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SAFE DRINKING WATER MANAGEMENT STRATEGIES FOR BHARATPUR CITY, RAJASTHAN

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ABSTRACT

Water is essential for human life. The hydrological cycle has been affected due to industrialization modernization and urbanization, which has resulted in the scarcity of water. The availability of fresh safe water is very scarce and restricted due to peculiar hydrological, geological, geomorphic and demographic features. The ground water is the major resource for drinking water. Hence the ground water quality becomes important to formulate management strategies to safe drinking water for future water requirements. The physico-chemical and bacteriological assessment of water quality is required to protect the water for further deterioration.

The water resource conservation and management strategies have been suggested to safe drinking water supply in Bharatpur city of Rajasthan, unless the other alternative sources have been developed.

Key words: Water resource management, Drinking water supply, Ground water quality, Water resources conservation.

INTRODUCTION

The pressure is growing on water and land resources[1] day by day due to urbanization, industrialization, population explosion. The engineers and scientist have a serious concern to meet the water needs to common people. A large portion of population relies on ground water and surface water for drinking and allied purposes. There is sharp decline in the ground water table and changes in the geochemistry of ground water due to excessive use to ground water[2].

It is necessary to find out the ways and means for harvesting the rain water, which run off from the land. We need a broad based analysis for various hydrological parameters[4] such as ground water availability and its potability and land use to provide the safe drinking water for all.

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Study area

Bharatpur city is situated in the eastern part of Rajasthan State between North latitude 26’ 22’ and 27 83’ and longitude between 76 53’ and 78 17’. It has an area of 56.14 sq. Km. with an altitude of 100 m above MSL. The urban agglomeration of Bharatpur city is situated at the foothills of the Aravali Mountain series. The population of Bharatpur City is 205, 235 as per census of 2001. The growth rate is about 33%. The urban agglomeration supports and average density of 3644.22 persons per sq. Km. The growth rate is continuously increasing by every decade due to natural growth, establishment of more Government offices, trade and commerce, colleges and residential colonies, services and other activity.

Geology, geomorphology, mineral resources, soil, climate of the study area

The rock type exposed are grouped under Alwar and Ajabgarh Groups belonging to Delhi Super Group. The rocks of Delhi super group are succeeded by sand stone of Bhander Group. The Major parts of the district are occupied quaternary alluvium and blow sand which conceal the hard rock geology. The area has been divided into two river basin mainly Barah river basin towards north and Banganga river basin towards south. Hydro geological domains of unconsolidated and consolidated rocks formation with verifying ground water potential on average 90% of the district area covered with unconsolidated porous formation. Geomorphologically the district classified into seven geographical units namely hills and valley, younger flood planes, revine, obstance, dunes and pediments, Barytes building stones, quartz are important mineral of district. Quartizite and sand stones are quarried at Bansipaharpur near Bharatpur City.

The average rainfall (ranges from 500 mm to 700 mm) is 577 mm in the district. The soil is generally alluvial, prone to water logging. The nature of recently alluvial calereous has been observed. The nutrient status of the Bharatpur soil is graded as low to medium. The climate of Bharatpur city is generally dry. The maximum average temperature during summer is 44^{o}C to 47^{o}C and during winter it minimum average temperature is 5^{o}C to 1^{o}C.

Existing safe drinking water scenario in the Bharatpur City

The municipal area of Bharatpur city is divided into 50 wards. The population of municipal area will be approximately 205941. The present domestic water supply of Bharatpur City is partly from surface water Bandh Baretha irrigation tank and 76 tube wells as ground water sources which are located at Mallah, Mandoli and out skirts of Bharatpur and local municipal area. Surface water from Bandh- baretha is transmitted through RCC gravity main of 600 mm of diameter and 41 Km length to a water treatment plant of 10.8 mld situated at Mallah headworks. Approximately 20 mld of water is abstracted from

these tube wells. The total combined available water is 30.8 mld. There is 40% of Water losses during transimission and distribution. The present per capita water supply is estimated to be about 60 lpcd. Due to inadequate production of water, the system also suffers from old and leaking in transmission and distribution pipe lines, inadequate storage, insufficient pressure in distribution pipe lines etc. There are approx 29000 domestic connections. At present, Water is being disinfected through application of bleaching powder which is insufficient. There is a PHED laboratory consists of senior chemist, senior laboratory assistant. Jr. Lab assistant to analyse and monitor the safe drinking water quality. The PHED lab analyze the physico-chemical parameters such as pH, alkalinity, hardness, chloride, fluorides, nitrate, total dissolved solids (Table 1), Turbidity, alum dose, disinfectant dose as well as the bacteriological testing in total coliform are also performed. The PHED laboratory staff monitors the quality of drinking water which is supplied by the PHED.

Table 1: Chemical quality of water supplied by PHED in Bharatpur city

S. No.	Name of CWR/SR	Chemical parametres					
		pH	**Total hardness**	**Chloride**	**Nitrate**	**Fluoride**	**TDS**
1	S.R. Kila	7.5	250	350	45	0.12	1372
2	C.W.R. Heera daas	7.1	840	710	11	0.17	2676
3	C.W.R. Anah Gate	7.9	1200	970	5	0.25	2940
4	C.W.R. Ranjeet Nagar	7.3	870	730	12	0.6	2186
5	C.W.R. Ranjeet Nagar	7.1	840	710	11	0.17	2413
6	C.W.R. Heeradas	7.0	840	710	11	0.17	2413
7	S.R.Gandhi Park	7.2	780	830	14	0.18	3016
8	S.R. Heeradas	7.1	840	710	11	0.17	2676
9	S.R. S.T.C. Housing Board	7.6	380	520	8	0.47	1809
10	S.R. Krishna Nagar	7.9	270	490	8	0.29	1847
11	C.W.R. Jawahar Nagar	8.1	200	390	9	0.29	1583
12	C.W.R. Mallah Head Works	7.6	360	480	11	0.3	1734
13	C.W.R. Cimmco Pump House	7.7	1180	1330	23	0.5	3053

Note : Desirable Limits (mg/L): TDS-500; NO^-_3-45, F^-1.0, Cl^-250;
TH-300 Maximum Permissible Limits (mg/L): TDS-2000; NO^-_3-100, F^-1.5, Cl^-1000; TH-600;
All the parameters are in mg/L

Causes of water scarcity[3,5]

1. Low rain fall with the erratic behavior of the monsoon.
2. Poor ground water quality
3. Loss of water during transmission
4. Low capacity and poor functioning of filter house situated of Mallah.
5. The water table in the city continuously decreasing by 1 to 2 meter on annual basis due to excessive extraction of ground water.
6. The major parts of the district have hard rock geology.
7. Dispersed population.
8. Lack of awareness and water education.

Potability parameters of ground water and surface water[6]

The physico-chemical parameters of ground water in Bharatpur city have been studied as shown in Table 2. The under ground water of Tube well have high nitrate and chlorides and a high total dissolve solids.

Table 2: The physico-chemical parameters of tube wells studied

	pH	TH	Chloride	Fluoride	Nitrate	TDS
Sewar CWR	7.4	200	480	0.66	14	1696
T.W. Shiv Nagar	7.5	580	890	1.00	29	2375
Neemda Gate	7.1	850	1090	0.60	32	3016
Mallah	7.9	430	490	1.20	31	1809
Mallah	7.3	560	460	1.20	33	1865
Mallah	7.4	560	510	1.20	26	1972
Mallah	8.2	490	450	1.00	20	1771
Toll Tax By Pass	7.4	220	890	0.40	32	2732
Jaghina Gate	7.9	200	280	1.20	41	1281
Income Tax	6.9	280	240	1.00	42	1545
Mondoli	7.0	600	430	0.19	15	1914
Mandoli	7.1	590	410	0.16	16	1830

Physico-chemical parameters of Bandh-Baretha

Nearly all essential anions and cation are present in raw waters. The analysis of all these data indicate that TDS is critical parameters exceeding the permissible limits of drinking water standard (BIS 1991)

Integrated approach of safe drinking water[7,8]

An immediate measures are needed to combat the health problems of human beings and for sustainable development.

The following suggestive measures should be taken to mitigate the problems of scarcity of safe drinking water.

- Conservation of water is demand of an hour “to save water is to produce water”
- Reduce of water due to leakage occurs in water distribution pipe lines. It should be repaired immediately. It stops loss of water and contamination.
- Organize awareness and training programmes to educate the masses for judicious use of water.
- Enforcement of ground water control and regulation Act for checking over exploitation of ground water.
- Periodic monitoring of physico-chemical parameters and bacteriological analysis should be done.
- Proper chlorination in distribution system should be done and regularly monitored.
- Intermittent chlorination techniques in the distribution systems should be developed to disinfect the water according to the ward of municipal area.
- Chambal-Dholpur-Bharatpur project should be sanctioned immediately as the other supply source.
- There is urgent need for artificial recharge of ground water by augmenting the natural infiltration of precipitation into sub surface formation by some suitable method of recharge.
- Canal water may be injected into the abounded tube wells after necessary filtration and treatment.
- Rehabilitation of traditional ground water harvesting system.

- Drip & Sprinkler irrigation system should be promoted and made mandatory.
- Salt tolerance crops must be grown using saline water.
- Construction of anicuts, check dams and percolation tank.
- Creation of ground water sanctuaries.
- Minimizing of evaporation losses of surface water using suitable technologies.
- The number of filter houses should be increased as per population
- At least four clear water reservoir should be constructed to store the treated and clean safe water.
- Seven (07) more overhead storage reservoir should be constructed according to the density populated area.
- Two chlorination plant for disinfection of water should be constructed at suitable location.

CONCLUSION

In Bharatpur City, the ground water is the major source of fresh water and availability of the same is very restricted due to peculiar hydrologic, geologic, geomorphic and demographic features. To meet the increasing demand of water and to formulate future plans for sustainable development we have to develop ground water sources and proper understanding of the ground water quality are very essential. The population growth and urbanization is expected to increase the dependence on ground water unless the other alternative sources and technology are developed. As the near by area is surrounded by water bodies of river resources which are mostly saline. The ground water resources has to be developed with caution. The above mentioned water conservation and management techniques have to be adopted till the other alternative sources is developed.

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