

Methodological Evaluation and Panel-Data Estimation of Transport Maintenance Depot System Reliability in Tanzania, 2000–2026

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Juma Rajabu^{1,2}|Neema Kavishe^{1,2}|Abasi Mwakyembe^{1,3}

¹ University of Dar es Salaam

² Tanzania Commission for Science and Technology (COSTECH)

³ Department of Electrical Engineering, Mkwawa University College of Education

Correspondence: jrajabu@yahoo.com

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ABSTRACT

Background: The reliability of transport maintenance depot systems is critical for infrastructure sustainability and economic development. In many developing nations, systematic evaluations of these systems are scarce, leading to inefficient asset management and increased lifecycle costs.

Purpose and objectives: This study aimed to develop and apply a novel panel-data methodology to evaluate the operational reliability of a national network of transport maintenance depots. The objective was to quantify system reliability trends and identify key determinants of performance.

Keywords: *panel-data estimation, system reliability, transport maintenance depots, Sub-Saharan Africa, methodological evaluation, infrastructure sustainability, developing economies*

Article Highlights

- First application of panel-data econometrics to model national transport depot reliability.
- Analysis reveals a 2.3% mean annual decline in aggregate system reliability (2000–2026).
- Depot age and spare parts inventory turnover are the most robust predictors of performance.
- Provides an evidence-based framework for diagnosing systemic weaknesses in maintenance infrastructure.

Core Methodology

Reliability was modelled using a fixed-effects panel estimator: $R_{it} = \alpha_i + \beta_1 X_{1,it} + \dots + \beta_k X_{k,it} + \epsilon_{it}$, with inference based on cluster-robust standard errors.

This study offers a replicable framework for infrastructure reliability assessment in resource-constrained settings.

ABSTRACT-ONLY PUBLICATION

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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