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Methodological Evaluation of Regional Monitoring Networks in Rwanda Using Quasi-Experimental Design for Cost-Efficiency Assessment

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Abstract

This study focuses on evaluating regional monitoring networks in Rwanda to assess their cost-effectiveness. A mixed-method approach combining quantitative analysis of monitoring data with qualitative interviews was used. The quasi-experimental design involved comparing baseline and post-intervention performance metrics across monitored regions in Rwanda. The results indicate that a distributed network model, which involves multiple smaller stations rather than fewer larger ones, showed a cost reduction of approximately 15% compared to the traditional centralized approach without compromising data accuracy. This study concludes with evidence supporting the use of distributed monitoring networks in Rwanda for cost-effective and efficient regional physics monitoring. Based on findings, it is recommended that future investments in regional physics monitoring should prioritise the deployment of a network model similar to the one found effective in this study. The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Geography, Africa, Spatial Analysis, Quasi-Experimental Design, Evaluation, Landscape Ecology, Quantitative Methods*

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