African Nanotechnology in Engineering (Environmental applications)

# Methodological Evaluation of Industrial Machinery Fleets in Rwanda: A Randomized Field Trial on System Reliability

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## Abstract

This study addresses a current research gap in Engineering concerning Methodological evaluation of industrial machinery fleets systems in Rwanda: randomized field trial for measuring system reliability in Rwanda. The objective is to formulate a rigorous model, state verifiable assumptions, and derive results with direct analytical or practical implications. A structured analytical approach was used, integrating formal modelling with domain evidence. 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 industrial machinery fleets systems in Rwanda: randomized field trial for measuring system reliability, Rwanda, Africa, Engineering, conference paper 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:** *Rwanda, Geographic Information Systems (GIS), Monte Carlo simulations, System Dynamics, Bayesian Networks, Randomized Field Trials, Reliability Engineering*

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