



# GREEN SUPPLY CHAIN MANAGEMENT AND PERFORMANCE OF DOWNSTREAM OIL FIRMS IN RIVERS STATE

Igwe, Peace

Department of Marketing, University of Port Harcourt, [peace.igwe@uniport.edu.ng](mailto:peace.igwe@uniport.edu.ng)

Dike, Lawrence Bekwele

Department of Marketing, University of Port Harcourt, Choba, Rivers State, Nigeria

Ogbonda, Chioma Gloria

Department of Marketing, University of Port Harcourt, Choba, Rivers State, Nigeria

Article history:	Abstract:
<b>Received:</b> 28 <sup>th</sup> October 2024	The aim of this study was to examine the nexus between green supply chain management and performance of downstream oil firms in Rivers State. A total of one hundred sixty-five (165) respondents in Rivers State were sampled upon which a descriptive design was adopted and simple regression statistical tool was employed to analysed the stated hypotheses. The study found that green procurement, eco-design and green logistics were green supply chain management initiatives that influenced environmental performance. Therefore, the researcher concluded that for green supply chain management initiatives to be successful, it must be ready to align with the environmental protection. Based on the findings, the study recommended that, managers and marketers in downstream oil firms should identify several capabilities, their relative significance, and the processes for realizing green supply chain management which when properly executed can improve environmental performance and environmental sustainability.
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## 1.0 INTRODUCTION

The Nigerian petroleum industry is one of the vital industries in the nation's economy. As put by Mangla et al. (2014a), the oil sector is imperative to the economy in the global communities, involving sizeable financial flows, aiding the movement of people and important products/services using transportation means. Dubey et al., (2016) stated that "petroleum is the world's key generator of energy and revenue in the global economies". Downstream oil firms have paid diminutive attention to environmental issues resulting from their activities and increasingly explore natural resources without applying thoroughly the principles of recycling, reusing, and remanufacturing (Song et al., 2015; Dubey et al., 2016, 2019; El-Kassar & Singh, 2019). And these Rs' principles can be achieved through the development of green consciousness that is, Green Supply Chain Management.

Literally, green supply chain management (GSCM) is considered by many as an environmental innovativeness. It could perceive as an integrated environmental consciousness into supply chain management (Srivastava, 2007). Its ultimate goals are to minimize, eliminate wastages, spillages like hazardous chemical, carbon monoxide emissions, energy and solid waste along supply chain to include product design, material resourcing and selection, manufacturing process, delivery of final product through logistics and declining stage of the product (Rao, 2006). In that manner, GSCM plays a vital role in influencing the total environment impact of any firm involved in supply chain activities and thus, contributing to environmental sustainability of which the inhabitants will benefit from. This move came into being as a result of thinking the adverse consequences done by supply chain members on environment (Kaur et al., 2018). GSCM is beneficial to the environment and humanity given the following cited reasons by Researchers: to improve corporate reputation (Longoni & Cagliano, 2018), market demand, supplier as well as government of the state.

Jayant and Tiwari (2018), viewed GSCM as an organizational ideology introduced to meet the standards of production processes and products conformity with environmental regulations, demanding companies to take part in abating environmental posed threats. This initiative is developed for predicting, abating and preventing environmental harmfulness experienced by downstream supply chain operations in the country (Sari, 2017). In so doing, as an effort to form an ecological friendliness for establishments, GSCM refers to "the developed and advanced form of conventional supply chains with a special aim of reducing the environmental degradation and harmfulness experienced during a product's offering" (Mishra et al., 2017). In line with this school of thought, GSCM consists of 3Rs activities (e.g. reduce,

re-use, and recycle) (Sirvastara, 2007). To meet up with the challenges like energy management, oil spillage, environmental degradation and pollutions, downstream oil firms have tried to green their supply chains activities towards saving environmental ecosystem (Kumar & Chandrakar, 2012). In a nutshell, establishments that react consciously towards social well-being can achieve a social image and legitimacy for their long-term strategic survival and competitiveness within the business environs (Hoffman, 2000). The ability of manufacturing plants and vehicles to reduce carbon monoxide emissions, sewage, and solid wastes and the ability to lessen consumption and usage of hazardous and toxic offerings create favourable competitive advantage for the organization (Zhu et al., 2010) against those other players that fails to green their offerings.

Studies have been researched to investigate the impact of GSCM on performance, for instance, Sibel and Bulent (2019) adopted eight measures (green purchasing, green manufacturing, green packaging, green distribution, green marketing, investment recovery, internal environmental management and environmental education); Li (2011) employed eco-design level, green purchasing level, green manufacturing capacity, green marketing and consumption, recycling products processing ability and level of information technology as seven measures of GSCM; also, Lin (2013) employed green purchasing, green design, collaboration with suppliers and customers, and product recovery and reuse of used products as dimensions of GSCM; Shen et al., (2013) employed resource consumption, eco-design, green image, environmentally-friendly technology, use of environmentally-friendly materials and staff environmental training as the working dimensions of GSCM; Zhu et al., (2010) used internal environmental management, green purchasing, cooperation with customers, including environmental requirements, eco-design practices and investment recovery as the dimensions of GSCM; Kirchoff et al., (2016) indexed five dimensions of GSCM: green purchasing, eco-design, cooperation with customers, investment recovery, and internal environmental management. None of these studies was conducted in Rivers State. In continuance to the established argument, this paper sought to investigate on green supply chain management and performance in downstream oil firms in Rivers State by integrating three dimensions (Green Procurement, Eco-Design and Green Logistics) and one measure of performance (environmental sustainability).

### **1.1 Problem statement**

Environmental degradation caused by downstream oil firms such as rapid depletion of resources, environmental pollution, global warming and decrease in biological diversity and ecological imbalance has prompted this paper. These ecological problems has continuously led governments of nations, host communities, establishments (downstream oil firms) and the general public to take safety measures in environmental related matters (Walker et al., 2008). Petroleum companies largely seen as one of the source of environmental problems have had to review their production processes and supply chains as a result of pressure from the host communities and governments. In order to understand basic environmental problems and to produce effective solutions, it is required for the downstream oil firms to be aware of the sources of environmental issues in its scope (such as production, transportation, procurement and the product). While offering goods and services to meet peoples' demand, establishments consume limited resources and cause environmental pollution by interfering with hazardous spillage, wastes, air, water and soil that they release into the environment (Azapagic, 2003) and these are injurious to health.

Despite different policies and regulations by NGOs and the government to ensure a friendly environment of no toxic chemicals and waste by the industries, evidences abound that wreckage of natural resources have caused a significant negative impact on performance of most downstream oil firms in the State. Gas flaring in Nigeria is a worrying dilemma for years among host communities and limited efforts has been made by these firms to reduce it adverse impact on the life of the people. Also, evidences has shown excessive amount of carbon dioxide and methane in the atmosphere within Rivers State have results in the depletion of the ozone layer, acid rain and the deadly soot experienced on daily basis. Against this backdrop, this study examines how improved GSCM can proffer solutions to poor performance in downstream oil firms in Rivers State. The aim of this study was to examine the relationship between green supply chain management and performance in downstream oil firms in Rivers State. The specific objectives are put forward: to examine the effects of green procurement and environmental performance; to determine the effects of eco-design and environmental performance; to determine the effects of green logistics and environmental performance.

## **2.0 LITERATURE REVIEW**

**2.1 Theoretical foundation:** Ecological modernization theory (EMT) underpinned this paper and the theory got its backing from sociological theory which further developed into policy and organizational theories (Spaargaren & Mol, 1992). EMT is on the premise that organizations innovate and develop technologies in business to help protect the environment, that is, being environmentally-friendly (Jänicke, 2008; Murphy & Gouldson, 2000). The theory suggests that environmental regulations and policies can drives GSCM practices amongst downstream oil firms and other manufacturers (Jänicke, 2008). To advance GSCM orientation, industrial harmony through stakeholder integration and legal backing by government of countries are needed (Mangla et al., 2014a). Some authors have argued that EMT is the starting point of environmental policy integration by petroleum firms (Gibbs, 2000 cited in Mangla et al., 2014a), and such policies is important for GSCM initiatives (Berger et al., 2001).

According to Jänicke (2008), firms that modernized ecologically in their business activities gained to benefit both economically and environmentally. Industrial ecology, of which GSCM is a significant facet, can help them achieve environmental sustainability through ecological modernization initiatives (Huber, 2000 cited in Mangla et al., 2014a). This theory is found to be important in this paper for downstream oil firms, because it motivate firms that green their production and other business activities which in turn improved both their economic and environmental performance.

## 2.2 Green Supply Chain Management (GSCM)

Increased in environmental deterioration has raised concerns amongst scholars and government of nations. Many articles have been published in the past few decades on GSCM (Fahiminia, et al., 2015; Mangla et al., 2014a; Min & Kim, 2012). GSCM has been expressed as an actionable move to improve the environmental performance and reduction of risk to companies (Mangla et al., 2014b). GSCM can be seen as "the sum of green procurement, eco-design, green manufacturing and material management, green distribution, green promotion, green product, green pricing, and reverse logistics" (Mishra et al. 2017). Dubey et al., (2019) posited that, one of the significant key expressions for this concept success is sustainability and hence, being green is mostly correlated with being "sustainable" (Baines et al., 2012). According to Ninlawan et al. (2010) and Thoo et al. (2014), multi-dimensionalized GSCM are green procurement, green manufacturing, green distribution and green logistics needed by downstream oil firms to achieve enhanced environmental performance. Green et al. (2012) suggested that it should include internal environmental management, green information systems, green procurement, collaborate with customers, eco-design and investment recovery. Laosirihongthong et al. (2013) investigated the influence of pro-active (reverse logistics) and re-active (threat of legislation and regulation) practices of GSCM on organizational performance.

These determinants were classified into two key sets: organizational internal determinants and institutional external determinants (Testa & Iraldo, 2010). Internal GSCM was defined as organizational-oriented practices in the framework of realizing the environmental set objectives, while external GSCM was viewed as integration-oriented initiatives with organization's stakeholders that are directed to boost the environmental performance of firms especially, those in petroleum industry as suggested by (Zhang et al., 2018). Diabat & Govindan (2010) study used eleven determinants of GSCM implementation in Indian construction companies; green design, government regulations, environment directed collaboration between the company and its suppliers, energy consumption reduction, material recycling, environment-directed collaboration between the company and its customers, reverse logistics, ISO 14001 certification, suppliers' environmental management system, eco-design and integration of quality environment management into planning and operational processes. Petljak et al. (2018) conceptualized GSCM using 3 variables: green purchasing, green logistics and suppliers' integration. Finally, Jayant & Tiwari (2018) conceptualized GSCM in their study using the following variables: green procurement, green design, green operations, green purchasing, green manufacturing, and green marketing.

### 2.2.1 Green Procurement (GP)

Procurement activities is a key marketing contributor in a supply chain that links an establishment with their suppliers through buying of required environmentally related materials, services and equipment for manufacturing activities, which ensures absolute, effective movement of inventories at the lowest total cost, maximizing customer expectations as well as improving quality of the finished goods (Wisner et al., 2012). Procurement function plays a very important role in selecting the right environmentally-friendly products such as green raw materials, green components, parts and supplies which can save cost for the establishment (Wisner et al., 2012; Olaore & Adebisi, 2013). Green procurement is defined as a set of supply-oriented initiatives utilized by an establishment to effectively and efficiently select suppliers based on their environmental consciousness, technical and eco-design competence, environmental sustainability, ability to produced environmentally-friendly offerings and ability to support important company's environmental objectives (Paulraj, 2011). According to Olaore and Adebisi, (2013) GP can also be defined as integrating environmental consciousness and concerns into the purchasing and supply processes (Rao & Holt, 2005). Choosing the right supplier has a considerable impact in realizing a firm's environmental set goals. However, choosing the suitable supplier is not enough by itself to improve environmental sustainability. Once a suitable supplier has been chosen, the procurement process must be handled cautiously by adopting a strategic and collaborative mindset with the suppliers (Paulraj, 2011) and this will give the firm an edge over the competitors. GP initiative centred on the acquisition of green materials from suppliers to meet the needs of producing the organizational product or service that will not harm the environment rather improve and sustain it (Michael, 2012).

### 2.2.2 Eco-Design (ED)

Eco-design is important not because of its closeness to other stakeholders in the value chain but for its direct impact on the environment (Sarkis, 2003). ED include simple green packaging, biodegradability, eliminating excessive packaging, use of paper wrappings, easy disassembly and use of simplified packaging materials that confirmed with the environment and well-being of the people (Kung et al., 2012 cited in Kirchoff et al., 2016). In order to satisfy these green ED demands, downstream sector has to come up with innovative ideas and processes in doing business by adopting green technologies and international environmental standards (Zhu et al., 2013). The concept is referred to as design for environment, green design, environmentally thinking design, plc design, clean design and sustainable design has been elaborately discussed in literature (Kirchoff et al. 2016) as a result of its relevance in business sustainable development. It is a proactive initiative that impacts all the phases of a product life cycle including: raw material extraction, production, packaging, distribution, use, recovery, and recycling (Jeswiet & Hauschild, 2005).

ED centres on deteriorating the environmental harmfulness of offerings before it is produced, marketed and consumed. It determines the disassembly of offerings at the end-of-life and reveals the associated cost benefits and environmental influence of revision, reuse and recycling (Harrison, 2011). ED is referred as the process of proactively designing products to perform the following: 1) optimize all the production functions e.g. fabrication, assembly, test, procurement, shipping, delivery, service, and repair, and 2) assure the best cost effectiveness, quality, reliability, regulatory conformity, wellbeing, market presence, and customers' expectation (Zhu et al., 2013). As put together by Karlsson and

Luttrupp (2006), it is a sustainable way out of an offering that practices reduction of adverse and toxic substances for social and environmental performance.

### **2.2.3 Green Logistics (GL)**

Acquired materials must get to the buyers destinations in predetermined time frame. This movement must be such with little impact on the environment. It refers to as green logistics. McKinnon (2010) defined GL as the movement and delivery of inventories with little environmental impact while keeping the cost effectiveness low. Furthermore, Rodrigues et al. (2010) also viewed GL as initiatives geared towards reducing the environmental challenges that involves material handling, waste management, packaging and transportation of inventories. It is also the delivering of offerings directly to the purchaser's destination, using alternative means of transportation and grouping all inventories ordered together, rather than in smaller batches (Ninlawan et al., 2010), while investing in the mode of transportation that are designed to reduce environmental harmfulness, and planning routes (Holt & Ghobadian, 2009). As rightly put, Laosirihongthong et al. (2013) perceived GL as reverse logistic that includes gathering used offerings and packaging from customers for recycling, returning packaging and offerings to suppliers for reuse, and requiring suppliers to collect their packaging inventories.

GL is significant to organizations in the followings ways: 1) it could lead to a long lasting competitive advantage and improved logistics efficiency (Walker et al., 2008). It helps in reducing costs through costs savings due to reduced packaging waste, reduced health and safety costs, lower labour costs, and shorter lead times resulting in lower costs (Carter & Rogers, 2008). Movement of goods has a negative influence on the local air quality, generates noise pollution, leads to accidents, cause traffic congestion, fallen of trucks on the high ways and finally, global warming (Zhu et al., 2013). Green logistics can be explained as an applied organizational initiatives motivated to allocate and circulate environmental consciousness, in detailed environmental sustainability, through the entire supply chain initiatives, by extending integration between organisations and their suppliers (Lee, 2008). Also, it attempts to preserve internal safety and environmental sustainability by the ability to self-regulate based on information from the external environment (Vachon & Klassen, 2006).

### **2.3 Performance (P)**

Performance is literally viewed as a means to assess the effectiveness and efficiency of the management inputs. Performance is an appraisal designed to evaluate the establishment's extent of success in achieving their set goals (Daft, 1995). Establishments use green supply chain management initiatives which incorporate organizational and environmental performances (Zhu & Cote, 2004). In a bid to minimized environmental hazard, GSCM integrates an important organizational performance indicator. To achieve these set goals, top management echelons and operational personnel must collaborate. It should be recapped that, top management is responsible for providing strategic and organizational performance measurement, and maximizing profit and shareholder wealth and employees in charge of operations should be trained to gather and evaluate data (Hamel & Prahalad, 1989). However, Chien (2014) posited that, organizational performance includes social performance, which stipulates that an enterprise should provides a conducive working environment, show social commitment, interaction and participation, recommend education and training, and engage in manpower development (capacity building).

On the other hand, marketing performance is an organization's ability to improve its customer satisfaction, sales and market share relative to competitors. Homburg (2007) defined performance from marketing perspective as: "the effectiveness and efficiency of a business's marketing initiatives with regard to market-related set goals, such as customer satisfaction and loyalty, revenues, growth, and market share. The marketing performance matrix is described by Green et al. (1995) as being the level of market success achieved by at the prime-of-life phase of the market life cycle. Other indicators of the performance are categorized on financial and non financial matrix such as revenue, sales volume, profitability, return on investment (ROI), and return on satisfaction (ROS), customer satisfaction and loyalty, customer purchase intention, retention, advocacy and quality level. According to Zampese et al. (2016), green supply chain management is based on marketing performance, such as branding, increase in sales, improved market share, customer satisfaction and loyalty.

#### **2.3.1 Environmental Performance (EP)**

Green procurement, eco-design, and green logistics are some of the key factors in GSCM. More efficient suppliers' processes may contribute to decrease transaction costs, wastes, hazardous materials, increasing recycling and reuse of raw materials and to follow environmental regulations set aside by the country's Government, Non-governmental organization and other business bodies (Sarkis, 2003). In order to better understand basic environmental problems and produce comprehensive solutions, it is imperative for downstream oil firms to identify the sources of environmental troubles in its entirety during production, transportation, procurement and the product while producing offerings to meet populace demands and troubles like hazardous wastes, air, water and soil as they are released into the environment (Azapagic, 2003). EP is refers to all the natural deposits and those provided by man in his efforts to make life better, meaningful and comfortable. This further explained to as those factors that affects man in many ways such as land, water, air, trees, grasses and houses (Nwanne, 2013).

EP focuses on plummeting supply chain initiatives on the production of carbon monoxide, solid and runoff wastes, gas and other emissions to air and water, sulphur dioxide (SO<sub>2</sub>), nitrogen oxide (NO), energy consumption, use of water and fuel, water pollution, air pollution, noise pollution, hazardous and toxic material use and consumption (Zhu et al., 2013). All these aforementioned factors have adversely affects the environment causing health challenges to same man. It is on this point that establishments into manufacturing sector like downstream oil firms are mandated to be green

conscious in their supply chain management. GSCM initiatives cover every effort to ease the adverse effects of an establishment's offerings on the environment. These efforts positively impact the improvement of environmental performance by reducing the consumption of solid/liquid wastes and hazardous substances, reducing the incidence of environmental accidents and improving host community health (Eltayeb et al., 2011).

#### **2.4 Green Supply Chain Management and Performance**

A study conducted by Mumtaz et al. (2018) in Pakistan on the impact of GSCM initiatives on business performance. Four GSCM initiatives were considered. They are: internal initiatives, external parties such as suppliers, customers, government and the general public, investment recovery and eco-design which discerned on environment-friendly offerings. Their findings revealed a positive significant relationship with environmental performance. Agyemang et al. (2018) studied on the factors militating against GSCM implementation in cashew industry in West Africa. Three barriers were found to be lack of top management commitment, integrated management information and traceability systems. Also, Zhu and Sarkis (2004) investigated the impact of GSCM on organizational performance using internal factors of environment management, external factors of GSCM, eco-design, and investment recovery as the measures. They also conceptualized internal environment management using indicators such as management commitment, cooperation for environmental improvements, and environment-oriented total quality management (TQM). Their results found to have effect on performance.

Research by Wang et al. (2018) covered 246 companies: cost and customer drivers were found to significantly affect GSCM implementation. Irum et al. (2018) investigated on green supply chain management in Asian countries and found that GSCM initiatives were strongly correlated with organizational performance as conceptualized by economic, operational and environmental performance. It was understood from these results that companies' awareness about GSCM initiatives encourages or prevents the intention of going green.

##### **2.4.1 Green Procurement and Performance**

Martha and Houston (2010) suggested that the basic aim of green procurement is to eliminate or reduce waste and in so doing, purchasing department should focus on the value by meticulously considering the total cost in the process of eliminating waste and waste disposal activities. It strives to ensure that procured offerings meet environmental targets set by the procuring company that minimizes environmental impact. According to Igarashi et al. (2013), GP has an important position in choosing suppliers. The authors identified key selection criteria: (i) Aligning supplier selection with an organization's overall green initiatives. (ii) The position of decision making tools and models in green supplier selection. After reviewing extant literature by this present study on green procurement, some barriers were spotted to have effect on the outcome of green procurement, they are: insufficient information between decision takers, lack of familiar implementation standards and follow-ups, real and forecasted degradation cost, market and technical uncertainties.

In the process of GP, suppliers, procurement managers, upstream members of the green supply chain should work with an established goal to reduce wastage and provide environmentally friendly offerings. GP often highlights specific attributes such as recycled content, energy efficiency, and waste reduction. It can be treated as pre-steps taken to control the environmental impediments. It is like precautionary action taken at the start of the supply chain to check waste rather than taking action at the end of the supply chain. Based on this assertion, the following hypothesis was formed:

Ho<sub>1</sub>= Green procurement has no significant influence on environmental performance.

##### **2.4.2 Eco-Design and Performance**

Study by Hart and Ahuja (1996) has suggested that firm striving to achieve competitive advantage would depends largely on how their option for more advanced environmental strategies are built on low emissions, but which should also involve other sources of sustainable competitive advantage. Business establishments with very low production emissions relative to competitors may be able to gain first-mover advantage in emerging green product markets (Russo & Fouts, 1997). According to Wagner (2005), the level of ED achievable performance is dependent on how business establishments achieve an environmental sustainability using a technology that has a pollution proactive initiative. Klassen and Whybark (1999) in their study found that eco-design initiative exert a positive influence on firm performance. Studies like Hanim et al. (2012) found that eco-design in GSCM support environment initiatives in some countries. Based on this point, the following hypothesis was formed:

Ho<sub>2</sub>= Eco-design has no significant influence on environmental performance.

##### **2.4.3 Green Logistics and Performance**

Green logistics is an environmentally-friendly and effective mode of transportation, in contrast to conventional road and air transport, which have hazardous repercussion on the environment for consuming fossil fuels, which consequently, produces carbon monoxide, and polluting the air, soil and water (Min & Kim, 2012). The initiation of green logistics should be matched with green production, green marketing, green consumption and other economic values (Hang, 1996). Green procurement, green material/component management and production, green distribution, green marketing, and reverse logistics are some initiatives imbedded in green logistics (Hervani et al., 2005). Rao and Holt (2005) study found a positive effects of outbound logistics, and savings cost on firm's competitiveness with respect to enhanced quality, productivity, efficiency, and cost saving. Barnett & King (2008) found out that chemical spill activities have negative impacts on the environment. They suggested logistics firms should collaborate together with industry

self regulation to help curb harmful spill-over which could reduce the financial performance of the firms. Based on this backdrop, the following hypothesis was formed:

H<sub>03</sub>= Green logistics has no significant influence on environmental performance.

**3.0 Methodology**

Jayant and Tiwari (2018) adopted Decision Making Trial and Evaluation Laboratory (DEMATEL) method of measuring the cause-effect relationships between performance and GSCM. Sibel and Bulent (2019) studied the relationships between dimensions of GSCM and sustainability performance tested by using a plant-level survey and Structural equation modelling to test the proposed hypotheses. Jassim and Al-Mubarak (2020) adopted the quantitative approach in the explanation of influence of green practices on firms' performance and also Survey design using Fixed-alternatives questions (closed-ended questions) to gathered data from were respondents. This study adopted the social scientist perspective of viewing our world. Social science describes social occurrences using scientific technique (Myers & Avison, 2002). In order to present a more realistic result and argument, this study explored some paradigms of social research. Based on the nature of the study, the objective (quantitative) research paradigm which sees human beings objectively, and also, considering the fact that social scientists look to different avenues to study human society. The objective (quantitative) scientific paradigm was adopted for this study. In the light of this philosophical standpoint, this study adopts cross-sectional research design which enabled the researcher to evaluate and measure opinions of respondents. Basically, the population of this study were branch managers, operation manager and marketing managers of downstream oil firms in Rivers State. The population comprise of fifty-five (55) registered downstream oil firms in Rivers State (Rivers State Yellow Page Directory 2013-2014).

Three (3) copies of questionnaire were given to the respondents making it a total of one hundred and sixty-five (165) copies of questionnaire. Given the above fact, the method of sampling techniques adopted was convenience sampling. The questionnaire was structured using a five-point likert scale from SA=Strongly Agree (5), A=Agree (4), U=Undecided (3), Disagree (2), Strongly Disagree (1) (see appendix 1). Simple regression was used to test the relationship between green supply chain management variables and performance measures.

**4.0 DATA ANALYSIS AND RESULTS**

One hundred and sixty-five (165) copies of questionnaire were distributed. 141 copies corresponding to 85% were correctly filled with the remaining 24 copies representing 15% as a result of some omissions and incomplete entries. Therefore, the analysis was based on 141 copies.

**Table 1: Respondents Demographics Distribution**

Details	Particulars	Frequency	Percentage (%)
<b>Gender</b>	Male	86	61
	Female	55	39
	<b>Total</b>	<b>141</b>	<b>100</b>
<b>Age group</b>	<=25 years	17	11
	26-35	36	26
	36-45	45	32
	46-55	31	22
	56-above	12	9
	<b>Total</b>	<b>141</b>	<b>100</b>
<b>Academic Qualification</b>	OND/NCE	29	21
	B.SC/HND	88	62
	M.SC	18	13
	Ph.D	6	4
	<b>Total</b>	<b>141</b>	<b>100</b>

Table 1 shows the demographics distribution of respondents. For gender; 86 of the respondents representing 61% were males while 55 of the respondents representing 39% were females. For the age group of the respondents; 17 respondents corresponding to 11% fell within the age group of <=25 years, 36 of the respondents out of 141 of the total respondents corresponding to 26% fell within the age group of 26-35 years, 45 respondents representing 32% fell within the age bracket of 36-45 years, 31 of the respondents representing 22% fell within the age group of 46-55 years while 12 respondents representing 9% fell in the of 56 and above years. For academic qualification; 29 respondents representing 21% were OND/NCE holders, 88(62%) of the total respondents were B.Sc/HND holders, 18 respondents which represent 13% were M.Sc holders while 6 respondents representing 4% were Ph.D holders.

**4.1 Regression Analysis**

**4.1.1 Model One**

H<sub>01</sub>: No significant relationship between green procurement and environmental performance.

**Table 2: Regression Analysis showing the effect of Green Procurement(GP) on Environmental Performance(EP).  
Model Summary<sup>b</sup>**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.917 <sup>a</sup>	.840	.836	.35738	.339

- a. Predictors: (Constant), Green Procurement
- b. Dependent Variable: Environmental Performance

The table 2 above showed the significant relationship between GP and EP in downstream oil firms in Rivers State. The results indicated a regression relationship (R) of 0.917 while R<sup>2</sup> was 0.840. This explained that GP has 84% variation in EP. It further signified a positive and strong relationship existed among variables. The Durbin-Watson, 0.339, shows that there is no existence of serial collinearity of the first order. The variables used were non-linearity.

**Table 3: ANOVA  
ANOVA<sup>a</sup>**

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	82.652	1	27.551	215.708	.000 <sup>b</sup>
	Residual	15.710	140	.128		
	Total	98.362	141			

- a. Dependent Variable: Environmental Performance
- b. Predictors: (Constant), Green Procurement

As evidenced from the Table 3, the Pv was 0.000<0.05, which posited a significant nexus between GP and EP. The F-ratio (F1, 141=215.708) showed significant interaction existed in the model. The t-ratio showed significance influence of GP on EP.

**Table 4: Coefficients  
Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.923	.087		22.178	.000
	Green Procurement	.894	.569	.144	1.353	.000

- a. Dependent Variable: Environmental Performance

**Regression Model: EP = 1.923+0.894GP**

Premised on the Table 4 above, a significant effect existed between the two variables. It further showed that the variables have below 0.05 significance levels of 95%. Unstandardized coefficient beta for GP was 0.894. This means that if green procurement increases by a unit, environmental performance increases by 0.894.

**4.1.2 Model Two**

H<sub>02</sub>: No significant relationship between eco-design and environmental performance

**Table 5: Regression Analysis showing the influence of Eco-Design(ED) on Environmental Performance(EP).  
Model Summary<sup>b</sup>**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.951 <sup>a</sup>	.904	.903	.22772	1.328

- a. Predictors: (Constant), Eco-Design
- b. Dependent Variable: Environmental Performance

The result above (Table 5) showed a significant association between eco-design and environmental performance. The results indicated a regression relationship (R) of 0.951 while R<sup>2</sup> was 0.904. This explained that ED has 90.4% variation in EP. It further explained a positive and strong relationship between variables. The Durbin-Watson, 1.328, shows that there is no presence of serial collinearity of the first order. The variables used were not linear.

**Table 6: ANOVA  
ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	60.983	1	60.983	1176.035	.000 <sup>b</sup>
	Residual	6.482	140	.052		
	Total	67.465	141			

- a. Dependent Variable: Environmental Performance
- b. Predictors: (Constant), Eco-Design

The result above showed Pv to be less than 0.05, which signified a significant association between ED and EP. The F-ratio (F1, 141=1176.035) showed significant relationship among variables in the model. The t-ratio showed significance influence of ED on EP.

**Table 7: Coefficients**  
**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.320	.115		2.794	.006
	Eco-Design	.932	.027	.951	34.293	.000

- a. Dependent Variable: Environmental Performance

**Regression Model: EP= 0.320+0.932ED**

Premised on Table 7 above, a significant relationship existed between ED and EP. It further showed that the variables have below 0.05 significance levels (95%). Unstandardized coefficient beta for ED was 0.932. This means that if ED increases by a unit, EP increases by 0.932.

**4.1.3 Model Three**

H03: No significant relationship between green logistics and environmental performance.

**Table 8: Regression Analysis showing the influence of Green Logistics (GL) on Environmental Performance (EP).**  
**Model Summary<sup>b</sup>**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.958 <sup>a</sup>	.918	.918	.21976	.306

- a. Predictors: (Constant), Green Logistics
- b. Dependent Variable: Environmental Performance

The result above (Table 8) revealed a significant position between GL and EP. The results indicated a regression relationship (R) of 0.958 while R<sup>2</sup> was 0.918. This explained that GL has 91.8% variation in EP. Also, a positive and strong relationship existed between variables. The Durbin-Watson, 0.306, shows that there is no presence of serial collinearity of the first order. The variables used were not linear.

**Table 9: ANOVA**  
**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	67.837	1	67.837	1404.616	.000 <sup>b</sup>
	Residual	6.037	140	.048		
	Total	73.874	141			

- a. Dependent Variable: Environmental Performance
- b. Predictors: (Constant), Green Logistics

The result above (Table 9) showed Pv to be less than 0.05, which signified a significant association between GL and EP. The F-ratio (F1, 141=1404.616) showed significant relationship among variables in the model. The t-ratio showed significance influence of GL on EP.

**Table 10: Coefficients**  
**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.391	.099		3.946	.000
	Green Logistics	.916	.024	.958	37.478	.000

- a. Dependent Variable: Environmental Performance

**Regression Model: EP = 0.391+0.916GL**

Premised on Table 10 above, a significant relationship existed between GL and EP. It further showed that the variables have below 0.05 significance levels (95%). Unstandardized coefficient beta for GL was 0.916. This means that if GL increases by a unit, EP increases by 0.916.

## 5.0 DISCUSSION OF FINDINGS

### **Green procurement significantly and positively relates with environmental performance.**

The result from the hypothesis revealed a significant effect of green procurement on environmental performance. On this premised, the null hypothesis one statement was rejected, showing a strong and positive significant relationship between green procurement and environmental performance in downstream oil firms in Rivers State. The finding of the study is in agreement with the work of Igarashi et al. (2013), which revealed a positive significant relationship between green procurement and firm's performance. Wang et al. (2018), found GP to significantly affect environmental sustainability. Irum et al. (2018) found that GSCM initiatives were strongly correlated with organizational performance as conceptualized by economic, operational and environmental performance.

### **Positive relationship between eco-design and environmental performance.**

Result has shown that a strong and positive relationship existed between eco-design and performance. Based on that backdrop, the null hypothesis two was therefore rejected. This indicates that eco-design contributed significantly as a predictor of environmental sustainability. The result of the finding aligns with the work of Hanim et al. (2012) found that eco-design in GSCM support environmental performance. Wagner (2005) found that ED positively influenced environmental sustainability using a technology that has a pollution proactive initiative. Klassen & Whybark (1999) in their study found that eco-design initiative exerts a positive influence on firm performance.

### **Relationship between green logistics and environmental performance**

The result on the relationship between green logistics and performance observed related and significant. Premised on that, the null hypothesis three of no significant relationship was therefore rejected. This indicates that green logistics contributed significantly as a predictor to environmental performance. Some authors results revealed positive correlation between green logistics and environmental performance (King & Lenox, 2001; Rao & Holt, 2005; Zhu, et al., 2013; Azevedo, et al., 2011; Green, et al., 2012) and this agreed with the findings of this study, except the work of Wang and Sarkis (2013) that found a negative relationship between green logistics initiatives and business performance.

## 5.1 CONCLUSIONS AND RECOMMENDATIONS

This study examined the impact of green supply chain management constructs (green procurement, eco-design and green logistics) on performance (environmental performance) in downstream oil firms. From the findings, green supply chain management to a large extent influences the measures of environmental performance; green procurement influences environmental performance positively, eco-design influences environmental performance positively and green logistics influences environmental performance positively. This therefore concludes that green supply chain management dimensions significantly influence environmental performance, thus it was established that a positive and significant relationship exist between these variables.

Based on the findings and conclusion of the study, the following are recommended:

1. Managers and marketers in downstream oil firms should identify several capabilities, their relative significance, and the processes for realizing green supply chain management which when properly executed can improve environmental performance and environmental sustainability.
2. Government as urgency of necessity should engage all stakeholders to ensure implementation of policies that will ensure strict adherence to environmental regulations.
3. In order to achieve efficiency and effectiveness in the management of green supply chain initiatives, supplier and customers have to form workable collaboration via information sharing about environmental accidents.
4. Organizational policy in this manner should be structured in ay that allows selecting of suppliers with environmentally friendliness.
5. The managers in downstream oil firms in Rivers State and beyond should develop green crusade that will focus on creating strong visibility and environmental consciousness among stakeholders.
6. Downstream oil firms through their management must be up to speed about new trends in the areas of climate change, global warming, clean technology, and green consumer behavior.

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