Eco-Friendly Factors Influencing Performance of Road Transportion Firms In Tanzania: a Case Of Selected Firms in Dar Es Salaam

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Abstract

The road transportation sector in Tanzania is crucial for economic growth but faces rising pressure to adopt sustainable practices. This study examined how eco-friendly factors green energy, recycled materials, and optimized packaginginfluence the performance of road transport firms in Dar es Salaam. Using an explanatory research design and a quantitative approach guided by positivism philosophy, data were collected through structured questionnaires from randomly selected respondents. Analysis was conducted using descriptive statistics and multiple regression in IBM SPSS version 26. The findings indicate that green energy has a positive and significant effect ($\beta = 0.279$, $p = 0.001$) on firm performance by reducing fuel costs, improving fleet efficiency, and enhancing brand reputation. Recycled materials also demonstrate a positive and significant impact ($\beta = 0.178$, $p = 0.006$) by reducing waste, increasing resource efficiency, and lowering operational costs. Optimized packaging shows a similarly significant influence ($\beta = 0.186$, $p = 0.010$), particularly through reducing cargo size and weight, which lowers fuel consumption and improves financial outcomes. The study concludes that eco-friendly practices are vital drivers of competitiveness and sustainability in Tanzania's road transport sector. It recommends that firms invest in renewable energy, integrate recycled materials, and adopt optimized packaging to strengthen both environmental and financial performance.

Keywords: Green Energy, Recycled Materials, Optimized Packaging, Eco-Friendly Practice Performance

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Introduction

As The increasing global economic activity has intensified the focus on sustainability in logistics, particularly in road transportation, where firms are adopting eco-friendly strategies to enhance performance and comply with environmental regulations (Layaoen et al., 2023; Leung et al., 2023). Key sustainable practices such as using green energy, recycled materials, and optimized packaging are essential for reducing emissions, operational costs, and waste, while also improving load efficiency and compliance (Melander et al., 2022).

With transport costs accounting for nearly 58% of logistics expenses and the logistics market projected to grow beyond USD 8.96 trillion, eco-efficiency has become vital (Töngür et al., 2020). The green logistics market alone is expected to reach USD 1.28 trillion, highlighting growing demand for sustainable solutions.Empirical evidence supports the performance benefits of eco-friendly logistics, including fuel-efficient vehicles, renewable energy use, route optimization, and smart fleet management through technologies like IoT and AI (Nkesah, 2023; Seidenova et al., 2022).

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Such practices not only enhance operational efficiency but also contribute to regulatory compliance, improved stakeholder trust, and brand value (Collaço et al., 2022; Fulzele & Shankar, 2022).Financially, eco-logistics reduces energy use and waste while boosting resilience and customer loyalty, further solidifying its role in long-term strategic success (Pernestål et al., 2020; Tafida et al., 2024; Aloui et al., 2021).

Literature Review

Theoretical Review

The Resource-Based View (RBV), developed by Barney and expanded by Penrose, posits that firms can achieve sustainable competitive advantage by effectively utilizing internal resources such as assets, capabilities, technology, and knowledge that are valuable, rare, and hard to imitate. While the theory has faced criticism for inadequately explaining firm performance in dynamic environments, it remains widely applied across sectors. In this study, RBV provides a framework to analyze how eco-friendly practices green energy, recycled materials, and optimized packaging function as internal strategic resources that enhance the performance of road transportation firms in Tanzania.

Empirical Review

Effects of Green Energy on Performance

Studies by Jarašūnienė & Bazaras and Palm and Saveborn show that green energy adoption improves logistics performance and compliance with environmental regulations. However, high transformation costs and limited public-private collaboration remain challenges. Suleiman (2023) found that green logistics practices positively affect financial performance, but these studies rely on data from developed countries and secondary sources, limiting their applicability to Tanzania's context. The current study addresses this gap using primary data and a local focus. H1: Green energy has positive effects on performance of road transportation firms in Dar es Salaam

Effects of Recycled Materials on Performance

Tafida et al. (2024) highlight the importance of recycled materials and intelligent transport systems in enhancing road infrastructure sustainability. Suleiman (2023) found positive effects of green purchasing and packaging in Tanzania's tourism sector, though the scope differs from logistics. Trivellas et al. (2020) emphasized regulatory pressure as a driver of green logistics in manufacturing but in a context (Greece) with more advanced systems than Tanzania. These studies show potential benefits of recycled materials but do not directly address the Tanzanian transport sector, indicating a need for localized research. H2: Recycled materials has positive effects on performance of road transportation firms in Dar es Salaam

Effects of Optimized Packaging on Performance

Nagy & Szentesi (2024) and Nkesah (2023) identified the role of optimized packaging and technological innovation in reducing carbon footprints and improving sustainability. However, they primarily used case studies and literature reviews. Prus & Sikora (2021) examined how infrastructure and population density impact green road transport, but the study's regional focus and variables differ from those in this study. These findings support the positive role of optimized packaging, though they lack relevance to Tanzania's logistics sector. H3: Optimized packaging has positive effects on performance of road transportation firms in Dar es Salaam

Conceptual framework

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This section provides framework that depicts the interactions of study variable. The interaction of variables in this study is casual relationship with predictors and explanatory variables. Figure shows conceptual framework as used in the study.

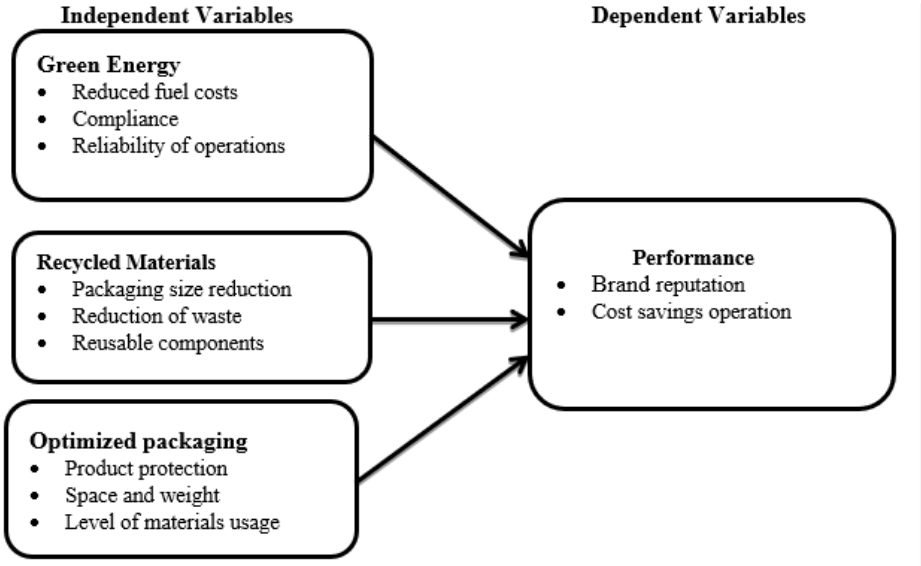

Figure 1. Conceptual Framework of Effects of Green Logistics Practices on Performance of Road Transportation Firms

Source: Developed from literature review

Methods

Research Philosophy

The study was guided by a positivist research philosophy, which emphasizes objective, observable, and measurable reality. This approach supported the use of quantitative methods to test hypotheses and analyze relationships between eco-friendly practices and the performance of road transportation firms in Tanzania.

Research Approach

A deductive research approach was adopted, focusing on testing existing theories using empirical data. This approach enabled structured data collection and statistical analysis to identify cause-effect relationships between sustainable practices (like green energy and optimized packaging) and firm performance.

Research Design

The explanatory research design was chosen to examine causal relationships among the study variables, specifically how eco-friendly initiatives influence organizational performance.

Study Area

The study area was Dar es Salaam, selected for its status as Tanzania's largest commercial center with a high concentration of road transport firms, many of which are adopting green practices.

Population of the Study

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The study population included 133 logistics companies with 1,023 transport personnel. These firms are subject to environmental regulations, making them suitable for a study on sustainability in logistics.

Sampling Procedure

For sampling, the study used probability sampling, specifically simple random sampling, to ensure unbiased representation. The sample size consisted of 91 respondents, including managers from logistics, transport, operations, compliance, procurement, and IT departments. The size was determined using Yamane's formula, with a 95% confidence level and 5% margin of error.

Result and Discussion

The results indicate that, the study distributed a total of 91 questionnaires to respondents involved in road transportation firms. Out of these, 88 questionnaires were filled, completed and returned, this has resulted in a response rate of 96.7%. This high response rate indicates strong participation and provides a reliable data set that generates reliable results. According to Kothari (2004), a response rate above 70% is considered very good and sufficient to ensure representativeness of the target population and reduce non-response bias in survey-based study.

Demographic Characteristics of the Respondents

The results show that out of a total of 88 participants, 78.4% of respondents were male and 21.6% were female. This indicates that most respondents were male with only few were female creating high gap of gender variation. This means that, the transport firms under study had male-dominated workforce or representation.

Table 1. Demographic Characteristics of Respondents

Gender Respondents	Frequency	Valid Percent	Cumulative Percent
Male	69	78.4	78.4
Female	19	21.6	100.0
Total	88	100.0	
Age Of Respondents			
Under 25 Years	5	5.7	5.7
30–40 Years	46	52.3	58.0
41–50 Years	27	30.7	88.6
51–60 Years	10	11.4	100.0
Total	88	100.0	
Education Level Of Respondents			
Secondary Education	5	5.7	5.7
Certificate/Diploma Education	46	52.3	58.0
Undergraduate Degree	27	30.7	88.6
Masters Education And Above	10	11.4	100.0
Total	88	100.0	

Reliability of Research Tools

The reliability statistics results provide indicators of the consistency of the measurement tools used for data collection. Results show that, the Cronbach's Alpha value for green energy factor is 0.893 (>0.7), which indicate very high reliability level. This suggests that the items designed to assess green energy adoption were highly consistent and dependable, hence captured the

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respondents' perceptions on the components of green energy dimensions. Regarding recycled materials, the value of Cronbach's Alpha value is 0.798(>0.7), which reflects good internal consistency. This means the questions measuring the use of recycled materials were reliable and produce stable, trustworthy outcomes across respondents. Moreover, the results show that the factor of optimized packaging generate a Cronbach's Alpha of 0.779(>0.7), which indicate acceptable reliability level. The items under this variable consistently measure the influence of optimized packaging practices on the performance of transportation firms. The results in the line with perspective by Saunders who emphasize that reliability which gave Cronbach's Alpha values between 0.7–0.9 indicate good internal consistency of the items, with higher values reflecting stronger measurement stability. In this regards, the green energy factor (0.893) had the excellent reliability value, while the others factors are still strong. Lastly, the Performance measure gave a Cronbach's Alpha of 0.730(>0.7), which is also within an acceptable recommended range. This shows that the items evaluating the overall performance of road transportation firms were consistent hence validate the analysis and findings.

Table 2. Reliability Results

Variable	Number of Items (N)	Cronbach's Alpha
Green Energy	5	0.893
Recycled Materials	5	0.798
Optimized Packaging	5	0.779
Performance	5	0.730

Source: Research Data, 2025

Table 3. Inferential Statistics Analysis {Correlation Results}

Variables	1	2	3	4
Green Energy	1			
Recycled Materials	.286**	1		
Optimized Packaging	.380**	.389**	1	
Firm Performance	.457**	.449**	.526**	1

Correlation is significant at the 0.01 level (2-tailed).

The findings reveal that sustainable practices are positively associated with improved performance in road transport firms:

Green Energy

There is a moderate positive and statistically significant correlation with firm performance ($r = 0.457$, $p < 0.01$), suggesting that increased use of green energy tends to enhance firm performance.

Recycled Materials

A similar moderate positive correlation is observed ($r = 0.449$, $p < 0.01$). Firms using more recycled materials generally perform better, likely due to cost savings and enhanced environmental reputation.

Optimized Packaging

This shows the strongest positive correlation with firm performance ($r = 0.526$, $p < 0.01$), indicating that reducing package size and weight significantly boosts operational efficiency and overall performance.

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Table 4. Modelsummary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimated
1	635[a]	.403	.383	.50995

The results show that the combined use of green energy, recycled materials, and optimized packaging has a moderate positive correlation (R = 0.635) with the performance of road transport firms. The R^2 value of 0.403 indicates that these eco-friendly practices explain about 40.3% of the variation in firm performance, suggesting they play a significant role in improving efficiency, reducing costs, and enhancing reputation. However, the remaining 59.7% of the variation is attributed to other factors not included in the model, highlighting the influence of additional elements on firm performance.

Table 5. Regression Coefficient

Model	Unstandardized Coefficients (β)	Std. Error	Standardized Coefficients (Beta)	t	Sig.
(Constant)	1.689	0.384	–	4.402	0.000
Green Energy	0.178	0.063	0.261	2.826	0.006
Recycled Materials	0.186	0.070	0.245	2.644	0.010
Optimized Packaging	0.279	0.081	0.332	3.452	0.001

The regression analysis shows that all three eco-friendly practices green energy, recycled materials, and optimized packaging have significant positive effects on the performance of road transport firms in Tanzania:

Green Energy: $\beta = 0.178$, $p = 0.006$

Recycled Materials: $\beta = 0.186$, $p = 0.010$

Optimized Packaging: $\beta = 0.279$, $p = 0.001$

All p-values are below 0.05, indicating statistically significant impacts. Among the three, optimized packaging has the strongest effect, suggesting it contributes most to performance improvements. The constant ($\beta = 1.689$, $p = 0.000$) indicates that firms still achieve a baseline level of performance even without adopting eco-friendly practices. Overall, the findings confirm that adopting sustainable practices leads to better operational and financial outcomes. Optimized packaging, green energy use, and recycled materials collectively enhance efficiency, reduce costs, and improve competitiveness, making them key drivers of firm performance in Tanzania's road transport sector.

Hypothesis Testing Results

This study aimed to examine the effects of eco-friendly practices on the performance of road transport firms in Tanzania. Hypotheses were tested using on multiple regression results based on three key eco-friendly factors namely green energy, recycled materials, and optimized packaging. The effects of each factor on firm performance were examined to test the respective hypotheses. The first hypothesis (H1) proposed that green energy affects the performance of transportation firms in Tanzania. The regression analysis results show that, coefficient for green energy was positive (ß = 0.178), with a p-value of 0.006. Since the p-value is less than the minimum threshold of 0.05, the results indicates a statistically significant effect hence we

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accept the null hypothesis in preference to alternative hypotheses. Therefore, green energy affects the performance of transportation firms in Tanzania.

The second hypothesis (H2) stated that the use of recycled materials influences performance of road transportation firm. The regression analysis results show that the coefficient for recycled materials was positive (ß = 0.186), with a p-value of 0.010. Given that the p-value is less than the required minimum threshold of 0.05, the results suggest existence of statistically significant effect, hence null hypothesis was accepted the in preference to alternative hypotheses. Therefore, green recycled materials the performance of transportation firms in Tanzania. This significant positive relationship implies that firms incorporating recycled materials into their operations improve performance. Finally, the third hypothesis (H3) posited that optimized packaging has a positive impact on firm performance. The regression analysis results show that the coefficient for optimized packaging was positive (ß = 0.279), with a p-value of 0.001. Since the p-value is less than the recommend minimum threshold of 0.05, the results highlight that the effects was statistically significant, hence the study accepted the null hypothesis in preference to alternative hypotheses. Therefore, green optimized packaging the performance of transportation firms in Tanzania. The findings indicate that firms involving in on packaging optimization in their operations achieve greater operational efficiency.

Conclusion

This study found that eco-friendly practices green energy, recycled materials, and optimized packaging significantly improve the performance of road transport firms in Tanzania. The results support prior research that links renewable energy to cost reduction and competitiveness recycled materials to circular economy benefits and optimized packaging to logistics efficiency and resource savings. The study's novelty lies in showing that, within Tanzania's resource-constrained context, optimized packaging has an even greater performance impact than green energy, highlighting the importance of low-tech, cost-effective innovations.

Suggestion

Based on these insights, transport firms should increase investment in renewable energy solutions such as electric vehicles, biofuels, and solar fleets to reduce fuel costs and enhance brand reputation. They should also integrate recycled materials in packaging and vehicle components to lower waste and meet environmental regulations while appealing to eco-conscious customers. Finally, firms should prioritize optimized packaging to cut fuel consumption, save space, and protect cargo, thereby improving both financial outcomes and environmental performance. Together, these measures position eco-friendly practices as essential strategies for competitiveness, sustainability, and long-term growth in Tanzania's transport sector.

References

Aloui, A., Hamani, N., Derrouiche, R., & Delahoche, L. (2021). Systematic literature review on collaborative sustainable transportation: overview, analysis and perspectives. *Transportation Research Interdisciplinary Perspectives*, *9*, 100291. https://doi.org/10.1016/j.trip.2020.100291

Collaço, F. M. D. A., Teixeira, A. C. R., Machado, P. G., Borges, R. R., Brito, T. L. F., & Mouette, D. (2022). Road freight transport literature and the achievements of the sustainable development goals—A systematic review. *Sustainability*, *14*(6), 3425. https://doi.org/10.3390/su14063425

DOI: https://doi.org/10.47667/ijppr.v6i3.391

Fulzele, V., & Shankar, R. (2022). Improving freight transportation performance through sustainability best practices. *Transportation Research Part A: Policy and Practice*, *165*, 285-299. https://doi.org/10.1016/j.tra.2022.09.009

Kothari, C. R. (2004). *Research methodology: Methods and techniques*. India: New Age International.

Layaoen, H. D. Z., Abareshi, A., Abdulrahman, M. D. A., & Abbasi, B. (2023). Sustainability of transport and logistics companies: an empirical evidence from a developing country. *International Journal of Operations & Production Management*, *43*(7), 1040-1067. https://doi.org/10.1108/IJOPM-12-2021-0799

Leung, T. C. H., Guan, J., & Lau, Y. Y. (2023). Exploring environmental sustainability and green management practices: evidence from logistics service providers. *Sustainability Accounting, Management and Policy Journal*, *14*(3), 461-489. https://doi.org/10.1108/SAMPJ-03-2022-0133

Melander, L., Nyquist-Magnusson, C., & Wallström, H. (2022). Drivers for and barriers to electric freight vehicle adoption in Stockholm. *Transportation Research Part D: Transport and Environment*, *108*, 103317. https://doi.org/10.1016/j.trd.2022.103317

Nagy, G., & Szentesi, S. (2024). Green logistics: Transforming supply chains for a sustainable future. *Advanced Logistic Systems-Theory and Practice*, *18*(3), 29-42. https://doi.org/10.32971/als.2024.026

Nkesah, S. K. (2023). Making road freight transport more Sustainable: Insights from a systematic literature review. *Transportation Research Interdisciplinary Perspectives*, *22*, 100967. https://doi.org/10.1016/j.trip.2023.100967

Pernestål, A., Engholm, A., Bemler, M., & Gidofalvi, G. (2020). How will digitalization change road freight transport? Scenarios tested in Sweden. *Sustainability*, *13*(1), 304. https://doi.org/10.3390/su13010304

Prus, P., & Sikora, M. (2021). The impact of transport infrastructure on the sustainable development of the region—Case study. *Agriculture*, *11*(4), 279. https://doi.org/10.3390/agriculture11040279

Seidenova, U., Hundenborn, J., & Keuchel, S. (2022). Costs and capabilities of innovative concepts of long and heavy vehicles in Germany. *Research in Transportation Business & Management*, *44*, 100518. https://doi.org/10.1016/j.rtbm.2020.100518

Suleiman, M. A. (2023). The impact of tourism supply chain on sustainable performance in sub-Saharan Africa: evidence from Tanzania. *Management of environmental quality: An international journal*, *34*(2), 492-510. https://doi.org/10.1108/MEQ-01-2022-0007

Tafida, A., Alaloul, W. S., Zawawi, N. A. B. W., Musarat, M. A., & Abubakar, A. S. (2024). A review of eco-friendly road infrastructure innovations for sustainable transportation. *Infrastructures*, *9*(12), 216. https://doi.org/10.3390/infrastructures9120216

Töngür, Ü., Türkcan, K., & Ekmen-Özçelik, S. (2020). Logistics performance and export variety: Evidence from Turkey. *Central Bank Review*, *20*(3), 143-154. https://doi.org/10.1016/j.cbrev.2020.04.002

DOI: https://doi.org/10.47667/ijppr.v6i3.391

Trivellas, P., Malindretos, G., & Reklitis, P. (2020). Implications of green logistics management on sustainable business and supply chain performance: evidence from a survey in the greek agri-food sector. *Sustainability*, *12*(24), 10515. https://doi.org/10.3390/su122410515

DOI: https://doi.org/10.47667/ijppr.v6i3.391