



Efficiency Gains in Ethiopian Water Treatment Facilities via Panel Data Estimation: A Methodological Assessment

Mekdes Abeba¹, Fenta Legesse^{1,2}

¹ Hawassa University

² Jimma University

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Correspondence: mabeba@gmail.com

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Author notes

Mekdes Abeba is affiliated with Hawassa University and focuses on Engineering research in Africa.

Fenta Legesse is affiliated with Jimma University and focuses on Engineering research in Africa.

Abstract

Water treatment facilities in Ethiopia are crucial for public health but often operate inefficiently. Panel data analysis was employed to assess the performance of water treatment facilities, utilising a specific econometric model. The analysis revealed significant improvements in operational efficiency across selected facilities (e.g., by up to 20% reduction in energy consumption). Efficiency gains were quantified and can be attributed to improved management practices and technological upgrades. Further implementation of best practices and investment in maintenance are recommended for sustained efficiency improvements. The maintenance outcome was modelled as $Y_i = \beta_0 + \beta_1 X_i + u_i + \varepsilon_i$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Ethiopia, Panel Data, Stochastic Frontier Analysis, Efficiency Measurement, Water Treatment Systems, Econometrics, Time Series Analysis*

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