जल वर्ष 2007 Water Year 2007

स्वच्छ सुरक्षित जल – सुन्दर खुशहाल कल

CONSERVE WATER - SAVE LIFE

CENTRAL GROUND WATER BOARD

Ministry of Water Resources

Government of India

GROUNDWATER SCENARIO

JHALAWAR DISTRICT, RAJASTHAN

Western Region

Jaipur

January, 2010

JHALAWAR DISTRICT- AT A GLANCE

Latitude (North)	23^0 45' : 24^0 52'	
Longitude (East)	75^0 27' : 76^0 56'	
Geographical area (sq. km)	6219.00 sq. km	
No. of Tehsils & Name	(7) Khanpur, Jhalrapatan, Aklera, Pachpahar, Pirawa, Gangdhar Manohar Thana	
No. of Block & Name	(6) Jhalrapatan, Khanpur, Manohar Thana, Dag, Pirawa	
No. of Villages	2600	
No. of Towns	8	
Population (as per 2001 census)	Rural - 10.12 lac Urban - 1.68 lac Total -11.80 lac	
Average annual rainfall (mm)	883.0 mm (1997-2006).	
Major physiographical Units	The district has 5 physical,divisions namely Mukandhara range, hills of Dag, plateau region with low rounded hills, central plains of Pachpahar and Jhalarapatan, plain of Khanpur.	
Major Drainage	Mainly by the rivers Chambal, Ahu, Kali Sindh & Parwan rivers.	
Forest area / hills	122009 ha	
Area under cultivation	463865 ha	
Soil types	(i) Black cotton soil (ii) lithosols (iii) Regosols	
Principal crop area (Ha)	Soyabean	1,38,602
	Urad	28,021
	Wheat	34,651
	Jowar	36,543
	Chana	21,875
	Maize	64,815
	Mustard	22,425
Area irrigated by Dug wells / Tube wells / Bore wells	1,48,818	
Area irrigated by Tanks / Ponds	1,087	
Area irrigated by Canals	11,856	
Area irrigated by Other sources	1,558	
Total area irrigated	1,63,319	

No. of dug wells & Pz. monitored	26
Geological formation	Basalt,Sandstone,shale, (Deccan trap & Vindhyan super group) and Quaternary alluvium
Principal water bearing Formation	Alluvium, Sandstone, Shale and Basalt.
Pre-monsoon depth to water level during 2008 (m.bgl)	8 to 16 mbgl.
Post-monsoon depth to water level during 2008 (m.bgl)	5 to 12 mbgl.

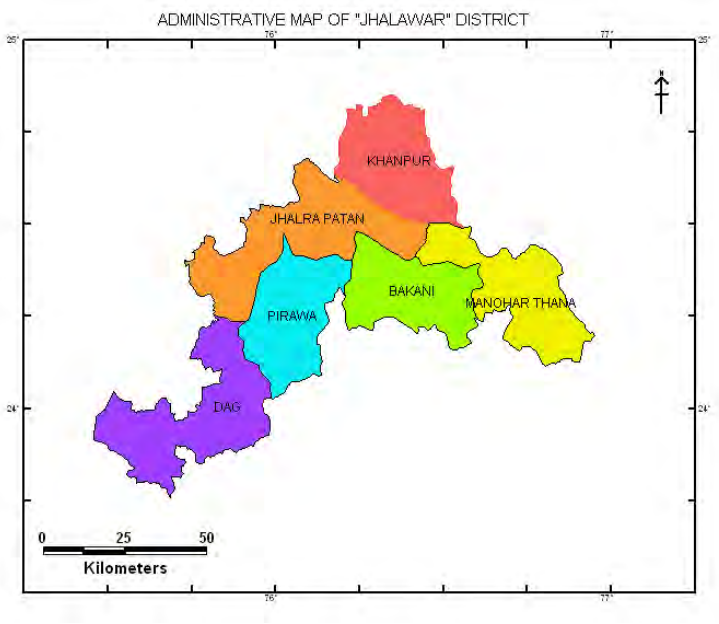
Type of wells	Formation		Total
	Unconsolidated	Consolidated	
EW	-	25	25
OW	-	-	-
SH	-	3	3
PZ	-	1	1

Depth of wells (m)	9.0 to 175.0
Discharge (lpm)	Negligible to 2017
Transmissivity (m/day)	9.307 to 249
Electric Conductivity	180 – 4620 micro mhos/cm at 25°C
Chloride	14-1337 ppm.
Fluoride	0.25 – 2.0 mg/lit.
Type of water	Alkaline
Net annual GW availability	430.8249MCM
Gross GW draft for all uses	453.0155 MCM
Stage of GW development	105.15%
Area Notified for Ground Water Regulation and Development	-
Mass awareness programme	-
Training on Water Management through Rainwater Harvesting	-

GROUND WATER SCENARIO
DISTRICT - JHALAWAR, RAJASTHAN

1.0 Introduction

Jhalawar district is located between 23° 45' 20" and 24° 52" 17' ' North latitude and 75° 27' 35" and 76° 56' 48" East longitude covering an area of 6219.00 sq.km. The district is part of Kota Division and is divided into five sub-divisions namely Aklera, Khanpur, Jhalawar, Pirawa, and Bhawanimandi. Administratively the district is divided into 7 tehsils and 6 development blocks.



Total number of villages in the district is 2600 and 8 urban town. Urban and rural population of the district is 1.68 lakh and 10.12 lakh respectively.

Systematic Hydrogeological survey in the district was carried out by GSI between 1961 & 1964 and by Central Ground Water Board from 1978 to 1986. Reappraisal hydroeological survey in entire district was completed by 1992. Under exploratory programme 25 exploratory boreholes, 3 Slim Hole and 1 Piezometer have been drilled. Since 1973, monitoring of water level is being carried out four times a year from 26 National Hydrograph Network Stations.

2.0 Rainfall & Climate

Average annual rainfall (1997-06) of the district is 883.0 mm. However normal rainfall for the period 1901 to 1970 is 934.5 mm. The western part of the district have lesser rains than the eastern part.

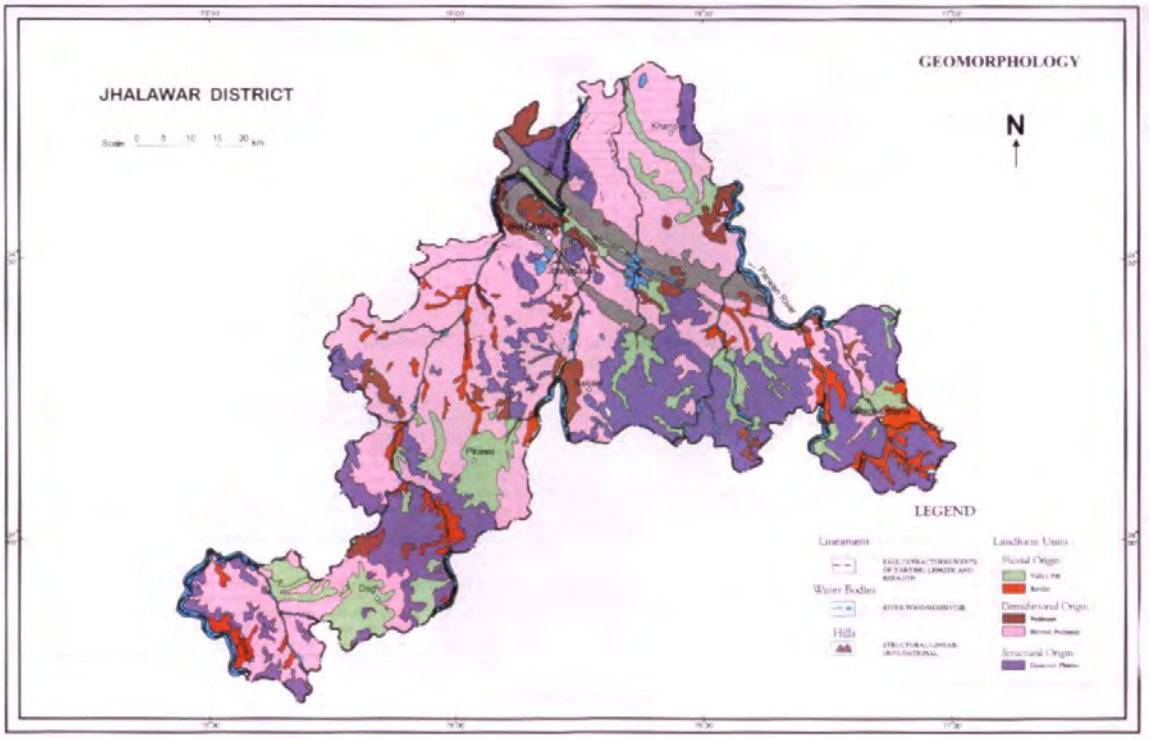
The climate of the district is dry except S-W monsoon season. The cold season is from December to February and is followed by summer from March to June. From mid of September to end of November constitute post monsoon season.

The drought are in general of mild or normal type, however severe types of drought are recorded at Manoharthanar, Aklera, Khanpur, Bakani and Pirawa.

3.0 Geomorphology & Drainage

The district lies at the edge of Malwa plateau, an area of low hills and shallow plains . The district falls in following 5 physical divisions:

(1) The Mukandhara range
(2) The hills of Dag
(3) The plateau region with low rounded hills
(4) Central plains of Pachpahar and Jhalarapatan
(5) The plain of Khanpur between two arms of Mukandhara



The whole of south Jhalawar has characteristics of the Malwa plateau, an area of rounded bare hills interspersed by plains. The Jhalawar plain stretches in a wide belt from Bhawani mandi in the west almost up to Asnawar in the east and is bounded in the northern, eastern and southern sides by the Mukandhara hills.

Geomorphologically the district is divided into following units:

Origin	Land Forms	Occurrence in the District
Fluvial	Valley Fill	Scattered in the entire district , more concentrated in south, west and central.
	Ravine	Along rivers Parwan, Ahu, Kalisindh and their tributaries
Denudational origin	Pediment	In small patches mainly in west, north east and central part.
	Burried pediment	Main concentration in northern, central, western and south west.
Hill	Structural hill	In central part.
Structural plateau	Dissected plateau	Scattered in central and prominent in south west.

Drainage:

The rivers and streams of the entire district belongs to the Chambal system. Except in the Gangdhar tehsil the general flow is from south to north. The rivers of Jhalawar may be divided into two groups the western group and eastern group. The western rivers are Ahu, Piplaj, Kyasri, Kantli, Rawa, Kalisindh and Chandrabhaga. The eastern rivers are Parwan, Andheri, Newaj, Ghar and Ujar. There are artificial lakes Kadila and Mansarovar. Generally speaking rivers have deep bed with the result the water level is below that of the surrounding area..
Drainage density in most part of the district varies from 0.5 to 0.7 km/km^2. Drainage density is from 0.7 to more than1km/km^2 in the south eastern and south western part of the district. In the north central part of the district its low and ranges between 0.3 to 0.5 km/km^2.

4.0 Soils & Irrigation Practices

Almost entire district is underlain by black cotton soil,except for a few small pockets in the north of district where recent alluvium in plain area and lithosols and regosols are present.

Irrigation:

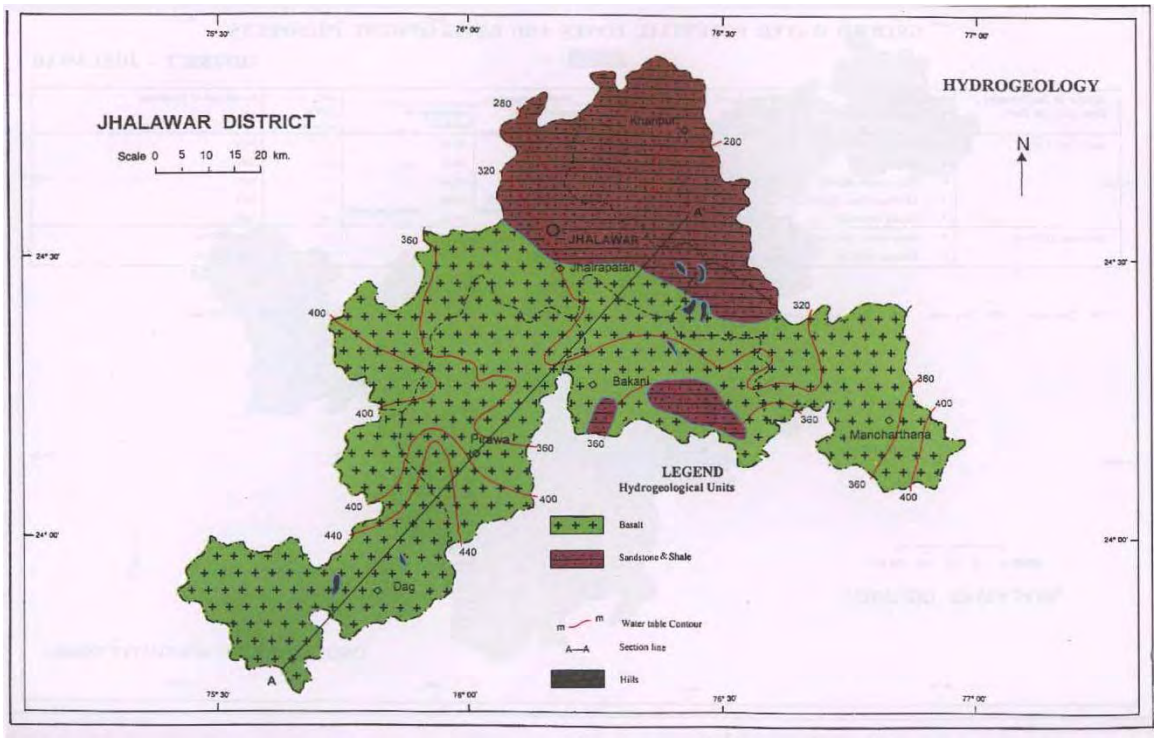
The principal means of irrigation in the district are wells/tube wells, though some areas are irrigated by canals, tanks etc. Groundwater is the main source of irrigation and is utilized through dug wells, DCB's, and tube wells. Tanks form the second most important source of irrigation in the district. Canal irrigates only a small area. Details of the gross irrigated area by different sources and number of structures have been given below:

(Area in Ha)

Sl. No	Tehsil	Total Irrigated Area	Irrigated Area & Number of structures						
			Tube wells/ Wells	Ponds/ Tanks	Canals	Others	No. Dug Well	No. Tube Well	No. Pond
1	Khanpur	49842	37663	452	10703	1024	6805	2665	2
2	Jhalrapatan	36475	35403	619	-	453	12514	196	20
3	Aklera	20970	19511	16	1394	49	8976	18	-
4	Pachpahar	10780	10780	-	-	-	8925	324	7
5	Plirawa	23649	23649	-	-	-	14564	302	2
6	Gangdhar	11778	-	-	-	-	5258	20	6
7	Manohar thana	14246	14169	-	-	-	6626	9	-

5.0 GROUNDWATER SCENARIO
Geological Framework

Jhalawar comprises rocks of Vindhyan super group and Deccan traps. About 60% of the district is covered by Deccan traps. The vindhyans comprised of lower and upper vindhyans represented by Jhalarapatan sandstone, Suket shale and limestone, Kaimur sandstone, Rewa shale, sandstone and conglomerate, Ganugarh shales, lower Bhander sandstone and limestone.



The Vindhyan sandstone and shale form linear hills trending north west to south east.They are exposed around Jhalawar town and to its north east and north west. These rocks are overlain by twelve basaltic flows between 280 and 481metres mean reduced level. Around Dag and Kolvi the flows have undergone wide spread laterization. Both fossiliferous and non fossiliferous clay, chert, limestone beds are also present.

The entire Dag, Pirawa, Manoharthana and parts of Bakani and Jhalarapatan Blocks are occupied by Deccan traps. The northern part of the district comprising of Khanpur block is occupied by sandstone and limestone of lower Bhander group. The main hill ranges comprising of shale, sandstone and conglomerates belongs to Rewa and Kaimur groups of upper Vindhyan. Semri group belonging to Lower vindhyan is exposed in parts of Jhalarapatan block.

Hydro-geological Condition:

The occurrence of ground water in the district is mainly controlled by the topographic and structural features present in the geological formations.Groundwater occurs mainly under unconfined condition to semi-confined in saturated zone of rock formation. Its occurrence is controlled by topography, physiography and structural features of the geological formations. The movement of the groundwater in hard rock areas is goverened by size, openness, interconnection and continuity of structural weak planes while in unconsolidated rocks groundwater movement takes places through pore space between grains. Water bearing properties of different aquifers are described below:

Groundwater in Vindhyan Super Group

Vindhyan sandstones and shales mainly occurs in northern part of the district. Sand stones (mostly of Bhander group) are the most widely distributed lithounits in the Vindhyan terrain of the district. Generally the sandstones and shales occur as alternate layers. The sandstones layers are low dipping, fine grained, compact and hard where as shales are flaky in nature. Under favourable conditions the contact of two yield water.

Within sandstone large dia. open wells are most feasible abstraction structures and yield of wells ranges from 50 to200 cu.m/ day ,value of specific capacities ranges from 20 to 200/litres/ min./meter.

Groundwater within Vindhyan shales occur under water table conditions in the weathered zone and in fractures formed due to splintery nature of the shales. Large diameter dug wells taping shales yield only in the range of 20 to 80 cu.meter /day.Dug wells at a stretch can run for 1 to 2 Hours only. Horizontal boring in the dug wells also does not yield promising result.

Groundwater in Deccan Traps

The thickness of basalt ranges from a few meter to more than 200meter. Generally in Dag block thickness of basalt is more than 200 meter.

Ground water in weathered basalt occurs under water table condition. Thickness of weathering in basalt ranges maximum up to 20 meter. Large dia. Wells are mainly feasible with an average yield of 100 to 120 cubic meter.

Ground water in compact basalt occurs under water table condition in the joints and fractures. Yield of open wells ranges from 20 to 200 cubic meter per day.

In vesicular basalt ground water occurs in the vesicles, joints, fissures and cracks. Yield of open wells varies from 40 to 280 cubic meter per day. Vesicular basalts are soft in comparision to compact basalts.

In amygaloidal basalt ground water occurs in the cavities, fissures, cracks and joints. Yields of openwells ranges from few to 330 cubic meter per day. .

Groundwater in Alluvium

Alluvial aquifer with limited thickness occurs along river courses like Ahu and Chhoti Kalisindh. Apart from this in some depressions also alluvium of limited thickness forms aquifer. It comprises sand , silt and gravel, along river courses pebbles are also found. Depth of open wells is maximum upto 18 meter and yield ranges from 100 to 200 cubic meter per day.

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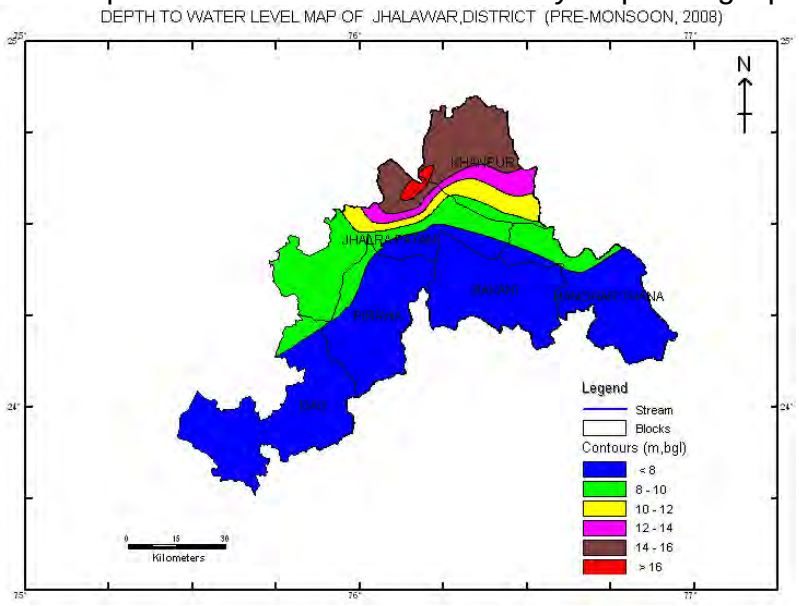
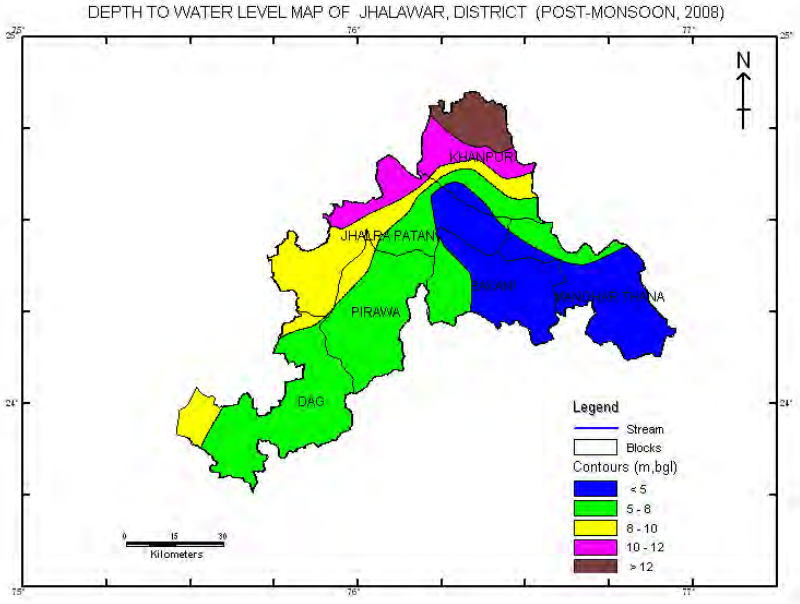
Depth to Water Level (Pre Monsoon 2008)

The depth to water level varies widely depending upon topography, drainage, bedrock geology etc. Depth to water varies from less than 8 to more than 16m bgl. Water level is shallower in southern part of the district. In general the depth of water level increases from south to north.



Depth to Water Level (Post Monsoon 2008)

During Nov.08 water level ranges widely from less than 5M to more than 12 m,bgl. Water level is shallower in south eastern part of the district. The depth to water level during post monsoon also is shallow

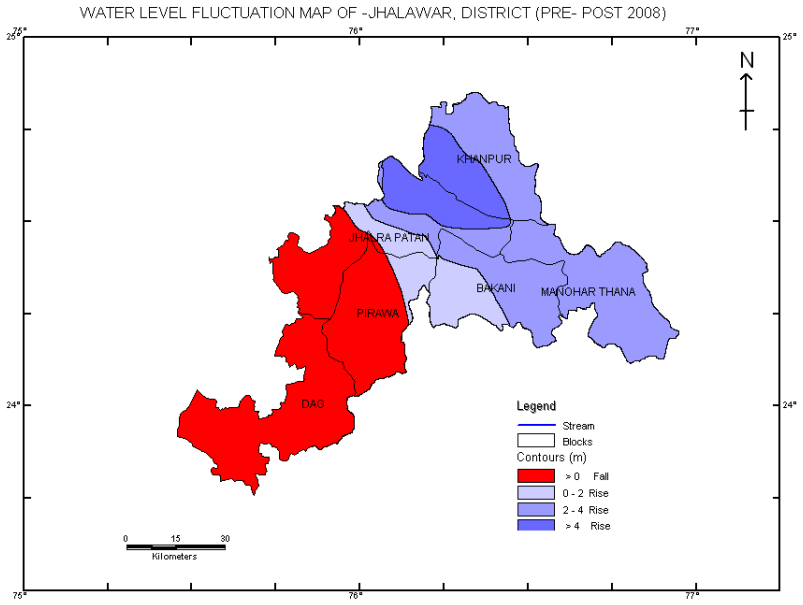


in south and deep in north.

Block	Pre Monsoon		Post Monsoon	
	Min	Max	Min	Max
Jhalrapatan	7.35	16.52	3.16	10.57
Khanpur	15.75	15.75	12.90	12.90
Manohar Thana	6.85	8.05	4.29	5.00
Dag	-	-	7.23	7.23

Water Level Fluctuation

Seasonal fluctuation in water level based on Pre and Post-monsoon 08' indicate that there has been rise in water level in major part of the district. Perusal of the fluctuation data indicate that major part of the district has recorded rise in water level of more than 4m.

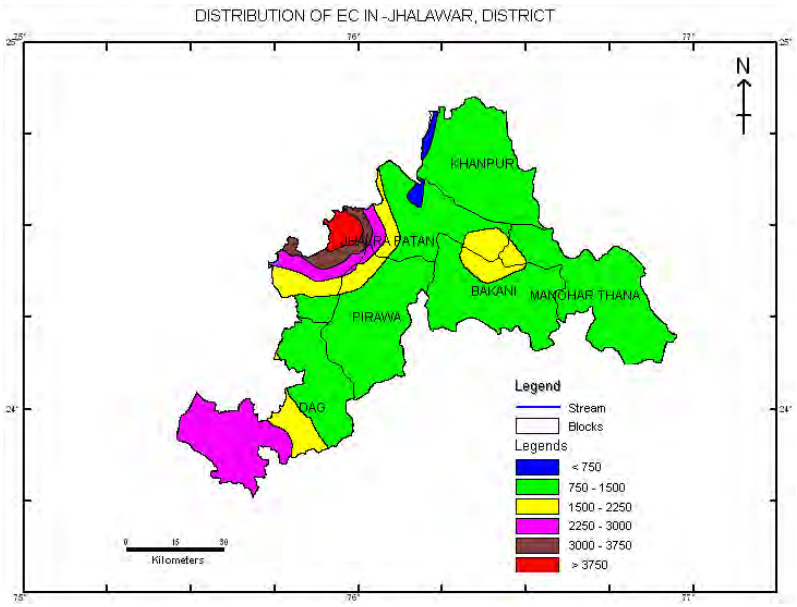


Block	Rise(meter)	
	Min	Max
Jhalrapatan	4.19	5.95
khanpuri	3.85	3.85
Manohar Thana	2.56	3.05

Groundwater Quality

Water Quality in Shallow Aquifer

In most of the district the electrical conductivity values are less than 1500 micro mhos/cm. at 25 centigrade. In western part of Jhalrapatan block electrical conductivity values more than 2250 micro mhos/cm are reported, at some places like Kundli Khera and Garnawad shallow water is brackish with values more than 3000 micro mhos/cm., the highest value of 5455 micro mhos/cm. is recorded from Jhalawar Road.



Fluoride in most of the district is less than permissible value of 1.5mg/lit . In Golana of Khanpur Block fluoride value of 2.5mg/lit is reported.

Water quality in Deep Aquifer

Salinity is not a serious problem except at Sunel in Pirawa block and Jhalrapatan where EC values of more than 4600 micro mhos/cm. is reported from the tube well.

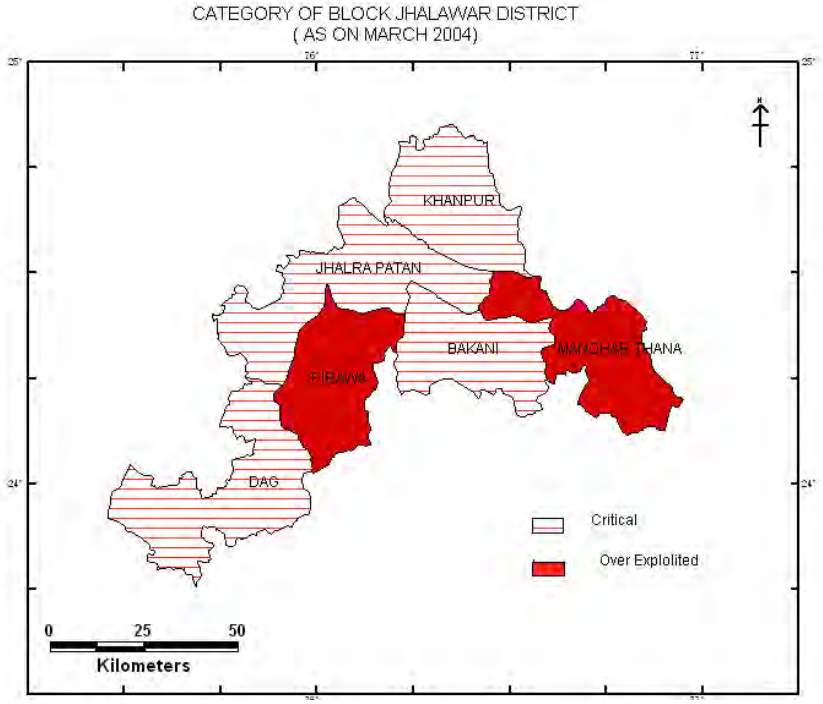
At many places fluoride concentration is more than 1.5 mg./lit. They are Pirawa, Sadla, Raipur, Sunel, Magispur, kagriya, Dongargaon,Ratali,Salawad and Sarda.

6.0 Groundwater Resources

Groundwater resources have been estimated as per the norms recommended by GEC 97. While assessing the ground water resources hilly areas have not been considered. Net annual groundwater availability is estimated to be 430.8249 mcm. Draft for all use is 453.0155 mcm and over all stage of development is 05.15%. Summarized block wise estimate of dynamic groundwater resources is given below:

(in mcm)

Sl. No.	Assessment Unit	Net Annual Ground Water Availability	Gross Ground Water Draft for All uses	Stage of Ground Water Development	Category
1	BAKANI	63.0508	58.5583	92.87	C
2	DAG	66.0468	59.4639	90.03	C
3	JHALRAPATAN	**93.0941**	**92.0244**	**98.85**	C
4	KHANPUR	72.1664	66.7506	92.50	C
5	MANOHAT THANA	56.8105	79.5201	139.97	O.E
6	PIRAWA	79.6563	96.6982	121.39	O.E
DISTRICT TOTAL		**430.8249**	**453.0155**	**105.15**	



7.0 Status of Groundwater Development

Basalts, Sandstone, and shales form the aquifer in different parts of the district. Alluvium area is restricted to riverbeds. Ground water occurs under unconfined to semi-confined condition. Depth and diameter of the dug well depends on formation and geomorphology. However, general depth of dug well ranges from 15 to 30m , details of dug well in different formations is follows:

Formation	Block	Avg. Yield m^3/day	Depth in m
Basalt	Bakani	30-50	20-25
	Dag	30-50	30-40
	Jhalarapatan	30-50	25-40
	Manohar Thana	30-50	30-40
	Pirawa	30-50	30-40
Sandstone	Jhalrapatan	70-100	25-40
	Khanpur	70-100	30-40

8.0 Ground Water Development Strategy

Ground Water Development

Stage of ground water development in the district is 105.15%. The scope of ground water development is already exhausted in 2 blocks where groundwater development has already exceeded 100% and categorized as “Over-exploited”. 4 blocks falls under “Critical” category where ground water development is approaching 100. There is no scope for further development in the district for irrigation or industrial use. However, exploratory drilling can be taken up in unexplored area for estimation of aquifer parameters.

Water Conservation and Artificial Recharge

Ground Water Management

Due to over development of groundwater further exploitation of this precious resource must be checked. Artificial recharge is not feasible in the district as the country rock is composed exclusively of hard rocks. The water level is shallow and transmissivity is low. Under such condition there is likelihood that recharged water will reappear as base flow. Any induced water application will create localized mound with no change in trend of declining water level in adjacent areas.

Since the stage of ground water development has already crossed 100%, for sustainable utilization of water resources conjunctive use of surface and groundwater is inevitable. Water Harvesting through construction of bunds, anicuts, and rooftop harvesting structures in Vindhyan formation is possible as the water level during rains is deep , in basalts which is the major aquifer the water level becomes very shallow during rains and hence aquifer is not available during the time when there is surplus availability of water. The area suitable for recharge is very limited and the site selection needs professional assistance

9.0 Recommendations

1. Ground water draft is very high in all the blocks. Stage of ground water development in the district has reached 105.15% due to indiscriminate use. It has to be controlled by preventing further development.

2. Water scarcity is a perpetual phenomenon in Jhalawar. Permanent solution to drinking water problem should be devised using Surface water, as aquifer is not potential and sustainability remains questionable.
3. Mines can be additional potential source of water supply in October to December and partly from January to June.
4. Revival of traditional ground water storage system i.e. *Baori*, open wells, *Tanka* etc for rainwater conservation for use in day to day life will reduce ground water draft.
5. Awareness programme and training on rainwater harvesting will be beneficial to check decline in water level and justified use.
6. Taking advantage of uneven topography of the area, small WHS or earthen dams, upstream of irrigation commands, at suitable sites, may be constructed to store rainwater. This will increase recharge to ground water which ultimately result in increase of yield of wells.
7. Modern agricultural management techniques have to be adopted for effective and optimum utilization of the water resources. Maintaining irrigation through minimum pumping hours as per minimum requirement of water by the crop and also selecting most suitable cost effective cropping pattern can achieve this.
8. Surface runoff can be harnessed by constructing tanks at feasible sites in the area occupied by the hard rock terrain for supplementing irrigation potential to increase the agricultural production.
9. High water requirement crops may be discouraged. Proper agriculture extension services should be provided to the farmers so that they can go for alternate low water requirement economical crops.