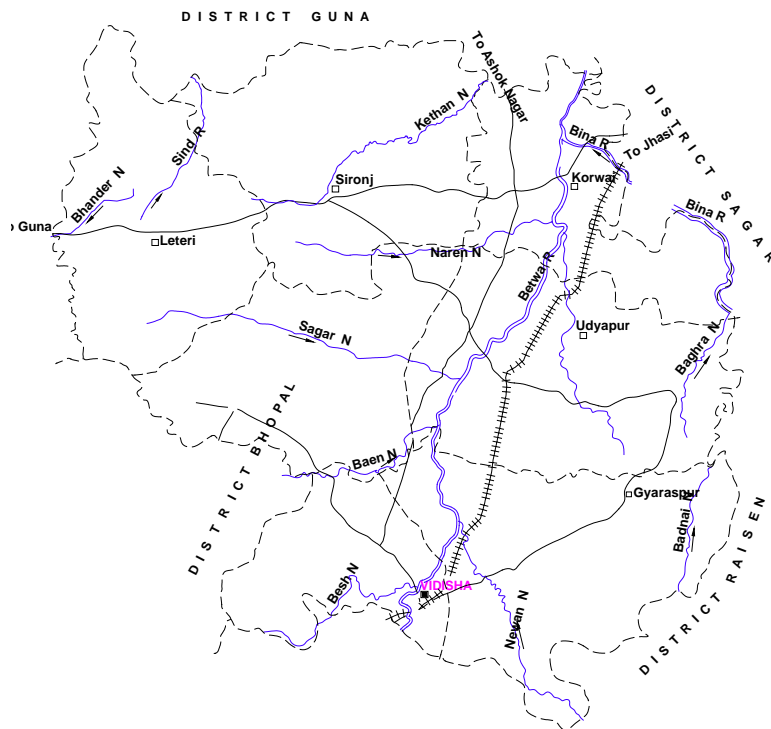


# DISTRICT GROUND WATER INFORMATION BOOKLET



## VIDISHA DISTRICT MADHYA PRADESH



**Ministry of Water Resources**  
**Central Ground Water Board**  
**North Central Region**  
Government of India

JUNE, 2009

## VIDISHA DISTRICT AT A GLANCE

S.No.	ITEMS	STATISTICS		
1.	<b>General Information</b>			
	i) Geographical area	7371 Km <sup>2</sup>		
	ii) Administrative Divisions (As on 2006 ) Number of Tehsil/Blocks	7/7 (Vidisha, Gyarspur, Basoda, Nateran, Kurwai, Sironj, Lateri)		
	No of Janpad Panchayats Panchayats/Villages	07/2113		
	iii) Population (Census 2001)	12,14,857		
iv) Average Annual Rainfall (mm)	1159.7			
2.	<b>Geomorphology</b>			
	1. Major Physiographic Units:  2. Major Drainage:	Malwa Plateau, Vindhyan Hill Range and Betwa Alluvium Betwa River, Bah Nadi, Nion River, Keother Nadi, Bina River, Kethan nadi and Sindh River		
3.	<b>Land Use (Km<sup>2</sup>)</b>			
	i) Forest area:	1084.71		
	ii) Net area sown:	5310.71		
	iii) Cultivable area:	5847.32		
4.	<b>Major Soil Types</b>			
5.	<b>Area Under Principal Crops ( June'2006)</b>			
6.	<b>Irrigation by Different Sources</b>		Nos.	Irrigated area km <sup>2</sup>
	Dugwells		11822	393.05
	Tube wells/Bore wells		12193	1002.95
	Tanks/Ponds		23	42.56
	Canals		11	386.56
	Other Sources		-	606.38
	Gross Irrigated Area			2431.50
	7.	<b>Number of Ground Water Monitoring Wells of CGWB (As on 31.3.2007)</b>		
No. of Dug Wells		20		
	No. of Piezometers	6		
8	<b>Predominant Geological Formations</b>			
	Deccan Trap basalts underlain by Vindhyan sandstone and overlain by river alluvium			
9	<b>Hydrogeology</b>			
	Major Water Bearing Formation			
	(Pre-monsoon depth to water level during 06)			
	(Post-monsoon depth to water level during 06)			
	3.00 – 13.66 mbgl			
	1.81 – 9.1 mbgl			
	Long Term water level trend in 10 years (1997-2006) in m/yr			
	Pre-monsoon 0-3.79 m/annum fall and 0-4.82 m/annum rise Post-monsoon 0.0- 0.27 m/annum fall and 0.05-1.87 m/annum rise			

10.	<b>Ground Water Exploration By CGWB (As on 31.3.2007)</b>	
	No of wells drilled (EW,OW,PZ,SH, Total)	25
	Depth Range (m)	18.0 – 242.0 mbgl
	Discharge (litres per second)	0.5 – 8.3
	Storativity (S)	
	Transmissivity (m <sup>2</sup> /day)	0.5- 32 m <sup>2</sup> /day
11.	<b>Ground Water Quality</b>	
	Presence of Chemical constituents more than permissible limit (e.g. EC, F, As, Fe)	Chloride & Nitrate
	Type of Water	Alkaline
12	<b>Dynamic Ground Water Resources (2004) In Mcm</b>	
	Annual Replenishable Ground Water Resources	658.03
	Net Annual Ground Water Draft	309.22
	Projected Demand for Domestic and Industrial Uses upto 2025	42.71
	Stage of Ground Water Development	47%
13	<b>Awareness and Training Activity</b>	
	Mass Awareness Programmes Organized Date: Place: No. of Participant:	Nil
	Water Management Training Programmes Date: Place: No.	Nil
14	<b>Efforts of Artificial Recharge &amp; Rainwater Harvesting</b>	
	Projects completed by CGWB (No. & Amount Spent)	Nil
	Projects under technical guidance of CGWB (Numbers)	Nil
15	<b>Ground Water Control and Regulation</b>	
	Number of OE Blocks	Nil
	Number of Critical Blocks	Nil
	Number of Notified Blocks	Nil
16	<b>Major Groundwater Problems and Issues</b>	Depletion in groundwater level and deterioration of Groundwater quality

## 1.0 INTRODUCTION

Vidisha district is lying in the central part of Madhya Pradesh. It is in Bhopal commissioners division and is well connected by roads and railway. National Highway 67, connecting Bhopal and Dewas passes through the district. There are 7 tehsils and 7 blocks in the district. The block headquarters are Vidisha, Gyarspur, Basoda, Nateran, Kurwai, Sironj, Lateri. Vidisha district with an area of 7371 km<sup>2</sup> lying between the North Latitudes 22<sup>o</sup> 20' and 24<sup>o</sup> 22' and East Longitudes 77<sup>o</sup> 16' and 78<sup>o</sup> 18' and falls under the Survey of India toposheet No. 54H, 54L, 55E and 55 I. The district is encircled by Guna district in the North, Sagar and Raisen in the east, Raisen in the South and Bhopal in the west (figure 1).

### Administrative Division

The district is sub divided into seven administrative blocks and seven tehsils. The administrative divisions are shown in figure-1 and details are given in table-1.

Table – 1: Administrative Division, District Vidisha, M.P.

District/ Block	Area Sq.km	Population 2001	Density of Population per km <sup>2</sup>
1. Vidisha	1066	268199	252
2. Gyarspur	872	106939	123
3. Basoda	1223	24205	198
4. Nateran	1069	155241	145
5. Kurwai	831	136862	165
6. Sironj	1255	193397	154
7. Lateri	986	112135	114
District Vidisha	7302	1214857	165

Vidisha district forms the part of Malwa plateau and Vindhyan hill range with an undulating topography. Vidisha district is primarily an agricultural district occupying the Betwa basin valley, having predominantly an agricultural economy. Agriculture is the main occupation of the people in the district. Wheat, Jawar, Maize and Soyabean are the major crops sown in the district. Ground water has an important role to play for irrigation.

Out of total 243150 hectares irrigated land, 139600 hectares was irrigated from ground water sources. There were 12193 tube wells and 11822 dug wells up to the year 2006 for irrigation purpose.

The statistical data of land use and Irrigation pattern of Vidisha district has been extracted from the district statistical booklet, Vidisha district 2006. The land use for the district is given in Table – 2. The irrigation details for the district are given in table – 3.

Table-2: Land Use, District Vidisha (M.P.)

District/Block	Total Geographical Area (In ha)	Forest area (In ha)	Agricultural area (In ha)	Non Agricultural area (In ha)	Fallow land (In ha)
1. Vidisha	106552	5568	1911	8741	1843
2. Gyarspur	87191	18171	1371	4218	823
3. Basoda	122324	10946	4921	8044	3835
4. Nateran	106899	14379	4624	7350	5042
5. Kurwai	83144	108	2178	7091	2639
6. Sironj	125454	20817	5612	7042	3410
7. Lateri	98633	38541	3135	4898	1853
District Vidisha	730197	108530	23752	47314	19460

Table 3: Irrigation, District, Vidisha (M.P.)

Block	Canals	Irrigated area (In ha)	Tube wells		Dug wells		Tanks	
			No.	Irrigated area (In ha)	No.	Irrigated area (In ha)	Nos.	Irrigated area (In ha)
1. Vidisha	3	29813	3035	16696	696	1460	6	96
2 Gyarspur	2	-	1861	9998	2366	7007	3	693
3. Basoda	1	2733	1440	12841	2212	7691	6	1016
4. Nateran	1	766	1726	7299	2631	14411	2	1141
5. Kurwai	-	-	1999	31662	814	1052	3	324
6. Sironj	4	5344	1302	15969	1508	2922	2	390
7. Lateri	-	-	830	5830	1595	4762	1	596
District Vidisha	11	38656	12193	100295	1182	39305	23	4256

## 2.0 RAINFALL AND CLIMATE

The climate of Vidisha district characterized by a hot summer and general dryness 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 middle of June. The period from the middle of June to September is monsoon season. October and November form the post monsoon or transition period. The normal rainfall of Vidisha district is 1159.7 mm. It receives maximum rainfall during southwest monsoon period. About 91.4% of the annual rainfall received during monsoon seasons. Only 8.6 % of the annual rainfalls take place during October to May period. The surplus water for groundwater recharge is available only during the southwest monsoon period. The maximum rainfall received in district at Kurwai i.e. 1191.0 mm and minimum at Bareli i.e. 1150.3 mm.

The normal maximum temperature received during the month of May is 41.7°C and minimum during the month of December is 8.9°C. The normal annual means maximum and minimum temperature of Vidisha district is 32.0°C and 17.9°C

respectively. During the southwest monsoon season the relative humidity generally exceeds 94% (August month). In rest of the year is drier.

The driest part of the year is the summer season, when relative humidity is less than 39%. April 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 11.2 km/hr observed during the month of June and is minimum 1.5 km/hr during the month of December. The average normal annual wind velocity of Vidisha district is 5.3 km/hr.

### **CGWB ACTIVITIES**

Shri S Gupta, Hydrogeologist, carried out systematic Hydrogeological Surveys in part of the district during 1990-91. Shri Babu Nair and Shri M. L Parmar, Hydrogeologist carried out reappraisal Hydrogeological surveys during AAP 1993-94 in the district.

Under the World Bank assisted Hydrology Project- I, 6 shallow and deep piezometers have been drilled by the Central Ground Water for water level and quality monitoring. In Vidisha district, 10 exploratory boreholes and nine-observation borehole were drilled under Indo-British Betwa Groundwater project. The exploratory boreholes were drilled in the depth range of 85.7 – 241.6 mbgl and the observation wells were drilled within the depths ranges from 17.8 and 171.4 mbgl. The yield of boreholes varies between 30 to 500 lpm.

## **3.0 GEOMORPHOLOGY & SOIL TYPES**

Physiographically the district has been divided into three major units i.e. Malwa Plateau, Vindhyan Hill range and Alluvium plain. The district is formed by the valleys of major rivers like Betwa basin and Sindh River.

Most part of the district, measuring about more than 80% is located in the Betwa river basin, which is drained by its tributary like Bah nadi, Nion river, Keother nadi, Bina river and Kethan nadi. The presence of elevated ground on all the subbasin marks the surface water divides. The interior area of the basin is marked by undulating topography with elevated plains with very few low altitude isolated hills. The ground elevations in the area vary between about 383 m (Kurwai Block) in the northeast and about 550 m (Lateri Block) in the northwest part of district.

The district is generally covered with black cotton soils covering almost three fourths of the area. This part is occupied by Deccan Basalts. The rest part has red-yellow mixed soils derived from sandstone, shale. The alluvial soils are found along the river courses. The higher elevations i.e. the hilly regions have a cover of murum, which is made up of small rounded pieces of weathered trap. The Vindhyan and Bijawars have a thin cover of sandy loams. The alluvium is derived from hill slopes by numerous streams and watercourses.



## 4.0 GROUND WATER SCENARIO

Most of the area of district is occupied by Deccan trap and remaining areas are covered by alluvium and Vindhyan formations. The generalized geological succession is given below in table 4 and the hydrogeological map of district is shown in figure 2.

Table-4: General geological succession of Vidisha district.

Age	Formation		Lithology
Recent to Pleistocene	Alluvium		Clay with Kankar Sand and river alluvium
	Laterite		Small capping of lateritic on hills and patches in river valley
Upper Cretaceous to Lower Eocene	Deccan Trap		Lava flows of basalt with red bole and intertrappean beds
Upper Pre-Cambrian to lower Paleozoic	Vindhyan System	Upper Bhandar series	Upper Bhandar sandstones Sirbu shales at the base of scarps.
		Lower Bhandar series	Lower Bhandar sandstone but intercalated bands of shales known as Sanchi shale, Bhandar limestone and ganurgarh shale

### Description of rocks and their water bearing properties

#### Vindhyan System

Vindhyan formations comprising of sandstone shales and breccias are exposed in the western and southeastern part of the district. The small patches of Vindhayans are exposed in the form of hills. A major part of Nateran, Gyarspur and Basoda blocks is occupied by Vindhyan formation and comprises of sandstone and shales. The sandstones are normally hard, Quartzitic, massive and compact. However, they are jointed at the surface level.

The Vindhyan are, in general, poor aquifers, however, these formations when subjected to weathering or jointing and fracturing gives rise to moderately yielding aquifers. The depth to water level in this formation varies from 4.0 m to 10.0 mbgl and seasonal water level fluctuation ranges from 1 to 4.00 meters. The yield of wells in this formation varies from 0.5 to 6 lps.

#### Deccan trap formations

Deccan trap formations occupy more than 60% of the total area of the district. The general flow is characteristic of lava flows in the area are the most of the flows are of 'Aa' type in nature being disposed in a three-fold system along a vertical column. Each flow normally consists of an upper fragmentary zone, a middle massive part and an impersistent thin layer of basalt clinkers. The fragmentary top zone presents a brecciate look. It is very often highly vesicular and amygdular.

The vesicles are generally sub- rounded to irregular in shape. The middle part comprises of massive basalt, which is aphanitic to highly porphyritic. Basalt clinker & horizon is impersistent and often absent. The thickness of this horizon where ever present varies between a few centimeters to about 0.50 m. This zone is analogous to top vesicular amygdular horizons in physical characters. Variation in thickness of different flows is also evident in the area.

Most of the flow contacts can be demarcated by the presence of a red bole horizon. About 10-12 flows of Deccan trap can be identified in the district. In general the thickness of the individual flows range between 4 and 12m. However, the older flows seems to have more thickness compared to the younger ones as indicated by flow numbers, 0 and 1. A major part of Lateri, Sironj, Kurwai, Nateran and basoda is covered by Basaltic rock formations.

The main aquifer systems in the formation are the weathered, vesicular flow contacts jointed, fractured zones etc. The ground water occurs mainly under phreatic conditions the red bole horizon generally confined conditions the red bole horizon generally act as semi-confining and confining layers in the deep aquifers. The yield of wells in this formation varies from 1 to 5 lps.

#### **Alluvium**

Recent to sub-recent alluvial formations of significant extension occur in the southeastern part of the district falling in Vidisha and Gyarspur block. The alluvial formation in this part occurs along the Betwa River. The other patches of alluvial formation, though insignificant in both aerial extension and thickness occur along the major rivers and streams flowing in the area. The alluvial formations comprises of Silt, Clay, Sand, Gravel and Pebbles Cobbles etc. with Kankar. The sandy gravelling zones when saturated form very good aquifers. The yield of the formation depends upon the ranges from 4 to 10 lps.

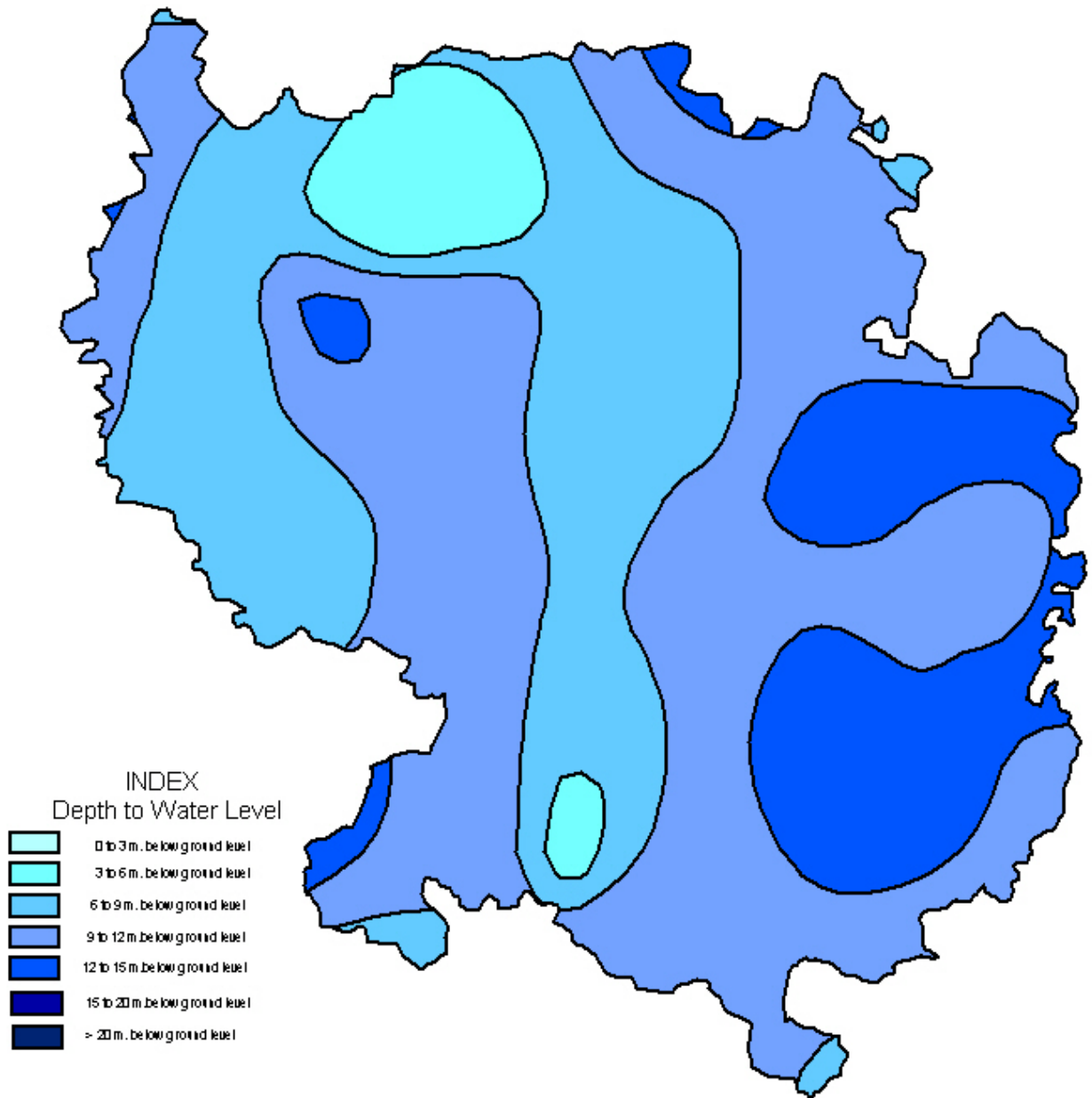
#### **WATER LEVELS**

A scientific database of groundwater levels is essential for assessing the regional groundwater scenario to reliably estimate the groundwater resources for long term planning and judicious use of available groundwater resources. Variation in groundwater levels in an area is an important component of the hydrological cycle because it is a physical reflection of aquifer systems. As change in groundwater level is directly related to groundwater balance its continuous records provide direct information to geo-environmental changes due to withdrawal of groundwater. To monitor the seasonal and year by year change in quantity and quality of groundwater, Central Ground Water Board (CGWB) has established 20 National Hydrograph Stations (NHS) and 6 Peizometers in Vidisha district.

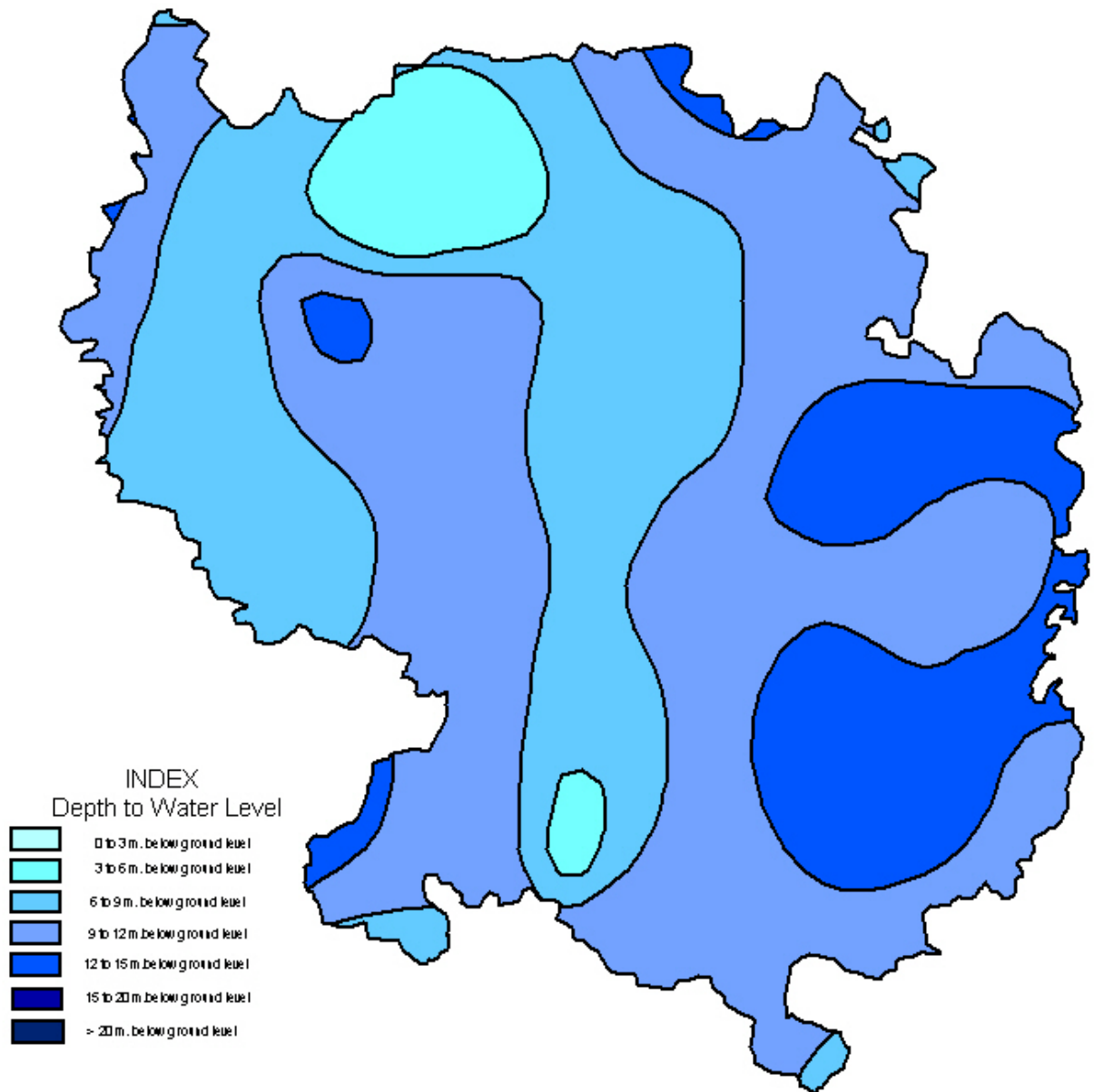
#### **Pre-monsoon (May 2006)**

During May 2006, pre-monsoon the depth to water level (figure-3) in Vidisha district ranged between 3.0 m bgl at Deopur in Sironj block and 13.66 m bgl at Gyarspur in Gyarspur block. During the pre monsoon the central part of the district have water level in the range of 3 - 9 mbgl. In the eastern part of district the water level in the range of > 12 mbgl.

**Fig-3: Depth to Water Level (May,2006)**



**Fig-4: Depth to Water Level (November,2006)**



#### Post-monsoon (November 2006)

During post-monsoon period of the same year, November 2006, (figure-4) the water levels varied from 1.81 m bgl at Imaliya in Vidisha block to 9.1 mbgl at Bagrod Crossing in Basoda block. It is observed that in most part of the district have shallow water levels in comparison to other part of the district.

#### Decadal Average Water Level (May 1995 - 2006)

Decadal average water level is an average of water levels of a particular monitoring station for the last 10 consecutive years. This gives a more realistic picture of the area as the water level of any particular year depends on rainfall and draft and may vary widely during the particular year. The 10-year average water level for the pre monsoon period is between 4.26 to 16.05 m bgl over a very large area of the district. In some areas it is falling and in some of the area it is rising in the district. The 10-year average water level for the post monsoon period is between 2.47 to 10.35 m bgl over a very large area of the district. In this seasons also, in some areas it is falling and in some of the area it is rising in the district. It is evident from the analysis of the data that the unplanned groundwater abstraction is going on in the district.

#### Aquifer Parameters

The exploratory drilling has been carried out mainly in areas occupied by Deccan Traps underlain by Vindhyan shale and sandstone. In Basalt, the vesicular, weathered and fractured basalt form the aquifers while in Vindhyan, fractured sandstones are aquifer. These exploratory wells were mostly drilled down to a depth of 290.41 m bgl, yielding upto 15 lps discharge. The piezometers were restricted to the depth of 30 m, 60 m, 90 m and 120 m bgl. The specific capacity, as determined in a few wells in basalt area, ranged from 3.5 to 61.23 lpm/m of draw down while in alluvium areas it varies from 15 to 120 lpm/m. The transmissivity of basaltic aquifer varies between 0.94 m<sup>2</sup>/day to 28.9 m<sup>2</sup>/day while in alluvium formation it varies between 32.31 to 137.87 m<sup>2</sup>/day.

#### 4.2 Ground Water Resources

The entire command and non-command area in all blocks of district are in safe categories. The stage of ground water development has reached to 47% in Vidisha district. The Net annual ground water available in the Vidisha District is 658.03 MCM and draft from all uses is 309.22 MCM, Net ground water available for future irrigation use is 338.05 MCM. The Net annual ground water resources available in the Vidisha District and draft from all uses for all the blocks is given in table-5 below.

**Table-5: Ground Water Resources & Stage of Development in Vidisha District.**

Block	Command/ non-Command/ Block Total	Net Annual Ground water Availability	Existing Gross Groundwater Draft for Irrigation	Existing Gross Groundwater Draft for Domestic & Industrial water Supply	Existing Gross Groundwater Draft for All uses	Allocation for domestic & industrial requirement supply upto nest 25 years	Net Groundwater Availability for future irrigation development	Stage of Groundwater Development (%)
		MCM *	MCM	MCM	MCM	MCM	MCM	
Vidisha	Command	37.26	3.19	0.79	3.98	2.01	32.07	11
	Non-Command	62.73	50.95	3.70	54.65	5.62	6.16	87
	Block Total	99.99	54.14	4.49	58.62	7.62	38.23	59
Gyraspur	Command	0.00	0.00	0.00	0.00	0.00	0.00	
	Non-Command	74.63	45.70	3.76	49.46	5.45	23.48	66
	Block Total	74.63	45.70	3.76	49.46	5.45	23.48	66
Nateran	Command	0.00	0.00	0.00	0.00	0.00	0.00	
	Non-Command	86.26	36.56	5.41	41.97	6.76	42.94	49
	Block Total	86.26	36.56	5.41	41.97	6.76	42.94	49
Basoda	Command	3.70	0.59	0.31	0.90	0.39	2.72	24
	Non-Command	98.61	41.89	6.10	47.99	7.62	49.09	49
	Block Total	102.30	42.48	6.41	48.89	8.01	51.81	48
Kurwai	Command	0.00	0.00	0.00	0.00	0.00	0.00	
	Non-Command	94.26	45.46	3.29	48.75	4.11	44.69	52
	Block Total	94.26	45.46	3.29	48.75	4.11	44.69	52
Sironj	Command	13.00	0.53	0.28	0.81	0.35	12.12	6
	Non-Command	93.52	28.96	5.19	34.15	6.48	58.07	37
	Block Total	106.52	29.49	5.47	34.96	6.83	70.19	33
Lateri	Command	0.00	0.00	0.00	0.00	0.00	0.00	
	Non-Command	94.07	23.44	3.14	26.58	3.92	66.71	28
	Block Total	94.07	23.44	3.14	26.58	3.92	66.71	28
	District Total	658.03	277.27	31.95	309.22	42.71	338.05	47

MCM\*=MillionCubicMeter

### **4.3 Ground Water Quality**

The quality of ground water in district is being assessed by the analysis of groundwater samples from 11 hydrograph stations. The analysis of water samples for year 2006 indicate that the pH values of all water samples showing alkaline nature of water in the district. Groundwater in the district is generally low to medium saline as the electrical conductivity (EC) values varies between 330 and 1270  $\mu\text{s}/\text{cm}$ . The highest EC value exceeding BIS limit (1000  $\mu\text{s}/\text{cm}$ ) was found at Patharia (1800  $\mu\text{s}/\text{cm}$ ) village. Nitrate in the groundwater of Vidisha district is varying between 7.4 to 338 mg/l. The concentration of  $\text{NO}_3^-$  exceeding 45 mg/l (BIS, 1990) was reported in four villages named Patharia (338 mg/l), Udaipur (131 mg/l), Gatera (102 mg/l) and Anadpur (86 mg/l). The higher concentration of  $\text{NO}_3^-$  may be due to excessive use of fertilizer and localized pollution. The total hardness of the groundwater in the district is under safe limit except Patharia village having 895  $\text{mg}/\text{l}$ , which is beyond 600  $\text{mg}/\text{l}$  as per BIS standard. The study of analyzed data shows that Vidisha district does not have any problem of fluoride since all the wells have fluoride less than 1.5 ppm of BIS (1990) permissible limit. No arsenic content was detected in the groundwater of district. Other chemical constituents like chloride, sulfate, calcium and magnesium were with in the safe limits for drinking water as per BIS standards.

The chemical quality of groundwater is an important factor to be considered in evaluating its suitability for irrigation purpose. The parameters such as EC, Sodium Absorption Ratio (SAR), percent sodium (% Na) and Residual Sodium Carbonate (RSC) are used to classify the water quality for irrigation purpose. High SAR is not good for irrigation as it leads to sodium hazards. Water sample in the district generally fall under C2-S1 (medium salinity and low sodium) and C3-S1 (high salinity and low sodium) class, which means that these waters can be used for all type of crops on soils of low to high permeability. Groundwater is safe for irrigation purposes however proper drainage system is required where EC is more than 1500  $\mu\text{s}/\text{cm}$ .

### **4.4 Status of Ground Water Development**

Ground water is the main source for drinking and irrigation in the Vidisha district. About 75% of irrigation in the district is from ground water, though the level of irrigation in the district is very low, only 25.5% of total geographical area is being irrigated. The total number of dug wells and tube wells in the district during 2005-06 were 11822 and 12193 respectively. On the drinking water front, Vidisha city have entire supply from ground water. There has been a steady rise in ground water development in the district. The Stage of Development in the district was 47%.

## **5.0 GROUND WATER MANAGEMENT STRATEGY**

It is felt that the overexploitation, indiscriminate development of groundwater, anthropogenic and irrigation practices have led to many groundwater related problems, which need proper management of groundwater resources. These problems are being discussed below.

### **5.1 Groundwater Depletion**

It is observed that in Vidisha district, the stage of groundwater development is moderate (47%). In certain areas the withdrawal of groundwater is more than recharges causing depletion in groundwater level. It is observed that the fluctuation in water table is mainly due to rainfall and withdrawal of groundwater. The study on the long term analysis of water level, conducted by CGWB, indicate that water level in Vidisha district have shown a steady decline of 0 to 2.49 m during past one decade. The incidence of rainfall remaining more or less same in the period of question the only possible reason for the decline in groundwater level appears to be over development of groundwater resources indiscriminately through ever increasing number of tube wells tapping the unconfined and unconfined aquifers for agricultural, industrial and domestic uses. To remedy the ill effects, the following steps are required to be taken for effective groundwater management in Vidisha district.

#### **5.1.1 Groundwater recharge**

Due to fast industrialization and urbanization in Vidisha district, there is a reduction in open green areas resulted in substantial decrease in natural recharge to groundwater. Also, the improvement in drainage pattern has caused reduction in percolation of rainwater to the groundwater thereby affecting the natural recharge. It is reported that huge amount of surface water available during rainy season goes as runoff. Hence it can be harnessed through suitable artificial recharge techniques to groundwater. Construction of various suitable artificial groundwater recharge structures will result in augmentation of the groundwater aquifers and arrest further decline of groundwater level. As the area is urban area the roof top rainwater harvesting technique should be adopted in a big way. As the geology of the area along with climatological and pedological parameters provide the hydrogeological environment which governs the groundwater recharge, modern techniques like remote sensing and geophysics should be applied for finalization of location, extent and design of artificial groundwater recharge structures.

#### **5.1.2 Water conservation**

It is evident that to solve the problem of depletion in groundwater level, it is necessary that the groundwater withdrawal should be reduced substantially. Some of the options available are:

##### **5.1.2.1 Recycling of water**

Due to limited groundwater resources and increased demand of water there is a need of recycling of water for its conservation. The treated sewage water can judiciously be utilized to reduce stress on exploitation of groundwater for various purposes including domestic, industrial and horticultural needs.

#### 5.1.2.2 Change in cropping pattern

In last few decades the cropping pattern in Vidisha district has changed substantially. In some parts of district, the farmers have started multi crop cultivation due to profitability which will caused extensive development of groundwater resources. There is a need to change the cropping pattern in the area and adopt cultivation of those crops, which require less irrigation.

#### 5.1.2.3 Change in irrigation policy and power pricing

It is observed that in many parts of Vidisha district the complete irrigation is being done through flooding. As the district is covered with hard rock terrain and is water scare, the flooding practice of irrigation requires change. Sprinkler and drip irrigation should be adopted in the area wherever feasible. In this regards the government should come forward and provide infrastructure and other benefits. In most parts of district the irrigation is being done through dugwell and tubewells using power pump. Rates of power for tube well irrigation are irrational and require modification. There should be no free power for irrigation so the consumers should take due cares for its economic and judicious use. Instead of flat rates, metering may be introduced.

#### 5.1.2.4 Mass awareness program

The management of groundwater resources cannot be successful without public participation. It requires educating the public regarding judicious use of water. To make the public aware, it is necessary to educate the people through mass awareness program at grass root level and impart training on rainwater harvesting and artificial recharge techniques for groundwater augmentation.

#### 5.1.2.5 Groundwater regulation

As the groundwater condition in Vidisha block is in alarming stage, groundwater regulation may be enforced for its judicious exploitation and use.

### 5.2 Groundwater Pollution

Due to increasing industrialization and fast population growth in Vidisha district, anthropogenic activities have led to pollution of groundwater in certain areas. The main sources of pollution are domestic and municipal waste, agricultural practices and industrial activities. Most of the localities/villages in Vidisha district do not have proper sewage treatment system; the groundwater gets polluted with variety of nutritional constituents and pathogenic microbes. Use of various chemical fertilizers and pesticides has led to increase of nitrates, phosphates and other organic component in groundwater. Untreated effluents discharged in/on ground has caused increased level of heavy metals. Some organic compounds have also led to deterioration of quality of groundwater.

#### 5.2.1 Action Plan

It is fact that the groundwater pollution in the area increasing day by day there is a need to take up the comprehensive groundwater pollution studies in the Vidisha district township. It is necessary to initiate measures to control further groundwater pollution. Dilution of pollutant concentration through groundwater recharge can be effective to mitigate the hazards of high concentration of chemical constituents. It is also desirable to formulate water supply schemes utilizing such water for purpose other than drinking.

## 6.0 RECOMMENDATIONS

- I. Ground water is meeting the most water needs of the district but it may not go very long in future. The average water levels of the district are deep, the decadal fluctuations and the long-term trends are showing a decline, and the water balance left is limited. The population and progress coupled with poor aquifers are responsible for this alarming situation. Thus special caution is to be observed while developing this natural resource.
- II. The groundwater development in Vidisha district, both for irrigation and domestic purposes, is being done on need basis without proper backup of scientific investigations. Some times failure of monsoon led to crisis of even drinking water in district. A serious thought should be given to plan future development of groundwater on scientific lines. For a planned and coordinated development of groundwater resources it is essential that detailed hydrogeological, remote sensing and geophysical investigation should be carried out before taking decision on finalization of sites for drilling wells for irrigation and domestic use. The lithological details along with aquifer wise yield records should be maintained for future inferences.
- III. The groundwater resource evaluation for year 2004 indicates that the stage of groundwater development in district has reached to 47%. The Net annual ground water available in the Vidisha District is 658.03 MCM and draft from all uses is 309.22 MCM, Net ground water available for future irrigation use is 338.05 MCM only. Thus it has become imperative for further detailed hydrogeological investigation in district for water balance studies making watershed as a unit.
- IV. Vidisha district is mainly a hard rock area and the decision for the type of groundwater structures for groundwater development is dictated by local hydrogeological situation. Figure-5 shows the areas recommended for future groundwater development in Vidisha district.
  - a. In areas of phreatic aquifers with low permeability large diameter dugwells is the only suitable groundwater structure. The dugwell should be located as far as possible in topographic depressions, nearer to rivers and streams and if possible nearer to zone of structural disturbances. In Deccan trap areas of the district, instead of increasing the diameter of dugwells drilling of horizontal bore into the dugwell should be preferred to increase the yield of dug well.
  - b. In certain areas of district where dugwell do not penetrate fully to the aquifer, it is recommended that dug cum bore wells may be constructed.
  - c. As the Red bole clay is present between two flows and are collapsible in nature, telescopic drilling should be adopted for screening/casing the collapsible strata to increase the longevity and yield of boreholes.

- d. In view of the limited regional extent of joints/fracturing, it is possible to miss a good water bearing horizons in a small diameter borehole during the drilling. It is recommended that technique of hydro-fracturing/bore blasting should be tried to enhance the yield of boreholes.
  - e. For wells constructed for drinking water it is much more important to ensure that the intake section of tubewell is not directly in connection with pollution from ground surface.
- V. It is observed that in most part of the district there is an ample fluctuation in depth to water level during pre and post monsoon period. Also, there is substantial surplus monsoon run off going as unutilized needs to be conserved through artificial recharge techniques. In order to get sustainable yield from groundwater structures the need for augmentation of groundwater resources through artificial recharge structure is imperative. Artificial Recharge practices in rural areas should be taken up earnestly to improve the ground water quantity and quality. The selection of sites should be done on scientific basis by conducting hydrogeological and geophysical investigations.
- VI. The Roof Top Rainwater Harvesting technique has wide scope in the areas covered with weathered basalt. In Vindhyan rock formation, tubewells can be used for this purpose. Roof top rainwater harvesting should be made mandatory considering the water scarcity in urban areas. This would mitigate the situation.
- VII. Unscientific use of fertilizer/pesticides for agriculture and disposal of untreated industrial effluents through unlined drain in most of the industrial areas of district will be very dangerous for groundwater quality in near future. There is a urgent need to control such type of activities to check the groundwater pollution.
- VIII. The deforestation of forestland to accommodate the population growth causes heavy run off and insufficient subsurface recharge to groundwater storage in foothill zone. Afforestation programme in such areas need to be taken up. This would not only check soil erosion and improve the environment but also conserve surface runoff and recharge the phreatic aquifers in the area.
- IX. Change in cropping pattern is another measure, which will relieve the situation. Presently Soya bean crop is being grown in large areas, which has a high water requirement. There is a need to change the cropping pattern in the area and adopt cultivation of those crops, which require less irrigation.

---

**Compiled by-**

Dr. Subhash C. Singh, *Geophysicist*

**Under the able guidance of-**

Shri. R.N.Singh,  
Regional Director  
Central Ground Water Board  
North Central Region  
Bhopal, M.P.

---

