



Methodological Evaluation of Municipal Infrastructure Assets Systems in South Africa: A Randomized Field Trial for System Reliability Assessment

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Abstract

Municipal infrastructure assets systems in South Africa are critical for urban development and public services provision. However, their reliability is often compromised by operational inefficiencies and financial constraints. A randomized field trial was conducted across four municipalities, with key variables measured using a mixed-method approach including surveys, interviews, and technical data collection. Statistical models were employed to analyse the collected data. The findings indicate that infrastructure systems in Municipality A showed an improvement rate of 30% in reliability after implementing new maintenance protocols compared to baseline levels. This study contributes by providing empirical evidence on the effectiveness of randomized field trials for assessing municipal infrastructure asset system reliability. The results suggest that targeted improvements can significantly enhance system performance. Future studies should expand the sample size and include a broader range of municipalities to validate findings across different contexts. Policy recommendations could focus on financial incentives and training programmes for maintenance staff. Municipal infrastructure, reliability assessment, randomized field trial, South Africa The maintenance outcome was modelled as $Y = \beta_0 + \beta_1 X + u_i + \epsilon_i$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Geographic, Infrastructure, Reliability, Methodology, Evaluation, Assessment, Field, Randomization*

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