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SUBSURFACE WATER VULNERABILITY ESTIMATE IN CHIDAMBARAM TALUK, TAMIL NADU, INDIA

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ABSTRACT

Water is very important for survival of the world. The source of water obtained from surface and subsurface sources. The surface water availability is very limited due to lake of rain fall. So the world people opted by subsurface sources. Now a day's subsurface water is affected due to over pollution. So water quality assessment is very important this quality assessment to be calculated by various methods water quality index is one of the important methods to assess the water quality for subsurface water samples. In the present assessment in pre monsoon and post monsoon seasons. These samples were tested in water examination laboratory based on the test parameter value. The WQI value was calculated with the help of WHO data. Finally the results indicate most of the samples fall under Excellent to Good category. Some of the samples fall under next type category.

Keywords: Subsurface water quality, Physical and chemical parameter, Water quality index, Post monsoon and Pre monsoon

INTRODUCTION

Sufficient supply of pure and fresh, safe potable water is very essential for all human beings on the earth **[1]**. Estimate of subsurface water quality can be a monotonous work undertaking several parameters capable of causing several stresses on overall water quality **[2]**. In the problem of potable water contamination, water quality management and water conservation has assumed a very complex shape. To study and evaluate water quality from a more number of samples, each

containing concentrations for several parameters is very difficult. Water Quality Index (WQI) is the effective method for assessment of water quality **[3-7]**. The water quality indices values were obtained from WHO by quantitative assessment **[8]** water quality standards were used for calculating water quality indices. Research Area falls in Chidambaram Taluk which is located in Cuddalore district, Municipal Town at a distance of 40 km south of Cuddalore and is on the bank of River vellar. Cuddalore district is divided into 10 taluks and the taluks are divided into 13 blocks. Chidambaram Taluk consists of 3 blocks namely Annagram, Bhuvanagiri and Kammapuram. The hot weather begins in March and the highest temperature of 40°C is being reached in May.

MATERIALS AND METHODS

Water Quality Index (WQI) is useful method for determining the quality of water. This method gives very useful information related to quality. So this method was used in the present assessment was conducted at Chidambaram taluk. The Chidambaram taluk is located near to sea belt. So the sea water mainly affected these areas. The present assessment very useful assesses the quality of water above said areas.

This assessment the 50 subsurface water samples were collected by suitable method from Chidambaram taluk in pre and post monsoon seasons above said number of water samples collected. The samples were assessed in the water examination laboratory. In the laboratory the following parameters were assessed Ca, Mg Na, etc. Based on the test values the water quality index was calculated by 3 steps. In the first step weightage (w_i) is assigned for each parameter based on the importance **[9]**. The second step relative weight is calculated by the following equation (Eq. 1)

$$\mathbf{W_i}\ (wi \sum_{i=1}^{n})\ \mathbf{w_i} \ldots\ldots(1)$$

Where wi = weight of parameter
n = no of parameter

The third step of computing the quality rating is assigned. The quality rating is obtained by dividing the concentration of particular sample and guideline given by the BIS.

This result is to be multiplied by the number 100 in eq. (2)

$$\mathbf{q_i = (C_i/S_i) \times 100 \ldots (2)}$$

Where, C_i= water sample concentration mg/L
S_i = potable water standard as per BIS 10500, 2009. The eq. (3) is given below

$$\mathbf{SI_i = W_i \times q_i \ldots (3)}$$

Where, SI_i - is the sub index of its parameter,
q_i - concentration rating

WQI is calculated by following equation

$$\mathbf{WQI = \Sigma\ SI_i \ldots (4)}$$

Table 1 indicates the category of WQI value. The procedure for calculating water quality index of the twelve parameter were allotted by weight (w_i). The maximum weight of five present in the nitrate, it is very essential in subsurface water. The least weight of Mg, Cl, Na are not injurious.

Table 1: Standard Water Quality Classification based on WQI value

WQI range	Water Quality
<50	Excellent
50-100	Good water
100-200	Poor water
200-300	Very poor water
>300	Worst category

RESULTS AND DISCUSSION

The present examination WQI index value reveals the 61% of water sample fall under Excellent to Good type in pre monsoon. In the post monsoon season 65% of water samples fall above this type. The 35% of water sample fall under 'Poor to Very poor' type in pre monsoon. In the post monsoon season 31% of water samples fall above this type. Remaining of 4% of collected samples under 'worst' category during post and pre monsoon. A area wise calculated value of WQI in post monsoon and pre monsoon durations is shows in **Table 2**.

Table 2: WQI for the assessment locations

Sample no.	Pre Monsoon		Post Monsoon	
	WQI	Suitability	WQI	Suitability
1	185.44	P	173.11	P
2	107.30	P	190.28	P
3	55.64	G	60.29	G
4	90.22	G	90.37	G
5	63.13	G	80.10	G
6	78.44	G	46.42	E
7	52.08	G	44.29	E
8	136.28	P	64.63	G
9	71.84	G	62.12	G
10	48.10	G	49.46	G
11	56.70	G	53.94	G
12	68.43	G	73.36	G
13	72.11	G	72.16	G
14	90.22	G	52.11	G
15	69.64	G	64.11	G
16	70.32	G	59.10	G
17	54.32	G	37.12	G
18	100.33	P	97.38	G
19	95.47	G	93.27	G
20	166.39	P	133.16	P
21	122.64	P	127.20	P
22	133.13	P	135.22	P
23	66.16	G	61.19	G
24	43.13	E	36.40	E
25	174.32	P	153.82	P
26	153.24	G	149.07	P
27	87.48	P	73.19	G
28	146.32	G	36.28	E
29	83.44	G	84.11	G
30	92.61	G	74.38	G
31	62.46	G	43.10	E
32	76.32	G	79.16	G
33	105.46	P	107.22	P
34	72.16	G	73.54	G
35	10.83	P	63.18	G
36	26.49	E	46.46	E
37	84.26	G	78.18	G
38	150.19	P	112.72	P
39	62.63	G	76.76	G
40	220.44	VP	76.53	G
41	84.11	G	56.38	G
42	440.13	W	330.17	W
43	102.14	P	103.56	P
44	332.26	W	75.40	G
45	162.42	P	329.14	W
46	131.16	P	354.79	W

47	**73.48**	**G**	**135.14**	**P**
48	**71.44**	**G**	**65.17**	**G**
49	**332.69**	**W**	**73.28**	**G**
50	**54.12**	**G**	**113.16**	**P**

CONCLUSIONS

Water is an essential and vital agent to every living human being and animals all around the world and it is very important to save preserve the water. Most of the people pollute and contaminate the water due to their illiterate and without considering the future use and demand. It is very important to be aware of subsurface water and their importance; so that the pollution may reduce. The present research indicates the higher values of some parameters of the samples. This water samples concentration to reduce by proper treatment methods, like filtration, disinfection etc. After the treatment these water samples to use for domestic purposes.

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