

Green Supply Chain Management as a Mediator Between Environmental Sustainability and Sustainable Development Among SMES in Asaba, Delta State

IGWENAZOR Osita Nchekwube 

Department of Marketing, Federal Polytechnic Oko 
igwenazor.nchekwube@federalpolyoko.edu.ng

OBIESIE Micheal Chuks 

Department of Marketing, Federal Polytechnic Oko 
mikechukssnr@yahoo.com

Abstract

As the world becomes more aware of and pays more attention to social and environmental issues, such as climate change, pollution and various health problems caused by pollution, sustainable development has emerged as a universally recognized and critical concept across countries. Green supply chain management as a green comprehensive environmental management tool has also received special attention from the public. The objective of this paper is to empirically investigate the mediating effect of green supply chain management on the relationship between environmental sustainability and sustainable development. Questionnaire was used to collect data from 250 SMEs in Asaba, Delta State, while PROCESS Macro version 3.4 was used to analyze the data with the aid of SPSS version 23. The results of the hypothesis testing showed that green supply chain management mediates the relationship between environmental sustainability and sustainable development. Also, environmental sustainability has a positive influence on sustainable development. The study recommends that the adoption of green supply chain management will ensure sustainable development.

Keywords: Green, Supply, Process, Environmental, Sustainability

Introduction

Due to the deterioration of the environment and limited resources, the consideration of sustainable development is a top priority for human beings, especially after the sustainable development goals introduced by the United Nations (Zijuan, Thoo, Yang & Qiu, 2024). Accordingly, sustainable development has been a concern in the world. Sustainable development which refers to current and future development achieved without infringing on the possibility development rights of future generations (Zijuan et al., 2024). It involves development that meets the needs of the present without compromising the ability of future generations to meet their own needs (Susana, Maria & Cruz, 2023). It is considered a global agenda for change that calls for concerted efforts towards building an inclusive, sustainable and resilient future for people and the planet. The concept of sustainable development is rooted in three interconnected main pillars – economy, society and environmental sustainability.

Environmental sustainability is the responsible management of natural resources to meet present human needs without compromising the ability of future generations to meet theirs. It focuses on preserving ecosystems, minimizing pollution, and conserving finite resources like water, clean air and energy (Zhu, Sarkis & Geng, 2025). Achieving environmental sustainability requires a balance across individual actions, corporate responsibility and global policies.

The pressing challenges posed by climate change, resource depletion and environmental degradation have heightened the needs for businesses to adopt sustainable practices that minimize negative impacts on the environment while enhancing economic and social values (Sumit, Rachita & Priyanshi, 2025). As a response, companies are increasingly integrating sustainability into their

core operations with a significant focus on supply chain management. According to Shekarian, Ijadi, Zare and Majava (2022), the supply chain encompasses a broad range of activities, including procurement, production, transportation and distribution, all of which have substantial environmental footprints. Thus, the adoption of green supply chain management practices has become a strategic priority for organizations aiming to achieve sustainability goals and improve their overall performance. Researchers have asserted a positive relationship between environmental sustainability and sustainable development, but the mediating effect of green supply chain management on the relationship between environmental sustainability and sustainable development has not been extensively looked at by researchers. Thus, the aim of this study is to empirically investigate the mediating effect of green supply chain management on the relationship between environmental sustainability and sustainable development.

Literature Review

Sustainable Development

With the increasing global awareness of environmental issues, such as rapid depletion of resources, environmental pollution, global warming and decreasing biodiversity, the sustainability has been widely used in the academic field and has brought terms of sustainability into the mainstream of academic discussion, which helps to gain a competitive advantage in the business world (Khan, Tao, Ahmad, Shafique & Nawez, 2022; Xu, Yu, Zhang & Zhang, 2023).

Sustainable development has been defined in many ways; Rahman, Zahid, Ullah & Al-Faryan (2023) define sustainable development as development that meets the needs of the present without compromising the ability of future generation to meet their own needs. It contains within it two key concepts; the concept of needs, in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs (Rahmad, Zahid, Ullah & Al-Faryan, 2023).

Rizki, Murwaningsari & Sudibyo (2022) define sustainable development as meeting people's need without destroying the environment. It can be viewed as a pattern of resources that aims to meet human needs while preserving the environment so that these needs can be met not only in the present, but in the indefinite future. According to Singh and Jaswal (2020), the field of sustainable development can be conceptually broken into three constituent parts: environmental sustainability, economic sustainability and socio-political sustainability. Sustainable development means resolving the conflict between the various competing goals, and involves the simultaneous pursuit of economic prosperity, environmental quality and social equity famously known as three dimensions of sustainability.

Sustainable development has continued to evolve as that of protecting the world's resources while its true agendum is to control the world's resources. Realizing its importance these days, one of the key business strategies, ensuring sustainable development has taken the shape of green supply chain management

Environmental Sustainability

Sustainability in the context of the environment refers to the practice of maintaining ecological balance by avoiding the depletion of natural resources. It involves meeting the needs of the present without compromising the ability of future generations to meet their own needs (Rajneesh, 2024). Environmental sustainability encompasses the responsible management of resources to meet present needs without compromising future generations' ability to meet theirs.

Zinn & Goldsby (2023) opine that the key aspects of environmental sustainability include (i) Resource Management: Efficient and responsible management of natural resources, including water, mineral and forests, to prevent over-exploitation and degradation. (ii) Energy Use: Promoting renewable energy source (like solar, wind and hydroelectric power) and improving energy efficiency to reduce dependence on fossil fuels and minimize greenhouse gas emissions. (iii) Waste Reduction: minimizing waste generation through practices like recycling, composting, and reducing consumption. Proper waste management practices to reduce pollution and environmental impact. (iv) Biodiversity Conservation: Protecting ecosystems and habits to preserve the diversity of plant and animal species, which are crucial for ecological balance and resilience. (v) Sustainable Agriculture: Implementing farm practices that protect the environment, such as crop rotation, organic farming, and integrated pest management. (vi) Pollution Control: Reducing air, water and soil pollution through regulations, technological innovations and best practices. (vii) Climate Change Mitigation and Adoption: Efforts to reduce greenhouse gas emissions and implement strategies to adopt the impacts of climate change. (viii) Sustainable Urban Development: Designing and managing cities to be environmentally friendly, including green building practices, efficient public transportation, and green spaces. Sustainability also encompasses social and economic dimensions, recognizing that a healthy environment is foundational to human wellbeing and economic prosperity.

Veckalne & Tambovceva (2022) assert that sustainability in the environment involves meeting current needs without compromising the ability of future generation. This holistic approach encompasses the responsible management of natural resources, minimizing waste and reducing environmental pollution. It aims to balance ecological health with economic growth and social well-being. Key aspects include the adoption of renewable energy sources like solar and wind to reduce dependence on fossil fuels, sustainable agricultural practices to ensure food security and soil health and efficient waste management to minimize landfill use and promote recycling. Furthermore, Xie (2023) suggests that biodiversity conservation is crucial, preserving ecosystems and the services they provide, such as clean air and water, pollution and climate regulation. Additionally, urban sustainability efforts focus on creating green, livable cities through smart planning and green infrastructure.

Green Supply Chain Management

In recent years, the global community has witnessed an increasing awareness of environmental sustainability, driven by the urgent need to address climate change, resource depletion and ecological degradation (Carter, Hatton, Wu & Chen, 2022; Wagas, Dong, Ahmad, Zhu, & Nadeem, 2023). As a result, Green Supply Chain Management (GSCM) has emerged as a crucial strategy for integrating sustainable practices into business operations (Touboulis & Walker, 2024). GSCM refers to including environmental considerations within the entire supply chain process, encompassing procurement, production, logistics and waste management (Dey, LaGuardia & Srinivasan, 2021; Hussein, Eltoukhy, Karam, Shaban & Zayed, 2021; Silva, Reno, Sevegnani, & Truzzi, 2023). This approach aims to reduce environmental impacts, enhance resource efficiency and promote sustainable consumption and production patterns. As organizations seek to align their operations with global sustainability goals, GSCM has become integral to achieving broader environmental and economic objective (Ganesh & Ashlin, 2021).

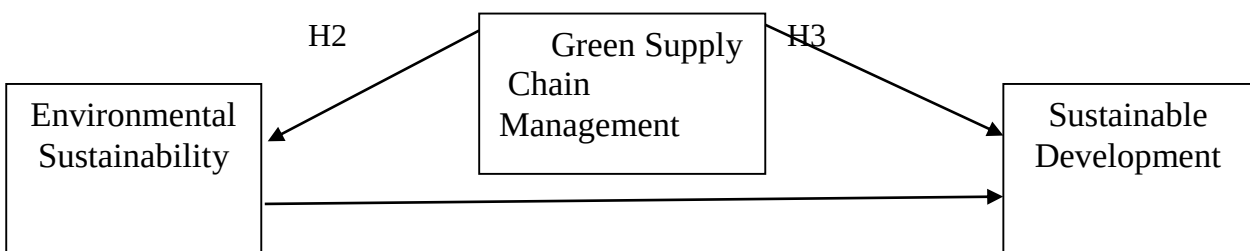
Green supply chains have increasingly recognized as a vital mechanism in contributing to sustainable development, particularly in addressing the challenges posed by climate change and the overexploitation of natural resources (Ziabina & Dzwigol-Barosz, 2022). For instance, green

procurement, waste minimization, resource recycling and eco-friendly product designs have proven to enhance environmental sustainability while offering cost-efficiency and improving a company's competitive edge (Ziin & Goldsby, 2023). Nevertheless, the effectiveness of GSCM practices in driving the achievement sustainable development has not been thoroughly quantifies or explore across various sectors, regions and industries (Veckalne & Dzwigol-Barosz, 2022). While individual studies have assessed the impact of GSCM practices on environmental outcomes, there is still a significant gap in understanding the cumulative and cross-sectoral impacts of these practices on the global sustainability agenda (Rozmiarek, Nowacki, Malchrowicz-Mosko & Dacko-Pikiewicz, 2022). Thus, this research aims to empirically investigate the mediating effect of green supply chain management on the relationship between environmental sustainability and sustainable development.

Conceptual Framework

This research aims to investigate the mediating effect of green supply chain management on the relationship between environmental sustainability and sustainable development. To this end, the study proposes a framework to test the mediating effect of green supply chain management on the links among environmental sustainability and sustainable development.

H4



Methodology

This study was conducted in Asaba, Delta State; and the data were collected with structured questionnaire. The population of the study comprises of registered SMEs in Asaba Delta State. The sample of 250 respondents was determined using mean or average value method. The sampling procedure adopted was quota sampling method and this sampling method was chosen to allow for the selection of respondents from the different gender, educational background and age in the sample. Out of 250 copies of questionnaire distributed, 200 copies were correctly filled, returned and certified usable. This represents a response rate of 93.3 percent and it is considered for a study of this nature. The reliability of the instrument was checked via Cronbach's Alpha reliability statistics. Table 1 below shows that a value of 0.73 was obtained for Cronbach's Alp ha, thus, yielding a high internal reliability.

Table 1: Cronbach's Alpha Reliability Statistics ('Output)

Reliability Statistics		
Cronbach's Alpha ^a	Cronbach's Alpha Based on Standardized Items ^a	N of Items
.730	.730	12

Result of Hypotheses Testing

Hypotheses were tested via the macro PROCESS with the aid of SPSS version 23. The rule of thumb for determining whether to accept or reject the null hypothesis; for direct effect, if the path coefficient is statistically different from zero and p-value less than 0.05, the null hypothesis will be rejected. For indirect effects, if the null of zero falls between the lower and upper bound of the 95% confidence interval, then the inference is that the indirect effect is zero, then, the null hypothesis will be accepted, but if zero falls outside the confidence interval, then the indirect effect is inferred to be non-zero, then the null hypothesis will be rejected. Table 2, shows the result of direct effect hypothesis testing for environmental sustainability and sustainable development, the path coefficient is .2480, standard error of .0245 and p-value of .0000. Thus, the hypothesis was supported. The result of hypothesis testing for direct effect of green supply chain management and environmental sustainability was shown in table 3. The path coefficient is .2865, standard error .0243 and p-value .0000. Hence, our hypothesis was supported. Table 4 shows result of hypothesis testing for the direct effect of green supply chain management and sustainable development, the path coefficient is .3055, standard error is .0197 and p-value is .0000. Table 5 shows the result of the indirect effect of environmental sustainability on sustainable development via green supply chain management. This has the point estimate effect of .6410, BootSE of .0118, BottLLCI of .0487 and BootULCI of .0944. Thus, the hypothesis was supported, showing that 64.1% of effects of environmental sustainability on sustainable development are accounted by green supply chain management.

Table 2: Relationship between environmental sustainability and sustainable development
OUTCOME VARIABLE:

ENVSUS

Model

	Coeff	Se	t	P	LLCI	ULCI
Constant	4.6601	.0510	91.4174	.0000	4.5601	4.7602
SUSDEV	.2480	.0245	10.1025	.0000	.2961	.1998

Table 3: Relationship between Green Supply Chain Management and Environmental Sustainability.
OUTCOME VARIABLE:

EVISUS

Model

	Coeff	Se	T	P	LLCI	ULCI
Constant	5.4950	.1199	45.8265	.0000	5.2597	5.7303
GRSUMG	.2865	.0243	11.7758	.0000	.3342	.2367

Table 4: Relationship between Green Supply Chain Management and Sustainable Development
OUTCOME VARIABLE:

SUSDEV Model

	Coeff	Se	T	P	LLCI	ULCI
Constant	5.4950	.1199	45.8265	.0000	5.2597	5.7303
GRSUMG	.3055	.0197	.2764	.0000	.0442	.0333

Table 5: Indirect Effect of Environmental Sustainability on Sustainable Development.

Indirect effect(s) of X on Y:

	Effect	BootSE	BootLLCI	BootULCI
GRSUMG	.6410	.0118	.0487	.0944

Discussion and Implications

The aim of this study was to assess the mediating effect of green supply chain management on the relationship between environmental sustainability and sustainable development in Nigeria. It was based on a sample of 250 respondents, out of which 200 responded. The study aims to find out if the IV (environmental sustainability) influences sustainable development and how. That is whether green supply chain management mediates the relationship between environmental sustainability and sustainable development. The data collected were analyzed using PROCESS Macro with the aid of SPSS version 23. The analyses show that green supply chain management mediates the relationship between environmental sustainability and sustainable development. This result depicts that some percentages of influence of environmental sustainability on sustainable development can be attributed to green supply chain management. There are three ways to test mediation: the causal method, the iterative method and the bootstrapping method. Our analyses based on 5000 bootstrap resample, show that the IV has statistically significant indirect effect on the DV. The indirect effect size for the IV on DV is .6410, indicating that green supply chain management fully mediates the relationship between environmental sustainability and sustainable development.

Also, the study demonstrates that environmental sustainability has a positive and significant influence on sustainable development. This means that greater efforts to ensure environmental sustainability will increase the achievement of sustainable development. The results also reveal that green supply chain management has a positive and significant influence on environmental sustainability. This means that the adoption of green supply chain management by the companies will help a lot in the achievement of sustainable development; this implies that by understanding and implementation of green supply chain management, environmental sustainability will be a great success.

The study has theoretical and managerial implications. Theoretically, the study establishes a critical linkage between environmental sustainability and sustainable development by adding green supply chain management as a key mediator. This enables both companies and researchers to predict the outcome of green supply chain management initiatives as it mediates the relationship between environmental sustainability and sustainable development.

Conclusions and Recommendation

The main aim of this research was to empirically investigate the mediating effect of green supply chain management on the relationship between environmental sustainability and sustainable development. Based on the findings of this research, the following were the conclusions:

1. The study concludes that green supply chain management mediates the relationship between environmental sustainability and sustainable development.
2. From the results of the study, we conclude that environmental sustainability has a positive and significant influence on sustainable development.
3. Also, the results of the study revealed that green supply chain management has positive and significant influence on sustainable development.
4. Based on the research results, we conclude that green supply chain management has a positive and significant relationship on sustainable development.

We recommend:

1. Companies should adopt and implement green supply chain management since it is a viable tool for environmental sustainability.
2. Future research can develop this research by using different methods in examining the mediating effect of green supply chain management on the relationship between environmental sustainability and sustainable development. For example, future research can use a qualitative method with a different type of collecting data such as depth interview, so that the information obtained can be more varied than questionnaire for which the answers are available.

References

- Carter, C.R, Hatton, M.R, Wu, C. & Chen, X. (2022). Sustainable supply chain management: Continuing evolution and future directions. *International Journal of Physical Distribution and Logistics Management*, 50, 122-146.
- Dey, A., LaGuardia, P., & Srinivasan, M. (2021). Building sustainability in logistics operations: A research agenda. *Managing Research Review*, 34, 1237-1259.
- Ganesh, K, R & Ashlin, N. J. (2021). A conceptual framework for reverse logistics operations. *International Journal of Supply Chain Management*, 9, 430-436.
- Hussein, M., Eltokhy, A.E, Karam, A., Shaban, I.A & Zayed, T. (2021). Modelling in off-site construction supply chain management: A review and future directions for sustainable modular integrated construction. *Journal of Cleaner Production*, 310, 127-140.
- Khan, S. A. R., Yu, Z. & Farooq, K. (2022). Green capability, green purchasing and triple bottom line performance: Leading toward environmental sustainability. *Business Strategy the Environment*, 32(4). 2022-2034.
- Rahman. H.U., Zahid, M., Ullah, M & Al-Faryan, M.A. (2023). Green supply chain management and firm sustainable performance: The awareness of China Pakistan Economic Corridor. *Journal of Cleaner Production*, 41(4), 137-153.
- Rajneesh, K.M. (2024). Environmental Sustainability: Challenges and opportunities. *International Journal of Social Impact*, 9 (3), 24-46.
- Rizki, A.F., Murwaningsari, E. & Sudibyo, Y.A. (2022). Does green supply chain management improve sustainable performance? *International Journal of Energy Economics and Policy*, 12(6), 32-50.
- Rozmiarek, M., nowacki, K. Malchrowicz-Mosko, E., & Dacko-Pikiewicz, Z (2022). Eco-initiatives in municipal cultural institutions as examples of activities for sustainable development: A case study of Poznan. *Sustainability*, 14, 682-690.

- Shekarian, E., Ijadi, B., Zare, A. & Majava, J. (2022). Sustainable supply chain management: A comprehensive systematic review of industrial practices. *Sustainability*, 14 (78-92).
- Silva, D.A.L, Reno, G.W.S, Sevegnani, G, Sevegnani, T.B & Truzzi, O.M.S (2023). Comparison of disposable and returnable packaging: A case study of reverse logistics in Brazil. *Journal of Cleaner Production*, 47, 377-387.
- Sumit, R., Rachita, K.B., Priyanshi, S. (2025). Sustainability and green supply chain practices: An in-depth analysis. *Academy of Marketing Studies Journal*, 29(4), 1-23.
- Susana, D., Maria, R. C. & Cruz-Machado, V. (2023). Green supply chain practices: Toward a sustainable industry development. *Journal of Cleaner Production*, 41 (5), 24-40.
- Tauboulic, A. & Walker, H. (2024). Theories in sustainable supply chain management: A structured literature review. *International Journal of Physical Distribution and Management*, 45, 16-42.
- Veckalne, R. & Dzwigol-Barose, S. (2022). Role of green innovation and supply chain management in driving sustainable corporate performance. *Journal of cleaner production*, 42(4) 37-54.
- Veckalne, R. & Tambovceva, T. (2022). The role of digital transformation in education in promoting sustainable development. *Virtual Economy*, 5, 65-86.
- Waqas, M, Dong, Q.L, Ahmad, N, Zhu, Y & Nadeem, M. (2023). Critical barriers to implementation of reverse logistics in the manufacturing industry: A case study of a developing country. *Sustainability*, 10, 42-52.
- Xie, H.L. (2023). Evidence-based green human resource management: A systematic literature review. *Sustainability*, 15(14) 101-130.
- Xu, J., Yu, Y., Zhang, M. & Zhang, J.Z. (2023). Impacts of digital transformation on rco-innovation and sustainable performance: Evidence from Chinese manufacturing companies. *Journal of Cleaner Production*, 39(3), 136-150.
- Ziabina, Y. & Dzwigol-Barosz, M.A. (2022). A country's green brand and the social responsibility of business. *Virtual Economy*, 5, 31-49.
- Zijuan, Z., Thoo, A.C., Yang, K. & Qiu. Q. (2024). Green supply chain management practices and sustainability performance: A review and future perspectives. *International Journal of Academic Research in Business and Social Sciences*.
- Zinn, V.N. & Goldsby, M.G. (2023). Green supply chain practices and sustainable performance: moderating role of total quality management practices in electronic industry of Thailand. *International Journal of Supply Chain Management*, 8(3), 33-46.
- Zhu, Q., Sarkis, J. & Geng, Y. (2025). Green supply chain management in China: Pressures practices and performance. *International Journal of Operations and Production Management*, 25(5) 449-468.