AFRICAN JOURNAL OF ORGANIZATIONAL PERSPECTIVES AND ECONOMY
VOL. 9 NO. 1 JUNE 2025

ANALYSIS OF THE PERCEIVED OPERATIONAL AND ENVIRONMENTAL SUSTAINABILITY COMPONENTS OF THE LEKKI DEEP SEAPORT

OGUNDIPE OLUWASEUN DAVID
Department of Transport Management
Redeemer's University Ede, Nigeria
ogundiped@run.edu.ng

Article history:
Received: 02 July 2025;
Received in revised form: 03 July 2025;
Accepted: 05 July 2025;

Keywords:
Global Competitiveness Index, Country: Port Level Liner Shipping Connectivity Index: Logistics Performance Index: Lekki Deep Sea Port: Sustainable Development Goal: Integrated Port Management System.

Abstract

The relevance of an efficient port system is a critical determinant of a country's achievement of the Global Competitiveness Index (GCI), Country and Port Level Liner Shipping Connectivity Index (CPLLSCI), and the Logistics Performance Index (LPI). This research provides an empirical assessment of the newly opened Lekki Deep Sea Port (LDSP), a facility constructed under a Build-Own-Operate-Transfer (BOOT) structure between a Chinese consortium of investors, the Nigeria Port Authority (NPA), and the government. The study examined the perceptions of 192 randomly sampled freight forwarders on how the established independent factors of quality of facilities, cost of operations, and the attention paid to the achievement of Sustainable Development Goal 14 (life below water) predicted their preference for the LDSP. A hierarchical linear regression model was applied to test the derived hypothesis. The results indicate that all the identified independent factors significantly predicted the respondents' preference for the choice of LDSP. This research underscores the import of a collaborative arrangement between the public and private sectors in the funding, and management of transport projects requiring a huge financial investment. Finally, the study advocates the development of an Integrated Port Management System (IPMS) that will ride on the back of the deployment of automated operation, and Intermodal Transport System (ITS), this will achieve the purpose of having consistent positive indicators such as turnaround time, berth productivity, container dwell time, vessel productivity, port connectivity, safety and security, environmental performance, and resilience a norm rather an exception.

Introduction

The 2022 data from the United Nations Conference on Trade and Development showed that African countries generally had low ratings in all the standardized metrics that measure port

efficiency and effectiveness (UNCTAD, 2022). The painful reality is that countries in the Sub-Saharan Africa (SSA) region have been performing badly in the three globally acclaimed criteria used in the assessment of ports over the years. Available statistics indicated that none of the countries in the region ranked among the top fifty countries in the Global Competitiveness Index (GCI), Country and Port Level Liner Shipping Connectivity Index (CPLLSCI), and the Logistics Performance Index (LPI) in the last ten years (Arvis et al, 2019:UNCTAD, 2022). These aforementioned metrics are the amalgam of critical indicators such as turnaround time, berth productivity, container dwell time, vessel productivity, port connectivity, safety and security, environmental performance, and resilience.

Indubitably, Nigeria is one of the topmost maritime destinations in the SSA. Until 2022 the country has six seaports where the importation of cargoes were done, these are the ports in Apapa, Tin-Can Island (both in Lagos state) Port Harcourt, Onne, (both in River State) Calabar, (in Cross Rivers), and Delta (in Delta State). However, it was only the two ports in Lagos that were used for both importation and exportation activities (Salisu and Raji, 2017: Nigeria Bureau of Statistics, 2018: Okon, 2019). The Apapa port complex that hitherto handled seventy-five percent of the country's maritime activities was completed by the British colonial government in 1913, over the years it has witnessed various infrastructural, operational, and governance interventions all in a bid to reverse its underwhelming performance indicators. (Salisu and Raji, 2017). By the turn of the century, it has become apparent to stakeholders that the construction and operation of a new deep seaport in Lagos, and by extension in Nigeria was inevitable. Astronomical growth in the country's population size, the attendant surge in the volume of maritime traffic, and the bureaucratic bottlenecks created by government agencies made the country's ratings in the GCI, CPLISCI, and LPI to be among the worst in the world (Salisu and Raji, 2017:Okeke, 2022).

This informed the design and the construction of the new Lekki Seaport by a group of public and private investors under a Build-Own-Operate-Transfer (BOOT) arrangement. The first phase of the project was completed in 2022, and full operation commenced at the beginning of 2023. This exploratory study filled a gap in the discourse surrounding port efficiency by providing an empirical assessment of the port efficiency and the attention given to the attainment of Sustainable Development Goal 14 (life below water), in the construction and daily management of the facility. SDG 14 is designed to sustainably manage and protect marine and coastal ecosystems from pollution, as well as address the impacts of ocean acidification (United Nations Development Programme, 2023). While there has been a rousing reception by Africans generally to Beijing's Belt and Road Initiative (a Chinese government's vast transcontinental development project looking to improve connectivity among nations in Asia, Europe, and Africa), there are concerns by stakeholders about the nature of the 'environmental footprints' these projects are leaving behind (Bosshard, 2008: Gordon, 2012: Gititu and Kyalo, 2020).

There has been no shortage of research that examined the efficiency, effectiveness, and resilience of Nigerian ports in recent times (Ugboma et al, 2008: Salisu

and Raji, 2017: Osondu-Okoko et al, 2022: Okere 2022: Ajayi et al, 2023), however, these studies were focused on the already extant ports. Also, there has been a paucity of research that examined the environmental footprints of some of the mega transportation projects financed under the Beijing BRI in the country. This research, therefore, provides a veritable insight into how maritime stakeholders in the newly commissioned Lekki port assessed its performance and environmental sustainability.

The rest of this paper is structured thus: the next section is dedicated to the review of relevant texts, conceptual and literature reviews. The third section provides the research methodology, the fourth the results, the fifth the discussion, and the last two sections are dedicated to the conclusion and areas of future research.

Literature Review

Port Performance Evaluation Techniques and Their Unique Characteristics

Analysts overtime has concluded that while there might be different measurement methodologies to assess the performances of seaports, all methodologies must have two key ingredients, and these are the objective evaluation of a port's economic efficiency and the productivity or throughput of the entire maritime sector (Brooks and Pallis, 2008: Gonzalez and Trujillo, 2012: Merk, and Dang 2012: Arvis et al, 2019: Noteboom et al, 2022).

To achieve the desired goal of optimal efficiency, the periodic measurement of the performances of ports is strongly canvassed by experts. Outcomes garnered from the objective assessment of port performances are critical tools that the port management team utilizes in making the required operational, tactical, strategic, structural, and developmental changes key to the achievement of persistently improved deliveries (UNCTAD, 2016: Saragiotis and de Langen, 2017: Ferarri et al, 2017). Due to the sensitive role that the maritime sector play in the economic development of the country, interest in the assessment of the ports is of great concern to the governing authorities, and local and international maritime operators. Empirical findings have established a strong correlation between the efficiency of ports and the consequential impact on the supply chain performance of the adjoining industries serviced by the ports (Cheng, 1993: UNCTAD, 2016). Two of the popular measurement methodologies that analysts utilize are Data Envelope Analysis (DEA) and Multi-Criteria Decision Analysis (MCDA).

Although the DEA has been used to measure efficiency in various industries before being applied to the maritime sector, its introduction into the assessment of port performance was done in an exploratory study by Valentien and Gray (2001). DEA is a robust quantitative technique that provides an extensive platform to evaluate port performance objectively. DEA utilizes secondarily sourced data to evaluate critical indicators such as berth occupancy, revenue per ton of cargo, capital equipment expenditure per ton of cargo, turnaround time, quay crane efficiency, and the number of gangs employed to facilitate cargo operations (Valentine and Gray, 2001: Hasan and Hanaa, 2016: Dewarlo, 2019: Krmac and Mozghan, 2022) requires port outputs and inputs to be accurately specified. Unlike the normal unidirectional technique of determining efficiency, DEA is designed to receive multiple inputs and generate outputs that reflect the quantity of the inputs. DEA is

however not without some critical shortcomings. First, the design of the technique is a bit rigid, it makes room mainly for the utilization of secondary data (Valentine and Gray, 2001: Hasan and Hanaa, 2016: Dewarlo, 2019). Similarly, in applying DEA models, the determination of port inefficiency factors through the perspectives of various stakeholders has not yet been studied (Kmarc and Mozghan). Lastly, the DEA application as a port assessment tool has always been deployed to provide a comparative analysis among regional ports (Valentine and Gray, 2001: Hasan and Hanaa, 2016: Dewarlo, 2019: Krmac and Mozghan, 2022).

As stated above another port measurement methodology is the MCDA. The approach is designed to evaluate port performance based on the choice made by users of the ports (Razeal et al, 2018). MCDA operationalizes the context of port choice, by presenting a "weighted approach using the Best-Worst Method (BWM). An empirical model is built based on an extensive port stakeholder survey" (Razeal et al, 2018).

The MCDA's ability to involve stakeholders in its assessment of port performance makes it an ideal tool where secondary data may not be readily available. The calibration of respondents' assessment of the port performance under a weighted approach or BWM is also an objective evaluation of the subject by using the survey method to arrive at an impartial estimation of ports performances' using selected indicators (Razeal, 2015: 2016: Wiegmans, and Dekker, 2016). The MCDA arguably is an improved version of the Analytical Hierarchical Process (AHP). The AHP which is an older multi-criteria theory of measurement has earlier been used to provide an assessment of the Nigeria port system in an exploratory study by Ugbonna et al (2008). The study identified critical indicators of Nigerian ports' performance from literature and thereafter provided an assessment based on the judgment of freight forwarders who utilized the selected four ports for the study (Lagos Port Complex, Tin Can Island Port Complex, Port Harcourt Port Complex, and RO-RO Port Complex).

An examination of the seven indicators utilized by Ugboma et al (port efficiency, adequate infrastructure, frequent ship visits, quick responses to port users' needs, location, port charges, and port reputation for damaged cargo) revealed that none of the items incorporated the question of environmental sustainability in both the construction and management of these ports. This study is therefore filling this gap. Moreover, the unlike the older ports in operation in the country, the performance of the newly completed LDSP is yet to be assessed based on some of the highlighted indicators above. There are also scanty pieces of evidence in the available literature that assessed how complaints Nigeria ports to the eco-friendly tenets of SDG 17. This research filled this gap.

From the review of relevant literature, a hypothesis that encapsulates the research objective is drawn thus:

The quality of infrastructure, cost of operation, and environmental sustainability considerations based on the perceptions of the respondents do not significantly predict the choice of LDSP

Methodology

To achieve the set objectives of this study, a positivist approach was chosen. The ethical approval for the research was obtained from the ethical committee of

Redeemer's University. In line with the dictate of ethical approval, all respondents were individually informed of their ethical rights before being sampled.

For this research, the research sampling frame is the total number of registered freight forwarders who are members of different national associations which are affiliates of the Council for the Regulation of Freight Forwarding in Nigeria (the national body in charge of freight forwarding practice in Nigeria) that have completed their various FIATA certification program by December 2022 (the research took place in June 2023). According to CRFFN (2022), the total number of these members was 948. These freight forwarders are members of the six (6) registered associations, they are National Association of Government Approved Freight Forwarders (NAGAFF), the Africa Association of Professional Freight Forwarders and Logistics of Nigeria (APFFLON), the Association of Registered Freight Forwarders in Nigeria (AREFFN), Association of Nigeria Licensed Customs Agents (ANLCA), National Council of Managing Directors of Licensed Customs Agents (NCMDLCA) and Nigerian Association of Air Freight Forwarders and Consolidators (NAFFAC).

Multistage and random sampling techniques are used in selecting participants for this study. In the first stage of sampling, three out of these associations are randomly sampled from the six. The sampled associations were ANLCA, NCMDACLA, and NAFFAC (Table 1).

Table 1: Analysis of Questionnaire Distribution

S/N	Associations	No of Registered FF	Percentage	Sampled	Percentage	Retrieved	Percentage
1	ANLCA	268	57.52	134	57.5	120	62.5
2	NAFFAC	110	23.60	55	23.60	45	23.43
3	NCMDCLA	88	18.88	44	18.9	27	14.07
	Total	466	100.0	233	100.0	192	100.0

Source: Author's Analysis 2023.

This research employed a hybrid of the MCDA and the AHP approaches in carrying out the analysis for this study. As discussed earlier in the literature review section, the two approaches are best suited for an objective assessment based on the survey of stakeholders in the maritime sector. However, unlike the weighted score estimation deployed in MCDA, this research employed a linear hierarchical regression (an adaptation of the AHP) to quantify the perceptions of the respondents on the critical determinant of the choice of LDSP. The method is favored because the study is not a comparative study.

The respondents' perceptions of the identified factors as predictors of LDSP as their choice. A structured questionnaire was prepared for the research, the first section included the information on socio-economic characteristics of the respondents. the second section provided the measurement of respondents' perceptions' on how the quality of infrastructure, cost of operation, and environmental sustainability considerations predicted their choice of LDSP as a choice for their maritime activities.

A pre-field exercise was undertaken to ensure the validity and reliability of the items used in the study. Two of the items used

(quality of infrastructure and cost of operations) are adopted from the earlier works of Ugbona et al (2008) and Razeal et al, (2018). While the scale of environmental sustainability was adopted from the works of (Ajayi, 2020, 2023[1], and Ajayi, 2023[2]). Despite this, a Cronbach alpha test was carried out on each of the constructed multi items instruments. A Cronbach's alpha lower than 0.60 indicates poor reliability, values between 0.6 and 0.7 are acceptable and values equal to or higher than 0.70 indicate good scale reliability (Churchhill 1979; Simchi-Levi et al. 2003; Ajayi 2016, 2020; Ajayi and Mazinyo, 2020). Quality of infrastructure has a Cronbach alpha test of 0.89, cost of operation has 0.87 while environmental sustainability has a Cronbach alpha of 0.81.

Result

Table 2. *Hierarchical Linear Regression Analysis Showing how the Quality of Infrastructure, Cost of Operations, and Environmental Sustainability Considerations Predicted Freight Forwarders choice of LDSP*

Predictors	**Step 1**		**Step 2**		**Step 3**		**Step 4**	
	B	**T**	**B**	**t**	**β**	**T**	**B**	**t**
Predictors								
Quality of Infrastructure	.26	4.08**	.34	7.16**	.35	7.94**	.36	7.77**
Cost of Operation			.30	6.64**	.31	7.12**	.33	7.47**
Moderator								
Environmental Consd.					-.45	-8.72**	-.31	-6.13**
Interactions								
Environ Consd* Quality of Infrastructure							-.01	-.31
Environ Consd*Cost of Operation							-.19	-5.21**
R	.26		.47		.60		.62	
R^2	.14		.32		.46		.55	
ΔR^2	-		.18		.14		.9	
Df	1, 41		2, 750		4, 330		5, 337	
F	40.14**		48.29**		66.63**		41.87**	
ΔF	-		57.91**		86.00**		5.28**	

Note: ** p < .01, * p < .05, N=192

The result in Table 2 is a 4-step regression analysis model that revealed the predictive ability of the independent variables: quality of infrastructure, cost of operations, and environmental sustainability considerations on the choice of LDSP by the respondents. In the first step of the model, the identified port performance metrics (turnaround time, berth productivity, container dwell time, vessel productivity,

port connectivity, safety and security, environmental performance, and resilience) were regressed on the respondents' perceptions of the influence that the quality of infrastructure had as a predictor for the choice of LDSP.

The result revealed that the sampled freight forwarders posited that port performance metrics (turnaround time, berth productivity, container dwell time, vessel productivity, port connectivity, safety and security, environmental performance, and resilience) are significant determinants of their choice of LDSP (β=.26, t= 4.08, $p < .01$). This was with 14% significant predictive ability in their decision-making process on the choice of their destination port for business activities [R2= .14, F (1, 41) = 40.14, $p < .01$]. This result implies that the freight forwarders using LDSP strongly avowed that the quality of the infrastructure available at the port is a significant determinant of their patronage of the port. Cost of operations or services enjoyed by freight forwarders was added to the model in step-2 and it was observed that the model significantly contributed 32% predictive ability to predict the choice of LDSP as a choice destination for the freight forwarders [R2= .32, F (2, 750) = 48.29, $p < .01$]. Independently, it was noted that operational cost predicted the preference by freight forwarders for LDSP (β=.30, t= 6.64, $p < .01$) with a variance of 18% in a positive desire of preference for LDSP attributable to suitable operational cost (ΔR2=.18, ΔF= 57.91, $p < .01$).

Step-3 introduced the moderating variable (environmental sustainability consideration) and it was observed that the model significantly contributed 46% variance to changes in the preference for LDSP [R2= .46, F (4, 330) = 66.63, $p < .01$]. Concentrating on the variable added in the third step, preference for LDSP tends to increase with the introduction of the issue relating to the sustainable management of the environment in the construction, and day-to-day running of the facility as perceived by the respondents (β= -.45, t= -8.72, $p < .01$) with a variance of 14% increment associated with the preference for LDSP as port of choice based on the perceptions of the respondents (ΔR2= .14, ΔF= 86.00, $p < .01$). This result showed that all the dependent variables (metrics for assessing port performance) have a significant joint prediction on the preference for the LDSP by sampled freight forwarders. Based on this fact, the derived hypothesis was rejected.

When the metric 'environmental sustainability consideration' was used to moderate the relationship between the quality of infrastructure and its influence on the preference for LDSP by sampled freight forwarders, it was observed in step-4 that the introduction of the environmental sustainability consideration in the construction and management of the newly constructed LDSP was not a significant moderator of the relationship (β= -.01, t= -.31, $p > .05$). However, sampled freight forwarders believed that steps taken to incorporate the tenets of SDG 14 in the management of the environment of LDSP significantly moderated the relationship between the cost of operation and their preference for LDSP (β= -.19, t= -5.21, $p < .01$).

This inferred that the respondents believed that steps taken to incorporate environmental sustainability considerations in the construction and management of LDSP and the attendant cost of operations positively influenced the preference for the ports by the respondents. It can be surmised from this result that the sampled

respondents strongly believed that the cost of operations at the LDSP can be justified by the strict adherence to the tenets of SDG 14 both in the construction and the management of the port.

Discussion

Findings from this study have clearly shown that the business community, particularly those in the maritime sector in Nigeria are willing to embrace global best practices both in the quality of infrastructural facilities, and environmental management even if it will imply the payment of higher operational costs. This negates the belief in some quarters that seems to suggest that (Ezeani, 2012: Udo and Ochei, 2020). Transport infrastructural projects are capital intensive, the construction, and maintenance of these projects often require the best of both the public and private sectors to collaborate. Experience from Nigeria and many other developing economies have proven the popular maxim that "government has no business in business" true. The success that the Lagos Bus Rapid Transit (BRT) has achieved close to two decades after it's initial its launch has shown that the transport sector of the Nigerian economy is better managed by the private sector (Ajayi, 2017).

Nigeria is strategically positioned in the Gulf of Guinea (GoG) which is a growing economic hub with the potential of being one of the emerging economic blocs in the coming decades (Farouk et al, 2021: Gbadegesin and Akintola, 2021: Oluwakoya and Ogundipe, 2021). The region's relevance to the world economy stems from its significant oil and gas reserves, its inimitable role as a maritime trade route, and its rich sources of aquatic resources. The need to have a modern port with infrastructural and managerial capabilities to compete with the best in the world in the region cannot be overstated.

Critical maritime sector metrics that determine a country's GCI, CPLLSCI, and LPI are centered on the efficiency of its port system. The arrival of LDSP in Nigeria's maritime sector is therefore a welcome development. The quality of the available infrastructures in the country's older ports is not at par with the best global practices, the literature is replete with reports that posited that nearly all these ports have grave infrastructural shortages, and this affected their abilities to compete with ports from neighboring countries (Ugbomma et al, 2008: Okon, 2018: Anagor, 2022: Okeke, 2022: Babalola, 2022: Onyenucheya, 2023: Lawal-Fagbo et al, 2023). The Nigeria Port Agency (NPA) the regulatory body with the oversight function on the maritime sector in the country reported that vessel turnaround time at the LDSP is a whopping twelve (12) days shorter than what is experienced at the Apapa port complex (the erstwhile nation's premier port), this development he affirmed has made the LDSP be among the best in the GoC, even when it is yet to be fully operational (Bello-Koko, 2023" Lawal-Fagbo et al, 2023).

The sampled respondents strongly averred that the management of the LDSP operated within the ambit of the best global practices in the management of the environment during the construction of the project, and in the day-to-day running of the facility. The respondents believed that the attention paid to the achievement of SDG 14, and the overarching environmental management principles employed by the management of LDSP significantly contributed to their preference for it as a port of destination for transactions(β= -.45,

t= -8.72, p < .01. Environmental consideration generated a variance of 14% preference for LDSP as a port of choice based on the perceptions of the respondents (ΔR2= .14, ΔF= 86.00, p < .01). Findings like this is a pointer to the fact that the business community in Nigeria are becoming conscious of the inimitable roles that sustainable management of the environmental resources play in the achievement of holistic economic development. It is advocated practices must be insisted upon in different ongoing transport infrastructural development in the country.

Managerial Implications

It is important to note that 'best global practices' in the management of port facilities are germane since seaports generally 'service the global community', specific requirements that underscore the unique characteristics of local seaports must always be factored into the decision-making process. For the LDSP both the government and the management must achieve an Integrated Port Management System (IPMS) a key feature of the next phase of its developmental strategy. IPMS encompasses all aspects of port operations, including vessel scheduling, cargo handling, logistics, security, and development of intermodal transport system to ease access to the port (Noralam et al, 2020: Notteboom et al, 2020: Noteboom et al, 2022). The condition of the access road that presently links LDSP is not at par with the expected traffic the port and the Dangote Refining Complex will generate in the nearest future, it is a strategic move if the link road is widened to accommodate the anticipated traffic. The rail track should also be extended to the LSDP, part of what reduces the efficiency of the Apapa port is the over-reliance on the road transport system as the sole means of accessing the port.

It is also important that the entire operating environment of the LDSP should be digitalized and automated. This will improve operational efficiency and reduce manual processes. It will also ease the process of information gathering, processing, and deployment. Some aspects of the operations of the LDSP are still presently handled manually. This will rob the port management of the use of advanced data analytics, artificial intelligence, and Internet of Things (IoT) devices to optimize port operations, enhance cargo tracking, and automate administrative tasks.

Limitations and Areas of Future Research

As is with all research, the present one is not without some limitations. First, efforts were not made to 'weigh the respondents' assessments of the port performance' in line with the practices established in earlier studies (Ugboma et al, 2008: Razeal et al, 2018), rather the assessments are ranked under a linear hierarchical regression model. The result could be different if the MCDA or AHP model that strictly utilized 'weighted score' is used. Another limitation is the fact that this research assessed only the LDSP, comparative evaluation of the new and the older ports could also produce a different result. Lastly, this exploratory assessment is carried out when the LDSP is within its first year of operation, and when the facility is yet to be fully completed (nearly 60% of the port facilities are yet to be opened for public use). Another study when the facility is completed advocated, such a study will be able to provide a comprehensive assessment of the facility, and its strategic role in the

achievement of a better GCI, CPLLSCI, and LPI ranking.

References

Ajayi A.P. (2023)[1]. Lean and circular economy relevance in post-harvest loss prevention: Nigerian retailers' perceptions'. International Journal of Integrated Supply Management. 16, 1. Pp 82-105.https://doi.org/10.1504/IJISM.2023.127652

Ajayi A.P. (2023)[2.] Empirical review of emergent uncertainties impact on supply chain performance of fresh food in Abuja metropolis. UniOsun Journal of Management Sciences, 5, 1. Pp 1-20

Ajayi A .P. Sile A, Irinyemi B and Fagbo-Lawal, Babatunde (2023). Assessment of Professional Training Program On Operational Performance Among Freight Forwarders In Lagos Ports, Nigeria. Nigerian Journal of Logistics and Transport. Volume 15-NO. II, Pp 90-112.

Ajayi. A.P. (2020) Uber: examination of socio-economic situation of its clienteles and security components in Lagos, Journal of Transportation Security, Vol. 13, pp.1–17, https://doi.org/10.1007/s12198-020-00216-0.

Ajayi, A.P. (2017) Assessment of the Influence of Lagos Bus Rapid Transit Scheme (BRT-Lite) on Road Traffic Crashes (RTC) on Lagos Mainland-Island Corridor. The Open Transportation Journal, 11, 102-109.https://doi.org/10.2174/1874447801711010102

Ajayi, A. P. (2016). Analytical study of supply chain collaboration guiding forestry products supply in a developing economy. Int. J. Business Performance and Supply Chain Modelling, 8, 4, Pp 277-298.

Anagor A. (2022). Maritime Things to know about completed $1.5bn Lekki Deep Sea Port. Business Day Nov 21, 2022. https://businessday.ng/maritime/article/things-to-know-about-completed-1-5bn-lekki-deep-sea-port/ Accessed May 4, 2023.

Arvis, J.F., Vesin, V., Carruthers, R. and Ducruet, C. (2019). Maritime Networks, Port Efficiency, and Hinterland Connectivity in the Mediterranean. Washington, D.C.: World Bank Group.

Babalola, Y. (2022). Lekki Port Begins Commercial Operation Q1 2023. Leadership https://leadership.ng/lekki-port-begins-commercial-operation-q1-2023/. Accessed April 27, 2023.

Bello-Koko, M. (2023). With Lekki Deep Sea Port, NPA has successfully `wrested' cargoes from neighbouring countries. Premium Times, April 12, 2023. https://www.premiumtimesng.com/business/593020-with-lekki-deep-sea-port-npa-has-successfully-wrested-cargoes-from-neighbouring-countries-official.html

Brooks M.R. and Pallis A.A. (2008). Assessing port governance models: Process and performance components. Maritime Policy and Management, 35(4), 411-432.

Bosshard, P. (2008). China's environmental footprints in Africa. SAIA Working

Papers in African Studies. 01, 08. https://sais.jhu.edu/sites/default/files/China%27s-Environmental-Footprint-in-Africa.pdf

Chung, K.C. (1993). Port performance indicators, Infrastructure notes, no. PS-6, Washington, D.C.: World Bank Group.

Dewarlo, O. (2019) DEA Window Analysis for Measuring Port Performances Efficiency of Four Islands Countries Located in West Indian Ocean Countries. American Journal of Industrial and Business Management, 9, 2098-2111. https://doi.org/10.4236/ajibm.2019.912139

Ezeani, E. C. (2012). Economic and Development Policy-Making in Nigeria. Journal of African Law, 56(1), 109–138. http://www.jstor.org/stable/41709954

Farouk, A, Saminu J, R. Maigoshi, Z. Ahamad, and Bako, M.. (2021). Broadening Nigeria's Revenue Base: Exploring Blue Economy Activities. Applied Finance and Accounting. 7. 9. 10.11114/afa.v7i2.5224.

Ferrari, C., Merk, O., Bottasso, A., Conti, M. and Tei, A. (2012). Ports and Regional Development: a European Perspective, OECD Regional Development Working Papers, 2012/07, Paris: OECD.

Gbadegesin, O and Akintola, S (2021). Charting the Course for a Blue Economy in Nigeria: A Legal Agenda Journal of Environmental Law and Policy 6-25. , Available at SSRN: https://ssrn.com/abstract=3860675

Gititu M. and Kyalo, C. (2020). Are China's Investments in Africa Environmentally Sustainable? A Case Review of Three Projects in Kenya. Journal of International Relations and Foreign Policy, Vol. 8, No. 1, pp. 7-18 . DOI: 10.15640/jirfp.v8n1a2

Gonzalez, M.M. and Trujillo, L. (2009). Efficiency Measurement in the Port Industry: A Survey of the Empirical Evidence. Journal of Transport Economics and Policy Vol. 43, No. 2, pp. 157-192

Gordon, R. (2012). The Environmental Implications of China's Engagement With Sub-Saharan Africa. Environmental Law Reporter. 42, 1108-1124 https://core.ac.uk/download/pdf/229258148.pdf

Hasan E and Hanaa A. (2016). Efficiency Assessment of Jazan Port Based on Data Envelopment Analysis. Mediterranean Journal of Social Sciences, [S.l.], v. 7, n. 3 S1, p. 320, may. 2016. ISSN 2039-2117. Available at: <https://www.mcser.org/journal/index.php/mjss/article/view/9118>.

Krmac, E., Mansouri Kaleibar, M. A comprehensive review of data envelopment analysis (DEA) methodology in port efficiency evaluation. Marit Econ Logist (2022). https://doi.org/10.1057/s41278-022-00239-5.

Lawal-Fagbo, S.B. Oluwakoya, A. O. and Ajayi A.P. (2023). Socioeconomic Factors and Navigational Safety among Marine Pilots in Lagos Ports. The International Journal on Marine Navigation and

Safety of Sea Transportation Volume 17 Number 4 DOI: 10.12716/1001.16. .17.04.17

Merk, O. and Dang, T. (2012). Efficiency of world ports in container and bulk cargo (oil, coal, ores and grain). OECD Regional Development Working Papers, 2012/09. Paris: OECD

Nigeria Bureau of Statistics (2018) Shipping and Port Related Activities Data. https://nigerianstat.gov.ng/elibrary/read/507.

Noralam,N.A., Othman, M.R. Jeevanc, J. and Saado, M. (2020). Seaport quality: a definition of the contemporary seaport management. Journal of Critical Reviews. 8,7. Pp 1137-1147.

Notteboom, T. , Pallis, A, and Rodrigue, J. (2022) Port Economics, Management and Policy, New York: Routledge, 690 pages / 218 illustrations. ISBN9780367331559.doi.org/10.4324/9780429318184.

Notteboom, T.E., Haralambides, H.E. (2020). Port management and governance in a post-COVID-19 era: quo vadis?. Marit Econ Logist 22, 329–352 . https://doi.org/10.1057/s41278-020-00162-7

Okeke, A.F. (2022). Port Concession and Ship Turnaround Time in Nigerian Ports. Himalayan Journal of Economics and Business Management. 3, 3, pp 42-49. DOI: 10.47310/Hjebm.2022.v03i03.004

Okon, A. (2019). Port development: How insecurity undermines progress of Rivers Port. Punch Newspaper. 17th January 2019. https://punchng.com/port-development-how-insecurity-undermines-progress-of-rivers-port/ Accessed February 2, 2023.

Oluwakoya, O.A, Ogundipe, O.D. (2021). Spatiotemporal Correlation between Railway Transport Development and Land use. Romanian journal of transport infrastructure, vol.10, 2021, no.2. pp 1-19.

Onyenucheya, A. (2023). Nigeria considers Benin, Ghana model as cargo diversion rises. The Guardian Newspaper. 22 February 2023. Accessed at https://guardian.ng/business-services/nigeria-considers-benin-ghana-model-as-cargo-diversion-rises/

Osondu-Okoro, G. Nwokedi, T. Mbachu, J. EmeOgwo, N, and Nwachukwu J. (2022). Ship Turnaround Time and Vessel Traffic in Nigerian Ports: A Correlation Analysis. European Journal of Maritime Research. 1, 1. DOI: 10.24018/maritime.2022.1.1.3

Rezaei, J. Palthe,L, Tavasszy, L,. Wiegmans, B,. van der Laan, F. (2018). Port performance measurement in the context of port choice: an MCDA approach. Management Decision. Vol. 57 No. 2, 2019 pp. 396-417. DOI 10.1108/MD-04-2018-0482.

Rezaei, J. (2016), “Best-worst multi-criteria decision-making method: some properties and a linear model”, Omega, Vol. 64, pp. 126-130.

Rezaei, J. (2015), “Best-worst multi-criteria decision-making method”, Omega, Vol. 53, pp. 49-57.

Salisu, U. O. and Raji, B. A. (April 2017). Analysis of Seaport Productivity in Pre and Post Concession Periods in Nigeria. a Study of Apapa Port. Transport & Logistics. 17 (42): 62–71.

Saragiotis, P., & de Langen, P. (2017). Achieving Full and Effective Corporatization of Port Authorities: Reform Models from Global Experience. The World Bank. Trade & Competitiveness in Practice http://documents.worldbank.org/curated/en/710621508517325031/pdf/120581-BRI-PUBLIC-8p-InPracticePortCorpfinal.pdf

Udo, M & Ochei, M. (2020). Analysis of the Contributions of Transport Sector to Economic Growth in Nigeria. IOSR Journal of Economics and Finance (IOSR-JEF) 11, 6 PP 18-35 10.9790/5933-1106031835

Ugboma, C., Ugboma, O. and Ogwude, I.C. (2006), An analytic hierarchy process (AHP) approach to port selection decisions – empirical evidence from Nigerian ports, Maritime Economics & Logistics, Vol. 8 No. 3, pp. 251-266

The United Nations Conference on Trade and Development releases today the Review of Maritime Transport (2022). UNCTAD's Review of Maritime Transport 2022: Facts and Figures on Africa. https://unctad.org/press-material/unctads-review-maritime-transport-2022-facts-and-figures-africa

UNCTAD (2016). Port Performance Linking Performance Indicators to Strategic Objectives, Port Management Series, 4, Geneva: UNCTAD.UNCTAD (various issues). Review of Maritime Transport, Geneva: UNCTAD.

United Nations Development Programme (2023). The SDGs in action. https://www.undp.org/sustainable-development-goals?gclid=CjwKCAjwkLCkBhA9EiwAka9QRgfj_NYLLNZkqI-ne-DydiQ4kHixq-7HrtDlCRthVH6EBp7-EjSQyhoCFdwQAvD_BwE

Valentine, V.F. and Gray, R. (2001) The Measurement of Port Efficiency Using Data Envelopment Analysis. Proceedings of the 9th World Conference on Transport Research, Seoul, 22-27 July 2001.

Wiegmans, B. and Dekker, S. (2016), Benchmarking deep-sea port performance in the Hamburg-Le Havre range, Benchmarking, an International Journal, Vol. 23 No. 1, pp. 96-112.