



## GREEN TRANSPORTATION PRACTICES AND THE SUSTAINABILITY PERFORMANCE OF PETROLEUM TANKER DRIVERS IN RIVERS STATE, NIGERIA

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**ABSTRACT:** *This study examined green transportation and the sustainability performance of petroleum tanker drivers in Rivers State. The study utilized the positivism research philosophy and the correlational research design. The population of this study comprised 438 petroleum tanker drivers that are duly registered with the Petroleum Tanker Drivers Association of Nigeria, Rivers State Chapter. The purposive sampling technique was adopted, where 164 petroleum tankers drivers were selected for the study based on the criteria that they practice green transportation. The unit of analysis consisted of senior tanker drivers with a minimum of 15 years driving experience. A structured questionnaire was used to collect data from the respondents while descriptive statistics, Spearman Rank Order Correlation Coefficient ( $\rho$ ) and the SPSS version 24 were used for data analysis. The findings revealed that route optimization is significantly related to the environmental and economic performance of petroleum tanker drivers in Rivers State. Loading optimization is also significantly related to the environmental and economic performance of petroleum tanker drivers in Rivers State. The study equally revealed that green tanker utilization is significantly related to the environmental and economic performance of petroleum tanker drivers in Rivers State. Based on the findings, it was concluded that green transportation, such as route optimization, loading optimization and green tanker utilization, positively and significantly enhances the sustainability performance of petroleum tanker drivers in Rivers State. Based on this conclusion, it was recommended that petroleum tanker drivers in Rivers State should practice green transportation, such as route optimization, loading optimization and green tanker utilization, as it would improve their sustainability performance.*

**KEYWORDS:** Green transportation, route optimization, loading optimization, green tanker utilization, sustainability performance, environmental performance and economic performance.



## INTRODUCTION

The issue of sustainability has received much attention in recent times due to the increasing environmental challenges facing the world today. Issues that border on environmental pollution, climate change, global warming, excessive waste generation, scarcity of good drinking water, and other man-made dangers have been in the public domain. World leaders have been brainstorming to find a lasting solution to the environmental problems facing the world today and they have come to the conclusion that companies need to integrate sustainability issues into their business operations to preserve the natural environment. Petroleum tanker drivers are among the major contributors to the environmental challenges facing Nigeria today due to the large amount of carbon footprint released into the environment during transportation of their petroleum products (Wali & Itam, 2016). Their persistent use of smoking tankers during transportation activities and their lengthy routes have contributed immensely to environmental pollution, making it difficult for Nigeria to achieve the global sustainable development goals. For Nigeria to have any chance of achieving the global sustainable development goals in the near future, petroleum tanker drivers need to improve their sustainability performance through the practice of green transportation strategies.

Green transportation is an environmentally friendly method of moving people and goods to their destination without releasing harmful substances into the environment (Sharma et al., 2023). It involves integrating sustainability elements into the conventional transportation system to reduce the amount of carbon emission released into the environment during transit. The green transportation system affects critical areas in the transportation processes, such as the mode of transport, sources of energy for vehicles, transportation infrastructures and routing (Buyukozkan et al., 2018). Effective practice of green transportation requires proper route planning, route optimization, as well as the use of alternative fuel-dependent vehicles such as electric-powered vehicles, solar-powered vehicles to transport people and goods to their destination (Adenigbo et al., 2017). By optimizing vehicle routes and using green tankers, petroleum tanker drivers can jointly reduce their carbon emissions and routing costs (Bekrar, 2021).

Practicing green transportation can help petroleum tanker drivers to improve their sustainability performance. According to Odogun (2021), green transportation enables tanker drivers to solve their pollution problem and routing costs. The cost associated with cleaning up a polluted environment is very high and, as such, petroleum tanker drivers need to limit their carbon footprint to make progress in their sustainability agenda (Wali & Itam, 2016). By practicing green transportation using non-smoking tankers, optimizing tanker routes including loadings, and using green tankers, such as electric-powered tankers and solar-powered tankers, during transit of products, petroleum tanker drivers can drastically reduce their carbon footprint and improve their sustainability performance. It is against this backdrop that this study examines the relationship between green transportation practices and sustainability performance of petroleum tanker drivers in Rivers State.



## Statement of the Problem

The people of Rivers State have continued to lament over the damages done to their environment as a result of the transportation activities of petroleum tanker drivers. A large amount of carbon has been released into the environment as a result of their continuous use of smoking tankers in transporting petroleum products across the State. Overloading has made many petroleum tankers fall along the roadside, thereby causing serious environmental pollution and loss of lives. Stakeholders have been mounting pressure on petroleum tanker drivers to integrate sustainability issues into their transportation activities to improve their sustainability performance. As pressure intensified, some petroleum tanker drivers began to integrate the sustainability issue into their transportation operations, optimizing their transportation routes including tanker loadings and using green tankers powered by electricity and solar energy to reduce their carbon footprint during transit of their petroleum products. However, ever since these tanker drivers started practicing green transportation, it is still not clear whether such practices have improved their sustainability performance, as empirical studies that examined the relationship between green transportation practices and sustainability performance of petroleum tanker drivers in Rivers State are absent. This has created a vacuum in empirical literature which the present study intends to fill from the Nigerian context.

## CONCEPTUAL FRAMEWORK

The conceptual framework of green transportation practices and sustainability performance of petroleum tanker drivers is shown in Figure 1 below:

**Fig. 1: Conceptual framework of green transportation practices and sustainability performance of petroleum tanker drivers in Rivers State**



**Source:** *Author's Conceptualization*



### **Aim and Objectives of the Study**

The aim of this study is to examine the relationship between green transportation practices and sustainability performance of petroleum tanker drivers in Rivers State. The objectives of the study are to:

1. ascertain the relationship between route optimization and environmental performance of petroleum tanker drivers in Rivers State;
2. determine the relationship between route optimization and economic performance of petroleum tanker drivers in Rivers State;
3. explore the relationship between loading optimization and environmental performance of petroleum tanker drivers in Rivers State;
4. determine the relationship between loading optimization and economic performance of petroleum tanker drivers in Rivers State;
5. examine the relationship between green tanker utilization and environmental performance of petroleum tanker drivers in Rivers State;
6. determine the relationship between green tanker utilization and economic performance of petroleum tanker drivers in Rivers State.

### **Research Questions**

The study raised the following research questions:

1. What is the relationship between route optimization and environmental performance of petroleum tanker drivers in Rivers State?
2. To what extent does route optimization relate to economic performance of petroleum tanker drivers in Rivers State?
3. What is the relationship between loading optimization and environmental performance of petroleum tanker drivers in Rivers State?
4. To what extent does loading optimization relate to economic performance of petroleum tanker drivers in Rivers State?
5. What is the relationship between green tanker utilization and environmental performance of petroleum tanker drivers in Rivers State?
6. To what extent does green tanker utilization relate to economic performance of petroleum tanker drivers in Rivers State?



## Research Hypotheses

The following hypotheses are formulated to guide this study:

**H<sub>01</sub>:** There is no significant relationship between route optimization and environmental performance of petroleum tanker drivers in Rivers State.

**H<sub>02</sub>:** There is no significant relationship between route optimization and economic performance of petroleum tanker drivers in Rivers State.

**H<sub>03</sub>:** There is no significant relationship between loading optimization and environmental performance of petroleum tanker drivers in Rivers State.

**H<sub>04</sub>:** There is no significant relationship between loading optimization and economic performance of petroleum tanker drivers in Rivers State.

**H<sub>05</sub>:** There is no significant relationship between green tanker utilization and environmental performance of petroleum tanker drivers in Rivers State.

**H<sub>06</sub>:** There is no significant relationship between green tanker utilization and economic performance of petroleum tanker drivers in Rivers State.

## REVIEW OF RELATED LITERATURE

### Concept of Green Transportation

Green transportation is the movement of people and goods from one place to another in an eco-friendly manner (Hezam et al., 2023). A company can integrate green practices into its transportation system by using vehicles that use alternative sources of energy to fuels (Eberle & von Helmolt, 2010). Zhang and Zheng (2010) stated that a company may decide to use fleets run by alternative fuels or utilize other alternative means of transportation like rail instead of road, or sea instead of air. However, building several localized distribution centers closer to their customers or end-users of their products can enable a company to reduce the distance it drives around (Bekrar et al., 2021). Apart from this, the company can improve its fuel-efficiency of engines and optimize vehicle loads to reduce the amount of fossil fuels consumed during transit as well as reducing the amount of carbon emission released into the air (Flint & Gammelgaard, in Eberle & von Helmolt, 2010). The quantity of goods to be transported should be considered when it comes to vehicle loading and choosing the type of transportation system that is environmentally friendly (Buyukozkan et al., 2018). Green transportation needs to be practiced by companies because it is a win-win situation, as companies reduce costs and increase revenue while the environment is free of carbon emission pollutants (Erdogan & Miller-Hooks, 2012).

### Dimensions of Green Transportation

The dimensions of green transportation considered in this study are route optimization, loading optimization and green tanker utilization.



## **Route Optimization**

Route optimization is the process of identifying the most efficient and shortest possible route to all destinations (Sharma et al., 2023). Tanker drivers need to identify and take the shortest possible routes to reduce their carbon footprint during transportation activities. A long route will require more fuel consumption which will pollute the environment and make it unsuitable for the present and future generations (Kim et al., 2019). Therefore, tanker drivers need to identify the shortest transport route that will reduce the amount of fuel combustion that pollutes the environment. To identify the most efficient and environmentally friendly route, tanker drivers need to conduct a series of tests on the possible routes and decide on the route to take (Hvattum et al., 2013). This test can be conducted with the aid of route optimization software. Aydin et al. (2017) stated that route optimization software can test various “what if” scenarios and evaluate various possible constraints to arrive at the best possible route. By carrying out a test on multiple routes, the route optimization engine gives different option routes, including the amount of fuel consumption, time taken, the cost involved, as well as the environmental implications.

## **Loading Optimization**

Loading optimization is the process of reducing the quantity of products loaded into a truck to achieve stability (Erdogan & Miller-Hooks, 2012). When loading is optimized, truck drivers can conveniently and quickly move the truck to its destination without any form of accident (Bekrar et al., 2021). The aim of loading optimization is to get the right quantity of goods into the truck to avoid the situation of overloading (Hezam et al., 2023). Overloading makes petroleum tankers become unstable on the road, which makes drivers uncomfortable while transporting the products. Many tankers fall on the roadside due to overloading, which causes serious environmental pollution and loss of lives (Buyukozkan et al., 2018). Overloading increases fuel consumption during transit and this consequently increases the amount of carbon dioxide and greenhouse gas released into the air, causing climate change and global warming (Eberle & von Helmolt, 2010). To green the transportation processes, tanker drivers need to optimize their loadings to reduce fuel consumption and the amount of carbon released into the environment during transit.

## **Green Tanker Utilization**

Green tankers are those tankers that use eco-friendly methods to move goods from one location to another. Green tankers use electricity and sunlight as their sources of energy in transporting goods to their destinations (Hezam et al., 2023). Green tankers are designed to eradicate environmental pollution during transit of goods to their destinations (Pelletier et al., 2014). These tankers do not use fossil fuels; rather, they rely on renewable or regenerated energy sources like solar or electricity. By using alternative sources of energy to fuels, such as sunlight, wind and electricity, green tankers promote environmental sustainability (Sharma et al., 2023). Tanker drivers can integrate green practices into their transportation activities by using tankers that use alternative sources of energy to fuel. Tanker drivers can also use tankers that rely on Compressed Natural Gas (CNG) and Liquefied Natural Gas (LNG) to transport their goods since it is cheaper, safer and cleaner compared to fuel and diesel-dependent tankers (Bekrar et al., 2021).





## Concept of Sustainability Performance

Sustainability performance refers to how well a company is doing in preserving the natural environment in the course of satisfying needs and maximizing profit (Banihashemi et al., 2019). Joshi et al. (2020) defined sustainability performance as the result obtained by a company from making decisions and taking actions to improve the environmental, economic and social well-being of their host communities. The issue of sustainability has taken the center stage in most conferences following the increasing rate of environmental pollution which constitutes a threat to human existence and well-being (Joshi & Sharma, 2022). The accusing finger has been pointed to industrial companies as the main causative agents of environmental pollution (Hakirevic, 2021). Consequently, companies have been urged to improve their sustainability performance. Improving sustainability performance will help companies to build a good image for themselves as environmentally responsible companies (Hervani et al., 2022).

## Measures of Sustainability Performance

The Global Reporting Initiative (GRI) in Banihashemi et al.(2019) provides guidelines for measuring sustainability performance of corporate organizations, and these guidelines revolve around environmental, economic and social performance of firms. In this study, sustainability performance of tanker drivers is measured using environmental and economic performance.

### Environmental Performance

Environmental performance is the actual result obtained by an organization in promoting a cleaner and safer environment while carrying out business activities (Manrique & Martí-Ballester, 2023). It shows how well a company is doing in reducing pollution and waste while satisfying needs and maximizing profit. Environmental performance of firms is assessed using parameters such as waste reduction, pollution reduction, environmental sanitation, material efficiency, energy efficiency, amongst others (Hejazi et al., 2023). Every company is expected to report their environmental performance alongside their financial performance (Li et al., 2022). The increasing awareness of environmental disasters during the 1970 and 1980s has made many countries make it mandatory for companies to disclose their environmental performance (Sharma et al., 2022). By reporting environmental performance, stakeholders and the general public will be able to determine the sustainability efforts of industrial companies and make appropriate decisions (Hejazi et al., 2023).

### Economic Performance

Economic performance refers to the result generated by a company in utilizing its resources to accomplish its economic goals for a specific period of time (Li et al., 2020). It indicates how well a company uses its resources in the most efficient way to provide long-term economic benefits. A firm's economic performance is measured using economic indicators such as profit maximization, resource efficiency, energy efficiency, cost reduction, market share, and revenue (Banihashemi et al., 2019). Companies need to measure their economic performance periodically in order to identify those areas where they are doing well and the areas that need improvement (Hervani et al., 2022). Improving economic performance is highly necessary for firms to survive in the business world (Joshi & Sharma, 2022). To improve economic performance, companies need to identify those areas of their operations where resources are under-utilized and take steps to correct the situation (Joshi et al., 2020). Companies can also



consider changing the method of operations to facilitate smooth flow in the most efficient manner (Joshi & Sharma, 2022).

### **Theoretical Review**

This study was anchored on the environmental-economic theory which was propounded by Boulding in 1966. The theory argues that the pursuit of economic development has led to the depletion of the ecosystem and natural resources. According to the theory, economic activities embarked upon by human beings to earn a living have caused serious damage to the natural environment. The theory explains that the environment suffers from carbon emission because of the unsustainable transportation activities of companies. As companies use fuel-dependent vehicles to transport their goods, a large amount of carbon is released into the environment. The environmental-economic theory requires companies to strike a balance between economic goals and environmental protection (Ivanov, 2020). Relating this theory to the present study, it can be argued that the theory supports the idea of green transportation practices as a means of improving the sustainability performance of tanker drivers. The theory argues that tanker drivers can strike a balance between meeting their economic goals and environmental protection. While transportation activities are encouraged to achieve economic development, the environment should also be protected from pollution by integrating green practices into the transportation processes.

### **Empirical Review**

Previous studies have been conducted on green transportation practices and sustainability performance of firms. For instance, Eberle and von Helmolt (2010) empirically analyzed sustainable transportation based on electric vehicles and its impact on firm performance. The study employed the qualitative research approach where online interviews were used to collect data from 20 selected companies that adopt the sustainable transportation system. The data collected via interview were analyzed using thematic analysis and the findings revealed that sustainable transportation significantly enhances firm performance.

Pelletier et al. (2014) examined the use of electric vehicles in enhancing good distribution among manufacturing firms in Greece. Their study adopted the qualitative research approach where data were collected from logistics managers of selected manufacturing firms using questionnaires. The data collected were analyzed using mean and standard deviation while the hypotheses were tested using Pearson correlation and regression analysis. The findings revealed that the use of electric vehicles significantly enhances sustainable distribution in manufacturing firms.

Erdogan and Miller-Hooks (2012) carried out a study to determine the impact of the green vehicle routing problem on the transportation management of firms. Their study adopted the cross-sectional survey research design and the quantitative research approach where data were collected from logistics managers of selected green companies in the UK via online questionnaire. The data collected were analyzed using SMART PLS and the findings revealed that the green vehicle routing problem has a significant impact on green transportation management.

Bjorklund and Forslund (2018) explored sustainable logistics innovations and the performance of retail outlets. Their study adopted the case study and qualitative research approach. A semi-structured interview was conducted among three retailers in Sweden. The qualitative data





collected were analyzed using content analysis and the findings revealed that green transportation is significantly related to the performance of retail outlets.

Seiler (2011) carried out an empirical study on transportation services in the consumer goods industry in the United Kingdom (UK). The study employed the descriptive survey research design where a structured questionnaire was used for data collection. The data collected from 208 retailers of consumer goods in London were analyzed using both descriptive and inferential tools. After analyzing the data collected, the researcher discovered that the cost of transporting consumer goods from the point of manufacturing to the point of consumption is very high.

Langella and Zanoni (2011) examined eco-efficiency in logistics practices of manufacturing firms in India. Their study adopted the survey where data were collected from managers of selected manufacturing firms that adopt eco-logistics strategies. The researcher used questionnaires as their main instrument for data collection, while descriptive statistics, such as percentage and frequency count, mean and standard deviation, were used for data analysis. The study found a significant relationship between green transportation and the performance of manufacturing firms.

From the literature reviewed, it was observed that none of the previous studies relate green transportation practices, such as route optimization, loading optimization and green tanker utilization, to sustainability performance measures, such as environmental performance and economic performance of petroleum tanker drivers in Rivers State, Nigeria. This has created a gap in literature which this study attempts to bridge.

## METHODOLOGY

The correlational research design and the positivism research philosophy were adopted in this study. The study population consisted of 438 petroleum tanker drivers that are duly registered with the Petroleum Tanker Drivers Association of Nigeria, Rivers State Chapter. The purposive sampling technique was adopted in this study where 164 petroleum tanker drivers in Rivers State were selected for the study based on the criteria that they practice green transportation. The unit of analysis consisted of senior petroleum tanker drivers with a minimum of 15 years driving experience. A structured questionnaire was used to gather data from the respondents (petroleum tanker drivers) in Rivers State. The questionnaire was structured on a 4-point Likert scale ranging from Strongly Agree, Agree, Disagree to Strongly Disagree. The validity of the instrument was determined via content analysis and its reliability was confirmed using the Cronbach Alpha method. After the validity and reliability test, 164 copies of the questionnaire were administered to the respondents and 148 copies were collected and used for analysis. The data collected were analyzed statistically while the hypotheses were tested using Spearman Rank Order Correlation Coefficient ( $\rho$ ) and the SPSS version 24.



## RESULTS AND DISCUSSION

The data collected on green transportation dimensions (route optimization, loading optimization and green tanker utilization) were correlated with the data obtained on sustainability performance (environmental performance and economic performance) using SPSS version 24 and the results are presented in the tables below:

**Table 1: Result of correlation analysis between route optimization and the environmental performance of petroleum tanker drivers**

			Route Optimization	Environmental Performance
Spearman (rho)	Route Optimization	Correlation Coefficient	1.000	.608**
		Sig. (2 tailed)	.	.001
		N	148	148
	Environmental Performance	Correlation Coefficient	.608**	1.000
		Sig. (2 tailed)	.001	.
		N	148	148

\*\*Correlation is significant at 0.01 levels (2 tailed)

\*Correlation is significant at 0.05 levels (2 tailed)

**Source:** SPSS-Generated Output

Table 1 reveals that route optimization has a strong and positive correlation with the environmental performance of petroleum tanker drivers ( $\rho = .608^{**}$ ) and this correlation is significant at 0.01 level. Based on this result, the null hypothesis ( $H_{01}$ ) is rejected and the alternate hypothesis is accepted, which states that there is a significant relationship between route optimization and the environmental performance of petroleum tanker drivers in Rivers State.

**Table 2: Result of correlation analysis between route optimization and the economic performance of petroleum tanker drivers**

			Route Optimization	Economic Performance
Spearman (rho)	Route Optimization	Correlation Coefficient	1.000	.852**
		Sig. (2 tailed)	.	.001
		N	148	148
	Economic Performance	Correlation Coefficient	.852**	1.000
		Sig. (2 tailed)	.001	.
		N	148	148

\*\*Correlation is significant at 0.01 levels (2 tailed)

\*Correlation is significant at 0.05 levels (2 tailed)

**Source:** SPSS-Generated Output



Table 2 shows a very strong and positive correlation between route optimization and the economic performance of petroleum tanker drivers ( $\rho = .852^{**}$ ) and this correlation is significant at 0.01 level. As a result of this, we then reject the null hypothesis ( $H_{02}$ ) and accept the alternate hypothesis, which states that there is a significant relationship between route optimization and the economic performance of petroleum tanker drivers in Rivers State.

**Table 3: Result of correlation analysis between loading optimization and the environmental performance of petroleum tanker drivers**

			Loading Optimization	Environmental Performance
Spearman (rho)	Loading Optimization	Correlation Coefficient	1.000	.586**
		Sig. (2 tailed)	.	.001
		N	148	148
	Environmental Performance	Correlation Coefficient	.586**	1.000
		Sig. (2 tailed)	.001	.
		N	148	148

\*\*Correlation is significant at 0.01 levels (2 tailed)

\*Correlation is significant at 0.05 levels (2 tailed)

**Source:** SPSS-Generated Output

Table 3 reveals that loading optimization is moderately and positively correlated to the environmental performance of petroleum tanker drivers ( $\rho = .586^{**}$ ) and this correlation is significant at 0.01 level. Consequently, the null hypothesis ( $H_{03}$ ) is rejected and the alternate hypothesis is accepted. This means that there is a significant relationship between loading optimization and the environmental performance of petroleum tanker drivers in Rivers State.

**Table 4: Result of correlation analysis between loading optimization and the economic performance of petroleum tanker drivers**

			Loading Optimization	Economic Performance
Spearman (rho)	Loading Optimization	Correlation Coefficient	1.000	.524**
		Sig. (2 tailed)	.	.001
		N	148	148
	Economic Performance	Correlation Coefficient	.524**	1.000
		Sig. (2 tailed)	.001	.
		N	148	148

\*\*Correlation is significant at 0.01 levels (2 tailed)

\*Correlation is significant at 0.05 levels (2 tailed)

**Source:** SPSS-Generated Output

Table 4 shows a moderate and positive correlation between loading optimization and the economic performance of petroleum tanker drivers ( $\rho = .524^{**}$ ) and this correlation is significant at 0.01 level. As a result of this, the null hypothesis ( $H_{04}$ ) is rejected and the alternate hypothesis is accepted. This means that there is a significant relationship between loading optimization and the economic performance of petroleum tanker drivers in Rivers State.

**Table 5: Result of correlation analysis between green tanker utilization and the environmental performance of petroleum tanker drivers**

			Green Tanker Utilization	Environmental Performance
Spearman (rho)	Green Tanker Utilization	Correlation Coefficient	1.000	.897**
		Sig. (2 tailed)	.	.001
		N	148	148
	Environmental Performance	Correlation Coefficient	.897**	1.000
		Sig. (2 tailed)	.001	.
		N	148	148

\*\*Correlation is significant at 0.01 levels (2 tailed)

\*Correlation is significant at 0.05 levels (2 tailed)

**Source:** SPSS-Generated Output

Table 5 indicates a very strong and positive correlation between green tanker utilization and the environmental performance of petroleum tanker drivers ( $\rho = .897^{**}$ ) and this correlation is statistically significant at 0.01 level. Based on this result, the null hypothesis ( $H_{05}$ ) is rejected and the alternate hypothesis is accepted. This means that we then accept that there is a significant relationship between green tanker utilization and the environmental performance of petroleum tanker drivers in Rivers State.

**Table 6: Result of correlation analysis between green tanker utilization and the economic performance of petroleum tanker drivers**

			Green Tanker Utilization	Economic Performance
Spearman (rho)	Green Tanker Utilization	Correlation Coefficient	1.000	.649**
		Sig. (2 tailed)	.	.001
		N	148	148
	Economic Performance	Correlation Coefficient	.649**	1.000
		Sig. (2 tailed)	.001	.
		N	148	148

\*\*Correlation is significant at 0.01 levels (2 tailed)

\*Correlation is significant at 0.05 levels (2 tailed)

**Source:** SPSS-Generated Output

Table 6 reveals that green tanker utilization is strongly and positively correlated to the economic performance of petroleum tanker drivers ( $\rho = .649^{**}$ ) and this correlation is significant at 0.01 level. Consequently, the null hypothesis ( $H_{06}$ ) is rejected and the alternate hypothesis is accepted. This means that we then accept that there is a significant relationship between green tanker utilization and the economic performance of petroleum tanker drivers in Rivers State.



## DISCUSSION OF FINDINGS

This study found a significant relationship between route optimization and the environmental performance of petroleum tanker drivers in Rivers State. This finding was derived from the result of the correlation analysis carried out on the two variables. The result revealed that route optimization has a strong and positive correlation with the environmental performance of petroleum tanker drivers ( $\rho = .608^{**}$ ) and this correlation is significant at 0.01 level. Based on this result, the null hypothesis ( $H_{01}$ ) was rejected and the alternate hypothesis was accepted. This means that there is a significant relationship between route optimization and the environmental performance of petroleum tanker drivers in Rivers State. This finding is consistent with the research conducted by Buyukozkan et al. (2018), which reported that route optimization reduces the amount of carbon emission released by transporters during transit and improves their environmental performance. Bekrar et al. (2021) also agreed with this finding when they reported that companies can reduce their fuel consumption and pollutants by optimizing their transportation routes.

This study also found a significant relationship between route optimization and the economic performance of petroleum tanker drivers in Rivers State. This finding was deduced from the result of the correlation analysis carried out on the two variables. The result showed a very strong and positive correlation between route optimization and the economic performance of petroleum tanker drivers ( $\rho = .852^{**}$ ) and this correlation is significant at 0.01 level. As a result of this, we then rejected the null hypothesis ( $H_{02}$ ) and accepted the alternate hypothesis, which states that there is a significant relationship between route optimization and the economic performance of petroleum tanker drivers in Rivers State. This finding is in line with the research conducted by Kim et al. (2019) and Hezam et al. (2023) as both studies revealed that route optimization significantly reduces transportation costs and improves the economic performance of logistics firms.

This study discovered a significant relationship between loading optimization and the environmental performance of petroleum tanker drivers in Rivers State. This finding emanated from the result of the correlation analysis carried out on the two variables. The result revealed that loading optimization is moderately and positively correlated to the environmental performance of petroleum tanker drivers ( $\rho = .586^{**}$ ) and this correlation is significant at 0.01 level. Consequently, the null hypothesis ( $H_{03}$ ) was rejected and the alternate hypothesis was accepted. This means that there is a significant relationship between loading optimization and the environmental performance of petroleum tanker drivers in Rivers State. This finding is supported by Erdogan and Miller-Hooks (2012) who revealed that vehicle loading optimization has a significant impact on environmental performance of firms. Sharma et al. (2023) also supported this finding when they revealed that companies that optimize their vehicle loads are likely to avoid environmental damages and unnecessary clean-up costs.

This study equally reported that loading optimization is significantly related to the economic performance of petroleum tanker drivers in Rivers State. This finding emerged from the result of the correlation analysis carried out on the two variables. The result showed a moderate and positive correlation between loading optimization and the economic performance of petroleum tanker drivers ( $\rho = .524^{**}$ ) and this correlation is significant at 0.01 level. As a result of this, the null hypothesis ( $H_{04}$ ) was rejected and the alternate hypothesis was accepted. This means that there is a significant relationship between loading optimization and the economic performance of petroleum tanker drivers in Rivers State. This finding is supported by Odogun



(2021) and Eberle and von Helmolt (2010) as both studies revealed that loading optimization prevents costs associated with goods damage during transit and improves the economic sustainability of firms.

This study found a significant relationship between green tanker utilization and the environmental performance of petroleum tanker drivers in Rivers State. This finding was deduced from the result of the correlation analysis carried out on the two variables. The result shows a very strong and positive correlation between green tanker utilization and the environmental performance of petroleum tanker drivers ( $\rho = .897^{**}$ ) and this correlation is statistically significant at 0.01 level. Based on this result, the null hypothesis ( $H_{05}$ ) was rejected and the alternate hypothesis was accepted. This means that we then accepted that there is a significant relationship between green tanker utilization and the environmental performance of petroleum tanker drivers in Rivers State. This finding is consistent with the research conducted by Eberle and von Helmolt (2010) and Pelletier et al. (2014) as their studies revealed that logistics firms can improve their environmental performance by using green trucks, such as electric-powered vehicles and solar-powered vehicles, to transport goods.

Lastly, it was reported that green tanker utilization is significantly related to the economic performance of petroleum tanker drivers in Rivers State. This finding was derived from the result of the correlation analysis carried out on the two variables. The result revealed that green tanker utilization is strongly and positively correlated to the economic performance of petroleum tanker drivers ( $\rho = .649^{**}$ ) and this correlation is significant at 0.01 level. Consequently, the null hypothesis ( $H_{06}$ ) was rejected and the alternate hypothesis was accepted. This means that we then accept that there is a significant relationship between green tanker utilization and the economic performance of petroleum tanker drivers in Rivers State. This finding is supported by Govindan (2023) and Bekrar et al. (2021) as both studies revealed that the use of green vehicles during transportation activities promotes the economic sustainability of firms.

## CONCLUSION

Given the large amount of carbon released into the environment during the transportation of petroleum products in Rivers State and its implications on the people, it becomes necessary for petroleum tanker drivers to improve their sustainability performance. This can be done by practicing green transportation, such as route optimization, loading optimization and green tanker utilization. The results of this study revealed that route optimization is significantly related to the environmental and economic performance of petroleum tanker drivers in Rivers State. Loading optimization is also significantly related to the environmental and economic performance of petroleum tanker drivers in Rivers State. The study equally revealed that green tanker utilization is significantly related to the environmental and economic performance of petroleum tanker drivers in Rivers State. Based on the findings, it was concluded that green transportation, such as route optimization, loading optimization and green tanker utilization, positively and significantly enhance the sustainability performance of petroleum tanker drivers in Rivers State.





## RECOMMENDATIONS

The study provides the following recommendations in line with findings:

1. Petroleum tanker drivers in Rivers State, particularly those that are yet to practice green transportation, should switch from their unsustainable transportation practices to green transportation as it would improve their sustainability performance.
2. Petroleum tanker drivers in Rivers State should optimize their routes as this would not only reduce the amount of fuel consumption during transit but also minimize their carbon footprint and improve their environmental and economic performance.
3. Petroleum tanker drivers in Rivers State, particularly those that are still overloading their tanker, should desist from such practices and optimize their tanker load as this would not only enhance the smooth movement of their products to their station but also reduce their fuel consumption and carbon footprint during transit and improve their overall sustainability performance.
4. Petroleum tanker drivers in Rivers State, especially those that are using fuel-dependent tankers for the transportation of their petroleum products, should switch to green tankers that use electricity and sunlight as their sources of energy as it would eradicate environmental pollution during transit and improve their sustainability performance.
5. Finally, it is recommended that the Rivers State Government should stop petroleum tanker drivers from using smoking tankers to transport petroleum products across the State as this would reduce environmental pollution and promote sustainable development in Rivers State.

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