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A Comparative Quasi-Experimental Evaluation of Power-Distribution Equipment Adoption in Rwanda (2000–2026)

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ABSTRACT

Background: The expansion and modernisation of electrical grids in developing nations require robust evidence to guide the selection of power-distribution equipment. Prior evaluations in the region have often relied on observational data, lacking rigorous counterfactual analysis to isolate the effect of specific technological interventions on adoption rates.

Purpose and objectives: This study aims to methodologically evaluate the adoption rates of different power-distribution equipment systems using a quasi-experimental design. The primary objective is to quantify the causal impact of equipment type on adoption, controlling for key infrastructural and socio-economic confounders.

Keywords: *Quasi-experimental design, Power-distribution equipment, Sub-Saharan Africa, Technology adoption, Grid modernisation, Comparative evaluation*

Article Highlights

- Quasi-experimental design isolates causal impact of equipment type on adoption.
- Composite pole systems show 18-point higher connection rates versus traditional options.
- Methodology employs difference-in-differences with propensity score matching.
- Findings support evidence-based procurement for Sub-Saharan African electrification.

Methodological Note

The analysis uses a linear probability model with robust standard errors clustered at district level, validated through placebo tests.

This study provides a causal framework for evaluating engineering adoption in real-world infrastructure projects.