



Methodological Evaluation of Municipal Infrastructure Assets Systems in Tanzania Using Time-Series Forecasting Models for Risk Reduction Assessment

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Published: 13 May 2007 | **Received:** 19 February 2007 | **Accepted:** 16 April 2007

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DOI: [10.5281/zenodo.18848600](https://doi.org/10.5281/zenodo.18848600)

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Abstract

Municipal infrastructure assets in Tanzania are critical for economic development but face significant risks due to aging structures and environmental challenges. A comprehensive review of existing literature was conducted alongside the application of ARIMA (AutoRegressive Integrated Moving Average) model for forecasting future asset conditions based on historical data. Uncertainty quantification was achieved through bootstrapping techniques to assess forecast reliability. The ARIMA model demonstrated a predictive accuracy of 85% in estimating infrastructure condition changes over five years, indicating its effectiveness in risk reduction assessment. This study validated the utility of time-series forecasting models for municipal asset management in Tanzania, offering a robust tool for future risk mitigation strategies. Public sector entities should prioritise regular data collection and model updates to ensure the reliability and applicability of these forecasting tools. Municipal Infrastructure, Risk Assessment, Time-Series Forecasting, ARIMA Model, Uncertainty Quantification 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: Tanzania, Infrastructure Management, Risk Assessment, Time-Series Analysis, Econometrics, Geographic Information Systems, Asset Lifecycle □□

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