

RESEARCH PAPER

ENVIRONMENTAL MANAGEMENT & POLICIES

# Eco-Innovation, Green Competitive Advantage, and Sustainable Business Performance in African Firms: An Empirical Structural Equation Modeling Approach

Saibabu Neyyila<sup>1\*</sup>, Tatayya Bommali<sup>2</sup>, Anjay Kumar Mishra<sup>3</sup> and Saumendra Das<sup>4</sup>

<sup>1</sup>Associate Professor, School of Postgraduate Studies, Skyline University, Nigeria

<sup>2</sup>Professor & HOD of Management Studies, & COE, Sanketika Vidya Parishad Engineering College (A), Visakhapatnam, India

<sup>3</sup>Dean, Madhesh University, Nepal

<sup>4</sup>Professor and HoD, School of Management Studies, GIET University, Gunupur, Odisha, India

\*Corresponding author: [nsaibabu82@gmail.com](mailto:nsaibabu82@gmail.com)

Received: 18 Mar., 2026

Revised: 03 May, 2026

Accepted: 27 May, 2026

## ABSTRACT

Eco-innovation has emerged as a strategic mechanism for enhancing corporate sustainability, particularly in emerging African economies facing environmental and institutional pressures. Despite growing interest, empirical evidence explaining how eco-innovation translates into sustainable business performance remains limited. This study investigates the direct and indirect effects of eco-innovation on sustainable business performance, incorporating green competitive advantage as a mediating construct. Using survey data collected from 312 manufacturing and service firms across Nigeria, Kenya, and South Africa, the study applies Partial Least Squares Structural Equation Modeling (PLS-SEM). The results reveal that product, process, and organizational eco-innovation significantly enhance green competitive advantage and sustainable business performance. Furthermore, green competitive advantage partially mediates the eco-innovation–performance relationship. The findings contribute to eco-innovation literature in emerging economies and provide strategic implications for managers and policymakers.

**Keywords:** Eco-innovation, Green competitive advantage, Sustainable business performance, Africa, PLS-SEM, Environmental strategy

Sustainable development has become a strategic imperative for firms operating in emerging economies. African countries face increasing environmental degradation, energy inefficiency, and regulatory

**How to cite this article:** Neyyila, S., Bommali, T., Mishra, A.K. and Das, S. (2026). Eco-Innovation, Green Competitive Advantage, and Sustainable Business Performance in African Firms: An Empirical Structural Equation Modeling Approach. *IJASE*, 14(01): 01-12.

**Source of Support:** None; **Conflict of Interest:** None



pressures, while firms simultaneously strive for profitability and competitiveness. This dual challenge requires innovative approaches that integrate environmental responsibility with economic performance. Eco-innovation innovations that reduce environmental harm while creating value has been recognized as a potential driver of sustainable growth. Although substantial evidence exists in developed economies, empirical research in African contexts remains limited. Moreover, the mechanism through which eco-innovation improves performance is not fully understood. This study proposes that green competitive advantage mediates the relationship between eco-innovation and sustainable business performance.

## **LITERATURE REVIEW**

### **Eco-Innovation**

Eco-innovation refers to new products, processes, organizational structures, or business models that reduce environmental impacts (Rennings, 2000). It is generally classified into:

- ☐ Product Eco-Innovation
- ☐ Process Eco-Innovation
- ☐ Organizational Eco-Innovation

Research suggests eco-innovation enhances efficiency, reduces costs, and strengthens market positioning.

### **Green Competitive Advantage**

Green competitive advantage refers to a firm's ability to differentiate itself through environmentally responsible practices, resulting in superior reputation, cost leadership, and customer loyalty (Chen, 2008). The Resource-Based View suggests that eco-innovation capabilities can become strategic assets that generate competitive advantage.

### **Sustainable Business Performance**

Sustainable performance encompasses:

- ☐ Economic Performance
- ☐ Environmental Performance
- ☐ Social Performance

Studies indicate that firms integrating environmental innovation into strategy achieve superior long-term outcomes (Albort-Morant *et al.* 2016).

### **1. Eco-Innovation and Sustainable Business Performance in Africa**

Eco-innovation has gained traction in Africa as businesses increasingly adopt environmentally oriented practices to improve performance. Recent systematic evidence shows that eco-process and eco-product

innovations dominate in African firms, with demonstrated environmental benefit though economic gains lag due to high upfront costs and limited social evaluations in earlier research. Furthermore, empirical work from Nigeria's agri-food sector highlights that eco-innovation strategies positively influence sustainable development outcomes, reinforcing the relevance of eco-innovation in driving business resilience in emerging African markets (Onobrakpeya & Uwagwu, 2025).

## 2. Green Innovation and Competitive Advantage

Green innovation acts both as an operational strategy and competitive differentiator in African contexts. For example, green supply chain management practices significantly influence sustainability outcomes among South African SMEs (Tsikada, Chasaya, & Ayandibu, 2025). Similarly, studies investigating green innovation strategy in Ethiopian eco-hotels find that green innovation strongly predicts sustainable competitive advantage, especially when mediated by green intellectual capital demonstrating that African firms can transform eco-innovative activities into market strength (Niguse, Kant, & Borji, 2025).

## 3. Green Dynamic Capabilities and Performance

Green dynamic capability the firm's internal competencies to adapt and leverage sustainable practices is increasingly shown to enhance sustainability performance. Asiedu and colleagues (2025) provide evidence from Ghana that green innovation combined with green dynamic capability strengthens sustainable outcomes of manufacturing firms.

## 4. Innovation Moderation and Broader Sustainability

Green innovation also plays a moderating role in broader performance relationships. A multi-nation study across African states finds that green innovation strengthens the impact of innovation strategies on corporate social responsibility (CSR) outcomes, suggesting that eco-innovative technologies support wider firm legitimacy and stakeholder value in African markets (Omonijo & Zhang, 2024).

## 5. Other Africa-Relevant Evidence on Innovation and Sustainability

Beyond firm-level studies, research on digital transformation, renewable energy transition, and environmental governance in Sub-Saharan Africa indicates that green innovation and institutional quality jointly support sustainable development goals, further underscoring the pivotal role of innovation in Africa's transition to sustainable economies (Dawo & Khalifa, 2025; see also studies on digital-green interplay). Collectively, these studies confirm that while challenges remain, recent African research increasingly highlights the positive role of eco-innovation and green innovation in driving sustainable business performance and competitive advantage providing strong empirical grounding for the hypotheses and model in the present study.

## 3. RESEARCH OBJECTIVES

- ❑ To examine the impact of eco-innovation on sustainable business performance.
- ❑ To assess the effect of eco-innovation on green competitive advantage.
- ❑ To evaluate the mediating role of green competitive advantage.

## HYPOTHESES

**H1:** Product Eco-Innovation has a positive and significant effect on Green Competitive Advantage.

**H2:** Process Eco-Innovation has a positive and significant effect on Green Competitive Advantage.

**H3:** Organizational Eco-Innovation has a positive and significant effect on Green Competitive Advantage.

**H4:** Green Competitive Advantage has a positive and significant effect on Sustainable Business Performance.

**H5:** Product Eco-Innovation has a positive and significant effect on Sustainable Business Performance.

**H6:** Process Eco-Innovation has a positive and significant effect on Sustainable Business Performance.

**H7:** Organizational Eco-Innovation has a positive and significant effect on Sustainable Business Performance.

**H8:** Green Competitive Advantage mediates the relationship between Product Eco-Innovation and Sustainable Business Performance.

**H9:** Green Competitive Advantage mediates the relationship between Process Eco-Innovation and Sustainable Business Performance.

**H10:** Green Competitive Advantage mediates the relationship between Organizational Eco-Innovation and Sustainable Business Performance.

## RESEARCH DESIGN

### Sample and Data Collection

- ☐ Sample size: 312 firms
- ☐ Countries: Nigeria (120), Kenya (95), South Africa (97)
- ☐ Method: Structured questionnaire
- ☐ Scale: 5-point Likert scale
- ☐ Analysis tool: SmartPLS 4

## MEASUREMENT MODEL RESULTS

### Structural Model Results (Direct Effects)

Table 1 presents the direct path relationships among eco-innovation dimensions, green competitive advantage, and sustainable business performance. The findings indicate that all hypothesized relationships are statistically significant at  $p < 0.05$ . Product eco-innovation has a positive and significant effect on green competitive advantage ( $\beta = 0.312$ ,  $t = 4.876$ ,  $p < 0.001$ ). This suggests that firms introducing environmentally friendly products gain a stronger competitive position in the market. Process eco-innovation also significantly influences green competitive advantage ( $\beta = 0.284$ ,  $t = 4.215$ ,  $p < 0.001$ ),

indicating that improvements in cleaner production methods enhance firms' strategic positioning. Organizational eco-innovation demonstrates the strongest effect on green competitive advantage ( $\beta = 0.356, t = 5.402, p < 0.001$ ). This finding implies that internal structural and managerial green practices contribute substantially to competitive superiority. Green competitive advantage significantly affects sustainable business performance ( $\beta = 0.421, t = 6.738, p < 0.001$ ). This confirms that environmentally differentiated firms achieve superior financial, environmental, and social outcomes. Furthermore, product ( $\beta = 0.168$ ), process ( $\beta = 0.142$ ), and organizational eco-innovation ( $\beta = 0.193$ ) also have direct positive effects on sustainable business performance. Thus, all direct hypotheses (H1–H7) are supported.

**Table 1: The Direct Path Relationships**

| Hypothesis | Path                                                                         | $\beta$<br>(Coefficient) | t-value | p-value | Decision |
|------------|------------------------------------------------------------------------------|--------------------------|---------|---------|----------|
| H1         | Product Eco-Innovation $\rightarrow$ Green Competitive Advantage             | 0.312                    | 4.876   | 0.000   | Accepted |
| H2         | Process Eco-Innovation $\rightarrow$ Green Competitive Advantage             | 0.284                    | 4.215   | 0.000   | Accepted |
| H3         | Organizational Eco-Innovation $\rightarrow$ Green Competitive Advantage      | 0.356                    | 5.402   | 0.000   | Accepted |
| H4         | Green Competitive Advantage $\rightarrow$ Sustainable Business Performance   | 0.421                    | 6.738   | 0.000   | Accepted |
| H5         | Product Eco-Innovation $\rightarrow$ Sustainable Business Performance        | 0.168                    | 2.945   | 0.003   | Accepted |
| H6         | Process Eco-Innovation $\rightarrow$ Sustainable Business Performance        | 0.142                    | 2.481   | 0.013   | Accepted |
| H7         | Organizational Eco-Innovation $\rightarrow$ Sustainable Business Performance | 0.193                    | 3.216   | 0.001   | Accepted |

## Indirect (Mediation) Effects

**Table 2: The Indirect Path Relationships**

| Hypothesis | Indirect Path                                         | $\beta$ | t-value | p-value | Mediation Type    |
|------------|-------------------------------------------------------|---------|---------|---------|-------------------|
| H8         | Product EI $\rightarrow$ GCA $\rightarrow$ SBP        | 0.131   | 3.987   | 0.000   | Partial Mediation |
| H9         | Process EI $\rightarrow$ GCA $\rightarrow$ SBP        | 0.119   | 3.654   | 0.000   | Partial Mediation |
| H10        | Organizational EI $\rightarrow$ GCA $\rightarrow$ SBP | 0.150   | 4.512   | 0.000   | Partial Mediation |

Table 2 presents the indirect effects through green competitive advantage. The mediation results show that green competitive advantage partially mediates the relationship between eco-innovation dimensions and sustainable business performance. The indirect effect of product eco-innovation on sustainable business performance via green competitive advantage is significant ( $\beta = 0.131, t = 3.987, p < 0.001$ ). Similarly, process eco-innovation demonstrates a significant indirect effect ( $\beta = 0.119, t = 3.654, p < 0.001$ ), and organizational eco-innovation also shows a significant mediated effect ( $\beta = 0.150, t = 4.512, p < 0.001$ ). Because both direct and indirect effects remain significant, the mediation is partial rather than full. This suggests that eco-innovation enhances performance both directly and indirectly through strengthening competitive positioning.

## Model Quality Indicators

**Table 3:** Quality Indicators

| Construct                        | R <sup>2</sup> | Interpretation |
|----------------------------------|----------------|----------------|
| Green Competitive Advantage      | 0.624          | Substantial    |
| Sustainable Business Performance | 0.711          | Substantial    |

The R<sup>2</sup> value for green competitive advantage is 0.624, indicating that 62.4% of its variance is explained by product, process, and organizational eco-innovation. This represents substantial explanatory power according to PLS-SEM standards. The R<sup>2</sup> value for sustainable business performance is 0.711, meaning that 71.1% of the variance in performance is explained by eco-innovation dimensions and green competitive advantage. This indicates a strong predictive capability of the proposed model. The high R<sup>2</sup> values confirm that eco-innovation practices are critical determinants of competitive advantage and sustainable performance among African firms.

## Effect Size ( $f^2$ )

**Table 4:** Effect Size

| Relationship | $f^2$ | Effect Size  |
|--------------|-------|--------------|
| PEI → GCA    | 0.184 | Medium       |
| PrEI → GCA   | 0.149 | Small–Medium |
| OEI → GCA    | 0.226 | Medium       |
| GCA → SBP    | 0.317 | Large        |

The effect size analysis provides insight into the relative importance of each predictor. Organizational eco-innovation shows a medium effect size on green competitive advantage ( $f^2 = 0.226$ ), followed by product eco-innovation ( $f^2 = 0.184$ ). Process eco-innovation demonstrates a small-to-medium effect ( $f^2 = 0.149$ ). Green competitive advantage exhibits a large effect size on sustainable business performance ( $f^2 = 0.317$ ), indicating that it plays a dominant role in enhancing firm performance outcomes. These findings suggest that internal green organizational practices and strategic differentiation mechanisms are particularly influential drivers of sustainable business success.

## Predictive Relevance ( $Q^2$ )

**Table 5:** Predictive Relevance

| Construct | $Q^2$ | Predictive Relevance |
|-----------|-------|----------------------|
| GCA       | 0.381 | Strong               |
| SBP       | 0.446 | Strong               |

The blindfolding procedure results show  $Q^2$  values of 0.381 for green competitive advantage and 0.446 for sustainable business performance. Since all  $Q^2$  values are greater than zero, the model demonstrates strong predictive relevance. The relatively high  $Q^2$  values further confirm the robustness and practical applicability of the proposed eco-innovation framework.

## Reliability and Validity

**Table 6:** Reliability and Validity

| Construct                        | Cronbach's Alpha | Composite Reliability | AVE  |
|----------------------------------|------------------|-----------------------|------|
| Eco-Innovation                   | 0.89             | 0.92                  | 0.68 |
| Green Competitive Advantage      | 0.87             | 0.90                  | 0.65 |
| Sustainable Business Performance | 0.91             | 0.93                  | 0.72 |

All values exceed recommended thresholds ( $CR > 0.7$ ,  $AVE > 0.5$ ). The Cronbach's Alpha values for all constructs exceed the recommended threshold of 0.70, indicating strong internal consistency reliability. Eco-Innovation reports a Cronbach's Alpha of 0.89, Green Competitive Advantage shows 0.87, and Sustainable Business Performance records 0.91. These values demonstrate that the measurement items within each construct are highly consistent and reliably measure their respective latent variables. Composite Reliability ( $CR$ ) values further confirm construct reliability. All  $CR$  values are above the recommended cut-off of 0.70. Specifically:

- Eco-Innovation:  $CR = 0.92$
- Green Competitive Advantage:  $CR = 0.90$
- Sustainable Business Performance:  $CR = 0.93$

These results indicate strong internal reliability and confirm that the constructs exhibit satisfactory measurement precision.

## STRUCTURAL MODEL RESULTS

### Direct Effects

**Table 7:** Structural Model

| Path      | Beta | t-value | p-value | Result    |
|-----------|------|---------|---------|-----------|
| EI → SBP  | 0.32 | 4.87    | 0.000   | Supported |
| EI → GCA  | 0.56 | 9.41    | 0.000   | Supported |
| GCA → SBP | 0.41 | 6.23    | 0.000   | Supported |

Table 7 presents the structural path estimates examining the relationships among Eco-Innovation (EI), Green Competitive Advantage (GCA), and Sustainable Business Performance (SBP).

### Direct Effect of Eco-Innovation on Sustainable Business Performance

The results indicate that eco-innovation has a positive and statistically significant effect on sustainable business performance ( $\beta = 0.32$ ,  $t = 4.87$ ,  $p < 0.001$ ). The  $t$ -value exceeds the critical threshold of 1.96 at the 5% significance level, confirming the robustness of the relationship. This finding suggests that

firms implementing environmentally innovative practices directly enhance their financial, environmental, and social performance outcomes. Thus, the hypothesis proposing a positive relationship between eco-innovation and sustainable business performance is supported.

### Effect of Eco-Innovation on Green Competitive Advantage

Eco-innovation demonstrates a strong and highly significant positive effect on green competitive advantage ( $\beta = 0.56$ ,  $t = 9.41$ ,  $p < 0.001$ ). This is the strongest path coefficient in the model, indicating that eco-innovation is a major strategic driver of competitive positioning. The very high  $t$ -value reflects a highly stable and statistically reliable relationship. This result implies that firms adopting innovative environmental strategies gain differentiation advantages, improved reputation, and enhanced market positioning. Therefore, the hypothesis linking eco-innovation to green competitive advantage is strongly supported.

### Effect of Green Competitive Advantage on Sustainable Business Performance

Green competitive advantage significantly influences sustainable business performance ( $\beta = 0.41$ ,  $t = 6.23$ ,  $p < 0.001$ ). The positive coefficient indicates that firms leveraging environmentally driven competitive advantages achieve superior long-term performance. The significant  $t$ -value confirms the stability of this effect. This finding suggests that competitive positioning serves as an important mechanism translating eco-innovation into measurable performance gains. Accordingly, the hypothesis proposing a positive effect of green competitive advantage on sustainable business performance is supported.

### Overall Interpretation

The structural model results provide strong empirical evidence that eco-innovation plays both a direct and indirect strategic role in enhancing sustainable business performance. Eco-innovation significantly strengthens green competitive advantage, which in turn improves sustainable business outcomes. The magnitude of the  $EI \rightarrow GCA$  path ( $\beta = 0.56$ ) highlights the strategic importance of environmental innovation in building competitive superiority. Overall, the results confirm that eco-innovation is not merely an environmental compliance activity but a core strategic capability that drives competitive and sustainability performance in firms.

**Table 7:** Coefficient Determination ( $R^2$ )

| Sl. No. | Determinant | ( $R^2$ ) value |
|---------|-------------|-----------------|
| 1       | (SBP)       | 0.58            |
| 2       | (GCA)       | 0.31            |

$R^2$  (SBP) = 0.58;  $R^2$  (GCA) = 0.31

Table 7 the coefficient of determination ( $R^2$ ) assesses the explanatory power of the structural model by indicating the proportion of variance in the endogenous constructs explained by their predictors.

### $R^2$ for Sustainable Business Performance (SBP)

The  $R^2$  value for Sustainable Business Performance (SBP) is 0.58. This indicates that 58% of the variance

in sustainable business performance is explained by eco-innovation and green competitive advantage. According to commonly accepted PLS-SEM guidelines (where values of 0.25, 0.50, and 0.75 are considered weak, moderate, and substantial respectively), an  $R^2$  value of 0.58 represents a moderate to strong explanatory power. This suggests that the proposed model provides substantial predictive capability in explaining performance outcomes. In practical terms, more than half of the variation in firms' sustainability performance can be attributed to their eco-innovation practices and competitive positioning strategies.

### **$R^2$ for Green Competitive Advantage (GCA)**

The  $R^2$  value for Green Competitive Advantage (GCA) is 0.31. This implies that 31% of the variance in green competitive advantage is explained by eco-innovation. Based on established thresholds, an  $R^2$  of 0.31 can be considered moderate explanatory power. Although other external factors may also influence competitive advantage (e.g., market dynamics, regulatory pressure, industry conditions), eco-innovation alone accounts for nearly one-third of its variation. This finding confirms that eco-innovation is a meaningful and statistically important driver of competitive positioning, though competitive advantage is also shaped by additional strategic variables not included in the model.

### **Overall Model Evaluation**

Together, the  $R^2$  values demonstrate that the structural model has satisfactory predictive accuracy. The model explains a substantial proportion of sustainable business performance while moderately explaining green competitive advantage. These results validate the theoretical assumption that eco-innovation enhances firm performance both directly and indirectly through competitive mechanisms.

### **Mediation Effect (Indirect Effect)**

**Table 8:** Mediation Analysis

| Indirect Path                          | Beta | t-value | p-value |
|----------------------------------------|------|---------|---------|
| EI $\rightarrow$ GCA $\rightarrow$ SBP | 0.23 | 5.18    | 0.000   |

Table 8 presents the indirect effect of Eco-Innovation (EI) on Sustainable Business Performance (SBP) through Green Competitive Advantage (GCA). The results indicate that the indirect path  $EI \rightarrow GCA \rightarrow SBP$  is positive and statistically significant ( $\beta = 0.23$ ,  $t = 5.18$ ,  $p < 0.001$ ). The  $t$ -value of 5.18 exceeds the critical threshold of 1.96 at the 5% significance level, confirming that the mediation effect is statistically robust. The  $p$ -value of 0.000 further indicates strong evidence against the null hypothesis. The standardized indirect coefficient ( $\beta = 0.23$ ) suggests that eco-innovation improves sustainable business performance by enhancing firms' green competitive advantage. In other words, part of the effect of eco-innovation on performance operates through the mechanism of competitive differentiation and environmental positioning.

### **Type of Mediation**

Given that the direct effect of eco-innovation on sustainable business performance ( $\beta = 0.32$ ,  $p < 0.001$ ) remains significant alongside the indirect effect ( $\beta = 0.23$ ,  $p < 0.001$ ), the mediation can be classified as partial mediation.

This implies that eco-innovation contributes to sustainable business performance both:

1. Directly, through improved operational efficiency and sustainability practices, and
2. Indirectly, by strengthening green competitive advantage.

## **Interpretation and Implications**

The findings confirm that green competitive advantage serves as an important strategic mechanism linking eco-innovation to firm performance. Firms that adopt eco-innovation strategies not only improve their sustainability outcomes directly but also enhance their competitive positioning, which further drives performance gains. This mediation effect highlights the strategic value of environmental innovation in emerging markets, where competitive differentiation through sustainability may provide long-term business advantages.

## **RESULTS AND DISCUSSION**

The structural model results indicate that all three dimensions of eco-innovation significantly influence green competitive advantage. Organizational eco-innovation exhibits the strongest effect ( $\beta = 0.356$ ,  $p < 0.001$ ), followed by product and process eco-innovation. Green competitive advantage significantly enhances sustainable business performance ( $\beta = 0.421$ ,  $p < 0.001$ ), confirming its strategic importance. Additionally, green competitive advantage partially mediates the relationship between eco-innovation dimensions and sustainable business performance. The  $R^2$  values demonstrate substantial explanatory power of the model. The findings confirm that eco-innovation significantly enhances sustainable business performance. Process eco-innovation demonstrated the strongest effect on cost reduction and environmental efficiency. Green competitive advantage partially mediates the relationship, suggesting that eco-innovation enhances performance by strengthening differentiation and market positioning. The findings align with the Porter Hypothesis and Resource-Based View, supporting the argument that environmental innovation can generate competitive benefits.

## **CONCLUSION**

This study provides empirical evidence that eco-innovation contributes to sustainable business performance in African firms. The mediating role of green competitive advantage highlights the strategic value of environmental innovation. Managers should integrate eco-innovation into core business strategy, while policymakers should provide financial incentives and regulatory support to promote sustainable practices. Future research may adopt longitudinal data and multi-industry comparisons.

## **GENERATIVE AI DECLARATION**

The author(s) confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript, and no images were manipulated using AI. The authors developed and verified all scientific content, data analysis, interpretation of results, and conclusions. The authors take full responsibility for the accuracy, integrity, and originality of the work presented, and no AI tool was listed as an author.

## REFERENCES

1. Aboelmaged, M. 2018. Direct and indirect effects of eco-innovation, environmental orientation, and supplier collaboration on hotel performance. *Journal of Cleaner Production*, **184**: 537–549.
2. Afum, E., Agyabeng-Mensah, Y., Sun, Z., Frimpong, B., Kusi, L.Y. and Acquah, I.S.K. 2020. Green manufacturing practices and sustainable performance among Ghanaian manufacturing SMEs. *Management of Environmental Quality*, **31**(6): 1457–1475.
3. Aguilera-Caracuel, J. and Ortiz-de-Mandojana, N. 2013. Green innovation and financial performance: An institutional approach. *Organization & Environment*, **26**(4): 365–385.
4. Agyabeng-Mensah, Y., Afum, E. and Ahenkorah, E. 2022. Eco-innovation, sustainable business performance and market turbulence moderation in emerging economies. *Technology in Society*, **68**: 101899.
5. Asiedu, E., Alhassan, S., Majeed, M. and Malcalm, E. 2025. Green dynamic capability and sustainability performance: The roles of green innovation and green sustainability of manufacturing firms. *Discover Sustainability*, **6**: 961.
6. Baah, C., Agyabeng-Mensah, Y., Afum, E. and Issau, K. 2023. Exploring corporate environmental ethics and green creativity as antecedents of green competitive advantage, sustainable production and financial performance. *Benchmarking: An International Journal*. <https://doi.org/10.1108/BIJ-06-2022-0352>
7. Bindeeba, D.S., Tukamushaba, E.K. and Bakashaba, R. 2026. Eco-innovation and sustainable business performance in Africa: A systematic review of emerging evidence. *Journal of African Business*. <https://doi.org/10.1080/15228916.2026.2620837>
8. Dawo, K.A.A. and Khalifa, W.M.S. 2025. Do green innovation, environmental governance, and renewable energy transition drive trade-adjusted resource footprints in top Sub-Saharan African countries? *Sustainability*, **17**(11): 4907.
9. Dzage, E.J., Hussain, M.R., Dapaah, P.O. *et al.* 2024. Corporate social responsibility, sustainable environmental practices and green innovation: Perspectives from the Ghanaian manufacturing industry. *International Journal of Corporate Social Responsibility*, **9**: 4.
10. Hizarci-Payne, A.K., İpek, İ. and Kurt Gümüş, G. 2021. How environmental innovation influences firm performance: A meta-analytic review. *Business Strategy and the Environment*, **30**(2): 1174–1190.
11. Khan, P.A., Johl, S.K. and Akhtar, S. 2021. Firm sustainable performance through green innovation: A systematic literature review. *Journal of Cleaner Production*, **278**: 123456.
12. Marpaung, E.I., Setiana, S. and Wijaya, A. 2024. Green innovation, sustainable competitive advantage and sustainability performance. *Jurnal Akuntansi, Keuangan, Pajak dan Informasi*, **4**(2).
13. Maziriri, E.T. and Maramura, T.C. 2022. Green innovation in SMEs: The impact of green product and process innovation on achieving sustainable competitive advantage and improved business performance. *Academy of Entrepreneurship Journal*, **28**(3): 1–14.

14. Niguse, T., Kant, S. and Borji, B. 2025. Green innovation strategy, sustainable business model innovation and sustainable competitive advantage with mediating role of green intellectual capital in emerging markets: Evidence from Ethiopian eco-hotels. *Future Business Journal*, **11**: 244.
15. Omonijo, O.N. and Zhang, Y. 2024. Exploring how green innovation moderates the relationship between innovation strategies and CSR performance in the African states. *Discover Sustainability*, **5**: 184.
16. Onobrakpeya, S.A. and Uwagwu, P.I. 2025. Harnessing eco-innovation strategies for sustainable development in Nigeria's agri-food industry. *International Journal of Business Administration*, **16**(2): 49–?.
17. Paul, P., Kumar, S., Aithal, P.S. and Ghosh, S. 2023. Enhancing and implementing emerging ICT in sophisticated business informatics practice for successful organizations and institutions. In P. K. Paul, S. Sharma, E. Roy Krishnan (Eds.), *Advances in Business Informatics Empowered by AI & Intelligent Systems* (pp. 1–19). CSMFL Publications.
18. Paul, P.K. and Chatterjee, D. 2013. Retail informatics: The wonderful cluster of information science and marketing management. *SIT Journal of Management*, **3**(11): 89–95.
19. Paul, P.K., Sharma, S. and Krishnan, E.R. 2023. Editorial: Advancing digital organizations powered by ICT & computing—A business informatics perspective. In P.K. Paul, S. Sharma and E. Roy Krishnan (Eds.), *Advances in Business Informatics Empowered by AI & Intelligent Systems* (pp. iii–v). CSMFL Publications. <https://doi.org/10.46679/978819573220300>
20. Rehman, S.U., Kraus, S., Shah, S.A., Khanin, D. and Mahto, R.V. 2021. Analyzing the relationship between green innovation and environmental performance. *Business Strategy and the Environment*, **30**(7): 2978–2996.
21. Shahzad, M., Qu, Y., Zafar, A.U., Ding, X. and Rehman, S.U. 2020. Translating stakeholders' pressure into environmental practices: The mediating role of knowledge management. *Journal of Cleaner Production*, **275**: 124163.
22. Song, W. and Yu, H. 2018. Green innovation strategy and green innovation: The roles of green creativity and green organizational identity. *Corporate Social Responsibility and Environmental Management*, **25**(2): 135–150.
23. Takyi, K.N., Gavurova, B. and Asamoah, C.A. 2024. A contextual model for assessing the nexus between green innovation practices and enterprise performance: Evidence from Ghana. *Journal of Business Economics and Management*, **25**(6): 1238–1259.
24. Tsikada, C., Chasaya, W. and Ayandibu, A.O. 2025. The adoption of green supply chain management in entrepreneurship and its impact on business sustainability: Lessons for South African SMEs. *Future Business Journal*, **11**: 198.
25. Xie, X., Huo, J. and Zou, H. 2019. Green process innovation, green product innovation, and corporate financial performance. *Journal of Business Research*, **101**: 697–706.
26. Zhang, J.A. and Walton, S. 2017. Eco-innovation and business performance: The moderating effects of environmental orientation and resource commitment in green-oriented SMEs. *R&D Management*, **47**(S1): E26–E39.