CHAPTER-4

4.0 JUNGLE MAHALS OF WEST BENGAL

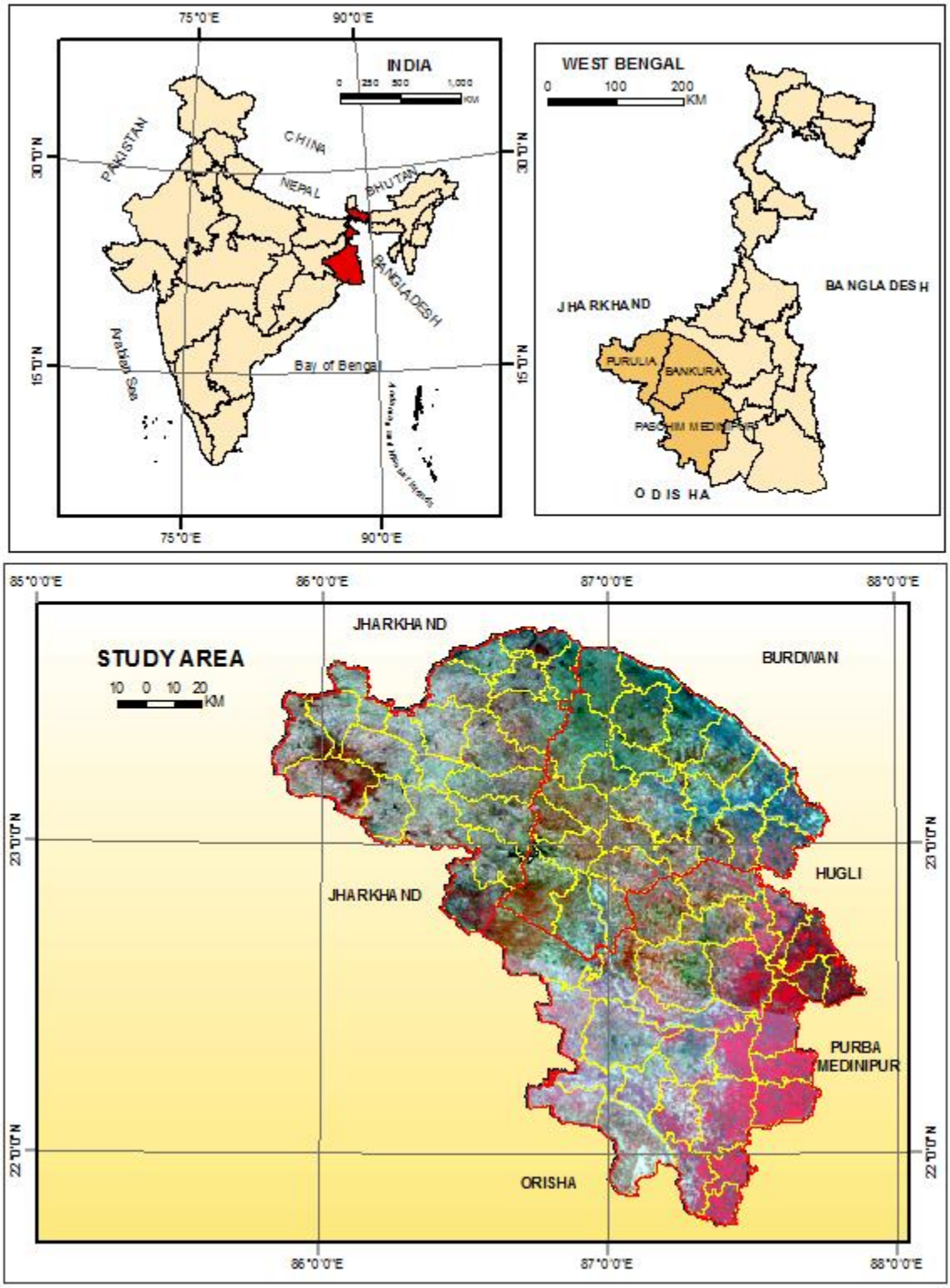

Figure- 4.1: Location of Study Area

4.1 LOCATION AND EXTENT OF THE STUDY AREA:

In the eastern part of undivided India, bordered by Chotonagpur plateau in the west, Himalayan mountain ranges in the north and east and Bay of Bengal in the south, there was a state called Bengal. After independence in 1947, a new country was born named East Pakistan or East Bengal (at present Bangladesh) in the eastern part of Bengal and western part remains inside India and named as West Bengal. Jungle Mahal covers three districts of West Bengal viz. Purulia, Bankura and Paschim Medinipur. It is extended from 86°02'52"E - 87°22'24"E & 23°36'7"N -21°47'5"N on globe. Jhargram, Belpahari, Banspahari, are forest towns and villages famous for their natural beauties, Kangsabati dam in Mukutmonipur is a very beautiful tourist spot. Ajodhya Hill in Purulia is a treasure house of natural beauties. It is a blend of steep mountains splendid waterfalls, dense forests with her wildlife beauties and huge water bodies (reservoirs). It is also appropriate for educational tours from various field of study e.g. Geology, Geography, Botany, Zoology, Anthropology, Sociology etc. Ajodhya hills have been declared as "Conservation Reserve" at the state level by the State Wildlife Board (Anonymous 2006)[13]. Bishnupur is a town and it is famous for its terracotta temple and the balucheri sarees. There is a huge potentiality of development of ecotourism in this 'only hill station' of South Bengal.

History:

Jungle Mahals, literally 'Jungle Estates',(জঙ্গল মহল) was a district formed by British possessions and some independent chiefdoms lying between Birbhum, Bankura, Midnapore and the hilly country of Chota Nagpur (Purulia) in what is now the Indian state of West Bengal.[8] The district was located in the area known as the Jungle Terry, a thickly forested region inhabited by tribal groups such as the Santhal people.

The vagueness of the jurisdiction caused inconvenience. In 1805, Regulation XVIII was passed whereby the areas known as Jungle Mahals was separated from the jurisdiction of the Magistrates of the districts of Burdwan, Birbhum, Bankura and Midnapore and placed under a Magistrate of Jungle Mahals. The district thus formed was composed of 23 parganas and mahals. By Regulation XIII of 1833, the district of Jungle Mahals was broken up. The estates of Senpahari, Shergarh and Bishnupur were transferred to the district of Burdwan and the remainder constituted the district of Manbhum.[8]

4.2 PHYSICAL AND CULTURAL SETTING OF THE STUDY AREA:

Physical and socio-economic conditions of the study area are found to be favorable for the promotion and development of ecotourism as an alternative economic practice of the region.

4.2.1 **Geology:** The greater portion of the Jungle Mahals covering Bankura Purulia, Paschim Medinipur consists of rolling topography covered by laterite and alluvium, while metamorphic or gneiss rocks are found to the extreme west. To the east, there is a wide plain of recent alluvium. The most characteristic geological feature of Jungle Mahals is laterite associated rocks, sand and gravels. Lateritic rocks cover a large area, but in the majority of cases the only variety visible at the surface is a gravelly and nodular rock. The parent rock is a mixture of metamorphic rocks of sedimentary origin and igneous rocks both basic and acidic. Laterite characteristic formation of the three districts occupies a large tract. The thickness of the laterite varies from place to place but is not known to exceed 15m in this area. At some places, one finds hard beds of laterite. At other places decomposed and reorganized. Locally the ferruginous rocks are called Kankar. The calcareous concretions, commonly used as the sources of lime, are known as Ghutin. In a few places the actual contact of the laterite with the underlying rocks can be traced.

In here mineral wealth, Purulia ranks first amongst the districts of West Bengal. The paleogeography of Purulia is very interesting. Its crust was formed into a land surface some four to five thousand million years ago when there was no recognizable sign of life and when the rest of Bengal remain beneath the sea or were mere syncline without water. The district embraces diverse groups of rocks of various geological ages ranging from Archaean to recent viz. I) The Chotonagpur gneissic complex (cover most part of the district), II) Plutonic gabbro and anorthositic rocks, III) Metasedimentary and meta basics of Singhbhum groups, IV) Dalma group of basic volcanic rocks, V) Intrusive granites (Kuilapal, Manbhum granites), VI) Gondowana groups of sedimentary with coal seam and VII) Quaternary sediment in order of decreasing antiquity. Apart from the whole district our study area chiefly constitute of a) Granite gneissic migmatite, b) Mica schist, c) Amphibolites and hornblende schist and d) Intrusive granites (Kuilapal, Manbhum and other granites)[9].

There are two shear zones: 1) South Purulia shear zone WNW – ESE trending tectonically disturbed shear zone. 2) North Purulia shear zone between Jhalda and

Raghunathpur block. There are numerous lineaments picked up by remote sensing in Baghmundi and Balarampur blocks.

As the area under study belongs to the peninsular shield of India it is constituted by the oldest Precambrian or Archaean formation. Beneath the thin soil cover of recent period appears the granite gneiss of the Archaean age except where the gneissic basement is overlain by the metamorphic rocks of Dharwar age and Gondowana deposits of Carboniferous Triassic age. The rocks of Gondowana system consist of glacial materials and fluvial sandstone and shale.

Paschim Medinipur district the surface, or detrital, laterite contains, in more or less abundance, shall rounded fragments of others rocks. The proportion in which these occur in the ferruginous matrix of the rock is very variable. Occasionally they constitute the mass of the rock, and the laterite then becomes coarse gritty sandstone of red color, which does not differ in lithological character from many sandstones of very different geological date. In the northwest of the district micaceous schists crop up from beneath the lateritic flats in a stream near village Silda, and about 8 miles further west a low ridge raises rather suddenly from the lateritic plain. In Gharbeta, Gangani one of the famous tourist place for educational study area for Laterite weathering characteristic formation.

The most characteristic geological feature of Bankura district is the area of lateritic and associated with sand and gravels. In places, one finds true laterite in hard massive beds blocks in other places laterite gravels. North of the district laterite does not cover any great are between the alluvial flats along the Damodar on the one hand and gneiss on the other.

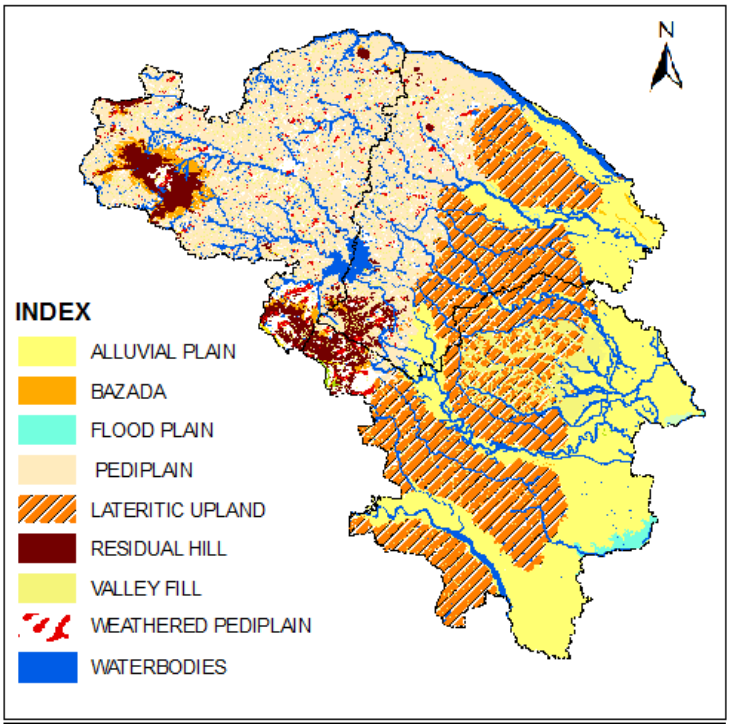

Figure- 4.2: Geomorphology of study area

The Dharwar consist of quartzite slates, mica, and chlorite schist. The Gondowana form the main undoubted representative of subsequent

sedimentation that continued throughout the Upper Carboniferous period and Mesozoic era responsible for the structure. The deposition of these glacio-fluvial sediments in the gradually sinking troughs is responsible for their enormous thickness and also for the preservation of there valuable coal seams from erosion and from the effect of crustal movement (Bhattacharya et al. 1985)[40].

Another point of interest connected with these laterite deposits is that as we approach the gneiss rocks to the west the number and the size of the fragments of quartz, feldspar, and other debris of those rocks increase, clearly indicating the source from which they have been derived. The most important is china-clay, coal, copper, feldspar, fluorite, yellow molding, sand, limestones, asbestos, barites, calcite, fireclay, garnet, graphite, limonite, pyrite, rutile cyanate, magnetite, mica, ochre, building material, iron-ore and a few radio-active minerals. In most importance the uranium (atomic number 92) bearing mineral, alunite occurs as an accessory mineral in the Kuilapal granite- gneiss at the trifunctional of Purulia, Bankura and Paschim Medinipur districts. It also found in the surrounding mica-schists and the calc-granulites intrusions.

4.2.2 **Relief and Topography:** The study boundary of western part consists of outliers of the Chotonagpur plateau. The highlands of area are actually the remnants of the spurs projecting from the Ranchi plateau to the west and functioning as watersheds of the Subarnarekha-Kasaie, Damodar group of rivers. This area western part of high and shout east part is lower this western part average elevation and lower part elevation and average

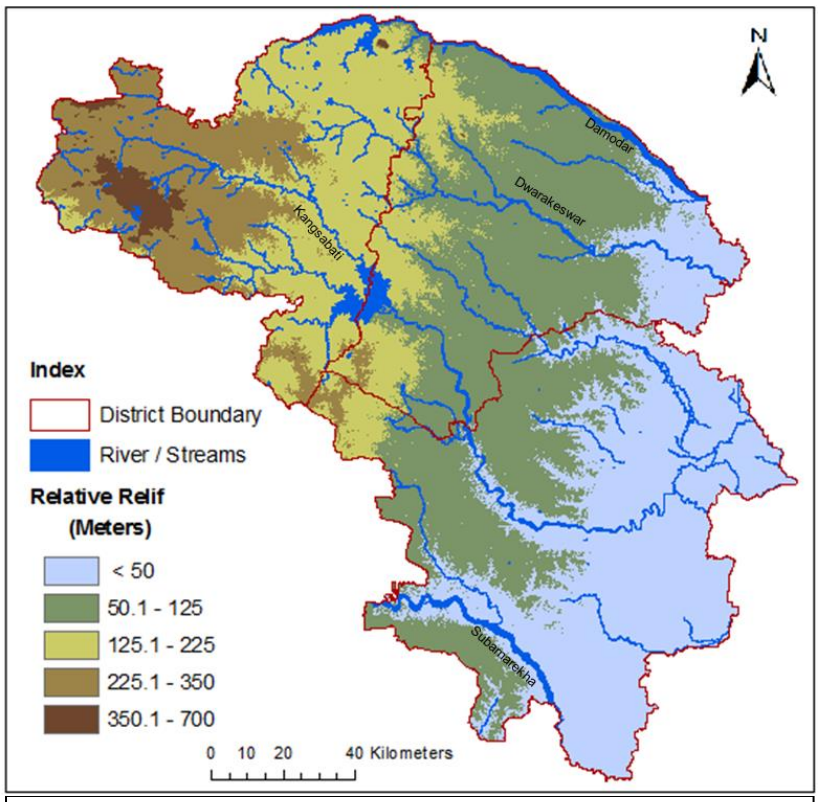

Figure- 4.3: Relief and River / Streams of study area

elevation. There is a long part but in the west the undulating plain and hill tract. Archaean's are the oldest and the most extensive rock formations in the study area the comprise granitic rocks, metasedimentary, calc-granulites and meta basics traversed by quartz and pegmatite veins. They are in fact, the eastern continuation of the peninsular Archaean tract of the Chota Nagpur plateau. In Purulia Due to undulated topography, nearly 50% of the rainfall flows away as runoff the district is covered by mostly residual soil formation by weathering of bedrocks. The Supra-Panchets are characterized by the coarse granted, red, yellow and gray sandstone and quartzes conglomerates with bands of dark red shales the maximum thickness being about 300 meters.

Paschim Medinipur district situated that one most important geological features hinge area of the Chota Nagpur platue and Digha sea coastal belt Paschim Medinipur district is that of large open and well cultivated plain but towards the north-west gentle undulation appears with ridges covered by thick growth Sal tree .there are several hills over 1000 feet in height. The western boundary is more broken and picturesque for lower ranges of Chota Nagpur hills lines the horizon, the jungle assumes the character of the forest.

There are several low hills in Bankura in north-west part; two great height part of Bankura is Biharinath, height 448 meters (1,470 ft) and Susunia, height 440 meters (1,440 ft), Mejia and Kora height above 350 meters. In thana Khatra and Raipur are a number of low pleasing hills, of which one known as Masaker Pahar. Ajodhya (650mt) this is a height ridge region of the area and other hills are Panchet/ Panchakot, Joychandi, Bero, Tilaboni. In the lower part the area has a very gentle slope from East to West. The one falling to the East is almost level while the other is a gently rolling topography punctuated by a small rise here and a matching fall there.

The Purulia upland includes Baghmundi plateau, which is an extension of Ranchi plateau of Chotonagpur region. The residual hills of Ajodhya are situated in the southwestern part of the district with an average elevation of 600m. 300m contour line divides the study area into two parts the hills in the north and the undulated rolling plain in the south. Degradation of the previous cycle and dissection of the present are the two common features of the highland zone. Several dissected ridges with outward facing scarps and splendid waterfalls, with one foot on the lower plain and the other on the hills. Ajodhya Hill forms the main highland of the region of Purulia and acts as a watershed divide between the Kansabati and Subarnarekha River. Numerous small streams drain their water at its southern slope into Subarnrekha River. Turga, Kestabazar and Kathlajal are some of them. The tributaries of northern and eastern slope fall into Kansabati and Kumari River.

The central part of the flat-topped plateau geomorphologically termed as *Plateau hills*. There are few *Stony-wastelands* scattered over the plateau hills. *Structural hills* are found encircling the plateau hills. Some of them are detached from the main highland and remain as *Residual hills*. Poraschists and Gneisses occur on the southern and southeastern face of the Baghmundi scarps where Gorgaburu (677m) and Karma (663m) are the highest peaks. *Denuded hill slopes* are common at the plateau rim. The undulated rolling plain in the south may be divided into *Pediment* (Tanr), *Buried Pediment* (Baid) and *wet in filled Valley* (Kanali / Bahal). The entire highland areas were previously veiled by a dense mixed forest of Sal tree (*Shorea Robusta*) but now under the threat of deforestation (Nag 1994)[90].

The physiography, vegetation and local climatic variation offer a wonderful opportunity to the ecotourism.

4.2.3 **Drainage:** The drainage system of the study area is mainly controlled by the Damodar, Dwarkeswar, Kangsabati, and Subarnarekha River. Although several rivers flow across the district, 50% of the water runoff due to the undulated topography. There are also several small dams like Murguma, Mokutmonipur, Panchet, Pardi, Burda, Gopalpur, which are mainly used for irrigation of agriculture field. These rivers and dams may become great tourist attractions if properly maintained.

Damodar: The Damodar rises in the hills of Chota Nagpur. Its course marks the northern boundary of the Purulia districts through the vest Panchet reservoir. It receives the water of many smaller hill streams including those of the Barakar, its principal tributary. The Panchet dam has been built on the Damodar 5 kms. above the confluence with the Barakar which is the tri-junction of Dhanbad, Barddhaman and Purulia districts. The Panchayat reservoir has submerged a vest area of the district but has also provided hydropower and a flood cushion to the neighboring districts in the lower Domoder valley region. This has greatly controlled the frequency of floods in the lower Damodar basin. Kaighata jor, Bodai and Sali are its main tributaries.

Gobai : The most important right bank tributary of the Damodar emptying into the tail-end of the Panchet reservoir is the Gobai or Gowai Nadi which has only a part of its upper course and the entire lower course within Purulia, but the middle course within Dhanbad (Chas and Chandankiari thanas) districts**.**

Dwarakeswar: The Dwarkeswar is the most important river in the Jungle Mahal region, which flows approximately through the middle of the Bankura district and divides it into two

halves. It rises in the Tilabolni hill adjoining Purulia and Bankura district, flows in a southeasterly course and enters Bankura district in Chhatna block. Below its confluence with Silabati in the lower course, it is known as the Rupnarayan, which debouches into the Bhagirathi near Diamond Harbour in 24-Parganas (South) district of West Bengal. The Silabati, popularly known as Silai is the largest tributary of Dwarkeswar.

Sali: The chief tributary of the Damodar is the Sali, which rises a few miles west of kora hill and fells into the Damodar at the village of Samsar in the thana Indas. This river drains a large portion of the north of the Bankura district.

Silabati: The Silabati or Silai River, as well as the Arkusa Nala and their ramifying channels, have furrowed up the eastern end of the south-east projecting Dwara Keswar-Kasai interfluves at Hura Thana. The Silabati originates at Baragram on the Manbazar – Adra and Bankura-Salanpur road, flows southeast to Bankura district and ultimately joins the Dwarakeswar on the border of Hooghly district.

Gandheswari: The Dhalkisor (Gandheswari) has many branches or old beds in thanas Onda and Bishnupur, most of which meander about for some distance and then rejoin the parent stream. During its course through the district, the Dhalkisor receives many tributaries, the principal of which is Gandheswari. They dry up in the weather, to be again replenished in the succeeding rains and are known as Kana nadis or dried- up rivers. The principal branch is the Jasoda Khal, which separates from the Dhalkisor near Abantika in the Bishupur subdivision.

Kangsabati: The River Kangsabati originates from Jabarband peak on the Ghoramara Pahar, an elevation of 641 meters in the Chhotonagpur range about 48 km. northeast of Purulia Town. The river traverses a length of 368 km. though the district of Purulia, Bankura, and Paschim Medinipur before it joins the River Kalaghai Dhewbhagna to form Haldi. River Kumari is the main tributary of the Kangsabati and joins the river on the right bank near Ambikanagar in the district of Bankura. The other two minor tributaries namely Bhairab Baanki and Tarafeni meet the river on the right bank.

The river up to Midnapore anicut at Mohanpur is known as Kangsabati after which further down up to Kapastikri, it is known as Kasai. At Kapastikari, the river bifurcates into two branches known as the Old Kasai and the New Kasai passes through Panskura and after flowing for a length of 65 Km. it meets the River Kaliaghi forming Haldi. After Old Kasai

flows for about 15 Km. below the bifurcating points, a branch known as Kanki Khal takes off. The Kanki Khal meets Silbabati River. The Old Kasai after flowing for another 10 km bifurcates into the Palaspai Khal and the Durbachati River. The Palaspai has flowed for 16 km. before joining with River Rupnarayan, while the Durbachati flows for about 25 km before joining the Rupnarayan out falling at the River Hooghly.

Subarnarekha: The river Subarnarekha rises from Chhotonagpur plateau near Ranchi (Jharkhand) at an elevation of 610 meters flows through the district of Ranchi and Singhbhum in Jharkhand. It enters Paschim Medinipur district on the North West from Dhalbhum and passes through the south west of Gopiballabhpur Thana. In South of Datan the river enters Balasore in Orissa, falls into the Bay of Bengal. The main tributaries are Kanchi and Karkai in Jharkhand. Dolong is the only tributary of the river Subarnarekha in the District of Paschim Medinipur in West Bengal 2 Km above Rohini. The total catchments area of the river at the Bhasraghat Barrage (proposed) site is 17,498 Sq.Km.

Kaliaghai: The second tributary of the Haldi is the River Kaliaghai, originates from Dudhkundi in Jhargram police station in the district of Paschim Medinipur. During its course of the journey from the high land in the Western part towards the east, it meets with numbers of tributaries namely, Deuli, Kapaleswri, Kalinondap, Ganpath, Chandia on its left and Baghai on its right. River Kapaleswari one of its main tributaries meets Kaliaghai at Langalkata, Thana Sabong and further down the river new Kasai meets at Dhewbhanga. After the confluence point, the river is named as Haldi and finally outfalls into River Hooghly.

Kapaleswari: The river Kapaleswari originates in Kharagpur-II Block and has a total stream length of 40.50 km its confluence with the River Kaliaghai at Langalkata in PS Sabong. The river has a catchment area of 254.25 Sq Km. It is a major tributary of the River Kaliaghai. The river is the main drainage channel in these areas which has a very flat slope resulting in a very low drainage condition.

The Kumari: The Kumari Nadi issues from the eastern face of the Baghmundi uplands covered by dense Sal forest (Mudali Reserve Forest). From the same uplands, the Kumari receives two tributaries: the east-flowing Kunwari Nala at an altitude of about 266 meters and the southeast flowing Hanumata Nala. The Kumari flows south – southeast almost in form of a straight and steep channel and then turns east describing a less steep and more tortuous

channel. The Kumari takes a sharp bend towards the south-east and becomes a perennial stream debouching into the Kangsabati reservoir.

The Panchet, the Kangsaboti Reservoirs and Upper Dam at Ajodhya hill are the most important artificial lakes of the area with a rich variety of scenic beauty which has been attracting tourists for decades

4.2.4 **Climate:** Tourism as its development highly depends on the climate condition of an area. The climate of the Jungle Mahal area has a resemblance with that of the Chotonagpur plateau. The climate of the area is tropical, moist and sub-humid. The climate of the area especially in the upland tracts to the west is much drier than the eastern or southern part. Purulia is one of the drought-prone districts of West Bengal. The study area has a tropical monsoon climate this tract experiences three seasons in a year. It has a subtropical climate nature and is characterized by high evaporation and low precipitation. Relative humidity varies from 20 to 99 % climatologically the months of March to June are extremely hot, the rainy season is oppressively humid and October to February months are the best and most comfortable period for tourist.

4.2.4.1 **Rainfall**: The rainfall is maintained chiefly by cyclonic storms, which form the north-east angle of the Bay of Bengal and influences weather over the whole of the south west of the province and also by inland depressions. There are on an average 71 rainy days in a year in this area. The average annual rainfall is 1300mm. The cold and hot season rain are very scarce. Rainfall during June to September constitutes about 86% of the annual rainfall. August is the wettest month of the year with some intermittent drought spells which may cause crop damage. The monsoon months are comparatively pleasant, as the weather is not as sultry as in other parts of Bengal.

4.2.4.2 **Temperature:** In Jungle Mahal minimum temperature varies from 7.8^0C to 10.1^0C and maximum temperature varies from 37^0C to 45^0C. By the end of February temperature rises over 33°C and by March there is a prevalence of hot westerly winds. May is usually the hottest with the maximum temperature around 46°C. Temperature varies over a wide range from 7^0C in winter to 48^0C in the summer. Record highest temperature is 52^0C some afternoons of March to May get showers from nor westerns associated with thunder and lightning. Monsoon rains occur during mid-June to mid-September with a drop of temperature by about 7-10°C. The diurnal range of temperature is greatest in the spring

months and least in the rainy season. With the onset of southwest monsoon in the area by the first week of June, the temperature decreases appreciably. Winter prevails from the end of October to February. The minimum temperature is usually recorded in the month of January with an average of about 5°C. The range of annual temperature is quite high, the mean being 26°C. The winter is excessively cold and mostly dry due to the incursion of western cold winds from the north and northwest.

The relative humidity is high in the monsoon season, being 75% to 85%. But in hot summer it comes down to 25% to 35% are significant variations of this general pattern in different places within the Jungle Mahals. The maximum relative humidity is recorded in the rainy season with an average more than 80 percent, and the minimum is recorded in the summer months with the average of about 50 percent, when many places of the district experience scorching heat waves.

4.2.5 **Soil Characteristics:** Soil of the study area may be divided into three main categories (Groundwater Resources Assessment and Management of the West Bengal, CSME, 1993) (1) Red Soil (2) Alluvial Soil and 3) Laterite Soil. Typical red soil has limited distribution in the south central, they are the red colored sedentary soil formed from residual parent materials found mainly on laterite supporting Sal vegetation. They are also found along the margins of small hills bare of vegetation. They are free from $CaCO_3$, low in Base Exchange capacity and have a highly unsaturated base.

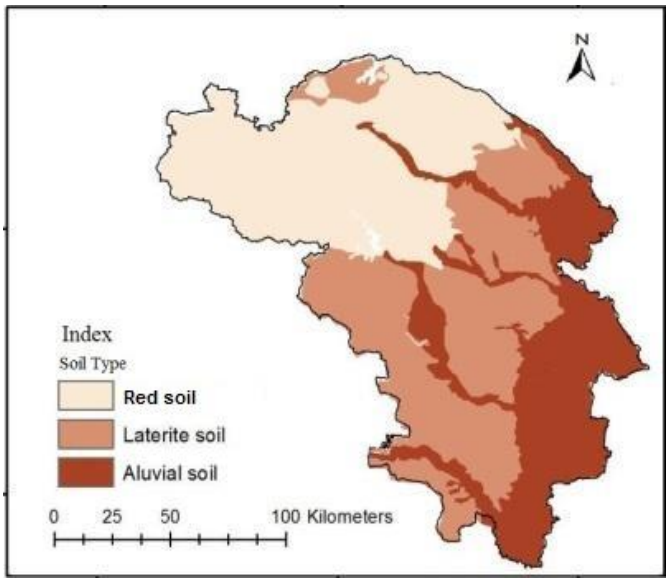

Figure - 4.4: Soil Map

The laterite soil of the hilly area, this owns its origins to the hot and humid climate associated with an alternate period of the wet and dry season. These are residual soil, formed of the bedrock of granite and gneiss i.e. decomposed and designated rocks have formed. Geologically the soil is older but immature compared to the alluvium of the foothill area. Ecological they are however old enough to support plants. When under the forest canopy,

sheltered from direct exposure to erosion the soil get enriched by chemical decomposition of parent materials and organic matter and develop into natural soil. But as soon the vegetation cover is removed the soil is severely depleted by mechanical weathering and erosion. These soils are mostly developed from gneiss. They are usually very shallow, well-drained , gravelly, and loamy to the gravelly loamy surface they developed as a result of lunching of calcium from upper horizon due to heavy and concentration of iron calcium at or near the surface of the soil. The colour of the soil varies from light red to brown depending on the minerals matter. Only at the river bed, there is a concentration of fine loamy of darker.

Brown soils form a group within this class which are also sedentary in nature, mainly derived from rocks like sandstone, granite gneiss and schists. The alluvial soils, which have a wide distribution in the east-central and southeastern part of the district, are grouped according to soil association as Damodar Rajmahal riverine, Damodar flatlands, Damodar highlands etc.

According to the textural types, soils of the district can be classified under the following types: (1) Sandy (2) Sandy Loam (3) Loam (4) Sandy Clay Loam (5) Clay Loam (6) Clay. Clay, clay dominated loam and loamy soils are mostly confident to the flood plains of the Damodar and the Dwarkeswar rivers through sporadic occurrences. This type of occurrences is also seen in other small river valleys. The district as a whole is covered generally by sandy loam.

Soil Characteristics: Soil group in the study area:

(Source: - ICAR-NBSS&LUP)

W102	Very deep well drained, fine loamy soils occurring on very gently sloping to undulating plateau with loamy surface and moderate erosion. Associate with a shallow well-drained , gravelly loamy soils.
W104	Very deep imperfectly drained, fine soil occurring on gently sloping to plateau with loamy surface and severe erosion. Associate with very deep imperfectly drained, fine soils.
W093	Shallow somewhat excessively drained gravely loamy soils occurring on the gently sloping subdued ridges with gravelly loamy surface and server erosion. Associate with very shallow excessively drained gravelly loamy soils.

W091	Very deep moderately well drained, fine loamy soils occurring on very gently sloping to undulating foothills slopes with loamy surface and server erosion. Associate with somewhat excessively drained. Coarse-loamy soils are subject to moderate erosion.
W092	Very shallow, well-drained, gravelly loamy soils, occurring on the gently sloping ridges with loamy to gravelly loamy surface and server erosion. Associate with shallow moderately well drained, loamy soils.
W094	Deep well-drained loamy soils Occurring on very gently sloping to undulating plain with loamy surface and moderate erosion. Associate with deep moderately well drained, loamy soils.
W095	Shallow, moderately well-drained coarse loamy soils, occurring on gently slope undulating plain with gravelly loamy surface and moderate erosion. Associate with shallow moderately well-drained loamy soils.
W096	Shallow, moderately well-drained gravelly loamy soils, occurring on very gently sloping to undulating plain with loamy surface and moderate erosion. Associate with shallow well-drained fine loamy soils.
W097	Very deep imperfectly drained fine soil, occurring on very gently sloping to undulating plain with loamy surface and moderate erosion. Associate with deep imperfectly drained fine soil.
W098	Very deep moderately well-drained fine loamy soils, occurring on very gently sloping to undulating plain with loamy surface and moderate erosion. Associate with deep imperfectly drained fine loamy soil.
W099	Shallow well-drained gravelly loamy soils, occurring on very gently sloping to undulating granite- gneiss plain with a gravelly loamy surface with moderate erosion. Associate with deep imperfectly drained fine loam soils.
W100	Very deep moderately well-drained fine loamy soils, occurring on very gently sloping to undulating plain with loamy surface and moderate erosion. Associate with deep imperfectly drained fine loamy soil.
W108	Very shallow somewhat excessively drained gravelly loamy soils occurring on gently sloping narrow hill sloping with the gravelly loamy surface with moderate erosion associated with deep well-drained fine loamy soils.
W109	Very shallow well-drained gravelly loamy soils on gently sloping hill slopes with gravelly loamy surface and severe erosion. Associate with rock outcrops

W110	Shallow moderate well-drained coarse loamy soil occurring on gently sloping subdued hills slope with loamy surface and server erosion. Associate with very shallow well-drained coarse loamy soil.
W111	Deep moderate well-drained fine loamy soils occurring on very gently sloping to undulating upland with loamy surface slight erosion. Associate with moderately deep, well-drained fine loamy soils.
W112	Very deep moderately well-drained fine loamy soils. Occurring on very gently sloping to undulating upland with loamy surface moderate erosion. Associate with moderately well-drained fine loamy soils
W107	Well deep well-drained coarse loamy soil occurring on very gently sloping valleys on the undulating plateau with loamy surface and moderate erosion. Associate with very deep moderately well-drained fine loamy soils.
W106	Very deep moderately well-drained fine loamy soils. Occurring on very gently sloping to undulating plateau with loamy surface moderate erosion. Associate with shallow well-drained gravelly loamy soils.
W105	Shallow well-drained gravelly loamy soils occurring on very gently sloping to undulating plateau with the gravelly loamy surface with moderate erosion. Associate with rock outcrops.
W113	Shallow imperfectly drained coarse loamy soils occurring on very gently sloping to undulating plain with the gravelly loamy surface with moderate erosion. Associate with deep imperfectly drained fine soil.
W115	Shallow moderate well-drained gravelly loamy soil occurring on gently sloping undulating plateau with gravelly loamy surface and moderate erosion. Associate with shallow imperfectly drained gravelly loamy soil
W064	Very deep moderately well-drained coarse loamy soils. Occurring on a level to nearly level flood plain with loamy surface and moderated flooding. Associate with very deep poorly drained fine loamy soil.
W067	Very deep imperfectly drained coarse loamy soils. Occurring on very gently sloping to undulating dissected upland and loamy surface moderate erosion. Associate with very deep moderately well-drained fine loamy soil.
W069	Very deep poorly drained fine loamy soil developed on old alluvium occurring on gently sloping to undulating dissected upland and loamy surface slight erosion. Associate with very deep poorly drained fine loamy soil.

W068	Very deep imperfectly drained coarse loamy soils. Occurring on very gently sloping to undulating dissected upland and loamy surface moderate erosion. Associate with very deep moderately well-drained fine loamy soil.
W065	Very deep moderately well-drained coarse loamy soils. Occurring on the level to nearly level flood plain with loamy surface and moderated flooding. Associate with very deep poorly drained fine sandy soil.
W070	Very deep poorly drained fine soil Occurring on nearly level upland and loamy surface. Associate with very deep poorly drained fine loamy soil.
W076	Very deep poorly /imperfectly drained fine soil occurring on the level to nearly level marshes in coastal plain with clayey surface and moderate flooding and slight to moderate salinity (limited extended). Associate with very deep poorly drained fine cracking soil.
W085	Very deep poorly drained fine soil[2] occurring on a level to nearly level marshes with clayey surface subject to sever flooding. Associate with very deep imperfectly drained fine soil with severe flooding.
W036	Very deep poorly drained cracking soil, occurring on the level to nearly level low lying alluvial plains with the clayey surface. Associate with very deep imperfectly drained fine soil.
W038-	Very deep poorly drained cracking soil, occurring on the level to nearly level low lying alluvial plains with the clayey surface. Associate with very deep imperfectly drained fine soil.
W041	Very deep poorly drained cracking soil, occurring on the level to nearly level low lying alluvial plains with the loamy surface. Associate with very deep poorly drained fine soil.
W042	Very deep poorly drained fine soil, occurring on the level to nearly level low lying alluvial plains with the clayey surface. Associate with very deep poorly drained fine soil.
W043	Very deep poorly drained fine soil, occurring on very gently sloping nearly level low lying alluvial plains with the loamy surface. Associate with very deep poorly drained fine cracking soil.
W044	Very deep poorly drained cracking soil, occurring on the level to nearly level low lying alluvial plains with the clayey surface with moderate flooding. Associate with very deep poorly drained fine soil.

W047	Very deep poorly drained fine soil, occurring on the level to nearly level low lying alluvial plains with the clayey surface with severe flooding. Associate with very deep moderate well-drained fine loamy soil.

4.2.6 **Natural Vegetation:** These Jungles Mahals area's natural vegetation or natural forest is very important for the nature lover tourists. The natural vegetation of Jungle Mahal area is essentially arboreal. Cultivation is very difficult due to unfertile soil of this area and most of the part forest cover. In summer forest area has been a relaxed zone for vegetation canopy. Vegetation cover and climate variation offer attraction for tourist of a diverse kind. It has however been cleared and degraded or replaced by shrubs bushes meadow and cultivation fields to such an extent that this statement has little practical significance today. The track to the west is laticiferous, undulating and even hilly and possesses a flora closely approximating to that of Chotonagpur. Some parts are entirely wasted while other parts contain small forest cover. The more important species in these areas are Ash-sheora (*Glycosmis arborea*), Bel (*Aegle marmelos*), Chalta (*Dillenia indica*), Sajina/Sanla (*Moringa oleifera*), Bhat (*Clerodendron viscosum*), Goat–begun *(Solanum torvum*), Chikum (*Trema orientalis*), Shaora (*Streblus asper*) and Dumur (*Ficus hispida*). Some other species of Ficus most notably Papal *(F. religiosa*) and Benyan (*F.benghalensis*) with Shimul the red cotton tree (*Bombax ceiba*), Mango (*Mangifera indica*), Jiyal (*Lannea cormandelica*), Nim (*Azadirachta indica*), Kul (*Zizyphus Jujuba*), Siakul*(Z,oneoplea*), Amra *(Spondias pinnata*), Palas (*Butea frondosa*),Siris (*Dalbergia lanceolaria*) Sotsal *(D, latifolia*), Tentul *Tamarindus indica*), Bidha *(Lagerstroemia parviflora*), Karam *(Haldina cordifolia*), Mahua/Mahul *(Bassia latifolia*), Kend *(Diospyros melanoxylon*), lodh*(Symplocos racemosa*), Kanthal (*Artocarpus*

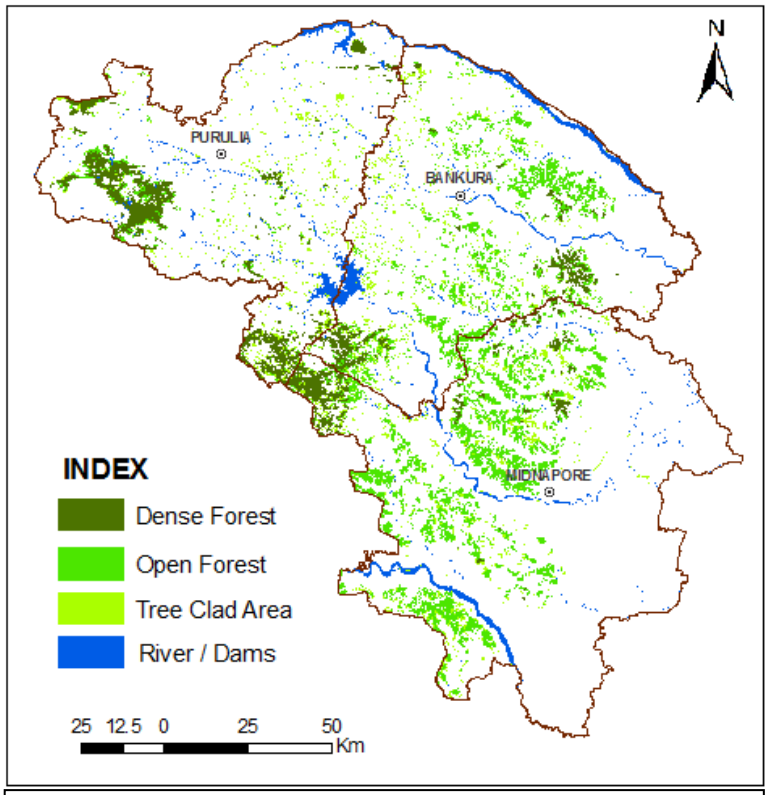

Figure - 4.5: Natural Vegetation with River & Dams

heterophyllus) Sal, Kusum, and Piasal, Mahua (Bassia Latifolia), Palash (Butea frondosa), Kend/Kendu (Dios–pyros), shimul (Bombax malabaricum), kadam (Anthocephalus cadamba), etc. make up the arbores cent part of these thickets, in which Bans (*Dendrocalamus strictus*) and also (*Bambusa tulda*), Khejur (*Phoenixsylvestris*), of the various tidies, vines, hedgerows and other stunted shrubs found mainly in the badlands (Khowai). The most important are the naturalized exotic Varenda (*Jatropha gossypifolia*), Banokra (*Urena lobata),* soft silk cotton creating Golgol (*Cochlospermum gossypium*), various species of fiber yielding shrubs of Malvaceae, Tiliaceas and Sterculiaceae families, the colic relieving Maronphal *(Helicters isora*), the culinary oil producing climber Raerui (*Ventilago calyculata*), Safed Bhangra (*Heliotropium strigosum*), Alkushi *(Mucuna prurita*), Bichuti (*Tragia involucrata*) Dhutura (*Datura fastiosa*), several species of Babla (*Acacia* spp), the dye yielding Mehendi (*Lawsonia inermis*), the house building and dye yielding Dhatke buch (*Woodfordia fruficose*), the Fragrant Sitik (*Nyctanthes arbortristis*), Akand (*Calotropis gigantea*) the inner bark of which produce a strong fiber used for bow strings, the silky hair covering the seeds for stuffing pillows and the root as a dye, the *Dregea Volubilis* (which yields an extremely strong fiber from which Paita or sacred thread is made) etc.

Of fodder grasses the best known is Durba *(Cynodon dectylon*) and Bachkom *(Pollina eriopoda*). These are sometimes cultivated. Bachkom is also used for all kinds of rough twine and cordage. Brooms are made of Kharang (*Aristida* sp) grass. Kher or Sauri *(Heteropogon contortus*) is the principal thatching grass of the district. Bena (*Vetiveria zizanioides*) is found in most areas. Khask has and the weaver's starch applying brushes are made out of the roots of this grass.

In the scrub jungle of the upland the more distinguishing constituents are Chanlai (*Wendlandia exserta*), Gumbar (*Gmelina arborea*), Nacom (*Adina cordifolia*), Kurchi *(Hollarhena pubescens*), Indrajab (*Wrightia tomentosa*), Nishinda *(Vitex negundo),* Asan (*Terminalia alata*), the tasar silkworm rearing trees and others. The scrub jungle gradually merges into the forests, due to more favorable environment, large trees grow close together and form the third type vegetational landscape of the Palmyra palm and Tal (*Borassus flabellifer*) occurs in large numbers, which yields valuable wood is fairly abundant. The Jungle Mahals land is tropical moist deciduous forests (characterized by lofty buttressed trees rising to 40 meters to from the top canopy).

This area is covered predominantly with Sal *(Shorea robusta*) of coppice origin on an average 60% area is covered with Sal and the rest is covered with plantation on, scrub jungles and bushes. Sal forest in this region fall under major group-II, dry tropical forests, tropical

dry deciduous forests, Northern tropical dry deciduous forests dry Sal bearing forests dry peninsular Sal forests according to Champion and Seth's classification of forests types. It is the Dom Sal *(Miliusa velutina*) of the lower hills, the heart wood of which is white slightly tinged with red. The Sal timber is heavy, strong and tough. The forest fruit of these areas is edible, the resin is used locally for various purposes and the bark serves as a tan. This is the sacred tree of tribal's the tribal deities being worshipped under its shade. The Muchkunda *(Pterospermum acerifolium*) is a tall evergreen tree, not very common, the large white flowers of which are used as a disinfectant. Bel is found wild, but Katbel *(Limonia acidissima*) is also not so common. The Tun (*Toona ciliata*) is a tall elegant tree. Its crowns spread out in many parasols of subtle greenery. Its roseate and scented wood is resistant to white ants and well used for construction determinations, cabinet work and cigar boxes. The seeds and leaves are used as cattle feed. The bark is a powerful harsh, these forests occur in rambling covers of varying sizes and in many instances an island among cultivation fields and occupancy. Plantation of trees includes mostly Eucalyptus, Akashmoni, Bamboo and Kaju etc.

(Table:- 4.1) The forest covered area according to forest report in West Bengal, 2011-12.

District name	Recorded Area (sq km)	Recorded (%)
Bankura	1482	21.53%
Purulia	876	14%
Paschim Medinipur	1709	12.14%
	Total	47.67%

Source: Forest Report of West Bengal 2011-2012. (ref[6])

4.2.7 **Animal Community:** Animal Community till existing in the forest becomes another region for an attraction of tourism. The physical features of large part of Jungle Mahals resemble those of the adjoining of the Chotonagpur is far from being so well stocked with game. Formerly the moist deciduous forest of the district supported a wide variety of herbivores and carnivores intimately linked to their habitat. But with the appearance of secondary forest and biotic interference, the mammal population decreased. Wild elephants have seen in the jungles for search of food from the Dalma forest range. The largest carnivore of the Jungle Mahals area is the Leopard. It is a rear animal and other wild cats, the jungle cut (ban biral) and leopard cat (chita biral) so called because of its resemblance with a small leopard. The wolf is rear but jackal and fox (khek-sial) are very common. The black or sloth

bear, otter (bhonder) may be seen near water bodies. The Indian grey mongoose (neul) sound everywhere keeps the population of snakes in cheek and wild pig (buno sour). The barking deer (muntjac) locally known as kukuoor harin is the most frequently seen of the deep Jungle Mahals area. Rabbit (khargosh) is very commom, the rhesus macaque (lal-bandar) is found everywhere but langur (hanuman) is restricted to the more wooded parts, through it visits the plains during summer in search of ripe fruits. The striped squirrel (kath-biral) and the porcupine are common all over the Jungle Mahal area.

The numerous species of birds unique to area conveniently are divided into game and non-game birds. Of the game bird, the little dabchick (pandubi), quails, pigeons, and the gray partridge (titir) are fairly commom). The black partridge, jungle fowl (ban murgi) pea-fowl (mayor) are almost on verged of extinction (Bhattacharya et al. 1985)[40].

4.2.8 Population Distribution: The state of West Bengal in India exhibits a considerable amount of heterogeneity as far as intra-regional development is concerned. Among various underdeveloped pockets of the state, one of the least developed zones is Jungle Mahals. Though there is no official recognition, the forest and hill based areas of districts of Paschim Medinipur, Bankura and Purulia of West Bengal is presently known as Jungle Mahals. These areas are mainly inhabited by tribal population.

Category Wise Distribution of Population: These districts are largely inhabited by scheduled tribes, scheduled castes and backward communities. As per 2011 Census, Scheduled Caste (SC) population constitutes 10.7% total population of West Bengal. From the district, wise distribution Purulia district is having the second highest percentage of the tribal population of the state (18.3%). Bankura has also a considerable representation of ST population. Apart from SC and ST population Jungle Mahals is the home of a considerable number of Other Backward Classes (OBC) population. There is however ambiguity regarding the actual number of OBCs residing in Jungle Mahals. People of different religious communities live in Purulia, the majority of the people (about 83.42%) believe in Hinduism. Santhal, Munda, Lodha Bhumij, Kora, Saddar, Oraon, Birhore etc. are some eminent tribal groups of this region (Basu, 1968)[38]. The land is known as the habitat of aboriginal Austro-Dravidian people from the Neolithic period. They practice animism tokenism and have distinct social structures and institutions. With the passage of time, their institutions are succumbing to the pressure of increasing cultural-political influences of the surrounding agrarians of the Hindu community (Siddique et.al, 1998)[103].

In Jhargram subdivision of the district of Paschim Medinipur scheduled tribes form 31% and scheduled castes form 20% of the population. Among the other caste-groups, there are communities like Mahato, Kumbhar, Teli, Tanti, Bangal, Raju, Khandayet, Tambuli etc. The Mahatos' constitute the largest caste group. Mahatos' call them as "Kurmikshatriya" and their ancestors were mainly nomadic professional soldiers. As far as their physical appearance, culture, the language there has been high resemblance with other tribes of the region but the interesting fact is that up to 1931 this community was considered as a tribe but according to tribal anthropologists no such list existed before independence. Low population density blocks are this area satiated are hilly and forest cover tribal people area. Large no of the block is low to very low population density so this area suitable for tourisms. (Anonymous, Census 2011).

4.2.9 Social Structure: India has the second largest attentiveness of tribal population, after that of the African continent. The Scheduled Tribes people have been an important part of the total population of West Bengal. As per 2011 Census, there are 38 tribal groups living in the state of West Bengal. The Indian tribes belong to over 550 communities (though only 427 are officially recognized). About 87% Scheduled Tribe population is concentrated in the central belt covering 8 states in the Madhya Pradesh, Chhattisgarh, Orissa, Bihar, Jharkhand, Maharashtra, Gujarat, Rajasthan, Andhra Pradesh and West Bengal.

The study has been accompanied by the five specific tribal groups viz. Santhal, Munda, Lodha, Savar and Birhor within the block areas of Jhargram and Sankrail in Paschim Medinipur district and Bagmundi, Jhalda-I and Balarampur in Purulia district. The Lodha and Birhor are the primitive tribal groups (PTGs) and their socio-economic status is not so advanced in comparison to that of the Santhal community in two blocks in Jhargram sub-division of Paschim Medinipur District, namely, Jhargram and Sankrail whereas the Birhor are only concentrated in three blocks in Purulia district viz. Balarampur, Bagmundi and Jhalda-I. The study uses data taken from three censuses namely, Census-1991 and Census - 2001, Census- 2011, the study decennial growth rate flowing given table.

Table:- 4.2 Decennial Growth Rate

District	Area (km^2)	Population (2011)	Decennial Growth Rate (%)		Population Density (sq km)	
			1991-2001	**2001-2011**	**2001**	**2011**
Bankura	6882	3192695	13.82	12.64	464	523
Purulia	6259	2536516	14.02	15.43	405	468
Paschim Medinipur	9345	5193411	15.76	14.44	556	636

Source: Census

This forest covered area Bankura Purulia Paschim Medinipur is one of the backward districts of West Bengal in terms of economy and human development.

Table:- 4.3 Social population structure of the study area (Bankura, Purulia Paschim Medinipur):

Study Area	Total Population	Male	Female	ST	SC
	1,14,74,907	5851816	5623091	1764075	2713339
Percentage (%)		51	49	15.37	23.65

All the people belonging to Bengali Hindu castes and Bengali Muslims have *Bengali* as their mother tongue; all the Bhumijs adopted Bengali as their mother tongue. Similarly, 100% of the Mahatos and Mahilies, returned to Bengali to be their mother tongue. Therefore in the year 2001, 78% of the people of the study area were Bengali. The people having *Santali* as their first language or mother tongue constitute the second demographically largest (16%) speech group in the region. About 76.85% of the ethnic Santals still retained their mother tongue, while 23.15% adopted other languages probably Bengali as their first language (Bhattacharya et al. 1985)[40].

4.2.10 Education and Economy: Education is thoughtful as well as a sociological concept. The 'Education' is an integral part of the empowerment procedure. Empowerment of the tribal community means capacitating tribal communities to secure access and control of their land, forest and water resources as well as sustains and promotes practical alternatives for the security of their livelihoods. Empowerment thus is an interactive process whereby tribal communities are enabled to participate actively in local governance. Education is essential for human emancipation and social development. It contributes to better health, higher productivity, greater income, human freedom, capability and esteemed living, increased

participation in community life. Education is the single best development investment and a powerful instrument to develop an economically prosperous society. As a tribal area Jungle Mahal is a backward area of West Bengal in terms of economy and human development. The literacy rate of this area 62.64% as per Census 2011. Female literacy percentage is not sufficient. So education and economic is a very important part of these area tourism infrastructure. Tour guide alternative income for local people.

The literacy rate of Bankura District in 2011 was 70.26% compared to 63.44% of 2001, male and female literacy was 80.05% and 60.05 % respectively. This backward districts rural area average literacy rate 68.93% and urban area literacy rate 84.42%. The male literacy rate is for rural 79.10%, urban area 90.15%, female literacy rate for rural 58.31% and urban area 78.50 %. Purulia is one of the backward districts in India. The average literacy rate of Purulia in 2011 was 64.48% compared to 55.57% of 2001. If things are looked out at gender wise, male and female literacy was 77.86% and 50.52% respectively in 2011. For the 2001 Census, same figures stood at 73.72% and 36.50%. The average literacy rate of Paschim Medinipur in 2011 were 78.00 compared to 70.41 of 2001, gender wise, male and female literacy was 85.26% and 70.50%. For 2001 census, same figures stood at 81.28 and 59.11 in Paschim Medinipur District

Due to the rough weather and soil, Purulia lags behind in the agricultural arena from the other districts of West Bengal. However, cultivation of silk and lac are the main agricultural products. The economy of the Purulia district is mainly driven by the tourism sector and the small industrial sector. The new industrial policies of Government of West Bengal, this district have attracted investments in steel, cement and power sectors. The district has large scale industries like Santaldih Thermal Power Station at Santaldih, Pumped Storage Project at Baghmundi, ACC Damodar Cement Factory at Madhukunda. Besides this, it has investments on steel and cement sectors. In addition the manufacturing sector especially the sponge iron sector got an investment, which is comparable to the economically developed districts of West Bengal.[20]

Tourism is another source of income for this district. Forests, Hillocks, Rivulets, Streams, Wild Life, Flora & Fauna have tremendous scope to be explored by the tourist. The prominent of the district like Ajodhya Hills, Matha, Murguma Dam and Kuilapal Forests,

Jaychandi Pahar, Panchakote Raj, Duarsini Hills and Forests attract quite a good number of visitors to Purulia every year.

Mejia thermal power plant is the only thermal power plant of Bankura District. The Bankura district is famous for some unique traditional crafts, terracotta (pottery) work of Panchmura, Baluchari silk sarees of Bishnupur, Dokra work of Bikna, Patrasayer and Gopalpur, the stone craft of Susunia are unique in the state. There are large pockets in the district where the people have endogenous skills in manufacturing fishing hook, fishing net, bamboo craft and manufacturing of babui rope. Purulia Chou dance is the tourism relate the best income for motherland people. Bankura world-famous Terracotta of Bishnupur (Bankura) forms began under the Molla dynasty, during the late medieval period. Bankura district is famous for its Terracotta Temples of Bishnupur and many other places in the area. Susunia hills and Beharinath hills, Mukutmonipur dam and Jaipur forest are notable tourist spots.

Paschim Medinipur is quite proximate to Kolkata. It has an excellent of transport and communication network of national highways, railways and major existing Industrial base. Kharagpur is well poised for getting industrial projects and investment especially in the Iron and Steel and allied Industrial Projects due to its proximity to various factors of production like mineral resources. Indian Institute of Technology, Kharagpur also makes access to technology and modern processes easy. The District has a number of natural advantages for Industrial and allied development. Though it may not have any mineral resources, it is very much close proximity to the mineral resource area of Jharkhand and Orrisa. The District has extensive areas under forest and social forestry which can be used for development of paper and pulp industry and other industries based on forest product. Along with rice, as the staple crop, potatoes, cashew nuts, mustard, betel leaves, flowers and fruits are some of the agricultural produce which can be processed in a value-added product.

Industry helps for local people development and this area develop by infrastructure like at the road, light electricity, employment. The West Bengal Government attaches maximum importance to providing necessary assistance and guidance to industrialists for facilitating industrial growth through Public Private Partnership (PPP) model.

4.2.11 Land use / Land cover scenario: The study area is divided into three distinct topographical regions viz hilly terrain, the undulating central part and alluvial plain in the eastern part. Drought-prone areas are identified in as many blocks. Dryland agriculture is practiced in the Jungle Mahals for which watershed management and water harvesting structure are very much essential for sustainable agriculture land utilization.

A **s**ignificant part of Purulia district is covered by dense to the moderate or thin forest. These areas are classified into the plantation, evergreen or semi-evergreen forest and deciduous scrub forest. Large numbers of the area are mono cropland (Kharif crop) with undulating and fallow land most one. In Purulia district Ajodhya ridge covered dense forest, there is no such suitable agriculture land and this area situated at Jhalda-I, Jhalda-II Baghmundi, Ashra. Others dense forest cover areas are Jhalda - II upper part, Balarampur west-southern part is border area of Jharkhand state, Neturia block Panchet hill region. Built

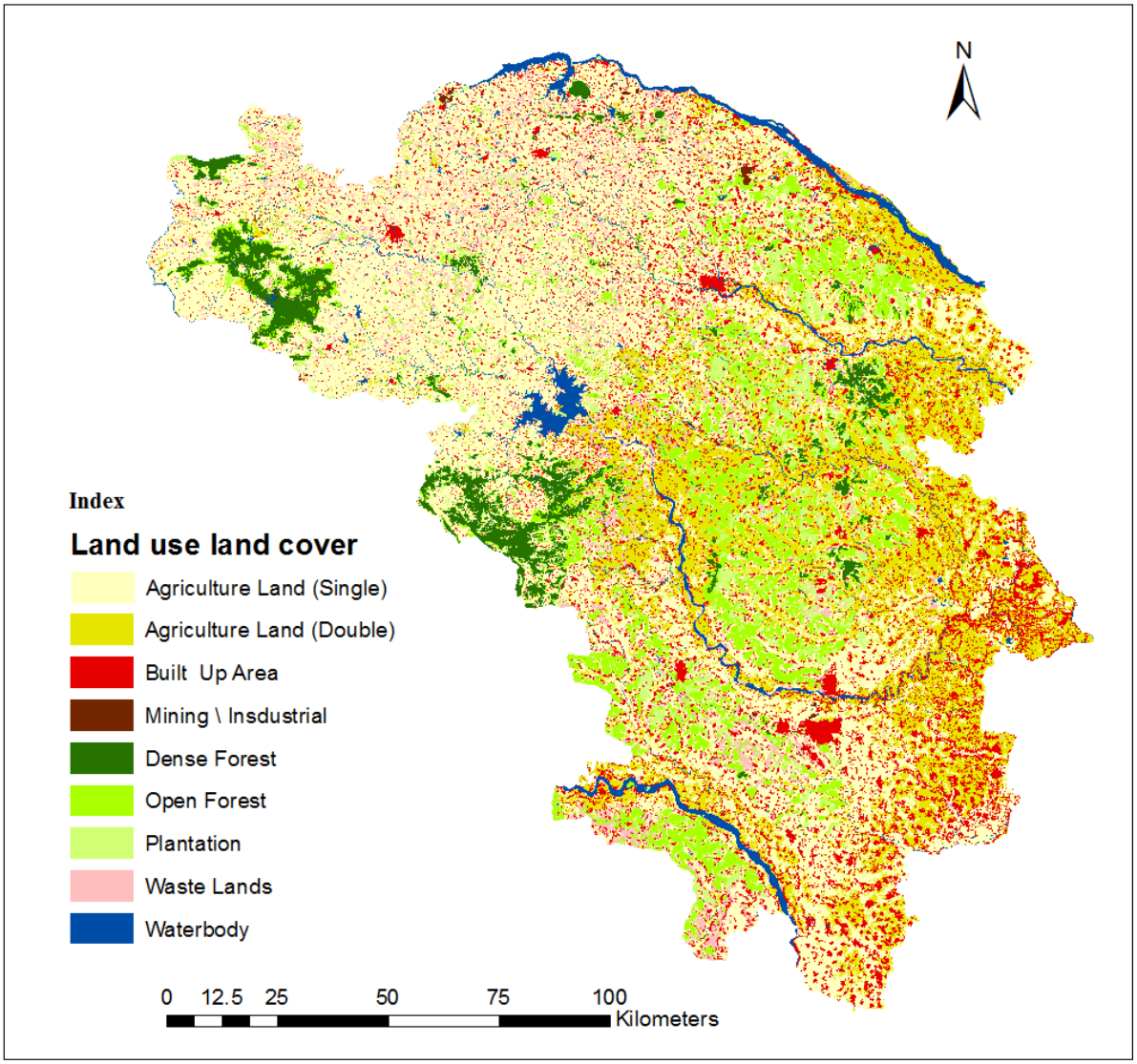

Figure 4.6: Land use / Land cover Map

–up area land it is an area of human habitation developed due to non-agricultural use and that has the cover of building transport and communication utilities. Settlement areas are growth and increase rapidly in this area. Main drainage system small rivers (Nalla) flow river covers by hilly undulating red corridor Jungle Mahals Chotonagpur terrain area. Bankura is the major district of the Jungle Mahals area. It's land use pattern various different basically, this area land use land cover determined such as agriculture land, built up land, dense forest, open forest, water body, sand, wetland, permanent fallow.

The western surface of the district gradually rises, giving way to the undulating country, interspersed with rocky hillocks, mostly large area covered by dense, open forest & permanent fallow. Damodar River valley east part of the Bankura district, such as block Sonamokhi, Barjora, Kotulpur, Indus, Joypur, Majhia, exist multi-crop agriculture area (Kharif, rabi or zaid). Others river valleys are Kangasabati, Dwarkeswar, Sitaboti riverside area also much double-crop agriculture lands. Adjoining part of Purulia, Bankura border area Kangasabati and Kumari river has created a confluence and constructed a big water reservoir famous Mukutmonipur dam occupy Manbazar, Khatra, Ranibandh blocks.

The district Paschim Medinipur, large area covered by dense Sal forest in Binpur-I, Binpur-II, Salboni, Jhargram, Gharbeta-I, Ghargeta-II, Chandrakona-I. Large numbers of an area of all block are open forest and plantations. The lower part is Ganga delta, this area alluvial fan valley plain area double crop (Kharif, rabi or zaid) agriculture field, mostly Debra, Pingla, Sabang, Narayangarh, Datan-II, Mohonpur, Gopiballavpur high percentage agriculture land. Midnapur town, Kharagpur town, Jhagram towns are an important built up area.

Land use & Land cover	**Total area (Sq km)**	**Area in percentage (%)**
Agriculture Land (Double Crop)	4254.89	18.84
Agriculture Land (Single Crop)	9536.60	42.22
Built Up Area	2630.74	11.65
Built Up Area (Mining / Industrial)	45.71	0.21
Dense Forest	869.17	3.86
Open Forest	2007.033	8.86
Plantation	1193.95	5.29
Waste Land	1250.09	5.53
Water Body	800.75	3.54
Total	**22588.93 sq km**	**100**

Table 4.4 Area under different Land use & Land cover classification, 2016.