DRAFT

DISTRICT SURVEY REPORT

OF

BAKSA DISTRICT, ASSAM

(For sand or riverbed mining)

CPC Environment Solution Pvt. Ltd.

(A QCI-NABET Accredited Organization)

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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 legislativecontrol. 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 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 to 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 which are considered for promoting balanced and equitable mining practices.

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

Introduction

The District Survey Report (DSR) of Baksa District has been prepared following the guidelines of the Ministry of Environment, Forests and Climate Change (MoEF&CC), Government of India. This report aligns with the MoEF&CC Notification S.O.-1533(E) dated 14th September 2006 and subsequent notification S.O. 141(E) dated 15th January 2016. It aims to ensure the scientific and systematic utilization of natural resources for the benefit of present and future generations. Furthermore, MoEF&CC's notification S.O. 3611(E) dated 25th July 2018 recommends the format for preparing the DSR.

The main objective of the DSR is to identify areas of aggradation where mining can be allowed, and areas of erosion where mining should be restricted. It also involves the calculation of the annual replenishment rate to maintain ecological balance. Additionally, the DSR includes 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 riverbed mining and reduction of demand- supply gaps.
3. Use of Information Technology (IT) for surveillance of riverbed 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/trench 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.

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.

Utilization and Demand of the minerals

Riverbed 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. Riverbed mining is a prevalent practice in Baksa 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 Baksa district come under B-category mining .

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.

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 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 (LU)/land cover(LC).

b. Data Analysis and Map Preparation

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

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

These maps help to 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 to 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**: 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 to cater light in the production of minor minerals and the revenues generated from the mining sectors.
- **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 jaw dropping 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 Baksa district collection of sand, gravel, stone, clay/silt etc. from riverbed is considered as one of the main minor mineral sources of the district. These materials are primarily used for civil construction purposes.

3. List of existing mining leases of the districts

Sl. No.	Name of Mining lease	Name of the lessee	Location and area of mining lease	Period of lease	Status (working/ closed)
1	Chandrapur Sand, Gravel & Stone Mahal	Sri Janata Brahma	4.90 Ha		Existing
2	Dirring Sand, Gravel & Stone Mahal No.1	Sri Maheswar Basumatary	4.10 Ha.		Existing
3	Dirring Sand, Gravel & Stone Mahal	Sri Maheswar Basumatary	4.95 Ha.		Existing
4	Dawjima Sand & Stone Mahal	Sri Diganmta Boro	4.98 Ha.		Existing
5	Mora Pagoldiya Sand Gravel & Stone Mahal	Sri Mridul Das	4.95 Ha.		Existing
6	Borikadanga (Bengalisupa) Sand Gravel & Stone Mahal	Sri RidipDeka	4.90 Ha.		Existing
7	Pallanadi Sand & Stone Mahal	Sri Sumit Kr Boro	4.98 Ha.		Existing
8	Sunbari Sand & Stone Mahal	Smt. Monica Brahhma	4.68 Ha.		Existing
9	Pagladia Barikadanga Sand Gravel & Stone Mahal	Sri NipulKalita	4.90 Ha.		Existing
10	Unniguri Sand & Stone Mahal	Sri MonojNarzary	4.98 Ha		Existing
11	Onthaibari Sand Gravel & Stone Mahal	Sri Decorous Mosahary	4.98 Ha.		Existing
12	Pakhamara Sand & Stone Mahal	Sri Ranjan Boro	4.98 Ha.		Existing
13	North Pagladiya Sand Gravel & Stone Mahal		4.94 Ha.		Proposed

14	Khagrabari Sand Gravel & Stone Mahal		4.90 Ha.		Proposed
15	Pagladiya Sand & Stone Mahal	Sri Ratan Boro	4.95 Ha.		Proposed
16	Nalzora Sand Gravel & Stone Mahal		4.99 Ha.		Proposed
17	Sinari North Sand Gravel & Stone Mahal	Sri Bubul Singh Brahma	4.99 Ha		Proposed
18	Sunbari Sand Gravel & Stone Mahal No-A		4.98 Ha		Proposed
19	Saunbari Bispani Sand Gravel & Stone Mahal		4.95 Ha.		Proposed
20	Borikadang Sand, Gravel & Stone Mahal	Sri Ganesh Basumatary	4.90 Ha.		Proposed
21	Khagrabari (Mwitabari) SS Mahal		4.90 Ha		Proposed
22	Pub- Baramchari Sand & Stone Mahal		4.50 Ha		Proposed

M- Sand Plants with Location (Manufacture sand)

Sl. No.	Name of Mahal	Name of the lessee	Location and area of mining lease	Period of lease	Status (working/ closed)
1	M/s J.B. Enterprise	Sri Janata Brahma	Maithabari, Subankhata		
2	M/s Dirring Stone Crusher Industry	Sri Sudhang Kr. Brahma	Sinaribasti, Mushalpur		
3	M/s Shree Krishna Automatic Sand Screening & Washing Plant	Sri Uttam Pathak	Dalajani, Jalah		
4	M/s SGCCI	Sri Rahul Jain	Kalpani, Jalah		
5	M/s M.B. Crusher	Sri Debadib Das	Sunbari, Jalah		
6	M/s Basumatary & Co.	Smt. Rita Boro Basumatary	Barikadonga, Baksa		

7	M/s HSG Associate	Sri Kailash Talukdar	Anchali, Jalah		
8	M/s Shree Krishna Stone Crusher Plant (Stone Crushing & Screening Plant)	Sri Uttam Pathak	Dalajani, Jalah		
9	M/s Rajdhani Engineering	AbulKalam Azad	Unnekuri, Jalah		
10	M/s Bathou Enterprise	Sri JugalSaha	Khagrabari, Baksa		
11	M/s Rhino Enterprise	Rafiqul Islam	Gobardhana, Jalah		
12	M/s Rangadao Stone Crusher	Smt. Sabita Ramchiary	Nikashi, Mushalpur		
13	M/s Danswarang Enterprise	Smt. Anita Das Baro	Maithabari, Baganpara		

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

Revenue generated for last 3 years in Baksa District is furnished in the table.

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

Financial Year	Total revenue
2024-23	77313376.00
2023-22	86557883.00
2022-21	79492753.00

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

Sl. No	Financial Year	Production(cum)
1	2024-23	
2	2023-22	
3	2022-21	

(to be updated)

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

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 riverbed 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 aftermath of rainy season.

Sediment transport is the movement of organic and inorganic particles by water. In general, the greater the flow, the higher will be the rate of sedimentation. 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 and floodplains.

Sediment transport is critical to grip 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 :

The original word 'Baksa' is not above controversy, a good chunk of population prefer to use 'Bagsa' in lieu of 'Baksa'. The popular assumption that 'Baksa' is the misspelt form of 'Bangsa'- a 'Dzonkha' word meaning a farm house and a corridor as it is known that Bhutanese king and subjects used this area for trade and passage to the plains. 'Bangsa' (Bagsa or Baksa) was in fact one of the most important 'Dooars' of Bhutan. Another source says that the name "Bagsa" is originated from Bhutanese language. According to Bhutanese origin they denoted the area as "Bagsa Duar". "Bagsa" means one kind of rice and "Duar" means entrance point. As Bhutanese king ruled these areas for a long time in an around first half of the nineteenth, so it might be possible that the name "Bagsa" or "Baksa" had a Bhutanese origin. According to Bodo source the name originated from a kind of rice grain which is known as "Bagsa". The said rice grain is one kind of broken and uncleaned product which is gained after milling the rice. As the name Baksa is itself derived from various sources and antecedents so there exists lots of controversy over the name. But still today no concrete evidence has been found which might determine the final source. Only popular sources and folklores are evident but no historical source has been found. Now the name Baksa is officially taken and used.

As a result of the historic BTC (Bodoland Territorial Council) accord signed on February 10th, 2003, BTAD (Bodoland Territorial Autonomous District) was formed with four districts namely Baksa, Chirang, Kokrajhar and Baksa. Baksa district was carved out of Nalbari, Barpeta, Kamrup and a small portion of Darrang district.

Baksa district is located in the north- western part of Assam with the district headquarter at Mushalpur, which is 105 Km away from state capital Dispur, Guwahati and 20 Km away from National Highway no.31 towards north. The main mode of connectivity with the district is by Road. The district headquarter is linked to the National Highway 31 mainly at two junction points namely Barama and Kadamtola. It shares its border with Tamulpur district in the east, Barpeta, Nalbari and Kamrup districts in the south and Chirang district in the west. The district also shares the privilege of having International Boundary with Bhutan in the North. The gentle and gradual slopes can be seen stretching from the foot hills of Bhutan and reaching out to the southern tips of Barpeta, Nalbari and Kamrup district.

Baksa was notified as one of the districts of Bodoland Territorial Council in October 2003 while it started functioning from 1 June 2004 when naturalist-bureaucrat Dr Anwaruddin Choudhury of the Assam Civil Service took charge as its founding Deputy Commissioner.

Administrative Setup :

Deputy Commissioner of the District is the overall in charge of the administration of the entire district. He also acts as the Collector in case of Revenue matters, as a District Magistrate in case of maintenance of Law and Order and General Administration, as a District Election Officer in case of conduct of Election, as a Principal Census Officer while conducting Census, and so on. A number of Officers, like Additional Deputy Commissioners, Subdivisional Officers, Extra Assistant Commissioners and others assist the Deputy Commissioner is looking after the administration of the district. At lower level each sub-division is headed by one Sub-Divisional Officer whereas under him there will be Revenue Circle Officers for each revenue circles who are responsible for the entire administration of the area under their respective revenue circle. For the administrative purposes, theentire district is divided into two sub-divisions : Mushalpur, Salbari. These sub- divisions comprising of 384 villages are further divided into 4 revenue circles. Important point to be noted is that Baksa is the only district in Assam where there is no notified town. Baksa district covers an area of 2400 Sq.Km.

GENERAL INFORMATION ABOUT BAKSA DISTRICT :	
1. Geographical area	2400 Sq. Km (Approx)
2. Population	**9.53773** Lakhs (as per 2011 census)
3. Sub-Divisions	1. Mushalpur (Sadar)
	2. Salbari(Civil)
4. Revenue Circles	1. Baska (Sadar)
	2. Barama
	3. Baganpara
	4. Jalah
5. Development Blocks	1. Baska Dev. Block
	2. Tihu-Barama Dev. Block
	3. Gobardhana Dev. Block
	4. Jalah Dev. Block
	5. Dhamdhama Dev. Block
6. Education Blocks (Ele.)	1. Baska
	2. Jalah
	3. Tihu- Barama
	4. Gobardhana
7. Health Blocks	1. Mushalpur BPHC
	2. Barama BPHC

	3. Jalah BPHC
	4. Golagaon BPHC
8. Total Police Stations	1. Mushalpur (HQ)
	2. Barbari PS
	3. Barama PS
	4. Salbari PS
	5. Simla PS
	6. Gobardhana PS
9. Total Out Posts	1. Baganpara Out Post
	2. Nikashi Out Post
	3. Doomni Out Post
	4. Athiabari Out Post
	5. Anandabazar Out Post
	6. Dalbari Out Post
10. Total Patrol Posts	1. Jalah Patrol Post
	2. Barbari Patrol Post
	3. Simlaguri Patrol Post
	4. Labdangguri Patrol Post
11. No. of Villages	384
12. No. of Tea Gardens	1. Doomni
	2. Fatemabad
13. No. of BTC Constituencies	11
14. No. of LAC(major part)	1. 62- Barama LAC
	2. 63- Chapaguri LAC

ACCESS TO THE DISTRICT:

By Road Connectivity:

There are number of bus services and small car services (Winger, Cruiser etc.) from Adabari and Basistha Chariali, Guwahati via NH31 touching two connection points to district head quarter (one at Barama, another at Kadamtola). Distance between Guwahati and Barama via NH31 is about 75 Km and Guwahati and Kadamtola via NH31 is about 80 Km.

i) From Adabari Bus Terminal, Guwahati there is direct bus service to Mushalpur (HQ). Distance is about 100 Km.
ii)From Adabari Bus Terminal, Guwahati there is direct bus service to Salbari Sub-Div HQ. Distance is about 160 Km.

By Railway Connectivity:

The district does not have any railway station. However the nearest railway station is Tihu which falls under Nalbari district (Distance 35 Km from District HQ). The distance of Nalbari railway station from district HQ is about 45 Km and Distance of Pathsala railway station (Barpeta district) is about 50 Km.

The distance of Guwahati railway station to district HQ by road (via NH 31) is about 105 Km.

By Air Connectivity:
The nearest airport is Lokpriya Gopinath Bordoloi International Airport at Borjhar, Kamrup (M) which is about 130 Km from the District HQ.

Places of Tourist Interest:

Baksa district has massive potential for development of tourism. The world famous Manas National Park falls under Baksa district. The main places of tourist interest in the district are as follows:-

1) Manas National Park
2) Manas Soushi Khongkhor
3) Moina Pukhuri
4) Daragaon Picnic Spot

1) Manas National Park & Tiger Project: Located at the western part of the district in the foothills of Bhutan, it is a place of great tourist attraction-both national as well as international. There are about 60 species of mammals, 312 birds, 42 reptiles, 7 amphibian, 54 fishes and more than 100 species of insects. The most abundantly found animals are Tiger, Leopard, Golden Langur, Pigmie Hog, DhaneshPakhi, Wild Buffalo, Bison, Python, Wild Cat, Elephant, Hyena, Fox etc. The river Manas flows through the National Park. River rafting facility is newly introduced for the tourists. Both govt. and private lodging and food facility is available.

Nearest Railway station: Barpeta Road

Connection through motorway: Barpeta Road - Bansbari forest range (Distance about 15 Kms)

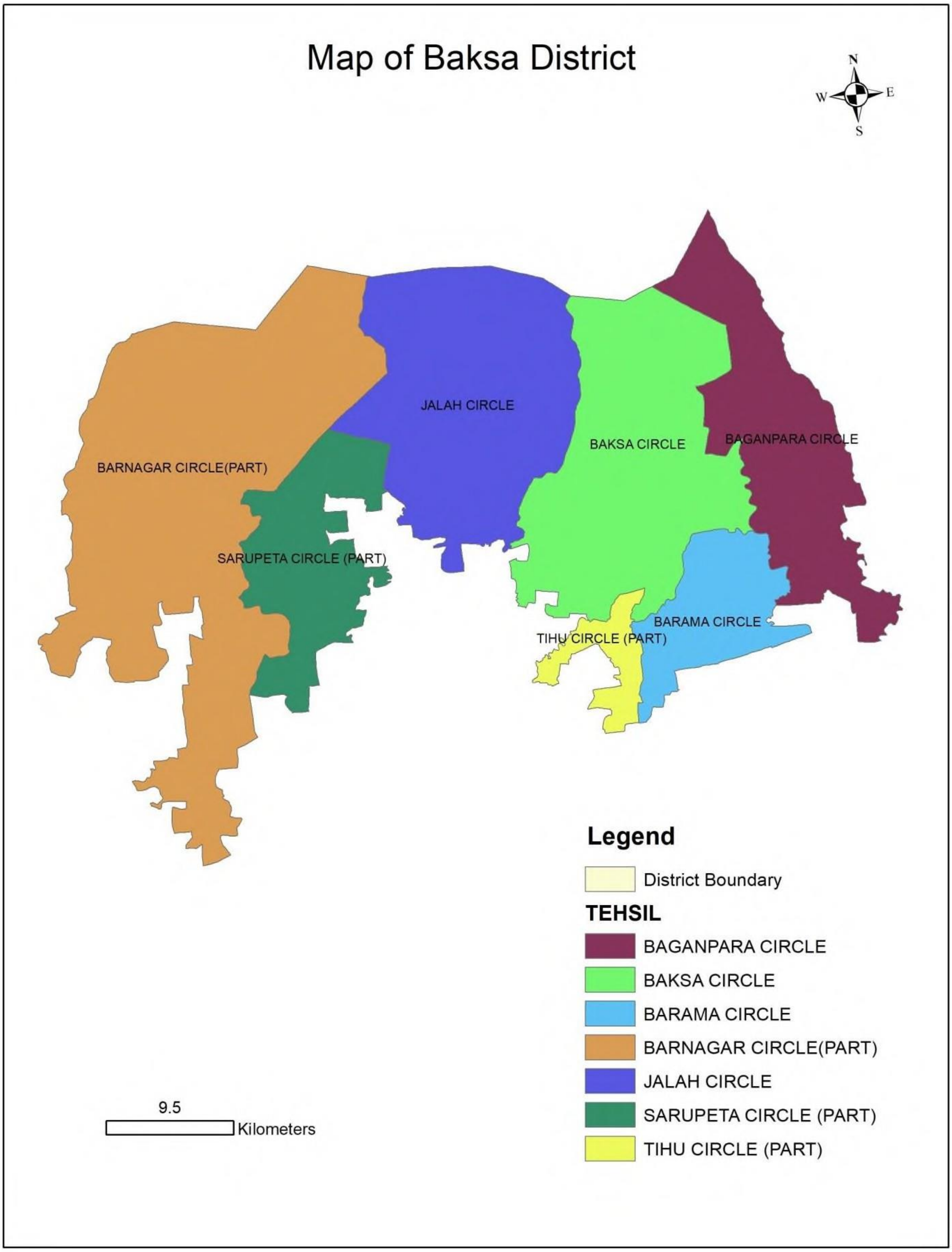
2) Manas Soushi Khongkhor: An eco-tourism spot located in the middle of Baksa district on the mouth of river Pagladia. Enshrined with natural beauty just adjacent with Bhutan hills, it attracts a large number of picnic goers in the month of December and January. It is new well maintained and looked after by an NGO known as Manas Soushi Khongkhor Eco Tourism Society (MASKETS). Some endangered wild animals such as Bison, Deer, Hogg Deer, White Belly Heron, Royal Bengal Tiger etc. are found here. Food and Guest House facility is provided by the volunteers of MASKETS if needed.

Nearest Railway station: Nalbari

Connection through motorway:

i) Mushalpur- Nikashi- Subankhata- Chowki (Distance about 25 Kms)

ii) Nalbari- Baganpara- Nayabasti- Subankhata- Chowki (Distance about 55 Kms)



Map: Administrative map of the District

b) Climatic condition:

The climate of the district is sub - tropical in nature with warm and humid summer followed by dry and cool winter. The average annual rainfall is about 2,200 mm per annum of which 70parcent is received during monsoon season (June to September). The rainfall is not uniform rather erratic. The mean maximum and minimum temperature varies from 33 to 38° C and 8 to 10°C respectively. The relative humidity varies from 65 - 90 per cent. The sky remains cloudy during June to September. The light and sun shine hour is the highest during March – April.

c) Drainage System

Number of perennial streams flow through the district from north to south and join the Brahmaputra River. The major streams that drain the area are Mara Manas, Palla, Po-Mara, Kaldia, Tihu, Burhadia, Pagladia, Nona and Puthimari River. The whole drainage of the district ultimately finds its way to all rivers and tributaries.

Assam state comprises of two main river valleys. The northern valley is known as the Brahmaputra valley and the southern valley is known as Barak valley. Baksa district falls in the Brahmaputra valley which is an alluvial plain in between the foot hills of Bhutan ranges and other hill tracts, on North and central ranges of Naga, Karbi, Khasi, Jaintia, Garo hills etc. This valley approximately covers 56339 sqkm. of riverine area within the strip of both bank of the river, stretching from Sadiya on the east up to Baksa on the West.

The district contains a network of 3 major rivers namely Beki, Pagladia, and Barnadi and around 10 small rivers which are very active during the summer season. There are numerous springs and streams which are a good source of water for household use and small scale irrigation. The district is endowed with large number of Dongs (Natural Depressions) where water remains stagnant for a large part (around 8 months) of the year. Farming community is using dong water for irrigation of their crops since long. The ground water is good and remains at about 25 to 45 feet during winter. Utilization of this water resource in the foothill region during winter is a problem since soil is shallow.

d) Irrigation

The district is primarily rainfed. Out of the gross cropped area of **164862** ha, the extent of irrigated land is only **22,043** ha, i.e. 13.37% of total cropped area. Considering the block-wise data, percentage of gross irrigated land to gross cropped area is maximum in Goreswar block, followed by Tamulpur block, i.e 21.0% and 20.8% respectively.

A total of **1,42,819** ha of area is under rainfed cultivation. While comparing the ratio of area under rainfed cultivation to gross cropped area in each block, Dhamdhama block comes at the top position with 90.35% (gross cropped area of 21146 ha) under rainfed irrigation, followed closely by Baska block with 90.34% area under rainfed cultivation (gross cropped area of 21085 ha). The area under partial irrigation has been reported to be zero across all the blocks the district.

Table No. 2.3: Irrigation Based Classification (Undivided Baksa District)

Block	Irrigated (Area in Ha)		Rainfed (Area in Ha)	
	Gross Irrigated Area	Net Irrigated Area	Partial /Protective Irrigation	Un- Irrigated or Totally Rainfed
Baksa	2,037.00	1,767.00	-	19,048.00
Tihu- Barama	2,096.00	1,812.00	-	19,066.00
Tamulpur	4,756.00	3,388.00	-	18,099.00
Nagrijuli	1,580.00	1,580.00	-	14,572.00
Goreswar	4848	3477	-	18,226.00
Jalah	2,065.00	1,843.00	-	18,728.00
Gobardhana	2,620.00	2,390.00	-	15,975.00
Dhamdhama	2,041.00	1,771.00	-	19,105.00
Total	**22,043.00**	**18,028.00**	**-**	**1,42,819.00**

Source: Irrigation Department, Baksa

e) Soil resources

The district forms a part of the vast alluvial plains of Brahmaputra River system and sub-basin of River Manas. Physiographically, it is characterized by the different land forms resulting from a) denudation structural hill and b) alluvial plain. The low mounds/hillocks are covered by a thick lateritic mantle and these are occupied by evergreen mixed forests. The alluvial plains comprise of Older and Newer alluvium.

The Older alluvium occupies the piedmont zone towards the north of the district bordering Bhutan. The narrow zone at the Himalayan foothill is known as the Bhabar zone and it supports grow of dense forests. To the south of the Bhabar zone and parallel to it, the flat Terai zone lays where the ground remains damp and sometimes, spring oozes out. The Terai zone is covered by tall grass. The Newer alluvium includes sand, gravel, pebble with silt and clay. Soil in greater parts of the district is sandy and silty loam, or clayey loam. The variation in composition is mainly due to the varying composition of the river borne 2 materials deposited at different times and under different conditions. The younger alluvial soil has a high phosphorous content whereas, in Older Alluvial soils, it is very low. In general, the soil is acidic to slightly alkaline in nature and is moderately permeable and characterized by the presence of low organic carbon and low soluble salts. Soils restricted to inselberg areas are more clayey, lateritic and less permeable and are highly acidic in nature.

From agricultural point of view, the soils in major parts of the district are suitable for all sorts of crops Overall the soil of the district has been classified into two orders namely

(i) Entisols (new alluvium) and
(ii) Inceptisols (Old alluvium).

The soil of this zone is mostly acidic in nature and pH increases towards south direction. The Organic carbon and available Nitrogen of the soil mostly varies from medium to high, low to medium in available P_2O_5 and medium K_2O status. The district has a more or less plain topography, some hillocks are found elsewhere. It has a gentle slope from northern side towards south direction.

Soil erosion is a naturally occurring process that affects all landforms. In agriculture, soil erosion refers to the wearing away of a field's topsoil by the natural physical forces of weather and wind or through forces associated with farming activities such as tillage. In the Baksa district, soil movement by rainfall (raindrop splash) is usually greatest and most noticeable during short-duration. Floods accompanied with soil erosion and sand deposition causes maximum damage to standing crops of the agricultural lands in the district and as a result the soils are subjected to severe soil erosion during rainy season. Due to topographical factors, the soil is subject to splash, sheet and gully erosion resulting into degradation of the soil. Besides this, there is biotic pressure on the lands to the curb this menace particularly on the agricultural lands.

f) Groundwater prospects in the district :

Hydrogeology The ground water conditions in the district can be described under two distinct hydrogeological units, i.e. conditions prevailing in the semi-consolidated formations and conditions prevailing in the unconsolidated formations.

I) Semi-Consolidated Formations: A very narrow belt of Upper Tertiary semi consolidated rock formation engulf the northern fringe area of the district with Bhutan consisting mainly claystone/siltstone/sandstone and form low to moderate altitude denudation structural hills. The trend of hills is generally in E-W direction. These are characterized by high run off, low infiltration to groundwater and experience secondary porosity development through cracks/joints/bedding planes. Springs are developed in this belt.

II) Unconsolidated Formations: Major parts of the district are underlain by unconsolidated formations represented by the alluvial deposits of Recent age. Bhabar formation comprises of the alluvial sediments at the foothill belt in the north and the valley covering the central and southern part. The behaviour of ground water in the piedmont sediments is naturally different from that in the alluvial areas occurring further south.

Bhabar- Terai Belt: This zone consists of the terrace deposits in the foot hill regions of the Himalayas composed of talus fans. The material is a heterogeneous admixture of boulders, pebbles, cobbles with the interstices filled by sand and silt. These sediments are highly permeable with low retentive capacity. Thus, the streams in this region are devoid of any appreciable surface flow, although, there are evidences of sub- surface flow. Behaviour of ground water in the further south is less erratic. Here, ground water occurs under water table conditions. The depth to water level is rather high.

Older Alluvium: Ground water occurs under water table conditions in the elevated flat-topped areas of Older alluvial sediments. These areas are usually forested. It comprises of sand, gravel and silt with higher proportion of clay. Ground water occurs under unconfined to confined conditions.

Newer Alluvium: The district is mostly covered by Newer alluvium and the formation comprises of sand, gravel and pebble with silt and clay. Ground water in this zone occurs under unconfined condition. Based on the behaviour and occurrence of ground water, the regional ground water flow system of district has been described under following categories.

i. Shallow Aquifer Group occurring within 50 m depth.
ii. Deeper Aquifer Group beyond the depth of 50 m and down to 200 m bgl.

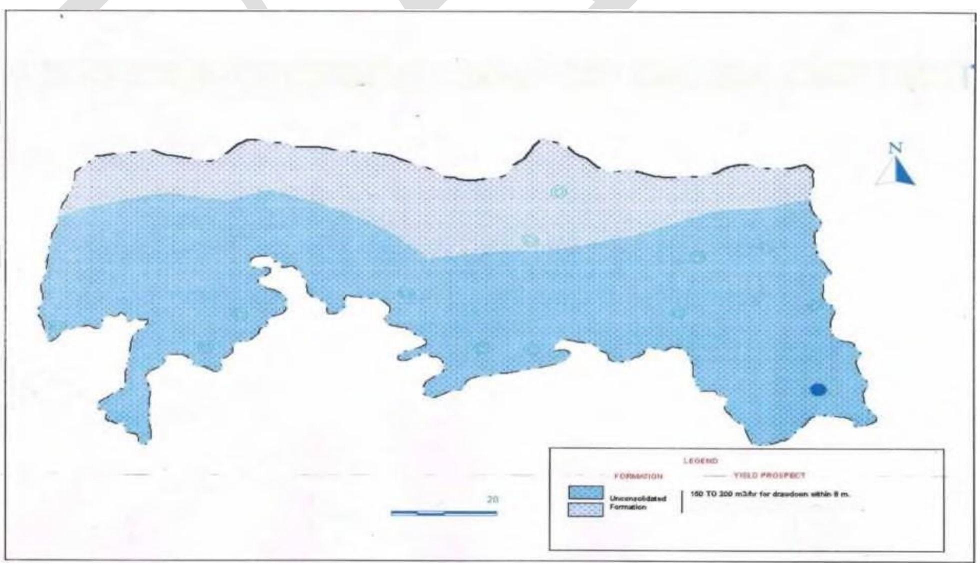
i. Shallow Aquifer Group: It consists of a mixture of boulder, gravel, sand, silt and clay. The thickness of the aquifer varies from 15 to 40 m. Ground water in this aquifer generally occurs under water table to semi-confined conditions. The pebbles, boulders are restricted mostly to the northern parts of the district. They occur at the depth between GL to 50 m bgl. The development of ground water from this aquifer is done by open well and shallow tube well for both the domestic and irrigation purposes. The water level in the major parts of the district generally lies between 2 to 4 m bgl. The northern most parts occupied by the piedmont zones and the areas adjoining to the border area are having deeper water level. The movement of ground water is southerly towards Brahmaputra River. The water table contour follows the topography of the area and lies more or less parallel to the Brahmaputra River. The hydraulic gradient becomes gentler towards south.

ii. Deeper Aquifer Group: It consists of coarse to medium sand with intercalation of clay. Ground water occurs under water table to confined conditions. Detailed hydrogeological surveys aided by exploratory drilling revealed the existence of two to three promising aquifer zones down to the depth of maximum 200 m bgl. Aquifer displays various degree of lateral and vertical variation of aquifer indicating various degree of depositional environment both in space and 4 times. The piezometric surface is highly variable and the movement of ground water is towards the south.

Ground Water Resource: Resources could not be computed for 2009 as the district was not formed at that time and was part of Darrang district.

Ground Water Quality: The ground water of the district is acidic to slightly alkaline in nature. Ground water has low content of dissolved minerals. The iron content is generally high for use for drinking purpose in some areas. In most of the sources, it is within permissible limit as per BIS (1991) standard of 1.0 ppm and as such, it does not pose any serious health hazard. Except high iron content, the ground water of the district is suitable and safe for drinking and other uses. Ground water of both shallow and deeper aquifers is suitable for irrigational and industrial purposes. Ground water having a little higher concentration of iron can be used after treatment.

Ground Water Management Strategy: Shallow ground water structures are congenial for construction in the district, as water resource and aquifer material are laterally persistent throughout the district. Dug wells and dug-cum-bore wells especially near the border area are beneficial. Deep tube well can be constructed preferably below the depth of 50 m tapping aquifer zone with an expected discharge of about 100 m3 /hr. 6.0 Ground Water Related Issues and Problems Floods devastate the district regularly during the monsoon season. Flood accompanied with soil erosion and sand deposition causes maximum damage to standing crops of the agricultural lands. Other than high Iron content in sporadic occurrences, most of the chemical constituents are within permissible limit.



Map: HydroGeological Map of Baksa (Undivided) District.

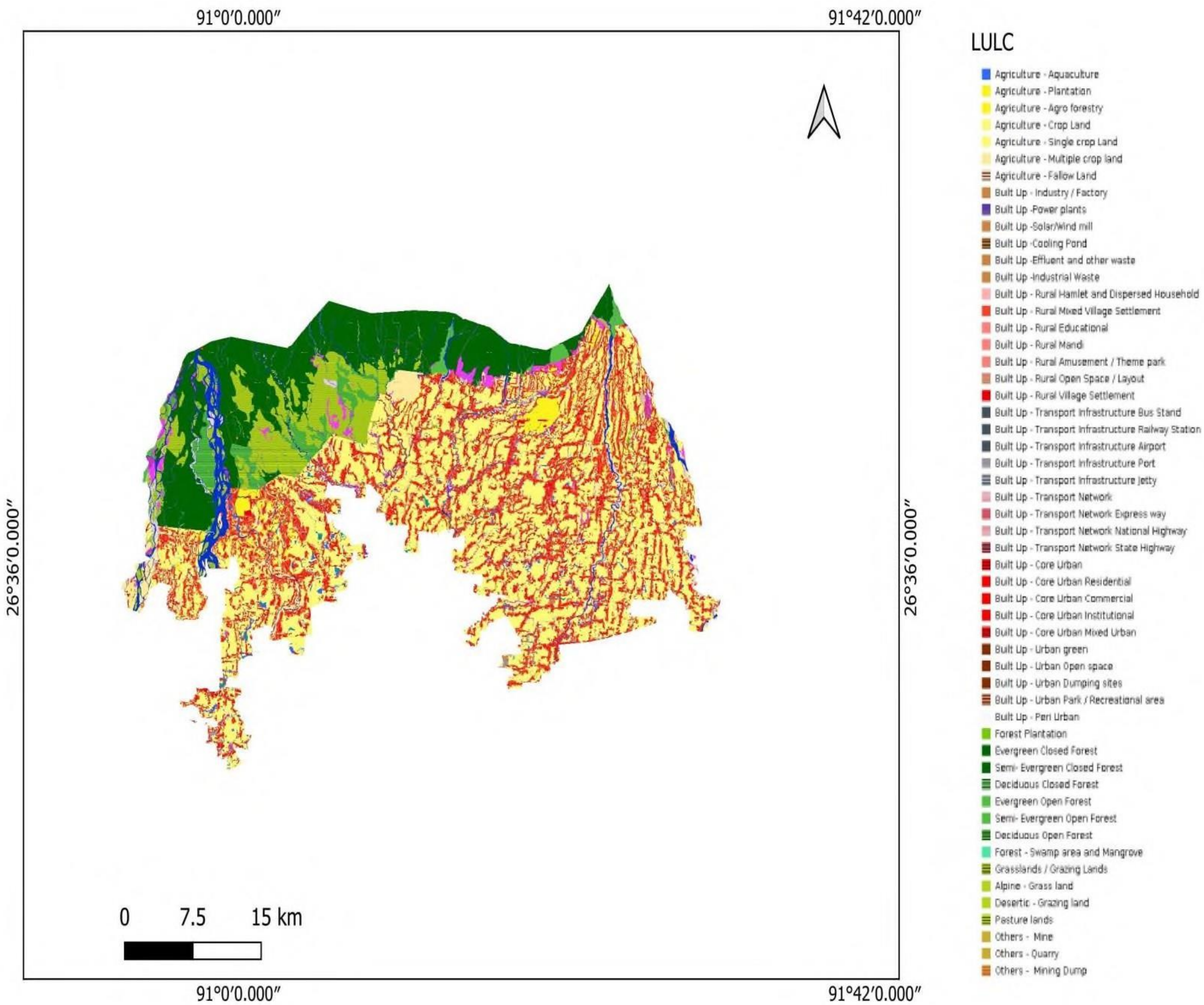
8. Land and land use pattern:

The total geographical area (TGA) of Baksa is 2.07 lakh hectare. The largest Block of the district is Gobardhana which comprises of a TGA of 42,787 hectare i.e. about 20.6% of the TGA of the district.

Table : Land use pattern in Baksa District (Undivided)

Name of the Taluka	TGA	Area under Agriculture				Area under forest	Area under wasteland	Area under other uses
		GCA	NSA	AST	CI (%)			
Goreswar	28747	23074	18861	4411	140	-	-	-
Nagrijuliu	20277	16152	13990	3560	120	4400	1257	629
Tamulpur	27155	22855	18698	10690	119	6843	1955	978
Dhamdhama	18777	21146	19620	9974	117	3943	1127	563
Baska	27102	21085	19587	4499	118	6504	1301	867
Barama	13427	21162	19619	13595	121	-	989	477
Gobardhana	42787	18595	16095	-5280	118	11381	3252	1626
Jalah	29456	20793	19402	3031	118	6804	1944	972
Total	**207727**	**164862**	**145872**	**44480**	**121**	**39876**	**11825**	**6112**

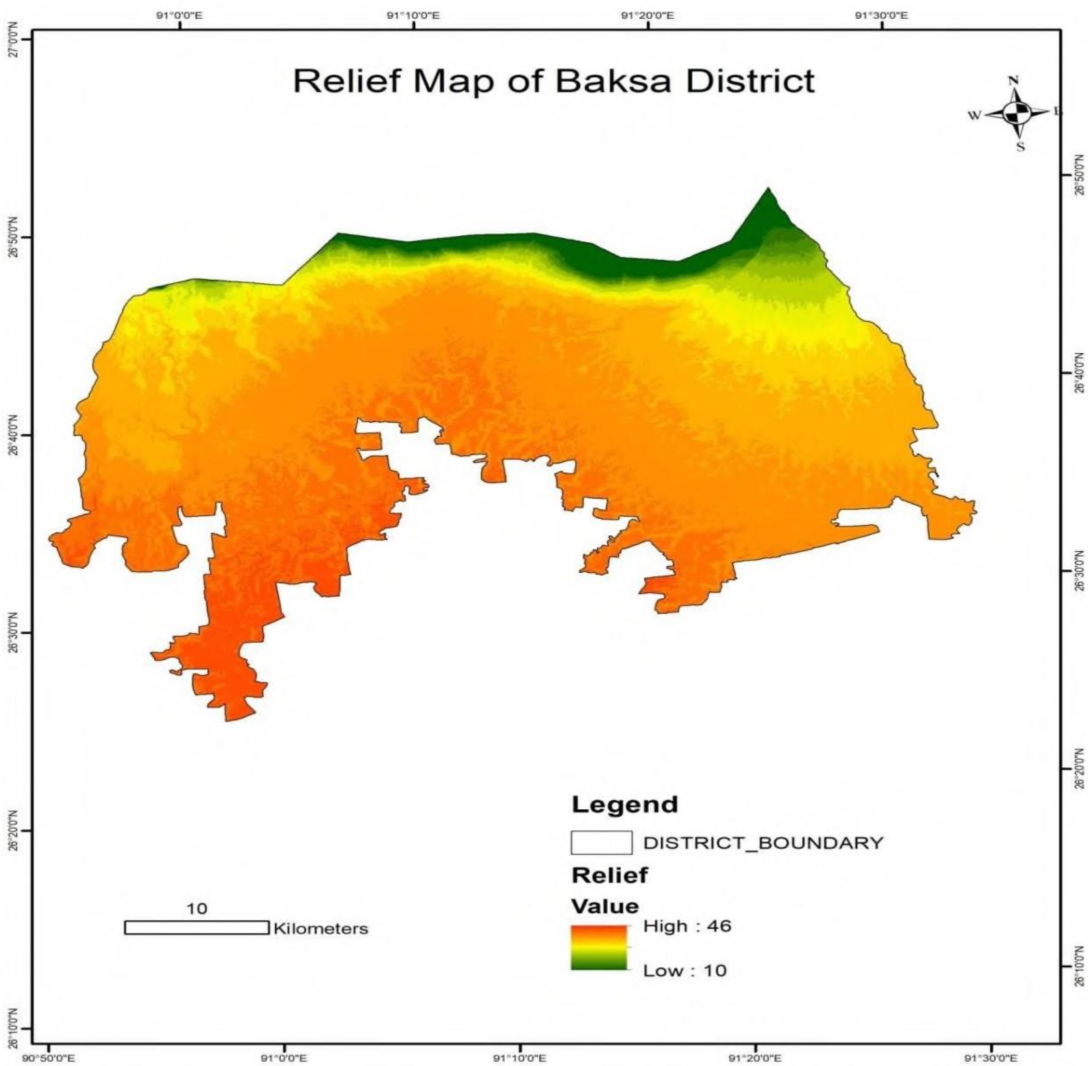
Source: Department of Agriculture, Baksa
TGA- Total Geographical Area, GCA- Gross Cropped Area, NSA- Net Sown Area, AST- Area Sown more than once, CI- Cropping Intensity



Map: Land use land cover map of Baksa district

9. Physiography of the District

The district forms a part of the vast alluvial plains of Brahmaputra River system andsub-basin of River Manas. Physiographically, it is characterized by the different land forms resulting from a) denudation structural hill and b) alluvial plain. The low mounds/hillocks are covered by a thick lateritic mantle and these are occupied by evergreen mixed forests. The alluvial plains comprise of Older and Newer alluvium. The Older alluvium occupies the piedmont zone towards the north of the district bordering Bhutan. The narrow zone at the Himalayan foothill is known as the Bhabar zone and it supports grow of dense forests. To the south of the Bhabar zone and parallel to it, the flat Terai zone lays where the ground remains damp and sometimes, spring oozes out. The Terai zone is covered by tall grass. The Newer alluvium includes sand, gravel, pebble with silt and clay.



10. Rainfall

The climate of the district is sub-tropical in nature with warm and humid summer followed by cool and dry winter. The average rainfall of the district is found to be 76 mm in the recent years.

YEARS	JAN	FEB	MAR	APR	MAY	JUN	JUL	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	21.5	87.2	73.1	355.4	314.8	373.5	200.8	515.6	26.1	31.1	19.2
2019	0.6	31.3	25.9	315.8	575.7	645.4	773.4	166.5	239.3	44.6	7.1	0.1
2020	12.5	6.4	21.1	123.9	608.5	941.8	807.8	168.7	407.7	100.3	0	4.3
2021	32.6	10	40.3	115.3	228.7	542.3	282.9	295.8	217.4	37.6	0	0
2022	15.7	35.3	61.8	662.7	549.7	1014.2	289.1	217.9	195.2	247.9	0	3.2

Temperature:

The district enjoys a sub-tropical humid climate with a hot summer and moderate winter. January is the coldest month and July/August is the warmest month. The winter temperature drops to 10°C and summer temperature goes up to 35°C. South-West monsoon activates from June and continues up to September-October.

11. a) Geology

(i) Regional Geology:

The Shillong Plateau (approx. 47,614 sq. km) is a Precambrian cratonic block in Northeast India, tectonically separated from the Indian Peninsula. It is bordered by:

- Dauki Fault to the south (dextral strike-slip fault),
- Brahmaputra Lineament to the north,
- Garo-Rajmahal Grabenand Dhuburi/Madhupur Lineament to the west,
- Belt of Schuppen to the east.

This block is made up of high- to medium-grade Paleoproterozoic basement gneisses and schists, which are classified as the **Basement Gneissic Group (BGG)**. These are overlain by Mesoproterozoic metasediments and metavolcanics of the **Shillong Group**, intruded by Neoproterozoic acidic intrusives such as:

- Myllem pluton
- South Khasi pluton
- Umroi granite
- Nongpoh pluton

The plateau is composed mainly of orthogneiss and paragneiss with the following geological units:

- Banded gneiss (bimodal character)
- Migmatite
- Augen gneiss
- Banded Iron Formation (BIF)
- Amphibolites
- Pyroxene granulite
- Calc granulite
- High-grade sillimanite-bearing metapelite with cordierite, corundum, spinel, sapphire.
- Intrusives like lamprophyre, diorite, granodiorite, mafic intrusions, andpegmatite veins.

Towards the southern boundary of the Shillong Plateau, Cretaceous–Tertiary sedimentary sequences overlay these basement rocks. The plateau also contains an intra-cratonic basin (approx. 2,500 sq. km) with sedimentary cover.

The Assam Basin to the north represents the cratonic margin with three main tectonic phases:

1. Late Cretaceous to Eocene block faulting and development of a southeasterly dipping shelf.
2. Oligocene uplift and erosion, during which basement faults reactivated.
3. Post-Oligocene phases, marked by sedimentation and structural developments.

The Eocene Sylhet Formation is significant for its varied depositional environments:

- The Lakadong Member (lagoonal environment) contains thin sandstone and interbedded shale and coal.
- The upper part of the Lakadong Formation represents calcareous sandstones formed in a shallow water platform.

11. b) Mineral Wealth

1. Overview of mineral resources:

In Baksa District especially riverbed sand & gravel deposits are found to occur. The flood plain deposits of Sand, Gravel, Stone, Clay/ Silt and M-sand occur in the form of fossilized channel. These have intrinsic economic interest in or within the earth's crust in such form, quality & quantity that these are reasonable for eventual economic extraction.Geological investigation carried out at Baksa reveals that a compatible relationship exists between the geological set up of Baksa & minor mineral occurrences.

Names of minor minerals , found at Baksa, are elucidated below: Riverbed Sand, Gravel, Stone, Clay/ Silt and M-sand Deposits having variation only in framework or sediment particles diameter

2. Details of Sand and other riverbed minerals Resources:

(The mineral resources of the district whose categorization and estimation is to be done will be furnished in this section.)

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	Dirring		
2	Kaldia		
3	Pallanadi		
4	Beki		
5	Pagladia		
6	Hukua		
7	Barnadi		
8	Motonga		
9	Balti		

(TO BE COLLECTED)

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	Dirring			
2	Kaldia			
3	Pallanadi			
4	Beki			
5	Pagladia			
6	Hukua			
7	Barnadi			
8	Motonga			
9	Balti			

(TO BE COLLECTED)

(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)
1	Dirring					
2	Kaldia					
3	Pallanadi					
4	Beki					
5	Pagladia					
6	Hukua					
7	Barnadi					
8	Motonga					
9	Balti					
Total for the district						

ii) Mineral potential

Boulder (MT)	Bajari (MT)	Sand (MT)	Total mineable mineral potential (MT)
Dirring			
Kaldia			
Pallanadi			
Beki			
Pagladia			
Hukua			
Barnadi			
Motonga			
Balti			

(TO BE PREPARED AFTERCOLLECTING PRE- MONSOON & POST MONSOON DATA FROM RESPECTIVE DEPARTMENTS)

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 collation:

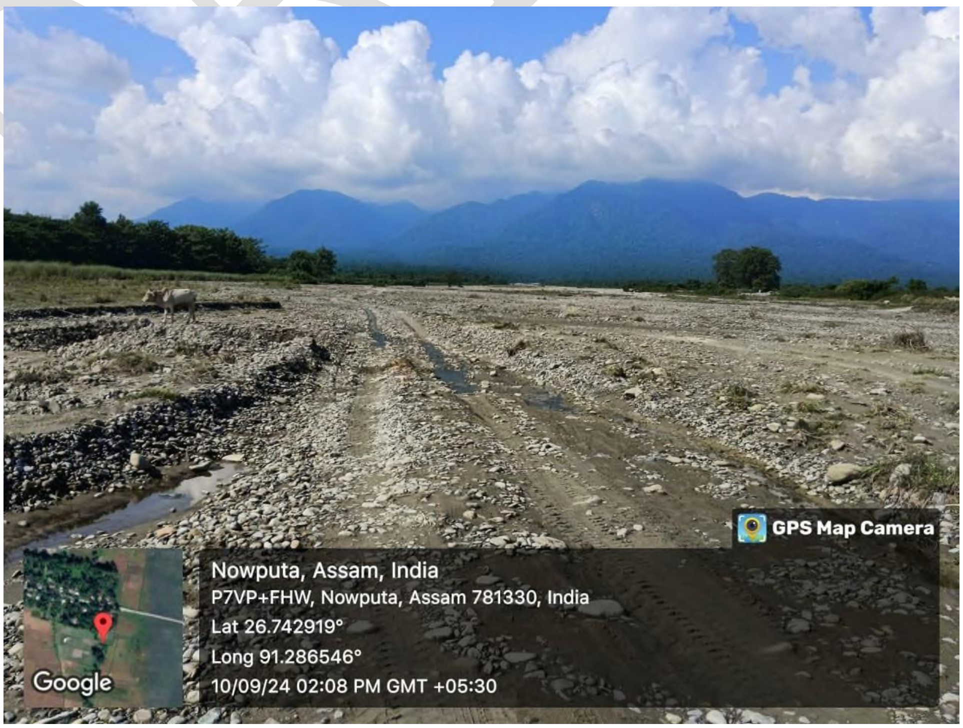
Secondary data were collected for pre- monsoon period and during September 2024 post-monsoon data were collected for the river banks. The relative elevation levels were captured through GPS/DGPS. Thickness of the sand bars was measured through sectional profiles.

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)

(TO BE PREPARED AFTERCOLLECTING PRE- MONSOON & POST MONSOON DATA FROM RESPECTIVE DEPARTMENTS)

Photoplates:

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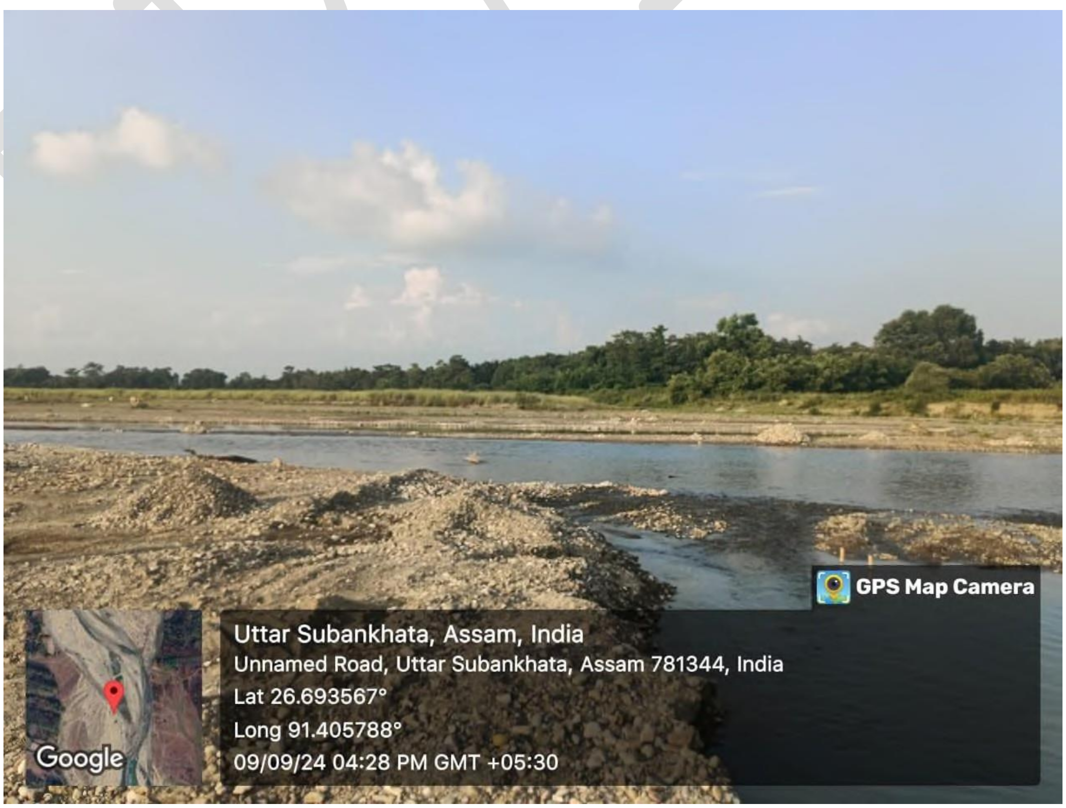
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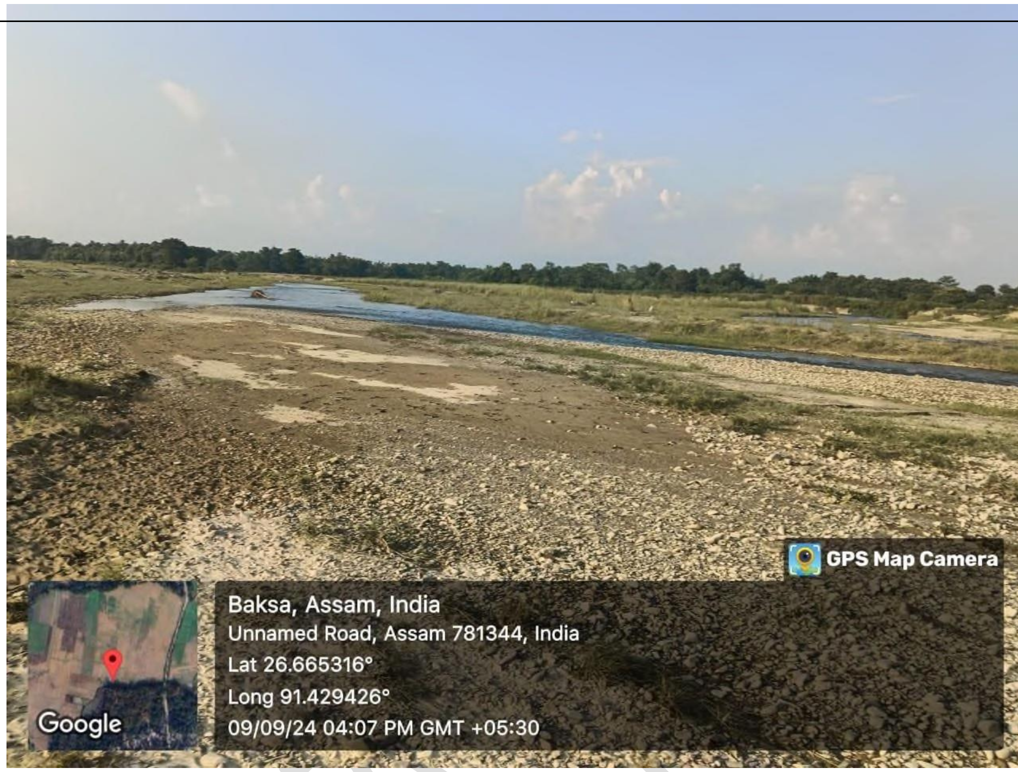
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DRAFT
DISTRICT SURVEY REPORT
OF
BAKSA DISTRICT, ASSAM

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

CPC Environment Solution Pvt. Ltd.

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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 Baksa District

Introduction

The District Survey Report (DSR) of Baksa District has been prepared following the guidelines of the Ministry of Environment, Forests and Climate Change (MoEF&CC), Government of India. This report aligns with the MoEF&CC Notification S.O.-1533(E) dated 14th September 2006 and subsequent notification S.O. 141(E) dated 15th January 2016. It aims to ensure the scientific and systematic utilization of natural resources for the benefit of present and future generations. Furthermore, MoEF&CC's notification S.O. 3611(E) dated 25th July 2018 recommends the format for preparing the DSR.

The main objective of the DSR is to identify areas of aggradation where mining can be allowed, and areas of erosion where mining should be restricted. It also involves the calculation of the annual replenishment rate to maintain ecological balance. Additionally, the DSR includes 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, 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.

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.

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 Baksa 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 Baksa 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.

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 Baksa 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. General profile of the district

- **General Information**

The original word 'Baksa' is not above controversy, a good chunk of population prefer to use 'Bagsa' in lieu of 'Baksa'. The popular assumption that 'Baksa' is the misspelt form of 'Bangsa'- a 'Dzonkha' word meaning a farm house and a corridor as it is known that Bhutanese king and subjects used this area for trade and passage to the plains. 'Bangsa' (Bagsa or Baksa) was in fact one of the most important 'Dooars' of Bhutan. Another source says that the name "Bagsa" is originated from Bhutanese language. According to Bhutanese origin they denoted the area as "Bagsa Duar". "Bagsa" means one kind of rice and "Duar" means entrance point. As Bhutanese king ruled these areas for a long time in an around first half of the nineteenth, so it might be possible that the name "Bagsa" or "Baksa" had a Bhutanese origin. According to Bodo source the name originated from a kind of rice grain which is known as "Bagsa". The said rice grain is one kind of broken and uncleaned product which is gained after milling the rice. As the name Baksa is itself derived from various sources and antecedents so there exists lots of controversy over the name. But still today no concrete evidence has been found which might determine the final source. Only popular sources and folklores are evident but no historical source has been found. Now the name Baksa is officially taken and used.

As a result of the historic BTC (Bodoland Territorial Council) accord signed on February 10th, 2003, BTAD (Bodoland Territorial Autonomous District) was formed with four districts namely Baksa, Chirang, Kokrajhar and Baksa. Baksa district was carved out of Nalbari, Barpeta, Kamrup and a small portion of Darrang district.

Baksa district is located in the north- western part of Assam with the district headquarter at Mushalpur, which is 105 Km away from state capital Dispur, Guwahati and 20 Km away from National Highway no.31 towards north. The main mode of connectivity with the district is by Road. The district headquarter is linked to the National Highway 31 mainly at two junction points namely Barama and Kadamtola. It shares its border with Tamulpur district in the east, Barpeta, Nalbari and Kamrup districts in the south and Chirang district in the west. The district also shares the privilege of having International Boundary with Bhutan in the North. The gentle and gradual slopes can be seen stretching from the foot hills of Bhutan and reaching out to the southern tips of Barpeta, Nalbari and Kamrup district.

Baksa was notified as one of the districts of Bodoland Territorial Council in October 2003 while it started functioning from 1 June 2004 when naturalist-bureaucrat Dr Anwaruddin Choudhury of the Assam Civil Service took charge as its founding Deputy Commissioner.

Administrative Setup :

Deputy Commissioner of the District is the overall in charge of the administration of the entire district. He also acts as the Collector in case of Revenue matters, as a District Magistrate in case of maintenance of Law and Order and General Administration, as a District Election Officer in case of conduct of Election, as a Principal Census Officer while conducting Census, and so on. A number of Officers, like Additional Deputy Commissioners, Subdivisional Officers, Extra Assistant Commissioners and others assist the Deputy Commissioner is looking after the administration of the district. At lower level each sub-division is headed by one Sub-Divisional Officer whereas under him there will be Revenue Circle Officers for each revenue circles who are responsible for the entire administration of the area under their respective revenue circle. For the administrative purposes, the entire district is divided into two sub-divisions : Mushalpur, Salbari. These sub- divisions comprising of 384 villages are further divided into 4 revenue circles. Important point to be noted is that Baksa is the only district in Assam where there is no notified town. Baksa district covers an area of 2400 Sq.Km.

GENERAL INFORMATION ABOUT BAKSA DISTRICT :	
1. Geographical area	2400 Sq. Km (Approx)
2. Population	**9.53773** Lakhs (as per 2011 census)
3. Sub-Divisions	1. Mushalpur (Sadar)
	2. Salbari(Civil)
4. Revenue Circles	1. Baska (Sadar)
	2. Barama
	3. Baganpara
	4. Jalah
5. Development Blocks	1. Baska Dev. Block
	2. Tihu-Barama Dev. Block
	3. Gobardhana Dev. Block
	4. Jalah Dev. Block

	5. Dhamdhama Dev. Block
6. Education Blocks (Ele.)	1. Baska
	2. Jalah
	3. Tihu- Barama
	4. Gobardhana
7. Health Blocks	1. Mushalpur BPHC
	2. Barama BPHC
	3. Jalah BPHC
	4. Golagaon BPHC
8. Total Police Stations	1. Mushalpur (HQ)
	2. Barbari PS
	3. Barama PS
	4. Salbari PS
	5. Simla PS
	6. Gobardhana PS
9. Total Out Posts	1. Baganpara Out Post
	2. Nikashi Out Post
	3. Doomni Out Post
	4. Athiabari Out Post
	5. Anandabazar Out Post
	6. Dalbari Out Post
10. Total Patrol Posts	1. Jalah Patrol Post
	2. Barbari Patrol Post
	3. Simlaguri Patrol Post
	4. Labdangguri Patrol Post
11. No. of Villages	384
12. No. of Tea Gardens	1. Doomni
	2. Fatemabad
13. No. of BTC Constituencies	11
14. No. of LAC(major part)	1. 62- Barama LAC
	2. 63- Chapaguri LAC

ACCESS TO THE DISTRICT:

By Road Connectivity:

There are number of bus services and small car services (Winger, Cruiser etc.) from Adabari and Basistha Chariali, Guwahati via NH31 touching two connection points to district head quarter (one at Barama, another at Kadamtola). Distance between Guwahati and Barama via NH31 is about 75 Km and Guwahati and Kadamtola via NH31 is about 80 Km.

i) From Adabari Bus Terminal, Guwahati there is direct bus service to Mushalpur (HQ). Distance is about 100 Km.

ii)From Adabari Bus Terminal, Guwahati there is direct bus service to Salbari Sub-Div HQ. Distance is about 160 Km.

By Railway Connectivity:

The district does not have any railway station. However the nearest railway station is Tihu which falls under Nalbari district (Distance 35 Km from District HQ). The distance of Nalbari railway station from district HQ is about 45 Km and Distance of Pathsala railway station (Barpeta district) is about 50 Km.

The distance of Guwahati railway station to district HQ by road (via NH 31) is about 105 Km.

By Air Connectivity:

The nearest airport is Lokpriya Gopinath Bordoloi International Airport at Borjhar, Kamrup (M) which is about 130 Km from the District HQ.

Places of Tourist Interest:

Baksa district has massive potential for development of tourism. The world famous Manas National Park falls under Baksa district. The main places of tourist interest in the district are as follows:-

1) Manas National Park
2) Manas Soushi Khongkhor
3) Moina Pukhuri
4) Daragaon Picnic Spot

1) Manas National Park & Tiger Project: Located at the western part of the district in the foothills of Bhutan, it is a place of great tourist attraction-both national as well as international. There are about 60 species of mammals, 312 birds, 42 reptiles, 7 amphibian, 54 fishes and more than 100 species of insects. The most abundantly found animals are Tiger, Leopard, Golden Langur, Pigmie Hog, DhaneshPakhi, Wild Buffalo, Bison, Python, Wild Cat, Elephant, Hyena, Fox etc. The river Manas flows through the National Park. River rafting facility is newly introduced for the tourists. Both govt. and private lodging and food facility is available.

Nearest Railway station: Barpeta Road

Connection through motorway: Barpeta Road - Bansbari forest range (Distance about 15 Kms)

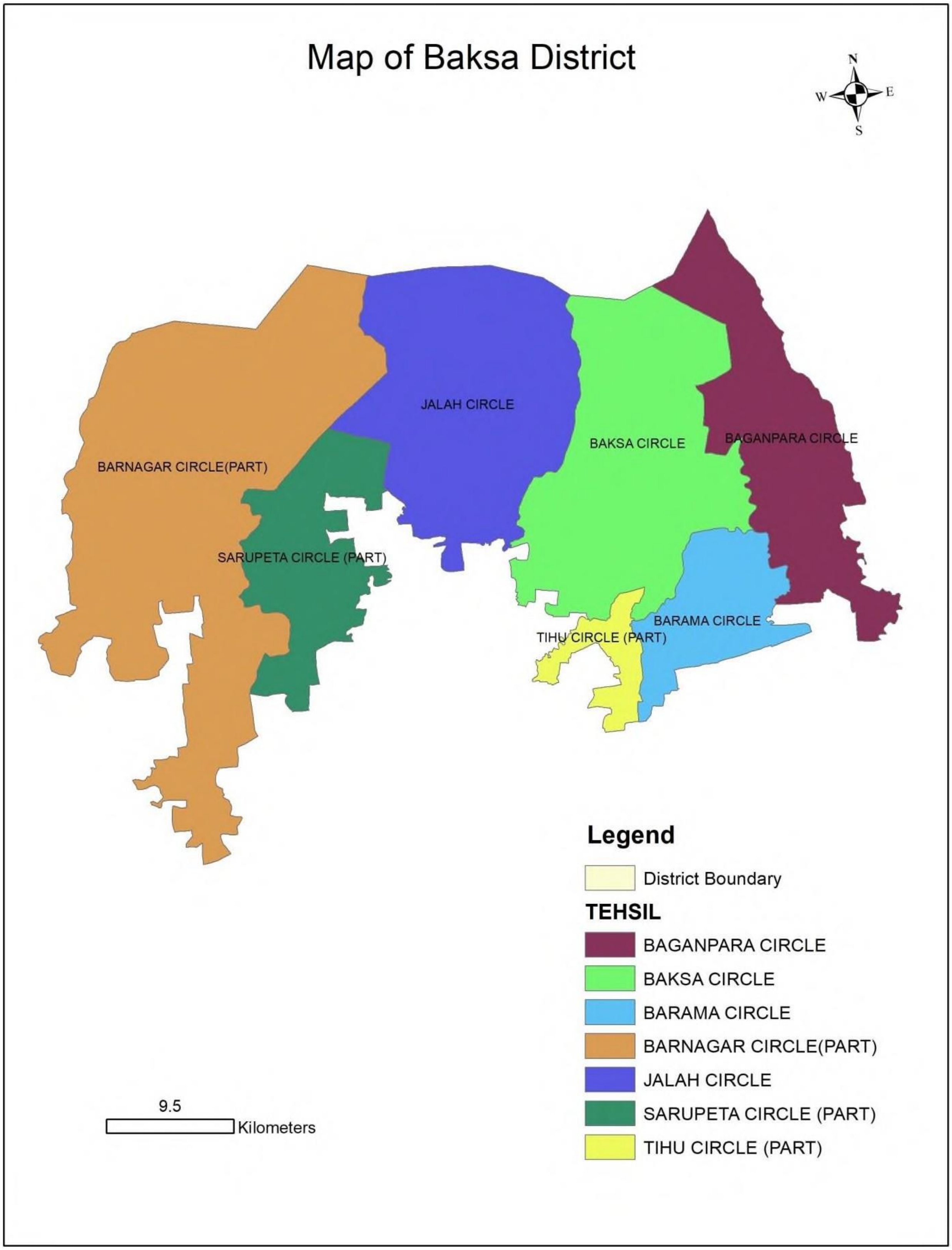
2) Manas Soushi Khongkhor: An eco-tourism spot located in the middle of Baksa district on the mouth of river Pagladia. Enshrined with natural beauty just adjacent with Bhutan hills, it attracts a large number of picnic goers in the month of December and January. It is new well maintained and looked after by an NGO known as Manas Soushi Khongkhor Eco Tourism Society (MASKETS). Some endangered wild animals such as Bison, Deer, Hogg Deer, White Belly Heron, Royal Bengal Tiger etc. are found here. Food and Guest House facility is provided by the volunteers of MASKETS if needed.

Nearest Railway station: Nalbari

Connection through motorway:

i) Mushalpur- Nikashi- Subankhata- Chowki (Distance about 25 Kms)

ii) Nalbari- Baganpara- Nayabasti- Subankhata- Chowki (Distance about 55 Kms)



Map: Administrative map of the District

4. Geology of the district

(i) Regional Geology:

The Shillong Plateau (approx. 47,614 sq. km) is a Precambrian cratonic block in Northeast India, tectonically separated from the Indian Peninsula. It is bordered by:

- Dauki Fault to the south (dextral strike-slip fault),
- Brahmaputra Lineament to the north,
- Garo- Rajmahal Graben and Dhuburi/Madhupur Lineament to the west,
- Belt of Schuppen to the east.

This block is made up of high- to medium-grade Paleoproterozoic basement gneisses and schists, which are classified as the **Basement Gneissic Group (BGG)**. These are overlain by Mesoproterozoic metasediments and metavolcanics of the **Shillong Group**, intruded by Neoproterozoic acidic intrusives such as:

- Myllem pluton
- South Khasi pluton
- Umroi granite
- Nongpoh pluton

The plateau is composed mainly of orthogneiss and paragneiss with the following geological units:

- Banded gneiss (bimodal character)
- Migmatite
- Augen gneiss
- Banded Iron Formation (BIF)
- Amphibolites
- Pyroxene granulite
- Calc granulite
- High- grade sillimanite-bearing metapelite with cordierite, corundum, spinel, sapphirine. Intrusives like lamprophyre, diorite, granodiorite, mafic intrusions, and pegmatite veins.

Towards the southern boundary of the Shillong Plateau, Cretaceous– Tertiary sedimentary sequences overlay these basement rocks. The plateau also contains an intracratonic basin (approx. 2,500 sq. km) with sedimentary cover.

The Assam Basin to the north represents the cratonic margin with three main tectonic phases:

1. Late Cretaceous to Eocene block faulting and development of a southeasterly dipping shelf.
2. Oligocene uplift and erosion, during which basement faults reactivated.
3. Post- Oligocene phases, marked by sedimentation and structural developments.

The Eocene Sylhet Formation is significant for its varied depositional environments:

- The Lakadong Member (lagoonal environment) contains thin sandstone and interbedded shale and coal.
- The upper part of the Lakadong Formation represents calcareous sandstones formed in a shallow water platform.

5. Drainage of irrigation pattern

Number of perennial streams flow through the district from north to south and join the Brahmaputra River. The major streams that drain the area are Mara Manas, Palla, Po-Mara, Kaldia, Tihu, Burhadia, Pagladia, Nona and Puthimari River. The whole drainage of the district ultimately finds its way to all rivers and tributaries.

Assam state comprises of two main river valleys. The northern valley is known as the Brahmaputra valley and the southern valley is known as Barak valley. Baksa district falls in the Brahmaputra valley which is an alluvial plain in between the foot hills of Bhutan ranges and other hill tracts, on North and central ranges of Naga, Karbi, Khasi, Jaintia, Garo hills etc. This valley approximately covers 56339 sqkm. of riverine area within the strip of both bank of the river, stretching from Sadiya on the east up to Baksa on the West.

The district contains a network of 3 major rivers namely Beki, Pagladia, and Barnadi and around 10 small rivers which are very active during the summer season. There are numerous springs and streams which are a good source of water for household use and small scale irrigation. The district is endowed with large number of Dongs (Natural Depressions) where water remains stagnant for a large part (around 8 months) of the year. Farming community is using dong water for irrigation of their crops since long. The ground water is good and remains at about 25 to 45 feet during winter. Utilization of this water resource in the foothill region during winter is a problem since soil is shallow.

The district is primarily rainfed. Out of the gross cropped area of **164862** ha, the extent of irrigated land is only **22,043** ha, i.e. 13.37% of total cropped area. Considering the block-wise data, percentage of gross irrigated land to gross cropped area is maximum in Goreswar block, followed by Tamulpur block, i.e 21.0% and 20.8% respectively.

A total of **1,42,819** ha of area is under rainfed cultivation. While comparing the ratio of area under rainfed cultivation to gross cropped area in each block, Dhamdhama block comes at the top position with 90.35% (gross cropped area of 21146 ha) under rainfed irrigation, followed closely by Baska block with 90.34% area under rainfed cultivation (gross cropped area of 21085 ha). The area under partial irrigation has been reported to be zero across all the blocks the district.

Table No. 2.3: Irrigation Based Classification (Undivided Baksa District)

Block	Irrigated (Area in Ha)		Rainfed (Area in Ha)	
	Gross Irrigated Area	Net Irrigated Area	Partial /Protective Irrigation	Un- Irrigated or Totally Rainfed
Baksa	2,037.00	1,767.00	-	19,048.00
Tihu- Barama	2,096.00	1,812.00	-	19,066.00
Tamulpur	4,756.00	3,388.00	-	18,099.00
Nagrijuli	1,580.00	1,580.00	-	14,572.00
Goreswar	4848	3477	-	18,226.00
Jalah	2,065.00	1,843.00	-	18,728.00
Gobardhana	2,620.00	2,390.00	-	15,975.00
Dhamdhama	2,041.00	1,771.00	-	19,105.00
Total	**22,043.00**	**18,028.00**	**-**	**1,42,819.00**

Source: Irrigation Department, Baksa

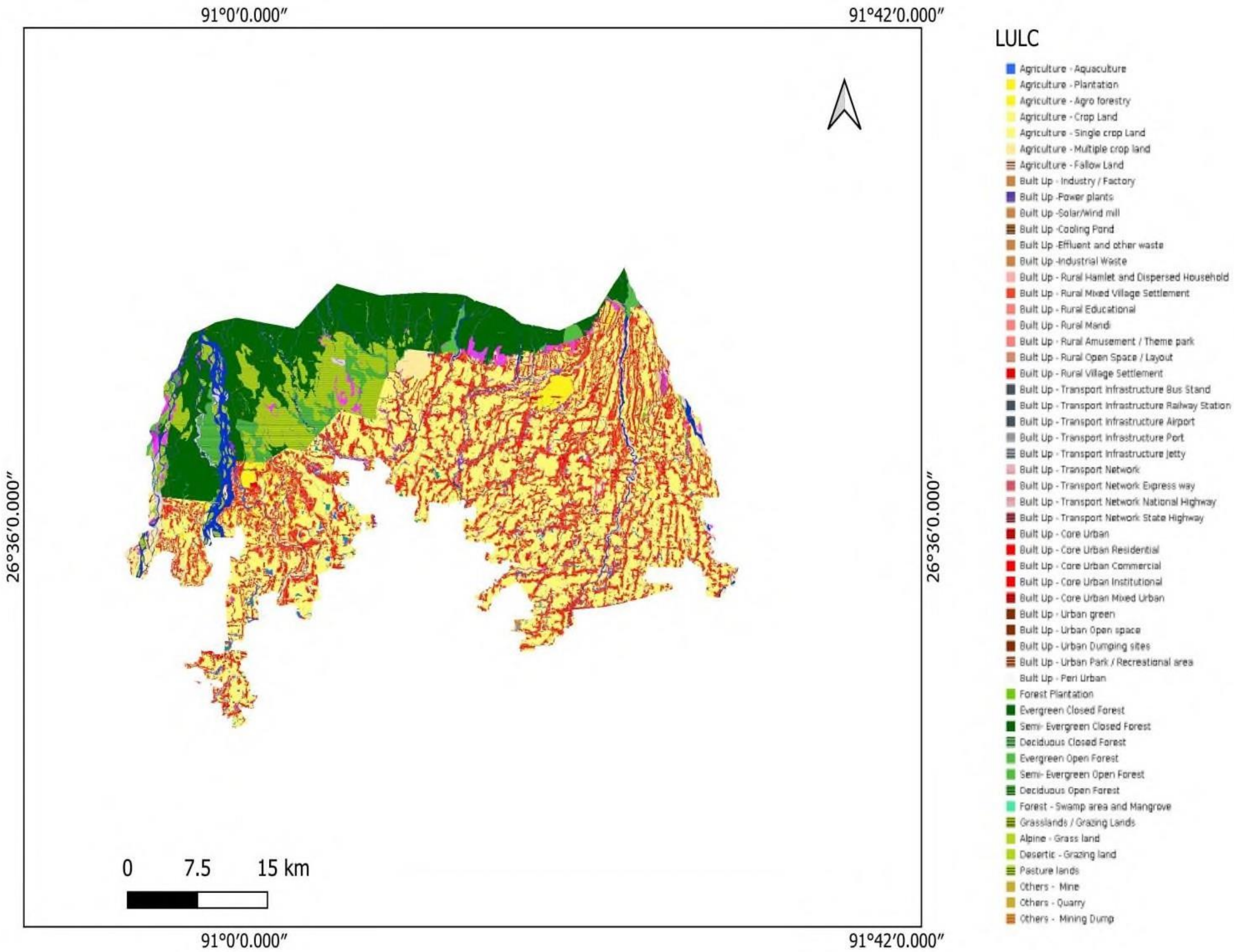
6. Land utilization pattern in the district: Forest, Agriculture, Horticulture, Mining :

The total geographical area (TGA) of Baksa is 2.07 lakh hectare. The largest Block of the district is Gobardhana which comprises of a TGA of 42,787 hectare i.e. about 20.6% of the TGA of the district.

Table : Land use pattern in Baksa District (Undivided)

Name of the Taluka	TGA	Area under Agriculture				Area under forest	Area under wasteland	Area under other uses
		GCA	NSA	AST	CI (%)			
Goreswar	28747	23074	18861	4411	140	-	-	-
Nagrijuliu	20277	16152	13990	3560	120	4400	1257	629
Tamulpur	27155	22855	18698	10690	119	6843	1955	978
Dhamdhama	18777	21146	19620	9974	117	3943	1127	563
Baska	27102	21085	19587	4499	118	6504	1301	867
Barama	13427	21162	19619	13595	121	-	989	477
Gobardhana	42787	18595	16095	-5280	118	11381	3252	1626
Jalah	29456	20793	19402	3031	118	6804	1944	972
Total	**207727**	**164862**	**145872**	**44480**	**121**	**39876**	**11825**	**6112**

Source: Department of Agriculture, Baksa
TGA- Total Geographical Area, GCA- Gross Cropped Area, NSA- Net Sown Area, AST- Area Sown more than once, CI- Cropping Intensity



Map: Land use land cover map of Baksa district

8. Surface and Groundwater scenario of the district:

Number of perennial streams flow through the district from north to south and join the Brahmaputra River. The major streams that drain the area are Mara Manas, Palla, Po-Mara, Kaldia, Tihu, Burhadia, Pagladia, Nona and Puthimari River. The whole drainage of the district ultimately finds its way to all rivers and tributaries.

Assam state comprises of two main river valleys. The northern valley is known as the Brahmaputra valley and the southern valley is known as Barak valley. Baksa district falls in the Brahmaputra valley which is an alluvial plain in between the foot hills of Bhutan ranges and other hill tracts, on North and central ranges of Naga, Karbi, Khasi, Jaintia, Garo hills etc. This valley approximately covers 56339 sqkm. of riverine area within the strip of both bank of the river, stretching from Sadiya on the east up to Baksa on the West.

The district contains a network of 3 major rivers namely Beki, Pagladia, and Barnadi and around 10 small rivers which are very active during the summer season. There are numerous springs and streams which are a good source of water for household use and small scale irrigation. The district is endowed with large number of Dongs (Natural Depressions) where water remains stagnant for a large part (around 8 months) of the year. Farming community is using dong water for irrigation of their crops since long. The ground water is good and remains at about 25 to 45 feet during winter. Utilization of this water resource in the foothill region during winter is a problem since soil is shallow.

The ground water conditions in the district can be described under two distinct hydrogeological units, i.e. conditions prevailing in the semi-consolidated formations and conditions prevailing in the unconsolidated formations.

I) Semi-Consolidated Formations: A very narrow belt of Upper Tertiary semi consolidated rock formation engulf the northern fringe area of the district with Bhutan consisting mainly claystone/siltstone/sandstone and form low to moderate altitude denudation structural hills. The trend of hills is generally in E-W direction. These are characterized by high run off, low infiltration to groundwater and experience secondary porosity development through cracks/joints/bedding planes. Springs are developed in this belt.

II) Unconsolidated Formations: Major parts of the district are underlain by unconsolidated formations represented by the alluvial deposits of Recent age. Bhabar formation comprises of the alluvial sediments at the foothill belt in the north and the valley covering the central and southern part. The behaviour of ground water in the piedmont sediments is naturally different from that in the alluvial areas occurring further south.

Bhabar- Terai Belt: This zone consists of the terrace deposits in the foot hill regions of the Himalayas composed of talus fans. The material is a heterogeneous admixture of boulders, pebbles, cobbles with the interstices filled by sand and silt. These sediments are highly permeable with low retentive capacity. Thus, the streams in this region are devoid of any appreciable surface flow, although, there are evidences of sub- surface flow. Behaviour of ground water in the further south is less erratic. Here, ground water occurs under water table conditions. The depth to water level is rather high.

Older Alluvium: Ground water occurs under water table conditions in the elevated flat-topped areas of Older alluvial sediments. These areas are usually forested. It comprises of sand, gravel and silt with higher proportion of clay. Ground water occurs under unconfined to confined conditions.

Newer Alluvium: The district is mostly covered by Newer alluvium and the formation comprises of sand, gravel and pebble with silt and clay. Ground water in this zone occurs under unconfined condition. Based on the behaviour and occurrence of ground water, the regional ground water flow system of district has been described under following categories.

i. Shallow Aquifer Group occurring within 50 m depth.

i. Deeper Aquifer Group beyond the depth of 50 m and down to 200 m bgl.

i. Shallow Aquifer Group: It consists of a mixture of boulder, gravel, sand, silt and clay. The thickness of the aquifer varies from 15 to 40 m. Ground water in this aquifer generally occurs under water table to semi-confined conditions. The pebbles, boulders are restricted mostly to the northern parts of the district. They occur at the depth between GL to 50 m bgl. The development of ground water from this aquifer is done by open well and shallow tube well for both the domestic and irrigation purposes. The water level in the major parts of the district generally lies between 2 to 4 m bgl. The northern most parts occupied by the piedmont zones and the areas adjoining to the border area are having deeper water level. The movement of ground water is southerly towards Brahmaputra River. The water table contour follows the topography of the area and lies more or less parallel to the Brahmaputra River. The hydraulic gradient becomes gentler towards south.

ii. Deeper Aquifer Group: It consists of coarse to medium sand with intercalation of clay. Ground water occurs under water table to confined conditions. Detailed hydrogeological surveys aided by exploratory drilling revealed the existence of two to three promising aquifer zones down to the depth of maximum 200 m bgl. Aquifer displays various degree of lateral and vertical variation of aquifer indicating various degree of depositional environment both in space and 4 times. The piezometric surface is highly variable and the movement of ground water is towards the south.

8. Rainfall of the district and climatic condition

The climate of the district is sub-tropical in nature with warm and humid summer followed by cool and dry winter. The average rainfall of the district is found to be 76 mm in the recent years.

YEARS	JAN	FEB	MAR	APR	MAY	JUN	JUL	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	21.5	87.2	73.1	355.4	314.8	373.5	200.8	515.6	26.1	31.1	19.2
2019	0.6	31.3	25.9	315.8	575.7	645.4	773.4	166.5	239.3	44.6	7.1	0.1
2020	12.5	6.4	21.1	123.9	608.5	941.8	807.8	168.7	407.7	100.3	0	4.3
2021	32.6	10	40.3	115.3	228.7	542.3	282.9	295.8	217.4	37.6	0	0
2022	15.7	35.3	61.8	662.7	549.7	1014.2	289.1	217.9	195.2	247.9	0	3.2

Temperature:

The district enjoys a sub-tropical humid climate with a hot summer and moderate winter. January is the coldest month and July/August is the warmest month. The winter temperature drops to 10°C and summer temperature goes up to 35°C. South-West monsoon activates from June and continues up to September-October.

Climatic condition

The climate of the district is sub - tropical in nature with warm and humid summer followed by dry and cool winter. The average annual rainfall is about 2,200 mm per annum of which 70parcent is received during monsoon season (June to September). The rainfall is not uniform rather erratic. The mean maximum and minimum temperature varies from 33 to 38° C and 8 to 10°C respectively. The relative humidity varies from 65 - 90 per cent. The sky remains cloudy during June to September. The light and sun shine hour is the highest during March – April.

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

Sl No	Name Of the Mineral	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		MangalChBoro	Golagaon Baksa													
2		MithunBasumatary	Chukrungbari Baksa													
3		JibeswarBoro	Sukrungbari Baksa													

10. Details of Royalty received in last 3 years

(Not provided)

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

(Not provided)

12. Mineral Map of the District

(to be prepared after complete of field survey)

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		MangalChBoro	Golagaon Baksa					
2		MithunBasumatary	Chukrungbari Baksa					
3		Jibeswar Boro	Sukrungbari Baksa					

14. Total Mineral Reserve available in the District

(TO BE UPDATED AFTER FIELD SURVEY)

15. Quality /Grade of Mineral available in the District

(TO BE UPDATED AFTER FIELD SURVEY)

16. Use of Mineral

(TO BE UPDATED AFTER FIELD SURVEY)

17. Demand and Supply of the Mineral in the last three years (TO BE UPDATED AFTER FIELD SURVEY)

18. Maps showing Mining leases of the district

(TO BE UPDATED AFTER FIELD SURVEY)

19. Details of the area of where there is a cluster of mining leases (TO BE UPDATED AFTER FIELD SURVEY)

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

(TO BE UPDATED AFTER FIELD SURVEY)

21. 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.

22. 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 and cities globally.
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 action.
Recommendation 3	**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 5	**Establish ownership and access to sand resources** through mineral rights and consenting.
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 possible.
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 solutions.

23. 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.

24. Risk Assessment & Disaster Management Plan

(TO BE UPDATED AFTER FIELD SURVEY)

25. 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.

26. 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:

- https://baksa.assam.gov.in
- https://www.cgwb.gov.in/old_website/District_Profile/Assam/BAKSA.pdf