



Methodological Evaluation of Municipal Water Systems in Tanzania Using Time-Series Forecasting Models for Reliability Assessment

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Abstract

This study examines the reliability of municipal water systems in Tanzania by evaluating their performance over a specific period. A comprehensive analysis was conducted using a combination of statistical methods including autoregressive integrated moving average (ARIMA) models to forecast water supply fluctuations in municipal systems. The ARIMA model demonstrated an R^2 value of 0.85, indicating that the model accurately captured 85% of the variability in water supply data over time, with a confidence interval for predictions ranging from $\pm 10\%$. The findings suggest that current forecasting models are robust and reliable for assessing municipal water system performance, providing actionable insights into future needs and resource allocation. Based on this analysis, municipalities should consider implementing adaptive management strategies to enhance water supply reliability and resilience against potential disruptions. The empirical specification follows $Y = \beta_{0+\beta} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: Tanzania, Geographic Information Systems, Time-Series Analysis, Forecasting Models, System Reliability, Methodology, Sustainability Assessment

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