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Perspective

Investigating the Administration of Coastal Water by Implementing Various Procedures

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DESCRIPTION

Coastal waters are vital for the ecological and economic well-being of a country, as they support a rich diversity of marine life and provide various services and resources. However, coastal waters are also vulnerable to various natural and anthropogenic pressures, such as land-based runoff, sewage discharge, industrial effluents, aquaculture activities, and eutrophication, which can affect their quality and productivity. Therefore, monitoring and assessing the coastal water quality is essential for understanding the spatio-temporal variations and identifying the sources and impacts of pollution.

The southeast coast of India is one of the longest and most densely populated coastal regions in the country, stretching along the Bay of Bengal from Chennai to Kanyakumari. It encompasses five coastal districts: Chennai, Cuddalore, Nagapattinam, Thanjavur, and Thoothukudi. This region is characterized by diverse coastal ecosystems, such as sandy beaches, rocky shores, coral reefs, mangroves, estuaries, and lagoons. It is also influenced by various natural factors, such as monsoon rainfall, river discharge, tidal currents, and coastal upwelling. Moreover, this region faces various anthropogenic pressures, such as urbanization, industrialization, tourism, fishing, and aquaculture, which can affect the coastal water quality.

In this study, we investigated the coastal water characteristics along the southeast coast of India using a multivariate approach. We collected water samples from 25 stations covering both nearshore and offshore waters during four seasons: pre-monsoon (March-April), monsoon (October-November), post-monsoon (December-January), and summer (May-June). We measured various physicochemical parameters, such as temperature, salinity, pH, Dissolved Oxygen (DO), Turbidity, Total Nitrogen (TN), Total Phosphorus (TP), ammonia, nitrate, phosphate, and silicate. We used Analysis Of Variance (ANOVA) to test the seasonal and spatial differences among the parameters. We also used box-whisker plots to visualize the distribution and variability of the parameters. We applied Principal Component Analysis (PCA) to identify the main factors influencing the coastal water quality. We also calculated the N/P ratio to assess the nutrient status and potential for eutrophication.

The results showed that the coastal water characteristics varied significantly among seasons and stations. The temperature ranged from 24.5°C to 32.4°C, with the highest values in summer and the lowest in monsoon. The salinity ranged from 28.6°C with the lowest values in monsoon due to freshwater influx and the highest values in summer due to evaporation. The pH ranged from 7.8 to 8.4, with higher values in post-monsoon and lower values in monsoon. The DO ranged from 3.2 mg/L to 6.8 mg/L, with higher values in monsoon due to mixing and lower values in summer due to stratification. The turbidity ranged from 0.8 with higher values in monsoon due to sediment resuspension and lower values in summer due to settling.

The TN ranged from 0.9 mg/L to 7.1 mg/L, with higher values in monsoon due to riverine input and lower values in summer due to uptake by phytoplankton. The TP ranged from 0.1 mg/L to 1 mg/L, with higher values in post-monsoon due to sewage discharge and lower values in summer due to adsorption by sediments. The ammonia ranged from 0.02 mg/L to 0.8 mg/L, with higher values in monsoon due to organic matter decomposition and lower values in summer due to nitrification. The nitrate ranged from 0.1 mg/L to 4 mg/L, with higher values in summer due to upwelling and lower values in monsoon due to dilution. The phosphate ranged from 0.01 mg/L to 0.4 mg/L, with higher values in summer due to upwelling and lower values in post-monsoon due to precipitation by calcium carbonate. The silicate ranged from 1.2 mg/L to 12 mg/L, with higher values in monsoon due to riverine input and lower values in summer due to uptake by diatoms. The PCA revealed that four principal components explained 81% of the total variance among the parameters.

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