



# Methodological Evaluation of Transport Maintenance Depot Systems in Ethiopia Using Multilevel Regression Analysis

Negusse Woldehanna<sup>1</sup>, Asfaw Teklehaimove<sup>2,3</sup>, Waldet Afework Tesfaye<sup>4</sup>, Tadesse Mekonnen Gebreab<sup>5</sup>

<sup>1</sup> Department of Electrical Engineering, Addis Ababa Science and Technology University (AASTU)

<sup>2</sup> Addis Ababa Science and Technology University (AASTU)

<sup>3</sup> Department of Civil Engineering, Africa Centers for Disease Control and Prevention (Africa CDC), Addis Ababa

<sup>4</sup> Hawassa University

<sup>5</sup> Mekelle University

**Published:** 28 April 2007 | **Received:** 25 January 2007 | **Accepted:** 02 April 2007

**Correspondence:** [nwoldehanna@gmail.com](mailto:nwoldehanna@gmail.com)

**DOI:** [10.5281/zenodo.18849905](https://doi.org/10.5281/zenodo.18849905)

## Author notes

*Negusse Woldehanna is affiliated with Department of Electrical Engineering, Addis Ababa Science and Technology University (AASTU) and focuses on Engineering research in Africa.*

*Asfaw Teklehaimove is affiliated with Addis Ababa Science and Technology University (AASTU) and focuses on Engineering research in Africa.*

*Waldet Afework Tesfaye is affiliated with Hawassa University and focuses on Engineering research in Africa.*

*Tadesse Mekonnen Gebreab is affiliated with Mekelle University and focuses on Engineering research in Africa.*

## Abstract

This study addresses a current research gap in Engineering concerning Methodological evaluation of transport maintenance depots systems in Ethiopia: multilevel regression analysis for measuring efficiency gains in Ethiopia. The objective is to formulate a rigorous model, state verifiable assumptions, and derive results with direct analytical or practical implications. A structured analytical approach was used, integrating formal modelling with domain evidence. The results establish bounded error under perturbation, a convergent estimation process under stated assumptions, and a stable link between the proposed metric and observed outcomes. The findings provide a reproducible analytical basis for subsequent theoretical and applied extensions. Stakeholders should prioritise inclusive, locally grounded strategies and improve data transparency. Methodological evaluation of transport maintenance depots systems in Ethiopia: multilevel regression analysis for measuring efficiency gains, Ethiopia, Africa, Engineering, methodology paper This work contributes a formal specification, transparent assumptions, and mathematically interpretable claims. The maintenance outcome was modelled as  $Y_i = \beta_0 + \beta_1 X_i + u_i + \epsilon_i$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** Ethiopia, Depots, Multilevel Regression, Hierarchical Analysis, Efficiency Measurement, Data-Driven Approaches, Statistical Modelling



## ABSTRACT-ONLY PUBLICATION

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

✉ **REQUEST FULL PAPER**

**Email:** [info@parj.africa](mailto:info@parj.africa)

Request your copy of the full paper today!

## SUBMIT YOUR RESEARCH

**Are you a researcher in Africa? We welcome your submissions!**

Join our community of African scholars and share your groundbreaking work.

**Submit at:** [app.parj.africa](http://app.parj.africa)



Scan to visit [app.parj.africa](http://app.parj.africa)

**Open Access Scholarship from PARJ**

Empowering African Research | Advancing Global Knowledge