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Assessment of Pond Water in Terms of Water Quality Index from Vashi, Navi Mumbai

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Abstract: Waste water problem is a never-ending hot issue since fast growing industries in developing countries have serious impact on wastewater contamination. To know the status of water its characterization is necessary. Physio - chemical analysis of pond water samples from two different sites with respect to food stalls, boarding houses, residential colonies, laboratories and industrial area of Vashi, Navi Mumbai district were carried out for the period of one year. The samples collected were analyzed according to APHA. The Water Quality Index is determined. The aim of the present study is to assess the quality of water of ponds. 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. "Water Quality Index" in a simplified format, which may be used at large and could represent the reliable picture of water quality.

Keywords: Pond water sample, surface water, Water Quality, Water Quality Index

I. INTRODUCTION

Water, a natural resource and precious national asset, forms the chief constituent of ecosystem. Besides the need of water for drinking, water resources play a vital role in various sectors of economy such as agriculture, livestock production, forestry, industrial activities, hydropower generation, fisheries and other creative activities. The availability and quality of water either surface or ground is important for deciding its purpose. The availability and quality of water either surface or ground, have been deteriorated due to some important factors like increasing population, industrialization, urbanization etc.

Physio-Chemical characteristics are highly important with regard to the occurrence and abundance of species. Discharge of urban, industrial and agricultural wastes have increased the quantum of various chemicals that enter the receiving water, which considerably alter their Physio-Chemical characteristics.

Turbidity, pH, temperature, conductance, dissolved oxygen, chloride and total alkalinity are significant parameters used to study the water quality. The present study involves the analysis of water quality with reference to Physio- Chemical characteristics of pond water from Vashi, Navi Mumbai, India.

The suitability of water sources for human consumption has been described in terms of Water quality index (WQI). WQI utilizes the water quality data and helps in the modification of the policies, which are formulated by various environmental monitoring agencies. WQI has the capability to reduce the bulk of the information into a single value to express the data in a simplified and logical form. The present study reviews some of the important water quality indices used in water quality assessment and provides their mathematical structure, set of parameters and calculations along with their merits and demerits, which are being used worldwide.

II. WEIGHTED ARITHMETIC WATER QUALITY INDEX METHOD

Weighted arithmetic water quality index method classified the water quality according to the degree of purity by using the most commonly measured water quality variables. The method has been widely used by the various scientists and the calculation of WQI was made by using the following equation:

$$WQI = \sum QiWi / \sum Wi$$

The quality rating scale (Qi) for each parameter is calculated by using this expression:

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$$Qi = 100[(Vi - Vo/Si - Vo)]$$

Where, V_i = estimated concentration of ith parameter in the analyzed water

 V_{o} = the ideal value of this parameter in pure water

 V_{o} = 0 (except pH =7.0 and DO = 14.6 mg/l)

 S_i = recommended standard value of ith parameter

The unit weight (Wi) for each water quality parameter is calculated by using the following formula: Where,

$$Wi = K/Si$$

K = proportionality constant and can also be calculated by using the following equation:

$$K = \frac{1}{\sum (1/Si)}$$

Parameter	Standard	Observed	Ideal	Unit	Quality Rating	W _i Q _i	
	Limits (Si)	Value (Vi)	Value (V ₀)	Weight (Wi)	(Qi)		
pН	6.5-8.5	5.65	7.0	0.2190	270	59.13	
Electrical	300(µS/cm)	303.71	0	0.371	101.24	37.56	
Conductance		(µS/cm)					
Total	300 (mg/L)	169.6 (mg/L)	0	0.0062	56.53	0.0350	
Hardness							
T D S	500 (mg/L)	1480 (mg/L)	0	0.0037	296	1.095	
T S S	500 (mg/L)	635 (mg/L)	0	0.0037	127	0.469	
Dissolved	5.0 (mg/L)	2.4 (mg/L)	14.6 mg/l)	0.3723	127.08	47.31	
Oxygen							
Calcium	75 (mg/L)	147 (mg/L)	0	0.025	196	4.9	
Magnesium	30 (mg/L)	21.33 (mg/L)	0	0.061	71.1	4.337	
Chloride	250 (mg/L)	157.5 (mg/L)	0	0.0074	63	0.466	
Ammonia	2.0 (mg/L)	0.28 (mg/L)	0		14		
Alkalinity	120 (mg/L)	50.7 (mg/L)	0	0.0155	42.25	0.655	
Acidity	6.0 (mg/L)	4.37 (mg/L)	0		72.83		
				$\sum W_i = 1.0848$	$\sum Q_i = 1350.2$	$\sum W_i Q_i = 155.957$	
$WQI = \sum QiWi / \sum Wi = 143.7657$							

Table 1	:	Water	quality	index	values	for	pond 1	
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LADIC 2. Water quality much values for poind 2

Parameter	Standard	Observed	Ideal	Unit Weight	Quality	W _i Q _i
	Limits (S _i)	Value (V ₀)	Value (Vi)	(Wi)	Rating (Qi)	
pH	6.5-8.5	5.8	7.0	0.2190	240	52.56
Electrical	300(µS/cm)	336.08 (µS/cm)	0	0.371	112.03	41.56
Conductance						
Total Hardness	300(mg/L)	184.41 (mg/L)	0	0.0062	61.47	0.381
T D S	500 (mg/L)	1720 (mg/L)	0	0.0037	344	1.273
T S S	500(mg/L)	580 (mg/L)	0	0.0037	116	0.429
Dissolved Oxygen	5.0(mg/L)	2.52 (mg/L)	14.6	0.3723	125.83	46.847
			(mg/l)			

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Calcium	75(mg/L)	160.45 (mg/L)	0	0.025	213.93	5.348
Magnesium	30(mg/L)	24.56 (mg/L)	0	0.061	81.87	4.994
Chloride	250 (mg/L)	173.31 (mg/L)	0	0.0074	69.32	0.513
Ammonia	2.0 (mg/L)	0.24 (mg/L)	0		12	
Alkalinity	120 (mg/L)	67.32 (mg/L)	0	0.0155	56.1	0.87
Acidity	6.0 (mg/L)	4.46 (mg/L)	0		74.33	
				$\sum W_i =$	$\sum Q_i =$	$\sum W_i Q_i =$
				1.0848	1420.55	154.775
$WQI = \sum QiWi / \sum Wi = 142.6761$						

The rating of water quality according to this WQI is given in Table 3.

Table 3: Water Quality Rating as per Weight Arithmetic Water Quality Index Method

WQI Value	Rating of Water Quality	Grading
0-25	Excellent water quality	А
26 - 50	Good water quality	В
51 - 75	Poor water quality	С
76 - 100	Very Poor water quality	D
Above 100	Unsuitable water quality	Е

III. RESULT

The water quality index value for both the ponds is above 100. The WQI indicates that the pond water is not suitable for use.

IV. CONCLUSIONS

The Water Quality Index values are above 100, indicates that water from the ponds is unsuitable for use.

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