

The Impacts of Causeway Modifications on Water Quality in Rekawa Lagoon, Sri Lanka

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Abstract

Rekawa lagoon, a major coastal aquatic system on the southern coast of Sri Lanka that supports numerous ecosystem services, has experienced impaired ecological integrity due to construction activities near the lagoon mouth. Water exchange through the causeway has undergone several modifications and evolved from 23 pipes (30 cm diameter) in 1984, to a partial bridge (6.2 m) in 1999, then eight larger culverts (79 cm diameter) with a partial bridge in 2005, followed by a complete bridge in 2018. Although these modifications have a potential to change the water quality of the lagoon, a comprehensive scientific report in this regard is unavailable. The present study was designed to compare the water quality of lagoon in parallel to these modifications by using published historical literature together with field observations conducted in August 2024 selecting eight sampling sites (S₁-S₈) across the lagoon. Salinity, Temperature, pH, Dissolved Oxygen, Nitrate nitrogen, Orthophosphate, Total dissolved solids, Total suspended solids, Chlorophyll-a, Turbidity, Chemical oxygen demand, Secchi depth and Electrical Conductivity were measured, and the Lagoon Water Quality Index (L-WQI) was calculated. Salinity levels recorded in 1994, 2002, and 2005 were 4.81 ± 0.66 ppt, 5.7 ± 4.4 ppt, and 8.1 ± 0.6 ppt, respectively, while the value increased to 9.78 ± 0.94 ppt in 2024. Significant differences ($p < 0.05$) were observed in salinity, temperature, pH, and Secchi depth between historical water quality and present findings, demonstrating notable improvements in lagoon water quality over time. L-WQI of study sites were range from 49.42 ± 0.52 to 56.70 ± 0.12 . L-WQI were significantly different ($p < 0.05$) among sites, where two sites (S₂ and S₆) were classified under “critical condition”, while the remaining sites were categorised as “good condition”. Present findings revealed that the causeway modifications have significantly altered the water quality dynamic of Rekawa lagoon, and the L-WQI indicated that, restoration efforts have improved water quality, but specific areas are still facing localized pollution and nutrient loading. This study recommends sustainable management strategies and conservation programs to preserve ecological health, support local livelihoods, and ensure the long-term sustainability of the Rekawa Lagoon ecosystem.

Keywords: Causeway, ecological integrity, lagoon water quality index (L-WQI), Rekawa lagoon, water quality