

CONCEPT OF WATER QUALITY CRITERIA INDEX A LITERATURE REVIEW

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Abstract: Water is one of the valuable regular assets available on the world and it is significant for the endurance of vegetation what's more, fauna. The nature of water is similarly imperative to the amount accessible. Calculating the percentage of water content available on Earth about 97% present in oceans and 3% as new water also including the glacier portions. Out of which 2 % as clear water in the structure of the surface and subsurface water bodies and it usable for the human application. So whenever there is the usage of water its quality estimations are important and the extraction to be done efficiently. Apart from resources bore well and well water is one of the significant resources for drinking and other human utilization. Water quality is straightforwardly identified with the physical, compound, natural, and radiological properties of water. Since most of the parameters cant taken and written individually, so the use of index of quality of water is used to compile all data in one statement. Here the physiochemical and health-related parameters are taken to find out the water quality index. Purpose and objective is to find out if water is suitable for drinking, human consumptions, criteria for suitability is prescribed in Bureau Of Indian Std(BIS) 10500. WHO and many other countries have dedicated to find out drinking water quality criteria Index.

Keywords- Environment protection Act, Bureau of Indian Standards, pollution, water quality index, physiochemical parameters, World Health Organization.

1. INTRODUCTION

Several regions of the World are facing severe challenges because of finite freshwater resources. A vital segment of these freshwater assets in the world are contaminated due to regularly expanding anthropogenic pressures, release of industrial wastes/effluents, farming run offs, energy power plant generation units and other activities. A nation's precious asset is water, it also helps in running a country's economy. Water is a significant component for all the living beings "there is no existence without water" is a typical statement relying on the way that water is the one of the important components that is utilized for day to day essential activities which supports life. Fresh water is limited, vulnerable, sustainable

treasure on the earth and portrays significant part in our environment. Water is an unique reserve since it is fundamental for all types of life. In Maharashtra water quality is observed by various organizations such as GSDA (Ground Water Surveys and Development Agency), MPCB (Maharashtra Pollution Control Board), Hydrology Project etc and also other agencies such as CWC (Central Water Commission), CGWB (Central Ground Water Board). All these water criteria and norms were made under proposed by Authority of Assessment of Water Quality under sub sections 1 and 2 of Section 3 of Environment Protection Act, 1986 (Act No.29 of 1986). Purpose and objective is to find out if water is suitable for drinking, human consumptions, criteria for suitability is prescribed Bureau Of Indian Std (BIS) 10500. WHO and many other countries have dedicated to find out drinking water quality criteria Index. It is proposed to find out DWQ criteria index based on analyses carried out and by Dr. A. K. Batadiyal of CMERI. WQI consists of encompassing a very large vary of variables into one numeric value. WQI will be considered as models of water quality that is a simplified explanation of a complex content, where variables are selected and methods for weighing and aggregating the variables are defined.

2. LITERATURE REVIEW

There are many approaches to evaluate water quality index that changes based on informational objectives, size of the sampling area and type of samples. The bore well and well water is said to be spotless and liberated from contamination than surface water. Various case studies and their findings regarding to water quality are given below.

K. Yogendra, E.T Puttaih et al. (2008) have studied determination of water quality index and suitability of an urban water body in Shimoga town Karnataka. In this study they find water quality index of an urban water body based on various physiochemical parameters. It

was found that water bodies have low DO and high COD and high nitrate contents and it was unsuitable for drinking purpose.

Devendra Dohare, et al. (2014) studied on, 'Analysis of Ground Water Quality parameters.' For calculating status of water quality of Indore, they were used statistical evaluation and WQI. Twenty seven parameters were considered like pH, Colour, TDS, EC, TH, Calcium, Total Alkalinity. And obtained results are compared with IS: 10500-2012. They suggest that the monitoring of water quality should be done periodically.

Sajitha V, Samitha Asok, Vijayamma et al. (2016) had studied physiochemical and pond water by using water quality index Athiyanoor Panchayat Kerala India. Examination was done as per BIS and WHO norms, later it was found that WQI samples goes under phenomenal classification and water seems to be useful for household purpose.

Rajankar P. et al., (2013). Had analysis on tube well using WQI in wardha India. The parameters were used such as pH, turbidity, DO, BOD, EC, Total hardness, calcium, chlorides etc, by considering samples from residential, commercial and rural regions. It was found that WQI of monsoon is slightly greater than other seasons.

A. K. Batabyal and S. Chakraborty et. Al (2015) carried out an analysis at Kanksa-Panagarh Area Bardhaman District of West Bengal for use of ground water as drinking purpose, 16 parameters were considered to find WQI of pre monsoon and post monsoon period and they have also given an equation to find out WQI which is very easy and fast method.

P. Shroff, & R.T Vashi et al., (2013) had a case study on, 'Assessment of Water Quality Index for Groundwater of Valsad district of South Gujarat (India)'. They used method of CCME(Canadian Council of Ministers of Environment. Seventeen physico-chemical parameters were considered for evaluating the WQI and 59.6 was the overall WQI of Valsad and WQI of few location lie under fair category and some of them lie under incredible while rest of them falls under great classification. Examination showed that Valsad need some pretreatment.

Namita Saxena and Alka Sharma et. Al(2017), studied on, 'Evaluation of Water Quality Index for drinking purpose in and around Tekanpur area M.P (India). The

case study was done on physiochemical parameters of ground water samples taken from Tekanpur Gwalior M.P India. The analysis carried out as per WHO and ISI guidelines. WQI ranges from 58.66 to 93.75 are obtained for those samples. It is seen that the samples need pretreatment.

Muthulakshmi L., Ramu, A., Kannan, N., & Murugan, A. et al., (2013), considered relationship of water quality parameters and find out linear regression models for highly correlated parameters.

2. OVERVIEW OF WATER QUALITY INDEX

Here bore well and well water are considered which is one of the vital origins of water for drinking purpose and other human activities and will determine the physiochemical parameters for water samples which is described in BIS 10500, later. World Health Organization introduced the perceptions about Drinking Water Quality Index(DWQI). This index empowers to describe about complex information of quality of water that results into a data which is lucid to express and easily understandable. There are four ways to find index of quality of water which are in trending are NSFQWI (National Sanitation Foundation Water Quality Index), OWQI (Oregon Water Quality Index), CCMEWQI (Canadian Council of Ministers of Environment water quality Index), WAWQI (Weighted Arithmetic Water Quality Index) etc. As there are several parameters as per given in WHO and BIS 10500 and it is complicated to carry out each parameter's values water quality index gives one result of all compilation of parameters. General WQCI is calculated for drinking purposes. BIS 10500 is applicable for drinking water use in India. Sometimes it is also used for other human activities. Basic parameters which are important in finding WQI are pH, TDS, T.A, T.H, electrical conductivity, Ca^{+} , Mg^{2+} , Cl^{-} , SO_4^{2-} , Fe and F. For calculating the objective of whether the water sample is efficient for drinking purpose physiochemical parameters should be considered. Based upon this parameter it will decide whether water is efficient for drinking and other human activities. Weighted Arithmetic Index of quality of water method gives better results but here we will discuss about a method which is given by Dr. A. K. Batabyal which is very lucid method.

2.1 Calculation of Water Quality Index

It is defined rating, representing and complex consequence of various parameters of quality of water

on samples of water. The prime aim of finding the index of quality of water is to transform the complicated, split and individual information into a compiled data which is effectively justifiable and stable. Here WQI is evaluated in four steps.

In step number one the term weight (w_i) has assigned to parameters such as pH, T.A, Fe, T.A, sulphates etc that were selected by giving a particular number (numbers from 1 to 5) depending upon the intensity of their effect on water for drinking purpose.

In step number two, the term relative weight (W_i) is calculated, equation of relative weight is given below

$$W_i = w_i / \sum w_i \text{ (here } i=n \text{)}$$

Where W_i is relative weight and weight of each parameter is w_i and number of parameters is considered as "n".

In step number three the quality rating scale(Q_i) is calculated for each parameter. The equation is given as below.

$$Q_i = (C_i / S_i) * 100$$

Where quality rating is considered as (Q_i), calculated samples of water is (C_i) and standard permissible values is (S_i). Here S_i values should be taken as per given Bureau of Indian Standards 10500.

In the last step before finding WQI the sub index (S.I) for each physiochemical parameters is to be calculated. The equation is given below.

$$S.I = W_i * Q_i \text{ and finally WQI is calculated}$$

$WQI = \sum S.I(1-n)$, where S.I is sub-index of i^{th} parameter. Relative weight is W_i . Quality rating is Q_i , it is usually depends on concentration of parameters and number is parameters is considered as "n".

2.2 Water Quality Index Table

Based upon the answer in numbers status of Water Quality is given in table.

Table 1 Water Quality Index and its status

Water Quality Index	Status	Catagory
Below 25	Excellent	A
25-50	Good	B

50-75	Poor	C
75-100	Very Poor	D
Above 100	Unsuitable for drinking purpose	E

2.3 MERITS

- Application of number of significant worth parameters into numerical condition that can give rating and evaluating to the water bodies.
- Specific application of water improves with assessment as number of parameters required.
- For the methodology makers and locals this number is amazingly useful for correspondence of as a rule water quality record.
- Affirmation about sensible of water for human use if there should arise an occurrence of new water bodies..
- Various parameters that can be used with their creation that is noteworthy for assessment and the administration of water quality..

2.4 DEMERITS

- The number given by water quality index doesn't describes the actual nature of water or its source.
- A minor mistake in finding water quality index changes entire story.

3. CONCLUSION

By examination of both lists, it is very certain that fundamental aim of Water Quality Index is give single number by application of numerical articulation providing in table 1. The sole grades decreased intricacy due to distinctive water quality parameters, as a huge measure of factors bring about a solitary number the records accurately for the whole presence of water bodies. It is the simple translation of water quality observing information. As we talk about the focal points furthermore, detriments of both National Sanitation Foundation WQI and Weight Arithmetic WQI that are valuable all inclusive to screen, evaluation and effect reads for various water bodies with various areas. It is useful for various chiefs to make appropriate move or discover cures. Water quality index gives compilations of all complex information into a single vital information. It is observed that the method of finding Drinking Water Criteria index explained by method of Dr. A. K. Batabyal

is very lucid and gives proper results as compared to other methods.

4. REFERENCES

[1]Sajitha V. and et al. (2016), Study of Physico Chemical Parameters and Pond Water Quality Assessment by using Water Quality Index at Athiyannoor Panchayath , Kerala, India, Emer Life Sci Res ,2(1): 46-45, E-ISSN : 2395-6658.

[2]Namita Saxena and Alka Sharma, "Evaluation of Water Quality Index for Drinking Purpose in and Around Tekanpur area M.P. India", International Journal of Applied Environmental Sciences, pp. 359-370, Volume 12, (2017).

[3]P. Shroff & R.T Vashi , "Assessment of Water Quality Index for Groundwater of Valsad District of South Gujarat (India), Journal of Fundamental & Applied Sciences, p.p 203-209, Vol 5, 31th December 2013.

[4] K. Yogendra et al. (2008), Determination of Water Quality Index and Suitability of Urban Water body in Shimoga Town, Karnataka, Proceedings of Taal 2007: The 12th World Lake Conference : 342-346.

[5] Devendra Dohare, (2014) Analysis of Ground Water Quality Parameters: A Review, Research Journal of Engineering Sciences, 3(5), 26-31, ISSN: 2278-9472.

[6]Rajankar P, 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).

[7]Muthulakshmi, L., Ramu, A., Kannan, N., & Murugan, A. (2013). Application of correlation and regression analysis in assessing ground water quality, Virudhunagar, India. International Journal of ChemTech Research, 5, 353-361.

[8] A .K Batabyal and Chakraborty Hydrogeochemistry and Water Quality Index in the Assessment of Ground Water Quality for Drinking Uses. Water Environment Research, 87(7) 607-617(2015).

[9] P. J. Puri, M. K. N. Yenkie, S. P. Sangal, N. V. Gandhare, G. B. Sarote and D. B. Dhanorkar - "Surface water (Lakes) quality assessment in Nagpur city (India) based on Water quality index (WQI)", Vol.4, No.1, 43-48 (2011), ISSN: 0974-1496 CODEN: RJCABP.

[10] Kushtagi S. and Srinivas P, "Studies on water quality index of ground water of Aland Taluka, Gulbarga District, Karnataka", International journal of applied biology and pharmaceutical technology, Volume: 2, Issue-4, Oct - Dec -2011.