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Engineered Solution to Improve Water Quality of Urban Water

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Abstract

The Kirulapone canal is one of the most polluted urban canals situated in residential and commercial area of the metro Colombo region. Although this is a drainage canal which is facilitated to prevent flooding in urban city of Colombo, it consists of unfavorable colour, eutrophication, and bad odor due to the haphazard wastewater disposal, crummy attitudes of inhabitants, which contribute to the nutrient enrichment of surface water ecosystems. This research illustrates the use of a constructed wetland to purify the canal water in the tributary of Kirulapone canal which flows across the Open University Premises.

This study is focused on designing a constructed wetland to reduce the high phosphate level and to reduce or remediate the disrupting compounds that negatively effect on the canal water quality. A canal bed level and pilot scale water quality surveys were carried out to identify the canal behavior and its current pollution status. The catchment area of the tributary is 0.47km^2. The canal water discharge of the tributary was measured using a v-notch and the minimum discharge 0.05 m^3/s was used for the designing purpose. After a continuous hydrological study on canal routing such as water level fluctuation, flood frequency condition with the interaction of precipitation within the selected catchment area, the retention time of the constructed wetland was decided. Subsequently size of the wetland is driven simultaneously providing good flood reduction and adequate supply even in the dry season with series of additional technical components to optimize the wetland functions. Biochar was obtained by pyrolyzed *Gliricidia sepium*, which is a byproduct of dendro power generation of Sri Lanka. The phosphate removal rate of biochar within the retention time was determined and suitability of native hydrologic plants for the wetland was in cooperated to the canal purification system.

According to the analysis, horizontal subsurface constructed wetland system with the combination of biochar was suggested due to the high potential of biochar to recapture excess nutrient. The wetland is designed with several technical aspects to properly function in both tropical and rainy climates. The benefit of constructed wetland system is discussed in the context of the global trend for introducing sustainable methods of environmental management and low cost pollution treatment system.

***Keywords*:** Biochar, Kirulapone canal, Urban water quality, Constructed wetland, Phosphate removal