Time-Series Forecasting for Evaluating Water Treatment Facility Reliability in Uganda: An Integrated Methodological Framework

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Abstract

Water treatment facilities in Uganda face challenges related to system reliability due to varying water quality inputs and operational conditions. The study employs a Box-Jenkins ARIMA (AutoRegressive Integrated Moving Average) model to forecast future system performance based on historical data collected over five years. This study provides a robust methodological framework for assessing and improving the reliability of water treatment facilities in Uganda, offering insights into system performance under varying conditions. The model can be extended to include additional variables such as socioeconomic factors affecting water demand and treatment facility maintenance schedules. The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Uganda, Geographic Information Systems (GIS), Monte Carlo Simulation, Time Series Analysis, Forecasting Models, Reliability Theory, System Dynamics*

ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

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