

Vulnerability of urban freshwater lakes to emerging pollutants in Colombo, Sri Lanka

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ABSTRACT

Freshwater lakes are an important integral part of city ecosystems. From ecological to recreational, and livelihood aspects to flood controlling and groundwater recharging lakes play a significant role. Nowadays lakes are prime sources for recreation, fishing, tourism, and stormwater runoff in highly dense urban areas. In line with urbanization and rapid development, lake pollution has become a serious ecological issue. Boralessgamuwa Lake which is situated within the Colombo suburb is one of the polluted urban lakes. So far studies carried out identified that lake water is contaminated. However, studies have not focused on sources of pollutant receiving and their impacts on the lake ecosystem. This research aimed to identify the key drivers, pressures, and impact of emerging pollutants in Boralessgamuwa Lake and assess the biological importance of the lake ecosystem. Water quality parameters pH, EC, DO, BOD, COD, nitrate, total phosphate, coliforms, and E-coli were measured. Randomly selected inhabitants in the lake's surroundings were selected for structured interviews. Results of the study show Boralessgamuwa lake is a highly polluted urban water body and subjected to eutrophication. Coliforms and E-coli content of the lake water are high and very high respectively. Results of water quality parameters are pH 7.5, 0.2-0.8us/cm EC, 29oC temperature, 2-8ppm DO, 1-12mg/L BOD, and 4-84 mg/L COD. Pollution is mainly caused by industrial waste, agriculture, solid waste, and recreation activities. Stormwater runoff and sewage pipelines directed to the lake largely affect the lake water quality. The pressure of these key drivers was highly visible from the number of fish species fished. Compared to the last ten years the fish harvest has been reducing in the lake. The lake islets provide green patches for aquatic birds. The number of birds visiting, and inhabiting the lake islets also decreased. The growth and spread of water hyacinths further reduced the water space required for birds. Though species, population, and community-level impacts of pollutants are not tested here, it is unquestionable such impacts are inevitable. Apart from these direct effects, there are several indirect effects also. Thus, lake water pollution has become a serious socio-ecological and socio-economical threat in the Boralessgamuwa suburb. This study recommends regular water quality monitoring, and further research at individual, population, and community levels to identify how emerging pollutants impact aquatic species in Boralessgamuwa lake to protect this biologically significant lake ecosystem.

Key Words: Freshwater, drivers of emerging pollutants, eutrophication, urban lakes, water quality



BACKGROUND

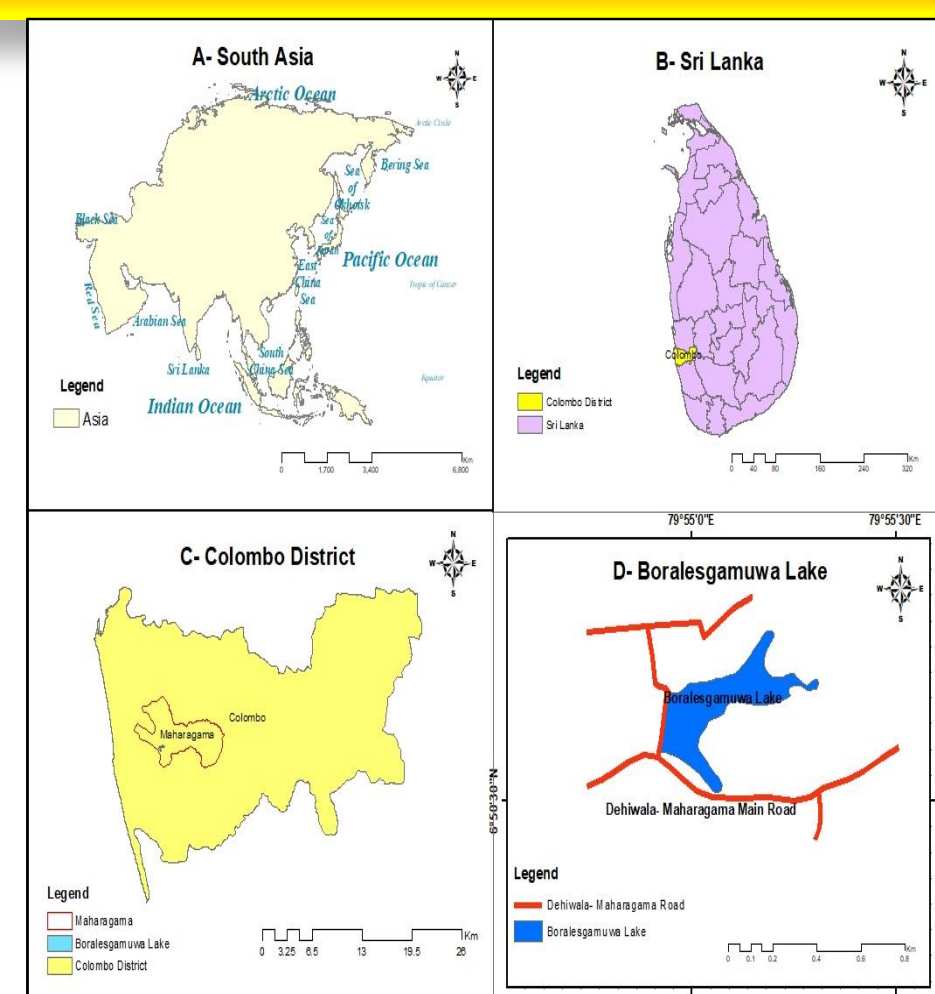
Urban freshwater lakes are at great risk due to various issues. Lakes as ecosystems are important ecologically, socio-economically, and recreationally. An understanding of lake ecosystems and environmental issues associated with lake ecosystems is important.

OBJECTIVE OF THE STUDY

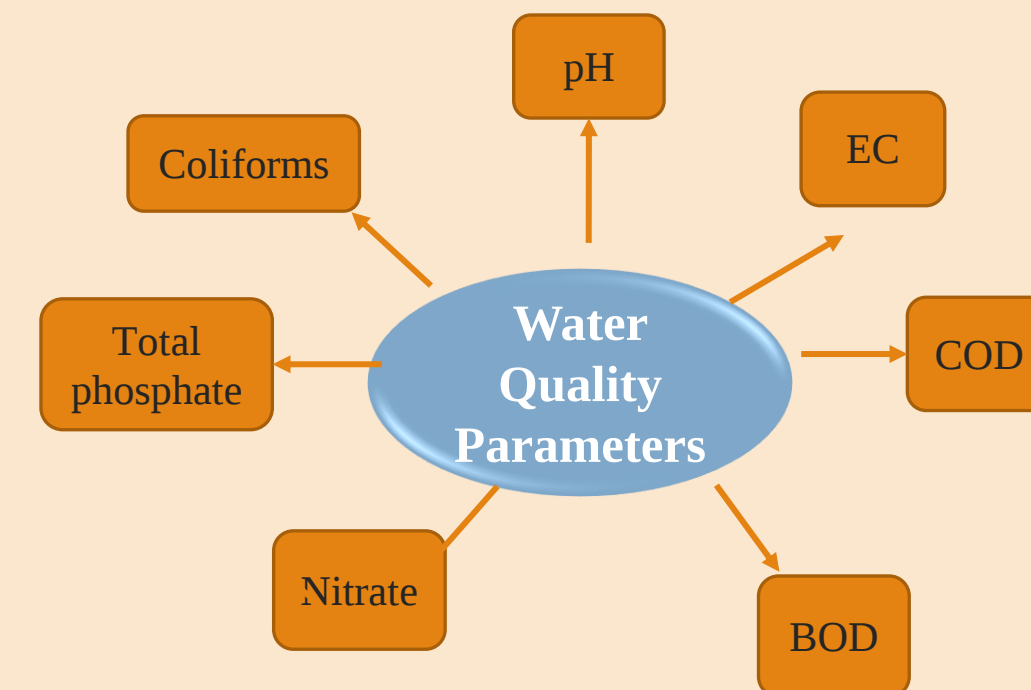
- To identify the key *drivers*, *pressures*, and *impact* of emerging pollutants in Boralessgamuwa Lake and assess the biological importance of the lake ecosystem.

STUDY AREA CHARACTERISTICS

- Boralessgamuwa lake, a dynamic area possessing sub-urbanization characteristics has few industrial buildings, well-wooded home gardens, and a marshy abandoned field near the lake.
- The lake surface area is about 9.86 ha and it lies at 79 ° 54' - 55' East and 6 ° 50 North. Boralessgamuwa lakes belong to the WL3 agroecological zone where the major soil type is Red Yellow Podzolic with soft and hard laterite while Low Humic Gley and Regosols are distributed intermittently.



METHODOLOGICAL APPROACH



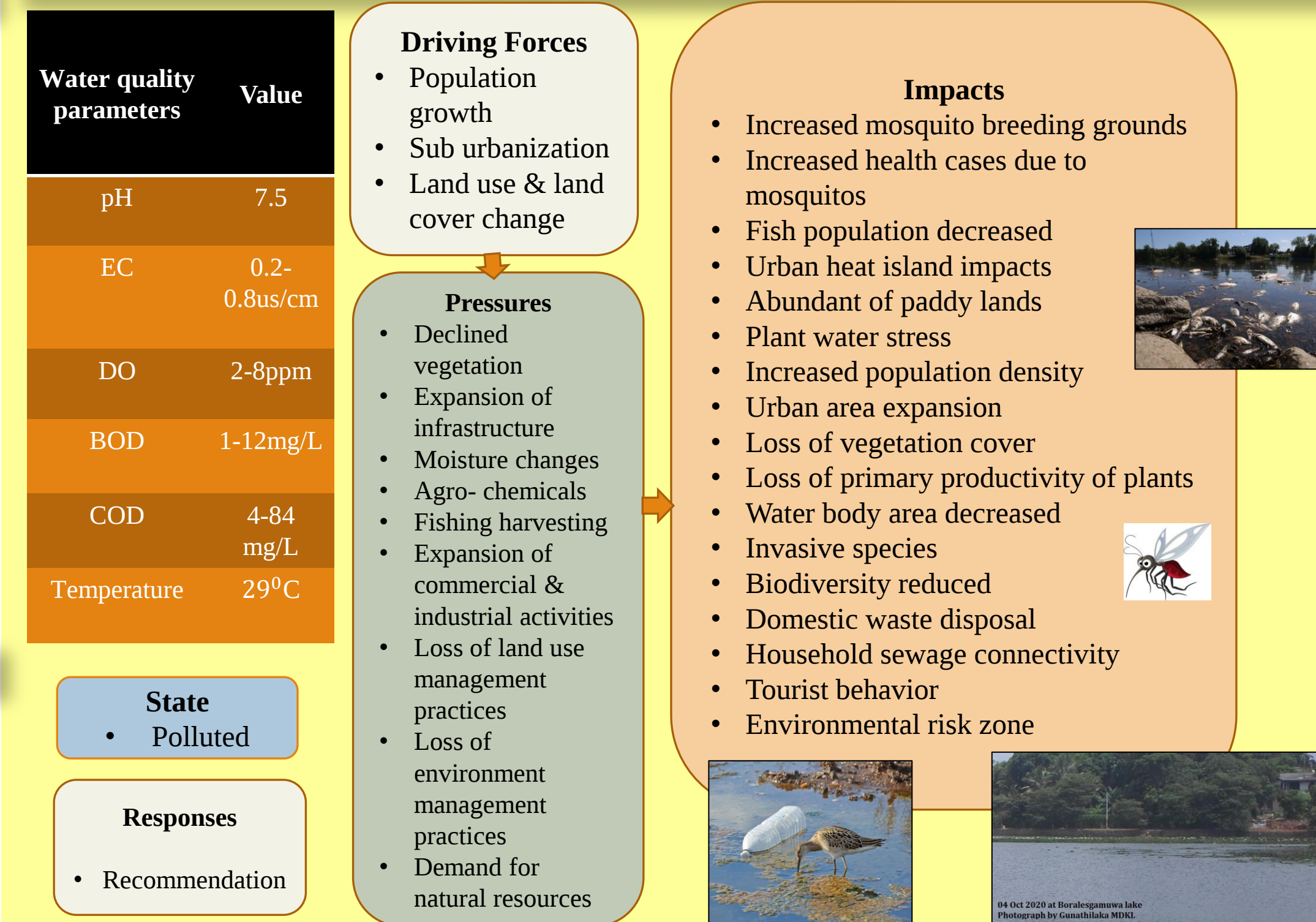
- ☐ Randomly selected inhabitants n= 30 in the lake's surroundings → structured interviews.

RESULTS & DISCUSSION

- Boralessgamuwa lake is a highly polluted urban water body and is subjected to eutrophication.
- Since 2000, the most common issue yet to be addressed is invasive species and water quality.
- Invasion of water hyacinth, scattered Salvinia mats, Kankun (*Ipomoea aquatica*) along with the bunt, and various weeds spread over the slope of the bunt. Scattered *Colocasia esculenta*, *Marsilea quadrifolia* over the water body, and Nil monaressa (*Utricularia reticulata*) (rarely) under the water body are visible making the scenery less attractive.
- Drainage pipes from the town end at the lake provide considerable sludge while household waste and wastewater are also released to the lake.
- The industrial effluents and additional waste from recreational activities already maximize the environmental issues of the lake.
- The spread of plastic waste and alcohol cans is observable.
- Unauthorized settlers and encroachments were identified since 2000.
- High coliform fecal coliform counts were reported.
- The fish and bird population has declined more than before.
- Threatened rich biodiversity.



DPSIR-BORALESGAMUWA LAKE



CONCLUSION

Lake water pollution has become a serious socio-ecological and socio-economical threat in the Boralessgamuwa suburb.

RECOMMENDATION

This study recommends regular water quality monitoring, and further research at individual, population, and community levels to identify how emerging pollutants impact aquatic species in Boralessgamuwa lake to protect this biologically significant lake ecosystem.

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