

# Maritime Traffic Density and Ports Efficiency in Rivers State

ADOH JONAH OMAJI<sup>1</sup>, NWABUEZE EBERE<sup>2</sup>, IBEKWE WECHIE<sup>3</sup>

<sup>1, 2, 3</sup>*Department of Maritime Science, River State University, Port Harcourt, Rivers State, Nigeria.*

**Abstract-** *The study examined the effect of Maritime Traffic Density and Ports Efficiency in Rivers State. There are three (3) shipping terminals in Onne population port, Rivers State. Hence, these constitute the population of the study. This study adopted a cross-sectional survey. Four (4) senior managers, operational manager, fleet manager, commercial manager and HR Manager in each of the company served as the study respondents. This made the respondents twelve (12) senior managers of the three shipping companies in Rivers State. The primary sources consist of first-hand information or raw data obtained by the researcher himself through the administration of research instruments. The secondary sources are existing data obtained from relevant materials such; books, journals, magazines and so on an unpublished work of others as well as valuable documents available to the researcher. In this study, percentages, ratios, frequency distribution, scaling, ranking and other statistical tools would be used to analyse and achieve research objectives. Spearman Rank Order Correlation (SROC). All these analyses were computed through the use of statistical package for social sciences (SPSS) IBM SPSS Statistics 23 version. A total of eighty-four (84) copies of questionnaire were distributed to the respondents who are senior managerial members of shipping terminals in Onne Port Harcourt. The findings from the study indicate a strong positive significant relationship between maritime density traffic and port efficiency in Rivers State, Nigeria. This relationship suggests that as the volume of maritime traffic increases, port operations in the state become more efficient, a dynamic that has important implications for both operational management and policy development. The study therefore concludes that maritime vessel traffic positively influences port efficiency in Rivers State.*

**Keywords:** *Maritime Spatial Traffic, Cargo Throughput, Vessel Turnaround Time, Maritime Vessel Traffic, Maritime Flow Traffic*

## I. INTRODUCTION

Maritime traffic is a crucial element of global trade, with more than 80% of world merchandise trade being transported by sea (UNCTAD, 2020). The efficiency

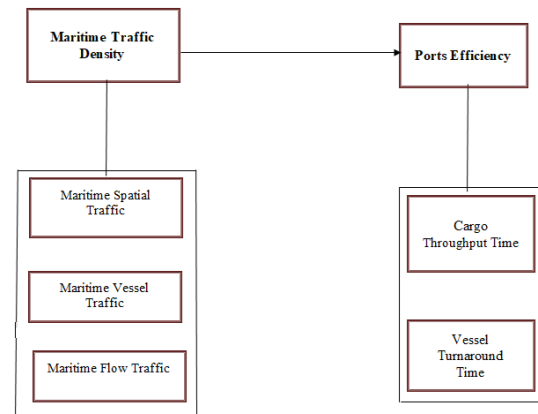
of ports and the density of maritime traffic are central to the economic development of coastal nations, as well as the smooth functioning of international trade networks (Notteboom & Winkelmanns, 2001). Port efficiency, which includes the effective handling of vessels, cargo, and logistical processes, is greatly influenced by maritime traffic density. Maritime traffic density refers to the number of vessels navigating within a specific maritime region over a given time period, and it is an important indicator of port congestion and the potential for operational inefficiencies (Kang & Park, 2012). Ports act as hubs where vessels converge to load and unload goods, and as such, their ability to efficiently manage maritime traffic directly impacts the flow of goods in and out of nations (World Bank, 2016). When traffic density increases beyond the optimal operational capacity of a port, the result can be severe congestion, delays in port services, and a reduction in the overall efficiency of the port (Song & Yeo, 2004). This is particularly evident in major global ports such as Rotterdam, Singapore, and Shanghai, where high maritime traffic density is often associated with long wait times for vessels to dock and unload, resulting in bottlenecks that affect the supply chain (Notteboom & Rodrigue, 2008). The growing size and complexity of vessels, along with the increase in global trade volume, have exacerbated these issues. Larger vessels, while capable of carrying more goods, require more time and specialized infrastructure for docking and unloading (Meng & Zhao, 2013). The development of new technologies, such as automation and real-time traffic monitoring using the Automatic Identification System (AIS), has made it possible to better manage maritime traffic density and improve the efficiency of ports (Wang et al., 2016). By providing accurate real-time data on vessel positions, AIS helps port authorities optimize traffic flows, manage congestion, and allocate docking spaces more effectively (Vasilenko & Kuksov, 2018). Furthermore, environmental factors, including weather conditions and seasonal variations,

can also significantly impact maritime traffic density and port efficiency. Adverse weather, such as storms or fog, can lead to slower vessel speeds, further increasing congestion and delay times (Parola et al., 2019). Moreover, environmental regulations, such as restrictions on fuel emissions, can complicate port operations, requiring significant adaptations in operational practices (Lam & Van De Voorde, 2014). While extensive global research has emphasized the importance of managing maritime traffic density to enhance port efficiency—especially in major international ports such as Rotterdam, Singapore, and Shanghai (Notteboom & Rodrigue, 2008; Wang et al., 2016)—there remains a significant gap in localized empirical studies focusing on developing countries, particularly within West Africa and, more specifically, Nigeria. Most of the existing literature centers around technologically advanced port systems and their integration of real-time traffic monitoring tools such as AIS (Meng & Zhao, 2013; Vasilenko & Kuksov, 2018), with little attention paid to the challenges faced by ports with outdated infrastructure and limited technological integration, such as those in Rivers State. Moreover, there is a paucity of research addressing how increasing maritime traffic density impacts the operational, environmental, and safety performance of under-resourced ports in developing economies. This gap underscores the need for a context-specific investigation into the implications of rising maritime traffic in Rivers State, Nigeria—a critical but underexamined maritime hub—thus contributing to the broader discourse on sustainable port operations in emerging economies. The maritime transport sector in Rivers State, Nigeria, is an essential component of the nation's economic activities, given the state's critical role as a gateway for international and domestic trade. The Port Harcourt Port and other smaller ports in the region are responsible for a significant portion of Nigeria's cargo imports and exports, particularly oil, agricultural goods, and raw materials (Akinwale et al., 2020; UNCTAD, 2023). However, the rapid growth in global trade, coupled with the steady increase in vessel sizes and frequency of calls to these ports, has led to a marked increase in maritime traffic density, creating a series of challenges for port efficiency (Rodrigue, 2020; Notteboom & Pallis, 2021). One of the most prominent issues caused by high maritime traffic density is congestion. The increasing number of ships, coupled with the

inadequacy of existing port infrastructure to accommodate them, has led to long waiting times for vessels to dock and unload (Onwuegbuchunam & Emeghara, 2018). The Port Harcourt Port, for instance, struggles with an aging infrastructure that cannot keep up with the modern demands of larger vessels (Akinwale et al., 2020). Ships are often forced to anchor in the harbor for extended periods, leading to delays in the unloading and loading of goods, which significantly impacts the turnaround time for vessels and the overall efficiency of port operations (Notteboom & Winkelmann, 2001). These delays also disrupt the schedules of shipping companies, leading to increased operational costs and affecting the broader supply chain (Afolayan & Oke, 2022).

The aim of this study is to examine the relationship between maritime traffic density and ports efficiency in Rivers State. By examining the relationship between maritime traffic, spatial and cargo throughput time, vessel turnaround, the maritime vessel density and vessel turnaround time in Rivers State.

## II. MATERIALS AND METHOD



### Research Questions

In order to guide the researcher within the context of this study, the following research questions were posed for answers.

- i. What is the relationship between maritime spatial traffic and cargo throughput in Rivers State?
- ii. What is the relationship between maritime spatial traffic and vessel turnaround time in Rivers State?

- iii. What is the relationship between maritime vessel traffic and cargo throughput in Rivers State?
- iv. What is the relationship between maritime vessel density and vessel turnaround time in Rivers State?
- v. What is the relationship between maritime flow traffic and cargo throughput in Rivers State?
- vi. What is the relationship between maritime flow traffic and vessel turnaround time in Rivers State?

**Research Hypotheses**

Base on above research questions the following null hypotheses were tested for validation or refutation.

- Ho<sub>1</sub>: There is no significant relationship between maritime spatial traffic and cargo throughput in Rivers State.
- Ho<sub>2</sub>: There is no significant relationship between maritime spatial traffic and vessel turnaround time in Rivers State
- Ho<sub>3</sub>: There is no significant relationship between maritime vessel traffic and cargo throughput in Rivers State.
- Ho<sub>4</sub>: There is no significant relationship between maritime spatial traffic and vessel turnaround time in Rivers State
- Ho<sub>5</sub>: There is no significant relationship between maritime flow traffic and cargo throughput in Rivers State.
- Ho<sub>6</sub>: There is no significant relationship between maritime flow traffic and vessel turnaround time in Rivers State

**Research Design**

This study adopted a cross-sectional survey. Cross-sectional surveys are studies aimed at determining the frequency or level of a particular attribute in a defined population at a particular point in time (Mugenda & Mugenda, 2003). Cross-sectional surveys are also useful in assessing practices, attitudes, knowledge and beliefs of a population either the entire population or a subset thereof is selected, and from these individuals, data are collected to help answer research questions of

interest. The research design that was adopted for this study is a survey approach. This method emphasizes quantitative analysis whereby data is collected through questionnaire, interviews, or from existing documents. Therefore, the research was carried out at one specific moment in time which means it can be qualified as a cross-sectional study. This type of time horizon was used because of the time limit of this study.

**3.2 Population of the Study**

Baridam (2008) opined that the population of a study identifies the total items within which a researcher wishes to study. Population refers to the entire group of people, event or things of interest that the researcher wishes to investigate (Sekaran, 2003).

The Consensus opinion emanating from scholars is that population of a study consists of a complete group of entities, showing some common characteristics (Saunders, Lewis & Thronhill, 2009). They also agree that population is the entire persons, organisations or things of interest that the researcher wishes to study. There are three (3) shipping terminals in onne population port, Rivers State. Hence, these constitute the population of the study.

Table 1: Population of the study

S/No.	Name of Company
1	Brawal Shipping Terminal
2	Federal Ocean Terminal (FOT)
3	Federal Light Terminal (FLT)
TOTAL	

Source: Field Survey, (2025)

**Sample Size and Sampling Technique**

According to Obioma (1987), sampling is the process by which a subset of persons or observations from a large set is drawn and studied in order to make inferences about the characteristics of a larger group. A sample occurs when a number of sampling units fewer than the aggregated is draw from a population and examined in some detail. There was no need for sampling in this study given that the population size is small and can be adequately covered. Hence, the

researcher adopted a census method. Therefore, the sample of the study is the three shipping terminals. However, four (4) senior manager, operational manager, fleet manager, commercial manager and HR Manager in each of the company served as the study respondents. This made the respondents twelve (12) Senior managers of the three shipping companies in Rivers State.

### 3.4 Validity Test

Validity also, known as relevance is the extent to which a test measures what is supposed to be measured Baridam (2007). According to Ritchie, Lewis, Nicholls, Ormston (2014) validity is seen as the correctness of the research and can be divided into internal and external validity. Internal validity is about whether the research investigates what it claims to investigate, while external validity is about whether the results are applicable to other parts of the population. To ensure the validity of the instrument the following areas were considered: Sample coverage, a capture of phenomena, identification or labelling, interpretation and display (Ritchie, Lewis, Nicholls & Ormston, 2014). Validity is concerned with the degree to which the sample of test items represents the content that the test is designed to measure. For this study, face validity was utilized.

### 3.5 Reliability Test

Reliability, therefore, refers to whether a test that is repeated on or about a study would give the same results or not (Ritchie, Lewis, Nicholls & Ormston, 2014; Saunders, Lewis and Thornhill, 2009). In the broadest sense, as argued by Cooper and Schindler (2014) reliability indicates the extent to which individual differences in test score are attributable to 'true' differences in the fluke characteristic being measured, and the extent to which they are attributable to chance (or unsystematic) errors. For example, if one repeats the same (or equivalent form of a) test and he/she obtains the same score each time, that test is likely to be reliable. In this study, the reliability was verified by conducting a confirmatory test of internal consistency on the instrument with our sample using the Cronbach alpha. The Cronbach alpha that indicated the only result of 0.7 and above were considered as reliable while any result below 0.7.

### 3.6 Methods of Data Collection

Data collection is the process of gathering data from either the primary or secondary sources for the purpose of the study analysis. The primary sources consist of first-hand information or raw data obtained by the researcher himself through the administration of research instruments. The secondary sources are existing data obtained from relevant materials such; books, journals, magazines and so on an unpublished work of others as well as valuable documents available to the researcher. The survey method entails a direct contact between the researcher and the subjects during which the researcher asks questions, which the subjects answer. The non-survey method, on the other hand, is one in which data are collected about subjects without necessarily involving any direct contact between the researcher and the subjects (Enyioko, 2016).

The primary data was sourced through the use of the questionnaire, observations, and personal/oral interviews. A questionnaire was used to elicit data from respondents on whom they were administered to. The method of gathering the data under this method involved e-mailing to the management and employees of the selected company for the study, administering letters and questionnaire to them, and requesting for their returning the filled copies of the questionnaire to the designated e-mail address. The letters that were administered to the managers and supervisors are to notify them of the researcher's intention to collect the data from them. Included in the letter is the purpose of the study and an appeal for their permission for their employees to partake in the study.

### Method of Data Analysis

As the scope of the dissertation broadened, the methods of statistical tools that were used for data analyses emerged and they would be organized into an understandable form. The answers given by this step allowed the further widening of the research, revealed some trends and answered the initial questions. Analysis, as defined by Akujuru and Enyioko (2018), is the breaking and ordering of the quantitative information gathered for research purposes into their component parts to uncover their interrelationships, understand their nature or to determine their essential ingredients. It also involves searching for trends and

patterns of organisations, relationships, and differences among these data or groups of data.

In this study, percentages, ratios, frequency distribution, scaling, ranking and other statistical tools would be used to analyse and achieve research objectives. Spearman Rank Order Correlation (SROC). All these analyses were computed through the use of statistical package for social sciences (SPSS) IBM SPSS Statistics 23 version.

By design it is constrained as follows:  $-1 < r_s < 1$  and its interpretation is, the closer  $r_s$  is to +1 the stronger the monotonic relationship. The sign of a correlation of (+ or -) indicates the direction of relationship between -1.00 and +1.00. Variables may be positively or negatively correlated. A positive correlation indicates a direct, positive relationship between two variables. A negative correlation, on the other hand indicates an inverse, negative relationship between two variables.

### III. RESULTS AND DISCUSSION

#### Data Presentation

Collection of data was carried out by the researcher through field survey which involved the personal administration of the copies of questionnaire to the senior managerial members of shipping terminal in Onne, Port Harcourt. A total of eighty-four (84) copies of questionnaire were distributed to the respondents who are senior managerial members of shipping terminals in Onne Port Harcourt. The administration and retrieval of copies of the questionnaire are shown in Table 1.

Table 1: Administration and Retrieval of Questionnaire

	Number of Cases	Percentage
Copies of Questionnaire Administered	84	100
Copies of Questionnaire Retrieved/Returned	81	96.42

Copies of Questionnaire Returned but not Usable	3	3.57
Completed and Usable Copies of Questionnaire	78	92.85

Source: Field Work (2025)

From Table 1, it is observed that 84 questionnaires were administered to respondents. 81 questionnaire representing 96.42 percent were returned. 3 questionnaire representing 3.57 percent were returned but not suitable for data analysis. 78 questionnaire representing 92.85 percent were correctly filled and thus suitable for data analysis.

#### 4.2 Demographic Profile of Respondents

In this study the output of the demographic analysis was presented. These presentations would further enable the understanding of demographic distribution of the sample.

Table 2 Gender Distribution

	Frequency	Percent	Valid Percent	Cumulative Percent
Male	51	65.4	65.4	65.4
Female	27	34.6	34.6	100.0
Total	78	100.0	100.0	

Source: SPSS output version 23.0

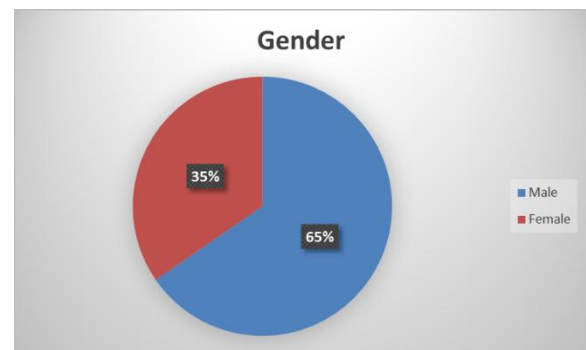


Figure 4.1: Pie chart showing gender distribution of respondents

Table 2 and Figure 1 displays the gender distribution of the respondents with male being 51 (65.4%) and female 27 (34.6%). The results indicate that in the target organizations, those working in

telecommunication companies are majorly of male gender.

Table 3 Age Range

	Frequency	Percent	Valid Percent	Cumulative Percent
25-39 years	22	28.2	28.2	28.2
40-54 years	33	42.3	42.3	70.5
55-69 years	23	29.5	29.5	100.0
Total	78	100.0	100.0	

Source: SPSS output version 23.0

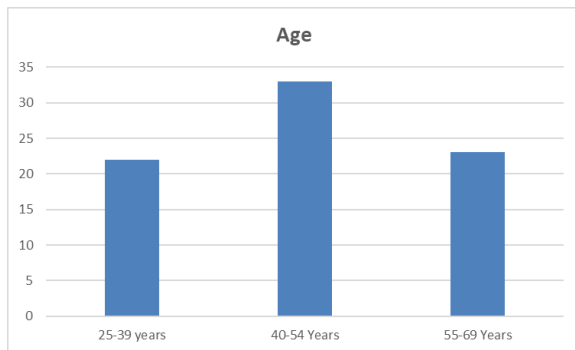


Figure 2: Bar chart showing age distribution of respondents

Table 3 and Figure 2 displays the age distribution of the respondents, 22 (28.2%) of the respondents were between 25-39 years, 33 (42.3%) were within the age bracket of 40-54 years, and 23 (29.5%) of the respondents were within the age bracket of 55-69. The distributions for the age of the respondents indicate a higher percentage distribution for respondents within the age brackets of 40-54 years. This implies that a good number of respondents have a lot of experience and career growth since age has bearing on working experience.

Table 4 Educational Qualification

	Frequency	Percent	Valid Percent	Cumulative Percent
Master's Degree	12	15.4	15.4	15.4
Bachelor's Degree	47	60.3	60.3	75.6
HND/ND	19	24.4	24.4	100.0
Total	78	100.0	100.0	

Source: SPSS output version 23.0

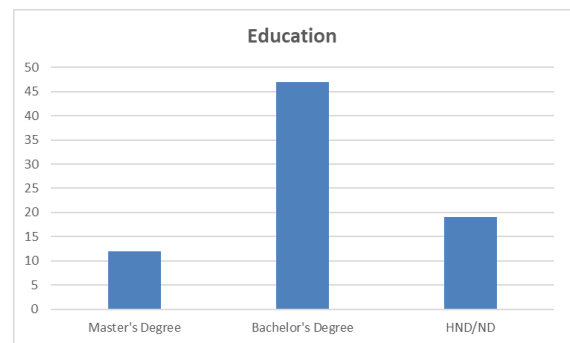


Figure 3: Bar chart showing educational distribution of respondents

The data in Table 4 portrays the educational qualifications of the respondents. From the results above, 12 of the respondents indicating 15.4 percent had Master's degree while 47 respondents representing 60.3 percent had Bachelor's degree, 19 respondents indicating 24.4 percent had HND/ND. The levels of educational attainment of the respondents were also considered. This is because education served as a key factor to effectively work in shipping terminals. The findings also show that most of our respondents are well educated and so are most likely to give credible responses. Therefore, from the findings, all of the respondents had tertiary education.

Table 5 Job Experience

	Frequency	Percent	Valid Percent	Cumulative Percent
--	-----------	---------	---------------	--------------------

Less than 5 years	20	25.6	25.6	25.6
5-10 years	46	59.0	59.0	84.6
11-15 years	12	15.4	15.4	100.0
Total	78	100.0	100.0	

Source: SPSS output version 23.0

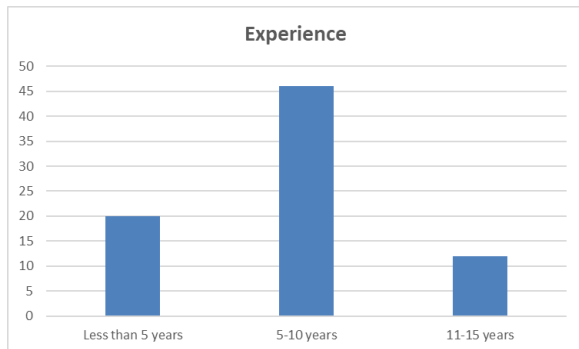


Figure 4: Bar chart showing experience of respondents

From the data presented in table 5 it can be observed that 20 respondents indicating 25.6 percent had worked for a period less than 5 years, 46 respondents which indicated 59 percent had been working for a period between 5-10 years, while 12 respondents which indicated 15.4 percent had been working for a period between 11-15 years. This shows that the respondents had sufficient background information to respond to the issue of maritime traffic density.

#### Data Analysis

##### Univariate Analysis

Univariate simply means a single unit variable, while analysis has to do with details of mathematical study or examination. Therefore, univariate analysis is simply an approach used in describing or analyzing data generated from an individual variable used in the study. It is an approach used in analyzing data generated from responses to items that make up an

individual research question in a study. In another development, Southern (2007) observed that univariate statistics reused to explain the distribution of only variable with simple frequency tables, percentages distributions.

##### Predictor Variable – Maritime Traffic Density

In generating the data on the operationalized variables, the study used a 5-point Likert scale instrument. Therefore, in interpreting the mean values, the study is relying on Asawo's (2016) categorization of responses with mean ( $\bar{x}$ ) thus:  $1 < \bar{x} \leq 2.5$  = low;  $2.5 < \bar{x} \leq 3.5$  = moderate;  $3.5 < \bar{x} \leq 4.5$  = high and  $4.5 \geq \bar{x}$  = very high. In order to ascertain the responses on maritime traffic density, the dimensions, namely; maritime spatial traffic, maritime vessel traffic, and maritime flow traffic, measured on a set of multi-item instruments, all scaled on a five points Likert scale and presented in the following tables below:

Table 6: Descriptive Statistics for Maritime Spatial Traffic

##### Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
The management of vessel traffic effectively prevents collisions.	78	1	5	3.63	1.320
Increased vessel activity has resulted in significant operational challenges.	78	1.00	5.00	3.2949	1.29041

There is sufficient planning to accommodate the growing number of vessels.	78	1.00	5.00	3.5513	1.45627
High levels of vessel activity negatively impact navigational safety.	78	1.00	5.00	3.7179	1.32799
The available space is sufficient for current and future vessel traffic.	78	1.00	5.00	3.6282	1.32026
Valid N (listwise)	78				

Source: SPSS Output

The data (table 6) illustrates that there is a high level of affirmation (where  $x > 2.50$ ) as regards the indicators of maritime spatial traffic which is a dimension of maritime traffic density. The construct examined the context and manifestations of maritime spatial traffic within the target organizations with indicators aimed at examining respondents' perception of maritime traffic density through its indicators. The results affirm to all five indicators of maritime spatial traffic within the target organizations as also supported by the low disparity in response ( $SD < 2.00$ ). The implication of these responses is that the respondents of maritime spatial traffic of shipping terminals in Onne, Port Harcourt, are strongly of the opinion that maritime traffic density is an observed phenomenon in their organizations and hence are largely on the agreement range of the scale.

Table 7: Descriptive Statistics for Maritime Vessel Traffic

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
The management of vessel traffic effectively prevents collisions.	78	1.00	5.00	3.2436	1.52201
Increased vessel activity has resulted in significant operational challenges.	78	1.00	5.00	3.4487	1.55127
There is sufficient planning to accommodate the growing number of vessels.	78	1.00	5.00	3.5000	1.43019
High levels of vessel activity negatively impact navigational safety.	78	1.00	5.00	3.3846	1.44358
The available space is sufficient for current and future vessel traffic.	78	1.00	5.00	3.7179	1.46737
Valid N (listwise)	78				

Source: SPSS Output

The data (table 7) illustrates that there is a high level of affirmation (where  $x > 2.50$ ) as regards the indicators of maritime vessel traffic which is a dimension of maritime traffic density. The construct examined the context and manifestations of maritime vessel traffic within the target organizations with indicators aimed at examining respondents' perception of maritime traffic density through its indicators. The results affirm to all five indicators of maritime vessel traffic within the target organizations as also supported by the low disparity in response ( $SD < 2.00$ ). The implication of these responses is that the respondents of maritime vessel traffic of shipping terminals in Onne, Port Harcourt, are strongly of the opinion that maritime traffic density is an observed phenomenon in their organizations and hence are largely on the agreement range of the scale.

Table 8: Descriptive Statistics for Maritime Flow Traffic

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
The flow of maritime traffic is well-organized and predictable.	78	1.00	5.00	3.4231	1.32429
Inefficient maritime flow often leads to delays in cargo operations.	78	1.00	5.00	3.7051	1.39674

Maritime traffic flow is effectively managed to avoid congestion.	78	1.00	5.00	3.5769	1.40055
Real-time data enhances the monitoring of maritime traffic flow.	78	2.00	3.00	2.9231	.26819
Variability in maritime flow traffic disrupts port scheduling and planning.	78	2.00	5.00	3.9487	.50703
Valid N (listwise)	78				

Source: SPSS Output

The data (table 8) illustrates that there is a high level of affirmation (where  $x > 2.50$ ) as regards the indicators of maritime flow traffic which is a dimension of maritime traffic density. The construct examined the context and manifestations of maritime flow traffic within the target organizations with indicators aimed at examining respondents' perception of maritime traffic density through its indicators. The results affirm to all five indicators of maritime flow traffic within the target organizations as also supported by the low disparity in response ( $SD < 2.00$ ). The implication of these responses is that the respondents of maritime flow traffic of shipping terminals in Onne, Port Harcourt, are strongly of the opinion that maritime traffic density is an observed phenomenon in their organizations and hence are largely on the agreement range of the scale.

Table 9 Descriptive Statistics for Maritime Traffic Density

	N	Minimum	Maximum	Mean	Std. Deviation
Maritime Spatial Traffic	78	1.00	5.00	3.5641	1.19642
Maritime Vessel Traffic	78	1.00	5.00	3.4590	1.19701
Maritime Flow Traffic	78	2.00	4.40	3.5154	.69918
Valid N (listwise)	78				

Source: SPSS Version 23.0 Output

Table 9 illustrates the descriptive statistics for the dimensions of maritime traffic density which are maritime spatial traffic, maritime vessel traffic, and maritime flow traffic, with mean scores of 3.56, 3.45, 3.51 respectively. The implication of this is that most of the respondents were on the agreement range of the scale which means that maritime traffic density is highly an observed phenomenon in shipping terminals in Onne, Port Harcourt.

Figure 5 Histogram showing descriptive statistics for maritime traffic density

Figure 5 summarizes the distribution for the predictor variable – maritime traffic density. The mean distribution for the variable reveals the extent of the manifestations of maritime traffic density to be moderate (where  $x = 3.51$ ) which is within the criterion of  $3.5 < x < \leq 4.5$  for high manifestations. This goes to show that maritime traffic density is an observed phenomenon in shipping terminals in Onne, Port Harcourt.

#### Criterion Variable – Ports Efficiency

In generating the data on the operationalized variables, the study used a 5-point Likert scale instrument. Therefore, in interpreting the mean values, the study is relying on Asawo's (2016) categorization of responses with mean (x) thus:  $1 < x \leq 2.5$  = low;  $2.5 < x \leq 3.5$  = moderate;  $3.5 < x \leq 4.5$  = high and  $4.5 \geq x$  = very high. In order to ascertain the responses on ports efficiency, the measures, namely; cargo throughput, and vessel turnaround time were measured on a set of multi-item

instruments, all scaled on a five points Likert scale and are as presented.

Table 10: Descriptive Statistics for Cargo throughput

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
The port efficiently handles cargo operations.	78	2.00	5.00	4.0256	.58051
Delays in cargo processing affect the overall turnaround time.	78	2.00	5.00	4.0256	.80541
The use of advanced technologies improves cargo handling efficiency.	78	2.00	5.00	3.1795	1.13668
A well-managed workforce reduces cargo throughput.	78	1.00	5.00	4.1282	1.02386
Congestion at the port affects the efficiency of cargo handling.	78	1.00	5.00	3.5897	1.06217
Valid N (listwise)	78				

Source: SPSS Output

The data (table 10) illustrates that there is a high level of affirmation (where  $x > 2.50$ ) as regards the indicators of cargo throughput which is a measure of ports efficiency. The construct examined the context and manifestations of cargo throughput within the target organizations with indicators aimed at examining respondents' perception of cargo throughput through its indicators. The results affirm to all five indicators of cargo throughput within the target organizations as also supported by the low disparity in response ( $SD < 2.00$ ). The implication of these responses is that the respondents of shipping terminals in Onne, Port Harcourt are strongly of the opinion that cargo throughput is an observed phenomenon in their organizations and hence are largely on the agreement range of the scale.

Table 11: Descriptive Statistics for Depersonalization

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
I sometimes feel disconnected from my emotions when interacting with others at work.	145	1.00	5.00	3.6897	1.55687
There are moments when I find it challenging to empathize with colleagues or clients.	145	1.00	5.00	3.7655	1.39450

I perceive that I sometime s adopt a detached or indifferen t attitude towards work-related tasks.	14 5	1.00	5.00	3.62 07	1.4096 3
I feel like I am going through the motions without genuinely engaging in my work.	14 5	1.00	5.00	3.22 76	1.5975 0
I perceive a sense of emotional numbness or detachme nt in certain work situations.	14 5	1.00	5.00	3.91 03	1.4236 0
Valid N (listwise)	14 5				

Source: SPSS Output

The data (table 11) illustrates that there is a high level of affirmation (where  $x > 2.50$ ) regards the indicators of vessel turnaround time which is a measure of ports efficiency. The construct examined the context and manifestations of vessel turnaround time within the target organizations with indicators aimed at examining respondents' perception of vessel turnaround time through its indicators. The results affirm to all five indicators of vessel turnaround time within the target organizations as also supported by the low disparity in response ( $SD < 2.00$ ). The implication of these responses is that the respondents of shipping terminals in Onne, Port Harcourt are strongly of the

opinion that vessel turnaround time is an observed phenomenon in their organizations and hence are largely on the agreement range of the scale.

Table 13 Descriptive Statistics for Ports Efficiency

	N	Minimu m	Maximu m	Mean	Std. Deviati on
Cargo throughp ut	7 8	2.00	4.80	3.789 7	.65734
Vessel Turnarou nd Time	7 8	3.80	5.00	4.374 4	.32291
Valid N (listwise)	7 8				

Source: SPSS Output

Table 13 illustrates the descriptive statistics for measures of ports efficiency which are cargo throughput and vessel turnaround time with mean scores of 3.78, and 4.37 respectively. The implication on this is that most of the respondents were on the agreement range of the scale which means that there is high ports efficiency in shipping terminals in Onne, Port Harcourt.

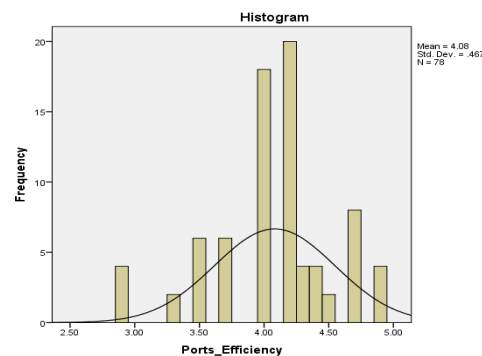


Figure 6 Histogram showing descriptive statistics for ports efficiency

Figure 6 summarizes the distribution for the criterion variable – ports efficiency. The mean distribution for the variable reveals the extent of the manifestations of ports efficiency to be high (where  $x = 4.08$ ) which is within the criterion of  $3.5 < x < \leq 4.5$  for high manifestations. This goes to show that although ports efficiency is an observed phenomenon in shipping terminal in Onne, Port Harcourt.

Test for Normality  
 This study particularly determined the normality graphically, by use of the normal Q-Q plots for every variable considered. Ordinarily, if the data is normally distributed, the data points will be close to the diagonal line. On the contrary, if the data points stray from the line in an obvious non-linear fashion, the data would not be normally distributed. In the context of this study, Shapiro-Wilk was used in testing normality of the data. Additionally, the normal Q-Q plot was used for summarizing the data. The Quantile-Quantile (Q-Q) plot is an excellent way to see whether the data deviates from other distributions but only interested in the normal distribution. The scatter plot on the other hand would show the relationship between the actual observed values and what those values would be expected when the data is normally distributed.

The tests are carried out on both predictor (maritime traffic density) and criterion (ports efficiency) variables to ascertain the extent to which their properties allow for the application of either the parametric tools (Pearson Product Moment Correlation, Regression analysis etc.) or the use of non-parametric tools (Spearman's rank order, correlation). This was considered necessary as the results of correlations are considered acceptable or suitable based on the appropriateness of the tool adopted in the assessment or tests for correlation. Hence, the argument for the application of non-parametric tools in this study hangs primarily on the abnormality of data distribution and the transformations of the adopted scales. The results for the tests for normality are presented accordingly in table 4.14.

Table 14 Test for Skewness and Kurtosis

		Statistic	Std. Error
	Mean	3.5128	.10896
	95% Lower Confidence Bound	3.2959	
Maritime Traffic Density	Interval for Upper Mean Bound	3.7298	
	5% Trimmed Mean	3.5624	
	Median	3.7000	
	Variance	.926	
	Std. Deviation	.96228	

	Minimum	1.33	
	Maximum	4.80	
	Range	3.47	
	Interquartile Range	1.20	
	Skewness	-.677	.272
	Kurtosis	-.206	.538
	Mean	4.0821	.05288
	95% Lower Confidence Bound	3.9768	
	Interval for Upper Mean Bound	4.1873	
	5% Trimmed Mean	4.1023	
	Median	4.2000	
Ports Efficiency	Variance	.218	
	Std. Deviation	.46703	
	Minimum	2.90	
	Maximum	4.90	
	Range	2.00	
	Interquartile Range	.30	
	Skewness	-.610	.272
	Kurtosis	.553	.538

Source: SPSS Output

It is essential before proceeding with further statistical tests to measure and judge whether these factors (dependent variables) are normally distributed. A normal distribution reflects that the majority of the scores (Means) of participants regarding the factor are around the mean with fewer scores on the extreme sides of a frequency histogram (Bell-Shaped). The skewness (the spread of score on histogram) and Kurtosis (Peak of the Histogram) give an idea of the normality of the data, where scores between +2/-2 reflect normality. Normal distribution is essential in order to justify the inferential tests to be used.

Skewness refers to lack of symmetry in a distribution. In a positively skewed distribution the longer tail is usually on the right side and the mean is on the right of the median. In a negatively skewed distribution the longer tail is on the left and the mean is on the left of the median. Results presented in Table 14 revealed that skewness coefficient for employment contract management and employee job burnout was between -.668 and -.813 implying that the variables had a negative skewness. Also, the table 17 describes the result on the assessment of the kurtosis distribution of the data for both variables – employment contract management. Therefore, results reveal platykurtic

distributions (where  $K < 3.00$ ) with negatively skewed data results (where  $S > 0.100$ ) for both variables. The evidence establishes the manifestations of asymmetric distributions for both variables. Based on the descriptive table for each of the factors, it can be assumed that all factors are considered abnormally distributed, justifying the choice of the non-parametric inferential tests of Spearman Rank Order Correlation (to be used in the following section). Also the normality test is further illustrated in the following Q-Q plots of figure 4.8.

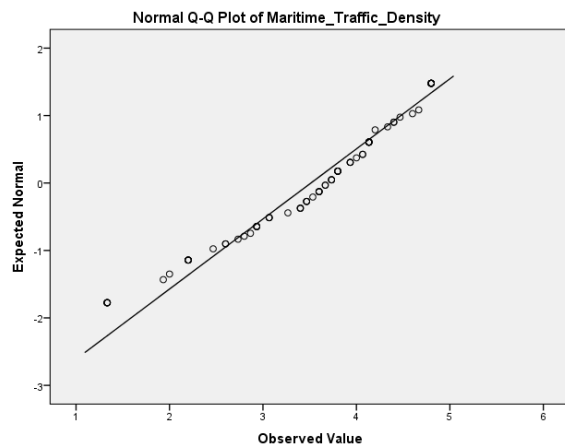


Figure 7 Showing Q-Q plot for Maritime Traffic density

Source: SPSS Output

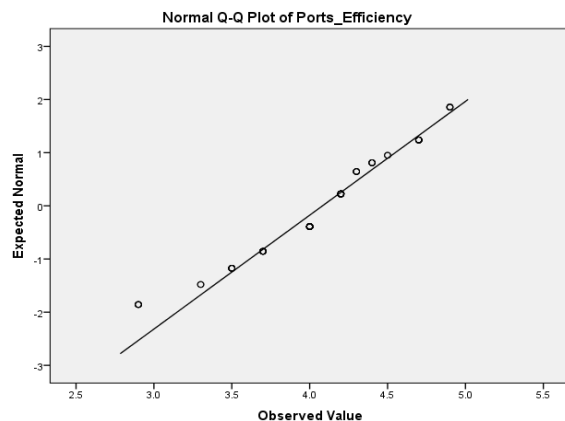


Figure 8 showing Q-Q plot for Port Efficiency  
 Source: SPSS Output

The figure 8 and 9 further emphasized through graphic illustrations the platykurtic distributions for both maritime traffic density and ports efficiency. Figures indicate graphically the evidence of asymmetric

distributions which apparently fail to correspond with the criterion line for mesokurtic distributions (or normal distributions). The significance of this asymmetry is tested using the kolmogorov-smirnov and shapiro-wilk tests as presented in table 4.19.

Table 15 Tests of Normality

	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	Df	Sig.
Maritime Traffic Density	.120	78	.007	.932	78	.000
Ports Efficiency	.200	78	.000	.933	78	.000

a. Lilliefors Significance Correction

Source: SPSS Output

Table 15 illustrates the results on the test for the significance of asymmetry in the distributions of the data for both maritime traffic density and ports efficiency. The evidence from the analysis reveals significant ( $P < 0.05$ ) manifestations of asymmetry in both instances. Thus, this study having established the distribution for the variables – maritime traffic density and ports efficiency, as asymmetric and abnormal, adopts the non-parametric test statistics which make no assumptions about the population distribution, in the test for the bivariate (Spearman's rank order correlation) null hypothetical statements.

#### Bivariate Analysis

The bivariate hypothetical statements for the study were tested using the Spearman's rank order correlation coefficient. The Spearman Rank Order correlation was adopted as the correlation tool as a result of its non-parametric features (normality of distribution, homogeneity of variance for the variables) and its suitability for data which is either scaled on the interval or ordinal level of scaling. The Spearman's rank order correlation also allows for the assessment of the assumptions of ranking in the effect and associations between the variables. The interpretation of Cooper and Schindler (2014) correlation decision scale frame as used in this study are presented below:

- i.  $\pm .00 - .19$  = Very Weak Correlation
- ii.  $\pm .20 - .39$  = Weak Correlation
- iii.  $\pm .40 - .59$  = Moderate correlation
- iv.  $\pm .60 - .79$  = Strong Correlation
- v.  $\pm .80 - .99$  = Very Strong Correlation
- vi.  $\pm 1$  = Perfect Correlation

The '+' sign of Rho points a direct and positive relationship, while '-' sign of Rho shows an indirect or inverse relationship. Thus, the Rho sign indicates the direction of relationship between the predictor and criterion variables. This section was therefore used to present the answers to our research questions and test the earlier postulated hypotheses. However, we commenced by first presenting a proof of existing relationships using a scatter graph. Generally, the decision rule for the acceptance or rejection of hypothetical statements is premised on the adoption of a 0.05 significance threshold due to its 95% test on all hypotheses.

**Maritime Spatial Traffic and Port Efficiency Measures**  
 Table 4.16 shows the result of correlation matrix obtained for maritime spatial traffic and measures of port efficiency. Also displayed in the table is the statistical test of significance (p - value), which makes us able to answer our research question and generalize our findings to the study population.

Table 16: Correlations for maritime spatial traffic and the measures of Ports Efficiency

		Maritime Spatial Traffic	Cargo throughput	Vessel Turnaround Time
Spearman's rho	Correlation Coefficient	1.000	.740**	.541**
	Sig. (2-tailed)	.	.000	.000
	N	78	78	78
	Correlation Coefficient	.740*	1.000	.891**

	Sig. (2-tailed)	.000	.	.000
	N	78	78	78
Vessel Turnaround Time	Correlation Coefficient	.541*	.891**	1.000
	Sig. (2-tailed)	.000	.000	.
	N	78	78	78

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

Source: SPSS Output

**RQ1:** What is the relationship between maritime spatial traffic and ports efficiency measures in Rivers State?

The correlation coefficient (rho) result in table 4.16 was used to answer research question 1. Table 16 shows a Spearman Rank Order Correlation Coefficient (rho) of 0.740 on the relationship between maritime spatial traffic and cargo throughput. This value implies that a strong relationship exists between the variables. The direction of the relationship indicates that the correlation is positive; implying that an increase in cargo throughput was as a result of the adoption of maritime spatial traffic. Therefore, there is a very strong positive correlation between maritime spatial traffic and cargo throughput of shipping terminals in Onne, Port Harcourt.

Similarly, Table 20 shows a Spearman Rank Order Correlation Coefficient (rho) of 0.541 on the relationship between maritime spatial traffic and vessel turnaround time. This value implies that a strong relationship exists between the variables. The direction of the relationship indicates that the correlation is positive; implying that an increase in vessel turnaround time was as a result of the adoption of maritime spatial traffic. Therefore, there is a very strong positive correlation between maritime spatial traffic and vessel turnaround time of shipping terminals in Onne, Port Harcourt.

Therefore, to enable us accept or reject hypotheses 1, and 2 as well as generalize our findings to the study population the p- value was used as shown below:

H<sub>01</sub>: There is no significant relationship between maritime spatial traffic and cargo throughput in Rivers State.

Similarly displayed in the table 16 is the statistical test of significance (p-value) which makes possible the generalization of our findings to the study population. From the result obtained from table 4.16, the sig-calculated is less than significant level ( $p = 0.000 < 0.05$ ). Therefore, based on this finding the null hypothesis earlier stated is hereby rejected and the alternate upheld. Thus, there is a significant relationship between maritime spatial traffic and cargo throughput in Rivers State.

H<sub>02</sub>: There is no significant relationship between maritime spatial traffic and vessel turnaround time in Rivers State.

Also displayed in the table 16 is the statistical test of significance (p-value) which makes possible the generalization of our findings to the study population. From the result obtained from table 4.16, the sig-calculated is less than significant level ( $p = 0.000 < 0.05$ ). Therefore, based on this finding the null hypothesis earlier stated is hereby rejected and the alternate upheld. Thus, there is a significant relationship between maritime spatial traffic and vessel turnaround time in Rivers State.

Therefore, the results for the first set of hypotheses with regards to the relationship between maritime traffic density and ports efficiency measures are stated as follows:

- i. There is a very strong positive significant relationship between maritime spatial traffic and cargo throughput in Rivers State.
- ii. There is a strong positive significant relationship between maritime spatial traffic and vessel turnaround time in Rivers State.

**Maritime Vessel Traffic and Ports Efficiency Measures**

Table 17 shows the result of correlation matrix obtained for maritime vessel traffic and measures of port efficiency. Also displayed in the table is the statistical test of significance (p - value), which makes

us able to answer our research question and generalize our findings to the study population.

Table 17 Correlations for Maritime Vessel Traffic and Ports Efficiency Measures

		Maritime Vessel Traffic	Cargo throughput	Vessel Turnaround Time
Maritime Vessel Traffic	Correlation Coefficient	1.000	.546**	.615**
	Sig. (2-tailed)	.	.000	.000
	N	78	78	78
	Correlation Coefficient	.546*	1.000	.891**
Spearman's rho	Cargo throughput	.000	.	.000
	Sig. (2-tailed)			
	N	78	78	78
	Correlation Coefficient	.615*	.891**	1.000
Vessel Turnaround Time	Sig. (2-tailed)	.000	.000	.
	N	78	78	78

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

Source: SPSS Output version 23.0

RQ2: What is the relationship between maritime vessel traffic and ports efficiency measures in Rivers State?

The correlation coefficient (rho) result in table 17 was used to answer research question 2. Table 17 shows a Spearman Rank Order Correlation Coefficient (rho) of 0.546 on the relationship between maritime vessel traffic and cargo throughput. This value implies that a very strong relationship exists between the variables. The direction of the relationship indicates that the correlation is positive; implying that an increase in

cargo throughput was as a result of the adoption of maritime vessel traffic. Therefore, there is a strong positive correlation between maritime vessel traffic and cargo throughput of shipping terminals in Onne, Port Harcourt.

Similarly, Table 4.17 shows a Spearman Rank Order Correlation Coefficient ( $\rho$ ) of 0.615 on the relationship between maritime vessel traffic and vessel turnaround time. This value implies that a very strong relationship exists between the variables. The direction of the relationship indicates that the correlation is positive; implying that an increase in vessel turnaround time was as a result of the adoption of maritime vessel traffic. Therefore, there is a strong positive correlation between maritime vessel traffic and cargo throughput of shipping terminals in Onne, Port Harcourt.

Therefore, to enable us accept or reject hypotheses 3, and 4, as well as generalize our findings to the study population the p- value was used as shown below:

Ho<sub>3</sub>: There is no significant relationship between maritime vessel traffic and cargo throughput in Rivers State.

Similarly displayed in the table 17 is the statistical test of significance (p-value) which makes possible the generalization of our findings to the study population. From the result obtained from table 17, the sig-calculated is less than significant level ( $p = 0.000 < 0.05$ ). Therefore, based on this finding the null hypothesis earlier stated is hereby rejected and the alternate upheld. Thus, there is a significant relationship between maritime vessel traffic and cargo throughput in Rivers State.

Ho<sub>4</sub>: There is no significant relationship between maritime spatial traffic and vessel turnaround time in Rivers State

Also displayed in the table 17 is the statistical test of significance (p-value) which makes possible the generalization of our findings to the study population. From the result obtained from table 17, the sig-calculated is less than significant level ( $p = 0.000 < 0.05$ ). Therefore, based on this finding the null hypothesis earlier stated is hereby rejected and the alternate upheld. Thus, there is a significant

relationship between maritime spatial traffic and vessel turnaround time in Rivers State.

Therefore, the results for the second set of hypotheses with regards to the relationship between maritime vessel traffic and ports efficiency measures are stated as follows:

- i. There is a positive significant relationship between between maritime spatial traffic and cargo throughput in Rivers State
- ii. There is a strong positive significant relationship between between maritime spatial traffic and vessel turnaround time in Rivers State.

#### Maritime Flow Traffic and Ports Efficiency Measures

Table 18 shows the result of correlation matrix obtained for maritime flow traffic and measures of ports efficiency. Also displayed in the table is the statistical test of significance (p - value), which makes us able to answer our research question and generalize our findings to the study population.

Table 18: Correlations for Maritime Flow Traffic and Ports Efficiency Measures

		Maritime Flow Traffic	Cargo throughput	Vessel Turnaround Time
Spearman's rho	Correlation Coefficient	1.000	.586**	.629**
	Sig. (2-tailed)	.	.000	.000
	N	78	78	78
	Correlation Coefficient	.586*	1.000	.891**
	Sig. (2-tailed)	.000	.	.000
	N	78	78	78

Vessel Turnaround Time	Correlation	.629*	.891**	1.000
	Coefficient			
	Sig. (2-tailed)	.000	.000	.
	N	78	78	78

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

Source: SPSS Output version 23.0

RQ3: What is the relationship between maritime flow traffic and ports efficiency measures in Rivers State?

The correlation coefficient (rho) result in table 18 was used to answer research question 3. Table 18 shows a Spearman Rank Order Correlation Coefficient (rho) of 0.586 on the relationship between maritime flow traffic and cargo throughput. This value implies that a very strong relationship exists between the variables. The direction of the relationship indicates that the correlation is positive; implying that an increase in cargo throughput was as a result of the adoption of maritime flow traffic. Therefore, there is a strong positive correlation between maritime flow traffic and cargo throughput of shipping terminals in Onne, Port Harcourt.

Similarly, Table 18 shows a Spearman Rank Order Correlation Coefficient (rho) of 0.849 on the relationship between maritime flow traffic and cargo throughput. This value implies that a very strong relationship exists between the variables. The direction of the relationship indicates that the correlation is positive; implying that an increase in cargo throughput was as a result of the adoption of maritime flow traffic. Therefore, there is a strong positive correlation between maritime flow traffic and cargo throughput of shipping terminals in Onne, Port Harcourt.

Therefore, to enable us accept or reject hypotheses 5, and 6 as well as generalize our findings to the study population the p- value was used as shown below:

H<sub>05</sub>: There is no significant relationship between maritime flow traffic and cargo throughput in Rivers State.

Similarly displayed in the table 18 is the statistical test of significance (p-value) which makes possible the generalization of our findings to the study population. From the result obtained from table 18, the sig-calculated is less than significant level ( $p = 0.000 < 0.05$ ). Therefore, based on this finding the null hypothesis earlier stated is hereby rejected and the alternate upheld. Thus, there is a significant relationship between maritime flow traffic and cargo throughput in Rivers State.

H<sub>06</sub>: There is no significant relationship between maritime flow traffic and vessel turnaround time in Rivers State

Also displayed in the table 18 is the statistical test of significance (p-value) which makes possible the generalization of our findings to the study population. From the result obtained from table 18, the sig-calculated is less than significant level ( $p = 0.000 < 0.05$ ). Therefore, based on this finding the null hypothesis earlier stated is hereby rejected and the alternate upheld. Thus, there is a significant relationship between maritime flow traffic and vessel turnaround time in Rivers State.

Therefore, the results for the third set of hypotheses with regards to the relationship between maritime flow traffic and ports efficiency measures are stated as follows:

- i. There is a strong positive relationship between maritime flow traffic and cargo throughput in Rivers State.
- ii. There is a strong positive significant relationship between maritime flow traffic and vessel turnaround time in Rivers State.

## CONCLUSION

The study concludes that maritime density traffic positively influences port efficiency in Rivers State. This implies that an increase in the volume and frequency of maritime traffic is directly correlated with improvements in the operational efficiency of the ports in the region. Specifically, as the number of vessels and cargo movements rises, the port's ability to process and manage these activities effectively improves, leading to faster turnaround times, reduced

congestion, and a smoother flow of goods. In specific terms, the following conclusions emerged:

Maritime spatial traffic positively influences port efficiency in Rivers State. This implies that the efficient management of the spatial distribution of maritime traffic, including the movement, positioning, and scheduling of vessels within the port's operational zones, directly contributes to improving the port's overall efficiency. When vessels are well-distributed and efficiently managed in terms of their arrival, docking, and unloading schedules, the port can maximize its capacity and minimize delays.

Similarly, maritime vessel traffic positively influences port efficiency in Rivers State. This implies that an increase in the number of vessels visiting the port directly contributes to the enhancement of operational efficiency. Higher vessel traffic typically leads to greater activity and throughput at the port, requiring improved management of logistics, resources, and infrastructure. Efficient management of vessel movements ranging from docking and cargo handling to unloading and departure ensures that the port operates at optimal capacity, leading to faster turnaround times, reduced congestion, and increased productivity.

Finally, maritime flow traffic positively influences port efficiency in Rivers State. This implies that a well-regulated and consistent flow of maritime traffic directly enhances the overall efficiency of port operations. When there is a steady and manageable flow of vessels moving in and out of the port, it allows for optimal scheduling, better coordination of docking times, and a more seamless handling of cargo. A balanced flow of traffic helps minimize congestion, reduces idle time for vessels, and maximizes the utilization of available resources, such as berth space, cranes, and storage facilities.

#### REFERENCES

- [1] Kang, H., & Park, Y. (2012). Maritime traffic density and port congestion: Implications for port efficiency. *Journal of Maritime Economics & Logistics*, 14(1), 25-43.
- [2] Notteboom, T. E., & Winkelmann, W. (2001). Structural changes in logistics: How will port authorities face the challenges? *Maritime Policy & Management*, 28(1), 71-89.
- [3] UNCTAD. (2020). Review of Maritime Transport 2020. United Nations Conference on Trade and Development.
- [4] World Bank. (2016). Port management and efficiency: A global view. World Bank Publications.
- [5] Song, D., & Yeo, G. T. (2004). Port efficiency and competitiveness: The impact of maritime traffic congestion. *Transportation Research Part A: Policy and Practice*, 38(10), 797-810.
- [6] Notteboom, T., & Rodrigue, J. P. (2008). *The geography of transport systems*. Routledge.
- [7] Meng, Q., & Zhao, L. (2013). Port congestion and its impact on the global supply chain. *International Journal of Shipping and Transport Logistics*, 5(4), 342-357.
- [8] Wang, S., Li, X., & Wang, X. (2016). AIS-based maritime traffic density analysis and port congestion prediction. *Journal of Navigation*, 69(4), 761-776.
- [9] Vasilenko, N., & Kuksov, M. (2018). Automatic identification systems and real-time maritime traffic management. *Journal of Maritime Science and Technology*, 22(2), 89-100.
- [10] Parola, F., Penco, L., & Sciomachen, A. (2019). Weather conditions and port performance: Implications for maritime traffic density and port efficiency. *Maritime Economics & Logistics*, 21(2), 147-168.
- [11] Lam, J. S. L., & Van De Voorde, E. (2014). Port congestion and environmental regulations: A framework for analysis. *Transport Reviews*, 34(5), 635-652.
- [12] UNCTAD (2023). Review of Maritime Transport 2023. United Nations Conference on Trade and Development.
- [13] Rodrigue, J. P. (2020). *The geography of transport systems* (5th ed.). Routledge.
- [14] Notteboom, T., & Pallis, T. (2021). IAPH-WPSP Port Economic Impact Barometer One Year Report: A survey-based analysis of the impact of

COVID-19 on world ports in the period April 2020 to April 2021.

- [15] Mugenda, O. M., & Mugenda, A. G. (2003). Research methods: Quantitative and qualitative approaches. African Centre for Technology Studies.
- [16] Baridam, D. M. (2008). Research methods in administrative sciences. Sherbrooke Press.
- [17] Sekaran, U. (2003). Research methods for business: A skill-building approach (4th ed.). John Wiley & Sons.
- [18] Saunders, M., Lewis, P., & Thornhill, A. (2009). Research methods for business students (5th ed.). Pearson Education.
- [19] Obioma, G. (1987). Principles and methods of educational research. University Press.
- [20] Ritchie, J., Lewis, J., Nicholls, C. M., & Ormston, R. (2014). Qualitative research practice: A guide for social science students and researchers (2nd ed.). Sage Publications.
- [21] Saunders, M., Lewis, P., & Thornhill, A. (2009). Research methods for business students (5th ed.). Pearson Education.
- [22] Enyioko, N. (2016). Research methods in social sciences. Pearl Publishers.
- [23] Akujuru, C. A., & Enyioko, N. (2018). Research methods: A practical approach. Pearl Publishers.
- [24] Akinwale, Y. O., Adepoju, A. O., & Oladele, O. I. (2020). Port infrastructure and economic development in Nigeria: The case of Port Harcourt Port. *Journal of Shipping and Trade*, 5(1), 1-15.
- [25] Onwuegbuchunam, D. E., & Emeghara, G. C. (2018). Port congestion and vessel waiting time in Nigeria's seaports: A study of Apapa and Onne Ports. *Journal of Transport and Supply Chain Management*, 12(1), 1-11.
- [26] Afolayan, A. O., & Oke, T. F. (2022). Impact of port congestion on shipping operations and supply chain in Nigeria. *International Journal of Supply Chain Management*, 11(2), 123-135.