Spatial Model for Water Quality Changes of Urban Canals and
Associated Land Use Pattern in Colombo City

By

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ABSTRACT

Studying of the complex relationship between surface water quality and land-use patterns in different regions under various spatial scales is a prime importance to explore effective methods for mitigating the water pollution. The focus of this study was to use a GIS based approach together with statistical analysis to examine the plausible and complex relationships to water quality of the canals in Colombo urban area with rainfall of climatic seasons, land use types, and population density. The data on land use, monthly rainfall, population density and water quality from 2003 to 2009 were collected from Department of Survey, Department of Meteorology, Department of Census & Statistics and SLLR&DC respectively. Parametric and Nonparametric statistical analysis techniques were used to analyse the relationship of land-use categories, rainfall and population density with water quality attributes namely pH value, Conductivity, Turbidity, Temperature, Dissolved Oxygen, Ammonia, Nitrate, Phosphate, COD, BOD and Salinity percentage. Majority of the selected water quality parameters except Dissolved Oxygen and BOD were in the permissible ranges of the general water quality standards in Sri Lanka. The seasonal mean values of COD, BOD, Turbidity and Conductivity remarkably vary at six sub-watersheds and they are statistically significant. The investigation reveals that the quality of canal water at these locations is found to be polluted with domestic pollutants and not suitable for the domestic purposes without any treatment. There is a strong significant difference within the mean values of Conductivity, COD, BOD and Salinity% according to the climatic seasons. The mean differences of COD, Conductivity, and Salinity% occur with the effect of third season (second inter-monsoon) and the second season (first monsoon) is affected for the mean difference of BOD. However, there are no significant mean differences of seasons on Turbidity, Ammonia and Dissolved Oxygen. Three out of eleven water quality attributes; Temperature, COD and Salinity% are significantly correlated with seasons. The correlation coefficients are -0.570, -0.225 and -0.216. It
presents a higher negative correlation between the Temperature and climatic seasons. It is found that there is no any relationship between the water quality and the population density. A significant regression model could be drawn to predict the surface water quality in Colombo city using one water quality indicator (BOD) which may suggest point sources contribute more pollutants than non-point sources.
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