Assessment of Pulsating Water Quality of Surface Water Body, Using Multivariate Statistical Techniques: A Case Study of The Mahanadi Water System

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ABSTRACT

The surface water quality of Mahanadi river system in Odisha was analysed by applying the multivariate statistical techniques including cluster analysis (CA), factor analysis (FA) and principal component analysis (PCA). Agglomerative hierarchical cluster analysis (AHC) grouped 13 sampling sites into three clusters namely less polluted (LP), moderately polluted (MP), and highly polluted (HP) sites under the similarity of surface water quality parameters. The application of factor analysis/ principal component analysis to the evaluated data set of three different clusters, generates four PCs for LP and MP and two PCs for HP having eigen value >1. The PCs obtained from factor analysis indicates that the increase in load of nitrate (NO$_3$−N); nitrite (NO$_2$−N); ammonical (NH$_4$-N), total Kjeldahl nitrogen (TKN), total phosphorous (TP) and decrease in DO, pH level of water in HP and MP sites, display the intensity of organic pollution in the river that are mainly attributed to agriculture runoff, industrial effluents and regional anthropogenic contributions from both point and non-point sources. Thus these methods are believed to be valuable for water resource manager to identify the complex nature of water quality issues and determine the relative precedence to enhance the water quality of surface water body.

Keywords: Mahanadi River, Industrial/Urban sewage, Cluster analysis, Principal Component analysis, Statistical analysis, Water quality.

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