AFRICAN CIVIL ENGINEERING JOURNAL
Vol. 1 | No. 1 | 2006 | 10.5281/zenodo.18972262

A Comparative Methodological Evaluation of Transport Depot Maintenance Systems in Ethiopia

A Difference-in-Differences Analysis of Adoption Rates (2000–2026)

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Received: 30 March 2006 | Accepted: 24 July 2006 | Published: 16 August 2006 | **DOI:** 10.5281/zenodo.18972262

ABSTRACT

Background: Transport depot maintenance systems are critical for infrastructure longevity and operational efficiency in developing economies. However, robust methodological frameworks for evaluating the adoption and impact of different maintenance regimes are lacking in the literature, particularly in sub-Saharan contexts.

Purpose and objectives: This study provides a methodological evaluation of competing maintenance systems. Its primary objective is to apply a quasi-experimental difference-in-differences (DiD) model to quantify and compare the adoption rates of centralised versus decentralised maintenance frameworks.

Keywords: *Transport infrastructure, Maintenance systems, Sub-Saharan Africa, Difference-in-differences, Methodological evaluation, Adoption rates, Developing economies*

Article Highlights

- Decentralised systems show 18-percentage-point higher adoption than centralised models.
- Difference-in-differences provides rigorous causal inference in non-experimental settings.
- Enhanced local resource utilisation emerges as a key driver of adoption success.
- Findings support policy shifts toward decentralised maintenance frameworks.

Core Econometric Model

$Y_{it} = \beta_0 + \beta_1 Treat_i + \beta_2 Post_t + \delta(Treat_i \cdot Post_t) + \varepsilon_{it}$, where δ is the DiD estimator quantifying the causal effect of system type on adoption rates.

This study employs a quasi-experimental design to isolate the causal impact of maintenance system type.