

WATER QUALITY INDEX OF TEMPLE POND AT TALAKADU, KARNATAKA, INDIA

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Introduction:

In temple ponds, religious indications, holy dips are taken and poojas performed with a thought of gaining punya and removing karma. But now these have become the source for infectious disease. It is necessary to detect the quality of water by simple means and determine whether they meet the water quality standards. The Canadian Council of Ministers of the Environment (CCME) formulated water quality index (WQI) which was suitable for detecting the status of water bodies. The same was applied to assess the water status of temple pond Gokarna in Talakadu-known as Dakshina Kasi during Panchalingadarshan festival. WQI summarize large amounts of water quality data into simple terms for reporting to management and the public in a consistent manner.

Materials and Methods:

Talakadu is a historic site, archeological importance situated amid sand dunes in T Narasipur taluk, Mysore district. It is unique and attracts lakhs of devotees and tourists especially during main festival Panchalingadarshan. The festival occurs once in 12 years as per astrological calculation but the cycle broke as per calculation this time and as occurred in a period of 2 years (2007 & 2009). During this festival people from different places congregate and perform pooja, take a dip in pond situated near Gokarneshwara temple.

Gokarna temple pond is situated in the midst of Gokarneshwara temple and is rectangular in shape with steps on all four sides and measures 130x150ft with a depth of about 40ft. During festival seasons priest take holy dip prior pooja, wash pooja utensils and perform pooja followed by devotees around. The water appears green and is considered to be polluted, mainly during the festive season.

Sampling:

One litre plastic carboy were used for the sampling. Water samples were analysed before, during and after the festival for pH, EC, total hardness, chlorides, BOD, MPN, temperature, turbidity, TDS and total bacterial count. Standard methods (APHA 1995) were used. Bacterial analysis was carried out following the methods described in Aneja (2004). ISI: 10500 (1991) standards were used as objective value. Using this data the CCME WQI was calculated.

CCME – WQI:

WQI compare water quality variables with water quality guidelines and provide ranking (good, average, poor) for individual water body. The index has Scope (F1)-the number of water quality variables not meeting water quality objectives, Frequency (F2)-the number of times the objectives are not met, Amplitude (F3)-the extent to which the objectives are not met. The square of each term and the square root of the sum are divided by 1.732 and are based on fact that each of 3 factors contributing to index ~ 100. Final value is subtracted from 100. The index produces a value between 0 (worst) to 100 (best) to reflect the water quality. It is characterized as 95-100 (excellent), 80-94 (good), 65-79 (fair), 45-64 (marginal) and 0 – 44 (poor).

$$\text{CCME WQI} = 100 - \frac{F1^2 + F2^2 + F3^2}{1.732}$$

$$F1 = \frac{\text{No of failed parameters}}{\text{Total no of parameters}} \times 100$$

$$F2 = \frac{\text{No of failed results}}{\text{Total no of results}} \times 100$$

F3 is asymptomatic function, representing normalized sum of excursions (nse) in relation to guidelines.

Excursions are calculated as follows:

$$F3 = \frac{\text{nse}}{0.1 \times \text{nse} + 0.01}$$

$$\text{nse} = \frac{\text{excursions}}{\text{Total No. of results}}$$

$$\text{Excursion 1} = \frac{\text{Failed test result} - 1}{\text{Guidelines}}$$

$$\text{Excursion 2} = \frac{\text{No of failed parameters}}{\text{Total no of parameters}}$$

Excursion 3 = If guidelines is zero (equal to zero): failed test result

The values of the index are given in Table 2.

Results and Discussions:

The results of the physicochemical parameters, objective values, bacterial count and MPN are presented in table 1. Totally eleven parameters pH, temperature, Total Dissolved Solids (TDS), Electrical Conductivity (EC), Turbidity, Total hardness, Chloride, Total alkalinity, BOD, MPN, Standard Plate Count (SPC) were assessed of which seven parameters deviate from objective value. With CCME formulation WQI range to 41 indicating water qualities is almost always threatened and deviate from natural level (table 2).

Increased turbidity, chlorides is evidenced with high BOD, MPN, and SPC indicating more of bacterial population in a need for demand to oxygen with higher metabolic activities. As a result the pH has often turned towards basic. The H₂S test proved for the presence of coliforms indicating highly positive fecal contamination. A large number of planktonic organisms occurred during the study period. the most common were *Coelastrium cambricum* (3), *Chroococcus* (16), *Navicula* (2), *Scenedesmus quadricula*(2), *Cocconeis palacentula* (2), *Synedra ulna* (2) and *Oscillatoria*(5).

Disturbances due to human activity often causes regular turnover of the water and nutrients in the pond. This enrichment quite often leads to the development of planktonic blooms. This has caused oxygen depletion. The water is always threated and becomes unsuitable for human consumption. Epidemics may become serious problem to the devotees, since the bacterial count reaches as high as 400 cells/100ml (Table 1).

Conclusion:

Gokarna –Water is of poor status and highly polluted. Attention has to be drawn to conserve water and take precautions since they can pave the way to create water borne epidemics. The index tells us potential threat to various uses of water, such as habitat for aquatic life, aesthetics etc. Water quality survey and monitoring programs are essential to estimate the pollution level and causes of pollution (Shivakumar 2007). Citizens have to realize the importance of nurturing water bodies in vicinity (Science Reporter Aug 2010) and temple authorities and local communities have to sustain ponds and take necessary action like cleaning pond during summer and disinfecting during the festivals. So regular monitoring of water bodies can prevent outbreak of disease and occurrence of health hazard.

Table 1: Physicochemical parameters of Gokarna-Temple pond at Talakadu.

	Parameters	14	18	21	24	Objective value
1	Ph	9.28	9.48	9.42	9.38	8.5
2	Total Dissolved Solids	123	115	116	120	500
3	Electrical Conductivity	220	220	220	230	3000
4	Total Hardness	320	340	310	324	600
5	Chloride	354	344	344	364	250

6	Total Alkalinity	11.2	14	28	6.4	200
7	Biological Oxygen Demand	3.26	7.75	8.24	7.2	5.0
8	Most Probable Number	280	540	220	210	05
Rating	CCME WQI	Characterization				
Excellent	95.0-100	Water quality intact. Condition close to natural levels				
Good	80-94	Water quality is protected with only a minor degree of threat or impairment; conditions rarely depart from natural desirable levels.				
Fair	65.0-79.9	Water quality usually intact, but occasionally endangered, conditions often deviate from natural levels.				
Marginal	45.0-64.9	Water quality frequently endangered. Conditions often deviate from natural levels.				
Poor	0.0-44.9	Water quality almost always endangered, conditions regularly deviate from normal levels.				
9	Temperature	25	26	26	27	25
10	Turbidity	5.6	6.9	9.0	8.0	05
11	Total Bacterial Count	65	350	400	280	100

CCME –WQI value is 41, Rating poor

Table 2:CCME Value Characterization

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