



INTACH
INDIAN NATURE CONSERVATION

MURSHIDABAD

GNAMAMI GANGE

DOCUMENTATION OF GANGA FROM GOMUKH TO GANGASAGAR



Report submitted by:
The Natural Heritage Division

GANGA CULTURAL DOCUMENTATION

MURSHIDABAD DISTRICT

Natural Heritage Documentation

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Sponsored by :



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Authored By :



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Abbreviations

AISLUS	All India Soil & Landuse Survey
As	Arsenic
ASI	Archaeological Survey of India
BGL	Below Ground Level
BOD	Biochemical Oxygen Demand
CGWB	Central Ground Water Board
COD	Chemical Oxygen Demand
CPCB	Central Pollution Control Board
CPT	Calcutta Port Trust
DEM	Digital Elevation Model
DO	Dissolve Oxygen
DPMS	District Planning Map Series
DWF	Dry Water Flow
E-Waste	Electronic Waste
EC	Electrical Conductivity
EKW	East Kolkata Wetlands
EMP	Environmental Management Plan
ETM	Enhance Thematic Mapper
FCC	False Colour Composite
GAP	Ganga Action Plan
GCP	Ground Control Point
GIS	Geographic Information System
GOI	Government of India
GoWB	Government of West Bengal
GPS	Global Positioning System
GSI	Geological Survey of India
HWL	High Water Level
IMD	Indian Meteorological Department
INTACH	Indian National Trust for Art & Cultural Heritage
IWMED	Institute of Wetland Management & Ecological Design
K	Potassium
KEIP	Kolkata Environment Improvement Project
KIT	Kolkata Improvement Trust
KMA	Kolkata Metropolitan Area

KMC	Kolkata Municipal Corporation
KMDA	Kolkata Metropolitan Development Authority
LULC	Landuse Land cover
LWL	Low Water Level
MSL	Mean Sea Level
MSS	Multi Spectral Scanner
MWL	Mean Water Level
N	Nitrogen
Na	Sodium
NATMO	National Atlas & Thematic Mapping Organisation
NBSS&LUP	National Bureau of Soil Survey & Landuse Planning
NDVI	Normalised Differential Vegetation Index
NH	Natural Heritage
NMCG	National Mission for Clean Ganga
NTFP	Non Timber Forest Product
pH	Hydrogen Ion Concentration
PPT	Precipitation
RF	Rainfall
RGB	Red Green Blue
RS	Remote Sensing
SPM	Suspended Particulate Matter
SRTM	Shuttle Radar Topographic Mission
SWID	State Water Investigation Directorate
TM	Thematic Mapper
UNDP	United Nations Development Programme
USGS	United Nations Geological Survey
WBPCB	West Bengal Pollution Control Board
WF	Wetland Fauna

CHAPTER 1 - INTRODUCTION

1.1. Background of the Project

Namami Gange Programme', is an Integrated Conservation Mission, approved as 'Flagship Programme' by the Union Government in June 2014 with the twin objectives of effective abatement of pollution, conservation and rejuvenation of National River Ganga.

1.1A. Key achievements under Namami Gange programme:

- a. **Creating Sewerage Treatment Capacity:** 63 sewerage management projects under implementation in the States of Uttarakhand, Uttar Pradesh, Bihar, Jharkhand and West Bengal. 12 new sewerage management Projects Launched in these states. Work is under construction for creating Sewerage capacity of 1187.33 (MLD). Hybrid Annuity PPP Model based two projects has been initiated for Jagjeetpur, Haridwar and Ramanna, Varanasi.
- b. **Creating River-Front Development:** 28 River-Front Development projects and 33 Entry level Projects for construction, modernization and renovation of 182 Ghats and 118 crematoria have been initiated.
- c. **River Surface Cleaning:** River Surface cleaning for collection of floating solid waste from the surface of the Ghats and River and its disposal are afoot and pushed into service at 11 locations.
- d. **Bio-Diversity Conservation:** Several Bio-Diversity conservation projects are namely: Biodiversity Conservation and Ganga Rejuvenation, Fish and Fishery Conservation in Ganga River, Ganges River Dolphin Conservation Education Programme has been initiated. 5 Bio-Diversity center's at Dehradun, Narora, Allahabad, Varanasi and Barrackpore has been developed for restoration of identified priority species.
- e. **Afforestation:** Forestry interventions for Ganga through Wildlife Institute of India; Central Inland Fisheries Research Institute and Centre for Environment Education has been initiated. Forestry interventions for Ganga have been executed as per the Detailed Project Report prepared by Forest Research Institute, Dehradun for a period of 5 years (2016-2021) at project cost of Rs.2300 Crores. Work has been commenced in 7 districts of Uttarakhand for medicinal plants.
- f. **Public Awareness:** A series of activities such as events, workshops, seminars and conferences and numerous IEC activities were organized to make a strong pitch for public outreach and community participation in the programme. Various awareness activities through rallies, campaigns, exhibitions, *shram daan*, cleanliness drives, competitions, plantation drives and development and distribution of resource materials were organized and for wider publicity the mass mediums such as TV/Radio, print

media advertisements, advertorials, featured articles and advertorials were published. Gange Theme song was released widely and played on digital media to enhance the visibility of the programme. NMCG ensured presence at Social Media platforms like Facebook, Twitter, YouTube etc.

- g. **Industrial Effluent Monitoring:** The number of Grossly Polluting Industries (GPIs) in April, 2019 is 1072. Regulation and enforcement through regular and surprise inspections of GPIs is carried out for compliance verification against stipulated environmental norms. The GPIs are also inspected on annual basis for compliance verification of the pollution norms and process modification, wherever required through third party technical institutes. First round of inspection of GPIs by the third-party technical institutes has been carried out in 2017. Second round of inspection of GPIs has been completed in 2018. Out of 961 GPIs inspected in 2018, 636 are complying, 110 are non-complying and 215 are self-closed. Action has been taken against 110 non-complying GPIs and is issued closure directions under Section 5 of the E (P) Act. Online Continuous Effluent Monitoring Stations (OCEMS) connectivity established to CPCB server in 885 out of 1072 GPIs.
- h. **Ganga Gram:** Ministry of Drinking Water and Sanitation (MoDWS) identified 1674 Gram Panchayats situated on the bank of River Ganga in 5 State (Uttarakhand, Uttar Pradesh, Bihar, Jharkhand, West Bengal). Rs. 578 Crores has been released to Ministry of Drinking Water and Sanitation (MoDWS) for construction of toilets in 1674 Gram Panchayats of 5 Ganga Basin States. Out of the targeted 15, 27,105 units, MoDWS has completed construction of 8, 53,397 toilets. Consortium of 7 IITs has been engaged in the preparation of Ganga River basin Plan and 65 villages have been adopted by 13 IITs to develop as model villages. **UNDP** has been engaged as the executing agency for rural sanitation programme and to develop Jharkhand as a model State at an estimated cost of Rs. 127 Crore.

National Mission for Clean Ganga (NMCG) endeavors to deploy best available knowledge and resources across the world for Ganga rejuvenation. Clean Ganga has been a perennial attraction for many international countries that have expertise in river rejuvenation. Countries such as Australia, United Kingdom, Germany, Finland, Israel etc. have shown interest in collaborating with India for Ganga rejuvenation. Memorandums of Understanding (MoUs) were signed with various Central Ministries viz.- Ministry of Human Resource Development, Ministry of Rural Development, Ministry of Railways, Ministry of Shipping, Ministry of Tourism, Ministry of Ayush, Ministry of Petroleum, Ministry of Youth Affairs and Sports, Ministry of Drinking Water & Sanitation and Ministry of Agriculture for synergizing the Government schemes.

1.1B. Why we need "Namami Gange" programmes:

- a. River Ganga has significant economic, environmental and cultural value in India.
- b. Rising in the Himalayas and flowing to the Bay of Bengal, the river traverses a course of more than 2,500 km through the plains of north and eastern India.
- c. The Ganga basin - which also extends into parts of Nepal, China and Bangladesh - accounts for 26 per cent of India's landmass.
- d. The Ganga also serves as one of India's holiest rivers whose cultural and spiritual significance transcends the boundaries of the basin.

1.1C. Aim & Objective of NMCG

The aims and objectives of NMCG are to accomplish the mandate of National Ganga River Basin Authority (NGRBA) are:

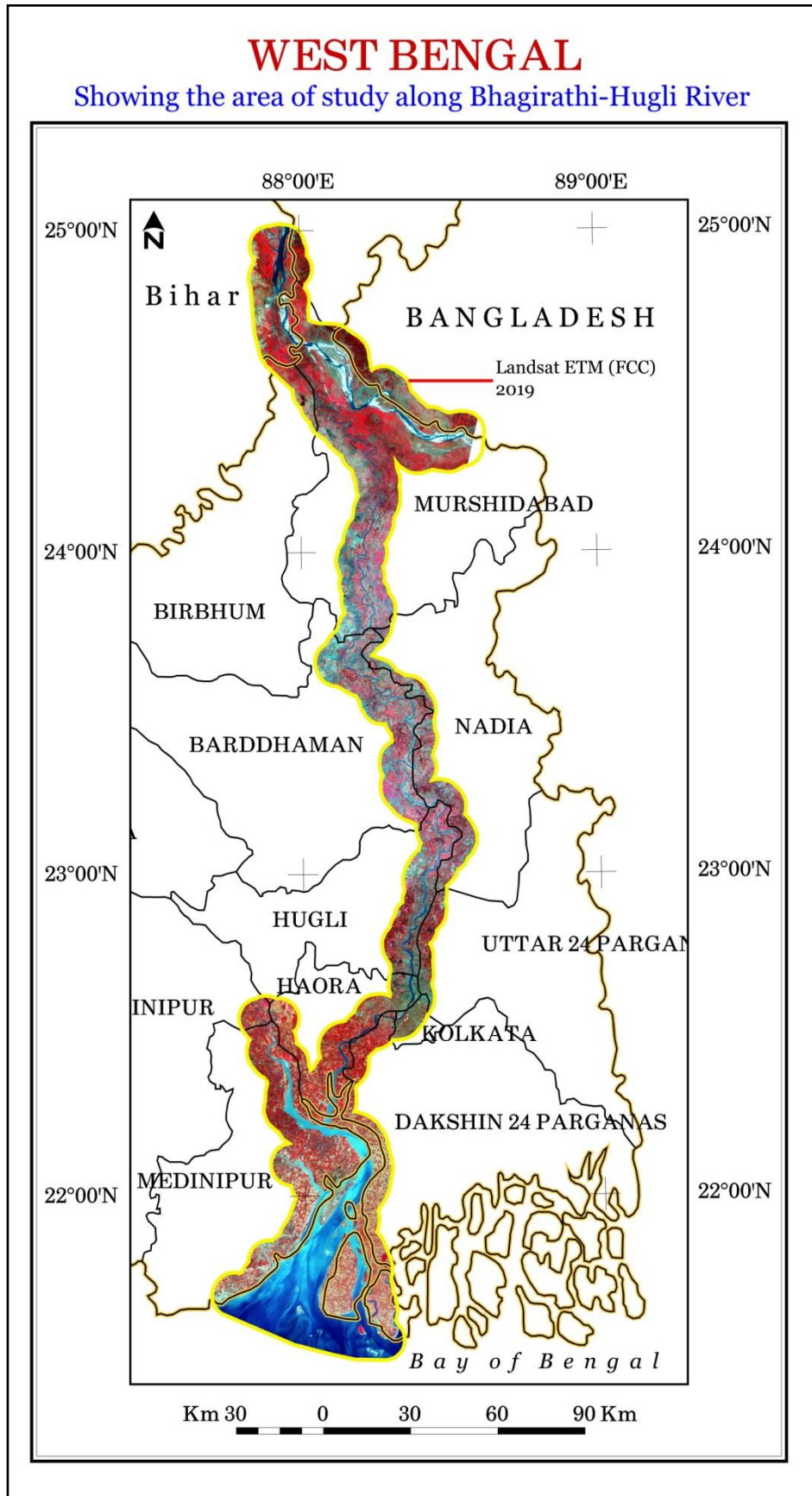
1. To ensure effective abatement of pollution and rejuvenation of the river Ganga by adopting a river basin approach to promote inter-sectoral co-ordination for comprehensive planning and management and
2. To maintain minimum ecological flows in the river Ganga with the aim of ensuring water quality and environmentally sustainable development.

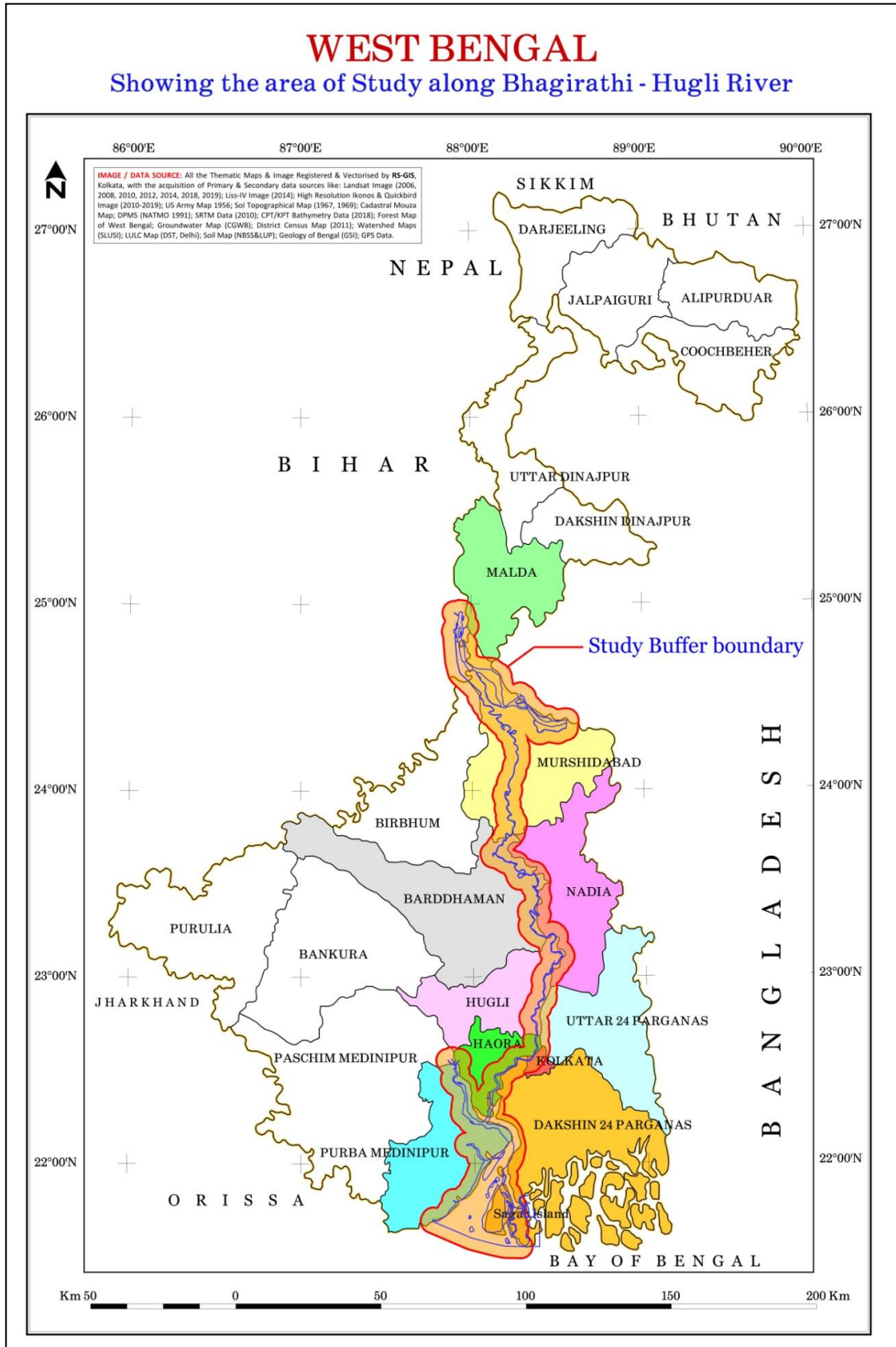
1.2. Ganga Cultural Documentation

India is endowed with rich water resources with approximately 45,000 km long riverine systems criss-cross the length and breadth of the country. The Ganga river basin is the largest of the basins of India with an area of 8,61,452 Sq.km in India, draining into the 11 states of the country, Uttarakhand, Uttar Pradesh, Haryana, Himachal Pradesh, Delhi, Bihar, Jharkhand, Rajasthan, Madhya Pradesh, Chhattisgarh and West Bengal. The Ganga river has many tributaries, both in the Himalayan region before it enters the plains at Haridwar and further downstream before its confluence with the Bay of Bengal. The basin has a total drainage length of about 624235.73 Sq.km. The Ganga basin lies between east longitudes 73°2' to 89°5' and north latitudes 21°6' to 31°21' having maximum length and width of approx. 1,543 km and 1024 km. The average water resource potential of the basin has been assessed as 525020 Million Cubic Meters (MCM).

Table No 1 : Murshidabad District Details

Sl.	Head Details		Quantitative Information		Remarks	
1.	State Name: West Bengal		-	-		
2.	Geographical Extension of Bhagirathi-Hugli		N	E		
			N	E		
3.	Areal coverage in 5km Buffer					
4.	Areal coverage in 10km Buffer					
5.	Total Number of Districts coverage		10			
6.	District wise Police Station & Ward coverage	District		Number of PS/ Wards	Length of Hugli River	
		A	Malda	04	88 Km	
		B	Murshidabad	13	520 Km	
		C	Nadia	09	112 Km	
		D	Barddhaman	04	138 Km	
		E	Hugli	09	91 Km	
		F	Haora	09	69 Km	
		G	North 24 Parganas	09	42 Km	
		H	South 24 Parganas	09	110 Km	
		I	Kolkata	144 Wards	20Km	
J	Purba Medinipur	06	92 Km			
7.	Total Length of the Bhagirathi-Hugli River in the Lower Part		1282 Km.			





1.3. Documenting Natural Heritage & Ecological Interdependencies

Natural Heritage would not replicate the work of scientific institutions Biodiversity Conservation is being studied and implemented by Wildlife Institute of India to cover Golden Mahseer, Dolphins, Crocodiles, Turtles and Otters and other fauna under conservation programme. These studies would be referred to.

- a. **Changes in Flows, Water Levels:** The documentation of natural heritage at several sites and banks will look at the changes in flows, earlier course of the river if any and observable changes in water level as revealed in discussions with resource persons and local communities.
- b. **Floodplains** Crops and natural riparian flora and fauna, ox-bow lakes would be recorded
- c. **Species-Fauna, Flora, Birds and others:** Observations of riparian communities regarding changes in flora and fauna both riparian and in-stream would be recorded
- d. **Sacred Groves:** Landscapes that have both ecological and religious significance, where religion has ensured conservation of natural landscapes shall be noted
- e. **Sacred Species:** Certain species and specific trees are considered sacred because of associated religious beliefs or biological significance. It is because of their presence that several landscapes and sites stand safe. Many of these trees have a close association with the river during performance of some rituals. For instance, Bhojapatra is a birch tree native to the Himalayas, growing at elevations up to 4,500 m. The specific epithet, *utilis*, refers to the many uses of the different parts of the tree. The white, paper-like bark of the tree was used in ancient times for writing Sanskrit scriptures and texts. It is still used as paper for the writing of sacred mantras, with the bark placed in an amulet and worn for protection. In the sacred forests of Bhojwasa, around Gaumukh, such forests have been protected by pilgrims and resident communities, for eons.
- f. **Community Understanding of Riparian Rights:** Several communities, like the fishermen of the lower delta regions, have been caught in conflict with incumbent authorities in British and Independent India over riparian rights. The project aims to develop an understanding of what constitutes community riparian rights and whether communities are in conflict with authorities over the same.
- g. **Confluence Points:** The course of the Ganga is dotted with several confluence points of lower order streams which will be marked geospatially to understand the catchment and wider system of this river. The documentation also aims to name the minor tributaries that flow within this system and join it at various places.
- h. **Review of Scientific Research on the Waters:** Many scientific papers have been published on the Ganga and features of its water that keep it free of decay. These

papers will be referred to recording what they suggest in terms of keeping the waters pristine.

1.4. Methodology

1.4 A. Capacity Building:

- a. **Training arrangement:** Two phases of training have given to the Field Coordinators, Field survey staff and the Project Resource persons. First phase of training has conducted by the Project Funding Authority i.e. INTACH, Delhi and second phase of training will be conducted by the Project Implementing Agency i.e. RS-GIS, Kolkata.
- b. **Development of Project Team:** A Project team has formed according to the need of the objective of the present Project. It is formed headed by the coordinator and the Social Scientist. Other members of the Project team are the GIS-Remote Sensing Expert, Field assistant (Geography background), Local Resource persons, Camera person and Hydrologist, Soil Scientist, Botanist, Zoologist & Agriculture scientist.
- c. **Acquisition / Procurement/ Purchase of Gadgets /Equipments / Analysis:** Following Gadgets/Equipments have been purchased for the implementation of the Project work: GPS machine, Satellite Image (Two seasons, Recent Data), Soft / hard copy Cadastral maps, Soil / Water storage Kit, Measuring Tape/ Compass/ Dumpy level, Topographical / DPMS, Laboratory Test / Analysis, procurement of other secondary Data / Information / Maps from Census, Irrigation, Ground water, Soil, Agriculture, Forest etc. Purchase of Books, Reproduction of Survey formats & Stationeries etc.

1.4 B. Pre-Field Survey:

- a. **Literature review:** Library work, Study of published and unpublished reports, News paper articles, Journals and Research papers.
- b. **Collection of Secondary Data/ Information (Maps) from Govt. Departments:** GSI, NATMO, CGWB, NBSS & LUP, IMD, SWID, PHED, KMC Office, Survey of India (Sol), KOPT, West Bengal Fisheries Corporation, Irrigation & Waterways GoWB, West Bengal Forest Deptt. PWD, Census of India, AISLUS etc.
- c. **Satellite Data Acquisition (Real-time):** NRSA Hyderabad, University of Calcutta (Deptt. of Geography), USGS Earth Explorer.
- d. **Base-Map Preparation (for whole Project area):** Consulting Topographical maps, Census maps, DPMS & Recent Multi spectral Satellite Image.

1.4 C. Field Survey:

- a. **Data-Information Collection & Measurements:** Collection of detail information with GPS locations, related to- Surface Morphology /Relief/ Physiography, Geology, Climatic conditions, Bank erosion, Embankment condition, Depth of river Bhagirathi-Hugli, Shifting river course and Paleo-channels, Status of Confluence and Off-take points of rivers, Canals, Flood events and Tide levels, Heritage water structures, Wetlands, Ground water regime, Soil, Water quality, Riparian Flora-Fauna, Sacred trees, Landuse-Land cover types, Impact of Dams/Barrages/Mining, Utilization of Flood plain, Riparian Rights etc.
- b. **Photo & Videography:** Professional photographers having enough experience of Physical, Social, Ecological & Environmental issues will be engaged for Digital documentation of different events related to the Natural phenomenon.

1.4 D. Post Field Analysis:

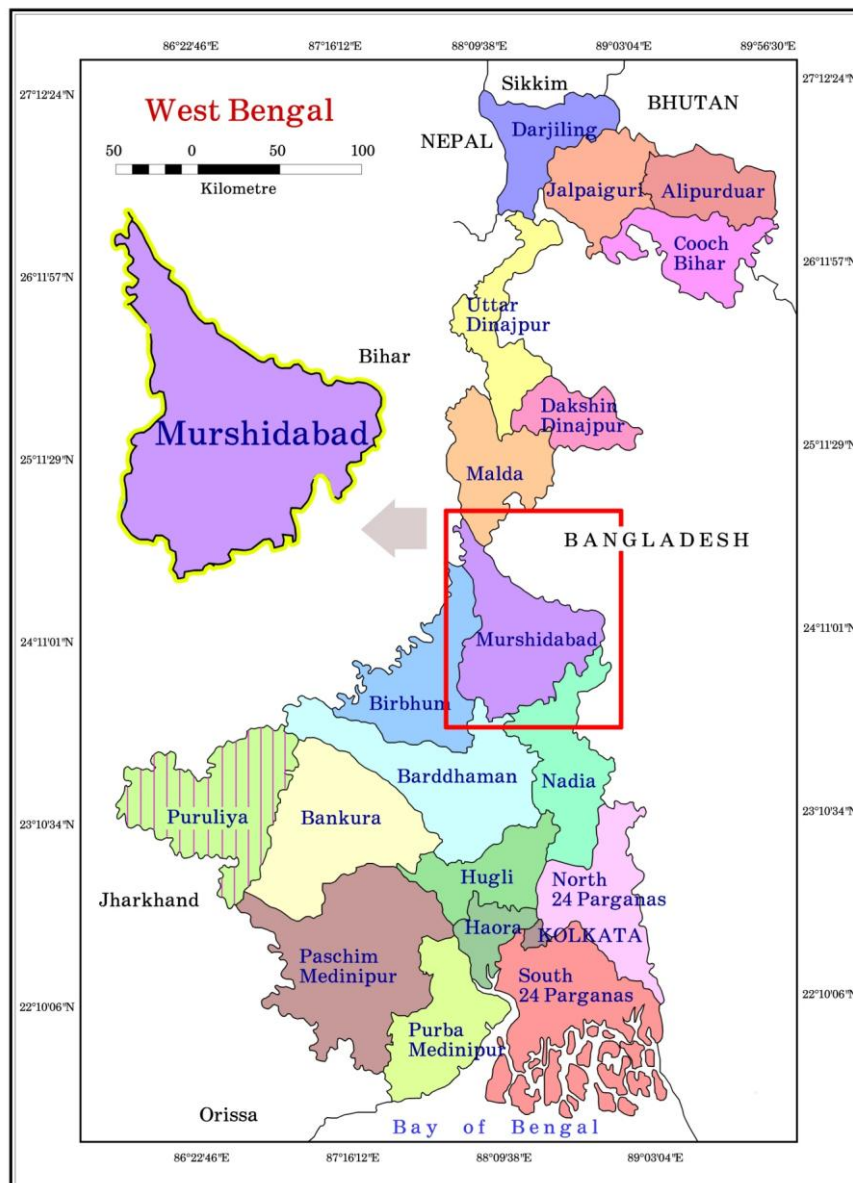
- a. **Collection & Scrutinization of Field Data/Survey sheets:** Region / Block/ PS/ Mouza wise *Proforma for Listing the Natural Heritage* survey sheets will be checked / verified with the concern persons.
- b. **GPS Data analysis:** Collecting the Ground Control Points (GCP's) & GPS-Tracks of Land surface & Waterbodies, the database will be processed through Map-Source Software
- c. **Water & Soil Sample data analysis:** Sample will be supplied for analysis in reputed Govt. Departments or Private agencies.
- d. **Preparation of Theme Maps:** Location, Administrative, Relief, Geology, Geomorphology, Drainage, Waterbody, Canals, Groundwater, Soil, Rainfall-Temperature, Vegetation, Tidal fluctuations, Landuse-Land cover, Shifting of Rivers, Embankment status, Population growth, Flood condition, Watershed divisions, GPS locations of specific units, Urbanization level etc.

1.4 E. Validating Field & Analised Data:

- a. **Landuse Land cover units:** Physical & Cultural units on land surface to be verified after revisit the area with recent Satellite Image.
- b. **GPS locations:** After Overlaying the data on Satellite Image (Google Earth Image) Cross-checking will be done
- c. **Water Sample analysis data:** COD, BOD, pH, EC, DO, Turbidity analysis of Water samples.
- d. **Flora/Fauna:** Riparian, Sacred Species with their environment.

1.4 F. Preparation & Submission of Report

- a. **Preparation of Draft Report:** Preliminary Draft Report in Soft & Hard copy mode (1 Colour Printed) of each District will be submitted to INTACH, Kolkata Convener for Verification / Correction
- b. **Report Correction:** Any corrections made by the funding authority will be incorporated judiciously into the Final Report.
- c. **Final Report Submission:** Final Report in form of Soft Copy will be submitted District wise and Hard copy Report will be submitted after completing the all Districts in three phases.



Map No 3 : Location Map of Murshidabad District in West Bengal

CHAPTER 2 - LOCATION SETTING

Located almost in the central position of West Bengal, this district plays an important role in connecting North & South Bengal. It also provides linkage with the rest of India through the corridor of Bihar. It has international border with Bangladesh in the east of the district. In shape, the district resembles an isosceles triangle with its apex pointing to the North-West. The **Padma River** flows through the entire eastern boundary, separating the district from Malda and Rajshahi (Bangladesh). Burdwan and Nadia are on the southern side and Birbhum and Pakur (Jharkhand) are on the western side of the District. The River Bhagirathi runs through the middle of the district. In the west of the district, river Mayurakshi and its tributaries washes the land.

The name '**Murshidabad**' comes from the place known as "**Muksudabad**" which was the capital of Bengal during **Murshid Quli Khan's** rule. Before the advent of British, the city of **Murshidabad was the capital of Bengal**. It has a great significance in the Indian History as in 1757 the British defeated **Siraj-ud-Daula** in the Battle of Plassey, after which the entire nation was brought under the British Colonial Rule. Even after the conquest of Bengal by the British, Murshidabad remained for some time the seat of administration.

The town still bears memories of Nawabs with mosques, tombs, and gardens, and retains such industries as carving in ivory, gold and silver embroidery and silk weaving. Of historic interest are Nizamat Kila (the Fortress of the Nawabs) also known as the Hazaarduari Palace (Palace of a Thousand Doors), the Moti Jhil (Pearl Lake), the Muradbagh Palace and the Khushbagh Cemetery. Murshidabad today is a centre for agriculture, handicrafts and sericulture.

Situated on the left bank of the river Ganga, the district is very fertile. Covering an area of 5,341 km² and having a population 7.103 million (according to 2011 census), it is a densely populated district and the ninth most populous in India (out of 640). **Baharampur or Berhampur city** is the headquarters of the district. It borders **Malda district** to the north, Jharkhand's **Sahebganj** district to the north-west, **Birbhum** to the west, **Bardhaman to the south-west** and **Nadia district due south**. The international border with **Bangladesh's Rajshahi** division is on the east.

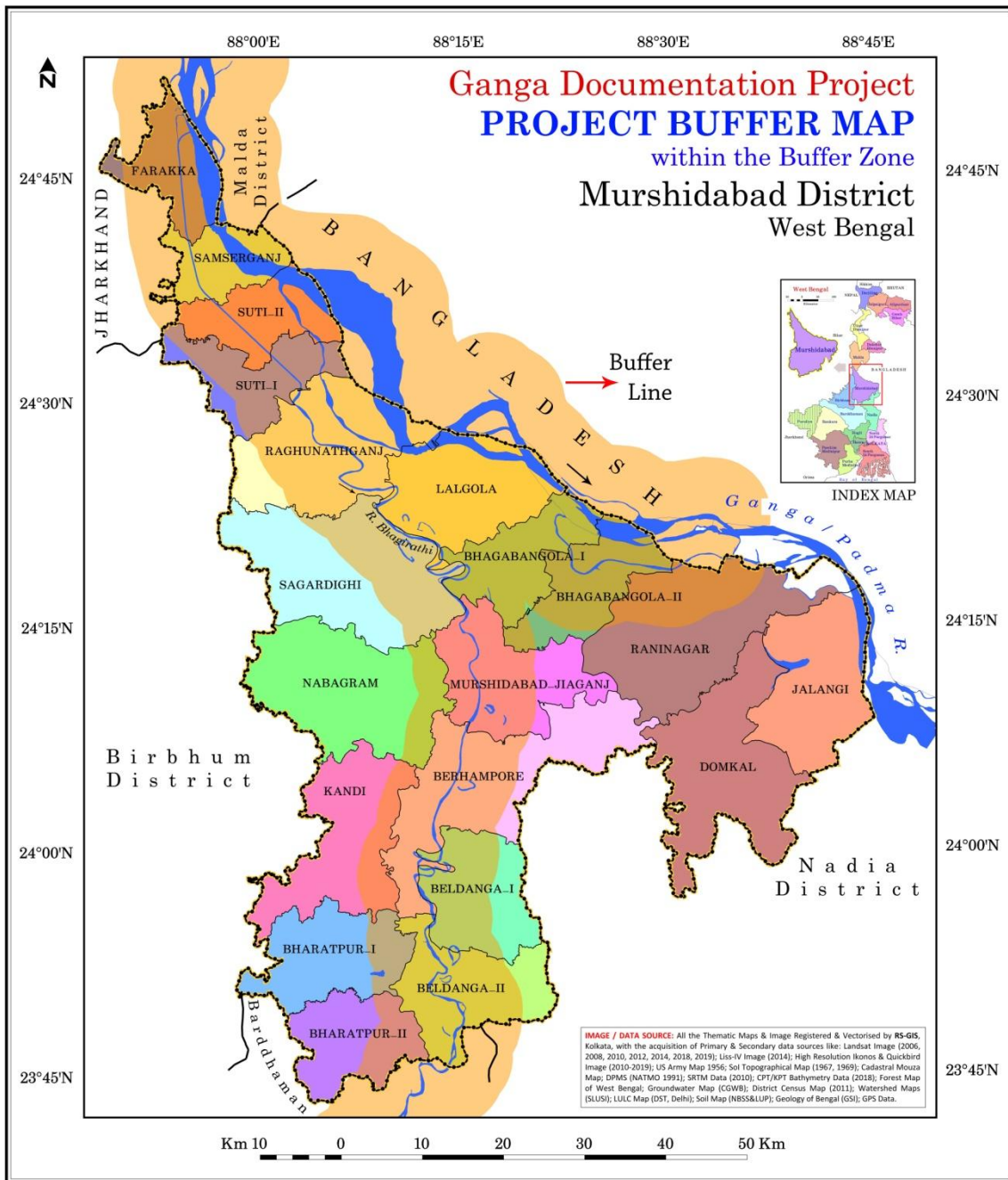
The district comprises five subdivisions: **Berhampur, Domkol, Lalbag, Kandi and Jangipur**. Other than municipality area, each subdivision contains community development blocks which in turn are divided into rural areas and census towns. In total there are 29 urban units: 8 municipalities and 22 census towns. Baharampur and Kasim Bazar together form an urban agglomeration.

Table No 2 : Block Division of Murshidabad District

Sl. No	DISTRICTS	POLICE STATION/BLOCKS	Area in sq.km	
6	MURSHIDABAD 260 X 2 = 520 KM	1	BHARATPUR I & II	187.14 & 156.79
		3	BELDANGA I & II	176.93 & 196.97
		5	BERHAMPUR	149.91
		6	KANDI	243.78
		7	NABAGRAM	315.24
		8	MURSHIDABAD JIAGANJ	213.35
		9	SUTI I & II	148.47 & 135.88
		11	LALGOLA	228.83
		12	RAGHUNATHGANJ I & II	280.45
		14	SAGARDIGHI	349.88
		15	SAMSHERGANJ	105.45
		16	BHAGAWANGOLA I & II	149.91 & 159.12
		18	FARAAKKA	131.62
		19	RANINAGAR 1& II	349.55
				21
		22	JALANGI	232.16
				SQ.km

In shape the district resembles an isosceles triangle with its Bound apex pointing to the north-west. It is bounded along its whole eastern frontier, from the extreme north to the south-eastern extremity, by the Padma or main channel of the Ganges, which separates it from the districts of Malda and Rajshahi. On the south it is bounded by the districts of Burdwan and Nadia, the river Jalangi on the south-east forming the boundary between it and Nadia for a considerable distance. To the west lie the districts of Birbhum and the Santhal Parganas.

River Bhagirathi-Hugli crosses through the district of Murshidabad bordering almost 22 blocks and 4 municipalities.

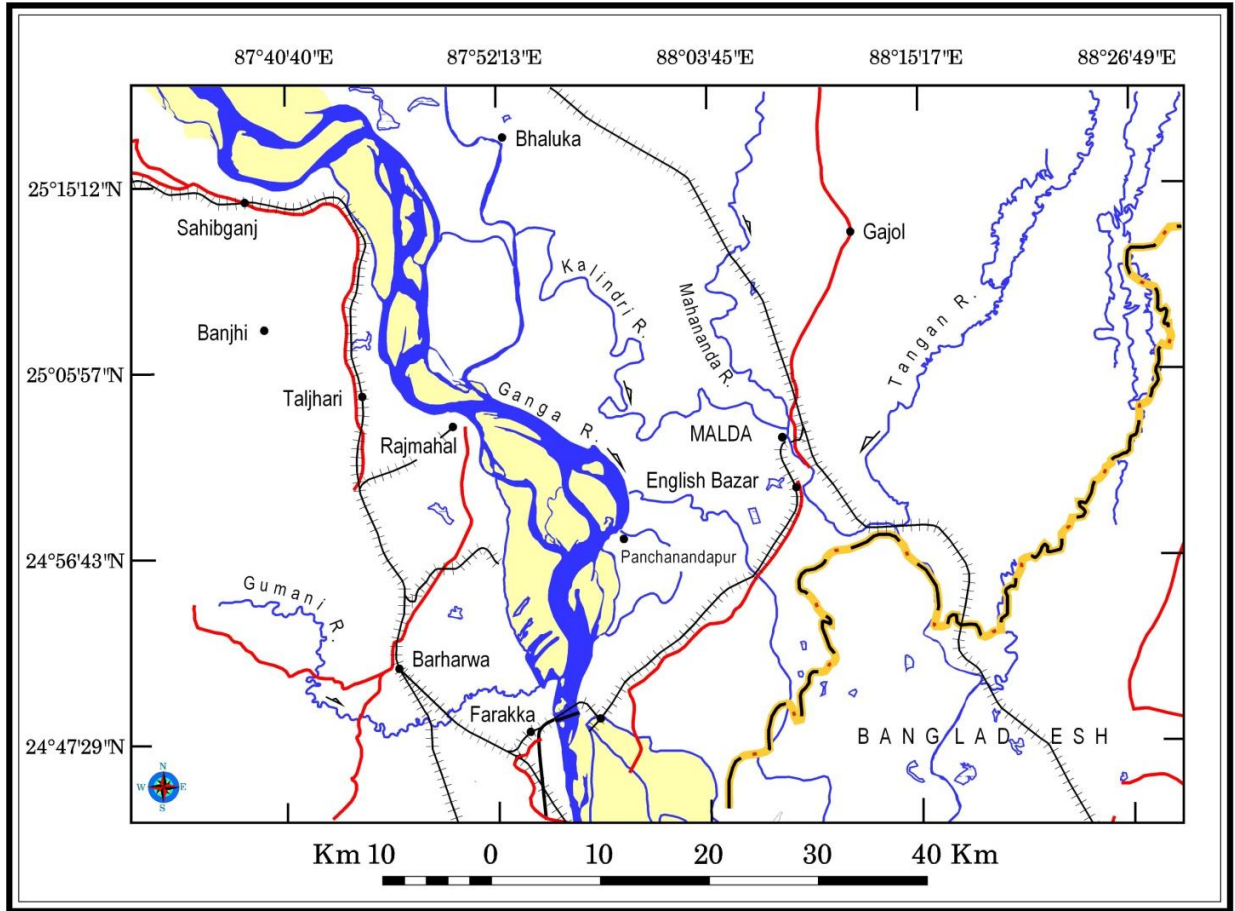


Map No 4 : Study Area Within Districts

2.1 River Ganges in Murshidabad:

The Ganges enters West Bengal after/near Rajmahal hills in Jharkhand. After flowing through Malda district, it enters Murshidabad district, where it splits into two river channels - the Bhagirathi flows south through West Bengal and the Padma flows east into Bangladesh.

Source: Landsat Image

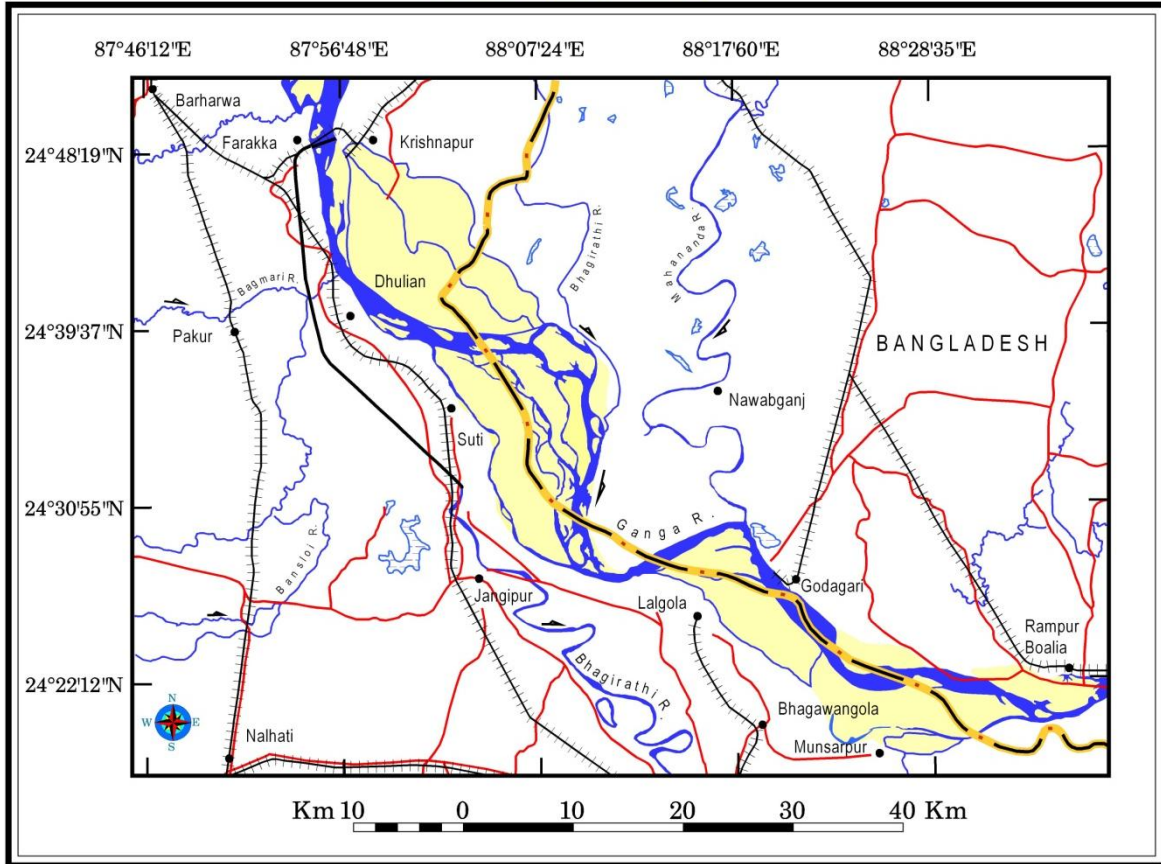


Map No 5 : Course of Ganga From Rajmahal to Farakka Source : River Atlas, Dr. Kalyan Rudra



Map No 6 : Google Image Showing the Course of the Ganga River Above Rajmahal

Source: Landsat Image

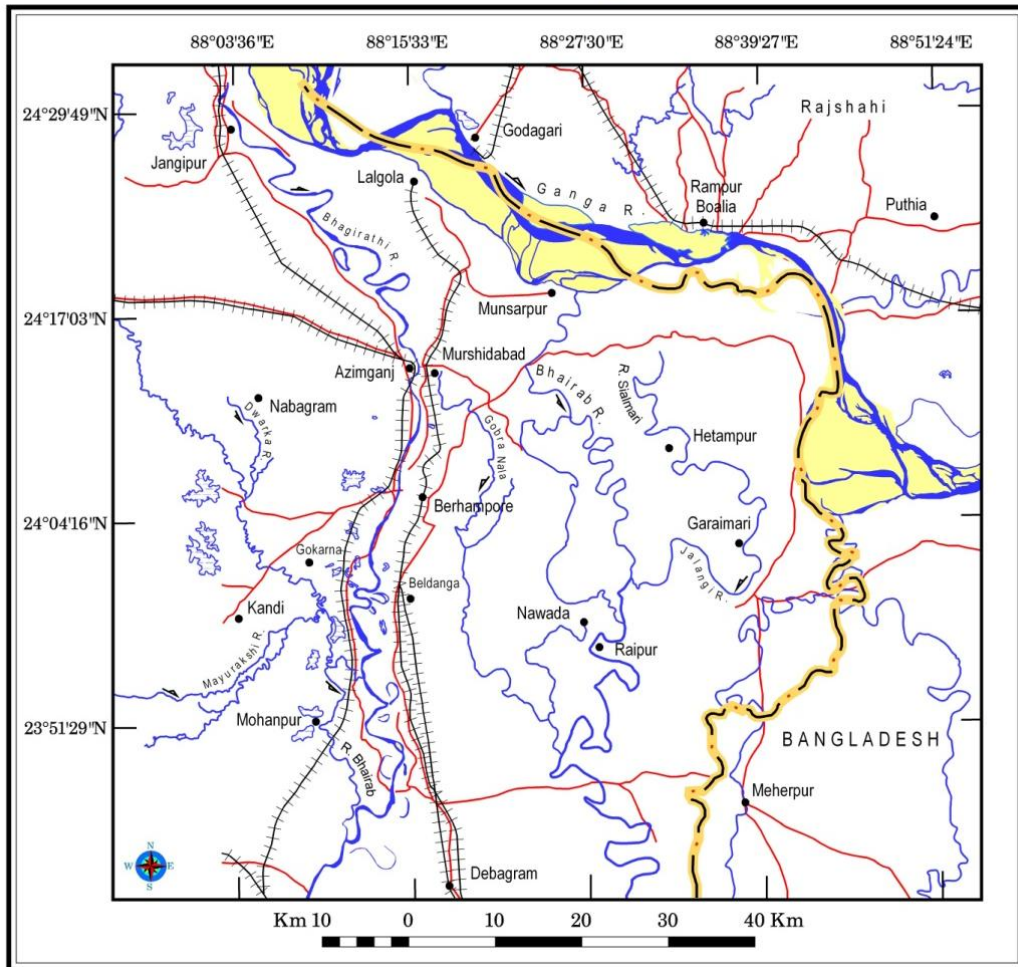


Source : River Atlas, Dr. Kalyan Rudra

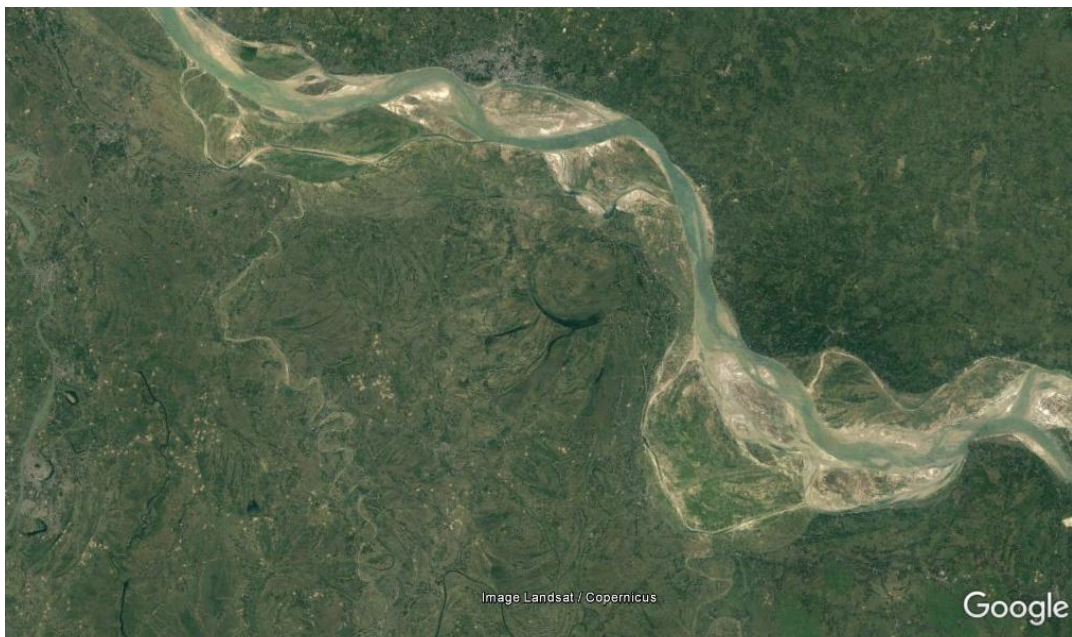


Map No 8 : Google Image Showing the Course of the Ganga River Above Farakka

Source: Landsat Image 2010



Map No 9 : Course of Ganga From Jangipur to Jalangi Source : River Atlas, Dr. Kalyan Rudra

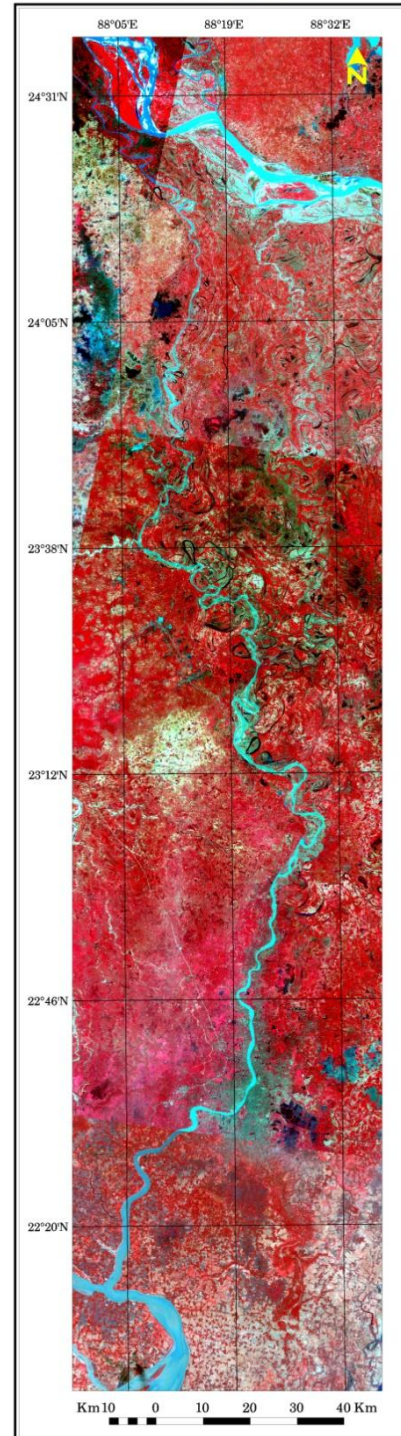


Map No 10 : Google Image Showing the Course of the Ganga River Above Farakka

2.2 River Bhagirathi Hugli in Murshidabad district:

According to the Bengal Gazetteer of 1914, Bhagirathi branches off from the Ganges at Nurpur about 35 km below Farakka and runs almost parallel to it for about 3km as far as Biswanathpur (near Suti) with a long narrow strip of char land between the two rivers. This river from flowing from north to south through the district, divides it into two almost equal portions, which, in their geology, their physical characteristics, their agriculture, and even the religion of their inhabitants, form a striking contrast to each other. The tract to the west of the river is locally known as **Rarh**, and the tract to the east as **Bagri**—names which recall the traditional division of Bengal by king Ballal Sen into four tracts, viz., Rarh to the south of the Ganges and west of the Bhagirathi, Barendra lying, north of the Ganges, between the Mahananda and Karatoya rivers, Bagri or South Bengal and Banga in East Bengal. East of the Bhagirathi the country is low-lying and alluvial, with a humid climate and a fertile soil, which is liable to be flooded by the spill of the Bhagirathi and other rivers. On the western side the surface is high and undulating ; the soil is a hard clay, on which winter rice alone grows well, and the climate is drier than in the eastern tract.

The Course of Bhagirathi : Suti to Kulpi
Landsat ETM 2010



Map No 11 : Course of Bhagirathi ,
Suti, Murshidabad to Kulpi

CHAPTER 3 - PHYSICAL SETTING OF THE STUDY AREA

3.1 Relief:

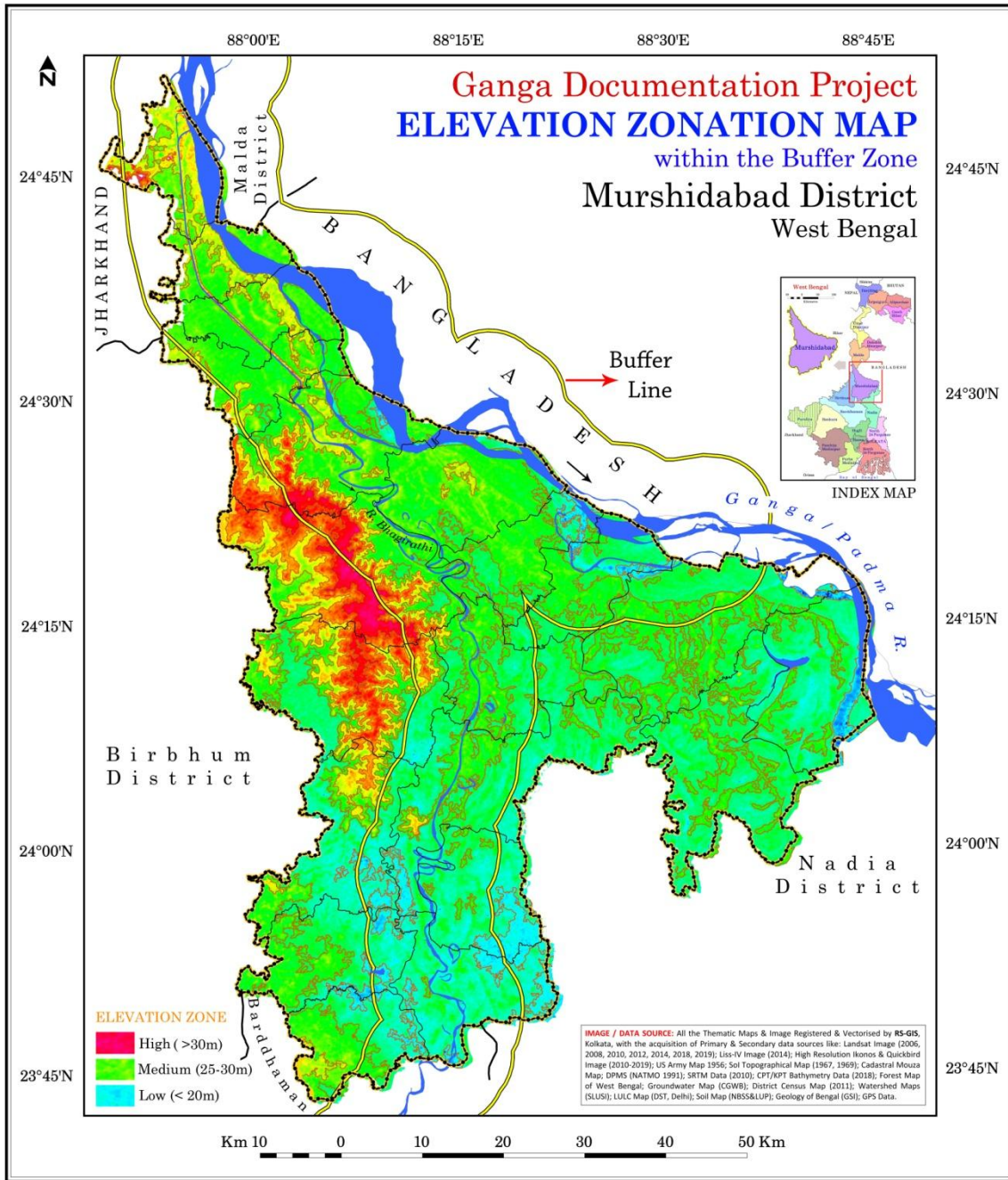
The western half of the district slopes eastwards toward the Bhagirathi; but the greater number of the hill streams do not find their way directly into that river, but are intercepted by *bill* or marshes and for the most part carried off to the south by the Dwarka river. The two chief drainage basins (if such they can be called) in this part of the district are that of the Bansloi in the north, and that of the Dwarka with its confluence in the south. The large *bills* act as reservoirs to break the violence of the floods of these hill streams, and also serve to drain the surrounding country, discharging their surplus water through the streams which issue out of them. The eastern half of the district may be described as an *isosceles* triangle, whose equal sides are formed by, the Ganges and the Bhagirathi, and whose base is almost closed by the Jalangi. The line of drainage is not along any of these rivers, but may be represented by a line intersecting the base at right angles. The local rainfall in this part of the district does not run off either into the Ganges or the Bhagirathi. In the same way the floods of these two great rivers converge towards each other, and ultimately make their way across the country. It may roughly be stated that the greater part of the surplus water ultimately falls into the Jalangi by means of the Gobra Nullah, the Bhairab, and the Sialmari. These channels are during the rains connected with the different *bills* and creeks (khals), forming a network of water communication. In the hot weather a number of springs may be observed along their banks, caused apparently by the drainage waters percolating through the understrata of sand and sandy soil.

3.1.1. The western tract, or Rarh, is substantially a continuation of the Sub-Vindhyan region of *laterite* clay and nodular limestone. The land is, as already stated, high and slightly undulating, but is interspersed with numerous swamps and beds of old rivers. It has the greatest elevation along the western boundary of the district towards Birbhum, but there are places where the eastern limits of this clayey tract are marked by banks or bluffs, fifteen and twenty feet high. The cliff at Rangamati on the Bhagirathi, six miles south of Berhampur, is forty or fifty foot above the ordinary level of the river. The soil is greyish or reddish, mixed with lime and oxide of iron ; and beds of nodular limestone {kankar} are scattered here and there. The rivers in this having their sources in hill torrents are liable to sudden freshets, but they never lay the country under water for any long space of time. The fields, therefore, do not possess the extraordinary fertility of a deltaic country. The chief crop in the central and more elevated portions of the Rarh is the winter rice, which is not dependent upon early rain for a successful harvest, but requires a steady downfall between July and October.

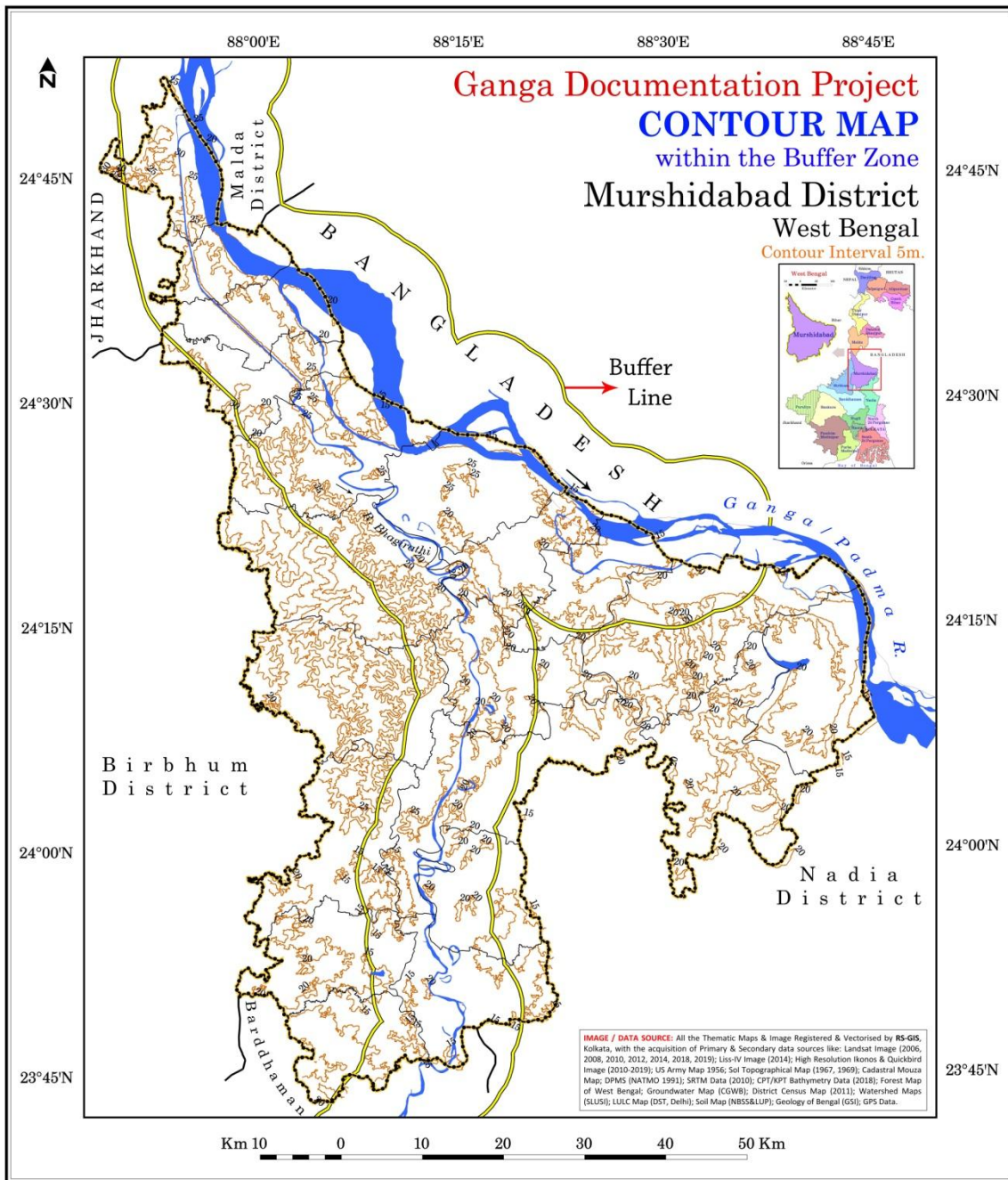
3.1.2. The Hijal: In the **Suti and Shamsheganj thanas** on the north, however, and in the tract known as the **Hijal** to the south, the nature and aspect of the country are entirely different. In the former two thanas, a strip of low-lying country, having an area of about 150 square miles, extends northwards from Mirzapur until it blends with the basin of the Bansloi river and other hill streams, which debouch from the western high lands and during the rains form a vast lake, in which the villages appear as islands, the whole of the arable land being submerged. This part of the district is also not fertile. The land forming the fringe of the flooded area where the inundation is shallower, bears two crops, viz., early rice and cold weather crops of wheat and gram with a minor cultivation of oil-seeds, peas, etc. The village sites are well wooded, and in the rains the scenery is highly picturesque. With the Rajmahal Hills closing in the horizon on the west, it presents a combination of wood, hill and water rarely met with in the plains of Bengal.

The tract called the **Hijal**, situated in the south-west of the district near the confluence of the Mor and the Dwarka, and about 129 sq.km in area, offers a very different aspect.

The country becomes more open, and, in place of rice fields, large stretches of thatching grass cover an almost treeless plain. Village sites are low, and there is a marked absence of forest growth, but round its edges copses of babul abound and occasional pipal or banyan trees are seen; fruit trees and bamboos are, however, almost entirely absent. On the west the land slopes somewhat abruptly upwards, marking the boundary of the true **Rarh**, while to the east a narrow line of high country forms the western bank of the Bhagirathi and culminates in the cliff of Rangamati. During the rains the **Hijal** is widely inundated with water, which varies very much in depth, being in places more than twenty feet, while elsewhere a boat drawing three feet is stranded. 'J'he whole of this tract becomes perfectly dry in the cold weather, and a large portion of it, which is yearly increasing in extent, is cultivated with cold weather crops, such as wheat, gram, mustard and linseed. It also affords a considerable area of pasturage, and the thatching grass, which it produces in great quantities, is celebrated for its toughness and, durability



Map No 12 : Relief Map of the Study Area



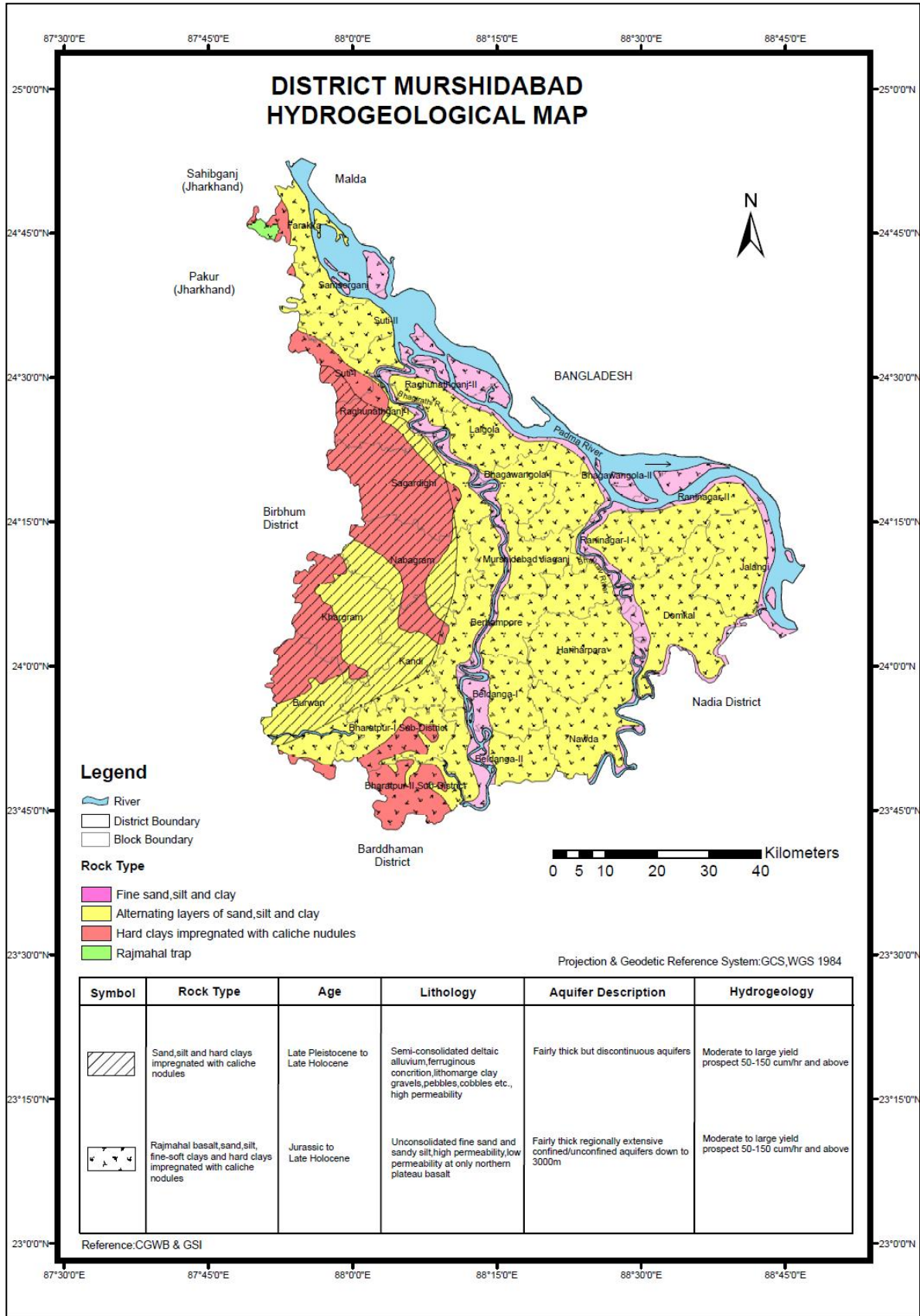
Map No 13 : Contour Map of the Study Area

3.1.3. The Bagri, or eastern tract, differs in no material respects Bagri, from the ordinary alluvial plains of Bengal. It lies almost entirely between the Ganges, Bhagirathi and Jalangi rivers, and is permeated by several other offshoots of the great river. The whole area lies low, and is exposed to annual inundations, which occasionally cause widespread suffering, but usually do no more than deposit over the land a top dressing of almost inexhaustible fertility. The variety of crops, this portion of the district is not surpassed by any part of Bengal. The *aus* or early rice crop is very largely cultivated and forms the bulk of the food supply of the

inhabitants; and this harvest is supplemented by the *chaitra*, a name given to the whole series of cold weather crops from the fact of their being harvested in *Chaitra*, or March. They are cultivated after the *aus* is out and on the same fields, as well as on the higher lands where rice will not grow. For these two harvests early rains are wanted in April and May, and a few showers in the cold weather.

The two fold division of Murshidabad described above is peculiarly interesting as furnishing a clue to the early formation and development of the western portion of the Gangetic delta. There is no doubt that the **present Bhagirathi represents the old channel of the Ganges, by which the greater part of the waters of the sacred river were formerly brought down to the sea.** The most ancient traditions, the traces of ruined cities, and the indelible record of names, all lead to this conclusion.

The geological evidence proves to demonstration that the hard laterite soil formed an inseparable obstacle to the Ganges flowing further to the west than the present course of the Bhagirathi, which is thus fixed as the limit of the Bengal alluvium and the ancient means of communication between the Bay of Bengal and the interior. There are no hill ranges in the district. The whole of the portion to the west of the Bhagirathi lies at an appreciable elevation, and the land in the extreme west slopes gently upwards towards Birbhum and the Rajmahal Hills, which rise a few miles beyond the north-western boundary. Here there are some hillocks, of which the heat known is called Dhuli Pahari, covered with small *sal* and *mahua* trees and surrounded at the base by stony jungle land.



Map No 14 : Hydrogeological Map of Murshidabad District

3.2 Geomorphology with Geology:

Bhattacharya and Banerjee 1979 and Misra and Ghosh 2008; classified the triangle shaped Ajay Bhagirathi valley into four geomorphic plains. All these geomorphic units can be co-related with the major Geologic horizons of the region. The correlation, as such can be ascribed as follows in the table below:

Sl.No	Geomorphic Plain	Geologic soil-stratigraphic Formation
1	Bhagitahi recent surface	Bagri region of Murshidabad district.
2	Younger Deltaic Plain or Kandi Plain	Late Pleistocene or Rarh region of Murshidabad district near Bhagirathi River.
3	Older Deltaic Plain or Rampurhat plain	Upper Pleistocene or western parts of Rarh region of Murshidabad and parts of Birbhum district.
4	Lateritic upland or Ilambazar plain	Lower to middle Pleistocene i.e., Birbhum district, Extreme western part of Farakka, Samserganj and Suti-II blocks of Murshidabad district.

The whole district is covered by unconsolidated sediments of the Late Pleistocene to Holocene times. The Quaternaries mainly belong to Rampurhat, Kandi and Bhagirathi formations whereas the older formations belong to the Rajmahal trap. The Rarh region is dominated by Rampurhat formation with sandy and silty clays making the predominant lithology. The Rarh region, mostly of higher elevation is occupied by the older Alluvium of Pleistocene age (upper Tertiary) age deposited by the Ajoy-Damodar-Mayurakshi river system. These are characterised by preponderance of clay and calcareous material. At the surface laterisation of clay is also seen at places. The clays are very stiff and plastic forming hard soil. On the other hand the eastern section or the Bagri region is covered by recent to sub-recent fluvial sediments deposited by the Ganga river system. The sediment consists of clay, silt, sand and gravel. Sand size varies from fine to very coarse, light grey to white in colour and micaceous. The gravels are associated with sand and sub-rounded in shape. In Gazetteer of India (1979), West Bengal, District Census handbook, Murshidabad, A. Mitra, classified the geological formations of the district in three parts; viz., 1) Recent alluvium. 2) Pleistocene-recent older alluvium and lateritic clay. 3) Jurassic Rajmahal Trap.

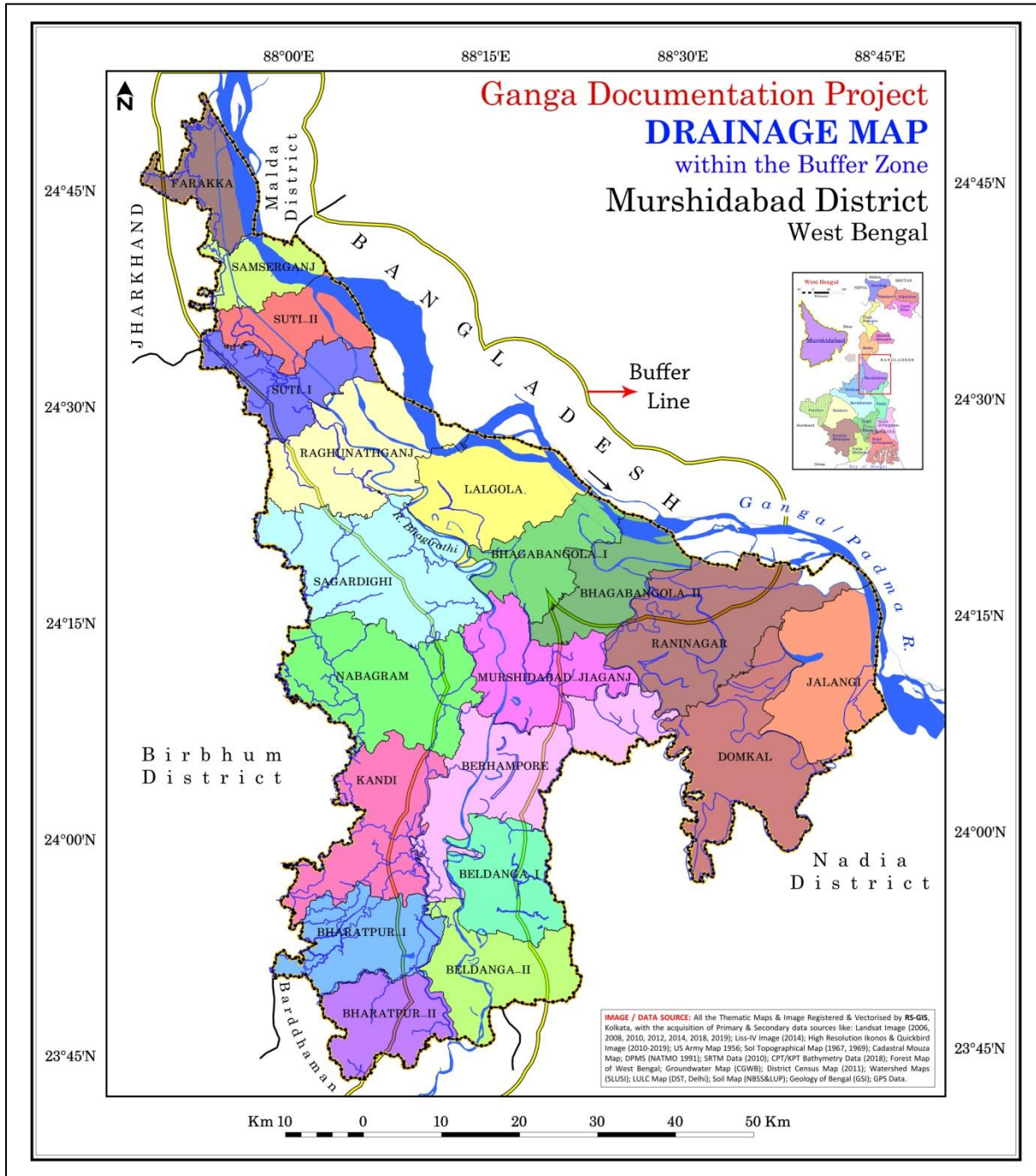
3.3 Drainage System:

3.2.1. The Ganges, or Padma, as it is called in this part of its Ganges or course, first touches Murshidabad at its extreme northern point, Padma and then flows almost due south-east, forming the eastern boundary of the district, and dividing it from Malda and Rajshahi.

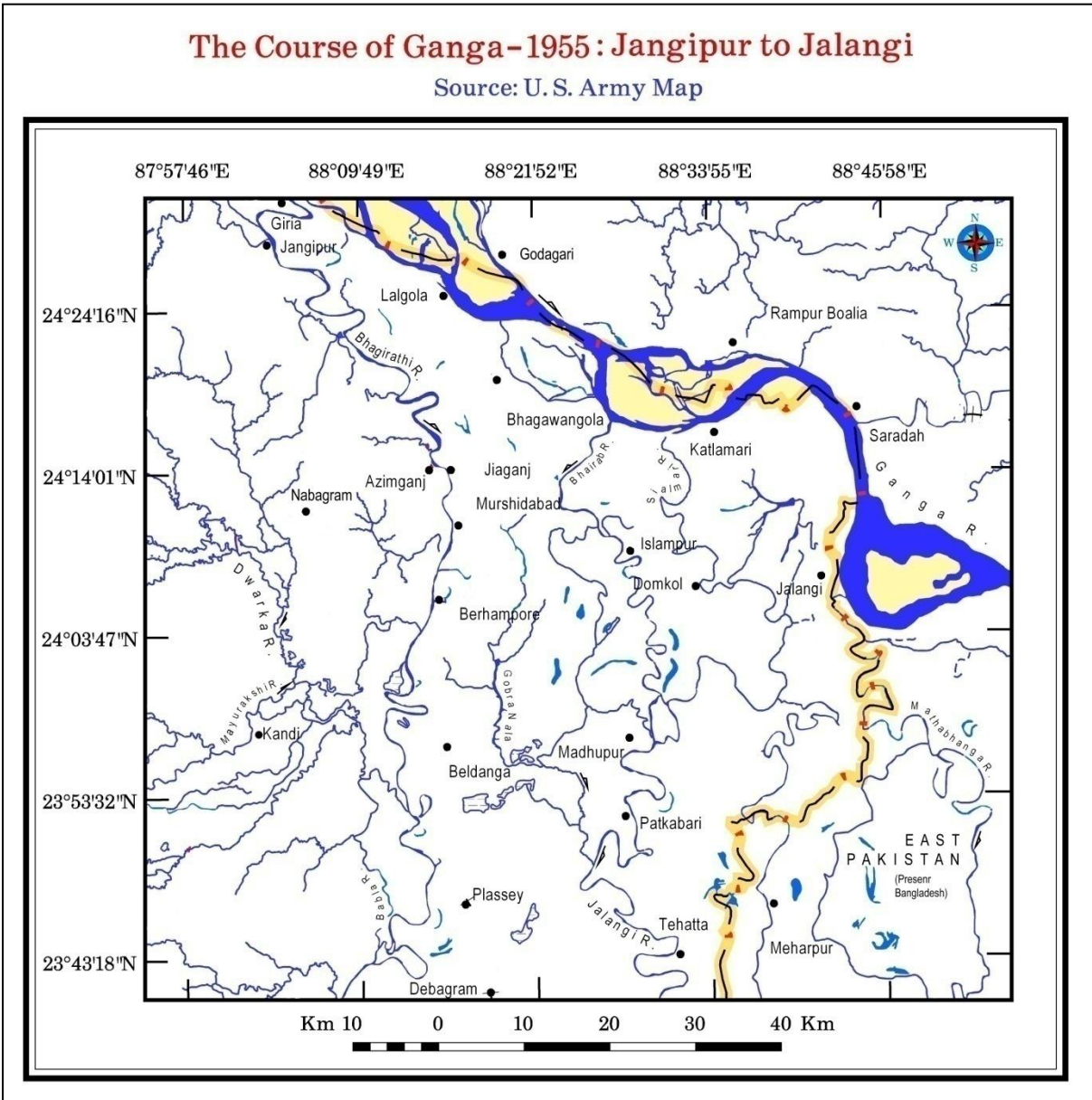
The river system is composed of the Ganges and its distributaries, of which the most important are the Bhagirathi, Jalangi and Bhairab. Formerly large rivers with an active current, they are now merely spill channels of the great river, which during the rains carry off a portion of its flood water, but for the remainder of the year have a very sluggish current. The stream is insufficient to carry off the large quantity of silt they receive, so that shoals form and navigation. The rivers in the east of the district are fed to a certain extent during the dry season by infiltration from the Ganges, Where that river is broad, and large islands or chars are thrown up, the volume of its discharge is sensibly affected by the portion of the stream which thus passes away through the sand.

The only tributary of any importance which it receives from the west is the Singa, which effects a junction with it about 16km from the spot where it first touches the district. The Singa enters the district from Birbhum at Adwaitapur, and just below Ankura divides into two branches; one falls into the Ganges near Nayan Sukh, and the other at Dhulian, Murshidabad. The offshoots of the Ganges on its western or right bank comprise the Bhagirathi, the Bhairab, the Sialmari, and the Jalangi. The fall of the Ganges is about 0.22m per km, but the windings of the river are so great as to reduce this estimate by about one-half. The current varies from about three miles an hour in the cold weather to at least double that rate during the rains, In particular spots, as, for instance, where the stream rushes around some projecting point, this rate of motion is exceeded, and boats and steamers find great difficulty in making their way against the current. The rise of water in the main channel between the middle of May and the middle of August is as much as 10ft.

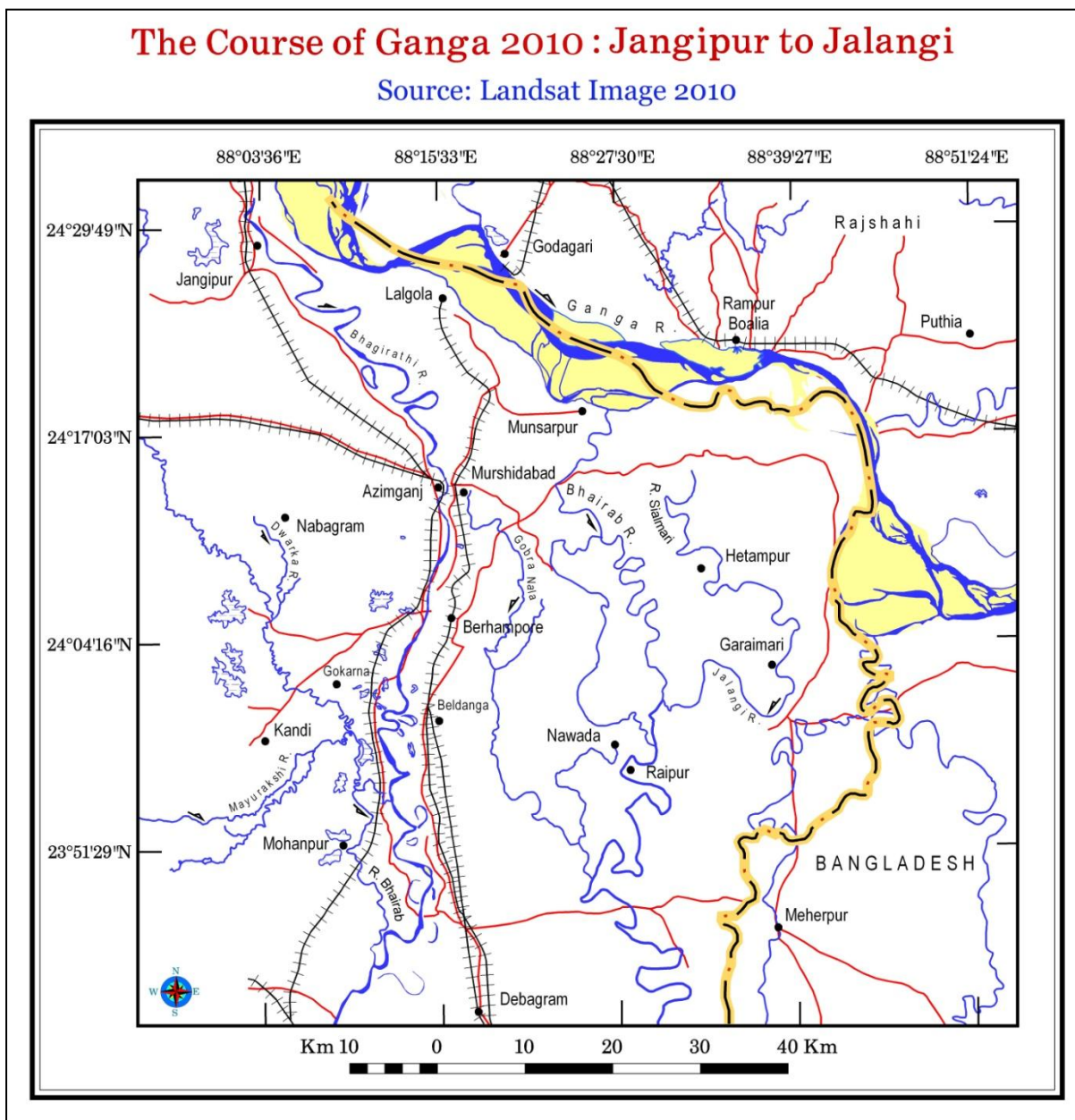
Every year the Ganges is forming and cutting away land along its course by a constant alternation of alluvion and diluvion. During the rainy season, the current impinges with Immense weight upon banks composed of loose soil, which is rapidly undermined. An acre of ground has been known to have been swept away in half an hour. Large islands are continually rising in the channel, some of thorn many miles in length. In the next year, perhaps, they become covered with grass and tamarisk jungle higher than an elephant. Captain Sherwill states that he has seen such islands "become inhabited, cleared, and cultivated till population increases, large villages start up; the land revenue is collected for ten or twelve years; and then the whole fabric will disappear within one rainy season."



Map No 15 : Drainage Map of Murshidabad District



Map No 16 : Course of Ganga, Jangipur to Jalangi, 1955, US Army Map Source : River Atlas , Dr. Kalyan Rudra



Map No 17 : Course of Ganga from Jangipur to Jalangi , Landsat 2010 Source : River Atlas , Dr. Kalyan Rudra

3.2.2 : The other important rivers of our study area in Murshidabad Districts are as follows :

Table No 3 : Important Rivers of Murshidabad Districts

Name of the tributaries	Source	Condition	Tributaries
River Bhagirathi	The place called –Giria. Distributaries Source is the main river Ganga.	After the creation of Feeder Canal the river receives water through it	Joint water of Bansloi and Pagla north of Jangipur Chora Dekra near Saktipur
River Bhairab	Rampur - Boalia	It is no more an active	Partly clogged

Ganga Documentation Project

Report on Natural Heritage Documentation: District - Murshidabad; West Bengal

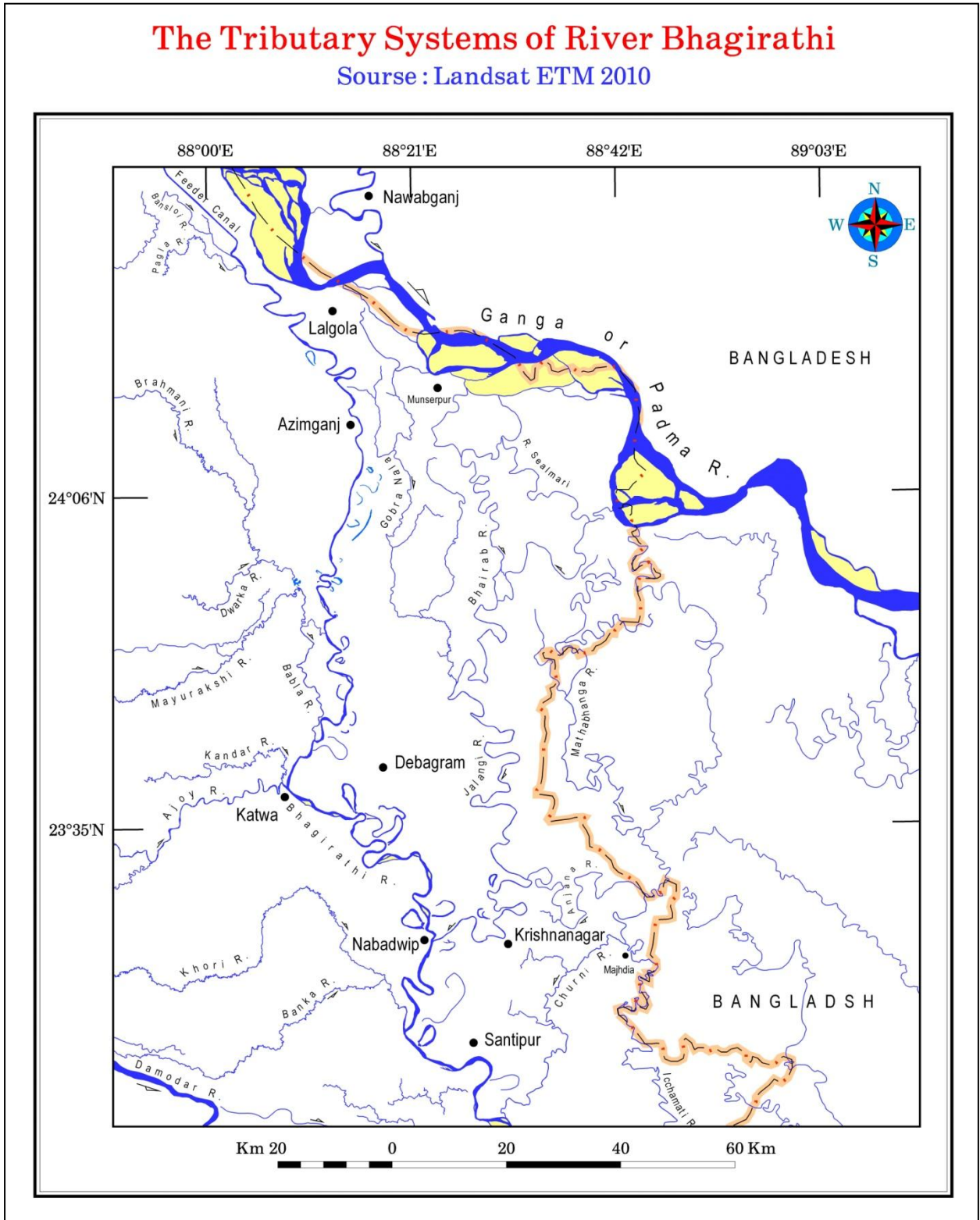
		river in West Bengal .	
River Jalangi	Jalangi	The Bhairab once flowed from the Ganges, across the present beds of the Jalangi and thus Jalangi is mentioned as Bhairab Jalangi in Murshidabad	The river is simultaneously a distributary of the river Padma and a tributary of the river Bhagirathi.
River Sialmari	Rampur - Boalia	After a meandering course it empties itself into the Jalangi below Kapila.	The river is simultaneously a distributary of the river Padma and a tributary of the river Jalangi
Gobra Nullah	Bali		
Bansloi	Joins Bhagirathi near Jangipur	Enters Murshidabad from Birbhum near village Husainpur, flows east and falls into the Bhagirathi north of Jangipur.	It is an old river and is partly deserted.
Dwarka / Babla	Enters Murshidabad from Birbhum near Morgram, flows eastward and then to the south-east, forms the eastern boundary of Kandi sub-division and leaves the district at Raghupur.	Estuaries: Mayurakshi & Kuiya (on the right bank)	Though a moderate river, it has several names and many small tributaries and estuaries. Its many backwaters and side channels also connect it with the Bhagirathi.
Feeder Canal (Man-made Farakka Barrage Project)	Originates off the upstream of the Farakka barrage and falls into the Bhagirathi down stream of Jangipur Barrage.		Length: 26½ kms
Brahmani, Mayurakshi, Kuiya	All originate from the hills of Birbhum, flows to the west and falls into the Dwaraka. All rivers meet at Hizal Beel of Kandi Sub-Division		All are hill streams with beds full of pebbles & yellow clay. Depth of river is reduced due to silt deposition.



Image No 1 : Dhuliyān Ganga, 24°40'18.88"N, 87°57'50.76"E,

The Tributary Systems of River Bhagirathi

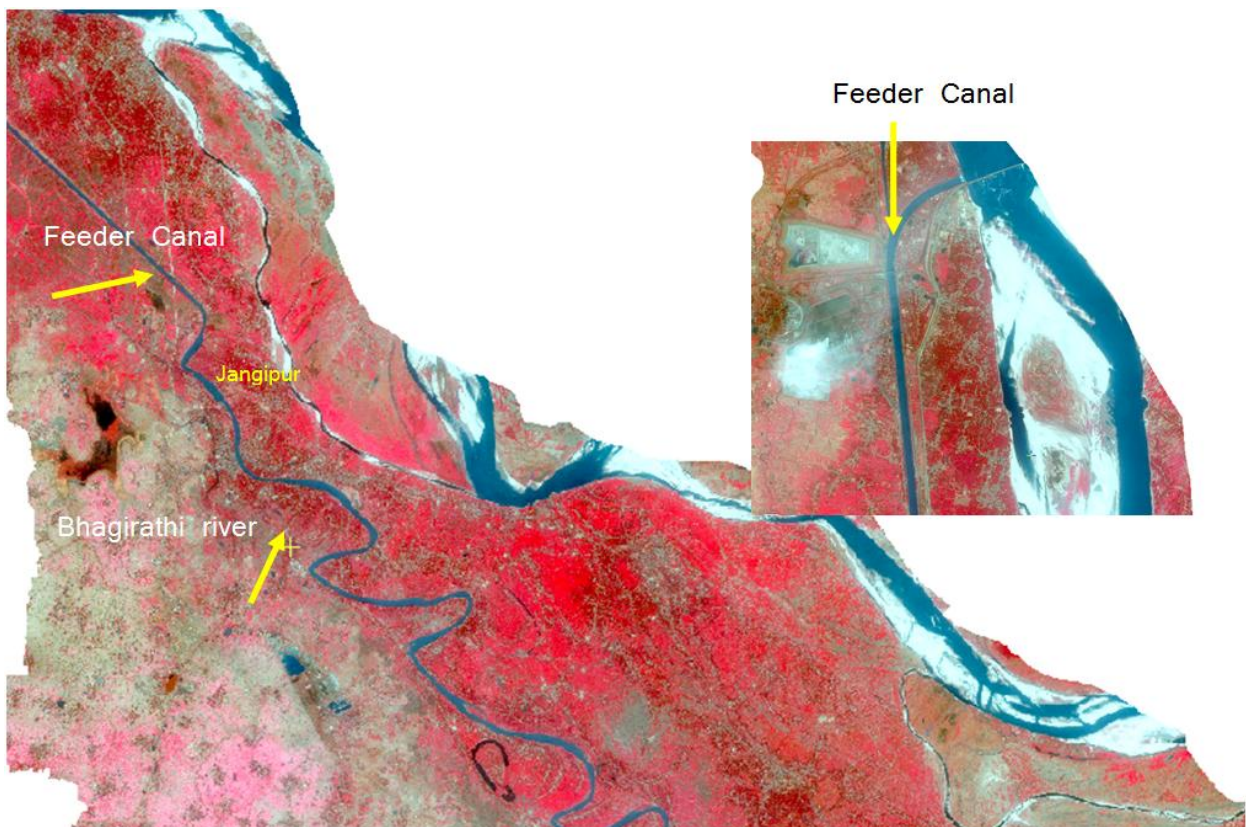
Source : Landsat ETM 2010



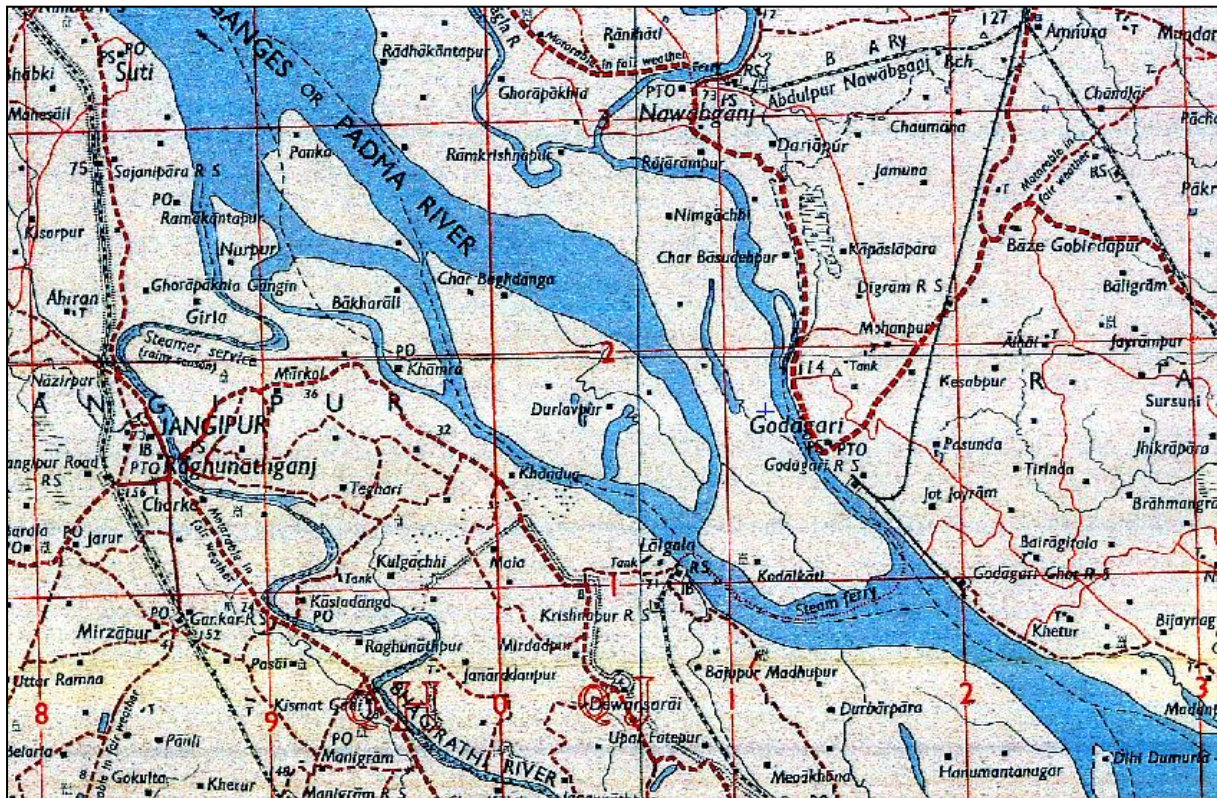
Map No 18 : Tributary System of River Bhagirathi

Bhagirathi - about 40km below Farakka, however before Feeder Canal was formed River Bhagirathi, used branch out near Nurpur, which was about 10 km south from Suti. After leaving the main channel it takes a very sinuous course through Jangipur, Jiaguange,

Murshidabad, Beherampur in the south and it finally leaves the district below the village of **Bidhupara**, just north of the celebrated battle-field of **Plassey**, part of which it has swept away. As has been already said, it divides the district into two almost equal portions, and on its banks, chiefly on the eastern or left bank, are situated all the historical and wealthy towns of the district. A little above Jangipur it receives from the west the united waters of the **Bansloi and Pagla** rivers; and near Shaktipur, the Chora Dekra, a considerable branch of the Dwarka river, flows into it, also from the west.

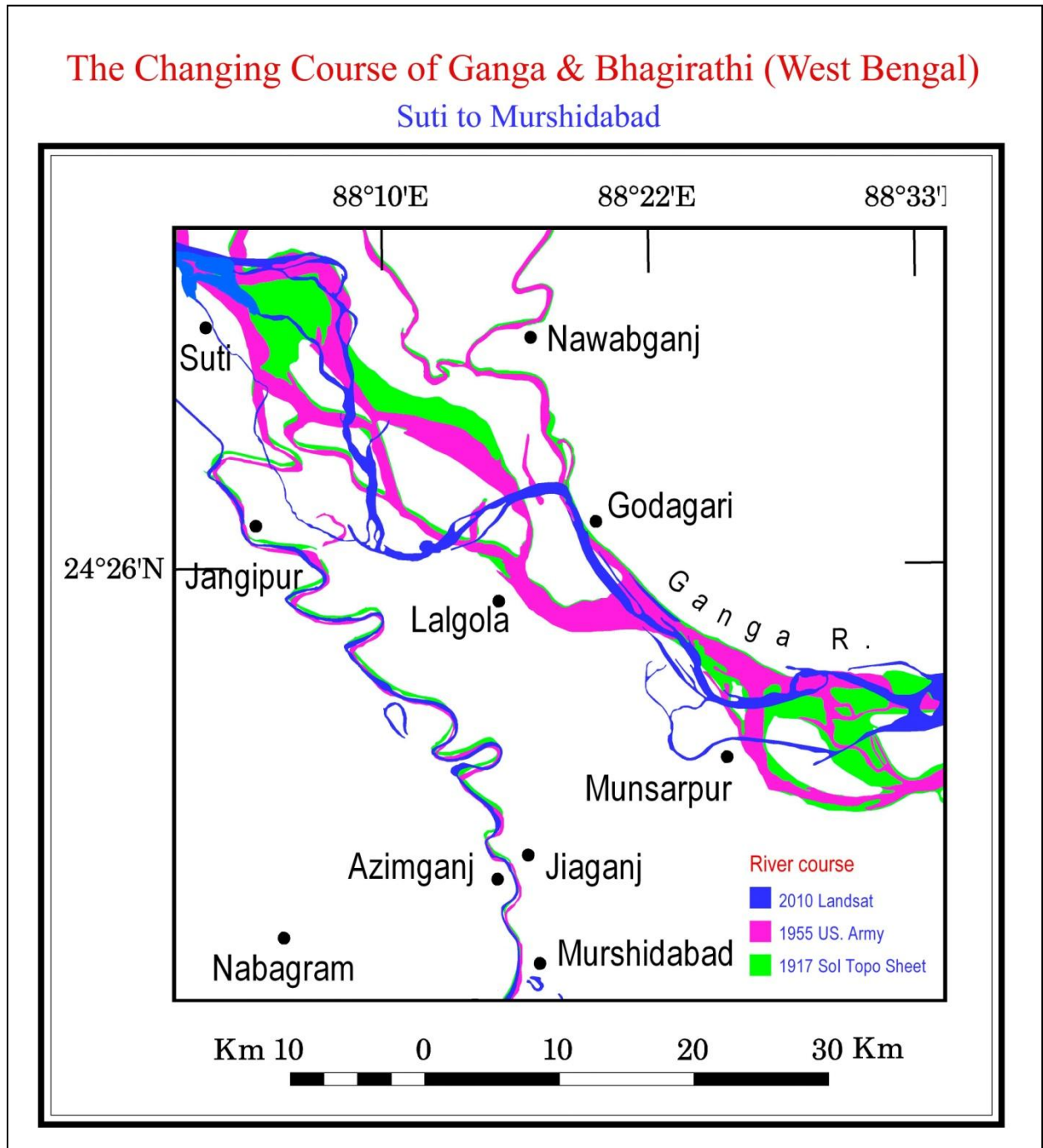


Map No 19 : Landsat Image, 2020 Showing the Branching Off Point of Bhagirathi-Hugli River Near Nurpur .



Map No 20: SOI Toposheet, 1946 Showing the Branching Off Point of Bhagirathi-Hugli River Near Nurpur Before Farakka Barrage.

The river used to take a meander near Giria to flow through Jangipur , Raghunathganj Block, Murshidabad District. Toposheet Number - 78D



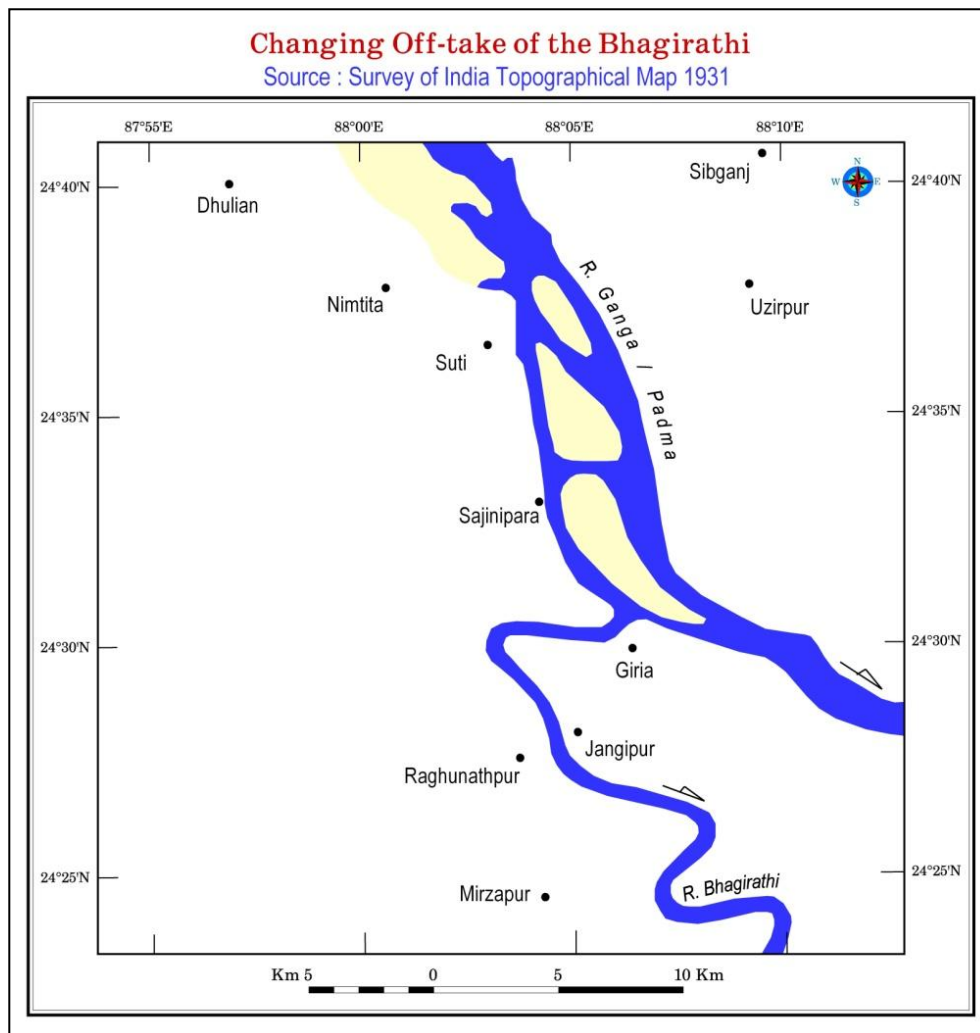
Map No 21: The Changing Course of River Ganga and Bhagirathi from Suti to Murshidabad

Source : River Atlas , Dr. Kalyan Rudra

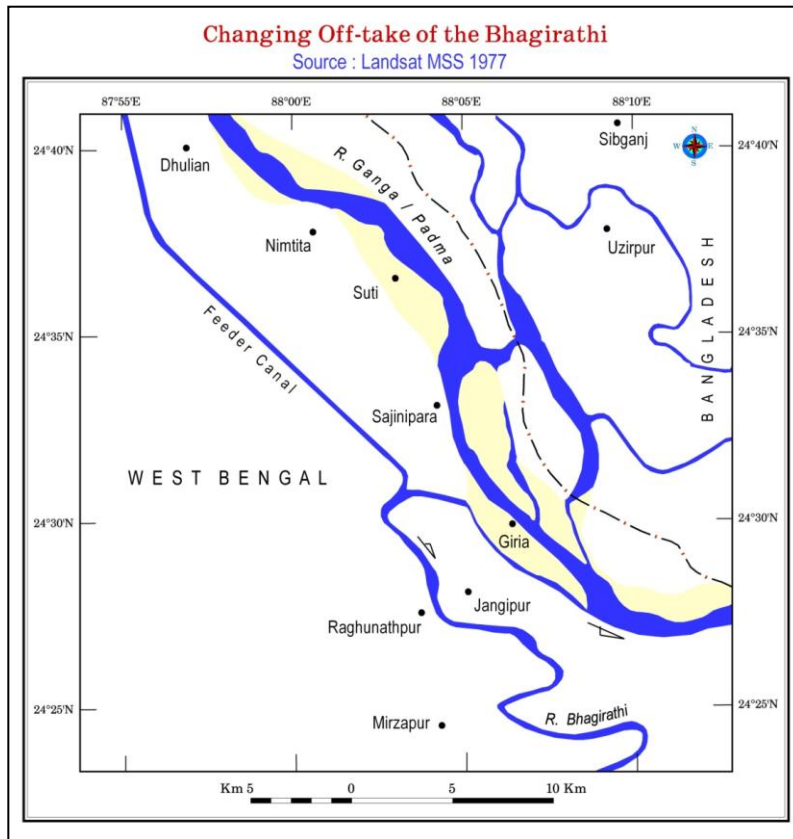
Changing Off-Take of the Bhagirathi-Hugli in Murshidabad District:

James Rennell in 1777 prepared the Bengal Atlas and published it in 1779 showing the detail river map of the entire region. From that time actually the spatial location of the rivers could be understood properly. We have georeferenced Rennel's Bengal Basin map with the US Army Toposheet, SOI Toposheet & the recent satellite images. The overlaying of the maps show that the off-take point of Bhagirathi has changed regularly. Specially after the creation of

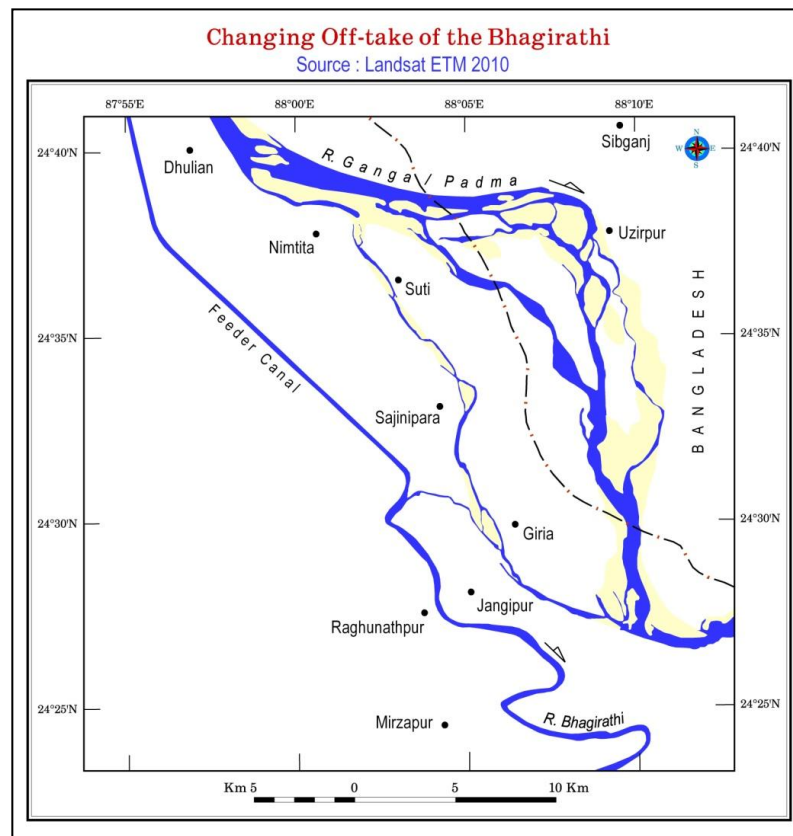
Farakka Barrage in the 70's. Farakka Barrage is a barrage across the Ganga river located in Murshidabad district in the Indian state of West Bengal, roughly 18 kilometres (11 mi) from the border with Bangladesh near Shibganj. It is a dam that diverts water from the Ganges into the Farakka Feeder Canal near the town of Tildanga in Murshidabad district, located 40 km upstream from Giria. This supplies the Hooghly with water as per agreement between India and Bangladesh. The feeder canal runs parallel to the Ganges, past Dhulian, until just above Jahangirpur where the canal ends and joins the Bhagirathi river. The Bhagirathi then flows south past Jiaganj Azimganj, Murshidabad, and Baharampur. South of Baharampur and north of Palashi it used to form the border between Bardhaman District and Nadia District, but while the border has remained the same the river is now often east or west of its former bed.



Map No 22 : Changing Off-Take of River Bhagirathi, 1931



Map No 23 : Changing Off-Take of River Bhagirathi, 1977



Map No 24 : Changing Off-Take of River Bhagirathi, 2010

The **banks of the Bhagirathi** are usually gently sloping on the one side, and abruptly shelving on the other. These changes of slope are due to the varying set of the current, and occur on the same bank by regular alterations from reach to reach, The stream shifts from side to side, sandbanks and other obstructions are constantly formed, and the bed has largely silted. It is a fine river for about four months of the year, when it is full, but for the remaining eight, it has an attenuated stream wandering through a wide expanse of sand. During the rainy season, freshets from the Ganges still come down the Bhagirathi ; but their permanent influence is obliterated by the large deposit of silt which they bring with them. In addition to this, it is important to recollect that the general line of drainage is not from north to south along the channel of the Bhagirathi, but from northwest to south-east.

The result is that the main waters of the Ganges display a greater inclination to proceed in their present channel than to turn into the Bhagirathi; and that the floods of the Bhagirathi have always a tendency to overflow its left or eastern bank, and wander over the country in the old river beds towards the Jalangi river.

The Bhairab: The Bhairab is an offshoot of the Ganges, from which it Bhairab branches off to the south nearly opposite to **Rampur-Boalia**. It empties itself, after a very circuitous route, into the Jalangi at Madhupur. The name Bhairab means 'the Terrible' and bears witness to the estimation in which this river was once held. It is noticeable that it takes off from the Ganges close to the point where the Mahananda flows into it, and it has been suggested that it originally formed a continuation of the Mahananda, which was cut in half by the Ganges as it worked its way eastwards, while lower down it was intersected by the Jalangi. In 1874 its upper channel, which had silted up, was forced open by floods at its intake from the Ganges, and it expanded into an important distributary which poured its waters into the Jalangi 64km further south. The result was that the channel of the Jalangi began to close up above the point of junction, and the Bhairab is now the main channel by which the Jalangi obtains its supply, from the Ganges. The two are hence commonly treated as a united stream called the **Bhairab-Jalangi**. The Bhairab bifurcates a little to the north-east of Daulatbazar and joins the Gobra Nullah, at Trimohini.



Map No 25 : Off-Take Point of River Bhagirathi - Hugli Near Nurpur and Feeder Canal, Murshidabad



Map No 26 : Off-Take Point of River Bhagirathi - Hugli Near Suti and Feeder Canal, Murshidabad

The Jalangi is another important branch of the Ganges, which nowhere intersects the district. It leaves the parent stream a short distance above the village of Jalangi, and flows in a westerly direction, with many windings, until it finally leaves the district with an abrupt turn

near the village of Bali. During this part of its course it forms the boundary between Murshidabad and Nadia for about 96km. The upper part of its course has silted up for some 36 miles, and it obtains its supply of water mainly from the Bhairab and the Sialmari. This river is also known locally as the Kharia.



Image No 2 : Jalangi River , Murshidabad 24° 2'9.22"N 88°34'2.89"E



Map No 27 : Off-Take Point of Bhairab River 24°18'32.14"N 88°29'53.92"E



Map No 28 : Off take Point of Jalangi River 24°10'36.66"N ,88°43'43.14"E

The Sialmari is also an offshoot of the Ganges, which, like the **Bhairab**, it leaves opposite Rampur-Boalia. After a meandering course it empties itself into the Jalangi below Kapila.

The Gobra Nullah is a channel running from the Bhagirathi to the Jalangi at Bali, a distance of about 96km. It was probably originally an effluent of the Bhagirathi, and it is, in fact, the natural drainage channel for the country east of that river. The action of nature, however, has been interfered with by the construction of a marginal embankment along the left bank of the Bhagirathi, called the Lalitakuri or Naltakuri embankment, which extends from Jaiganj to Bhagwangola to Kalukhali and has out off its connection with that river. It's off take being closed, it receives only local drainage water south of the embankment. It has silted up in its lower reaches, but still has a good deal of water in the portion lying to the east of the Sadar subdivision; further north, in the Lalbagh subdivision, it is much narrower and in many places is merely a marshy depression. The Bansloi is the most considerable tributary of the Bhagirathi. It enters the district from Birbhum near the village of Husainpur and pursues on the whole an easterly course, until it falls into the Bhagirathi a little to the north of the town of Jangipur.

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The Dwarka or Babla: It is a moderate-sized stream, which wanders, under several names and with many tributaries and effluents, throughout the south-western corner of Murshidabad. The channel which is considered the main stream, and which bears the name Dwarka, enters the district from Birbhum not far from Margram. At first it flows in an easterly direction, until its waters are augmented by those of the Brahmini at Ramchandrapur. It then turns towards the south-east and is joined on its right bank by the **Mor and the Kuiya**, two rivers which also flow down from Birbhum. Here commence the numerous backwaters and side channels which connect it with, the Bhagirathi, and cause great confusion by the changes of name which they occasion: the Banka and the **Chora Dekra** are the two most important of these lines of junction. The main stream forms the eastern boundary of the Kandi subdivision and quits the district at Raghupur. Like all hill streams it has a rapid current and is liable to sudden floods.

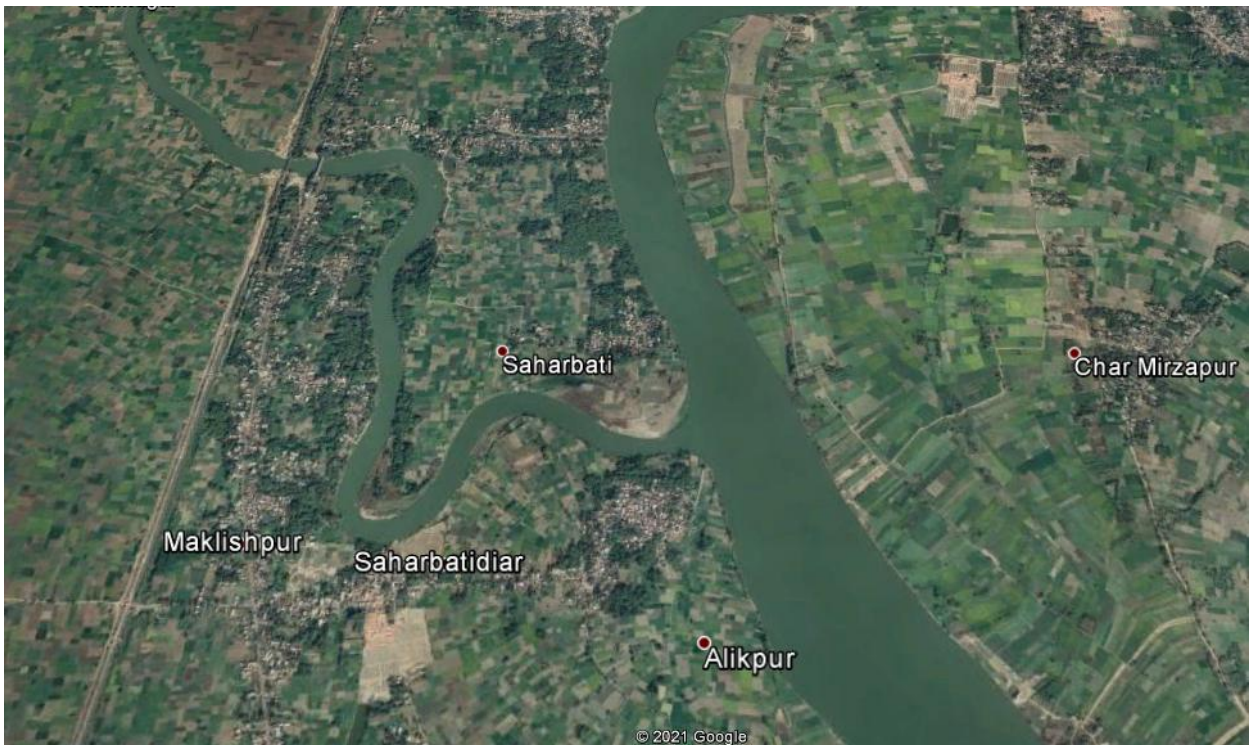
Other Rivers : Among minor rivers may be mentioned the Brahmini, the Mor (or Maurakhi or Kana) and the Kuiya, which all flow from the west into the Dwarka, and are partially navigable during the rainy season. The beds of all these hill streams are of a yellow clay and pebbly.



Map No 29 : River Bansloi, Right Bank Tributary Confluences with River Bhagirathi-Hugli Near Jangipur.



Image No 3 : River Bansloi in Murshidabad District



Map No 30 : River Dwarka Confluence With River Bhagirathi-Hugli, 23°54'0.64"N 88°12'3.62"E

3.3. Climate

Murshidabad has a tropical wet-and-dry climate (Köppen climate classification). The annual mean temperature is approximately 27°C; monthly mean temperatures range from 17°C to 35°C (approximate figures). Summers are hot and humid with temperatures in the low 30s and during dry spells the maximum temperatures often exceed 40 °C during May and June. Winter tends to last for only about two and a half months, with seasonal lows dipping to 9°C - 11°C between December and January. On an average, May is the hottest month with daily average

temperatures ranging from a low of 27°C to a maximum of 40°C, while January the coldest month has temperatures varying from a low of 12°C to a maximum of 23°C. Often during early summer, dusty squalls followed by spells of thunderstorm or hailstorms and heavy rains cum ice sleet lash the district, bringing relief from the humid heat. These thunderstorms are convective in nature, and is locally known as Kal baisakhi ,Norwesters. Rains brought by the Bay of Bengal branch of South-West monsoon lash the city between June and September and supplies the district with most of its annual rainfall of approx 1,600 mm (62 in). The highest rainfall occurs during the monsoon in August approx 300 mm (12 in). Floods are common during Monsoon, causing loss of life, destruction of property, and loss of crops.

Table No 4 : Monthly Climatic Condition

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average high °C (°F)	26.4 (79.5)	29.1 (84.4)	33.5 (92.3)	35.3 (95.5)	35.4 (95.7)	34 (93)	32.3 (90.1)	32.1 (89.8)	32.4 (90.3)	32.3 (90.1)	30.3 (86.5)	27 (81)	31.7 (89.0)
Average low °C (°F)	13.8 (56.8)	16.9 (62.4)	21.7 (71.1)	25.1 (77.2)	26 (79)	26.5 (79.7)	26.1 (79.0)	26.1 (79.0)	25.8 (78.4)	23.9 (75.0)	19.6 (67.3)	14.5 (58.1)	22.2 (71.9)
Average precipitation mm (inches)	1 (0.0)	2 (0.1)	3 (0.1)	4 (0.2)	89 (3.5)						8 (0.3)	0 (0)	
Average rainy days	4	3	4	6	12					11	3	1	125

3.4. Soil:

Soils of the area are taxonomically classified into three orders i.e. *Alfisols*, *Inceptisols* and *Entisols*. All the 18 soils series identified in the area are further classified into 6 sub-orders, 7 great groups, 13 subgroups and 18 families. Soils are slightly acidic to neutral in reaction and low to medium in fertility needs recommended doses of balanced Fertilizer in addition suitable agronomic practices for sustained increase in agriculture production. Good land with minor limitations and suitable for cultivation i.e LCC II covers the maximum area 384149 ha (72.26%) followed by II-III (15.98%), IV(2.01%), III(0.99%) and III-IV(0.03%). These lands are suitable for the adoption of crop based farming system. Total 18 nos soil series have been mapped in Murshidabad district 84.58% area of the district are cultivated followed by plantation (4.66%), barren lands (2.01%) and forest land (0.03%).Soils of the district has almost none to slight erosion(74.27%) followed by moderate erosion (16.62%) and marginal area are moderate to severe erosion(0. 03%).Alluvial plains (87.78%) is the major physiography of the district followed by marshy land (2.01%).Soils of the district falls in four slope classes. Level to nearly level slope 61436ha 11.56% Nearly level to very gently slope 270073ha 50.80% Very gently slope

82579ha 15.53% Very gently to gently slope 71172ha 13.39%. In the study area known as 'Bagri' area, the soil is light alluvium type with comparatively light texture. The soil is low in organic carbon content and soil reaction is slightly acidic to neutral. Main types of soil in the study area are sandy soil, sandy loam, clay and clayey loam.

3.5. Ground Water:

The area under study is underlain by recent alluvium, the aquifers are regionally extensive and interconnected forming a single potential aquifer system within about 150 mbgl. However, number of discontinuous clay partings exists within this top aquifer. From the exploration data of CGWB & other organisations, it has been found that this top aquifer is, in general, underlain by the thick clay layer down to the drilled depth of about 350 mbgl. However, at some parts of the blocks namely Bhagawangola I & II, Lalgola, Raninagar-I & II, Jalangi, Mur-Jiaganj, Nawada & Berhampore, the deeper aquifers exists generally between 200 - 300 mbgl, separated from top aquifers by thick clay layers. In the eastern part of Bhagirathi river, ground water occurs under water table conditions down to a depth of about 150 mbgl. Wherever upper sandy or silty clay is present, aquifer imparts a partially confined conditions. In some parts of Beldanga, Nowda, Baharampur, Lalgola, Raghunathganj-II, Bhagabangola-I ground water occurs under confined conditions between depth of 160 to 330 mbgl.

3.6. Natural Vegetation:

The flora of the district bears resemblance with those of the other deltaic districts of West Bengal. Only in Northernmost part of the district some plants which thrive well in drier regions can also be found. In the swampy areas numerous marshy species of plants are available. Bamboo plantations are found to be scattered all over the district. Similarly, mangos, jackfruit, Segun, Sisoo trees along with Babla, Pitali, Tentul etc. are also spread over the district. Bot, Aswattha, Sal, Mahua, Khend and Palas trees are also found in some parts of the district. Kul mainly for the purpose of lac cultivation can be found predominantly in the Jangipur Sub-division of the district. Mulberry cultivation is popular in the areas famous for sericulture activities namely in Berhampore, Islampur and Beldanga areas. The district boasts of its varieties of mango delicacies. Many varieties available are unique to the district and trace their origin to the days of the Nawabs. Shadulla, Himsagar, Ranipasand (favorite to the queen), Begumpasand (favorite to the Begum), Sharanga, Mulayamjam, Kohitur (the king of mangoes) are among the varieties cherished by the mango connoisseurs.

Trees: Albizzia lebbek (Sirish); Aegle marmelos (Bel); Acacia arabica (Babul); Azadiracta indica (Neem); Artocarpus integrifolia (Jack fruit); Anona sguamosa (Ata); Baisica latifolia (Mahua);

Butea monosperma (palas); Borassus flabellifer (Tel); Ficus glomerate (Jagya dumur); Ficus hispida (Kakdumur); Caesalpinia pulcherrima (Krishnachuda); Cassia fistula (Sonali); Dendrocalamus strictus (Bamboo); Dyospyros melanoxylon (Rend); Dalbergia sisso (Sisso); Libinia officinalis (Amlaki); Ficus bengalensis (Banyan); Jambulana indica (Jam); Terminalia arjuna (Arjun); Terminalia tomentosa (Plan); Ficus religiosa (Peepal); Mangifera indica (Mango); Madivika latifolia (Mohul); phoenix sylbestris (Date palm); Odina wodier (Jiyal); Passiflora guava (Guava); Tamarindus indica (Tamarind); Gliricidia pentanthylla (Ash shaora); Tectona grandis (Teak); Shorea robusta (Sal).

Shrubs and herbs Agave sisalina (Mogra/Ageve); Calotropis procera (Shet Akanda); Clerodendron infortunatum (Ghetu); Flacotid nemontchi (Boinchi); Jatropha gossypifolia (Lal bharenda); Clerodendron inerme (Bonjui); imbricaria aziziphium (Kul/Jujube); Vitex negundo (Nishinda);

Grasses: Cynodon dactylon (Doob); Bragrostis sp; Dicanthium annulatum; Saccharum munja (Ser); Solanum nigrum (Kakmachi). Weeds Cyperus rotundus (Muthe); Chenopodium album (Goose foot); Saccharum spontaneum (Kens); Commelina benghalensis (Kansira/Dholapata);

There is no Reserve or Protected forest within our study stretch of Murshidabad. The entire area is under the intensive agricultural practice. Only some of the old cut-offs are having the riverine forests. The Riverine forests have tree species intermixed with Thatch grasses, viz .. Sissoo, Simul etc. In addition to these, introduced species like Akashmoni, Subabul, Minijiri and to some extent Eucalyptus are found grown in varied soil types. The babla is found thriving well everywhere.

Littoral species such as Sundari etc. are found sporadically near the clayey riverbanks . Oxbow lakes generally bear a favourable and supportive environment for the growth and sustenance of water and hygrophilous flora, a rich source of biomass that forms the base of the food pyramid of the ecosystem [100]. The connection with the river makes the environment of an oxbow lake suitable for growth of fauna and flora [11,12]. Naturally, the River cut-offs or Oxbow lake also hosts diverse plant and animal species. Nearly 39 species of flora have been found in the lake and its adjoining areas. Among the floral species, 21 species have been found in bank areas i.e. the zone of human encroachment. Whereas, 9 species have grown in open water and another nine species live in the edge areas.

Table No 5 : List of Aquatic Plants

Categories	Family	Species
Free Floating	<i>Aroidaea</i>	<i>Pistia sp</i>
	<i>Lemnaceae</i>	<i>Lemna sp</i>
		<i>Spirodella sp</i>
	<i>Onagraceae</i>	<i>Trapa bispinosa</i>
	<i>Pontederiaceae</i>	<i>Eicchornia crassipes</i>
	<i>Salviniaceae</i>	<i>Azolla pinnata</i>
Rooted Submerged	<i>Characeae</i>	<i>Chara branchypus</i>
	<i>Hydrochorideae</i>	<i>Hydrilla verticillata</i>
	<i>Naiadaceae</i>	<i>Vallisneria spiralis</i>
		<i>Potamogeton crispus</i>
Free Submerged	<i>Ceratophyllaceae</i>	<i>Ceratophyllum demersum</i>
Emergent	<i>Cyperaceae</i>	<i>Scirpus articulates</i>
	<i>Typhaceae</i>	<i>Typha angustata</i>
	<i>Convolvulaceae</i>	<i>Ipomia aquatic</i>

The stretches of low-lying land under rice cultivation afford a foothold for many marsh species, while the numerous ponds and ditches are filled with submerged and floating water plants. Remarkable among these for its rarity, and interesting on account of its distribution to Europe on the one hand, and to Australia on the other, is the floating Drosera. The edge of sluggish creeks are lined with large sedges and bulrushes, and the banks of rivers frequently have a hedge-like shrub jungle. The sides of embankments and village sites, where not occupied by human habitations, are densely covered with large growths of semi-spontaneous vegetation, often interspersed with clumps of planted bamboos, and groves of Areca, Moringa, Mangifera, and Anona. Waysides and waste places are filled with grasses and weeds, usually of little intrinsic interest, but sometimes striking because of their distribution. A large proportion of the species of this class to be met with in the district have been inadvertently introduced by human agency, and besides weeds that are indigenous in other parts of India, European, African and American species are sometimes found, which can not only hold their own with, but actually spread more plentifully than, similar weeds of truly Indian origin. In many places the soil does not seem to suit mango, jack and other indigenous fruit trees, and consequently the poorer classes are, in times of scarcity and famine, deprived of one resource which they can fall back upon in more favoured districts



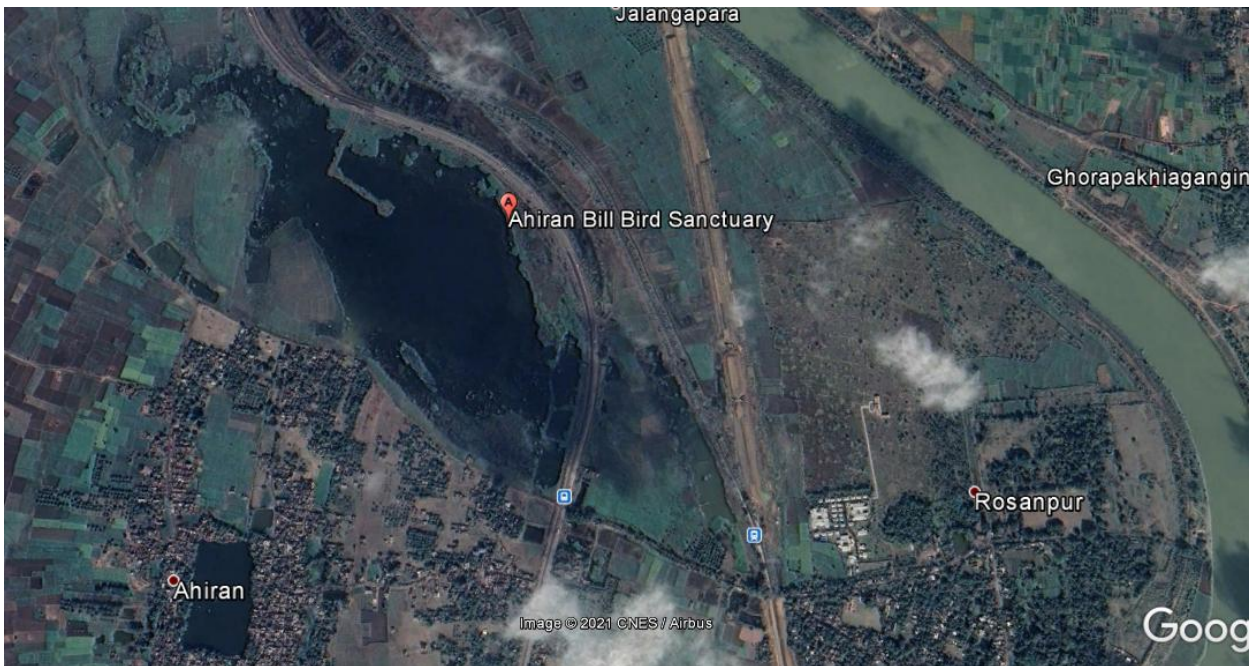
Image No 4 : Ahiran Bill, Murshidabad, 24°31'37.02"N 88° 2'9.12"E

Source : An Environmental Study Of Ahiron Lake Of Murshidabad District, Anushri Mondal



Image No 5 : Lal Bagh, Murshidabad

Source : <https://www.murshidabadzp.in/zp>



Map No 31 : Ahiran Bill, 24°31'30.87"N 88° 2'6.17"E



Map No 32 : Nirmal Char, 24°19'54.34"N 88°27'12.62"E

3.7. Fauna :

In the district wild animals of bigger type do not exist now. Monkeys, Jackals, Snipes, wild Duck, Pigeons, Teals, Geese etc. are found in the district. Among the Ducks, Pintail, Pochard and Brahminy are very common. Snakes like Cobra, Darrash, Karait etc. are found to be in existence all over the district and they mostly appear in more numbers at the aftermath of

floods. The black-faced monkey is however found in abundance. The water bodies attract many water birds like the dabchick / little grebe, cormorants of different types, Indian shag, darter, ibis, herons, egrets, storks, teals along with various varieties of ducks. Kites, pheasants, fowls & partridges, owls, vultures, pigeons, doves, woodpeckers, cuckoos, swifts, larks, ioras (Fotik Jal), orioles and shrikes are also visible in the district. Among the household birds commonly visible are drongoes (Fingey), mynas, babblers, pigeons, doves, and crows. Of the smaller birds the tailorbird, wagtails, sunbirds and weaverbirds are common. The area attracts the bird-lovers.

Birds of Murshidabad is much less studied in comparison to elsewhere. This district contain 43 very large wetlands in total, 30 of these wetlands are frequently used for organized fisheries. 13 wetlands are wild in nature till date. Very few literatures are available on water birds of Murshidabad. These literatures are only describing avifauna of four wetlands mainly. De, M. and Dey, S.R. (2015) described the flora and fauna of Patan wetland which includes birds. Detail description and change in population dynamics of birds of Motijheel were described by Dey, S.R. (2015) and De, M et al (2016). Mistry, J. and Mukherjee, S. (2015) and Chatteraj, S., Dey, S.R. and Bhattacharya, Shilanjana (2018) described the fauna of Ahiran. Bhattacharya and Sarkar (2017) described a detailed account of flora, fauna of a fishery known as Bisnupur Beel, an Ox-Bow adjacent to Berhampore. None of the literature mentioned the number of birds seen; moreover the rare bird photographs are not given in some literature. So, there was an urgent need for actual bird census in Murshidabad district.

However, based on one survey done in 2020 by the Department of Zoology, Calcutta University we find the data of few commonly found species of the 13 wetlands of Murshidabad in our study area . They are as follows:

Table No 6 : Major Marshes / River Cut-Offs in the Murshidabad District

Sl.No.	Name of the Wetlands	GPS Location	Type/Approximate area	Name of the species found	Condition
1	Ramnagar Beel	23°47'41" N 88°13'37" E	Beel (2000 bigha ox bow)	Little Grebe Waterhen, Purple Swamp hen, Common Moorhen, Pheasant Tailed Jacana, Bronze Tailed Jacana, Common Kingfisher, Brahminey Kite	Clean (Fishery)
2	Kathalia Baor	23°58'58" N 88°11'16" E	Beel (500 bigha ox bow)	Asian Open Bill, Asian wooly Neck Waterhen, Purple Swamp hen, Common Moorhen, Pheasant Tailed	Totally covered by water hyacinth

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				Jacanaa, Bronze Tailed Jacana, Common Kingfisher, Brahminey Kite	
3	Kodla Beel	23°59'50" N 88°11'10" E	Beel (1000 bigha ox bow)	Indian Pond Heron, Cattle Egret, Grey Heron, Little Cormorant, River Lapwing, Brahminey Kite	Clean
4	Motijheel	24°9'42" N 88°16'33" E	Beel (2000 bigha ox bow)	Grey Heron, Little Cormorant, River Lapwing, Brahminey Kite	Partially water
5	Ahiran	24°31'15" N 88°2'21" E	Beel (3000 bigha ox bow)	Grey Heron, Little Cormorant, River Lapwing, Brahminey Kite	Most of the areas covered by water hyacinth
6	Farkka Bird Watching Zone	24°48'21" N 87°15'12" E		Grey Heron, Little Cormorant, River Lapwing, Brahminey Kite	Clean
7	Patan	24°02'04" N 88°01'18" E	Beel (5000 bigha)	Grey Heron, Little Cormorant, River Lapwing, Brahminey Kite	Foot and Car
8	Nirmal Char	24°34'72.65" N 88°43'58.74" E	Lowland (2000 bigha)	Grey Heron, Little Cormorant, River Lapwing, Brahminey Kite	Partially Water hyacinth
9	Rampara Beel	23°51'28" N 88°13'26" E	Lowland (100 bigha)	Grey Heron, Little Cormorant, River Lapwing, Brahminey Kite	Partially Water hyacinth
10	Sagardighi Thermal power Ash Pond	24°37'88" N 88°09'11" E	Large water body	Cotton Pygmy Goose , Greylag Goose Grey Heron, Little Cormorant, River Lapwing, Brahminey Kite	Very Clean, marginal vegetation
11	Amlai Beel	23°91'80" N 88°14'45" E	Beel (ox bow 220 bigha)	Ruddy Shelduck Grey Heron, Little Cormorant, River Lapwing, Brahminey Kite	Partially Water hyacinth
12	Chandpara	24°01'85" N 88°19'70" E	Beel (ox bow 110 bigha)	Cotton Pygmy Goose , Greylag Goose Grey Heron, Little Cormorant, River Lapwing, Brahminey Kite	Partially Water hyacinth



Image No 6 : Ahiran Bird Sanctuary, 24°31'30.87"N 88° 2'6.17"E

CHAPTER 4 – DOCUMENTING NATURE & PROPERTIES OF NATURAL HERITAGE

4.1. Characteristics of the Flood Plain:

In Murshidabad district, most of the variable for flood is natural which includes rainfall, gentle slope of the land, drainage, and continuous siltation of river bed. The main channel Bhagirathi river along with River Jalangi & River Bhairab has been shifted significantly making the entire eastern part of the district very fertile with the fresh deposition of alluvial. The characteristics of the flood plain are as follows :

A. River Cut-Offs

"I suppose no one will hesitate to acknowledge that the whole of the country lying between the Hooghly on the west and the Meghna on the east is only the delta caused by the deposition of the debris carried down by the rivers Ganges and Brahmaputra and their tributaries. It is also equally well known that in such flats the streams are constantly altering their courses, eating away on one bank and depositing on the other, until the channel in which they formerly flowed becomes choked up, and the water is compelled to seek another course. It is also certain that, in this peculiar delta, the general course of the main waters of the Ganges has gradually tracked from the west towards the east, until, of late years, the larger body of the waters of the Ganges have united with those of the Brahmaputra, and have together proceeded to the sea as the Meghna" - Dr. Thomas Oldham in an article published in the Proceedings of the Asiatic Society of Bengal 1870:

Murshidabad, a district standing at the head of the **Gangetic Delta**, affords a striking example of the grand operations of nature produced by fluvial action. There can, as already pointed out, be no doubt that the present channel of the Bhagirathi, with its sacred traditions and early settlements, marks the ancient course of the Ganges, while that portion of the district which lies between the Bhagirathi and the present channel of the Ganges has been the scene of important river changes both before the dawn of history and within historical times. The whole of this area is scored with the tracks of old river beds, which represent the various channels scooped out by the waters of the great river while they were being gradually diverted to their present course.

The Ganges river, emerging from its upper levels round the Rajmahal Hills, and prevented by their solid rocky barrier from cutting further to the west, sought its channel in the lower ground adjoining, and originally the main body of its waters flowed along the general course now indicated by the Bhagirathi and Hooghly. But, gradually filling up this channel, it was again compelled to seek a new course in the lower, because as yet comparatively unfilled-in,

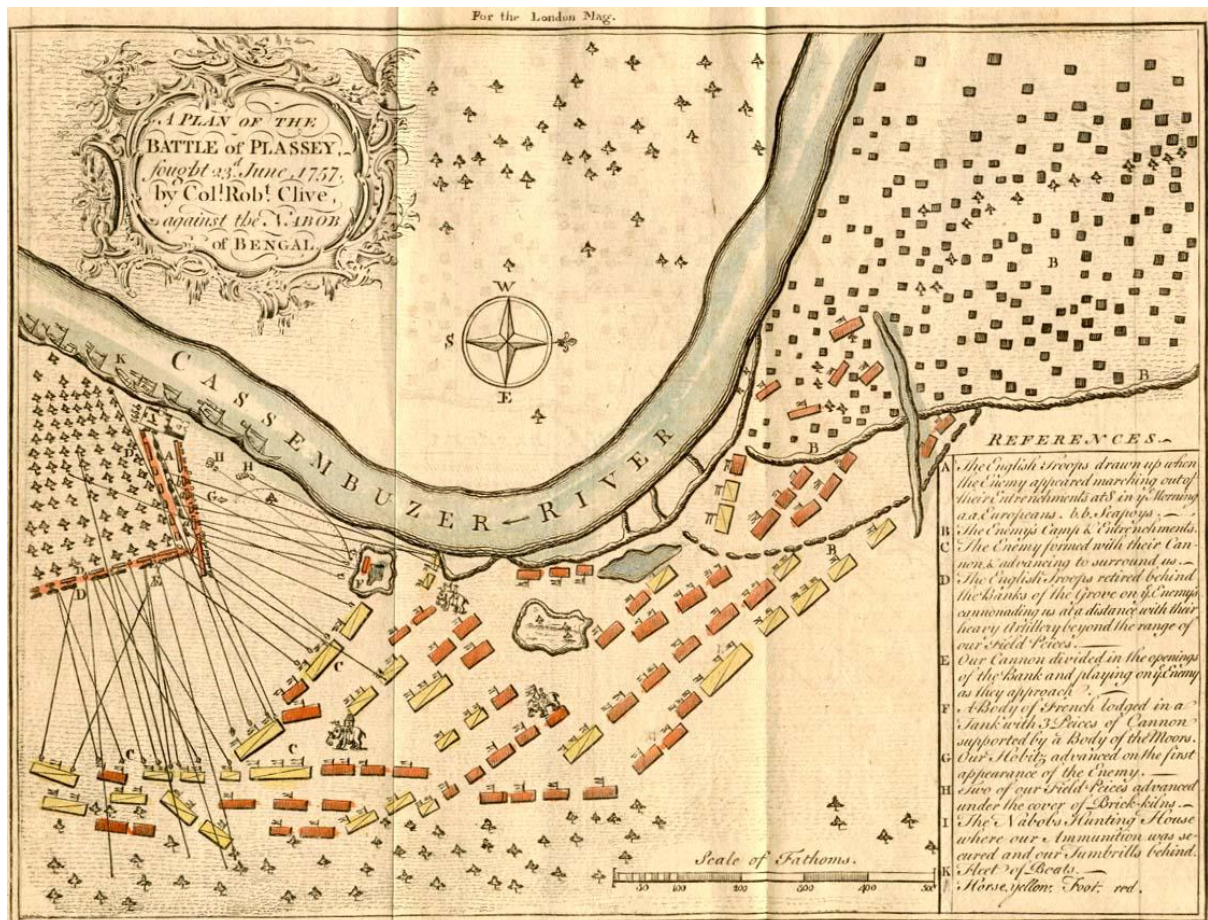
ground lying to the east. And the same process being repeated, it wandered successively from the rocky western limit of the delta-flat towards the eastern. If this progress eastwards was allowed, to be sufficiently slow to admit of the gradual filling in of the country adjoining, the delta was formed continuously up to the same general level, and the larger streams or channels, passing through this flat to the sea, became unavoidably diminished in size and in the quantity and force of the water they carried, the main body passing around further to the east and having its course in the channels successively formed there.

The Bhagirathi formerly afforded a regular means of communication between the upper Gangetic valley and the sea-board, but ever since the British occupation of the country much difficulty has been experienced in keeping it open for navigation throughout the year. The earliest historical mention of its silting up appears to be contained in a letter, dated 6th January 1666, of the Blench traveller Tavernier, in which he states (that Bernier was going overland from a place near Rajmahal to Cossimbazar because the river rent was impracticable. " When the river is low, it is impassable because of a large sand-bank which lies before a town called Suti." Elsewhere Tavernier speaks of the river as a canal, and says it is 16 leagues long. Hedges, again, writing in 1683, said that the river above Nadia was full of shoals, and that, when he arrived at "Mauia" (Mohula), he went from thence to Cossimbazar by *palki*, a distance of 9 or 10 miles.

There is ample evidence of the deterioration of the Bhagirathi in the next century. Stewart in his History of Bengal, which was chiefly compiled from the accounts of Muhammadan chroniclers, states that in 1757, just before the battle of Plassey, Siraj-ud-daula, "believing that the English ships of war might proceed up the eastern branch of the Ganges to the northern point of the Cossimbazar island* and come down the Bhagirathi to Murshidabad, commanded immense piles to be driven in the river at Suti, by which the passage of that river has been rendered merely navigable by boats, and that only during half the year. " In 1781 Rennell wrote that the Cossimbazar river (i.e the Bhagirathi) was almost dry from October to May, and that the Jalangi, although a stream ran through it the whole year, was in some years un navigable during two or three of the driest months. Captain Colebrook, again, in a memoir on the course of the Ganges (1797) wrote: "The Bhagirathi and Jalangi are not navigable throughout during the dry season.

There have been instances of all these rivers continuing open in their turn during the dry season. The Jalangi used formerly to be navigable during the whole or greater part of the year. The Bhagirathi was navigable in the dry season of 1796. This year (1797), however, it was informed that the passage was no longer practicable for boats proceeding to Calcutta.

Experience has shown that none of these rivers are to be depended on.” About the year 1813 the Bhagirathi suddenly deserted its old bed near Cossimbazar, and instead of following its former bend to the east of the town took a sweep to the west. Its old channel became a stagnant stretch of water, and the main stream flowed three miles away from its former bed. The cause of this diversion of the channel is not known, but it may perhaps be surmised that it was connected with an attempt to introduce a larger supply of water down the channel by a cut across two bends. That there was some interference with the natural channel is clear from Hamilton’s East India Gazetteer of 1816, in which it is stated:—“ In 1813, a canal was dug between the Bhagirathi and great Ganges, partly to ameliorate the unhealthiness of the town (Murshidabad) and adjacent villages by maintaining a permanent stream of wholesome water.” There is, moreover, a local tradition that a new channel was actually excavated, as stated by a writer in the Calcutta Review of 1873: “All these places (Cossimbazar and the adjacent villages),” he writes, “were originally situated on a curve of the river Bhagirathi, but seventy years ago a straight cut was made forming the chord of the curve, thus changing the course of the river. This engineering operation was followed by the breaking out of an epidemic fever, which, in virulence and mortality, is unparalleled by any pestilence save that - which destroyed Gaur.”* The old channel survives as a *khal*, which is used by boats in the rains. It is curious that it is called *Katigang* as if it were an artificial channel, and there is a tradition that the Sahebs cut a channel and brought the river out to the north of Farasdanga.



Map No 33 : River Bhagirathi Was Said to be as Cassimbazar River by the British in 18h Century.

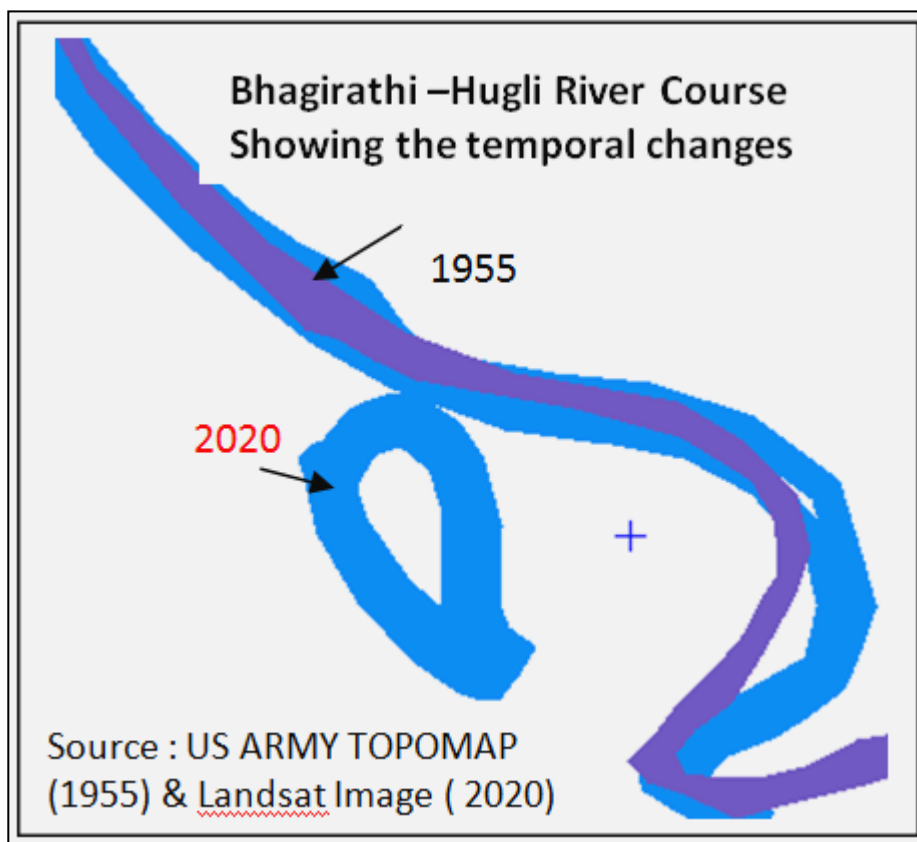
Source The battle of Plassey (June 23, 1757); an engraving from the London Magazine, 1760, with modern hand colouring

The channel of Bhagirathi River within the study region is excessively dynamic and characterized by irregular meandering and lateral migration. Consequently, the adjacent area is susceptible to continuous erosion and channel migration hazards, which may cause substantial losses of crops, land property, livestock and human lives. Since the installation of the Farakka in 1975, there has been an increase in the discharge of the river. This has caused several cut-offs to be formed in the river Bhagirathi. We have documented about 13 Cut-Offs or Ox-Bow lakes indicating the existence of the old channel course. These cut-offs are mostly used for agricultural and fishing practises. Many of them are also birding hotspots.

a. Cut-off at Dear-Balagachi - $24^{\circ}19'41.87''N$ $88^{\circ}10'39.95''E$ Dear-Balagachi is the only conspicuous meander to be formed in the upper course of the river. At Dear-Balagachi it is seen that the angle between the two tangents and the distance between the two tangents is decrease, so there is a chance of a cut-off in near future Dear-Balagachi loop which is downstream from the Feeder Canal outfall. The erosion near the neck of the loop during the year 1993-1994 has been observed.



Map No 34 : Balagrachi Cut-off on River Bhagirathi Formed in the Downstream of Feeder Canal.

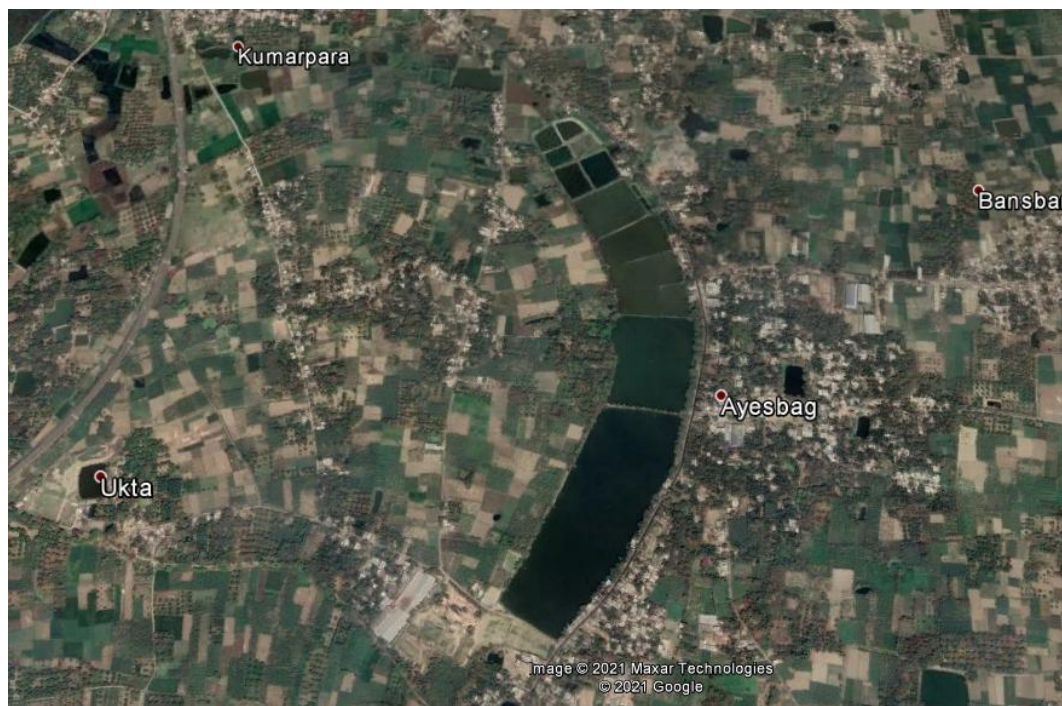


Map No 35 : The Temporal Changes of Bhagirathi (1955-2020).

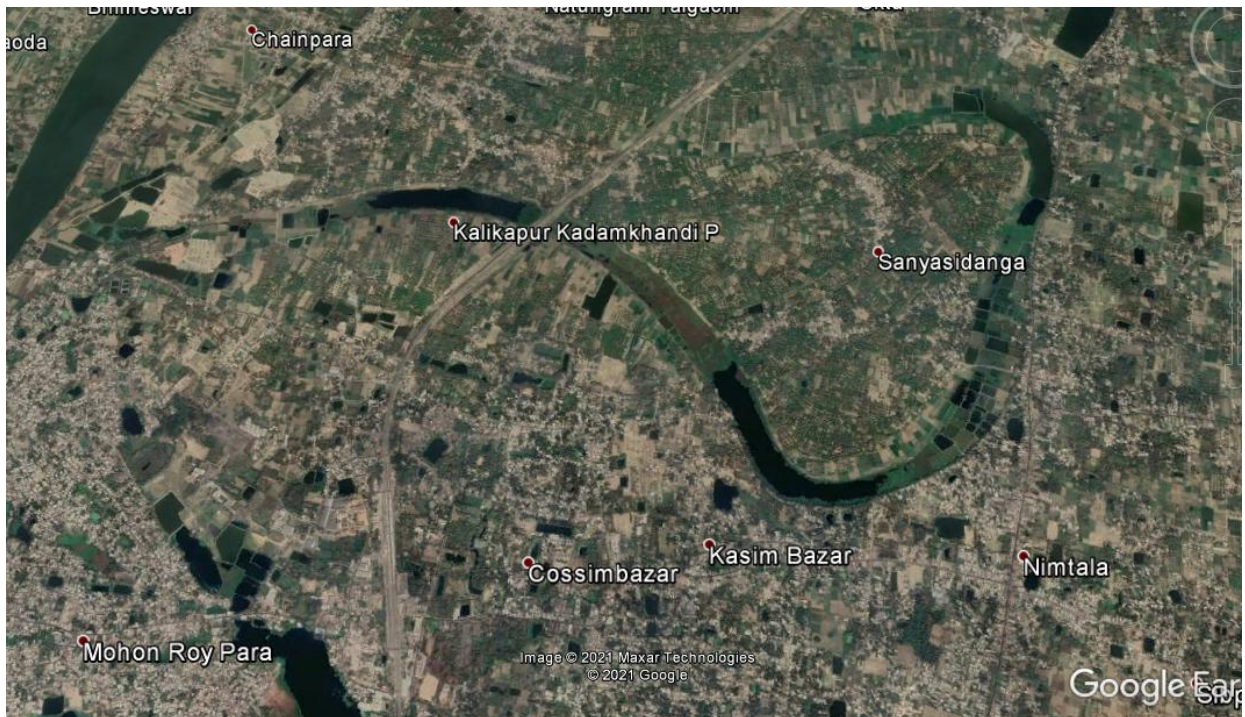
b. Motijheel: $24^{\circ} 9'41.12''N$ $88^{\circ}16'54.27''E$ According to James Rennell Motijhil is a horse shoe shaped lake. Motijhil is situated about one and a half kilometers away from Murshidabad in the south and about three kilometres away from the Hazarduari Palace in the south east. It has been excavated on the former beds of the Bhagirathi River that once flowed near this lake. The river was much nearer in 1766 than now. At south there is a tank known as the Shanti Pukur. The offices were built on its banks.



Map No 36 : Motijheel , $24^{\circ} 9'25.97''N$ $88^{\circ}17'5.36''E$



Map No 37 : Ayesbag: $24^{\circ} 8'43.74''N$ $88^{\circ}17'58.26''E$, High Resolution Image,2019



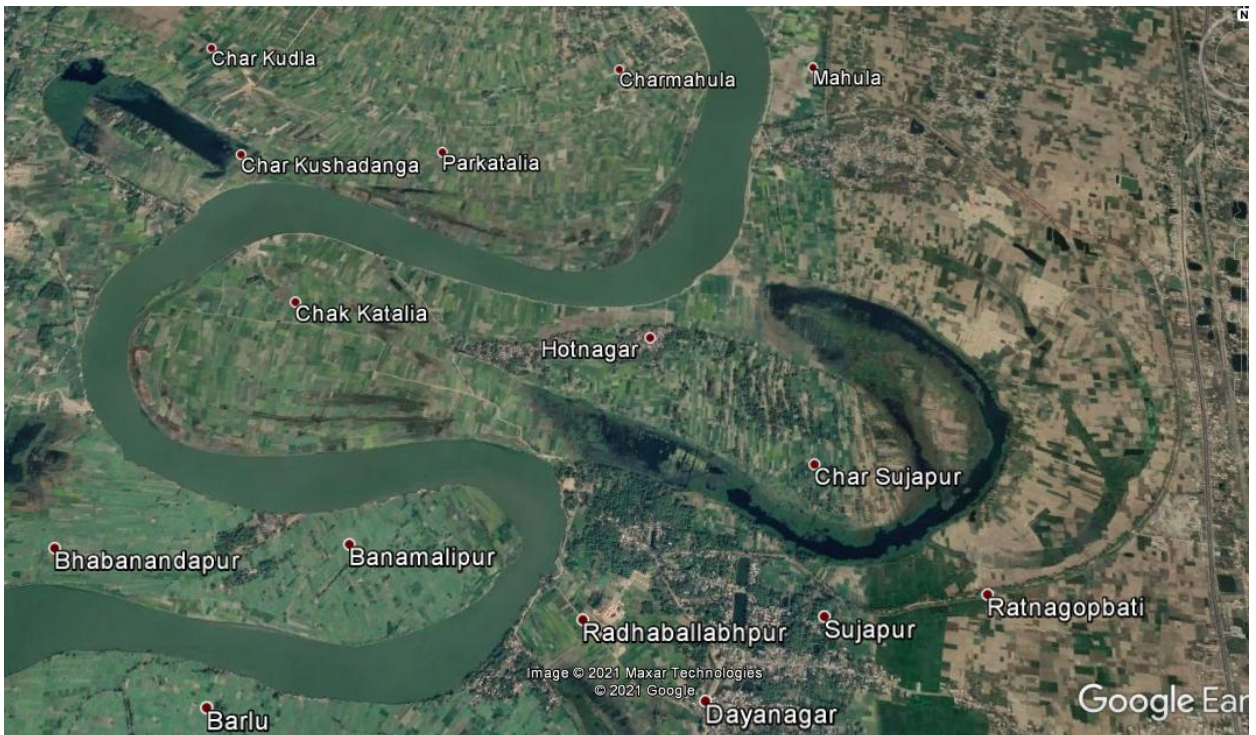
Map No 38 : Sanyasidanga, 24° 8'15.94"N 88°17'37.95"E



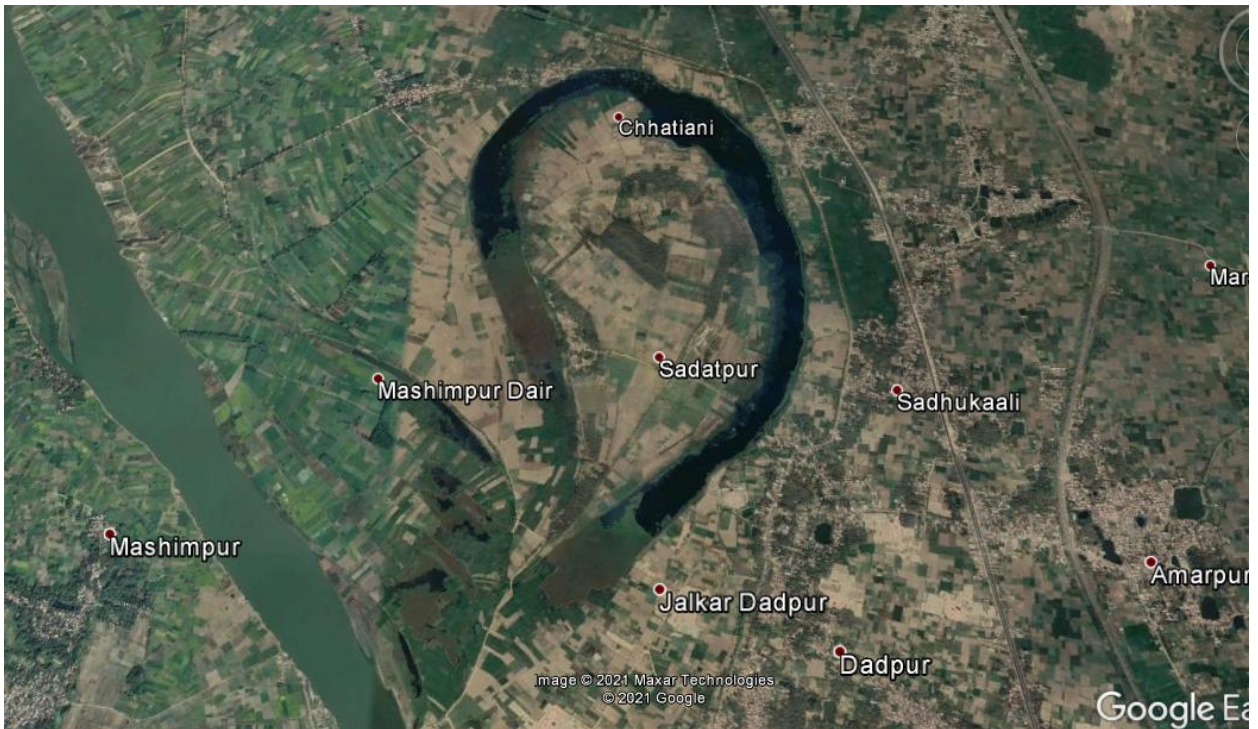
Map No 39 : Khagra, 24° 6'52.61"N 88°15'55.61"E



Map No 40 : Haridasmati, 24° 4'10.12"N 88°15'15.08"E



Map No 41 : Char Sujapur, 23°59'14.88"N 88°13'33.87"E



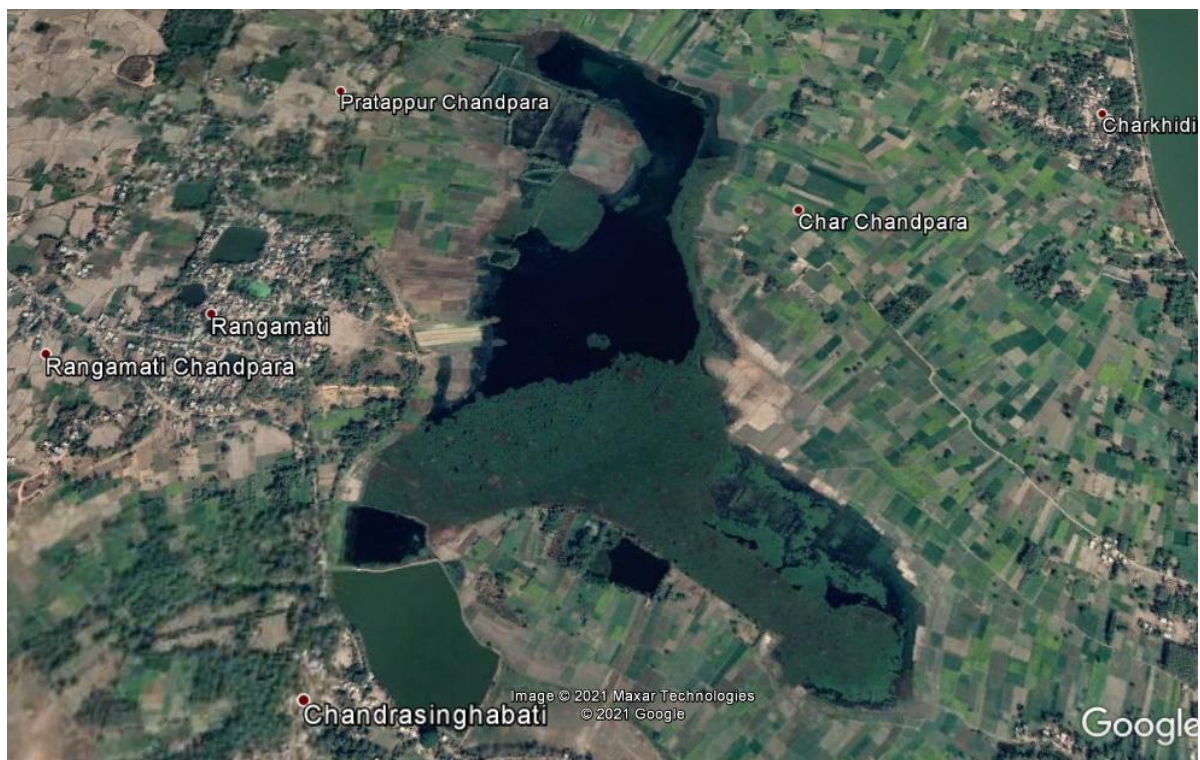
Map No 42 : Chatiyani, 23°53'41.47"N 23°53'41.47"N



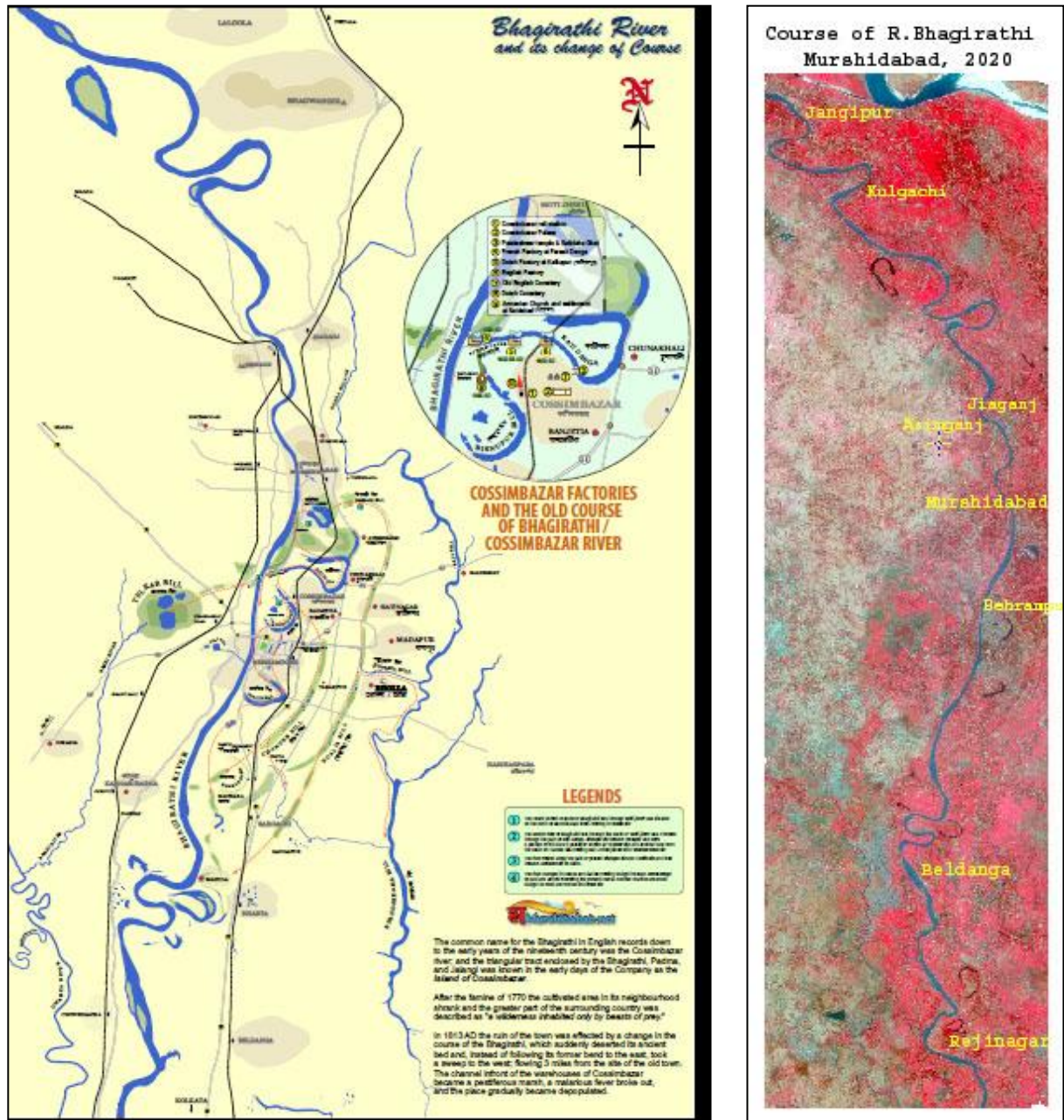
Map No 43 : Chak Chandpur, 23°51'28.93"N 88°13'47.16"E



Map No 44 : Char Kushadanga, 23°59'46.85"N 88°11'39.48"E



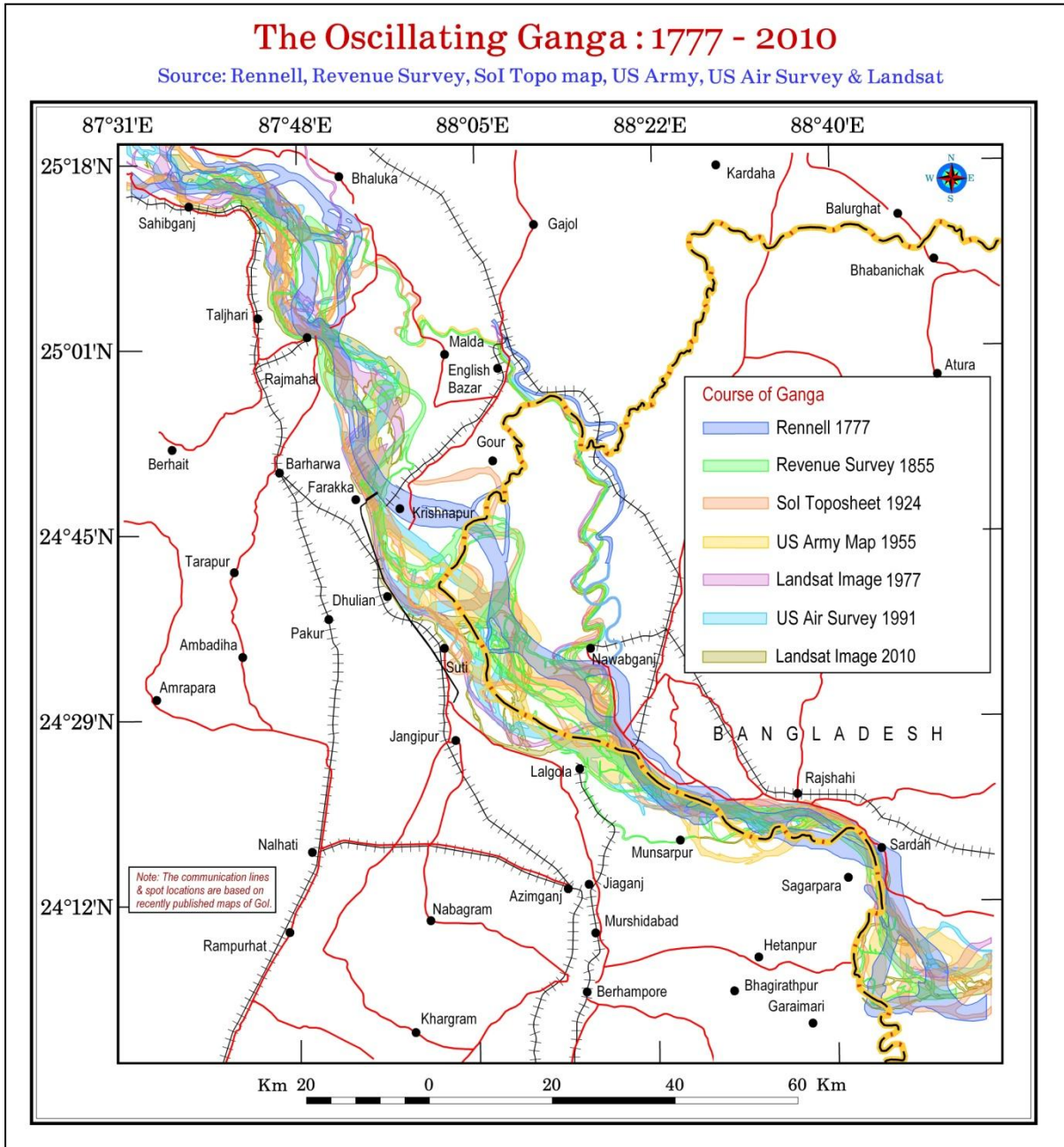
Map No 45 : Rangamati, Chandpara 24° 1'5.24"N 88°11'52.06"E



Map No 46 : Course of Bhagirathi River

B. The Oscillating Ganga – 1777-2010

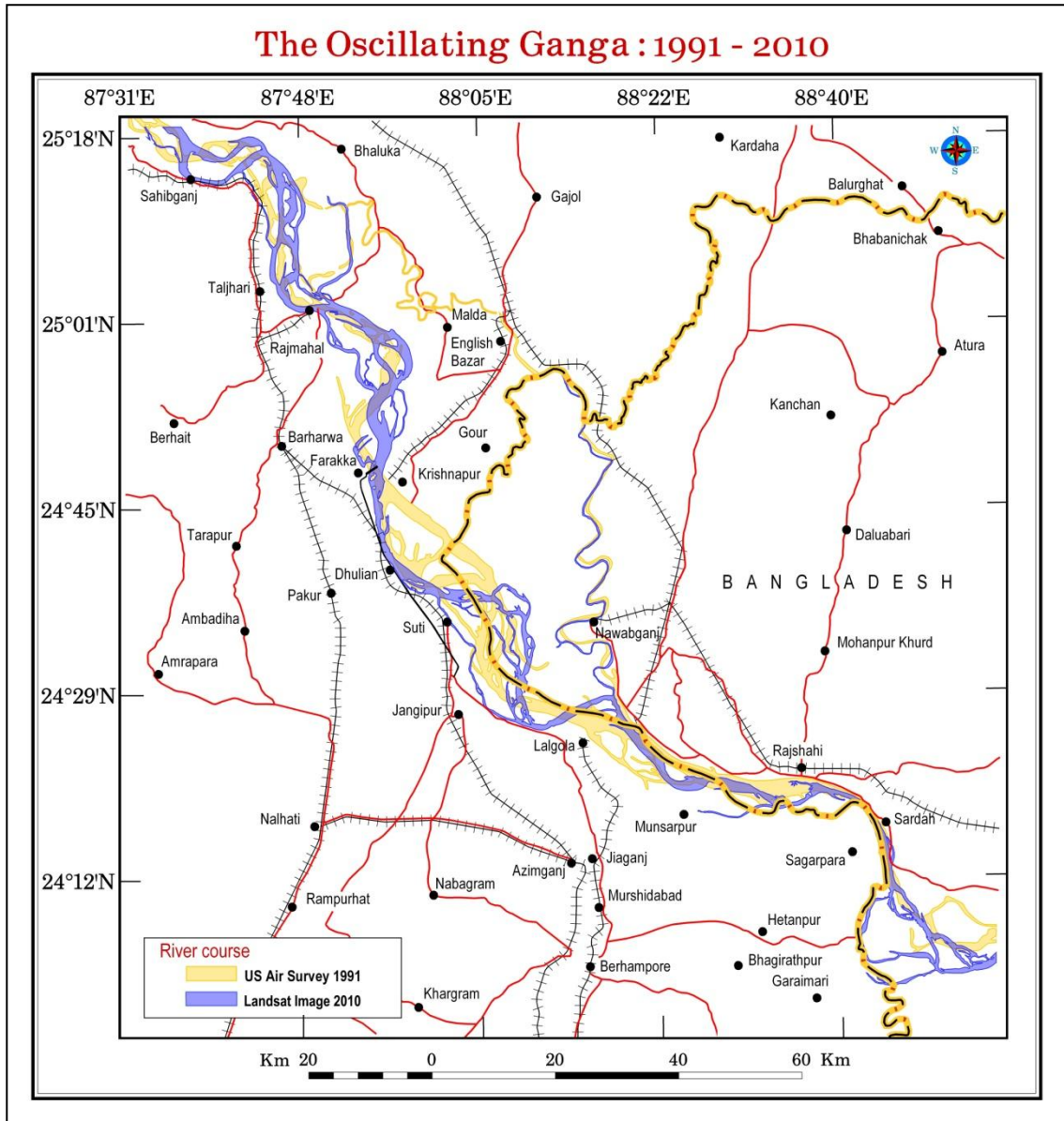
The entire course of Ganges shows massive oscillation in the district of Murshidabad from Farakka to Jalangi. Old maps from 1777 (James Rennell's Map of Bengal Basin) till the Landsat Image of 2010 have been overlaid to get the following map. (Map - 47)



Map No 47 : Oscillating Ganga, 1777 - 2010

The original Ganga used to flow across the north and east India from Uttarakhand to West Bengal before the 16th century. Geologists say, before it diverted to the Padma eastward, there might have been 2 major channels, flowing more or less independently and building the deltaic tract in the part of Bengal, west of Madhupur Jungle, the Ganga flowed through central Bengal and Teesta through south Bengal. Earlier Teesta was reinforced by the Mahananda and the Kosi and still earlier perhaps by Brahmaputra before it coursed eastward to the Meghna. Early in the 16th century, the main course of the Ganga shifted eastward to the present Padma. This is due to the tectonic changes and natural calamities lead to a rapid

deterioration of Bhagirathi. Bhagirathi was the main trading link between north and south Asian countries through Bay of Bengal. Sir William Willcock described the Bhagirathi, the Jalangi and the Mathabhanga as the “overflow irrigation system” in ancient Bengal. Others believe that Bhagirathi was a natural stream line and was the main channel of Ganga.



Map No 48 : Oscillating Ganga, 1991 - 2010

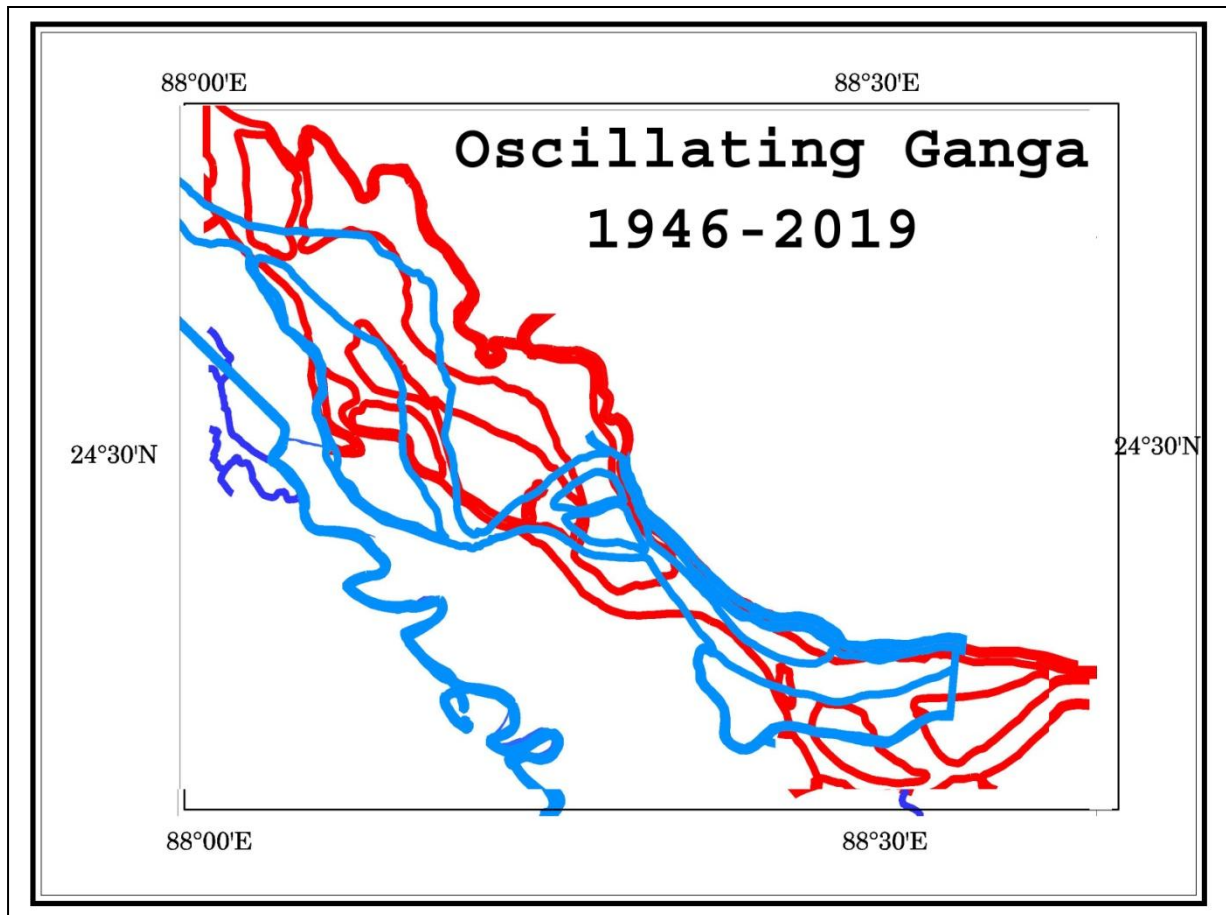
Source : US Air Survey & Landsat Image

C. Bank Erosion :

The main channel of the Ganges has a bankline of 94 km along its right bank from downstream of Farakka Barrage to Jalangi. Severe erosion occurs all along this bank. From a little above Nimtita, about 20 km downstream from Farakka, the Ganges flows along the international boundary with Bangladesh in the left bank. The following blocks have to face the

brunt of erosion year after year: Farakka, Samserganj, Suti I, Suti II, Raghunathganj II, Lalgola, Bhagawangola I, Bhagawangola II, Raninagar I, Raninagar II and Jalangi. Between 1931 and 1977, 26,769 hectares have been eroded and many villages have been fully submerged.

According to government reports between 1988 and 1994, 206.60 square km. land was eroded displacing 14,236 families.



Map No 49 : Oscillating Ganga, 1946-2019

Source – SOI Toposheet, Landsat Image

Dhulian and its adjoining areas were greatly affected in mid 1970s when about 50,000 people became homeless. The encroaching river wiped out 50 mouzas and engulfed about 10,000 hectares of fertile land. 1980-1990 was a decade of erosion for this district and during the decade Giria, Sekhalipur, Khejustala, Mithipur, Fajilpur, Rajapur, Akheriganj, Parashpur villages were badly affected. Many families living along the Ganges continue to be affected. As for example, in 2007, severe erosion occurred in Lalgola, Bhagawangola II, Farakka and Raninagar II CD Blocks. In 2008, 1,245 families were affected in Lalgola, Bhagawangola I and Bhagawangola II CD Blocks.

According to the Report on Impact of the Farakka Barrage on the Human Fabric: "People in Murshidabad had been experiencing erosion for the last two centuries but the ravages caused by the mighty Padma at Akheriganj in 1989 and 1990 surpassed all previous records. Akheriganj disappeared from the map destroying 2,766 houses, leaving 23,394 persons homeless many of whom migrated to the newly emerged Nirmal char along the opposite bank.... This area has lost its school, college, places of worship, panchayat office to the raging Padma.... Original Akheriganj of nearly 20,000 inhabitants has gone into the river around 1994."

"**Jalangi**" situated 50 km east of Baharampur district headquarter has suffered tremendously in 1994-95. At Jalangi Bazaar severe erosion started in September 1995 engulfing nearly 400 metre width of land within a week and then high built up homestead land thereby destroying Jalangi High School, Gram Panchayat Office, Thana and innumerable buildings rendering nearly 12000 people homeless."

"As per official estimate, till 1992-94 more than 10,000 hectares of chars (flood plain sediment island) have developed in main places, which have become inaccessible from the Indian side but can be reached easily from Bangladesh. The erosion wiped away boundary posts at many places creating border dispute. In Parliament when this issue was raised the House was assured that the boundary was fixed on the map even though the river has shifted".

"One typical example is that of **Nirmal char** built by eroding Akheriganj. Here a population of 20,000 lives in an area of 50 sq.km. From here Rajshahi city of Bangladesh can be reached within 45 minutes on road whereas to come to the mainland of India one has to cross the mighty Padma which will take more than three hours. Moreover, the basic infrastructure provided here is too poor and the people's plight is further heightened by negligence of the mainland administration. Since there is no primary health centre, people go to Rajshahi for treatment. The concept of international border is very much flexible here due to basic problems of living. Instances of fighting for harvesting with Bangladeshi cultivators have been reported again and again apart from the usual problem of allotting created land to the rightful owners. Once again, the question of Bangladeshi infiltrators, the recent fiasco over ISI agents has increased in this district due to these char areas."

"Downstream of Jangipur Barrage the river Ganga/Padma is swinging away close to river Bhagirathi at Fazilpur leaving only 1.34 km. in width. In 1996, this distance was 2.86 km. If Ganga/Padma actually merges with Bhagirathi due to the natural tendency, it will lead to flood and catastrophe in the entire Bhagirathi basin. Bhagirathi water remains at a higher elevation than the river Ganga/Padma during lean season and if they merge the water of the feeder

canal will flow through Padma to Bangladesh defeating the very purpose of the Farakka Project."

Sequence of erosion events in the district along Padma and Bhagirathi River bank

1. The right bank of river in the district below Faraka barrage have been undergoing heavy erosion since 1930 prior to the construction of barrage (barrage commissioned in 1975) as per available record of Central Water and Power Research Station, Pune (CWPRS).
2. In 1939 erosion between Farakka to Dhulian has been specially recorded and the railway line between Barharwa and Nimtita has been abandoned.
3. During the period from 1945 to 1950, eroded about 3.2 km width of land near Dhulian.
4. During 1952-53 the old Dhulian town was completely washed away by the river. The present Dhulian town is at a distance of more than 1.6 km from the location of the old town and again severe erosion near Dhulian town and Suti police station after 1967.
5. It has been observed that since the beginning of construction of the Farakka Barrage in 1962, the intensity of erosion has been increased. Dhulian and its adjoining areas were severely affected in mid 1970s when about 50,000 people became homeless. The present site of Dhulian is reportedly the fourth site. The encroaching river wiped out 50 mouza and engulfed about 10,000 hectares of fertile land. A large part of the interfluves, lying between the Bhagirathi and Padma with an area of about 77sq. km between Nayansukh and Giria, disappeared for ever between 1925 and 1974. During 1968 to 1978 the entire reach between Beniagram and Nimtita was under severe attack. Erosion is also continuing in this region.
6. After commissioning of Farakka Barrage in 1975, the dry Bhagirathi River (summer season) was rejuvenated and river bank erosion along Bhagirathi River and flood both increases in different parts of Murshidabad district. As for example, Mahispur and Balagachi mouza were washed away and displaced people are forced to migrate at Ganja Sinheswari mouza. Bhagirathi River formed new point bar (char land) and excessive meandering pattern and widen river channel in this area. Bhagirathi river meander cut-off may be occurred in near future.
7. Erosion along Bhagirathi River in different places is also associated in devastating floods in the year 2000 in Murshidabad district. The part of earthen embankment in Ajothya Nagar near Bermhampore is destroyed. Erosion is also observed right bank of Bhagirathi along Berhampore town. Arable land is also encroached by Bhagirathi River at Shaktipur area.

8. During 1977 - 1980 the reach further down between Biswanathpur and Giria just upstream of barrage across the Bhagirathi near Jangipur was severely attacked and agricultural lands were affected (Parua, 2009).
9. According to the old records, the erosion is very active in 1939 and in 1968 in the reach between Hanumantnagar and Akhriganj (about 4.5 km). After silent of erosion of two decades, erosion again very much active from 1989 to 1997 at Akhriganj. Akhriganj town, surrounding villages, state highway, market complex, school building was severely affected. Now erosion is less active at Akhriganj region due to flow concentrated towards left bank i.e. Bangladesh side. According to Rudra, K. (2005), "The erosion has been the cause of major distress of the people living along the river front of Murshidabad district for the last two centuries, and the ravages caused by mighty Padma at Akheriganj in 1989 and 1990 surpassed all previous records. Akheriganj, which literally means the last settlement, virtually disappeared from the map. The disastrous erosion engulfed 2,766 houses and left 23,394 persons homeless. Many erosion-victims migrated to the newly emerged Nirmal char along opposite bank. The southward encroachment of the river reached the limit of meander belt in 2002 when principal flow started to migrate towards opposite side".
10. In the reach between Bamnabad to Rajnagar (about 4 km) active erosion started during floods of 1996. Many villages, state highway, agricultural land and school building had been affected. During field survey in March 2015, Ajabul Sardar, one of the inhabitants of Bishpara village told us that Bamnabad, Nalbona, Lalkup, Jagirpara and part of present Bishpara villages are washed away due to erosion of Padma River. Hospital, Madrasa was also washed away. Neo-refuges are resettled at New Bamnabad, Bishpara, Sibnagar and other villages. Now River shifted towards Bangladesh side and new charland was emerged. People live this charland temporarily for grazing purpose of their animals. This is locally known as Bethan (Plate II). Border Security Force Outpost is also situated in this char.
11. From 1978 to 1987, severe river bank erosion at Fazilpur downstream of Jangipur Barrage and the gap between Ganga and Bhagirathi is reduced by 200m. Thereafter the erosion stopped and present distance stable at 1.20 km.
12. At Jalangi Bazar, about 3km stretch of river bank (before the river enters into Bangladesh) is severely affected due to erosion from 1994 due to development of central char land and construction of 15 km long concrete bund for protecting Rajsahi town of Bangladesh. Five villages near Jalangi Bazar town have been completely washed away and Jalangi town has been severely affected. Now this area is more or less stable due to flow concentrated towards left bank of Bangladesh side.

13. Severe erosion started at Maya in 2011 & 2012, about 30 houses have been washed away in a single day. Erosion is also rejuvenated in February, 2015 after silent of two years.
14. Mango garden is eroded in 2013 at Mithipur area (Plate III). This area is also eroded during previous three to four years. Early time this area is also affected by bank erosion.
15. Erosion also affected in 2014 at different places such as Banamalipur village (Baldanga-I block), Shaktipur region, Khos bagh (Lalbagh) and other places along Bhagirathi River, Rajanagar char (Raninagar II Block) along Padma River.



Image No 7 : Bank Erosion , Samsenguange Block, Murshidabad.

Source : The Wire ,06,11,2020

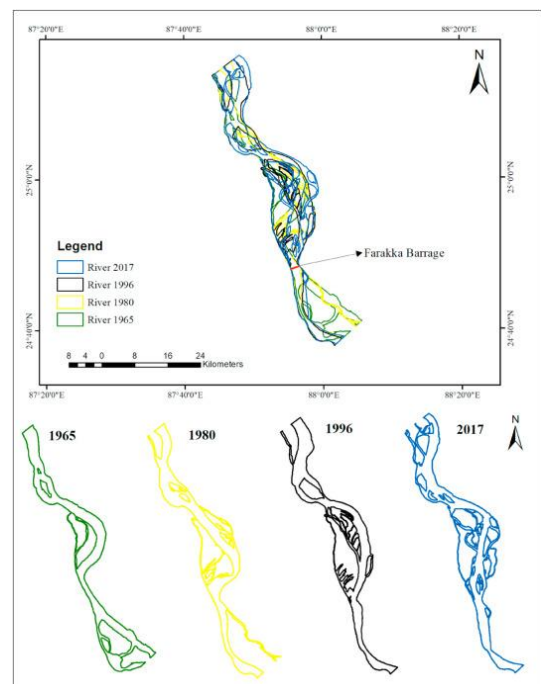


Image No 8 : Bank Erosion Near Bhagawangola Block, Murshidabad, Source : Telegraph , July 2021

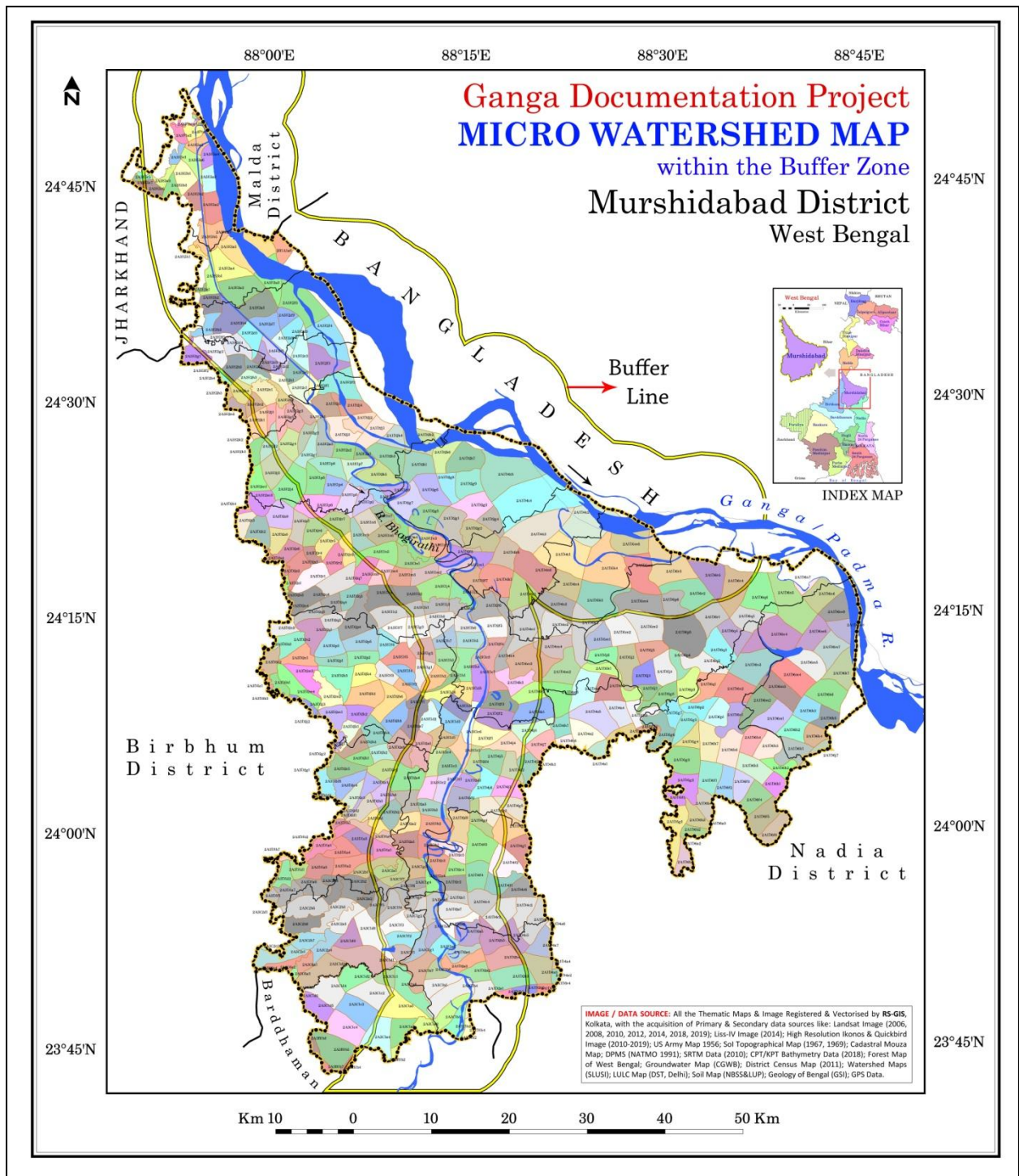
D. Braided Channel:

A braided channel pattern is characterized by multiple channels wherein these channel ways are divided by bars and islands and are always shifting within highly erodible river banks. The characteristic features of braided channel pattern include unstable bars and islands; temporal changes in their (bars and islands) positions and size and shape from one day to the other, from one month to the other and from one season to the other.

The braided stream channel contains bars and island, and the degree of braiding can be expressed by the reach length that is divided by one or more islands or bars’.



Map No 50 : Shifting of River 1965, 1980, 1996 & 2017



4.2. Lakes and Marshes:

There are many small lakes or lagoons, commonly called *jheel* or most of which are the remnants of old riverbeds. The best known of there is the **Motijhil**, or Pearl Lake, a fine

horseshoe lake about two miles from the town of Mursbidabad, which has been formed by a change in the course of the Bhagirathi. Another large lagoon is the **Telkar Bil**, about 3.8 km long and 4km broad, which lies two miles to the west of the Bhagirathi near the Khagra Q-hat railway station; it has, however, dried up to a large extent. To the east of Berhampore lie known as the Bishnupur, Chaltia and Chanda Bils. The **Bishtupur Bil** is a crescent-shaped expanse of water stretching from the north-east of Berhampore to about half a mile south-east of the railway station at Cossimbazar. It is connected with the Bhagirathi by two sluices, called the **Khagra and Berhampore** sluices, which are under the control of the Public Works Department.



Image No 9 : Watercolour of the Moti Jhil, 'The Pearl Lake,' Near Mushidabad, by an Anonymous Artist Working in the Murshidabad Style, c. 1790-1800. Inscribed on the Back in Ink and Pencil: 'Bird's Eye View of Mootijeel'.



Image No 10 : Constructed Island at Motijheel, Murshidabad

Motijheel, Murshidabad Motijheel or Pearl lake is situated about one and a half kilometre south of Lalbagh and about three kilometres south-east of Hazarduari Palace at MURSHIDABAD, WEST BENGAL. The horse-shoe shaped lake, according to Rennell, was one of the meandering courses of the Bhagirathi that once flowed near this area. Within the bend of the lake were built a beautiful palace called 'Sang-i-dalan' (stone palace), a lofty gateway, a mosque and some other structures by NAWAZISH MUHAMMAD KHAN alias Shahmat Jang, nephew and son-in-law of Nawab ALIVARDI KHAN. The palace of Nawazish Khan was built using materials, especially the black basalt pillars brought from the ruins of Gaur and thus assumed the name Sang-i-dalan. After his death, his widow GHASETI BEGUM lived here until SIRAJUDDAULA took over the palace and seized enormous amount of treasures in 1756 AD. Source : Banglapedia.



Image No 11 : Aquatic Plant at Motijheel, Murshidabad

The **Chaltia Bil** is another crescent- shaped sheet of water, which starts at the south of Berhampore near the Judge’s Court and extends past the villages of Bhakril, Chaltia and Krishnainati to Kalabaria near Haridasraati. The **Chanda Bil** is a shallow marsh about 6.4km long and a 1km broad, which is bounded on the north by Badurpur, Tarakpur and other villages, and on the south by



Image No 12 : Chaltia Bil

Maukara and the Chaltia Bil to the Gobra Nullah but they were not sufficiently deep for efficient drainage. Another cut has recently been made in the Bishtupur Bil in order to improve its drainage. Other important dils in the east of the district are the Goas (20 sq.km), Dumkul (15 square km) and Bhandardaha Bils, the last of which requires separate mention.

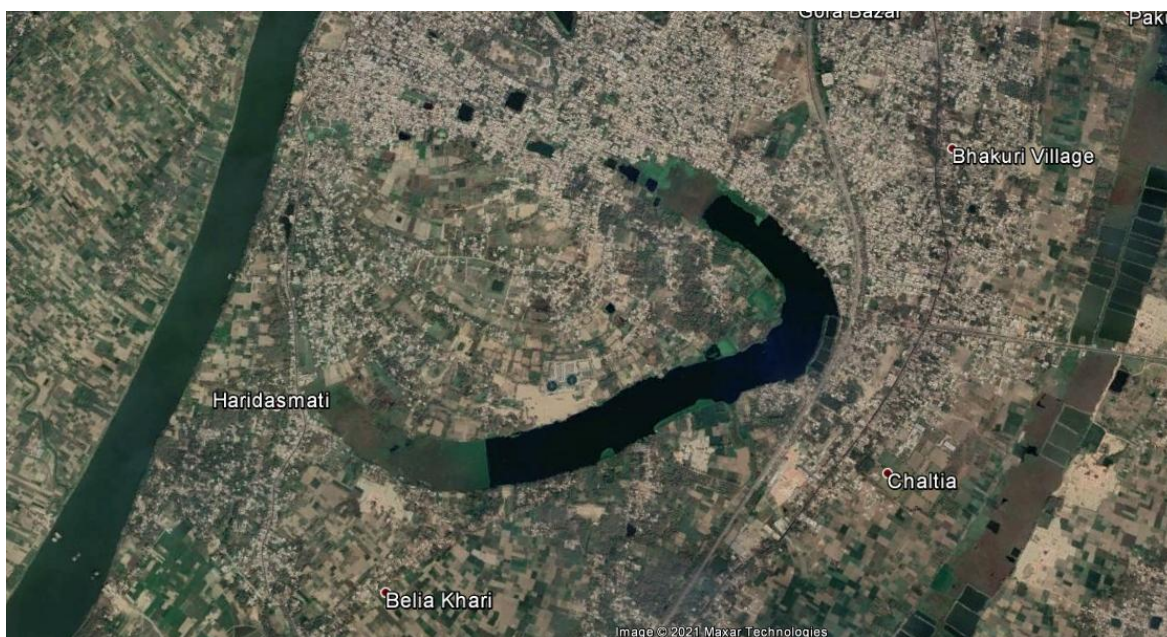


Image No 13 : Chaltia Bil, 24° 4'10.16"N 88°15'15.06"E

Beside these above mentioned Bils there are also many waterbodies in our study area mostly used for agricultural and fishing purpose. Here is a list of the waterbodies ;

Table No 7 : List of Water Bodies of Murshidabad District

Sl.no	Blocks	Coordinates		Purpose	Condition
		Latitude	Longitude		
1	RAGH UNAT HGAN J I & II	24°46'28.53"N	87°52'44.92"E	Agriculture	Regular
2		24°46'49.34"N	87°52'43.31"E	Agriculture	Partial Clogging

3		24°45'53.18"N	87°53'56.70"E	Agriculture	Partial Clogging
4		24°44'47.24"N	87°53'43.88"E	Agriculture	Partial Clogging
5		24°43'50.17"N	87°54'34.87"E	Agriculture	Partial Clogging
6		24°43'26.37"N	87°55'47.99"E	Agriculture	Partial Clogging
7		24°43'8.08"N	87°56'5.34"E	Agriculture	Partial Clogging
8		24°42'54.52"N	87°55'53.45"E	Agriculture	Partial Clogging
9		24°42'22.27"N	87°55'42.75"E	Agriculture	Regular
10		24°42'19.80"N	87°55'35.03"E	Agriculture	Regular
11		24°42'14.72"N	87°55'36.01"E	Agriculture	Regular
12		24°42'2.83"N	87°56'1.99"E	Agriculture	Regular
13		24°41'48.24"N	87°55'58.54"E	Agriculture	Regular
14		24°41'34.46"N	87°56'18.81"E	Agriculture	Regular
15		24°40'56.14"N	87°56'10.65"E	Agriculture	Regular
16		24°40'50.44"N	87°56'12.85"E	Agriculture	Regular
17		24°40'58.00"N	87°55'59.79"E	Agriculture	Partial Clogging
18		24°40'18.69"N	87°56'14.08"E	Agriculture	Partial Clogging
19		24°40'2.64"N	87°56'27.34"E	Agriculture	Partial Clogging
20		24°39'34.26"N	87°56'42.79"E	Agriculture	Partial Clogging
21		24°38'35.57"N	87°56'51.46"E	Agriculture	Regular
22		24°38'47.41"N	87°57'58.98"E	Agriculture	Regular
23		24°38'27.80"N	87°58'21.05"E	Agriculture	Regular
24		24°38'6.45"N	87°58'1.39"E	Agriculture	Regular
25		24°37'15.26"N	87°58'31.41"E	Agriculture	Regular
26		24°36'46.67"N	87°58'26.50"E	Agriculture	Regular
27		24°36'5.55"N	87°58'49.39"E	Agriculture	Partial Clogging
28		24°35'36.01"N	87°58'46.85"E	Agriculture	Partial Clogging
29		24°35'30.34"N	87°59'35.82"E	Agriculture	Partial Clogging
30		24°35'27.25"N	88° 0'47.67"E	Agriculture	Partial Clogging
31		24°34'36.47"N	88° 1'0.94"E	Agriculture	Partial Clogging
32		24°33'53.71"N	88° 1'17.53"E	Agriculture	Partial Clogging
33		24°32'44.38"N	88° 2'15.08"E	Agriculture & Fishing	Partial Clogging
34		24°31'33.06"N	88° 1'55.40"E	Agriculture	Regular
35		24°30'44.35"N	88° 2'51.93"E	Agriculture	Regular
36		24°29'53.37"N	24°29'53.37"	Agriculture	Regular
37		24°29'2.35"N	88° 3'4.14"E	Agriculture	Regular
38		24°28'37.32"N	88° 3'16.61"E	Agriculture	Regular
39		24°28'27.44"N	88° 3'49.00"E	Agriculture & Fishing	Regular
40		24°28'23.00"N	88° 3'23.59"E	Agriculture & Fishing	Partial Clogging
41		24°26'39.66"N	88° 3'19.77"E	Agriculture & Fishing	Partial Clogging
42		24°21'56.69"N	88° 9'56.36"E	Agriculture & Fishing	Partial Clogging
43		24°21'46.63"N	88°10'29.23"E	Agriculture & Fishing	Partial Clogging

44		24°21'34.94"N	88°10'37.11"E	Agriculture & Fishing	Partial Clogging
45		24°21'35.18"N	88°10'44.81"	Agriculture	Regular
46		24°21'33.53"N	88°10'49.87"E	Agriculture	Regular
47		24°21'28.12"N	88°10'56.63"E	Agriculture	Regular
48		24°21'10.96"N	88°11'0.21"E	Agriculture	Regular
49		24°21'6.81"N	88°11'5.32"E	Agriculture	Regular
50		24°21'10.94"N	88°11'8.17"E	Agriculture	Regular
51		24°21'4.12"N	88°11'18.76"E	Agriculture	Regular
52		24°21'3.71"N	88°11'35.05"E	Agriculture	Regular
53		24°21'9.25"N	88°11'53.21"E	Agriculture	Regular
54		24°21'5.44"N	88°12'4.23"E	Agriculture	Regular
55		24°20'58.13"N	88°12'7.60"E	Agriculture	Regular
56		24°20'57.22"N	88°12'18.50"E	Agriculture	Regular
57		24°20'56.26"N	88°12'32.21"E	Agriculture	Partial Clogging
58		24°20'52.51"N	88°12'42.53"E	Agriculture	Regular
59		24°20'47.43"N	88°12'59.96"E	Agriculture	Regular
60		24°20'47.59"N	88°13'4.37"E	Agriculture	Partial Clogging
61		24°20'28.31"N	88°13'28.26"E	Agriculture	Partial Clogging
62		24°20'10.39"N	88°13'38.50"E	Agriculture	Partial Clogging
63		24°19'55.84"N	88°13'46.23"E	Agriculture	Regular
64		24°19'44.96"N	88°13'50.02"E	Agriculture	Regular
65		24°19'51.47"N	88°13'58.80"E	Agriculture	Partial Clogging
66		24°19'43.18"N	88°14'8.84"E	Agriculture & Fishing	Partial Clogging
67		24°19'40.76"N	88°14'3.29"E	Agriculture & Fishing	Partial Clogging
68		24°19'34.94"N	88°14'8.21"E	Agriculture & Fishing	Regular
69		24°19'32.90"N	88°14'18.67"E	Agriculture & Fishing	Regular
70	FARAKKA	24°19'45.17"N	88°14'28.90"E	Agriculture & Fishing	Regular
71		24°18'55.25"N	88°12'54.57"E	Agriculture & Fishing	Regular
72		24°18'4.94"N	88°13'50.61"E	Agriculture & Fishing	Regular
73		24°17'20.74"N	88°14'29.95"E	Agriculture	Regular
74		24°17'13.68"N	88°14'35.34"E	Agriculture	Regular
75		24°16'48.82"N	88°15'46.83"E	Agriculture	Partial Clogging
76		24°16'16.81"N	88°16'29.16"E	Agriculture	Partial Clogging
77		24°16'1.50"N	88°16'26.78"E	Agriculture	Partial Clogging
78		24°16'20.21"N	88°16'31.87"E	Agriculture	Regular
79		24°15'15.63"N	88°16'15.54"E	Agriculture	Regular
80		24°15'6.67"N	88°16'23.28"E	Agriculture	Regular
81	SUTI 1&II	24°14'58.43"N	88°16'15.40"E	Agriculture	Regular
82		24°14'33.74"N	88°16'5.02"E	Agriculture	Regular
83		24°14'33.65"N	88°16'0.09"E	Agriculture	Regular

84		24°14'21.58"N	88°16'3.33"E	Agriculture	Regular
85		24°14'21.54"N	88°15'49.97"E	Agriculture	Regular
86		24°14'32.62"N	88°15'44.67"E	Agriculture	Regular
87		24°14'35.19"N	88°15'36.78"E	Agriculture	Partial Clogging
88		24°14'37.05"N	88°15'30.17"E	Agriculture	Regular
89		24°14'42.53"N	88°15'19.76"E	Agriculture	Regular
90		24°14'44.52"N	88°15'12.60"E	Agriculture	Regular
91		24°14'30.74"N	88°15'47.24"E	Agriculture & Fishing	Regular
92		24°13'54.59"N	88°16'13.22"E	Agriculture & Fishing	Regular
93		24°13'35.10"N	88°16'16.81"E	Agriculture & Fishing	Regular
94		24°13'21.11"N	88°16'15.19"E	Agriculture & Fishing	Regular
95		24°13'4.78"N	88°16'11.29"E	Agriculture & Fishing	Regular
96		24°12'57.18"N	88°16'22.29"E	Agriculture & Fishing	Regular
97		24°12'37.75"N	88°16'14.22"E	Agriculture & Fishing	Regular
98		24°12'38.30"N	88°16'6.53"E	Agriculture & Fishing	Regular
99		24°12'26.70"N	88°16'12.19"E	Agriculture & Fishing	Regular
100		24°12'10.83"N	88°16'13.56"E	Agriculture & Fishing	Partial Clogging
101		24°12'9.76"N	88°16'3.18"E	Agriculture & Fishing	Partial Clogging
102		24°12'7.43"N	88°16'1.74"E	Agriculture & Fishing	Partial Clogging
103		24°11'57.89"N	88°16'4.33"E	Agriculture & Fishing	Partial Clogging
104		24°12'8.78"N	88°16'1.54"E	Agriculture & Fishing	Partial Clogging
105		24°11'49.99"N	88°16'14.33"E	Agriculture & Fishing	Regular
106	LALGOLA	24°11'23.41"N	88°16'16.22"E	Agriculture & Fishing	Regular
107		24°11'17.28"N	88°16'19.30"E	Agriculture & Fishing	Regular
108		24°10'52.79"N	88°16'18.87"E	Agriculture & Fishing	Regular
109		24°10'38.66"N	88°16'23.20"E	Agriculture & Fishing	Regular
110		88°16'23.20"E	88°16'31.73"E	Agriculture & Fishing	Regular
111		24°10'29.93"N	88°16'40.77"E	Agriculture &	Regular

				Fishing	
112		24°10'20.05"N	88°16'40.25"E	Agriculture & Fishing	Regular
113		24°10'17.28"N	88°16'47.60"E	Agriculture & Fishing	Regular
114		24°10'11.82"N	88°16'50.99"E	Agriculture & Fishing	Regular
115	BHAGAWAN GOLA I & II	24°10'3.09"N	88°16'59.60"E	Agriculture & Fishing	Regular
116		24° 9'46.14"N	88°17'4.22"E	Agriculture & Fishing	Regular
117		24° 9'41.37"N	88°17'14.67"E	Agriculture & Fishing	Regular
118		24° 9'29.65"N	88°17'27.59"E	Agriculture & Fishing	Regular
119		24° 9'19.95"N	88°17'30.51"E	Agriculture & Fishing	Regular
120		24° 9'7.77"N	88°17'21.30"E	Agriculture & Fishing	Regular
121		24° 9'9.63"N	88°17'9.98"E	Agriculture & Fishing	Regular
122		24° 8'35.91"N	88°17'14.42"E	Agriculture & Fishing	Regular
123		24° 8'26.05"N	88°17'15.51"E	Agriculture & Fishing	Regular
124		24° 8'18.25"N 24° 7'59.32"N	88°17'28.74"E 88°15'44.24"E	Agriculture & Fishing	Partial Clogging
125		24° 9'11.08"N 24° 8'14.58"N	88°16'0.40"E 88°15'35.19"E	Agriculture & Fishing	Regular
126		24° 7'55.78"N	88°15'7.79"E	Agriculture & Fishing	Regular
127		24° 7'44.64"N	88°15'13.07"E	Agriculture & Fishing	Regular
128		24° 7'27.47"N	88°15'22.35"E	Agriculture & Fishing	Regular
129		24° 6'46.98"N	88°15'22.11"E	Agriculture & Fishing	Regular
130		24° 6'11.85"N	88°15'31.89"E	Agriculture & Fishing	Regular
131		24° 5'40.35"N	88°15'24.03"E	Agriculture & Fishing	Regular
132		24° 5'38.88"N	88°15'12.22"E	Agriculture & Fishing	Regular
133		24° 4'54.38"N	88°14'53.87"E	Agriculture	Regular
134		24° 4'48.70"N	88°15'2.48"E	Agriculture	Regular
135	24° 4'54.89"N	88°14'51.07"E	Agriculture	Regular	
136	24° 4'42.54"N	88°14'22.11"E	Agriculture	Regular	
137	24° 3'46.17"N	88°14'12.26"E	Agriculture	Regular	

138		24° 3'35.71"N	88°14'0.41"E	Agriculture	Regular
139		24° 3'34.02"N	88°13'44.05"E	Agriculture	Regular
140		24° 2'29.82"N	88°13'12.65"E	Agriculture	Regular
141		24° 2'24.66"N	88°13'15.07"E	Agriculture	Regular
142		24° 2'0.24"N	88°13'8.18"E	Agriculture	Regular
143		24° 1'40.59"N	88°12'46.56"E	Agriculture	Regular
144		24° 1'25.94"N	88°12'47.84"E	Agriculture	Regular
145		24° 1'25.29"N	88°13'34.65"E	Agriculture	Regular
146		24° 1'7.15"N	88°13'41.54"E	Agriculture	Regular
147		24° 0'45.89"N	88°13'14.55"E	Agriculture	Regular
148		24° 0'50.13"N	88°13'15.36"E	Agriculture	Regular
149		24° 0'40.51"N	88°13'7.41"E	Agriculture	Regular
150		24° 0'35.84"N	88°13'41.45"E	Agriculture	Regular
151		24° 0'40.56"N	88°13'50.77"E	Agriculture	Regular
152		24° 0'0.77"N	88°13'29.23"E	Agriculture	Regular
153		88°13'29.23"E	88°13'45.43"E	Agriculture	Regular
154		23°59'43.62"N	88°13'50.06"E	Agriculture	Regular
155		23°59'56.89"N	88°13'57.01"E	Agriculture	Regular
156		23°59'47.88"N	88°14'1.95"E	Agriculture	Regular
157		23°59'27.78"N	88°14'6.29"E	Agriculture	Regular
158		23°59'12.11"N	88°13'59.05"E	Agriculture	Regular
159		23°58'56.67"N	88°13'52.20"E	Agriculture	Regular
160		23°57'59.44"N	88°13'38.62"E	Agriculture	Regular
161		23°57'57.47"N	88°14'9.40"E	Agriculture	Regular
162		23°58'10.11"N	88°14'32.23"E	Agriculture	Regular
163		23°58'2.28"N	88°14'32.91"E	Agriculture	Regular
164		23°58'17.32"N	88°14'33.36"E	Agriculture	Regular
165		23°58'16.18"N	88°14'50.50"E	Agriculture & Fishing	Regular
166		23°58'28.53"N	88°14'41.21"E	Agriculture & Fishing	Regular
167		23°58'38.31"N	88°14'30.75"E	Agriculture & Fishing	Regular
168	SAGARDIGHI	23°58'36.46"N	88°14'38.04"E	Agriculture & Fishing	Regular
169		23°58'37.90"N	88°14'57.74"E	Agriculture	Regular
170		23°59'0.42"N	88°15'6.09"E	Agriculture	Regular
171		23°59'23.87"N	88°14'59.14"E	Agriculture	Regular
172		88°14'59.14"E	88°14'37.79"E	Agriculture	Regular
173		23°59'38.41"N	88°14'48.94"E	Agriculture	Regular
174		23°59'55.33"N	88°15'13.22"E	Agriculture	Regular
175		24° 0'8.03"N	88°15'20.29"E	Agriculture	Regular
176		24° 0'11.32"N	88°15'27.70"E	Agriculture	Regular
177		24° 0'28.11"N	88°15'26.75"E	Agriculture	Regular
178	BERHAMPUR	24° 0'35.72"N	88°15'33.37"E	Agriculture	Regular
179		24° 0'48.78"N	88°15'41.34"E	Agriculture & Fishing	Regular

180		24° 0'51.92"N	88°15'50.04"E	Agriculture & Fishing	Regular
181		24° 0'30.36"N	88°15'57.15"E	Agriculture & Fishing	Regular
182		24° 0'58.04"N	88°16'22.63"E	Agriculture & Fishing	Regular
183		24° 0'34.36"N	88°16'6.63"E	Agriculture & Fishing	Regular
184		23°59'53.40"N	88°16'10.56"E	Agriculture & Fishing	Partial Clogging
185		24° 0'12.57"N	88°16'16.32"E	Agriculture	Partial Clogging
186	MURSHIDABAD JIAGUANGE	24° 0'27.43"N	88°16'34.97"E	Agriculture	Partial Clogging
187		24° 0'54.04"N	88°16'27.52"E	Agriculture	Partial Clogging
188		24° 1'5.90"N	88°17'22.51"E	Agriculture	
189		88°17'22.51"E	88°15'2.95"E	Agriculture	Regular
190		23°58'36.67"N	88°14'31.54"E	Agriculture	Regular
191		23°58'14.82"N	88°14'31.66"E	Agriculture	Regular
192		23°58'3.13"N	88°14'34.14"E	Agriculture	Regular
193		23°57'45.31"N	88°14'38.91"E	Agriculture	Regular
194		23°57'21.03"N	88°14'1.69"E	Agriculture	Regular
195		23°56'47.44"N	88°14'15.30"E	Agriculture	Regular
196		23°56'21.26"N	88°14'21.37"E	Agriculture	Regular
197		23°56'32.18"N	88°14'40.97"E	Agriculture	Regular
198		23°55'34.47"N	88°14'10.44"E	Agriculture	Regular
199		23°55'27.82"N	88°14'9.71"E	Agriculture	Regular
200	23°55'18.40"N	88°13'28.68"E	Agriculture	Regular	
201	BELDANGA I & II	23°54'32.17"N	88°13'17.94"E	Agriculture	Regular
202		23°54'4.74"N	88°12'45.21"E	Agriculture	Regular
203		23°53'54.00"N	88°12'37.17"E	Agriculture	Regular
204		23°54'19.05"N	88°13'5.73"E	Agriculture	Regular
205		23°54'9.59"N	88°13'25.82"E	Agriculture & Fishing	Regular
206		23°53'42.43"N	88°13'25.31"E	Agriculture & Fishing	Regular
207		23°52'46.20"N	88°13'36.33"E	Agriculture & Fishing	Regular
208		23°51'57.27"N	88°13'49.58"E	Agriculture & Fishing	Regular
209		23°51'51.87"N	88°13'36.49"E	Agriculture & Fishing	Regular
210		23°51'36.34"N	88°13'6.44"E	Agriculture & Fishing	Partial Clogging
211		23°51'24.94"N	88°12'45.69"E	Agriculture & Fishing	Partial Clogging
212		23°50'59.97"N	88°12'25.50"E	Agriculture	Partial Clogging
213		23°50'44.82"N	88°12'3.59"E	Agriculture	Regular
214		23°50'18.26"N	88°12'13.63"E	Agriculture	Regular
215		23°50'5.70"N	88°12'31.01"E	Agriculture	Regular

216		23°49'41.79"N	88°12'15.84"E	Agriculture	Regular
217		23°49'39.86"N	88°12'37.30"E	Agriculture	Regular
218		23°49'23.97"N	88°12'1.17"E	Agriculture	Regular
219		23°49'12.10"N	88°11'35.08"E	Agriculture & Fishing	Regular
220		23°49'6.99"N	88°11'28.17"E	Agriculture & Fishing	Regular
221		23°48'36.05"N	88°11'22.71"E	Agriculture & Fishing	Regular
222		23°48'15.97"N	88°11'29.34"E	Agriculture & Fishing	Regular
223		23°47'55.77"N	88°11'29.49"E	Agriculture & Fishing	Regular
224		23°47'24.40"N	88°11'38.02"E	Agriculture & Fishing	Regular
225		88°11'38.02"E	88°12'13.01"E	Agriculture & Fishing	Regular
226		23°47'21.15"N	88°12'31.63"E	Agriculture & Fishing	Partial Clogging
227		23°47'15.98"N	88°12'38.90"E	Agriculture & Fishing	Regular
228		23°47'28.06"N	88°12'35.13"E	Agriculture	Regular
229		23°47'37.18"N	88°12'27.74"E	Agriculture	Regular
230		23°47'46.83"N	88°12'45.31"E	Agriculture	Regular
231		23°47'19.39"N	88°12'59.77"E	Agriculture	Regular
232		23°46'54.26"N	88°12'25.91"E	Agriculture	Regular
233		23°44'20.96"N	88°11'17.53"E	Agriculture	Regular
234	BHARATPUR I & II	23°43'25.27"N	88°11'9.53"E	Agriculture	Regular
235		23°42'39.05"N	88°10'46.67"E	Agriculture	Regular
236		23°40'55.93"N	88° 8'37.95"E	Agriculture & Fishing	Regular
237		23°40'17.76"N	88° 8'29.91"E	Agriculture & Fishing	Regular
238		23°39'22.34"N	88° 9'16.60"E	Agriculture & Fishing	Regular
239		23°38'48.46"N	88° 9'33.93"E	Agriculture & Fishing	Regular
240		23°38'54.58"N	88°10'9.52"E	Agriculture & Fishing	Regular
241		23°38'25.02"N	88° 9'55.81"E	Agriculture & Fishing	Regular
242		23°38'0.75"N	88°10'55.44"E	Agriculture & Fishing	Regular
243		23°38'2.07"N	88°13'31.00"E	Agriculture & Fishing	Regular
244		23°37'4.70"N	88°12'49.51"E	Agriculture & Fishing	Regular
245		23°37'5.18"N	88°14'48.42"E	Agriculture &	Regular

				Fishing	
246		23°36'54.06"N	88°15'20.82"E	Agriculture	Partial Clogging
247		23°35'7.89"N	88°14'45.48"E	Agriculture	Partial Clogging
248		23°35'0.09"N	88°14'42.73"E	Agriculture	Partial Clogging
249		23°34'27.42"N	88°15'43.24"E	Agriculture	Regular
250		23°33'46.97"N	88°14'49.90"E	Agriculture	Regular
251		23°33'25.40"N	88°14'54.61"E	Agriculture	Regular
252		23°32'54.83"N	88°14'30.46"E	Agriculture	Regular
253		23°31'49.87"N	88°14'47.72"E	Agriculture	Regular
254		23°31'37.43"N	88°15'36.41"E	Agriculture	Regular
255		23°31'13.02"N	88°15'25.40"E	Agriculture	Regular
256		23°30'14.68"N	88°16'2.40"E	Agriculture	Regular
257		23°29'38.98"N	88°15'40.61"E	Agriculture	Regular
258		24°16'57.14"N	88°31'9.94"E	Agriculture	Regular
259		24°17'6.82"N	88°31'41.34"E	Agriculture	Regular
260		24°16'57.90"N	88°31'49.54"E	Agriculture	Regular
261		24°16'32.67"N	88°32'13.41"E	Agriculture & Fishing	Regular
262		24°16'22.93"N	88°32'19.17"E	Agriculture & Fishing	Regular
263	RANINAGAR	24°17'7.49"N 24°16'53.06"N	88°34'34.79"E 88°31'11.70"E	Agriculture & Fishing	Regular
264		24°17'28.73"N	88°37'52.14"E	Agriculture & Fishing	Regular
265		24°16'17.69"N	88°38'25.24"E	Agriculture & Fishing	Regular
266		24°15'52.25"N	88°39'38.91"E	Agriculture & Fishing	Regular
267		24°15'43.81"N	88°39'57.43"E	Agriculture & Fishing	Regular
268		24°15'52.56"N	88°40'26.89"E	Agriculture	Regular
269		24°15'40.36"N	88°40'57.92"E	Agriculture	Regular
270		24°15'47.97"N	88°41'1.80"E	Agriculture	Regular
271		24°15'40.44"N	88°41'30.39"E	Agriculture & Fishing	Regular
272	JALANGI	24°15'38.27"N	88°41'46.33"E	Agriculture & Fishing	Regular
273		24°15'52.64"N	88°42'0.50"E	Agriculture & Fishing	Regular
274		24°15'33.60"N	88°42'35.58"E	Agriculture & Fishing	Regular
275		24°15'39.02"N	88°42'51.18"E	Agriculture & Fishing	Regular
276		24°15'20.68"N	88°43'21.75"E	Agriculture & Fishing	Regular
277		24° 6'23.59"N 24° 6'11.89"N	88°39'50.48"E 88°39'31.27"E	Agriculture & Fishing	Regular
		24° 5'29.76"N	24° 5'32.48"N	Agriculture &	Regular

		88°39'35.16"E	88°39'59.92"E	Fishing	
278		24° 6'16.29"N	88°41'32.42"E	Agriculture & Fishing	Partial Clogging
279		24° 5'51.15"N	88°41'23.91"E	Agriculture & Fishing	Partial Clogging
280		24° 5'47.62"N	88°41'50.22"E	Agriculture & Fishing	Partial Clogging
281		24° 5'18.65"N	88°41'40.43"E	Agriculture & Fishing	Partial Clogging
282		24° 5'18.56"N	88°41'16.01"E	Agriculture & Fishing	Partial Clogging
283		24° 5'15.99"N	88°41'7.57"E	Agriculture & Fishing	Partial Clogging
284		24° 5'31.31"N	88°41'7.77"E	Agriculture & Fishing	Partial Clogging
285		24° 5'30.92"N	88°40'57.96"E	Agriculture & Fishing	Partial Clogging
286		24° 5'40.52"N	88°41'20.65"E	Agriculture & Fishing	Partial Clogging
287		24° 5'48.59"N	88°41'33.88"E	Agriculture & Fishing	Partial Clogging
288		24° 6'26.17"N	88°40'41.31"E	Agriculture	Partial Clogging
289		24° 6'33.99"N	88°40'31.15"E	Agriculture	Partial Clogging
290		24° 7'0.88"N	88°40'15.63"E	Agriculture	Partial Clogging
291		24° 6'51.05"N	88°39'54.78"E	Agriculture	Partial Clogging
292		24° 6'39.44"N	88°39'34.43"E	Agriculture	Partial Clogging
293		24° 6'32.69"N	88°39'13.01"E	Agriculture	Partial Clogging
294		24° 7'6.68"N	88°38'54.54"E	Agriculture	Partial Clogging
295		24° 7'6.35"N	88°38'41.55"E	Agriculture	Partial Clogging
296		24° 7'18.82"N	88°38'37.66"E	Agriculture	Partial Clogging
297		24° 7'25.49"N	88°38'50.19"E	Agriculture	Partial Clogging
298		24° 7'35.83"N	88°38'59.25"E	Agriculture & Fishing	Partial Clogging
299		24° 7'32.99"N	88°39'36.96"E	Agriculture & Fishing	Partial Clogging
300		24° 7'18.99"N	88°39'33.86"E	Agriculture & Fishing	Partial Clogging
301		24° 7'39.33"N	88°40'0.38"E	Agriculture & Fishing	Partial Clogging
302		24° 7'30.15"N	88°40'20.81"E	Agriculture & Fishing	Partial Clogging
303		24° 7'31.84"N	88°39'24.28"E	Agriculture & Fishing	Partial Clogging
304		24° 7'38.56"N	88°39'0.66"E	Agriculture & Fishing	Partial Clogging
305		24° 7'12.95"N	88°38'10.64"E	Agriculture & Fishing	Partial Clogging
306		24° 7'13.95"N	88°37'48.56"E	Agriculture &	Partial Clogging

				Fishing	
307		24° 7'2.50"N	88°38'12.97"E	Agriculture & Fishing	Partial Clogging

Sl.no	Blocks	Coordinates		Purpose	Condition
		Latitude	Longitude		
308	Raghunathganj 1	24°24'50.06"N	88°11'1.07"E	Agriculture & Fishing	Partial Clogging
		24°22'50.49"N	88°11'10.05"E		
309		24°25'22.43"N	88°10'6.63"E	Agriculture & Fishing	Partial Clogging
310		24°22'31.48"N	88°10'41.16"E	Agriculture & Fishing	Partial Clogging
311		24°21'23.83"N	88°10'58.60"E	Agriculture & Fishing	Partial Clogging
312		24°21'38.87"N	88°11'42.27"E	Agriculture & Fishing	Partial Clogging
313		24°21'27.45"N	88°11'54.25"E	Agriculture & Fishing	Partial Clogging
314		24°21'24.10"N	88°12'3.19"E	Agriculture & Fishing	Partial Clogging
315		24°21'17.25"N	88°11'44.40"E	Agriculture & Fishing	Partial Clogging
316		24°21'57.51"N	88°11'48.47"E	Agriculture & Fishing	Partial Clogging
317		24°22'13.83"N	88°11'41.57"E	Agriculture & Fishing	Partial Clogging
318		24°21'57.63"N	88°12'9.68"E	Agriculture & Fishing	Partial Clogging
319		24°21'47.17"N	88°12'25.07"E	Agriculture	Partial Clogging
320		24°21'38.57"N	88°12'38.84"E	Agriculture	Partial Clogging
321		24°21'30.62"N	88°12'33.37"E	Agriculture	Partial Clogging
322		24°21'10.73"N	88°12'31.88"E	Agriculture	Partial Clogging
323		24°20'9.00"N	88°13'36.70"E	Agriculture	Partial Clogging
324		24°19'51.10"N	88°14'2.60"E	Agriculture & Fishing	Partial Clogging
325		24°21'53.01"N	88°11'31.73"E	Agriculture & Fishing	Partial Clogging
326		24°22'56.39"N	88°10'7.71"E	Agriculture & Fishing	Partial Clogging
327	24°22'58.00"N	88° 8'57.33"E	Agriculture & Fishing	Partial Clogging	

4.3. Sacred Groves:

Conservation of biodiversity due to religious beliefs helped flora and fauna to thrive within these tracts of vegetation, now popularly known as sacred groves. Often within the sacred groves local deities are found which are worshipped by the tribal communities even in recent times. Some other sacred groves become a religious place example Takib Shah Pirtala, which is about 200+ years old. It was observed by Deb and Malhotra in 1997 that often the sacred grove was used for religious purposes like fairs during the celebration of certain festivals. Some workers felt that the sacred Groves were examples of the love humans have towards animals and plants which is just an expression of the love and respect of nature (Wilson 1988; Deb and Malhotra 2001).

Both ancient and recent sacred groves around temples are found in Murshidabad, some examples Pataleswar Shiv Mondir (250+ years), Kriteswari Temple (from time immemorial), Domdoma Kali Mondir (40+ years), Ramnagarghat Radhagobinda Mondir (20 years). In Murshidabad district there are several cemeteries with lush vegetation around them. They are usually known as 'Koborsthan' in the local language meaning place of burial of the dead. Some sacred groves with cemeteries in Murshidabad are Talbagan Kaborsthan (100+ years), Elahiganj Cemetery (150+ years), Baro Bigha Kaborsthan (100+ years) etc. There are graveyards too example Residency Cemetery of Babulbona (European Cemetery about 200+ years). Here are 12 major Sacred Groves of Murshidabad District.

Table No 8 : Major Sacred Groves of Murshidabad District

Sl.no	Name of the Sacred Groves	Approximate age
1	Baro Bigha Kaborsthan	100+
2	Jinarapara Gorosthan	100+
3	Khosbag Graveyard	200+
4	Kriteswari Temple	Time immorial
5	Residency Cemetery	200+
6	Ramnagarghat Radhagobindo Mondir	200+
7	Elahiganj Cemetery	150+
8	Talbagan Kaborsthan	100+
9	Takib Shah Pirtala	200+
10	Pataleswar Shiv Mandir	250+
11	Protestant Curch Girja More	300+
12	Domdoma Kali Mandir	40+

Source : Ethno –Botanical Documentation of some Sacred Groves of Murshidabad district, West Bengal, India



Image No 14 : Kiriteswari Temple, Kritikona Village, Nabagram

Local people call this temple as Mahishamardini. Devi is also worshipped as Mukuteshwari (as her mukut or crown fell) the Holy Goddess. The original Temple was destroyed in 1405. The present temple was re-constructed by Darpanarayan, king of Lalgola in the 19th century and this is the oldest mark of architecture amongst 51 Peethas. It is the oldest temple in the Murshidabad district. There is a myth that Nawab Mir Jafar in his death bed had requested for the holy Charanamrito (the holy water) of Maa Kiriteswari while suffering from leprosy.



Image No 15 : Pataleswar Shib Mandir



Image No 16 : Elahiguange Sacred Grove



Image No 17 : Takib Shah



Image No 18 : Khushbagh (also spelled as Khoshbagh; Literally "Garden of Happiness") is the Garden-Cemetery of the Nawabs of Bengal

Khushbagh situated on the west bank of the Bhagirathi river, about a mile from its east bank, in Murshidabad, West Bengal, India. Khushbagh hosts the graves of the Nawabs of Bengal of the Afshar dynasty and their family members; while Jafarganj Cemetery hosts the graves of the later Nawabs and their families, starting from Mir Jafar, who belonged to the Najafi dynasty. Khushbagh is the resting place of Nawab Siraj ud-Daulah, his wife Lutf-un-nisa, Nawab Alivardi Khan, and his mother, amongst others.



Image No 19 : Berhampore or Baharampur was Fortified in 1757 by the East India Company

Berhampore or Baharampur was fortified in 1757 by the East India Company, after the Battle of Plassey in June 1757, and it continued as a cantonment until 1870. Many important British residents and military personnel of East India Company, who lived in Berhampore are buried in this cemetery. There are the graves of many European Residents amongst whom most famous were Captain James Skinner, George Thomas, Henry Creighton. There are a number of epitaphs attached to the tombs and monuments of 18th and 19th century. Presently this is a Monument of National Importance in West Bengal under maintenance of Archaeological Survey of India. The sacred groves associated with this site is also protected.

On the basis of the secondary sources we found that sacred Groves of Murshidabad district were of two types. In the first type the sacred groves surrounded temples of **Hindu deities**. In the second type a Muslim graveyard or “**Muslim Kabarsthan.**” Around the Hindu temples there were several plants which considered as religious trees like *Cocos nucifera* (coconut), *Ficus religiosa* (sacred fig), *Aegle marmelos* (wood apple) etc. Around these trees which have a religious importance there are several herbaceous plant associations. Similarly many small patches of vegetation were found in the “Kabarsthan” where many trees were considered as “Sacred Trees”. In this investigation only the places having high diversity of vegetation, protected by walls, maintained by a statutory authority and age old were listed as sacred groves in this study.

Major Flora of Sacred Groves of Murshidabad

Table No 9 : List of Flora of Sacred Groves of Murshidabad

Sl.No	Type	Name of the plants
1	Sacred Tree and associated vegetation	<i>Aegle marmelos, Alocasia fornicata, Annona reticulate, Areca catechu, Bombax ceiba, Cassia fistula, Cocos nucifera, Comellina benghalensis, Costus speciosa, Ecbolium viridae, Ficus hispida, Ficus recemosa, Ficus religiosa, Hemidesmus indicus, Litsea glutinosa, Moringaoleifera, Polyalthea subarosa, Tinospora cordifolia.</i>
2	Major plants in Sacred Groves with Temples and Kabarsthan (graveyard)	<i>Aegle marmelos, Annona reticulate, Azadiracta indica, Bombax ceiba, Calotropis gigantean, Cassia fistula, Cassia sophera, Chrozophora rottleri, Ceratophyllum sp. Clerodendrum viscosum, Croton bonplandianus, Cynodon dactylon, Cyperus rotendus, Eichornia crassipes, Ficus religiosa, Glycosmis pentaphylla, Hydrilla verticillata. Lantana camara, Moringa oleifera, Scirpus articulates, Trewia nudiflora, Typha domingensis, Zizipus mauritiana.</i>
3	Wall flora in old walls of Ancient monuments	<i>Murshidabad district is famous for historical places and there are a widespread of monuments, temples, mosques like Katra Mosque, Hazarduari, Khosbagh, Siva-temple of Rani Bhabani, Moti Jhil. Temple of Jagat Seth, Palace of Kashimbazar, Lalkuthi and many others which have recognizable wall floral association of Boerhaavia diffusa, Euphorbia hirta, Euphorbia prostrate, Ficus benghalensis, Ficus religiosa, Lindenbergia indica, Peperomia pellucida, Pilea microphylla, Tridex procumbens, Vernonia cinerea.</i>
4	Parasitic plants	<i>Cuscuta reflexa, Macrosolen cochinensis</i>
5	Common Epiphytes	<i>Vanda tessellata, Rhyncostylis retusa.</i>

CHAPTER 5 – DOCUMENTING STRUCTURES IN THE RIVER

5.1. The National Waterway 1 or NW-1 or Ganga-Bhagirathi-Hugli river system is located in India and runs from Haldia (Sagar) to Prayagraj across the Ganges, Bhagirathi and Hugli river systems. It is 1,620 km (1,010 mi) long, making it the longest waterway in India. It is of prime importance amongst all the national waterways considering its locational advantages. The NW-1 passes through West Bengal, Jharkhand, Bihar and Uttar Pradesh and serves major cities and their industrial hinterlands like; In West Bengal there are 7 major terminals and amongst them Santipur in our study area is one of the most important one.

5.2. Farakka Barrage Project: Farakka Barrage Project with headquarters at Farakka in Murshidabad district of West Bengal is a subordinate office under the Union Ministry of Water Resources, River Development & Ganga Rejuvenation. The Farakka Barrage Project Authority was set up in 1961 with the mandate to execute and thereafter operate and maintain the Farakka Barrage Project Complex comprising of Farakka Barrage, Jangipur Barrage, Feeder Canal, Navigation Lock and associated structures. The Barrage comprises of 112 nos. of Gates (108 Nos. main Gates and 4 Nos. Fish Lock Gates) and 11 Nos. Head Regulator Gates for diversion of approximately 40,000 cusec (1035 cumec) of discharge into the Feeder Canal. The project construction commenced in 1961 and the project was commissioned and dedicated to the Nation in May 1975. This dam is 64m high and around 137m long. The Farakka barrage is 2,240 metres long and located on a 2,000km-long monsoonal river with an average discharge of 12,037 cum/sec.

Purpose: Main objective of the Farakka Barrage Project complex is to divert adequate quantity of Ganga waters to Bhagirathi-Hoogly river system through 38.38 km long feeder canal for preservation and maintenance of Kolkata Port by improving the regime and navigability of the Bhagirathi-Hoogly river system. The increased upland supply from Ganga at Farakka into Bhagirathi reduces salinity and ensures sweet water supply to Kolkata and surrounding areas. The rail-cum-road bridge built across the river Ganga at Farakka establishes direct road and rail communication link to the North-Eastern Region with rest of the country. The Hoogly-Bhagirathi river system, the Feeder Canal and the Navigation Lock at Farakka form part of the Haldia-Allahabad Inland Waterway (National Waterway No:1). The Feeder Canal also supplies water to 2100 MW Farakka Super Thermal Power Project (FSTPP) of NTPC Ltd. at Farakka.



Image No 20 : The Farakka Barrage, Farakka. The Farakka barrage has been blamed for worsening land erosion by the Ganga. Source – India Climate Dialogue



Image No 21 : The Farakka Barrage, Farakka. The Farakka barrage has been blamed for worsening land erosion by the Ganga, Source – India Climate Dialogue

Problems: After commissioning the project, it was found that the diverted water flow from the Farakka barrage was not adequate to flush the sediment from the river satisfactorily. In addition, there are regular land/bank collapses in to the Ganga river due to the high level

back waters of the Farakka barrage. Substantial high land is already converted into low level river bed causing displacement of huge populations. The water diverted from the Farakka barrage is less than 10% of Ganga river water available at Farakka.

Despite the barrage, the siltation is an ongoing problem. The Kolkata port continues to dredge an ever-increasing amount of silt to maintain its usefulness; from 6.4 million cum (cubic metre) before the barrage was constructed, they need to annually dredge out 21.18 million cum today. This increase in siltation is due to the deforestation in the catchment area and vastly reduced flows. Besides not preventing siltation, the Farakka barrage has led to a great deal of what might be termed 'collateral damage'.

Floods, erosion and more: The Farakka barrage affects the upstream and downstream differently.

Upstream of the barrage, the river is flanked on its right by the Raj Mahal hills. This causes the river to tend towards its left, away from the obstruction, eroding its left bank in the process. The district of Malda, on the left bank of the river, has been flooding regularly for decades. This flooding has been further increased by the impoundment at Farakka which has greatly increased the sedimentation at the barrage, thus causing a rise in the bed level and changes in the gradient of the riverbed. The government of West Bengal acknowledges the role of the barrage in the inundation of Malda. The 13th legislative assembly stated, "It is accepted at all levels that the construction of Farakka barrage is solely responsible behind the erosion of River Ganges in Malda district."

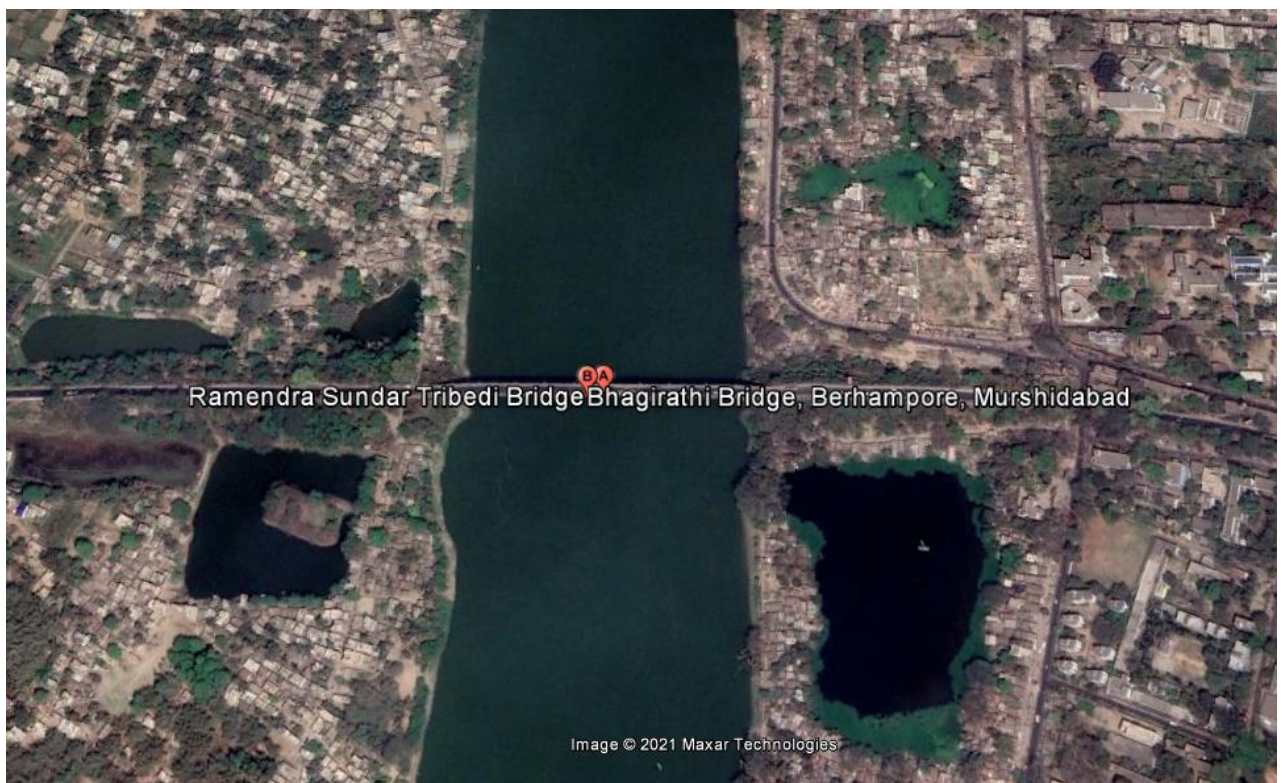
Downstream, the residents of Murshidabad are not well off either. The Ganga river has been steadily eroding its banks downstream of the barrage--206sq km of land was eroded from Murshidabad district between the years of 1988 and 1994.

Farakka Super Thermal Power Station of NTPC: The discharge of hot water from Farakka Super Thermal Power Station of NTPC at Dhuliyani in Murshidabad has been causing fluctuations in the water level and temperature, posing a danger to the aquatic life surviving on it. Fishers lament that the hot water discharge from NTPC is affecting aquatic life in the Ganga downstream. The catch in the river has been dwindling each year. Earlier, the fishermen used to get around 20 kg fish everyday, which has now come down to 1-2 kg. It is becoming difficult to run our families as we solely depend on fish for our livelihood. The river is turning dry, may be because of increasing pollution and chemical laced hot water released by NTPC.

5.3. Major Bridges in Murshidabad:

There are 2 bridges on the Bhagirathi - Hugli River. They are as follows -

- a. **Ramendra Sundar Tribedi Setu:** Connecting Khagraghat and Baharampur, Jangipur. A very old bridge on NH 34, Beherampur, Murshidabad is made in 1967. The bridge is 280 meters long and every day like 5000 vehicle passing through it.
- b. **Bhagirathi Bridge Connecting Raghunathganj and Jangipur:** There is a 213m long barrage across the Bhagirathi at Jangipur.



Map No 52 : Ramendra Sundar Tribedi Setu, River Bhagrathi at Berhampur, Murshidabad 24° 6'1.15"N 88°14'40.97"E



Image No 22 : Bhagirathi Bridge



Map No 53 : Bhagirathi Bridge on River Bhagrathi at Jangipur , Raghunathganj I , Murshidabad
24°27'34.35"N 88° 4'8.37"E

5.4. Major Ferry Service at Murshidabad:

Table No 10 : List of Ferry Service at Murshidabad District

Sl.No	Block	Service from Longitude/Latitude	Service to Longitude/Latitude	Condition
1	Beldanga	Garduara 23°50'17.91"N 88°12'55.07"E	Narikelbari 23°50'23.26"N 88°13'0.70"E	Regular
2		Shaktipur 23°51'21.59"N 88°12'8.89"E	Hatpara Dowra 23°51'14.27"N 88°12'30.96"E	Depends on availability of water
3		Satui Chowrigacha 23°56'52.56"N 88°11'38.65"E	Kumarpara 23°57'9.42"N 88°12'1.35"E	Depends on availability of water
4		Halsanpara Ferry Ghat 23°57'29.79"N 88°11'29.16"E	Jalalpur 23°57'32.24"N 88°11'46.66"E	Regular
5	Berhampur	Ballydhawra Ferry Ghat 23°59'34.89"N 88°11'40.02"E	Ballydhawra Ferry Ghat 23°59'26.11"N 88°11'49.78"E	Depends on availability of water
6		Jagannathpur Ferry Ghat 24° 2'28.63"N 88°12'56.78"E	Jagannathpur Ferry Ghat 24° 3'21.93"N 88°13'4.24"E	Depends on availability of water
7		GoraBazar Ghat 24° 5'25.09"N 88°14'39.26"E	Ranibagan 24° 5'38.82"N 88°14'32.77"E	Depends on availability of water
8		Krishnanath College Ghat 24° 5'27.01"N 88°14'28.79"E	24° 5'28.33"N 88°14'28.48"E	Depends on availability of water
9		Radharghat Ferry Service 24° 6'23.41"N 88°14'34.54"E	Radharghat 24° 6'23.51"N 88°14'45.05"E	Depends on availability of water
10	Murshidabad- Jiaganj	Bhairabtala Ferry Ghat 24° 6'46.37"N 88°14'45.99"E	Bhairabtala Ferry Ghat 24° 6'45.96"N 88°14'36.91"E	Depends on availability of water
11		Gopal Ghat 24° 6'59.21"N 88°14'46.82"E	Gopal Ghat 24° 7'2.19"N 88°14'39.75"E	Depends on availability of water
12		Raniswari Ferry Ghat 24° 7'52.99"N 88°14'54.84"E	Raniswari Ferry Ghat 24° 7'52.99"N 88°15'3.46"E	Depends on availability of water
13		Motijheel Boat Service 24° 9'46.12"N	Motijheel Boat Service 24° 9'45.03"N	Regular

		88°16'4.18"E	88°15'54.10"E	
14		Lalbagh Sadar 24°10'13.73"N 88°16'7.71"E	Lalbagh Sadar 24°10'15.11"N 88°16'0.48"E	Regular
15		Sahanagar Ferry Service 24°10'35.53"N 88°16'8.76"E	Elahiganj Ferry Service 24°10'34.00"N 88°16'2.01"E	Regular
16		Hazarduari Jetty 24°10'57.77"N 88°16'6.52"E	24°10'57.54"N 88°16'0.68"E	Regular
17		Icchaganj Ferry Ghat 24°11'32.44"N 88°15'50.41"E	Ajimganj Station 24°11'27.81"N 88°15'43.98"E	Regular
18	Bhagawangola	Baranagar Ferry Ghat 88°15'21.70"E 88°14'34.18"E	24°15'11.46"N 88°14'44.89"E	Regular
19		Nimtala Ferry Ghat(Jiaganj) 24°14'8.11"N 88°15'48.31"E	Nimtala Ferry Ghat (Ajimganj) 24°14'7.30"N 88°15'38.50"E	Regular
20		Shibtala Ghat 24°14'15.08"N 88°15'33.91"E	Shibtala Ghat 24°14'19.26"N 88°15'44.44"E	Regular
21		Jiaganj Sadar Ferry Ghat 24°14'32.07"N 88°15'27.18"E	Jiaganj Sadar Ferry Ghat 24°14'27.24"N 88°15'21.70"E	Depends on availability of water
22		Sundapur Ferry Ghat 24°19'12.47"N 88°15'7.31"E	Sundapur Ferry Ghat 24°19'1.83"N 88°15'7.46"E	Depends on availability of water
23		Kharibona Hostelpara Ferry Ghat 24°18'28.28"N 88°23'29.44"E	Kharibona Hostelpara Ferry Ghat 24°18'30.79"N 88°23'30.41"E	Depends on availability of water
24			Shibtala Ghat 24°14'18.53"N 88°15'44.27"E	Shibtala Ghat 24°14'15.68"N 88°15'34.36"E



Image No 23 : Jiaganj Sadar Ferry Service



Image No 24 : Jagannathpur Ferry Service

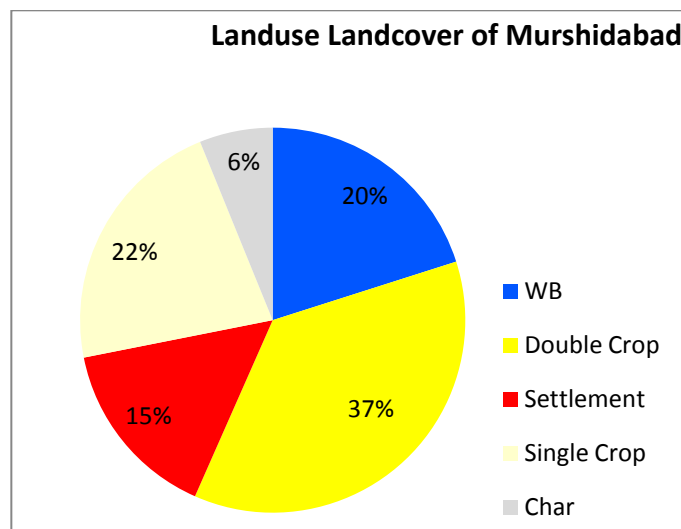
CHAPTER 6 - DOCUMENTING LIVELIHOOD PATTERN & ACTIVITIES

6.1. Landuse Landcover :

Land use - Land cover: Based on the recent satellite image, **Land sat Image 2019**, we have done Unsupervised Classification and found out the following database of the Murshidabad District.

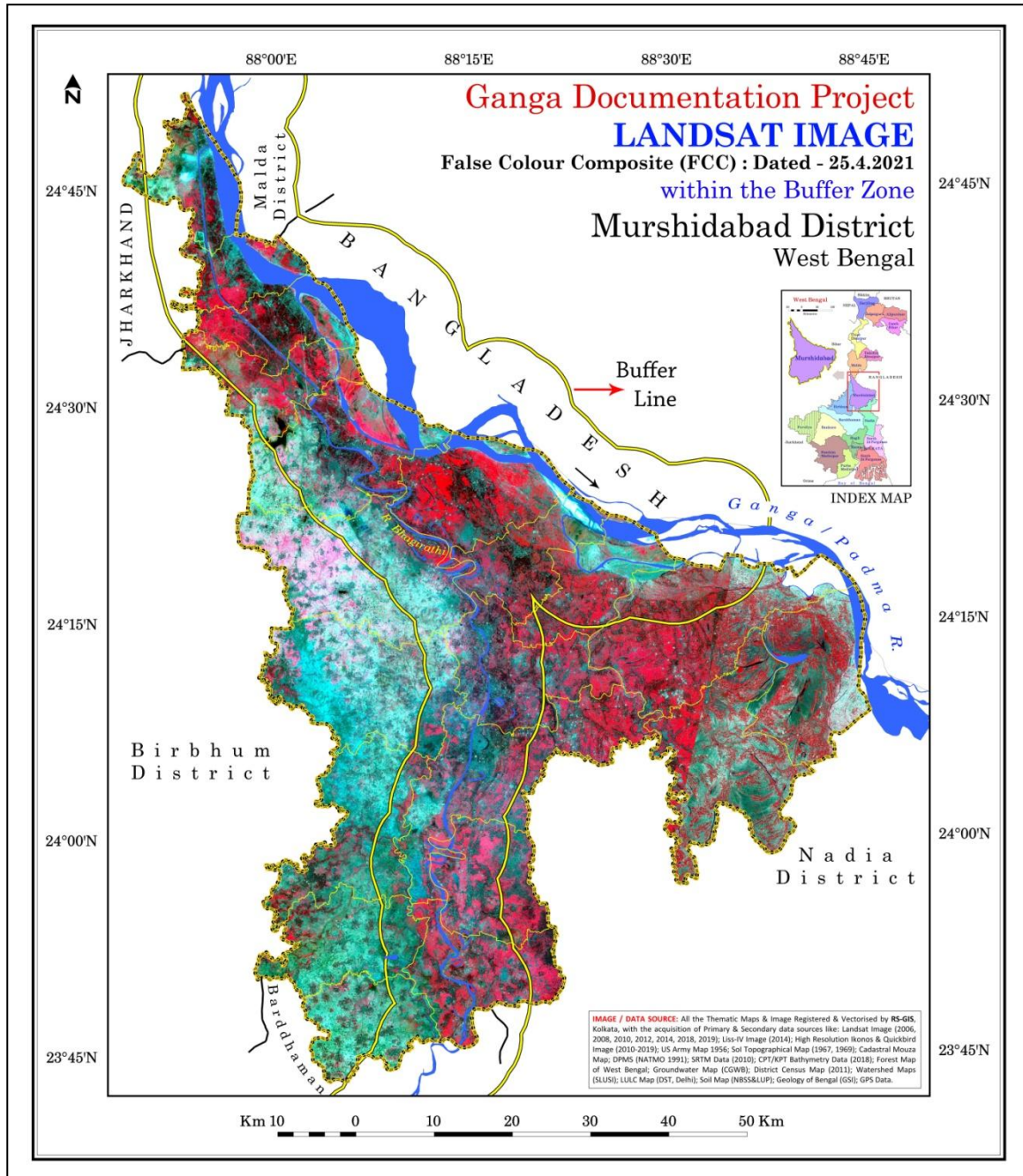
Table No 11 : Landuse Landcover Area

Sl. No	Landuse Landcover	Area (sq.km)
1	Waterbody (River,Bills,Cutoff,)	882
2	Double Crop	1604
3	Settlement	670.31
4	Single Crop	964.38
5.	Char	270.27
Total		4390.96

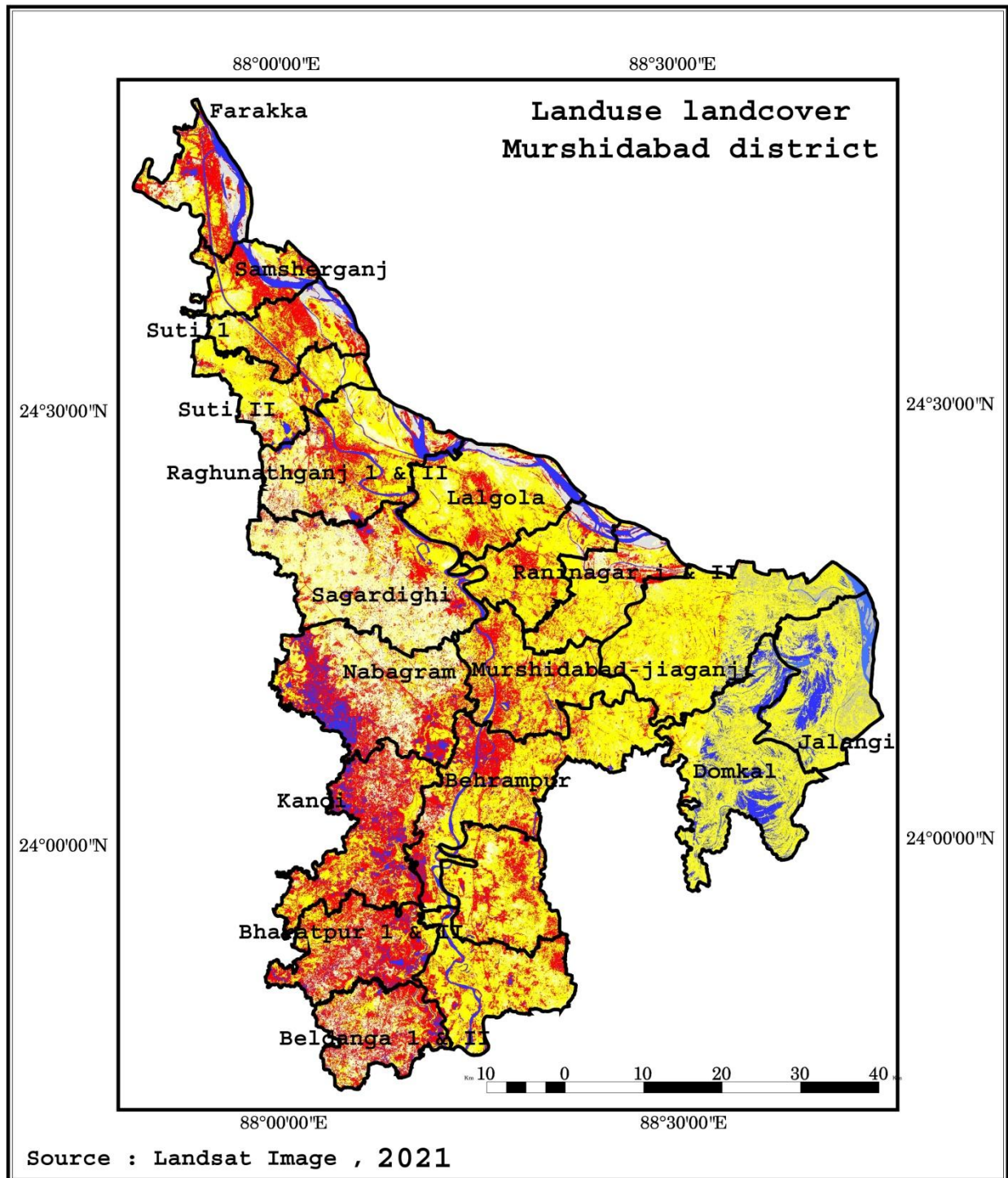


Murshidabad district has a low lying depressed area where water clogging is very common. Especially in the eastern part of the district, the low lying area is very much suitable for rice cultivation and jute. About 20% area that is 882 sq.km of our study area is under waterbody including river Cut-offs, Bills, meanders etc. About 37% of the area is under double or multiple crops. The fine sediments are very fertile and suitable for more than 2 crops. Rest of the 22% are suitable for monocrop. Jangipur, Kandi and part of Berhampore subdivision are flood prone which is a threat to the economy of the district. The problem of soil acidity which is being aggravated day by day due to continuous and injudicious use of chemical fertilizers posing a threat especially to the pulses and oil seeds cultivation. Rice, jute, legumes, oilseeds,

wheat, barley, and mangoes are the chief crops in the east; extensive mulberry cultivation is carried out in the west. The district is known for the quality and diversity of Mango produced. However, Mango is not a major produce of the Murshidabad district, unlike the adjoining district of Malda.



Map No 54 : Recent Landsat Image of the Study Area , 2021



Map No 55 : Landuse Landcover Map

6.2. River / Channel bank using for various Economic activities

6.2.A. Agriculture: Since pre-independence, the district of Murshidabad has been earmarked as “Major Agricultural District”. The economy of this district primarily rests on agriculture as

more than 70% of the district population directly depends on it. The climatic condition and soil of this district are congenial for cultivation of almost every field crops and for this; the district can be designated as "Crop Museum". As the land is the main resource and the cultivable land is fixed, so there is a declining trend in area due to enormous factors like soil erosion, construction of roads, buildings, brick fields etc. The whole district, with the exception of the small portion which lies to the north of the entrance of the Bhagirathi, is divided into two tracts of nearly equal size by that river. The characteristics of these two divisions are quite distinct both as regards the configuration of the country and the kind of crops cultivated, as well as the sort of weather required for their cultivation. The **Bagri** or eastern half is, as a rule, low and subject to inundation, but the alluvial soil is very fertile. The principal crops are am or early **rice and Jute**, and when they are off the ground abundant cold weather crops are raised ; but in the low lands to the southeast, over the tract known as the **Kalantar**, practically the only crop is Aman or winter rice, which depends on floods for successful cultivation. In the **Rarh** or western portion, on the other hand, and also in thana Shamsheganj and the northern part of thana Suti the land is generally high, but intersected with numerous bill and old beds of rivers. "Winter rice is the main staple grown on the hard clay of the Rarh, and the cold-weather crops are few, but sugarcane, mulberry, tobacco, potatoes and various vegetables are also grown.

Owing to differences of situation and surface, and of the nature of the crops grown, these two portions of the district are differently affected by the weather. Thus, for the eastern half, early rains are needed in April and May for the proper cultivation of the Aus crop, and steady but not too heavy falls until the crop is reaped in August; a premature break-up of the rains is undesirable, as also are, very heavy falls when the cold-weather crops are in the ground; Finally, some rain is wanted during the cold season. For Aman rice, the great staple of the western half of the district, it is not so important that there should be early rain, though it is of advantage that the land should be prepared in good time for the reception of the seed. "What is wanted above all is steady rain in the months of July, August, September and the early part of October, without long intervals of dry scorching weather: this is especially the case when the seedlings have been transplanted from the nurseries.

The country to the west is highly cultivated and, except for and marshes and a few patches of jungle, there is comparatively little waste land : even the beds and banks of the nullahs and bills, as they dry up, are tilled to the fullest extent. The fields of the high lands are almost exclusively devoted to the production of rice, The land, where sloping, is terraced each field having a bank round it to retain the water for the rice crop. When rain is deficient, the fields in the vicinity of tanks, which abound in the western portion of the district, are irrigated

from them. This part of the country is prettily wooded with mango, banyan, pipal, sakwa and palm trees; and on some uncultivated patches of land custard apple and gaman bushes form a thick underwood. The produce of the northern low lands consists of abundant and luxuriant crops of different kinds of paddy, gram, peas, mustard, different kinds of pulse, mulberry, pan (betel vine), yams, and in the vicinity of villages different sorts of vegetables. In the Bagri or eastern half large crops of red chillies are grown. The principal trees are those above enumerated, together with babul, jack, tamarind, papaya, bel, kath, guluria, plantain, Jamalgota, fan-leaf and date palm trees and mangoes.

In the vicinity of the bills, boro dhan, a coarse grained rice, is planted largely. As the bill water dries up, this is transplanted into the bil lands, and is harvested in the latter end of March and April. The long sloping banks of nullahs and khals yield good crops of mustard, wheat, and other grains. The richest soil and that least liable, from height or locality, to inundation, is, chosen for the cultivation of mulberry and is called *tunt land (indigo)*.

The fields thus selected require a fresh layer of good earth every second year. In the course of time they thus become raised above the surrounding country five or six feet high, still further securing the young plants from being drowned by the lodgement of water. The average rent of such land is from three to five times that of any other, except pan gardens: these command the highest rent of all, for very rich soil, well raised, is required for the growth of pan. Sugar-cane cultivation is carried on to a small extent in the west and south-west. Date palm trees are chiefly cultivated for the preparation of paddy, but little date sugar being made in the district.

Principal Crops: More than 70% of the population of the district depends on agriculture. The normal annual rainfall of the district is 1256.1mm. The major crop grown is **paddy**, which occupies 66% of the gross cropped area followed by jute, wheat, oilseeds, vegetables, pulses etc.

The rice crop is divided into two great classes, known as - Aman and Aus. The Aman or *haimantik* is the principal crop of the district, and constitutes the bulk of the rice that is consumed by the well-to-do classes, and exported to foreign markets. It is sown in July and August, occasionally as late as September, and reaped in December and January. It generally undergoes one transplantation, but sometimes it is allowed to grow up as it is sown broadcast. Well-watered or marshy lands are best suited to its cultivation, though it can be grown on high lands. The Aus crop, which is sometimes also called *bhadoi*, from the name of the month in which it is reaped, is sown in April and May and harvested in August and September. It is a coarser kind of rice, and is chiefly retained in the district as the food of

the lower classes. It is usually grown on dry land, and never in the marshes. Convenience of irrigation is the circumstance that mainly governs the selection of land for its cultivation : fields which border on rivers or khah are most frequently chosen. It is sown broadcast and not transplanted. There is one variety of the *Aus* crop, the cultivation of which differs considerably from that which has been just described. It is distinguished from the common *bhadoi* by the name of *kartiki*, and is also known as *jhanti*. It is sown in July and reaped in October. It grows for the most part on moist lands, and is sometimes transplanted.



Image No 25 : Kharif Rice Cultivation in the Inundated Low Lands Adjoining the River Area

There are two minor crops known as **boro** and **jali**. The boro is a coarse kind of marsh rice, sown in January or February and reaped in April, May or June. It grows on swampy lands, the sides of tanks, or the beds of dried-up water-courses. The *jali rice* is not much cultivated. It is sown in spring and reaped during the rainy season. It grows on low river banks, which remain moist even during the hot months owing to subsoil percolation.



Image No 26 : Boro Rice Cultivation Found in the Adjoining Areas of Ox-bow Lakes

Cereals other than rice: comprise **wheat** and **barley** (both of which are sown in October and November and reaped in March and April) and the following coarse grains—(1) *bhura*, (2) *china*, (3) *kodo*, (4) *marud*, (5) *kowdin*, (6) *sial neja* and (7) *syama*. These seven are all sown in April or May and reaped in August or September. For eating they are either boiled entire like rice or ground into flour. **Maize** (*bhutta*), **oats** and **bajra** are also cultivated, but only to a small extent.

Gram (*chola / chana*) is sown in October and November and reaped in February and March. The pulses cultivated are of various sorts, and include (1) common *kalai* which is sown in October and reaped in January, 2. *Mas-Kalai* which is sown in September and reaped in January, (3) *Mug*, sown and reaped at the same time as the preceding, (4) *Arhar*, sown in April and reaped in March and (5) *Musuri*, sown in October and reaped in February and March. *Kurti Kalai* is sown in August and reaped in December and January. *Khesari* is also sown in October and reaped in February and March. The *khesari* crop is sown among the rice, as it begins to ripen, in moist and muddy land. This crop requires no care, and ripens in Phalgun (February- March), when it is cut and threshed.

Mustard (*sarisha*) is sown in October and reaped in December and January. **Linseed** (*tisi*) is sown in October and reaped in February and March. **Sesamum** (*til*) is sown in July and August and reaped in December and January.

Jute: The seasons for sowing and growth are the same as for am or early rice. After the usual ploughing the seed is sown broadcast from the middle or end of March to the beginning of June, and the plant is generally out from the middle of August to the middle of October, by which time it has attained a height of five to ten feet. The stalks, when cut, are made up into bundles and immersed in some pool, tank or stream, and left to steep ; this process is called retting. While the bundles are under water, they are examined from time to time to see how far' decomposition has proceeded As soon as it is found that the fibre will peel off easily from the stem, the bundles are taken out, and the stalks are beaten or shaken in the water till the glutinous substance in the bark is entirely washed away. The fibre is then dried in the sun, and, when dry, is made up into hanks (*gant*) and sold to agents, who consign it to the jute presses and mills.



Image No 27 : Jute Cultivation in the Low Lying Areas, Source : Matir Katha

Mulberry cultivation is of considerable importance in Murshidabad. The plant (*Morus indica*) requires a light soil above flood level with good drainage. It is propagated from cuttings and cultivated like a shrub. The plants are arranged in lines. 2 feet apart and are pruned so as to prevent them reaching a height of more than to 2 feet. In the way the plants are laid down in lines and regularly pruned, the cultivation resembles that of tea. Plucking of leaves

goes on throughout the year, but the chief seasons are April, June and November, The mulberry fields have generally embankments round them, which gives them a curious chess-board appearance. The principal centres of cultivation are called *Juars*.



Image No 28 : Mulberry Plants, Source : Matir Katha



Image No 29 : Mulberry Plantation for sericulture

For mulberry cultivation, the ground is first ploughed three times in Bhadra (August-September), and is afterwards dug up with the hoe, and well manured. In Aswin (September-October) the cuttings are planted, the ground watered, and the earth pressed down ; in ten or twelve days the cuttings begin to sprout. In Kartik (October-November) the ground must be dug and the plants earthed up. In Ohaitra (March-April) a top-dressing of mud from the bottom of a tank is spread over the field. During the hot weather irrigation must be kept up, and during the rains the field must be weeded monthly. In Bhadra (August-September), after the first year of growth, then plants should be pruned.

The crop is a risky one, for, should the worms die, the mulberry leaf becomes a drug in the market. Mulberry fields are more valuable than any others, except the little plots on which pin is grown; but, as the quality of the silk mainly depends on a full supply of good and fresh leaves to the worms, the demand for mulberry constantly fluctuates according as silkworms are plentiful or otherwise. When worms are plentiful, the leaf fetches a high price, and the gain to the mulberry grower is great; when the worms fail, it is merely used as fodder for cattle.

6.2.B. Sericulture: Murshidabad is the second largest traditional silk producing district in West Bengal, which bears a golden legacy of producing superlative silk in India since seventeenth century. Kassimbazar was one of the major hubs of silk purchase for the British silk merchants. The industry went into great decline as the Industrial Revolution in West set in. In the post Independence period attempts were made to revive this home-based artisanal industry in India to expand employment and income opportunities in the rural economy. However, during

2002-2012, there was an exodus of more than 23 thousand silk farmers and 10 thousand silk weavers from the industry.

On the basis of feeding of the silk worm, four types of sericulture have been practiced i.e., Mulberry, Tasar, Muga and Eri. (Mandal, 2008). Among these, the silk produced from Mulberry is the best type considering its luxuries, fineness and comfort. About 20,000 families in the block of Khargram and Nabagram are associated with sericulture activities. Besides, some families of other blocks are also engaged in sericulture. The production of mulberry cocoons and raw silk in the district is increasing gradually. Recently, MSME-DI, Govt of India (2016) had identified that sericulture based units like nylon net, bamboo rearing tray, matka spinning unit, bio-fertilizer, silk reeling, pupa oil extraction, etc. may have enormous potential in the district. Pisciculture, poultry and dairy farming are also some of the major areas which can be immensely benefited from seri-waste.

Seri-tourism is a new concept, basically where sericulture and tourism intersect. In this confluence of tourism, sericulture growers / rearers, silk reelers and weavers invite the public onto their domain to experience the out of doors, the leisure pace, and the healthy and nutritious produce during the time of traditional tours. Some of the potential seri-tourism areas of the district are highlighted below:

Table No 12 : List of Potential Seri-tourism Areas of Murshidabad District

Sl.No	Area	Major sericulture related activities / products	How to reach	Salient seri-tourism features and Link for detail information
1.	Islampur Chak	Matka shirting Silk kora than Silk dyeing unit	About 30 KM via Jalangi Road; frequent bus, trekker and hires vehicles area available.	Oldest silk reeling location of the state and famous for 'Matka spinning' (unique in the country).Majority of the Matka spinerers (about 40,000 in West Bengal) are present at this zone.
2	Nagar & Magram	Silk kora than Silk shirting	About 35 KM via SH 11; frequent bus, trekker and hires vehicles area available	Three areas comprises of about 16,000 silk-handloom units of West Bengal. Among these about 130 weavers' (silk) co-operative societies with 12000 weavers (approx.) working with 9400 looms. These cooperative societies mostly market their products through their own sale

				outlets (Berhampore and other cities) or through Govt. marketing agencies like Tantuja, Tantushree etc
3	Mirzapur	Korial saree, Garad saree Garad shirting, Silk sora than	About 58 KM via NH 34 and near to Raghunathganj; frequent bus, trekker and hires vehicles are available.	Unique Korial and Garad producing areas of West Bengal.
4	Panchagram-Nabagram-Kiriteswari	Major sericulture-rearing, reeling and weaving areas of Murshidabad	Around 15 sq. km area in and around Nabagram town; frequent bus, trekker and hires vehicles are available.	Walk through / exposure visit / interaction with sericulture-commercial / seed rearers and reelers; sericulture related SHG groups / NGOs.
5	Sagarpara	Important sericulture- seed rearing areas of Murshidabad	Around 55 km east of Berhampore town; frequent bus, trekker and hires vehicles are available	Walk through / exposure visit / interaction with sericulture - seed rearers;
6	PRITEX – Silk Printing Unit at Gopegram (Nabagram)	Activities: Fabric Printing Product: Block, Screen, Dispersed printed Sarees	Around 2 km from ARM unit towards Palsanda via NH34; frequent transports are available	PRITEX: The major printing cluster is located in Serampore area of Hooghly district in West Bengal. The activities could not be diversified in other areas of the state in the past, though scattered units at cottage sector are available in different parts. PRITEX is also a newly established organized unit to cater service to the individual weaver and large no. of Co-operative and Apex Societies.
7	Jiaganj	Activities: Yarn dyeing, Fabric dyeing Products: Silk Jamdani Saree	Around 210 km from Kolkata and 20 km from Berhampore court in Sealdah-Lalgola route. Frequent rail & road transports are available.	Baluchari' fabric is named after the village 'Baluchar', a peripheral village of Jiaganj town located on the bank river of Bhagirathi in Murshidabad district. Baluchari weaving was flourished during the period of Murshid Quli Khan, the Diwan of Bengal, an erstwhile Hindu Brahamin who embraced Islam and these textiles are famous for their elaborate 'anchal' (palloo). It has been eulogized as the "loveliest

				<p><i>and most charming of all silks of India". Geographically, there is no existence of 'Baluchar' village today and said to be drowned under the river Bhagirathi. The weavers have been migrated to Bishnupur block of Bankura district of West Bengal. Presently the activity of weavers of this area is restricted to the production of silk Jamdani saree.</i></p>
	Cosimbazar	Ruin of the British factory (Nil ground).	about 3 km from Berhampore town well connected by rail and road	
	Behrampur	A premier Institute provides R&D support for the promotion of silk industry in eastern and northeastern India.	About 0.2 km from Berhampore court railway station	Sericulture museum; library with nice collection of books on sericulture; arrange demonstration of silkworm rearing and silk reeling <i>on request</i> .



Image No 30 : Silk Thread is Extracted Out From Silk Worm, Source : Murshidabad.Sericulture



Image No 31 : Silk Threads are Processed in the Murshidabad Area



Image No 32 : Silk Threads

6.2.C. Horticulture

Mango Orchards:

Murshidabad and Malda are the mango gardens of West Bengal. They are the two major mango producing districts of the state although a few varieties are cultivated in West Midnapore, Nadia, pockets of North and South 24 Parganas but nothing can beat Murshidabad and Malda. There were roughly around 124 varieties of mangoes grown in the orchards of Murshidabad alone! However, our survey suggests that there are 60 varieties of mangoes which exist still now.

Mango cultivation is a labour of love. The erstwhile Nawabs were fond of the sweet, juicy fruit and encouraged farmers to set up orchards and experiment to better the product. This led to various hybrid varieties, many of which are unfortunately on the verge of extinction. These include Dilpasand, Nawabpasand, Mirzapasand, Ranipasand, Sarenga, Kalasur, and a few others. Myriad stories galore about the origin of these species like -

Ranipasand :

An age old mango from the era of the Nawabs who ruled Bengal in the 18th century, Rani pasand is popular in Murshidabad and is part of the district's heritage. It is so named, as the erstwhile nawab's best wife liked it. Its characteristics include early maturing, sweet flesh, yellow coloured skin when it ripens but nonetheless exquisite.



Image No 33 : Ranipasand Mango

Enaet Pasand :

It is a beautiful mango that is part of the 'pasand' series of Murshidabad mangoes popularised



Image No 34 : Enayet Pasand

by the nawabs. Enaet Khan, a jagirdar or a local ruler or omrah, liked this variety of mango and patronised it and thus it got its name. It is a medium-sized mango, weighing 200-300gram, is thin-skinned, juicy and has a flavourful pulp.



Image No 35 : Mango Gardens , Lal Bagh



Image No 36 : Mango Gardens , Lal Bagh

Bimli: During the rule of Mir Jafar, a maid named Bimli was employed for cultivating new mango varieties. Pleased by her hard work a new mango variety was named after her and thus its name Bimli. This variety is reddish yellow in colour and has a sweet, juicy flesh and weighs 200-250gms.



Image No 37 :Bimli

Anaras: As the name suggests, this mango has a pineapple flavour. This one is a “bira” look-alike though is smaller in size. The pulp is whitish like a pineapple and it smells like one too. It is easily digestible and is a favourite with the people for its unusual and interesting taste.



Image No 38: Anaras

Himsagar: Found mostly in Murshidabad, Malda, Nadia and North 24 Parganas, these mangoes are as sweet as they come. It is green when raw but on ripening, it has a golden tinge to its skin. Not many mangoes can come down to its taste. The mango is devoid of any fibers and is said to be as sweet as Amrit.



Image No 39 : Himsagar

Molamjam: Among the Murshidabad mangoes, one exclusive prized breed is the Molamjam. It is said that this variety should be consumed at the very moment it is ripe.



Image No 40 : Kohitoor

Kohitoor: Golden yellow in colour, the Kohitoor has to be kept wrapped in cotton wool to keep it fresh. As its name suggest, it is soft, juicy mango. Unlike other mangoes, this one is whitish in colour and very tasty indeed. Each mango weighs about 300-400gms.

Gulabkhas: Since the Mughal era, these particular mangoes have been patronised by many rulers. Gulabkhas, as the name suggests, has a mild flavour of the gulab or rose along with the colour of the rose petals on the top part of the mango. These premium sized (250-300 gms) mangoes find their way to the export fruit markets of Dubai and Oman.



Image No 41 : Gulabkhas

Bhavani: This mango variety is dedicated to Rani Bhavani of Murshidabad. Rather small in size, the ripened mango is yellow and is so called as it glows like the skin of a queen. It is not very pulpy as the seed is rather big.



Image No 42 : Bhavani

Shahdulla: This variety is similar to the Himsagar and gets its name due to its patronisation by the shahs and nawabs of Murshidabad. A preferred mango of the elite class, its medium to bigger size, weighing 400gms approximately, has a green coloured skin when ripe and yellow flesh.



Image No 43 : Shahdulla

Mohanbhog: The Hindus of Murshidabad offered this beautiful variety of mango to Lord Krishna and thus originated its name, Mohanbhog. This medium to large sized mango, weighing 300-400gms is greenish-yellow in colour and is extremely sweet in taste and is of premium quality. It is said that one who eats this mango will find their tastebuds feel completely satiated.



Image No 44 : Mohanbhog

Bombai: This variety of mango derives its name from the city of Bombay or Mumbai, as it's now called. It was an important port and a hub for export-import of goods during the Mughal era. The nawabs of Bengal too used the Bombay port for trade activities. This variety of mango is greenish yellow in colour, has a good, juicy and sweet pulp and weighs around 300 gms.



Image No 45 : Bombai

Sabdar pasand: One of the famous ones from the 'pasand' series of Murshidabad mangoes, it is commonly known as bira. Popular lore said that a local ruler, Sabdar Khan, liked the mango and thus this variety got its name. The ruler scientifically propagated this variety and it is because of his effort that you can still find these mangoes in this region. Its characteristics include a juicy flesh with bright yellow coloured skin.



Image No 46 : Sabdar Pasanad

Sarikhas: Locals also refer it to as Sonakhas owing to its golden yellow colour when the mango ripens. One of the age-old variety of mangoes that occupies a pride of place, these medium-sized mangoes weigh 250-350 gms each approximately and have a sweet pulp that makes it ideal for export. Old tales from the region state that this particular variety of mango was used to prepare premium quality drinks and cocktails.

Chandankosa: It was said that during the rule of the nawabs in Murshidabad, the mejaji (connoisseurs) nawabs were fond of these flavoured mangoes that had exquisite taste and scent. The small and light coloured mango weighing below 200gms is thin skinned, juicy and has a flesh which smells of sandal wood.

Table No 13 : Major Varieties of Mangoes and Their Locations

Sl.No	Name of the species	Location	Availability
1	Alapati	Lalbag	Rare
2	Arajanma	Lalbag	Rare
3	Badsabhog	Lalbag	Moderate

4	Baishakguti	Lalbag, Murshidabad	Moderate
5	Bharati	Lalbag, Murshidabad	Moderate
6	Bimli	Ajimgaunge, Murshidabad	Rare
7	Brindabani	Ajimgaunge, Murshidabad	Rare
8	Champa	Ajimgaunge, Murshidabad	Moderate
9	Chinichampa	Jiagaunge, Murshidabad	Moderate
10	Dilswad	Lalbag	Moderate
11	Chotolakhshman	Lalbag	Moderate
12	Dudhkumar	Jiagaunge	Rare
13	Krishnabhog	Jiagaunge	Moderate
14	Anarasi Fajli	Jiagaunge	Available
15	Fania	Jiagaunge	Available
16	Golachaka	Jiagaunge	Available
17	Gopalbhog	Shaktipur	Available
18	Jilepikera	Shaktipur	Moderate
19	Kanchamitha	Shaktipur, Murshidabad	Available
20	Khirsapti	Shaktipur	Available
21	Guti Khirsapti	Shaktipur	Available
22	Kopai	Shaktipur	Moderate
23	Laksmanbhog	Shaktipur	Available
24	Madhuchuski	Murshidabad	Moderate
25	Madhugulguli	Murshidabad	Rare
26	Misrikanta	Murshidabad	Moderate
27	Molamjam	Lalbag, Murshidabad	Available
28	Rakhalbhog	Lalbag, Murshidabad	Available
29	Rani	Shaktipur	Available
30	Shadulla	Shaktipur	Available
31	Sinduria	Lalbag	Moderate
32	Vabani	Lalbag	Moderate

33	Surikhas	Lalbag	Rare
34	Sarengi	Murshidabad	Moderate
35	Aswina	Murshidabad	Available
36	Amrapali	Murshidabad	Available
37	Mohonbhog	Jiagaunge	Moderate
38	Langra	Jiagaunge	Available
39	Muchi Samania	Jiagaunge	Moderate
40	Rasi	Murshidabad	Moderate
41	Vadaria	Murshidabad	Moderate
Royal varieties of Nawab Bagan (orchard of Nawab), Lalbag, Murshidabad			
42	Anaras	Lalbag	Moderate
43	Bhabani	Lalbag	Moderate
44	Borosinduria	Lalbag	Moderate
45	Chandankhosa	Lalbag	Moderate
46	Daudi	Lalbag	Moderate
47	Dhobani	Lalbag	Moderate
48	Dilpasand	Lalbag	Moderate
49	Gulabkhas	Lalbag	Moderate
50	Kohitoor	Lalbag	Moderate
51	Mirchridana	Lalbag	Moderate
52	Rumali	Lalbag	Moderate
53	Amrapali	Lalbag	Moderate

Apple Cultivation Experiment in Murshidabad, West Bengal

The plains of Bengal's Murshidabad may seem an unlikely place to grow apples, but that's not an impediment for the district administration from giving it a shot. Around 20 men from Sagardighi in Murshidabad district had migrated to Kashmir, looking for employment. Most of them, including the five gunned down in Kulgam, worked in apple orchards in the Valley. But after the gory incident, jobless youths returned to their villages in panic. Taking cue from this incident, the local administration decided to set up apple orchards for the local youths.

The project was initiated by the community block administration in Murshidabad's Sagardighi where the victims lived. Around 20 men from this region went to Kashmir annually and worked in apple orchards in the Valley. The block administration decided to impart scientific training to these men who had some experience and had acquired some skill in working in apple orchards. Accordingly, the state procured nearly 1,500 apple saplings from Dehradun. These Anna variety of saplings were planted in nearly two hectares of state-owned land and in three-and-a-half acres given by land owners in Bahalnagar and Belkhorra villages in Murshidabad's Sagardighi. The plants are expected to bear fruits within the next three years. In the first year, each tree is likely to bear 50 apples. The amount will increase gradually and in the next five years, each tree will produce around 250 to 300 apples. In monetary terms, this amount will fetch around Rs 2,000 from each tree for the farmer. After five years, each farmer will make an annual profit of around Rs 9,500 per tree. The fruits will be available in the local market from the end of June and July. The price of apples will also be within the buying capacity of the masses.



Image No 47 : Apple Cultivation

6.2.D. Beedi Industry In Murshidabad

BEEDI industry is one of the informal industries in India. This industry is now blasting day by day. It employs millions of workers. Most of them are all BPL labourer and deprived of many

facilities. This paper attempts to focus on the socio-economic as well as health status of the labourer of Jangipur sub-division of Murshidabad district, West Bengal. Beedi workers are poor and mostly unorganized. They face innumerable problems such as poor working conditions, low wages, fraudulent actions by the contractors, health hazards, etc. Some of the main health problems are tuberculosis, skin problem, cancer, eye problem, bronchitis, asthma, etc. The paper tries to understand the nature of the beedi industry, the problems and the socio-economic condition of the beedi rollers in the Murshidabad district of West Bengal. **Jangipur sub-division** of Murshidabad district has the major concentration of the beedi industry and also the beedi workers. There are eleven census towns in Samserganj CD Block in Jangipur subdivision namely, Anup Nagar, Jaffrabad, Kankuria, Uttar Mahammadpur, Chachanda, Dhusaripara, Serpur, Kohetpur, Bhasaipaiakar, Jaykrishnapur and Basudebpur. The major focus area are - Anup Nagar, Uttar Mahammadpur and Kankuria census towns in Samserganj CD (Community Development) Block, in Jangipur sub- division.



Image No 48 : Bidi Making Industry

6.2.E. Handicraft Industry In Murshidabad:

Handicrafts of **Murshidabad district** are hugely acclaimed not only in the country but also across the globe. The history of these crafts is enrooted in the ancient past when these craftworks flourished under royal patronage. Since then, a number of artisans emerged in different parts of the district. Numerous artefacts are produced with a variety of materials such

as ivory, wood, sholapith, bell-metal and silk. Meticulous and elaborate designs are furnished on the handicrafts, some of which takes a long time to complete.

Ivory and Wood Handicraft:

Murshidabad district is famous for its ivory and wood handicrafts having its origin in the times when **Nawabs of Bengal** had their court in the district. The industry flourished with the luxurious support of wealthy noblemen, the craftwork faced a crisis with the decline of the power of Nawabs. The ivory crafts were also admired during the British rule and were also exported to different parts of the country. Railway communication in that period helped a great deal to flourish this art. The artisans practicing Ivory and Wood handicraft once used to receive orders from the Government for supplying their artefacts in the exhibitions of England and other European countries. The main centres of this industry in the districts were located at Mathra, Ranshagorgram and Daulatbazar.



Image No 49 : Ivory Wood Craft

Sholapith Handicraft:

Another renowned craftwork of Murshidabad district is Sholapith handicrafts. Sholapith is white coloured spongy wood taken from a plant known as Sola. Sola mostly grows wildly in waterlogged marshy areas. Sholapith is in fact the core or cortex of the plant having one and a half inch of diameter. Although it resembles a thermocol, it is superior to it in terms of texture, malleability, sponginess and lustre. The testaments of this handicraft can be seen on the images of Gods and Goddesses during festivals and as beautiful backdrops in **Durga Puja** celebrations. Sholapith is meticulously carved with beautiful designs. The common motifs of this craft include floral designs, garlands, decorative head-wears of deities, **elephant-howdahs**, palanquins and **peacock-boats**.



Image No 50 : Sholapith Handicraft

Bell Metal Handicrafts:

Handicrafts of Bell metal and brass utensils are found mostly in Khagra, Kandi, Jangipur, Berhampore and Baranagar. They cater both the local as well as international markets. **Dhulian** is known for betel nut cutters and locks whereas iron chests are manufactured

at Jangipur. However, there is a persisting problem in acquiring the raw materials by the artisans owing to the complicated formalities involved in submitting of applications

Silk Industry:

Baluchar town in the district is famous for **Baluchari sarees**. The saris have a base of silk with silk brocaded designs of varied hues. However strong contrast in terms of colour is avoided in these saris. Artisans from Muslim community are known for traditionally producing these saris with depiction of figured patterns, horse with a rider, court scenes and women smoking hookah. Floral borders surrounding the cone motif or the Kalka design are also common. Silk saris of Bengal are famed not only in the country but also in the international market. Handicrafts of Murshidabad district have well captured the international markets too. Since ancient times, there is a huge demand for them worldwide and a major portion of these artefacts are exported. These handicrafts have greatly enriched the cultural heritage of the country and have also contributed in the bloom of handicraft industry of India.

CHAPTER 7 - DOCUMENTING ENVIRONMENTAL PROBLEMS

7.1. Flood

The Murshidabad district is one of the most flood prone districts of West Bengal. Every year during the rainy season large areas have been inundated by flood water. The main rivers of the district are becoming very much shallower due to rapid siltation of its bed. Sometimes river water over flows its banks and inundated to its surrounding regions and water from one river bed enters at the other river. As a result many blocks and villages flooded by water. Almost all the blocks specially along the main channel River Ganga, i.e. Jalangi, Bhagawangola 1& II, Raninagar I&II, Samsorganj, Suti 1&II, Farkka, Murshidabad, Nabagram are all prone to heavy flooding during heavy rainfall. Flood hazard and vulnerability results in collapsing of the houses, damage to agricultural crops, buildings, roads and livelihood support system of the villagers.

Table No 14 : List of Villages Prone to Flood

Name of the Block	Type of Hazard	Cause or Vulnerability	Villages	Name of The GPs / Wards Affected	No. of People Affected	No. of Houses Damaged
Raninagar I	Water Logging	Overflow of Bhairab River	Char Doulatpur, Char Gopalpur Uttar, Begampur, Jnaginagar, Molladanga, Ghughupara, Paschim Mondalpara Char Pirojpur, Mohanpur, Gopinathpur Harharia Mathpara, Chak Kalitala, Chak Garamgari Chatra	Hurshi	19516	4071
				Lochanpur	2720	910
				Paharpur	920	250
				Islampur Chak	2625	1820
Raninagar II	Flood/ Water logging	Flood with Soil Erosion	Charbangsara, Boarderpara, Mahadevpur Uttarchar, Majhardiar Char, Durgapur Char Munshipara, Lalkup Nalbon Jagirpara Bamnabad Ramchandrapur Char	Malibari I	6585	1375
				Kalinagar-1	6176	1370
				Rajpur	18285	4108
Jalangi	Flood	Water releases	Tiktikipara , Thakurnagar Colony Parashpur Char	Saheb Nagar, Sagarpara,	53180	11436

		from Farakka	Colony, Udaynagar, , Taltali, Joykrishnapur, & Sarkarpara	Ghoshpara Jalangi, & Choapara G.P.		
Bhagawan gola I	Flood & Waterlogging	Flood with Soil Erosion	Tikli Char , Char Babupur, Charbinpara Arijpur Malopara and Sundarpur Diararpara	Hanumantana gar & Sundarpur Gram Panchayat Area.	15550	2550
Bhagawan gola II	Flood	Heavy Rain	Shibnagar	Akheriganj	15056	3568
	Flood	Heavy Rain	Amdahara	Nirmalchar	11584	2896
	Flood	Heavy Rain	Bhandara Bill	Baligram	17296	4128
	Flood	Heavy Rain	Anup Nagar	Kharibona	16092	3887
	Flood	Heavy Rain	Aloypur, Sahapur, Chandpur	Nashipur	11768	2942
Murshidabad - Jiaganj	Water logging	Over Flooded situation occurred by Jhunka Cannel	Elahiganj, Haidarpur	Dahapara	18128	4156
		Heavy Rain	Mahinagar, Kusumkhola	Mukundabad	29935	6564
		Heavy Rain	Ganeshpur, Billkandi	Bahadurpur	31469	6699
		Heavy Rain	Sasidharpur, Kalikapur	Kapasdanga	27511	6328
		Heavy Rain	Amaniganj, Binpara	Natungram	24360	5455
		Heavy Rain	Banti, Hulaspur	Dangapara	29687	6972
Lalgola	Flood	Erosion & over following of River	Sadhakpara, Ghoshpara, Panditpur (due to flood and erosion)	Maiya	883	221
			Boyra, Khandua	Bilborakopra	452	130

		Over following of River Bhagirathi	Kadamtala, Natundiar, Basumati, Rianpur Khamarpara, Kuchidanga	Nashipur	1282	322
		Over following of River Bhagirathi	Rampal, Dangapara	Paikpara	800	192
	Waterlogging	Rainfall & lack of proper drainage	Fakirpara, Lalgola Bazar (water logging)	Lalgola	1000	233
	Flood	Over following of River Bhagirathi	Siteshnagar	Dewansarai	618	123
Nabagram	Flood&Waterlogging	Heavy Rainfall	Chandraghat,Sukdevpur, pirdanga,sankoghat,Laxmanpur,Jhulonpur,Barkatpur,Radhanagar,Jurankandi,Fakirpur,Kachubari,Sayedpur,Rasulpur,Ratanpu	Rasulpur	16384	4385
	Flood&Waterlogging	Heavy Rainfall	Milki,Dangapara,Kutubpur,Jafarpur,Sahebnagar,Hazibidanga,Bandhpura	Hazibidanga	14430	4221
	Flood&Waterlogging	Heavy Rainfall	Balaspur, Tenitulia,Mehenadanga, Digridanga,Kishorpur,Burardanga,Khirkadanga,Targram,Panchgram,Parkunda,Mobarakpur	Panchgram	3007	5826
	Flood&Waterlogging	Heavy Rainfall	Bilol, Natungram,Ramchandrapur,Gurah, Pundi,Koregram,Nimgram,Beluri, Pshla	Gurah-Pashala	27488	6291
	Flood&Waterlogging	Heavy Rainfall	Talgori,Bhattabati,Ekpaharia,Bagmara,Charalpara ,Khekul,Kaliganj,Rajdharpur,Marghati,Bilbari,Tala	Kiriteswari	29364	7327

			pahar, Nerkelbagan			
	Flood & Water logging	Heavy Rainfall	Gangareampur, Dafarpur, Basudebpur, Fanpore, Joykrishnapur, Mukundapur, Shibpur, Raghupur, Bilbari	Shibpur	17998	6129
	Flood & Water logging	Heavy Rainfall	Singer, Bill Colony, Islampur, Kalyanaganj, Daspara, Mohurul, ramdanga	Mohurul	27862	6568
	Flood & Water logging	Heavy Rainfall	Madhunia, Lamal[ara, Nandigram, Bagore	Amarkunda	12546	2867
	Flood & Water logging	Heavy Rainfall	Vhhotobathan, Gopegram	Narayanpur	24367	7750
	Flood & Water logging	Heavy Rainfall	Shilgram, Kusmore, Gopalnagar	Nabagram	27027	8257
Suti 1	Flood & Water logging	Overfolw of Banslai & Pagla river	Pachgachhi Gaighata Amarpur Paraipur Sovarghat	Harua	7200	1286
	Flood & Water logging	Overfolw of Banslai & Pagla river	Battala Baisnabdanga Nadai Sidhori Gopalnagar Hossainpur Nazirpur Ajagarpara Hilora Bansabati (Part)	Bahutali	14173	2993
		Overfolw of Banslai & Pagla river	Ramdova Ahiran	Ahiran	3908	2647
		Overfolw of Banslai & Pagla river	Sadikpur Fatullapur Chandamari Araj-Ramakantapur	Sadikpur	6340	1232

		Overflow of Banslai & Pagla river	Nurpur Khoribona Ramakantapur Chak Sayedpur	Nurpur	8578	1622
Suti II	Flood & Flood like situation	Rain water & Water logging	Ullapara ,Bauripuni,Elahabad,Sahajadpur,Umrapur,Bahagolpur	Umrapur	37058	6520
	Flood & Flood like situation	Rain water & Water logging	Lokaipur,Sarala,Basantapur	Mahesail-II	24824	4531
Sagardighi	Flood	The river Bhagirathi the flowing on the eastern side of the Block	Kanranagar, Sahebnagar, Titikipara, Diohipara, Fulbari, Gadi, Ujjalnagar, Dogachi, Mohammadpur, Chandpur	Manigram	7500	1500
	Flood	The river Bhagirathi the flowing on the eastern side of the Block	Balia, Nayandanga, Kharikapukur, Kuthipara, Trailakshyanagar, Ramnagar, Uladanga, Gopalpur, Pilki	Balia	6500	1400
	Flood	The river Bhagirathi the flowing on the eastern side of the Block	Kashiadanga, Teghari Kayalpara, Pakalpara, Char Kabilpur, Char Kabilpur Baroj, Ranjit pur, Mathurapur, Bhupendranagar, Sahebnagar, Amritpur	Kabilpur	31845	6111
	Flood	The river Bhagirathi the flowing on the eastern	Diar Balagachi, Char Sundarpur Colonoy, Maheshpur, Islampur, Dhibaraj, Balanagar, Gauripur, Balagachi, Amlabari, Patkeldanga,	Patkeldanga	4500	1200

		side of the Block	Bishnupur, Hayetpur			
	Flood	The river Bhagirathi the flowing on the eastern side of the Block	Chaltabari,Dosturhat,Ga ysabad, Biswanathpur,Dhansing h,Natumpara, Gobinda Ghosh. Binod, Sahanabagan, Mansinghpur, Tiktikipara,Kamarpara.	Gobardhandan ga	5500	1300
	Flood	Water logging of Gambhira Cannel on the Western side of Block	Fulbari,Belkharria,Sankob azar,Bahalnagar	Bokhara-I	2800	700
	Flood	Water logging of Gambhira Cannel on the Western side of Block	Telangal,Fakirpara,Dang apara,Debagram Colony	Bokhara-II	2880	720
	Flood	Water logging of Gambhira Cannel on the Western side of Block	Domaipur.	Moregram	600	150
		Water logging of Gambhira Cannel on the Western side of Block	jaglai,Athua,Belaipara	Banneyswar	700	170
Raghunat	Cyclone	Heavy	Mirergram, Panchabati,	Kanupur	7890	1578

hganj-I	Flood	Rain/Bans hloi River/ The Bhagirathi river rises speedily due to discharge of water from Farakka Barrage	Kanupur, Khidirpur, Sonatikuri Colony, Dewli Colony and Gadaipur			
	Cyclone Flood	Kalbaisak hi	Gopalnagar, Nista (part), Bahadinagar and Bandhkhola	Jarur	5015	1003
	Cyclone Flood	Kalbaisak hi	Barala (part) and Baindhya under Jamuar Gram Panchayat .Besides that due to over flow of Farakka Canal a large field area under Jamuar Gram Panchayat become	Jamuar	7670	1534
	Flood / Cyclone / Water / logging / Boat capsize	The Bhagirathi river rises speedily due to discharge of water from Farakka Barrage	Sujapur, Charka, Purba to Charka Paschim and part of Dafarpur Mouza	Dafarpur	8700	1740
	Flood / Cyclone / Water / logging / Boat capsize	The Bhagirathi river rises speedily due to discharge of water from Farakka Barrage	Raninagar, Dier-Raninagar, Dwipchar, Natunganj, part of Baikunthapur,	Raninagar	8100	1620
	Cyclone	Kalbaisak hi	Ailerupar and Dwipcharpara under	Mirzapur	4000	800

	Flood		Mirzapur Gram Panchayat.			
Samsheganj	Flood/Flood like situation, Water logging, Erosion	Overflow of the Ganga River.	Kamalpur, Dhangara, Durgapur Usufpur	NIMTITA	39937	7853
	Flood/Flood like situation, Water logging, Erosion	Overflow of the Ganga River.	Jaladipur Colony, Nutan-Shibpur Chachanda	CHACHANDA	32667	5899
	Flood/Flood like situation, Water logging, Erosion	Overflow of the Ganga River.	Protapganj, Loharpur, Sikdarpur	PROTAPGANJ	34301	6089
	Flood/Flood like situation, Water logging, Erosion	Overflow of the Ganga River.	Ghanashyampur, Housenagar	TINPAKURIA	33819	5820
		Overflow of the Ganga River.	Satghoria, Hoglabari	BOGDADNAGAR	24347	4483
		Overflow of the Ganga River.	Hijaltala, Ratanpur, Sulitala	KANCHANTALA	23005	3980
		Overflow of the MasnaRiver.	Krishnanagar, Fulandar Baharagachhi	GAZINAGAR-MALANCHA	22179	4095
		Overflow of the MasnaRiver.	Islampur, Elizabad, Bhasaipaikar Mohabbatpur, Sekhpur	BHASAIPAIKAR	41894	6999
Overflow of the MasnaRiver.		Sitarampur, Sankharghat Dogachhi, Hansupur	DOGACHHI-NAPARA	31870	5805	

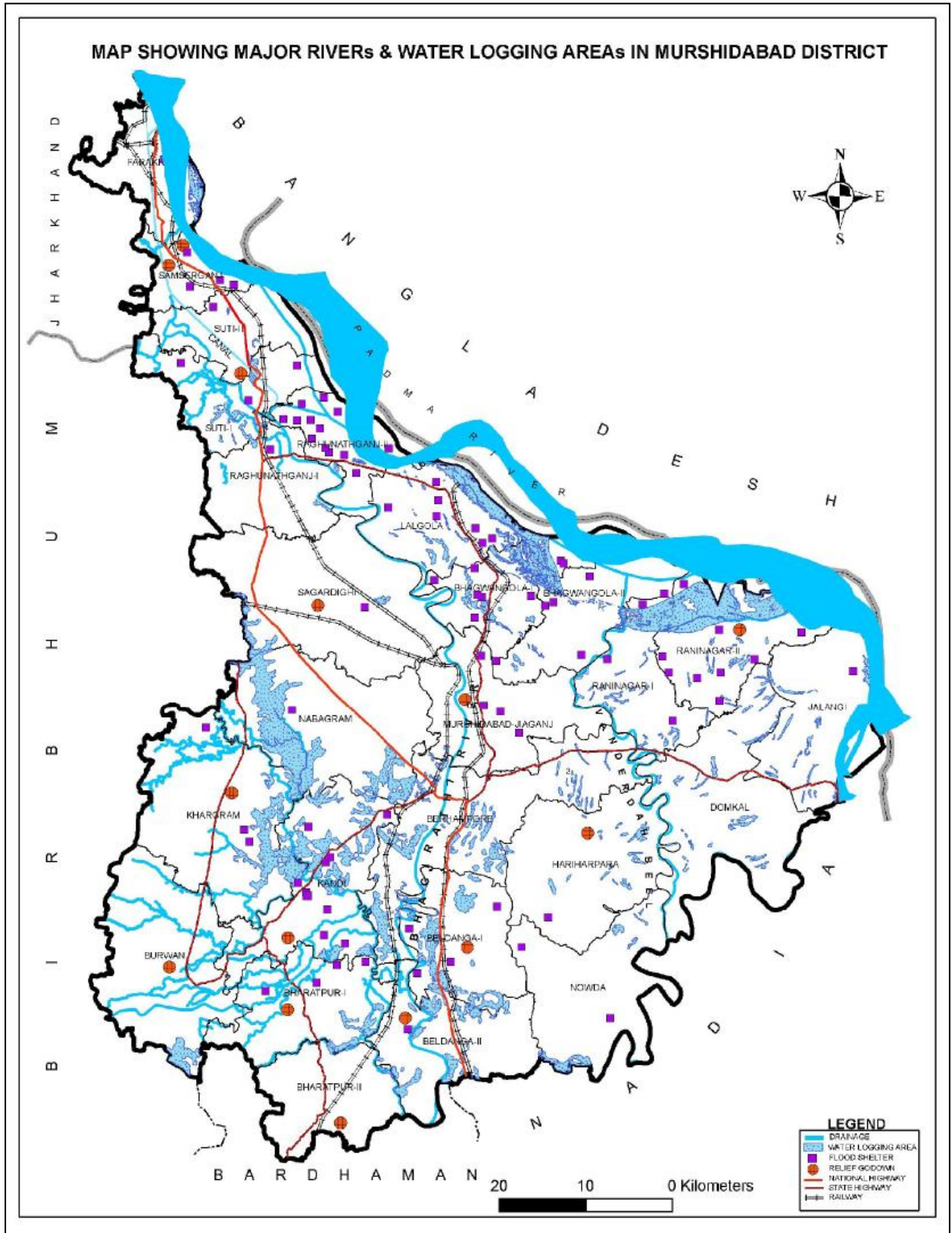
		Overflow of the Ganga River.	Laxminagar, Guripara, Ghoshpara Krishnanagar, Lalpur, Hatichitra	DHULIAN – MUNICIPALITY	96000	16000
Farakka	Flood /Boat capsize/ Erosion Water logging etc.	Water logging & Erosion	KHODABANDAPUR,DIAR PARA, MANDAL PARA,SANKOPARA,SHIB NAGAR,PER DEONAPUR,TOFAPUR	ARJUNPUR	5225	750
	Hilly Flood, Cyclone.	Hilly Flood.	JORPUKURIA,CHANDOR E,SUDNA,NAGRI,KALAI D ANGA & BHAI RABDANGA,	BAHADURPUR	2250	325
	Flood /Boat capsize/ Erosion Water logging etc.	Flood, Erosion, Water logging, Boat capsize	HOSSAINPUR,RAGHUNA THPUR,ACHHUA,BINDU GRAM & BENIAGRAM	BENIAGRAM	4500	675
Berhampore	Flood, Water logging, Cyclone	Heavy rainfall	Fatipur Bhipur	Nealishpara Goaljan	26471	3650
	Flood, Water logging, Cyclone	Heavy rainfall	Gopejan	Radharghat-I	21385	2690
	Flood, Water logging, Cyclone	Heavy rainfall	Raninagar Muktarpur	Radharghat-II	16448	1274
	Flood, Water logging,	Heavy rainfall	Char sungai	Sahajadpur	25317	3843

	Cyclone					
	Flood, Water logging, Cyclone	Heavy rainfall	Hot nagar santoshnagar nolghosha	Satui Chowrigachha	26104	3707
	Flood, Water logging, Cyclone	Heavy rainfall	Char Halalpur	Rangamati Chandpara	29884	5091
	Cyclone,	Kalbaisakhi	Fatesildiar	Haridasmati	29374	4880
	Cyclone	Kalbaisakhi	Gajdorpara	Bhakuri-II	22035	2594
	Cyclone Boat Capsize	Kalbaisakhi	Nagrazole Rajdharpara	Nowdapanur Rajdharpara	25020 26904	3281 3496
	Cyclone	Kalbaisakhi	Ghoshpara	Chhaighari	26229	3872
	Cyclone	Kalbaisakhi	Kaladanga	Madanpur	20983	4125
	Cyclone	Kalbaisakhi	Chailtia	Bhakuri-I	30451	2269
	Cyclone	Kalbaisakhi	Manindranagar	Manindranagar	39691	4288
	Cyclone	Kalbaisakhi	Dighirpar	Hatinagar	30928	3229
	Waterlogging		Garabasa Harirampur	Gurudaspur	26873	4009
	Cyclone	Kalbaisakhi	Kalupur Ghasipur	Doulatabad	27664	6102
Berhampur Municipal	Flood	Uprising of the river bed		Ward No. 20, 19, 13,5,2,6, 24,21,28	680000	17000

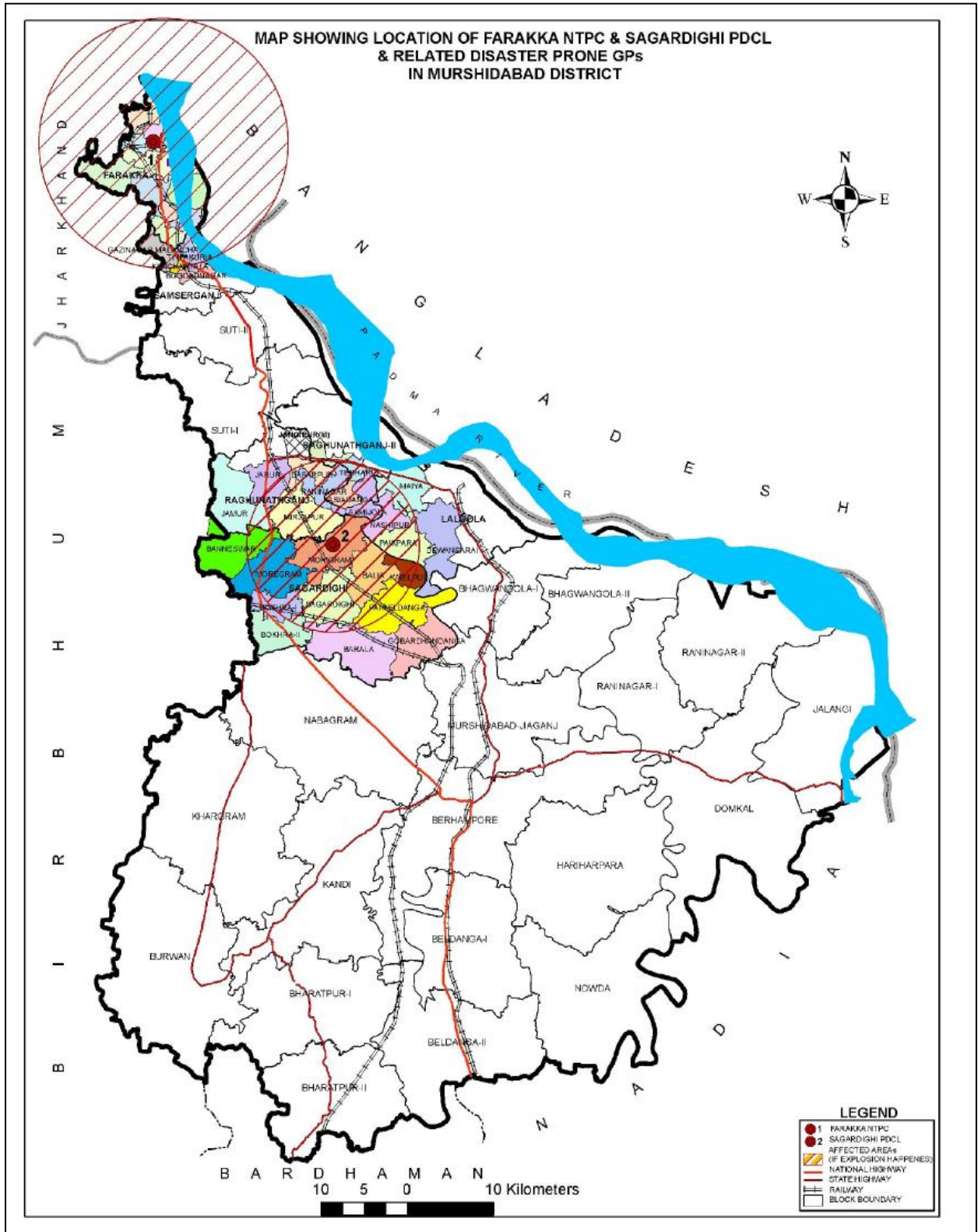
ity		due to soil erosion				
Kandi	Flood	Flood	All hamlets (Severely affected are Gopalnagar, Benipur, Bajegopalnagar, Srikanthapur, Harinagar, Bhabanandapur, Ranipur, Hizole, Srikrishnapur)	Hizole	27073	8981
			All hamlets (Severely affected area are Ranagram, Indrahata, Chatore, Chandraprosadpur, Bhabanipur, Purandarpur, Parbatipur, Dakshin Lakshminarayanpur, Ghanashyampur, Rayabanti, Boltuli, Banti)	Purandarpur	22944	4390
	Flood	Flood	All hamlets (Severely affected are Gobindapur, Jitpur, Rajarampur, Chandnagar, Santoshpur, Durgapur, Lakshmikantapur, Andulia, Mahadia, Gopalpur)	Andulia	21698	4739
	Flood	Flood and discharge of water is made from Tilipara Barrage, Dewcha or Baidhara dam	All hamlets	Kumarsanda	30809	4598
	Flood		KHOSBUSPUR,GOKARNA	Gokarna-I	20510	4521
	Flood	Flood and discharge of water is made from Tilipara Barrage,	NABAGRAM,MOTRA,MO RURA,PATENDA,ARAJI CHANDPARA	Gokarna-II	22373	4378
	Flood		MAHALANDI,PATNA	Mahalandi-I	18959	3587

		Dewcha or Baidhara dam along with Farraka Dam				
	Flood	Flood	BHATPARA, BHATRA PALASY, BILL BEGUMPUR, UTTAR LAXMI NARAYANPUR, DURGAPUR	Mahalandi-II	18575	2839
	Flood	Flood and discharge of water is made from	MUNIGRAM, RAGHUPUR, KAHARPARA, ANUKHA, RATUNI, MAHADEVBATI, SINGADDA	Jasohari Anukha-I	15112	4941
	Flood	Tilipara Barrage, Dewcha or Baidhara dam along with Farraka Dam	KALYANPUR, SADPUR, BAMANDASBATI, JASOHARI, RAMBHADRABATI, RUDRABATI, BHANDRA	Jasohari Anukha-II	22578	5989

Source- District Disaster Management Plan, Government of West Bengal, 2019-20



Map No 56 : Inundated Areas of Murshidabad



Map No 57 : The Disaster Prone GPs of Murshidabad District in Relation to Farakka NTPC & PDCL.

Due to increasing huge population pressure in the study area and increasing frequency of flood the local peoples who are living there are exposed to flood hazard. They are forced to

take higher risks for collecting their livelihoods. To save the local people from flood hazard and vulnerability both government and non-government level immediate actions must be taken. The Bhagirathi and Jalangi these two rivers basin must be managed following the preservation of natural eco-system and bio-diversity. The flood plain zone and the low land must be kept safer by protecting flood hazard with the application of modern technology. In this way the people of the blocks can be saved.

Regular dredging of the canals and river beds must be done. Embankment construction, its repair and maintenance must be done regularly. The land use pattern maintenance by the local people is scientifically essential. Flood emergency measures like flood warning and evacuation of the affected people are required. It is also necessary to build up flood awareness among the people. Flood hazard mapping and rescue shelter must be developed for taking the shelter during flood hazard. Lastly the integrated flood management approach must be adopted in the flood affected region.

7.2. Bank Erosion and its impact

Channel instability and rhythmic fluctuation through erosion-deposition sequence are very familiar phenomena in the lower course of a river in monsoon climate. The river Ganga and Bhagirathi-Hooghly, in West Bengal resorts to massive bank erosion at an alarming scale in Murshidabad District along with Nadia, Purba Bardhaman, Malda and contributes to a dominant irreparable loss of farm lands of a very high quality each year. It has been estimated, that about 43% of the total geographical area of the state has been declared as flood prone. From reports of West Bengal Irrigation Department, it has been seen that the average annual quantum of land, engulfed by the rivers in West Bengal is about 800 hectares.

Consequences of river bank erosion are many folds such as environmental, social, economic and sometimes political. The first and foremost impact is social i.e. homelessness and landlessness due to river bank erosion which compels people to migrate. After force migration, people face firstly identity crisis as many people change their administrative boundary. The border dispute due to the Ganges bank erosion in Murshidabad district is related the inter-country border between India and Bangladesh.

They also face economic problems due to loss fertile land, property and loss of jobs. As a result they deprive from basic human needs such as education, food, proper shelter, job, proper health care facility, sanitation, safe drinking water etc. River bank erosion causes continuous forced migration in the following manner: submergence of river bank area.



Image No 51 : Bank Erosion

River bank erosion & Forced Resettlement in new land area or emerged migration. Again bank erosion deposited sand bar area (char land) & forced migration or displacement.

7.3. Farakka Barrage and its problems

“When Farakka barrage was built, the engineers did not plan for such massive silt. But it has become one of the biggest problems of the barrage now” said Dr. P.K. Parua, [General Manager of Farakka Barrage Project (FBP)]

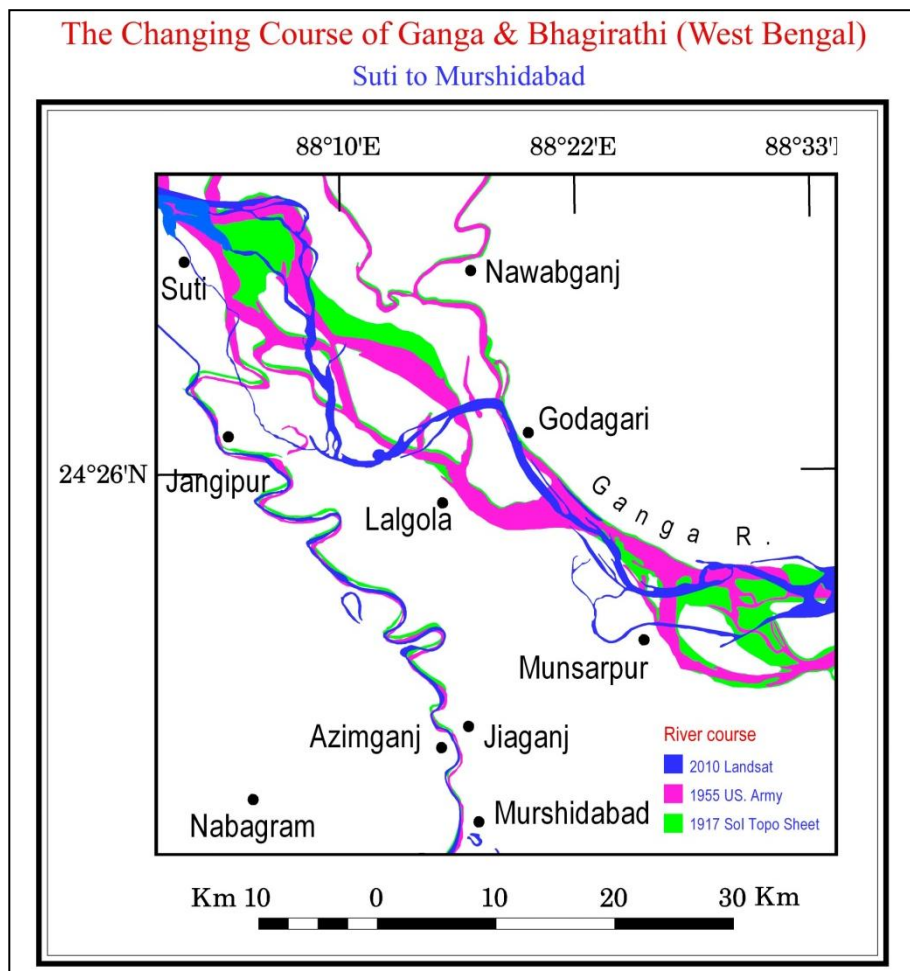
Farakka Barrage has compounded erosion problems in Murshidabad, Malda and Nadia districts. The story of the Farakka barrage begins a century before its construction. It was when the East India Company set up their headquarters in Kolkata that the navigability of the Hugli River became a matter of crucial importance. Problems with shifting river channels existed even then, this being a natural action on the part of these silt-laden rivers. Since the middle of the 19th century, there have been deliberations of bringing in water from the Ganga to flush out the port. This idea took concrete form in 1957, when the government of India appointed a consultant to look into the problem of siltation of the Kolkata port. Construction on the barrage began in 1962 and was commissioned in 1975.

Despite the barrage, the **siltation** is an ongoing problem. The Kolkata port continues to dredge an ever-increasing amount of silt to maintain its usefulness; from 6.4 million cum (cubic metre) before the barrage was constructed, they need to annually dredge out 21.18 million cum today. This increase in siltation is due to the deforestation in the catchment area and vastly reduced

flows. Besides not preventing siltation, the Farakka barrage has led to a great deal of what might be termed 'collateral damage'.

a. **Erosion in the Upstream of the barrage due to Sedimentation:**

Upstream of the barrage, the river is flanked on its right by the Raj Mahal hills. This causes the river to tend towards its left, away from the obstruction, eroding its left bank in the process. The district of Malda, on the left bank of the river, has been flooding regularly for decades. This flooding has been further increased by the impoundment at Farakka which has greatly increased the sedimentation at the barrage, thus causing a rise in the bed level and changes in the gradient of the riverbed. The government of West Bengal acknowledges the role of the barrage in the inundation of Malda. The 13th legislative assembly stated, "It is accepted at all levels that the construction of Farakka barrage is solely responsible behind the erosion of River Ganges in Malda district."



Map No 58 : The Changing Course of Bhagirathi - Hugli

According to Audit Report on Farakka Barrage by Indian Audit and Accounts Departments, between 2006-2012, the “**Unintended Consequences**” of Farakka include:

- Induced water through feeder canal raised water level of Bhagirathi by about 5 meters near Jangipur and does not allow Bansloi and Pagla to join Bhagirathi freely. A new wetland due to congestion formed Ahiron Beel which has submerged fertile land.
- The barrage has trapped substantial sediment and hence river in changing course. In homogenous situation the oscillation of river is secular but it gets aggravated due to Farakka Barrage. On account of Rajmahal hills on right bank and Farakka barrage on the channel, the **river erodes the left bank**.
- The 10 day cycle of increased and decreased release of water from the Barrage has resulted in a complex phenomenon of recharging ground water by river and then receiving base flow from groundwater (when river is low). The frequent change in water level on account of 10 day altered flow adversely affects the rivers hydro geomorphology **leading to escalating bank erosion**.
- River bed height in Farakka pondage has increased and the **river is compensating this reduction by expanding its cross section sideways**

b. Erosion Downstream of the barrage, leading to loss of life and property:

Sedimentation upstream the barrage, coupled with natural swing of Ganga has meant that the river is swinging to the left, encroaching the left bank, leading to erosion in thousands of villages, roads, fields in the downstream of the Barrage in India as well as Bangladesh, causing annual floods. The Irrigation Department West Bengal (Report of the Irrigation Dept for 1997-2001) itself has agreed not only about this erosion due to Farakka Barrage, but has also cautioned about the possibility of outflanking of the Farakka Barrage itself. Many experts maintain the eminent possibility of Ganga outflanking the barrage to flow through its old course of the 15th century, which will reduce the barrage to just a bridge.

It is seen an extensive erosion in the left bank of the river in the upstream at *Simultola* as well as downstream in *Chauk Bahadurpur*. In both these regions, the eroding river has paid little heed to the erosion control measures on the banks. Huge boulders have been swept with the current, destabilizing land in their wake.

c. Ecological Impacts:

Environmentalists have been speaking for years about the negative ecological and social consequences of the Farakka barrage.

Absence of Hilsa: Farakka Barrage has stopped migration of economically important species like the Hilsa (*Tenualosa ilsha*) and *Macrobrachium* prawns, both Ilish (Hilsa) and Chingri (*Macrobrachium*) hold a special significance to people in West Bengal and Bangladesh. A lot has been written about the Barrage's disastrous impact on Hilsa production and impoverishment of fisherfolk in India and Bangladesh. About 2 lakh fisherfolk in Malda district alone depend on riverine fisheries and Hilsa here was the backbone of the fishing economy. Prior to commissioning Farakka Barrage in 1975, there are records of the Hilsa migrating from Bay of Bengal right upto Agra, Kanpur and even Delhi covering a distance of more than 1600 kms. Maximum abundance was observed at Buxar (Bihar), at a distance of about 650 kms from river mouth. Post Farraka, Hilsa is unheard of in Yamuna in Delhi and its yield has dropped to zero in Allahabad, from 91 kg/km in 1960s. Studies as old as those conducted in mid-seventies single out Farakka's disastrous impacts on Hilsa, illustrating a near 100% decline of Hilsa above the barrage post construction.

Fable of Farakka Fish Lock: The tale of Farakka Barrage Fish Lock is another tragic story. Fish Lock is a gated structure in a Barrage that needs to be operated specifically to facilitate migration of fish from the downstream to the upstream or vice versa to breed, feed or complete their lifecycles.

According to Central Inland Fisheries Research Institute (CIFRI), Farakka Barrage has two Fish Locks between gates 24 and 25. The locks need to be operated to aid fish migration and transport fish. We talked with the Engineers at Farakka Barrage Authority, local villagers, fishermen and even the Barrage Control Room officials who operate the gates of the barrage about the functioning of the Fish Lock. No one had heard about a Fish Lock. There is some information that there is one more lock further upstream in the river, but the FBP Authorities did not seem aware of this.

The control room officials kept showing us the ship lock at the Barrage (which is also rarely used due to turbulence and sedimentation) and told us categorically that "There is nothing called as fish lock here". The locks have not been operated for a minimum of a decade, possibly much longer.

