Methodological Evaluation and Time-Series Forecasting of Municipal Infrastructure Asset Adoption in Ethiopia, 2000–2026

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ABSTRACT

Background: Municipal infrastructure asset management in developing nations is often hindered by a lack of robust, data-driven forecasting tools, leading to reactive rather than strategic planning. This gap is particularly acute in sub-Saharan Africa, where rapid urbanisation places immense pressure on existing systems.

Purpose and objectives: This study aims to methodologically evaluate the current state of municipal infrastructure asset systems and to develop a predictive time-series model for forecasting the adoption rates of key infrastructure assets, providing a tool for long-term capital planning.

Keywords: *Municipal infrastructure, Asset management, Sub-Saharan Africa, Time-series forecasting, Adoption modelling, Developing economies, Strategic planning*

Article Highlights

- Methodological evaluation reveals systemic deficiencies in data standardisation.
- ARIMA(1,1,1) model provides best fit for forecasting infrastructure adoption rates.
- Forecast highlights a concerning slowdown in critical service provision.
- Study underscores urgent need for enhanced investment and procedural reforms.

Forecasting Model

An ARIMA(1,1,1) model, specified as $Y_t = \mu + \varphi_1 Y_{t-1} + \theta_1 \varepsilon_{t-1} + \varepsilon_t$, was estimated using maximum likelihood to project infrastructure uptake.

This analysis provides a data-driven tool for long-term municipal capital planning.

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