African Coastal Engineering

Methodological Evaluation of Industrial Machinery Fleet Systems in Nigerian Context Using Panel Data Estimation for System Reliability Measurement

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Published: 21 November 2012 | **Received:** 07 August 2012 | **Accepted:** 23 September 2012

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DOI: 10.5281/zenodo.18960067

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Abstract

Industrial machinery fleets play a crucial role in Nigerian coastal engineering projects, yet their reliability is often under-researched. The research employs a fixed effects model (FE) to analyse the impact of maintenance schedules and operational conditions on machinery reliability, using a dataset comprising five years of field observations from ten coastal engineering projects in Nigeria. A positive correlation was observed between regular maintenance intervals and system availability rates, indicating that effective preventive maintenance significantly enhances fleet reliability. The fixed effects model provided robust estimates for system reliability, with confidence intervals suggesting a 95% probability of the true effect falling within the estimated range. Coastal engineering firms should implement more frequent and targeted maintenance schedules to improve machinery reliability in Nigerian contexts. Nigerian coastal engineering, industrial machinery fleets, panel data estimation, system reliability, fixed effects model The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Nigerian, Coastal, Engineering, Panel, Data, Reliability, Econometric*