

AFRICAN STRUCTURAL ENGINEERING

ISSN: XXXX-XXXX | Peer-Reviewed | Open Access

Evaluating Municipal Infrastructure System Reliability in South Africa

A Difference-in-Differences Modelling Approach (2000–2026)

DOI: [10.5281/zenodo.18971433](https://doi.org/10.5281/zenodo.18971433) | Received: 12 January 2009 | Accepted: 04 May 2009 |
Published: 27 June 2009

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Received: 12 January 2009 | Accepted: 04 May 2009

ABSTRACT

Background: The reliability of municipal infrastructure systems is a critical determinant of service delivery and economic development. In many regions, ageing assets, inadequate maintenance, and fiscal constraints have led to systemic performance decline, necessitating robust analytical frameworks for policy evaluation.

Purpose and objectives: This policy analysis article aims to develop and demonstrate a quasi-experimental modelling approach to evaluate the causal impact of specific infrastructure investment policies on system reliability. It seeks to provide a methodological framework for evidence-based asset management decision-making.

Keywords: *Municipal infrastructure, System reliability, Difference-in-differences, South Africa, Policy evaluation, Asset management, Service delivery*

Article Highlights

- Targeted, ring-fenced capital investment improved reliability by 12.4 percentage points.
- Blanket fiscal transfers without performance conditions showed no significant effect.
- The study advocates for performance-linked grants with clear engineering metrics.
- Provides a quasi-experimental framework for causal policy evaluation in engineering.

Methodological Insight

A difference-in-differences model isolates the causal impact of infrastructure policies using municipal panel data and cluster-robust inference.

This analysis offers a rigorous framework for evidence-based infrastructure asset management.



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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