

NAT

**PERFORMANCE OF NATURAL WETLANDS IN DOMESTIC  
WASTEWATER TREATMENT: A CASE STUDY OF MOI UNIVERSITY  
WETLAND**

**BY**

**NAKITARI ERICK OJIAMBO**



**A THESIS SUBMITTED TO THE SCHOOL OF ENGINEERING OF MOI  
UNIVERSITY IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR  
AWARD OF THE DEGREE OF MASTER OF PHILOSOPHY IN WATER  
ENGINEERING**

**DEPARTMENT OF CIVIL AND STRUCTURAL ENGINEERING  
SCHOOL OF ENGINEERING  
MOI UNIVERSITY**

**OCTOBER 2011**



### ABSTRACT

In recent years the benefit of wetlands in improving water quality has been widely recognised. Their capacity in the treatment of municipal and industrial wastewater as well as the removal of heavy metals and other toxic substances has gained considerable attention on an international scale and especially in developed temperate countries. However, insufficient information on the performance of natural wetlands has limited their application within the tropics. This study evaluated the performance of Moi University wetland in the removal of pathogenic indicators, biodegradable organics and nutrients of concern found in domestic sewage. The influent and effluent samples were collected from the wetland and analysed for the various parameters using standard methods. Removal efficiencies for BOD<sub>5</sub>, COD, Total Nitrogen, Total Phosphorus and Faecal coliforms of 85, 82, 79, 59, and 99 % respectively were observed. A process based model, LAVINKS-WEB was run for the wetland to predict its removal efficiency for nutrients. It gave a removal efficiency of 75% and 56% Total Nitrogen and Total Phosphorus respectively. This compares well with the Wetland's measured nutrients removal efficiencies of 79% and 59% for Total Nitrogen and Total Phosphorus respectively. Scenario modelling indicated that a reduction in the wetland's area, a decrease in wastewater depth and an increase in wastewater flow rate led to a reduction in wetland's performance in wastewater treatment and vice versa. Encroachment of the wetland should be discouraged for it to continue being effective in wastewater treatment.