

DISTRICT GROUND WATER INFORMATION BOOKLET



CHHINDWARA DISTRICT
MADHYA PRADESH



Ministry of Water Resources
Central Ground Water Board
North Central Region
BHOPAL

September, 2013

CHHINDWARA DISTRICT AT A GLANCE

S.No	ITEMS	Statistics
1.	GENERAL INFORMATION	
	i) Geographical area (As on 31.03.2011)	11,815 Sq. Km
	ii) Administrative Divisions (As on 31.03.2011)	Number of Tehsil = 12 Block = 11 (4-Tribal) Number of Panchayat = 808 Number of Villages = 1998
	iii) Population (As on 2011 Census)	20,90,306
	iv) Normal Rainfall (mm)	1139.3 mm
2.	GEOMORPHOLOGY	
	Major Physiographic units	1. Northern hilly region 2. Central high plateau region 3. Southern low grounds 4. Upland trough of <i>Jam & Kanhan</i> rivers
	Major Drainages	Narmada and Godavari basins
3.	LAND USE	
	a) Forest area:	4795 SqKm
	b) Net area sown:	4844 SqKm
	c) Cultivable area	5555 SqKm
4.	MAJOR SOIL TYPES	Black cotton soil, Sandy loam soil and Clayey loam soil
5.	PRINCIPAL CROPS during 2012	Soyabean, Maize, cotton, Ground nut and Jawar
6.	IRRIGATION BY DIFFERENT SOURCES	Areas and Numbers of Structures
	Dug wells	No = 86282 Area irrigated = 928 Sq km
	Tube wells/ Bore wells	No = 7280 Area irrigated = 367 sqkm
	Tanks/ ponds	No = 69 Area irrigated = 42 sqkm
	Canals	No = 63 Area irrigated = 108 sqkm
	Others sources	Area irrigated = 59 Sqkm
	Net area sown	1268 Sqkm
	Gross Irrigated area	1504 sqkm
7.	NUMBERS OF GROUND WATER MONITORING WELLS OF CGWB (As on 31- 3- 2013)	No of Dug Wells = 33 No of Piezometers = 12
10.	PREDOMINANT GEOLOGICAL FORMATIONS	Recent Alluvium, Deccan Traps Gondwanas and Archaeans (Sausar

		series)
11.	HYDROGEOLOGY	
	<ul style="list-style-type: none"> ➤ Major water bearing formation ➤ (Pre- monsoon Depth to water level Range during 2012) ➤ (Post- monsoon Depth to water level Range during 2012) ➤ Long term water level trend Range Range in 10 yrs (2001-2010) in m/yr 	<p>Archaeans (Gneisses, Schist, Granites& Pegmatite), Gondwanas, Deccan traps, Alluvium Min.= 1.60m, Max. =35.00m</p> <p>Min.= 0.70m, Max. =17.19m</p> <p>Pre monsoon -Rising 0.02 to 0.2 m /year Fall 0.02 to 0.2m /year</p>
12.	GROUND WATER EXPLOITATION BY CGWB(As on 31- 03- 2013)	
	No of wells drilled (EW, OW, PZ, Total)	<p>Exploratory Wells =31 Observation Wells = 09 Piezometers (H.P) =12 Total = 52</p>
	Depth range(m) (EW)	35.60-201.30 m
	Discharge(litres per second)	0.10-10.00 lps
	Storativity(s)	-
	Transmissivity	4.78 m ² / day
13.	GROUND WATER QUALITY	
	Presence of Chemical constituent more than permissible limit	Ground water in phreatic aquifer is potable but excessive fluoride (1.60- 20.00 Mg/l) is noticed in deeper aquifers. EC- 280-1600, Nitrate- 1-243, Fluoride - .09-.97 in phreatic aquifer
	Type of water for irrigation purpose	C ₃ -S ₁ and C ₃ -S ₂ Type
14.	DYNAMIC GROUND WATER RESOURCES (2009)	
	Ground Water availability	1385.94 MCM
	Gross Annual Ground Water Draft	712.39 MCM
	Projected Demand for Domestic and industrial Uses for next 25 years (2033)	69.38 MCM
	Stage of Ground water Development	51 %
15.	EFFORTS OF ARTIFICIAL RECHARGE & RAINWATER HARVESTING	Recommended construction of Artificial recharge structures in Fluoride –affected areas and Artificial Recharge through dug well
16.	GROUND WATER CONTROL AND REGULATION	
17.	AWARENESS AND TRAINING ACTIVITY	Water Management Training Programmes-1
	Number of Semi-Critical Blocks	1 (Chhindwara)
18.	Major Ground water problems	Fluoride –affected District

1.0 INTRODUCTION

Chhindwara district was formed on 1st November 1956. It is located on the Southwest region of 'Satpura Range of Mountains'. The district is spread over an area of 11,850 Sq. km and is located at the southern boundary of the state, laying between North Latitudes 21^o 28' and 22^o 50' and East longitudes 78^o 15' and 79^o 25' falls under the Survey of India Topo Sheet No. 55 J, K, N, & O. The district is bounded by Narsinghpur and Hoshangabad district in the north, Seoni district in the east, Betul district in the west and by Maharashtra state in the south (Fig-1).

The District is divided into 12 Tahsils (Chhindwara, Tamia, Parasia, Jamai, Chourai, Amarwara, Sausar, Bichhua Umreth, Mohkhed, Harrai and Pandhurna) and 11 Development Blocks (Chhindwara, Mohkhed, Tamia, Parasia, Jamai, Amarwara, Harrai, Chourai, Sausar Bichhua, and Pandhurna). There are 1984 villages in the district, out of which 1903 villages are inhabited (Table.1)

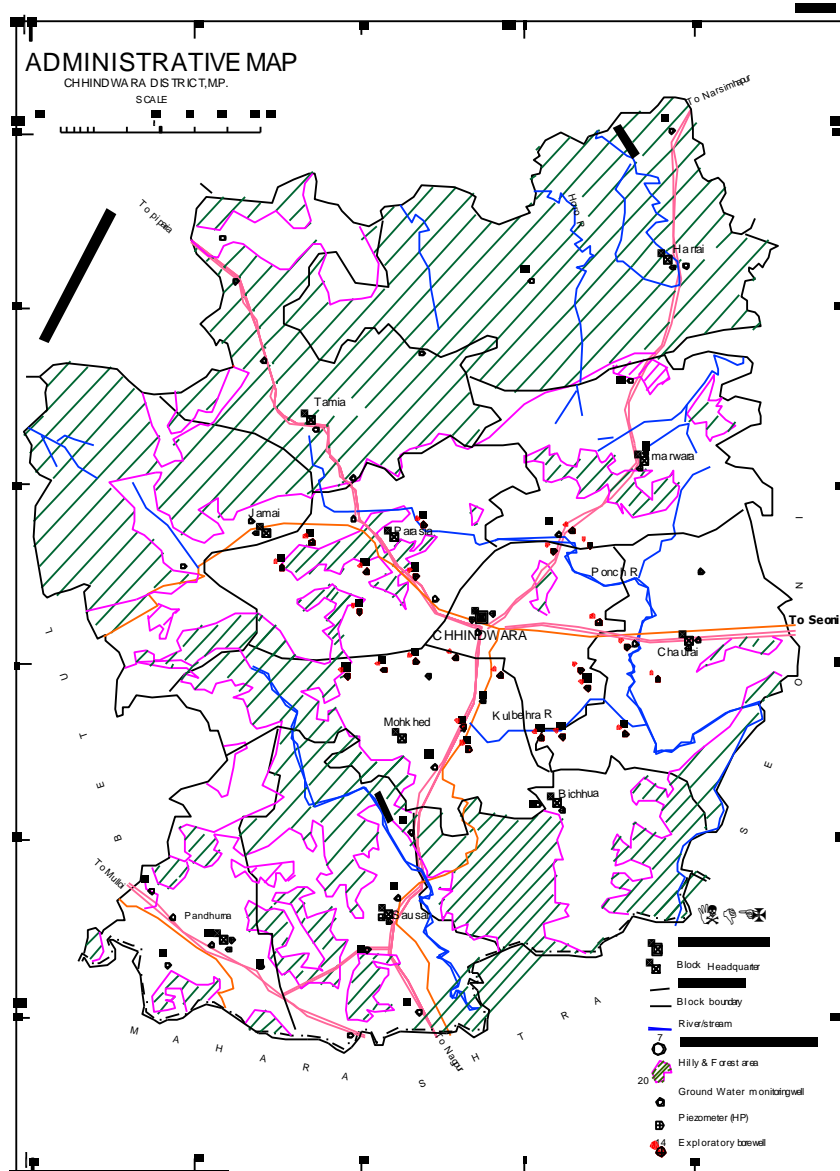
As per Census 2001, the total population of the district is 18, 48,882 out of which 76.90% belong to rural areas. The Scheduled Caste and Scheduled Tribes population is 2, 14,201 and 6, 41,421 respectively.

Table 1. Administrative units of Chhindwara district.

S. No.	Blocks	Area in Sq. km.
1	Amarwara	1022
2	Bichhua	527
3	Chhindwara	683
4	Chourai	1172
5	Harrai	2107
6	Jamai	1424
7	Mohkhed	775
8	Pandhurna	972
9	Parasia	787
10	Sausar	808
11	Tamia	1538
	Toatal	11815

The district lies in parts of the Narmada and the Godavari basin, Wainganga sub basins. The total catchments areas of the Narmada & the Wainganga rivers falling in the district are 3,555 and 8,295 Sq. km respectively. The major tributaries of the Godavari River are Kanhan, Pench and Wardha, while Sakkar, Sitarewa, Dudh are tributaries of Narmada River

Crops: Paddy, Barley, Maize, Tuar, Urad, Soyabean, Sugarcane, Groundnut, Cotton (KHARIF) and Wheat, Gram & Vegetables (RABI) are the main crops. The total irrigated area is 1504 Sq. km., of which 108 Sq. km. was irrigated by canals, 367 Sq. km. by tube wells and 928 Sq. km. by open wells



Activities carried out by CGWB

The Scientists of Central Ground Water Board carried out Systematic Hydro geological Surveys during various Field Season Programmes:

- Sh. L.M. Mothghare during 1978-79, 1979-80, & 1984-85; Sh. P. Srinivasan during 1987-88; Sh. J.N. Rao, during 1978-79; Sh. A.B. Deshmukh & Seraj Khan, during 1987-88).

- Reappraisal Hydrogeological Surveys were carried out by Sh. C. Paul Prabhakar Scientist-B, in Mohkhed, Chhindwara & Chourai blocks of Chhindwara district during Annual Action Plan 1991-1992.
- Ground water management studies were carried out by G. Bhaskara Rao, Scientist-C, in Mohkhed, Chhindwara & Chourai blocks of Chhindwara district during Annual Action Plan 1999-2000.
- Ground water management studies were carried out by G. Bhaskara Rao, Scientist-C, in Amarwara and Harrai blocks of Chhindwara district during Annual Action Plan 2000-2001.
- Ground water management studies were carried out by G. Bhaskara Rao, Scientist-C, in Tamia, Parasia, and Jamai blocks of Chhindwara district during Annual Action Plan 2001-2002.
- Ground water management studies were carried out by G. Bhaskara Rao, Scientist-C, in Bichhua, Sausar and Pandhurna blocks of Chhindwara district during Annual Action Plan 2002-2003.
- Exploratory drilling operations were carried out by the CGWB during AAP 1999-2000, 2000-2001 and 2001-2002 in the entire district area (S/Shri D.K.Rai, A.K.Jain and S.K Shrivastava, Hydrogeologists attended drilling operations).
- Technical guidance provided in Artificial recharge through dug well scheme

2.0 RAINFALL AND CLIMATE

A hot summer and general dryness characterize the climate of the area, except during the southwest monsoon season. The year may be divided into four seasons. The cold season, December to February is followed by the hot season from March to about the middle of June. The period from the middle of June to September is the south-west monsoon season. October and November form the post monsoon or transition period.

The normal annual rainfall of Chhindwara district is 1139.3 mm. The district receives maximum rainfall during south-west monsoon period i.e. June to September. About 85.7 % of the annual rainfall falls during monsoon season. Only 14.3 % of the annual rainfall takes place between Octobers to May period. Thus, surplus water for ground water recharge is available only during the southwest monsoon period.

The normal maximum temperature noticed during the month of May is 39.4⁰ C and minimum during the month of December 9.8⁰ C The normal annual mean minimum and maximum temperatures has been worked out as 18.2⁰ C and 30.6⁰ C respectively.

During the south-west monsoon season, the relative humidity generally exceeds 87% (August month) and the rest of the year is drier. The driest part of the year is the summer season, when relative humidity is less than 33%. May is the driest month of the year.

The wind velocity is higher during the pre-monsoon period as compared to post-monsoon period. The maximum wind velocity, 9.5 km/hr observed during the month of June and minimum, 3.3 km/hr during the month of November. The average annual wind velocity in is 5.4 km/hr.

3.0 GEOMORPHOLOGY AND SOIL TYPES

Physiographically the district has been divided broadly in to two main geomorphic units - one is Satpura plateau and other is Nagpur plateau. The hill ranges lying in the northern part of the district belong to the *Mahadeo* hill ranges of the Satpura mountains stretching nearly east-west. These hills form the water divide. The district can be further divided in to four parts. I) Northern hilly region II). Central high plateau region III). Southern low grounds IV). Upland trough of *Jam* and *Kanhan* rivers. Presence of fluvial units showing occurrences of alluvium in the flood plains of all major streams and rivers, buried pediplains showing denudational hills of sandstone as seen in western part of the district. Similarly structural hills, covered by Gondwanas, are seen in northern part, denudational hills in southern part and dissected Deccan plateau in eastern and northeastern parts of the district.

The soils in the district are generally of three types Viz., black cotton soil, sandy loam soil and clayey loam soils. The black cotton soils occur mainly in Sausar Tahsil while sandy loam soil is found in Chhindwara Tahsil. The clayey loam is predominant in Amarwara Tahsil. The northern hilly region covered by loamy soils, are very shallow, somewhat excessively drained, developed by moderately steep slopes and are marked by severe erosion.

4.0 GROUND WATER SCENARIO

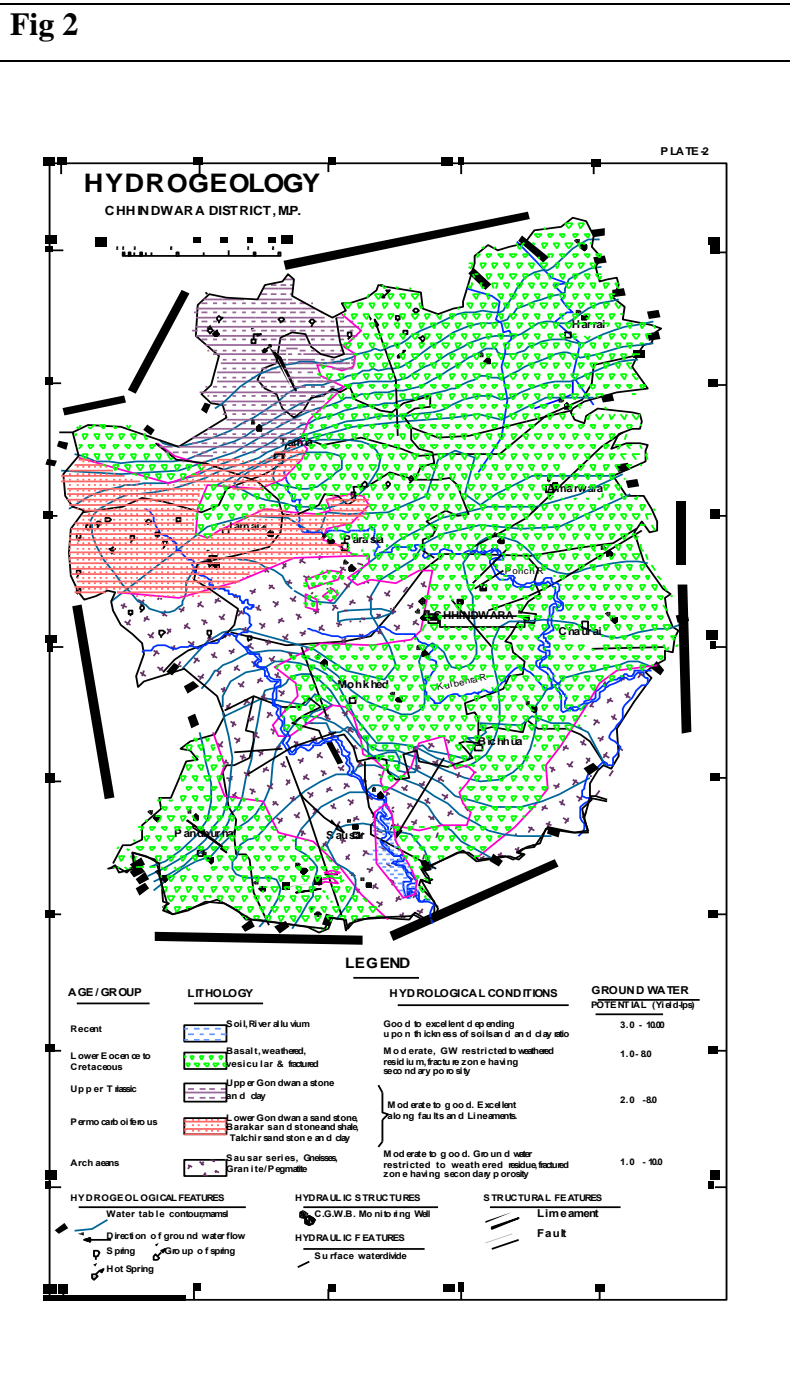
4.1 Hydrogeology

i) Aquifer System

The major part of the district is occupied by Deccan Trap, consisting of different lava flows whose thickness ranges between 7 to 21 m. The recent alluvium deposits are found at places along the *Pench* and the *Kanhan* rivers with thickness varying from 5.00 to 20.00 m. Alluvium comprises clayey material with intercalated layers of sand and gravels. Archaeans are exposed in parts of Sausar, Bichhua, Chhindwara, Jamai and Mohkhed blocks whereas the Coal bearing lower Gondwanas in parts of Jamai, Parasia and Jamai blocks. The upper Gondwanas occupy parts of Harrai and Tamia blocks.

Ground water occurs under phreatic and semi-confined to confined conditions. Alluvium, weathered granites/gneisses, lower Gondwana sandstones, weathered, fractured and jointed massive basalts and vesicular basalts form the major phreatic aquifers; and weathered,

fractured granites are noticed as main water-bearing zones at deeper levels. It is observed that the discharge of dug wells tapping alluvium and vesicular basalt ranges between 80 and 235 m³/day respectively and jointed massive basalts and weathered gneisses range from 44 to 177 m³/day and from 61 to 77 m³/day respectively. Hydrogeological details of some of CGWB exploratory bore wells are given in Table 2. Water bearing fractured zones is encountered between the depths of 71.00 and 176.00 m bgl at deeper levels. The discharge in weathered, fractured granite at deeper levels ranges from 0.2 to 10.00 l/s (Fig-2).



ii) Water levels

Water level data, including historical data, are essential for not only to know the present ground water conditions but also for forecasting future trends in response to ground water reservoir operations. Using the water level data of 34 monitoring wells of Chhindwara district, Pre and Post monsoon depth to water level maps are reproduced.

iii) Pre- monsoon (May 2012)

Pre monsoon depth to water levels in the year 2012 range from 3.651.76 to 35 m bgl. Shallow water levels (< 4.00m) occur in west the district. Water levels between 8.0-20.00 m noticed in major part of the area and water levels between more than 20 m bgl is observed south western part, where intense agricultural activities are noticed. The deepest water level of 35 m bgl was recorded in the well at Pandurna. The long-term water level trend (2001 to 2010) shows declining trend ranges from 0.02 to 0.2 m/year (Pre- monsoon). Water level fall is noticed particularly in Sausar and Pandhurna block areas where a large-scale withdrawal of ground water for irrigation purpose is observed (Fig-3).

iv) Post- monsoon (May 2012)

During post monsoon period, water levels ranges from 0.70 to 15.00 m bgl. Shallow water level (< 5.00 m) occurs in north, while deep water levels (>10.00m) observed in southern part. The deepest water level of 15.00 m bgl was also recorded in the well at Sarangbheri and Water level fluctuation between pre and post monsoon period ranges from 0.30-to-7.60 m. (Fig3-4).

Fig 3

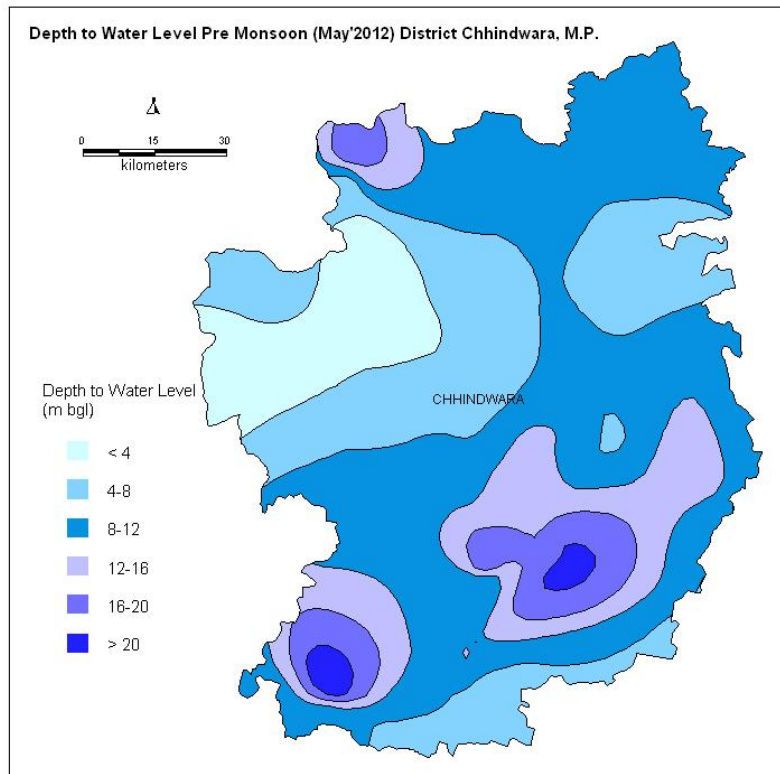


Fig 4

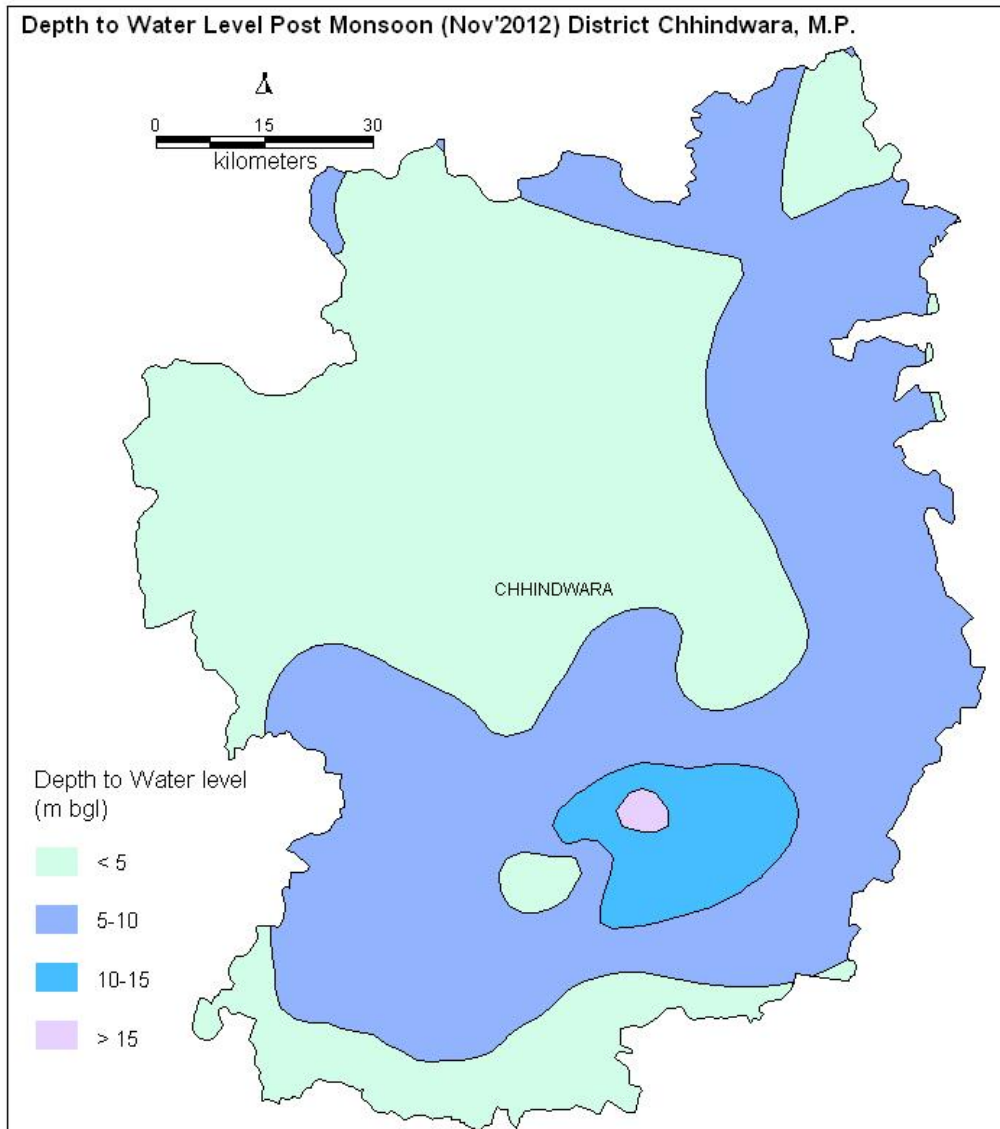


Table 2. Hydrogeological details of CGWB exploratory bore wells.

S. No.		Depth Drilled (m bgl)	Depth of Well constructed (m bgl)	Zones tapped (m bgl)	Aquifer material	Static water level (m bgl)	Discharge (lps)	Draw down (m)	Remarks/ Fluoride
1	Jhiilmili	127.10	127.10	82-90; 115-126	Fractured granite	58.90	4.07	8.72	2.5
2	Rajakhodhana	103.70	103.70	88.5-103.7	Fractured granite	20.98	10.0	38.45	20.00
3	Khakra Chaurai	137.20	137.20	82-84; 122-137	Fractured granite	19.22	5.04	67.45	15.00
4	Panjara	138.30	138.30	82-92.5; 135. 5-138.3	Fractured granite	52.88	3.41	-	
5	Loniamaru	167.70	167.70	71-82;97.5-107;140-146	Fractured granite	48.48	4.07	13.16	10.00
6	Khedi Bhutai	183.00	183.00	-	Basalt	80.00	Meager	-	
7	Atarwara	134.20	130.00-133.00	130-134	Fractured granite	71.72	4.5	26.28	9.00
8	Sarra	183.00	43.00	9-15.5; 18.00-27.00; 30.50-36.50	Fractured granite	6.50	1.1	22.37	1.95
9	Sahapura	183.00		Abandoned	Fractured granite	9.84	0.40	67.06	0.49
10	Ubhegaon	152.50	152.50	-	Basalt & Fractured granite				Abandoned
11	Datla	183.00	183.00	30-45 (basalt)	Basalt & Fractured granite	27.30	1.0	-	Abandoned
12	Bichhbi	201.30		115.90 – 128.10	Basalt & Fractured granite				Abandoned
13	Bisapur	183.00	183.00		Basalt & Fractured granite				Abandoned
14	Datla	183.00	183.00	30.00 – 45.00	Basalt & Fractured granite	27.30	1.00	-	
15	Gangiwara	183.00			Fractured granite	15.81	0.84	-	
16	Goreghat	183.00	-	-	Basalt & Fractured granite	9.58	-	-	Abandoned
17	Jatama	173.80	-	-	Fractured granite	88.55	1.00	-	9.00 Abandoned
18	Khunajhir Khurd	113.90	113.90	14.00 – 20.00	Basalt & Fractured granite	17.30	1.85		8.50 Abandoned
19	Lawagogri	183.00	-	-	Fractured granite	3.25	Poor		Abandoned
20	Rajara	125.00	125.00	-	Basalt & Fractured granite	80.93	3.38	-	
21	Ridhora Mal	183.00	183.00	-	Fractured granite	72.50	1.60	-	1.75
22	Salimeta	201.30	-	39.00 – 42.00	Basalt & Fractured granite	Dry	-	-	Abandoned
23	Umret	183.00	-		Fractured granite	25.28	3.00	72.27	1.30
24	Chhinda	118.90	-	18.00 – 70.00	Basalt	-	-	-	Abandoned

4.2 GROUND WATER RESOURCES (2009)

The entire district, command and Non Command areas, falls under Safe Category, except Chhindwara block which is falling under Semi -Critical category where stage of ground water development is 93%.

The net annual ground water availability in the district is 138594 ham and draft from all uses is 71239 ham. Net ground water available for future irrigation use is 65615 ham (Table 3)

Table 3. Ground water availability and stage of development

District/ Assessment Unit	Sub-unit Command/ Non- Command/	Net Annual Ground water Availabili ty (ham)	Existing Gross Ground water Draft for Irrigation (ham)	Existing Gross Ground water Draft for Domestic & Industrial water Supply (ham)	Existing Gross Ground water Draft for All uses (ham)	Provision for domestic, and industrial requirement supply to next 25 year (2033) (ham)	Net Ground water Availability for future irrigation d development (ham)	Stage of Ground water Development (%)	Category
Chhindwara									
Amarwara	Command								
	Non- Command	16495	5415	638	6053	864	10216	37	Safe
	Block Total	16495	5415	638	6053	864	10216	37	Safe
Bichhua	Command								
	Non- Command	6310	3035	195	3230	306	2969	51	Safe
	Block Total	6310	3035	195	3230	306	2969	51	Safe
Chindwara	Command								
	Non- Command	12810	10811	1122	11933	1250	749	93	Semi Critical
	Block Total	12810	10811	1122	11933	1250	749	93	Semi Critical
Chourai	Command								
	Non- Command	19915	11648	427	12075	679	7589	61	Safe
	Block Total	19915	11648	427	12075	679	7589	61	Safe
Harrai	Command								Safe
	Non- Command	11910	2119	198	2317	279	9512	19	Safe
	Block Total	11910	2119	198	2317	279	9512	19	Safe
Jamai	Command								
	Non- Command	15277	3278	499	3778	621	11378	25	Safe
	Block Total	15277	3278	499	3778	621	11378	25	Safe
Mohkhed	Command	1080	245	23	267	68	68	25	Safe
	Non- Command	11092	7822	383	8205	551	551	74	Safe
	Block Total	12172	8067	405	8473	619	3486	70	Safe
Pandhurna	Command								
	Non- Command	16879	10305	428	10733	594	5980	64	Safe
	Block Total	16879	10305	428	10733	594	5980	64	Safe

Parasia	Command								
	Non-Command	10816	6654	642	7296	721	3441	67	Safe
	Block Total	10816	6654	642	7296	721	3441	67	Safe
Sausar	Command	1001	186	34	220	62	753	22	Safe
	Non-Command	7596	3774	389	4164	623	3198	55	Safe
	Block Total	8596	3961	423	4384	685	3951	51	Safe
Tamia	Command								
	Non-Command	7414	750	220	969	320	6345	13	Safe
	Block Total	7414	750	220	969	320	6345	13	Safe
	District Total	138594	66042	5197	71239	6938	65615	51	Safe

4.3 GROUND WATER QUALITY

The EC value of water samples ranges between 280-1600. Nitrate value of water samples ranges between 1-243 and Fluoride between.09-.97 in phreatic aquifer. Ground water in phreatic aquifer is potable but excessive **fluoride** (1.60-20.00 Mg/l) is noticed in deeper aquifers.