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Impact of Eco-Entrepreneurship as Climate Change Mitigation Strategy of SMES on Environmental Sustainability in Nigeria

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Abstract
This study investigated the impact of eco-entrepreneurship on environmental sustainability in Nigeria. Three purposes and three null hypotheses were stated for the study. Related literatures were reviewed. Descriptive survey design was adopted. It was conducted in Six-geopolitical zones of Nigeria. Population of the study consisted of 7,800,000 SMEs operators while the sample was 400 SMEs operators determined using Taro Yamane formula. 15-item, researchers-constructed questionnaire was used for data collection. It was face-validated by five experts. Reliability coefficient of the instrument was 0.81 using Cronbach Alpha formula. 392 SMEs operators returned their questionnaires. Z-test was used to test hypotheses at 0.05 significance level. Findings showed no significant difference on the impact of eco-friendly product development practice of SMEs on environmental sustainability in Nigeria; no significant difference on the impact of sustainable supply chain adoption practice of SMEs on environmental sustainability in Nigeria; and no significant difference on the impact of green marketing and consumer education practice of SMEs and environmental sustainability in Nigeria. It was recommended that eco-friendly product development strategy and sustainable supply chain adoption strategies of SMEs should be modified to impact environmental sustainability in Nigeria while, green marketing and consumer education strategy of SMEs should be maintained to impact environmental sustainability in Nigeria.

Key Words: Eco-entrepreneurship; Eco-friendly Product Development; Sustainable Supply Chain; Green Marketing; Environmental Sustainability

Introduction

Africa's most populous nation is Nigeria, which has over 200 million people, and most of the country's economy is bedeviled by substantial environmental sustainability issues that create both urgent needs for attention and eco-entrepreneurial opportunities to be leveraged. Eco-entrepreneurship practices for ecological sustainability in Nigeria, particularly amongst Small and Medium-sized Enterprises (SMEs), are pivotal as they play a crucial role in Nigeria's economy. Organization for Economic Co-operation and Development (OECD, 2019) asserted that as pivotal drivers of job creation and economic development, SMEs have a unique opportunity to embrace eco-entrepreneurial innovations that contribute significantly to environmental sustainability. This study explored multifaceted impact of some strategies employed by SMEs to address environmental sustainability so as to provide insights that could inform policy and eco-entrepreneurial practices aimed at enhancing environmental stewardship.

SMEs are increasingly acknowledging the significance of implementing eco-entrepreneurship practices, which contribute to environmental sustainability and improve their market standings (Adelekan

et al., 2018). The push for sustainable supply chains is beginning to minimize waste and enhance resource efficiency in industry clusters (Abubakar & Sadiq, 2020). Despite challenges, the growing sensitization and demand for green products and services among consumers suggest a positive trend towards sustainability in the consumption pattern of the people. In all, while hurdles are yet to be surmounted, the potential for SMEs to lead Nigeria towards greater environmental sustainability through the instrumentality of eco-entrepreneurship is promising and could result in both ecological and economic benefits.

Eco-entrepreneurship is the pursuit of entrepreneurial opportunities that create social, environmental, and economic value around sustainable products or services while minimizing negative impact on the environment [Global Green Growth Institute (GGGI), 2025]. Solutions to environmental problems can be addressed through eco-entrepreneurial practices. These practices encompass several significant areas, including sustainable supply chains, green marketing and consumer education, and eco-friendly product development (Porter & Kramer, 2011). Such innovations collectively promote environmental sustainability and economic growth.

Sustainable supply chain is the practice of incorporating environmental, social and financial dimensions into the sourcing, production and distribution of goods and services (McGrath & Jonker, 2024). On the other hand, green marketing is a promotional practice that focuses on the echo-friendly aspects of a product or service to encourage sales (Fernando, 2024), while green consumer education is an awareness platform for information exchange and resources for sharing sustainable knowledge to help consumers make informed purchasing decisions, particularly regarding environmental impact of product or services (Tamboli et al., 2023; IGI Global, 2025). Eco-entrepreneurship is essential to the development and propagation of innovative green values and solutions needed to tackle climate change (OECD, 2025).

Climate change is a long-term variation in the average weather patterns that have come to define Earth's local, regional, and global climates (NASA Science, 2025a). It is critical to mitigate climate change through sustainable approaches before it causes irreparable damage to the environment. NASA Science (2025b) opined that climate change mitigation is the action taken by governments, businesses or people to minimize or prevent greenhouse gases, or to improve carbon sinks that remove them from the atmosphere. SMEs eco-entrepreneurial practices play a crucial role in driving these mitigation strategies by providing innovative solutions for a more sustainable future.

Federal Ministry of Commerce and Industry (FMCI) defined SMEs differently as firms with a total investment (excluding the cost of land but including capital) of up to N750,000 and paid employment of up to fifty (50) persons (WTC-Abuja, 2025). The population of SMEs in Nigeria is significant and varies by geopolitical zone and sector. According to the National Bureau of Statistics (NBS, 2020), SMEs constitute about 96% of businesses in Nigeria and contribute approximately 48% to the country's Gross Domestic Product (GDP). Accountancy Europe (2023) noted that by accepting sustainability, SMEs can improve their environmental and social impact, bolster their financial standing and open doors to diverse and abundant financing resources.

Environmental sustainability is the ability to maintain an ecological balance in the Earth's natural environment and conserve natural resources to support the well-being of current and future generations (Microsoft, 2025). SMEs in Nigeria can benefit from the traditional business model and implement green entrepreneurial values, practices and technologies that would mitigate climate change to become more sustainable (Rodrigues & Franco, 2023). SMEs can harness the resources in Nigeria sustainably by adopting green entrepreneurial values and practices.

Scholars interested in SMEs research have recently provided research output in the area of eco-entrepreneurial practices of SMEs and how such practices relate with environmental sustainability. Some scholars that have published works in areas related to eco-entrepreneurship include Eltayeb et al. (2011) who found that eco-design have significant positive effect on four types of outcomes (environmental outcomes, economic outcomes, cost reductions, and intangible outcomes); and Shabbir et al. (2020) who discovered that key factors of green marketing, such as eco-labeling (EL) and green packaging and branding (GPPP), have a significant positive influence on consumer beliefs towards the environment (CBTE); and also found that environmental concerns and beliefs (ECB) also have a significant and positive influence on CBTE in the United Arab Emirates (UAE).

Others are Wiradirja et al. (2020) who confirmed the mediating role of organizational citizenship behaviour environment (OCBE) between green training, green shared vision and green employee involvement practices and environmental performance. Moreover, the direct impact of green training, green shared vision and green employee involvement practices on OCBE is also supported by the findings of the study. Prieto-Sandoval et al. (2022) found that the non-compulsory university green marketing campaigns and instruction courses impacted students' propensities toward sustainable consumption; Nnabugwu and Odieli (2023) found that green entrepreneurial initiatives have a significant effect on pro-environmental behaviour among SMEs; green entrepreneurial innovation has a significant effect on pro-environmental behaviour among SMEs and green entrepreneurial marketing has a significant effect pro-environmental behaviour among SMEs in Anambra State, Nigeria; and Pekaar and Demerouti (2023) revealed that in a research, the intervention group had increased sustainability intentions after sustainability training.

Furthermore, Umair et al. (2023) established that green hard and green soft talent management (TM) and employee engagement with green initiatives are significant predictors of the sustainable environmental performance of HEIs; and Rofiaty et al. (2024) discovered that green entrepreneurship has a significant role in the eco-friendly tourism context. Finally, scholar whose research endeavour also relate to the present study is Al Khazraje (2024) who found that there is a relationship of influence and correlation between the green strategy and the development of environmentally friendly products; and also found that the shift towards green strategies leads to achieving noticeable environmental and economic benefits, despite the high initial costs and challenges associated with supply chain management and compliance with environmental regulations.

Despite the growing research interest and output from scholars studying eco-entrepreneurial practices and climate change mitigation strategies among SMEs, significant gaps persist in the literature. There is a limited understanding of how these practices impact environmental sustainability within Nigeria's unique socio-economic context. Moreover, the specific factors that influence the effectiveness of eco-friendly product development in Nigeria remain poorly understood. Knowledge about small-scale initiatives, especially in rural areas, is still lacking, undermining national efforts to address climate impacts. Furthermore, the relationship between various green marketing strategies and consumer behaviour requires deeper exploration. Addressing these gaps is critical for advancing effective climate mitigation strategies and fostering sustainable practices amongst SMEs in Nigeria. Based on this background, this study was designed to determine the impact of eco-entrepreneurship as a climate change mitigation strategy of SMEs on environmental sustainability in Nigeria.

Statement of the Problem

Ideally, entrepreneurs in Nigeria operating within the SME sector ought to develop and implement sustainable entrepreneurial ventures that facilitate economic growth and mitigate environmental degradation to tackle challenges associated with climate change. This is achievable through eco-friendly product development, sustainable supply chain adoption, and green marketing adoption. In doing so, they would contribute to a more sustainable future, improve the reputation of their entrepreneurial brands, and capitalize on emerging market opportunities in the Nigerian green economy.

Unfortunately, some of the entrepreneurial models of SMEs operators are not eco-friendly. The lack of eco-friendly entrepreneurial models in Nigeria has severe environmental consequences, including inadequate waste disposal and industrial pollution that contaminate waterways, soil, and air; greenhouse gas emissions from fossil fuels and industrial/commercial processes accelerate climate change, leading to droughts, floods, and heatwaves. It is against these concerns, therefore, that this study was designed to investigate the impact of eco-entrepreneurship as a climate change mitigation strategy of SMEs on environmental sustainability in Nigeria.

Purpose of the Study

The general purpose of this study was to investigate the impact of eco-entrepreneurship on environmental sustainability in Nigeria. Specifically, the study sought to investigate:

1. the impact of eco-friendly product development practice of SMEs on environmental sustainability in Nigeria.
2. the impact of sustainable supply chain adoption practice of SMEs on environmental sustainability in Nigeria.
3. the impact of green marketing and consumer education practice of SMEs on environmental sustainability in Nigeria.

Research Questions

The following research questions were stated to guide the study:

1. what is the impact of eco-friendly product development practice of SMEs on environmental sustainability in Nigeria?
2. what is the impact of sustainable supply chain adoption practice of SMEs on environmental sustainability in Nigeria?
3. what is the impact of green marketing and consumer education practice of SMEs on environmental sustainability in Nigeria?

Hypotheses

The following null hypotheses were postulated for the study and tested at 0.05 level of significance:

1. significant difference will not exist on the impact of eco-friendly product development practice of SMEs on environmental sustainability in Nigeria.
2. significant difference will not exist on the impact of sustainable supply chain adoption practice of SMEs on environmental sustainability in Nigeria.
3. significant difference will not exist on the impact of green marketing and consumer education practice of SMEs on environmental sustainability in Nigeria.

Methodology

This study adopted descriptive survey design and was conducted in the six geo-political zones - North-Central, North-East, North-West, South-East, South-South, and South-West of Nigeria. The population for the study was 7,800,000 SMEs operators [Central Bank of Nigeria (CBN), 2021]. This was made up of approximately 1,500,000 SMEs operators in North-West; approximately 800,000 SMEs operators in North-East; approximately 1,000,000 SMEs operators in North-Central; approximately 2,000,000 SMEs operators in South-West; approximately 1,500,000 SMEs operators in South-East; and approximately 1,000,000 SMEs operators in South-South (CBN, 2021).

The sample of this study was approximately 400 SMEs operators. The sample was determined using Taro Yamane formula given as:

$$n = \frac{N}{1+N(e)^2}$$

where: n = the sample size,
N = the finite population,
e = level of significance (i.e., limit of tolerable or allowable error);
1 = unity (a constant).

The sample size was further proportionately distributed into SMEs operators in North-Central, North-East, North-West, South-East, South-South, and South-West of Nigeria using ratio: $\frac{1500000}{7800000}$ x 400 = 77 SMEs operators in North-Central Nigeria, $\frac{800000}{7800000}$ x 400 = 41 SMEs operators in North-East Nigeria, $\frac{1000000}{7800000}$ x 400 = 51 SMEs operators in North-West Nigeria, , $\frac{2000000}{7800000}$ x 400 = 103 SMEs operators in South-East Nigeria, $\frac{1500000}{7800000}$ x 400 = 77 SMEs operators in South-South Nigeria, and, $\frac{1000000}{7800000}$ x 400 = 51 SMEs operators in South-West Nigeria. Stratified random sampling technique was adopted in selecting the sample.

Researchers-constructed questionnaire with response options of 4-points consisting of 15 questionnaire items was used for data collection. The questionnaire was divided into two parts - I and II.

Part I was designed to seek information on the Biographical characteristics (Bio-data/Background) of the respondents. The part contained three items numbered a – d. Item 'a' was meant to collect data on the geo-political zone of SMEs operators, 'b' was meant to obtain data on the sector of SMEs operators, 'c' was meant to gather data on the operational scale (Small or Medium Enterprise) of the SMEs; and 'd' was meant to obtain data on the sex (Male or Female) of the SMEs operators. Part II was further sub-divided into three sections (A-C) according to the specific purposes of the study and structured on four response options of Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). Section A contained five item statements (1-5) designed to elicit data on the impact of eco-friendly product development strategy of SMEs on environmental sustainability in Nigeria. Section B contained five item statements (6-10) designed to elicit data on the impact of sustainable supply chain adoption strategy of SMEs on environmental sustainability in Nigeria. Section C contained five item statements (11-15) designed to obtain data on the impact of green marketing and consumer education strategy of SMEs on environmental sustainability in Nigeria.

The instrument was face-validated by five experts from the Department of Entrepreneurship Education, Faculty of Vocational and Technical Education, University of Nigeria, Nsukka. The internal consistency of the instrument for data collection was determined using the Cronbach Alpha reliability coefficient, and the test yielded a coefficient value of 0.81. Based on the sample size, 400 copies of the questionnaire were administered to the respondents by the researchers and twelve research assistants. Out of the 400 copies administered, 392 were retrieved, making a return rate of 98%. The copies of the instrument were returned as follows: Northern Nigeria – 164 copies (North-Central – 75 copies, North-East – 40 copies, and North-West – 49), and Southern Nigeria – 228 copies (South-East - 101, South-South - 76, and South-West – 51). Data collected for this study were analyzed using mean and standard deviation to answer research questions and a z-test to test the null hypotheses at 0.05 level of significance. Since the mean of 4-point scale is 2.5, any item statement whose mean value falls below 2.5 would be rejected while any item statement whose mean value falls from 2.5 and above would be accepted.

Results

Research Question 1

What is the impact of eco-friendly product development strategy of SMEs on environmental sustainability in Nigeria?

Table 1: Mean responses of SMEs operators on impact of eco-friendly product development strategy of SMEs on environmental sustainability in Nigeria

N = 392 SMEs Operators: [Northen Nigeria – 164; Southern Nigeria - 228]

S/N	Item Statements	Northern Nigeria		Southern Nigeria		Grand Mean	Remarks
		$\overline{X_1}$	SD_1	$\overline{X_2}$	SD_2		
1.	Our company's eco-friendly product development strategy has led to a measurable reduction in waste generation during production processes	2.37	1.12	2.08	1.04	2.23	D
2.	The implementation of sustainable materials in our product development significantly contributes to preserving natural resources	2.11	0.13	2.44	0.46	2.28	D
3.	Our development process includes regular assessments of environmental impacts, ensuring that each new product is designed with sustainability in mind	2.15	1.01	2.19	0.64	2.17	D
4.	Collaborating with suppliers who adhere						

	to sustainable practices has positively impacted our overall environmental footprint	2.32	0.32	2.10	1.22	2.21	D
5.	Our eco-friendly product development strategy has resulted in cost savings through reduced energy consumption and waste management	2.23	1.02	2.17	1.21	2.22	D
	Total	**11.18**	**3.60**		**10.98**	**4.57**	

Cluster Mean ($\bar{X}$) = 2.22 (Disagreed)

Data presented in table 1 indicates that the means ($\bar{X}$) in respect of item statements 1 – 5 are less than 2.5 being the decision point. Hence, it is concluded that item 1 - 5 do not impact environmental sustainability in Nigeria. Finally, since the cluster mean ($\bar{X}$) of 2.22 is less than 2.5, it is concluded that eco-friendly product development strategy of SMEs does not impact environmental sustainability in Nigeria.

Hypothesis 1

Significant difference will not exist between the impact of eco-friendly product development strategy of SMEs on environmental sustainability in Nigeria.

Table 2: z-Test of statistical difference on impact of eco-friendly product development strategy of SMEs on environmental sustainability in Nigeria

Respondents	$\bar{X}$	SD	N	df	Standard Error	z-Cal	z-Critical	Decision
SMEs in Northern Nigeria	11.18	3.60	164					
				390	0.50	0.40	1.65	Accept Ho_1
SMEs in Southern Nigeria	10.98	4.58	228					

In table 2, the z – ratio (z distribution or z-test) indicates that the critical value of z with 241 degree of freedom at 0.05 level of statistical probability is 1.65. Since the calculated value of z is 0.40, being less than the critical value, we accept the null hypothesis (Ho_1) because there is no significant difference in mean responses. This implies that eco-friendly product development strategy of SMEs does not impact environmental sustainability in Nigeria.

Research Question 2

What is the impact of sustainable supply chain adoption strategy of SMEs on environmental sustainability in Nigeria?

Table 3: Mean responses of SMEs operators on impact of sustainable supply chain adoption strategy of SMEs on environmental sustainability in Nigeria

N = 392 SMEs Operators: [Northen Nigeria – 164; Southern Nigeria - 228]

S/N	Item Statements	Northern Nigeria		Southern Nigeria		Grand Mean	Remarks
		$\overline{X_1}$	SD_1	$\overline{X_2}$	SD_2		
6.	The adoption of sustainable supply chain practices in our SME has led to a noticeable						

reduction in waste generation	2.36	0.16	2.29	1.04	2.33	D
7. We actively sources materials from suppliers that prioritize environmental sustainability, positively impacting local ecosystems	2.19	1.11	2.27	1.21	2.23	D
8. Implementing sustainable supply chain strategies has enhanced our energy efficiency, contributing to lower carbon emissions	2.15	1.21	2.11	1.14	2.13	D
9. We regularly assess the environmental impact of our supply chain decisions, leading to improved sustainability outcomes	3.12	0.89	2.89	0.98	3.01	D
10. We collaborate with partners and stakeholders in the supply chain to promote environmental sustainability initiatives, fostering a culture of responsibility	2.21	1.55	2.09	1.23	2.15	D
Total	**12.03**	**4.92**		**11.65**	**5.60**	

Cluster Mean ($\bar{X}$) = 2.37 (Disagreed)

Data presented in table 3 shows that the means ($\bar{X}$) in respect of item statements 6 – 10 are less than 2.5 being the decision point. Hence, it is concluded that the item statements do not impact environmental sustainability in Nigeria. Finally, since the cluster mean ($\bar{X}$) of 2.37 is less than 2.5, it is concluded that sustainable supply chain adoption strategy of SMEs does not impact environmental sustainability in Nigeria.

Hypothesis 2

Significant difference will not exist between the impact of sustainable supply chain adoption strategy of SMEs on environmental sustainability in Nigeria.

Table 4: z-Test of statistical difference on impact of sustainable supply chain adoption strategy of SMEs on environmental sustainability in Nigeria

Respondents	$\bar{X}$	SD	N	df	Standard Error	z-Cal	z-Critical	Decision
SMEs in Northern Nigeria	12.03	4.92	164					
				390	0.56	0.67	1.65	Accept Ho_3
SMEs in Southern Nigeria	11.65	5.60	228					

In table 4, the z – ratio (z distribution or z-test) indicates that the critical value of z with 390 degrees of freedom at 0.05 level of statistical probability is 1.65. Since the calculated value of z is 0.67, being less than the critical value, we accept the null hypothesis (Ho_2) because there is no significant difference in mean responses. This implies that sustainable supply chain adoption strategy of SMEs does not impact environmental sustainability in Nigeria.

Research Question 3

What is the impact of green marketing and consumer education strategy of SMEs on environmental sustainability in Nigeria?

Table 5: Mean responses of SMEs operators on impact of green marketing and consumer education strategy of SMEs on environmental sustainability in Nigeria

N = 392 SMEs Operators: [Northen Nigeria – 164; Southern Nigeria - 228]

S/N	Item Statements	Northern Nigeria		Southern Nigeria		Grand Mean	Remarks
		$\overline{X_1}$	SD_1	$\overline{X_2}$	SD_2		
11.	Training employees on sustainable supply chain practices has increased their awareness and commitment to environmental sustainability	3.89	0.34	3.14	1.11	3.52	A
12.	We actively engage employees in sustainability training, which enhances their awareness and contributes to the success of our eco-friendly product initiatives	3.71	1.82	3.61	0.89	3.66	A
13.	The eco-friendly marketing strategies used by SMEs positively influence customers purchasing decisions	3.54	0.15	3.52	0.21	3.53	A
14.	Educational resources provided by SMEs about environmental sustainability have increased customers understanding of sustainable practices	3.82	1.32	3.37	0.32	3.60	A
15.	Customers prefer to buy products from SMEs that actively engage in green marketing and promote sustainability	2.16	0.58	2.36	1.02	2.26	D
	Total	**17.12**	**4.21**		**16.00**	**3.55**	

Cluster Mean ($\overline{X}$) = 3.31 (Agreed)

Data presented in table 9 reveals that the means ($\bar{X}$) in respect of item statements 11 – 15 are more than 2.5 being the decision point. Hence, it is concluded that the item statements do impact environmental sustainability in Nigeria. Moreso, the mean ($\bar{X}$) in respect of item statement 25 is less than 2.5 being the decision point. Hence, it is also concluded that the item statement does not impact environmental sustainability in Nigeria. Finally, since the cluster mean ($\bar{X}$) of 3.31 is more than 2.5, it is concluded that green marketing and consumer education strategy of SMEs impact environmental sustainability in Nigeria.

Hypothesis 3

Significant difference will not exist between the impact of green marketing and consumer education strategy of SMEs on environmental sustainability in Nigeria.

Table 6: z-Test of statistical difference on impact of green marketing and consumer education strategy of SMEs on environmental sustainability in Nigeria

Respondents	$\bar{X}$	SD	N	df	Standard Error	z-Cal	z-Critical	Decision
SMEs in Northern Nigeria	17.12	4.21	164					
				390	0.47	2.37	1.65	Reject Ho_5
SMEs in Southern Nigeria	16.00	3.55	228					

In table 6, the z – ratio (z distribution or z-test) indicates that the critical value of z with 390 degree of freedom at 0.05 level of statistical probability is 1.65. Since the calculated value of z is 2.37, being more than the critical value, we reject the null hypothesis (Ho_3) because there is significant difference in mean responses. This implies that green marketing and consumer education strategy of SMEs do impact environmental sustainability in Nigeria.

Discussion of Findings

The major findings revealed that the eco-friendly product development strategy of SMEs does not impact environmental sustainability in Nigeria; the sustainable supply chain adoption strategy of SMEs does not impact environmental sustainability in Nigeria; and that green marketing and consumer education strategy of SMEs do impact environmental sustainability in Nigeria. This pattern of results is inconsistent with the previous literature, like Eltayeb et al. (2011) who found that eco-design have significant positive effect on four types of outcomes (environmental outcomes, economic outcomes, cost reductions, and intangible outcomes); and Shabbir et al. (2020), who revealed that key factors of green marketing, such as eco-labeling (EL) and green packaging and branding (GPPP), have a significant positive influence on consumer beliefs towards the environment (CBTE). The results also disagree with the findings of Wiradirja et al. (2020) that the mediating role of organizational citizenship behaviour environment (OCBE) between green training, green shared vision and green employee involvement practices and environmental performance.

Again, these results do not align with the findings of Nnabugwu and Odieli (2023) that green entrepreneurial initiatives have a significant effect on pro-environmental behaviour among SMEs; green entrepreneurial innovation has a significant effect on pro-environmental behaviour among SMEs and green entrepreneurial marketing has a significant effect pro-environmental behaviour among SMEs in Anambra State, Nigeria. Furthermore, the results are at variance with the findings of Rofiaty et al. (2024) that green entrepreneurship has a significant role in the eco-friendly tourism context and with Al Khazraje (2024) that there is a relationship of influence and correlation between the green strategy and the development of environmentally friendly products; and also found that the shift towards green strategies leads to achieving noticeable environmental and economic benefits, despite the high initial costs and challenges associated with supply chain management and compliance with environmental regulations.

The results strongly imply that SMEs do not apply eco-friendly product development, sustainable supply chain, and green marketing and consumer education as eco-entrepreneurship strategies for environmental sustainability in Nigeria. In my view, the most compelling explanation for the present set of findings is that SME operators in Nigeria are yet to imbibe the practice of developing eco-friendly products largely due to small working capital and poor technology. This argument also suffices in the case of a sustainable supply chain because SME operators lack the financial requirements for investing in sustainable supply chain infrastructure. Finally, SMEs operators have not started engaging in green marketing and consumer education, probably due to a lack of knowledge about green entrepreneurship and environmental sustainability.

These results are not without some critical limitations. The reliance on self-reported data obtained from SMEs operators may lead to response bias and affect the accuracy of findings, which is one potential

limitation of the study. Again, the sampling method adopted may not fully capture the diversity of SMEs in Nigeria, particularly those in remote areas. This would mean that the study is not inclusive and this may affect the dependability on the results. Lastly, the study's cross-sectional design limits the ability to establish causal relationships between variables, potentially influencing the generalizability of the results. In spite of these limitations, these results suggest several theoretical and practical implications. Theoretical implications of the results suggest the need for further investigation of the impact of eco-entrepreneurship within SMEs in Nigeria, contributing to existing literature on sustainable entrepreneurship. Practically, the findings can inform policymakers to design targeted interventions that enhance support for SMEs, facilitating access to green technologies and improving environmental sustainability efforts, ultimately promoting a more sustainable entrepreneurial ecosystem in Nigeria.

With respect to future research, it would be useful to extend the current findings by adopting longitudinal studies to empirically establish cause-and-effect relationships between eco-entrepreneurial variables and environmental sustainability in Nigerian SMEs. It is essential to investigate the specific impacts of government policies and support systems on SMEs' adoption and promotion of eco-entrepreneurship practices. Despite these limitations, this research can be seen as a first step towards integrating three lines of research, eco-friendly product development, sustainable supply chain, and green marketing and consumer education, that, to our knowledge, have not been directly linked. This study underscores the pressing need for Nigerian SMEs to embrace eco-entrepreneurial innovations as vital pathways towards environmental sustainability. The research highlights the importance of SME operators practicing eco-entrepreneurship, ultimately promoting a more sustainable future for Nigeria. Policymakers, business leaders, and environmental advocates are urged to collaborate in establishing supportive and facilitative frameworks for SMEs to adopt eco-entrepreneurship in Nigeria. The capacity of SMEs to contribute to environmental sustainability through eco-entrepreneurship can be achieved with training and retraining programmes and awareness campaigns. The present research, therefore, contributes to a growing body of evidence suggesting that eco-friendly product development, sustainable supply chain, and green marketing and consumer education as eco-entrepreneurship strategies of SMEs do not impact on environmental sustainability in Nigeria.

Conclusion and Recommendations

Conclusively, this study sought to investigate the impact of eco-entrepreneurship on environmental sustainability in Nigeria. The major findings revealed that the eco-friendly product development strategy of SMEs does not impact environmental sustainability in Nigeria; the sustainable supply chain adoption strategy of SMEs does not impact environmental sustainability in Nigeria; and that green marketing and consumer education strategy of SMEs do impact environmental sustainability in Nigeria. Based on these findings, it was recommended that:

1. eco-friendly product development strategy of SMEs should be modified to impact environmental sustainability in Nigeria.
2. sustainable supply chain adoption strategy of SMEs should be modified to impact environmental sustainability in Nigeria.
3. green marketing and consumer education strategy of SMEs should be maintained to impact environmental sustainability in Nigeria.

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