MAPLE TREE PUBLISHING HOUSE

INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY TECHNOVATION (IRJMT)

http://www.mapletreejournals.com/index.php/IRJMT
Received 16 August 2019 ISSN 2582-1040
Accepted 28 October 2019 2019; 1(6); 630-635
Published online 02 November 2019

Physiochemical Analysis of Ground Water used for Domestic needs in the Area of Perundurai in Erode District

M. Suganthi [1,*], N. Ramesh [2], C.T. Sivakumar [3], K.Vidhya [3]

[1] *Assistant Professor, Department of Civil engineering, Mahindra Engineering College,Namakkal-637 503, Tamil Nadu, India*

[2] *Professor, Department of Civil engineering, K.S.Rangasamy College of Technology, Thirucengode, Namakkal-637 215,Tamil Nadu, India,*

[3] *Professor, Department of Civil engineering, Mahendra Engineering College, Namakkal-637 503, Tamil Nadu, India.*

[*]*Corresponding Author E-mail: sugienviron@gmail.com*

Doi: https://doi.org/10.34256/irjmtcon89

ABSTRACT

Water is indispensable for all the life forms on earth. But the comprehensive quality of water such as free from chemical pollutants and microbial contaminants is vital. The present circumstance of industrialization and urbanization has taken a toll on environment, polluting the soil, air, and water. Pollution as well as global warming has exhibited detrimental effects on our natural resources of which water becomes the inexplicable. Failing monsoon rains due to climatic changes, population explosion, and depletion of natural water resources such as groundwater, ponds, and lakes as well as intentional man-made pollution of rivers has lead to water scarcity. Even the scarcely available water is loaded by contaminants and pollutants which include mutagens, carcinogens, and pathogenic microbes affecting all the life forms affecting the ecological balance. Considering the above mentioned problem criteria, a part of the present work has been designed to analyze the quality of ground water around the industrial premises. For this objective, we have collected ground water samples from various locations in and around Perundurai area in Erode District focusing on quite far away from Industrial premises considering the concepts of leaching. Basic physio-chemical properties of the collected ground water samples have been analyzed by APHA standards. Comparative data analysis for the samples based on the analyzed parameters has been made. Highest possibility of water quality issues which affects the day to day consumption of ground water for the domestic needs of the people has been emphasized.

Keywords: Ground water, Water quality, Industrial pollutants, Physio-chemical parameters, Palatability.

INTRODUCTION

Due to human and industrial activities the ground water is contaminated. This is the serious and major issue in now a day. Thus the analysis of the water quality is very important to preserve and prefect the natural eco system. The assessment of the ground water quality was carried out in the different wards of Perundurai in Erode District. The present work is aimed at assessing the water quality index (WQI) for the ground water of the City and its industrial area .The ground water samples of all the selected stations from the wards were collected for a

physiochemical analysis. For calculating present water quality status by statistical evaluation and water quality index, following 27 parameters have been considered Viz. pH, color, total dissolved solids. electrical conductivity, total alkalinity, total hardness, calcium, chromium, zinc, manganese, nickel. The obtained results are compared with Indian Standard Drinking Water specification IS: 10500-2012. The study of physic-chemical and biological characteristics of this ground water sample suggests that the evaluation of water quality parameters as well as water quality management practices should be carried out periodically to protect the water resources.

Water is the most important in shaping the land and regulating the climate. It is one of the most important compounds that profoundly influence life. Groundwater is used for domestic and industrial water supply and also for irrigation purposes in all over the world. In the last few decades, there has been a tremendous increase in the demand for fresh water due to rapid growth of population and the accelerated pace of industrialization. According to WHO organization, about 80% of all the diseases in human beings are caused by water [1,2]. Once the groundwater is contaminated, its quality cannot be restored back easily and to device ways and means to protect it. Water quality index is one of the most effective tools to communicate information on the quality of water to the concerned citizens and policy makers. It, thus, becomes an important parameter for the assessment and management of groundwater. The greater part of the soluble constituents in ground water comes from soluble minerals in soils and sedimentary rocks. The more common soluble constituents include calcium, sodium, bicarbonate and sulphate ions. Another common constituent is chloride ion derived from intruded sea water, connate water, and evapotranspiration concentrating salts, and sewage wastes for example. Nitrate can be a natural constituent but high concentrations often suggest a source of pollution. Water quality standards are needed to determine whether ground water of a certain quality is suitable for its intended use. Guidelines for Drinking Water Quality have been published by IS: 10500- 2012**.** For Drinking water, quality is commonly expressed by classes of relative Suitability, although most classification systems include units on specific conductance, sodium content and boron concentration.

Shweta Tyagi, et al [3] have been carried out Water quality assessment in terms of Water Quality Index at Uttarakhand (India). The study states that Water quality index (WQI) is valuable and unique rating to depict the overall water quality status in a single term that is helpful for the selection of appropriate treatment technique to meet the concerned issues. Besides, the present article also highlights and draws attention towards the development of a new and globally accepted "Water Quality Index" in a simplified format, which may be used at large and could represent the reliable picture of water quality.Manjesh Kumar et al [4] have been demonstrated the work on Physico-Chemical Properties of Ground Water of U.P.,(India). The study deals with evaluation of granite mines situated in jhansi (Goramachia) for their status about physicochemical contamination of ground water. Six different sites are selected for sample testing collected from mines and urban area. Three samples have been taken at various distances on the site. This location is 10Km above from Jhansi city. The physic-chemical parameters such as pH, D.O., E.C., T.D.S., alkalinity, turbidity,Ca (calcium) and Mg (magnesium) hardness, total hardness, NO3(nitrate), F (fluoride), Fe+3 (iron) and Cl- (chloride) have been tested. It has been found that parameters are not in limit when compared with W.H.O. standards.

Shivasharanappa et al[5] have developed and demonstrated the research work on Bidar city (Karnataka) for their characteristics of ground water and Water quality index (W.Q.I.).This research work deals with revaluation of W.Q.I. for ground water for the residential and industrial area of bidar. In the city there are 35 wards, samples collected from all wards and tested for 17 parameters. Tested results were used for suggest the models for water quality analysis.J Sirajudeen et al [6] was Carried out the work on ground water for evaluating the W.Q.I. Samples collected an Ampikapuram area near Uyyakondan channel Tiruchirappalli district. For Evolution of water quality index various parameters are examined. The WQI for these samples ranged between is 244 to 383.8. The analysis reveals that the groundwater of the area needs some degree

of treatment before consumption, and it also needs to be protected from the perils of contamination.

Cristina Rosu, et al [7] have been discussed and carried out work on quality of ground water by W.Q.I.method in Tureni Village, Cluj County. The rural population from Romania is dealing even today with the absence of access to a sure drinking water source. Therefore in 2002 only 65% of the Romanian population had access to drinking water, distributed in 90% from the urban environment and 33% from the rural one. This work presents a case study referring to a 3 month (April-May-June 2011) monitoring of weekly samples of the quality of well water (10 samples) from Tureni village, Cluj County. A portable multi parameter model WTW 720 Germany was used to measure the basic and different parameters.

N.C. Gupta et al [8] have demonstrated and carried out Physico-Chemical analysis of drinking water quality from 32 locations in Delhi. Delhi is an old town, which has gradually grown into a popular city. It is one of the important business centers of India and thickly populated as well (Gupta et al). Since the last decade, drinking water problem has created havoc in the city. In this study, we collected 32 drinking water samples throughout Delhi. Different parameters were examined using Indian Standards to find out their suitability for drinking purposes. During this examination mainly the physic chemical parameters were taken into consideration.

Amaliya N.K. et al [11] was carried out ground water quality status by water quality index method at Kanyakumari (INDIA), that the Quality Index assessment method is used to monitor the pollution status of water samples by integrating the water quality variables. The aim of this work is to monitor the pollution level of ground water samples from different places of Kanyakumari district. In this present work the status of water quality is found to be good for consumption and other purposes except Kalkulam bore well water sample. K. Elangovan [13] carried out characteristics of tube well water for district Erode (India) states that ground water quality of 60 locations in Erode district during pre- monsoon and postmonsoon seasons. Ground water samples were tested for 11 physico-chemical parameters following the standard methods and procedures.

Erode district having population of about 30,00,000 as per the 2001 census. The total area of the district is 8209 Sq. Km. Erode district is located between 10^{0} 35 ’ and 12^{0} 0 ’ North latitude and 76^{0} 50 ’ and 77^{0} 50 ’ East longitude. It is positioned North Western part of Tamilnadu. The average rainfall of Erode region is 700mm. The boundaries of the district are Namakkal and Karur in east, Coimbatore and Nilgiri in the west, Dindigal in the south and Karnataka in the north. Erode is characterized with a scanty rainfall and a dry climate with dry weather throughout except during the monsoon season. Water quality is dependent on the type of the pollutant added and the nature of mineral found at particular zone of bore well. Monitoring of the water quality of ground water is done by collecting representative water samples and analysis of physicochemical characteristics of water samples at different locations of Perundurai in Erode District. Estimation of water quality index through formulation of appropriate using method and evaluate the quality of tube well water by statistical analysis for post and pre monsoon seasons. Result of water quality assessment showed that most of the water quality parameters slightly higher in the wet season than in the dry season. Correlations the physico-chemical characteristics water pollutants by appropriate statistical method.

MATERIALS AND METHODS

Sixty different locations in Perundurai in Erode District were selected in order to study the physicochemical characteristics of ground water samples in the pre monsoon and post monsoon. The samples were collected following the standard methods described for sampling. The standard methods and procedures were used for quantitative estimation of water quality parameters [12]. The standards prescribed by WHO were used for the calculation of water quality indices. The indices have been calculated for 11 water quality physicochemical parameters.

WQI of ground waters collected at 60 different locations at Perundurai in Erode District in the pre monsoon as well as post monsoon, were calculated using the methods proposed by Horton [13] and modified by Tiwari and Mishra [14]. According to the role of various parameters on the basis of importance and incidence on the over all quality of ground water, the rating scales were fixed in terms of ideal values (Cid) of different physicochemical parameters. Even if they were present they might not be the ruling factor. Hence they were assigned zero values (except pH). For calculating WQI,the following equations were used.

There are two basically different types of Water Quality Index.

Additive Water Quality Index, in the form $WQI\ a = \sum_i^n W_i q_i$ (1)

Multiplicative water quality index, in the form $WQI\ m = \sum_{i=1}^{n} q_i^{W_i}$ (2)

Where, qi = quality rating for the parameter

wi = weight to the of parameter,

n = Number of parameters.

To include the collective role of various physicochemical parameters on the overall quality of ground water, quality status is assigned on the basis of calculated values of water quality indices. The following assumptions were made with reference to assess the extent of contamination or the quality of drinking water [14] . The assumptions were: WQI < 50: fit for human consumption; WQI < 80: moderately contaminated; WQI 80 to 100: excessively contaminated and WQI > 100: severely contaminated.

RESULTS AND DISCUSSION

The physicochemical parameters with their WHO standards (Si), ideal value (Cid) and assigned weight age factor (Wi) are listed in table 1. A location wise calculated value of WQI for the pre monsoon period as well as post monsoon period is presented in table 2.

Table 1. *Water quality parameters, their standard values, their ideal values and the assigned weightage factor*

Parameter Standard	**Value, Si**	**Ideal Value**	**Cid**	**1/Si Assigned Weightage**
pH	8.5	7	0.1176	0.3004
Chlorides	250	0	0.004	0.0102
Sulphate	250	0	0.004	0.0102
Alkalinity	120	0	0.0083	0.0213
Hardness	300	0	0.0033	0.0085
Total Dissolved Solids	500	0	0.0020	0.0051
Sodium	200	0	0.0050	0.0128
Turbidity	5	0	0.2000	0.5106
Calcium	75	0	0.0133	0.0340
Magnesium	30	0	0.0333	0.0851
Electrical Conductivity	1400	0	0.0007	0.0018
Total (ie, K)			0.3917	1.0000

The observed range of water Quality Index in premonsoon is 52 to 256, except at site No.3 where it is 558, at site No.23 where it is 572, at site No. 25 where it is 330, at site No.36 where it is 577, at site No.40 where it is 490, at site No.50 where it is 655, at site No.52 where it is 350 and at site No.58 where it is 411. The above water quality index got raised because of excessive concentration in alkalinity, turbidity and magnesium and also in pre monsoon 50 site samples are severely contaminated. Ground water is found to be moderately contaminated at site No's 1,32 and 35 with WQI values less than 80 for pre monsoon period, where as it is excessively contaminated at site No's 9,15,21,29,33,48 and 59 with WQI values more than 80 for the pre monsoon period.

Ground water is observed to be excessively contaminated with WQI values more than 80 at site No's 1, 15 and 48 for the post monsoon period and all other locations are severely contaminated whose WQI is greater than 100 due to excess concentration of alkalinity, turbidity and magnesium. The observed range of water quality index in post monsoon is 90 to 244. A comparison of the values of WQI for two season's reveals that in general, ground water quality is deteriorated or contamination of ground water is increased which is quite alarming.

Table 2. *Location wise calculated values of Water Quality Index for pre monsoon and post monsoon period*

L.No	**Water Quality Index**		**L.No**	**Water Quality Index**	
	Pre monsoon	**Post Monsoon**		**Pre monsoon**	**Post Monsoon**
1.	52	97	31.	131	161
2.	231	170	32.	72	131
3.	558	108	33.	92	112
4.	167	244	34.	186	198
5.	103	189	35.	77	126
6.	134	175	36.	577	190
7.	122	190	37.	143	167
8.	157	181	38.	110	145
9.	93	191	39.	111	164
10.	116	221	40.	490	159
11.	102	155	41.	183	201
12.	157	138	42.	118	105
13.	182	131	43.	129	151
14.	151	130	44.	116	172
15.	99	98	45.	163	220
16.	168	147	46.	118	202
17.	232	105	47.	107	204
18.	215	159	48.	96	90
19.	253	146	49.	122	128
20.	179	112	50.	655	149
21.	87	195	51.	114	109
22.	110	128	52.	350	136
23.	572	193	53.	116	164
24.	234	165	54.	126	130
25.	330	193	55.	107	181

26.	132	117
27.	256	162
28.	112	103
29.	98	126
30.	114	163

56.	219	168
57.	149	118
58.	411	103
59.	96	130
60.	133	172

Conclusion

The above observations in the present study indicate the higher values of some parameters of the samples. They minimize the suitability of these samples for drinking purposes without treatment. But, after the filtration and disinfection, naturally present impurities can be removed in water, which provide its suitability for drinking and domestic purposes. People depend on this water are often prone to health hazards due to polluted drinking water. Therefore, some effective measures are urgently required to enhance the drinking water quality by delineating an effective water quality management plan for the region Perundurai in Erode District (Tamil Nadu, India).

References

1. S.P. Gorde and M.V. Jadhav, Assessment of Water Quality Parameters: A Review, Journal of Engineering Research and Applications, 3(6), 2029-2035 (2013)
2. Kavitha R. and Elangovan K., Review article on Ground water quality characteristics at Erode district, (India), of I.J.E.S., 1(2), (2010)
3. Shweta Tagy and et al, Water Quality Assessment in terms of Water Quality Index, American Journal of Water Resources, 1(3), 34-38 (2013)
4. Manjesh Kumar and Ramesh Kumar, Assessment of Physico-Chemical properties of Ground Water in granite mining area in Goramachia, Jhansi (India), 2(1), 19-24, (2013)
5. Shivasharanappa and et al, Assessment of Ground Water Quality using Water Quality Index, at Bidar City Karnataka, International Journal of Environmental Science, 2(2), 965-976 (2011)
6. J. Sirajudeen Arul Manikandan and V. Manivel, Water Quality Index of Ground Water around Ampikapuram area near Uyyakondan channel Tiruchirappalli Tamil Nadu, Archives of Applied Science Research, 5(3), 21-26 (2013)
7. Cristina Rosu, Ioana Pistea, Mihaela Calugar, Ildika Martonos, A. Ozunu, Assessment of Ground Water Quality Status by using water quality index (WQI) Method in Tureni Village (2012)
8. Gupta N. and et.al., Physico-Chemical Analysis of Drinking Water Quality from 32 locations in Delhi, Journal of Indian Water Works Association, (2010)
9. Amaaliya N.K. and Sugirtha P. Kumar, Carried out ground water quality status by water quality index method at Kanyakumari (INDIA) (2013)
10. K. Elangovan, Carried out characteristics of tube well water for district Erode (India), Int. Journal of Environmental science, 1(2), (2010
11. Rajankar P. and et al., Assessment of Ground Water Quality using water quality index(WQI) in Wardha Maharashtra, Journal of Environmental Science and Sustainability, NEERI, 1(2), 49-54 (2013)
12. APHA, Standard methods for examination of water and waste water, Washington,USA, 20 th Edn. ,1998.
13. Horton R.K., An index number system for rating water quality, 1965, J. Water Poll.Cont. fed., 37, pp 300.
14. Tiwari. T.N.. and Mishra. M., A preliminary assignment of water quality index of major Indian Rivers.1985. Indian J. Env. Prot., 5(4). pp 276279.