Bayesian Hierarchical Model for Evaluating Regional Monitoring Networks in Rwanda: A Methodological Framework

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Abstract

Regional monitoring networks are crucial for ensuring effective energy policy implementation in Rwanda. However, their cost-effectiveness and optimal design remain contentious issues. The proposed methodology integrates Bayesian inference into a hierarchical model to assess cost-effectiveness across different regions in Rwanda. This approach accounts for spatial and temporal variations in energy usage patterns. The Bayesian hierarchical model offers a robust framework for evaluating regional monitoring networks in Rwanda. Its application demonstrates how spatial and temporal data can inform optimal network design. Based on the findings, policymakers should prioritise investments in monitoring networks where energy usage is most variable or critical to policy outcomes. The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\,X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

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