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Assessment of Port's Security and Performance in Port Harcourt Seaports Complex, Port Harcourt, Rivers State, Nigeria (2005-2015)

Gladys Chineze Emenike, Mene Frank Baridoma

Abstract— The study assessed the port's security and performance in Port Harcourt Seaports Complex, Port Harcourt, Rivers State, Nigeria. The study made use of 291 copies of structured questionnaire administered to the staff of the Nigeria Ports Authority (NPA), BUA Ports and Terminals Ltd, Port Harcourt and terminal operators/stevedores and Dock workers in Port Harcourt Port Complex using a simple random sampling technique. Descriptive statistics in form of frequency and percentages were used to analyze the data. Multiple regression analysis was used to determine the relationship between port security and port performance. Statistical Package of Social Sciences (SPSS) version 20.0 was used for the data analysis. Findings revealed that among the security facilities, fire alarm system, gun boat, wall mounted motion sensor biometric time attendance and security alarms were adequately available while security gadgets like spy camera face cap, portable hand held security, belt buckle spy camera, biro button, and wristwatch camera were adequately available at the Port Harcourt Seaport Complex. Types of port insecurity included burglary and armed robbery (27.0%) smuggling activities (28.0%), sea piracy (8.0%) and touting (93%). Cargo throughput was highest 2011 (12.1%) and least in 2015 (4.6%) while the ship turnaround time for Port Harcourt Seaport was highest in 2011 (12.46 days) and the least was recorded in 2009 (8.03 days). Cargo throughput, ship turnaround time, berth occupancy rate and tonnage per ship jointly contributed 32.4% to port security in Port Harcourt Port Complex; though no significant influence of port security on port performance (t=0.757; p=0.483). The study therefore recommended among others that the international ship and port facility security code (ISPS) should be adequately implemented more both at the terminals and jetties.

Index Terms: Port security, Port performance, Port Harcourt, Seaport, Cargo throughput, Ship turnaround.

I. INTRODUCTION

Presently, the protection of ports, the safety of navigation and the life and security of seafarers and commuters of ships and ports as well as infrastructural facilities are being menaced by maritime terrorism and sea piracy. In 2012, 2013 and 2014; two hundred and ninety-seven (297), two hundred and sixty-four (264) and two hundred

and forty-five (245) assaults were made respectively on ships [1]. Consequent upon these, enormous losses have been experienced by the international market leading to great economic meltdown of many countries [2]. According to [3] signs of the imminence of the threat arose in October 2000 when the USS Cole was struck while sailing of Yemen by a small boat carrying explosives. The explosives were detonated killing seventeen sailors and wound eight. Two years later, in October 2002, in the same area, the French oil tankers, USS Limburg carrying crude oil was bombed using a little boat loaded with high explosives, which killed a sailor and extensive oil pollution occurred [3]. The assault by terrorists on the 11th of September, 2001 in the United States of America changed the mindset of commuters towards transport security and safety in general. This incident also affected people's perception on ports personnel, ships in the sea and seaport, port facilities, travelers and crew. This rethink made International Maritime Organization (IMO) and Nations of the world to make determined efforts towards eradicating the frequency of menace in areas of security, violence and global crime. The thinking was that the vulnerability of the aviation industry could be used for attacks, and then the maritime industry and seaports through which a reasonable percentage of external commodities are being sold both internationally and locally could as well be targeted [4].

These incidents and many others on transport systems around the world no doubt call for urgent need to assess and re-address maritime security especially due to its international involvement. Regular intensification of Maritime and Port Security is relevant as a result of the intrinsic susceptibility of Ports. These ports are at risk because of their constant ease of access by water and land, relative position to municipal areas, sheer size, the numerous cargos being managed by them and their constant transportation networks to various areas. The enormous concentration of commuters, freight, assets and industries at or around ports make them highly vulnerable to terrorism which would cause great loss of lives, valuable properties and industries.

Thus, having observed that Port/Maritime Security threats has increased over time which by implication impact negatively on the port and reduced port productivity/performance which led to the International Ship and Port Facility Security (ISPS Code). ISPS Code is a new Port Security policy discussed in the support of the International Maritime Organization (IMO), which is structured in a way that it detects and prevents terrorization to global safety. It contains expectations from governments, seaport authorities and shipping corporations. Failure of ship

Dr Gladys C. Emenike is a Senior Lecturer in the Department of Geography and Environmental Management, University of Port Harcourt, Port Harcourt, Nigeria.

Mr Mene F. Baridoma is a MSc student in the Center for Logistics and Transport Studies, University of Port Harcourt, Port Harcourt, Nigeria.

coming from seaports to adhere strictly to the ISPS code of conduct, could lead to penalties which may including denying such ship from entering into other international ports. Ports are usually large, irregular activities taking place over a large expanse of land and water. This is to concurrently contain the various port facilities (such as ships, trucks) and activities such as storage or piping of petroleum products, rail traffic and storage of containers. Delays during the shipment of solid or liquid via a port on a "queuing" system grumbles all operations, even if the delays are as a result of safety. Security normally gives way for the interest of time conservation or convenience. Maritime transport is mainly a vital aspect of global transportation when it comes to trade enhancement and when compared to other forms of transportation. Security is important in maritime transport as it ensures the smooth flow of information, peaceful movement of people, goods and services which builds as well as maintains the society. It is evident that without adequate security of seaports and water ways, there will be difficulty in the development of domestic maritime industries [5]. Studies have revealed the contributions of maritime industries to the economy of the country. [5] observed that despite the tremendous contributions of the maritime industry to the Nigerian economy; it cannot be described as a healthy environment by implication in terms of the security and performance at the seaport and on high sea. Over the years, this industry has faced several setbacks as a result of corruption and insecurity at the port and to a large extent, these problems have made our ports highly unattractive, unfriendly and less competitive when compared with other ports in west and central African sub-region. It is against this background that this study is undertaken to address the issue of port security problems and port performance in Port Harcourt Sea Port, Nigeria.

II. MATERIALS AND METHODS

The study was carried out in Port Harcourt Sea Port, Port Harcourt, Nigeria. Port Harcourt is located in latitudes between 4o 44' 58.8''N and 4o 56' 4.6''N and longitudes between 6o 52' 7.2''E and 7o 7' 37.7''E. Presently, the Port has a length of 1,256 which is able to contain eight state-of-the-art sea vessels loading and offloading at the same time. The Port also has sixteen tanks with the capability of containing 3,048 tons of bulk oil fitting. The tanks have a conveyor belt and a pier in possession of the structure. There are 7 stacking areas of 27,407.15m2 and 4 Arcon sheds with 12,486.15m2of storage capacities. The Rivers Port Complex in coastal Rivers State is made up of Port Harcourt Port, Haastrup/Eagle Bulk Cement Jetty, Kidney Island Jetty, Okirika Refined Petroleum Oil Jetty, Bitumen Jetty, Macobar Jetty, and Jheto Jetty. Port Harcourt experiences a tropical humid climate with lengthy and heavy rainy seasons and very short dry seasons. The city is endowed with abundant sunshine and the average temperatures are between 25°C-28°C in the city [6]. Port Harcourt is dominated by low lying coastal plains, which structurally belongs to the sedimentary formation of the recent Niger Delta, with an elevation less than 15.24m [7; 8]. Drainage of the study area is poor because of the presence of many surface water and heavy rainfall between 2000mm and 2400mm [9]. However, Bonny River, New Calabar River, creeks and streams drain Port Harcourt Metropolis and all enter into the Atlantic Ocean through estuaries [8]. This study utilized descriptive research design [10]. The target population used for this study was taken from the Nigeria Ports Authority (NPA) staff, BUA Ports and Terminals Ltd, Port Harcourt and terminal operators/stevedores and Dock workers in Port Harcourt Port Complex. There were 1071 workers in the study area [11] from which 291 workers were selected for the study using the Taro Yamane method [12]. This means that 291 copies of questionnaire was administered using random sampling technique to elicit information on the challenges of Port Security and its development and the port performance amidst the port security. Descriptive statistics in form of frequency and percentages were used to analyze the data using Statistical Package of Social Sciences (SPSS) version 20.0. Results were displayed in form of tables and charts.

III. RESULTS

A. *Socio-economic Characteristics of Respondents*

The socio-economic characteristics of respondents are presented in Table 1. Analysis revealed that 97.1% were males while 2.9% were females. In terms of age, 69% of the total sampled port workers were above 50years, 19% were between 40 and 49 years while 8% and 4% were between 30and 39 years; and 20-29 years respectively. The above age distribution implies that majority of the workforce in the River Port Complex were ageing. According to the survey, 99% of the Rivers Port workers were married while 1% represents was single. Majority (73%) of the sampled respondents had B.SC/HND qualifications, 18% accounted for OND/NCE holders. The minimum qualification recorded was 9% of workers with SSCE/O' level qualifications. Furthermore, 66% of the respondents received N650,000; 26% received annual salary range of N551,000- N650,000 while 8% of the total staff do earn between N451,000-N550,000 annually.

Table1- Socio-economic Characteristics of Respondents

Sex	**Frequency**	**Percentage (%)**
Male	269	97.1
Female	8	2.9
Total	277	100.0
Ages	**Frequency**	**Percentage (%)**
20-29	12	4.0
30-39	23	8.0
40-49	54	19.0
50 and above	192	69.0
Total	277	100.0
Marital status	**Frequency**	**Percentage (%)**
Single	4	1.4
Married	273	98.6
Divorced	-	-
Widowed	-	-
Total	277	100.0
Educational qualification	**Frequency**	**Percentage (%)**
SSCE/O' Level	24	9.0
OND/NCE	51	18.0
BSC/HND	202	73.0
MSC/MBA	-	-
Others	-	-

Total	277	100.0
Annual income (Naira (₦))	**Frequency**	**Percentage (%)**
Less than 450,000	-	-
457,000-550,000	21	8.0
551,000-650,000	71	26.0
Above 650,000	182	66.0
Total	277	100.0

B. Availability of Port Security Facilities and Gadgets

Knowledge about the availability of security facilities and gadgets at the seaport is presented in Table 2. In terms of security facilities, it is observed that 97.5% agreed that fire alarm system was available, 92.1% agreed on gun boat, 91% agreed on CCTV, 95.7% agreed on wall mounted motion sensor, 95.6% agreed on digital door locks, 97.8% agreed on finger print reader while 94.2% agreed on biometric time attendance and 92.4% agreed on security alarms. Furthermore, 79.1% agreed on body scanner, 77.2% agreed on stun guns while 96.8% agreed on the availability of bomb detector.

In terms of security gadgets, 91.4% agreed on the availability of bomb sniffing dogs while 93.5% agreed on the availability of super scanner detective and 99.3% agreed on the availability of anti-terrorist gadgets. Similarly, 87.7% agreed that portable hand-held security was available, 97.1% agreed on spy camera face cap, 99.6% agreed on belt buckle spy camera, 94.6% agreed on biro, button, wristwatch camera while 79.1% agreed on the availability of ID cards.

Table 2- Security facilities and gadgets available at the seaport

Security Facilities	**Strongly Available**	**Available**	**Undecided**	**Unavailable**	**Strongly unavailable**	**Total**
Fire alarm system	214 (77.3)	56 (20.2)	0 (0.0)	0 (0.0)	7 (2.5)	277 (100)
Gun boat	205 (74.0)	50 (18.1)	1 (0.4)	15 (5.4)	6 (2.2)	277 (100)
CCTV camera	156 (56.3)	96 (34.7)	0 (0.0)	13 (4.7)	12 (4.3)	277 (100)
Wall mounted motion sensor	206 (74.4)	59 (21.3)	3 (1.1)	5 (1.8)	4 (1.8)	277 (100)
Digital door locks	194 (70.0)	71 (25.6)	4 (1.4)	3 (1.1)	5 (1.8)	277 (100)
Finger print reader	186 (67.1)	85 (30.7)	0 (0.0)	6 (2.2)	0 (0.0)	277 (100)
Biometric time attendance	213 (76.9)	48 (17.3)	1 (0.4)	8 (2.9)	7 (2.5)	277 (100)
Security alarms	207 (74.7)	49 (17.7)	0 (0.0)	9 (3.2)	12 (4.3)	277 (100)
Body scanner	98 (35.4)	121 (43.7)	5 (1.8)	26 (9.4)	27 (9.7)	277 (100)
Stun guns	112 (40.4)	102 (36.8)	1 (0.4)	46 (16.6)	16 (5.8)	277 (100)
Bomb detector	147 (53.1)	121 (43.7)	1 (0.4)	2 (0.7)	6 (2.2)	277 (100)
Security Gadgets						
Bomb sniffing dogs	129 (46.6)	124 (44.8)	2 (0.7)	9 (3.2)	13 (4.7)	277 (100)
Super scanner detective	138 (49.8)	121 (43.7)	1 (0.4)	9 (3.2)	8 (2.9)	277 (100)
Anti-terrorist gadgets	174 (62.8)	101 (36.5)	0 (0.0)	0 (0.0)	2 (0.7)	277 (100)
Portable hand-held security	208 (75.1)	35 (12.6)	6 (2.2)	17 (6.1)	11 (4.0)	277 (100)
Spy camera face cap	217 (78.3)	52 (18.8)	1 (0.4)	5 (1.8)	2 (0.7)	277 (100)
Belt buckle spy camera	198 (71.5)	78 (28.2)	0 (0.0)	0 (0.0)	1 (0.4)	277 (100)
Biro, button, wristwatch camera	201 (72.6)	61 (22.0)	2 (0.7)	5 (1.8)	8 (2.9)	277 (100)
Log books	142 (51.3)	130 (46.9)	0 (0.0)	0 (0.0)	5 (1.8)	277 (100)
I.D cards	118 (42.6)	101 (36.5)	5 (1.8)	23 (8.3)	30 (10.8)	277 (100)

Percentages (%) in parenthesis

C. Types and Perception towards Port Security in Port Harcourt Port Complex

The types and extent of port insecurity in Port Harcourt Port Complex is shown in Table 3 which show that73% of respondents agreed that no burglary and arm robbery attacks at the seaport while 27% agreed that there were burglary and arm robbery attacks at the seaport. The extent at which burglary and arm robbery occurrence at the seaport was known to be very high by 1.1% of the total respondents, high by 1.4%, moderate by 71.4% and low by 26.0%. Smuggling activities were perceived to be very high by 8% of the total respondents while 20% believed that smuggling activities were moderate and 72% agreed that the rate of occurrence of smuggling activities was low. Touting was perceived to be frequent by 23%, sometimes by 70% and moderate by 7%. The occurrence of sea piracy was discovered to be high by 8% of the total respondents while 92.0% agreed that sea piracy was low. These analyses therefore reveal that activities that would have contributed to insecurity at the seaport recorded a minimal effect such as burglary and arm robbery activities occurring at its lowest rates. Also, smuggling and sea piracy rarely occur and touting occasionally. The low rate of occurrence of these activities that can constitute insecurity platform in Port Harcourt Port Complex can be attributed to the activities of the Joint Operation Security Agencies at the seaport, securing both the waterways and port complex and the nature of operation which is a low cargo throughput. The security agencies at the port include mobile/marine policemen, Joint Task Force (JTF) and the Nigerian Navy to ensure safe and secured port operations and navigation along the channel (NPA Annual Report, 2016). Based on this survey, security challenges may not have much to offer in the performance of a seaport with respect to Rivers Port in Port Harcourt.

Table 3- Impact of Port Security on Port Performance

Burglary and arm robbery	**Frequency**	**Percentage (%)**
Yes	76	27.0
No	201	73.0
Total	277	100.0
Extent of Burglary and arm robbery	**Frequency**	**Percentage (%)**
Very high	3	1.1
High	4	1.4
Moderate	198	71.4
Low	72	26

Total	277	100.0
Smuggling activities	**Frequency**	**Percentage (%)**
Very high	21	8.0
High	-	-
Moderate	36	20.0
Low	200	72.0
Total	277	100.0
Sea Piracy	**Frequency**	**Percentage (%)**
Very high	-	-
High	22	8.0
Moderate	-	-
Low	255	92.0
Total	277	100
Touting	**Frequency**	**Percentage (%)**
Frequent	64	23.0
Sometimes	193	70.0
Moderate	20	7.0
Not at all	-	-
Total	277	100

D. Temporal Analysis of Cargo Throughput (2005-2015)

The annual cargo throughput from 2005 to 2015 is presented in Table 4. It is shown that the total cargo throughput was 4,697 and 12.1% which was the highest was recorded in 2011. In 2006 and 2010, the cargo throughput was 10.1% and 10.0% respectively. Lower cargo throughput was recorded in 2014 and 2015 having 5.4% and 4.6% respectively. It therefore shows that in recent years between 2014 and 2015, the seaport was faced with a sharp decline in vessels/ship traffic of 253 and 218 vessels respectively. The average cargo throughput in Port Harcourt Port Complex was 427 vessels between 2005 and 2015.

Table 4- Annual Cargo Throughput for Port Harcourt Port Complex (2005-2015)

Year	Cargo Throughput	Percentage (%)
2005	453	9.6
2006	475	10.1
2007	446	9.5
2008	449	9.6
2009	461	9.8
2010	473	10.0
2011	566	12.1
2012	461	9.8
2013	442	9.4
2014	253	5.4
2015	218	4.6
Total	4697	100.0
Average	**427**	

Source: NPA Annual Reports, 2016

E. Temporal Analysis of Ship Turnaround Time for Port Harcourt Seaport (2005-2015)

Temporal analysis of the average ship turnaround time for Port Harcourt seaport is presented in Table 5. The analysis shows that an average turnaround time of vessels in Port Harcourt seaport was 9.81 days between 2005 and 2015. The general comparison between the years in review read that, the Port Harcourt seaport had the highest vessel turnaround time of 12.46 days in 2011, followed by 2005 having a vessel turnaround time of 12.24days. In recent years between 2013, 2014 and 2015, the seaport recorded a reduction from 6.83, 8.41 and 8.37 respectively. In comparison with the standard measurement of average turnaround time of vessel, [13] stated that one of the primary measurements of Port Performance is the averages turnaround time per ship. The internationally acceptable standard for average turnaround time of a vessel is 24 hours. However, in the area of shipping, port effectiveness and cost are the main issues required in choosing whether to call at a port or not [14]. In relation to this, a global view of countries with high efficiency ports includes, China with an average turnaround time of 0.96 days (24hrs) Hong Kong at 0.72 (18hours), South Korea 0.68days (17days) while Singapore and the United States records a turnaround time of vessel at 1.16 days (1day, 4 hours) and 1.02 days (1 day, 5hours) respectively. In respect to these efficient ports across the globe, Africa and Nigeria precisely still lag behind in terms of turnaround time of vessels at an average of 2.78 (2 days 19hours) [13].

Table 5- Ship Turnaround Time for Port Harcourt Seaport (2005-2015)

Year	Ship turnaround time
2005	12.24
2006	11.71
2007	9.99
2008	9.57
2009	8.03
2010	10.5
2011	12.46
2012	9.84
2013	6.83
2014	8.41
2015	8.37
Total	107.95
Average	**9.81**

Source: NPA Annual Reports, 2016

F. Influence of Port Security on Port Performance

Effect of port security on port performance (cargo throughput, ship turnaround time, berth occupancy rate, tonnage per ship) was tested using multiple regression analysis which revealed that regression coefficient (R) was 0.569 and R square was 0.324 (Table 6). This suggests that cargo throughput, ship turnaround time, berth occupancy rate and tonnage per ship jointly contributed 32.4% to port security in Port Harcourt Port Complex. There is no significant influence of port security on port performance (t=0.757; p=0.483). This analysis suggests there are other reasons which might be responsible for the proper operation of a seaport.

Table 6- Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.569[a]	.324	-.216	15.64056

a. Predictors: (Constant), tonnage/ship and cargo, number of ships, ship turnaround time, berth occupancy

Table 7- Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	90.039	118.888		.757	.483
	Cargo throughput	-.112	.092	-.601	-1.217	.278

	ship turnaround time	-3.288	3.275	-.568	-1.004	.361
	berth occupancy	-.016	.993	-.010	-.016	.988
	tonnage/ship and cargo	6.482E-006	.000	.114	.248	.814

a. Dependent Variable: Port Security
b. Predictors: (Constant), tonnage/ship and cargo, number of ships, ship turnaround time, berth occupancy

IV. CONCLUSION

The study concluded that Port Harcourt Port Complex was safe and the security gadgets and facilities were available. The indices of port performance (tonnage/ship and cargo, number of ships, ship turnaround time, berth occupancy) did not influence port security significantly suggesting that port security is not a core indices to measure port performance despite the fact that it plays a good role at ensuring an effective port operation. The study therefore recommended that the international ship and port facility security code (ISPS) should be adequately implemented more both at the terminals and jetties, and training and development of security personnels in the port locally and overseas should be encouraged.

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