



# Methodological Evaluation of Water Treatment Facilities in Ethiopia: Multilevel Regression Analysis for Adoption Rates

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## Abstract

Water treatment facilities play a critical role in improving water quality in Ethiopia's rural areas. The study employed multilevel regression models to analyse data from various Ethiopian regions, accounting for hierarchical structures such as villages within districts. Multilevel regression showed that district-level factors significantly influenced adoption rates of water treatment facilities in Ethiopia, with a coefficient estimate of -0.53 (95% CI: -0.68 to -0.37). The multilevel approach provided robust insights into the determinants of facility adoption, highlighting the importance of considering contextual factors at different levels. Future research should explore interventions targeting specific district characteristics to enhance adoption rates and water quality improvements. Water Treatment Facilities, Multilevel Regression Analysis, Adoption Rates, Ethiopia The maintenance outcome was modelled as  $Y_{ij} = \beta_0 + \beta_1 X_{ij} + u_i + v_j + \epsilon_{ij}$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** *African geography, multilevel modelling, water quality improvement, rural development, econometric methods, statistical analysis, spatial heterogeneity*

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