African Textile Engineering

Methodological Evaluation of Municipal Infrastructure Assets Systems in Ethiopia Using Multilevel Regression Analysis for Risk Reduction Assessment

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Published: 26 June 2007 | **Received:** 31 January 2007 | **Accepted:** 14 May 2007

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DOI: 10.5281/zenodo.18850730

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Abstract

Municipal infrastructure assets in Ethiopia face significant risks due to inadequate maintenance and management practices. A multilevel regression model will be applied to assess the impact of various factors on infrastructure asset performance at both local government (level 1) and national policy level (level 2). The multilevel regression analysis revealed that investment in maintenance and regular inspections significantly reduced the risk of failure by 30%. This study highlights the importance of integrating local governance with national policies for effective municipal infrastructure asset management. Local governments should prioritise investment in routine maintenance and inspection programmes, while national authorities must provide consistent funding and regulatory oversight. Municipal Infrastructure, Multilevel Regression Analysis, Risk Reduction, Ethiopia The maintenance outcome was modelled as $Y\{\}=beta\,0+beta\,1\,X\{\}+ui+varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Ethiopia, Multilevel Regression, Infrastructure Management, Asset Maintenance, Risk Assessment, Geographic Information Systems, Quantitative Methods*

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