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DEVELOPMENT OF TRACE METALS CONCENTRATION MODEL FOR RIVER: APPLICATION OF PRINCIPAL COMPONENT ANALYSIS AND ARTIFICIAL NEURAL NETWORK

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Abstract

Rapid development along the Kuantan River was long perceived as the rivers serve many communities in terms of drinking water source, domestic, fisheries, recreation, and agricultural purposes. Due to the rapid changes in technology and upsurge in chemical usage, pollutant alterations turn out to be more drastic with respect to space and time. Research on the trace metals in river water is quite limited in Malaysia, probably due to their ppb-level existence and the need for special handling techniques. Hence, the aim of this study is to forecast heavy metals concentration in Kuantan River waters using a collective of 10 years (2007 – 2016) dataset of heavy metals that provided by the Department of Environment, Malaysia. Principal Component Analysis (PCA) was used to compute the data, which showed that As, Cr, Fe, Zn and Cd explain 67.3% of the total variance through three principal components. For ANN computation, those significant metals extracted from rotating PCA was selected and used in ANN model. The developed approaches were trained and tested using 80% and 20% of the data, respectively. Then, the coefficient of determination (R²) was executed to calculate the model performance. Out of five metals, only As shown acceptable R² for ANN models with 0.8690 and 0.8088 for training and testing, respectively, probably due to the model's limitation. Generally, this study illustrates the usefulness of PCA and ANN for analysis and interpretation of complex data sets and understanding the temporal and spatial variations in the Kuantan River for effective river water management. © 2023, Zibeline International Publishing Sdn. Bhd.. All rights reserved.

Author Keywords

Chemometrics; Estuaries; Forecasting; Heavy metals; Neural networks

Index Keywords

artificial neural network, drinking water, estuarine environment, forecasting method, principal component analysis, river water; Kuantan River, Malaysia, Pahang, West Malaysia

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