



# Methodological Assessment of Municipal Water Systems in Ethiopia: A Multilevel Regression Analysis on Adoption Rates

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## Abstract

Municipal water systems in Ethiopia face challenges related to adoption rates, which vary across different regions and socio-economic groups. A rigorous literature search was conducted using databases such as PubMed and Google Scholar. Studies were screened based on predefined inclusion criteria, including peer-reviewed articles published between and . Quality assessment of studies followed the Cochrane collaboration guidelines. Analysis revealed a significant variation in adoption rates across regions (e.g., urban vs rural), with higher rates observed in areas where water quality standards were more stringent, indicating an impact from policy interventions. The multilevel regression analysis highlighted the importance of socio-economic factors and environmental conditions on municipal water system adoption rates, providing a nuanced understanding for policy formulation. Further research should explore the long-term sustainability of these systems and consider the interplay between technological innovation and community engagement in enhancing adoption rates. Model estimation used  $\hat{\theta} = \underset{\theta}{\operatorname{argmin}} \{ \sum_{i=1}^n (y_i - f(\theta(\xi)))^2 + \lambda \operatorname{Vert} \theta \operatorname{Vert} \}^2$ , with performance evaluated using out-of-sample error.

**Keywords:** *Sub-Saharan, econometric, randomized, stratified, regression, intervention, GIS*

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