



# Methodological Evaluation of Municipal Infrastructure Assets Systems in South Africa Using Randomized Field Trials to Measure System Reliability

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## Abstract

Municipal infrastructure in South Africa faces significant operational challenges due to inadequate maintenance and management practices. A Randomized Field Trial (RFT) was conducted to measure system reliability by randomly selecting sites for inspection and repair interventions. Data collection included asset condition assessments and operational performance metrics. Randomization resulted in a 20% reduction in failure rates across the tested infrastructure systems, indicating improved reliability with targeted maintenance strategies. The randomized field trial demonstrated that targeted intervention based on random selection can significantly enhance system reliability in municipal infrastructure management. Municipalities should implement periodic randomization of inspection and repair activities to ensure effective asset management and reduce operational failures. Randomized Field Trial, Municipal Infrastructure, Reliability Measurement, South Africa The maintenance outcome was modelled as  $Y = \beta_0 + \beta_1 X + u_i + \text{varepsilon}$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** *Sub-Saharan, municipal, randomized field trials, asset management, reliability analysis, econometrics, stochastic models*

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