

A Quasi-Experimental Framework for Reliability Diagnostics in Senegalese Municipal Infrastructure Asset Management

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ABSTRACT

Background: Municipal infrastructure asset management in many African contexts lacks robust, data-driven frameworks for assessing system reliability. Current practices often rely on reactive maintenance, leading to inefficient resource allocation and service disruption. This gap is particularly acute for secondary urban centres where diagnostic capacity is limited.

Purpose and objectives: This policy analysis article proposes and evaluates a quasi-experimental methodological framework designed to diagnose the reliability of municipal infrastructure systems. The objective is to provide a replicable, evidence-based tool for municipal engineers and policymakers to prioritise maintenance and investment.

Keywords: *Municipal infrastructure asset management, Quasi-experimental design, System reliability diagnostics, Sub-Saharan Africa, Engineering policy analysis, Asset management frameworks, Data-driven decision-making*

Article Highlights

- Proposes a quasi-experimental framework for reliability diagnostics in municipal infrastructure.
- Employs difference-in-differences design with Weibull survival modelling for system reliability.
- Finds a significant positive treatment effect on log-reliability in water distribution case study.
- Highlights the critical role of standardised operational data logging for diagnostic accuracy.

Methodological Contribution

The framework provides a statistically rigorous, operationally feasible tool for reliability diagnostics in resource-constrained municipal settings.

This article presents a novel methodological framework for data-driven infrastructure management.

ABSTRACT-ONLY PUBLICATION

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