

A Review of Environmental Factors Affecting River Water Quality in Peninsular Malaysia

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Structured Abstract

Background: Rivers in Peninsular Malaysia are vital for domestic water supply, ecological health, and socio-economic development. However, river water quality has steadily declined due to a combination of natural environmental dynamics and anthropogenic pressures. Natural drivers such as monsoonal rainfall, aquifer vulnerability, and geological conditions establish the baseline quality of river systems. These are increasingly compounded by rapid urbanization, agricultural runoff, and untreated industrial discharges.

Methods: This study conducted a narrative review of scientific publications, government reports, and environmental assessments published between 2014 and 2024. The sources were selected based on their relevance to key river water quality indicators, including biochemical oxygen demand (BOD₅), chemical oxygen demand (COD), total suspended solids (TSS), nutrient enrichment, and microbial contamination. Studies covering both natural and anthropogenic factors influencing these parameters were synthesized thematically.

Results: The review identifies consistent degradation trends in water quality across urban and agricultural catchments. Urban development contributes significantly to BOD₅ elevation, COD loads, and microbial contamination, often linked to poor sanitation infrastructure. Agricultural areas show increased nutrient concentrations and sediment loads, contributing to eutrophication. Industrial zones are associated with high levels of organic waste and heavy metals. Natural factors such as seasonal rainfall amplify pollutant transport, especially in areas with exposed soils and unregulated land use. Regions underlain by shallow, unconfined aquifers are particularly vulnerable to contamination due to surface–subsurface interactions.

Conclusion: The review highlights that both natural and anthropogenic factors exert a synergistic effect on river water quality deterioration in Peninsular Malaysia. Effective mitigation requires integrated watershed management approaches, enhanced land use controls, improved wastewater infrastructure, and climate-adaptive policies. These strategies are essential to safeguard freshwater resources and ensure long-term water security.

Keywords: River water quality, Peninsular Malaysia, Urbanization, Monsoon runoff, Anthropogenic pollution

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