

AN ASSESSMENT OF SEASONAL WATER QUALITY VARIATION IN THE INLETS OF DIYAWANNA LAKE, SRI LANKA

U. Y. I. L. Dharmasoma¹, Ranjana U. K. Piyadasa²

¹Faculty of Graduate Studies, University of Colombo, Colombo, Sri Lanka. Email: isuriedharmasoma@yahoo.com

²Department of Geography, University of Colombo, Colombo, Sri Lanka. Email: ranjana@geo.cmb.ac.lk

ABSTRACT

Diyawanna Lake is an important water retention area which is to be completely dredged, de-silted and fully rehabilitated. In the recent past the lake water indicated many water quality problems such as bloom formation, fish kills etc. The study was done with the objective of determining the status and trends in water quality changes of two inlets of Diyawanna Lake. According to the results obtained for the period of 2006-2010; the pH values of Location 1 are varied from 5.4 to 7.4 and the pH values of Location 2 are varied from 5.2 to 7.2. The electrical conductivity values of Location 1 and Location 2 are varied from 0.07 mS/cm to 0.30 mS/cm and from 0.11mS/cm to 0.23 mS/cm respectively. The turbidity values of Location 1 and Location 2 are varied from 4.15 NTU to 33.50 NTU and from 4.00 NTU to 27.90 NTU respectively. The Dissolved Oxygen concentrations of the Location 1 and Location 2 are ranged from 3.02 mg/l to 6.88 mg/l and 2.17 mg/l to 6.84 mg/l respectively. The Nitrate (V)-N values of Location 1 and Location 2 are varied from 0.01 mg/l to 0.70 mg/l and from 0.01 mg/l to 0.80 mg/l respectively.

Keywords: Diyawanna Lake, water quality

1. INTRODUCTION

About two-thirds of the Earth is covered by water. Among many water bodies, lakes are the most fertile, diversified and productive of all the ecosystems in the world. A variety of environmental goods and services are bestowed upon us by lakes which makes them vulnerable to human exploitation. The water quality of receiving water bodies such as rivers and lakes is critically important because it is one of the most essential resources for human existence and settlement. However, the rapid growth of population and increase of urban activities significantly influence the water quality of receiving water bodies [1]. water quality of urban water bodies are being changed over the time due to various reasons. Lakes are subject to various natural processes taking place in the environment, such as hydrologic cycle. With enormous developmental activities, human beings are responsible for the severe deterioration of several lakes.

The canal system which is in and around Colombo-Sri Jayewardenepura area is currently in such an environmentally deteriorated condition due to rapid development and urbanization of the area. The quality of water and habitat in most of the areas are influenced by industrial and public

effluent discharge to the canal system [2].

In the recent past, water of Diyawanna Lake indicated many water quality problems such as bloom formation, fish kills etc. The maintenance of good water quality in Diyawanna Lake is fundamental to the long term future of the lake as a multi-user resource. Good water quality, with low levels of micro organisms, pesticides and other contaminants, is vital to maintain the lake's current social and scenic value. Any future development of recreation in the lake is likewise dependent on maintaining good water quality in the lake now.

However there is no recent scientific water quality analysis conducted for the inlets of the lake to determine its' status and to identify the potential pollution sources. The lack of such scientific information is a constraint to develop proper management criteria to protect the lake and to maximize its' uses to the community. Therefore it has become a needy requirement to identify level and trends of the deterioration of the water quality of the lake by analysing the inlets' water.

The objective of this research study was to determine the status and trends in water quality changes of two inlets of Diyawanna Lake.

2. METHODOLOGY

2.1. Study Area

The study area is confined to two water inlets to the Diyawanna Lake and surroundings (Figure 1). In this study, the water samples collected at two locations namely: Kimbulawala Madiwela (Location 1) and Battaramulla South-Pelawatte (Location 2) were analyzed (Figure 1).

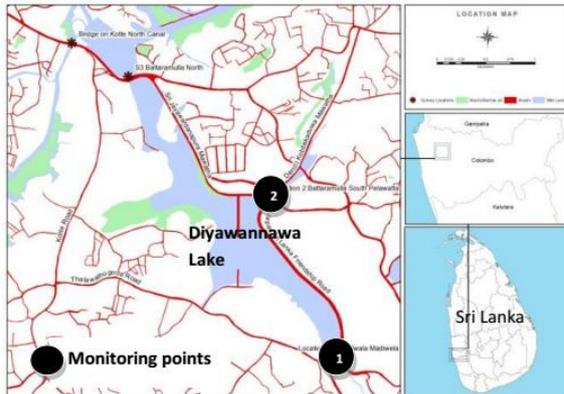


Figure 1: Study area including two water inlets to the Diyawanna Lake and surroundings

The GPS coordinates of Location 1 and Location 2 are 6°52'43.93"N; 79°55'36.58"E and 6°53'31.48"N; 79°55'17.08"E respectively.

2.2 Data Collection and Analysis

The monthly water quality data for a period of five years from 2006-2010 available at Sri Lanka Land Reclamation and Development Corporation were used for the study. The water quality parameters considered for the study are pH, Turbidity, Electrical Conductivity, Dissolved Oxygen and Nitrate (V)-N. In addition,

In addition, rainfall data, land use maps of the study area and primary data gathered through field visits were used in the study. Field visits were made along two identified canals and around the lake in order to ground verify the existing land use pattern of the area. In addition, identification of potential point and non-point pollution sources of the area, which will directly or indirectly impact on the water quality of the canals were done through transect walks.

The primary and secondary data collected through field observations and secondary sources were analyzed using MS Excel and SPSS

packages.

3. RESULTS

According to the results obtained for the period of 2006-2010; the variation of the selected water quality parameters of Location 1 and Location 2 are given in Table 1 and Table 2.

In all the instances, except in 2006 where the mean pH is 6.7, the mean pH values of both locations are less than 6.5, which indicate the water is more acidic.

Table 1: Variation of water quality parameters of Location 2 during the period of 2006-2010

Parameter	Unit	Min	Max
pH	-	5.4	7.4
Electrical Conductivity	mS/cm	0.07	0.30
Turbidity	NTU	4.15	33.50
Dissolved Oxygen	mg/l	3.02	6.88
Nitrate (V)-N	mg/l	0.01	0.70

Table 2: Variation of water quality parameters of Location 1 during the period of 2006-2010

Parameter	Unit	Min	Max
pH	-	5.2	7.2
Electrical Conductivity	mS/cm	0.11	0.23
Turbidity	NTU	4.00	27.90
Dissolved Oxygen	mg/l	2.17	6.84
Nitrate (V)-N	mg/l	0.01	0.80

The average electrical conductivity value of Location 1 and Location 2 over the five years varies from 0.14 mS/cm to 0.17 mS/cm and 0.15 mS/cm to 0.18 mS/cm respectively. When comparing the electrical conductivity variation of 2 locations over the period of five years, the highest electrical conductivity is in year 2009 for both locations and the electrical conductivity of Location 2 is comparatively higher than the electrical conductivity of Location 1.

In Location 1, the lowest mean turbidity was recorded in 2008 (9.01 NTU) and the highest mean turbidity was recorded in 2007 (14.90 NTU). In Location 2, the highest mean turbidity was recorded in 2006 (12.21 NTU) and the lowest mean turbidity was recorded in 2010 (10.18 NTU). Except for the mean turbidity of 2009, the mean turbidity values of other four

years show a decreasing trend. Except in few cases, the turbidity values of both locations are higher than the maximum permissible limits (max. 2 NTU according to SLS 614:2013; max. 5 NTU according to proposed water quality standards for Sri Lanka by CEA).

The mean Dissolved Oxygen concentration in the Location 1 over the five years is ranged from 4.69 mg/l-5.86 mg/l. The Dissolved Oxygen values over the period indicate an increasing trend. The mean Dissolved Oxygen values of Location 2 during the period of 2006-2010 are varied from 4.15mg/l to 5.29mg/l. In all five years, mean Dissolved Oxygen values in Location 1 is higher than the mean Dissolved Oxygen values in Location 2. Except in few cases, the Dissolved Oxygen levels recorded for two locations for the period of 2006-2010 are higher than 3 mg/l which indicating acceptable levels during the sampling occasions according to the proposed water quality standards for Sri Lanka by CEA for fish and aquatic life.

The mean levels of Nitrate (V)-N in Location 1 are varied from 0.14 mg/l to 0.27 mg/l where the lowest mean value is in 2006 and the highest mean value is in 2010. The mean levels of Nitrate (V)-N in Location 2 is varied from 0.12 mg/l to 0.27 mg/l whereas the variation of the mean Nitrate (V)-N value in 2010 is similar to the mean Nitrate (V)-N recorded in 2010 in Location 1. In both locations, Nitrate (V)-N levels are within the standard limits (max. 5 mg/l Nitrate (V)-N is threshold for fish and aquatic life as indicated in proposed water quality standards for Sri Lanka by CEA).

4. CONCLUSION

The study revealed that the water quality of two inlets have deteriorated over the period of 2006-2010. The quality of water in most of the areas along these two canals are influenced by both point and non-point sources. It has been severely affected on well being of the community live around these canals. Therefore it is important to conduct further studies on the current status of water quality of inlets, outlets and also the Lake and implement effective policy implications to avoid polluting the Diyawanna Lake.

5. REFERENCES

[1] A. Goonetilleke, E. Thomas, S. Ginn and D. Gilbert, "Understanding the role of land use in urban storm water quality management" Journal of Environmental Management, 74 (01), pp. 31-

42, 2005.

[2] L. Perera, G. R. Y. Perera, J. Wattavidanage and N. Nilakarawasam, "Development of a Macroinvertebrate-based Index of Biotic Integrity (MIBI) for Colombo-Sri Jayewardenepura Canal System", Journal of Tropical Forestry and Environment, 2 (01), pp.10-19, 2012.

[3] J.P Lebrun, "Water environmental issue in Greater Colombo". In: Colombo Environmental Issues at Stake. Colombo: CMC, pp 58-74, 2007.

[4] R Perera, "Problems and prospects of utilizing canal banks to enhance the built-environment in Colombo", Built-Environment, 03(02), 2003.

[5] Sri Lanka Land Reclamation and Development Cooperation, "Proposed remedial measures for floods in the city of Colombo". Colombo: SLLRDC, p2, 2011.

[6] World Bank, "Environment Assessment-Metro Colombo Urban Development Project". Colombo: GreenTech Consultants (Pvt) Ltd, pp. 1-155, 2011.