

A Panel-Data Estimation of Power-Distribution System Reliability for Policy Formulation in Senegal (2000–2026)

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ABSTRACT

Background: Chronic power outages and unreliable electricity supply remain significant impediments to economic development in many Sub-Saharan African nations. A robust, evidence-based policy framework requires precise, longitudinal measurement of distribution system performance, yet such analyses are often lacking.

Purpose and objectives: This policy analysis aims to develop and apply a panel-data econometric model to quantitatively evaluate the reliability of Senegal's power-distribution infrastructure. The objective is to generate actionable evidence for prioritising investment and maintenance policies.

Keywords: *Panel-data estimation, Power-distribution reliability, Sub-Saharan Africa, Infrastructure policy, Engineering systems analysis, Electricity access*

Article Highlights

- Panel-data analysis reveals a significant link between maintenance expenditure and reduced outage duration.
- Regional heterogeneity in equipment degradation is a key driver of reliability disparities.
- Findings advocate for a shift from blanket replacement to predictive, targeted maintenance policies.
- Establishes a longitudinal econometric framework for infrastructure assessment in Sub-Saharan Africa.

Policy Implication

The study recommends establishing a mandated national reliability database to enable continuous refinement of predictive maintenance models.

This analysis provides empirical evidence to inform infrastructure investment and maintenance policy in Senegal.

ABSTRACT-ONLY PUBLICATION

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