Suitability of Constructed Wetlands and Waste Stabilisation Ponds in Wastewater Treatment: Nitrogen Transformation and Removal

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Abstract

It is estimated that 90% of sewage in cities in developing countries are today discharged untreated into water bodies. In Tanzania, pollution of rivers such as Karanga, Njoro and Rao in Moshi; Mirongo in Mwanza and Themi in Arusha is the cause of frequent disease outbreaks in communities downstreams. Solutions to effluent crisis can be found by its proper treatment and disposal. The principal objective of wastewater treatment is to allow effluents to be disposed without danger to human health or unacceptable damage to the ecology of receiving water bodies. Field investigations were made on pilot scale horizontal subsurface flow constructed wetlands (CW) units located downstream of waste stabilisation ponds (WSP). Six units filled with gravel of 6–25 mm diameters in equal proportion, which gave an initial hydraulic conductivity of 86 m/d were used. While four units covering surface area of 40.7 m^2 each, were located downstream of primary facultative pond, the other two units with surface area 15.9 m^2 each were located downstream of maturation pond. An attempt was made to compare the output of mathematical models for *Phragmites* and *Typha* macrophytes located downstream of primary facultative pond. Based on total inflow nitrogen of 1.457 gN/m^2 d, while*Phragmites* has shown a removal of 54%, *Typha* had a removal of 44.2%. Furthermore, while the system downstream of primary facultative pond has accretion as a major pathway, accounting for 19.1% of inflow nitrogen, the system downstream of maturation pond has denitrification as its major removal mechanism accounting for 20.5%. In this paper, a comparison of land required by CW and WSP based on the amount of water to be treated is made.

Keywords

Constructed wetlands;
Pollution;
Phragmites;
Typha;
WSP;
Nitrogen