DISTRICT GROUND WATER INFORMATION BOOKLET

MANDSAUR DISTRICT

MADHYA PRADESH

Ministry of water Resources
Central Ground Water Board
North Central Region
BHOPAL
2013

DISTRICT PROFILE - MANDSAUR DISTRICT

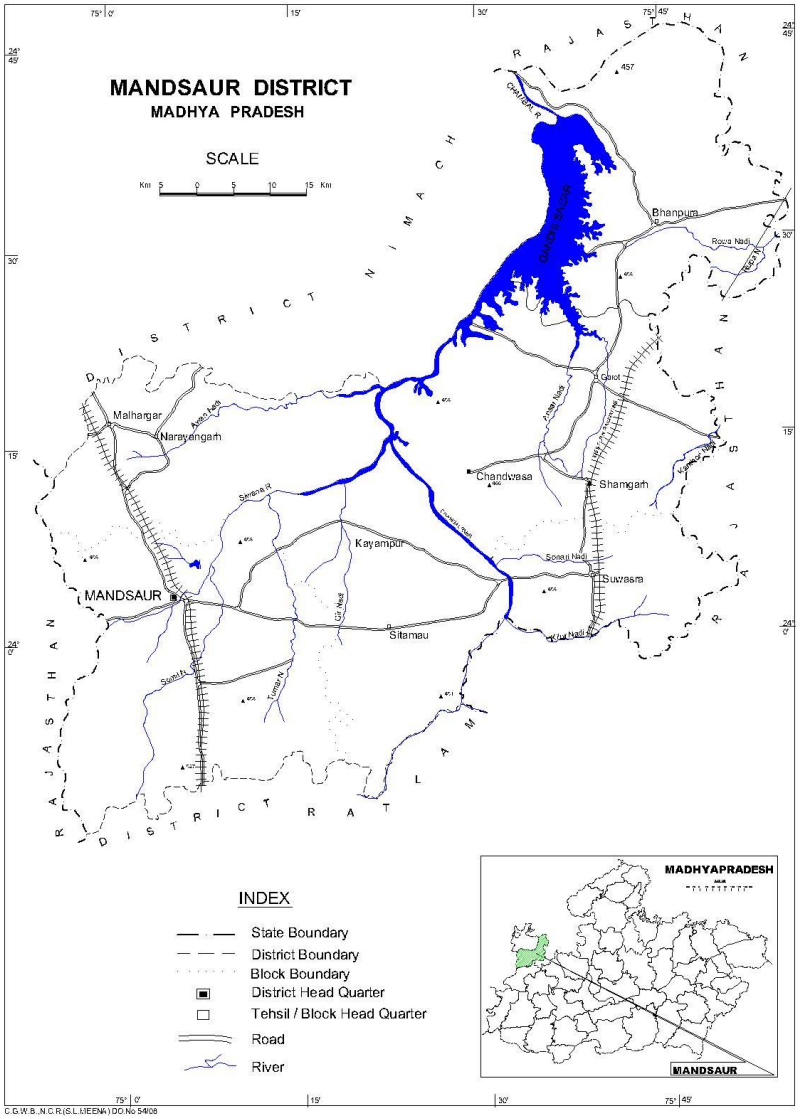
S.No.	Items	Statistics	
1.	**General Information**		
	i) Geographical area	5,535km^2	
	ii) Administrative Divisions (As on 2013) Number of Tehsil/Blocks Number of Panchayats Number of Villages	 5/5 441 944	
	iii) Population (Census 2011)	13,39,832	
	iv) Normal Rainfall	657.3 mm	
2.	**Geomorphology**		
	1. Major Physiographic Units:	i. Plain area ii. Upland and undulating topography iii. Chambal and Sivna valley	
	2. Major Drainage:	I. Chambal River II. Sivna River III. Awan River	
3.	**Land Use (In Km^2)**		
	a) Forest area b) Cultivable area c) Net area sown	386.00 3587.00 3587.00	
4.	**Major Soil Types**	Sandy and black cotton soil.	
5.	**Area Under Principal Crops In Km^2 (2009)**		
	a) Soyabean b) Gram c) Maize d) Wheat e) Mustard	2620 530 350 450 310	
	Total	**4260 Km^2**	
6.	**Irrigation by Different Sources**	**No.**	**Area irrigated (km$^{2)}$**
	Dug wells Tube wells/Bore wells Tanks/Ponds Canals Other Sources Net Irrigated Area Gross Irrigated Area	106052 7606 28 8 - - -	1519 183 27 10 143 1882 1892
7.	**Number of Ground Water Monitoring Wells of CGWB (As on 31.3.2013)**		
	Number of Dug Wells Number of Piezometers	25 24	
8	**Predominant Geological Formations**	Alluvium, Deccan Trap basalts, Vindhyan shale, sandstone and limestone.	

9	**Hydrogeology**	
	Major Water Bearing Formation	Sandy Alluvium, Weathered and vesicular basalt, flow contacts & fractured sandstone.
	Pre-monsoon Depth to water level range during 2012	4.4 to 25.4 m bgl
	Post-monsoon Depth to water level range during 2012	1.2 to 11.35 m bgl
	Long-term water level trend in 10 years (2003-2012)	**(Pre monsoon)** 0.005 to 0.69 m/year (Rise) 0.08 to 0.79 m/year (Fall)
10.	**Ground Water Exploration By CGWB (As on 31.3.2013**)	
	No of wells drilled (EW, OW, PZ, Total)	17 EW, 8 OW, 27 PZ
	Depth Range	66.00 to 200.85 m. bgl
	Discharge	0.40 to 11.66 lps
	Specific Capacity	0. 48 x 10^3
	Transmissivity	1.82 to 149.5 m^2/day
11.	**Ground Water Quality**	
	Presence of Chemical constituents more than permissible limit (e.g. EC, F, As, Fe)	EC and F
12	**Dynamic Ground Water Resources (31.3.2009)**	ham
	Net Annual Ground Water Availability	55624
	Gross Annual Ground Water Draft for all uses	54150
	Projected Demand for Domestic and Industrial uses up to 2035	3093
	Stage of Ground Water Development	97 %
13	**Awareness and Training Activity**	
	Mass Awareness Program Organized and Number of Participant	**Mass Awareness Programme (MAP)** and **Water Management Training Programme (WMTP) on** 03.02.2002 at Mandsaur
	Water Management Training Program and Number of Participant	
14	**Efforts of Artificial Recharge & Rainwater Harvesting**	
	Projects completed by CGWB	Nil
	Projects under technical guidance of CGWB	Nil
15	**Ground Water Control and Regulation**	
	Number of Over-Exploited Blocks	2- Mandsaur & Sitamau
	Number of Semi-critical Blocks	2- Bhanpura & Malhargarh
	Number of Safe Blocks	1- Garoth
	Number of Notified Blocks	2- Mandsaur and Sitamau block
16	**Major Groundwater Problems and Issues**	Decline in ground water trend, some area having saline water quality problem.

1.0 INTRODUCTION

Mandsaur district is located on northwest part of Madhya Pradesh state. It is one of the important tribal district of Malwa regions of Madhya Pradesh. The district is bounded by Neemuch district in the north, Ratlam district in the south, Banswara district of Rajasthan state in the west and Jhalawar district of Rajasthan state in the east. The district area extends between the parallels of latitude 23^0 46' and 24^0 45' North and between the meridians of longitude 74^0 44' and 75^0 54' East, and it is falling in the Survey of India Topo Sheet No. 45P and 46M.

In past three decades industries had rapidly grown up in the district. Mandsaur is mainly agriculture-based district and its cropping pattern is diversified. Mandsaur district is well connected by roads and rail.



The total geographical area of the district is 5535 Sq.Km, with a population of 36,51,183 according to census 2011. The details of administrative units are given in Table. The details of administrative units are also has been depicted in Fig.

Administrative units of Mandsaur district, Madhya Pradesh.

S.No	Tehsil	Block	Area in Sq Km	No. of Villages Panchayats
1	Bhanpura	Bhanpura	1051	45
2	Garoth	Garoth	1136	91
3	Malhargarh	Malhargarh	806	78
4	Mandsaur	Mandsaur	1266	119
5	Sitamau	Sitamau	1276	106
	Total		**5535**	**439**

Drainage

Mandsaur district falls under Ganga basin and Chambal river sub-basins. The river is broad, flat shallow valley with low gradient because the Chambal has reached the base level of erosion. Vertical erosion has reached and lateral erosion is taking place. Other tributaries of Chambal River are Retam, Shivna and Chhoti Kali Sindh.

Irrigation

Mandsaur district has limited irrigation facilities. Only 34.10% of net sown area is irrigated and rest of the area is rain fed. Surface water irrigation in the district is only 1.96% of the net sown area. Groundwater is the main source in the district and about 90 % of total irrigation in the district. There are a total 7,606 bore wells and 1,06,052 dug wells in the district for irrigation.

Central Ground Water Board (CGWB) activities-

Systematic hydrogeological surveys carried out in Mandsaur district during 1986-91.

- Reappraisal Hydrogeological surveys carried out in the district during 1996-97.
- Exploratory drilling in the district carried out during the year 2003-2005. During the exploration period 24 exploratory well, 15 observation well and 3 piezometers were constructed.
- Under the World Bank assisted Hydrology Project 4 shallow piezometer and 8 deep piezometers had been constructed.
- Central Ground Water Board has carried out 52 numbers of vertical electrical soundings in Bhanpura, Garoth and Malhargarh blocks of Mandsaur district during 1991-93,

2.0 RAINFALL AND CLIMATE

The climate of the Mandsaur district is semi-tropical characterized by hot summer and well-distributed rainfall during the southwest monsoon. The year can be divided in four seasons. The winter commences from December and last up to February. January is the coldest month with temperature falling 9.8^0 C. The period from March to first week of June is the summer season. May is the hottest month when the temperature may go up to 39.8 ^{0} C. The monsoon starts from middle of June to the first week of October. October and November constitute the post monsoon or retreating monsoon period.

During the southwest monsoon season the relative humidity generally exceeds 87 % (August month). The driest part of the year is the summer season, when relative humidity is less 26%. 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 16.7 km/hr observed during the month of June and minimum 4.7 km/hr during the month of November. The average normal annual wind velocity of Mandsaur district is 9.2 km/hr.

The average annual rainfall of Mandsaur district is 657.3mm. Mandsaur district receive maximum rainfall during southwest monsoon period i.e. June to November. About 90.5% of annual rainfall is received during monsoon season. Only 9.5% of annual rainfall takes place between Octobers to May period. The surplus water for groundwater recharge is available only during the southwest monsoon period.

3.0 GEOMORPHOLOGY AND SOIL TYPES

3.1Geomorphology

Physiographically, the major parts of the district covered by Malwa Plateau, by gently sloping topography ranging the elevation between 445 m and 518 m above mean sea level. Topographic high plateau form surface water divides. Main surface water divide separates Chambal sub basin from Shiva micro-basin. Shivna is tributary of Chambal River is running ENE-WSW direction in southwestern parts of the area.

The highest elevation of the area is noticed on northwest corner of the area near village Rewas Dewda (24^0 07', 74^0 57') with an elevation of 560 m above mean sea level, which represent hills comprising sedimentary formation. The lowest elevation is 416 m above mean sea level marked north of village Pipalda (24^0 37', 75^0 38') in northern parts of the district. Prominent isolated residual hillocks formed of Deccan Trap basalt are observed in north part of Bhanpura town is forming northern plateau area, consisting of Vindhyan formation. Northern plateau area is highly undulating in topography and forming escarp running northwest, southeast direction. Highest elevation of the escarpment is 510 m above mean sea level, located north of village Kotri.

3.2 Soils

The soils in the district are generally of four types:

1. Black cotton soil
2. Red loamy soil
3. Laterite soil
4. Alluvial soil

Black cotton soil is derived from weathering and disintegration of basaltic lava flow. Major parts of the district are covered by black cotton soil. Red loamy soils consist of sandy loam to clayey loam and brick in colour. This soil is derived from Vindhyan sandstone and shales and occurring in valley portion on the plateau and adjacent to hill composed of Vindhyan sandstone. This type of soil covers a northern part of the district. Laterite soil dark brown to pink coloured lateritic soil is found as capping over hillocks of basaltic terrain. Alluvial soil is greyish yellow to brownish yellow in colour and occupy along the major rivers.

4.0 GROUNDWATER SCENARIO

4.1 Hydrogeology

Geologically major parts of the Mandsaur district is occupied by Deccan Trap basalts except narrow patch of alluvium and sedimentary rocks of Vindhyans super group in isolated patches, which are forming different type of aquifer in the area. Occurrence and movement of groundwater in hard rock is mainly controlled by secondary porosity through joints and fractures. Presences of vesicle in basaltic lava flow of Deccan Traps play an important role in groundwater movement. Groundwater in general occurs under unconfined to semi-confined conditions. The general hydrogeological conditions of the district are depicted in figure -2 and formation wise settings are discussed below.

4.1.1 Vindhyans

The Vindhyan sandstone has primary porosity, but this depends on the degree of compaction. Ground water availability in sandstone is controlled by secondary porosity generated by weathering, jointing and fracturing. Ground water is sandstone occurs under confined conditions. Yield of Vindhyans sandstone formation is generally poor to moderate and less than 2 liters per second.

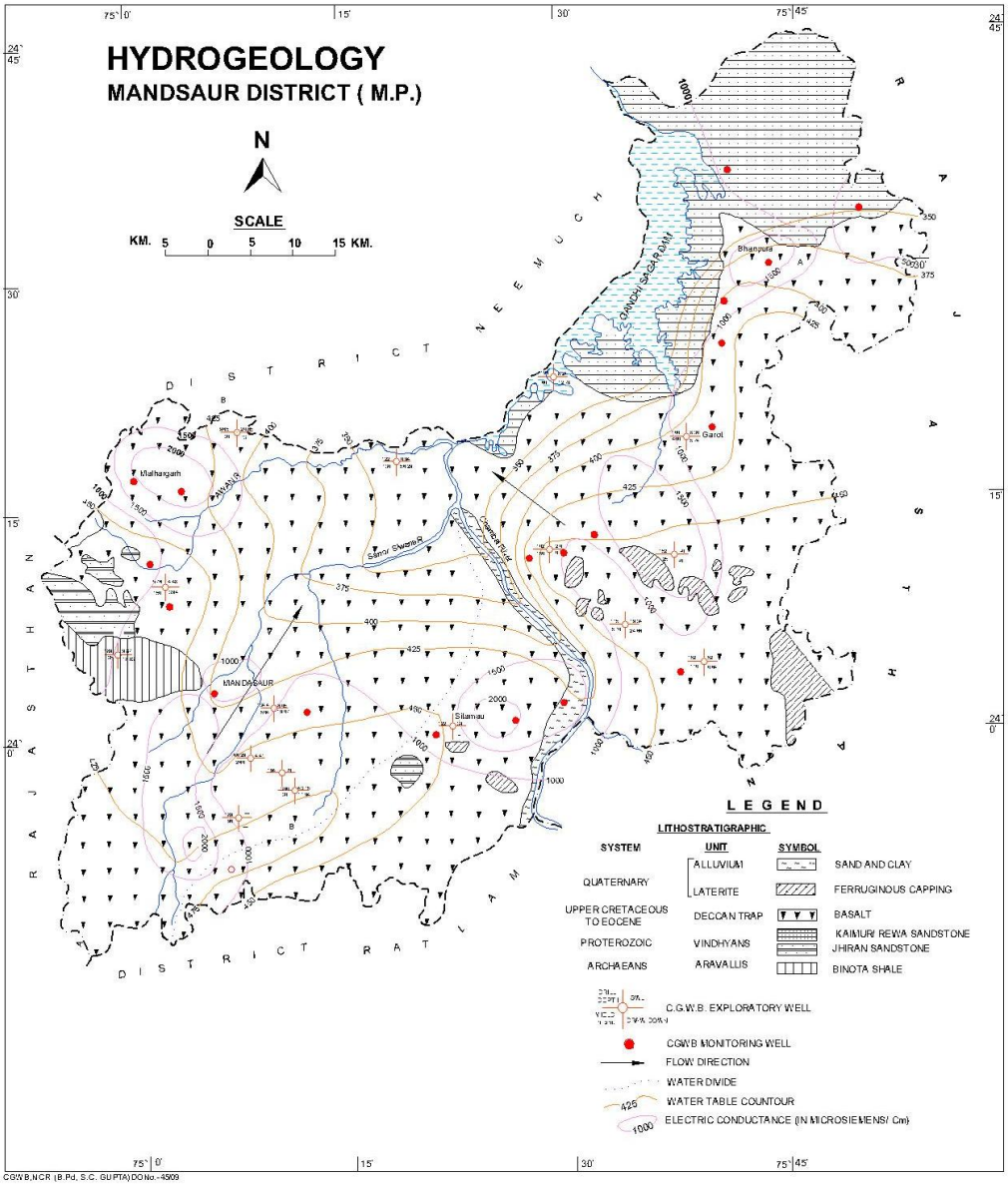
4.1.2 Basalts

The basalts underlie a major part of the district and generally groundwater occurs under phreatic conditions in shallow weathered, jointed and fractured horizons. Basalts does not exhibits uniform occurrence of groundwater both vertically and latterly. Physiographic location, thickness of weathered mantle, degree of jointing, fracture or shear zones, characteristics of vesicular horizons and their inter connection are important factor, which play a deciding role in the yield capacity of open wells tapping shallow aquifers. The deeper aquifer system appear to be under unconfined to semi-confined conditions while visualizing lava flow sequence which

shows alternate units of vesicular and massive horizons. The hydrogeological regime in different tires, deeper aquifer is more likely to be governed by the secondary porosity jointed/fractured form of massive units is creating possibilities of their acting as leaky confining bed consequently resulting into semi-confined condition for water bearing vesicular units occurring below it. Yield of basalts in this is reported low to moderates (1 to 5 lps).

4.1.3 Alluvium

The alluvium deposits are restricted to narrow linear along the river courses of Chambal and Shivna. The thickness of alluvium varies from 5 to 10 meters, which is proportionately thinning away from the river line. The thickness of alluvium along the Chambal River reported about 20 meter thick. The alluvium deposits consists series of consolidated, fine to medium grained sand admix in varying proportion and yield varies from 1 to 8 liters per second.

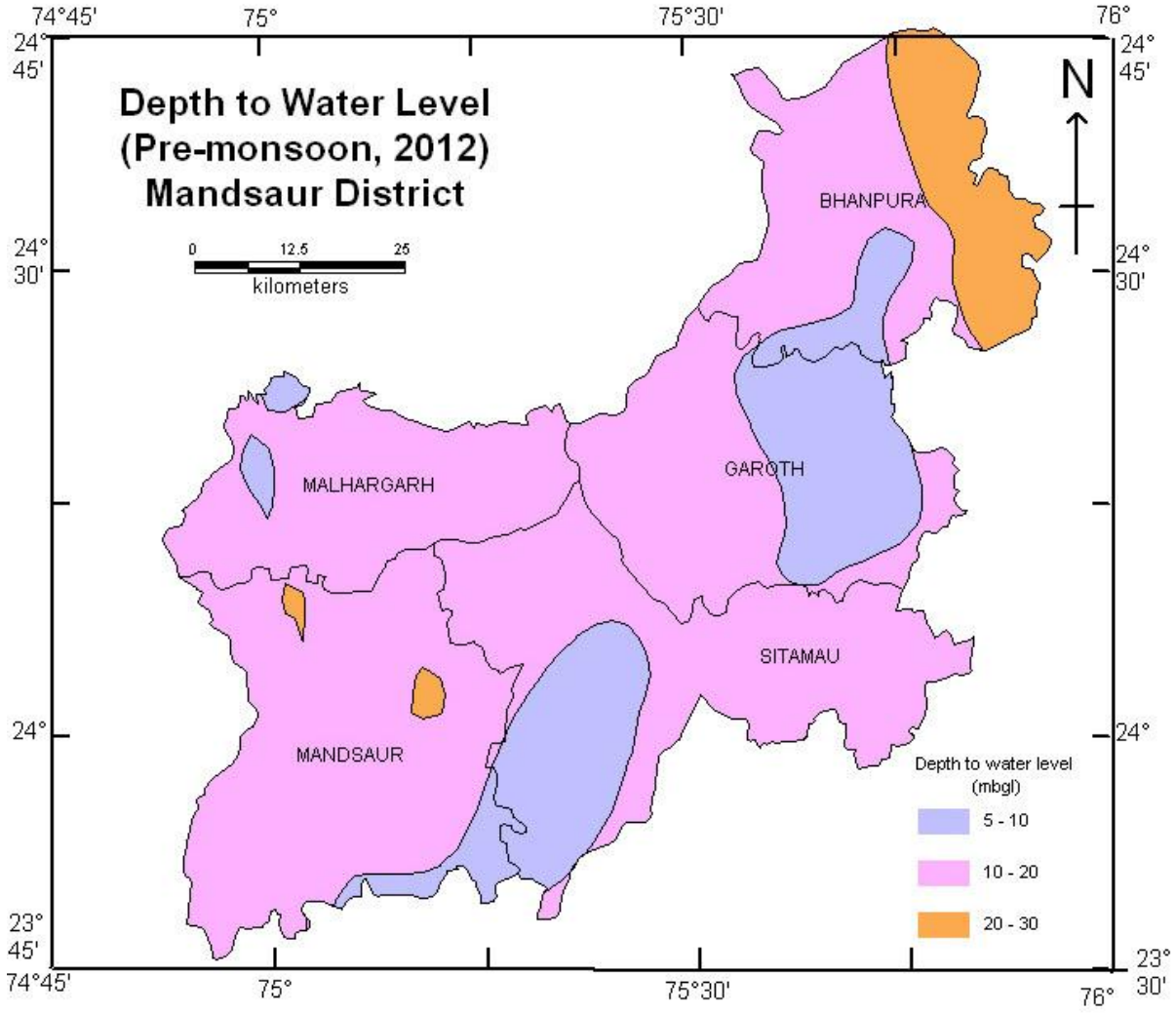


4.2 Groundwater Regime monitoring

Variation of groundwater levels in an area is an important component of hydrological cycle because it is a physical reflection of aquifer systems. As the change in groundwater level is directly related to groundwater balance and its continuous records provide direct information of subsurface geo-environmental changes due to withdrawal of groundwater. To monitor the seasonal and annual change in quantity and quality of groundwater, CGWB has established 25 Groundwater Monitoring Wells and 24 Piezometers in entire Mandsaur district. The monitoring of groundwater levels in these wells is being carried out by CGWB during the month of May, August, November and January. High frequency Groundwater level monitoring is being carried out at Mandsaur, Pipliya and Suwasra deep piezometer using Automatic Water Level Recorders. The brief details of groundwater level in Mandsaur district for the year 2012 are being discussed below:

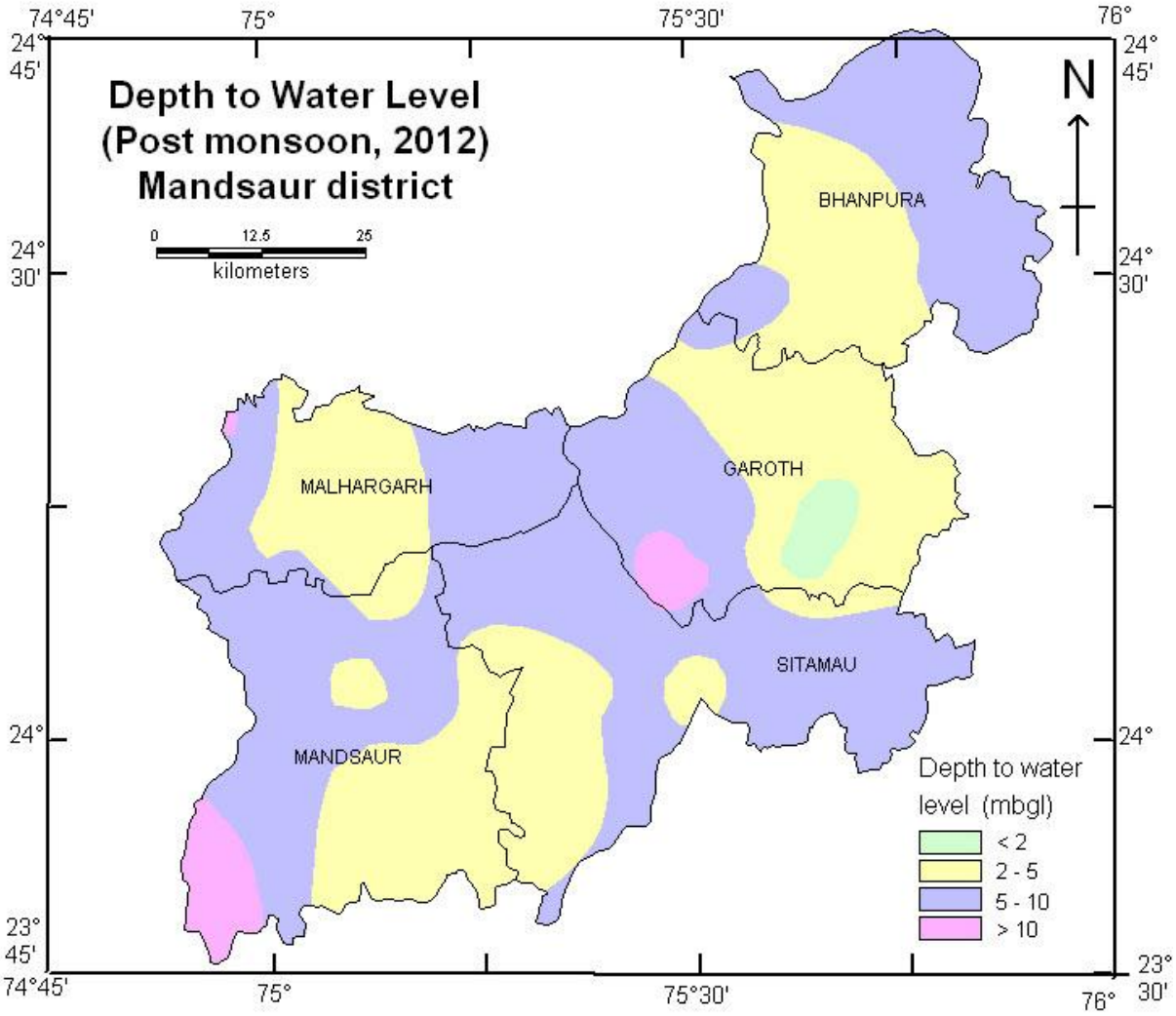
4.2.1 Pre-monsoon (May 2012)

In pre-monsoon period, May 2012, depth to water level ranges between 4.40 m bgl at Sitamau to 25.40 m bgl at Sandhara. The most part of the district have water level in the range of 10-20 m bgl during the pre monsoon. Water level more than 20 m bgl has been recorded at isolated locations in Mandsaur & northeastern part of Bhanpura block.



4.2.2 Post-monsoon (November 2012)

During post-monsoon period, November 2012, depth to water level ranges from 1.20 m bgl at Shamgarh to 11.25 m bgl at Dhamara. It is observed that in 53% area of the district the water level lies between 5 & 10 and 43% area has water level between 2 & 5 m bgl.



4.2.3 Groundwater level trend (May 2003 to May 2012)

Analyses of Groundwater level data of pre-monsoon period indicate that there is rising as well as declining trend in water level in the district. Declining trend in water level is in the range of 0.005 to 0.69 m/year whereas rising trend is in the range of 0.08 to 0.79m/year. About 48% wells shows declining trend.

4.4 Aquifer Parameters

Central Ground Water Board has drilled 16 exploratory wells in the Mandsaur district between years 1981 to 1994. Under the World Bank assisted Hydrology Project 4 shallow and 8 deep piezometers have been drilled for monitoring of groundwater levels in entire district. It is inferred from the exploratory data that the yields of Deccan Trap basalt formation vary from 0.4 to 11.66 liters per second and

draw down ranges between 7.45 to 57.40 m. Due to meager yield 6 exploratory wells have been abandoned. From the exploratory data it is observed that granitic basement is occurring at Digau Kalan, Rinda and Barwan sites at depth 130.0 m, 184.10 m and 192.60 m bgl. The depth range of exploratory wells is range from 66.0 m to 200.85 m bgl. The value of transmissivity ranges from 1.82 m^2/day at Garoth to 149.5 m^2/day at Tharod exploratory well site.

4.5 Groundwater Resources

Mandsaur district is underlain by mainly Basaltic lava flows of Deccan trap. Dynamic ground water resources of the district have been estimated for base year - 2008/09 on block-wise basis. Out of 5,52,318 ha of geographical area, 4,99,047 ha (90%) is ground water recharge worthy area and 53,271 ha (10 %) is hilly area.

Groundwater availability and stage of development (31.3.2009)

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 (11+12) (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 {(13/10)*100} (%)	Category
Bhanpura	Command								
	Non-Command	5567	4350	375	4725	375	842	85	Semi-Critical
	Block Total	**5567**	**4350**	**375**	**4725**	**375**	**842**	**85**	**Semi-Critical**
Garoth	Command								
	Non-Command	13007	9401	588	9989	588	3017	77	Safe
	Block Total	**13007**	**9401**	**588**	**9989**	**588**	**3017**	**77**	**Safe**
Malahargarh	Command								
	Non-Command	8676	8064	466	8530	466	146	98	Semi-Critical
	Block Total	**8676**	**8064**	**466**	**8530**	**466**	**146**	**98**	**Semi-Critical**
Mandsaur	Command								
	Non-Command	13619	14877	1040	15918	1040	-2299	117	Over exploited
	Block Total	**13619**	**14877**	**1040**	**15918**	**1040**	**-2299**	**117**	**Over exploited**
Sitamau	Command								
	Non-Command	14756	14364	624	14988	624	-232	102	
	Block Total	**14756**	**14364**	**624**	**14988**	**624**	**-232**	**102**	Over exploited
	District Total	**55624**	**51057**	**3093**	**54150**	**3093**	**1474**	**97**	**Over exploited**

There are five number of assessment units (block) in the district which fall under non-command . Malhargarh (over exploited in 2003/04) Bhanpra (safe in 2003/04) blocks of the district are categorized as semi critical, Mandsaur and Sitamua (same in 2003/04) as over exploited. The highest stage of ground water development is computed as 117 % in Mandsaur block. The net ground water

availability in the district is 55.624 ham and ground water draft for all uses is 5,14 ham, making stage of ground water development 97 % (109 % 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 1474 ham.

4.6 Groundwater Quality

Groundwater quality in Mandsaur district is assessed annually by CGWB on the basis of analysis of groundwater samples collected from groundwater monitoring wells in the district. The water quality is described as follows.

Quality of Groundwater for Drinking Purpose

Chemical analysis of water samples collected during pre-monsoon, 2011 indicates that pH value (the hydrogen ions activity) of water samples ranged in between 7.16 to 8.25 hence proved alkaline in nature and were generally within permissible limit (6.5 to 8.5) as set by BIS (1991). The EC values were found to be in the range of 609 and 2870 µS/cm. The EC values exceeding BIS limit (1250 µS/cm) were noticed at Sitamau (1329 µS/cm), Bhanpura (1422 µS/cm), Shamgarh (1463 µS/cm), Barhkeranayak (1493 µS/cm), Narayangarh (2300 µS/cm), Kachnera (2730 µS/cm) and Nayakheda (2870 µS/cm). The concentration of NO_3^- exceeding 45 mg/l (BIS, 1990) was reported from most of the wells of the district with highest as 140 mg/l of Shamgarh village.

The higher concentration of NO_3^- is an indicative of man-made pollution. High nitrate in then village area is appears due to excessive use of fertilizers and agriculture waste. A scrutiny of data shows that fluoride is within permissible limits. No arsenic content was detected in the groundwater of district as per the analysis carried out in the year 2003.

Quality of Groundwater for Irrigation Purpose

In classification of water for irrigation purpose, it is assumed that the water will be used under average conditions with respect to soil texture, infiltration rate, drainage and climate. The chemical data of all the water samples pertaining to Mandsaur district was plotted on U.S. Salinity Laboratory diagram.

It is clear that wells of Garoth and Babulda were observed under C_2-S_1 class (Medium Salinity and Low Sodium), which means that this water can be used for irrigation purposes without any chance of development of soil salinity.

The ground water representing the wells of Babulda, Bhanpura, Dudhakheri, Sandhara, Barkheranayak, Dharamrajeshwar, Botalganj, Malhargarh, Narayangarh,

Pipliya, Basakheda, Daloda, Mandsaur, Khejariya, Sitamau and Surjani were grouped under C_2-S_1 (High Salinity and Low Sodium) class. This water can be used with the special management practices for salinity control. Salt tolerance crops may be grown in these areas. Two wells namely Shamgarh and Nayakheda were found

under C_4-S_1 class (Very High Salinity and Low Sodium) types of water; hence these waters are not suitable for irrigation purposes.

5.0 GROUNDWATER RELATED ISSUES AND MANAGEMENT STRATEGY

It is felt that the over exploitation, 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

As per Ground Water Resources estimation of Mandsaur district for the year 2011, the available ground water resources and gross annual groundwater drafts are 57221 ham and 55201 ham respectively, reaching stage of groundwater development 97% as a whole far the district. Mandsaur & Sitamau blocks fall under the **Over-Exploited** category. The Central Ground Water Authority has declared Mandsaur and Sitamau blocks of Mandsaur district notified blocks of regulation and ground water management act in the year 2006.

Mandsaur is prosperous district where agriculture and industrial growth had taken place during past and for irrigation, as stated earlier groundwater is main source and created problems of groundwater level depletion. The groundwater quality is also saline in deeper aquifer system at many places in Mandsaur district. Construction of new groundwater abstraction structure should be stopped and schemes have to implement for artificial recharge. The cultivation of opium should be stopped as its require seven to eight number of watering and crops like gram and lentils, which require very less or almost no irrigation, should be adopted.

5.2 Groundwater conservation and artificial recharge

Considering the hydrogeological situation, stage of groundwater development and declining groundwater level trend in the district, there is an urgent need to execute artificial recharge work immediately. Major parts of the Mandsaur district is occupied by the black cotton soil which most suitable for Rabi and Khrif crops. The surface water availability is inadequate to meet the total requirement and the irrigation is mainly based on the groundwater resources. The depletion of this resource is manifested by continuous decline of water level and upcoming of saline fresh water interface. To revive the situation it is necessary to implement artificial recharge project in the area on large-scale basis.

Detailed hydrogeological investigations should be taken up in different watershed for selection of suitable sites for various artificial structures. Watershed should be considered as unit for artificial recharge and water conservation. Various structures right from ridge to valley i.e. gully plug, gabion structure, percolation tank, nala bund, cement plug, Check dam, waste weir and sub-surface dyke should be constructed in each watershed having ridge to valley approach. Under “Pani Roko Abhiyan” water conservation mission Govt. of Madhya Pradesh had taken up

construction of various artificial recharge/water conservation structures in different block of Mandsaur district.

It is suggested that haphazard site selection and implementation of artificial project should be stopped and plan may be adopted hill to valley approach in a watershed. At the origin of streams structures like gully plug and contour bunds should be constructed to arrest surface run off and to enhance the soil moisture retention and development of vegetation cover in the area. Gabion structures may construct at down stream of these structures, across the stream local boulder and wire mess to check the velocity of flowing water.

Percolation tanks are the most important structures from ground water recharge point of view and these are suitable structures in the second and third order streams on porous and permeable formation. Foundation of these structures should not hard and compact or on impermeable formation. Water should be allowed to seep below streambed to recharge ground water body at sub-surface. Percolation tank should not hold water beyond month of January because these are not water storage structures. It is quit possible that in due course of time infiltration of water from percolation tank is reduced due to silting.

To over come this problem recharge shaft may be constructed inside percolation tank to allow continuous seepage of water to ground water system in the area. Recharge shaft may be constructed using hume pipes of diameters from 1 to 3 meters and graded filter media is filled in the structure and periodic change of upper layer course sand of filter media is required to avoid silt layer deposited over the sand bed.

Recharge shaft may also be constructed in those places where impervious where formations are occurring at surface and at shallow depths porous and permeable media rocks are found, which may accept water for recharge.

By constructing recharge shaft in side the water bodies of this type of situation, inter connection is made to reach water in underlying porous and permeable formation at shallow depth. Properly designed tube well also act as recharge shaft, if recharge of water is needed in deeper aquifer overlain by impervious rocks.

Sub-surface dykes are water conservation structures constructed at suitable hydrogeological locations across the river bed at end of watershed to check subsurface flow of water along streambeds. Trench is dug down to impervious horizons across the stream and filled with local clay ball over high-density polythene, making subsurface barrier for flow of water from stream of bed.

Dug well recharge is also applicable in rural areas. In this system water from field is diverted in to recharge well passing through de-siltation chamber and filter media. Filtered water reaches into recharge well though delivery pipe lowered at the bottom of the well to avoid chocking aquifer by entry of air bubbles. In urban areas roof top rainwater harvesting structures should be constructed, as per guideline provided by Central Ground Water Board.

6.0 GROUNDWATER RELATED ISSUES AND PROBLEMS

There are many ground water related issue and problems in the Mandsaur district. First is water level decline and water scarcity is due to heavy ground water abstraction for agriculture use, which is contributing more than 92% for irrigation and resulting in stage of ground water development of 97% during 2009.

Secondly, Mandsaur district having various industries which has improper waste disposal technique and creating ground water pollution due leaching of industrial waste into ground water system. Water quality of deeper aquifer is highly saline in nature.

7.0 AWARENESS AND TRAINING ACTIVITY

Central Ground Water Board, North Central Region, has organized following Mass Awareness Programme (MAP), Water Management Training Programme (WMTP), and participation in exhibition, Mela, Fair in Mandsaur district.

7.1 Mass Awareness Programme (MAP) and Water Management Training Programme (WMTP)

One Water Management Training Programme was conducted in Nutan Madhyamik Vidyalaya at Mandsaur on dated 3rd February 2002. The theme of Water Management Training Programme was " Roof top rainwater harvesting".

7.2 Participation in exhibition, Mela, Fair

No exhibition, Mela and Fair was organized in Mandsaur district.

7.3 Presentation and Lectures delivered in public forum

Nil

8.0 AREA NOTIFIED BY CGWA/SGWA

In the Mandsaur district, Central Ground Water Authority has notified 2 blocks. The list of these blocks is as follows.

1. Mandsaur block (Notified under regulation act)
2. Sitamau block (Notified under regulation act)

9.0 RECOMMENDATIONS

- The stage of ground water development of Mandsaur district as a whole is 96 % and special attention is needed to tackle problem of over-exploitation of ground water resources and to prevent falling water level of Sitamau, Mandsaur, and Malhargarh blocks area. Salinity problem is also reported in different blocks of the district, there for proper management of ground water resources is required, so that salinity problem can

be checked from future expansion due to up conning of saline water from deeper levels to shallow aquifer because of pumping of water from deeper aquifer system.

- Construction of new ground water abstraction structures (dug wells and tube wells) should be avoided in over-exploited Sitamau, Mandsaur and Malhargarh blocks areas except for domestic and drinking purposes and proper control should be kept in further use of ground water resources of these blocks.

- There is an urgent need to implement artificial recharge/ water conservation schemes in over-exploited blocks of Mandsaur districts. Different water conservation and artificial recharge structures right from gully plug to contour bund, gabion structures, nala bunds, check dams, cement plugs etc. Percolation tanks and sub-surface dykes should be constructed at suitable hydrogeological locations, in large scale after detailed site specific studies to prevent depleting water levels, drying of wells in the areas. Watershed concept should be followed for construction of these structures at suitable sites.

- Change in cropping pattern may be opted for low water requirement crops.

- Conjunctive use of surface water and ground water to minimize irrigation load from ground water.

- Implementation of roof top rainwater harvesting schemes in urban areas and dug well / tube well recharge schemes in rural areas and in agriculture fields.