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Methodological Evaluation and Risk Reduction in Ethiopian Transport Maintenance Depots

A Multilevel Regression Analysis

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ABSTRACT

Background: Transport maintenance depots are critical infrastructure for national economies, yet their operational systems in developing nations are often under-evaluated. In the Ethiopian context, a systematic, data-driven assessment of the methodological frameworks used to manage these depots and quantify associated risks is lacking, hindering targeted engineering interventions.

Purpose and objectives: This case study aims to methodologically evaluate the existing operational systems within a network of transport maintenance depots. Its core objective is to develop and apply a multilevel regression model to measure the potential for risk reduction in structural and operational failures.

Keywords: *transport infrastructure, Sub-Saharan Africa, maintenance management, risk reduction, multilevel modelling, developing economies, systems evaluation*

Article Highlights

- Multilevel modelling quantifies variance between depot and regional management levels.
- Standardised digital inventory systems linked to significant reduction in part shortages.
- Findings advocate for integrated interventions across organisational hierarchies.
- Case study provides a methodological framework for infrastructure evaluation in developing economies.

Methodological Insight

The analysis employed a two-level random intercept model to partition variance between depot-specific factors and regional cluster effects, providing evidence for targeted interventions.

This study offers a quantitative framework for evaluating maintenance systems in developing infrastructure contexts.