (I,II). Original i.e. *'gooti'* (indigenous) and grafted i.e. *'Kalam'*, both of the mango types yield higher percentage of currency. A bumper hyke in production comes once in 4 years and followed by a bad year in which the production may come down to 25-30% of the average production.

Economy affected by bank erosion deserves great importance now-a-days in Malda. For example in 2002 at two important sites near Panchanandapur the renovation works were taken up; first was, repairing of the marginal embankment from spur no. 17 to onwards about 700 m and, the second one was the rebuilding of 8th retired embankment , both of which incurred an estimation of about 50 lakhs. Now-a-days one of the main economic works here is loading and unloading of boulders through boulder carriage boats for tagging of embankments. A big country boat can contain 600-2,500 boulder in a single trip and 08 to 09 trips per day per boat is the competency level of the boats.But normally 07 trips are completed, because of disproportionate workforce of loading and unloading at the ghat.A labour as a boulder carrier can take boulders from the boat and keep them at reserve ground can carry 80-100 boulders per day. The value of each boulder is R. 7.50 of comparatively inferior quality and 8.00 Rs. of superior basaltic boulders (field investigation, 2001). Daily 15,000 number of boulders approximately are brought at Panchanandapur ghat. A turnover of nearly Rs. 1,00,000 per day is really a day's story in the peak season of tagging. About 13 major and 100 sub agency entrepreneurs had found working during 2001 like Amplified Engineer and Company; R. K. Enterprise, Ashoke chakraborty and Sons. etc. Makintosh Burn Ltd. is one of the leading concerns in this field. Labourers in the Tinpahar hills from the 'Khadans' (mines) demand 38 paisa in 2001 for the carriage of mostly one piece of boulder at a time for the first 30m of distance, then 14 paisa and again 38 paisa for the each and every increment of 30 m of distance. Similarly those who unload the boulder demand 50 to 60, 60-80 and 80-100 paisa per boulder on the basis of the size of boulder-small, medium and massive to carry from

the boat to the reserve ground of Ganga Bhawan campus as per field data base in 2001-2002 (Field investigation, 2001). The digging labours to dig soils for the bund demand Rs. 600 for digging of 100 cubic feet area in case of tough soil and Rs. 450-500 for comparatively soft soil and are usually deployed by the government officials. Main turmoil in the economic background is found in the rainy season mainly in the form of overburden of works with unseer speculations and irrelevance to real irony which indicates the backwardness of economiy in the district and in the concerned areas like Panchanandapur, Sakullapur, Khaskol, Domhat, Mayanapur, Dharampur Manikchak ghat etc. behind original issues of rescue, rehabilitation, embankment tagging etc. But to depose the depressancy of the melachology of the sons of the soil is really at stake to the governmental policies.

On the other hand the present and the past scenario of Panchanandapur, Manikchak and adjacent areas near bank in respect of land value (2009) can be presented as below which is really despairing from profit point of view*(table 2.19)*.

Table 2.19 Time series fluctuations in Land Valuation of selected sites.

Sl. No.	Places	Land under cultivation (Rs./Bigha)			Land under settlement (Rs/Bigha)		
		1998	2003	2008-09	1998	2003	2008-09
1	Panchanandapur	20,000	10,000	60,000	40,000	15,000	2,00,000
2	Manikchak ghat	19,000	8,000	55,000	35,000	10,000	1,80,000

Source: Compiled from field interaction.

The above table shows that both at Panchanandapur and Manikchak the monetary value for areas of agriculture and dwelling both reduced to half during 1998-2003 and 2004, when acute phases of erosion occurred but again growth in value for about 4 time and more during 2008-2009.This can be attributed to the fact of char development alongside the main channel and waking up of the central channel. Thus land values always have found fluctuating on the basis of expiration of land by the exploding Ganges. The river is so facetious in attitude that one precious mango orchard tract of about Rs. 1,00,000/bigha can be of zero price in the next year due to the graspy paws of the river and orchards of 50 to 100 trees can have unknowingly gone even to the one seasonal grasp amounting to about 3-5 lakhs of

economic value during a normal harvest year and 6-10 lakhs during a successful harvest year (verbal interaction, 2002). Grandee and vaterians told in robust that winter rice lands, croplands and homestead lands were tradianally valued lands compared to regular reed lands and Kalia lands of newer silts. In 1842 the the rates were found to be Rs. 1 per bigha (1,600 sq. yards) for homestead and, 4 annas per bigha for two crop lands, and 3 annas per bigha for winter rice lands. In 1872 the prevailing rates were found to be for two crop lands 8 annas per bigha; boro lands 8 annas to Rs. 3; one crop rabi lands 3 annas to 10 annas, orchard lands 10 annas to Rs. 3 and the higher rates prevailing in the centre of the district and towards the south and west (Lambourn, 1918) of the district. From long past *'Adhiar' 'trikhati' 'Hal hasli'*, all such tenure systems had been found in practice till the end of 'Jamindari'system. '*Thika*' and '*Meyadi*' systems to lease orchards of mangoes was a common practice which is still operative in another form and with grafted norms. Constant alluviation and diluviation resulted into the concept of resettlement in the diaras and even through 'Mandals' i.e group of Thinkers of the zamindars. The landlord, by custom was allowed to give suitable lands to tenants for their homestead from that in possession of other tenants (Bengal District Gazetter, 1918). An purely agricultural family after expense of all such needed articles could cash a surplus of Rs. 12/year in 1888 i.e. about 121 years back (Lambourn, 1918), which is indicative of prosperous life style compared to present if a general inflation rate is taken as Rs. 1 to Rs. 100 for 100 years of span, projected estimations say that Rs. 12 equivalents to Rs. 12,000 of present day Which is not possible for present destitutes cum inhabitants. From the middle to the beginning of the last century and days forward, small Co-operative credit societies were found in Panchanandapur at the the *Khas Mahals* (Lambourn, 1918). For winter rice, from time immemorial to the middle of the last century the diara people during the cold weather, go with hundreds of carts to the barind and beyond to cut paddy or buy it,in exchange or Kalai and money which has now retarded due to over diluviation of lands of engagement of workers as daily wage labour for barest subsistence. Ruction and competition among the farmers have also resulted to the explodation of Kalai fields and bloody village factions to capture the realluvions. Slumping of one grange house with cattle shed accounts for the loss of averagely Rs. 10,000 and a 5-6 members family of 5 times of homestead shifting causes loss of Rs. 50,000 in wash out and Rs. 60,000 for installed resettlements.

Another, economic impulses start with the incursion of improvident and inevitable issues of embankment and bund making polices having incoherent linkages between and among the priority phases of policy implementation. From reliable sources it can be estimated that construction of one long spur downstream of Manikchak ghat was estimated 12.12 crores. On the other hand maintenance of bull headed spurs between Panchanandapur and Jugaltala incurred 1.12 crores per annum. Strengthening of spurs years to year for a single phase requires 10.30 crores roughly. Similarly revetment along river requires 28.00 crore for one phase priority work. And repitching from reach to reach accounts 50 crores of investment at once.Such immense investments without draconian administrative system normally went in vein and many a time exploding all in the hossana of beaurocracy and diplomatic decisions. Ministry of Water Resource (MWR), Central water Commission (CWC), Planning Commission of India (PCI), Ganga Flood Control Commission (GFCC), Farakka Barrage Project Authority (FBPA) etc. walked together from 1997 and estimations through recommendations have also rested meticulous expenditures which can be made out in the foregoing paras. In reality such investment was found really unrealistic. Allocation of money was only 20 crore according to the 10th 5 years plan. On the basis of government records estimation of cost for trimming the entire length of the channels caused, havoc of investment and ultimately renunciation of the nature in the form of damage and derestoration.

On the basis of above table it can be stated that immense money cum financial assistance was incurred and almost went in vein. Now-a-days though the problem is almost in stake at few places but incurring of financial investment is still under serious demands.

Thus in a single year if about 6000.00 crores are required for rescue acts against a damage of 5,660.05 crores, then over a 10 years of period when the frequency of Flood and Erosion becomes 3 times, it will state a need of about 18,000.00 crores roughly which is really over pressure for any state like West Bengal to readily allocate. Not only that, once a property goes to be damaged, its renewal does not satisfy the similar competency as before rather it becomes low level resource after recapturing or renewal of that. Not going in details for past years (1998-2000), the degree of damage and loss in flood 1999 is presented hereunder to give a glimpse of idea.

1. People affected	2,44,135
2. Crop damaged	Rs. 168.15 lakhs
3. House damaged	Rs. 550.00 lakhs
4. Total Erosion since 1980 to 1999	3756.00 hect.

Hence lies the reason for the construction of the retired embankments to at best tackle the present situation whereas local people is not ready to spare any furthr land for construction of retired embankments.

Conclusion

From physiographic point of view the district is receiving very low slope character except the swelling parts of Barinds which is indicative of channel water stagnancy and possibilities of frequent floods and phases of sedimentation over time.On the other hand it receives huge amount of rainfall and quite good number of presence of river which are alsos over- burden to carry out the huge discharge as overland flow and channelised water specially in the wet season .The net effect is that the district has been experiencing long periods of inundation and riverbank erosion with that of bank line disruption.From demographic point of view the district is populous and even the charlands like Bhutni and Duani are also captured by human settlements and this is the reason that any calmity related to flood and erosion is detremental to destruction of civilization and the relatively poor economy has resulted their low degree of revival from these frequently occuring hazardous situations. In this chapter the main motive of the author is to view the Geographical personality of the district keepin in mind the age old occurences of bank erosion and flood. The economic set up of the district specially of the affected blocks is really volatile in nature for the local dwellers. Any presupposition cum estimation regarding annual profit through agriculture, orchards etc. can be successful or not and in many time the mood of the nature.

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