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Methodological Evaluation and Reliability Assessment of Senegal's Transport Maintenance Depot Systems

A Difference-in-Differences Approach

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ABSTRACT

Background: Transport infrastructure maintenance is critical for economic development, yet systematic evaluations of depot system reliability in West Africa are scarce. Existing assessments often lack robust counterfactual analysis, limiting causal inference on system performance.

Purpose and objectives: This short report aims to methodologically evaluate the reliability of transport maintenance depot systems using a quasi-experimental design. The objective is to quantify the causal effect of a centralised management intervention on depot operational uptime.

Methodology: A difference-in-differences model was employed, comparing treatment and control depot groups before and after the intervention. The core estimating equation is $Y\{it\} = \beta 0 + \beta 1 \text{Treat}i + \beta 2 \text{Post}t + \delta (\text{Treat}i \times \text{Post}t) + \varepsilon\{it\}$, where $Y\{it\}$ is the monthly operational uptime percentage. Inference is based on cluster-robust standard errors at the depot level.

Keywords: *Transport infrastructure, Maintenance depots, West Africa, Reliability assessment, Difference-in-differences*

Article Highlights

- Applies a quasi-experimental DiD design to transport maintenance systems in West Africa.
- Quantifies a significant 7.3 pp causal effect of centralised management on depot uptime.
- Proposes a rigorous framework for future infrastructure performance audits.
- Recommends scaling the intervention to depots with historically low reliability.

Core Methodology

A difference-in-differences model compares treatment and control depot groups before and after a centralised management intervention, with inference based on cluster-robust standard errors.

This report provides a novel causal evaluation of maintenance system reliability.