

## Effect of Green Shipping Practices on Cost Reduction of Shipping Companies in Rivers State, Nigeria

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### ABSTRACT

This study investigates the effect of green shipping practices, specifically green suppliers and green procurement, on cost reduction in shipping companies operating in Rivers State, Nigeria. The study employed a cross-sectional survey design and census sampling technique; structured questionnaires were administered to 160 managerial staff across 20 functional shipping firms, with 134 valid responses retrieved (83.75% response rate). Data reliability was established using Cronbach's alpha (overall  $\alpha = 0.8464$ ). Multiple regression analysis revealed that green suppliers have a positive but statistically insignificant effect on cost reduction ( $\beta = 0.030$ ,  $t = 0.971$ ,  $p = 0.812 > 0.05$ ), while green procurement demonstrates a positive and significant influence on cost reduction ( $\beta = 0.028$ ,  $t = 2.310$ ,  $p = 0.007 < 0.05$ ). These findings indicate that green procurement contributes meaningfully to operational cost reduction through efficient resource utilization and waste reduction, supporting the adoption of sustainable practices in the maritime sector. The study recommends that shipping companies prioritize green procurement strategies and calls for supportive government policies to enhance the implementation and economic benefits of green shipping initiatives in developing economies.

**Keywords:** Shipping Companies, Green Shipping Practices, Green Procurement, Green Suppliers, Cost Reduction, Operational Performance.

### Introduction

Green shipping is an efficient form of marine transport that causes minimal health and minimal ecological damage (Wan *et al.*, 2016). It could serve as an energy-efficient means of moving large quantities of cargo, facilitating a transition to a low-carbon green economy. Green shipping is widely believed to be efficient in controlling pollution emissions and in achieving a friendlier environment. This is to imply that green shipping is ecofriendly. This, in turn, makes green shipping a worldwide interest. An increased number of studies have been conducted over the last three decades toward the transition to green shipping. Increasing operational efficiency directly affects the organization's profitability; efficient businesses are more cost-effective. Any aspect of operational efficiency in business types is crucial and must be earned by management for consideration of healthy and sustainable financial performance (Sufian, 2007).

One of the most important goals of company management is to maximize its effectiveness in current and future financial and business performance as they affect market price per share and shareholder wealth (Gill *et al.*, 2014).

The shipping industry is now experiencing increased pressure to comply with more stringent environmental regulations to become cleaner and greener in its operations. Therefore, adoption of green shipping practices (GSP) is increasingly popularized by shipping companies (Lun & Lai, 2014; Venus-Lun *et al.*, 2015; Cheng *et al.*, 2013). Lirn *et al.* (2014) and Lai *et al.* (2011) reported separately the importance of green shipping management on the ecosystem and efficiency in the operation of shipping company and the conceptualization of GSP in the shipping sector. Yang *et al.* (2013) addressed the effect of green supply chain management on firm competitiveness in the container shipping industry in Taiwan.

The research findings confirmed that green practices positively influence firm competitiveness. Lirn *et al.* (2014) identified critical green shipping management dimensions in terms of greener policy, greener ships, and greener suppliers. The results found that greener policy had a positive impact on greener ships and greener suppliers, whereas greener ships and greener suppliers had an indirect impact on financial performance via operational performance.

Green shipping may help shipping companies to better control uncertainty, increase their ability to seize fresh opportunities, and keep a competitive edge in a corporate environment which is always evolving (Bleady *et al.*, 2018). Therefore, Dynamic Capabilities Theory stresses the need for shipping companies to create and use contemporary green shipping practices to enable constant adaptation and reconfiguration of their long-term growth and success strategies. The need for green shipping practices has been growing as organizations and researchers begin to realize that the management of environmental programs and operations does not end at the boundaries of the organization (Bleady *et al.*, 2018). According to Rao (2002), major companies around the world have developed and implemented comprehensive programs to control and improve their environmental practices across their companies.

One of the most importances of green suppliers is that it reduces purchasing risk issues (Quan *et al.*, 2018). The goal of green shipping practice is to minimize damage to resources and the environment within which enterprises operate, about the company, while pursuing economic benefits, to meet the sustainable development of societies (Chang *et al.*, 2017). This study is aimed at investigating the effect of green shipping practices on the cost reduction of shipping companies in Rivers State, Nigeria.

## Methodology

### Research Design

The study adopted a cross-sectional survey. The purpose of the research design was to help avoid a situation in which the evidence does not address the initial research questions (Architha and Aithal, 2020). This explanatory study=adopted a causal investigation method to examine the influence of green shipping practices and operational performance of shipping companies, in a non-contrived environment.

The study's level of involvement will be minimal. The study adopts the concurrent methodological triangulation while our unit of analysis will be at the macro level.

### Population of the Study

The population of this study comprised of the twenty (20) functional shipping companies operating with physical offices in Port Harcourt, Rivers State, Nigeria which are also enlisted on Finelib.Com Nigerian Directory 2024.

### Sample Size and Sampling Procedure

The sample size was the same as the population since the population is not too large. However, a census sampling technique was adopted to administer copies of structured questionnaire to eight (8) managerial staff of each of the shipping companies. This means that a total of 160 respondents were sampled in the study. Twenty (20) registered shipping companies, listed in the Nigerian Stock Exchange Facts Book of 2024 from the population of the study constituted the sample size. To ensure equitable coverage of the firms under the study, eight management staff were purposely designated from each of the twenty (20), of the selected shipping companies and 160 management staff on the whole were sampled.

### Data Collection Methods

The concurrent methodological triangulation approach was adopted by combining the nomothetic and ideographic methods of data collection and analysis. Two major sources of data were employed in this study. The primary source of data collection method was through questionnaire. The secondary source of data was documentary sources, where the study relied on the information that was derived from literature review, Journals, Textbooks, Internet and annual reports of our study firms. The structured questionnaire design for this study was divided into two sections. Section one was structured to elicit demographic information on the respondents, while section two presented questions on the study variable.

### Measurement of Variables

The survey instrument that will be used in this study to measure the variables of the study was adopted from the literature (Architha and Aithal, 2020).

The dimensions were measured using the five-point Likert scale response (ranging from 5 = very great extent to 1 = very low extent). It is expected that respondents will show with the scale the extent to which green shipping practices relates with operational efficiency at the workplace.

**Validity of the Research Instrument**

Validity is defined as how much any measuring instrument measures proposed to quantify. Bryman and Bell (2003) additionally suggested that the crucial issue of measurement validity identifies with if measures of idea measure the design. Validity alludes to the result of whether a marker (or set of pointers) that is conceived to gauge an idea measure that idea. A few methods for establishing validity are; face validity, concurrent validity, predictive validity, construct validity and convergent validity (Architha and Aithal, 2020). In this study, construct validity was used.

**Reliability of the Research Instrument**

Reliability is quality in a general sense worried with issues of consistency measures (Architha and Aithal, 2020). There are three important elements identified with considering whether a measure is a sign of reliability: dependability, inner dependability, and internal observer consistency. Bryman and Bell (2003) recommended that a multi-item measure in which each answer each question are amassed to frame overall score, we should make certain that every one of our indicators is identified. It can be tested using Cronbach’s alpha method (Bahman et al., 2022). The results of 0.7 and above will simply be an acceptable level of internal reliability.

**Model Specification**

The econometric model of the study was given as:

$$\begin{aligned}
 CR &= \beta_0 + \beta_1 GS + \beta_2 GP + \mu_t \dots\dots\dots 1 \\
 C &= \beta_0 + \beta_1 GS + \beta_2 GP + \mu_t \dots\dots\dots 2 \\
 ECE &= \beta_0 + \beta_1 GS + \beta_2 GP + \mu_t \dots\dots\dots 3
 \end{aligned}$$

Where;

- CR = Cost Reduction;
- C = Competitiveness;
- ECE = Effective Cargo Delivery
- $\mu$  = Error term
- $\beta_0$  = Constant
- $\beta_1 - \beta_3$  = Estimated Parameters

While the variable mathematical model of the study was given as:

$$\begin{aligned}
 CR &= f(GS, GP) \dots\dots\dots 1B \\
 C &= f(GS, GP) \dots\dots\dots 2B \\
 ECE &= f(GS, GP) \dots\dots\dots 3B
 \end{aligned}$$

Where;

- CR = Cost Reduction;
- C = Competitiveness;
- ECE = Effective Cargo Delivery
- GS = Green Supplier
- GP = Green Procurement

$b_0$  = The parameter which represents the intercept,  $b_1$ ,  $b_2$  = the regression parameters were used in determining the significance of the effect of each of the independent variables  $x_1, x_2$  on the dependent variables  $CR = Y_1$ ;  $C = Y_2$ ;  $ECE = Y_3$ ;  $e$  = Random disturbance term.

These include the variables that (although not specified) in this model may also affect green shipping practices and operational performance of shipping companies in Rivers State.

They include government policies, political instability, corruption, environmental digitalization of maritime logistics problems etc. The effects of digitalization of maritime logistics on the dependent variables were measured in interval and ratio scaling. The coefficient of determination ( $R^2$ ) was used to measure the rate at which the independent variable explained the dependent variable. The a priori expectations for the coefficients are as follows:  $\beta_0 > 0$ ;  $\beta_1 > 0$ ;  $\beta_2 > 0$ ;  $\beta_3 > 0$ ;  $\beta_4 > 0$

**Data Analysis**

In this study, percentages, ratios, frequency distribution, scaling, ranking, and other statistical tools were used to analyse and achieve the research objectives. Nevertheless, stepwise regression was used to test the moderating variable. Regression analysis was used to test the extent of the effect of individual and collective variables on the other.

Also, regression analysis was used to test the hypotheses formulated in the study. All these analyses were computed through the use of statistical package for the Social Sciences (SPSS), IBM SPSS Statistics 25 version” (Bahman et al., 2022).

## Results

The result of the alpha outcomes is shown in Table 1.

**Table 1: Test of Reliability**

Construct	No. of items	Alpha( $\alpha$ )
Green supplier	5	0.865
Green procurement	5	0.817
Cost reduction	5	0.824
Competitiveness	5	0.877
Effective cargo delivery	5	0.849
Total		4.232
Mean Reliability	$4.232 \div 5$	0.8464

From the alpha outcomes in Table 1, the instrument is a dependable one and is identified with the topic of the study. The information gathering instrument was tried for unwavering quality utilizing Cronbach's Alpha is within the acknowledged scope of 0.70 or more as the overall reliability test of the instrument is 0.8464.

The predictors and the criterion variables were found to be dependable as the constructs have alpha values above the Nunnally threshold of 0.7.

Table 2 shows the administration and retrieval of the questionnaire from the respondents' shipping companies. The summary of the number of the copies of questionnaire (data) found useful for the study indicate as follows: Captain 16 (80% response rate); Shipping Managers 18 (90% response rate); Vessel Owners 17 (85% response rate); Financial Controller/Accountant 18 (90% response rate); Flag State Surveyor's Owner 17 (85% response rate); Chief Engineer 16 (80% response rate); Second Engineer 17 (85% response rate) Chief Mate 15 (75% response rate).

Table 3 shows the gender distribution of the respondents, and this section enables the study to determine the number of men and the number of women who participated in the survey. The Table reveals that 114 males (85.0%) responded correctly to the questionnaire, while 20(15%) were females who responded correctly to the questionnaire. This indicates that the male respondents are in the majority.

**Table 2: Administration and Retrieval of Questionnaire**

Nature of the Respondents	Number of Questionnaire Administered	Number of Questionnaire Retrieved	Number of Questionnaire Found Useful	Percentage Performance
Captain	20	18	16	80.00
Shipping Managers	20	20	18	90.00
Vessel Owners	20	19	17	85.00
Financial Controller/Accountant	20	20	18	90.00
Flag State Surveyor's Owner	20	17	17	85.00
Chief Engineer	20	18	16	80.00
Second Engineer	20	18	17	85.00
Chief Mate	20	19	15	75.00
Total	160	149	134	83.75

**Table 3: Gender Distribution of the Respondents**

Sex	Number of Respondents	Percentage Performance
Male	114	85.00
Female	20	15.00
Total	134	100.00

Table 4 shows the years of experience’ distribution of the respondents in their present shipping companies.

**Table 4: Respondents’ Years of Experience in the Present Shipping Company**

Options	Number of Respondents	Percentage Performance
0 – 5 years	19	14.30
6 – 10 years	28	21.10
11 – 15 years	35	26.30
16 – 20 years	24	18.00
Above 20 years	27	20.30
Total	134	100.00

The data reveal that 19(14.30%) of the respondents have been in their shipping companies for 0-5 years; 28(21.10%) of the respondents have been in their shipping companies for 6-10 years; 35(26.30%) of the respondents have worked in their present shipping companies for 11-15 years; 24(18%) of the respondents have been in their present shipping companies for 16-20. Finally, Table 4.4 shows that 27(20.30%) of the respondents have been in their present shipping companies for above 20 years.

Table 5 showed that 23(17.3%) of respondents got their jobs with SSCE or its equivalent; 30(22.6%) of the respondents are holders of National Diploma; 32(23.30%) of the respondents possess a B.Sc. /BA/B. Ed/HND; 29(21.80%) of the respondents are Masters and above degree holders; 20(15%) of the respondents are professional certificate holders.

**Table 5: Respondent’s Level of Education**

Options	Number of Respondents	Percentage Performance
SSCE or Equivalent	23	17.30
National Diploma	30	22.60
B.Sc. /BA/B. Ed/HND	32	23.30
Masters and Above	29	21.80
Professional Certificate	20	15.00
Total	134	100.00

Table 6 shows the mean and standard deviation scores of 3.9624±1.85213 indicating that the consensus opinion of the respondent is that to a large extent implementation of green supply chain practices directly contribute to a reduction in our overall operational costs. Also, the mean and standard deviation scores of 3.9098±0.90837 imply that to a large extent government policy inconsistency problem, poor company policies and procedural problems, etc affect the implementation of Cabotage law. The statistical result of 3.8195±1.16667 (mean and standard deviation scores) shows that to a large extent company’s green initiatives provide a significant long-term reduction in terminal operating costs.

**Table 6: Cost Reduction as a Measure of Operational Performance of Shipping Companies**

S/No	Question Items	Mean	Standard Deviation
1	To what extent does implementation of green supply chain practices directly contribute to a reduction in our overall operational costs	3.7744	1.01217
2	To what extent do efficient waste segregation and recycling practices shorten processing times within our terminal operations affect the implementation of Cabotage law?	3.9624	1.85213
3	To what extent do company’s green initiatives provide a significant long-term reduction in terminal operating costs?	3.8195	1.16667
4	To what extent do shipping companies seen to engage technical/operations shipping staff. Training on ship building technology as their favorable human capacity development resulting from the Cabotage Law?	3.9098	0.90837
5	To what extent is eco-friendly practices, such as green procurement and waste management, help reduce unexpected operational expenses?	3.6992	1.04436

Table 7 shows the results of the test of hypothesized statements -  $H_1$  A and B. The result of the hypothesis 1A tested, show positive and insignificant effect of green supplier on cost reduction with t- value outcome of 0.971 @  $p0.812 > 0.05$ , meaning that green supplier has positive effect which is not significant on cost reduction, indicating that the alternate hypothesis 1( $H_{i1}$ ) has been rejected and null hypothesis 1( $H_{o1}$ ) accepted hence – “Green supplier has no significant effect on cost reduction of shipping companies in Rivers State”. In the case of green procurement and cost reduction which is hypothesis ( $H_{o1}$ ) B, the result of the hypothesis 1 ( $H_{o1}$ ) B tested, show positive and significant effect of green procurement on cost reduction with t- value outcome of 2.310 @  $p0.007 < 0.05$ , denoting that Green procurement has a positive effect which is also significant on cost reduction; therefore;

The alternate hypothesis 1 ( $H_{i1}$ ) B has been accepted and null hypothesis 1( $H_{o1}$ ) B rejected hence – “Green procurement has positive and significant effect on cost reduction of shipping companies in Rivers State”.

From the inferential statistical analysis so far, it can be stated that:

1. Green supplier as a dimension of green shipping practices has a positive and insignificant effect on cost reduction which is a measure of operational performance of shipping companies.
2. Green procurement as a dimension of green shipping practices has a positive and significant effect on cost reduction which is a measure of operational performance of shipping companies.

**Table 7: Results of Green shipping practices (GSP) and Cost reduction (SBA)**

Green shipping practices (Independent Variables)	Unstandardized Coefficients		Standardized Coefficients	t - value	Significant/ Probability Value	Decision
	B	Std. Error	Beta			
(Constant)	2.127	0.185		11.495	0.000	
Green supplier ( $H_{o1}$ ) (A)	0.030	0.081	0.049	0.971	0.812	Insignificant
Green Procurement ( $H_{o1}$ )(B)	0.028	0.080	0.033	2.310	0.007	Significant

## Discussion

The study found that the effect of green suppliers on cost reduction of shipping companies in Rivers State is positive but insignificant, as the t-value outcome of 0.971 validates this. Pang *et al.* (2021) revealed that green shipping practices reduce costs by lowering fuel consumption through route optimization and more efficient vessel operations, avoiding penalties for non-compliance with environmental regulations, accessing green financing opportunities, and improving operational efficiency and asset lifespan. While there are initial investments in new technologies and alternative fuels, the long-term economic benefits stem from increased profitability, better market positioning with eco-conscious customers, and potential access to financial incentives from lenders.

This study found that the effect of green procurement on cost reduction of shipping companies in Rivers State is positive but insignificant because of the study’s result t-value of 2.310.

From the various outcomes of the effects of green supplier as a dimension of green shipping practices on the measures of operational performance of shipping companies, it simply means that green supplier is meant for the operational performance of shipping companies.

This study also found that the implementation of green supply chain practices directly contributes to a reduction in our overall operational cost. This finding aligns with work of Bahman *et al.* (2022) as they maintain that green practices help our company achieve cost savings through more efficient use of resources and processes.

As the shipping industry moves toward sustainability, many businesses worry about the cost of adopting eco-friendly practices. A common myth is that green shipping is expensive and unsustainable for long-term profitability.

In support of this finding Barth *et al.* (2023) revealed that many businesses assume that switching to sustainable shipping comes with high upfront costs, making it less viable for profitability. While initial investments may be required, the long-term savings and benefits far outweigh the costs. Colantone *et al.* (2022) have submitted that by embracing green shipping today, companies can stay ahead of regulatory changes, enhance their brand reputation, and achieve long-term savings proving that sustainability and profitability can go hand in hand. Ghata and Dipesh (2024) collaborated this by opining that the myth that sustainable shipping is too expensive is rapidly being debunked. With fuel-efficient technologies, optimized logistics, government incentives, and AI-driven solutions, businesses can cut costs while reducing their environmental footprint. Lee and Wu (2023) argued that by embracing green shipping today, companies can stay ahead of regulatory changes, enhance their brand reputation, and achieve long-term savings—proving that sustainability and profitability can go hand in hand. The study found that governments, businesses, and individuals each play a vital role in enhancing the economic and environmental advantages of green shipping. Companies can adopt green technologies, pursue certifications like the IMO's Green Ship Certification, or implement waste reduction systems. Oyelade (2019) agrees that environmental management practices undertaken by shipping firms, with a focus on waste reduction and resource conservation in handling and distributing cargoes, should emphasize proactive green shipping practices. Ogbekor *et al.* (2022) argued that by prioritizing conservation, businesses and governments can avoid the high costs associated with environmental disasters, such as oil spill cleanups or rebuilding after storm surges. Healthy ecosystems, like mangroves and coral reefs, serve as natural barriers against extreme weather, reducing infrastructure damage and recovery expenses.

## Conclusion

This present study revealed that green suppliers has no significant effect on cost reduction of shipping companies in Rivers State and also exhibit a positive but statistically insignificant effect on cost reduction for shipping companies in Rivers State, Nigeria. Future studies could examine more comprehensive aspects of green shipping throughout Nigeria.

## References

- Architha, A. & Aithal, P. S. (2020). Development and Validation of Survey Questionnaire & Experimental Data – A Systematical Review-based Statistical Approach. *International Journal of Management, Technology, and Social Sciences*, 2020, 233.
- Barth, M. E., Berkovitch, J. & Israeli, D. (2023). The information content of operational efficiency. *SSRN Electronic Journal*, 2023, 6-57.
- Bahman, C., Mohammad, A.V., Ahmad, S. & Yahya, Z. M. (2022). Selection of green suppliers with the approach of integrating economic, environmental and social decisions (Case study of SazehGostarSaipa Photovoltaic Company). *Int. J. Nonlinear Anal. Appl.* 13 (1), 1965-1975.
- Chang, Y.-T. & Danao, D. (2017). Green Shipping Practices of Shipping Firms. *Sustainability*, 9(5), 829.
- Cheng, T.C.E., Lai, K.; Venus Lun, Y.H., & Wong, C.W.Y. (2013). Green shipping management. *Transp. Res. Part E*, 55, 1–2.
- Colantone, I. L., Livio D.I., Margalit, Y. & Percoco, M. (2022). The political consequences of green policies: Evidence from Italy, *CESifo Working Paper, No. 9599, Center for Economic Studies and ifo Institute (CESifo), Munich*.
- Ghata, H. S. & Dipesh, P. (2024). A review study on the assessment of operational efficiency. *EPR International Journal of Multidisciplinary Research (IJMR)*, 10(10), 312-315.
- Gill, A., Singh, M., Mathur, N. & Mand, H. S. (2014). The impact of operational efficiency on the future performance of Indian manufacturing firms. *International Journal of Economics and Finance*, 6(10), 259-269.
- Lai, K.H., Lun, V.Y.H., Wong, C.W.Y., & Cheng, T.C.E. (2011). Green shipping practice in the shipping industry: Conceptualization, adoption, and implications, *Resources, Conservation and Recycling*, 55(6), 631–638.

- Lee, H. & Wu. X. (2023). Green supplier selection and operational performance of firms in the Chinese manufacturing industry: the roles of behavior and outcome controls. *Journal of Manufacturing Technology*. 2023, 1-8.
- Lirn, T.C., Lin, H.W. & Shang, K.C. (2014). Green shipping management capability and firm performance in the container shipping industry. *Maritime Policy & Management*, 41(2), 59–175
- Lun, Y. H. V., Lai, K.H., Wong, C. W. Y. & Cheng, T. C. E. (2014). Green shipping practices and firm performance. *Maritime Policy & Management* 41(2), 134-148.
- Nigerian Exchange Group Plc (2024). Unaudited Financial Statements for the period ended 30 September 2024. pp 5-9.
- Ogbebor, R. O., Ifurueze, M. S. & Ofor, T. N. (2022) An empirical examination of the effect of firm size on the financial reporting quality of quoted consumer goods manufacturing companies in Sub-Sahara Africa *GOUNi Journal of Faculty of Management and Social Sciences*, 10 (1), 49-62.
- Oyelade, A. O. (2019). The impact of firm size on firm's performance in Nigeria: a comparative study of selected firms in the building industry in Nigeria. *Asian Development Policy Review*, 7(1), 1-11.
- Pang, K., Lu, C.S., Shang, K.C. & Weng, H. K. (2021). An empirical investigation of green shipping practices, corporate reputation and organizational performance in container shipping. *International Journal of Shipping and Transport Logistics*, 13 (3/4), 422-444.
- Quan, J., Zeng, B., & Liu, D. (2018). Green supplier selection for process industries using weighted grey incidence decision model, *Complexity* 2018 (2018). 1-10
- Rao, P. (2002), Greening of the supply chain: a new initiative in South East Asia. *International Journal of Operation Production Management*, 22, 632–655.
- Sufian, F. (2007). The efficiency of Islamic banking industry: A non-parametric analysis with non-discretionary input variable. *Islamic Economic Studies*, 14(1-2), 53-78.
- Venus Lun, Y.H., Lai, K., Wong, C.W.Y. & Cheng, T.C.E. (2015). Environmental governance mechanisms in shipping firms and their operational performance. *Transp. Res. Part E*, 78, 82–92.
- Wan, Z., Zhu, M., Chen, S. & Sperling, D. (2016). Pollution: Three steps to a green shipping industry. *Nature*, 530, 275-277.
- Yang, C.S., Lu, C.S., Haider, J.J. & Marlow, P.B. (2013). The effect of green supply chain management on green performance and firm competitiveness in the context of container shipping in Taiwan. *Transportation Research Part E*, 55, 55–73.