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Remediation of Urban Polluted Lake Water and Sediments

M. Satish Kumar, Ambati Dattatreya Kumar, P. Srinivasa Rao, G. Venu Ratna Kumari

Abstract: ***Entry of contaminated soils and sediments in to the water sources from the urban runoff decreases lake water quality and increases the cost of water purification. Water pollution is inevitable issue when the surrounding activities of nearby people are not maintained proper water handling techniques with respect to preserving lake water quality along with the quantity. Sedimentation is a complex process where the eroded soil particle enters in to the water bodies through flowing water or through any of the transporting media and settles as layers on the bottom of the water bodies. Maintenance of good water quality in the lakes is always most important criteria for promoting good irrigation standards and drinking facilities to the nearby people along with other benefits like recreation, fisheries etc. but all these benefits are questionable in the current scenario as the water in the lakes are being contaminated by industrial and municipal waste disposal practices along with agricultural runoff at certain rural connected areas. Urban areas especially in India are facing severe problems with water as the availability of water reducing year by year at an alarm rate which in turn leads to increased pressure on sustainable consumption of lake water to meet the daily water demand of the city. There should be some suitable management strategies for Protecting water bodies to promote ecological balance at study area, the present study has taken up at koritapadu lake falls under the limits of guntur municipal corporation, Andhra Pradesh, earlier this lake served as major source for drinking and also for other requirements of water to the nearby people but now it became un useful as the water contamination is high and unable to consume as part of daily activities. Total eight samples were collected for both water and sediments by considering all possible corners of contamination, all he samples were analyzed by adopting standard water quality analysis procedures [7]. By keeping the above considerations this study was initiated to promote water quality for future consumption.***

Keywords: ***Contaminated, Ecological balance, Industrial, Lake, Sediments.***

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* Correspondence Author
Dr.Satish Kumar Moparthi*, Professor, Civil Engineering, Kallam Harandha Reddy Institute of Technology, Guntur, A.P, India.
Mr.Ambati Dattatreya Kumar, Assistant Professor, Civil Engineering, V.R Siddhartha Engineering College, Vijayawada, A.P, India.
Mr.P.Srinivasa Rao, Assistant Professor, Civil Engineering in Tirumala Engineering College, Narasaraopet, A.P, India.
Ms.G.Venu Ratna Kumari, Assistant Professor, Civil Engineering in P.V.P. Siddhartha Engineering College, Vijayawada, A.P, India.

I. INTRODUCTION

Lakes are the major important surface water resources which gives the scope for human settlements and habitation by providing water to meet the various daily requirements like domestic, commercial, Fire and public water demand
At present because of the rapid development in the industrial sector and increased population along with increased urban living standards the demand of water is increased with respect to its quantity and quality. In some of the regions lakes are the major sources for power generation, navigation, fisheries and also as one of the prime recreational source to the public. It has been observed that aquatic ecosystem [2] is greatly damaging due to the release of effluents from the industries and the sewage from the drainage canals without proper treatment methods. Most of these pollutants [8] reaches to the bottom of the lakes and settles as layer of soils and sediments during the period of time and makes the situation worst.
Un scientific and nonstop conversion of land as part of developmental activities in the urban areas, un predictable climatic conditions, accidental release of chemicals in to the lakes through urban runoff along with uncontrolled, un scientific use of synthetic fertilizers to raise the irrigation standards shows significant long term undesirable impact on ground as well as on surface water sources. [6]
Water quality in the lakes is always in dynamic stage as it tends to change with respect to season, time, and flow velocity along with flow direction [5]. Water quality in the lakes cannot be measured at one single point of location but it may require multiple points at various depths by covering all the corners of the lake including the centre portion of the lake. To find out the quality of lake the differences may be examined with an extent of day to day monitoring to month by month monitoring as the variability of lake water is influenced by climatic conditions. The present study is carried out by collecting water and sediment samples from eight locations by covering all the possible corners of the lake contamination including centre part of the lake to find out the existed conditions of the water quality along with the quality of lake sediments with suitable technological solutions and remediation techniques to make the lake as a useful surface water resource at study area.

II. OBJECTIVE

To determine the quality of lake water and sediments with suitable technologies and remediation techniques for improving the lake standards for promoting sustainable development at study area.

III. METHODOLOGY

I Collection of Samples:

Total eight locations were identified throughout the lake by covering all the possible corners of lake contamination including the centre part of the lake for both water and sediments collection.

Samples were collected in sterilized bottles by using standard procedure [10] during the period of three months; all the samples were named with labels indicating date and location of the sample in lake. [3]

II Water Quality Analysis:

In the analysis part all the important water quality influencing parameters like Color, Turbidity, P^H, Conductivity, Total dissolved solids(TDS), Alkalinity, Total alkalinity, Total hardness, Calcium hardness, Magnesium hardness, Nitrite, Chlorides, Iron were analyzed with standard procedures[1] and the values were tabulated, the final results were obtained with average of three months' values during the study period.

III Sediment analysis:

The sediment analysis[4] was carried by considering the possible contaminant sources and it has done mainly to identify the parameters like Color, P^H, Texture, Electrical conductivity, organic carbon, Available nitrogen, Available phosphorous, Available potassium, Available Sulphur, Available zinc, Available iron, Available manganese, Available copper, and available boron in the lake sediments.

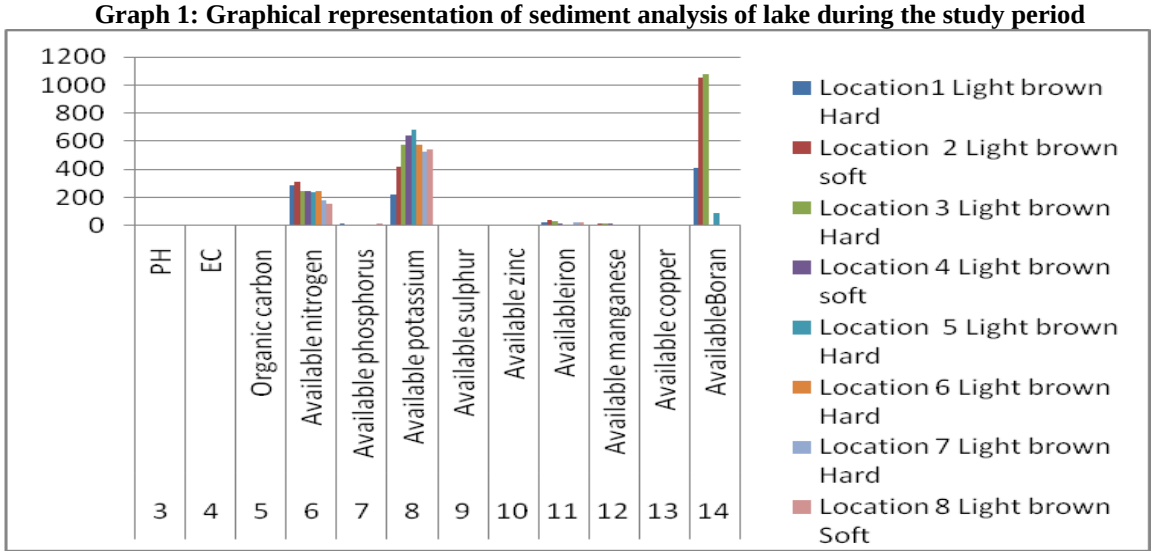
Table- I: Lake Water quality analysis during the study period

S.NO	Parameter	Location 1	Location 2	Location 3	Location 4	Location 5	Location 6	Location 7	Location 8
1	Colour (Hazen units)	Colour less	Colour less	Colour less	Colour less	Colour less	Colour less	Colour less	Colour less
2	Turbidity in NTU's	0.5	0.6	0.8	0.8	0.5	0.6	0.7	0.8
3	Odour	Unobjecti onable	unobjectio nable	Unobjecti onable	Unobjecti onable	Unobjecti onable	Unobjec tionable	Unobject ionable	Unobject ionable
4	P^H	7.5	7.65	7.85	6.56	8.15	6.5	8.28	8.56
5	Conductivity (micro mhos/cm)	630	480	520	640	520	580	440	510
6	TDS (mg/L)	640	520	460	680	525	630	440	490
7	Alkalinity (as caco3)	Nil	5	Nil	Nil	5	Nil	Nil	Nil
8	Total alkalinity	125	225	245	250	245	285	250	530
9	Total hardness	120	210	160	180	160	210	140	280
10	Calcium hardness (as caco3)	60	80	60	60	80	90	80	60
11	Magnesium hardness (as caco3)	40	60	45	55	65	120	130	80
12	Calcium (as ca)	32	20	52	30	95	50	24	75
13	Magnesium (as mg)	10	20	20	30	20	15	35	25
14	Ammonical nitrogen	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
15	Nitrite (as N)	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
16	Chloride (as Cl)	75	80	65	110	60	50	60	200
17	Fluoride as (F)	0.8	0.8	0.6	0.4	0.3	0.5	8	0.8
18	Iron as (Fe)	Nil	Nil	Nil	Nil	Nil	0.5	Nil	0.4

Table- I: sediment analysis of lake during the study period

S.NO	Parameter	Location 1	Location 2	Location 3	Location 4	Location 5	Location 6	Location 7	Location 8
1	Colour	Light brown	Light brown	Light brown	Light brown	Light brown	Light brown	Light brown	Light brown
2	Texture	Hard	soft	Hard	soft	Hard	Hard	Hard	Soft
3	P^H	7.9	7.8	8.1	7.89	7.65	8.2	8.1	8.25
4	Electrical Conductivity	1.3	1.24	1.39	1.16	0.9	1.27	1.2	1.5
5	Organic carbon	0.4	0.3	0.2	0.3	0.31	0.11	0.28	0.39
6	Available nitrogen as Kg/ha	289	315	250	245	236	248	185	160
7	Available phosphorus as Kg/ha	18	12	6	4	2.8	2.4	9	14
8	Available potassium as Kg/ha	222	418	578	645	680	574	530	540
9	Available sulphur as ppm	8	5	4	8	5	9	9	9
10	Available zinc as ppm	0.589	0.826	1.4	0.564	0.485	0.425	0.854	0.645
11	Available iron as ppm	22.64	44.12	34.56	18.26	11.84	5.648	28.24	22.64
12	Available manganese as ppm	12.52	18.56	14.25	14.26	9.65	5.82	9.24	10.56
13	Available copper as ppm	0.7	1.32	0.92	0.97	0.613	0.913	2.014	1.564
14	Available Boron as ppm	408	1056	1078	0.8	89	1.2	2.8	2.64

Graph 1: Graphical representation of sediment analysis of lake during the study period



IV. RESULTS AND DISCUSSIONS

1. The P^H of the water and the sediment samples shows that the lake is alkaline condition.
2. The acceptable limit of Turbidity is up to 1%, the result for the water samples collected gives the average of 0.8 %, which is within the acceptable limit

3. Total dissolved solids (TDS) up to 500mg/L is acceptable, In the present study TDS is crossed the permissible levels and it is noted as 680mg/l
4. The acceptable limit total alkalinity in water is 200 mg/L but we had the average value of 280 mg/L
5. Hardness of water is acceptable up to 300mg/L. The average value of hardness in the present study is noted as 280 mg/L
6. Calcium in water is acceptable about 75mg/L, in the present study it is 95 mg/L.
7. The presence of magnesium is permissible up to 30mg/L, we got it is 35mg/L
8. The presence of fluoride is acceptable up to 1mg/L, 0.8mg/L.
9. In the sediment samples ait is noted that available nitrogen and phosphorous is in excess limit and it leads to the eutrophication of the lake
10. The remaining parameters are within the permissible limits

V. CONCLUSIONS

1. Eutrophication of the lake should be reduced by avoiding releasing of domestic wastes in to the lake Proper guidelines must be framed on discharge of effluents and sewage in to the lakes.
2. Lake Intakes must be designed and constructed in such a way they won't disrupt aquatic eco system
3. Urban runoff must be reduced by encouraging greenbelt nearby lake surroundings to avoid contamination of the lake
4. Natural fertilizers must be encouraged for agricultural practices to avoid the entry of chemicals into the lakes through agricultural runoff to maintain equilibrium of various parameters
5. Strict punishment must be imposed on the people who ever releasing untreated wastes in to the water bodies.
6. Careful monitoring and periodical assessment of lake parameters must be done to avoid the contamination of the lake[9]
7. Proper management strategies must be framed to avoid lake contamination by human activities in and around the lake area to maintain the aquatic ecological balance.
8. Iron fencing must be provided around the lake to avoid the entry of animals

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AUTHORS PROFILE

Dr.Satish Kumar Moparthi is the professor of Civil Engineering in Kallam Harandha Reddy Institute of Technology, Guntur, A.P, India, He has twelve years of teaching along with one year industrial experience, and He has more than 35 International journals in the field of Civil Engineering. He got sanctioned grant from Science and Engineering Research Board, Department of Science and Technology, Government of India.

Mr.Ambati Dattatreya Kumar is working Assistant Professor, department of Civil Engineering in V.R Siddhartha Engineering College, Vijayawada, A.P, India. He has ten Years of teaching experience along with fifteen years of Industrial experience in the field of Civil Engineering

Mr.P.Srinivasa Rao is working as Assistant Professor, department of Civil Engineering in Tirumala Engineering College, Narasaraopet, A.P, India. He has six Years of teaching experience.

Ms.G.Venu Ratna Kumari is working as Assistant Professor, department of Civil Engineering in P.V.P. Siddhartha Engineering College, Vijayawada, A.P, India. She has eight Years of teaching experience along with two years of Industrial experience in the field of Civil Engineering