

DETERMINING SEASONAL PATTERN IN STREAM WATER QUALITY: A CASE STUDY OF RIVER MAHANANDA AT SILIGURI, WEST BENGAL, INDIA

Rupak Kumar Paul

Assistant Professor, Department of Geography & Applied Geography, University of North Bengal,
E-mail: rupaknbu@gmail.com

Abstract

The objective of the present study is to recognize the seasonal pattern in water quality status of the stretch of river Mahananda at Siliguri Municipal Corporation of West Bengal. Monthly observations on 21 water quality parameters for the period between January, 2010 and May, 2022 were used for resolving the present problem. The whole database was generated by West Bengal Pollution Control Board following the guideline of Central Pollution Control Board, Govt. of India. The Hierarchical Cluster Analysis was applied to determine the seasonality while Spearman's Rank correlation was used for determining the association of water quality parameters with seasonal and monthly normal rainfall total in view to capture the role of rainfall in controlling such seasonality. The result demonstrates that the temporal change in water quality status forms three specific hydrogeochemical seasons, January to May, June to August, and September to December which are governed by local rainfall pattern. Further observed that geogenic parameters e.g., Turbidity, TFS, TSS etc. completely follow seasonality of rainfall but this straight forward relation is not found for anthropogenic contaminants. Many anthropogenic parameters (e.g., Na^+ , EC, TA etc.) show significant negative relationship with rainfall while many of them (e.g., BOD, DO, etc.) do show any pattern at all. Since rainfall cannot fully explain the whole complexity, the role of other factors like discharge associated with hydrogeochemical seasons, needs to be evaluated in this context.

Keywords: Hierarchical Cluster, Seasonal pattern of stream water quality, River Mahananda, Spearman's Rho

Introduction

Stream water quality is a dynamic phenomenon which at a given place changes across the seasons if such change is largely controlled by local climate. The man-induced processes, on the other hand, may also cause the status of stream water quality to have seasonal response but the mechanism in this case is somehow different from the way the nature itself governs the system.

Usually, water contamination of anthropogenic substances which occurs in many ways e.g., disposal of urban and industrial sewage, solid waste etc. constitute the constant polluting sources (Pejman et al., 2009). But the fluctuating river discharge that is caused by seasonality in rainfall eventually dilutes the concentration of such pollutants during high flow period. Therefore, during wet season such anthropogenic pollution gets moderated while during dry period it becomes mighty enough and hence, there produces the seasonality in stream water quality. Contrary to this, the agricultural activity that pollutes the river water through fertilizer and pesticide contamination becomes very influential only during rainy seasons since this kind of pollution is caused by agricultural runoff which is generated by rain water. On the other hand, during dry seasons agriculture eventually has no effect on stream water as the agricultural runoff during this period ceases to exist. Therefore, anthropogenic processes can create specific patterns in water quality status in both urban and rural environments, but they have characteristic differences.