



केंद्रीय भूमि जल बोर्ड

जल संसाधन, नदी विकास और गंगा संरक्षण

विभाग, जल शक्ति मंत्रालय

भारत सरकार

Central Ground Water Board

Department of Water Resources, River
Development and Ganga Rejuvenation,

Ministry of Jal Shakti

Government of India

**AQUIFER MAPPING AND
MANAGEMENT OF GROUND WATER
RESOURCES
AMETHI DISTRICT,
UTTAR PRADESH**

उत्तरी क्षेत्र, लखनऊ

Northern Region, Lucknow



सत्यमेव जयते

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Azadi Ka
Amrit Mahotsav

**Government of India
Ministry of Jal Shakti
CENTRAL GROUND WATER BOARD**



**INTERIM REPORT ON
NATIONAL AQUIFER MAPPING AND MANAGEMENT PLAN
(NAQUIM) OF AMETHI DISTRICT, U.P.
(AAP: 2022-23)**

SUBMITTED BY,
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EXECUTIVE SUMMARY

Central Ground Water Board (CGWB) is implementing National Aquifer Mapping and Management program (NAQUIM), which envisages mapping of aquifers (water bearing formations), their characterization and development of Aquifer Management Plans to facilitate sustainable management of Ground Water Resources.

NAQUIM was initiated in 2012 as a part of the 'Ground Water Management and Regulation' scheme with the objectives to delineate and characterize the aquifers and develop plans for sustainable ground water management in the country. The State-wise information is shared with States/UTs for implementation.

Under this project, Central Ground Water Board, Northern Region, Lucknow have completed NAQUIM study of Amethi District under AAP: 2022-23. Key findings are given below

1. Mappable area of the district is 2330 sq. km distributed in 13 blocks of the district. Net irrigated area of the district is 1309 sq. km. Total 57.53% of the net irrigated area is being irrigated by ground water in the district. Average (2011-2020) annual rainfall of the district is 692.39 mm, whereas last 10 years' average monsoon rainfall is 618.85 mm and non-monsoon rainfall is 73.54 mm. Geomorphology of the study area governed by Older Alluvium Plain with some patches of flood plain and younger alluvium. Major soil type of the study area is Fine to coarse loamy.
2. Water Level of the study area ranges from 1.05 mbgl (Bahadurpur-II Block) to 13.65 mbgl (Sangrampur Block) in Pre-Monsoon season 2022 and 1.65 mbgl (Singhpur Block) to 10.29 mbgl (Shukul Bazar block) in Post-Monsoon 2022.
3. The lithological units along the district are composed of various grades of sand, sandy clay, clay and kankar. A perusal of the fence diagram and other geological section along the exploratory well exhibit presence of two-tier aquifer system in the area up to the depth of 300m. The Upper Aquifer group is the most potential aquifer group and occurs in the depth range of 25 to 138 m below ground level. The quality of this aquifer group is fresh and potable. The Second Aquifer group occurs between the depth range of 125 to 290 m below ground level.
4. As per Ground Water Resource Estimation (GWRE-2022), out of 13 blocks, 12 no. of blocks are in safe category and 1 no. of block is in Semi-critical category. Stage of ground water extraction varies from 55.45% (Bhetua Block) to 74.57% (Sangrampur Block). Total Net Annual Ground Water Availability of the district is 78247.38 ham, existing gross ground water draft for all uses is 49139.5 ham and average stage of

ground water extraction assessed as 62.80%. Total static resource of the Aquifer Group I assessed as 1281799 Ham and Aquifer Group II as 105587 Ham.

5. As per ground water quality from shallow aquifers, assessed by CGWB, NR, Lucknow, Electrical conductivity of the study area ranges between 513 μ /cm at 25°C to 9116 μ /cm at 25°C with sporadic distribution of Iron, Manganese, Nitrate and Fluoride above permissible limit (as per BIS 10500:2012). Arsenic has been reported only in one sample while Uranium has been found above permissible limit in two samples.

6. As per Hydrogeological study of the area, supply side and demand side management interventions have been proposed. Under supply side management, water conservation, aquifer management and additional abstraction has been proposed depending upon the stage of ground water development of the assessment unit (Block) and corresponding water level scenario. In demand side management change in on farm water conservation practices, enhanced irrigation facility under PM-Krisi Sinchayi Yojana, introduction of industries has been proposed. By implementing the management strategies on ground, effective utilization of Ground water resources vis a vis Sustainable Aquifer Management can be achieved without deteriorating the Assessment unit categorization.

DISTRICT AMETHI AT A GLANCE

General Information

Geographical Area (Sq. Km) : 2330

Administrative Divisions

Number of Tehsil/Block : 4/13

Number of Panchayats/ Villages : 682/983

Population (Census-2011) : **1867000**

Rural : 1761000

Urban : 106000

Average Annual Normal Rainfall : **692.39 mm**

Geomorphology : **Central Ganga Plain (Upper Ganga Basin)**

Major Physiographic Units : Younger Flood Plain;
Older Flood Plain

Major Drainages : Gomati River and its tributaries.

Land Use (in Hectares) :

Total Area : 233000

Net Sown Area : 14502

Major Soil Types : Loamy

Area Under Principal Crops (in Hectares) :

Rabi : 116489

Kharif : 111612

Zaid : 12154

Irrigation By Different Sources (in Hectares) :

Tube wells : 4267 (Public)/70074 (Private)

Canal : 56363

Dug Well : 248

Net Irrigated Area : 130961

Number of Ground Water Monitoring

Stations

Dug-wells : 43 (CGWB), 46 (GWD)

Piezometer : 33 (GWD)

Predominant Geological Formations : (a) Major part (upland areas) covered with Older Alluvium
: (b) Younger (Newer) Alluvium occurs in low land tracts along rivers.

Hydrogeology

Major water bearing formation : 2 Aquifer Groups up to the explored depth of 300m; ground water occurs in grades of sand, sandy clay, clay and kankar.

Pre-monsoon Depth to water level during 2022 : 1.05-13.65 mbgl

Post-monsoon Depth to water level during 2022 : 1.65-10.29 mbgl

Ground Water Exploration by CGWB

No. of Exploratory well : 03

Depth range : Up to 437 mts.

Discharge (litres per minute) : 745-3243

Storativity (S) : 00007.8 to 003.6

Transmissivity (m² /day) : 150-1385

Ground Water Quality

Presence of Chemical constituents more than permissible limit (e.g. EC, F, NO₃) : High EC is reported in various part of the district. High concentration of Mn, F, NO₃, Fe along with As and U in isolated patches.

Dynamic Ground Water Resources (2022)

Net Ground Water Availability : 78247.38 ham

Ground Water Draft : 49139.5 ham

Stage of Ground Water Development : 62.80%

Number of OE/ Critical/ Semi-critical/ Safe : 12 Blocks are Safe

Blocks : 01 Block (Sangrampur) is semi-Critical.

Major Ground Water Problems and Issues

: GW Quality issues, water-logging, Arsenic and Fe & Mn contamination, WL decline in some area

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AQUIFER MAPPING AND GROUND WATER MANAGEMENT PLAN OF AMETHI DISTRICT, UTTAR PRADESH

(A.A.P.: 2022-23)

By: Dr. Kriti Mishra, Scientist-B

1.0 INTRODUCTION

India is the largest groundwater user in the world, with an estimated usage of around 230 cubic kilometers per year, more than a quarter of the global total. This accelerated demand for the water may be attributed to rapid growth in population, industrial expansion and adoption of multi cropping practices. With more than 60 percent of irrigated agriculture and 85 percent of drinking water supplies dependent on it, groundwater is a vital resource for rural areas in India (*Suhag, 2016*). Apart from this, dependency of urban and industrial water supplies on groundwater is also becoming increasingly significant in India, thereby, making groundwater, the most extracted raw material. Hence in this era of seemingly endless dependency on groundwater for both drinking water and irrigation purposes, number of aquifers are now approaching unsustainable levels of exploitation.

In order to converse this large-scale development of ground water, it has become imperative to monitor the behaviour of groundwater and to identify management strategies for promoting sustainable groundwater use in India. To facilitate this paradigm shift from “groundwater development” to “groundwater management”, an accurate and comprehensive micro-level picture of ground water through aquifer mapping in different hydrogeological settings in an appropriate scale is a pre-requisite.

Aquifer mapping is a process wherein a combination of geologic, geophysical, hydrologic and chemical field and laboratory analyses are applied to characterize the quantity, quality and sustainability of ground water in aquifers. This would help achieving drinking water security, improved irrigation facility and sustainability in water resources development in large parts of rural India, and many parts of urban India. The aquifer mapping approach can help integrate ground water availability with ground water accessibility and quality aspects.

During AAP 2022-23, under National Aquifer Mapping Programme (NAQUIM), CGWB Northern Region, has taken up Aquifer mapping studies of Amethi district. The study aims to formulate various ground water management interventions for the district after studying

the characteristics of different water bearing formations (aquifer) in the district. The existing and additional data sets generated on geologic, geophysical, hydrologic and chemical quality are integrated and used to characterise the quantity, quality and sustainability of ground water in the aquifer systems. Various thematic maps on hydrogeological data are generated under a GIS environment which can be customised based on the administrative requirements. Aquifer mapping in Amethi District also envisages development of an Aquifer Management Plan to facilitate sustainable management of groundwater resources in the district. Major objectives of the aquifer mapping programme are (i) delineation and characterization of aquifers in three dimensions (ii) identification of issues on water quantity and quality (iii) Evaluation of groundwater water resources in various aquifer systems and, (iv) to evolve a block-wise groundwater management plan to ensure sustainable development of ground water resources. Various management plans for each block of the district are to be prepared for different interventions to optimize ground water withdrawal/recharge. The management options also include identification of feasible area for artificial recharge to ground water and water conservation besides, demand side management option including crop diversification, increasing water use efficiency etc. These management measures will help in the containment of declining water levels and overall improvement in the groundwater scenario.

1.1 OBJECTIVE

Amethi district has an agricultural based economy; about 60% of its total area is under cultivation. The rural population of the district mainly depends upon agriculture for their livelihood. Assured irrigation is one of the most essential factors for obtaining the optimal agriculture yield. Groundwater irrigation, due to its lesser variation in its supply and higher accessibility provide a reliable source. Hence, the ground water is plays important role in agriculture. Also ground water is the most dependable source of water supply therefore it is also extensively used for domestic and industrial use. Consequently, the exploitation of ground water is increasing rapidly with time and resulting depletion in water level in some of the blocks. Old fashion and conventional way of irrigation leads to huge exploitation of ground water resources. With this background, the aquifer mapping with the following objectives has been proposed for Amethi district:

- (i) Defining the aquifer geometry and depiction of the lateral and vertical variations through 2D and 3D maps.
- (ii) Characterization of the aquifer systems and its hydraulic properties

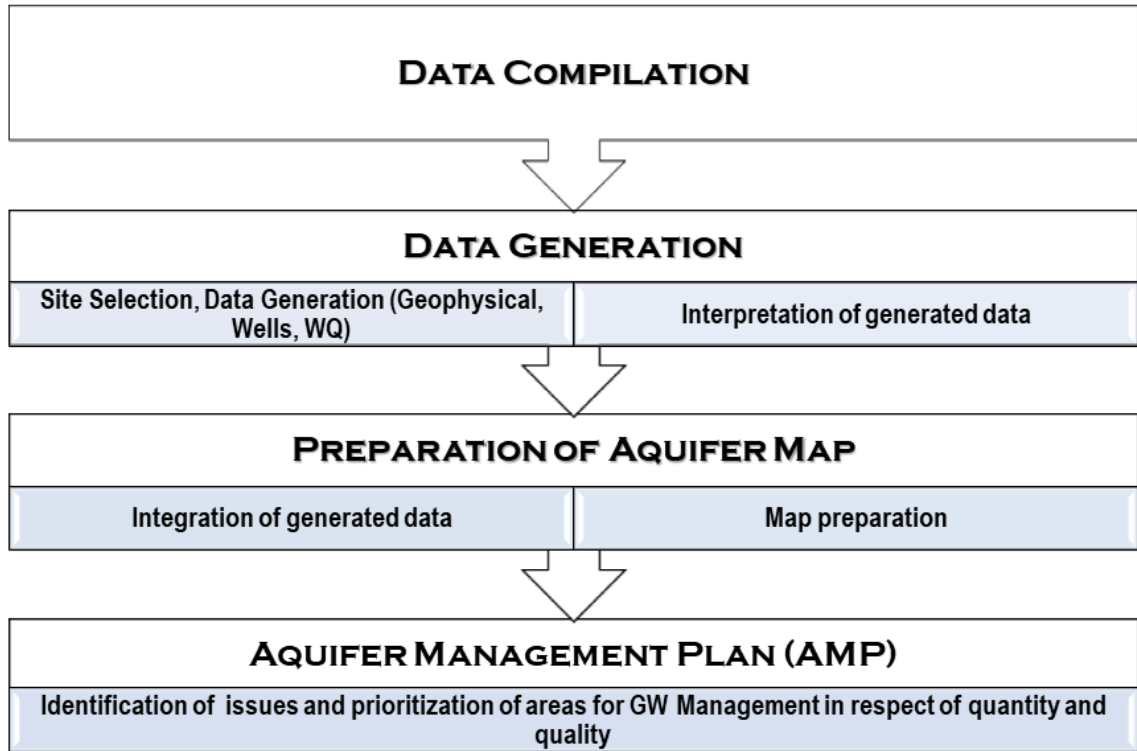
- (iii) Assessing the influence of various components of the groundwater regime on the aquifer systems.
- (iv) Evaluation of the hydro-chemical characteristics of groundwater and the extent of contamination/pollution of groundwater, if any.
- (v) Identification of the quantitative and qualitative issues of the aquifer systems.
- (vi) Evaluation of the groundwater resources in each aquifer system.
- (vii) Formulation of block-wise sustainable aquifer management plan.

1.2 SCOPE OF THE STUDY

Groundwater resources have enabled thousands of farmers of the district to mitigate climate-related uncertainties and the limitations of centralised surface-water supplies. Over the last half century, farmers across the districts have drilled their own wells, in pursuit of the socio-economic advantages of groundwater irrigation. Also, the ground water availability in the district has enabled the industries in the area to be established and flourish, thereby creating the employment in the region. However, the incessant withdrawal of ground water can result into groundwater exploitation and quality deterioration, thereby causing less groundwater availability for agriculture which will lead to less agricultural production. The key point of consideration for such study is that, all the impact of the ground water withdrawal must be critically considered during planning which in turns calls for improved resource utilization. To facilitate such planning, the extent and quality of the underlying aquifer much be deciphered so as to attain sustainable management of ground water.

1.3 APPROACH AND METHODOLOGY

An approach and methodology adopted to achieve the major objective are Compilation of existing data collected from different sources and agencies and identification of data gaps. Based on existing data various thematic layers and maps have been prepared in GIS environment and Aquifer maps incorporation the data and management plans are prepared. Various activities under NAQUIM are as follows:



2. INTRODUCTION TO STUDY AREA

Amethi district is the 72nd district of the state of Uttar Pradesh in northern India. This district is a part of Faizabad division (officially Ayodhya division) in the Awadh region of the Uttar Pradesh. It covers an area of 2330 km². Gauriganj is the administrative headquarters of the district. The district came into existence on 1 July 2010 by merging three tehsils of the erstwhile Sultanpur district namely Amethi, Gauriganj and Musafirkhana and two tehsils of the erstwhile Raebareli district, namely, Salon and Tiloi. In 2013, however, it was proposed that the Salon sub-district be moved from Amethi district back to Rae Bareli district in Lucknow division which was effected by 2019.

Amethi lies on the Raebareli-Amethi-Sultanpur road about 40 km south-west of Sultanpur city. Also called as Raipur-Amethi, of which Raipur belonged to the Raja of Amethi who lived at Ram Nagar. The first fort of Raja of Bachhalgoti Rajputs was located at Raipur. His ancestors used to reside in Raipur which is now Raipur Phulwari. New fort was built in Ram Nagar about 6 Kms north of present Amethi which had been Center of Political activities during freedom movement. Amethi became known worldwide with Sanjay Gandhi contesting Parliamentary Election on the behest of Raja Rannjay Singh who had close relationship with Nehru family. It is also famous for the Hanuman temple called (Hanumangarhi) and a mosque both built about hundred years ago. About 7 kilometres north of Amethi there is a tomb of famous Poet Malik Mohammad Jayasi at Magraavan which is near Ram Nagar, where he died. Present fort was built by Bachhalgoti Rajput Rajas.

Amethi is connected to the major cities in Uttar Pradesh and North-Eastern India via Indian Railways and roads. It has direct trains connecting with major cities like Delhi, Lucknow, Kanpur, Dehradun, Haridwar, Allahabad, Varanasi, Kolkata, Puri, Bhopal, Mumbai and Bangalore. The closest airport is Allahabad Airport which is 95 kilometers (59 miles) from Amethi.

2.1 LOCATION AND GEOGRAPHICAL UNITS

District Amethi lies at the latitude 26°9' North and longitude 81°49' East at an average elevation of 101 meters (331 feet) from mean sea level. The total geographic area of the district is about 2330 Sq. Km. The district is bounded on North side by Faizabad district, south side by

Pratapgarh district. On the West side, the district is bounded by Barabanki district and Raibareilly district.

The district is administratively divided into 4 tehsils namely Gauriganj, Amethi, Musafirkhana and Tiloi. There are 13 development blocks in the district namely Amethi, Gauriganj, Musafirkhana, Tiloi, Jagdishpur, Bazar Shukul, Bhetua, Bhadar, Sangrampur, Jamo, Singhpur and Bhadurpur-II. The no. of Nyay Panchayat, no. of Panchayat and village detail is mentioned below:

No. of Nyay Panchayat	2019-20	98
No. of Gram Panchayat	2019-20	682
No. of Inhabited Villages	2019-20	976
No. of Un-Inhabited Villages	2019-20	7
Total no. of Villages	2019-20	983

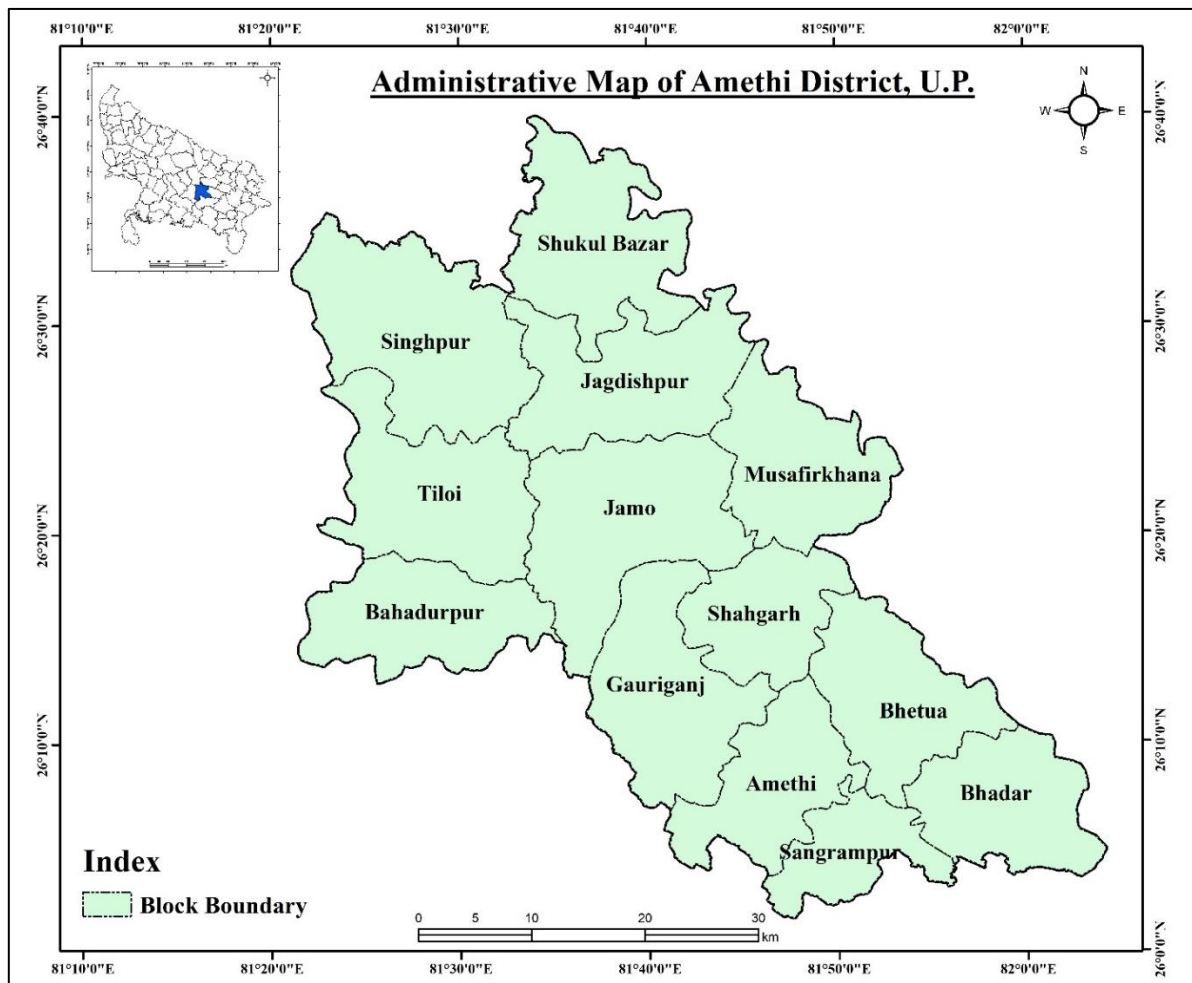


Figure 1: Administrative Map of Amethi

2.2 DEMOGRAPHICS

As per provisional figures of 2011 census (source: Official Website of Amethi) total population of the district is 1,867,000, with a population density of 802 person/per sq.km and the rural population constitutes 94% (1761000 nos.) of the total population.

Gender	
Males	945000
Female	922000

Urbanization	
Rural	1761000
Urban	106000

Table-1: Block-wise Population of Amethi District, Census-2011

Block	Total Population	Male Population	Female Population	Decadal growth in population (%)
Shukul Bazar	158524	80333	78191	21.22
Jagdishpur	205312	104301	101011	6.66
Musafirkhana	130874	65850	65024	19.07
Singhpur	196256	100670	95586	25.37
Tiloi	154083	78553	75530	25.06
Bhadurpur-II	124978	64229	60749	24.89
Guriganj	117718	59389	58329	-2.63
Amethi	123577	61843	61734	16.78
Bhetua	96527	48147	48380	13.71
Bhadar	123979	61776	62203	17.08
Sangrampur	82874	41399	41475	12.02
Jamo	171303	86769	84534	22.79
Shahgarh	75375	37130	38245	13.66
Total (Rural)	1761380	890389	870991	-7.38

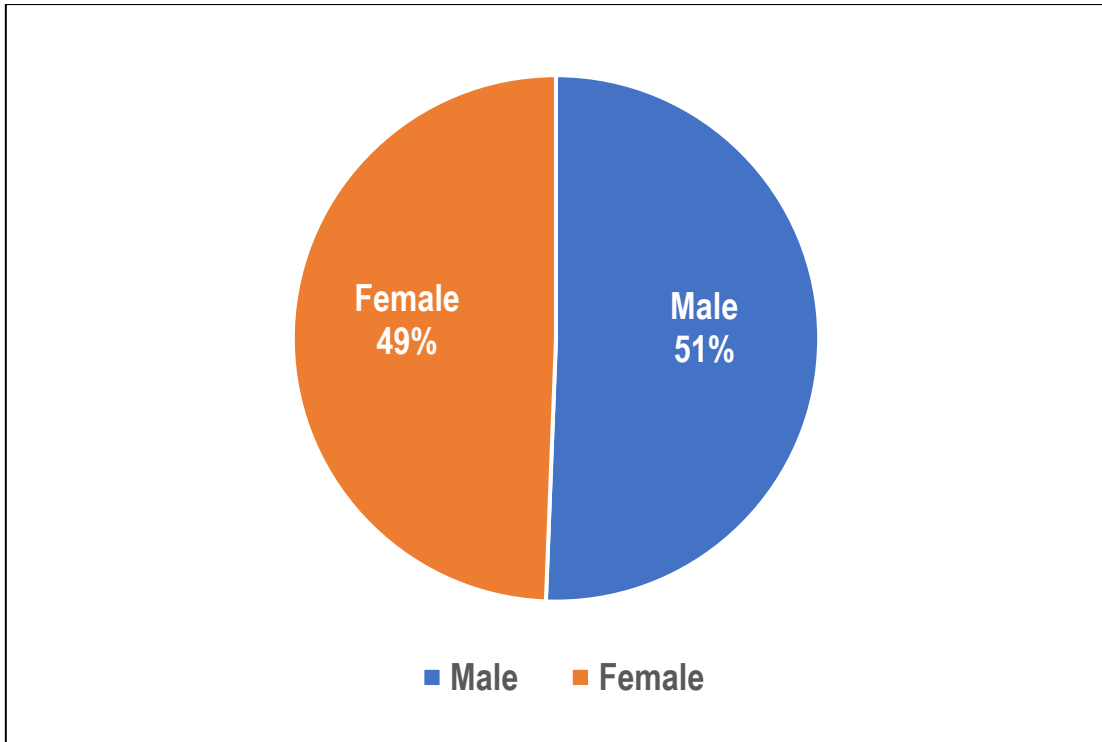


Figure 2: Population Structure (Gender Distribution) of Amethi

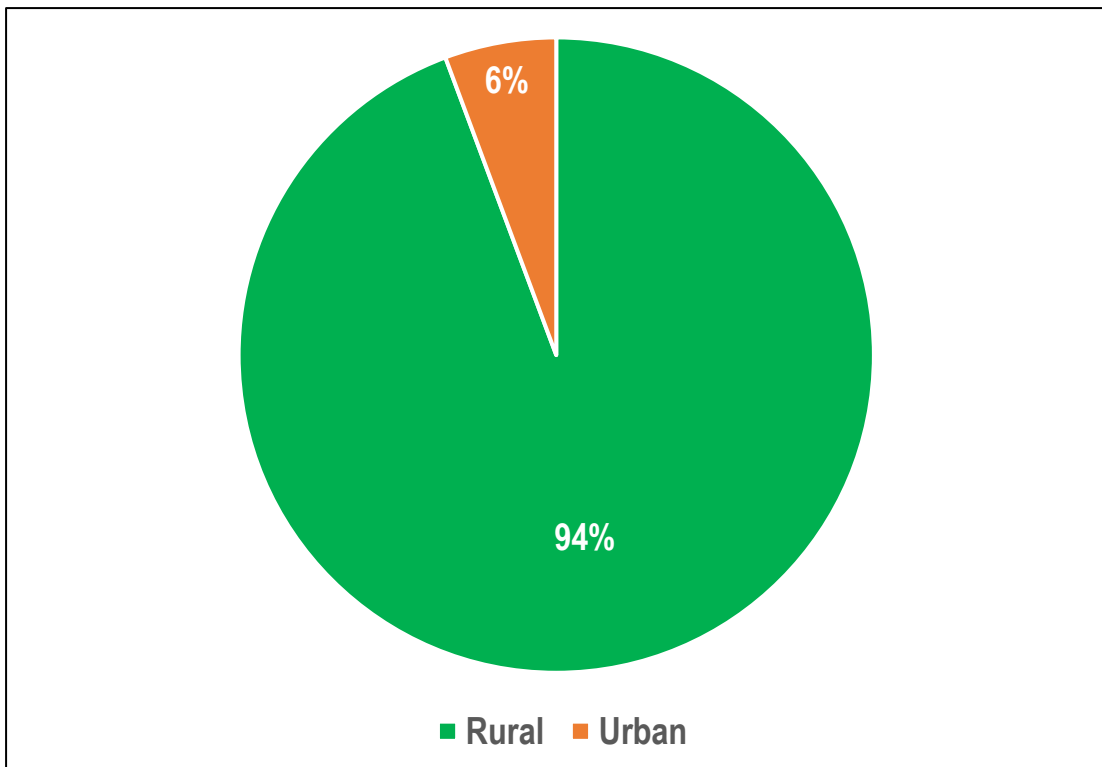


Figure 3: Population Structure (Rural vs Urban) of Amethi

2.3 CLIMATIC CONDITIONS: RAINFALL AND CLIMATE

Amethi district has a wet and dry climate with average temperatures ranging between 23° C to 28 °C Typical summer months are from March to May, with maximum temperatures ranging from 36° to 44 °C. The rainy season in the districts falls between June and September and July being the wettest month of the year. Rainfall is adequate and well-distributed. The southwest monsoon is active from mid-June to September, with maximum rainfall (~88%) taking place during this period. Winter starts from November. The daytime temperature hovers around 23 °C while night temperature is below 10 °C during December and January, often dropping to 2°to 3 °C.

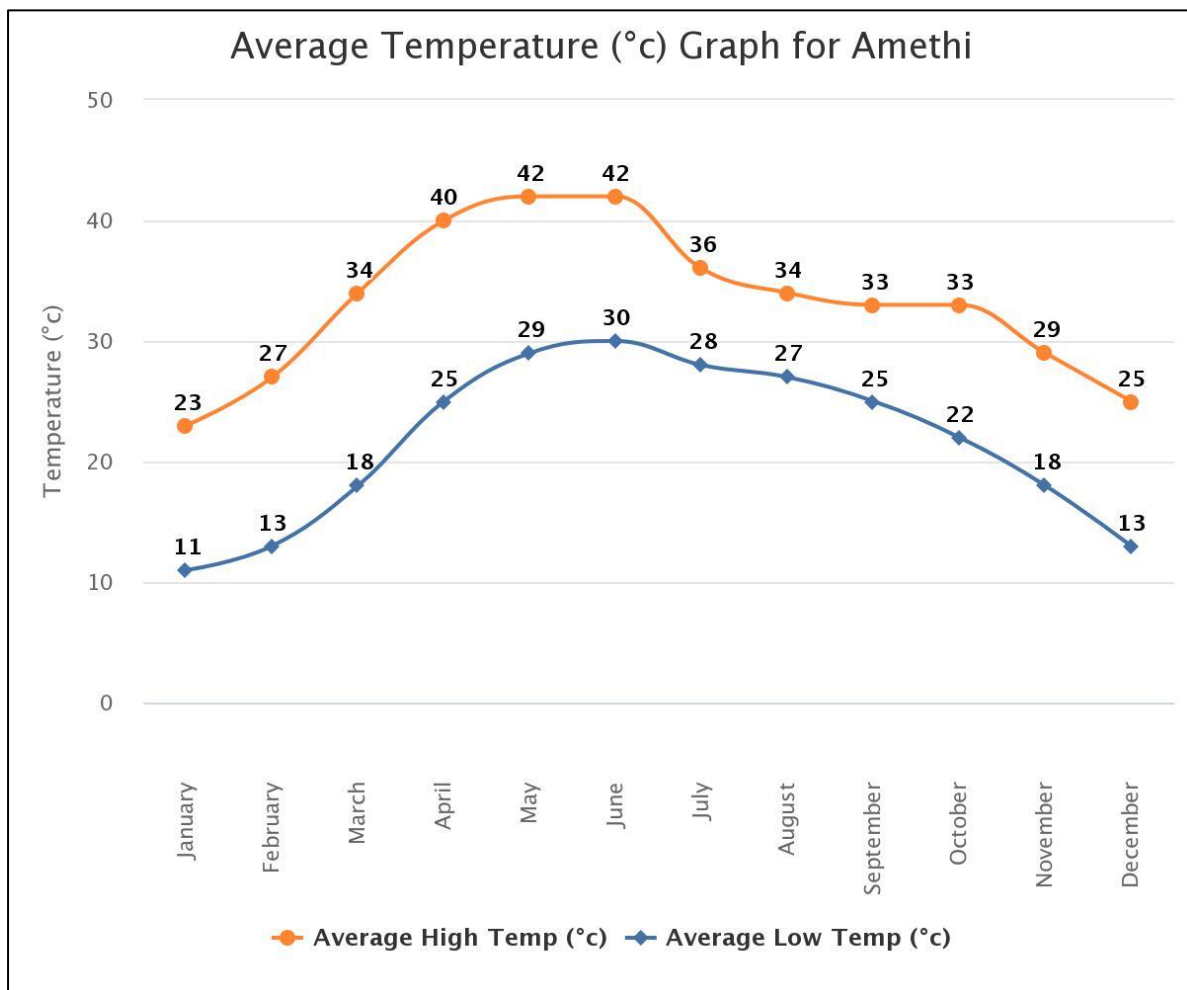


Figure 4: Average Temperature (°C) Graph of Amethi District

The annual rainfall for Amethi is derived as a product of average rainfall from Raebareli and Sultanpur rain gauge stations. The average annual rainfall in the district is 693.39 mm. The southwest monsoon is active from mid-June to September, with maximum rainfall (~90%) taking place during this period, July being the wettest month. There is average 45 rainy days (days with rainfall of 2.5 mm or more) in a year. Scanty rainfall also occurs in Winter Season.

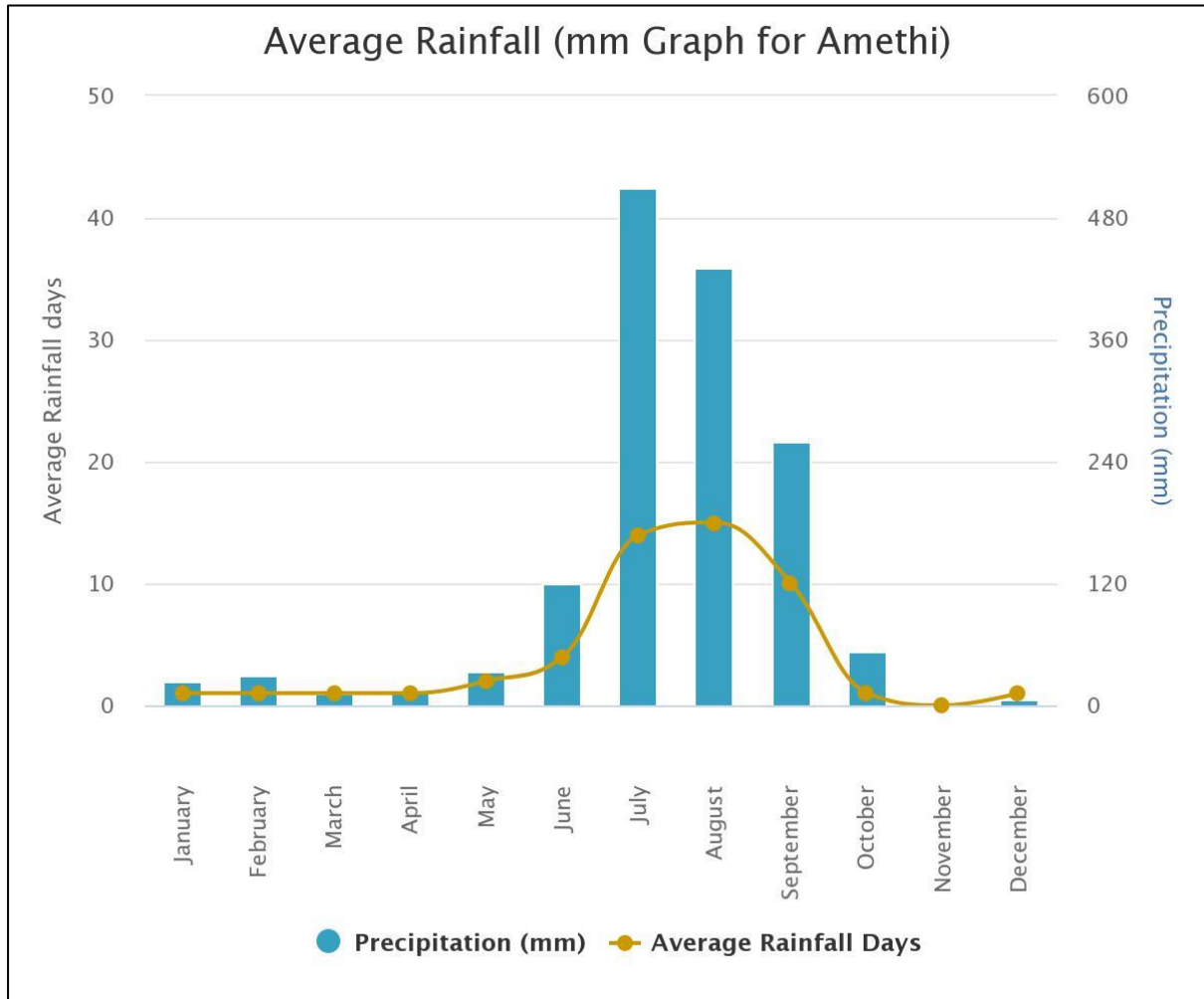


Figure 5: Average Rainfall (mm) Graph of Amethi District

Table-2: Year-Wise Rainfall Data for Amethi District

Year	Annual Rainfall	Monsoon (June to September)	Non-Monsoon (October to May)
2011	598.35	583.75	14.6
2012	697.5	653.1	44.4
2013	1025.95	912.1	113.85

2014	560.45	421.15	139.3
2015	412.15	315.8	96.35
2016	767.85	666.15	101.7
2017	490.2	471.75	18.45
2018	734.15	708.3	25.85
2019	903.01	837.42	65.59
2020	734.38	619.07	115.31
Average	692.399	618.859	73.54

2.4 GEOMORPHOLOGY, SOIL AND GEOLOGY

With the exception of a very gradual and scarcely perceptible slope from north-west to south-east, the surface of the district is generally level, being broken only by the valley of the Gomti and the ravines by which its drainage is affected. Almost the whole of district lies in the watershed of the Gomti, only the southern portion draining towards the Sai. The former - divides the district into two unequal tracts the larger of which lies in the south. Each of these tracts has the same three natural zones running parallel to the river. They are the, the Gomti valley with its light soil, alluvium and ravines; a higher lying belt of adequately drained medium loam; and a low-lying tract of land containing vast loamy plains and innumerable depressions. The Gomti valley is composed of a light and sandy or gritty and reddish soil which lends itself easily to erosion. The numerous water courses which carry down the surplus rain water from the uplands, have led to the formation of deep ravines, especially in the lower reaches where there are bare brown tracts, cut up into ugly ridges and inhabited only by patches of unprofitable jungle. There are some stretches of rich alluvium which grow good rabi crops without irrigation. The tract is liable to flooding. The loam tracts are a level country, highly cultivated and well-wooded. The soil is fertile medium to light loam fully irrigated and adequately drained. There are some patches of land which suffer either from excessive drainage. The rest of the district, consists of usarous land, interspersed with large arid plains. Drainage is poor. Thus, the predominant soil of the district is loam or *dumat*, its percentage in the district being approximately 65%.

Geologically, the district lies in Gomti Sub-basin of Central Ganga Plains in the upper Ganga Basin, exhibiting monotonous flat topography. The entire district is underlain by Quaternary Alluvium deposit. The formations are mainly composed of various grades of sand,

sandy clay, clay and kanker. The Older Alluvium generally occupies the larger part of the area away from the flood plains of the river Gomati forming the gentle physiographic plains, whereas the Younger Alluvium occupies the low-lying areas which are restricted to flood plains along the river course only. However, the lithological character of both the units is more or less same.



Figure 6: Geomorphological Map of Amethi District

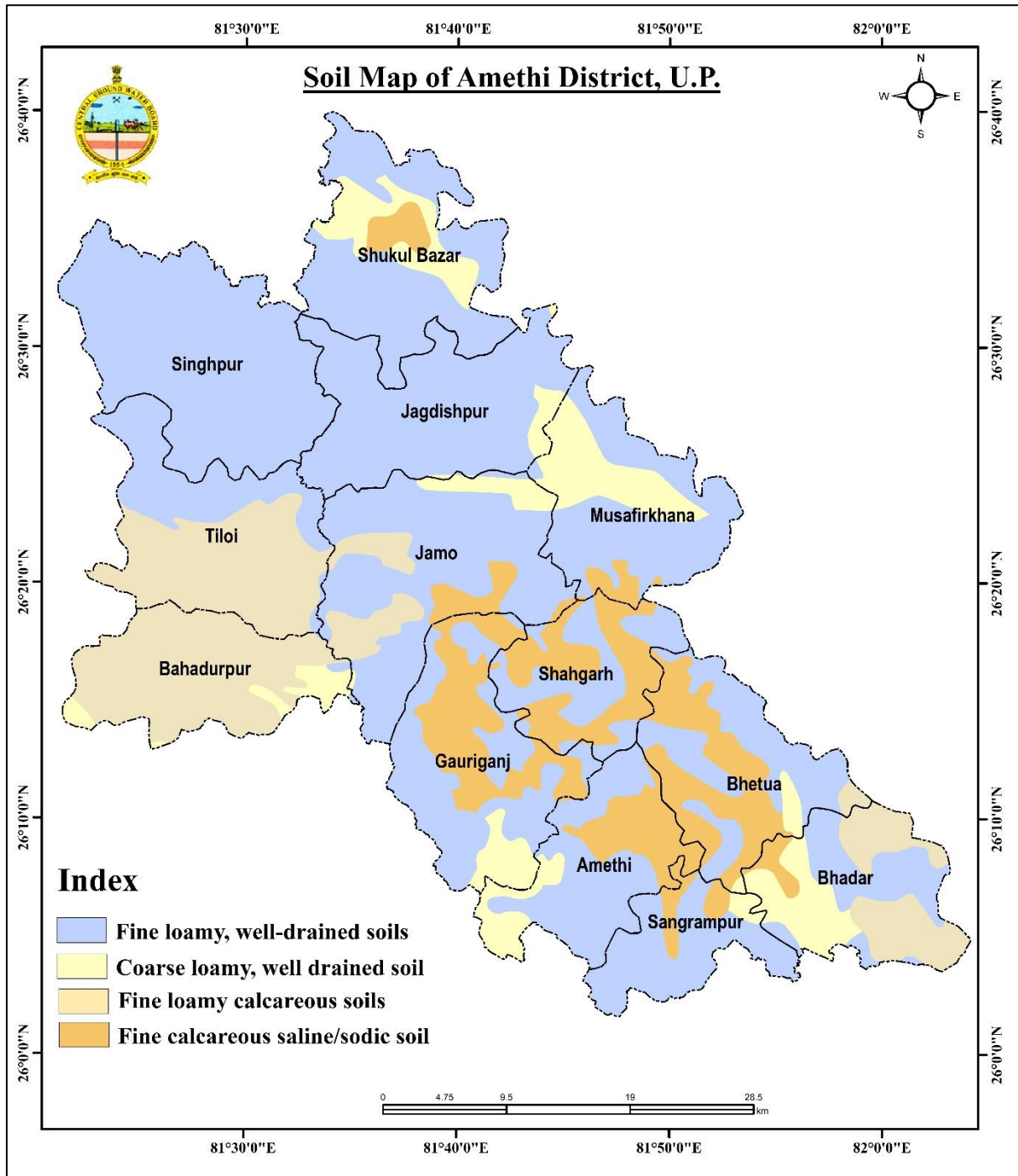


Figure 7: Soil Map of Amethi District

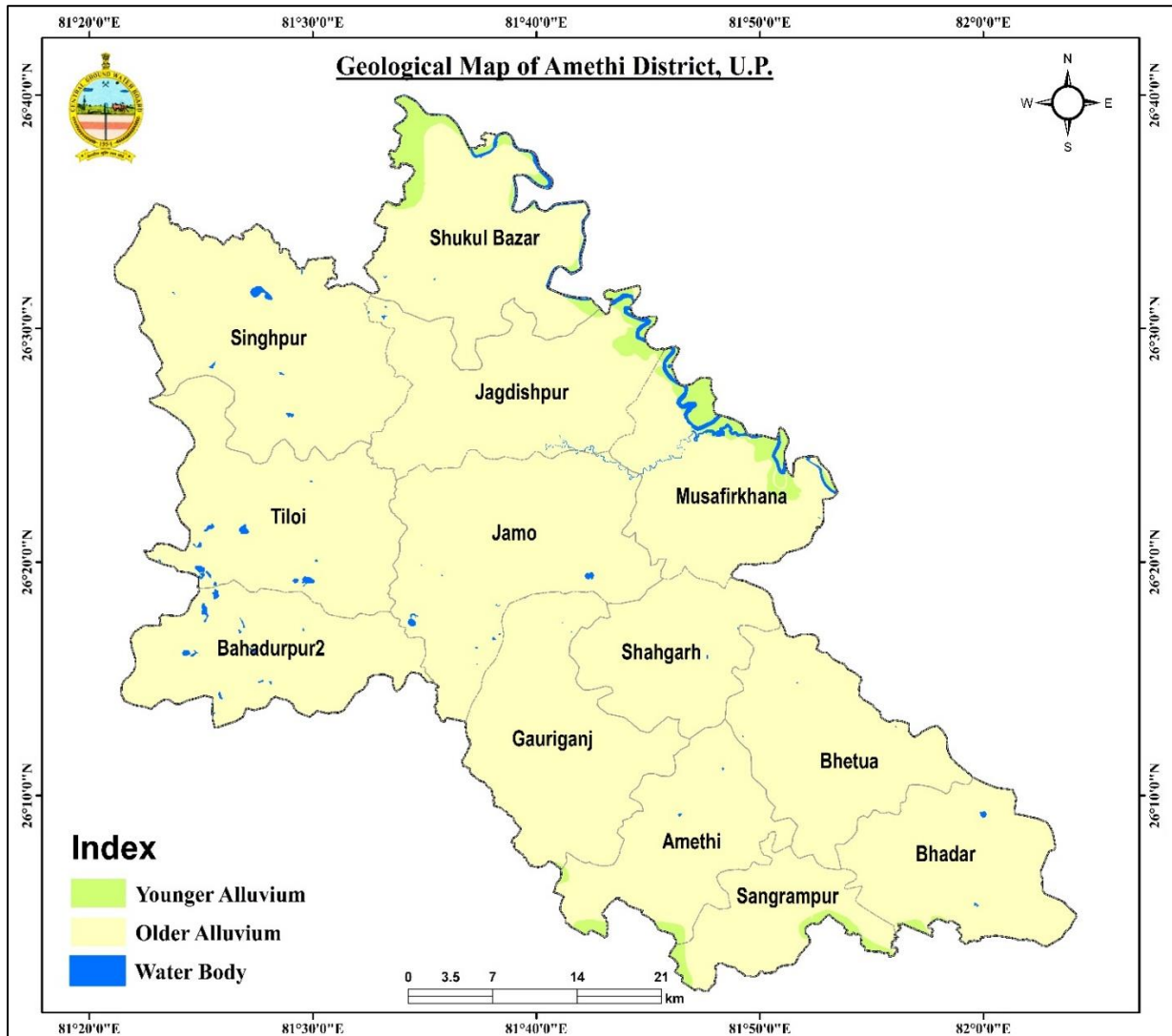


Figure 8: Geological Map of Amethi District

2.5 HYDROLOGY

The district is drained mainly by perennial Gomati River and its tributaries. The river Gomati with its meandering pattern flows from north-west to south-east, forming the north-eastern boundary of the district. Chamraura Nala, a tributary of Sai River drains the south-eastern part of the district. Some artificial drains have been constructed by the State Irrigation Department.

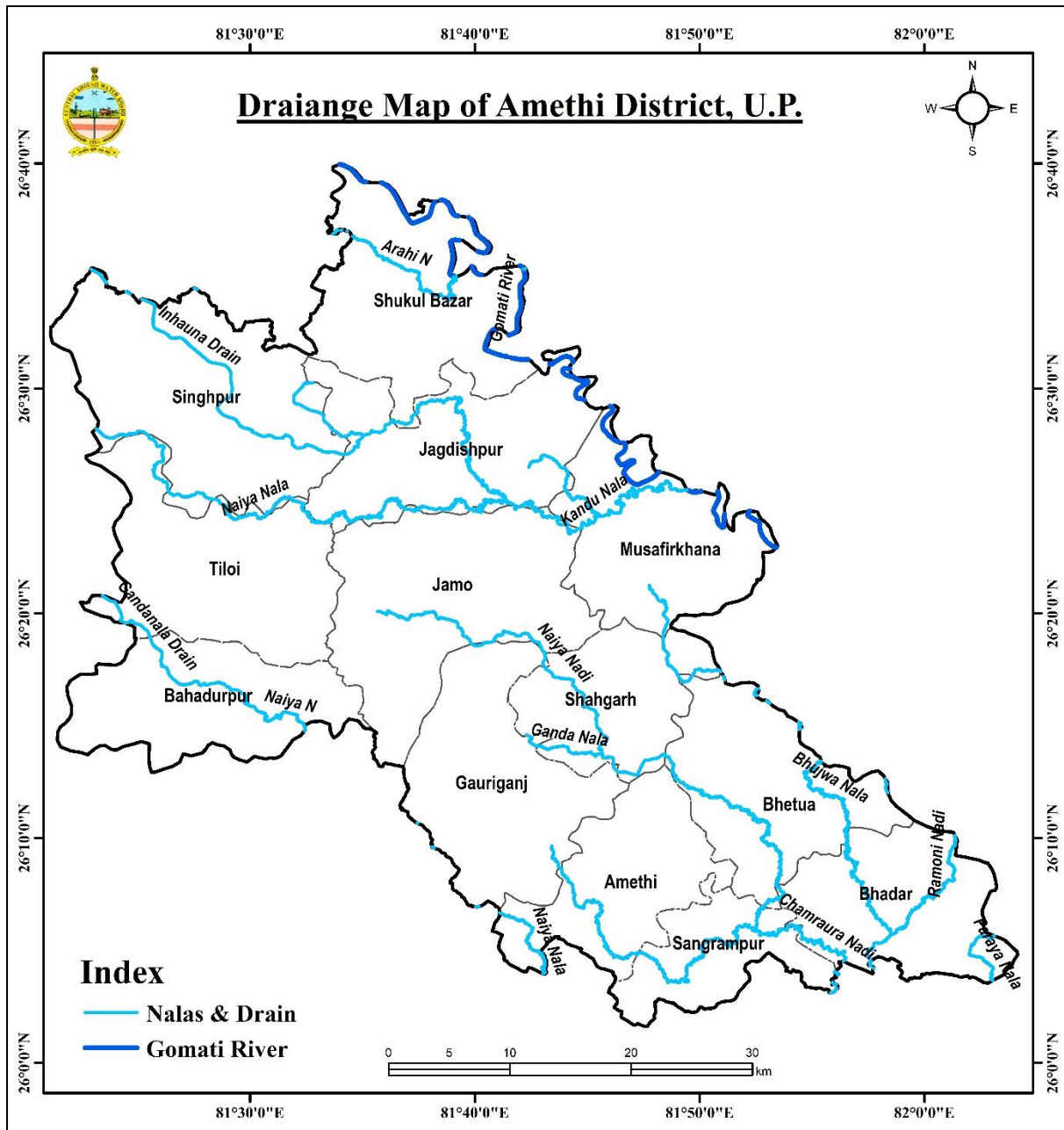


Figure 9: Drainage Map of Amethi District

2.6 LAND-USE

The block-wise land use as per Statistics of Amethi district for the Year 2018-19 is given in Table-3. A perusal of Table-3 shows that, out of 238201 Hectares geographical area of Amethi District, only 145202 Hectare is under cultivation, which is about 61% of total geographical area.

Table-3: Block-wise Land Utilization, District Amethi, U.P.**(in Hectares)**

Block	Area	Net Sown Area	Forest	Cultivable Waste Land	Current Fallow	Other Fallow	Uncultivable land	Land for use other than agriculture	Pasture	Areas under trees and shrubs
Shukul Bazar	19115	12147	423	598	942	1548	645	2161	115	536
Jagdishpur	21284	14061	101	456	1836	638	732	2799	142	519
Musafirkhana	16427	10344	221	354	1364	772	596	2276	152	348
Simhapur	24025	12033	167	471	1039	4029	580	4865	233	608
Tiloi	21898	12038	55	638	2385	954	504	4274	341	709
Bahadurpur	16750	10122	67	639	1873	638	457	2285	87	582
Gauriganj	18895	12888	56	252	1129	913	761	2403	149	344
Amethi	16123	10687	42	275	919	1115	408	1900	121	656
Bhetua	16621	10444	39	440	1218	987	861	1904	231	497
Bhadar	15692	8827	97	411	1958	1003	785	1859	174	578
Sangrampur	10611	6599	46	255	482	915	335	1152	87	740
Jamo	23673	15572	42	747	1285	1273	477	3692	84	501
Shahgarh	13718	8187	755	210	1009	1265	313	1526	134	319
Total rural	234832	143949	2111	5746	17439	16050	7454	33096	2050	6937
Total urban	3369	1253	0	42	387	586	92	899	36	74
Total district	238201	145202	2111	5788	17826	16636	7546	33995	2086	7011

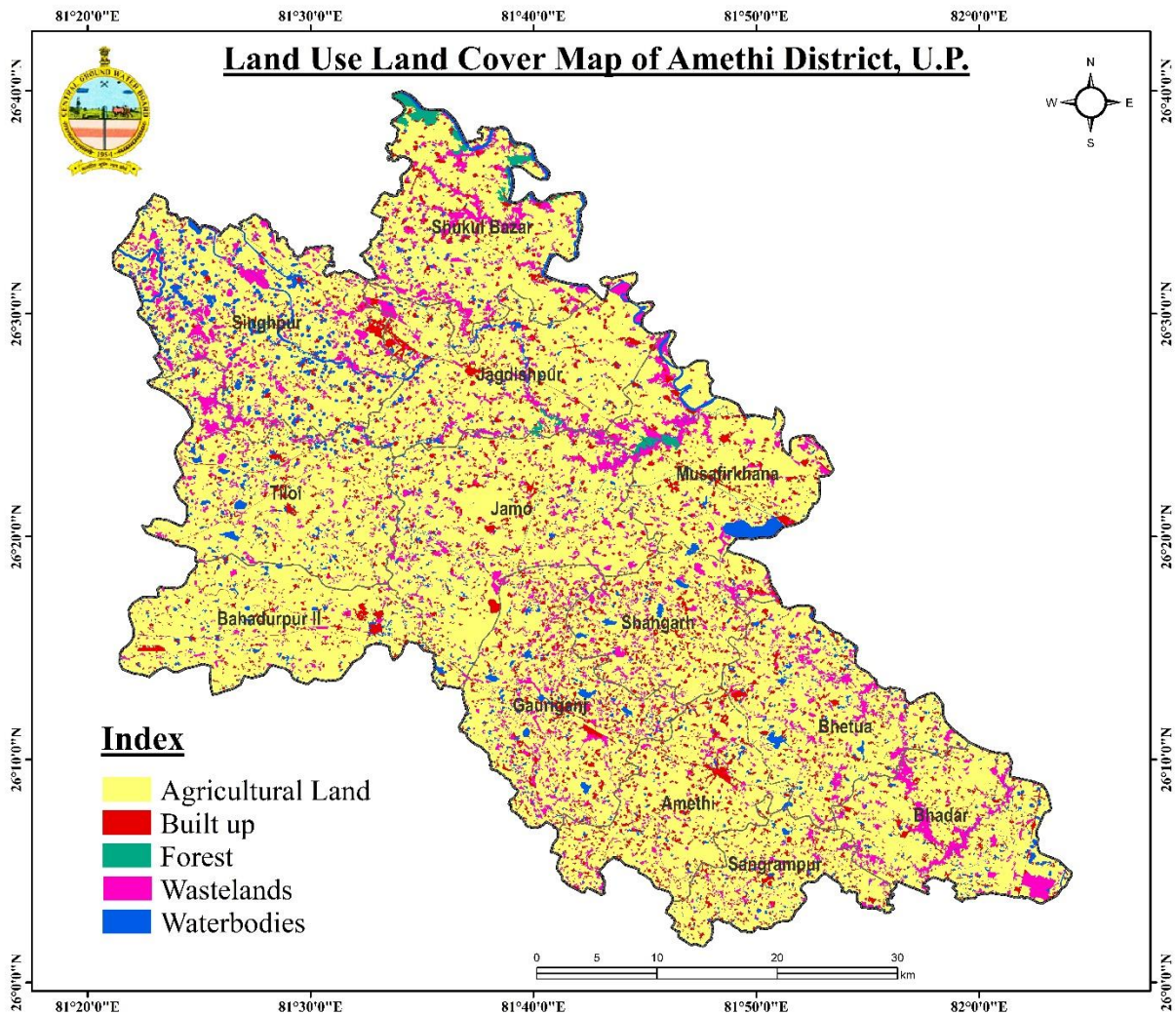


Figure 10: Land Use Land Cover Map of Amethi District

Forest cover is only 1% and mainly concentrated in the northern part of the district. Current fallow and other fallow together constitute 15% area of the district, which have the potential to be converted into the cultivable land. Land other than agriculture like rivers, ponds, lakes, wetlands, orchards, urban area etc. together constitute 23% of total geographic area. From this data it is safe to conclude that agriculture and associated activities are dominant economic activity in the District.

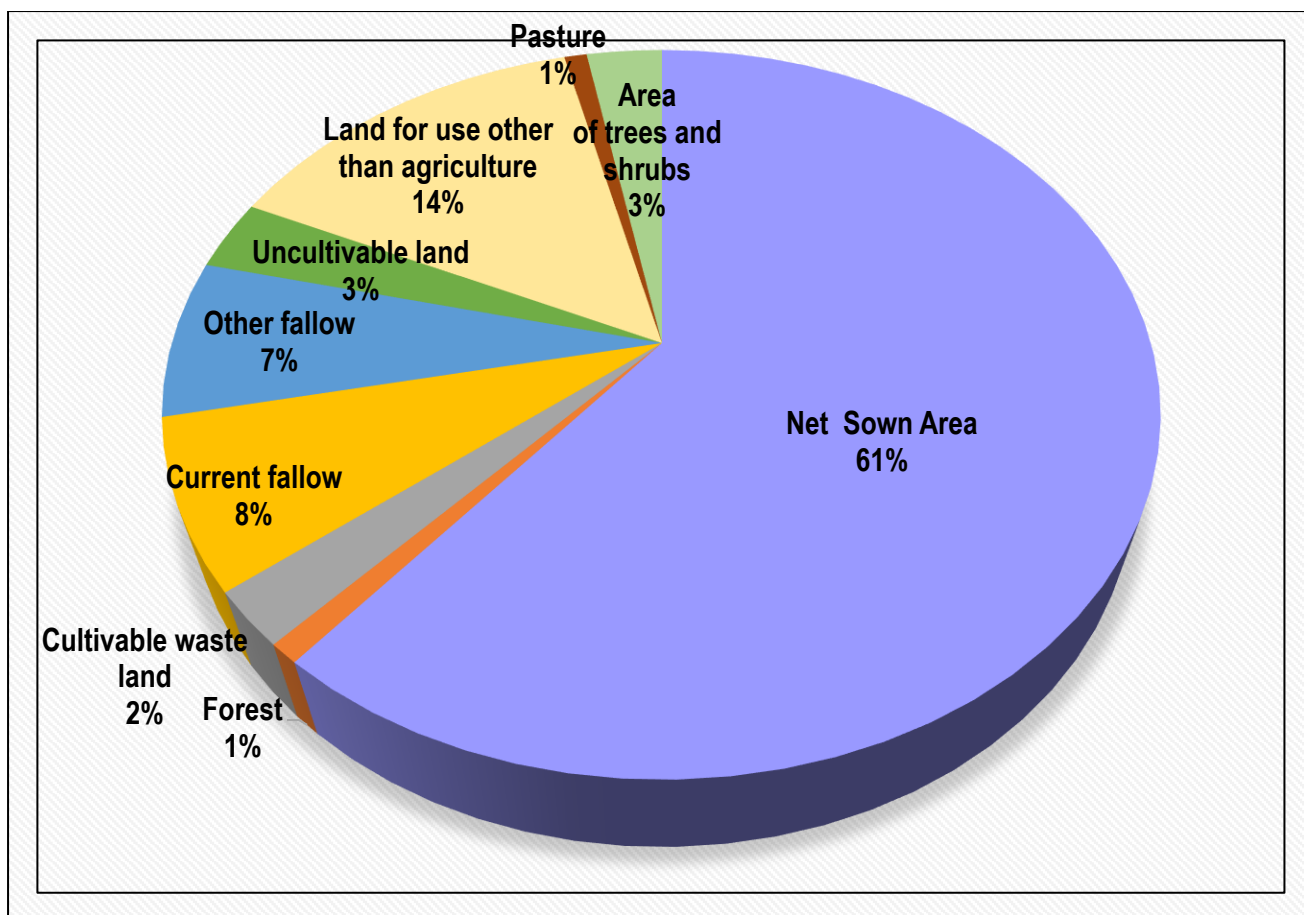


Figure 11: Pie Chart showing Land Use Utilization in Amethi District

2.7 AGRICULTURE AND CROPPING PATTERN

There are two major harvests in a year, the Rabi and the Kharif. Rabi crops like wheat, barley, pulses, oil seeds etc. are sown in an area of 116489 ha whereas only 11612 ha area is under cultivation for Kharif crops like paddy, maize, millet etc. Zaid crops are sown in an area of 12154 ha only.

Area-wise major crops sown in district is presented below:

S. No.	Crop	Area (in Hectares)
1.	Wheat	97212
2.	Rice	93635
3.	Pulses	18238
4.	Other Cereals	4872
5.	Oil-seed	2435
6.	Sugarcane	1532

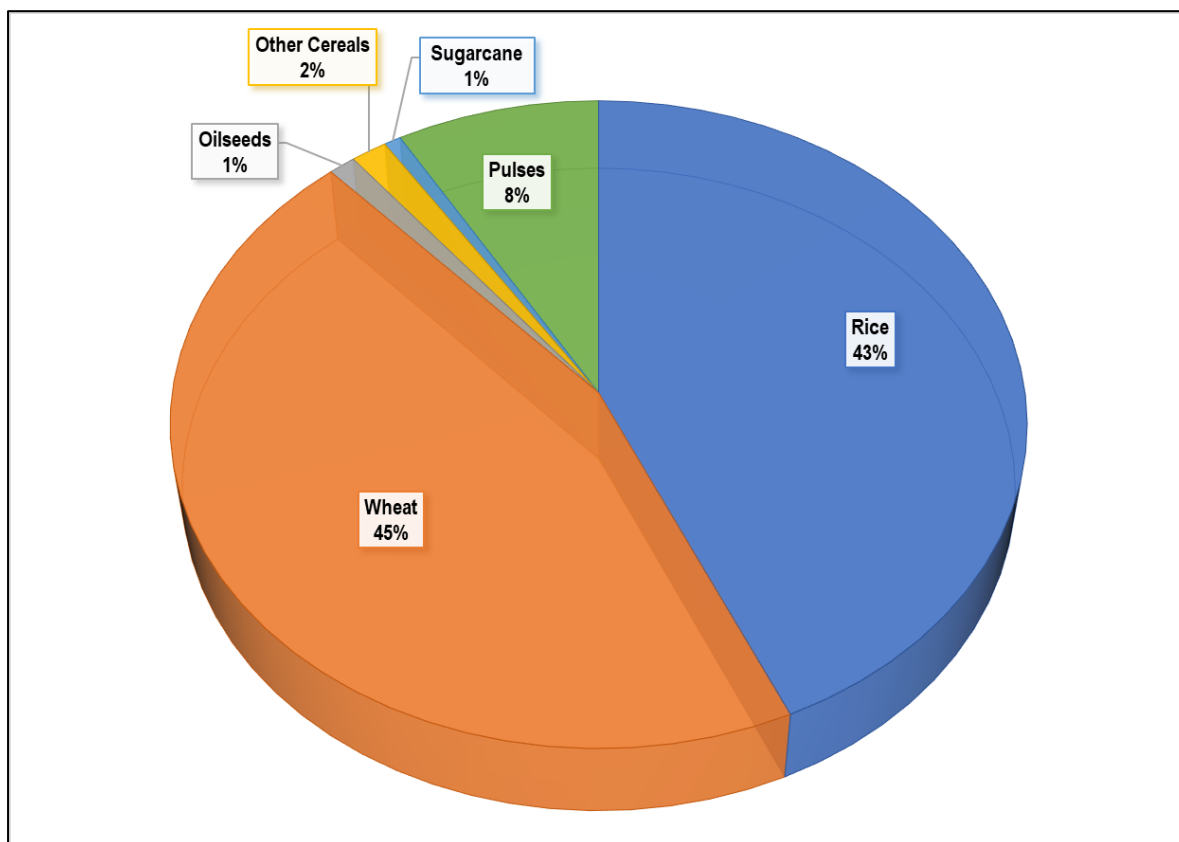


Figure 12: Pie Chart showing major crops sown in Amethi District

Table-4: Block-Wise Cropping Pattern in Amethi District (in Hectares)

Block	Net Sown area	Area sown more than once	Gross Sown Area				Land prepared for sugarcane
			Gross	Rabi	Kharif	Zayed	
Shukul Bazar	12147	5174	17321	8471	7802	1035	13
Jagdishpur	14061	9831	23892	11446	10702	1733	11
Musafirkhana	10344	7227	17571	8556	7995	1001	19
Simhapur	12033	9587	21620	10688	10188	731	13
Tiloi	12038	9560	21598	10564	10487	537	10
Bahadurpur	10122	8012	18134	9272	8542	311	9
Gauriganj	12888	7433	20321	9789	9423	1104	5

Amethi	10687	6606	17293	8301	8002	984	6
Bhetua	10444	6483	16927	7982	7947	984	14
Bhadar	8827	5144	13971	6667	6494	800	10
Sangrampur	6599	4097	10696	5228	4838	607	23
Jamo	15572	8963	24535	11521	11609	1395	9
Shahgarh	8187	6074	14261	6861	6586	795	18
Total District	145202	95213	240415	116489	111612	12154	160

From Irrigation point of view, the major part of the area is irrigated by tube-wells (Govt. and Private both) and canals. Table 5a & 5b shows the block-wise irrigation pattern of the district. A perusal of Table 5a shows that out of 145202 ha of culturable land, 130961 ha area is under irrigation. Hence, the total percentage of irrigated area falls at around 90%. About 10% of the cultivated area is unirrigated.

Tubewell is the most important method of irrigation in the district. An area of 75350 ha is irrigated by Tube wells which comprises 57.53 % of Net Irrigated Area. The other important ground water source of irrigation is dugwells. Tubewell and Dugwell together contributes to 57.55% of total irrigation in the district. It shows high dependency of irrigation on groundwater.

Canals contribute about 43.03% in irrigation i.e. an area of 56363 ha of Net Irrigated Area, making it second most utilized source of irrigation.

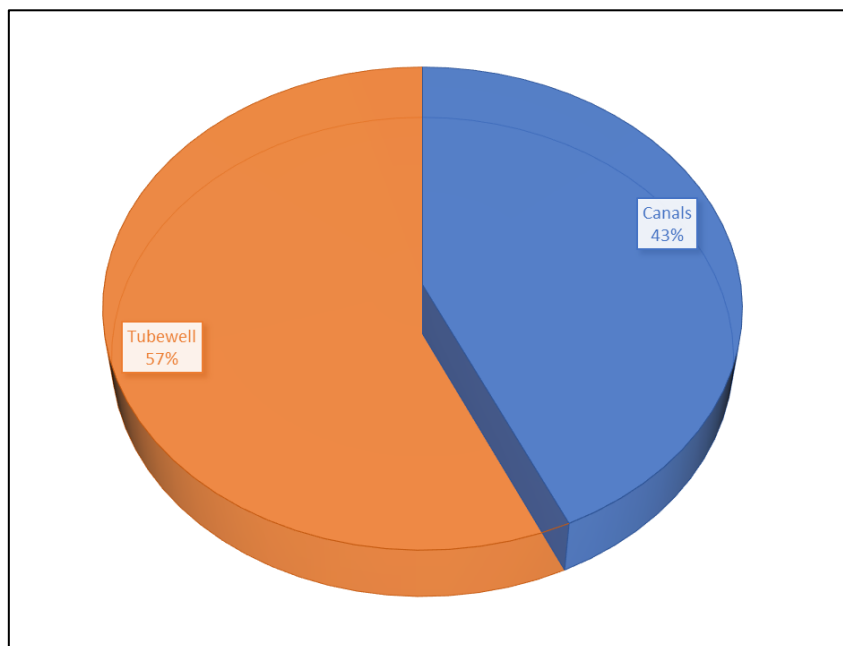


Figure 13: Pie Chart showing percentage distribution of methods of irrigation in Amethi District

Table-5a: Block-Wise Irrigated Area by various Sources in Amethi District (in Hectares)

Block	Canal	Tube well		Well	Total
		Public	Personal		
Shukul Bazar	3816	163	7033	0	11012
Jagdishpur	4420	130	7623	0	12173
Musafirkhana	3446	369	5210	0	9025
Simhapur	7541	95	3517	58	11211
Tiloi	8687	118	1551	59	10415
Bahadurpur	5594	91	3574	86	9345
Gauriganj	6203	766	5529	0	12498
Amethi	2915	198	6897	0	10010
Bhetua	1640	673	6940	0	9253
Bhadar	1319	405	6011	0	7735
Sangrampur	603	181	4656	45	5485
Jamo	7758	482	5737	0	13977
Shahgarh	2389	605	4576	0	7570
Total District	56363	4276	70074	248	130961

Table-5b: Block-Wise details of water structures in Amethi District (in Hectares)

Block	Length of canals (km)	State Tube Wells (No.)	Shallow tube well				Medium Tube Well (No.)
			Electric powered	Diesel powered	other	Total	
Shukul Bazar	134	18	10	345	0	355	287
Jagdishpur	135	36	14	262	0	276	438
Musafirkhana	52	57	19	255	0	274	361
Simhapur	198	14	12	331	0	343	276
Tiloi	150	9	13	225	0	238	297
Bahadurpur	120	1	17	236	0	253	343
Gauriganj	115	6	15	436	0	451	246
Amethi	81	23	16	564	0	580	311
Bhetua	96	69	21	338	0	359	297
Bhadar	94	37	15	368	0	383	298
Sangrampur	26	23	12	345	0	357	261
Jamo	136	32	11	286	0	297	289
Shahgarh	57	37	12	310	0	322	293
Total District	1428	362	201	4313	0	4514	3997

2.8 INDUSTRIALIZATION AND MINING ACTIVITIES

The district has industrial set-up, mostly around Jagdishpur and Gauriganj Block. The districts have 04 large scale units and 03 large scale units are under construction. The majority of the industries are agro based. Bharat Heavy Electricals Ltd., Indo-Gulf Fertilizers, and Steel Authority of India are some of the major establishments. In the district the growth of large and heavy industry has been very good with an annual growth rate of 15%-20% during the last five years due to their strategic location.

Table-6: Industrial Scenario in Amethi District

S. No.	Head	No. of Units
1.	Registered Industrial Units	148 nos.
2.	Total Industrial Units	148 nos.
3.	Registered medium and large units	06 nos.
4.	No. of industrial areas/estate	04 nos.

Table-7: Details of existing industrial units in Amethi District

Type of Industry	No. of Units	Investments (in Lakhs)
Agro based	33	98.55
Wood/Wooden-based furniture	04	10.25
Repairing and servicing	79	168.27
Others (Ice-cream, Ice, handicrafts and computer-based industry)	32	228.63
Total	148	505.70

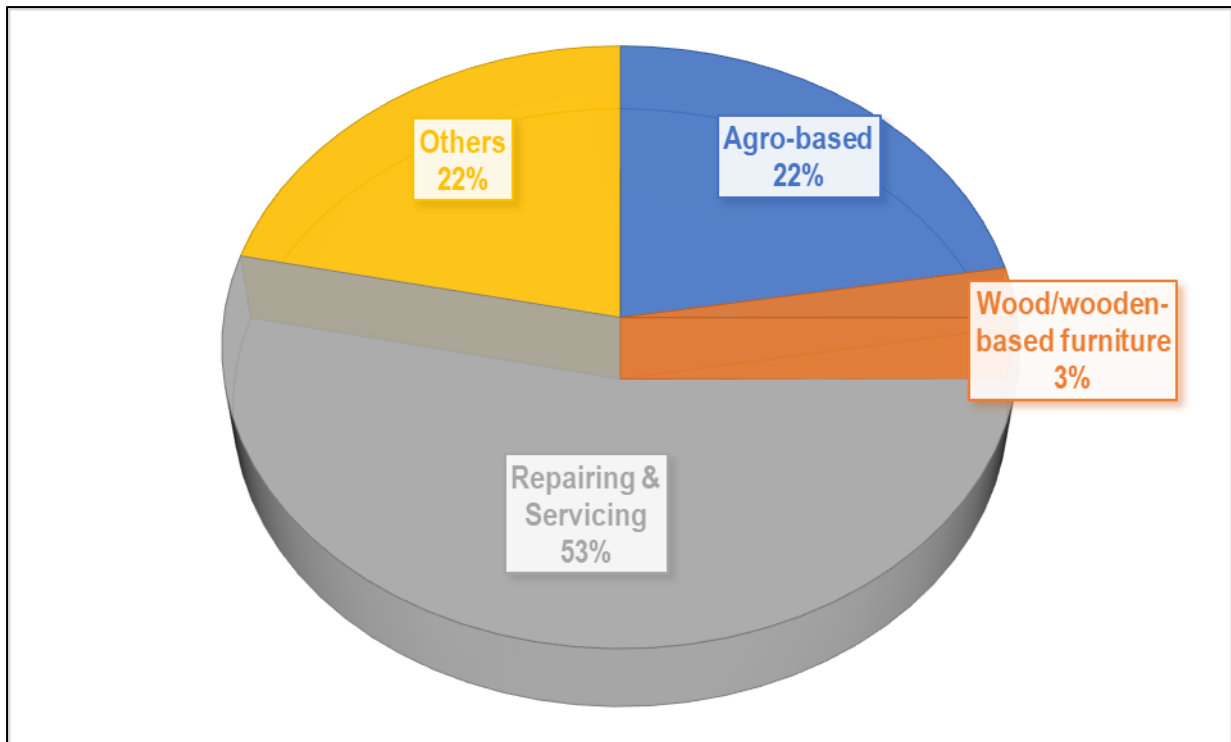


Figure 14: Pie Chart showing percentage distribution of types of industries in Amethi District

No major minerals are found in the districts. Only sand is available along the bank of river Gomti which is used in construction of permanent houses. In some places stones are also found which are used by the Public Work Department for road construction in the districts.

3. DATA COLLECTION, GENERATION AND INTEGRATION

3.1 HYDROGEOLOGY

3.1.1 General Geology

The alluvium of Quaternary age occupies entire district. On the basis of age and its constituents, it may be further classified as Older Alluvium, and the Newer Alluvium. All these sedimentary formations were deposited during the middle to late Pleistocene and Holocene times, and are comprising of different grades of sands, silts, clays, with varying amounts of secondarily developed calcareous nodules known as kankar.

Description of the geological formations comprising the aquifers in the area is based on the exploratory data and geophysical exploration carried out in and around Amethi district by CGWB. Based on litho-characteristics the sediments are divided in two units viz. clayey zone and sandy zone. Clayey zone comprises of thick beds of clay with thin bands of sand and silt in association of kanker in the varying proportions. Sandy zones contain sands of coarse to very fine grained with granules of ferruginous materials. These zones also contain some bands of clay.

3.1.2 Water Level

Ground water occurs in the pore spaces of the unconsolidated alluvial material in the zone of saturation. In Amethi District, ground water occurs under unconfined condition at shallow depths while deeper aquifers are under confined state of disposition, the confining layers are impermeable clay beds. Hydrogeological data of wells inventoried during Pre-Monsoon is appended in Table-8.

On the basis of water level data collected during Pre-Monsoon Reconnoitering Survey, the depth to water level map has been prepared for May, 2022. The study of the pre-monsoon water level reveals that the depth to water level in the district generally ranges between 1.05 to 13.65 mbgl during pre-monsoon. Shallow water level conditions i.e., up to 5 mbgl generally occurs in Tiloi and Gauriganj blocks and in parts of Singhpur, Bahadurpur-II, Bhadar and Musfirkhana. The major part of the district has a water level in the range of 5 to 10 mbgl. The deepest water level i.e., 13.65 mbgl has been observed in Sangrampur Block.

Table-8: Details of Well Inventoried During Reconnoitry Survey in Amethi District

S. No.	District	Block	Village/Location detail	Type of well	Geological Horizon	Diameter (in m)	MP (in m)	Total Depth (in m)	Longitude	Latitude	Pre-Monsoon WL (mbgl)	Post-Monsoon WL (mbgl)
1	Amethi	Singhpur	Anguri Village, near Shanker Bajrang Temple	DW	Alluvium	1.5	0.45	8.5	81.45899	26.56407	5.18	2.75
2	Amethi	Shukul Pur	Mahaveeran Temple premise	DW	Alluvium	3.8	0.55	15.7	81.577033	26.60505	9.82	10.29
3	Amethi	Shukul Pur	Pure Bharthe	DW	Alluvium	2.95	0.7	9.8	81.6122	26.4799	6.12	5.06
4	Amethi	Bhadar	Durgapur	DW	Alluvium	2	1.6	12.28	82.0446	26.1239	5.98	3.18
5	Amethi	Bhadar	Chheda	DW	Alluvium	1.67	0.7	7.8	82.0317	26.0714	4.4	2.39
6	Amethi	Sangram Pur	Tarapur	DW	Alluvium	1.47	0.8	10.1	81.84023	26.114	8.44	8.53
7	Amethi	Amethi	Murai ka Purwa	DW	Alluvium	1.4	0.22	8.1	81.7876	26.1634	5.46	4.28
8	Amethi	Gauriganj	Pure Ramdeen	DW	Alluvium	3.3	1	9.2	81.7075	26.19533	4.75	2.04
9	Amethi	Bhetua	Newarhiya	DW	Alluvium	2.36	0.7	8.57	81.81397	26.23426	5.88	2.71
10	Amethi	Bhetua	Tikri Chauraha, on Peeparpur Road	DW	Alluvium	1.52	0.56	8.2	81.8845	26.21591	5.4	4.34
11	Amethi	Bhetua	Shree ka Purwa	DW	Alluvium	2.07	0.79	8.5	81.86851	26.2058	5.57	4.81
12	Amethi	Jagdishpur	Mubarakpur	DW	Alluvium	1.72	0.55	9.2	81.6139	26.4482	8.15	8
13	Amethi	Musafirkhana	Madhar Basunda (Madha Urf Bhusanda)	DW	Alluvium	1.32	0.7	12.74	81.7754	26.39433	7.87	7.35

14	Amethi	Jamo	Janapur	DW	Alluvium	1.6	0.54	6.55	81.5868	26.37043	5.86	2.73
15	Amethi	Jamo	Gauhaniya	DW	Alluvium	1.32	0.14	7.1	81.5886	26.25466	4.7	3.18
16	Amethi	Bahadurpur-II	Barandi ka Purwa	DW	Alluvium	2.22	0.05	6.52	81.47441	26.26169 5	4.75	1.75
17	Amethi	Bahadurpur-II	Pure Himachal ka Purwa	DW	Alluvium	1.87	0.28	8.3	81.3876	26.2586	6.02	2.95
18	Amethi	Tiloi	Saidpur	DW	Alluvium	1.27	0.24	8.05	81.4226	26.34538	4.8	2.09
19	Amethi	Tiloi	Mohanganj	DW	Alluvium	1.14	1.17	14.1	81.46857	26.37228	5.53	1.9
20	Amethi	Tiloi	Phoola	DW	Alluvium	1	1.21	13.68	81.46857	26.43982	7.6	3.81
21	Amethi	Tiloi	Basantpur	DW	Alluvium	1.44	1.17	9.18	81.42178	26.44931	5.91	3.15
22	Amethi	Singhpur	Tedhai	DW	Alluvium	1.69	0.55	9.5	81.40993	26.53501	5.72	1.65
23	Amethi	Singhpur	Jamunipur	DW	Alluvium	1.65	0.62	5.87	81.43368	26.5609	5.25	2.08

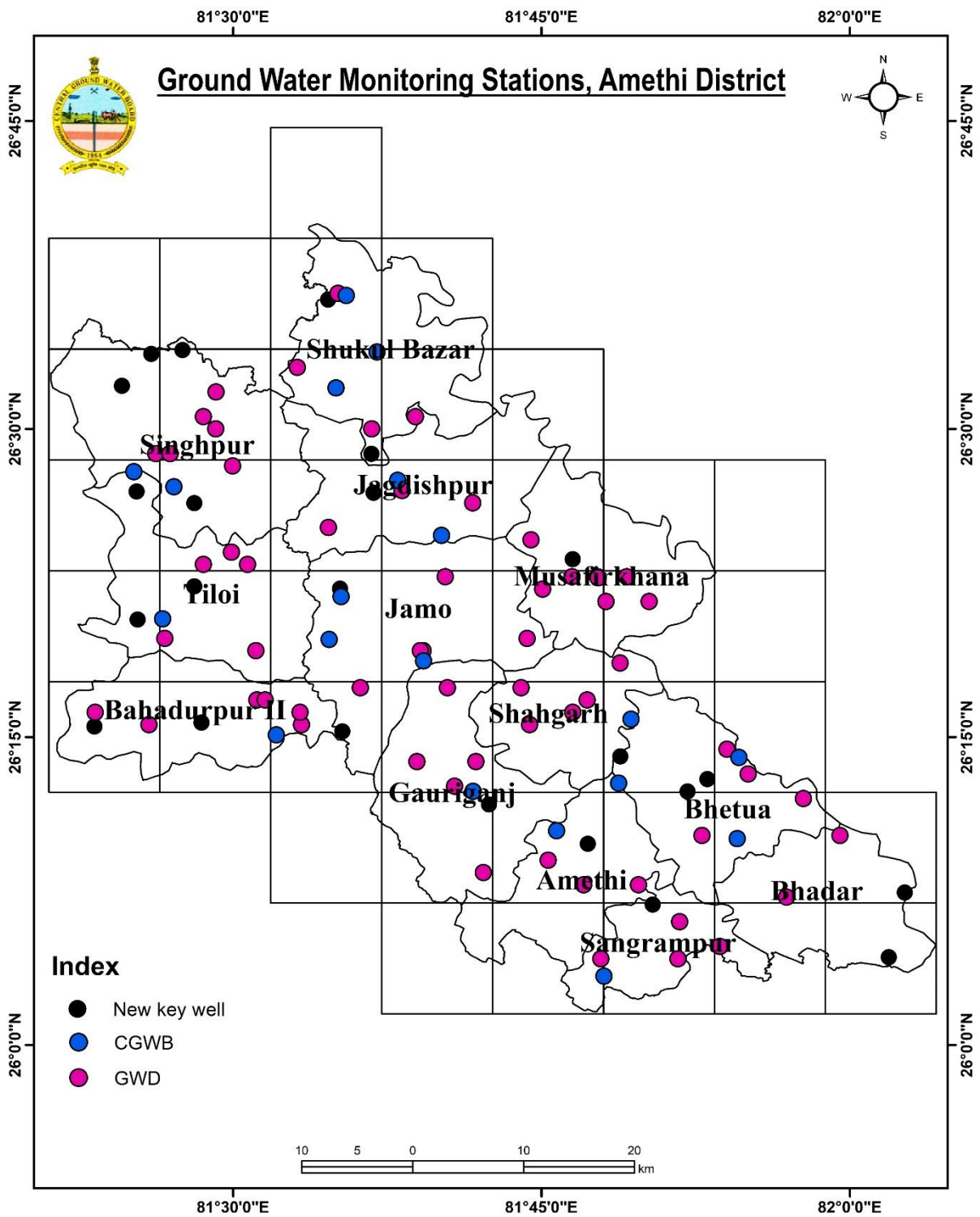


Figure 15: Map showing location of monitoring well in Amethi District

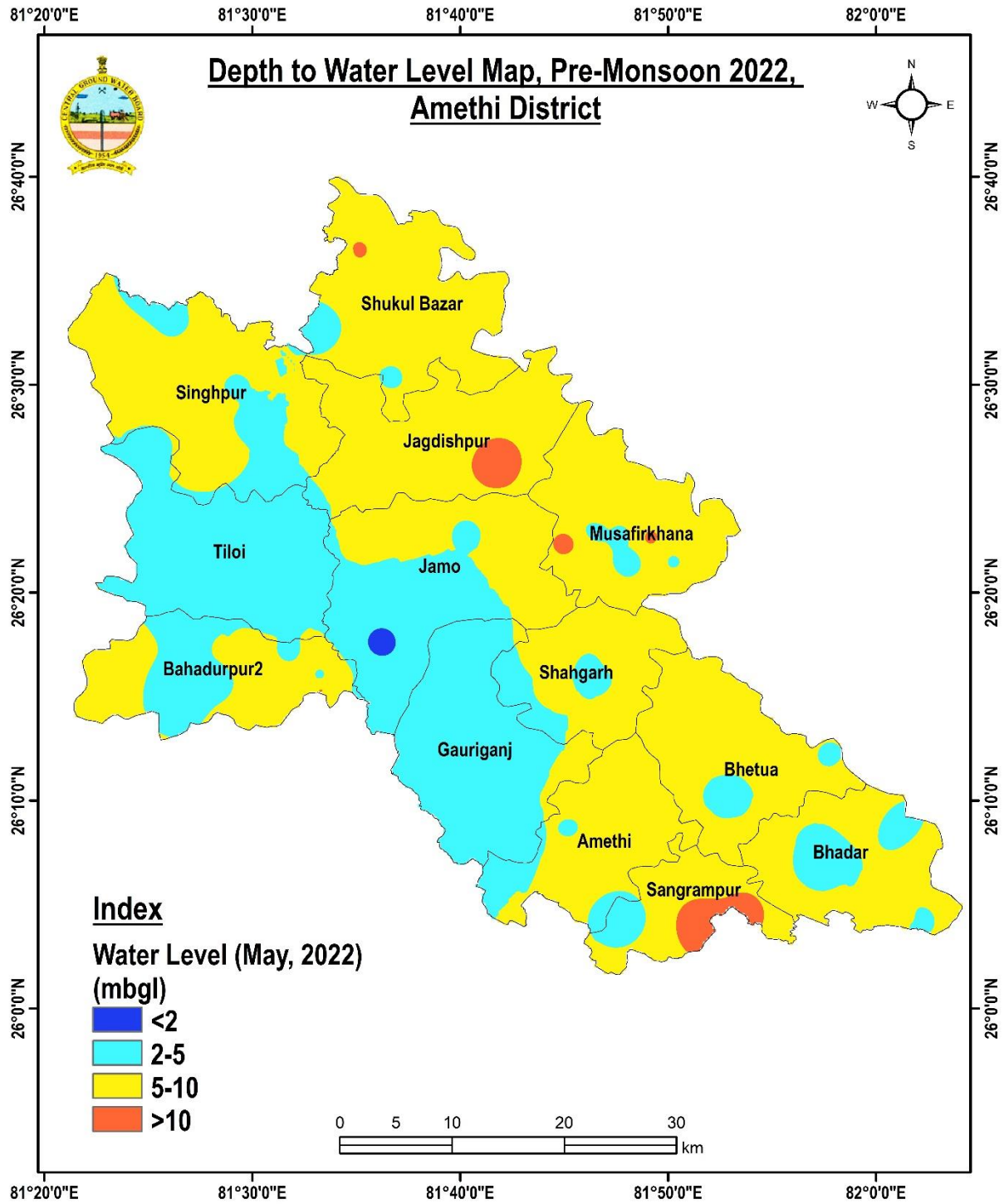


Figure 16: Map showing depth to water level map, Pre-Monsoon: 2022 in Amethi District

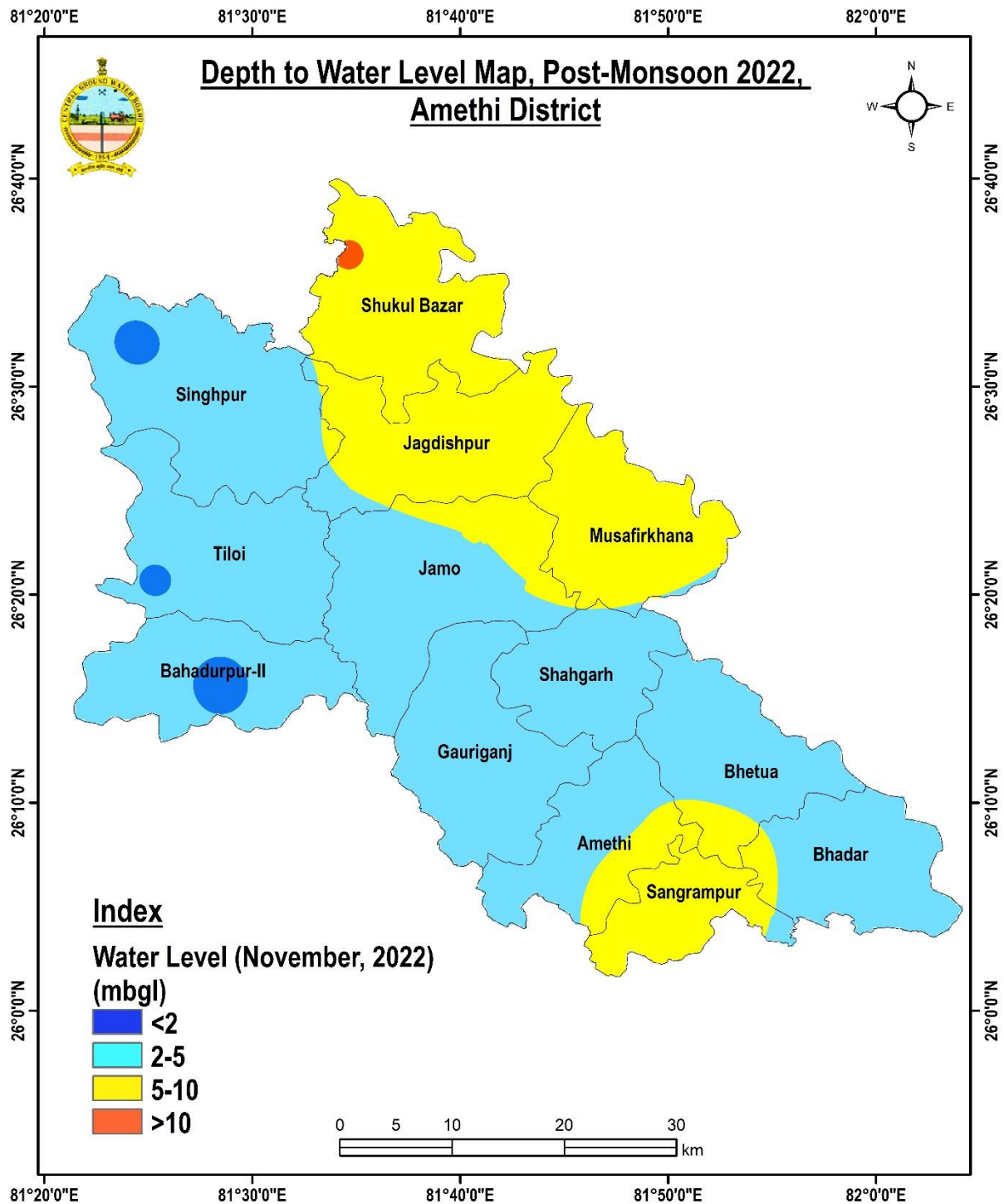


Figure 17: Map showing depth to water level map, Post-Monsoon: 2022 in Amethi District

On the basis of water level data collected during Post-Monsoon Reconnoity Survey, the depth to water level map has been prepared. The study of the post-monsoon water level reveals that the depth to water level in the district generally ranges between 1.65 to 10.29 mbgl

during post-monsoon. Shallow water level conditions i.e., up to 5 mbgl generally occurs in Tiloi, Bhadurpur-II, Shahgarh and Gauriganj blocks and in parts of Amethi, Bhadar and Bhetua. The major part of the district has a water level in the range of 2 to 5 mbgl. The deepest water level i.e., 10.29 mbgl has been observed in Shukul Bazar Block.

3.1.3 Pre-Monsoon & Post-Monsoon Long Term Trend Analysis And Comparison of Present Ground Water Regime With Reference to Earlier Studies

About 90% of the NHS show a rise in water levels during the Pre-monsoon period. The perusal of the decadal map shows that the most of the area shows rising trend in ground water levels. This is due to the fact that the district mostly lies in the command area and is characterized by canals with higher running days and availability of surface water.

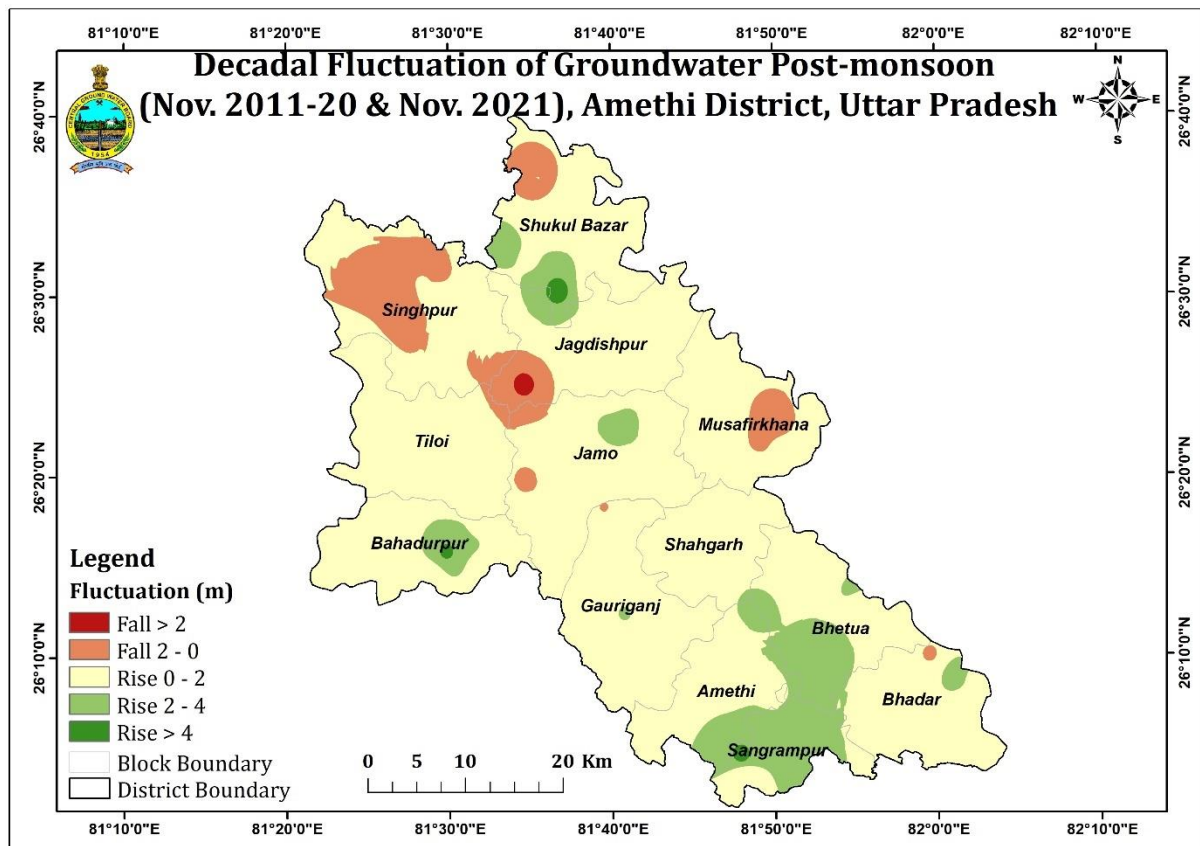


Figure 18: Map showing Decadal fluctuation in respect of Pre-Monsoon Monitoring in Amethi District

The decline is observed in the isolated patches. The highest decline in the water levels is observed in parts of Sangrampur blocks of the district. The declining trend is, however, maintained in the non-command area of the district. This is on account of the fact that most of this area is in the tail end of the canals. The amount of water availability of canal water is less and sometimes negligible, forcing the use of ground water for irrigation and other uses.

During the post monsoon, most of the NHS show a rising trend in ground water levels. Declining water level trend is observed in isolated patches in Northern and north-western part of the district. This is on account of the fact that most of this area is in the tail end portion of the Subeha and Singhpur Distributaries. The amount of water availability of canal water is less and sometimes negligible, forcing the use of ground water for irrigation and other uses.

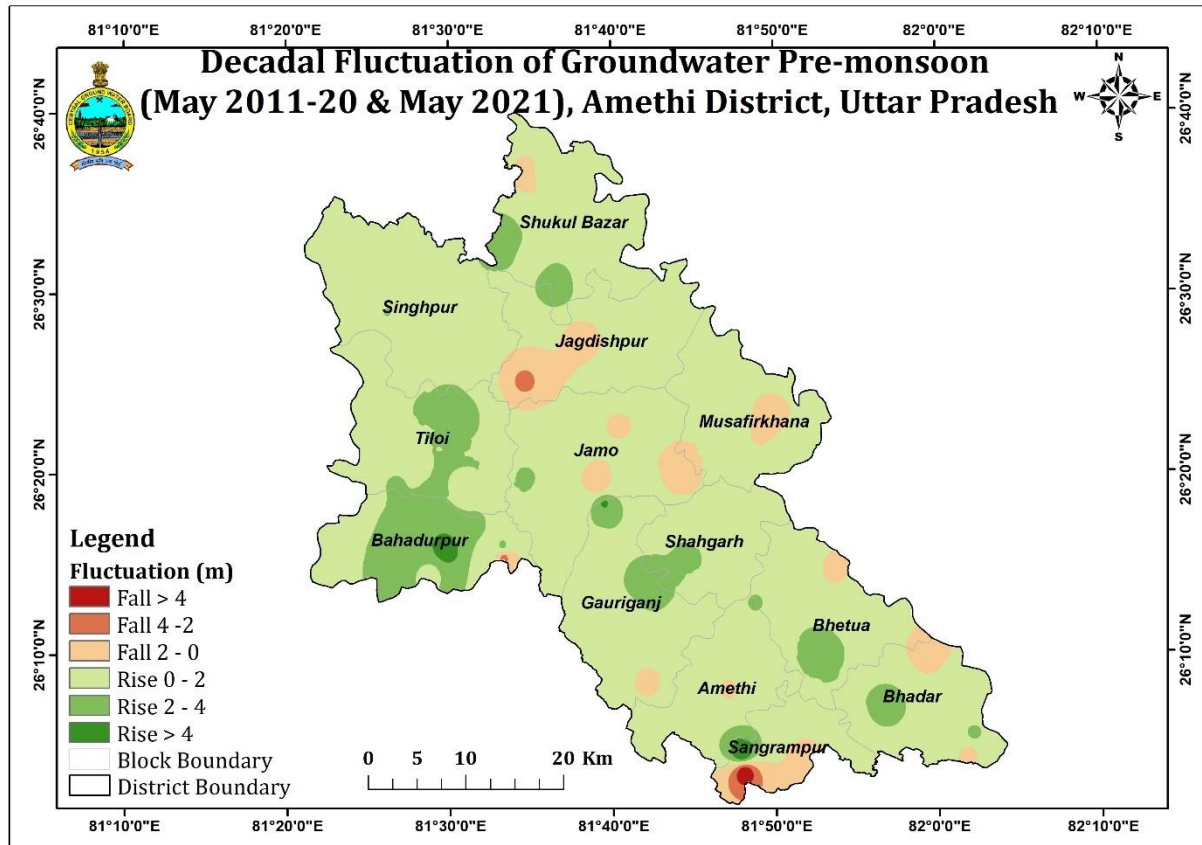


Figure 19: Map showing Decadal fluctuation in respect of Post-Monsoon Monitoring in Amethi District

3.2 SUB-SURFACE DISPOSITION

3.2.1 Previous Work

Central Ground Water Board has drilled 03 nos. exploratory boreholes in Amethi district to delineate and determine potential aquifer zones, evaluation of aquifer characteristics etc. Ground water exploration undertaken by CGWB has revealed the presence of 3 aquifer groups down to a depth of 450 m. A perusal of the fence diagram and other geological section along these exploratory well exhibit presence of three-tier aquifer system in the area. The Upper Aquifer group is the most potential aquifer group and occurs in the depth range of 25 to 130 m below ground level. The quality of this aquifer group is fresh and potable. The Second Aquifer group occurs between the depth range of 80 to 240 m below ground level. The quality of water

in this zone is saline. The Third Aquifer Group generally lies in the depth range of 180m to 433m. The quality of this deeper aquifer is fresh and generally occurs under confined state.

3.3 AQUIFER GEOMETRY:

The aquifers in the study area have been mapped through lithology ascertaining through exploratory drilling and few Borehole logging Self Potential (SP) and Electrical Resistivity Natural Gamma Radioactivity.

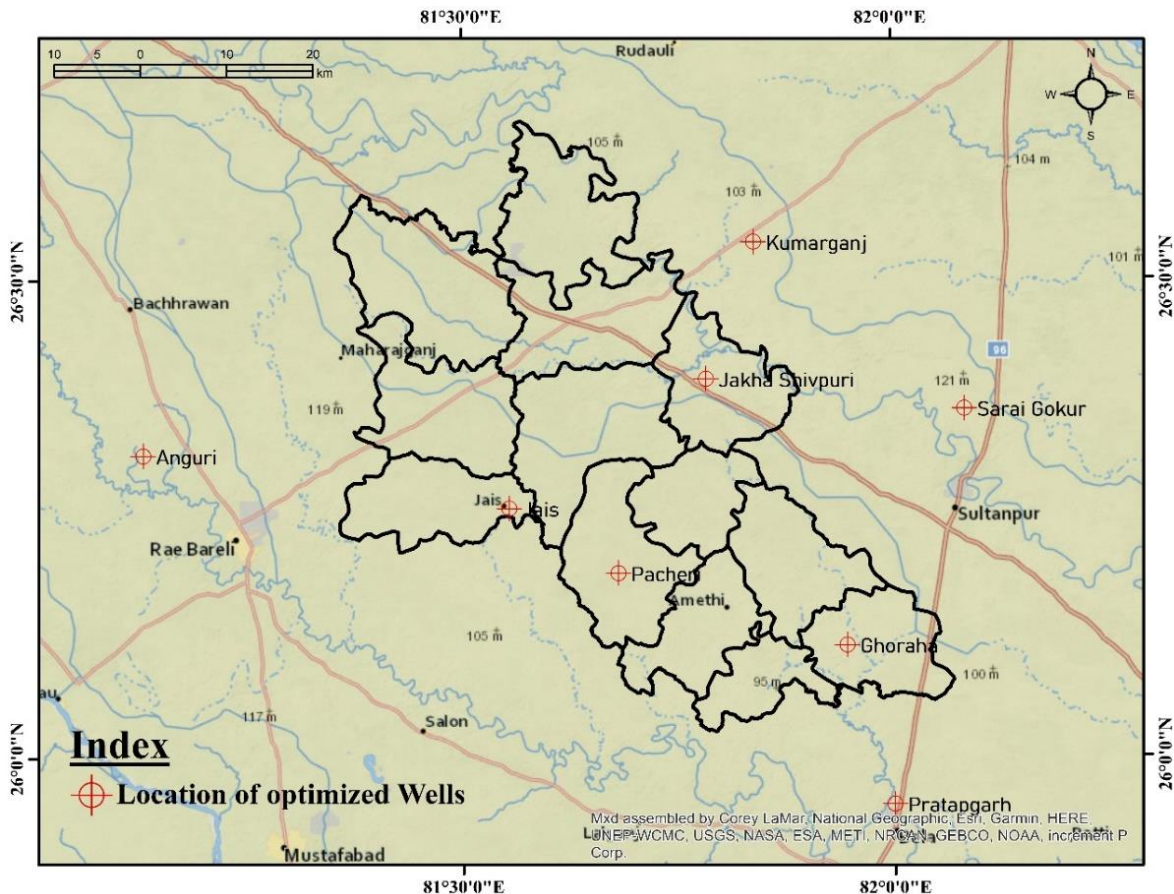


Figure 20: Exploratory Wells used for NAQUIM, Amethi District, UP

3.2.1 Lithological Variation

The Lithological Variations of the area are established through existing data of exploration and various geophysical methods. The aquifer disposition map have been prepared based on the lithological and geophysical log information obtained through existing exploratory well data of CGWB in Amethi and adjoining districts. Total 08 nos. of Exploratory wells (EW) of various depth taken into consideration for generation of aquifer model/ lithological model. Among 08 EWs, 4 have been constructed at various blocks of Amethi District, 1 EWs each at adjacent Pratapgarh, Sultanpur, Raebareli and Faizabad Districts.

Based on grain size distribution, geophysical log and composite log, lithological model of the area obtained by 3D co-relation in Rockworks Software. The 3D Lithological Geometry and Fence Diagram is shown in Figure 18 & 19. The lithological units are composed of various grades of sand, sandy clay, clay and kankar. The lithological character of the formations changes greatly both vertically and laterally thereby restricting larger extensions of beds. However, some sand beds can be traced for larger distances.

The lithological characteristics have been identified through the examination of borehole drill cuttings obtained from exploratory drilling in the area. Based on litho-characteristics the sediments are divided into 2 units viz. clayey zones and sandy zones. Clayey zones comprise of thick beds of clay with thin bands of sand and silt in association of kankar in varying proportions. Sandy zones contains sand of coarse to very fine grained with granules of ferruginous materials. These zones also contain some bands of clay or silt.

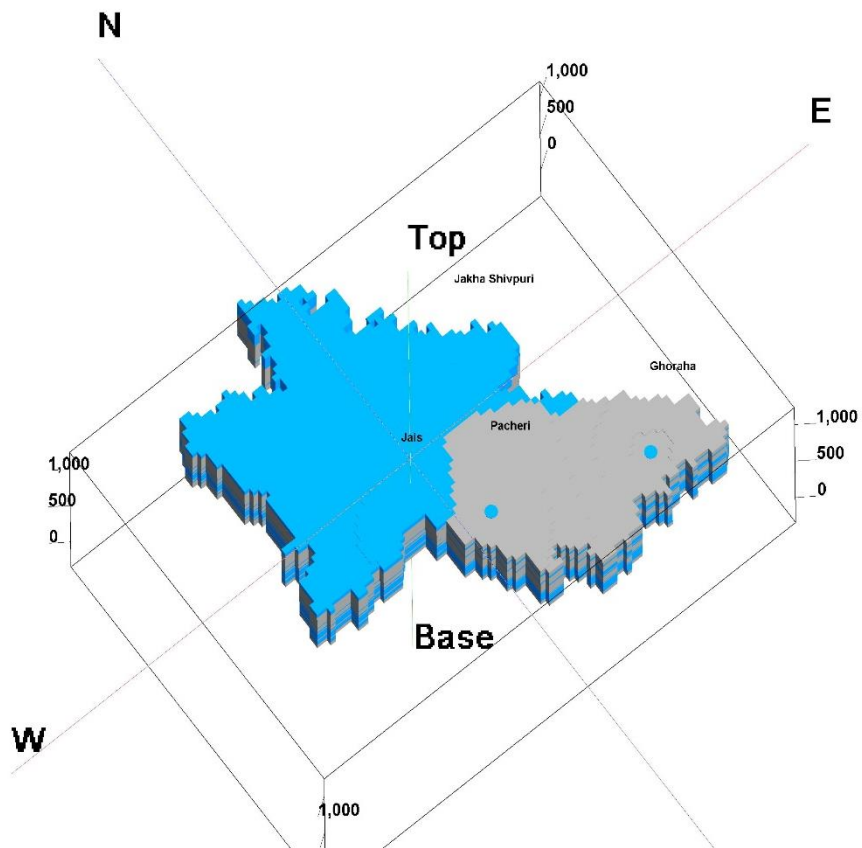
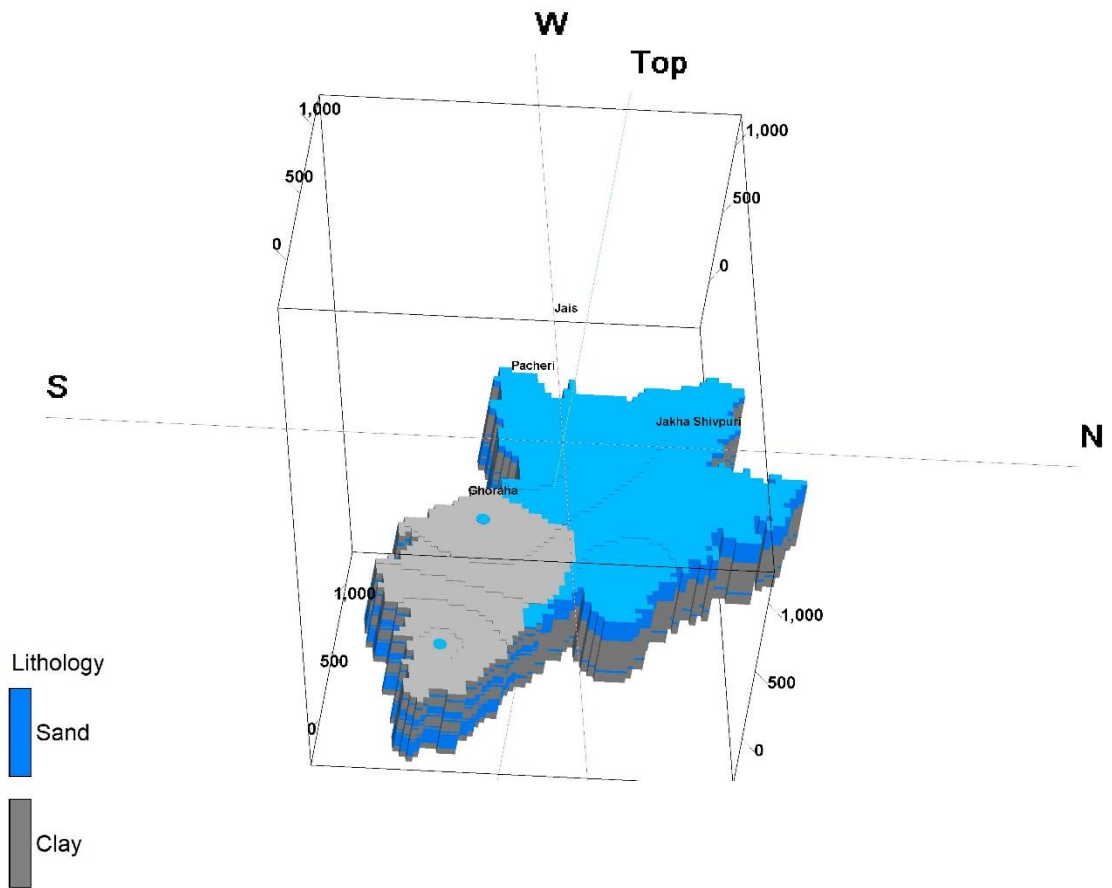


Figure 21: 3D Lithological Disposition in Amethi District

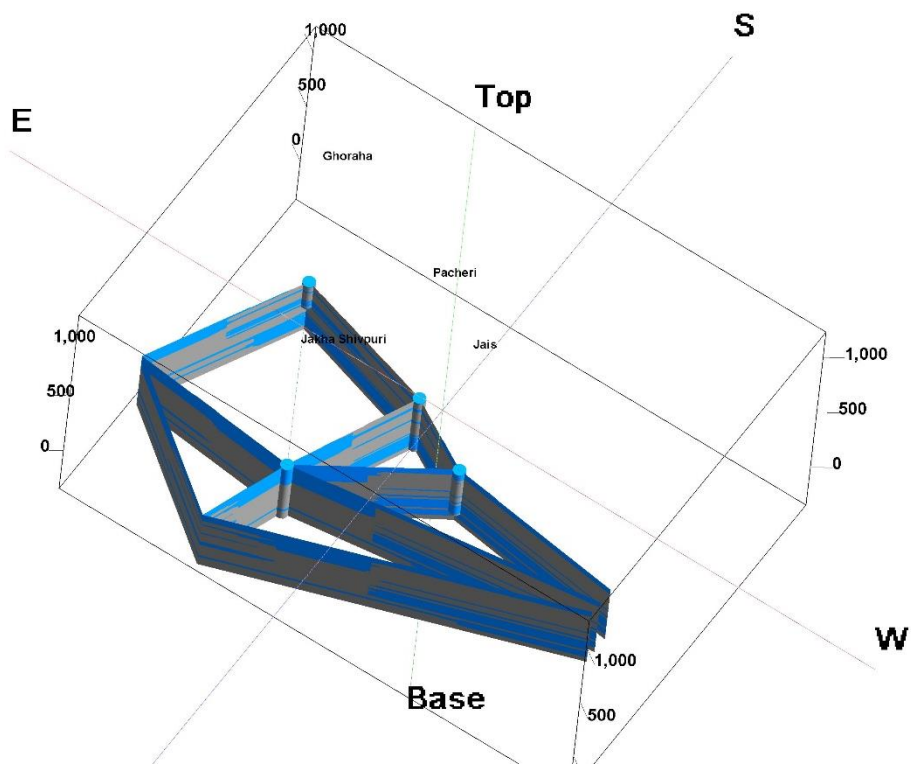
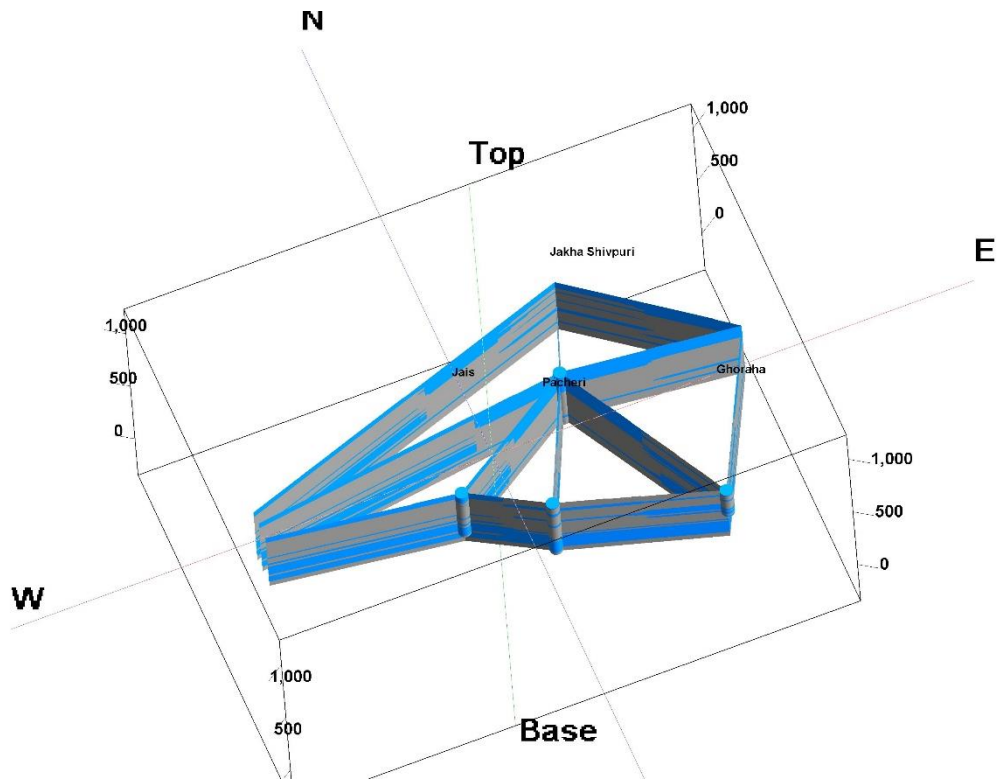
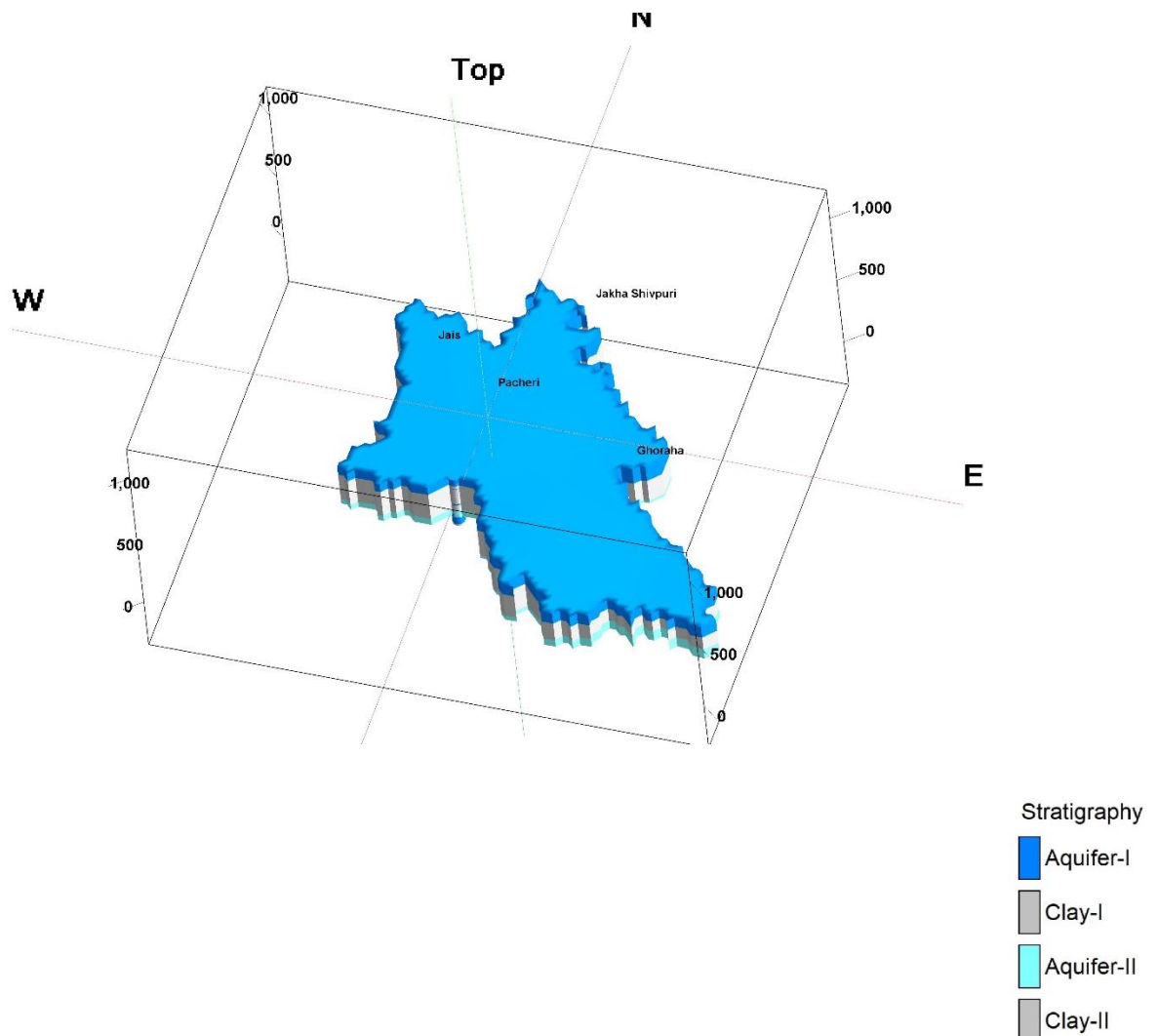


Figure 22: 3D Lithological Fence Diagram of Amethi District

3.2.2 Aquifer Geometry and Disposition

Exploratory borehole data reveal a varied nature of aquifer disposition in the area. A thick a 100 metres sand bed occur below the clay capping of approximately 6.70 metres in Sarai Gokul area whereas 400 to 500 metre thick play bed occur in the meander belt of Gomati river near Sultanpur as has been revealed from the exploratory drilling of C.G.W.B. A number of sand zones however located at greater depth beyond 250 metres in Jhaka Shivpuri and Pacheri area through C.G.W.B. exploratory drilling, maybe of potential aquifer.

Based on lithological model, stratigraphic model conceptualised where different aquifer groups delineated based on their geophysical and geological characters. The stratigraphic model as follows:



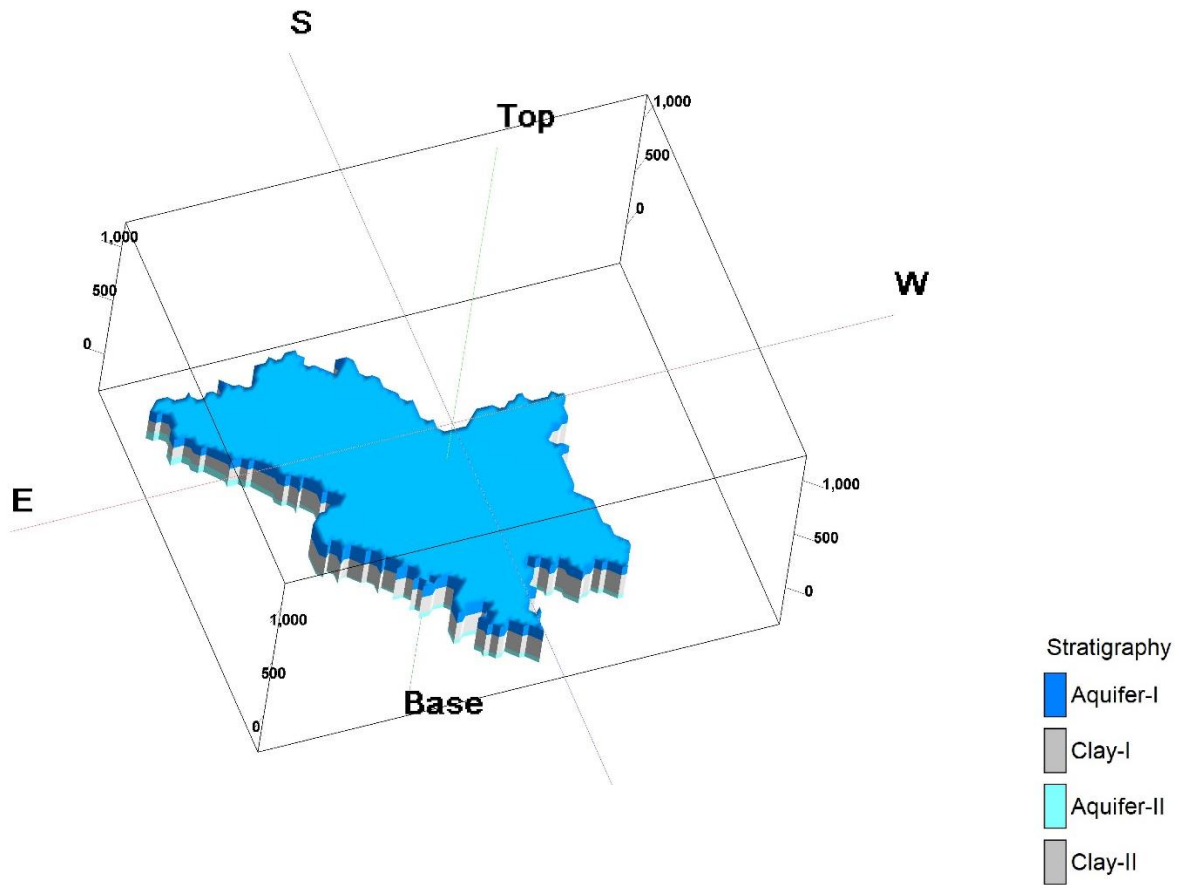


Figure 23: 3D Aquifer Disposition in Amethi District

Aquifer 3D models are prepared up to the depth of 300 metres bgl. Three aquifer group have been reported in the area. However, up to the depth of 300 metres bgl, out of these 3 aquifers groups, only two aquifer groups have been penetrated. Since the area belongs to the Great Northern plains, sediments are quaternary in age while the sediment type varies in grain size from clay to coarse sand. The sand zones form the major aquifer forming material. Regional clay layers have been identified and marked as confining layers.

Hydrogeologically the area shows following characteristics based on previous studies:

- (i) There are three group of sediments enclosing three aquifer systems.
- (ii) The First Group of Aquifer System occurs between the depth range of 15 to 160 mbgl, mainly composed of two or three sand beds varying in thickness from 5 to 25 metres.
- (iii) The Second Group of Aquifer Systems occurs between the depth ranges of 50 to 280 mbgl, mainly brackish water bearing aquifer group embedded into a clay rich sediment, argillaceous in nature and fine grained.
- (iv) The Third Group of Aquifer System occurs below 280 metres, these are mainly composed of arenaceous sediments, i.e. thick sand beds. This aquifer system is regionally extensive and made of coarse sand and gravel.

The current study is coherent with the previous study as Aquifer Group -I which is phreatic in nature begins from the ground level and extends upto variable depths. According to the Map Minimum thickness of the first aquifer is in the Western Part of the district whereas maximum thickness is in the eastern part of the district. Thickness of the Aquifer Group I vary from 35m (Western Parts) to 138m (Eastern Part). Although primary constituent of the aquifer is sand but, mixing does occur. Aquifer Group I is underlain by a regional Clay layer. This clay layer acts as a Top confining layer for Aquifer group II. Thickness of this layer is in the range of 67 to 232 meters. Aquifer Group II begins just after above confining layer at the top. Top of the Aquifer Group II is below 125 to 290 mbgl, while the bottom is below 200 to 300mbgl. Sand is the most important constituent of this Aquifer group. Mixing with variable size particle is observed too. Bottom of this aquifer group is bound by moderately thick clay layer having thickness in range of 10 to 30 meters. Hence, top confining clay and bottom confining clay layer together give rise to confined aquifer system.

3.4 AQUIFER PARAMETERS:

A perusal of aquifer parameters conducted on exploratory tube-wells at various places reveal the maximum discharge of 3243 lpm can be obtained from the moderately deep tube-wells, at a reasonable drawdown. The coefficient of Transmissivity has been determined to be in the range of 98.65 to 1392 m²/day. The low transmissivity can be explained by the small thickness of aquifers. Storativity (S) has been computed to the order of 3.69X10⁻³ to 7.8X10⁻⁵, showing the semi-confined to confined state of aquifers.

Table-9: Details of Aquifer Parameters of Optimized Wells

S. No.	Location	Latitude	Longitude	Depth Drilled	Granular Zones	Aquifer group	Discharge lpm	Aquifer Parameter
1.	Pacheri	26.1931	81.6806	437.49	312-340 348-358 362-385	III	3150	T=1392 m ² /day S=2.89X10 ⁻⁴
2.	Pratapgarh	25.9500	82.0000	379.98	189-235 242-271	II	3243	T=1385 m ² /day
3.	Sarai Gokur	26.3639	82.0833	309.98	34-104	I	1925	T=1015 m ² /day S=3.69X10 ⁻³
4.	Jakha Shivpuri	26.3961	81.7833	437.49	225-234 242-248 251-260 266-272 280-292 300-309 339-345	II & III	1810	T=150 m ² /day S=7.8X10 ⁻⁵
5.	Anguri	26.3167	81.1292	427.25	224-230 252-261 279-288 294-318 324-330 349-361	II&III	1752	T=1357 m ² /day S=5.99X10 ⁻⁴
6.	Kumarganj	26.5393	81.8392	300	141-144 163-172 210-213 222-225	I & II	745	T= 98.652 m ² /day S= 2.362x 10 ⁻⁵

4. GROUND WATER QUALITY

The chemical composition of ground water will vary depending upon several factors like frequency of rain, which will leach out the salts, time of stay of rain water in the root-zone and intermediate zone, presence of organic matter etc. The movement of percolating water through larger pores is much more rapid than through the finer pores. The overall effect of all these factors is that the composition of ground water varies from time to time and from place to place.

The ground water sampling was carried out during Pre-Monsoon Reconnoitering Survey from India Marka handpump. 26 no. of samples were collected from Phreatic/Aquifer Group-I and were analysed for Basic parameters and Heavy Metals. Unconfined aquifers are extensively tapped for drinking and irrigation purpose and therefore, its quality is of paramount importance. The chemical parameters like TDS, Chloride, Fluoride, Iron, Arsenic and Nitrate etc are main constituents defining the quality of ground water in unconfined aquifers. Therefore, presence of these parameters in ground water beyond the permissible limit in the absence of alternate source has been considered as ground water quality hotspots.

Maps depicting distribution of electrical conductance (salinity) are regional in nature and has contours, whereas fluoride, iron, & nitrate are depicted as hot spots/ locations having concentrations exceeding the permissible limit prescribed by Bureau of Indian Standards for drinking water.

Table-10: Chemical Quality (Basic Elements) of Ground Water from shallow aquifers in Amethi District, U.P.

S. No.	Location Details	Block	pH	EC $\mu\text{S/cm}$ at 25°C	CO ₃	HCO ₃	Cl	F	NO ₃	SO ₄	TH	Ca	Mg	Na	K	SiO ₂	PO ₄
					mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1	Hazariganj Chauraha	Singhpur	7.31	567	0	293	7.0	0.43	31	20	280	48	38	6.5	4.5	24	0
2	Anguri	Singhpur	7.49	587	0	317	14	0.62	0	8.6	250	40	36	16	5.5	28	0
3	Shukul Bazar	Shukul Bazar	7.47	513	0	281	7.0	0.14	10	13	230	48	26	12	3.4	28	0
4	Mahona	Shukul Bazar	7.67	625	0	305	21	0.75	12	18	280	64	29	11	4.2	27	0
5	Durgapur	Bhadar	7.39	3160	0	1061	220	0.08	42	219	910	72	175	241	8.4	30	0
6	Chheda	Bhadar	7.71	871	0	427	21	0.46	5.3	48	360	52	55	31	3.5	38	0
7	Banbirpur	Sangram Pur	7.46	667	0	378	14	0.48	0.0	7.4	250	48	31	39	4.5	29	0
8	Tarapur	Sangram Pur	7.47	1679	0	531	121	0.37	53	95	390	48	65	162	6.8	28	0
9	Murai Ka Purwa	Amethi	7.56	2668	0	671	213	0.45	56	352	610	8	142	298	4.1	25	0
10	Pure Ramdeen	Gauriganj	7.68	789	0	445	21	0.19	0.0	7.2	280	72	24	55	5.6	27	0
11	Misrauli	Gauriganj	7.47	584	0	293	7.0	0.51	0.0	21	230	52	24	19	4.5	19	0
12	Newarhiya	Bhetua	7.48	598	0	311	21	0.66	0.0	5.2	240	44	31	13	20.4	22	0
13	Tikri Chauraha	Bhetua	7.81	802	0	451	21	1.0	0.0	0.0	340	48	53	29	4.4	29	0
14	Shree Ka Purwa	Bhetua	7.56	546	0	305	14	0.19	0.0	0.0	210	44	24	27	3.8	28	0
15	Pure Prem Shah	Musafirkhana	7.70	691	0	354	21	0.87	6.1	15	300	56	38	17	4.4	27	0
16	Pure Umrao	Jagdishpur	7.86	762	0	464	14	0.67	0.0	0.0	360	44	60	21	5.0	28	0
17	Deokali Chauraha	Jagdishpur	7.44	635	0	317	21	0.42	6.1	12	280	44	41	13	3.9	29	0
18	Mubarakpur	Jagdishpur	7.48	750	0	360	35	0.74	0.0	26	300	44	46	32	4.9	27	0

19	Janapur	Jamo	7.48	1488	0	537	113	0.53	38	49	520	56	91	76	8.7	25	0
20	Hardo	Jamo	7.89	801	0	354	28	0.04	27	41	300	40	48	10	60.0	23	0
21	Akelwa Chauraha	Bahadurpur- II	7.81	927	0	525	14	0.87	0.0	12	195	36	25	121	6.1	23	0
22	Himachal Pur	Bahadurpur- II	7.74	1048	0	537	21	0.63	5.1	58	230	36	34	140	2.6	23	0
23	Alaipur Chauraha	Tiloi	7.11	9116	0	1171	780	1.3	38	2338.5	1010	40	218	1616	6.9	24	0
24	Mohanganj	Tiloi	7.53	1981	0	817	106	0.36	39	67	590	36	120	155	7.2	32	0
25	Phoola	Tiloi	7.50	1644	0	512	170	0.47	74	52	640	40	130	57	7.0	26	0
26	Basantpur	Tiloi	7.45	1376	0	598	64	0.65	7.7	76	450	44	82	97	3.8	29	0

Table-11: Chemical Quality (Heavy Elements) of Ground Water from shallow aquifers in Amethi District, U.P.

S. No.	Location Details	Block	Cr	Fe	Mn	Cu	Zn	As	Pb	U
			mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1	Hazariganj Chauraha	Singhpur	BDL	1.25	0.10	BDL	BDL	0.00	0.00	0.00
2	Anguri	Singhpur	BDL	0.19	0.00	BDL	BDL	0.00	0.00	0.01
3	Shukul Bazar	Shukul Bazar	BDL	0.19	0.00	BDL	BDL	0.00	0.00	0.01
4	Mahona	Shukul Bazar	BDL	0.19	0.09	BDL	BDL	0.00	BDL	0.01
5	Durgapur	Bhadar	BDL	0.37	0.21	BDL	0.35	0.00	BDL	0.02
6	Chheda	Bhadar	BDL	0.54	0.00	BDL	0.15	0.00	0.00	0.01
7	Banbirpur	Sangram Pur	BDL	0.27	0.00	BDL	0.08	0.00	BDL	0.00
8	Tarapur	Sangram Pur	BDL	0.50	0.00	BDL	BDL	0.00	BDL	0.02
9	Murai Ka Purwa	Amethi	BDL	0.17	0.00	BDL	BDL	0.00	BDL	0.03
10	Pure Ramdeen	Gauriganj	BDL	0.25	0.00	BDL	0.85	0.00	0.00	0.01
11	Misrauli	Gauriganj	BDL	3.30	0.31	BDL	0.11	0.04	0.00	0.00
12	Newarhiya	Bhetua	BDL	0.45	0.00	BDL	0.07	0.00	BDL	0.00
13	Tikri Chauraha	Bhetua	BDL	0.18	0.00	BDL	0.31	0.00	0.00	0.01
14	Shree Ka Purwa	Bhetua	BDL	1.65	BDL	BDL	0.16	0.00	BDL	0.01
15	Pure Prem Shah	Musafirkhana	BDL	0.46	0.00	BDL	0.08	0.00	0.00	0.01
16	Pure Umrao	Jagdishpur	BDL	0.33	0.00	BDL	0.59	0.00	BDL	0.01
17	Deokali Chauraha	Jagdishpur	BDL	0.13	0.09	BDL	BDL	0.00	BDL	0.01
18	Mubarakpur	Jagdishpur	BDL	3.21	0.15	BDL	BDL	0.00	BDL	0.02
19	Janapur	Jamo	BDL	0.00	0.25	BDL	BDL	0.00	BDL	0.00
20	Hardo	Jamo	BDL	0.11	0.00	BDL	0.62	0.00	0.00	0.02

Ground Water Quality

21	Akelwa Chauraha	Bahadurpur- II	BDL	0.17	0.00	BDL	BDL	0.00	BDL	0.01
22	Himachal Pur	Bahadurpur- II	BDL	0.19	0.00	BDL	BDL	0.00	0.00	0.02
23	Alaipur Chauraha	Tiloi	BDL	1.03	0.14	BDL	0.06	0.00	BDL	0.01
24	Mohanganj	Tiloi	BDL	0.00	0.20	BDL	0.07	0.00	BDL	0.02
25	Phoola	Tiloi	BDL	0.54	0.00	BDL	0.17	0.00	BDL	0.03
26	Basantpur	Tiloi	BDL	0.11	0.00	BDL	BDL	0.00	BDL	0.00

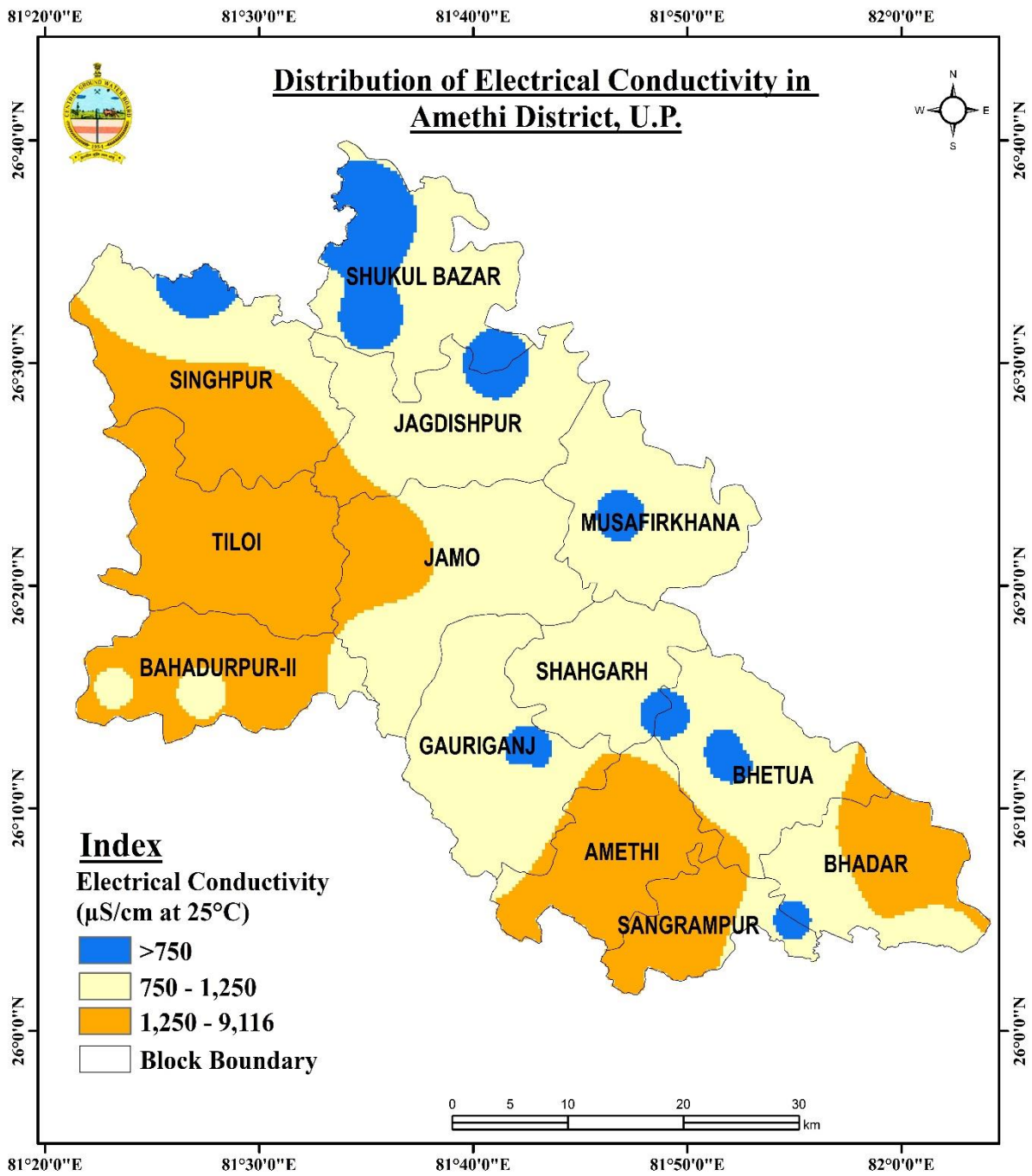


Figure 24: Map showing distribution of Electrical Conductivity in Amethi District

4.1 SUITABILITY FOR DRINKING WATER

The chemical data indicate that the pH ranges between 7.11 and 7.89 indicating that the water is neutral to slightly alkaline. TDS values ranges from 328 to 5834. TDS values throughout the district is within permissible limit except at Durgapur and Alaipur. All other parameters fall under the permissible limit except Nitrate, Iron, Manganese, Magnesium and Sulphate which are observed in specific locations. The suitability of ground water for drinking purpose of phreatic aquifers is presented in Table 12.

4.2 SUITABILITY FOR AGRICULTURE

The quality of water for irrigation plays a major role in the cultural practices of crops. The irrigation water is one of the major contributors of soluble salts to the soil in addition to those already present. The rate of accumulation of soluble salts in soils depends upon nature and concentration of salts present in the irrigation water, soil characteristics, depth to water level and quality of water present, soil management etc.

The potential hazards by irrigation water to soil and crops are:

1. Impairment of plant growth due to salinity (TDS) – Salinity hazard
2. A build-up of sodium in the cation exchange complex impairs permeability of the soil-sodium or alkali hazard
3. Specific toxicities of both macro and micro toxins like boron.

Suitability of water for irrigation is evaluated based on Salinity hazard, sodium adsorption ratio (SAR), sodium percent, residual sodium carbonate (RSC) and Kelly's index. Diagrams such as USSL, Wilcox are used to evaluate suitability for irrigation.

I. Total Salt Concentration

It is expressed as Electrical Conductivity (EC) and in relation to the hazardous effect on soils, the classification is given below in Table 13:

Table-13: Summarized table of GW samples w.r.t EC, Amethi District, UP

S. No	Class	Range of EC ($\mu\text{S}/\text{cm}$)	No. of Samples
1.	Low	1-1500	20
2.	Medium	1500-3000	4
3.	High	3000-6000	1
4.	Very High	>6000	1

Table-12: Assessment for suitability of water for drinking purposes as per Indian Standard Drinking Water - Specification - IS 10500 : 2012.

Sl No.	Sample No.	pH	TDS	TH	Ca ²⁺	Mg ²⁺	Na ⁺	K ⁺	Cl ⁻	SO ₄ ²⁻	NO ₃ ⁻	F ⁻	Fe	Mn	As
1	Hazariganj	7.31	362.88	280	48	38	6.5	4.5	7.0	20	31	0.43	1.25	0.10	0.00
2	Anguri	7.49	375.68	250	40	36	16	5.5	14	8.6	0	0.62	0.19	0.00	0.00
3	Shukul Bazar	7.47	328.32	230	48	26	12	3.4	7.0	13	10	0.14	0.19	0.00	0.00
4	Mahona	7.67	400.00	280	64	29	11	4.2	21	18	12	0.75	0.19	0.09	0.00
5	Durgapur	7.39	2022.40	910	72	175	241	8.4	220	219	42	0.08	0.37	0.21	0.00
6	Chheda	7.71	557.44	360	52	55	31	3.5	21	48	5.3	0.46	0.54	0.00	0.00
7	Banbirpur	7.46	426.88	250	48	31	39	4.5	14	7.4	0.0	0.48	0.27	0.00	0.00
8	Tarapur	7.47	1074.56	390	48	65	162	6.8	121	95	53	0.37	0.50	0.00	0.00
9	Murai Ka Purwa	7.56	1707.52	610	8	142	298	4.1	213	352	56	0.45	0.17	0.00	0.00
10	Pure Ramdeen	7.68	504.96	280	72	24	55	5.6	21	7.2	0.0	0.19	0.25	0.00	0.00
11	Misrauli	7.47	373.76	230	52	24	19	4.5	7.0	21	0.0	0.51	3.30	0.31	0.04
12	Newarhiya	7.48	382.72	240	44	31	13	20.4	21	5.2	0.0	0.66	0.45	0.00	0.00
13	Tikri Chauraha	7.81	513.28	340	48	53	29	4.4	21	0.0	0.0	1.0	0.18	0.00	0.00
14	Shree Ka Purwa	7.56	349.44	210	44	24	27	3.8	14	0.0	0.0	0.19	1.65	0.00	0.00
15	Pure Prem Shah	7.70	442.24	300	56	38	17	4.4	21	15	6.1	0.87	0.46	0.00	0.00
16	Pure Umrao	7.86	487.68	360	44	60	21	5.0	14	0.0	0.0	0.67	0.33	0.00	0.00

17	Deokali Chauraha	7.44	406.40	280	44	41	13	3.9	21	12	6.1	0.42	0.13	0.09	0.00
18	Jagdishpur	7.48	480.00	300	44	46	32	4.9	35	26	0.0	0.74	3.21	0.15	0.00
19	Janapur	7.48	952.32	520	56	91	76	8.7	113	49	38	0.53	0.00	0.25	0.00
20	Hardo	7.89	512.64	300	40	48	10	60.0	28	41	27	0.04	0.11	0.00	0.00
21	Akelwa	7.81	593.28	195	36	25	121	6.1	14	12	0.0	0.87	0.17	0.00	0.00
22	Himachal Pur	7.74	670.72	230	36	34	140	2.6	21	58	5.1	0.63	0.19	0.00	0.00
23	Alaipur Chauraha	7.11	5834.24	1010	40	218	1616	6.9	780	2338.5	38	1.3	1.03	0.14	0.00
24	Mohanganj	7.53	1267.84	590	36	120	155	7.2	106	67	39	0.36	0.00	0.20	0.00
25	Phoola	7.50	1052.16	640	40	130	57	7.0	170	52	74	0.47	0.54	0.00	0.00
26	Basantpur	7.45	880.64	450	44	82	97	3.8	64	76	7.7	0.65	0.11	0.00	0.00
BIS DWS- IS 10500 : 2012	Requirement (Acceptable limit)	<6.5- >8.5	500.0	200.0	75.0	30.0	N/A	N/A	250.0	200.0	45.0	1.00	1.00	0.10	0.01
	Permissible Limit	N/R	2000.0	600.0	200.0	100.0	N/A	N/A	1000.0	400.0	N/R	1.50	N/R	0.30	0.05

1267.20

Above Requirement (Acceptable limit)

1.03

Above Permissible limit

N/R No relaxation

N/A Not Applicable

BDL below the limit of detection

II. Residual Sodium Carbonate

It is given with respect to hazardous effects of Bicarbonate ion concentration on soil and calculated by the following formula where all constituents are in meq/l:

$$\text{RSC} = (\text{HCO}_3^- + \text{CO}_3^{2-}) - (\text{Ca}^{2+} + \text{Mg}^{2+})$$

The classification as per standard is tabulated below in Table 14.

Table 14: Summarized table of GW samples w.r.t RSC, Amethi District, UP

S. No	Class	Range of RSC (meq/l)	No. of Samples
1.	Low	<1.5	22
2.	Medium	1.5-3.0	2
3.	High	3.0-6.0	2
4.	Very High	>6.0	-

The majority of the samples (85% of total samples) come under 'Low' class with reference to RSC and are suitable for irrigation. Two samples (7.5% of total samples) come under 'Medium' class and the soil requires some treatment prior to application of groundwater for irrigation. Two samples, namely Akelwa and Himachal Pur (Bahadurpur-II block), come under 'High' class and can be used under exceptional circumstances.

III. Sodium Adsorption Ratio

It is an irrigation water quality parameter used in the management of sodium-affected soils. It is an indicator of the suitability of water for use in agricultural irrigation, as determined from the concentrations of the main alkaline and earth alkaline cations present in the water. It is also a standard diagnostic parameter for the sodicity hazard of a soil, as determined from analysis of pore water extracted from the soil. It is calculated by the following formula:

$$\text{SAR} = \text{Na}^+ / \sqrt{(\text{Ca}^{2+} + \text{Mg}^{2+})/2}$$

The classification as per standard is tabulated below in Table 00.

Table 00: Summarized table of GW samples w.r.t SAR, Amethi District, UP

S. No	Class	Range of SAR (meq/l)	No. of Samples
1.	Low	<10	25
2.	Medium	10-18	-
3.	High	18-26	1
4.	Very High	>26	-

25 samples (96.10% of total samples) come under 'Low' category with reference to SAR and there is negligible chance of soil salinity development. One sample (4% of total samples) comes under 'High' category and is unsuitable for irrigation except for exceptional circumstances.

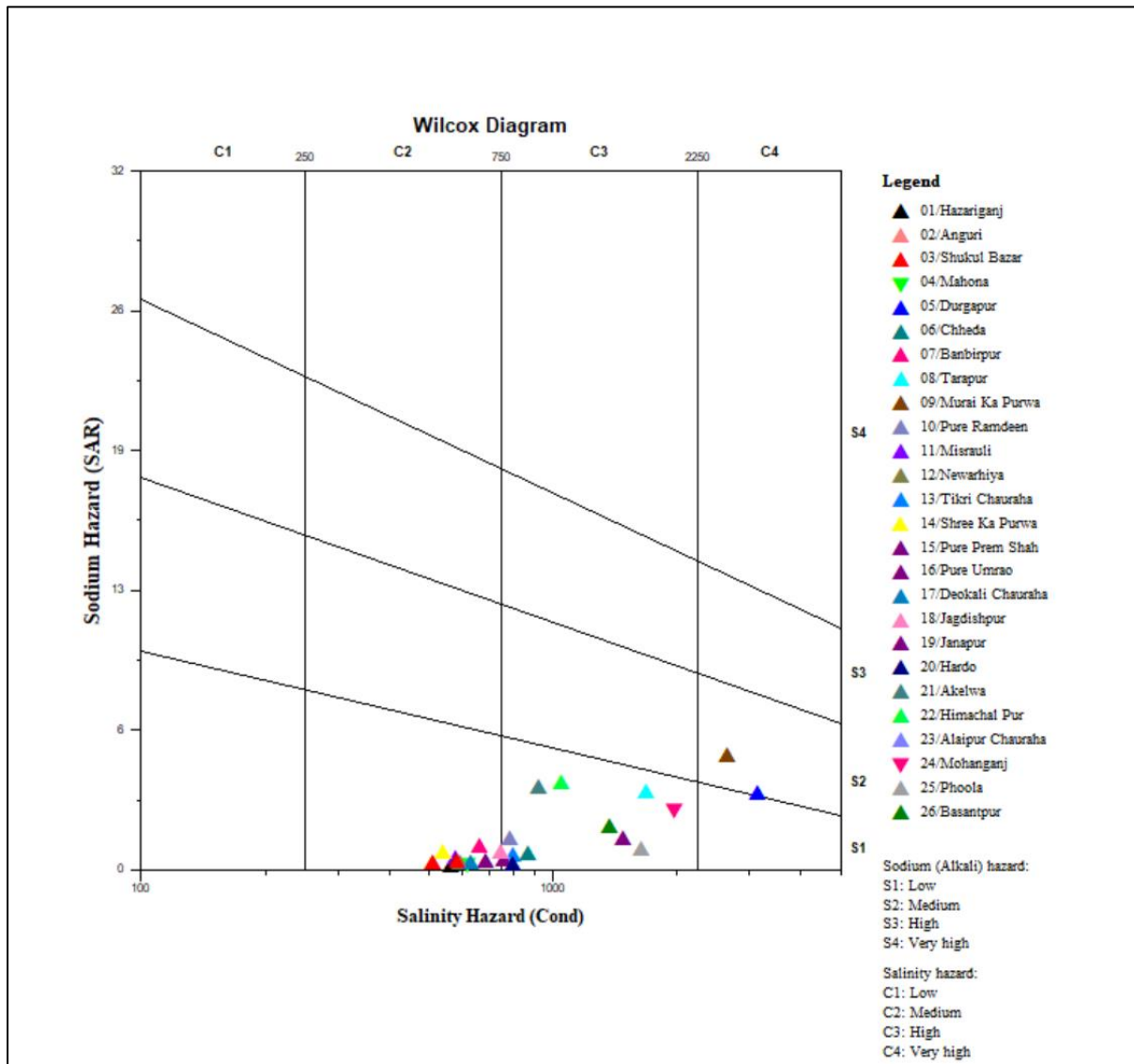


Figure 18: Plot of EC vs SAR in US Salinity Diagram for water samples from Amethi District, U.P.

Based on conductivity and SAR the United States Salinity Laboratory classified irrigation waters into 16 classes. i.e. C1 to C4 and S1 to S4. Most of the samples fall in S1, indicating medium to high salinity and low Na water for irrigation purposes for most soils and crops.

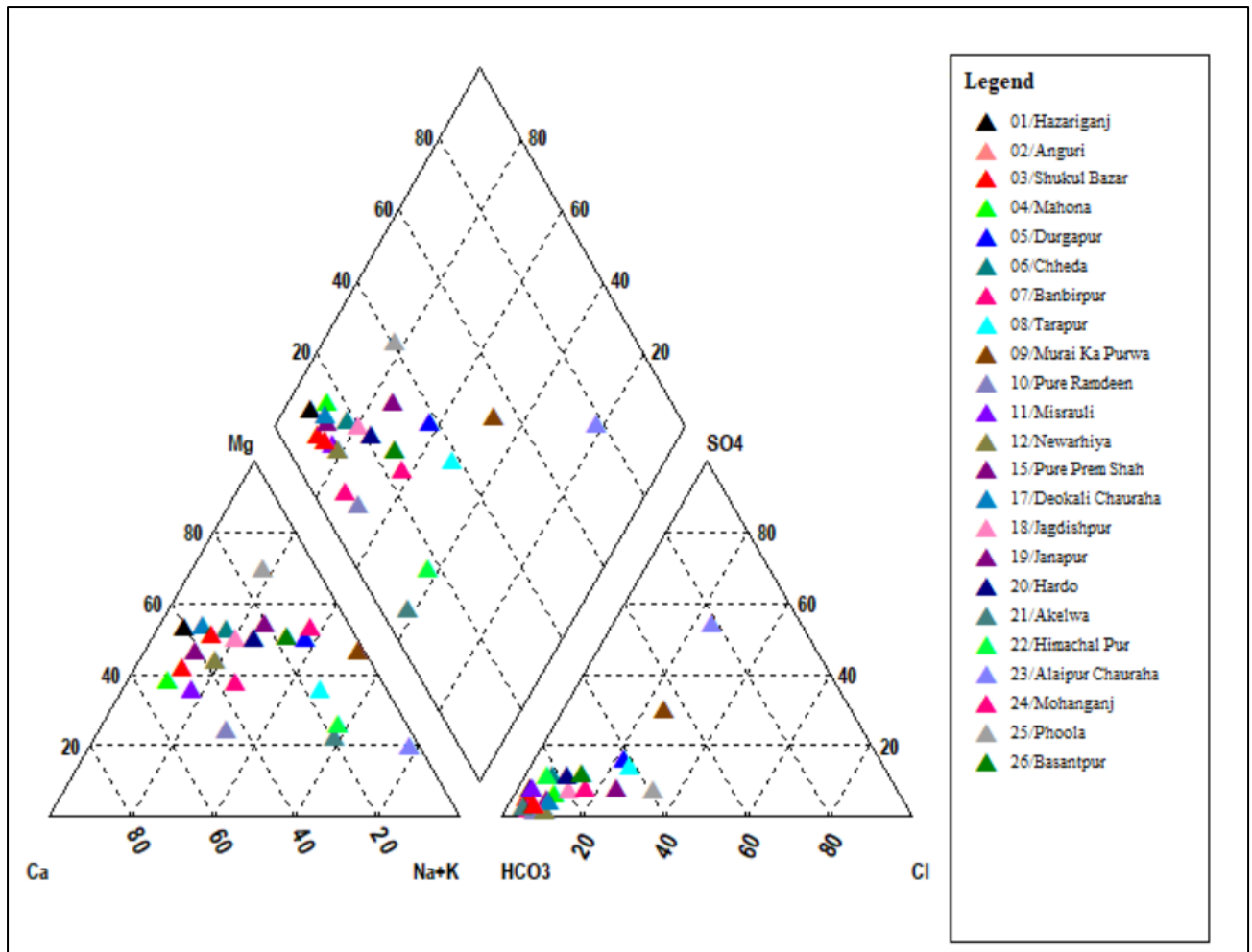


Figure 19: Hill Piper Plot for water samples from Amethi District, U.P.

The ground water quality data of the study area plotted on the Piper trilinear diagram is shown in Figure 19. The cations plotted in the diagram are showing the dominance of Ca^{2+} or Mg^{2+} type in maximum number of samples. In anion plot it is clearly seen that $\text{HCO}_3^- + \text{CO}_3^-$ is dominant. Majority of ground water samples fall in mixed Ca^{2+} - Mg^{2+} - HCO_3^- . Ca - HCO_3^- type of water is likely caused by rainfall recharge processes.

4.3 TRACE ELEMENTS

- Three samples display higher than desirable concentration of Iron in groundwater [Permissible limit > 1.5 mg/l] and two sample [Acceptable limit > 1.5 mg/l] have elevated levels of Iron in groundwater.
- One sample display higher than desirable concentration of Manganese in groundwater [Permissible limit > 0.3 mg/l] and six sample [Acceptable limit > 0.1 mg/l] have elevated levels of Manganese in groundwater.

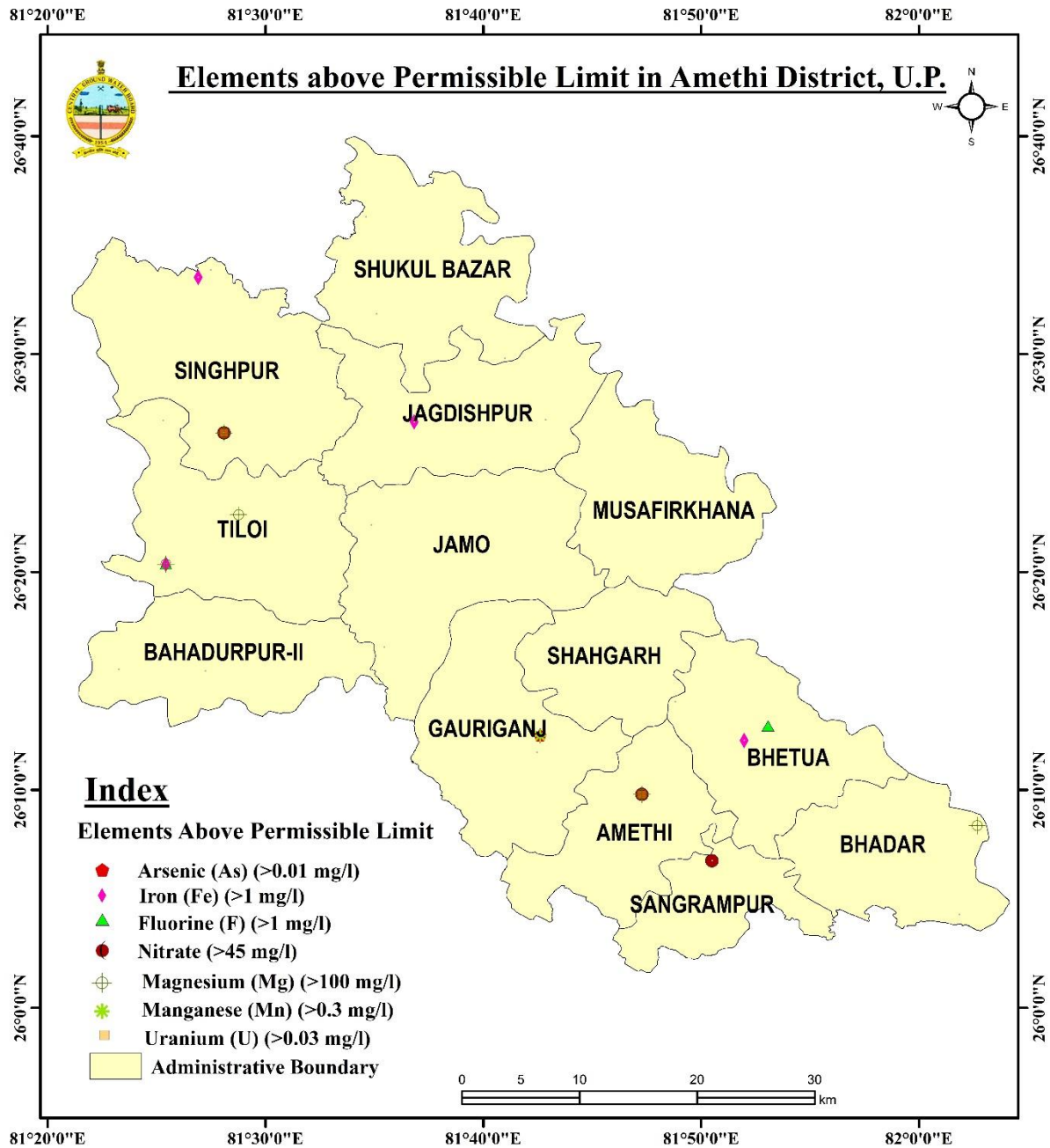


Figure 25: Map showing distribution of Elements above Permissible Limit in Amethi District

- Arsenic has been reported in one sample at Misrauli in concentration higher than desirable limit [Permissible limit > 0.01 mg/l].
- Two samples display higher than desirable concentration of Uranium in groundwater [Permissible limit > 0.03 mg].

5. GROUND WATER RESOURCES

The assessment of Dynamic Ground Water Resource (as on 31st March, 2022) of the district has been carried out jointly by CGWB and Ground Water Department, Uttar Pradesh on the basis of Ground Water Estimation Committee (2015) methodology.

5.1 DYNAMIC RESOURCES

The annual Ground water availability works out to be 78247.38 HAM and present ground water utilization amounts as 49139.5 HAM (Table-15). The Stage of Ground water Extraction is 62.8%. The status of Ground water Extraction varies from block to block in the district. The highest Stage of Ground water Extraction is observed in Sangrampur block (74.57%) and lowest in Bhetua (55.45%). The blocks where groundwater extraction is above 65% are Amethi, Bahadurpur-II, Bhadar, Jagdishpur and Shukul Bazar. Over rest part of the district the stage of ground water extraction varies between 56% to 63%. It is evident that there is still scope for development of groundwater resource in the district in future.

Table-15: Block-wise Dynamic Ground Water Resource & Development Potential (as on 31st March, 2022), District Amethi, U.P.

Block	Total Geographical Area (Ha)	Annual Extractable Ground Water Resource (ham)	Ground Water Extraction for all uses (ham)	Stage of Ground Water Extraction (%)	Categorization of Assessment Unit
Amethi	16236	5125.89	3352.65	65.41	Safe
Bahadurpur-II	15554	5585.95	3671.78	65.73	Safe
Bhadar	15921	5616.61	3881.12	69.10	Safe
Bhetua	16495	5362.33	2973.15	55.45	Safe
Gauriganj	20791	7121.76	4489.31	63.04	Safe
Jagdishpur	21476	7697.38	5081.73	66.02	Safe
Jamo	23553	9669.82	5916.6	61.19	Safe
Musafirkhana	18206	6571.31	3719.25	56.60	Safe
Sangrampur	10176	3385.4	2524.44	74.57	Semi-Critical
Shahgarh	12774	3737.14	2110.83	56.48	Safe
Shukul Bazar	19176	4736.7	3196.6	67.49	Safe
Singhpur	21261	6839.19	3972.15	58.08	Safe
Tiloi	21373	6797.9	4249.89	62.52	Safe
Total	232992	78247.38	49139.5	62.80	Safe

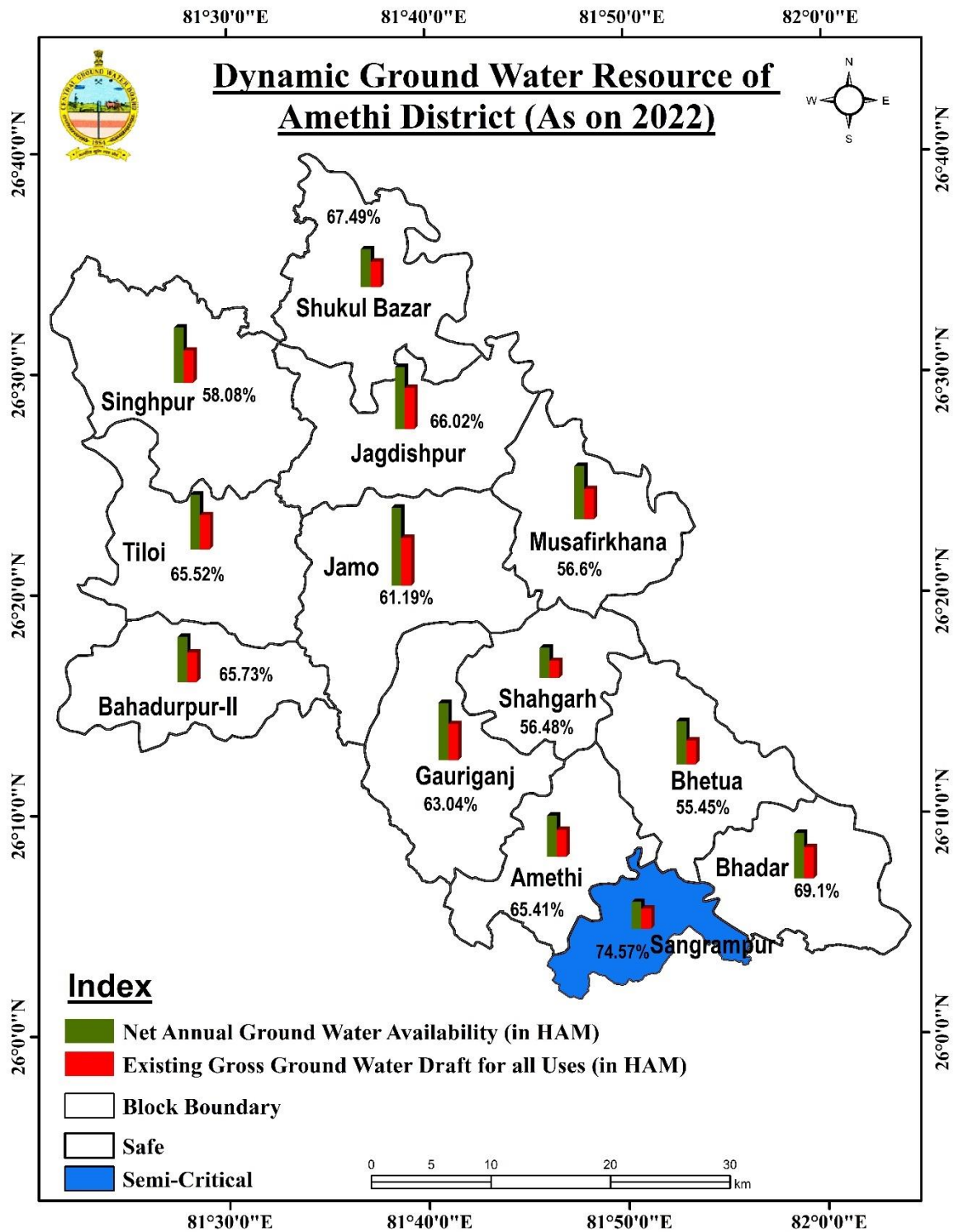


Figure 26: Dynamic Ground Water Resource of Unconfined Aquifer of Amethi District

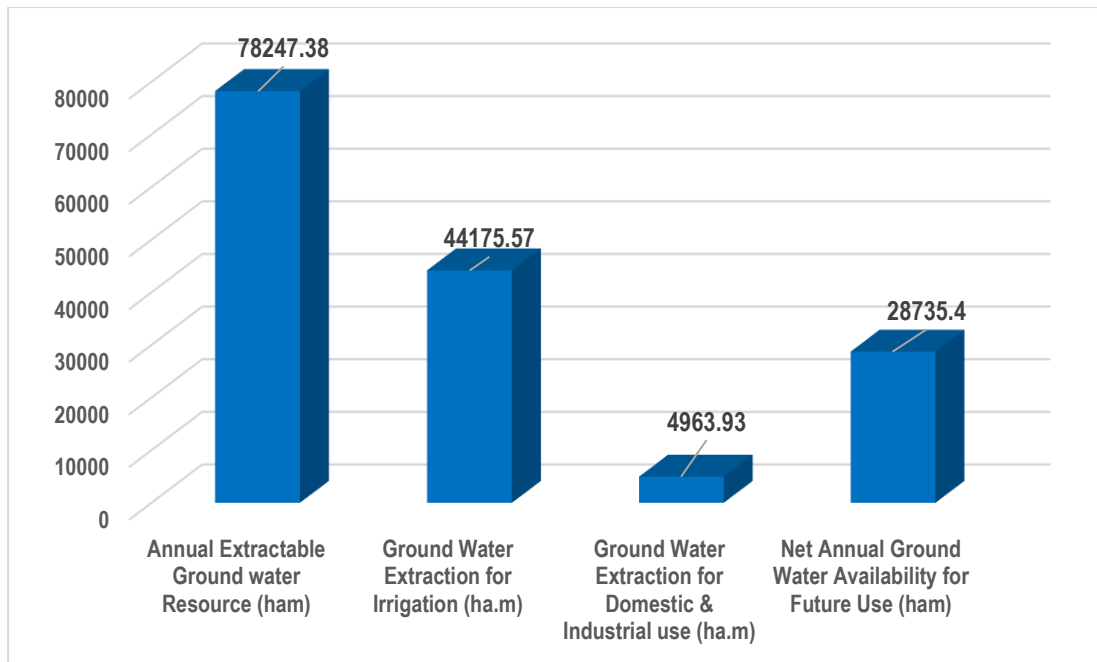


Figure 27: Graph showing Ground water Availability and Draft from Unconfined Aquifer of Amethi District

5.2 STATIC RESOURCES

(A) Static/ In Storage Ground Water Resources (Shallow Aquifer/ Aquifer Group-I)

The Static / In storage Ground Water Resource has been estimated for district by using the sub-surface data of exploratory tube wells constructed by CGWB for evaluating the average thickness of granular zones. The static resource of the Aquifer Group I is presented in Table-16

(B) Static/ In Storage Ground Water Resources for Aquifer Group-II

Aquifer Group II in the districts exists as confined condition and CGWB, NR have derived its aquifer parameters by tapping exploratory wells in particularly the aquifer group II zones. The static resource of the Aquifer Group II has been presented in Table-17

Table-16: Block-wise Ground Water Resource in Aquifer Group-I, District Amethi, U.P.

BLOCK WISE IN-STORAGE GROUND WATER RESOURCES IN AQUIFER GROUP-I							
Block	Area (Hectare)	Pre monsoon WL	Average bottom depth in mbgl	Total thickness of the Granular Zones up to the depth of Fresh Water Zones available (m)	Total Thickness of formation below Pre-monsoon Water Level	Specific Yield % as taken for estimating Resource	Static Resource for Aquifer Group-I (Ham)
Shukul Bazar	19115	12.75	98	62	49.25	14	120667.78
Jagdishpur	21284	9.2	138.01	128.81	119.61	14	383822.89
Musafirkhana	16427	12.74	138.01	125.27	112.53	14	288093.44
Singhpur	24025	5.87	32	26.13	20.26	14	87888.255
Tiloi	21898	11.25	50.5	36.75	25.5	14	105489.08
Bahadurpur	16750	7.41	50.5	40.59	33.18	14	89661.181
Gauriganj	18895	9.2	80.37	21.67	12.47	14	17454.033
Amethi	16123	8.1	80.37	32.27	24.17	14	32524.735
Bhetua	16621	8.35	57.5	12.15	3.8	14	6988.9868
Bhadar	15692	10.05	57.5	12	1.95	14	6667.0331
Sangrampur	10611	12.67	57.5	7.33	-5.34	14	1780.4245
Jamo	23673	6.82	50.5	41.18	34.36	14	128668.25
Shahgarh	13718	9.2	80.37	21.17	11.97	14	12093.822
Total							1281799.9

Table-17: Block-wise Ground Water Resource in Aquifer Group-II, District Amethi, U.P.

BLOCK WISE IN-STORAGE GROUND WATER RESOURCES IN AQUIFER GROUP-II					
Block	Area (Hactare)	Aquifer Thickness	Total thickness of the Granular Zones up to the depth of Water Zones available (m)	Storativity	Static Resource for Aquifer Group-II (Ham)
Shukul Bazar	19115	58	30	0.02	5932.24
Singhpur	24025	36	36	0.02	17298.00
Tiloi	21898	52.5	34.7	0.02	10044.63
Bahadurpur	16750	52.5	34.7	0.02	7683.24
Gauriganj	18895	9.54	9.54	0.02	3605.17
Amethi	16123	9.54	9.54	0.02	3076.27
Bhetua	16621	75	56.5	0.02	14148.90
Bhadar	15692	58	30	0.02	4869.93
Jamo	23673	52.5	34.7	0.02	10858.83
Shahgarh	13718	9.54	9.54	0.02	2617.39
Total District					105587.42

6. GROUND WATER RELATED ISSUES

The following Ground Water related issues and problems have been identified in the district viz. (i) Water Logging; and (ii) Quality-related issues.

I. Water Logging

The district has a good network of canals under Sarda Sahayak Canal system. The canal network in Amethi District is basically comprised of Jaunpur Branch of Sarda Canal System. A small region in the northwestern part of the district under Shukul Bazar and Jagdishpur Blocks is however, irrigated by Subeha and Singhpur distributaries of Haidergarh Branch. Such extensive network of Canal System in the district has resulted in reduction of utilization of other irrigation resources and imposition of potent factors of recharge into ground water regime, thus adversely affecting the dynamic equilibrium of ground water system. When this equilibrium is disturbed, it results in environmental problems like water logging. Isolated areas of the district is affected by water logged condition where depth to water occur near ground surface ($DTW < 2m$ bgl) during Pre-Monsoon period. Such area occur in south western part of Jamo Block, which lies in the vicinity of Jaunpur Branch of Sarda Canal System. Water logged condition progressively increases during Post-Monsoon. Various factors that have caused the water logging is mentioned below:

- Most of the canals in the district are unlined, hence canal seepage has added to the water logging problem in most of the area.
- Poor surface and sub-surface drainage in the area leading to stagnation of water and subsequent seepage.

II. Quality Related Issues:

The Ground Water Quality problem may be grouped into two categories viz. Geogenic and Anthropogenic. The geogenic ground water quality problem mainly includes the occurrence of saline / brackish ground water and presence of Fluoride, Iron, and Chloride concentration beyond the maximum permissible limit. The Higher concentration of Nitrate may be due to Anthropogenic activities.

The ground water occurring at Alaipur is brackish. The concentration of fluoride has been recorded beyond acceptable limit at Tikri and Alaipur village. Nitrate concentration has been recorded beyond permissible limit at Tarapur, Murai ka Purwa and Phoola.

7. GROUND WATER DEVELOPMENT AND MANAGEMENT STRATEGIES

Keeping in view the level of ground water development, growing needs, there is an urgent need for scientific approach for proper management of the available ground water resources for sustainability of this precious natural resource without having any adverse effect on the environment. At those places where water level declining, proper management is required to restrict or minimize the ground water for irrigation needs. Whereas, in the area with excess unused resources focus shall be shifted to enhance physical access of water on farm and expand cultivable area under assured irrigation.

Planned ground water development is possible only when availability of the ground water potential is precisely quantified and also the demand for various uses is properly estimated for the projected development scenario of urban as well as rural area for next 25 years.

7.1 GROUND WATER MANAGEMENT STRATEGIES

Average stage of ground water development in the district is 63% and remaining 7% is yet to be tapped for various developmental activities, so as to maintain the status-quo of the district as “safe”. Although 12 blocks have been classified as Safe in terms of exploitation of ground water resources, but 1 block have been categorized as “semi-critical”. Therefore, effective utilization of ground water resource is the challenging part in management of groundwater resource in Amethi district. Hence, it is pertinent to formulate a practical and scientific management plan suitable to the area.

7.2 GROUND WATER MANAGEMENT OPTIONS FOR BLOCKS HAVING STAGE OF GW DEVELOPMENT LESS THAN 70%-

There are 12 assessment unit as per Ground Water Resource assessment 2022 which have the stage of ground water development less than 70%. In these assessment units there exists further scope for ground water development. Sustainable utilization plans can be formulated for ground water development in these assessment units. A perusal of Table-18 shows that the balance of dynamic ground water resource potential for further exploitation is 5633.66 ham. This may help mitigate water logging condition in various part of the district and may promote industrial and agricultural development. Considering the present stage of groundwater extraction and unit draft per structure, there is potential for a total of 2920 no of

groundwater extraction structures for optimal development of the available groundwater resources.

Table-18: Block-wise Ground Water Feasible Structure of Amethi District, U.P (as on 31st March, 2022)

Block	Ground water Availability (ham)	70% Of GW availability (in ham)	GW draft (in ham)	Recomm ended GW balance for structure (in ham)	Recomm ended no. of shallow tube-well for irrigation (draft 1.8 ham)	Recomm ended no. of deep tube-well for irrigation (draft 22 ham)	Additional area that can be brought under assured GW irrigation with av. CWR of 0.65 m) in Hec)
Amethi	5125.89	3588.12	3352.65	235.473	118	1	362.27
Bahadurpur	5585.95	3910.16	3671.78	238.385	119	1	366.75
Bhadar	5616.61	3931.62	3881.12	50.507	25	0	77.70
Bhetua	5362.33	3753.63	2973.15	780.481	390	4	1200.74
Gauriganj	7121.76	4985.23	4489.31	495.922	248	2	762.96
Jagdishpur	7697.38	5388.16	5081.73	306.436	153	1	471.44
Jamo	9669.82	6768.87	5916.6	852.274	426	4	1311.19
Musafirkhana	6571.31	4599.91	3719.25	880.667	440	4	1354.87
Sangrampur	3385.4	2369.78	2524.44	-154.66	0	0	0.00
Shahgarh	3737.14	2615.99	2110.83	505.168	253	2	777.18
Shukul bazar	4736.7	3315.69	3196.6	119.09	60	1	183.22
Singhpur	6839.19	4787.43	3972.15	815.283	408	4	1254.28
Tiloi	6797.9	4758.53	4249.89	508.64	254	2	782.52
Total	78247.38	54773.16	49139.5	5633.66	2894	26	8905.11

7.2.1 Promotion to Pradhan Mantri Kisi Sinchayi Yojana (Har Khet Ko Pani Ground Water Component) (PMKSY-HKGP-GW)

Amethi District, in terms of Ground Water level condition, includes area which are Waterlogged (0-2 m. b.g.l.) and Prone to waterlogging condition (2-5 m. b.g.l.). Also, along with this shallow water level condition, majority of the area is showing a rising water level trend with strong correlation with the rainfall. Hence, sufficient scope exists for the further ground water abstraction potential. It is, therefore, suggested to include the blocks which are having stage of Ground Water Extraction below 65% and post monsoon GW level upto 5 m bgl to be included in Pradhan Mantri Kisi Sinchayi Yojana – Har Khet Ko Pani component.

So that better irrigation potential can be generated which will help in increasing crop productivity in turn farm income of the farmers.

7.2.2 Promotion to Industries (Water Intensive)

In water logged areas having water level less than 2 meter below ground, non-polluting water intensive industries can be introduced on pilot basis. This will help in lowering of ground water level, which will not only be beneficial for higher economic activity in the area but also the vadose zone created may help in storage of water during the flooding period. In this way along with the prosperity, security from the frequent natural disaster can be achieved if planned and executed in a scientific manner. Rigorous monitoring of the project will be required at all stages.

7.3 GROUND WATER MANAGEMENT OPTIONS FOR BLOCKS HAVING STAGE OF GW DEVELOPMENT MORE THAN 70%-

Over draft of Ground water issues can be addressed mainly by focusing on measures to increase recharge and reducing the draft. As per Ground Water Resource Assessment 2022, 1 no of block have stage of ground water development more than 70%. Management strategy should be focusing on both side of the influence i.e. supply side and demand side.

7.3.1 Supply Side Management

It includes Artificial Recharge to ground water, Water conservation and On Farm Activities to increase storage capacity and conservation of rainfall where stage of ground water development is more than 70% and GW level trend is showing significant decline. Based on available information about the area such as ground water scenario, hydrogeology, hydrology, topography, rainfall pattern, drainage, soil cover, utilizable rainfall, etc., scope for various interventions shall be studied and assessment of suitable areas, tentative design and costs of structures shall be worked out.

Water conservation structures such as check dams, farm ponds, nala bunds, Stream Development etc results in ground water recharge to the tune of about 50% of the storage capacity considering 3 annual fillings. Further construction of recharge trenches in the upstream side of the check dams is also proposed to enhance rate of infiltration by about 30 to 40%. The existing ponds and tanks lose their storage capacity as well as the natural ground water recharge due to siltation and encroachment by farmers for agricultural purposes. Through desilting, coupled with providing proper waste weir, the village tanks can be converted into

recharge structures. These activities should be focused in the assessment units (Blocks) which are having stage of ground water extraction more than 65% and on priority basis in blocks with more than 70%, having ground water level more than 5 m bgl, in order to prevent the deterioration of the Categorization of assessment unit.

7.3.2 Demand Side Management

It mainly includes adoption of techniques to enhance water use efficiency for reducing draft of ground water and on farm practices.

On Farm Practices

Levelling of crop field is essential for uniform distribution of water. Laser levelling has been found very effective ensuring saving of 10 to 30% of applied irrigation. The in-situ farm activities such as contour bunding, land levelling, bench terracing, water harvesting structures, afforestation and diversification of cropping pattern are other measures to increase recharge in the block. These practices should be promoted in the areas where ground water level is declining and/or stage of ground water extraction is more than 70%.

Efficient Irrigation

In deeper ground water level areas having stage of ground water extraction more than 70%, irrigation by flood / furrow irrigation method in which more than 50% of applied water is wasted through seepage to deeper level, localized inundation causes loss through evaporation. Drip & sprinkler irrigation method of irrigation should be promoted. Through drip & sprinkler irrigation wastage of irrigational water could be minimized. The conveyance losses (mainly seepage & evaporation) can be saved upto 25 to 40% through utilization of HDPE pipes.

8.1 AQUIFER MAPPING AND MANAGEMENT PLAN OF AMETHI BLOCK, AMETHI DISTRICT, U.P.

1. General Information

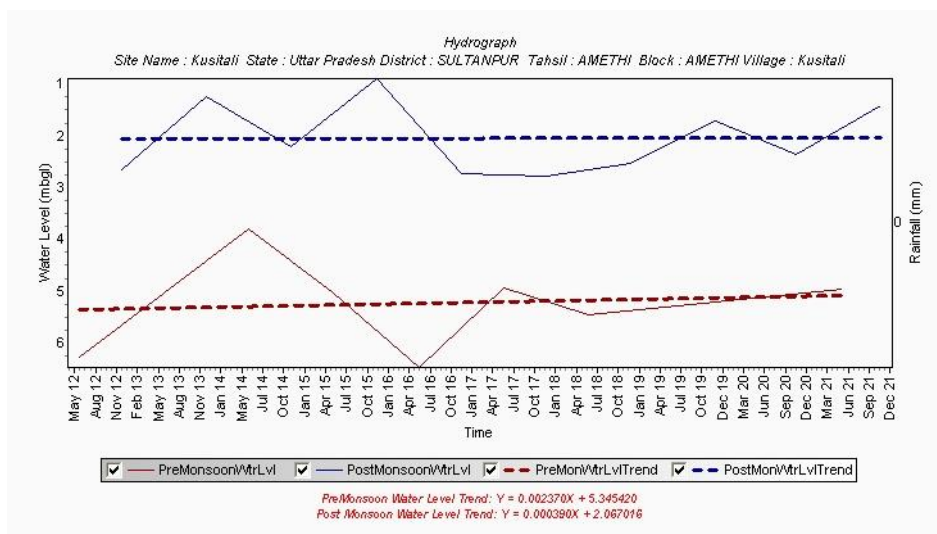
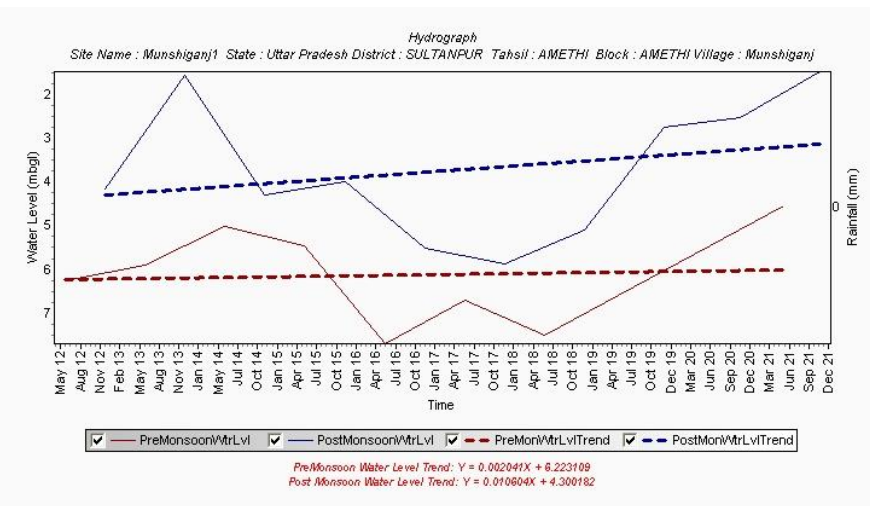
State	Uttar Pradesh
District name	Amethi
Block Name	AMETHI
Geographical area	162.36 Sq. km
Basin/Sub-basin	Ganga Basin/Gomati Sub-Basin
Principal Aquifer System	Alluvium
Major Aquifer System	Younger Alluvium Older Alluvium
Normal Annual Rainfall	693.39 mm

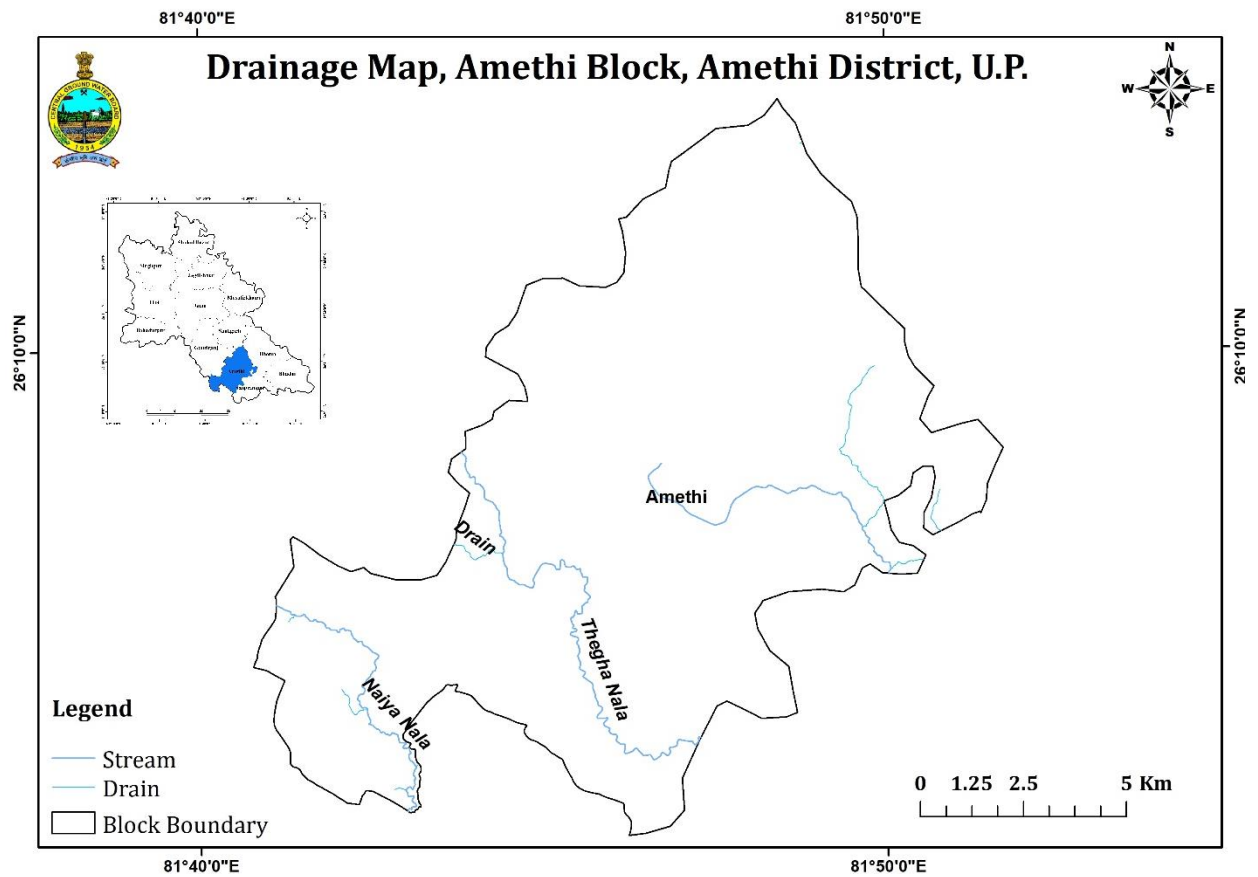
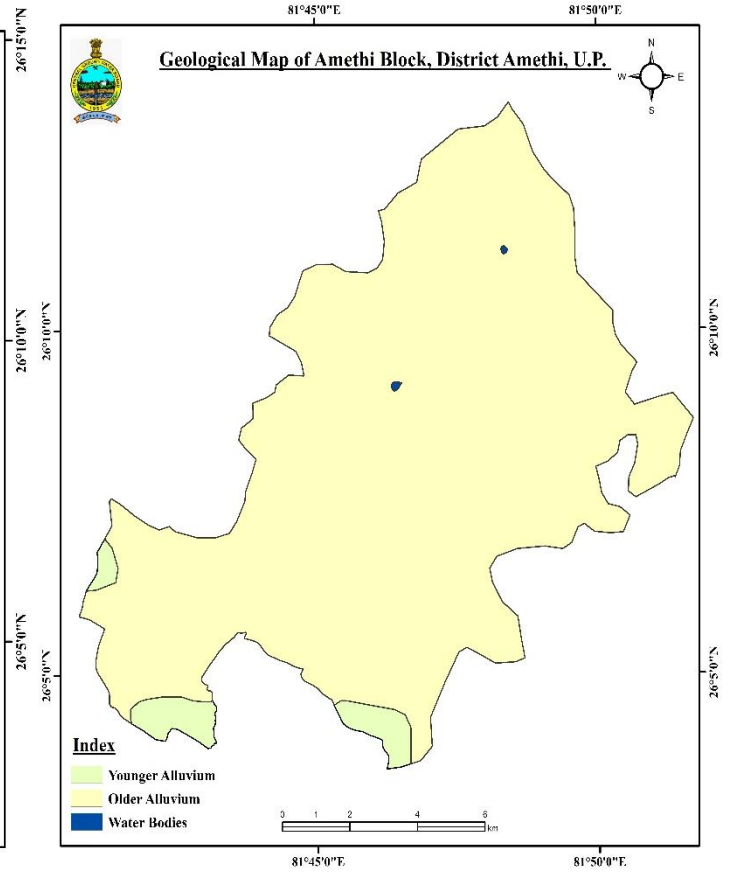
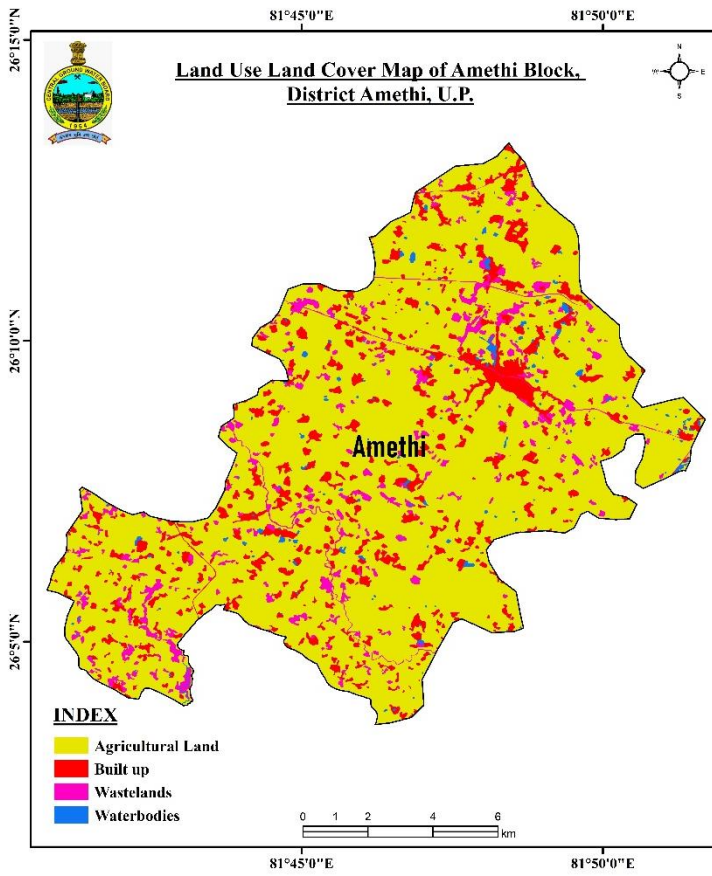
2. Aquifer Disposition

Aquifer Disposition	<ul style="list-style-type: none"> • Aquifer Disposition: Two Aquifer Groups exists up to 300 m bgl. <ul style="list-style-type: none"> o Aquifer I (mbgl): From Ground Level up to 80.37 mbgl o Aquifer II (mbgl): 290 to 300 • Transmissivity (m²/day): 1392 • Sp. Yield: 0.00028
Groundwater Monitoring Status	<ul style="list-style-type: none"> • Ground Water Monitoring Wells (CGWB): 2 • Ground Water Monitoring Wells (GWD): 3
Ground Water Quality	<ul style="list-style-type: none"> • For Aquifer Group I: Good
Aquifer Potential	<ul style="list-style-type: none"> • 3150 lpm
Groundwater Resource	<ul style="list-style-type: none"> • Annual Extractable GW Recharge: 51.25 MCM • GW Draft: 33.52 MCM • Stage of GW Development: 65.41 % • Total in-storage resource of the block: 356.01 MCM
Existing and Future Water Demand	<ul style="list-style-type: none"> • Present demand for All Usage: 33.52 MCM • Future Demand for Domestic and Industrial Use: 3.99 MCM

3. Aquifer Management Plan

<p>Groundwater Management issues</p>	<ul style="list-style-type: none"> • Sufficient Ground Water Resource potential exists • Rise in water level may result in water-logging • GW quality: EC, Nitrate, Uranium and Magnesium concentration are high
<p>AR & Conservation Possibilities</p>	<ul style="list-style-type: none"> • Adoption of water use efficiency practices if GW level declines below 5 m bgl in post-monsoon season.
<p>Groundwater Management Plan</p>	<ul style="list-style-type: none"> • SUPPLY SIDE MANAGEMENT: Additional GW potential can be generated. • DEMAND SIDE MANAGEMENT: Sustainable Ground Water based industrial and Agricultural activities may be promoted.





8.2 AQUIFER MAPPING AND MANAGEMENT PLAN OF BAHADURPUR-II BLOCK, AMETHI DISTRICT, U.P.

1. General Information

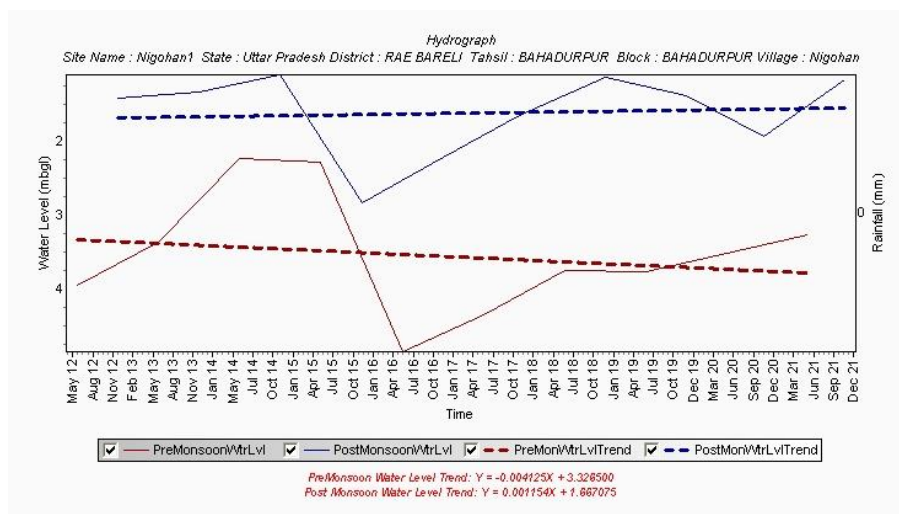
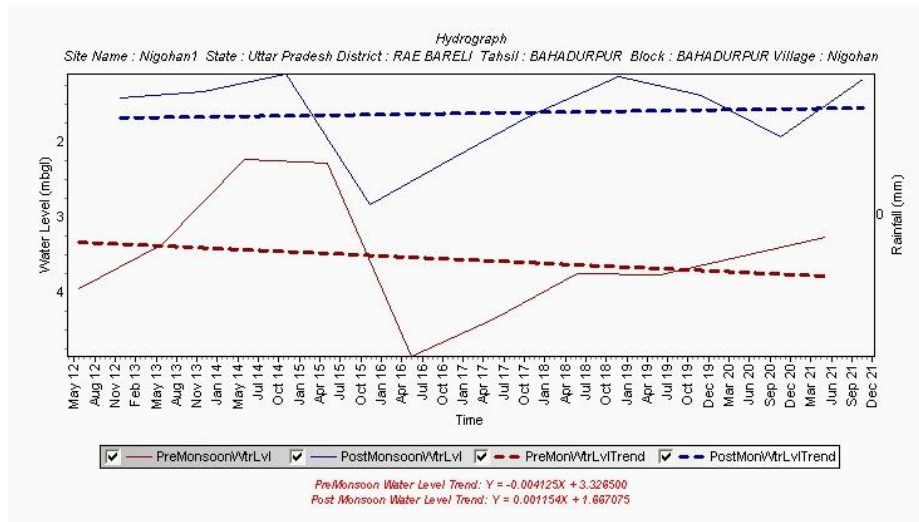
State	Uttar Pradesh
District name	Amethi
Block Name	BAHADURPUR-II
Geographical area	155.54 Sq. km
Basin/Sub-basin	Ganga Basin/Gomati Sub-Basin
Principal Aquifer System	Alluvium
Major Aquifer System	Older Alluvium
Normal Annual Rainfall	693.39 mm

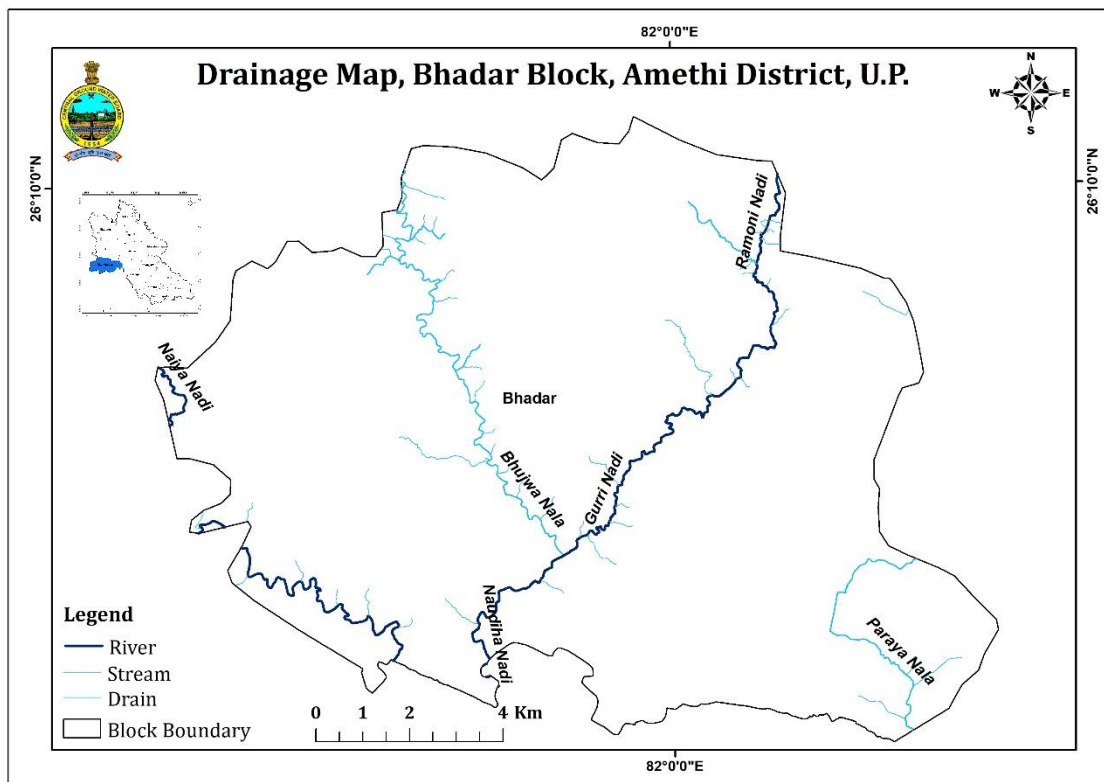
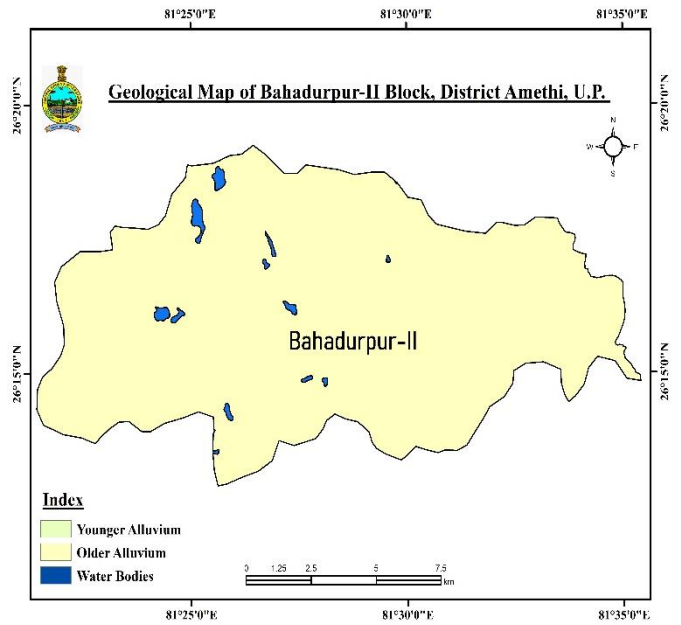
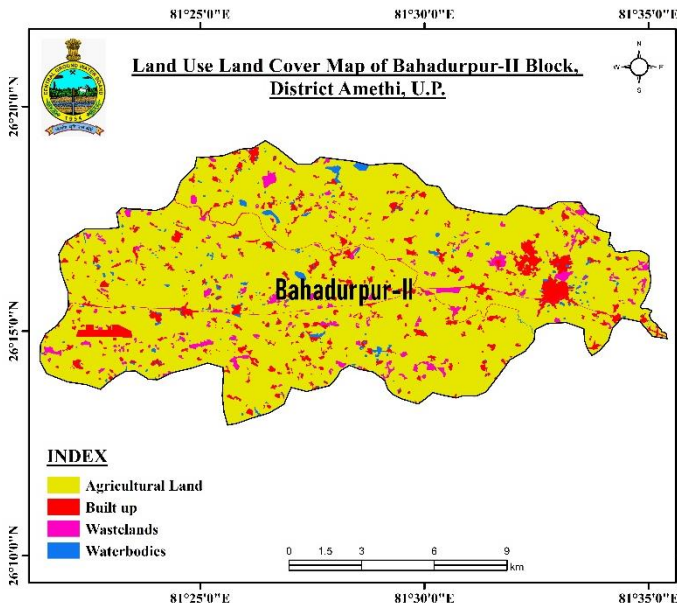
2. Aquifer Disposition

Aquifer Disposition	<ul style="list-style-type: none"> • Aquifer Disposition: Two Aquifer Groups exists up to 300 m bgl. <ul style="list-style-type: none"> o Aquifer I (mbgl): From Ground Level up to 50.5 mbgl o Aquifer II (mbgl): 247.5 to 300 • Transmissivity (m^2/day): 1357 • Sp. Yield: 0.00059
Groundwater Monitoring Status	<ul style="list-style-type: none"> • Ground Water Monitoring Wells (CGWB): 4 • Ground Water Monitoring Wells (GWD): 6
Ground Water Quality	<ul style="list-style-type: none"> • For Aquifer Group I: Good
Aquifer Potential	<ul style="list-style-type: none"> • 1752 lpm
Groundwater Resource	<ul style="list-style-type: none"> • Annual Extractable GW Recharge: 55.85 MCM • GW Draft: 36.71 MCM • Stage of GW Development: 65.73 % • Total in-storage resource of the block: 973.44 MCM
Existing and Future Water Demand	<ul style="list-style-type: none"> • Present demand for All Usage: 36.71 MCM • Future Demand for Domestic and Industrial Use: 3.89 MCM

3. Aquifer Management Plan

<p>Groundwater Management issues</p>	<ul style="list-style-type: none"> • Sufficient Ground Water Resource potential exists • Rise in water level may result in water-logging • GW Quality: High EC reported at various places.
<p>AR & Conservation Possibilities</p>	<ul style="list-style-type: none"> • Adoption of water use efficiency practices if GW level declines below 5 m bgl in post-monsoon season.
<p>Groundwater Management Plan</p>	<ul style="list-style-type: none"> • SUPPLY SIDE MANAGEMENT: Additional GW potential can be generated. • DEMAND SIDE MANAGEMENT: Sustainable Ground Water based industrial and Agricultural activities may be promoted.





8.3 AQUIFER MAPPING AND MANAGEMENT PLAN OF BHADAR BLOCK, AMETHI DISTRICT, U.P.

1. General Information

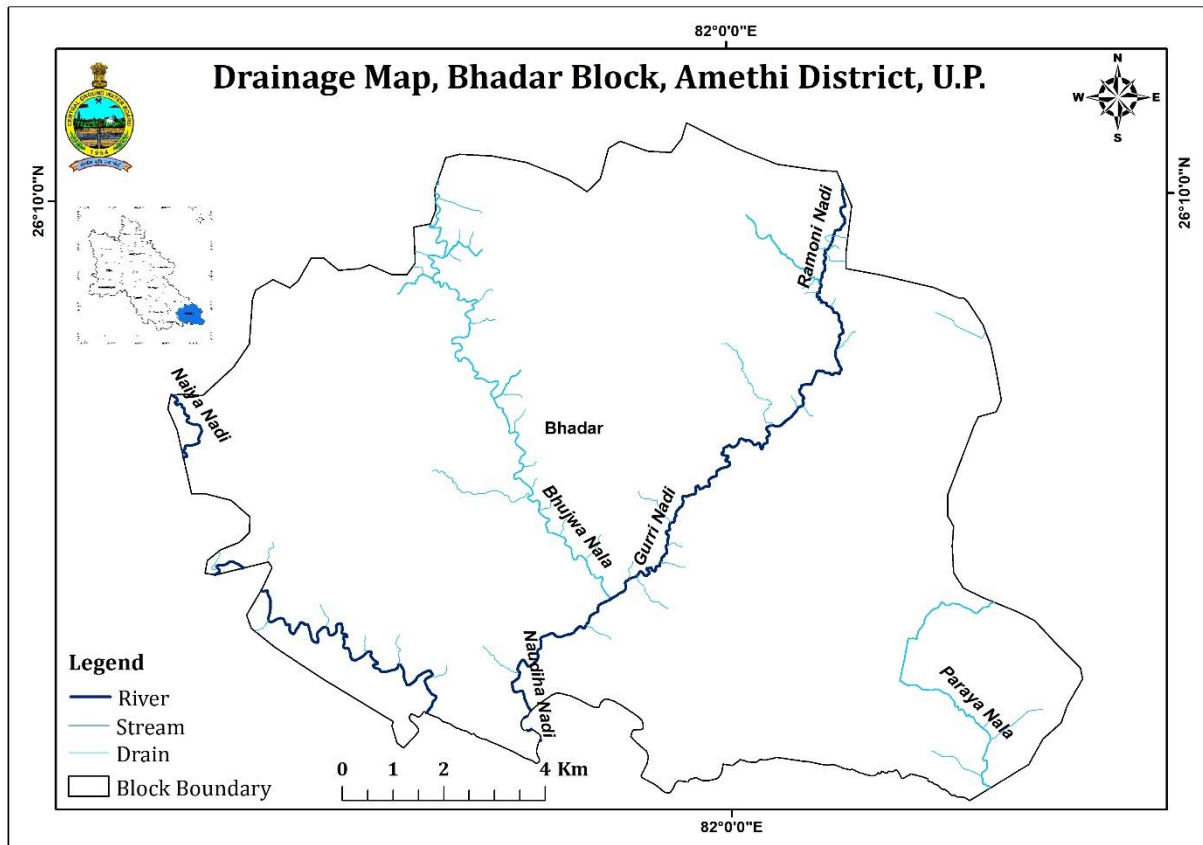
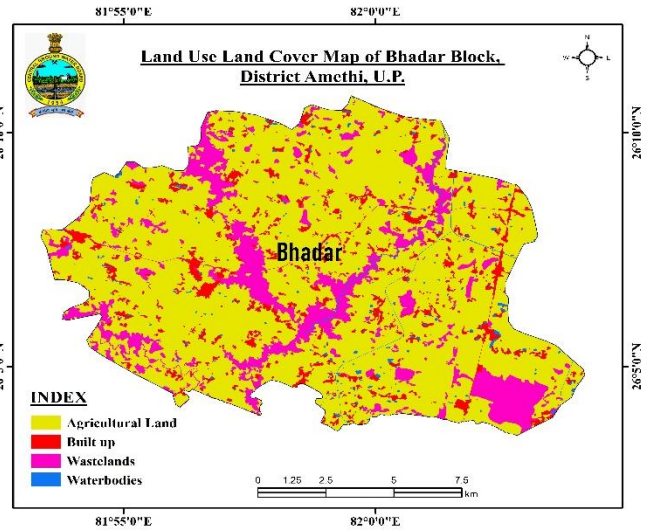
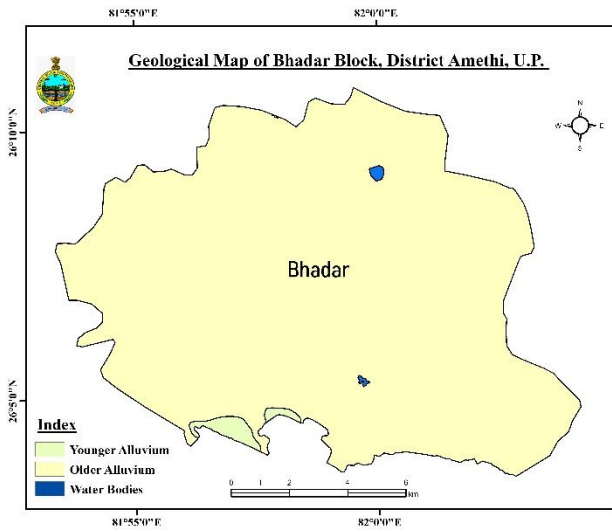
State	Uttar Pradesh
District name	Amethi
Block Name	BHADAR
Geographical area	159.21Sq. km
Basin/Sub-basin	Ganga Basin/Gomati Sub-Basin
Principal Aquifer System	Alluvium
Major Aquifer System	Younger Alluvium Older Alluvium
Normal Annual Rainfall	693.39 mm

2. Aquifer Disposition

Aquifer Disposition	<ul style="list-style-type: none"> • Aquifer Disposition: Two Aquifer Groups exists up to 300 m bgl. <ul style="list-style-type: none"> o Aquifer I (mbgl): From Ground Level up to 57.5 mbgl o Aquifer II (mbgl): 242 to 300 • Transmissivity (m^2/day): 1385
Groundwater Monitoring Status	<ul style="list-style-type: none"> • Ground Water Monitoring Wells (CGWB): 2 • Ground Water Monitoring Wells (GWD): 2
Ground Water Quality	<ul style="list-style-type: none"> • For Aquifer Group I: Good
Aquifer Potential	<ul style="list-style-type: none"> • 3243 lpm
Groundwater Resource	<ul style="list-style-type: none"> • Annual Extractable GW Recharge: 56.16 MCM • GW Draft: 38.81 MCM • Stage of GW Development: 69.1% • Total in-storage resource of the block: 115.36 MCM
Existing and Future Water Demand	<ul style="list-style-type: none"> • Present demand for All Usage: 38.81 MCM • Future Demand for Domestic and Industrial Use: 3.45 MCM

3. Aquifer Management Plan

Groundwater Management issues	<ul style="list-style-type: none">• Sufficient Ground Water Resource potential exists• Rise in water level may result in water-logging• GW quality: EC and Magnesium concentration is high
AR & Conservation Possibilities	<ul style="list-style-type: none">• Adoption of water use efficiency practices if GW level declines below 5 m bgl in post-monsoon season.
Groundwater Management Plan	<ul style="list-style-type: none">• SUPPLY SIDE MANAGEMENT: Additional GW potential can be generated.• DEMAND SIDE MANAGEMENT: Sustainable Ground Water based industrial and Agricultural activities may be promoted.



8.4 AQUIFER MAPPING AND MANAGEMENT PLAN OF BHETUA BLOCK, AMETHI DISTRICT, U.P.

1. General Information

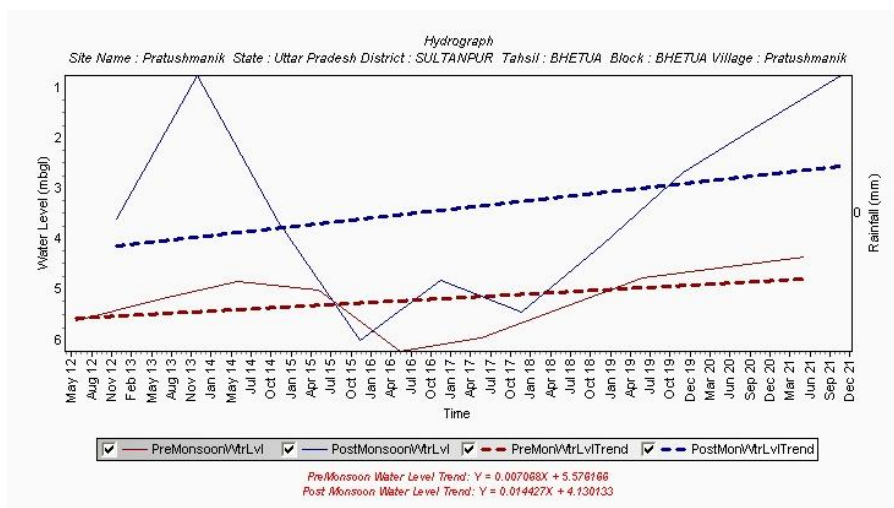
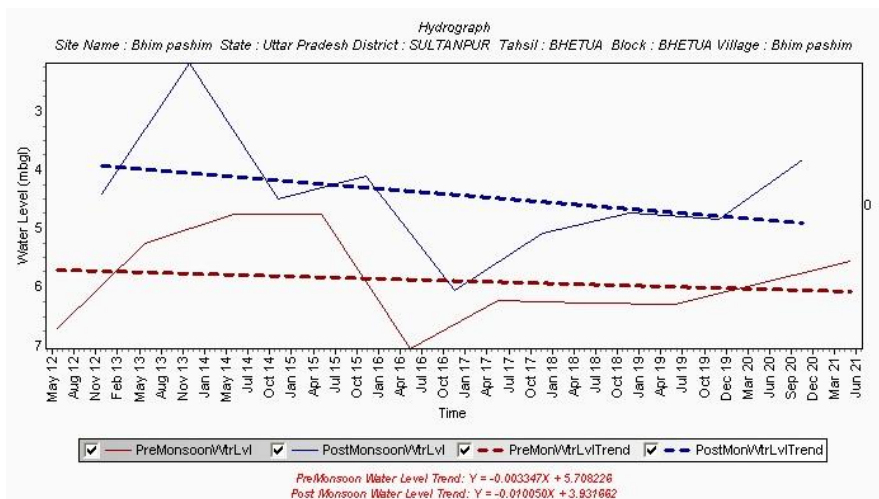
State	Uttar Pradesh
District name	Amethi
Block Name	BHETUA
Geographical area	164.95 Sq. km
Basin/Sub-basin	Ganga Basin/Gomati Sub-Basin
Principal Aquifer System	Alluvium
Major Aquifer System	Older Alluvium
Normal Annual Rainfall	693.39 mm

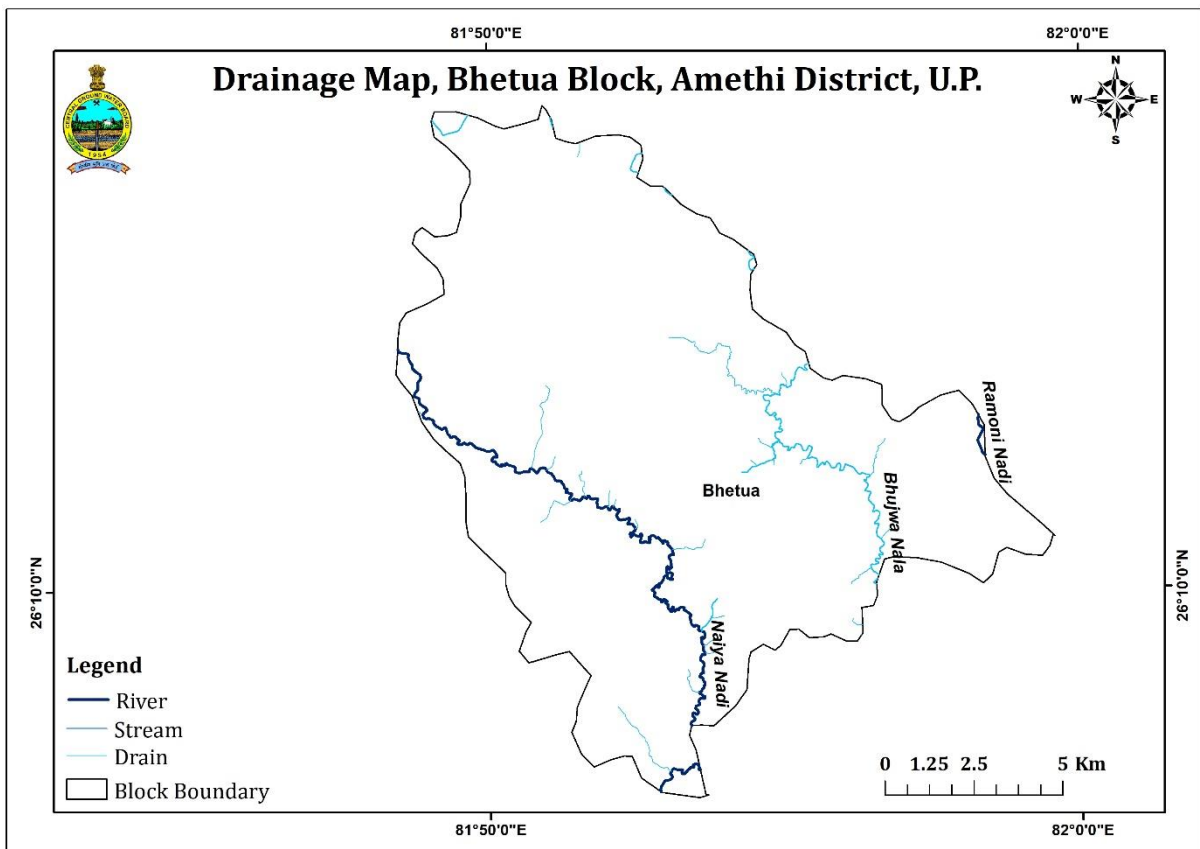
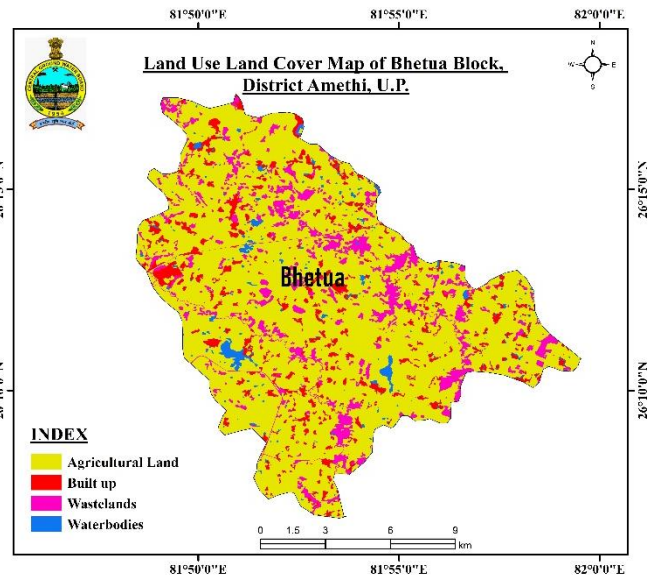
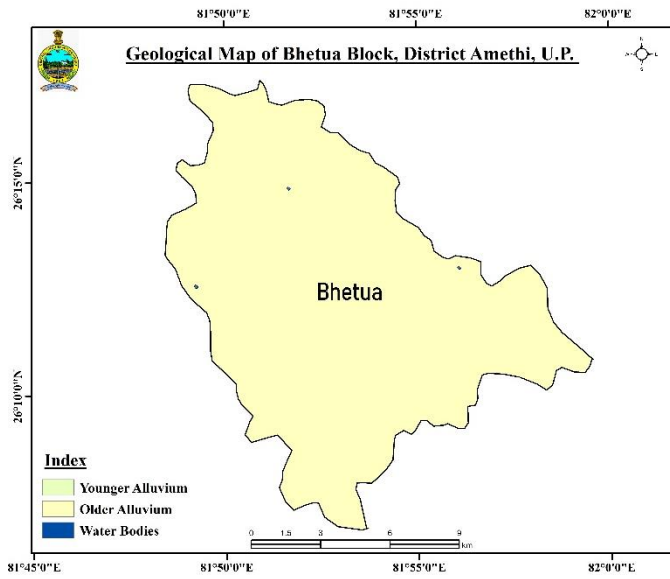
2. Aquifer Disposition

Aquifer Disposition	<ul style="list-style-type: none"> • Aquifer Disposition: Two Aquifer Groups exists up to 300 m bgl. <ul style="list-style-type: none"> o Aquifer I (mbgl): From Ground Level up to 57.5 mbgl o Aquifer II (mbgl): 125 to 200 • Transmissivity (m^2/day): 1385
Groundwater Monitoring Status	<ul style="list-style-type: none"> • Ground Water Monitoring Wells (CGWB): 6 • Ground Water Monitoring Wells (GWD): 4
Ground Water Quality	<ul style="list-style-type: none"> • For Aquifer Group I: Good
Aquifer Potential	<ul style="list-style-type: none"> • 3243 lpm
Groundwater Resource	<ul style="list-style-type: none"> • Annual Extractable GW Recharge: 53.63 MCM • GW Draft: 29.73 MCM • Stage of GW Development: 55.45% • Total in-storage resource of the block: 211.37 MCM
Existing and Future Water Demand	<ul style="list-style-type: none"> • Present demand for All Usage: 29.73 MCM • Future Demand for Domestic and Industrial Use: 2.65 MCM

3. Aquifer Management Plan

<p>Groundwater Management issues</p>	<ul style="list-style-type: none"> • Sufficient Ground Water Resource potential exists • GW quality: Iron and Fluoride concentration are high
<p>AR & Conservation Possibilities</p>	<ul style="list-style-type: none"> • Adoption of water use efficiency practices if GW level declines below 5 m bgl in post-monsoon season.
<p>Groundwater Management Plan</p>	<ul style="list-style-type: none"> • SUPPLY SIDE MANAGEMENT: Additional GW potential can be generated. • DEMAND SIDE MANAGEMENT: Sustainable Ground Water based industrial and Agricultural activities may be promoted.





8.5 AQUIFER MAPPING AND MANAGEMENT PLAN OF GAURIGANJ BLOCK, AMETHI DISTRICT, U.P.

1. General Information

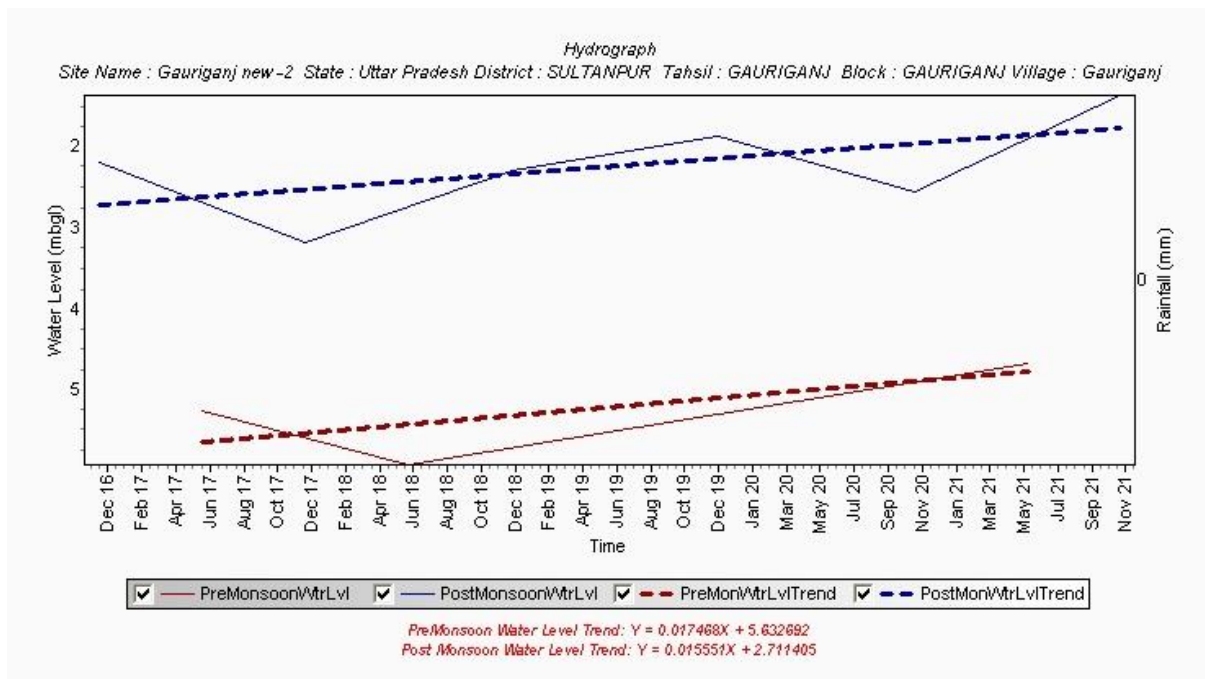
State	Uttar Pradesh
District name	Amethi
Block Name	GAURIGANJ
Geographical area	207.91 Sq. km
Basin/Sub-basin	Ganga Basin/Gomati Sub-Basin
Principal Aquifer System	Alluvium
Major Aquifer System	Younger Alluvium Older Alluvium
Normal Annual Rainfall	693.39 mm

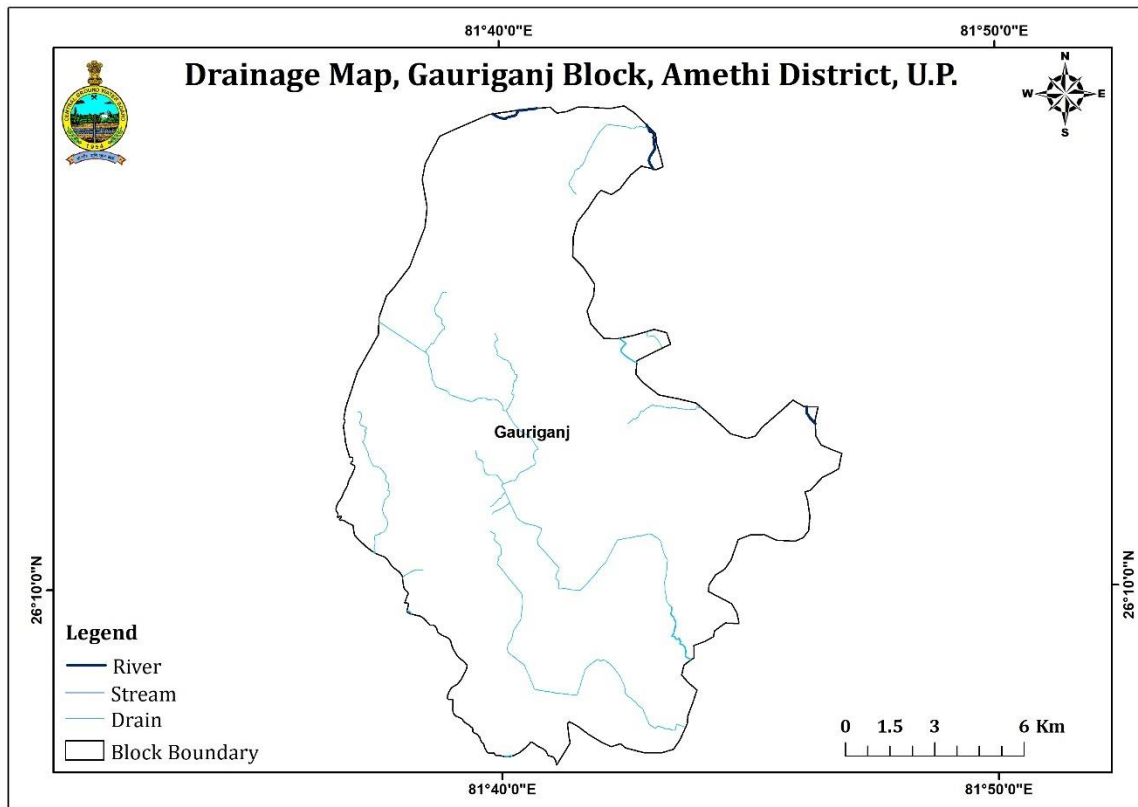
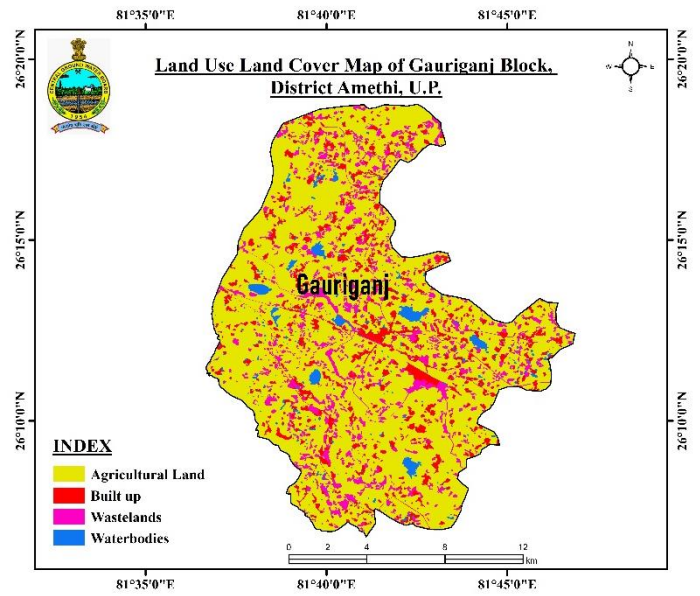
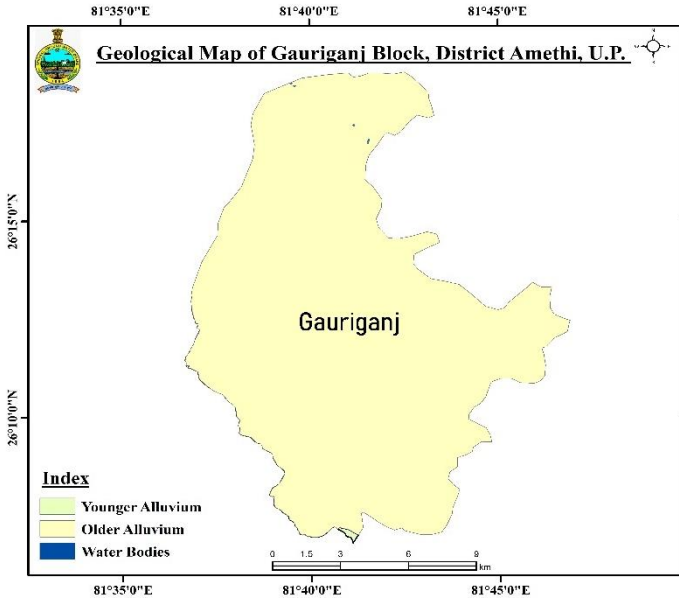
2. Aquifer Disposition

Aquifer Disposition	<ul style="list-style-type: none"> • Aquifer Disposition: Two Aquifer Groups exists up to 300 m bgl. <ul style="list-style-type: none"> o Aquifer I (mbgl): From Ground Level up to 80.37 mbgl o Aquifer II (mbgl): 290.46 to 300 • Transmissivity (m^2/day): 1392 • Sp. Yield: 0.00028
Groundwater Monitoring Status	<ul style="list-style-type: none"> • Ground Water Monitoring Wells (CGWB): 2 • Ground Water Monitoring Wells (GWD): 5
Ground Water Quality	<ul style="list-style-type: none"> • For Aquifer Group I: Good
Aquifer Potential	<ul style="list-style-type: none"> • 3150 lpm
Groundwater Resource	<ul style="list-style-type: none"> • Annual Extractable GW Recharge: 71.21 MCM • GW Draft: 44.89 MCM • Stage of GW Development: 63.04 % • Total in-storage resource of the block: 210.59 MCM
Existing and Future Water Demand	<ul style="list-style-type: none"> • Present demand for All Usage: 44.89 MCM • Future Demand for Domestic and Industrial Use: 3.94 MCM

3. Aquifer Management Plan

<p>Groundwater Management issues</p>	<ul style="list-style-type: none"> • Sufficient Ground Water Resource potential exists • Rise in water level may result in water-logging • GW quality: Iron, Manganese and Arsenic concentration are high
<p>AR & Conservation Possibilities</p>	<ul style="list-style-type: none"> • Adoption of water use efficiency practices if GW level declines below 5 m bgl in post-monsoon season.
<p>Groundwater Management Plan</p>	<ul style="list-style-type: none"> • SUPPLY SIDE MANAGEMENT: Additional GW potential can be generated. • DEMAND SIDE MANAGEMENT: Sustainable Ground Water based industrial and Agricultural activities may be promoted.





8.6 AQUIFER MAPPING AND MANAGEMENT PLAN OF JAGDISHPUR BLOCK, AMETHI DISTRICT, U.P.

1. General Information

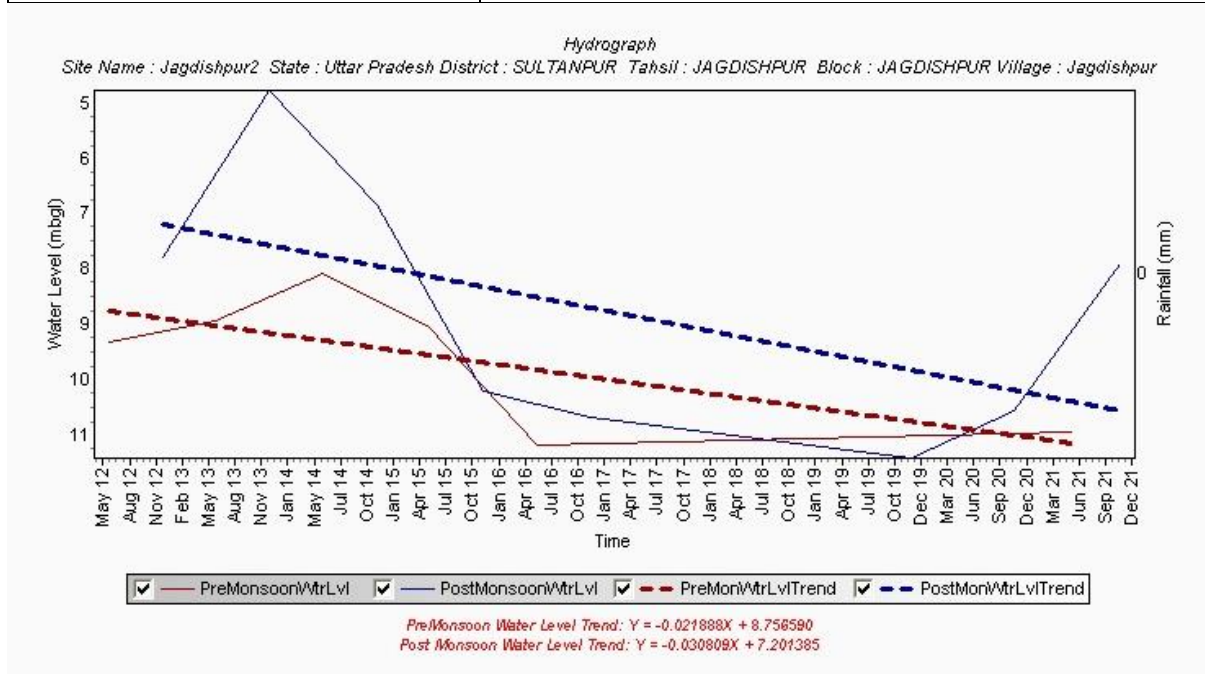
State	Uttar Pradesh
District name	Amethi
Block Name	JAGDISHPUR
Geographical area	214.76 Sq. km
Basin/Sub-basin	Ganga Basin/Gomati Sub-Basin
Principal Aquifer System	Alluvium
Major Aquifer System	Younger Alluvium Older Alluvium
Normal Annual Rainfall	693.39 mm

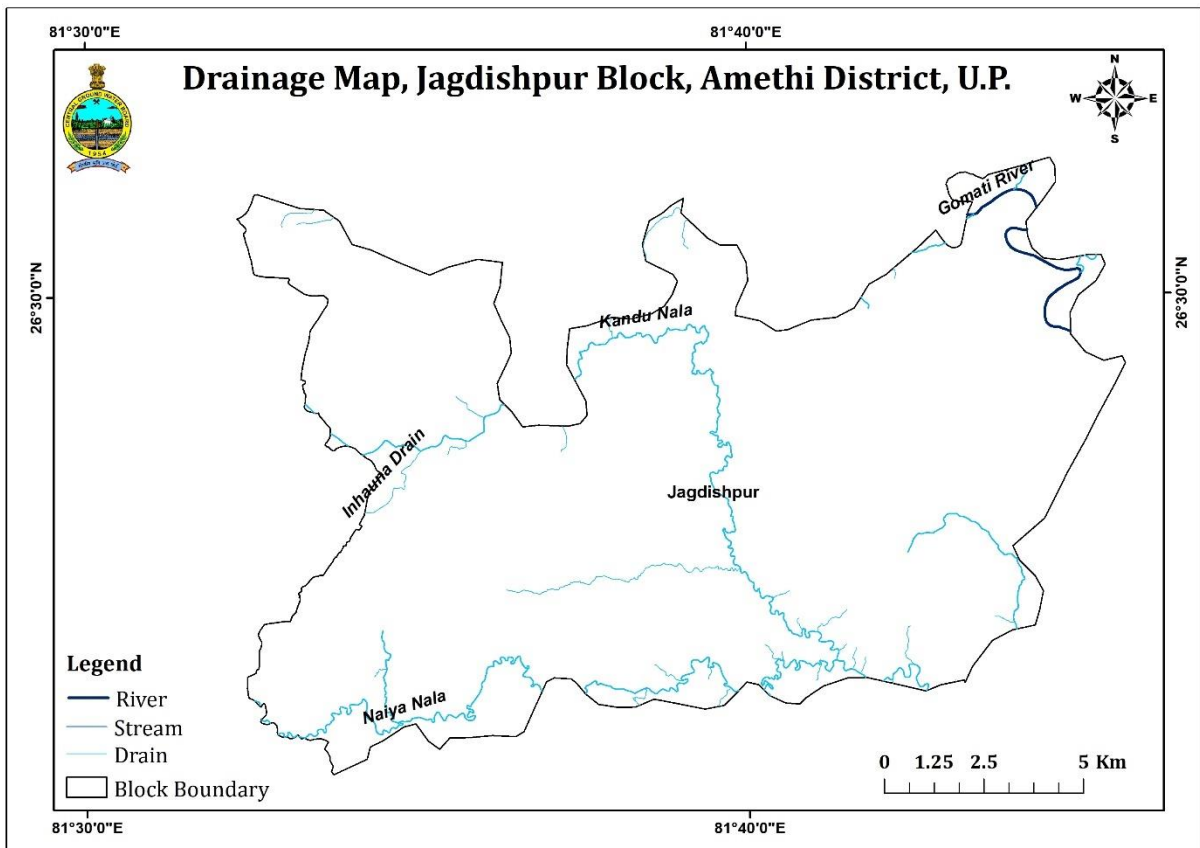
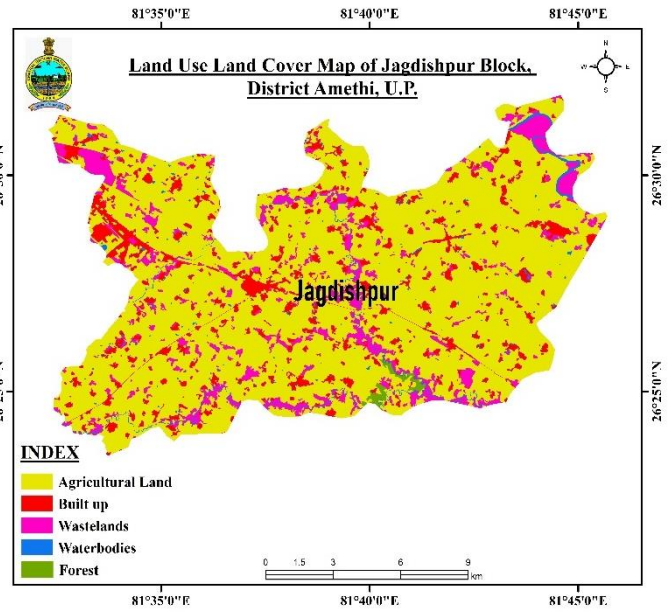
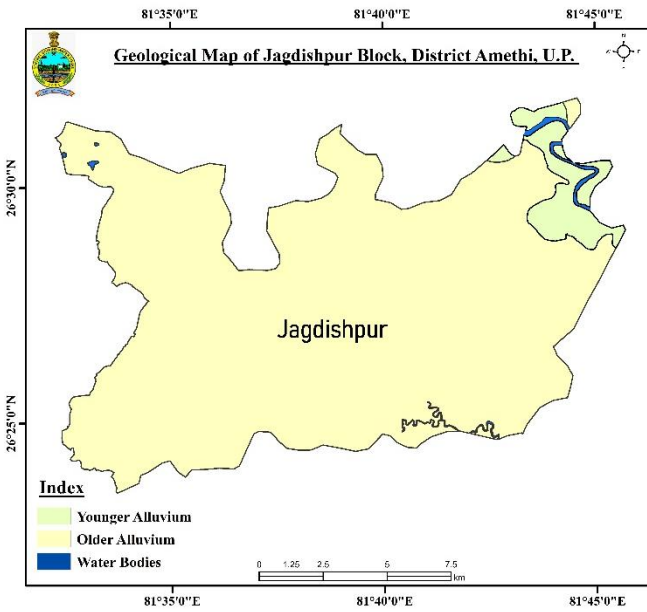
2. Aquifer Disposition

Aquifer Disposition	<ul style="list-style-type: none"> • Aquifer Disposition: Two Aquifer Groups exists up to 300 m bgl. <ul style="list-style-type: none"> o Aquifer I (mbgl): From Ground Level up to 138.01 • Transmissivity (m^2/day): 150 • Sp. Yield: 0.000078
Groundwater Monitoring Status	<ul style="list-style-type: none"> • Ground Water Monitoring Wells (CGWB): 3 • Ground Water Monitoring Wells (GWD): 3
Ground Water Quality	<ul style="list-style-type: none"> • For Aquifer Group I: Good
Aquifer Potential	<ul style="list-style-type: none"> • 1925 lpm
Groundwater Resource	<ul style="list-style-type: none"> • Annual Extractable GW Recharge: 76.97 MCM • GW Draft: 50.81 MCM • Stage of GW Development: 66.02 % • Total in-storage resource of the block: 383.8 MCM
Existing and Future Water Demand	<ul style="list-style-type: none"> • Present demand for All Usage: 50.81 MCM • Future Demand for Domestic and Industrial Use: 4.95 MCM

3. Aquifer Management Plan

Groundwater Management issues	<ul style="list-style-type: none"> • Sufficient Ground Water Resource potential exists • Decline in water level
AR & Conservation Possibilities	<ul style="list-style-type: none"> • Adoption of water use efficiency practices if GW level declines below 5 m bgl in post-monsoon season.
Groundwater Management Plan	<ul style="list-style-type: none"> • SUPPLY SIDE MANAGEMENT: Additional GW potential can be generated. • DEMAND SIDE MANAGEMENT: Sustainable Ground Water based industrial and Agricultural activities may be promoted.





8.7 AQUIFER MAPPING AND MANAGEMENT PLAN OF JAMO BLOCK, AMETHI DISTRICT, U.P.

1. General Information

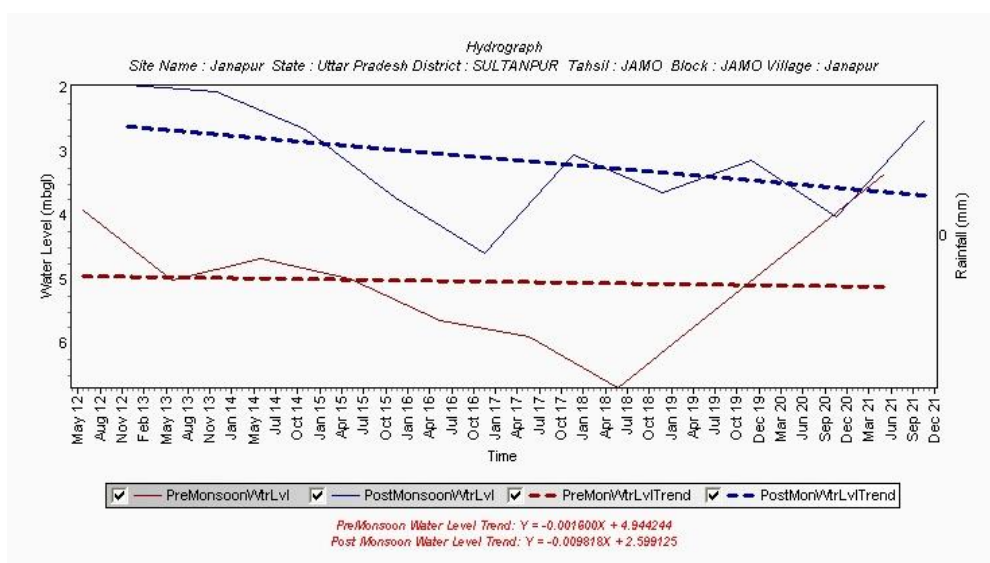
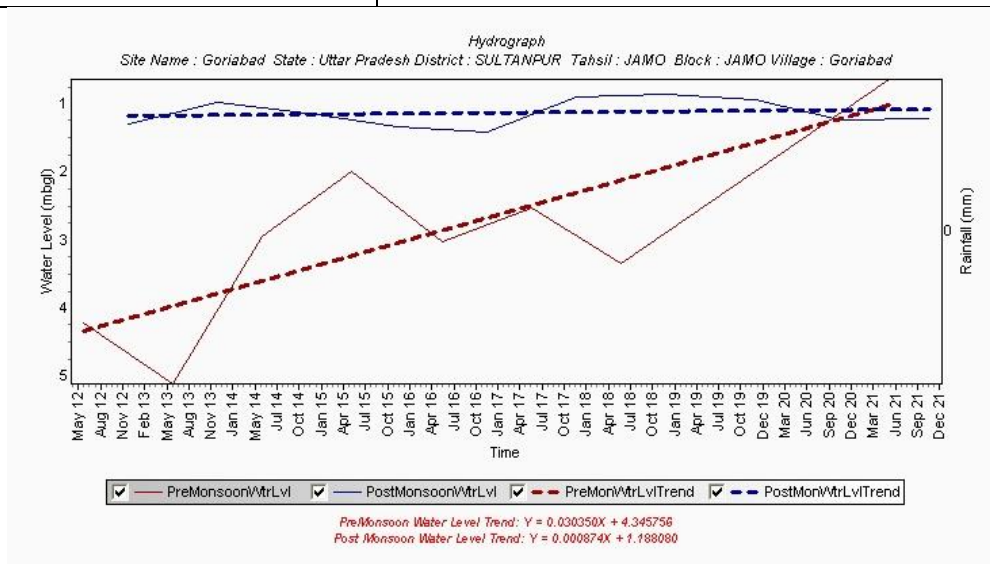
State	Uttar Pradesh
District name	Amethi
Block Name	JAMO
Geographical area	235.53 Sq. km
Basin/Sub-basin	Ganga Basin/Gomati Sub-Basin
Principal Aquifer System	Alluvium
Major Aquifer System	Younger Alluvium Older Alluvium
Normal Annual Rainfall	693.39 mm

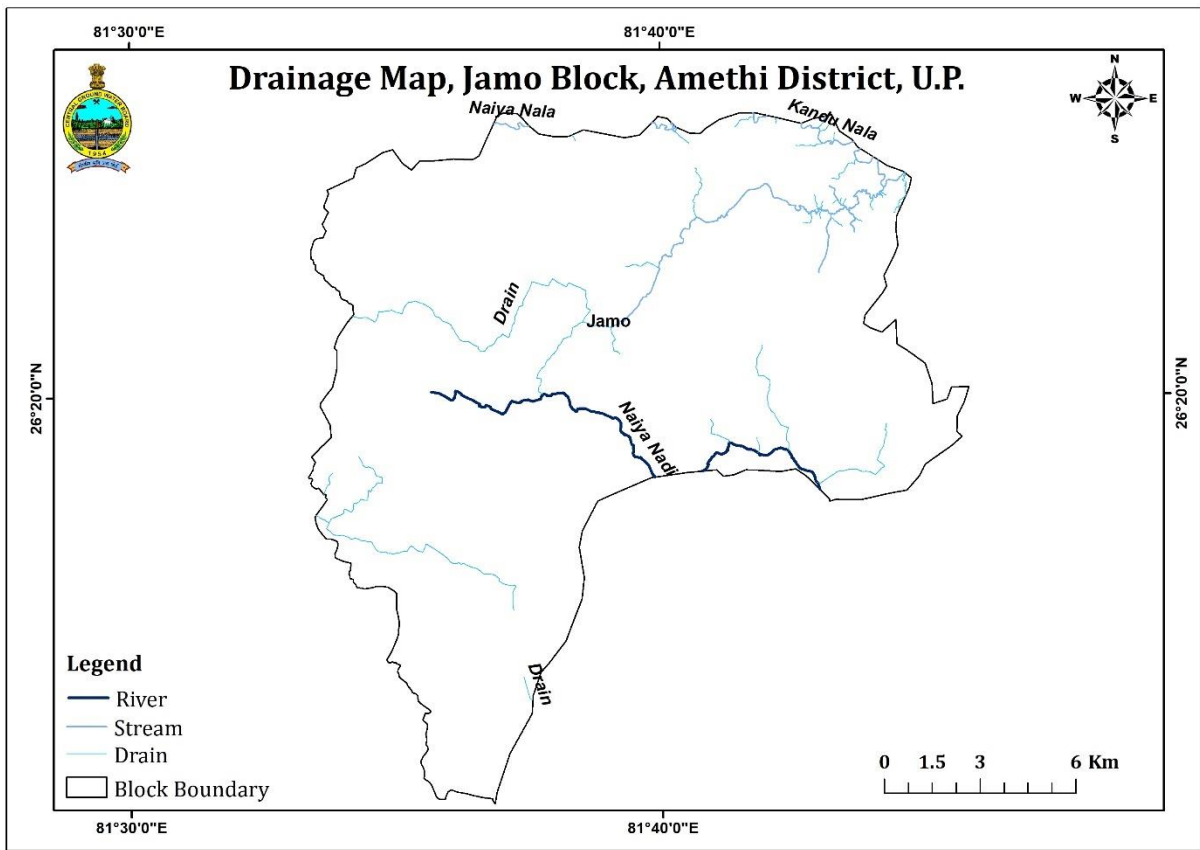
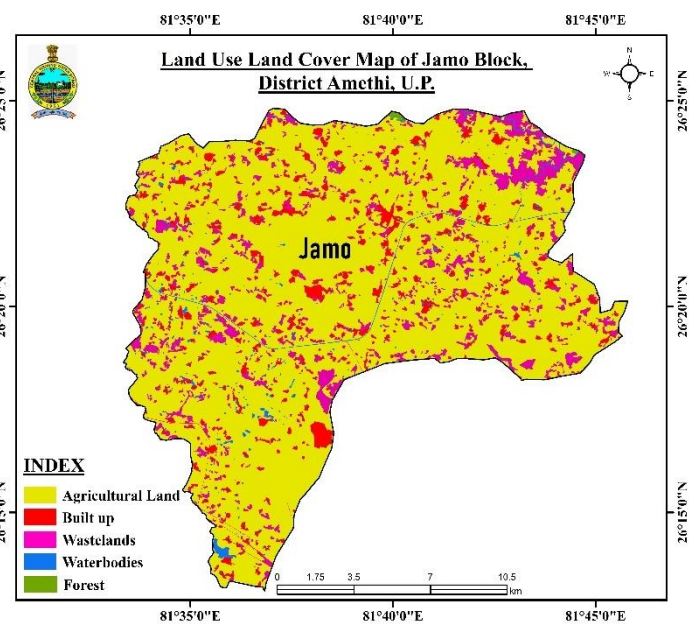
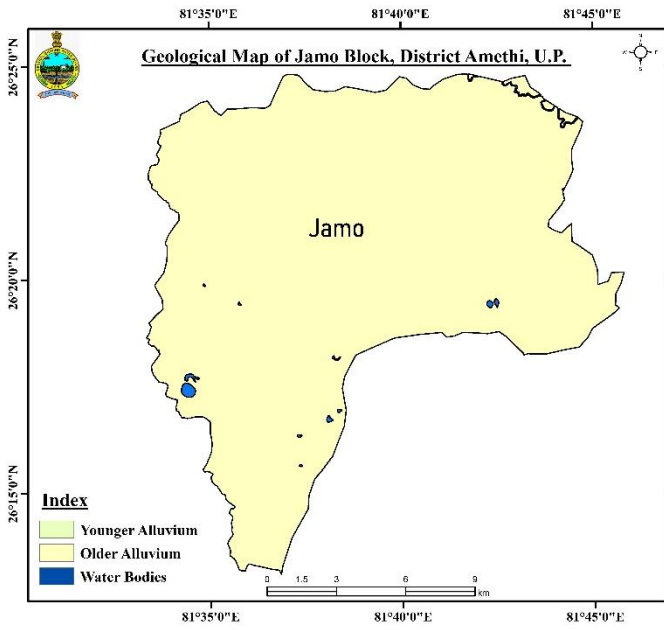
2. Aquifer Disposition

Aquifer Disposition	<ul style="list-style-type: none"> • Aquifer Disposition: Two Aquifer Groups exists up to 300 m bgl. <ul style="list-style-type: none"> o Aquifer I (mbgl): From Ground Level up to 50.5 o Aquifer II (mbgl): 247.5 to 300 • Transmissivity (m^2/day): 150 • Sp. Yield: 0.000078
Groundwater Monitoring Status	<ul style="list-style-type: none"> • Ground Water Monitoring Wells (CGWB): 5 • Ground Water Monitoring Wells (GWD): 4
Ground Water Quality	<ul style="list-style-type: none"> • For Aquifer Group I: Good
Aquifer Potential	<ul style="list-style-type: none"> • 1925 lpm
Groundwater Resource	<ul style="list-style-type: none"> • Annual Extractable GW Recharge: 96.69 MCM • GW Draft: 59.16 MCM • Stage of GW Development: 61.19 % • Total in-storage resource of the block: 1395.27 MCM
Existing and Future Water Demand	<ul style="list-style-type: none"> • Present demand for All Usage: 59.16 MCM • Future Demand for Domestic and Industrial Use: 5.16 MCM

3. Aquifer Management Plan

<p>Groundwater Management issues</p>	<ul style="list-style-type: none"> • Sufficient Ground Water Resource potential exists • GW quality: EC high at various places.
<p>AR & Conservation Possibilities</p>	<ul style="list-style-type: none"> • Adoption of water use efficiency practices if GW level declines below 5 m bgl in post-monsoon season.
<p>Groundwater Management Plan</p>	<ul style="list-style-type: none"> • SUPPLY SIDE MANAGEMENT: Additional GW potential can be generated. • DEMAND SIDE MANAGEMENT: Sustainable Ground Water based industrial and Agricultural activities may be promoted.





8.8 AQUIFER MAPPING AND MANAGEMENT PLAN OF MUSAFIRKHANA BLOCK, AMETHI DISTRICT, U.P.

1. General Information

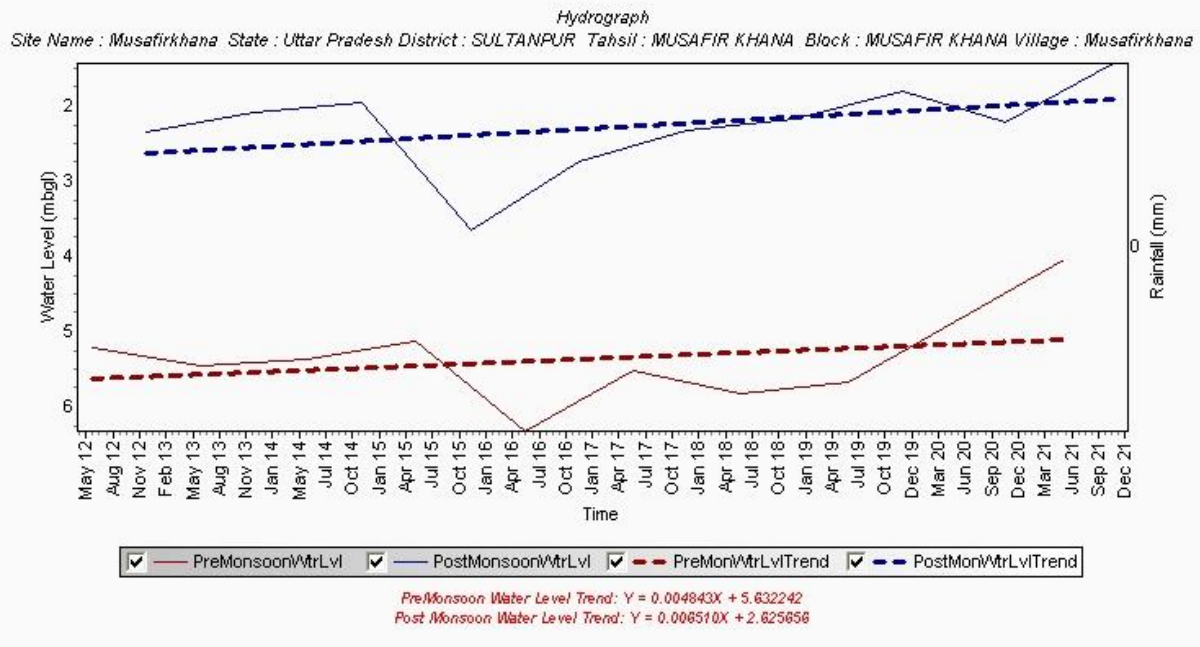
State	Uttar Pradesh
District name	Amethi
Block Name	MUSAFIRKHANA
Geographical area	182.06 Sq. km
Basin/Sub-basin	Ganga Basin/Gomati Sub-Basin
Principal Aquifer System	Alluvium
Major Aquifer System	Younger Alluvium Older Alluvium
Normal Annual Rainfall	693.39 mm

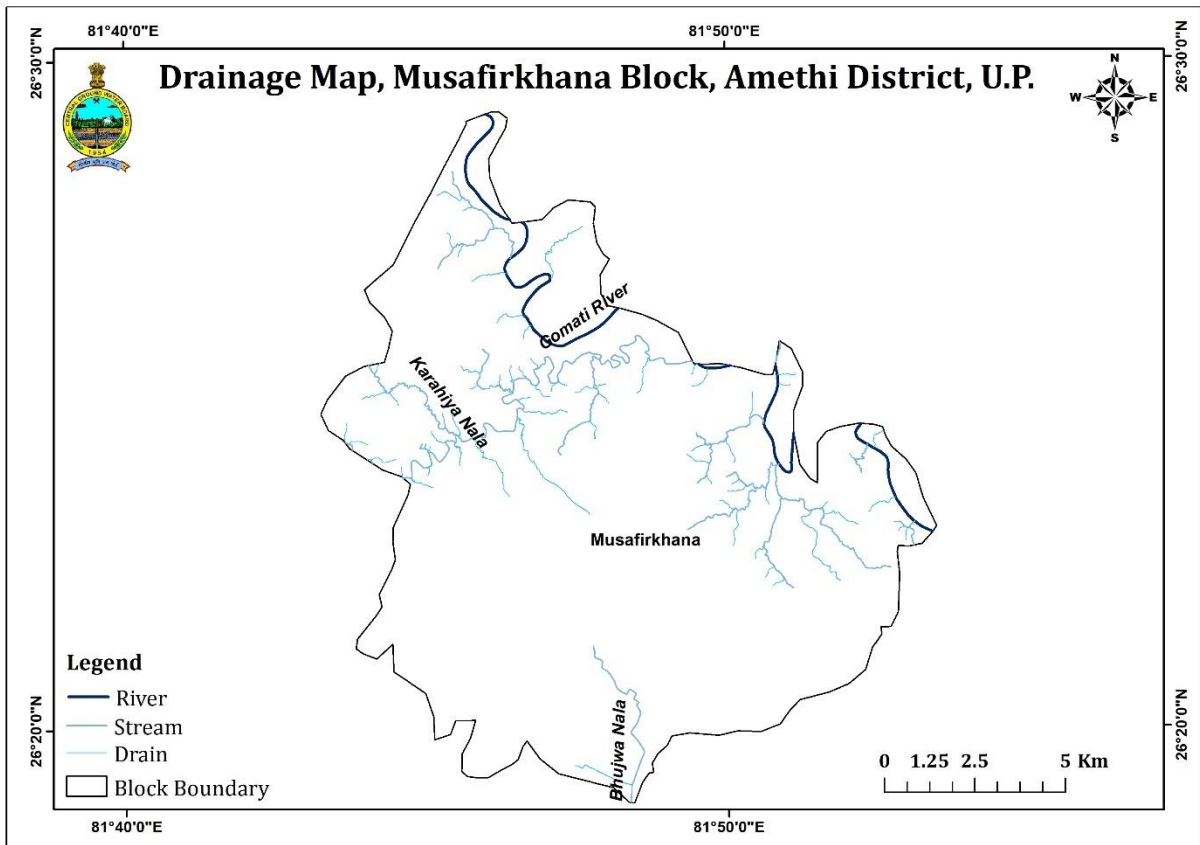
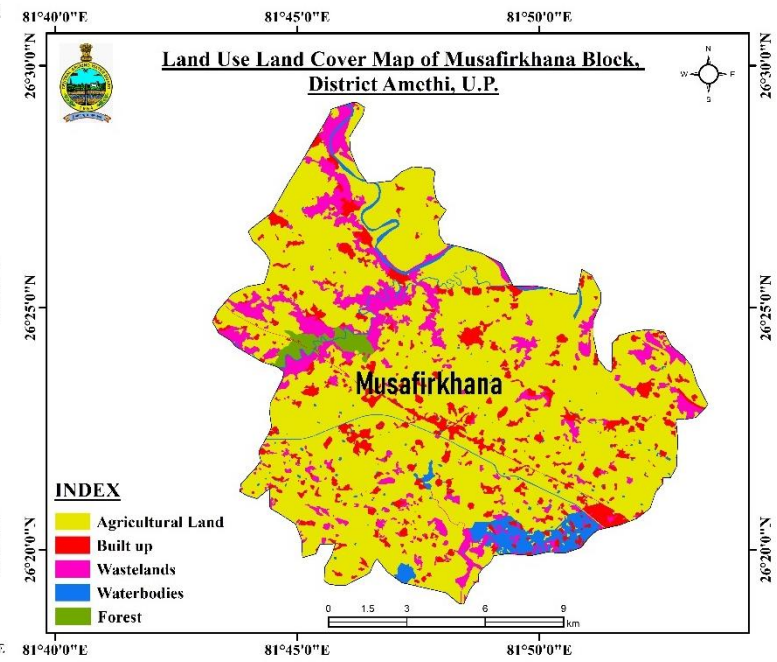
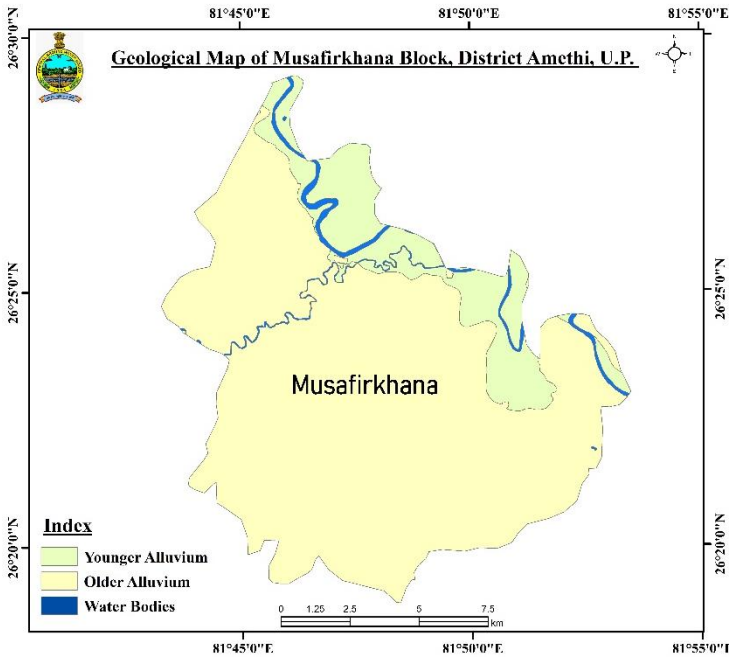
2. Aquifer Disposition

Aquifer Disposition	<ul style="list-style-type: none"> • Aquifer Disposition: Two Aquifer Groups exists up to 300 m bgl. <ul style="list-style-type: none"> o Aquifer I (mbgl): From Ground Level up to 138.01 • Transmissivity (m^2/day): 150 • Sp. Yield: 0.000078
Groundwater Monitoring Status	<ul style="list-style-type: none"> • Ground Water Monitoring Wells (CGWB): 1 • Ground Water Monitoring Wells (GWD): 7
Ground Water Quality	<ul style="list-style-type: none"> • For Aquifer Group I: Good
Aquifer Potential	<ul style="list-style-type: none"> • 1925 lpm
Groundwater Resource	<ul style="list-style-type: none"> • Annual Extractable GW Recharge: 65.71 MCM • GW Draft: 27.19 MCM • Stage of GW Development: 56.6 % • Total in-storage resource of the block: 2880.93 MCM
Existing and Future Water Demand	<ul style="list-style-type: none"> • Present demand for All Usage: 37.19 MCM • Future Demand for Domestic and Industrial Use: 4.68 MCM

3. Aquifer Management Plan

Groundwater Management issues	<ul style="list-style-type: none"> • Sufficient Ground Water Resource potential exists • Rise in water level may result in water-logging
AR & Conservation Possibilities	<ul style="list-style-type: none"> • Adoption of water use efficiency practices if GW level declines below 5 m bgl in post-monsoon season.
Groundwater Management Plan	<ul style="list-style-type: none"> • SUPPLY SIDE MANAGEMENT: Additional GW potential can be generated. • DEMAND SIDE MANAGEMENT: Sustainable Ground Water based industrial and Agricultural activities may be promoted.





8.9 AQUIFER MAPPING AND MANAGEMENT PLAN OF SANGRAMPUR BLOCK, AMETHI DISTRICT, U.P.

1. General Information

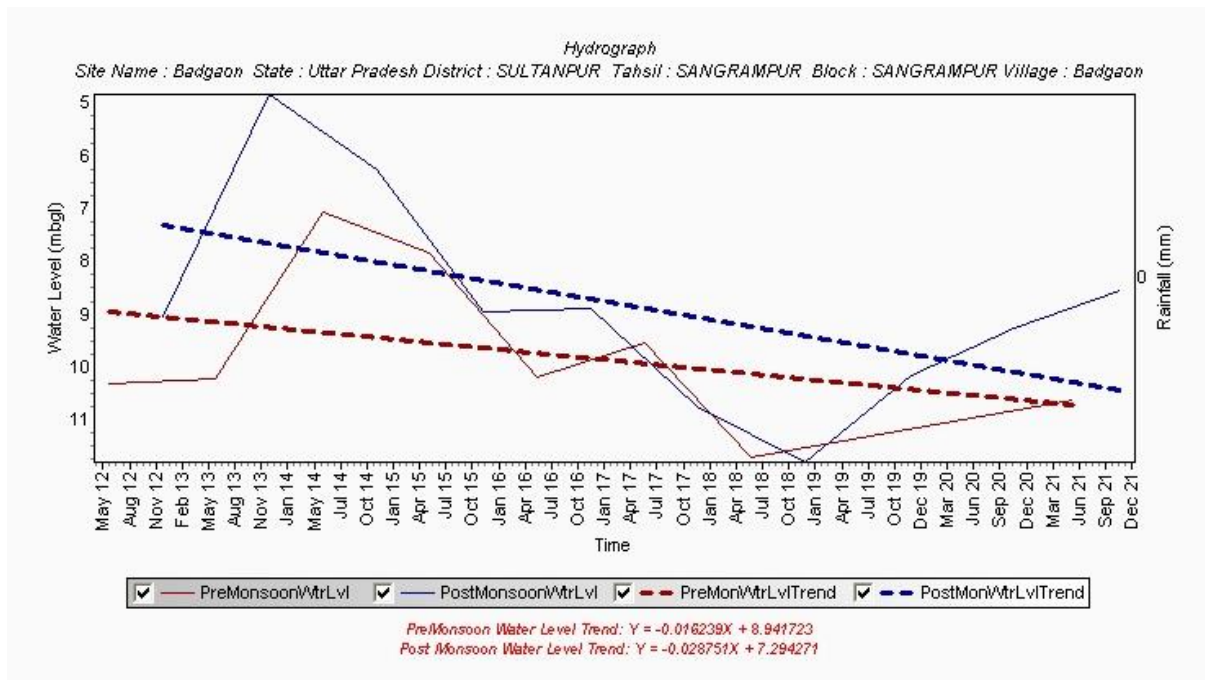
State	Uttar Pradesh
District name	Amethi
Block Name	SANGRAMPUR
Geographical area	101.76 Sq. km
Basin/Sub-basin	Ganga Basin/Gomati Sub-Basin
Principal Aquifer System	Alluvium
Major Aquifer System	Younger Alluvium Older Alluvium
Normal Annual Rainfall	693.39 mm

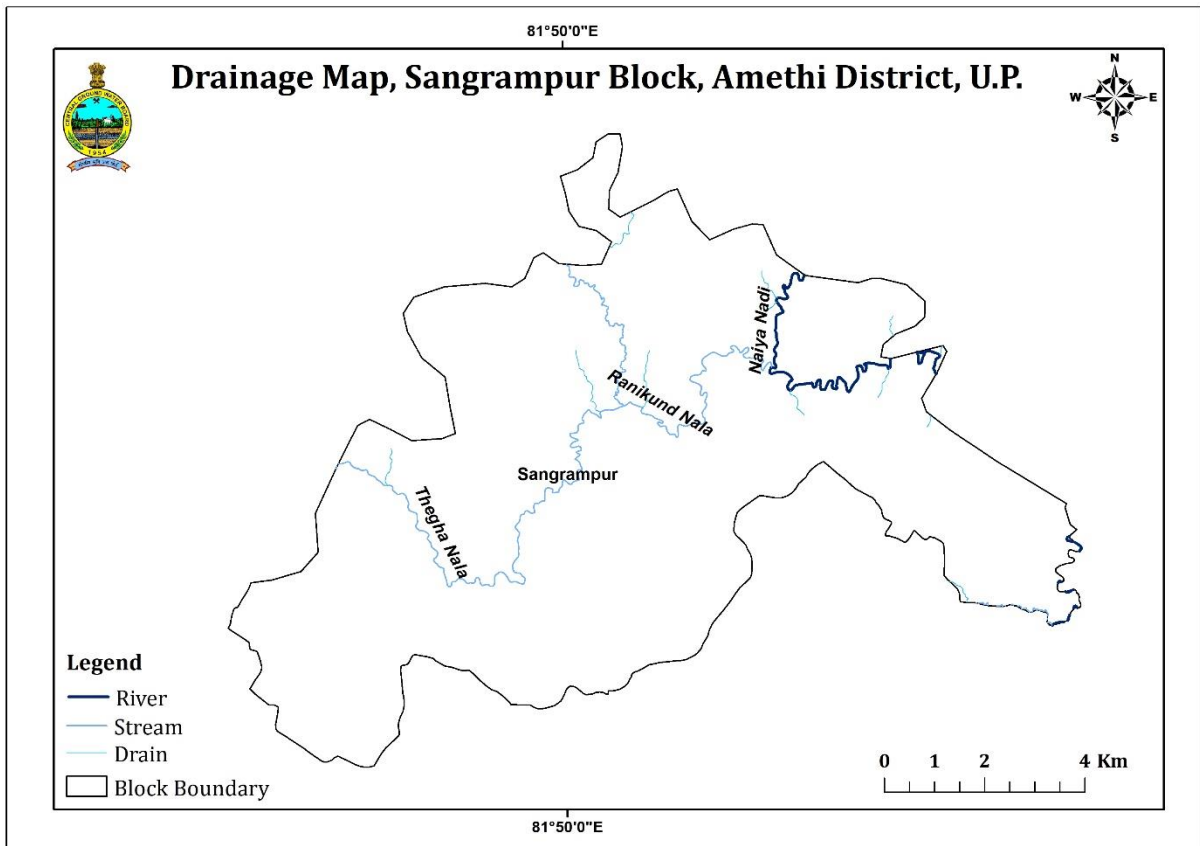
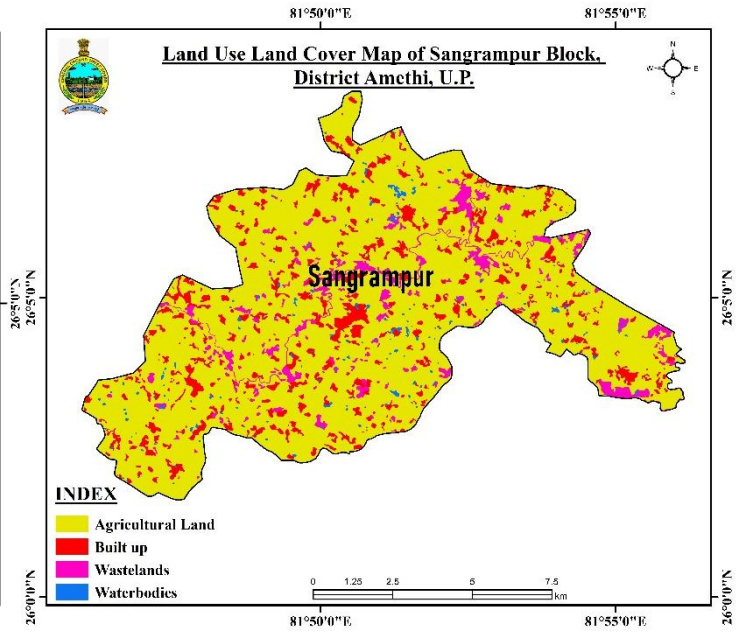
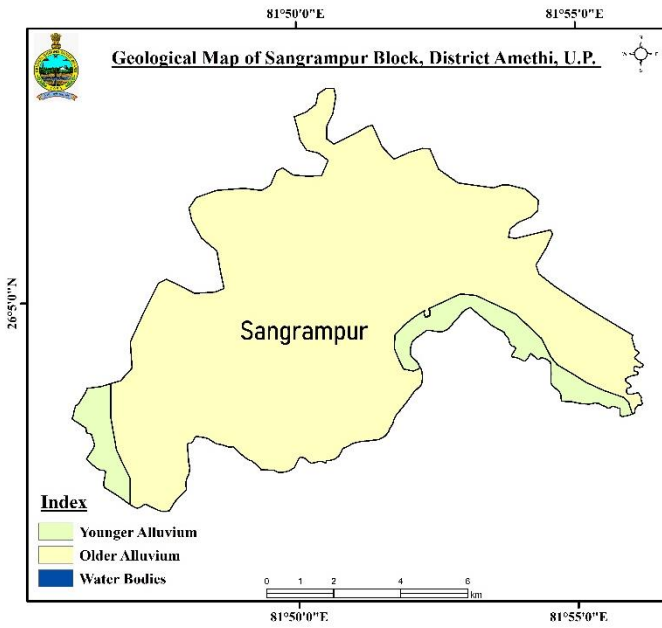
2. Aquifer Disposition

Aquifer Disposition	<ul style="list-style-type: none"> • Aquifer Disposition: Two Aquifer Groups exists up to 300 m bgl. <ul style="list-style-type: none"> o Aquifer I (mbgl): From Ground Level up to 138.01 • Transmissivity (m^2/day): 150 • Sp. Yield: 0.000078
Groundwater Monitoring Status	<ul style="list-style-type: none"> • Ground Water Monitoring Wells (CGWB): 2 • Ground Water Monitoring Wells (GWD): 4
Ground Water Quality	<ul style="list-style-type: none"> • For Aquifer Group I: Good
Aquifer Potential	<ul style="list-style-type: none"> • 1925 lpm
Groundwater Resource	<ul style="list-style-type: none"> • Annual Extractable GW Recharge: 33.85 MCM • GW Draft: 25.24 MCM • Stage of GW Development: 74.57 % • Total in-storage resource of the block: 17.80 MCM
Existing and Future Water Demand	<ul style="list-style-type: none"> • Present demand for All Usage: 25.24 MCM • Future Demand for Domestic and Industrial Use: 2.15 MCM

3. Aquifer Management Plan

<p>Groundwater Management issues</p>	<ul style="list-style-type: none"> • Stage of Ground water development >70% • Decline in water levels. • GW Quality: High EC and Nitrate reported in parts of the district
<p>AR & Conservation Possibilities</p>	<ul style="list-style-type: none"> • Adoption of water use efficiency practices
<p>Groundwater Management Plan</p>	<ul style="list-style-type: none"> • SUPPLY SIDE MANAGEMENT: Water conservation practices should be encouraged • DEMAND SIDE MANAGEMENT: Adoption of techniques to enhance water Use Efficiency viz sprinkler, drip irrigation and diversification of cropping pattern





8.10 AQUIFER MAPPING AND MANAGEMENT PLAN OF SHAHGARH BLOCK, AMETHI DISTRICT, U.P.

1. General Information

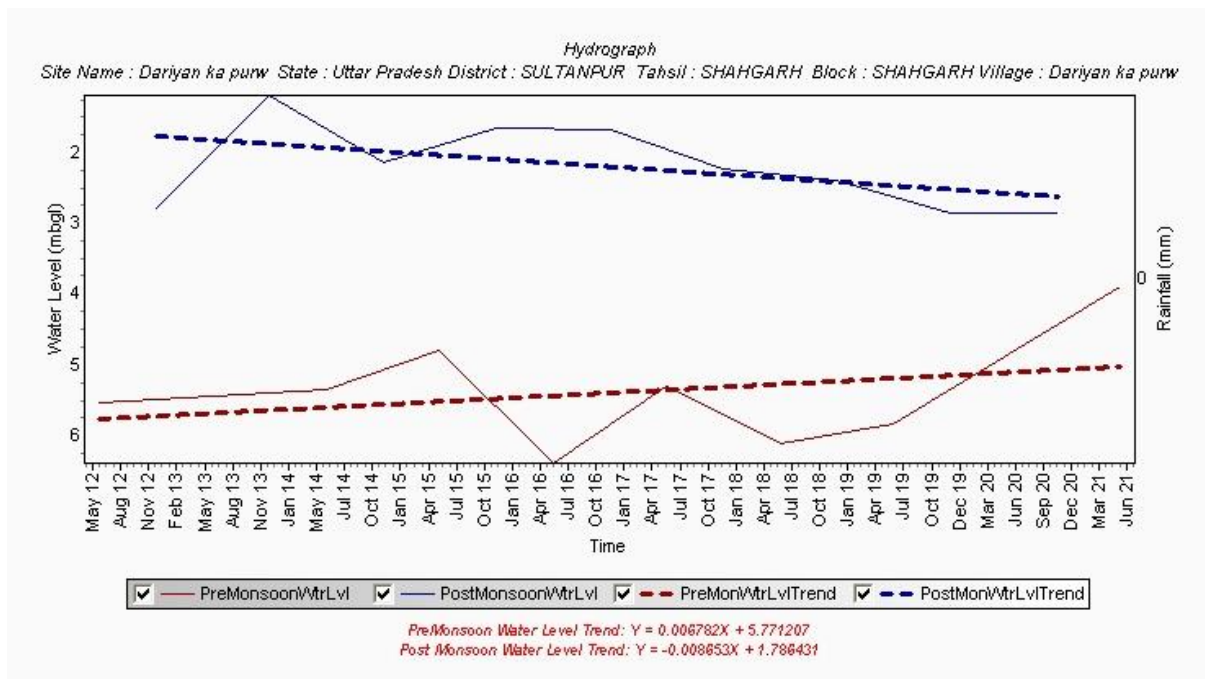
State	Uttar Pradesh
District name	Amethi
Block Name	SHAHGARH
Geographical area	127.74 Sq. km
Basin/Sub-basin	Ganga Basin/Gomati Sub-Basin
Principal Aquifer System	Alluvium
Major Aquifer System	Older Alluvium
Normal Annual Rainfall	693.39 mm

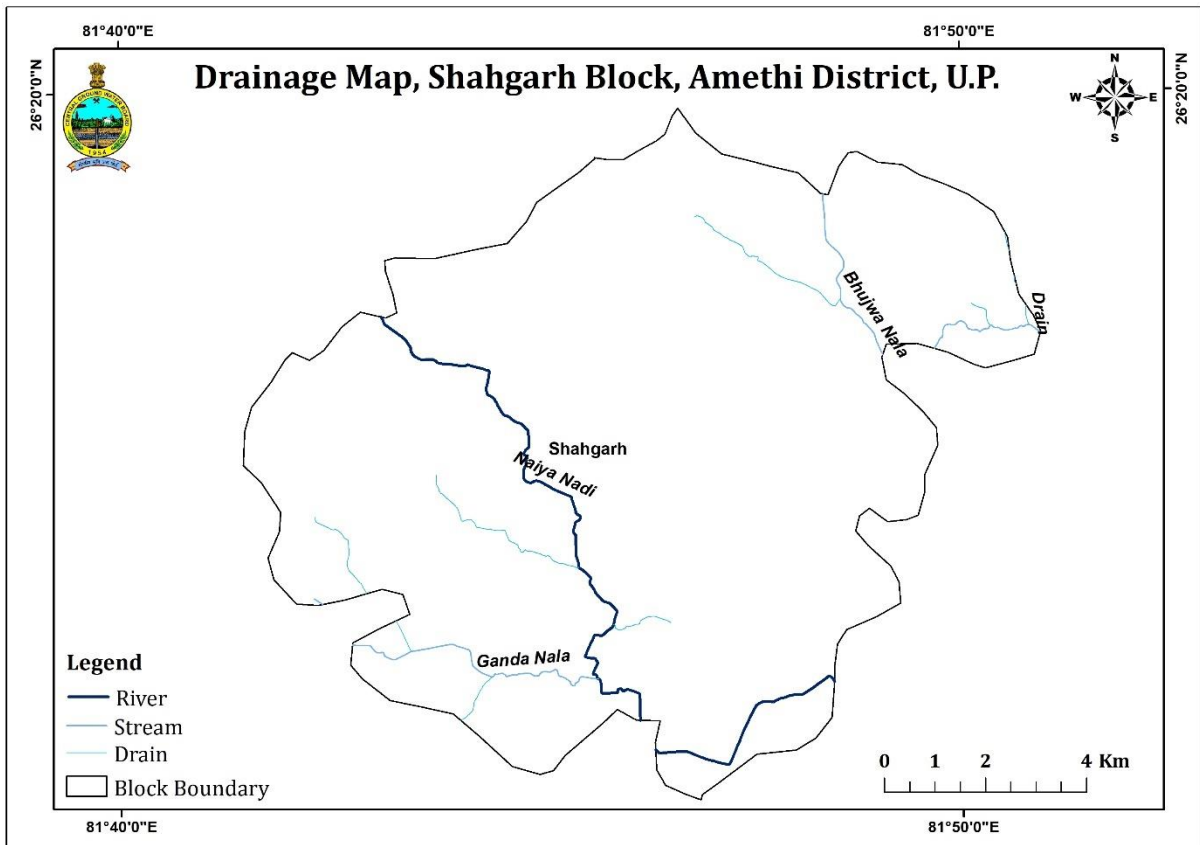
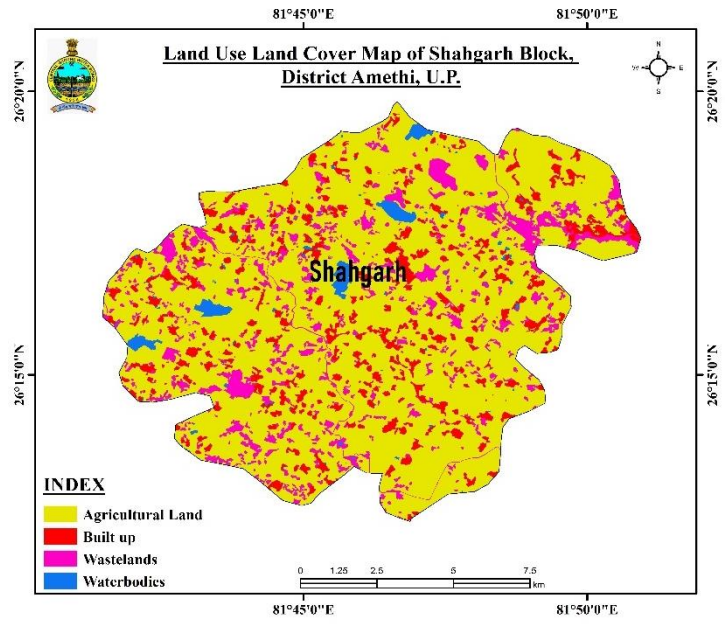
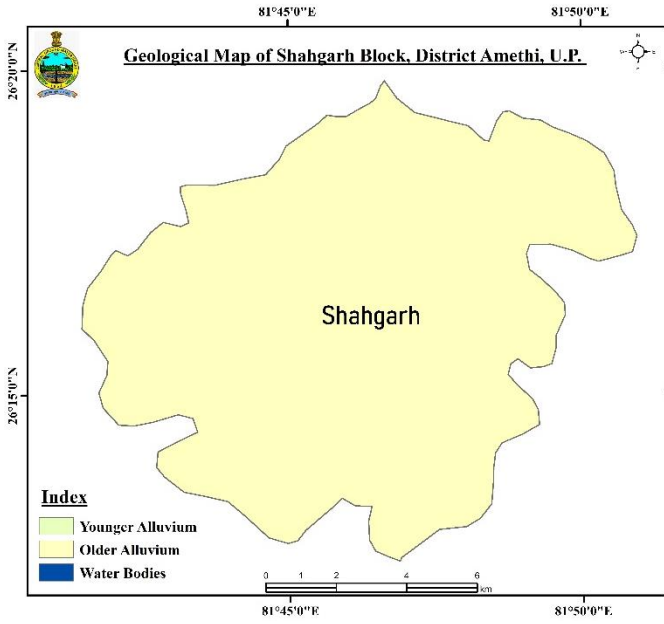
2. Aquifer Disposition

Aquifer Disposition	<ul style="list-style-type: none"> • Aquifer Disposition: Two Aquifer Groups exists up to 300 m bgl. <ul style="list-style-type: none"> ◦ Aquifer I (mbgl): From Ground Level up to 80.37 ◦ Aquifer II (mbgl): 290.46 to 300 • Transmissivity (m^2/day): 1392 • Sp. Yield: 0.00028
Groundwater Monitoring Status	<ul style="list-style-type: none"> • Ground Water Monitoring Wells (CGWB): 1 • Ground Water Monitoring Wells (GWD): 5
Ground Water Quality	<ul style="list-style-type: none"> • For Aquifer Group I: Good
Aquifer Potential	<ul style="list-style-type: none"> • 3150 lpm
Groundwater Resource	<ul style="list-style-type: none"> • Annual Extractable GW Recharge: 37.37 MCM • GW Draft: 21.10 MCM • Stage of GW Development: 56.48 % • Total in-storage resource of the block: 147.11 MCM
Existing and Future Water Demand	<ul style="list-style-type: none"> • Present demand for All Usage: 21.10 MCM • Future Demand for Domestic and Industrial Use: 2.04 MCM

3. Aquifer Management Plan

Groundwater Management issues	<ul style="list-style-type: none"> • Sufficient Ground Water Resource potential exists • GW quality is suitable for irrigation & drinking.
AR & Conservation Possibilities	<ul style="list-style-type: none"> • Adoption of water use efficiency practices if GW level declines below 5 m bgl in post-monsoon season.
Groundwater Management Plan	<ul style="list-style-type: none"> • SUPPLY SIDE MANAGEMENT: Additional GW potential can be generated. • DEMAND SIDE MANAGEMENT: Sustainable Ground Water based industrial and Agricultural activities may be promoted.





8.11 AQUIFER MAPPING AND MANAGEMENT PLAN OF SHUKUL BAZAR BLOCK, AMETHI DISTRICT, U.P.

1. General Information

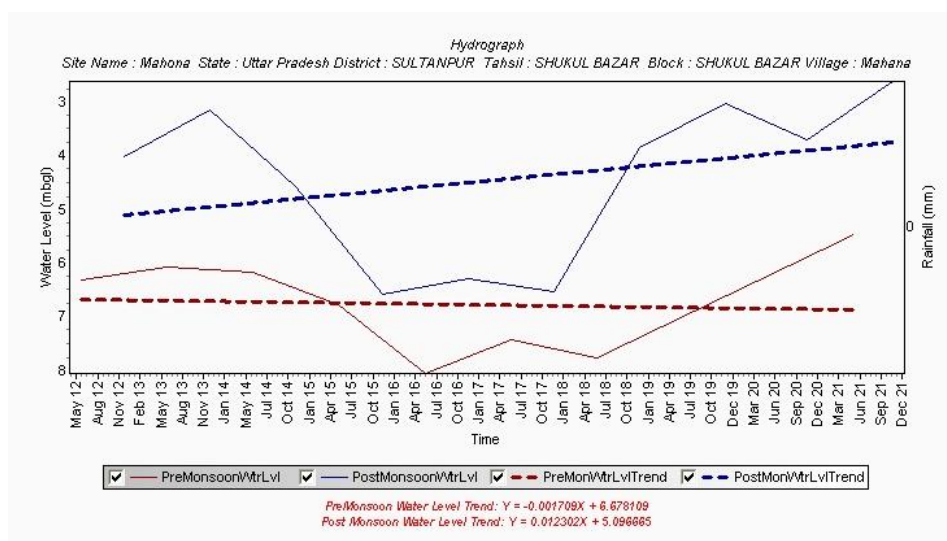
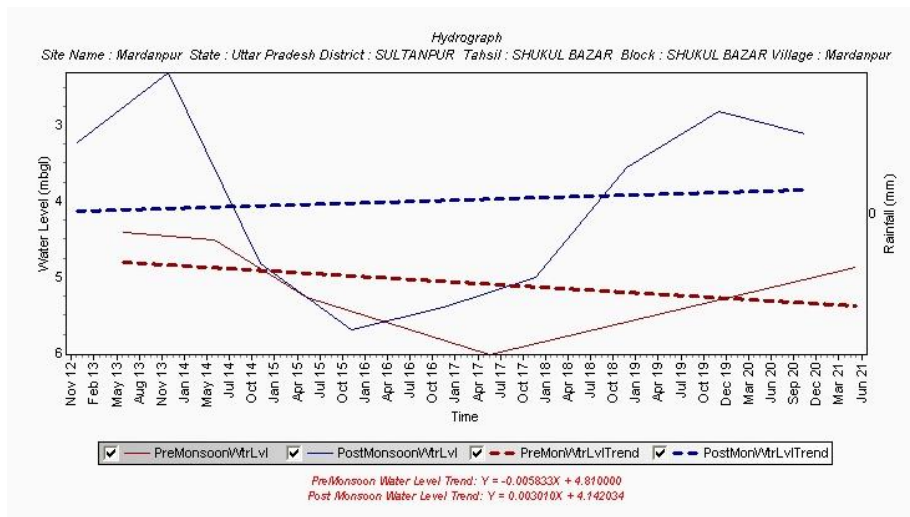
State	Uttar Pradesh
District name	Amethi
Block Name	SHUKUL BAZAR
Geographical area	191.76 Sq. km
Basin/Sub-basin	Ganga Basin/Gomati Sub-Basin
Principal Aquifer System	Alluvium
Major Aquifer System	Younger Alluvium Older Alluvium
Normal Annual Rainfall	693.39 mm

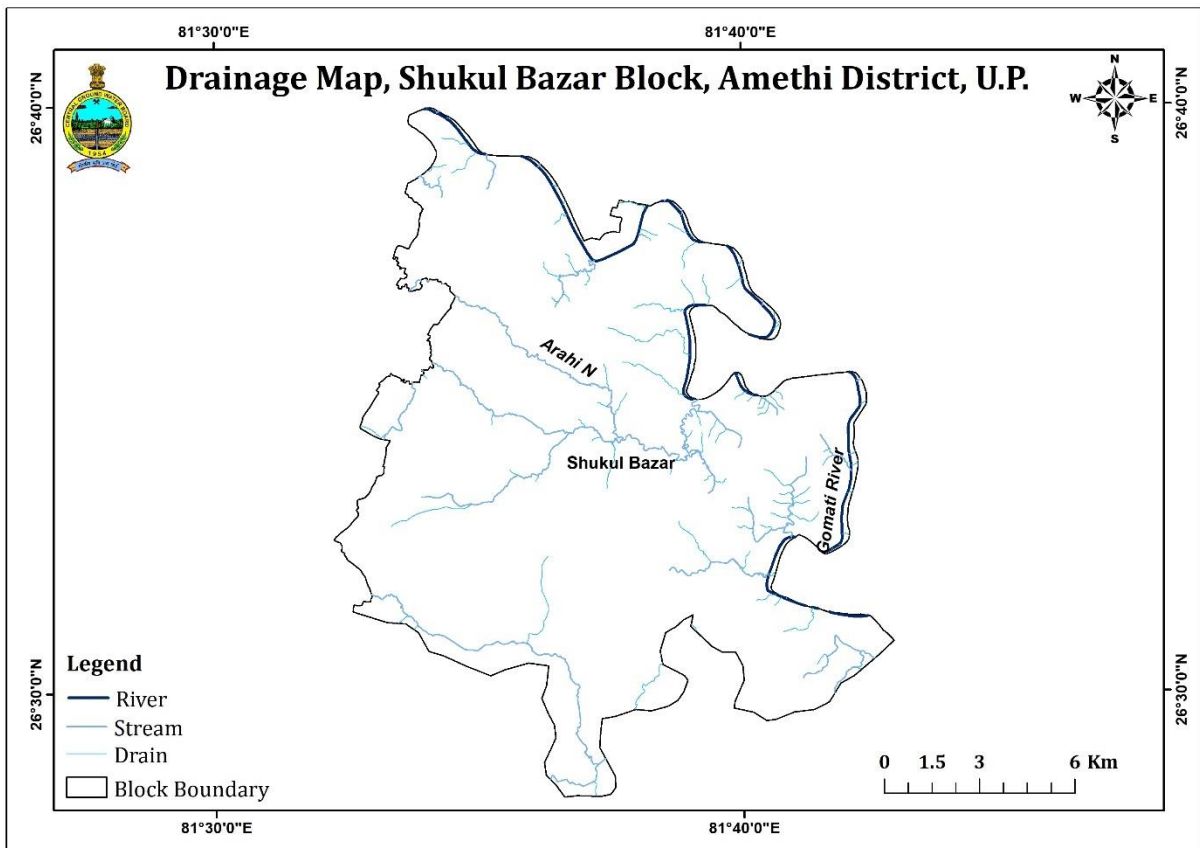
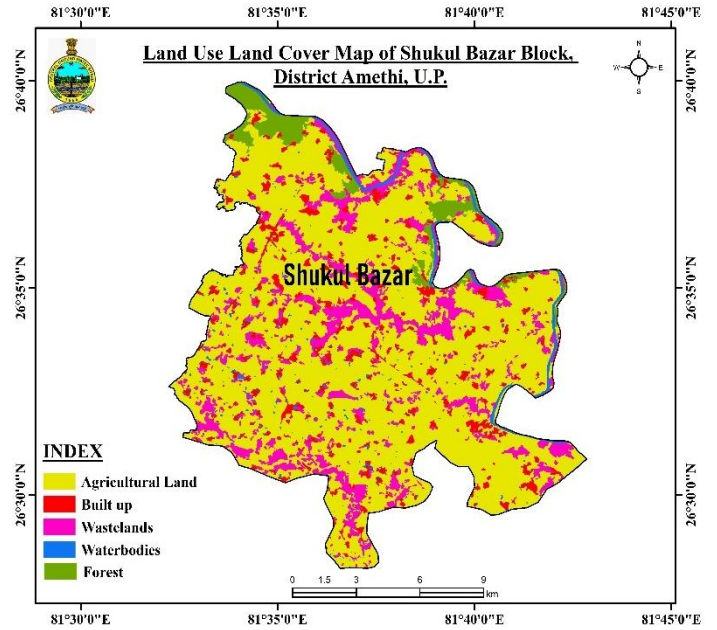
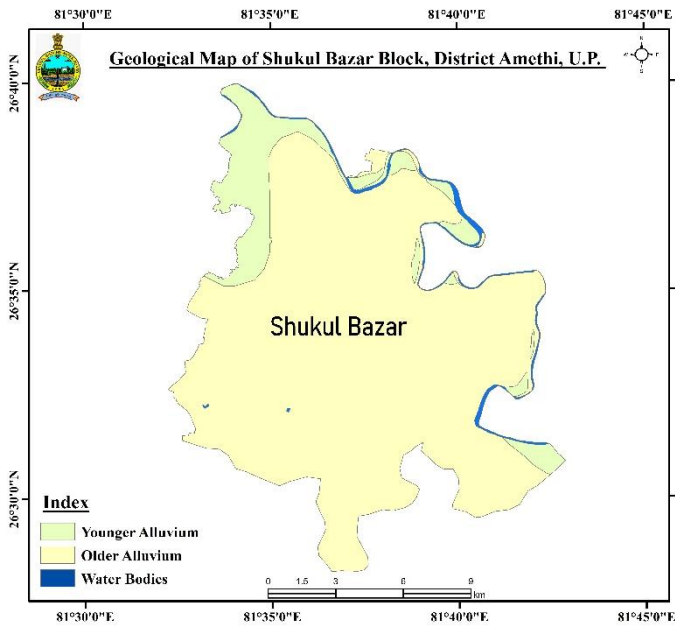
2. Aquifer Disposition

Aquifer Disposition	<ul style="list-style-type: none"> • Aquifer Disposition: Two Aquifer Groups exists up to 300 m bgl. <ul style="list-style-type: none"> o Aquifer I (mbgl): From Ground Level up to 98 o Aquifer II (mbgl): 242 to 300 • Transmissivity (m^2/day): 98.65 • Sp. Yield: 0.00023
Groundwater Monitoring Status	<ul style="list-style-type: none"> • Ground Water Monitoring Wells (CGWB): 5 • Ground Water Monitoring Wells (GWD): 3
Ground Water Quality	<ul style="list-style-type: none"> • For Aquifer Group I: Good
Aquifer Potential	<ul style="list-style-type: none"> • 745 lpm
Groundwater Resource	<ul style="list-style-type: none"> • Annual Extractable GW Recharge: 47.36 MCM • GW Draft: 31.96 MCM • Stage of GW Development: 67.49 % • Total in-storage resource of the block: 126.6 MCM
Existing and Future Water Demand	<ul style="list-style-type: none"> • Present demand for All Usage: 31.96 MCM • Future Demand for Domestic and Industrial Use: 4.67 MCM

3. Aquifer Management Plan

<p>Groundwater Management issues</p>	<ul style="list-style-type: none"> • Sufficient Ground Water Resource potential exists • GW quality is suitable for irrigation & drinking. • Decline in water levels.
<p>AR & Conservation Possibilities</p>	<ul style="list-style-type: none"> • Adoption of water use efficiency practices if GW level declines below 5 m bgl in post-monsoon season.
<p>Groundwater Management Plan</p>	<ul style="list-style-type: none"> • SUPPLY SIDE MANAGEMENT: Additional GW potential can be generated. • DEMAND SIDE MANAGEMENT: Sustainable Ground Water based industrial and Agricultural activities may be promoted.





8.12 AQUIFER MAPPING AND MANAGEMENT PLAN OF SINGHPUR BLOCK, AMETHI DISTRICT, U.P.

1. General Information

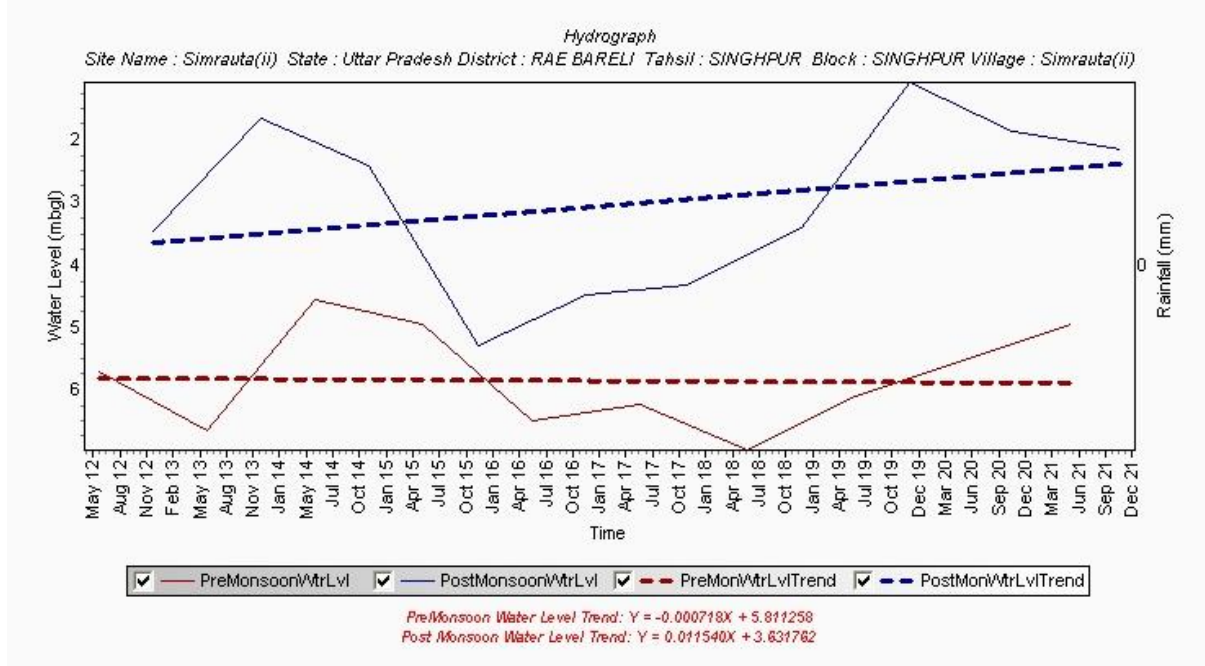
State	Uttar Pradesh
District name	Amethi
Block Name	SINGHPUR
Geographical area	212.61 Sq. km
Basin/Sub-basin	Ganga Basin/Gomati Sub-Basin
Principal Aquifer System	Alluvium
Major Aquifer System	Older Alluvium
Normal Annual Rainfall	693.39 mm

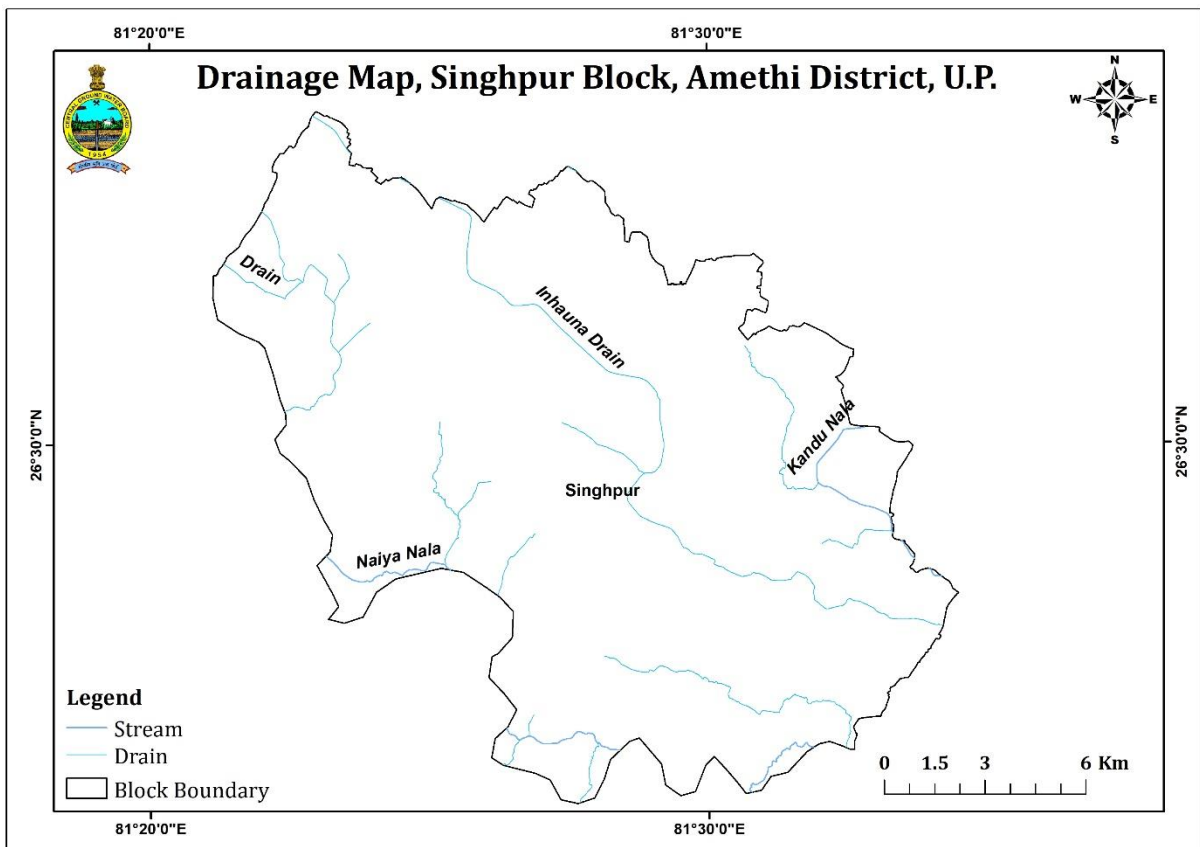
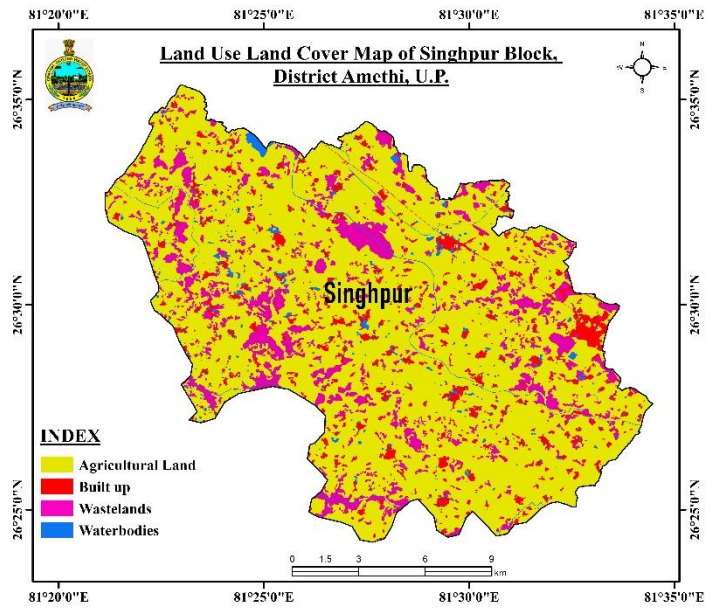
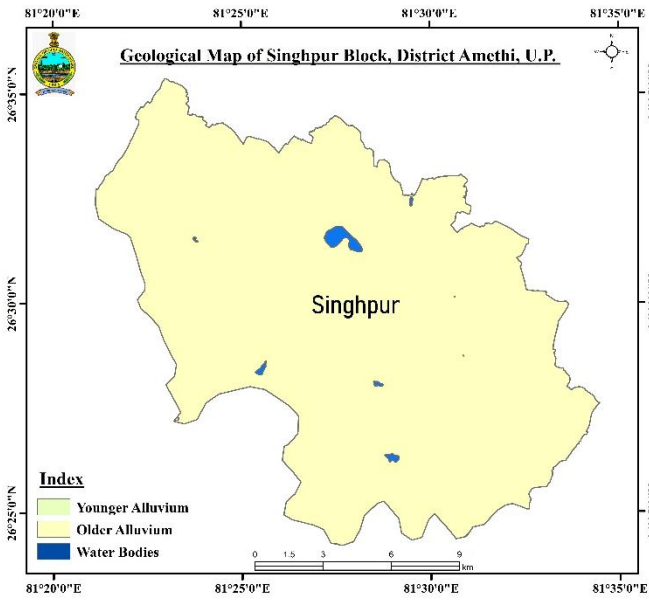
2. Aquifer Disposition

Aquifer Disposition	<ul style="list-style-type: none"> • Aquifer Disposition: Two Aquifer Groups exists up to 300 m bgl. <ul style="list-style-type: none"> o Aquifer I (mbgl): From Ground Level up to 32 o Aquifer II (mbgl): 264 to 300 • Transmissivity (m²/day): 1357 • Sp. Yield: 0.00059
Groundwater Monitoring Status	<ul style="list-style-type: none"> • Ground Water Monitoring Wells (CGWB): 6 • Ground Water Monitoring Wells (GWD): 6
Ground Water Quality	<ul style="list-style-type: none"> • For Aquifer Group I: Good
Aquifer Potential	<ul style="list-style-type: none"> • 1752 lpm
Groundwater Resource	<ul style="list-style-type: none"> • Annual Extractable GW Recharge: 68.39 MCM • GW Draft: 39.72 MCM • Stage of GW Development: 58.08 % • Total in-storage resource of the block: 1051.86 MCM
Existing and Future Water Demand	<ul style="list-style-type: none"> • Present demand for All Usage: 39.72 MCM • Future Demand for Domestic and Industrial Use: 6.13 MCM

3. Aquifer Management Plan

<p>Groundwater Management issues</p>	<ul style="list-style-type: none"> • Sufficient Ground Water Resource potential exists • GW quality: EC, Magnesium, Uranium, Iron and Nitrate concentration are high
<p>AR & Conservation Possibilities</p>	<ul style="list-style-type: none"> • Adoption of water use efficiency practices if GW level declines below 5 m bgl in post-monsoon season.
<p>Groundwater Management Plan</p>	<ul style="list-style-type: none"> • SUPPLY SIDE MANAGEMENT: Additional GW potential can be generated. • DEMAND SIDE MANAGEMENT: Sustainable Ground Water based industrial and Agricultural activities may be promoted.





8.13 AQUIFER MAPPING AND MANAGEMENT PLAN OF TILOI BLOCK, AMETHI DISTRICT, U.P.

1. General Information

State	Uttar Pradesh
District name	Amethi
Block Name	TILOI
Geographical area	213.73 Sq. km
Basin/Sub-basin	Ganga Basin/Gomati Sub-Basin
Principal Aquifer System	Alluvium
Major Aquifer System	Older Alluvium
Normal Annual Rainfall	693.39 mm

2. Aquifer Disposition

Aquifer Disposition	<ul style="list-style-type: none"> • Aquifer Disposition: Two Aquifer Groups exists up to 300 m bgl. <ul style="list-style-type: none"> o Aquifer I (mbgl): From Ground Level up to 50.5 o Aquifer II (mbgl): 247.5 to 300 • Transmissivity (m^2/day): 1357 • Sp. Yield: 0.00059
Groundwater Monitoring Status	<ul style="list-style-type: none"> • Ground Water Monitoring Wells (CGWB): 4 • Ground Water Monitoring Wells (GWD): 5
Ground Water Quality	<ul style="list-style-type: none"> • For Aquifer Group I: Good
Aquifer Potential	<ul style="list-style-type: none"> • 1752 lpm
Groundwater Resource	<ul style="list-style-type: none"> • Annual Extractable GW Recharge: 67.97 MCM • GW Draft: 42.49 MCM • Stage of GW Development: 62.52 % • Total in-storage resource of the block: 1155.33 MCM
Existing and Future Water Demand	<ul style="list-style-type: none"> • Present demand for All Usage: 42.49 MCM • Future Demand for Domestic and Industrial Use: 4.61 MCM

3. Aquifer Management Plan

<p>Groundwater Management issues</p>	<ul style="list-style-type: none"> • Sufficient Ground Water Resource potential exists • GW quality: EC, Magnesium, Iron and Fluoride concentration are high • Rise in water level may result in water-logging
<p>AR & Conservation Possibilities</p>	<ul style="list-style-type: none"> • Adoption of water use efficiency practices if GW level declines below 5 m bgl in post-monsoon season.
<p>Groundwater Management Plan</p>	<ul style="list-style-type: none"> • SUPPLY SIDE MANAGEMENT: Additional GW potential can be generated. • DEMAND SIDE MANAGEMENT: Sustainable Ground Water based industrial and Agricultural activities may be promoted.

