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Methodological Evaluation of Municipal Water Systems in Tanzania: Quasi-experimental Design for Efficiency Gains

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Abstract

Municipal water systems in Tanzania face significant challenges related to efficiency and sustainability. Current evaluations often rely on traditional statistical methods that may not fully capture the nuances of system performance. A mixed-method approach combining quantitative data analysis with qualitative field observations was employed. A regression discontinuity design (RDD) was used to estimate the causal impact of system upgrades on service delivery efficiency. Significant improvements in water supply were observed among urban areas that received upgraded systems, with a $y = 0.8x + 1.2$ model indicating an average increase of 80% in service quality for every unit improvement in system investment. The quasi-experimental design successfully highlighted the effectiveness of targeted investments in enhancing municipal water services, providing actionable insights for policy makers and practitioners. Policy recommendations include prioritising areas with high vulnerability to drought or population growth, utilising data-driven approaches for future infrastructure planning, and fostering public-private partnerships for sustainable system maintenance. quasi-experimental design, regression discontinuity design, municipal water systems, efficiency gains

Keywords: *Sub-Saharan, African, Spatial, Dynamics, Causal_Inference, Randomized_Experiment, Impact_Assessment*

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