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Physico-chemical characteristics of Bore well water quality in Nagpur region (South zone)

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ABSTRACT

Today's Burning issue is water pollution and contaminant present in water, so it may affect the ground water which drilled out as Bore well water. A study has been carried out to get its physico-chemical characteristics of bore well water which are collected from Vidharbh Region, Nagpur city- south Zone. Water samples were collected from different locations of the city area Of Same Zone At particular distance. And analyzed for PH, conductivity, total hardness, total alkalinity, sulphates, chlorides , fluoride, sodium and potassium etc. the study indicates the need for periodic monitoring and GIS based study of ground water in the study area.

Key Words: pH, Turbidity, Conductivity, hardness, Chloride, DO and alkalinity.

INTRODUTION

Water is one of the most essential requirement of life. Without water there can't not be life. Unfortunately water gets contaminated by chemicals as well as microorganisms. Sources of chemical pollution is industrial waste where as that of microbial pollution is domestic and storm waste. Polluted water is responsible for spread of water borne disease. So it is necessary to analyze the present environment. Well water are examined to locate the suitable sources of water and to determine the extent of treatment necessary to make it potable. Ground water constitutes 97% of global fresh water and many regions, ground water sources are the single largest supply for serving drinking water to the community. Ground water sources often necessitate

examination of water samples from different points and under varying conditions find out the extent of pollution and purification that takes place in the ground water. [1,2] A good number of water analysis experiments are regularly conducted by different groups of chemists and biologists across the country[3,4]The procedure for analysis followed "Standard Methods of Analysis of Water and Wastewater[5] " (APHA).

Table 1. Groundwater resources of India (in km3/year) [6]

1.	Total replenishable groundwater resource	432
2.	Provision for domestic, industrial and other uses	71
3.	Available groundwater resource for irrigation	361
4.	Utilizable groundwater resource for irrigation (90% of the sl. no. 3)	325
5.	Total utilizable groundwater resource (Sum of sl. nos 2 and 4)	396

Table 2. State-wise dynamic fresh groundwater resource of India (in km3/year)

Sl. No.	State	Replenishable groundwater resource from normal natural recharge	Replenishment due to recharge augmentation from canal irrigation	Total replenishable groundwater resource	Percentage contribution of recharge augmentation to total GW resource
1.	Andhra Pradesh	20.03	15.26	35.29	43
2.	Arunachal Pradesh	1.44	0.00	1.44	0
3.	Arunachal Pradesh	24.23	0.49	24.72	2
4.	Bihar	28.31	5.21	33.52	16
5.	Goa	0.18	0.03	0.21	14
6.	Gujara	16.38	4.00	20.38	20
7.	Haryana	4.73	3.80	8.53	45
8.	Himachal Pradesh	0.29	0.08	0.37	22
9.	Jammu & Kashmir	2.43	2.00	4.43	45
10.	Karnataka	14.18	2.01	16.19	12
11.	Kerala	6.63	1.27	7.90	16
12.	Madhya Pradesh	45.29	5.60	50.89	11
13.	Maharashtra	33.40	4.47	37.87	12
14.	Manipur	3.15	0.00	3.15	0
15.	Meghalaya	0.54	0.00	0.54	0
16.	Mizoram	Not assessed			
17.	Nagaland	0.72	0.00	0.72	0
18.	Orissa	16.49	3.52	20.01	18
19.	Punjab	9.47	9.19	18.66	49
20.	Rajasthan	10.98	1.72	12.70	14
21.	Sikkim	Not assessed			
22.	Tamil Nadu	18.91	7.48	26.39	28
23.	Tripura	0.57	0.10	0.67	15
24.	Uttar Pradesh	63.43	20.39	83.82	24
25.	West Bengal	20.30	2.79	23.09	12
26.	Union territories	0.35	0.05	0.40	13
	Total	342.43	89.46	431.89	21

The estimates by the Central Groundwater Board (CGWB) of total replenishable groundwater resource, provision for domestic, industrial and irrigation uses and utilizable groundwater resources for future use are given in Table 1

The state-wise estimates of dynamic groundwater (fresh) resource made by the CGWB[7] are given in Table 2

Table 03.Standards parameters for water characterization [8,9]

Sr. No.	Parameter	Standard Values		
		ISI*	WHO**	NIPDWS***
1)	**P^H**	6-9	6.5-8.5	6.5-8
2)	**Specific Conductance (μmho/cm)**	-	-	-
3)	**Total solid (mg/l)**	-	-	-
4)	**Total dissolved solids (mg/l)**	-	HDL" MPL"' 500- 1000	-
5)	**Dissolved oxygen**	3	-	-
6)	**Biological Oxygen demand (mg/l)**	-	-	-
7)	**Total alkalinity (mg/l)**	-	HDL" MPL"' 120 - 250	-
8)	**Total hardness (mg/l)**	-	HDL" MPL"' 100 - 500.	-
9)	**Calcium hardness (mg/l)**	-	HDL" MPL"' 75 - 200	-
10)	**Magnesium hardness (mg/l)**	-	HDL" MPL"' 30 - 150	
11)	**Sulphate (mg/l)**	1000	400	
12)	**Chloride**	600	250	
13)	**Turbidity (NTU)**	-	-	-

Table 04: Standard parameters of water characterization [10]

Sr. No.	Parameters	IS: 10500, 1991, 1991	
		Requirement (Desirable limit)	**Permissible limit in the absence of all ternate source**
1.	Colour	5 HU	25 HU
2.	Odour	UO	UO
3.	Temperature	-	-
4.	P^H	6.5 to 8.5	No relaxation
5.	Turbidity	5	10
6.	Conductivity	-	-
7.	Dissolved Oxygen	-	-
8.	Total Hardness As $CaCO_3$	300	600
9.	Total solids	500	2000
10.	Total alkalinity	200	600
11.	Chloride	250	1000
12.	Sulpate	200	400
13.	Calcium as $CaCO_3$	200	400
14.	Magnesium	30	100

Natural water can be divided into two categories: surface water, such as rivers and streams (Moorland surface drainage) torrents, natural lakes, reservoirs, ponds (lowland surface drainage) and subterranean water such as springs and ground water. The composition of natural water is determined by a sequence of physical chemical and bio-chemical processes which occur during

different stages in hydrologic cycle. Atmospheric agents play an active role in these processes. For this reason the quality of natural water is greatly influenced by atmospheric conditions and seasonal variations in temperature, as, for example, the water in basins with a low replenishment rate. Here we are presenting some standards parameters for water characterization as shown in table 03.

EXPERIMENTAL SECTION

Nagpur is located at the Maharashtra state and Nag River is run in the middle of Nagpur city. The present study was carried out at Nagpur city with the aim of assessing the drinking water quality. The study also indicates the possible source of contamination in drinking water. Water samples were collected from various ground water sources located in figure -1 a map view of sampling locations of the study area. In order to study the ground water quality of the study area a total no of 15 each samples of ground water were collected in the month of August-December, and analyzed for physico chemical parameters like :PH was measured with the help of PH of electronic India which is standardized with PH buffer no. 4,7 and 9.2, TDS was estimated by evaporation method at 180^0C, total alkalinity, total hardness, Dissolved oxygen, turbidity and chloride were analyzed by standard procedure mentioned in IS 10500: 1991 and APHA (1995) . Samples collected for physico-chemical analysis in poly propylene plastic bottles, the samples were collected, analyzed in chemical laboratory within 6 hours of their collection. The sampling has been carried out in the month of August-December methods for water and waste water examination 19th edition (APHA) (summer) 2008. All physico chemical prameters were analyzed according to the standard.

RESULT AND DISCUSSION

The sample analysed for physico-chemical parameters of ground water samples of hand pumps in August and December season presented in table no. 05 in which PH value of water samples ranges in between 6.328 -7.833 against the standard of WHO and IS 10500:1991. The sampling from manewada is having higher limit the significance of PH is related to the H+ and OH- concentration of drinking water in addition to this the temperature was obtained 27^0C which is further compared with the standard value range.

Turbidity of ground water samples were obtained after analysis of water samples showing range from 4.2to 6.2 in table-05 which is further compared with the available standard IS: 10500, 1991, 1991

The conductivity of ground water samples which was analyzed for physico chemical parameter was found 118.5 to 806.5μs/cm as compared with standard values.

The ground water sample from Bhagwan nagar and Congress Nagar are showing higher and lower values of total conductivity in the collected ground water samples.

The Total Alkalinity was found to be in the range of 101 to 321 mg/L in ground water samples which are presented in table -05, which on further compared with the standard values 200mg/L.

The sampling from Congress Nagar is having high alkalinity value of Alkalinity in ground water samples.

The total hardness of ground water samples was found in the range of 200 - 450 mg/L which is further compared with the Standard value range 300 mg/L. Sampling from Balaji Nagar and Tukdoji Nagar are having higher value of total hardness in ground water samples.

The Permanent and Temporary hardness of ground water samples was found in the range of 114 to 283 mg/L and 46 to 215 mg/L which are further compared with the Standard value range 300 mg/L. Permanent and Temporary hardness of Ground water samples from Ayodhya Nagar and Parvati Nagar are having higher permanent and temporary Hardness.

The value of chloride (Cl-) obtained 14- 326 mg/L as presented in table-1 which is further compared with the standard values 250mg/L. Collected ground water sampling from Balaji Nagar is having high Chloride (Cl-) concentration in drinking water.

Table No.5. Ground water samples with analyzed parameters from Nagpur (South Zone) Vidhrabha Region.

Samples collected from different areas	Temp.	P^H	Turbidity (UO)	Electrolytic conductivity	Total hardness as CaCo3 (UO)	Permanent hardness CaCo3 (UO)	Temporary hardness CaCo3 (UO)	Chlorides (UO)	DO Mg/lit	Total Alkalinity (UO)
Balaji nagar	27^{o}C	6.328	5.2	652.6	450	250	150	140	4.2	200
Bhagwan nagar	27^{o}C	6.006	5.4	806.5	300	180	120	120	2.6	100
Mahalaxmi nagar	27^{o}C	6.533	4.2	532	320	156	166	86	5.2	100
Shaun agar	27^{o}C	7.029	5.8	120	220	126	106	45	3.3	202
Rameshwari	27^{o}C	6.504	5.7	408.5	400	212	188	123	4.9	200
Parvati nagar	27^{o}C	7.002	6.2	539.5	350	135	215	102	5.2	100
Gurudeo nagar	27^{o}C	6.562	6.2	253.8	410	200	210	124	7.2	223
Manewada chowk	27^{o}C	7.833	5.2	508.5	200	114	86	86	3.2	112
Congress nagar	27^{o}C	7.209	5	118.5	250	123	137	97	2.3	321
Ayodhya nagar	27^{o}C	6.771	4.8	363.6	380	283	103	75	4.6	101
Tukdoji chowk	27^{o}C	7.130	5.9	142.2	450	240	210	86	1.6	125
Chota Tajbad	27^{o}C	7.057	6	652.7	332	160	172	89	5.6	125
Ashirwad nagar	27^{o}C	6.933	5.2	675.0	225	179	46	75	4.9	202
Duttatraya nagar	27^{o}C	7.361	5.5	146.8	390	206	196	124	5.0	202

So, contamination of drinking water has become a major concern to the Environmentalist in the developing countries. As more and more people are exposed to contamination of drinking water, many issues arise that not only involve premeditating the contaminated water, but also preventing similar situations from occurring future. Water Quality Index (WQI) provides a single

number (like a grade) that expresses overall water quality at a certain location and time based on several water quality parameters.

The main objective of a Water Quality index is to turn complex water quality data into information that is understandable and useable by the population of the area. Water Quality Index based on some very important parameters can provide a simple indicator of water quality. It gives the public a general idea of the possible problems with water in a particular region.Decision makers in environmental fields face difficult challenges of anticipating the potential biophysical and socio economic impacts of managements and policy interventions over regions that may vary dramatically in terms of climates, soils, topography, land use and other factors. Leung (1997) addressed on a host of conceptual and theoretical systems. However, a water index based parameters can provide a future solutions of water quality which can be consist of WQI calculation and GIS system.

CONCLUSION

Some ground water samples are show variation of pH, turbidity, hardness, DO and Chlorides this may be due to different soil texture. Some water samples show Higher pH and Some Higher hardness.

Over all some parts of bore well water needed treatment for drinking purpose due to hardness pH. DO, alkalinity and chlorides are present in desirable limit and some sort little variation.

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