

Water Quality Index of Different Areas in Calicut City

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In the present study, the water samples during pre-monsoon, monsoon and post-monsoon for three consecutive years were taken and physicochemical parameters were analyzed. Water quality index has been calculated from the point of view of the suitability of surface and bore waters for human consumption.

Key Words: Water quality index, Alkalinity, Total hardness, Total dissolved solids, Nitrate, Dissolved oxygen, pH.

Water is essential for the survival of any form of life. Ground water acts as reservoir by virtue of large pore space in earth materials, as a conduit that can transport water over a long distance and as a mechanical filter that improves water quality by removing suspended solids and bacterial contamination¹. The available fresh water potential on the earth though remains the same, the demand is increasing day by day. Activities like industrialization, modern agricultural practices and other developmental programmes along with population explosion pose a great threat to the limited fresh water resources in terms of pollution. Therefore, continuous monitoring of the system is necessary which in turn will help to take necessary steps to protect and conserve the system.

Environmental monitoring in many countries over the last few years had produced large amount of data on many aspects of pollution of natural water. Many workers have identified the parameters causing major stresses to the system².

One of the effective ways of communicating the available knowledge of the quality of water is to use certain indices, which can be easily computed mathematically. The quality index allows comparison of quality status of two or more water bodies from different localities and also helps to evaluate pollution control programmes.

The Central Board for the Prevention and Control of Water Pollution in India has suggested the use of 52 parameters in monitoring pollution in a water body. Since the use of such a large number of parameters is a difficult task, only a few parameters, which are relevant to that particular type of aquatic system, are usually incorporated into the water quality index. Water quality index (WQI) is defined as a rating reflecting the composite influence of different water quality parameters on the overall quality of water. Though distortion can occur from

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combining various environmental variables into one single value or index score and there can be loss of information on a single variable. The highest score a body of water can receive is 100³. Water Quality Index ranges are 90–100 (Excellent), 70–90 (Good), 50–70 (Medium), 25–50 (Bad), 0–25 (Very Bad). In the present study, the WQI has been calculated from the point of view of the suitability of surface and bore water for human consumption.

The state of Kerala, situated on the south-west coast of India, falls within the humid tropics. Calicut is one of the important cities in the northern part of Kerala between 11°10'–11°15' north latitude and 75°45'–75°52' east longitude. It is situated on the Malabar Coast. The study was carried out at five different sites of Calicut district. The water samples were collected from West Hill (shallow well), Eranhipalam (shallow well), Koorachund 50 km away from Calicut city (shallow well), Malaparamba (shallow well) and Florican Hill (bore well).

The water samples during pre-monsoon, monsoon and post-monsoon for three consecutive years were collected in sterilized polythene air-tight containers and physicochemical parameters were analyzed⁴. In the present assessment of ground water, only seven prominent parameters, which significantly alter the water quality, are selected and their quality functions are computed. The seven parameters are nitrate, DO (dissolved oxygen), pH, chloride (Cl⁻), alkalinity, total hardness and total solids. The average of the seven values is taken as the observed value.

As far as bacteriological pollution is concerned, there is no regular trend in variation with respect to seasons or wells. There are abrupt changes in MPN values from season to season and well to well. Based on the MPN value, purification can be effected and so this parameter is not included in the calculation of WQI. For the calculation of WQI, ICMR standard is taken. For all parameters $q_i = 100(V_i/S_i)$ except for pH and DO. For pH, $q = 100(V - 7.0)/(8.5 - 7.0)$. For DO, $q = 100(V - 14.6)/(5 - 14.6)$ where 14.6 is the solubility of oxygen in pure water at 0°C in mg/L; $WQI = \Sigma(q_i w_i)/w_i$.

The observed values (average of the nine values taken at different seasons per site) for various parameters are given in Table-1.

The calculated water quality index based on the nine values of the study area is given in Table-2. The values of WQI in water sampling areas were reported under 50–70 range, indicating that the water is useful for human use. The quality of the water in the wells of the study is good (range 70–90). The water of the well away from the city is moderately good (50–70). WQI of all the wells for three different seasons also are calculated and are given in Table-3. The result shows that the WQI is different for each season. In all the wells, WQI was found to be comparatively low during monsoon. This is most probably because of the onset of monsoon and first time recharge of water on account of heavy rains bring down the heaviest levels of contaminants from the atmosphere to the soil which gradually seep into the groundwater system and become part of it. The report prepared by the WHO and the World Bank emphasizes the importance of safe water supply and sanitation in the control of waterborne diseases. The value of WQI in water sampling axis was reported to be less than 100, indicating that the water is suitable for human use.

TABLE-1
OBSERVED VALUE (V_i)

Parameters	Units	Standards	West Hill	Eranhipalam	Malaparamba	Koorachund	Florican Hill
Nitrate	0.0500	20	0.8022	2.2778	0.3700	0.5133	0.0011
DO	0.2000	5	5.8667	5.4378	5.2822	6.2711	5.8000
pH	0.0040	7	7.2111	5.6444	6.6778	6.2333	7.3110
Chloride	0.0040	250	38.0000	36.0000	8.4440	8.2222	12.8889
Alkalinity	0.0083	120	73.1111	16.6667	15.5556	18.0000	79.5556
Total hardness	0.0033	300	109.5560	24.4444	20.2222	17.5556	68.0000
TDS	0.0020	500	223.2220	128.4444	66.4444	59.5556	142.2222

TABLE-2
WATER QUALITY INDEX OF DIFFERENT PLACES

Parameter	West Hill		Eranhipalam		Malaparamba		Koorachund		Florican Hill	
	Quality standards	q _i w _i	Quality standards	q _i w _i	Quality standards	q _i w _i	Quality standards	q _i w _i	Quality standards	q _i w _i
Nitrate	4.0110	0.2006	11.3890	0.5695	1.8500	0.0925	2.5665	0.1283	0.0055	0
DO	90.9719	18.1944	95.4396	19.0880	97.0604	19.4120	86.7594	17.3519	91.6667	18.30
pH	14.0733	0.0563	90.3733	-0.3620	-21.4800	-0.0860	-51.1133	-0.2045	20.7400	0.08
Chloride	15.2000	0.0608	14.4000	0.0576	3.3778	0.0135	3.2889	0.0132	5.1556	0.02
Alkalinity	60.9259	0.5057	13.8889	0.1153	12.9630	0.1076	15.0000	0.1245	66.2963	0.55
Total hardness	36.5185	0.1205	8.1481	0.0269	6.7407	0.0222	5.8519	0.0193	22.6667	0.07
Total solids	44.6444	0.0893	25.6889	0.0514	13.2889	0.0266	11.9111	0.0238	28.4444	0.06

TABLE-3
WATER QUALITY INDEX OF DIFFERENT SEASONS

Season	West Hill	Eranhipalam	Malaparamba	Koorachund	Florican Hill
Pre-Monsoon	78.5563	73.1704	78.4115	68.5945	76.3463
Monsoon	67.5861	70.7535	62.4462	59.8746	63.4368
Post-monsoon	66.2389	71.9865	75.5111	64.3492	71.4003

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