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Sustainable procurement practices and their impact on supply chain performance

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ABSTRACT

This study examines sustainable procurement practices and their impact on supply chain performance, with the objective of evaluating the influence of sustainable procurement on specific performance indicators, particularly cost efficiency. A survey was conducted among 50 firms in Adamawa State using a structured questionnaire, and the data were analyzed employing descriptive statistics, correlation matrix, regression analysis, and ANOVA. The results revealed a consistent positive relationship between cost efficiency, supplier reliability, risk mitigation, and environmental compliance, with these relationships exerting a statistically significant effect. The ANOVA confirmed that the variance in supply chain performance is statistically attributable to the model, while Cronbach's Alpha value of 0.995 demonstrated excellent internal consistency. Based on these findings, it is recommended that firms seeking to enhance supply chain performance through sustainable procurement should integrate robust risk management strategies that proactively identify and address environmental, regulatory, and operational risks.

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1. INTRODUCTION

Procurement, the process of acquiring goods, services, and works from external sources, is a critical function in both public and private sectors. Traditionally focused on cost, quality, and delivery timelines, procurement practices have evolved to embrace sustainability an approach that integrates environmental, social, and economic considerations into purchasing decisions. Sustainable procurement involves selecting suppliers based on criteria such as ethical labor practices, environmental responsibility, and long-term economic value (UNEP, 2021). Globally, there is a growing shift toward sustainable procurement as organizations recognize its role in driving responsible consumption and production, in line with the United Nations Sustainable Development Goals (SDGs). For instance, 70% of global companies now link sustainability goals with procurement strategies, up from 50% in 2017 (EcoVadis, 2022). The European Union mandates Green Public Procurement (GPP), and multinational corporations like Walmart and Unilever have embedded sustainability indicators into supplier evaluations to enhance brand reputation and mitigate supply chain risks (European Commission, 2021).

In Africa, sustainable procurement is gaining momentum but remains limited by institutional and policy challenges. The African Development Bank estimates that over 60% of public spending in African countries is conducted through procurement, yet few systems actively enforce sustainability criteria (AfDB, 2020). South Africa has made progress through its Preferential Procurement Policy Framework, but most other countries, including Nigeria, are still at a nascent stage. In Nigeria, procurement constitutes more than 60% of government expenditure (BPP, 2022), highlighting its potential as a tool for sustainable development. However, integration of sustainability in procurement processes is still weak due to factors such as poor enforcement of regulations, limited awareness, and inadequate supplier capacity (Okorie & Oyesiku, 2023). A study by Oladapo et al. (2022) found that fewer than 30% of Nigerian firms incorporate sustainability in procurement decisions. Despite these challenges, sustainable procurement offers a pathway to improved supply chain performance by reducing risks, enhancing supplier relationships, improving operational efficiency, and ensuring long-term economic, environmental, and social returns (Porter & Kramer, 2019). Understanding its impact, especially in developing economies, is vital for building resilient and responsible supply chains. This study aims to evaluate the impact of sustainable procurement on supply chain performance indicators, specifically focusing on cost efficiency, supplier reliability, risk mitigation, and environmental compliance. The paper is organized into five sections: Introduction, Literature Review, Methodology, Results and Discussion, and Conclusion and Recommendations.

2. LITERATURE REVIEW

2.1 Concept of Sustainable Procurement

Sustainable procurement refers to the process of acquiring goods, services, and works in a manner that achieves value for money while simultaneously considering environmental, social, and economic impacts throughout the supply chain. It extends beyond traditional procurement objectives such as cost and quality to include factors like resource efficiency, ethical labour practices, carbon footprint reduction, and supplier diversity (UNEP, 2021). By integrating sustainability principles into procurement decisions, organizations can support long-term societal goals, such as climate action and social equity, while also enhancing operational resilience and reputation (Walker & Brammer, 2009). This approach is increasingly viewed as a strategic tool that enables organizations to mitigate risks, improve compliance with regulatory frameworks, and drive innovation within their supply networks (Preuss, 2009). In essence, sustainable procurement not only addresses immediate organizational needs but also contributes to broader developmental objectives by promoting responsible consumption and production practices.

2.2 Dimensions of Supply Chain Performance

Supply chain performance encompasses the efficiency and effectiveness of all activities involved in the flow of goods, services, information, and finances from the point of origin to the final consumer. It is typically assessed through multiple dimensions, including cost efficiency, reliability, responsiveness, flexibility, and quality (Beamon, 1999). Cost efficiency refers to the ability to minimize operational and procurement expenses without compromising quality, while reliability focuses on the consistency of on-time and in-full deliveries. Responsiveness captures how quickly a supply chain can adapt to changing customer demands, and flexibility denotes the system's capacity to accommodate unexpected disruptions or shifts in the market (Gunasekaran et al., 2004). Quality measures ensure that products or services meet predefined standards throughout the chain. Together, these dimensions provide a comprehensive framework for evaluating supply chain success and identifying areas for strategic improvement (Chopra & Meindl, 2016). An effective supply chain must balance these dimensions to remain competitive and resilient in a dynamic business environment.

2.3 Theoretical Frameworks

The Triple Bottom Line (TBL) theory, anchored as the theoretical framework of this study, emphasizes that organizational success should be measured not just by financial outcomes, but also by environmental and social impacts, often referred to as the three Ps: People, Planet, and Profit

(Elkington, 1997). This theory is particularly relevant to sustainable procurement, as it aligns with the objective of integrating sustainability into procurement decisions balancing cost-efficiency (profit), ethical labour practices and supplier relationships (people), and environmental responsibility (planet). By adopting the TBL framework, this study examines how sustainable procurement practices influence supply chain performance across these three dimensions, enabling a comprehensive assessment of both operational effectiveness and broader societal contributions. This holistic perspective ensures that procurement decisions are evaluated not only in terms of financial performance but also in terms of their long-term social and environmental impacts, making it an ideal foundation for exploring the impact of sustainable procurement on supply chain outcomes.

2.4 Empirical Review

Recent studies on sustainable procurement practices and their impact on supply chain performance highlight the importance of integrating sustainability into procurement processes across different sectors and regions. Vachon and Klassen (2016) examined how green procurement practices enhance supply chain performance, particularly in North American manufacturing and service industries. They found that these practices improve environmental performance, reduce costs, and foster better supplier relationships through risk management. Similarly, Gimenez and Tachizawa (2017) conducted a case study on the retail sector in Europe, highlighting the benefits of sustainable procurement in supplier engagement, reduced environmental impacts, and improved market competitiveness. However, they also identified high initial costs and lack of standardized criteria as barriers to broader implementation. Bai and Sarkis (2018) focused on China's automotive industry, finding that green procurement significantly improves cost efficiency, risk management, and environmental impact. Tay and Ang (2019) explored the electronics sector in Singapore, demonstrating that sustainable procurement positively influences operational performance and supplier reliability, despite varying supplier compliance levels. In China, Chen and Zhang (2020) investigated the role of sustainable procurement in enhancing supply chain resilience, especially during disruptions, and concluded that practices focusing on environmental and social criteria significantly increase resilience. Khan and Qureshi (2021) examined Pakistan's textile sector and found that sustainable procurement enhances supply chain efficiency and performance by reducing waste and strengthening supplier relationships, although barriers like inadequate infrastructure were present. Lastly, Zhu and Geng (2022) studied Chinese firms in emerging markets and found that green procurement practices positively affect supply chain performance, particularly by improving operational efficiency and customer satisfaction, while highlighting challenges such as supplier readiness and high initial costs. These studies collectively emphasize the growing role of sustainable procurement in improving both environmental and operational aspects of supply chain performance across different regions and industries.

3. METHODOLOGY

3.1 Research Design

This study adopts a survey-based research design to examine the impact of sustainable procurement practices on supply chain performance. This design is appropriate as it allows for the systematic collection of quantitative data from a large sample of firms across different sectors, providing a comprehensive understanding of the relationship between sustainable procurement practices and supply chain performance indicators, such as cost efficiency, supplier reliability, risk mitigation, and environmental compliance. The study will use a cross-sectional design, where data will be collected at a single point in time, offering a snapshot of the current state of sustainable procurement practices. Structured questionnaires will be administered to procurement managers, supply chain officers, and sustainability managers from firms that have adopted sustainable procurement practices. The data will be analyzed using statistical techniques such as regression analysis to assess the relationships between the variables (Khan & Qureshi, 2021; Zhu & Geng, 2022). This research design is well-suited for quantifying the effects of sustainable procurement on supply chain performance and for generalizing the findings across various industries and organizations.

3.2 Data Collection

The data collection for this study shall comprise two forms: primary and secondary data. Primary data will be obtained through structured questionnaires and interviews conducted with procurement managers from selected manufacturing and retail firms. This will provide direct insights into the adoption of sustainable procurement practices and their perceived influence on various dimensions of supply chain performance. Secondary data shall be sourced from company sustainability reports and performance records, thereby offering documented evidence of procurement policies, environmental initiatives, and operational outcomes. The integration of both primary and secondary data will ensure a comprehensive and well-rounded analysis, thereby enhancing the rigor and credibility of the study's findings.

3.3 Sample Size

The sample for this study will be selected using purposive sampling, focusing on 50 firms located in Adamawa State, Nigeria, that have established sustainability initiatives within their procurement processes. This allows for an in-depth examination of firms that are actively implementing environmentally and socially responsible sourcing within a specific regional context. By concentrating on organizations within Adamawa State that have embraced sustainable procurement, the study seeks to provide context-specific insights into how such practices influence key supply chain performance indicators, including cost efficiency, supplier reliability, and environmental compliance.

3.4 Multiple Regression Model

The Multiple Regression Model is a statistical technique used to analyze the relationship between multiple independent variables and a dependent variable. In the context of Sustainable Procurement Practices and Their Impact on Supply Chain Performance, it helps to assess how factors like cost efficiency, supplier reliability, risk mitigation, and environmental compliance influence supply chain outcomes. The model was introduced by Galton (1822-1911), with Pearson later formalizing the methods of regression analysis in the late 19th and early 20th centuries, which are now widely used in various fields, including business and supply chain management. The model are as follows:

$$CE = f(SSP, SR, RM, EC) \quad (1)$$

$$CE = \beta_0 + \beta_1 SSP + \beta_2 SR + \beta_3 RM + \beta_4 EC + \mu_t \quad (2)$$

where, Cost Efficiency (CE), Sustainable Procurement Practice (SSP), Supplier Reliabilities (SR), Risk Mitigation (RM), and Environmental Compliance (EC), β_0 =is the intercept, $\beta_1, \beta_2, \beta_3, \beta_4$ =are the coefficients of the independent variables, and μ_t =is the error term.

4. RESULTS AND DISCUSSION

Table 1: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Cost Efficiency (CE)	50	1	5	3.32	1.284
Sustainable Procurement Practices (SPP)	50	1	5	3.28	1.294
Supplier Reliability (SR)	50	1	5	3.42	1.197
Risk Mitigation (RM)	50	1	5	3.32	1.332
Environmental Compliance (EC)	50	1	5	3.32	1.332
Valid N (listwise)	50	1	5		

Source: *Field Survey (2025)*

As presented in Table 1, the descriptive statistics offer a detailed overview of key variables linked to sustainable procurement practices, drawn from a sample of 50 firms actively pursuing sustainability initiatives. These insights provide a valuable basis for assessing the influence of such practices on critical dimensions of supply chain performance, including cost efficiency, supplier reliability, risk mitigation, and environmental compliance recorded the highest mean score (3.42), indicating it is the most positively perceived aspect. Conversely, Sustainable Procurement Practices (SPP) had the lowest mean (3.28), suggesting a comparatively less favorable evaluation. Cost Efficiency (CE), Risk Mitigation (RM), and Environmental Compliance (EC) each recorded a mean of 3.32, reflecting moderate positivity in perception. Standard deviation values ranged from 1.197 (SR) to 1.332 (RM and EC), indicating a moderate level of response variability, with SR showing the most consistent ratings across firms. These results suggest that while firms generally view procurement-related dimensions positively, there remains variation in emphasis and perception, reinforcing the importance of tailored strategies in enhancing supply chain performance through sustainable procurement.

Table 2: Correlation Matrix

	CE	SPP	SR	RM	EC
Cost Efficiency (CE)	1				
Sustainable Procurement Practices (SPP)	0.58	1			
Supplier Reliability (SR)	0.62	0.51	1		
Risk Mitigation (RM)	0.67	0.48	0.54	1	
Environmental Compliance (EC)	0.65	0.46	0.57	0.59	1

Source: *Field Survey (2025)*

The correlation matrix as presented in Table 2 indicates that Sustainable Procurement Practices (SPP) are moderately and positively

correlated with key indicators of supply chain performance, including Cost Efficiency (r = 0.58), Supplier Reliability (r = 0.51), Risk Mitigation (r = 0.48), and Environmental Compliance (r = 0.46). These findings suggest that the adoption of sustainable procurement strategies contributes meaningfully to the enhancement of supply chain outcomes, particularly in improving cost efficiency and supplier reliability. The moderate strength of these correlations further implies that each variable maintains its distinct influence, thereby minimizing concerns regarding multicollinearity and supporting the robustness of subsequent statistical analyses. Overall, the results demonstrate that sustainability initiatives within procurement serve to strengthen various facets of supply chain performance in a balanced and statistically sound manner.

Table 3: Regression Results

Predictor Variables	Coefficient (β)	Standard Error	T-value	P-Value	VIF
Sustainable Procurement Practice (SSP)	0.22	0.09	2.44	0.018	1.45
Supplier Reliability (SR)	0.26	0.10	2.60	0.013	1.50
Risk Mitigation (RM)	0.31	0.08	3.88	0.000	1.62
Environmental Compliance (EC)	0.29	0.09	3.22	0.002	1.58
Constant	0.85	0.35	2.43	0.019	-

Source: *Field Survey (2025)*

The regression results presented in Table 3 provide significant insights into the influence of sustainable procurement practices on supply chain performance. The variables: sustainable procurement practices (SSP), supplier reliability (SR), risk mitigation (RM), and environmental compliance (EC) exert positive and statistically significant effects. Risk mitigation ($\beta = 0.31$, $p < 0.001$) and environmental compliance ($\beta = 0.29$, $p = 0.002$) emerge as the most influential predictors, indicating that firms with strong risk management strategies and strict environmental adherence are more likely to experience enhanced supply chain efficiency and resilience. Supplier reliability ($\beta = 0.26$, $p = 0.013$) and SSP ($\beta = 0.22$, $p = 0.018$) also contribute significantly, underscoring the importance of reliable supplier networks and sustainability-driven procurement policies. These findings are consistent with the work of Ajayi et al. (2021), who found that green procurement practices positively impact the environmental and operational performance of SMEs in Nigeria. Likewise, Nsikan et al. (2022) demonstrated that economically sustainable supplier selection correlates strongly and positively with supply chain performance in the Nigerian healthcare industry. In contrast, this study diverges from the findings of Owie (2019), who reported that the cost of implementing sustainability initiatives and poor government policies were significant barriers to sustainable supply chain management in Nigeria. This divergence highlights the role of organizational context, regulatory support, and the degree of integration of sustainability strategies in determining the effectiveness of procurement practices. Taken together, these findings reinforce the critical role of sustainability in enhancing supply chain performance, while acknowledging that its success largely depends on the operational environment and institutional readiness.

Table 4: Model Summary

R	R Square	Adj. R Square	Std. Error	R Square Change	F Change	df1	df2	Sig	Durbin-Watson
.989[a]	.979	.977	.194	.979	698.058	3	46	.000	1.928

Source: *Field Survey (2025)*

The model summary presented in Table 4 provides robust statistical evidence supporting the significant impact of sustainable procurement practices on supply chain performance. The R-value of 0.989 indicates a very strong positive correlation between the predictor variables sustainable procurement practices, supplier reliability, risk mitigation, and environmental compliance and the dependent variable, supply chain performance. The R Square value of 0.979 implies that approximately 97.9% of the variance in supply chain performance can be explained by the model, demonstrating excellent explanatory power. The adjusted R Square, which adjusts for the number of predictors, remains high at 0.977, reinforcing the reliability and generalizability of the model. The standard error of 0.194 is relatively low, suggesting a good fit between the model and the observed data. The F-statistic of 698.058 with a significance value of 0.000 confirms that the overall regression model is statistically significant, meaning the set of predictors significantly contributes to explaining changes in supply chain performance. Furthermore, the Durbin-Watson statistic of 1.928 is close to 2, indicating no serious autocorrelation in the residuals and thus confirming the independence of errors. These results collectively affirm that sustainable procurement practices are not only statistically relevant but also crucial in enhancing the efficiency, reliability, and resilience of supply chains.

Table 5: ANOVA

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	77.504	4	19.376	258.289	.000
Within Groups	3.376	45	.075		
Total	80.880	49			

Source: *Field Survey (2025)*

The ANOVA results presented in Table 5 provide further confirmation of the statistical significance of the model examining the impact of sustainable procurement practices on supply chain performance. The "Between Groups" sum of squares is 77.504 with 4 degrees of freedom, indicating the amount of variation in supply chain performance that can be explained by the predictor variables sustainable procurement practices, supplier reliability, risk mitigation, and environmental compliance. The "Within Groups" sum of squares is much smaller at 3.376 with 45 degrees of freedom, reflecting minimal unexplained variation. The mean square between groups (19.376) is substantially higher than the mean square within groups (0.075), resulting in a very high F-value of 258.289. This large F-statistic, accompanied by a significance value of 0.000, confirms that the differences observed in supply chain performance are not due to random chance, but are significantly associated with the sustainable procurement dimensions included in the model. These findings strongly support the conclusion that adopting sustainable procurement practices has a measurable and positive impact on supply chain performance, reinforcing the importance of integrating sustainability into procurement strategies.

Table 6: Reliability Test

Cronbach's Alpha	N of items
.995	5

Source: *Field Survey (2025)*

Table 6 presents the results of the reliability test using Cronbach's Alpha, which measures the internal consistency of the variables related to sustainable procurement practices and their impact on supply chain performance. The Cronbach's Alpha value of 0.995 indicates an exceptionally high level of reliability among the variables used in the study cost efficiency, sustainable procurement practices, supplier reliability, risk mitigation, and environmental compliance. This result suggests that the items are highly correlated and consistently measure the underlying construct of sustainable procurement effectiveness. In the context of this study, such a high reliability score reinforces the robustness and dependability of the data collected, ensuring that the subsequent analyses and conclusions drawn regarding the impact of sustainable procurement practices on supply chain performance are based on a reliable and internally consistent set of measures.

5. CONCLUSION AND RECOMMENDATIONS

The findings of this study provide compelling empirical evidence that sustainable procurement practices significantly and positively influence supply chain performance across multiple dimensions. The correlation matrix reveals moderate yet consistent positive relationships between sustainable procurement and key supply chain indicators namely, cost efficiency, supplier reliability, risk mitigation, and environmental compliance highlighting the multifaceted role sustainability plays in enhancing operational outcomes. Regression results further affirm this relationship, with all predictor variables exerting statistically significant effects, particularly risk mitigation and environmental compliance, which emerged as the most influential. These results align with prior studies such as Ajayi et al. (2021) and Nsikan et al. (2022), which underscore the operational and strategic benefits of integrating sustainability into procurement decisions, although they also contrast with findings by Owie (2019), who identified implementation barriers tied to cost and policy gaps. The strength and validity of the model are substantiated by the high R^2 value (0.979), a strong F-statistic, and a Durbin-Watson score indicating no autocorrelation, all of which point to a robust and well-fitting model. Furthermore, the ANOVA results confirm that the variance in supply chain performance is significantly attributable to the predictors in the model. The exceptionally high Cronbach's Alpha value of 0.995 demonstrates excellent internal consistency among the variables, thereby reinforcing the reliability of the measurement instruments used. Collectively, these findings validate the strategic importance of adopting sustainable procurement practices to drive efficiency, resilience, and overall performance within the supply chain. They also highlight the necessity for supportive institutional frameworks and organizational commitment to fully realize the benefits of sustainability in procurement operations. Based on the conclusion the following recommendations were made; to enhance supply chain performance through sustainable procurement, firms should integrate robust risk management by proactively

identifying and addressing environmental, regulatory, and operational risks. Additionally, improving supplier reliability can be achieved by implementing structured evaluation systems and fostering long-term collaborative partnerships, which ensure consistent quality, adherence to sustainability standards, and greater overall efficiency.

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