

# **Water pollution study in Nalanada Lake to improve the Water quality of Naula Water Treatment Plant**

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## **Introduction**

Water is the largest natural resources of Sri Lanka although only a relatively low percentage of total population is getting safe and clean water for daily use. Water is using for Drinking, bathing, washing, and cleaning. Beside it is used for agriculture, industrial, hydropower generation.

The Nalanda reservoir located in Naula, Matale district is the main water source of Naula Water Treatment Plant of National Water supply and Drainage Board (NWSDB). On the other hand NWSDB faces a big problem in the dry season because pumping water had a less amount of Dissolved Oxygen (DO) and occurring black color in pumping water. The dissolved oxygen (DO) concentration is a primary measurement of a stream's healthiness. The dissolved oxygen concentration responds to the biochemical oxygen demand (BOD) load. Investigators have continuously studied the dissolved oxygen uptake characteristics in stream water in relation to different sinks and sources in order to develop mathematical models describing the DO consumption.

In this reservoir percent high amount of Algae due to high nutrients content such as nitrate and phosphorous and change that algae type seasonally. One of the objectives of this research study is that Nitrate and Phosphorus variation in reservoir. And Main Objective was identification of the Dissolved Oxygen (DO) Variation in Nalanda reservoir.

## **Methodology**

In this study six sampling location points were selected and studied the variation of nitrate, phosphorous and DO of these sampling points for four weeks of time. These data were collected in rainy and dry season. Samples were collected from the different distances from the intake of Naula Water Supply System. Totally 24 samples were collected from the upstream of the reservoir. Basically, the selected pollution points are surrounding point of the reservoir. Samples were taken from different morphological units of the reservoir. DO was analyzed at the sample collected points and COD and BOD also analyzed using the Standard laboratory procedures. Finally DO concentration variation was analyzed by using mathematical model called Streeter-phelps.

## Results and discussion

Eutrophication of water body is occurred under high nutrients. The nutrients such as nitrate and phosphate distribution within selected pollution points in Nalanda reservoir is shown in figure 1. The recommended phosphate level for maintaining healthy water to minimize algae growth is 0.1 mg/L and nitrate level is 10 mg/L (USEPA). The results shown below indicated that the nitrate level was within required limit and phosphate level was exceeded limit. Therefore, phosphate consuming algae species can occur in Nalanda reservoir during this period.

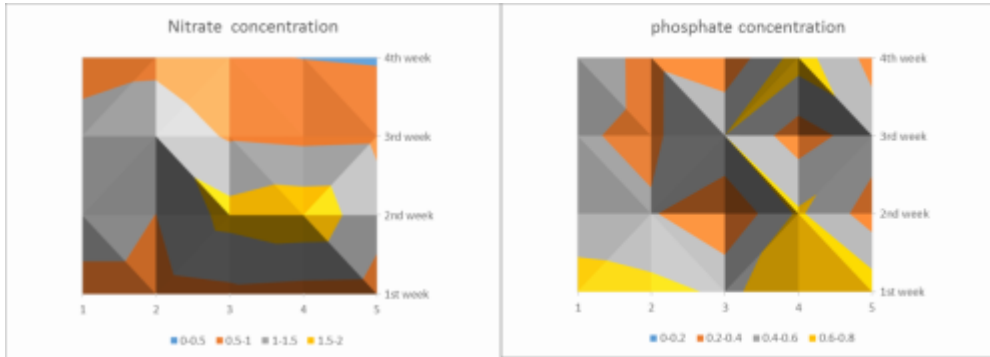


Figure 1: Nitrate and phosphate concentration variation within selected pollution points in Nalanda Reservoir

Here, we used the mathematical equation called Streeter-Phelps equation to identify oxygen consumption by aerobic BOD degradation and DO recovery by dissolution from water surface. The data obtained from DO sag curve is summarized in Table 1. The position where the lowest DO appeared was around 14 – 18 km. If dissolved oxygen levels in water drops below 5.0 mg/ the aquatic life is under stress. According to our data, the lowest DO appeared around 5.6 – 7.5 ppm. Therefore it is not under stress conditions. A high DO level in a water supply gives better taste for drinking water. However, high DO levels speed up corrosion in water pipes.

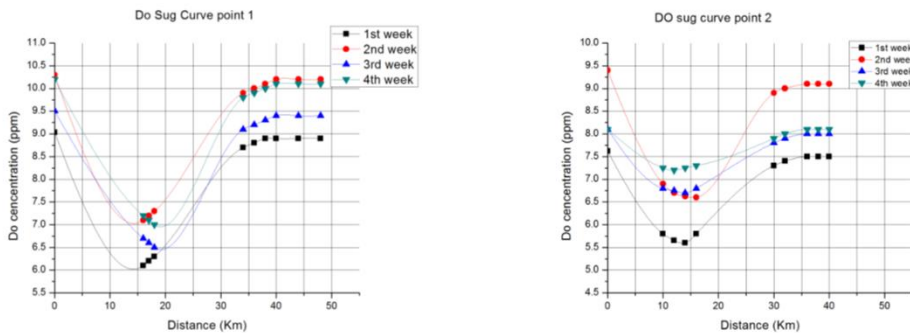


Figure2: DO sag curves in Sample collected Point 01 and 02

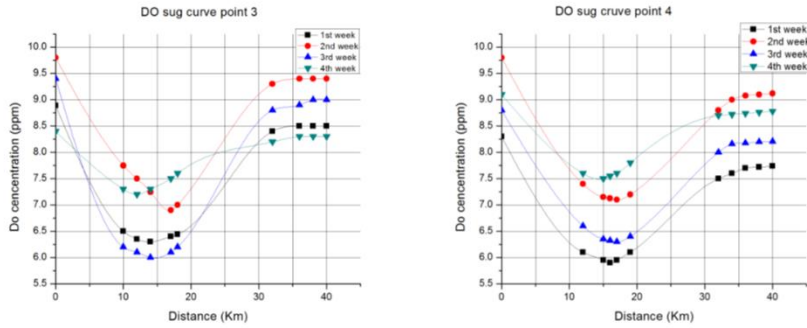


Figure3: DO sag curves in Sample collected Point 03 and 04

point	week	Initial DO/ppm	Critical DO/ppm	Distance (Km)
1	1	9.03	6.2	17
	2	10.3	7.2	18
	3	9.5	6.5	18
	4	10.2	7	18
2	1	7.62	5.6	14
	2	9.4	6.6	16
	3	8.1	6.7	14
	4	8.1	7.2	12
3	1	8.89	6.4	17
	2	9.8	6.9	17
	3	9.4	6.2	18
	4	8.4	7.4	12
4	1	8.3	5.9	16
	2	9.8	7.1	17
	3	8.8	6.3	17
	4	9.1	7.5	15

Table 1: Distance where the low DO concentration was occurring.

## **Conclusion**

Following conclusion and future works can be made as final outcomes based on the results of the current study. Every point has been effect nearby 15km in to the polluted point. Therefore no any kind of effect to the pumping inlet.

In the rainy season high amount of DO concentration is in the water. But in dry season less amount of DO concentration is in the water. Because Oxygen dissolved in water depends on the temperature.

Camper the nitrate and phosphate con centration it shows inverse relationship. It can be change the season wise. In the rainy season there is a high amount of Nitrate concentration in the reservoir. And dry season there is a high amount of phosphate concentration in the water. And also changes in the nitrate and phosphate concentration of the reservoir, change the Algae type in the reservoir.

## **References**

Cox, B.A. (2003). A review of dissolved oxygen modelling techniques for lowland rivers. *The Science of the Total Environment* 314 –316 (2003) 303–334