

DISTRICT GROUND WATER INFORMATION BOOKLET



INDORE DISTRICT

MADHYA PRADESH

Ministry of Water Resources
Central Ground Water Board
North Central Region
Bhopal
2013

INDORE DISTRICT - DISTRICT AT A GLANCE

S.No.	ITEMS	Statistics	
1.	GENERAL INFORMATION		
	i) Geogeaphical area (Ha)	389800	
	ii) Administrative Divisions Number of Tehsil/Blocks Number of Villages	4/4 661	
	iii) Population (2011)	32,72,335	
	iv) Normal Rainfall (mm)	960.90	
2.	GEOMORPHOLOGY		
	Major Physiographic Units	Plateaus, plains of extrusive origin, colluvial fans.	
	ii) Major Drainage	Chambal, Gambhir, Kshipra, Khan (Ganga basin) & Choral, Kanar (Narmada basin)	
3.	LAND USE (Ha '000)		
	i) Forest area:	52.20	
	ii) Net area sown:	264.20	
	iii) Gross cropped area:	437.80	
4.	MAJOR SOIL TYPES	Medium Black Soil	
5.	PRINCIPAL CROPS	Wheat, Soyabean	
6.	IRRIGATION BY DIFFERENT SOURCES (Area and Number of Structures)	Area (Ha '000)	Number
	Dugwells	18.30	10699
	Tube wells/Bore wells	118.20	41630
	Tanks/Ponds	5.10	276
	Canals	17.70	-
	Other Sources	17.0	-
	Total Irrigated Area	177.30	
7.	NUMBER OF GROUND WATER MONITORING WELLS OF CGWB(As on 31.3.2013) No. of Dug Wells No. of Piezometers	9 28	
8	PREDOMINANT GEOLOGICAL FORMATIONS	Basalt (Deccan Traps)	
9	HYDROGEOLOGY Major Water Bearing Formation	Basalt (fractured/weathered)	
	Pre-monsoon depth to water level during 2012	3.17 – 30.59 mbgl	

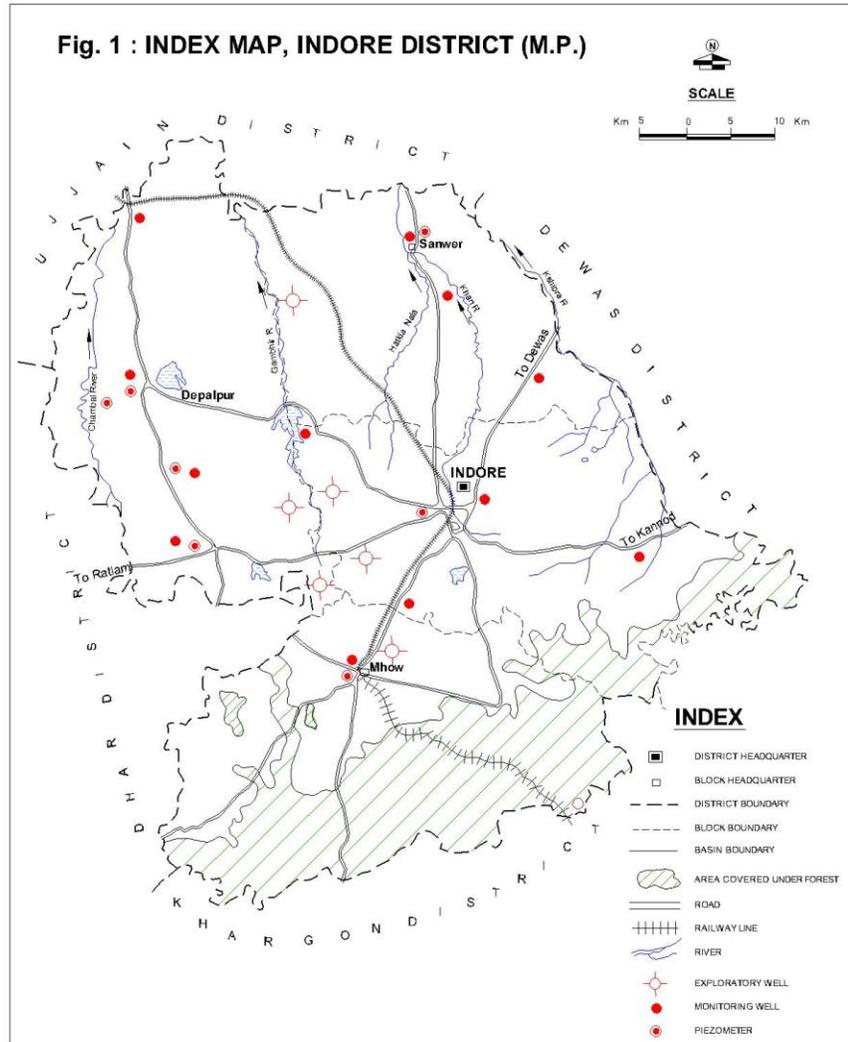
	Post-monsoon depth to water level during 2012 Long Term water level trend in 10 years (2003 - 2012) in cm/yr Pre monsoon b) Post monsoon	2.01 – 11.71 mbgl Rise: 15.88 – 26.44cm/yr. Fall: 10.06- 12.14 cm/yr Rise: 3.09 – 19.36 cm/yr Fall : 12.19 cm/yr
10.	GROUND WATER EXPLORATION BY CGWB (As on 31.3.2013)	
	No of wells drilled (EW,OW,PZ,SH, Total)	9 EW, OW 14, Pz 37
	Depth Range (m)	33-238.00 mbgl
	Discharge (litres per second)	0.5-6.33
	Transmissivity (m ² /day)	31.8-149.6
11.	GROUND WATER QUALITY	EC 586 - 3780 µS/cm) NO ₃ 0.5 – 296 mg/l F 0.12 – 0.48 mg/l
12	DYNAMIC GROUND WATER RESOURCES (2009) in Ham	
	Net Ground Water Availability	52314
	Gross Ground Water Draft	65620
	Projected Demand for Domestic and Industrial Uses upto 2035	3931
	Stage of Ground Water Development	125%
13.	AWARENESS AND TRAINING ACTIVITY	
	Mass Awareness Programmes Organised Date Place No. of Participants	1 22.9.2000 Indore 225
14	EFFORTS OF ARTIFICIAL RECHARGE & RAINWATER HARVESTING	
	Projects completed by CGWB (No. & Amount Spent)	1 Rs. 6.92 lakhs
	Projects under technical guidance of CGWB (Numbers)	Nil
15.	GROUND WATER CONTROL AND REGULATION	
	Number of OE Blocks	3
	Number of Semi Critical Blocks	1
	Area notified	Indore Municipal Corporation.
16	MAJOR GROUND WATER PROBLEMS AND ISSUES	Over - exploitation

1.0 INTRODUCTION

Indore district lies in the heart of Malwa plateau and covers an area of 3831 sq km. It is bounded by N latitudes 22° 31' and 23° 05' and E longitudes 75° 25' and 76° 15' in the survey of India toposheet nos. 46M, 46N and 55B.

Indore district is bounded in the north by Ujjain district, in the south by Khandwa district, in the east by Dewas district and in the west by Dhar district. Indore district is divided into four tehsils and four development blocks. It has 661 villages. The total population of the district is 32,72,335 (2011 Census).

The district lies partly in the Chambal sub basin of the Ganga basin (75%) and partly in the Narmada basin (25%). The main rivers draining the district in the north are Chambal, Gambhir, Khan and Shipra. The southern fringe of the district, south of the hills is drained by the river Narmada, flowing from east to west. Its main tributaries are Choral and Kanar.



2.0 RAINFALL & CLIMATE

The climate of Indore district is characterized by hot summer and well-distributed rainfall during the southwest monsoon season. Monsoon arrives generally in the middle of June and the weather becomes pleasant. January is

generally the coolest month. Sometimes in December, the minimum temperature drops down to even as low as about 2 to 3°C. There are seven rain gauge stations in Indore district, namely Indore, Mhow, Manpur, Depalpur, Sanwer, Hatod and Gautampura. Normal annual rainfall of the district is 960.96 mm. The district receives maximum rainfall during the south west monsoon period. Thus about 91.2 % of the total annual rainfall takes place during the south west monsoon period (June to September) alone. The maximum monthly rainfall takes place during the month of July. Season wise, the distribution of rainfall during the remaining period of the year is somewhat as follows:

3.0 GEOMORPHOLOGY & SOIL TYPE

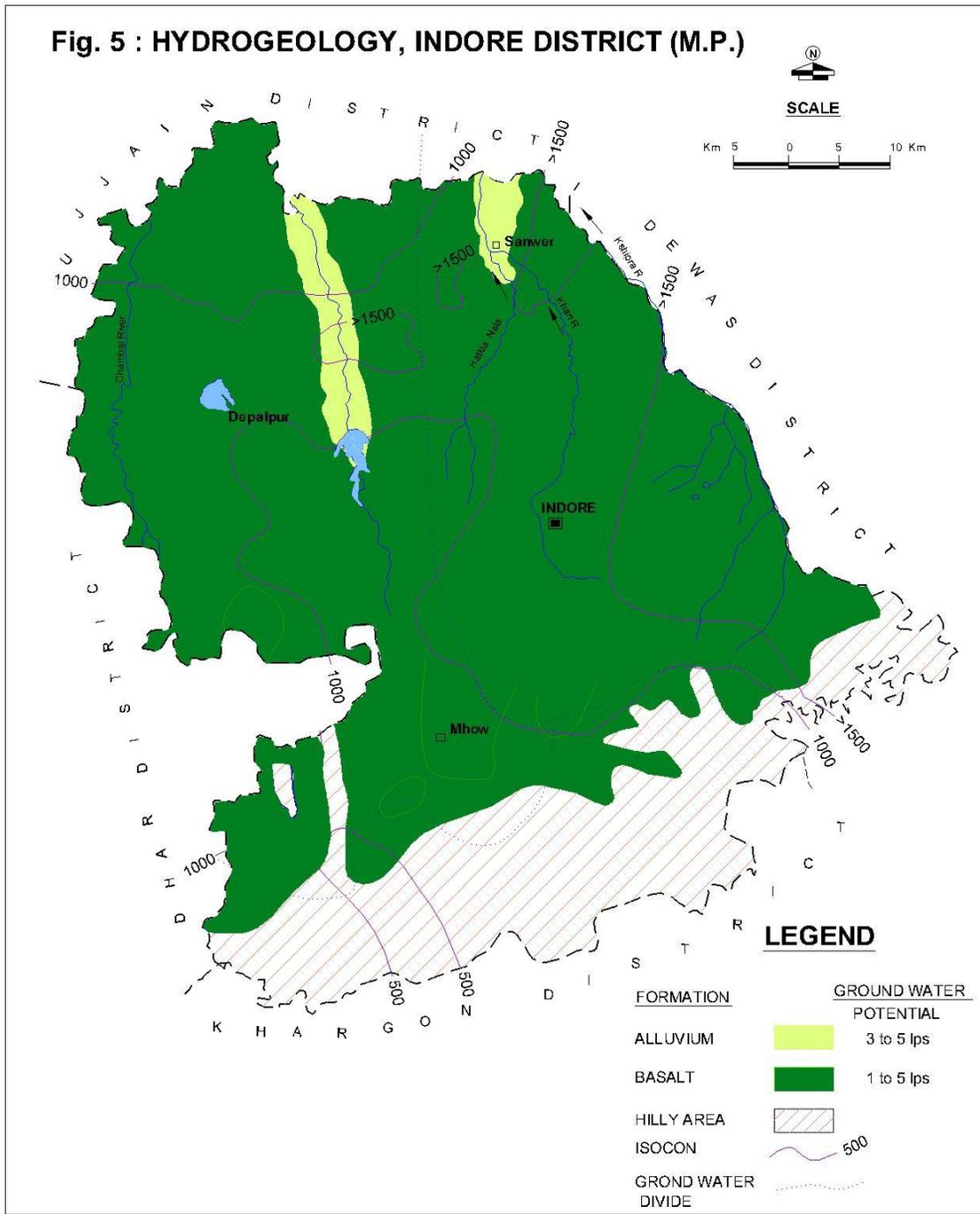
Geomorphologically, the district can be divided into three units; Units of extrusive origin, units of denudational origin and units of fluvial origin (Plate II). The units of extrusive origin comprise of Region of middle level plateaus (550-900m amsl), Region of low level plateaus (350-550m amsl) and Plain. The Region of middle level plateaus is scattered, while the Regions of low-level plateaus form the main unit in the district. The Plain occupies a very small area around the border of Khandwa district. Of the units of denudational origin, denudational slope on Deccan Trap occupy a large area in Mhow block and is mostly covered with forests. The undifferentiated colluvial fans occupy a very small area in Mhow block. The Unit of fluvial origin viz; floodplain is confined to the drainage of the main rivers in the district.

The district is covered by medium black soils. These soils are 0.46 to 0.9 meters thick and are rich in lime and lime nodules. The sub-soil and the partially disintegrated rock below allows easy drainage and hence these medium black soils can be freely irrigated.

3.0 GROUND WATER SCENARIO

4.1 Hydrogeology

The Deccan Traps, which are the predominant rocks in the district, have wide variation in the water bearing properties of the different units constituting them. The massive basalts their weathered zones and secondary porosities and the vesicular basalts with their minutely connected and partially filled vesicles play an important role in determining the occurrence, movement and storage of ground water. These invariably form potential aquifers. The red-bole is non productive. In the alluvial areas, the occurrence of ground water is governed by sand/clay ratio. The sand beds generally form good aquifers, but due to the limited thickness and erratic occurrence in the form of lenses, the ground water structures in them are poor to moderately productive.



The main source of recharge to the basaltic aquifer in the district is rainfall. To some extent, recharge also takes place by influent seepage from the streams and their tributaries. Due to low permeabilities of basalts and undulating topography, the run off is very high. This restricts the recharge to ground water body. This is reason for large scale seasonal fluctuation in the water level of the wells tapping trappean formation. Ground Water in the Deccan Traps in Indore

district occurs mostly under water table conditions. The nature of topography, extent and depth of weathering, distribution of secondary porosity in the form of fractures and joints and the occurrence and disposition of vesicular units govern the movement of ground water.

At some places, confined conditions area also observed due to the alternating nature of the impermeable massive and productive vesicular basalts. At places, like Khajarana, Betma and Gautampura, semi-artesian conditions are also observed.

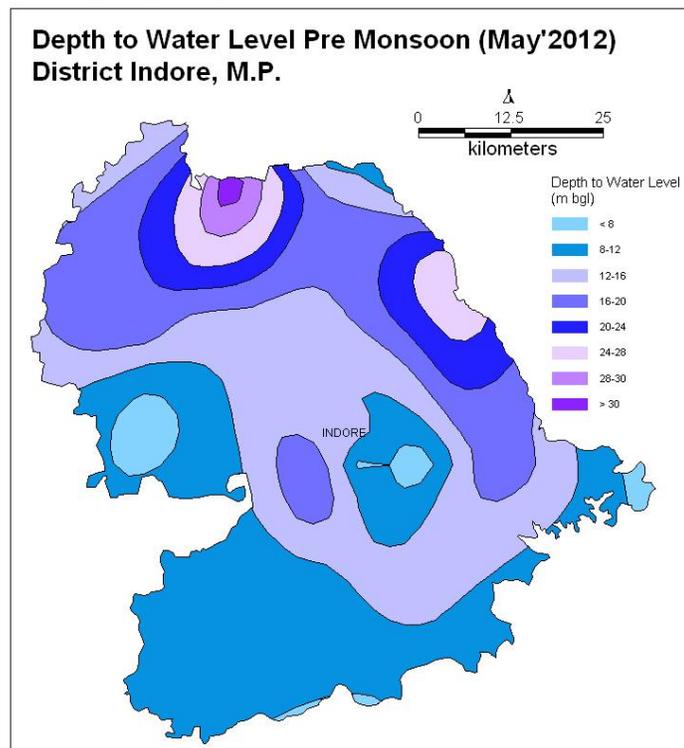
The Central Ground Water Board has drilled 9 exploratory wells, 14 observation wells and 37 piezometers in the district. These boreholes drilled down to a depth of 100 mbg. Older Trap have recorded higher yields – 375 to 825 lpm as compared to boreholes piercing younger trappean units in the southern part of the district where the yields vary between 75 to 225 lpm. It has also been observed that the yields of dug-cum-bore wells tapping confined aquifers are two to three times higher than the yields of wells tapping the water table aquifer.

A study of the lithologs of exploratory wells and piezometers indicate that almost ten vesicular layers have been encountered within a thickness of 218 m. The individual layers vary in thickness from 3 to 20 meters. Pumping tests were carried out at Rojri, Harsola and Sonway. The discharge during the tests ranged between 160 and 260 lpm. The transmissivity values ranged between 127.7 m²/day to 149.6 m²/day. It was observed that the vesicular zones occurring below a depth of 30 m have poor water yielding capacity. The thickness of the weathered formation encountered ranges between 6 and 30 m. The thickness of the water bearing zones is generally between 1 and 3 meters. However, a 14 m thick water bearing zone was struck at Gautampura.

4.2 Water Levels

4.2.1 Depth to Water Level – Pre-monsoon (2012)

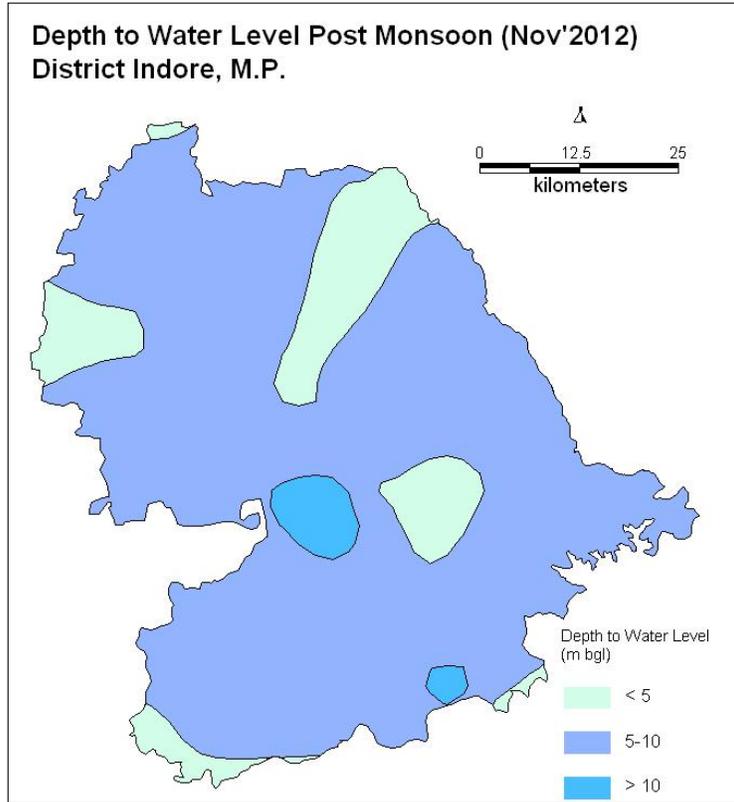
Depth to water level data reveals that the water levels in the range of 10-20 mbgl occupy major part of the Depalpur Block and a maximum part of Indore Block. Some parts of Mhow and Sanwer Blocks have



water levels in the range of 10-20 mbgl. Shallower water levels of 5-10 mbgl cover the remaining parts of the district.

4.2.2 Depth to Water Level – Post-monsoon (2012)

Depth to water level data reveals that a major part of the district has water levels in the range of 2-5 mbgl. Some parts of Sanwer and Depalpur Blocks have water levels in the range of 5-10 m bgl as also do isolated patches in Indore Block and some part in Mhow Block. Deeper water levels >10 m bgl are found in north western part of Depalpur Block.



4.2.3 Groundwater level trend (May2003 to May 2012)

Analyses of Groundwater level data of pre-monsoon period indicate that there is rise as well as decline in water level in the district. In general, rise in water level is in the range of 15.88 to 26.44 cm/year whereas decline is in the range of 10.06 to 12.14cm/yr.

4.3 Ground Water Resources

Dynamic ground water resources of the district have been estimated for base year -2008/09 on block-wise basis. There are four number of assessment units (block) in the district which fall under non-command (99 %) and command (1.% Mhow and Depalpur) sub units. Mhow block of the district is categorized as semi critical and Depalpur , Indore and Sanwer as over exploited. The highest stage of ground water development is computed as 148 % in Indore block. The net ground water availability in the district is 52,314 ham and ground water draft for all uses is 65,620 ham, making stage of ground water development 125 % (104 % in 2003/04) as a whole for district. After making allocation for future domestic and industrial supply for next 25 years, balance available ground water for future irrigation would be negative.

Table: Ground water availability and Stage of development

S. No.	District/ Assessment Unit	Sub-unit Command/ Non- Command/	Net Annual Ground water Availability (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 (%)
21	Indore								
	Depalpur	Command	399	184	16	200	25	190	50
		Non-Command	13513	17184	688	17872	688	-4359	132
		Block Total	13912	17368	704	18072	713	-4169	130
	Indore	Command		184					
		Non-Command	17885	25405	990	26395	990	-8510	148
		Block Total	17885	25405	990	26395	991	-8511	148
	Mhow	Command	620	150	52	202	76	394	33
		Non-Command	10947	7333	982	8315	1712	1901	76
		Block Total	11567	7483	1033	8517	1788	2296	74
	Sanwer	Command							
		Non-Command	8950	12198	439	12637	439	-3687	141
		Block Total	8950	12198	439	12637	439	-3687	141
		District Total	52314	62454	3166	65620	3931	-14072	125

4.3 Ground Water Quality

Quality of Ground Water for drinking

Ground water quality in Indore district is assessed annually by CGWB on the basis of water samples collected from hydrograph stations in the district. Ground water in the district is generally medium to high saline as electric conductivity values varies between 586 to 3780 $\mu\text{s}/\text{cm}$. Nitrate in the ground water of Indore district is varying between 0.5 to 296 mg/l. Nitrate more than 45 mg/l was found in four villages namely Sanwer (52 mg/l), Hatod (79 mg/l), Machal (139 mg/l) and Ushapura (177 mg/l). High nitrate in the village area is apparently due to excessive use of fertilizers and agricultural waste. The total hardness of ground water in the district is generally under safe limit as per BIS standards. Ground water of Machal, Sanwer and Ushapura village is not safe for drinking. Fluoride in the district is in the range of 0.12 to 0.48 mg/l, i.e. well below 1.5 mg/l. No arsenic has been detected in the district.

Quality of water for irrigation

High SAR is not good for irrigation as it leads to sodium hazard. Water samples in the district generally fall in $C_2 S_1$, $C_3 S_1$ and $C_4 S_1$ classes of US salinity diagram. However, ground water in the district is generally safe for irrigation but proper drainage system is required where EC is more than 1500 $\mu\text{s}/\text{cm}$.