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Methodological Evaluation of Transport Maintenance Depot Systems in South Africa: Quasi-Experimental Design for Risk Reduction Measurement

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Abstract

Transport maintenance depots play a critical role in ensuring operational efficiency of road transport fleets in South Africa. A quasi-experimental design was employed to assess the impact of different maintenance strategies on fleet reliability, incorporating statistical modelling techniques with robust standard errors for uncertainty quantification. The analysis revealed that an optimised maintenance schedule reduced vehicle breakdowns by approximately 20% over a six-month period. This study provides evidence that strategic implementation of maintenance protocols can significantly enhance fleet reliability and operational risk management in South African road transport environments. Adoption of the recommended optimization techniques is encouraged to further improve fleet performance and safety standards. The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *African, Depot, Evaluation, Methodology, Risk, Quasi-Experimental, Systems*

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