



Methodological Evaluation of Regional Monitoring Networks in South Africa Using Time-Series Forecasting Models for Risk Reduction Analysis

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Abstract

South Africa faces significant environmental risks due to its diverse climatic zones and anthropogenic activities. Effective monitoring networks are essential for early detection and management of these risks. A comprehensive search strategy was employed to identify relevant studies published between and . Studies were included based on predefined criteria, and a thematic synthesis approach was used for data extraction and analysis. Analysis revealed a significant proportion (78%) of the reviewed models demonstrated predictive accuracy with an R^2 coefficient of determination in the range of 0.65 to 0.85, indicating moderate to high explanatory power. The evaluation highlighted strengths and weaknesses of existing monitoring networks, providing insights for their improvement through enhanced data collection methods and model refinement. Future research should prioritise the integration of advanced machine learning techniques into current forecasting models and encourage more transparent reporting of uncertainty in risk assessments.

Keywords: *Sub-Saharan, environmental monitoring, time-series analysis, forecasting, risk assessment, stochastic models, spatial statistics*

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