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GOVERNMENT OF INDIA
MINISTY OF WATER RESOURCES
CENTRAL GROUND WATER BOARD

GROUND WATER BROCHURE OF DURG DISTRICT, CHHATTISGARH 2012-2013

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DISTRICT AT A GLANCE DURG DISTRICT)
By
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1. GENERAL INFORMATION

i) Geographical area (Sq. km)	8701.80
ii) Administrative Divisions (As on 2009)	
a) Number of Tehsil/ Block	11/12
b) Number of Panchayat/ Villages	998/1176
iii) Population as on 2011 Census	1316140
iv) Annual Normal Rainfall (IMD,2008)	1142 mm
v) Average Annual Rainfall (1994-12)	1055.56mm

2. GEOMORPHOLOGY

i) Major Physiographic Units	Two; Chhattisgarh Plain
ii) Major Drainages	Mahanadi, Seonath.

3. LAND USE (Sq. km) As on 2009

i) Forest Area	709.11
ii) Net Area Sown	5469.61
iii) Double cropped Area	2392.76

4. MAJOR SOIL TYPES Red & yellow soil, Black soil

5. AREA UNDER PRINCIPAL CROPS, in Sq. km (As on 2011) Rice: 2325.95, Pulses:555.28 Wheat: 186.90,

6. IRRIGATION BY DIFFERENT SOURCES (2011)

(Areas in Sq. km. and Numbers of Structures)

i) Dugwells	1458/16.69
ii) Tubewells/Borewells	33938/917.94
iii) Canals	296/1272.24(1788 km)
iv) Ponds	306/27.29
v) Other sources	126.15
vi) Net Irrigated Area	2360.31
vii) Gross Irrigated Area	3174.33

7. NUMBERS OF GROUND WATER MONITORING WELLS OF CGWB (As on 31.3.2012)

i) No of Dugwells	39
ii) No of Piezometers	25

8. PREDOMINANT GEOLOGICAL FORMATIONS

Proterozoics: Chhattisgarh Supergroup (Sedimentaries)
Archaeans: Unclassified Metamorphics, Granites and Gneiss

9. HYDROGEOLOGY

i) Major Water Bearing Formation	Proterozoic Sedimentaries (Limestone, Shale and Dolomites of Chhattisgarh Supergroup)
ii) Pre-monsoon Depth to Water Level During 2012 (mbgl)	2.1 to 12.25, Avg.: 6.70
iii) Post-monsoon Depth to Water Level During 2012 (mbgl)	0.40 to 8.50, Avg.: 3.00
iv) Long Term Water Level Trend (Post-Monsoon) in 10 yrs (2002-2011) in m/yr	Fall: 0 to 0.19 Rise: 0.06 to 0.69

10. GROUND WATER EXPLORATION BY CGWB (As on 31.3.2012)

i) No of Wells Drilled	EW: 91, OW: 13, PZ: 48 , Total: 152
ii) Depth Range (m)	67 to 300, Avg.: 140
iii) Discharge (litres per second)	0.2 to 16, Avg.: 4.3
iv) Transmissivity (m^2/day)	Chhattisgarh Supergroup: 5.1 to 130, Avg.: 42.31

11. GROUND WATER QUALITY

i) Presence of Chemical Constituents More Than Permissible Limit (e.g. EC, F, As, Fe)	Some patches underlain by Maniyari and Tarenga shale have high EC values upto 2900.
ii) Type of Water	Water is potable and fit for irrigation purpose

12. DYNAMIC GROUND WATER RESOURCES (As on March 2009)- in mcm

i) Annual Replenishible Ground Water Resources	916.12
ii) Net Annual Ground Water Draft	598.86
iii) Projected Demands for Domestic and Industrial Uses upto 2025	52.32
iv) Stage of Ground Water Development	68.81%

13. AWARENESS AND TRAINING ACTIVITY

Mass Awareness Programmes Organised

AAP 2002-03, Place: Patan

Water Management Training Programmes Organised

2002-03, Place: Durg city

2005-06, Place: Durg city

14. EFFORTS OF ARTIFICIAL RECHARGE & RAIN WATER HARVESTING

i) Projects Completed by CGWB (No & Amount spent)	Nil
ii) Projects Under Technical Guidance of CGWB (Numbers)	1

15. GROUND WATER CONTROL AND REGULATION

i) Number of Over Exploited Blocks (Stage of Development > 100%)	Nil
ii) Number of Critical Blocks (Stage of Development > 90%)	Nil
iii) Number of Blocks Notified	Nil

16. MAJOR GROUND WATER PROBLEMS AND ISSUES

A few areas mostly in Gurur, Durg, Bemetara and Nawagarh blocks show decline in long term water level trend. Some patches underlain by Maniyari and Tarenga shale have high EC values upto 2900.

1.0 **INTRODUCTION**

The Durg district covers an area of 8701.80 sq. km. It is situated in the central part of Chhattisgarh state. It falls in the Survey of India's Degree Sheet Nos. 64G, 64H and 64D (1:250000 Scale) between latitudes 20°23'to 22°02'N and longitudes 80°46'to 81°58'E. The district is bounded by Bilaspur district in the north, Kawardha district in the north-west, Rajnandgaon district in the west, Raipur district in the east, Dhamtari district in the south-east and Kanker district in the south (**Plate 1**). The district has a very well developed road & rail network. The National Highway No. 6 traversing the district is the Mumbai-Calcutta G. E. Road. Other important roads of district are Durg-Dhamdha-Bemetara Road. Kawardha-Bemetara- Simga Road, Kumhari-Patharia Road, Rajnandgaon-Antagarh Road, Durg-Utai Road etc. Durg town is favorably situated on the main line of the South Eastern Central Railway midway between Mumbai-Calcutta. The main railway line cuts across the district at its narrowest width, the total length of the line being only 17 Km's. There is also branch line from Durg to Dalli-Rajahara. Nearest airport i.e. Mana Airport (Raipur) is situated at about 50 Km's from the District Headquarter.

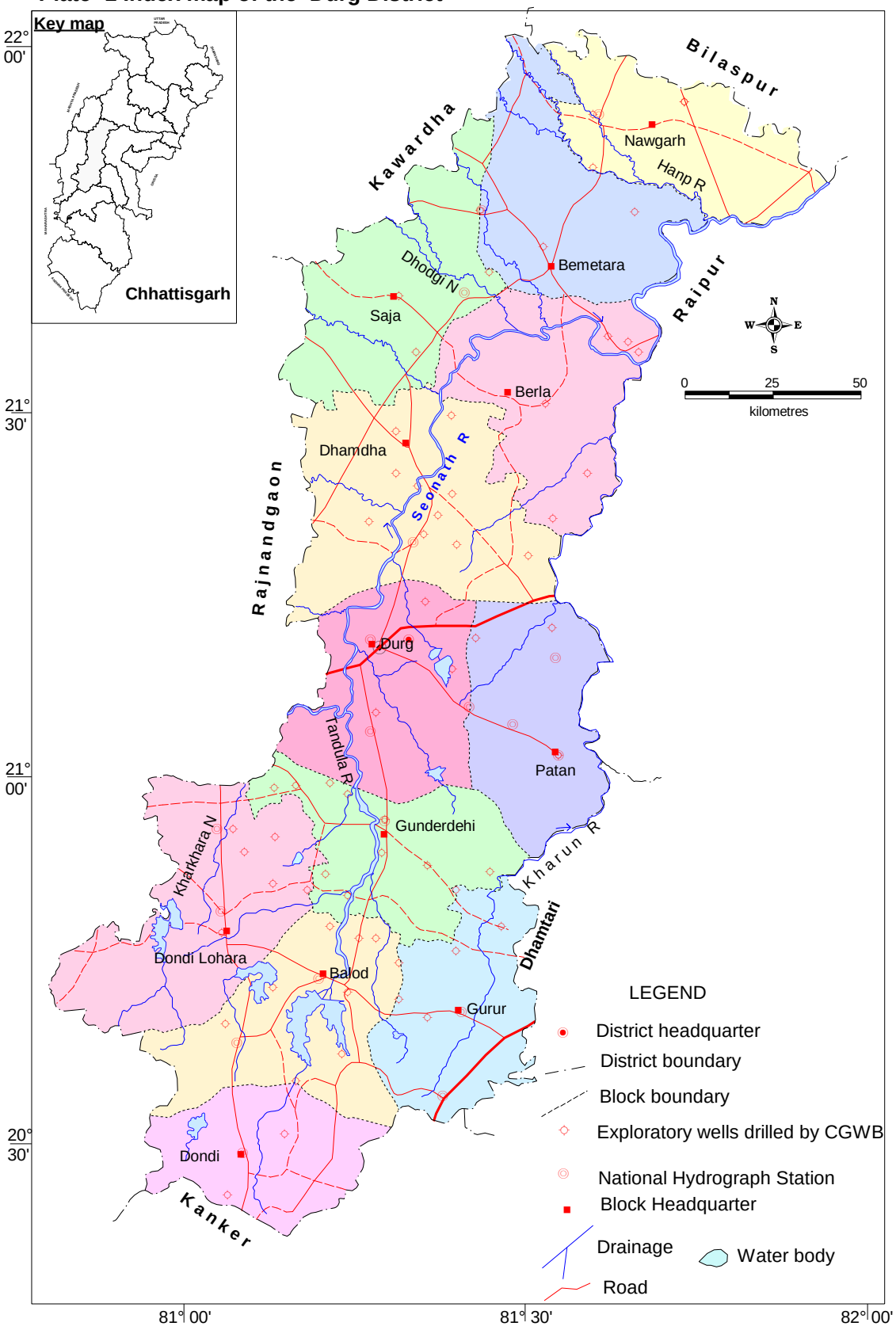
In all, a total of 1176 no. of villages are existing in the district. For administrative convenience, the district is divided into 11 tehsils, 12 blocks, 998 grampanchayats and 12 janpad panchayats. The block headquarters are located at Durg, Nawagarh, Bemetara,Saja, Berla, Damdha, Patan, Gunderdehi, Dondi-Lohara, Gurur, Balod and Dondi.

As per 2011 census the total population of the district is 3343079 The male population is 1681521 and female population is 1661558 .The urban population is 11 % and the rural population is 89 % of the population in the district lives in the rural area. The population density calculated from 2001 Census is 329 where as in 2011 it is 391. The literacy rate is around 79.69 %.

Durg gained importance as an industrial centre after the establishment of a large steel plant at Bhilai. Industries include brass working and bell-metal working, oil pressing, mining, and weaving. Cement,and steel are the main industries in the district..

The general slope of the district comes under Mahanadi river slope and is towards the north and north east and locally in some places towards east. The main rivers of Mahanadi are Sheonath, Kharun, Tandula, Kharkhara and Aamner. Sheonath is the main river of the district which originates from Panabaras Hill (625 M) and flows towards north-east. This river is the main tributary of Mahanadi River. The total length of the Sheonath river is 345 km. The length of Sheonath river in Durg district is 120 km. The main tributary of Sheonath river is Tandula river. This river originates from hills situated in the north of Bhanupratappur (District- Kanker). After covering a distance of 34 km

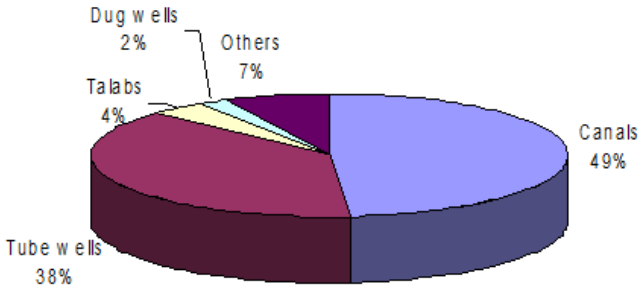
Plate -1 Index map of the Durg District



this river joins Sukhanala. This river joins Sheonath river in the south-west of Durg in a distance of approximately 13 km. The total length of this river is 96.6 km. A dam is constructed during the period 1905 to 1921 at the joining point of Sukhanala and Tandula river. Kharun river originates from Petechua in the south-east of the district and after flowing 80 km joins Sheonath river near Somnath in the north. Sheonath river flows nearer to the western border of the district whereas river Kharun forms the eastern border of the district. The length of Kharun river is 120 km. The area around Kharun river is very furtile. Kharkhara river originates from hills situated in Dalli Rajahara in the south-west of the District. This river joins Sheonath river after covering a distance of 90 km towards north-east. To fulfill the water requirement of Bhilai Steel Plant and Industry, in 1965-66, Kharkhara Dam was constructed. This is situated at Village Petechua at Balod Tehsil.

Durg generally has a dry tropical weather which is moderate but on a warmer side in summer season. The peak temperatures are usually reached in May/June and can be as high as 45C. The onset of monsoon is usually from July and the season extends up to September, with monsoon peaking during July and August. Maximum, Average & Minimum Rain fall Of District Durg are 1477.2 mm, 1071.16 mm and 781.5 mm per year respectively.

Fig 1 Area irrigated through different sources

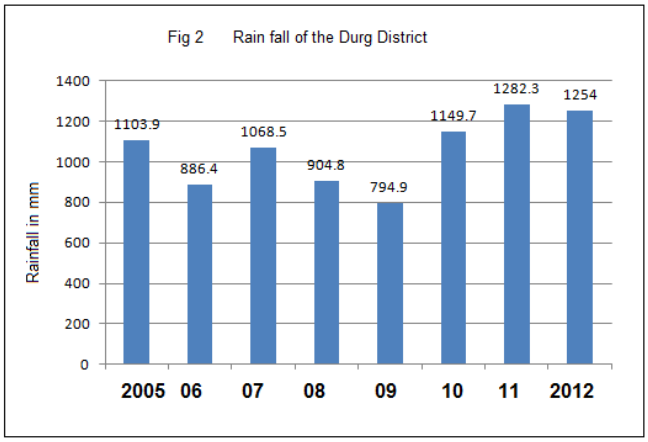


There are 9 Major, 9 Medium, 553 Minor and 6 Tube well irrigation schemes exist in Durg district. Out of 9 Major irrigation schemes only 1 Major irrigation scheme (Tandula Reservior) is completed while 8 no. of schemes are under progress. Out of 9 Medium irrigation schemes 6 no. of Medium irrigation schemes (Gondli, Khapri, Maroda, Kharkhara, Kharkhara Mohadipat and Matiya Moti Reservior) are completed while 3 no. of schemes are under progress. Out of 553 Minor irrigation schemes, 479 no. of Minor irrigation schemes are completed and remaining 74 no. of schemes are under progress. Beside this 4 tube well irrigation schemes are completed and 2 no. of schemes are under progress.The command area of these projects is 4696.72 sq.km and the utilizable storage capacity of all these projects is around 812 MCM. The total area irrigated by these projects in the district during year 2009-10 is 57705 ha out of their designed capacity of 218212 ha. It is also observed that, the percentage of irrigated area through Minor irrigation schemes is more than that of Major & Medium irrigation scheme.

Central Ground Water Board carries out different hydrogeological studies related to assessing the prevailing hydrogeological conditions, ground water potential, level of development and management of ground water resources through different surveys and studies like exploratory drilling, geophysical studies, geochemical studies, ground water level monitoring, systematic hydrogeological studies, reappraisal hydrogeological studies in the district. The whole district was covered by Systematic Hydrogeological Survey by CGWB in the year 1989. Reappraisal hydrogeological survey was carried out by CGWB in the year 1995 and in 2005-06 to know the ground water potential, behaviour and development in the district. CGWB under its accelerated drilling programme in drought-affected districts of Chhattisgarh has carried out exploration in southern blocks of the district in the year 2000-2001.The Block-wise groundwater resources estimation of the district was carried out jointly by CGWB and Water Resource Department, Govt. of Chhattisgarh in 2004,2009 and 2011. In the district a total of 91 nos of borewells were drilled under exploration programme using DTH rigs. One hundred fifty (150) vertical electrical resistivity soundings (VES) were carried out in the area in order to select best sties for drilling. A total of 39 nos. of dug wells (DW) and 25 no. of piezometers (Pz) are monitored four times a year for water levels and one time for water quality in the area.

1.0 RAINFALL AND CLIMATE

The Durg district experiences sub-tropical climate and is characterized by extreme summer and winter seasons. The annual temperature of the district varies between 8^0C and 46^0C .The maximum temperature is observed in the month of May and June where as the minimum is observed in the months of December and January. The rainy season extends from the month of June to September with well distributed rainfall through southwest monsoon. Monsoon generally breaks in the third week of June and is maximum in the months of July and August. Winter season is marked by dry and cold weather with intermittent showers during the months of December and January. The Durg district receives rainfall mainly from south-west monsoon. It sets in third/fourth week of June and continues till mid August/September with heaviest showers in the months of July and August. The average annual rainfall for the district is around 1055.56 mm (Average of the fifteen years i.e.1994 to 2012). The months of July and August are the heaviest rainfall months and nearly 95% of the annual rainfall is received during June to September months. Fig 2 showing rain fall variation from 2005 to 2012



2.0 GEOMORPHOLOGY & SOIL TYPES

Geomorphologically the district displays Structural Plains, Structural Hills and Valleys, Pediment/Pediplain, Denudational Slope and Flood Plain which can be divided into two distinct physiographic units as Central plains belonging to Chhattisgarh basinal area and Southern peripheral undulating terrain of low hills. The Central Chhattisgarh Plain is represented by Structural Plain on Proterozoic rocks which cover major area in the northern & central part of the district. This unit is developed over rocks of Purana sedimentary basin of Chhattisgarh. This unit has extensive cris-crossed fractures and joints. They are having gently sloping erosional surfaces and thin to moderate cover of soil. Southern peripheral is undulating terrain of low hills in the district represented by Structural Hills and Valleys, Pediment/Pediplain and Denudational Slope.The Structural Hills and valleys are developed in the southern part of the district. This unit is associated with folding and faulting. They are generally having a high relief steep sided linear to arcuate hill which shows definite trend lines covered with thin soil and forest.

The Pediment/Pediplain is developed in the south-western part of the district. They are also control by fractures and joints. They are having gently sloping smooth surface of erosional bed rock between hill and plain with veneer of detritus.The Denudation slope is developed in the extreme southern part of the district. This unit is also control by fractures, joints and lineaments. They are formed due to differential erosion along the plains. Along with the above mentioned geomorphic units, Flood Plain is also developed in the district especially in north-western and eastern part. It is formed by extensive deposition of alluvium by major river system in the district. This unit is normally flat/gently undulating land surface and located along river courses. This unit is primarily composed of unconsolidated fluvial materials like gravels, sand and silt.

Overall the topography in the district varies between 241 m to 652 m amsl. The area has general slope towards north & north-east direction with average elevation of 290 m amsl. The highest elevation recorded in the district is 652 m above mean sea level (in the southern part of the district near Kauchar village) and the lowest point is 241 m above mean sea level (in the north-eastern part of the district along Sheonath river course near Nandghat village).

3.0 GROUND WATER SCENARIO

3.1 Hydrogeology

Hydrogeologically the Durg district can be categorized into three groups.

1. Basement crystalline province
2. Plutonic, Volcanic and meta-sedimentary province
3. Precambrian sedimentary province

In the district, the Basement crystalline province of Archean age consists of the basement granite gneiss with enclaves of quartzite, quartz-mica schist and amphibolite belonging to the Bengpal Group. The ground water in this group of rocks occurs under phreatic/water table conditions in the weathered portion while semi-confined to confined conditions in deeper part consist of fractures/cracks/joints. The average thickness of the weathered portion in the area extends from 2 to 15m and in some places it goes up to 25m followed by shallow fracture zone down to depth of 70 mbgl. The occurrences of fractures at depth in the area are not common and whenever occur are less potential in ground water point of view ; however the thick weathered mantle in the coarse grained granites of this group of rocks forms potential aquifers. In general the discharge varies from 0.5 to 3 lps. The ground water development in these formations is mainly through dug wells, dug cum bore wells and shallow bore wells.

The Plutonic, Volcanic and meta-sedimentary province of the district of Palaeo Proterozoic to Archaean age consist of Banded Iron Formation, Shale and Phyllite belonging to Bailadila Group and Rhyolite, Rhyolitic tuffs, Basic pyroclastics, Basalt, Dolerite and Gabbro etc belonging to Nandgaon Group. Ground water in these rocks are mainly occurs in phreatic to semi-confined condition. Weathered and fractured zones provide space for ground water occurrence and movement in these rocks. The thickness of weathered zone varies from 6 to 36 m, followed by fractures down to depth of 150 mbgl. The ground water development in these formations is mainly through dug wells, dug cum bore wells and bore wells.

The Precambrian sedimentary province of the district includes Chhattisgarh Super Group of rocks of Upper Proterozoic age of marine origin. This province occupies nearly 90% of the district area. It mainly consists of arenaceous-argillaceous-calcareous rocks and are dominated by limestone/ dolomite and calcareous shale. The ground water in these formations occurs under water table, semi-confined and confined conditions. The weathered, cavernous and fractured part of the formation constitutes the aquifers in the area. These formations are the most potential in regards to ground water yield and development of the district. The weathered zone is restricted to upper 30 m depth and in exceptional cases it is observed up to 58 m. Most of the cavernous zones occur between 10 and 70 m depth and fractures are productive down to 150 to 200m. In this province, cavernous zones sometimes start just after soil horizon, particularly in the stratified calcareous rocks along the bedding. These caverns provide good channel for ground water movement when free from residual clays. But many times the solution channels are filled with residual clay and cause hindrance to ground water movement. The gypsum karsts occurring in the Maniyari formation of this province are more productive. Though gypsum is more soluble than calcite, their alternative assemblage with thinly laminated shale provides special condition where dissolution of gypsum laminae causes roof collapses to create larger openings. Artisian conditions are also reported from

this province especially in gypsum karstic terrain. Except Gunderdehi shales all the formation are productive. The contacts between different formations in this province are generally found productive. The ground water development in this province is through dug wells and bore wells. The dug wells are generally restricted up to 20m whereas bore wells are 30 to 180 m deep.

3.2 Water Level Scenario

As a part of National Hydrograph Network Observation Stations (NHS), 39 no of dug wells and 25 no of piezometers are established to monitor water levels four times in a year i.e. in January, May (Pre-monsoon0, August and in November (post-monsoon). The dug well depths are varying form 6.2 to 20.81 mbgl. These monitoring wells are distributed throughout the district covering all the lithological formations.

Depth to Water Level- Pre-monsoon (May 2012)

The depth to water (DTW) level observed during pre-monsoon period in the month of May 2012 is presented in **Plate-II**. The average depth to water level in the district during pre-monsoon period is 6.70 m bgl. In most of the area the water level lies in the range of 5 to 10 m bgl. The shallow water levels are observed in parts of Durg and Dhamdha blocks which comes under the canal command area. The water levels in the range of 10 to 12.25 m is observed in 15 % of cases and covers mostly in the parts of Dondi and Dondi Lohara blocks which are mostly underlain by Chandrapur formation of the Chhattisgarh Supergroup and older metamorphics.

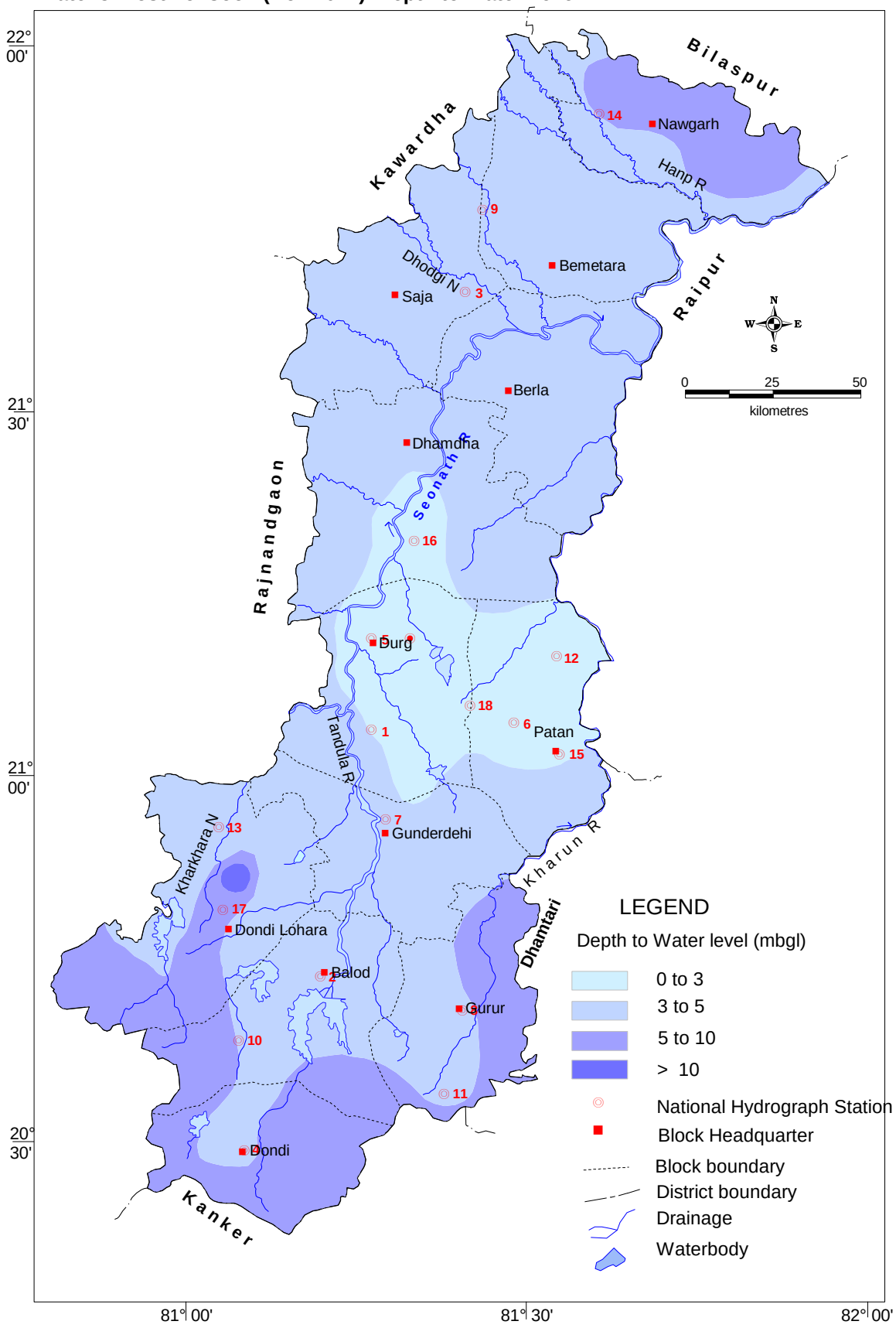
Depth to Water Level- Post-monsoon (November 2012)

The depth to water level measured during the post-monsoon period in the month of November 2012 is presented in **Plate-III**. The average depth to water level in the district during post-monsoon period is 3 m bgl. Water levels during the post-monsoon period are mostly varying from 0 to 5 m. The water levels in the range of 5 to 8.4 m are observed in Dondi,Gururand Dondi lohara blocks.

3.3 Aquifer Parameters

A total of 91 exploratory wells and thirteen observation wells are constructed in the district to delineate the aquifer geometry and to estimate different aquifer parameters. The Precambrian sedimentaries are the potential aquifers in the district. The transmissivity and specific yield of different formations varies in wide limits. In Archaean crystallines only six wells are drilled and their discharge is varies from 1 to 10 lps. The transmissivity (T) value in general is low except a few exceptions and the average specific capacity is less than 20 lpm/m of drawdown. The Maniyari,Tarenga, Hirri and Chandi Formations form good aquifers. The specific capacity value recorded for the exploratory wells at

Plate -3 Postmonsoon (Nov 2012) Depth to Water Level



Andhiyakhor,Nawagarh in Maniyari Formation is exceptionally high and is the order of 965 lpm/m of drawdown. **Table- 2** is presented here to show the transmissivity and discharge obtained for different formations in the area.

Table 2: Range of Transmissivity and discharge value obtained in Durg district

S. N.	Formation	No.of wells	Depth Range (m)	Zones Encountered Between (mbgl)	No.of Zones	Discharge(lps)						Transmissivity (m^2/day)
						<1	1- 3	3- 5	5-10	10-15	>15	
1	Maniyari Fm	8	122.12-269.49	12.4-137	2 to 12	0	0	1	1	2	4	79.11-1125.65
2	Hirri Fm	2	148.57-200.00	8.0-200.0	8 to 10	0	0	1	0	1	0	22.15-69.80
3	Tarenga Fm	3	274.25-300.57	8-49.5	2 to 3	1	1	0	0	1	0	0-58.6
4	Chandi Fm	32	19.5-304.57	6-152.5	2 to 8	16	9	2	3	1	1	0.17-1474
5	Gunderdehi Fm	10	55.25-300.57	5.78-134	2 to 4	3	4	3	0	0	0	13-233.6
6	Charmuriya Fm	17	45.17-151.4	3.72-73.17	2 to 10	6	3	2	2	4	0	0.38 - 1354
7	Chandrapur Group	7	89.25-141.67	9.96-131	2 to 6	5	2	0	0	0	0	
8	Nandgaon Group	3	100.54	8-40.95	1 to 2	1	1	0	1	0	0	
9	Basement Gneissic Complex	6	105.6-153	9-146	2 to 4	1	2	2	1	0	0	

4.0 Ground Water Resources

The total ground water recharge from all the sources is **91611.99** ham. The net available resource is **87031.37** ham. Existing gross ground water draft for all purposes is **59886.4** ham out of which **55402.34** ham is for irrigation and **4484.12** ham is for domestic and industrial water supply. The stage of the ground water development in the district is 68.81 %. The Gurur block (96.55 %), Durg (83.74 %) ,Bemetara(80.41 %) Balod(79.84 %) and Dhamdha (78.98 %) blocks categorized as semi critical block. In Durg district six blocks having stage of ground water development more tha 70 % and decline watertable is categorized semicritical blocks in ground water development point of view and remaining five blocks are safe for future groundwater development. At present the total irrigated

area by groundwater in the district is 93463 ha. The block wise resource is presented in **Plate-V and table 3.**

Table 3 Ground Water Resources Durg District

Assessment Unit / Block	Total Annual Recharge in Ham	Net Ground Water Availability in Ham	Existing Gross Ground Water Draft for Irrigation in Ham	Existing Gross Ground Water Draft for Domestic & Industrial Water Supply in Ham	Existing Gross Ground Water Draft for All Uses in Ham	Allocation For Domestic & Industrial Water Supply in Ham	Net Ground Water Availability for Future Irrigation Development in Ham	Stage of Ground Water Development in %
Balod	5796.07	5506.26	3877.6249	291.73	4169.3549	308.09	1320.5451	75.72
Bemetara	10325.72	9809.44	6867.4172	330.64	7198.0572	345.7	2596.3228	73.38
Berla	7316.29	6950.47	4284.3495	326	4610.3495	388.63	2277.4905	66.33
Dhamdha	10682.91	10148.76	7145.0132	624.44	7769.4532	655.72	2348.0268	76.56
Dondi Lohara	9268.33	8804.91	4285.59	409.9	4695.49	530.12	3989.2	53.33
Dondi	4664.52	4431.3	1632	231.97	1863.97	283.88	2515.42	42.06
Durg	6630.87	6299.33	4700.9475	453.25	5154.1975	586.25	1012.1325	81.82
Gunderdehi	6763.4	6425.23	3498.5897	455.76	3954.3497	612.72	2313.9203	61.54
Gurur	5771.17	5482.61	4976.925	316.51	5293.435	383.125	122.56	96.55
Nawagarh	7095.06	6740.3	2485.4106	283.96	2769.3706	293.75	3961.1394	41.09
Patan	8972.45	8523.82	5984.6608	430.32	6414.9808	478.1	2061.0592	75.26
Saja	8325.2	7908.94	5663.8152	329.64	5993.4552	366.68	1878.4448	75.78
District	91611.99	87031.37	55402.344	4484.12	59886.464	5232.765	26396.261	68.81

4.3 Ground Water Quality

The quality of groundwater in the district is suitable for drinking as well as irrigation purposes. However, at some places, instances of contamination have been reported which are mostly geogenic in nature. The concentration of Ca & Mg at Khati (242 mg/l & 800 mg/l respectively) & Nawagarh (316 mg/l & 850 mg/l) is found more than permissible limit making the water hard. The Fluoride (F) concentration in two samples is found more than desirable limit at Bitkuli(1.2 mg/l) & Nawagarh(1.3mg/l) but within permissible limit. The concentration of NO3 at Berla (125 mg/l) & Dargaon (119 mg/l) is found more than permissible limit which may be due to the anthropogenic activity (animal waste disposal) & it causes methaemoglobinaemia (Blue babies).

The concentration of SO4 at Khati (850 mg/l) & Nawagarh (930 mg/l) it is found more than permissible limit. The High concentration of sulphate in the ground water of Durg district is due to the dissolution of gypsum veins present within Maniyari shale Formation. Higher concentration of SO4 in drinking water

causes gastrointestinal irritation. The concentration of iron more than permissible limit is found in about 30% of the samples of the groundwater in Durg district. The highest value of iron is reported from Khurmuri village (5mg/l).

Further, the ground water in the district is having low sodium and medium to high salinity hazard.

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4.4 Status of Ground Water Development

Durg is developed district from ground water development point of view but the ground water development in the district is also not uniform and steady. Along with this, declining of water levels in post-monsoon season is also observed in some of the areas. This requires a judicious sustainable development and management of ground water resources in future. Watershed management programmes, rainwater harvesting and artificial recharge, advance irrigation techniques and use of surface and ground water in conjunction with each other should be practiced along with the education and awareness among the local population and farmers for accepting the benefits of many developmental schemes of government if ground water extraction by way of bore wells/tube wells is a costly affair for them. The available ground water balance for future use in the district is of the order of **26396.261**ham leaving behind sufficient scope for further development. It is estimated that a total of 9789 no. of bore wells can be drilled in the district to utilized balance ground water resources.

On the basis of the hydrogeological behavior of the formations, development by way of feasible abstraction structures, method and depth of drilling is suggested in Durg district. Dug wells up to 20m (manually), shallow bore wells up to 70 m, deep bore wells up to 250m depth by DTH method are the most suitable and feasible ground water structures for ground water development in the district. Existing gross ground water draft for all purposes is **59886.46** ham out of which **55402.34** ham is for irrigation and **4484.12** ham is for domestic and industrial water supply. The stage of the ground water development in the district is **68.81** %. The Gurur block (96.55 %) ,followed by Durg (83.74 %) ,Bemetara(80.41 %) Balod(79.84 %) and Dhamdha (78.98 %) blocks. In Durg district six blocks having stage of ground water development more tha 70 % and decline watertable is categorized semicritical blocks in ground water development point of view and one block is over exploited ,remaining five blocks are safe for future groundwater development. At present the total irrigated area by groundwater in the district is 93463 ha.

GROUND WATER MANAGEMENT STRATEGY

The Gurur block (96.55 %) followed by Durg (83.74 %) ,Bemetara(80.41 %) Balod(79.84 %) and Dhamdha (78.98 %) blocks. In Durg district six blocks having stage of ground water development more tha 70 % and decline watertable is categorized semicritical blocks in ground water development point of view and one block is over exploited ,remaining five blocks are safe for future groundwater development. However, the areas where the

depth to the water levels during the post monsoon period are more than 3 m and having a decline trend of water level require immediate attention to regain the water levels or to maintain the water levels irrespective of development activities in the area in future. To achieve this target artificial recharge to the ground water is one of the solutions, which may be taken up in these areas. These areas are mostly in Gurur, Durg, Bemetar, Balod and Dhamdha blocks and are suitable for artificial recharge (**Plate-VI**). The rainwater can be harvested by percolation tank and the ground water can be recharged by recharge shaft method. The shale-covered areas can be recharged by injection well method. From ground water contour map (**Plate-V)** it can be observed that the flow of ground water is towards the major drainage indicating that the water in the river is nothing but the base flow. So suitable obstruction structures may be constructed on the tributaries of major rivers like Tandula, Kharun andSeonath to check the base flow which can enhance the pre monsoon depth to water level in the district.

4.0 GROUND WATER RELATED ISSUES & PROBLEMS

The decline of ground water level during the pre monsoon period in Gurur, Durg, Bemetar, Balod and Dhamdha blocks was observed and higher concentration of SO4 at Khati (850 mg/l) & Nawagarh (930 mg/l) it is found more than permissible limit. The High concentration of sulphate in the ground water of Durg district is due to the dissolution of gypsum veins present within Maniyari shale Formation. Higher concentration of SO4 in drinking water causes gastrointestinal irritation. The concentration of iron more than permissible limit is found in about 30% of the samples of the groundwater in Durg district. The highest value of iron is reported from Khurmuri village (5mg/l).was observed The area is famous for paddy crop for which crop water requirement is maximum.
Improper waste disposal in the areas underlain by limestone and dolomite in and around Durg, Nandani and Dhamdha may cause ground water pollution as the solution channels formed in these rocks act as conduits for direct recharge of surface water to ground water and hence require attention.

AWARENESS & TRAINING ACTIVITY

One mass awareness programme and two water management training programmes are conducted in the district. The details of the programmes are as follows.

Sl. No.	Year	Programme	Venue
1	2002-03	MAP	Patan
2	2002-03	WMTP	Durg city
3	2005-06	MAP	Durg city

5.0 AREAS NOTIFIED BY CGWA/SGWA

Gurur block in the district is categorized as over exploited from ground water abstraction point of view. Sis blocks i.e. Durg,Balod,Bemetara.Saja,Patan and Dhamdha are categorized as semi-critical, none of the blocks of the district has been notified by the CGWA/SGWA for regulation of ground water.

Plate -4 Ground Water Resource (as on March 2009) of Durg District.

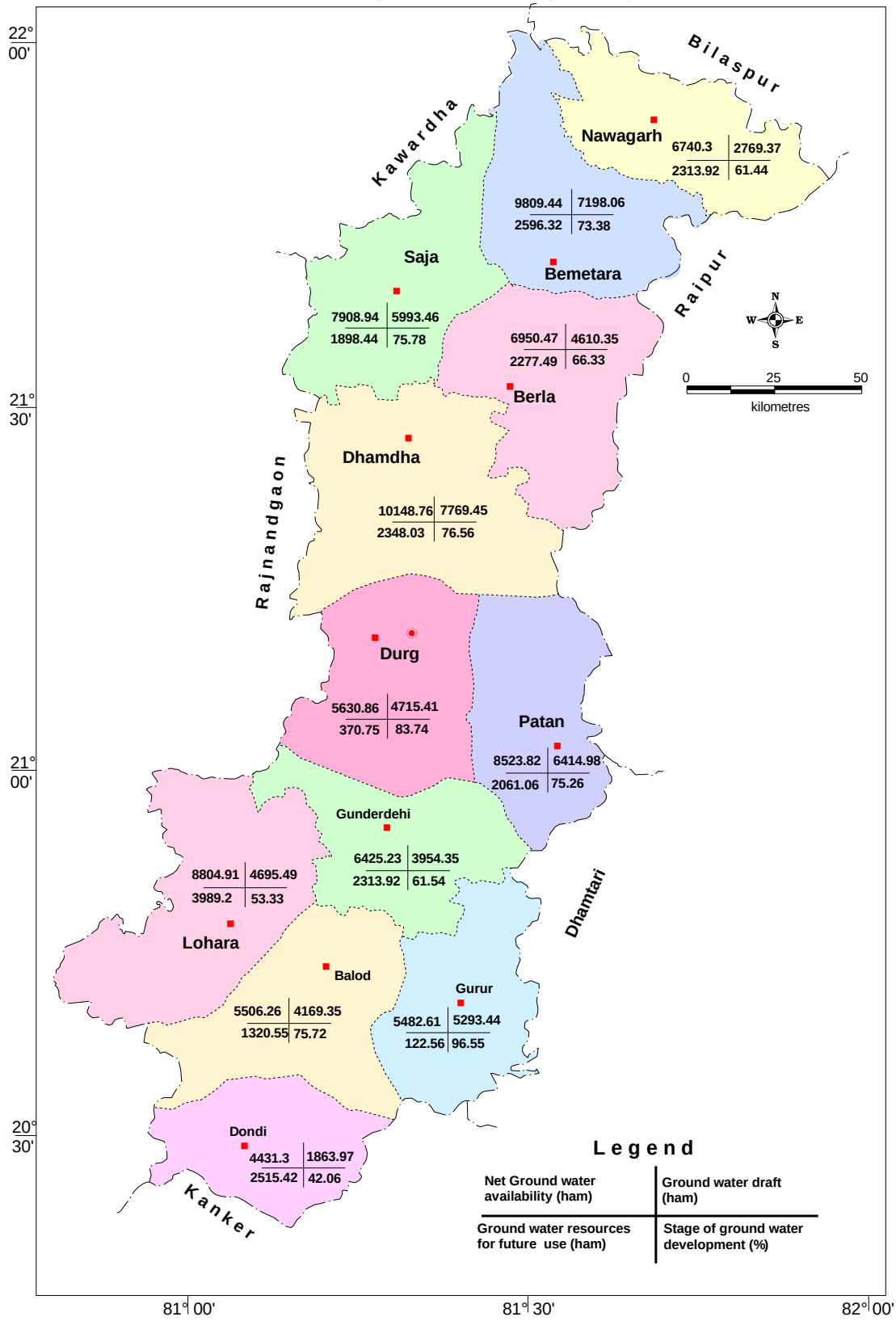
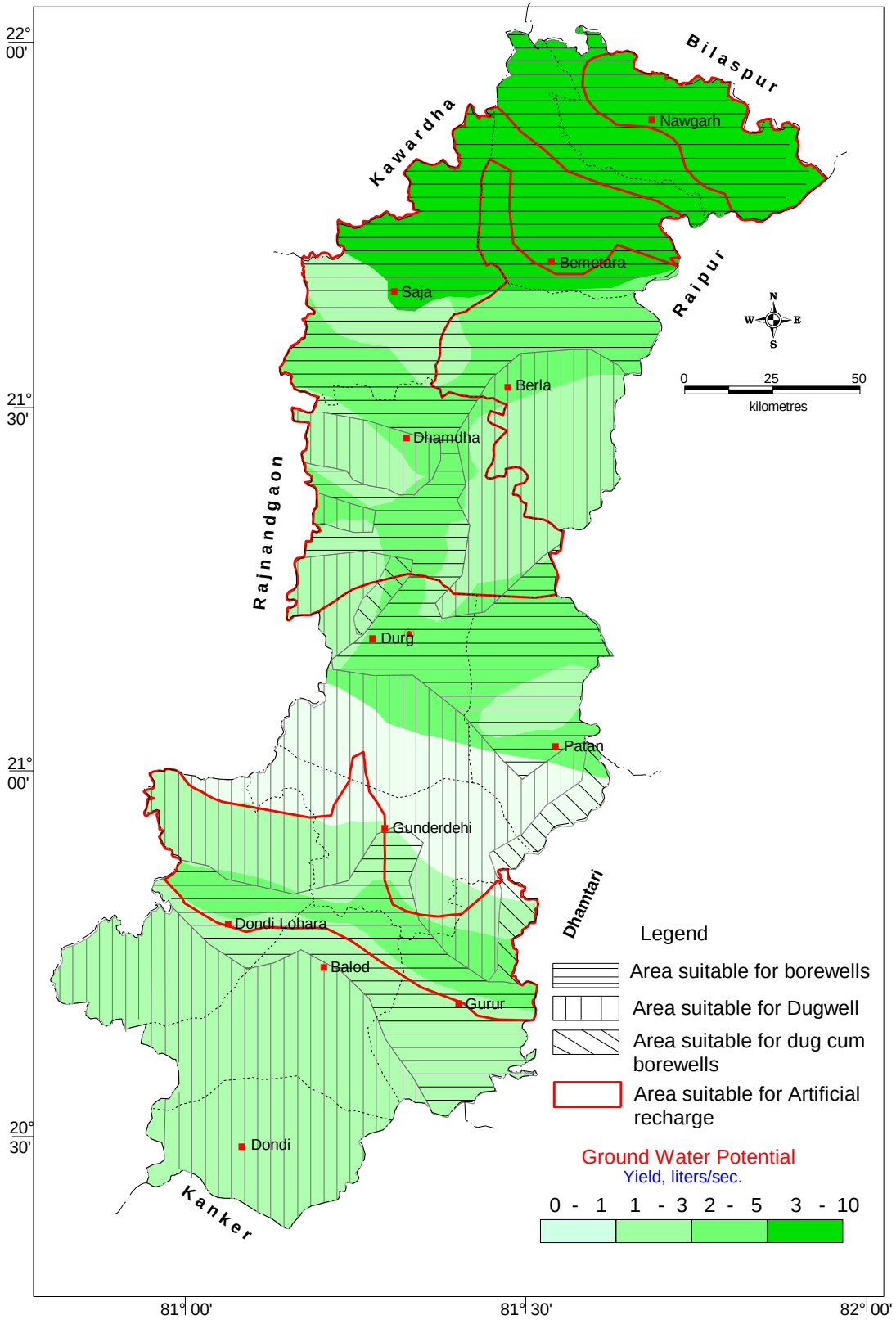


Plate - 6 Ground Water Development Potential & Artificial Recharge Prospects



RECOMMENDATIONS

- It has been observed that the crop water applied for paddy in the district (1.12m) is at the much higher side than the crop water requirement (0.69m) thereby wasting a lot of water as paddy is the main crop in the district. Efficient irrigation practices and proper awareness can create more irrigation potential and bring more area under irrigation.
- Technical input for well construction in alluvium covered hard rock area and for highly cavernous zone can help obtaining good yield and successful construction of wells in this area in the district. Combination type of rigs can successfully drill wells in these areas.
- Large diameter dug wells are recommended as the ground water abstraction structures in the areas underlain by granites and older metamorphic. Similarly dug wells with bore at the bottom are recommended in the low yielding shale area.
- Improper waste disposal in the areas underlain by limestone and dolomite in and around Durg, Dhamdha and Saja may cause ground water pollution as the solution channels formed in these rocks act as conduits for direct recharge of surface water to ground water and hence require attention.
- The flow of ground water is observed to be towards the major drainage indicating that the water in the river is nothing but the base flow. So suitable obstruction structures may be constructed on the tributaries of major rivers like Hasdeo, Borai, Son to check the base flow which can enhance the pre monsoon depth to water level in the district.
- In parts of the Bemetar,Nawagarh,Gurur,Balod and Patan blocks rain water harvesting and artificial recharge measures are to be taken to regain the water levels or to maintain the water levels irrespective of development activities in the area in future.
- Conjunctive use study should be taken up to avoid water logging condition in the areas underlain by shale and crystalline under canal command.

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Plate 5 Hydrogeological map of the Durg District