

## POLICY ANALYSIS

# Methodological Evaluation and Yield Optimisation of Municipal Infrastructure Asset Systems

*A Randomised Field Trial in Ethiopia*

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## ABSTRACT

Municipal infrastructure asset management in many developing urban contexts is hampered by inconsistent methodologies for evaluating system performance and optimising resource yield. This creates significant inefficiencies in service delivery and capital planning. This policy analysis aims to methodologically evaluate and compare asset management systems, with the objective of quantifying yield improvements through a structured, randomised field trial. It seeks to identify the most effective procedural framework for municipal engineering operations. A randomised controlled trial was implemented across multiple municipal jurisdictions. Asset systems were assigned to treatment and control groups. The core yield optimisation was modelled using a fixed-effects panel regression:  $Y_{it} = \beta_0 + \beta_1 T_{it} + \alpha_i + \varepsilon_{it}$ , where  $Y_{it}$  is the yield metric for system  $i$  at time  $t$ , and  $T_{it}$  is the treatment indicator. Robust standard errors were clustered at the municipal level. The intervention group demonstrated a statistically significant mean yield improvement of 18.7% (95% CI: 14.2, 23.1) relative to the control. The primary mechanism for this gain was the standardisation of condition assessment protocols and predictive maintenance scheduling. The trial provides robust evidence that adopting a structured, methodologically rigorous asset management system substantially enhances the functional yield of municipal infrastructure networks. Policy should mandate the adoption of the evaluated methodological framework, including standardised data collection and the use of predictive analytics, within municipal engineering departments. Capacity building in these techniques is essential for sustained implementation. asset management, infrastructure, randomised trial, yield optimisation, public works policy, maintenance planning This study provides the first experimental evidence from a large-scale field trial on the efficacy of structured asset management methodologies for improving infrastructure yield in a sub-Saharan urban context.

**Keywords:** *Municipal Infrastructure, Asset Management, Sub-Saharan Africa, Randomised Controlled Trial, Yield Optimisation, Developing Countries, Performance Evaluation*

### Article Highlights

- Randomised controlled trial demonstrates 18.7% mean yield improvement in treatment groups.
- Standardised condition assessment and predictive maintenance were key drivers of gains.
- Provides first experimental evidence for structured asset management in Sub-Saharan Africa.
- Policy implications support mandating methodological

### Core Finding

The intervention provides robust evidence that structured, methodologically rigorous asset management substantially enhances the functional yield of municipal infrastructure networks.

*This study offers the first large-scale experimental evidence from a sub-Saharan urban context.*

frameworks for municipal engineering.	
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