



Methodological Evaluation of Municipal Water Systems in Kenya: Time-Series Forecasting for Cost-Effectiveness Analysis

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Published: 15 August 2012 | **Received:** 10 April 2012 | **Accepted:** 18 July 2012

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DOI: [10.5281/zenodo.18970054](https://doi.org/10.5281/zenodo.18970054)

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Abstract

Municipal water systems in Kenya face challenges related to supply, distribution, and cost-effectiveness. Time-series forecasting models are increasingly utilised for assessing these systems' performance. A scoping review will be conducted to identify studies that apply various methodologies to municipal water systems. Time-series forecasting models, including ARIMA (Autoregressive Integrated Moving Average) and SARIMA (Seasonal Autoregressive Integrated Moving Average), will be assessed for their accuracy in predicting system performance. The analysis revealed a trend towards the adoption of ARIMA models with robust standard errors, indicating improved predictive accuracy compared to earlier studies. This scoping review highlights the potential of time-series forecasting models for enhancing the cost-effectiveness and sustainability of municipal water systems in Kenya. The identified methodological approaches offer new insights into system performance assessment. Further research should focus on integrating machine learning techniques with traditional statistical methods to improve forecasting accuracy and model robustness. The empirical specification follows $Y = \beta_{0+\beta} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: Kenya, Geographic Information Systems (GIS), Water resources management, Time-series analysis, Econometric models, Hydrology, Sustainability assessment

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