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Review Article

Challenges of Multimodalism in the West Africa's Trade Corridor

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ABSTRACT

The work surveys the intermodal improvement models applied in modern times to improve port supply chain systems for world's busiest ports and assesses how West African ports especially the overtly congested port of Lagos can benefit from these improvement models. Different aspects of the port operations drivers were considered including the land side, the sea side and digital technology business ecosystem. An assessment of developmental pursuits of Nigeria's central government for the port sub sector was analyzed and criticized. The findings shows that a system of development that fails to consider logistics and supply chain improvement models will achieve limited development. The work hitherto assessed Nigeria's freight and passenger transport development models and found absence of linkage between the various modes, thus the proposal of an intermodal development option that links the road the rail and barge transportation alternative. The focus of the work not only proposes methods for the reactivation of the functionality of the Niger river presently dredged but unutilized, but goes ahead to design an intermodal alternative incorporating both road and rail transport alternatives. International best practices of countries already applying this model were applied. A model was built from the work based on multinomial logit model explaining the dependence of cargo throughput on two other variables drawn from Nigerias' economy namely consumer price index and gross domestic product. An exponential increase was found in the variable gross domestic product based on multinomial logit model. The West African economy of Nigeria was advised to go multimodal based on the findings.

Key words: Multinomial Regression; Barge Transportation; Intermodal Transportation; Port Business Ecosystem; Supply Chain.

INTRODUCTION

The West African trade corridor happens to be a region with issues in her intermodal traffic movements arising from the exit of the rail corridor in the region. Considering that the region is an import dependent economy, movement of goods originate from the ports which recently have merged with expanding cities, the level of congestion in the region have become unacceptable resulting in major lock jams of trucks in port city centers. The ports of Lagos and Tn Can Island in Nigeria has become most notorious for this. The only major likely solution to this menace is intermodalism. Intermodalism involves the organization of a sequence of modes between an origin and destination, including the transfer between the modes using intermodal units such as containers to effect the transfer between modes. Modes involved will include sea to road, sea to rail, ship to barge and vice versa. Where possible, sea to air intermodal links have emerged. The concept of intermodalism has constantly reoccurred in literature as the optimum solution to the ever rising problem of port congestion especially as it affects the ever increasing encroachment of the city to the port gates Macharis et al [1] define intermodal transport as the combination of at least two modes of transport in a single transport chain, without a change of container for the goods, with most of the route travelled by rail, inland waterway or ocean-going vessel and with the shortest possible initial and final journeys by road New rail way connection running 3 times per week with 20 rail cars moving a total of 20-40 containers at a time to inland container depots at Kaduna 730 km and or to Kano 960 km from the port has been introduced to Nigeria's rail network. According to Notteboom [2] the concept of containerization, together with intermodality has extended seaports' inland access and redefined seaport competition in a way that seaports have to strive for a position in intermodal corridors

Many seaports, as well as shipping lines, integrate vertically with inland intermodal terminals to control hinterland transport thus giving rise to new concepts, the seaports foreland and hinterland.

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OBJECTIVE

To analyze the relationship between cargo throughput and other endogenous variables such as consumer price index and gross domestic product drawn from the economy of Nigeria in West Africa and determine concepts and issues preventing the free flow of cargo in her inward logistics moves to the region's hinterland

LITERATURE REVIEW

Violeta et al [3] has outlined different inland terminal types operated in the transport industry. They include: Inland Clearance Depot, Dry Port, Inland Container Depot, Logistics Centre, Freight Village, and Inland Port. Goçmen and Erol [4] assessed the possibility of using the mathematical allocation technique to create a more sustainable transport solution in the port to hinterland logistics congestion problem. Another way of looking at the problem is to apply the combined transport approach. Combined transport is viewed as the integration of transport processes in the transport chain at all levels, technical, technological, organizational, documentary, pricing and legal [5]. The port of Lagos ,Nigeria ,West Africa's most congested port has presented a continuous type of congestion on a constant basis and thus demands a special approach different from different ports of the world [6]. Efforts was therefore be made in this work to further understand this constant congestion phenomenon existing in Lagos port.

A Freight Village is a typical infrastructure destined to: host transport and logistics companies, as well as product processing businesses. Other roles include to integrate the different modes of transport, both in a structural way and through information exchange; provide services to the hosted businesses, to goods and people, with a view to enhancing the intermodal transport and the storage of products, as well as to assuring the control of common areas, the Freight Village entrance and exit, the regular functioning of the technological plants etc.

METHODOLOGY

The work applied gap analysis to structurally review infrastructural gaps existing between advanced economies and the emerging economy of Nigeria, West Africa's most congested port of Lagos. Multinomial logistic regression (often just called 'multinomial regression') was used to predict the nominal dependent variable cargo throughput given two independent variables consumer price index and gross domestic product of Nigeria. It is sometimes considered an extension of binomial logistic regression to allow for a dependent variable with more than two categories.

REPORT OF FINDINGS

Developing a multimodal transport system in West Africa faces a great challenge. The first is the absence of a well-organized transportation policy that is all inclusive taking care of all the pit holes and learning from the ugly experiences of other nations. This will only be possible where a triple helix development strategy is adopted including the academia and research organizations in transport who will update the members of the multimodal transport ecosystem of best strategies and new trends in the profession.

The transport sector should embark on a tax reduction strategy especially in the aviation sub sector with a view to attracting short-haul cargo and passenger planes into the country. A regional open sky strategy in West Africa is a concept that will improve intermodalism. Such a strategy should be extended to the short sea shipping sector with the establishment of reduced rates for cabotage shipping firms Table 1 from Sources of Nigerian Port Authority [7].

CPI= Consumer Price Index

The absence of sufficient cold infrastructure in the port has caused cargo diversion to the adjacent port of Lome in Togo and adjoining Cotonou port in Benin Republic.

Final Multinomial Logit Equation from result in the Appendix is:

214.20VAR00003 +1957.00VAR00002 =70365036.00VAR00001

The explanation to this is that for every single increase in the exponentiated variable the Gross domestic product will result in equivalent increase in cargo throughput. The result is in line with current reality in the zone, Nigeria in West Africa being an import dependent economy.

Data available from vehicle registration centers in Nigeria showed an increase in number of new vehicles imported in excess of 11million vehicles for the year 2018, while developments in the rail sector has been minimal. Tearline [6] Barge transportation development on the other hand has also remained minimal thus passing the bulk of the increased freight generated due to cargo throughput increase only to the truck sector. This contravenes the rules of multimodal sustainable and green transportation. West Africa as a whole as well as the government of Nigeria are therefore advised to go multimodal as this remains the only solution to the ever increasing cargo throughput nature of their economy. **Table 2-5**.

Conclusion and Recommendations

An intensive campaign on improvement of corridors in West Africa is on-going with little or no study going on in Nigeria. Reduction of number of checkpoints in these transit regions has been found to improve efficiency of freight movement in these corridors.

Table 1: Collected Data for analysis.

Year	CPI	GDP/capita	Cargo Throughput (Tonnes)
2010	100.0	2310.9	76,744,727
2011	110.8	2507.7	83,461,697
2012	124.4	2730.2	77,092,625
2013	134.9	2966.1	78,281,634
2014	145.8	3184.6	84,951,927
2015	158.9	2,744	77,387,638
2016	183.9	2,214	70,365,036
2017	214.2	1,957	71,535,636

Table 2: Output Statistics.

VAR00001		
N	Valid	8
	Missing	0
Mean		77477615.0000
Median		77240131.5000
Mode		70365036.00[a]
Range		14586891.00
Minimum		70365036.00
Maximum		84951927.00
a. Multiple modes exist. The smallest value is shown		

Table 3: Data Information Generalized log linear analysis.

		N
Cases	Valid	8
	Missing	0
	Weighted Valid	8
Cells	Defined Cells	512
	Structural Zeros	0
	Sampling Zeros	504
Categories	VAR00001	8
	VAR00003	8
	VAR00002	8

Table 4: Convergence Information a, b.

Maximum Number of Iterations	20
Converge Tolerance	.00100
Final Maximum Absolute Difference	.00018[c]
Final Maximum Relative Difference	1360.13289
Number of Iterations	4
a. Model: Multinomial Logit	
b. Design: Constant + VAR00001 + VAR00001 * VAR00003 + VAR00001 * VAR00002 + VAR00001 * VAR00003 * VAR00002	
c. The iteration converged because the maximum absolute changes of parameter estimates is less than the specified convergence criterion.	

Table 5: Analysis of Dispersion a, b.

	Entropy	Concentration	df
Model	4.258	1.400	441
Residual	544.715	229.600	1400
Total	548.973	231.000	1841
a. Model: Multinomial Logit			
b. Design: Constant + VAR00001 + VAR00001 * VAR00003 + VAR00001 * VAR00002 + VAR00001 * VAR00003 * VAR00002			

To this end a study on corridor efficiency in Nigeria's major corridors of Portharcort to Enugu- Kaduna; Calabar to Maiduguri; Warri-Benin-Abuja corridors should commence immediately to juxtapose findings and improvements in other West African corridors.

Introduction of a digital compliant maritime freight processing system where all the maritime sisters in Nigeria will have common access to cargo movement should be put in place. This will reduce personal contact in bill payment with a common visibility by customs, ports authority, freight forwarders, Nigerian Maritime Administration and Safety Agency (NIMASA) and Shippers in Nigeria. Such a hub has been commenced in Ghana and has been long in existence in Europe.

Short Sea shipping groups should be formed to handle West African trade cargo. Trade should be encouraged among West Africans with the development of Shipping fleet, the creation of choice areas for inter-regional trade and government encouragement of Shipping and trade among sisters in the maritime sector. Special ports with reduced tariffs should be dedicated for this purpose by all ECOWAS member states.

Nigeria should encourage trade in oil and gas between West African states who accept to carry goods with Nigerian vessels to encourage investment in tanker vessels for inter African trade and tanker fleet development. Other areas of strength such as Roro/ cargo shipping should be identified and encouraged.

Figure 1: Plan for a new Port in Lagos to handle congestion in Lagos port. (Source: Courtesy of https://www.ship-technology.com/projects/badagry-megaport-free-zone-project-lagos/)

The land bridge concept as it applies to West Africa is a design where cargo entering into West Africa from one end will move via a rail link across West Africa to another end of the region exiting through water. Such a bridge exists in Europe, United States and India. European Marco Polo project encourages this development which now is seen as a sustainable transportation solution to congested road transport system. The Calabar-Portharcourt rail system is visibly the first land bridge in West Africa. This should be encouraged to crisscross West Africa. Development of inland container depots should be encouraged along such bridge with subsequent hinterland developments. Calabar- Arochukwu-Aba-Owerri- Onitsha-Benin-Lagos angle of a West African Land bridge.

The bridge can be extended to ECOWAS countries through a West African rail line westwards

Plan for a new Port in Lagos to handle Congestion in Lagos port

APM Terminals and its consortium partners announced plans to develop a green field mega-port project and Free Trade Zone at Badagry in Lagos State, Nigeria billed to open in the year 2018. When fully completed the deep-water full-service port is billed to be one of the largest in Africa. The facility, located 34 miles west of Apapa and the Port of Lagos on the Benin-Lagos Expressway, is expected to have 7 km of quay and 1,000 hectares (2,470 acres) of dedicated yard.

Plans for the adjoining Badagry Free Trade Zone is designed to include a power plant, oil refinery, industrial park and warehousing and Inland Container Deport functions A new approach to transport development in West Africa is the introduction of the freight village. The Freight Village is a well-organized set of structures and integrated services for the exchange of goods between the different transport modes, which includes, however, a railway station that can form or receive complete trains and is connected with ports, airports and high ways. This is highly suggested as a decongestion alternative for the Lagos port. However this will require a form of intermodal connectivity to Murtala Mohammed International airport Lagos. Facilities are planned be provided for container, bulk, liquid bulk, Ro/Ro and general cargo as well as oil and gas operations support and a barge terminal.

Given the efforts mentioned applied by the government of Nigeria in West Africa, the Lagos port constant congestion problem will remain a challenge until bigger logistics units are designed in an exponential dimension sufficiently higher the rise in cargo throughput as was made visible from the findings of this research (Figure 1).

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