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The Performance of Nigeria's Inland Dry Ports and Truck Turnaround Time

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ABSTRACT

The paper examines the general performance of the inland dry ports in Nigeria and the truck turnaround time among the IDPs. The objectives of the study were to compare the volume of containers discharged and evaluate the truck turnaround time at the inland dry ports of Nigeria between 2022 and 2024. The study adopts cross-sectional survey design to examine the population of study. Out of a population of 5,910, Taro Yamane formula was used to determine the sample size of 406. In order to analyze the data gathered, Analysis of variance (ANOVA) was used to test the hypotheses. The study adopted simple random sampling technique due to its ease of use and accuracy of representation. From statistical analyses, interviews, literature review, media reports and critical stakeholders' opinions, the study finds that there was no statistically significant difference in the cargo throughput among the inland dry ports of Nigeria and no significant difference in the truck turnaround time among the inland dry ports of Nigeria from 2022 to 20204. The study establishes the relationship between port processes and truck turnaround time and observes that port operations at the IDPs could be enhanced by improving the efficiency of port infrastructure, installing modern cargo handling equipment, as well as fine tuning the management of truck traffic within the port. Consequently, the study recommends, among others, that the Federal Government of Nigeria should introduce the automation of operations at the inland dry ports in order to improve port processes and fast track truck turnaround time.

1. INTRODUCTION

Ports around the world have come up with a number of strategies to improve their hinterland connections. This is in response to the challenges created by increasing traffic, shrinking public budgets, competition for road and rail use from passenger and personal vehicles and the proximity of many ports to densely urbanized areas (Viet Hung, 2017).

These strategies have resulted in several policies such as the development of inland dry ports (IDPs) (Roso, Woxenius and Lumsden, 2009), improving stakeholder management (Bergqvist, Wilmsmeier and Cullinane, 2016), developing appointment systems to improve port gate efficiency, extending operation times (Werikhe and Zhihong, 2015), extending the borders of the port beyond the port precinct or influencing

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the port modal split (Monios and Lambert, 2013 cited Nguyen and Notteboom, 2018).

In order to improve the hinterland connections in Nigeria and make seaports more efficient, seven locations were approved for the establishment of inland dry ports. This was with the aim of bringing port activities closer to shippers who are based in the hinterland. The intention was to speed up the flow of cargoes (import and export) between seaports and inland terminals through land transportation network. The proposal to develop a chain of inland dry ports in Nigeria came in the heels of the logistical constraints experienced at the seaports. The emergence of IDPs is therefore aimed at addressing constraints which included insufficient storage space, cumbersome documentation procedures, and congestion at the seaports (Eto, 2023).

However, since the establishment of inland dry ports in Nigeria, most shipping companies are yet to recognize the functional IDPs as ports of origin for exports and port of destination for imports. This explains why they (shipping companies) seldom issue bill of laden for cargoes destined for the inland dry ports in the country. This has contributed to the failure of the only two functional IDPs (Kaduna and Kano) to serve the purpose for which they were introduced thereby affecting truck turnaround time.

According to Adejumo (2020), since the Kaduna and Kano Inland Dry Ports are located in the same geo-political zone within a short distance of each other, the truck turnaround time might not significantly differ, since they have identical challenges that plague their respective operations.

The efficiency and effectiveness of inland dry port operations are crucial to the enhancement of the key performance indicators of IDPs which include, among others: vehicle waiting time; revenue generated; truck turnaround time; cargo throughput; equipment availability. Thus, this paper sought to appraise the general performance of the inland dry ports in Nigeria and the truck turnaround time among the IDPs. Consequently, the objectives of the study were to compare the volume of containers discharged and evaluate the truck turnaround time at the inland dry ports of Nigeria between 2022 and 2024.

2. LITERATURE REVIEW AND CONCEPTUAL CLARIFICATION

Conceptual Clarification

The concept of inland dry port is based on shifting intermodal terminals from the port areas further to the hinterland. This move helps to avoid traffic bottlenecks, in order to connect cargo handling from the seaport with other types of cargo at one common transport centre and it can help develop the hinterland areas (Jaržemskis and Vasiliauskas, 2007 cited in Olah *et al.*., 2018).

Seaports are among the most space-demanding in terms of land occupation in metropolitan areas and their rapid expansion leads to environmental and land use conflicts. Therefore, satellite terminals (inland intermodal terminals- IDPs in remote areas) are seen as an alternative to seaport expansions (Slack, 1999 cited in Roso and Lumsden, 2009).

Ports around the globe are planning expansions in response to the growth of containerized maritime trade and as a result of the development needs of their hinterland economies (Brooks *et al.*., 2014). One major way of doing this, is through the development of inland dry ports. In essence, inland dry ports evolved as a result of the challenges that face existing sea ports. As a result of the increase in size and capacity of container vessels, sea ports eventually found themselves faced with the challenge of inability to handle import and export cargo

in a regular manner. This frequently resulted in congestion at different sea ports due to long waiting time of trucks and haulage vehicles (Woxenious *et al*.., (2004).

Consequently, it is in response to these challenges facing the maritime transport sector, and in particular ports and their hinterlands, that the inland dry port concept continues to grow (Roso and Andersson, 2017). The emergence of inland dry ports (IDPs) in the overall seaports system has become a veritable complement for seaports due to the unstable and ever-changing nature of seaports, due to technological changes in shipping, evolution of information and communication technology, increase in global trade and the constant change in customer expectations with respect to port service delivery.

IDPs are in general considered as partners to seaport terminals because they relieve ports of capacity constraints while also offering value added services along the supply chain. Their focal functions include handling and storage of containers, cargo consolidation and distributions as well as receipt and delivery of containers (Haasis, 2010; Nathan Associates Inc., 2010 as shown in Mwemezi and Huang, 2012).

Inland Dry Ports in Nigeria

The establishment of inland dry ports in Nigeria is aimed at leading to an overall reduction in the country's transportation costs if an optimal number of the inland terminal facilities are put into operation in strategic locations (Eto, 2021). Table 1 shows the Inland Dry Ports Locations in Nigeria, Concessionaires and Percentage Completion.

Table 1: The Inland Dry Ports Locations in Nigeria, Concessionaires and Percentage Completion

S/N	Location	Capacity (TEUs)	Concessionaire	Percentage Completion
1	Erunmu, Ibadan	50,000	Catamaran Logistics Ltd	10%
2	Isiala Ngwa, Aba	50,000	Eastgate Ltd	5%
3	Heipang, Jos	20,000	Duncan Maritime Nig. Ltd	29.70%
4	Zawachiki, Dala -Kano	20,000	Dala Inland Dry Port Ltd.	100%
5	Zanfarawa, Funtua	10,000	Equatorial Marine Oil and Gas Ltd	75%
6	Jauri, Maiduguri	10,000	Migfo Nig. Ltd	5%
7	Kaduna Inland Dry Port	5,000	Inland Container Nig. Ltd (ICNL)	100%

Source: Nigerian Shippers' Council (2024)

Truck Turnaround Time

Truck turnaround time is an essential key performance indicator (KPIs) used to measure the efficiencies within drayage services and port logistics. Starting from gate-in until gate-out, "turnaround" is the total time spent by a truck in the terminal area while loading and/or unloading a cargo. This metric considers the loading, and unloading of cargo, inspecting a truck, completing documentation, and leaving the terminal (Port City, 2021).

In the view of Rathnayake, Jing and Erandi (2015), truck turnaround time in an inland dry port is the time it takes for a truck to enter the port, complete its designated task (such as loading or unloading cargo), and then exit the port. By optimizing truck turnaround time, inland dry ports can improve their overall performance, reduce costs, and enhance customer satisfaction.

Components of Truck Turnaround Time

1. Entry time: Time taken for the truck to enter the port.

2. Waiting time: Time spent waiting for loading/unloading operations.
3. Service time: Time taken for loading/unloading operations.
4. Exit time: Time taken for the truck to exit the port.

Importance of Truck Turnaround Time

1. Efficiency: Reducing turnaround time improves the efficiency of the port's operations.
2. Productivity: Faster turnaround times enable more trucks to be processed, increasing productivity.
3. Cost savings: Minimizing turnaround time can reduce costs associated with truck idle time and increase the overall competitiveness of the port.

Factors Affecting Truck Turnaround Time

1. Port infrastructure: Design and capacity of the port's facilities.
2. Operational efficiency: Effectiveness of the port's operations and management.
3. Traffic management: Management of truck traffic within the port.
4. Cargo handling: Efficiency of cargo handling equipment and processes.

Empirical Studies

In a study titled: "Truck turnaround time problem at the port of Colombo and a solution through inland ports", Rathnayake et al., (2015) observe that at the inland dry port of Colombo, the truck turnaround time (TTT) procedure leads to trucks being delayed, and this caused congestion in the port and on the roads of Colombo city. A survey conducted showed that the TTT in the Colombo port ranged from minimum 47 minutes to maximum eight hours with mean value of three hours. The authors suggest that to improve the TTT at the inland ports, it would be necessary to replicate the services and facilities of seaports. They suggest the need for the inland dry ports to be connected to the seaport through railways, and by so doing improve the TTT in the port and relieve congestion on the city roads.

Zainuddin, Saifudin, Zalazilah, Bahaudin and Khalid (2019) conducted a study on Malaysian inland dry ports and concluded that inasmuch as truck turnaround time is clearly relevant for shipping lines (in terms of related port costs) and has profound effects on the performance of an inland dry port, ports do not usually report turnaround times in their annual reports or other publications.

3 METHODOLOGY

The study used cross-sectional survey design on a population shown in Table 2.

Table 2: Population of the Study

S/N	ACTORS	NO. STAFF	TARGETED RESPONDENT
1.	Nigerian Shippers' Council	400	27
2.	Nigerian Ports Authority	550	38
3	Nigerian Railway Corporation	650	45
4	Kaduna Inland Dry Ports	125	9
5.	NDLEA	450	31
6.	Dala Inland Dry Ports, Kano	300	21
7.	NAGAFF	480	33

8	NCS	480	33
9.	NAFDAC	465	32
10.	MAN	560	38
11.	NACCIMA	340	23
12	NARTO	545	37
13	Shippers' Association (Importers and Exporters)	540	37
14	Terminal Operators	25	2
	Total	5,910	406

Source: Compiled by the researchers, 2025

The study used primary and secondary sources of data. Questionnaire and structured interview were the instruments used for sourcing primary data. The study adopted the Taro Yamane formula to determine 406 as the sample size, out of population of study of 5,910. In determining the sample size for this research, the Taro Yamane's formula given as *Eq.(1)* was used:

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

Where:

n = sample size
N = population size (603)
e = level of significance (our level of significance is chosen at 5%)
Applying the formula at significant level of 5%

The formula yielded a calculated value of 406 as sample size drawn at 95% confidence level and 0.05 error rates. The results are shown in Table 3.

Table 3: Sample Size Determination

S/N	**Actors**	**Number of Staff**	**Suitable sample size /Target Respondents**
1.	Nigerian Shippers' Council	400	400/5910 x 406 = 27
2.	Nigerian Ports Authority	550	550/5910 x 406 = 38
3	Nigerian Railway Corporation	650	650/5910 x 406 = 45
4.	Kaduna Inland Dry Port Limited	125	125/5910 x 406 = 9
5	NDLEA	450	450/5910 x 406 = 31
6	Dala Inland Dry Port, Kano	300	300/5910 x 406 = 21
7	NAGAFF	480	480/5910 x 406 = 33
8	NCS	480	480/5910 x 406 = 33

9	NAFDAC	465	465 x 406 = 32 5910
10	MAN	560	560x 406 = 38 5910
11	NACCIMA	340	340 x 406 = 23 5910
12	NARTO	545	545 x 406 = 37 5910
13	Shippers' Association (Importers and Exporters)	540	540 x 406 = 37 5910
14	Terminal Operators	25	25 x 406 = 2 5910
	Total	**5,910**	**406**

Source: *Compiled by researchers, 2025*

4. RESULTS AND DISCUSSION

4.1 Summary of Questionnaire Distributed

The questionnaire distributed and the number of copies retrieved is presented in Table 4.

Table 4: Copies of Questionnaire Administered

Number of copies of Questionnaire Distributed	Number of copies of Questionnaire Retrieved	% of Copies of Questionnaire Retrieved
406	**398**	**98.03**

Source: *Field survey* (2025)

A total of 406 copies of the questionnaire were distributed to major stakeholders in the inland dry port sector. 398 copies were returned to represent 98.03% response rate as shown in the Table 4.

4.2 Socio-Economic Characteristics of Respondents

The socio-economic characteristics of the respondents are shown in Table 5.

Table 5: Demographic Analysis of Respondents

Characteristics	**Frequency**	**Percentage (%)**
Gender		
Male	289	72.61
Female	109	27.39
Total	**398**	**100**
Age (Years)		
Less than 18	7	1.76
18-35	183	45.98
36-65	193	48.49
Above 65	15	3.77

Total	**398**	**100**
Educational Level		
Primary	12	3.01
Secondary	31	7.79
Tertiary	355	89.20
Total	**398**	**100**
Occupation		
Civil Servants	227	57.03
Exporters	15	3.77
Importers	22	5.53
Freight Forwarders	29	7.29
Association Representatives	57	14.32
Terminal Operators	2	0.50
Tally Clerks	9	2.26
Transporters	37	9.30
Total	**398**	**100**
Status		
Top-level Management	107	26.88
Senior-level Management	196	49.25
Junior Management	95	23.87
Total	**398**	**100**

Source: Researchers' Field Survey, 2025

4.3 Discussion of Results

Cargo throughput at the inland dry ports of Nigeria

Table 6 shows the cargo throughput at the Kaduna and Dala Inland Dry Ports, Kano. At Kaduna Inland Dry Port, the number of cargo in the year 2022 was put at 4318, a slight drop at 4294 was observed in 2023 while a significant drop continued in 2024 to 3439. On the other hand, at Dala Inland Dry Port, Kano cargo was put at 1986 in 2022; it increased in 2023 to 2689 and in 2024 a slight drop by 2517.

Figure 1 further reveals that the highest cargo throughput was observed in 2022 in Kaduna. Table 6 further portrays that the average cargo throughput at Kaduna Inland Dry Port was put at 4017 TEUs as compared to the 2397 TEUs at Kano Inland Dry Port. It clearly shows that Kaduna handled more cargo throughput compared to Dala Inland Dry Port, Kano. The linear equation ($y = -439.5x + 4896$) for Kaduna Inland Port showed that as the years increase, cargo throughput will decrease by 439.5 with coefficient of determination of 0.7705 while at Kano Inland Port, the linear equation ($y = 265.5x + 1866.3$) shows that as years increase, cargo throughput will increase by 265.5 with coefficient of determination of 0.5249.

Table 7 shows the result of the hypothesis tested. It reveals that there was no statistically significant difference in the cargo throughput among the inland dry ports of Nigeria from 2022 to 2024 as the p-values (0.058 and 0.646) obtained were greater than the critical level of $\alpha = 0.05$. This implies that the cargo throughput between the two inland ports were not significantly different across the years.

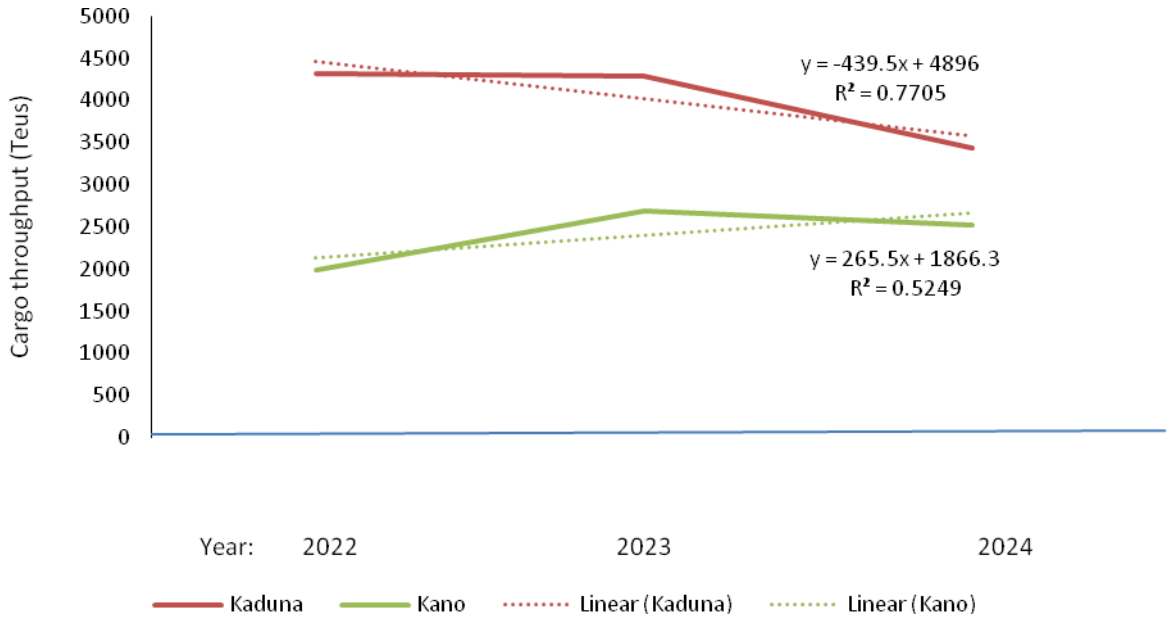


Figure 1: Cargo throughput at the inland dry ports of Nigeria across three years

Table 6: Cargo Throughput at the inland dry ports of Nigeria

InlandDry Ports/Year	**2022 (TEUs)**	**2023 (TEUs)**	**2024 (TEUs)**	**Mean**
Kaduna	4318	4294	3439	4017
Kano	1986	2689	2517	2397

Source: *Nigerian Shippers Council (NSC), 2024*

Test of Hypothesis (1)

H_{01}: There is no statistically significant difference in the cargo throughput among the inland dry ports of Nigeria from 2022 to 2024

The above hypothesis was tested using the Analysis of Variance (ANOVA)

The ANOVA compares the means between two or more populations.

Model Specification for ANOVA

$X_{ij} = \mu + \alpha_i + \varepsilon_{ij}$

Where X_{ij} = is the observation of the treatment (Cargo Throughput)

μ = the universal mean

α_i = is the effect of the treatments (Inland Dry Port)

ε_{ij} = the random error component.

Where

α_1 = Kaduna, α_2 = Kano

Decision Rule

When the P–Value < α (0.05) at a given degree of freedom (df): Reject the Null Hypothesis (H_0)

When the P–Value > α (0.05) at a given degree of freedom (df): Accept the Null Hypothesis (H_0)

Table 7: Cargo throughput at the inland dry ports of Nigeria as it relates to their performance.

Tests of Between-Subjects Effects

Dependent Variable: Cargo Throughput

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	Hypothesis	61715508.167	1	61715508.167	16.144	.167
	Error	3598580.094	.941	3822793.167[a]		
Inland Dry Port	Hypothesis	3934980.167	1	3934980.167	15.829	.058
	Error	497186.333	2	248593.167[b]		
Year	Hypothesis	272812.333	2	136406.167	.549	.646
	Error	497186.333	2	248593.167[b]		
Inland Dry Port * Year	Hypothesis	497186.333	2	248593.167	.	.
	Error	.000	0	.[c]		

a. MS(Inland Dry Port) + MS(Year) - MS(Inland Dry Port * Year)
b. MS(Inland Dry Port * Year)
c. MS(Error)

Source: *SPSS Output, 2025*

Truck Turnaround time at the Inland Dry Ports of Nigeria

The results from the interview and questionnaire showed that only two locations (Kaduna and Kano) out of the seven sites set aside for IDPs were complete (100%) and fully operational between 2022 and 2024 while others were at various stages of completion (See Table 7).

This section reveals the truck turnaround time at the inland dry ports in Nigeria as seen in Table 8. It reveals that at the Kaduna inland dry port in the year 2022 it took 5 days for trucks to be cleared, in 2023 it took 4 days and 2024 recorded 5 days. However, Dala inland dry port, Kano had a truck turnaround time of 3 days in 2022 and 5days in 2023 and 2024 respectively. On the average, Kaduna IDP took 5 days to clear a truck while Kano Port took 4 days.

Figure 2 also reveals that the linear equation (y = 4.6667) for Kaduna Inland Dry Port

implies that there is no variation in the truck turnaround time with coefficient of determination at 0% which implies that in succeeding years the truck turnaround time in Kaduna Inland Dry Port will maintain its truck turnaround time of 5days while at Kano Inland Dry Port, the linear equation (y = x + 2.333) shows that with time, the truck turnaround time will increase by 1 day with coefficient of determination of 0.75. Table 9 shows the result of the hypothesis tested. It reveals that there is no statistically significant difference in the truck turnaround time among the inland dry ports of Nigeria from 2022 to 2024. This simply means that there is 75% likelihood that the truck turnaround time in Kano will be within a day period in future years.

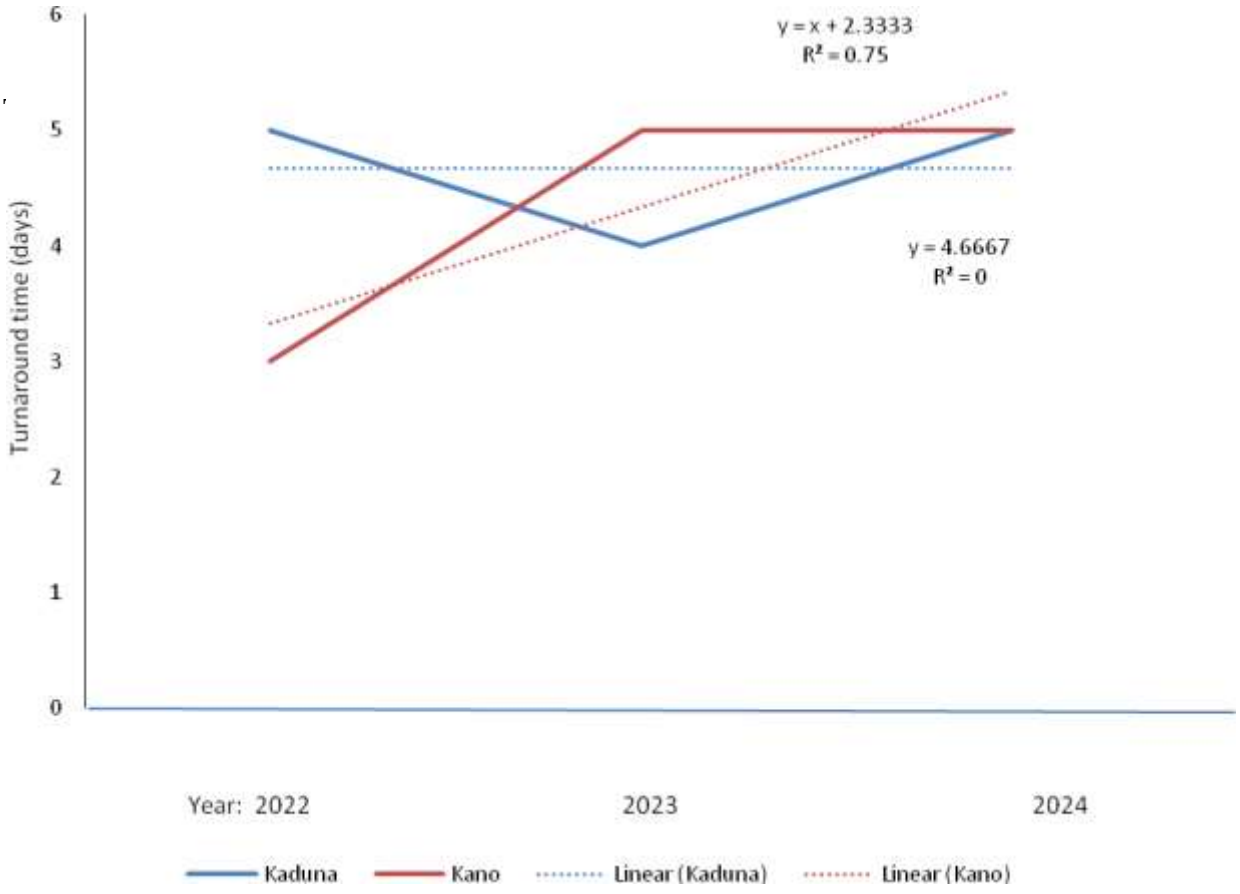


Figure 2**:** Truck Turnaround Time at the inland dry ports of Nigeria across three years

Table 8: Truck Turnaround Time at Kaduna and Kano Inland Dry Ports

InlandDry Ports/Year	**2022**	**2023**	**2024**	**Mean**
Kaduna	5days	4days	5days	5days
Kano	3days	5days	5days	4days

Source: *Nigerian Shippers Council (NSC), 2024*

Test of Hypothesis

H_{02}: There is no statistically significant difference in the truck turnaround time among the inland dry ports of Nigeria from 2022 to 2024.

The above hypothesis was tested using the Analysis of Variance (ANOVA)

The ANOVA compares the means between two or more populations.

Model Specification for ANOVA

$X_{ij} = \mu + \alpha_i + \varepsilon_{ij}$

Where X_{ij} = is the observation of the treatment (Truck Turnaround time)

μ = the universal mean

α_i = is the effect of the treatments (Inland Dry Port)

ε_{ij} = the random error component.

Where

α_1 = Kaduna, α_2 = Kano

Decision Rule

When the P–Value < α (0.05) at a given degree of freedom (df): Reject the Null Hypothesis (H_0)

When the P–Value > α (0.05) at a given degree of freedom (df): Accept the Null Hypothesis (H_0)

Table 9: Truck Turnaround time at the inland dry ports of Nigeria as it relates to their performance

Tests of Between-Subjects Effects

Dependent Variable: Truck Turnaround Time

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	Hypothesis	121.500	1	.	.	.
	Error	.	.[a]	.		
Inland Dry Port	Hypothesis	.167	1	.167	.143	.742
	Error	2.333	2	1.167[b]		
Year	Hypothesis	1.000	2	.500	.429	.700
	Error	2.333	2	1.167[b]		
InlandDryPort * Year	Hypothesis	2.333	2	1.167	.	.
	Error	.000	0	.[c]		

a. Cannot compute the error degrees of freedom using Satterthwaite's method.

b. MS(InlandDryPort * Year)

c. MS(Error)

Source: *SPSS Output, 2025*

4.4 Discussion of Findings

Cargo throughput at the inland dry ports of Nigeria

Finding on this objective reveals that despite Kaduna Inland Dry Port handling more cargoes, when subjected to statistical test reveals that there was no statistically significant difference in the cargo throughput among the inland dry ports of Nigeria from 2022 to 2024. This finding concurs with the assertion by Adejumo (2020) who infers that the Kaduna and the Dala Inland Dry Ports, Kano being located in the same geo-political zone, within a short distance of each other, could have similar cargo throughput levels. Moreover, both inland dry ports share the same problem of poor rail freight services as observed by the respective Port Managers of the dry ports in an interview. The Port Managers pointed out that the Nigerian Railway Corporation (NRC) is yet to meet demand for wagons to operate rail haulage and this affects the cargo throughput at both IDPs.

Truck Turnaround Time at the Inland Dry Ports of Nigeria

Findings on the objective show that there is no significant difference in the truck turnaround time among the inland dry ports of Nigeria from 2022 to 2024. This finding tallies with the assertion by Adejumo (2020) who infers that since the Kaduna and Kano Inland Dry Ports are located in the same geo-political zone within a short distance of each other, the truck turnaround time might not differ significantly.

5. CONCLUSION AND RECOMMENDATIONS

Based on the findings of the study, it can be concluded that the inland dry ports in Nigeria (which aim to decongest the seaport and bring shipping and port services closer to the hinterland) are indispensable to an efficient seaport that desires to maximize the patronage of hinterland markets. Accordingly, port processes and truck turnaround time could be enhanced by improving the efficiency of port infrastructure, installing modern cargo handling equipment, as well as fine tuning the management of truck traffic within the port.

Consequently, the Federal Government of Nigeria should introduce the automation of operations at the inland dry ports in order to improve truck turnaround time. The road transport infrastructure serving as access roads from the seaports to the inland dry ports in the hinterland should be rehabilitated to assure the safety of freight-ladened vehicles on the highways.

The Federal Government of Nigeria should formulate policies that encourage shipping companies to issue bill of lading destined for specific inland dry port as port of origin and port of destination in order that hinterland-based shippers and exporters might be saved the cost and hardship of taking delivery or sending their ware through the seaports.

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