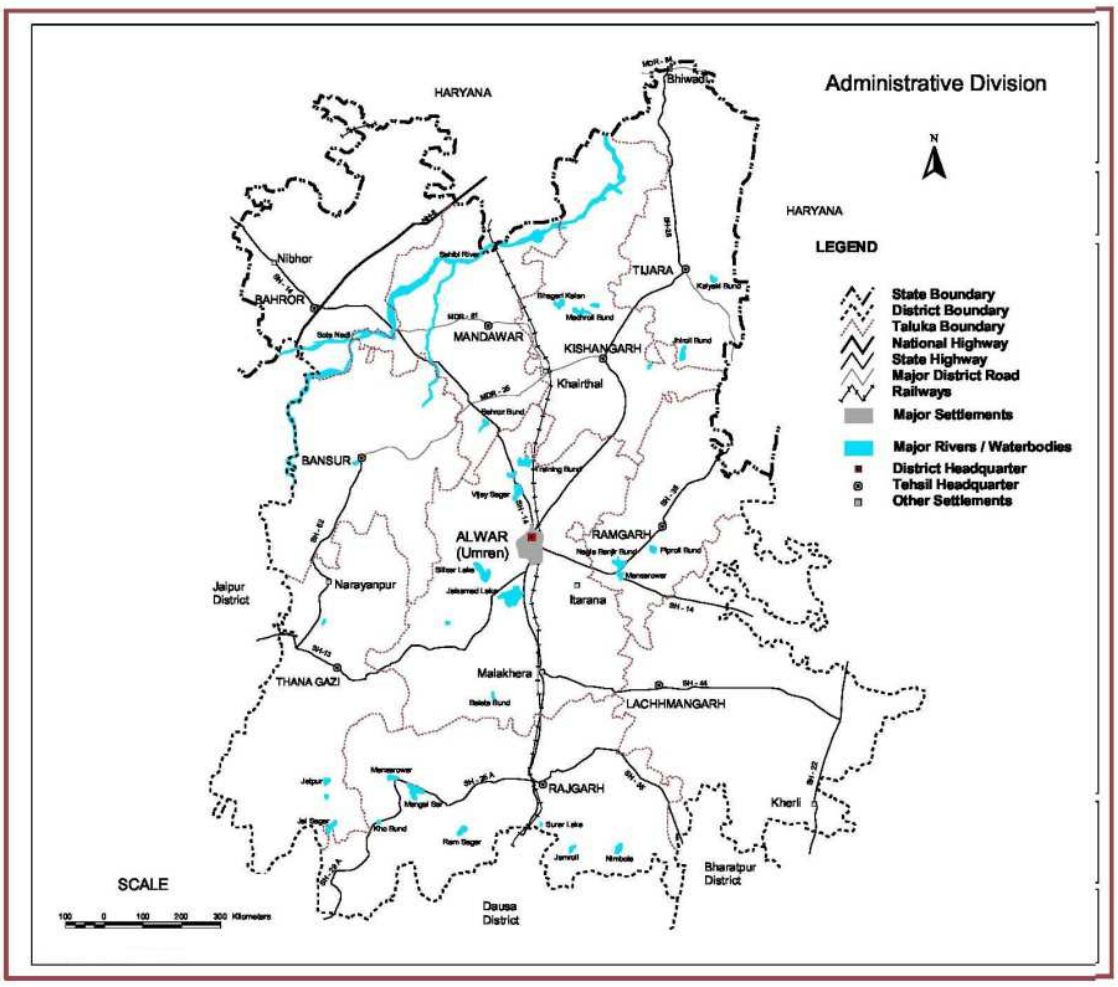
GOVERNMENT OF INDIA
MINISTRY OF WATER RESOURCES
CENTRAL GROUND WATER BOARD

GROUND WATER INFORMATION
ALWAR DISTRICT
RAJASTHAN



WESTERN REGION
JAIPUR
2013

ALWAR DISTRICT AT A GLANCE

1. GENERAL INFORMATION

Geographical Area	:	8380 sq. km
Administrative Divisions	:	Tehsils - 14; Panchayat Samities -14
Villages	:	1991
Population (2011)	:	3,674,179
Average Annual Rainfall	:	637mm

2. GEOMORPHOLOGY

Major Physiographic unit	:	Alluvium, Hills
Major Drainage	:	Seasonal streams

3. LAND USE (2010-11)

Forest Area	:	84058 ha
Net Area Sown	:	507171 ha
Total Cropped Area	:	859220 ha

4 SOIL TYPE : Lithosols & Regosols of hills, Older Alluvial Soils, Red Sandy Soils

5. PRINCIPAL CROPS (2010-11)

Bajra	:	273147 ha
Jowar	:	31990 ha
Wheat	:	193992 ha
Maize	:	6773 ha
Barley	:	13011 ha
Pulses	:	19080 ha
Fruits & Vegetables	:	17716 ha
Oilseeds	:	259995 ha

6. IRRIGATION BY DIFFERENT SOURCES (2010-11) -

Tubewells	:	324632 ha
Other wells	:	12615 ha
Canal	:	789 ha
Other Sources	:	20 ha
Net Irrigated Area	:	451546 ha
Gross Irrigated Area	:	478570 ha

7. GROUND WATER MONITORING WELLS (As on March, 2012)

Dugwells	: 12
Piezometers	: 23

8. GEOLOGY

Quaternary to Recent	: Alluvium
Delhi Super Group	: Quartzite, Limestone, Phyllite, Granite and Pegmatite
Bhilwara Super group	: Granite, Gneiss, Schist

9. HYDROGEOLOGY

Water Bearing Formation	: Alluvium; Weathered and fractured hard rocks
Pre-monsoon Depth to Water Level (May-2011)	: 5 m to 77 m
Postmonsoon Depth to Water level (Nov.-2011)	: 2 m to 80m

10. GROUND WATER EXPLORATION (As on 31.3.2012)

Wells Drilled	:	EW 53, OW 3, PZ 41
Depth Range	:	12.8 to 202.7 mbgl
Discharge	:	10 to 1003 lpm
Transmissivity	:	27 to 662.4 m^2/day

11. GROUND WATER QUALITY

Major problems	:	Salinity and Fluoride in some parts

12. DYNAMIC GROUND WATER RESOURCES- (As on 31/03/2009)

Net Annual Ground Water Availability	:	79482 ham
Annual Ground Water Draft (Irrigation+Domestic)	:	132387 ham
Stage of Ground Water Development	:	167%

13. AWARENESS AND TRAINING ACTIVITY

A	Mass Awareness Programme	:	1
	Date	:	26.11.2001
	Place	:	Behror
B	Water Management Training Programme	:	3

14. GROUND WATER CONTROL & REGULATION

Notified Block	:	Behror block notified on 2.12.2006

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1.0 Introduction

Alwar district is located in the north eastern part of Rajasthan and extends between north latitude 27°03' and 28°14' and east longitude 76°07' and 77°13'. It covers 8720 sq. km of geographical area. Its length from south to north is about 137 km and breadth from east to west is about 110 km. The district occupies about 2.45% of total area of the State.

Administratively, the district is divided into 14 tehsils and 14 Panchayat Samitis. The District has 1991 villages, 9 urban towns and 6 Municipalities. Rural and urban population in the district is 30.18 lacs and 6.54 lacs respectively (Census, 2011). Density of the population is 438 persons/sq.km. A map of the district showing taluka boundaries, taluka headquarters, physical features and locations of monitoring wells is presented as Figure-1.

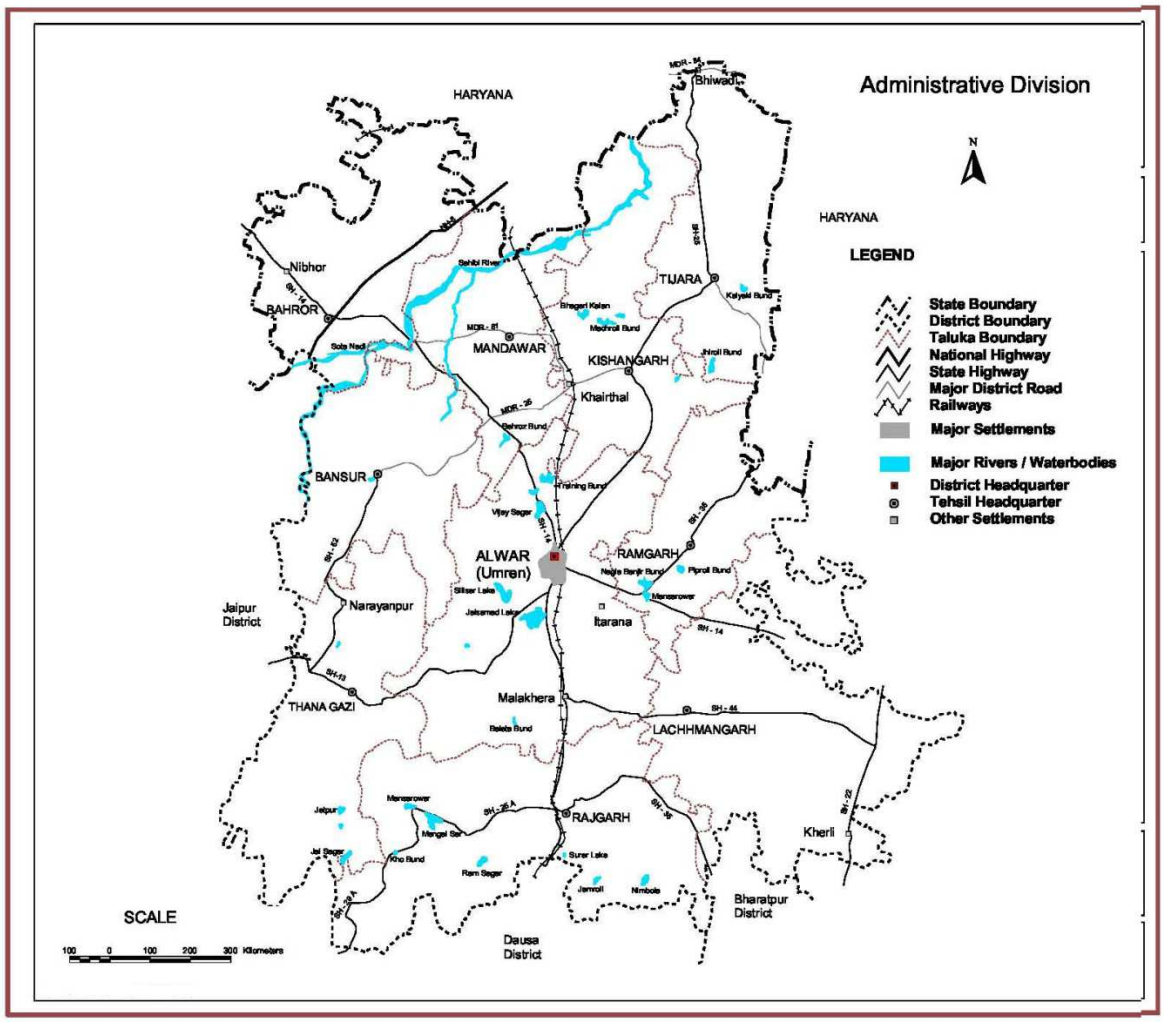

Fig. 1. Administrative Division

During the years 1967-72, systematic hydrogeological surveys and ground water investigations were carried out by Siddiqui (1967-68), Sinha (1969-72), Karanth (1969) and Prasad (1970-71) of Geological Survey of India. These surveys were

continued by Central Ground Water Board after its inception in 1972. A list of various scientific studies carried out in the district by Central Ground Water Board is given in Table 1.

Table 1: Studies undertaken by CGWB.

S. No.	Officer	AAP	Type of Survey/Study
1.	M.Mehta	1974-75	Systematic hydrogeological surveys in Banganga river basin, Jaipur, Bharatpur, Alwar and Sawai Madhopur districts.
2.	S. Venkataraman	1975-76	Investigation for water supply to Laxmangarh, Manjpur, Alwar district
3.	R.P. Mathur	1981-82	Systematic hydrogeological investigation in parts of Alwar district
4.	Hussain A.	1980-81	Study on geohydrological features of Upper Sahibi river basin in relation to flood control measures
5.	R.P. Mathur	1986-87	Reappraisal hydrogeological Survey in parts of Alwar district.

The report on 'Ground water resources and development potential of Alwar district' was brought out by Central Ground Water Board in the year 1990. Revised District report was brought out in the year 1999. Since its inception, the Central Ground Water Board has drilled 53 Exploratory wells, 3 Observation wells and 41 piezometers in the district. Salient features of ground water exploration are listed in Table 2. Presently, ground water regime monitoring is being carried out in the district from a network of 37 observation wells. Water levels are monitored four times in a year during the months of January, May, August and November. Samples for water quality analyses are collected during May.

Table 2: Salient Features of Ground Water Exploration

Type of well	No.	Depth drilled (m)	SWL (m)	T (m^2/day)	Discharge (lpm)	EC (micromhos/cm) at 25^oC
EW	53	12.8 – 202.7	1.92 – 45.12	27 – 662.4	10 - 1003	455 - 22240
OW	3	101.5 – 160.07	4.68 – 27.5	105	35 - 670	680 - 2710
PZ	41	30 – 159.42	2.55 – 62.94	35.66 – 362	15 - 880	540 - 15000

1.1 Climate and Rainfall

Climate of the district can be classified as semi-arid. It is characterized by very hot summer and very cold winters with fairly good rainfall during south west monsoon period. In May and June, the maximum temperature may go up to 47^0C. The potential evapotranspiration rates are quite high especially during May and June. Normal annual rainfall of the district is 631mm. Monthly distribution of normal rainfall, month and season-wise actual rainfall during 2010-2011 are given in Table 3a, b, c respectively (Commissionrate of Agriculture, Govt. of Rajasthan, 2012).

Table 3a: Month-wise Normal Rainfall of Alwar

District	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Alwar	9.6	10.2	5.6	5.5	15.8	44.2	196.9	213.3	100.9	20.0	4.1	4.8	630.9

Table 3b: District-wise actual rainfall during 2010-2011

District	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Total
Alwar	40.4	214.2	272.5	233.0	3.6	21.8	4.5	0.0	44.0	0.0	0.0	21.0	855.0

Table 3c: District-wise actual seasonal rainfall during 2010-2011

District	Annual Normal	June 10 - Sep 10	Oct 10 - Dec 10	Jan 11 - Feb 11	March 11 - May 11	Total (Jun 10 to May 11)
Alwar	630.9	760.1	29.9	44.0	21.0	855.0

(Source: Rajasthan Agricultural Statistics at a Glance, 2010-2011)

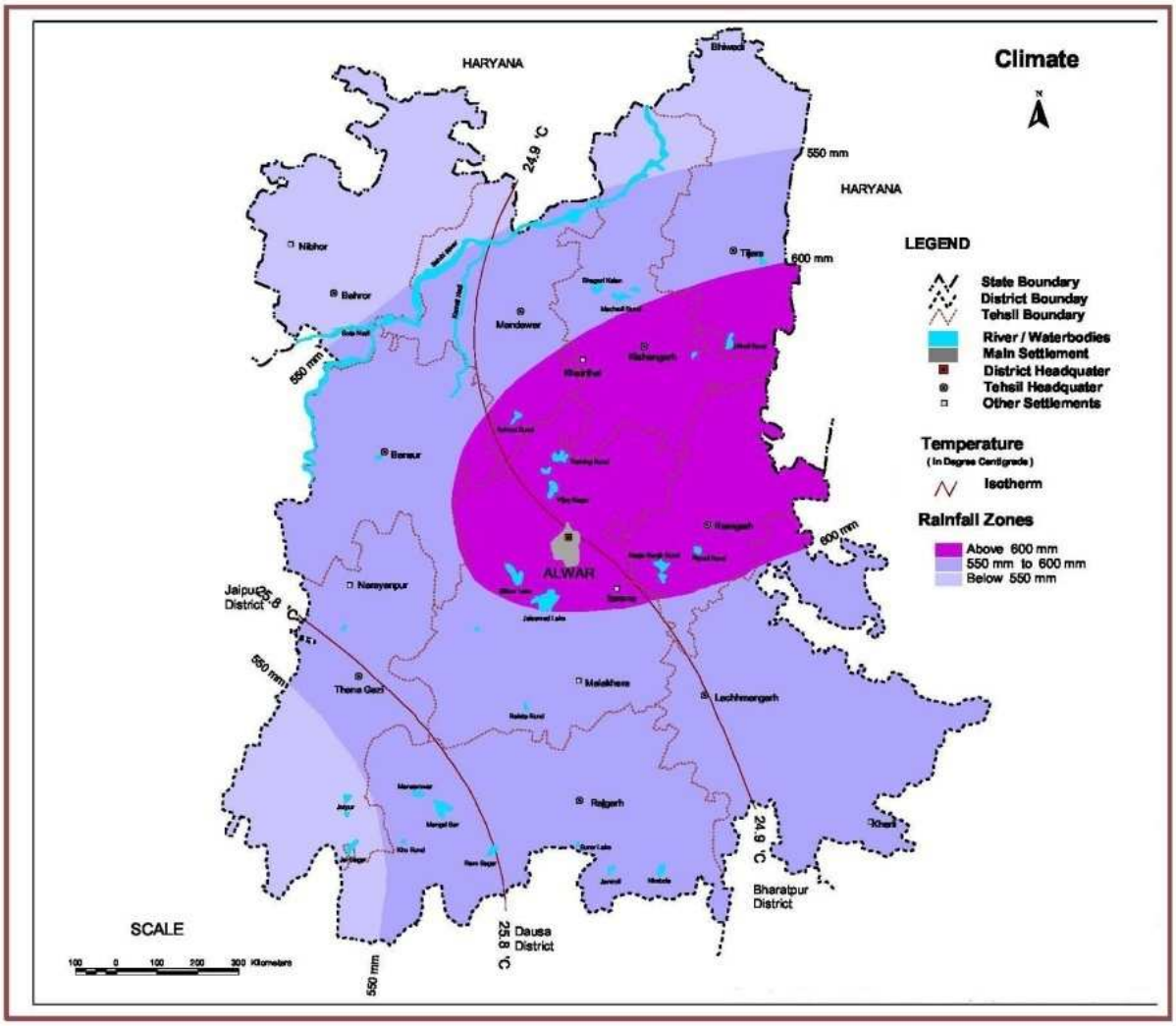

Fig. 2. Climate and Rainfall

1.2 Geomorphology and Soil Types

The district is quadrilateral in shape. The Aravalli ranges form ridges of rocky hills in most parts and are generally parallel. These make their appearance in the district from north east in Tijara subdivision and run southwards forming boundary of the district in the north east for about 24 km, terminating near Naugaon. Another prominent hill range is at Mandawar, which passes through Jindoli and Alwar towards the extreme south west corner of the district adjacent to Jaipur district. The low hills cover almost entire Thanagaji and Rajgarh tehsils & about one third of the Alwar tehsil

and form prominent feature in Bansur, Kishangarh and Tijara tehsils. Mandawar, Behror, eastern part of Alwar, Rajgarh tehsils and western part of Bansur tehsils are gentle plains with scattered peaks of small hills. The highest peak in the district is at Bilahi, which is 775 mamsl. Geomorphology of Alwar district is depicted in Fig. 3 and various geomorphological units in the district are listed in Table 4.

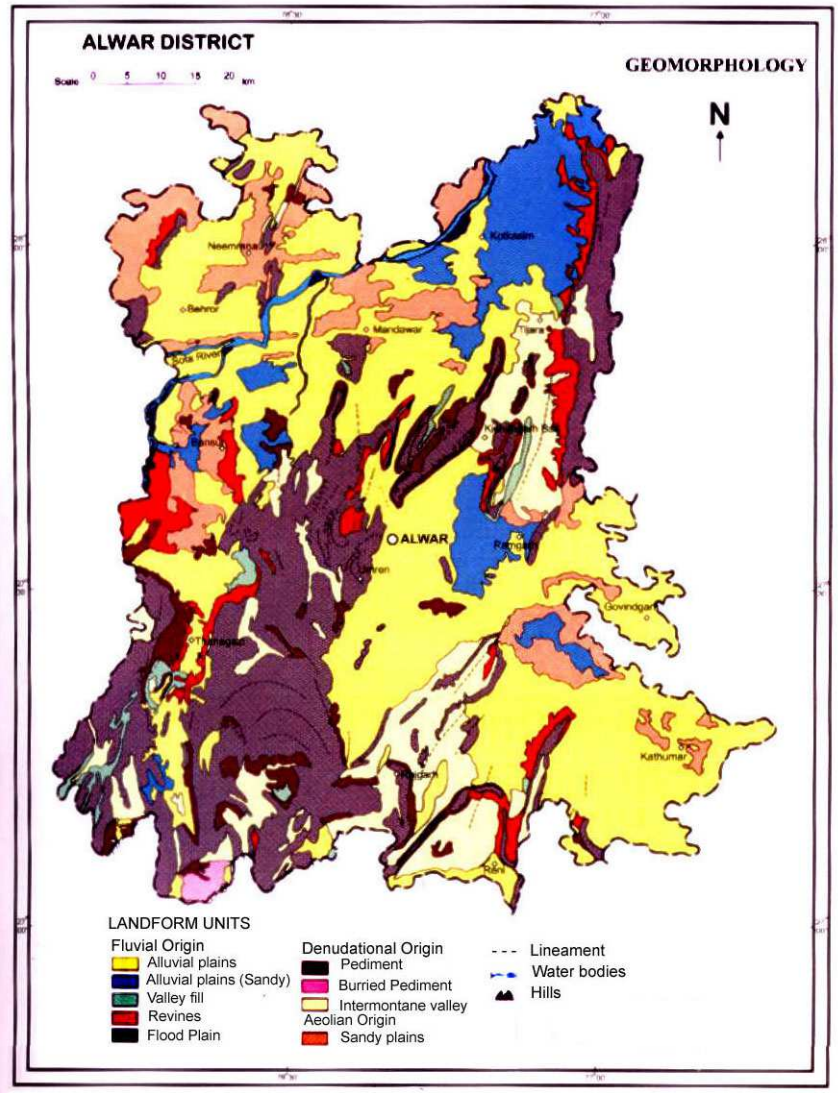

Fig. 3. Geomorphology

Table 4. Geomorphological units of Alwar district

S. No.	Origin	Landforms	Description & Occurrence
1	Fluvial	i)Alluvial plains	Mainly undulating landscape formed due to fluvial activities scattered in entire district
		ii) Valley fill	Formed by fluvial activities usually at low topographic locations mainly south west of Thanagaji and north west of Alwar town
		iii) Ravine	Small narrow deep depressions occur along river Sabi
		iv) Flood plain	Surface of relatively smooth land adjacent to a river channel as found along river Sabi and Sota.
2	Denudational	Pediment and Buried Pediment	Broad gently sloping rock forming erosion surface of low relict between hills and plains. Occurs along forest hills & east of Kherthal town around Gola Ka Bas.
3	Aeolian	Sandy plains	Formed by the wind activities. Occurs in west & north eastern parts.

S. No.	Origin	Landforms	Description & Occurrence
4	Hills	Linear ridge	Long narrow low lying ridge usually barren. Occurs in south eastern parts.
		Denudational hill	Steep sided relict hills. Occur north of Hamirpur and east of Khara village.
		Structural hills	Linear to arcuate hills associated with folding & faulting etc. Occurs in western boundary of the district.

1.3 Drainage & Surface Water Projects

There is no perennial river in the district. The seasonal rivers, which flow through the district and carry the runoff from the hills are Sabi (Sahibi), Ruparail (Barah), Chuhar Sidh and Landoha. The natural drainage is from south west to north east.

Table 5: Tehsil-wise distribution of basin area is given below:

S. No.	Name of Tehsil	Area in river basin (sq. km)		
		Sabi	Ruparail	Banganga
1	Alwar	87.7	1077.8	0.3
2	Bansur	551.4	98.9	
3	Behror	242.6		
4	Kathumar			
5	Kishangarh	564.9	138	
6	Kot kasim			
7	Laxmangarh			967.1
8	Mandawar	607.4		
9	Rajgarh		254.6	725.6
10	Ramgarh		659.3	
11	Thanagaji	68.1	114.8	554.6
12	Tijara	625.3	193.6	
TOTAL		**2747.4**	**2537.0**	**2247.6**

1.4 Soil

Mainly three major types of soils are found in the area (Fig.4). Brief description of these soils is presented below:

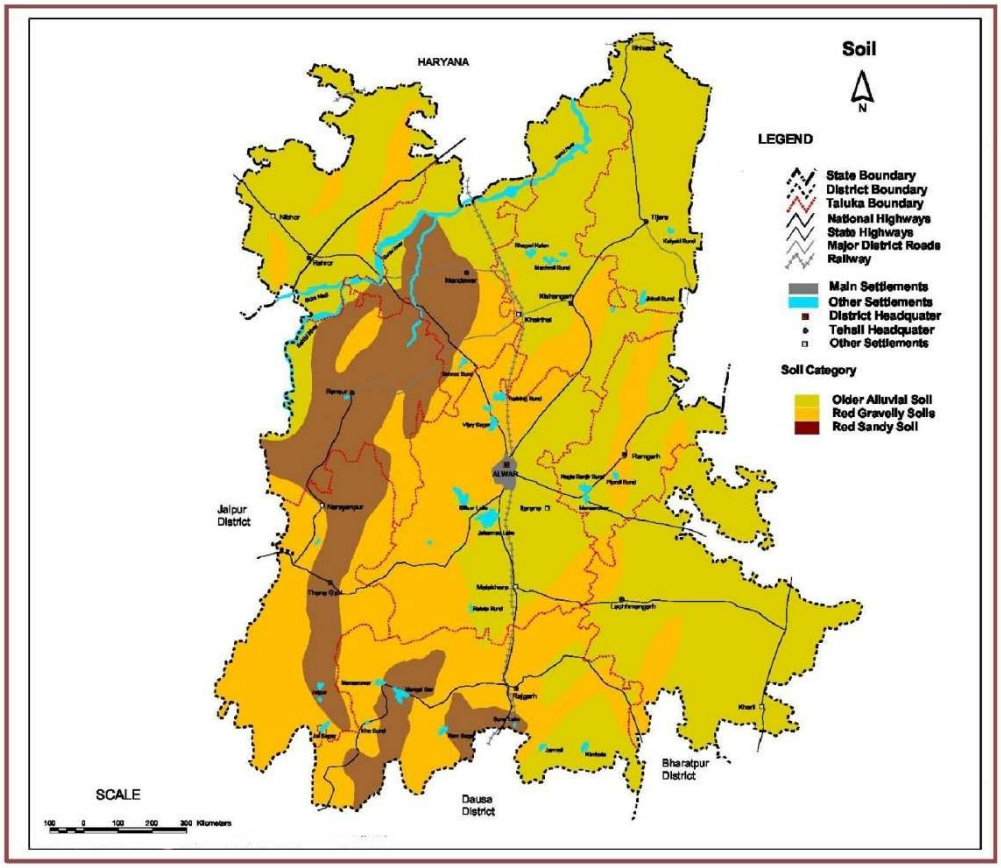

Fig. 4. Soils

1.4.1 Lithosol & regosol of hills (Red Grey valley Soil)

These are found in the Aravalli hills of south western part of the district. These soils are shallow with gravels found very near the surface, light textured, fairly drained, reddish brown to grayish brown in colour.

1.4.2 Older alluvium (Older Alluvial Soils)

These soils are derived from alluvium and found mainly in western parts of the district. These soils are non calcareous, semi-consolidated to unconsolidated brown soils, loamy sand to sandy loam in texture. They are well drained and occupy gently sloping terrains.

1.4.3 Recent alluvium (Red Sandy Soils)

These soils are developed in alluvium and found mainly in the eastern part of the district. These soils are deep, well drained, sandy loam to loam in texture and non-calcareous.

2.0 Ground Water Scenario

2.1 Hydrogeology

Alwar district is mostly underlain by the rocks of Delhi Super Group with minor outcrops belonging to Bhilwara Super Group and Post Delhi Intrusives at places overlain by Quaternary alluvium. A map depicting hydrogeological features is presented in **Figure-5**.

The occurrence of ground water in the district is mainly controlled by topographic features, physical characteristics and structural features present in the geological

formations. Ground water in the area occurs under confined conditions in phreatic zones, semi-confined conditions in deeper zones and weathered & fractured portions of the hard rocks.

2.1.1 Ground Water in Hard rocks

Ground water occurs under unconfined conditions in the weathered zones in the joints, fractures and plains of structural weakness available in the hard rocks. In the district the hard rocks are grouped as granite, gneiss, schist of Bhilwara Super group and quartzite, impure limestone, phyllite, granite and pegmatite of the Delhi Super Group. The movement of the ground water in these rocks is controlled by the nature, size openness and continuity of joints & fracture present in them. They do not form important water bearing formation except in the fractured and brecciated quartzite at places. Wells in hard rocks generally yield 50 to 70 m^3 /day of all the rock types. Schist, phyllite and their variants form very poor aquifers yielding 10 to 30 m^3 /day for heavy drawdown.

The fractured quartzite located at Karoli and Kala Pahar yield between 80 to 200 m^3/day. Dug wells tapping crystalline limestone around Bairawas and Kushalgarh yield 80 to 100 m^3 /day for drawdown of 4 to 5 m in limited area. Wells tapping cavernous limestone near Fatehpur yield 200 m^3 /day for drawdown of less than 9m.

2.1.2 Ground water in unconsolidated sediments

About 60% of the district area is covered by Quaternary sediments overlying the hard rock formations. Ground water occurs under phreatic conditions in the shallow aquifers and under semi-confined conditions in the deeper aquifer, which is the principal water bearing zone.

Yield of the open irrigated wells (2 to 4 m diameter), ranges between 40 and 300 m^3/day with drawdown of 1 to 6m. Yield of wells mainly depends on the aquifer material and to some extent on the depth of the wells. Bored cavity tube wells are the most common ground water abstraction structures being used for irrigation purposes. Yield of wells in the area around Kot kasim, Tijara, Bhindusi and Tapukra varies from 10 to 45 m^3 /hour.

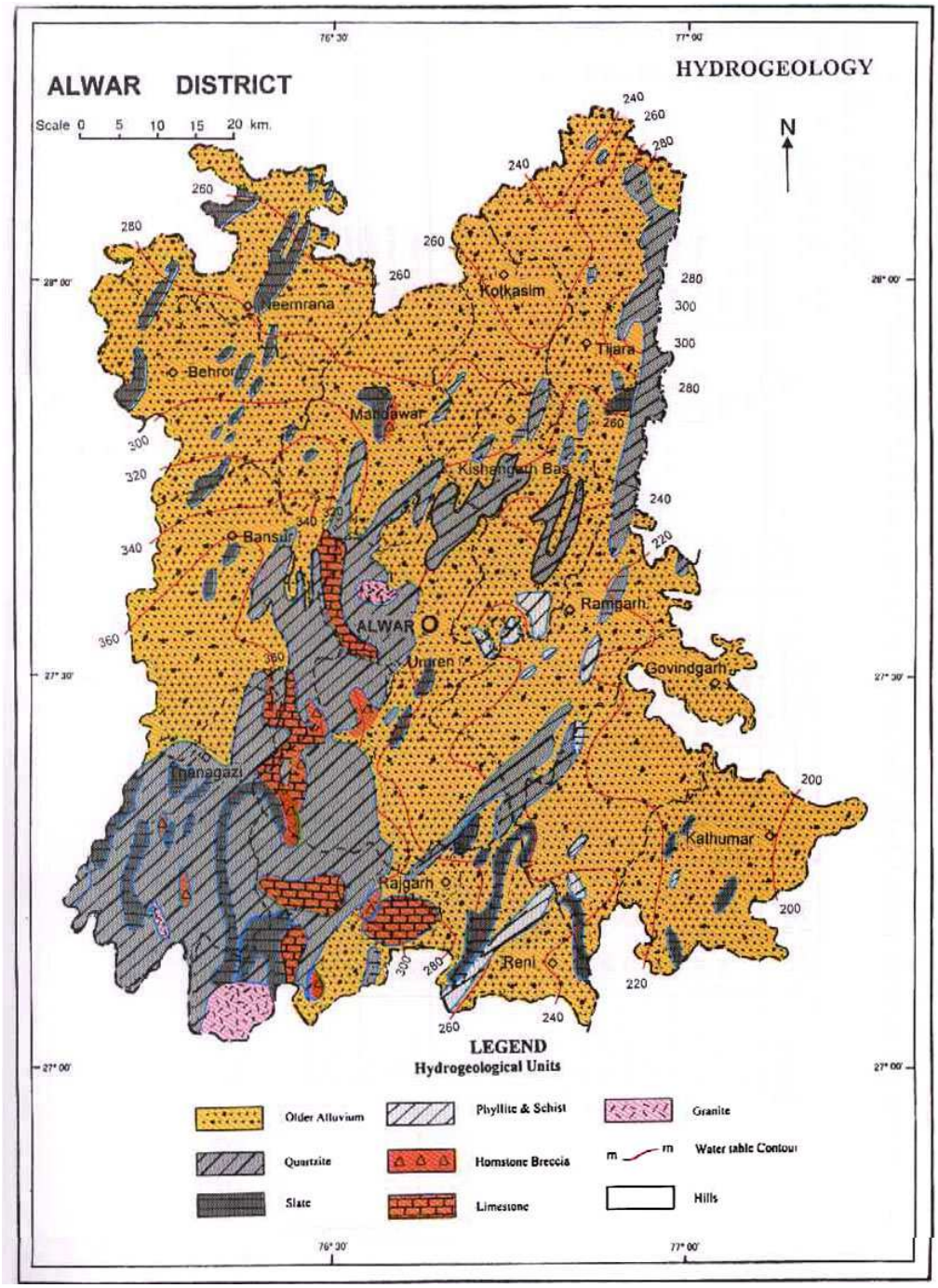

Fig. 5. Hydrogeology

In Sabi river basin, the yield of dug cum bore wells ranges from 100 to 300 m^3/day for a small drawdown and these sustain pumping for more than 10 or 12 hours continuously. Dug cum bore wells around Bansur yield between 500 & 800 m^3 /day. Ground water potential zones in the district are depicted in Fig. 6.

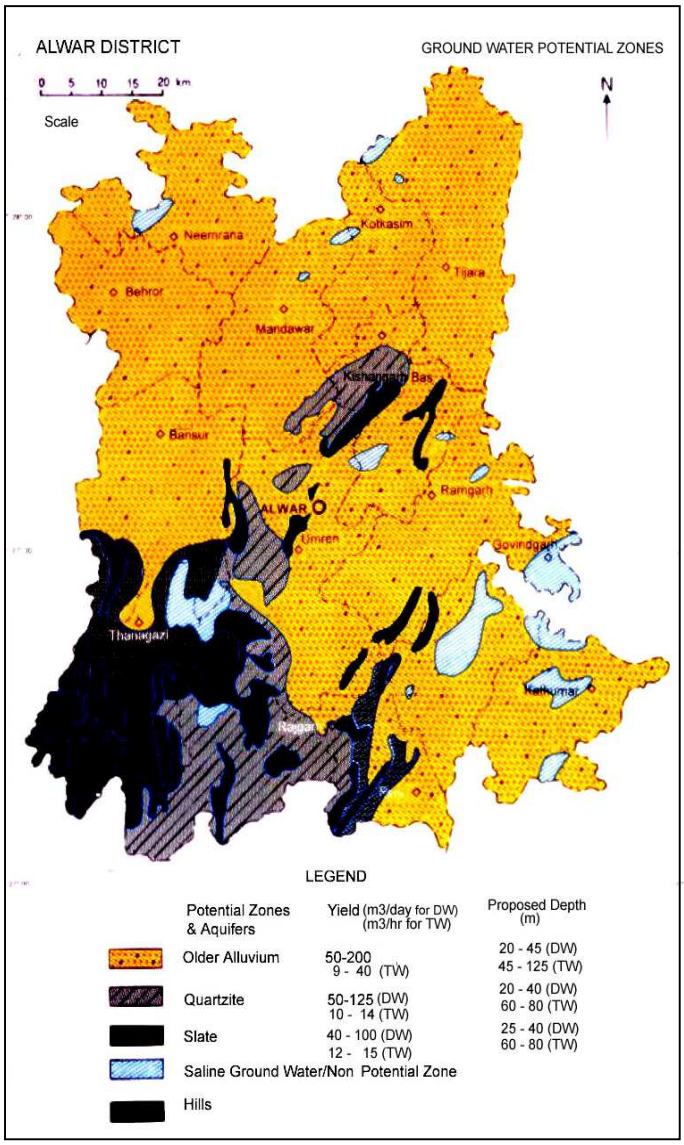

Fig. 6. Ground water potential zones

2.2 Water Level Scenario

Central Ground Water Board periodically monitors the National Hydrograph Network Stations (NHNS) stations in the Alwar district, four times a year i.e. in January, May (Premonsoon), August and November (Postmonsoon).

2.2.1 Depth to Water Level – Pre-monsoon (May-2011)

Depth to water level varies widely depending upon topography, drainage, bed rock, geology etc. During May, 2011, shallow water level less than 10m was observed in parts of Rajgarh, Tijara and Laxmangarh (Govindgarh) blocks whereas deepest water level i.e. more than 40m is noticed in Behror and Nimrana blocks. In major part of the district depth to water level varies from 10 to 40 m bgl (Fig. 7).

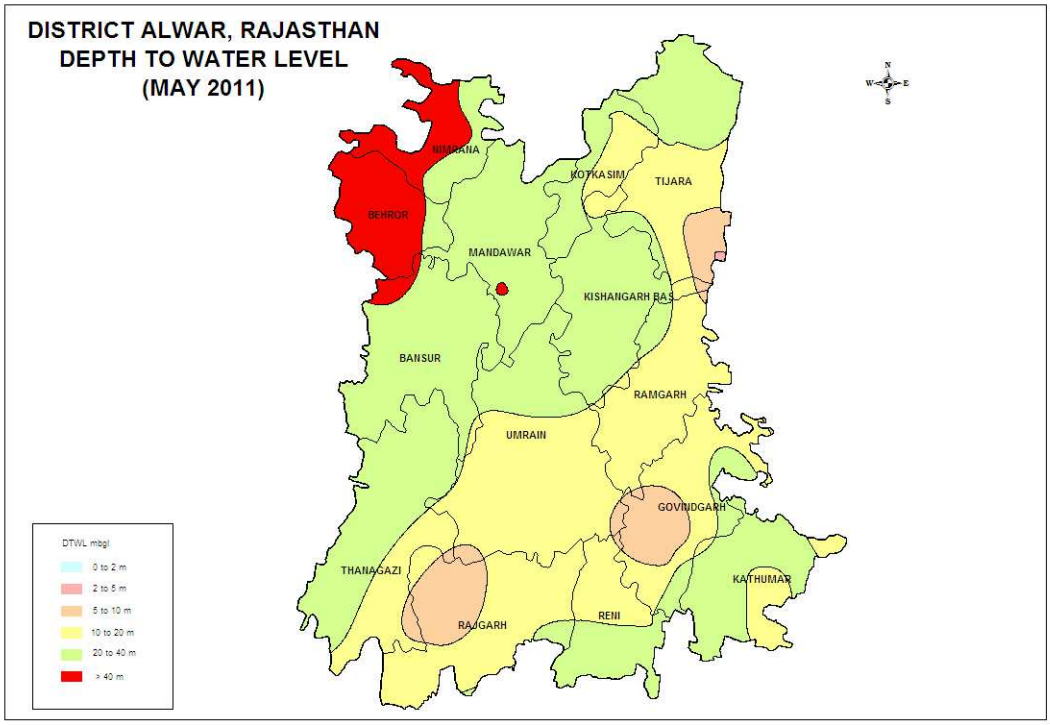

Fig. 7. Depth to Water Level during pre-monsoon (May), 2011)

2.2.2 Depth to Water Level – Post monsoon (Nov-2011)

During November, 2011, shallow water level less than 10m was observed in parts of Rajgarh, Laxmangarh (Govindgarh) blocks whereas deepest water level i.e. more than 40m is noticed in Behror and Neemrana blocks. In major part of the district depth to water level varied from 10 to 40 m bgl (Fig.8).

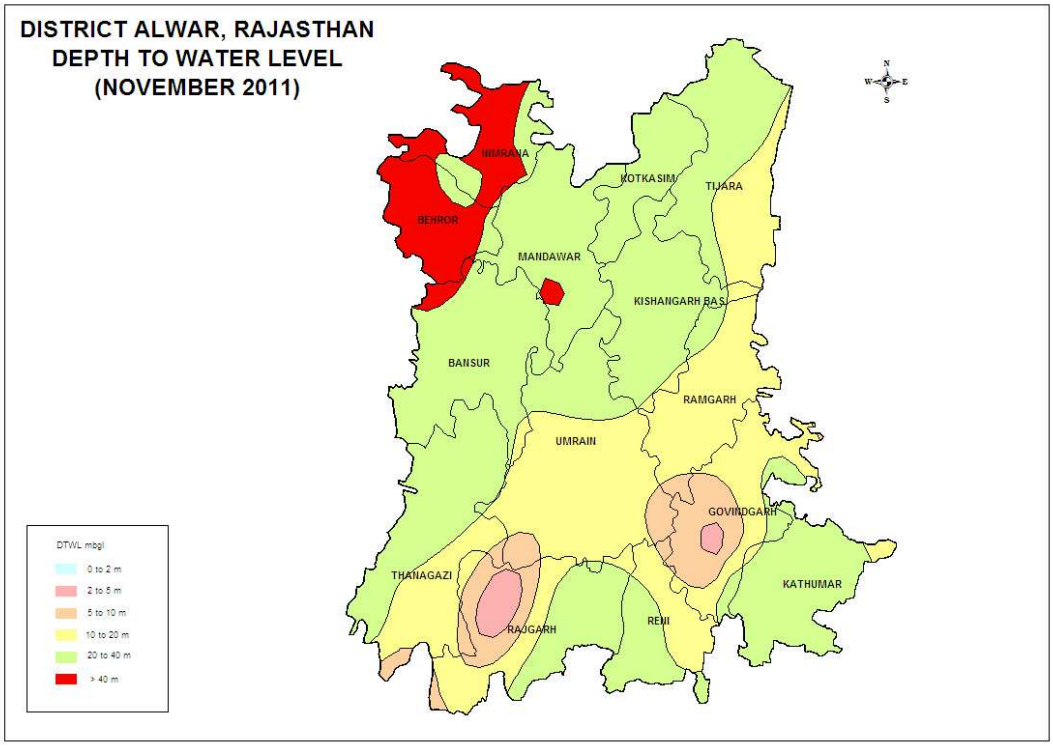

Fig. 8. Depth to Water Level during post-monsoon (November, 2011)

2.2.3 Seasonal Water Level Fluctuation (May-Nov. 2011)

Seasonal fluctuation in water level based on Pre (May)- and Post (November)-Monsoon, 2011 indicates that there has been rise in water levels during post-monsoon period in major part of the district (Fig. 9). Perusal of the fluctuation map also indicates that in significant parts of Tijara, Kotkasim, Rajgarh and Reni blocks, water level decline of more than 4 m have been observed between the pre- and post-monsoon fluctuation.

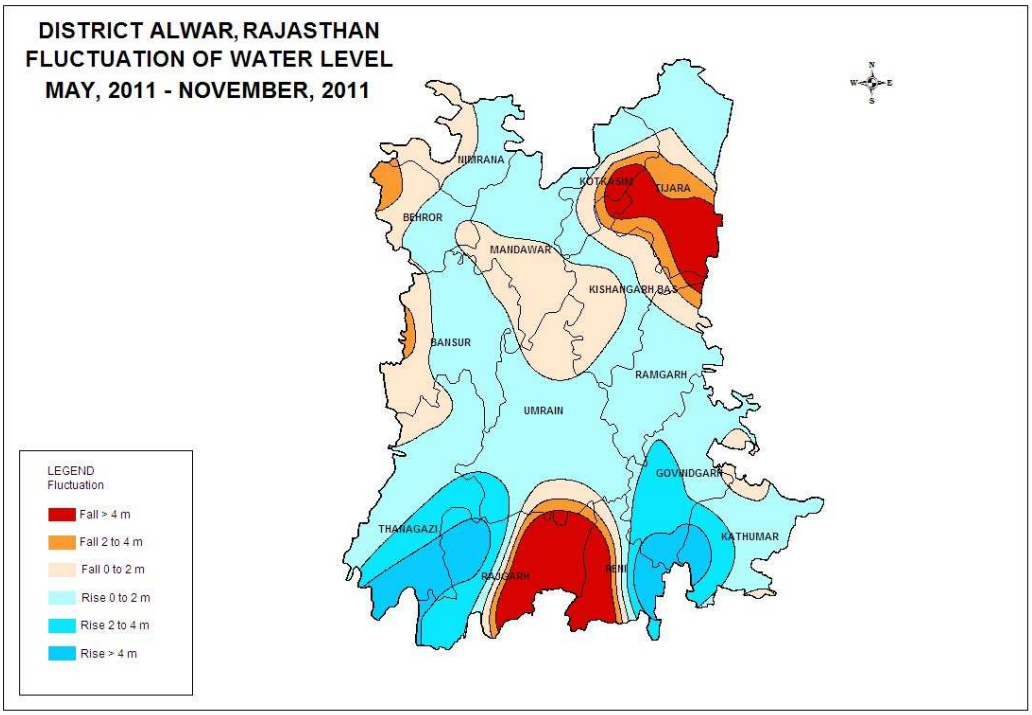

Fig. 9. Water level fluctuation (May – Nov. 2011)

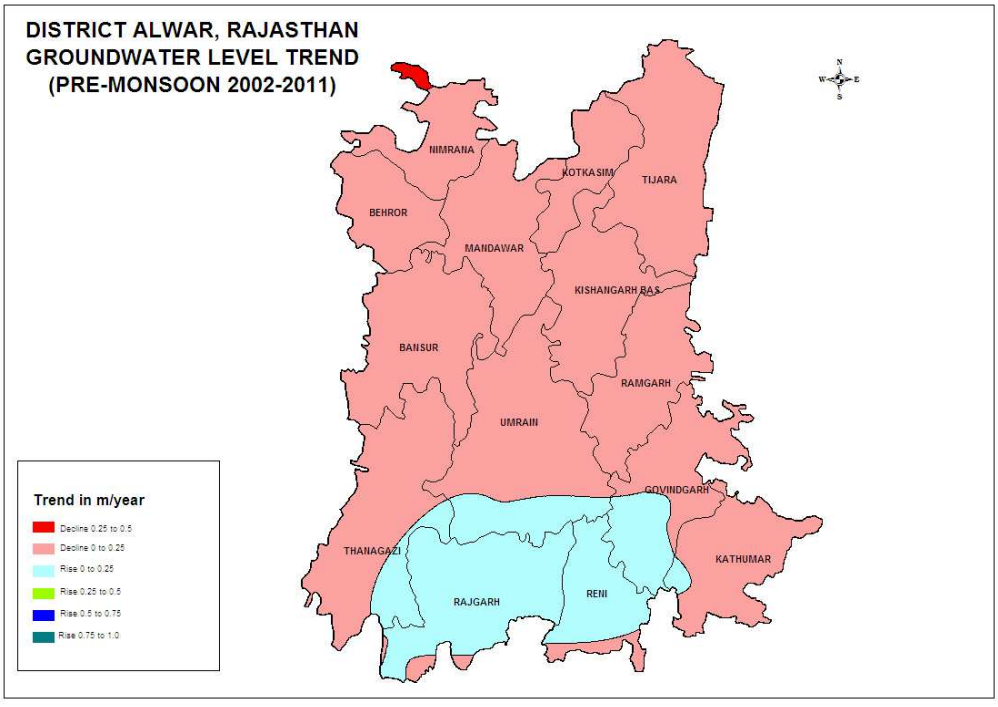

Fig. 10. Decadal pre-monsoon ground water level trend (2002-2011)

2.2.4 Water Level Trend (2000-11)

Analysis of long term Pre-monsoon water level data (2002 – 2011) indicates that ground water levels in major part of the district have declined at the rate of upto 25cm/ year (Fig. 10). Declining trend of 25 to 50cm /year has also been recorded in northwestern part of Nimrana block. Rising trend of upto 25cm/year has been observed in southern part of the district in Rajgarh, Reni and parts of Thanagazi, Umrain, Laxmangarh and Kathumar blocks.

2.3 Ground Water Resources

Central Ground Water Board and Ground Water Department, Government of Rajasthan have jointly estimated the ground water resources of Alwar district based on GEC-97 methodology. The same are presented in Table 6. Total annual ground water resources and net annual ground water availability in the district have been estimated as 869.51 mcm and 794.82 mcm respectively. Annual ground water draft for all uses in the district has been assessed to be 1323.87 mcm with overall stage of ground water development at 167%. In Behror, Kotkasim and Reni blocks, stage of ground water development has exceeded 200 %. All the blocks in the district are Over-exploited.

Table 6: Block wise Ground Water Resources (March 2009)

Block	Total Annual Ground Water Recharge	Net Annual Ground Water Availab-ility	Gross Ground Water Draft For Irrigation	Gross Ground Water Draft For Dom.& Ind. Use	Gross Ground Water Draft For All Uses	Stage of G.W. Develop-ment	Category
	(mcm)	(mcm)	(mcm)	(mcm)	(mcm)	(%)	
Behror	44.7197	40.2477	92.8122	7.9526	100.7648	250	OE
Bansur	83.2123	74.8911	121.3080	4.4822	125.7902	168	OE
Kathumar	54.6763	49.2087	82.4850	4.0468	86.5318	176	OE
Kishangarh	68.1011	64.4866	90.6240	7.3018	97.9258	152	OE
Kotkasim	46.7175	44.3816	87.0150	4.0752	91.0902	205	OE
Laxmangarh	89.1768	84.7180	81.9300	2.9456	84.8756	100	OE
Mandawar	75.5847	68.0262	123.9060	3.6190	127.5250	187	OE
Neemrana	41.5470	37.3923	59.8830	4.8060	64.6890	173	OE
Rajgarh	35.47	33.2298	50.4030	4.8731	55.2761	166	OE
Ramgarh	78.2819	70.4537	108.1860	4.3753	112.5613	160	OE
Reni	19.40	18.4335	40.3890	2.1283	42.5173	231	OE
Thanagazi	56.39	50.7467	53.0070	5.1028	58.1098	115	OE
Tijara	82.0111	73.8100	117.0150	7.2533	124.2683	168	OE
Umrain	94.2200	84.7980	122.8650	29.0825	151.9475	179	OE
TOTAL	**869.5087**	**794.8239**	**1231.8282**	**92.0445**	**1323.8727**	**167**	**OE**

2.4 Ground Water Quality

In general, quality of ground water is suitable for irrigation and domestic uses. Shallow ground water in the district is alkaline in nature with pH varying from 7.4 to 9.

Electrical Conductivity varies from 500 µS/cm at 25^{o}C at Chatarpura, Bansur block to 12000 µS/cm at 25^{o}C at Sundana, Laxmangarh block. Electrical Conductivity in major part of the district is below 2000 µS/cm at 25^{o}C (Fig. 11). EC value of 2000 to 3000

µS / cm at 25^{o}C has been observed in parts of Neemrana, Behror, Tijara, Mandawar, Kishangarh Bas, Reni, Umrain and Kathumar blocks. Higher EC values varying from 3000 to 10000 µS/cm at 25^{o}C have been reported from Ramgarh, Laxmangarh and Kathumar blocks and EC more than 10000 µS / cm at 25^{o}C has been reported from localized pockets in Kathumar block.

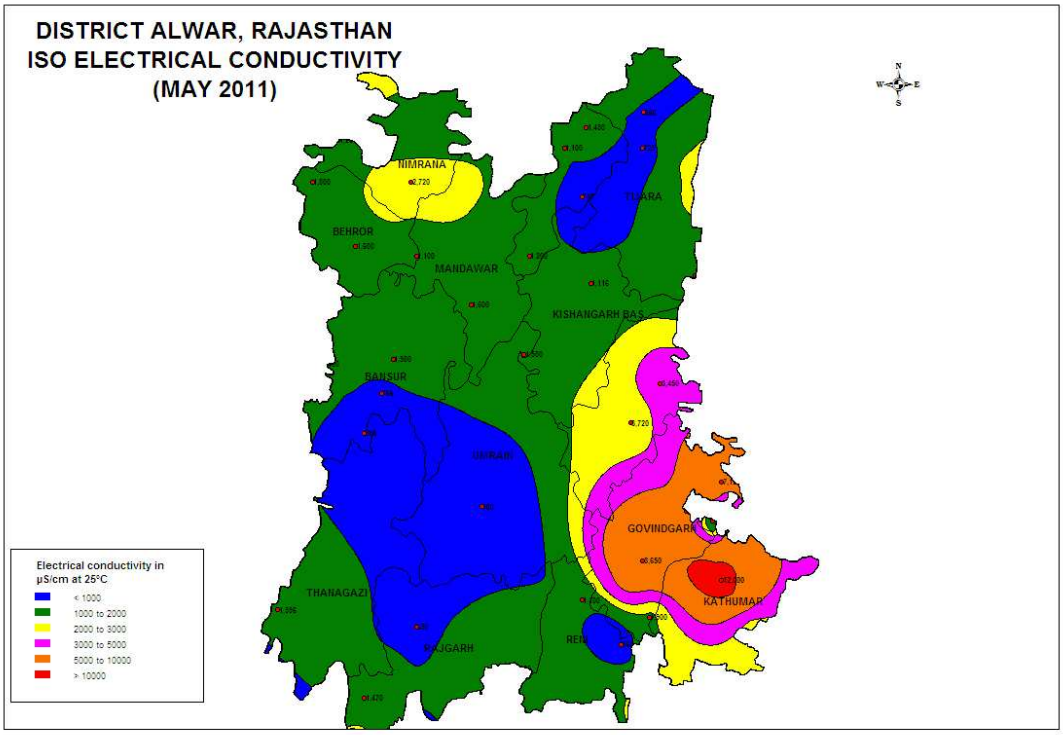

Fig. 11. Iso Electrical Conductivity

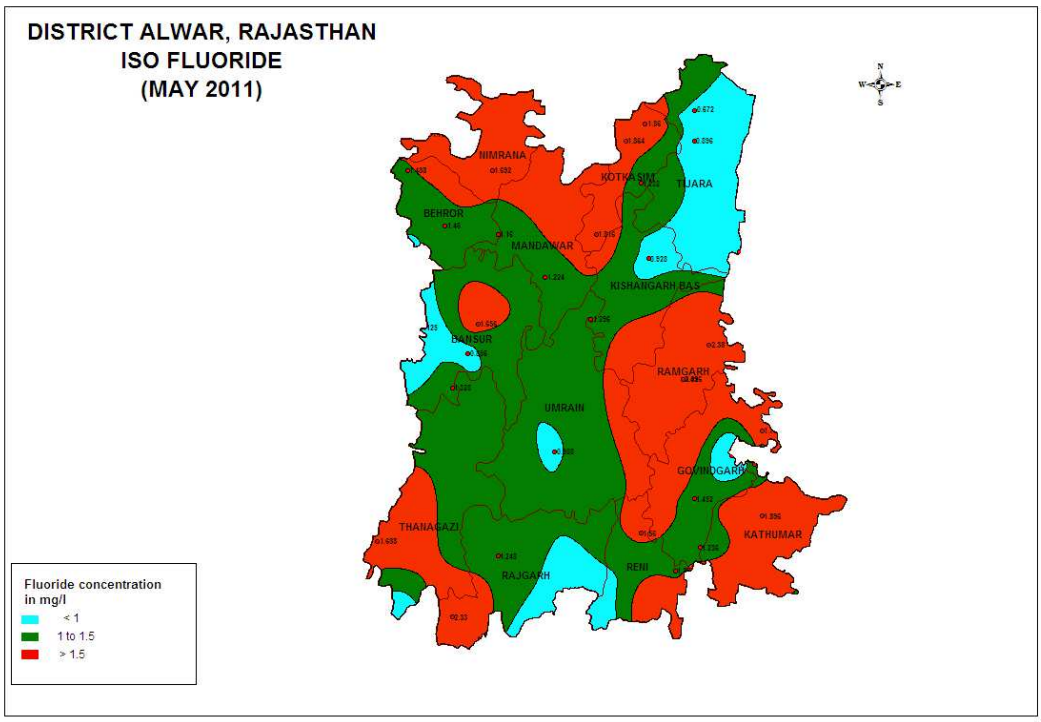

Fig. 12. Iso Fluoride

Concentration of fluoride in ground water has been found to vary from 0.672 mg/l at Tapukara, Tijar block to 3.42 mg/l at Ramgarh. It is found to be within the permissible limit of 1.5 mg/l in major part of the district (Fig. 12). However, Neemrana, Ramgarh and Kathumar blocks have excess fluoride. Fluoride contamination in ground water has also been reported from parts of Kotkasim, Mandawar, Behror, Bansur, Thanagazi, Rajgarh, Reni, Umrain, Laxmangarh and Kishangarh Bas blocks.

Nitrate concentration in ground water has been found to be within the maximum permissible limit of 45 mg/litre in major part of the district (Fig. 13). However, higher values of nitrate in excess of 45 mg/l have been reported from parts of Umrain, Tijara, Thanagazi, Neemrana, Kishangarh Bas, Laxmangarh and Ramgarh blocks.

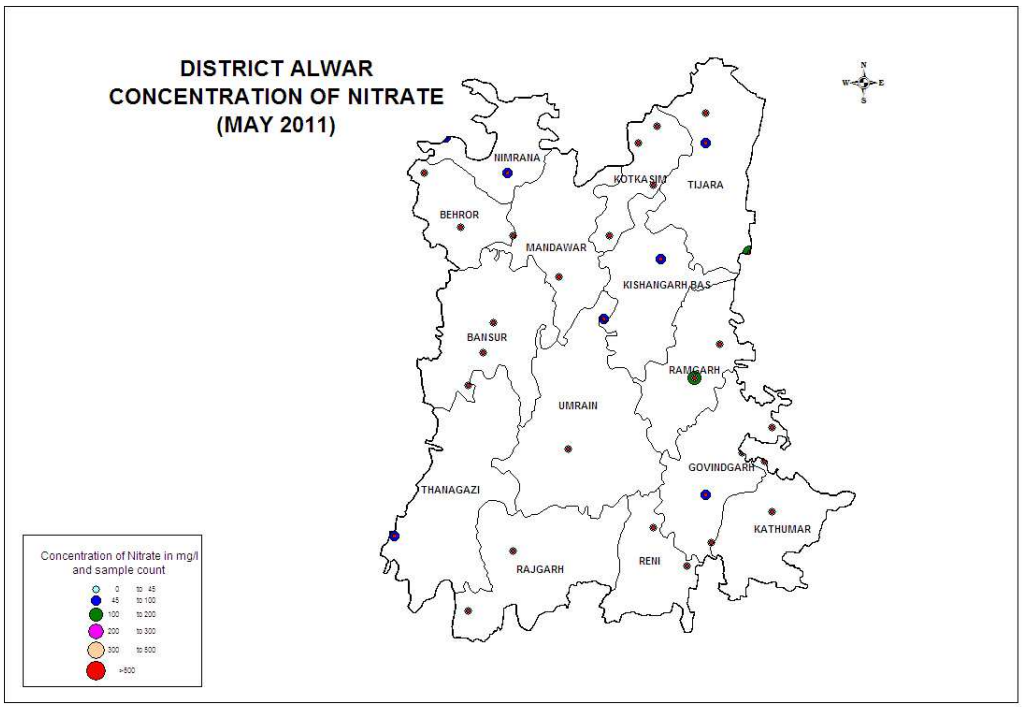

Fig. 13. Nitrate distribution

Iron concentration in ground water was found to be within the permissible limit of 1 mg/litre in most parts of the district except isolated pockets in Umarain, Laxmangarh, Rajgarh and Reni blocks (Fig. 14). Iron content has been found to vary from 0 in Neemrana and Kanhawas in Neemrana block and Holawas in Behror block to 1.395 mg/l at Govindgarh, Laxmangarh block.

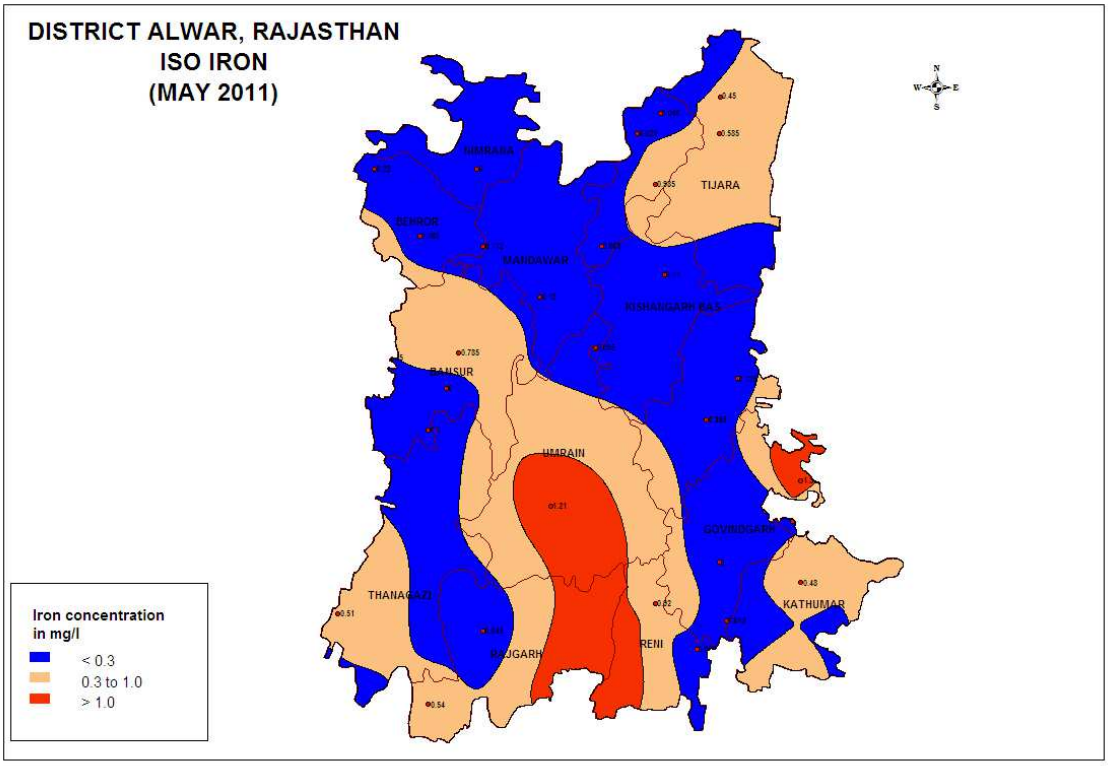

Fig. 14. Iso Iron

2.5 Status of Ground Water Development

The stage of ground water development for the district is 167% as on 31.03.2009. All blocks have stage of ground water development more than 100% ranging from 100% (Laxmangarh block) to 250% (Behror block) and these have been categorized as Over exploited.

Availability of groundwater in the district is estimated to be 795 mcm. Draft for all uses is 1324 mcm. Out of which 1232 mcm is used for irrigation and 92 mcm is used for industrial/domestic needs. At present there are 89,363 wells and cavity wells/ tubewells for irrigation and 1024 tubewells, 17,599 hand pumps and 2687 dug wells for domestic and industrial use. Rainfall in the district is the main source of ground water recharge. Due to less rainfall and increased ground water withdrawal the groundwater levels are declining. As a result quality of ground water is also deteriorating. High salinity is observed in of Laxmangarh, Kotkasim and Ramgarh blocks.

3.0 Ground Water Management Strategy

Due to pressure of population and improvement in the standard of living, the demand of fresh water for both agriculture and domestic use has substantially increased. As surface flow is available only for a limited period ground water withdrawal has sharply increased. The top layer of fresh ground water is also reducing every year. Artificial recharge serves as a means for restoring the depleted ground water storage, slow down the quality deterioration and put back into operation many groundwater abstraction structures.

3.1 Ground Water Development

Stage of ground water development in all the blocks in the district has exceeded

100%, which indicates that the scope of ground water development is already exhausted in all the blocks and the blocks have been categorized as "Over-exploited". 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. There is need to control and regulate ground water development in all the blocks in the district. Behror block has been notified on 2/12/2006 for Ground Water Regulation and Development by Central Ground Water Authority.

3.2 Water Conservation and Artificial Recharge

Irrigation in the area is mainly done by ground water i.e. dug wells and tube wells. Irrigation potential generated by irrigation project is negligible being scanty rainfall and high evaporation rate. Ani-cuts, tanks and check dams are surface water storage structures and these structures augment recharge to ground water bodies during monsoon period. The rain water during monsoon period can be used for artificial recharge through various techniques feasible in alluvial hard rock terrains. In hard rock terrain nala bunding and anicuts, dug wells, percolation tanks etc. are feasible structures which may be used to recharge the ground water body.

In alluvial area following ways of recharge techniques may be adopted.

- Roof top/paved area rainwater harvesting for recharge to ground water in urban and industrial areas.
- Village water run off/ roof top rainwater harvesting by dug wells and percolation tank in rural areas
- Construction of recharge shafts with gabian structures in Nalas.
- Recharge by dug well/percolation pit in agriculture farms

However, the prospects of using artificial recharge in hard rock areas are not very promising. Thus, conjunctive use of surface and groundwater is to be considered. In such a case the combined surface and groundwater supply for irrigation is more reliable than in the case of relatively small aquifer storage, and even more so compared to surface water supply alone.

The complexity of the option of artificial recharge is compounded by following problems:

- The area experiencing the most acute water shortages even for domestic consumption, is the urban area in the west, situated partly at the foothills of the Aravali range. The alluvial aquifer there is on the whole fairly thin and part of the demand is met by wells in the hard rock, usually of poor discharge. For all practical purposes, artificial recharge in this area is not likely to be successful.
- The aquifer in the south-east, south and east of the vanishing Ruparail river course, constitutes a salinity patch, similar to the one in the Banganga Basin to the east and south. Although artificial recharge in areas lying upstream of this patch may retard the process of deterioration and control the expansion of this zone westwards, it will not change the basic situation. In other words, any artificially recharged fresh water reaching this zone will be wasted.
- In the Sabi basin a recharge system consisting of a number of much smaller spreading ponds will be better and the most effective solution is a network of unlined canals which may also serve as irrigation canals. This pattern is likely to

minimize local effects, such as water level mounding, and ensure distribution of the recharged water in the alluvial aquifer over as wide an area as possible.

On the initiative taken up by CGWA, some of the industries located in Bhiwari, Chopanki, Kushkera, MIA, Neemrana etc have taken up recharge scheme by renovating/de-silting/increase in storage capacity of village ponds to make availability of water to human, livestock and biological needs.

4.0 Ground Water Related Issues and Problems

Long term water level data (pre monsoon 2002-2011) have indicated declining water level trend in major part of the district. All the blocks fall under Over exploited category, which necessitates regulation and control of ground water withdrawals through notification of blocks and further imposing ban on construction of ground water abstraction structures except under indispensable cases.

Laxmangarh and Kotkasim blocks are affected by problem of ground water salinity. Further many areas in the district have problem of fluoride contamination in ground water.

5.0 Mass Awareness and Training Activities

Central Ground Water Board has been organizing Mass Awareness Programmes in different parts of the state to educate local people about the existing ground water situation and need for water conservation and rain water harvesting. One Mass Awareness Programme was organized in Behror during 2001-2002. Further, 3 Water Management Training Programmes were conducted during 2003-04, 2004-05 and 2011-12 at Alwar, Behror and Neemrana respectively.

6.0 Recommendations

- Ground water draft is very high in the blocks. Stage of ground water development in the district has reached 167% due to indiscriminate use. It has to be controlled by preventing further development.
- Revival of traditional rainwater storage system i.e. Baori, open wells, tanka etc. for rainwater conservation for use in day to day life will reduce ground water draft.
- Awareness programme on rainwater harvesting will be beneficial to check decline in water level and justified use.
- Taking advantage of uneven topography of the hard rock area small water harvesting system or earthen dams, up streams of irrigation commands at suitable sites may be constructed to store rainwater. This will increase recharge of ground water which ultimately results in increase yield of wells.
- Modern agriculture management techniques have to be adopted and optimum utilization of the water resource
- High water requirement crops should be discouraged. Proper agricultural extension services should be provided to the farmers so that they can go for alternate low water requirement economical crops.