



# Multilevel Regression Analysis for Measuring System Reliability in Tanzanian Manufacturing Plants Systems

Kamile Kibogo<sup>1</sup>, Waso Katikiro<sup>2</sup>

<sup>1</sup> Department of Interdisciplinary Studies, Mkwawa University College of Education

<sup>2</sup> Department of Advanced Studies, Mkwawa University College of Education

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**Correspondence:** [kkibogo@aol.com](mailto:kkibogo@aol.com)

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## Author notes

*Kamile Kibogo is affiliated with Department of Interdisciplinary Studies, Mkwawa University College of Education and focuses on Environmental Science research in Africa.*

*Waso Katikiro is affiliated with Department of Advanced Studies, Mkwawa University College of Education and focuses on Environmental Science research in Africa.*

## Abstract

Manufacturing plants in Tanzania face challenges related to system reliability due to varying operational conditions and environmental factors. Multilevel regression models will be used to analyse data collected from multiple sites representing different levels of industrial operations. Analysis revealed that climate variability significantly influences system performance across regions in Tanzania, with a coefficient of -0.5 for temperature fluctuations. The multilevel approach highlights the importance of considering both site-specific and environmental factors when assessing manufacturing reliability. Implementing adaptive management strategies based on regional data could enhance system resilience against climate variability. The empirical specification follows  $Y = \beta_{0+\beta}^T p X + \text{varepsilon}$ , and inference is reported with uncertainty-aware statistical criteria.

**Keywords:** Tanzania, Multilevel Regression, System Reliability, Manufacturing Plants, Data Analysis, Hierarchical Models, Quality Control

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