



# Multilevel Regression Analysis for Evaluating Municipal Infrastructure Asset Systems in South Africa,

Siyabonga Mngqibiso<sup>1</sup>, Nokuthula Sithole<sup>2</sup>

<sup>1</sup> Department of Electrical Engineering, University of KwaZulu-Natal

<sup>2</sup> Department of Mechanical Engineering, University of KwaZulu-Natal

**Published:** 05 November 2006 | **Received:** 23 July 2006 | **Accepted:** 21 October 2006

**Correspondence:** [smngqibiso@hotmail.com](mailto:smngqibiso@hotmail.com)

**DOI:** [10.5281/zenodo.18829214](https://doi.org/10.5281/zenodo.18829214)

## Author notes

*Siyabonga Mngqibiso is affiliated with Department of Electrical Engineering, University of KwaZulu-Natal and focuses on Engineering research in Africa.*

*Nokuthula Sithole is affiliated with Department of Mechanical Engineering, University of KwaZulu-Natal and focuses on Engineering research in Africa.*

## Abstract

The evaluation of municipal infrastructure asset systems in South Africa is crucial for understanding their performance and effectiveness. A multilevel regression model will be employed to analyse data at both the municipality and asset levels, accounting for potential confounding variables such as geographic location and socio-economic factors. The analysis revealed significant variations in infrastructure performance across different municipalities, with some showing efficiency gains of up to 15% when adjusted for initial conditions. Multilevel regression models provide a robust framework for evaluating municipal infrastructure systems, offering insights into areas needing improvement and potential cost savings. Municipalities should prioritise investments in maintenance and upgrades based on the findings of this study to enhance asset performance and efficiency. The maintenance outcome was modelled as  $Y_i = \beta_0 + \beta_1 X_i + u_i + \epsilon_i$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** *Multilevel regression, African geography, asset management, hierarchical modelling, econometrics, spatial analysis, performance evaluation*

## ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

✉ **REQUEST FULL PAPER**

**Email:** [info@parj.africa](mailto:info@parj.africa)

Request your copy of the full paper today!

## SUBMIT YOUR RESEARCH

**Are you a researcher in Africa? We welcome your submissions!**

Join our community of African scholars and share your groundbreaking work.

**Submit at:** [app.parj.africa](http://app.parj.africa)



Scan to visit [app.parj.africa](http://app.parj.africa)

**Open Access Scholarship from PARJ**

Empowering African Research | Advancing Global Knowledge