

# A Difference-in-Differences Model for the Cost-Effectiveness Evaluation of Transport Maintenance Depot Systems in South Africa

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## ABSTRACT

**Background:** The cost-effectiveness of transport maintenance depot systems is a critical concern for infrastructure asset management, yet robust quantitative evaluation methods tailored to the operational and data constraints of emerging economies are lacking.

**Purpose and objectives:** This case study develops and applies a novel quasi-experimental econometric model to evaluate the causal impact of a centralised depot management system on maintenance expenditure, compared to a decentralised model.

**Keywords:** *Cost-effectiveness analysis, Difference-in-differences, Infrastructure asset management, Transport maintenance depots, Sub-Saharan Africa, Quantitative evaluation, Life-cycle costing*

### Article Highlights

- A difference-in-differences model isolates the causal impact of centralised depot management.
- Analysis reveals an 18% reduction in maintenance costs attributable to the centralised system.
- The study provides a viable quasi-experimental framework for infrastructure investment appraisal.
- Methodology addresses data constraints common in emerging economy contexts.

### Core Econometric Model

The difference-in-differences estimator  $\delta = -0.198$  (95% CI: -0.376, -0.020) captures the causal effect of the centralised system implementation on maintenance expenditure.

*This study offers a methodological framework for causal evaluation where randomized trials are impractical.*

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This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.



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