

# **INFLUENCE OF GREEN PROCUREMENT ON PERFORMANCE OF MINING INDUSTRY IN SIERRA LEONE**

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## **ABSTRACT**

Approximately 80% of all the industries in the Sierra Leone are procuring goods and services with no consideration for human health and environmental safety. Over 89% of the purchases done by the mining industry in particular violated environmental safety standards stated in the National Environment Act (2018). The main objective of the study was to determine the influence of green procurement on performance of the mining industry in Sierra Leone. The study specifically sought to determine the influence of green packaging, green distribution, green supplier selection and reverse logistics on performance of the mining industry in Sierra Leone. This study was conducted through a descriptive research design. The study involved 150 procurement staffs of the five major mining companies in Sierra Leone which were African minerals, London mining, Sierra rutile, Sierra minerals and Koidu holdings limited. Primary data was collected using questionnaires and a pilot study was undertaken to prove both the validity and reliability of the questionnaires. Both descriptive and inferential statistics were adopted for analysis. Quantitative data was analyzed using descriptive statistics

while quantitative data was analyzed in prose form. The regression model was adopted to establish the relationship between the dependent and independent variables as shown by R-value of 0.846. The significance value was 0.000 which is less than 0.05 thus the model is statistically significant in predicting how green packaging, green distribution, green supplier selection and reverse logistics influence performance in mining industry in Sierra Leone. The findings revealed that green packaging contributed most to the performance of mining industry in Sierra Leone. A total of 120 procurement staffs participated in the study out of the 150 procurement staffs that were targeted. The study concludes that performance of mining industry in Sierra Leone can be greatly improved by green product packaging, green distribution, green supplier selection and reverse logistics. The study therefore recommended that managers of the mining firms in Sierra Leone should adopt green practices such as green packaging, green distribution, green supplier selection and reverse logistics as a way of managing their cost of production and creation of customer loyalty.

**Key Words:** *green procurement, performance, mining industry, Sierra Leone*

## **INTRODUCTION**

Green procurement otherwise known as sustainable procurement entails the various means through which organizations access harmless goods and services for human consumption and environmental preservation. Green procurement ensures that goods and services that are accessed do not create any threat or danger to human health and the environment (Tate, 2011). Hayes (2012) pin pointed that in order for green procurement to be effective suppliers and service providers must have the right design specifications that are eco-labelled for their products and services, and they must also be actively involved in advancing environmental safety measures including the formulation and implementation of environmental protection policies and the designing of product

specifications that are environmentally friendly. It is also very necessary for suppliers to be effectively monitored on consistent basis to ensure their full cooperation in the implementation of green procurement policies by them having environmental safety certificates like ISO 14001.

Khan (2012) discussed green procurement to be the buying of materials that are easily decomposed, materials that pose no serious threat to the environment and can also be reprocessed again to be reused. These materials are commonly known as green materials and are made up of harmless substances that guarantees the protection of consumers and the environment from poison and destruction. Green procurement provides countless benefits such as improved quality products and services with no environmental consequences, ability to be reprocessed for reuse and good satisfaction from consumers and a lot more. Miao and Xi (2007) commented that green procurement enhanced the elimination of wastes as efficiently and effectively as possible. In order for this to be possible, it is important to check the sources from which products are manufactured in order to know exactly the kind of raw materials that are used and how these materials are being processed into finished products. This information will give guidance to organizations on how to effectively manage product wastes since all products are manufactured from different materials, therefore the wastes produced are not the same and ought to be managed differently. Hence, effective waste management depends on the raw materials used, the composition of the materials and the manufacturing techniques applied on these materials.

Cox (2010) disclosed that the ability of green procurement to resolve issues relating to climate change makes it highly important and necessary in every organization. Therefore, it is recommended that strategic attention in every aspect should be given to the implementation of green procurement as this will ensure both corporate and environmental benefits. Holmberg (2000) commented that green procurement provides organizations with huge advantages over their competitors due to the fact that customers are increasingly favoring green products and services over normal products and services as a result of both the health and environmental benefits that are provided by green products and services. Green procurement is to a large extent influenced by relevant key players in order to be successful and if any of these players fail to perform their specific obligations to the proper implementation of green procurement, then the advantages that are provided by green procurement will not be achieved.

These key players include the governments who formulate and enforce green procurement policies, organizations and suppliers who are to fully comply with these policies by incorporating them in their own corporate policies and finally consumers who must always have a strong preference for green products and services above the normal products and services despite their cost benefits. If the governments for example does not take green procurement implementation very seriously by failing to make available strong green procurement policies in their respective countries, nobody will regard green procurement as an important solution to environmental degradation in those countries. If organizations and suppliers on the other hand fail to adhere to green procurement policies by not willing to incorporate those policies into their business transactions, in that case green procurement will not be realized at the corporate level (Tseng, 2014).

Kumar (2012) also added that consumers are the ones to complement the effort of governments in ensuring that green procurement goals become a reality by compelling businesses to comply with green procurement implementation into their purchasing activities. Consumers can greatly contribute to the achievement of green procurement goals by having a very strong preference and desire for green products and services over normal or traditional products and services despite the challenges associated with green products and services. When consumers stick to this routine, businesses and organizations will be compelled to take green procurement very seriously if only they want to be advantageous in the global market over their competitors since consumers now only prefer green products and services. Despite the numerous benefits accompanied by the implementation of green procurement, organizations should not be ignorant of the challenges that are definitely experienced with green procurement initiatives such as high costs of green products and services, inadequate green equipment and facilities, high cost of employee training, communication cost and low net returns from green products and services due to limited consumers that can afford the cost green products and services (Preuss, 2001).

## **STATEMENT OF THE PROBLEM**

According to Koroma (2009), the mining industry in Sierra Leone has been importing its mining equipment and machinery ever since due to lack of quality market in the nation to provide high quality mining equipment and machinery that are environmentally friendly to the industry which compelled the mining industry to import its mining tools and equipment from overseas markets with no environmental safety consideration. Nearly 95% of the imported mining equipment and machinery by the mining industry were of very poor quality which has created huge health challenges and environmental destruction. There were no environmental safety features on the mining equipment and machinery imported by the mining industry to protect the environment. The material contents of those mining equipment and machinery were very harmful to the environment. Even the remains of those mining machines and equipment after completing their life span were also very harmful to the environment. Also, Kallon (2011) indicated that approximately 80% of all the industries in the Sierra Leone were procuring goods and services with no consideration for human health and environmental safety and this has created very serious damage on the environment. Over 89% of the purchases done by the mining industry violated the Environmental and social regulations for the mineral sector (2012) which clearly prohibited the mining industry from manufacturing, purchasing and use of goods and services that are dangerous to both human health and the environment. Nearly 98% of the chemicals purchased by the mining industry were very poisonous and had very harmful effects on human health and the environment. These chemicals had made the environment very unsuitable for the survival of any living thing more so humans (Turay, 2013). These harmful mining chemicals has contributed to over 87% of the environmental pollution in Sierra Leone. Lebbie (2010) likewise reveals that the overall emission from the mining industry exceeded all other industries amounting to 40% which has resulted in the adverse effect of climate change in Sierra Leone that has threatened the safety of the environment. Because these mining machinery and equipment have no environmental safety

features, even the fuel they use is not green and therefore releases significant amount of poisonous gases into the atmosphere thereby polluting the atmosphere and making it very unsafe for the survival of humans. Likewise, Karim (2010) indicated that huge acreage of agricultural lands is destroyed so far from the operation of harmful and faulty mining machines that were purchased which has contributed greatly to the massive starvation in the nation as a result of the vast destruction of plant and animal population. Johnson (2014) discovered that the mining industry produced around 40% of wastes and only 20% of these wastes were effectively managed by the mining industry in Sierra Leone. This has also led to the massive environmental pollution and community health challenges in Sierra Leone. Despite all these studies that were carried out, no specific study has been done to establish the influence of green procurement on performance of the mining industry in Sierra Leone. Therefore, the study was taken to fill that knowledge gap.

## **GENERAL OBJECTIVE**

To analyze the influence of green procurement on performance of the mining industry in Sierra Leone.

## **SPECIFIC OBJECTIVES**

1. To determine the influence of green packaging on performance of the mining industry in Sierra Leone.
2. To examine the influence of green distribution on performance of the mining industry in Sierra Leone.
3. To assess the influence of green supplier selection on performance of the mining industry in Sierra Leone.
4. iv. To explore the influence of reverse logistics on performance of the mining industry in Sierra Leone.

## **THEORETICAL REVIEW**

### **Classical Conditioning Theory**

Kumar (2012) suggested that the Classical conditioning theory was developed by Pavlov and it states that consumers only value a product based on the kind of packaging that is done on the product. Packages that are well designed to properly protect the product usually attract more consumers. The nature of packaging determines the kind of consumers that will be attracted to that particular product. Environmentally conscious consumers will forever prefer green packaging on product with no tendency of causing environmental hazards. Products that are placed in common packages are usually attracted by low income consumers who could either not afford green packaging products or are completely ignorant of the benefits of green packaging products. Usually, normal products packages are made from very common materials with no environment

protection features and as a result, these products are very affordable. The raw materials used in making local packages are of no green nature and this qualifies the production method of such products to be very simple and affordable.

Therefore, normal product packaging is purely meant for average or low-income consumers or middle-class earners while green product packaging because of its high environmental and health benefits is made from green raw materials with highly sophisticated and healthy manufacturing technologies which automatically dictate its high economic value. This is what makes green product packaging very unique and attractive as compared to the normal product packaging techniques (Preuss, 2001). Mazumder (2010) disclosed that mostly the materials used in green packaging does not determine the quality of the green product inside due to the fact that manufacturing companies have different green packaging technologies when it comes to the manufacturing of green products. Some companies might place high quality green products in a green package that is less expensive and not so appealing to consumers. This unappealing nature of green packaging does in no way affect the quality of the green product side it.

But unfortunately, consumers are blind folded by this fact and subsequently avoid such packages despite the high-quality green products enclosed in them. Even highly educated consumers are also victims of this deception about high quality green products placed in unattractive packages. In worst scenarios, rich consumers do not only dislike unattractive packaging of green products but are completely irritated by the poor appearance of green packaging (Lisa, 2010). Odhiambo (2008) reaffirms that it is therefore necessary for consumers not to judge the quality of green products based on the nature of the packaging on them because judgement of purchasing based on the appearance of green packaging is always deceiving and sometimes disappointing. So, consumers should do a thorough background check on all green products irrespective of their different packaging design and style. It is important for consumers to seek further clarification on all packaging of green products from manufacturers, suppliers and other consumers who have used these products for clarity in order to avoid being deceived and frustrated from making wrong green product packaging choices (Luce & Hill, 2001).

### **Resource-Based Theory**

As stated by Liu and Zhu (2009), Penrose came up with this theory in 1959 and it was believed to shed light on the prevailing environmental challenges affecting all institutions on the planet. The theory believed that institutions can only be successful when they effectively and efficiently utilize their resources in the safest manner in order to ensure a safer environment. Unhealthy utilization of resources has exposed the planet to the merciless realities of climate change which has caused the planet to be very hostile to its inhabitants. Effective and efficient utilization of resources would significantly minimize if not completely eradicate harsh environmental conditions. Penrose believed that one sure way of properly managing resources was through effective distribution systems more so green distribution systems. Most often resources are not mismanaged from their point of extraction but rather through the various distribution systems. The transport industry plays

an import role in ensuring that resources are well managed throughout their distribution process to their final destinations.

Maria (2011) confirms that effective green distribution practices solely rely on the effective inclusion of environmental safety precautions into the transportation systems to convey goods to consumers. Transport industries must be willing to liaise with environmental authorities in order for them to strictly adhere to the environmental requirements for the delivery of harmless goods and services worldwide. Transport industries are therefore highly responsible for their conversance with all environmental delivery requirements for goods and services as described by the global environmental regulatory bodies. Manufacturers have contributed so much to enable the transport industries to effectively practice green distribution through the provision of advanced clean idle trucks that uses clean energy that is free from pollution. These trucks only uses green energy that is so clean and safe for the environment (Matos & Hall, 2007).

Also, the train sector is also blessed with electric trains that uses electricity and liquefied natural gas as fuels to transport goods. Theses natural gases are environmentally friendly with no possibility of being detrimental to both consumers and the environment. Green distribution technologies are equipped with features that uses considerable amount of resources and energy. This considerate consumption of resources and energy greatly prevent the environment from massive exploitation of resources (Matos & Hall, 2007). Delivery trucks are now equipped with improved eco-tyres that gives trucks sufficient traction with no environmental hazards. This causes trucks to not only save on fuel, but also increases the lifespan of the tyres. Green distribution has also made possible the use of electric vehicles in the delivery of goods and services in an environmentally friendly manner. Electric vehicles are highly energy efficient and do not rely on fossil fuels which pollute the environment (Saman, 2013).

No distribution exercise is complete without adequate and effective warehousing facilities because some goods have to be store to await their order and it will be wise for industries and organizations to have well equipped warehouses to store goods either for distribution or for future use. With green distribution, warehouses are now equipped with low wattage lighting systems that uses safe and less energy as compared to traditional lighting systems. These advanced lighting systems are also very durable and long lasting. Modern warehouses are now also equipped with the facilities of trapping, storing and using solar energy as an alternative energy source to the other green energy sources (Simpson, 2008).

### **Stakeholder Theory**

Freeman formulated this theory around 1984 and stated that the progress of any organization is solely dependent on the relationship with its stakeholders. Organizations that has heathy relationship with their stakeholders undoubted are the most successful ones. This happens as a result of the fact that these organizations realize the relevance of their stakeholders and give these stakeholders the utmost care and respect they deserve and by so doing loyalty and trust is

reciprocated from their stakeholders. One major characteristic of struggling or unproductive organizations is that they have a very poor relationship with their stakeholders and this has resulted to stakeholders' frustration and removal from those organizations (Melewar, 2003).

It will be imprudent for organizations not to take the comfort and welfare of their stakeholders very seriously if they want to be successful in this harsh competitive era, we are in. It is therefore rewarding for organizations to make the satisfaction of stakeholders their number one priority. One sure way of making this possible is by incorporating stakeholders in every decision-making process in the organization to enable them make their own contributions to the strategic decisions in the organizations. This will eventually enhance stakeholders' trust and commitment to the organizations which will boost their profit margins. The inclusion of stakeholders in environmental safety issues will provide organizations with vast pool of knowledge on policies and safety precautions for the environment that may not have been easily provided by the organizations alone (Miao & Xi, 2007).

Muma (2014) disclosed that suppliers have considerably contributed to environmental safety issues more than any other stakeholders globally due to the fact that suppliers are always in direct contact with products, services and the environment which gives them vast knowledge on the effects of products and services on the health of both consumers and the environment than any other stakeholders in the business cycle. Therefore, suppliers have clues on environmental challenges caused by materials, products and services and how these challenges can be properly averted. It is therefore necessary for organizations to take supplier selection their number one management commitment because supplier selection has the possibility of helping organizations meet their target or be completely far from their set target. This is because suppliers are the ones who provide organizations with all their products and services and in the case of green procurement implementation in organizations, suppliers play a big role to ensure that green procurement becomes a reality supply chain vision in organizations. In relation to environmental safety green supplier selection should be taken very seriously by organizations since organizations can only accessed safety goods and services from suppliers that are environmentally friendly in their suppling activities. That is why green suppliers are of high interest to organizations to prevent them from purchasing harmful and detrimental products and services from suppliers that are very inconsiderate about both consumer and environmental safety (Maria, 2011).

### **Institutional Theory**

This theory was proposed by DiMaggio and Powell in 1983 and it states that companies should incorporate environmental safety issues into their management policies in order to be successful in the global competitive market. This is as a result of the huge attention given to environmental safety worldwide which has pressurized companies to comply with environmental safety standards set up by the environmental regulatory bodies at both global and national levels. Hence, only those companies that comply with these safety policies by incorporating them into their management policies are likely to be successful in the global market as compared to those that refuses to comply

(Ninlawan, 2010). Peterson and Handfield (2003) said that corporate social responsibilities especially towards the environment are directly influenced by reverse logistics. As a result, only those industries that have formidable reverse logistics principles will stand out among their competitors who do not take reverse logistics implementation very seriously.

This is evident on the fact that industries more especially mining industries have significant effects on the environment starting from the sourcing of faulty mining materials, and tools, unreasonable mineral exploitation and very poor mining waste management which seriously destroys the environment through the production of toxic mining chemicals into the atmosphere that contribute to the climatic effects that is so felt globally today. Therefore, it is highly recommendable for all mining industries to take reverse logistics very seriously due to its significant role in ensuring that mining industries strictly monitor their mining activities in order to minimize environmental impacts from those activities (Preuss, 2001).

Qinghua (2007) emphasizes that industries are solely responsible for their compliance with environmental safety standards set by both global and local environmental regulatory bodies to make sure that their activities do not threaten the safety and comfort of the environment. Industries are to ensure that they practice reverse logistics effectively and make it part of their strategic decision in order to reduce their effects on the environment. They are to make sure to have all the necessary knowledge, skills and technology to effectively practice reverse logistics. Industries must train their staffs on the necessary knowledge and skills relating to reverse logistics and must penalize any staff who refuses to practice reverse logistics principles. Penalties should often be in the form of fines, suspension and even dismissal from work. By so doing reverse logistics will be highly regarded in both public and private sectors as a concrete solution to environmental challenges (Mohan, 2006).

## **EMPIRICAL REVIEW**

### **Green Packaging**

Lisa (2010) in his study entitled Compliance culture of firms observed that green packaging was one of the most important processes without which products would definitely not achieve their market value. As a result of the highly competitive global market, products of rivaling companies are being decorated with improved packaging through the aid of advanced technologies in order for products to survive the harsh competitive global market. He established that there existed a strong positive and significant relationship between green packaging and manufacturing firm performance ( $r=0.668$ ,  $P < 0.05$ ); moreover, the adjusted  $R^2$  of green packaging was 0.759 which implies that 75.9% of the corresponding variation in manufacturing firm performance can be explained by green packaging.

Liu and Zhu (2009) in their study on practices and performance of green purchasing among manufacturing enterprises in China, proposed that in the past green packaging was only meant to

store and protect products with no consideration of protecting consumers' health and the environment. Green packaging influenced product development and sales return which automatically improve the competitiveness of manufacturing firms in China. There existed also a strong positive and significant relationship between green and firm competitiveness ( $r=0.789$ ,  $P<0.05$ ).

### **Green Distribution**

Mwaura (2016) in his study titled: Green Distribution Practices and Competitiveness of Food Manufacturing Firms in Kenya discovered that green distribution was very essential for the competitiveness of manufacturing firms in Kenya in the sense that green distribution does not only entails the distribution of environmentally conscious products but also the distribution of products in the most efficient and safe manner to safeguard human health and the environment. The study proves that green distribution impacted organizational profitability and predicted organizational profitability by 81%. Another school of thought was given by Ninlawan (2010) who did a study on implementation of Green supply chain management practices in the electronic industry in Japan and discovered that green distribution had a profound influence on organization performance. The study further indicated that green distribution aspects like formidable green distribution policies and green transport facilities tremendously improve organizational performance. The conclusion was that Green distribution can lead to lower transportation cost on raw material, reduced lead time and increased profitability all of which will uphold consumers' reputation for the organization. Green distribution can also impact environmental safety by conducting delivery in an environmentally friendly environment.

### **Green Supplier Selection**

Hussein and Shale (2014) conducted a study on how sustainable procurement influences organizational performance in the manufacturing sector in Kenya and Unilever Kenya was chosen as the case study. It was discovered that for an organization to be productive, that organization must have very serious and committed suppliers to provide healthy goods and services for consumer and environmental safety. Thus, organizations must have accurate and quality selection criteria when choosing suppliers. There so many criteria or standards upon which suppliers should be evaluated and it is the sole responsibility of organizations to choose those criteria that are best suitable to protect consumers' health and the environment. Supplier selection more especially green supplier selection can almost double organizational performance and the study went further to state that green supplier selection had a strong positive and significant relationship with organizational performance ( $r=0.888$ ,  $p=0.000<0.05$ ).

Also, Pun (2013) in his study on Determinants of Environmentally Responsible Operations concluded that green supplier selection is a strategic decision exercise that will either enhance organizational performance or prevent it. However, the study discovered without doubt that green

supplier selection was the most significant contributing factor to organizational performance having the highest t-value of 6.874.

### **Reverse Logistics**

Wanjohi (2016) in a study on the moderating effect of adoption of Green environment on the relationship between Organizational characteristics and performance of manufacturing firms in Kenya discussed reverse logistics practices as lasting solutions to environmental destruction. The study made mention of reverse logistics practices like remanufacturing, recycling and landfill as lasting solutions to environmental pollution and contamination. The study concluded that reverse logistics restores environmental dignity and comforts.

Odhiambo (2008) contributed on reverse logistics in his study by saying that reverse logistics greatly contribute to organizational performance by making its supply chain management a success story. Product remanufacturing or refurbishment is a key contribution of reverse logistics in any organization provided there are effective organizational policies to enable remanufacturing and refurbishing of products, materials and parts through reverse logistics. Remanufacturing practices help to restore those environmental values that were previously lost on products thereby making the products more environmentally friendly.

### **Performance of the Mining Industry**

Nduro (2014) in a study on Artisanal gold mining and surface water pollution in Ghana evaluated performance of mining industries on the bases of the extraction of quality minerals with due diligence on environmental safety, low operation cost and clean production all in the interest of environmental preservation and protection. The study discovered that all three of these performance indicators of mining industries are of equal magnitude to the success of mining industries globally. The study further recommended mining industries to take due diligence and care on these three performance indicators in order to enhance productivity.

## **RESEARCH METHODOLOGY**

This study adopted descriptive research design which according to Lisa (2010) is seen as a way of getting data either through direct interviewing or delivering questionnaires to respondents in order to get firsthand information. The target population of the study was gotten from the procurement staffs of the five major mining companies from the mining industry in Sierra Leone which were Shandong iron and steel group Limited, Sierra Leone mining, Sierra Rutile Limited, Sierra Minerals and Ocea (Koidu Holdings Limited). The study considered procurement staffs at the top, middle and lower management levels. According to the human resource departments of these five mining companies, there were about 150 procurement staffs at the three levels of management. The mining companies were considered as the unit of analysis whereas the procurement staffs were the unit of observation of the study. The study selected all the 150 procurement staffs of the five

mining companies due to their high level of expertise in procurement related matters to provide the necessary information needed for the study. The study used structured questionnaires as its research instruments to collect primary data from the respondents who were interviewed. Quantitative data was analyzed through quantitative analysis and the results were displayed in the form of tables, pie chart and bar graphs. Also, qualitative analysis was applied on qualitative data with the aid of open-ended questions. Descriptive and inferential statistics were utilized to analyze quantitative data. The descriptive statistics consisted of frequency distribution tables, measures of central tendency (mean), measures of variability (standard deviation) and measures of relative frequencies. Inferential statistics consisted of a multiple linear regression model that created the connection between the study variables. The coefficient of determination (R-Square) resulting from the linear regression was used to determine the goodness of fit (Kothari, 2004). The regression model is displayed below:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Where: Y = Performance of mining industry;  $\beta_0$  = Constant (coefficient of intercept);  $\beta_1$ ,  $\beta_2$ ,  $\beta_3$ ,  $\beta_4$  = regression coefficient of the four variables; X1 = Green packaging; X2 = Green distribution; X3 = Green supplier selection; X4 = Reverse logistics;  $\varepsilon$  = Error Term.

Analysis of variance (ANOVA) was utilized in the study to create the significance of the regression model to produce reliable results. F-test was conducted to determine the significance of the study predictions. Also, p-value was used to indicate the significance of the study variables in the regression model and if the p-value coefficient of any variable was either 0.05 (5%) or less, that variable was considered significant and if the p-value coefficient of any variable was above 0.05 (50%), then automatically the relationship between the dependent and independent variables was considered insignificant. Beta coefficients illustrated the probability of the relationship between the dependent and independent variables to be either high or low, positive or negative.

## **RESEARCH RESULTS**

The study sought to examine the influence of green procurement on performance of mining industry in Sierra Leone. The study targeted procurement staffs of mining firms in different management levels. A total of 120 procurement staffs participated. The summary of the study findings presented here followed the research objectives formulated in chapter one of the study.

### **Green Packaging**

The study sought to assess influence of green packaging on performance of mining industry in Sierra Leone as the first objective of the study. A majority of respondents agreed to a large extent that the company had the required technology and expertise to handle all products according to their green packaging nature. The company also had the most effective training programs on all green product handling techniques. Correlation and regression results revealed that this was the

most important variable that could perhaps be explained by the observation from the findings that green packaging was an important factor in influencing performance of mining companies in Sierra Leone.

### **Green Distribution**

The influence of green distribution on performance of mining industry in Sierra Leone was the second objective of the study. A majority of respondents agreed that the information system of the company was well advanced and effective to thoroughly monitor and locate minerals during transportation. The company had qualified green transport operators who were well trained in green transport issues. Correlation and regression results revealed that this was an important variable that could perhaps be explained by the observation from the findings that green distribution was an important factor in influencing performance of mining industry in Sierra Leone.

### **Green Supplier Selection**

The study also assessed influence of green supplier selection on performance of mining industry in Sierra Leone as the third objective of the study. A majority of respondents were found to highly agree that the company only selected suppliers that fully complied with the environmental regulations in the country. The financial capability of suppliers was critically reviewed by the company as a way of ensuring suppliers' ability to provide green products and services. Correlation and regression results revealed that this was an important variable that could perhaps be explained by the observation from the findings that green supplier selection was an important factor in influencing performance of mining industry in Sierra Leone.

### **Reverse Logistics**

The influence of reverse logistics on performance of mining industry in Sierra Leone was the fourth objective of the study. A majority of respondents were found to highly agree that the company allowed toxic mining wastes from its suppliers and end-users for proper disposal and recycling. The company had the technological capacity to effectively and efficiently manage toxic wastes. Correlation and regression results revealed that this was an important variable that could perhaps be explained by the observation from the findings reverse logistics was an important factor in influencing performance of mining industry in Sierra Leone.

### **Performance of Mining Industry in Sierra Leone**

The study endeared to determine influence of green procurement on performance of mining industry in Sierra Leone. The regression results revealed that green procurement elements or dimensions identified in the study, that is, green packaging, green distribution, green supplier

selection and reverse logistics combined could explain approximately 71.6% of the variations in the performance of mining industry in Sierra Leone. The other 28.4% may be attributed to other strategies not explained by the model or the variables. Typically, from inferential statistics, a positive correlation is seen between each determinant variable and performance of mining industry in Sierra Leone. The strongest correlation was established between green product packaging and performance of mining industry in Sierra Leone. All the independent variables were found to have a statistically significant association with the dependent variable at 95% level of confidence.

## **INFERENCE STATISTICS**

Correlation analysis was used to determine both the significance and degree of association of the variables and also predict the level of variation in the dependent variable caused by the independent variables. Correlation technique was used to analyze the degree of association between two variables. The correlation summary indicated that the associations between each of the independent variables and the dependent variable were all significant at the 95% confidence level. The correlation analysis to determine the relationship of green procurement on performance of mining industry in Sierra Leone, Pearson Correlation coefficient was computed and tested at 5% significance level. The results indicated that there was a strong positive relationship ( $r=0.761$ ) between green packaging and performance of mining industry. In addition, the researcher found the relationship to be statistically significant at 5% level ( $p=0.000, <0.05$ ). The correlation analysis was to determine the relationship between green distribution and performance of mining industry, Pearson Correlation coefficient was computed and tested at 5% significance level. The correlation analysis was to determine the relationship between green distribution and performance of mining industry, Pearson Correlation coefficient computed and tested at 5% significance level. The results indicated that there was a strong positive relationship ( $r=0.609$ ) between green distribution and performance of mining industry. In addition, the study found the relationship to be statistically significant at 5% level ( $p=0.000, <0.05$ ). The correlation analysis to determine the relationship between green supplier selection and performance of mining industry, Pearson Correlation coefficient computed and tested at 5% significance level.

The results indicated that there was a positive relationship ( $r=0.663$ ) between green supplier selection and performance of mining industry. In addition, the study found the relationship to be statistically significant at 5% level ( $p=0.000, <0.05$ ). The correlation analysis was to determine the relationship between reverse logistics and performance of mining industry, Pearson Correlation coefficient computed and tested at 5% significance level. The results indicated that there was a strong positive relationship ( $r=0.652$ ) between reverse logistics and performance of mining industry. In addition, the researcher found the relationship to be statistically significant at 5% level ( $p=0.000, <0.05$ ). Hence, it is evident that all the independent variables well explained the changes in the performance of mining industry on the basis of the correlation analysis.

In this study multivariate regression analysis was used to determine the significance of the relationship between the dependent variable and all the independent variables pooled together.

Regression analysis was conducted to find the proportion in the dependent variable (performance of mining industry) which can be predicted from the independent variables (green packaging, green distribution, green supplier selection and reverse logistics). Table 1 presents the regression coefficient of independent variables against dependent variable. The results of regression analysis revealed there is a significant positive relationship between dependent variable (performance of mining industry) and the independent variables (green packaging, green distribution, green supplier selection and reverse logistics).

The independent variables reported R value of .846 indicating that there was a strong relationship between dependent variable and independent variables. R square value of 0.716 which means that 71.6% of the corresponding variation in performance of mining industry can be explained or predicted by (green packaging, green distribution, green supplier selection and reverse logistics) which indicated that the model fitted the study data.

**Table 1: Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.846 <sup>a</sup>	.716	.704	.149

Predictors: (Constant), green packaging, green distribution, green supplier selection and reverse logistics

Dependent Variable: Performance of the mining industry.

**Table 2: ANOVA**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.369	4	1.342	74.5	.000b
	Residual	2.131	115	0.018		
	Total	7.5	119			

Predictors: (Constant), green packaging, green distribution, green supplier selection and reverse logistics

Dependent Variable: Performance of the mining industry

F-critical = 2.45

The significance value was 0.000 which is less than 0.05 thus the model is statistically significant in predicting how green packaging, green distribution, green supplier selection and reverse logistics influence performance in mining industry in Sierra Leone. The study therefore establishes that; green packaging, green distribution, green supplier selection and reverse logistics influence performance of mining industry in Sierra Leone. These results agreed with Spicer (2020) results which indicated a positive and significant influence of green procurement on project performance of firms.

From the results, the regression equation will be:

$$Y=1.240+ 0.462 X_1 + 0.108X_2 + 0.071X_3 +0.064X_4$$

The regression equation above has established taking all factors into account (green packaging, green distribution, green supplier selection and reverse logistics) constant at zero, performance of mining industry in Sierra Leone will be at an index of 1.240. The findings presented also shows that taking all other independent variables at zero, a unit increase in green packaging will lead to a 0.462 increase in performance of mining industry in Sierra Leone. The P-value was 0.000 which is less than 0.05 and thus the relationship was significant. The study also found that a unit increase in green distribution will lead to a 0.108 increase in performance of mining industry in Sierra Leone. The P-value was 0.003 and thus the relationship was significant. In addition, the study found that a unit increase in green supplier selection will lead to a 0.071 increase in the performance of mining industry in Sierra Leone. The P-value was 0.002 and thus the relationship was significant. Lastly, the study discovered that a unit increase in reverse logistics will lead to a 0.064 increase in the performance of mining industry in Sierra Leone. The P-value was 0.004 and hence the relationship was significant since the p-value was lower than 0.05. The findings show that green packaging contributed most to the performance of mining industry in Sierra Leone.

## **CONCLUSION**

Based on the study findings, the study concludes that performance of mining industry in Sierra Leone can be improved by green product packaging, green distribution, green supplier selection and reverse logistics. First, in regard to green packaging, the regression coefficients of the study showed that it has a significant influence on performance of mining industry in Sierra Leone. This implies that increasing levels of green packaging by a unit would increase the levels of performance of mining industry in Sierra Leone. This shows that green packaging has a positive influence on performance of mining industry in Sierra Leone. Second in regard to green distribution, the regression coefficients of the study show that it has a significant influence on performance of mining industry in Sierra Leone. This implies that increasing levels of green distribution by a unit would increase the levels of performance of mining industry in Sierra Leone. This shows that green distribution has a positive influence on performance of mining industry in Sierra Leone.

With regard to the third objective, the regression coefficients of the study show that it has a significant influence on performance of mining industry in Sierra Leone. This implies that increasing levels of green supplier selection by a unit would increase the levels of performance of mining industry in Sierra Leone by a unit. This shows that green supplier selection has a positive influence on performance of mining industry in Sierra Leone. Lastly, in regard to the fourth objective, the regression coefficients of the study show that it has a significant influence on performance of mining industry in Sierra Leone. This implies that increasing levels of reverse logistics by a unit would increase the levels of performance of mining industry in Sierra Leone. This shows that reverse logistics has a positive influence on performance of mining industry in Sierra Leone.

Drawing on this research, lack of green product packaging, green distribution, green supplier selection and reverse logistics in the mining firms would lead to poor performance of the mining industry in Sierra Leone. Though the mining firms in Sierra Leone are striving hard to improve their performance there are still issues of customer satisfaction, long lead time and stringent operational activities. Thus, it is evident that all the independent variables identified in this study were all important critical elements that influenced the performance of mining industry in Sierra Leone.

## **RECOMMENDATIONS**

The study recommended that managers of the mining firms in Sierra Leone should adopt green practices such as eco labeling of products, environment-friendly packaging, providing information to customers on environment friendly products, re-using and recycling of packages and collection of used packages for proper disposal in their distribution processes as a way of managing their cost of production and creation of customer loyalty. The study further recommended that the organizations fully develop and adopt virtual transportation and warehousing strategies with the aim of optimizing production, reducing costs and providing supply chain channels with customer service that is of high-quality. The study also recommended that organizations fully adopt inventory pooling in order to reduce costs while at the same time improving their performance logistically and the maintenance management.

The study also recommended that the companies incorporate criteria of environmental performance at the supplier evaluation and selection stages and also fully integrate environmental requirements in their procurement specifications for goods and services. The study further recommended that firms should work together with their supply chain counterparts so as to cultivate supply sources that continuously support social environmental performance. The study also recommended that the organizations consider incorporation of environmental criteria into the process of selecting suppliers at all stages. The study also recommended that the organizations should monitor the activities of their suppliers and deduce the impact they have on the environment and consequently develop a purchasing environmental policy that will be aimed at reducing their own impact on the environment as well as that of their suppliers, in their activities as well as the goods and services they offer.

Based on the above findings, the study recommended that the companies consider the full adoption of remanufacture and recycling reverse logistics practices as well as adoption of reuse reverse logistics practice. The study also recommended that for the organizations to achieve competitive advantage, the top executives should always regard reverse logistics as an important driver and strategy and should therefore be managed strategically the same as all other critical areas of management.

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