



Bayesian Hierarchical Model for Measuring Adoption Rates in Municipal Infrastructure Assets Systems, Ethiopia

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Abstract

This case study evaluates municipal infrastructure asset systems in Ethiopia, focusing on adoption rates across various sectors such as water supply, sanitation, and drainage. A Bayesian hierarchical model was employed to analyse adoption rates in municipal infrastructure assets systems in Ethiopia, considering spatial variability and heterogeneity among regions. Adoption rates varied significantly across different regions, with a notable trend indicating higher adoption in urban areas compared to rural settings. This pattern suggests that contextual factors play a crucial role in system implementation. The Bayesian hierarchical model provided insights into the spatial distribution of municipal infrastructure asset systems' adoption rates and highlighted the importance of considering regional-specific conditions. Future research should incorporate additional socioeconomic data to refine the model, thereby enhancing its predictive accuracy for similar studies in Ethiopia and other regions. Bayesian hierarchical models, municipal infrastructure, asset systems, adoption rates, Ethiopia 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: *Geographic, Infrastructure, Bayesian, Hierarchical, Modelling, Adoption, Quantitative*

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