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An Assessment Of Physico Chemical Charecteristics Of Nandhivaram Lake Water To Reduce Environmental Impacts .

PK Raji[1]*, and Marykutty Abraham[2].

[1]Department of Civil Engineering, Sathyabama University Chennai, India
[2]CRSG, Sathyabama University, Chennai, India

ABSTRACT

Water quality of peri-urban lakes is deteriorating due to fast urbanization and industrialization. This study pertains toassessment of physico-Chemical characteristics of Nandhivaram lake for effective mangement of lakes. Water samples were collected during the Northeast monsoon season from the biggest lake Nandhivaram of Guduvanchery watershed in Kanchipuram district of Tamilnadu, India. The sampling and analytical methodologies were followed for the estimation of selected parameters as per 'Standard methods of water and wastewater analysis' (APHA et al.1998). The NIST traceable standards are used for calibration of instruments before and after sample analysis for quality control check [6]. Water samples were collected from various locations of the lake. The water quality parameters such as pH, turbidity, conductivity, COD, BOD, Total Dissolved Solids, Phosphate, Nitrate and Chlorophyll-a were analyzed. The ranges of water quality parameters obtained are as follows. pH (6.71-7.04), Turbidity (2.4-3.3NTU), conductivity(565-660µs/m), COD (3.5-12.8mg/l), BOD(1.5-3.7mg/l), TDS(294-335mg/l), PO_4(0.219-0.608mg/l), NO_2(0.094-2.359mg/l), chlorophyll-a (3.14-3.93µg/l). The analysis revealed that the parameters pH, TDS, COD, BOD, conductivity levels are within the standard limits for surface water quality whereas Nitrogen, phosphorus and chlorophyll-a were noticed exceeding the permissible level at many of the sampling locations. The phyto plankton is an important index of presence of high nutrients like phosphorus and nitrogen, which are the factors responsible for eutrophication of the lake.

Keywords: Chlorophyll-a, eutrophication, Nutrients, phytoplankton, physico-Chemical characteristics

Corresponding author
Email: rajipk72@gmail.com

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INTRODUCTION

The contamination and pollution of water is of a great concern in the the present day world as it poses undeminished threat to the ecosystem . the eco socio significance of the lakes are immediately felt as the lakes are the sources in the process of ground water replenishing and agricultural operations including as an inevitable regulator of river flow in trapping sediments and nutrients. Increasing urbanization coupled with industrialization during the past few decades are depleting water ecosystem[7]. Due to anthropogenic effects and due to some natural processes the quality of the lakes are getting degraded and losing their efficiency on the above mentioned functions. When it is unfit for its intended use, water is considered polluted.[5]. Thus monitoring programs are very much essential to check frequently the lake water quality to assess its usability and to reduce the pollution. This study pertains to assessment of physico-Chemical characteristics of Nandhivaram lake for effective management of lakes.

THE STUDY AREA

Water spread Area of the lake: 4.58 km^2
Volume of the lake: 1.69 MCM
Total catchment area: 20.653km^2
Depth: 10 feet.
Trophic state: Early eutrophic

The lake Nandhivaram is the biggest lake in Guduvanchery water shed area in Kancheepuram district, Tamilnadu in India. The main source of water to this lake is surrounding catchment areas and the monsoon rains during the months of October, November. This lake once was used as the sole supplier of water for irrigating several hectares of paddy field and also for domestic usages. Presently the lake is found to be eutrophic due to natural run-off of nutrients from the soil and also due to the residual runoff of chemical manure, pesticides from the farms. Nowadays unbridled encroachments and dumping of garbage pose a big threat to the very existence of the lake and may lead to slow extinction of such natural and useful reservoirs. The Google map of Nandhivaram lake is illustrated in the fig.1 and the photographical view of a portion of the lake is shown in fig. 2.

Fig 1: Map of Nandhivaram Lake. Fig 2: Photographic view of the lake.

MATERIALS AND METHODOLOGY

Water samples are collected during the Northeast monsoon season. The sampling and analytical methodologies are followed for the estimation of selected parameters as per 'Standard methods of water and wastewater analysis' (APHA et al.1998). [1]. All quality control procedures are followed during the sample collection, preservation and analysis. The sampling locations were selected along bund length and based on some major inflow areas. The sampling locations are shown in the fig.3.The pH is tested by electrometric method. Bio chemical oxygen demand(BOD) is examined by incubation technique followed by the estimation of oxygen. The chemical oxygen demand (COD) is examined by micro digestion and colorimetry. The

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conductivity of water is examined by electrometric method. TDS is detected by gravimetric method. The chlorophyll-a is analysed by colorimetry method.

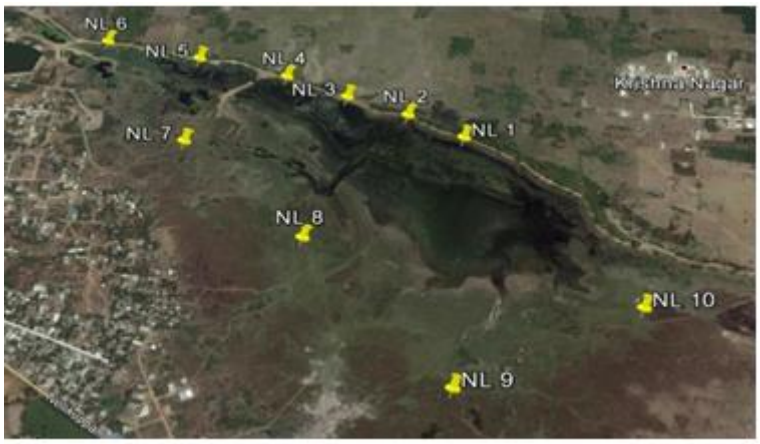

Fig 3: Map showing the sampling Locations.

RESULTS AND DISCUSSION

pH

The water quality analysis shows the present status of the lake. The distribution of the parameters at various sampling locations (fromNL1 to NL10) are shown in the Table 1.Extreme values will show excessive acidity or alkalinity. Generally, the range of pH in fresh water extends from 4.5 in acidic environment to over 10 where there is intensive photosynthetic activity by algae. However, the most frequently encountered range is 6.5-8.0. As per the surface water regulations the permissible value is 5.5 to8.5. The lake water in this study has the desirable pH value. The fig.4 shows the values of pH at various sampling locations.

Table 1: Water quality parameters at different locations

Parameter	NL1	NL2	NL3	NL4	NL5	NL6	NL7	NL8	NL9	NL10
pH	6.71	6.75	6.82	6.85	6.9	7.04	7.02	6.92	6.94	6.91
Turbidity (NTU)	2.4	2.8	2.9	3.2	2.7	3.3	6.2	4.6	3.7	3.4
Conductivity (µs/cm)	565	580	590	605	625	660	867	746	682	676
(COD)mg/l	3.5	4.6	5.2	5.6	7.2	7.9	12.8	10.1	9.4	7.8
(BOD)mg/l	1.5	2.2	2.5	2.9	3.3	3.7	3.9	3.5	3	3.2
(TDS)mg/l	294	300	304	312	322	335	443	386	367	354
PO_4 mg/l	0.219	0.324	0.325	0.332	0.338	0.405	0.608	0.596	0.374	0.361
NO_3 mg/l	2.047	2.056	2.067	2.072	1.094	1.117	2.359	2.286	1.237	1.172
Chlorophyll a ug/l	3.14	3.26	3.47	3.69	3.74	3.93	6.69	6.82	6.04	4.88

Bio chemical Oxygen Demand(BOD).

As per surface water regulation (EPA1994) permissible value of BOD is 5mg/l(class A1&A2) and 7mg/l(for class A3). The present study shows that BOD value in all sampling locations fall within the permissible limit. The bio chemical oxygen demand ranges between 1.5 mg/l to 4.01 mg/l. The values of BOD at the selected locations are illustrated in the fig.5

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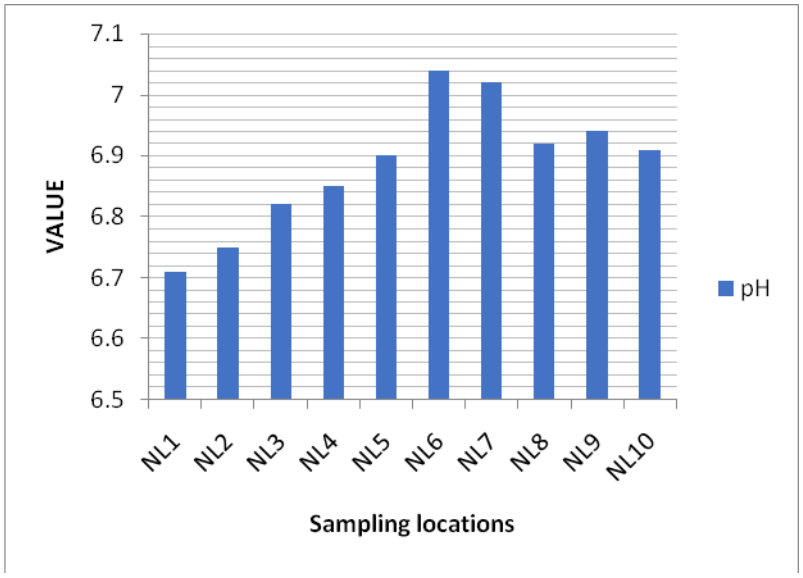

Fig 4: pH at various sampling locations.

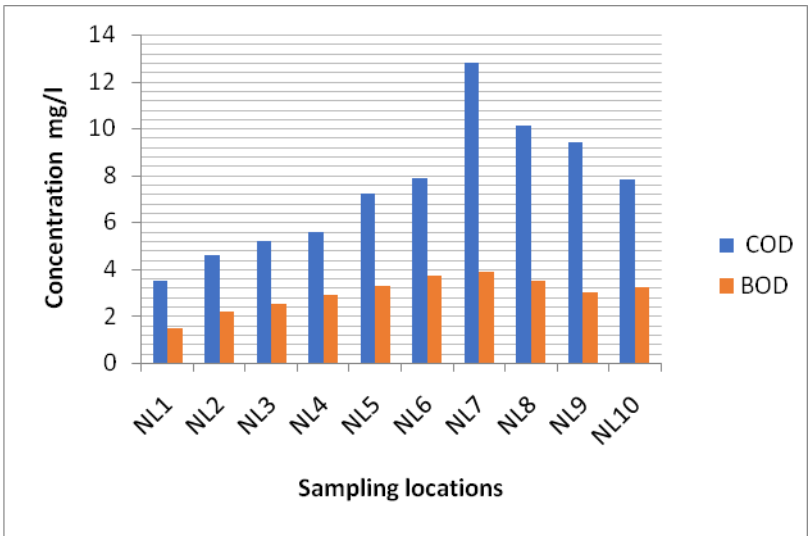

Fig 5: BOD and COD at various sampling locations

Chemical Oxygen Demand(COD).

COD is also an indicator of overall water quality. As per surface water quality the permissible limit of COD is40 mg /l(class A3)(EPA 1994)[4].The analysis estimated the value of COD falls between 3.5 to 12.8 mg/l. The fig.5 shows the spatial distribution of COD at different locations of the lake.

Phosphorus and Nitrogen

In this study higher range of phosphate(0.219-0.608 mg/l) was noted which acts as the main accelerating factor of eutrophication in the lake which in turn affect the concentration of dissolved oxygen which might have adverse effect on aquatic life and the ecosystem. The nitrate value falls between 1.117-2.286mg/l, which is also one of the nutrient influences the algal blooming. As per surface water standards the phosphate shall not exceed 0.5 mg/l(class A1 EPA)[4] and nitrates shall not exceed 50mg/l to reduce health hazards. Therefore it was noted that the phosphate level is more than the permissible value. Measures should be taken to limit the phosphate contamination. Fig.6 shows the levels of phosphate and nitrate at various locations. At sampling station NL7, the concentration of phosphate exceeding the permissible value.

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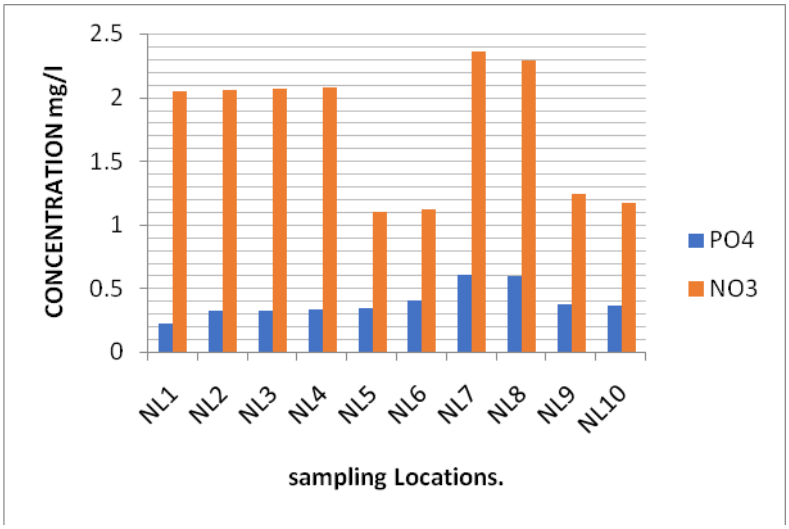

Fig 6: Phosphates and Nitrates at various sampling locations.

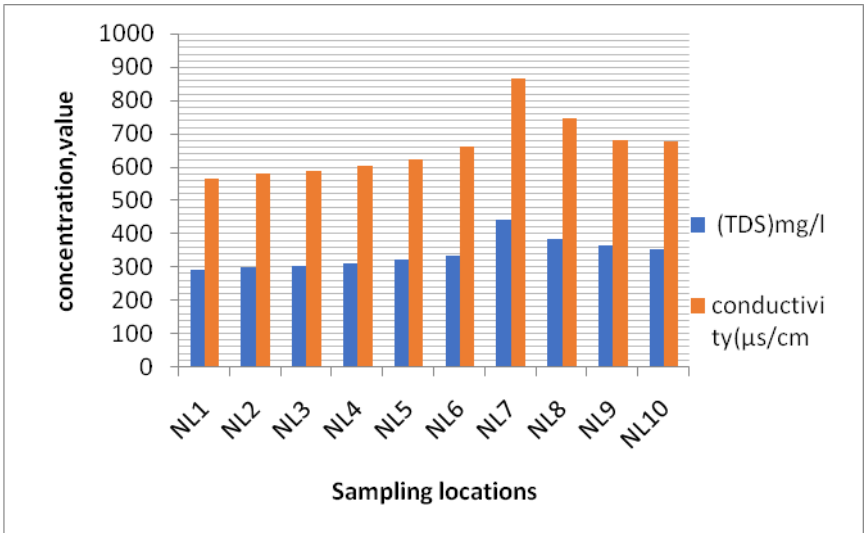

Fig 7: TDS and Conductivity at various sampling locations.

Conductivity

It reflects the mineral salt content of water. The permissible value for (A1 class) conductivity is 1000µs/cm.(EPA)[4]. In our study in all sampling locations the value is within the limit. The range is 565- 867 µs/cm. At elevated levels the water may be saline. The fig .7 shows the distribution of conductivity at the selected locations.

Total Dissolved Solids (TDS)

EPA has established National Secondary Drinking Water Regulations (NSDWRs). The value of TDS shall not exceed 500 mg/l. In the present study it ranges between 294 and 386 mg/l. Fig .7 shows the variations of TDS at various locations.

Turbidity

Turbidity arises from the presence of very finely divided solids .The presence of turbidity will affect the acceptability to the consumers and also not accepted in certain industries also. As per the surface water quality standards, the turbidity shall not exceed 5 NTU. In our study in the sampling location (NL7), turbidity

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exceeds the permissible limit. It is the indicator of overall water quality.Fig.8 shows the distribution in different sampling locations.

Chlorophyll-a

Chlorophyll-a is the pigment that makes plants and algae green. Chlorophyll-a is tested in lakes to determine how much algae is in the lake. Algae are important in lakes because it adds oxygen to the water as a by-product of photosynthesis. On the other hand, if there is too much algae in a lake it can produce a foul odor and be unpleasant for swimming. Chlorophyll-a concentration can tell you a lot about the lake's water quality and trophic state as shown in fig 4.5. The concentration of chlorophyll-a at various locations is shown in the fig. 8

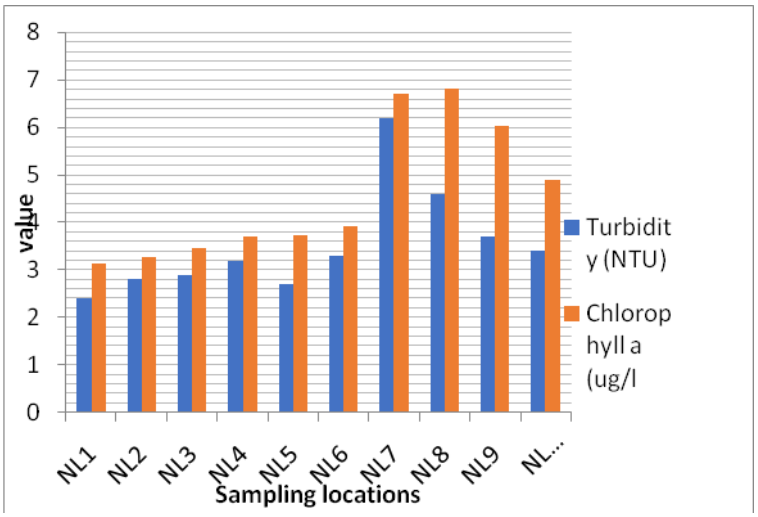

Fig 8: Turbidity and Chlorophyll-a atvarious sampling locations.

CONCLUSION

This close technical analysis and overall study relating to the geophysical environmental features of the Nandhivaram lake of Kancheepuram district of Tamilnadu in India, would reveal that the lake has been consistently and ignorantly been neglected due to lack of awareness of the public , despite the anxiety of the environmental enthusiastists. Due to the nutrient enrichment, the lake lost its aesthetic value and became unfit for domestic purposes. In spite of the advantageous location and erstwhile management and maintenance, it is required the lake needs greater attention to rejuvenate it on a utilitarian basis. The primary attention may be focused to check the inflow and the inlets including the feeder canals to clean the catchment area which will greatly help in improving and maintaining the potability of the lake water. Widespread dissemination of knowledge and need emphasizing the significance of the water bodies would go a long way in improving the structure of the lake and augmenting the quality of water.

REFERENCES

[1] APHA 1998 standards method for examination of water and waste water 20th edition.
[2] Ansari Ali A.and Khan F .A 2006.Studie son the role of selected nutrient source in the eutrophication of fresh water ecosystem .Natural environment pollution technology 5(1):47-52.
[3] Draft proposal for Ecological restoration in Ambilodha watershed through negotiable IWRM approach September 2006.
[4] Environmental Protection Agency 1994 WQS Hand book second edition.
[5] Khare H.C .M.S.Jadhav water quality assessment of KatrajlakePune 12th world lake conference 292-299. 2008.
[6] NIST National Institute of Standards and Technology special publication 250
[7] Sahastrabudde K., Patwardhar A. Changing status of urban water bodies and associate health concern in Pune India Conference on environment and health Chennai.2003.