



Bayesian Hierarchical Model in Assessing Efficiency Gains across Tanzania's Water Treatment Facilities Systems

Kasamvu Lukwesa¹, Mashika Kinyanjui^{2,3}, Tanganya Magangwa², Simiyu Mwenyezi^{2,4}

¹ Tanzania Commission for Science and Technology (COSTECH)

² Muhimbili University of Health and Allied Sciences (MUHAS), Dar es Salaam

³ Ardhi University, Dar es Salaam

⁴ Department of Electrical Engineering, Tanzania Commission for Science and Technology (COSTECH)

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Correspondence: klukwesa@gmail.com

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Author notes

Kasamvu Lukwesa is affiliated with Tanzania Commission for Science and Technology (COSTECH) and focuses on Engineering research in Africa.

Mashika Kinyanjui is affiliated with Muhimbili University of Health and Allied Sciences (MUHAS), Dar es Salaam and focuses on Engineering research in Africa.

Tanganya Magangwa is affiliated with Muhimbili University of Health and Allied Sciences (MUHAS), Dar es Salaam and focuses on Engineering research in Africa.

Simiyu Mwenyezi is affiliated with Department of Electrical Engineering, Tanzania Commission for Science and Technology (COSTECH) and focuses on Engineering research in Africa.

Abstract

Water treatment facilities in Tanzania face challenges related to operational efficiency. A Bayesian hierarchical model was applied to evaluate efficiency metrics of water treatment plants in Tanzania. The model accounts for heterogeneity among facilities while estimating average efficiencies. The model identified that three out of ten facilities showed significant efficiency gains when compared to baseline levels, with gains averaging at least 15% over a year. Bayesian hierarchical modelling provided nuanced insights into the variability and improvements in water treatment facility performance across Tanzania. Further research should explore factors influencing these efficiency changes to inform policy and resource allocation for sustainable water management. water treatment, Bayesian hierarchical model, efficiency gains, Tanzania The maintenance outcome was modelled as $Y_i = \beta_0 + \beta_1 X_i + u_i + \epsilon_i$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: Tanzania, Water Treatment Facilities, Bayesian Hierarchical Model, Efficiency Metrics, Methodological Evaluation, Quantitative Analysis, Statistical Modelling

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