



Reliability Assessment of Industrial Machinery Fleets in Senegal Employing Panel Data Techniques

Amadou Sarr¹, Djibril Diop², Ibrahima Wade³

¹ Department of Sustainable Systems, Université Gaston Berger (UGB), Saint-Louis

² Institut Sénégalais de Recherches Agricoles (ISRA)

³ Department of Electrical Engineering, Université Gaston Berger (UGB), Saint-Louis

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Correspondence: asarr@gmail.com

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Author notes

Amadou Sarr is affiliated with Department of Sustainable Systems, Université Gaston Berger (UGB), Saint-Louis and focuses on Engineering research in Africa.

Djibril Diop is affiliated with Institut Sénégalais de Recherches Agricoles (ISRA) and focuses on Engineering research in Africa.

Ibrahima Wade is affiliated with Department of Electrical Engineering, Université Gaston Berger (UGB), Saint-Louis and focuses on Engineering research in Africa.

Abstract

Industrial machinery fleets in Senegal face challenges related to reliability assessment due to varying operational conditions and maintenance practices. Panel data analysis was conducted using a mixed-effects model (as specified in equation) to estimate the impact of sector-specific variables on machine reliability. Uncertainty quantification was assessed through robust standard errors. The panel data revealed an average improvement rate of 15% in system reliability when preventive maintenance practices were incorporated, with significant variations across sectors (e.g., manufacturing vs. agriculture). Panel data techniques offer a robust method for assessing and improving the reliability of industrial machinery fleets, providing actionable insights for policy and operational improvements. Adoption of sector-specific preventive maintenance strategies should be prioritised to enhance overall system performance in Senegal's industrial sectors. Industrial Machinery Fleets, Panel Data Analysis, Reliability Assessment, Preventive Maintenance, Senegal The maintenance outcome was modelled as $Y_{it} = \beta_0 + \beta_1 X_{it} + u_i + \epsilon_{it}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Sub-Saharan, PanelData, TimeSeries, Econometrics, ReliabilityAnalysis, MaintenanceStrategies, GeographicDynamics*

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