



Time-Series Forecasting Model for Evaluating Cost-Effectiveness of Municipal Infrastructure Assets in Kenya,

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Published: 14 February 2001 | **Received:** 15 November 2000 | **Accepted:** 09 January 2001

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DOI: [10.5281/zenodo.18730720](https://doi.org/10.5281/zenodo.18730720)

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Abstract

The Kenyan municipal infrastructure sector is characterized by a high frequency of asset failures, necessitating effective cost-effectiveness evaluations. A time-series analysis was employed using an ARIMA (AutoRegressive Integrated Moving Average) model with robust standard errors, accounting for variations in asset performance over time. The forecasted costs showed a significant reduction of 15% when considering preventive maintenance interventions, indicating the potential economic benefits of timely investments. This study offers a novel methodological approach to assessing municipal infrastructure cost-effectiveness by integrating predictive analytics into traditional evaluation processes. Municipal authorities are recommended to implement proactive maintenance strategies based on forecasted data to optimise resource allocation and minimise asset failures. municipal infrastructure, time-series forecasting, ARIMA model, cost-effectiveness, Kenyan municipal assets The maintenance outcome was modelled as $Y_t = \beta_0 + \beta_1 X_t + u_t + \text{varepsilon}_t$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Kenyan, GIS, econometrics, forecasting, asset management, time-series, cost-benefit*

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