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POST-CONCESSION EVALUATION OF TERMINAL OPERATORS' PERFORMANCE IN TINCAN ISLAND PORT LAGOS, NIGERIA

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Abstract

This research examined concessionaires, also known as terminal operators in Tincan Island port to determine their performance in the post concession era. Terminal operators play a significant role in enhancing port performance. Consequently, the port concession that was meant to improve port efficiency and productivity is faced with some challenges. Hence there is the need to evaluate the performance of concessionaires on service delivery in Nigerian Ports. Both primary and secondary data were collected from staff in Tincan Island Port Complex. Stratified sampling method was employed, in which 324 respondents were selected using Yamene formula. Hungarian assignment technique was used to determine the optimal turnaround time while multiple regression analysis was used to examine the factors influencing the storage yard capacity. The results showed that there was a decrease in turnaround time from January to December across the five terminals. The turnaround time for Josephdam is the highest, while that of PTML was the least. It also discovered that as the beta value of handling equipment, terminal space, availability of skilled workers, average daily rolling stock and yard occupancy increase by one unit, storage area improves operation by 0.225, 0.388, 0.163, 0.212 and 0.97 units. Hence, there is a positive relationship. Also, an increase in dwell time by one unit leads to a decrease in storage area operations by 0.184. All were significant at $p < 0.05$. It was recommended that berth idle time for vessels should be minimised in order to enhance productive berth occupancy. Concessionaires should utilise the existing terminal facility effectively so that it can accommodate more cargo. Automated loading systems should be provided for the loading and offloading of cargo. Also, concessionaires should train and re-train indigenous personnel that will handle this equipment.

Keywords: Port, Concessionaires, Performance, Maritime industry

INTRODUCTION

A port is an area or point of transfer of cargo from a vessel into an immediate mode of transport and is attached to a sea, ocean or river by connecting waterways which are regarded as entities. It exists as a vital and integral part of the overall pattern of trade and transport. It plays a strategic role in the development of domestic and international trade of any given maritime nation (Mogobojuri, 2020). However, in Nigeria, Nigerian Port Authority regulates the activities of the port, ensuring that all activities are in the interest of the port, administers land and provides the maintenance of the infrastructure including the depth of the berths (Pinwa, 1999). The Authority enjoys operational benefits of terminal ownership: it ensures, by priority use of the facility, a level of service tailored to the line and it allows exercising a greater dominance over costs. From a strategic point of view, it will enable control to be exercised in a part of the supply chain beyond the seaborne frontier (Haralambides and Benacchi, 2002). Prior to port reforms, Nigerian ports suffer low productivity and inefficiency (Ndikom, 2005). Similarly, Somuyiwa and Ogundele (2015) opined that handling equipment and plant in Nigerian ports are either old, antiquated, malfunctioning broken down or insufficient, thus, impeding cargo handling operations, stacking and the movement of goods to its final destination. In the year 2006, port reforms came into existence by the federal government through her agency the Nigerian Ports Authority.

These reforms encourage private sector participation and aimed at ports to be competitive and productive. Some researches focused on the efficiency and performance of port concession with a specific study area using some specific analytical tool. Dosunmu, Adepoju and Somuyiwa (2016) analysed cargo handling operations in Apapa and TincananalysedPorts using Pearson Product Moment Correlation (PPMC) and chi-square analytical technique. Stephen (2018) focused on terminal operation in the Apapa Port Complex (APC). The study adopted Data Envelopment Analysis (DEA) and Stochastic Frontier Analysis (SFA) which was used to determine the efficiency and performance after port concession. Mogbojuri (2020) analyse the performance of container terminal operations in Tincan Island port, Lagos. The study makes use of the Ordinary Least Square to determine the performance of container terminal operations. Adepoju (2020) evaluates new seaport development-prospects and challenges: perspectives from Apapa and Calabar seaports in Nigeria. This study used descriptive statistics and Stochastic Frontier Analysis (SFA) to analyse the efficiency of Apapa and Calabar seaports. Therefore, this study examined the concessionaire's performance in Tincan Island Ports using Hungarian techniques and regression model.

LITERATURE REVIEW

The development of Nigeria's ports system has been largely driven by government. However, in 2006, the government began to concession the ports and terminals and began the automation of the ports; thus, increasing private sector participation in the provision of supporting infrastructure. The restructuring of ports by the government, which saw the emergence of port concessionaires still experiences high intensity of sea traffic. Substantial volumes of Nigeria-bound traffic are even lost to neighbouring port in various country like Benin and Togo. Port charges have considerably increased to the level above the pre-concession era. (Stephen, 2018).

Port Model

The following are models that are internationally recognised i. Tool port model: In this model, the Port Authority provide both the infrastructure and super structure while the private terminal operators are responsible for stevedoring labour. The port authority leases out certain infrastructure to the private terminal operators. This includes the quayside, crane and shade. Examples are seen in some developed countries like the USA, Europe and Japan ii. Service port model: The model connotes that the Port Authority provides for the whole services and port infrastructure and as well fulfils its regulatory functions. This model allows the port authority to carry out stevedoring services known as the master stevedores while contracting stevedoring companies who assist in managing the operations of port labour. iii. Landlord port model:

The port authority provides the infrastructure which includes access channel, wharves, and terminal yards while the superstructure such as cranes, forklift and other lifting equipment is provided by the private operators. The Ports Authority is the regulator service and as well operations in the port. Most of the infrastructures are concessioned for a limited number of years. Nigeria ports adopt the landlord port model in which the terminal was concessioned to private operators known as concessionaires. iv. Multipurpose port model: This type of model allows two purposes of operations. Many port owners enjoy the economy of scale and also ensure maximum utilization of their facilities. The port cannot be considered as a specialized port due to its dual functions. v. P rivate Port Model. This model involved specialised operations carried out by private investor due to special nature, depending on the nature of cargo involved. Examples are ferry ports, liner ports, oil ports, bulk ports and fishing ports.

Functions of Nigeria Ports Authority (Landlord)

The Nigerian Ports Authority (NPA) owns the land and infrastructure, and the infrastructure is leased to private operating companies. The private operating company provides

and maintains the equipment and employs labour to handle cargo. NPA (2015) states other functions of NPA which are:

1. Ownership and administration of land water within the port limit

2. Planning and development of port operational infrastructure

3. Marine pollution

4. Leasing and concession of port operational infrastructure and setting benchmark for tariff structure

5. Safety and security

6. Enacting port regulations and bye-laws as well as monitor and enforce them

7. Procedural monitoring of operations and enforcement of important part of the agreements

Functions of Terminal Operators (concessionaires)

1. Ship chandelling and ship repairs

2. Cargo handling, stevedoring, warehousing and delivery

3. Procurement of cargo handling anequipment

4. Ports' superstructure growth and development

5. Bunkering

However, the performance of these concessionaires is inevitable as they affect a country's trade competitiveness. The followings are stipulated by UNCTAD, 2015 as determinants of port performance. a. Port access channel b. Landside access c. Custom efficiency d. Cargo handling types e. Quality of backhaul area Also, the port size is an indicator that deals with the total length or surface of port areas, regardless of their utilisation but not performance. Itoh et al., (2003) and Tongzon (2004) identify some useful port indicator. They are maximum water depth at port terminals, the depth of the navigation channel, and the number of twenty-foot equivalent units (TEUs) per gantry berth. Furthermore, port indicators includes facilities such as the storage areas and warehouses, the number of reefer plugs and the handling equipment such as cranes, straddle carriers, etc. Table 1 shows the performance indicators proposed by UNCTAD (1976).

Table 1: Original performance indicators proposed by UNCTAD (1976)

Tonnage worked	Arrival date
Berth occupancy revenue per ton of cargo	Waiting time
Cargo handling revenue per ton of cargo	Service time
Labour expenditure	Turnaround time
Capital equipment expenditure per ton of cargo	Tonnage per ship
Contribution per ton of cargo	The fraction of time berthed ships worked
Total contribution	Number of gangs employed per ship per shift
	Tons per ship-hour in port
	Tons per ship hour at berth
	Tons per gang hours
	The fraction of time gangs idle

Source: César et al. (2014)

METHODOLOGY

Tincan Island Port Complex was used as the study area which located in Apapa, the port for the city of Lagos, Nigeria. Tin Can Island Port is about seven kilometres due west of the city centre of Lagos across Lagos Harbor Wikipedia, (2016). It consists of five (5) Terminals, and they are Tin-Can Island Container Terminal Limited, Josepdam Port Services, Five Star Logistics Limited, Ports and Terminals Multiservices and Ports and Cargoes Handling Services. Hence, it is regarded as the second busiest Port in Nigeria after Apapa Port with her coordinates 6.4328° N, 3.3452° E and has the bearing of Latitude 620N Longitude 30023E. This was expressed in figure 1, which showed the digital map of Tincan Island Port, Lagos. Table 2 also showed the arrangements in Tincan Island Ports with the concession of the terminals to five (5) Terminals Operator showing different concessioning agreements, type of cargo and depth (m).

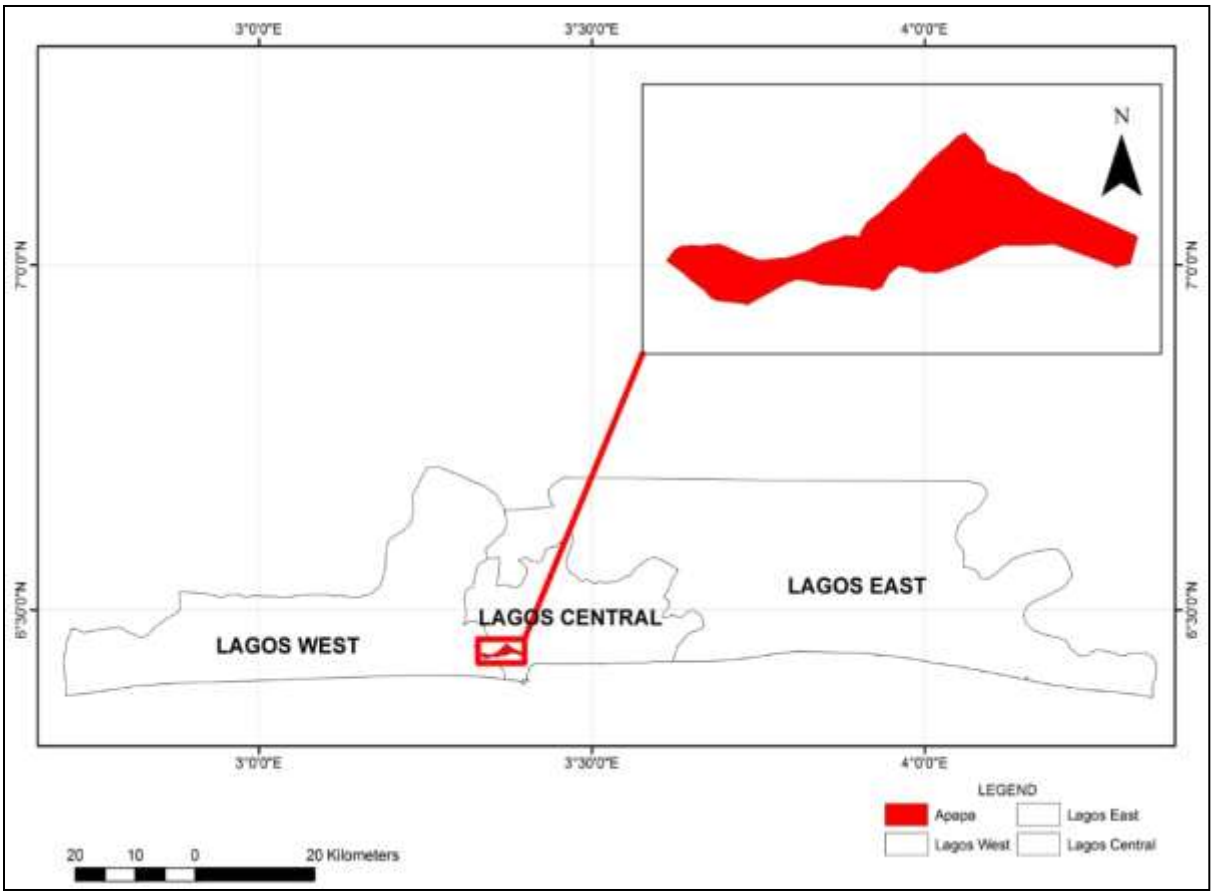

Figure 1: Digital map of Tincan Island Port, Lagos

Source: Department of Survey and Geoinformatics, University of Lagos, Nigeria (2016)

Table 2: Tincan Island Terminal Operators

Terminal	Concessionaires	Type Of Cargo	Depth (M)	Terms
A	Josepdam Port Services Limited	Bulk	13.2	10 years (Commencing 10-05-06)
B	Tin Can Island Cont. Terminal Limited	Container	13.3	15 years (Commencing 01-06-06)
C	Port and Cargo Handling Services Limited	Multipurpose	13.3	10 years (Commencing 10-05-06)
D	Five Star Logistics Limited	Ro-ro	12.9	10 years (Commencing 10-05-06)
E	Ports and Terminal Multiservices Ltd	Multipurpose	11.3	25 years

Source: NPA Tincan Island Port Complex (2015)

The study population are the staff of the container terminals in Tincan Island Port Complex. Table 3 shows the staff strength of the terminal operators.

Table 3: Staff strength of terminal operators

S/N	Terminal	Contract Staff	Nigerian	Foreign	Total
1	JOSEPDAM	1	60	-	61
2	PTML	116	372	11	499
3	TICT	60	336	4	400
4	PORT & CARGO	-	404	4	408
5	FIVE STAR	74	267	5	346
	TOTAL	**251**	**1439**	**24**	**1714**

Source: NPA statistics (2015)

The population was divided into strata using a stratified sampling technique. Random sampling was used in which each stratum has an equal chance of being selected. However, Yemane (1967) provides a simplified formula to calculate sample sizes. However, Dosunmu, Adepoju and Somuyiwa (2016) adopted this formula to determine the sample size in analysing Cargo Handling Operations in Apapa and Tincaanalysing Ports. Table 4 shows the sample size.

Table 4: Sample size

S/N	Terminal	Population	Size
1.	JOSEPDAM	61	12
2.	PTML	499	94
3.	TICT	400	76
4.	PORT & CARGO	408	77
5.	FIVE STAR	346	65
	TOTAL	**1714**	**324**

$$n = \frac{N}{1 + N(e)^2}$$

Where,

e= error term which is 0.05

n = total sample size

$$n = \frac{1714}{1 + 1714\ (0.05)^2}$$

n = 324

The sources of data collected for this study were the primary and secondary data. The questionnaires were distributed to the staff of the terminal operator. Secondary data were obtained from the annual report of the Nigerian Ports Authority.

RESULTS

Figure 3 shows the average time vessel spend at berth at each terminal. The graph showed that five star logistics and PTML have the least average time vessel spend at berth.

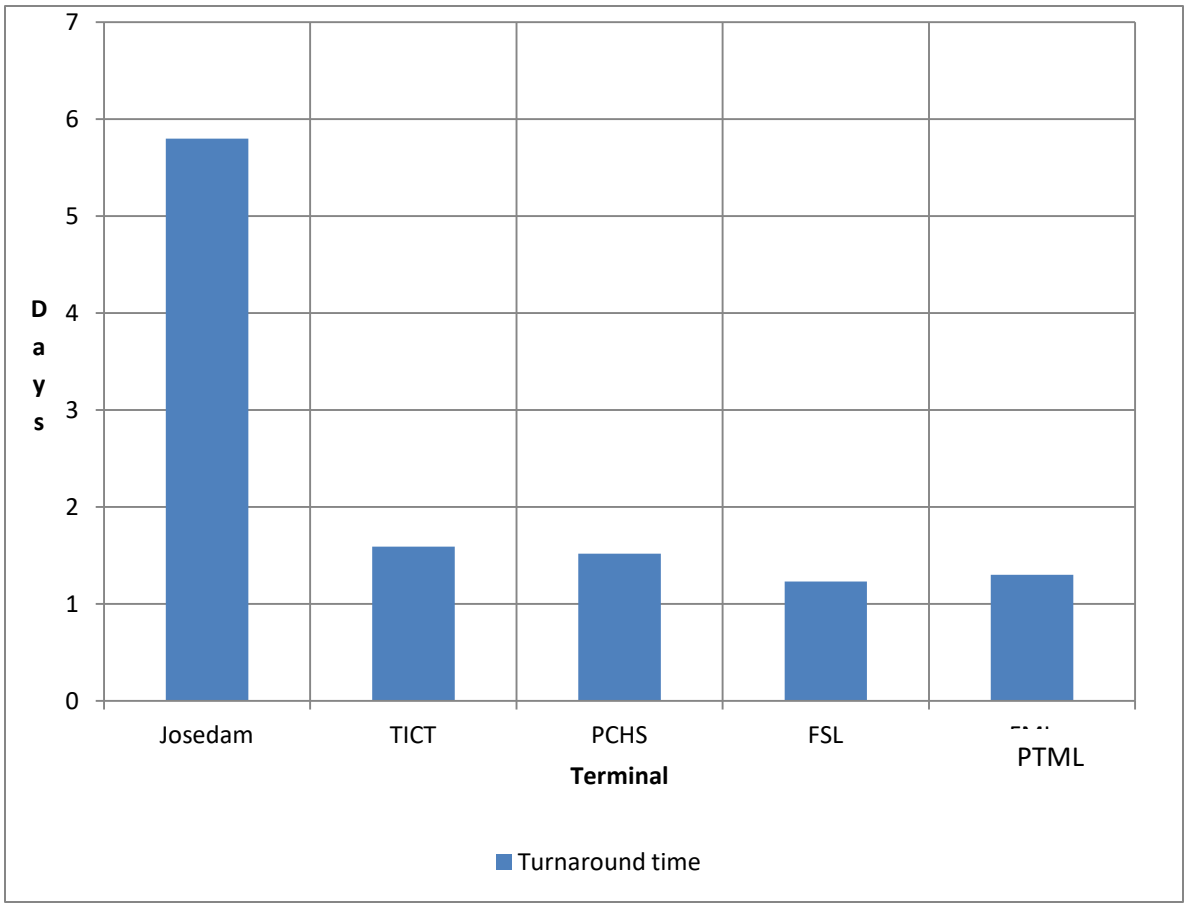

Figure 3: Optimal Turnaround Time

Table 5: Hungarian optimal turnaround time

	Josedam	TICT	PCHS	FSL	PTML
Jan	0	1	0	0	0
Feb	0	0	0	0	0
Mar	0	0	0	0	0
Apr	0	0	0	0	0

May	0	0	0	1	0
Jun	0	0	0	0	0
Jul	0	0	0	0	0
Aug	0	0	0	0	0
Sep	0	0	1	0	0
Oct	0	0	0	0	0
Nov	1	0	0	0	0
Dec	0	0	0	0	1

Table 5…

Table 5 was adopted from appendix I. It shows the turn round time (day) for each terminal operators from January to December. Table 5 shows the optimal turnaround time for each concessionaire for the year 2015. However, the optimal turnaround time for PTML can be found in the cell for December, which is equal to 1which had the shortest turnaround time, while May is the optimal turnaround time for FSL. The month of September is the optimal turnaround time for PCHS, the month of January is the optimal turnaround time for TICT and November is the optimal turnaround time for Josepdam. Figure 3 shows a decrease in turnaround time from January to December across the five terminals. The turnaround time for Josephdam is the highest, while that of PTML is the least.

Factors influencing yard storage operations

Terminal Area Requirement: This is regarded as the measure of the terminal container holding capacity and is measured in terms of the number of containers that can be handled by the terminal over a particular period of time. This variable is measured in TEUs

However, The motive of using this variable rest on the findings of UNCTAD (1979), where adequate planning for terminal area requirement was found to enhance port productivity. As a result of increased container throughput, more income for government and terminal operators and availability of adequate space to cater for heavy container handling plants.

Dwell Time: This is defined as the estimate of the average storage time of containers in the terminal. Dwell time stipulate the definite time consignment stays at the port of entry, loading and discharging of containers until it exits from the port premises.

However, the purpose of using this variable is rest on the fact that low dwell time increases container throughput, reduces costs of storage of containers and other port ancillary services such as security of containers.

Average Daily Stock of Containers: This is the estimate of expected container in a terminal per day. This is usually measured in the number of TEUs or tons of containers handled per day. This aid the terminal operators in projecting terminal output and also enables them to know how many workers to employ in the terminal at a particular period and the number of trucks to be allowed into the terminal.

Yard Occupancy: This is the measure of what the terminal can take in relation to the number of TEUs or tons of cargo expected in the terminal. This variable was assessed through manual calculation considering the calculated area needed for result and a determined occupancy factor. This variable is measured in square metres (m^2). This variable assists terminal operators in port decongestion.

Table 6: Factors influencing yard storage operations

Model	Unstandardised Coefficients		Standardised Coefficients		
		Unstand. Error	Beta		
	206	.044		4.636	.000
Type of handling equipment	.225	.112	.300	2.012	.045
Terminal space	.388	.069	.377	5.600	.000
Availability of skill workers	.163	.074	.190	2.197	.029
Average daily stock	.212	.138	.221	1.539	.125
Yard occupancy	.097	.102	.131	.950	.343
Dwell time	-.184	.071	-.180	-2.608	.010

Dependent variable: yard storage

Table 7: Model Summary of storage capacity

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
	.945[a]	.893	.889	.244

Table 8: Analysis of variance of factors influencing storage area

Model		Sum of Squares	Df	Mean Square	F	Sig.
	Regression	119.270	8	14.909	250.739	.000[a]
	Residual	14.330	241	.059		
	Total	133.600	249			

Table 6 gives the estimate of b value and tells us about the relationship between the dependent variable and the independent variable. However, the b value indicates both positive and negative relationship from the below model.

Yos = 0.206 + 0.225Thq + 0.388Ts + 0.163Sw + 0.212Ads + 0.97Yo – 0.184Dw

Where,
Yos = Yard storage area operation
Thq = Type of handling equipment
Ts = Terminal space
Sw = Availability of skilled workers
Ads = Average daily stocks
Yo = Yard occupancy
Dw = Dwell time

However, the b value indicated that as handling equipment, terminal space, availability of skilled workers, average daily rolling stock and yard occupancy increase by one unit, storage area improves operation by 0.225, 0.388, 0.163, 0.212 and 0.97 units. Hence, there is a positive relationship. Also, an increase in dwell time by one unit leads to a decrease in storage area operations by 0.184. Similarly, an increase in equipment used improves operations in the storage area. Also, if the equipment used is obsolete or faulty, then there will be an operational delay. This will mar the performance and effectiveness of yard storage capacity. Ogundele (2014) concludes that there exists a relationship between number and state of equipment in Tincan Island Port. Also, an increase in the availability of skilled labour in handling various equipment enhances storage operation. However, Ndikom (2015), stated that issues regarding operational inefficiencies in the Nigeria port system have to do with the operational dwell time process. The dwell time is, however, the time between the vessel arrived at the port berth and container exit from the port facilities. This time usually exceeds 20 days on average for most ports in Africa, which makes their ports the most inefficient in the world. Table 7 shows the correlation coefficient (r) of 0.945 and coefficient of multiple determinant (r2) of 0.893. It simply means that 89% of the variation in the independent variable may be attributed to a magnitude increase in the dependent variable, which is storage capacity while 11% account for the unexplained variable. Similarly, table 8 shows that the F ratio, which is 250.739 was statistically significant at p-value = 0.00. The regression model overall predicts that the factors influencing storage capacity are significant.

CONCLUSION AND RECOMMENDATIONS

Based on the findings of the study, it was concluded that the sophisticated handling equipment used improves the operations at the storage area. Also, if the equipment used is obsolete or faulty then there will be an operational delay. This will mar the performance and the effectiveness of yard storage capacity. Terminal space, availability of skilled labour, average daily stock of containers, yard occupancy and dwell time if not harnessed properly will render the yard storage to be ineffective. It was recommended that berth idle time for vessels should be minimised in order to enhance productive berth occupancy. Concessionaires should utilise the existing terminal facility effectively so that it can accommodate more cargo. Automated loading systems should be provided for the loading and offloading of cargo. Also, concessionaires should train and re-train indigenous personnel that will handle this equipment.

As a scope for further studies, South eastern ports in Nigeria could be adopted for the empirical research in future.

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APPENDIX I

Terminal	Indicators	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
JOSEPDAM	Total no of ships	11	17	11	9	18	11	13	16	14	10	11	11	152
	Total waiting time	31.04	61.64	22.43	37.2	47.04	24.77	53.55	44.93	55.13	23.8	24.05	23.17	448.75
	Average waiting time	2.82	3.63	2.04	4.13	2.61	2.25	4.12	2.81	3.94	2.38	2.19	2.11	2.92
	Total time at berth	60.38	54.93	45.84	45.08	72.84	55.09	50.46	72.93	63.67	59.46	39.71	48.76	669.15
	Average time at berth	5.49	3.23	4.17	5.01	4.05	5.01	3.88	4.56	4.55	5.95	3.61	4.33	4.49
	Turn – Round Time Days	8.31	8.86	6.21	9.14	6.66	7.26	8.00	7.37	8.49	8.33	5.80	6.54	7.41
TICT	Total no of ships	39	37	37	38	37	38	44	47	40	43	39	44	483
	Total waiting time	15.17	20.96	41.04	40.30	39.30	32.23	59.73	78.44	44.84	54.63	22.85	16.34	465.83
	Average waiting time	0.39	0.57	1.11	1.06	1.06	0.85	1.36	1.67	1.12	1.27	0.59	0.37	0.95
	Total time at berth	46.93	48.90	50.21	58.83	50.45	61.63	59.81	65.30	47.55	61.85	50.22	53.63	655.31
	Average time at berth	1.20	1.32	1.36	1.55	1.36	1.62	1.36	1.39	1.19	1.44	1.29	1.22	1.36
	Turn – Round Time (Days)	1.59	1.89	2.47	2.61	2.43	2.47	2.72	3.06	2.31	2.71	1.87	1.59	2.31

PCHS	Total no of ships	21	15	14	16	17	15	16	14	16	19	15	17	195
	Total waiting time	5.78	11.26	9.69	3.80	3.80	5.10	12.17	1.67	3.64	7.93	1.73	8.10	74.67
	Average waiting time	0.28	0.75	0.69	0.24	0.22	0.34	0.76	0.12	0.23	0.42	0.12	0.48	0.39
	Total time at berth	30.59	24.40	18.51	21.89	21.89	19.42	24.48	22.40	20.67	25.19	19.17	31.47	280.08
	Average time at berth	1.46	1.63	1.32	1.37	1.29	1.29	1.53	1.60	1.29	1.33	1.28	1.85	1.44
	Turn – Round Time Days	1.73	2.38	2.01	1.61	1.51	1.63	2.29	1.72	1.52	1.74	1.39	2.33	1.82
FSL	Total no of ships	15	13	13	8	14	11	13	15	11	12	9	10	144
	Total waiting time	8.45	8.82	5.77	4.79	2.50	5.93	3.56	16.38	1.89	3.75	2.50	1.92	66.26
	Average waiting time	0.56	0.68	0.44	0.60	0.18	0.54	0.27	1.09	0.17	0.31	0.28	0.19	0.44
	Total time at berth	24.18	26.23	16.62	13.18	14.75	16.88	25.93	20.45	18.88	21.18	13.09	21.35	232.72
	Average time at berth	1.61	2.02	1.28	1.65	1.05	1.53	1.99	1.36	1.72	1.77	1.45	2.14	1.63
	Turn – Round Time Days	2.18	2.70	1.72	2.25	1.23	2.07	2.27	2.46	1.89	2.08	1.73	2.33	2.07
PTML	Total no of ships	13	14	12	11	9	14	9	15	10	10	10	10	137
	Total waiting time	6.13	9.94	5.78	4.85	1.38	3.54	2.64	5.05	1.88	1.93	1.05	0.98	45.15
	Average waiting time	0.47	0.71	0.48	0.44	0.15	0.25	0.29	0.34	0.19	0.19	0.11	0.10	0.31
	Total time at berth	20.05	18.15	16.63	20.67	12.04	24.22	14.22	21.63	13.43	14.70	12.19	12.05	199.98
	Average time at berth	1.54	1.30	1.39	1.88	1.34	1.73	1.58	1.44	1.34	1.47	1.22	1.21	1.45
	Turn – Round Time Days	2.01	2.01	1.87	2.32	1.49	1.98	1.87	1.78	1.53	1.66	1.32	1.30	1.76

Source: NPA (2015)