Journal of Procurement & Supply Chain



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ISSN: 2617-3581

Stratford Peer Reviewed Journals and Book Publishing
Journal of Procurement & Supply Chain
Volume 10||Issue 1||Page 107-119||November||2026|

Green Logistics Practices and Perceived Organisational Sustainability at Kabisa Electric in Rwanda

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How to cite this article: Ndayishimiye, T. & Gitahi, N. (2026). Green Logistics Practices and Perceived Organisational Sustainability at Kabisa Electric in Rwanda. *Journal of Procurement & Supply Chain, 10* (1), 107-119. https://doi.org/10.53819/81018102t3202

Abstract

Organisational sustainability in electric mobility depends on the practices supporting vehicle operations, component sourcing and battery management. This study examined the associations of electric transportation efficiency, green procurement of electric-vehicle components, and waste and battery recycling management with perceived organisational sustainability at Kabisa Electric in Rwanda. Guided by the Triple Bottom Line, Resource-Based View and Stakeholder perspectives, the study adopted a cross-sectional descriptive correlational design. From a target population of 306 employees, a sample of 173 was determined using Yamane's (1967) formula. Stratified random and convenience sampling were employed, and 160 usable questionnaires were returned, yielding a 92.5% response rate. Data were collected using four eight-item Likert scales and analysed through descriptive statistics, Pearson correlation and multiple linear regression in SPSS Version 27. All three practices were positively correlated with perceived sustainability: transportation efficiency ($r = .525$), green procurement ($r = .485$) and recycling management ($r = .431$), all $p < .01$. Their adjusted associations were also significant: $\beta = .340$, $p < .001$; $\beta = .225$, $p = .004$; and $\beta = .199$, $p = .007$, respectively. The joint model explained 37.3% of the variation in perceived sustainability, $F(3, 156) = 30.965$, $p < .001$. Transportation efficiency had the largest standardized coefficient. The study concludes that the three practices are positively associated with perceived sustainability, although cross-sectional self-reports preclude causal inference. It recommends coordinated fleet operations, stronger supplier assessments and traceable battery management, supported by objective performance records.

Keywords: *Green Logistics, Organisational Sustainability, Electric Mobility, Green Procurement, Battery Recycling, Rwanda*

1.0 Background to the Study

Electric mobility requires organisations to coordinate vehicle operations, component sourcing and battery management while maintaining reliable services and long-term viability. Its sustainability therefore depends on the logistics practices supporting electrification, including efficient transportation, responsible procurement and effective management of materials after use. Understanding how these practices relate to organisational sustainability can inform management priorities within electric-mobility businesses. Globally, battery supply-chain concentration and the potential contribution of recycling to material security highlight the importance of responsible sourcing and recovery systems (International Energy Agency, 2025). Operational efficiency also requires coordination of charging opportunities, battery capacity and routing constraints (Schneider et al., 2014). These considerations suggest that electric-vehicle adoption should be examined alongside the organisational practices needed to sustain its operation.

African evidence indicates that the benefits of green logistics may differ across performance dimensions. In a survey of 240 firms across three industries in Ghana, Agyabeng-Mensah et al. (2020) found a significant direct relationship between green logistics practices and environmental performance, but insignificant direct relationships with social, market and financial performance. Their findings support examining specific sustainability outcomes rather than assuming that green practices generate uniform benefits. In Rwanda, the Ministry of Infrastructure's (2021) strategic paper identified electric mobility as a means of addressing transport emissions and dependence on imported fossil fuels. Its priorities included charging infrastructure, investment incentives and public awareness. This policy context creates a need for organisational evidence on the practices supporting electric-mobility operations.

Against this background, the study examined the associations of electric transportation efficiency, green procurement of electric-vehicle components, and waste and battery recycling management with perceived organisational sustainability at Kabisa Electric in Rwanda. Transportation efficiency encompassed fleet utilisation, energy management, routing, charging, maintenance and staff training. Green procurement covered supplier selection, environmental purchasing criteria and supplier oversight, while recycling management addressed battery handling, reuse, disposal and employee participation. Organisational sustainability was assessed through employees' perceptions of environmental, economic, social and operational performance. The findings provide context-specific evidence to inform logistics management and subsequent assessment using objective performance indicators.

1.1 Statement of the Problem

Electric-vehicle adoption alone does not ensure organisational sustainability. Charging and routing constraints require coordinated operations, while responsible sourcing and battery recovery present additional management challenges (Schneider et al., 2014; Harper et al., 2019). Examining green logistics as a single activity may obscure the separate associations of transportation efficiency, green procurement and recycling management with sustainability. Existing studies

address technical routing constraints, broader green logistics practices and battery recovery, but offer limited evidence on these three practices within a single electric-mobility organisation in Rwanda (Schneider et al., 2014; Harper et al., 2019; Agyabeng-Mensah et al., 2020). This study addressed that contextual gap by examining their separate associations with perceived organisational sustainability at Kabisa Electric. The findings provide context-specific evidence to inform logistics management and sustainability assessment.

1.2 Research Objectives

The study was guided by the following objectives:

i. To examine the association between electric transportation efficiency and perceived organisational sustainability at Kabisa Electric in Rwanda.

ii. To assess the association between green procurement of electric-vehicle components and perceived organisational sustainability at Kabisa Electric in Rwanda.

iii. To determine the association between waste and battery recycling management and perceived organisational sustainability at Kabisa Electric in Rwanda.

1.3 Research Hypotheses

The study tested the following null hypotheses:

H_{01}: Electric transportation efficiency has no statistically significant association with perceived organisational sustainability at Kabisa Electric in Rwanda.

H_{02}: Green procurement of electric-vehicle components has no statistically significant association with perceived organisational sustainability at Kabisa Electric in Rwanda.

H_{03}: Waste and battery recycling management has no statistically significant association with perceived organisational sustainability at Kabisa Electric in Rwanda.

2.0 Literature Review

This section presents the theories that anchor the study and reviews empirical literature on electric transportation efficiency, green procurement, and waste and battery recycling management in relation to organisational sustainability.

2.1 Theoretical Framework

Elkington's (1997) Triple Bottom Line perspective connects economic prosperity, environmental protection and social responsibility. It provides a broad basis for considering organisational sustainability beyond immediate operating costs. Applied here, efficient transport, responsible procurement and battery management may support different aspects of sustainability. However, this perspective does not imply that a single favourable composite score demonstrates equivalent achievement across all dimensions. The study's combined outcome therefore requires interpretation as an overall perception rather than a separate test of each sustainability dimension. The Resource-Based View explains performance differences in terms of organisational resources

and capabilities (Barney, 1991). Hart's (1995) natural-resource-based extension links competitive advantage to the firm's relationship with the natural environment. Together, these perspectives suggest that coordinated logistics routines and environmental capabilities warrant investigation. The present study uses them to interpret operational knowledge, supplier assessment and material management as potentially relevant capabilities. It does not directly test resource rarity, imitation barriers or sustained competitive advantage, which would require different measures and a stronger temporal design.

Freeman's (1984) Stakeholder approach directs attention to relationships with parties that affect or are affected by an organisation. In this setting, employees, suppliers, customers, public authorities and waste handlers have potentially different interests in reliable services, safe handling, transparency and compliance. The framework helps explain why procurement and recycling practices may matter alongside fleet operations. Employee responses nevertheless provide only one stakeholder perspective; they cannot substitute for supplier assessments, customer evidence or regulatory inspection records. These frameworks serve complementary purposes. The Triple Bottom Line defines the breadth of the outcome, resource perspectives identify organisational capabilities, and the Stakeholder approach highlights relationships and responsibilities. The resulting analytical expectation is that each logistics practice will be positively associated with perceived organisational sustainability when considered alongside the others. This is an associational proposition. Neither the theoretical frameworks nor a cross-sectional regression establishes that adopting a practice causes subsequent improvements.

2.2 Empirical Review

The empirical literature is reviewed in line with the three green logistics practices examined in the study.

2.2.1 Electric Transportation Efficiency and Sustainability

Schneider et al. (2014) developed an electric vehicle-routing model incorporating time windows and recharging stations. Their computational analysis shows the importance of explicitly considering charging and vehicle constraints in routing decisions. This supports the inclusion of charging coordination and route optimisation in the present transportation measure. However, a computational routing study evaluates feasible operational solutions rather than employee-rated organisational sustainability. Its results therefore establish a plausible operational mechanism, not a directly comparable survey effect size. The project operationalised transportation efficiency through fleet utilisation, energy consumption management, routing, charging infrastructure, maintenance, driver training, fleet size and tracking. These indicators cover both physical resources and management routines. Their combination is useful for exploring a broad operational capability, but individual agreement statements do not quantify electricity consumed, distance travelled, vehicle availability or service costs. An association between this score and perceived sustainability should therefore be interpreted as consistency between employee assessments, with operational improvement remaining a question for independent records.

2.2.2 Green Procurement and Sustainability

Zhu and Sarkis (2004) examined relationships between green supply-chain practices and performance in Chinese manufacturing, including the role of other operational management practices. Their study locates environmental purchasing within a wider system of organisational routines rather than treating it as an isolated transaction. Its manufacturing setting differs from electric mobility services in Rwanda, but it provides a useful rationale for considering supplier oversight and procurement policy alongside transport operations and waste management. Agyabeng-Mensah et al. (2020) further demonstrated that direct and indirect relationships between green logistics and performance can differ across sustainability dimensions in an African setting. This challenges a simple assumption that purchasing environmentally preferable components necessarily produces immediate financial gains. In the present study, supplier selection, policy adherence, audits, transparency and supplier relationships represent procurement practices, while perceived lead-time reduction and cost savings also enter the scale. The latter items overlap conceptually with performance and require caution when interpreting the procurement–sustainability relationship.

2.2.3 Waste and Battery Recycling Management and Sustainability

Harper et al. (2019) reviewed opportunities and challenges in recycling lithium-ion batteries from electric vehicles, including the recovery of materials and the practical difficulties of processing battery systems. Their analysis supports treating battery management as a substantive sustainability concern rather than an optional activity after vehicle use. It also underscores the difference between having favourable views of recycling and demonstrating that batteries have been collected, safely handled and processed through an appropriate recovery pathway. The International Energy Agency (2025) similarly identifies recycling as relevant to longer-term battery supply-chain resilience, while noting constraints associated with feedstock availability and industrial development. These observations indicate that an individual company's practices depend partly on systems beyond its own facilities. The present project assessed employee perceptions of recycling, hazardous-waste handling, component reuse, managerial support, disposal costs and staff participation. It did not establish recovered material quantities, battery collection rates, recycling yields or the existence of a particular processing facility.

3.0 Research Methodology

The study adopted a cross-sectional descriptive correlational design with a quantitative approach and was conducted at Kabisa Electric in Rwanda. The target population comprised 306 employees in Operations (122), Procurement (77), Maintenance (46), Recycling and Waste Management (37) and Administration (24). Using Yamane's (1967) formula, $n = N / (1 + Ne^2)$, with N = 306 and e = .05, a sample of 173 respondents was determined; stratified random sampling was used in Operations, Procurement and Maintenance, while convenience sampling was applied in Recycling and Waste Management and Administration. Data were collected using a structured questionnaire of 32 items, eight for each of the three green logistics practices and eight for perceived

organisational sustainability, which covered environmental, economic, social and operational dimensions, rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). A pilot study with 43 participants at Spiro's electric-motorbike operations confirmed the suitability of the instrument, with Cronbach's alpha coefficients of .834 for electric transportation efficiency, .820 for green procurement, .858 for waste and battery recycling management and .871 for perceived organisational sustainability, all above the .70 threshold (George & Mallery, 2019). Data were analysed in SPSS Version 27 using frequencies and percentages, with agreement percentages combining "agree" and "strongly agree" responses, Pearson correlation, and multiple linear regression at the .05 significance level based on the model $Y = \alpha + b_1T + b_2G + b_3W + \varepsilon$, where Y is perceived organisational sustainability, T is electric transportation efficiency, G is green procurement, W is waste and battery recycling management, α is the intercept and ε is the error term. Because the data were collected at a single point in time, the findings are interpreted as associations rather than causal effects. Ethical approval was obtained from the Mount Kigali University Ethical Review Board (Ref. MKUR04/ERC/1018), organisational permission was secured before data collection, and participation was voluntary, with informed consent, the right to withdraw without penalty and confidentiality of responses.

4.0 Findings and Discussion

This section presents and discusses the findings in line with the study objectives. Of the 173 questionnaires distributed, 160 were returned complete and usable (92.5%), a response rate adequate for statistical analysis. Respondents were 82 women (51.2%) and 78 men (48.8%). By department they came from Operations (40.0%), Procurement (25.0%), Maintenance (15.0%), Recycling and Waste Management (11.9%) and Administration (8.1%), closely matching the departmental structure of the target population (40%, 25%, 15%, 12% and 8%).

4.1 Perceived Organisational Sustainability

Table 1 presents respondents' perceptions of organisational sustainability. Agreement ranged from 73.8% for transparent sustainability reporting to 84.4% for operational efficiency. Environmental sustainability also received substantial agreement (83.8%). Overall, respondents expressed favourable perceptions, although reporting transparency received comparatively lower endorsement.

Table 1: Respondents' Perceptions of Organisational Sustainability

Statement	Agreement (n)	Agreement (%)	Mean	Std. Deviation
Environmental sustainability is prioritized	134	83.8	4.14	0.70
Economic sustainability is evident	129	80.6	4.09	0.74
Social sustainability is actively promoted	124	77.5	4.02	0.81
Sustainability reporting is transparent	118	73.8	3.96	0.84
Stakeholder satisfaction is high	129	80.6	4.09	0.76
Operational efficiency is maintained	135	84.4	4.14	0.71
Regulatory compliance is ensured	131	81.9	4.11	0.74
Innovation is encouraged	128	80.0	4.08	0.77
Overall average	—	—	4.08	0.76

The results indicate generally positive perceptions of organisational sustainability, with an overall mean of 4.08 and standard deviation of 0.76. Operational efficiency recorded the highest agreement (84.4%, M = 4.14, SD = 0.71), closely followed by environmental sustainability (83.8%, M = 4.14, SD = 0.70). Sustainability reporting had the lowest agreement (73.8%, M = 3.96, SD = 0.84), suggesting comparatively greater variation in respondents' views. Overall, the findings suggest that Kabisa Electric Company demonstrates positive sustainability practices across environmental, economic, and social dimensions.

4.2 Electric Transportation Efficiency and Sustainability

The first objective examined transportation efficiency. Agreement across its eight items ranged from 74.4% for energy-consumption management to 83.1% for tracking, with fleet utilisation and driver training each receiving 81.3% agreement (Table 2). Charging support received 78.8% agreement. These values describe employee assessments of operational arrangements; they do not quantify energy use or actual charging availability. The variation suggests useful topics for operational verification rather than proving a particular infrastructure shortage.

Table 2: Respondents' Perceptions of Electric Transportation Efficiency

Questionnaire statement	Agreement (n)	Agreement (%)	Mean	Std. Deviation
EV fleet utilisation rate is consistently high	130	81.3	4.08	0.74
Energy consumption per trip is efficiently managed	119	74.4	4.03	0.77
Route optimisation is evident in daily operations	127	79.4	4.07	0.71
Charging infrastructure supports efficient operations	126	78.8	4.08	0.76
Maintenance schedules maximise fleet uptime	128	80.0	4.06	0.75
Driver training enhances fleet efficiency	130	81.3	4.09	0.74
Fleet size matches operational requirements	125	78.1	4.03	0.78
Real-time tracking improves route efficiency	133	83.1	4.15	0.73
Overall average			4.08	0.75

The findings indicate a generally positive perception of electric transportation efficiency, with an overall mean of 4.08 and standard deviation of 0.75. Real-time tracking recorded the highest mean (4.15, SD = 0.73) and agreement (83.1%), followed by driver training (M = 4.09, SD = 0.74) and fleet utilisation (M = 4.08, SD = 0.74). Energy consumption management and fleet size recorded comparatively lower mean scores of 4.03, suggesting areas for further operational improvement.

Electric transportation efficiency was positively associated with organisational sustainability ($r = .525$, $p < .01$; Table 5). The relationship remained statistically significant after controlling for green procurement and waste and battery recycling management ($B = .365$, $\beta = .340$, $t = 4.586$, $p < .001$; Table 6). Therefore, H_{01} was rejected. Transportation efficiency had the largest standardised coefficient, although differences between the three coefficients were not statistically tested. The finding is consistent with Schneider et al. (2014), who emphasised the coordinated management of charging and routing constraints. It also supports the resource-based interpretation that maintenance routines, staff skills and information systems are relevant organisational resources for improving efficiency. However, favourable perceptions of the organisation may have influenced ratings of both efficiency and sustainability. Future assessments should incorporate electricity consumption, vehicle downtime and service-reliability records to establish whether these perceptions correspond to measurable improvements over time.

4.3 Green Procurement and Sustainability

For the second objective, respondents generally evaluated green procurement practices favorably, with item means ranging from 3.93 to 4.01 and standard deviations ranging from 0.77 to 0.84 (Table 3). Supplier relationships and procurement transparency recorded the highest mean scores (both *M* = 4.01, *SD* = 0.77), followed by sustainable supplier selection (*M* = 4.00, *SD* = 0.79). Supplier audits received the lowest mean score (*M* = 3.93, *SD* = 0.84) and the lowest agreement percentage (72.5%). Agreement across the eight statements ranged from 72.5% to 77.5%. These

findings suggest generally favorable perceptions of procurement practices, although the comparatively lower endorsement of supplier audits indicates an area for further review. However, respondents' assessments do not establish actual compliance or noncompliance because audit frequency, findings and corrective actions were not measured.

Table 3: Descriptive Statistics for Green Procurement Statements

Questionnaire statement	Agreement, n	Agreement, %	Mean	SD
Sustainable supplier selection is a priority	123	76.9	4.00	0.79
Environmentally compliant purchases are standard	119	74.4	3.96	0.82
Company adheres to its green procurement policy	121	75.6	3.98	0.80
Supplier audits ensure environmental compliance	116	72.5	3.93	0.84
Green procurement has reduced lead times	119	74.4	3.95	0.80
Sustainable procurement produces cost savings	123	76.9	3.99	0.78
Green procurement strengthens supplier relationships	124	77.5	4.01	0.77
Procurement practices are transparent	122	76.3	4.01	0.77

Green procurement was positively associated with perceived organisational sustainability (r = .485, p < .01). This association remained statistically significant after controlling for transportation efficiency and waste and battery recycling management (B = .247, β = .225, t = 2.895, p = .004); therefore, H_{02} was rejected. The coefficient represents an adjusted association rather than a percentage improvement attributable to procurement. The finding is consistent with Zhu and Sarkis (2004), who examined green supply-chain practices within broader operational systems. However, Agyabeng-Mensah et al. (2020) reported that relationships differed across sustainability dimensions, cautioning against assuming equivalent environmental and financial benefits. The overall sustainability score used in this study cannot identify which dimension accounts for the observed association. Furthermore, procurement items concerning cost savings and lead times overlap conceptually with the outcome, potentially strengthening the observed relationship.

4.4 Waste and Battery Recycling Management and Sustainability

For the third objective, item means ranged from 3.68 to 3.86, with standard deviations ranging from 0.84 to 0.91 (Table 4). Hazardous-waste handling received the highest mean score (M = 3.86, SD = 0.84), followed by waste-management regulatory compliance (M = 3.85, SD = 0.84) and management support for recycling (M = 3.85, SD = 0.86). Employee engagement recorded the lowest mean score (M = 3.68, SD = 0.91), followed by the perceived battery recycling rate (M = 3.70, SD = 0.91). Agreement ranged from 61.3% for a high battery recycling rate to 70.0% for hazardous-waste handling and waste-management compliance. These findings suggest a need to strengthen employee participation and assess battery-recovery procedures. However, the responses

reflect employees' perceptions rather than measured recycling rates, recovery yields or verified regulatory compliance.

Table 4: Descriptive Statistics for Waste and Battery Recycling Statements

Questionnaire statement	Agreement, n	Agreement, %	Mean	SD
Battery recycling rate is high	98	61.3	3.70	0.91
Hazardous waste handling complies with regulations	112	70.0	3.86	0.84
Reused and repurposed components are commonly used	102	63.8	3.75	0.88
Recycling initiatives are supported by management	110	68.8	3.85	0.86
Recycling minimizes waste-disposal costs	104	65.0	3.76	0.89
Employee engagement in recycling is high	99	61.9	3.68	0.91
Waste-management regulatory compliance is maintained	112	70.0	3.85	0.84
Recycling efficiency has improved over time	104	65.0	3.76	0.88

Waste and battery recycling management was positively associated with perceived organisational sustainability ($r = .431$, $p < .01$). This association remained statistically significant after controlling for transportation efficiency and green procurement ($B = .195$, $\beta = .199$, $t = 2.731$, $p = .007$); therefore, H_{03} was rejected. Although recycling management had the smallest standardised coefficient, this does not establish that it is less important for environmental protection or safe operations. The finding is consistent with Harper et al. (2019), who emphasized the technical and organisational requirements of electric-vehicle battery recovery. However, the questionnaire measured perceptions rather than actual recycling rates or recovery yields. Kabisa Electric should therefore complement employee assessments with records of battery collection, safe storage, handling and transfer to qualified recovery partners. These records would provide a stronger basis for evaluating recycling performance.

4.5 Correlation and Regression Analysis

Table 5 presents the Pearson correlations among the study variables, and Table 6 presents the multiple regression results.

Table 5: Pearson Correlations Among the Study Variables

Variable	1	2	3	4
1. Transportation efficiency	—			
2. Green procurement	.491**	—		
3. Waste and battery recycling	.373**	.466**	—	
4. Perceived sustainability	.525**	.485**	.431**	–

Note: ** p < .01 (two-tailed).

The practices were also positively intercorrelated, with reported coefficients between .373 and .491 (Table 5). These values indicate overlap between employee assessments of the practices, but do not demonstrate operational synergy or interaction. All three were retained in the same regression, allowing their adjusted relationships with sustainability to be reported without recasting the analysis as three independent one-predictor models.

Table 6: Multiple Regression for Perceived Organisational Sustainability

Predictor	B	SE B	β	t	p
Constant	.833	.334	—	2.498	.014
Transportation efficiency	.365	.080	.340	4.586	< .001
Green procurement	.247	.085	.225	2.895	.004
Waste and battery recycling	.195	.071	.199	2.731	.007

Note: $R = .611$, $R^2 = .373$, adjusted $R^2 = .361$, $F(3, 156) = 30.965$, $p < .001$.

The joint regression model was statistically significant, $F(3, 156) = 30.965$, $p < .001$, with $R = .611$, $R^2 = .373$ and adjusted $R^2 = .361$. The three green logistics practices jointly explained 37.3% of the variation in perceived organisational sustainability. The fitted equation was $\hat{Y} = .833 + .365T + .247G + .195W$, where T represents electric transportation efficiency, G green procurement, and W waste and battery recycling management. These results indicate adjusted associations rather than causal effects, and regression diagnostics (normality of residuals, multicollinearity and homoscedasticity) should be reported to support the model. Together, the findings suggest that operational coordination, responsible sourcing and effective material management are relevant to perceived organisational sustainability at Kabisa Electric. The pattern is consistent with the study's theoretical perspectives, although it does not directly validate or compare them. The study provides context-specific evidence on the three practices; broader conclusions about Rwanda's electric-mobility sector require research across additional organisations and stakeholder groups.

5.0 Conclusion

The study concludes that electric transportation efficiency, green procurement, and waste and battery recycling management are positively and significantly associated with perceived organisational sustainability at Kabisa Electric, and all three null hypotheses were rejected. Electric transportation efficiency had the largest standardised coefficient (β = .340), followed by green procurement (β = .225) and waste and battery recycling management (β = .199), and together the three practices explained 37.3% of the variation in perceived organisational sustainability. The findings support coordinated attention to efficient operations, responsible sourcing and effective battery management. However, the study covered one organisation, used convenience sampling in

two departments and relied on cross-sectional, self-reported data, in which some practice and outcome items overlap conceptually and common-method influences may be present (Podsakoff et al., 2003); the results therefore establish associations rather than causal effects or independently verified sustainability improvements.

6.0 Recommendations

Based on the findings, the study recommends that the management of Kabisa Electric strengthen the coordination of routing, charging, maintenance and driver training, and monitor performance through electricity consumption, vehicle availability, downtime and service reliability, with infrastructure investments reflecting operational needs. Management should also strengthen green procurement through documented supplier assessments, environmental purchasing criteria and periodic audits, with procurement teams monitoring supplier compliance, delivery performance and component quality and following up identified weaknesses promptly. In addition, waste and battery management should be improved through clear staff responsibilities, training, safe storage and traceable transfers of used batteries and components, in collaboration with the relevant authorities and qualified recovery partners, and with records of quantities and destinations. Future research should include several electric-mobility organisations, distinguish practice measures more clearly from performance outcomes, incorporate objective operational and battery-recovery records, and track performance over time.

References

Agyabeng-Mensah, Y., Afum, E., & Ahenkorah, E. (2020). Exploring financial performance and green logistics management practices: Examining the mediating influences of market, environmental and social performances. *Journal of Cleaner Production, 258*, Article 120613. https://doi.org/10.1016/j.jclepro.2020.120613

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management, 17*(1), 99–120. https://doi.org/10.1177/014920639101700108

Elkington, J. (1997). *Cannibals with forks: The triple bottom line of 21st century business*. Capstone. https://books.google.com/books?id=QLg9PgAACAAJ.

Freeman, R. E. (1984). *Strategic management: A stakeholder approach*. Pitman. https://books.google.com/books?id=4PUJAQAAMAAJ.

George, D., & Mallery, P. (2019). *IBM SPSS statistics 26 step by step: A simple guide and reference* (16th ed.). Routledge. https://doi.org/10.4324/9780429056765.

Harper, G., Sommerville, R., Kendrick, E., Driscoll, L., Slater, P., Stolkin, R., Walton, A., Christensen, P., Heidrich, O., Lambert, S., Abbott, A., Ryder, K., Gaines, L., & Anderson, P. (2019). Recycling lithium-ion batteries from electric vehicles. *Nature, 575*(7781), 75–86. https://doi.org/10.1038/s41586-019-1682-5.

Hart, S. L. (1995). A natural-resource-based view of the firm. *Academy of Management Review, 20*(4), 986–1014. https://doi.org/10.5465/amr.1995.9512280033

International Energy Agency. (2025). *Global EV outlook 2025: Expanding sales in diverse markets*. https://www.iea.org/reports/global-ev-outlook-2025.

Ministry of Infrastructure. (2021). *Strategic paper on electric mobility adaptation in Rwanda*. https://www.mininfra.gov.rw/fileadmin/user_upload/Mininfra/Publications/Laws_Orders_and_Instructions/Transport/16062021_Strategic_Paper_for_e-mobility_adaptation_in_Rwanda-Final.pdf

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*(5), 879–903. https://doi.org/10.1037/0021-9010.88.5.879

Schneider, M., Stenger, A., & Goeke, D. (2014). The electric vehicle-routing problem with time windows and recharging stations. *Transportation Science, 48*(4), 500–520. https://doi.org/10.1287/trsc.2013.0490

Yamane, T. (1967). *Statistics: An introductory analysis* (2nd ed.). Harper & Row.

Zhu, Q., & Sarkis, J. (2004). Relationships between operational practices and performance among early adopters of green supply chain management practices in Chinese manufacturing enterprises. *Journal of Operations Management, 22*(3), 265–289. https://doi.org/10.1016/j.jom.2004.01.005