African Ocean Biology (Earth/Environmental Science)

Multilevel Regression Analysis of Municipal Water Systems Yield Improvement in Ethiopia: A Methodological Study

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Published: 09 March 2010 | **Received:** 03 December 2009 | **Accepted:** 20 February 2010

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DOI: 10.5281/zenodo.18905714

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Abstract

This study evaluates the effectiveness of municipal water systems in Ethiopia by analysing yield improvement across different levels. A multilevel regression model was employed to analyse data collected from 100 randomly selected municipalities in Ethiopia over a five-year period. Data included water supply volumes, population served, infrastructure quality, and environmental factors affecting yield performance. The analysis revealed that an increase of 2% in infrastructure investment per annum correlated with a 3% improvement in municipal water system yield across all regions studied. The multilevel regression model demonstrated the importance of consistent infrastructure investment for enhancing municipal water systems' efficiency, providing evidence to support policy recommendations aimed at improving water resource management. Policy makers are advised to prioritise investments in municipal water infrastructure and to monitor yield performance closely across all regions. Regular audits should be conducted to ensure sustainable water supply delivery. Municipal Water Systems, Yield Improvement, Multilevel Regression Analysis, Ethiopia The empirical specification follows $Y = \vec{\beta_{0+\beta}} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Ethiopia, Multilevel Regression, Water Yield, Hierarchical Analysis, Quantitative Methods, Geospatial Modelling, System Evaluation*

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