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Analysis Of Seaport Safety in Nigeria: Case Of Apapa Port Complex Lagos

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A b s t r a c t

The aim of this study is to assess the seaport operational safety of Apapa port Lagos. Primary data were collected using survey for the analysis. The study utilized Logit model and Multi-Criteria Decision Analysis to analyze the data collected from` the seaport. In running the analysis, SPSS software version 24.0 was used to analyze the data. The result from the Logit model shows that there is a high significant relationship between the dependent and independent variables tested in the study. This means that there is need for improvement in the area of safety at the port. Furthermore, the multi-criteria decision analysis result also shows various sections and their corresponding weights and ranks with a level of improvement that will be help to step up or enhance the safety variables during port operation. The study recommends that the seaport should be carrying out constant safety study from time to time to increase the safety and security levels of the seaport as recommended by the IMO.

Keywords: Safety, Security, Seaport, and Terminal

1. Introduction

Seaports are significant operational and business contributors to any nation's economy [1]. The seaport area is described as the catalyst that drives the economic activities through the import and export of goods, whereby duties are paid through cargo clearance, port charges, and other revenues are achieved for the nation through the seaports. This process makes the trade and commerce of the nation grow very fast [1]. The maritime industry includes all enterprises engaged in the business of, constructing, manufacturing, acquiring, operating, supplying, repairing, and maintaining vessels, or parts thereof: of managing and operating shipping lines, stevedoring and customs brokerage services, shipyards, dry docks, marine railways, marine repair shops, shipping and freight forwarding services and similar enterprises. Generally, the industry embraces all the maritime-related business activities within the country's maritime environment. These include offshore economic activities such as fishing, salvage, towage, and underwater resources and onshore economic activities such as port activities, maritime transport (shipping), ship construction, repairs, and maintenance [2].

The maritime industry plays a significant role in the international trade, and most of these maritime activities are through the sea transport. Due to the importance of the industry and to the globe, various ports and terminals involved in maritime activities, there is a need to study how to manage the overall quality of service of the seaports regarding the safety of operation is a significant factor. Evaluating the overall safety operation of the ports is vital since the Apapa port in question is experiencing severe congestion issues and accidents, thereby

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making several vessels and shipping companies divert their vessels to eastern ports. Locally, there is movement of goods, which involves much logistics and planning. To this end, delivering safe, quality service to port users and operators is necessary for success and survival in today's competitive port environment. In the last decade, there have been numerous studies on safety service quality; researchers have reported that excellent service is a profitable strategy because it results in new customers, more operational efficiency, more business with existing customers, fewer lost customers, more insulation from price competition, and fewer mistakes requiring the performance of services. [3].

Moreso, [2] stated that service safety touches our lives daily during port operations. Efficient and effective service delivery is essential for the economy to function and enhance the quality of human life. In general terms, customer and employee satisfaction regarding safety are essential determinants of port operational success. On the other hand, as the competition has increased in the port operations as a big market, safety service quality is a determinant of market share, return on investment, and cost reduction; thus, it is essential to cooperate successfully in the operations. Customer satisfaction (as in the shipping companies and shippers) increases market share and profit. Operational service organizations, ranging from stevedoring service owners to large corporations at the port, existing throughout the business world, constantly seek unique ways of differentiating their offerings. The port industry is no exception. With so many changes occurring in the Nigerian port industry due to globalization, liberalization, and privatization programs, including expansion and intensification of competition from the neighboring port of Cotonou and increasing customer sensitivity, the safety of service at the ports has gained considerable traction.

The demand for port service is derived, and ports must follow safety service quality because, in any operation, safety comes first. Otherwise, This trend will be left behind, especially if alternative transport systems provide quality services that do not require cargo to pass through ports. Within this context, evaluating the safety of operations at the port becomes essential in Nigerian port operational services. The Nigerian economy has witnessed an exponential rise in the importation of goods in recent times, thus leading to acute cases of congestion at its ports. These congestions are partly attributed to a favorable business environment occasioned by the liberalization of trade in the country, the stable political situation, and, above all, the craze to import anything, even toothpicks [2].

The security of each transportation mode is one of the major factors needed for managing all modes. To check how safe a transportation mode is, it is fundamental for you to know the different components that will, in general, temper the security of such a method of transportation; this can be compared to evaluating the different hazards that are related to that very method of transportation, these dangers come up accordingly various elements. As indicated by past investigations, there are two arrangements of transportation opportunities, the transportation mode and terminal activity dangers, both sharing scarcely any angles for all intents and purposes [4]. It is fundamental to check the different components that influence the security of that port that offers need to these different dangers that adjust the exhibition of that particular vessel at the port.

Seaports serve as an interface between different modes of transport during maritime transport. Indeed, they are significant places where the operation of all the modes like rail, road, inland waterway, air, and pipeline transport meet together for on ward operational services of the cargo and other maritime-related activities; therefore, there is a need to develop the safety system at the port to be very effective, [5]. This is because maritime transport is fundamentally the mode that contributes about 90% of the worldwide trade in the maritime business through the seaports. Because of this, there is a need to be extremely careful regarding managing all the operational activities related to dangerous cargo, cargo handling, management of petroleum products, vessel berthing, environmental pollution, and other safety issues concerning the port. [5].

This study exposes the need for improved seaport operational safety and provides alternative ways to boost the operational safety of the seaport. Port managers need to know the strategic models for assessing the operational safety of their seaports and the relevance of seaport safety as a significant factor in the efficient operation of the seaport. It will also serve as a guide to the government in future policy-making. All-inclusive, the Nigerian seaport operational security investigation is a genuine guide to exhibit the impacts of national port productivity on seaport effectiveness. The need to give an enduring answer for the issues confronting the operational well-

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being of seaports in Nigeria's economy, as would be upheld in this examination work, is, in this way, an undertaking that must be done and regard for specific components that are viewed as determinants for operational security in a seaport. Factors, for example, the human factor, offices, executives, and administration to be exact; the examination will concentrate on port execution activity in the Apapa ports complex. The study aims to analyze the seaport's operational safety using a logic Model. The study assesses the risk associated with the various operations at the seaport, devise ways of avoiding those risks, and ensure a safe seaport environment. The aim can be achieved by assessing the dangers associated with the study area, examining the safety measures at the AP Moller Terminal, and the safety measures at the Eko support terminal.

Occupational Safety and Health in the Maritime Industry [6] A Case Study of Nigerian Ports Authority (NPA). The study states that Occupational Health and Safety (OHS) is critical to the success of a modern organization and is considered highly relevant for the port operators and users for effective operations at the port. Ports are exposed to severe hazards and risks that may endanger employees, and the equipment used in handling port operations has attracted considerable investments to mitigate any unprofessional practices that marred operations related to OHS. The study examines OSH in the maritime sector, specifically focusing on the Nigeria Ports Authority. The study used some comparative studies of the International best practices of OSH in Gambia, USA, Thailand, and Egypt, and the results derived from those studies were used to benchmark the Nigeria Ports Authority on the OHS. Findings from the study reveal many factors that remain the key drivers and causes of OHS practices; they include technology and human errors. Besides, this present study contributes to regulatory compliance with the ISPS code, and ISM code towards safety and health standards and promotions of OHS in the port and prevention of harmful manner that cause death or serious injuries or damage to workers. Thus, the NPA management is advised to ensure the enthronement of international best practices related to OHS and increase training and awareness on work hazards and safety with rigorous monitoring and control [6].

Furthermore, [7] studied the advanced risk analysis approach for container port safety evaluation. Seaport risk analysis is increasingly crucial in ensuring port operation reliability, maritime transportation safety, and supply chain distribution resilience. However, the task is not straightforward because of the challenges involved in the port; multiple factors related to design, installation, operation, and maintenance affect the environment's safety. Traditional risk assessment methods, such as quantitative risk analysis, need more data or information to address the port's uncertainty.

An Empirical Study [8] on Risk Responses for Various Operation Risks of Container Terminals in Hong Kong and China. The study shows that Hong Kong and mainland China have been the places with the most important container terminals in the world, and these have yet to be carried out in any studies concerning risk and safety management. The countries around China and places like Taiwan have already devoted some efforts to the issue. From the study, they observed that operational risks in terminal operations might lead to many harmful consequences, like incurring high costs for recovering the losses if they did not handle them properly.

Safety evaluation of the ports along the maritime Silk Road [9] The 21st Century Maritime Silk Road (MSR) is critical for world freight transport. The ports along the MSR present a vital element of the involved shipping networks to support the connectivity of the MSR. Therefore, carrying out a practical safety assessment of the ports is crucial to ensure the robustness and sustainability of the growing MSR. However, the study used the traditional quantitative risk analysis approaches (QRA) to work on the ports and face many challenges when applied within the context of the MSR, such as risk data incompleteness and ambiguity and operational and environmental uncertainties. The study proposes a novel safety evaluation approach to address these issues encountered during the risk analysis process in the MSR ports. The fuzzy set theory (FST), evidential reasoning (ER) approach, and expected utility theory are integrated holistically into a proposed methodology. The methodology was used to analyze five critical ports along the MSR. The results provide policy implications for decision-makers with valuable insights on enhancing port safety, effective route planning, and improving operational efficiency.

Moreso, [10] studied the maintaining and researching port safety: a case study of the port of Kaohsiung. They stated that maintaining port safety in full conformity with IMO standards is a requisite for every port and country. For this maintenance to

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work, there is a need to understand the challenges and human factors involved in the port operation. This study considers all aspects in the context of a case study of port safety in Kaohsiung Port, Taiwan. The study analyzed historical data and data from in-depth interviews with port operators and government officials. The study's results discussed the data used to generate theory for consideration in ways to approach research in the field. Specifically, the result shows a more holistic largescale of the safety issues and recommends improving port safety. They also explore the interdependencies of factors that can enhance and complement port safety.

Furthermore, [11] study on accident and pollution risk assessment for hazardous cargo in a port environment shows the catastrophic environmental, life, and monetary losses concomitant to the hazardous cargo accidents in the seaport. Moreso, these have remained a critical concern in maritime transportation operations, officials, and the environment. The factors instigating these accidents while dealing with hazardous cargo in a port environment require rigorous analysis and evaluation, which remains in its infancy. This study assesses multifactor risks associated with dealing with hazardous cargo inside a port. The study utilized a methodology amalgamating expert judgment and literature review to identify factors and develop their causal relationship. At the same time, the Bayesian Network (BN) for the inference was based on 348 past accident reports from 1990 to 2018. The results show that the probability of an accident with considerable consequences is 59.8% under normal circumstances. Human error and management were observed to be the highest contributing factors. Setting evidence of the environment and pollution accidents to occur, the incidence probability of the management is raised by 7.06%. A sensitivity analysis determined the most critical factors for the hazardous cargo accident. This study recommends that to evade hazardous cargo accidents and the severity of the consequences, the port authorities, concerned government departments, mentors, and other related institutions should pay specific attention to the qualification, training, dining, and attitude of the involved workforce. Developing and implementing stringent safety protocols were also revealed to have critical prominence.

2. Materials and Methods

The study focused on the major terminals at Apapa port, which are EKO support and AP Moller terminal. The AP Moller and Eko support are container terminals. The study used examinations and surveys to gather information regarding safety operations in the study area. One hundred questionnaires were administered to the staff in the study area, and out of the 100 questionnaires, 85 were returned. The terminal staff specialists are 40, equipment administrators 16, short assistance representatives 5, workshop 14, light vehicle drivers 14, security 43, and lasting staff 33. The laborers at the Ap Moller terminal are anticipated to have about 335 staff. Interviews were conducted for the staff working in the port. The survey contained key operational well-being as safety questions concerning these terminals.

The logit model and the multicriteria choice were used to analyze and test Port Operational safety and some security issues in the port. The logical factors are either quantitative or subjective. The logit model focuses on the data as 1 or 0 worth. Assume one needs to examine the work power investment of grown-up people as a component of the joblessness rate, normal compensation rate, family salary, instruction etc. An individual is either in the work power or not. Subsequently, the needy variable, work power investment, can take just two qualities: 1 if the individual is at the workplace and 0 on the off chance that he isn't. Additionally, in this exploration, there are key fundamental factors, which are safety and security.

Logit model analysis is a uni/multivariate system that considers evaluating the likelihood that an occasion happens or not by anticipating a twofold reliant result from many autonomous factors. The logit model is a probability model, which is denoted as:

$$P_i = E(Y = 1|X_i) = \beta 1 + \beta 2X_2 \quad (1)$$

Y is the dependent variable, and X is the independent variable; in this case, the Y variable is positive, therefore carrying 1. It is represented by

$$\frac{1}{1+ex}P_i = E(Y = 1|X_i) = \frac{1}{esp(-Z_i)} \quad (2)$$

Where:

$$Z_i = \beta 1 + \beta 2X_2 \quad (3)$$

This equation (1) is known as the (aggregate) strategic dissemination work. Here Z_i ranges from $-\infty\ to\ +\infty Pi$ extends somewhere in the range of 0 and 1; P_i is non-directly identified with Z_i (i.e. X_i)

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in this way fulfilling the two conditions required for a likelihood model.

In fulfilling these prerequisites, an estimation issue is made on the grounds that Pi is non-straight in X as well as in the ∞' s. This implies one can't utilize OLS methodology to appraise the parameters. Here P_i , is likelihood of having a 1 and it is given by: $\frac{1}{1+exp(-Z_i)}$, Then (1- P_i), the probability of having a negative that is 0 is $^{(1-Pi)} = \frac{1}{1+exp(Z_i)}$. Taking natural log of the formula we will obtain $L_i = \ln[P_i/(1-P_i)] = \beta_1 + \beta_2 X_i$. That is the log of the odds ratio is not only linear in X_i but also linear in the parameters.

3. Results

The response of respondent on possible dangers associated to both are revealed in Table 3.1 and Table 3.2.

Table 1. Percentage Representation of Danger Associated to Eko Support Terminal.

S/N	Statements	Yes		No	
		Freq.	%	Freq	%
1	Vessels are usually securely moored.	75	88.2	10	11.8
2	Adequate supply of counter pollution equipment	80	94.1	5	5.9
3	The unused valves in the bunker system been checked closed and lashed	60	70.6	25	29.4
4	Unused bunker connections properly blanked	58	68.2	27	31.8
5	Provisions for first aid treatments	78	91.8	7	8.2
6	Frequent occurrence of fire	0	100.0	85	0.0
7	Weakness the board plans created and executed, assessing: (work requests, booking and arranging, working time, ecological conditions and individual elements)	75	88.2	10	11.8
8	The terminal properly lighted to aid visibility during poor vision	85	100.0	0	0.0
9	High level of noise pollution at the terminal	80	94.1	5	5.9
10	Oil spills from the equipment/machineries which pollute the surface and may likely cause slips of personnel and other machineries	10	11.8	75	88.2

From the analysis, table 3.1 shows the dangers associated with Eko Support and AP Moller terminal. The outcome of the study revealed that 75 (88.3%) agreed that the vessel is usually securely moored, while 10 (11.8%) disagreed, 80 (94.1%) agreed that there is an adequate supply of counter-pollution equipment, and 5 (5.9%) disagree 58 (68.2%) agree that the unused bunker connections are properly blanked, while 27 (31.8%) disagree; on the provisions for first aid treatments, 78 (91.8%) agree, while 7 (8.2%) disagree. 75 (88.2%) go for the presence of fatigue management plans developed and implemented, taking account of: (work demands, scheduling and planning, working time, environmental conditions and individual factors). Moreso, 85 (100.0%) agree that the terminal is properly lit to aid visibility during poor vision, while 80 (94.1%) disagree with high noise pollution at the airport. 75 (88.2%) disagree with oil spills from the equipment, which pollute the surface and may likely cause slips of personnel and other machinery.

Although all respondent agrees that there is frequent occurrence of fire. 60 (70.6%) disagree that the unused valves in the bunker system have been checked, closed, and lashed.

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Table 2. Safety and Security Measures at EKO Moller Terminal

S/N	Statements	Yes		No	
		Freq.	%	Freq.	%
1.	Are NO SMOKING notices positioned and observed	84	98.8	1	1.2
2	Are adequate firefighting appliance available?	81	95.3	4	4.7
3	Is there an agreed ship/shore communication system?	59	69.4	26	30.6
4	Are drip trays in position?	67	78.8	18	21.2
5	Are scuppers and drains effectively plugged?	78	91.8	7	8.2
6	Have transfer rates been agreed?	81	95.3	4	4.7
7	Does facility have an approved Port Facility Security Plan (PFSP)?	79	92.9	6	7.1
8	Does the facility personnel without security duties receive initial ISPS Code training?	69	81.2	16	18.8
9	Does a fence or wall surround the entire facility?	79	92.9	6	7.1
10	Are all entrances equipped with gate or barricades?	84	98.8	1	1.2
11	Are guards posted to all access point?	69	81.2	16	18.8
12	Does all the workers identification card include a photograph of the employee?	84	98.8	1	1.2
13	Are the CCTV cameras monitored at all times	69	81.2	16	18.8
14	waterborne patrols conducted	77	90.6	8	9.4
15	guards maintained on docks at all times	84	98.8	1	1.2

Table 3.2 show the level of safety and security measure that is in place at the AP Moller terminal. The results show that all items stated under safety and security measures are appropriate. The factors are NO SMOKING notices positioned and observed, adequate firefighting appliance available, ship/shore communication system, drip trays in position, scuppers and drains effectively plugged, transfer rates have been agreed upon, the facility has an approved Port Facility Security Plan (PFSP). Facility personnel working at security duty posts must receive initial ISPS Code training. The perimeter fence of the entire facility, all entrances equipped with gate or barricades, guards posted to all access point, workers identification card include a photograph of the employee, CCTV cameras monitored at all times show frequency count of 84 (98.8%), 81 (95.3%), 59 (69.4%), 67 (78.8%), 78 (91.8%), 81 (95.3%), 79 (92.9%), 69 (81.2%),79 (92.9%), 84 (98.8%), 69 (81.2%), 84 (98.8%) and 69 (81.2%) respectively.

3.2 Logistics Regression of the seaport operational Safety of Eko support and AP Moller Terminal.

Table 4.3 below shows the outcome of the Logit model as associated with danger in Eko support Terminal and AP Moller Terminal, respectively.

Table 3. Logit Model on Danger Associated to Eko support Terminal

Variables	Coefficient	Standard error	Z value	P
Vessel securely moored	0.364	0.329	-1.11	0.000
counter pollution	0.012	0.014	1.08	0.000
bunker system been checked	0.024	0.006	-3.57**	0.000
Unused bunker connections	0.017	0.003	-4.58**	0.000
Provisions for first aid treatments	0.313	8.41e07	4*	0.012
Frequent occurrence of fire	-0.006	0.005	-1.20	0.029
Fatigue management	0.023	0.010	2.24**	0.025

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Variables	Coefficient	Standard error	Z value	P
plans developed and implemented				
The terminal properly lighted	0.637	0.085	-7.48**	0.000
High level of noise pollution at the terminal	-0.230	0.081	-2.85**	0.004
Cons	3.423	0.257	13.32***	0.000
Scale cons	3.987	0.137	29.20***	0.000
No of observation	85			
LR chi^2 (9)	312.40			
Prob>chi^2	0.0000			
Log likelihood	-160.06434			

*** implies significant at 1%, ** significant at 5%, * significant at 10%

From the analysis, Table 3.3 above shows the result of the Logit regression model on Danger associated with the two Terminals. The result shows all the six hypothesized explanatory variables in the Logit regression model are statistically significant. The likelihood ratio statistics is indicated by Chi2 ($\mathcal{X}2$) statistics (312.40) was effective at 1% probability levels (Prob. > Chi = 0.0000), suggesting that the model has strong positive explanatory variables used for the analysis. Hence, the Terminals have a no or low vulnerability to any danger whatsoever. From the analysis, Table 3.3 above shows that the values of P-Value are calculated as 0.000, 0.000, 0.004, 0.000, & 0.025.

Since the p-value calculated is less than the α value of 0.05 tabulated, the alternative hypothesis is accepted, which means that there is a statistically significant relationship between dangers and safety and security variables used in the study area. Moreso, this shows a positively meaningful relationship between the dependent and the independent variables (vessel securely moored, bunker system checked, high level of noise pollution, terminal properly lighted & fatigue plans developed and implemented) since p-value < 0.05. This implies that the higher the danger at the airport during port operation, the higher the safety and security measures taken to tackle the danger issues at the port. This will reduce high casualties during port operations, increasing safety [12 &13]. To interpret Z values, as a rough rule of thumb, if the absolute value of the Z value is bigger than 2.0, the variable is significant to the independent variable in this case, which is safety and security, using a significance of α = 0.05 [12 & 13].

Table 4. Mutli Criterion Decision Analysis on Danger of EKO Support Terminal Using Performance Matrix

Variable	Facilities	Environment	Human	Security	Weight	Rank
Frequent reoccurrence of machinery failure	0.198	0.0	0.0	0.0	286	7th
Frequent damage to equipment and containers been handled.	0.376	0.0	0.0	0.0	327	5th
Oil spills from the equipment/machineries which pollute the surface and may likely cause slips of personnel and other machineries.	0.0	0.432	0.0		351	4th
The level of noise pollution at the terminal	0.0	0.557	0.0		405	2nd
Falling of containers at the terminal.	0.0	0.0	0.341		311	6th

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Variable	Facilities	Environment	Human	Security	Weight	Rank
Usual errors in cargo handling and storage.	0.0	0.0	0.545		370	3rd
Terrorist attacks at the terminal	0.0	0.0	0.0	0.127	255	8th
Goods usually stolen from the container	0.0	0.0	0.0	0.673	598	1st

The result from the analysis, as shown in Table 4.5 above, indicates various dangers associated with the terminals. The Multicriteria result shows different criteria weights and ranks; it means where attention is needed or the variable to be given high attention. The variable that ranked first is goods usually stolen from the container, with a weight of 598, which means that there is an urgent need for such security threats compared to other categories, followed by the level of noise pollution, with a weight of 405 as the 2nd ranking. The 3rdcategory is an error in handling cargo and equipment, which is a human error and requires more attention with a weight of 370. The oil spill is at the 4th level, attracting a weight of 354, an environmental issue.

In comparison, frequent damages to equipment ranked 6th level, a facility issue with a total weight of 327. The 7th is the frequent reoccurrence of machine failure with a weight of 286, and lastly, terrorist attack at the terminal. This multicriteria analysis shows the various categories and their consequences as they are being ranked. With the result, the types can be given priority based on the weight of the criteria that need improvement.

Table 5. Safety and Security Measures

S/N	Statements	Yes		No	
		Freq.	%	Freq	%
1	Are NO SMOKING notices positioned and observed	84	98.8	1	1.2
2	Are adequate firefighting appliance available?	81	95.3	4	4.7
3	Is there an agreed ship/shore communication system?	59	69.4	26	30.6
4	Are drip trays in position?	67	78.8	18	21.2
5	Are scuppers and drains effectively plugged?	78	91.8	7	8.2
6	Have transfer rates been agreed?	81	95.3	4	4.7
7	Does facility have an approved Port Facility Security Plan (PFSP)?	79	92.9	6	7.1
8	Does the facility personnel without security duties receive initial ISPS Code training?	69	81.2	16	18.8
9	Does a fence or wall surround the entire facility?	79	92.9	6	7.1
10	Are all entrances equipped with gate or barricades?	84	98.8	1	1.2
11	Are guards posted to all access point?	69	81.2	16	18.8
12	Does all the workers identification card include a photograph of the employee?	84	98.8	1	1.2
13	Are the CCTV cameras monitored at all times	69	81.2	16	18.8
14	waterborne patrols conducted	77	90.6	8	9.4
15	guards maintained on docks at all times	84	98.8	1	1.2

Table 3.5 above show the level of safety and secure measure that are in place in AP Moller support terminal. The result show that all the items stated under safety and security measures are appropriately adopted, among these are: Are NO SMOKING notices positioned and observed; adequate firefighting appliance available; ship/shore communication system; drip trays in position; scuppers and drains effectively plugged; transfer rates been agreed, facility have an approved Port Facility Security Plan (PFSP); facility personnel without security duties receive initial ISPS

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Code training; fence or wall surround the entire facility; all entrances equipped with gate or barricades; guards posted to all access point; workers identification card include a photograph of the employee; CCTV cameras monitored at all times with frequency count of 84 (98.8%), 81 (95.3%), 59 (69.4%), 67 (78.8%), 78 (91.8%), 81 (95.3%), 79 (92.9%), 69 (81.2%), 79 (92.9%), 84 (98.8%), 69 (81.2%), 84 (98.8%) and 69 (81.2%) respectively.

Table 6. Logit Model on Safety and Security measures of AP Moller Support Terminal

Variables	Coefficient	Standard error	Z value	P
Approved Port Facility Security Plan (PFSP)	0.1210	0.4519	2.12	0.003
Work force without security obligations get starting ISPS Code preparing	0.132	0.003	2.02	0.017
Does a fence or divider encompass the whole office	0.33	0.011	-2.51**	0.031
Are on the whole doorways furnished with entryway or blockades?	0.253	4.71e014	3.18**	0.040
Are guards posted to all access point?	0.106	0.007	-2.20	0.029
Does all the workers identification card include a photograph of the employee?	0.027	0.041	3.52**	0.025
A CCTV cameras monitored at all times	0.112	0.064	-6.33**	0.040
Cons	4.241	0.311	10.12***	0.010
Scale cons	3.187	0.319	16.10***	0.000
No of observation	92			
LR chi^2 (9)	122.56			
Prob>chi^2	0.0000			
Log likelihood	-286.03193			

*** implies significant at 1%, ** significant at 5%, * significant at 10%

The outcome of the Logit regression model on the Safety and Security of the AP Moller support Terminal is in Table 3.6. All the speculated factors in Logit model were seen as fundamentally legitimate with appropriate measure requirement for ideal security at various likelihood levels. The probability proportion insights as showed by Chi2 measurements (122.56) was noteworthy at 1% likelihood levels, (Prob. > Chi = 0.0000) proposing that the model have solid illustrative power. Henceforth, the Safety and Security of AP Moller bolster Terminal has a low weakness to any security challenge.

From the analysis of the Eko Support Terminal, Table 3.3 above shows the hypothesis result with P-Value calculated as 0.000, 0.000, 0.004, 0.000, & 0.025 for the safety and security of the Terminal.

Since the p-value calculated is less than the α value of 0.05 tabulated, the alternative hypothesis is accepted since it is less than the p-value 0.05, which means that there is a statistically significant relationship between dangers and safety and security variables used in the study area. Moreso, this shows a positively significant relationship between the dependent and the independent variables (vessel securely moored, bunker system checked, high level of noise pollution, Terminal properly lighted & fatigue plans developed and

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implemented) since p-value < 0.05. This implies that the higher the danger at the Terminal during port operation, the higher the safety and security measures taken to tackle the danger issues at the port.

Furthermore, the outcome of the Logit regression model on the Safety and Security of the AP Moller support Terminal is in Table 3.6. All the speculated factors in the Logit model were seen as fundamentally legitimate with appropriate measure requirements for ideal security at various likelihood levels. The probability proportion insights, as showed by Chi2 measurements (122.56), were noteworthy at 1% likelihood levels (Prob. > Chi = 0.0000), proposing that the model has solid illustrative power. Moreso, the Safety and Security of AP Moller Bolster Terminal need to be stronger for any security challenge. Finally, the multicriteria analysis of the Eko Support and AP Moller Terminal shows the various categories and their weights as they are ranked. With the result, the categories can be given priority based on the weight of the criteria that need improvement.

5. Conclusions

The analysis was carried out to answer research questions and hence fulfill the purpose of the study, which includes; assessing the dangers in the study area and the safety and security issues in the study area. The findings from the analysis reveal that the logit model shows that the Eko support terminal, which is the petroleum terminal, does not have an issue as regards safety. This is because the respondent answers were on the positive side, but it was not 100%, which means that there is room for more improvement at every level of the variables of both the dangers and for the measures being put in place.

The logit model shows that there is a significant relationship between the safety variables during the test of the hypothesis. The coefficient result from the output summary shows a great degree of improvement of the variables to get a robust result regarding safety measures in the terminals. The multi criteria decision analysis, which entails ranking, shows that although these variables of dangers or safety measures are there or not there, it rates them based on their level of performance; this shows how effective or how often safety measures are placed when there are dangers at the terminals. The dangers and safety measures were categorized into sections to allow the proper decision and attention to be given at the appropriate safety level and rank from the 1st to the last. The findings show that the criteria that ranked 1st is the goods that are usually stolen from the terminals, while the criteria that rankled 2nd is the noise pollution, which posed a very high environmental hazard to the port workers. The study contributes to the issue of safety and security and various dangers as it regards the maritime and shipping operations in the port. The study also shows some safety and security factors based on criteria ranking and how to reduce the dangers that may occur during maritime operation. Furthermore, future studies can be made on the area of safety and security risk assessment and challenges facing Apapa port complex being the hub seaport in Nigeria that handles the Western, Northern, some parts of Eastern Nigeria, Niger and some parts of Mali.

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