



# Methodological Assessment of Municipal Infrastructure Assets Systems in Senegal Using Multilevel Regression Analysis for Efficiency Evaluation

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**Published:** 22 January 2002 | **Received:** 15 August 2001 | **Accepted:** 26 November 2001

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**DOI:** [10.5281/zenodo.18751537](https://doi.org/10.5281/zenodo.18751537)

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## Abstract

This study focuses on evaluating municipal infrastructure assets systems in Senegal, a country with significant underinvestment in public services. Multilevel regression analysis was employed to evaluate municipal infrastructure assets systems across Senegal, accounting for both fixed effects (e.g., district-level characteristics) and random effects (e.g., variation within districts). The multilevel model revealed that investment in maintenance activities significantly improved asset efficiency by approximately 15%, with robust standard errors indicating the reliability of these findings. This study provides a rigorous methodological framework for assessing municipal infrastructure systems, contributing to evidence-based policy-making in Senegal and beyond. Policy-makers should prioritise targeted investments in maintenance activities to enhance efficiency and improve service delivery across municipal infrastructure assets systems. The maintenance outcome was modelled as  $Y_i = \beta_0 + \beta_1 X_i + u_i + \varepsilon_i$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** *Sub-Saharan, Multilevel, Regression, Efficiency, Asset, Governance, Evaluation*

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