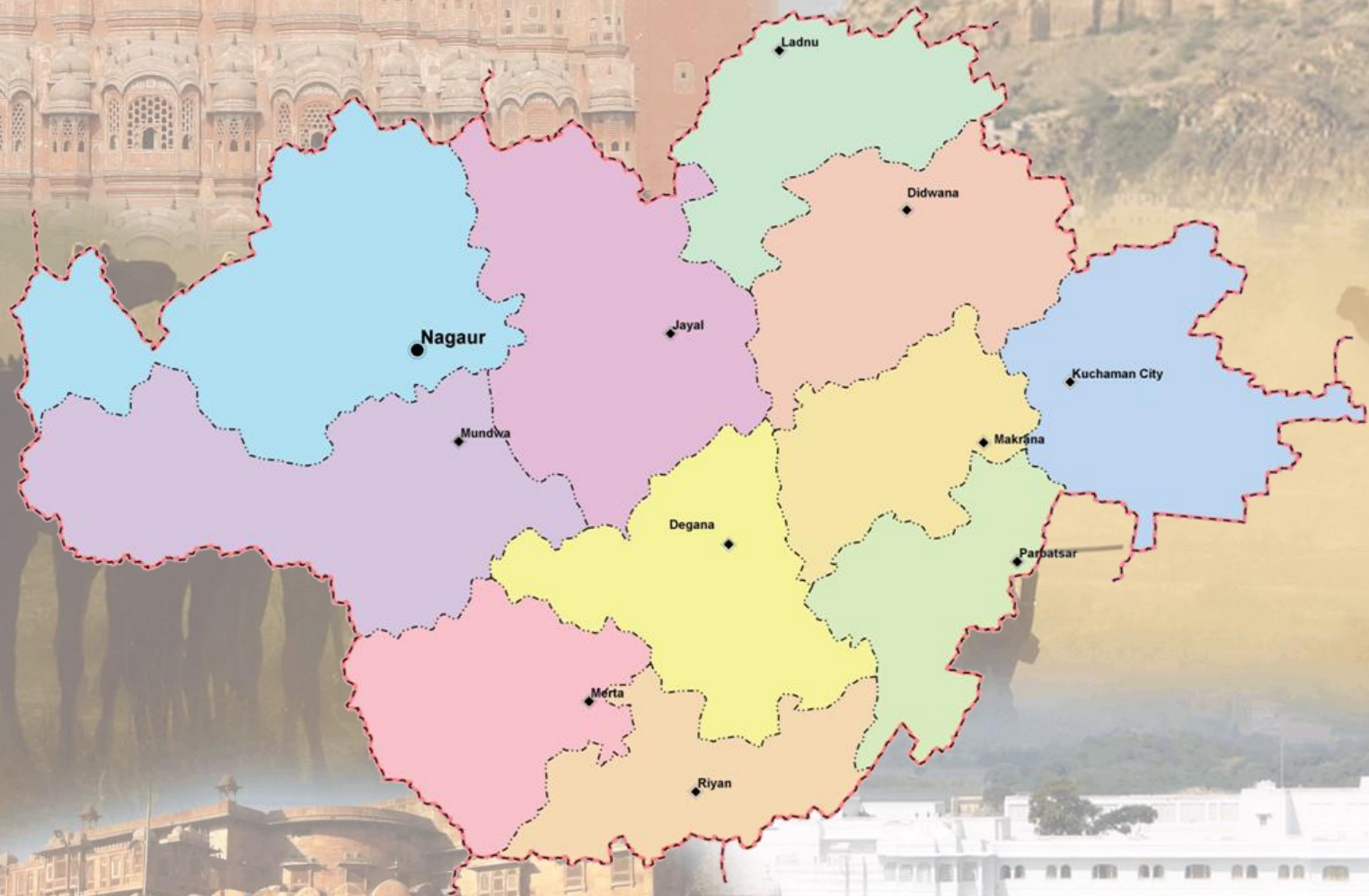
Ground Water Department,
Rajasthan

Hydrogeological Atlas of Rajasthan
Nagaur District

European Union
State Partnership Programme



2013

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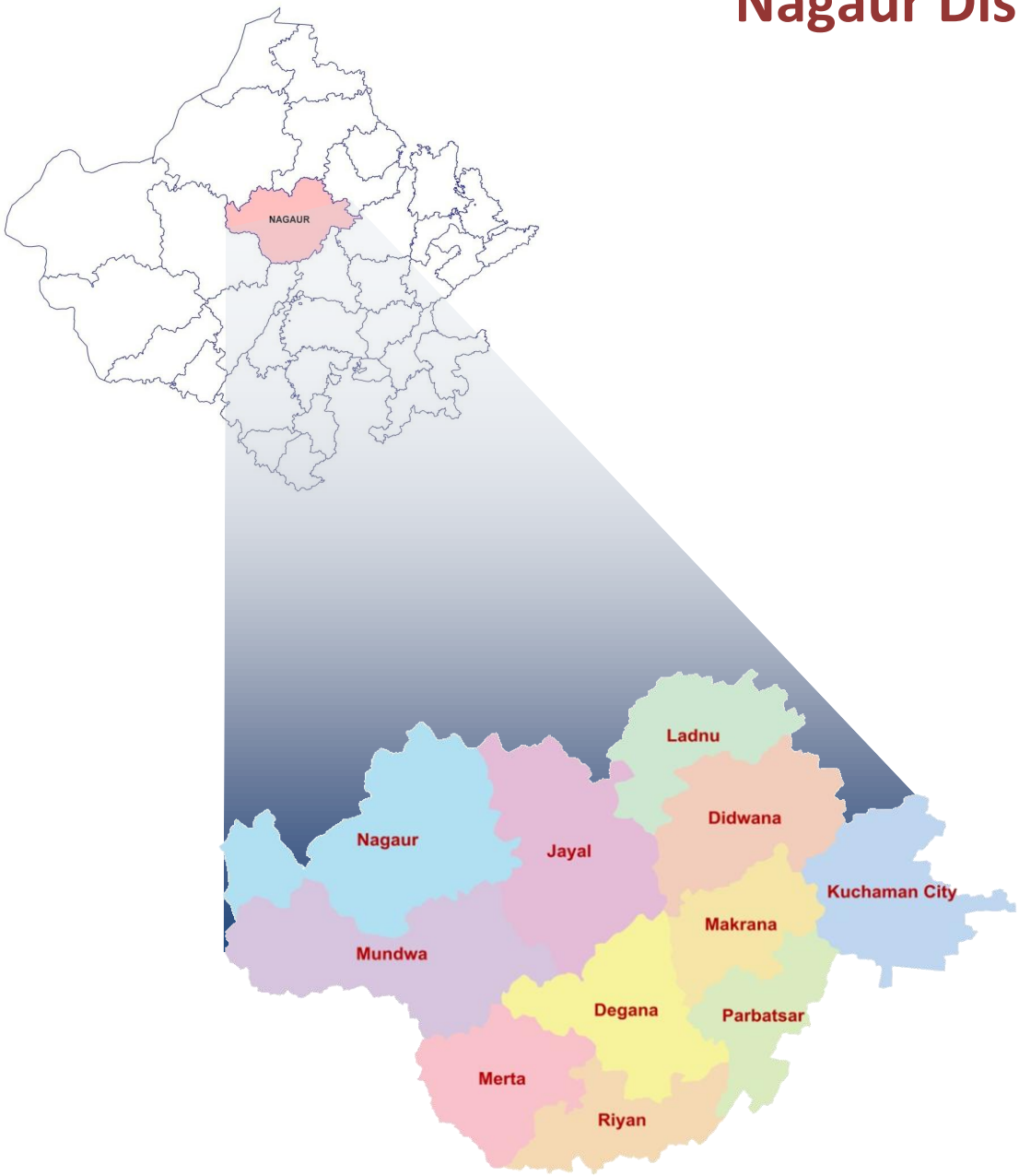
Hydrogeological Atlas of Rajasthan

Nagaur District



Contents:

2013

ADMINISTRATIVE SETUP

DISTRICT – NAGAUR

Location:

Nagaur district is located in the central part of Rajasthan. It is bounded in the north by Bikaner and Churu districts, in the east by Sikar and Jaipur districts, south by Pali and Ajmer districts and the western boundary is bounded by Jodhpur district. It stretches between 26° 24' 01.10" to 27° 42' 28.21" north latitude and 73° 04' 43.46'' to 75° 22' 04.08'' east longitude covering area of 17,805.1 sq km. Major part of the district does not have a systematic drainage system, so most of the central and northern region is part of 'Outside' Basin. The Luni River drains in the southwestern part and Sekhawati River drains in the southeastern part of Nagaur district.

Administrative Set-up:

Nagaur district is administratively divided into eleven blocks. The following table summarizes the basic statistics of the district at block level.

S. No.	Block Name	Population (Based on 2001 census)	Area (sq km)	% of District Area	Total Number of Towns and Villages
1	Degana	1,99,923	1,578.7	9.0	153
2	Didwana	3,29,706	1,641.9	9.2	173
3	Jayal	2,24,944	2,201.2	12.3	137
4	Kuchaman City	3,36,963	1,632.1	9.1	195
5	Ladnu	2,15,096	1,275.3	7.0	99
6	Makrana	2,83,000	1,076.3	6.0	120
7	Merta	2,23,681	1,356.8	8.0	116
8	Mundwa	2,33,070	2,335.4	13.1	124
9	Nagaur	3,35,201	2,555.0	14.3	156
10	Parbatsar	2,00,234	1,045.6	6.0	111
11	Riyan	1,79,629	1,106.8	6.0	128
Total		**27,61,447**	**17,805.1**	**100.0**	**1,512**

Nagaur district has 1,512 towns and villages, of which eleven are block headquarters as well.

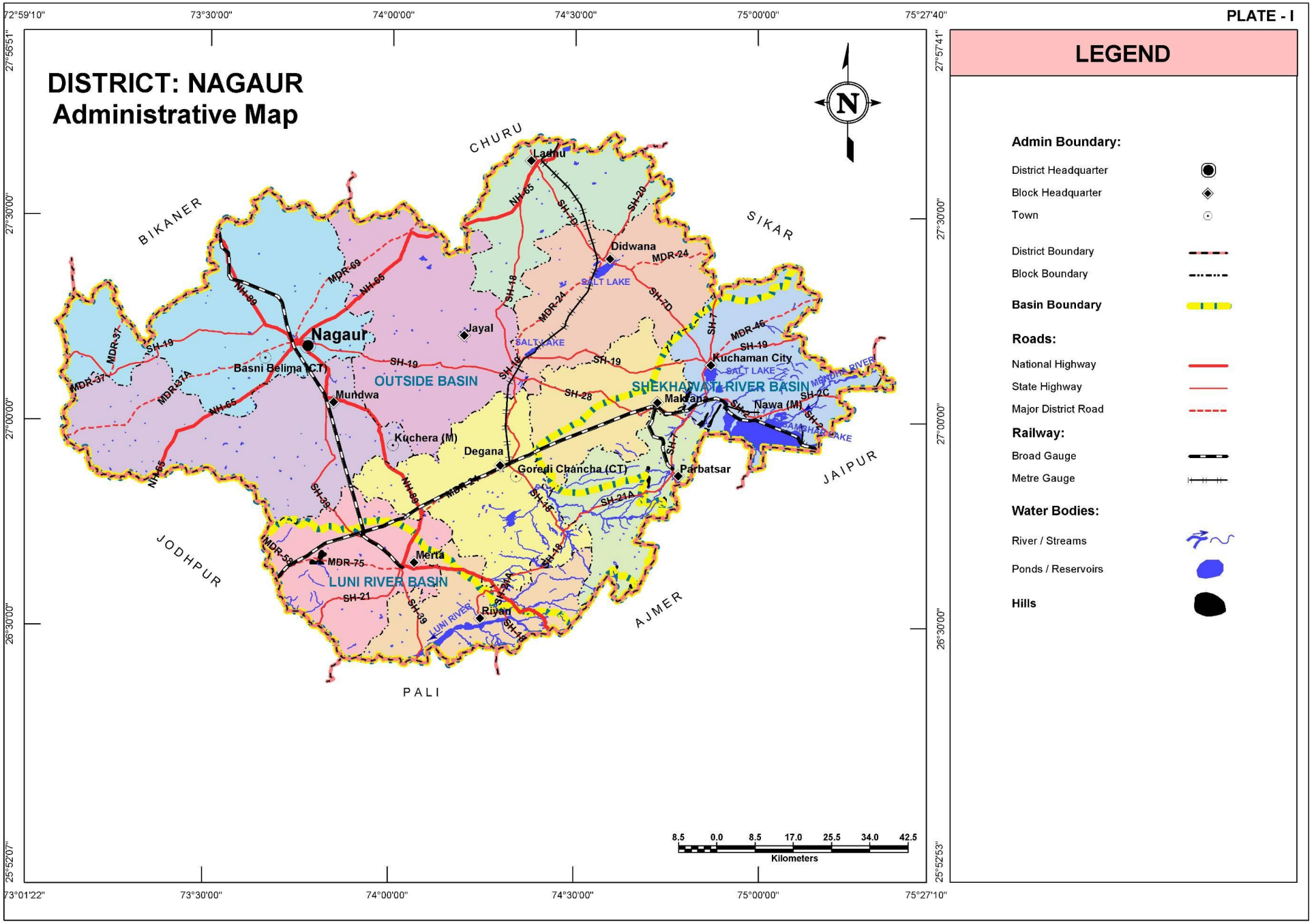
Climate:

Nagaur is largely part of arid climate with hot summer. Sand storms are common in summer. The climate of the district is marked by extreme dryness, large variations of temperature & highly irregular rainfall patterns. The maximum temperature recorded in district is 47.2 °C with 0 °C as the lowest recorded temperature. The average temperature of the district is 23.3°C. The winter season extends from mid-November until the beginning of March. The rainy season is relatively short, extending from July through mid-September. The average rainfall in the district is 349.8mm.

Ground Water Department, Rajasthan

European Union
State Partnership Programme

PLATE - I



LEGEND

Admin Boundary:

- District Headquarter
- Block Headquarter
- Town

- District Boundary
- Block Boundary

Basin Boundary

Roads:

- National Highway
- State Highway
- Major District Road

Railway:

- Broad Gauge
- Metre Gauge

Water Bodies:

- River / Streams
- Ponds / Reservoirs

Hills

ROLTA
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TOPOGRAPHY

The general topography of the district is undulating. Eastern part of the district comprises small scattered hillocks. The slope of the area is towards west. The northwestern part of the district is extensively covered with sand dunes. The general topography in the district ranges between 275 m to 375 m above mean sea level. Elevation ranges from a minimum of 275.0 m above mean sea level in Nagaur block in the NW part of the district and maximum of 794.0 m above mean sea level In Parbatsar block in eastern part of the district.

Table: Block wise minimum and maximum elevation

S. No.	Block Name	Min. Elevation (m amsl)	Max. Elevation (m amsl)
1	Degana	299.0	459.0
2	Didwana	306.0	416.0
3	Jayal	284.0	454.0
4	Kuchaman City	357.0	688.0
5	Ladnu	296.0	371.0
6	Makrana	339.0	633.0
7	Merta	279.0	384.0
8	Mundwa	278.0	391.0
9	Nagaur	275.0	348.0
10	Parbatsar	365.0	794.0
11	Riyan	298.0	735.0

RAINFALL

The rainfall is generally scanty and erratic. The general distribution of rainfall across can be visualized from isohyets presented in the Plate – III where rainfall is gradually increasing from northwest to southeast. Most of the blocks seem to have generally received rainfall in the range of 400 to 600 mm in the year 2010 and the average annual rainfall was 559.4 mm based on the data of available blocks. Parbatsar block received highest rainfall (911.6 mm) whereas lowest was in Nagaur block (424.1 mm). Highest average annual rainfall was recorded in Parbatsar block about 750.7 mm.

Table: Block wise annual rainfall statistics (derived from year 2010 meteorological station data)

Block Name	Minimum Annual Rainfall (mm)	Maximum Annual Rainfall (mm)	Average Annual Rainfall (mm)
Degana	495.7	736.8	579.6
Didwana	475.4	666.7	576.6
Jayal	434.0	534.8	468.5
Kuchaman City	478.7	666.7	566.1
Ladnu	462.8	680.9	545.4
Makrana	543.3	859.8	635.1
Merta	466.5	574.3	511.6
Mundwa	436.5	508.7	466.1
Nagaur	424.1	462.7	445.1
Parbatsar	590.2	911.6	750.7
Riyan	491.4	719.5	608.7

PLATE - II

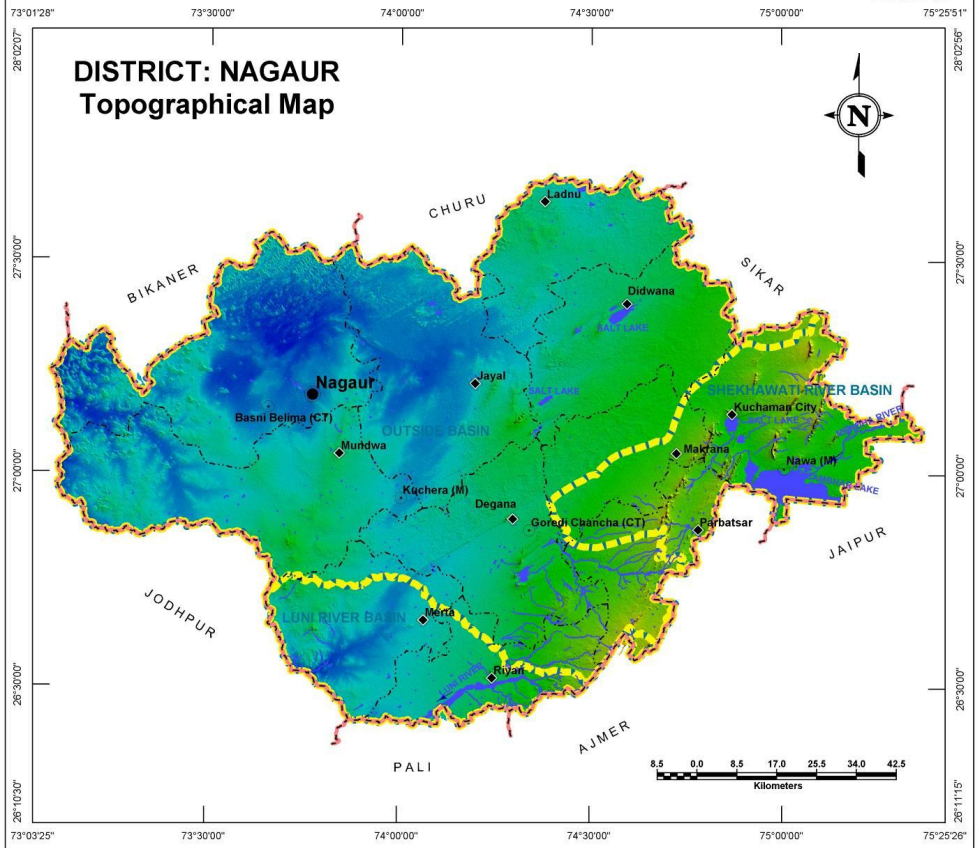
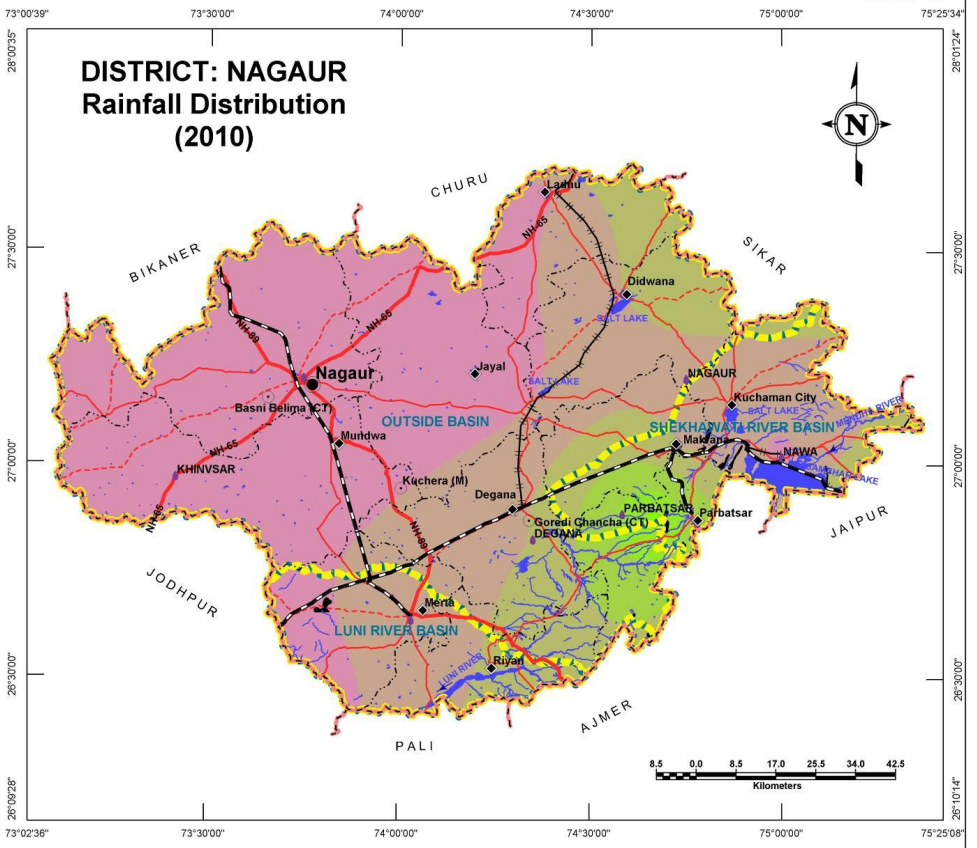


PLATE - III



LEGEND

Admin Boundary:
- District Headquarter
- Block Headquarter
- Town
- District Boundary
- Block Boundary

Basin Boundary

Water Bodies:
- River / Streams
- Ponds / Reservoirs

Elevation (m amsl):

796
750
625
500
375
274

Source : SRTM DEM

LEGEND

Admin Boundary:
- District Headquarter
- Block Headquarter
- Town
- Raingauge Stations
- District Boundary
- Block Boundary

Basin Boundary

Roads:
- National Highway
- State Highway
- Major District Road

Railway:
- Broad Gauge
- Metre Gauge

Water Bodies:
- River / Streams
- Ponds / Reservoirs

Hills

Isohyets (mm):
- 400-500
- 500-600
- 600-700
- 700-800
- 800-900
- 900-1000

GEOLOGY and GEOMORPHOLOGY

DISTRICT – NAGAUR

Geology

The district is occupied by the Delhi Super Group, Erinpura granite and Marwar Super Group rocks. Delhi Super Group comprises of the Punagarh, Siroli, Kumbhalgarh, Alwar and Ajabgarh Groups mainly exposed in the Ladnu, Didwana, Makrana, Degana and Riyan blocks of the district trending NNE to south. The Kumbhalgarh Group comprises of calc-schist, gneiss and marble, exposed in Riyan and Kuchman city blocks in small patches. The Alwar Group comprises mainly quartzite and arkose whereas the overlying Ajabgarh Group is consists of crystalline limestone and marble, siliceous limestone, ferruginous quartzite, slate and schist both mainly exposed in the northeastern part of district around Kuchaman city and Parbatsar blocks. Erinpura granite & gneiss occupies the NNE part and exposed in Ladnu, Didwana, Makrana and Degana blocks. Malani Igneous Suite of rocks viz. rhyolite and granite are exposed in the NNE to SSW part of the district in Ladnu, Didwana, Degana, Merta and Riyan blocks of the district. Marwar Super Group, occupying more than 50% area of the district is mainly exposed in the western part of the district. This sedimentary sequence has been classified into Jodhpur, Bilara and Nagaur Groups and consists of sandstone, dolomite and limestone.

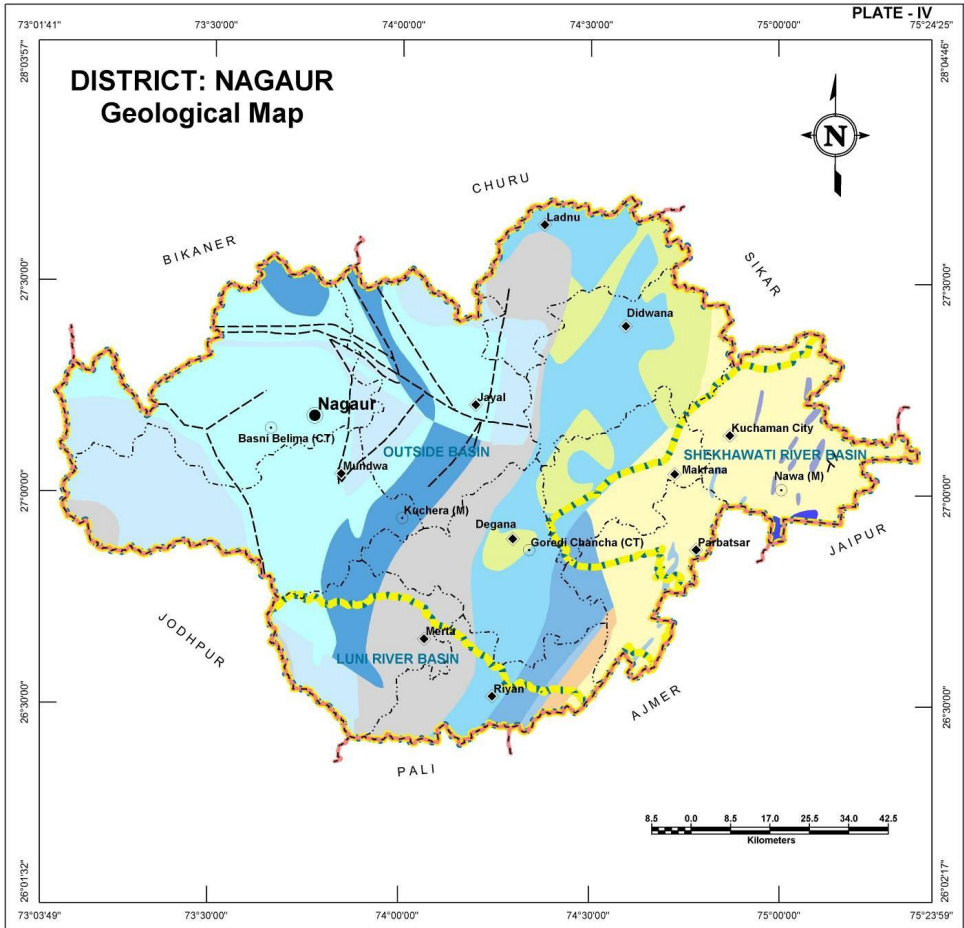
Super Group	Group	Formation
	Quaternary	Aeolian sand, Kankar, clay
Marwar	Nagaur	Sandstone
	Bilara	Dolomite and Limestone
	Jodhpur	Sandstone
	Malani Igneous suite	
Delhi	Punagarh	Shale, Phyllite, micaschist & quartzite with metavolcanics
	Sirohi	Phyllite, mica schist with intercalated quartzite & marble
	Intrusive	Erinpura and Sendra-Ambaji Granite & Gneiss
	Kumbhalgarh	Calc-schist, gneisses, marble
	Ajabgarh	Crystaline limestone & marble, siliceous limestone, ferruginous quartzite, slate & schist
	Alwar	Quartzite and arkose

Geomorphology

Table: Geomorphologic units, their description and distribution

Origin	Landform Unit	Description
Aeolian	Dune Complex	An undulating plain composed of number of sand dunes of crescent shape.
	Dune Valley Complex	Cluster of dunes and interdunal spaces with undulating topography formed due to wind-blown activity, comprising of unconsolidated sand and silt.
	Eolian Plain	Formed by aeolian activity, with sand dunes of varying height, size and slope. Long stretches of sand sheet. Gently sloping flat to undulating plain, comprised of fine to medium grained sand and silt. Also scattered xerophytic vegetation.
	Interdunal Depression	Slightly depressed area in between the dunal complex showing moisture and fine sediments.
	Obstacle Dune	Formed on windward/leeward sides of obstacle like isolated hills or continuous chain of hills, dune to obstruction in path of sand laden winds. Badly dissected well cemented and vegetated.
Denudational	Buried Pediment	Pediment covers essentially with relatively thicker alluvial, colluvial or weathered materials.
	Intermontane Valley	Depression between mountains, generally broad & linear, filled with colluvial deposits.
	Pediment	Broad gently sloping rock flooring, erosional surface of low relief between hill and plain, comprised of varied lithology, criss-crossed by fractures and faults.
	Pediplain	Coalescence and extensive occurrence of pediment.
Fluvial	Alluvial Plain	Mainly undulating landscape formed due to fluvial activity, comprising of gravels, sand, silt and clay. Terrain mainly undulating, produced by extensive deposition of alluvium.
	Alluvial Plain (Sandy)	Flat to gentle undulating plain formed due to fluvial activity, mainly consists of gravels, sand, silt and clay with unconsolidated material of varying lithology, predominantly sand along river.
	Paleochannel	Mainly buried on abandoned stream/river courses, comprising of coarse textured material of variable sizes.
	Salt Encrustation/ Playa	Topographical depression comprising of clay, silt, sand and soluble salts, usually undrained and devoid of vegetation.
Hills	Denudational, Structural Hill, Linear Ridge	Steep sided, relict hills undergone denudation, comprising of varying lithology with joints, fractures and lineaments. Linear to arcuate hills showing definite trend-lines with varying lithology associated with folding, faulting etc. Long narrow low-lying ridge usually barren, having high run off may form over varying lithology with controlled strike.

PLATE - IV



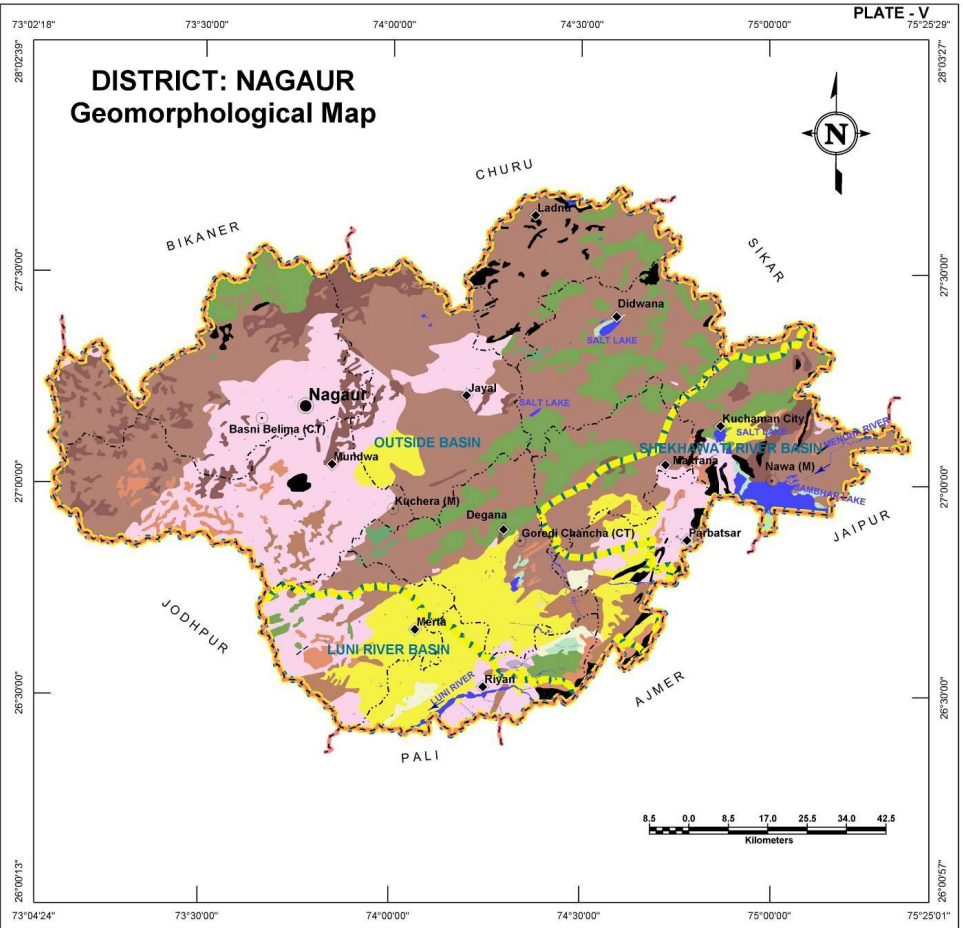
LEGEND

Admin Boundary:
- District Headquarter
- Block Headquarter
- Town
- District Boundary
- Block Boundary
- **Basin Boundary**
- **Water Bodies**
- **Structural Features:**
- Fault

Geology:
- Alluvium and Wind blown sand
- Palana Formation
- Nagaur Group
- Bilara Group
- Jodhpur Group
- Punagarh Group
- Sirohi Group
- Kumbhalgarh Group
- Ajabgarh Group
- Alwar Group
- Sand Mata Complex
- Erinpura Granite & Gneiss
- Sendra-Ambaji Granite & Gneiss

Source: District Resource Map of Rajasthan - GSI

PLATE - V



LEGEND

Admin Boundary:
- District Headquarter
- Block Headquarter
- Town
- District Boundary
- Block Boundary
- **Basin Boundary**
- **Water Bodies:**
- River/Ponds/Reservoirs
- **Structural Features:**
- Fault/Fractures/Lineament

Hills:
- Structural/Denudational/Linear Ridge

Landform Units:

Fluvial Origin:
- Alluvial Plain
- Alluvial Plain (Sandy)
- Palaeochannel
- Salt Encrustation/Playa

Structural Origin:
- Dissected Plateau

Denudational Origin:
- Pediment
- Burried Pediment
- Intermontane Valley
- Pediplain

Aeolian Origin:
- Eolian Plain
- Dune Complex
- Dune Valley Complex
- Obstacle Dune
- Interdunal Depression

Source: Ground Water Atlas of Rajasthan - SRSAC & GWD, Rajasthan

AQUIFERS

DISTRICT – NAGAUR

Older alluvium constitutes the most spatially prominent aquifer in the district comprising of sand, silt and kankar occupying about 37% of district area. Other aquifers are in hardrocks and important among them are limestone of Bilara Group, Tertiary sandstones and the Nagaur Jodhpur sandstone occupying about 20% and 28% aquifer areas in the district respectively. In the southeastern part of the district aquifers formed in schist is seen occupying about 2570 sq kms aquifer area i.e., 14.4%.

Table: aquifer potential zones their area and their description

Aquifer in Potential Zone	Area (sq km)	% age of district	Description of the unit/Occurrence
Older Alluvium	6,562.0	36.9	This litho-unit comprises of mixture of heterogeneous fine to medium grained sand, silt and kankar.
Bilara Limestone	3,629.8	20.4	It is grey to buff coloured hard and compact.
Tertiary Sandstone	1,093.8	6.1	Medium to coarse grained, consolidated to semi consolidated sandstone.
Nagaur & Jodhpur Sandstone	3,916.5	22.0	Buff to reddish brown in colour, fine to medium grained hard and compact sandstone.
Schist	2,568.5	14.4	Medium to fine grained compact rock. The litho units are soft, friable and have closely spaced cleavage.
Hills	34.5	0.2	
Total	**17,805.1**	**100.0**	

STAGE OF GROUND WATER DEVELOPMENT

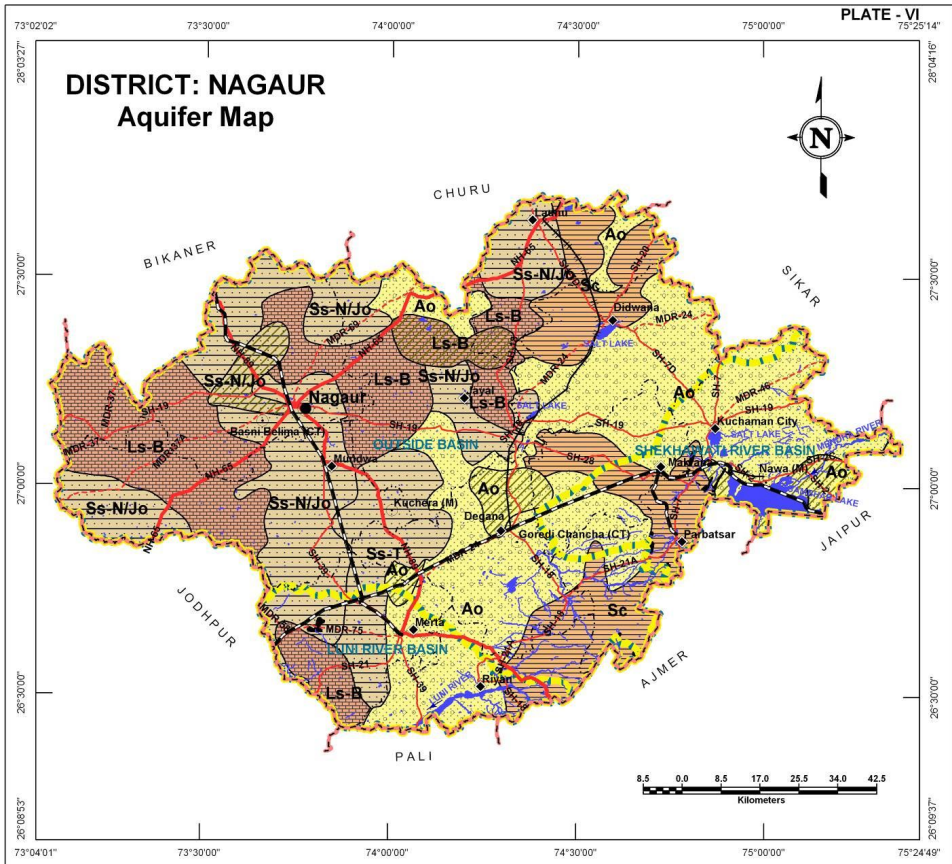
Ground water development is very high in the district as suggested by the resource assessment studies and categorization of blocks on that basis. Three blocks have been categorized as Notified where the ground water is under severe stress and no more development of it is permissible. >100% development of ground water is seen in six other blocks of the district which have been categorized as 'Over Exploited'. Ladnu and Nagaur are the two districts where the ground water situation appears to be better than other blocks but still falling within the 'Critical' category i.e., close to 100% development has already taken place.

Categorization on the basis of stage of development of ground water	Block Name
Critical	Ladnu, Nagaur
Over Exploited	Jayal, Parbatsar, Makrana, Didwana, Riyan, Degana
Notified	Mundwa, Merta, Kuchaman City

Basis for categorization: Ground water development <=100% - Critical and >100% - Over-Exploited. In Notified blocks development of GW is not permitted any more.

PLATE - VI

DISTRICT: NAGAUR
Aquifer Map



LEGEND

Admin Boundary:
- District Headquarter
- Block Headquarter
- Town
- District Boundary
- Block Boundary

Basin Boundary

Roads:
- National Highway
- State Highway
- Major District Road

Railway:
- Broad Gauge
- Metre Gauge

Water Bodies:
- River / Streams
- Ponds / Reservoirs

Hills

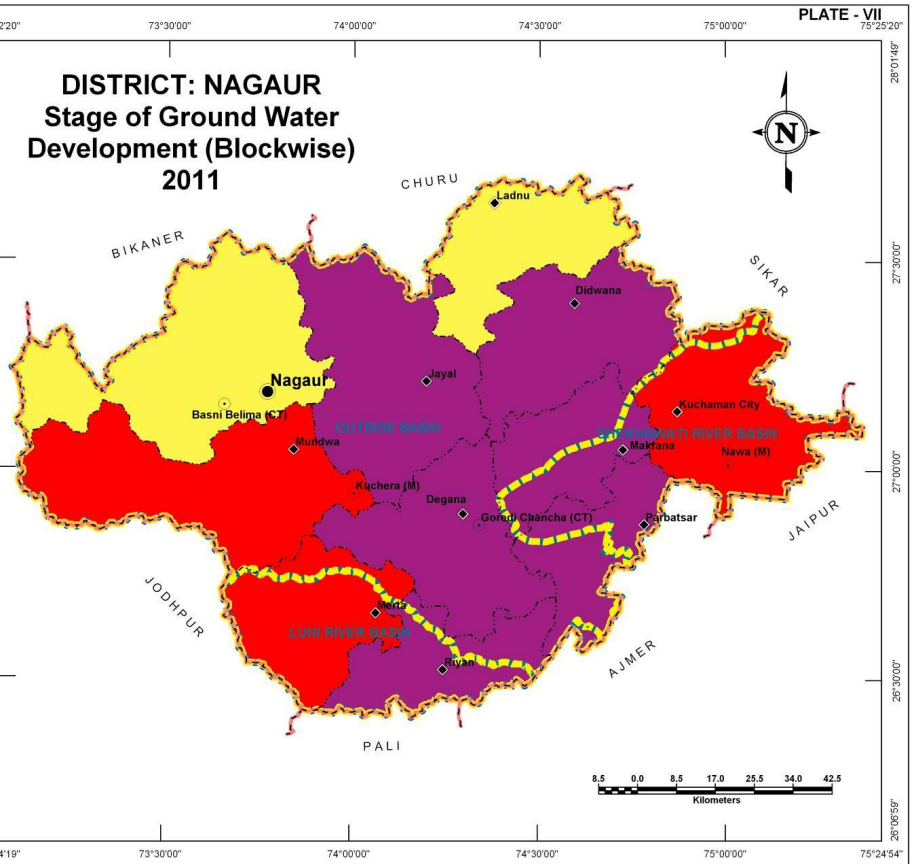
Saline Area

Aquifer:
- Older Alluvium
- Bilara Limestone
- Tertiary Sandstone
- Nagaur & Jodhpur Sandstone
- Schist

Source: Ground Water Potential Zone Map - GWD, Rajasthan

PLATE - VII

DISTRICT: NAGAUR
Stage of Ground Water Development (Blockwise) 2011



LEGEND

Admin Boundary:
- District Headquarter
- Block Headquarter
- Town
- District Boundary
- Block Boundary

Basin Boundary

Stage of Ground Water Development:
- Critical
- Over-Exploited
- Notified

Source: Ground Water Department, Rajasthan

LOCATION OF EXPLORATORY AND GROUND WATER MONITORING WELLS DISTRICT – NAGAUR

Nagaur district has a well distributed network of exploratory wells (265) and ground water monitoring stations (324) in the district owned by RGWD (184 and 311 respectively) and CGWB (81 and 13 respectively). The exploratory wells have formed the basis for delineation of subsurface aquifer distribution scenario in three dimensions. Benchmarking and optimization studies suggest that ground water level monitoring network is sufficiently distributed for appropriate monitoring but for water quality, 113 wells are recommended to be added to existing network for optimum monitoring of the aquifers.

Table: Block wise count of wells (existing and recommended)

Block Name	Exploratory Wells			Ground Water Monitoring Stations			Recommended additional wells for optimization of monitoring network	
	CGWB	RGWD	Total	CGWB	RGWD	Total	Water Level	Water Quality
Degana	5	20	**25**	1	35	**36**	0	12
Didwana	22	25	**47**	-	31	**31**	0	20
Jayal	4	19	**23**	2	29	**31**	0	1
Kuchaman City	13	18	**31**	-	35	**35**	0	49
Ladnu	11	13	**24**	1	32	**33**	0	0
Makrana	0	12	**12**	1	25	**26**	0	2
Merta	12	24	**36**	-	29	**29**	0	4
Mundwa	7	20	**27**	3	23	**26**	0	2
Nagaur	1	15	**16**	1	35	**36**	0	0
Parbatsar	1	4	**5**	1	18	**19**	0	9
Riyan	5	14	**19**	3	19	**22**	0	14
Total	**81**	**184**	**265**	**13**	**311**	**324**	**0**	**113**

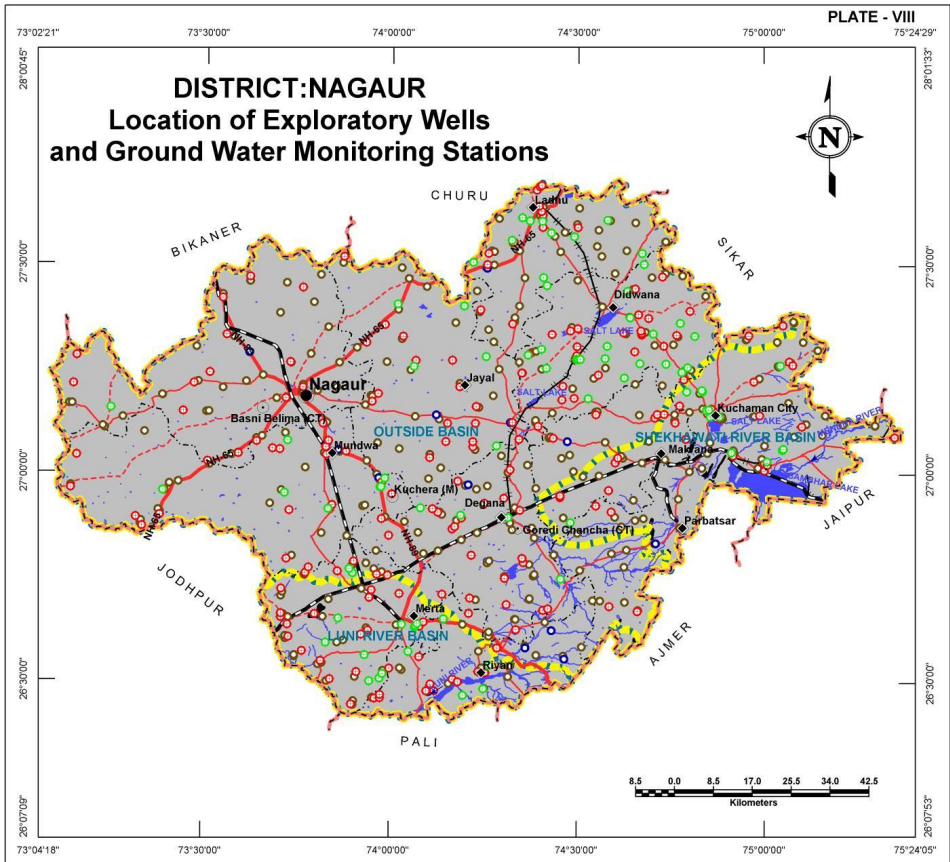
DEPTH TO WATER LEVEL (PRE MONSOON – 2010)

Depth to water level shows variation from less than 10m below ground level to about 130m below bgl. The alluvial aquifers in the eastern and northern parts have shown a fairly shallower ground water occurrence i.e., upto 60m of depth from ground level whereas the hardrock areas in the western part i.e., within Sandstone and limestone aquifers very deep water levels reaching upto 130m bgl are seen.

Block Name	Block wise area coverage (sq km) per depth to water level range (m bgl) *														Total Area (sq km)
	<10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	100-110	110-120	120-130	>130	
Degana	-	-	3.0	387.3	597.9	363.5	159.3	59.3	8.3	-	-	-	-	-	**1,578.6**
Didwana	3.0	77.3	291.6	446.4	441.9	280.3	97.2	3.6	0.5	-	-	-	-	-	**1,641.8**
Jayal	-	162.8	284.7	677.9	671.3	181.7	87.0	67.2	42.4	21.5	4.7	-	-	-	**2,201.2**
Kuchaman City	-	56.8	364.9	280.7	332.5	399.0	191.2	0.3	-	-	-	-	-	-	**1,625.4**
Ladnu	32.9	161.5	272.8	327.4	386.3	94.1	0.3	-	-	-	-	-	-	-	**1,275.3**
Makrana	-	-	6.2	81.0	394.2	551.5	40.5	1.0	-	-	-	-	-	-	**1,074.4**
Merta	-	-	54.9	177.8	287.5	170.3	116.8	163.1	171.6	78.9	62.6	48.9	17.1	0.1	**1,349.6**
Mundwa	-	-	-	25.5	78.5	122.6	212.9	418.7	930.1	305.3	123.8	75.7	36.4	6.0	**2,335.5**
Nagaur	-	3.1	337.0	529.3	244.7	223.5	623.7	470.4	107.6	15.6	-	-	-	-	**2,554.9**
Parbatsar	-	-	83.5	392.5	275.2	273.9	2.1	-	-	-	-	-	-	-	**1,027.2**
Riyan	-	34.4	346.8	308.6	289.1	54.3	28.9	23.4	18.5	2.7	-	-	-	-	**1,106.7**
Total	**35.9**	**495.9**	**2,045.4**	**3,634.4**	**3,999.1**	**2,714.7**	**1,559.9**	**1,207.0**	**1,279.0**	**424.0**	**191.1**	**124.6**	**53.5**	**6.1**	**17,770.6**

* The area covered in the derived maps is less than the total district area since the hills have been excluded from interpolation/contouring.

PLATE - VIII



LEGEND

Admin Boundary:
- District Headquarter
- Block Headquarter
- Town
- District Boundary
- Block Boundary
- **Basin Boundary**

Roads:
- National Highway
- State Highway
- Major District Road

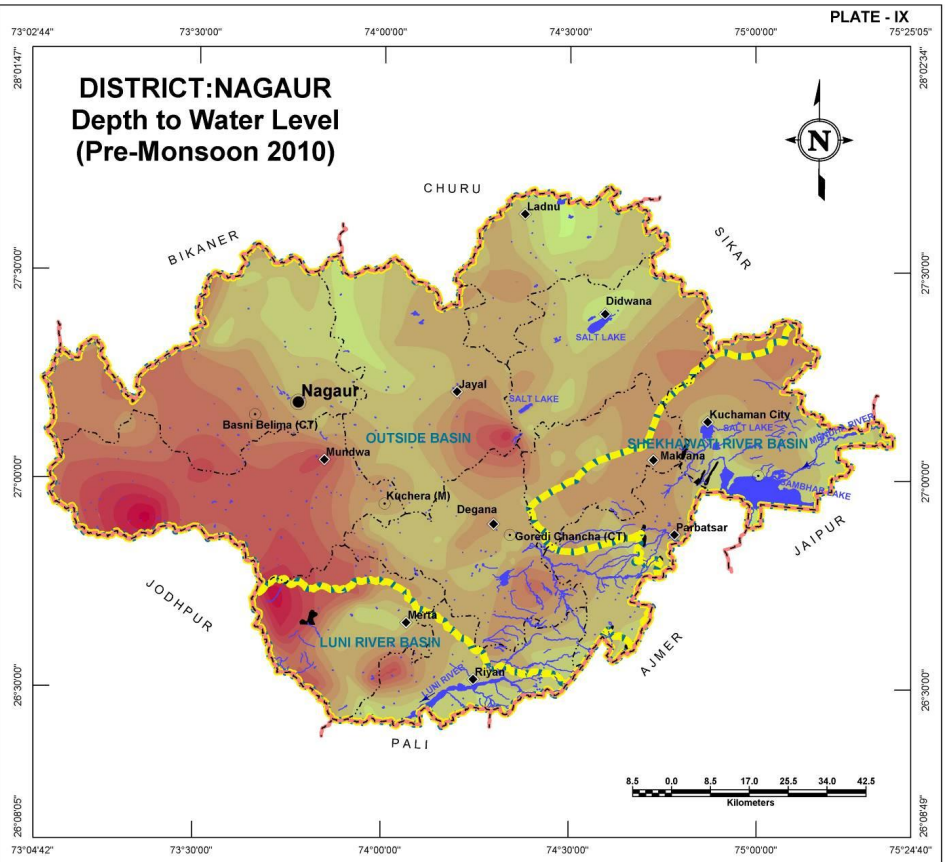
Railway:
- Broad Gauge
- Metre Gauge

Water Bodies:
- River / Streams
- Ponds / Reservoirs
- **Hills**

Exploratory Wells:
- CGWB
- RGWD

Ground Water Monitoring Stations:
- CGWB
- RGWD

PLATE - IX



LEGEND

Admin Boundary:
- District Headquarter
- Block Headquarter
- Town
- District Boundary
- Block Boundary
- **Basin Boundary**

Water Bodies:
- River / Streams
- Ponds / Reservoirs
- **Hills**

Depth to Water Level (m bgl):

<10	70 - 80
10 - 20	80 - 90
20 - 30	90 - 100
30 - 40	100 - 110
40 - 50	110 - 120
50 - 60	120 - 130
60 - 70	> 130

WATER TABLE ELEVATION (PRE MONSOON – 2010) DISTRICT – NAGAUR

The flow direction of ground water in the district is broadly indicated as from east to west with local modification occasionally. Perusal of Plate – X indicates that water table elevation is highest reaching up to >440m above mean sea level in southeast part (Parbatsar Block) of the district whereas minimum elevation (<180m amsl) is in the Mundwa and Merta blocks in the western most part of the district.

Table: Block wise area covered in water table elevation range

Block Name	Block wise area coverage (sq km) per water table elevation range (m amsl)														Total Area (sq km)
	< 180	180 - 200	200 - 220	220 - 240	240 - 260	260 - 280	280 - 300	300 - 320	320 - 340	340 - 360	360 - 380	380 - 400	400 - 440	> 440	
Degana	-	-	-	-	74.4	214.3	339.3	555.3	198.2	103.7	66.8	26.6	-	-	**1,578.6**
Didwana	-	-	-	-	2.9	126.6	336.4	548.6	495.9	130.0	1.4	-	-	-	**1,641.8**
Jayal	-	-	-	-	1,553.2	579.3	68.2	0.5	-	-	-	-	-	-	**2,201.2**
Kuchaman City	-	-	-	-	-	-	-	-	25.2	333.3	952.6	235.0	79.3	-	**1,625.4**
Ladnu	-	-	-	-	106.3	260.0	390.3	513.7	5.0	-	-	-	-	-	**1,275.3**
Makrana	-	-	-	-	-	-	-	403.9	450.2	153.6	49.8	16.9	-	-	**1,074.4**
Merta	-	-	67.1	598.4	295.7	197.4	191.0	-	-	-	-	-	-	-	**1,349.6**
Mundwa	1.8	205.9	513.8	822.3	713.5	78.2	-	-	-	-	-	-	-	-	**2,335.5**
Nagaur	-	-	416.0	1,026.6	761.3	351.0	-	-	-	-	-	-	-	-	**2,554.9**
Parbatsar	-	-	-	-	-	-	-	30.5	71.7	81.5	188.5	353.4	282.0	19.6	**1,027.2**
Riyan	-	-	-	56.0	99.9	72.5	143.2	229.8	132.7	88.0	78.7	89.9	115.0	1.0	**1,106.7**
Total	**1.8**	**205.9**	**996.9**	**2,503.3**	**3,607.2**	**1,879.3**	**1,468.4**	**2,282.3**	**1,378.9**	**890.1**	**1,337.8**	**721.8**	**476.3**	**20.6**	**17,770.6**

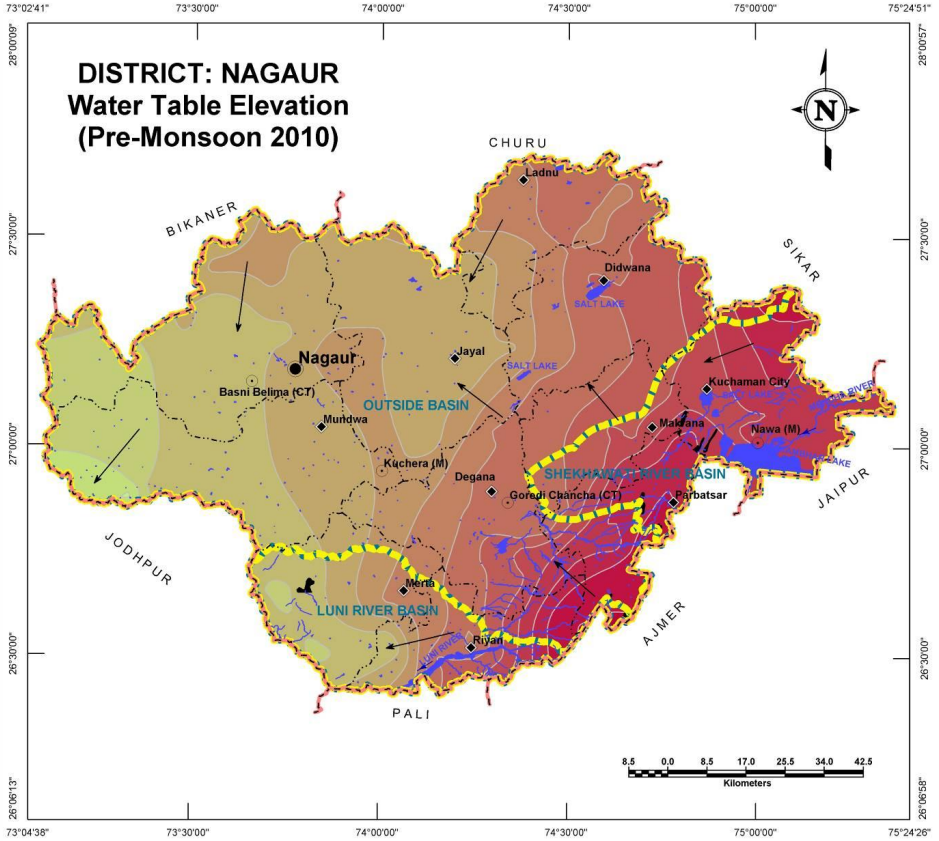
WATER LEVEL FLUCTUATION (PRE TO POST MONSOON 2010)

Ground water level fluctuation is seen to vary from fall of 2m to rise by 16m in the district as seen in Plate – XI. The negative fluctuation areas, mostly in the range from 0 to -2m are the areas where over exploitation is taking place as a belt running from west to east in the central part of the district. Rest of the district has shown a general rise in ground water level in the post monsoon season by upto 4m and occasionally rising by 16m (however very localized rise in nature) as seen in southwestern part of Didwana block.

Table: Block wise area covered in water fluctuation zone

Water level fluctuation range (m)	Block wise area coverage (sq km)											Total Area (sq km)
	Degana	Didwana	Jayal	Kuchaman City	Ladnu	Makrana	Merta	Mundwa	Nagaur	Parbatsar	Riyan	
< -2	-	-	-	-	-	-	-	-	1.0	-	-	**1.0**
-2 to 0	387.5	186.9	300.4	316.1	83.9	451.6	576.2	1,956.9	594.3	139.8	127.0	**5,120.6**
0 to 2	1,191.1	1,212.8	1,710.7	1,276.5	1,156.4	622.8	773.0	378.6	1,927.6	628.5	842.9	**11,720.9**
2 to 4	-	169.6	138.2	30.0	35.0	-	0.4	-	32.0	137.0	88.9	**631.1**
4 to 6	-	24.0	24.0	2.8	-	-	-	-	-	75.6	37.8	**164.2**
6 to 8	-	16.7	13.7	-	-	-	-	-	-	40.5	8.3	**79.2**
8 to 10	-	12.9	7.4	-	-	-	-	-	-	5.8	1.8	**27.9**
10 to 12	-	8.8	4.5	-	-	-	-	-	-	-	-	**13.3**
12 to 14	-	5.7	2.0	-	-	-	-	-	-	-	-	**7.7**
14 to 16	-	4.0	0.3	-	-	-	-	-	-	-	-	**4.3**
> 16	-	0.4	-	-	-	-	-	-	-	-	-	**0.4**
Total	**1,578.6**	**1,641.8**	**2,201.2**	**1,625.4**	**1,275.3**	**1,074.4**	**1,349.6**	**2,335.5**	**2,554.9**	**1,027.2**	**1,106.7**	**17,770.6**

PLATE - X



LEGEND

Admin Boundary:

- District Headquarter
- Block Headquarter
- Town
- District Boundary
- Block Boundary
- **Basin Boundary**

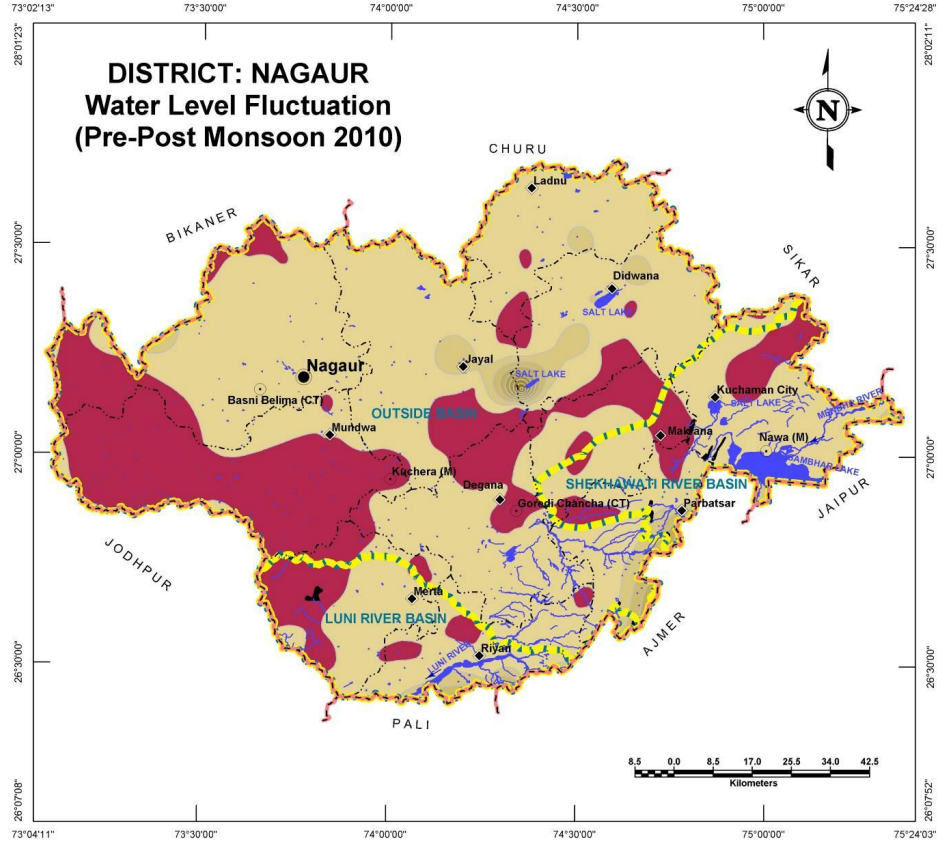
Water Bodies:

- River / Streams
- Ponds / Reservoirs
- **Hills**
- **Water Table Elevation**

Water Table Elevation (m amsl):

< 180	300 - 320
180 - 200	320 - 340
200 - 220	340 - 360
220 - 240	360 - 380
240 - 260	380 - 400
260 - 280	400 - 440
280 - 300	>440

PLATE - XI



LEGEND

Admin Boundary:

- District Headquarter
- Block Headquarter
- Town
- District Boundary
- Block Boundary
- **Basin Boundary**

Water Bodies:

- River / Streams
- Ponds / Reservoirs
- **Hills**

Water Level Fluctuation (m):

- < -2
- -2 to 0
- 0 to 2
- 2 to 4
- 4 to 6
- 6 to 8
- 8 to 10
- 10 to 12
- 12 to 14
- 14 to 16
- > 16

GROUND WATER ELECTRICAL CONDUCTIVITY DISTRIBUTION — DISTRICT – NAGAUR

The Electrical conductivity (at 25°C) distribution map is presented in Plate – XII. The areas with high EC values in ground water (>4000 µS/cm) are shown in red color and are seen to occupy almost 50% of the district in central part of the area where the ground water is not suitable for domestic purpose. Fringing the high EC areas are the areas with moderately high EC values (2000-4000 µS/cm) which also occupy significantly large areas to the extent of 38% of the district. Remaining part of the district, approximately 11% has low EC values in ground water (<2000 µS/cm) as shown in yellow color in the northern part of Kuchman City and in the western part of Parbatsar blocks. The ground water in this low EC area is suitable for domestic purpose but is of limited spatial occurrence. By and large the ground water in the district is having high EC with limited suitability for domestic purposes.

Table: Block wise area of Electrical conductivity distribution

Electrical Conductivity Ranges (µS/cm at 25°C) (Ave. of years 2005-09)	Block wise area coverage (sq km)																						Total Area (sq km)
	Degana		Didwana		Jayal		Kuchaman City		Ladnu		Makrana		Merta		Mundwa		Nagaur		Parbatsar		Riyan		
	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	
< 2000	3.8	0.2	96.0	5.9	-	-	550.7	33.9	44.6	3.5	56.4	5.3	227.0	16.8	501.9	21.5	5.0	0.2	329.4	32.1	176.4	16.0	**1,991.2**
2000-4000	487.9	30.9	643.2	39.1	324.4	14.7	443.8	27.3	558.1	43.7	528.3	49.1	454.1	33.7	1,466.8	62.8	595.8	23.3	608.8	59.2	699.0	63.0	**6,810.2**
>4000	1,086.9	68.9	902.6	55.0	1,876.8	85.3	630.9	38.8	672.6	52.8	489.7	45.6	668.5	49.5	366.8	15.7	1,954.1	76.5	89.0	8.7	231.3	21.0	**8,969.2**
Total	**1,578.6**	**100.0**	**1,641.8**	**100.0**	**2,201.2**	**100.0**	**1,625.4**	**100.0**	**1,275.3**	**100.0**	**1,074.4**	**100.0**	**1,349.6**	**100.0**	**2,335.5**	**100.0**	**2,554.9**	**100.0**	**1,027.2**	**100.0**	**1,106.7**	**100.0**	**17,770.6**

GROUND WATER CHLORIDE DISTRIBUTION

High chloride concentration in ground water also renders it unsuitable for domestic and other purposes. The green colored regions in Plate – XIII are such areas where chloride concentration is moderately high (250-1000 mg/l) which occupy approximately 56% of the district area. The areas with high chloride concentration (>1000 mg/l) are shown in red color approximately occupying 37% of the district area. Together these two areas constitute about 93% area of the district where the ground water has limited suitability for domestic purposes. That leaves just about 7% of the district which has low chloride concentration (<250 mg/l, yellow color in the map) located around north of Kuchman City that is suitable for domestic purposes.

Table: Block wise area of Chloride distribution

Chloride Concentration Range (mg/l) (Ave. of years 2005-09)	Block wise area coverage (sq km)																						Total Area (sq km)
	Degana		Didwana		Jayal		Kuchaman City		Ladnu		Makrana		Merta		Mundwa		Nagaur		Parbatsar		Riyan		
	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	
< 250	2.4	-	157.0	10.0	-	-	561.8	34.5	17.4	1.0	61.9	6.0	119.8	9.0	187.2	8.0	-	-	167.0	16.5	82.7	7.5	**1,357.2**
250-1000	704.6	45.0	1,092.0	67.5	451.7	21.0	484.7	30.0	798.2	63.0	742.8	69.0	812.0	60.0	1,921.7	82.0	1,135.7	44.0	794.1	77.5	931.1	84.2	**9,868.6**
> 1000	871.6	55.0	392.8	22.5	1,749.5	79.0	578.9	35.5	459.7	36.0	269.7	25.0	417.8	31.0	226.6	10.0	1,419.2	56.0	66.1	6.0	92.9	8.3	**6,544.8**
Total	**1,578.6**	**100.0**	**1,641.8**	**100.0**	**2,201.2**	**100.0**	**1,625.4**	**100.0**	**1,275.3**	**100.0**	**1,074.4**	**100.0**	**1,349.6**	**100.0**	**2,335.5**	**100.0**	**2,554.9**	**100.0**	**1,027.2**	**100.0**	**1,106.7**	**100.0**	**17,770.6**

Ground Water Department,
Rajasthan

European Union
State Partnership Programme

PLATE - XII

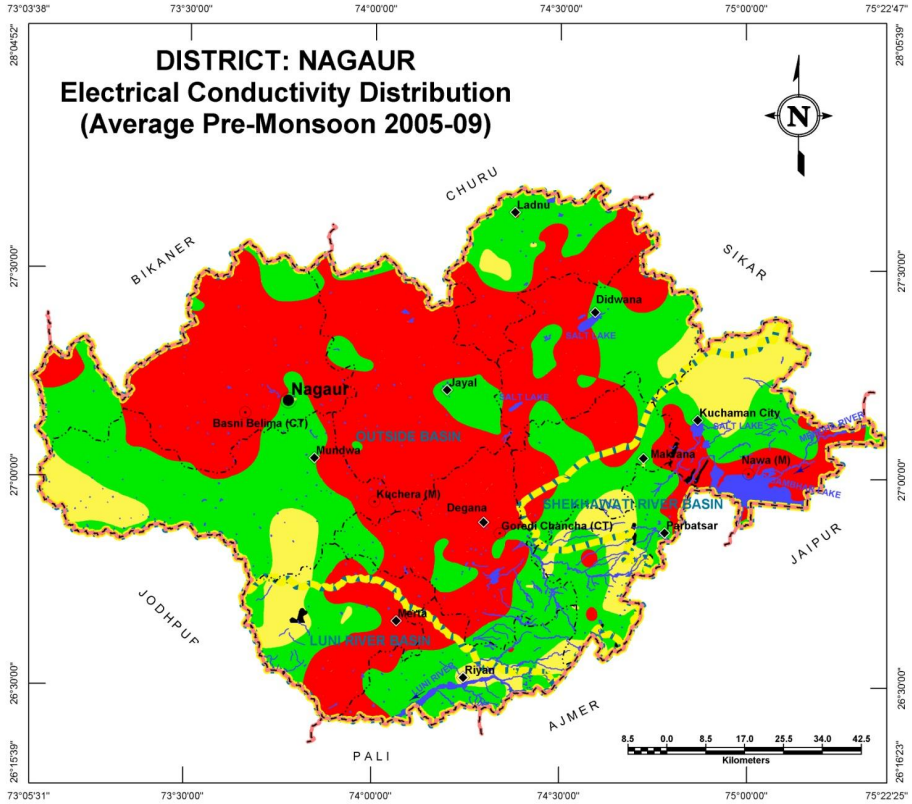
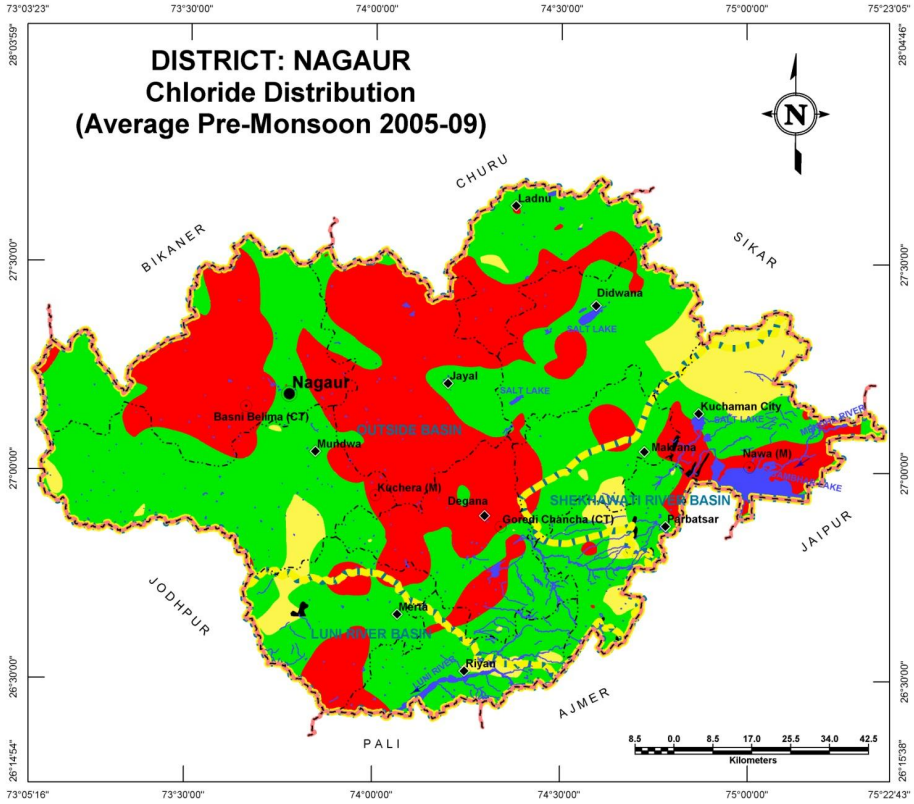


PLATE - XIII



LEGEND

Admin Boundary:

- District Headquarter
- Block Headquarter
- Town
- District Boundary
- Block Boundary

Basin Boundary

Water Bodies:

- River / Streams
- Ponds / Reservoirs

Hills

Electrical Conductivity (µS/cm at 25°C):

- < 2000
- 2000-4000
- >4000

LEGEND

Admin Boundary:

- District Headquarter
- Block Headquarter
- Town
- District Boundary
- Block Boundary

Basin Boundary

Water Bodies:

- River / Streams
- Ponds / Reservoirs

Hills

Chloride Concentration (mg/l):

- < 250
- 250 - 1000
- > 1000

ROLTA
Rolta India Limited

GROUND WATER FLUORIDE DISTRIBUTION

DISTRICT – NAGAUR

The Fluoride concentration map is presented in Plate – XIV. The areas with moderately high concentration (1.5-3.0 mg/l) are shown in green color that occupy approximately 54% of the total district area and the areas with high concentration (>3.0 mg/l) are shown in red color which occupy 25% of the district area. Together these areas account for about 79% of district area where ground water is unsuitable for domestic purposes because of high (>1.5 mg/l) fluoride concentration. Remaining part (21%) of the district area falls under low concentration (<1.5 mg/l) and shown in the map with yellow color. Such areas are seen largely in the southern part of Ladnu and around the Kuchman City and Nawa where the ground water is suitable for domestic purpose.

Table: Block wise area of Fluoride distribution

Fluoride concentration Range(mg/l) (Ave. of years 2005-09)	Block wise area coverage (sq km)																						Total Area (sq km)
	Degana		Didwana		Jayal		Kuchaman City		Ladnu		Makrana		Merta		Mundwa		Nagaur		Parbatsar		Riyan		
	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	
< 1.5	98.8	6.3	436.0	26.6	358.4	16.3	1,220.3	75.1	460.2	36.1	20.9	2.0	383.7	28.4	89.3	3.8	306.0	12.0	315.8	30.7	78.8	7.0	**3,768.2**
1.5-3.0	844.1	53.5	1,094.1	66.6	1,528.1	69.4	338.1	20.8	446.2	35.0	473.5	44.0	958.2	71.0	1,508.9	64.6	1,115.6	43.7	547.7	53.4	778.1	70.0	**9,632.6**
> 3.0	635.7	40.2	111.7	6.8	314.7	14.3	67.0	4.1	368.9	28.9	580.0	54.0	7.7	0.6	737.3	31.6	1,133.3	44.3	163.7	15.9	249.8	23.0	**4,369.8**
Total	**1,578.6**	**100.0**	**1,641.8**	**100.0**	**2,201.2**	**100.0**	**1,625.4**	**100.0**	**1,275.3**	**100.0**	**1,074.4**	**100.0**	**1,349.6**	**100.0**	**2,335.5**	**100.0**	**2,554.9**	**100.0**	**1,027.2**	**100.0**	**1,106.7**	**100.0**	**17,770.6**

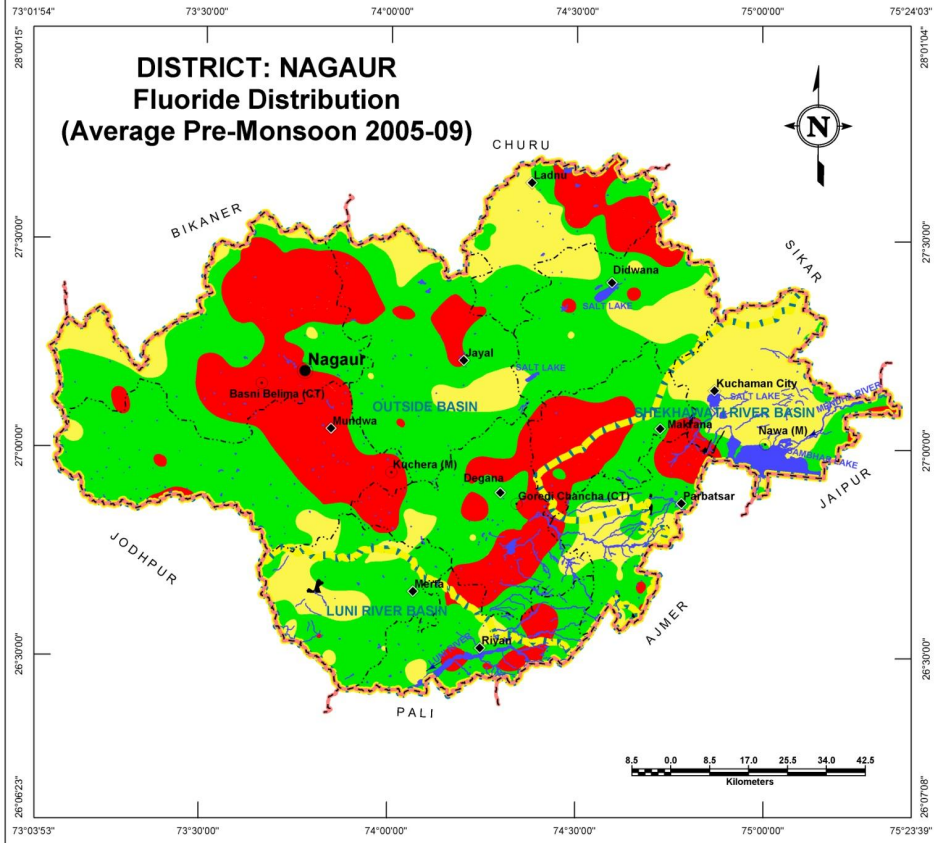
GROUND WATER NITRATE DISTRIBUTION

High nitrate concentration in ground water renders it unsuitable for agriculture purposes. Plate – XV shows distribution of Nitrate in ground water of Nagaur district. High nitrate concentration (>100 mg/l) is shown in red color and occupies approximately 64% of the district area which is not suitable for agriculture purpose. The areas with moderately high nitrate concentration (50-100 mg/l) are shown in green color and occupy approximately 27% of the district area. Remaining part of the district has low nitrate concentration (<50 mg/l) in ground water, shown in yellow color. Such low Nitrate areas are largely seen around Metra, Parbatsar and Kuchman City where the ground water is suitable for agriculture purpose.

Table: Block wise area of Nitrate distribution

Nitrate concentration range(mg/l) (Ave. of years 2005-09)	Block wise area coverage (sq km)																						Total Area (sq km)
	Degana		Didwana		Jayal		Kuchaman City		Ladnu		Makrana		Merta		Mundwa		Nagaur		Parbatsar		Riyan		
	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	
< 50	-	-	3.7	0.2	12.3	0.6	307.2	18.9	56.4	4.4	13.0	1.2	658.8	48.8	215.7	9.2	19.0	0.7	249.2	24.3	85.0	8.0	**1,620.3**
50-100	139.1	8.8	66.1	4.1	310.7	14.1	461.0	28.4	319.0	25.0	88.4	8.2	607.8	45.0	934.5	40.0	683.6	26.8	561.1	54.6	655.9	59.0	**4,827.2**
>100	1,439.5	91.2	1,572.0	95.7	1,878.2	85.3	857.2	52.7	899.9	70.6	973.0	90.6	83.0	6.2	1,185.3	50.8	1,852.3	72.5	216.9	21.1	365.8	33.0	**11,323.1**
Total	**1,578.6**	**100.0**	**1,641.8**	**100.0**	**2,201.2**	**100.0**	**1,625.4**	**100.0**	**1,275.3**	**100.0**	**1,074.4**	**100.0**	**1,349.6**	**100.0**	**2,335.5**	**100.0**	**2,554.9**	**100.0**	**1,027.2**	**100.0**	**1,106.7**	**100.0**	**17,770.6**

PLATE - XIV



LEGEND

Admin Boundary:

- District Headquarter
- Block Headquarter
- Town
- District Boundary
- Block Boundary

Basin Boundary

Water Bodies:

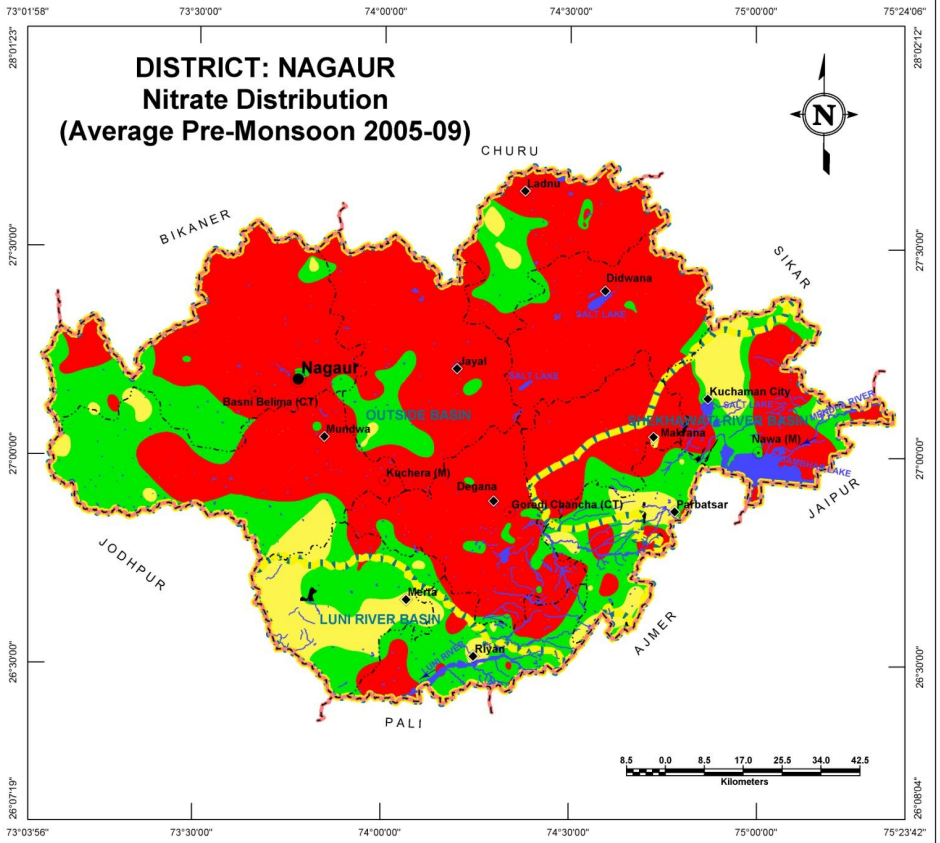
- River / Streams
- Ponds / Reservoirs

Hills

Fluoride Concentration (mg/l):

- < 1.5
- 1.5-3.0
- >3.0

PLATE - XV



LEGEND

Admin Boundary:

- District Headquarter
- Block Headquarter
- Town
- District Boundary
- Block Boundary

Basin Boundary

Water Bodies:

- River / Streams
- Ponds / Reservoirs

Hills

Nitrate Concentration (mg/l):

- < 50
- 50-100
- >100

DEPTH TO BEDROCK

DISTRICT – NAGAUR

The thick alluvial deposits in Nagaur district are underlain by rock of different lithology and age. Plate – XVI depicts the distribution of bedrock depth below ground level. The beginning of massive bedrock has been considered for defining top of bedrock surface. The major rocks types occurring in the district are Limestone, Sandstones and Schist. These rocks are overlain by alluvial deposits of sand, clay, silt and admixture of these in different proportions and thicknesses. The map of depth to bedrock in meters below ground level reveals that the bedrock surface is highly undulating in the western part whereas it is relatively even northeast and southwards. It varies from less than 20m bgl to more than 260m bgl. Shallow bedrock depth (less than 20m bgl) is found in the north part of Landu block. Deepest occurrence of bedrock (indicating high alluvial thickness) is found in eastern part of Nagur block (more than 260m bgl) covering a small area of eight sq km. The central, eastern and south parts of the district have the bedrock reaching upto 160m bgl whereas, Nagur block has moderately deep bedrock i.e. in the range of 160m bgl to 260m bgl.

Depth to bedrock (m bgl)	Block wise area coverage (sq km)																						Total Area (sq km)
	Degana		Didwana		Jayal		Kuchaman City		Ladnu		Makrana		Merta		Mundwa		Nagaur		Parbatsar		Riyan		
	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	
< 20	-	-	-	-	-	-	-	-	26.4	2.0	-	-	-	-	-	-	-	-	-	-	-	-	**26.4**
20-40	-	-	-	-	-	-	-	-	179.9	14.0	-	-	-	-	0.1	-	-	-	193.8	19.0	19.6	2.0	**393.4**
40-60	6.4	-	98.2	6.0	169.0	7.7	610.7	37.6	160.5	13.0	-	-	-	-	1.0	-	15.1	1.0	267.3	26.0	126.0	11.0	**1,454.2**
60-80	25.0	2.0	1,137.0	69.0	820.0	37.2	718.9	44.2	297.3	23.0	321.7	30.0	-	-	14.3	1.0	111.5	4.0	228.0	22.0	306.4	28.0	**3,980.1**
80-100	1,112.8	70.0	341.8	21.0	651.6	29.6	295.8	18.2	264.8	21.0	513.6	48.0	1,243.8	92.0	744.8	32.0	302.5	12.0	305.1	30.0	535.7	48.0	**6,312.3**
100-120	347.5	22.0	36.9	2.0	407.0	18.5	-	-	206.8	16.0	239.1	22.0	105.8	8.0	1,079.6	46.0	230.7	9.0	33.0	3.0	119.0	11.0	**2,805.4**
120-140	86.9	6.0	13.0	1.0	138.6	6.3	-	-	106.1	8.0	-	-	-	-	401.3	17.0	893.5	35.0	-	-	-	-	**1,639.4**
140-160	-	-	10.6	1.0	15.0	0.7	-	-	23.9	2.0	-	-	-	-	94.4	4.0	383.9	15.0	-	-	-	-	**527.8**
160-180	-	-	4.3	-	-	-	-	-	9.6	1.0	-	-	-	-	-	-	285.0	11.0	-	-	-	-	**298.9**
180-200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	173.7	7.0	-	-	-	-	**173.7**
200-220	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	92.2	4.0	-	-	-	-	**92.2**
220-240	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35.4	1.0	-	-	-	-	**35.4**
240-260	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23.3	1.0	-	-	-	-	**23.3**
> 260	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.1	-	-	-	-	-	**8.1**
Total	**1,578.6**	**100.0**	**1,641.8**	**100.0**	**2,201.2**	**100.0**	**1,625.4**	**100.0**	**1,275.3**	**100.0**	**1,074.4**	**100.0**	**1,349.6**	**100.0**	**2,335.5**	**100.0**	**2,554.9**	**100.0**	**1,027.2**	**100.0**	**1,106.7**	**100.0**	**17,770.6**

UNCONFINED AQUIFER

Alluvial areas:

Alluvial material forms aquifers in most of northeastern and southeastern half of the district and also in the northern and southern parts of Jayal block. The thickness of unconfined aquifer varies from less than 10 m to about 90m with the thickest parts lying to the south of Makrana and the southeastern part of Didwana block. The general thickness of alluvial aquifers is however, upto 30m.

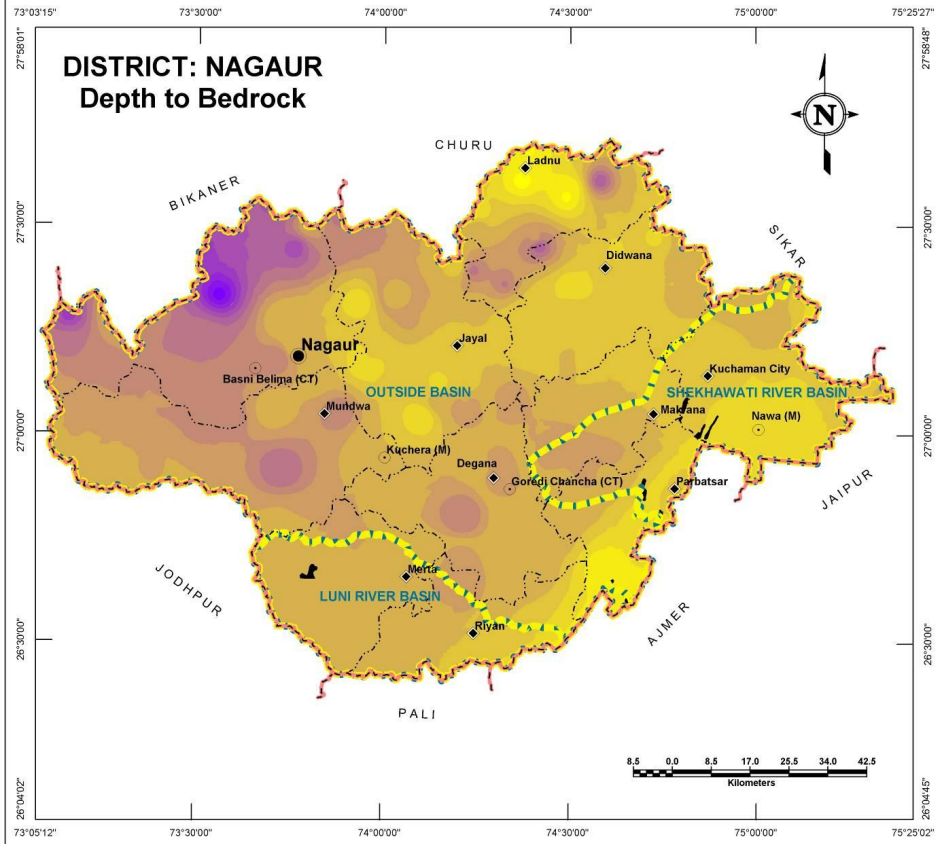
Unconfined aquifer Thickness (m)	Block wise Area coverage(sq km)											Total Area (sq km)
	Degana	Didwana	Jayal	Kuchaman City	Ladnu	Makrana	Merta	Mundwa	Nagaur	Parbatsar	Riyan	
< 10	402.9	740.0	206.7	1,120.1	43.0	371.1	238.9	-	-	259.0	442.0	**3,823.7**
10-20	397.7	259.2	162.5	267.8	75.9	171.2	69.2	-	-	38.3	111.7	**1,553.5**
20-30	273.4	60.3	137.7	100.5	2.4	61.0	0.1	-	-	15.6	62.6	**713.6**
30-40	85.0	31.5	8.0	64.2	-	32.7	-	-	-	4.5	66.9	**292.8**
40-50	13.0	20.1	-	27.8	-	23.7	-	-	-	1.0	14.5	**100.2**
50-60	3.0	12.4	-	3.9	-	16.9	-	-	-	0.2	2.3	**38.7**
60-70	-	7.2	-	-	-	12.7	-	-	-	-	-	**19.9**
70-80	-	4.3	-	-	-	12.3	-	-	-	-	-	**16.6**
> 80	-	1.6	-	-	-	1.7	-	-	-	-	-	**3.3**
Total	**1,175.0**	**1,136.6**	**514.9**	**1,584.3**	**121.3**	**703.3**	**308.2**	**-**	**-**	**318.6**	**700.0**	**6,562.2**

Hard rock areas:

Weathered, fractured and jointed rock formations occurring at shallower depths constitute good unconfined aquifers. Such zone ranges in thickness from less than 10m to about 70m. Western part of the district in Nagaur block has thickest zone of weathered/fractured hardrock where a thickness of more than 60m is seen whereas the rest of the blocks has moderate thickness of upto 30m.

Unconfined aquifer Thickness (m)	Block wise Area coverage (sq km)											Total Area (sq km)
	Degana	Didwana	Jayal	Kuchaman City	Ladnu	Makrana	Merta	Mundwa	Nagaur	Parbatsar	Riyan	
<10	280.5	447.0	1,287.9	34.7	1,010.4	43.1	823.4	1,734.7	418.4	240.8	377.0	**6,698.1**
10-20	121.8	58.2	398.4	6.4	143.4	322.6	209.2	273.6	775.2	381.9	28.4	**2,719.2**
20-30	1.3	-	-	-	0.2	5.4	8.8	160.5	614.3	56.9	1.3	**848.7**
30-40	-	-	-	-	-	-	-	113.1	264.9	25.6	-	**403.6**
40-50	-	-	-	-	-	-	-	52.9	188.0	3.4	-	**244.3**
50-60	-	-	-	-	-	-	-	0.7	262.8	-	-	**263.5**
> 60	-	-	-	-	-	-	-	-	31.3	-	-	**31.3**
Total	**403.6**	**505.2**	**1,686.3**	**41.1**	**1,154.0**	**371.1**	**1,041.4**	**2,335.5**	**2,554.9**	**708.6**	**406.7**	**11,208.4**

PLATE - XVI



LEGEND

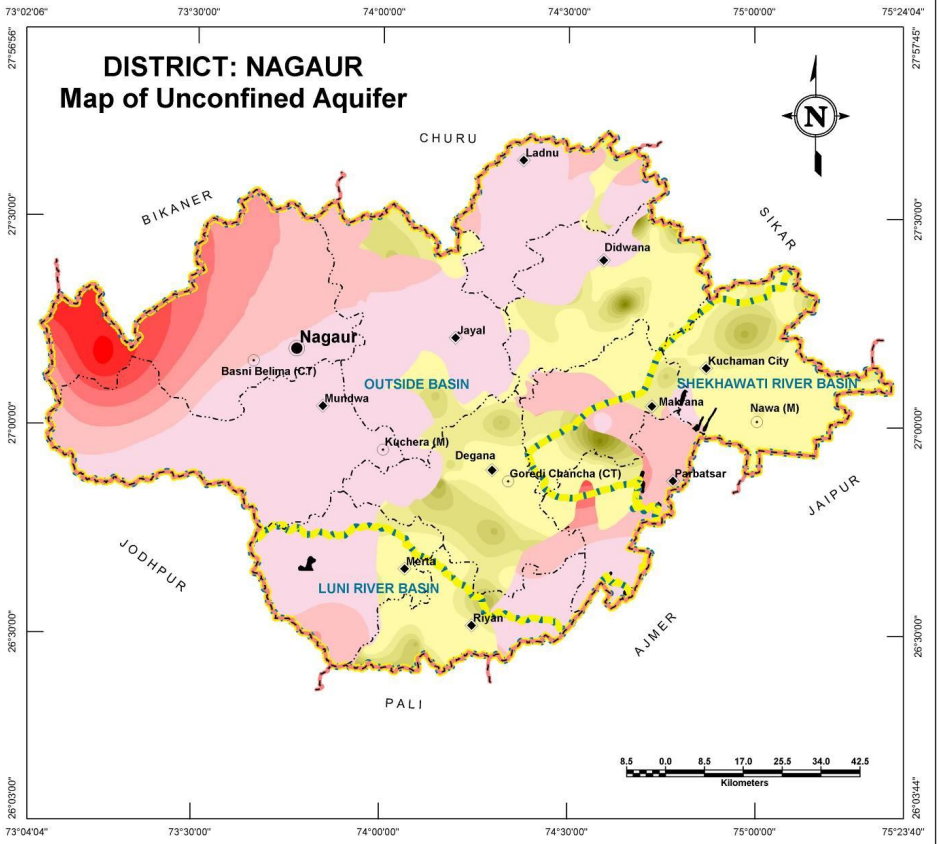
Admin Boundary:

- District Headquarter
- Block Headquarter
- Town
- District Boundary
- Block Boundary
- **Basin Boundary**
- **Hills**

Depth to Bedrock(m bgl):

< 20	140-160
20-40	160-180
40-60	180-200
60-80	200-220
80-100	220-240
100-120	240-260
120-140	>260

PLATE - XVII



LEGEND

Admin Boundary:

- District Headquarter
- Block Headquarter
- Town
- District Boundary
- Block Boundary
- **Basin Boundary**
- **Hills**

Aquifer Thickness(m):

Alluvial Area:	Weathered & Fractured Zone in Hardrock Area:
< 10	<10
10-20	10-20
20-30	20-30
30-40	30-40
40-50	40-50
50-60	50-60
60-70	>60
70-80	
>80	

Glossary of terms

S. No.	Technical Terms	Definition
1	AQUIFER	A saturated geological formation which has good permeability to supply sufficient quantity of water to a Tube well, well or spring.
2	ARID CLIMATE	Climate characterized by high evaporation and low precipitation.
3	ARTIFICIAL RECHARGE	Addition of water to a ground water reservoir by man-made activity
4	CLIMATE	The sum total of all atmospheric or meteorological influences principally temperature, moisture, wind, pressure and evaporation of a region.
5	CONFINED AQUIFER	A water bearing strata having confined impermeable overburden. In this aquifer, water levels represent the piezometric head.
6	CONTAMINATION	Introduction of undesirable substance, normally not found in water, which renders the water unfit for its intended use.
7	DRAWDOWN	The drawdown is the depth by which water level is lowered.
8	FRESH WATER	Water suitable for drinking purpose.
9	GROUND WATER	Water found below the land surface.
10	GROUND WATER BASIN	A hydro-geologic unit containing one large aquifer or several connected and interrelated aquifers.
11	GROUND WATER RECHARGE	The natural infiltration of surface water into the ground.
12	HARD WATER	The water which does not produce sufficient foam with soap.
13	HYDRAULIC CONDUCTIVITY	A constant that serves as a measure of permeability of porous medium.
14	HYDROGEOLOGY	The science related with the ground water.
15	HUMID CLIMATE	The area having high moisture content.
16	ISOHYET	A line of equal amount of rainfall.
17	METEOROLOGY	Science of the atmosphere.
18	PERCOLATION	It is flow through a porous substance.
19	PERMEABILITY	The property or capacity of a soil or rock for transmitting water.
20	pH	Value of hydrogen-ion concentration in water. Used as an indicator of acidity (pH < 7) or alkalinity (pH > 7).
21	PIEZOMETRIC HEAD	Elevation to which water will rise in a piezometers.
22	RECHARGE	It is a natural or artificial process by which water is added from outside to the aquifer.
23	SAFE YIELD	Amount of water which can be extracted from ground water without producing undesirable effect.
24	SALINITY	Concentration of dissolved salts.
25	SEMI-ARID	An area is considered semiarid having annual rainfall between 10-20 inches.
26	SEMI-CONFINED AQUIFER	Aquifer overlain and/or underlain by a relatively thin semi-pervious layer.
27	SPECIFIC YIELD	Quantity of water which is released by a formation after it's complete saturation.
28	TOTAL DISSOLVED SOLIDS	Total weight of dissolved mineral constituents in water per unit volume (or weight) of water in the sample.

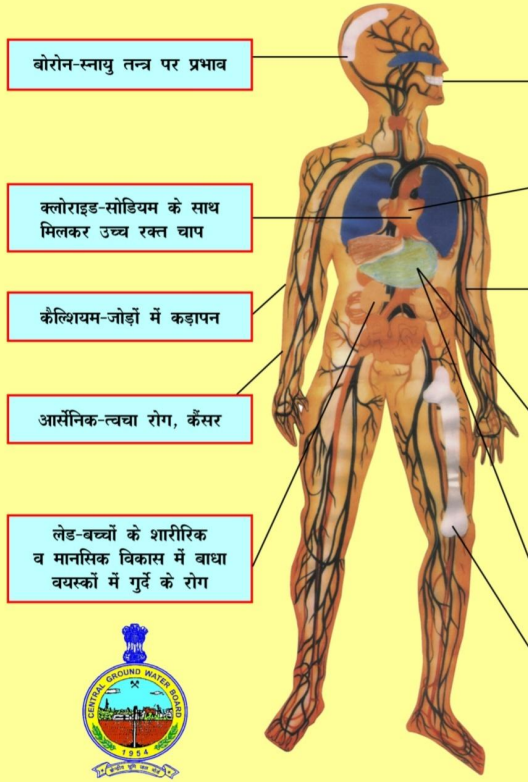
(Contd…)

S. No.	Technical Terms	Definition
29	TRANSMISSIBILITY	It is defined as the rate of flow through an aquifer of unit width and total saturation depth under unit hydraulic gradient. It is equal to product of full saturation depth of aquifer and its coefficient of permeability.
30	UNCONFINED AQUIFER	A water bearing formation having permeable overburden. The water table forms the upper boundary of the aquifer.
31	UNSATURATED ZONE	The zone below the land surface in which pore space contains both water and air.
32	WATER CONSERVATION	Optimal use and proper storage of water.
33	WATER RESOURCES	Availability of surface and ground water.
34	WATER RESOURCES MANAGEMENT	Planned development, distribution and use of water resources.
35	WATER TABLE	Water table is the upper surface of the zone of saturation at atmospheric pressure.
36	ZONE OF SATURATION	The ground in which all pores are completely filled with water.
37	ELECTRICAL CONDUCTIVITY	Flow of free ions in the water at 25C mu/cm.
38	CROSS SECTION	A Vertical Projection showing sub-surface formations encountered in a specific plane.
39	3-D PICTURE	A structure showing all three dimensions i.e. length, width and depth.
40	GWD	Ground Water Department
41	CGWB	Central Ground Water Board
42	CGWA	Central Ground Water Authority
43	SWRPD	State Water Resources Planning Department
44	EU-SPP	European Union State Partnership Programme
45	TOPOGRAPHY	Details of drainage lines and physical features of land surface on a map.
46	GEOLOGY	The science related with the Earth.
47	GEOMORPHOLOGY	The description and interpretation of land forms.
48	PRE MONSOON SURVEY	Monitoring of Ground Water level from the selected DKW/Piezometer before Monsoon (carried out between 15th May to 15th June)
49	POST-MONSOON SURVEY	Monitoring of Ground Water level from the selected DKW/Piezometer after Monsoon (carried out between 15th October to 15th November)
50	PIEZOMETER	A non-pumping small diameter bore hole used for monitoring of static water level.
51	GROUND WATER FLUCTUATION	Change in static water level below ground level.
52	WATER TABLE	The static water leval found in unconfined aquifer.
53	DEPTH OF BED ROCK	Hard & compact rock encountered below land Surface.
54	G.W. MONITORING STATION	Dug wells selected on grid basis for monitoring of state water level.
55	EOLIAN DEPOSITS	Wind-blown sand deposits

Ground Water Department,
Rajasthan

European Union
State Partnership Programme

भूजल में घुले मुख्य तत्वों की अधिकता का मानव शरीर पर दुष्प्रभाव



- बोरोन-स्नायु तन्त्र पर प्रभाव
- फ्लोराइड - दंत क्षरण
- सोडियम-हृदय, गुर्दा व रक्त परिसंचरण रोगों से ग्रसित लोगों को हानिकारक
- क्लोराइड-सोडियम के साथ मिलकर उच्च रक्त चाप
- नाइट्रेट-नवजात शिशुओं में ब्लू बेबी बीमारी (मेथमोग्लोबिनिमिया)
- कैल्शियम-जोड़ों में कड़ापन
- सल्फेट-अधिकता में मैग्नेशियम के साथ मिलकर दस्तावर
- आर्सेनिक-त्वचा रोग, कैंसर
- आयरन-आयरन जीवाणु से आमाशय संबंधी रोग
- लेड-बच्चों के शारीरिक व मानसिक विकास में बाधा वयस्कों में गुर्दे के रोग
- फ्लोराइड-जोड़ों में अकड़न, हड्डियों में मुड़ाव

केन्द्रीय भूमि जल बोर्ड,
पश्चिमी क्षेत्र, जयपुर
जल संसाधन मंत्रालय
भारत सरकार
e-mail:cgwbwr@sancharnet.in

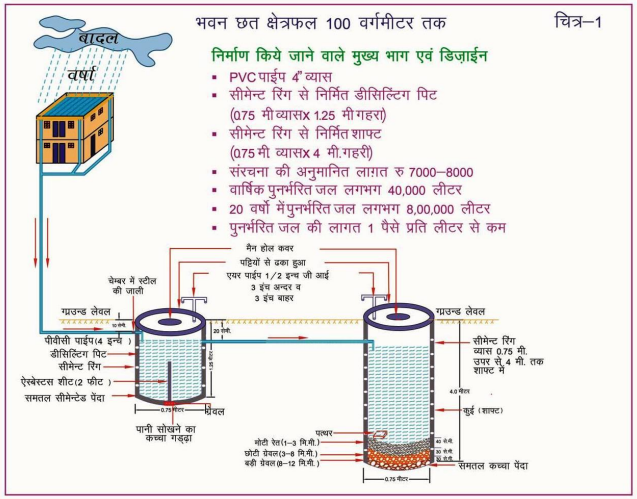
भूजल अमूल्य है इसे प्रदूषित न करें।

चित्र–1

भवन छत क्षेत्रफल 100 वर्गमीटर तक

निर्माण किये जाने वाले मुख्य भाग एवं डिज़ाईन

- PVC पाईप 4" व्यास
- सीमेन्ट रिंग से निर्मित डीसिल्टिंग पिट (0.75 मी.व्यास x 1.25 मी.गहरा)
- सीमेन्ट रिंग से निर्मित शाफ्ट (0.75 मी.व्यास x 4 मी.गहरी)
- संरचना की अनुमानित लाग़त रु 7000–8000
- वार्षिक पुनर्भरित जल लगभग 40,000 लीटर
- 20 वर्षों में पुनर्भरित जल लगभग 8,00,000 लीटर
- पुनर्भरित जल की लागत 1 पैसे प्रति लीटर से कम

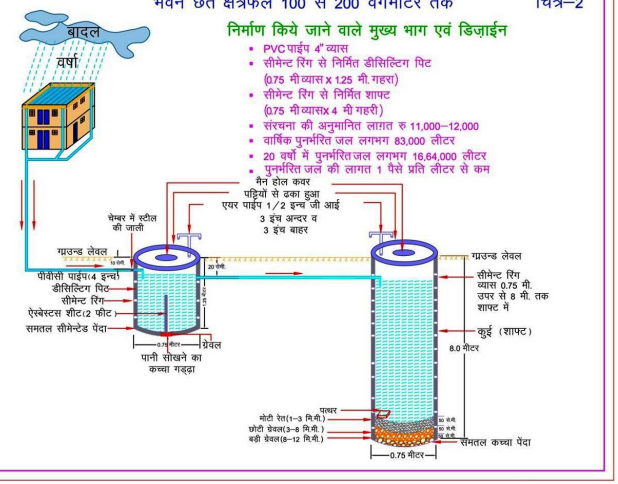


चित्र–2

भवन छत क्षेत्रफल 100 से 200 वर्गमीटर तक

निर्माण किये जाने वाले मुख्य भाग एवं डिज़ाईन

- PVC पाईप 4" व्यास
- सीमेन्ट रिंग से निर्मित डीसिल्टिंग पिट (0.75 मी.व्यास x 1.25 मी.गहरा)
- सीमेन्ट रिंग से निर्मित शाफ्ट (0.75 मी.व्यास x 4 मी गहरी)
- संरचना की अनुमानित लाग़त रु 11,000–12,000
- वार्षिक पुनर्भरित जल लगभग 83,000 लीटर
- 20 वर्षों में पुनर्भरित जल लगभग 16,64,000 लीटर
- पुनर्भरित जल की लागत 1 पैसे प्रति लीटर से कम

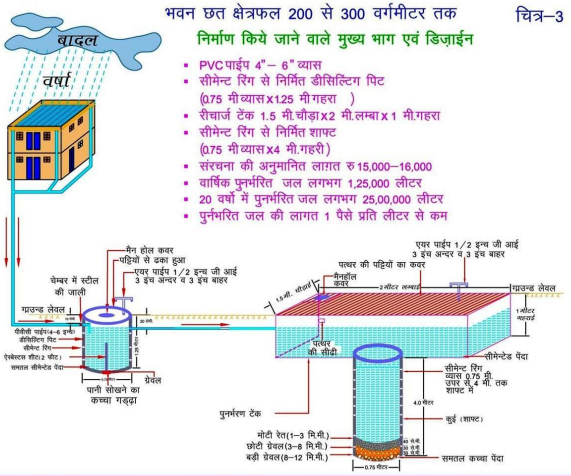


चित्र–3

भवन छत क्षेत्रफल 200 से 300 वर्गमीटर तक

निर्माण किये जाने वाले मुख्य भाग एवं डिज़ाईन

- PVC पाईप 4"– 6" व्यास
- सीमेन्ट रिंग से निर्मित डीसिल्टिंग पिट (0.75 मी.व्यास x 1.25 मी.गहरा)
- रीचार्ज टेंक 1.5 मी.चौड़ा x 2 मी.लम्बा x 1 मी.गहरा
- सीमेन्ट रिंग से निर्मित शाफ्ट (0.75 मी.व्यास x 4 मी.गहरी)
- संरचना की अनुमानित लाग़त रु 15,000–16,000
- वार्षिक पुनर्भरित जल लगभग 1,25,000 लीटर
- 20 वर्षों में पुनर्भरित जल लगभग 25,00,000 लीटर
- पुनर्भरित जल की लागत 1 पैसे प्रति लीटर से कम

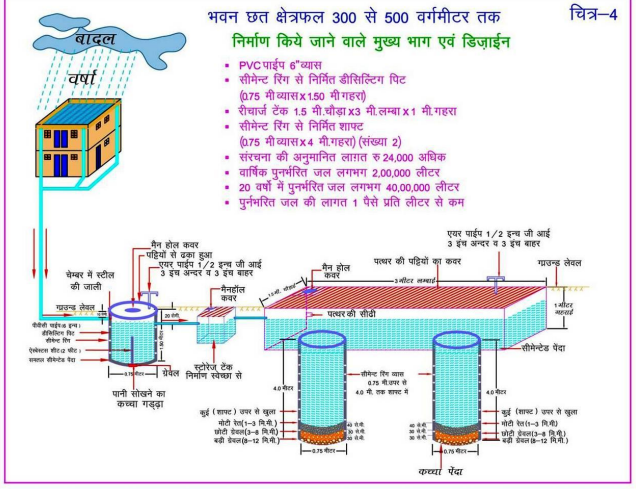


चित्र–4

भवन छत क्षेत्रफल 300 से 500 वर्गमीटर तक

निर्माण किये जाने वाले मुख्य भाग एवं डिज़ाईन

- PVC पाईप 6" व्यास
- सीमेन्ट रिंग से निर्मित डीसिल्टिंग पिट (0.75 मी.व्यास x 1.50 मी.गहरा)
- रीचार्ज टेंक 1.5 मी.चौड़ा x 3 मी.लम्बा x 1 मी.गहरा
- सीमेन्ट रिंग से निर्मित शाफ्ट (0.75 मी.व्यास x 4 मी.गहरा) (संख्या 2)
- संरचना की अनुमानित लाग़त रु 24,000 अधिक
- वार्षिक पुनर्भरित जल लगभग 2,00,000 लीटर
- 20 वर्षों में पुनर्भरित जल लगभग 40,00,000 लीटर
- पुनर्भरित जल की लागत 1 पैसे प्रति लीटर से कम



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Myths and Facts about Ground Water

S No	Myths	Facts
1	What is Ground Water • an underground lake • a net work of underground rivers • a bowl filled with water	Water which occurs below the land in geological formations/rocks is Ground water
2	Ground Water occurs everywhere beneath the Land Surface	Not really, it depends on the nature of rock formation
3	There is a relationship between ground water and surface water	Not all the places. Near streams/rivers there is relation
4	Groundwater is not renewable resource	It is renewable source and every year it is being recharged through rain/applied irrigation etc
5	Ground water is unlimited and deeper you drill more discharge	It is limited to annual recharge from rain/applied irrigation. The discharge may not increase if you go deeper
6	Ground Water moves rapidly	The movement of ground water is very slow
7	Ground water pumped from wells is thousands of years old	Generally the ground water being tapped through wells is a few years old
8	If water taste good—it is safe to drink	It may have other chemicals e.g. fluoride, nitrates etc which are harmful
9	Water from free flowing tube wells is very pure	This water can also be contaminated so test before use
10	If I recharge my TW/DW/HP it will not benefit me	It will also benefit you and also adjoing wells
11	There is no static ground water resources in Rajasthan	Rajasthan is also having Static GW resources, and being tapped in most of areas as GW annual withdrawal is more than annual recharge
12	I cannot meet annual cooking and drinking water requirement by rain water harvesting	The water requirement for drinking and cooking is only 8 lit/day. You can harvest this water for family of 5 persons from roof top or paved area of 75 Sq m to meet annual requirement
13	You can increase ground water recharge	This can be done by harvesting the rain water and storing in sub surface reservoir (GW) by constructing the recharge structures
14	You cannot use abandoned TW/HP/DW for ground water recharge	These should be used as recharge structures as harvested rain water is directly put into GW reservoir
15	Putting waste near HP/TW will not cause any problem	Such actions will pollute wells and water

ROLTA

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