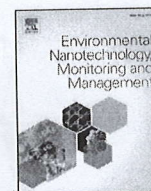




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## Environmental Nanotechnology, Monitoring &amp; Management

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# Surface water quality assessment for the management of hydrological regimes: Kalu Oya and Mudun Ela catchment in Sri Lanka

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## ARTICLE INFO

## Keywords:

Surface water quality  
Spatial autocorrelation  
Land-use  
Oil & grease  
Urban catchment

## ABSTRACT

This study aims to assess the relationship between surface water quality and the land-use of an urban catchment named 'Kalu Oya and Mudun Ela catchment' located in the western province, Sri Lanka. Ten judgmental sampling locations of the streamflow were selected to measure water temperature, pH, salinity, conductivity, Total Dissolved Solids (TDS), Biological Oxygen Demand (BOD<sub>5</sub>), Chemical Oxygen Demand (COD), oil & grease, nitrate and dissolved phosphorous levels, flow rates over five months of the period from June to October 2018. All these parameters varied independently with a significant difference from other sites (ANOVA,  $p < 0.05$ ). Water temperature and nitrate levels showed a strong clustering pattern with positive Moran's index values supported by higher Z-scores. (Moran's index 0.557 and 0.5106, Z-score 2.773 and 2.419 respectively). Higher oil & grease levels exceeding the accepted levels were observed at all the sampling sites. Oil & grease values showed a strong positive correlation with the flow rate (Coefficient-0.807, P value-0.005) revealing that higher oil & grease levels in the stream may be resulted by subsurface flushing. Site O2 is affected by the effluent discharged by the Colombo fish market having higher phosphate and TDS levels. Clustering pattern of nitrate and dispersed pattern of oil & grease of the Kalu Oya and Mudun Ela catchment show evidence of the poor drainage system in the catchment. Improving the drainage system may enhance water infiltration by reducing the volume of runoff and improve the water quality by that it can be used as an effective urban storm water drainage system in the hydrologic water regime.

## 1. Introduction

Unplanned urbanization has made water pollution a severe issue mainly in developing countries. Direct discharges of pollutants into water contribute to the water quality degradation in such water regimes. Surface runoff across urban landscapes make the natural waters polluted as they bring waste generated by the upstream anthropogenic activities to the open drainage system and finally ends up in natural waters. Hence both point and diffuse source pollution in urban catchments need to be monitored to secure the water quality within the accepted standard levels (Kipyego and Ouma, 2018). Not only that but also the haphazard developments and developmental activities such as land clearing, constructions of highways and buildings, and alteration of natural channels have significantly modified the hydrologic regimes in urban catchments (Yusop et al., 2011). Thereby, poor drainage, flood inundation during rainy seasons and concentration of pollutants get lined up next making the conditions worse at these catchments (Kändler et al., 2017).

The complex variation in water quality of streams which flow across

diverse urban spaces is an important factor in effective catchment management once they are linked with the spatial characteristics of the catchment like land-use (Girardi et al., 2016; Mei et al., 2014; Nilsson and Renöfält, 2008). The information about the driving factors influencing the water quality with relevance to the pollutants is the key information required in water environment research. (Liu et al., 2016). The relationship between land-use/ land-cover and the water quality parameters have been studied by many researchers around the world using different methods and analytical software (Richard and Ogba, 2016; Kändler et al., 2017; Camara et al. (2019) have done a review article on 'Impact of land uses on water quality in Malaysia' which gives a summary of many of the studies done in Malaysia to address the relationship between land-use and the water quality parameters in very concise manner.

Sri Lanka being a developing country with rapid and haphazard developments, surface water quality is subjected to deterioration due to pollution. The polluted water finally ends up in the surface waters, subsurface waters and sometimes to the groundwater. Western province

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