



Time-Series Forecasting Model for Evaluating Water Treatment Facilities Reliability in Tanzania

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Abstract

Water treatment facilities in Tanzania face challenges related to reliability due to varying water quality and operational inefficiencies. A time-series forecasting model was developed using historical data from existing water treatment facilities in Tanzania. The model incorporates autoregressive integrated moving average (ARIMA) to predict future reliability metrics based on past operational data. The ARIMA model identified a significant trend of increasing system downtime by 5% over the last five years, with an uncertainty margin of $\pm 2\%$. The findings suggest that preventive maintenance and regular calibration are essential for improving water treatment facility reliability in Tanzania. The proposed time-series forecasting model provides a robust tool for future reliability assessments. Investment in predictive maintenance strategies should be prioritised to reduce downtime, thereby enhancing the overall efficiency of water treatment facilities in Tanzania. water treatment facilities, reliability, time-series analysis, ARIMA, predictive maintenance. The maintenance outcome was modelled as $Y_t = \beta_0 + \beta_1 X_t + u_t + \epsilon_t$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: African Geography, Time-Series Analysis, Forecasting Models, Reliability Engineering, Water Quality Management, System Dynamics, Econometrics

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