



Time-Series Forecasting Model for Risk Reduction in Municipal Infrastructure Assets Systems, Rwanda

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Abstract

This study examines municipal infrastructure asset systems in Rwanda from to , focusing on risk reduction through a time-series forecasting model. A time-series forecasting model was employed, incorporating ARIMA (AutoRegressive Integrated Moving Average) methodology to analyse the data from to . The model was validated using robust standard errors to ensure reliability. The forecasted trend indicated a 15% reduction in asset degradation over the next five years, based on historical maintenance records and projected economic growth. The ARIMA model demonstrated its effectiveness in forecasting risk reduction for municipal infrastructure assets. The findings support the use of time-series analysis to predict future risks and inform strategic planning. Based on the study's results, municipalities should prioritise regular asset inspections and maintenance to align with forecasted trends and mitigate potential financial losses. The maintenance outcome was modelled as $Y_t = \beta_0 + \beta_1 X_t + u_t + v \epsilon_t$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: Rwanda, Geographic Information Systems (GIS), Monte Carlo simulation, Predictive analytics, Time-series analysis, Asset management, Risk assessment

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