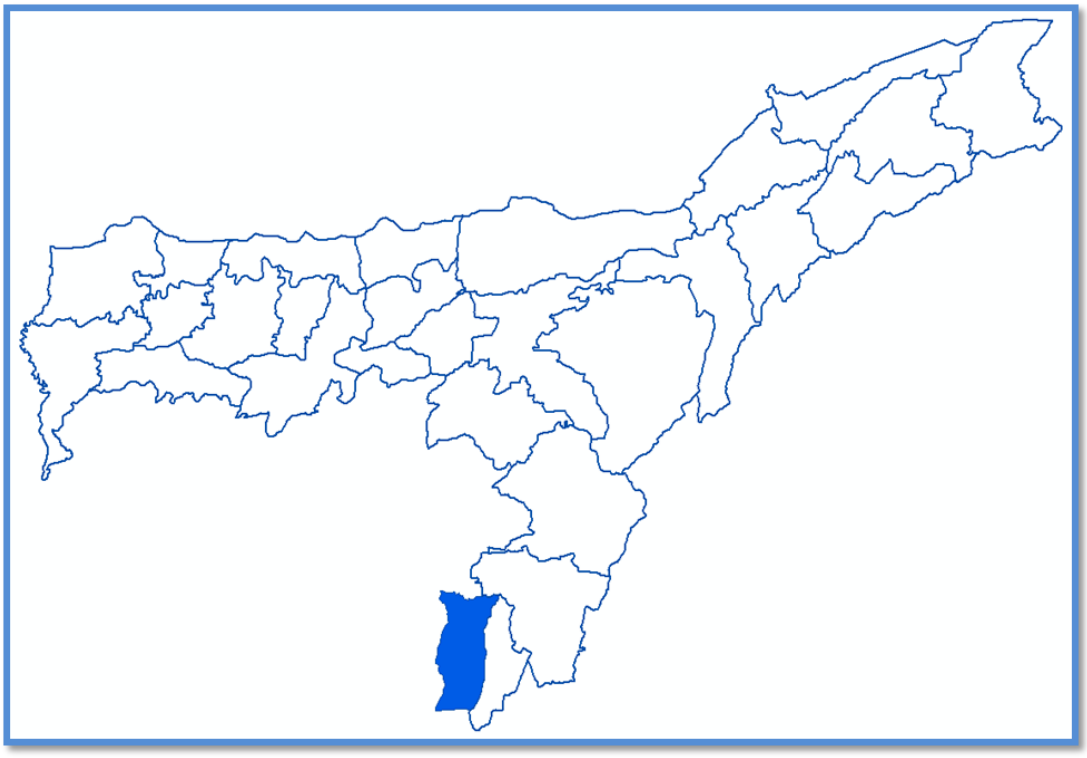
Technical Report Series: D

No:

Ground Water Information Booklet

Karimganj District, Assam



Central Ground Water Board

North Eastern Region

Ministry of Water Resources

Guwahati

GROUND WATER INFORMATION BOOKLET
KARIMGANJ DISTRICT, ASSAM

DISTRICT AT A GLANCE

Sl. No.	Items	Statistics
1.	GENERAL INFORMATION i) Geographical Area (in sq.km) ii) Administrative Divisions (as on 31.3.2011) iii) Population (as per 2011 census) iv) Normal Annual Rainfall (mm) Actual Annual Rainfall (mm) 2010-11	 1809.00 i) Blocks :07 ii) G.P's : 96 iii) Villages : 1130 12,17002 Urban: 110257 Density: 557/sq km 4067 mm 4093 mm
2.	GEOMORPHOLOGY i) Major Physiographic units : ii) Major drainage	 Hills: Chatachura, Admil, Dhulia and Bhadrapur. Valleys: Karimganj and Anipur Barak, Kushira, Longai and Singla
3.	LAND USE (ha) as on 2010-2011 i) Forest area ii) Net area sown iii) Total cropped area	 159454-32.86% 68545-37.89% 100689-55.66%
4.	MAJOR SOIL TYPES	Transported soils and residual soils
5.	AREA UNDER PRINCIPAL CROPS (ha) as on 2010-11	 Paddy : 74126 Fruits: 2004 Beetlenut: 2276 Coconut: 670 Sugarcane: 498 Total Pulses: 879 Total Vegetables: 880
6.	IRRIGATION BY DIFFERENT SOURCES (sq.km.) i) Dugwells ii) Tubewells/borewells iii) Tanks/ponds iv) Canals v) Lift Irrigation (Minor Irrigation) vi) Other Sources (Medium irrigation) vii) Gross irrigated area	 Nil Nil Nil Nil 2892 Nil 2892
7.	NUMBERS OF GROUND WATER MONITORING STATIONS OF CGWB	11 (09 Dug Wells & 02 Piezometers)

<table>
<tr><td></td><td>(as on March 2013)</td><td></td></tr>
<tr><td>8.</td><td>PREDOMINANT GEOLOGICAL FORMATIONS</td><td>Recent formations of Quarternary age, Dupitila, Tipam and Surma Formation of upper Tertiary age.</td></tr>
<tr><td>9.</td><td>HYDROGEOLOGY
i) Major water bearing formations
ii) Pre-monsoon water level
iii) Post-monsoon water level
iv) iv)Long term water level trend(1988-07)</td><td>Tipam and Dupitila Formations
0.35-2.80 m bgl
0.19-3.88 m bgl
Significant decline is not observed.</td></tr>
<tr><td>10.</td><td>GROUND WATER EXPLORATION BY CGWB (as on 28.02.2013)
i) No. of wells drilled.
ii) Depth range in meters.
iii) Discharge in lps
iv) Transmissibility (m^2/day)
v) Permeability (m^2/day)</td><td>18 (8 EW, 5,OW, 2 PZ & 3 SH)
<table><tr><td>EW</td><td>OW</td><td>PZ</td><td>SH</td></tr><tr><td>50-297.25
0.86-30.24
15×10^{-4}-
2.67×10^{-4}
26.06×347.57</td><td>27.9-45
-
-
-</td><td>50
-
-
-</td><td>292.50-299.50
-
-
-</td></tr></table></td></tr>
<tr><td>11.</td><td>GROUND WATER QUALITY
i) Presence of chemical constituents beyond permissible limit
• EC in umhos/cm
• Fluoride
• Iron
ii) Type of water</td><td><table><tr><td>Min</td><td>Max</td></tr><tr><td>121
BDL
0.18</td><td>841
1.08
1.75</td></tr></table>
Potable</td></tr>
<tr><td>12.</td><td>DYANMIC GROUND WATER RESOURCES (2009) in MCM
i) Annual replenishable G.W. resources
ii) Net annual G.W. draft
iii) Projected demand for domestic and industrial use upto 2025
iv) Stage of G.W. development</td><td>472.87
28.36
31.43
9%</td></tr>
<tr><td>13.</td><td>AWARENESS AND TRAINING ACTIVITY
i) Mass awareness programmes organized (Date & Place)</td><td>Nil</td></tr>
<tr><td>14.</td><td>EFFORTS OF ARTIFICIAL RECHARGE AND RAINWATER HARVESTING
i) Project completed by C.G.W.B. Nos. and amount spent)
ii) Project under technical guidance of CGWB (Nos.)</td><td>Nil</td></tr>
<tr><td>15.</td><td>GROUND WATER CONTROL AND REGULATION</td><td></td></tr>
</table>

	i) No. of OE blocks ii) No. of critical blocks. iii) No. of blocks notified.	Nil
16.	MAJOR GROUND WATER PROBLEMS AND ISSUES	Ground water contain sporadic high Iron Concentration.

1.0 INTRODUCTION

The Karimganj district started functioning from 1st July 1983. It covers an area of 1809 sq. km. and is located between North Latitudes 24 º 15'00" & 25 º 55'00" and east Longitudes 92º15'00" & 92º35'00". The study area falls in parts of Survey of India toposheet numbers 83D/1,2,3,5,6,7,9,10 &11. It is bounded by Bangladesh and Cachar district of Assam on north, Bangladesh and Tripura state on west, Tripura and Mizoram states on the South and eastern part by Hailakandi district. Karimganj is the district headquarters. Administratively the district is divided in to seven Community Development Blocks which contains 96 gram panchayats and 1130 villages. The district headquarter Karimganj is connected with the other parts of the district and state by all weather metal roads. The National Highway No.44 and railway line connecting Lamding and Agartala passes through Karimganj district.

As per 2011 cencus, the total population of the district is 1217002 persions with a density of 557 persons/sq km. and with sex ratio of 944 females/1000 males. The percentage decadal growth rate is 21.87 (1991-2001). The literates constitutes 67.21%. rural and urban population constitutes 92.67% AND 7.33% respectively. The Scheduled Caste and Scheduled Tribe constitute 12.99% and 0.3% respectively. The administrative divisions are shown in Fig-1.

Drainage:

The anticlinal hill ranges forms the watershed from which various drainage channels emerged. The common drainage patterns are sub-parallel to parallel and dendritic. In general, drainage pattern of the area is in conformity with the topography, which area structurally controlled. The major river in the district is Barak and its tributaries are Kushiara, Longai, Singla. The drainage of the district is shown in Fig-1.

Irrigation:

The forests cover 594.54 sq. km. (32.86%) to the total geographical area of the district. The net area sown is 76035 ha. Which is 37.89% and the total cropped area is 1045552 ha. And the cropping intensity is 147% to the net area sown.

There are neither major nor medium irrigation projects in district. Agriculture is mainly dependent on rainfall. A few minor irrigation schemes, such as lift irrigation on perennial rivers and cherras, deep tube and shallow tubewells flow irrigation schemes (diversion of small streams streamlets by constructing seasonal or permanent bunds across the stream and upstream water goes to paddy lands through channels by gravity).

Land utilization:

The land utilization pattern in the district during 2010-11 indicates, the forest cover is 55995 hectares and the net area sown is 76035 ha and the total cropped area is 1,00,689 ha. The details of the land utilization is presented in **table-1**.

Table-1. Land utilization particulars in Karimganj district (2010-11)

Sl.No.	Item	Area (in ha)	% to Geographical area
1	Forest	55995	32.86
2	Barren and uncultivable land	7099	13.30
3	Land put to non-agricultural use	17730	9.80
4	Permanent pastures and other grazing lands	-	-
5	Misc. Tree crops & grooves not included in net area sown	8640	4.78
6	Cultivable waste	2100	2.11
7	Other fallow lands	62	2.90
8	Current Fallows	10	2.80
9	Net area sown	76035	37.89
10	Total cropped area	104555	55.66
11	Area sown more than once	28528	19.48
12	Total geographical area	180900	

2.0 RAINFALL & CLIMATE

Rainfall:

There are five number of rain gauge stations in the district located at Karimganj, Dullabcherra TE, Isabeel TE, Longai TE and Hatikira TE. The average annual rainfall for the last 50 years of Karimganj is 4067 mm. the annual rainfall data of rain gauge stations located in tea estates indicates the rainfall varies from 1789 mm at Dullabcherra TE to 3771 mm at Longai TE. The long term rainfall data for the Karimganj station indicates the coefficient variation varies from -33.4% (1981) to 92% (1989).

Climate:

The climate in the district is characterized by moderate temperature and is highly humid in nature. The summer season is from March to May. The rainy season is from June to September and the winter starts from November and lasts till the end of February.

Temperature:

March to May constitutes the summer season. In general the temperature in the district varies from 20ºC to 32ºC. the mean temperature begins to rise from March and reaches to a maximum of about 35ºC in April/May and thereafter with the onset of pre-monsoon showers temperature decreases and the mean minimum temperature reaches to a maximum of about 10ºC in the month of January.

Humidity:

The humidity is generally high throughout the year. The relative humidity is of the order of 89 to 97% in the mornings and 40 to 81% in the afternoons.

Potential Evapotranspiration:
Potential evapotranspiration is lowest in December being 99 mm and increases till the end of summer. The annual potential evapotranspiration is 1757 mm.

3.0 GEOMORPHOLOGY AND SOILS

Geomorphology:
Physiographically, the area can be divided into two parts, Anticlinal hill ranges and Synclinal flat-bottomed valleys. The hill ranges are tightly folded. The major hill ranges are Chatachura Range, Admil (Patharia) range, Dudalia (Pratapgarh) range and Bhadrepur range. The trend of the hill ranges is almost NE-SW and occasionally varying N-S. The height of the hill ranges decreases from south to north and the highest elevation being 636 m amsl at Chhatachura. The lowest hill range is Bhadrapur with average height of 150 m amsl.

The board synclinal valleys occurring in the district are Karimganj vand Anipur valleys. The average elevation elevation of the valleys is about 15 m. All the valleys become narrow and constricted towards south and widens towards north. The master slope of the valleys is towards north.

Soils:
Both residual and transported soils are found in the district. Older alluvial soil is also developed almost entire district and is light grey to dark grey in colour. This is particularly unaltered alluvium representing a broad spectrum of sand, silt and humus rich bog clay depending on landform component. The soils are mainly clay to clay-loam except in reverine tracts. Younger soils or river valley soils are found along all major river courses.

4.0 GROUND WATER SCENARIO

4.1 Hydrogeology:

Water Bearing Formations:

There are three hydrogeological units/water bearing formations exists in the district. They are Alluvium, Dupitila and Tipam formation and are shown in fig.2. the details of the water bearing formations are as follows:

1. Alluvial formation: It occurs along the banks of main rivers and its thickness varies from 10 to 15 m. ground water occurs under unconfined condition. Ground water Development in the area has not been very significant because of high content of clay and sandy clay. Ground water is developed through dug wells and hand pumps.

2. Dupitila formation: Dupitila formation is nearly horizontal in deposition. The formation mainly consists of clay and silt with some intercalations of gritty and ferruginuous

sandstones. It is exposed in the southern and western aprt of the district along valley flanks. In general, it has low permeability and low storage capacity due to high clay content. It has been developed through dug wells, shallow tubewells and deep tube wells.

3. Tipam formation: Sandstone of Tipam formation constitutes the principal aquiofer in the district. The permeability of this sandstone is much higher than that of Dupitila sandstone or Surma sandstone. The recharge area of the sandstone is in the anticlinal hills. This formation consists of sub- rounded, fine to medium grained, friable sandstone with intercalated clay. The exposures of Tipam formation is found mainly along the foot-hill areas. Ground water occurs under semi-confined to confined conditions. This sandstoneis developed mainly by deep tube wells.

Occurrence of groundwater:

Ground water occurs under unconfined condition in alluvial formation. In Dupitila and Tipam formations ground water occurs under unconfined, semi confined to confined conditions. In major part of the area, ground water occurs under unconfined condition in shallow aquifers and under semi confined to confined conditions in deeper aquifers.

Nature and depth of Aquifer system:

Aquifer system of the district is divided into two types, viz, shallow aquifer within 50 m bgl and deep aquifer between 50-300 m bgl.

Karimganj valley:

Six major aquifers are present within the depth of about 260 m. the cumulative thickness of aquifer zones to a depth of 200 m. The disposition of aquifers is almost horizontal between Hashimganj and Loharpara and then they dip towards north. The aquifers are persistant throughout the valley with minor facies variations. The sediments in the top zones 25-50 m are predominantly clayey. The surfacial top clay has thickening trend from south to north. The granular zones which comprise fine to medium grained sands have an effective grain size of 0.1 to 0.16 mmin the depth range up to 100 m while for deeper aquifer zones from 100 to 200 m it varies from 0.06 to 0.1 mm, indicating finer nature of the sediments at depth. By and large, the sediments are predominantly clayey beyond a depth of 200 m down to the explored depth of 300 m.

Anipur valley:

Six aquifers are present within a depth of 220 m. these aquifer zones are uniformly extensive in nature with minor lithofacies variations. However, towards north beyond Ratakandi the top clayey formations become thick and increases to about 70 m with thin sand lenses. The aquifer material comprising fine to medium grained sand have effective grain size of 0.14 to 0.17 mm within a depth range of about 100 m while the same in the depth range of 100- 220 m the effective size of aquifer material ranges from 0.09 to 0.12 mm indicating that with depth the aquifer materials tend to become finer.

Depth to water recharge:

The Central Ground Water is monitoring water levels four times a year i.e., during January, March, August and November. During pre-monsoon period of 2011 (March), depth to water level in preatic aquifer varies from 0.35-2.80 m bgl and is shown in Fig.3. during post monsoon 2011 (November), depth to water level in phreatic aquifer varies from 0.19-3.88 m bgl and is shown in fig.4.

Seasonal fluctuation:

The seasonal fluctuation of water level varies between 0.48 to 2.96 m during the year 2011.

Long term Trend of Water level:

The CGWB is monitoring water levels data over the years through monitoring of network stations. There are 10 number of netwotk stations in the district. The data generated was utilized for long term trend of water levels.

During pre-monsoon season, the trend of water level for between 2001-2011 shows rise of water level in seven stations and ranges from 0.001 to 0.379 m/yr, and fall in three station at the rate of 0.002 to 0.133 m/yr. during post monsoon season, the trend of water level between 2001-2011 shows a rise in five stations with 0.019 to 0.326 m/yr and fall in five stations with 0.003-0.068 m/yr.

Aquifer parameters of confined/deeper aquifers:

Under Ground Water exploratory programme, the Board has constructrd eight exploratory wells five observation wells, two Peziometers and three slim holes, with depth ranges from 12-178 m. the discharge of these wells varies from 3.4 to 30.2 lps in deep tube wells, where as it is 0.9 to 2.7 lps in shallow tube wells. The transmissivity values range from 102.5 to 347.6 m^2/day in deep tube wells, while it is 26.06 to 120.48 m^2/day in shallow tube wells. The Storativity value in the deep tube well is 1.5×10^{-4} andin shallow tube wells it ranges from 2.67×10^{-4} to 8.4×10^{-4}. The hydrogeological details of exploration are given in table-2.

Sl no.	Well location	Type of well	Depth drilled/Assembly lowered (m)	Thickness of aquifer tapped (m)	Discharge (lps)	Yield (m3/hr)	Draw down (m)	SWM (mbgl)	Specific capacity	Tramsmisivity (m2/day)	storativity
1	Hasimganj 9219’48” 2437’54”	EW	294.1/144	39	30.2	109	15.3	2.5	119	208.0	-
2	Loharpara 9222’18” 2445’36”	EW	281.2/178	53	25.3	91	10.0	1,9	218	347.6	-
3	Fakirabazar	EW	297.25/15	57	16.2	58	15.3	1.2	64	102.5	-

	9217’42” 2451’48”		1								
4	Nairgram (Chorgula) 9225’36” 2450’12”	EW	293.60/109	30	18.0	65	13.7	2.0	79	166.9	1.5×10^{-4}
5	Anipur 9226’42” 2432’48”	EW	287.60/109	35	21.8	78	11.5	0.1	114	246.3	-
6	Harinadik	EW	200/170	30	3.4	12		Auto flow	-	-	-
7	Harinadik	OW	159/138	12		-	-	-	-	-	-
8	Mahakal 9229’54” 2450’42”	SH	292.5	-		-	-	-	-	-	-
9	Chandpur 9222’48” 2450’42”	SH	299.5		-	-	-	-	-	-	-
10	Anipur	EW	50/41	6	2.7	10	3.4	-	47	120.5	-
11	-do-	OW	45/41	6		-	1.7	-	-	64.9	2.67×10^{-4}
12	-do-	OW	45/40.5	6		-	1.5	-	-	70.3	2.74×10^{-4}
13	Mahakal	PZ	50/12	2		-	-	-	-	-	-
14	-do-	SH	50/-	Abandoned due to absence of granular zone							
15	Badarpur	PZ	50/50	3		-	-	-	-	-	-
16	Rakeshnagar	EW	50/24	9	0.9	3.1	3.4	-	15	26.1	-
17	-do-	OW	27.9/24	3		-	0.6	-	-	54.2	4.51×10^{-4}
18	-do-	OW	28.9/24	3		-	0.4	-	-	67.8	84×10^{-4}

4.2 Ground water resources

Groundwater resources for the year 2009 were estimated by the GEC’97 methodology. During resource estimation, the district is taken as unit of computation. The main source of ground water recharge in the district is precipitation (rain). Other sources of ground water recharge in the area are return flow from irrigation and seepage from ponds/tanks.

Ground water in the area is mostly used for domestic and irrigation purposes. Ground water draft for industrial purpose is 26.36mcm. Net ground water available in the district is 425.58mcm mcm and ground water draft for all uses is 28.36mcm mcm. The stage of ground water development of the district is only 7 % and categorized as ‘Safe’.

4.3 Ground water quality

Suitability of ground water for drinking and domestic Use:

Ground water quality in the district is potable and range of all chemical constituents are within the permissible limit aet by BID (1991), except iron. The ph values of the ground water range from 6.96-8.38. The EC values ranges from 121 to 841. The fluoride content ranges from 0.10 to 1.70 ppm.

Suitability of ground water for irrigation Use:

In general, ground water in the area is suitable for irrigation purpose.

Status of ground water development

Ground water is developed in the district mainly by deep tube wells for drinking, domestic and irrigation purposes. Other groundwater abstraction structures are shallow tube wells (hand pumps) and dug wells were constructed within a depth range of 5-35 m bgl.

Drinking water scenario:

In urban areas water supply is mainly from surface water sources through piped water supply schemes. In rural areas, piped water supply schemes are mainly dependent on 109 surface water schemes, in addition to 36 deep tubewells. In addition to piped water supply schemes there are 3676 Tara pumps, 674 Singur hand pumps and 1707 ring wells in the district to meet the domestic water demand in rural areas. Water from deep tubewells is treated in water treatment plants before supply.

Irrigation scenario:

Irrigation is mostlt done by utilizing surface water in the district. During the year 2007-08, the surface water irrigates 98% of the total irrigation. Ground water irrigates only 2% of the total Irrigation which shows that the ground water utilization is negligible for irrigation in the district. Ground water developed for irrigation purpose is through deep and shallow tube wells fitted with pump sets. As on 31.03.2008, there are 19 lift irrigation schemes, 1 flow irrigation scheme, 17 CTW and 385 STW in the district, most of the monor irrigation sources are not in use.

GROUND WATER MANAGEMENT STRATEGY

Ground water development

Based on hydrogeological situation and yield drawdown relation, the district has been divided into three sectors A, B, C, sector A coincides with the central parts of the valleys, where high yielding tubewells for moderate drawdowns are considered feasible, while sector B forms the foothill areas where small yielding tubewells at considerable drawdown are considered feasible. Lastly, sector C coincides with the hills of the district which are generally not suitable for tubewells except some intermountain valleys where some very small capacity

tubewells may be constructed. Ground water development prospects of shallow tubewells and deep tubewells are depicted in fig 5 and 6 respectively.

Shallow tubewells depth up to 100 m can be constructed through 150/100 mm diameter well assembly tapping 20-30 m granular zones having 25 m housing and 10 m slotted portion. The annular space between the borehole and the well assembly should be shrouded preferably with 100 mm thick zone of pea gravels. The yield of such tubewells in sector A is expected to be 15-20 m^3/hr at 5-10 m drawdown and in sector B the yield of such tubewells is expected s expected to be 10-15 m^3/hr at draw down of 20 m. shallow tubewells in valley portions where drawdown is less than 5 m and where non pumping water level is less than 2 m bgl, enable the use of centrifugal pumps.

Deep tubewells of large yield potentiality down to the depth of 200 m bgl can be constructed through 250/150 mm diameter assembly tapping 30 to 20 m granular zones with 30-40 m housing in sector-A and with 40-50 m housing in sector-B. the annular space between the borehole and the well assembly should be shrouded preferably with 100-120 mm thick zone of pea gravels. The yield of such tubewells in sector-A is expected to be 60-100 m^3/hr with upto 20 m drawdown and in sector-B the yield of such tubewell is expected to be 10-20 m^3/hr with drawdown upto 30 m.

The slot size is required to be in between 0.50-1.00 mm and size of gravel between 2-4 mm. gravels for shrouding should be composed of quartz and should be sub rounded to sub angular.

WATER CONSERVATION AND ARTIFICIAL RECHARGE

Scope for artificial recharge in thr area is minimum because water level in the major part of the district is within 5 m bgl and major part of the area under submergence for 6-8 months in a year. The area receives about 4000 mm of rainfall in a year. Roof top rainwater harvesting structures can be taken up in order to meet the demand for drinking and other domestic purposes in the villages located on higher elevations.

GROUND WATER RELATED ISSUES AND PROBLMS

Water quality problems:

The major ground water related problems in the district are the high concentration of iron in the ground water. The content of iron in ground water ranges from 0.10 to 1.70 ppm. The earlier hydrogeological surveys indicates the concentration of ground water is generally higher than the prespribed desirable limit of 0.3 ppm and maximum permissible of 1 ppm in northern part of Karimganj district district. The enrichment of iron in ground water is due to the ferruginous nature of Tipam sandstones, which forms the major aquifers. The high content of iron renders ground water unsuitable for drinking purpose, hence the level of concentration should be brought down to the desirable limit before use for drinking purpose.

Awareness and Training Activity:

Mass Awareness program me (MAP) and water management Training programme by (CGWB)

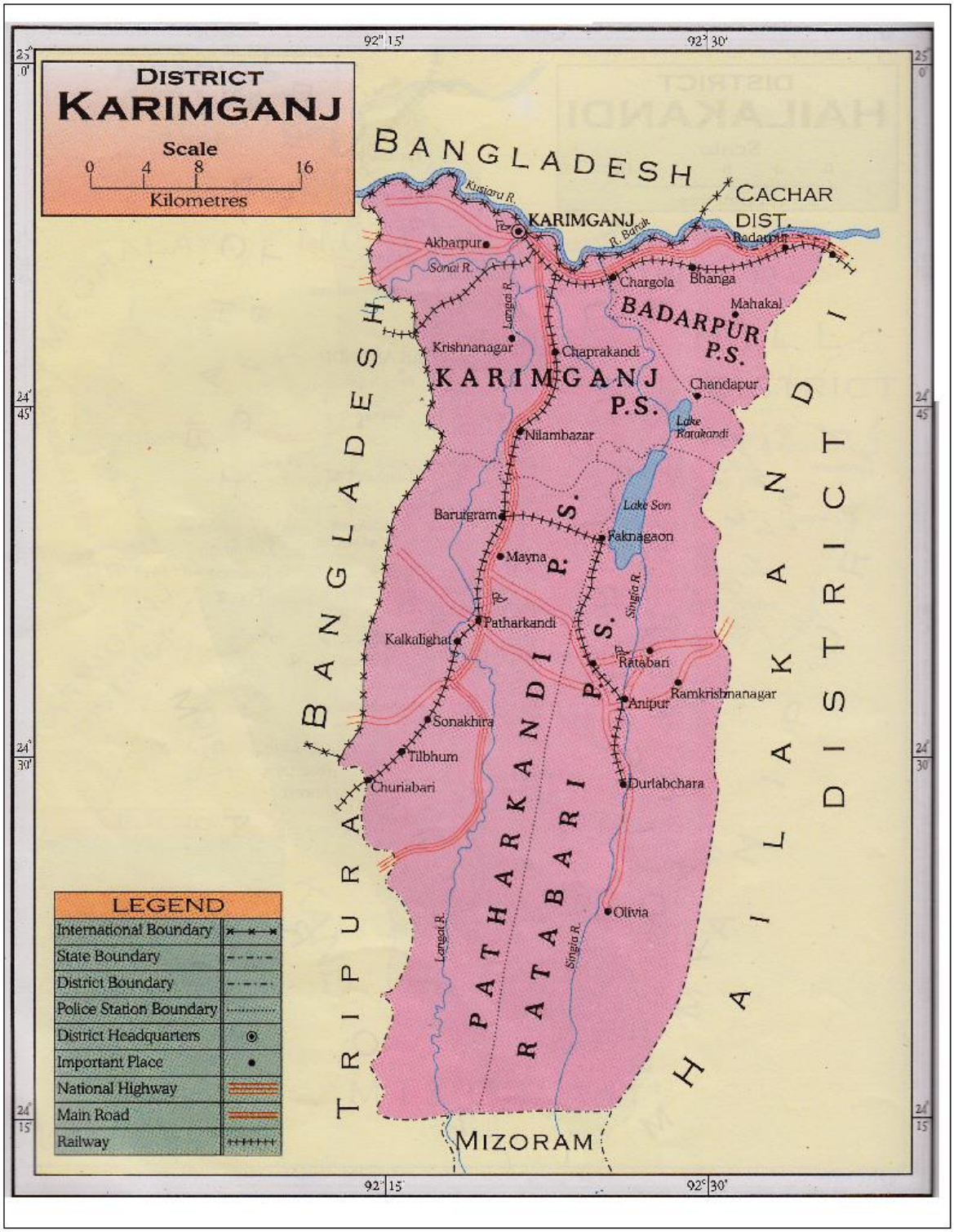
MAP and WMPT are yet to be conducted in this district.

Areas Notified by CGWA/SGWA

No area has been notified.

Recommendations:

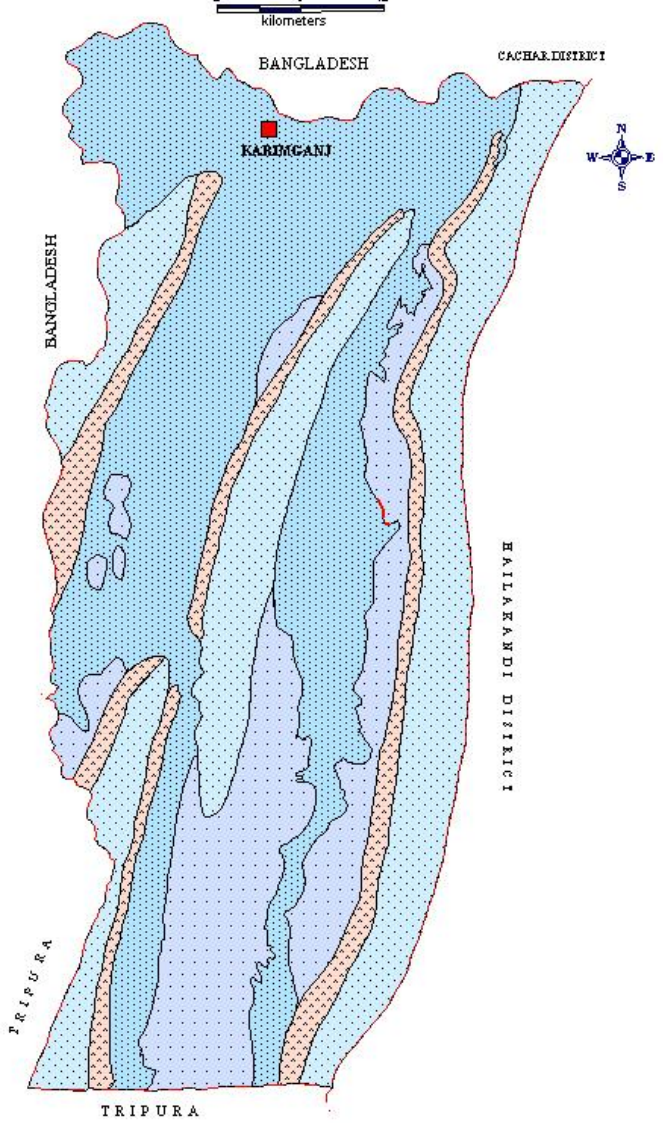
- The stage of ground water development in the district is only about 4% which indicates that there is ample scope for ground water development in the district.
- Ground water contains high concentrations of iron in northern part of district. So, iron removal plants are required to be installed wherever necessary for water supply schemes.
- Ground water quality should be monitored both during pre-monsoon and post-monsoon period, especially for iron and arsenic content of ground water because ground water in the neighbouring Bangladesh is arsenic infested.
- Research may be taken up on the impact of high iron waters on the soil, growth of various crops, plants etc. and their yield because of continuous supply of iron rich ground water for irrigation and also its impact on human health.
- Conjunctive use of surface and ground water should be taken up in the area for better utilization of waters.
- Rainwater harvesting should be encouraged, particularly in hilly terrains. Roof top rainwater harvesting may be taken up in the areas where settlements are located on higher reaches for domestic purpose.
- Safe distance of 500 m between two deep tubewells and 150 m between two shallow tubewells should be maintained while constructing tubewells in the district.
- While constructing tube wells sufficient gravel packing is a must because the grain size of sandstones (granular zones) is very small. The slot size should be within 0,5 to 1 mm size and gravel between 2-4 mm. gravels should be composed of quartz and should be sub rounded to sub angular.
- Ground water regime including deeper aquifer should be monitored by the state Govt. in view of increasing demand due to urbanization and ever increasing population.
- In hilly areas where springs exist should be developed. Nearby springs deforeststion should occur to have good dischar4ge.
- Public awareness should be created for proper use and conservation of water.
- At suitable locations installation of low lift points may be intensified throughout the district.
- Waterlogged areas if any are there, may be converted into integrated farm ponds.
- Emphasis has to be given for school children regarding water and its importance of water conservation, harvesting techniques in their curriculum.


DISTRICT
KARIMGANJ
Scale
0 4 8 16
Kilometres
92° 15'
92° 30'
25° 0'
24° 45'
24° 30'
24° 15'
BANGLADESH
CACHAR DIST.
KARIMGANJ
Kusiara R.
R. Barak
Badarpur
Akhorpur
Sonai R.
Chargola
Bhanga
Mahakal
Longai R.
BADARPUR P.S.
Krishnanagar
Chaprakandi
KARIMGANJ P.S.
Chandapur
Lake Ratakandi
Nilambazar
Lake Son
Barurgram
Faknagaon
P.S.
Mayna
Singla R.
Patharkandi
Kalkalighat
Ratabari
Ramkrishnanagar
Anipur
Sonakhira
Tilbhum
Churiabari
Durlabchara
PATHARKANDI
RATABARI P.S.
Olivia
Longai R.
Singla R.
TRIPURA
HAILAKANDI DISTRICT
MIZORAM
LEGEND
International Boundary
State Boundary
District Boundary
Police Station Boundary
District Headquarters
Important Place
National Highway
Main Road
Railway

KARIMGANJ DISTRICT, ASSAM

HYDROGEOLOGY

0 5 10
kilometers



LEGEND

MAP UNIT	FORMATION	LITHOLOGY	GEOMORPHOLOGIC CHARACTERS	GROUND WATER POTENTIAL
	ALLUVIUM	Clay, sands of various grades, silt	Synclinal valley, structurally controlled, occasionally flooded	Moderate to high yield, semi-confined to confined aquifer.Development restricted to synclinal, tectonic & intermontane valleys
	DUPITILA	Mottled clay, ferruginous sandstone & conglomerate	Undulating Plain with low lying flat topped mound & narrow and wide valleys	Suitable for deep tube wells, yield upto 100m3/hr. High drawdown upto 25m
	TIPAM	Medium to fine grained feldspathic ferruginous friable sandstone & well sorted mottled clay	Closely parellel round topped serrated residual ridges, low lying highle dissected hills with steep valleys	
	SURMA	Alternating shale, mudstone, siltstone, ferruginous sandstone & conglomerate	Hills sharp crested & low lying; moderate to highly dissected	Hilly area,not suitable for ground water development