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INLAND DRY PORTS AND INTERMODAL TRANSPORT SYSTEM: MECHANISMS TO RECALIBRATE TRADITIONAL LOGISTICS SERVICES BETWEEN SEAPORTS AND THEIR HINTERLANDS IN NIGERIA

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ABSTRACT

The paper focuses on the role of inland dry ports and intermodal transport system in recalibrating traditional logistics services between seaports and their hinterlands in Nigeria. The study identifies the challenges involved in the recalibration of traditional logistics services between seaports and their hinterlands in Nigeria and the inherent benefits to be derived. It used descriptive survey method to draw a sample of 406 respondents through simple random sampling technique and it used descriptive statistics in the data analysis. Questionnaire and interview were used to elicit information from primary source of data, while secondary data came from 12 organizations in addition to media report and literature review. The findings show that it will take automated IDPs and functional intermodal transport services to contribute significantly to recalibrate traditional logistics services between seaports and their hinterlands in Nigeria, and that shippers will be certain to receive better and reliable services because there will be effective planning and processes due to digitalization of operations. However, some of the challenges identified in this respect are the absence of regulatory framework for meaningful inland dry port development; the absence of political and operational will to automate IDP operations; absence of a unifying umbrella body for the numerous firms that provide hinterland transport services and the absence of incentive for cooperation among the operators who provide hinterland transport services. Therefore, the study recommends that government should provide platform to automate IDP operations and processes and provide incentives to encourage effective coordination of the numerous firms involved in providing hinterland transport services.

1. Introduction

Inland dry ports as extended gateways are being established in many parts of the world in response to land-side port capacity constraints (Brooks et al., 2014) and the inadequacy resulting from relying solely on trucking as the major means of moving freight to the hinterland from the seaports and back (Notteboom et al., 2020). From a more strategic perspective, IDPs offer opportunities to improve logistics services to shippers, grow the regional economy, and generate new employment sources (Roso and Lumsden, 2010). Therefore, IDPs are in position to cut down the costs associated with ineffective and inefficient logistics services arising from the absence of reliable port hinterland connectivity and functional inland terminals.

Inland dry ports (IDPs) have contributed to speed and agility in the supply chain in order to meet customers' demands in a timely, reliable and economically efficient manner. This has happened due to the deployment of intermodal freight transport. IDPs can play the equivalent role as seaports in the hinterland and in landlocked countries by facilitating the provision of efficient intermodal transport and logistics services. Moreover, IDPs can promote balanced spatial

development through the establishment of industrial bases in the hinterland (Cabrillos et al., 2016).

Traditional logistics services play crucial role in facilitating seamless and efficient transportation of goods between seaports and their hinterlands, thereby contributing to the economic development of the regions. However, in order for regional markets served by the seaports to feel their impact, inland dry ports are required to complement seaport services as well as efficient intermodal freight transport system. Thus, as a point of convergence, automated inland dry ports are capable of facilitating the recalibration of traditional logistics services in Nigeria by performing logistics services through the replication of some of the activities carried out at seaports, besides helping to integrate the different transport modes to achieve intermodal freight transport.

The distance between the seaport and the hinterland-based shippers' business premises, which can translate to huge costs, necessitates the establishment of inland dry ports to reduce overland transport and logistics costs. Thus, the development of IDP would result in direct connection between it and the seaports by rail, road or inland waterways transportation modes. This would make the IDPs to operate as logistics centres for the transshipment of sea cargo to inland destination.

Inasmuch as port hinterland connectivity will enhance the logistical functions of IDPs in receiving inbound cargoes and distributing outbound goods, when considered from the point of view of financial and environmental costs, their use as logistics centre would be beneficial in terms of cost-saving. However, the use of trucks for inland freight distribution cannot guarantee cost saving as much as rail freight transport. Thus, in terms of the negative impact on the environment, it is the low energy consumption per ton kilometre of train and the less carbon emissions by rail transport services that makes it to be preferred to trucks.

Furthermore, railway transport can offer significant cost efficiency for freight haulage over distances in excess of 300 km. While rail freight services lasted, rail transport of a twenty-equivalent unit in Nigeria was between N500,000 and N600,000 from the seaport to Kano, Kaduna and Abuja in the North and to Onitsha and Nnewi in Anambra State by trucks as against the current charge of between N900,000 and N1 million respectively.

Currently, for 40-foot equivalent unit transported from Lagos port to Kano, Kaduna and Abuja in the North and to Onitsha and Nnewi in Anambra State, the amount charged varies from N1.8m to N2.3 million by trucks, due to longer pickup times from the port to client's base (Anagor-Ewuzie, 2023). This necessitated the need for this study to examine IDPs and intermodal transport system as mechanisms to recalibrate traditional logistics services in Nigeria in the face of declining rail freight services and increased land freight charges using trucks.

Traditional logistics services were hitherto bogged down with unimodal transport with the result of transit delays and associated costs. At the initial stage of the development of inland freight distribution systems, trucking (unimodal transport) seemed to be sufficient, however, as a result of heightened level of commercial activity, diminishing returns in the form of congestion, energy consumption, carbon emission and empty movements tended to become strong incentives factored into consideration to set up inland terminals in regional freight planning (Rodrigue & Notteboom, 2012). Thus, with the advent of inland dry ports, intermodal freight distribution system has emerged to recalibrate traditional logistics services in Nigeria as well as globally.

Intermodal freight transport often proves to be a crucial solution for addressing the complex challenges associated with traditional logistics services in Nigeria. Efficient intermodal freight transport paves the way for rapid evacuation of inbound cargoes and speedy delivery of outbound cargoes to the seaports with the IDPs serving as freight distribution or logistics centres (see Figure 1).

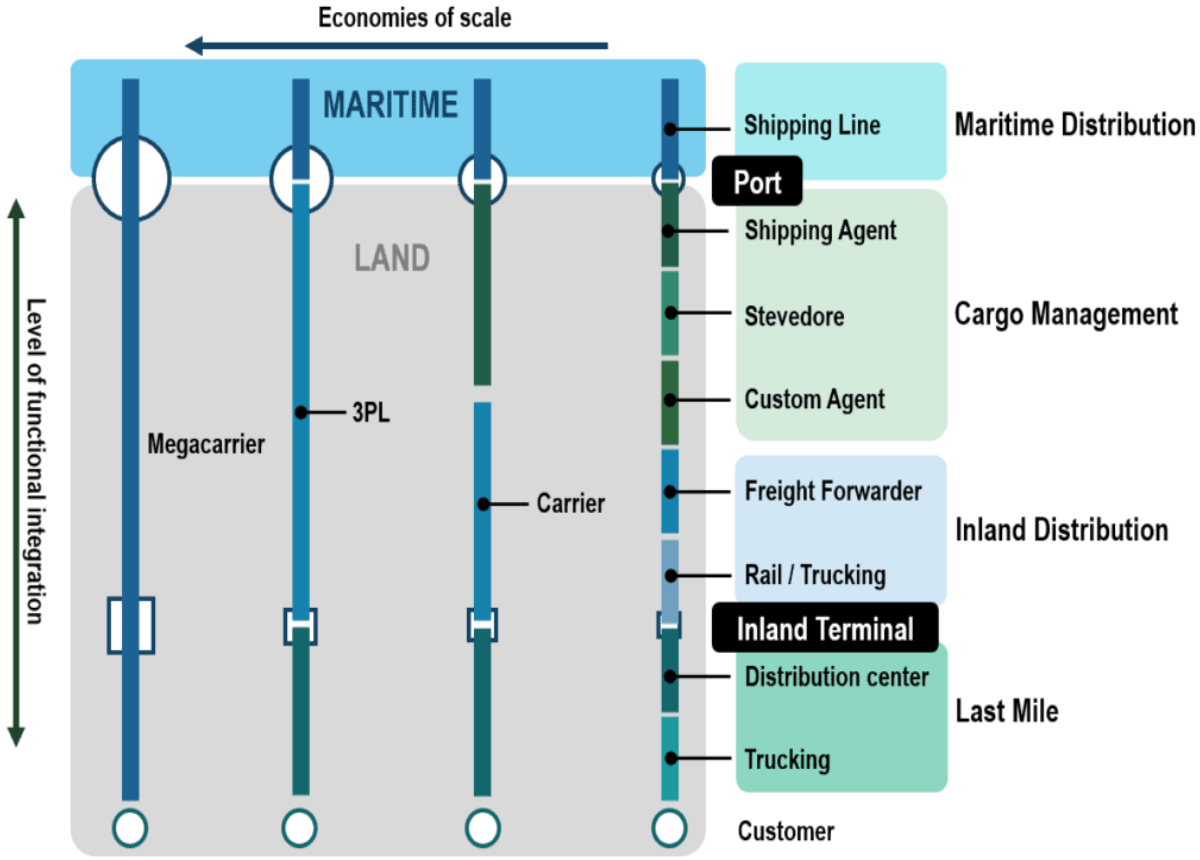


Figure 1: Functional Integration of Maritime Supply Chains
Source: Notteboom et al. (2022) Ports Economics, Management and Policy

1.1 Problem

Approximately 80% of international trade is channeled through seaports and it takes efficient logistics processes to evacuate cargo to hinterland destinations to avoid cargo congestion. Logistics processes at the seaports and at inland dry ports must be at par and in sync in terms of efficiency for the inflow and outflow of goods through intermodal transport to guarantee the satisfaction of port users. This is of utmost concern to policymakers, investors, port managers and port users. To recalibrate traditional logistics services between seaports and their hinterlands, inland dry ports were introduced in order to use rail as the alternative transport mode to replace road cargo with rail cargo to enhance port hinterland connections (Veenstra et al., 2012).

Traditional logistics services as applicable to the landside leg of the international transport chain has to do with the conventional and established processes involved in planning, coordinating, and executing the movement and storage of goods from one place to another. The improvement by way of recalibration of these processes will require automation of both seaports and inland

dry ports and the provision of efficient hinterland connections in the logistics process (Eto et al, 2023).

The emergence of inland dry ports (IDPs) is part of the strategy to promote the hinterland of maritime gateways and this calls for enhanced development of inland freight distribution systems. If automated, the establishment of IDPs will in turn lead to the recalibration of traditional logistics services between seaports and their hinterlands in Nigeria. At the outset of establishing inland freight distribution systems, trucking (being flexible means of transporting freight) seems to be a profound remedy to logistical challenges facing inbound and outbound goods from seaports and the hinterland respectively. However, sequel to the growing level of trade activities, diminishing returns in the form of traffic congestion, cargo poaching, insecurity, energy consumption, carbon emission and empty movement, trucking has proved to be inadequate, thereby making the development of IDPs and need for modal shift inevitable. This will facilitate speed and agility in the logistics process and the supply chain (Rodrigue & Notteboom, 2012).

Therefore, as a result of issues bordering on environmental matters (emission) and traffic congestion concerns, safety challenges of freight movement, security and efficiency concerns, and logistics cost implications, the need to recalibrate traditional logistics services between seaports and their hinterland in Nigeria has become compelling. To that effect, inland dry ports are introduced to address the aforementioned concerns, and this requires functional intermodal transport system.

Consequently, the establishment of IDPs is not merely for the sake of proximate convenience but is based mainly on consideration of overall transit costs of freight movement (Olah et al., 2018). This will be facilitated because IDPs are usually established along developed transport corridors and they make door-to-door logistics services possible.

Therefore, in order to examine how inland dry ports and inland transportation can facilitate the recalibration of traditional logistics services in Nigeria, the study was undertaken with the following objectives: (1) To identify need for recalibration of traditional logistics services between seaports and their hinterlands in Nigeria. (2) To determine what it takes to recalibrate traditional logistics services between seaports and their hinterlands in Nigeria? (3) The benefits of recalibrating traditional logistics services through the functions of IDPs and inland transport system in Nigeria. (4) The challenges of coordinating firms involved in providing hinterland transport services in Nigeria.

Considering that international trade is a significant driver of economic growth and logistics is the backbone of trade, the recalibration of traditional logistics services between seaports and their hinterland in Nigeria will contribute to enhancing the country's Logistics Performance Index ranking, which currently places Nigeria as 88th position out of 141 countries (Oritse, 2024).

2. Literature Review and Conceptual Framework

Accessibility Framework and Traditional Logistics

Accessibility in the context of availability, affordability and awareness of transportation infrastructure ensures the efficient flow of goods and services. Accessibility can be linked to improvements in transport infrastructure (Kiel et al. 2013). The various transportation modes are meant to grant access for freight to get to their destination. When transportation infrastructure is

improved, greater access is made possible and logistics processes are enhanced between the seaports and their hinterland. Challenges related to inland access are better addressed through the provision of functional transportation infrastructure and intermodal inland terminals (Eto et al., 2023).

IDPs as transportation infrastructure can improve access to the hinterland to alleviate the suffering of shippers, decongest the seaports and take shipping services closer to importers and exporters in the hinterland to facilitate trade (Eto, 2023). Therefore, to make IDPs to serve the intended purpose as inland intermodal terminals, port hinterland connectivity is essential to assure accessibility. This would enhance the performance of the logistics process between the seaport and the hinterland.

Traditional logistics refers to the process of planning, implementing and controlling the movement and storage of goods and services from point of origin to point of destination, which may be from the seaport to the final destination in the port's hinterland. This involves many players (See figure 1). Activities in traditional logistics include transportation, warehousing, inventory management, and order fulfillment (Quora, 2024).

The primary focus of traditional logistics is to optimize the physical flow of goods through the supply chain in order to ensure that products are delivered to customers in a timely and cost-effective manner. This involves coordinating with suppliers, carriers and distribution centres to streamline the movement of goods and minimize disruption in the supply chain.

Traditional Logistics generally depends on established practice and technologies to manage and track the flow of goods, such as using transportation management systems, warehouse management systems, and inventory tools. While traditional logistics has been effective in managing supply chains for many years, the advent of digital technologies and data analytics has led to e-logistics to facilitate the development of a more advanced and seamless interconnection of systems (Quora, 2024).

Traditional Logistics Services between Seaports and Hinterland

Typically, according to Rodrigue & Notteboom (2009), the traditional logistics services rendered between seaports and their hinterland include the following:

Transportation

This involves moving cargoes between the seaport and the hinterland with the use of transport vehicles such as trucks, trains, and barges. While trucks are used for short distances, trains and barges are used for longer distances.

Warehousing

Warehousing services at the seaports facilitate efficient transshipment and are essential for storing goods temporarily prior to being transported to the hinterland.

Customs Clearance

Customs clearance services are vital for processing import and export documentation, paying duties and taxes, and in compliance with regulations. Customs brokers and agents facilitate the clearance process for goods moving between the seaport and the hinterland.

Freight Forwarding

Freight forwarding companies coordinate the movement of goods from the seaport to the hinterland by managing transportation, documentation, and customs clearance. They often provide end-to-end logistics solutions for shippers.

Distribution and last-mile Delivery

Distributors and logistics providers play a crucial role in delivering goods from distribution centres or warehouses located in the hinterland to their final destinations, such as retail stores or customer's homes.

Supply Chain Management

Supply chain management services involve the planning, coordination, and optimization of the flow of goods, information, and finances between the seaport and the hinterland. This includes inventory management, demand forecasting, and supplier relationship management.

Value-Added Services

Some logistics providers offer value-added services such as packaging, labeling, kitting, assembly, and reverse logistics to satisfy the exact specification of customers in order to add value to the supply chain.

Information Technology

The use of information technology and logistics software solutions is essential for optimizing supply chain operations, tracking shipments in real-time, managing inventory, and improving overall efficiency.

Inland Dry Ports as Logistics Centres

Inland dry ports provide a number of functions which include logistics, transport, value adding service provision and administration functions in order to assist seaports and their clients (Jeevan et al., 2017). This is in addition to helping to reduce waiting times at seaports, provide clearance systems, reduce freight costs, facilitate cross border transactions and reduce empty container movements (Eto et al., 2023). When automated, the functions of IDPs will be enhanced if adequately linked with seaports through intermodal transport system. Thus, they will be able to recalibrate traditional logistics services and make room for e-logistics.
The demand for new standards of efficiency for maritime transport and inland freight distribution has created new challenges for the world's seaports (Eto et al, 2023). The efficiency of maritime transport system is tied to the functionality of inland freight distribution system, which depends on the optimization of established of multimodal and intermodal transport systems for the landside leg of the journey to inland dry port which are the logistics centres.

Consequently, this has influenced the dynamics of inland freight distribution systems and also brought about the introduction of logistics centres and affiliate services. These have all turned out to be critical factors that determine the nomination of particular ports as preferred destinations (Menegaki & Alexopoulous, 2017).

As logistics centres, inland dry ports (IDPs) are expected to offer opportunities to improve services to shippers by optimizing logistics capability, grow the regional economy, and generate new employment sources (Roso and Lumsden, 2010). IDPs are components of the logistics system and are considered to be logistics centres. They are part of seaports system, playing complementary role towards seaports by offering services such as storage and transshipment

between vehicles and traffic modes, distribution, assembly, consolidation, sorting and cross-docking (UNESCAP, 2015).

As a result of diminishing returns such as congestion, energy consumption and empty movements setting in from over reliance on trucking, the establishment of inland dry ports (as logistics centres) became the next best thing to do in regional freight planning (Notteboom et al., 2020). Accordingly, Roso et al. (2009) opine that a well applied inland dry port concept can help to recalibrate traditional logistics services by encouraging the shifting of freight volumes from road to more energy efficient traffic modes (such as rail freight transport) which are less harmful to the environment, relieve seaport cities from some congestion, make goods handling more efficient in seaports and facilitate improved logistics solutions for shippers in the port's hinterland.

Whether in receiving imports from the seaports or receiving exports from the interior for onward transportation to the seaports, inland dry ports have helped to recalibrate traditional logistics services in Nigeria to a large extent. Thus, Cullinane et al. (2012) assert that the successful implementation of the inland dry port concept has the combined effects of minimizing congestion, easing pressure on storage space and lessening handling costs of operations in ports. By so doing, as inland terminals, the introduction of inland dry ports has contributed to recalibrating traditional logistics services in terms of overall costs of inland freight distribution, agility and efficiency of the supply chain and as distribution points; they lighten the burden of shippers' efforts in conveying exports to and imports from the seaports (Eto, 2023).

The Essence of Inland Dry Ports

Inland dry ports are facilities that provide cargo handling and logistics services that are similar to those offered by seaports, however, they are without direct access to the sea. According to Rodrigue and Notteboom (2022), the following constitute the essence of inland dry ports, which make them suitable for recalibrating the traditional logistics services:

Extend seaport services

Inland dry ports bring port services nearer to shippers and consignees in the hinterland; this brings about reduction in transportation costs and it increases efficiency.

Relieve congestion

By providing additional capacity for cargo handling, inland dry ports can contribute to alleviating congestion at seaports and reduce transportation bottlenecks.

Facilitate trade

Inland dry ports can serve as centers for trade, which provide facilities for cargo consolidation, warehousing, and distribution.

Boost economic growth

By stimulating trade and commerce, inland dry ports can contribute to economic growth and development in the surrounding regions.

Improve connectivity

Inland dry ports can provide services as regional hubs for multimodal transportation, by connecting road, rail, and air network systems to facilitate the movement of goods.

Significance and Benefits of Inland Dry Ports in Logistics Services

The reduction in tariffs on goods traded among ASEAN members increased border trade and transit trade by an average of 7 per cent annually over the past five years thereby leading to significant increase in the movement of raw materials, goods and labour. This led to increase in the demand for logistics services to manage goods and services throughout the supply chain, and this spurred many countries in the ASEAN region to step up efforts to expand their existing inland dry port facilities or build new ones (UNESCAP, 2018). This trend agrees with the observation by Rodrigue and Notteboom (2012) who stated that inland dry port (IDP) development is receiving increasing attention due to the complication of modern freight distribution.

In Nigeria, the port concession carried out in 2006 ushered in an era of increased maritime trade with resultant in surge of the volume of cargo throughput. This called for the development of a more efficient inland freight distribution system and the establishment of inland dry ports in the hinterland of maritime gateways to recalibrate traditional logistics services in Nigeria (Eto, 2023).

The implementation of the IDP concept and the emphasis on port hinterland connectivity are aimed at recalibrating traditional logistics services between the seaport and the hinterland. This entails channeling freight volumes via inland intermodal transport system to hinterland corridors in order to utilize the economies of scale at the IDPs, increase the storage capacity in the port system and decrease the transit time through the seaport (Roso & Lumsden, 2009). The associated benefits identified are strong justification for the development of IDPs as mechanism for the recalibration of traditional logistics services.

i. Reduced transportation costs and times
ii. Increased efficiency and productivity
iii. Improved supply chain reliability
iv. Enhanced trade facilitation
v. Economic growth and development in the surrounding regions.

Port Hinterland Connectivity and Inland Freight Distribution System in Nigeria

The functionality of port hinterland connectivity is dependent on functional intermodal transport infrastructure. Since maritime transport now uses larger ships in order to cope with the demand for increased containerized transport and so as to fully take advantage of economies of scale (see figure 1), seaports face challenges as it relates to terminal capacity, fairway drafts, equipment to handle those vessels, and, especially challenges related to inland access (Haralambides, 2019). Despite huge investments in container terminal capacity and equipment, larger ships and tremendous influx of containers exert a serious strain on seaports. Hence progress in seaport, port hinterland connections and development of IDPs must therefore match this growth. Efficient logistics services (handling and distribution) involving the movement of cargo to and from the port's hinterland is vital to the overall performance of seaports and for the whole supply chain.

The concept of inland dry port is crucial considering the need for seaports to match the rapid increase in the inflow of containers. This has necessitated shifting intermodal terminals (IDPs) from the port areas further to the hinterland. This step helps to prevent traffic bottlenecks, by

establishing IDPs to receive cargo from the seaport with other types of cargo, and this would help to fast track the development of the hinterland areas (Jaržemskis and Vasiliauskas, 2007 cited in Olah et al., 2018).

At the inception, when inland dry ports were just being introduced, they were commonly developed from the landside towards the sea; a requirement which became necessary as a result of a country being landlocked or if they are faced with the challenge of poor maritime access (Wilmsmeier et al., 2011 cited in Olah et al., 2018). The inland dry port concept is demonstrated when a seaport is directly connected by rail to inland intermodal terminals (also referred to as inland dry port**s**) and shippers are able to leave and/or collect their standardized units as if directly at the seaport (Roso, Woxenius and Lumsden, 2009 cited in Roso & Lumsden, 2009).

Figure 1 shows the inland terminal (Inland dry port) as the last mile, having passed through the supply chain corridor via the seaport.

Inland Freight Transportation and the Functionality of Inland Dry Ports in Nigeria

Port hinterland connections are vital life-line for the functionality of the inland dry ports, which are the last mile for the goods destined for the hinterland. The movement of exports from the IDPs (as logistics centres) to the seaports and as points of convergence for imports requires multimodal and intermodal transport systems in the overall inland freight movement. Multimodal transport services use two or more transport methods to convey goods to their final destination. The management of cargo is entrusted to multiple operators (Eto et al., 2022).

Intermodal transport refers to a method of transporting goods in the same load unit (containers, swap bodies, or semi-trailers) using two or more transport methods, without any need for direct handling of the goods in the course of the shipment. An example is when a container (or other load unit) is transferred from one mode to another (ships, trucks, trains, planes) without removing and placing the contents in a different load unit. This method of transport provides a seamless, integrated, and flexible solution which is ideal for companies who want to improve the efficiency of their supply chain (Del Bene, n.d.).

Intermodal transportation is designed to simplify the movement of goods, and eliminate handling while in transit. In this mode, the pick-up and delivery of the goods is handled by truck, with the majority of the transportation between the two points handled by railway or truck or by sea, even though barging services have started.
The advantages of intermodal transport as identified by Del Bene (n.d.) and European Commission (2000) are enough to encourage shipping companies to issue through bill of laden in order to take advantage of intermodal transport as identified below:

- Efficiency: the adoption of intermodality eliminates any extra handling of the cargo, offers the use of different modes of transport, reduces downtime, and maximizes efficiency.
- Economies of scale: when shipping significant volumes, intermodality reduces the transport cost per single load unit and, consequently, the cost per ton transported;
- Safety: maintaining the cargo in the same load unit throughout transport minimizes the risks of theft and damage to the goods.
- Sustainability: intermodality represents one of the most effective solutions for sustainable logistics, as it reduces the impact on the environment through better management of resources.
- Energy efficiency: Reduced energy consumption,
- Optimization of the usage of the main strength of different modes,

- Reduction of congestion on road networks, and
- Low environmental impacts are considered as the advantages of intermodal (road-rail) transport.

The role of inland dry ports in integrating modes of transport is indisputable; however, in order for the intermodal transport system to serve the purpose, the various transport modes must be functional. Inasmuch as intermodalism and multimodalism offer lots of advantages for the movement of inland freight, the functionality and efficiency of the various modes of transport are crucial to the implementation of the IDPs as mechanisms for recalibrating traditional logistics services in Nigeria. This brings to the fore the challenges confronting the various modes of transportation in inland freight distribution in Nigeria.

Aside from the absence of functional and efficient inland transportation system, which affect the implementation of IDP (as mechanism for recalibrating traditional logistics services), the functionality of IDPs in Nigeria has been stalled by the failure of shipping companies to issue through bill of lading for cargoes meant for specific IDP as the final destination of imports (Eto, 2023). Moreover, port hinterland connections that should enable land freight to be transshipped between seaports and inland destinations are not efficient. This is attributable to the enormous challenges facing road, barging and rail freight services.

Challenges of Rail Freight Services in Nigeria

The non-availability of rail freight services to adequately meet the needs of IDPs in Nigeria is a huge challenge, and this is due to the following:

1. Inadequate rail network to reach the IDPs
2. Over aged and inadequate locomotives and rolling stock (locomotives, coaches, wagons)
3. Frequent breakdown and derailments

Thus, this detracts from inland dry ports' capacity to recalibrate traditional logistics services in Nigeria. This is with the result that there would be loss of revenue to the IDPs due to lack of patronage. According to the Chairman of the Kaduna Inland Container Terminal, shipping companies fail to issue through bill of lading for cargoes destined for inland dry ports under the guise that hinterland transport companies refuse to offer concrete amount as to the charges for transporting cargoes from the seaport to the IDPs. Consequently, this makes it difficult for shipping companies to charge importers for the second and final leg of the landward journey (The Journal of Freight & Energy, 2019).

The Challenges faced by Road Freight Transport in Nigeria

The over reliance on road transportation makes it to accounts for 95% of all freight and passenger movement in Nigeria (Fashola, 2021). To that effect, Olawale (2017) has identified the following as the challenges confronting road transportation in Nigeria: (1) poor road infrastructure (2) poorly maintained roads (3) Road congestion due to rapid urbanization and over population (4) Frequent Road crashes (5) Over reliance on road transport system due to the neglect of the rail mode (6) Road encroachment (Joseph, 2018).

The Challenges of Barge Operations in Nigeria

Since the introduction of inland barge services in Nigeria, there have been significant changes in port operations and service delivery along with the lessening of traffic burden on roads. However, some of the challenges being experienced by barge operations in the waterways, which do not augur well for the implementation of IDPs in Nigeria, include:

1. The presence of wrecks that endanger navigation,

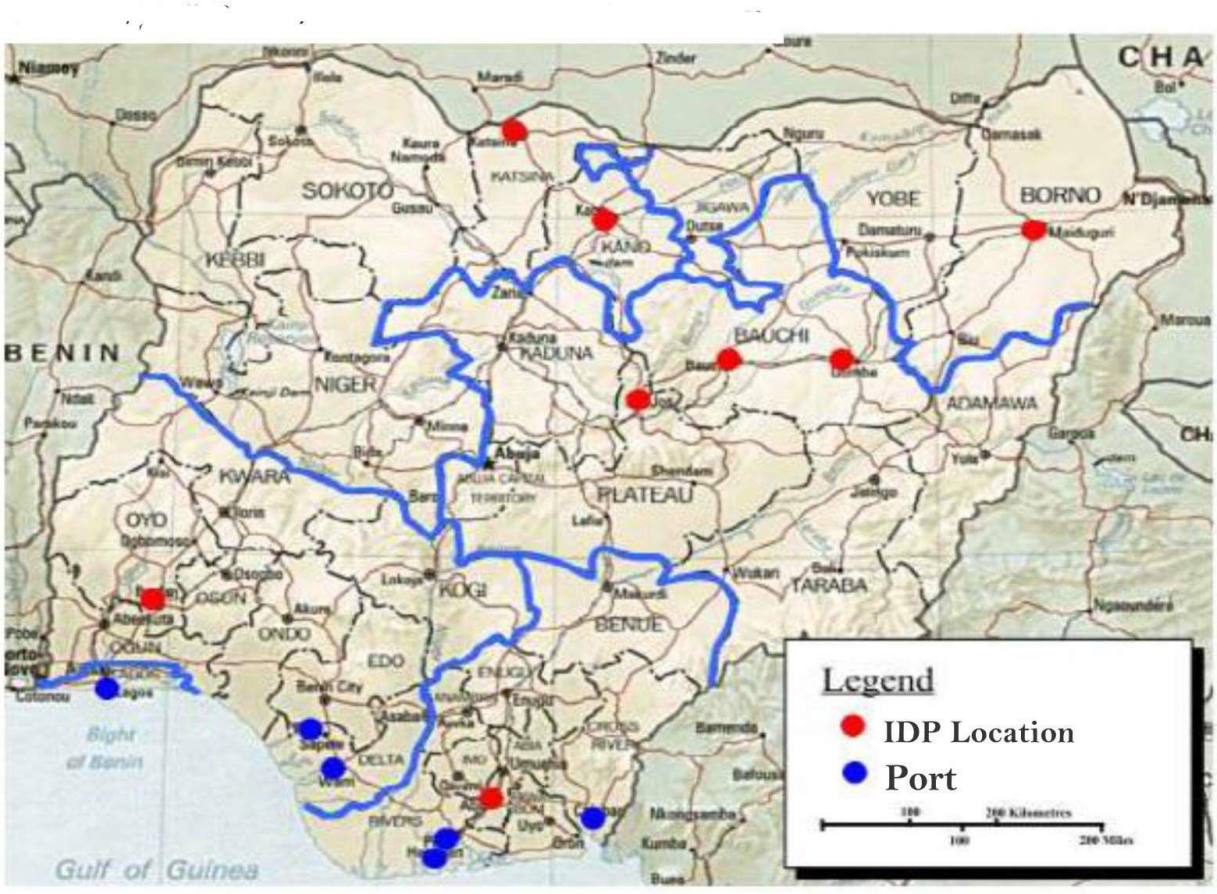
2. Inadequate infrastructural facilities and
3. Shortage of qualified human capacity and
4. The high cost of operations
5. Insecurity in the waterways hinders cargo movement (Nigerian Ports Today, 2022).

Inland Dry Ports in Nigeria

The introduction of inland dry ports becomes essential due lack of sufficient storage space in seaports. Unless such situation is promptly tackled, it could cause port customers to switch to competing ports. The emergence of inland dry ports can be considered as part of efforts to develop facilities and services for efficient inland distribution of freight in an attempt to bring the seaport services to the hinterland (Eto et al., 2022).

According to Shippers' Council (2021), seven locations were approved by the Federal Executive Council in Nigeria for the execution of IDPs in the country as shown in the map (Figure 2), and they are:

1. IsialaNgwa, Aba
2. Erunmu, Ibadan
3. Heipang, Jos
4. Zawachiki, Kano
5. Zamfarawa, Funtua
6. Jauri, Maiduguri
7. Kaduna



(Source: Nigerian Shippers' Council)

Figure 2: Map showing IDP locations in Nigeria

The enormous volumes of imported cargoes that flooded Lagos ports led to the proposed establishment of the seven IDPs in Nigeria. A good number of the proposed IDPs are at various stages of implementation, while the Federal Government is looking out for private investors to join forces for the take-off of the IDP projects, based on Design, Build, Finance, Operate, Maintain and Transfer model of the Public-Private Partnership arrangement (Shippers' Council, 2020).

Even though three IDPs in Nigeria (located in Kaduna, Funtua and Kano) have been commissioned and declared as ports of final destination for imports and ports of exit for exports by the Federal Government, only the Kaduna IDP operational. Yet the supply of imported cargoes from seaports has been in trickles due to non-linkage of rail transport between the former and the latter.

In the view of Adejumo (2020), the other factors that accounted for the introduction of IDPs in Nigeria included:

• Ship delay and prolonged ship turnaround time,

• Delay in cargo discharge and delivery operations at Lagos ports,

• Safety and security challenges imposed on seaports,

• Increasing cost in port operations in Nigeria,

• Decline in expected revenue at the seaports, and

• Cargo diversion to neighboring countries.

Furthermore, according to Adejumo (2020), due to seaports' location in the southern part of the country, which is rather far from the operational base of shippers in the hinterland, clearing goods was extremely difficult. This forms part of the basis for establishing the IDPs in Nigeria, and by so doing; the following objectives were aimed at:

- Creation of employment opportunities and other related socio-economic services in the IDP location.
- The IDP could also be used as a strategy for regional development and population redistribution.
- Redevelopment of the road and rail transport systems in the country.
- Boosting of export activities.

Some of the challenges facing the IDPs in Nigeria, as identified by Eto et al. (2022) include:

1. The political will to implement and operate inland dry ports in Nigeria is lacking judging from the poor/dysfunctional inland transport system.
2. The stoppage of rail freight transport services is affecting the volume of cargo that the IDPs receive.
3. The Federal Government is not doing enough to encourage private partnership in inland dry port development even though there is growing presence of private initiative in ports in other countries.
4. Shipping companies are yet to fully recognize the need to issue through bill of lading, both for import and export coming to and going from the IDPs as ports of destination and origin respectively.
5. The challenges facing seaports have bandwagon effects on the inland dry ports in that whenever the former has glitches with timely evacuation of sea freight, the latter experiences idle time.

6. There are no functional scanners at the Kaduna and Kano Inland dry ports.
7. In most cases, the trucks moving containers from the seaports to the inland dry ports are not road worthy, and as such they break down frequently on the highway thereby causing delay in delivery of consignments.
8. There is inadequate lighting at the Inland dry ports, and this encourages acts of criminality.

3. METHODOLOGY

Population for the Study

The population for this study was made up of organizations which were considered to be the major stakeholders in inland dry ports in Nigeria. The study focused on Kaduna and Dala Inland Dry Ports, Kano because the other five inland dry ports are non-functional and such were not involved since no data could be generated from them.

For the purpose of the study, a total of 5910 potential respondents were considered. This number was considered to be adequate and a reasonable representation of the population considered relevant to the study.

Sample and Sampling Techniques

In determining the sample size for this research, the Taro Yamane's formula given as *(equ 1)* will be used:

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

Where:

n = sample size

N = population size (5,910)

e = level of significance (our level of significance is chosen at 5%)

Applying the formula at significant level of 5%;

$$\frac{5910}{1 + 5910\ (0.05)^2}$$

$$\frac{5910}{1+14.775}$$

$$\frac{5910}{1+ 15}$$

$$\frac{5910}{16}$$

$$= 369$$

Therefore, the sample size = 369, which is approximated to be 369. However, 37 (i.e.10%) is added to accommodate non-response and this brings the sample size to 406.

For this study the simple random sampling technique was adopted to cover very large proportion of the population. To select the sample, the researcher considered all the stakeholders as compulsory sample strata. The researcher therefore used proportion to size technique in the selection of sample. This involved the final selection of the research sample from the study population. To determine the actual sample size, Taro Yamane statistical test was used and the selection of the proportion of sample from each stakeholder was determined based on the sample size.

Table 1: 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 & Exporters)	540	37
14	Terminal Operators	25	2
	Total	5910	406

Source: Researcher's Field work, 2025

The table above shows the total sample size of 406 respondents considered for the survey, which was drawn from the population frame of stakeholders involved in operations of IDPs. This was the sample size that agreed to participate in the survey, both for the completion of the research questionnaire and the granting of oral interviews to provide additional data to validate survey responses. The research sample was drawn from the study population, which represents those that actually responded to the requests made, including their respective contact addresses and phone numbers to reach them, in case there was need for clarifications. A sample of 406 respondents was earmarked to provide the information through the copies of the questionnaires distributed.

Table 2: Computed sample size proportional allocation to each actor used

S/N	Actors	Number of Staff	Suitable sample size /Target Respondents
1.	Nigerian Shippers' Council	400	400 x 406 = 27 5910
2.	Nigerian Ports Authority	550	550 x 406 = 38 5910
3	Nigerian Railway Corporation	650	650 x 406 = 45 5910
4.	Kaduna Inland Dry Port Limited	125	125 x 406 = 9 5910
5	NDLEA	450	450 x 406 = 31 5910
6	Dala Inland Dry Port, Kano	300	300 x 406 = 21 5910
7	NAGAFF	480	480 x 406 = 33 5910
8	NCS	480	480 x 406 = 33 5910
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 & Exporters)	540	540 x 406 = 37 5910
14	Terminal Operators	25	25 x 406 = 2 5910
	Total	5,910	**406**

Source: Researcher's *Field work, 2025*

The table above shows the computed sample size proportional allocation to each set of respondents used.

Method of Data Collection/Instrumentation

Data collection involves obtaining and measuring information concerning the phenomenon of concern in an established systematic fashion that enables the researcher to analyze and answer stated objectives and evaluate outcomes of the research. To achieve this, the data based on each objective was analyzed using descriptive statistics and simple percentage.

To generate primary data, the researcher developed instrument known as Recalibration Mechanism Questionnaire (RMQ) alongside interview conducted. The secondary sources of other data were mostly from the National Bureau of Statistics and other relevant organizations. The RMQ was 12-item questionnaire (8 closed ended and 4 open ended questions) based on the study of the variables of interest in the study.

Method of Data Analysis

1. Objective I: To evaluate the need for recalibration of traditional logistics services between seaports and their hinterlands in Nigeria.

- Data Collection: Data for this objective was collected from both primary and secondary sources from National Bureau of Statistics, NPA, Nigerian Shippers' Council, plus 12 other organizations.
- Data Analysis: Simple percentage.

2. Objective II: To determine what it takes to recalibrate traditional logistics services between seaports and their hinterlands in Nigeria.
   - Data Collection*:* Data for this objective was collected from both primary and secondary sources such as NPA, Nigerian Shippers' Council, plus 12 other organizations.
   - Data Analysis: Simple percentage
3. Objective III: To evaluate the benefits of recalibrating traditional logistics services through the functions of IDPs and inland transport system in Nigeria.
   - Data Collection: Data for this objective was collected from primary and secondary sources such as NPA, Nigerian Shippers' Council, plus 12 other organizations
   - Data Analysis: Simple percentage
4. Objective IV: To examine the challenges of coordinating firms involved in providing hinterland transport services in Nigeria.
   - Data: Data for this objective was the primary data.
   - Data Collection: Data for this objective was collected from primary sources with the use of open-ended questionnaire.

Descriptive statistics was adopted in the analysis of the data generated.

5. RESULTS AND DISCUSSION

Table 3: Copies of Questionnaire Administered

Source: Researcher's Field work, 2025

Number of Copies distributed	Number of Copies of Questionnaire	% of Copies of Questionnaire Retrieved
406	**398**	**98.03**

The total number of copies of the questionnaire distributed and number retrieved is presented in the table above. The table shows the distribution of questionnaire to the sample selected towards the examination of IDPs and intermodal transport services as mechanisms for recalibrating traditional logistics services between seaports and their hinterland in Nigeria and the 398 copies retrieved were used to determine the findings and analysis of the study.

Table 4: 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: Researcher's Field Survey, 2025

Table 5: Socio-Economic Significance of IDPs and intermodal transport services in Nigeria

S/N	Question Items	SA	%	A	%	D	%	SD	%	Total	%
1.	IDPs and functional intermodal transport services can contribute significantly to recalibrate traditional logistics services between seaports and their hinterlands in Nigeria	294	73.9	78	19.6	26	6.5	-	-	398	100
2.	IDPs and functional intermodal transport services can provide platform for the coordination of hinterland logistics service providers	249	62.6	108	27.1	21	5.3	20	5.0	398	100
3.	IDPs and functional intermodal transport services will enhance the efficiency of seaports through speedy delivery and evacuation of cargoes at seaports in Nigeria.	224	56.3	109	27.4	39	9.8	26	6.5	398	100
4.	IDPs and functional intermodal transport services will make freight handling more efficient.	298	74.9	93	23.4	-	-	7	1.7	398	100

Source: Researcher's Field Survey, 2025

Table 5 above shows the responses of the respondents to questions on how significantly IDPs and intermodal transport services can contribute to recalibrate traditional logistics services

between seaports and their hinterlands in Nigeria. It shows that 73.9% of the total respondents strongly agreed that IDPs and intermodal transport services contribute significantly to recalibrate traditional logistics services between seaports and their hinterlands in Nigeria, 19.6% agreed and 6.5% disagreed whereas none strongly disagreed. This indicates that IDPs and intermodal transport services can contribute significantly to recalibrate traditional logistics services between seaports and their hinterlands in Nigeria.

The table shows that 62.6% strongly agreed that IDPs and intermodal transport services can provide platform for the coordination of hinterland logistics service providers; 27.1% agreed, while 5.3% and 5.0% disagreed and strongly disagreed respectively. This indicates that IDPs and intermodal transport services can provide platform for the coordination of hinterland logistics service providers.

56.3% strongly agreed that IDPs and intermodal transport services will enhance the efficiency of seaports through speedy delivery and evacuation of cargoes at seaports in Nigeria, 27.4% agreed, and 9.8% disagreed whereas 6.5% strongly disagreed. This indicates that IDPs and intermodal transport services will enhance the efficiency of seaports through speedy delivery and evacuation of cargoes at seaports in Nigeria.

The table shows that 74.9% strongly agreed that IDPs and intermodal transport services will make freight handling more efficient. 23.4% agreed, none disagreed whereas 1.7% strongly disagreed. This indicates that IDPs and intermodal transport services will make freight handling more efficient.

Table 6: Logistical Potential Impact of IDPs and Intermodal Transport Services in Nigeria

S/N	Question Items	SA	%	A	%	D	%	SD	%	Total	%
1.	IDPs and functional intermodal transport services will have logistical beneficial effects for seaports and their hinterlands in Nigeria	284	71.4	94	23.6	9	2.3	11	2.7	398	100
2.	IDPs and functional intermodal transport services can contribute to the reduction of transport costs as well as transit time between the seaports and the hinterlands.	296	74.4	82	20.6	7	1.7	13	3.3	398	100
3.	IDPs and functional intermodal transport services will attract investment to the hinterland in Nigeria.	224	56.3	76	19.1	58	14.5	40	10.1	398	100
4.	IDPs and functional intermodal transport services will facilitate logistics solutions for shippers in ports' hinterland.	214	53.8	106	26.7	42	10.5	36	9.0	398	100

Source: Researcher's Field Survey, 2025

Table 6 above shows the responses of the respondents to questions related to the logistical potential impact of IDPs and intermodal transport services in Nigeria. It shows that 71.4% of the total respondents strongly agreed that IDPs and intermodal transport services will have logistical beneficial effect for seaports and their hinterlands in Nigeria, 23.6% agreed and 2.3% disagreed whereas 2.7% strongly disagreed. This indicates that IDPs and intermodal transport services will have logistical beneficial effects for seaports and their hinterlands in Nigeria.

The table shows that 74.4% strongly agreed that IDPs and intermodal transport services can contribute to the reduction of transport costs as well as transit time between the seaports and the hinterlands. 20.6% agreed, 1.7% disagreed whereas 3.3% strongly disagreed. This indicates that IDPs and intermodal transport services can contribute to the reduction of transport costs as well as transit time between the seaports and the hinterlands.

The table shows that 56.3% strongly agreed that IDPs and intermodal transport services will attract investment to the hinterland in Nigeria. 19.1% agreed, 14.5% disagreed whereas 10.1% strongly disagreed. This indicates that that IDPs and intermodal transport services will attract investment to the hinterland in Nigeria.

53.8% of the respondents strongly agreed that IDPs and intermodal transport services will facilitate logistics solutions for shippers in ports' hinterland. 26.7% agreed, 10.5% disagreed whereas 9.0% strongly disagreed. This indicates that IDPs and intermodal transport services will attract investment to the hinterland in Nigeria.

Objective (1) To identify need for recalibration of traditional logistics services between seaports and their hinterlands in Nigeria.

In an interview, respondents identified the following as the firms that are involved in hinterland transport chain: shipping lines, terminal operating companies, freight forwarding companies, inland terminal operators and port authorities. 100% of the respondents identified the following reasons as the need to recalibrate traditional logistics services between seaports and their hinterlands in Nigeria: For effective coordination of the numerous firms involved in providing hinterland transport services and in order for port services to fit into door-to-door supply chains, terminal operating companies and port authorities are playing active role.

Objective (2) To determine what it takes to recalibrate traditional logistics services between seaports and their hinterlands in Nigeria?

Majority (97%) of the respondents observed that IDPs function as facilitators along supply chain corridors and that to achieve effective recalibration of traditional logistics services between the seaports and their hinterland, the efficiency of intermodal transport services and automated/digitalized IDPs is crucial. They were of the view that this would enhance the competitive position of seaports and the IDPs.

Objective (3) The benefits of recalibrating traditional logistics services through the functions of IDPs and inland transport system in Nigeria

100% of the respondents agreed that there are numerous benefits for recalibrating traditional logistics services provided the functions of IDPs are automated and efficient intermodal transport system in put in place. They identified some of the benefits to include: better and effective planning by shippers who are certain to receive reliable services; it will assure economies of scale; logistics and transport facilities will be optimally deplored; hinterland access for land freight will be unhindered and without delays; port hinterland connectivity will be put to utmost use with the guarantee of efficient supply chain management; it will shift freight volumes from road to more energy efficient transport modes like rail and barges on inland waterways; it will relieve seaport cities from traffic congestion; goods handling will be more efficient; it will bring about improved logistics solutions for shippers in the port's hinterland and it will relieve seaports from cargo congestion.

Objective (4) The challenges of coordinating firms involved in providing hinterland transport services in Nigeria

The challenges identified by respondents are similar to those identified by De Langen (2007). These include: absence of regulatory framework for inland dry port development; the absence of political and operational will to automate IDP operations; free riding problem in which hikers want to transport their luggage for free; there is absence of a unifying umbrella body for the numerous firms that provide hinterland transport services; there is no incentive for cooperation among the operators providing hinterland transport services.

6. Conclusion

Strategically, IDPs offer opportunities to improve logistics services to shippers and as a point of convergence for different transport modes; thus, the ability to facilitate modal shift makes the establishment of IDPs a welcome development towards recalibrating traditional logistics services between seaports and their hinterland. The advent of digital technologies and data analytics in port processes will lead to more advanced and interconnected systems in supply chain management practices. When such is replicated at the IDPs, it will recalibrate traditional logistics services between the seaports and their hinterland.

Thus, when inland dry ports are automated, they will provide credible alternative solution to solving space shortage occasioned by cargo congestion at the seaport and provide other seaport services as logistics centres. The establishment of inland dry ports as intermodal freight terminals in the hinterland aids the replication of seaport activities by bringing the seaport closer to shippers based in the hinterland. However, hinterland connections are needed to help in the movement of export and import between the seaports and the inland dry ports. Therefore, for inland dry ports to help in recalibrating traditional logistics services, the hinterland connections (road, rail, inland waterways and pipeline networks), which are the veins of the seaports have to be developed and maintained to achieve a smooth flow of incoming and outgoing goods (Bernard, 1995). Government should provide regulatory framework for inland dry port development in Nigeria, encourage the automation of IDP operations and processes and provide incentives to encourage effective coordination of the numerous firms involved in providing hinterland transport services

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