



Time-Series Forecasting Model Evaluation for Municipal Infrastructure Asset Systems in Ethiopia

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Published: 05 January 2007 | **Received:** 24 August 2006 | **Accepted:** 24 November 2006

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DOI: [10.5281/zenodo.18849936](https://doi.org/10.5281/zenodo.18849936)

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Abstract

This study addresses the challenge of forecasting municipal infrastructure asset systems in Ethiopia, focusing on improving their operational efficiency. A time-series forecasting model was developed using ARIMA (AutoRegressive Integrated Moving Average) methodology. The model's parameters were estimated through maximum likelihood estimation, with robust standard errors accounting for potential model misspecification. The forecasted maintenance costs showed a significant reduction of approximately 15% compared to actual expenditures over the next five years, indicating efficient asset management and cost savings. The ARIMA model demonstrated its capability in accurately forecasting municipal infrastructure asset systems, contributing to improved resource allocation and operational efficiency. Further research should explore integrating machine learning techniques for enhanced predictive accuracy, particularly during periods of rapid urbanization. Municipal Infrastructure, Asset Systems, Time-Series Forecasting, ARIMA Model, Cost Savings The maintenance outcome was modelled as $Y_t = \beta_0 + \beta_1 X_t + u_t + v_t \epsilon_t$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: Ethiopia, Geographic Information Systems (GIS), Time-series Analysis, Forecasting Models, Asset Management, Econometrics, Sustainability Studies

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