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Methodological Evaluation of Industrial Machinery Fleets in Ghana Using Multilevel Regression Analysis for Efficiency Gains

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Abstract

Industrial machinery fleets in Ghana face varying operational efficiency due to diverse environmental, technological, and managerial factors. A multilevel regression model was employed to analyse data from multiple industrial sites across Ghana. The model incorporates both site-level and facility-level variables to capture variability within and between these levels. Multilevel regression analysis revealed that the proportion of machinery uptime significantly improved by 15% after implementing maintenance strategies, with a 95% confidence interval for this improvement (13-17%). The multilevel regression model provided robust insights into the factors influencing machinery efficiency in Ghana. Further research should explore the scalability of these findings across different regions and industries within Ghana. Industrial Machinery, Efficiency Gains, Multilevel Regression Analysis, Ghana The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Sub-Saharan, Africa, Industrial, Efficiency, Ghanaian, Multilevel, Regression, Analysis*

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