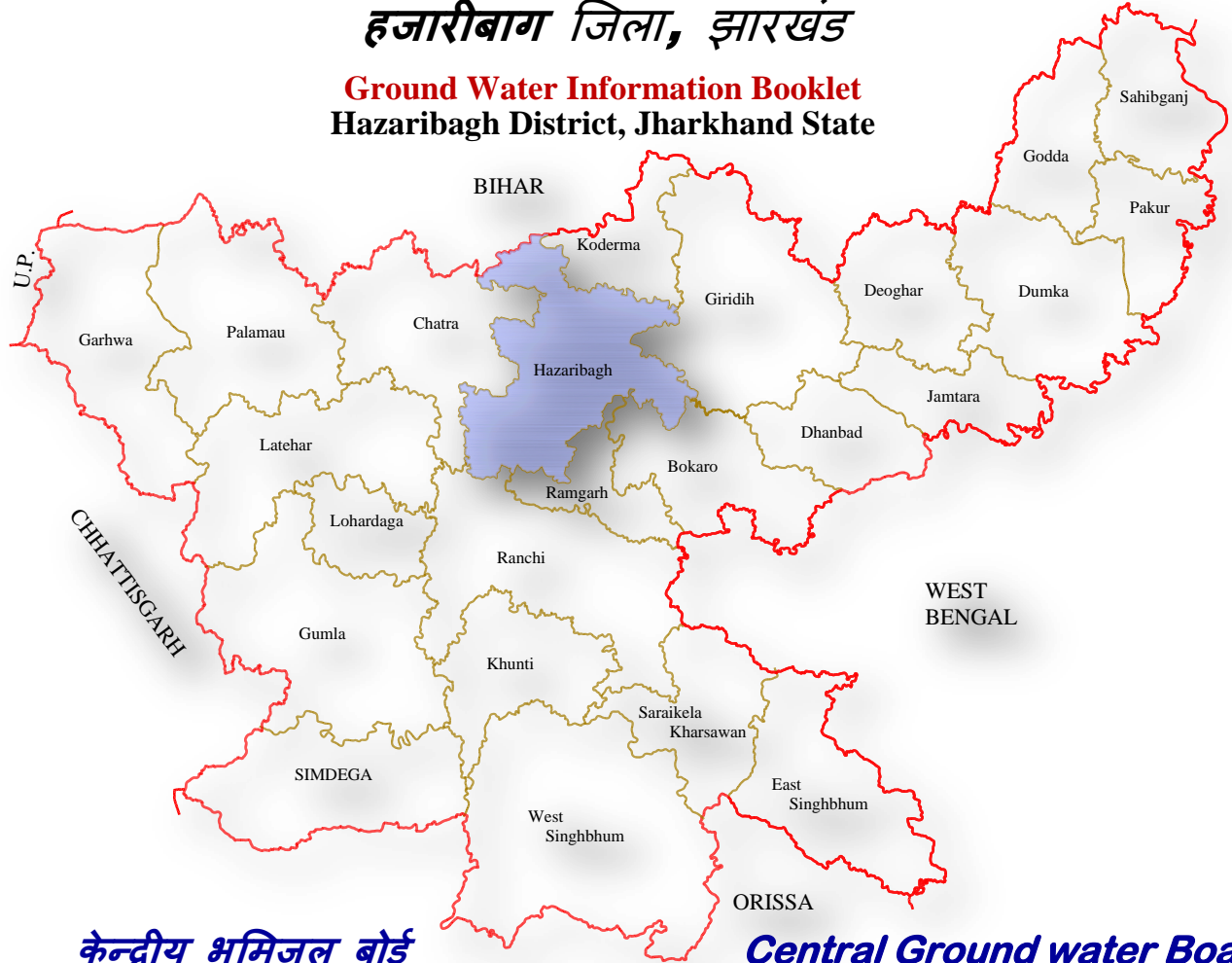




भूजल सूचना पुस्तिका

हजारीबाग जिला, झारखंड

Ground Water Information Booklet
Hazaribagh District, Jharkhand State



केन्द्रीय भूमिजल बोर्ड

Central Ground water Board

जल संसाधन मंत्रालय

Ministry of Water Resources

(भारत सरकार)

(Govt. of India)

राज्य एकक कार्यालय, राँची

State Unit Office, Ranchi

मध्य-पूर्वी क्षेत्र

Mid-Eastern Region

पटना

Patna

सितंबर 2013

September 2013

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Contents

Serial no.	Contents
1.0	Introduction
1.1	Administration
1.2	Drainage
1.3	Land use, Irrigation and cropping pattern
1.4	Studies, activities carried out by C.G.W.B.
2.0	Climate
2.1	Rainfall
2.2	Temperature
3.0	Geomorphology
3.1	Physiography
3.2	Soils
4.0	Ground water scenario
4.1	Hydrogeology
	Exploratory Drilling
	Depth to water levels
	Aquifer systems
4.2	Ground water Resources
4.3	Ground water quality
4.4	Status of ground water development
5.0	Ground water management strategy
6.0	Ground water related issues and problems
7.0	Awareness and training activity
7.1	Mass Awareness Programme (MAP) and Water Management training Programme by CGWB
	Participation in Exhibition, Mela and Fairs
7.2	Presentations and Lectures delivered in public
7.3	Forums/Radio/T.V. etc
8.0	Area notified by CGWA/SGWA
9.0	Recommendations

List of tables

Table 1	Details of Exploratory wells drilled in Hazaribagh district
Table 2	Depth to water level of NHNS wells (2012)
Table 3	Block wise Ground water Resources of Hazaribagh district (2009)
Table 4	Major chemical parameters of ground water samples of HNS during Premonsoon (2012)

List of Figures

Fig. 1	Administrative map, Hazaribagh district
Fig. 2	Drainage map, Hazaribagh district
Fig. 3	Hydrogeological map of Hazaribagh district
Fig.4	Depth to water level map (Pre-monsoon 2012) of Hazaribagh district
Fig. 5	Depth to water level map (Post-monsoon 2012) of Hazaribagh district
Fig. 6	Block wise stage of ground water development of Hazaibagh district(2009)

HAZARIBAGH DISTRICT AT A GLANCE

Sl No.	ITEMS	Statistics	
1.	GENERAL INFORMATION		
	Geographical Area (Sq km.) (As on 2011)	4302 Sq. km.	
	(i) Administrative Divisions (As on 2011)		
	Number of Blocks	16	
	Number of Panchyats	330	
	Number of Villages	1659	
	(ii) Population (As on 2011 Census)	17,34,005	
	(iii) Average Annual Rainfall (mm)	1234 mm	
2.	GEOMORPHOLOGY		
	Major Physiographic units	Pediplains, dissected plateau, Erosional valley, ridges and valley	
	Major Drainages	Barakar, Konar, Bokaro and Damodar	
3.	LAND USE (Sq Km.)		
	a) Forest area:	2566	
	b) Net area sown:	1061	
	c) Cultivable area:	1183	
4.	MAJOR SOIL TYPES	Alfisols (Red sandy soils) Ultisols (red and yellow soils) Light textured Slightly Acidic, Poor in N & P, Fairly rich in K	
5.	AREA UNDER PRINCIPAL CROPS (ha)	Pulses – 2263 Oilseeds – 1353 Paddy – 26291	
6.	IRRIGATION BY DIFFERENT SOURCES	Area (Ha)	Structures
	Dugwell	14132	39363
	Tube wells /Bore wells	46	6
	Tanks / Ponds	391	83
	Canals	---	----
	Other Sources	3924	758
	Net irrigated area	----	---
	Gross irrigated area	----	-----
7.	NUMBERS OF GROUND WATER MONITORING WELLS OF CGWB (As on 31-03-13)		
	No of Dugwell	15	
	No. of Piezometers	Nil	
8.	PREDOMINANT GEOLOGICAL FORMATIONS	Granite Gneissic Complex, Gondwanas	
9.	Hydrogeology		

	<ul style="list-style-type: none"> ➤ Major Water bearing formation ➤ Pre-monsoon Depth to water level during 2012 ➤ Post-monsoon Depth to water level during 2012 	<p>Granites, Granite gneiss, Gondwanas 6.90-11.90 mbgl</p> <p>2.10-8.90 mbgl</p>
12.	GROUND WATER EXPLORATION BY CGWB (As on 31-03-13)	
	No. of wells drilled (EW, OW, PZ, SH)	EW – 26 OW – 1
	Depth Range (m)	61.86 to 201
	Discharge (m ³ /hr)	0.3 to 65
13.	GROUND WATER QUALITY	Potable
	Presence of Chemical constituents more than permissible limit (e.g. EC, F, As, Fe)	EC 300 to 1115 micro mhos/cm at 25 ⁰ C.
	Type of Water	Ca - HCO ₃ Type
14.	DYNAMIC GROUND WATER RESOURCES (2009) in ha-m	
	Annual Replenishable Ground Water Resources	30188
	Gross Ground Water Draft	11744
	Projected Demand for Domestic and Industrial uses up to 2034	3391
	Net Annual Ground Water availability for future irrigation	17316
	Stage of Ground Water Development	39 %
15.	AWARENESS AND TRAINING ACTIVITY	
	Mass Awareness Programmes Organized	--
	Date	--
	Place	--
	No. of Participants	--
	Water Management Training Programmes Organized	1
	Date	2003
	Place	Vinoba Bhave University
	No. of Participants	65
16.	EFFORTS OF ARTIFICIAL RECHARGE & RAINWATER HARVESTING	Nil
	Projects completed by CGWB (No & Amount spent)	Nil
	Projects under technical guidance of CGWB (Numbers)	Nil
17	GROUND WATER CONTROL AND REGULATION	
	Number Of OE Blocks	Nil
	No. of Critical Block	Nil

	No. of Blocks notified	Nil
18.	MAJOR GROUND WATER PROBLEMS AND ISSUES	Low discharge of bore wells in Gondwana Formations

GROUND WATER INFORMATION BOOKLET

HAZARIBAGH DISTRICT

1.0 Introduction

1.1 Administration—

The district of Hazaribagh is situated in the north east of north Chotanagpur division. The boundary of the district consists of districts of Gaya and Koderma in the north, Giridih and Bokaro in the east, Ranchi in the South and Palamau and Chatra in the west. The Hazaribagh district consists of total area of 4302 Sq. Km. The district comprises of 16 no. of blocks namely Hazaribagh, Chauparan, Barhi, Padma, Ichak, Barkatha, Bishungarh, Katkam Sandi, Keredari, Barkagaon, Patraru, Churchu, Mandu, Ramgarh and Gola. The district has total population of 17,34,005 (2011 census). There was change of 25.75 percent in the population compared to population as per 2001. In the previous census of India 2001, Hazaribagh District recorded increase of 26.13 percent to its population compared to 1991.

The NH-33 connects Ranchi to Patna and it passes through the Hazaribagh. The National Highway No. 2 (G.T. Road) passes through the Chauparan, Barhi and Barkatha block. Density of population is 403 persons per sq. km.

1.2 Drainage---

The district is drained by two major rivers, the Damodar and the Barakar river with a few minor tributaries like Naikari, Bhera, Kusum, Bokaro, Mohana and Kumari. The Naikari with drainage from the south and further down the Bhera joins the Damodar river. The Damodar has I, II, III and IV order tributaries whereas the river Barakar has only II and III order tributaries namely Keso, Harhi, Barsot, Chandwara, Kolhuteri, Karkara and Kewta. In the southern portion of the district, river Konar has a second order tributary viz. the Siwane river which is flowing south to south-east. All these tributaries show dendritic to sub-dendritic drainage pattern typical of granitic terrain. The Damodar and the Barakar rivers show structurally controlled pattern. The drainage here is highly dissected in criss-cross fashion.

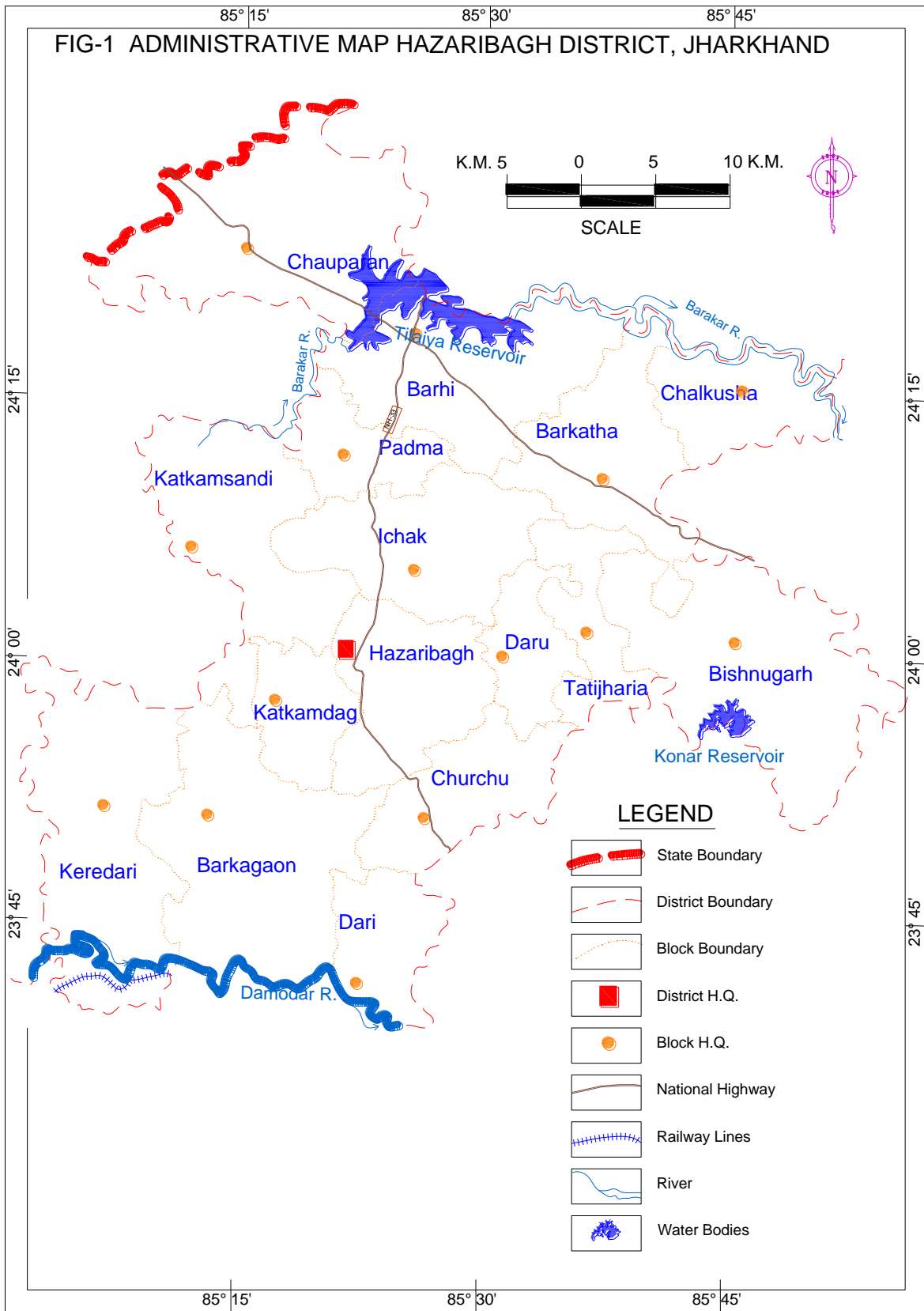
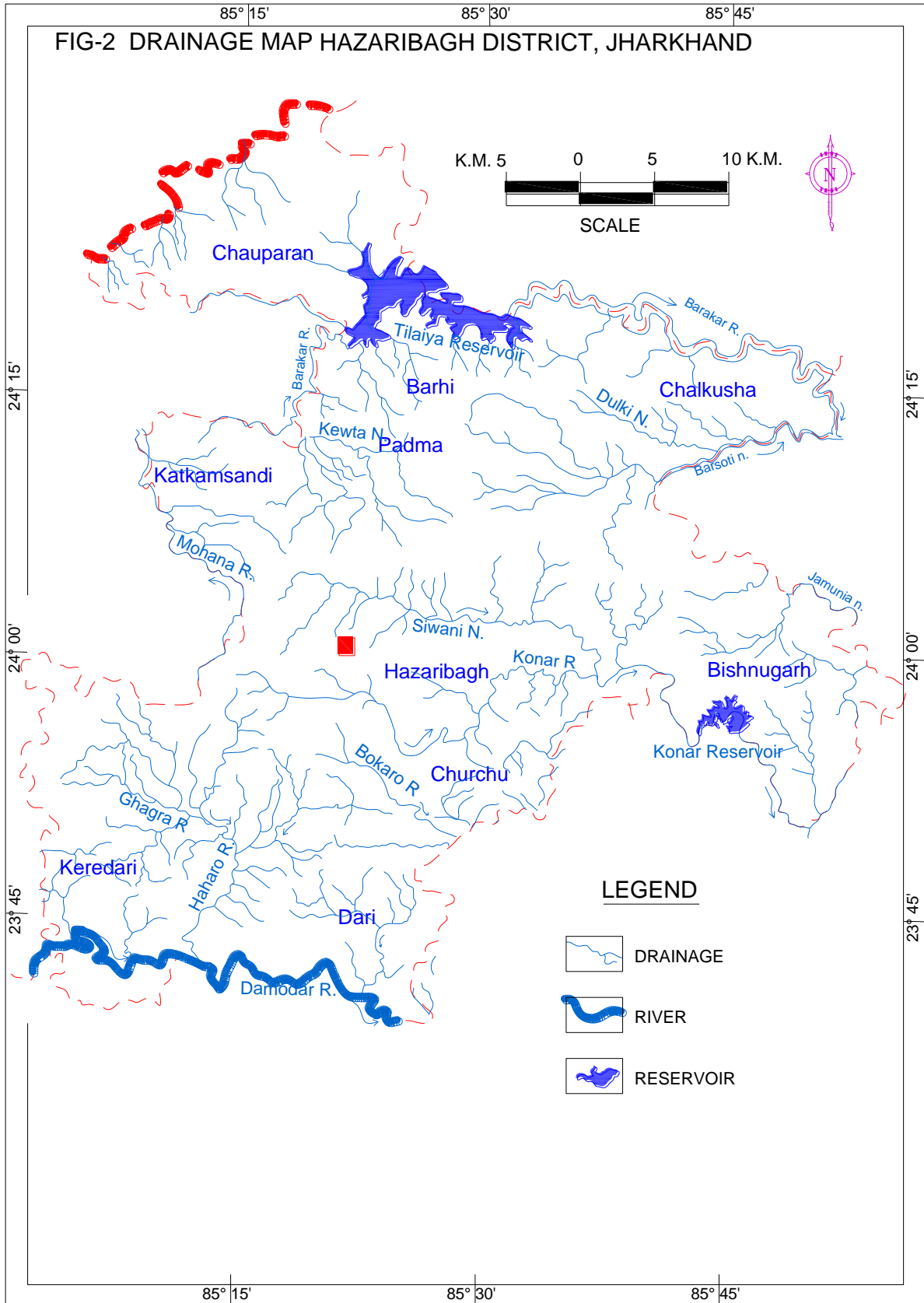





FIG-2 DRAINAGE MAP HAZARIBAGH DISTRICT, JHARKHAND



LEGEND

-  DRAINAGE
-  RIVER
-  RESERVOIR

1.3—Land use, Irrigation and cropping pattern –

As per 2012 land use pattern, district has 4302 sq. km. area. Forest area is 2560 sq. km (42.3%). Land put to non-agricultural use is 376 sq. km. (6.21%). Barren and uncultivable land is 541 sq.km. (8.9%). Current fallow is 730 sq. km. and land other than current fallow is 560 sq. km. (9.2%). Net area sown is 1061 sq. km. (17.5%). Kharif and Rabi are the two seasons for agriculture. Kharif extends from the end of June to the end of October when Paddy, maize, cereals and millets are grown. Rabi starts at the end of October and continues up to the end of March.wheat, Barley, maize grams and vegetables are grown during this season. The district has very little irrigation facilities. Irrigation is done mostly from dug wells, tanks and talabs. The culturable land is divided into two categories, namely, the upland and the lowland. Uplands are suitable for dry crops whereas paddy is grown in low land.

1.4---Studies/ activities carried out by C.G.W.B.—

Systematic hydrogeological investigation in the Damodar basin of Hazaribagh district was done by D.P.Ghose of G.S.I. in the year 1969-70.A report on District hydrogeology and Ground water Resources of the Hazaribagh district was done by B.B.Bhattacharya (Scientist-B) in the year 1989-90.Altogether 26 no. of exploratory drilling was done in the Hazaribagh district up to March 2013.About 48 no. of vertical electrical sounding (V.E.S.) was done by B.K.Oraon (Scientist-B) around Hazaribagh urban area to know about low resistivity zones in the area

2.0 Climate—

The area experiences three distinct seasons namely summer (March-May), Monsoon (June-October) and winter (November –February)

2.1 Rainfall—

Annual average rainfall is 1347 mm.

2.2 Temperature—

During peak summer maximum temp. goes up to 46⁰C and minimum temperature drops down to 4⁰C.

3.0 Geomorphology

3.1 Physiography—

Physiographically, the district consists of Plateaus, residual hills and intermontane valleys. The district can be divided into three divisions namely the Central Plateau, The lower plateau and the Damodar valley. The Central plateau is situated in the central part of the district. Hazaribagh town lies in this part having an average elevation of 600m. The lower plateau is situated all around surrounding the central plateau. The height of the lower plateau averages to 450m. The Damodar valley region is situated in the southern part and extends through the blocks of Keredari, Barkagaon, Patratu, Ramgarh and Gola blocks. The average elevation varies from 150-200m.

3.2 Soils-

Three types of soils are found in the district.

(a) Hill and forest soils of steep slopes and high-dissected region in Barkagaon, Bishungarh and Charhi blocks.

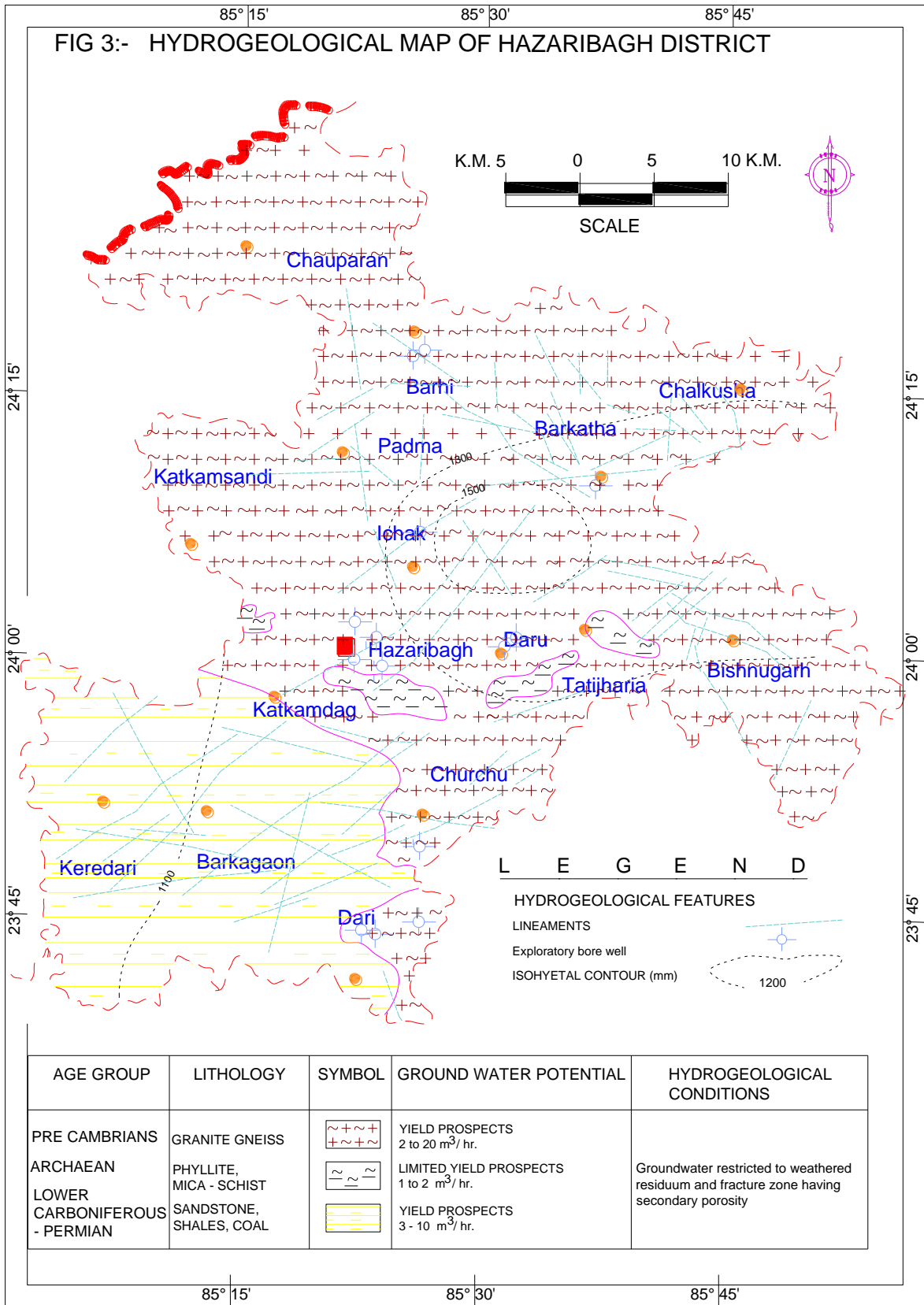
(b) Red yellow and light grey soil in Barhi, Ichak, Katkamsandi, keredari and Hazaribagh blocks.

(c) Pale yellow, yellow and pinkish deep soil on high micaceous schists.

4.0 Groundwater Scenario

4.1 Hydrogeology -

Geologically the area is underlain by Chotanagpur granite gneiss, phyllite-mica-schist. It is unconformably overlain by lower Gondwana formations consisting of Sandstone, Shales and Coal seams. Ground water mainly occurs under water table condition in weathered residuum and semi-confined condition in deeper fractures. Granite rocks show maximum thickness of weathered mantle in favourable topographic and drainage condition.



Exploratory drilling-

Altogether 12 no. of exploratory wells and one observation well were drilled in Hazaribagh district. Weathered thickness varies from 5m to 36 mbgl. Maximum thickness of weathered mantle is observed in the Hazaribagh zila school campus (34m) and St. Columbus college campus (36m) Hazaribagh. Thickness of weathered mantle in Barkatha block campus it is 20-26m. In granite gneiss terrain exploration was done upto 200m depth and 4-5 potential fractures were encountered upto 120 mbgl. High discharge wells in granite gneiss were found in Vinoba Bhave university campus, charhi and Barhi areas.

TABLE-1 EXPLORATORY WELLS DRILLED IN HAZARIBAGH DISTRICT							
Sl. No.	Location/ Block	Depth Drilled mbgl.	Length of Casing pipe/ m.	Static Water level m. bgl.	Discharge m³/hr.	Diameter of assembly mm.	Formation
1	2	3	4	5	6	7	8
	VBU,EW ₁	136.56	15.25	1.1	8.46	203	GRANITE GNEISS
2	VBU,EW ₂	136.58	-	2.08	9.6	203	GRANITE
3	ZILA SCHOOL HAZARIBAGH Hazaribagh	172	34.3	3.18	0.9	203	GRANITE GNEISS
4	ICHAK/ EW1	184	18.4	3.23	0.9	203	GRANITE GNEISS
5	PADMA / EW₁	62	12.7	3.38	3	178	GRANITE GNEISS
6	PADMA,EW ₂	166	25.5	2.9	3	178	GRANITE GNEISS
7	CHARHI/25051'- 85026',EW1	62	12.2	9.56	30(Air compressor)	178	GRANITE GNEISS
8	Charhi,EW₂	129.81	20	9.4		178	GRANITE GNEISS
	OW	135	22.5	9.4	6.84	178	GRANITE GNEISS
9	HIGH SCHOOL BARHI	125.1	18.75	5.48	6	178	GRANITE GNEISS
10	BLOCK campus,Barhi	118.41	19.9	7.56	14.52	178	GRANITE GNEISS
11	BARKATHA/ Barkatha	105	20.5	8.55	0.9	178	GRANITE GNEISS
12	St. COLUMBUS COLLEGE	199	36.2		1.14	178	GRANITE GNEISS

Depth to water levels – Depth to water levels during **pre-monsoon season** varies between 7.10 mbgl to 11.90 mbgl. Shallowest water levels were reported from Meru (7.10mbgl) and the deepest water level from Barkagaon (11.90 mbgl). Hazaribagh, Padma, Barkagaon, Dari, Churchu, Barhi blocks have water level more than 10mbgl, Bishungarh, Barkatha, Chalkusha block.

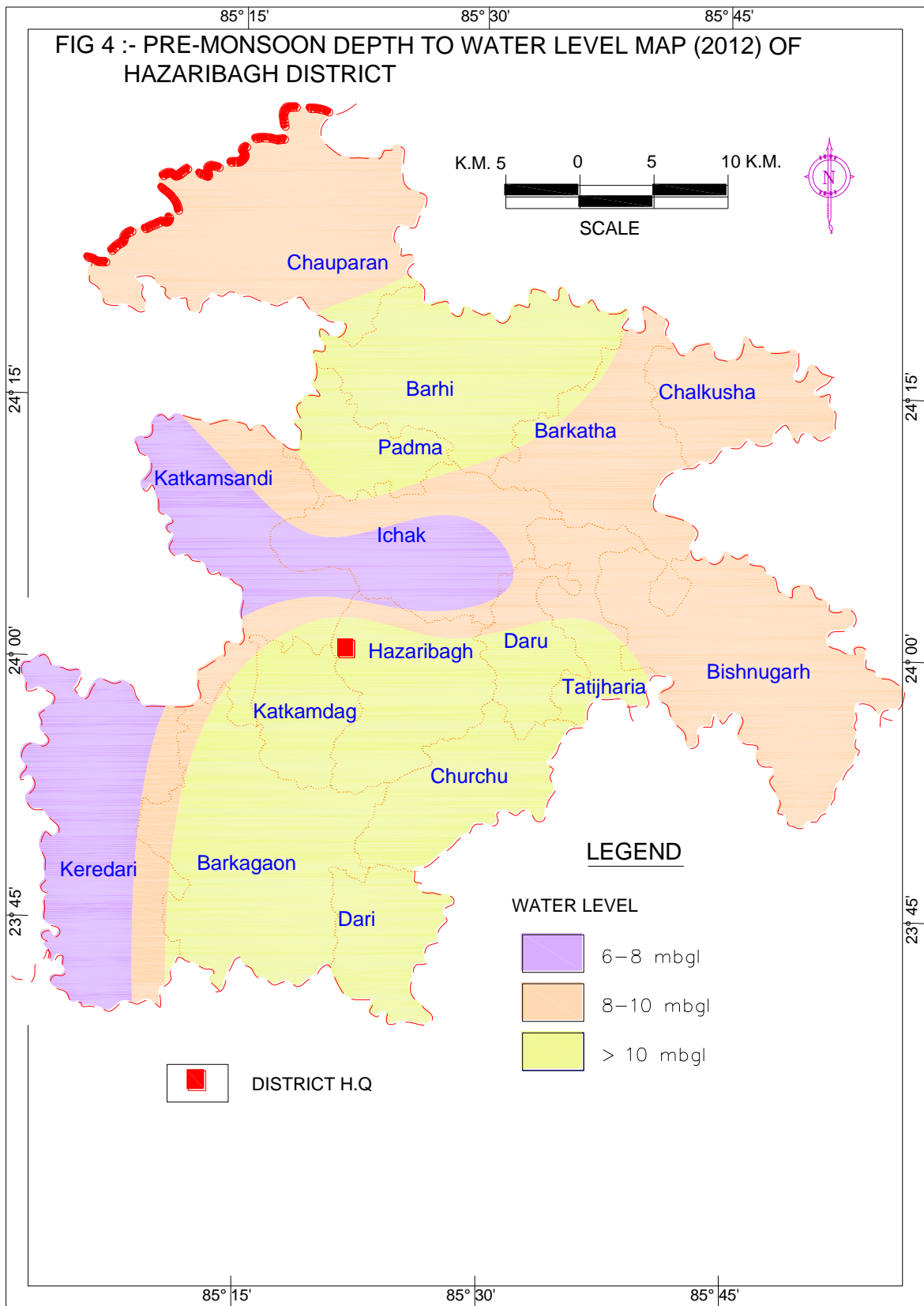
During **Post-monsoon season** water level varies between 2.10 mbgl to 8.90 mbgl.

Fluctuation varies between 2 to 6 m.

Table 2: Depth to water level map of NHNS wells (2012-13)

Location	May-2012	August 12	November-12	January-2013
Barhi	10.70	6.60	7.60	8.30
Barkatha	8.50	7.00	5.50	6.80
Hazaribagh	10.80	3.10	2.95	6.30
Ichak	6.90	4.65	5.40	5.80
Padma	11	9.00	8.90	9.10
Daru	10.20	1.10	2.10	3.30
Meru	7.10	6.65	7.50	9.30
Barkagaon	11.90	8.80	8.50	10.30
Garrikalan	8.20	5.10	1.90	3.80
Keredari	6.80	4.30	2.90	3.05
Chauparan	8.60	6.40	6.85	7.80

FIG 4 :- PRE-MONSOON DEPTH TO WATER LEVEL MAP (2012) OF HAZARIBAGH DISTRICT



Aquifer systems –

Two types of aquifers are observed in both Granite- gneiss and Gondwana rocks. Phreatic aquifer is observed in weathered formations and Semi-confined to confined aquifers in deeper fractures. Water levels in phreatic aquifers vary between 3-10mbgl. Piezometric head in Granite- gneiss varies between 2-9 mbgl.

4.2 Ground water Resources—

The Ground water assessment has been done based on the recommendation of the GEC-1997. The Ground water assessment has been carried out on the block wise basis for the year 2009. Padma block (997 ha-m) has lowest resource while Chauparan block (4369 ha-m) has the highest resources. Net annual ground water availability is 30188 ha-m..Existing ground water draft for all uses comes out to be 11744 ha-m. Net ground water availability for future irrigation is 17316 ha-m. Stage of Ground water development is 39%.

Table 3: Block wise Ground Water Resources(ha-m) of Hazaribagh District as on 2009(GEC-1997)

Sl.No	Assessment Unit/District	Net Annual Ground water Availability	Existing Gross Ground Water Draft for Irrigation	Existing Gross Ground water Draft for Domestic and Industrial Water Supply	Existing Gross Ground Water Draft For all Uses (10+11)	Allocation for Domestic and Industrial Requirement suply upto next 25 years	Net Ground Water Availability for future irrigation development (9-12-13)	Stage of Ground Water Development (12/9)*100 (%)	Categorisati on of blocks
1	2	3	4	5	6	7	8	9	10
1	Barhi	2239.13	734.976	158.27	893.25	237.06	1267.10	39.89	SAFE
2	Barkagaon	2440.39	544.49	187.07	731.56	280.20	1615.70	29.98	SAFE
3	Barkatha	3069.81	727.09	212.21	939.30	317.85	2024.87	30.60	SAFE
4	Bishungarh	3658.45	1235.75	240.86	1476.61	360.76	2061.94	40.36	SAFE
5	Chauparan	4369.55	595.08	281.97	877.05	422.34	3352.13	20.07	SAFE
6	Churchu	3137.75	811.88	184.37	996.25	276.15	2049.72	31.75	SAFE
7	Hazaribagh	1778.50	844.60	336.44	1181.04	503.93	429.97	66.41	SAFE
8	Ichak	2843.73	1497.44	195.20	1692.64	292.37	1053.92	59.52	SAFE
9	Katkamsandi	3415.72	1094.81	240.98	1335.79	360.95	1959.96	39.11	SAFE
10	Keredari	2237.80	1015.92	153.83	1169.75	230.41	991.47	52.27	SAFE
11	Padma	997.17	378.04	73.19	451.23	109.62	509.51	45.25	SAFE
		30187.99	9480.07	2264.39	11744.46	3391.63	17316.29	38.90	

4.3 Ground water Quality –

Ground water analyses data from the national hydrograph network station reveal that ground water in general is potable.

- (1) E.C. --- Specific conductance of ground water varies from 182 mhos to 2420 mhos/cm at 25⁰c.**
- (2) Ca-** Concentration of Ca varies from 42 mg/l to 124 mg/l.
- (3) Mg-**Concentration of Mg varies from 4-85 mg/l.
- (4) Na-** Concentration of Na varies from 10-170 mg/l.
- (5) K-** Concentration of K varies from 1.6-4.2 mg/l.
- (6) HCO₃**—Concentration of bi-carbonate varies from 92-451 mg/l.
- (7) Cl-** Concentration of Chloride varies from 10.6-284 mg/l.
- (8) Total hardness as CaCo3**— It varies from 75-660 mg/l.

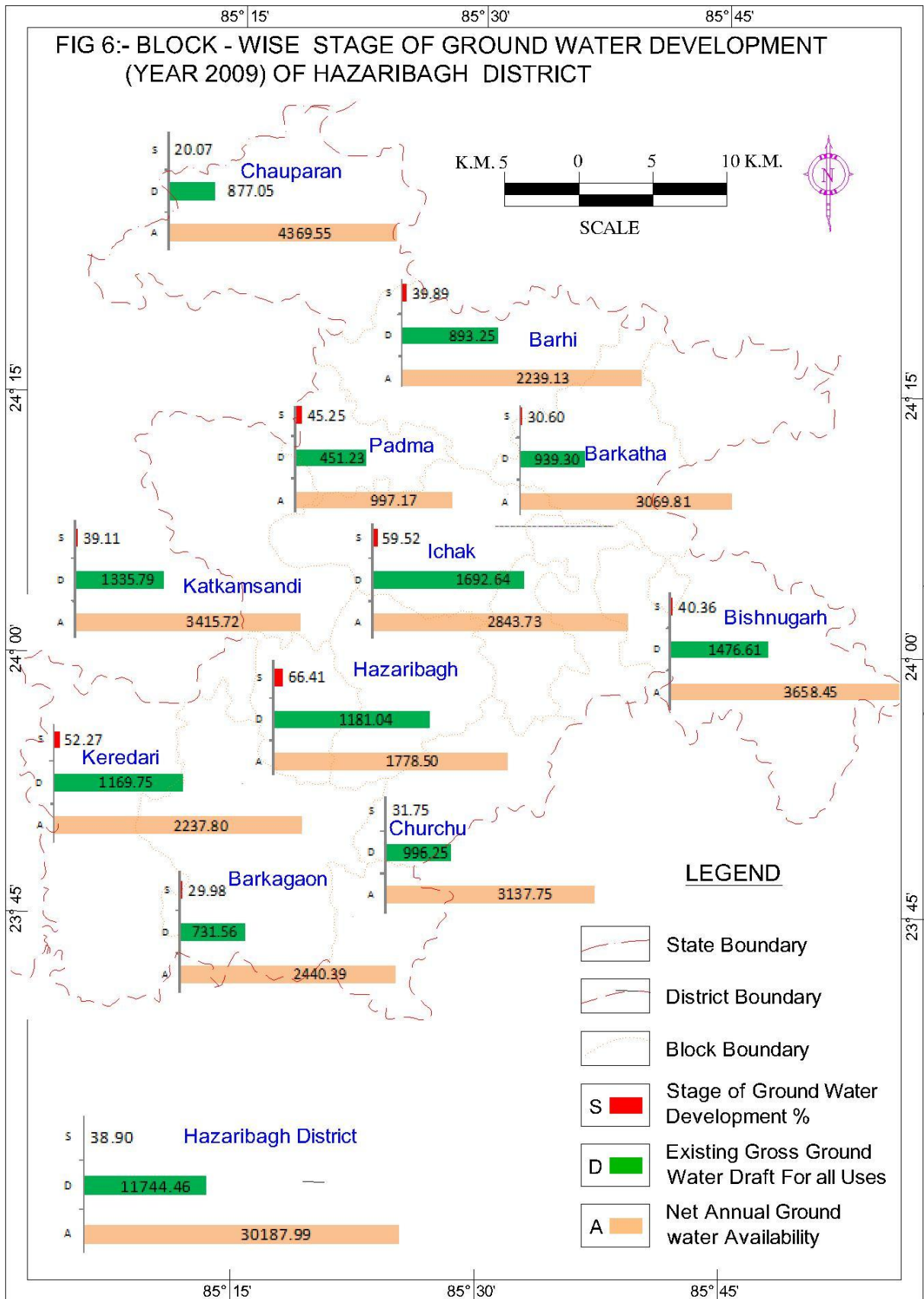
Table 4 - Results of chemical analysis of Ground water samples of Hazaribagh district (2012)

Sl No.	Well No.	Block	Location	E.C. micro- Siemens/ Cm at 25°C	Concentration in mg/l							
					CO ₃	HCO ₃	Cl	Ca	Mg	TH as CaCO ₃	Na	K
1	BHB-1	Barhi	Barhi	2420	3	451	284	124	85	660	170	1.8
2	BHB-4	Hazaribagh	Hazaribagh	1143	0	274	128	44	46	300	120	3.8
3	BHB-9	Chouparan	Chouparan	1929	0	252	34.3	94	82	590	141	4.2
4	BHB-10A	Hazaribagh	Barkatha	515	0	92	60.3	42	24	205	19	2.5
5	BHB-13	Hazaribagh	Ichak	182	0	98	10.6	60	4	75	10	1.6

4.4 Status of ground water development—

Overall stage of ground water development is 39%. Hazaribagh block has the highest stage of ground water development (66.41%) and Chauparan block (20.07%) has the lowest stage of ground water development. At present ground water is feeding entire requirement of water for domestic purpose except a few places like Hazaribagh where lake reservoirs are used. Recently a few dams namely Lotoa and Salparni have been constructed for irrigation purposes.

FIG 6:- BLOCK - WISE STAGE OF GROUND WATER DEVELOPMENT (YEAR 2009) OF HAZARIBAGH DISTRICT



5.0 Ground water management strategy—

In Hazaribagh district ground water is localized in the secondary porosity i.e. fractures in granite gneiss and gondwana rocks. C.G.W.B. have drilled 26 no. of borewells in the district .Exploratory wells at Ramgarh cant, vinoba bhava university campus Hazaribagh, Barhi block campus and Charhi are high productive wells. Lineaments are concentrated mostly in Ichak, Barkatha, barkagaon and keredari blocks. Valley fills area and areas having more lineament density are most promising sites for potential ground water. Resistivity survey should be preceded before exploratory drilling.

Water conservation and artificial recharge—

Long-term NHNS trend of Hazaribagh, Barhi and Padma blocks show declining trend so these areas are suitable for artificial recharge. Check dams, Gully plugging, contour bunding, Nala bunding, cement plugging are some of the Rain water harvesting structures that can be implemented in rural areas of Hazaribagh district. Roof top rainwater harvesting can be a suitable option in Hazaribagh urban areas.

6.0 Ground water related issues

7.0 Awareness and training activity---

7.1 One training programme on Artificial recharge to Ground water was organized at Vinoba Bhave University campus in Hazaribagh. Vice-chancellor of the university Dr. Bahura Ekka was the chief guest. The Scientists of C.G.W.B delivered lectures on ground water conservation and techniques of artificial recharge.

8.0 Areas notified by C.G.W.A./S.G.W.A. –

All blocks of the district comes under safe category.

9.0 Recommendations—

1. Remote sensing studies coupled with Hydrogeological investigation and followed by Resistivity survey is essential to locate favourable sites for ground water drilling in the district.
2. In pediment and shallow buried pediment, large diameter open wells are suggested for optimum extraction. Rectangular shape (that is longer axis perpendicular to the major fracture) is desirable in place of rounded well.
3. Hazaribagh, Ichak and Padma blocks are suitable for Artificial recharge and Rainwater harvesting.
4. Large number of bore wells drilled in granite gneiss show good discharge during weathered formation drilling but due to casing of the weathered formation, the discharge is diminished. So, Slotted casings can be a good option where both weathered and fractured cumulative discharge can be utilized.