REVIEW OF RESEARCH
ISSN: 2249-894X
IMPACT FACTOR : 5.7631(UIF)
UGC APPROVED JOURNAL NO. 48514
VOLUME - 8 | ISSUE - 9 | JUNE - 2019

DRINKING WATER QUALITY ANALYSIS AND IMPACT REFERENCE TO CHURU DISTRICT

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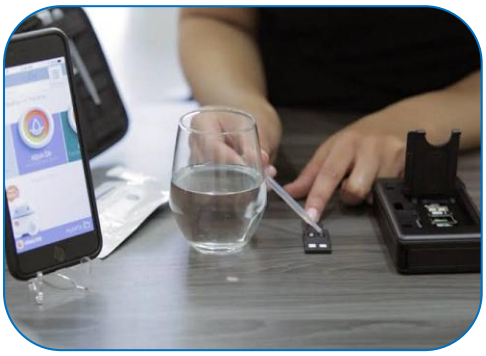
ABSTRACT:



Water is a crucial natural resource for life and livelihoods of mankind. Unfortunately, the craze for limitless economic growth has now made water a finite renewable natural resource and so its development and optimal utilization overtime is a major concern for planning and programming sustainable development in developing economies. And India is no exception to this global phenomenon.

The study area having desertic condition where water is precious resource. Increasing population growth, dwindling natural resources that man has been consuming for centuries and deteriorations of overall environmental quality are the basic problem society is facing today. Unbalanced development activities create many problems. Increasing population has specifically increased the pressure on water and it directly affects the quality of water.

A brief critique of literature pertaining to the contamination of the drinking water in different parts of District Churu, Rajasthan, India and its source and also its extent has beenpresented.

The work presented in the thesis deals with the statistical analysis of drinking water quality parameters in the selected drinking water samples of Churu tehsil in Churu district of Rajasthan, India and mapping the potability of drinking water in the study area. Such an attempt would help the water authorities in taking decisions to protect the quality of water resources and to execute the suitable water treatment design.

KEYWORDS: *Quality,Potability,Parameters,Consuming,Development ,Population, Unbalance, Statisticals, Development*

HYPOTHESIS OF THE STUDY

For the research study the following hypothesis has been formulated:

There is spatial-temporal variation in the quality of potable water.

There is increasing pressure on water resources due to increasingpopulation.

Increasing pressures on water resources adversely affects its quality and simultaneously humanhealth.

The measures of water conservation trends to increase the availability of potable water.

OBJECTIVES OF THE STUDY

The present research has been formulated the following objectives for the study on the quality of drinking water in the study area:-

To determine the present status of water resources in Churudistrict.

To determine availability of Potable water in the studyarea.

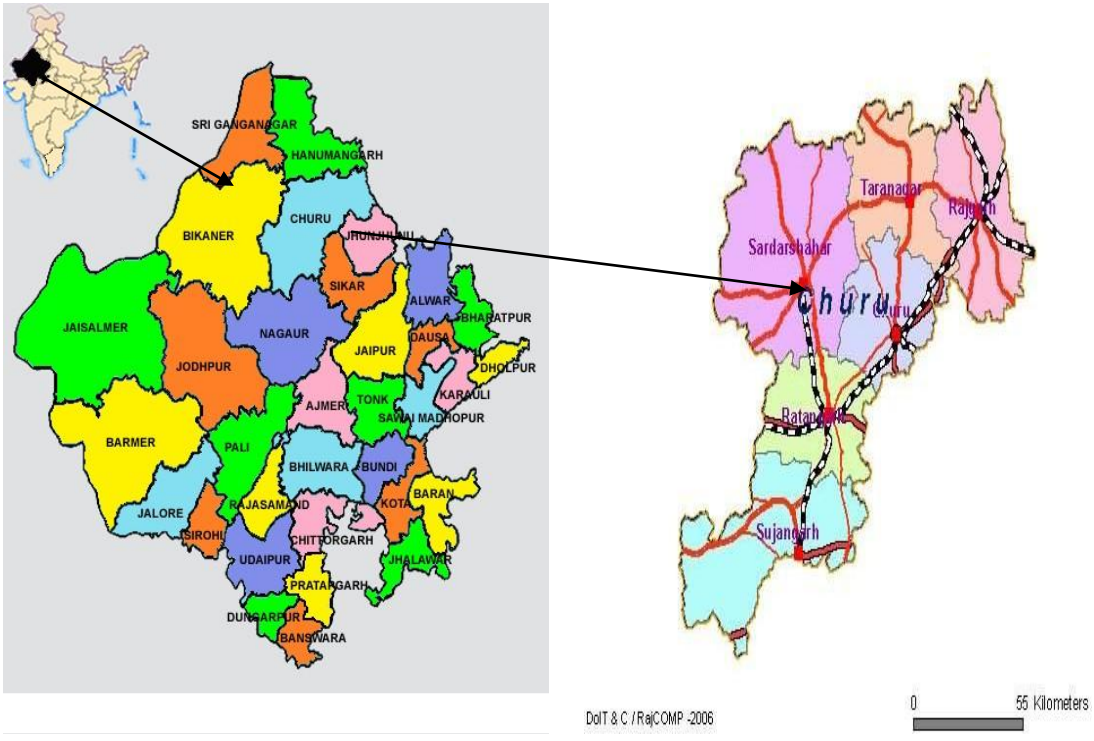
To determine the spatial variation in quality of potablewater.
To establish relationship between population and availability of potable water.
To suggest measures for sustainable availability of potable water.

Drinking water samples from a total of 20 sampling sites of 20 villages of Churu Tehsil were collected. The total water collection in the year of 2016 is divided in to two seasons, one is pre monsoon and another one is post monsoon. The sampling is carried out, during April 2016 for pre monsoon season and in September- October 2016 for post monsoon season from manually operated tube wells and hand pumps of varying depth, bore well, fresh water pond, Johra, govt. water supply, water cooler and Kui/Kundi/Tanka. The present research work has been divided into 6chapters.

STUDY AREA CHURU DISTRICT:

Churu, the district of Thar Desert is a unique example of a prosperous human habitat in the western desert of India. It is bounded by Hanumangarh district in the north, Sikar and Jhunjhunun districts of Rajasthan and Hissar district of Haryana in the east, Nagaure district in the south and Bikaner district in the west. It has a vast area of 13784.38 lacs as per census 2011. Geographical condition of the district comprises of severe desertic climate with a rainfall of about 320 mm per annum. Agriculture is the principal occupation of the people of Churu district providing employment to 76 percent of working population either as cultivation or agricultural labour.

Map No.1 Location of the Study Area (Churu District)



Water bearing formations in Churu district range from unconsolidated alluvium to semi consolidated sandstones and consolidated schistose rocks. The older and younger alluvium constituted of primarily sand of windblown and fluvial origin forms aquifers covering 71% of the district area. Next most prominent aquifers in the district are sandstones (17.5%) followed by schist (6.8%) and limestone

(4.7%) aquifers. The hardrock aquifers are prominent in southern and partly in western part of the district.

Table No. 15 Aquifer potential zones their area and their description

Aquifer in Potential Zone	Area (sq km)	% age of district	Description of the unit/Occurrence
Younger Alluvium	1,976.7	14.3	It is largely constituted of Aeolian and Fluvial sand, silt, clay, gravel and pebbles in varying proportions.
Older Alluvium	7,854.0	56.7	This litho unit comprises of mixture of heterogeneous fine to medium grained sand, silt and kankar.
Bilara Limestone	655.0	4.7	It is grey to buff coloured hard and compact.
Nagaur & Jodhpur Sandstone	2,415.1	17.5	Buff to reddish brown in colour, fine to medium grained hard and compact sandstone.
Schist	943.2	6.8	Medium to fine grained compact rock. The litho units are soft, friable and have closely spaced cleavage.
Total	13,844.0	100.0	

Source: Churu District, Hydrogeological Atlas of Rajasthan, Jaipur

Rainfall

The average annual rainfall in the district is 347 mm. In general there are 19 rainy days (i.e. days with rain of 2.5 mm or more) in a year. About 7.5 percent of the annual rainfall is received during the South-West monsoon period. The variation in the rainfall from year to year is very large. In general the rainfall increases from North-West to South-East.The analysis of 15 years average monthly rainfall data shows that there is negative relationship between the amount of monthly rainfall and itsvariability.

Table No. 18 Rainfall in Churu district

Year	Rainfall (in mm)	Percent variation from Normal Rainfall
2007	405.2	14.2
2008	506.0	42.7
2009	266.5	-24.9
2010	649.5	83.1
2011	659.9	86.0

Source: Statistical Abstract Rajasthan 2011 /2012 (DES, Government of Rajasthan)

Rainfalls took place here in the month of July-September due to southwest monsoon. In the month of May-June, sometimes pre-monsoon is also took place. In winter season some rainfall is taking place due to Cyclone and Bay of Bengal monsoon impact. Western and southern-western winds are generally blows in rest of the period. The July-September is Monsoon season. In the month of May-June sandy winds are affecting road and rail traffic for some time cold northern winds are blows in December- January months. Frost showering is common in the nights ofJanuary.

Drainage in Churu District

There is no any river or stream, which flow throughout the year. River ―Katli‖ is only river, which start from Triveni of Jaipur district and passing through Khardela hills of Sikar district, Udaipurwati-Gudha area of Jhunjhunun district and ended at Rajgarh tehsil of the district. At padihara of Ratangarh tehsil and Taal-Chhapar area of Sujangarh are pond area, where rainy water is found.

The drinking water is supplied through Gandheli-Sahaba Water Supply Scheme by Rawatsar branch of Indira Gandhi Canal Project."Apni Yojana" which is a part of Indira Gandhi Canal Project is in progress at present. This significant scheme of 645 crores starts from Dhannasar village of Hanumangarh district & will be supply drinking water to Hanumangarh, Churu and Jhunjhunun district also. This project is financially supported by German Government. In the first phase of the scheme three tehsils of Churu district viz. Taranagar, Sardarshahar and Rajgarh will be provided drinking water facility. In second phase other tehsils of the district will benefited. On the completion of this project people as well as cattle will be provided with safe drinking water in place of salty water, for which they are compel to use from many years.

Water Resources:

A water condition in the desert is worst in the country. Life in the desert revolves around whatever water and vegetation is available. The people in the desert settled around the places where water was available but as the supply of water dried out or ceased either in pond or well, the population shifted to other places. To study the water resources in this area, the entire resources have been divided in three categories asunder:

1. Rain water HarvestingSystem:

The desert, highly drought prone area has limited sources for drinking water. The ground water table is generally 150 meter deep and that too at most places are brackish and unfit for human use. Mostly small ponds (Nadi) or the step well (Boari) are the main sources of water. Large populations in the villages are dependent upon rain water stored in Tankas, Nadis or Ponds shared both by roan and livestock. This water lasts for a period of 4 to 6 months only after monsoon. About 60 percent of water in this region is moderate to highly saline. Some special traditional arrangement has been developed by each desert dwellers to collect the rainwater and use it round the year. Tanks are commonly constructed in the houses, otherwise in a low lying area a pure water storage tank; to catch hold the surface raining water of the area is also made. The water level in the wells varies from 40 to 150 feet below the surface and decreases considerably during the hot weather, when several tanks, springs and wells dry up, people carry potable water over long distance on camels and asses. Sweet water wells are few and faraway.

2. UndergroundWater:

The district comprises two ground water basins - the Sikar basin (eastern part of the district) and Bikaner basin (western part of the district). The water level of the wells, which are mostly tapping alluvium or hard rocks, varies between 7.5 meter (Sujangarh tehsil) to 79 meter (Jhanjhu well no. 44 H-4 D 7). In general depth of water level in the district ranges between 30 to 40 meter below ground water level. The water table is deep inwest of Sujangarh and worth of Sardar shahar. The decline of water level ranged from 0.2 meter (Jeevandesar) to 4.98 meter (Bhiroser Ki Dhani) to 1.75 meter (Kitalsar). The quality of ground water in prelatic zone is highly variable. The salinity is gradually increasing towards north and north-eastern part of the district. It is observed that potable or irrigable water is confined only to less than half of the area. The chloride is less than 250 ppm around Rajaldesar-Ratangarh and as high as 4396 ppm in well No. 44 C-2D1 about 20 km. south-west of Taranagar. In Taranagar-Rajgarh area the ground water contain high salinity. In most of the area to the northern and northwest of Churu also the ground water is characterized by high salinity with chloride content exceeding 2000ppm.

Ingeneral the ground water in the district is alka line with phranging from7.5 to 8.5. The ground water is mostly hard to extremely hard wherein bicarboriate is ranging between 90 ppm (Godhwal) to 5200 ppm (Buchawas), At many places the fluoride content in water record edisvery high then the permissible limit for drinking water,it is recorded 3.8 mg/liter. The northern part of Rajgarh, Taranagar and Sardarshahar tehsils and certain areas of Ratangarh and Sujangarh the phreatic aquifer yield highly saline water.

DATA ANYLASIS

Potable water is the water of sufficiently high quality that can be consumed or used with low risk of immediate or long term harm. Water has always been an important and life-sustaining drink to humans and is essential to the survival of all organisms (Wateraid, 2008). Excluding fat, water composes approximately 70% of the human body by mass. It is a crucial component of metabolic processes and serves as a solvent for many bodily solutes. Water is essential for the growth and maintenance of our bodies, as it is involved in a number of biological processes. The amount of water needed varies with the individual, as it depends on the condition of the subject, the amount of physical exercise, and on the environmental temperature and humidity. An individual's thirst provides a better guide for how much water they require rather than a specific fixed quantity. In terms of mineral nutrients intake, it is unclear what the drinking water contribution is. However, inorganic minerals generally enter surface water and ground water via storm water runoff or through the Earth's crust. Treatment processes also lead to the presence of some minerals. Examples include calcium, zinc, manganese, phosphate, and sodium compound (Greenhalgh, 2001). Water generated from the biochemical metabolism of nutrients provides a significant proportion of the daily water requirements for some arthropods and desert animals, but provides only a small fraction of a human's necessary intake. Parameters for drinking water quality typically fall under two categories: chemical/physical and microbiological (Ackah et al., 2011; Sayyed and Wagh, 2011; Tiwari, 2011). Chemical/physical parameters include heavy metals, trace metals, total suspended solids (TSS) andturbidity.

SAMPLING

To evaluate contamination of potable drinking water, water samples were collected during 2016. The samples were collected into acid pre-cleaned high-density polystyrene bottle of 1.5 L capacity. Two sets of water samples were collected at each of the sampling points. One was for the measurement of anions. The other, for analysis of cations and trace elements was acidified with 1% nitric acid to discourage the formation of precipitates and to keep the metal ions in the dissolved state. Temperature, pH, electrical conductivity, redox potential (eh), salinity and total dissolved solids measurements were conducted on site with a portable HACH conductivity meter which was calibrated prior to taking of readings. The samples were kept over ice in an ice chest and transported to the inorganic laboratory of the Rajasthan PHED, District Laboratory, Churu, Rajasthan foranalysis.

SAMPLE PREPARATION AND ANALYSIS

All chemicals and standards used during preparation and analysis were of the highest purity analytical grade available. De-ionized water was used throughout the analysis wherever applicable. Alkalinity was determined by strong acid titration method. Calcium (Ca) was determined using the standard EDTA titrimetric methods according to APHA (1998). Zinc, Magnessium, Copper, Nickel, Cobalt, Chromium, Iron, Cadmium

and Lead were determined using Varian Fast Sequential Atomic Absorption Spectrometer (model AA 240FS). Total hardness was determined using standard EDTA titration with ammonia buffer and erichrome black _T' indicator. The water samples for anion analysis were filtered using a hand operated vacuum pump equipped with a 0.45pm cellulose acetate filter membrane. Chloride determination was undertaken using the argentometric method (APHA, 1998). Sulphate (SO_4^{2-}) and phosphate (PO_4^{3-}) were determined by UV spectrophotometric method. Bicarbonate (HCO_3^-) determination was carried out using acid titration, with methyl orange as indicator.

PHYSICO-CHEMICAL ANALYSIS

All the samples were analyzed for the following Physico-chemical parameters; pH, Total Alkalinity (TA), Total Hardness (TH), Calcium hardness (Ca H), Magnesium hardness (Mg H), Chloride, Nitrate, Fluoride, Total Dissolved Solid (TDS) and Electrical Conductivity (EC). The analysis of water samples were carried out in accordance to standard analytical methods. All the chemicals used were of AR grade and double distilled water used for preparation of solutions. Details of the analysis methods are summarized in Table 5.1.

Parameters and methods employed in the physicochemical examination of water samples

S.No.	Parameters	Unit	Method Employed
1.	pH	-	Digital pH-meter
2.	Total Alkalinity	mg/L	Titrimetric method (With H2SO4)
3.	Total Hardness (as CaCO3)	mg/L	Titrimetric method (With EDTA)
4.	Calcium Hardness (as CaCO3)	mg/L	Titrimetric method
5.	Magnesium Hardness (as CaCO3)	mg/L	Titrimetric method
6.	Chloride (as Cl-)	mg/L	Titrimetric method (With AgNO3)
7.	Nitrate (as NO3-)	mg/L	Spectrophotometric method
8.	Fluoride (as F-)	mg/L	Ion Selective Electrode
9.	Total Dissolved Solids	mg/L	Digital TDS-meter
10.	Electrical Conductivity	µmhos/cm	Digital Conductivity- meter

Source : Parameters and methods employed by Research

RESULT AND DISCUSSION

H_1: There is spatial -temporal variation in the quality of potable water in Churu tehsil, Churu district, Rajasthan

Table 42
Physico-chemical parameters of Drinking Water of Churu Tehsil of Churu District in Rajasthan (2016)

As per I.S. Specification10500 {Drinking Water}							
Description		Colorless liquid					
tt. No.	ttample tttation	Water ttample	Odour	Colour	Taste	Water Temp.	Air Temp.
1.	Thailasar	Fresh Water Pond	Unobjectionable	Nil	Agreeable	24.5	37.4
2.	Asloo tttation	Johra	Unobjectionable	Nil	Agreeable	24.5	37.6
3.	Asalkheri	Bore Well	Unobjectionable	Nil	Agreeable	23.9	37.5
4.	Bas Dhakan	Bore Well	Unobjectionable	Nil	Agreeable	23.7	36.7
5.	Boontiya	Hand Pump	Unobjectionable	Nil	Agreeable	24	37.5
6.	Kotwad Tal	Hand Pump	Unobjectionable	Nil	Agreeable	23.9	36.8
7.	Hunatpura	Tube Well	Unobjectionable	Nil	Agreeable	23.8	36.8
8.	Gajsar	Tube Well	Unobjectionable	Nil	Agreeable	23.8	36.8

9.	Kunsisar	Kui/Kundi/Tanka	Unobjectionable	Nil	Agreeable	24.5	37.5
10.	Dhadhar	Kui/Kundi/Tanka	Unobjectionable	Nil	Agreeable	23.9	36.8
11.	Dhameri	Water Cooler	Unobjectionable	Nil	Agreeable	24.5	37.8
12.	ttatra	Water Cooler	Unobjectionable	Nil	Agreeable	23.8	36.8
13.	Churu (Rural)	Hand Pump	Unobjectionable	Nil	Agreeable	23.5	37.5
14.	Churu (M Cl + OG)	Govt. Water ttupply	Unobjectionable	Nil	Agreeable	23.5	36.9
15.	Indrapura	Govt. Water ttupply	Unobjectionable	Nil	Agreeable	24.5	37.5
16.	Jhariya	Hand Pump	Unobjectionable	Nil	Agreeable	25.9	36.8
17.	ttirsali	Tube Well	Unobjectionable	Nil	Agreeable	24.5	38.8
18.	Ranasar	Tube Well	Unobjectionable	Nil	Agreeable	25.8	36.8
19.	tturatpura	Bore Well	Unobjectionable	Nil	Agreeable	26.5	37.5
20.	Motisar	Bore Well	Unobjectionable	Nil	Agreeable	23.5	35.9

Source : Primary Data Collected by Research Scholar

Note: **Standard parameters used for analysis to test water sample**

S. No	Parameter	Is Code Is-10500	WHO Standards
1	Colour	5-25 (Hazan Unit)	5-25 (On Pt- Co scale)
2	Odour	Unobjectionable	Unobjectionable
3	Taste	Agreeable	Unobjectionable

From the above table it is shows that in all the 20 samples the odour is unobjectionable, colour is nil and the taste is agreeable.

Physico-Chemical Characteristics of Drinking Water Samples of Churu Tehsil of Churu District inRajasthan

S. No.	Sample Station	Sample Source	Turbidity	pH	Total alkalinity	Total Hardness	Ca H	Ca+2 ions	Mg H	Mg+2 ions	Chloride as Cl-	Nitrate as NO-3	Fluoride asF-	TDS	EC	B.O.D	Dissolved Oxygen (DO)	Sulphate as SO4 2-	Iron as Fe 2+	Sodium as Na+	Pesticides	Total Coliform	E-coli
1.	Thailasar	Fresh Water Pond	0.09	8.6	411	529	237	94.8	292	70.95	1120	108	0.71	2216	3165	0	6.5	BDL	BDL	3.6	Absent	1	0
2.	Asloo Station	Johra	0.09	8.4	305	115	43	17.2	72	17.49	1140	15	1.44	778	1111	0	6.1	1.1	BDL	6.8	Absent	1	Absent
3.	Asalkheri	Bore Well	0.1	7.9	748	360	151	60.4	209	50.78	278	22	0.37	2100	3000	0	6	1.1	0.01	8	Absent	□1	Absent
4.	Bas Dhakan	Bore Well	0.03	8.3	462	161	67	26.8	94	22.84	176	131	1.8	1470	2100	0	6.1	BDL	BDL	7.6	Absent	1	Absent
5.	Boontiya	Hand Pump	0.1	7.5	651	516	172	68.8	344	83.59	137	28	2.12	1696	2422	0	6.4	BDL	0.01	7.2	Absent	□1	Absent
6.	Kotwad Tal	Hand Pump	0.12	8.4	396	105	40	16	65	15.79	123	27	1.99	1298	1855	0	7	1.2	0.04	8	Absent	1	Absent

7.	Hunatpura	Tube Well	0.16	7.5	586	192	78	31.2	114	27.7	333	11	2.05	2146	3065	0	6.9	0.6	BDL	9.6	Absent	□1	Absent
8.	Gajsar	Tube Well	0.35	8.4	258	158	64	25.6	94	22.84	202	86	1.14	1590	2271	0	6.1	BDL	BDL	9.2	Absent	□1	Absent
9.	Kunsisar	Kui/Kundi/ Tanka	0.41	7.8	333	156	67	26.8	89	21.62	163	8	0.79	1191	1701	0	6.6	1.3	BDL	7.6	Absent	□1	Absent
10.	Dhadhar	Kui/Kundi/ Tanka	0.4	7.6	435	732	336	134.4	396	96.22	315	18	0.93	1740	2486	0	6.6	5.11	BDL	11.2	Absent	□1	Absent
11.	Dhameri	Water Cooler	0.24	7.0	368	188	78	31.2	110	26.73	176	20	0.42	920	1314	0	7	2.4	BDL	11.2	Absent	□1	Absent
12.	Satra	Water Cooler	0.48	7.7	562	115	46	18.4	69	16.76	80	12	1.3	1034	1477	0	6.6	3.61	BDL	10	Absent	□1	Absent

S. No.	Sample Station	Sample Source	Turbidity	pH	Total alkalinity	Total Hardness	CaH	Ca+2 ions	MgH	Mg+2 ions	Chloride as Cl-	Nitrate as NO-3	Fluoride asF-	TDS	EC	B.O.D	Dissolved Oxygen (DO)	Sulphate as SO4 2-	Iron as Fe 2+	Sodium as Na+	Pesticides	Total Coliform	E-coli
13.	Churu (Rural)	Hand Pump	0.49	7.7	426	163	70	28	93	22.59	60	70	1.13	760	1085	6	5.1	5.51	BDL	13.6	Absent	□1	Absent
14.	Churu (M Cl + OG)	Govt. Water Supply	0.64	7.4	243	264	121	48.4	143	34.74	33	29	0.71	792	1131	0	6.4	7.01	BDL	16	Absent	□1	Absent
15.	Indrapura	Govt. Water Supply	0.8	7.6	707	112	45	18	67	16.28	65	19	4.67	1200	1714	3	4.8	6.51	BDL	17.2	Absent	□1	Absent
16.	Jhariya	Hand Pump	0.9	8.2	582	46	22	8.8	24	5.83	20	22	1.4	1055	1507	12	4.8	12.08	BDL	17.2	Absent	□1	Absent
17.	Sirsali	Tube Well	1.30	7.7	409	568	206	82.4	362	87.96	484	8	0.9	2644	3777	4	4.8	26.07	BDL	32.4	Absent	□1	Absent
18.	Ranasar	Tube Well	0.63	7.0	460	317	128	51.2	189	45.92	380	16	0.88	2310	3300	0	6.5	3.61	BDL	12.5	Absent	□1	Absent
19.	Suratpura	Bore Well	0.72	7.9	595	528	238	95.2	290	70.47	259	72	1.4	1764	2520	6	5.5	5.51	BDL	13.6	Absent	□1	Absent
20.	Motisar	Bore Well	0.75	8.6	520	374	171	68.4	203	49.32	22	44	1.8	1333	1904	0	6.4	7.01	BDL	16	Absent	1	Absent
Range			0.09-0.9	7.4-8.6	243-595	46-732	22-336	8.8-134.4	24-396	5.83-96.22	20-1140	8-131	0.37-4.67	760-2644	1085-3777	0-12	4.8-7.0	0.6-26.07		3.6-32.4	Absent	1	Absent
Mean			0.044	7.86	472.85	284.95	119	47.6	155.8	40.32	278.3	37.9	1.39	1435.2	2050.05	1.55	6.11	4.48		11.92	Absent	1	Absent

Where- TA = Total Alkalinity, TH = Total Hardness, CaH = Calcium Hardness, MgH = Magnesium Hardness, Cl^- = Chloride,
NO-3 = Nitrate, F - = Fluoride, TDS = Total Dissolved Solids, EC = ElectricalConductivity. All parameters are expressed in mg/L except pH and EC. EC is expressed in µmhos/cm. Ca+2 = Ca mg/L (as CaCO3), Mg+2 = Mg mg/L (asCaCO3).

Physico-Chemical Characteristics of Drinking Water Samples of Churu Tehsil of Churu District inRajasthan

Post Monsoon Season (2016)

S. No.	Sample Station	Sample Source	Turbidity	pH	Total alkalinity	Total Hardness	CaH	Ca+2 ions	MgH	Mg+2 ions	Chloride as CI-	Nitrate as NO-3	Fluoride asF-	TDS	EC	B.O.D	Dissolved Oxygen (DO)	Sulphate as SO4 2-	Iron as Fe 2+	Sodium as Na+	Pesticides	Total Coliform	E-coli
1.	Thailasar	Fresh Water Pond	1.23	8.1	410	406	180	72	226	54.91	987	102	1.36	2246	3145	ND	6.45	1.68	BDL	5.2	Absent	1	Absent
2.	Asloo Station	Johra	1.38	8.6	294	82	32	12.8	50	12.15	992	21	1.94	771	1080	ND	6.24	2.86	BDL	7.8	Absent	□1	Absent
3.	Asalkheri	Bore Well	1.37	7.7	607	284	122	48.8	162	39.36	194	15	0.85	2125	3010	ND	6.24	3.45	BDL	8.67	Absent	□1	Absent
4.	Bas Dhakan	Bore Well	1.40	7.7	517	540	245	98	295	71.68	417	129	0.73	1520	2962	ND	6.10	3.46	BDL	8.95	Absent	□1	Absent
5.	Boontiya	Hand Pump	1.41	7.8	580	478	173	69.2	305	74.11	193	31	1.92	1630	2328	ND	6.26	7.20	0.01	9.12	Absent	□1	Absent
6.	Kotwad Tal	Hand Pump	1.39	8.5	363	98	41	16.4	57	13.85	98	14	1.54	1207	1724	ND	6.98	7.45	BDL	9	Absent	□1	Absent
7.	Hunatpura	Tube Well	1.40	7.7	484	110	45	18	65	15.79	118	9	1.8	2132	2954	ND	BDL	9.15	BDL	9.48	Absent	□1	Absent
8.	Gajsar	Tube Well	1.47	7.6	459	161	68	27.2	93	22.59	171	94	0.81	1474	1820	ND	BDL	9.24	BDL	9.35	Absent	□1	Absent
9.	Kunsisar	Kui/Kundi/ Tanka	1.49	7.4	255	187	80	32	107	26	113	6	0.51	1256	1937	ND	BDL	9.78	BDL	10.6	Absent	□1	Absent
10.	Dhadhar	Kui/Kundi/ Tanka	1.57	8.5	838	254	111	44.4	143	34.74	107	7	0.98	1612	2303	1.20	6.54	9.21	BDL	12.9	Absent	□1	Absent
11.	Dhameri	Water Cooler	1.58	7.8	482	364	163	65.2	201	48.84	146	21	0.6	1044	1491	ND	6.87	9.45	BDL	15.2	Absent	□1	Absent
12.	Satra	Water Cooler	1.62	7.7	703	261	113	45.2	148	35.96	118	11	1	1206	1723	ND	5.87	10.20	BDL	14.7	Absent	□1	Absent

S. No.	Sample Station	Sample Source	Turbidity	pH	Total alkalinity	Total Hardness	CaH	Ca+2 ions	MgH	Mg+2 ions	Chloride as CI-	Nitrate as NO-3	Fluoride asF-	TDS	EC	B.O.D	Dissolved Oxygen (DO)	Sulphate as SO4 2-	Iron as Fe 2+	Sodium as Na+	Pesticides	Total Coliform	E-coli
13.	Churu (Rural)	Hand Pump	1.65	7.7	282	211	88	35.2	123	29.88	28	67	0.9	724	605	6.50	5.67	11.89	BDL	19.2	Absent	1	Absent
14.	Churu (M Cl + OG)	Govt. Water Supply	1.77	7.7	168	220	92	36.8	128	31.1	40	27	0.32	780	1017	1.8	5.87	12.30	BDL	19.8	Absent	□1	Absent
15.	Indrapura	Govt. Water Supply	1.86	7.6	698	147	63	25.2	84	20.41	60	18	4.2	1225	1665	4.20	5.90	16.10	BDL	23.5	Absent	□1	Absent
16.	Jhariya	Hand Pump	1.98	7.6	454	159	66	26.4	93	22.59	34	24	1.17	999	1618	6.80	6.21	12.08	BDL	20.6	Absent	□1	Absent
17.	Sirsali	Tube Well	2.10	7.2	312	660	237	94.8	423	102.8	103	6	0.45	2652	3759	2.5	6.14	0.23	BDL	45.2	Absent	□1	Absent

18.	Ranasar	Tube Well	1.63	8.3	822	77	31	12.4	46	11.17	206	15	0.84	2286	2787	1.5	5.25	2.11	BDL	5.2	Absent	□1	Absent
19.	Suratpura	Bore Well	1.42	7.7	389	119	43	17.2	76	18.46	148	62	1.9	1755	2869	3.20	3.90	7.52	BDL	7.6	Absent	□1	Absent
20.	Motisar	Bore Well	1.15	8.5	859	53	21	8.4	32	7.77	112	36	1.6	1310	1914	4.80	6.21	5.01	BDL	12.5	Absent	1	Absent
Range			1.15-2.1	7.2-8.6	168-859	53-660	21-245	8.4-94.8	32-305	7.77-74.11	22-992	6-129	0.32-4.2	724-2652	605-3759	1.2-6.8	3.9-6.98	0.23-16.1	BDL	5.2-45.2	Absent	1	Absent
Mean			1.54	7.87	455.85	243.55	100.7	40.28	142.85	34.71	219.25	35.75	1.27	1497.7	2135.5	1.62	5.13	7.52	0	13.72			

Where- TA = Total Alkalinity, TH = Total Hardness, CaH = Calcium Hardness, MgH = Magnesium Hardness, Cl^- = Chloride,
NO-3 = Nitrate, F - = Fluoride,
TDS = Total Dissolved Solids, EC = Electrical Conductivity.
All parameters are expressed in mg/L except pH and EC. EC is expressed in µmhos/cm. Ca+2 = Ca mg/L (as CaCO3), Mg+2 = Mg mg/L (as CaCO3).
Conclusions and Suggestions

Water is a crucial natural resource for life and livelihoods of mankind. Unfortunately, the craze for limitless economic growth has now made water a finite renewable natural resource and so its development and optimal utilization overtime is a major concern for planning and programming sustainable development in developing economies. And India is no exception to this global phenomenon.

In India, along with environmental degradation and ecological instability, water crisis including water scarcity and water quality deterioration have assumed such grave dimensions that they demand top priority to recognize them as a natural resource management issues. The World Bank report on Water Economy of India envisages a turbulent future by 2025 and suggests to the reform the water sector at the earliest to squarely face water sector challenges of the 21st century. The comfortable position of water balance clearly indicates that the non-availability of water is not the basic issue for India, but to develop and manage now finite and vulnerable, but renewable water resources in an optimal manner to promote sustainable development in India, is the basic issue.

Water is essential for sustaining life, and adequate, safe and accessible supply of water must be available to all. Human and plant body consists of 60% and 90% water respectively. Access to safe drinking water is essential to health, a basic human right and a component of effective policy for health protection. The drinking water risks in developing countries are mainly associated with microbial contamination with about two dozen infectious diseases related to water quality. Millions of people all over the world particularly in the developing countries are losing their lives every year from water borne diseases (Arnal et al,, 2001). Use of water containing viruses, bacteria and protozoa, for drinking and cooking as well as contact with it and its intake during bathing and washing, or even inhalation of small droplets in the form of aerosols may result in spread up diseases like cholera, typhoid, bacillary dysentery, infectious hepatitis,leptospirosis,giardiasis and gastroenteritis (Gadgil, 1998).

REFERENCES

1. Agrawal V., Vaish P. (1987) 'Ground Water Quality : Focus on fluoride and flurosis in Rajasthan - Current Sciences, 73(9), (743-746)
2. Bhalla, L.R,"Geography of Rajasthan".2006
3. Bhatia, Ramesh (2005), 'Water and Energy', World Bank Background paper, Washington,DC
4. BIS (Bureau of Indian Standards) Indian standard specification for Drinking Water, 1992, IS :10500.
5. Central Ground Water Board,2010

6. Chand Dinesh, Proceeding of the International workshop on fluoride in Drinking Water : Strategies, Management and Mitigation, Bhopal, 2001,PP-13-27.
7. Chandra R. and R.N. Prasad, 2006 "Study of Groundwater quality variation during a year in Singhana Town, Distt Jhunjhunu, Rajasthan": Indian Journal of Environmental Sciences, 10 (1), 81 - 82
8. Charles C and Verma S., "out of water : 'From Abundance to scarcity and how solve the World's water Problems, FT Press ***2010.***
9. Chaudhary V., Kumar M., Sharma M. and Yadav B.S., 2010. Fluoride, Boron and Nitrate Toxicity in Groundwater of Northwest Raj., Environmental Monitoring and Assessment, 343-348.
10. Chatterjee K. "Water Resources ofIndia".
11. Dhar Aarti, 'UN Report Rings Alarm on Water Scarcity in India ; TheHindu.
12. Das Gupta A.B, (1977) "Water Availability : Supply and Problems Geographical Review of India, Vol. PP -302-311.
13. Draft National Water Policy (2012) As Recommended by National Water Board in its 14lh Meeting, GOI, Ministry of WaterResources
14. Drinking water supply system in Raj., Govt, of Rajasthan, International Conference on Water Quality Management; South Asian perspective,Jaipur,2002.
15. Dynamic Groundwater Resources of India (As on 31 March 2009), Central Groundwater Board, Ministry of Water Resources, GOI, Nov.2011.
16. Efficient Water Management: Challenges and opportunities India Water Week, 2013.
17. Government of India (2006), Report of the Working Group on Water Resources for the XI the five year Plan (2007-12 Ministry of waterResources.
18. Govt., of Rajasthan, "State policy for Rural Drinking Water and Sanitation PHED (draft). I.C. Servastva, B. Sharma, S.K. Kulshrishtha,Aug.2005.
19. Groundwater in Urban Development, World Bank org. Retrieved 2009.
20. Guideline for Drinking water quality, Fourth Edition,WHO;2011
21. Flanda B.K., 'Geochemistry and Genesis of fluoride Containing Groundwater in India. 1975, Groundwater,275-281.
22. Hashim Committee Report,1993.
23. Howard G., Bartran J. (2003) Domestic Water Quantity, Service Level and Health, Geneva WHO,2009.
24. Initiating and sustaining water sector Refrom : A Synthesis World Bank in collaboration with the Govt, of India, Ministry of Water Resources, Allied Publishers,1999.
25. India's Water Resources at a Glance, Indian water Resources Society (IWRS), 2005)
26. Lyer, Ramaswamy R., (2003) "Water Perspectives, Issues and concerns, "Sage Publication, NewDelhi.
27. Jain Sharad K., Agarwal Pushpendra t., Singh Vijay P., "Hydrology andwater Resources of India", PP, 235-294, 997- 1033
28. Jethoo A.S. "Consumer Behavior of Urban Resident of Jaipur City (Ind.) for water supply". Conference Proceeding of IEEE,Singapore
29. Jethoo A.S. 'Analysis of Urban Water Supply and Quality for Dist. Nagaur (Raj.)', Proceeding of Hydro-8 National Conference on Hydraulics water Resources and Management, MNIT, Jaipur,2008
30. Kayastha. S.L. (1981), An Appraisal of Water Resources of India and Need for National Water policy, Geo journal, Vol.5; PP 563-572