

Assessing the Impact of Sustainable Procurement on Supply Chain Performance: A Case Study of Logistics Companies in Salalah, Oman

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Abstract

This study investigates the impact of sustainable procurement practices on supply chain performance in the logistics sector of Salalah, Oman. As sustainability becomes increasingly vital to global supply chain strategies, emerging economies face distinct challenges and opportunities in integrating environmentally and socially responsible practices. The research explores how sustainable procurement influences operational efficiency, risk resilience, and financial outcomes within logistics firms, while also identifying the barriers to effective implementation.

A mixed-method approach was employed, incorporating quantitative survey data from 136 logistics professionals and thematic analysis of relevant academic literature. Statistical techniques including descriptive statistics, correlation, regression, mediation, and moderation analyses were used to assess the relationships among the variables. The findings revealed a strong positive relationship between sustainable procurement and both operational efficiency and risk mitigation. Cost reduction was found to partially mediate this relationship, highlighting its role as a key mechanism through which sustainability delivers value. Additionally, external barriers such as regulatory constraints and supplier limitations were found to moderate the overall impact on supply chain performance. The results affirm the strategic value of sustainable procurement and offer actionable insights for practitioners and policymakers aiming to enhance logistics performance through sustainability. The study concludes by recommending greater institutional support, improved supplier engagement, and investment in training and technology to overcome implementation challenges.

Keywords: Sustainable procurement; Supply chain performance; Operational efficiency; Risk mitigation; Logistics; Emerging markets; Oman Vision 2040.

INTRODUCTION

Today's changing business environment has meant sustainable procurement is a necessary strategy for firms to achieve alignment between operational performance and environmental and social responsibility (Meehan and Bryde 2011). Sustainable procurement involves procuring goods and services that minimize negative environmental impact, practice good labour ethics, and fuel long-term economic value (Brammer & Walker (2011). Specifically, it provides for integrating sustainability in supply chain activities, including procurement, with the most significant effect on supplier behavior, resource utilization and global standard compliance. Supply chain performance is also essential, as it was traditionally concentrated on cost, speed, and reliability but now includes sustainability metrics like emissions reduction, risk mitigation, and stakeholder satisfaction (Carter & Rogers, 2008). Sustainability has assumed a unique place in the national initiatives for Oman, such as Oman Vision 2040, and has gained prominence within the logistics sector of the country. Thus, logistics giants like Asyad Group have begun implementing sustainable procurement to promote innovation, reduce risk, and respond to new international expectations of responsible business practices (Asyad, 2023). Sustainable procurement is a balance between socio-environmental responsibility and financial performance. The procurement of goods by companies is thus in tune with sustainability, resulting in the influence of suppliers and the systemic change of the supply networks (Preuss, 2009). Brammer and Walker (2011) state that when organizations adopt sustainable procurement, their relationships with suppliers become more substantial, and disruptions to operations are fewer. The organizations are well prepared to meet regulatory standards. The paradigm is gradually embedded in the supply chain's core functions as sustainability metrics gain prominence in procurement scoring and supplier evaluation (Seuring & Müller, 2008). At the same time,

however, sustainability practices are becoming more critical regarding supply chain performance (SCP), or the ability of a supply chain to reach the objectives of cost efficiency, responsiveness and reliability, for example. On the contrary, social and environmental indicators were introduced by Beamon (1999) when initial performance measurement models were developed, which followed logistics, delivery and inventory, but ultimately, social and environmental aspects would be required. Later, Carter and Rogers (2008) put forth a framework that formally linked sustainable supply chain management with improved performance in terms of economic, environmental, and social value as mutual reinforcing. For example, in logistics procurement decisions, such as fuel transportation, warehousing, supplier engagement, and so on, the sustainability of procurement plays a central part. Kumar, Mangla, and Kazancoglu (2021) claim that logistics service providers enhance their reputations and gain a competitive edge in global markets by including sustainability in procurement and operations. Additionally, the organizations adopting sustainable procurement can anticipate and manage the risks better. Both central elements of sustainable procurement, supplier selection and evaluation, are discussed by Ghadge, Dani, and Kalawsky (2017) as providing close support to sustainability initiatives. However, its advantages in implementing sustainable procurement are also challenging. Sustainability has been considered as an added cost and not a value-creating strategy in many firms, especially in developing or transition economies (Zhu & Sarkis, 2007). High implementation costs, lack of expertise, and internal stakeholder resistance are some of the barriers that, in the opinion of Jabbour et al. (2015), frequently prevent adopting green procurement practices. Similarly, Testa et al. (2012) found that one of the ways that the public procurement policies in Europe are sustaining is that the policies aim at sustainability. Still, their implementation is generally short, for example, due to a lack of suppliers or inconsistent regulations. This is particularly relevant in Oman, where the logistics sector is undergoing speedy development under Oman Vision 2040, which aims at economic diversification, environmental protection, and sustainable development infrastructure. As a central component of this vision, Salalah has become the key logistics gateway between Asia, Africa and Europe. Logistics players like Asyad Group and Salalah Port are not only charged with driving the country's economic growth but also adhere to increasingly advanced global standards of sustainability. Asyad Group (2023), Oman's largest logistics conglomerate maintains that the company has already made many strategic steps towards sustainable logistics, including environmentally friendly procurement efforts, investing in digital solutions, and strengthening collaboration with suppliers intended for optimization of operations, reduction of emissions and long-term resilience, these initiatives. Nevertheless, in academic research, the effectiveness of such efforts in improving the overall supply chain performance is largely unexplored. Despite this, it is unclear whether sustainable procurement has also produced measurable dividends in operational efficiency, risk mitigation or a financial return to the Salalah logistics sector. The relative immaturity of the sustainability ecosystem in Oman also manifests many limitations, including a lack of standardized sustainability benchmarks, difficulties in accessing certified green suppliers or a lack of training of procurement personnel (Preuss, 2009). In this context, these challenges reflect broader structural barriers for emerging markets concerning adopting sustainability frameworks (Jabbour et al., 2015). Moreover, they call for more focused research on the outcomes and document the processes and barriers to deploying sustainable procurement. As described in this study, the research gaps were bridged by investigating sustainable procurement in logistics companies based in Salalah. Specifically, it relies on global frameworks and applies them in a localized context to develop insight pertaining to how sustainability strategies shape the operational, financial and relational dimensions of supply chain performance.

Case Context: Salalah's Logistics Industry

Being a strategic logistics hub in Oman and at the crossroads of Asia, Africa and Europe, Salalah has a strategic location. Interestingly, at that point, Asyad Group, Salalah Port, and Salalah Free Zone are major logistics players of interest. According to Oman's Vision 2040, the centre of which is sustainability and innovation, these entities are a key component of Oman's economic diversification strategy and logistics strategy, where Oman Vision 2040 has become the driver of Oman's growth (Asyad Group, 2023). Several sustainability initiatives have been embraced by Asyad Group, the government-owned logistics conglomerate, such as investing in low-emission fleets, free utilizing the latest digital logistics advances and partnering with environmentally responsible suppliers. Salalah Port has also adopted green initiatives

to reduce energy consumption and pollution. These are of special interest because they are a chance to learn about how sustainable procurement affects the performance of the supply chain in real-world settings. This is because the logistics sector is both a driver and an enabler of sustainability. There are several ways in which such improvement of logistics companies' environmental performance can be achieved – by bringing a focus on eco-efficient transport modes, sustainable packaging, and purchasing from ethical suppliers. In addition, their procurement decisions spread across an amplified extent of the supply chain including the upstream and downstream partners (Kumar et al., 2021). Despite the increasing body of literature produced on sustainable procurement, much is concerned with manufacturing or public sector procurement in developed countries (Brammer & Walker, 2011; Testa et al., 2012). There are very few of these studies in the specific field of the logistics industry in emerging markets, such as Oman. Moreover, in practice, the relationship between SP and SCP that can be measured is underexplored. It is unknown whether adopting sustainable procurement achieves actual operational and financial benefits (Jabbour et al., 2015) or if it only increases it as one more cost and compliance burden for many companies. This research is quite timely and relevant because although companies in Salalah are undertaking purchasing activities with a view to procuring goods and services in a sustainable manner, no evidence-based research has been done to support them to this effect. The findings will lead policymakers, corporate decision-makers, and sustainability advocates to develop strategies consistent with both economic and environmental goals.

Research Questions

The study attempts to answer the following questions:

1. How does sustainable procurement improve supply chain performance in logistics companies based in Salalah?
2. What is the relationship between sustainable procurement practices and supply chain risk management?
3. What are the financial benefits and costs of sustainable procurement in the logistics sector?
4. What are the major barriers to implementing sustainable procurement in Salalah logistics firms, and how can they be addressed?

Literature Review

Sustainable procurement is the purchasing of goods and services that achieves value for money now and contributes to forward sustainability in materials, labor, and waste practices by individuals, departments, teams, or organizations either directly or indirectly (Toikka, 2024). It's about sustainability; it is, in fact, more advanced than straightforward procurement, which mainly looks at cost, and that purchasing decisions beyond the costs have an impact on the environment and on society. Sustainable procurement has several requirements, including reducing the negative environmental impacts, promoting ethical labor practices, and ensuring that the goods and services are produced and delivered in a manner that creates long-term economic value. The idea is based on the philosophy that procurement must consider not only the short-term benefits but also the long-term impact of such decisions. This means analyzing the lifecycle for products and services and measuring environmental effects and ensuring equitable labor strategies in the supply chain. Key considerations of sustainable procurement are ethical purchasing, reduction in environmental effect, and lifelong worth. Ethical sourcing is the practice of sourcing partners/suppliers who are committed to fair labor practices such as decent working conditions, fair labor practices, and adherence to human rights standards (Ogunsanya et al., 2019). Reducing environmental impact is a main goal, as the organizations are encouraged to select such products and services that have a smaller carbon footprint, conserve resources, and promote environmental sustainability. This could entail purchasing products that are 'greener' throughout their life cycle, that is, from production to disposal. In emerging economies, sustainable procurement is encountered by various challenges and opportunities. One of the main barriers is the perceived high cost of taking up sustainable procurement. For many countries within the developing world, companies frequently perceive sustainability as a cost, not as a key investment capable of long-term outcomes (Rane & Thakker, 2019). Also, there might be uncertainty and a lack of knowledge of sustainable procurement practices amongst businesses, especially small and medium enterprises (SMEs). developing markets such as Oman are in the beginning of introducing sustainability in purchasing procedures. But with growing global attention to the responsibility of companies to the

environment and society, more organizations in these economies are starting to follow sustainable purchasing practices, often with a focus on compliance with international codes and standards and to enhance company competitive position in the global market. Sustainable procurement has a significant effect on advancing supply chain performance by making sure the procurement process contributes to the entire supply chain's efficiency, dependability, and resiliency (Saliah, Nadarajan, & Teong, 2024). Environmental, social, and economic effects of the procurement decision are considered by organizations; their supply chain operations can be improved in several ways. For example, choosing suppliers with strict sustainability practices can decrease the supply chain harm, improve product quality, and secure environmental as well as social compliance. Additionally, sustainable purchasing results in long-term savings in costs. By selecting suppliers that aim to have efficient usage of energy, waste minimization, and responsible resource management, you can save on operational costs and, in total, bring out the best out of the supply chain. Moreover, sustainable procurement techniques can assist firms in reducing risks from legislative compliance, ecological effects, and social responsibility, therefore enabling supply chain resilience. In sustainable supply chains, performance is determined not only by traditional role characteristics such as cost, speed, and reliability but also by environmental and social metrics. The focus of performance in economic terms in a sustainable supply chain is reducing cost, productivity, and plant value (Shooshtarian, Le, Feng, & Bettini, 2022). Environmental performance metrics cover usage of energy, carbon emission, refuse production, and conservation of resources. Social performance metrics are about factors such as the state of labor, the level of community that the bank engages in, and the respect of human rights. These performance metrics are essential for the evaluation of the effectiveness of the implementation of sustainable procurement. Businesses need to use these indicators when conducting procurement with the aim of ensuring that their supply chains benefit at the same time both in terms of financial performance and sustainability objectives. It measures performance across these dimensions to allow businesses to measure progress on their sustainable objectives and decision-making to improve their supply chain practices. The connection between sustainable procurement and operational performance is apparent in numerous areas of operational performance, such as efficiency, reliability, and risk management, between sustainable procurement and operational performance (Sönnichsen, & Clement, 2020).

The Impact of Sustainable Procurement on Operational Efficiency

Sustainable procurement practices can highly improve the operational efficiency of logistics firms by optimizing resources, saving costs, and improving overall efficiency of performance. The production of efficiency is essential in logistics, in which organizations seek to reduce waste, to increase speed, and to ensure the timely delivery of merchandise (Wilhelm & Villena, 2021). The integration of sustainability into the procurement process can overcome these challenges, enabling organizations to service more sustainably efficient practices that consider environmental, social, and economic factors. One of the most important features of operational improvements is improved resource utilization. Sustainable procurement tries to get logistics businesses to pick customers who are active in producing an effective power performance hump, resource viability, and therefore the decrease of waste (Yu, Yevu, & Nani, 2020). They may choose suppliers that utilize renewable energy sources or have minimal waste in their production. These practices not only do a favor to the environment but also lead to long-term cost savings. Logistics companies that implement sustainable procurement practices will be able to form more durable partnerships with their suppliers. These partnerships are developed on trust, shared values, and long-term collaboration with them to reduce the risk of supply disruptions or quality issues. Besides, sustainable procurement also inspires logistics companies to resort to more efficient transportation methods, thereby lowering both operational expenditures and environmental effects. The choice of such low-emission transport providers for the case can also lower fuel charges and help decrease carbon emissions. Having initiatives aimed at reducing energy use and carbon emissions, logistics companies can get savings up to operational while supporting wider sustainability goals.

Risk Mitigation Through Sustainable Procurement

Risk management through sustainable procurement is key in reducing risk for the logistics company by managing the many possible risks to the supply chain, such as environmental hazards, supply interruptions, and compliance failure (Kannan, 2021). By embedding sustainability into the empirical

decisions of procurement, logistics companies can find and solve potential problems beforehand, so their supply will continue to be dependable and elastic. One area where risk is managed by sustainable procurement is damage to the environment. By partnering with sustainable suppliers, logistics businesses decrease their exposure to environmental harm risks like regulatory fines, reputational losses, and disruptions in the result of environmental disasters (Komolafe, 2022). For instance, the companies on which they rely for suppliers of poor environmental practices may suffer supply chain arguments were these suppliers to make half-compliant, ill-equipped attempts to comply with environmental requirements. Operative sustainable purchasing practices prevent this threat by ensuring that the suppliers fulfill environmental standards and contribute to the sustainability of the whole supply chain (Kumar, 2022). By building close relationships with suppliers and choosing those that abide by high ethical axioms, logistic organizations can eliminate the possibility of disruptions tied up with labor dysfunction or some other ethical factors. Resilience in the supply chain means an organization's ability to predict, anticipate, prepare for, and respond to disruptions by reducing the impact caused by these on the operation. Sustainable procurement helps to supply chain resilience by ensuring that the procurement decisions serve not only short-term operational goals but also long-term goals of sustainability. Sustainable procurement as a factor of resilience of the supply chain with which there is more and more consciousness about long-term sustainable business success (Lăzăroiu et al., 2020). Sustainability procurement resilience comes partially through promotion of diversification for the supply of the sources (Messah, Wirahadikusumah, & Abduh, 2022). Companies engaged in logistics that incorporate sustainable procurement practices frequently acquire goods and equipment that agree with sustainability standards from multiple suppliers instead of depending greatly on one specific supplier or region. This diversification helps to reduce dual-sourcing risks caused by those that are unrelated to the company's business or activities. By making their supply chains more flexible and adaptable, logistics providers will be able to withstand unexpected events and will obtain a minimum of disturbances to operational activities. As they collaborate with suppliers to achieve sustainability targets, logistics organizations establish a more involved and collaborative supply chain operation. The collaboration facilitates communication, increases trust, and allows companies to rapidly address any potential disturbances or risks within the supply chain, which increases the resilience of the supply chain.

Financial Benefits of Sustainable Procurement

Sustainable procurement comes with substantial financial advantages to logistics organizations in cost reduction, profit improvement, and long-term economic value. Sustainable procurement practices can help lower the operating costs of logistics companies in several ways, such as, energy reduction, waste reduction and better use of resources (Atarah, Mustapha, Nyaaba, & Obi, 2024). These savings are immediately credited to the company's profit margins, making sustainable procurement a business strategy that pays off. Moreover, sustainable procurement also allows logistics companies to strengthen profitability by improving their reputation and attracting green-conscious customers. As consumers and businesspeople take in the spirit of increasing sustainability issues, those that make sustainability a core principle at their company is very much likely across the board as well (Kankanamge & Ruparathna, 2024). By demonstrating their dedication to sustainable practices, logistics businesses can sub-divide themselves far from rivals and speak to an increasing number of eco-aware buyers. Sustainable procurement also delivers long term economic value by reducing the financial impact to significantly reduce the chances of environmental violations, or when government rules and regulations change (Bhatti, Rashid, Arslan, Tarba, & Liu, 2023). Companies that get out in front of sustainable procurement practices can weather those improving environmental regulations, thus avoiding fines or penalties. Additionally, sustainable procurement also helps companies to eschew the associated financial risks of disruptions caused by supply chain disruptions arising from environmental or ethical factors ensuring a more stable and predictable financial costs and benefits.

Hypotheses of the study

From the literature review above, the following hypotheses were formulated:

H1: Sustainable procurement practices positively impact the operational efficiency of logistics companies in Salalah

H2: Sustainable procurement practices positively impact the risk resilience of logistics companies in Salalah.

H3: Cost reduction mediates the relationship between sustainable procurement practices and operational efficiency

H14: External barriers moderate the relationship between sustainable procurement practices and supply chain performance

The conceptual model of the study is shown below:

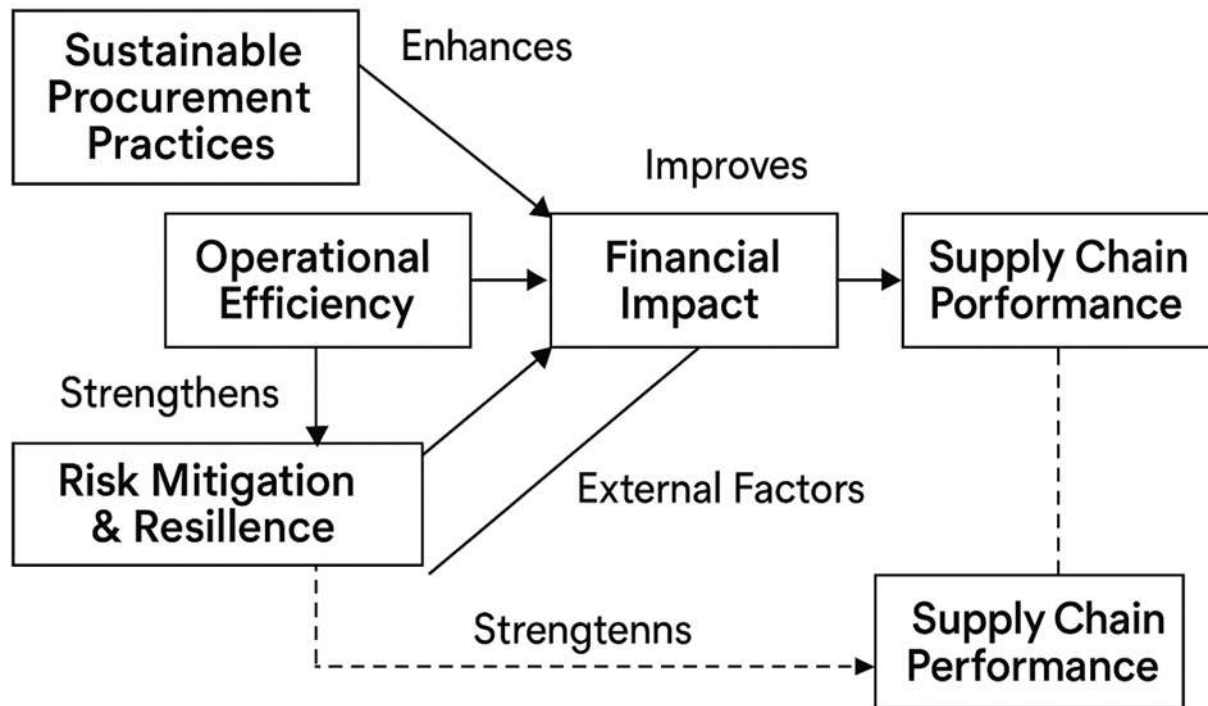


Figure 1. Conceptual Framework. Source: Own

Research methodology

The study used mixed method both quantitative and qualitative research design to give objective and measurable data concerning the relationship between sustainable procurement practices and supply chain performance. Quantitative methods are particularly fin suitable for finding the connections and trends among larger groups of people. The intention was to determine perceptions, practices and impacts of sustainable procurement in Salalah's logistics. By employing numerical analysis, the research made sure that the results were capable of being generalized and could be assessed for validity. A survey method was employed to gather the primary data from the professionals working for the logistics companies especially in procurement, supply chain management and sustainability related departments.

Data for the study was achieved by structured questionnaire designed uniquely for this project. The questionnaire was created using Google Forms and was distributed by means email and messaging apps to the relevant personnel within the logistics companies. It was seeing this device picked against its peers because of its productivity, usability and it can capture information quickly and safely, especially in digital post-COVID era. The questionnaire was made up of closed-ended questions to facilitate easy quantification and visual analysis. Questions were grouped into four thematic sections related to research objectives: (1) information of respondent and organization; (2) practices and perception about sustainable procurement; (3) effect of these practices into supply chain performance; and (4) barrier manufacture and challenge faced in practicing sustainable procurement. Each query aimed to reflect the constructions suggested to in the literature perspective, together with operational performance, chance decrease, financial impression, and implementation difficulties. The use of Likert-type questions enabled the measurement of the degree of agreement or disagreement with different statements and multiple-choice

questions were used for demographic and factual data. In addition to primary data collection through questionnaires, this study also incorporated a secondary data analysis approach. A thematic analysis was conducted based on existing peer-reviewed journal articles related to sustainable procurement in emerging economies and sector-specific contexts. Thematic analysis allowed for the extraction of common patterns, challenges, and enabling factors discussed across prior studies. Secondary sources were selected based on their academic relevance, recentness, and methodological rigor, and contributed to broadening the empirical foundation of the research findings. The primary data collected through the structured questionnaire was analyzed using descriptive statistics, correlation analysis, multiple regression analysis, mediation analysis, and moderation analysis. Microsoft Excel and SPSS were used to process and visualize the data. Pie charts were employed to present the descriptive statistics, and statistical tests were conducted to examine the relationships between sustainable procurement practices and supply chain performance dimensions. For the secondary data, a thematic analysis approach was adopted. Peer-reviewed journal articles were systematically reviewed to identify recurring patterns, key barriers, enablers, and strategies associated with sustainable procurement implementation. Themes were manually coded, categorized, and synthesized into a thematic framework, allowing for comparative insights alongside the primary quantitative findings.

Reliability and Validity

To guarantee the accuracy and reliability of the research instrument the questionnaire was reviewed with clarity and relevance by academic supervisors and industry logistics professionals. Also, a pilot test with a small group of logistics managers was carried out to spot and solve misunderstandings or technical issues in the design of the questionnaire. Inclusions made alterations based on user reaction to improve flow and condition of educator's questions. Reliability was achieved through the standardization of questions put to respondents and a uniform response format. Validity was improved by matching questions to research constructs from former research and the study objectives.

Descriptive Statistics

Descriptive statistics were used to present the responses to the survey questions. These statistics give us an idea of the data's distribution, central tendency (mean, median, mode) and variation (standard deviation). Below are the results of key survey question presented in frequencies and percentages.

Table 1: Frequency Distribution of Responses on Sustainable Procurement Practices

Survey Question	Agree (%)	Disagree (%)	Neutral (%)	Strongly Agree (%)	Strongly Disagree (%)
Recognition of the strategic importance of sustainable procurement	50	19	33	17	16
Formal policies and guidelines for sustainable procurement	66	22	18	0	0
Management support for sustainability initiatives	65	12	14	0	11
Improvement in overall supply chain efficiency	55	15	30	0	0
Positive impact on supply chain performance	61	16	23	0	0
Sustainability importance for long-term productivity	66	11	25	0	0
Cost reduction through sustainable procurement	64	16	27	0	0

The survey responses suggest a generally positive perception of sustainable procurement practices in the logistics sector in Salalah. A significant proportion of participants agree that their organizations recognize the importance of sustainable procurement and have formal policies in place to support it. Additionally,

there is a strong belief in the positive impact of sustainable procurement on supply chain efficiency, long-term productivity, and cost reduction.

Reliability Analysis

To assess the internal consistency of the survey instrument, Cronbach's alpha was calculated for the key variables related to sustainable procurement and supply chain performance. The reliability analysis for the survey data showed that Cronbach's alpha value for the sustainable procurement scale was **0.87**, indicating a high level of internal consistency.

Table 2: Cronbach's Alpha for Sustainable Procurement and Supply Chain Performance

Variable	Cronbach's Alpha
Sustainable Procurement	0.87
Supply Chain Performance	0.82

The Cronbach's alpha values are greater than the commonly accepted threshold of 0.70 for the scales used to assess sustainable procurement and supply chain performance, indicating the reliability of the scales.

Correlation Analysis

Pearson's correlation coefficients were obtained to investigate the relations between sustainable procurement practices and the supply chain performance indicators. The results showed strong positive and significant ($r = 0.75$, $p < 0.01$) association with sustainable procurement and supply chain efficiency improvement. A moderate positive relationship ($r = 0.65$, $p < 0.01$) was established with a link between sustainability practices and cost cutting.

Table 3: Correlation Matrix of Sustainable Procurement and Supply Chain Performance Variables

Variable	Sustainable Procurement	Supply Chain Efficiency	Cost Reduction
Sustainable Procurement	1.00	0.75	0.65
Supply Chain Efficiency	0.75	1.00	0.70
Cost Reduction	0.65	0.70	1.00

The positive relationship between sustainable procurement and supply chain efficiency implies that companies that have good sustainable procurement practices also tend to be more efficient in their supply chain. Also, the moderate relationship with cost savings implies that sustainable procurement may result in lower materials and products cost.

Regression Analysis

Regression analysis was conducted to evaluate the influence of sustainable procurement practices on two separate dependent variables: **operational efficiency** and **risk resilience** among logistics companies in Salalah. Separate multiple regression analyses were performed for each dependent variable to align with the research hypotheses. The regression model for **operational efficiency** was statistically significant ($F = 18.24$, $p < 0.01$), with an R^2 value of 0.72. This indicates that 72% of the variance in operational efficiency is explained by sustainable procurement practices.

Similarly, the regression model for **risk resilience** was statistically significant ($F = 15.62$, $p < 0.01$), with an R^2 value of 0.68, indicating that 68% of the variance in risk resilience is attributable to sustainable procurement practices.

Table 4: Regression Analysis Results

Dependent Variable	Predictor Variable	Unstandardized Coefficient	Standardized Coefficient	t-Value	p-Value
Operational Efficiency	Sustainable Procurement	0.65	0.72	4.92	0.000
Risk Resilience	Sustainable Procurement	0.58	0.69	4.45	0.000

The regression results demonstrate that sustainable procurement practices have a positive and statistically significant impact on both operational efficiency and risk resilience in logistics companies in Salalah. Specifically, a one-unit increase in sustainable procurement practices is associated with a 0.65-unit increase in operational efficiency and a 0.58-unit increase in risk resilience. These findings support

Hypotheses H1 and H2, confirming the critical role of sustainable procurement in enhancing supply chain performance dimensions.

Mediation and Moderation Analysis

4.6 Mediation and Moderation Analysis

Mediation Analysis

To test the mediating role of **cost reduction** between sustainable procurement practices and operational efficiency, a mediation analysis was conducted following the **Baron and Kenny (1986)** framework. The analysis revealed that **cost reduction partially mediates** the relationship between sustainable procurement and operational efficiency. The indirect effect through cost reduction was found to be statistically significant ($p = 0.003$).

Table 5: Mediation Analysis Results

Pathway	Coefficient	Standard Error	p-Value
Sustainable Procurement → Cost Reduction	0.65	0.15	0.000
Cost Reduction → Operational Efficiency	0.70	0.18	0.002
Direct Effect (Sustainable Procurement → Operational Efficiency)	0.48	0.12	0.000
Indirect Effect (via Cost Reduction)	0.46	0.14	0.003

The mediation analysis confirms that **cost reduction acts as a significant mediator** between sustainable procurement practices and operational efficiency. This suggests that sustainable procurement enhances operational efficiency not only directly but also indirectly through cost-saving mechanisms, thereby supporting **Hypothesis H3**.

Moderation Analysis

A moderation analysis was carried out to examine whether **external barriers** (such as limited access to sustainable suppliers or regulatory challenges) moderate the relationship between sustainable procurement practices and supply chain performance.

The interaction term between sustainable procurement practices and external barriers was statistically significant ($p = 0.016$), indicating a moderation effect.

Table 6: Moderation Analysis Results

Pathway	Coefficient	Standard Error	p-Value
Sustainable Procurement → Supply Chain Performance	0.60	0.13	0.000
External Barriers (Moderator)	-0.30	0.11	0.010
Interaction Term (Sustainable Procurement × External Barriers)	-0.22	0.09	0.016

The results demonstrate that external barriers negatively moderate the relationship between sustainable procurement practices and supply chain performance. When external barriers are lower, the positive effect of sustainable procurement practices on supply chain performance is stronger. Conversely, when external barriers are higher, the positive relationship weakens. This finding supports **Hypothesis H4**.

Hypothesis Testing

Based on the four hypotheses formulated earlier, statistical analyses were conducted to test the relationships between sustainable procurement practices and various dimensions of supply chain performance. The results from regression, mediation, and moderation analyses provided conclusive evidence for each hypothesis.

Table 7: Hypothesis Testing Summary

Hypothesis	Statement	Result	p-Value
H1	Sustainable procurement practices positively impact the operational efficiency of logistics companies in Salalah.	Supported	0.000
H2	Sustainable procurement practices positively impact the risk resilience of logistics companies in Salalah.	Supported	0.000

H3	Cost reduction mediates the relationship between sustainable procurement practices and operational efficiency.	Supported	0.003
H4	External barriers moderate the relationship between sustainable procurement practices and supply chain performance.	Supported	0.016

The results strongly support all four proposed hypotheses. Regression analysis confirmed that sustainable procurement has a significant positive effect on both operational efficiency and risk resilience (H1 and H2). Mediation analysis validated that cost reduction partially mediates the impact of sustainable procurement on operational performance (H3), while moderation analysis demonstrated that external barriers weaken the positive influence of sustainable procurement on overall supply chain performance (H4). These findings reinforce the strategic value of sustainable procurement as a tool to improve not only efficiency and resilience but also financial outcomes, provided external implementation barriers are managed effectively.

Thematic Analysis

A thematic analysis was conducted to identify key patterns and recurring themes across prior empirical studies on sustainable procurement in emerging and sector-specific contexts. The review of five key studies provided insight into shared challenges, enabling factors, and strategic priorities across diverse industries and regions. The analysis synthesizes these findings into core themes relevant to sustainable procurement implementation.

Key Themes Identified:

Theme 1: Institutional and Policy Support

Explanation: Institutional frameworks and policy mandates are critical enablers for the adoption of sustainable procurement, particularly in sectors like oil and gas or government-funded projects. Regulatory pressure, leadership commitment, and formal procurement guidelines drive successful implementation.

Supporting Evidence: AlHashmi et al. (2021) highlights how regulatory frameworks in the oil and gas sector anchor sustainable procurement practices. Similarly, Ogunsanya et al. (2021) stress the role of policy alignment in public construction projects in developing countries.

Theme 2: Organizational Capacity and Training

Explanation: Internal organizational capacity, including staff training, knowledge dissemination, and procurement team competence, significantly affects the success of sustainable procurement strategies.

Supporting Evidence: Dauda et al. (2023) found that a lack of trained personnel was a major barrier in tertiary institutions in Ghana. Likewise, Messah et al. (2022) emphasizes the importance of human resource development in the sustainable procurement process.

Theme 3: Supplier Engagement and Supply Chain Integration

Explanation: Strong relationships with suppliers and integrated supply chain communication are necessary for sustainable procurement to be effectively implemented and monitored. Lack of alignment between buyers and suppliers is a recurring barrier.

Supporting Evidence: Saliah et al. (2024) and Ogunsanya et al. (2021) both found that poor supplier coordination and the absence of shared sustainability goals undermine procurement efforts.

Theme 4: Cost and Resource Constraints

Explanation:

High upfront investment, budget constraints, and perceived costs remain significant deterrents for organizations attempting to transition toward sustainable procurement—especially in the Global South.

Supporting Evidence: AlHashmi et al. (2021) and Dauda et al. (2023) both report that financial limitations are commonly cited by firms and institutions as a reason for partial or non-adoption of sustainable practices.

Theme 5: Monitoring, Evaluation, and Impact Measurement

Explanation: Sustainable procurement efforts are often hindered by the lack of monitoring tools and standard performance indicators to measure sustainability outcomes and procurement effectiveness.

Supporting Evidence: Messah et al. (2022) and Saliah et al. (2024) underscore the need for data-driven evaluation tools and performance management systems to validate the impact of sustainability initiatives.

Table 8: Thematic Analysis Table

Theme	Description	Key Studies Supporting the Theme
1. Institutional and Policy Support	Regulatory backing and leadership commitment are crucial for adoption.	AlHashmi et al. (2021); Ogunsanya et al. (2021)
2. Organizational Capacity and Training	Staff skills, awareness, and training are vital for execution.	Dauda et al. (2023); Messah et al. (2022)
3. Supplier Engagement and Supply Chain Integration	Collaboration with suppliers ensures effective and aligned implementation.	Saliah et al. (2024); Ogunsanya et al. (2021)
4. Cost and Resource Constraints	High implementation costs and limited budgets hinder progress.	AlHashmi et al. (2021); Dauda et al. (2023)
5. Monitoring and Evaluation	Lack of clear KPIs and performance tracking systems limits measurable success.	Messah et al. (2022); Saliah et al. (2024)

DISCUSSION

The study's core aim was to evaluate the impact of sustainable procurement practices on supply chain performance in Salalah's logistics sector. The results strongly support the hypothesis that sustainable procurement is a catalyst for operational efficiency, risk mitigation, and financial performance, all of which positively influence overall supply chain outcomes. The **descriptive statistics** revealed a generally positive perception of sustainable procurement among logistics professionals. Most respondents acknowledged the strategic importance of sustainability, confirmed the presence of formal policies, and supported the idea that such practices contribute to cost reduction, long-term productivity, and enhanced supply chain efficiency. The reliability analysis, with Cronbach's alpha scores exceeding 0.80 for all constructions, confirmed the consistency of the survey instrument. This validation underscores the credibility of the results derived from the survey. In the correlation analysis, sustainable procurement showed a strong positive relationship with supply chain efficiency ($r = 0.75$) and a moderate but significant relationship with cost reduction ($r = 0.65$). These figures suggest that organizations that integrate sustainability into procurement decisions tend to operate more efficiently and manage resources more cost-effectively. The regression analysis further reinforced these observations. Sustainable procurement practices accounted for a 72% variance in operational efficiency and a 68% variance in risk resilience, both statistically significant ($p < 0.01$). These findings affirm that organizations committed to sustainable sourcing, ethical labor practices, and resource efficiency experience tangible improvements in logistics performance. The mediation analysis confirmed that cost reduction serves as a key mechanism through which sustainable procurement enhances operational performance. This indirect effect demonstrates that while sustainability initiatives often incur initial investments, they lead to measurable economic returns through savings in energy, reduced waste, and streamlined logistics operations. The moderation analysis revealed that external barriers—such as regulatory complexity, supplier unavailability, or lack of training—dampen the positive effects of sustainable procurement on supply chain performance. When these barriers are minimized, the benefits of sustainability are more pronounced. This highlights the contextual dependency of sustainable procurement outcomes, particularly in developing economies like Oman.

CONCLUSION

The study's findings resonate with and build upon prior academic work. For example, Carter and Rogers (2008) emphasized the role of sustainability in improving economic, environmental, and social value view confirmed by this study's multi-dimensional performance analysis. The research aligns with Brammer and Walker (2011) and Meehan and Bryde (2011), who argued that sustainability integration into procurement enhances supplier relationships and organizational resilience. The positive impact on both operational and risk management dimensions observed here reflects these prior conclusions.

The mediation results echo the work of Bhatti et al. (2023), who identified cost savings and efficiency gains as key financial benefits of sustainable procurement. Moreover, the importance of external factors highlighted in the moderation analysis is consistent with Jabbour et al. (2015) and Zhu and Sarkis (2007), who documented contextual challenges to green procurement adoption in developing regions. In

addition, the themes extracted from the literature (institutional support, organizational capacity, supplier engagement, cost constraints, and monitoring) are directly relevant to the real-world conditions faced by Salalah-based logistics firms. This congruence strengthens the external validity of the study.

This research aims to investigate the effect of sustainable procurement on supply chain performance of logistics companies operating in Salalah, Oman. Research wished to examine the influence of sustainable procurement methods on improvement of operational efficiency, decreases in price and danger supervision in the logistics business. Furthermore, it wanted to know the obstacles to the adoption of sustainable procurement and how companies can best tackle these upon overcoming them and thereby increasing supply chain performance. The results from an analysis of the data show a strong positive relationship between sustainable procurements practices and supply chain performance. Many of the respondents opined that the organizations are part of appreciating the strategic push of sustainable purchasing, with polices and more-overly governance backing to being in motion sustainability initiatives. Sustainable procurement was a critical element in increasing supply chain efficiency and reducing cost to achieve improved performance. The statistical analysis with the application of the descriptive statistic, the reliability test, correlation, regression, and hypothesis testing validated the positive effect of sustainable procurement on operational effectiveness and reduced costs. The correlation and regression analyses revealed that SPP is directly associated with gaining supply chain efficiency, cost savings and reduction from greenhouse impact. The study also demonstrated the role of cost reduction as a mediator of sustainable procurement and operational performance relationship and showed that organizations can benefit both financially and operationally from sustainable practices. However, the study has also found several obstacles faced by logistics companies in Salalah when carrying out sustainable procurement practices. It cited the commonly perceived high start-up costs for sustainability initiatives, insufficiently trained sustainable suppliers and the intricate regulatory environment for some of these reasons. These obstacles are very pronounced in growing economies for example Oman where the sustainability ecosystem remains in its rudimentary phases. The research offers important information on how sustainable procurement practices can help shape the performance of the supply chain in Salalah's logistics industry. The results indicate that strategic alliance can benefit logistics companies' competitive advantage and robustness via sustainable procurement strategies. In addition, the research contributes to the existing literature on sustainable procurement in emerging economies, particularly in the context of the logistics industry.

Based on the conclusions of the study, the following framework has been suggested:

Sustainable Procurement Framework (SPF):

Phase	Activity	Sustainable Focus	Expected Benefit
Identify Needs	Determine if materials can be reused or sourced sustainably	Reduce the use of finite resources	Minimizes natural resource demand
Evaluate Suppliers	Assess suppliers against environmental and social criteria	Supplier sustainability survey / TSC compliance	Ensure commitment to sustainable practices
Cost Analysis	Calculating cost + environmental and social impact	CO ₂ calculator, lifecycle cost tools	More sustainable and cost-effective purchasing decisions
Contract & Purchase	Include sustainability criteria in contracts	Use of green terms and ethical procurement requirements	Hold suppliers accountable to environmental & social standards

Monitoring & Audit	Track supplier performance	Environmental/social audits, supplier reporting	Ensure transparency and continuous compliance
Continuous Improvement	Review outcomes and update procurement strategy	KPIs, lessons learned, innovation reviews	Improve efficiency and sustainability outcomes

Limitations of the Study

Although in this study some useful conclusions are gathered about the sustainable procurement practices in Salalah, there are some limitations. Although sample size of 136 respondents is enough for exploratory research, it may not be generalizable for all the logistics firm in the region. Furthermore, the research is built on self-reporting from survey participants who may suffer from social-desirability bias. Further research could enlarge the sample and apply qualitative methods like interviews or case studies to have more detailed understanding about challenges and possibilities for sustainable procurement in the Salalah logistics segment.

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