Monitoring of Water Quality During the Dry Season in Cheung Ek Lake, Cambodia

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ABSTRACT

Choeung Ek Lake is the largest wastewater lake in the capital, has massive water and nutrient inflow. Since 2008, rapid urbanization of the satellite city in Phnom Penh has decreased the lake size and contributed to the lake's water quality degradation. The concentration of different chemical parameters such as pH, electroconductivity (EC), nitrate (NO_3^-), phosphate (PO_4^{3-}), iron(Fe^{2+}) dissolved oxygen (DO) was measured in a week period. The average concentration of the parameters showed a decreasing trend from the inlet to the lake's outlet point. The significant differences in concentration were found in EC, PO_4^{3-} and DO. The comparing the PO_4^{3-} concentration between weekday and weekend was found statistically significant at confidence levels of 0.05 and 0.01.

INTRODUCTION

Cheung Ek Lake performs many functions such as flood control, natural wastewater treatment and cultivation of vegetable production. Around 70% of rain and wastewater in Phnom Penh flows into Cheung Ek Lake through three main canals: Trabek canal, Stung Meanchey canal, and Lou Pram canal before discharging into Bassac River. There are serval studies that pointed out the negative impact of lake's water pollution on the local ecosystem and human livelihoods. As an addition to these, the research have been done to see the quality and the pattern changes in nutrient in the lake.

OBJECTIVES

Objectives
- To analyze the daily changes of water quality parameters during the dry season
- To describe daily and hourly changes of phosphate concentration in the lake
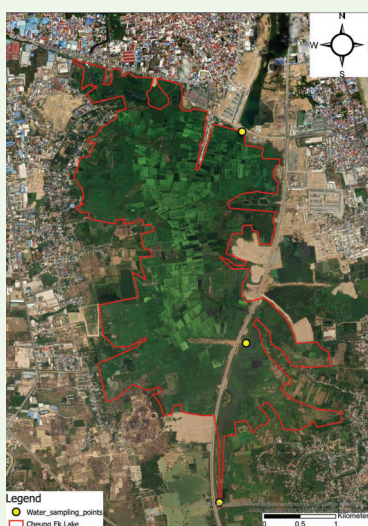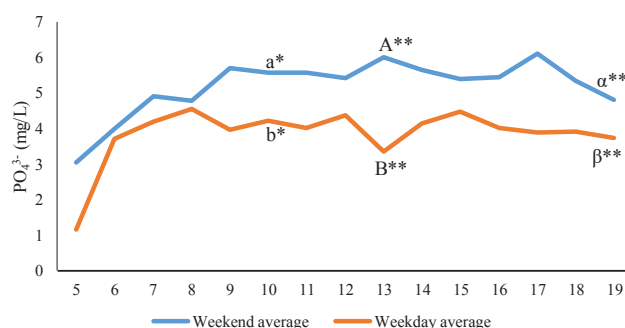
MATERIALS AND METHODS

Fig. 1 Cheung Ek Lake map and sampling points (Google map)

Water sampling and analysis

- Sampling was conducted in inlet, middle and outlet of the lake for seven days in December 2020
- The samples were analyzed for pH, EC, NO_3^-, PO_4^{3-}, Fe^{2+} and DO
- Hourly water sample data were collected for PO_4^{3-} analyze for seven days
- Water samples were analyzed in-situ using a spectrophotometer DR900

RESULTS AND DISCUSSION

Table 1 Chemical parameters of inlet, middle and outlet of the lake

Sampling Location	pH	EC (mS/cm)	NO_3^- (mg/L)	PO_4^{3-} (mg/L)	Fe^{2+} (mg/L)	DO (mg/L)
Inlet	7.7	0.37a*	0.4	4.64ab*	0.08	3.25α*
Middle	7.7	0.36a*	0.4	3.66ab*	0.06	6.3β*
Oulet	7.6	0.33b*	0.1	2.56AB*	0.03	6.75β*

Note: Values are mean (n=3), $*p < 0.01$

The decreasing trends in the inlet concentration to outlet point showed the water quality was improving. This can be because of the plant cultivation, settlement of sediment, nutrient cycle, and microorganism activities inside the lake.

Note: $*p < 0.05, **p < 0.01$

The significant difference at 10am, 1pm and 7pm with confidence level at 95% and 99%, respectively. These hours can represent the busy time of household activities.

CONCLUSION

- The result of the water parameters showed that the water quality improves after it enters the lake
- The result of the PO_4^{3-} concentration suggests that the primary source was from the household activities, not from the industries