

(131)

Modeling the Water Quality of Attanagalu Oya

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Abstract

Attanagalu Oya is an economically important river in Sri Lanka which is a major source of supplying potable water, water for industries, irrigational activities and for the maintenance of aquatic ecosystems. Rapid urbanisation and anthropogenic activities in the catchment area increase the level of pollution of the river basin and it is one of the river basins that is constantly affected by floods. The current study focused on the statistical analysis of data that had been acquired through assessment of the water quality of Attanagalu Oya and the impact of rainfall on the river basin using 16 water quality parameters collected from 10 water quality monitoring stations and 5 rainfall gauging stations. The trends in rainfall in the river basin and water level were investigated using Mann-Kendall's test and Sen's slope estimator test. The results of trend analysis of rainfall showed a negative trend in January and a positive trend in June for the Katunayake rain gauge station. The results of monthly trend analysis for the water level confirmed the potential for flood occurrence in May. Generalised linear and ARIMA models were developed to predict daily precipitation and water level of the river basin and flood alerts in Attanagalu Oya were forecasted with sufficient lead time. Multivariate analysis revealed that cluster analysis is an efficient technique to identify homogeneous clusters among sampling sites and water quality parameters. Moreover, the principal component analysis and factor analysis determined the major sources of pollutants contributing towards water pollution in each identified homogeneous cluster. The ordinal logistic model fitted predicts the flood alerts with an accuracy of 93.7%. Therefore, the results and techniques used for this study could be applied in further research work to explore the pollution extent of the river. Thus, this model can be used by the respective authorities for decision making purposes in effective water quality management.

Keywords: Attanagalu oya, Water quality, Multivariate analysis, Trend analysis