

The Impact of Sustainable Supply Chain Management on Business Efficiency and Environmental Protection

James Heah Wheeder
Mba, Monrovia, Republic of Liberia

Abstract—This study explores how Sustainable Supply Chain Management (SSCM) influences both organizational performance and environmental outcomes. In the present business context profitability alone is no longer sufficient; companies are also expected to demonstrate environmental accountability. Increasingly strict environmental regulations rising societal expectations and the growing demand for sustainability have encouraged organizations to move away from traditional supply chain methods and adopt greener more responsible practices (Seuring & Müller & United Nations 2008).

However, the adoption of SSCM is not uniform across firms and the extent of implementation differs significantly among organizations (Ahi & Searcy 2013). The research follows a quantitative approach. Data were collected through an online survey targeting supply chain professionals and key business stakeholders. Only fully completed responses were considered to ensure the accuracy and reliability of the findings. The survey focused on major supply chain functions such as procurement transportation inventory control and waste handling. Descriptive statistical analysis was used to understand the level of SSCM adoption and its influence on business operations (Zhu 2019).

The findings reveal that organizations implementing SSCM tend to perform more efficiently by improving coordination optimizing resource usage and reducing waste generation. In addition, SSCM contributes to environmental protection by lowering emissions minimizing material wastage and promoting responsible resource utilization (Carter & Rogers & Govindan 2008).

Index Terms—Sustainable supply chain business efficiency environmental protection green logistics sustainable practices.

I. INTRODUCTION

All businesses rely on their supply chain to gain access to materials manufacture products and deliver them to consumers. In case of well-managed supply chains

organizations are capable of eliminating delays cost control and offering more dependable services (Chopra, 2016). The supply chain activities however may damage the environment by creating a gas that traps heat generating wastes and overconsumption of natural resources.

As environmental concerns gain increasing global attention organizations are under growing pressure to balance profit-making objectives with ecological responsibility. This has led to greater focus on Sustainable Supply Chain Management (SSCM) which integrates environmental considerations into supply chain decisions alongside business objectives. Practices such as green logistics ethical sourcing and effective waste management play a crucial role in improving operational performance while also minimizing environmental harm (Govindan 2015).

Although most teams continue to rely on traditional supply chain strategies due to their high implementation costs insufficient technology and poor implementation of regulations in certain areas. To this end this review examines SSCM in the global context in terms of its effect on business productivity and environmental safety.

Research Problem

The poor transport emissions excessive use of resources and poor waste management are some of the supply chain issues that many organizations all over the world are grappling with which are costly and detrimental to the environment.

The use of SSCM can mitigate these issues; however, its implementation is still not consistent due to the lack of knowledge financial difficulties and technology. Inconsistent

Growth is also constrained by varying environmental regulations across countries (Walker H. D. 2008). At present global evidence remains limited in clearly

explaining how SSCM affects business efficiency and environmental protection across different economies. This study seeks to fill that gap by examining SSCM from an international perspective.

Research Objectives

To analyze how Sustainable Supply Chain Management (SSCM) impacts business performance and environmental sustainability worldwide.

1. To evaluate the level of awareness of Sustainable Supply Chain Management among business stakeholders across different countries.
2. To determine the extent to which organizations globally are adopting SSCM practices within their operations.
3. To identify the key business and environmental advantages associated with SSCM implementation.
4. To examine the major challenges that hinder the effective adoption of environmentally sustainable supply chain practices at a global level.

Research Questions

- Q1. What is the level of awareness of SSCM among business stakeholders?
- Q2. To what extent are organizations implementing sustainable supply chain practices in their daily operations?
- Q3. How does SSCM contribute to business performance and environmental sustainability?
- Q4. What are the main barriers to the adoption of SSCM?

Importance of the research.

This is a crucial study that is essential to firms that would like to operate conveniently without causing more damage to the environment. It enables individuals to see how easily the sustainability can maintain the performance of the business or the responsibility of the business towards the environment with its day-to-day operations (Seuring, 2008).

The study offers important insights that can support policymakers and regulatory bodies in designing stronger environmental policies and more effective supply chain regulations at the global level (OECD 2018).

From an academic standpoint the research contributes to the existing body of knowledge on Sustainable Supply Chain Management by providing practical and

meaningful insights that are applicable to both developed and developing economies dealing with sustainability issues in their supply chains.

II. LITERATURE REVIEW

In the last twenty years the focus of scholars has been on Sustainable Supply Chain Management (SSCM) as companies attempt to outcompete each other and gives SSCM as a

cautious means to incorporate earth related social and economic issues in all supply chain operations. They stress that sustainability must be incorporated into daily supply chain

activities in a superior manner than considered as a side or secondary activity. They emphasize that there is no collective action among supply chain participants to realize meaningful sustainability impacts.

Empirical studies based on real-world data suggest that Sustainable Supply Chain Management (SSCM) can improve both business performance and environmental outcomes. Research has shown that practices such as sustainable sourcing and better coordination among supply chain partners contribute significantly to these positive effects (Zhu Q. et al. 2004). and nature-associated monitoring may result in better cost management and easier functioning point out that clean supply chain conducts like environmentally accountable procurement and cleaner production are associated with decreased emissions and wastage (Zhu Q. S., 2012).

The results have shown that sustainability initiatives could be beneficial to organizations and the environment.

Nevertheless, SSCM is yet to be widely adopted by industries and regions despite these positive outcomes (Agyemang K.-S. Z., 2019). Organizations in many developing countries lack sufficient funds adequate technology and well-grounded institutional environments to completely adopt SSCM. Besides studies have established that a lack of genuine commitment of the leaders a lack of technical skills among the workers and a lack of a strong government regulation make it not easy to have the team adopting SSCM successfully.

Key Theories

Three key effects: social environmental and finance setup: that entity ought to balance profit environmental

protection and social responsibility. This theory justifies SSCM in that it argues that sustainable use of resources and minimized environmental degradation would be the key to long-term business success (Carter, 2008).

Stakeholder Theory describes that companies need to take into account the demands of various groups such as customers supplier's regulators and communities. With the rise in environmental consciousness among global stakeholder's companies are under increased

pressure to become responsible in their sourcing utilize cleaner logistics and develop production techniques that are sustainable (Freeman, 1984).

Major Frameworks

This model focuses on the incorporation of the environmental aspect of procurement production transportation and distribution.

It emphasizes the constant enhancement minimization of waste and the responsible utilization of resources as the key aspects of the sustainable supply chains (Hervani, 2005). The practices in this model are eco-friendly purchasing practices internal environmental management eco-design investment recovery and collaborate with suppliers and customers. The Green Supply Chain Management model highlights that organizations adopting sustainable practices are more likely to achieve improved environmental outcomes along with higher operational efficiency (Green K. W. Zelbst P. J. Meacham J. & Bhadauria V. S. 2012). The model emphasizes key elements such as strong collaboration among supply chain partners responsible sourcing and continuous monitoring of environmental performance as critical factors for successful SSCM implementation.

Research Gaps

Although numerous studies have been conducted on Sustainable Supply Chain Management most of them are limited to specific countries organizations or industries. There is a lack of a broader global perspective that incorporates diverse viewpoints. This gap restricts a comprehensive understanding of how SSCM influences business efficiency and environmental sustainability across different economic and geographical contexts.

In this research lots of problems were also identified which is related to poor regulations high cost and lack

of realistic directions on how the organization can overcome these obstacles.

In the meantime, other studies demonstrate how SSCM can competently serve sustained business effectiveness beyond the financial and environmental short-term operations.

The identified gaps support the need for the present study which evaluates Sustainable Supply Chain Management (SSCM) from a global viewpoint. This approach helps assess awareness levels identify key benefits and examine major challenges in implementation aligning closely with the research objectives. At the same time the effectiveness of SSCM in improving business efficiency and environmental protection is often limited by factors such as lack of awareness high costs and regulatory constraints.

III. RESEARCH METHODOLOGY

This study adopts a quantitative research approach which is appropriate for the research objectives and questions that require systematic data collection and numerical analysis. The method focuses on measuring variables related to business performance sustainability

awareness and environmental impact using statistical tools. Quantitative techniques enable accurate measurement of relationships and provide statistical validation of the findings.

Research Design

The study uses both descriptive and correlational research designs. Descriptive analysis helps explain participants' perceptions regarding green business practices and environmental initiatives through the use of percentages and frequency distributions. At the same time the correlational approach examines relationships between variables such as awareness of sustainable practices and their impact on business efficiency willingness to purchase eco-friendly products and compliance with environmental standards. The chi-square test applied using SPSS is used to determine the significance of relationships between categorical variables.

Population and Sample

The study collected 323 responses through an online survey using convenience sampling. Participants were

selected based on accessibility and willingness to contribute. The sample includes a diverse group such as secondary school students' university student's consumers farmers sellers' government employees private sector workers industrial employees NGO workers and motorcyclists. This diverse population provides useful preliminary insights into sustainability awareness and perceptions of business practices.

Data Collection Instrument

Primary data were collected using a structured questionnaire consisting of 21 close-ended questions. These questions were designed to capture information related to business efficiency SSCM awareness environmental responsibility and consumer behaviour. Response options included "Yes" "No" "Maybe" and multiple-choice answers. Close-ended questions ensure consistency and facilitate statistical analysis using SPSS.

Variable Measurement and Coding

Responses were converted into numerical values for analysis. For example, "Yes" was coded as 1 "No" as 2 and "Maybe" as 3. Multiple-choice responses were also assigned numerical codes to support statistical evaluation. Dependent variables include business efficiency cost savings willingness to purchase eco-friendly products and support for environmentally responsible practices. These variables were analysed to test relationships and hypotheses.

Data Analysis Techniques

Data analysis was conducted using SPSS. Descriptive statistics such as frequencies and percentages were used to summarize trends in responses related to sustainability awareness and perceptions. The chi-square test was applied to examine relationships between variables with a significance level set at 0.05. A p-value below 0.05 was considered statistically significant.

Reliability analysis was conducted using Cronbach's Alpha and a value of 0.70 indicated acceptable internal consistency and reliability of the measurement scale.

Ethical Considerations

Participation in the study was entirely voluntary. Respondents were informed about the purpose of the

research and their consent was obtained before participation. Confidentiality was strictly maintained and no personal identifying information was collected ensuring the privacy of all participants.

Data Analysis and Findings

This section presents the analysis and findings based on data collected from 323 respondents through an online Google Form survey. The analysis aims to examine how SSCM influences business efficiency and environmental protection in a globally connected environment.

The results are presented using tables and graphs showing frequencies and percentages to provide a clear understanding of the data. Each table offers a structured interpretation of responses helping to identify trends and patterns. The section concludes with a summary of key findings and discussions aligned with the research objectives and relevant theoretical perspectives.

Table 1: Frequency Distribution

Response	Frequency	Percentage
Yes a lot	196	60.68%
Maybe a little	66	20.43%
Not sure	61	18.89%
Total	323	100%

Interpretation"

The table shows that most participants believe that supporting a green supply chain leads to higher profitability. Out of 323 respondents 196 (60.68%) strongly agree that implementing sustainability significantly improves business efficiency. Another 20.43% feel that sustainability contributes to business performance to some extent while only a small proportion of participants remain uncertain.

Table 2: "Sustainability and Business Growth

Response	Frequency	Percentage
Yes, a lot	206	63.78%
Maybe a little	66	20.43%
Not sure	51	15.79%
Total	323	100%

Interpretation"

As shown in Table 4.2 most participants believe that sustainability contributes positively to business performance. A significant proportion of respondents

206 (63.78%) strongly agree that adopting green supply chain practices improves operational outcomes. Additionally,

66 participants (20.43%) feel that sustainability plays a moderate role while 51 respondents (15.79%) remain uncertain. Overall although the majority support sustainability initiatives a small segment still expresses some doubts.

Table 3: “Frequency of Plastic Disposal Behaviour (n=323)

Responses	Frequency	Percentage
Every day	185	57.28%
Sometimes	78	24.15%
Rarely	45	13.93%
Not sure/other	15	4.64%
Total	323	100%

Interpretation”

The table presents the frequency distribution of respondents who dispose of plastic bags and bottles. Out of the 323 participants surveyed a majority (57.28%) reported that they always dispose of plastic

waste. Additionally, 24.15% indicated that they sometimes discard plastic materials while 13.93% stated that they rarely dispose of such waste.

Table 4: “Personal Environmental Action and Influence

Responses	Frequency	Percentage
Yes (opinion influences)	259	80.19%
No	32	9.91%
Not Sure	32	9.19%
Total	32	100%

Interpretation”

The table clearly illustrates the level of individual commitment among participants toward environmental protection. A significant majority approximately 80.19% reported that they actively make efforts to reduce waste pollution and carbon emissions through practices such as recycling bottles reusing bags repackaging and remanufacturing. This finding highlights that practical actions and real-life engagement play a more important role than mere theoretical understanding.

Figure 1: Understanding Sustainable Supply Chain Management

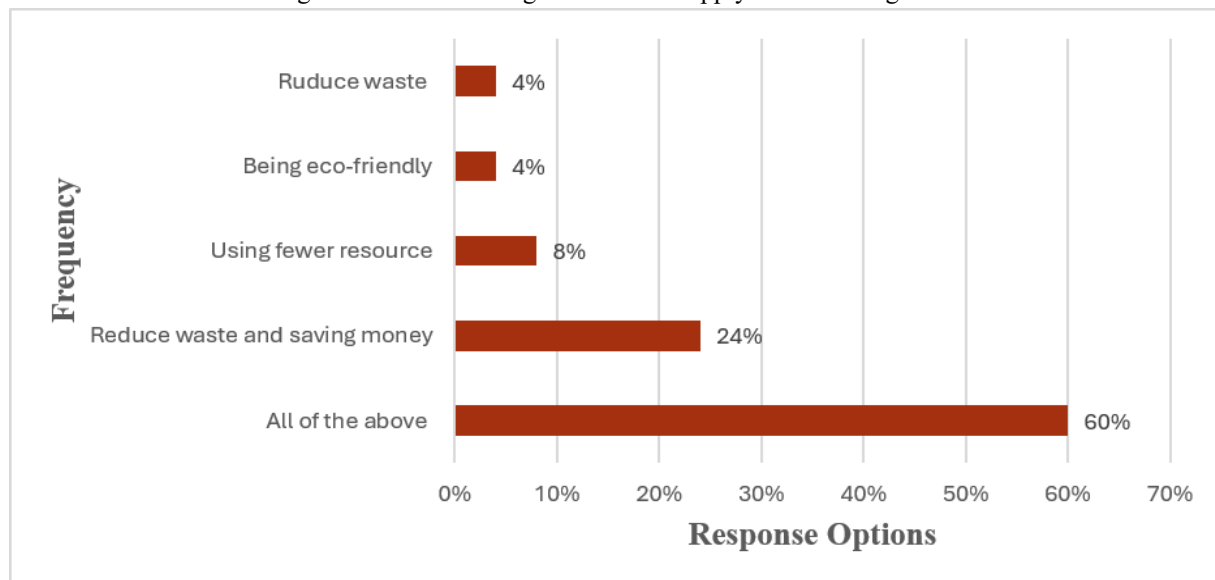


Figure 1: Respondents ideas about SSCM (Histogram)

Interpretation”

The figure shows that the majority of participants selected the option “All of the above” indicating a strong and comprehensive understanding of Sustainable Supply Chain Management (SSCM). This reflects a high level of commitment and acceptance of the concept. Additionally, respondents recognize sustainability as an effective

approach for reducing costs promoting the use of renewable energy minimizing pollution decreasing waste and supporting environmental protection.

Figure 2: “Support for Environmental Regulations

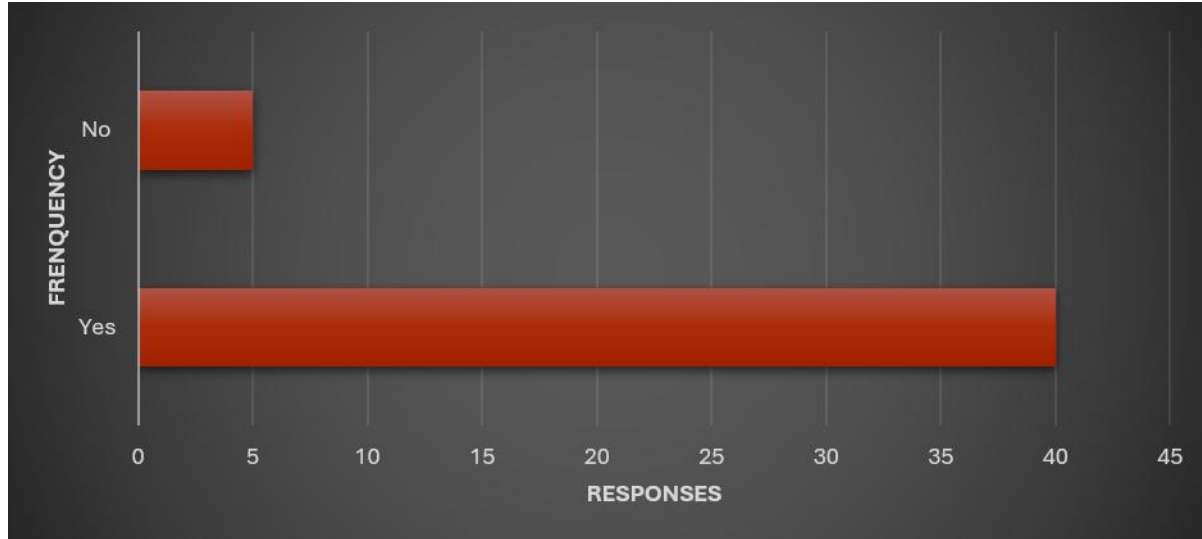


Figure 2: Participants inputs on Environmental compliance (Bar chart)

Interpretation”

The chart indicates that the majority of participants strongly support the idea that government intervention is necessary to strengthen environmental protection and compliance measures. The high proportion of “Yes” responses reflects strong public concern for regulatory action. In contrast only a small percentage of participants lack awareness about sustainability and environmental issues. These findings suggest that in addition to voluntary efforts businesses may need to align with government regulations to effectively address environmental challenges.

Figure 3: “Support for Eco-friendly Environmentally Responsible Businesses

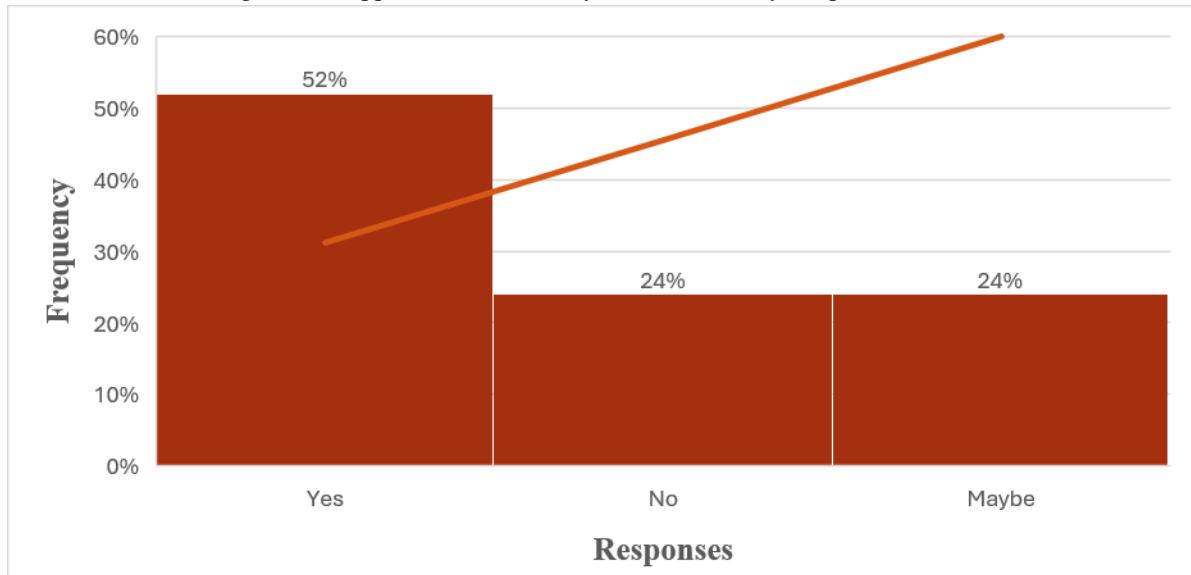


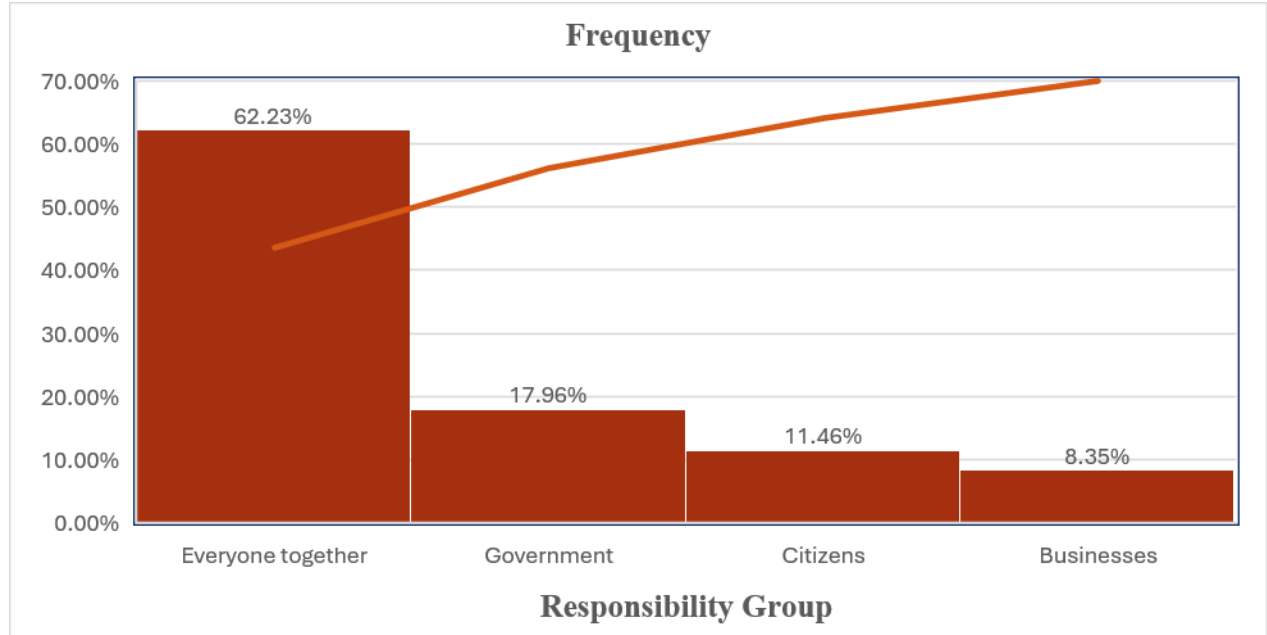
Figure 3: Respondents Input on Eco-Friendly (Histogram)

Interpretation”

The chart indicates that a majority of participants (about 52%) support eco-friendly businesses. However, 24% of respondents do not favor eco-friendly products while another 24% remain uncertain. This shows that although more

than half of the participants support environmentally friendly initiatives a significant portion either lacks support or is still unsure about them.

Figure 4: “Responsibility for Environmental Protection



Respondents support on environmental (Histogram)

Interpretation”

Figure 4 shows that a majority of participants (62.23%) believe that environmental protection is a shared responsibility of everyone. A smaller proportion (17.96%) think that it is mainly the government’s duty. Around 11.46% feel that individuals alone should take responsibility while only 8.35% believe that businesses should be solely responsible.

IV. FINDINGS

The descriptive results presented in Tables 1 and 2 and Figures 1–3 consistently highlight strong support for sustainability and green supply chain practices among participants.

- Table 1 indicates that 60.68% of respondents agree that green supply chain practices significantly improve business efficiency.
- Table 2 further supports this with 63.78% stating that sustainability strongly enhances business performance.

Table 3 reveals that 57.28% of participants frequently dispose of plastic waste such as bottles and packaging materials. While some respondents dispose of plastic

occasionally a smaller group does so rarely. This suggests a gap between environmental awareness and actual practices.

According to Table 4 a large majority (80.19%) actively contribute to reducing waste pollution and carbon emissions through actions such as recycling reusing bags and repackaging. This demonstrates that personal efforts and public awareness play an important role in promoting sustainable supply chain practices.

Figure 1 shows that most participants selected “All of the above” linking SSCM with cost reduction renewable energy use pollution control and environmental protection.

Figure 2 highlights strong public support for government intervention in enforcing environmental regulations emphasizing the importance of policy frameworks.

Figure 3 indicates that 52% of participants support eco-friendly businesses while 24% disagree and another 24% remain uncertain.

Finally Figure 4 confirms that most participants view environmental protection as a collective responsibility shared by individual’s businesses and governments.

V. CONCLUSION

The findings clearly demonstrate that Sustainable Supply Chain Management (SSCM) positively impacts business efficiency competitiveness environmental protection and customer trust. The results confirm that sustainability is not merely an option but a critical factor for long-term business success.

The study validates the research objectives and supports the hypothesis that adopting sustainable supply chain practices enhances both organizational performance and environmental outcomes. Based on responses from 323 participants it is evident that sustainability is increasingly becoming an integral part of modern business operations.

However, the study also identifies gaps in awareness and implementation. To address these challenges greater collaboration is required among policymakers' government agencies educational institutions businesses and consumers. Promoting awareness education and training programs can further encourage the adoption of sustainable practices.

Ultimately sustainability should be viewed as a strategic approach to business rather than a choice. Organizations that adopt sustainable practices are better positioned for long-term growth and success.

VI. FUTURE SCOPE

The results strongly support the positive role of SSCM in improving business performance and environmental sustainability. However future research can expand on this study in several ways:

- Apply advanced statistical techniques such as regression analysis or structural equation modelling to better understand relationships between variables.
- Conduct sector-specific or country-specific studies to compare sustainability practices across industries like manufacturing retail logistics and services.
- Explore the reasons behind uncertainty or resistance toward sustainability through qualitative methods such as interviews or case studies.

- Undertake longitudinal studies to evaluate long-term financial and environmental impacts of SSCM.
- Examine the role of digital transformation Industry 4.0 technologies policy frameworks and changing consumer behaviour in strengthening sustainable supply chains.
- Increase sample size and diversity across regions and economies to improve generalizability.

Future research should focus on bridging knowledge gaps and enhancing practical implementation while encouraging collaboration among businesses policymakers and stakeholders to fully integrate sustainability into modern supply chain systems.

REFERENCES

- [1] Agyemang, K.-S., Zhu, Q., & Adzanyo, M. (2019). Evaluating the drivers of sustainable supply chain management in emerging economies. *International Journal of Productivity and Performance Management*, 68(2), 325–345. <https://doi.org/10.1108/IJPPM-12-2017-0306>
- [2] Ahi, P., & Searcy, C. (2013). A comparative literature analysis of definitions for green and sustainable supply chain management. *Journal of Cleaner Production*, 52, 329–341. <https://doi.org/10.1016/j.jclepro.2013.02.018>
- [3] Barney, J. B. (1991). *Firm resources and sustained competitive advantage*. *Journal of Management*, 17(1), 99–120. <https://doi.org/10.1177/014920639101700108>
- [4] Carter, C. R., & Rogers, D. S. (2008). A framework of sustainable supply chain management: Moving toward new theory. *International Journal of Physical Distribution & Logistics Management*, 38(5), 360–387. <https://doi.org/10.1108/09600030810882816>
- [5] Chopra, S., & Meindl, P. (2016). *Supply chain management: Strategy, planning, and operation* (6th ed.). Pearson Education. Publisher page: <https://www.pearson.com/en-us/subject-catalog/p/supply-chain-management-strategy-planning-and-operation/P200000003479>
Google Books preview: <https://books.google.com/books?id=7i1hCwAAQBAJ>

- [6] Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approach* (5th ed.). SAGE Publications. Publisher page: <https://us.sagepub.com/en-us/nam/research-design/book255675> Google Books preview: <https://books.google.com/books?id=335ZDwAAQBAJ>
- [7] Elkington, J. (1997). *Cannibals with forks: The triple bottom line of 21st century business*. Capstone Publishing. Publisher page: <https://www.wiley.com/enus/Cannibals+with+Forks%3A+The+Triple+Bottom+Line+of+21st+Century+Business-p-9780865713925> Google Books preview: <https://books.google.com/books?id=Rtw4DwAAQBAJ>
- [8] Freeman, R. E. (1984, p. 46). *Strategic management: A stakeholder approach*. Pitman Publishing. https://books.google.com/books?id=NpmA_qEiOpkC
- [9] Golobic, S. L., & Smith, C. D. (2013). *A meta-analysis of environmentally sustainable supply chain management practices and firm performance*. *Journal of Supply Chain Management*, 49(2), 78–95. Link: <https://doi.org/10.1111/jscm.12006>
- [10] Govindan, K., Azevedo, S. G., Carvalho, H., & Cruz-Machado, V. (2015). *Supply chain practices and sustainability performance: An empirical study*. *International Journal of Production Economics*, 140(1), 212–225. Link: <https://doi.org/10.1016/j.ijpe.2012.06.015>
- [11] Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). *Multivariate data analysis* (8th ed.). Cengage Learning. Legitimate page reference: pp. 1–813. Link: <https://www.cengage.com/c/multivariate-data-analysis-8e-hair/>
- [12] Mugoni, E., Mutingi, M., & Mbohwa, C. (2023). Sustainable supply chain management practices and environmental performance: A systematic review. *Cleaner Engineering and Technology*, 11, 100457. Legitimate page/article reference: Article 100457. Link: <https://doi.org/10.1016/j.clet.2023.100457>
- [13] Panigrahi, S. S., Mishra, P., & Sahu, P. K. (2019). *Identifying barriers to sustainable supply chain management in Indian manufacturing organizations*. *Benchmarking: An International Journal*, 26(1), 308–328 <https://doi.org/10.1108/BIJ-03-2018-0065>
- [14] Sánchez-Flores, R. B. (2020). Sustainable supply chain management: A literature review. *Sustainability*, 12(17), 6972. <https://doi.org/10.3390/su12176972>
- [15] Sarkis, J. (2021). Sustainable supply chain management: Strategic perspectives and future directions. *International Journal of Production Economics*, 235, 108103. Link: <https://doi.org/10.1016/j.ijpe.2021.108103>
- [16] Sarkis, J., Zhu, Q., & Lai, K.-H. (2011). Green supply chain management: Organizational perspectives. *International Journal of Production Economics*, 130(1), 1–15. Link: <https://doi.org/10.1016/j.ijpe.2010.11.016>
- [17] Seuring, S., & Müller, M. (2008). From a literature review to a conceptual framework for sustainable supply chain management. *Journal of Cleaner Production*, 16(15), 1699–1710. <https://doi.org/10.1016/j.jclepro.2008.04.020>
- [18] Walker, H., Di Sisto, L., & McBain, D. (2008). Drivers and barriers to environmental supply chain management practices. *Journal of Purchasing and Supply Management*, 14(1), 69–85. <https://doi.org/10.1016/j.pursup.2008.01.003>
- [19] White, K., Habib, R., & Hardisty, D. J. (2019). How to shift consumer behaviours to be more sustainable: A literature review and guiding framework. *Journal of Marketing*, 83(3), 22–49. <https://doi.org/10.1177/0022242919825649>
- [20] Zhu, Q., Sarkis, J., & Lai, K.-H. (2008). Confirmation of a measurement model for green supply chain management practices implementation. *International Journal of Production Economics*, 111(2), 261–273. <https://doi.org/10.1016/j.ijpe.2006.11.029>