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PHYSICAL SET-UP OF MALDA DISTRICT WITH SPECIAL REFERENCE TO WETLANDS

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CHAPTER-II

PHYSICAL SET-UP OF MALDA DISTRICT WITH SPECIAL REFERENCE TO WETLANDS

2.1 INTRODUCTION

Wetlands normally are part of a physical set-up of a region. However, there are some regions leading to the existence of wetlands and there are some physical properties that are directly or indirectly associated with wetlands. Therefore to understand the geographical perspective location of regions, property specifications and impact characteristics over a wide set off indicesses it is necessary to have thematic exposure about some basic physical properties of the area concerned. Wetlands are products of physiographic configurations, climatic properties, pedological compositions and of-course hydrological specialties. Geological properties and characteristics do not ordinarily play vital role and natural vegetation is considered as a product of the entire physical geographical set-up. So, the four items have direct roles to play in determining the geographical properties of the wetlands, geological characteristics do not usually have any direct influence expected in a wetland as part of micro-ecosystem. The distinct similarities and dissimilarities of vegetational characteristics between wetlands and non-wetlands area can be understood with pre-requisite information of natural characteristics of vegetation as a whole.

On the basis of these logics a brief information about some of the basic physical indiceses are provided below:

2.2 TOPOGRAPHY

Malda district is a low-lying plain, through which flows a number of rivers. On the basis of topography and drainage pattern, the district can physiographically be divided into three regions i.e. Tal (north portion above river Kalindri), Diara (southern portion below river Kalindri) and Barind (eastern part of river Mahananda).
**Barind Region:**

The ‘Barind’ tracts have the highest elevation of the district measuring 39.7 metres from the M.S.L. The highest lands are present in Gajol P.S. under this tract. Barind areas extend over a wide area in Malda district. The characteristic feature of this tract is wild undulations of successive ridges and depressions seamed with small water courses in the valleys and are practically devoid of shade except for the village sites and small patches of sal forest here and there in Habibpur P.S. The ground is baked hard as iron; drinking water is scarce during summers. Except in autumn when it becomes green with winter rice, it remains arid. Of the 11 police stations in Malda, 4 P.S. viz. Old Malda, Gajol, Bamangola and Habibpur are within the tract. Adina, which was once the then capital of Bengal for sometime during the muslim rule is located in Gajol P.S. of this tract and the Barind tract comprises of an area of 1,32,761 hectares.

**Tal Region:**

The Tal region is situated to the west of Mahananda River and north of Kalindri River. It is a low-lying area subjected to inundation with the rise of water level in the Ganges, Mahananda and Kalindri. The construction of flood protection measures has however eased the situation to some extent. The Tal area gradually slopes down towards the south and west and gradually merges with the Diara region. Ratua, Chanchal and Harishchandrapur P.S. are within this region. The total area under Tal tract is 1,14,100 hectares.

**Diara Region:**

The ‘Diara’ consists of a strip roughly 12.87 K.M. in width along the western and southern sides 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 Gaur and extending westwards by successive stages. The soil is of light nature with a sandy appearance. English Bazar, Baishnab Nagarar, Kaliachak and Manikchak P.S. are under Diara tract. Total area under this tract is 1,09,493 hectares.

There are no uplands in the district excepting a few elevated tracts in the district above sea level is 39.7 meters and is situated in Gazole Police Station. But the average elevation range of the
The district is 30 mts above sea level. And the slope direction of the district is generally forming the north to south.

The natural division of the district coincides with that of the administrative division boundaries also. The River Kalindri flowing west to east act as a boundary between the Tal region in the north and Diara in the south. Mahananda up to its confluence with that of the Ganga acts as a boundary between the Tal region in the west and Barind in the east. The administrative boundaries particularly of police station in many cases follow the natural alignment of these rivers. So, the Tal region consists of Ratua, Chanchal and Harishchandrapur P.S., the Barind contains of Old Malda, Gajol, Bamongola & Habibpur P.S. and the Diara region comprises of English Bazar, Mallikchak, Kaliachak and Baisnabnagar P.S. Therefore obtaining of various secondary data related to population, land use etc have become easier and directly applicable to the natural region as a whole. This indeed is an advantage for the present research work since the administrative divisions coincides with the natural division as referred above.

From the brief description of the topographic characteristics of the district of Malda, it is evident that the topographic configuration in association with the river system, soil characteristics and climatic particularly rainfall characteristics do influence innumerable water bodies, their distribution, areal extension and seasonal fluctuation.

Given the slightly undulating topographic character present in the Brind area the surface water regions are expected to the less in numbers, more confined in nature and the seasonal fluctuations are expected to be more also. More over the topographic positivity in association with hydrological and pedological supportive characteristics the Tal and Diara regions are the more populous area of the district. Therefore, the topographic configuration of Tal and Diara provides an important support in terms of presence of major water bodies in one hand and these two areas being more populated the human interaction with that of water bodies are naturally expected to be more on the other.
Fig 2.1
2.3 GEOMORPHOLOGY

The district is situated on the western part of the alluvial filled gap between the Rajmahal hills on the west and Garo hills on the east. The entire area in the district is covered by alluvium of two different ages (e.g. Pleistocene and Tertiary) displaying different physical and physiographic characteristics. East of the Mahananda which bisect the district roughly along a north-south line older (Pleistocene Period) alluvial are found. This portion known as Barind region, is usually made up of massive, argillaceous beds of a pale reddish brown hue. Disseminated this formation occur kankar and pisolitic ferruginous concretions. On the other hand the recent alluvium (tertiary period) is found in the western part of the district. This alluvium is typically dark, loosely compacted with a high water and organic material content. It is also consisting of sandy clay, sand and fine slit. A part of the Tal region on the west of Mahananda up to the Kalindri has the same formation. Given the geological set-up of Malda region there is no apparent relation between the underlying rock structure and its properties (the reason is simple). The continuing bed rock between Rajmahal and Garo hills is overlain by several layers of alluvium with huge depth. The only direct expression of geological properties in a feeble degree can be seen only the Barind tract. Malda region is located in the para-delta with strong past references of deltaic hydrological activities and substantial recent activities in terms of shifting river channels, bank erosion, dereliction of river etc. and these have some relation with that of the beel formation in the district. The massive basin characteristics of Malda region therefore provides a freehand to the oscillating river course characteristics which in turn is considered as one of the reasons for formation of beels in this region.
Fig 2.2
2.4 SOIL

The pedological characteristics of the district do not have a very strong explanatory characteristic so far as the thematic spreads of the present research work. However the beels or water body areas partly act as depositional areas as follow up of surface runoff and resultant structural change over of soil horizon. Broadly speaking except that of Barind region the entire district possesses a strong active alluvial characteristic and the beels areas are no exception. But since the beels’ areas contain some kind of static hydrological condition the scope of depositional activities leading to creation of specific soil characteristic that take place. The overlying introduction of newer soil ingredients as product of the surface runoff is expected to create a pedological composition that becomes a part of the abiotic components in the beel ecosystem.

The district having different physical and physiographical characteristics is covered by alluvium of two different ages. Older alluvium dominates the Barind region while newer alluvial dominate both Tal and Diara regions. So, the soils of the district are locally classified as below;

A) The Soils of Barind Area
B) The Soils of Tal Area
C) The Soils of Diara Area

(A) Soils of Barind Area- Barind Soils are usually made up of massive argillaceous beds of a pale reddish brown colour. It is composed of stiff clay, containing iron and lime and become extremely hard in the cold weather.

B) Soils of Tal Area- The Soils of Tal region are clay loam to sandy loam in texture. These soils are light loam called ‘Do-ash’. It is a later alluvial formation and consists of an admixture of clay and sand.

(C) Soils of Diara Area – The Soils of Diara region are relatively new one and most fertile. These soils are admixture of sand and clay.

But according to the National Bureau of Soil Survey and Land use Planning (WBSS & LUP) map of soil occurrences in West Bengal, the District of Malda possesses 14 categories of soil. These occurrences are shown in the Fig. 2.3. In the following table the number codes of the soils of Malda area given with their respective brief description highlighting soil depth, texture, drainage, slope, erosion, salinity etc. of the dominant and associated subdominant mapped soils.
Table 2.1 Soils of Malda District

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Soil Unit No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Active Alluvial Plain- Flood Plain Soil</strong></td>
</tr>
<tr>
<td>1.</td>
<td>WO 11</td>
<td>Very deep, moderately well drained, fine loamy soils occurring on level to nearly level active alluvial plain loamy surface and moderate flooding associated with very deep imperfectly drained fine soils.</td>
</tr>
<tr>
<td>2.</td>
<td>WO 14</td>
<td>Very deep, imperfectly drained fine soils occurring on surface and moderate flooding associated with very deep moderately well drained fine loamy soils.</td>
</tr>
<tr>
<td>3.</td>
<td>WO 15</td>
<td>Very deep moderately well drained, coarse loamy soils occurring on very gently sloping active alluvial plain with loamy surface associated with very deep imperfectly drained fine loamy soils.</td>
</tr>
<tr>
<td>4.</td>
<td>WO 16</td>
<td>Very deep, moderately well drained fine silty soils occurring on very gently sloping active alluvial plain with loamy surface and moderate erosion associated with very deep moderately well drained fine loamy soils.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Recent Alluvial Plain- Most Recent Soils</strong></td>
</tr>
<tr>
<td>5.</td>
<td>WO 17</td>
<td>Very deep, Well drained coarse loamy soils on level to nearly level recent alluvial plain with loamy surface associated with very deep imperfectly drained fine loamy soils.</td>
</tr>
</tbody>
</table>
6. WO 19  
Very deep, imperfectly drained fine loamy soils occurring on level to nearly level recent alluvial plain with loamy surface and moderate flooding, associated with very deep, imperfectly drained, coarse loamy soils.

7. WO 21  
Very deep poorly drained fine soils occurring on level to nearly level recent alluvial plain with clayey surface and moderate flooding, associated with very deep imperfectly drained fine loamy soils.

8. WO 24  
Very deep, imperfectly drained, fine loamy soils occurring on very gently sloping recent alluvial plain with loamy surface and moderate erosion, associated with very deep, imperfectly drained, fine loamy soils.

9. WO 27  
Very deep, moderately well drained fine loamy soils occurring on level to nearly level recent alluvial plain with loamy surface, associated with very deep imperfectly drained fine loamy soils.

10. WO 29  
Very deep, poorly drained, fine loamy soils occurring on level to nearly level recent alluvial plain with loamy surface, associated with very deep, poorly drained fine soils.

11. WO 30  
Very deep, moderately well drained, coarse loamy soils occurring on level to nearly level recent alluvial plain.

[Old Alluvial Plain- Sub-recent soils]

12. WO 32  
Very deep, imperfectly drained, fine loamy soils occurring on very gently sloping old alluvial plain with loamy surface, associated with very deep, imperfectly drained, fine loamy soils.

13. WO 33  
Very deep, imperfectly drained fine loamy soils occurring
on level to nearly level old alluvial plain with loamy surface, associated with very deep, moderately well drained, fine loamy soils.

14. WO 35

Very deep, imperfectly drained, fine loamy soils occurring on level to nearly level old alluvial plain with loamy surface and moderate flooding, associated with very deep, poorly drained, coarse loamy soils.

According to NBSS & LUP the entire state of West Bengal has been divided into several agro-ecological sub regions. The district of Malda falls within the sub region ‘Hot moist sub humid (Bengal basin)’ unit which stretches from North Dinajpur in the north to north of Gangetic Delta of South 24 Parganas and coastal sandy soil area of south-eastern part of Medinipur covering entire portions of Malda, Murshidabad, Nadia, Hoogly, Hawra and North 24 Paragans. It covers eastern parts of Birbhum, Bankura, Brddhaman and Medinipur districts, thereby constituting the most extensive subregion within the state. This agro-ecological subregion comprises the Ganga Plain (Bengal Basin) and eastward continuation of Indo-Gangetic Alluvial Plain. The sub region occupies an area of 4.93 m. hectares representing 55.7% of the total geographical area of the state.

The soils have been developed in the alluvium laid by Ganga and its tributaries and sub tributaries. These soils are greatly variable in their morphological, physical and chemical properties depending upon the geomorphic situations, moisture regime and degree of profile development.

In general, the soils of the zone are slightly acidic to slightly alkaline and have high base saturation. The major problems of this agro-ecological sub region are that Bengal basin inherently suffers from improper drainage outlets. The tributaries and distributaries in spate frequently inundate the low lying areas resulting in stagnation of water for smaller and longer periods. Such flood hazards adversely affect the normal dry land crop yields. On the other hand the potential of these soils are that they contain high nutrients and mineral reserve which are suitable for a fairly large variety of agricultural and horticultural crops keeping in view the soils and landform conditions.
Fig 2.3

(Source: NBSS & LUP)
2.5 HYDRO-GEOMORPHOLOGY

Malda region is located in southern edge of the northern para-delta of Bengal region. By virtue of the fact that Malda region provides the final passage of the Ganga river system with its several tributaries having longitudinal alignments originating from the Himalayas and its foot hills in the north the surface hydrological conditions are prominently active in its true sense. In addition to this, as mentioned earlier, the basin between Rajmahal and Garo hills in the Malda district is situated. This set-up does not offer any structural (geological) or relief (geomorphological) obstruction against the free play area stage of surface hydrological features. The hydrological activities are evident from the facts that, first, a number of perennial rivers including the Ganga traverse through the district, Secondly, there is a strong evidence of shifting river channel and Thirdly, almost the entire district floods keep on occurring almost regularly. So, it is quite natural that among the physical indices of the district hydrological characteristics, particularly surface hydrology features have created distinctive, prominent and permanent imprints.

Beels of the district are one of the products of this active hydrological characteristic of the district. This prominent characteristic in turn has penetrated in some of the explained physical geographical characteristics of the district in one hand and created impression on ethno-socio-cultural mosaic of human life in the district, on the other.

In the following paragraph descriptive information is provided about the river systems and allied themes related to surface hydrological condition.
Fig 2.5
2.5.1 River System

To describe the river system of the district the two most important rivers draw attention at the first instance. They are the Ganges and the Mahananda which flow through this district. All the main rivers of Malda are of Himalayan or sub-Himalayan origin and take a southerly course in flowing through the district. The main rivers of the district are all of Himalayan or Sub-Himalayan origin and flow in a southerly and south-easterly direction. The principal rivers of the district are 1) The Ganga  2) The Mahananda 3) The Kalindri 4) The Tangan and 5) The Punarbhava. A short account of the rivers of the district is given below;

**The Ganga:** River Ganga flows through the western part of the district and acts as a natural division between Jharkhand and Malda district. The Ganga first touches the district as it sweeps round to the south of the Rajmahal hills and leaves the district at Khejuria near Farakka Barrage. During the last few years the tendency has been for the river to continue gradually the westward movement. Alluvium and dilluvium had occurred constantly as a result of the continual changes in the course of the river. The position of the Ganges was therefore, very similar in Rennell’s time (1764-1773) to what it is today .Buchanan Hamilton noted in 1810 that the general course of the river Ganges was away from plains of Malda. At the time of the revenue survey, Rajmahal was on the bank of the river but in 1870 the river took an eastward move leaving Rajmahal at its west and almost threatened to cut into the river Kalindri, as a result of which a good amount of erosion took place in the Malda Bank. But at present time the river has been flowing through channel.

**The Mahananda:** River Mahananda first touches the district at its extreme north point near the tri-junction point of the P.S. of Chanchal, Ratua and Gajol and leaves the district at the southern most point and falls into the river Ganges. The main channel of river Mahananda in Malda district is fairly deep and alluvium & dilluvium processes are going on gradually. River Mahananda runs for about 88.6 km in this district and divided the district into two nearly equal portions. During the last century few changes have been taken place in its course. But in between the dates of Rennell’s map and revenue survey a very great change took place. In Renells time, the river ran from Swarupganj down to what is now the channel known as the Mora Mahananda along the western boundary of Kharba P.S., instead of along the eastern boundary as at present.
**River Kalindri:** The River Kalindri is taken as an off-shoot of eastern branch of the Ganges. It enters into the district near Miaghat of Harislichandrapur-II. In the Tal region, the river Kalindri receives four tributaries, namely Kalkos, Kankar, Kos and Baromasia. These four small tributaries of Kalindri drain the excess water of Tal region and meet river Kalindri. After then, the river Kalindri is flowing mainly in south-eastern direction and meets river Mahananda. The alteration in the course of river Kalindri is still now going on. The present bed being in places at some distance from the position of the river at the time of revenue survey.

**The Tangan and Purnabhaba** are very similar river systems. Both are narrow system, muddy and tortuous courses. Both are also the tributaries of the river Mahananda. The Tangan forms the boundary between Gazol and Bamongola Block. The Tangan appears to have shifted its course at various periods. Due to shifting of course, a branch of named Mara Tagon, flows several Kilometers through the police station of Gazol and join the mother course in Bamongola.

The total linear length of all the rivers in the district of Malda runs up to 172 km and thus the district possesses an ample scope for surface water utilization. At the same time the presence of large number of extensive ‘beels’ ‘Jheels’ and ‘Dhaps’, as the local term of naturally stored surface water areas or part of abandoned river channels with the presence of intermittent water bodies, also provide considerable support to the augmentation possibility of surface water utilization. The beels throughout the district are the direct or indirect result of fluvial action and are not due to earth subsidence. The direct result of fluvial action may be seen in the Tangan and Purnabhaba valleys, which contain a chain of beels stretching northwards to the border of South Dinajpur district. From the appearance of these valleys it can be surmised that they were originally courses of very long rivers than the present streams. The largest is Beel Ahore in the Tangan valley covering an area of nearly two square miles. The same river action is found in the marshy tract between the Mahananda River and the main road from English Bazar to Gour. In Diara tract also beels are due to depressions left by the Ganges. The district is also dotted with numerous tanks, large and small. There are approximately 30,000 tanks in the district, of which about 11,000 tanks are being utilized or utilizable for irrigation purposes.
MALDA DISTRICT RIVER SYSTEMS

Fig 2.6
2.5.2 Ground Water Level Condition

Ground water table is very significant item with regards to the genesis and properties etc. of the soil. The depth of the water table of any region is bound to various factors such as – physiography, climate, and porosity of substrata water table in the uplands and in the low lands of the district is thus expected to differ considerably. The depth of the ground water table also depends on the distribution of moisture in the various soil horizons. The level of ground water depends to a great extent on the geological conditions too as the height of the water table depends on the underground relief. The relief of the water table changes constantly in relation to the condition of the water balance of soil and ground water. Ground water table is balanced by the amount of rainfall, rate of evaporation, rate of run-off and of the amount that percolates through the soil body. The conditions of ground water table of Malda district, during both summer and rainy season are discussed below,

During summer the water table lies between 7.97 meters to 50.58 meters below the surface over the whole of the district. Major part of the ground water tables lies between 19.98 meters to 39.96 meters from the surface. Water table remains at a greater depth (above 19.98 meters from the surface) in Chanchal, Dakshinsahar, Malda, Sekhpura, Betla etc.

In summer water table lies below on an average of 11.97 meters in Kaliachak Police Station and 19.98 meters below the surface in Habibpur Police station. In most of the area water table lies between 6.90 meters to 39.96 meters covering the blocks of English Bazar, Gajol, Chanchal, Ratua, Harischandrapur-I etc. The depth of the water table from the surface is highest 39.96 meters in Gajol block of Barind area.

During rainy season ground water table lies between 2.92 meters to 25 meters from the surface. Ground water table of the district lies nearer to the surface of the soil. But it is not continuous all over the district. On the south-west, east and in the middle of the district, water table lies between 3.96 meters to 5.97 meters below the surface. In the northern part of the district water table lies below 3.96 meters and more from the surface. The general water table lies more or less nearer to the surface.
2.6 CLIMATE

The Climatic characteristic of the district can be considered as one of the explanatory factor for the nature and type of surface water bodies essentially the ‘beels’ in the district. Reduction in the water quantities during summer months and recharging of water during monsoon and post monsoon months depend to a great extent on the temperature, humidity and precipitation. Rainfall naturally carries slightly more weightage in determining the recharge quantity and quality of water in the beels. The district with its notorious flooding background provides the recharging quantity and quality factors of the beels of the district. A brief description of the climatic parameters of the district is given below-

The Malda district is significantly under hot and humid monsoonal climate. An oppressive summer season, plentiful rain and humid atmosphere all through the year are the main characteristics of the climate of Malda district.

On the basis of temperature variation, rainfall, humidity and winds, the year of the district can be divided into four well defined seasons;

Namely

1) Hot- Summer Season- March to May,
2) Monsoon Season –June to September,
3) Retreating Monsoon-October to November and
4) Winter Season- December to February,

The Hot Summer Season starts from March and ends in the 1st week of June. This season characterized by a rise in temperature, increases in the amount and frequent rainfall with the advance of the season, decreases in diurnal range of temperature. The total average temperature of this season is around 30° c, average diurnal range of about 6° c and average rainfall is 308.7m.m.

The Monsoon Season starts from June and extends up to September. The seasonal characteristic includes weak surface winds, cloudy sky, high humidity and sultry weather. The average rainfall during the season is recorded at 250 cm. Maximum amount of rainfall of the year takes place during this period.

In Retreating Monsoon through there prevails a homogeneous climate in plain nevertheless; a little heterogeneity in climatic conditions within and between different parts of the district in terms of variation in rainfall and range of temperature etc prevails.
The winter season starts from December and ends in February. The main characteristic phenomena of this season is cool weather, frequent morning fog, average monthly temperature above $10^0$ c and a little amount of rainfall.
2.7 **NATURAL VEGETATION**

Natural Vegetation is the first biotic expression of a combination of physical and abiotic indices of a region. Therefore the nature and degree of combination of different physical-geographical parameters are expressed in terms of nature and distribution of vegetation. Since, ‘beels’ are part of macro physical-geographical system the expression in terms of natural vegetation in the beel areas and the region as a whole should be in concordance with each other. But at the same time it’s quite natural expectation that in spite of this uniformity at the macro scale, the beels areas are expected to project a slightly different physical set-up. This in turn should support vegetation characteristics in the beel areas in a slightly different manner. To be precise, the beels should possess a slightly different vegetal characteristics as a part of its micro-ecosystem in comparison to the non-beel areas and the region as a whole.

As a part of the biotic components of the ecosystem in Malda, flora plays their vital role in human survival and activities. There is an alteration of the beels and village shrubberies with the jungle of the Barind region. Where the ground is not occupied by the usual crops, it is covered by abundant natural vegetation excepting the sandy beds of rivers. Old river beds, ponds, marshy land etc. have a copious vegetation of Vallisneria and other plants. Some portions of Barind area are covered by jungles, which consist chiefly of thorny scrub bush jungles mixed with Pipal, Bat, Simul and Pakur trees and Nepal Bamboos. Species of thorny bamboos are also seen in Pandua areas near villages and embankment areas of Gour thickets or shrubberies, ordinary Neem tree, Jack-fruit tree, Tamarind, Bamboo, Peepul tree and Mango tree are seen in plenty. The soil of the western region of the district is particularly suited to the growth of mulberry and mango, for the production of both Malda has become famous. Though large games were found in plenty in the Malda district, the jungles have now mostly been cleared and their inhabitants exterminated by the Santals and Paharias, who have crossed the Ganges in large number to settle in Barind.