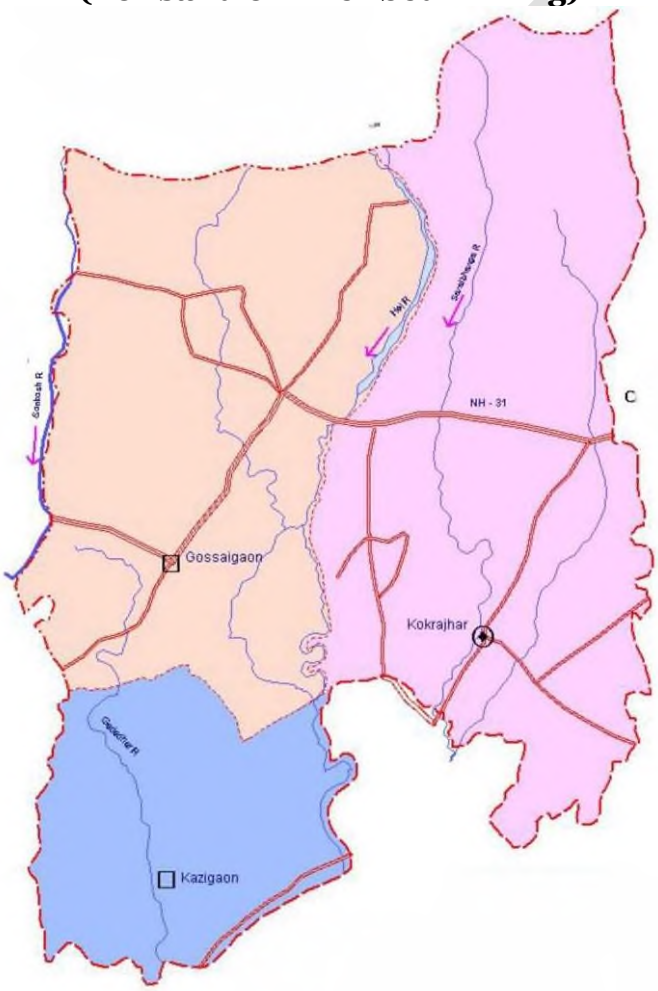
DRAFT
DISTRICT SURVEY REPORT
OF
KOKRAJHAR DISTRICT, ASSAM

(For sand or river bed mining)



CPC Environment Solution Pvt. Ltd.

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Table of Content

PREFACE

The need for a District Survey Report (DSR) has been mandated by the Ministry of Environment, Forest, and Climate Change (MoEF&CC) through Notification No. 125 (Extraordinary, Part II Section 3, Sub-section ii), S.O. 141 (E), dated 15th January 2016. This notification introduced amendments to the EIA Notification 2006, aimed at improving legislative control. As part of these changes, district-level committees were introduced, and the preparation of DSRs became a requirement.

Subsequently, Notification No. 3611 (E), dated 25th July 2018, expanded the DSR's scope to include "Minerals Other than Sand" and provided a specific format for its preparation. The DSR's purpose is to identify areas with mineral potential where mining activities can be permitted, as well as to flag areas where mining should be restricted due to proximity to infrastructure, erosion-prone zones, or environmentally sensitive regions.

The preparation of the DSR involves both primary and secondary data collection. Primary data includes site inspections, surveys, and ground truthing, while secondary data comes from authenticated sources and satellite imagery studies. The secondary data covers information such as the district profile, local geology, mineralization, and other relevant activities, often compiled from disparate sources.

Key Aspects of District Survey Report (DSR)

Assessment of Resources: The DSR provides a comprehensive evaluation of the mineral resources available in riverbeds within the district. It includes detailed data on the quantity, quality, and distribution of sand and other minor minerals, helping to prevent over-extraction and resource depletion through accurate estimation.

Environmental Impact Analysis: The report analyzes the environmental effects of riverbed mining, addressing changes in river morphology, hydrology, and impacts on aquatic ecosystems and biodiversity. This analysis is vital for mitigating harmful environmental impacts and conserving riverine habitats.

Regulation and Compliance: The DSR serves as a regulatory tool for riverbed mining, outlining standards and guidelines to ensure compliance with national and state environmental laws. It helps curb illegal mining activities and promotes regulated, lawful mining operations.

Sustainable Mining Practices: The DSR advocates for sustainable mining practices that reduce environmental degradation. Recommendations may include controlled mining depths, designated extraction zones, and periodic studies to maintain the ecological balance of river systems.

Socio- Economic Considerations: The report addresses the socioeconomic implications of riverbed mining, such as employment generation and local government revenue. It also considers the negative impacts on communities, including displacement and loss of livelihoods.

Data- Driven Decision Making: The DSR provides a scientific foundation for decisions regarding riverbed mining. Incorporating geospatial data, remote sensing images, and field surveys enhances the accuracy and reliability of the report, supporting informed policy-making and resource management.

Stakeholder Involvement: The preparation of the DSR involves consultations with various stakeholders, such as government bodies, local communities, environmentalists, and industry representatives. This inclusive approach ensures diverse perspectives are considered, promoting balanced and equitable mining practices.

1. Introduction of District Survey Report (DSR) of Kokrajhar District

1.1 Introduction

The District Survey Report (DSR) of Kokrajhar District has been prepared in accordance with the Ministry of Environment, Forests and Climate Change (MoEF&CC) guidelines. This report aligns with the MoEF&CC Notifications: S.O.-1533(E) dated 14th September 2006, S.O. 141(E) dated 15th January 2016, and S.O. 3611(E) dated 25th July 2018, which recommends the format for preparing the DSR. These notifications ensure scientific and systematic utilization of natural resources for the benefit of present and future generations.

The primary objectives of the DSR are to identify areas of aggradation suitable for mining and areas of erosion where mining should be restricted. It involves calculating the annual replenishment rate to maintain ecological balance and assessing the development potential of in-situ minor minerals.

Objectives of the DSR:

1. Identification and quantification of minor mineral resources for optimal utilization.
2. Regulation of river bed mining mining, and reduction of demand-supply gaps.
3. Use of Information Technology (IT) for surveillance of river bed mining activities.
4. Facilitation of environmental clearance for clusters of mines.
5. Restriction of illegal mining.
6. Reduction of flood occurrences in the area.
7. Preservation of aquatic habitats.
8. Protection of groundwater by limiting extraction to above base flow levels.
9. Maintenance of data records related to mineral resources, leases, and revenue generation.
10. Creation of a scientific mining plan, including ultimate pit limit estimation.
11. Development of comprehensive guidelines for mining minor minerals.

The DSR includes secondary data on the district's geology, climate, mineral resources, and other relevant factors, compiled from published and unpublished reports, as well as government websites.

1.2 Statutory Framework

The MoEF&CC has issued several notifications and guidelines over the years to regulate mining and formulate DSRs for each district. Below is a summary of the legal framework:

Year	Particulars
1994	The MoEF&CC issued the Environmental Impact Assessment (EIA) Notification for major minerals covering areas over 5 hectares.
2006	EIA Notification SO 1533 (E) made it mandatory to obtain environmental clearance (EC) for minor minerals exceeding 5 hectares.
2012	The Hon'ble Supreme Court mandated EC for minor minerals, even for areas under 5 hectares.
2016	"Sustainable Sand Mining Guidelines (SSMG)" introduced, requiring EC for all minor minerals and district-level monitoring.
2018	MoEF&CC issued notification S.O. 3611(E) with a recommended DSR format for identifying aggradation areas, replenishment rates, and protected zones.
2020	The "Enforcement and Monitoring Guidelines for Sand Mining (EMGSM)" introduced for improved regulatory enforcement and technological monitoring of sand mining activities.

Enforcement & Monitoring Guidelines, 2020

These guidelines address illegal mining, directing states to implement monitoring mechanisms like river audits, aerial surveys, and drone- based surveillance.

1.3 Utilization and Demand of the minerals

River bed minerals like sand, gravel, stone etc. plays an essential role in construction and is widely used in concrete production, glass manufacturing, road base formation, and many more. River bed mining is a prevalent practice in Kokrajhar District, mainly for construction. The rise in real estate and government infrastructure projects has significantly increased the demand for sand and bricks. The minor minerals of Kokrajhar district comes under B-category mining and it is included in sub-category B2. All the available minerals are of Y-schedule.

Uses of minerals:

1. **Construction**: Sand, gravel, silt, clay and ordinary earth are key ingredients in concrete, mortar and asphalt.
2. **Industrial**: Used in glass production and abrasives.
3. **Environmental**: The minerals can improve traffic safety by providing grip on icy roads, and it helps in soil conditioning for agriculture.
4. **Decorative**: Sand, gravel and stones are used in candles, aquariums, and for enhancing aesthetic appeal in landscaping.
5. **Flood Protection**: Proper management of sand mining helps maintain river flood discharge capacity, reducing the risk of floods.

This DSR aims to provide a well-rounded, data-driven approach for sustainable mineral resource management, ensuring compliance with environmental guidelines and promoting socio-economic benefits for the district.

1.4 Methodology of DSR Preparation

The District Survey Report (DSR) preparation follows a systematic methodology to ensure accuracy and comprehensiveness. The steps involved in the preparation of the DSR are illustrated in Figure 2.1 and are described in detail in the following sections.

a. Data Source Identification

The DSR is based on both primary and secondary data collected from reliable and authoritative sources. Identifying authentic data sources is critical for compiling accurate data. The primary data sources for the DSR are collected through field surveys and replenishment studies. Secondary data sources include publicly available information from government publications, reports, and reputable journals.

- **District Profile**: Information related to the district's demographics and basic statistics is sourced from the **District Census Report, 2011** and the **District Statistical Handbook** published by the Government of Assam.
- **Mineral Resources**: The potential mineral resources of the district are described based on reports published by the **Geological Survey of India (GSI)** or other government agencies
- **Mining Data**: Information on mining leases, lease holders, lease areas, resource allocations, and revenue generation is collected from the **Forest Department.**
- **Satellite Images**: Satellite imagery is utilized to prepare maps related to the district's physiography and land use/land cover.

b. Data Analysis and Map Preparation

After collecting data, a detailed analysis is conducted to extract relevant insights. This involves analyzing spatial data and preparing maps that depict:

- Geomorphology of the district
- Topography
- Land use patterns
- Mineral resource distribution

These maps help visualize the key characteristics of the district and identify potential mining areas.

c. Primary Data Collection

Primary data is essential for preparing a comprehensive DSR. Fieldwork is conducted across the district to assess mineral resources. This field study provides a detailed understanding of the mineral composition and their distribution in the area.

d. Replenishment Study

A key aspect of sustainable mining is ensuring that the amount of sediment removed from riverbeds is replenished naturally. Therefore, replenishment studies are conducted to assess the annual rate of replenishment of riverbed sand. This helps avoid the adverse impacts of excessive sand extraction.

- Physical surveys of the riverbed are carried out using **GPS/DGPS** to define the topography, contours, and offsets.
- The surveys provide a detailed depiction of important features in and around the river, including nearby civil structures and other key landmarks.
- This information helps define the spatial area eligible for sand mining and estimate the sand reserves.

e. Report Preparation

The DSR covers various aspects of the district, including:

- **General Profile**: A brief overview of the district, including demographics, land use patterns, and economic activities.
- **Geomorphology and Geology**: An assessment of the district's physical landscape, including its geological structure.
- **Mineral Resources**: A detailed account of riverbed sands and other minor minerals in the district, including their distribution and potential for extraction.
- **Mining Block Delineation**: Identification of potential mining blocks and mineral reserves within the district.

- **Production Trends**: An analysis of recent trends in the production of minor minerals and the revenue generated from the mining sector.
- **Replenishment Estimation**: The annual replenishment rate of riverbed sand, based on field surveys.
- **Environmental Impact and Mitigation**: An evaluation of the potential environmental impacts of mining activities, along with proposed mitigation measures.
- **Risk Assessment and Disaster Management**: A strategy for managing risks associated with mining and minimizing the impact of any potential disasters.
- **Reclamation Strategy**: A plan for the reclamation of already mined-out areas to restore the ecological balance.

This structured approach ensures that the DSR not only identifies mineral resources but also emphasizes sustainable mining practices and environmental preservation.

2. Overview of mining activity in the district

In the Kokrajhar district collection of sand, gravel, stone, clay/silt etc. from river- bed is considered as one of the main minor mineral sources of the district. These materials are primarily utilized for construction purpose.

3. List of existing mining leases of the districts

a. Details of List of existing mining leases of the districts are furnished in the following table:

Sl. No.	Name of Mahal	Name of the lessee	Location and area of mining lease	Period of lease	Status
1	Jalabila Mahal	NA	Tipkai River 4.53 Ha		Existing Subjudice case in Hon'ble Gauhati High Court
2	Falakata Mahal	NA	Tipkai River 4.52 Ha		Do
3	Joypur Mahal	NA	Tipkai River 4.81 Ha		Do
4	Panijani Mahal	NA	Tipkai River 4.90		Do
5	Garumarachar Pt-I Mahal	NA	Sankosh River 4.43 Ha		Do
6	Garumarachar Pt-II Mahal	NA	Sankosh River 4.43 Ha		
7	Simultapu Mahal	NA	Sankosh River 4.43 Ha		Do
8	Mongaljhora Mahal	Prasanta Brahma	Mongaljhora Stream		Proposed
9	Sankosh Khoksaguri Sand & Stone Materials Mahal	Marjit Basumatary	Sankosh River 4.43 Ha		Existing
10	Balanga Sand & Stone Material Mahal	Bisinta Mushahary	Gongia River		Existing

11	Chitila 2 Sand & Stone Materials Mahal	Argeng Narzary	Gongia River 4.34 Ha		Existing
12	Gurufela 2 Sand & Stone Materials Mahal	Manash Basumatary	Gurufela River 2.0 Ha		Existing
13	No.4 Hel Sand Gravel & Stone Mahal	Bisinta Mushahary	Hel River 3.0 Ha		Existing
14	Sankosh Khoksaguri No.2 Stone Mahal (MPA)	Jandu Construction India Pvt. Ltd.	Sankosh River 4.83 Ha		Existing
15	Sankosh Khoksaguri No.3 Stone Mahal (MPA)	Jandu Construction India Pvt. Ltd.	Sankosh River 4.74 Ha		Existing
16	Sankosh Khoksaguri Sand Gravel Mahal (MPA)	V. R. Saravana Kumar	Sankosh River 4.5 Ha		Existing
17	Sankosh Jaraguri Sand Gravel Mahal (MPA)	V. R. Saravana Kumar	Sankosh River 4.5 Ha		Existing
18	Sankosh Jaraguri No.2 Stone Mahal (MPA)	Bhuven Mukherjee	Sankosh River 4.65 Ha		Existing
19	Haldhibari Sand, Gravel & Stone Mahal	Vivek Mushahary	Sankosh River 4.5 Ha		Under Process
20	Jogdwi Sand & Gravel Mahal	Bisinta Mushahary	Gongia River 3.0 Ha		Under Process
21	Gokulkata Sand, Sandgravel & Stone Mahal	Vivek Mushahary	Sankosh River 4.50 Ha		Under Process

22	Sankosh Surendrapur Ghat Stone Materials Mahal	Loknath Narzary	Sankosh River 4.5 Ha		Under Process
23	Jaraguri PGR-II Stone Materials Mahal-1		Sankosh River 3.0 Ha		Tender Not done yet
24	Jaraguri Sand & Stone Materials Mahal No. 2		Sankosh River 3.0 Ha		Tender Not done yet
25	Khoksaguri No. 4 Stone Materials Mahal		Sankosh River 3.0 Ha		Tender Not done yet
26	No. 9 Harbhanga Sand & Gravel Mahal		Sankosh River 3.0 Ha		Tender Not done yet
27	Khoksaguri No. 3 River Stone Materials Mahal		Sankosh River 3.0 Ha		Tender Not done yet
28	Jaraguri PGR-II Stone Materials Mahal		Sankosh River 3.0 Ha		Tender Not done yet
29	Jaraguri PGR-II Sand & Stone Materials Mahal No.2		Sankosh River 3.0 Ha		
30	Khoksaguri No. III Sand & Stone Materials Mahal No. 3		Sankosh River 3.0 Ha		
31	Jaraguri PGR-II Sand & Stone Materials Mahal No.3		Sankosh River 3.0 Ha		
32	Jaraguri PGR-II Sand & Stone Materials Mahal No.1		Sankosh River 4.5 Ha		

33	Saralbhanga Mohal No. 2	Sri Bul Bul Brahma	4.63 Ha	7 Years	Tenure completed
34	Saralbhanga Mohal No. 3	Sri Sukuram Narzary	9.56 Ha	7 Years	Tenure completed
35	Saralbhanga Mohal No. 4	Sri Lwithwma Basumatary	4.86 Ha	7 Years	Tenure completed
36	Saralbhanga Mohal No. 5	Sri Nangla Basumatary	4.24 Ha	7 Years	Running
37	Saralbhanga Mohal No. 2 A	Sri Hiramba Narzary	4.82 Ha	7 Years	Running
38	Champa Mohal No.-2	Sri Bansho Moshahary	3.76 Ha	7 Years	Running
39	Ouguri Mohal	Sri Tamion Brahma	Jharbari Range, Saralbhanga River	wef. 10-02-21 to 28-02-2027	Old Mohal (Stoped Due to Inside of RNP)
40	Champa (Bandarchara Mohal)	Sri Kiran Basumatary	Nayekgaon Range, Champamoti River	wef. 28-06-17 to 30-06-2024	Old Mohal (Tenure Completed)
41	Dholpani R.F. Mohal (Still Under Process)	Sri Swgwmsar Machahary (User Agency)	Ultapani Range, Dholpani River	Under Process	Proposed Mohal inside of RF Ares (Now Under Chikna Jhalawo NP)
42	Khalasi R.F. Mohal (Still Under Process)	Sri Rajib Narzary (User Agency)	Jharbari Range, Saralbhanga River	Under Process	Proposed Mohal (Stoped Due to Inside of RNP)
43	Tarang Mohal No. 1	NA	Nayekgaon Range, Tarrang River	N/A	Potential Mining Area

44	Saralbhanga Mohal No.- 2 (B)	NA	Gaurang	N/A	Potential Mining Area
45	Saralbhanga Mohal No.- 4 (A)	NA	Gaurang	N/A	Potential Mining Area
46	Saralbhanga Mohal No.- 4 (B)	NA	Gaurang	N/A	Potential Mining Area
47	Saralbhanga Mohal No.- 4 (C)	NA	Gaurang	N/A	Potential Mining Area
48	Saralbhanga Mohal No.- 4 (D)	NA	Gaurang	N/A	Potential Mining Area
49	Saralbhanga Mohal No. 6	NA	Gaurang	N/A	Potential Mining Area
50	Saralbhanga Mohal No.- 7	NA	Gaurang	N/A	Potential Mining Area
51	Saralbhanga Mohal No.- 8	NA	Gaurang	N/A	Potential Mining Area
52	Saralbhanga Mohal No.- 9	NA	Gaurang	N/A	Potential Mining Area
53	Haraputa Adelghutu Mahal	NA	Haraputa 4.0 Ha	NA	Potential Mining Area
54	Haraputa Majardabri Mahal	NA	Haraputa 2.0 Ha	NA	Potential Mining Area

55	Sankosh Majardabri	NA	Sankosh 2.5 Ha	NA	Potential Mining Area
56	Monglajhora Mahal	NA	2.16 ha	NA	

4. Details of revenue generated from mineral sector during last three years

Revenue generated for last 3 years in Kokrajhar District is furnished in Table.

Table: District revenue generation from mineral sector (In INR)

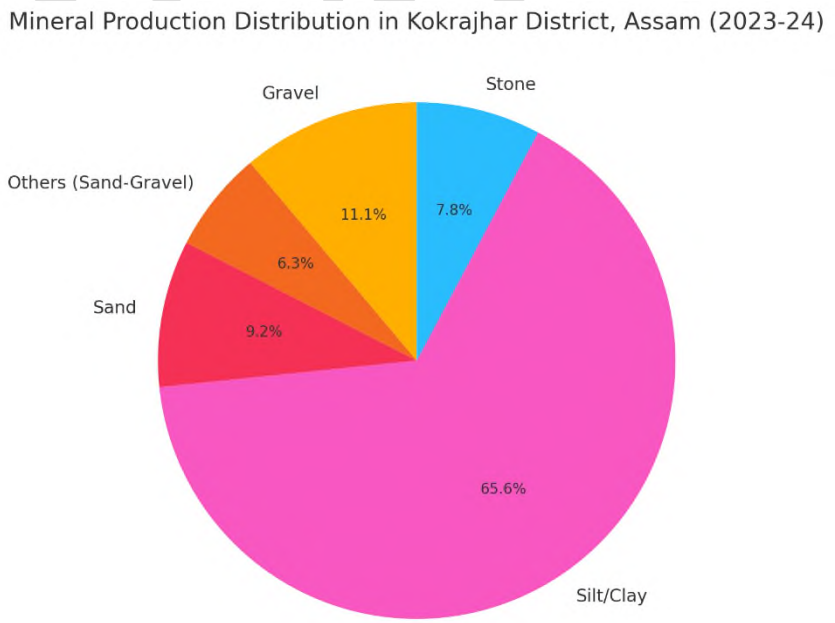
Year	Type of Mining	Quantity	Revenue
2021-22	River Mining	101800 m3	23425153
2022-23	River Mining	175130 m3	40368302
2023-24	River Mining	279700 m3	72723788

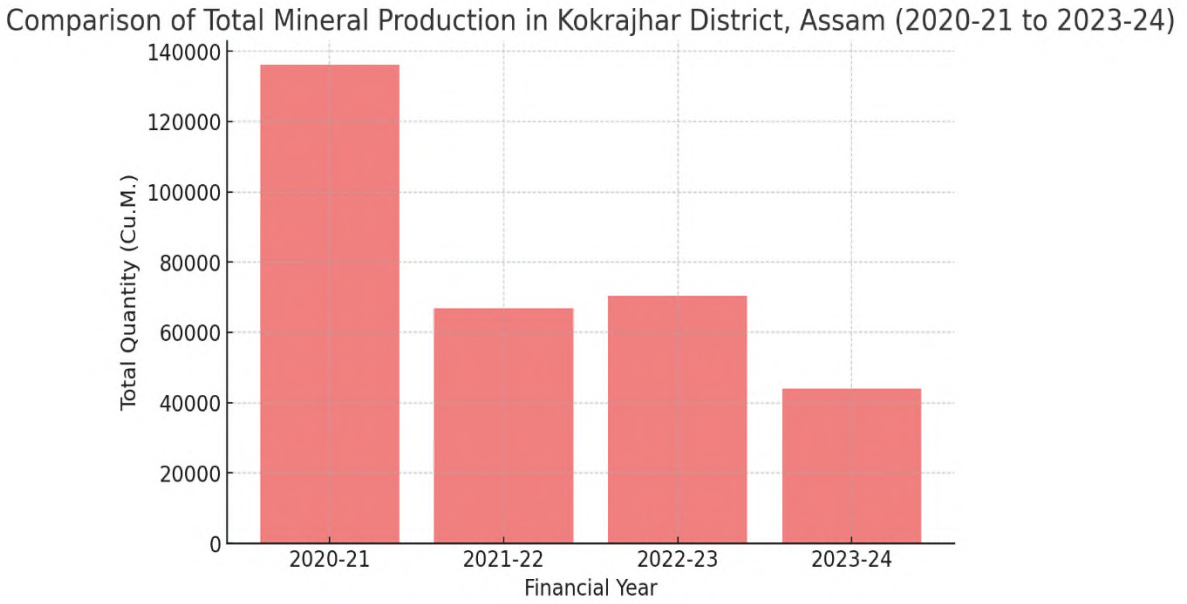
5. Detail of Production of Sand or Bajri or minor mineral in last three years:

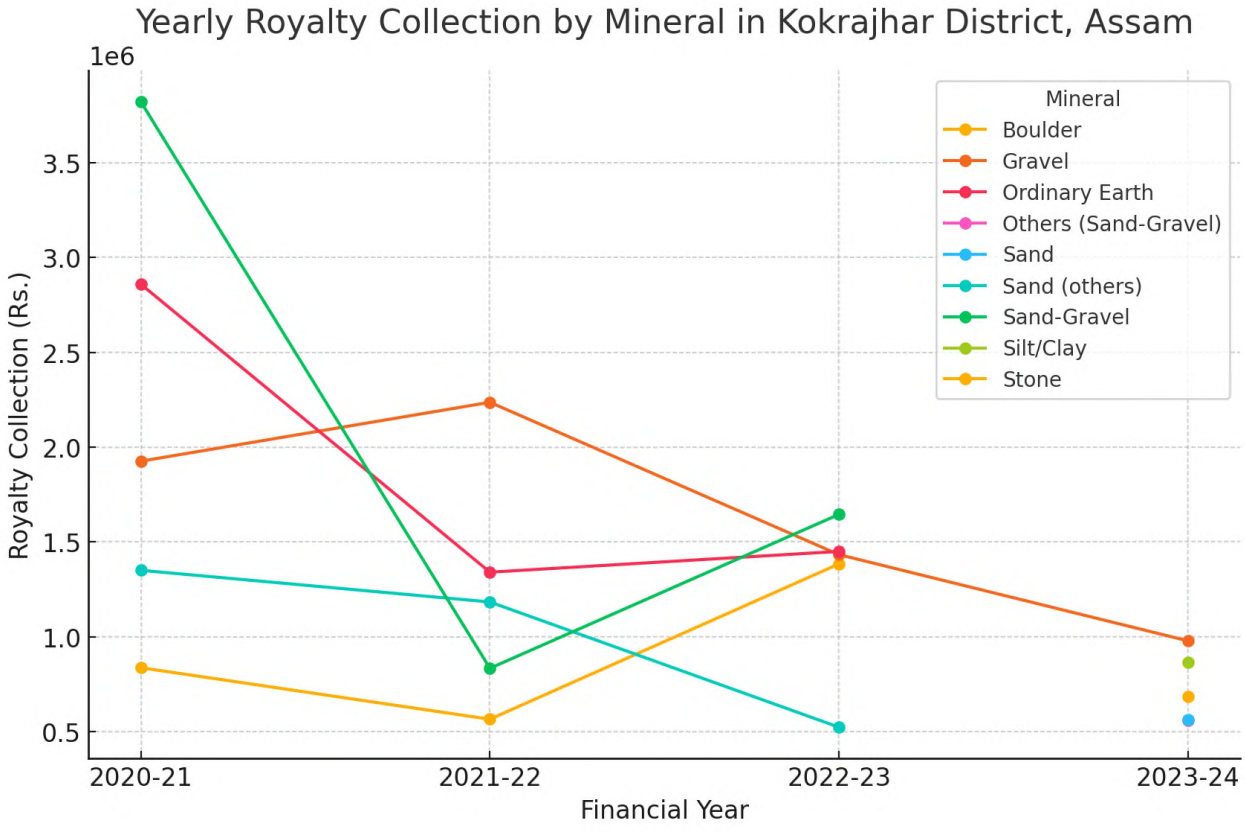
FOR THE FINANCIAL YEAR:				2020-21
Sl No.	Name of Mineral	Unit of Quantity	Quantity	Value in Rs.
5	Boulder	Cu.M.	3986.775	837409.80
23	Gravel	Cu.M.	9033.666	1926521.0
37	Ordinary Earth	Cu.M.	95426.315	2859904.3
47	Sand (others)	Cu.M.	8555.62	1351041.24
	Sand-Gravel	Cu.M.	19144.45	3821690.0
Total			136146.826	10796566.51
FOR THE FINANCIAL YEAR:				2021-22
Sl No.	Name of Mineral	Unit of Quantity	Quantity	Value in Rs.
5	Boulder	Cu.M.	2603	565553.22
23	Gravel	Cu.M.	9373.6683	2237104.8
37	Ordinary Earth	Cu.M.	44402.4517	1341139.96
47	Sand (others)	Cu.M.	6347.25099	1184033.9
	Sand-Gravel	Cu.M.	4171.68325	834337.00

Total			66898.05424	6162169.0
FOR THE FINANCIAL YEAR:				2022-23
Sl No.	Name of Mineral	Unit of Quantity	Quantity	Value in Rs.
5	Boulder	Cu.M.	6470.408	1384777.54
23	Gravel	Cu.M.	4792.211	1433829.2
37	Ordinary Earth	Cu.M.	47884.998	1450523.0
47	Sand (others)	Cu.M.	3148.295	523663.80
	Sand-Gravel	Cu.M.	8031.835	1645845.0
Total			70327.747	6438638.5

		FOR THE FINANCIAL YEAR:		2023-24
Sl No.	Name of Mineral	Unit of Quantity	Quantity	Value in Rs.
9.1	Sand	Cu.M.	4039.16	565482.68
9.2	Stone	Cu.M.	3418.98	683796.00
9.3	Silt/Clay	Cu.M.	28864.207	865926.21
9.4	Others ..(Sand-Gravel).	Cu.M.	2789.73	557947.20
9.5	Gravel	Cu.M.	4895.36	979073.00




Comparison of Total Mineral Production in Kokrajhar District, Assam (2020-21 to 2023-24)
Total Quantity (Cu.M.)
140000
120000
100000
80000
60000
40000
20000
0
2020-21
2021-22
2022-23
2023-24
Financial Year


Yearly Royalty Collection by Mineral in Kokrajhar District, Assam
1e6
Royalty Collection (Rs.)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
2020-21
2021-22
2022-23
2023-24
Financial Year
Mineral
Boulder
Gravel
Ordinary Earth
Others (Sand-Gravel)
Sand
Sand (others)
Sand-Gravel
Silt/Clay
Stone

6. Process of Deposition of Sediments in the rivers of the District of Kokrajhar

The sediment of a river is commonly considered to be aesthetically displeasing and environmentally degrading. Conversely, part of the sediment (sand and gravel) may represent a natural resource for use by society. The potential usefulness of the sediment is enhanced when it is composed of particle sizes found in deposits on the river- bed that would be replenished by newly transported sediment after mining. As such, river deposits become renewable resources, periodically replaced by sediment transport in the river.

Sediment transport is the movement of organic and inorganic particles by water. In general, the greater the flow, the more sediment that will be conveyed. Water flow can be strong enough to suspend particles in the water column as they move downstream, or simply push them along the bottom of a water way. Transported sediment may include mineral matter, chemical sand pollutants, and organic material. Another name for sediment transport is sediment load. The total load includes all particles moving as bed load, suspended load, and wash load. Sediment deposition is the process of settling down of suspended particles to the bottom of a body of water. This settling often occurs when water flow slows down or stops, and heavy particles can no longer be supported by the bed turbulence. Sediment deposition can be found anywhere in a water system, from high mountain streams, to rivers, lakes, delta, floodplains.

Sediment transport is critical to understanding how rivers work because it is the set of processes that mediates between the flowing water and the channel boundary. Erosion involves removal and transport of sediment (mainly from the boundary) and deposition involves the transport and placement of sediment on the boundary. Erosion and deposition are what form the channel of any alluvial river as well as the flood plain through which it moves. The amount and size of sediment moving through a river channel are determined by three fundamental controls: competence, capacity and sediment supply. Competence refers to the largest size (diameter) of sediment particle or grain that the flow is capable of moving; it is a hydraulic limitation. If a river is sluggish and moving very slowly it simply may not have the power to mobilize and transport sediment of a given size even though such sediment is available to transport. So a river may be competent or incompetent with respect to a given grain size. If it is incompetent it will not transport sediment of the given size.

If it is competent it may transport sediment of that size if such sediment is available (that is, the river is not supply-limited). Capacity refers to the maximum amount of sediment of a given size that a

stream can transport in traction as bed load. Given a supply of sediment, capacity depends on channel gradient, discharge and the caliber of the load (the Presence of fines may increase fluid density and increase capacity; the presence of large particles may obstruct the flow and reduce

capacity). Capacity transport only occurs when sediment supply is abundant (non- limiting). Sediment supply refers to the amount and size of sediment available for sediment transport. Capacity transport for a given grain size is only achieved if the supply of that caliber of sediment is not limiting (that is, the maximum amount of sediment in stream is capable of transporting is actually available). Because of these two different potential constraints (hydraulic sand sediment supply) distinction is often made between supply-limited and capacity-limited transport.

Much of the material supplied to a stream is so fine (silt and clay) that provided it can be carried in suspension, almost any flow will transport it. Although there must be an upper limit to the capacity of the stream to transport such fines, it is probably never reached in natural channels and the amount moved is limited in supply. In contrast, transport of coarser material (say, coarser than fine sand) is largely capacity limited.

Modes of Sediment Transport: The sediment load of a river is transported in various ways although these distinctions are to some extent arbitrary and not always very practical in the sense that not all of the components can be separated in practice.

The modes are: 1. Dissolved Load.
2. Suspended Load.
3. Intermittent Suspension (Siltation) Load
4. Wash Load
5. Bed Load

7. General Profile of the district

a) General Information

District profile:

Kokrajhar is the westernmost district of the state sharing the international border with Bhutan in the North and state boundary with West Bengal in the west. The district can be described as the gateway to the northeastern region of India. Both road and rail touches this district at Srirampur before they go on to other districts in Assam and the other northeast states. Kokrajhar district is located on the north bank of the river Brahmaputra. The district lies roughly between 89.46' E to 90.38' E longitudes and 26.19" N to 26.54" N latitudes. Agro-climatically the district is the Lower Brahmaputra Valley Zone. Kokrajhar town is the headquarter of Bodoland Territorial Council, created on 10th February, 2003 comprising of four districts viz. Kokrajhar, Chirang, Baska, Udalguri on the north bank of Brahmaputra within Assam.. The district consists of 3 Sub-divisions, 5 Revenue circles, 11 Community Development blocks, 88 VCDC and 2091 revenue villages.

As per 2011 census, the population of the district is 887142 which is 2 % of the state's population. With a population density of 269 person per square kilometer. The number of males and females in the district are 452,905 and 434,237 respectively forming a sex ratio of 959 female per 1000 male. The decadal population growth (2001-2011) of the district is 5.21 %.

Agro-climatically, the district falls under Lower Brahmaputra Valley Zone of Assam. The climate of the district is humid sub-tropical in nature characterized by warm-humid summer and cool-dry winter.The district has been divided into three Agro Ecological situations (AES). The average annual rainfall of the district is 3463 mm against the state average of 2584.50 mm with 139 normal rainy days.The maximum rainfall occurs during the period from April to August. Heavy rainfall starts from April with the onset of monsoon and continues till September. July month receives highest rainfall in a year.

Animal Husbandry is an important enterprise of the district and rearing of the millch cow is a pre dominant activities followed by poultry & goatry. The total livestock population in the district, as per the livestock survey 2015 is 594834 of which 2,94,599 are small animals 3,00,235 are large animals.

Table 1: District Profile

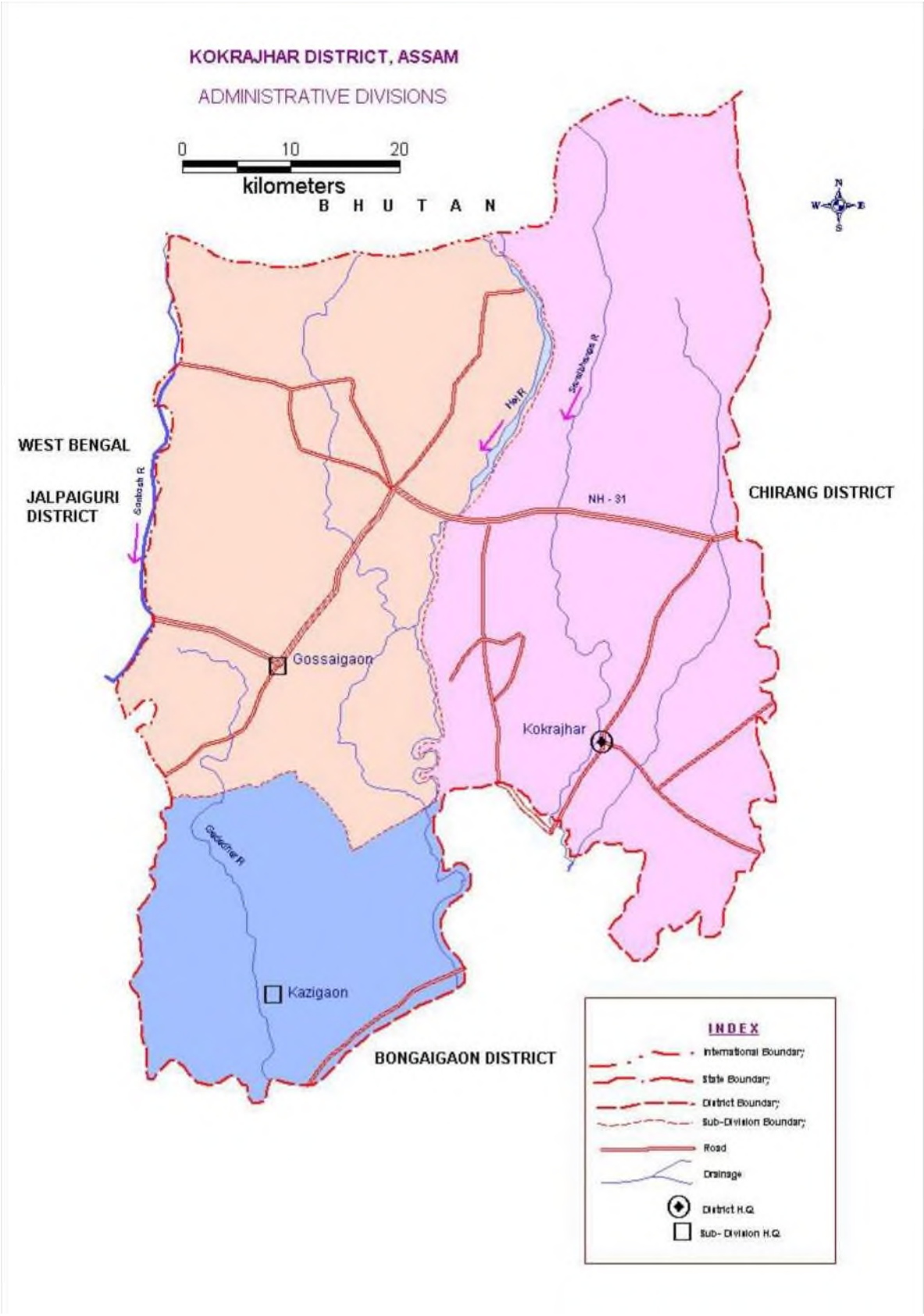
Sr. No.	Name of the District	District code	Latitude	Longitude
1.	Kokrajhar	**300**	26.19" N to 26.54" N	89.46' E to 90.38' S

ADMINISTRATIVE SETUP

Division	Lower Assam
Headquarter	Kokrajhar
Sub-Divisions	3
Revenue Circles	5
Development Blocks	13
Geographical Area	2287 sq. km
Population	1892550
Literacy	71%
Revenue Villages	960
Panchayats	169

Kokrajhar was originally a part of undivided Goalpara district. Till 1956, it was merely a small village with a railway station that connected it to the rest of the world. In 1957, a new Civil Sub-division was created after carving out the northern part of Dhubri Subdivision and some parts of Goalpara Subdivision. This new sub-division was called Kokrajhar Sub-division. The area covered by the then Kokrajhar Sub-division consisted of five tracts of the Eastern Dooars, viz., Bijni, Sidli, Chirang, Ripu and Guma with a total area of 4065 square kilometers. On the 1st of July, 1983 the Kokrajhar Subdivision was upgraded into Kokrajhar district with headquarter at Kokrajhar town. There were four police stations in the new district. They were Bijni, Sidli, Kokrajhar and Gossaigaon. The area of the district extended from the Manas River in the east to the Sonkosh on the west In 1989, there was P a g e | 21 further reorganization of the districts in the state of Assam and some new districts were created. Thus, about 40 percent of the total geographical area of Kokrajhar district was carved out for inclusion in the new district of Bongaigaon. The area delimited from Kokrajhar district to Bongaigaon covers the entire Bijni Revenue Circle along with 347.50 square kilometres of Sidli

Circle. Later on 20 villages of Naikgaon G.P. with a total area 40.22 square km under Chapar Revenue Circle of Dhubri district was transferred to Kokrajhar district. The present geographical area of Kokrajhar district is estimated to be 3,169.22 square km. The district now has two revenue sub-divisions--- Kokrajhar and Gossaigaon Subdivisions. The river Gongia which is known as Tipkai in the southern part is the natural boundary of two civil sub-divisions. Gossaigaon town is headquarters of Gossaigaon sub-division.



Map: Administrative map of the District

Demography

As per 2011 census, the population of the district is 887142 which is 2 % of the state's population. With a population density of 269 person per square kilometer. The number of males and females in the district are 452,905 and 434,237 respectively forming a sex ratio of 959 female per 1000 male. The decadal population growth (2001-2011) of the district is 5.21 %. The district is demographically dominated by tribal and non-tribal communities namely Bodo, Rava, Koch Rajbangshi, Santhal, Orao, Muslim, Nepali, Bengali etc. There are altogether four towns in the district. Altogether 34.74 percent population in the district belongs to various scheduled tribes, mainly the Bodos.The scheduled caste and scheduled tribes population of the district is 29,570 and 278,665 .respectively consisting 3.33 % and 31.41 % of the total population of the district respectively. The total literacy rate of the population in the district stands at 65.27 % lower than the state average of 72.19% but the female literacy rate at 214,085 (58.27%) which is at par with state literacy rate of 58.27%.In terms of religion, altogether 65.6 percent population is constituted by the Hindus, 20.36 percent by the Muslims, 13.72 percent by the Christian and negligible proportion of the total population of the district belongs to other religions.

Biomass and livestock:

Next to Agriculture and Horticulture, Livestock rearing is an important enterprise of the district. Cows, buffaloes, draft animals, goats pigs, poultry/ducks are main commodities of livestock enterprise. Cross breed cows, improved breed buffaloes and upgraded pigs in small numbers are also reared in almost all the blocks of the district. Mostly the local breeds are common.

Animal Husbandry is an important enterprise of the district and rearing of the milch cow is a pre dominant activities followed by poultry & goatry. The total livestock population in the district, as per the livestock survey 2015 is 594834 of which 2,94,599 are small animals 3,00,235 are large animals. Assuming 0.15% as a annual growth rate in the livestock population, the current & future population for 2015 & 2020 has been calculated.

It is observed that Golokganj has the highest number of the livestock population of 200231 which is 33.66% of the total livestock population of kokrajhar followed by Mahamaya (113817) and Gossaigaon (106914)

Agro-ecology:

The district has a total area of 279681 Ha. The district had over 50% of its geographical area covered

by deep green forest. But the forest coverage has dwindled substantially due to unscrupulous and massive denudation. Most of the terrain in the district is scantily populated and thickly forested. The district is characterized by almost plain topography being flanked by foothills of Bhutan in the upper strip of north and high plain in the middle to lower strip towards the southern side with a gradation from North to South.

The district is very rich in forest trees and have three forest divisions. Sal, (Shorea robusta) Teak (Tectona Grandis), Gomari (Gamelina arborea), Sisoo (Dalbargia sisoo), Bamboo (Bambusa spp.), Chap (Maicalia champaca), Koroi (Albizzia procera), Simul (Salmalia malbaricum) Neem (Azadirachta indica) etc. are different forest trees that are commonly found in the district. A large number of herbaceous plants found in cultivated fields, roadsides and wasteland. Some of these plants are Lantana Camara, Empereta cylindrical, Mimosa species, Eupatorium odoratum, Cynodon dactylon etc.

b. Climatic condition

Agro-climatically, the district falls under Lower Brahmaputra Valley Zone of Assam. The climate of the district is humid sub-tropical in nature characterized by warm-humid summer and cool-dry winter.The district has been divided into three Agro Ecological situations (AES) based on physiography, hydrology, soil, climate and cropping patterns.

The average annual rainfall of the district is 3463 mm against the state average of 2584.50 mm with 139 normal rainy days.

The maximum rainfall occurs during the period from April to August. Heavy rainfall starts from April with the onset of monsoon and continues till September. July month receives highest

rainfall in a year

It is observed that Gossaigaon (1478 mm) & Dotoma (1422 mm) receives the maximum annual rainfall as compared to other districts.

In Kokrajhar district the mean maximum and minimum temperature varies from 33-38°C and 8-10°C respectively. The district experiences a Sub-tropical and Humid climate with heavy rainfall and hot summer. The average humidity remains almost same with variation from 62% in winter to 87% in post monsoon period.

The maximum rainfall occurs during the period from April to August. Heavy rainfall starts from April with the onset of monsoon and continues till September. July month receives highest rainfall in a year.

c)Irrigation Based Classification

The water that flows along natural dongs and canals are the main source of irrigation. Rain water flows down from the hill tracts of Bhutan and along the foothills and reserve forests of the district. The Bhutan hills are also the source of a number of rivers that flow through the district and act as tributaries of the mighty Brahmaputra that flows from east to west far from the southern boundary of Kokrajhar district. The important rivers of the district that flow from north
to south are the Champamati, the Gaurang, the Tipkai and the Sonkosh. All the rivers and rivulets flowing hrough the district have their origin in the Bhutan hills. The water that flows along natural nalas and canals are the main source of irrigation for the agricultural fields. The Bhutan hills are the source of a number of rivers that flow through the district and act as tributaries to the mighty Brahmaputra that flows from east to west. The important rivers of the district that flow from north to south are Champamati, Saralbhanga and the Sonkosh. The River Brahmaputra along with its tributaries like Gangia, Laponi, Saumukha, Lonya etc control the main drainage system of the district. These rivers emerge from the Himalayan foot hills and are perennial in nature and flow in north –south direction. They often flow in meandering courses developing ox-bow lakes and a number of lakes or beels formed as a result of change in river courses. The drainage density is very high 5and drainage pattern is more or less parallel. Water logged area in the district is 332 ha and area under still water is 2052 There is about 1,37,141 Ha is under rainfed areas of the district. The percentage of the rainfed areas of the block ranges from 60 % - 90 % in different blocks. The gross area under irrigation is 58931 Ha .

d) Soil resources

The soils are predominantly from sandy loam to clay loam with PH ranging from 4.7 to 7.8 i.e. acidic to neutral. The general fertility status of soils of the district is poor with low organic carbon, low available N, P and K status. Physiographically, the district is divided into two units – i) Northern alluvial region ii) Southern swamps or flood plains of the river Brahmaputra. The northern alluvial part forms a flat land with heights of 40-300 m above MSL with a gentle slope towards south the river Brahmaputra. The regional gradient is from east to west which indicates the general flow direction of the Brahmaputra River. The Brahmaputra River flows from east to west and form the main regional drainage. Its tributaries like Gangia, Laponi, Saumukha, Saralaganga and Lonya etc. originating from 6 Northern Himalayan foothill have a steep slope and shallow braided channels for considerable distances. The elevation of land near the Brahmaputra is 5-10 m amsl and the flood water in the flood plain area is detained in low depression forming beel and marshy land along the main river course.

Soils: The soil of the district can broadly be classified into two groups. (I) Deep reddish clayey soil in forest and hilly area and (2) Alluvial soil of Recent age occurring along the alluvial plains of the

Brahmaputra River. The red clayey alluvial highlands of the district are ideally suited for the tea and sugarcane cultivation. The swampy and very low lands are characterized by deep grey silty soil suitable for jute cultivation. Soils are mainly alluvial in nature composed mixture of sand, clay and silt in varying proportions. The soils in Peidmont Plain have sandy in nature, alkaline to slightly acidic and highly permeable. The soils in flood plains have loamy soil, moderately permeable and are less acidic than piedmont plain soils.

e.Groundwater prospects in the district

Ground Water Resources

The net ground water availability estimated in the year 2009 is 1609.70 mcm. The existing gross ground water draft 150.54 mcm and the stages of development are 9% only. Future provision for domestic and Industrial use is 31.43 mcm and for Irrigation use is 1450.93 mcm.

Assessment unit can be categorized into 4 categories as SAFE, SEMI-CRITICAL, CRITICAL, and OVER-EXPLOITED. In Kokrajhar district stage of ground water development is 9%, which shows under the SAFE category. As long-term water level trend does not show any major change so the whole district may be considered as SAFE.

Ground Water Quality

The ground water in general is neutral to alkaline in nature with pH ranging between 7.94 and 8.53. The Electrical Conductivity value (48 -245 micro mhos at 250C) is within permissible limit. Calcium content is from 6 to 24 mg/l and well within permissible limit. The alkalinity value governed by anion content of carbonates and bicarbonates is within range of 18 to 146 mg/l. The hardness of groundwater ranging from 20 to 150 ppm indicates that ground water is of soft to moderately hard in nature. The water is of medium salinity and contains low sodium.

The ground water quality data indicate that in general it is suitable for domestic and irrigation purposes. There is not much appreciable variation in quality of ground water in shallow and deep aquifers. Abundant rainfall and relatively insolvable matter of the aquifer material makes the ground water of the district remarkably fresh in nature.

Status Of Ground Water Development

Ground water development in the district is in primary stages.A few deep and shallow tube wells

have been constructed. Rural water supply by Public Health Department covers almost entire district. Irrigation wells by ASMIDC, Irrigation department, and Agriculture department have covered a few schemes with constructing of shallow tube wells.

Ground Water Management Strategy:

As stated above, the Kokrajhar district as a whole is represented by a mono-aquifer system- alluvial formation with thickness varying from 50 to 250 m. Ground water development in the district is almost in nascent stage. Shallow tube wells down to the depth of 50 m and deep tube well down to the depth of 200 m or more can be constructed in almost all parts of the district with proper hydrogeological investigation, with expected discharge of 3,500 m3 /day and draw down of 5 - 6 m in the alluvial area.

The area adjacent to the Brahmaputra River is feasible for shallow tube wells with depth range of 30 to 50 m depending on availability of granular zones. Such tube well is expected to yield from 35 to 45 m3 /hr tapping 15 m of aquifer zone with drawdown of 2.5 to 5 m. 9 Deep tube wells can be constructed in all parts of the district especially on northern parts where water requirement is more. Low cost ground water structures can be constructed to a depth of 50 m and tapping 10-15 m granular zone using standard strainer /slot pipes.

Ground Water Related Issues And Problems

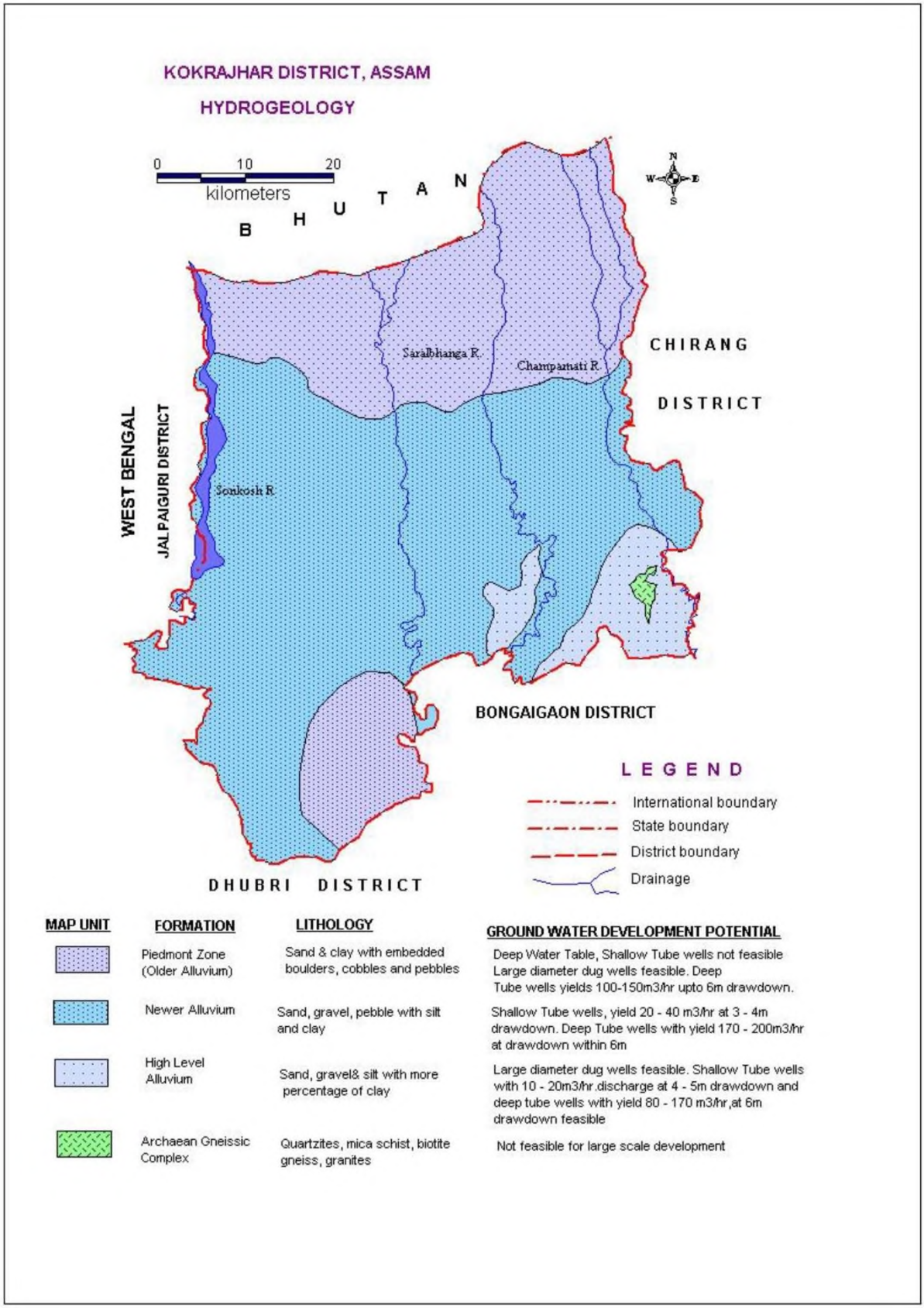
Almost every year the district gets inundated by floods during monsoon season. The effect of flood and soil erosion is much more in southern part than in the northern part of the Brahmaputra River.

The frequent flood affects the ground water regime of the district with water logging problem along with rising of water table which recedes in post-monsoon period due to porous and monotonous nature of the aquifer.

No ground water quality problem is recorded except, high iron content in certain pockets. The problems of arsenic and fluoride have not been reported.

Both shallow tube wells down to the depth of 50 m and deep tube wells down to 250 m are feasible in the district, particularly deep tube wells in northern part and shallow tube wells in southern part near the Brahmaputra River. The shallow tube wells in such cases can yield average 30 m3 /hr while the deep tube wells can yield 100 to 120 m3 /hr. The selection of sites in both the cases may be done after proper investigation.

Low cost ground water development structures in the alluvial part of the district can be constructed to a depth of 50 m tapping 10-15 m saturated granular zones through standard strainers. Ground water is suitable for domestic, industrial and irrigation purposes except in a few localities where iron content is high. Iron Removal Plant should be installed to remove iron from ground water.



Map: Map showing Groundwater Hydrology of the District (Source:CGWB,NE)

f. Agricultural Resources

Agriculture is the main occupation of Kokrajhar district and contributes a major part in the district economy. Rice is the main crop. Agriculture development is the prime consideration for making radical changes in the district through the marginal, small and landless farmers. The average size of the operational landholding in the district is 1.20 Ha. Rice is the main crop which covers about 80% of the Gross cropped area. The Gross cropped Area of the district is 191608 ha as against the Net Cropped area of 179955 Ha with a cropping intensity of 106.47. There is about 1,37,141 Ha is under rainfed areas of the district. The percentage of the rainfed areas of the block varies in different blocks. The gross area under irrigation is 58931Ha .

The major crop grown in the district are Ahu Paddy , Sali Paddy , Jute, Mesta during Kharif season and Boro paddy, Toria, Niger, buckwheat, Potato, Pulse during Rabi season. Sali paddy is distributed throughout the district under the rainfed condition. Apart from these, many other varities of crops namely Black gram, Green gram, Sesamum, Tapioca, Chilli, Tobacco, Turmeric, Sweet Potato, Onion, Vegetables etc. are also grown in the district. Under horticultural crops, vegetables like cucurbits, cabbage Cauliflower, Knolkhol, Radish, Brinjal, Tomato etc., fruit tres, namely Banana, Pineapple, Citrus, Jack fruit etc, Chilli Ginger , Turmeric, Black Pepper etc as spices, tuber crops like potato, tapioca, Colocasia etc. and Plantation crops viz. Areca nut, Coconut etc are commonly cultivated in the district.

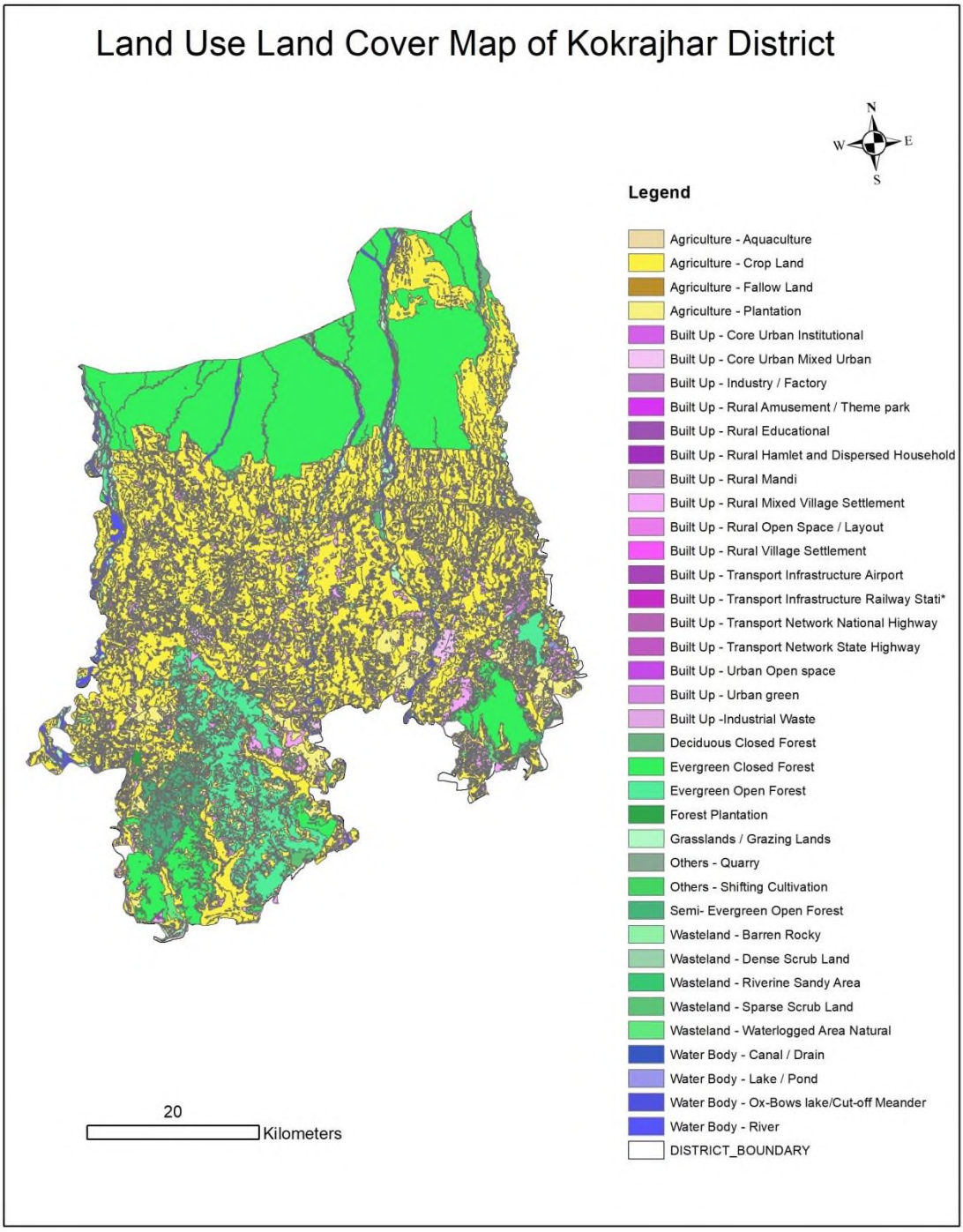
8. Land and land use pattern:

The entire district Kokrajhar is located on a flat alluvial plain. It is one of the most fertile zones of the state with luxurious vegetarian growth. Agriculture is the main occupation of the people of district. The land put to different uses in the district may be classified as forest, agriculture, wasteland etc. The total geographical area of the district is 279681 ha and out of which, 38.05 % is cultivable, 0.7% cultivable wasteland, 0.9% current fellow, 54.94% forest, 5.78% Pasture, 9.1 % under non-agricultural use, 1.75 % under miscellaneous plantation. The Net Sown Area of Kokrajhar district is 179955 ha which is 64.34% of the total area of the district. There are 55,908 operational holdings and the average size of land holding is 1.20 ha. The marginal farmers constitute 40.77% of farm families with 17.91% of land under their possession and the small farmer is 33.39% occupying 30.54% of land. 19.52% of farm families represent semi-medium farmers possessing 31.99% of land while medium farmers constitute 6.27% of farm families with 19.07% of land. The large farmer in the district is only less than 1% of total farm families.

Land use-pattern in Kokrajhar district, 2010-2011

SI. No.	Land put to different uses	Area in hectares
1	Total Geographical area	3,12,900
2	Forest area	1,61,195
3	Land not available for cultivation	43,458
a	Land put to non-agricultural uses	23,648
b	Barren and un-cultural land	19,810
4	Other non-cultivated land excluding fallow land	19,448
a	Permanent pastures and other grazing land	15,031
b	Land under misc, trees, groves etc. not included in net area	2,352
c	Cultivable waste land	2,065
5	F allow land	2,243
a	F allow other than current fallow	1,450
b	Current fallow	793
6	Net area sown	86,556
7	Total cropped area	1,79,533
8	Area sown more than one	92,977

Source :Statistical Handbook,Assam 2012.



Map: Land use land cover map of Kokrajhar district

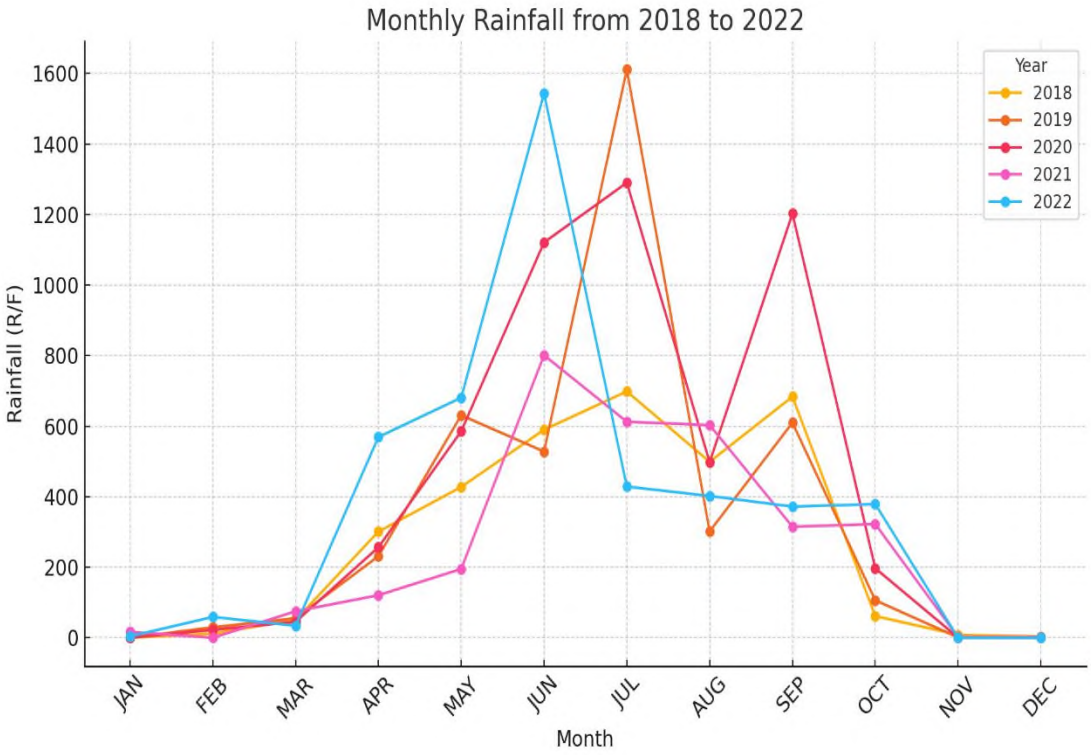
9. Physiography of the District

Physiographically, the district can be divided into two units (1) Northern alluvial region (between 120 – 140 m amsl) and (2) the Southern swamps or flood plain of River Brahmaputra. The general gradient is towards the River Brahmaputra in the south. A major portion of the district is constituted by vast alluvial area formed by Bramhaputra and its river system. The alluvial plain has southerly slope with flat topography and the elevation generally varies from 40 to 300 m above MSL. The alluvial plain can be broadly classified into piedmont plain and Terraced alluvial plain. The former forms the highest terrace of Quaternary landscape characterized by high relief with dense forest and thinly populated. The latter covers the major part of the district occupies a large portion of cultivable land with moderate population.

10. Rainfall:

Kokrajhar District experience Rainfall in abundance for more than six months in a year with occasional shower throughout the rest of the year. The maximum humidity lies from June to October. The south west monsoon season is from June to September and October, November constitute post monsoon season. The actual total rainfall during the year 2011 was 2674.6 mm against the average.

	JAN	FEB	MAR	APR	MAY	JUN	JU	AUG	SEP	OCT	NOV	DEC
	R/F	R/F	R/F	R/F	R/F	R/F	R/F	R/F	R/F	R/F	R/F	R/F
2018	0	11.5	50.6	300.8	427.5	589.7	698.4	498.7	683.5	61.6	8.4	3.3
2019	0	29.6	55.4	231.2	630.8	528	1611.1	301.5	609.7	106.3	1	2.1
2020	0.3	22.2	45.4	256.5	585.5	1120.7	1290.2	497.9	1202.7	197	0.6	0
2021	16.9	0	75.1	120.6	195	801	612.4	602.9	314.8	322.4	1.8	1.4
2022	4	59	34.1	569	680.6	1543.6	428.5	402	371.8	379	0	0


Monthly Rainfall from 2018 to 2022
Rainfall (R/F)
Month
Year
2018
2019
2020
2021
2022
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
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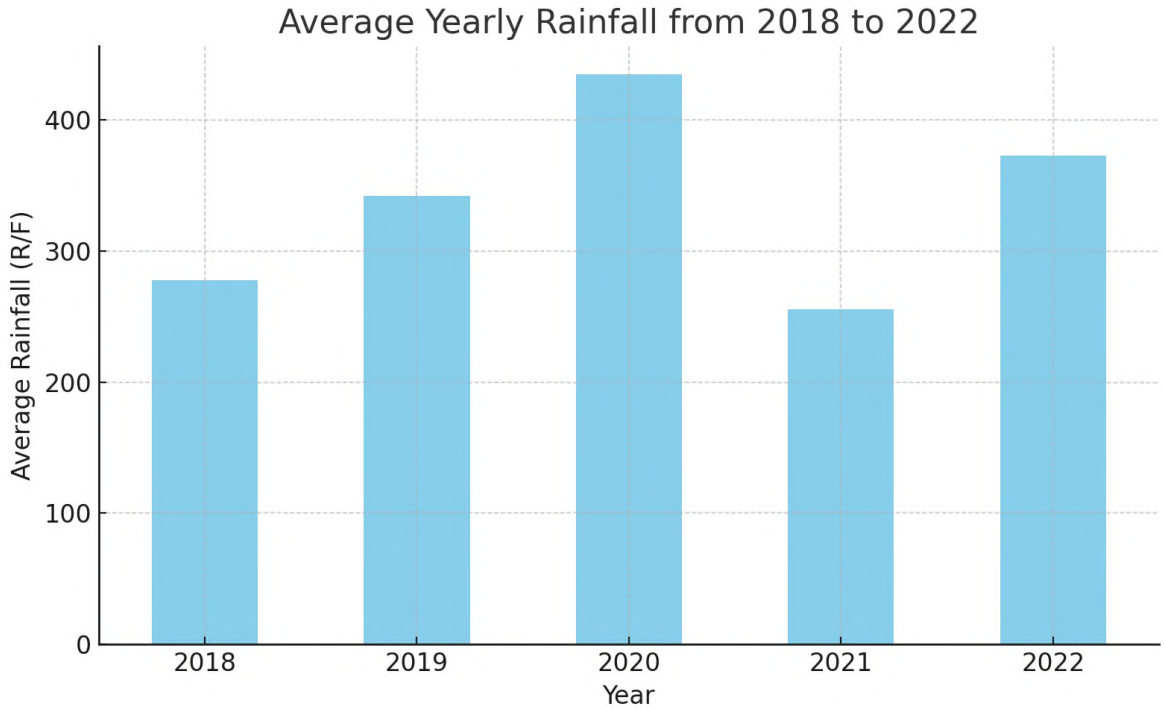
DEC
0
200
400
600
800
1000
1200
1400
1600


Average Yearly Rainfall from 2018 to 2022
Average Rainfall (R/F)
Year
2018
2019
2020
2021
2022
0
100
200
300
400

11. a) Geology

(i) Regional Geology:

Shillong plateau (covering approx. 47614 sq. km.) is the singular representative of Precambrian cratonic block of northeast India tectonically detached from the mainland of Indian Peninsula. The cratonic block is girdled by dextrally moving Dauki fault to the south, Brahmaputra lineament to the north, Garo- Rajmahal graben, Dhuburi/Madhupur lineament to the west and belt of schuppen to the east. It consists of high to medium grade Paleoproterozoic basement gneisses and schist designated as Basement Gneissic Group (BGG) overlain by Mesoproterozoic metasediments and metavolcanics of the Shillong Group, both being intruded by Neoproterozonic acidic intrusives such as Myllem pluton, South Khasi pluton, Umroi granite, Nongpoh and a few others enlisted by Mazumdar (76); Ghosh*et. al*. (2005); Devi and Sharma (2006, 2010).The Paleocene to Eocene continental shelf of the Indian plate which became emergent and which is being over-thrust by the Himalayas on the north-northwest and by the Naga hills on the southeast comes under the upper Assam shelf.

The present-day Assam Basin, a cratonic margin, reflects three distinct tectonic phases. The earliest was Late Cretaceous to Eocene block faulting and development of a southeasterly dipping shelf. Duringthe second phase, in Oligocene time, uplift and erosion occurred north of the many basement faults were reactivated; and many basement-controlled structures became prominent.

The Eocene Sylhet Formation was deposited in a range of environments and was subdivided into the members which generally represents these different depositional environments. The lower Lakadong member was deposited in a lagoonal environment consists of more than 350m of thin sandstones and interbedded shales and coals in it basal parts (Fig. 4 showing the development of Assam Shelf). The environment of the Lakadong member typically consists of the thick sands of barrier- bar. The members of upper part of the Lakadong Formation are calcareous sandstone of a restricted shallow water platform.

The gneissic groups of rocks are well exposed in the western, northern and north eastern part of the Shillong plateau. Towards the southern boundary it is covered by Cretaceous –Tertiary sedimentary sequences and within the plateau about 2500 sq. km. (approx.) area is occupied by intracratonic basin sediments. Orthogneiss and paragneiss are the two major components of basement gneissic complex. The main characteristic features of the banded gneiss are of bimodal character. Other constituents are migmatite, augen gneiss, BIF, amphibolites, pyroxene granulite, calc granulite, high grade sillimanite bearing metapelite with characteristic cordierite, corundum, spinel and sappherine, lamprophyre, diorite, granodiorite, mafic intrusion, pegmatite and other vein rocks.

(ii) Local Geology

The entire Kokrajhar district is occupied by alluvial sediments of Quaternary age. The alluvium comprises unconsolidated sediments of clay, silt, sand, gravel, cobbles and boulders of quartz, feldspars etc. The younger alluvial cover deposited during the period comprises thick beds of clay, sand and gravel. The upper layer of the alluvial formation comprises clayey/sandy soil followed by coarse sand gravel beds at depth. This formation is a very good potential zone for ground water extraction.

Hydrogeologically, the district is divided into 2 units viz., (1) Piedmont plain which occupy in the north and elevated portion along the foothills of Himalayas and (2) Flood plain in the lower part comprise of Newer Alluvium forms in southern part of the district. Ground water in the district occurs under unconfined to semi-confined conditions. The district is underlain by thick alluvium having uniform porosity and permeability of 10-15%. Water level records of the ground water monitoring stations show very little variation. The average pre-monsoon water level of the district is 4.07 m bgl while that of post monsoon is 1.64 mbgl. The flood plain area constitutes a major part of the district is underlain by alluvial formation. The depth to water level varies from 2 to 4 mbgl. The seasonal fluctuation has been in the range between 1 to 2 m. The movement of ground water is towards south. The ground water recharge by rainfall infiltration is much slower in the zone as compared to the piedmont zone. The average value of permeability of shallow aquifer is about 40 m/day.

11. b) Mineral Wealth

i. Overview of mineral resources:

Kokrajhar district, located in the Bodoland Territorial Region of Assam, possesses a range of mineral resources. The key minerals include coal, natural gas, and limestone. The district also has deposits of iron ore (hematite) along with smaller quantities of other minerals like quartz and fuller's earth. In Kokrajhar district, the minor minerals primarily include sand, gravel, stones, and clay. These materials are often used for construction activities such as building roads and infrastructure.

ii. Details of Sand and other riverbed minerals Resources:

The mineral resources of the district whose categorization and estimation have to be done will be furnished in this section**. (After field survey)**

12. (a) District wise detail of river or stream and other sand source

i) Drainage system with description of main rivers

S. No.	Name of the river	Area drained (sq. m)	% Area drained in the district
1	Sankosh		
2	Hel		
3	Gorufela		
4	Haraputa		
5	Sitlhla		
6	Champawati		
7	Saralbhanga		
8	Tarang		
9	Tipkai		
10	Gauring		

ii) Salient features of important rivers and streams:

S. No.	Name of the river or stream	Total length in the district (in km)	Place of origin	Altitude at origin
1				
2				

3				
4				

(b) District wise availability of sand or gravel or aggregate resources

i) Annual deposition

S. No	River/ stream	Portion of the river/ stream recommended for mineral concession	Length of area recommended for mineral concession (in km)	Average width of area recommended for mineral concession (in m)	Area recommended for mineral concession (in sq. m)	Mineable mineral potential (in metric T) (60% of total mineral potential)
Total for the district						

(To be submitted after field survey)

ii) Mineral potential

Boulder (MT)	Bajari (MT)	Sand (MT)	Total mineable mineral potential (MT)

(To be submitted after field survey)

13. Replenishment Study

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 analyzed 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.

Field data collection:

Secondary data were collected for pre- monsoon period and during September 2024 post-monsoon data will be collected for the river banks. The relative elevation levels will be captured

through GPS/DGPS. Thickness of the sand bars was measured through sectional profiles.

To be submitted in the Final report after completing field

REPLENISHMENT STUDY

Sr No	River Name	Mine Name	Area (Ha)	Pre Monsoon			Post Monsoon			
				Total Area (in Sqm)	Average depth of Sand Deposit (in meters)	Total Quantity of Sediment Load (in cum)	Total Area (in Sqm)	Average depth of Sand Deposit (in meters)	Total Quantity of Sediment Load (in cum)	Mineable mineral potential (in Cubic meter) (60% of total mineral potential)

References:

- **https://dhubri.assam.gov.in/**
- **https://southsalmaramankachar.assam.gov.in/about-district/district-glance**
- https://www.researchgate.net/publication/270895196_GEOLOGICAL_SURVEY_OF_INDIA_NORTH_EASTERN_REGION_TECTONO-SEDIMENTARY_EVOLUTION_AND_RECLASSIFICATION_OF_LOWER_GONDWANA_ROCKS_-_A_CASE_STUDY_FROM_SINGRIMARI_COALFIELD_DHUBRI_DISTRICT_ASSAM

Photoplates:


GPS Map Camera
Kokrajhar,AS,India
Aminkata Rupshi Road, Bhowraguri, Kokrajhar, 783337, AS, India
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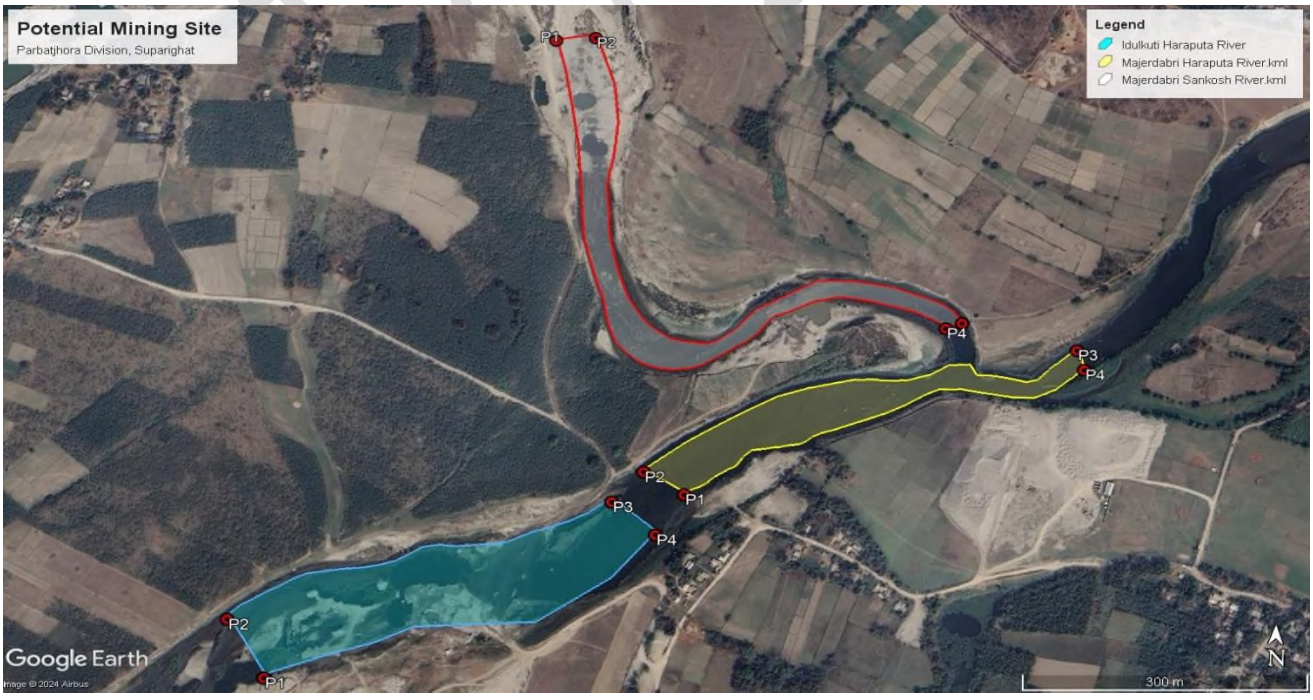
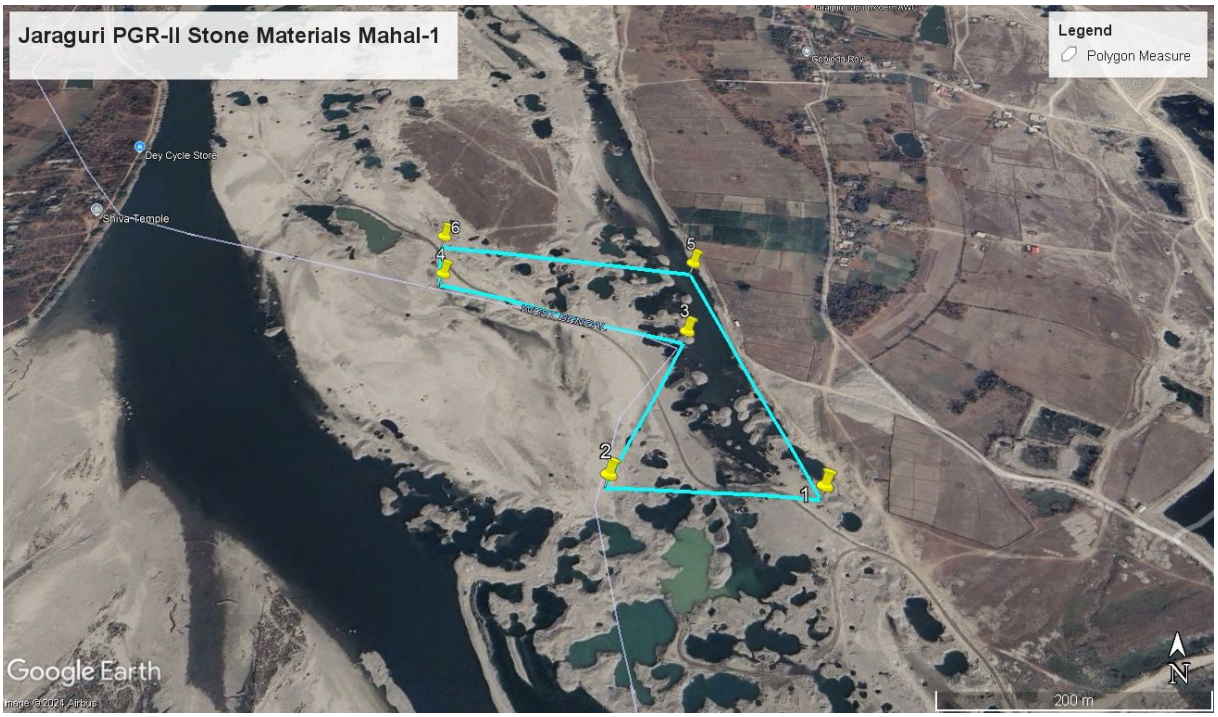
09/07/2024 02:58 PM GMT+05:30
Note : Captured by GPS Map Camera
Maps

Map of Potential Mining Sites:

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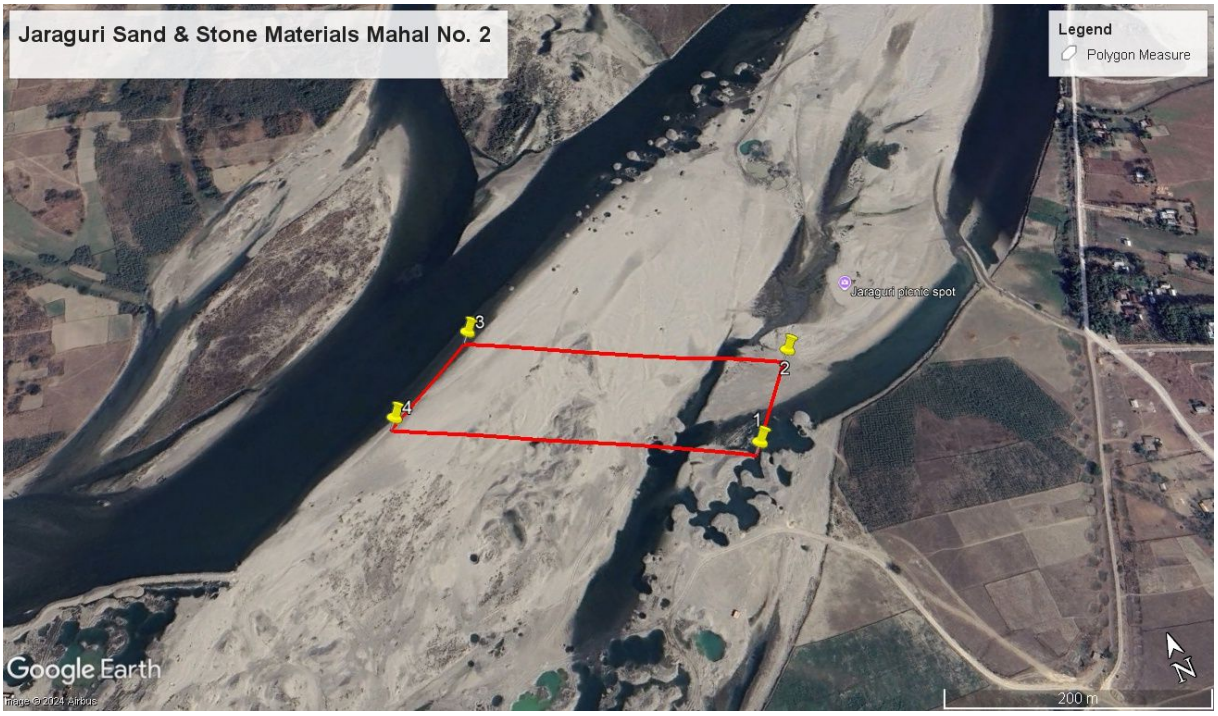
Legend
Polygon Measure
Dey Cycle Store
Shiva Temple
1
2
3
4
5
6
Google Earth
200 m
N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Polygon Measure
Jaraguri picnic spot
1
2
3
4
Google Earth
200 m
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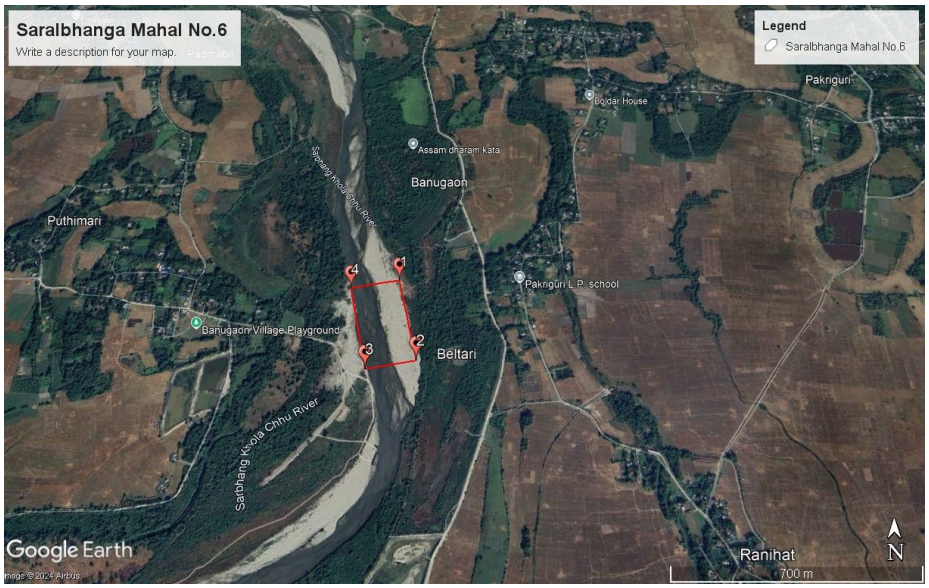
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Bojdar House
Assam charam kata
Banugaon
Puthimari
Pakriguri L.P. school
Banugaon Village Playground
Beltari
Saltibhanga Khola Chhu River
Google Earth
Ranihat
700 m
N


Saralbhanga Mahal No.7
Write a description for your map.
Legend
Saralbhanga Mahal No.7
Banugaon Village Playground
Beltari
Bhalukmari
Nalbari
Gopalgaon
Taktara
Ontaini dwi
Anthaibil
Google Earth
800 m
N


Saralbhanga Mahal No.8
Write a description for your map.
Legend
Saralbhanga Mahal No.8
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Gopalgaon
Taktara
Thalitbari
Anthaibil
Sikargaon
Taktara
Google Earth
900 m
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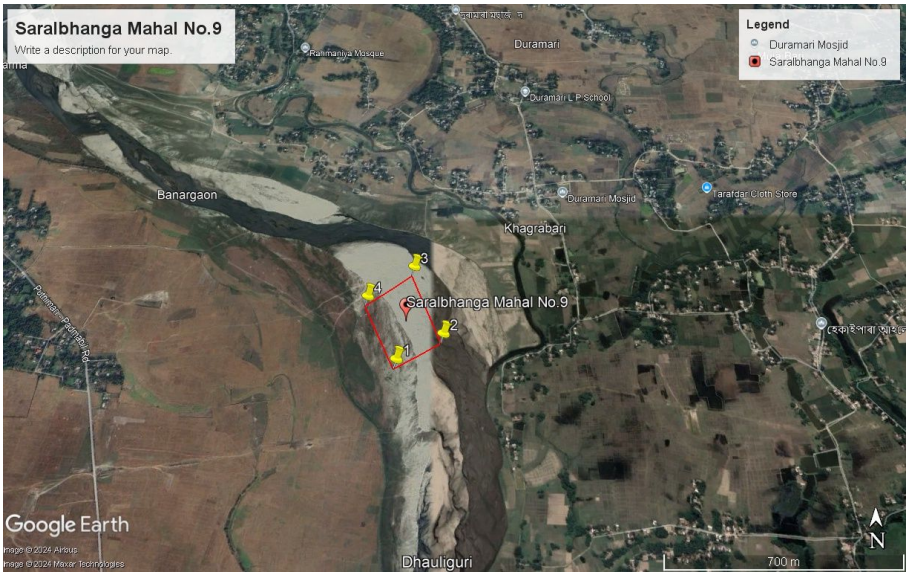
Saralbhanga Mahal No.9
Write a description for your map.
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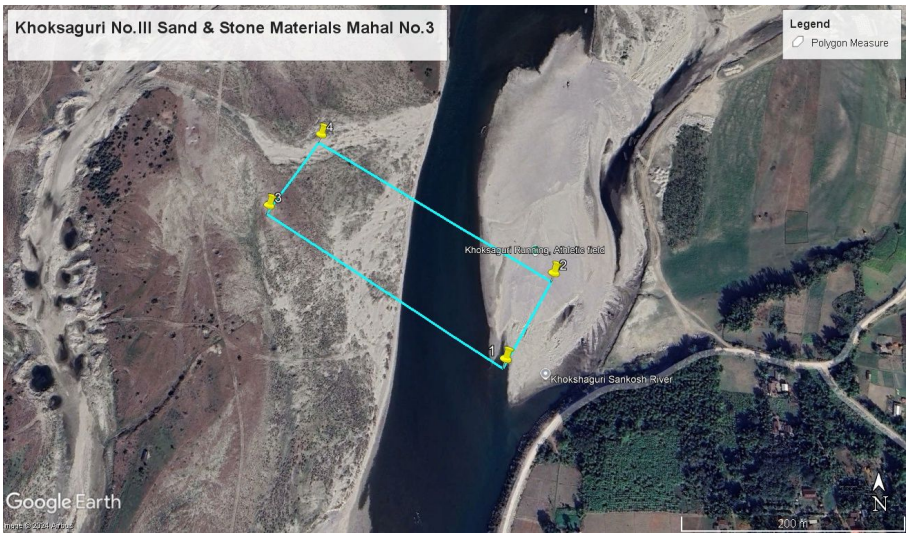
Duramari Mosjid
Saralbhanga Mahal No.9
Duramari
Duramari L P School
Banargaon
Duramari Mosjid
Tarafdar Cloth Store
Khagrabari
Saralbhanga Mahal No.9
Dhauliguri
Google Earth
700 m
N


Jaraguri Sand & Stone Materials Mahal No.1
Legend
Polygon Measure
Jaraguri picnic spot
Google Earth
200 m
N


Khoksaguri No.III Sand & Stone Materials Mahal No.3
Legend
Polygon Measure
Khoksaguri Running, Athletic field
Khokshaguri Sankosh River
Google Earth
200 m
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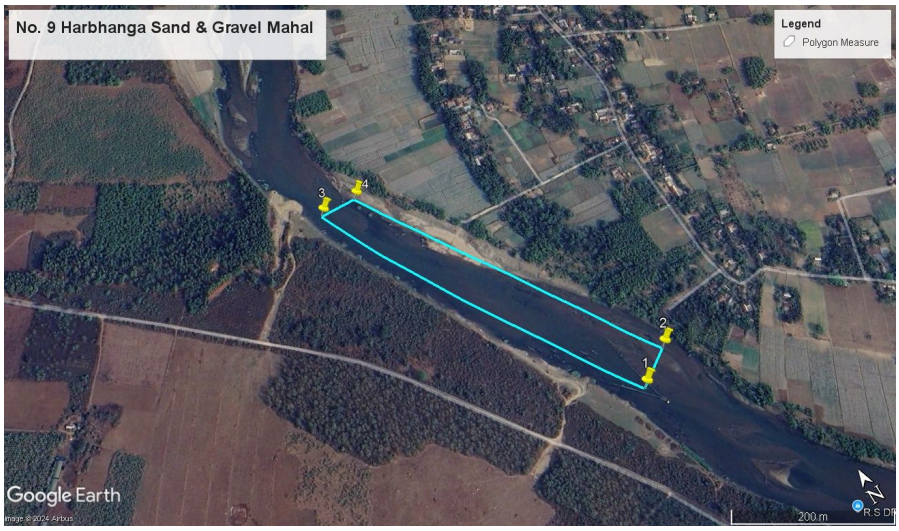
Jaraguri PGR-II Stone Materials Mahal
Legend
Polygon Measure
1
2
3
4
Dey Cycle Store
Google Earth
200 m


No. 9 Harbhanga Sand & Gravel Mahal
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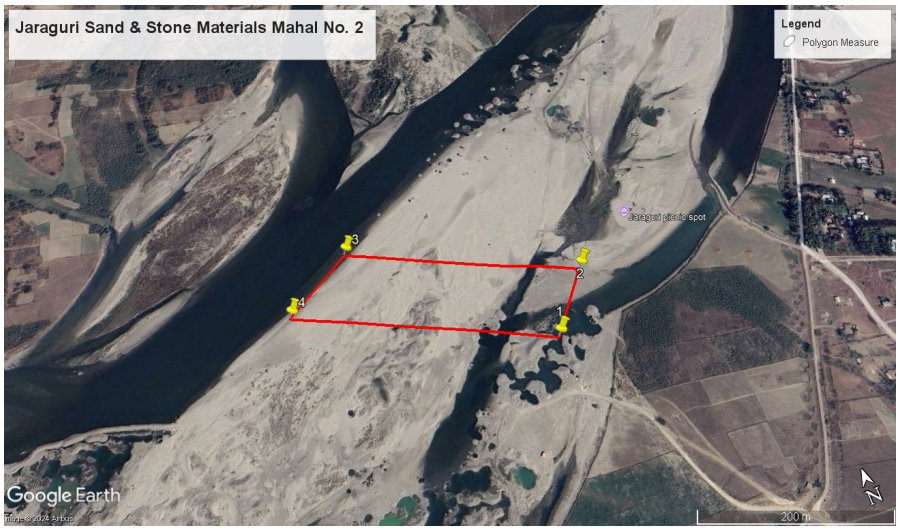
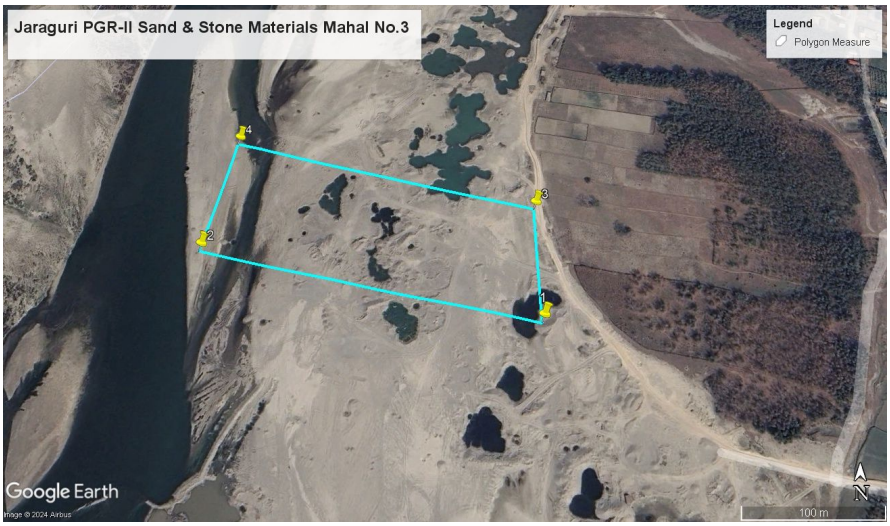
Polygon Measure
1
2
3
4
Google Earth
200 m


Jaraguri Sand & Stone Materials Mahal No. 2
Legend
Polygon Measure
1
2
3
4
Google Earth
200 m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Polygon Measure
1
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3
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Google Earth
100 m
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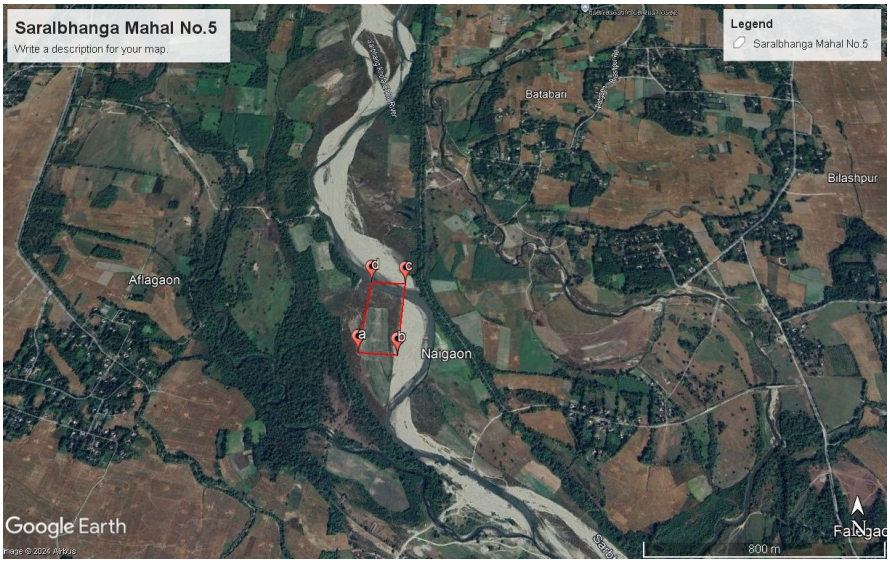
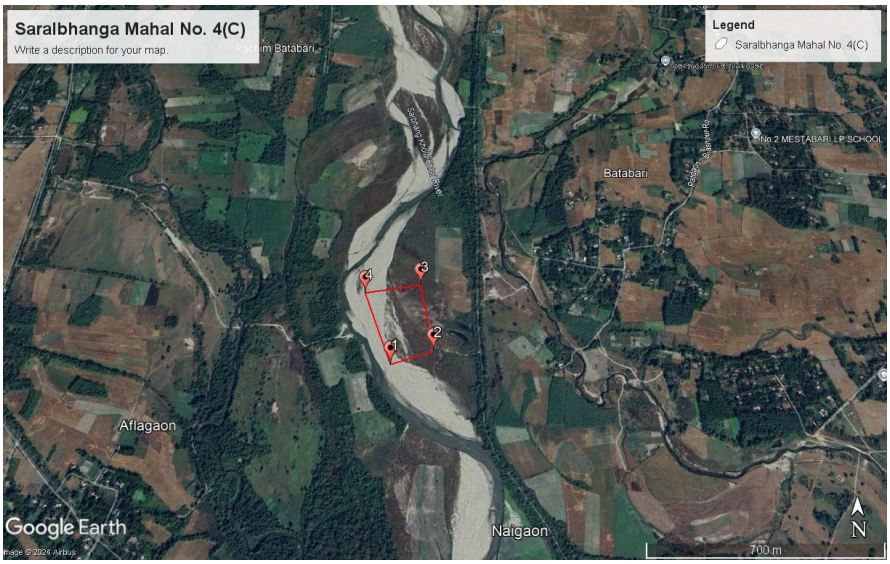

Saralbhanga Mahal No.5
Write a description for your map.
Legend
Saralbhanga Mahal No.5
Batabari
Bilashpur
Aflagaon
Naigaon
a
b
c
d
Google Earth
800 m
N


Saralbhanga Mahal No. 4(C)
Write a description for your map.
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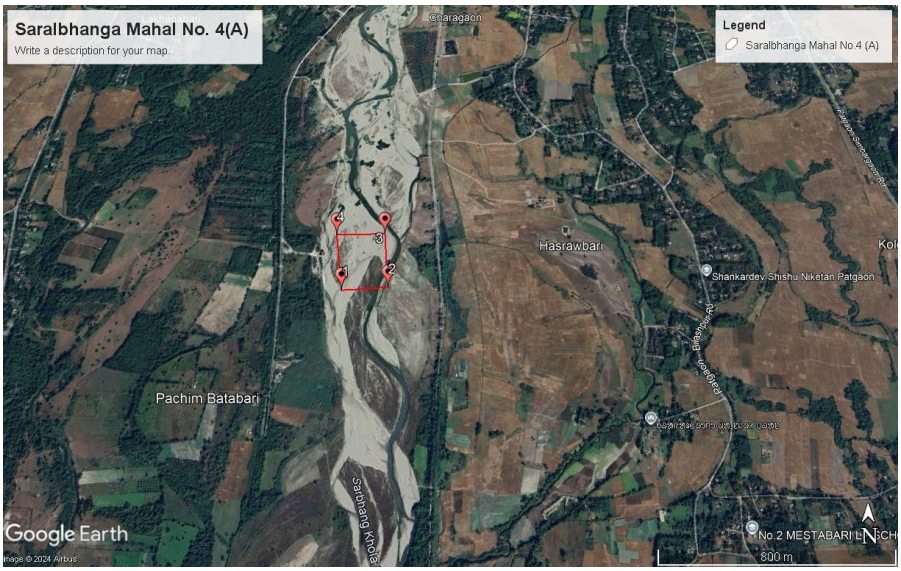
Batabari
Aflagaon
Naigaon
1
2
3
4
Google Earth
700 m
N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Write a description for your map.
Legend
Saralbhanga Mahal No.4 (A)
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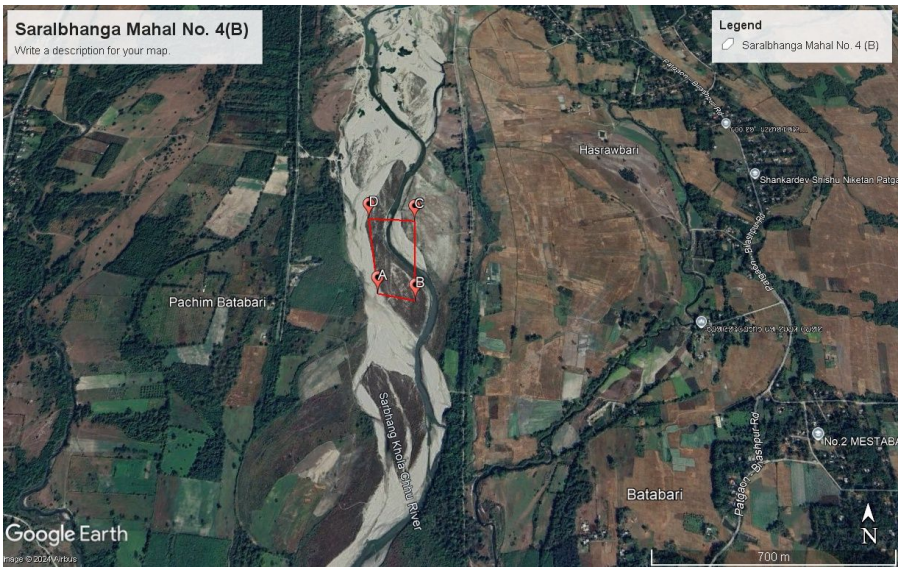
Hasrawbari
Shankardev Shishu Niketan Patgaon
Pachim Batabari
Sarbhang Khola
Google Earth
800 m
N


Saralbhanga Mahal No. 4(B)
Write a description for your map.
Legend
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Pachim Batabari
Sarbhang Khola
Batabari
Google Earth
700 m
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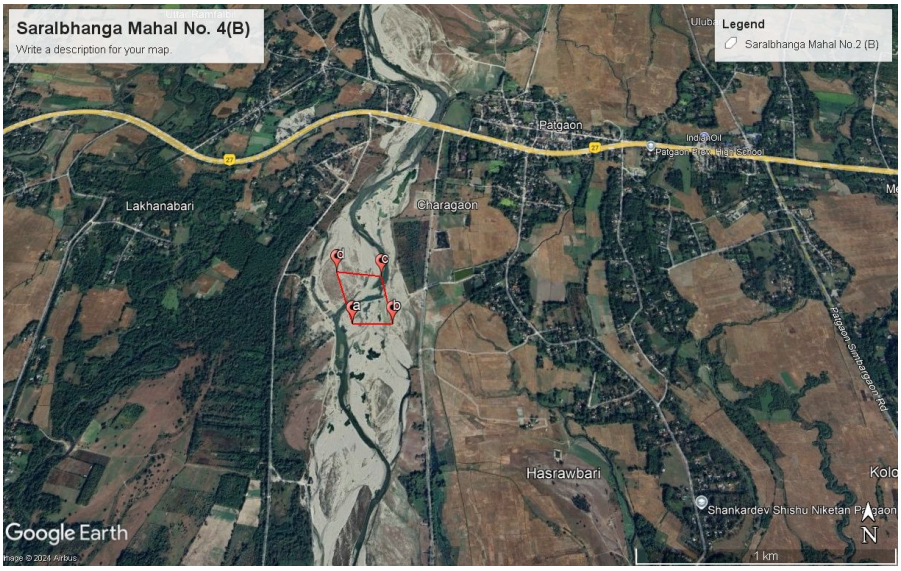
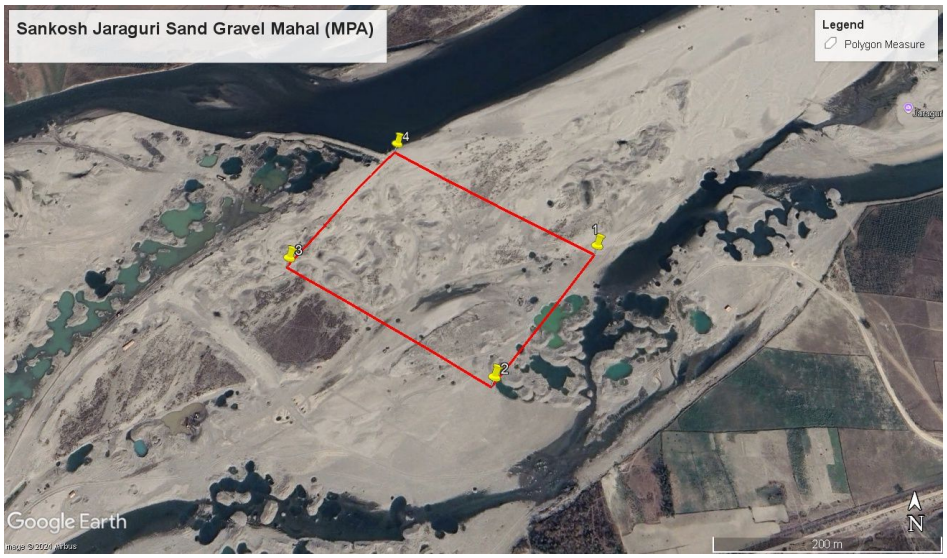
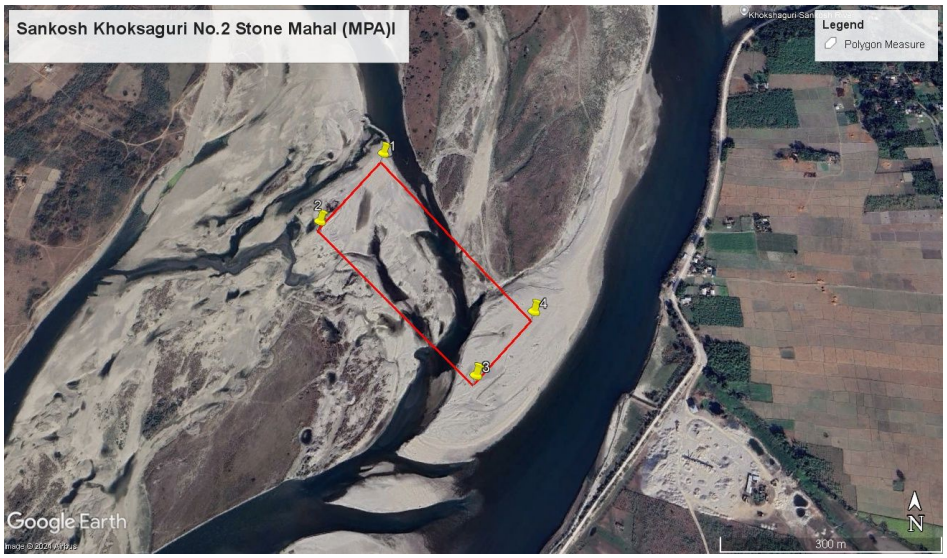
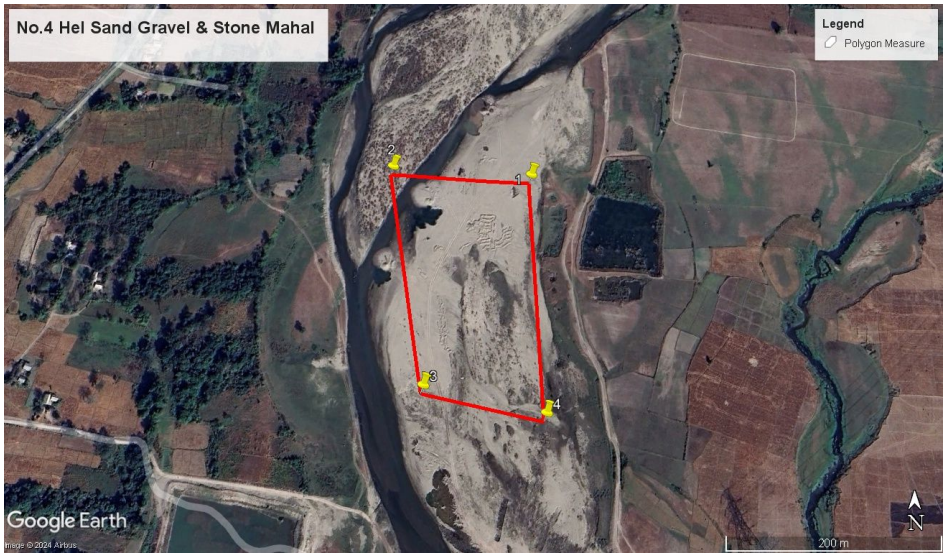
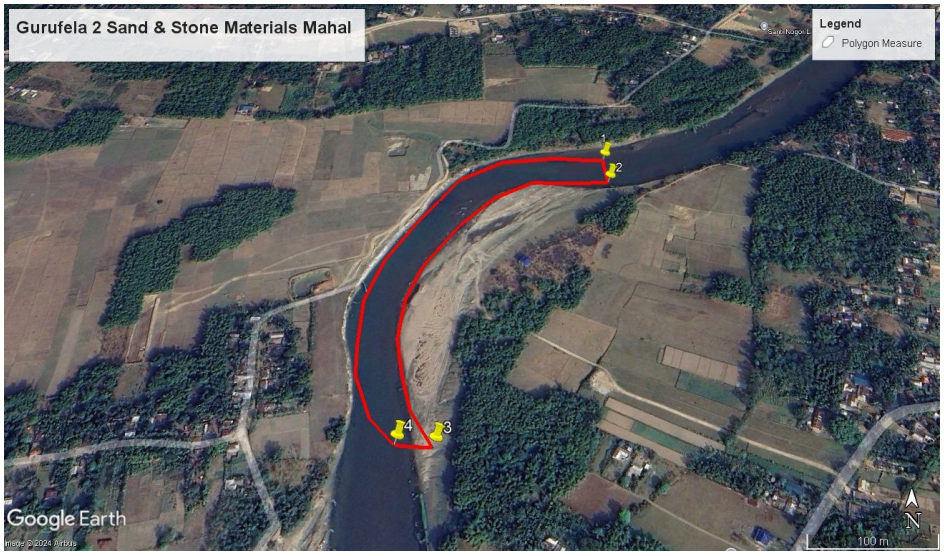

Saralbhanga Mahal No. 4(B)
Write a description for your map.
Legend
Saralbhanga Mahal No.2 (B)
Patgaon
Lakhanabari
Charagaon
Hasrawbari
Shankardev Shishu Niketan Patgaon
Google Earth
1 km
N

Map of Existing Mines








Gurufela 2 Sand & Stone Materials Mahal
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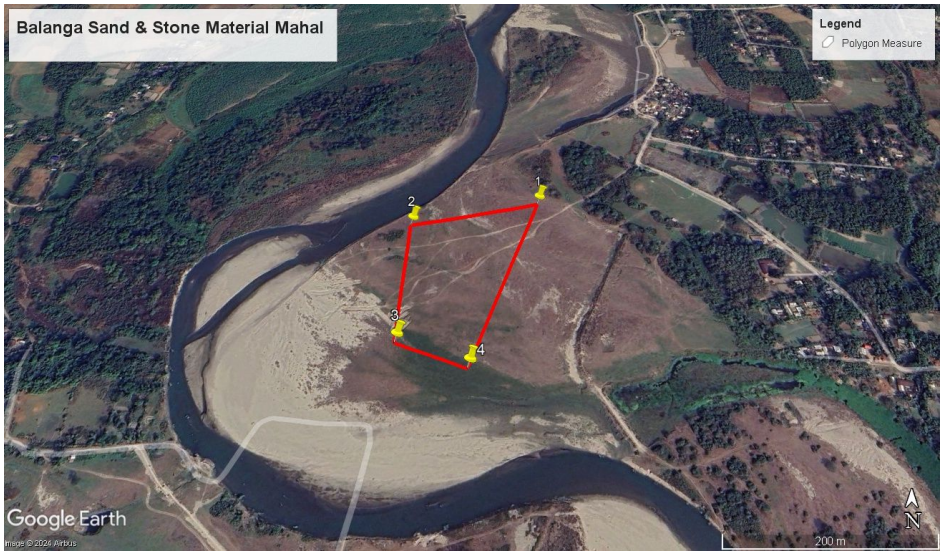
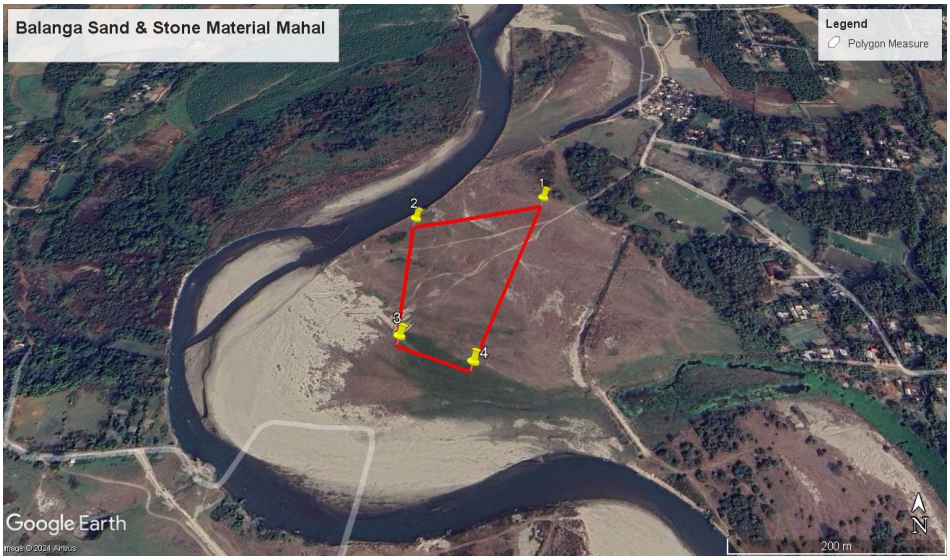
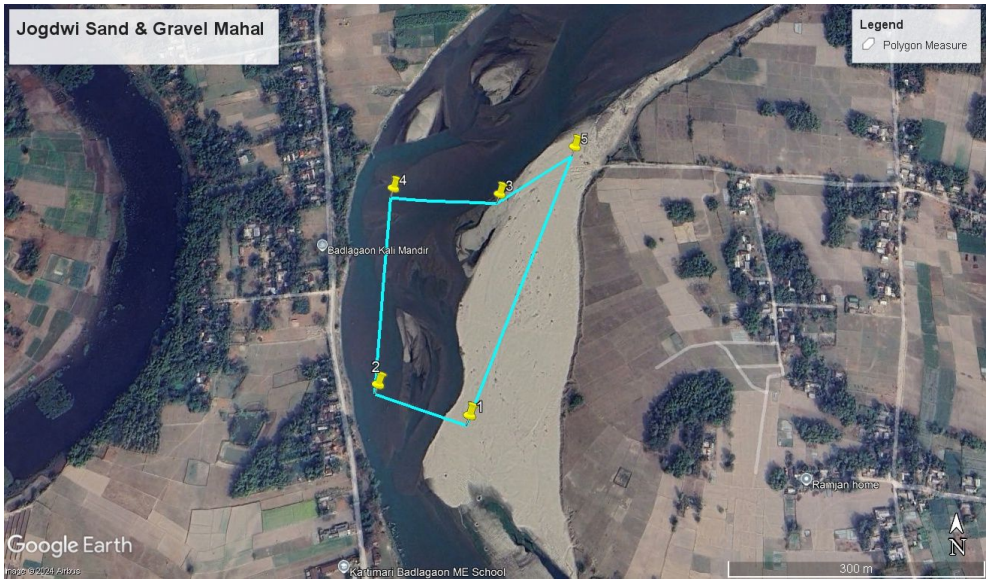
Polygon Measure
1
2
3
4
Google Earth
100 m
N

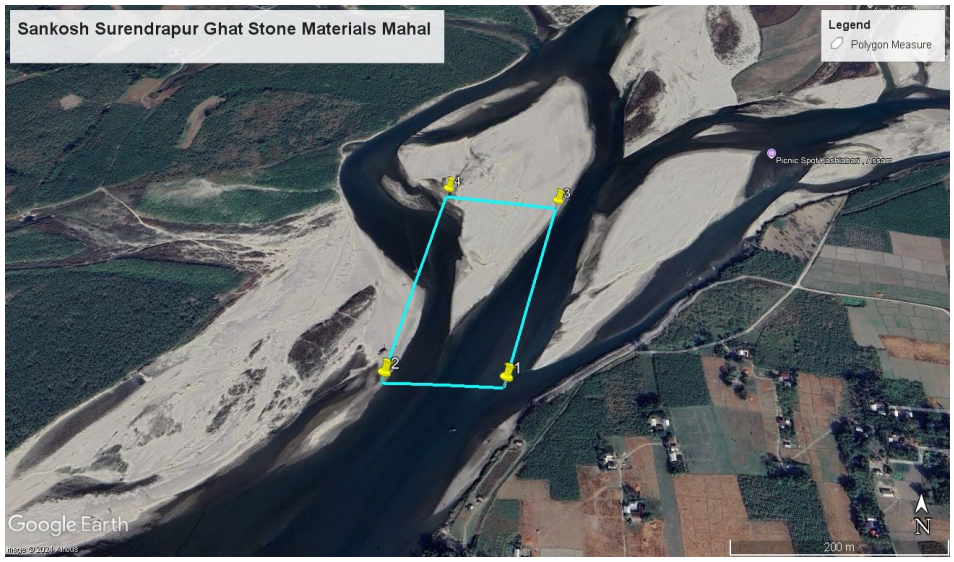

Balanga Sand & Stone Material Mahal
Legend
Polygon Measure
1
2
3
4
Google Earth
200 m
N


Chitila 2 Sand & Stone Materials Mahal
Legend
Polygon Measure
Kachukata football playground
1
2
3
4
Google Earth
300 m
N


Balanga Sand & Stone Material Mahal
Legend
Polygon Measure
1
2
3
4
Google Earth
Image © 2024 Airbus
200 m
N

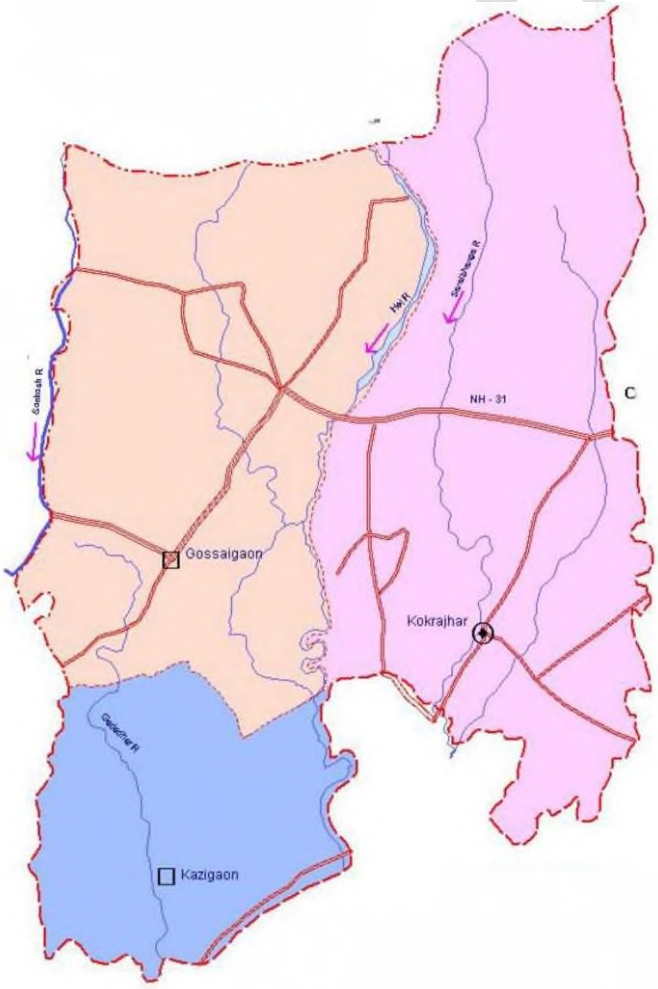
Mining Zones under Process




Sankosh Surendrapur Ghat Stone Materials Mahal
Legend
Polygon Measure
4
3
2
1
Google Earth
200 m
N

DRAFT
DISTRICT SURVEY REPORT
OF
KOKRAJHAR DISTRICT, ASSAM

(For Minor minerals other than sand or river bed mining)



CPC Environment Solution Pvt. Ltd.
(A QCI-NABET Accredited Organization)

Table of Content

PREFACE

The need for a District Survey Report (DSR) has been mandated by the Ministry of Environment, Forest, and Climate Change (MoEF&CC) through Notification No. 125 (Extraordinary, Part II Section 3, Sub-section ii), S.O. 141 (E), dated 15th January 2016. This notification introduced amendments to the EIA Notification 2006, aimed at improving legislative control. As part of these changes, district-level committees were introduced, and the preparation of DSRs became a requirement.

Subsequently, Notification No. 3611 (E), dated 25th July 2018, expanded the DSR's scope to include "Minerals Other than Sand" and provided a specific format for its preparation. The DSR's purpose is to identify areas with mineral potential where mining activities can be permitted, as well as to flag areas where mining should be restricted due to proximity to infrastructure, erosion-prone zones, or environmentally sensitive regions.

The preparation of the DSR involves both primary and secondary data collection. Primary data includes site inspections, surveys, and ground truthing, while secondary data comes from authenticated sources and satellite imagery studies. The secondary data covers information such as the district profile, local geology, mineralization, and other relevant activities, often compiled from disparate sources.

Key Aspects of District Survey Report (DSR)

Assessment of Resources: The DSR provides a comprehensive evaluation of the mineral resources available in riverbeds within the district. It includes detailed data on the quantity, quality, and distribution of sand and other minor minerals, helping to prevent over-extraction and resource depletion through accurate estimation.

Environmental Impact Analysis: The report analyzes the environmental effects of riverbed mining, addressing changes in river morphology, hydrology, and impacts on aquatic ecosystems and biodiversity. This analysis is vital for mitigating harmful environmental impacts and conserving riverine habitats.

Regulation and Compliance: The DSR serves as a regulatory tool for riverbed mining, outlining standards and guidelines to ensure compliance with national and state environmental laws. It helps curb illegal mining activities and promotes regulated, lawful mining operations.

Sustainable Mining Practices: The DSR advocates for sustainable mining practices that reduce environmental degradation. Recommendations may include controlled mining depths, designated extraction zones, and periodic studies to maintain the ecological balance of river systems.

Socio- Economic Considerations: The report addresses the socioeconomic implications of riverbed mining, such as employment generation and local government revenue. It also considers the negative impacts on communities, including displacement and loss of livelihoods.

Data- Driven Decision Making: The DSR provides a scientific foundation for decisions regarding riverbed mining. Incorporating geospatial data, remote sensing images, and field surveys enhances the accuracy and reliability of the report, supporting informed policy-making and resource management.

Stakeholder Involvement: The preparation of the DSR involves consultations with various stakeholders, such as government bodies, local communities, environmentalists, and industry representatives. This inclusive approach ensures diverse perspectives are considered, promoting balanced and equitable mining practices.

1. Introduction of District Survey Report (DSR) of Kokrajhar District

1.1 Introduction

The District Survey Report (DSR) of Kokrajhar District has been prepared in accordance with the Ministry of Environment, Forests and Climate Change (MoEF&CC) guidelines. This report aligns with the MoEF&CC Notifications: S.O.-1533(E) dated 14th September 2006, S.O. 141(E) dated 15th January 2016, and S.O. 3611(E) dated 25th July 2018, which recommends the format for preparing the DSR. These notifications ensure scientific and systematic utilization of natural resources for the benefit of present and future generations.

The primary objectives of the DSR are to identify areas of aggradation suitable for mining and areas of erosion where mining should be restricted. It involves calculating the annual replenishment rate to maintain ecological balance and assessing the development potential of in-situ minor minerals.

Objectives of the DSR:

1. Identification and quantification of minor mineral resources for optimal utilization.
2. Regulation of river bed mining mining, and reduction of demand-supply gaps.
3. Use of Information Technology (IT) for surveillance of river bed mining activities.
4. Facilitation of environmental clearance for clusters of mines.
5. Restriction of illegal mining.
6. Reduction of flood occurrences in the area.
7. Preservation of aquatic habitats.
8. Protection of groundwater by limiting extraction to above base flow levels.
9. Maintenance of data records related to mineral resources, leases, and revenue generation.
10. Creation of a scientific mining plan, including ultimate pit limit estimation.
11. Development of comprehensive guidelines for mining minor minerals.

The DSR includes secondary data on the district's geology, climate, mineral resources, and other relevant factors, compiled from published and unpublished reports, as well as government websites.

1.2 Statutory Framework

The MoEF&CC has issued several notifications and guidelines over the years to regulate mining and formulate DSRs for each district. Below is a summary of the legal framework:

Year	Particulars
1994	The MoEF&CC issued the Environmental Impact Assessment (EIA) Notification for major minerals covering areas over 5 hectares.
2006	EIA Notification SO 1533 (E) made it mandatory to obtain environmental clearance (EC) for minor minerals exceeding 5 hectares.
2012	The Hon'ble Supreme Court mandated EC for minor minerals, even for areas under 5 hectares.
2016	"Sustainable Sand Mining Guidelines (SSMG)" introduced, requiring EC for all minor minerals and district-level monitoring.
2018	MoEF&CC issued notification S.O. 3611(E) with a recommended DSR format for identifying aggradation areas, replenishment rates, and protected zones.
2020	The "Enforcement and Monitoring Guidelines for Sand Mining (EMGSM)" introduced for improved regulatory enforcement and technological monitoring of sand mining activities.

Enforcement & Monitoring Guidelines, 2020

These guidelines address illegal mining, directing states to implement monitoring mechanisms like river audits, aerial surveys, and drone-based surveillance.

1.3 Utilization and Demand of the minerals

River bed minerals like sand, gravel, stone etc. plays an essential role in construction and is widely used in concrete production, glass manufacturing, road base formation, and many more. River bed mining is a prevalent practice in Kokrajhar District, mainly for construction. The rise in real estate and government infrastructure projects has significantly increased the demand for sand and bricks. The minor minerals of Kokrajhar district comes under B-category mining and it is included in sub-category B2. All the available minerals are of Y-schedule.

Uses of minerals:

1. **Construction**: Sand, gravel, silt, clay and ordinary earth are key ingredients in concrete, mortar and asphalt.
2. **Industrial**: Used in glass production and abrasives.
3. **Environmental**: The minerals can improve traffic safety by providing grip on icy roads, and it helps in soil conditioning for agriculture.
4. **Decorative**: Sand, gravel and stones are used in candles, aquariums, and for enhancing aesthetic appeal in landscaping.
5. **Flood Protection**: Proper management of sand mining helps maintain river flood discharge capacity, reducing the risk of floods.

This DSR aims to provide a well-rounded, data-driven approach for sustainable mineral resource management, ensuring compliance with environmental guidelines and promoting socio-economic benefits for the district.

1.4 Methodology of DSR Preparation

The District Survey Report (DSR) preparation follows a systematic methodology to ensure accuracy and comprehensiveness. The steps involved in the preparation of the DSR are illustrated in Figure 2.1 and are described in detail in the following sections.

a. Data Source Identification

The DSR is based on both primary and secondary data collected from reliable and authoritative sources. Identifying authentic data sources is critical for compiling accurate data. The primary data sources for the DSR are collected through field surveys and replenishment studies. Secondary data sources include publicly available information from government publications, reports, and reputable journals.

- **District Profile**: Information related to the district's demographics and basic statistics is sourced from the **District Census Report, 2011** and the **District Statistical Handbook** published by the Government of Assam.
- **Mineral Resources**: The potential mineral resources of the district are described based on reports published by the **Geological Survey of India (GSI)** or other government agencies
- **Mining Data**: Information on mining leases, lease holders, lease areas, resource allocations, and revenue generation is collected from the **Forest Department.**
- **Satellite Images**: Satellite imagery is utilized to prepare maps related to the district's physiography and land use/land cover.

b. Data Analysis and Map Preparation

After collecting data, a detailed analysis is conducted to extract relevant insights. This involves analyzing spatial data and preparing maps that depict:

- Geomorphology of the district
- Topography
- Land use patterns
- Mineral resource distribution

These maps help visualize the key characteristics of the district and identify potential mining areas.

c. Primary Data Collection

Primary data is essential for preparing a comprehensive DSR. Fieldwork is conducted across the district to assess mineral resources. This field study provides a detailed understanding of the mineral composition and their distribution in the area.

d. Replenishment Study

A key aspect of sustainable mining is ensuring that the amount of sediment removed from riverbeds is replenished naturally. Therefore, replenishment studies are conducted to assess the annual rate of replenishment of riverbed sand. This helps avoid the adverse impacts of excessive sand extraction.

Physical surveys of the riverbed are carried out using **GPS/DGPS** to define the topography, contours, and offsets.

- The surveys provide a detailed depiction of important features in and around the river, including nearby civil structures and other key landmarks.
- This information helps define the spatial area eligible for sand mining and estimate the sand reserves.

e. Report Preparation

The DSR covers various aspects of the district, including:

- **General Profile**: A brief overview of the district, including demographics, land use patterns, and economic activities.
- **Geomorphology and Geology**: An assessment of the district's physical landscape, including its geological structure.
- **Mineral Resources**: A detailed account of riverbed sands and other minor minerals in the district, including their distribution and potential for extraction.
- **Mining Block Delineation**: Identification of potential mining blocks and mineral reserves within the district.

- **Production Trends**: An analysis of recent trends in the production of minor minerals and the revenue generated from the mining sector.
- **Replenishment Estimation**: The annual replenishment rate of riverbed sand, based on field surveys.
- **Environmental Impact and Mitigation**: An evaluation of the potential environmental impacts of mining activities, along with proposed mitigation measures.
- **Risk Assessment and Disaster Management**: A strategy for managing risks associated with mining and minimizing the impact of any potential disasters.
- **Reclamation Strategy**: A plan for the reclamation of already mined-out areas to restore the ecological balance.

This structured approach ensures that the DSR not only identifies mineral resources but also emphasizes sustainable mining practices and environmental preservation.

2. Overview of mining activity in the district

In the Kokrajhar district collection of sand, gravel, stone, clay/silt etc. from river- bed is considered as one of the main minor mineral sources of the district. These materials are primarily utilized for construction purpose.

General profile of the district District profile:

Kokrajhar is the westernmost district of the state sharing the international border with Bhutan in the North and state boundary with West Bengal in the west. The district can be described as the gateway to the northeastern region of India. Both road and rail touches this district at Srirampur before they go on to other districts in Assam and the other northeast states. Kokrajhar district is located on the north bank of the river Brahmaputra. The district lies roughly between 89.46' E to 90.38' E longitudes and 26.19" N to 26.54" N latitudes. Agro-climatically the district is the Lower Brahmaputra Valley Zone. Kokrajhar town is the headquarter of Bodoland Territorial Council, created on 10th February, 2003 comprising of four districts viz. Kokrajhar, Chirang, Baska, Udalguri on the north bank of Brahmaputra within Assam.. The district consists of 3 Sub-divisions, 5 Revenue circles, 11 Community Development blocks, 88 VCDC and 2091 revenue villages.

As per 2011 census, the population of the district is 887142 which is 2 % of the state's population. With a population density of 269 person per square kilometer. The number of males and females in the district are 452,905 and 434,237 respectively forming a sex ratio of 959 female per 1000 male. The decadal population growth (2001-2011) of the district is 5.21 %.

Agro-climatically, the district falls under Lower Brahmaputra Valley Zone of Assam. The climate of the district is humid sub-tropical in nature characterized by warm-humid summer and cool-dry winter.The district has been divided into three Agro Ecological situations (AES). The average annual rainfall of the district is 3463 mm against the state average of 2584.50 mm with 139 normal rainy days.The maximum rainfall occurs during the period from April to August. Heavy rainfall starts from April with the onset of monsoon and continues till September. July month receives highest rainfall in a year.

Animal Husbandry is an important enterprise of the district and rearing of the millch cow is a pre dominant activities followed by poultry & goatry. The total livestock population in the district, as per the livestock survey 2015 is 594834 of which 2,94,599 are small animals 3,00,235 are large animals.

Table 1: District Profile

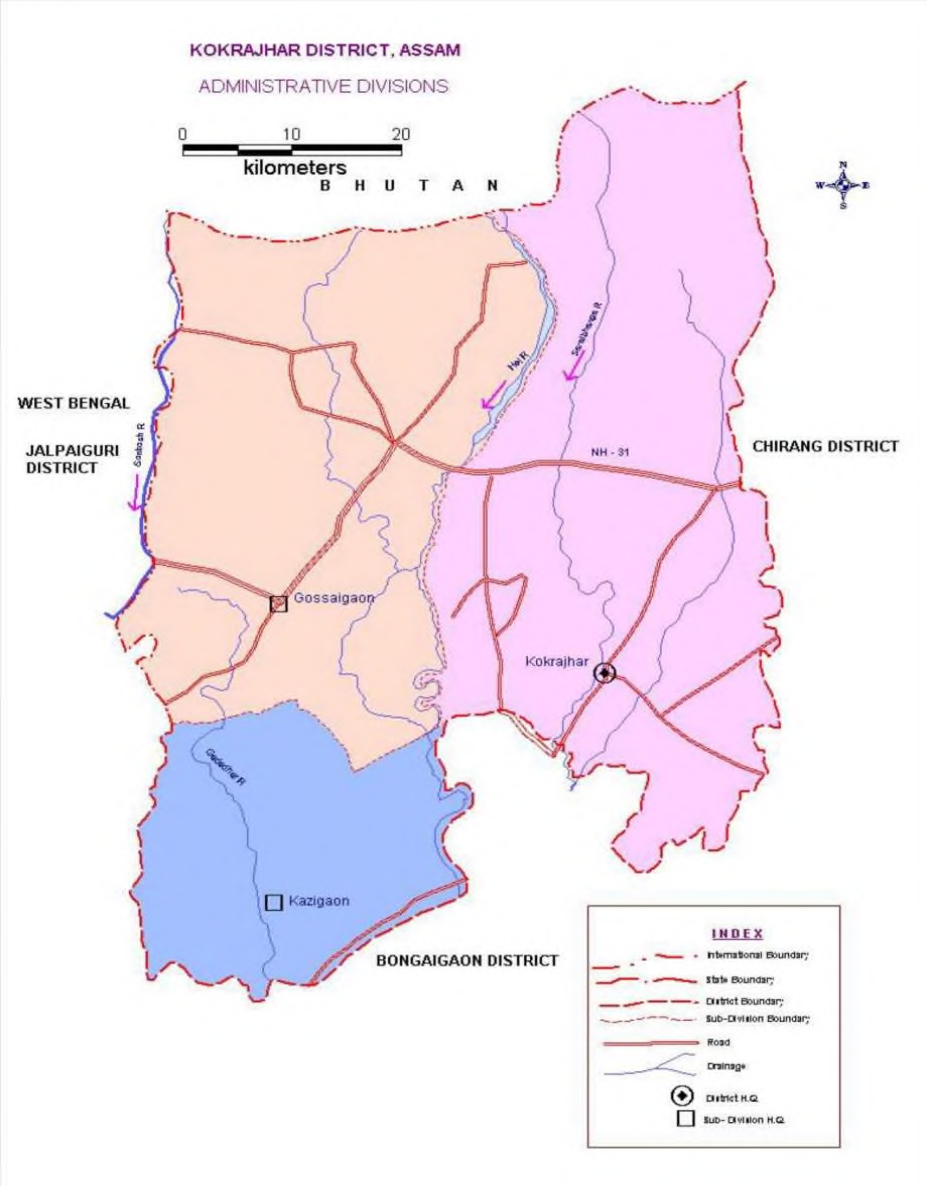
Sr. No.	Name of the District	District code	Latitude	Longitude
1.	Kokrajhar	**300**	26.19" N to 26.54" N	89.46' E to 90.38 S

ADMINISTRATIVE SETUP

	Lower Assam
Headquarter	Kokrajhar
Sub-Divisions	3
Revenue Circles	5
Development Blocks	13
Geographical Area	2287 sq. km
Population	1892550
Literacy	71%
Revenue Villages	960
Panchayats	169

Kokrajhar was originally a part of undivided Goalpara district. Till 1956, it was merely a small village with a railway station that connected it to the rest of the world. In 1957, a new Civil Sub-division was created after carving out the northern part of Dhubri Subdivision and some parts of Goalpara Subdivision. This new sub-division was called Kokrajhar Sub-division. The area covered by the then Kokrajhar Sub-division consisted of five tracts of the Eastern Dooars, viz., Bijni, Sidli, Chirang, Ripu and Guma with a total area of 4065 square kilometers. On the 1st of July, 1983 the Kokrajhar Subdivision was upgraded into Kokrajhar district with headquarter at Kokrajhar town. There were four police stations in the new district. They were Bijni, Sidli, Kokrajhar and Gossaigaon. The area of the district extended from the Manas river in the east to the Sonkosh on the west In 1989, there was P a g e | 21 further reorganization of the districts in the state of Assam and some new districts were created. Thus, about 40 percent of the total geographical area of Kokrajhar district was carved out for inclusion in the

new district of Bongaigaon. The area delimited from Kokrajhar district to Bongaigaon covers the entire Bijni Revenue Circle along with 347.50 square kilometres of Sidli Circle. Later on 20 villages of Naikgaon G.P. with a total area 40.22 square km under Chapar Revenue Circle of Dhubri district was transferred to Kokrajhar district. The present geographical area of Kokrajhar district is estimated to be 3,169.22 square km. The district now has two revenue sub-divisions--- Kokrajhar and Gossaigaon Subdivisions. The river Gongia which is known as Tipkai in the southern part is the natural boundary of two civil sub-divisions. Gossaigaon town is headquarters of Gossaigaon sub-division.



Map: Administrative map

4. a) Geology

(i) <u>Regional Geology</u>:

Shillong plateau (covering approx. 47614 sq. km.) is the singular representative of Precambrian cratonic block of northeast India tectonically detached from the mainland of Indian Peninsula. The cratonic block is girdled by dextrally moving Dauki fault to the south, Brahmaputra lineament to the north, Garo- Rajmahal graben, Dhuburi/Madhupur lineament to the west and belt of schuppen to the east. It consists of high to medium grade Paleoproterozoic basement gneisses and schist designated as Basement Gneissic Group (BGG) overlain by Mesoproterozoic metasediments and metavolcanics of the Shillong Group, both being intruded by Neoproterozonic acidic intrusives such as Myllem pluton, South Khasi pluton, Umroi granite, Nongpoh and a few others enlisted by Mazumdar (76); Ghosh*et. al.* (2005); Devi and Sharma (2006, 2010).The Paleocene to Eocene continental shelf of the Indian plate which became emergent and which is being over-thrust by the Himalayas on the north-northwest and by the Naga hills on the southeast comes under the upper Assam shelf.

The present-day Assam Basin, a cratonic margin, reflects three distinct tectonic phases. The earliest was Late Cretaceous to Eocene block faulting and development of a southeasterly dipping shelf. Duringthe second phase, in Oligocene time, uplift and erosion occurred north of the many basement faults were reactivated; and many basement-controlled structures became prominent.

The Eocene Sylhet Formation was deposited in a range of environments and was subdivided into the members which generally represents these different depositional environments. The lower Lakadong member was deposited in a lagoonal environment consists of more than 350m of thin sandstones and interbedded shales and coals in it basal parts (Fig. 4 showing the development of Assam Shelf). The environment of the Lakadong member typically consists of the thick sands of barrier- bar. The members of upper part of the

Lakadong Formation are calcareous sandstone of a restricted shallow water platform. The gneissic groups of rocks are well exposed in the western, northern and north eastern part of the Shillong plateau. Towards the southern boundary it is covered by Cretaceous –Tertiary sedimentary sequences and within the plateau about 2500 sq. km. (approx.) area is occupied by intracratonic basin sediments. Orthogneiss and paragneiss are the two major components

of basement gneissic complex. The main characteristic features of the banded gneiss are of bimodal character. Other constituents are migmatite, augen gneiss, BIF, amphibolites, pyroxene granulite, calc granulite, high grade sillimanite bearing metapelite with characteristic cordierite, corundum, spinel and sappherine, lamprophyre, diorite, granodiorite, mafic intrusion, pegmatite and other vein rocks.

(ii) Local Geology

The entire Kokrajhar district is occupied by alluvial sediments of Quaternary age. The alluvium comprises unconsolidated sediments of clay, silt, sand, gravel, cobbles and boulders of quartz, feldspars etc. The younger alluvial cover deposited during the period comprises thick beds of clay, sand and gravel. The upper layer of the alluvial formation comprises clayey/sandy soil followed by coarse sand gravel beds at depth. This formation is a very good potential zone for ground water extraction.

Hydrogeologically, the district is divided into 2 units viz., (1) Piedmont plain which occupy in the north and elevated portion along the foothills of Himalayas and (2) Flood plain in the lower part comprise of Newer Alluvium forms in southern part of the district. Ground water in the district occurs under unconfined to semi-confined conditions. The district is underlain by thick alluvium having uniform porosity and permeability of 10-15%. Water level records of the ground water monitoring stations show very little variation. The average pre-monsoon water level of the district is 4.07 m bgl while that of post monsoon is 1.64 mbgl. The flood plain area constitutes a major part of the district is underlain by alluvial formation. The depth to water level varies from 2 to 4 mbgl. The seasonal fluctuation has been in the range between 1 to 2 m. The movement of ground water is towards south. The ground water recharge by rainfall infiltration is much slower in the zone as compared to the piedmont zone. The average value of permeability of shallow aquifer is about 40 m/day.

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5. Drainage of irrigation pattern

In the district the river acts as drainagae to flush out the water.So during rainy season the river beds rise to an optimum level causing stagnancy in lowlying areas for months together. With the coming down of water in river the stagnant water is swept away by the rivers. Many important south flowing tributaries of the Brahmaputra are flowing down this district. Among them the Sankosh, Hel, Saralbhanga, Bhur, Ai, Kanamakra and Manas deserve mention. All these rivers except the Manas are originating from the Bhutan Himalayas white the later five are from the Himalayan River in this part of the state. The Sankosh emerging into plain at Jamduar from the Bhutan foot hills is known as the Gangadhar in its lower course. It also demarcates the boundary between west Bengal and Assam for a considerable part. The Hel is known as Gangia in its lower part. The Gaurang originating in the foot hills of the Chirang R.F meets the Saralbhanga near Titaguri and flows in to the Brahmaputra as Gaurang. Originating from the Bhutan foot hills, the Bhur, Dholpani and Lopani meet each other near Simlaguri and flow as the Champamati in the lower course. The Manas flows into flat alluvial plain of Assam at Mathanguri near the international border and immediately divided into two branches, the Manas and Mora Manos or Beki. The later one possibly the abandoned course of the main channel, still maintains it's perennially. All these rivers are fairly wide and enormously braided in its upper course at times forming large soil and Sand Island on its beds by

deposition of silts and debris's carried along from the hills. They loss their torrential speed due to loss of inclination on the ground and flow as ordinary river cutting sharp meanders along their lower courses. But during rainy season, due to incessant rains on the hills, these rivers causes havoc in its upper as well as lower course by sudden flood, causing breach of embankment and loss of life and property to the dwellers on its banks. Innumerable rivulets and streams also join these rivers from the north. These rivers form a fertile plain along the entire foot hills of the Bhutan boundary providing excellent base of luxurious and evergreen vegetation growth all through the year.

Irrigation Based Classification

The water that flows along natural dongs and canals are the main source of irrigation. Rain water flows down from the hill tracts of Bhutan and along the foothills and reserve forests of the district. The Bhutan hills are also the source of a number of rivers that flow through the district and act as tributaries of the mighty Brahmaputra that flows from east to west far from the southern boundary of Kokrajhar district. The important rivers of the district that flow from north

to south are the Champamati, the Gaurang, the Tipkai and the Sonkosh. All the rivers and rivulets flowing hrough the district have their origin in the Bhutan hills. The water that flows along natural nalas and canals are the main source of irrigation for the agricultural fields. The Bhutan hills are the source of a number of rivers that flow through the district and act as

tributaries to the mighty Brahmaputra that flows from east to west. The important rivers of the district that flow from north to south are Champamati, Saralbhanga and the Sonkosh.
The River Brahmaputra along with its tributaries like Gangia, Laponi, Saumukha, Lonya etc control the main drainage system of the district. These rivers emerge from the Himalayan foot hills and are perennial in nature and flow in north –south direction. They often flow in meandering courses developing ox-bow lakes and a number of lakes or beels formed as a result of change in river courses. The drainage density is very high 5and drainage pattern is more or less parallel. Water logged area in the district is 332 ha and area under still water is 2052 There is about 1,37,141 Ha is under rainfed areas of the district. The percentage of the rainfed areas of the block ranges from 60 % - 90 % in different blocks. The gross area under irrigation is 58931 Ha .

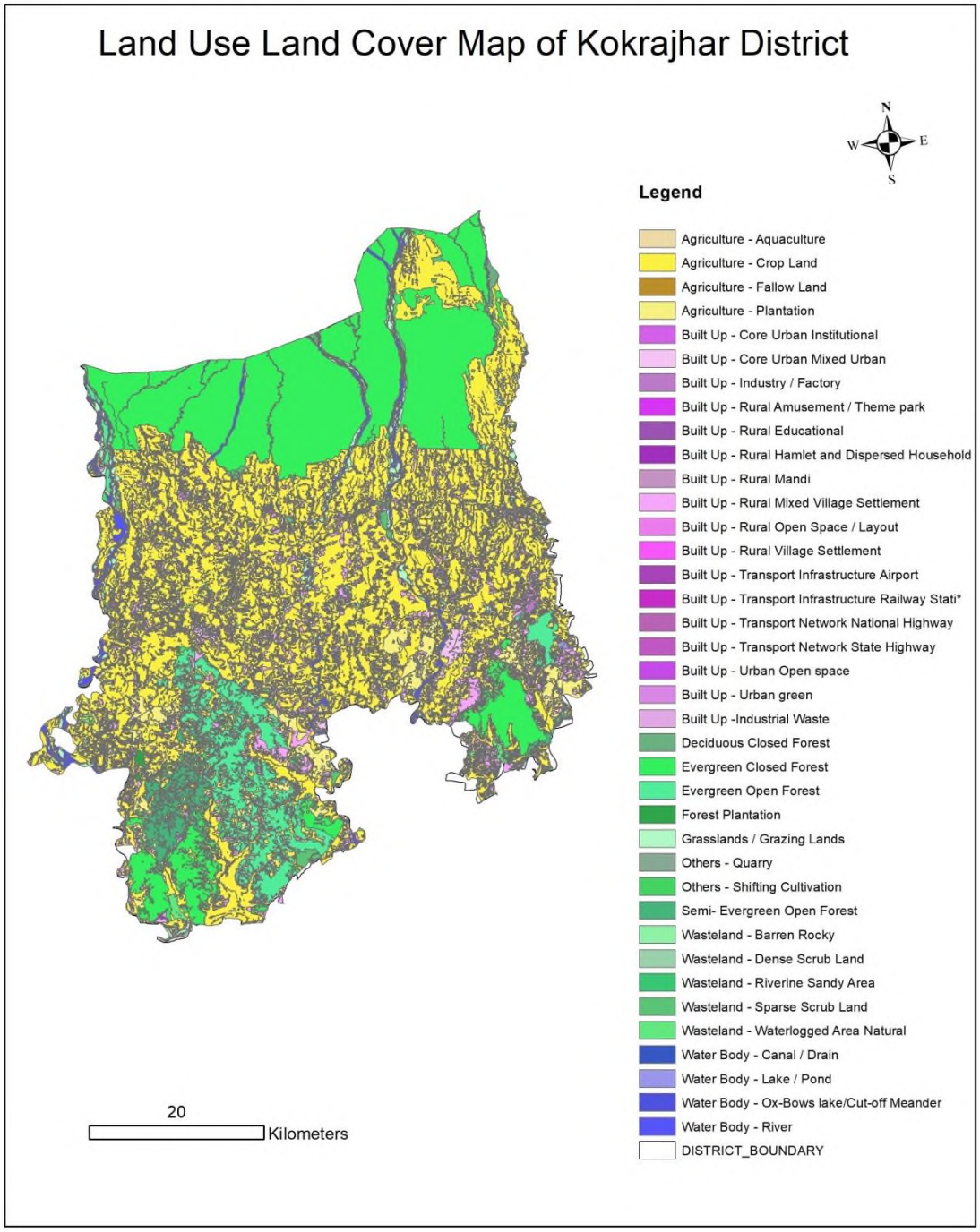
6.Land utilization pattern in the district: The entire district Kokrajhar is located on a flat alluvial plain. It is one of the most fertile zones of the state with luxurious vegetarian

growth. Agriculture is the main occupation of the people of district. The land put to different uses in the district may be classified as forest, agriculture, wasteland etc. The total geographical area of the district is 279681 ha and out of which, 38.05 % is cultivable, 0.7% cultivable wasteland, 0.9% current fellow, 54.94% forest, 5.78% Pasture, 9.1 % under non-agricultural use, 1.75 % under miscellaneous plantation. The Net Sown Area of Kokrajhar district is 179955 ha which is 64.34% of the total area of the district. There are 55,908 operational holdings and the average size of land holding is 1.20 ha. The marginal farmers constitute 40.77% of farm families with 17.91% of land under their possession and the small farmer is 33.39% occupying 30.54% of land. 19.52% of farm families represent semi-medium farmers possessing 31.99% of land while medium farmers constitute 6.27% of farm families with 19.07% of land. The large farmer in the district is only less than 1% of total farm families.

Land use-pattern in Kokrajhar district, 2010-2011

SI. No.	Land put to different uses	Area in hectares
1	Total Geographical area	3,12,900
2	Forest area	1,61,195
3	Land not available for cultivation	43,458
a	Land put to non-agricultural uses	23,648
b	Barren and un-cultural land	19,810
4	Other non-cultivated land excluding fallow land	19,448
a	Permanent pastures and other grazing land	15,031
b	Land under misc, trees, groves etc. not included in net area	2,352
c	Cultivable waste land	2,065
5	F allow land	2,243
a	F allow other than current fallow	1,450
b	Current fallow	793
6	Net area sown	86,556
7	Total cropped area	1,79,533
8	Area sown more than one	92,977

Source :Statistical Handbook,Assam 2012.



Map: Land use land cover map of kokrajhar district

6. Surface and Groundwater scenario of the district:

Ground Water Resources

The net ground water availability estimated in the year 2009 is 1609.70 mcm. The existing gross ground water draft 150.54 mcm and the stages of development are 9% only. Future provision for domestic and Industrial use is 31.43 mcm and for Irrigation use is 1450.93 mcm.

Assessment unit can be categorized into 4 categories as SAFE, SEMI-CRITICAL, CRITICAL, and OVER-EXPLOITED. In Kokrajhar district stage of ground water development is 9%, which shows under the SAFE category. As long-term water level trend does not show any major change so the whole district may be considered as SAFE.

Ground Water Quality

The chemical analysis shows that the ground water in general is neutral to alkaline in nature with pH ranging between 7.94 and 8.53. The Electrical Conductivity value (48 -245 micro mhos at 250C) is within permissible limit. Calcium content is from 6 to 24 mg/l and well within permissible limit. The alkalinity value governed by anion content of carbonates and bicarbonates is within range of 18 to 146 mg/l. The hardness of groundwater ranging from 20 to 150 ppm indicates that ground water is of soft to moderately hard in nature.

The analysis of ground water samples from deep aquifer indicates its suitability for its domestic & irrigation use. The ground water in general is alkaline as pH of ground water ranges from 7.9 to 8.4. The water is of medium salinity and contains low sodium.

The ground water quality data indicate that in general it is suitable for domestic and irrigation purposes. There is not much appreciable variation in quality of ground water in shallow and deep aquifers. Abundant rainfall and relatively insolvable matter of the aquifer material makes the ground water of the district remarkably fresh in nature.

Status Of Ground Water Development

Ground water development in the district is in primary stages. A few deep and shallow tube wells have been constructed. Rural water supply by Public Health Department covers almost entire district. Irrigation wells by ASMIDC, Irrigation department, and Agriculture department have covered a few schemes with constructing of shallow tube wells.

Ground Water Management Strategy

As stated above, the Kokrajhar district as a whole is represented by a mono-aquifer system-alluvial formation with thickness varying from 50 to 250 m. Ground water development in the district is almost in nascent stage. Shallow tube wells down to the depth of 50 m and deep tube well down to the depth of 200 m or more can be constructed in almost all parts of the district with proper hydrogeological investigation, with expected discharge of 3,500 m3 /day and draw down of 5 - 6 m in the alluvial area.

The area adjacent to the Brahmaputra River is feasible for shallow tube wells with depth range of 30 to 50 m depending on availability of granular zones. Such tube well is expected to yield from 35 to 45 m3 /hr tapping 15 m of aquifer zone with drawdown of 2.5 to 5 m. 9 Deep tube wells can be constructed in all parts of the district especially on northern parts where water requirement is more. Low cost ground water structures can be constructed to a depth of 50 m and tapping 10-15 m granular zone using standard strainer /slot pipes.

Ground Water Related Issues And Problems

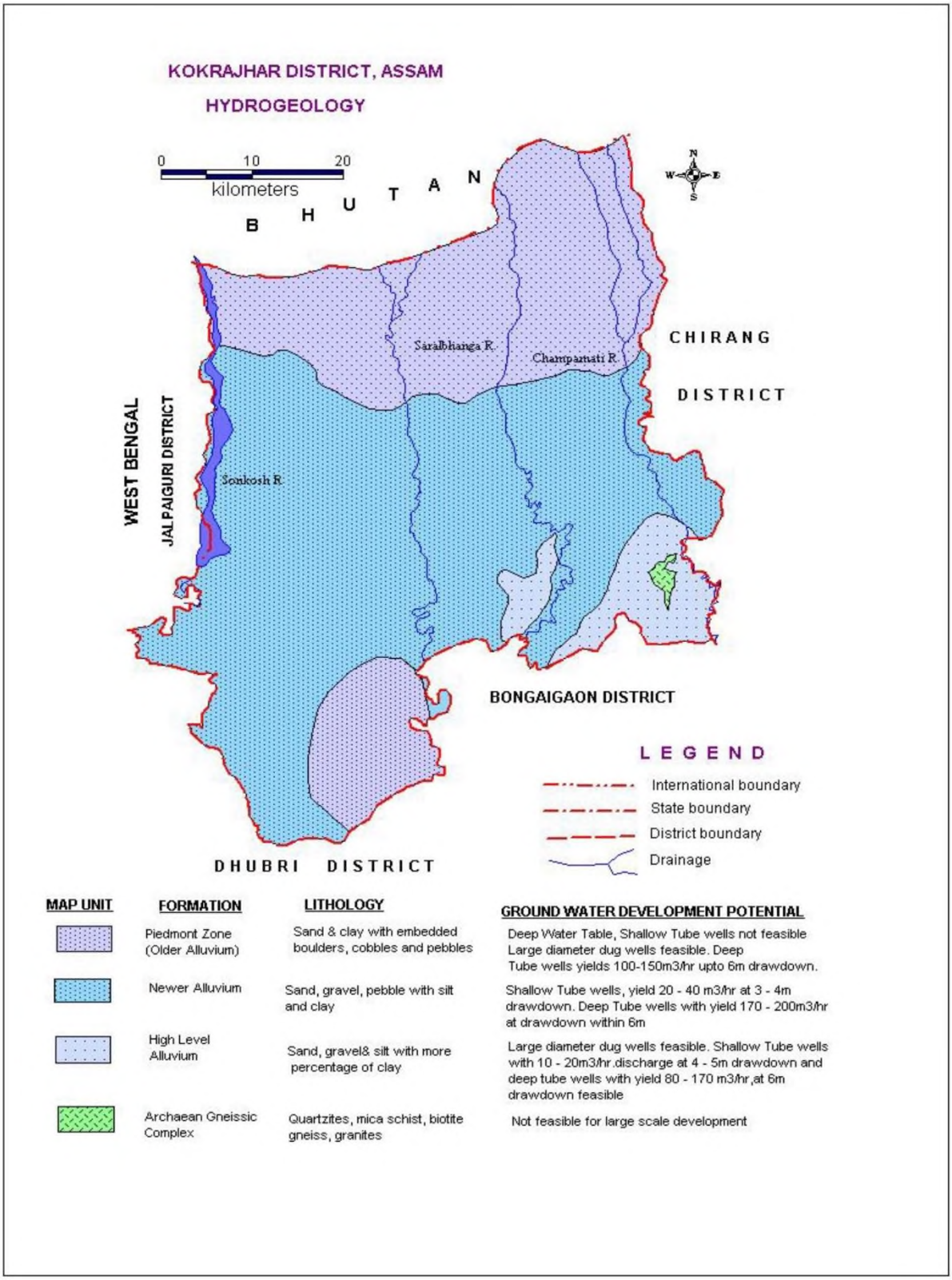
Almost every year the district gets inundated by floods during monsoon season. The effect of flood and soil erosion is much more in southern part than in the northern part of the Brahmaputra River.

The frequent flood affects the ground water regime of the district with water logging problem along with rising of water table which recedes in post-monsoon period due to porous and monotonous nature of the aquifer.

No ground water quality problem is recorded except, high iron content in certain pockets. The problems of arsenic and fluoride have not been reported.

Both shallow tube wells down to the depth of 50 m and deep tube wells down to 250 m are feasible in the district, particularly deep tube wells in northern part and shallow tube wells in southern part near the Brahmaputra River. The shallow tube wells in such cases can yield average 30 m3 /hr while the deep tube wells can yield 100 to 120 m3 /hr. The selection of sites in both the cases may be done after proper investigation.

Low cost ground water development structures in the alluvial part of the district can be constructed to a depth of 50 m tapping 10-15 m saturated granular zones through standard strainers. Ground water is suitable for domestic, industrial and irrigation purposes except in a few localities where iron content is high. Iron Removal Plant should be installed to remove iron from ground water.



Map: Map showing Groundwater Hydrology of the District

Agricultural Resources

Agriculture is the main occupation of Kokrajhar district and contributes a major part in the district economy. Rice is the main crop. Agriculture development is the prime consideration for making radical changes in the district through the marginal, small and landless farmers. The average size of the operational landholding in the district is 1.20 Ha. Rice is the main crop which covers about 80% of the Gross cropped area. The Gross cropped Area of the district is 191608 ha as against the Net Cropped area of 179955 Ha with a cropping intensity of 106.47. There is about 1,37,141 Ha is under rainfed areas of the district. The percentage of the rainfed areas of the block varies in different blocks. The gross area under irrigation is 58931Ha .

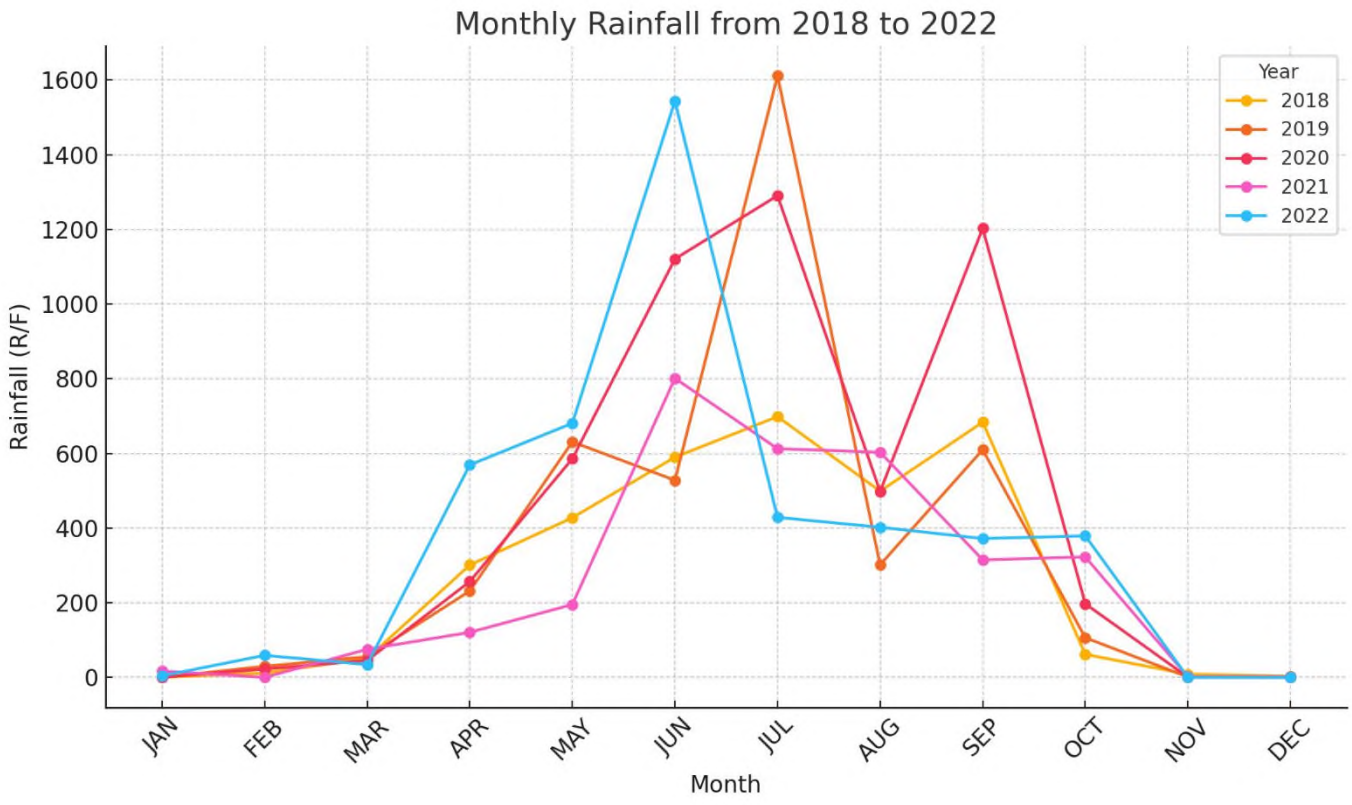
The major crop grown in the district are Ahu Paddy , Sali Paddy , Jute, Mesta during Kharif season and Boro paddy, Toria, Niger, buckwheat, Potato, Pulse during Rabi season. Sali paddy is distributed throughout the district under the rainfed condition. Apart from these, many other varities of crops namely Black gram, Green gram, Sesamum, Tapioca, Chilli, Tobacco, Turmeric, Sweet Potato, Onion, Vegetables etc. are also grown in the district. Under horticultural crops, vegetables like cucurbits, cabbage Cauliflower, Knolkhol, Radish, Brinjal, Tomato etc., fruit tres, namely Banana, Pineapple, Citrus, Jack fruit etc, Chilli Ginger , Turmeric, Black Pepper etc as spices, tuber crops like potato, tapioca, Colocasia etc. and Plantation crops viz. Areca nut, Coconut etc are commonly cultivated in the district.

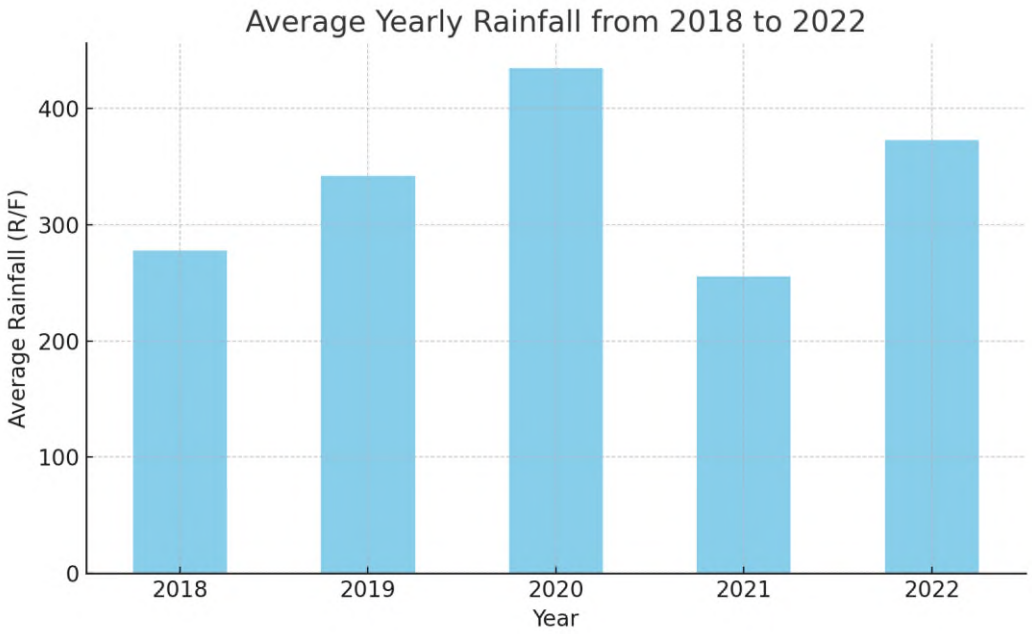
8. Rainfall of the district and climatic condition

Rainfall

Kokrajhar District experience Rainfall in abundance for more than six months in a year with occasional shower throughout the rest of the year. The maximum humidity lies from June to October. The south west monsoon season is from June to September and October, November constitute post monsoon season. The actual total rainfall during the year 2011 was 2674.6 mm against the average.

	JAN	FEB	MAR	APR	MAY	JUN	JU	AUG	SEP	OCT	NOV	DEC
	R/F	R/F	R/F	R/F	R/F	R/F	R/F	R/F	R/F	R/F	R/F	R/F
2018	0	11.5	50.6	300.8	427.5	589.7	698.4	498.7	683.5	61.6	8.4	3.3
2019	0	29.6	55.4	231.2	630.8	528	1611.1	301.5	609.7	106.3	1	2.1
2020	0.3	22.2	45.4	256.5	585.5	1120.7	1290.2	497.9	1202.7	197	0.6	0
2021	16.9	0	75.1	120.6	195	801	612.4	602.9	314.8	322.4	1.8	1.4
2022	4	59	34.1	569	680.6	1543.6	428.5	402	371.8	379	0	0





Climatic condition

Agro-climatically, the district falls under Lower Brahmaputra Valley Zone of Assam. The climate of the district is humid sub-tropical in nature characterized by warm-humid summer and cool-dry winter.The district has been divided into three Agro Ecological situations (AES) based on physiography, hydrology, soil, climate and cropping patterns.

The average annual rainfall of the district is 3463 mm against the state average of 2584.50 mm with 139 normal rainy days.

The maximum rainfall occurs during the period from April to August. Heavy rainfall starts from April with the onset of monsoon and continues till September. July month receives highest rainfall in a year. It is observed that Gossaigaon (1478 mm) & Dotoma (1422 mm) receives the maximum annual rainfall as compared to other districts.

In Kokrajhar district the mean maximum and minimum temperature varies from 33-38°C and 8-10°C respectively. The district experiences a Sub-tropical and Humid climate with heavy rainfall and hot summer. The average humidity remains almost same with variation from 62% in winter to 87% in post monsoon period.

The maximum rainfall occurs during the period from April to August. Heavy rainfall starts from April with the onset of monsoon and continues till September. July month receives highest rainfall in a year.

9. Details of the mining leases in the district as per the following:

I. M-Sand Plants with Location:

Sl. No.	Name of Mahal	Name of the lessee	Location and area of mining lease	Period of lease	Status (working/ closed)
1	M/S AB Indsutry (Stone Crusher)	Nobi Hussain	Failaguri Pt-I, Kokrajhar		
2	M/S Basumatary & Son Crusher Unit, Bajugaon	Marjit Basumatary	Bajugaon Kokrajhar		
3	M/S Narzary Stone Crusher Unit, Sapkata Part-II	Rabiram Narzary	Saplata Part-II Kokrajhar		
4	M/S Dwhau Enterprise Crusher Unit,Dhauliguri	Dwhau Narzary	Dhauliguri Kokrajhar		
5	M/S Sarmanga Washing & Crusher Plant, Patgaon	Swmachar Basumatary	Patgaon Kokrajhar		
6	M./S Manaranjan Brahma Crusher Unit at No.2 Khoksaguri	Manaranjan Brahma	No.2 Khoksaguri Kokrajhar		
7	M/S Jaraguri Crusher Unit, Khoksaguri (L&T)	V.R. Saravana Kumar	Jaraguri Kokrajhar		
8	M/S Simplex Infrastructure Limited Crusher, Jaraguri	Bhudev Mukherjee	Jaraguri No.2 Kokrajhar		

9	M/s Amguri Stone Crusher	Durgamohan Basumatary,	Amguri Revenue Village, Kokrajhar Circle, Dag No. 64, Patta No. 77, 4B-0 K-15 Ls		
10	M/s Gaurang Stone Crusher	Sewli Mahilari,	Amguri Revenue Village, Kokrajhar Circle, Dag No. 183,184,182 & 191 P.P. No. 164		
11	M/s Champa Stone Crusher	Sewli Mahilari	Barswangaon, PO-Karigaon, Dist-Kokrajhar, Dag No. 12 of Patta No. 43 // Dag No. 11/189 of Patta No. 42 // Dag No. 11/188 of Patta No. 41		

II. List of Patta Lands/Khatedari Land

Sl No	Name Of the Miner al	Name of the Lessee	Address & Contact No. Of Lessee	Mining lease Grant Order No. & date	Area of Mining lease (ha)	Period mining lease (Initial)		Period of Mining lease 1st/2nd .. renewal)		Date of commencement of Mining Operation	Status Working/Non-Working/temp. Working for dispatch etc.)	Captive / Non-Captive	Obtained Environmental Clearance (Yes/No), If Yes Letter no with date of grant of EC	Location of the Mining lease (Latitude & Longitude)		Method of Mining (Opencast/ underground)
						From	To	From	To					Latitude	Longitude	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		16
1		Md. Munuruddin SK.	No. 1 Polashguri, Kokrajhar		0.45 ha											
2		Bhaigya Basu	Saraguri Kokrajhar		1.49 ha											

		matary														
3		Md. Kopiluddin Sk.	No.1 Burichatam, Kokrajhar		4.10 Ha											
4		Jamal Hussain Sk.	No.1 Burichatam, Kokrajhar		0.46 ha											
5		Delowar Hussain	Garumarachar Pt-II, Kokrajhar		2.4160 Ha											
6		Alom Sheikh	Garumarachar Pt-II, Kokrajhar		0.8 Ha											
7		Rupuram Rabha	Majerdabri No.2		2.70 Ha											
8		Mansing Basumatary	Choto Malgaon Pt-II Kokrajhar		0.64 Ha											
9		Rezaul Islam	Borogaon, Kokrajhar		1.82 Ha											

10. Details of Royalty received in last 3 years

Revenue generated for last 3 years in Kokrajhar District is furnished in Table.

Table: District revenue generation from mineral sector (In INR)

•

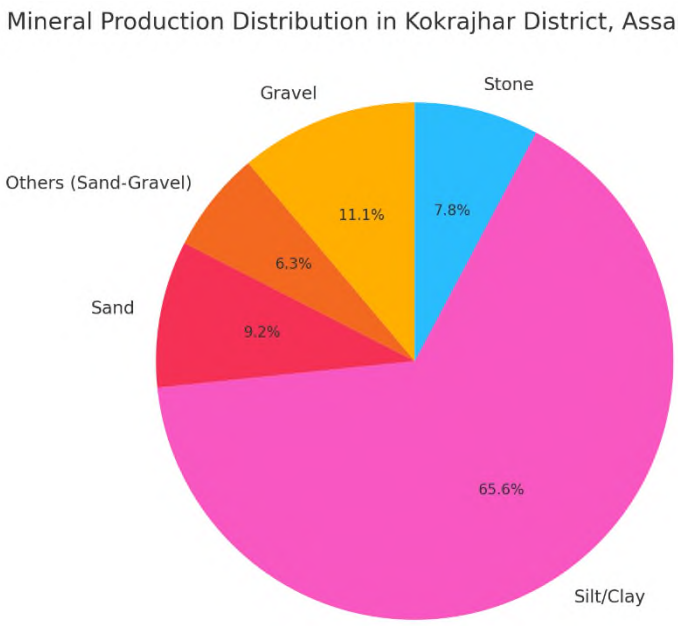
Year	Type of Mining	Quantity	Revenue
2021-22	River Mining	101800 m3	23425153
2022-23	River Mining	175130 m3	40368302

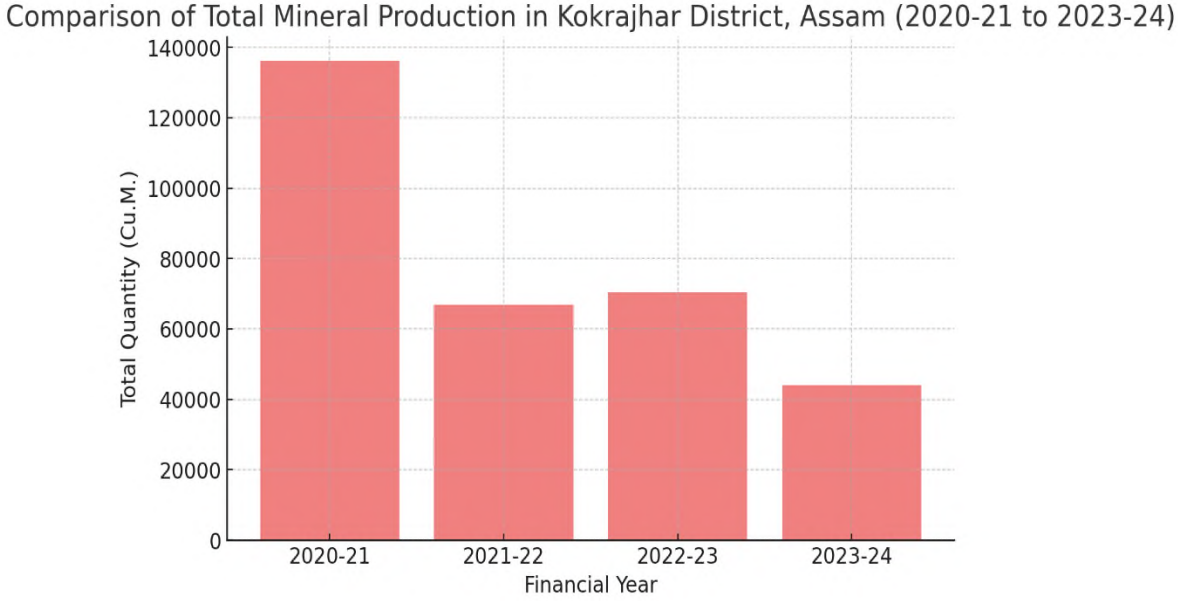
2023-24	River Mining	279700 m3	72723788

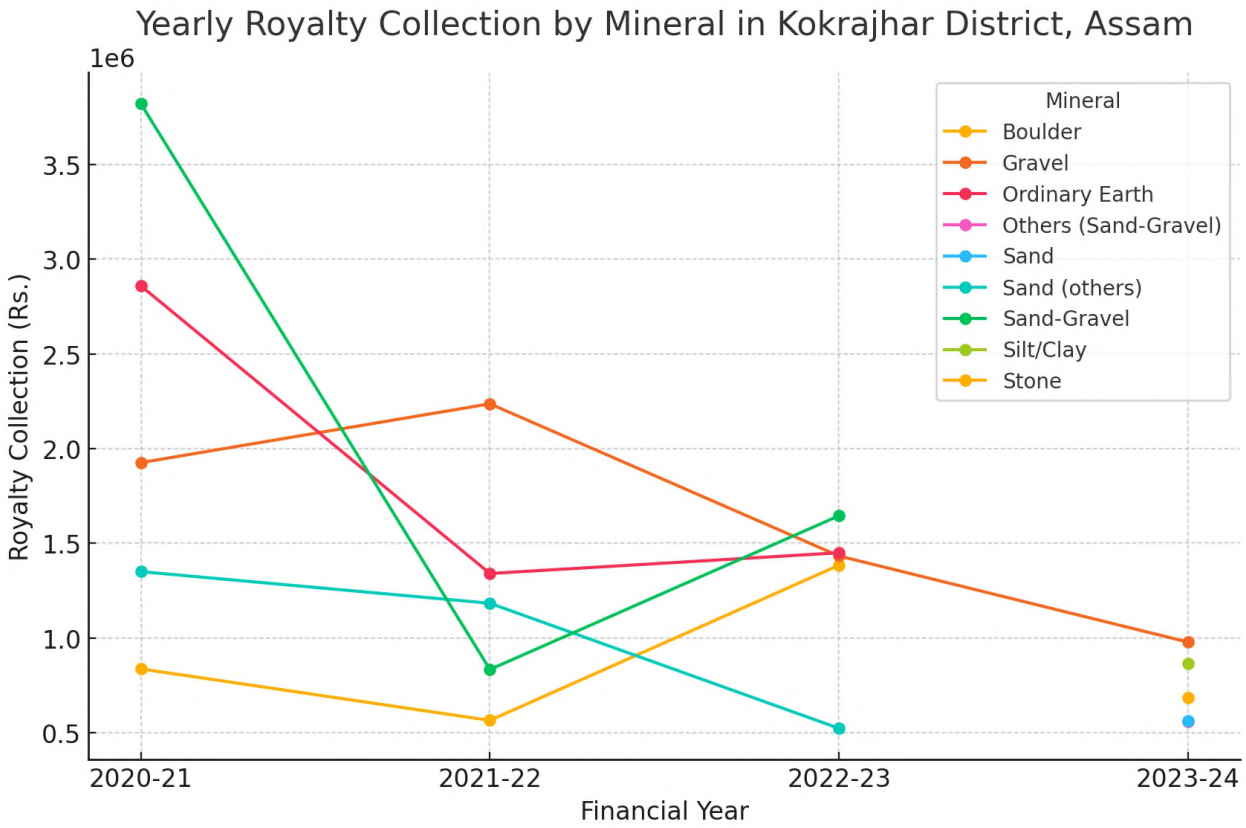
11. Details of Production of minor mineral in last 3 years

FOR THE FINANCIAL YEAR:				2020-21
Sl No.	Name of Mineral	Unit of Quantity	Quantity	Value in Rs.
5	Boulder	Cu.M.	3986.775	837409.80
23	Gravel	Cu.M.	9033.666	1926521.0
37	Ordinary Earth	Cu.M.	95426.315	2859904.3
47	Sand (others)	Cu.M.	8555.62	1351041.24
	Sand-Gravel	Cu.M.	19144.45	3821690.0
Total			136146.826	10796566.51
		FOR THE FINANCIAL YEAR:		2021-22
Sl No.	Name of Mineral	Unit of Quantity	Quantity	Value in Rs.
5	Boulder	Cu.M.	2603	565553.22
23	Gravel	Cu.M.	9373.6683	2237104.8
37	Ordinary Earth	Cu.M.	44402.4517	1341139.96
47	Sand (others)	Cu.M.	6347.25099	1184033.9
	Sand-Gravel	Cu.M.	4171.68325	834337.00
Total			66898.05424	6162169.0
		FOR THE FINANCIAL YEAR:		2022-23
Sl No.	Name of Mineral	Unit of Quantity	Quantity	Value in Rs.
5	Boulder	Cu.M.	6470.408	1384777.54
23	Gravel	Cu.M.	4792.211	1433829.2
37	Ordinary Earth	Cu.M.	47884.998	1450523.0
47	Sand (others)	Cu.M.	3148.295	523663.80
	Sand-Gravel	Cu.M.	8031.835	1645845.0
Total			70327.747	6438638.5

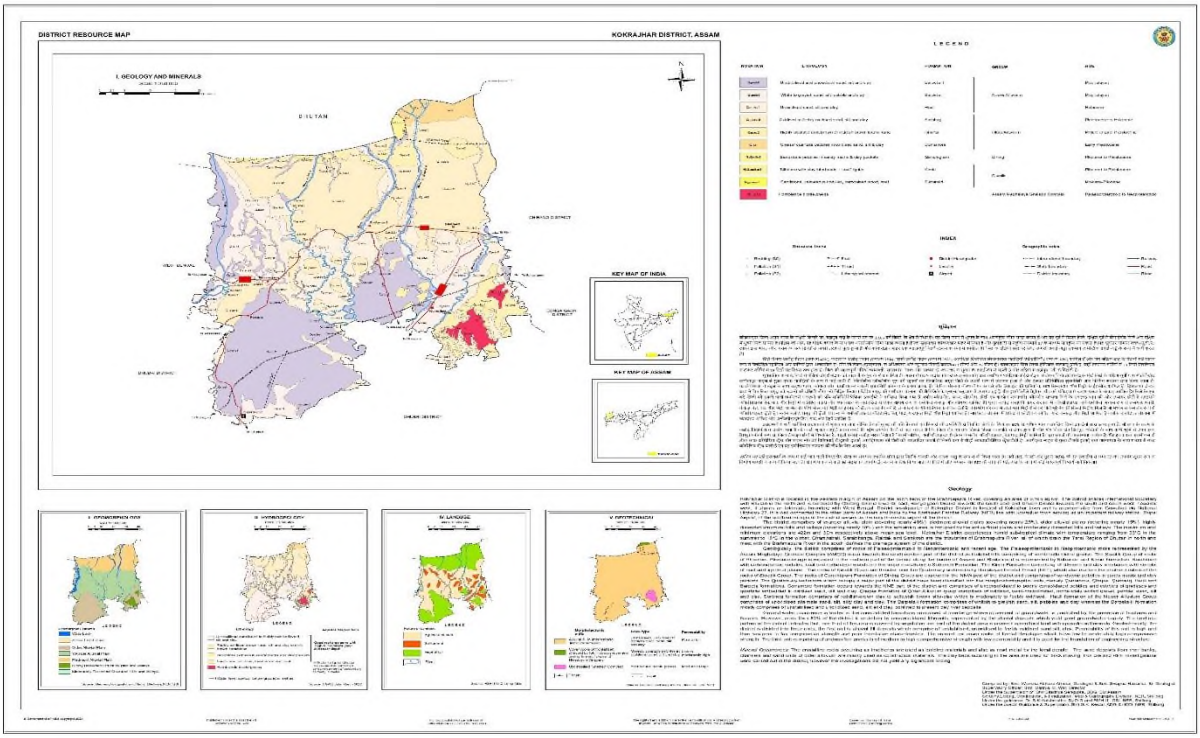
		FOR THE FINANCIAL YEAR:		2023-24
Sl No.	Name of Mineral	Unit of Quantity	Quantity	Value in Rs.
9.1	Sand	Cu.M.	4039.16	565482.68
9.2	Stone	Cu.M.	3418.98	683796.00
9.3	Silt/Clay	Cu.M.	28864.207	865926.21
9.4	Others ..(Sand-Gravel) .	Cu.M.	2789.73	557947.20
9.5	Gravel	Cu.M.	4895.36	979073.00


Mineral Production Distribution in Kokrajhar District, Assam (2023-24)
Stone
Gravel
Others (Sand-Gravel)
Sand
Silt/Clay
7.8%
11.1%
6.3%
9.2%
65.6%


Comparison of Total Mineral Production in Kokrajhar District, Assam (2020-21 to 2023-24)
Total Quantity (Cu.M.)
0
20000
40000
60000
80000
100000
120000
140000
2020-21
2021-22
2022-23
2023-24
Financial Year



12.Mineral Map of the District



13. List of Letter of Intent (LOI) Holders in the District along with its validity

Sl. No.	Name of the Mineral	Name of the Lessee	Address & Contact No. of Letter of Intent Holder	Letter of Intent Grant Order No. & date	Area of Mining lease to be allotted	Validity of LoI	Use (Captive/ NonCaptive)	Location of the Mining lease (Latitude & Longitude)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
				NA				

14. Total Mineral Reserve available in the District

(To be updated in the Final DSR after field survey)

15. Quality /Grade of Mineral available in the District

(To be updated in the Final DSR after field survey)

16. Use of Mineral

(To be updated in the Final DSR after field survey)

17. Demand and Supply of the Mineral in the last three years

(To be updated in the Final DSR after market survey)

18. Maps showing Mining leases of the district: AnnextureI

19. Details of the area of where there is a cluster of mining leases

20. Details of Eco-Sensitive Area, if any, in the District

(Will be updated after cluster and proximity analysis)

10. Impact on the Environment due to mining activity

The demand for sand and gravel continues to increase for the construction of roads and buildings. The impact of mining on environment can occur at local, regional, and global scales through direct and indirect mining practices. Impact on Environment due to mining activities varies based on amount of production rate. Mining can cause erosion, sinkholes, loss of biodiversity, or the contamination of soil, groundwater, and surface water by chemicals emitted from mining processes. These processes also affect the atmosphere through carbon emissions which contributes to climate change. The different activities involved before & during mining can impact the environment. The high growth in population speeds- up economic activities. Meanwhile, it also deteriorates environment as for the high level of economic development, plenty of natural resources are exploited. Similarly, mining activities have considerable impacts on environment.

Excessive instream sand- gravel mining causes the degradation of rivers. Instream mining lowers the stream bottom, which may lead to bank erosion. Depletion of sand in the streambed and along coastal areas causes the deepening of rivers and estuaries, and the enlargement of river mouths and coastal inlets. It may also lead to saline- water intrusion from the nearby sea. The effect of mining is compounded by the effect of sea level rise. Any volume of sand exported from streambeds and coastal areas is a loss to the system.

Excessive instream sand mining is a threat to bridges, river banks and nearby structures. Sand mining also affects the adjoining groundwater system and the uses that local people make of the river. River bed mining impacts include bed degradation, bed coarsening, lowered water tables near the streambed, and channel instability. These physical impacts cause degradation of riparian and aquatic biota and may lead to the undermining of bridges and other structures. Continued extraction may also cause the entire streambed to degrade to the depth of excavation. River bed mining can have other costly effects beyond the immediate mine sites. Many hectares of fertile streamside land are lost annually, as well as valuable timber resources and wildlife habitats in the riparian areas. Degraded stream habitats result in loss of fisheries productivity, biodiversity, and recreational potential. Severely degraded channels may lower land and aesthetic values.

Native species in streams are uniquely adapted to the habitat conditions that existed before humans began large-scale alterations. These have caused major habitat disruptions that favored some species over others and caused overall declines in biological diversity and productivity. In most streams and rivers, habitat quality is strongly linked to the stability of channel bed and banks. Unstable stream channels are inhospitable to most aquatic species. Sand mining generates extra vehicle traffic, which negatively impairs the environment. Where access roads cross riparian areas, the local environment may be impacted.

Degradation of land is one of the significant impacts arising out of mining and quarrying activity which is mainly in the form of alternation of land structure due to excavation, stacking of top soil and loss of the land due to dumping of mine waste and overburden soil. Stone and sand quarrying causes damage to property, depletion of ground water, loss of fertile top soil, degradation of forest land, adverse effect on the biodiversity and public health.

Mining and quarrying, either open cast or underground, destroys landscape and forest ecosystems. Air pollution, due to dust from the mines, is a common environmental problem in mines and quarries especially open cast operations.

Immediate impact of stone quarrying is land degradation. It causes landscape alternation due to excavation, water induced soil erosion due to surface runoff water in quarrying site, dumping of waste rock causes loss of land or generation of waste land, over burned soil etc. Soil erosion and soil contamination are common in quarrying sites. In current study area, in many places waste land were generated due to stone quarrying activities. Waste stones are dumped in many places causes blockage of drainage channels. In many sites of the quarry area waste water were stored. This decrease aesthetic value of the site. In many areas, plants are unable to grow and some land completely lost their ability for cultivation because of soil contamination by stone quarrying activities.

Noise pollution occurs due to blasting operation in quarry, noise emitted by stone crusher and transport of stone material by truck, dumper, tractor etc. Loss of peace, fear due to loud noise and vibration, increased heart beat, headache, development of cracks on houses etc. are various effects of quarrying related noise pollution. Stone quarrying activities also goes during night. Stone quarrying occupation is not a suitable alternative livelihood like agriculture, service, business etc.

Because of its uncertainty nature. Massive transport of truck and dumper are not safe and there is always chance of accident. Due to short time, seasonal and uncertainty nature, it is not possible to formulate any future planning for employment generation in this field.

Noise pollution is associated with many types of equipment used in mining operations, but blasting is considered as the major source. It also affects stability of infrastructures, building and houses of people living near to these working sites. In this regard, noise pollution may include noise from vehicle engines, power generation, and other sources. Mining operations impact the environment in several ways, and water pollution is a major concern in such operations. For instance quarry dust can change the chemistry of water resources by dissolving in them, it can also settle in water bodies and cause pollution. Furthermore, these operations disrupt the existing movement of surface water and groundwater; they interrupt natural water recharge and can lead to reduced quantity and quality of drinking water for residents and wildlife near or down streams from a quarry site.

As far as impact on surface water is concerned, during mining and transportation, the chances of contamination of surface water resources (pond, well etc.) with dust or by other means.

The labourers working in stone mining come from nearby districts and colonies in the surrounding areas with inadequate facilities for waste disposal. This, in due course, leads to disposal of various things into surface water bodies which in due course of time results into surface water contamination through misuse/mismanagement and decomposition of the trash.

11. Remedial Measures to mitigate the impact of mining on the Environment

Recommendation 1	**Recognise sand as a strategic resource** that delivers critical ecosystem services and underpins the construction of vital infrastructure in expanding towns
Recommendation 2	**Include place-based perspectives for just sand transitions,** ensuring the voices of all impacted people are part of decision-making, agenda-setting and
Recommendation	**Enable a paradigm shift to a regenerative and circular future.**
Recommendation 4	**Adopt strategic and integrated policy and legal frameworks** horizontally, vertically and intersectionally, in tune with local, national, and regional realities.
Recommendation	**Establish ownership and access to sand resources** through mineral rights
Recommendation 6	**Map, monitor and report sand resources** for transparent, science-based and data-driven decision-making.
Recommendation 7	**Establish best practices and national standards, and a coherent international framework**
Recommendation 8	**Promote resource efficiency & circularity** by reducing the use of sand, substituting with viable alternatives and recycling products made of sand when
Recommendation 9	**Source responsibly** by actively and consciously procuring sand in an ethical, sustainable, and socially conscious way.
Recommendation 10	**Restore ecosystems and compensate for remaining losses** by advancing knowledge, mainstreaming the mitigation hierarchy, and promoting nature-based

12. Reclamation of Mined out area

Reclamation entails the re- establishing of viable soils and vegetation at a mine site. Although regulatory agencies may require complex reclamation designs, simple approaches can be very effective. One simple approach depends on adding lime or other materials that will neutralize acidity plus a cover of top soil or suitable growth medium to promote vegetation growth. Modifying slopes and other surfaces and planting vegetation as part of the process stabilizes the soil material and prevents erosion and surface water infiltration. Even this simple approach is likely to cost a few thousand dollars per acre to implement. Where soils have a sustained high acidity, the costs of using this approach can increase, sometimes to tens of thousands of dollars per acre. The challenge to find cost-effective reclamation approaches continues.

Promising reclamation options in the future may include using sludge, “biosolids,” from municipal waste water treatment processes as an organic soil amendment, and growing plant species that are more tolerant of acidic conditions.

Soil Treatment

High levels of metals in soils, not just acidity, can be harmful to plants, animals, and, in some cases, people. A common to specially designed repositories. This approach can be very expensive and controversial, but it is sometimes required. With this approach, the volume and toxicity of the soil is not reduced, the soil is just relocated. Effective soil treatment approaches in the future depend upon better understanding of the risks associated with metals in mine wastes. These “natural” metals in minerals may not be as readily available in the biosphere, and therefore, they may not be as toxic as the metals in processed forms, such as lead in gasoline.

Future approaches may include:

- Using chemical methods to stabilize metals in soils, making them less mobile and biologically available.
- Using bacteriacides that stop the bacterial growth that promotes the oxidation of pyrite and the accompanying formation of sulfuric acid.

- Using bioliners, such as low permeability and compacted manure, as barriers at the base of waste piles.
- Permanently flooding waste materials containing pyrite to cut off the source of oxygen, stop the development of acidic conditions, and prevent mobilization of metals.

Water Treatment

The most common treatment for acidic and metal-bearing waters is the addition of a neutralizing material, such as lime, to reduce the acidity. This “active” treatment process, which causes the dissolved metals to precipitate from the water, usually requires the construction of a treatment facility. The ongoing maintenance that such a plant requires makes this treatment technique very expensive.

Aside from the expense, some active treatment plants generate large amounts of sludge. Disposal of the sludge is a major problem. Because of the cost and the physical challenges of dealing with sludge, alternatives to active treatment facilities are needed. Some possible

alternatives include:

- Using "passive" wetland systems to treat metal-bearing water. This approach has been successfully used where the volumes and acidity of the water are not too great. Passive wetland systems have the added advantage of creating desirable wildlife habitat.
- Using in-situ treatment zones where reactive materials or electric currents are placed in the subsurface so that water passing through them would be treated.
- Combining treatment with the recovery of useful materials from contaminated water.

13. Risk Assessment & Disaster Management Plan:

(To be updated based on field survey)

14. Details of the Occupational Health issues in the District

The negative impacts of dust pollution due to quarrying activities on health revealed by respondent information were respiratory problem, eye infection, cough, sneezing, allergy , chest pain , headache , accumulation of dust on home , and slow growth of fodder for cattle and goats. Negative effects of dust pollution on crop productivity. Two major effects were reduction of agricultural yield due to deposition of dust on crop and secondly availability of ground water and water contamination. Another problem we noticed through interview was many agricultural labour were faced difficulty to work in dusty environment therefore resulting in reduction of agricultural yield indirectly. Many fruit trees also affected by dust pollution resulting in stunted growth and decreased fruit yields. There are also reductions in appearance of insect pollination like butterflies, bees, moths etc. due to dust pollution.

15. Plantation and Green Belt development in respect of leases already granted in the District

Protect natural or semi- natural environments:

- Improve air quality with inurban areas
- Protect the unique character of rural communities that might otherwise be absorbed by expanding suburbs.
- Plants that grow fast should be preferred
- Preference for high canopy covers plants with local varieties
- Perennial and evergreen plants should be preferred
- Plants having a high Air pollution Tolerance Index (APTI) should be- preferred.

Greenbelt Development & **Plantation Programme**

Plantation should be developed at 2**M**x2**M** spacing, the rate of survival should be aimed at 80% by regular watering & fencing to keep plants safe from animal grazing. Local species will be planted in consultation with local horticulturist. Diseased plants should be replaced by planting new saplings.

Recommendation for green Belt Development

It is strongly recommended to create greenbelt around the project or incase lease failed the authority should take proper action to stop mining operation or
Revoke mining permission with necessary action.

References:

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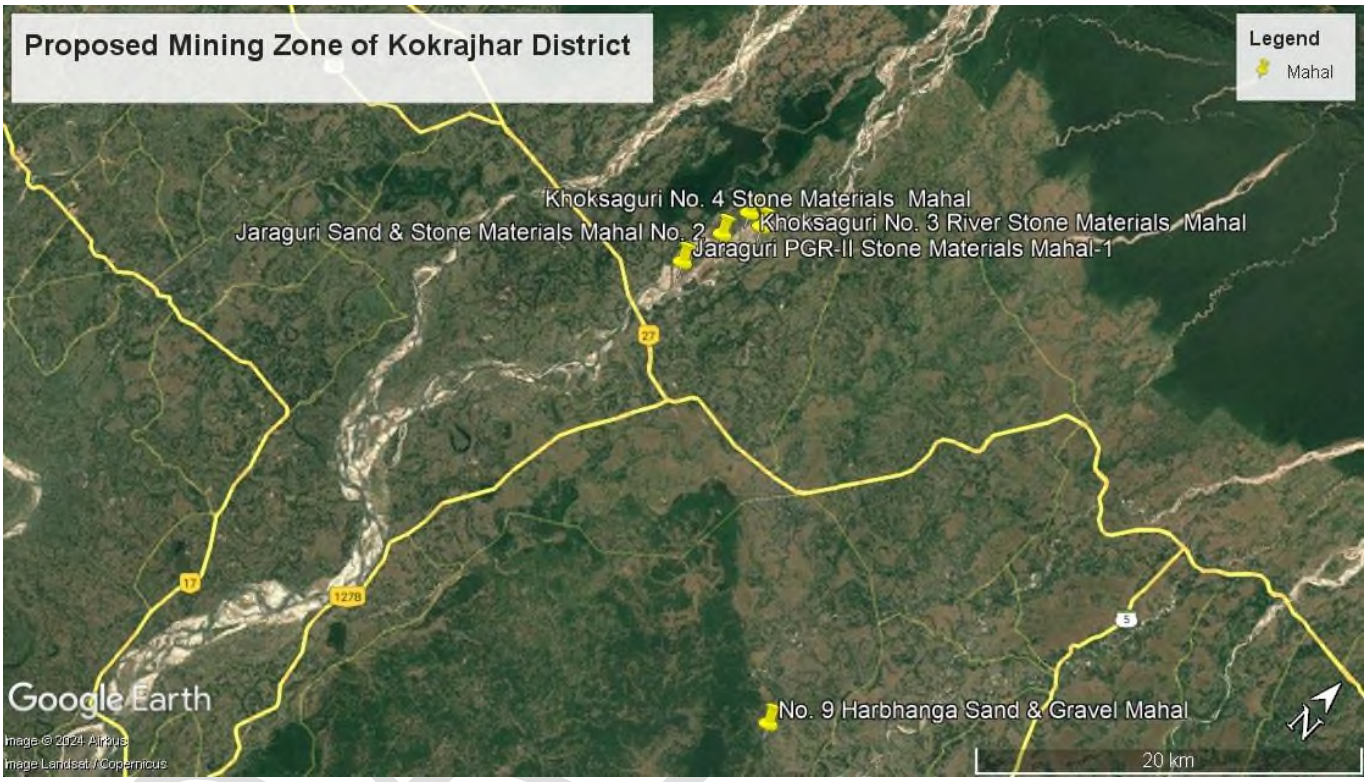
- https://www.researchgate.net/publication/364948163_Impact_of_Stone_Mining_on_the_Health_and_Environment_A_Study_of_the_Village_of_Mewat_India
- https://www.americangeosciences.org/critical-issues/faq/can-we-mitigate-environmental-impacts-mining

Annexture-I:


Proposed Mining Zone of Kokrajhar District
Legend
Mahal
Khoksaguri No. 4 Stone Materials Mahal
Khoksaguri No. 3 River Stone Materials Mahal
Jaraguri Sand & Stone Materials Mahal No. 2
Jaraguri PGR-II Stone Materials Mahal-1
No. 9 Harbhanga Sand & Gravel Mahal
Google Earth
Image © 2024 Airbus
Image Landsat / Copernicus
20 km
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