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### Rethinking Green Supply Chain Management Practices Impact on Company Performance A Close-Up Insight

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**Published in:**  
Sustainability (Switzerland)

**Published:** 01/10/2022

**Document Version:**  
Final Published version, also known as Publisher's PDF, Publisher's Final version or Version of Record

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**Publication record in CityU Scholars:**  
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**Published version (DOI):**  
[10.3390/su142013197](https://doi.org/10.3390/su142013197)

**Publication details:**  
Ojo, L. D., Adeniyi, O., Ogundimu, O. E., & Alaba, O. O. (2022). Rethinking Green Supply Chain Management Practices Impact on Company Performance: A Close-Up Insight. *Sustainability (Switzerland)*, 14(20), Article 13197. <https://doi.org/10.3390/su142013197>

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## Article

# Rethinking Green Supply Chain Management Practices Impact on Company Performance: A Close-Up Insight

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**Abstract:** Manufacturing organisations have contributed to a poor living environment via unsustainable practices in the production process and the entire service delivery operation. More importantly, the health performance of manufacturing employees may also be affected by unsustainable production practices in the industry. Therefore, the green supply chain management (GSCM) practice has become a topical issue in recent decades due to its significant impact on the ecosystem at large. Via green practices, various performances have been achieved in organisations; meanwhile, the relationships between the practices and performance metrics in most developing countries are unclear, although there have been supposed general submissions. In addition, the study of relationships in a leading business conglomerate in developing nations is rare. Therefore, this paper investigated relationships between GSCM practices and performance metrics in a leading manufacturing organisation in Africa by using a close-up study approach with data collected from 154 respondents. The data were analysed using multiple methods such as factor analysis to consolidate the measured variables; correlation, multiple regression analysis with stepwise estimation, and structural equation modelling (SEM) were used to examine the relationships between GSCM practices and performance. The results of these analyses revealed that environmental performance is significantly predicted by the measure of the organisation's commitment to GSCM vision, while financial performance is significantly impacted by eco-centric consumption and education. This study concludes that inhouse-drafted strategies based on the insight from the study will facilitate the optimisation of GSCM practices.

**Keywords:** close-up study; green supply chain management practices; performance



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**Citation:** Ojo, L.D.; Adeniyi, O.; Ogundimu, O.E.; Alaba, O.O. Rethinking Green Supply Chain Management Practices Impact on Company Performance: A Close-Up Insight. *Sustainability* **2022**, *14*, 13197. <https://doi.org/10.3390/su142013197>

Academic Editor: Alessio Ishizaka

Received: 18 August 2022

Accepted: 12 October 2022

Published: 14 October 2022

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## 1. Introduction

Since the campaign for green practices in the 1970s, developed countries had embraced the initiative [1,2]. The quick adoption was due to the ecological consequences of various production organisations' pollutants and other sectors [3]. The awareness of the benefits of green supply chain management (GSCM) to society also made people crave sustainable products and processes [4]. Many countries have implemented environmental legislation to encourage "green" practices and the usage of environmentally friendly products [5,6]. Meanwhile, these policies have not fully curbed the environmental damages caused by various organisations [7], especially in developing nations. Surprisingly, some ameliorative measures employed by developed nations are injurious to the masses [8], thus, generating a barrage of debates between scholars and practitioners [9].

Previous studies revealed the challenges preventing manufacturing organisations in developing nations from "going green" [10,11]. It is worthy to note that some companies in developing countries joined the league of green-minded organisations [12,13]. For example, a major manufacturing conglomerate in Nigeria and Africa at large, i.e., the Dangote

Group of companies, was recently recognised for its commitment to “green” practices [14]. This manufacturing conglomerate has seven sustainability pillars, namely operational, financial, economic, environmental, social, institutional, and cultural, in its pursuit of green practices [15]. The sustainable insight of the establishment is crucial to lessen the environmental menace that contributed to a poor living ecosystem [16]. It is important to note that the quality of life of manufacturing employees may be endangered if sustainable practices are not embraced. Sadly, research enquiries on GSCM practices and their impact on various outcome performances are limited in the Nigerian manufacturing industry.

In the Nigerian manufacturing sector, previous research indicated that training employees is a key driver for adopting green initiatives [17]. Unfortunately, the study of Quadri [18] conducted in Nigeria was not explicit on whether the respondents had prior training or knowledge of GSCM practices fostered by the establishment, apart from being full-time employees. On the part of Ogunlela [19], 41 respondents were purposely selected to investigate GSCM practices in the manufacturing industry and mainly used descriptive statistics in the study. Perhaps the limited sample size sets a limitation for not undertaking robust inferential statistics. In addition, the relationship between GSCM practices and performance metrics was not considered in the study. The study of Umar et al. [20] considered green performance as the output variable; meanwhile, the description in the measurement variable connotes a different meaning. Thus, there is a need to advance the frontier of knowledge in GSCM practices in the Nigerian manufacturing industry. To be precise, a relationship between the GSCM practices and environmental and financial performance metrics in a leading manufacturing conglomerate with in-house training of GSCM and pro-environmental behaviour in Nigeria is rare. Therefore, the findings of this study can assist other production organisations to learn, engage in green production, and understand GSCM practices and their relationship with organisation performance. In addition, this study can shed light on environmental problems triggered by major manufacturing enterprises in the Nigerian manufacturing industry.

## 2. Literature Review

### 2.1. Overview of Green Supply Chain Management

The GSCM idea emerged around the 1970s, following the United Nations’ first summit on the Human Environment, while the practice dates from the 1990s, and academic discussions began a decade later [21,22]. The practice of GSCM in industrialized nations arose as a result of the health effects of many industrial toxins [23]. Among scholars and practitioners, the GSCM movement culminated in mitigation methods, namely, the pollution halo hypothesis, pollution haven hypothesis, and relocating hazardous technologies and businesses to developing countries [8]. In sum, the embracement of GSCM practices mostly contributed to environmental performance in developed nations [24,25]; meanwhile, developing nations have not fully embraced the concept. Surprisingly, there is no universal definition for GSCM; however, common themes such as “green procurement”, “environmental management”, and “sustainability” are often present in common definitions [26,27]. GSCM involves the incorporation of sustainable practices into several arms of manufacturing firms, such as design, inventory control, sales, and product end-of-life management [28,29]. On the part of Sarkis et al. [30], GSCM implies environmental consciousness in organisational practices. Thus, GSCM connotes pro-environmental principles in the lifecycle of a product for environmental performance, risk control, etc. [31].

### 2.2. Green Supply Chain Management Practices

GSCM practices and the associated dimensions for its measurement are extensive [32]. Some studies used four dimensions [33], five dimensions [34,35], six dimensions [36], eight dimensions [37], and ten or more dimensions in investigating GSCM procedures and the resultant impacts on various performance metrics namely financial, environmental, organisational, and social. For example, the study of Al-Sheyadi et al. [33] considered four dimensions of GSCM practices, namely, source-reduction, eco-design, environmental

management system, and external environmental management, which are different from the four factors of inbound operations, production operations, outbound operations, and reverse logistics explicated by Deng and Jiang [38]. Interestingly, the two studies investigated GSCM practices in the manufacturing industry with different factors from the pool of GSCM dimensions. In fact, past research studies with the same choice of GSCM dimensions are rare, except for eco-design and green procurement, which are commonly adopted. For research investigations, the determinants of the choice of dimensions could be linked to the perceived pollution contribution of manufacturing firms, the commitment of the management to sustainable production practices, and staff training, amongst other factors [39]. According to Deng and Jiang [38], cost implications are major determinants of undertaking any GSCM practice in most firms, and this could also be a contributory factor for the selection of dimensions for empirical investigations. Hence, large-sized organisations may easily employ the best GSCM practices to enhance environmentally compliant processes, to enjoy other associated benefits, and to achieve overall environmental performance.

The adoption of GSCM practices in an establishment has been attributed to the awareness and knowledge of top management officials in organisations. The pro-environmental knowledge possessed by senior management culminates in formulating a firm-based environmental vision and mission voyage [40,41]. Environmental visions assist companies in devising green and innovative means in the production process [42]. A production organisation may be practising a fractional part of GSCM such as “green procurement” unknowingly with advancements in technology. For a manufacturing firm to judiciously utilise the benefits of GSCM and measure its outcomes appropriately, they must be aware of what eco-practices entail and the accrued benefits. In some situations, creative methods are devised by the company’s employees when the organisation practices inclusive management [43], thus creating cross-functional cooperations for environmental improvements among employees and other associates. Therefore, in a situation in which every employee and management officials possessed environmental consciousness, the inability to manage standard environmental control policies drastically reduced in the organisation [44].

In reality, changing basic features such as the organisation’s strategic mission, major technological setups, organisational structure, logistics, and operational policy is a difficult feat [45]. Thus, the commitment from top management is very crucial to aid this paradigm shift [46,47]. In addition, to sustain the paradigm shift from traditional patterns to “green” approaches, creating environmental awareness via training, education, and practicum among subordinates is essential [48,49]. On the other hand, the financial commitment and time involved in implementing the change may discourage top management from embracing the new supply chain practice [50], especially for small- and medium-sized enterprises in developing countries.

The daily business practice involves substantial interaction with suppliers since manufacturing establishments need raw materials to produce final products. Supplier integration in the pursuit of sustainable production is vital for realizing green goals for the manufacturer and their team of suppliers. However, past studies revealed that most organisations have difficulties in managing their suppliers [50]. For a production organisation to utilise and accomplish sustainable concepts, suppliers must also possess the same “green” views. To achieve green concept goals with respect to manufacturing organisations, design directives with green principles can be suggested for suppliers [51]. Collaborative approaches such as joint research, training, and environmental information sharing or less-collaborative methods such as demanding the supplier to adopt ISO14001 may be employed [52]. By using directives and collaborative or less-collaborative approaches, the suppliers can become acquainted with the sustainable vision and thereby aid the sustainable performance of both parties, i.e., the suppliers and producers [53]. The understanding and dedication between the establishments (i.e., the production organisations and suppliers) may also assist in attaining mutual green goals that lead to environmental performance. The internal environmental management system within the manufacturing organisation may assist in environmental knowledge sharing between mid-level cadre and junior employees. On the

other hand, the cooperation within an organisation or amidst employees in an establishment and other firms' workers that assist green practices may be enhanced because of the awareness and knowledge of top management staff and their subordinates [54]. Therefore, all staff of the manufacturing establishment may be a mouthpiece in advocating GSCM practices to suppliers via the instituted internal environmental management system.

The implementation of GSCM is mainly directed to the efforts of the government [55]. Interestingly, Ososanmi et al. [17] deduced that GSCM is a collective effort of the community, industries, and government. However, the government initiative to enact environmental laws and guidelines can motivate industry actors to embrace sustainable initiatives [56]. It is worthy to note that the non-compliance of industries to international environmental regulations may hinder foreign patronage [36,57]. For example, non-compliance to environmental policies of foreign nations caused China to lose about USD 20b within the span of two years [58]. This economic damage amongst others has made China and some other developing countries join the movement for environmental sustainability [36,59]. Thus, legislation and regulation on sustainable practices with enforcement strategies can compel manufacturing firms to undertake green processes and green procurement in daily service deliveries [32]. The large-sized production organisations can also measure their environmental compliance and participation via regular sustainability audits to identify areas for future improvements [33]. The environmental audit may channel the course of cooperative relationships with other manufacturing establishments with the same sustainable vision.

Interestingly, environmental management system implementation also reveals varying opportunities, namely, the improvement of organisational image, promoting pro-environmental behaviour among employees, etc. [45,60]. By implementing an environmental management system, some developing countries have also stepped up their campaigns for environmentally friendly products via the provision of incentives [61]. Some organisations have greatly reduced waste and improved relationships within the networks of their suppliers [48,62]. Eco-designs have also assisted the utilization of the residual values of products at the end of their lifecycle by using reverse logistics [51]. In addition, manufacturing organisations have also contributed to addressing the level of energy consumption by using some measures [63].

Environmental impact assessments, ISO14001 certification, ISO 14000 certification, and other international environmental procedures are available for educating manufacturing stakeholders [64]. The ISO series is one of the driving factors that can enhance environmental performance [65]. ISO 14001 documents aid training and the optimum utilization of organisational resources in the bid to achieve environmental performance [49]. The domestication of ISO 14001 to suit the manufacturing environment and situations peculiar to each country is also essential [66,67]. Interestingly, the study of Oladinrin and Ojo [49] shows that micro or small establishments in developing countries may not consider the importance of ISO14001 or environmental performance since they are in their survival stage; meanwhile, ISO 14001 certification is essential in developed nations [60]. Furthermore, the high cost of ISO 14001 certification in production enterprises discourages most businesses from investing in eco-friendly procedures and activities [68].

### 2.3. Performance

The performance obtained via GSCM practices includes environmental, financial, operational, and organisational performances [69,70]. The inclusion of intangible performance that describes product image and consumer loyalty in past studies is limited [52,71]. Meanwhile, most studies mainly investigated environmental and financial outcomes [38,72], because organisations are often concerned about the economical implication of adopting an innovative approach, while environmental performance is also critical in assessing the implications of embracing "green" practice. Anecdotally, most establishments would prioritize financial performance over other performance metrics. In addition, only organisations that have passed the survival stage often take environmental performance into consideration [47], hence the importance of economic outcomes to most manufacturing

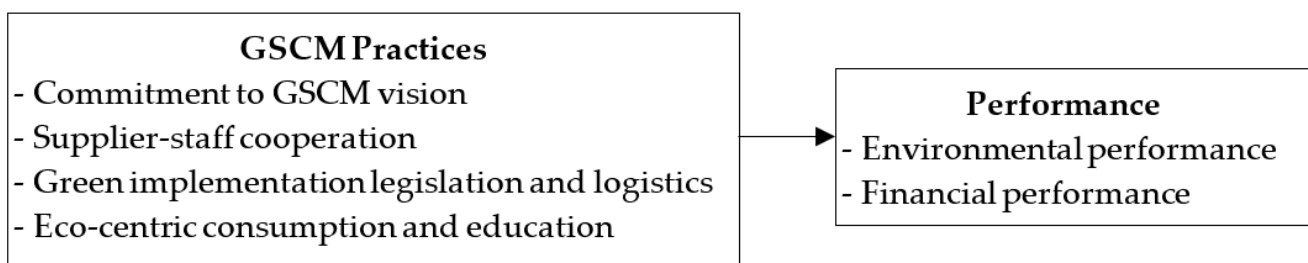


establishments. On the other hand, operational and organisational performances could be explained within the purview of environmental and financial performances to some extent. In fact, early adopters of green practices or large-sized enterprises in developing countries are more concerned about the duo [73]. Thus, this is the reason why environmental and financial performances are essential in manufacturing organisations' sustainability assessment in this study.

Environmental performance underscores the ability of manufacturing establishments to reduce air contaminants, solid and effluent wastes, toxic materials usage, and so on [74]. The environmental dimension of sustainable performance is important because of its benefits to people's health and the existence of nature [75]. According to the submission of Epstein and Buhovac [76], an effective environmental management system that improves environmental performance is complex in practice because of the financial commitments required and other factors. Therefore, achieving environmental performance entails imbibing pro-environmental behaviours into stakeholders and employees for daily activities [77,78]. Possessing a continually improving culture also helps manufacturing organisations in investing in their employees, which in turn give rise to creative ideas and processes that are environmentally sustainable [43,49]. Meanwhile, such investments for sustainable practice translate into considerable capital outlay to the organisation as well [79]. The financial commitment may be enormous at the start due to costs related to training, practicum, etc., for the organisations' employees to achieve green practice and goals [17,80]. However, this commitment is worthwhile since the dividend would be received in the long run. The financial performance dimension of GSCM also encompasses the minimization of costs related to resources, electricity usage, industrial effluent, evacuation, etc. [51]. Financial performance may also be achieved by recycling and reusing materials instead of discarding them [69]. This helps the organisation to purchase materials that are not only environmentally friendly but also recyclable [81,82], thus improving the financial performance of the establishment.

#### 2.4. Conceptual Model

Based on the extensive literature review, adopting sustainable practices in the supply chain of a manufacturing organisation is essential to improve the entire ecosystem and the financial performance of the organisation. The importance of green practices to achieving a sustainable environment may stir the commitment of the top executives of manufacturing establishments, and the practices may encourage junior staffs' cooperation in the organisation's logistics and consumption as well [51,68]. Hence, GSCM practices may be hypothesised as determinants of environmental and financial performance (see Figure 1). The findings of this study are essential for revealing the relationships between GSCM practices and the common performance metrics of a leading manufacturing conglomerate in a developing nation.



**Figure 1.** Conceptual Model of GSCM Practices and Outcome.

### 3. Materials and Methods

#### 3.1. Close-Up Research Approach

A close-up study is a type of investigation that takes place within the confines of the establishment where the examiner(s) work [83]. It is also known as "research in your

organisation", because the researcher(s) is a dedicated employee(s) of the organisation being examined [84,85]. A close-up study helps make inquiries into the motivations behind a specific organisational practice and the success for the learning of other establishments [17]. Scholars have debated the potential challenges of the professional relationship between the investigator(s) and the target respondents during data collection [86,87]; nevertheless, the deleterious situations could be ameliorated if researchers assure professionalism, honesty, and data protection at the commencement of the study. As a result, it is critical to use a data-gathering strategy that aids a high level of confidentiality in close-up research.

### 3.2. Sample

In this study, purposive sampling was utilised to establish sample homogeneity and to control data collection quality in this investigation [88,89]. This sampling method was adopted because not all employees in the selected manufacturing conglomerate, i.e., the Dangote Group of companies, had the opportunity to participate in in-house training on GSCM practices. Therefore, procurement officers, outbound and inbound workers, logistic officers, departmental heads, directors, etc., with the requisite knowledge as indicated in the Dangote Group of companies' employee data interphase, i.e., System Application and Product (SAP), are the target respondents. This conglomerate is a big manufacturing establishment that constantly produces basic necessities for Nigerians and Africans in general [90]. Furthermore, the selected organisation is recognized for their sustainability vision, GSCM training, and commitment to green practices, among other attributes [14]. The company has many business outlets and a large employee base. An attempt was made at purposively engaging employees with requisite knowledge of Green Supply Chain Management; hence, a target size of 500 employees was selected.

### 3.3. Measurement of Items

Since there is no universal benchmark for selecting GSCM practices in organisations and diverse dimensions used in past studies [34,37,91], this study selected commonly used GSCM practices. Thirteen items of GSCM practices adapted from the study of Zhu et al. [32,92] and validated by numerous studies were used to develop a survey. The thirteen items of GSCM practices were to ensure higher granularity and wider coverage of the GSCM dimension. The selected items comprise of intra-organisational management—the company's environmental vision and mission application, legislation, and regulation—support of the regulatory environment, environmental management system's existence, etc. [33,91]. Thirdly, the selected variables were considered to fit into the investigation of GSCM studies of manufacturing establishments in developing countries. Lastly, the items of performance metrics were also adapted from [32]. The selection of variables for measuring GSCM variables in past studies dovetailed around the aforementioned rationales. Therefore, the GSCM practices considered in this study could be considered acceptable and, thus, provide opportunities for future research studies.

### 3.4. Data Collection

A questionnaire survey was employed to investigate the links between GSCM procedures and performance to maintain confidentiality, and decrease the possibility of interpersonal effects capable of distorting the respondents' judgment [17]. The questionnaire contained three sections: the first consisted of the background information of respondents, and the second and third sections contained GSCM practices and performance on a 5-point Likert scale in which 1 = strongly disagree and 5 = strongly agree. The Dangote Group of companies' employee data interphase, i.e., SAP, was used to obtain the email addresses of target responders.

Obtaining large data is important to conduct some statistical analysis in order to make suitable recommendations in research investigations [93]. To obtain a large response from respondents, the questionnaire was emailed to 500 target responders. A total of one hundred and fifty-four copies of the questionnaires were retrieved, resulting in a 30.8 percent

response rate. Various statistical analysis methods were used, namely, factor analysis, correlation, multiple stepwise regression analysis, and structural equation modelling (SEM). The underlying links among the descriptors of GSCM procedures and performance were investigated using factor analysis. The ratio of GSCM practices and performance descriptors to the questionnaire retrieved was 1:14 and 1:11, respectively, and could be adjudged satisfactory for factor analysis [94], while multiple regression and correlation analysis results were used to determine relationships between GSCM practices and performance.

In total, one hundred and fifty-four obtained samples is above the minimum benchmark of 100 samples, with at least five respondents per construct posited to determine the suitability of conducting SEM [95]. In fact, a smaller number of data were employed to run SEM in past studies [96,97]. Therefore, the one hundred and fifty-four surveys received from the respondents can be considered suitable to conduct SEM to investigate the relationships between GSCM practices and performance. Adopting multiple statistical analyses was not unusual in past studies for understanding complex relationships between dependent and independent factors [98–100]. Hence, the statistical analysis, namely, factor analysis, correlation, multiple regression, and SEM, employed in this study would be useful to understand the interaction between GSCM practices and the performance outcomes in the selected manufacturing conglomerate.

## 4. Results

### 4.1. Background Information of Respondents

The respondents in this study comprised 37.7 percent of the supply chain team in oil refinery, cement production (9.7 percent), food and beverages (7.1 percent), wheat mill (5.8 percent), salt refinery (6.5 percent), and other business units (33.2 percent). Most respondents were senior staff (44.8 percent), with a minimum of a master's degrees (48.7%). According to background information, respondents have the necessary academic and professional qualifications to meet the study's goal.

### 4.2. Factor Analysis

The GSCM practices and the measure of performance were factor analysed by varimax rotation with a factor inclusion criteria of a minimum eigenvalue score of one. Items having a factor loading greater than 0.5 were deemed satisfactory in this study to ensure that items with similar features converged [101]. Cronbach's alpha ( $\alpha$ ) value for internal consistency was used to test the dataset grouping's dependability [102]. The four GSCM practices  $\alpha$  values were 0.817, 0.757, 0.890, and 0.812, whereas the  $\alpha$  values of the outcomes were 0.903 and 0.847 (see Table 1). These numbers are higher than 0.6; thus, they can be regarded as satisfactory [103]. At a  $p$ -value less than 0.05, Kaiser–Meyer–Olkin (KMO) values of 0.914 and 0.932 were achieved for GSCM practices and outcomes, respectively, for sampling adequacy. It implies that the KMO explained 91.4 and 93.2 percent of the data gathered for GSCM practices, and the outcomes were suitability for the collected data.

The G1 comprised items indicating the commitment of an organisation to GSCM; thus, it was named "commitment to GSCM vision", and G2 consisted of mutual relationships between an establishment's staff and suppliers with respect to achieving "green" goals. The items of G3 indicated "green implementation legislation and logistics", while G4 describes "eco-centric consumption and education". On the other hand, the two factors generated for performance metrics represent "environmental performance (O1)" and "financial performance (O2)". Since there is no scientific procedure for giving names to the factors generated in factor analysis other than ensuring that the names largely represent the constituting items [17,104], therefore, the names of the factors can be adjudged appropriate.



**Table 1.** Factor Analysis of GSCM Practices and Performance.

Factors	Items	Factor Loading	Alpha
<b>GSCM Practice</b>		<b>KMO = 0.914</b>	
G1: Commitment to GSCM vision	g1—Intra-organisational management—company’s environmental vision and mission application	0.849	0.817
	g2—Measure of commitment to green production	0.746	
G2: Supplier-staff cooperation	g3—Supplier integration—cooperation with suppliers for environmental objectives	0.697	0.757
	g4—Internal environmental management system—with support for GSCM from mid-level managers	0.578	
G3: Green implementation legislation and logistics	g5—Legislation and regulation—support of the regulation environment	0.742	0.890
	g6—Green logistics—procurement, warehouse, etc.	0.732	
	g7—Green information system—with environmental compliance and auditing programs	0.636	
	g8—Environmental management systems existence	0.605	
	g9—Environmental participation—cross-functional cooperation for environmental improvement	0.519	
G4: Eco-centric consumption and education	g10—Eco-design—design of product for reduced consumption of materials, energy, etc.	0.732	0.812
	g11—Green production—increased use of renewable energy sources (e.g., solar, wind)	0.686	
	g12—Supplier environmental management—Suppliers’ ISO 14000 certification	0.646	
	g13—Green education—with ISO 14001 certifications	0.602	
<b>Performance</b>		<b>KMO = 0.932</b>	
O1: Environmental performance	o1—Improve an enterprise’s environmental situation	0.796	0.903
	o2—Reduction in wastewater	0.781	
	o3—Reduction in solid waste	0.773	
	o4—Eliminate, reduce, or re-purpose manufacturing waste	0.766	
	o5—Decrease in consumption of hazardous/harmful/toxic materials	0.757	
	o6—Decrease in fines for environmental accidents	0.754	
O2: Financial Performance	o7—Increase in investment	0.823	0.847
	o8—Decrease in cost of energy consumption	0.788	
	o9—Decrease in cost for materials purchase	0.776	
	o10—Increase in costs for purchasing environmentally friendly materials.	0.554	

#### 4.3. Correlation between GSCM Practices and Performance

According to the results of Pearson's correlation analysis between the GSCM practices and outcomes, variables with a correlation significant at 0.01 levels (two-tailed) are considered to be significantly correlated in this study (see Table 2). The factors of the GSCM practices and performances were measured using the summation of items in Table 1 (e.g.,  $G1 = g1 + g2$ ;  $G2 = g3 + g4$ ;  $G3 = g5 + g6 + g7 + g8 + g9$ , etc.) [105]. In the results of the Pearson correlation analysis, all four GSCM factors (i.e., commitment to GSCM vision (G1), supplier–staff cooperation (G2), green implementation legislation and logistics (G3), and eco-centric consumption and education (G4)) are significantly associated with environmental performance (O1) and financial performance (O2). Environmental performance is positively associated with commitment to GSCM vision (G1: 0.446; 0.01), supplier–staff cooperation (G2: 0.589; 0.01), green implementation legislation and logistics (G3: 0.678; 0.01), and eco-centric consumption and education (G4: 0.601; 0.01); financial performance is positively correlated with commitment to GSCM vision (G1: 0.467; 0.01), supplier–staff cooperation (G2: 0.617; 0.01), green implementation legislation and logistics (G3: 0.578; 0.01), and eco-centric consumption and education (G4: 0.579; 0.01), while significant positive relationships exist between the outcomes.

**Table 2.** Correlation between GSCM Practices and Performance.

Factors	G1	G2	G3	G4	O1	O2
G1: Commitment to GSCM vision	1					
G2: Supplier–staff cooperation	0.687 **	1				
G3: Green implementation legislation & logistics	0.669 **	0.753 **	1			
G4: Eco-centric consumption and education	0.598 **	0.656 **	0.737 **	1		
O1: Environmental performance	0.446 **	0.589 **	0.678 **	0.601 **	1	
O2: Financial performance	0.467 **	0.617 **	0.578 **	0.579 **	0.730 **	1

\*\* Correlation is significant at the 0.01 level (2-tailed).

#### 4.4. Multiple Regression

Multiple stepwise regression analysis was employed to investigate the interaction between GSCM practices and outcomes because of the limitation of bivariate correlation in testing the linear relationship between two single variables only. According to the results of the analysis, two predictive models were developed (see Table 3). Environmental performance (O1) was predicted by a commitment to GSCM vision (G1) and green implementation legislation and logistics (G3), with 46.5 percent variance, while financial performance (O2) was determined by supplier–staff cooperation (G2) and eco-centric consumption and education (G4), with 42.8 percent variance.

**Table 3.** Multiple Stepwise Regression Model for the Prediction of Performance.

Model	Dependents (Performance)	Independents (GSCM Practices)	B	Std	T	Sig	R	Adj. R <sup>2</sup>
1	O1: Environmental performance	Constant	4.129	1.508	2.738	0.007	0.687	0.465
		G3: Green implementation legislation and logistics	0.661	0.119	5.548	0.000		
		G1: Commitment to GSCM vision	0.356	0.131	2.719	0.007		
2	O2: Financial performance	Constant	4.696	0.961	4.886	0.000	0.660	0.428
		G2: Supplier–staff cooperation	0.849	0.165	5.133	0.000		
		G4: Eco-centric consumption and education	0.281	0.075	3.744	0.000		

#### 4.5. Structural Equation Modelling

To further confirm the results of the multiple regression analysis, SEM using AMOS version 22 was used. Via SEM, the unobserved latent variables of GSCM practices and the performances were computed from the observed indices by establishing relationships (path) within the latent factors [106]. Two modified models with additional causal paths were developed based on previous analyses (see Tables 4 and 5). The root-mean-square error of approximation (RMSEA) should be less than 1, while the comparative fit index (CFI), normed fit index (NFI), incremental fit index (IFI), and goodness-of-fit index (GFI) must be greater than 0.9. Based on the results in Table 4, the fit indices, namely, RMSEA, CFI, NFI, IFI, and GFI, are satisfactory [107,108]. The modified Model 1b for GSCM practices—environmental performance—shows RMSEA = 0.084, CFI = 0.955, NFI = 0.917, IFI = 0.955, and GFI = 0.893, while RMSEA = 0.097, CFI = 0.940, NFI = 0.904, IFI = 0.941, and GFI = 0.920 were obtained for Model 2b for GSCM practices—financial performance. The value of GFI of 0.893 for the modified Model 1b still falls within the allowable index [109]. However, the requirement of a minimum of four satisfactory fit indices is met by the results of the analysis [110]. Therefore, the results of the modified Models 1b and 2b were considered appropriate for interpretation and discussion.

**Table 4.** Fit Indices of the GSCM Practices and Performance.

Model	$\chi^2$	df	$\chi^2/df$	RMSEA	p-Value	CFI	NFI	IFI	GFI
GSCM Practices → Environmental Performance (O1)									
1a	142.692	62	2.301	0.092	0.000	0.944	0.907	0.945	0.881
1b	126.579	61	2.075	0.084	0.000	0.955	0.917	0.955	0.893
GSCM Practices → Financial Performance (O2)									
2a	82.631	32	2.582	0.101	0.000	0.932	0.895	0.933	0.915
2b	75.830	31	2.446	0.097	0.000	0.940	0.904	0.941	0.920

Note:  $\chi^2$  = chi-square; df = degree of freedom; RMSEA = root-mean square error of approximation; CFI = comparative fit index; NFI = normed fit index; IFI = incremental fit index; GFI = goodness of fit index.

**Table 5.** Optimum Structural Equation GSCM Practices—Performance Models.

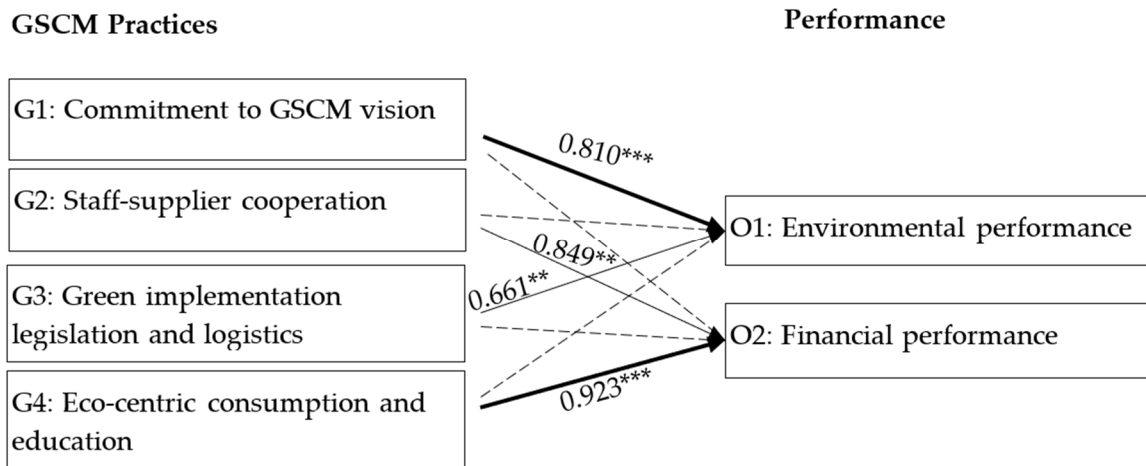
	Causal Relationships	Estimate	S.E.	C.R.	p-Value
GSCM Practices → Environmental Performance (O1)					
1a	G1: Commitment to GSCM vision	0.810	0.274	2.957	0.003 **
	G3: Green implementation legislation and logistics	0.079	0.276	0.285	0.776
1b	G1: Commitment to GSCM vision	0.810	0.227	3.570	***
	G3: Green implementation legislation and logistics	0.123	0.219	0.564	0.573
GSCM Practices → Financial Performance (O2)					
2a	G2: Supplier–staff cooperation	0.055	0.120	0.462	0.644
	G4: Eco-centric consumption and education	0.940	0.166	5.674	***
2b	G2: Supplier–staff cooperation	0.060	0.171	0.470	0.638
	G4: Eco-centric consumption and education	0.923	0.171	5.411	***

Note: \*\* = significant at the 0.01 level (2-tailed), and \*\*\* = significant at the 0.001 level (2-tailed).

The path of the optimized Model 1b revealed that commitment to GSCM vision (G1) is the only significant predictor of environmental performance (O1), while eco-centric consumption and education (G4) are main determinants of financial performance (O2) in Model 2b (see Table 5).

## 5. Discussion

The relationships between GSCM practices and company performance were determined with Pearson correlation analysis, multiple regression analysis, and SEM (Tables 2, 3 and 5). The detailed relationships between the GSCM practices and the indicators of company performance are illustrated in Figure 2.



**Figure 2.** Model of Relationships between GSCM Practices and Outcome. ---- represents a positive significant linear correlation relationship only; —→ represents a positive significant linear relationship confirmed by correlation and regression; —→ represents a positive significant linear relationship confirmed by correlation, regression, and SEM. \*\* = significant at the 0.01 level (2-tailed), and \*\*\* = significant at the 0.001 level (2-tailed).

### 5.1. Impact of Commitment to GSCM Vision and Green Implementation Legislation and Logistics on Environmental Performance

This study reveals that the existence of commitment of the Dangote group of companies to the GSCM vision gives rise to environmental management performance in the organisation. Commitment could be at different levels within the organisation; i.e., it could be from the top management, middle-tier, or lower-tier employees. Commitment could be in the form of interest or concessions based on the interest in GSCM practices. Interestingly, previous studies indicated that the commitment of high-ranked officers in an establishment has a major impact on expected outcomes [49]. The commitment of senior managers in the Dangote group of companies is fundamental to ensure that lower-ranked subordinates follow suit in achieving the vision of the organisation. This confirms the impact top management officials have on other employees in an organisation; thus, the commitment of senior managers must be first secured [33,111]. The secured commitment of the top officials makes the applications of the company's environmental vision and mission feasible. As a result of the commitment, the Dangote group of enterprises' devotion to the GSCM mission resulted in multiple honours in recent years [14]. Indeed, an environmental vision would remain a mirage and unfulfilled when the senior managers in institutions are not convinced of the importance of the vision. On the other hand, the reward of honour for GSCM practices obtained by the Dangote Group of companies could encourage other establishments' leaders to adopt GSCM practices in their delivery of services. More importantly, the findings of this study also corroborate with coordination theory [112]. That is, the understanding of the top management could help in leading and coordinating other members of the organisations to embrace GSCM practices and to think of creative ways of improving their services, processes, and final products.

The results of the analyses, namely, Pearson correlation and multiple regression, reveal the relationships between green implementation legislation and logistics (G3) and environmental performance (O1). Green implementation legislation and logistics first depict the awareness of issues relating to the environment and the pursuance through

legislation and logistics. Total quality management, environmental management system, compliance, and support for environmental improvement measures are all important indicators of an organisation's environmental consciousness. In reality, the attainment of the seven sustainability pillars of the Dangote group of companies requires proper consideration and continual consciousness of environmental-management-related issues to keep championing manufacturing enterprises in Africa and to attract international recognition. Thus, cooperation for environmental improvement among employees within an organisation and other affiliates outside the establishment is equally fundamental, as revealed in previous studies [113]. The legislation of green practices by the government can also help production organisations to be environmentally conscious. In addition, the enforcement of the green implementation legislation is crucial for manufacturers' compliance. In other words, both legislation and enforcement with strict punishments for defaulters in developing countries could help in adopting sustainable practices in manufacturing establishments [114].

Interestingly, environmental participation—cross-functional cooperation for environmental improvement—has the least factor loading amongst the items of “green implementation legislation and logistics” in this study. It implies that the knowledge of environmental management among the employees in the Dangote group of companies also requires cooperation to ensure and foster continuity in environmental-related management. Based on the study of Oladinrin and Ojo [49], the environmental participation of the employees may be improved when a participative management strategy is used in establishments. This approach provides privilege to all employees to devise methods through which daily services and duties can be carried out sustainably without necessarily obtaining formal approval from their superiors [43]. However, more attention must be given to training the employee on the importance of GSCM and what it entails for them to devise such out-of-the-box sustainable ideas for daily service delivery. In sum, the relationships between commitment to GSCM vision with green implementation legislation and logistics and environmental performance as indicated in this study aligns with some previous research efforts [115]; meanwhile, some studies did not confirm the relationships as well [116,117]. This study revealed that achieving environmental performance in an organisation requires environmental consciousness via legislation and logistics and a deliberate commitment to the environmental vision [118].

### *5.2. Impact of Staff–Supplier Cooperation and Eco-Centric Consumption and Education on Financial Performance*

Financial performance is an indispensable outcome that organisation employers often assess to determine the importance and implications of a novel practice that is being implemented. Eco-centric consumption and education significantly contribute to financial performance in this study. It is worthy to note that energy is indispensable in manufacturing organisations, and it is responsible for a considerable percentage of expenditure [119]. The adequate control of the percentage of energy consumption in the gross amount of expenditure in an organisation, coupled with the progressive implementation of a strategy for reduction, leads to enhanced economic performance [120]. This implies that achieving financial performance by minimizing energy consumption might not be quickly realized. Continuously utilizing renewable resources to generate energy for the establishment provides a constant reduction in the amount being paid to electricity companies by the organisation. In addition, the certification and training of some members in the organisation on the “green” concept brings some advantages to the company in the long run. For example, the green specialist in the organisation may investigate other processes in the organisation that could be improved with innovations and technologies that will in turn lead to financial performance. To obtain extensive ideas and improved results, the organisation may provide a reward system to encourage employees with ideas that can be simultaneously advantageous to sustainable practice and economic performance. It is also worthy to note that undertaking methodology such as value management and



asking the fundamental question of “what does an entity, machine, or process do?” and “what else does it do?” has added value and enhanced financial performance in various organisations [121–123]. Therefore, to realize such values in manufacturing establishments, training and certifications of some members of the organisation and the introduction of innovative concepts to top management officials by external consultants are essential.

This study also revealed that staff–supplier cooperation is vital for achieving financial performance. The interaction between GSCM practices and financial performance is not often confirmed in most previous studies due to the huge initial capital outlay of green purchasing [18,72,91,124], whereas the results of other studies confirmed such relationships [33]. In fact, Golicic and Smith [124] predicted that financial performance may be achieved via direct impacts of other outcome performance metrics. It implies that realizing financial performance in a manufacturing organisation is a challenging feat. It could also connote difficulty in predicting the exact time when the economic profitability of adopting GSCM practices would be achieved for the betterment of the establishments. Therefore, the non-establishment of the relationships between GSCM practices and financial performance thus poses a question as to when economic benefits of environmental-conscious practice would be reaped. Considering the initial investment cost of GSCM practices, financial performance may not be achieved within a limited time of implementing environmental-related practices [125]. It thus infers that the economic benefits of GSCM are achieved in the long run in an establishment. Meanwhile, understanding the point at which a manufacturing organisation obtains a return for green practices would assist in the campaign for environmental sustainability practices.

According to the results of the analysis, the cooperation between the staff of an organisation to ensure that environmentally friendly products are used, and on the part of the supplier to ensure that eco-related materials are supplied, allows improved financial performances with respect to manufacturing establishments. Interestingly, this cooperation leads to expected positive outcomes when an organisation practices inclusive management [17,43]. This inclusive management enables suppliers and employees to work individually or collaboratively to develop means through which sustainable products and/or processes could be developed for the financial performance of the establishment. In addition, the creativity of the employees and suppliers is harnessed [49], and the image of the organisation is improved, thereby introducing non-financial outcomes, i.e., a better reputation for the establishment. The cooperation between the supplier and the staff could also lead to financial performance if the organisation provides incentives for innovations of such cooperativeness that leads to improved financial performance or other outcomes for the establishment. However, such an incentive should be commensurate with the financial performance achieved through the cooperation between the suppliers and the staff of the organisation. In other words, innovative outputs with little financial performance should be allotted small rewards and recognitions, while the ones with significant economic performance to the organisation should attract greater rewards.

## 6. Recommendations

Based on the results of the multiple analyses to investigate the relationships between GSCM practices and performance factors, some practical recommendations are posited. It is recommended that to continually realize the commitment to GSCM vision, top management officials and other employees should be educated and trained often on the importance of GSCM relative to environmental performance. A sound understanding of GSCM practices and their long-term implications by the senior officials would help enforce their subordinates (lower cadre employees) in following suit. This understanding would generate environmental management consciousness among the employees in the organisation. Therefore, it is advised that comprehensive GSCM training should be used to create environmental management consciousness. In addition, participation in seminars and workshops where novel means of GSCM practices are taught locally and internationally should be encouraged. It thus implies that funds should be set aside in manufacturing es-

establishments to ensure the participation of employees in conferences, seminars, workshops, and practicums.

The results of the analyses also showed that financial performance in manufacturing organisations was achieved through staff–supplier cooperation and eco-centric consumption and education. It is therefore advised that purposive cooperative relationships on green-related issues should be sourced and secured among every affiliate with organisations. Because previous studies established that financial performance is not achieved within a short time, it then implies that specific attention should be given to energy consumption in manufacturing organisations. To achieve energy consumption management using renewable resources, manufacturing establishments should ensure that they have certified green specialists (s). The manufacturing organisations could also partner with green certification institutions to train some employees. Thus, organisations would have internal green assessors that could audit the green practices of the establishment at regular intervals. An external green specialist could be hired yearly to investigate the organisations' green activities and make recommendations on areas of improvement.

## 7. Conclusions, Limitations and Future Research

With a close-up approach, this study explored relationships between GSCM practices and performance in a large manufacturing conglomerate in Nigeria and other African countries. A total of 154 copies of the questionnaire were obtained by email from supply chain officers at various Dangote Group of companies in Nigeria and analyzed using various statistical analyses such as correlation, multiple regression, and SEM. According to the findings from the analyses, environmental performance is highly related to a measure of organisation dedication to the GSCM vision and green implementation legislation and logistics. This gives the impression that environmental goals can be achieved via a level of commitment to GSCM desires and the existence of legislation and some logistics, whereas enhanced financial performance is significantly related to staff–supplier cooperation and eco-centric consumption and education. Based on the findings of the study, some practical recommendations such as lifelong learning to enhance the knowledge of top management officials on the importance of GSCM practices were proposed. The deliberate involvement of all affiliated establishments with the main producer in GSCM practices to foster the campaign for green production was also suggested.

Various statistical methods, such as factor analysis, Pearson's correlation, multiple regression analysis, and SEM were used to identify relationships between GSCM practices and performance (i.e., environmental performance and financial success). Each item in the study has a factor loading of more than 0.5, and the related alpha values are satisfactory. Furthermore, the respondents in the study had prior GSCM experience. Therefore, the study's findings can be adjudged satisfactory based on the respondents' background information and statistical analyses. However, the generalizability of the study's findings may be limited in certain aspects. First, using a close-up study approach, a significant manufacturing establishment was purposefully chosen for the examination. Due to the company's various business units in various African countries, selecting this major manufacturing conglomerate may be deemed satisfactory; however, obtaining data from other production organisations may produce different results between the dependent and independent variables considered in this study. Second, it would be necessary to compare the results of correlations between GSCM procedures and performance in other manufacturing organisations in developing countries. Third, other aspects of performance, such as social, organisational, and operational performance, were not considered in this study. As a result, these results should be evaluated in future investigations. Fourth, qualitative research on the linkages between GSCM procedures and manufacturing company success is critical. Finally, peculiar GSCM practices that are deduced qualitatively and other sustainable variables can be used to investigate their impact on the performance metrics in the Dangote Group of companies and other manufacturing establishments.

**Author Contributions:** Conceptualization, L.D.O. and O.A.; methodology, L.D.O., O.E.O. and O.O.A.; formal analysis, L.D.O.; resources, L.D.O. and O.O.A.; writing—original draft preparation, L.D.O., O.E.O. and O.O.A.; writing—review and editing, O.A. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research received no external funding.

**Institutional Review Board Statement:** Ethical review and approval were waived for this study because the questionnaire does not contain any implicating items relative to the image of the institution where the research was conducted.

**Informed Consent Statement:** Informed consent was obtained from all subjects involved in the study.

**Data Availability Statement:** The dataset used and/or analyzed during the current study are available from the corresponding authors upon reasonable request.

**Conflicts of Interest:** The authors declare no conflict of interest.

## References

- Berny, N.; Rootes, C. Environmental NGOs at a crossroads? *Environ. Politics* **2018**, *27*, 947–972. [CrossRef]
- Washington-Ottombre, C.; Washington, G.L.; Newman, J. Campus sustainability in the US: Environmental management and social change since 1970. *J. Clean. Prod.* **2018**, *196*, 564–575. [CrossRef]
- Wibowo, M.A.; Handayani, N.U.; Mustikasari, A. Factors for implementing green supply chain management in the construction industry. *J. Ind. Eng. Manag.* **2018**, *11*, 651–679. [CrossRef]
- Kulshreshtha, K.; Bajpai, N.; Tripathi, V.; Sharma, G. Consumer preference for eco-friendly appliances in trade-off: A conjoint analysis approach. *Int. J. Prod. Dev.* **2019**, *23*, 212–243. [CrossRef]
- Khan, S.A.R.; Qianli, D. Impact of green supply chain management practices on firms' performance: An empirical study from the perspective of Pakistan. *Environ. Sci. Pollut. Res.* **2017**, *24*, 16829–16844. [CrossRef]
- Wu, T.; Kung, C.C. Carbon emissions, technology upgradation and financing risk of the green supply chain competition. *Technol. Forecast. Soc. Chang.* **2020**, *152*, 119884. [CrossRef]
- Miller, S.M.; Michalak, A.M.; Detmers, R.G.; Hasekamp, O.P.; Bruhwiler, L.M.; Schwietzke, S. China's coal mine methane regulations have not curbed growing emissions. *Nat. Commun.* **2019**, *10*, 303. [CrossRef] [PubMed]
- Singhania, M.; Saini, N. Demystifying pollution haven hypothesis: Role of FDI. *J. Bus. Res.* **2021**, *123*, 516–528. [CrossRef] [PubMed]
- Wang, H.; Dong, C.; Liu, Y. Beijing direct investment to its neighbors: A pollution haven or pollution halo effect? *J. Clean. Prod.* **2019**, *239*, 118062. [CrossRef]
- Muduli, K.; Govindan, K.; Barve, A.; Geng, Y. Barriers to green supply chain management in Indian mining industries: A graph theoretic approach. *J. Clean. Prod.* **2013**, *47*, 335–344. [CrossRef]
- Bakos, J.; Siu, M.; Orengo, A.; Kasiri, N. An analysis of environmental sustainability in small & medium-sized enterprises: Patterns and trends. *Bus. Strategy Environ.* **2020**, *29*, 1285–1296.
- Ojo, E.; Mbohwa, C.; Akinlabi, E. Green supply chain management in construction industries in South Africa and Nigeria. *Int. J. Chem. Environ. Biol. Sci.* **2014**, *2*, 146–150.
- Manchanda, S.; Kaleem, H.; Schlorke, S. *Artificial Intelligence Investments Allow Emerging Markets to Develop and Expand Sophisticated Manufacturing Capabilities*; International Finance Corporation, World Bank: Washington, DC, USA, 2020; pp. 1–8.
- Africanews. Corporate Social Responsibility: Dangote Gets top 5 Recognition in Most Responsible Business in Africa' Category. Available online: <https://www.africanews.com/2018/12/07/corporate-social-responsibility-dangote-gets-top-5-recognition-in-most-responsible-business-in-africa-category/#:~:text=Dangote\T1\textquoterights%20seven%20pillars%20of%20sustainability,are%20designed%20to%20ensure%20sustainability> (accessed on 20 April 2021).
- Dangote Cement. *Championing Impact and Sustainability: Building Prosperity and Self-Sufficiency across Africa*; Dangote Cement Sustainable Report; Dangote Cement: Lagos, Nigeria, 2018.
- Dong, Z.; Tan, Y.; Wang, L.; Zheng, J.; Hu, S. Green supply chain management and clean technology innovation: An empirical analysis of multinational enterprises in China. *J. Clean. Prod.* **2021**, *310*, 127377. [CrossRef]
- Ososanmi, A.O.; Ojo, L.D.; Ogundimu, O.E.; Oke, A.E. Drivers of green supply chain management: A close-up study. *Environ. Sci. Pollut. Res.* **2022**, *29*, 14705–14718. [CrossRef]
- Quadri, S.O. Effects of Green Supply Chain Management Practices on Performance of Nigerian Bottling Company Limited, Nigeria. Ph.D. Thesis, Federal University of Technology, Akure, Nigeria, 2021.
- Ogunlela, G.O. Green supply chain management as a competitive tool in the fast-moving consumer goods manufacturing industry. *J. Bus. Retail. Manag. Res.* **2018**, *12*, 167–176. [CrossRef]
- Umar, M.S.; Danjuma, I.; Hammawa, D.D.; Habibu, S.A. Effects of technological innovation in relationship between green supply chain management practices and green performance. *Int. Rev. Manag. Mark.* **2016**, *6*, 677–682.

21. Fahimnia, B.; Sarkis, J.; Davarzani, H. Green supply chain management: A review and bibliometric analysis. *Int. J. Prod. Econ.* **2015**, *162*, 101–114. [[CrossRef](#)]
22. Fiorini, P.D.C.; Jabbour, C.J.C.; de Sousa Jabbour, A.B.L.; Stefanelli, N.O.; Fernando, Y. Interplay between information systems and environmental management in ISO 14001-certified companies. *Manag. Decis.* **2019**, *57*, 1883–1901. [[CrossRef](#)]
23. Asif, M.S.; Lau, H.; Nakandala, D.; Fan, Y.; Hurriyet, H. Adoption of green supply chain management practices through collaboration approach in developing countries—From literature review to conceptual framework. *J. Clean. Prod.* **2020**, *276*, 124191. [[CrossRef](#)]
24. Dubey, R.; Gunasekaran, A.; Ali, S.S. Exploring the relationship between leadership, operational practices, institutional pressures and environmental performance: A framework for green supply chain. *Int. J. Prod. Econ.* **2015**, *160*, 120–132. [[CrossRef](#)]
25. Ardito, L.; Dangelico, R.M. Firm environmental performance under scrutiny: The role of strategic and organizational orientations. *Corp. Soc. Responsib. Environ. Manag.* **2018**, *25*, 426–440. [[CrossRef](#)]
26. Tseng, M.L.; Islam, M.S.; Karia, N.; Fauzi, F.A.; Afrin, S. A literature review on green supply chain management: Trends and future challenges. *Resour. Conserv. Recycl.* **2019**, *141*, 145–162. [[CrossRef](#)]
27. Yu, Z.; Khan, S.A.R. Green supply chain network optimization under random and fuzzy environment. *Int. J. Fuzzy Syst.* **2021**, *24*, 1–12. [[CrossRef](#)]
28. Mutingi, M. Developing green supply chain management strategies: A taxonomic approach. *J. Ind. Eng. Manag.* **2013**, *6*, 525–546. [[CrossRef](#)]
29. Liu, H.C.; You, X.Y. *Green Supplier Evaluation and Selection: Models Methods and Applications*; Springer: Berlin/Heidelberg, Germany, 2021; pp. 13–55.
30. Sarkis, J.; Zhu, Q.; Lai, K.H. An organizational theoretic review of green supply chain management literature. *Int. J. Prod. Econ.* **2011**, *130*, 1–15. [[CrossRef](#)]
31. Malviya, R.K.; Kant, R. Green supply chain management (GSCM): A structured literature review and research implications. *Benchmarking Int. J.* **2015**, *22*, 1360–1394. [[CrossRef](#)]
32. Zhu, Q.; Sarkis, J.; Lai, K.H. Initiatives and outcomes of green supply chain management implementation by Chinese manufacturers. *J. Environ. Manag.* **2007**, *85*, 179–189. [[CrossRef](#)] [[PubMed](#)]
33. Al-Sheyadi, A.; Muyldermans, L.; Kauppi, K. The complementarity of green supply chain management practices and the impact on environmental performance. *J. Environ. Manag.* **2019**, *242*, 186–198. [[CrossRef](#)]
34. Rostamzadeh, R.; Govindan, K.; Esmaeili, A.; Sabaghi, M. Application of fuzzy VIKOR for evaluation of green supply chain management practices. *Ecol. Indic.* **2015**, *49*, 188–203. [[CrossRef](#)]
35. Uygun, Ö.; Dede, A. Performance evaluation of green supply chain management using integrated fuzzy multi-criteria decision making techniques. *Comput. Ind. Eng.* **2016**, *102*, 502–511. [[CrossRef](#)]
36. Ali, Y.; Saad, T.B.; Sabir, M.; Muhammad, N.; Salman, A.; Zeb, K. Integration of green supply chain management practices in construction supply chain of CPEC. *Manag. Environ. Qual. Int. J.* **2020**, *13*, 185–200. [[CrossRef](#)]
37. Stekelorum, R.; Laguir, I.; Gupta, S.; Kumar, S. Green supply chain management practices and third-party logistics providers' performances: A fuzzy-set approach. *Int. J. Prod. Econ.* **2021**, *235*, 108093. [[CrossRef](#)]
38. Deng, X.; Jiang, W. Evaluating green supply chain management practices under fuzzy environment: A novel method based on D number theory. *Int. J. Fuzzy Syst.* **2019**, *21*, 1389–1402. [[CrossRef](#)]
39. Shen, L.; Olfat, L.; Govindan, K.; Khodaverdi, R.; Diabat, A. A fuzzy multi criteria approach for evaluating green supplier's performance in green supply chain with linguistic preferences. *Resour. Conserv. Recycl.* **2013**, *74*, 170–179. [[CrossRef](#)]
40. Layzer, J.A. *Natural Experiments: Ecosystem-Based Management and the Environment*; MIT Press: Cambridge, MA, USA, 2008; pp. 1–267.
41. Lewis, A.S. Society on Its Best Behavior? A Mixed Method Study on the Influence of External Societal Forces on Delawareans' Private Pro-Environmental Behavior. Ph.D. Thesis, University of Delaware, Newark, DE, USA, 2020.
42. Silva, G.M.; Gomes, P.J.; Sarkis, J. The role of innovation in the implementation of green supply chain management practices. *Bus. Strategy Environ.* **2019**, *28*, 819–832. [[CrossRef](#)]
43. Al-Dmour, R.; Yassine, O.; Masa'deh, R. A review of literature on the associations among employee empowerment, work engagement and employee performance. *Mod. Appl. Sci.* **2018**, *12*, 313–329. [[CrossRef](#)]
44. Jabbour, C.J.C.; Mauricio, A.L.; Jabbour, A.B.L.D.S. Critical success factors and green supply chain management proactivity: Shedding light on the human aspects of this relationship based on cases from the Brazilian industry. *Prod. Plan. Control* **2017**, *28*, 671–683. [[CrossRef](#)]
45. Zulkefli, N.S.; Mahmud, F.; Zainudin, N.M. A survey on green supply chain management (GSCM) challenges in the Malaysian construction industry. In Proceedings of the 2nd FGIC Conference on Governance and Integrity, Kuantan, Malaysia, 19–20 August 2019.
46. Kehbila, A.G.; Ertel, J.; Brent, A.C. Strategic corporate environmental management within the South African automotive industry: Motivations, benefits, hurdles. *Corp. Soc. Responsib. Environ. Manag.* **2009**, *16*, 310–323. [[CrossRef](#)]
47. Ojo, L.D.; Oladinrin, O.T.; Obi, L. Critical Barriers to Environmental Management System Implementation in the Nigerian Construction Industry. *Environ. Manag.* **2021**, *68*, 147–159. [[CrossRef](#)] [[PubMed](#)]
48. Nur, F.; Handayani, N.U.; Wibowo, M.A. Developing indicators to implementing green material management in construction industry: A literature review. *E3S Web Conf.* **2018**, *73*, 8009. [[CrossRef](#)]



49. Oladinrin, O.T.; Ojo, L.D. Characterisation of the drivers of environmental management system implementation. *Eng. Constr. Archit. Manag.* 2021; ahead of print. [\[CrossRef\]](#)
50. Mathiyazhagan, K.; Govindan, K.; NoorulHaq, A.; Geng, Y. An ISM approach for the barrier analysis in implementing green supply chain management. *J. Clean. Prod.* **2013**, *47*, 283–297. [\[CrossRef\]](#)
51. Abdel-Baset, M.; Chang, V.; Gamal, A. Evaluation of the green supply chain management practices: A novel neutrosophic approach. *Comput. Ind.* **2019**, *108*, 210–220. [\[CrossRef\]](#)
52. Laosirihongthong, T.; Adebajo, D.; Tan, K.C. Green supply chain management practices and performance. *Ind. Manag. Data Syst.* **2013**, *113*, 1088–1109. [\[CrossRef\]](#)
53. Hajmohammad, S.; Vachon, S.; Klassen, R.D.; Gavronski, I. Reprint of Lean management and supply management: Their role in green practices and performance. *J. Clean. Prod.* **2013**, *56*, 86–93. [\[CrossRef\]](#)
54. Colicchia, C.; Marchet, G.; Melacini, M.; Perotti, S. Building environmental sustainability: Empirical evidence from Logistics Service Providers. *J. Clean. Prod.* **2013**, *59*, 197–209. [\[CrossRef\]](#)
55. Ilyas, S.; Hu, Z.; Wiwattanakornwong, K. Unleashing the role of top management and government support in green supply chain management and sustainable development goals. *Environ. Sci. Pollut. Res.* **2020**, *27*, 8210–8223. [\[CrossRef\]](#)
56. Lambin, E.F.; Kim, H.; Leape, J.; Lee, K. Scaling up solutions for a sustainability transition. *One Earth* **2020**, *3*, 89–96. [\[CrossRef\]](#)
57. Zhu, Q.; Sarkis, J. The moderating effects of institutional pressures on emergent green supply chain practices and performance. *Int. J. Prod. Res.* **2007**, *45*, 4333–4355. [\[CrossRef\]](#)
58. Pan, J.; Ma, H.H.; Zhang, Y. *Green Economy and Green Jobs in China: Current Status and Potentials for 2020*; Worldwatch Institute: Danvers, MA, USA, 2011; pp. 5–37.
59. Sahoo, S.; Vijayvargy, L. Green supply chain management practices and its impact on organizational performance: Evidence from Indian manufacturers. *J. Manuf. Technol. Manag.* **2020**, *32*, 862–886. [\[CrossRef\]](#)
60. Matuszak-Flejszman, A. Benefits of Environmental Management System in Polish Companies Compliant with ISO 14001. *Pol. J. Environ. Stud.* **2009**, *18*, 411–419.
61. Zeb, K.; Ali, Y.; Khan, M.W. Factors influencing environment and human health by cement industry: Pakistan a case in point. *Manag. Environ. Qual. Int. J.* **2018**, *30*, 66–73. [\[CrossRef\]](#)
62. Ghobakhloo, M.; Tang, S.; Zulkifli, N.; Ariffin, M.K. An integrated framework of green supply chain management implementation. *Int. J. Innov.* **2013**, *4*, 1–4.
63. Cai, W.; Lai, K.H.; Liu, C.; Wei, F.; Ma, M.; Jia, S.; Lv, L. Promoting sustainability of manufacturing industry through the lean energy-saving and emission-reduction strategy. *Sci. Total Environ.* **2019**, *665*, 23–32. [\[CrossRef\]](#)
64. Walker, H.; Di Sisto, L.; McBain, D. Drivers and barriers to environmental supply chain management practices: Lessons from the public and private sectors. *J. Purch. Supply Manag.* **2008**, *14*, 69–85. [\[CrossRef\]](#)
65. Tyagi, M.; Kumar, P.; Kumar, D. Analysis of interactions among the drivers of green supply chain management. *Int. J. Bus. Perform. Supply Chain Model.* **2015**, *7*, 92–108. [\[CrossRef\]](#)
66. Opoku, D.G.J.; Agyekum, K.; Ayarkwa, J. Drivers of environmental sustainability of construction projects: A thematic analysis of verbatim comments from built environment consultants. *Int. J. Constr. Manag.* **2019**, *22*, 1–9. [\[CrossRef\]](#)
67. Bravi, L.; Santos, G.; Pagano, A.; Murmura, F. Environmental management system according to ISO 14001: 2015 as a driver to sustainable development. *Corp. Soc. Responsib. Environ. Manag.* **2020**, *27*, 2599–2614. [\[CrossRef\]](#)
68. Geng, R.; Mansouri, S.A.; Aktas, E. The relationship between green supply chain management and performance: A meta-analysis of empirical evidences in Asian emerging economies. *Int. J. Prod. Econ.* **2017**, *183*, 245–258. [\[CrossRef\]](#)
69. Vijayvargy, L.; Thakkar, J.; Agarwal, G. Green supply chain management practices and performance: The role of firm-size for emerging economies. *J. Manuf. Technol. Manag.* **2017**, *28*, 299–323. [\[CrossRef\]](#)
70. Zaid, A.A.; Jaaron, A.A.; Bon, A.T. The impact of green human resource management and green supply chain management practices on sustainable performance: An empirical study. *J. Clean. Prod.* **2018**, *204*, 965–979. [\[CrossRef\]](#)
71. Eltayeb, T.; Zailani, S.; Ramayah, T. Green supply chain initiatives among certified companies in Malaysia and environmental sustainability: Investigating the outcomes. *Resour. Conserv. Recycl.* **2011**, *55*, 495–506. [\[CrossRef\]](#)
72. Feng, M.; Yu, W.; Wang, X.; Wong, C.Y.; Xu, M.; Xiao, Z. Green supply chain management and financial performance: The mediating roles of operational and environmental performance. *Bus. Strategy Environ.* **2018**, *27*, 811–824. [\[CrossRef\]](#)
73. Kengkathran, S. A literature review on the impact of environmental, social and governance (ESG) disclosure on financial performance of energy companies in Asean. *Glob. Bus. Manag. Res.* **2018**, *10*, 1071–1079.
74. Zhu, Q.; Sarkis, J.; Lai, K.H. Confirmation of a measurement model for green supply chain management practices implementation. *Int. J. Prod. Econ.* **2008**, *111*, 261–273. [\[CrossRef\]](#)
75. Ayuso, S.; Rodríguez, M.A.; García-Castro, R.; Ariño, M.A. Maximizing stakeholders' interests: An empirical analysis of the stakeholder approach to corporate governance. *Bus. Soc.* **2014**, *53*, 414–439. [\[CrossRef\]](#)
76. Epstein, M.J.; Buhovac, A.R. *Making Sustainability Work: Best Practices in Managing and Measuring Corporate Social Environmental and Economic Impacts*; Berrett-Koehler Publishers: San Francisco, CA, USA, 2014; pp. 19–260.
77. Ren, S.; He, D.; Zhang, T.; Chen, X. Symbolic reactions or substantive pro-environmental behaviour? An empirical study of corporate environmental performance under the government's environmental subsidy scheme. *Bus. Strategy Environ.* **2019**, *28*, 1148–1165. [\[CrossRef\]](#)



78. Ojo, A.O.; Tan, C.N.L.; Alias, M. Linking green HRM practices to environmental performance through pro-environment behaviour in the information technology sector. *Soc. Responsib. J.* **2020**, *18*, 1–18. [[CrossRef](#)]
79. Oke, A.E.; Aigbavboa, C.O. *Sustainable Value Management for Construction Projects*; Springer: Cham, Switzerland, 2017; pp. 3–189.
80. Yu, W.; Chavez, R.; Feng, M.; Wiengarten, F. Integrated green supply chain management and operational performance. *Supply Chain Manag. Int. J.* **2014**, *19*, 683–696. [[CrossRef](#)]
81. Laari, S.; Töyli, J.; Solakivi, T.; Ojala, L. Firm performance and customer-driven green supply chain management. *J. Clean. Prod.* **2016**, *112*, 1960–1970. [[CrossRef](#)]
82. Tseng, S.H.; Wee, H.M.; Song, P.S.; Jeng, S. Optimal green supply-chain model design considering full truckload. *Kybernetes* **2019**, *48*, 2150–2174.
83. Baiocchi, G.; Connor, B.T. The ethnos in the polis: Political ethnography as a mode of inquiry. *Sociol. Compass* **2008**, *2*, 139–155.
84. Brannick, T.; Coghlan, D. In defense of being “native”: The case for insider academic research. *Organ. Res. Methods* **2007**, *10*, 59–74. [[CrossRef](#)]
85. Coghlan, D. *Doing Action Research in Your Own Organization*; Sage: London, UK, 2019.
86. Newton, J. Views from below: Academics coping with quality. *Qual. High. Educ.* **2002**, *8*, 39–61. [[CrossRef](#)]
87. McDermid, F.; Peters, K.; Jackson, D.; Daly, J. Conducting qualitative research in the context of pre-existing peer and collegial relationships. *Nurse Res.* **2014**, *21*, 28–33. [[CrossRef](#)] [[PubMed](#)]
88. Jawale, K.V. Methods of sampling design in the legal research: Advantages and disadvantages. *Online Int. Interdiscip. Res. J.* **2012**, *2*, 183–190.
89. Sibona, C.; Walczak, S.; White Baker, E. A guide for purposive sampling on twitter. *Commun. Assoc. Inf. Syst.* **2020**, *46*, 537–559. [[CrossRef](#)]
90. Akinyoade, A.; Uche, C. Dangote cement: An African success story? *ASC Work. Pap.* **2016**, *131*, 1–40.
91. Çankaya, S.Y.; Sezen, B. Effects of green supply chain management practices on sustainability performance. *J. Manuf. Technol. Manag.* **2019**, *30*, 98–121. [[CrossRef](#)]
92. Zhu, Q.; Sarkis, J.; Lai, K.H. Green supply chain management: Pressures, practices and performance within the Chinese automobile industry. *J. Clean. Prod.* **2007**, *15*, 1041–1052. [[CrossRef](#)]
93. Ojo, L.; Ibrahim, B.; Oke, A.; Akindeinde, A. Mitigating strategies of threats to quantity surveying profession in the Nigerian construction industry. *J. Constr. Proj. Manag. Innov.* **2020**, *10*, 1–13.
94. Pallant, J. *SPSS Survival Manual: A Step by Step Guide to Data Analysis Using IBM SPSS*, 7th ed.; Routledge: New York, NY, USA, 2020.
95. Bagozzi, R.P.; Yi, Y. Specification, evaluation, and interpretation of structural equation models. *J. Acad. Mark. Sci.* **2012**, *40*, 8–34.
96. Leung, M.Y.; Wang, C.; Chan, I.Y. A qualitative and quantitative investigation of effects of indoor built environment for people with dementia in care and attention homes. *Build. Environ.* **2019**, *157*, 89–100.
97. Leung, M.Y.; Wang, C.; Wei, X. Structural model for the relationships between indoor built environment and behaviors of residents with dementia in care and attention homes. *Build. Environ.* **2020**, *169*, 106532.
98. Chan, Y.S. Stress Management of Hong Kong Expatriate Construction Professionals in Mainland China. Ph.D. Thesis, City University of Hong Kong, Hong Kong, China, 2011.
99. Yu, J. Public Engagement via Value Methodology for Construction Projects. Ph.D. Thesis, City University of Hong Kong, Hong Kong, China, 2013.
100. Ahmed, K. Stress Management of Ethnic Minority Workers in the Construction Industry. Ph.D. Thesis, City University of Hong Kong, Hong Kong, China, 2021.
101. Field, A. *Discovering Statistics Using SPSS*; Sage Publications: London, UK, 2005.
102. Pallant, J. *SPSS Survival Manual: A Step by Step Guide to Data Analysis Using SPSS*, 4th ed.; Everbest Printing Company: Hong Kong, China, 2011.
103. Hair, J.F.; Black, W.C.; Babin, B.J.; Anderson, R.E. *Multivariate Data Analysis*, 7th ed.; Prentice Hall: Hoboken, NJ, USA, 2010.
104. Henson, R.K.; Roberts, J.K. Use of exploratory factor analysis in published research: Common errors and some comment on improved practice. *Educ. Psychol. Meas.* **2006**, *66*, 393–416.
105. Tabachnick, B.G.; Fidell, L.S. *Using Multivariate Statistics*; Allyn and Bacon: New York, NY, USA, 2007.
106. Wang, J.; Wang, X. *Structural Equation Modelling with Mplus: Application Using Mplus*; Wiley: Chichester, UK, 2012.
107. Huang, A.H.; Yen, D.C.; Zhang, X. Exploring the potential effects of emoticons. *Inf. Manag.* **2008**, *45*, 466–473.
108. Bowen, N.K.; Guo, S. *Structural Equation Modeling*; Oxford University Press: Oxford, UK, 2011.
109. Hu, L.T.; Bentler, P.M. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Struct. Equ. Model. Multidiscip. J.* **1999**, *6*, 1–55. [[CrossRef](#)]
110. Kline, R.B. *Principle and Practices of Structural Equation Modelling*, 3rd ed.; Guilford Press: New York, NY, USA, 2011.
111. Stone, R.J.; Cox, A.; Gavin, M. *Human Resource Management*; John Wiley & Sons: Hoboken, NJ, USA, 2020.
112. Zhu, Q.; Sarkis, J.; Lai, K.H. Examining the effects of green supply chain management practices and their mediations on performance improvements. *Int. J. Prod. Res.* **2012**, *50*, 1377–1394.
113. Suryanto, T.; Haseeb, M.; Hartani, N.H. The correlates of developing green supply chain management practices: Firms level analysis in Malaysia. *Int. J. Supply Chain Manag.* **2018**, *7*, 316–324.

114. Adeniyi, O.; Ojo, L.D.; Idowu, O.A.; Kolawole, S.B. Compliance with the stipulated procurement process in local governments: A case from a developing nation. *Int. J. Procure. Manag.* **2020**, *13*, 678–700. [[CrossRef](#)]
115. Cousins, P.D.; Lawson, B.; Petersen, K.J.; Fugate, B. Investigating green supply chain management practices and performance: The moderating roles of supply chain ecocentricity and traceability. *Int. J. Oper. Prod. Manag.* **2019**, *39*, 767–786.
116. Matos, S.; Hall, J. Integrating sustainable development in the supply chain: The case of life cycle assessment in oil and gas and agricultural biotechnology. *J. Oper. Manag.* **2007**, *25*, 1083–1102.
117. Green, K.W.; Zelbst, P.J.; Meacham, J.; Bhadauria, V.S. Green supply chain management practices: Impact on performance. *Supply Chain Manag. Int. J.* **2012**, *17*, 290–305.
118. Romero-Perdomo, F.; Carvajalino-Umaña, J.D.; Moreno-Gallego, J.L.; Ardila, N.; González-Curbelo, M.Á. Research Trends on Climate Change and Circular Economy from a Knowledge Mapping Perspective. *Sustainability* **2022**, *14*, 521. [[CrossRef](#)]
119. Javied, T.; Rackow, T.; Stankalla, R.; Sterk, C.; Franke, J. A study on electric energy consumption of manufacturing companies in the German industry with the focus on electric drives. *Procedia CIRP* **2016**, *41*, 318–322.
120. Liu, L.; Zhang, Y.; Zhao, L.; Zhan, C.; Liang, C. An Attempt to Evaluate the Green Construction of Large-Scale Hydropower Projects: Taking Wudongde Hydropower Station on the Jinsha River, China as an Example. *Sustainability* **2021**, *14*, 1–17.
121. Neilson, R. VE/VM Assisting Non-Profit Sector in Creative Decision Makings. Presentation at the 2nd Value Factory Conference. Available online: [www.youtube.com/watch?v=q\\_ySvv4TKyg](http://www.youtube.com/watch?v=q_ySvv4TKyg) (accessed on 6 October 2021).
122. Jo, D.; Kwon, C. Structure of Green Supply Chain Management for Sustainability of Small and Medium Enterprises. *Sustainability* **2021**, *14*, 50.
123. Nishiyama, K.; Sawaguchi, M. Development of template for outlining science and engineering research based on functional thinking in VE and TRIZ. In Proceedings of the 74th Virtual Value Summit of Society of American Value Engineers, Virtual, 5–9 June 2021.
124. Golicic, S.L.; Smith, C.D. A meta-analysis of environmentally sustainable supply chain management practices and firm performance. *J. Supply Chain Manag.* **2013**, *49*, 78–95.
125. Bowen, F.; Cousins, P.; Lamming, R.; Faruk, A. Horses for Courses: Explaining the Gap between the Theory and Practice of Green Supply. In *Greening the Supply Chain*; Sarkis, J., Ed.; Springer: London, UK, 2006; pp. 151–172.