THE IMPACT OF ROAD TRANSPORT INFRASTRUCTURE DEVELOPMENT IN PORTHARCOURT METROPOLIS

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CERTIFICATION

I certify that this study **'The Impact of Road Transport Infrastructure Development in Port Harcourt Metropolis'** was carried out by **SULEIMAN SAIDU SANGARI** , (Reg No: 2011505139) in partial fulfilment for the award Master of Business Administration (MBA) in the Department of Transport Management Technology, Federal University of Technology Owerri.

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DEDICATION

I humbly dedicated this work to my late wife Hassana Musa Gadu for the good time we spent together.

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This project work has been realized through the assistance of good number of people. First I am obliged to entire family of Bawan Allah, Authors, researchers, reporters, and professors from whose work significant material have been derived to strengthen views on this work.

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S. S. Sangari

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ABSTRACT

This research assessed the Impact of Road Transport Infrastructure Development in Port Harcourt. It also examined critically, the importance of quality road infrastructure in Port Harcourt and its relative impact on the Nigerian economic development. Relevant literatures on road infrastructure development and its impact on Rivers State were reviewed. A time-series data (2004 - 2016) on road infrastructure quality index (RIQI), GDP per capita, cost of cargo haulage and volume of cargo, secondary data were obtained from World Bank database and National Bureau of Statistics. These data were analyzed using multi linear Regression analysis with the aid Statistical Package for Social Scientist (SPSS V.20). From the result of the Regression analysis, the quality of road infrastructure in Nigeria will increase GDP per capita by 96.9% for every one percent increase in port infrastructure, Reduce Ship turnaround time by 29.1% for every one percent increase in road infrastructure, Increase by 20.9% for a percent increase in cost of freight and increase by 55.6% for a percent increase in Cargo volume. . And also that expansion in vehicle fleet makes a strong contribution to the revenue generated from the sector. The study therefore concludes that road transport is a critical factor to the development of any nation. Recommendations on how to make the system much more efficient so that the benefits enshrined in the operation of the system could be optimally maximized where presented in the study.

Key Words: **Road, infrastructure, fleet, freight, Portharcourt, Cargo Volume**

CHAPTER ONE

INRODUCTION

1.1 Background of the Study

In spite of the importance of Port Harcourt urban area as the oil city of Rivers State, there has been no attempt to study the dynamics of the transportation network its distribution system, traffics, road congestion, and changes in physical development of the oil city.

The dynamics of the transportation network has to do with spatial data infrastructure (SDI) where a database on transportation network such as existing spatial distribution of roads and their possible links to the roads of neighboring states has been created and up dated using remote sensing and GIS like in advanced country of the world (Igbokwe, 2010). It is known facts that the developments have taken place in Port Harcourt and its environs since the last time the Port-Harcourt street Maps were produced. Because new roads have been constructed and some expanded, the oil City growth has increased and so many other infrastructure changes has taken place.

These new changes need to be documented accurately in such a way that its packages can easily be updated, analysis, queried, managed manipulated and displayed for the purpose of solving complex physical planning, management and development problem (Ejikeme, 2013). This is very important, as the city is rapidly undergoing physical development and upgrade with remarkable

change, in road junctions, bus-stops, congestion, bus routes, stress, loss of travel time.

Therefore there is urgent need to map and analyze the transportation system of Port Harcourt for improved service delivery by professionals in the area of planning, physical development, construction, and environmental management as well as efficiently public utility service delivery

The main city of Port Harcourt is the Port Harcourt city in the Port Harcourt Local Government Area, consisting of the old Government Reservation Area (GRA) and New Layout Areas. The Port Harcourt Urban Area (Port Harcourt metropolis) is made up of the city itself and parts of Obio /Akpor Local Government Area. Port Harcourt city, which is the capital of Rivers State, is highly congested as it is the major city of the state. A law was recently passed by the past State house of assembly to spread development to the surrounding communities as part of the effort to decongest the Port Harcourt metropolis.

The Greater Port Harcourt urban area spans eight local government areas that include Port Harcourt local government, Okrika, Obio/Akpor, Ikwerre, Oyigbo, Ogu/Bolo, Tai and Eleme local governments. Port Harcourt features a tropical monsoon climate with lengthy and heavy rainy seasons and very short dry seasons. Only the months of December and January truly qualifies as dry season months in the city. The harmattan which climatically influences many cities in West Africa is less pronounced in Port Harcourt. Port Harcourt" heaviest

precipitation occurs during September with an average of 370mm of rain. December on average is the driest month of the year; with an average rainfall of 20mm. Temperature throughout the year in the city are relatively constant, showing little variation throughout the course of the year. Average temperatures are typically between 25°C -28°C in the city.

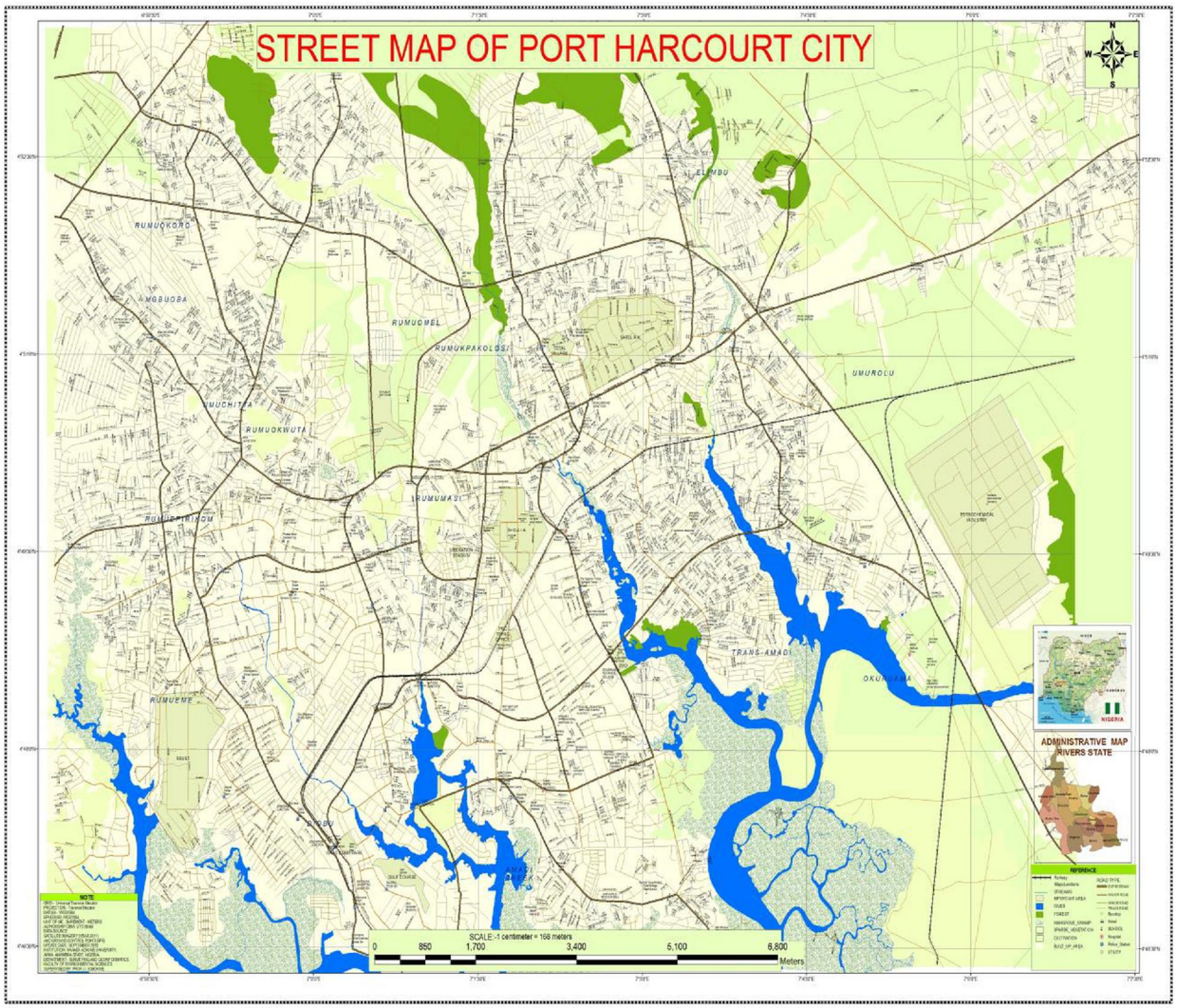

Figure1.1: Street Map of Port Harcourt City

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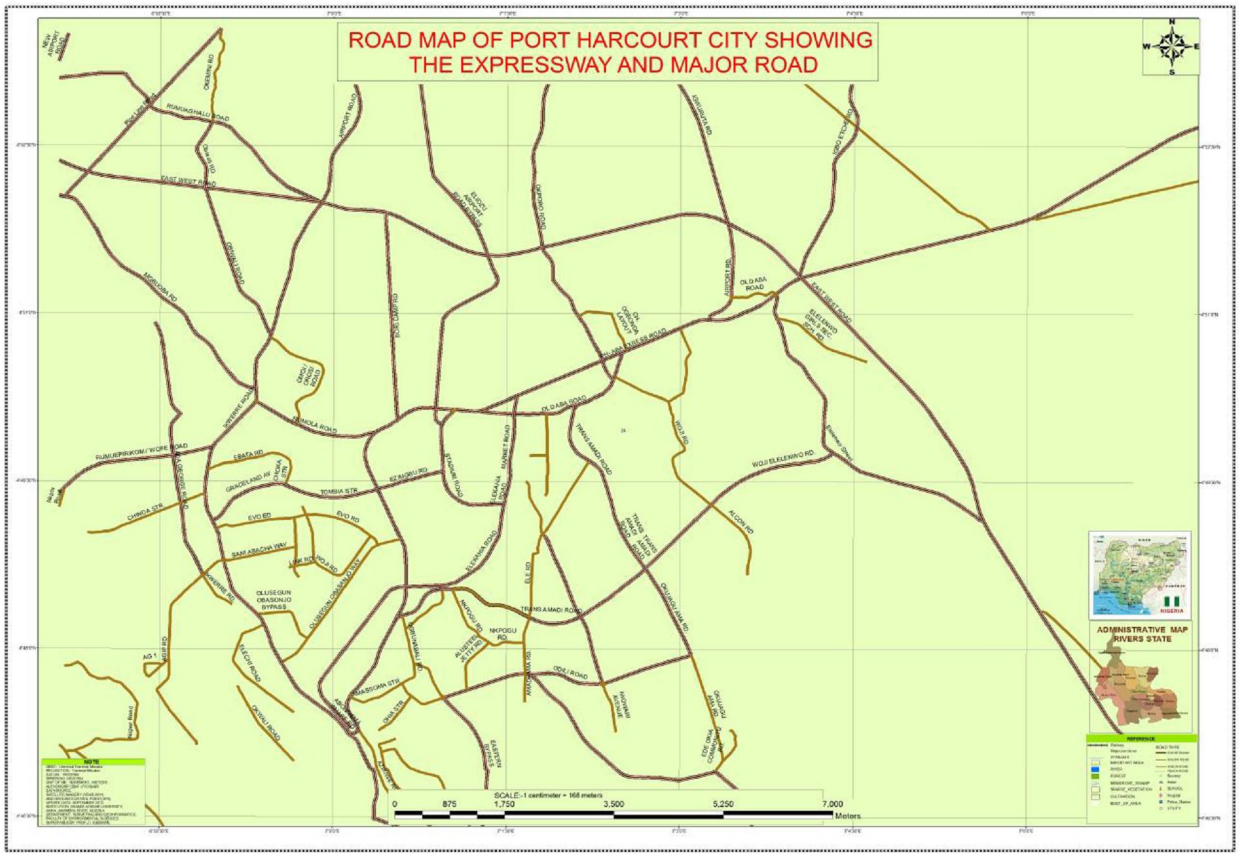

Figure 1.2: Road map of Port Harcourt city

1.2 Statement of Problem

The importance of accessibility is however faced with increased constraints in financing road transport infrastructure as well as the establishment of policies that will create space for the establishment of sound road transport infrastructure. Consequently, governments need evaluation methods for project appraisals which enable their resources to be allocated in the most efficient way while taking cognizance of priorities that will give the greatest returns.

The lack of institutional capacity both nationally and locally has hampered the availability of a harmonized policy that can be applicable in Port Harcourt metropolis to ensure effective management of roads. There is also the issue of old and smaller roads which need to be enlarged and even new ones build to cater for the growing population and the need for these populations to engage economically in enhancing regional integration. Based on previous inadequate research carried out on this area of study, this research aims to evaluate the state of the road transport infrastructure in Port Harcourt metropolis as it is and give recommendations on the way forward in order to accelerate and achieve economic growth and enhance the integration of roads in Port Harcourt . This research will therefore fill in the research gaps left out by earlier researches conducted in this area of study.

1.3 Research Aim and Objectives

The aim of this research is to assess the Effects of port infrastructure development and performance on the Nigerian economy. The specific objectives include To:

1. Assess the relationship between GDP per capita of Rivers State and road infrastructure quality index
2. Examine the relationship between cost of road freight and GDP per capita.
3. Analyze the relationship between volume of freight and GDP per capita.

1.4 Research Questions

This study analyses the objectives of research to derive some findings, thus seeks to answer the following research questions;

1. To what extent does GDP per capita relate with road transport infrastructure in Port Harcourt?

2. To what degree does cost of road freight relate with GDP per capita?

3. Analyze the relationship between volume of road freight and GDP per capita?

1.6 Research Hypotheses

The null hypotheses for the research are as follows;

1. **H_o**:GDP per capita has no statistical significant relationship with road infrastructure quality index
2. **H_o**: cost of road freight has no statistical significant relationship with GDP per capita.
3. **H_o**: volume of road freight has no statistical significant relationship with GDP per capita.

1.6 Significance of the Study

This work shall be of great importance to the government and her transport policy makers as it will provide a deep insight on the importance of the sector thereby motivating them to not only make policies aimed at revitalizing the sector which is marred with so many operational challenges due to inadequate attention from the government on the management and operations of the sector, but also take strategic steps aimed at revolutionizing our road transport sector. The study through insightful literature review, data analysis and discussions shall endeavor to present road transport as the engine of economic development rather than a source of nuisance to the society as it is being perceived in the country and demonstrated in the crusade for developing alternative means of transportation.

The road transport operators shall also benefit from the study in the form of increased revenue brought about by hitch free operations, fleet enlargement and reduction in operational cost when the system is made efficient.

The entire citizens of the country shall benefit immensely from the study in the form of socio-economic benefit resulting from the application of the knowledge gained from the study. Finally, this work shall serve as a foundational source of knowledge for further research on the sector as the engine of economic development.

1.7 Scope of the Study

The study focused on the entire component of the road transport system comprising the infrastructure, vehicles, and the related services, as well as the management of the system with the aim of establishing the overall importance of the sector to economic development.

1.8 Limitations of the Study

The greatest challenge faced by the researcher during the course of the study was that of getting the respondents fill the questionnaire presented to them. So many of them do not understand the significance of academic research and sought for incentives to fill the questionnaire, while others showed lack of knowledge to the issue under study. The researcher however did a lot to enlighten them and convince them respond to the questions presented in the

questionnaire. The absence of reliable source of secondary data was also a great challenge. The researcher had relied on primary data for the justification of the objectives of the research. A great deal of time and resources was spent sourcing for relevant data as required. Finally, time factor was another issue that put the researcher on his toes while carrying out the research as the study was meant to be accomplished within a given time frame. Frankly speaking, a research work enormous as this requires a great deal of time to be accomplished. It is worthy to note that the research is worthwhile as the researcher did not relent in putting in all that it takes to ensure that the objectives of the research were realized.

1.9 Assumptions of the Study

As highlighted in the limitations, not all users were involved in the study – a sample was used to represent the whole population. Another assumption was that the respondents responding to questionnaires did so honestly and objectively.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Conceptual Framework

2.1.1 Transportation Infrastructure Situation in Nigeria: An Overview

The major problems of Nigerian transport system include among others; bad roads network; inadequate fleets of buses and trucks; irregular, insufficient and overcrowded trains and airplanes and congested ports. Besides, there exists scarcity of suitably-trained transport managers and planners, capital investment difficulty, problems of institutional reforms and ineffective traffic regulations. Due to these challenges, the share of transport in the gross domestic product has been very low, and a paltry 3% (http://www .nigerianstat. gov.ng/pages/ download/29).

This situation has never helped the pursuant of accelerated economic development in emerging Nigeria economy and has created abnormal defects in resources distribution and rendered many people deformed and some death due to road accidents and plan crash.

Undoubtedly, the government of Nigeria has in various ways played unqualified roles to reposition transport infrastructure in Nigeria. This intention has been incorporated in the various National developmental and rolling plans. Every government that has piloted the affairs of the country has in one way or the other attempted to improve on transportation infrastructure.

However, the sector is still far from the desired level of development capable of speedy acceleration of economic development of the country.

FRN (2000) points out that Nigeria had about 195,500km road network all over the country. Out of the whole, a proportion of about 32,000km are federal roads while 31,000km are state roads. A large proportion of these roads are so poor due to insufficient investment and lack of adequate maintenance. The four classifications of Nigerian roads are: the federal trunk 'A' roads, owned,managed and controlled by the federal government. Trunk 'F' was initially under the management of the state, but was taken over by the federal government with the intention to ensure its upgrading to federal highway standard and adequate maintenance. Trunk 'B' roads are owned by the state who develop and maintain it while trunk 'C' roads are under the local government ownership and control. Each of the levels of government shared the responsibility of planning, construction and maintenance of roads in each respective domain. This arrangement is to ensure even development of the entire country (Ighodaro, 2009; CBN 2003). Disgustingly, lack of adequate investment has made these roads very poor, and as such has retarded the level of resources mobility over the years, which is associated with economic backwardness effects, in terms of inefficient mobility of inputs of production and low income generation.

The country's present infrastructure situation has been pointed by Sanusi (2012) as one of the main factor debilitating the achievement of the aspired nation's vision of being one of the largest economies in the year 2020.

Besides, the road network of the country is highly poor as about 70% of 193,000 kilometers of roads are in a deplorable condition. However, he also notes that Nigeria is currently allocating 7% of her gross domestic product on infrastructure, which is relative above average in Sub-Saharan Africa, but this is not adequate to propel the economy to the desired level of development.

In October 1958, Nigerian Airways came on board as a Joint Venture between the Nigerian Government, Elder Dempster Lines and British Overseas Airways Corporation (BOAC). This put to an end the operation of West African Airways Corporation (WAAC) that has functioned as commercial aircraft in the country since 1946. After independence, in 1963, the Federal Government of Nigeria acquired the other part of the shares and Nigerian Airways became fully owned by Nigeria. The leaders gradually acquired aircrafts of various types aimed at improving domestic and international journeys. Many airports were built such as the Murtala Mohammad airport was built between 1975 and 1980. Actually, other airports were built between 1980s and 1990s, among which includes airports in Kano, Ilorin, Kaduna, Sokoto, Port Harcourt and Maiduguri to accommodate the largest international aircraft. Nigeria also allowed private

operators and delve into Joint Venture with private Uk-based Virgin Atlantic Airways.

Besides, the country spent heavily to develop aviation industry, establishment of Civil Aviation training Centre for the manpower needed to pilot the aviation industry (Ladan, 2012; Filani, 1993).

Besides, CBN (2009) reports that the reforms in the aviation industry, which commenced in 2007 were reinforced in 2009. International standards for commuters' safety have been aspired vigorously by various bodies in aviation industry such as Federal Airports Authority of Nigeria (FAAN), Nigerian Airspace Management Authority (NAMA) and the Nigerian Civil Aviation Authority (NCAA). Actually, expenditure in this sector over the years has not been enough to achieve all aspired. For instance, there is still inability to tackle Air Traffic Control radar failures, air misses and noncompliant search and rescue organization. The cases of incessant plane crash in the country are associated with lack of adequate facilities to ensure hitch free movement and poor state of some crafts.

The rail transport in Nigeria is not left behind since after independence. The rail system in Nigeria consists of 3 feet 6 inches narrow-gauge single track lanes extending from South-West to North-East and from South-East to North-West. East-West link was not in the link. Some states and Federal Capital Territory was exempted from the link in rail network. Rail system in Nigeria has not

experience adequate attention like roads and airways, and so it has remained underdeveloped with out-modeled tracks, outdated signaling system and facilities. Out of the total 280 railway stations in the country, only 50% remained functional as at 2000. As such, only very few passengers could be attended (Federal Republic of Nigeria, 2000). The regime of Obasanjo in 2000 articulated some strategies and measures aimed at revamping the sub-sector, which includes, among others, the intention to refurbish and rehabilitate the Nigerian Railway Corporation's equipments and facilities; commercialization of the Nigerian Railway Corporation and encouragement of private sector participation in rail operation in the country. CBN (2009) reports that the government increased attention on the Nigeria railway in 2009. The suspended modernization of railway line in 2008 was resuscitated in 2009.Contract for the first phase was awarded for the construction of 186km single track standard gauge railway lines from Abuja to Kaduna at a cost of US$875million,of which over 50% to be provided by the Chinese Government as concessional loan. In addition, Lagos-Kano railway modernization project got more attention and a repackaging of the project into five segments thus: Lagos-Ibadan; Ibadan-Ilorin; Ilorin-Minna, Abuja-Kaduna and Minna-Kano. Apart from improvement of facilities and construction of bridges and culverts, government acquired 25 brand new locomotives engines. The railway sub-sector received boost aimed at improving resources mobility.

The relegation of the railway lines is attributed to the transportation policy which overlooked and sidelined a very useful and cheap means of transport required to encourage the growth and development of privately owned long haulage transport services, which would have assisted revamp the sub-sector. The prevailing transportation policy made the sub-sector a lame duck that relied absolutely on the government subvention, and brought about a disorganized, unregulated private sector owned road transport system supplying freight and passengers services, which resulted into traffic congestion in urban roads; raised rate of fatal accidents due to bad roads, poorly maintained vehicles and careless driving and increased the problem of environmental pollution, which could have been avoided.

2.1.2 The Nexus between Transport Infrastructure and Poverty

Poverty alleviation requires reduction of inequality in rural and urban transportation infrastructural distribution. Poverty reduction or eradication has gained relatively good attention in recent time. The attack on poverty has called for diversifications and vigorous pursuance of actions in some priority sectors such as education, health, financial institutions, civil service and infrastructure. The existence of capital overheads is a pre-requisite for changes in productivity that is capable of improving income generation needed to escape from poverty.

Mwabu (2004) informed that poverty is really a complex human phenomenon associated with unacceptable standard of living. This implies that poverty Air

transport in Nigeria, although it is developing, but the number of airports is not sufficient for the population of the country. Air transport, just like water, railway and road transport in a locality creates different types of benefits such as providing job opportunities, tax revenues generation, makes for easy conveyance of varieties of inputs and outputs within and outside the territory and contributes to the gross domestic product (GDP). Besides, the connections created between cities, regions and markets show a significant infrastructure asset which brings relevant benefits that promotes foreign direct investment, business conglomerates, specialization and other positive externalities required for enhancing productive capacity of a country. For instance, the Nigeria aviation sector contributed 0.4% to the GDP, supports 159,000 jobs and pays over N8.5 billion in various taxes and other forms of taxes derivable from services offered (Oxford Economics, 2012).

These benefits could be more than that if sufficient air transport exists in the country. Actually, there is multiplier effect of such air transport investment in an area, in that it does bring about other investments such as hotels, artisans, business centres, private security agents and forms of businesses which in one way or the other cater for the main investment and impacting desirably to productivity. The contribution to gross domestic product and other benefits derivable is capable of raising the income generation of all economic agents in the country, thereby reducing unemployment, raising aggregate resources

capacity utilization, further reposition income generation, enhancing economic activity and tackling poverty. Besides, the existence of air transport in area attracts tourists with its associated positive effects to the host community in form of increased demand of products and services.

Scholars have pointed that adequate infrastructure network connectivity has the advantage of ensuring easy access to historical cities and proximity to transport networks have a moderate positive causal effect on per capita gross domestic levels across sectors which shows that factor mobility within an economy plays significant role in determining the economic benefits of infrastructure development. This implies that revamping an economy in the quest for poverty reduction also necessitates sufficient investment in transportation infrastructure. From the aforementioned, it suggests that Nigeria has much to do in the transport infrastructure in virtually every state so as to reap the benefits of adequate infrastructure network connectivity.

2.1.3 Wayforwd for Improving Transport Infrastructure

Restructuring transport infrastructure can be said to be positively related to poverty alleviation considering the multiplier effect of its establishment in employment creation, productivity increase and income generation.

The positive effect of the investment in the sector tends to reduce the number of people who do not earn income due available ones are in a deplorable state and lack maintenance. Really, the study has shown that the chain effects of

improved transport infrastructure have a great power to create different development opportunities that are perceived to enhance efficient and effective resources mobilisation and utilization, which benefits economic agents in varieties of ways and thereby reposition employment, income generation and change the poverty trend.

The study has contributed to knowledge as it has exposed severe shortfall in transport infrastructure in Nigeria, and reaffirmed the fact that pursuant of development intention and poverty alleviation necessitates adequate investment in transport infrastructure, especially in the rural areas.

The status of Nigerian transport infrastructure during the period of military rule was far from satisfactory in spite of the sectoral allocation. A remarkable change came up as from the year 2000 during the regime of President Obasanjo. At present, although changes are going on as put in place by President Goodluck Jonathan but there is the need to intensify action on the part of the various tiers of the government to improve transportation infrastructure so as to encourage efficient, effective resources mobilization, poverty reduction and national development to upsurge of employment opportunities and assist in putting food on the table of many people. In this regard, we hereby pinpoint some of the ways that will help restructure transportation infrastructure in Nigeria.

(i) Dredging of rivers and waterways in the country for easy movement should be practical and vigorously pursued. In addition, air ports and railways need be pursued strongly. The federal, the state and local governments have to collaborate to ensure the realization of this intention. Procrastination has never helped a developing economy in any way. Obayelu (2007) posits that the importance of infrastructure for economic growth and development cannot be overemphasized. The poor state of electricity, transport and communications is a major handicap for doing business in Nigeria.

(ii) It is imperative for the government to open doors to foreign private investors in this sector. This is because capital has been considered a debilitating factor in infrastructural investment. But the caveat is that adequate and conducive environment has to be provided which must be highly beneficial and appealing considering other seekers of such international investment.

(iii) The government has to reduce cost of governance or recurrent expenditure and invest more on transport infrastructure which is capital intensive. This call for sacrifice and reform of the ways resources are allocated and utilized.

(iv) Resources managers must be sincere to themselves and guard against appropriating public funds for self at the expense of the society. This is one of the hallmarks for restructuring transport infrastructure given the antecedents of some leaders over the years, which led to the country being perceived as one of the most corrupt countries of the world by the Transparency International

(2011).In similar vein, Uma and Eboh (2013) point that corruption is one of the greatest obstacles to the development of the Nigerian economy as it has brought about high level selfishness, misallocation, diversion and improper allocation of scarce resources.

(v) Nigerian professionals in Diaspora should be co-opted to assist the country with technical knowledge, funding, direct and indirect support in any way possible to restructure transport infrastructure. Also domestic investors can be encouraged to invest in road construction or other transport infrastructure provision and possibly recoup investment cost and profit through toll gates or other forms of taxes for a specific time period which consumers of the facilities will willingly pay.

(vi)The federal, state and local governments should intensify efforts in providing mass transportation to minimize the difficulty of traveling experiences by the people.

2.2 Theoretical Framework

This study was guided by the theory of hegemonic stability. According to Gilpin (2000) the basic assumption of the theory of hegemonic stability is that a hegemony is central to maintaining adherence to moderate international economic countries, and by extension peace and stability, through minimizing the costs of maintaining this economies for example by providing access to its own market rather than through coercion. Hegemonic Stability Theory is based

on wide research that indicates that the international system is more likely to remain stable when a single nation-state is the monopoly.

Thus, when an existing monopoly collapses or the state of no superpower diminishes, then the stability of international system is greatly affected. When a monopoly exercises its powers over other regimes by whichever methods or means then the monopoly is seen to be actually exercising its super powers. This is called hegemony, which refers to a state's ability to single-handedly dominate the rules and arrangements of international political and economic relations. (Fujimura, M., 2004).

Modal choice represents an important household’s travel characteristics in transportation research. There are many theories available in the literature to explain transportation planning. These include travel demand model, gravity model, residential location model, traffic assignment model and modal split model. The theory that we consider very appropriate to explain transport services in this context is the modal split model. According to the model, different modes of urban transport are available to urban commuters; these include cars, buses, walking, motorcycles, taxis, ships or trains. The choice of a particular mode would depend on such factors as the trip type, trip purpose, the level of satisfaction of transport services, transport fare / cost associated with the available modes, comfort and income of the commuters (Adetunji, 2010; Ogunsanya, 1986; Okonko, 2000).

In a study of urban mobility patterns in Ilesa in South western Nigeria, Adetunji (2010) reported that the household's income affects the modal choice of urban resident. According to him, high income earners travel by their personal cars to different activity patterns while the low income earners commute by foot for short distances and rely on public transport services for which exorbitant fares are charged.This is contrary to what exists in some other countries of the world, particularly in China where the train is the principal mode of transport for all categories of trips by urban residents while the local trips are made by public transport services (buses and taxis) which are cleaner and more comfortable.

2.2.1 Road Pricing in Theory

It would now be the general consensus that congestion is a price problem and not an infrastructural or supply problem. Following conventional neo-classical economic theory, solving this problem should thus be left to the price mechanism. However, left to itself the market produces too much urban motoring. An increase in general wealth induces an increase in car ownership and consequently, through increased congestion, a decrease in welfare.

Thus the main idea behind road pricing is to seek to increase welfare by internalising externalities and as a result include the social costs of urban motoring in the price charged. What are the gains to be made by reducing the externalities of road traffic? These have been calculated in a number of different ways by different agencies but the basic theory stays the same: shadow-prices.

Shadow-prices are a way to correct market prices in order to reflect social costs (Barrett, 1991). In the case of congestion the following would have to be taken into account: time savings which could be related to earnings gained by time saved, the spill-over effects of air pollution on health and infrastructure, as well as noise and visual nuisances on the population living in the surrounding areas. This last point is characteristic of neighbourhood effects as the people affected by the problem are not necessarily the ones using the product.

Other taxes on transport such as petrol tax and car tax are not efficient in reducing the externalities involved as, in the case of car taxes, the tax is not related to use at all. Thus the price mechanism needs to directly target the cause of the congestion, i.e. the people that are using their cars in certain zones at peak times.

As a consequence, an efficient congestion charge would be one that takes into account all these negative spill-over effects and charges motorists the true cost of their journey. Making them aware of this price would lead them to evaluate the marginal utility of their trips and consequently force them to postpone their less urgent travel needs to off-peak times. It would transfer taxation from those who purely own vehicles to those who use them the most. Bobel, I. and de Rham, C. (2004)

2.2.2 Models of Road Classification and Hierarchy

According to Lawal (2000), most transport systems are hierarchical, they are purposely designed to suit specified requirements. The principal functional categories are local, intra-city, intra-regional, inter-regional, inter-continental, and intracontinental. Roads may be classified into those constructed as highway primarily for purpose of acting as traffic routes, and those laid out by developers primarily to give access to building plots. Road may be classified based on function and from traffic point of view, by three generic types of roads which are arterial, sub-arterial and local.

In arterial and sub-arterial types the interests of traffic are regarded as absolute while traffic consideration is entirely subordination to needs of frontages, local population and pedestrian in the local category, which is also known as minor.

The classification and nomenclature of road according to functions are arterial road, through road, and local through. Arterial roads serve the whole region of a country and linking up the main centres of population with the various regions through road carries traffic with origin outside the town and its destination inside the town or vice versa while local through carries traffic with origin in one part of town and its destination in another part. Roads consist of a number of structural components some of which constitute carriageway, footpath, haunch, channel, kerb, width, quality, length, and density. A street is a road that has urban characteristics or as urban place, serving as a right of way and having

variety of official designations and other possible bases for distinction (Marshall, 2005), while ICE (1996) opines that any particular street will tend to have “multiple personalities”, consisting variety of different characteristics that are present simultaneously.

2.3 Empirical Review

The relationship between transport infrastructure and economic growth has attracted a lot of research effort and attention from economists, policy makers and politicians since the early 1990s. (Gramlich, 1994) said it remains essentially unclear whether the direction of causation is from transport infrastructure to economic growth or vice-versa or both.(Kessides, 1996) notes that one of the main shortcomings of research on the economic impact of transportation infrastructure is that it has so far not adequately accounted for simultaneity effects on which economic growth can lead to development of the transport system as well as result from it. Several previous studies could not confirm the direction of causation between the development of the transport sector and economic growth. In addition, most of these studies have typically relied on cross-sectional or panel data regressions. A general problem associated with such studies is that they implicitly impose or assume cross-sectional homogeneity on coefficients that in reality may vary across countries because of differences in geographical, institutional, social and economic structures. Hence, the overall results obtained from these regressions represent only an

average relationship, which may or may not apply to individual countries in the sample (Bloch and Tang, 2003).

The adequacy of road transport infrastructure determines a country's success and another; failure in diversifying production, expanding trade, coping with population growth reducing poverty, or improving environmental conditions. A good road transport infrastructure raise productivity especially in the agricultural sector of the economy and lowers production costs. In Nigeria, the link between where the major production activities take place and where it is needed for final consumption need good road transportation that will bridge the gap, although the precise linkages between infrastructure and development are still open to debate. However, according to the World Development Report, 1994 infrastructure capacity grows step by step with economic growth.

Good road infrastructure services helps the poor contribute to environments sustainability. Clean water and sanitation, non-polluting sources of power, safe disposal of solid waste, and better management of traffic in urban areas provide environmental benefits for all income groups. The urban poor often benefit most directly from good road infrastructure services which mitigates standard of living conditions characteristic of concentrated settlements such as unsanitary conditions, hazardous emissions, and accident risks.

Integrated urban planning and transport policy can lead to more efficient use of both land and transport capacity with favourable environmental results.

Expansion of transport infrastructure can reduce total pollution loads as congestion falls, average .Vehicle speeds rise, and routes are shortened. Road improvements can also encourage vehicle use and decrease emissions. Therefore, additions to infrastructure capacity are only part of the solution. Improved management of traffic and land use and promotion of non-motorized modes, cleaner fuels, and public transport are also important.

Empirical work by Aschauer (1989) on the United States has provided evidence of a strong and positive relationship between public investment in infrastructure and growth over the period 1949-1985. He asserts that the decrease in public investment may be crucial in explaining the US economy‟s relatively poor economic performance between 1970s and 1990s. This finding has been confirmed in some subsequent studies, but challenged in others. For example, the World Bank‟s World Development Report (1994) finds a large range of empirical results on the importance of infrastructure for economic growth, with estimates ranging from no effect, to rates of return in excess of 100% per annum.

Using cross-country data, Easterly and Rebelo (1993) find a positive effect of investment in transport and communication on economic growth. Sanchez-Robles (1998) also find a positive impact of road length and electricity generating capacity in explaining subsequent economic growth. Aschauer (2000) finds that the stock of public infrastructure capital is a significant

determinant of aggregate total factor of productivity and that investments in public sector not only improve quality of life but also increase economic growth and returns for private investments. The findings of Demetriades and Mamuneas (2000) indicate that public infrastructure capital has significant positive long-run effects on both output supply and input demands in 12 OECD countries. Boopen (2006) analyses the contribution of transport capital to growth for a sample of 38 Sub- Saharan African countries using both cross-sectional and panel data analysis. In both sample cases, the analysis concludes that transport capital has been a contributor to the economic progress of these countries. Result of Seethepalli (2008) also proves that infrastructure is important for promoting growth in East Asia.

The results obtained by Montolio and Solé-Ollé (2009) support the idea that productive public investment in road infrastructure has positively affected relative provincial productivity performance in Spain. In contrast, Tatom (1991; 1993), Holtz-Eakin and Schwartz (1995) and Garcia-Mila (1996) suggest that there is little evidence of an effect from infrastructure to economic growth in a panel of U.S. state level data, particularly when fixed effects are included. It is interesting to note that even though the relationship between transport infrastructure and economic growth has attracted a lot of research effort and attention from economists, policy makers and politicians in the early 1990s (Gramlich, 1994), it remains essentially unclear whether the direction of

causation is from transport infrastructure to economic growth or vice-versa or both. Kessides (1996) notes that one of the main shortcomings of research on the economic impact of transportation infrastructure is that it has so far not adequately accounted for simultaneity of effects-economic growth can lead to development of the transport system as well as result from it.

Previous studies based on Cobb-Douglas production function could not confirm the direction of causation between the development of the transport sector and economic growth. In addition, most of these studies have typically relied on cross-sectional or panel data regressions. A general problem associated with such studies is that they implicitly impose or assume cross-sectional homogeneity on coefficients that in reality may vary across countries because of differences in geographical, institutional, social and economic structures. Hence, the overall results obtained from these regressions represent only an average relationship, which may or may not apply to individual countries in the sample (Bloch and Tang, 2003). Results obtained by Ashipala and Haimbodi (2003), Canning and Pedroni (2008) and Egart et al. (2009) lend support to this view.

The World Development Report noticed that as the economy develops, an increasing proportion of the country would need to open up by the construction of roads (World Bank, 1994). Work by Fernald (1999) provides evidence that increasing the road stock induces faster productivity growth in those industries

that use reading more intensively, implying that the causation is more likely to be from infrastructure investment to output growth, rather than the other way around. Based on a cross-regional study comparing infrastructure provision in Spain and the US. De la Fuente (2000) also concludes that causality flows from infrastructure investment to economic growth. Other studies have used the VAR approach to solve the problem associated with the endogeneity of public investment in the production function approach. Majority seems to agree with the theoretical postulation that public investment has a positive effect on output. Among these are Queiroz and Gautam (1992) who find road infrastructure to be significant factor of economic growth and development.

Mittnik and Neumann (2001) also establish that public investment has positive influence on GDP. However, there is no significant causal link running from GDP to public investment. Their results provide evidence for a complementary relationship between public and private investment. Using time series data for the US economy and cointegration analysis, Lau and Sin (1997) reject the endogenous growth model for the US economy. Looney (1997) analyses the effects of several types of public infrastructure in Pakistan and finds that public infrastructures have not been instigating private sector expansion but have been rather a response to the needs of the sector. Mamatzakis (2002) finds a positive effect of public infrastructure (ports, railways, roads, electricity and communications) on output and private capital productivity of the Greek

industrial sector. He also finds that the causal relationship is from public infrastructure to productivity. Canning and Pedroni (2008) investigate the consequence of various types of infrastructure provision in a panel of countries. They show that while infrastructure does tend to cause long-run economic growth, there is substantial variation across countries.

Ashipala and Haimbodi (2003) look at the relationship between public investment and economic growth in South Africa, Botswana and Namibia using the VECM methodology. They find that the effect of public investment on growth is not significant however, it has the correct sign. On the other hand, private investment is shown to have a long run growth impact in South Africa and Namibia. However, they find evidence indicating a reverse causality from GDP growth to public investment. The causality is negative in the case of Botswana suggesting that as the economy grows investment in public goods declines, which contradicts both the Keynesian theory and Wagner‟s law. Nurudeen and Usman (2010) use cointegration and error correction methods to analyze the relationship between government expenditure and economic growth in Nigeria. Their results reveal that government total capital expenditure, total recurrent expenditures, and government expenditure on education have negative effect on economic growth. On the contrary, rising government expenditure on transport and communication results to an increase in economic growth. Finally, Pradhan (2010) explores the nexus between transport infrastructure (road and

rail), energy consumption and economic growth in India over the period 1970-2007. He finds evidence of unidirectional causality from transport infrastructure to economic growth.

2.4. Benefits of Road Transport Infrastructure

The improvement of travel conditions resulting from road transport infrastructure investment has wider impacts on the road network by inducing and effecting demand on a cross modal basis as well as improving reliability and quality of transports service (OECD, 2006). Some of the benefits which have been realized as a result of the existing transport infrastructure are enhanced accessibility, employment, efficiency and social inclusion.

2.4.1. Accessibility

The primary and most important aspect of an economic activity is mobility. The reason is that it satisfies the vital need or desire of going from one place to the other. There is also the need for mobility that is shared by passengers, freight and information. Most regions in the world do not share the same level of mobility and this is because other regions are more developed than the others in regard to the different modes of transport in those regions. Economies that possess greater mobility are often those with better opportunities to develop than those with scarce mobility (Chymera, 2006).

Where there is reduced mobility it is evident that development and enhancement of regional integration will be hindered while greater mobility is a catalyst for

development and regional integration (Bonhet, and Rail-Volution,2012). In any given region, economic development and regional integration is indicated by the mobility levels in that region. To provide this sort of mobility to the different players in the economy in providing employment, offering services to customers, investing the capital and generating income, great emphasis has to be put in the road transport infrastructure. Economic importance of the transportation industry can be assessed from a macroeconomic and microeconomic perspective (Gwilliam, and Judge, 2008).

In many cases, the objective of transport infrastructure investment is to improve the accessibility of a given region by reducing travel time or increasing the potential to travel.Accessibility can be measured as the quantity of economic or social activities that can be reached using the transport system. Improvement in accessibility will increase the market size for manufacturing, tourism and/or labour, leading to increased competition and/or centralization. On the other hand, the impact for the region concerned could be both positive and negative, depending on its initial level of competitiveness.

2.4.2. Employment

The additional value and employment effects of transport services usually go beyond employment and the additional value generated by that activity; indirect effects are significant. A case in point is where a transport company opts to acquire a part of their inputs from a local supplier.

The production of these inputs generates additional value, market and employment in the regional economy and the suppliers in turn purchase goods and services from other local companies in the region.61 Likewise, households that receive earnings from employment in the transport industry also use some of that income on goods and services produced locally. Because of this sort of spending, more local jobs are created for the youth and therefore growing the economy of the member countries which ultimately grow and enhance regional integration.

Thus, from a general perspective the economic impacts of transportation can be direct, indirect and related. Regional employment is an important government objective and goal and therefore, most countries in the region put a lot of emphasis with a view of achieving the employment goals in their countries. The impacts of roads transport infrastructure allows for increased employment which may be either direct or indirect and as a result positively impact on the development and enhancement of regional integration. Direct and indirect employment linked to the operation and maintenance of transport infrastructure is largely related to the level of traffic.

2.4.3. Efficiency

For any industry especially in the road transport infrastructure to be efficient in any given region, mobility from one point to another, time taken to access various points of production and cost savings arising from the transport

infrastructure would allow productivity gains to be achieved by improving their production and distribution63. The ability to access the market will create both new business opportunities and increased competition, leading to further increases in returns. The market will be expanded to the advantage of those companies which are able to adjust to the increased market centers. In conclusion, the road transport infrastructure could be said to have an impact on investments and income on investments and hence improve economic growth and regional integration.

2.4.4 Growth of towns

With the improvement, rehabilitation and expansion of the road transport infrastructure in the region, towns are set to come up to accommodate the truck drivers who make stops along the roads either for rest or at a weighbridge. For example, Mlolongo town has a weighbridge where tracks from Tanzania or Mombasa make stops for the weighing of their axle loads and the same applies to the trucks going to those destinations. Also where road infrastructure has been constructed or expanded, other than small towns coming up, high cost of living is experienced, the value of property also goes up and employment is created all of which are an impact of road transport infrastructure and enhances economic growth. This is as shown by the figure below on backward and forward linkages.

Figure 2.1: Backward and forward linkages

Source: Emerald Insight Images 2011

2.5 Geographic Information System Transportation Analysis and Modeling

GIS transportation applications have benefited from many of the standard GIS functions (query, geo-coding, buffer, overlay, etc) to support data management analysis, and visualization needs; like many other fields, transportation has developed its own unique analysis methods and models. Examples include shortest path and routing algorithms *e.g. traveling salesman problems, vehicle routing problem), spatial interaction models (e.g. gravity model), network flow problems (e.g. minimum cost flow problem, maximum flow problem, network flow equilibrium models), facility location problems (e.g. p-median problem, set covering problem, maximal covering problem, p-centers problem), travel demand models (e.g. the four-step trip generation, trip distribution, modal spilt, and traffic assignment models), and land use-transportation interaction models. While the basic transportation analysis procedures (e.g. shortest path finding) can be found in most commercial GIS software, other transportation analysis

procedures and models (e.g. facility location problems) are available only selectively in some commercial software packages. Fortunately, the component GIS design approach adopted by GIS software companies provides a better environment for experienced GIS transportation users to develop their own custom analysis procedures and models.

It is essential for both GIS transportation practitioners and researchers to have a thorough understanding of transportation analysis methods and models. For GIS transportation practitioners, such knowledge can help them to evaluate different GIS software products and choose the one that best meets their needs. It also can help them select appropriate analysis functions available in a GIS package and properly interpret the analysis results. GIS transportation researchers, on the other hand, can apply their knowledge to help improve the design and analysis capabilities of GIS transportation.

2.6 GIS Transportation Applications and Modeling

2.6.1 GIS Transportation Applications

GIS transportation is one of the leading GIS application fields. Many GIS transportation applications have been implemented at various transportation agencies and private firms.

They cover much of the broad scope of transportation and logistics, such as infrastructure planning and management, transportation safety analysis, travel demand analysis, traffic monitoring and control, public transit planning and

operations, environmental impacts assessment, intelligent transportation systems (ITS), routing and scheduling, vehicle tracking and dispatching, fleet management, site selection and service area analysis, and supply chain management. Each of these applications tends to have its specific data and analysis requirements. For example, representing a street network, as centerlines may be sufficient for transportation planning and vehicle routing applications.

A traffic engineering application, on the other hand, may require a detailed representation of individual traffic lanes. Turn movements at intersections also could be critical to a traffic engineering study, but not to a region-wide travel demand study. These different application needs are directly relevant to the GIS transportation data representation and the GIS transportation analysis issues discussed above. When a need arises to represent transportation networks of a study area at different scales, what would be an appropriate GIS transportation design that could support the analysis and modeling needs of various applications? In this case, it may be preferable to have a GIS transportation data model that allows multiple geometric representations of the same transportation network. Research on enterprise and multi-dimensional GIS transportation data models discussed above aims at addressing these important issues of better data representations in support of various transportation applications.

With the rapid growth of the Internet and Wireless communications in recent years, a growing number of Internet-based and Wireless GIS transportation applications can be found.

People to get driving directions frequently use web sites such as Google Maps and Map quest. Global Positioning System (GPS) also are available as a built-in device in vehicles or as a portable device. With the aid of wireless communications, these devices can offer realtime traffic information and provide helpful location-based services (LBS) (e.g., finding the closest ATM location based on the current traffic conditions). Another trend observed in recent years is the growing number of GIS transportation applications in the private sector, particularly for logistic applications. Since many businesses involve operations at geographically dispersed locations (e.g., supplier sites, distribution centers/warehouses, retail stores, and customer sites), GIS transportation can be useful tools for a variety of logistics applications. Again, many of these logistics application are based on the GIS transportation analysis and modeling procedures such as the routing and the facility location problems. GIS transportation is interdisciplinary in nature and has many possible applications. Transportation geographers, who have appropriate backgrounds in both geography and transportation, are well positioned to pursue GIS transportation studies.

2.6.2 GIS Transportation Modeling

There is a powerful synergy between GIS and transportation modeling systems. By using GIS with a transportation-modeling package, it is possible to extend modeling capabilities and open up new possibilities for development using, and maintaining transportation data.

2.6.3 Road transport infrastructure in Africa

Despite the importance of road transport infrastructure in enhancing connectivity and access between neighboring countries, one is saddened by the reality that the road network in Africa is still not adequate enough to serve the economic undertakings of countries that largely depend on roads for transportation of goods and people. Kessides (2012) captures this unfortunate scenario when he observes that Africa's road density is substantially lower than in other developing regions: 204 Kms of road per 1,000 square Kms with only one-quarter paved, compared to a global average of 944 Kms per 1,000 square Kms with more than one-half paved.

Beuran (2013) and others indicate that in the Sub-Saharan Africa, road transport is the most used mode of transportation, carrying over 75% of passengers and freight yet more than 50% of these roads are in poor condition due to poor management of road maintenance. This situation has seriously jeopardized economic growth and poverty reduction in the sub Saharan Africa.

2.6.4 Bus Rapid Transit (BRT)

According to online definition and concept, Bus Rapid Transit is described as a high capacity urban public-transit system with its own right-of-way. The expression BRT is mainly used in the United States of America, while in Europe and Australia, it is often called busway. It espoused that the system uses buses on a wide variety of rights-of-way, including mixed traffic, dedicated lanes on surface streets, and busways completely separated from other traffic.

Levinson et al (2001), in Bus Rapid Transit – Implementation Guidelines, posited the system as "A flexible, high performance rapid transit mode that combines a variety of physical, operating and system element, into an integrated system with a quality image and unique identity."

The two concepts agreed that the system is unique and flexible, and tailored to meet ever challenging traffic of a particular environment. This physical environment encompass route segment which is also known as corridor where the vehicle operates in a dedicated manner.

In his submission, Abii (2009) states that BRT system has existed for over three decades in Latin America, and has just been added to Africa's transport mode as part of the drive towards sustainable urban transport. The principle of BRT is to stimulate a mass transit system using exclusive rights of way lanes in line with the metro system as known in developed countries, using bus technology instead of rail. The BRT, with dedicated right of way lane and cleaner

technology has proved to be useful in many Asian and Latin American countries. The BRT is said to be cost effective and draws on best practices from modern metro systems in managing its operations, including pre-board fare collection, fare verification, enclosed stations that are comfortable, clear route maps and real-time information displays.

Siveknmar et al (2008), also posit that BRT is a mode of transportation with great flexibility with main features such as:

i) “Provision of means of separation from mixed traffic. This could be done along or partially on the bus route or by creating a bus lane by road markings or through the provision of slightly raised median.

ii) Provision to guide on boarding and alighting from facility for pre collection of fare and provision of quality low floor bus

iii) Provision of unique appearance of buses, bus stops and lanes

iv) Provision of additional priority measures at grade intersections with provision for passenger information at stations or on-board.

v) Provision of feeder system such as Park and Ride system.

vi) Provision of integrated and coordinated information technology system incorporating signal priority, vehicle tracking to real-time and passenger information to enable pre-planned trip

The above operational features are fundamental to the success of BRT scheme in any part of the world. This is adopted by the researcher to serve as benchmark for BRT operation in Lagos and FCT.

The United States Department of Transportation, Federal Transit Administration (2001) defines BRT as a flexible form of rapid transit that combines advanced bus technologies and innovative bus operations with management techniques into an integrated system that can provide enhanced transportation services equivalent of light rail transit system. The goal of BRT scheme is therefore to increase the level and quality of bus service through the integration of vehicles, facilities, services and intelligent transportation system (ITS). As a result, bus service can become safer, more reliable and dependable mobility option.

To further give clarity to the subject of study, the following key words would be considered and adopted for better understanding of the BRT operation. These include:

i) Right-way: A dedicated bus lane which allows the bus to operate separately, without interference from other modes of traffic. In most cases these lanes are physically separated while in other places there are merely separated with markings.

ii) Bus Priority/Intelligence Transport System (ITS): Preferential treatment is given to buses at intersections through the extension of green light time or activation of the green light upon detection of an approaching bus.

iii) Branding: For purpose of identity, all BRT buses are branded in same colour. The brand's identity contributes to its attractiveness, as an alternative to striving cars.

iv) Level Boarding: Unlike the conventional bus stops, BRT systems features low buses to speed passengers boarding and enhance accessibility.

v) Stations: BRT systems feature significant investments in building shelter/enclosed stations, which may incorporate attractive sliding glass doors or windows for smooth ticketing. This style of station is seen through the operating corridors in Lagos Nigeria, Bogata in Columbia, Ottawa and Cleveland in the United States of America.

2.7 Traffic Management Measures Practiced in Nigeria

The practice of traffic management has a long history in Nigeria even though there is still a lot of room for improvement in the area. The concern with traffic was the initial preoccupation of civil engineers and city planners until the fad of land use transportation planning started in the late 1960s. Since that time, urban transportation concerns have widened in scope and focus by drawing on the

social science concept of a system, which enabled the city to be viewed as an urban system with transport as a sub-system of the urban area or the city. Yet some stakeholders still think in terms of traffic planning and management despite the wider objectives of transport, thus limiting the scope of the initiatives and the instruments that may be available for sustainable mobility in the urban area.

The following short-term measures have been used in the management of traffic movement in Nigeria: (1) traffic control by use of traffic police or wardens, and by use of traffic lights, as already mentioned (2) traffic control by use of speed breakers, such as speed bumps or humps (3) enforcement of existing regulations, such as violations of safe driving and the use of defective vehicles.

Both the Vehicle Inspectorate Divisions of state Ministries of Works and Transport and the FRSC conduct periodic checks on vehicle users in cities as a means of controlling unsafe road usage that can lead to vehicle break-down which slows or completely obstructs the traffic. The FRSC free vehicle safety checks take place every quarter of the year. The exercise conducted in the last quarter of 2010 revealed that of the total of 15,198 vehicles (including 618 motorcycles) that were checked, 21,475 defects were detected in them. This brings the prevalence of defects in vehicles in use at that time to about 1.4 per vehicle.

Another enduring means of traffic control used by FRSC is the use of policy orders. The major objective of policy orders is the prevention of road crashes through proactive regulatory enactments aimed at influencing behaviour. The most prominent existing policy orders of FRSC are (1) the Use of Seat Belts (2003) (2) the Use of Safety Helmet (2009); (3) prohibition of overloading and (4) prohibition of phoning while driving (2009). The impacts of these policy orders are yet to be formally evaluated in the context of a research programme, but there is no doubt that the import of the orders has affected transport-behaviour in Nigeria.

2.7.1. Travel Demand Management (TDM) in Nigeria

The object of travel demand management is to control rising congestion levels, deter further growth in car use and address the negative impacts of traffic and congestion on transport efficiency and the environment (CFIT World Review of Road Pricing, 2006). Nigeria is yet to try any of the standard methods of travel demand management used to combat congestion. Although road pricing is often canvassed, the TDM method previously employed in the Lagos area was described as the Even-Odd Number System of road use allocation. Under the system; cars and vehicles with even registration numbers alternated with cars and vehicles with odd registration numbers in the week days when they were prohibited or allowed to travel to the central areas of Lagos. The scheme appeared to have worked well for some months and there were claims of

substantial improvements in congestion levels before it was aborted, obviously, on political grounds. After that, no further efforts have been made to use a similar TDM measure in a Nigerian city.

2.7.3. The Role of Road Pricing in Travel Demand Management

According to CFIT Review on Road Pricing (2006), road pricing has been successful as a travel demand management measure in some countries notably

a. In Singapore where Road Pricing has been operating successfully since 1975, with Electronic Road Pricing (ERP) introduced in 1988. The ERP scheme reduced traffic in the area by about 13% and increased average speed by up to 24%.

b. In London, where the Central London Congestion Charging scheme has been successful by reducing traffic in the central London charging zone by up to 30%.

c. In Stockholm where a six month trial of Road Pricing ended in July 2006. Overall, 51% of the residents of the Stockholm area voted in favor of a permanent Road Pricing scheme.

d. In Trondheim, Norway, where a Road Pricing system operated between 1991 and 2005 and reduced traffic by up to 10%.

2.8 Road Transport Service

Road transport ranging from the mule tracks and to modern highways is the most universal mode of transport (Areola et al., 1997). Local people has

benefited from road usage more than any other means of transport. Railways and water ways link large center and flying is a luxury mainly for the wealthy. But as soon as one steps out of the house, one treads on roads of some kind. They are so universal that men take for granted that they exist. And never pause to think of the tremendous effort that has made them possible. Road transport service includes Private automobiles, passengers and buses services which serve numerous needs, trucks, lorries and vans which are becoming increasingly important in competing with railway as freight carriers. Their flexibility is their greatest advantage over other modes of transport. In recent years, many railway companies have found increasing difficult in competing effectively with various modes of motor transport. Private cars, long-distance taxis and chartered coaches have largely replaced trains for passenger transport. In Nigeria, the big trailer lorries usually seen along the roads between the northern and the southern part of the country have seriously and successfully challenged the domination of the railway in long distance haulage between the northern and southern parts of the country. Such 12-wheeler trucks carry groundnuts and cotton to the ports in the south, and as a back-haul takes imported goods and kola nuts, for example, to northern towns.

2.8.1 Demand for Road transport Service

The demand for transport service is a derived one, because it depends on the demand for the commodities carried or the benefit of personal travel and each

travel is unique in time and space. It increases with the extension of the input-output relationships of an economy. The demand for road transport originates from categories of users, ranging from passenger cars & trucks to motorcycles, bicycles and passenger buses, depending on the purpose of travel. Figures for the United Kingdom suggest that individual car travel is used primarily for shopping, leisure and going to work, with an average of 641 car journeys per person every year(Papi et al., 2007).

The demand for freight traffic originates first from the purchase of goods and services by end users, which require the transfer of raw materials to the manufacturing site, followed by the distribution of products from the manufacturing site to the final point of use via the point of sale. Many sectors strongly depend on road networks, with considerable assets invested in vehicles, petrol, food, logistics, road haulage transport, etc. A case study of Nokia corporation as presented by Papi et al. (2007), shows that road transport is at the heart of the efficient operation of the company which owns seven manufacturing plants and operates seven days per week, turning out seven telephone sets every second, with each phone comprising of more than 200 components, it is easy to understand why logistics is one of Nokia's key priorities. Road transport according to Papi et al. (2007) provides the company with the means to deliver 54% of materials to its EU-based plants (97 tonnes/day) and to export 60% of the finished goods. The unquestionable

advantage of road freight is that manufactured phones can be collated onto pallets and located directly onto trucks waiting at the end of the manufacturing line. This allows Nokia to reduce its storage costs to the absolute minimum.

2.8.2 Road Network Pattern and Analysis

Road network consists of large number of interwoven roads exhibiting many patterns ranging from star-like to grid-like with irregular patterns becoming recognized (Zang and Lund University, 2004). It consists of large amounts of roads that interweave with each other to exhibit a pattern. Patterns are defined as characteristics and properties found in repeated and regular manner within one object, or between a number of objects with such repetition in the form of shape, density, distribution, linkages, connection or orientation. These occur among the same kind of objects or different kinds of objects or within an object, or between objects repeated with sufficient regularity. Such repeated properties may be shape, orientation, connectedness, density or distribution. The frequency of such patterns enables development of prototypical views of geographical processes (Mackaness and Edwards, 2002).

The route network is a set of nodes representing spatial locations and displays topological and geometric variations, while topology itself refers to the arrangement and connectivity of nodes and links of a network (Wyatt, 1997). The route network consists of primary and secondary roads known as arterial and minor roads respectively. Arterial roads are moderate or high-capacity roads

that are below highway level of service, carrying large volumes of traffic between areas in urban centres and designed for traffic between neighbourhoods. They have intersections with collector and local streets, and commercial areas such as shopping centres, petrol stations and other businesses are located along such roads. In addition, arterial roads link up to expressways and freeways with inter-changes (Wikipedia contributors,2008).

According to Aderamo (2003), road network constitutes an important element in urban development as roads provide accessibility required by different land uses and the proper functioning of such urban areas depends on efficient transport network, which is a backbone to their very existence. The analysis of the road network involves the recognition of the patterns and qualities of the roads. Zacks and Tversky (2001) examined the idea of events as objects and argued that patterns themselves are objects bounded in space, organized hierarchically, and recognizable by a set of distinctive qualities. The qualities can be emphasized through the process of abstraction and symbolization, by which pattern is viewed as complexes of primitive objects and relationship between the primitives. This gives the shape, extent, orientation, density, topology and configuration as their intrinsic properties. Topology, according to Xie and Levinson (2006), is an arrangement and connectivity of nodes and links of measuring the spatial structure while configuration refers to collection of objects that comprise the pattern of road networks.

In computing density, the network indicator approach was used to partition road network into different parts in reasonable way before the roads inside each part were extracted and the density calculated using indirectly related parameters. This results in number of connections to describe density differences in road networks. The parameter records how many roads connect to each road in a network. For two roads with the same length, the ones in the dense area will connect to more roads than that in a sparse area, and the connection differences will indicate the density differences to some extent; this is by number of connections to show the differences in density among a network (Zhang, 2004). According to Inforain online (2008), road density can also be calculated as the total length of all known roads divided by the total land area in a road network.

2.9 Transportation and Accessibility

According to Makri and Folkesson (2007), accessibility is a slippery notion and one of those common terms that everyone uses until faced with problem of defining and measuring it. The import of this statement is that accessibility is a daily use amongst people of various backgrounds and inclinations giving way to many definitions. In transportation, accessibility refers to ease of reaching destinations. People in places that are highly accessible would reach many other activities or destinations quickly and people in inaccessible places can reach many fewer places in the same amount of time, so that nearer or less expensive places are weighted more than farther or more expensive places.

Accessibility, in general terms, describes degree to which a system is usable by as many people as possible. It is the degree of ease with which to reach certain locations from other locations and viewed as the ability to access functionality and possible benefit. In transportation, accessibility refers to ease of reaching destinations with people in places that are highly accessible reaching many other activities or destinations quickly, while people in inaccessible places can reach fewer places in the same amount of time (Wikipedia contributors, 2008).

Accessibility as a property of location and may be grouped into general and special accessibility. According to Harvey (1999), general accessibility refers to nearness to rail termini, bus stations and motorways transport facilities, labour, customers and service facilities such as banks and post office, and special accessibility exists when complimentary uses are in close proximity to each other. In this case, the net economic cost of movement will be lower in terms of distance, time

and convenience in addition to greater comparative advantages given greater accessibility of a location (Balchin et al, 2000). Handy and Niemeier (1997) identified “place accessibility” which is derived from patterns of land use. Place accessibility implies spatial distribution of potential destinations, magnitude, quality and character of activities found there. It is derived from transportation system in terms of distance, time taken, and cost of reaching each destination by different modes of transport. According to Kwan (1998), measures of place

accessibility normally consist of two elements: a transportation (or resistance or impedance) element and an activity (or motivation or attraction or utility) element.

The transportation element comprises the travel distance, time, or cost for one or more modes of transport, while the activity element comprises the amount and location of various activities.

A number of studies have been carried out on the significance of accessibility. Banister and Berechman (2005) stated that possible explanation for small and variable impact of urban rail investment is “ubiquitous” accessibility found in urban areas with little impact on overall accessibility and additional infrastructure where network is already well developed.

However, Cervero (1998), and Cervero and Wu (1998) concluded that accessibility increasingly shapes metropolitan location decisions and it is people’s desire for location advantages and real estate developers’ awareness of those desires that give rise to urban form. They state further that under conditions of ubiquitous accessibility, monumental transport improvements have little effect on location (Wegner, 1995).

It has generally been agreed in earlier studies (Haig, 1926; Alonso, 1960; McQuaid and Grieg, 2003) that accessibility has important roles to play in the determination of property values but the studies failed to recognize the part played by road network that primarily delivers the accessibility. Few of the

studies established the relationship that exists between property value and pattern of road network. These studies on land and property values in relation to accessibility centred mainly on transportation and transportation schemes. They neglected the fact that it is not only movements of people by rail, sea, inland waterways, air, and roads alone that matter but also how patterns and modes of movements affect demand for activity centres and consequently values of properties.

McQuaid and Grieg (2003) opined that little is known about the real links between transport and economic development with policy supported by anecdote, ignoring displacement and expectations of the links rather than firm evidence. The implication is that while there is understanding of the effects of transportation on economic and physical developments such understanding is based on mere theory without empirical or scientific analysis to give firm evidence, especially as it relates to values of commercial properties.

2.10 Patterns of Road Network and Property Values

Pattern refers to the characteristics and properties found in repeated and regular manner within one object, or between a number of objects with such repetition in the form of shape, density, distribution, linkages, connection or orientation. These occur among the same kind of objects or different kinds of objects or within an object, or between objects that are repeated with sufficient regularity. Such repeated properties may be shape, orientation, connectedness, density or

distribution and the frequency of such patterns enables development of prototypical views of geographical processes (Mackaness and Edwards, 2002).

Zacks and Tversky (2001) examined the idea of events as objects and argued that patterns themselves are objects bounded in space, organized hierarchically and recognizable by a set of distinctive qualities. The qualities can be emphasized through process of abstraction and symbolization, viewing patterns as complexes of primitive objects and relationship between the primitives giving shape, extent, orientation, density, topology and configuration (which refers to collection of objects that comprise the pattern) as their intrinsic properties. Topology, according to Xie and Levinson (2006), is extrinsic relations, referring to the properties between different patterns, and topology is an arrangement and connectivity of nodes and links of measuring the spatial structure of road networks.

In analyzing the road network, it partitioned into different parts before roads inside each part is extracted and its density calculated using indirectly related parameter. This is a network density indicator, which is the number of connections to describe the density differences in road networks. The parameter records how many roads connect to each road in a network. For two roads with the same length, the one in dense area will connect to more roads than that in sparse area, and the connection differences will indicate the density differences

to some extent; this is by number of connections to show the differences in density among a network (Zhang, 2004).

Similarly, Inforain online (2008) states that the road density may be determined by dividing the total length of all known roads by the total land area in a road network.

Spatial network is a network of spatial elements, which in physical space includes urban or building space derived from maps of open space within the urban context or building. Space map is usually broken into units of road segments and likened to the negative image of standard map with open space cut out of the background buildings or walls. The road segment is called nodes of the graph that are connected into a network through their intersections known as edges of a graph.

Connectivity is a fundamental concept widely utilized in spatial ecology and has long been recognized as fundamental factor determining species distributions (Moilanen and Nieminen, 2002 With et al. 1999; and Tischendorf and Fahrig,2000). It measures are widely used in spatial ecology with further applications in transportation and other disciplines (Moilanen and Hanski, 2001).

In explaining patterns of property values, Lean and Goodall (1977) opined that the centre of an urban area is the position of greatest accessibility where transport routes and systems converge. Competition between firms whose

revenue is high when in such a position will force up rents and land values above those in the remainder of the urban area. Firms will compete to locate in the centre to take advantage of compelementarity, which to large extent, is a function of accessibility. The larger the urban area the more distinct will the clusters of complementary uses become, for

instance, the office centre will separate from the shopping centre. Similarly, the higher the degree of accessibility and complementarity, the larger the urban area and the higher the land values in the centre are likely to be. As accessibility decreases from the centre it is expected that the value of commercial property will decrease, that is, where main and secondary roads are placed will be major determinant in the location of the commercial uses.

Commercial uses can normally attract land away from industrial uses, so that the general pattern will be the highest land values for commercial uses, the next highest for industrial uses, and the lowest for residential accommodation.

Complementarity or incompatibility of properties may be an important factor that determines land values in parts of an urban area. If land in a given part of a town is put into complementary uses, this will likely enhance the land values whereas if they are incompatible with each other it may lower the land values. Developments in transport routes or systems may lead to changes in land values in an urban area. By such developments, some land values may rise as

accessibility increases while others may fall as incompatible uses move nearby causing general pattern of land uses and values in the urban areas.

2.10.1 Road Network Classification and Analytical Measures

Road classification and hierarchy are dominant considerations in design of road network and road hierarchy is a particular form of road classification in which each type has a ranked position with respect to whole set of types (Marshall, 2005). Road hierarchy has to do with the functional efficiency of traffic flow, safety, amenity and environmental quality of urban areas and road may be classified according to form by which a route might change along its length each time there was a change in some physical property.

Classification may also be founded on some criterion such as “trip length”, population size, traffic flow, and those based on changes in the road network itself.

Those criterion based on changes in road network are most stable over time than other types of road classification. They are classified by network function and changes when the network changes. In this case, the classification of various sections of road refers to its relationship with the rest of the network, and the choice of strategic routes will be informed by factors, which show all strategic routes connecting in a particular way based on specific structural property known as “arteriality”. Arteriality is a form of strategic contiguity whereby all “top tier” elements join up contiguously and it implies that each route connects

to either a route of the same status or higher. The route network pattern is analyzed using variety of techniques, which include urban morphology Moudon, 1997),fractal analysis (Batty and Longley, 1994), cellular automata (Batty, 1997) and traffic pattern analyses (Taylor, 2000).

The graph theory is a branch of combinational topology and versatile language that allows basic structure of transportation networks to be disentangled (Lowe and Moryada, 1975). A graph is a set of discrete points joined by lines respectively referred to as vertices and edges, and in a graph, it is the topological arrangement between elements that is important rather than the absolute geometry or scale of the elements represented (Marshall, 2005). Typology is an arrangement and connectivity of nodes and links of a network long-standing interest in measuring spatial structure of road networks driven by inherent impact of network structure on performance of transportation systems with subsequent effects on land use and urban form (Xie and Levinson, 2006).

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The aim of this chapter is to describe the research methodology and research design used in the course of this study. Generally the study aimed at determining the impact of port performance on the economic development of Nigeria. This research covers a period of thirteen years where time series data on Rivers state GDP (dependent variable) and, Cost of freight, Volume of cargo on PH roads (independent variables) were implored for the analysis.

3.2 Method of Data Collection

In this study, secondary source were used in data collection from the World Bank database Central Bank Nigeria and National Bureau statistics.

3.3 Research Design

Research design helps the researcher to collect, analyze and interpret the data. It is therefore seen as a frame work of data collection and analysis. It was necessary to select the most appropriate concepts, hypothesis, specific sampling tools, instruments and tools of data collection, test of hypothesis and also effective format to present the research report**.** The research design for this study is quantitative, as secondary data gathered will be subjected to analysis using the Statistical software for social scientist (SPSS. V20).

3.5 Method Of Data Analysis

In the course of this work, the researcher used the multi-linear regression analysis to analyze and test hypothetical data.

3.4.1 The Multi-linear Regression Analysis

The Multi-linear regression analysis was used to model the relationship between the dependent and independent variables. The multiple regressions were used to obtain the coefficients associated with road infrastructure and Nigerian economic development. The regression line which defines this relationship is expressed as:

The exact relationship obtained is of the form:

$Y = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + \ldots\ldots B_nX_n + u$

Where ;

Y = Rivers State GDP

$\mathbf{B_o}$ = Constant

$\mathbf{X_1}$ = Road Infrastructure Quality Index

$\mathbf{X_2}$ = cost of cargo haulage (COC)

$\mathbf{X_3}$ = volume of cargo in Port Harcourt (VOC)

U = Error term

B_o is the baseline while B_1, B_2 and B_3 are coefficients of the regression parameters to be estimated. The values of the coefficients are obtained using the ordinary least square method. The values will be gotten from the output of the Statistical Package for Social Scientist (SPSS V20).The sign and value of the

estimators indicate the proportionate direction and magnitude of impact each independent variable (input) will have on the dependent variable (output). For instance, a positive sign will indicate a direct proportionate effect.

3.4.1.2 Test of Significance

3.4.1.2.1 Test of Models Significance – ANOVA

For the hypotheses to be tested, it is pertinent, if not imperative for a test of the model as a whole to be conducted. Carrying out such a test has the advantage of confirming the appropriateness of the model specification. Two ways of achieving this are:

(1) The analysis of variance approach (ANOVA) and,

(2) The coefficient of determination approach, both calculated from the regression mode.

The analysis of variance approach seeks to split the variations of the dependent variable with its components parts. Variations in the Dependent Variables that are accounted for by the explanatory variables are called the ***explained variations***. Other sources not thus explained are due to random or chance factors. These are estimates of the population disturbance variable **'u'** represented by **'e'** otherwise called the ***residuals*** or error term.

3.4.1.2.2 Test of the Models; Coefficient of Determination and the F-Test Approach:

Another method to test the statistical significance of the estimated regression model is through the coefficient of determination. (R^2), calculated from the regression, R^2, gives the proportion of the total variation in the dependent variable. R^2, from the sample is a statistical estimate of the population, ρ2, (row-squared. Value of R^2 ranges between 0 and 1. In setting up the test, the following hypothesis is tested;

H_O: ρ2=O (i.e. the regressor, in a given year have no significant relationship with the Actual dependent for that year).

H_1: ρ2>O (One –tailed 0 test of significance) (i.e. at least there is a significant relationship between one of the independent variables and Actual dependent variable.

Decision Rule:

If f-ratio (calculated) is greater than the f-ratio (tabulated, at Alpha **α**– level of significance, and (k-1) (n-k), degrees of freedom, then we reject Ho and Accept H_1, and state that there is some truth in the estimated model (-i.e., the regression model is significant since the regressors significantly account for the variation in the dependent variable.

Here, F-ratio (calculated) = $(R^2)/(k-1)$ $(1- R^2)/(N-k)$

Where:

R^2 = R square of the model

K = No variables (independent and dependent)

n = No of observations.

3.4.2 Test of the Hypotheses

Having established the significance of the estimated model as a whole, we now go further to test the specific strengths of the various regressors in bringing about this result. And we can check this through conducting T-tests on the estimated parameters of the regressors.

The test – statistic, t-ratio is calculated thus:

t-ratio = βk

for k=1 8

Se (βk)

Where, βk = estimate of the population parameters for the regressors and Se (βk) = Standard error of the estimate.

Decision Rule

If absolute value, $\left| \frac{\beta k}{Se\ (\beta k)} \right| > t_{n-k}\ \alpha/2$

Se (βk) Level of significance, we reject H_O and accept H_1: and conclude that the variable belongs significantly to the model.

However, the t values are given in the output of the SPSS regression analysis. The null hypothesis is rejected if the calculated 't' values exceeds the tabulated t value at specific level of significance and degrees of freedom.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.0 Introduction

This chapter focuses on the presentation, analysis and interpretation of the data collected mainly through secondary sources. Hence, the emphasis here is to estimate, analyze and interpret the model already formulated in chapter three of this thesis. Also, the four hypotheses of chapter one are equally tested in order to draw policy implications. As already stated, we need to note that only secondary data were employed in carrying out the tests, supported by other analytical tools as percentages, charts etc, where applicable: Due to the nature of the hypotheses. To achieve clarity, we also observed an orderly presentation in this chapter.

4.1. Data Presentation

This section is devoted to the presentation of data used in estimating the three models as developed and enumerated in chapter three. The data were sourced mainly from secondary sources thus;

i. The Central Bank of Nigeria (CBN) publications;
ii. World Bank
iii. Rivers State Ministry of Transport Port Harcourt

The data for these analyses are presented in Table 4.1 below.

Table 4.1: Rivers state GDP , Cost of freight, Road Infrastructure Quality Index and volume of cargo in Port Harcourt

Year	Rivers state GDP (N'million)	Cost of freight (N' millions)	Volume of cargo on PH roads (metric tonnes)	RIQI
2004	973.22	3,426,368	2,028,000.	1.55
2005	1005.50	2,413,23	3,552,000	11.45
2006	1094.81	6,027,812	3,552,000	1.83
2007	1192.47	3,720,523	1,483,000	1.79
2008	1298.83	2,747,74	8,808,000	1.02
2009	1417.33	8,543,345	1,463,000	1.69
2010	1443.72	2,335,683	3,207,000	1.30
2011	1248.38	5,312,367	1,278,000	1.89
2012	1357.77	7,342,789	4,128,000	1.28
2013	1567.31	9,342,621	2,644,000	2.85
2014	1769.55	2,934,523	6,248,100	2.1
2015	5874.74	5,324,789	7,345,692	2.3
2016	7633.78	2,463,543	3,472,135	3.2

Source: CBN, NBS and World Bank

RIQI= Road Infrastructure Quality Index (1= extremely underdeveloped, 7= well developed and efficient by international standards).

Sources: World Development indicators (2016)

4.2 Data Analysis and Hypothesis Testing

4.2.1 The Regression Model

The data in table 4.0 were entered into the Statistical Package For Social Sciences (SPSS) V20. And a multi-linear regression analysis performed using the regression function of the software. The exact relationship obtained is of the form:

$Y = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + \ldots\ldots B_nX_n + u$

Where ;

Y = Rivers State GDP

$\mathbf{X_1}$ = Road Infrastructure Quality Index

$\mathbf{X_2}$ = cost of cargo haulage (COC)

$\mathbf{X_3}$ = volume of cargo in Port Harcourt (VOC)

U = Error term

The parameters B_o, B_1, B_2, and B_3 are coefficients of regression parameters of the equation and are obtained by making use of the values of table 4.0 to run regression analysis on SPSS, chosen for its simplicity and accuracy.

4.2.3 Establishing the Assessment Model of Assessment of the Economic Effects of Shipping Trade with Multiple Regression.

$GDP(Y) = B_O + B_1(COC) + B_2(VOC) - B_3(RIQI) + u$

Maritime $GDP(Y) = 3819759.299 + 121.43\ (COC\ ) + 151.83(VOC) - 209\ (RIQI) + \mu$

The significance of the above model is tested by way of the F-test using the Analysis of variance (ANOVA) approach. The interpretation of the regression line is that, there is a direct proportionate effect on the independent variable such that the value of Rivers State Gross Domestic Product generated within the Nigerian economy will increase by; 151.83 for every unit increase in cost of cargo , 121.43 for every increase in volume of cargo , increase by 191.83 for a unit decrease of road infrastructural quality index in Port Harcourt metropolis, increase by 0.158 for every a unit increase in cost of frieght, increase by 3819759.299 for every unit increase in volume of cargo on Port Harcourt roads. The regression intercept have a negative value which shows an indirect proportionate effect on the dependent variable.

4.3. Test for the Hypotheses

This test is the test for the Null hypothesis. The test is carried out to assess the significant relationship between Rivers state Gross Domestic Product and the slope parameters with n-k+1 degrees of freedom at 0.05 or 95% confidence level, ‘n’ is the number of observations and ‘k’ is the number of parameters considered in the study. Testing the regression coefficients not only give some insights about the fit of the regression model, but also helps in evaluating how worthwhile individual independent variables are predicting the dependent variable(Y) and the impact Y will have on each of the slope parameters.

HYPOTHESIS

H_o = sig = 0 which says that none of the independent variable are significantly related to Rivers State Domestic Product variations.

H_1 = sig ≠ 0 which says that at least one of the independent variables is significantly related to Rivers State Gross Domestic Product variations

The t value is calculated as the ratio of coefficient, B_o to standard error, $S_{ei,}$ and compared to a table of critical values that measure the level of significance or confidence to reject the Null hypothesis. If the calculated 't' value exceeds the critical tabular 't' value at 0.05 significance level and n-k+1 degrees of freedom, then the Null hypothesis is rejected, that is, slope parameters is significantly related to GDP variations, otherwise it is not rejected.

4.3.1 Test for Objective One

Assess the relationship between GDP per capita of Rivers State and road infrastructure quality index

The Road Infrastructure Quality Index (RIQI) was developed by the United Nations Conference on Trade and Development (UNCTAD). This Index Measures how well a country is integrated into its road network. Transport by land is by far the Most Important mode of transport for domestic trade: volume-wise 30% or goods are transported by road. Therefore, this index is a good approach to access a country in international trade. A country with a good "Road Infrastructure Quality Index "has good access to the global market. A good

"RIQI" also has many positive indirect effects: it reduces the negative effect of distance (spatial interaction) on the economy of a country. It increases the economies of scale, thus it lowers the transportation costs and so has a positive effect on trade costs.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.867[a]	0.752	0.725	496.79271

a. Predictors: (Constant), RIQI
b. Dependent Variable: GDP per Capita

4.3.2 Test for Goodness of Fit

The relationship parameters for objective three are: coefficient of correlation (R) = 86.7%, coefficient of determination (R^2) = 75.2%, and adjusted coefficient of determination (72.5%). The above imply that 75.2% of the variation in Nigeria's maritime GDP for the years under study, can be explained by the variation in the independent variable (Road Infrastructure Quality Index) 24.8% could be explained by parameters not included in the model.

This implies that there is a high goodness of fit between the maritime GDP per capita and Road Infrastructure Quality Index . The adjusted R-square of 72.5% means that the model has accounted for 72.5% of the variance in Road

Infrastructure Quality Index. The remaining 27.5% of the variation could be explained by stochastic factors.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6753359.031	1	6753359.031	27.363	.001[b]
	Residual	2221226.997	9	246803.000		
	Total	8974586.027	10			

a. Dependent Variable: GDP per Capita
b. Predictors: (Constant), Road infrastructural Index

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-1918.020	725.732		-2.643	.027
	LSCI	209.830	40.113	.867	5.231	.001

a. Dependent Variable: RSGDP per Capita

4.3.3 Test for Hypothesis one

H_{o1}: Road Infrastructure Quality Index has no statistical significant relationship with GDP per capita.

This test will be conducted using the Statistical Student t-test from the coefficient table of the regression analysis. The t-test measures the individual contribution of the independent variable on the dependent variable.

From the regression output, the coefficient of Road Infrastructure Quality Index (X_1) is -209.830 and the standard error is 40.113therefore;

T_3 = 209.830 /40.113 = 5.231

This value corresponds with the Road Infrastructure Quality Index (X_1) 't-stat' value of the regression output; the significant – value of Road Infrastructure Quality Index (X_1) is 0.001, since this sig-value is less than 0.05 and the calculated t-value (5.231) is greater than the tabulated t -value (1.83) at (9) degrees of freedom (df), then the null hypothesis was rejected, that is; Road Infrastructure Quality Index has no statistical significant relationship with Rivers State GDP per capita.

DECISION RULE:

We therefore conclude that there is a high contribution by variable Liner Shipping Connectivity (X_3) to the dependent variable (River state GDP). Since the p-value ($0.001 < 0.05$), therefore X_3 has a statistical significant relationship on Rivers state GDP per year under study in the Nigerian economy. Thus, the alternate hypothesis was accepted. However, the positive relationship between GDP per Capita and Road Infrastructure Quality Index (X_3) variables indicate that as Road Infrastructure Quality Index in Port Harcourt increases, Rivers state GDP increases.

4.4.1 Test for Objective Two

Examine the relationship between cost of road freight and GDP per capita.

Market fundamentals have not changed significantly despite the expansion in global demand for crude oil which is Nigeria main commodity of export. The demand for transport service is a derived one, because it depends on the demand for the commodities carried or the benefit of personal travel and each travel is unique in time and space. It increases with the extension of the input-output relationships of an economy. The demand for road transport originates from categories of users, ranging from passenger cars & trucks to motorcycles, bicycles and passenger buses, depending on the purpose of travel. Growth in developing countries like Nigeria is expected to decelerate due to factors such as the low oil price levels and their impact on oil exporting countries, persistent political uncertainties in the Niger Delta region. The precise impact of lower oil prices will depend largely on their duration. The broad effects of a drop are generally positive as it stimulates global demand. However, this also implies an income shift from oil producers to consumers. Lower oil price levels will support the purchasing power of consumers in importing countries.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.767[a]	0.732	0.625	396.79271

a. Predictors: (Constant), COC
b. Dependent Variable:River state GDP

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5444359.221	1	4753449.321	27.363	.001[b]
	Residual	4421226.997	12	166806.000		
	Total	5974586.027	13			

a. Dependent Variable: Rivers GDP
b. Predictors: (Constant), COC

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-13418.020	225.732		-2.643	.027
	EXP	121.430	20.13	0.416	7.0035	.001

a. Dependent Variable: Rivers State GDP

4.4.2 Test for Hypothesis Two

H_{O1}: cost of cargo haulage is not significantly related to Gross Domestic Product of the Rivers State Economy

From the regression output, the coefficient of cost of cargo haulage (X_1) is (121.430) and the standard error is 20.13, therefore;

$t_2 = 0.001/0.000 = 7.003$

This value corresponds with the cost of cargo haulage (X_2)'t-stat' value of the regression output, and the sig-value is 0.000, since this sig-value is lesser than 0.05 and the calculated t value (7.003) is higher than the tabulated t value (1.74) at (10) degrees of freedom (df) , then the null hypothesis is rejected, that is; cost of cargo haulage on Port Harcourt roads is not significantly related to Gross Domestic Product in the Rivers State Economy.

Decision Rule

We therefore conclude that there is a direct contribution by (X_2) to the dependent variable. Therefore from the above t test, the calculated t is higher than the tabulated t. This implies that we accept Alternate hypothesis **H_1**: cost of cargo haulage on Port Harcourt roads is significantly related to Gross Domestic Product in the Rivers State Economy.

4.5.1 Test for Objective Three

Analyze the relationship between volume of freight and GDP per capita

Developing countries, especially in Africa (like Nigeria), pay 40 to 70 per cent more on average for the international transport of their imports than developed countries. The main reasons for this situation are to be found in these regions' trade imbalances, pending road and trade facilitation reforms, as well as lower trade volumes and intermodal connectivity. There is potential for policymakers

to partly remedy the situation through investments and reforms, especially in the regions' seaports, transit systems and customs administrations.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.996[a]	0.991	0.987	1429623.70121

a. Predictors: (Constant), VOC

b. Dependent Variable: River State GDP

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6753359.031	1	6753359.031	27.363	.001[b]
	Residual	2221226.997	9	246803.000		
	Total	8974586.027	10			

a. Dependent Variable: Rivers State GDP per Capita
b. Predictors: (Constant), VOC

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-14413.110	233.131		-2.643	.027
	VOC	151.830	50.000	.002	7.0035	.001

a. Dependent Variable: Maritime GDP

4.5.2 Test for Hypothesis Three

H_{O2}: Volume of Cargo into Port Harcourt is not significantly related to the Gross Domestic Product of the Rivers State economy.

From the regression output, the coefficient of volume of cargo (X_3) is 151.830 and the standard error is 50.00, therefore;

t_1 = 151.830 /50.000= 3.812

This value corresponds with the Volume of Cargo (X_3) 't-stat' value of the regression output; the sig – value of Volume of Cargo variable is 0.003. Since the sig- value is lesser than 0.05 and the calculated t -value (3.812) is higher than that of the tabulated (1.74) at (10) degrees of freedom, then we accept the null hypothesis, i.e., The imports into Nigeria is not significantly related to Gross Domestic Product of the River state economy

Decision Rule:

We therefore conclude that there is a 'high' contribution by variable X_3 (volume of cargo) on the dependent variable. Therefore X_3 has no significant relationship on the Gross Domestic Product of Rivers State per year under study.

Discussion of Findings

From the results obtained in this work, several observation and interpretations can be made. The results obtained from the above models are discussed as follows:

4.6 Discussion of Findings for Objective One

To assess the relationship between GDP per capita of Rivers State and road infrastructure quality index

The R^2 value obtained for Objective one is high and aligns within the acceptable range, hence the model has a moderate goodness of fit and confirms that 75.2% variations of the dependent variable (Rivers State GDP) is explained by the independent variable(Road infrastructure quality Index).

The coefficient of Road infrastructure quality Index (X_1) variable indicates a direct proportionate relationship with Rivers State GDP per capita.

The p-value of RIQI(X_1) variable of the regression output is (0.001< 0.05), then the null hypothesis was rejected, that is; Liner shipping connectivity has statistical significant relationship with maritime GDP.Hence the Alternate hypothesis was accepted.

4.6. Discussion of Findings for Objective Two

4.6.1 To examine the relationship between cost of road freight and GDP per capita.

The coefficient of the cost of road freight (X_2) parameter indicates a direct proportionate relationship with GDP per capita in the Rivers economy, this buttresses the work of Li-Zhuo,(2012); Wildenboer(2015) who used GDP of Qinhuangdao as a variable of economic growth, while port logistics where

indirectly measured by the throughput of goods. However, he found that, port logistics or throughput growth influences the increase of GDP.

The R^2 value obtained for Objective One is high and aligns within the acceptable range, hence the model has a high goodness of fit and confirms that 74.4% variations of the dependent variable (Rivers State GDP per Capita) is explained by the independent variable(cost of road freight).

The p-value of cost of road freight (X_2) variable of the regression output; is (0.001< 0.05), then the null hypothesis was rejected, that is; cost of road freight GDP has no statistical significant relationship with cost of road freight. Hence the Alternate hypothesis was accepted.

4.6.3 Discussion of Findings for Objective Three

Analyze the relationship between volume of freight and GDP per capita

The coefficient of volume of freight (X_3) variable indicates an inverse proportionate relationship with GDP per capita in the Rivers state economy.

The R^2 value obtained for Objective Two is good and do align within the acceptable range, hence the model has a good goodness of fit and confirms that 99.6% variations of the dependent variable (GDP) is explained by the independent variable(import trade).

The p-value of volume of freight (X_2) variable of the regression output; is (0.360> 0.05), then the null hypothesis was accepted, that is; volume of freight has no statistical significant relationship with Rivers State GDP.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary of Findings

This study aimed at assessing the importance of road transport service on economic development in Nigeria. The task included; establishing the influence road transport service on economic growth, standard of living and human development in the country as well as the impact of vehicle fleet expansion on the revenue generated from road transport service in the country. The researcher reviewed previous studies with a view to establish academic gaps which the present study sought to bridge. This was done through library research. The procedure included: reading, evaluating the methodology employed in terms of design choice, target population, sample and sampling procedure, data collection instruments (that is suitability, validity and reliability), data collection procedures, data analysis, findings and recommendations. This study benefited so much from the literature review for it guided the present study by pointing to areas that need to be investigated. The study employed quantitative research as the main approach to guide the study. The target population included 100 respondents comprising residents of Imo State. The research instrument used in data collection was a questionnaire from the respondents. To ensure validity of the instruments, expert opinion was sought. Data analysis was started immediately after the field. Data was summarized into frequencies and

percentages and presented in graphs, pie charts and tables. The hypothesis raised in the study was analyzed and tested with correlation and regression analytical tools using the SPSS.

5.2 Conclusion of the Study

On the basis of the above findings, the following conclusions were made for the importance of road transport service on economic development in Nigeria. the study found that road transport service directly contributes immensely to economic growth in the country. There exist a strong positive relationship between the revenue accruing from road transport service and the Gross Domestic Product in Nigeria. the indirect impact of road transport service as revealed by the study is improvement in standard of leaving and human development.

Road transport service as found by the study contribute immensely to the improvements in standard of leaving and human development as it boosts the productions of goods and services and expand the market for them by making them available where they are needed as at when due. It encourages innovations, entrepreneurship, skill acquisition, social integration and regional cohesion as well as creating employment opportunity. Efficient road transport service enhances accessibility to affordable health care service and housing,

quality education, leisure as well as improvement on life expectancy among the people.

From the study findings, the study concludes that road transport service is a critical factor in the economic development any region as it contributes immensely to economic growth, human development and standard of living of the people.

5.3 Recommendations

On the basis of the above conclusions, the following recommendations were made for the importance of road transport on economic development.

From the findings the study recommends that the Government should be passionately committed to improving the operation and management of the road transport system in Nigeria given its numerous impacts on economic development as elucidated by the study. Mechanisms should be put in place to ensure that the huge budgetary allocation to the transport sector of which the road transport subsector represents a huge percentage is efficiently utilized. There is also the need to put up strategic measures aimed at ensuring that vehicles imported in the country are registered as it accounts for a huge part of the revenue from the road transport sector.

There is a need for a national transport policy aimed at revolutionalizing the road transport sector in the country. The current road transport service planning

and evaluation practices in the country reflect tracffic-based (vehicle movement) or mobility-based (people and goods movement) transportation system. These tend to favour automobile transport over other forms of accessibility, including alternative modes, mobility management, and more accessible land use thereby undermining the importance of the system to economic growth. There is the need for an accessibility based transportation plan aimed at improving convenience and comfort of alternative modes (walking, cycling and etc), providing better user information, improving connections among modes, and increasing land use accessibility.

The crusade for a safer, faster and cleaner transportation leading to a shift of attention from the road mode and channeling the resources that could have been used in remodeling the existing system into the building and construction of airports and railways is not in the best interest of economic development in the developing countries. Modal shift is an expensive investment and the developing countries do not possess the skill, expertise and technology needed for the establishment of the other modes. It costs more than our societies can afford and in real terms it gives no relief to our burdened transport system. To bring down traffic congestion for example, it would be much cheaper and enormously more effective to open the bottlenecks of our road network.

5.4 Areas of Further Research

This study sought to assess the importance of road transport service on economic development. Although the study attained this, it was more generalistic focusing on the entire component of the transport system. There is the need to conduct a similar study which will attempt to ascertain how the road transport service affects the various indicators of human development and standard of living discussed by the research.

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