African Computational Statistics (Technology/Maths)

Methodological Evaluation and Time-Series Forecasting of Water Treatment Facilities in Ethiopia: A Risk Reduction Study

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Published: 26 November 2009 | **Received:** 23 July 2009 | **Accepted:** 18 October 2009

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DOI: 10.5281/zenodo.18894150

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Abstract

Water treatment facilities in Ethiopia face challenges related to operational efficiency and risk management. A comprehensive review of existing models was conducted, followed by a predictive model based on ARIMA methodology. Uncertainty in forecasts was quantified through robust standard errors. The ARIMA model showed an average error reduction of around 15% in forecasting future water quality levels compared to baseline methods. ARIMA models provide a reliable framework for monitoring and predicting the performance of water treatment facilities, with practical applications in risk reduction strategies. Implementing ARIMA-based forecasts can help minimise operational risks by enabling proactive management decisions. water quality forecasting, ARIMA model, Ethiopian water treatment systems The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Ethiopia, Geographic Information Systems (GIS), Monte Carlo simulation, Time series analysis, Risk assessment, Water treatment systems, Predictive modelling*

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