African Nanotechnology Applications (Technology)

Power-Distribution Equipment System Reliability in Senegal: A Panel Data Assessment

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Abstract

This study addresses a current research gap in Engineering concerning Methodological evaluation of power-distribution equipment systems in Senegal: panel-data estimation for measuring system reliability in Senegal. The objective is to formulate a rigorous model, state verifiable assumptions, and derive results with direct analytical or practical implications. A mixed-methods design was used, combining survey and interview data collected over the study period. The results establish bounded error under perturbation, a convergent estimation process under stated assumptions, and a stable link between the proposed metric and observed outcomes. The findings provide a reproducible analytical basis for subsequent theoretical and applied extensions. Stakeholders should prioritise inclusive, locally grounded strategies and improve data transparency. Methodological evaluation of power-distribution equipment systems in Senegal: panel-data estimation for measuring system reliability, Senegal, Africa, Engineering, original research This work contributes a formal specification, transparent assumptions, and mathematically interpretable claims. The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Sub-Saharan, Geographic Information Systems, Monte Carlo Simulation, Time-Series Analysis, Econometric Modelling, Geostatistics, Energy Infrastructure Assessment*

ABSTRACT-ONLY PUBLICATION

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