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GROUND WATER QUALITY INDEX IN AN INDUSTRIAL TOWN- HOSUR DURING RAINY SEASON

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ABSTRACT

Water is most essential and precious object on earth for every life. The fresh water has always demanding for any biological activities. Due to increasing population, these demands have some limitations. WQI gives quick assessment of any water system. The present work focuses on the quality of ground water in an industrial town, Hosur (Tamil Nadu). The physico-chemical characteristics were determined during rainy season for the parameters such as pH, dissolved oxygen, total hardness, chloride, total alkalinity, turbidity, EC, TDS, sulphates, iron, fluoride, nitrate, sodium, potassium, arsenic, lead, cadmium, zinc, manganese, BOD, COD etc. of seven sampling sites.

INTRODUCTION

Water Quality Index is contributing for water quality of any water system. It is one of the effective, helpful parameter and provides information data, which is important to citizens, Government and public health. Policies for improvement of water quality programmes (Singh and Ghosh, 1999). The sampling sites were selected in the industrial town, Hosur, which has housed lot of reputed industries. The present work was done during rainy season with seven sampling sites. The domestic waste and industrial effluent was run-off through drainage. By this system, it may change or disturb the ground water quality due to percolation of water contains high attendance of some parameters, like hardness, BOD, dissolved oxygen, chlorides, nitrates and some heavy meals generated from human and industrial activities (Yazdandoost and Katdare, 2000). Common ions and nitrates of sodium, potassium, magnesium and calcium, etc., keep accumulating in the stream once added (Guldrich, 1972; Jain, 1995). In this paper the water quality index is based on Dahlia and Jain (1998). Some literatures are also added on water quality index (Sharma and Pande, 1999; Adak and Purohit, 2001; Musaddiq, 2000 and Patil and Tijare, 2001).

MATERIALS AND METHODS

The groundwater samples were collected in plastic cans from bore wells. The samples were analyzed as per standard procedures (APHA, 1989; Trivedy and Goel, 1986). The statistical calculations were made

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by the following literature method (Dhamija and Jain, 1995). In this method, the rating scale was applied to the parameters according to its relative importance in the over all water quality. The maximum weight is 4 given to the parameters, like pH, dissolved oxygen, total dissolved solids, etc., and the minimum weight is 2 given to the parameters like hardness, chlorides, sulphates etc., due to its importance in assessment of water quality, which was shown in Table 1. The unit weight (Wi) is calculated from the formula:

Wi / 11 q Wi = Σ Wi as Σ Wi = 1 1=1 1=1

The rating scale from 11 physico-chemical parameters is given in Table 1. Parameters divided into 4 stages (permissible, slight, moderate, and severe) and quality rating (qi) ranges from 100-0. For calculating WQI, the Sub Index (SI) is first found out for each parameter which is:



RESULTS AND DISCUSSION

The consideration of permissible limits of standards



Hosur - An Industrial Town

Fig. 1 Map showing the location sites of the

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Table 1. Water Quality Parameters (WHO standards)

Parameter	Weight	Unit Weight
pН	4	0.16
Hardness	2	0.08
Ca Hardness	2	0.08
Mg Hardness	2	0.08
Alkalinity	3	0.12
Dissolved Oxygen	4	0.16
Total Dissolved Solids	4	0.16
Chloride	2	0.08
Sulphate	2	0.08
Nitrate	3	0.12
Iron	3	0.12

(Table 1) for various beneficial uses, values of some relevant variables for each class of the various uses are given in table 2. The 5 classes adopted are given below:

Table 2. Scale rating for water quality parameters (qi)

Class 1 (WQI 90 and above) – Excellent Class 2 (WQI between 65 and 89) – Good Class 3 (WQI between 35 and 64) - Satisfactory Class 4 (WQI between 10 and below) – Poor Class 5 (WQI 10 and below) – Unaccepted.

The pH of all the samples during rainy season was in accepted range which was in the range 6.5 - 7.4. The hardness was in the range 198 - 334 during rainy season. Both Ca hardness and Mg hardness are in the moderate range. The D.O is in the permissible limit only. Chlorides were found to be in the range 40-300, which is slightly permissible. The sulphates present in the samples are in the permissible limit. Nitrates were found to be in 14 - 24, which are permissible. The iron content was found to be in the permissible limit.

Water Quality Index (WQI) denoting the integrated effect of the various parameters that are rel-

Parameter	Standards	Permissible	Slight	Moderate	Severe
pН	7.0-8.5	7.0-8.5	8.6-8.8	8.9-9.2	>9.2
•			6.8-7.0	6.5-6.7	<6.5
Hardness	100-500	<100	101-300	310-500	>500
Ca hardness	75-200	<75	76-137	138-200	>200
Mg hardness	30-150	<30	31-90	91-150	>500
Alkalinity	<120	50	51-85	86-120	>120
D.O	>6	>6	4.4-4.9	3-4.5	<3
Total solids	500-1500	<500	500-1000	1000-1500	>1500
Chlorides	200-500	200	201-400	401-500	>500
Sulphate	200-400	200	201-300	301-400	>400
Nitrate	>45	20	21.0-32.5	33.0-45	>45
Iron	0.1-1.0	0.1	0.2-0.5	0.6-1.0	>1.0

Table 3.	Seasonal	physico-chemic	al changes of	ground wate	r samples	collected	during rainy	/ season
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Parameter	No. of samples						
	S1	S2	S3	S4	S5	S6	S7
pН	6.5 (100)	6.6(100)	6.9 (100)	6.5 (100)	7.3 (100)	7.4 (100)	7.1(100)
Hardness	300 (33.3)	310 (32)	254 (40)	278 (36)	310 (32)	334 (30)	198 (51)
Ca hardness	200 (37.5)	205 (37)	120 (62.5)	130 (58)	205 (37)	220 (34)	120 (62.5)
Mg hardness	100 (30)	105 (29)	134 (22)	148 (20)	105 (29)	114 (26)	78 (38)
Alkalinity	100 (20)	300 (60)	120 (24)	100 (20)	165 (33)	300 (60)	108 (26)
D.O	6.40 (100)	6.32 (100)	5.88 (100)	6.87 (100)	6.73 (100)	7.15 (100)	6.40 (100)
T.S.	900 (55)	1100 (22)	650 (13)	630 (13)	1190 (24)	1050 (21)	604 (12)
Chloride	300 (66)	269 (74)	152 (100)	40 (100)	200 (100)	226 (88)	150 (100)
Sulphate	50.48 (100)	30.43 (100)	62.48 (100)	47.45 (100)	55.42 (100)	54.42 (100)	26.0 (100)
Nitrate	23.9 (84)	21.53 (93)	20.20 (100)	20.83 (100)	16.53 (100)	14.42 (100)	20.0 (100)
Iron	0.03 (100)	0.02 (100)	0.03 (100)	0.04 (100)	0.04 (100)	0.05 (100)	0.03 (100)
WQI	65.98	67.9	69.23	67.9	68.64	69.0	71.77

S1- Sipcot Phase I; S2 - Sipcot Phase I; S3 - Sipcot Phase II; S4 - Sipcot Phase II; S5 - Near Bus Stand; S6 - Commercial Area S7 - Educational Institutions

evant and significant to a particular use that is proposed to express the water quality for different uses. From tables 3, it can be clear that, from these sites show good WQI values. The average of WQI values during rainy season was found to be 68.63. It may be due to the percolation of water with dissolved matter. These values indicate the slightly pollution in some of the samples. In view of the above, it has been observed that the samples of all the sites are not suitable for drinking and can be used for irrigation purposes. After the treatment like osmosis, electro dialysis, ion-exchange and solar distillation, etc., the water can be used for drinking purposes. So our investigations are the useful for the government authorities for taking care and alteration against the ground water pollution.

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