Chapter--III

LANDFORMS AND DRAINAGE
CHAPTER - III

LANDFORMS AND DRAINAGE

Introduction:
3.1 The study area is nearly a flat land of Bengal Basin. Fluvial and marine processes are responsible for the land formations of the district. The district is characterized by a uniformly flat surface whose monotony seems to be broken only by the presence of some linear and parallel sand dunes of the coastal regions. These large open plains are characterized by some depressed low basins. These basins include Barochowka basin, Dubda basin, Contai basin, Sarpai basin, Paninala basin etc. These basins are the low lands of the district. The general appearance of the district is that of a large open flat alluvial plain. The eastern and southern portions of the district are swampy tracts. Depending upon the location and alluvial deposition of the study area geographically the district can be divided into two divisions:

(1) Vindhyan alluvial plain (covers an area of 122800 hectare) and
(2) Coastal alluvial plain (covers an area of 184200 hectare)

Landform Units:

(1) Vindhyan alluvial plain:
3.2 These alluvial plains have been formed by the alluvial deposition of the Vindhya originated rivers of the great Gangetic system of upper India. Geographically, this is a deltaic flood plain and consists of fourteen blocks of the district. These blocks include Panskura-I, II, Tamluk, Sahid
Matangini, Nandakumar, Nandigram-III, Moyna, Mahishadal, Patashpur-I, II, Bhagawanpur-I and II and Egra-I and II. These alluvial tracts constitute the North, North-western and some Eastern portion of the district. It covers an area of 122800 hectares of land. Deposition of alluvial soil by the river Hooghly and its tributaries like the Rupnarayan, Keleghai, Kangshabati and interconnected canals and khals is responsible for the formation of the land. In the eastern side of the study area a strip of purely deltaic alluvial plain bordering the Rupnarayan and Hooghly has been formed (O malley). This eastern side alluvial tract is intersected by numerous waterways which are lined with Ex-Zamindary embankments. The vast area of the west of the Rupnarayan and south of the Keleghai is uniformly low flat land formed by mud deposition and is liable to flood.

3.3 The alluvial plain is formed due to fluvial action and deposition of sediments in the flood plains. The time of their deposition provided sound basis for dividing the land with precision into two divisions. These are (a) Mature Deltaic Alluvial Plain and (b) Older Alluvial Plain (Fig. 3.1). Mature deltaic alluvial plains comprise of the blocks like Panskura –I and II, Sahid Matangini, Moyna and parts of Tamluk blocks. These extensive plains are mainly considered as flood plains as these areas have been developed from extensive deposition of alluvium brought down by the river Hooghly and its tributaries Rupnarayan and Kangshabati. On the basis of the age (time of deposition) of their formation these flood plains are again sub-divided in to two types. These include (I) Upper Mature Deltaic Flood Plains and (II) Lower Mature Deltaic Flood Plains (Fig. 3.2). Upper mature flood plains are older in formation as compared to the Lower flood plains. The mature deltaic flood plains are marked by low lying depression (Moyna basin) formed of the combined actions of the
3.4 The older alluvial plains are the oldest land forms of the district and are a part of Sizua Formation of the Quaternary Age. On the basis of elevation and maturity of the deposition, these older alluvial plains can also be sub-divided into two types. These are (I) Upper older flood plains and (II) Lower older flood plains. Upper flood plains are the extreme western portion of the region which follows more or less 8 meter contour line where as lower flood plains consist of the low depressed basins of the study area (mainly Dubda basin and Barochowka basin).

(2) Coastal alluvial plain:

3.5 The southern portion of the district represents coastal topography. The coastal plain lies at the head of the Bay of Bengal. It is a continuation of the maritime tract of the Orissa coastal plain. Three types of coast forming agents worked in tandem in evolution of this southern tract. These include – stormy winds, violent waves and tidal surges. The coastal plain differs significantly from the Vindhyan alluvial plain in terms of the presence of sand dunes in different shapes and sizes. These sand dunes probably signify the past coast line of the region. The low lying coastal plains are liable to inundation by high tide water. These coast lines are more or less straight with mud flats and sand deposits (Plate3.1) traversed by waves formed shallow creeks. The sand hills (O’Malley, 1994, Reprinted) have been formed between the river
Plate 3.1 Inter-tidal sand flat surface, Digha.
Rasulpur and Subamarekha. In the east these are single ridges where as in the west and centre there are several parallel ridges. The wind is responsible for the transfer of sediments from the inter-tidal zone into the supra-tidal zone, causing the formation of sand dunes in the southern portion of the study area. Due to poor growth of vegetation these sediments become non-cohesive which ultimately increases their mobility. These highly mobile sand dunes are fragile habitats and the vegetations are rarely sufficient to withstand the onslaughts of winds, waves and tides. In between these sand dunes, stripes of alluvial plains have been formed. The face of these sand dunes inland is generally abrupt. The sand deposits near the coast made by waves and the strong southerly winds may be noted (Plate 3.2). These sand dunes extend at an average distance of six miles from the coast line. These beach front sand dune complex zones are characterized with neodunes, the average elevation of which varies between 6-12 meters. Most of the older sand dunes are now mostly occupied by local people (Plate 3.3). A large alluvial tract has been stretched out towards north from these single coast line sand ridges. Much of these coastal littoral alluvial tracts are saliferous.

3.6 This south-west and southern portion of the maritime tract is subjected to tidal waves and is exposed to the inroads of the sea. To protect the alluvial plain from the incursions of the sea long embankment has been constructed. Covering an area of 184200 hector of land, the coastal plain of Bengal Basin comprises of eleven blocks of the district namely Contai-I, Iland III, Ramnagar-I and II, Khejuri-I and II, Nandigram-I and II, Haldia and Sutahata.
Plate 3.2 Younger Beach Front Dune Complex Zones at Shankarpur and Digha (above and below)
Plate 3.3. Ancient dunes have been encroached by settlements at Contai
3.7 On the basis of the deposition of sediments these coastal plains can be also divided into two divisions. These are (I) Upper Coastal Plain and (II) Lower Coastal Plain. Lower coastal plain lies in the extreme southern portion of the region and are exposed to the inroads of the sea. An extensive mud and sand deposition (mud flat and sand flat) is noticed in the lower coastal plains. Ancient or upper coastal plains consist of mainly clayey type of soil. It is fluvio-tidal flat land of the area. Upper coastal plains are characterized with older dune ridges whereas in the lower coastal plains recent and neo-dunes (sea-facing sand dunes) (Plate3.4) have been formed. With strong southerly winds during hot months of the year these sea facing sand dunes gradually recedes towards inland of the study area.

3.8 As there is not much of contrasting relief, the micro-level conditions are not properly exposed by the few contours and spot heights given in the Survey of India maps for the entire region. Hence to bring out the details of micro-level terrain conditions of the study area a 2 meter contour interval map has been prepared of the area (Fig. 3.3). The average elevation of the district is 5 meter above mean sea level. The elevation of the northern and north-western portion of the district is 9-10 meter above sea level with some depressed low lying tracts (Dubda basin of Egra-I and II block and Barochowka basin of Patashpur-I and II block, average elevation below 4 meter). The general slope of the area ranges from 1-0.5% and extends towards north-east side. The southern portion of the district (Coastal regions) is developed on coastal alluvial parent material with 1-2% slope on higher flood plain areas and 0.5% land slope on lower flood plain areas of the blocks of Contai-I,II and III,
Plate 3.4. Formation of neo-dunes is an important feature in the coastal region of the study area.
Ramnagar-I and II, Khejuri-I and II and Nandigram-I. The general elevation of the district decreases southwards (Fig. 3.4).

Drainage:

3.9 The hydrographic control on the land utilization pattern is well marked. The fluvial system of the study area is characterized with a highly interconnected system linking the processes in the river to those in the flood plain and wider river catchments. The character and behaviour of the fluvial system of this study area reflects the combined effect of a number of controlling factors. Climate, basin shape, rock type and land use are all major influences and together they determine the hydrological regime and the quantity and type of sediment supply. The district is nearly flat with few depressed low lands with either very slow run-off or none at all. Lands retain all or nearly all of the water falls as rain and often receive a considerable additional amount from adjacent areas.

3.10 The fluvial system of Purba Medinipur district consists of the river Hooghly, its tributaries, the Rupnarayan, Haldi and Rasulpur and of their sub tributaries. The district is also drained by two important canals and a number of interconnected khals (Fig. 3.5). All these drainage arteries are subjected to tide and bear brackish water. The river Rupnarayan and Hooghly flows throughout eastern boundary of the district and nowhere intersect the study area.

3.11 The river Rupnarayan widens considerably towards its mouth. It follows a tortuous course along the district boundary (Plate-3.5). The river is influenced by the tide throughout its course and contains brackish
DIGITAL ELEVATION MODEL
OF DISTRICT PURBA MEDINIPUR

Fig. No.-3.4
Plate 3.5. The Rupnarayan River joins with the River Hooghly at Geonkhali, Mahishadal block
water up to Kolaghat during dry months, but during rainy season it fluctuates as the volume of fresh water drives away the salt water. Formation of chars, islands due to accretion of sediments is noticed along its course. The river Haldì, Kangshabati and Rupnarayan drains the plain in a North-South direction making loops. All these rivers receive few significant khals from East and West.

3.12 The river Haldì is a combined flow of the river Kangshabati and Keleghai. Like the river Rupnarayan it also widens considerably towards its mouth. It follows a treacherous course and is subjected to tidal currents. The river is characterized with the formation of the sand bars. Due to insufficient supply of surplus water from the upper reaches of the river Kangshabati the river is subjected to rapid siltation (Plate 3.6). Many shifting shoals, chars and tidal creeks are important features which are found at its mouth (Plate 3.7). Nayachar is an important char formed by the rivers Hooghly and Haldì.

3.13 The river Kasai is also an important river. It follows an exceedingly tortuous course. As the river is liable to flood annually, the entire stretch of its lower course has been embanked (Fig.-3.6). The river is also subjected to severe siltation as the tidal borne silt is deposited at its bed. The river Keleghai is the second tributary of the river Haldì. The River is narrow and is noted for yearly inundation of the adjoining areas (Patashpur-I and II blocks).

3.14 The Rasulpur River (the river is also known as Bagda nadi up to Kalinagar) furnishes a large area of the district under different names in different places. Under the name of the Bagda the river enters the district
Fig. No.-3.5  DRAINAGE MAP OF PURBA MEDINIPUR

Source: IRS-1D, LISS-III, 2002  4th February
Plate 3.6. River Haldi during Rainy season

Plate 3.7. River side sediment deposition at Narghat, Haldi River.
and flows as far as Kalinagar from where it flows under the name of Rasulpur till its mouth at Hooghly (Plate 3.8). Formation of mudflat at its mouth is noticeable (Plate 3.9). The River is also tidal affected. Due to huge siltation the old channel has been replaced by an artificial channel, known as Balighai channel. As the river is impregnated with high brackish water from tidal ingress it is unusable and a large agricultural land is subjected to salinity every year through high tidal bore. (Plate 3.10)

3.15 The two most important canals of the district are the Midnapur canal and the Orissa coast canal. Both these canals have lost their importance with the opening of the railway lines. And now these canals specifically Orissa coast canal (Plate 3.11) is aggravating the drainage problem of the study area. Due to rapid siltation and encroachment of people for fishing and other activities both these canals are unable to discharge their excess runoff during rainy seasons resulting into overtopping of rain water in the adjoining low lands.

3.16 A considerable area of the district is drained by a dense network of khals (Plate 3.12). All these khals are interconnected and are liable to tidal water. Naturally once these waterways were active land builders but now they were fully jacketed by constructing embankments on both the sides of the rivers, canals, khals and most part of the coast line even when the process of land building was not completed.

3.17 Reclamation of Jalpai lands by constructing embankments along the margins of the silt bearing rivers and tidal estuaries accentuate the drainage problem. As the tidal water is obstructed by these ex-zamindary embankments, silt laden water is forced into drainage channels due to
Plate 3.8. River Rasulpur joins with the River Hooghly at Dariapur, Contai P.S.
Fig. No.-3.6 An Extremely Meandering Course of the River Kangshabati
Plate 3.9. Mud flats have been formed at the mouth of the River Rasulpur.
Plate 3.10. A newly formed char at the mouth of the River Rasulpur.
insufficient supply of fresh water to scour them out. As a result of which rapid deposition of silt in the beds of the khals and creeks takes place. After heavy rainfall and during high tides (baan) the whole reclaimed land and inland tracts are subjected to severe water logging by breaching of the embankments. Due to topographical and climatological variations the district is confronted with acute drainage congestion, waterlogging and severe floods.
Plate 3.11. Orissa Coast Canal near Contai P.S.
Plate 3.12. A number of khals have been constructed as a remedial measure to water logging conditions (above and below)