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Revisiting Time-Series Forecasting Models for Water Treatment Facilities in Tanzania: A Methodological Evaluation

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Abstract

This study revisits previous research on time-series forecasting models applied to water treatment facilities in Tanzania, focusing on methodological improvements and evaluation. A comprehensive replication of the original study's data collection and analysis methods was employed, ensuring consistency with previous work but incorporating enhanced statistical models for improved forecasting precision. Specifically, a Random Forest regression model is used to predict future water treatment facility performance based on historical data. The findings indicate that the Random Forest model accurately forecasts water quality improvements by over 85% in terms of both direction and proportion across various facilities compared to baseline models. This replication confirms the reliability of time-series forecasting for monitoring and improving water treatment facility performance in Tanzania, with a notable improvement in predictive accuracy using advanced statistical methods. Future research should explore additional variables that could influence water quality predictions beyond those initially considered, such as fluctuations in raw water supply or technological advancements in treatment processes. The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Tanzania, Geographic Information Systems (GIS), Monte Carlo Simulation, Empirical Validation, Time-Series Analysis, Forecasting Models, Data Quality Assurance*

ABSTRACT-ONLY PUBLICATION

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