

DISTRICT SURVEY REPORT OF NADIA DISTRICT

(For Mining of Minor Minerals)

As per Notification No. S.O.141 (E) New Delhi Dated 15th of January 2016, S.O.3611 (E) New Delhi Dated 25th of July 2018 and Enforcement and Monitoring Guidelines for Sand Mining (EMGSM) January 2020, Issued by Ministry of Environment, Forest and Climate Change (MoEF&CC) July, 2022



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No. 1333 MD

Kolkata, 6th January, 2022.

TO WHOM IT MAY CONCERN

This is to certify that DSRs of concerned districts of West Bengal have been duly validated by respective district authorities and their suggestions/inputs, if any, have been duly incorporated in the DSRs. The DSRs have been finally scrutinised and accepted by the scrutiny committee of DMM, WB and the same have been forwarded to the Dept. of Industry, Commerce and Enterprises along with respective scrutiny reports for onward transmission to SEAC for necessary action.



Director of Mines and Minerals
Govt. of West Bengal



Table of Content

Chapter No	Subject	Page No
	Executive Summary	1
1	Preface	2
2	Introduction	3-14
3	General Profile of The District	15-38
	3.1. General Information	15-18
	3.2. Climate Condition	19
	3.3. Rainfall and humidity	19-20
	3.4. Topography & Terrain	21-22
	3.5. Water courses and Hydrology	23-24
	3.6. Ground water Development	25-30
	3.7. Drainage System	30-31
	3.8. Demography	32-33
	3.9. Cropping pattern	34
	3.10. Land Form and Seismicity	35-36
	3.11. Flora	37
	3.12. Fauna	37-38
4	Physiography of the District	39-43
	4.1 General Landforms	39
	4.2 Soil and rock pattern	39-41
	4.3 Different geomorphologic units	42-43
5	Land Use Pattern of The District	44-51



Chapter No	Subject	Page No
	5.1 Forest	47-48
	5.2 Agriculture and Irrigation	48-49
	5.3 Horticulture	49-51
	5.4 Mining	51
6	Geology	50-53
7	Mineral Wealth	49-78
	7.1 Overview of mineral resources	54
	7.2 Details of Resources	54
	7.2.1 Sand and other riverbed minerals	54-77
	I. Drainage System	54-55
	II. Annual deposition of riverbed minerals	56-59
	A. Geomorphological studies	56-73
	i. Place of Origin	56
	ii. Catchment Area	56
	iii. General profile of river stream	56-58
	iv. Annual deposition factor	59-61
	v. Replenishment Study as per EMGSM guidelines 2020	61-73
	vi. Total potential of minor mineral in the river bed	73
	B. Geological studies	73
	i. Lithology of the catchment area	73
	ii. Tectonics and structural behavior of rocks	73
	C. Climate Factors	74-77
	i. Intensity of rainfall	74
	ii. Climate zone	74



Chapter No	Subject	Page No
	iii. Temperature variation	74-75
	III. Riverbed Mineral Potential	75-77
	7.2.2 In-situ Minerals	78
	7.3 Mineral development prospect of the district with respect to Minor Mineral	78
	7.4 Exploration Requirement of the district	78
8	Overview Of Mining Activity in the District	79
9	Details of Revenue Generated from Mineral Sector During Last Three Years	80
10	Transport	81-83
11	Remedial measure to mitigate the impact of Mining	84-87
12	Suggested reclamation plan for already mined out areas	88
13	Risk assessment & disaster management plan	89-90
14	Conclusion and Recommendation	91-92
References		93

List of Plates

Plate No	Subject	Page No
Plate 1A	Drainage Map of The District	1-2
Plate 1B	Location Map of dams, barrages, bridge showing on drainage system	3
Plate 2A1-2A10	Distribution Map of Sand Bars on Rivers During Pre-Monsoon Period of Nadia District	4-14
Plate 2B1-2B8	Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Nadia District	15-23
Plate 3A	Watershed Map of Nadia District	24-25



Plate No	Subject	Page No
Plate 3B	District watershed map showing ground water level during Pre-monsoon period	26
Plate 3C	District watershed map showing ground water level during Post-monsoon period	27
Plate 4	Map showing long-term (10-year or more) erosion-accretion areas on both the banks of Hooghly River, Nadia	28-29

List of Annexure

Annexure No	Subject	Page No
Annexure 1	Compliance as per Enforcement & Monitoring Guidelines for sand Mining, 2020 (MoEF& CC) for preparation of District Survey Report	1-4
Annexure 2	Estimation of Sand Resources based on sediment load comparison between Pre and Post Monsoon period of Nadia District	1-3
Annexure 3	Coordinates of Potential Blocks of Nadia District	1-5
Annexure 4	Maps showing Potential Blocks of Nadia District	-
Annexure 5	SEIAA 88 th Meeting (21 st February, 2023) MOM	-

List of Figure

Figure No	Subject	Page No
Figure 2.1	Steps followed in preparation of DSR	11
Figure 2.2	Pictorial Description of Land Use Classification Methods	12
Figure 2.3	Pictorial Description of Geomorphological Units Classification Methods	13
Figure 3.1	Location Map of Nadia	16
Figure 3.2	Block divisional map of Nadia	18
Figure 3.3	Graphical representation of Nadia District rainfall	20
Figure 3.4	Physiographic Map of Nadia District	22



Figure No	Subject	Page No
Figure 3.5	Hydrogeological Map of Nadia District	24
Figure 3.6	Graphical representation of pre-monsoon and post-monsoon water level data of Chapra, Nadia	25
Figure 3.7	Block wise Hydrograph showing variation of water level during 2011 to 2021	26-30
Figure 3.8	Drainage map of Nadia District	31
Figure 3.9	Population distribution of the district	33
Figure 3.10	Block-wise Literacy rate of the district	33
Figure 3.11	Earthquake zonation map of West Bengal highlighting the Nadia district position	36
Figure 3.12	District location with respect to Wild Life Sanctuary of West Bengal	38
Figure 4.1	Soil Map of Nadia District	40
Figure 4.2	Geomorphological Map of Nadia District	43
Figure 5.1	Land use pattern of Nadia District	45
Figure 5.2	Land Use Land Cover map of Nadia District	46
Figure 6.1	Geological map of Nadia district	53
Figure 7.1	Plan showing the major rivers along with the distribution of Section Lines	57
Figure 7.2	River profile section of the district	58
Figure 7.3	River cross section of the district	58
Figure 7.4	Watershed map of Nadia district	65
Figure 7.5	Graphical representation of year-wise sedimentation rate	73
Figure 7.6	A representative map showing no-mining zone demarcated on Hooghly River	77
Figure 10.1	Transportation Map of Nadia District	82
Figure 10.2	Map showing approach road to potential sand bars	83

List of Table

Table No	Subject	Page No
Table 2.1	Requirement Of District Survey Report & Its Year Wise Modification of Guidelines	4-5



Table No	Subject	Page No
Table 3.1	Block distribution of Nadia District	17
Table 3.2	Annual rainfall (in millimeter) recorded in Nadia District	19
Table 3.3	Monthly mean temperature (in °C) distribution of Nadia district	20
Table 3.4	Demographic distribution of Nadia District	32-33
Table 3.5	Yield rates of Principal Crops in the district of Nadia District	34
Table 4.1	Soil characteristics of the Nadia district	41
Table 5.1	Classification of Land Utilisation Statistics in the district	44
Table 5.2	Distribution of Villages according to Agricultural Land Use. Census, 2011	45
Table 5.3	Classification of Forest Area, Out-turn of Forest Produce, Revenue and Expenditure of Forest Department	47-48
Table 5.4	Production of Principal Crops in the district	48-49
Table 5.4	Production of Fruits and Vegetables in the district	50
Table 5.5	Production of Flowers in the district	51
Table 6.1	Geological succession of Nadia	52
Table 7.1	Drainage System with Description of Main Rivers	55
Table 7.2	Salient Features of Important Rivers and Streams	55
Table 7.3	Place of origin of rivers of Nadia district	56
Table 7.4	Sediment Load Comparison Between Pre and Post Monsoon Period for Different Rivers of Nadia District	63
Table 7.5	Runoff coefficient of the catchment based on Strange's table	66-67
Table 7.6	Replenishment parameter estimated for each river in the district	72
Table 7.7	Year-wise sedimentation rate for last 5 years of each river	72
Table 7.8	River wise thickness of sand bar considered mineable	74
Table 7.9	Annual mineable mineral potential	75
Table 7.10	Resources of Potential Riverbed Mineral	75
Table 7.11	Potential Zone of Riverbed Mineral	75-76
Table 7.12	No Mining zone of the district riverbed deposits	77



Table No	Subject	Page No
Table 8.1	Details of Production of sand as per mine plan in Nadia district	79
Table 9.1	District Revenue Generation from Mineral Sector	80

Abbreviations

% DEP – Departures

° C – Degree Centigrade

BGL – Below Ground Level

CD - Community Development

Cft- Cubic Feet

CGWB - Central Ground water Board

CRIS - Customized Rainfall Information System

Cum - Cubic meter

DGMS - Directorate General of Mines Safety

DGPS - Differential Global Positioning system.

DL&LRO - District Land & Land Reform officer

DSR - District Survey Report

EC – Environmental Clearance

EIA- Environment Impact Assessment

EMGSM - Enforcement and Monitoring Guideline for Sand Mining

ENVIS - Environmental Information System

ft – Feet

GIS - Geographical Information System

GMEC - Global Management and Engineering Consultant

GSI - Geological Survey of India

Ha – Hectare

hr - Hour

IMD – Indian Meteorological Department

ISRO - The Indian Space Research Organisation

KM - Kilometer

LISS - Linear Imaging Self-Scanning Sensor

LOI - Letter of Intent

LULC - Land Use Land Cover

m² - Square meter



Mcum – Million Cubic Meter

MMDR - Mines & Minerals (Development and Regulation) Act

MMR - Metalliferous Mines Regulation

MOEF & CC - Ministry of Environment, forest & Climate Change

Mph- miles per hour

M-Sand - Mineral Sand

MSME - Micro, Small & Medium Enterprises

Mt - Metric Ton

MT – Million Tons

NGT - National Green Tribunal

NH – National Highway

NIC - National Informatics Centre

OC - Officer In Charge

OGL - Original Ground level

PSU - Public Sector Unit

R/F – Rain Fall

SSMG - Sustainable Sand Mining Guidelines

WBMDTCL- West Bengal Mineral Development and Trading Corporation Limited

The WBMMCR 2016 – The West Bengal Minor Mineral Concession Rules, 2016



Definitions

Riverbed: A riverbed is the area between two banks of river where sediment deposited. During the normal flow period, river water is contained in and flows along the riverbed. However, during a flood, the river overflows the riverbed and flows onto the floodplain.

Sandbars: The sandbar is the ridge of sand or coarse sediment that is built over a period of time.

Pre monsoon Sandbars: Sandbars which are identified from satellite imagery of pre monsoon period.

Post monsoon Sandbars: Sandbars which are identified from satellite imagery of post monsoon period.

Restricted Area: Sandbars or part of sandbars which are falling within restricted area. As per the Enforcement & Monitoring Guidelines for Sand Mining (EMGSM) 2020 the restricted zone for mining is a distance from the bank is $\frac{1}{4}$ th of river width and not be less than 7.5 meters. Also, there is a no mining zone up to a distance of 1 kilometre (1 km) from major bridges and highways on both sides, or five times (5x) of the span (x) of a bridge/public civil structure (including water intake points) on up-stream side and ten times (10x) the span of such bridge on down-stream side, subjected to a minimum of 250 meters on the upstream side and 500 meters on the downstream side. No mining zone has been marked for an area up to a width of 100 meters from the active edge of embankments.

Potential Zone: Sandbars which are falling within the central $\frac{3}{4}$ th part of the riverbed and which are not falling within the restricted area.

Potential Block: Each individual sand bars of potential zone is Potential Block.

River bed occurrence: River bed occurrence means sand, stone, boulder, pebbles, gravel accumulated in the river bed by natural phenomenon.

Replenishment: Quantum of sand deposited in a mined out void during monsoon period.

Aggradations: Aggradation (or alluviation) is the term used in geology for the increase in land elevation, typically in a river system, due to the deposition of sediment. Aggradation occurs in areas in which the supply of sediment is greater than the amount of material that the system is able to transport.

Act: It means the Mines and Minerals (Development and Regulation) Act, 1957(67 of 1957), as subsequently amended.

Mineral: It means minor minerals as defined in clause (e) of section 3 of the Act.

Sand: A natural resource, is a minor mineral as defined under S 3(e) of the Mines and Minerals (Development and Regulation) Act, 1957 (" MMDR Act").

Lease: It means a mining lease granted under West Bengal Minor Mineral Concession Rules, 2016.

Mining: Excavation of mineral by manual method or using machineries.



EXECUTIVE SUMMARY

Nadia district is one of the oldest districts of West Bengal. The geographical boundary of Nadia district comprises Bangladesh in the East, Bardhaman and Hooghly district on the West, Murshidabad district on the North and North West and North 24 Parganas towards South and South East. The Tropic of Cancer divides the district in two parts. The district covers an area of around 3927 sq. km. Nadia district of West Bengal is having total population of around 5,167,600 distributed over 17 C.D. Blocks, 8 Municipalities and 2 Notified Areas.

The district is characterized by humid tropical monsoon climate. The average annual rainfall in the district is 1245mm (2017-2021). Average temperature of the district varies from 16°C during January to 39°C during May.

Geologically, entire area of the district is completely blanketed by a sequence of Quaternary sediments of Ganga-Bhagirathi River system. The deposits constitute three litho stratigraphic units namely, Bethuadahar formation (Khagaria formation), Chinsura formation (Katawa formation/Panskura formation) and Hugli formation (Bhagirathi formation). The Bethuadahari formation is lithologically characterized by yellow and pale brown very fine sand silt and silty clay with soft iron nodules and caliche nodules. The Chinsura formation is characterised by an alternation of oxidized to unoxidized fine to very fine sand and silt with clay and it lies in the relatively lower elevation than the oldest Bethuadahari formation. The Hugli formation is characterised by the present-day flood plain deposits of unoxidised and less compact, fine to very fine silver-grey micaceous sand, silt and dark grey clay occurring at lowermost topographic level around river banks.

The physiography of the district is mostly plain. There are pockets of mild slopes here and there. The whole district is drained number of rivers and streams. The principal rivers of the district are Bhagirathi, Jalangi and Mathabhanga. There are few more rivers in the district viz. Ichhamati, Churni, Bhairabi and Jamuna. All the rivers flow from north to south keeping pace with general slope with district land. Numerous small rivers and abandoned river causes are interspersed throughout the district with a number of depressions meander scars, Ox- Bow lakes, point bars etc. It lies in the heart of Bengal Delta held within the arms of Ganga and Bhagirathi on the west and Mathabhanga on the North.

The district does not hold good potential for riverbed sand deposits. Upside mineral potential of river sand has been calculated as 0.76Mcum. There are no existing sand mining leases in the district. Therefore, the district is not generating revenue from mining riverbed sand deposits. It requires further systematic and scientific approach to quantify the resource along with their grade assessment.



1 Preface

The need for District Survey Report (DSR) have been necessitated by Ministry of Environment, Forest and Climate Change (MoEF&CC) vide Notification No. 125 (Extraordinary, Part II Section 3, Sub-section ii), S.O. 141 (E), dated 15th January 2016. The notification was addressed to bring certain amendments with respect to the EIA notification 2006 and in order to have a better control over the legislation. District level committee's have been introduced in the system. As a part of this notification, preparation of District Survey Reports has been introduced. Subsequently, MOEF& CC has published Notification No. 3611 (E), dt. 25th July, 2018 regarding inclusion of the "Minerals Other than Sand" and format for preparation of the DSR has been specified. Enforcement & Monitoring Guidelines for Sand Mining (EMGSM) January 2020, Issued by MoEF& CC is prepared in consideration of various orders/directions issued by Hon'ble NGT in matters pertaining to illegal sand mining and also based on the reports submitted by expert committees and investigation teams. This DSR has been prepared in conformity with the S O 141 (E), S O 3611 (E) and other sand mining guidelines published by MOEF& CC time to time as well as the requirement specified in West Bengal Minor Mineral Concession Rule, 2016.

The purpose of DSR is to identify the mineral potential areas where mining can be allowed; and also to distinguish areas where mining will not be allowed due to proximity to infrastructural structures and installations, areas of erosion, areas of environmental sensitivities etc. The DSR would also help to estimate the annual rate of replenishment wherever applicable.

Preparation of this DSR involved both primary and secondary data generation. The primary data generation involved the site inspection, survey, ground truthing etc. while secondary data has been acquired through various authenticated sources and satellite imagery studies. The secondary data related to district profile, local geology, mineralization and other activities are available in rather a piecemeal fashion.

The district survey report of Nadia district also describes the general geographical profile of the district, distribution of natural resources, livelihood, climatic condition, inventory of minor minerals and revenue generation.



2 Introduction

The District Survey Report of Nadia District has been prepared as per the guide line of Ministry of Environment, Forests and Climate Change (MoEF& CC), Government of India vide Notification S.O.-1533(E) dated 14th Sept, 2006 and subsequent MoEF& CC Notification S.O. 141(E) dated 15th Jan, 2016. This report shall guide systematic and scientific utilization of natural resources, so that present and future generation may be benefitted at large. Further, MoEF& CC published a notification S.O. 3611(E) Dated 25th July, 2018 and recommended the format for District Survey Report.

The main objective of DSR is identification of areas of aggradations or deposition where mining can be allowed; and identification of areas of erosion and proximity to infrastructural structures and installations where mining should be prohibited and calculation of annual rate of replenishment and allowing time for replenishment after mining in that area. The DSR would also help to calculate the annual rate of replenishment wherever applicable and allow time for replenishment. Besides sand mining, the DSR also include the potential development scope of in-situ minor minerals.

The objectives of the District Survey Report are as follows:

1. To identify and quantify minor mineral resources for its optimal utilization.
2. To regulate sand and gravel mining, identification of site-specific end-use consumers and reduction in demand and supply gaps.
3. To facilitate use information technology (IT) for surveillance of the sand mining at each step.
4. To enable environmental clearance for cluster of sand and gravel mines.
5. To restrict illegal mining.
6. To reduce occurrences of flood in the area.
7. To maintain the aquatic habitats.
8. To protect ground water in the area by limiting extraction of material in riverbeds to an elevation above the base flow.
9. To maintain data records viz. details of mineral resource, potential area, lease, approved mining plan, co-ordinates of lease hold areas, and revenue generation.
10. To design a scientific mining plan and estimate ultimate pit limit.
11. To frame a comprehensive guideline for mining of sand and other minor minerals.



The District Survey Report (DSR) comprises secondary data on geology, mineral resources, climate, topography, land form, forest, rivers, soil, agriculture, road, transportation, irrigation etc. of the district collected from various published and un-published literatures and reports as well as various websites. Data on lease and mining activities in the district, revenue etc. have been collected from the DL&LRO office of the district and from West Bengal Mineral Development Corporation Limited.

2.1 Statutory Framework

Ministry of Environment, Forest and Climate Change (MoEF& CC) has published several notifications time to time to formulate and implement the District Survey Report (DSR) for every district. Statutory Framework and its legal aspect with respect to DSR is tabulated in Table 2.1.

Table 2: Statutory Framework and guidelines on DSR with time scale

Year	Particulars
1994	The Ministry of Environment, Forest & Climate Change (MoEF&CC) published Environmental Impact Assessment Notification 1994 which is only applicable for the Major Minerals more than 5 ha.
2006	In order to cover the minor minerals also into the purview of EIA, the MoEF & CC has issued EIA Notification SO 1533 (E), dated 14th September 2006, made mandatory to obtain environmental clearance for both Major & Minor Mineral more than 5 Ha.
2012	Further, Hon'ble Supreme Court wide order dated the 27th February, 2012 in I.A. No.12- 13 of 2011 in Special Leave Petition (C) No.19628-19629 of 2009, in the matter of Deepak Kumar etc. Vs. State of Haryana and Others etc., ordered that "leases of minor minerals including their renewal for an area of less than five hectares be granted by the States/Union Territories only after getting environmental clearance from MoEF"; and Hon'ble National Green Tribunal, order dated the 13th January, 2015 in the matter regarding sand mining has directed for making a policy on environmental clearance for mining leases in cluster for minor Minerals.
2016	The MoEF&CC in compliance of above Hon'ble Supreme Court's and NGT'S order has prepared "Sustainable Sand Mining Guidelines (SSMG), 2016" in consultation with State governments, detailing the provisions on environmental clearance (EC) for cluster, creation of District Environment Impact Assessment Authority, preparation of District survey report and proper monitoring of minor mineral. There by issued Notification dated 15.01.2016 for making certain amendments in the EIA Notification, 2006, and made mandatory to obtain EC for all minor minerals. Provisions have been made for the



	preparation of District survey report (DSR) for River bed mining and other minor minerals.
2016	West Bengal Minor Minerals Concession Rules, 2016 amended the Mines and Minerals (Development and Regulation) Act, 1957 (Act 67 of 1957), to make the rules regulating the grant of mining licenses, prospecting license-cum-mining leases and mining leases in respect of minor minerals by auction process. The rule also incorporates EIA 2016 also includes SSMG 2016 for minor mineral mining.
2018	MoEF& CC published a notification S.O. 3611(E) Dated 25th July, 2018 and recommended the format for District Survey Report. The notification stated about the objective of DSR i.e. "Identification of areas of aggradations or deposition where mining can be allowed; and identification of areas of erosion and proximity to infrastructural structures and installations where mining should be prohibited and calculation of annual rate of replenishment and allowing time for replenishment after mining in that area".
2020	Enforcement & Monitoring Guidelines for Sand Mining (EMGSM) 2020 has been published modifying Sustainable sand Mining Guidelines, 2016 by MoEF& CC for effective enforcement of regulatory provisions and their monitoring. The EMGSM 2020 directed the states to carry out river audits, put detailed survey reports of all mining areas online and in the public domain, conduct replenishment studies of river beds, constantly monitor mining with drones, aerial surveys, ground surveys and set up dedicated task forces at district levels. The guidelines also push for online sales and purchase of sand and other riverbed materials to make the process transparent. They propose night surveillance of mining activity through night-vision drones.

Important statutory Guidelines for sand or gravel mining:

➤ The West Bengal Minor Minerals Concession Rules (WBMMCR), 2016

- 1) (a) No person shall undertake mining operation in any area prohibited by the 'State Government in the public interest by notification in the *Official Gazette*.
Provided that nothing in the sub-rule shall affect any mining operation undertaken in any area in accordance with the terms and conditions of a mining lease or mineral concession already granted.
- (b) No person shall transport or store or cause to be transported or stored any mineral otherwise than in accordance with the provisions of these rules and the West Bengal Minerals (Prevention of Illegal Mining, Transportation and Storage) Rules, 2002.
- (2) No minor mineral coming out in course of digging of wells or excavation of tanks shall be disposed of by the person digging or excavating without informing the District Authority as



well as the Executive Officer of the *Panchayat Samiti* or the Executive Officer of the Municipality concerned, as the case may be, about such occurrence.

Provided that disposal of such minor mineral may be allowed on pre-payment of prices of such minor mineral at the prevailing market rate as determined on the basis of the rates published by the Public Works Department / concerned department of the State Government for the concerned area from time to time.

- (3) No mining of river bed occurrences shall be allowed within 300 meters, upstream and downstream, measured from the centre line of any bridge, regulator or similar hydraulic structure and from the end point of bank protection works.
- (4) No river bed mining shall be allowed beneath 3 meters of the river bed or ground water level, whichever is less.
- (5) No mining operation in case of river bed occurrence shall be done within a distance of three (3) kilometers of a barrage axis or dam on a river unless otherwise permitted by the concerned Executive Engineer or Revenue Officer or authorized officer and such distance shall be reckoned across an imaginary line parallel to the 'barrage, or dam axis, as the case maybe.
- (6) No extraction of river bed occurrence shall 'be allowed beyond the central one third of the river bed, or keeping a distance of 100 meter from the existing bank line whichever is less, unless otherwise permitted by the concerned Executive Engineer or Revenue Officer.
- (7) No extraction of minerals other than river bed occurrence shall be allowed within fifty (50) meters from any road, public structure, embankment, railway line, bridge canal, road and other public works or buildings.
- (8) No mining lease shall be granted without proof of existence of mineral contents in the area for which the application for a mining lease has been made in accordance with such parameters as may be prescribed by the Government from time to time.

N.B- The aforesaid application for mining lease shall succeed the competitive bidding for mining lease for a specified mineral(s).

➤ **Sustainable Sand Mining Management Guidelines (SSMMG), 2016 by MoEF& CC.**

The sustainable sand Mining Management Guidelines 2016 has been prepared after extensive consultation with the States and Stakeholders over a period of one year. The main objective of the Guideline is to ensure sustainable sand mining and environment friendly management practices in order to restore and maintain the ecology of river and other sand sources.

- a) Parts of the river reach that experience deposition or aggradation shall be identified first. The Lease holder/ Environmental Clearance holder may be allowed to extract the sand and gravel deposit in these locations to manage aggradation problem.
- b) The distance between sites for sand and gravel mining shall depend on the replenishment rate of the river. Sediment rating curve for the potential sites shall be developed and checked against the extracted volumes of sand and gravel.
- c) Sand and gravel may be extracted across the entire active channel during the dry season.
- d) Abandoned stream channels on terrace and inactive flood plains be preferred rather than active channels and their deltas and flood plains. Stream should not be diverted to form inactive channel.



- e) Layers of sand and gravel which could be removed from the river bed shall depend on the width of the river and replenishment rate of the river.
- f) Sand and gravel shall not be allowed to be extracted where erosion may occur, such as at the concave bank.
- g) Segments of braided river system should be used preferably falling within the lateral migration area of the river regime that enhances the feasibility of sediment replenishment.
- h) Sand and gravel shall not be extracted within 200 to 500 meter from any crucial hydraulic structure such as pumping station, water intakes, and bridges. The exact distance should be ascertained by the local authorities based on local situation. The cross-section survey should cover a minimum distance of 1.0 km upstream and 1.0 km downstream of the potential reach for extraction. The sediment sampling should include the bed material and bed material load before, during and after extraction period. Develop a sediment rating curve at the upstream end of the potential reach using the surveyed cross- section. Using the historical or gauged flow rating curve, determine the suitable period of high flow that can replenish the extracted volume. Calculate the extraction volume based on the sediment rating curve and high flow period after determining the allowable mining depth.
- h) Sand and gravel could be extracted from the downstream of the sand bar at river bends. Retaining the upstream one to two thirds of the bar and riparian vegetation is accepted as a method to promote channel stability.
Flood discharge capacity of the river could be maintained in areas where there are significant flood hazard to existing structures or infrastructure. Sand and gravel mining may be allowed to maintain the natural flow capacity based on surveyed cross- section history.
- i) Alternatively, off-channel or floodplain extraction is recommended to allow rivers to replenish the quantity taken out during mining.
- j) The Piedmont Zone (Bhabhar area) particularly in the Himalayan foothills, where riverbed material is mined, this sandy-gravelly track constitutes excellent conduits and holds the greater potential for ground water recharge. Mining in such areas should be preferred in locations selected away from the channel bank stretches.
- k) Mining depth should be restricted to 3 meter and distance from the bank should be 3 meter or 10 percent of the river width whichever less.
The borrow area should preferably be located on the river side of the proposed embankment, because they get silted up in course of time. For low embankment less than 6 m in height, borrow area should not be selected within 25 m from the toe/heel of the embankment. In case of higher embankment the distance should not be less than 50 m. In order to obviate development of flow parallel to embankment, cross bars of width eight times the depth of borrow pits spaced 50 to 60 meters centre-to-centre should be left in the borrow pits.
- l) Demarcation of mining area with pillars and geo-referencing should be done prior to start of mining.

➤ **Enforcement & Monitoring Guidelines for sand Mining, 2020 (MoEF& CC)**

The Ministry of Environment Forest & Climate Change formulated the Sustainable Sand Management Guidelines 2016 which focuses on the Management of Sand Mining in the Country. But in the recent past, it has been observed that apart from management and



systematic mining practices there is an urgent need to have a guideline for effective enforcement of regulatory provision and their monitoring. Section 23 C of MMDR, Act 1957 empowered the State Government to make rules for preventing illegal mining, transportation and storage of minerals. But in the recent past, it has been observed that there was large number of illegal mining cases in the Country and in some cases, many of the officers lost their lives while executing their duties for curbing illegal mining incidence. The illegal and uncontrolled illegal mining leads to loss of revenue to the State and degradation of the environment.

- a) Parts of the river reach that experience deposition or aggradation shall be identified. The Leaseholder/ Environmental Clearance holder may be allowed to extract the sand and gravel deposit in these locations to manage aggradation problem.
- b) The distance between sites for sand and gravel mining shall depend on the replenishment rate of the river. Sediment rating curve for the potential sites shall be developed and checked against the extracted volumes of sand and gravel.
- c) Sand and gravel may be extracted across the entire active channel during the dry season.
- d) Abandoned stream channels on the terrace and inactive floodplains be preferred rather than active channels and their deltas and flood plains. The stream should not be diverted to form the inactive channel.
- e) Layers of sand and gravel which could be removed from the river bed shall depend on the width of the river and replenishment rate of the river.
- f) Sand and gravel shall not be allowed to be extracted where erosion may occur, such as at the concave bank.
- g) Segments of the braided river system should be used preferably falling within the lateral migration area of the river regime that enhances the feasibility of sediment replenishment.
- h) Sand and gravel shall not be extracted up to a distance of 1kilometre (1 km) from major bridges and highways on both sides, or five times (5x) of the span (x) of a bridge/public civil structure (including water intake points) on up-stream side and ten times (10x) the span of such bridge on down-stream side, subjected to a minimum of 250 meters on the upstream side and 500 meters on the downstream side.
- i) The sediment sampling should include the bed material and bed material load before, during and after the extraction period. Develop a sediment rating curve at the upstream end of the potential reach using the surveyed cross-section. Using the historical or gauged flow rating curve, determine the suitable period of high flow that can replenish the extracted volume. Calculate the extraction volume based on the sediment rating curve and high flow period after determining the allowable mining depth.
- j) Sand and gravel could be extracted from the downstream of the sand bar at river bends. Retaining the upstream one to two-thirds of the bar and riparian vegetation is accepted as a method to promote channel stability.
- k) The flood discharge capacity of the river could be maintained in areas where there is a significant flood hazard to existing structures or infrastructure. Sand and gravel mining may be allowed to maintain the natural flow capacity based on surveyed cross-section history. Alternatively, off-channel or floodplain extraction is recommended to allow rivers to replenish the quantity taken out during mining.



- l) The Piedmont Zone (Bhabhar area) particularly in the Himalayan foothills, where riverbed material is mined, this sandy-gravelly track constitutes excellent conduits and holds the greater potential for groundwater recharge. Mining in such areas should be preferred in locations selected away from the channel bank stretches.
- m) Mining depth should be restricted to 3 meters and distance from the bank should be $\frac{1}{4}$ th or river width and should not be less than 7.5 meters.
- n) The borrow area should preferably be located on the riverside of the proposed embankment because they get silted in the course of time. For low embankment, less than 6 m in height, borrow area should not be selected within 25 m from the toe/heel of the embankment. In the case of the higher embankment, the distance should not be less than 50 m. In order to obviate the development of flow parallels to the embankment, crossbars of width eight times the depth of borrow pits spaced 50 to 60 meter center-to-center should be left in the borrow pits.
- o) Demarcation of mining area with pillars and geo-referencing should be done prior to the start of mining.
- p) A buffer distance /un-mined block of 50 meters after every block of 1000 meters over which mining is undertaken or at such distance as may be the directed/prescribed by the regulatory authority shall be maintained.
- q) A buffer distance /unmined block of 50 meters after every block of 1000 meters over which mining is undertaken or at such distance as may be the directed/prescribed by the regulatory authority shall be maintained.
- r) River bed sand mining shall be restricted within the central $\frac{3}{4}$ th width of the river/rivulet or 7.5 meters (inward) from river banks but up to 10% of the width of the river, as the case may be and decided by regulatory authority while granting environmental clearance in consultation with irrigation department. Regulating authority while regulating the zone of river bed mining shall ensure that the objective to minimize the effects of riverbank erosion and consequential channel migration are achieved to the extent possible. In general, the area for removal of minerals shall not exceed 60% of the mine lease area, and any deviation or relaxation in this regard shall be adequately supported by the scientific report.
- s) Mining Plan for the mining leases(non-government) on agricultural fields/Patta land shall only be approved if there is a possibility of replenishment of the mineral or when there is no riverbed mining possibility within 5 KM of the Patta land/Khatedari land. For government projects mining could be allowed on Patta land/Khatedari land but the mining should only be done by the Government agency and material should not be used for sale in the open market.

The minerals reserve for riverbed area is calculated on the basis of maximum depth of 3 meters and margins, width and other dimensions as mentioned in para (s) above. The area multiplied by depth gives the volume and volume multiplied with bulk density gives the quantity in Metric Ton. In case of riverbed, mineable material per hectare area available for actual mining shall not exceed the maximum quantity of 60,000 MT per annum.

Demand and Utilisation of Sand

Sand is a multi-purpose topographical material. It is known as one of the three fundamental ingredients in concrete. The composition of sand is diverse. Mostly sand is made of



silica which is a common element. It can also come from another source of minerals like quartz, limestone, or gypsum.

From beds to flood plains to coastlines- we can find the sand at almost everywhere. The robustness of sand has played a significant role in everyday life. We use sand practically every other day.

Sand extraction from river beds and brick earth mining for making raw bricks are the main mining activities in the district. With a spurt in construction of real estate sectors and various govt. sponsored projects, the demand for both sand and bricks has increased manifold. The extraction of sand is carried out either manually or through semi- mechanized system. The depth of mining for both river bed sand and brick earth is restricted due to statutory provision in the regulations pertaining to conservation and development of minor minerals.

River sand mining is a common practice as habitation concentrates along the rivers and the mining locations are preferred near the markets or along the transportation route, for reducing the transportation cost.

In the real world, there are a lot of situations where we can find uses of sand. Followings are the common sand uses.

1. While binging metal, we can mix sand with clay binder for frameworks used in the foundries.
2. Sand can be used for cleaning up oil leak or any spill by dredging sand on that spill. The material will form clumps by soaking up, and we can quickly clean the mess.
3. Sand can be used as a road base which is a protective layer underneath all roads
4. Industrial sand is used to make glass, as foundry sand and as abrasive sand.
5. One creative usage of sand is serving as a candle holder. We can try putting some sand before pouring tea light or any candle in a glass. It holds the candle still and refrain the candle from rolling by giving it an excellent decoration.
6. Adds texture and aesthetic appeal to space.
7. Sand is mostly pure to handle, promptly available and economically wise.
8. We use sand in aquariums, fabricating artificial fringing reefs, and in human-made beaches
9. Sandy soils are ideal for growing crops, fruits and vegetables like watermelon, peaches, peanuts, etc.
10. Sand can light a path by filling mason jars with sand and tea light which is another inexpensive way to make a walkway glow.
11. Sand helps to improve resistance (and thus traffic safety) in icy or snowy conditions.
12. We need sand in the beaches where tides, storms or any form of preconceived changes to the shoreline crumble the first sand.
13. Sand containing silica is used for making glass in the automobile and food industry- even household products for the kitchen.
14. Sand is a strong strand which is used for plaster, mortar, concrete, and asphalt.
15. The usual bricks formulated of clay only are way weaker and lesser in weight than blocks made of clay mixed with sand.



2.1 Methodology of DSR Preparation

The steps followed during the preparation of District Survey Report are given in Figure 2.1. The individual steps are discussed in following paragraphs.

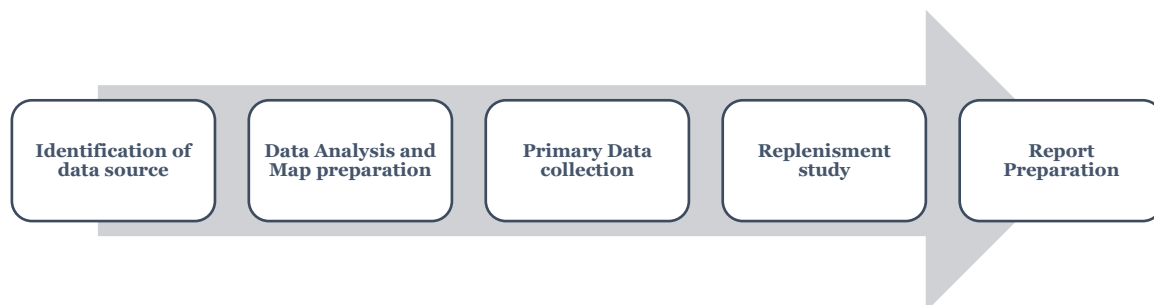


Figure 2.11: Steps followed in preparation of DSR

Data source Identification: District Survey Report has been prepared based on the primary data base and secondary data base collected and collated from different sources. It is very critical to identify authentic data sources before compiling the data set. The secondary data sources which are used in this DSR are mostly taken from public domain and or from the published report in reputed journals. Information related to district profile has been taken from District Census Report, 2011 and District Statistical Handbook published by the Govt. of West Bengal. Potential mineral resources of the district have been described based on the published report of Geological Survey of India (GSI) or any other govt. agencies like MECL etc. List of mining lease, name of lease holder, lease/block area, resource in already allotted mining lease, revenue from minor mineral sector etc. have been collected from the concern DL & LRO offices of the district. Satellite images have been used for map preparation related to physiography and land use/land cover of the district.

Data Analysis and Map preparation: Dataset which are captured during the report preparation, are subjected to detail analysis work. District Survey Report involves the analytical implication of the captured dataset to prepare relevant maps.

Methodology adopted for preparation of relevant maps is explained below.

Land Use and Land Cover Map: Land Use and Land Cover classification is a complex process and requires consideration of many factors. The major steps of image classification include determination of a suitable classification system via Visual Image Interpretation, selection of training samples, Satellite image (FCC-False Color Composite) pre-processing, selection of suitable classification approaches, post classification processing, and accuracy assessment.

Here LISS-III satellite imagery has been taken for supervised classification as supervised classification can be much more accurate than unsupervised classification, but depends heavily on the training sites, the skill of the individual processing the image, and the spectral distinctness of the classes in broader scale.

According to the Visual Image Interpretation (Tone, Pattern, Texture, Shape, Color etc.) training set of the pixel has been taken. Pictorial descriptions of Land Use classification are explained in Figure 2.2.



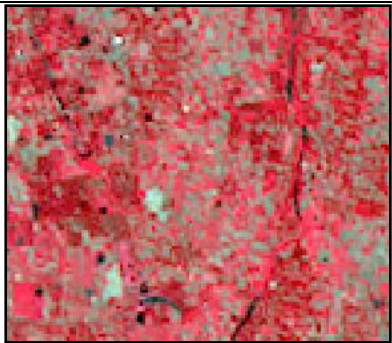
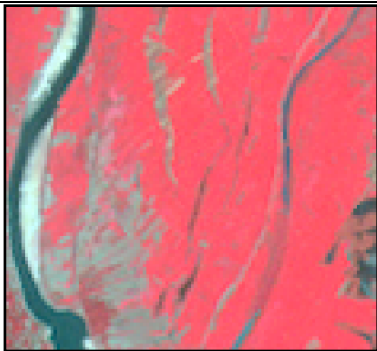
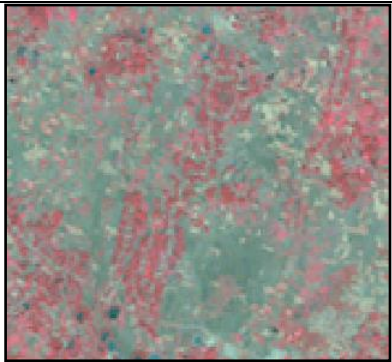



	
<p>Agricultural Land - Based on their Geometrical shape, Red and Pink color tone, Agricultural Land has been identified.</p>	<p>Vegetation Covered Area - Area with continuous Red color tone, Vegetation Covered Area has been classified.</p>
	
<p>Agricultural Fallow Land - Based on their Geometrical shape, Yellowish green color tone, Agricultural Fallow Land has been identified.</p>	<p>Badland Topography- Area with Non geometrical shape and Yellowish green color tone has been identified as Bad Land Topography.</p>
	
<p>Settlement – Area with some geometrical shape in a Linear Pattern including Light Cyan Color has been recognized as Settlement Area.</p>	<p>Water Bodies – Area with Blue color has been classified as Water Bodies.</p>

Figure 2.12: Pictorial description of Land Use Classification methods (Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)



Geomorphological Map: The major step of preparing Geomorphological Map is identifying features like – Alluvial Fan, Alluvial Plain, Hilly Region etc. from Satellite Imagery (FCC-False Colour Composite) via Visual Image Interpretation and then digitisation has been taken into the consideration to prepare map including all the Geomorphological features according to their location. Pictorial descriptions of Geomorphological unit's classification are explained in Figure 2.3.



	
<p>Flood plain-Flood plain is a generally flat area of land next to a river or stream. It stretches from the banks of the river to the outer edges of the valley. For Nadia District, Whole region has been classified as Flood Plain Area.</p>	<p>OX-BOW Lake- An ox-bow lake starts out as a curve, or meander, in a river. This “U” shaped body of water identified as Ox-Box Lake from Satellite Imagery.</p>

Figure 2.13: Pictorial description of Geomorphological Units Classification methods (Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)

Physiographical Map: The major step of preparing Physiographical Map is generating contour at a specific interval to show the elevation of the area using Cartosat DEM.

Block Map/Transportation Map/Drainage Map:

- Raw Data collected from **National Informatics Centre (NIC Website) during Sept 2020.**
- Data has been geo-referenced using GIS software.
- Digitization of block boundary, district boundary, state boundary, international boundary, and district headquarter, sub–district headquarter, places, road, railway, river, nala etc.
- Road name, River name, Railway name has been filled in attribute table of the Layers
- Final layout has been prepared by giving scale, legend, north arrow, etc.

Earthquake Map:

- Raw data collected from **Ministry of Earth Science.**
- Data has been geo-referenced using GIS software.
- Digitization of Earthquake zone and superimposed it over Block Boundary.
- Zone name has been filled in attribute table of the Layers
- Final layout has been prepared by giving scale, legend, north arrow, etc.



Soil Map:

- Raw data collected from **National Bureau of Soil Survey and Land Use Planning during Sept 2020.**
- Data has been geo-referenced using GIS software.
- Digitization of Soil classification zone and superimposed it over District Boundary.
- Soil classification has been filled in attribute table of the Layers.
- Final layout has been prepared by giving scale, legend, north arrow, etc.

Wildlife Sanctuary and National Park location Map:

- Raw data obtained from **ENVIS Centre on Wildlife & Protected Areas during August 2020.**
- Data has been geo-referenced using GIS software.
- Digitization of Wildlife Sanctuary and National Park and superimposed it over Block Boundary.
- Wildlife Sanctuary & National Park name has been filled in attribute table of the Layers
Final layout has been prepared by giving scale, legend, north arrow, etc.

Primary Data Collection: To prepare DSR, primary data has been collected and field work has also been carried out for the district. Field study involves assessment of the mineral resources of the district by means of pitting / trenching in specific interval. This provides clear picture of mineral matters characterization and their distribution over the area.

Replenishment study: One of the principal causes of environmental impacts of river bed mining is the removal of more sediment than the system can replenish. Therefore, there is a need for replenishment study for riverbed sand in order to nullify the adverse impacts arising due to excess sand extraction. The annual rate of replenishment carried out on every river of the district to have proper assessment of the potential sand reserve.

Four times physical survey has been carried out by GPS/DGPS/ Total Station to define the topography, contours and offsets of the riverbed. The surveys clearly depict the important attributes of the stretch of the river and its nearby important civil and other feature of importance. This information will provide the eligible spatial area for mining.

Report Preparation: The district survey report portrays general profile, geomorphology, land use pattern and geology of the district. The report then describes the availability and distribution of riverbed sands and other minor minerals in the district. Apart from delineation the potential mining blocks, the report also includes inventorization of the minerals, recent trends of production of minor minerals and revenue generation there from. Annual replenishment of the riverbed sand has been estimated using field observation, satellite imagery and empirical formula. The road network connecting arterial road to potential mining blocks has been identified. Potential environmental impacts of mining of these minerals, their mitigation measures along with risk assessment and disaster management plan have also been discussed. Finally the reclamation strategy for already mined out areas is also chalked out.



3 General Profile of the district

a) General Information

Nadia district is bounded between 22°53" and 24°11" North latitude and 88°09" and 88°48" East longitude (Census, 2011). The geographical boundary of Nadia district comprises Bangladesh in the East, Bardhaman and Hooghly district on the West, Murshidabad district on the North and North West and North 24 Parganas towards South and South East direction (<https://Nadia.gov.in/geography/>). The district extends over an area of 3927 Sq. Kms (Figure 3.1) (Census, 2011).

Geographically, the district is largely alluvial plain, formed by the constant shifting of the various rivers of the Ganges Delta. To the west of the district is the Bhagirathi (or Hooghly) river, which was once the main distributary of the Ganga towards the Bay of Bengal, and is still considered to be the continuation of the Ganga for Hindus. As the main flow of the Ganga flowed east into the Padma, the Bhagirathi largely dried up. Most of the rivers now flowing through Nadia now have little water in them. Nearly all the district has been converted into farmland (https://en.wikipedia.org/wiki/Nadia_district).

Administratively, the district has 4 Sub-divisions, viz. Krishnanagar Sadar, Ranaghat, Kalyani and Tehatta. There are 17 Community Development (C.D.) Blocks, 8 Municipalities and 2 Notified Areas in the district. Krishnanagar Sadar Sub-division has got 7 C.D. Blocks namely, Kaliganj, Nakashipara, Chapra, Krishnanagar-I, Krishnanagar- II, Nabadwip and Krishanganj and two Municipalities, namely, Krishnanagar (M) and Nabadwip (M). Ranaghat Subdivision has got 4 C.D. Blocks namely, Hanskhali, Santipur, Ranaghat-I and Ranaghat-II; three Municipalities namely, Shantipur (M), Ranaghat (M) and Birnagar (M) and two Notified Areas (N.A.) namely, Taherpur (NA) and Cooper's Camp (NA). Kalyani Sub-division has got 2 C.D. Blocks namely Chakdaha and Haringhata and 4 Municipalities (M), namely, Chakdaha (M), Kalyani (M), Gayeshpur (M) and Haringhata (M). Tehatta Sub-division has got 4 C.D. Blocks namely Karimpur-I, Karimpur-II, Tehatta-I and Tehatta-II. (Census, 2011).

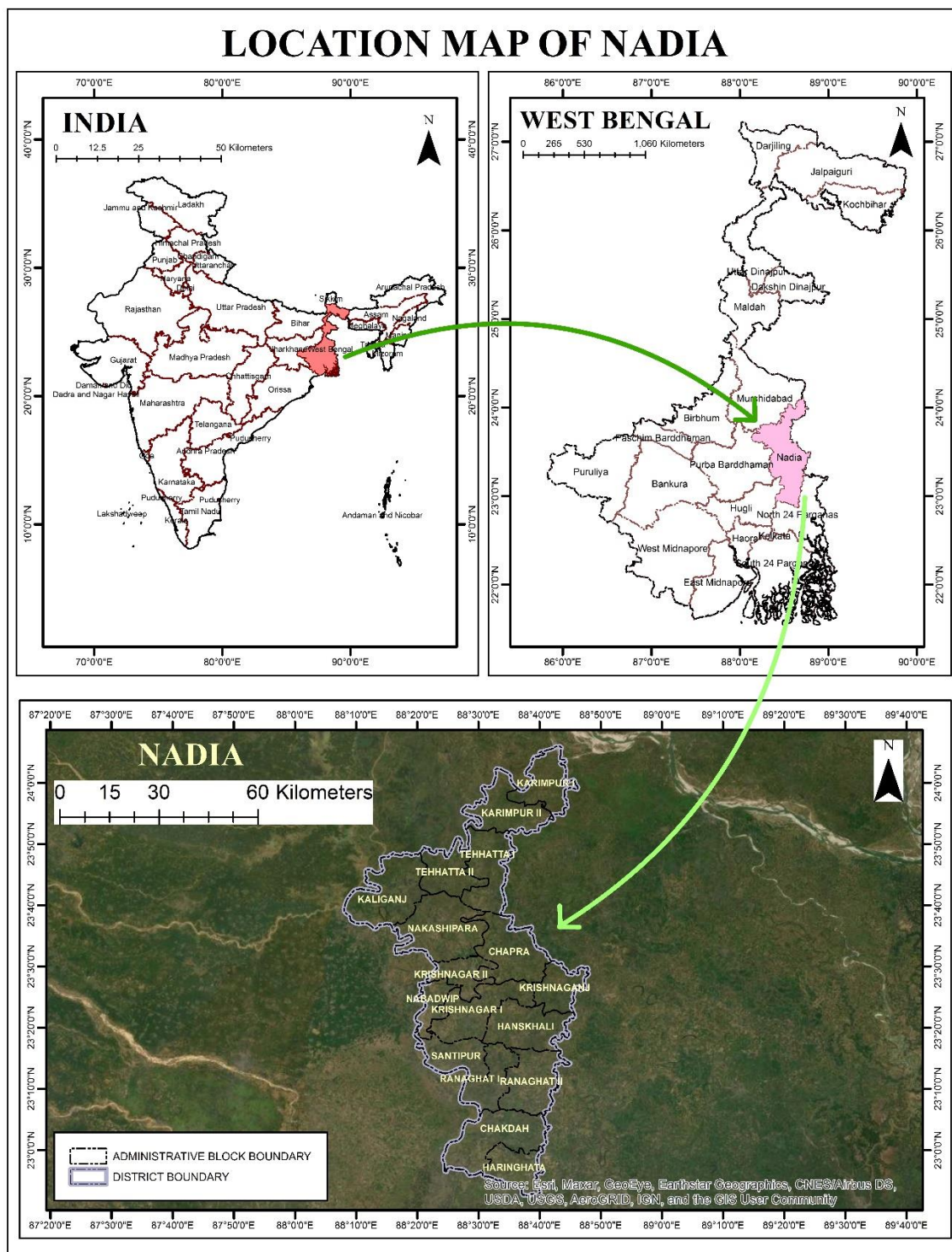


Figure 3.1: Location of Nadia
 (Source: National Informatics Centre and ESRI Base Map, September 2020)



Table 3.1: Block distribution of Nadia District

Sub-Division	C.D.Block / M / N.A.	Panchayat			Mouza	Area (Sq.Km.)
		Samity	Gram	Gram Sansad		
Tehatta Sub-Division	4/ 0/ 0	4	36	602	240	862.18
	Karimpur-I	1	8	144	73	215.78
	Karimpur-II	1	10	161	71	224.38
	Tehatta-I	1	11	185	62	249.55
	Tehatta-II	1	7	112	34	172.47
Krishnanagar Sub-Division	7/ 2/ 0	7	77	1294	534	1661.10
	Kaliganj	1	15	241	127	320.02
	Nakashipara	1	15	278	107	360.94
	Chapra	1	13	220	84	305.97
	Krishnananj	1	7	112	54	151.60
	Krishnanagar-I	1	12	236	92	273.19
	Krishnanagar(M)	-	-	-	-	15.96
	Krishnanagar-II	1	7	103	45	124.37
	Nabadwip	1	8	104	25	97.39
	Nabadwip(M)	-	-	-	-	11.66
Ranaghat Sub-Division	4/ 3/ 2	4	47	865	327	893.58
	Santipur	1	10	172	69	171.41
	Santipur(M)	-	-	-	-	24.60
	Hanskhali	1	13	231	81	246.29
	Ranaghat-I	1	10	177	64	145.53
	Ranaghat(M)	-	-	-	-	7.72
	Birnagar(M)	-	-	-	-	5.52
	Taherpur(N.A.)	-	-	-	-	12.18
	Ranaghat-II	1	14	285	113	279.03
	Cooper's Camp (N.A.)	-	-	-	-	1.30
Kalyani Sub-Division	2/ 3/ 0	2	27	483	245	526.57
	Chakdaha	1	17	307	158	288.80
	Chakdaha(M)	-	-	-	-	15.54
	Kalyani(M)	-	-	-	-	21.91
	Gayeshpur(M)	-	-	-	-	30.00
	Haringhata	1	10	176	87	170.32
Grand Total	17/ 8/ 2	17	187	3244	1346	3927.00

(Source: <http://wbpspm.gov.in/publications/District%20Statistical%20Handbook>
Accessed on November 2022)

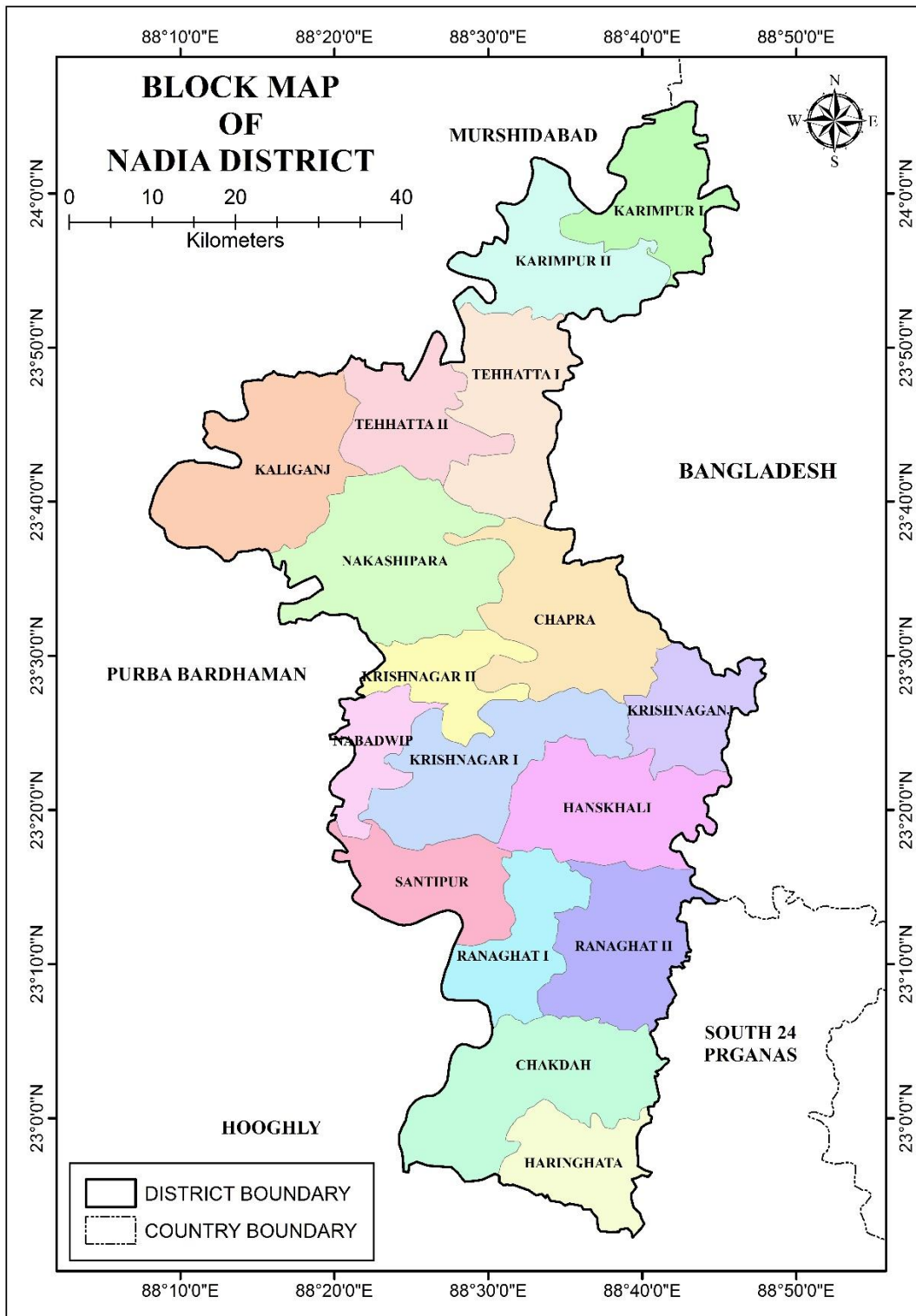


Figure 3.2: Block divisional map of Nadia

(Source: National Informatics Centre, September 2020)



b) Climate Condition

The climate of this district is characterised by an oppressive hot summer, high humidity nearly all the year round and a well distributed rainfall during the southwest monsoon season. The winter season is from about the middle of November and continues till the end of February. The period from March to May is the summer season. The southwest monsoon season commences by about the beginning of June and lasts till the end of September. October and the first half of November constitute the post-monsoon season.

January is the coldest month with the mean daily maximum temperature at 28.2°C and the mean daily minimum temperature at 10.7°C. The average annual temperature in the district is 27 °C. (<https://www.imdpune.gov.in/library/public/Climate%20of%20WestBengal.pdf> Accessed on November 2022)

c) Rainfall

The average annual rainfall in the district is 1245.06 mm. The variations in the annual rainfall within the district and from year to year are not large. The rainfall during the monsoon season – May to September – constitutes 75 percent of the annual rainfall; July and August are the rainiest months. The district receives a mean annual rainfall varying from 948.20 mm. to 1489.3 mm.

([https://hydro.imd.gov.in/hydrometweb/\(S\(tpe2h445mwlrnaufd5a3u545\)\)/DistrictRaifall.aspx](https://hydro.imd.gov.in/hydrometweb/(S(tpe2h445mwlrnaufd5a3u545))/DistrictRaifall.aspx) Accessed on November 2022)

The information on annual rainfall for the five years from 2017 to 2021 for the district Nadia is given in Table 3.2. Average rainfall of the district explained graphically in Figure 3.3.

Table 3.2: Annual rainfall (in milimeter) recorded in Nadia District

YEAR	2017	2018	2019	2020	2021	AVERAGE
JAN	0	0	0	25.9	0	5.18
FEB	0	3.6	75.3	2.1	0.2	16.24
MAR	12.4	0.6	22.6	47.4	3.3	17.26
APR	12.2	66.4	69.8	12.4	10.3	34.22
MAY	136.3	87.3	101.9	245.7	283.9	171.02
JUN	221.3	137.4	73.7	212.4	255.8	180.12
JUL	404.2	319.9	174.7	309.7	235.9	288.88
AUG	200.9	188.4	230.6	281.8	225.6	225.46
SEPT	147.4	96.9	169.8	117	228.2	151.86
OCT	155.2	22.9	144.6	68.3	103.3	98.86
NOV	23.6	1.1	52.5	1.3	32.8	22.26
DEC	21.5	23.7	13.3	0	110	33.7
TOTAL	1335	948.2	1128.8	1324	1489.3	1245.06

Source: Website of Indian Meteorological Department, Govt. of India

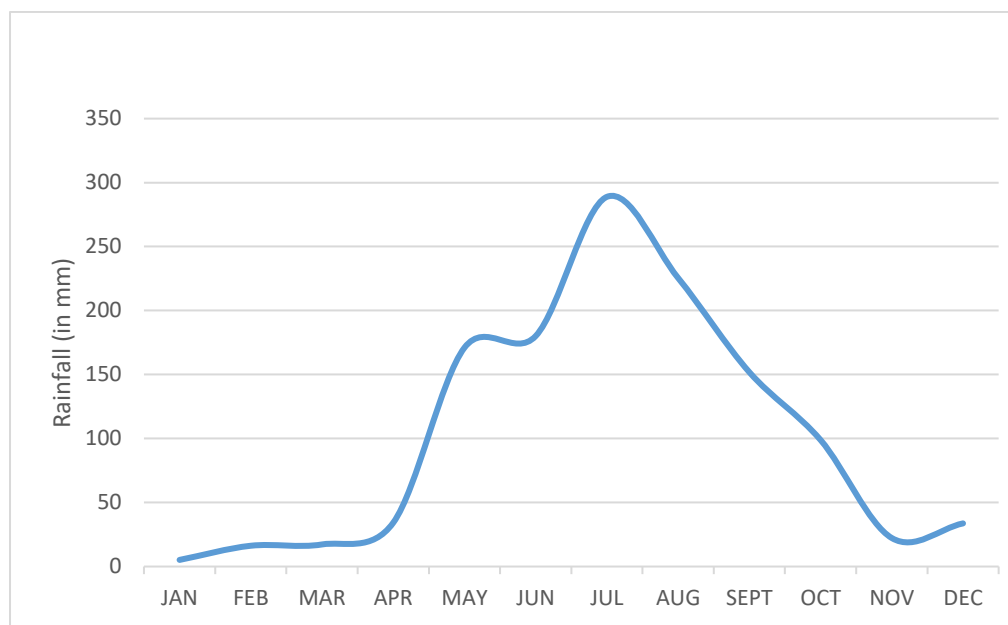


Figure 3.3: Graphical representation of Nadia District rainfall

▪ **Temperature:**

Temperature along with other meteorological conditions of the district is more or less uniform. The cold season commences by about the middle of November when the temperature begins to decrease. January is the coldest month with the mean daily maximum and minimum temperature at 27 °C and 16°C respectively. By about the end of February the temperature begins to increase and May is found as the hottest month, the mean maximum daily temperature is 39°C and the mean minimum daily temperature is 28°C. The average maximum and minimum temperature recorded in Nadia is given in Table 3.3

Table 3.3: Monthly mean temperature (in °C) distribution of Nadia District

Month	January	February	March	April	May	June	July	August	September	October	November	December
Maximum Temperature	27°C	31°C	37°C	40°C	39°C	37°C	33°C	33°C	33°C	32°C	31°C	28°C
Minimum Temperature	16°C	19°C	23°C	27°C	28°C	29°C	27°C	27°C	26°C	25°C	21°C	18°C
Average Temperature	21°C	25°C	30°C	34°C	34°C	33°C	30°C	30°C	29°C	29°C	26°C	23°C

Source: <https://www.worldweatheronline.com/nadia-weather-averages/west-bengal/in.aspx>

Accessed on November 2022



d) Topography & Terrain

The physiography of the district is mostly plain. There are pockets of mild slopes here and there. The whole district is drained by number of rivers and streams. The principal rivers of the district are Bhagirathi, Jalangi and Mathabhanga. There are few more rivers in the district viz. Ichhamati, Churni, Bhairabi and Jamuna. All the rivers flow from north to south keeping pace with general slope with district land. The district is an extensive alluvial plain possessing the characteristics of younger flood plain. Elevation ranges from 28.84 m above mean sea level (near Jairampur, block Karimpur) to 5.48 m above mean sea level (near Pamila, block Haringhata). Numerous small rivers and abandoned river causes are interspersed throughout the district with a number of depressions meander scars, Ox- Bow lakes, point bars etc. It lies in the heart of Bengal Delta held within the arms of Ganga and Bhagirathi on the west and Mathabhanga on the North. The shape of the district is irregular lying north to south. The soil of Nadia district is classified as Gangetic alluvium and is light texture in nature. Mostly the soil is a mixture of silt and sand and does not possess much moisture retaining capacity. However, in Ranaghat Sub- Division the soil characteristics are different. The soil here is composed of clay loam and in places, the surface soil has hardened into stiff black clay. Soil reaction varies around neutral from mildly acid to mildly alkaline and crops give good response to NPK fertilizers. The maximum height of the district above sea level is 17.06 metres in the Police Station of Karimpur and the minimum is 7.31 metres in the Police Station of Chakdaha.

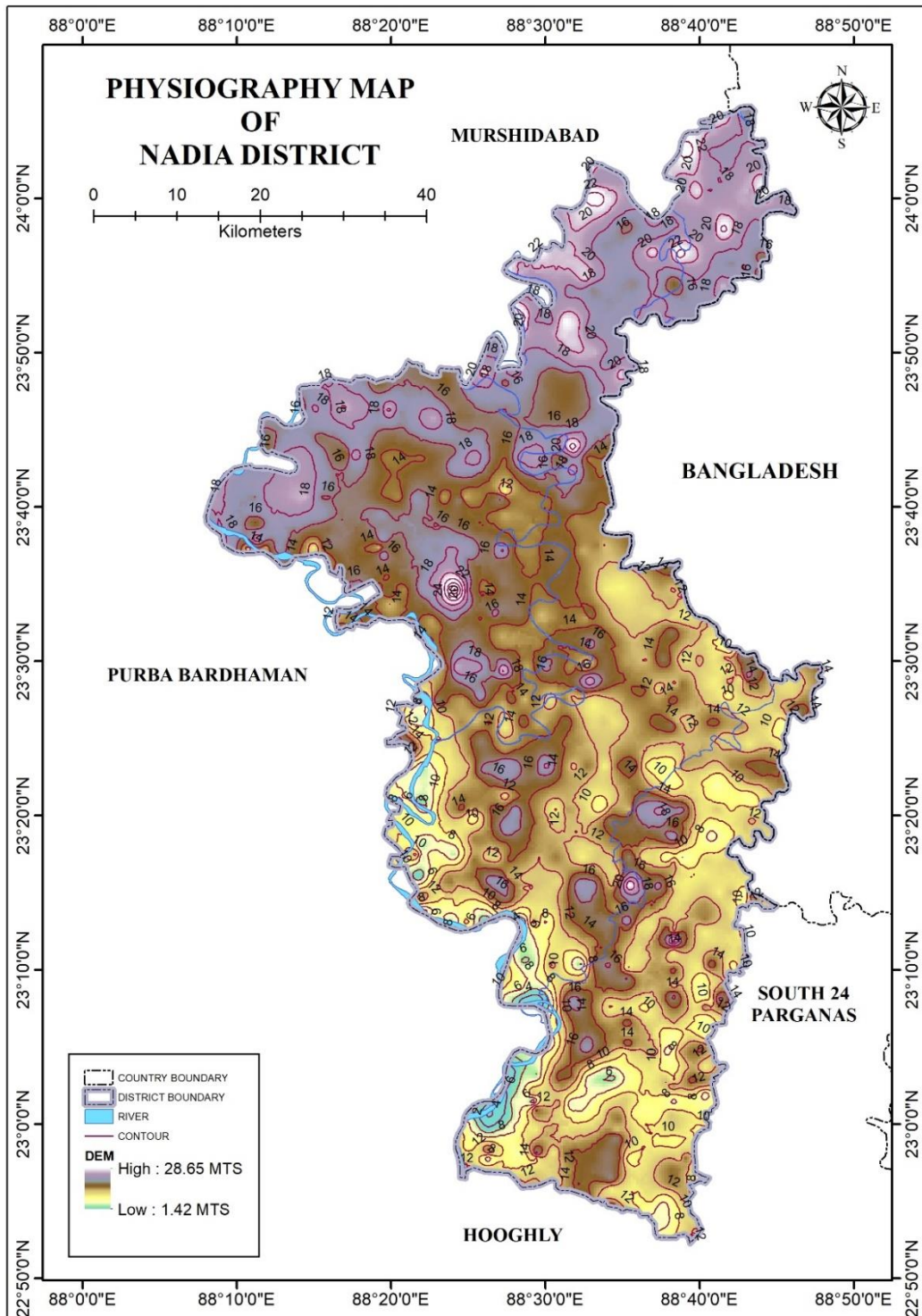


Figure 3.4: Physiographic map of Nadia District

(Source: Cartosat-1, Bhuvan India, September, 2020)



e) Water Course & Hydrology

The entire district is covered by thick alluvial formations and the aquifers consist mostly of sand of different grades (fine to coarse). Gravel that is in general the most important constituent of the aquifers is not playing important role in the district. As it is observed in most of the boreholes, gravel is absent and it is present in very insignificant quantity. In general, three aquifer systems have been identified. The shallow aquifer exists down to a depth of 80 m, which extends up to 126 m at Tungi. The next aquifer system occurs within the depth range of 100 to 162 m and the deepest one exists within the depth range of 200m to 335m. In the northern part of the district groundwater flow direction is towards southwest, however in the extreme northern corner due to the presence of groundwater mound, the flow direction is towards northeast. In the western part of the district flow direction is easterly where as in the eastern part flow direction is westerly or southwesterly.

Aquifer Characteristics: - The tube wells tapping the zones at shallow and intermediate depth are yielding maximum discharge and it ranges from 3.21 lps to 6.211 lps. The tube wells tapping only the intermediate / deep zones generally do not yield very high discharge. The value of Transmissivity in the district ranges from 1487.3m² /d to 8607m²/d. The pumping tests data indicate that the value of storage co-efficient ranges from 0.74*10⁻³. However, at many places the top aquifers are under unconfined condition.

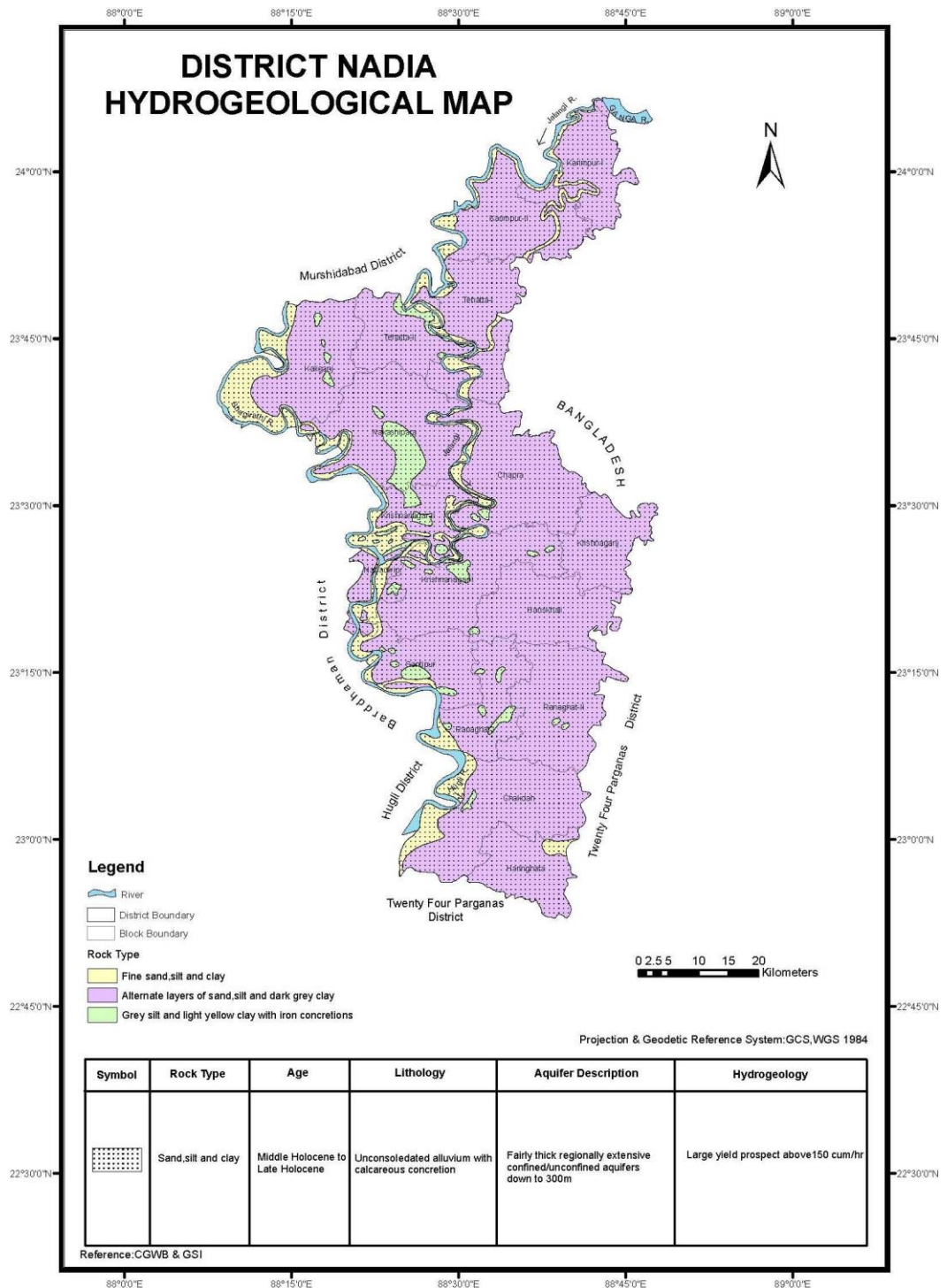


Figure 3.5: Hydrogeological map of Nadia district

(Source: <http://wbwridd.gov.in/swid/mapimages/NADIA.pdf>, September 2020)



f) Ground Water Development

At present ground water development in this district mainly controlled by shallow tube wells along with some deep tube wells. As per the Ground Water Estimation Committee 1997, the total Ground water resources thus calculated is about 2,17,234.01 ham. About 165330.02 ham is being withdrawn from different purposes which is about 84.56%. Ground water draft is minimum in Nabadwip block and maximum in Chapra block. In most of the areas ground water does not show any decline in water level as depth to water level is shallow. Further development may be restricted particularly in the semi critical blocks, Tehatta-I & Tehatta-II, Chapra, Kaliganj, Karimpur-I, Karimpur-II.

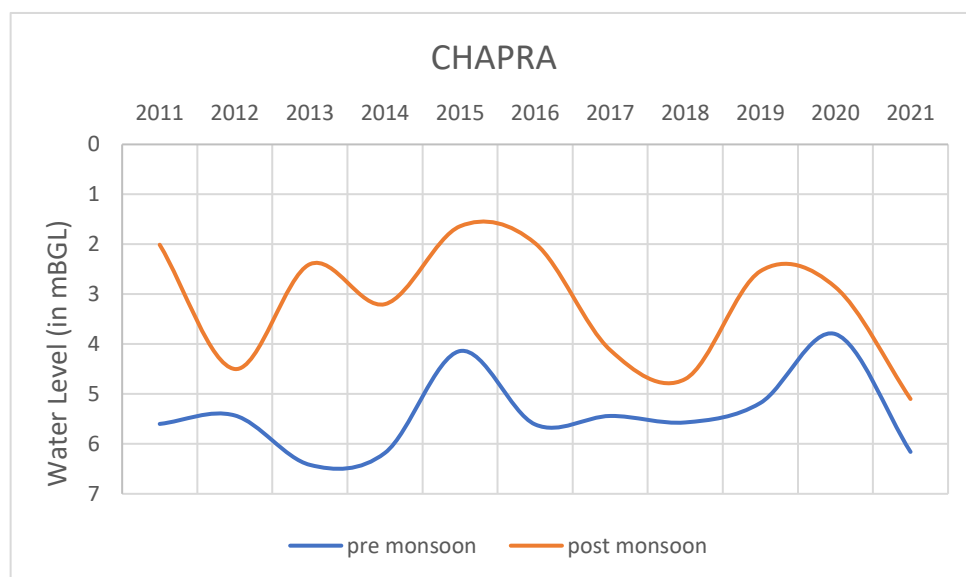
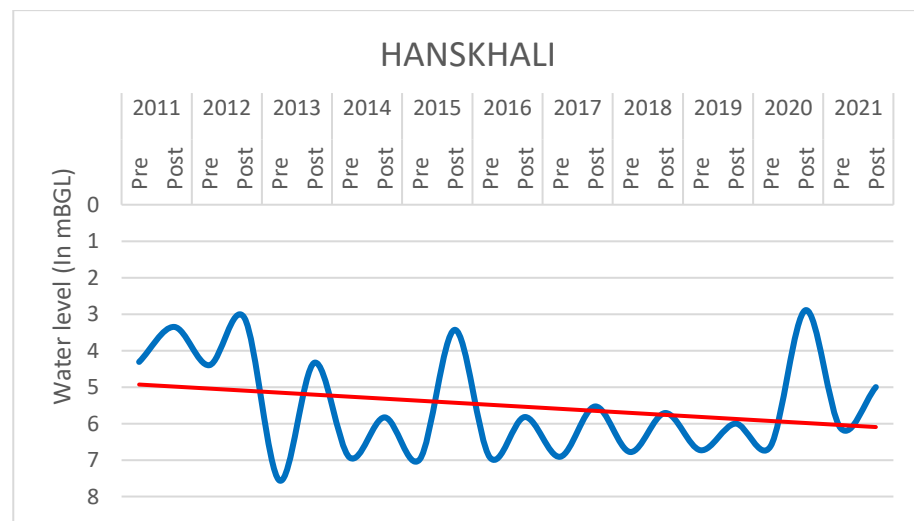
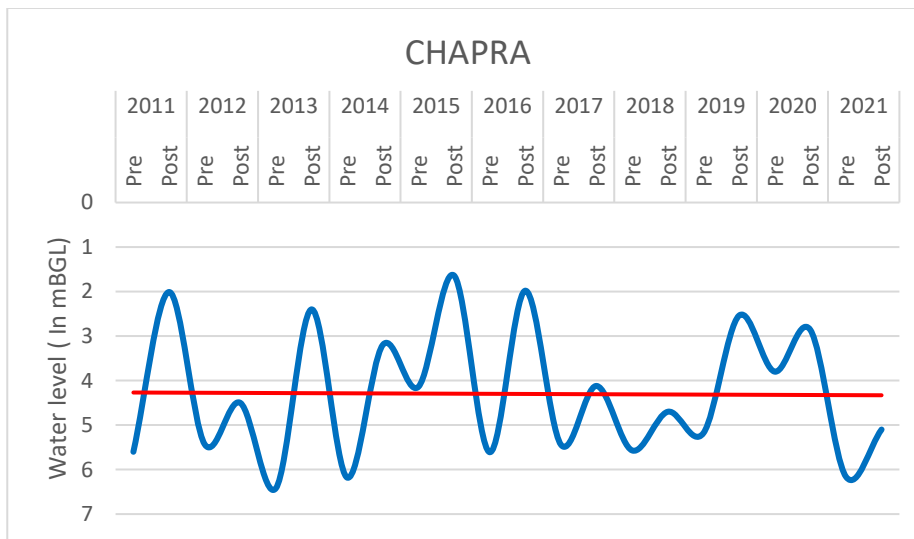
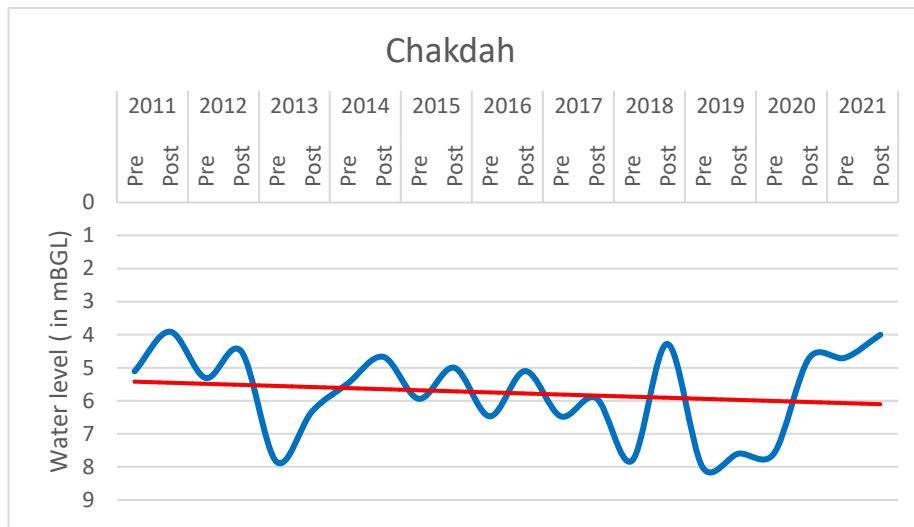
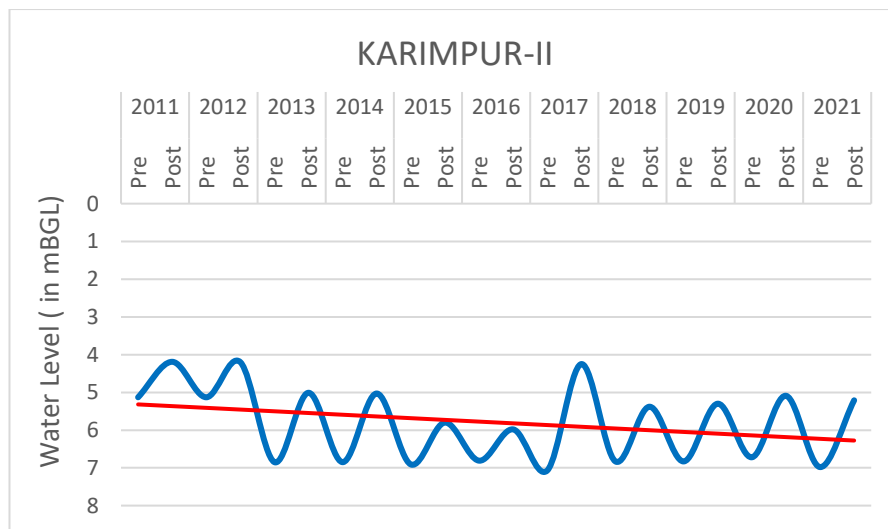
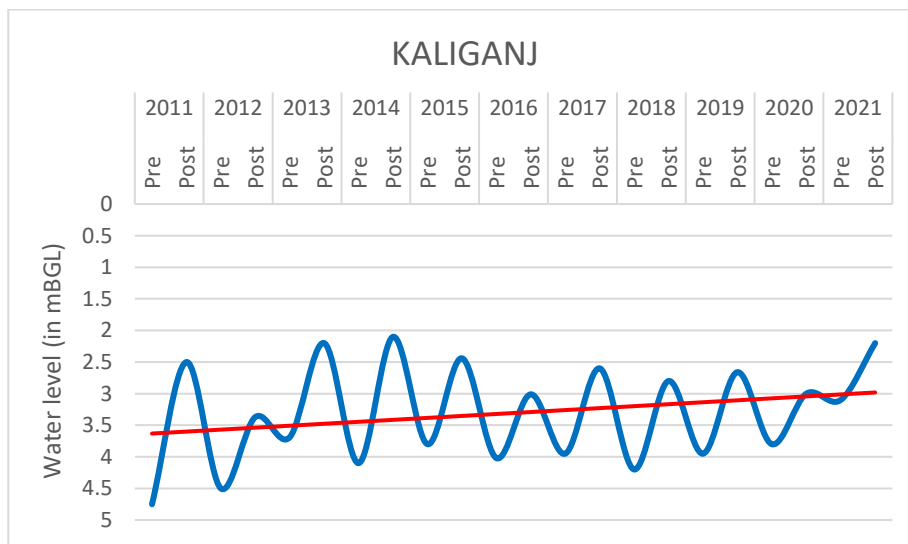
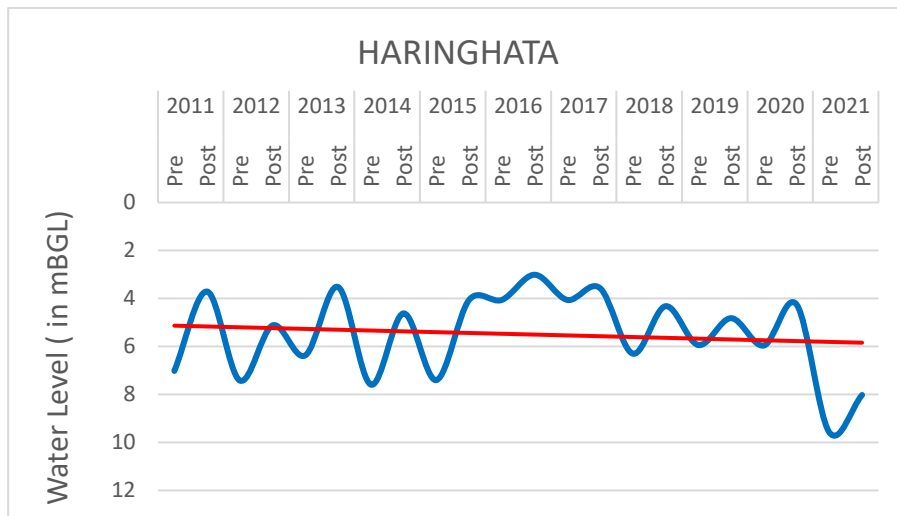


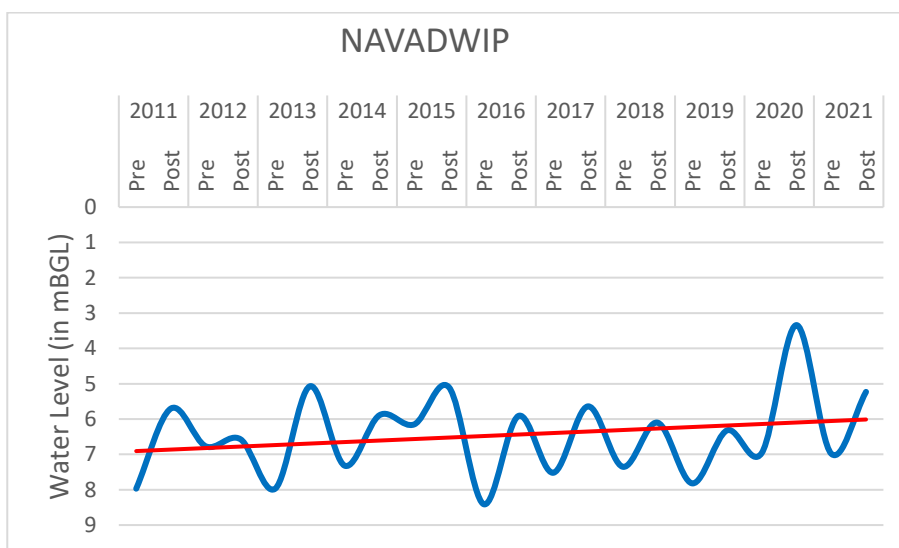
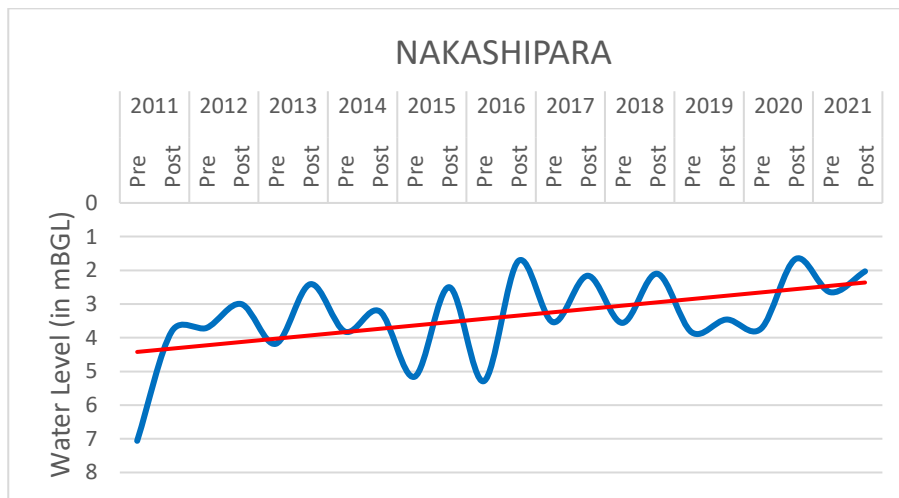
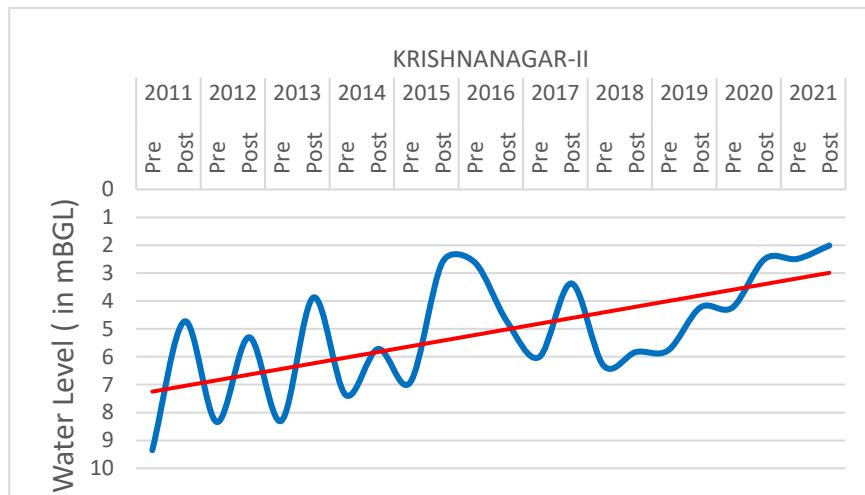
Figure 3.6: Graphical representation of pre-monsoon and post-monsoon water level data of Chapra, Nadia

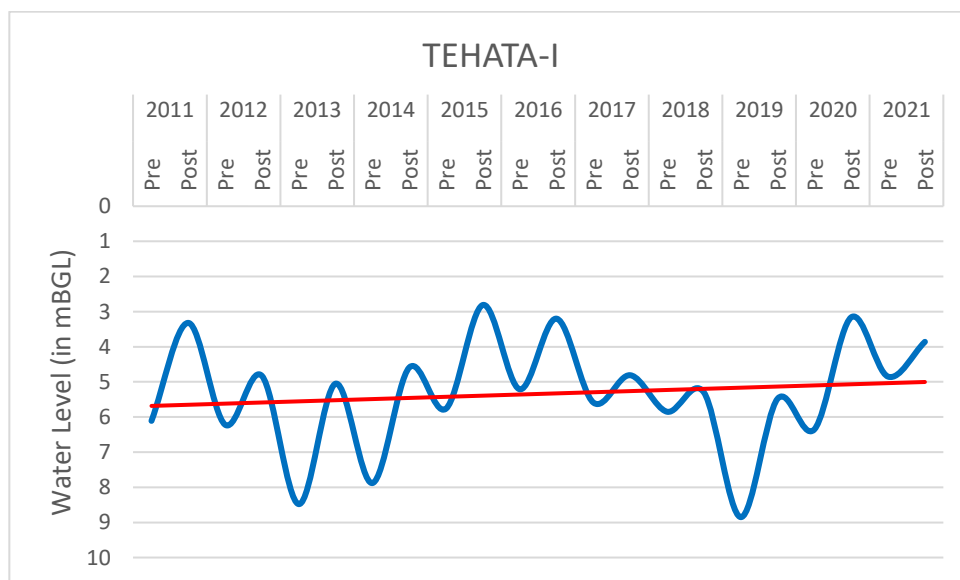
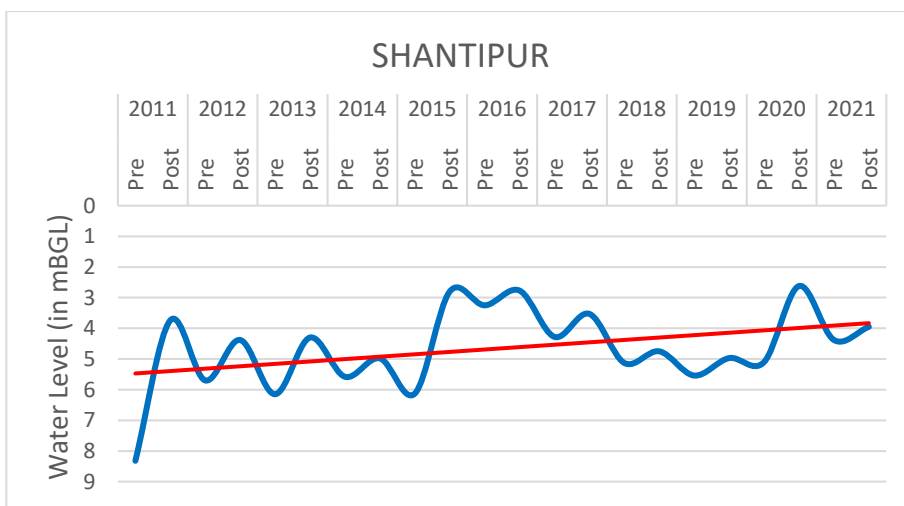
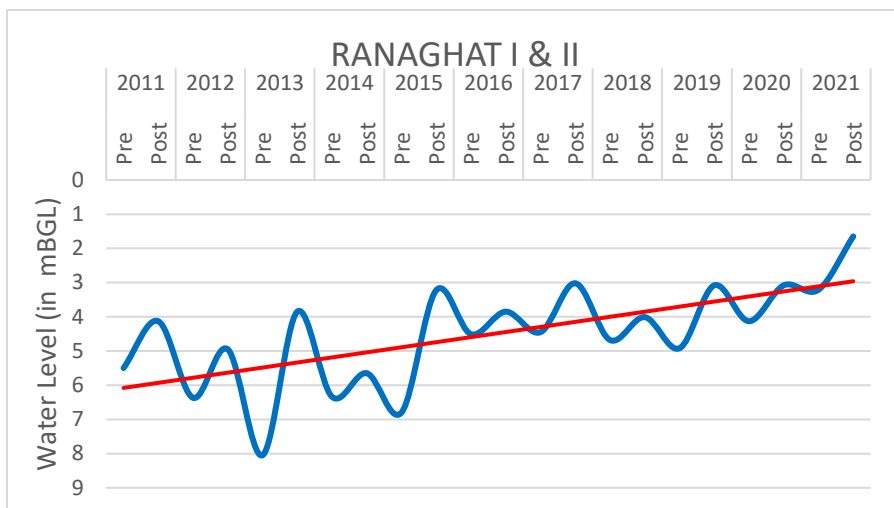
Over all stage of ground water development is 34% in the Nadia district which implies safe stage (CGWB, 2017). Ground water resources estimation of 2013 (calculated using GEC 1997 Methodology) have been considered in case of Nadia, West Bengal. However, the groundwater development status is not uniform throughout the district.

Hydrographs showing variation in water level observed in between 2011 to 2021 in the district is given in Figure 3.7.









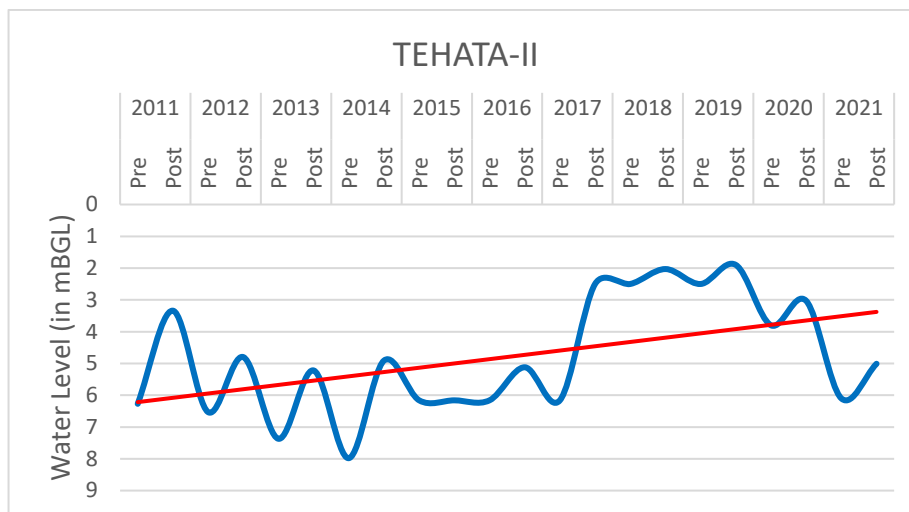


Figure 3.6: Block wise Hydrograph showing variation of water level during 2011 to 2021

g) Drainage System

The district is located in the lower part of the Ganga Basin. The district is well drained by a number of rivers and rivulets running in nearly from North to South. District has five important rivers, namely, Bhagirathi River, Mathabhanga River, Churni River, Ichamati River and Jalangi River.

Drainage map of Nadia district is furnished as Figure 3.8 and in Plate 1A.

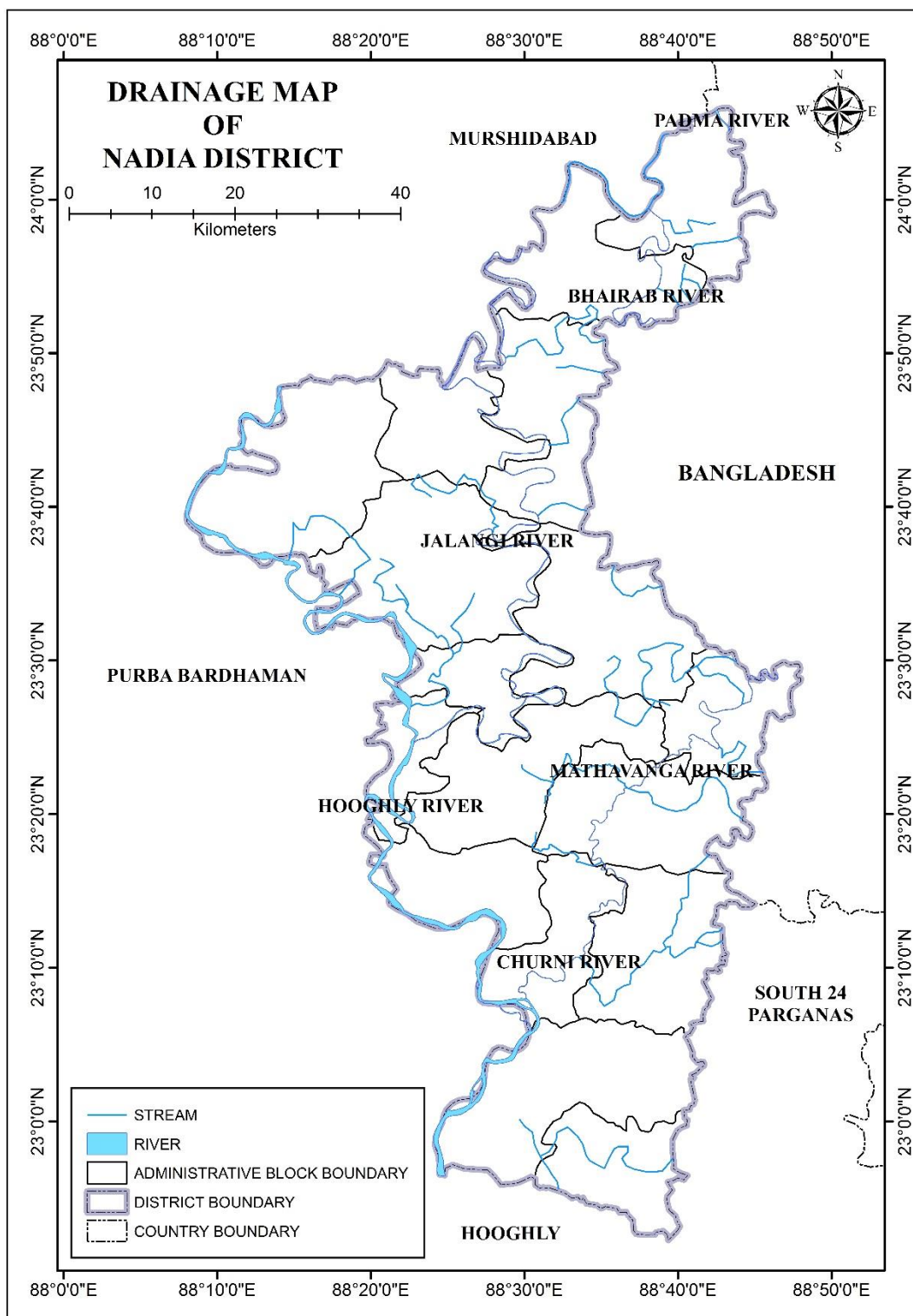


Figure 3.7: Drainage map of Nadia District
 (Source: National Informatics Centre, September 2020)



h) Demography

According to the 2011 census Nadia district has a population of 5,167,600, roughly equal to the US state of Colorado. This gives it a ranking of 18th in India (out of a total of 640). The district has a population density of 1,316 inhabitants per square kilometre (3,410/sq mi). Its population growth rate over the decade 2001-2011 was 12.24%. Nadia has a sex ratio of 947 females for every 1000 males, and a literacy rate of 75.58%. Scheduled Castes and Scheduled Tribes make up 29.93% and 2.72% of the population respectively. Bengali is the predominant language, spoken by 98.02% of the population.

Table 3.4: Demographic distribution of Nadia District

Sub-Division / C.D.Block / M / N.A.	Total Population			Literacy Rate		
	Male	Female	Total	Male	Female	Total
Tehatta Sub-Div.	409233	387012	796245	69.47	64.89	67.25
Karimpur-I	94571	88985	183556	69.82	65.44	67.7
Karimpur-II	111488	105648	217136	63.35	60.65	62.04
Tehatta-I	125875	118447	244322	73.68	67.56	70.72
Tehatta-II	77299	73932	151231	70.93	65.99	68.52
Krishnanagar Sub-Div.	1051695	995336	2047031	74.68	67.17	71.03
Kaliganj	171912	162969	334881	69.04	63.02	66.11
Nakashipara	198517	188052	386569	68.68	60.82	64.86
Chapra	159736	150916	310652	70.3	66.13	68.28
Krishnaganj	75573	71132	146705	77.43	67.98	72.86
Krishnanagar-I	162086	152747	314833	76.5	66.08	71.45
Krishnanagar(M)	77146	75916	153062	92.59	88.11	90.36
Krishnanagar-II	71614	67858	139472	72.88	63.92	68.52
Nabadwip	69696	65618	135314	73.8	61.26	67.72
Nabadwip(M)	65415	60128	125543	90.44	83.94	87.33
Ranaghat Sub-Div.	736033	696728	1432761	83.86	74.9	79.51
Santipur	124400	116680	241080	78.23	67.63	73.1
Santipur(M)	77011	74766	151777	84.94	76.73	80.9
Hanskhali	151645	141395	293040	84.92	74.94	80.11
Ranaghat-I	119444	112838	232282	82.08	72.89	77.61
Ranaghat(M)	37948	37417	75365	95.04	91.33	93.19
Birnagar(M)	15658	15141	30799	88.26	80.82	84.6
Taherpur(N.A.)	10642	10252	20894	95.72	90.4	93.1
Ranaghat-II	189706	178975	368681	83.66	74.85	79.38
Cooper's camp(N.A.)	9579	9264	18843	91.3	79.72	85.61
Kalyani Sub-Div.	456807	434756	891563	87.89	78.56	83.35
Chakdaha	209513	196206	405719	85.14	74.57	80.03
Chakdaha(M)	48047	47156	95203	93.61	87.93	90.8
Kalyani(M)	50727	49848	100575	91.73	84.01	87.9



Sub-Division / C.D.Block / M / N.A.	Total Population			Literacy Rate		
	Male	Female	Total	Male	Female	Total
Gayeshpur(M)	29811	29187	58998	94.19	86.71	90.49
Haringhata	118709	112359	231068	87.11	76.9	82.15
District Total	2653768	2513832	5167600	78.75	70.98	74.97

Table 3.4 shows the district demographic profile based on Census 2011. Block-wise literacy rate of the population is described as the percentage of literates. Figures 3.9 and 3.10 representing population distribution of the district and block-wise literacy rate respectively.

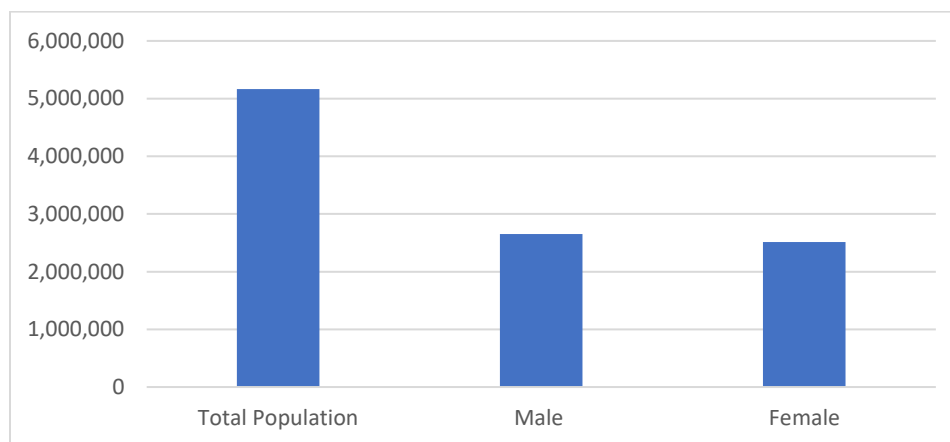


Figure 3.8: Population distribution of the district

(Source: Census, 2011)

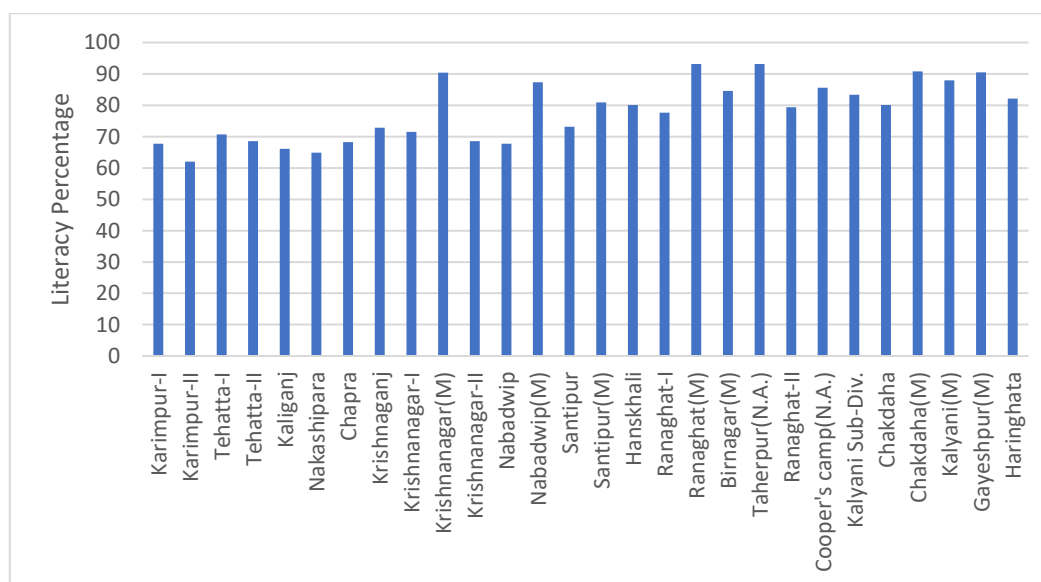


Figure 3.9: Block-wise Literacy rate of the district

(Source: Census, 2011)



i) Cropping pattern

The soil type in Nadia district is new alluvium. Almost all-important crops are profitably grown in this district. The economy of the district is depending upon agriculture. The soil is suitable for paddy cultivation. In many parts of the district farmers cultivate wheat, pulses and jute. The low-lying tract in the district which is known as Kalantar is also good for cultivation of Aman rice. Nadia district remains evergreen with seasonal field crops throughout the year and almost all-important crops are grown profitably in the district. The economy of the district mainly depends on agriculture. Among agricultural crops paddy, wheat, pulses and jute are most important.

Table 3.5: Yield rates of Principal Crops in the district of Nadia District

Crops	2009-10	2010-11	2011-12	2012-13	2013-14
Kilogram per hectare					
Foodgrains:					
1. Rice	2784	2759	2953	2870	3072
Aus	2270	2080	2210	2214	2401
Aman	2462	2272	2706	2280	2772
Boro	3345	3532	3584	3756	3721
2. Wheat	2549	2536	3078	3320	3366
3. Barley	1960	1384	1630	1670	1505
4. Maize	2362	2622	2613	2541	2614
5. Other Cereals	-	-	-	-	-
Total Cereals	2747	2726	2967	2934	3112
6. Gram	861	853	1095	913	1074
7. Tur	1327	1626	448	1403	1555
8. Other Pulses	917	984	918	951	906
Total Pulses	890	974	935	950	930
Total Foodgrains	2533	2478	2659	2599	2761
Oil Seeds:					
1. Rapeseed & Mustard	1100	1028	949	1193	1177
2. Linseed	555	600	451	497	484
3. Other Oil seeds	1243	1230	1222	1341	1372
Total Oil seeds	1139	1080	1025	1233	1238
Fibres*:					
1. Jute	16.1	13.7	13.9	14.2	17.4
2. Mesta	10.1	9.7	17.1	11.9	13.2
3. Other Fibres	-	-	-	-	-
Total Fibres	16.0	13.7	13.9	14.2	17.4
Miscellaneous crops:					
1. Sugarcane	47088	81190	137139	101323	100232
2. Potato	30676	27301	30959	31905	30590
3. Tobacco	850	867	850	875	800
4. Tea	-	-	-	-	-
5. Chillies (dry)	1641	1645	1644	1644	1645
6. Ginger	1702	1778	1783	1823	1892
Total Miscellaneous crops	18409	17830	29875	26000	25777

* In bales / hectare

(Source: <http://wbpspm.gov.in/publications/District%20Statistical%20Handbook>,

Accessed on September 2022)



j) Land Form and Seismicity

The seismic hazard map of India was updated in 2000 (Figure 3.11) by the Bureau of Indian Standards (BIS). Western sections of the northern districts of Jalpaiguri and Coochbehar lie in Zone V. The remaining parts of these two districts, along with the districts of Darjeeling, Uttar Dinajpur, Dakshin Dinajpur, Maldah, 24 North Parganas and 24 South Parganas lie in Zone IV. The rest of the state along with the city of Kolkata lies in Zone III. The Nadia district falls under the Seismic Zone III, indicating the district under Moderate Damage Risk Zone.

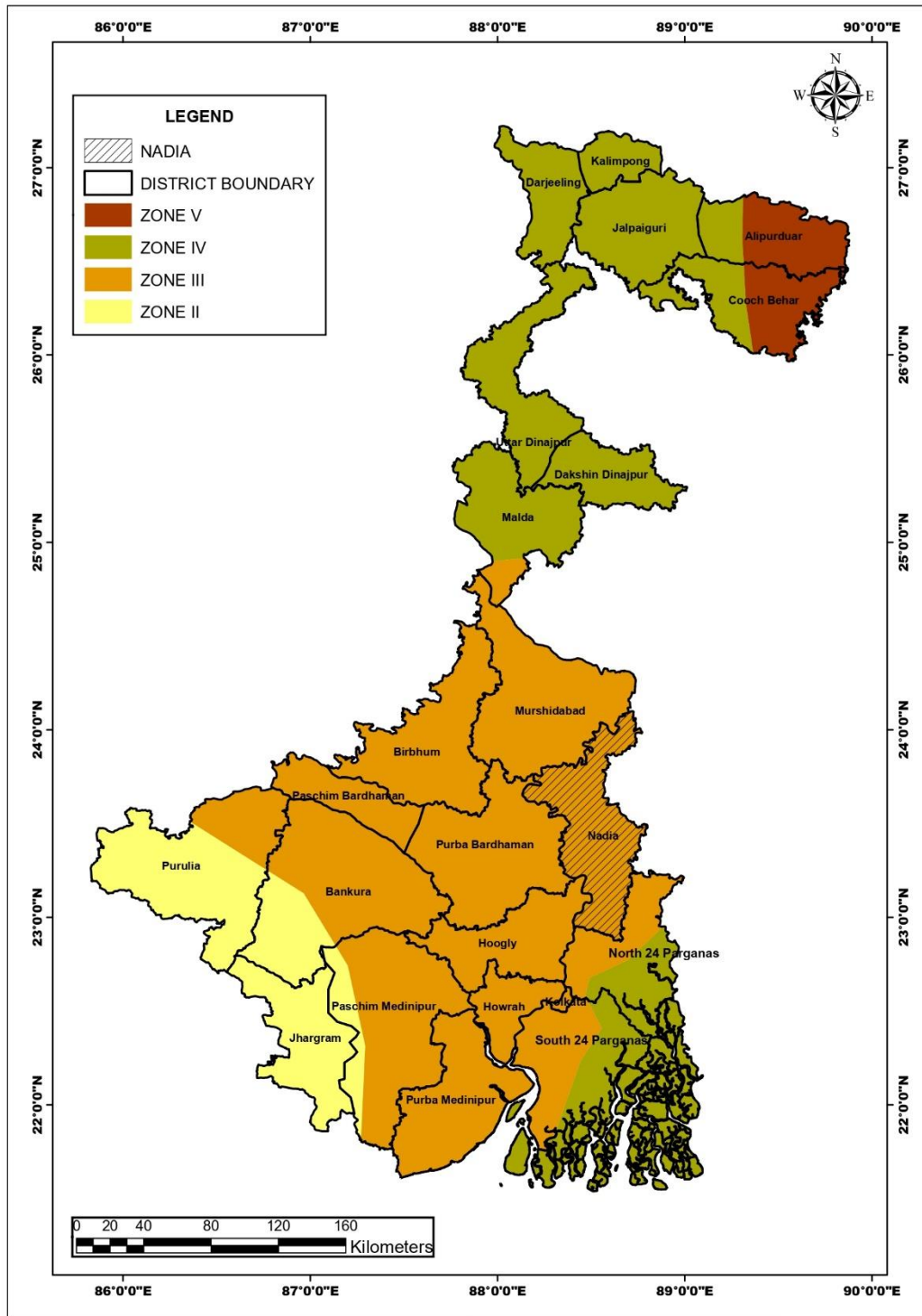


Figure 3.10: Earthquake zonation map of West Bengal highlighting the Nadia district position

(Source: <https://pib.gov.in/PressReleasePage.aspx?PRID=1740656>, September 2020)



k) Flora

Broadly three types of forests are recorded in the district, viz. (i) Moist deciduous type, (ii) Dry deciduous type, and (iii) Riverine type. Forests in Nadia mostly belong to moist deciduous type represented by species such as: Arjun, Sissoo, Jam, Teak, Behera, Hijl, Neem, Ghora neem, Chatim etc. The dry deciduous tracts are represented by (i) Mahua (ii) Peasal (iii) Sal (iv) Teak (v) Kendu etc. 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 due to the tidal currents that reach upto Nabadwip.

l) Fauna

With the development of forestry in the district various wild animals are being attracted towards recently groomed forests. The forest of the district has been a shelter for leopard pig, porcupine and birds like partridges. Snipes are very common in the South of the district during the latter part of the rains and the beginning of the cold weather. Various species of wild ducks and other aquatic birds are found in large numbers in the East and North of the district during the cold weather. A few partridges and quails are occasionally met with. Snakes are common and account for many deaths annually. Innumerable varieties of fishes are also found in the district.

Bethuadahari Wildlife Sanctuary is situated in the Bethuadahari town (Nakashipara area) of Nadia District, West Bengal, India. The sanctuary is located beside National Highway 12 (old no NH 34). The sanctuary covers 67 hectares, and was established in 1980 to preserve a portion of the central Gangetic alluvial zone. The sanctuary has a large population of spotted deer (chital), jackal, Bengal fox, porcupine, Asian plam Civet cat, Jungle Cat, Small civet Cat, Black Napped Hare and common langur. Bird species include parakeets, (Rose Ring parakeet, Plum headed parakeet, Alexandrine parakeet, Red-breasted parakeet) Owls- Barn Owl, Spotted Owlet, Brown Fish Owl, Scopes owl, Indian cuckoos, barbets and other smaller birds, while reptiles - Spectacled Cobra, Monocled Cobra, Russell's Viper, Common Krait, Banded Krait, Common Cat Snake, Green Vine Snake, Rainbow Mud snake, ornate flying snake, Copper haded trinket, Indian Rat Snake, Buff Striped keelback, Checkered keelback, Common wolf snake, Twine Spotted Wolf snake, Common Kukri snake, Red sand boa, Common sand boa and amphibians include pythons.

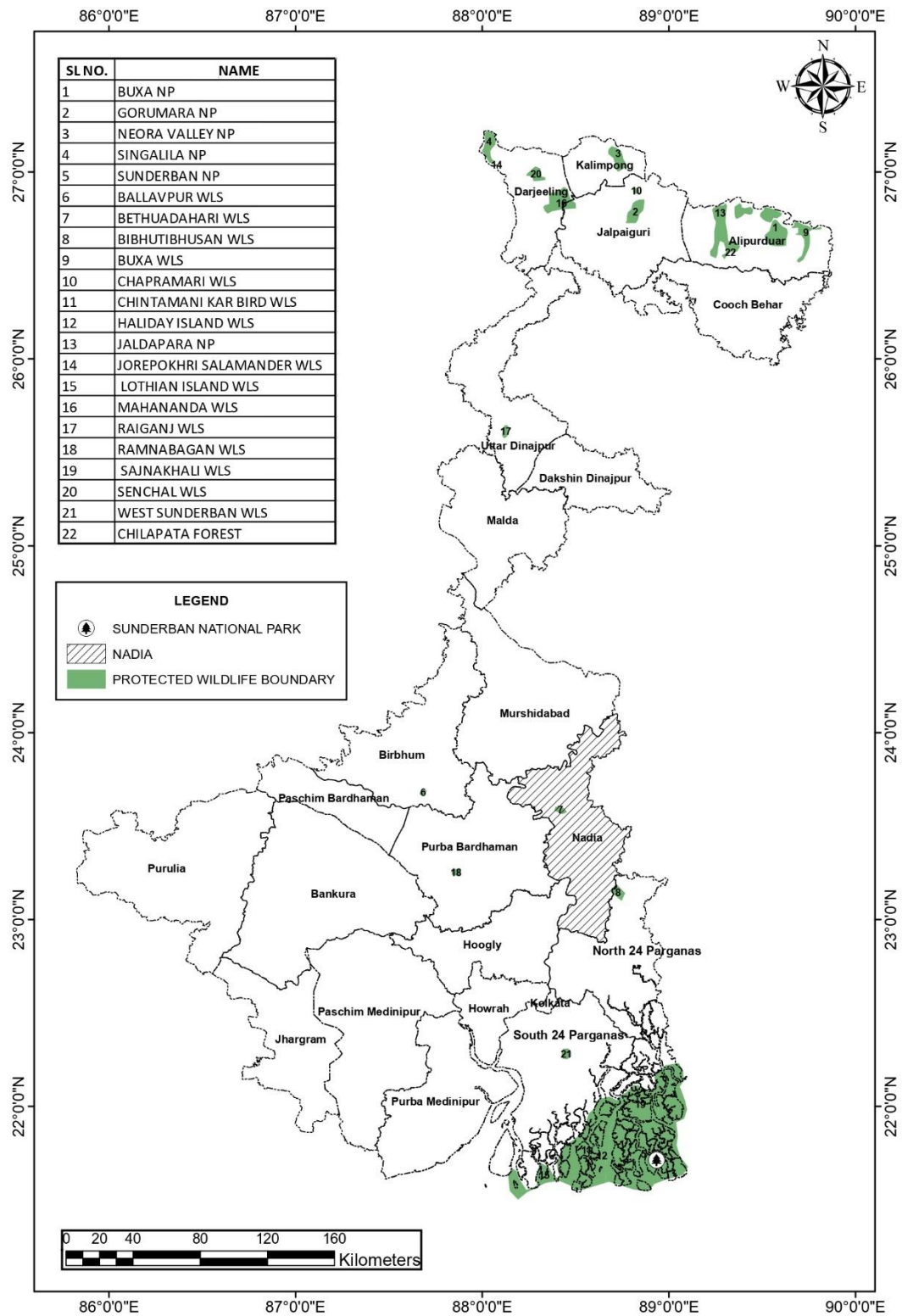


Figure 3.11: District location with respect to Wild Life Sanctuary of West Bengal

(Source: <http://wiienvis.nic.in/>, September 2020)



4 Physiography of the district

4.1 General Landforms

The Nadia district is located in southern West Bengal, in the west-central Bengal region. The district is largely alluvial plain, formed by the constant shifting of the various rivers of the Ganges Delta. To the west of the district is the Bhagirathi (or Hooghly) river, which was once the main distributary of the Ganga towards the Bay of Bengal, and is still considered to be the continuation of the Ganga for Hindus. As the main flow of the Ganga flowed east into the Padma, the Bhagirathi largely dried up. Most of the rivers now flowing through Nadia now have little water in them. Nearly all the district has been converted into farmland. (https://en.wikipedia.org/wiki/Nadia_district#Geography Accessed on September 2022)

4.2 Soil and rock pattern

The district is a large alluvial plain spreading South-ward from the head of the delta formed by the succession of rivers into which the Ganga has from time to time distributed itself. The alluvial formation in the district is due to the Ganga-Bhagirathi system. The alluvial formation is found on the top of the surface in different layers and colours. The soil regions in this area are categorized as Ganga flat-lands, Ganges riverine lands and Ganges low lands. Agriculturally, the soil is considered to be high land and bears rice and cold weather crops. To the West of the district is the Kalantar, a low-lying tract of black clay soil stretching from Murshidabad district. The important rivers in the district are the Bhagirathi, the Jalangi and the Churni. The Bhairab-Jalangi and the Mathabhanga-Churni. The Bhagirathi rivers flows through the Western side of Nadia district sharing the boundary with the neighborhood district. (Census, 2011)

Figure 4.1 is showing soil pattern of the Nadia district and its characteristics are furnished as Table 4.1.

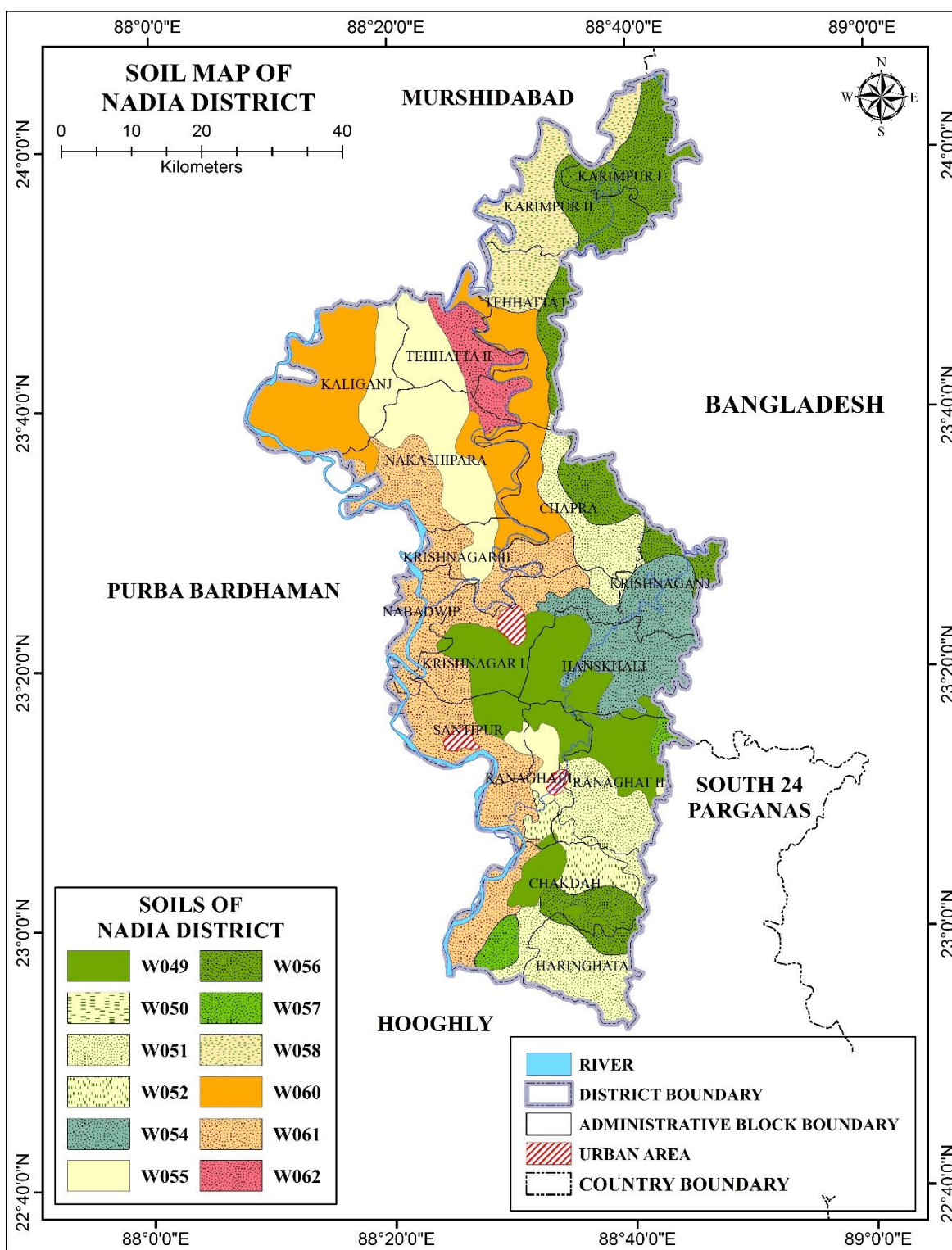


Figure 4.1: Soil Map of Nadia District

(Source: <https://esdac.jrc.ec.europa.eu/content/west-bengal-soils-sheet-2>)



Table 4.1: Soil characteristics of the Nadia district

MAP SYMBOL	DESCRIPTION	TAXONOMIC NAME
W049	Very deep, poorly drained, fine cracking soils occurring on level to nearly level low lying alluvial plains with clayey surface associated with very deep, imperfectly drained, fine soils	Fine, Vertic Ochraqualfs
		Fine, Typic Ustochrepts
W050	Very deep, poorly drained, fine cracking soils occurring on level to nearly level low lying alluvial plains with loamy surface associated with very deep, poorly drained, fine soils	Fine, Vertic Ochraqualfs
		Fine, Aeric Haplaquepts
W051	Very deep, poorly drained, fine soils occurring on level to nearly level low lying alluvial plains with clayey surface associated with very deep, imperfectly drained, fine cracking soils	Fine, Aeric Haplaquepts
		Fine, Vertic Ochraqualfs
W052	Very deep, poorly drained, fine soils occurring on very gently sloping low lying alluvial plain with loamy surface associated with very deep, poorly drained, fine cracking soils	Fine, Typic Ochraqualfs
		Fine, Vertic Ochraqualfs
W054	Very deep, poorly drained, fine cracking soils occurring on level to nearly level low lying alluvial plain with clayey surface and moderate flooding associated with very deep, poorly drained, fine soils	Fine, Vertic Haplaquepts
		Fine, Aeric Haplaquepts
W055	Very deep, poorly drained, fine cracking soils occurring on level to nearly level low lying alluvial plain with clayey surface and moderate flooding associated with very deep, poorly drained, fine soils	Fine, Vertic Haplaquepts
		Fine, Aeric Ochraqualfs
W056	Very deep, poorly drained, fine soils occurring on level to nearly level low lying alluvial plain with clayey surface and severely flooding associated with very deep, moderately well drained, fine loamy soils	Very Fine, Aeric Haplaquepts
		Fine loamy, Typic Ustochrepts
W057	Very deep, moderately well drained, fine loamy soils occurring on very gently sloping flood plain with loamy surface, moderate erosion and moderate flooding associated with very deep, well drained, sandy soils	Fine loamy, Typic Ustifluvents
		Typic Ustifluvents
W058	Very deep, well drained, fine soil occurring on gently sloping upland with loamy surface and subject to moderate erosion associated with very deep, imperfectly drained, fine loamy soils	Fine loamy, Typic Haplaquepts
		Fine loamy, Aeric Haplaquepts
W060	Very deep, moderately well drained, fine soil occurring on very gently sloping upland with loamy surface and moderate erosion associated with very deep, poorly drained, fine soils	Fine, Typic Haplaquepts
		Fine, Aeric Haplaquepts
W061	Shallow, somewhat excessively drained , gravelly loamy soils occurring on gently sloping subdued ridges with gravelly loamy surface and severe erosion associated with very shallow excessively drained gravelly loamy soils	Loamy, Lithic Ustochrepts
		Loamy, Lithic Ustorthentsts
W062	Deep, well drained , loamy soils occurring on very gently sloping to undulating plain with loamy surface and moderate erosion associated with deep, moderately well drained, loamy soils	Fine Loamy, Typic HaplustalFs
		Fine Loamy Typic Ustochrepts



4.3 Different geomorphologic units

Topographically Nadia district is divided into five sub-micro regions which are as follows:

Nadia Plain North: Nadia Plain North region of the district constitutes the North-Eastern part and it shares boundary with the neighboring country, Bangladesh. This region slopes towards South-East. The major river flows through the Western boundary of Nadia Plain region are the Jalangi River. Other rivers transverse through the region are the Mathabhanga and the Bhairab rivers.

Jalangi-Bhagirathi Inter-fluve: Kalantar, the low-lying tract of black clay soil lies in the Western part of Nadia district. This tract is found between the rivers of Bhagirathi and Jalangi. This region extends towards South and there is no drainage found in its path.

Bhagirathi Plain: The Bhagirathi River flows from North to South through the Western part of the Nadia district and it forms the district boundary in the Western side with Bardhaman district. The Bhagirathi plain region constitutes the entire stretch of the river throughout the district, sloping towards South-East. This region experiences many depressions in the form of swamps due to the overflow of the Bhagirathi River.

Krishnanagar-Santipur Plain: This area lies in the central part and it has sloping towards South-West. Boundary of this region constitutes rivers. Towards South-East the Churni River and towards North-West the Jalangi and the Bhagirathi Rivers are flowing. Many swamps are found in this region.

Ranaghat-Chakdah Plain: This region is low-lying area found in the South-Eastern part of the district. The Churni River separates this region from Krishnanagar-Santipur plain. This region slopes towards South and due to the variation in river flows, many depressions and swamps are found in this region.

Wet Land: In India, wet-lands are classified according to their location (coastal or inland), water quality (saline or fresh water) seasonal flooding etc. The rivers like the Padma and the Bhagirathi in Nadia district caused formation of wetland in this region. Wetland in Gangetic flood plain of Nadia district is mostly used for irrigation. It is also used for fresh water fish cultivation. During summer season when wetland bed dries up, major crops like paddy and jute are grown. Medicinal plants and various species of angiosperms are also found in wetland.

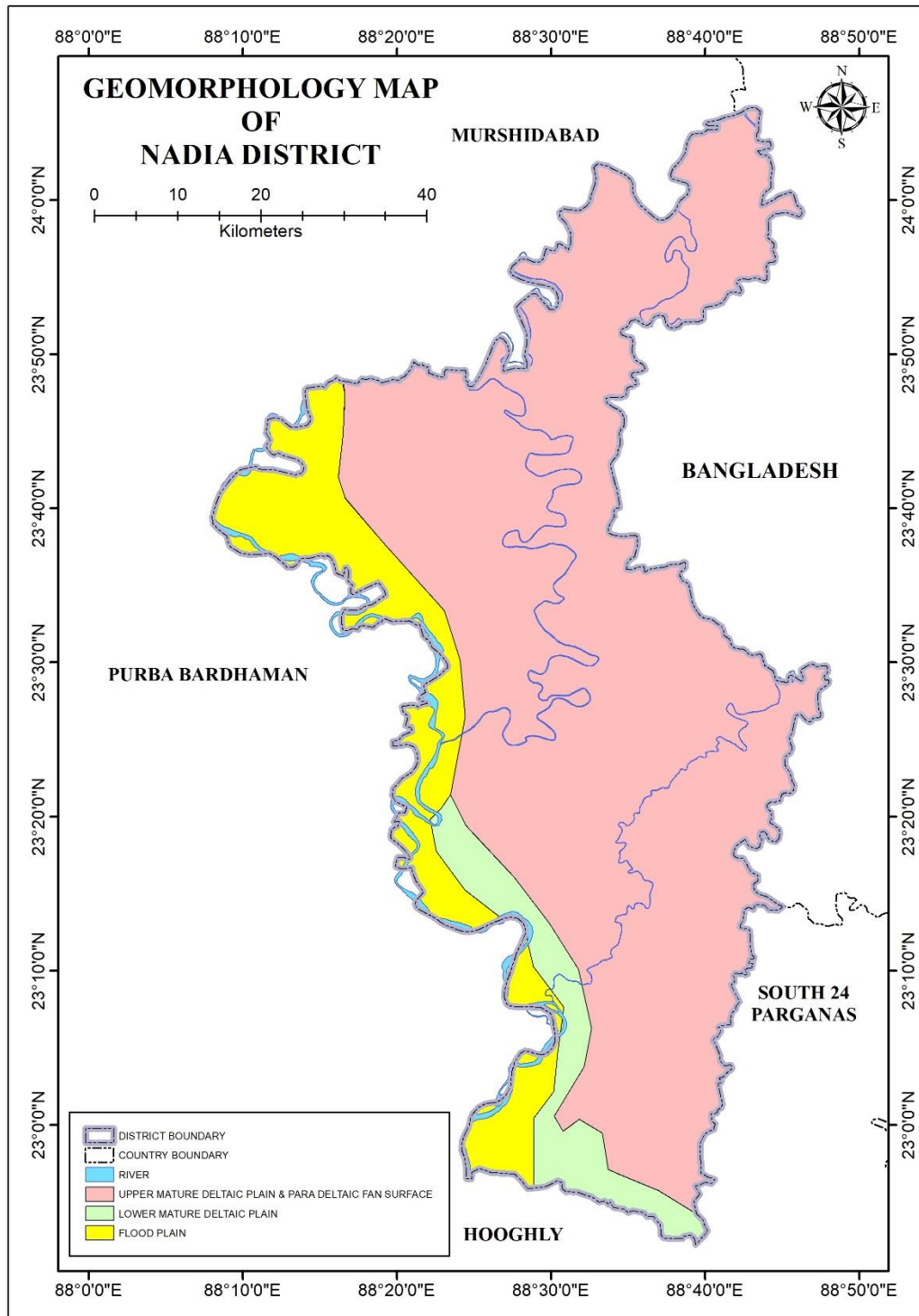


Figure 4.2: Geomorphological map of Nadia District

(Source: Resourcesat-1&2 – Liss-3, Bhuvan India, September 2020)



5 Land use pattern of the district

Nadia district comprises of very good fertile land suitable for agricultural crop cultivation. The important crops cultivated in the district are paddy, wheat, jute, pulses. Vegetables are also produced in the district in very good quality. The following table shows the land use pattern in the district.

Table 5.1 gives land utilization status of Nadia district. Figure 5.1 is the pie diagram representing broad land use pattern of the district.

Table 5.1: Classification of Land Utilisation Statistics in the district

(In thousand hectares)

Year	2009-10	2010-11	2011-12	2012-13	2013-14
Reporting Area (In Thousand Hectares)	390.66	390.66	390.66	390.66	390.66
Forest Area	1.22	1.22	1.22	1.22	1.22
Area under Non-agricultural use	88.94	90.22	88.45	89.02	89.15
Barren & unculturable land	0.24	0.06	0.03	0.03	0.03
Permanent pastures & other grazing land	0.05	0.06	0.01	-	-
Land under Misc. tree groves not included in Net area sown	3.91	3.73	2.58	2.49	2.28
Culturable waste land	0.79	0.63	0.58	0.40	0.31
Fallow land other than Current fallow	0.37	0.11	0.59	0.52	0.43
Current fallow	4.40	4.18	4.26	3.43	2.94
Net area sown	290.74	290.45	292.94	293.55	294.30

(Source: Census, 2011)

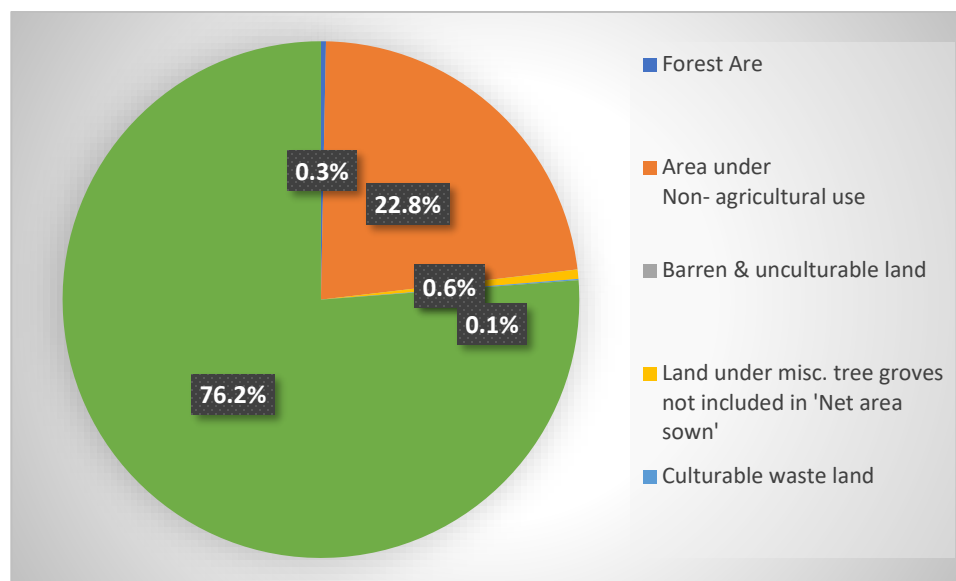


Figure 5.1: Land use pattern of Nadia District

Table 5.2: Distribution of Villages according to Agricultural Land Use. Census, 2011

Sr. No.	Name of C.D. Block	Total area (in Hectares)	Percentage of cultivable area to total area	Percentage of irrigated area to total cultivable area
1	Karimpur-I	20473.5	88.31	61.05
2	Karimpur-II	22106.64	74.02	65.59
3	Tehatta-I	24442.94	72.43	71.86
4	Tehatta-II	17141.17	85.25	81.18
5	Kaliganj	29712.43	74.71	59.25
6	Nakashipara	35244.9	67.96	71.54
7	Chapra	29745.03	87.32	82.35
8	Krishnagar-II	12189.05	83.14	74.99
9	Nabadwip	8272.8	73.14	83.41
10	Krishnagar-I	25873.84	79.61	70.27
11	Krishnaganj	15100.56	70.38	43.69
12	Hanskhali	23541.11	71.22	82.8
13	Santipur	13337.83	74.09	77.03
14	Ranaghat-I	10596.05	71.86	77.16
15	Ranaghat-II	25907.24	68.11	70.8
16	Chakdah	25320.46	77.56	78.05
17	Haringhata	15463.31	81.21	77.84
	Total	354468.86	76.28	72.03

Table 5.2 shows the distribution of agricultural land, both irrigated and non-irrigated land in different blocks of Nadia district. In the district around 76.28% land area is available for cultivation. Irrigation is considered as an important factor for cultivation. As per the Census 2011



dataset, 72.03% of the cultivable land is under irrigation. The proportions of cultivable area in Nakashipara block with respect to its total area is lowest. Figure 5.2 is the Land Use Land Cover map of the district.

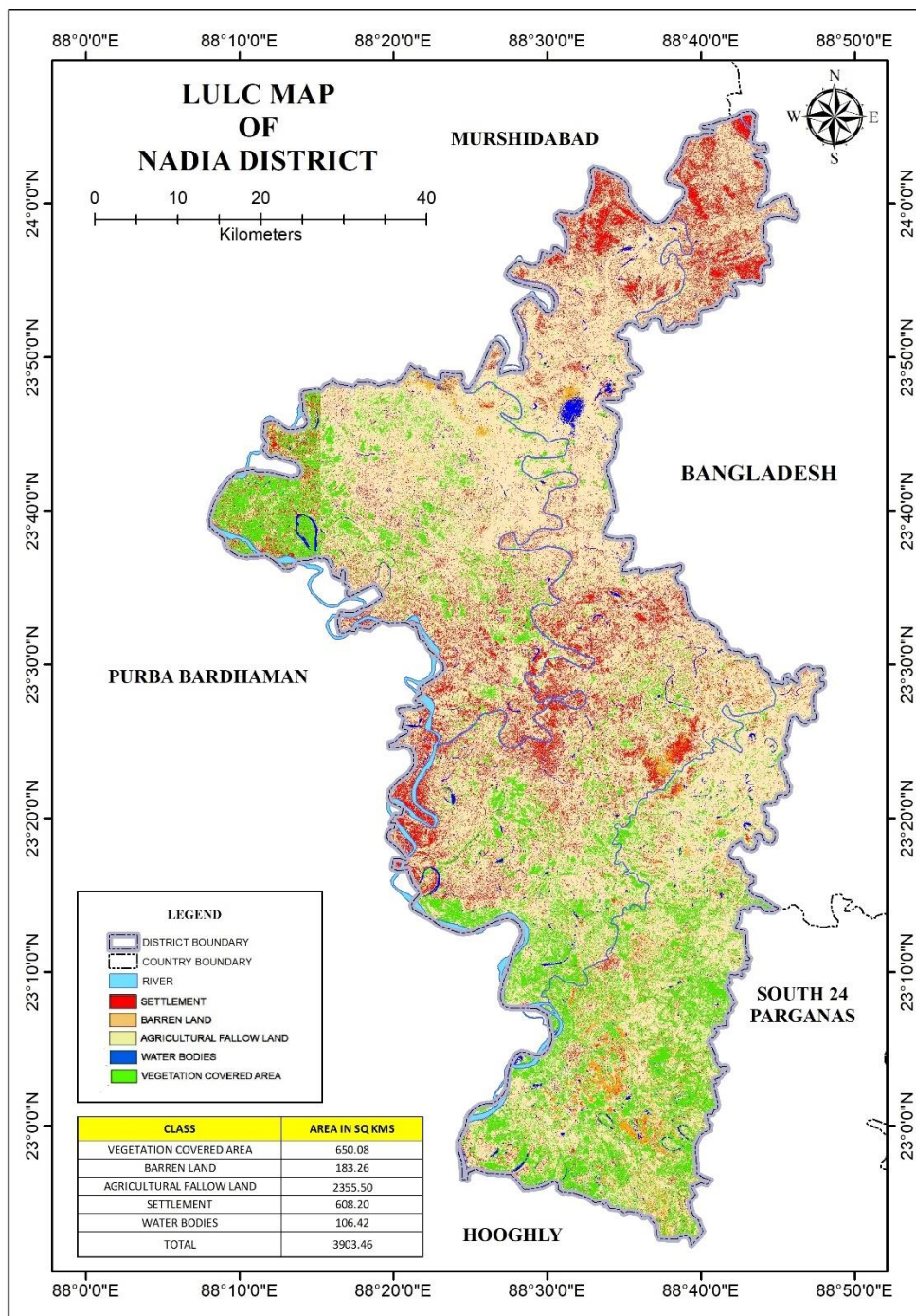


Figure 5.2: Land Use Land Cover map of Nadia District

(Source: Resourcesat-1&2 – Liss-3, Bhuvan India, September 2020)



5.1 Forest -detail of the district

Forest in West Bengal was not under the Government possession till independence. During fifties, the Government of West Bengal promulgated the Estate Acquisition Act and started experimenting with scientific forestry extensive teak plantations were raised during this period. Huge influx of refugees took place in the district immediately after the partition which paves way for conversion of forest into agricultural land. However, the introduction of social forestry scheme by the Government could compensate the loss by encouraging the people to plant trees on the cultivable space. There are three types of forests in Nadia district which are as follows:

a) Most Deciduous type: Most of the forest in Nadia district is most deciduous type represented by species like Sissoo, Teak, Behara, Arjun, Neem etc.

b) Dry Deciduous type: Dry deciduous tracts represented by Sal, Kendu, Mahua, Peasal etc.

c) Riverine type: The riverine type forest has tree species intermixed with thatch grasses, Simul, Sissoo etc. Besides, with the advent of scientific forestry in the district, different species of wild animals are being attracted to the groomed forests. Leopard, pig and porcupine were found in the Bethudahari forest areas. Snakes of various types were common to the forest region (Census, 2011).

Table 5.3: Classification of Forest Area, Out-turn of Forest Produce, Revenue and Expenditure of Forest Department

Item	Unit	2009-10	2010-11	2011-12	2012-13	2013-14
1. Area by Class of forest:	-	-	-	-	-	-
Reserved forest	Hectare	510.37	510.37	510.37	510.37	510.37
Protected forest	"	317.29	317.29	317.29	317.29	317.29
Unclassed state forest	"	405.77	405.77	405.77	405.77	405.77
Khas forest	"	-	-	-	-	-
Vested waste land	"	-	-	-	-	-
Forest owned by Corporate Bodies	"	-	-	-	-	-
Forest owned by Private Individuals	"	-	-	-	-	-
Total		1233.43	1233.43	1233.43	1233.43	1233.43
2. Forest Produce:	-	-	-	-	-	-
Timber	Thousand Cu. Metre	0.33	2.87	-*	5.15	146.86
Fuel	"	0.50	2.11	-*	2.66	-
Pole	Number	1797	12350	-*	6744	-



Item	Unit	2009-10	2010-11	2011-12	2012-13	2013-14
3. Revenue & Expenditure:	-	-	-		-	-
Revenue	Rs. in thousand	8234.28	35468.28	7461.88	53006.32	12438.441**
Expenditure	"	13043.88	23470.44	8075.48	6953.44*	10502.045*

**Except Salary & wages

*No harvesting done in 2011-12.

(Source: <http://wbpspm.gov.in/publications/District%20Statistical%20Handbook>,

Accessed on September 2022)

5.2 Agriculture and Irrigation

Nadia district remains evergreen with seasonal field crops throughout the year and almost all-important crops are grown profitably in the district. The economy of the district mainly depends on agriculture. Among agricultural crops paddy, wheat, pulses and jute are most important. Table 5.4 shows the crop production capacity of the district.

River is the main source of irrigation in the district. Lift irrigation and tube wells are also installed for watering the field under crop. The following table shows the area under irrigation and various sources of irrigation for the period from 2006-2011 (Census, 2011).

Table 5. 4: Production of Principal Crops in the district

(In thousand tonnes)

Crops	2009-10	2010-11	2011-12	2012-13	2013-14
Foodgrains:					
1. Rice	664.9	650.5	744.5	668.3	734.4
Aus	99.5	100.7	104.9	105.1	114.5
Aman	242.5	201.7	289.4	205.5	268.9
Boro	322.9	348.1	350.2	357.7	351.0
2. Wheat	94.8	98.3	124.0	138.5	149.0
3. Barley	0.3	0.2	(b)	0.2	0.1
4. Maize	8.5	6.7	6.7	7.4	8.2
5. Other Cereals	-	-	-	-	-
Total Cereals	768.5	755.7	875.2	814.4	891.7
6. Gram	3.6	5.2	6.9	6.5	7.3
7. Tur	0.1	0.9	0.2	0.6	0.4
8. Other Pulses	28.7	38.5	42.2	46.3	43.5
Total Pulses	32.4	44.6	49.3	53.4	51.2
Total Foodgrains	800.9	800.3	924.5	867.8	942.9



Crops	2009-10	2010-11	2011-12	2012-13	2013-14
Oil Seeds:					
1. Rapeseed & Mustard	69.6	74.9	68.5	103.2	90.8
2. Linseed	0.4	0.3	0.2	0.3	0.2
3. Other Oil seeds	34.5	33.1	36.2	48.8	50.5
Total Oil seeds	104.5	108.3	104.9	152.3	141.5
Fibres*:					
1. Jute	2047.9	1565.9	1762.1	1775.3	2087.7
2. Mesta	1.8	0.2	1.8	0.6	3.2
3. Other Fibres	-	-	-	-	-
Total Fibres	2049.7	1566.1	1763.9	1775.9	2090.9
Miscellaneous crops:					
1. Sugarcane	87.2	57.6	244.1	182.7	192.7
2. Potato	153.6	193.1	162.3	177.6	154.0
3. Tobacco	(b)	(b)	(b)	(b)	(b)
4. Tea	-	-	-	-	-
5. Chillies (dry)	11.0	11.0	11.0	11.1	11.1
6. Ginger	0.4	0.4	0.4	0.4	0.5
Total Miscellaneous crops	252.2	262.1	417.8	371.8	358.3

* In 1000 bales of 180 kgs each

(Source: <http://wbpspm.gov.in/publications/District%20Statistical%20Handbook>,
Accessed on September 2022)

5.3 Horticulture

The major horticultural vegetable crops found in the district are Brinjals, Cauliflowers, Cabbage, Tomato, Peas, Cucurbits, the major horticultural fruit crops grown in the district are mango, banana, guava, jackfruit, papaya etc.

The floriculture of the district consists of various types of orchids, decorative plants, temperate and tropical flowers, etc. Flowers like Tuberose, Marigold, Rose and seasonal flowers are main of Nadia district. In this district the most popular flower is marigold.



Table 5. 5: Production of Fruits and Vegetables in the district

Name of Fruits/ Vegetables	Production (Thousand tonnes)				
	2009-10	2010-11	2011-12	2012-13	2013-14
A. Fruits					
Mango	55.53	57.53	58.67	59.50	35.50
Banana	388.80	394.90	396.00	395.80	398.67
Pineapple	0.50	0.50	0.40	0.38	0.35
Papaya	26.71	26.89	27.14	29.14	29.71
Guava	12.54	12.53	12.63	12.90	13.00
Jackfruit	17.40	17.40	17.41	17.92	17.91
Litchi	9.20	9.30	9.20	9.55	9.87
Mandarin Orange	-	-	-	-	-
Other Citrus	2.60	2.60	2.79	2.95	3.15
Sapota	0.26	0.26	0.26	0.27	0.27
Others	2.71	2.76	2.90	2.31	2.60
Total	516.25	524.67	527.40	530.72	511.03
B. Vegetables					
Tomato	101.23	102.55	104.45	104.65	107.79
Cabbage	200.73	203.54	206.50	206.90	209.42
Cauliflower	201.26	203.91	205.99	209.00	213.79
Peas	24.53	25.26	25.20	25.10	25.29
Brinjal	261.65	220.17	274.94	275.20	276.69
Onion	36.88	37.89	38.30	38.25	39.16
Cucurbits	134.71	139.47	141.47	141.60	141.79
Ladies Finger	112.91	115.60	115.62	115.59	120.90
Radish	65.84	13.25	67.71	67.90	69.16
Others	111.17	217.70	121.69	127.16	128.58
Total	1250.91	1279.34	1301.87	1311.35	1332.57

(Source: <http://wbpspm.gov.in/publications/District%20Statistical%20Handbook>,
Accessed on September 2022)

The floriculture of the district consists of various types of orchids, decorative plants, temperate and tropical flowers, etc. Flowers like Tuberose, Marigold, Rose and seasonal flowers are main of the district (Table 5.6). In this district the most popular flowers are rose and marigold.



Table 5.6: Production of Flowers in the district

Name of Flowers	Production					
	Unit	2009-10	2010-11	2011-12	2012-13	2013-14
Rose	Crore Cut Flower	10.500	11.200	11.100	11.000	10.600
Chrysanthemum	"	0.718	0.718	0.718	0.700	1.010
Gladiolus	"	3.510	4.340	4.345	4.400	4.600
Tuberose	"	42.400	51.690	54.000	55.400	56.560
Marigold	Thousand M.T.	14.050	15.400	15.900	16.100	16.250
Jasmine	"	-	-	-	-	-
Seasonal Flower	"	1.992	2.007	2.007	2.015	2.016
Misc. Flower	"	1.189	1.195	1.195	1.200	1.200

(Source: <http://wbpspm.gov.in/publications/District%20Statistical%20Handbook>,

Accessed on September 2022)

5.4 Mining

There is no mineral of economic importance in the area except silt, silty clay and sand. The silt and silty clay of Bhagirathi and Jalangi flood plains are extensively utilised for manufacturing clay products such as bricks, tiles, terrakota articles and earthen ware. The earthen ware and other pottery works are located at Krishnanagar. Point bar sands of Jalangi River are locally used as a building material. Micaceous sand is used to a wide extent in brick kilns, located in many parts of the district.



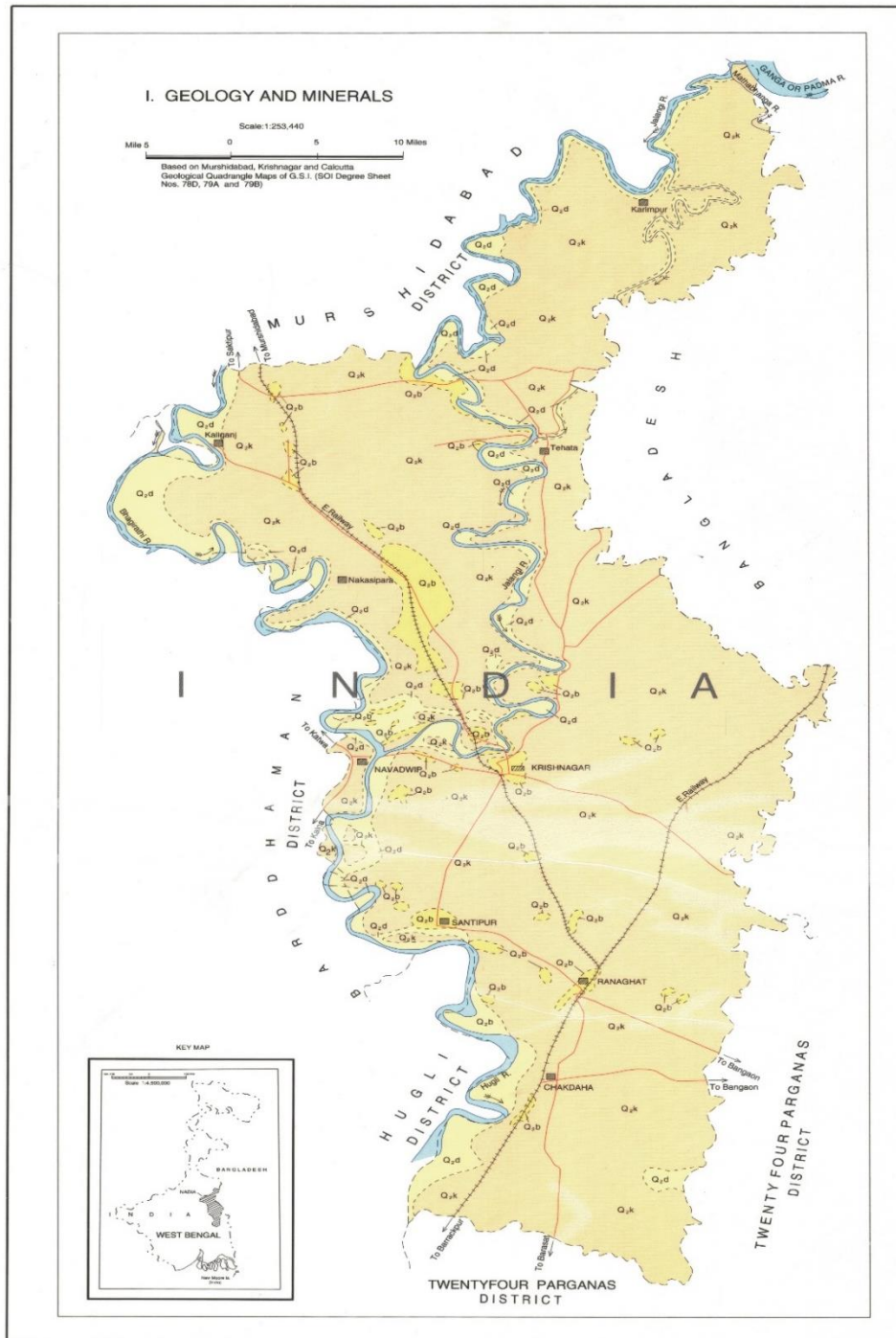
6 Geology

The district of Nadia is situated in the heart of Bengal delta occupying the alluvial plains around Ganga River and its tributaries. The entire area of the district is completely blanketed by a sequence of Quaternary sediments of Ganga-Bhagirathi River system. The surficial Quaternary deposits constitute three litho stratigraphic units. In the order of diminishing antiquity these are i) Bethuadahar formation (Khagaria formation), ii) Chinsura formation (Katawa formation/Panskura formation) and iii) Hugli formation (Bhagirathi formation) The Bethuadahari formation is lithologically characterized by yellow and pale brown very fine sand silt and silty clay with soft iron nodules and caliche nodules. Caliche is invariably present in this formation. This formation remains as sporadic inliers within the Chinsura formation. The Chinsura formation is characterised by an alternation of oxidized to unoxidized fine to very fine sand and silt with clay and it lies in the relatively lower elevation than the oldest Bethuadahari formation. The sediments of this formation are absolutely devoid of any ferruginous and calcareous concretions. The Hugli formation is characterised by the present-day flood plain deposits of unoxidised and less compact, fine to very fine silver-grey micaceous sand, silt and dark grey clay occurring at lowermost topographic level around river banks.

Table 6.1: Geological succession of Nadia

AGE	GEOLOGICAL UNIT	LITHOLOGY
Late Holocene to Recent	Hugli Formation	Fine sand, silt and clay
Middle to Late Holocene	Chinsura Formation	Alternate layers of sand, silt and dark grey clay
Early to Middle Holocene	Bethuadahari Formation	Grey silt and light-yellow clay with iron concretions

(Source: District Resource Map Compiled by DK Bose, GSI, 2008)



LEGEND

LITHOLOGY	GEOLOGICAL UNIT	AGE
Q _{1d} Fine sand, silt and clay	Hugli formation (Bhagrathi formation)	Late Holocene to Recent
Q _{1k} Alternate layers of sand, silt and dark grey clay (natural levee & flood basin zone)	Chinsura formation (Akhona formation / Panskur formation)	Middle to Late Holocene
Q _{1k} Gray silt and light yellow clay with iron concretions (Landforms of higher level)	Bethuadaha formation (Magura formation)	Early to Middle Holocene

**Figure 6.1: Geological map of Nadia district
 (Source: District Resource Map Compiled by DK Bose, GSI, 2008)**



7 Mineral wealth

7.1 Overview of mineral resources:

The entire area of the district is completely blanketed by a sequence of Quaternary sediments of Ganga-Bhagirathi River system. There are no mineral occurrences in the district except silt, silty clay and sand of Bhagirathi and Jalangi flood plains.

7.2 Details of Resources:

The riverbed mineral resources of the district whose categorization and estimation have been done are furnished in this section.

7.2.1. Sand and other riverbed minerals:

I. Drainage:

Rivers of District Nadia are described as off shoots of the rivers Padma or Ganga. The Bhagirathi or Hugli River, Jalangi and Mathabhanga-Churni rivers are collectively known as Nadia Rivers. The collective flow of the rivers Jalangi, Bhairab-Jalangi and Mathabhanga-Churni join river Bhagirathi.

River Bhagirathi: Also called Hugli River flowing along the Western boundary of Nadia district. It flows through Southwards. In its upper reaches, the river is generally known as Bhagirathi, until it reaches Hugli. This river was an important transportation channel and enroute of trade for foreign countries in the early history of Bengal. The British might have chosen Calcutta as their base because of presence of the rivers for easy access for trade with this region. Many historic battles were fought in the bank of Bhagirathi River and the Battle of Plassey is probably the most notable one. Like the Ganges, the Bhagirathi-Hugli River is considered as sacred river to Hindus.

River Jalangi: The Jalangi river leaves the Padma River at the extreme North of the district and after forming the greater part of the North-Western boundary, enters in Tehatta below Palashipara. It pursues a tortuous course towards Southern direction until it reaches Krishnagar from which point it proceeds due West until it falls into the Bhagirathi. The Jalangi is a modern stream, which is apparently opened up long after the Bhairab River ran as a strong stream in a south easterly direction. The Bhairab once flowed from the Ganges, across the present beds of the Jalangi, and further eastwards towards Faridpur, Bangladesh. The Bhairab is no more a very active river.

River Mathabhanga: This river flows between Karimpur in Nadia and Daulatpur in Bangladesh and re-enters the district again at Krishnaganj. The river later bifurcates near Majidia in Nadia District in India, creating two rivers, Ichamati and Churni.



Churni River: River Churni is a stream in the Nadia district of the Indian state of West Bengal. It is a distributary of the Mathabhanga River. After originated from Mathabhanga, the Churni flows through Shibnivas, Hanskhali, Birnagar, Aranghata, and Ranaghat, and finally joins River Bhagirathi at Shivpur, Nadia-Hooghly near Chakdaha.

Ichamati River: Ichamati River (also spelt Ichhamati), is a trans-boundary river which flows through India and Bangladesh and also forms the boundary between the two countries. The river is facing the problem of siltation leading to thin flow of water in the dry season and floods in the rainy season. It bifurcates from River Mathabhanga near Majidia in Nadia District in India, traverses a length of 19.5 kilometers through Nadia district India and then enters Bangladesh near Mubarakpur.

a) Drainage System with description of main rivers

Table 7.1: Drainage system with description of main rivers

Sl.No.	Name of the River	Area drained (Sq.km)	% Area drained in the district
1	Bhagirathi	14.88	0.37%
2	Churni	20.89	0.53%
3	Mathabhanga	97.88	2.49%
4	Ichamati	9.86	0.25%
5	Jalangi	17.63	0.44%

b) Salient Features of important rivers and streams

Table.7.2: Salient Features of important rivers and streams

S.No.	Name of the River or Stream	Total Length in District (in Km)	Place of origin	Altitude at Origin
1	Bhagirathi	22.56	Jangipur	26 m
2	Churni	63.12	Majhdia, West Bengal	12 m
3	Mathabhanga	174.79	Mohishkundi	15 m
4	Ichamati	21.93	Hasabpur, West Bengal	11 m
5	Jalangi	136.72	Padma (Murshidabad), West Bengal	21 m



II. Annual deposition of riverbed minerals

Annual deposition of riverbed minerals is dependent on various factors which are explained below.

A) Geomorphological studies

Geomorphological characteristic of a river is foremost factor for annual deposition of sedimentary load. The study includes following parameter:

i) Place of Origin

Details of origin of rivers of Nadia District are furnished in Table 7.3.

Table 7.3: Place of Origin of important rivers and streams

S.No.	Name of the River or Stream	Place of origin
1	Bhagirathi	Jangipur
2	Churni	Majhdia, West Bengal
3	Mathabhanga	Mohishkundi
4	Ichamati	Hasabpur, West Bengal
5	Jalangi	Padma (Murshidabad), West Bengal

ii) Catchment Area

Rivers of District Nadia are described as off shoots of the rivers Padma or Ganga. The Bhagirathi or Hugli River, Jalangi and Mathabhanga-Churni rivers are collectively known as Nadia Rivers. The collective flow of the rivers Jalangi, Bhairab-Jalangi and Mathabhanga-Churni join river Bhagirathi.

iii) General profile of river stream

River profile has been studied along the cross-section lines which was chosen based on the drastic variation of the river widths, proximity of the operating sand 'ghats' and the position of the sand bars.

Relative disposition of rivers in Nadia district along with the distribution of the section lines are shown in Figure 7.1. River profile section and cross section views are presented in Figures 7.2 and 7.3.

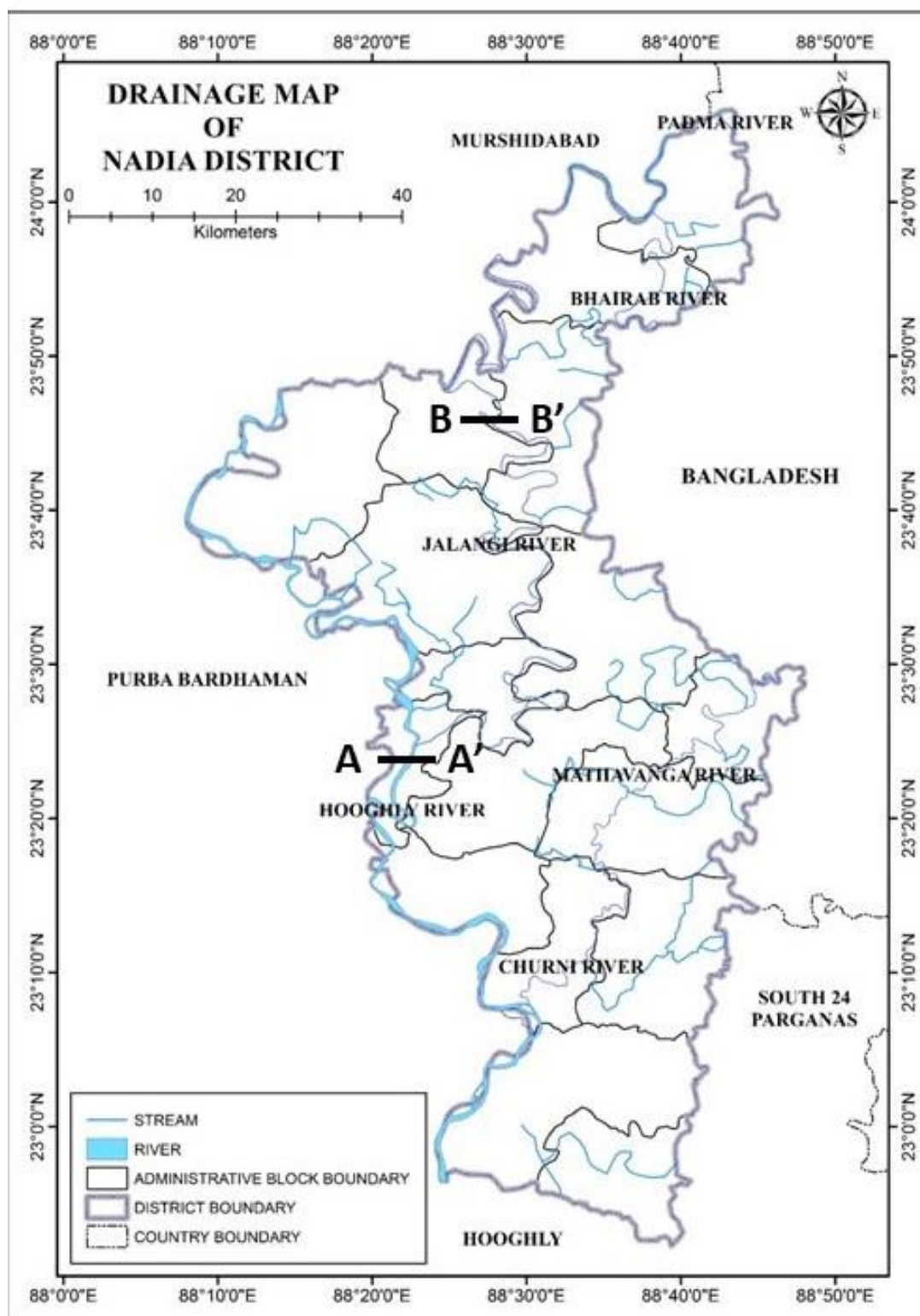


Figure 7.1: Map showing the major rivers along which profile section drawn

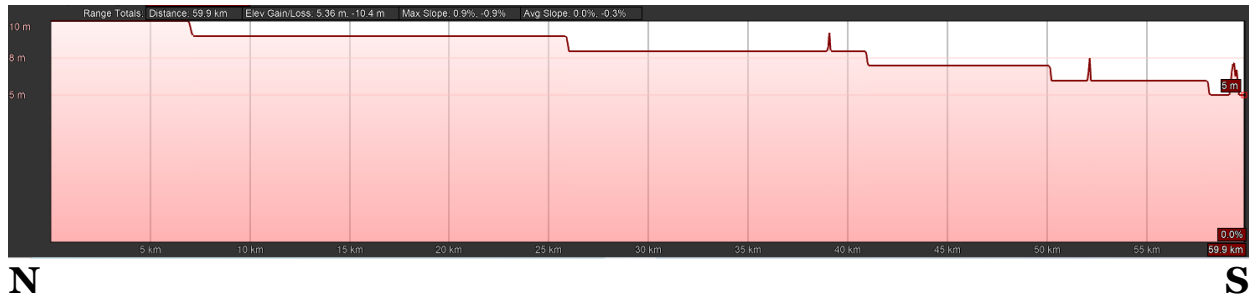


Figure 7.2A: Profile section of Bhagirathi River

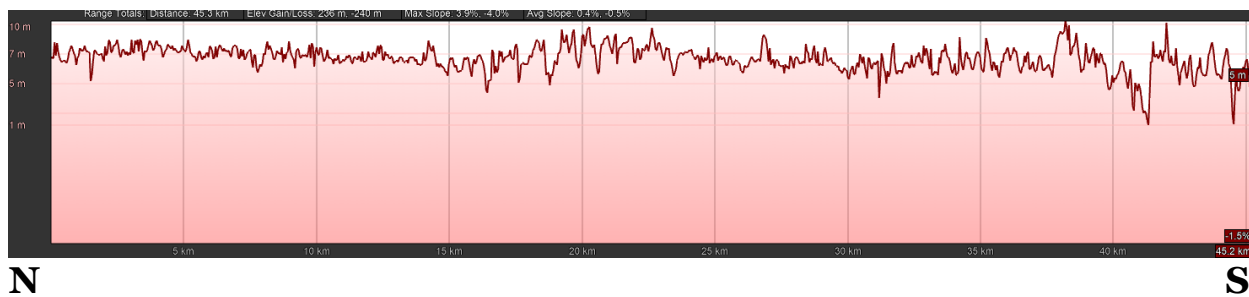


Figure 7.2B: Profile section of Jalangi River

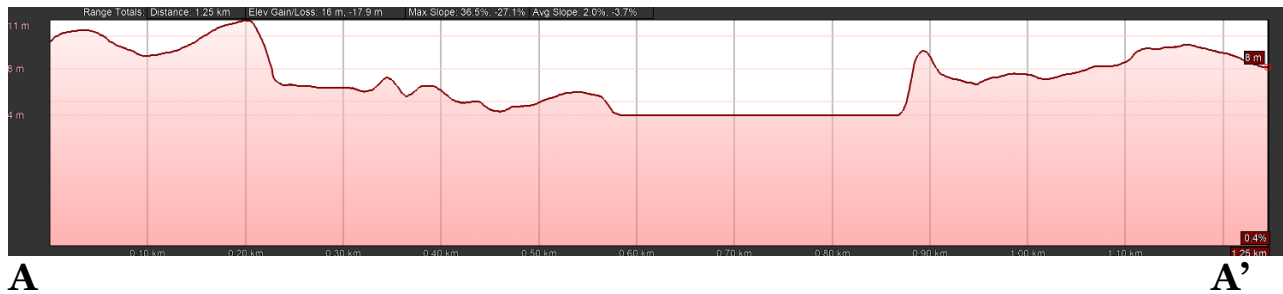


Figure 7.3A: Cross section view of Bhagirathi River

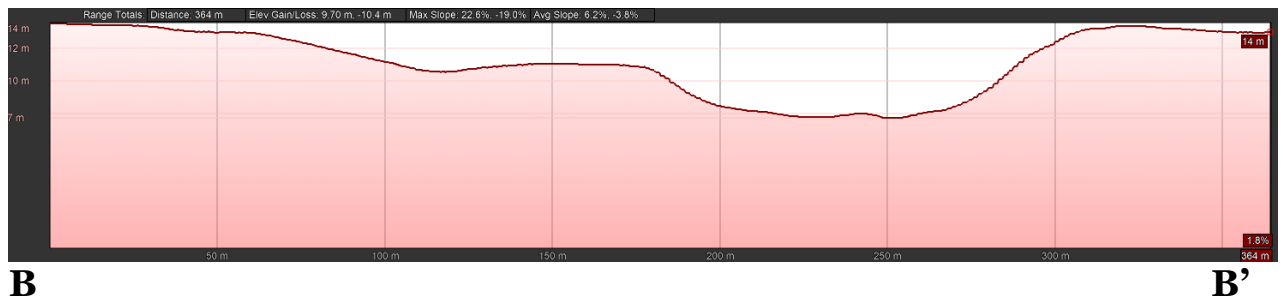


Figure 7.3B: Cross section view of Jalangi River



iv) Annual deposition factor

Annual deposition of riverbed materials depends on various factors, such as process of deposition, mode of sediment transport, sediment transport rate, and sediment yield of the river.

1. Process of deposition

Deposition is the processes where material being transported by a river is deposited. Deposition occurs when the forces responsible for sediment transportation are no longer sufficient to overcome the forces of gravity and friction, creating a resistance to motion; this is known as the null-point hypothesis. This can be when a river enters a shallow area or towards its mouth where it meets another body of water.

The principle underlying the null point theory is due to the gravitational force; finer sediments remain in the water column for longer durations allowing transportation outside the surf zone to deposit under calmer conditions. The gravitational effect or settling velocity determines the location of deposition for finer sediments, whereas a grain's internal angle of friction determines the deposition of larger grains on a shore profile.

Deposition of non-cohesive sediments: Large-grain sediments are transported by either bedload or suspended load. In case of bedload, when there is insufficient bed shear stress and fluid turbulence is insufficient to keep the sediment moving, the grains loses horizontal movement and rapidly come to rest. In case of suspended load the grains travel longer distance vertically through the fluid before coming to rest.

Deposition of cohesive sediments: The cohesion of sediment occurs with the small grain sizes associated with silts and clays, or particles smaller than 4Φ or $62.5 \mu\text{m}$. If these fine particles remain dispersed in the water column, Stokes law applies to the settling velocity of the individual grains. The face of a clay platelet has a slight negative charge whereas the edge has a slight positive charge. When two platelets come into close proximity with each other the face of one particle and the edge of the other are electrostatically attracted, and then have a higher combined mass which leads to quicker deposition through a higher fall velocity.

2. Mode of sediment transport in rivers

Sediment transport in rivers provides a dynamic linkage between flow and channel form. Mainly there are three processes by which sediment load is transported and these are (i) rolling or traction, in which the particle moves along a sedimentary bed but is too heavy to be lifted from it; (ii) saltation; and (iii) suspension, in which particles remain permanently above the bed, sustained there by the turbulent flow of the water.

Another name for sediment transport is sediment load. The total load includes all particles moving as bedload, suspended load, and wash load.



Bed load: Bedload is the portion of sediment transport that rolls, slides or bounces along the bottom of a waterway. This sediment is not truly suspended, as it sustains intermittent contact with the streambed, and the movement is neither uniform nor continuous. Bedload occurs when the force of the water flow is strong enough to overcome the weight and cohesion of the sediment. While the particles are pushed along, they typically do not move as fast as the water around them, as the flow rate is not great enough to fully suspend them. Bedload transport can occur during low flows (smaller particles) or at high flows (for larger particles). Approximately 5-20% of total sediment transport is bedload. In situations where the flow rate is strong enough, some of the smaller bedload particles can be pushed up into the water column and become suspended.

Suspended load: While there is often overlap, the suspended load and suspended sediment are not the same thing. Suspended sediment are any particles found in the water column, whether the water is flowing or not. The suspended load, on the other hand, is the amount of sediment carried downstream within the water column by the water flow. Suspended loads require moving water, as the water flow creates small upward currents (turbulence) that keep the particles above the bed. The size of the particles that can be carried as suspended load is dependent on the flow rate. Larger particles are more likely to fall through the upward currents to the bottom, unless the flow rate increases, increasing the turbulence at the streambed. In addition, suspended sediment will not necessarily remain suspended if the flow rate slows.

Wash load: The wash load is a subset of the suspended load. This load is composed of the finest suspended sediment (typically less than 0.00195 mm in diameter). The wash load is differentiated from the suspended load because it will not settle to the bottom of a waterway during a low or no flow period. Instead, these particles remain in permanent suspension as they are small enough to bounce off water molecules and stay afloat. However, during flow periods, the wash load and suspended load are indistinguishable.

3. Sediment Transport Rate

The rate at which sediment is moved past a cross section of the flow is called either the sediment transport rate or the sediment discharge. It is related to the sediment load, but it's different, just because different fractions of the sediment load are transported at different rates. It can be measured in mass per unit time, or in weight per unit time, or in volume per unit time. The sediment transport rate is commonly denoted by Q_s .

4. Estimation of Sedimentation

There are two approaches to obtaining values describing sediment loads in streams. One is based on direct measurement of the quantities of interest, and the other on relations developed between hydraulic parameters and sediment transport potential.

The total bed material load is equal to the sum of the bedload and the bed material part of the suspended load; in terms of volume transport per unit width, $q_t = q_b + q_s$. Here wash load,



i.e. that part of the suspended load that is too fine to be contained in measurable quantities in the river bed, is excluded from q_s .

There are number of equations to compute the total sediment load. Most of these equations have some theoretical and empirical bases.

In 1973, Ackers and White developed a general theory for sediment transport which was calibrated against the flume-transport data then available. Their functions have been widely accepted as one of the best available procedures for estimating the total bed load over the full width of the flow section.

Dendy Bolton formula is often used to calculate the sedimentation yield. But use of these equations to predict sediment yield for a specific location would be unwise because of the wide variability caused by local factors not considered in the equations development. However, they may provide a quick, rough approximation of mean sediment yields on a regional basis. Computed sediment yields normally would be low for highly erosive areas and high for well stabilized drainage basins with high plant density because the equations are derived from average values. The equations express the general relationships between sediment yield, runoff, and drainage area.

5. Sediment Yield

The water that reaches a stream and its tributaries carries sediment eroded from the entire area drained by it. The total amount of erosional debris exported from such a drainage basin is its sediment load or sediment discharge and the sediment yield is the sediment discharge divided by the total drainage area of the river upstream of the cross section at which the sediment discharge is measured or estimated. Sediment yield is generally expressed as a volume or weight per unit area of drainage basin—e.g., as tons per square kilometre. Further, sediment yield is usually measured during a period of years, and the results are thus expressed as an annual average.

v) Replenishment Study (As per EMGSM guidelines, 2020):

Replenishment study for a river solely depends on estimation of sediment load for any river system and the estimation is a time consuming and should be done over a period. The process in general is very slow and hardly measurable on season-to-season basis except otherwise the effect of flood is induced which is again a cyclic phenomenon. Usually, replenishment or sediment deposition quantities can be estimated in the following ways as given below:

- A. Replenishment study based on satellite imagery involves demarcation of sand bars potential for riverbed mining. Both pre and post monsoon images need to be analysed to established potential sand bars. Volume estimation of sand is done by multiplying Depth and Area of the sand bar. The sand bars are interpreted with the help of satellite imagery. Ground truthing has been done for 100% of the total identified sand bars. During ground truthing, width and



length of each segment were physically measured. It has also been observed that in few cases, sand bars have attained more than 3 meters height from the average top level of the river beds. Considerations of sand resources have been restricted within 3 meters from the average top surface of the river bed.

- B. Direct field measurement of the existing leases involving estimation of the volume difference of sand during pre- and post-monsoon period. With systematic data acquisition, a model has developed for calculation of sediment yield and annual replenishment with variable components.
- C. The replenishment estimation based on a theoretical empirical formula with the estimation of bed-load transport comprising of analytical models to calculate the replenishment estimation.

A. Replenishment estimation based on satellite imagery study

Sedimentation in any river is dependent on sediment yield which depends on soil erosion in river's catchment area. Catchment yield is computed using Strange's Monsoon runoff tables for runoff coefficient against rainfall return period. Peak flood discharge is calculated by using Dickens, Jarvis and Rational formula at 25, 50 and 100 years return period. The estimation of bed load transport is done using Ackers and White Equation.

Methodology Adopted: To delineate replenishment percentage in the river bed of the district, below mentioned steps have been followed.

- **Field data collation:**

Field data collations were done during June 2020 for pre monsoon period and during December 2020 for post monsoon period for the river ghats on continuous basis. In both the cases, relative elevation levels were captured through GPS/DGPS/ Electronic Total Station. Thickness of the sand bars was measured through sectional profiles. In few instances, sieve analysis of the sands was carried out to assess their particle size distribution.

- **Selection of Study profiles:**

Study profiles are selected based on the occurrence of the sand bars in the channel profiles. Aerial extents of each of the profiles are mapped from satellite imagery.

- **Data Compilation:**

Following data were compiled for generation of the annual replenishment report:

- Elevation levels of the different sand ghats and sand bars as measured at site.
- Extent of the sand bars are measured from the pre monsoon satellite imagery.
- Sand production data of the district.



- **Assessment of sediment load in the river:**

Assessment of sediment load in a river is subjective to study of the whole catchment area, weathering index of the various rock types which acts as a source of sediments in the specific river bed, rainfall data over a period not less than 20 years, and finally the detail monitoring of the river bed upliftment with time axis. Again, the sediment load estimation is not a dependent variable of the district boundary, but it largely depends upon the aerial extent of the catchment areas, which crosses the district and state boundaries.

- **Estimation of annual sand deposition:**

The major rivers of Nadia district are, Bhagirathi River, Mathabhanga River, Jalangi River and Padma River. Churni River and Ichamati River are the tributary of Mathabhanga River. Planning has been done for systematic sand mining in the rivers.

While calculation of the areas of sand bar, a classification system has been adopted with three categories of land identified within the channel areas which is as follows:

- The untapped sand bars.
- The sand bars worked in the pre-monsoon period.
- Main channel course within the channel.

A summary of sediment load comparison between pre- and post-monsoon periods for different rivers Nadia district is given in Table 7.4 and details of each sand bars along with their sand resources in pre monsoon and post monsoon period are provided in Annexure-2. Maps showing distribution of sand bars on rivers of the Nadia district during pre- and post-monsoon periods are depicted in Plate-2A and 2B respectively.

Table 7.4: Sediment Load comparison between Pre- and Post-monsoon periods for different rivers

River Name	Pre-Monsoon no of ghats	Post-Monsoon no of ghats	Pre-Monsoon Sediment Load (Mcum)	Post Monsoon Sediment Load (Mcum)	Difference (Mcum)	Difference (%)
Hooghly	15	11	2.18	1.84	-0.34	-16
Padma	2	2	0.35	0.35	0.00	0
Total	17	13	2.537970123	2.19612026	-0.34185	-8

Thus, in Nadia district, about 0.34 million cum of sand has been found as a difference in volume when compared between pre- and post-monsoon sand reserve data. Therefore, 92% replenishment and aggradation rate for the year has been estimated.



Long-term satellite imagery study has also been carried out for sand producing rivers of Nadia district to analyse the changes in river course. A representative map, showing long-term erosion-accretion areas on both the banks of Hooghly River, Nadia has been prepared and furnished in Plate No. 5. Map shows changes in river channel through erosion and accretion of river bank and in the process the river shows narrowing of width of the river course by almost 450m from 2001 to 2021.

B. Replenishment estimation based on field investigation

The study carried out on existing mining leases to assess the annual replenishment rate. The study involves of measurement of the depth and area of the mining leases through DGPS/Total station just before the closure of the mines in pre-monsoon period and the same areas are resurveyed in the post-monsoon period. The differences between the depths of the surveyed areas are accounted for the volumetric measurement of the replenished sand.

In case of Nadia district, there was no existing mining leases present in the district therefore estimation of replenishment rate based on field investigation has not been carried out.

C. Replenishment estimation based on a empirical formula:

The river reaches with sand provide the resource and thus it is necessary to ascertain the rate of replenishment of the mineral. Regular replenishment study needs to be carried out to keep a balance between deposition and extraction.

Sediment load deposition in a river is dependent on catchment area, weathering index of the various rock types of the catchment area, land-use pattern of the area, rainfall data and grain size distribution of the sediments. Again, the sediment load estimation is not a dependent variable of the district boundary, but it largely depends upon the aerial extents of the catchment areas, which crosses the district and state boundaries.

i. Methodology of the study:

The replenishment estimation is based on a theoretical empirical formula with the estimation of bedload transport comprising of analytical models to calculate the replenishment estimation. Sedimentation in riverbed depends on catchment yield, peak flood discharge due to rainfall, bed load transport rates and sediment yield characteristic of the river. Some of the common methods used for replenishment study are explained below.

a. Catchment Yield Calculation:

The total quantity of surface water that can be expected in a given period from a stream at the outlet of its catchment is known as yield of the catchment in that period. The annual yield from a catchment is the end product of various processes such as precipitation, infiltration and evapotranspiration operating on the catchment.

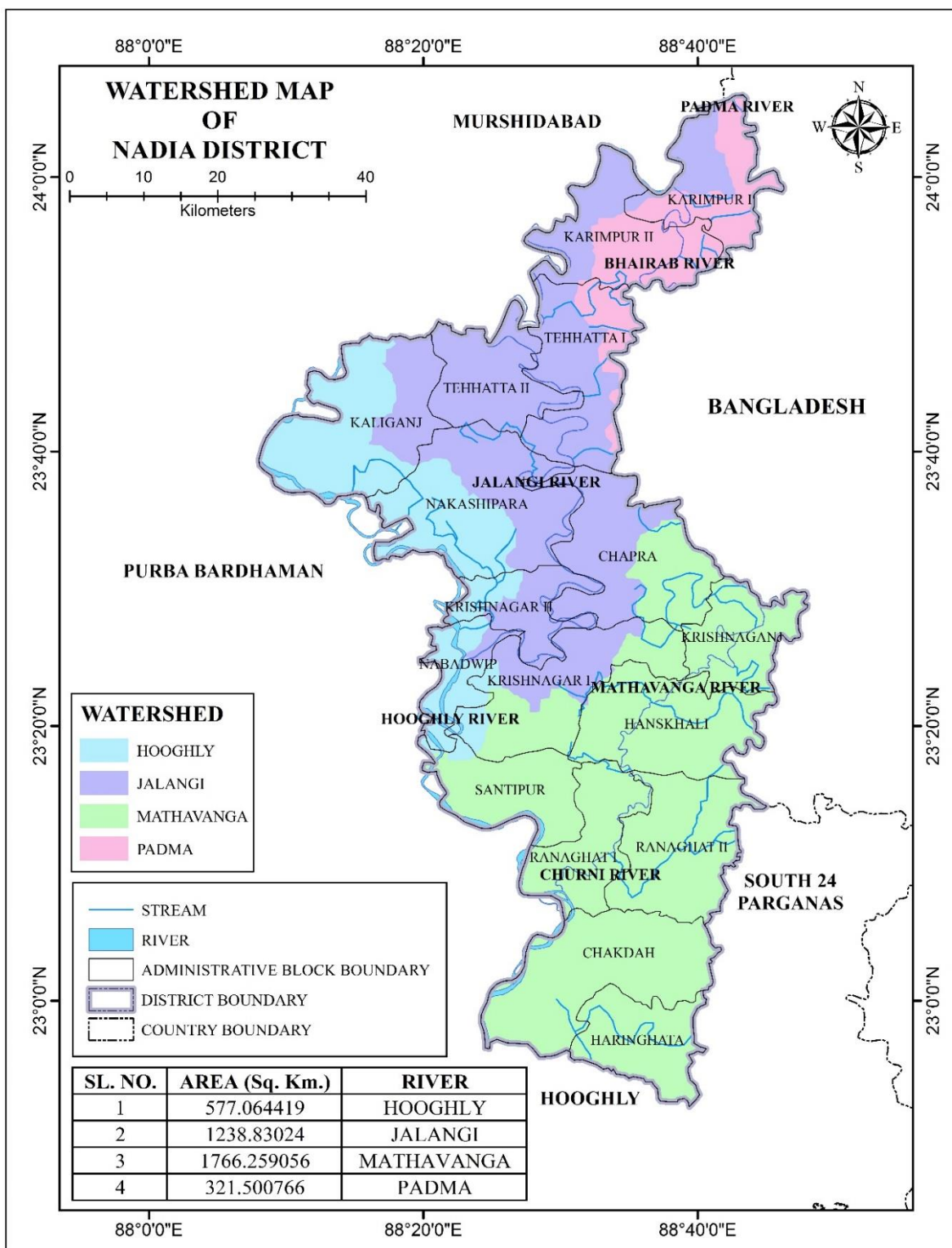


Figure 7.4: Watershed map of Nadia district (Source: World Wild Fund for Nature, September 2020)



Catchment Yield can be estimated using following formula:

Eq. 1: Catchment Yield (m³) = Catchment area (m²) × Runoff coefficient (%) × Rainfall (m)

The runoff generated from the watershed is analyzed using Strange's Table to get the reliable yield results. Runoff from a catchment is dependent upon annual rainfall as well as catchment characteristics such as soil types and the type of groundcover / land usage. Remote sensing was used for demarcation of catchment area relevant to the drainage system. Runoff coefficient of the catchment has been established based on Strange's Table.

Strange (1892) studied the available rainfall and runoff and obtained yield ratios as functions of indicators representing catchment characteristics (Subramanya, 2008). Catchments are classified as good, average and bad according to the relative magnitudes of yield of sediment. For example, catchment with good forest cover and having soils of high permeability would be classified as bad, while catchment having soils of low permeability and having little or no vegetal cover is termed good. Based on the study Strange established runoff coefficient table as given in Table 7.5.

Table 7.5: Runoff coefficient of the catchment based on Strange's table

Total monsoon rainfall (mm)	Runoff coefficient (%)			Total monsoon rainfall (mm)	Runoff coefficient (%)		
	Good catchment	Average catchment	Bad catchment		Good catchment	Average catchment	Bad catchment
25.4	0.1	0.1	0.1	787.4	27.4	20.5	13.7
50.8	0.2	0.2	0.1	812.8	28.5	21.3	14.2
76.2	0.4	0.3	0.2	838.2	29.6	22.2	14.8
101.6	0.7	0.5	0.3	863.6	30.8	23.1	15.4
127	1	0.7	0.5	889	31.9	23.9	15.9
152.4	1.5	1.1	0.7	914.4	33	24.7	16.5
177.8	2.1	1.5	1	939.8	34.1	25.5	17
203.2	2.8	2.1	1.4	965.2	35.3	26.4	17.6
228.6	3.5	2.6	1.7	990.6	36.4	27.3	18.2
254	4.3	3.2	2.1	1016	37.5	28.1	18.7
279.4	5.2	3.9	2.6	1041.4	38.6	28.9	19.3
304.8	6.2	4.6	3.1	1066.8	39.8	29.8	19.9
330.2	7.2	5.4	3.6	1092.2	40.9	30.6	20.4
355.6	8.3	6.2	4.1	1117.6	42	31.5	21
381	9.4	7	4.7	1143	43.1	32.3	21.5
406.4	10.5	7.8	5.2	1168.4	44.3	33.2	22.1
431.8	11.6	8.7	5.8	1193.8	45.4	34	22.7
457.2	12.8	9.6	6.4	1219.2	46.5	34.8	23.2
482.6	13.9	10.4	6.9	1244.6	47.6	35.7	23.8
508	15	11.3	7.5	1270	48.8	36.6	24.4



Total monsoon rainfall (mm)	Runoff coefficient (%)			Total monsoon rainfall (mm)	Runoff coefficient (%)		
	Good catchment	Average catchment	Bad catchment		Good catchment	Average catchment	Bad catchment
533.4	16.1	12	8	1295.4	49.9	37.4	24.9
558.8	17.3	12.9	8.6	1320.8	51	38.2	25.5
584.2	18.4	13.8	9.2	1346.2	52.1	39	26
609.6	19.5	14.6	9.7	1371.6	53.3	39.9	26.6
635	20.6	15.4	10.3	1397	54.4	40.8	27.2
660.4	21.8	16.3	10.9	1422.4	55.5	41.6	27.7
685.8	22.9	17.1	11.4	1447.8	56.6	42.4	28.3
711.2	24	18	12	1473.2	57.8	43.3	28.9
736.6	25.1	18.8	12.5	1498.6	58.9	44.4	29.4
762	26.3	19.7	13.1	1524	60	45	30

Rainfalls return period for 25, 50 and 100 years calculated as below:

As per Weibull's Formula (Subramanya, 2008),

Return period/Recurrence interval = $(n+1)/m$

Where: n number of years on record;

m is the rank of observed occurrences when arranged in descending order.

b. Peak Flood Discharge Calculation:

The term “peak discharge” stands for the highest concentration of runoff from the basin area. The accurate estimation of flood discharge remains one of the major challenges as it depends upon physical characteristic of the catchment area and the flood intensity, duration and distribution pattern. There have been many different approaches for determining the peak runoff from an area. As a result, many different models (equations) for peak discharge estimation have been developed. Formulas used for Peak Discharge calculation areas below:

As per Dicken's formula (Subramanya, 2008),

$$\text{Eq. 2: } Q = CA^{3/4}$$

Where: Q is Maximum flood discharge (m^3/sec) in a river

A is Area of catchment in Sq. Km

C is Constant whose value varies widely between 2.8 to 5.6 for catchments in plains and 14 to 28 for catchments in hills

As per Jarvis formula (Subramanya, 2008),

$$\text{Eq. 3: } Q = CA^{1/2}$$

Where: Q is Maximum flood discharge (m^3/sec) in a river

A is Area of catchment in Sq. Km



C is Constant whose value varies between 1.77 as minimum and 177 as maximum. Limiting or 100 percent chance floods are given by the value of C of 177

As per Rational formula ((Subramanya, 2008),

$$\text{Eq. 4: } Q = CIA$$

Where: Q is Maximum flood discharge (m³/sec) in a river

A is Area of catchment in Sq. Km

C is Runoff coefficient which depends on the characteristics of the catchment area. It is a ratio of runoff: rainfall

I is Intensity of rainfall (in m/sec)

c. Bed Load Transport Calculation:

The most important problems in river engineering are to predict bed load transport rates in torrential floods flowing from mountainous streams. Three modes of transport namely; rolling, sliding and saltation may occur simultaneously in bed load transport. The different modes of transportation are closely related and it is difficult, if not impossible, to separate them completely. There are number of equations to compute the total sediment load. Most of these equations have some theoretical and empirical bases.

Ackers and White Equation:

Ackers and White (1973) used dimensional analysis based on flow power concept and their proposed formula is as follows.

$$\text{Eq. 5: } C_t = C_s G_s (d_{50}/h) (v/U_*)^{n'} [(F_{gr}/A_1) - 1]^m$$

The dimensionless particle d_{gr} is calculated by:

$$\text{Eq. 6: } d_{gr} = d_{50} (g(G_s - 1)/v^2)^{1/3}$$

The particle mobility factor F_{gr} is calculated by:

$$\text{Eq. 7: } F_{gr} = (U \times n' / (G_s - 1) g d_{50})^{1/2} \times (V / (5.66 \log(10h/d_{50}))^{1-n'}$$

Where,

- A_1 = Critical particle mobility factor
- C_s = Concentration coefficient in the sediment transport function
- C_t = Total sediment concentration
- d_{50} = Median grainsize
- d_{gr} = Dimensionless particle diameter
- F_{gr} = Particle mobility parameter
- g = Acceleration of gravity
- D_s, S_g = Specific gravity
- h = Water depth
- m = Exponent in the sediment transport function
- n' = Manning roughness coefficient
- U_* = Shear velocity
- V = Mean flow velocity
- ν = Kinematic viscosity



Meyer – Peter’s equation (Source: Hydrologic Engineering Center):

Meyer-Peter’s equation (Ponce, 1989) is based on experimental work carried out at the Federal Institute of Technology, Zurich. Mayer-Peter gave a dimensionless equation based on rational laws. Mayer- Peter equation gave an empirical formula of bed load transport rates in flumes and natural rivers. The simplified Meyer-Peter’s equation is given below:

$$\text{Eq. 8: } g_b = 0.417[\tau_0 (\eta' / \eta)^{1.5} - \tau_c]^{1.5}$$

Where,

g_b = Rate of bed load transport (by weight) in N per m width of channel per second.

η' = Manning’s coefficient pertaining to grain size on an unrippled bed and Strickler formula i.e. $\eta' = (1/24) \times d^{1/6}$ where d is the median size (d_{50}) of the bed sediment in m.

η = The actual observed value of the rugosity coefficient on rippled channels. Its value is generally taken as 0.020 for discharges of more than 11cumecs, and 0.0225 for lower discharges.

τ_c = Critical shear stress required to move the grain in N/m² and given by equation $\tau_c = 0.687d_a$, where d_a is mean or average size of the sediment in mm. This arithmetic average size is usually found to vary between d_{50} and d_{60} .

τ_0 = Unit tractive force produced by flowing water i.e. $\gamma_w R S$. Truly speaking, its value should be taken as the unit tractive force produced by the flowing water on bed = $0.97\gamma_w R S$. R is the hydraulic mean depth of the channel (depth of flow for wider channel) and S is the bed slope.

d. Sediment Yield Estimation:

Sedimentation occurs as the velocity decreases along with its ability to carry sediment. Coarse sediments deposit first, then interfere with the channel conveyance, and may cause additional river meanders and distributaries. The area of the flowing water expands, the depth decreases, the velocity is reduced, and eventually even fine sediments begin to deposit. As a result, deltas may be formed in the upper portion of reservoirs. The deposited material may later be moved to deeper portions of the reservoir by hydraulic processes within the water body.

There are many sediment transport equations which are suitable for use in the prediction of the rate of replenishment of river. Some of the famous sediment transport equations are:

1. Dendy – Bolton Equation
2. Yang Equations
3. Engelund-Hansen Equation
4. Modified Universal Soil Loss Equation (MUSLE) developed by Williams and Berndt (1977)

Dendy – Bolton Equation:

Dendy – Bolton formula (Dendy and Bolton 1976) is often used to calculate the sedimentation yield because:-



- The formula uses catchment area and mean annual runoff as key determinants.
- It does not differentiate in basin wide smaller streams and their characteristics.
- Dendy and Bolton equation calculates all types of sediment yield i.e. sheet and rill erosion sediments, gully erosion sediments, channel bed and bank erosion sediments and mass movement etc.

Dendy-Bolton determined the combined influence of runoff and drainage area on sediment yield to compute the sediment yield. They developed two equations i.e. for run off less than 2 inch and for run off more than 2 inch, which are given below:

For run off less than 2 inch:

$$\text{Eq. 9: } (Q < 2\text{in}) S = 1289 \times (Q)^{0.46} \times [1.43 - 0.26 \text{ Log } (A)]$$

For run off more than 2 inches:

$$\text{Eq. 10: } (Q > 2 \text{ in}): S = 1958 \times (e^{-0.055 \times Q}) \times [1.43 - 0.26 \text{ Log } (A)]$$

Where: S = Sediment yield (tons/sq miles/yr)

Q = Mean Annual runoff (inch)

A = Net drainage are in sq mile

Dendy-Bolton formula is often used to calculate the sediment yield. But use of these equations to predict sediment yield for a specific location would be unwise because of the wide variability caused by local factors not considered in the equations development. However, they may provide a quick, rough approximation of mean sediment yields on a regional basis for preliminary watershed planning. Computed sediment yields normally would be low for highly erosive areas and high for well stabilized drainage basins with high vegetation density because the equations are derived from average values. The equations express the general relationships between sediment yield, runoff, and drainage area. Many variables influence sediment yield from a drainage basin. They include climate, drainage area, soils, geology, topography, vegetation and land use. The effect of any of these variables may vary greatly from one geographic location to another, and the relative importance of controlling factors often varies within a given land resource area. Studies revealed that sediment yield per unit area generally decreases as drainage area increases. As drainage area increases, average land slope usually decreases; and there is less probability of an intense rainstorm over the entire basin. Both phenomena tend to decrease sediment yield per unit area.

Modified Universal Soil Loss Equation (MUSLE):

Modified universal soil loss equation (MUSLE) for estimation of sediment yield is also widely used. MUSLE is a modification of the Universal Soil Loss Equation (USLE). USLE is an estimate of sheet and rill soil movement down a uniform slope using rainfall energy as the erosive force acting on the soil (Wischmeier and Smith 1978). Depending on soil characteristics (texture, structure, organic matter, and permeability) some soils erode easily while others are inherently more resistant to the erosive action of rainfall.



MUSLE is similar to USLE except for the energy component. USLE depends strictly upon rainfall as the source of erosive energy. MUSLE uses storm-based runoff volumes and runoff peak flows to simulate erosion and sediment yield (Williams 1995). The use of runoff variables rather than rainfall erosivity as the driving force enables MUSLE to estimate sediment yields for individual storm events. The generalized formula of MUSLE is as below:

$$\text{Eq. 11: } Y = 11.8 \times (Q \times qP)^{.56} \times K \times Ls \times C \times P$$

Where,

Y = sediment yield of stream (t/yr/km²),

Q = average annual runoff (m³),

K = soil erodibility factor,

qP = Highest discharge recorded (m³/s),

Ls = gradient/slope length,

C = cover management factor,

P = erosion control practice

ii. Estimation of Replenishment:

Nadia district is mainly drained by the Bhagirathi River, Mathabhanga River and Jalangi River. These rivers and its tributary rivers are forming the main catchment area.

For replenishment study, following assumption/calculation are taken in to consideration:

- Catchment area (Watershed area) against each river has been calculated based on remote sensing data.
- Rainfall runoff coefficient as per Strange's table for the catchment area is consider 38.2%, as the rainfall in the district is 1324mm during 2022 and the characteristic of the catchment of the district is average in nature.
- Peak flood discharge of the river of the district calculated based on Dicken's formula which is more applicable to north Indian and central Indian catchment. Here Dicken constant C is taken as 12 in present study as per published literature by Saha (2002).
- Bed load transport has not been computed in the regional aspect of the district, as the values are highly dependent on local factors such as particle mobility factor, roughness coefficient, Shear velocity, Mean flow velocity, Kinematic viscosity etc.
- Sedimentation yield calculated as per Dendy and Bolton formula as the equations express the general relationships between sediment yield, runoff, and drainage area.
- Computed sediment yields by Dendy Bolton formula normally would be low for highly erosive areas and high for well stabilized drainage basins with high plant density because the equations are derived from average values.
- Dendy and Boltan formula also says that actual sediment yield from individual drainage basin may vary 10-fold or even 100-fold from computed yields. Since the district river basins comprise sedimentary rocks with good average rainfall therefore the estimated replenishment is considered as 50-fold of computed results sediment yield.

The data estimated for each river in the district are given in Table 7.6.



Table 7.6: Replenishment parameter estimated for each river in the district

Estimation parameter	Hooghly	Padma
Catchment Area (m ²)	577100000	321500000
Annual Rainfall (m) (in 2020)	1.34	1.34
Strange Runoff coefficient (%)	39%	39%
Annual Run-off (m) (in 2020)	0.2948	0.2948
Catchment Yield (m ³)	297725890	165861850
Peak Flood Discharge (m ³ /sec)	44680657.13	28811573.62
Flow depth d (m)	0.8	1
Channel width b (m)	300	160
Mean velocity v (m/s)	0.1	0.1
Channel slope S _o (m/m)	0.001	0.001
Sediment Yield (Tons/year)	10301.1	14564.1
Estimated Annual Replenishment (in million m ³)	0.19290	0.27274

Sedimentation rate of a river is dependent on the annual rainfall of the district. Sedimentation rate for the period 2016-2020 of each river is presented in Table 7.7 and Figure 7.5.

Table 7.7: Year-wise sedimentation rate (tons/km²/yr) for last 5 years of each river

Year	Hooghly	Padma	Annual Rainfall
2017	25.07	28.42	1335
2018	64.84	78.14	948.2
2019	37.91	52.55	1128.8
2020	24.8	37.84	1324
2021	10.14	15.36	1489.3

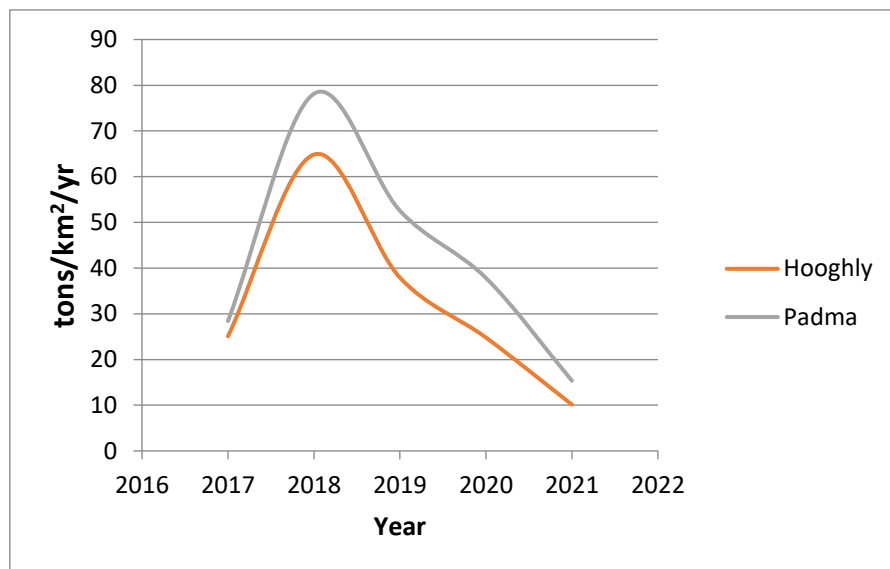


Figure 7.5: Graphical representation of year-wise sedimentation rate

The estimation of sedimentation rate based on empirical formula need critical analysis of different factors related to the LULC property of the catchment area, slope geometry, sediment erosion factor of catchment litho-type. This will help to assess replenishment rate more precisely.

vi) Total potential of minor mineral in the river bed

The sand producing rivers of the Nadia district are Bhagirathi River and Padma River. The total mineable potential sand resources are 0.76 Mcum.

B. Geological studies

i) Lithology of the catchment area

The district is largely alluvial plain, formed by the constant shifting of the various rivers of the Ganges Delta. The alluvial formation is found on the top of the surface in different layers and colours. The soil regions in this area are categorized as Ganga flat-lands, Ganges riverine lands and Ganges low lands. West of the district is the Kalantar, a low-lying tract of black clay soil stretching from Murshidabad district.

ii) Tectonics and structural behavior of rocks

Nadia District has thick Gangetic alluvium of quaternary age conceals the sub- surface geology. The physiography of the district is mostly plain. There are pockets of mild slopes here and there. The whole district is bisected by number of rivers and streams. Elevation ranges from 28.84 m above mean sea level (near Jairampur, block Karimpur) to 5.48 m above mean sea level (near Pamila, block Haringhata).



C. Climate Factors

i) Intensity of rainfall

The average annual rainfall in the district is 1245.06 mm. The variations in the annual rainfall within the district and from year to year are not large. The rainfall during the monsoon season – May to September – constitutes 75 percent of the annual rainfall; July and August are the rainiest months. The district receives a mean annual rainfall varying from 948.20 mm. to 1489.3 mm.

ii) Climate zone

Nadia district belongs to humid tropical monsoon climatic region. According to District Meteorological Department, there is very minor variation of temperature, rainfall and relative humidity in the district.

The climate of this district is characterised by an oppressive hot summer, high humidity nearly all the year round and a well distributed rainfall during the southwest monsoon season. The winter season is from about the middle of November and continues till the end of February. The period from March to May is the summer season. The southwest monsoon season commences by about the beginning of June and lasts till the end of September. October and the first half of November constitute the post-monsoon season.

iii) Temperature variation

Temperature along with other meteorological conditions of the district is more or less uniform. The cold season commences by about the middle of November when the temperature begins to decrease. January is the coldest month with the mean daily maximum and minimum temperature at 28.2°C and 10.7°C respectively. By about the end of February the temperature begins to increase and April is the hottest month, the mean maximum daily temperature is 38 °C and the mean minimum daily temperature is 30 °C.

Annual Deposition:

Annual deposition of riverbed minerals has been calculated on post-monsoon sand volume. The pre-monsoon sand volume of the river is the depleted resources and is replenished by the monsoon rainfall. For the purpose of estimating mineable mineral potential, the thickness of the sand bar considered extractable based on base flow level is given in Table 7.8.

Table 7.8: River wise thickness of sand bar considered mineable

River Name	Considered Mining Thickness (m)
Hooghly	2
Padma	2



Based on geomorphology, geology, climate and mineable thickness of sand bar the annual deposition of riverbed minerals has been estimated. Sand bar area recommended for mineral concession in the table is calculated as per the Enforcement and Monitoring Guidelines for Sand Mining (EMGSM) 2020. As per guidelines, mining depth restricted to 3 meters depth and distance from the bank is 1/4th of river width and not less than 7.5 meters. Also, mining is prohibited up to a distance of 1 kilometer (1 km) from major bridges and highways on both sides, or five times (5x) of the span (x) of a bridge/public civil structure (including water intake points) on up-stream side and ten times (10x) the span of such bridge on down-stream side, subjected to a minimum of 250 meters on the upstream side and 500 meters on the downstream side. The annual minable mineral potential is given in Table 7.9.

Table 7.9: Annual mineable mineral potential

Sl. No.	River or Stream	Portion of the river stream recommended for mineral concession	Length of area recommended for mineral concession (in meter)	Average width of area recommended for mineral concession (in meters)	Area recommended for mineral concession (in Sqm)	Mineable mineral potential (in Mcum) (60% of total mineral potential)
1	Hooghly	1%	5350.2925	279.3206	442545.191	0.53
2	Padma	43%	258522%	151.719	194679.196	0.23

III. Riverbed Mineral Potential

Process of disposition etc.:

Good quantities of silty sands are found to occur in part of rivers. Smaller patches are also available locally in the other smaller rivers as well. Table 7.10 summarizes the potential riverbed mineral deposits of the district.

Table 7.10: Resources of Potential Riverbed Mineral

Boulder (Mcum)	Pebbles/Gravel (Mcum)	Sand/White sand (Mcum)	Total Mineable, Mineral Potential (Mcum)
-	-	0.76	0.76

Based on satellite imagery study and field investigation, potential zones for riverbed deposits for each river of the district have been identified and the details of the zones are provided in Table 7.11.

Table 7.11: Potential Zone of Riverbed Mineral

Sl.No	Rivers or Streams	Location of potential zones				Area within prohibited zone as per rule 3 of WBMMC Rules, 2016 (in sq.m)
		Administrative Block	Zone	Co-ordinates		
				Latitude	Longitude	
1		KALIGANJ	HG_ZONE_1	23° 47' 46.268" N	88° 14' 8.217" E	0



Sl.No	Rivers or Streams	Location of potential zones				Area within prohibited zone as per rule 3 of WBMMC Rules, 2016 (in sq.m)
		Administrative Block	Zone	Co-ordinates		
				Latitude	Longitude	
2	HOOGHLY RIVER	NAKASHIPARA	HG_ZONE_2	23° 47' 32.314" N	88° 14' 4.847" E	0
				23° 33' 3.166" N	88° 21' 19.338" E	
		NABADWIP	HG_ZONE_3	23° 32' 56.313" N	88° 21' 32.444" E	35996.77011
				23° 23' 53.138" N	88° 22' 35.348" E	
		NABADWIP	HG_ZONE_4	23° 23' 24.981" N	88° 22' 25.281" E	13225.64313
				23° 22' 57.192" N	88° 21' 45.711" E	
		NABADWIP	HG_ZONE_5	23° 22' 44.086" N	88° 21' 38.211" E	0
				23° 21' 10.630" N	88° 20' 19.857" E	
		SANTIPUR	HG_ZONE_6	23° 21' 13.817" N	88° 20' 1.971" E	0
				23° 12' 58.711" N	88° 23' 58.394" E	
		CHAKDAH	HG_ZONE_7	23° 12' 36.919" N	88° 24' 57.603" E	0
				23° 0' 33.635" N	88° 25' 45.607" E	
		KARIMPUR I	PD_ZONE_1	23° 0' 27.981" N	88° 25' 16.996" E	22191.50475
				24° 5' 48.116" N	88° 42' 30.088" E	
			24° 4' 36.499" N	88° 43' 18.212" E		

NO MINING ZONE:

As per the Enforcement and Monitoring Guidelines for Sand Mining (EMGSM) 2020 the restricted zone for mining is a distance from the bank is ¼th of river width and not be less than 7.5 meters. Also, there is a no mining zone up to a distance of 1 kilometer (1 km) from major bridges and highways on both sides, or five times (5x) of the span (x) of a bridge/public civil structure (including water intake points) on up-stream side and ten times (10x) the span of such bridge on down-stream side, subjected to a minimum of 250 meters on the upstream side and 500 meters on the downstream side.

No mining zone has been marked for an area up to a width of 100 meters from the active edge of embankments. Also, the concave side of the river is marked as no mining zone, as mining in this area will affect the course of river in future and will erode the river bank. A representative map of no mining zone shown on River Hooghly of Nadia district is given in Figure 7.6. Table 7.12 summarized the area of no mining zones demarcated for each river of the district.

Bethuadahari Wildlife Sanctuary is situated in the Bethuadahari town of Nadia District considered as no mining zones.



Table 7.12: No mining zone in the district

RIVER NAME	BLOCK NAME	ZONE	RESTRICTED AREA (SQ MTS)
HOOGLY RIVER	KALIGANJ	HG_ZONE_1	0
	NAKASHIPARA	HG_ZONE_2	0
	NABADWIP	HG_ZONE_3	35996.77011
	NABADWIP	HG_ZONE_4	13225.64313
	NABADWIP	HG_ZONE_5	0
	SANTIPUR	HG_ZONE_6	0
	CHAKDAH	HG_ZONE_7	0
PADMA RIVER	KARIMPUR I	PD_ZONE_1	22191.50475

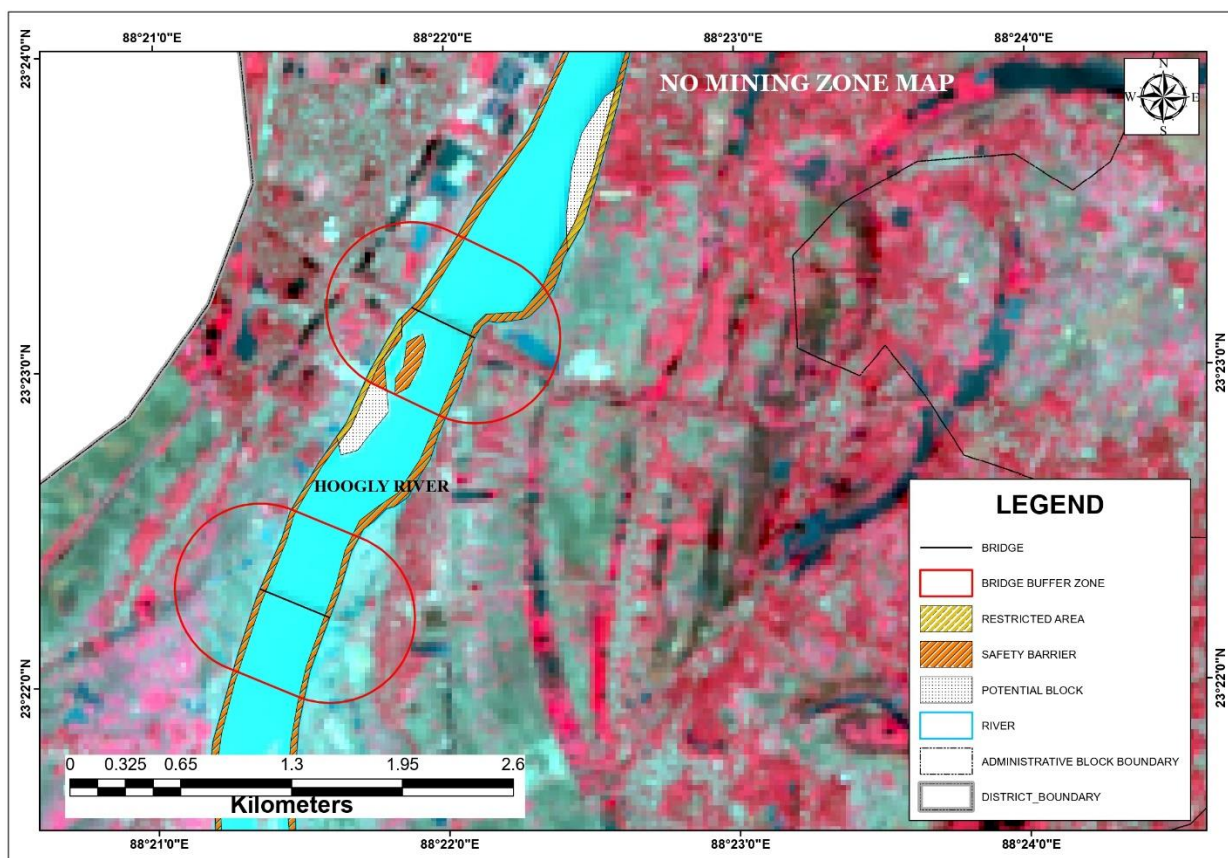


Figure 7.6: A representative map showing no-mining zone demarcated on Hoogly River (Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)



7.2.2. In-situ Minerals:

I. Mineral Reserve

There are no in-situ mineral resources in the district except silt, silty clay and sand deposits of Bhagirathi and Jalangi flood plains.

II. Mineral Potential

Potential riverbed deposits have been demarcated in this district survey report.

7.3 Mineral development prospect of the district with respect to Minor Mineral

The district does not hold any prospect of major mineral resources. Mining of sand, silt and clay from the river-beds are the important source of revenue generation.

7.4 Exploration requirement of the district

In this district the sand industry might be very much useful. So, the scope of sand exploration in this district is very high and, there is a need for more scientific sand mining procedure.



8 Overview of mining activity in the district

8.1 General overview

In Nadia district mining activity is mainly associated with collection of Clay, silt, sand from river-bed. These materials are primarily utilized for construction purpose.

8.2 List of existing mining leases of the districts

There are no existing sand mining leases present in Nadia district.

8.3 Detail of production of sand and other minerals during last three years

District does not mine out any riverbed sand deposits.

Table 8.1: Details of production of sand as per mine plan in Nadia district

Sl. No.	Year	Name of mineral	Total Production (inCft.)	Total Production in cum
1	2017-2018	Sand	NA	
2	2018-2019	Sand	NA	
3	2019-2020	Sand	NA	

Conversion factor: 1cum=35.315 cft
(Source: Directorate of Mines and Minerals, West Bengal)



9 Details of revenue generated from mineral sector during last three years

Nadia district does not generated revenue from riverbed sand deposits.

Table 9.1: District revenue generation from mineral sector (In cr.)

Year	Royalty/ deed rent	Cess	Total revenue
2017-18			
2018-19			
2019-20			

(Source: Directorate of Mines and Minerals, West Bengal)



10 Transport

Nadia district holds a good network of road and railways. National Highway No. 34 passes through the district and is joined to other parts of the country. The road connects East to West from Krishnanagr to Nabadwip. It also extends towards South to Shantipur. Roads in the district maintained by Government of West Bengal, PWD and local authorities. Municipalities in the district also maintained certain important road links in the district.

The main railway network in the district is between District Head Quarter Krishnanagar and Sub-divisional head quarter Ranaghat situated on the main rail route connecting Howrah/Kolkata and New Jalpaiguri (NJP) including parts of North Eastern states. The district network is maintained by Eastern Railway.

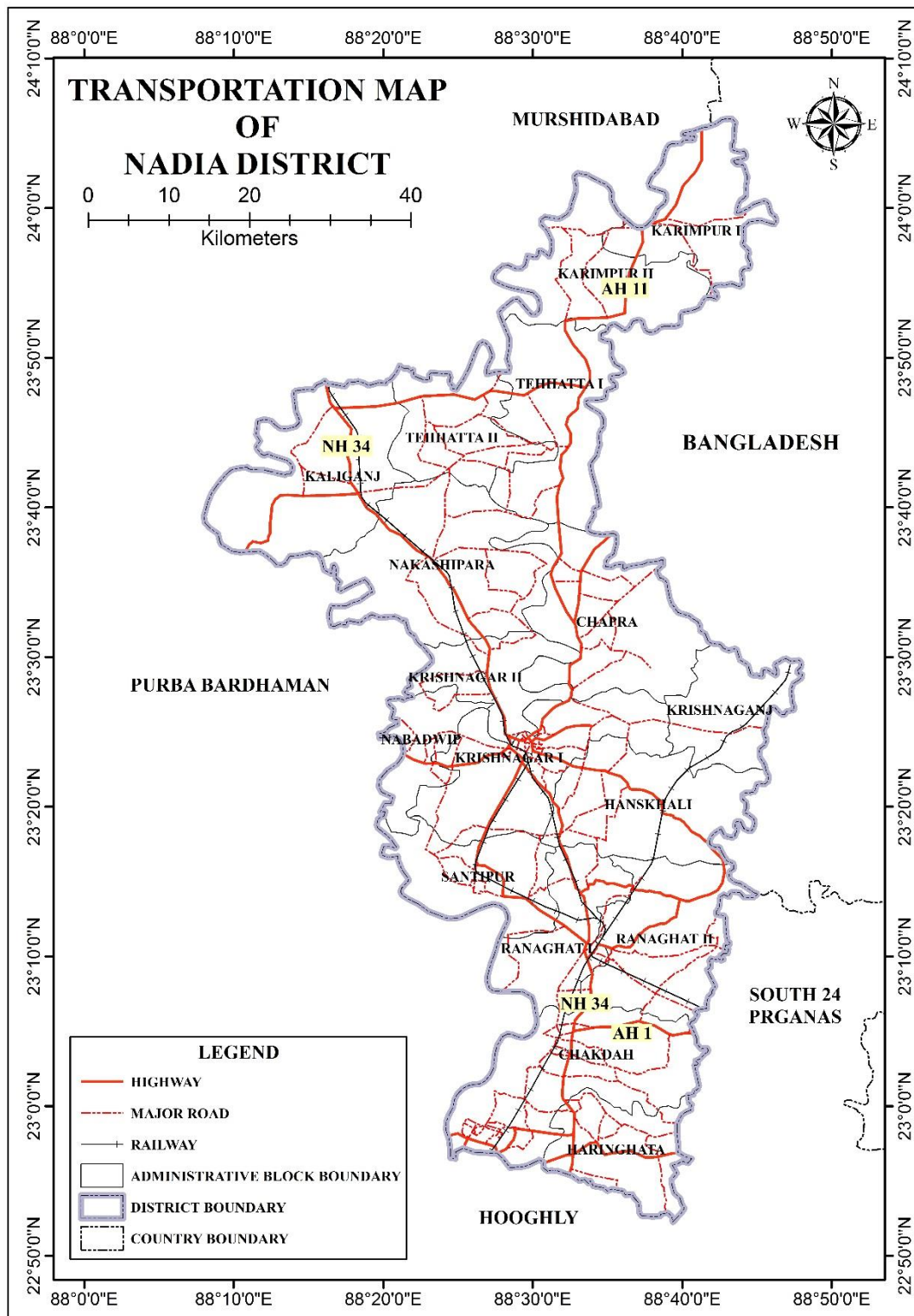


Figure 10.1: Transportation map of Nadia District

(Source: National Informatics Centre, September 2020)

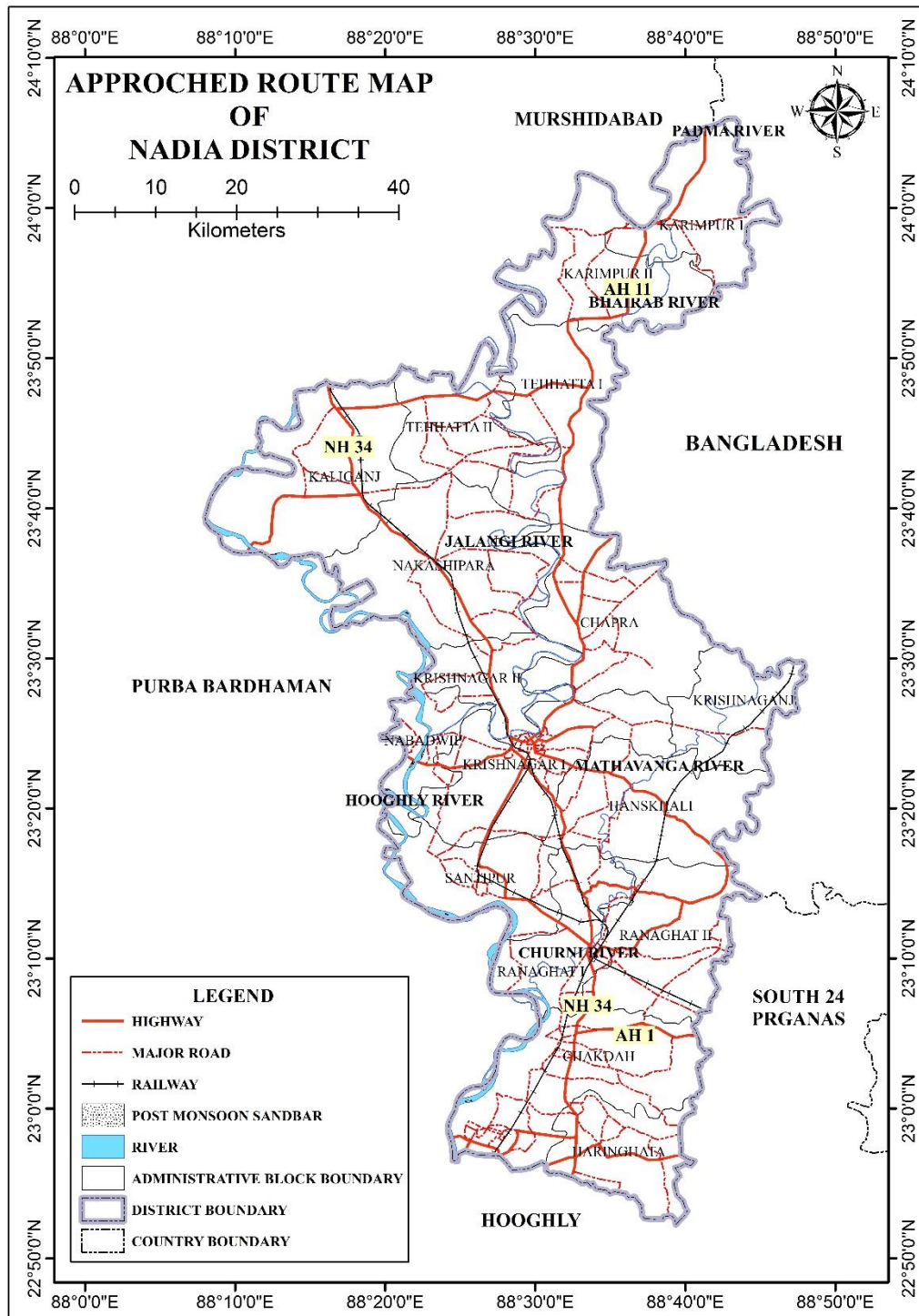


Figure 10.2: Map showing approach road to potential sand bars

(Source: National Informatics Centre, September 2020)



11 Remedial measure to mitigate the impact of mining

11.1 Environmental Sensitivity

Geo-environmental sensitivity generally hampered due to increases in human population, introduction of new settlements, extension of agricultural lands, roadways etc.

Due to unprecedented growth of population during the last few decades, nature has started reacting sharply to the accumulated human guilt. Soil erosion and its conservation play an important role.

The land use practices play the most important role in determining the stability factors in respect of landslide hazards. Stone quarrying from the slope is another way of human intervention that causes occasional slope failure.

11.2 Sand mining Impact

Another serious environmental problem around the globe in recent years is of sand and gravel mining. Sand mining is a process of extraction of sand from an open pit, river bed, sea beaches, ocean floor, river banks, deltas and island dunes. The extracted sand could be utilized for various types of manufacturing, such as concrete used in the construction of building and other structures. The sand can also be used as an abrasive. The demand for sand will increase with population growth and urbanization. The high demand of sand has led to unsustainable sand mining process resulting in illegal mining.

Although most jurisdictions have legal limit on the location and volume of sand that can be mined, illegal sand extraction is taking place in many parts of the country due to rapid urbanization and industrialization.

Removal or extraction of too much sand from rivers leads to erosion of river banks. Deltas can recede due to sand mining. These destructive effects of sand mining ultimately result in loss of fertile land and property. It also destabilizes the ground and causes failure of engineering structures.

In-stream mining directly alters the channel geometry and bed elevation. Removing sediment from the channel disrupts the pre-existing balance between sediment supply and transporting capacity, typically inducing incision upstream and downstream of the extraction site. The resultant incision alters the frequency of floodplain inundation along the river courses, lowers valley floor water table and frequently leads to destruction of bridges and channelization structures.



11.3 Remedial measure

11.3.1 Sustainable Mining Practices:

- The depth of mining in riverbed shall not exceed 3 meter or base flow level whichever is less, provided that where the Joint Inspection Committee certifies about excessive deposit or over accumulation of mineral in certain reaches requiring channelization, it can go above 3 meters.
- Mining shall be done in layers of 1 meter depth to avoid ponding effect and after first layer is excavated, the process will be repeated for the next layers.
- No stream should be diverted for the purpose of sand mining. No natural water course and/ or water resources are obstructed due to mining operations.
- No blasting shall be resorted to in river mining and without permission at any other place.

11.3.2 Monitoring the Mining of Mineral and its Transportation:

- For each mining lease site, the access should be controlled in a way that vehicles carrying mineral from that area are tracked and accounted for.
- There should be regular monitoring of the mining activities in the State to ensure effective compliance of stipulated EC conditions and of the provisions under the Minor Mineral Concessions Rules framed by the State Government.

11.3.3 Noise Management:

- Noise arising out of mining and processing shall be abated and controlled at source to keep within permissible limit.
- Restricted sand mining operation has to be carried out between 6 am and 7 pm.

11.3.4 Air Pollution and Dust Management:

- The pollution due to transportation load on the environment will be effectively controlled and water sprinkling will also be done regularly.
- Air pollution due to dust, exhaust emission or fumes during mining and processing phase should be controlled and kept in permissible limits specified under environmental laws.
- The mineral transportation shall be carried out through covered trucks only and the vehicles carrying the mineral shall not be overloaded. Wheel washing facility should be installed and used.

11.3.5 Bio-Diversity Protection:

- Restoration of flora affected by mining should be done immediately. Five times the number of trees destroyed by mining to be planted preferably of indigenous species.



Each EC holder shall have to undertake plantation of trees over at least 20% of the total area of lease in the same plot or plots utilised for such working.

- No mining lease shall be granted in the forest area without forest clearance in accordance with the provisions of the Forest Conservation Act, 1980 and the rules made there under.
- Protection of natural home of any wild animal shall have to be ensured.
- No felling of tree near quarry is allowed. For mining lease within 10km of the National Park / Sanctuary or in Eco-Sensitive Zone of the Protected Area, recommendation of Standing Committee of National Board of Wild Life (NBWL) has to be obtained as per the Hon'ble Supreme Court order in I.A. No. 460 of 2004.
- Spring sources should not be affected due to mining activities. Necessary protection measures are to be incorporated.

11.3.6 Management of Instability and Erosion:

- Removal, stacking and utilization of top soil should be ensured during mining. Where top soil cannot be used concurrently, it shall be stored separately for future use keeping in view that the bacterial organism should not die and should be spread nearby area.
- The EC should stipulate conditions for adequate steps to check soil erosion and control debris flow etc. by constructing engineering structures
- Use of oversize material to control erosion and movement of sediments
- No overhangs shall be allowed to be formed due to mining and mining shall not be allowed in area where subsidence of rocks is likely to occur due to steep angle of slope.
- No extraction of stone / boulder / sand in landslide prone areas.
- Controlled clearance of riparian vegetation to be undertaken.

11.3.7 Waste Management:

- Site clearance and tidiness is very much needed to have less visual impact of mining.
- Dumping of waste shall be done in earmarked places as approved in Mining Plan.
- Rubbish burial shall not be done in the rivers.

11.3.8 Pollution Prevention:

- Take all possible precautions for the protection of environment and control of pollution.
- Effluent discharge should be kept to the minimum and it should meet the standards prescribed.



11.3.9 Protection of Infrastructure:

- Mining activities shall not be done for mine lease where mining can cause danger to site of flood protection works, places of cultural, religious, historical, and archeological importance.
- For carrying out mining in proximity to any bridge or embankment, appropriate safety zone should be worked out on case to case basis, taking into account the structural parameters, location aspects and flow rate, and no mining should be carried out in the safety zone so worked out.



12 Suggested reclamation plan for already mined out areas

As per statute all mines/quarries are to be properly reclaimed before final closure of the mine. Reclamation plans should include:

a) A baseline survey of river cross section. The study of cross section is basis for delineating channel form. Cross-sections must be surveyed between two monumented endpoints set on the river banks, and elevations should be referenced based on benchmark set in the area;

b) The proposed mining cross-section data should be plotted over the baseline data to illustrate the vertical extent of the proposed excavation;

c) The cross-section of the replenished bar should be the same as the baseline data. This illustrates that the bar elevation after the bar is replenished will be the same as the bar before extraction;

d) A planimetric map showing the aerial extent of the excavation and extent of the riparian buffers;

e) A planting plan developed by a plant ecologist familiar with the flora of the river for any areas such as roads that need to be restored;

f) Each EC holder shall have to undertake plantation of trees over at least 20% of the total area of the plot or plots of land as subject to such working in accordance with a plan approved by the concerned Divisional Forest Officer holding jurisdiction, provided further the competent authority i.e, The Divisional Forest Officer may fix up norms for plantation of trees in a particular area regarding choice of species, spacing, nos of trees and maintenance etc.

g) A monitoring plan has to establish.



13 Risk assessment and disaster management plan

Risk analysis is the systematic study of risks encountered during various stages of mining operation. Risk analysis seek to identify the risks involved in mining operations, to understand how and when they arise, and estimate the impact (financial or otherwise) of adverse outcomes. The sand mining operation in the district is mainly done manually.

13.1 Identification of risk due to river sand mining

There is no land degradation due to mining activities as mining is done only on river bed dry surface. There will be no OB or waste generation as the sand is exposed in the river bed and is completely saleable. There will be neither any stacking of soil nor creation of OB dumps. The mining activity will be carried out up to a maximum depth of 3m below the surface level. So, there is no chance of slope failure, bench failure in the mines. However, there are some identified risks in the mining activity which are as follows:

1. Accident during sand loading and transportation
2. Inundation/ Flooding
3. Quick Sand Condition

13.2 Mitigation measures

13.2.1 Measures to prevent accidents during loading and transportation:

- During the loading, trucks should be brought to a lower level so that the loading operation suits the ergonomic condition of the workers.
- The workers will be provided with gloves and safety shoes during loading.
- Opening of the side covers of the truck should be done carefully and with warning to prevent injury to the loaders.
- Mining operations will be done during daylight only.
- The truck will be covered with tarpaulin and maintained to prevent any spillage.
- To avoid danger while reversing the trackless vehicles especially at the embankment and tipping points, all areas for reversing of lorries should be made man free as far as possible.
- All transportation within the main working will be carried out directly under the supervision and control of the management.
- Overloading should not be permitted and the maximum permissible speed limit should be ensured.
- There will be regular maintenance of the trucks and the drivers will have valid driving license.



13.2.2 Measures to prevent incidents during Inundation/ Flooding:

To minimize the risk of flooding/ inundation following measures should be under taken:

- Mining will be completely closed during the monsoon months.
- Proper weather information particularly on rain should be kept during the operational period of mines so that precautionary measures will be undertaken.

13.2.3 Measures for mitigation to quick sand condition:

- Quick sand zone and deep water zone will be clearly demarcated and all the mine workers will be made aware of the location.
- Mining will be done strictly as per the approved mining plan.

13.3 Disaster management plan

As the depth of mining will be maximum of 3m below the surface level considering local condition, the risk related to mining activity is much less. The mining operation will be carried out under the supervision of experienced and qualified Mines Manager having Certificate of Competency to manage the mines granted by DGMS. All the provisions of Mines Act 1952, MMR 1961 and Mines Rules 1955 and other laws applicable to mine will strictly be complied. During heavy rainfall and during the monsoon season the mining activities will be closed. Proper coordination with Irrigation Department should be maintained so that at the time of releasing water, if any, from the dam suitable warning/information is given in advance. Special attention and requisite precautions shall be taken while working in areas of geological weakness like existence of slip, fault etc. The mining site will be supplied with first aid facilities and the entire mines worker will have access to that.



14 Conclusions and Recommendations

The District Survey Report has been prepared in conformity with the S O 141 (E), S O 3611 (E) and other sand mining guidelines published by MoEF&CC time to time as well as the requirement specified in WBMCR, 2016.

Potential areas riverbed deposition has been identified and list is furnished in the report. Estimation of annual sand deposition by replenishment study has also been incorporated in the report.

The district survey report has been prepared by utilizing both primary and secondary data. The primary data generation involved the satellite imagery study, site inspection, survey, ground truthing etc. while secondary data has been acquired through various authenticated sources and satellite imagery studies.

The district is characterized by humid tropical monsoon climate. The average annual rainfall in the district is 1245mm (2017-2021). Average temperature of the district varies from 16°C during January to 39°C during May.

Geologically, entire area of the district is completely blanketed by a sequence of Quaternary sediments of Ganga-Bhagirathi River system. The deposits constitute three litho stratigraphic units namely, Bethuadahar formation (Khagaria formation), Chinsura formation (Katawa formation/Panskura formation) and Hugli formation (Bhagirathi formation). The Bethuadahari formation is lithologically characterized by yellow and pale brown very fine sand silt and silty clay with soft iron nodules and caliche nodules. The Chinsura formation is characterised by an alternation of oxidized to unoxidized fine to very fine sand and silt with clay and it lies in the relatively lower elevation than the oldest Bethuadahari formation. The Hugli formation is characterised by the present-day flood plain deposits of unoxidised and less compact, fine to very fine silver-grey micaceous sand, silt and dark grey clay occurring at lowermost topographic level around river banks.

The physiography of the district is mostly plain. There are pockets of mild slopes here and there. The whole district is drained by number of rivers and streams. The principal rivers of the district are Bhagirathi, Jalangi and Mathabhanga. There are few more rivers in the district viz. Ichhamati, Churni, Bhairabi and Jamuna. All the rivers flow from north to south keeping pace with general slope with district land. Numerous small rivers and abandoned river causes are interspersed throughout the district with a number of depressions meander scars, Ox- Bow lakes, point bars etc. It lies in the heart of Bengal Delta held within the arms of Ganga and Bhagirathi on the west and Mathabhanga on the North.

The district does not hold good potential for riverbed sand deposits. Upside mineral potential of river sand has been calculated as 0.76 Mcum. It requires further systematic and scientific approach to quantify the resource along with their grade assessment.



14.1. Conclusion

- I. The river beds of the district are enriched with sand which is highly potential for mining.
- II. The replenishment study has been carried out during the preparation of this DSR. Both field-based surveys coupled with satellite imagery study and empirical study were carried out to determine the rate of replenishment in each river of the district.
- III. The determined values of various methods as adopted for replenishment study gives a comparable value and in all cases the values are found to be much more as compared to the capping limit (60%) as suggested in the Enforcement & Monitoring Guidelines for Sand Mining (EMGSM) January 2020, Issued by Ministry of Environment, Forest and Climate Change (MoEF&CC) 2020.
- IV. Based on satellite imagery study along with field verification, about 0.34 million cum of sand has been found as a difference in volume when compared between pre- and post-monsoon sand reserve data. Percentage difference is about 92% which is replenishment and aggradation rate for the year 2020.
- V. There are no existing mining block present in the district, that is why replenishment study based on field investigation not carried out.
- VI. The total potential river bed deposit for the district comes to about 0.76 Mcum.

14.2. Recommendation:

1. The mining lease distribution for the district must be carried out by involving a district level committee constituted with inter-disciplinary members of various departments including irrigation and waterways, DL&LRO, forest, biodiversity, wetland management, SWID or any other relevant department which the district authority may find suitable to include.
2. While recommending for Mining Leases, the District Level Committee should ensure the protection of Biodiversity Zones as recorded by relevant Government Agencies from time to time.
3. During finalization of mining leases for the district, strict adherence of Supreme Court orders No 1501 dated 03/06/2022 should be followed.
4. Efforts should be given to restrict distribution of mining leases along the confluence zone of the rivers where rich aquatic habitats are reported.
5. Since the state of West Bengal has royalty system in volumetric measurement, specific gravity for sand and gravel has not been determined during this study. However, during the finalization of mining lease if it is found necessary such test may be initiated by the state government on case-to-case basis.
6. It is recommended to have a periodical review along with primary data collection during pre- and post-monsoon periods to record the seasonal variance of the sedimentation rate on annual basis and update replenishment rate of the district.



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PLATE 1
DRAINAGE MAP OF THE DISTRICT

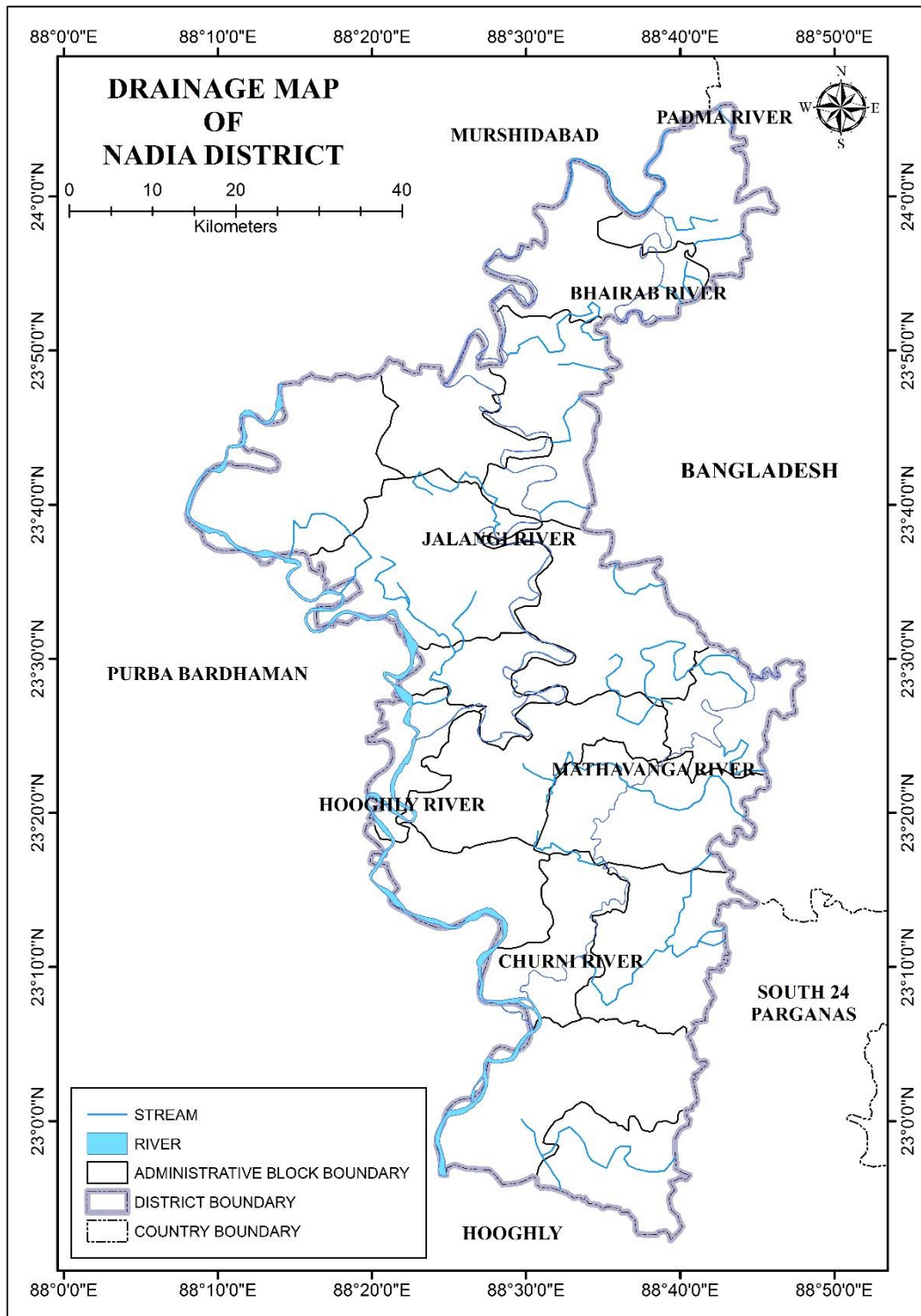


Plate 1A: Drainage Map of the District (Source: National Informatics Centre -NIC Website, Sept 2020)

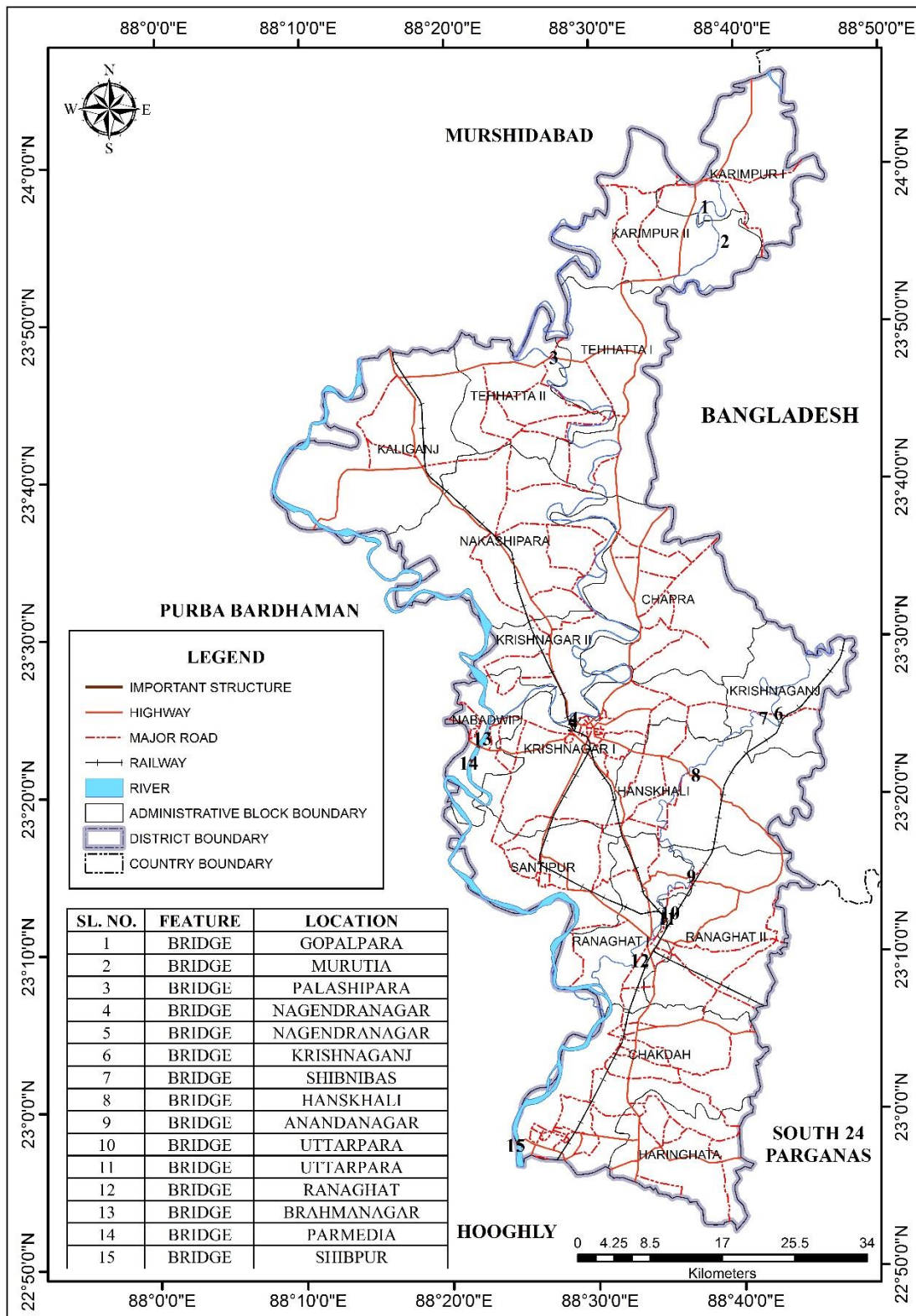


Plate No 1B: Location Map of dams, barrages, bridge showing on drainage system of the district (Source: National Informatics Centre -NIC Website, Sept 2020)



PLATE 2A
**DISTRIBUTION MAP OF SAND BARS ON RIVERS DURING PRE-MONSOON
PERIOD OF NADIA DISTRICT**

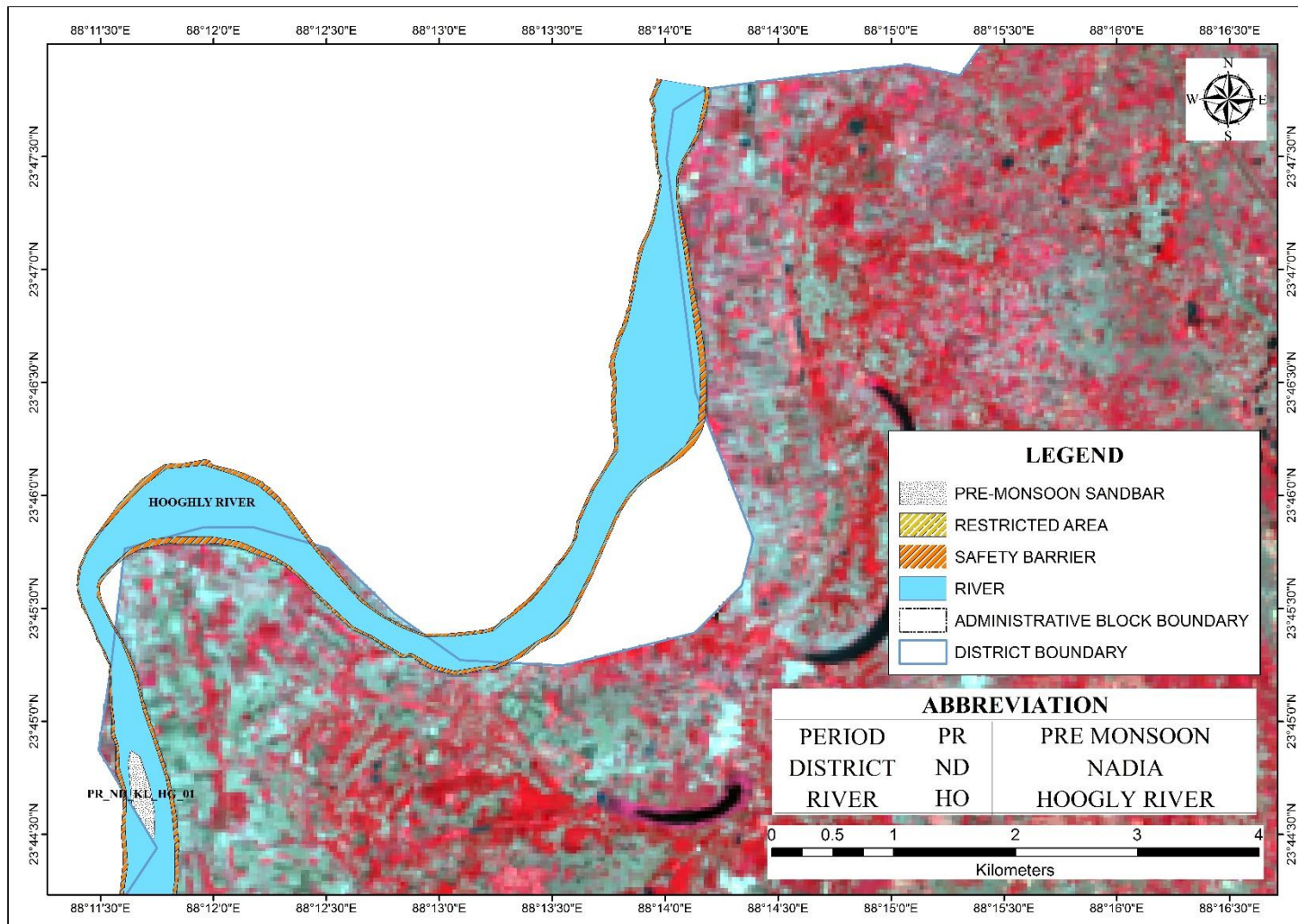


Plate 2A1: Distribution Map of Sand Bars on Rivers During Pre-Monsoon Period of Nadia District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, March 2020)

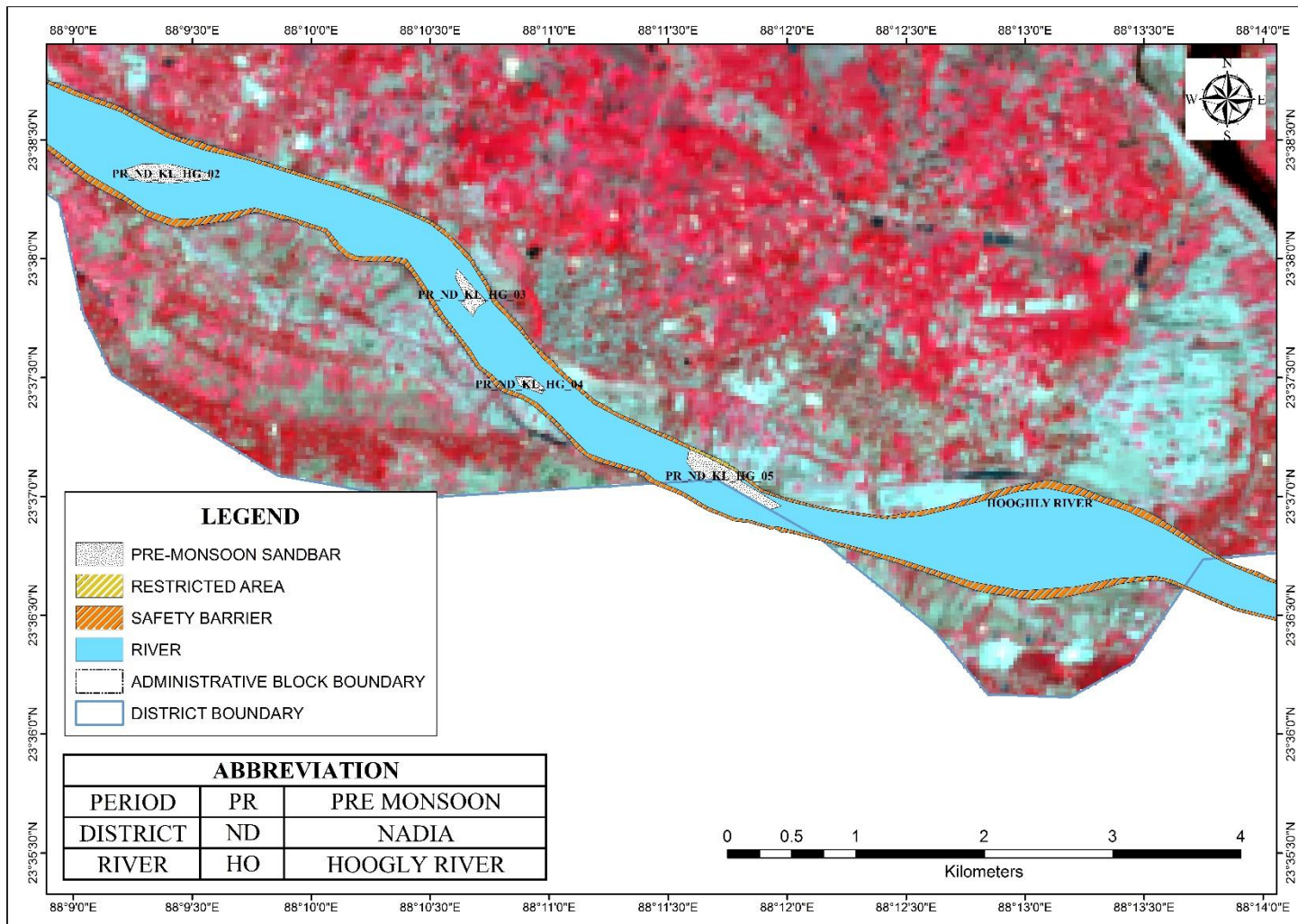


Plate 2A2: Distribution Map of Sand Bars on Rivers During Pre-Monsoon Period of Nadia District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, March 2020)

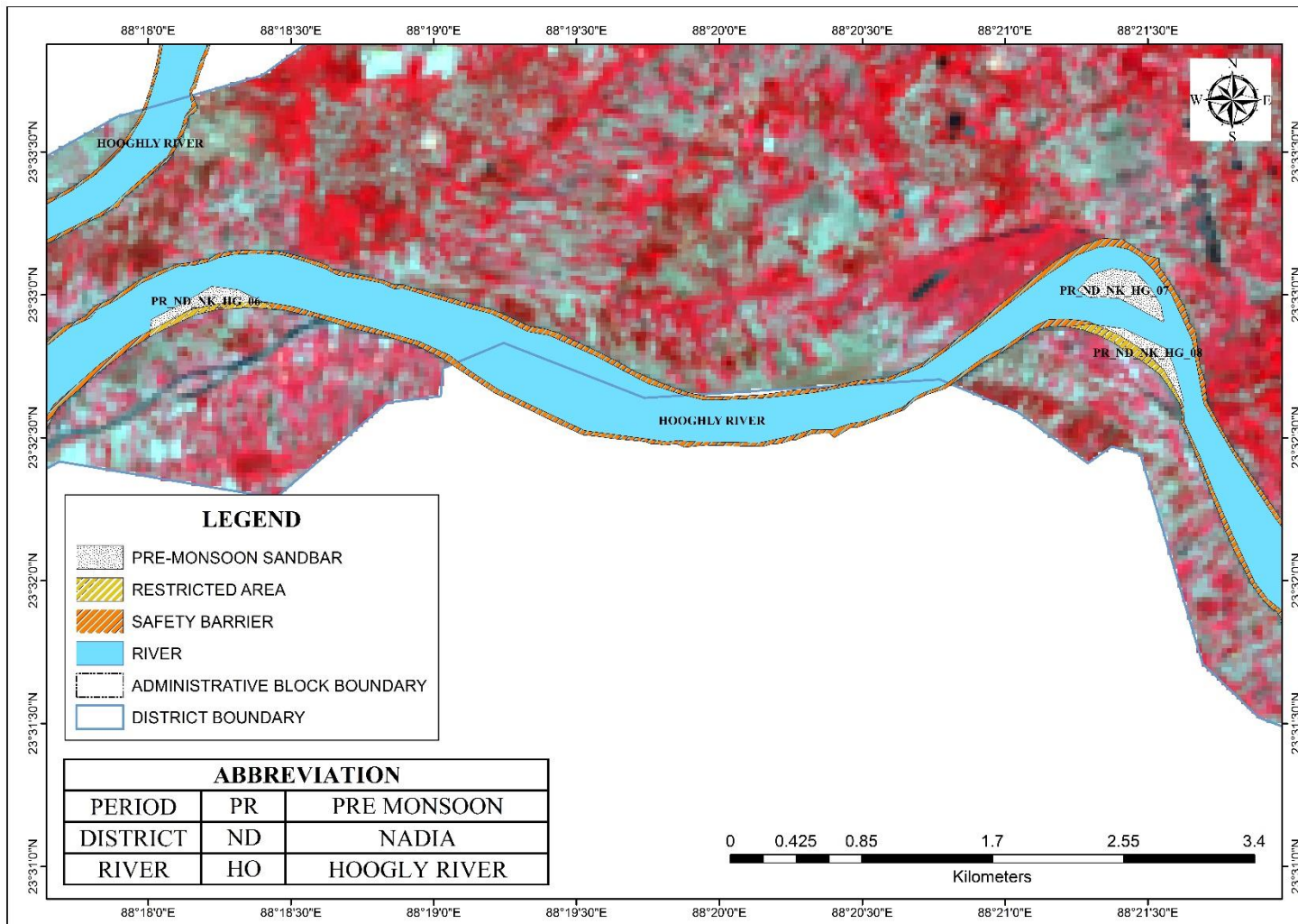


Plate 2A3: Distribution Map of Sand Bars on Rivers During Pre-Monsoon Period of Nadia District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, March 2020)

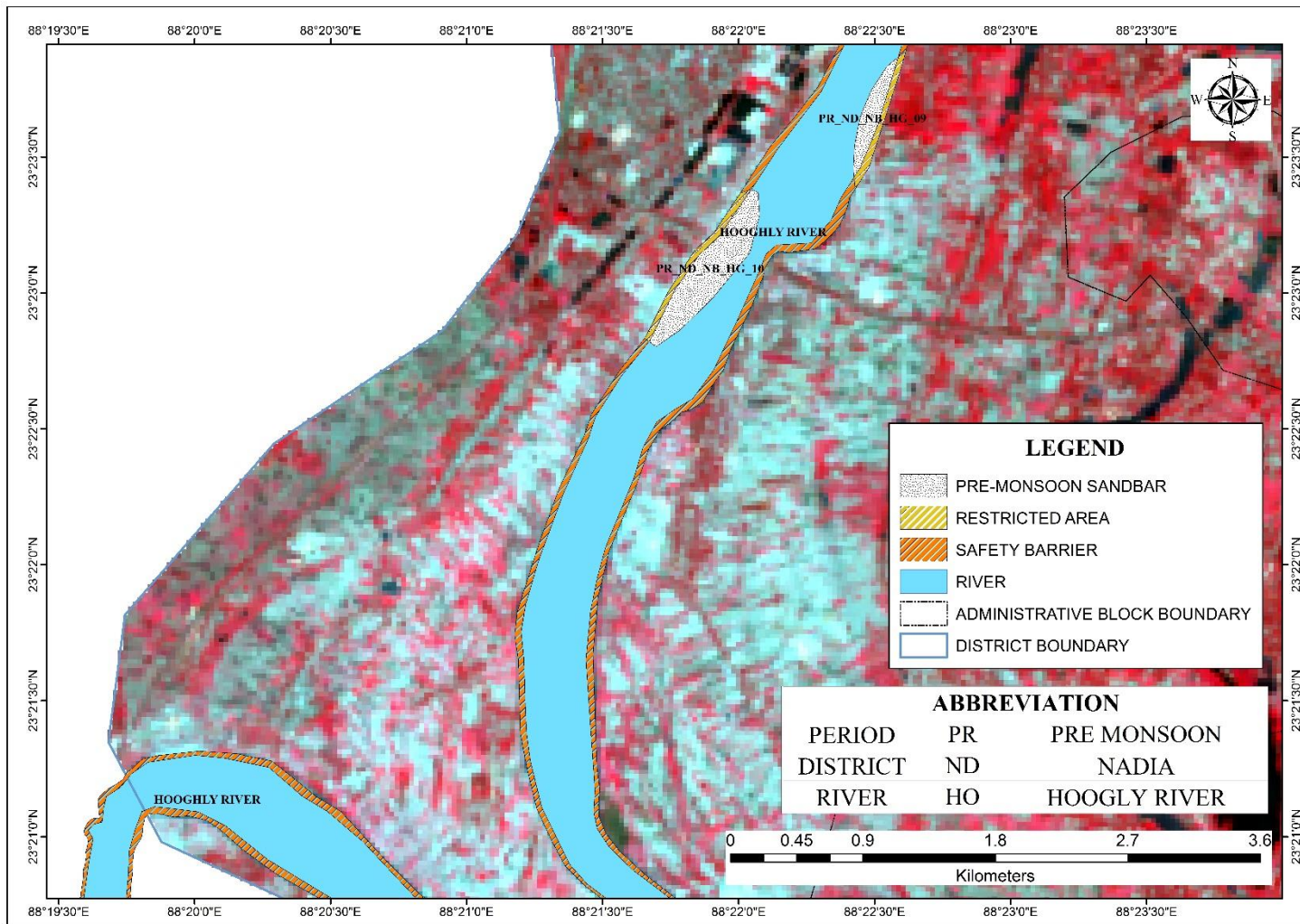


Plate 2A4: Distribution Map of Sand Bars on Rivers During Pre-Monsoon Period of Nadia District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, March 2020)

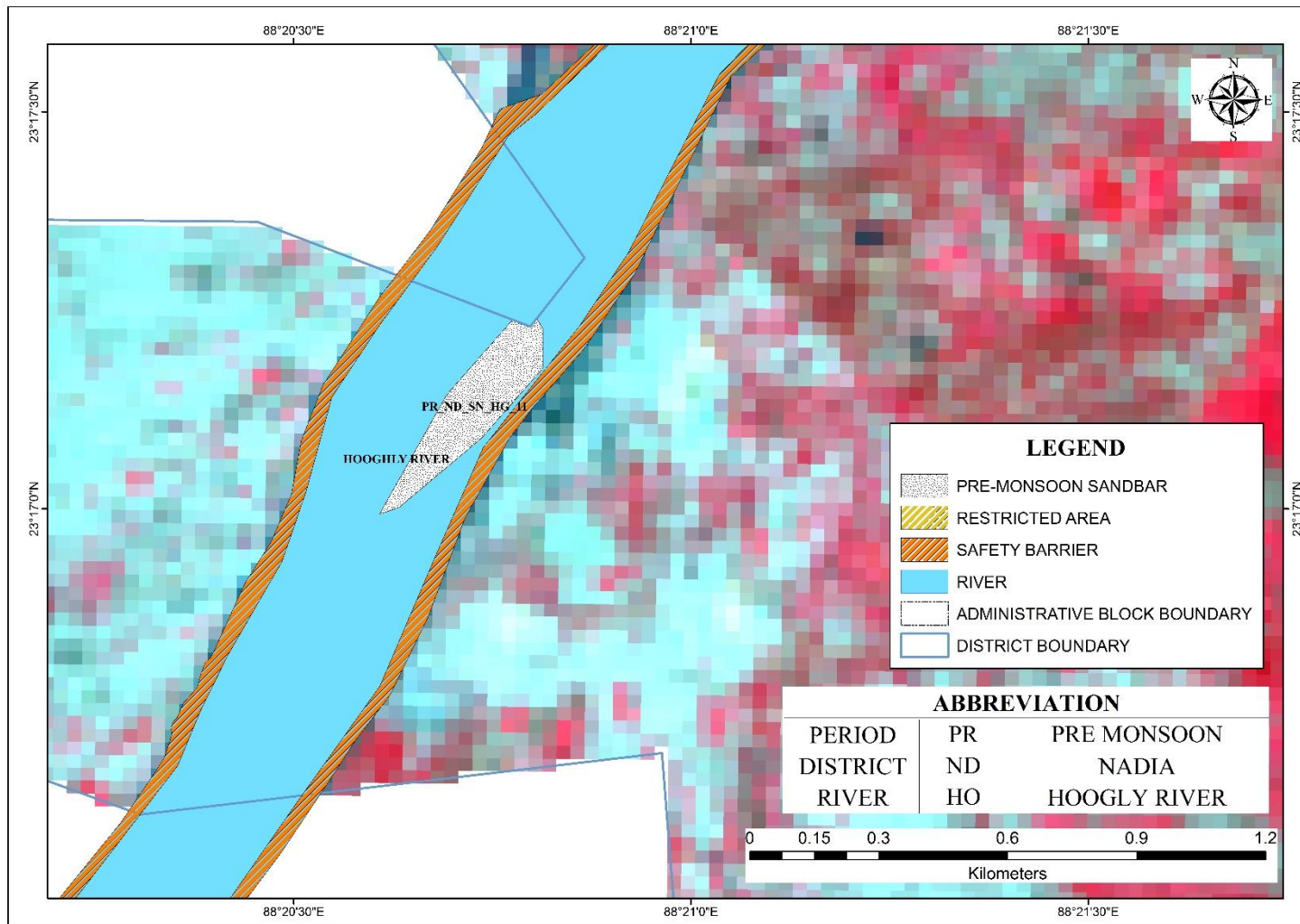


Plate 2A5: Distribution Map of Sand Bars on Rivers During Pre-Monsoon Period of Nadia District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, March 2020)

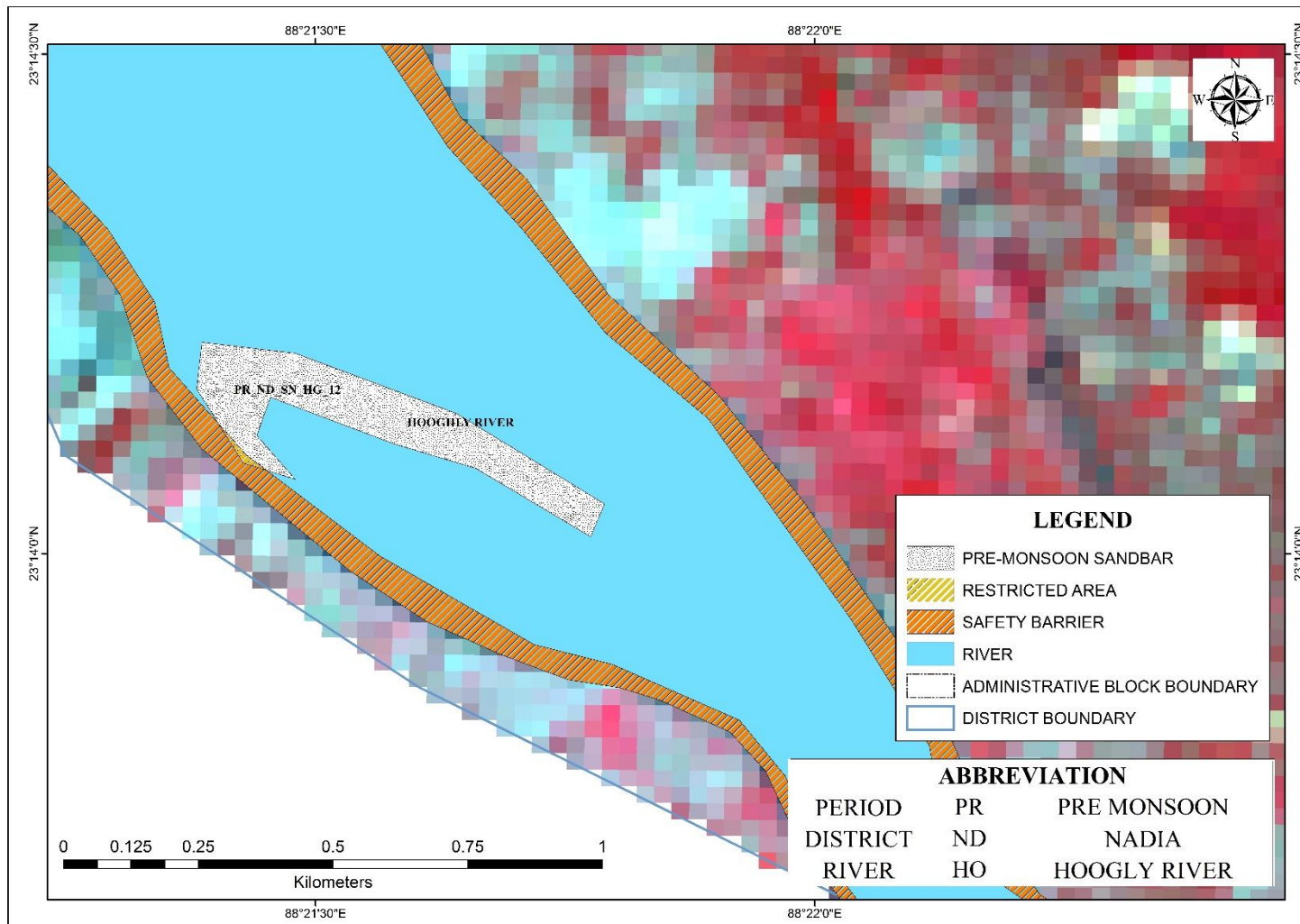


Plate 2A6: Distribution Map of Sand Bars on Rivers During Pre-Monsoon Period of Nadia District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, March 2020)

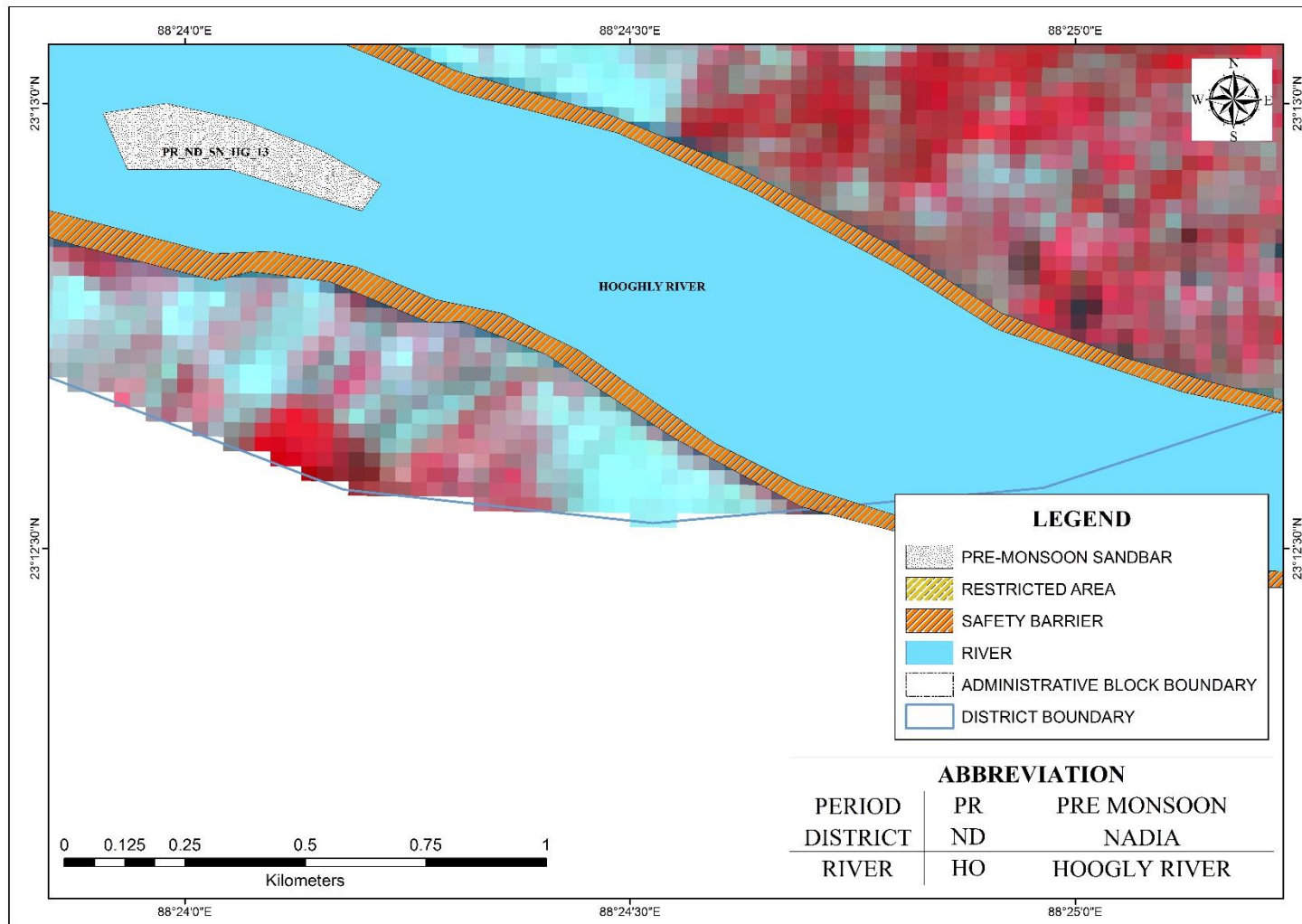


Plate 2A7: Distribution Map of Sand Bars on Rivers During Pre-Monsoon Period of Nadia District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, March 2020)

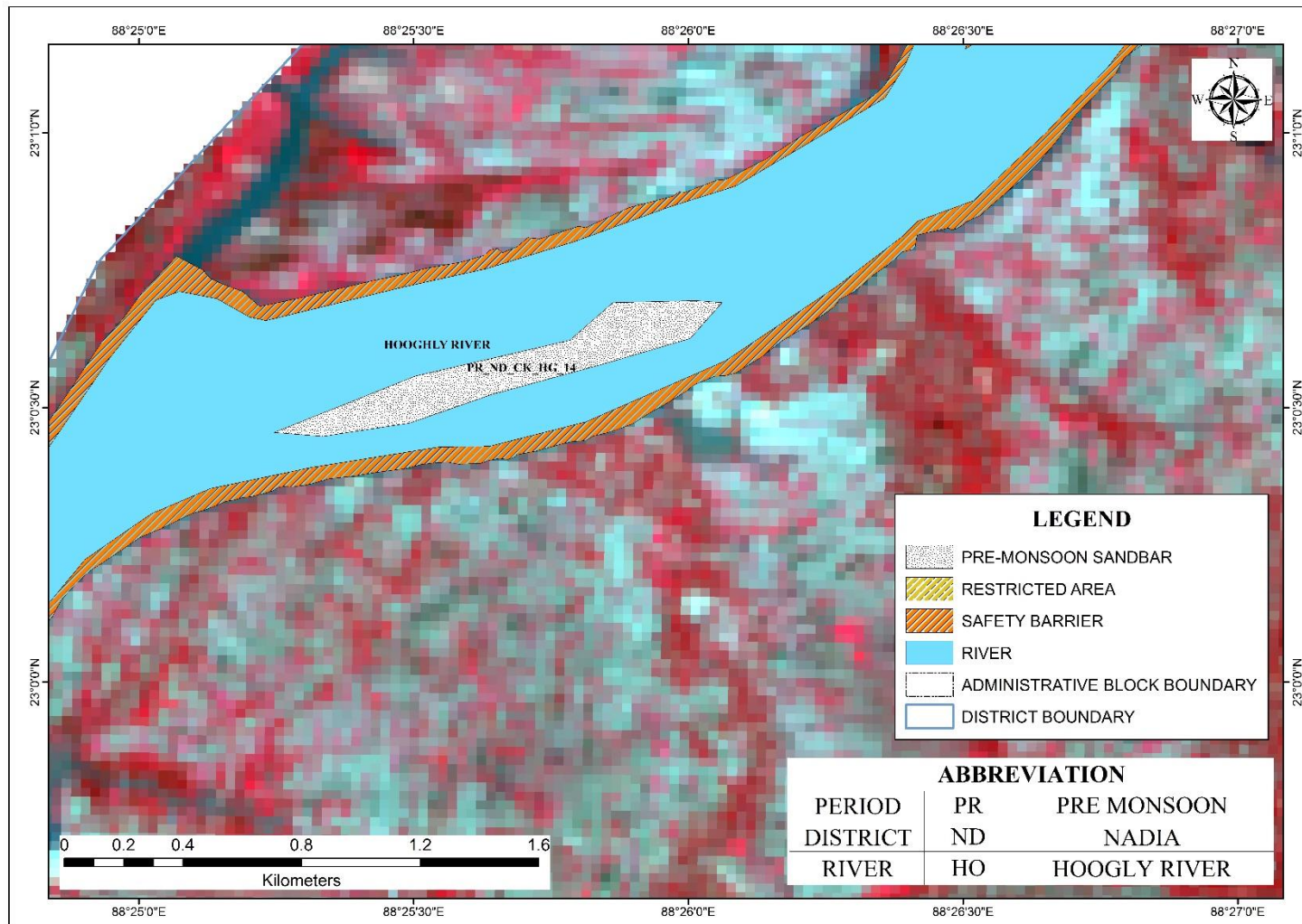


Plate 2A8: Distribution Map of Sand Bars on Rivers During Pre-Monsoon Period of Nadia District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, March 2020)

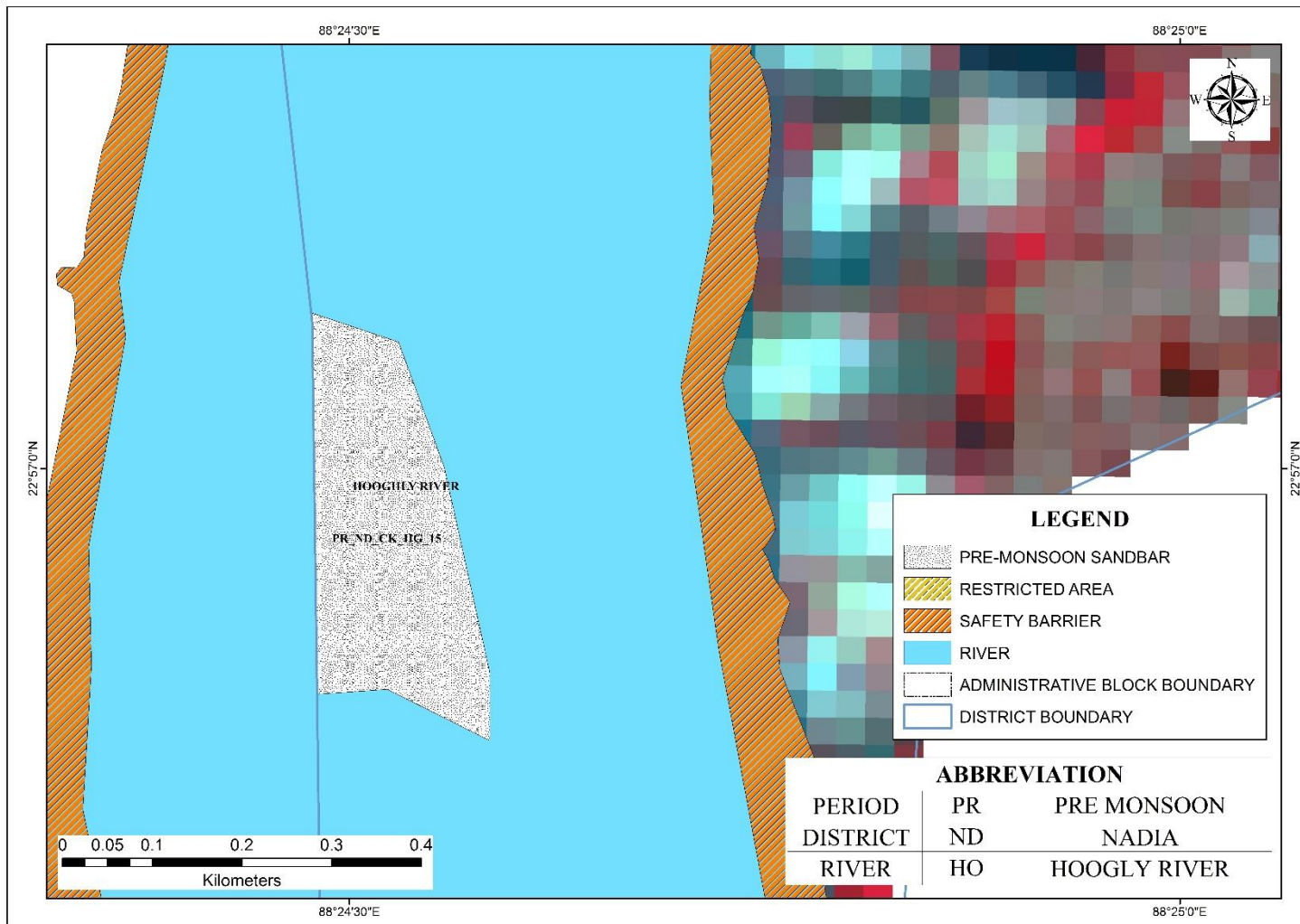


Plate 2A9: Distribution Map of Sand Bars on Rivers During Pre-Monsoon Period of Nadia District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, March 2020)

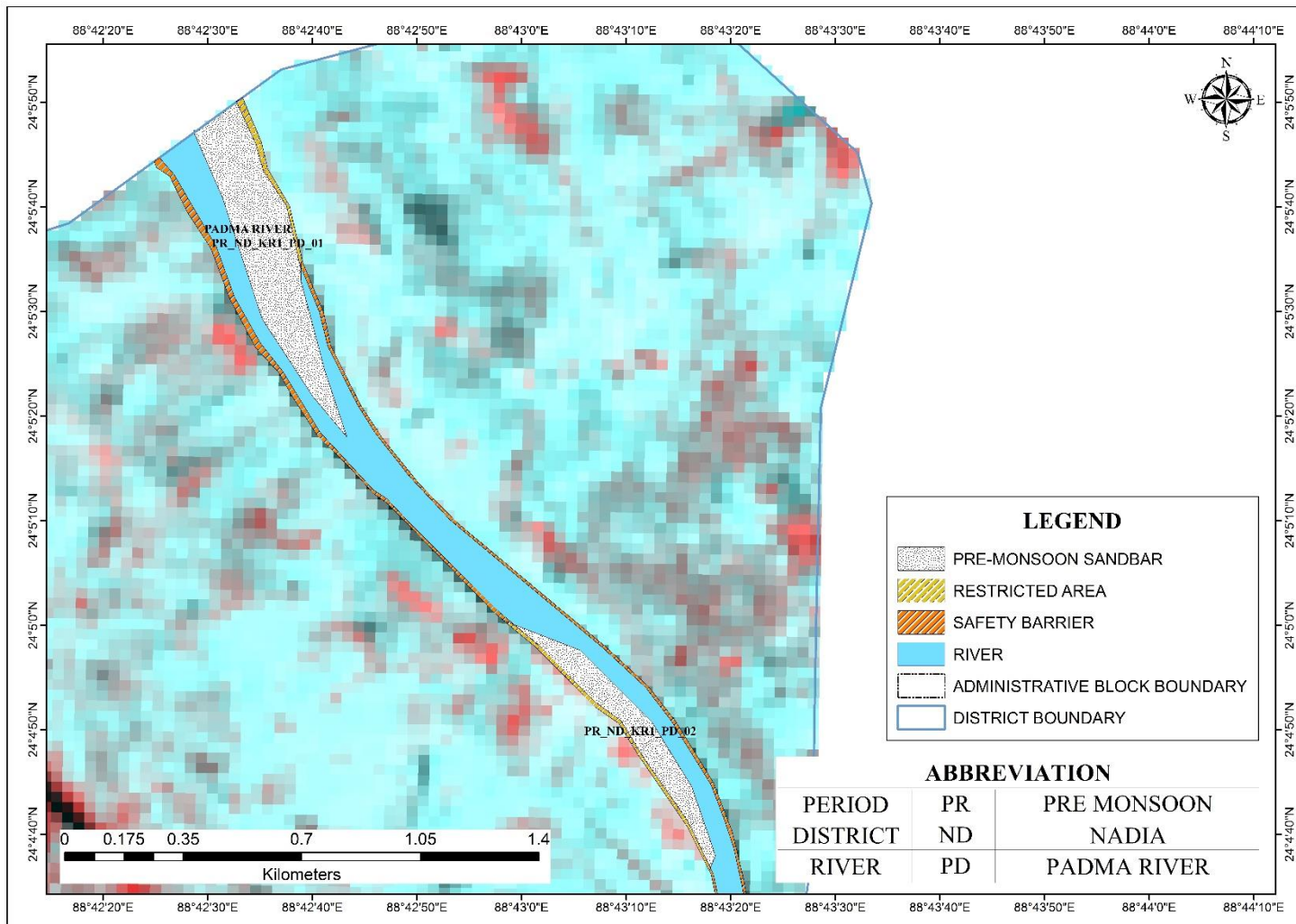


Plate 2A10: Distribution Map of Sand Bars on Rivers During Pre-Monsoon Period of Nadia District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, March 2020)



PLATE 2B
**DISTRIBUTION MAP OF SAND BARS ON RIVERS DURING POST-MONSOON
PERIOD OF NADIA DISTRICT**

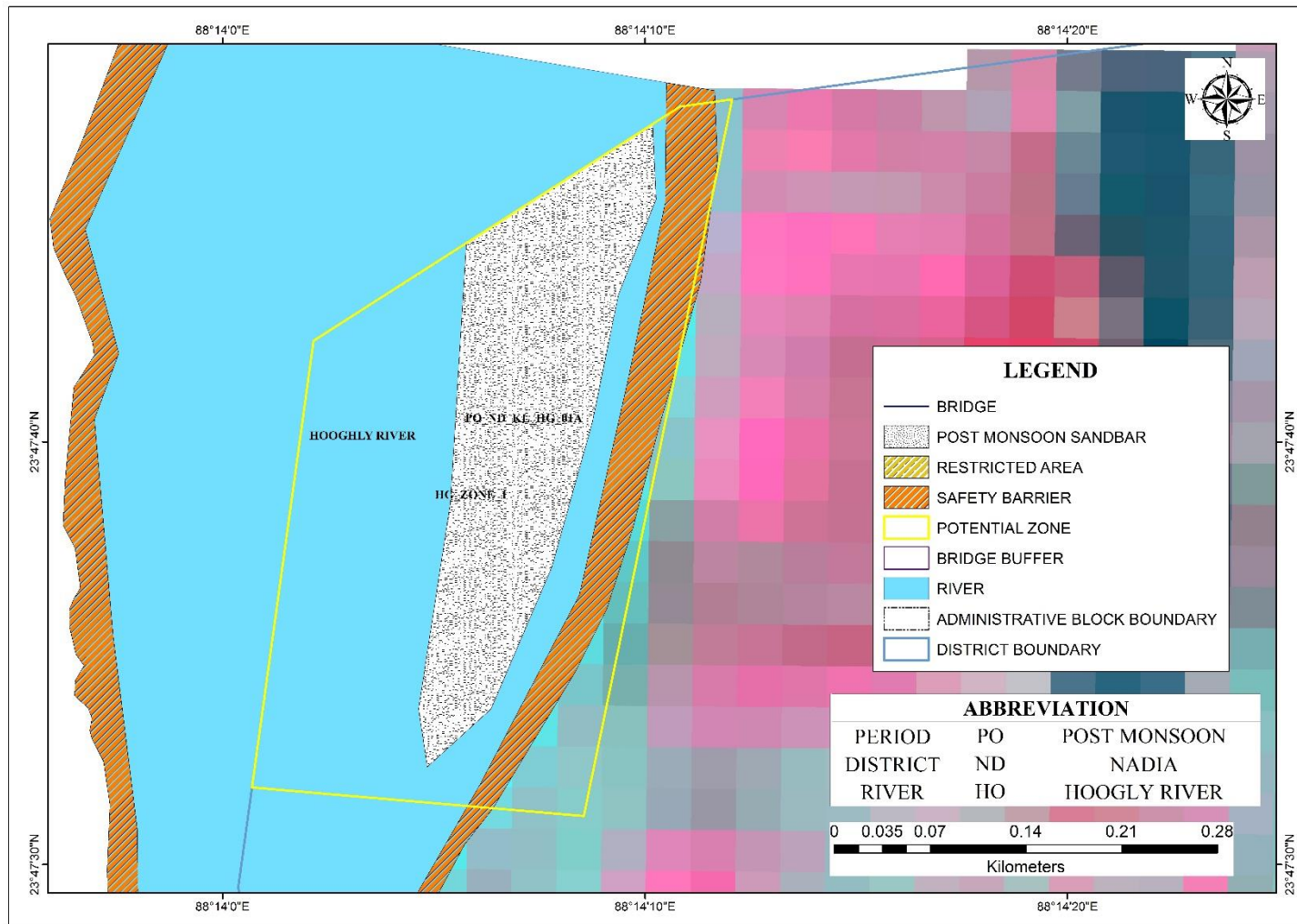


Plate 2B1: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Nadia District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)

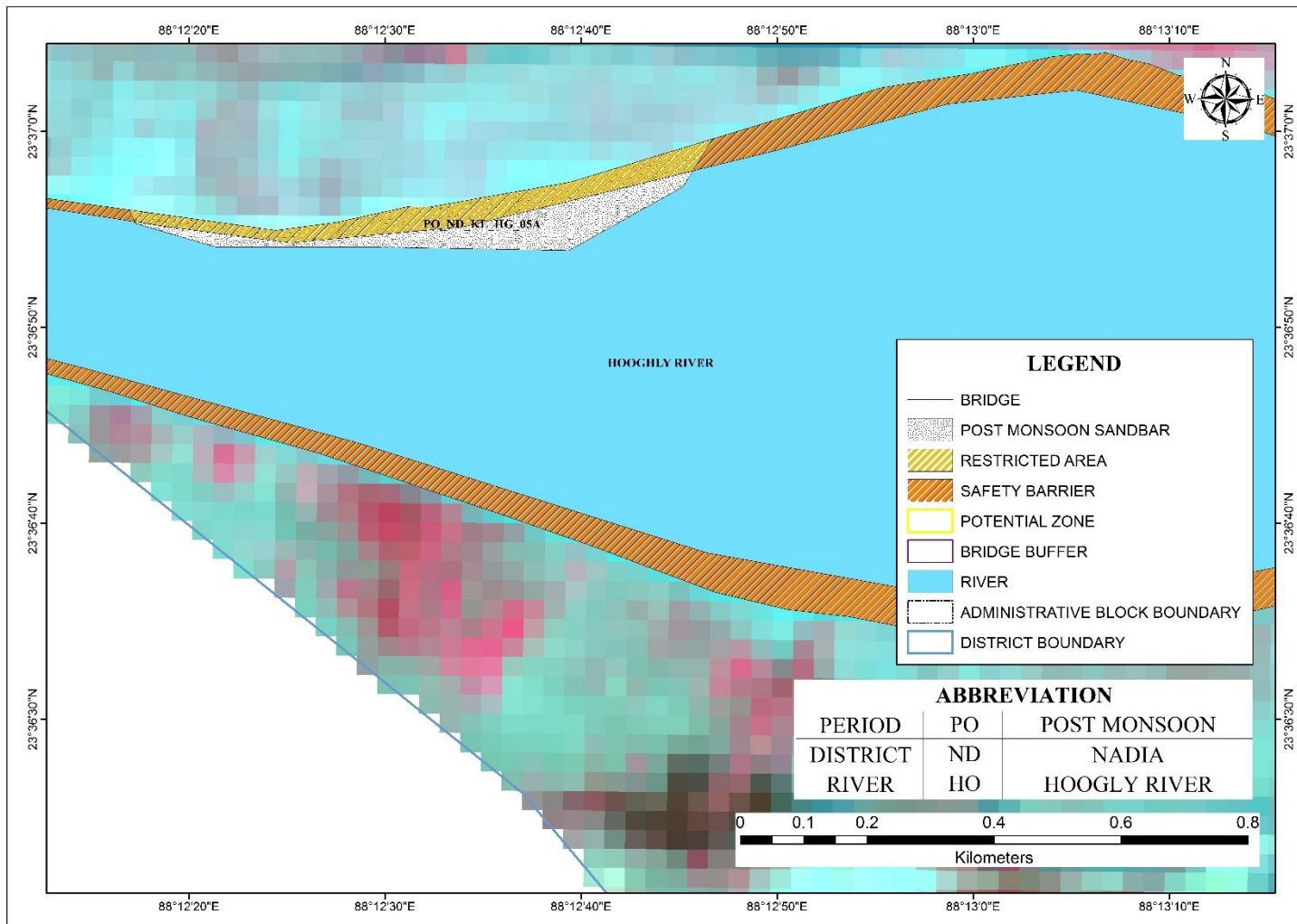


Plate 2B2: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Nadia District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)

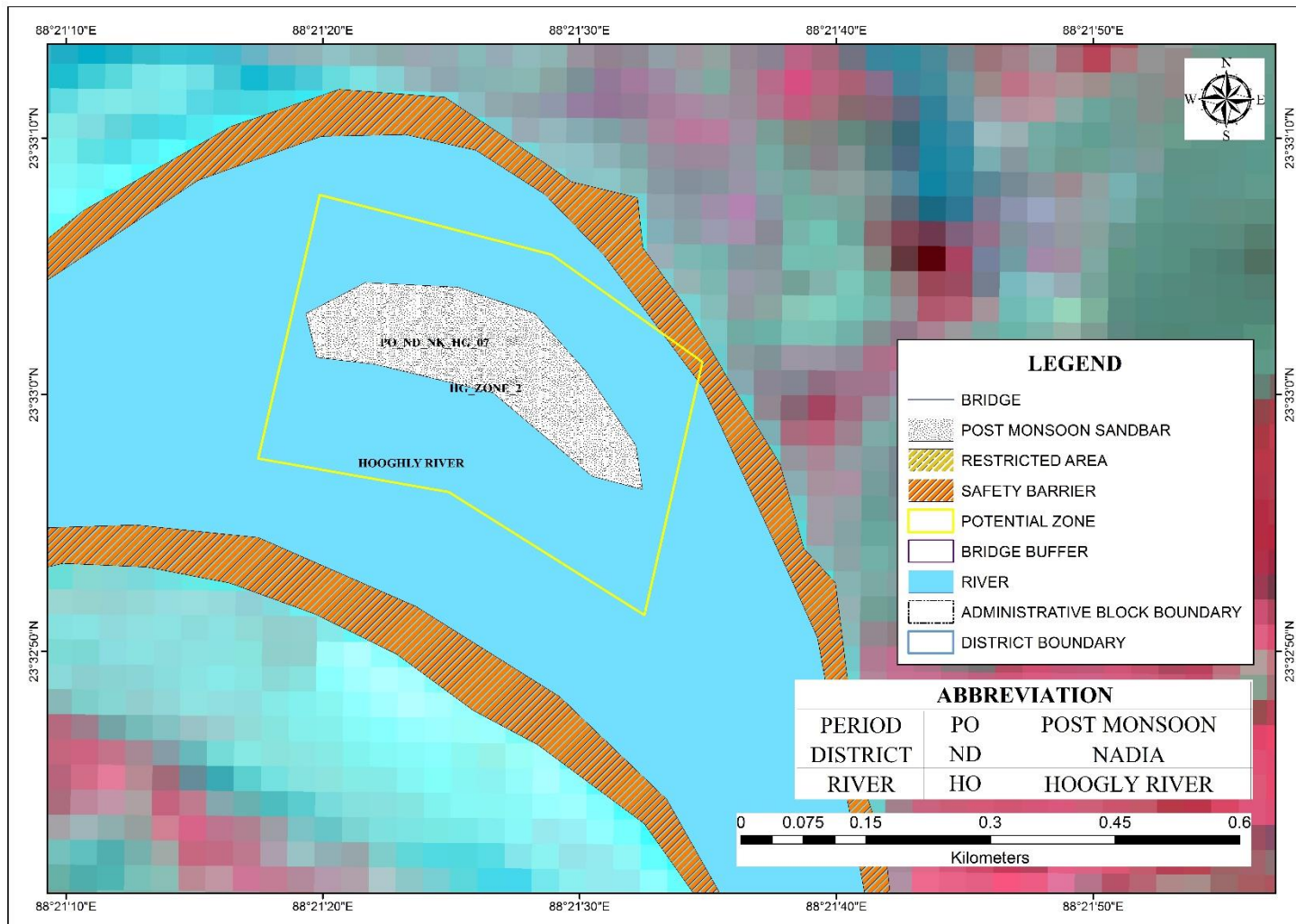


Plate 2B3: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Nadia District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)

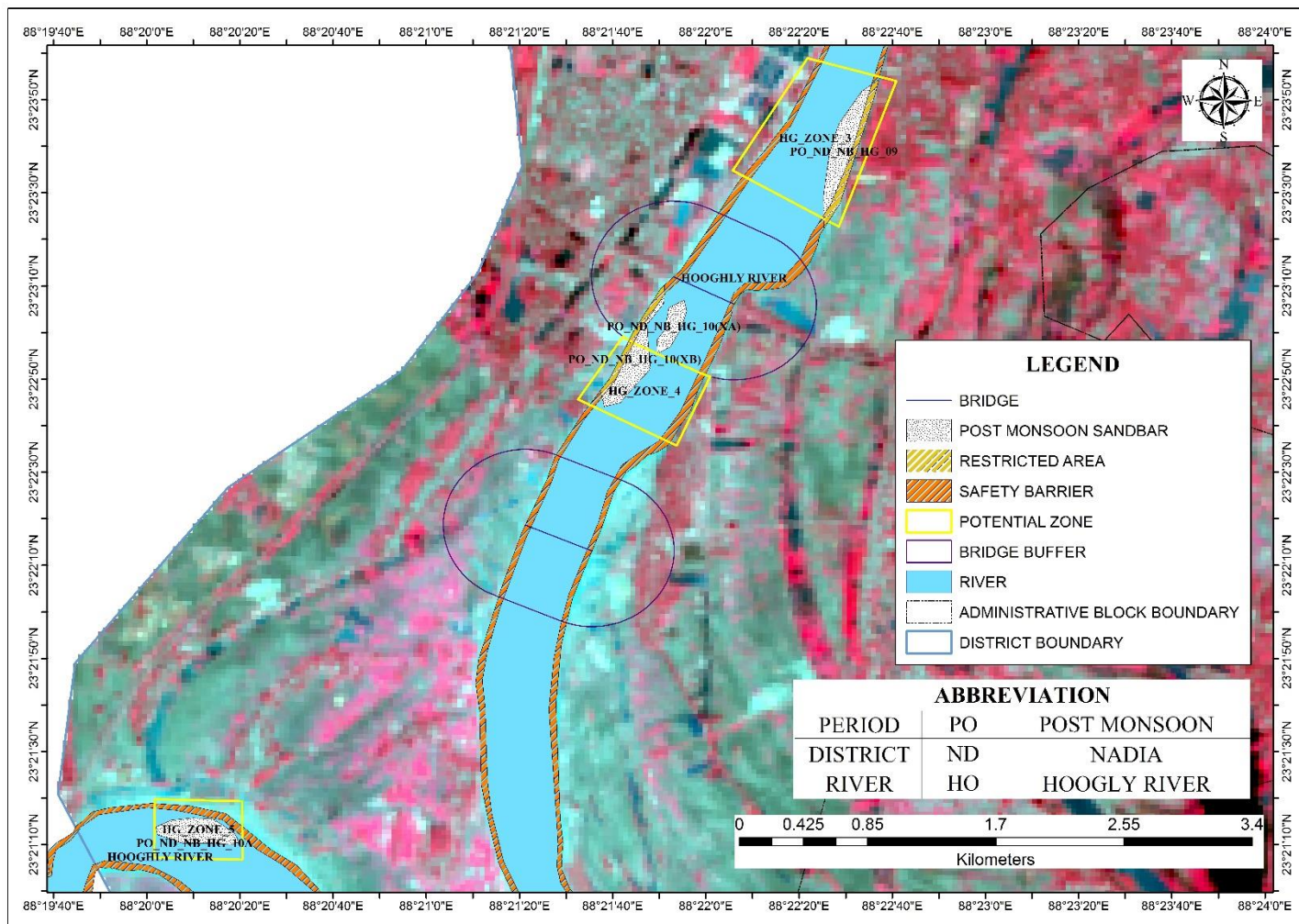


Plate 2B4: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Nadia District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)

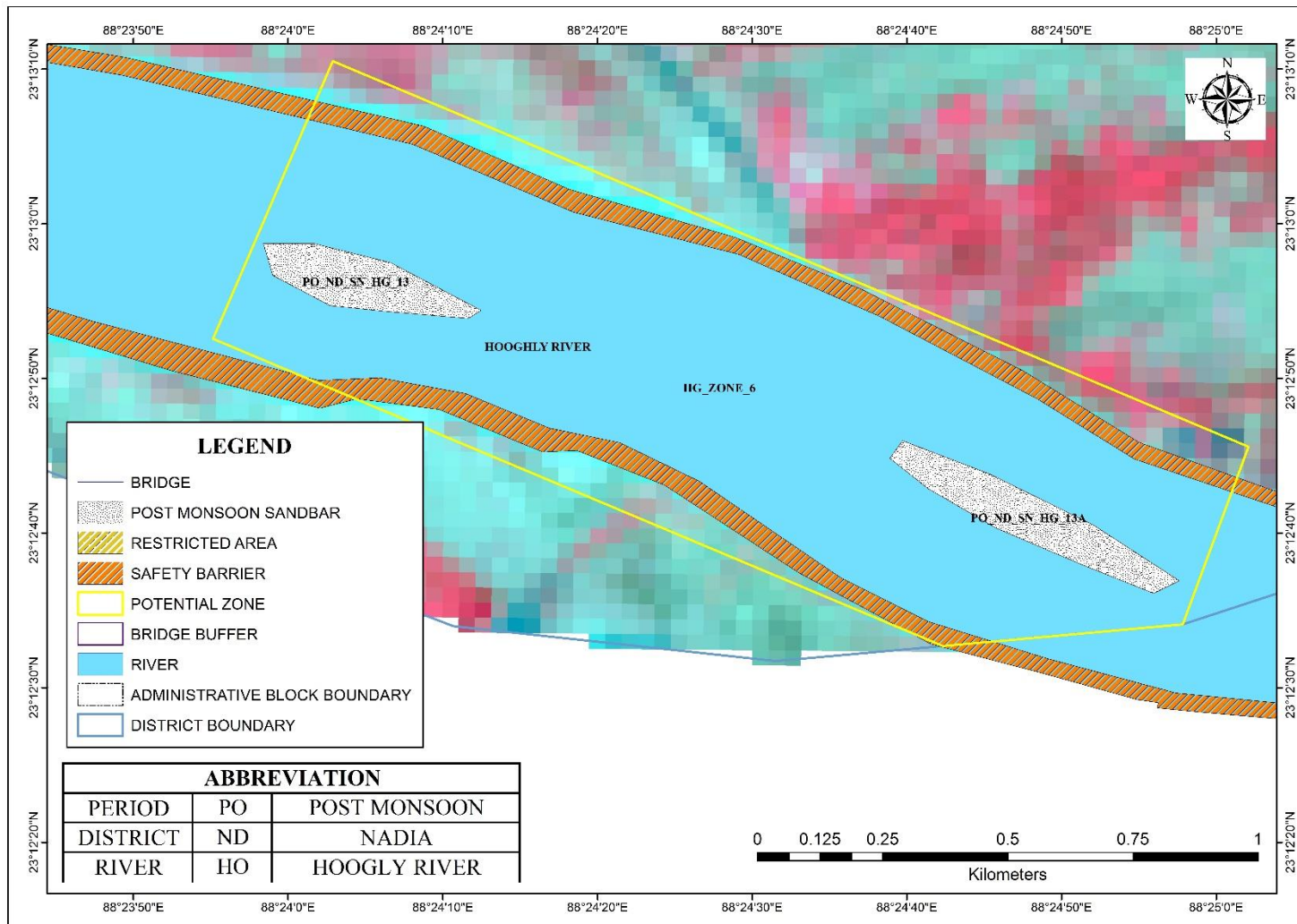


Plate 2B5: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Nadia District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)

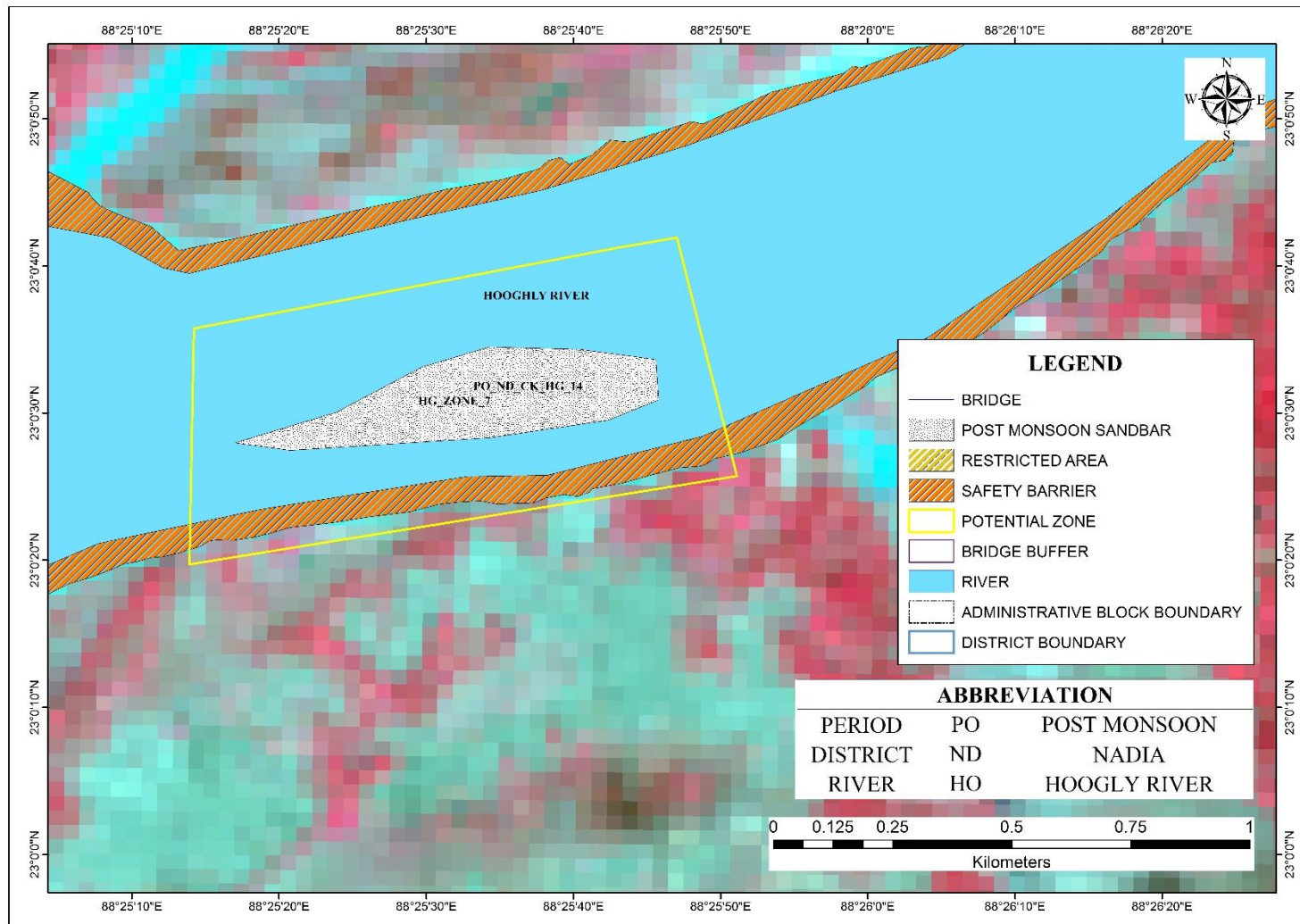


Plate 2B6: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Nadia District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)

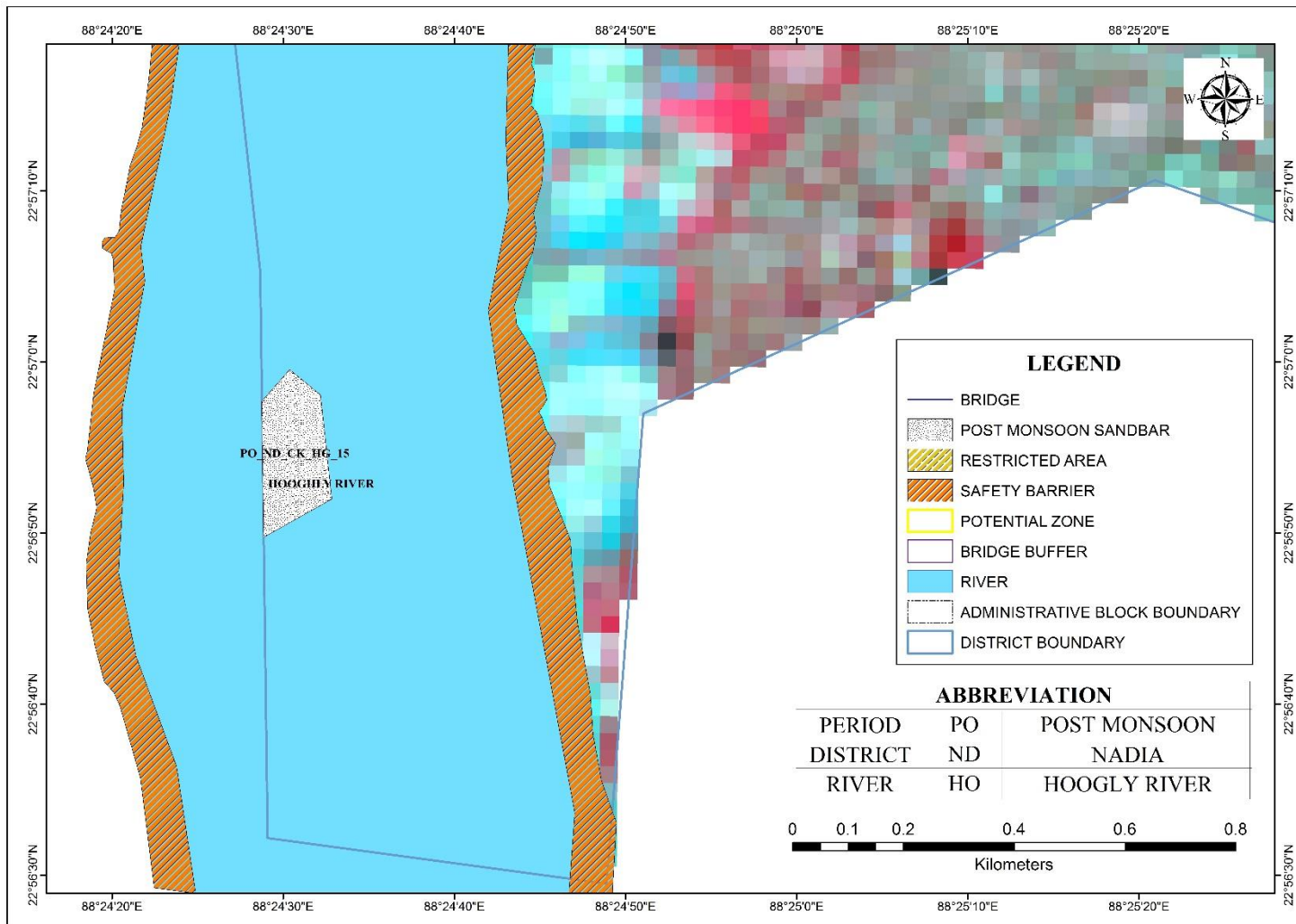


Plate 2B7: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Nadia District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)

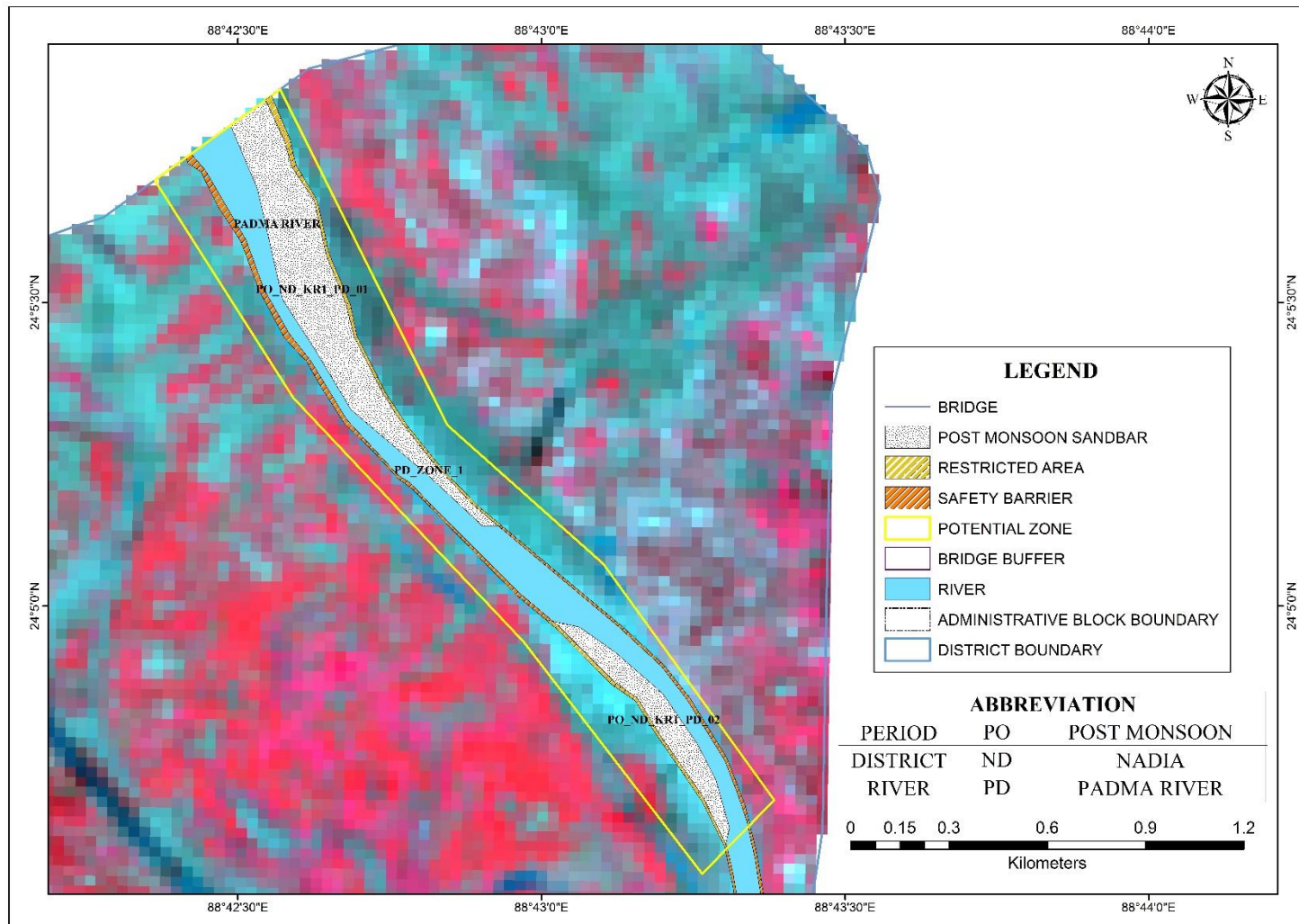


Plate 2B8: Distribution Map of Sand Bars on Rivers During Post-Monsoon Period of Nadia District (Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2020)



PLATE 3

WATERSHED MAP OF THE DISTRICT

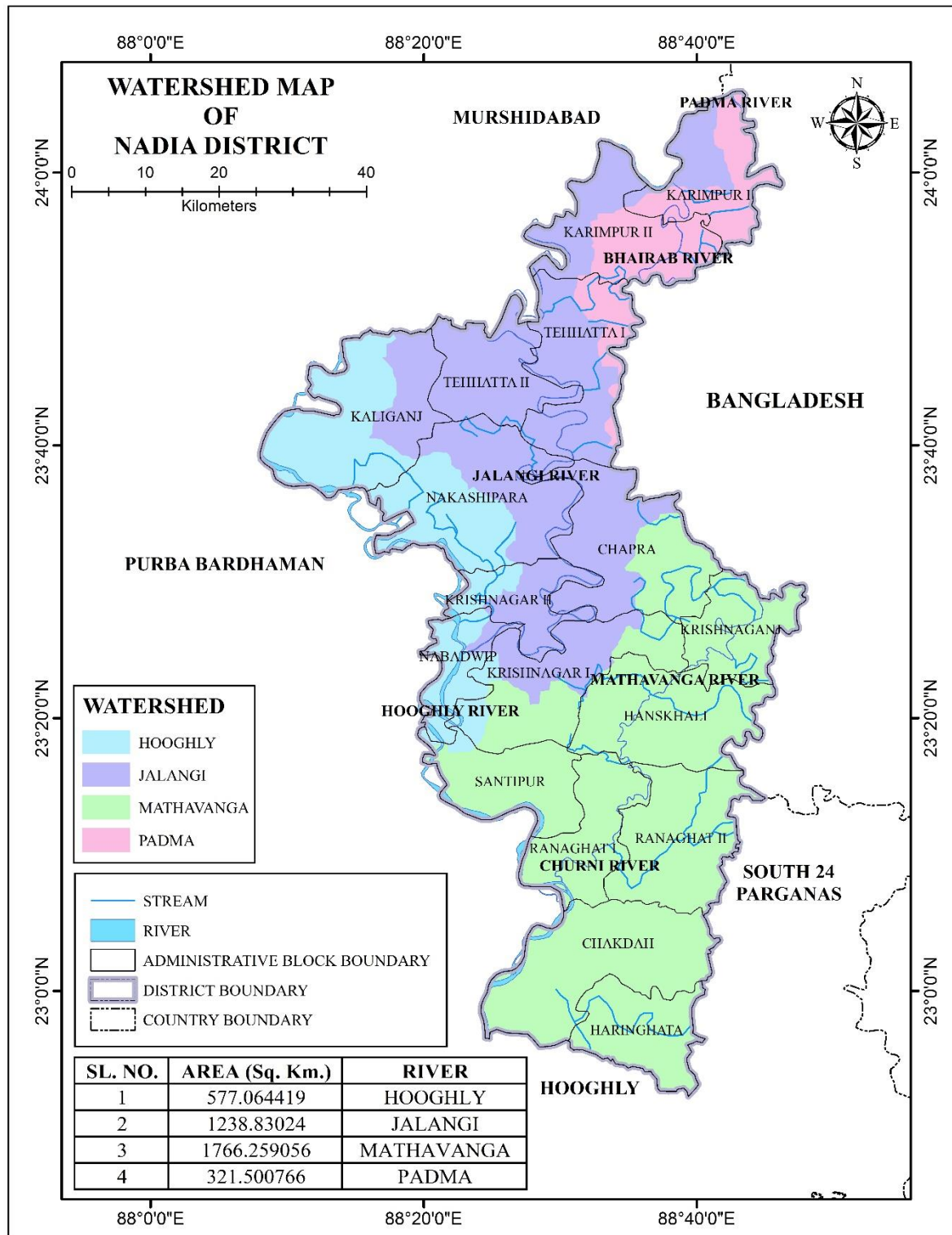


Plate 3A: Watershed Map of Nadia District (Source: World Wild Fund for Nature, September 2020)

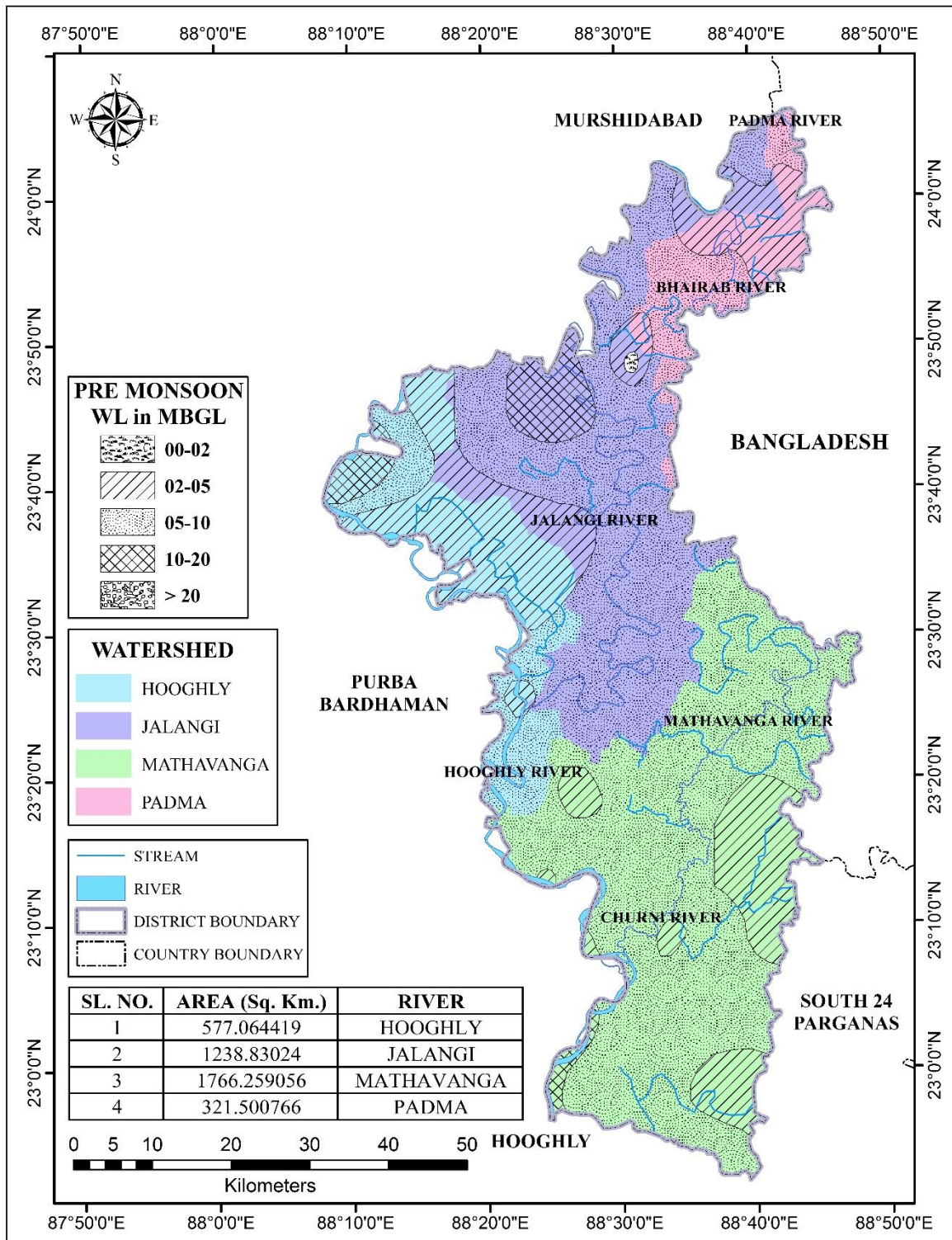


Plate 3B: District Watershed map showing ground water level during Pre-monsoon period (Source: World Wild Fund for Nature, September 2020)

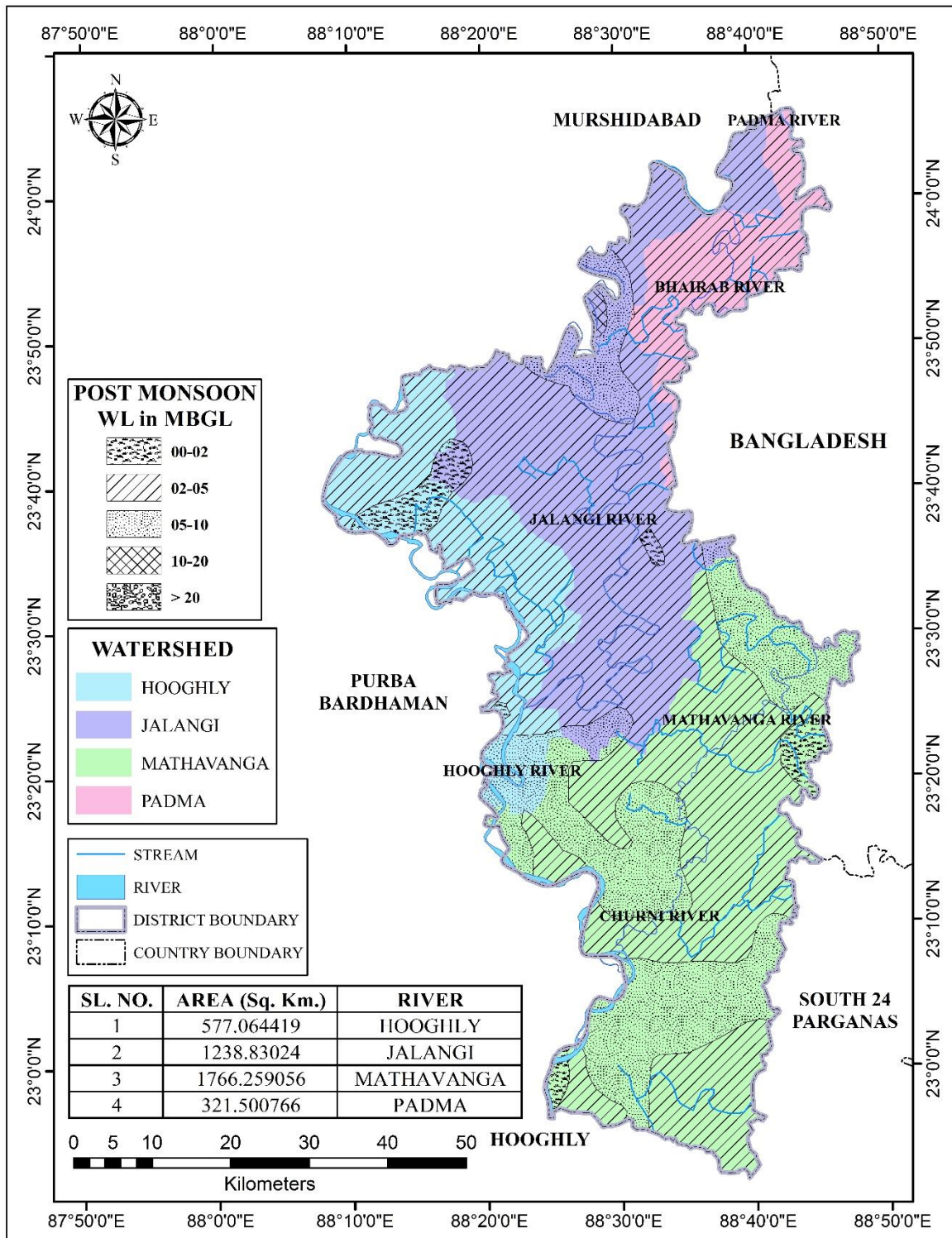


Plate 3C: District Watershed map showing ground water level during Post-monsoon period (Source: World Wild Fund for Nature, September 2020)



PLATE 4

LONG TERM EROSION-ACCRETION MAP OF RIVER BANK

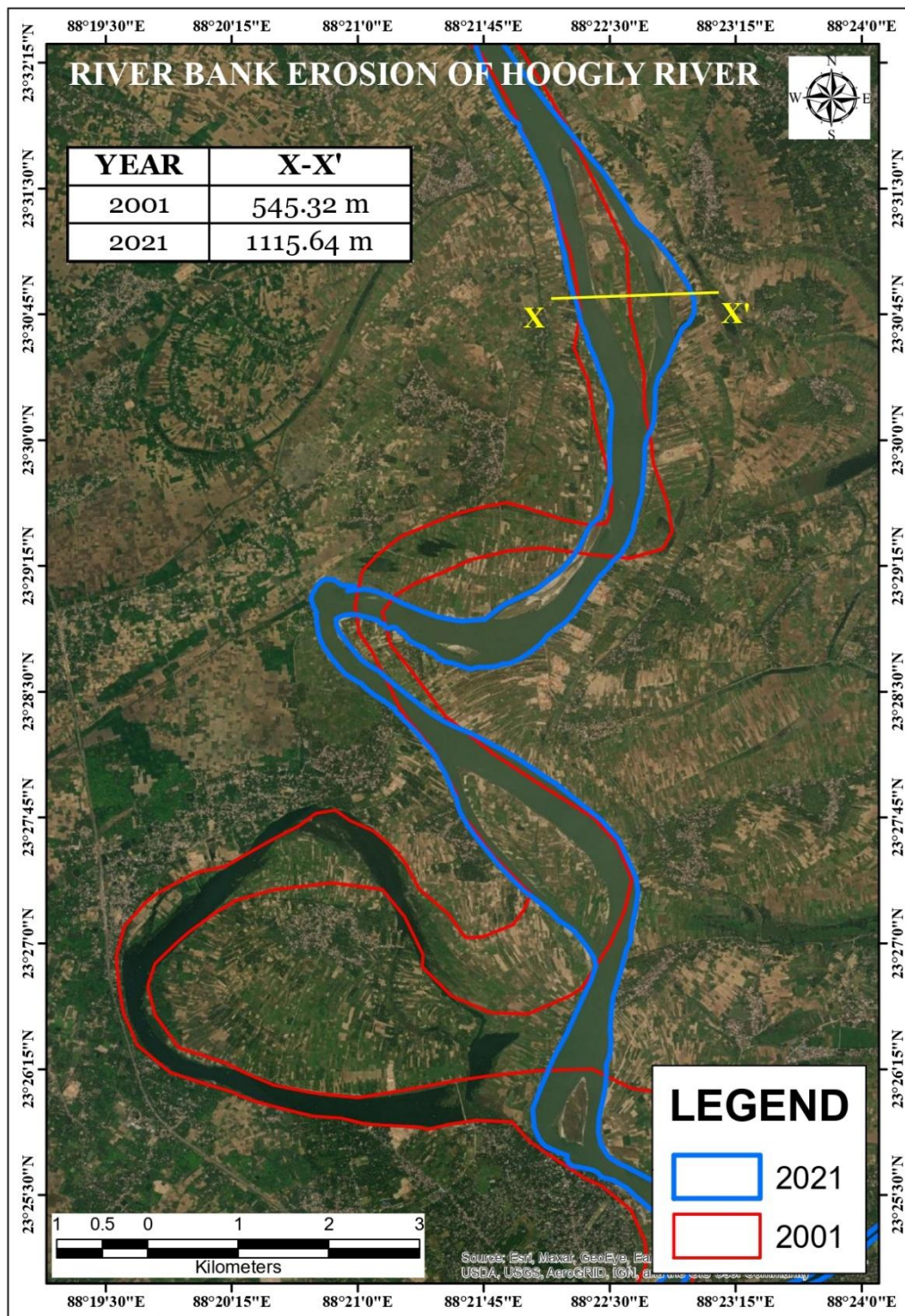


Plate 5: Map showing long-term (10-year or more) erosion-accretion areas on both the banks of Hooghly River, Nadia (Source: ISRO RESOURCE Sat 2 LISS III Sensor, November 2022)



Annexure 1
**Compliance as per Enforcement & Monitoring Guidelines for sand Mining,
2020 (MoEF& CC) for preparation of District Survey Report**



Sl. No.	Particulars	Status
1	District Survey Report for sand mining shall be prepared before the auction/e-auction/grant of the mining lease/Letter of Intent (LoI) by Mining department or department dealing the mining activity in respective states.	Noted.
2	In order to make the inventory of River Bed Material, a detailed survey of the district needs to be carried out, to identify the source of River Bed Material and alternative source of sand (M-Sand). The source will include rivers, desiltation of reservoir/dams, Patta lands/Khatedari Land, M-sand etc.	Complied with and explained in Chapter 7 pg no 54 to 78.
3	District Survey Report is to be prepared in such a way that it not only identifies the mineral-bearing area but also define the mining and no mining zones considering various environmental and social factors.	Complied with and furnished in pg no 76-77.
4	Identification of the source of Sand & M-Sand. The sources may be from Rivers, Lakes, Ponds, Dams, De-silting locations, Patta land/Khatedari lands. The details in case of Rivers such as [name, length of river, type (Perennial or Non-Perennial), Villages, Tehsil, District], in case of Lakes, Ponds, Dams, De-silting locations [Name, owned/maintained by (State Govt./PSU), area, Villages, Tehsil, District] in case of Patta land/Khatedari lands [Owner Name, Sy No, Area, Agricultural/Non-Agricultural, Villages, Tehsil, District], in case of M-Sand Plant [Owner Name, Sy No, Area, Quantity/Annum, Villages, Tehsil, District], needs to be recorded.	Complied with and given in table 7.4 pg 63.
5	Defining the sources of Sand/M-Sand in the district is the next step for identification of the potential area of deposition/aggradation wherein mining lease could be granted. Detailed survey needs to be carried out for quantification of minerals. The purpose of mining in the river bed is for channelization of rivers so as to avoid the possibility of flooding and to maintain the flow of the rivers. For this, the entire river stretch needs to be surveyed and original ground level (OGL) to be recorded and area of aggradation/deposition needs to be ascertained by comparing the level difference between the outside riverbed OGL and water level. Once the area of aggradation/deposition is identified, then the quantity of River Bed Material available needs to be calculated. The next step is channelization of the river bed and for this central $\frac{3}{4}$ th part of the river, width needs to be identified on a map. Out of the $\frac{3}{4}$ th part area, where there is a deposition/aggradation of the material needs to be identified. The remaining $\frac{1}{4}$ th area needs to be kept as no mining zone for the protection of banks. The specific gravity of the material also needs to be ascertained by analyzing the sample from a NABL accredited lab. Thus, the quantity of material available in metric ton needs to be calculated for mining and no mining zone.	Complied with and given in table 7.11 pg 75-76.



Sl. No.	Particulars	Status
6	The permanent boundary pillars need to be erected after identification of an area of aggradation and deposition outside the bank of the river at a safe location for future surveying. The distance between boundary pillars on each side of the bank shall not be more than 100 meters.	Benchmark Pillars are established in strategic locations while boundary pillars will be fixed while fixation of the mining lease boundary subsequent to district level verification.
7	Identifying the mining and no mining zone shall follow with defining the area of sensitivity by ascertaining the distance of the mining area from the protected area, forest, bridges, important structures, habitation etc. and based on the sensitivity the area needs to be defined in sensitive and non-sensitive area.	Complied with and furnished in pg no 76-77.
8	Demand and supply of the Riverbed Material through market survey needs to be carried out. In addition to this future demand for the next 5 years also needs to be considered.	Complied with and given in pg no 9-10.
9	It is suggested that as far as possible the sensitive areas should be avoided for mining, unless local safety condition arises. Such deviation shall be temporary & shall not be a permanent feature.	Complied with and furnished in pg no 76 to 77.
10	Sand and gravel could be extracted from the downstream of the sand bar at river bends. Retaining the upstream one to two-thirds of the bar and riparian vegetation is accepted as a method to promote channel stability.	Noted. The DSR is composing of all the potential sand zones for defining the resources. In a subsequent phase blocking of potential zones shall be done in due consultation with the district level committee. The areas mentioned in the observation points shall be excluded while blocking of sand mining leases which are part of these potential zones marked in this DSR.
11	The final area selected for the mining should be then divided into mining lease as per the requirement of State Government. It is suggested the mining lease area should be so selected as to cover the entire deposition area. Dividing a large area of deposition/aggradation into smaller mining leases should be avoided as it leads to loss of mineral and indirectly promote illegal mining.	Shall be Complied with.
12	Cluster situation shall be examined. A cluster is formed when one mining lease of homogenous mineral is within 500 meters of the other mining lease. In order to reduce the cluster formation mining lease size should be defined in such a way that distance between any two clusters preferably should not be less than 2.5 Km. Mining lease should be defined in such a way that the total area of the mining leases in a cluster should not be more than 10 Ha.	Noted. Due care will be taken while distribution of mining leases either to prevent cluster situation or keeping the prescribed distance in-between two mining clusters.
13	The number of a contiguous cluster needs to be ascertained. Contiguous cluster is formed when one cluster is at a distance of 2.5 Km from the other cluster.	Noted and shall be complied with.



Sl. No.	Particulars	Status
14	The mining outside the riverbed on Patta land/Khatedari land be granted when there is possibility of replenishment of material. In case, there is no replenishment then mining lease shall only be granted when there is no riverbed mining possibility within 5 KM of the Patta land/Khatedari land. For government projects, mining could be allowed on Patta land/Khatedari land but the mining should only be done by the Government agency and material should not be used for sale in the open market. Cluster situation as mentioned in para k above is also applicable for the mining in Patta land/Khatedari land.	Noted.
15	The State Government should define the transportation route from the mining lease considering the maximum production from the mines as at this stage the size of mining leases, their location, the quantity of mineral that can be mined safely etc. is available with the State Government. It is suggested that the transportation route should be selected in such a way that the movement of trucks/tippers/tractors from the villages having habitation should be avoided. The transportation route so selected should be verified by the State Government for its carrying capacity.	Noted and final transport route will be submitted during preparation of mine plan.
16	Potential site for mining having its impact on the forest, protected area, habitation, bridges etc, shall be avoided. For this, a sub-divisional committee may be formed which after the site visit shall decide its suitability for mining.	Shall be Complied with.
17	Public consultation-The Comments of the various stakeholders may be sought on the list of mining lease to be auctioned. The State Government shall give an advertisement in the local and national newspaper for seeking comments of the general public on the list of mining lease included in the DSR. The DSR should be placed in the public domain for at least one month from the date of publication of the advertisement for obtaining comments of the general public. The comments so received shall be placed before the sub-divisional committee for active consideration. The final list of sand mining areas [leases to be granted on riverbed &Patta land/Khatedari land, de-siltation location (ponds/lakes/dams), M-Sand Plants (alternate source of sand)] after the public hearing needs to be defined in the final DSR.	After publication of the West Bengal Sand Mining Policy, 2021, it is now eminent that State owned The West Bengal Mineral Development and Trading Corporation Limited (WBMDTCL) shall be responsible for mining of sand/ gravel/ river bed materials in whole state of West Bengal. However, the existing mining leases which were in effect before hand of this Gazzate notification July 2021 will be in operation till the year 2027-28. In order to have the rational distribution of mining leases as per the prevailing norms and guidelines grant of mining leases in the state of West Bengal shall be carried out in phases till all the blocks are under the ambit of WBMDTCL. This DSR thus consist of the identified potential sand deposite areas within which the existing and future mining leases shall occur. The details of the mining leases as and when granted shall follow the procedure described in EMGSM 2020 and prevailing norms.
18	The LOI should not be granted for mining area falling on both riverbed and outside riverbed. Therefore, in the same lease, both types of area should not be included.	Shall be Complied with.



Annexure 2

Estimation of Sand Resources based on sediment load comparison between Pre and Post Monsoon period of Nadia District



Abbreviation used in the table as below

PERIOD	PR	PRE MONSOON	BLOCK	NB	NABADWIP	
	PO	POST MONSOON		KN2	KRISHNAGAR II	
DISTRICT	ND	NADIA		KJ	KRISHNAGANJ	
BLOCK	RN2	RANAGHAT II		KN1	KRISHNAGAR I	
	KL	KALIGANJ		SN	SANTIPUR	
	KR1	KARIMPUR I		HS	HANSKHALI	
	KR2	KARIMPUR II		RN1	RANAGHAT I	
	TH2	TEHHATTA II		RIVER	HO	HOOGLY RIVER
	TH1	TEHHATTA I			PD	PADMA RIVER
	CH	CHAPRA			JL	JALANGI RIVER
	NK	NAKASHIPARA	MT		MATHAVANGA RIVER	
	HN	HARINGHATA	BH		BHAIRAB RIVER	
	CK	CHAKDAH	CR		CHURNI RIVER	

Pre monsoon						Post monsoon					
SL No	Sand Bar_Code	RL (m)	Area in sq.m.	Sand Thickness in m.	Sand Volume in M.Cum	SL No	Sand Bar_Code	RL (m)	Area in sq.m.	Sand Thickness in m.	Sand Volume in M. Cum
Estimation of Sand Resources in Pre monsoon period & Post monsoon period in sand bar regions of Hooghly River											
1	PR_ND_KL_HG_01	11	80958.98564	2	0.16	1	PO_ND_KL_HG_01A	11.5	34563.30148	2.00	0.07
2	PR_ND_KL_HG_02	10	67791.14126	2	0.14		PO_ND_KL_HG_02		0		
3	PR_ND_KL_HG_03	10	30992.25119	2	0.06		PO_ND_KL_HG_03		0		
4	PR_ND_KL_HG_04	10	14842.58935	2	0.03		PO_ND_KL_HG_04		0		
5	PR_ND_KL_HG_05	9	90389.8395	2	0.18	2	PO_ND_KL_HG_05A	9.5	148853.9436	2.00	0.30
6	PR_ND_NK_HG_06	8	77655.6471	2	0.16		PO_ND_NK_HG_06		0		
7	PR_ND_NK_HG_07	9	82567.5014	2	0.17	3	PO_ND_NK_HG_07	9.5	137729.8363	2.00	0.28
8	PR_ND_NK_HG_08	7	78636.29686	2	0.16		PO_ND_NK_HG_08		0		
9	PR_ND_NB_HG_09	4	103712.9419	2	0.21	4	PO_ND_NB_HG_09	4.5	115093.3577	2.00	0.23
10	PR_ND_NB_HG_10	5	64749.45143	2	0.13	5	PO_ND_NB_HG_10(XA)	5.5	60825.25771	2.00	0.12
						6	PO_ND_NB_HG_10(XB)		95864.24711	2.00	0.19
						7	PO_ND_NB_HG_10A		94825.27356	2.00	0.19
11	PR_ND_SN_HG_11	4	49108.05835	2	0.10		PO_ND_SN_HG_11		0		
12	PR_ND_SN_HG_12	5	71018.38521	2	0.14		PO_ND_SN_HG_12		0		
13	PR_ND_SN_HG_13	5	54331.3462	2	0.11	8	PO_ND_SN_HG_13	5.5	37506.89091	2.00	0.08

*District Survey Report
Nadia District,
West Bengal*



Pre monsoon						Post monsoon					
SL No	Sand Bar_Code	RL (m)	Area in sq.m.	Sand Thickness in m.	Sand Volume in M.Cum	SL No	Sand Bar_Code	RL (m)	Area in sq.m.	Sand Thickness in m.	Sand Volume in M.Cum
						9	PO_ND_SN_HG_1 3A		41247.05002	2.00	0.08
14	PR_ND_CK_HG _14	1	165788.652	2	0.33	10	PO_ND_CK_HG_1 4	1.5	98988.29192	2.00	0.20
15	PR_ND_CK_HG _15	3	59005.0715	2	0.12	11	PO_ND_CK_HG_1 5	3.5	55691.97864	2.00	0.11
Estimation of Sand Resources in Pre monsoon period & Post monsoon period in sand bar regions of Padma River											
1	PR_ND_KR1_PD _01	13	119617.9512	2	0.24	1	PO_ND_KR1_PD _01	13.5	122735.9109	2.00	0.25
2	PR_ND_KR1_PD _02	12	57818.9513	2	0.12	2	PO_ND_KR1_PD _02	12.5	54134.79063	2.00	0.11



Annexure 3
Boundary Coordinates of Potential Blocks of Nadia District



Abbreviation used in the table as below

PERIOD	PR	PRE MONSOON	BLOCK	NB	NABADWIP	
	PO	POST MONSOON		KN2	KRISHNAGAR II	
DISTRICT	ND	NADIA		KJ	KRISHNAGANJ	
BLOCK	RN2	RANAGHAT II		KN1	KRISHNAGAR I	
	KL	KALIGANJ		SN	SANTIPUR	
	KR1	KARIMPUR I		HS	HANSKHALI	
	KR2	KARIMPUR II		RN1	RANAGHAT I	
	TH2	TEHHATTA II		RIVER	HO	HOOGLY RIVER
	TH1	TEHHATTA I			PD	PADMA RIVER
	CH	CHAPRA			JL	JALANGI RIVER
	NK	NAKASHIPARA	MT		MATHAVANGA RIVER	
	HN	HARINGHATA	BH		BHAIRAB RIVER	
	CK	CHAKDAH	CR		CHURNI RIVER	

SANDBAR CODE	POINT_NO	LATITUDE	LONGITUDE
ND_KL_HG_01A	1	23° 47' 33.685" N	88° 14' 6.354" E
	2	23° 47' 32.314" N	88° 14' 4.847" E
	3	23° 47' 33.685" N	88° 14' 4.641" E
	4	23° 47' 38.551" N	88° 14' 5.395" E
	5	23° 47' 44.705" N	88° 14' 5.771" E
	6	23° 47' 44.895" N	88° 14' 6.068" E
	7	23° 47' 47.297" N	88° 14' 9.829" E
	8	23° 47' 47.520" N	88° 14' 10.178" E
	9	23° 47' 45.746" N	88° 14' 10.261" E
	10	23° 47' 43.485" N	88° 14' 9.370" E
	11	23° 47' 40.469" N	88° 14' 8.753" E
	12	23° 47' 37.043" N	88° 14' 7.794" E
ND_NK_HG_07	1	23° 32' 58.026" N	88° 21' 32.187" E
	2	23° 32' 56.313" N	88° 21' 32.444" E
	3	23° 32' 56.827" N	88° 21' 30.474" E
	4	23° 33' 0.082" N	88° 21' 26.619" E
	5	23° 33' 1.195" N	88° 21' 21.993" E
	6	23° 33' 1.452" N	88° 21' 19.766" E
	7	23° 33' 3.166" N	88° 21' 19.338" E
	8	23° 33' 4.365" N	88° 21' 21.651" E
	9	23° 33' 4.194" N	88° 21' 25.248" E
	10	23° 33' 3.166" N	88° 21' 28.247" E
	11	23° 33' 0.938" N	88° 21' 30.217" E
ND_NB_HG_09	1	23° 23' 27.781" N	88° 22' 26.889" E



SANDBAR CODE	POINT_NO	LATITUDE	LONGITUDE
	2	23° 23' 25.248" N	88° 22' 25.277" E
	3	23° 23' 29.178" N	88° 22' 25.221" E
	4	23° 23' 38.361" N	88° 22' 26.455" E
	5	23° 23' 44.802" N	88° 22' 28.511" E
	6	23° 23' 51.792" N	88° 22' 33.445" E
	7	23° 23' 53.296" N	88° 22' 35.572" E
	8	23° 23' 36.895" N	88° 22' 30.658" E
ND_NB_HG_10(XB)	1	23° 22' 44.909" N	88° 21' 41.637" E
	2	23° 22' 44.086" N	88° 21' 38.211" E
	3	23° 22' 46.145" N	88° 21' 37.716" E
	4	23° 22' 49.456" N	88° 21' 40.373" E
	5	23° 22' 57.774" N	88° 21' 44.500" E
	6	23° 22' 57.451" N	88° 21' 45.140" E
	7	23° 22' 57.359" N	88° 21' 45.340" E
	8	23° 22' 56.274" N	88° 21' 47.744" E
	9	23° 22' 52.173" N	88° 21' 48.079" E
	10	23° 22' 49.020" N	88° 21' 45.201" E
ND_NB_HG_10A	1	23° 21' 10.630" N	88° 20' 19.857" E
	2	23° 21' 10.014" N	88° 20' 18.315" E
	3	23° 21' 10.322" N	88° 20' 12.867" E
	4	23° 21' 10.322" N	88° 20' 7.727" E
	5	23° 21' 11.453" N	88° 20' 4.541" E
	6	23° 21' 12.070" N	88° 20' 2.382" E
	7	23° 21' 13.817" N	88° 20' 1.971" E
	8	23° 21' 15.256" N	88° 20' 5.260" E
	9	23° 21' 15.770" N	88° 20' 9.989" E
	10	23° 21' 15.565" N	88° 20' 14.203" E
	11	23° 21' 12.584" N	88° 20' 18.726" E
ND_SN_HG_13	1	23° 12' 54.394" N	88° 24' 12.477" E
	2	23° 12' 53.880" N	88° 24' 11.654" E
	3	23° 12' 54.291" N	88° 24' 6.720" E
	4	23° 12' 54.702" N	88° 24' 2.712" E
	5	23° 12' 56.655" N	88° 23' 59.011" E
	6	23° 12' 58.711" N	88° 23' 58.394" E
	7	23° 12' 58.711" N	88° 24' 1.684" E
	8	23° 12' 57.477" N	88° 24' 6.618" E
ND_SN_HG_13A	1	23° 12' 36.919" N	88° 24' 57.603" E
	2	23° 12' 36.096" N	88° 24' 55.958" E
	3	23° 12' 37.947" N	88° 24' 51.332" E



SANDBAR CODE	POINT_NO	LATITUDE	LONGITUDE
	4	23° 12' 40.311" N	88° 24' 45.782" E
	5	23° 12' 42.881" N	88° 24' 41.362" E
	6	23° 12' 44.834" N	88° 24' 38.895" E
	7	23° 12' 45.965" N	88° 24' 39.717" E
	8	23° 12' 43.806" N	88° 24' 45.370" E
	9	23° 12' 40.516" N	88° 24' 52.052" E
ND_CK_HG_14	1	23° 0' 28.324" N	88° 25' 34.300" E
	2	23° 0' 27.467" N	88° 25' 20.765" E
	3	23° 0' 27.981" N	88° 25' 16.996" E
	4	23° 0' 30.037" N	88° 25' 23.849" E
	5	23° 0' 33.121" N	88° 25' 29.674" E
	6	23° 0' 34.492" N	88° 25' 34.300" E
	7	23° 0' 34.320" N	88° 25' 40.467" E
	8	23° 0' 33.635" N	88° 25' 45.607" E
	9	23° 0' 30.894" N	88° 25' 45.778" E
	10	23° 0' 29.523" N	88° 25' 42.352" E
ND_KR1_PD_01	1	24° 5' 7.934" N	88° 42' 55.719" E
	2	24° 5' 7.921" N	88° 42' 54.163" E
	3	24° 5' 12.691" N	88° 42' 49.064" E
	4	24° 5' 19.434" N	88° 42' 41.170" E
	5	24° 5' 25.190" N	88° 42' 37.716" E
	6	24° 5' 30.289" N	88° 42' 34.427" E
	7	24° 5' 41.144" N	88° 42' 31.960" E
	8	24° 5' 47.529" N	88° 42' 29.278" E
	9	24° 5' 50.034" N	88° 42' 32.737" E
	10	24° 5' 46.016" N	88° 42' 34.594" E
	11	24° 5' 43.446" N	88° 42' 35.314" E
	12	24° 5' 40.088" N	88° 42' 37.541" E
	13	24° 5' 34.640" N	88° 42' 38.740" E
	14	24° 5' 29.980" N	88° 42' 40.659" E
	15	24° 5' 26.656" N	88° 42' 41.481" E
	16	24° 5' 21.106" N	88° 42' 44.291" E
	17	24° 5' 18.433" N	88° 42' 45.970" E
	18	24° 5' 14.253" N	88° 42' 49.259" E
	19	24° 5' 10.072" N	88° 42' 53.165" E
ND_KR1_PD_02	1	24° 4' 38.091" N	88° 43' 18.566" E
	2	24° 4' 36.477" N	88° 43' 18.207" E
	3	24° 4' 41.291" N	88° 43' 15.883" E
	4	24° 4' 47.492" N	88° 43' 11.565" E



SANDBAR CODE	POINT_NO	LATITUDE	LONGITUDE
	5	24° 4' 50.885" N	88° 43' 9.509" E
	6	24° 4' 52.598" N	88° 43' 7.111" E
	7	24° 4' 58.011" N	88° 43' 1.731" E
	8	24° 4' 58.515" N	88° 43' 1.132" E
	9	24° 4' 57.930" N	88° 43' 3.764" E
	10	24° 4' 55.463" N	88° 43' 7.259" E
	11	24° 4' 51.351" N	88° 43' 11.987" E
	12	24° 4' 46.417" N	88° 43' 15.379" E
	13	24° 4' 42.819" N	88° 43' 17.230" E



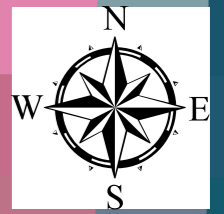
Annexure 4
Map showing of Potential Blocks of Nadia District

POTENTIAL BLOCK ND_KL_HG_01A OF HOOGHLY RIVER

88°13'55"E 88°14'0"E 88°14'5"E 88°14'10"E 88°14'15"E 88°14'20"E

23°47'45"N
23°47'40"N
23°47'35"N

23°47'45"N
23°47'40"N
23°47'35"N

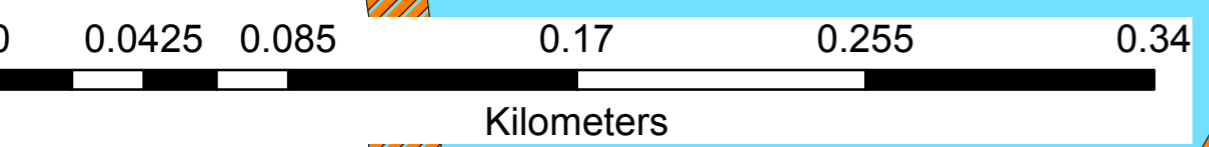


HOOGHLY RIVER

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

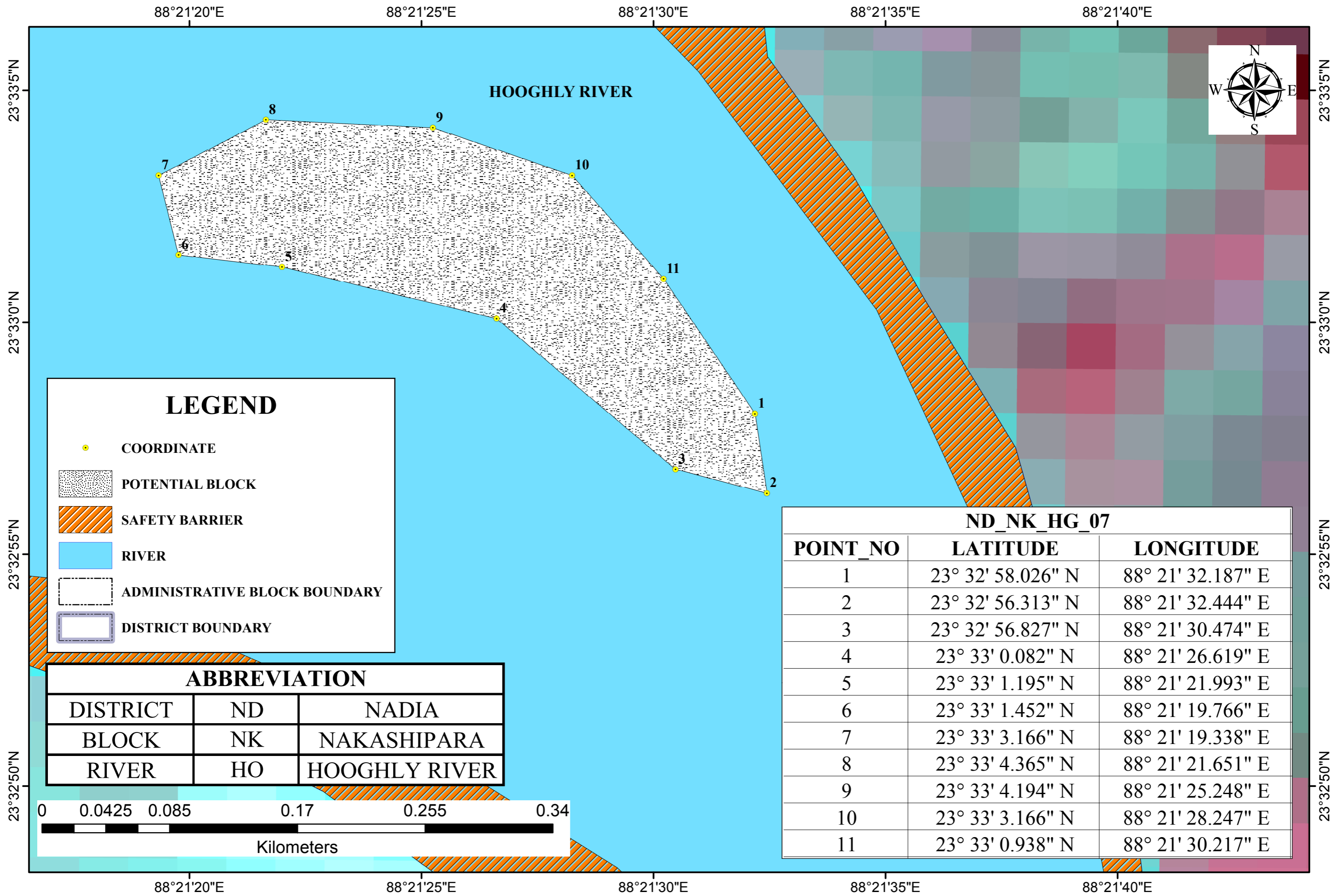
ABBREVIATION		
DISTRICT	ND	NADIA
BLOCK	KL	KALIGANJ
RIVER	HO	HOOGHLY RIVER



ND_KL_HG_01A		
POINT_NO	LATITUDE	LONGITUDE
1	23° 47' 33.685" N	88° 14' 6.354" E
2	23° 47' 32.314" N	88° 14' 4.847" E
3	23° 47' 33.685" N	88° 14' 4.641" E
4	23° 47' 38.551" N	88° 14' 5.395" E
5	23° 47' 44.705" N	88° 14' 5.771" E
6	23° 47' 44.895" N	88° 14' 6.068" E
7	23° 47' 47.297" N	88° 14' 9.829" E
8	23° 47' 47.520" N	88° 14' 10.178" E
9	23° 47' 45.746" N	88° 14' 10.261" E
10	23° 47' 43.485" N	88° 14' 9.370" E
11	23° 47' 40.469" N	88° 14' 8.753" E
12	23° 47' 37.043" N	88° 14' 7.794" E

88°13'55"E 88°14'0"E 88°14'5"E 88°14'10"E 88°14'15"E 88°14'20"E

POTENTIAL BLOCK ND_NK_HG_07 OF HOOGHLY RIVER

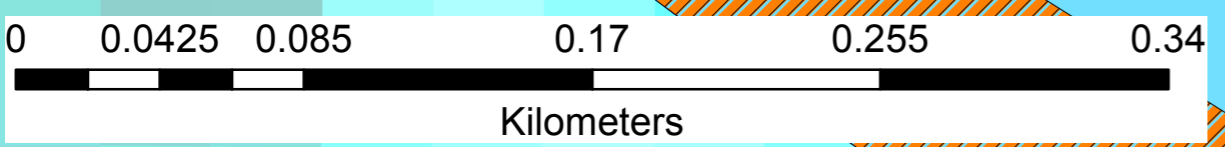


LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

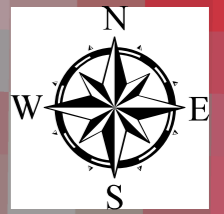
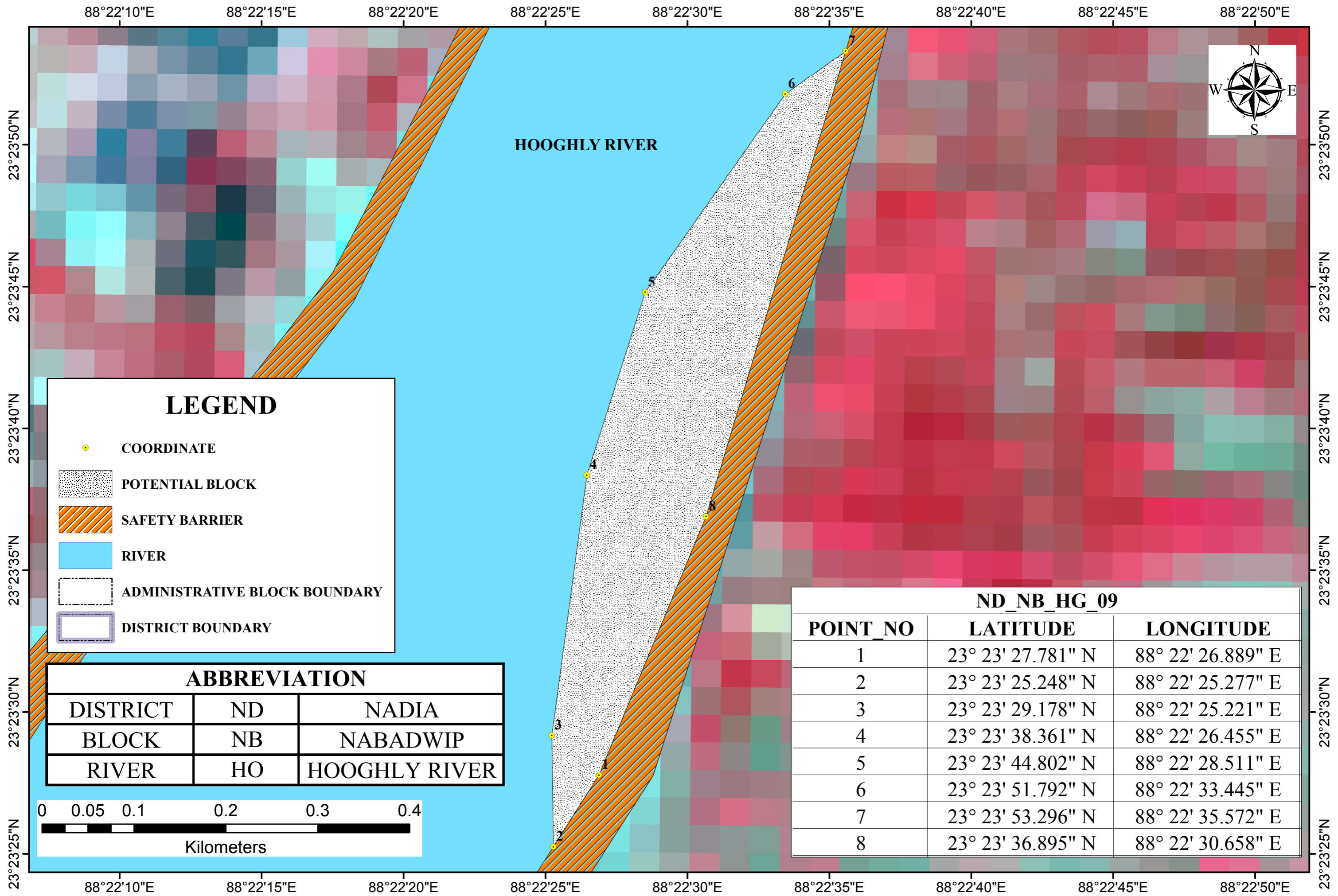
ABBREVIATION

DISTRICT	ND	NADIA
BLOCK	NK	NAKASHIPARA
RIVER	HO	HOOGHLY RIVER



ND_NK_HG_07		
POINT_NO	LATITUDE	LONGITUDE
1	23° 32' 58.026" N	88° 21' 32.187" E
2	23° 32' 56.313" N	88° 21' 32.444" E
3	23° 32' 56.827" N	88° 21' 30.474" E
4	23° 33' 0.082" N	88° 21' 26.619" E
5	23° 33' 1.195" N	88° 21' 21.993" E
6	23° 33' 1.452" N	88° 21' 19.766" E
7	23° 33' 3.166" N	88° 21' 19.338" E
8	23° 33' 4.365" N	88° 21' 21.651" E
9	23° 33' 4.194" N	88° 21' 25.248" E
10	23° 33' 3.166" N	88° 21' 28.247" E
11	23° 33' 0.938" N	88° 21' 30.217" E

POTENTIAL BLOCK ND_NB_HG_09 OF HOOGHLY RIVER

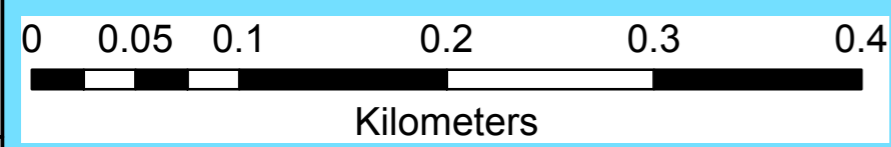


LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION

DISTRICT	ND	NADIA
BLOCK	NB	NABADWIP
RIVER	HO	HOOGHLY RIVER



ND_NB_HG_09		
POINT_NO	LATITUDE	LONGITUDE
1	23° 23' 27.781" N	88° 22' 26.889" E
2	23° 23' 25.248" N	88° 22' 25.277" E
3	23° 23' 29.178" N	88° 22' 25.221" E
4	23° 23' 38.361" N	88° 22' 26.455" E
5	23° 23' 44.802" N	88° 22' 28.511" E
6	23° 23' 51.792" N	88° 22' 33.445" E
7	23° 23' 53.296" N	88° 22' 35.572" E
8	23° 23' 36.895" N	88° 22' 30.658" E

POTENTIAL BLOCK ND_NB_HG_10A OF HOOGHLY RIVER

88°19'55"E

88°20'0"E

88°20'5"E

88°20'10"E

88°20'15"E

88°20'20"E

88°20'25"E

23°21'20"N

23°21'20"N

23°21'15"N

23°21'15"N

23°21'10"N

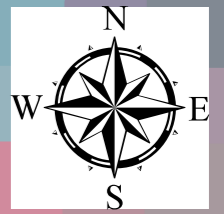
23°21'10"N

23°21'5"N

23°21'5"N

23°21'0"N

23°21'0"N



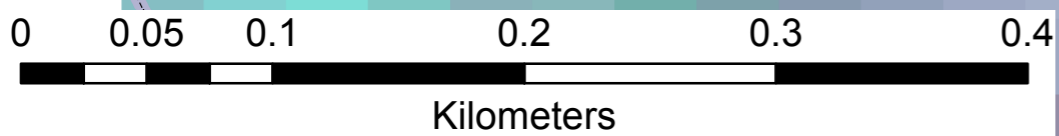
HOOGHLY RIVER

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION

DISTRICT	ND	NADIA
BLOCK	NB	NABADWIP
RIVER	HO	HOOGHLY RIVER



ND_NB_HG_10A		
POINT_NO	LATITUDE	LONGITUDE
1	23° 21' 10.630" N	88° 20' 19.857" E
2	23° 21' 10.014" N	88° 20' 18.315" E
3	23° 21' 10.322" N	88° 20' 12.867" E
4	23° 21' 10.322" N	88° 20' 7.727" E
5	23° 21' 11.453" N	88° 20' 4.541" E
6	23° 21' 12.070" N	88° 20' 2.382" E
7	23° 21' 13.817" N	88° 20' 1.971" E
8	23° 21' 15.256" N	88° 20' 5.260" E
9	23° 21' 15.770" N	88° 20' 9.989" E
10	23° 21' 15.565" N	88° 20' 14.203" E
11	23° 21' 12.584" N	88° 20' 18.726" E

88°19'55"E

88°20'0"E

88°20'5"E

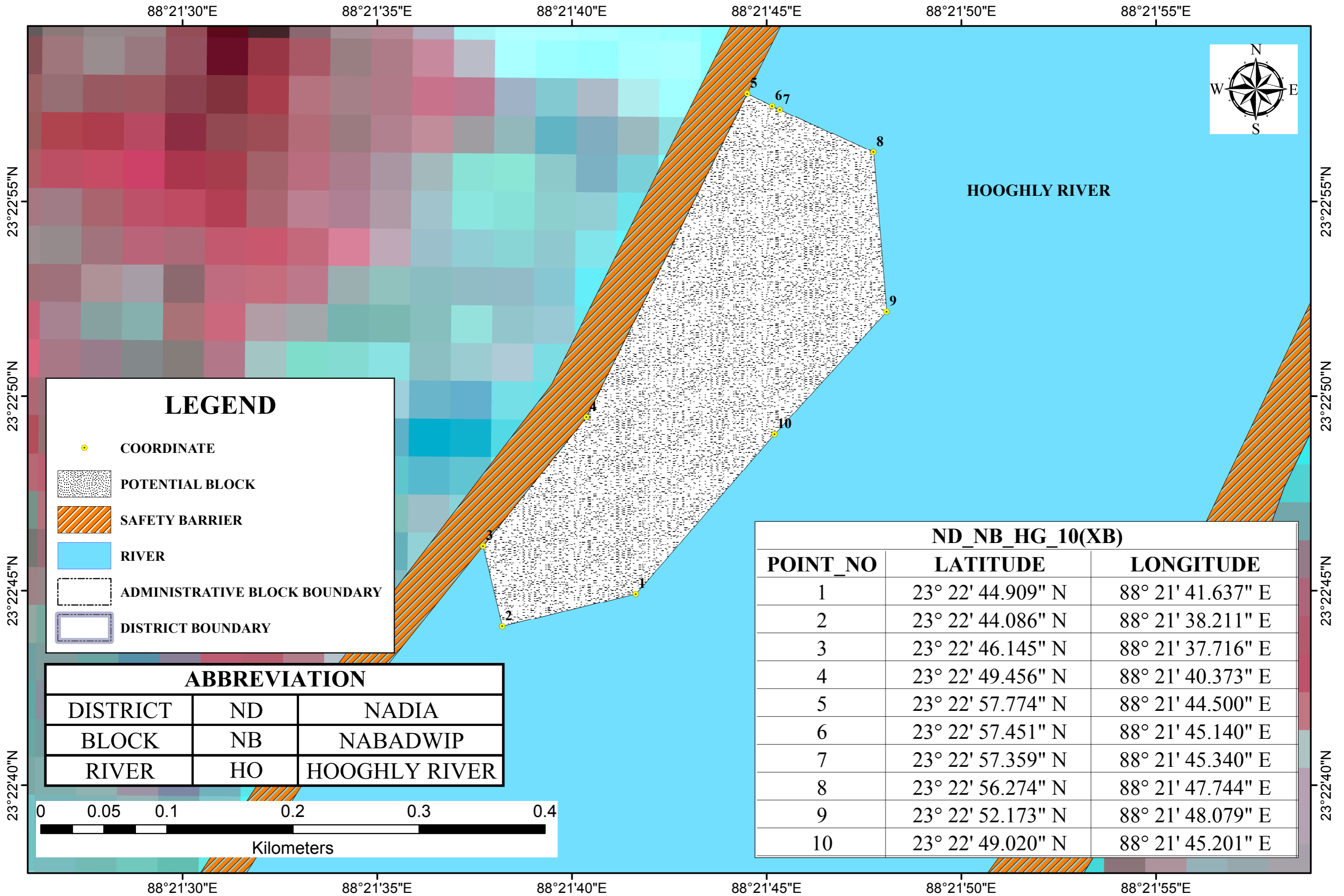
88°20'10"E

88°20'15"E

88°20'20"E

88°20'25"E

POTENTIAL BLOCK ND_NB_HG_10(XB) OF HOOGHLY RIVER

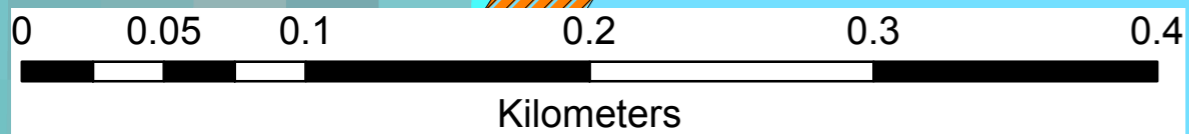


LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION

DISTRICT	ND	NADIA
BLOCK	NB	NABADWIP
RIVER	HO	HOOGHLY RIVER



ND_NB_HG_10(XB)		
POINT_NO	LATITUDE	LONGITUDE
1	23° 22' 44.909" N	88° 21' 41.637" E
2	23° 22' 44.086" N	88° 21' 38.211" E
3	23° 22' 46.145" N	88° 21' 37.716" E
4	23° 22' 49.456" N	88° 21' 40.373" E
5	23° 22' 57.774" N	88° 21' 44.500" E
6	23° 22' 57.451" N	88° 21' 45.140" E
7	23° 22' 57.359" N	88° 21' 45.340" E
8	23° 22' 56.274" N	88° 21' 47.744" E
9	23° 22' 52.173" N	88° 21' 48.079" E
10	23° 22' 49.020" N	88° 21' 45.201" E

POTENTIAL BLOCK ND_SN_HG_13 OF HOOGHLY RIVER

88°23'55"E

88°24'0"E

88°24'5"E

88°24'10"E

88°24'15"E

23°13'0"N

23°13'0"N

23°12'55"N

23°12'55"N

23°12'50"N

23°12'50"N

23°12'45"N

23°12'45"N



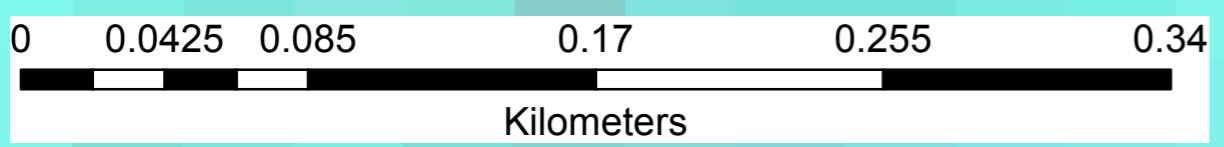
HOOGHLY RIVER

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION

DISTRICT	ND	NADIA
BLOCK	SN	SANTIPUR
RIVER	HO	HOOGHLY RIVER



ND_SN_HG_13		
POINT_NO	LATITUDE	LONGITUDE
1	23° 12' 54.394" N	88° 24' 12.477" E
2	23° 12' 53.880" N	88° 24' 11.654" E
3	23° 12' 54.291" N	88° 24' 6.720" E
4	23° 12' 54.702" N	88° 24' 2.712" E
5	23° 12' 56.655" N	88° 23' 59.011" E
6	23° 12' 58.711" N	88° 23' 58.394" E
7	23° 12' 58.711" N	88° 24' 1.684" E
8	23° 12' 57.477" N	88° 24' 6.618" E

88°23'55"E

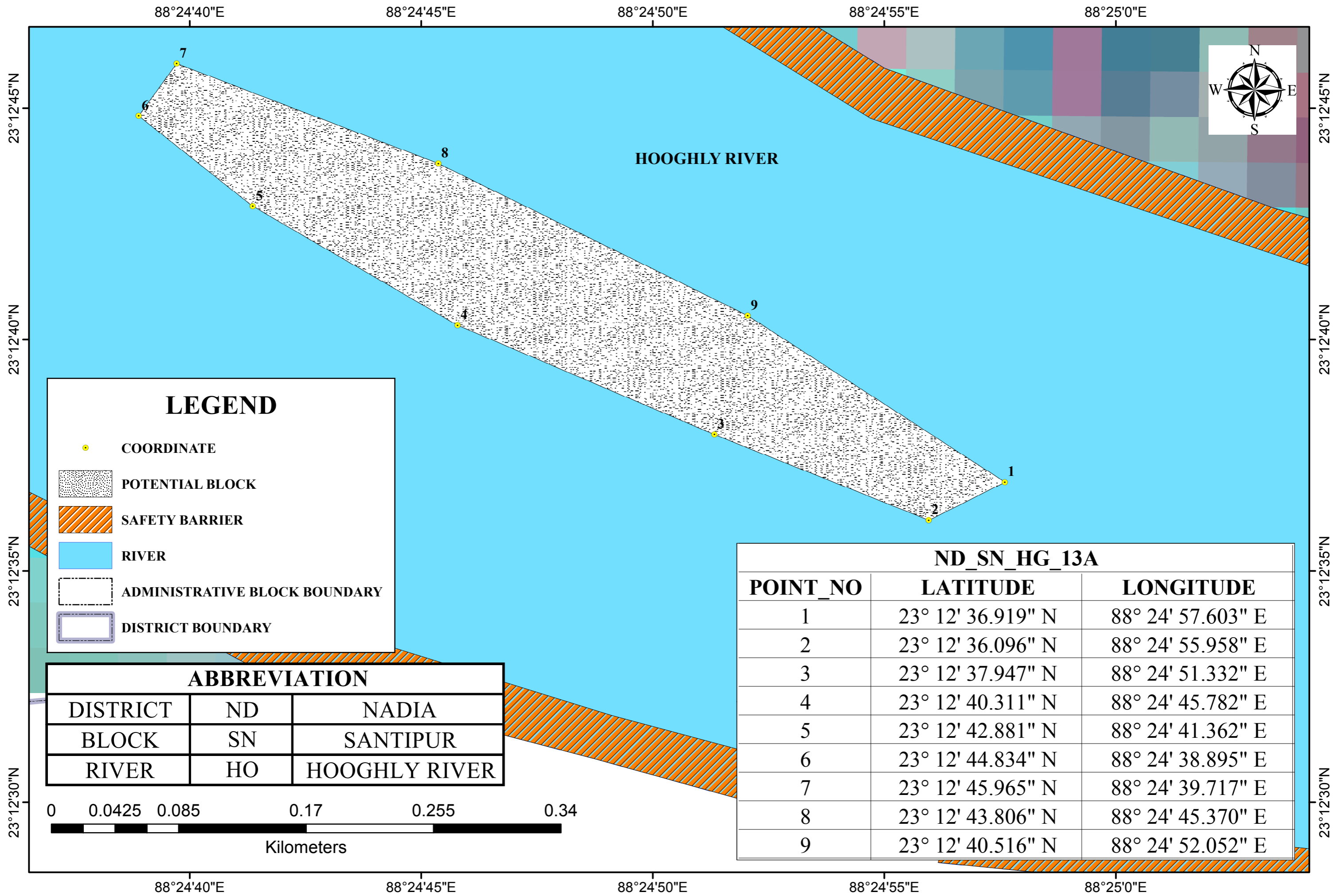
88°24'0"E

88°24'5"E

88°24'10"E

88°24'15"E

POTENTIAL BLOCK ND_SN_HG_13A OF HOOGHLY RIVER

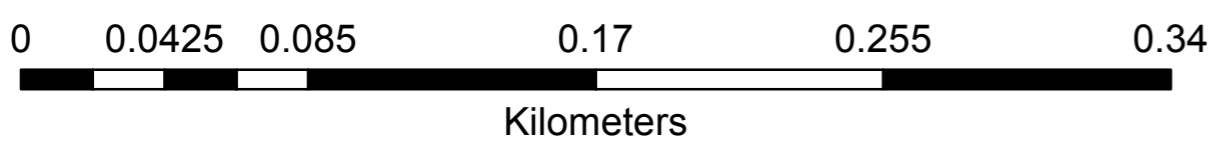


LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

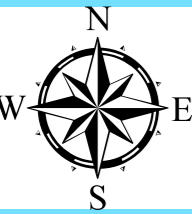
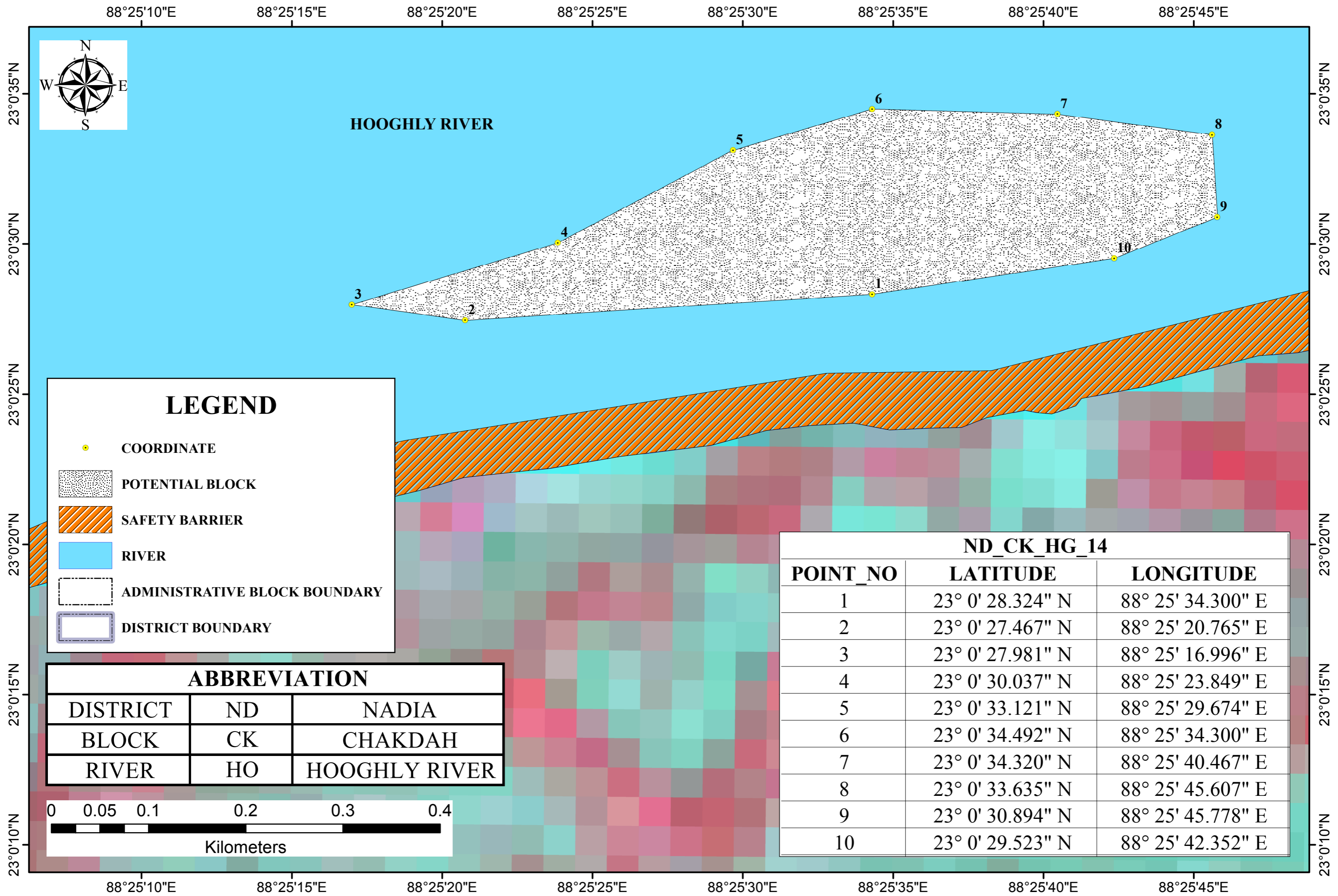
ABBREVIATION

DISTRICT	ND	NADIA
BLOCK	SN	SANTIPUR
RIVER	HO	HOOGHLY RIVER



ND_SN_HG_13A		
POINT_NO	LATITUDE	LONGITUDE
1	23° 12' 36.919" N	88° 24' 57.603" E
2	23° 12' 36.096" N	88° 24' 55.958" E
3	23° 12' 37.947" N	88° 24' 51.332" E
4	23° 12' 40.311" N	88° 24' 45.782" E
5	23° 12' 42.881" N	88° 24' 41.362" E
6	23° 12' 44.834" N	88° 24' 38.895" E
7	23° 12' 45.965" N	88° 24' 39.717" E
8	23° 12' 43.806" N	88° 24' 45.370" E
9	23° 12' 40.516" N	88° 24' 52.052" E

POTENTIAL BLOCK ND_CK_HG_14 OF HOOGHLY RIVER



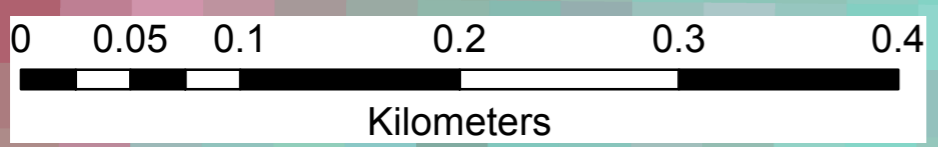
HOOGHLY RIVER

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

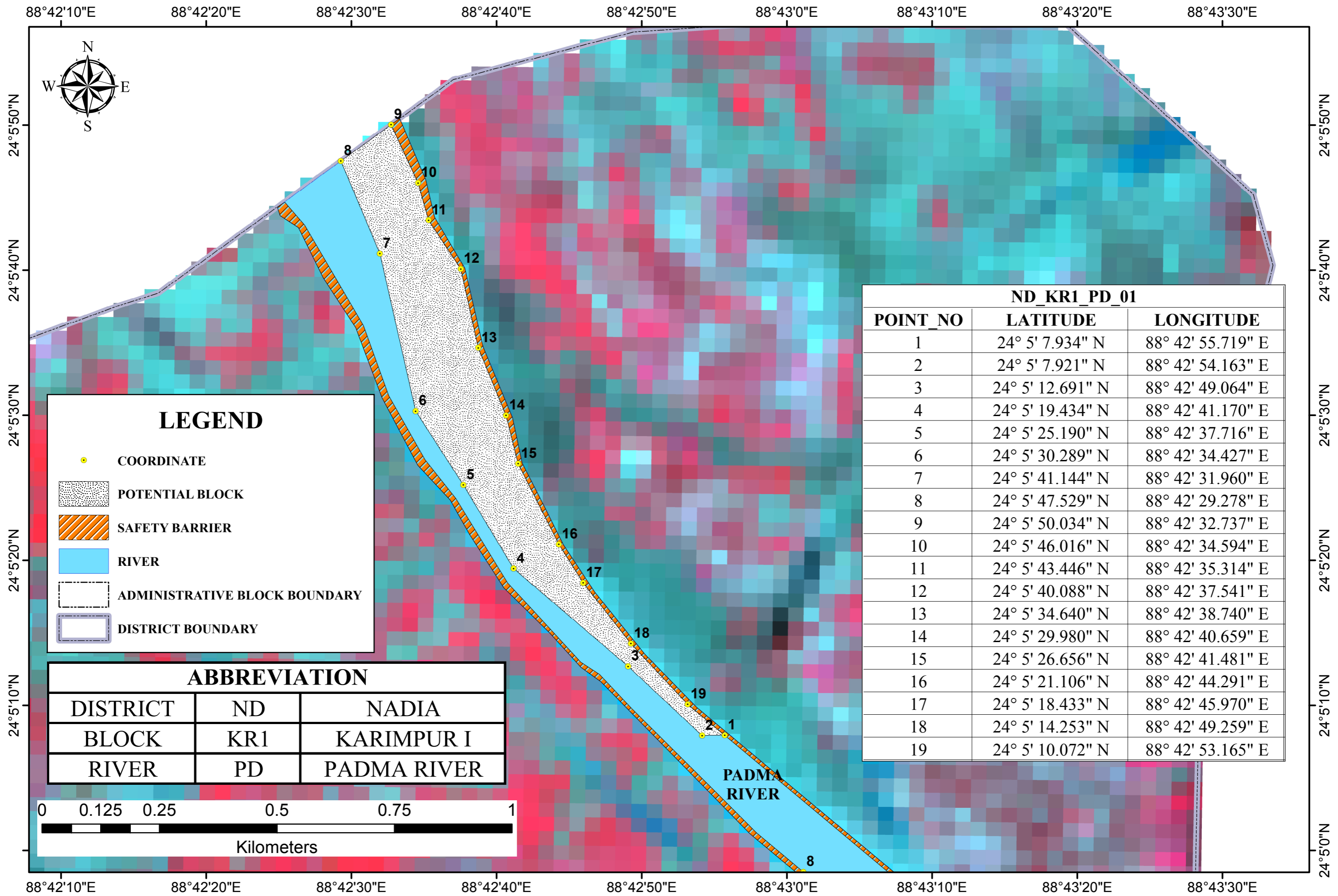
ABBREVIATION

DISTRICT	ND	NADIA
BLOCK	CK	CHAKDAH
RIVER	HO	HOOGHLY RIVER



ND_CK_HG_14		
POINT_NO	LATITUDE	LONGITUDE
1	23° 0' 28.324" N	88° 25' 34.300" E
2	23° 0' 27.467" N	88° 25' 20.765" E
3	23° 0' 27.981" N	88° 25' 16.996" E
4	23° 0' 30.037" N	88° 25' 23.849" E
5	23° 0' 33.121" N	88° 25' 29.674" E
6	23° 0' 34.492" N	88° 25' 34.300" E
7	23° 0' 34.320" N	88° 25' 40.467" E
8	23° 0' 33.635" N	88° 25' 45.607" E
9	23° 0' 30.894" N	88° 25' 45.778" E
10	23° 0' 29.523" N	88° 25' 42.352" E

POTENTIAL BLOCK ND_KR1_PD_01 OF PADMA RIVER

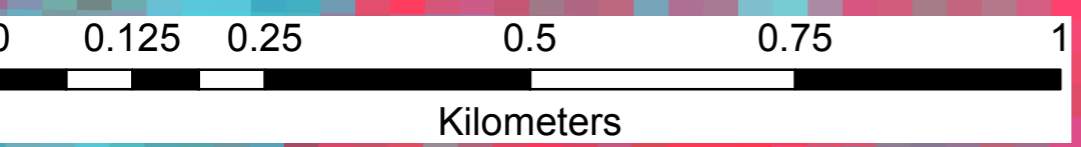


LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION

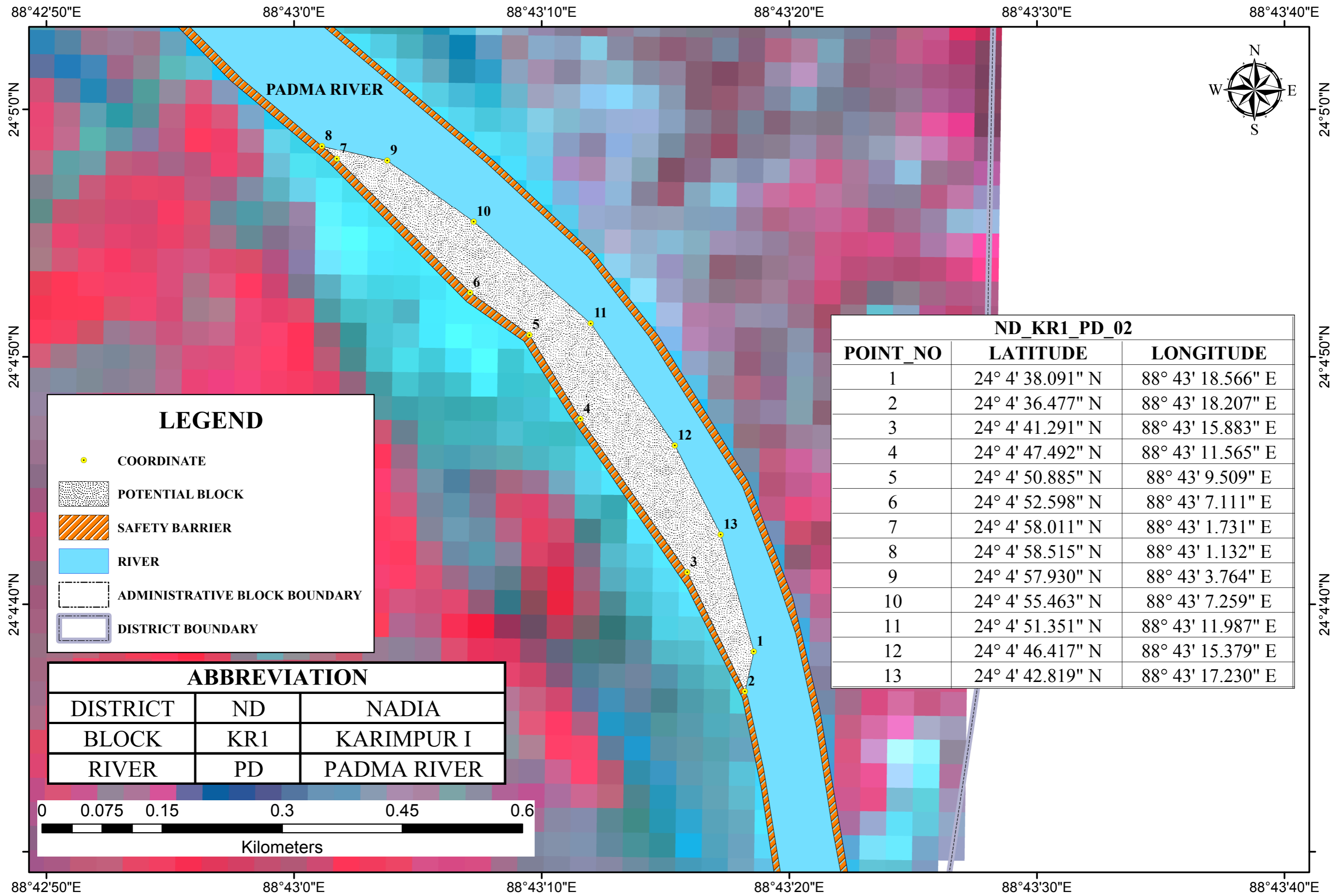
DISTRICT	ND	NADIA
BLOCK	KR1	KARIMPUR I
RIVER	PD	PADMA RIVER



ND_KR1_PD_01

POINT_NO	LATITUDE	LONGITUDE
1	24° 5' 7.934" N	88° 42' 55.719" E
2	24° 5' 7.921" N	88° 42' 54.163" E
3	24° 5' 12.691" N	88° 42' 49.064" E
4	24° 5' 19.434" N	88° 42' 41.170" E
5	24° 5' 25.190" N	88° 42' 37.716" E
6	24° 5' 30.289" N	88° 42' 34.427" E
7	24° 5' 41.144" N	88° 42' 31.960" E
8	24° 5' 47.529" N	88° 42' 29.278" E
9	24° 5' 50.034" N	88° 42' 32.737" E
10	24° 5' 46.016" N	88° 42' 34.594" E
11	24° 5' 43.446" N	88° 42' 35.314" E
12	24° 5' 40.088" N	88° 42' 37.541" E
13	24° 5' 34.640" N	88° 42' 38.740" E
14	24° 5' 29.980" N	88° 42' 40.659" E
15	24° 5' 26.656" N	88° 42' 41.481" E
16	24° 5' 21.106" N	88° 42' 44.291" E
17	24° 5' 18.433" N	88° 42' 45.970" E
18	24° 5' 14.253" N	88° 42' 49.259" E
19	24° 5' 10.072" N	88° 42' 53.165" E

POTENTIAL BLOCK ND_KR1_PD_02 OF PADMA RIVER



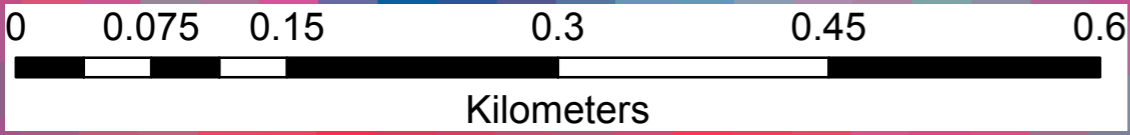
ND_KR1_PD_02		
POINT_NO	LATITUDE	LONGITUDE
1	24° 4' 38.091" N	88° 43' 18.566" E
2	24° 4' 36.477" N	88° 43' 18.207" E
3	24° 4' 41.291" N	88° 43' 15.883" E
4	24° 4' 47.492" N	88° 43' 11.565" E
5	24° 4' 50.885" N	88° 43' 9.509" E
6	24° 4' 52.598" N	88° 43' 7.111" E
7	24° 4' 58.011" N	88° 43' 1.731" E
8	24° 4' 58.515" N	88° 43' 1.132" E
9	24° 4' 57.930" N	88° 43' 3.764" E
10	24° 4' 55.463" N	88° 43' 7.259" E
11	24° 4' 51.351" N	88° 43' 11.987" E
12	24° 4' 46.417" N	88° 43' 15.379" E
13	24° 4' 42.819" N	88° 43' 17.230" E

LEGEND

- COORDINATE
- POTENTIAL BLOCK
- SAFETY BARRIER
- RIVER
- ADMINISTRATIVE BLOCK BOUNDARY
- DISTRICT BOUNDARY

ABBREVIATION

DISTRICT	ND	NADIA
BLOCK	KR1	KARIMPUR I
RIVER	PD	PADMA RIVER





Annexure 5
SEIAA 88th Meeting (21st February, 2023) Minutes of Meeting

--***--
State Environment Impact Assessment Authority
West Bengal
Minutes of SEIAA Meeting
--***--

Subject: **88th meeting of SEIAA**
Venue:- **Conference Room of Environment Department, Prani Sampad Bhavan, 5th Floor, LB – Block, Sector – III, Salt Lake, Kolkata – 700106**
From :- **21 February 2023**
To :- **21 February 2023**

(1) Proposed construction of a Residential complex with all modern amenities at Premises No. 1, Rustomjee Parsee Road, Ward No. 6, Borough– I, P.S. – Cossipore, Kolkata – 700002, West Bengal by M/s. **Oswal Residential Buildings LLP.**

Proposal No. :- SIA/WB/INFRA2/408662/2022, File No. : EN/T-II-1/078/2022, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/INFRA2/408662/2022** dated **03 Dec 2022** seeking environment clearance under the provisions of the EIA Notification, 2006 for the above-mentioned project. The proposed project activity is listed at SL. No. **8(a) Building / Construction** projects under Category "**B2**" of EIA Notification 2006.

SEAC recommended the proposed project for Environmental Clearance during its 63rd meeting held on 18.01.2023.

PROJECT DETAILS

The project of M/s **Oswal Residential Buildings LLP** located in as follows :

S. No.	State	District
(1.)	West Bengal	Kolkata

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and observed that the project proponent (PP) should submit the following in the PARIVESH Portal:-

- 1. Original land ownership document/s.**
- 2. Original land classification document and subsequent changes, if any.**
- 3. In case the proposed project area belonged to more than one owner, an amalgamation certificate from KMC.**
- 4. NGT order dated 13.02.2015 and its compliance.**
- 5. Guidelines framed by the trustees of KOPT as mentioned in the point no. 2(i) in the letter vide no. Admn./6454/Antrix Housing/2 dated 16.08.2016.**

RECOMMENDATIONS OF SEIAA

Therefore, the application for EC is deferred for additional information.

CONCLUSION

Deferred (Additional Information).

(2) Proposed project for installation of 2x10 Tonnes Induction Furnaces at JL No. 90, Touzi No. 1, C.S. Plot Nos. 33(P), 34(P), 35(F), 36(F), 37(F), 38(F), 57(P), 61(P), 596(P), 597(P), 698(P), 599(P), 600(P), 602(P), 604(P), 605(P), 606(P), 608(P), 609(P), 36/532, Touzi No. 10, C.S. Plot Nos. 37(P), 38(P), 39(F), 40(F), 41(P), 42(P), 579(P), 589(P), 590(P), 591(F), 592(F), 593(P), 594(P), 595(P), 597(P), 427(F), Raturia, Angadpur Industrial Area, Dist – Paschim Bardhaman, Durgapur – 713215, West Bengal by **M/s. C. P. Re-Rollers Limited**.

Proposal No. :- SIA/WB/IND/69795/2019, File No. : EN/T-II-1/021/2019, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/IND/69795/2019** dated **08 Dec 2021** along with copies of EIA/EMP seeking environment clearance under the provisions of the EIA Notification, 2006 for the above-mentioned project. The proposed project activity is listed at SL. No. **3(a) Metallurgical industries (ferrous & non ferrous)** under Category "**B1**" of EIA Notification 2006.

The project proponent (PP) obtained ToR for the proposed project vide Memo No. 414-2N-26/2019(E) dated 06.05.2019 against proposal no. SIA/WB/IND/30878/2019.

SEAC recommended the proposed project for Environmental Clearance during its 50th meeting held on 31.08.2022 with the additional conditions mentioned in O.M. issued by MoEF&CC vide F No. 22-23/2018.IA.III(Pt.) dated 31.10.2019 as the project is located within the municipal boundaries of Durgapur Municipal Corporation which is declared as Severely Polluted Area.

The proposal was placed before SEIAA in its 79th meeting held on 10.11.2022 and it was observed that some documents required to be uploaded in the PARIVESH Portal. The project proponent uploaded documents on 15.02.2023.

PROJECT DETAILS

The project of **M/s C. P. Re-Rollers Limited** located in as follows :

S. No.	State	District
(1.)	West Bengal	Paschim Bardhaman

DELIBERATION IN SEIAA

SEIAA considered the submission uploaded by the project proponent on 15.02.2023 and observed that based on the order of the Hon'ble NGT, Eastern Bench, Kolkata decided to conduct a site inspection of the industrial unit on 28.02.2023 and a hearing of the PP on 02.03.2023 before passing appropriate orders. It was also observed that the plantation plan approved by the DFO is to be uploaded.

RECOMMENDATIONS OF SEIAA

Therefore, the application for EC is deferred for further consideration.

CONCLUSION

Deferred for further consideration.

(3) Proposed Residential, mercantile & MLCP project near Vega Circle Mall, Sevok Road, at Plot no. (LR) – 555, 611, Plot no. (RS) – 82, 82/298, 81/297, Khatian no. (LR) – 545, 2516, Khatian no. (RS) – 282/1, 282/3, 282/5, JL No.- 02, Mouza- Dabgram, Parganas Baikunthapur, P.S.- Bhaktinagar, District- Jalpaiguri, under Siliguri Municipal Corporation, West Bengal by **M/s. Shree Vinayak Constructions**.

Proposal No. :- SIA/WB/MIS/257178/2022, File No. : EN/T-II-1/008/2022, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIS/257178/2022** dated **17 Feb 2022** seeking environment clearance under the provisions of the EIA Notification, 2006 for the above-mentioned project. The proposed project activity is listed at SL. No. **8(a) Building and Construction** projects under Category "**B2**" of EIA Notification 2006.

The SEAC in its 55th meeting held on 09.11.2022 recommended that based on the letter vide No. 2945/WL/2W-682(Part-III)/2019 dated 28.09.2022 received from Principal Chief Conservator of Forest (Wildlife) and Chief Wildlife Warden wherein it was confirmed that the proposed project site is falling within the eco-sensitive zone of Mahananda Wildlife Sanctuary. Hon'ble Supreme Court of India in its order dated 03.06.2022 in its L.A No.1000 of 2003 in W.P.202 of 1995 ordered that no new structure shall be permitted to come up in ESZ, hence, permission for the above proposal (SIA/WB/MIS/257178/2022) cannot be granted.

The proposal was placed before SEIAA in its 81st meeting held on 06.12.2022 and it was decided to request the PP for a hearing before the final decision on the EC application is taken. Accordingly, the PP is requested to appear before SEIAA for hearing in the 88th meeting on 21.02.2023.

PROJECT DETAILS

The project of **M/s. Shree Vinayak Constructions** located in as follows :

S. No.	State	District
(1.)	West Bengal	Jalpaiguri

DELIBERATION IN SEIAA

The PP attended the hearing before SEIAA and submitted copies of few documents from the Divisional Forest Officer, Darjeeling Wildlife Division along with enclosures wherein it is mentioned that the project site lies at a distance of about 6.35 km and 6.6 km respectively which is falling out of ESZ declared for Mahananda Wildlife Sanctuary. The PP to be intimated to submit NOC / clearance from Chief Wildlife Warden, West Bengal in this regard.

RECOMMENDATIONS OF SEIAA

Therefore, the application for EC is deferred for additional information.

CONCLUSION

Deferred (Additional Information).

(4) Proposed Dhantali Sand Mine on Bura Raidak river in area of 1.21 Ha. (3.00 Acres) at Plot No: 05(RS), JL No.: 28, Mouza – Dhantali, Block – Kumargram, Dist – Alipurduar, West Bengal by **Atiar Rahaman**.

Proposal No. :- SIA/WB/MIN/412060/2022, File No. : EN/T-II-1/003/2023, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/412060/2022** dated **28 Dec 2022** seeking environment clearance under the provisions of the EIA Notification, 2006 for the above-mentioned project. The proposed project activity is listed at SL. No. **1(a) Mining of minerals** projects under Category "**B2**" of EIA Notification 2006.

SEAC recommended for rejection of the proposed project for Environmental Clearance during its 63rd meeting held on 18.01.2023. Based on the submission and presentation made by the project proponent, the SEAC during its 63rd meeting held on 18.01.2023 observed that the plot area for the proposed project (geo-coordinates) as reported in the approved Mine Plan does not fall within the potential mining zone recorded in the approved District Survey Report (DSR) of Alipurduar district. SEAC further observed that the plot area appears to be near Buxa National Park. The PP has not uploaded valid LoI, cluster certificate from the competent authority, and other relevant documents from the competent authority.

The SEAC, therefore, recommended that the proposed project, in its present form, cannot be considered for further processing of Environmental Clearance.

PROJECT DETAILS

The project of **Atiar Rahaman** located in as follows :

S. No.	State	District
(1.)	West Bengal	Alipurduar

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

The EC application is rejected.

CONCLUSION

Rejected.

(5) Proposed Chittalghata Sand & stone Mine on Mahananda river in area of 11.24 Acres / 4.55 Ha. at Plot No: 604, 606, 607, 610, 612, 613, 619, 620, 622, 624-627, 630, JL No.: 1, Mouza – Chittalghata, PS – Chopra, Dist – Uttar Dinajpur, West Bengal by **Krishna Agarwal**.

Proposal No. :- SIA/WB/MIN/408730/2022, File No. : EN/T-II-1/002/2023, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/408730/2022** dated

22 Dec 2022 seeking environment clearance under the provisions of the EIA Notification, 2006 for the above-mentioned project. The proposed project activity is listed at SL. No. **1(a) Mining of minerals** projects under Category "**B2**" of EIA Notification 2006.

SEAC recommended for rejection of the proposed project for Environmental Clearance during its 63rd meeting held on 18.01.2023. Based on the submission and presentation made by the PP, the SEAC during its 63rd meeting held on 18.01.2023 observed that the plot area for the proposed project (geo-coordinates) as reported in the approved Mine Plan does not fall within the potential mining zone recorded in the approved District Survey Report (DSR) of Uttar Dinajpur district. Also, the PP has not uploaded valid LoI, cluster certificate from the competent authority, and a few other relevant documents.

The SEAC, therefore, recommended that the proposed project, in its present form, cannot be considered for further processing of Environmental Clearance.

PROJECT DETAILS

The project of **Krishna Agarwal** located in as follows :

S. No.	State	District
(1.)	West Bengal	Uttar Dinajpur

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

The EC application is rejected.

CONCLUSION

Rejected.

(6) Proposed Kotalsole Sand Mine on Kangsabati river in area of 11.86 Acres / 4.80 Ha. at Plot No: 194, JL No.: 108, Mouza – Kotalsole, Block & PS – Sarenga, Dist – Bankura, West Bengal by **Arun Kumar**.

Proposal No. :- SIA/WB/MIN/411215/2022, File No. : EN/T-II-1/117/2022, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/411215/2022** dated **18 Dec 2022** seeking environment clearance under the provisions of the EIA Notification, 2006 for the above-mentioned project. The proposed project activity is listed at SL. No. **1(a) Mining of minerals** under Category "**B2**" of EIA Notification 2006.

SEAC recommended for rejection of the proposed project for Environmental Clearance during its 63rd meeting held on 18.01.2023. Based on the submission and presentation made by the PP, the SEAC during its 63rd meeting held on 18.01.2023 observed that the plot area for the proposed project (geo-coordinates) as reported in the approved Mine Plan does not fall within the potential mining zone recorded in the approved District Survey Report (DSR) of Bankura district. Also, the PP has not uploaded valid LoI, cluster certificate from the competent authority, and other relevant documents.

The SEAC, therefore, recommended that the proposed project, in its present form, cannot be considered for further processing of Environmental Clearance.

PROJECT DETAILS

The project of **Arun Kumar** located in as follows :

S. No.	State	District
(1.)	West Bengal	Bankura

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

The EC application is rejected.

CONCLUSION

Rejected.

(7) Proposed Chhoto Chowkirboss Sand Mine on river Raidak-I in area of : 2.89 Acres (1.95 Ha) at Plot No: 430, 447, 448, 750, & 752(LR), JL No.: 124, Mouza – Chhoto Chowkirboss, Block – Alipurduar II, Dist - Alipurduar, West Bengal by **S Agarwal**.

Proposal No. :- SIA/WB/MIN/409371/2022, File No. : EN/T-II-1/116/2022, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/409371/2022** dated **14 Dec 2022** seeking environment clearance under the provisions of the EIA Notification, 2006 for the above-mentioned project. The proposed project activity is listed at SL. No. **1(a) Mining of minerals** under Category "**B2**" of EIA Notification 2006.

SEAC recommended for rejection of the proposed project for Environmental Clearance during its 63rd meeting held on 18.01.2023. Based on the submission and presentation made by the PP, the SEAC during its 63rd meeting held on 18.01.2023 observed that the plot area for the proposed project (geo-coordinates) as reported in the approved Mine Plan does not fall within the potential mining zone recorded in the approved District Survey Report (DSR) of Alipurduar district. SEAC further observed that the plot area appears to be near Buxa National Park.

The SEAC, therefore, recommended that the proposed project, in its present form, cannot be considered for further processing of Environmental Clearance.

PROJECT DETAILS

The project of **S Agarwal** located in as follows :

S. No.	State	District
(1.)	West Bengal	Alipurduar

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

The EC application is rejected.

CONCLUSION

Rejected.

(8) Proposed Malbagicha Sand Mine on river Silabati in area of 2.82 acres (1.14 Ha) at Plot No. 48(P), 56, 57(P), 58(P), 59, 60, 61(P), & 62(P), J.L. No.- 411, Mouza – Malbagicha, PS – Garhbeta, Dist – Paschim Medinipur, West Bengal by **Ataur Rahaman Mondal**.

Proposal No. :- SIA/WB/MIN/260787/2022, File No. : EN/T-II-1/080/2022, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/260787/2022** dated **13 Dec 2022** seeking environment clearance under the provisions of the EIA Notification, 2006 for the above-mentioned project. The proposed project activity is listed at SL. No. **1(a) Mining of minerals** under Category "**B2**" of EIA Notification 2006.

SEAC recommended for rejection of the proposed project for Environmental Clearance during its 63rd meeting held on 18.01.2023. Based on the submission and presentation made by the PP, the SEAC during its 63rd meeting held on 18.01.2023 observed that the plot area for the proposed project (geo-coordinates) as reported in the approved Mine Plan does not fall within the potential mining zone recorded in the approved District Survey Report (DSR) of Paschim Medinipur district. Also, the PP has not uploaded valid LoI, cluster certificate from the competent authority, and a few other relevant documents.

The SEAC, therefore, recommended that the proposed project, in its present form, cannot be considered for further processing of Environmental Clearance.

PROJECT DETAILS

The project of **Ataur Rahaman Mondal** located in as follows :

S. No.	State	District
(1.)	West Bengal	Paschim Medinipur

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

The EC application is rejected.

CONCLUSION

Rejected.

(9) Proposed Chhipra Sand Mine on river Raidak-I in area of 2.82 Ha. at Plot no: 336, 337 & 355 (LR), J.L. No.-125, Mouza: Chhipra, Block: Alipurduar-II, District: Alipurduar, West Bengal by **HMHG Construction**.

Proposal No. :- SIA/WB/MIN/409416/2022, File No. : EN/T-II-1/115/2022, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/409416/2022** dated **13 Dec 2022** seeking environment clearance under the provisions of the EIA Notification, 2006 for the above-mentioned project. The proposed project activity is listed at SL. No. **1(a) Mining of minerals** under Category "**B2**" of EIA Notification 2006.

SEAC recommended for rejection of the proposed project for Environmental Clearance during its 63rd meeting held on 18.01.2023. Based on the submission and presentation made by the PP, the SEAC during its 63rd meeting held on 18.01.2023 observed that the plot area for the proposed project (geo-coordinates) as reported in the approved Mine Plan does not fall within the potential mining zone recorded in the approved District Survey Report (DSR) of Alipurduar district. SEAC further observed that the plot area appears to be near Buxa National Park.

The SEAC, therefore, recommended that the proposed project, in its present form, cannot be considered for further processing of Environmental Clearance.

PROJECT DETAILS

The project of M/s. **HMHG Construction** located in as follows :

S. No.	State	District
(1.)	West Bengal	Alipurduar

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

The EC application is rejected.

CONCLUSION

Rejected.

(10) Proposed Bhalukmura Sand Mine on river Silabati in area of 5 acres (2.02 Ha) at Plot No. 16(P), 63(P) & 77(P), J.L. No.- 795, Mouza – Bhalukmura, PS – Garhbeta, Dist – Paschim Medinipur, West Bengal by **Prasanta Karak**.

Proposal No. :- SIA/WB/MIN/260047/2022, File No. : EN/T-II-1/081/2022, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/260047/2022** dated **12 Dec 2022** seeking environment clearance under the provisions of the EIA Notification, 2006 for the above-mentioned project. The proposed project activity is listed at SL. No. **1(a) Mining of minerals** under Category "**B2**" of EIA Notification 2006.

SEAC recommended for rejection of the proposed project for Environmental Clearance during its 63rd meeting held on 18.01.2023. Based on the submission and presentation made by the PP, the SEAC during its 63rd meeting held on 18.01.2023 observed that the plot area for the proposed project (geo-coordinates) as reported in the approved Mine Plan does not fall within the potential mining zone recorded in the approved District Survey Report (DSR) of Paschim Medinipur district. Also, the PP has not uploaded valid LoI, cluster certificate from the competent authority, and a few other relevant documents.

The SEAC, therefore, recommended that the proposed project, in its present form, cannot be considered for further processing of Environmental Clearance.

PROJECT DETAILS

The project of **Prasanta Karak** located in as follows :

S. No.	State	District
(1.)	West Bengal	Paschim Medinipur

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

The EC application is rejected.

CONCLUSION

Rejected.

(11) Proposed Bangpur Sand Mine on river Damodar in area of 7.96 acres (3.22 Ha) at Plot No. 1859(P), 1860(P) & ors. J.L. No.- 32, Mouza – Bangpur, PS – Bardhaman, Dist – Purba Bardhaman, West Bengal by **Sanjay Bhakta**.

Proposal No. :- SIA/WB/MIN/409062/2022, File No. : EN/T-II-1/119/2022, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/409062/2022** dated **08 Dec 2022** seeking environment clearance under the provisions of the EIA Notification, 2006 for the above-mentioned project. The proposed project activity is listed at SL. No. **1(a) Mining of minerals** under Category "**B2**" of EIA Notification 2006.

SEAC recommended for rejection of the proposed project for Environmental Clearance during its 63rd meeting held on 18.01.2023. Based on the submission and presentation made by the PP, the SEAC during its 63rd meeting held on 18.01.2023 observed that the plot area for the proposed project (geo-coordinates) as reported in the approved Mine Plan does not fall within the potential mining zone recorded in the approved District Survey Report (DSR) of Purba Bardhaman district. Also, the PP has not uploaded valid LoI, cluster certificate from the competent authority, and a few other relevant documents.

The SEAC, therefore, recommended that the proposed project, in its present form, cannot be considered for further processing of Environmental Clearance.

PROJECT DETAILS

The project of **Sanjay Bhakta** located in as follows :

S. No.	State	District
(1.)	West Bengal	Purba Bardhaman

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

The EC application is rejected.

CONCLUSION

Rejected.

(12) Proposed Nimai Sand and Stone Mine in NIMAI SIL 8 Sand Block on river Balason in the area of 2.7 Ha (6.67 Acres) at Mouza - Nimai, J.L. No.: 57, Plot Nos. 289(P), 290(P), 315(P), 321(P), 322(P), P.S. – Matigara, Dist. – Darjeeling, West Bengal by **Santosh Singh**.

Proposal No. :- SIA/WB/MIN/273925/2022, File No. : EN/T-II-1/010/2023, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/273925/2022** dated **28 Nov 2022** seeking environment clearance under the provisions of the EIA Notification, 2006 for the above-mentioned project. The proposed project activity is listed at SL. No. **1(a) Mining of minerals** under Category "**B2**" of EIA Notification 2006.

SEAC recommended for rejection of the proposed project for Environmental Clearance during its 64th meeting held on 01.02.2023. This application for EC was noted to be a duplicate one. An earlier application for the same project was considered in the 61st meeting of SEAC held on 04.01.2023. Considering the above, the SEAC recommended that the proposal may be rejected.

PROJECT DETAILS

The project of **Santosh Singh** located in as follows :

S. No.	State	District
(1.)	West Bengal	Darjeeling

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

The EC application is rejected.

CONCLUSION

Rejected.

(13) Proposed Fakirpur Sand Mine on river Damodar over an area of 5 Ha (12.33 Acres) at Mouza - Fakirpur, J.L. No.: 25, Plot No. 1293(P), 1377(P) etc. P.S. – Bardhaman, Dist. – Purba Bardhaman, West Bengal by **Mohan Choudhury**.

Proposal No. :- SIA/WB/MIN/264681/2022, File No. : EN/T-II-1/019/2023, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/264681/2022** dated **24 Dec 2022** seeking environment clearance under the provisions of the EIA Notification, 2006 for the above-mentioned project. The proposed project activity is listed at SL. No. **1(a) Mining of minerals** under Category "**B2**" of EIA Notification 2006.

SEAC recommended for rejection of the proposed project for Environmental Clearance during its 64th meeting held on 01.02.2023. The PP appeared for the presentation without NABET accredited consultant. It was also observed that the lease area is 5 ha. and therefore, should have been applied under ToR category as specified in the O.M. issued by MoEF&CC dated 12.12.2018.

Based on the submission and presentation made by the PP, the SEAC observed that the geo-coordinates of the proposed plot given in the approved Mining cum Progressive Mine Closure Plan does not give a proper representation of the lease area for the proposed project. Also, the PP has not uploaded valid LOI, original LOI mentioning the plot nos. showing the exact location, cluster certificate from the competent authority, and other related documents.

The SEAC, therefore, recommended that the proposed project, in its present form, cannot be considered for further processing of Environmental Clearance.

PROJECT DETAILS

The project of **Mohan Choudhury** located in as follows :

S. No.	State	District
(1.)	West Bengal	Purba Bardhaman

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

The EC application is rejected.

CONCLUSION

Rejected.

(14) Proposed Krishnadebpur Sand Mine on river Bhagirathi over an area of 1.84 Ha (4.54 Acres) at Mouza - Krishnadebpur, J.L. No.: 91 Plot No. 2251(P), (HAL 3199, 3200 & ORS., P.S. – Kalna, Dist. – Purba Bardhaman, West Bengal by **Basiruddin Seikh**.

Proposal No. :- SIA/WB/MIN/274629/2022, File No. : EN/T-II-1/016/2023, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/274629/2022** dated **18 Jan 2023** seeking environment clearance under the provisions of the EIA Notification, 2006 for the above-mentioned project. The proposed project activity is listed at SL. No. **1(a) Mining of minerals** under Category "**B2**" of EIA Notification 2006.

SEAC recommended for rejection of the proposed project for Environmental Clearance during its 64th meeting held on 01.02.2023. The PP appeared for the presentation without NABET accredited consultant. Based on the submission and presentation made by the PP, the SEAC observed that the plot area for the proposed project (geo-coordinates) as reported in the approved Mining cum Progressive Mine Closure Plan does not fall within the potential mining zone recorded in the approved District Survey Report (DSR) of Purba Bardhaman district. Also, the PP has not uploaded cluster certificate from the competent authority, and other related documents.

The SEAC, therefore, recommended that the proposed project, in its present form, cannot be considered for further processing of Environmental Clearance.

PROJECT DETAILS

The project of **Basiruddin Seikh** located in as follows :

S. No.	State	District
(1.)	West Bengal	Purba Bardhaman

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

The EC application is rejected.

CONCLUSION

Rejected.

(15) Proposed Kansra Sand Mine on river Damodar over an area of 1.75 Ha (4.3 Acres) at Mouza - Kansra, J.L. No.: 44 Plot No. 1345(P), Block & P.S. – Jamalpur, Dist. – Purba Bardhaman, West Bengal by **Basudev Majhi**.

Proposal No. :- SIA/WB/MIN/262037/2022, File No. : EN/T-II-1/017/2023, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/262037/2022** dated **26 Dec 2022** seeking environment clearance under the provisions of the EIA Notification, 2006 for the above-mentioned project. The proposed project activity is listed at SL. No. **1(a) Mining of minerals** under Category "**B2**" of EIA Notification 2006.

SEAC recommended for rejection of the proposed project for Environmental Clearance during its 64th meeting held on 01.02.2023. The PP did not engage any NABET accredited environmental consultant and appeared himself for the EC presentation. Based on the submission and presentation made by the PP, the SEAC observed that the plot area for the proposed project (geo-coordinates) as reported in the approved Mining cum Progressive Mine Closure Plan does not fall within the potential mining zone recorded in the approved District Survey Report (DSR) of Purba Bardhaman district. Also, the PP has not uploaded valid LOI, original LOI mentioning the plot nos. showing the exact location and cluster certificate from the competent authority, and other related documents.

The SEAC, therefore, recommended that the proposed project, in its present form, cannot be considered for further processing of Environmental Clearance.

PROJECT DETAILS

The project of **Basudev Majhi** located in as follows :

S. No.	State	District
(1.)	West Bengal	Purba Bardhaman

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

The EC application is rejected.

CONCLUSION

Rejected.

(16) Proposed Kogram Sand Mine on river Ajay over an area of 3.4 Ha (8.41 Acres) at Mouza - Kogram, J.L. No.: 58 Plot No. 284(P), 285(P) & Ors. P.S. – Mongalkote, Dist. – Purba Bardhaman, West Bengal by **Ashok Kumar Saha**.

Proposal No. :- SIA/WB/MIN/408625/2022, File No. : EN/T-II-1/015/2023, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/408625/2022** dated **19 Jan 2023** seeking environment clearance under the provisions of the EIA Notification, 2006 for the above-mentioned project. The proposed project activity is listed at SL. No. **1(a) Mining of minerals** under Category "**B2**" of EIA Notification 2006.

SEAC recommended for rejection of the proposed project for Environmental Clearance during its 64th meeting held on 01.02.2023. The PP did not engage any NABET accredited environmental consultant and appeared himself for the EC presentation. Based on the submission and presentation made by the PP, the SEAC observed that the plot area for the proposed project (geo-coordinates) as reported in the approved Mining cum Progressive Mine Closure Plan does not fall within the potential mining zone recorded in the approved District Survey Report (DSR) of Purba Bardhaman. Also, the PP has not uploaded pre-feasibility report and cluster certificate from the competent authority, and other related documents.

The SEAC, therefore, recommended that the proposed project, in its present form, cannot be considered for further processing of Environmental Clearance.

PROJECT DETAILS

The project of **Ashok Kumar Saha** located in as follows :

S. No.	State	District
(1.)	West Bengal	Purba Bardhaman

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

The EC application is rejected.

CONCLUSION

Rejected.

(17) Proposed Bhattagram Sand Mine on river Silabati over an area of 0.80 Ha (1.98 Acres) at Mouza - Bhattagram, J.L. No.: 399, Plot No. 680(P), P.S. – Garhbeta, Dist. – Paschim Medinipur, West Bengal by **Mr. Bablu Sarkar**.

Proposal No. :- SIA/WB/MIN/259966/2022, File No. : EN/T-II-1/021/2023, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/259966/2022** dated **21 Jan 2023** seeking environment clearance under the provisions of the EIA Notification, 2006 for the above-mentioned project. The proposed project activity is listed at SL. No. **1(a) Mining of minerals** under Category "**B2**" of EIA Notification 2006.

SEAC recommended for rejection of the proposed project for Environmental Clearance during its 64th meeting held on 01.02.2023. Based on the submission and presentation made by the PP, the SEAC observed that the plot area for the proposed project (geo-coordinates) as reported in the approved Mine Plan does not fall within the potential mining zone recorded in the approved District Survey Report (DSR) of Paschim Medinipur district. Also, the PP has not uploaded valid LoI, cluster certificate from the competent authority and other related documents.

The SEAC, therefore, recommended that the proposed project, in its present form, cannot be considered for further processing of Environmental Clearance.

PROJECT DETAILS

The project of **Mr. Bablu Sarkar** located in as follows :

S. No.	State	District
(1.)	West Bengal	Paschim Medinipur

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

The EC application is rejected.

CONCLUSION

Rejected.

(18) Proposed Idilpur Sand Mine on river Damodar over an area of 4.98 Ha (12.3 Acres) at Mouza - Idilpur, J.L. No.: 24, Plot No. 829(P) to 131(P), 1267, 1420(P), 1425(P) – 1428(P), 1430(P), 1431(P), 1436(P), 1603(P), 1604(P), P.S. – Bardhaman, Dist. – Purba Bardhaman, West Bengal by **Namita Enterprise, Idilpur.**

Proposal No. :- SIA/WB/MIN/262127/2022, File No. : EN/T-II-1/023/2023, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/262127/2022** dated **23 Dec 2022** seeking environment clearance under the provisions of the EIA Notification, 2006 for the above-mentioned project. The proposed project activity is listed at SL. No. **1(a) Mining of minerals** under Category "**B2**" of EIA Notification 2006.

SEAC recommended for rejection of the proposed project for Environmental Clearance during its 64th meeting held on 01.02.2023. The PP did not engage any NABET accredited environmental consultant and appeared himself for the EC presentation. Based on the submission and presentation made by the PP, the SEAC observed that the plot area for the proposed project (geo-coordinates) as reported in the approved Mining cum Progressive Mine Closure Plan does not fall within the potential mining zone recorded in the approved District Survey Report (DSR) of Purba Bardhaman. Also, the PP has not uploaded valid LoI, cluster certificate from the competent authority, and other related documents.

The SEAC, therefore, recommended that the proposed project, in its present form, cannot be considered for further processing of Environmental Clearance.

PROJECT DETAILS

The project of **Namita Enterprise, Idilpur** located in as follows :

S. No.	State	District
(1.)	West Bengal	Purba Bardhaman

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

The EC application is rejected.

CONCLUSION

Rejected.

(19) Proposed Baranda Sand Mine on river Silabati over an area of 0.90 Ha (2.22 Acres) at Mouza - Baranda, J.L. No.: 572, Plot No. 1(P) P.S. – Garhbeta, Dist. – Paschim Medinipur, West Bengal by **Ataur Rahaman Mondal**.

Proposal No. :- SIA/WB/MIN/260727/2022, File No. : EN/T-II-1/020/2023, Type-EC

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/260727/2022** dated **21 Jan 2023** seeking environment clearance under the provisions of the EIA Notification, 2006 for the above-mentioned project. The proposed project activity is listed at SL. No. **1(a) Mining of minerals** under Category "**B2**" of EIA Notification 2006.

SEAC recommended for rejection of the proposed project for Environmental Clearance during its 64th meeting held on 01.02.2023. Based on the submission and presentation made by the PP, the SEAC observed that the plot area for the proposed project (geo-coordinates) as reported in the approved Mine Plan does not fall within the potential mining zone recorded in the approved District Survey Report (DSR) of Paschim Medinipur district. Also, the PP has not uploaded cluster certificate from the competent authority and other related documents.

The SEAC, therefore, recommended that the proposed project, in its present form, cannot be considered for further processing of Environmental Clearance.

PROJECT DETAILS

The project of **Ataur Rahaman Mondal** located in as follows :

S. No.	State	District
(1.)	West Bengal	Paschim Medinipur

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

The EC application is rejected.

CONCLUSION

Rejected.

(20) Proposed Residential cum Commercial Complex at L.R. Plot No. – 81, 82, 83, 84, 101, 102, L.R. Khatian No. – 3409, J.L. No. – 72, Mouza – Kawakhari, Pargana – Patharghata, P.S. – Matigara, under Matigara Panchayat Samity, Dist. – Darjeeling, West Bengal by **M/s. Realm Construction (VIOLATION CASE)**.

Proposal No. :- SIA/WB/INFRA2/411577/2022, File No. : EN/T-II-1/004/2023, Type-TOR

INTRODUCTION

The proponent made online application under violation category vide proposal no. **SIA/WB/INFRA2/411577/2022** dated **26 Dec 2022** seeking Terms of reference (TOR) under the provisions of the EIA Notification, 2006 for the above mentioned proposed project. The proposed project activity is listed at S. No. **8(a) Building and Construction** projects under Category **B2** of EIA Notification, 2006.

The SEAC during its 62nd meeting held on 11.01.2023 recommended the proposal for Standard Terms of Reference under violation category.

PROJECT DETAILS

The project of **M/s. Realm Construction** located in as follows :

S. No.	State	District
(1.)	West Bengal	Darjeeling

The salient features of the project submitted by the project proponent is available at [Report](#) under online proposal no. **SIA/WB/INFRA2/411577/2022**.

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and decided that the PP should provide the following documents:-

- 1. A notarized affidavit as per the enclosed format given in Annexure – 1.**
- 2. Land ownership documents along with mutation certificate.**
- 3. Developers Agreement.**
- 4. The plot nos. mentioned in the certificate in land conversion and other documents do not match with the land use certificate issued by Matigara Panchayat Samity.**
- 5. Concurrence for waste water discharge, solid waste disposal and other services from the Competent**

Authority.

6. **Ground water permission from the Competent Authority indicating the quantity of water to be abstracted and also the running hours of the pump for the bore wells.**
7. **Power of Attorney in the name of M/s. Realm Construction.**
8. **Present status of construction of the project clearly showing the violation portion with photographs.**
9. **Commitment / undertaking regarding shape of 'Nalah' to confirm that the character and physical *shape* of the said Nalah will remain unchanged. Management plan of the *Nalah* during construction phase and also for the post construction phase, along with plan of protection of the micro-flora and fauna at the bank of the *Nalah*. The ownership of that particular segment of a continuous *Nalah* should be ensured.**
10. **Depth of 'Nalah' throughout the entire stretch.**
11. **No high-tension electrical line should run across the proposed project site. Communication with WBSEDCL regarding relocation of the pole should be submitted.**
12. **Basement depth. A report on the impact of basement on confined water /groundwater flow to be submitted.**
13. **Subsurface hydro-geological study of the area. Detail Chemical analysis of groundwater from at least nearby five wells along with their geographical location and depth should also be submitted with the hydrogeological report. Detail design of all artificial recharge structures should be submitted based on sub-surface geology.**
14. **Measures taken to control pollution from surface runoff during monsoon.**
15. **Storm water management during construction and post construction phase.**
16. **Undertaking to be submitted regarding location of recharge pits which should be shifted away from driveway.**
17. **While submitting the land use plan within the project area, the details (exact width) of underground service lines including fire, electrical, sewerage and drainage should be depicted with a different colour in order to assess that the area required for exclusive tree plantation does not overlap with these underground service lines. The plan should be certified by the project architect.**
18. **Proposal for organic waste composter.**

RECOMMENDATIONS OF SEIAA

Therefore, the application for EC is deferred for additional information.

CONCLUSION

Deferred (Additional Information).

Annexure – 1

UNDERTAKING for Building projects

(To be done on Non-Judicial Stamp Paper of valuation Rs.10/- and duly notarized)

I, son of _____ (Father's Name) _____, resident _____ (Address) _____ presently working as _____ (Designation) _____ of M/s _____ (Organization Name) _____ am an authorized person of the above named organization, do hereby solemnly declare and state as follows :

1) THAT M/s. _____ are the project proponent in respect of the _____ (Project Name) _____.

2. THAT M/s. _____ has constructed _____ sq.mt. built-up area at premises No. _____.

3. THAT in terms of EIA Notification 2006 and amendments thereof, our project falls within the purview of environmental clearance.

4. THAT M/s. _____ has failed to get prior environmental clearance as per statutory provisions of EIA Notification due to the reasons mentioned below: (please mentioned the reasons) –

- i.
- ii.
- iii.
- iv.

5. THAT M/s. _____ has submitted the application form for obtaining necessary Terms of Reference / Environmental Clearance as per EIA Notification, 2006 and its amendments issued by the Ministry of Environment, Forest & Climate Change & Standard Operating Procedure (SoP) issued by MoEF&CC vide its OM dated 07.07.2021 which was upheld by hon'ble Supreme Court vide its order dated 09.12.2021 (MoEF&CC O.M. No.22-21/2020-IA.III[E 138949] dated 28.01.2022).

6. Now I, on behalf of the Project Proponent undertake the followings :-

- a) To comply with all statutory requirements/norms, for obtaining Environmental Clearance;
- b) To take all necessary permissions/licences/clearances from the concerned Government Departments and to submit compliance before the State Level Appraisal Committee, West Bengal;
- c) To take all measures for the protection of the environment as may be prescribed by the Central Government or the State Government from time to time at the expenses of the project proponent.

7. THAT the project proponent also undertakes not to repeat such violation in future, in case of violation, the ToR/EIA shall be liable to be terminated.

The above-mentioned statements are true to the best of my knowledge and belief.

(21) Proposed Jujuti Sand mining project of 9.13 acres / 3.69 Ha. in Damodar river at Plot No. 1101(P)/D, Mouza – Jujuti, JL No. 123, PS - Galsi, Dist – Purba Bardhaman, West Bengal by **Raja Ghosh**.

Proposal No. :- SIA/WB/MIN/60356/2021, File No. : EN/T-II-1/114/2022, Type-TOR

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/60356/2021** dated **21 Dec 2022** seeking Terms of reference (TOR) under the provisions of the EIA Notification, 2006 for the above mentioned proposed project. The proposed project activity is listed at S. No. **1(a) Mining of minerals** projects under Category **B** of EIA Notification, 2006.

The SEAC during its 63rd meeting held on 18.01.2023 recommended issuance of standard Terms of Reference for EIA preparation for the project with the following additional conditions :-

1. A Cluster certificate from the competent authority should be submitted.
2. A need-based EMP, prepared in accordance with the MoEF&CC Office Memorandum vide F. No. 22-65/2017.IA.III dated 30.09.2020.
3. Details of accredited consultant including valid NABET accreditation certificate should be submitted.
4. Study report on base flow level measured at 5 points with date and supporting photographs. It should be committed that mining will be done at least 1m above the base flow level. Accordingly, if required, the proposal may also be revised.

The proponent, – while applying for environmental clearance, shall upload in the PARIVESH portal, the EIA/EMP report along with the documents/ sought above.

PROJECT DETAILS

The project of **Raja Ghosh** located in as follows :

S. No.	State	District
(1.)	West Bengal	Purba Bardhaman

The salient features of the project submitted by the project proponent is available at [Report](#) under online proposal no. **SIA/WB/MIN/60356/2021**.

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

SEIAA approved the proposal for ToR.

CONCLUSION

Conditions

A. STANDARD TERMS OF REFERENCE

1. Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any one year prior to 1994. It may also be categorically informed whether there had been any increase in production after the EIA Notification 1994 came into force, w.r.t. the highest production achieved prior to 1994.
2. A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.
3. All documents including approved mine plan, EIA and Public Hearing should be compatible with one another in terms of the mine lease area, production levels, waste generation and its management, mining technology etc. and should be in the name of the lessee.
4. All corner coordinates of the mine lease area, superimposed on a High Resolution Imagery/ toposheet, topographic sheet, geomorphology and geology of the area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).
5. Information should be provided in Survey of India Toposheet in 1:50,000 scale indicating geological map of the area, geomorphology of land forms of the area, existing minerals and mining history of the area, important water bodies, streams and rivers and soil characteristics.
6. Details about the land proposed for mining activities should be given with information as to whether mining conforms to the land use policy of the State; land diversion for mining should have approval from State land use board or the concerned authority.
7. It should be clearly stated whether the proponent Company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be spelt out in the EIA Report with description of the prescribed operating process/procedures to bring into focus any infringement/deviation/violation of the environmental or forest norms/conditions? The hierarchical system or administrative order of the Company to deal with the environmental issues and for ensuring compliance with the EC conditions may also be given. The system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the Company and/or shareholders or stakeholders at large, may also be detailed in the EIA Report.
8. Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should also be provided.
9. The study area will comprise of 10 km zone around the mine lease from lease periphery and the data contained in the EIA such as waste generation etc. should be for the life of the mine / lease period.
10. Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.
11. Details of the land for any Over Burden Dumps outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be given.
12. A Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.

13. Status of forestry clearance for the broken up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.
14. Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.
15. The vegetation in the RF / PF areas in the study area, with necessary details, should be given.
16. A study shall be got done to ascertain the impact of the Mining Project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly, detailed mitigative measures required, should be worked out with cost implications and submitted.
17. Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/Elephant Reserves/(existing as well as proposed), if any, within 10 km of the mine lease should be clearly indicated, supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished.
18. A detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any scheduled-I fauna found in the study area, the necessary plan alongwith budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.
19. Proximity to Areas declared as 'Critically Polluted' or the Project areas likely to come under the 'Aravali Range', (attracting court restrictions for mining operations), should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB or State Mining Department should be secured and furnished to the effect that the proposed mining activities could be considered.
20. Similarly, for coastal Projects, A CRZ map duly authenticated by one of the authorized agencies demarcating LTL, HTL, CRZ area, location of the mine lease w.r.t CRZ, coastal features such as mangroves, if any, should be furnished. (Note: The Mining Projects falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority).
21. R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing the R&R Plan, the relevant State/National Rehabilitation & Resettlement Policy should be kept in view. In respect of SCs /STs and other weaker sections of the society in the study area, a need based sample survey, family-wise, should be undertaken to assess their requirements, and action programmes prepared and submitted accordingly, integrating the sectorial programmes of line departments of the State Government. It may be clearly brought out whether the village(s) located in the mine lease area will be shifted or not. The issues relating to shifting of village(s) including their R&R and socio-economic aspects should be discussed in the Report.
22. One season (non-monsoon) [i.e. March-May (Summer Season); October-December (post monsoon season) ; December-February (winter season)]primary baseline data on ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so compiled presented date-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500 m of the mine lease in the pre-dominant downwind direction. The mineralogical composition of PM10, particularly for free silica, should be given.
23. Air quality modeling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of mineral. The details of the model used and input parameters used for modeling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation.

The wind roses showing pre-dominant wind direction may also be indicated on the map.

24. The water requirement for the Project, its availability and source should be furnished. A detailed water balance should also be provided. Fresh water requirement for the Project should be indicated.
25. Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.
26. Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.
27. Impact of the Project on the water quality, both surface and groundwater, should be assessed and necessary safeguard measures, if any required, should be provided.
28. Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working will intersect groundwater table, a detailed Hydro Geological Study should be undertaken and Report furnished. The Report inter-alia, shall include details of the aquifers present and impact of mining activities on these aquifers. Necessary permission from Central Ground Water Authority for working below ground water and for pumping of ground water should also be obtained and copy furnished.
29. Details of any stream, seasonal or otherwise, passing through the lease area and modification / diversion proposed, if any, and the impact of the same on the hydrology should be brought out.
30. Information on site elevation, working depth, groundwater table etc. Should be provided both in AMSL and bgl. A schematic diagram may also be provided for the same.
31. A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the Project. Phase-wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given. The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution.
32. Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out, indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered. Project Proponent shall conduct Impact of Transportation study as per Indian Road Congress Guidelines.
33. Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.
34. Conceptual post mining land use and Reclamation and Restoration of mined out areas (with plans and with adequate number of sections) should be given in the EIA report.
35. Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.
36. Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.
37. Measures of socio economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.
38. Detailed environmental management plan (EMP) to mitigate the environmental impacts which, should inter-alia include the impacts of change of land use, loss of agricultural and grazing land, if any, occupational health impacts besides other impacts specific to the proposed Project.

39. Public Hearing points raised and commitment of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.
40. Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.
41. The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.
42. A Disaster management Plan shall be prepared and included in the EIA/EMP Report.
43. Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shall clearly indicate environmental, social, economic, employment potential, etc.
44. Besides the above, the below mentioned general points are also to be followed:-
 - a. Executive Summary of the EIA/EMP Report
 - b. All documents to be properly referenced with index and continuous page numbering.
 - c. Where data are presented in the Report especially in Tables, the period in which the data were collected and the sources should be indicated.
 - d. Project Proponent shall enclose all the analysis/testing reports of water, air, soil, noise etc. using the MoEF&CC/NABL accredited laboratories. All the original analysis/testing reports should be available during appraisal of the Project.
 - e. Where the documents provided are in a language other than English, an English translation should be provided.
 - f. The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall also be filled and submitted.
 - g. While preparing the EIA report, the instructions for the Proponents and instructions for the Consultants issued by MoEF&CC vide O.M. No. J-11013/41/2006-IA.II(I) dated 4th August, 2009, which are available on the website of this Ministry, should be followed.
 - h. Changes, if any made in the basic scope and project parameters (as submitted in Form-I and the PFR for securing the TOR) should be brought to the attention of MoEF&CC with reasons for such changes and permission should be sought, as the TOR may also have to be altered. Post Public Hearing changes in structure and content of the draft EIA/EMP (other than modifications arising out of the P.H. process) will entail conducting the PH again with the revised documentation.
 - i. As per the circular no. J-11011/618/2010-IA.II(I) dated 30.5.2012, certified report of the status of compliance of the conditions stipulated in the environment clearance for the existing operations of the project, should be obtained from the Regional Office of Ministry of Environment, Forest and Climate Change, as may be applicable.
 - j. The EIA report should also include (i) surface plan of the area indicating contours of main topographic features, drainage and mining area, (ii) geological maps and sections and (iii) sections of the mine pit and external dumps, if any, clearly showing the land features of the adjoining area.

B. Additional Conditions :

1. Cluster certificate from the competent authority should be submitted.
2. Need-based EMP, prepared in accordance with the MoEF&CC Office Memorandum vide F. No. 22-65/2017.IA.III dated 30.09.2020.
3. Details of accredited consultant including valid NABET accreditation certificate should be submitted.
4. Study report on base flow level measured at 5 points with date and supporting photographs. It should be

committed that mining will be done at least 1m above the base flow level. Accordingly, if required, the proposal may also be revised.

The project proponent is requested to submit the final EIA/EMP prepared as per the above-mentioned ToRs and incorporating all the issues raised during Public Hearing / Public Consultation to the SEAC for further consideration of the proposal for environmental clearance.

The proponent, – while applying for environmental clearance, shall upload in the PARIVESH portal, the EIA/EMP report along with the documents/ sought above.

The ToR is valid for a period of 3 (three) years from the date of issue.

(22) Proposed Chaitpur Sand Mine project in river Damodar in area of 7.75 Acres / 3.14 Hectares at Plot No. 1453(P), 1454(P), 1480(P), 1564(P), 1581(P), 1585(P), JL No. 84, Mouza – Chairpur, PS – Bardhaman, Dist – Purba Bardhaman, West Bengal by **Buddhadeb Adhikari**.

Proposal No. :- SIA/WB/MIN/73729/2022, File No. : EN/T-II-1/087/2022, Type-TOR

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/73729/2022** dated **21 Dec 2022** seeking Terms of reference (TOR) under the provisions of the EIA Notification, 2006 for the above mentioned proposed project. The proposed project activity is listed at S. No. **1(a) Mining of minerals** projects under Category **B** of EIA Notification, 2006.

The SEAC during its 63rd meeting held on 18.01.2023 recommended issuance of Standard Terms of Reference for EIA preparation for the project with the following additional conditions :-

1. Valid LOI from the competent authority.
2. Cluster certificate from the competent authority should be submitted.
3. Need-based EMP, prepared in accordance with the MoEF&CC Office Memorandum vide F. No. 22-65/2017.IA.III dated 30.09.2020.
4. Details of accredited consultant including valid NABET accreditation certificate should be submitted.
5. Study report on base flow level measured at 5 points with date and supporting photographs. It should be committed that mining will be done at least 1m above the base flow level. Accordingly, if required, the proposal may also be revised.

The proponent, – while applying for environmental clearance, shall upload in the PARIVESH portal, the EIA/EMP report along with the documents/ sought above.

PROJECT DETAILS

The project of **Buddhadeb Adhikari** located in as follows :

S. No.	State	District
(1.)	West Bengal	Purba Bardhaman

The salient features of the project submitted by the project proponent is available at [Report](#) under online proposal no.

SIA/WB/MIN/73729/2022.

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

SEIAA approved the proposal for ToR.

CONCLUSION

Approved ToR.

Conditions

A. STANDARD TERMS OF REFERENCE

1. Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any one year prior to 1994. It may also be categorically informed whether there had been any increase in production after the EIA Notification 1994 came into force, w.r.t. the highest production achieved prior to 1994.
2. A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.
3. All documents including approved mine plan, EIA and Public Hearing should be compatible with one another in terms of the mine lease area, production levels, waste generation and its management, mining technology etc. and should be in the name of the lessee.
4. All corner coordinates of the mine lease area, superimposed on a High Resolution Imagery/ toposheet, topographic sheet, geomorphology and geology of the area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).
5. Information should be provided in Survey of India Toposheet in 1:50,000 scale indicating geological map of the area, geomorphology of land forms of the area, existing minerals and mining history of the area, important water bodies, streams and rivers and soil characteristics.
6. Details about the land proposed for mining activities should be given with information as to whether mining conforms to the land use policy of the State; land diversion for mining should have approval from State land use board or the concerned authority.
7. It should be clearly stated whether the proponent Company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be spelt out in the EIA Report with description of the prescribed operating process/procedures to bring into focus any infringement/deviation/violation of the environmental or forest norms/ conditions? The hierarchical system or administrative order of the Company to deal with the environmental issues and for ensuring compliance with the EC conditions may also be given. The system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the Company and/or shareholders or stakeholders at large, may also be detailed in the EIA Report.
8. Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should also be provided.
9. The study area will comprise of 10 km zone around the mine lease from lease periphery and the data contained in

the EIA such as waste generation etc. should be for the life of the mine / lease period.

10. Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.
11. Details of the land for any Over Burden Dumps outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be given.
12. A Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.
13. Status of forestry clearance for the broken up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.
14. Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.
15. The vegetation in the RF / PF areas in the study area, with necessary details, should be given.
16. A study shall be got done to ascertain the impact of the Mining Project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly, detailed mitigative measures required, should be worked out with cost implications and submitted.
17. Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/Elephant Reserves/(existing as well as proposed), if any, within 10 km of the mine lease should be clearly indicated, supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished.
18. A detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any scheduled-I fauna found in the study area, the necessary plan along with budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.
19. Proximity to Areas declared as 'Critically Polluted' or the Project areas likely to come under the 'Aravali Range', (attracting court restrictions for mining operations), should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB or State Mining Department should be secured and furnished to the effect that the proposed mining activities could be considered.
20. Similarly, for coastal Projects, A CRZ map duly authenticated by one of the authorized agencies demarcating LTL, HTL, CRZ area, location of the mine lease w.r.t CRZ, coastal features such as mangroves, if any, should be furnished. (Note: The Mining Projects falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority).
21. R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing the R&R Plan, the relevant State/National Rehabilitation & Resettlement Policy should be kept in view. In respect of SCs /STs and other weaker sections of the society in the study area, a need based sample survey, family-wise, should be undertaken to assess their requirements, and action programmes prepared and submitted accordingly, integrating the sectorial programmes of line departments of the State Government. It may be clearly brought out

whether the village(s) located in the mine lease area will be shifted or not. The issues relating to shifting of village(s) including their R&R and socio-economic aspects should be discussed in the Report.

22. One season (non-monsoon) [i.e. March-May (Summer Season); October-December (post monsoon season) ; December-February (winter season)] primary baseline data on ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so compiled presented date-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500 m of the mine lease in the pre-dominant downwind direction. The mineralogical composition of PM10, particularly for free silica, should be given.
23. Air quality modeling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of mineral. The details of the model used and input parameters used for modeling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The wind roses showing pre-dominant wind direction may also be indicated on the map.
24. The water requirement for the Project, its availability and source should be furnished. A detailed water balance should also be provided. Fresh water requirement for the Project should be indicated.
25. Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.
26. Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.
27. Impact of the Project on the water quality, both surface and groundwater, should be assessed and necessary safeguard measures, if any required, should be provided.
28. Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working will intersect groundwater table, a detailed Hydro Geological Study should be undertaken and Report furnished. The Report inter-alia, shall include details of the aquifers present and impact of mining activities on these aquifers. Necessary permission from Central Ground Water Authority for working below ground water and for pumping of ground water should also be obtained and copy furnished.
29. Details of any stream, seasonal or otherwise, passing through the lease area and modification / diversion proposed, if any, and the impact of the same on the hydrology should be brought out.
30. Information on site elevation, working depth, groundwater table etc. Should be provided both in AMSL and bgl. A schematic diagram may also be provided for the same.
31. A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the Project. Phase-wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given. The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution.
32. Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out, indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered. Project Proponent shall conduct Impact of Transportation study as per Indian Road Congress Guidelines.
33. Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA

Report.

34. Conceptual post mining land use and Reclamation and Restoration of mined out areas (with plans and with adequate number of sections) should be given in the EIA report.
35. Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.
36. Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.
37. Measures of socio-economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.
38. Detailed environmental management plan (EMP) to mitigate the environmental impacts which, should inter-alia include the impacts of change of land use, loss of agricultural and grazing land, if any, occupational health impacts besides other impacts specific to the proposed Project.
39. Public Hearing points raised and commitment of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.
40. Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.
41. The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.
42. A Disaster management Plan shall be prepared and included in the EIA/EMP Report.
43. Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shall clearly indicate environmental, social, economic, employment potential, etc.
44. Besides the above, the below mentioned general points are also to be followed:-
 - a. Executive Summary of the EIA/EMP Report
 - b. All documents to be properly referenced with index and continuous page numbering.
 - c. Where data are presented in the Report especially in Tables, the period in which the data were collected and the sources should be indicated.
 - d. Project Proponent shall enclose all the analysis/testing reports of water, air, soil, noise etc. using the MoEF&CC/NABL accredited laboratories. All the original analysis/testing reports should be available during appraisal of the Project.
 - e. Where the documents provided are in a language other than English, an English translation should be provided.
 - f. The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall also be filled and submitted.
 - g. While preparing the EIA report, the instructions for the Proponents and instructions for the Consultants issued by MoEF&CC vide O.M. No. J-11013/41/2006-IA.II(I) dated 4th August, 2009, which are available on the website of this Ministry, should be followed.
 - h. Changes, if any made in the basic scope and project parameters (as submitted in Form-I and the PFR for securing the TOR) should be brought to the attention of MoEF&CC with reasons for such changes and permission should be sought, as the TOR may also have to be altered. Post Public Hearing changes in structure and content of the draft EIA/EMP (other than modifications arising out of the P.H. process) will

entail conducting the PH again with the revised documentation.

- i. As per the circular no. J-11011/618/2010-IA.II(I) dated 30.5.2012, certified report of the status of compliance of the conditions stipulated in the environment clearance for the existing operations of the project, should be obtained from the Regional Office of Ministry of Environment, Forest and Climate Change, as may be applicable.
- j. The EIA report should also include (i) surface plan of the area indicating contours of main topographic features, drainage and mining area, (ii) geological maps and sections and (iii) sections of the mine pit and external dumps, if any, clearly showing the land features of the adjoining area.

B. Additional Terms of Reference

- 1) Valid LOI from the competent authority.
- 2) Cluster certificate from the competent authority should be submitted.
- 3) Need-based EMP, prepared in accordance with the MoEF&CC Office Memorandum vide F. No. 22-65/2017.IA.III dated 30.09.2020.
- 4) Details of accredited consultant including valid NABET accreditation certificate should be submitted.
- 5) Study report on base flow level measured at 5 points with date and supporting photographs. It should be committed that mining will be done at least 1m above the base flow level. Accordingly, if required, the proposal may also be revised.

The project proponent is requested to submit the final EIA/EMP prepared as per the above-mentioned ToRs and incorporating all the issues raised during Public Hearing / Public Consultation to the SEAC for further consideration of the proposal for environmental clearance.

The proponent, – while applying for environmental clearance, shall upload in the PARIVESH portal, the EIA/EMP report along with the documents/ sought above.

The ToR is valid for a period of 3 (three) years from the date of issue.

(23) Proposed Ghanesharpur sand mine on Kangshabati river at JL no. 109, Plot No. 84(P), 85(P) & 86(P), Mouza - Ghanesharpur, P.S. - Sadar, Dist.- Paschim Medinipur, West Bengal by **Kartick Jana**.

Proposal No. :- SIA/WB/MIN/72819/2022, File No. : EN/T-II-1/007/2023, Type-TOR

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/72819/2022** dated **07 Jan 2023** seeking Terms of reference (TOR) under the provisions of the EIA Notification, 2006 for the above mentioned proposed project. The proposed project activity is listed at S. No. **1(a) Mining of minerals** projects under Category **B** of EIA Notification, 2006.

The SEAC during its 64th meeting held on 01.02.2023 recommended issuance of standard Terms of Reference for EIA preparation for the project with the following additional conditions: -

1. Valid LOI to be obtained from the competent authority.
2. Necessary cluster certificate may be obtained from the competent authority and the same may be submitted/ uploaded along with the EIA.
3. As stipulated in the MoEF&CC Office Memorandum vide F. No. 22-65/2017.IA.III dated 30.09.2020 all the commitments made by the project proponent to address the concerns raised during the public consultation shall be

clearly spelt out and the same shall be made part of the Environment Management Plan.

4. Details of accreditation of the environmental consultant including a copy of the valid NABET accreditation certificate should be submitted/ uploaded.
5. A base line study may be conducted on the base flow level (to be measured at least at 5 points giving the dates of measurement). The study report should also contain supporting photographs. It should be committed that mining will be done at least 1m above the base flow level. Accordingly, if required, the proposal may be revised.

The proponent, – while applying for environmental clearance, shall upload in the PARIVESH portal, the EIA/EMP report along with the documents/ reports sought above.

PROJECT DETAILS

The project of **Kartick Jana** located in as follows :

S. No.	State	District
(1.)	West Bengal	Paschim Medinipur

The salient features of the project submitted by the project proponent is available at [Report](#) under online proposal no. **SIA/WB/MIN/72819/2022.**

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

SEIAA approved the proposal for ToR.

CONCLUSION

Approved ToR.

Conditions

A. STANDARD TERMS OF REFERENCE

1. Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any one year prior to 1994. It may also be categorically informed whether there had been any increase in production after the EIA Notification 1994 came into force, w.r.t. the highest production achieved prior to 1994.
2. A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.
3. All documents including approved mine plan, EIA and Public Hearing should be compatible with one another in terms of the mine lease area, production levels, waste generation and its management, mining technology etc. and should be in the name of the lessee.
4. All corner coordinates of the mine lease area, superimposed on a High Resolution Imagery/ toposheet, topographic sheet, geomorphology and geology of the area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).

5. Information should be provided in Survey of India Toposheet in 1:50,000 scale indicating geological map of the area, geomorphology of land forms of the area, existing minerals and mining history of the area, important water bodies, streams and rivers and soil characteristics.
6. Details about the land proposed for mining activities should be given with information as to whether mining conforms to the land use policy of the State; land diversion for mining should have approval from State land use board or the concerned authority.
7. It should be clearly stated whether the proponent Company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be spelt out in the EIA Report with description of the prescribed operating process/procedures to bring into focus any infringement/deviation/violation of the environmental or forest norms conditions? The hierarchical system or administrative order of the Company to deal with the environmental issue and for ensuring compliance with the EC conditions may also be given. The system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the Company and/or shareholders or stakeholders at large, may also be detailed in the EIA Report.
8. Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should also be provided.
9. The study area will comprise of 10 km zone around the mine lease from lease periphery and the data contained in the EIA such as waste generation etc. should be for the life of the mine / lease period.
10. Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.
11. Details of the land for any Over Burden Dumps outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be given.
12. A Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.
13. Status of forestry clearance for the broken up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.
14. Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.
15. The vegetation in the RF / PF areas in the study area, with necessary details, should be given.
16. A study shall be got done to ascertain the impact of the Mining Project on wildlife of the study area and detail furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly detailed mitigative measures required, should be worked out with cost implications and submitted.
17. Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/Elephant Reserves/(existing as well as proposed), if any, within 10 km of the mine lease should be clearly indicated supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished.
18. A detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the

Schedule of the fauna present. In case of any scheduled-I fauna found in the study area, the necessary plan along with budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.

19. Proximity to Areas declared as 'Critically Polluted' or the Project areas likely to come under the 'Aravali Range (attracting court restrictions for mining operations), should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB or State Mining Department should be secured and furnished to the effect that the proposed mining activities could be considered.
20. Similarly, for coastal Projects, A CRZ map duly authenticated by one of the authorized agencies demarcating LTL HTL, CRZ area, location of the mine lease w.r.t CRZ, coastal features such as mangroves, if any, should be furnished. (Note: The Mining Projects falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority).
21. R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing the R&R Plan, the relevant State/National Rehabilitation & Resettlement Policy should be kept in view. In respect of SCs /STs and other weaker sections of the society in the study area, a need based sample survey, family-wise should be undertaken to assess their requirements, and action programmes prepared and submitted accordingly integrating the sectorial programmes of line departments of the State Government. It may be clearly brought out whether the village(s) located in the mine lease area will be shifted or not. The issues relating to shifting of village(s) including their R&R and socio-economic aspects should be discussed in the Report.
22. One season (non-monsoon) [i.e. March-May (Summer Season); October-December (post monsoon season) December-February (winter season)] primary baseline data on ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so compiled presented date-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500 m of the mine lease in the pre-dominant downwind direction. The mineralogical composition of PM10, particularly for free silica, should be given.
23. Air quality modeling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of mineral. The details of the model used and input parameters used for modeling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The wind roses showing pre-dominant wind direction may also be indicated on the map.
24. The water requirement for the Project, its availability and source should be furnished. A detailed water balance should also be provided. Fresh water requirement for the Project should be indicated.
25. Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.
26. Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.
27. Impact of the Project on the water quality, both surface and groundwater, should be assessed and necessary safeguard measures, if any required, should be provided.
28. Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working will intersect groundwater table, detailed Hydro Geological Study should be undertaken and Report furnished. The Report inter-alia, shall include details of the aquifers present and impact of mining activities on these aquifers. Necessary permission from Central Ground Water Authority for working below ground water and for pumping of ground water should also be obtained and copy furnished.
29. Details of any stream, seasonal or otherwise, passing through the lease area and modification / diversion proposed

if any, and the impact of the same on the hydrology should be brought out.

30. Information on site elevation, working depth, groundwater table etc. Should be provided both in AMSL and bgl. A schematic diagram may also be provided for the same.
31. A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the lineal and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the Project. Phase-wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given. The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution.
32. Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered. Project Proponent shall conduct Impact of Transportation study as per Indian Road Congress Guidelines.
33. Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.
34. Conceptual post mining land use and Reclamation and Restoration of mined out areas (with plans and with adequate number of sections) should be given in the EIA report.
35. Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.
36. Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.
37. Measures of socio-economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frame for implementation.
38. Detailed environmental management plan (EMP) to mitigate the environmental impacts which, should inter-alia include the impacts of change of land use, loss of agricultural and grazing land, if any, occupational health impact besides other impacts specific to the proposed Project.
39. Public Hearing points raised and commitment of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.
40. Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.
41. The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.
42. A Disaster management Plan shall be prepared and included in the EIA/EMP Report.
43. Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shall clearly indicate environmental, social, economic, employment potential, etc.
44. Besides the above, the below mentioned general points are also to be followed:-
 - a. Executive Summary of the EIA/EMP Report (enclosed as **Annexure – A**).
 - b. All documents to be properly referenced with index and continuous page numbering.
 - c. Where data are presented in the Report especially in Tables, the period in which the data were collected and the sources should be indicated.

- d. Project Proponent shall enclose all the analysis/testing reports of water, air, soil, noise etc. using the MoEF&CC/NABL accredited laboratories. All the original analysis/testing reports should be available during appraisal of the Project.
- e. Where the documents provided are in a language other than English, an English translation should be provided.
- f. The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall also be filled and submitted.
- g. While preparing the EIA report, the instructions for the Proponents and instructions for the Consultants issued by MoEF&CC vide O.M. No. J-11013/41/2006-IA.II(I) dated 4th August, 2009, which are available on the website of this Ministry, should be followed.
- h. Changes, if any made in the basic scope and project parameters (as submitted in Form-I and the PFR for securing the TOR) should be brought to the attention of MoEF&CC with reasons for such changes and permission should be sought, as the TOR may also have to be altered. Post Public Hearing changes in structure and content of the draft EIA/EMP (other than modifications arising out of the P.H. process) will entail conducting the PH again with the revised documentation.
- i. As per the circular no. J-11011/618/2010-IA.II(I) dated 30.5.2012, certified report of the status of compliance of the conditions stipulated in the environment clearance for the existing operations of the project, should be obtained from the Regional Office of Ministry of Environment, Forest and Climate Change, as may be applicable.
- j. The EIA report should also include (i) surface plan of the area indicating contours of main topographic features, drainage and mining area, (ii) geological maps and sections and (iii) sections of the mine pit and external dumps, if any, clearly showing the land features of the adjoining area.

B. Additional Terms of Reference

1. Valid LOI to be obtained from the competent authority.
2. Necessary cluster certificate may be obtained from the competent authority and the same may be submitted/ uploaded along with the EIA.
3. As stipulated in the MoEF&CC Office Memorandum vide F. No. 22-65/2017.IA.III dated 30.09.2020 all commitments made by the project proponent to address the concerns raised during the public consultation shall be clearly spelt out and the same shall be made part of the Environment Management Plan.
4. Details of accreditation of the environmental consultant including a copy of the valid NABET accreditation certificate should be submitted/ uploaded.
5. A base line study may be conducted on the base flow level (to be measured at least at 5 points giving the date of measurement). The study report should also contain supporting photographs. It should be committed that mining shall be done at least 1m above the base flow level. Accordingly, if required, the proposal may be revised.

The project proponent is requested to submit the final EIA/EMP prepared as per the above-mentioned ToRs and incorporating all the issues raised during Public Hearing / Public Consultation to the SEAC for further consideration of the proposal for environmental clearance.

The proponent, – while applying for environmental clearance, shall upload in the PARIVESH portal, the EIA/EMP report along with the documents/ sought above.

The ToR is valid for a period of 3 (three) years from the date of issue.

Executive Summary

The Executive summary of the EIA/EMP report in about 8-10 pages should be prepared incorporating the information on following points:

- 1) Project name and location (Village, District, State, Industrial Estate (if applicable).
- 2) Products and capacities. If expansion proposal, then existing products with capacities and reference to earlier EC.
- 3) Requirement of land, raw material, water, power, fuel, with source of supply (Quantitative).
- 4) Process description in brief, specifically indicating the gaseous emission, liquid effluent and solid and hazardous wastes.
- 5) Measures for mitigating the impact on the environment and mode of discharge or disposal.
- 6) Capital cost of the project, estimated time of completion.
- 7) Site selected for the project - Nature of land - Agricultural (single/double crop), barren, Govt./private land, status of is acquisition, nearby (in 2-3 km.) water body, population, with in 10km. other industries, forest, eco-sensitive zones, accessibility, (note - in case of industrial estate this information may not be necessary).
- 8) Baseline environmental data - air quality, surface and ground water quality, soil characteristic, flora and fauna, socio-economic condition of the nearby population.
- 9) Identification of hazards in handling, processing and storage of hazardous material and safety system provided to mitigate the risk.
- 10) Likely impact of the project on air, water, land, flora-fauna and nearby population.
- 11) Emergency preparedness plan in case of natural or in plant emergencies.
- 12) Issues raised during public hearing (if applicable) and response given.
- 13) Environment Management Plan (EMP) as per Office Memorandum issued by the MoEF & CC vide F. No. 22-65/2017-IA.III dated 30.09.2020 with proposed expenditure.
- 14) Occupational Health Measures.
- 15) Post project monitoring plan.

(24) Proposed Nischintapur Sand Mine on Kangshabati River in the area of 2.80 Ha (6.92 Acres) at Mouza - Nischintapur, J.L. No.: 48, Plot Nos. 1(P), 2(P), P.S. – Medinipur, Dist. – Paschim Medinipur, West Bengal by **Deep Dutta**.

Proposal No. :- SIA/WB/MIN/73865/2022, File No. : EN/T-II-1/008/2023, Type-TOR

INTRODUCTION

The proponent made online application vide proposal no. **SIA/WB/MIN/73865/2022** dated **07 Jan 2023** seeking Terms of reference (TOR) under the provisions of the EIA Notification, 2006 for the above mentioned proposed project. The proposed project activity is listed at S. No. **1(a) Mining of minerals** projects under Category **B** of EIA Notification, 2006.

The SEAC during its 64th meeting held on 01.02.2023 recommended issuance of standard Terms of Reference for EIA preparation for the project with the following additional conditions :-

1. Cluster certificate from the competent authority should be submitted.
2. Need-based EMP, prepared in accordance with the MoEF&CC Office Memorandum vide F. No. 22-65/2017.IA.III dated 30.09.2020.
3. Details of accreditation of the environmental consultant including a copy of the valid NABET accreditation certificate may be submitted/ uploaded.
4. A base line study may be conducted on the base flow level (to be measured at least at 5 points giving the dates of measurement). The study report should also contain supporting photographs. It should be committed that mining will be done at least 1m above the base flow level. Accordingly, if required, the proposal may be revised.

The proponent, – while applying for environmental clearance, shall upload in the PARIVESH portal, the EIA/EMP report along with the documents/ sought above.

PROJECT DETAILS

The project of **Deep Dutta** located in as follows :

S. No.	State	District
(1.)	West Bengal	Paschim Medinipur

The salient features of the project submitted by the project proponent is available at [Report](#) under online proposal no. **SIA/WB/MIN/73865/2022.**

DELIBERATION IN SEIAA

SEIAA considered the recommendation of SEAC and accepted the same.

RECOMMENDATIONS OF SEIAA

SEIAA approved the proposal for ToR.

CONCLUSION

Approved ToR.

Conditions

A. STANDARD TERMS OF REFERENCE

1. Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any one year prior to 1994. It may also be categorically informed whether there had been any increase in production after the EIA Notification 1994 came into force, w.r.t. the highest production achieved prior to 1994.
2. A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.
3. All documents including approved mine plan, EIA and Public Hearing should be compatible with one another in terms of the mine lease area, production levels, waste generation and its management, mining technology etc. and should be in the name of the lessee.
4. All corner coordinates of the mine lease area, superimposed on a High Resolution Imagery/ toposheet, topographic

sheet, geomorphology and geology of the area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).

5. Information should be provided in Survey of India Toposheet in 1:50,000 scale indicating geological map of the area, geomorphology of land forms of the area, existing minerals and mining history of the area, important water bodies, streams and rivers and soil characteristics.
6. Details about the land proposed for mining activities should be given with information as to whether mining conforms to the land use policy of the State; land diversion for mining should have approval from State land use board or the concerned authority.
7. It should be clearly stated whether the proponent Company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be spelt out in the EIA Report with description of the prescribed operating process/procedures to bring into focus any infringement/deviation/violation of the environmental or forest norms conditions? The hierarchical system or administrative order of the Company to deal with the environmental issue and for ensuring compliance with the EC conditions may also be given. The system of reporting of non compliances / violations of environmental norms to the Board of Directors of the Company and/or shareholders or stakeholders at large, may also be detailed in the EIA Report.
8. Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should also be provided.
9. The study area will comprise of 10 km zone around the mine lease from lease periphery and the data contained in the EIA such as waste generation etc. should be for the life of the mine / lease period.
10. Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.
11. Details of the land for any Over Burden Dumps outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be given.
12. A Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.
13. Status of forestry clearance for the broken up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.
14. Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.
15. The vegetation in the RF / PF areas in the study area, with necessary details, should be given.
16. A study shall be got done to ascertain the impact of the Mining Project on wildlife of the study area and detail furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly detailed mitigative measures required, should be worked out with cost implications and submitted.
17. Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/Elephant Reserves/(existing as well as proposed), if any, within 10 km of the mine lease should be clearly indicated supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished.

18. A detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any scheduled-I fauna found in the study area, the necessary plan along with budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.
19. Proximity to Areas declared as 'Critically Polluted' or the Project areas likely to come under the 'Aravali Range (attracting court restrictions for mining operations), should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB or State Mining Department should be secured and furnished to the effect that the proposed mining activities could be considered.
20. Similarly, for coastal Projects, A CRZ map duly authenticated by one of the authorized agencies demarcating LTL, HTL, CRZ area, location of the mine lease w.r.t CRZ, coastal features such as mangroves, if any, should be furnished. (Note: The Mining Projects falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority).
21. R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing the R&R Plan, the relevant State/National Rehabilitation & Resettlement Policy should be kept in view. In respect of SCs /STs and other weaker sections of the society in the study area, a need based sample survey, family-wise should be undertaken to assess their requirements, and action programmes prepared and submitted accordingly integrating the sectorial programmes of line departments of the State Government. It may be clearly brought out whether the village(s) located in the mine lease area will be shifted or not. The issues relating to shifting of village(s) including their R&R and socio-economic aspects should be discussed in the Report.
22. One season (non-monsoon) [i.e. March-May (Summer Season); October-December (post monsoon season) December-February (winter season)] primary baseline data on ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so compiled presented date-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500 m of the mine lease in the pre-dominant downwind direction. The mineralogical composition of PM10, particularly for free silica, should be given.
23. Air quality modeling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of mineral. The details of the model used and input parameters used for modeling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The wind roses showing pre-dominant wind direction may also be indicated on the map.
24. The water requirement for the Project, its availability and source should be furnished. A detailed water balance should also be provided. Fresh water requirement for the Project should be indicated.
25. Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.
26. Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.
27. Impact of the Project on the water quality, both surface and groundwater, should be assessed and necessary safeguard measures, if any required, should be provided.
28. Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working will intersect groundwater table, detailed Hydro Geological Study should be undertaken and Report furnished. The Report inter-alia, shall include details of the aquifers present and impact of mining activities on these aquifers. Necessary permission from Central Ground Water Authority for working below ground water and for pumping of ground water should also be

obtained and copy furnished.

29. Details of any stream, seasonal or otherwise, passing through the lease area and modification / diversion proposed if any, and the impact of the same on the hydrology should be brought out.
30. Information on site elevation, working depth, groundwater table etc. Should be provided both in AMSL and bgl. A schematic diagram may also be provided for the same.
31. A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the lineal and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the Project. Phase-wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given. The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution.
32. Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered. Project Proponent shall conduct Impact of Transportation study as per Indian Road Congress Guidelines.
33. Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.
34. Conceptual post mining land use and Reclamation and Restoration of mined out areas (with plans and with adequate number of sections) should be given in the EIA report.
35. Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.
36. Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.
37. Measures of socio-economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frame for implementation.
38. Detailed environmental management plan (EMP) to mitigate the environmental impacts which, should inter-alia include the impacts of change of land use, loss of agricultural and grazing land, if any, occupational health impact besides other impacts specific to the proposed Project.
39. Public Hearing points raised and commitment of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.
40. Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.
41. The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.
42. A Disaster management Plan shall be prepared and included in the EIA/EMP Report.
43. Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shall clearly indicate environmental, social, economic, employment potential, etc.
44. Besides the above, the below mentioned general points are also to be followed:-
 - a. Executive Summary of the EIA/EMP Report (enclosed as **Annexure – B**).
 - b. All documents to be properly referenced with index and continuous page numbering.

- c. Where data are presented in the Report especially in Tables, the period in which the data were collected and the sources should be indicated.
- d. Project Proponent shall enclose all the analysis/testing reports of water, air, soil, noise etc. using the MoEF&CC/NABL accredited laboratories. All the original analysis/testing reports should be available during appraisal of the Project.
- e. Where the documents provided are in a language other than English, an English translation should be provided.
- f. The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall also be filled and submitted.
- g. While preparing the EIA report, the instructions for the Proponents and instructions for the Consultants issued by MoEF&CC vide O.M. No. J-11013/41/2006-IA.II(I) dated 4th August, 2009, which are available on the website of this Ministry, should be followed.
- h. Changes, if any made in the basic scope and project parameters (as submitted in Form-I and the PFR for securing the TOR) should be brought to the attention of MoEF&CC with reasons for such changes and permission should be sought, as the TOR may also have to be altered. Post Public Hearing changes in structure and content of the draft EIA/EMP (other than modifications arising out of the P.H. process) will entail conducting the PH again with the revised documentation.
- i. As per the circular no. J-11011/618/2010-IA.II(I) dated 30.5.2012, certified report of the status of compliance of the conditions stipulated in the environment clearance for the existing operations of the project, should be obtained from the Regional Office of Ministry of Environment, Forest and Climate Change, as may be applicable.
- j. The EIA report should also include (i) surface plan of the area indicating contours of main topographic features, drainage and mining area, (ii) geological maps and sections and (iii) sections of the mine pit and external dumps, if any, clearly showing the land features of the adjoining area.

B. Additional Terms of Reference

- i. Cluster certificate from the competent authority should be submitted.
- ii. Need-based EMP, prepared in accordance with the MoEF&CC Office Memorandum vide F. No. 22-65/2017.IA. dated 30.09.2020.
- iii. Details of accreditation of the environmental consultant including a copy of the valid NABET accreditation certificate may be submitted/ uploaded.
- iv. A base line study may be conducted on the base flow level (to be measured at least at 5 points giving the dates of measurement). The study report should also contain supporting photographs. It should be committed that mining will be done at least 1m above the base flow level. Accordingly, if required, the proposal may be revised.

The project proponent is requested to submit the final EIA/EMP prepared as per the above-mentioned ToRs and incorporating all the issues raised during Public Hearing / Public Consultation to the SEAC for further consideration of the proposal for environmental clearance.

The proponent, – while applying for environmental clearance, shall upload in the PARIVESH portal, the EIA/EMP report along with the documents/ sought above.

The ToR is valid for a period of 3 (three) years from the date of issue.

Executive Summary

The Executive summary of the EIA/EMP report in about 8-10 pages should be prepared incorporating the information on following points:

- 1) Project name and location (Village, District, State, Industrial Estate (if applicable)).
- 2) Products and capacities. If expansion proposal, then existing products with capacities and reference to earlier EC.
- 3) Requirement of land, raw material, water, power, fuel, with source of supply (Quantitative).
- 4) Process description in brief, specifically indicating the gaseous emission, liquid effluent and solid and hazardous wastes.
- 5) Measures for mitigating the impact on the environment and mode of discharge or disposal.
- 6) Capital cost of the project, estimated time of completion.
- 7) Site selected for the project - Nature of land - Agricultural (single/double crop), barren, Govt./private land, status of its acquisition, nearby (in 2-3 km.) water body, population, with in 10km. other industries, forest, eco-sensitive zones, accessibility, (note - in case of industrial estate this information may not be necessary).
- 8) Baseline environmental data - air quality, surface and ground water quality, soil characteristic, flora and fauna, socio-economic condition of the nearby population.
- 9) Identification of hazards in handling, processing and storage of hazardous material and safety system provided to mitigate the risk.
- 10) Likely impact of the project on air, water, land, flora-fauna and nearby population.
- 11) Emergency preparedness plan in case of natural or in plant emergencies.
- 12) Issues raised during public hearing (if applicable) and response given.
- 13) Environment Management Plan (EMP) as per Office Memorandum issued by the MoEF & CC vide F. No. 22-65/2017-IA.III dated 30.09.2020 with proposed expenditure.
- 14) Occupational Health Measures.
- 15) Post project monitoring plan.

MISCELLANEOUS

1. Discussion on draft DSRs of **Hooghly, Howrah and Nadia**.

DSRs of Hooghly, Howrah and Nadia are approved.