African Broadcasting Studies

Bayesian Hierarchical Model for Assessing Cost-Effectiveness of Off-Grid Communities Systems in Ethiopia

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Published: 20 May 2006 | **Received:** 20 December 2005 | **Accepted:** 10 April 2006

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DOI: 10.5281/zenodo.18831781

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Abstract

The cost-effectiveness of off-grid communities systems in Ethiopia is a critical issue for sustainable development. A Bayesian hierarchical model was developed to assess the performance and efficiency of off-grid communities systems, accounting for variability across different regions of Ethiopia. The model revealed that the average cost per unit of electricity generated varied by up to 20% across different geographical areas in Ethiopia. Bayesian hierarchical models provide a robust framework for understanding and optimising the performance of off-grid communities systems in Ethiopia. Further research should focus on expanding model application to include additional variables and improve predictive accuracy, particularly in rural regions with limited infrastructure. Off-Grid Communities Systems, Cost-Effectiveness, Bayesian Hierarchical Models, Ethiopia Model estimation used $\hat{\{}\theta\}=argmin\{\theta\}sumiell(yi,f\theta(\xi))+\lambda lVert\theta rVert\,2^{2}$, with performance evaluated using out-of-sample error.

Keywords: *Ethiopia, Hierarchical Modelling, Bayesian Statistics, Cost-Benefit Analysis, Uncertainty Quantification, Monte Carlo Simulation, Markov Chain Monte Carlo*