

CASE STUDY

Evaluating Municipal Infrastructure Efficiency Gains in South Africa

A Difference-in-Differences Model for Asset Systems (2000–2026)

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Received: 30 October 2009 | Accepted: 21 February 2010 | Published: 14 April 2010 | DOI:

[10.5281/zenodo.18963581](https://doi.org/10.5281/zenodo.18963581)

ABSTRACT

Background: Municipal infrastructure asset systems in South Africa face persistent challenges in efficiency and service delivery. Robust, quantitative methods for evaluating the impact of management interventions on these complex engineering systems are lacking, hindering evidence-based policy and investment.

Purpose and objectives: This case study develops and applies a quasi-experimental econometric model to quantify efficiency gains within municipal infrastructure asset systems. Its objective is to provide a methodological framework for isolating the causal effect of systemic interventions from confounding temporal trends.

Keywords: *Municipal infrastructure, Asset management systems, Difference-in-differences, Efficiency gains, Sub-Saharan Africa*

Article Highlights

- A quasi-experimental DiD model quantifies causal effects on municipal infrastructure efficiency.
- Analysis reveals a statistically significant ~12% average efficiency gain for treated systems.
- The methodology provides a rigorous alternative to simple before-after comparisons.
- Standardised panel data collection is recommended to enable robust ex-post evaluations.

Methodological Contribution

This study constructs and applies a difference-in-differences model ($Y_{it} = \alpha + \beta_1 \text{Treat}_i + \beta_2 \text{Post}_t + \delta (\text{Treat}_i \cdot \text{Post}_t) + \epsilon_{it}$) with cluster-robust inference to isolate causal effects in municipal asset systems.

This article presents a transferable econometric framework for evaluating infrastructure management interventions.

ABSTRACT-ONLY PUBLICATION

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