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Impact of Wastewater Treatment Plant on the Quality of Water in the Canals Passing Through Kurunegala City

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Water scarcity is a growing concern worldwide, leading to the adoption of innovative treatment solutions. Urban stormwater drains collect runoff and wastewater released from many urban entities. Canals passing through Kurunegala city have been a traditional means of irrigation but also serve as stormwater drains collecting polluted water causing public health problems. Communities have complained about commercial establishments, residents, institutions, and hospitals releasing untreated wastewater into these canals. In response, the Greater Kurunegala Sewage Treatment Plant (GKSTP) was commissioned to address the issue in 2018. The GKSTP is not covering the whole city and is not operated up to its maximum capacity (73% of the capacity is operated). This study aimed to investigate the impact of wastewater treatment by the GKSTP on water quality in canals passing through Kurunegala City. Water samples were collected from seven sampling sites along the canals during the dry (DS) and wet (WS) seasons. Physical, and chemical parameters were measured to determine the water quality from each sampling point. The study employed General Linear Model (GLM) to assess the spatial and temporal variations in physicochemical parameters of water. Cluster analysis identified patterns, and Analysis of Similarities evaluated the significance. Distance-based Redundancy Analysis analyzed overall parameter influence on seven locations. The effectiveness of the GKSTP in improving water quality was evaluated using the Water Quality Index (WQI). Physicochemical parameters of water along Kurunegala city canals exhibited notable spatial and temporal variation ($p < 0.05$, GLM). The WQI of the canals in 2005 was around 35.2, indicating bad water quality, however, at present, it is 49.4, indicating a significant improvement in water quality ($p < 0.05$, ANOVA). However, the current WQI is still not satisfactory as it depicts that the GKSTP has not been able to achieve good water quality ($90 > \text{WQI} > 69$) in the canals. The GKSTP has a positive impact on the water quality of the canals, with significant reductions observed on key indicators of organic pollution and sedimentation, such as BOD₅ and TSS. Improvements have been noted in nitrate levels, indicating a reduction in acidity and nutrient pollution. These findings suggest that the GKSTP is partially effective in removing pollutants from the canals. Unconnected areas need to be connected to the GKSTP to improve the effectiveness of the treatment plant.

Keywords: Pollution, Treatment plant, Urban canal, Wastewater, Water Quality Index