

Praneeth Nishadi Wicramarachchi 2008: Greenhouse Gas Emission from Constructed Wetland for Treating Landfill Leachate in the Tropics. Master of Engineering (Environmental Engineering), Major Field: Environmental Engineering, Department of Environmental Engineering. Thesis Advisor: Associate Professor Chart Chiemchaisri, D.Eng. 127 pages.

This research was carried out to determine the emission of greenhouse gas from constructed wetland (CW) for treating landfill leachate. Two subsurface horizontal CWs located in Asian Institute of Technology (AIT) were used to carry out experiments. In first run hydraulic loading rate (HLR) of 28 mm/d and hydraulic retention time (HRT) of 10 days were functioned with only fresh leachate whereas in second run fresh and stabilized leachate with mixing ration 1:1 were used. CW was evaluated in term of greenhouse gas emission and treatment efficiencies of leachate until CW reached to steady state condition. CH<sub>4</sub>, CO<sub>2</sub> and N<sub>2</sub>O were investigated as greenhouse gases and leachate in term of COD, BOD<sub>5</sub>, TKN, NH<sub>3</sub>-N and pH were tested.

The experimental results revealed that the CWs were prone to emit greenhouse gases. In both runs the organic pollutant removal efficiencies were ranged 93-98% whereas N removal was ranged 40-53%. CH<sub>4</sub> and CO<sub>2</sub> emission from constructed wetland were found in the range between ND to 0.732 g CH<sub>4</sub>-C m<sup>-2</sup>.d<sup>-1</sup> and 0.096- 3.266 g CO<sub>2</sub>-C m<sup>-2</sup>.d<sup>-1</sup> respectively. The emission of both gases was higher during the warmer months. Water table showed a negative relationship for both gas emissions whereas elevated temperature had a positive relationship. Furthermore diurnal variation showed that the emissions of CH<sub>4</sub> and CO<sub>2</sub> increased during night time. The increase was 10-20% for CH<sub>4</sub> and 30-80% for CO<sub>2</sub>. N<sub>2</sub>O emission was not detected at ppm level. Both aerobic and anaerobic conditions prevailed in most underlying bed area and it affected the greenhouse gas emission from the system. No total aerobic area was found in both runs. The ORP value was always well below the +200 mV.

Organic carbon balance showed only 3-4 % of influent organic carbon was removed from the systems via greenhouse gas emission. More than 93% of influent organic C has been accumulated in wetland, while only 3-4% removed with outflow.

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