International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2013): 6.14 | Impact Factor (2013): 4.438

Assessing Water Quality of Kala Talao by Adopting Pollution Remedies

Shailesh C Kulkarni[1], Dr. Shweta Verma[2], S. J. Mane[3]

[1]M.E Student, D.Y. Patil College of Engineering, Akurdi , Maharashtra, India

[2, 3] Assistant Professor, D.Y. Patil College of Engineering, Akurdi, Maharashtra, India

Abstract: ***Now a day's conservation of natural and artificial sources of water is of great importance due to water shortage. Natural and artificial lakes are important sources for ground water recharging. It is therefore absolutely necessary to conserve lakes for betterment of sustainable development. This project concerns with the study of water quality of Kala Talao, Kalyan . Kala Talao is located in the Kalyan city and has its sides lined throughout with broken basalt masonry. The physico -chemical study of the water body is being conducted to assess the present status of water quality and to suggest the conservation strategies based on the findings. The parameters taken to calculate Trophic State Index (TSI) are Temperature, Secchi depth, pH, Suspended Solids(SS), Dissolved Oxygen(DO), Chemical Oxygen Demand(COD), Biochemical Oxygen Demand(BOD), Total Phosphate, Nitrate Nitrogen, Chlorophyll-a, M.P.N. In present study, Trophic State Index is calculated for the June 2014 to May 2015 comprising of three seasons, summer, winter and rainy season. The Trophic State Index (TSI) calculations can be useful in conservation of Lakes. Trophic State Index (TSI) for Kala Talao has been calculated for September 2014 and February 2015 and May 2015 is 85 , 75 and 53.96 respectively. This proves that Kala Talao was in Hyper-Eutrophy stage (as value is >70) in rainy season. Physical and chemical parameters of the Kala Talao water are analyzed after completion constructive work for pollution prevention in May 2015.***

Keywords: Lakes, Lake water, Lake Conservation, Physico-chemical analysis, Physico chemical parameters.

1. Introduction

The water bodies are essential part of earth ecosystem along with the human requirements. The fresh water bodies can be in the form of rivers, ground water, wet lands, lakes or reservoir [1]. Kala Talao is a historic lake. The lake about Twelve hundred meters to the north of the Kalyan railway station, covers about 24 acres and varies in depth from 6 to 14 feet and has its sides lined throughout with broken basalt masonry.

The lake deteriorated due to development of residential and commercial buildings around the lake and increased quarrying activities in the catchments area. Thus over a period of many decades lake deteriorated and had gone under eutrophication [3]–[6]. It was necessary to know status of Kala Talao which has not been revived till date but now constructive measures are being made to prevent pollution from October 2014 by Kalyan Dombivili Municipal Corporation (KDMC).

Initially upto1960 the drinking water requirement of Kalyan city was completely fulfilled by Kala Talao. Now due to polluted condition of lake with greenish water, lake water cannot be used for any purpose. Even commercial activities like boating are also affected due to smell and bad water quality.

Visible pollution observed especially because of offerings flower and garbage. Floating debris are polluting lake water bodies [7]–[10]. The tourist spot is also in polluted condition with garbage dumping.

2. Materials and Method

The Water samples are collected from Kala Talao. Grab sampling method adopted for collecting water samples [11]. Samples were collected using a boat. Sample bottles were closed with air tight cap. Tests were carried out laboratories immediately.

2.1 Calculation of Trophic State Index (TSI):

Trophic State Index was calculated using Carlson's Method.

Carlson's TSI = $(TSI_{SD} + TSI_{CHL} + TSI_P)/ 3$

Where, TSI_{SD} = 60 -14.41 ln Secchi depth (in mtr.)

TSI_{CA} = 9.81 ln Total Chl-a (µg/L) + 30.6

TSI_{PTP} = 14.42 ln Total P (µg/L) + 4.15

Where ln = natural log

Chl-a= Chlorophyll- a

Total P= Phosphate

3. Results and Discussion

Results are taken for Kala Talao and are shown in Table 1. The procedure and norms followed as per "Standard Methods for Examination of water and waste water of American Public Health Association" (APHA-2005).

Comments on tested parameter results are noted with respect to standard eco limits.

The **temperature** was in the range of 23°C to 35° C during the study. This shows that lake is homothermous. **Secchi depth** for Kala Talao was in the range of 0.1 m to 1.5 m. The prescribed limit is 1.0 m. Ecologically the quantity and duration of the light reaching the lake surface and subsurface

is very important. Secchi disc transparency is the indicator of the light into the lake water column.

pH for Kala Talao was found in the range 7.3 to 7.8 which is in the standard limits of 7.0 to 8.5. The pH of lake water has an important bearing on both the plankton and the fish population. pH is a dynamic parameter in an aquatic ecosystem which varies with the changes in physical and chemical properties of water.

The **Suspended Solids** for Kala Talao was found in the range 50 to 95 mg/L which ae higher than prescribed limit of less than 10 mg/L. The same are reported to be somewhat more because of the renovation and construction activities.

Dissolved oxygen (DO) for Kala Talao was found in the range 3.6 mg/L to 4.8 mg/L, which is just close to the standard parameter (5.0 mg/L at top). The non-functioning of aerator units at designed capacity is also responsible for low D.O. levels at bottom layer. A laminar inversion of flow is need to be maintained with adequate numbers of aerators in working condition.

The **Chemical Oxygen Demand (COD)** for Kala Talao was found in the range 50 mg/L to 80 mg/L, which is higher than the prescribed limit of 10 to 30 mg/L. COD represents the organic load in the water indicating heavy pollution.

The **Biochemical Oxygen Demand $(BOD)_5$** for Kala Talao was found in the ranges 14 to 22.5 mg/L which is higher than a prescribed limit of 3 to 6 mg/L. This shows moderate organic pollution. BOD_5 value is considered as limiting factor for the living organisms.

Total **Phosphate** for the lake was found in the range 0.025 to 0.587 mg/L which is higher than the prescribed limit of 0.01 to 0.035 mg/L.

The **Nitrate Concentration** for the lake was found in the range 0.2 to 0.29 mg/L which is higher than the prescribed limit of 0.10 mg/L. Sewage contamination is a main source of nitrate loadings in the lake water.

Chlorophyll-a for Kala Talao in rainy season was 36 mg/m^3 which is higher than prescribed limits of 8 to 25 mg/m^3. The value in winter season is just within the prescribed range. Chlorophyll-a for summer is below range.

Bacteriological analysis (MPN): The MPN for Kala Talao was found more than 1600 per 100 ml which shows presence of fecal coli form (M.P.N.) very much higher than the prescribed Eco-Limit. The Eco-limit prescribed for the same is below 1000 per 100 ml.

Table 1: Results of parameters for three seasons of Kala Tala

S. No	*Parameter*	*Kala Talao Sample Season*		
		Rainy Season	Winter Season	Summer Season
1	Temperature(°C)	23	26	35
2	Secchi depth (mtr.)	0.1	0.3	1.5
3	Ph	7.8	7.5	7.3
4	Suspended Solids (mg/L)	95	65	50
5	Dissolved Oxygen (D.O.)(mg/L)	4.8	3.6	4.0
6	Chemical Oxygen Demand (C.O.D.) (mg/L)	80	65	50
7	Biochemical Oxygen Demand (B.O.D.) (mg/L)	22.5	18.2	14
8	Total Phosphate (mg/L)	0.587	0.298	0.025
9	Nitrate Nitrogen (mg/L)	0.29	0.22	0.20
10	Chlorophyll-a(mg/m3)	36	23	15
11	M.P.N. (No/100ml)	>1600	> 1600	>1600

3.1 Trophic State Index (Tsi) Of Lakes:

With the help of Carlson's formula TSI was calculated for three seasons of the year as represented in Table 2. TSI values are plotted in the Figures 1, 2. It shows constructive work in progress at Kala Talao was improving lake condition. A high TSI of 85 in rainy season represents lake had gone under Eutrophication (Hyper-trophic State) and in requirement of urgent revival.

Technique of construction of barrier for preventing sewage seepage entry, construction of RCC drain along the compound wall, stoppage of entry of building drain and aeration resulted in improving lake condition reducing TSI to 75.

TSI value of summer which came to 53.96 shows that construction work for pollution preventation and continuous functioning of aerators can change lake stage along with improving water quality.

Table 2: TSI Calculations for Kala Talao

Season	*Secchi depth*	*Chlorophyll-a*	*Phosphate*	TSI_{SD}	TSI_{CA}	TSI_{PTP}	*TSI*
Rainy	0.1	36	0.59	93.18	65.75	96.08	85.00
Winter	0.3	23	0.30	77.35	61.36	86.30	75.00
Summer	1.5	15	0.03	54.16	57.17	50.57	53.96

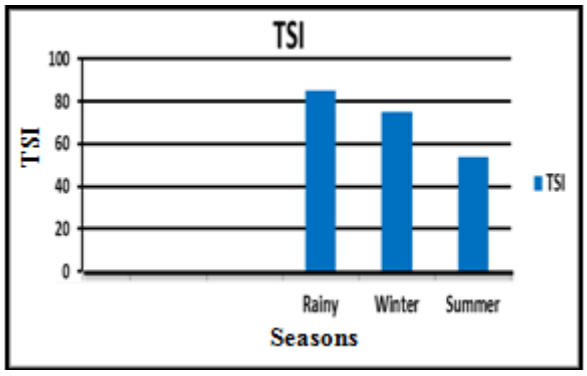

Figure 1: Representation of TSI for THREE seasons for Kala Talao.

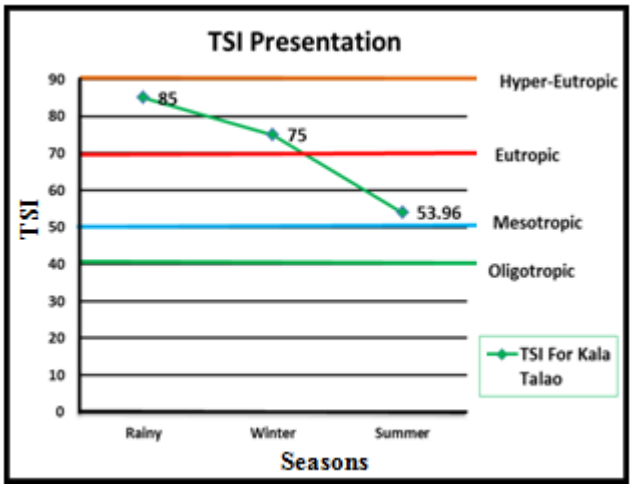

Figure 2: TSI Presentation of Kala Talao w.r.t. standard limits

4. Conclusion

During the period of Study, Kala Talao was monitored from June 2014 to May 2015. During this period water samples were collected for three seasons. The results of three seasons are tabulated and graphs are plotted to ascertain the lake condition.

Kala Talao which is maintained by KDMC, it is observed that it is under the threat of in Hyper-Eutrophy stage. The Trophic State Index (TSI) indicates that lake is turned fully Hypertrophic.

Infiltration of sewage through leaky joints of nearby storm water, disposal of garbage, washing of clothes, bathing activities, throwing breads as food for fish, disposal of flower offerings and religious waste directly into the lake water, Non-functioning of aerator units, leads to 'Hyper-trophic State' and unaesthetic condition of lakes. Adequate collection arrangement in the form of Nirmalya Kalash and dustbins are required. At Kala Talao fixed aerators should be work atleast for six hour per day. The change in the parameters of lake indicates that water quality can be improved by adopting various physical, chemical, biological and constructive measures so that lake water can be used for various purposes like gardening.

References

[1] D.S.Chaskar 'Water Quality management for Lakes and Reservoirs', National Water Academy, Pune, 2010.
[2] CPHEEO, 'Manual on Water Treatment' Ministry of Urban Development, New Delhi, 1993.
[3] Patil Snehal, Padalia Unnati, Challenges Faced and Solutions towards Conservation of Ecology Of Urban Lakes**.** International Journal of Scientific & Engineering Research, Volume 3, Issue 10, October-2012 1 ISSN 2229-5518, 2012.
[4] Shankar P. Hosmani, Fresh Water Algae as Indicators of Water Quality Universal Journal of Environmental Research and Technology, Volume 3, Issue 4: 473-482, 2013
[5] Basharat Mushatq, Rajni Raina, Tabasum Yaseen, Ashwani wanganeo and A. R. Yousuf, 2013,Variations in the physico-chemical properties of Dal Lake, Srinagar, Kashmir, African Journal of Environmental Science and Technology, Vol. 7(7), pp. 624-633, 2013.
[6] T. Subramani, Study of Pollution Prevention Strategies for Reclamation and Waster Management of Lake in Tourism Place, International Journal of Modern Engineering Research (IJMER), Vol.2, Issue.3, ISSN: 2249-6645, 2012.
[7] A. C. Patel, and Dr. R. S. Patel, Comparison of the Physico-Chemical Parameters of Two Lakes at Lodra and Nardipur under Biotic Stress**,** International Journal of Scientific and Research Publications, Volume 2, Issue 9, ISSN 2250-3153, 2012
[8] Sulekh Chandra, Arendra Singh And Praveen Kumar Tomar, Assessment of Water Quality Values in Porur Lake Chennai, Hussain Sagar Hyderabad and Vihar Lake Mumbai, India ,Chemical Science Transactions, ISSN/E-ISSN: 2278-3458/2278-3318, 2012.
[9] Kiran, R and Ramachandra, T.V, Status of Wetlands in Bangalore and its Conservation aspects, ENVIS Journal of Human Settlements, volume: 16-24, 1999.
[10] P. Chaudhry, M.P. Sharma, R. Bhargave, S. Kumar and P.J.S.Dadhwal, Water Quality Assessment of Sukhna Lake of Chandigarh City of India, Hydro Nepal issue 13, 2013.
[11] APHA. Standard methods for the examination of water and waste water (10th Ed.) Washington, DC. American Public Health Association, 1985.
[12] CPHEEO,'Manual on Water Treatment' Ministry of Urban Development, New Delhi, 1993.

Author Profile

Shailesh c Kulkarni is civil Engineering graduate from pune University, pune. Currently pursuing Post graduation in Environmental Engineering from Savitribai Phule Pune University, Pune.

Dr. Shweta Verma is Assistant Professor at D. Y. Patil College of Engineering, Akurdi, Pune.

S. J. Mane is Assistant Professor at D. Y. Patil College of Engineering, Akurdi, Pune.