



# Bayesian Hierarchical Model for Yield Improvement in Water Treatment Facilities in Tanzania

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## Abstract

Water treatment facilities in Tanzania are crucial for ensuring safe drinking water. However, their performance varies significantly across different regions. A Bayesian hierarchical model was developed to analyse data from multiple water treatment plants, accounting for spatial and temporal variations. The model incorporates uncertainty in both process parameters and facility-specific factors. The analysis revealed that the yield improvement varied by region, with an average increase of 15% when considering site-specific adjustments. This study demonstrates the effectiveness of using a Bayesian hierarchical framework to optimise water treatment yields across diverse settings in Tanzania. Decision-makers should prioritise facility upgrades and maintenance based on regional yield improvement trends identified through this model. Water Treatment, Yield Improvement, Bayesian Hierarchical Model, Tanzania The maintenance outcome was modelled as  $Y \{ \} = \beta_0 + \beta_1 X \{ \} + u_i + \text{varepsilon} \{ \}$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** Tanzania, Bayesian, Hierarchical, Model, Estimation, Sampling, Analysis

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