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RESEARCH ARTICLE

Coastal Development Options for Nigeria's Lagos Lagoon-The Marine Transport Integration Model

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Abstract

The work surveyed technical development options for the optimal utilization of Nigeria's Lagos Lagoon situated in the rich waterfronts of Nigeria's commercial city of Lagos. Options assessed include renewable energy development option together with marine transportation development options. The work assessed the available transport modes in the country with a view to solving rising congestion problems along coastal states in the region. A marine transport integration model was thus developed in the long run as the major solution to the over-used coastal road network. The marine transport integration model considered the use of dry-docks, short sea shipping ports and increase in shipping activities and freight loading centres as necessary criteria for the optional utilization of Nigeria's Lagos Lagoon. It also proffered solution to the nation's unimodal freight transportation system.

Keywords: *Coastal development, Marine transport, Renewable energy, Congestion, Dry-docks, Short sea shipping.*

Introduction

In seeking for a performance measure for the assessment of development patterns for a nation's maritime system, three very different but interrelated systems have been identified. They are deepwater ports, inland waterways and landside connections. In West Africa, the location of Lagos Lagoon of Nigeria, seaside connectivity also should be included.

Nigeria aught to borrow from Texas Development of Trade's maritime integration planning scheme in her bid to integrate her port systems in to a multimodal transport system. The Texas port system constitutes of 17 local ports located along the Gulf of Mexico. In the Texas DOT assessment, a two phased approach consisting of: (i) critical bottle neck identification of both current and future conditions of marine terminal, navigable waterways, inland highway and rail systems; and (ii) Infrastructural and operational solutions to bottleneck together with a cost-to-benefit analysis of the solutions were adopted [1].

Another tool applied in measuring a country's level of integration into existing liner shipping network is the liner shipping connectivity index. (LSCI). Export oriented ports of China, Singapore and Hong Kong ranks highest with this measure. One concept that would maximize a nations effort towards multimodal integration is her ability to understand the concept of port regionalization. The concept of port regionalization encourages the use of barge and rail transport leading to higher integration between maritime and inland transport systems. The focus of the concept is the formation of a regional load centre network characterized by strong functional interdependency and sometimes joint development of specific load centre and hinterland logistics platforms. [2]

Objective

Having surveyed what nations do to develop and integrate her coastal waters, the work sets out as its objective, the analysis of available options for the development of Nigeria's Lagos Lagoon and adjacent coastline. The work also aims to create a marine transport integration model suitable for Nigeria.

Literature Review

Realizing the poor infrastructural state of West Africa's maritime transport writers has suggested an improvement in the areas of port-to-rail connectivity, provision of port equipment and port capacity.[3] Furthermore, the need for port sector improvement have been suggested in the area of port reform.[4] In Nigeria, for example, the trend towards landlord port ownership where government owns the port and port operational activities are concessioned to private port operators have since become the model. However more work remain in the area of trade connectivity among coastal states. Every coastal

state aught to be mandated to develop her maritime base properly positioned to enhance interstate trade between member states. To this end the government should review her policy framework to mandate states to achieve port infrastructural sufficiency at their maritime gateways. This becomes more visible when freight analysis is carried out to assess trade activities along our coastal frontiers. An interstate freight analysis study has been carried out for United States water borne commerce applying the logit model. [5]

Where however, there exist port infrastructures, measures of port productivity and performance such as data envelopment analysis DEA and free disposal Hull (FOH) may be applied. [6]

Methodology

The method applied in this research is the use of sustainable transport development theory to effect changes in Nigeria's congested port environment of lagos. The Lagos lagoon region of the state was used to create possible areas for the development of logistics centres ,tank farm logistics centers and renewable energy investment centre. A new shipping pathway that directs cargo from the landside to the sea side using short sea shipping was also suggested in the marine integration model. Also applied were factor analytical techniques and varimax rotation of the same technique using MINITAB.

Report of Findings

The Lagos lagoon Nigeria has lied fallow for years with no planned effort to integrate logistics operation first between intra city terminals and next between intercity (i.e coastal) networks. A natural linkage already exists. In this sense the navigable water connectivity between Lagos and other states made possible by the Atlantic ocean provides this natural highway.

The next aspect is the connectivity concept. In this sense we evaluate the availability or possible sources of provisioning of the water vehicle for indentified societal needs in the region. Generally, when one looks at Lagos Nigeria, one observes an over-populated industrial centre with development of its transport focused on the road mode, majorly. It is just recently that the long forgotten rail tracks were revitalized.

However, the impact of the rail revitalization is so how compared with existing logistics challenges presently existing in the sector.

Marine Transport Integration Model

If one takes up the freight distribution problem for example, it will be discovered that both the rail and the road modes have produced an unsustainable solution in the sector. Logistics marshalling areas for containers still abound at points very close to port areas, thus producing a multiplier effect by attracting more trucks to the port area. This situation increases idling at the port gates, thus increasing the emission of greenhouse gas in the zone . Recommended solution approach offered in this paper is the creation of new logistics centres with lagoon (water) connectivity making use of roro (marine vehicle) supported by government policy. This solution approach will reduce congestion at the port gates.

Still on the freight distribution problem so far, one observes that the container logistics congestion at the Apapa and Tin can island ports of Lagos state is only an iota of the total problem in the area. A new dimension of the freight congestion problem has been created by the existence of petroleum tank farms along the Apapa-Oshodi highway adjacent to the port water fronts. The attracted tankers to this zone add to the marshalling area idling problem (a non sustainable solution). This situation requires government or regulatory body intervention through the mandation of a distribution pathway that provides for sustainable transportation. Two possible solution options suggested in this work are construction of pipelines leading to loading centres outside the city centre or increased barge transportation to special logistics tank farm centres located outside the city centre. This will mean the creation of a loading hub in locations outside the major city.

All of the above suggestions form but a little aspect of the transport integration model being set up in this work. They may be classified as the city freight distribution optimization model created for Nigeria's Lagos Lagoon district. The other aspect has to do with the identification of industrial clusters properly located with sea side connectivity with optimum preparedness to use sea transport for journeys to adjacent coastal states. This demands the adequate provisioning of port facilities by all coastal states in the region with a highly regulated tariff structure designed to accommodate short sea shipping. The marine vehicle component of the integration model should be encouraged through the formation of short sea

shipping promotion centres in both Nigeria and West Africa. Government policies such as local content should be designed to favour international organizations who invest in Nigeria's local shipping market. An elongation of cabotage to accommodate foreign investments in the local shipping market is thus necessary at this stage.

The language of the shipping industry in Nigeria and West Africa with respect to local shipping investment should be redefined at this stage with emphasis being laid on such terms as direct foreign investments in the local market attracting benefits from the government. Tax relief incentives should be designed at this stage to accommodate shipping lines willing to invest in Nigeria's local shipping market. The same principle should apply to industrial clusters and renewable energy investors willing to come into Nigeria's coastal waters.

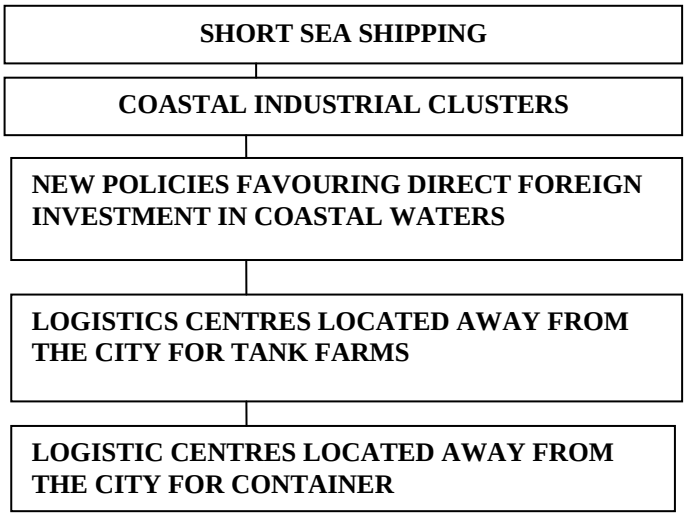

Fig: 1. Marine transport integration model

Factor Analytical Study of Nigeria's Freight Distribution Network

Table 1: Nigeria's data compared To GDP 1989-2002

Year	Rail	Road	Water
1989	22,634	499,416	139,128
1990	-	597,319	85,685
1991	5,400	833,640	103,652
1992	10,176	295,411	38,915
1993	-	524,469	99,690
1994	19,099	582,032	99,552
1995	504	541,032	98,400
1996	16	826,121	160,623
1997	0	656,000	218,000
1998	7000	593,000	218,000
1999	0	3,753,000	101,000
2000	7000	958,000	19,000
2001	0	844,000	45,000
2002	-	993,000	24,000

Source: [7].

Table 2: Unrotated factor loadings and communalities 12 cases used 2 cases contain missing values

Variable	Factor1	Factor2	Factor3	Communality
rail	0.797	0.230	0.558	1.000
road	-0.817	-0.061	0.573	1.000
water	0.241	-0.966	0.097	1.000
Variance	1.3609	0.9890	0.6501	3.0000
% Var	0.454	0.330	0.217	1.000

In the analysis above,the contributions of the rail,the road and the coastal water transportation system in Nigeria were analyzed using input data from the 1999 to 2002 freight traffic.The whole data were subjected to factor analysis using MINITAB.The output result as captured in Tale 4.2.1 shows a communality of 1.00 for all the three variables indicating complete analysis for all variables.

Table 3: Factor score coefficients

Variable	Factor1	Factor2	Factor3
rail	0.586	0.233	0.859
road	-0.600	-0.061	0.882
water	0.177	-0.976	0.149

The unrotated factor scores for the coefficients of the first factor shows two significant factors of rail and road,though negatively related with factor scores of (0.5 and _0.6).The water mode was completely neglected being insignificant wwith a score of 0.1.

Table 4: Rotated factor loadings and communalities varimax rotation

Variable	Factor1	Factor2	Factor3	Communality
rail	0.009	-0.985	0.175	1.000
road	-0.042	0.175	-0.984	1.000
water	0.999	-0.009	0.040	1.000
Variance	1.0002	1.0001	0.9997	3.0000
% Var	0.333	0.333	0.333	1.000

Table 5: Factor score coefficients

Variable	Factor1	Factor2	Factor3
rail	-0.002	-1.049	-0.187
road	0.041	-0.186	-1.052
water	1.003	0.001	-0.043

When subjected to varimax rotation, the communalities still showed full explanation of the variables concerned having scored 1.00.However,from the factor score of the coefficients of the first factor, only the water mode made a significant contribution with a factor score of 1.003.The road and rail sectors having scored -0.0 and 0.0 in either case. The interpretation of this being that if put to use the water sector has capacity that has for long been neglected. In this regard the short sea sector of Nigeria's coastline if developed has a transformative capacity to national development. Nigeria's government is thus advised to tap into this significant transport development reserve option and transform the nation's transport sector.

Conclusion

The work evolved a new policy pathway for coastal water development in Nigeria requiring the extension of the existing cabotage regime to advance to a new regime that favours foreign direct investment in the entire maritime sector. This approach will certainly bring the necessary change required for sustainability.

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