

ASSESSMENT OF GROUND WATER QUALITY BY USING WATER QUALITY INDEX AND PHYSICO CHEMICAL PARAMETERS

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Abstract

Water quality is considered as a big issue in many cities of developing countries. Bore well water is valuable than surface water but due to different activities done by human being this water is contaminated. And now-a-days this is the grave problem. In those areas of Nanded city where the door to door garbage pickup vehicle brought their garbage, the assessment of the bore well water was carried out. At assessing the water quality index (WQI) and physico-chemical parameters for the ground water of Nanded the present work is aimed. For a physico-chemical analysis, ground water samples of selected location were collected. For calculating the present water quality status the following quality parameters were considered: pH, electrical conductivity, TDS, total hardness, COD, total alkalinity, turbidity, sulphate, chloride. After calculating water quality status of considered parameters, results are compared with IS: 10500-2012. This ground water sample's physico-chemical characteristics suggest that the evaluation of water quality parameters should be carried out periodically.

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 [1]. Water is one of the most important and abundant compounds of the ecosystem. All living organisms on the earth need water for their survival and growth. Groundwater is used for domestic and for irrigation purposes in all over the world. In the last few decades, there has been a tremendous increases 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[2]. Once the groundwater is contaminated, its quality cannot be restored back easily and to device ways and means to protect it. Groundwater plays important role in supplying water to much of the global population for use in agriculture, drinking water, and industrial purposes.

KEYWORDS Ground water, water quality index, physico-chemical.

I. INTRODUCTION

Water is the most significant overabundant compound of the earth. Water is life. No life can lie without water. Groundwater is employed for domestic and industrial facility and jointly for irrigation purpose. The previous couple of decades, there has been an incredible increase within the demand for water as a result of rise of population and therefore the accelerated pace of industrial enterprise. Per UN agency organization (WHO), regarding all the diseases in group of people are caused by water. Once ground water is contaminated, its quality cannot be renovated back easily and to device ways in which and suggests that to guard it. Water quality index is one among the foremost effective tools to speak data on the standard of water to the involved voters and policy manufacturers. It thus, becomes crucial parameter for the assessment and management of bore well water. Water quality standards square measures required to see whether or not bore well water of a precise quality is appropriate for its meant use. Guidelines for potable Water Quality are printed by IS: 10500-2012. WQI is outlined as a rating reflective the composite influence of various water quality parameter. WQI is calculated from the purpose of read of suitability of bore well water for human consumption. For demarcating groundwater quality and its suitability for drinking purpose WQI is an important technique. A mere numerical value is computed by WQI to reduce large amount of water quality data. At a certain location and time based on several water quality parameters

a mere numerical value expresses the overall water quality. A mathematical equation used in water quality index to remodel range (sizable amount) of water quality information into one number. For decision makers' possible uses and quality of any water body, a single number (WQI) is straightforward to understandable.

II. LITERATURE AND PHYSICO CHEMICAL PARAMETERS: REVIEW PAPER

In the year 2008 K. Yogendra, et al. have studied on, 'Determination of Water Quality Index and Suitability of an Urban Water body in Shimoga town, Karnataka.' In this study they determined WQI of an urban water body on the basis of different physico-chemical parameters. The analysis revealed that water bodies have low DO, high COD a [179] In the year 2017 V.Jena, et al., studied on, 'Physicochemical analysis of ground water of selected area of Raipur city.' In this study, during 2018-2019 assessment of physicochemical parameters is done for 20 ground water samples of Raipur city. Standard methods and procedures were used for assessment. They conclude regular chemical analysis must be done. Water samples were collected from five selected locations. After analysis results were compared with WHO and ISI standards. Most of the parameters satisfy the guidelines. WQI ranges from 58.66 to 93.75 are obtained for those samples. And they suggest that the pretreatment required before consumption. In this study they were checked the quality of groundwater. By hydro chemical parameters, quality of ground water assessed for its suitability for different purposes. 25 samples were collected during post monsoon season. For sample analysis different physical and chemical parameters were considered. To find out the quality, for drinking and irrigation purposes, the quality of groundwater has been carried out by an analysis which is based on Geographic Information System (GIS). Results show that, seventy five percent of samples are lie within the permissible limit for drinking. And for irrigation all the groundwater samples of study area are suitable [4].

III. ASSESSMENT OF WATER QUALITY

Under mentioned parameters are analyzed: P^H , TDS, EC, TH, COD, Sulphate, Chloride, Alkalinity, Turbidity.

P^H : The pH value is the -ve log of hydrogen ion concentration. The hydrogen ion concentration usually ranges from 0 to 14. When values of pH lower than seven then the water is termed acidic. When pH value exceeds seven then water is consider basic. When pH value is exactly equal to seven then water is said to be neutral. P^H value is measured by pH meter. 6.7 to 8.1 is the limit of pH value for drinking water [3].

Electrical Conductivity (EC): Electrical Conductivity (EC) is a numerical value. This is the ability of an aqueous solution to take away the electric current. The purity of water is evaluated by EC (electrical conductivity) and therefore it is a useful tool to check the purity of water [3]. EC is measured by an instrument called electrical conductivity meter. The instrument is standardized with the help of std. KCl solution [5].

Total Dissolved Solid: Solids might impact on water quality adversely in many ways. A different kind of minerals which is present in water is denoted by total dissolved solids (TDS). TDS is directly associated with the purity of water and also the quality of water. And we can say the sum of the cations and anions concentration is equal to TDS. TDS can be calculated by TDS Meter. As per IS: 10500-2012 acceptable limit is 500 mg/l and permissible limit is 2000 mg/l [8].

Total Hardness: The sum of calcium and magnesium hardness in mg/l is equal to the total hardness . And it is determined by EDTA method. The degree of hardness of potable water has been classified in terms of equivalent $CaCO_3$ concentrations follows: Soft- 0-60 mg/l, Medium- 60-120 mg/l, Hard- 120-180 mg/l [8].

Turbidity: Particles which are suspended in water interfering with route of light is known as turbidity. Turbidity is due to the presence of different types of suspended particles. It is measured by Turbidimetry. As per IS: 10500-2012 acceptable limit is 1 NTU and permissible limit is 5 NTU [8].

Sulphate: In natural water ions of sulphate are present and most of those ions are soluble in water. It is measured by Ultraviolet Spectrophotometer. As per IS: 10500-2012, acceptable limit of sulphate is 200 and permissible limit is 400 mg/l[6].

Total Alkalinity: Alkalinity could be a chemical activity of water's ability to neutralize acid. Hydroxide, carbonate and bicarbonate are caused the large part of the large part of the alkalinity in natural water. In potable water 120 mg/l is the acceptable limit of alkalinity [9].

Chemical Oxygen Demand: For measuring the organic strength of domestic and industrial waste COD test is widely used. COD is evaluating in short time means it takes about 3-4 hours while BOD takes five days. It is used to assess the carbonaceous fraction of organic matter.

Chloride: In all types of natural waters the amount of chloride present in widely varying concentration. When the mineral content will increase in water then chloride content will automatically increases. Due to human activities the concentration of chloride is high. As per IS: 10500-2012 acceptable limit of chloride is 450 mg/l and permissible limit is 1000 mg/l[7].

Water Quality Index (WQI):

The Water Quality index is employed to combination of numerous parameters and their dimensions into one score.

Water Quality Index, $WQI = \sum W_i q_i n_i = 1$

Where, q_i (quality rating for the parameter) = $(C_i/S_i) \times 100$

C_i = Concentration of the i^{th} parameters

S_i = Standard guidelines value for each parameters, mg/l

$W_i = w_i / \sum w_i n_i = 1$

w_i = weight to the i^{th} parameter,

n = Number of parameters

Canadian council has discovered Canadian Water Quality Index (CWQI) that is founded on W.Q.I. of British Columbia. Canadian Water Quality Index is predicted on 3 attributes of water quality that relate to water quality objectives: i.Scope-F1, ii.Frequency-F2, iii. Amplitude-F3 +++++++.

$CWQI = 100 - (F1^2 + F2^2 + F3^2) / 1.732$

Quality Index defines ranges for each CWQI: Unhealthy (0-54), Marginal (45-74), Good (65-89), Superb (70-81), and Glorious (85-96) [8].

IV. CONCLUSION

Ground water quality is dependent on the type of the pollutant. And it is also depending on the nature of mineral found at specific space of bore well. Ground water quality monitoring is done by collecting water samples and analysis of physico-chemical characteristics of water samples at completely different location of Indore city wherever door to door garbage pickup vehicle brought their garbage (substation of waste collection). The present review paper undertaken to fetch awareness among those who lives close to the substation of waste collection. The individual, the community and Municipal Corporation of Nanded city will facilitate to reduce bore well water pollution by straight forward housework and management practices. Estimation of water quality index by exploitation appropriate technique and verify the standard of bore well water by applied math analysis for post and pre monsoon seasons, results of water quality assessment showed that some water quality parameters slightly higher in wet season as compare to summer season [8].

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