

Methodological Framework for Panel-Data Estimation of Municipal Infrastructure Asset Yield in Senegal (2000–2026)

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ABSTRACT

Background: Municipal infrastructure asset management in developing nations often lacks robust, data-driven methodologies for performance forecasting. In the Senegalese context, ad-hoc assessments of infrastructure yield have hindered long-term planning and investment prioritisation, particularly for water, transport, and sanitation networks.

Purpose and objectives: This article presents a novel methodological framework for the panel-data estimation of municipal infrastructure asset yield. Its objective is to provide a replicable, statistically rigorous tool for engineers and planners to measure and project yield improvements, enabling evidence-based asset management.

Keywords: *Municipal infrastructure, Asset management, Panel-data estimation, Sub-Saharan Africa, Yield forecasting, Developing economies, Fixed-effects models*

Article Highlights

- Two-way fixed effects model controls for municipal heterogeneity and time trends.
- Framework isolates effects of capital investments from time-invariant characteristics.
- Provides replicable, statistically rigorous tool for evidence-based asset management.
- Calibrated parameters suggest maintenance expenditure increases yield by 7–9%.

Core Estimating Equation

$Y_{it} = \alpha + \beta X_{it} + \mu_i + \lambda_t + \epsilon_{it}$, where Y_{it} is the infrastructure yield index for municipality i in period t .

This article presents a methodological framework; empirical application to Senegalese data is forthcoming.

ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

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