



Time-Series Forecasting Model Evaluation for Risk Reduction in Water Treatment Facilities in Rwanda: A Methodological Approach

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Abstract

Water treatment facilities in Rwanda face challenges related to variability in water quality and operational efficiency. A comprehensive evaluation of existing water treatment systems was conducted using statistical models. Specifically, an autoregressive integrated moving average (ARIMA) model was applied to forecast future operational risks based on historical data. The ARIMA model showed a significant predictive accuracy with a root mean square error (RMSE) of 12% for the forecasting period. The time-series forecasting model demonstrated potential in reducing operational risks by providing timely and accurate risk assessments. Further research should focus on integrating ARIMA predictions into existing risk management frameworks to optimise facility performance. Water treatment, Risk reduction, Time-series forecasting, Autoregressive integrated moving average (ARIMA), Operational efficiency The maintenance outcome was modelled as $Y_t = \beta_0 + \beta_1 X_t + u_t + v \epsilon_t$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Sub-Saharan, geospatial analysis, time-series analysis, ARIMA model, Monte Carlo simulation, predictive maintenance, stochastic models*

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