

TRANSPORTATION DEVELOPMENT IN NIGERIA: THE JOURNEY SO FAR AND THE WAY FORWARD

An Inaugural Lecture By

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PROTOCOL

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PREAMBLE

I am very grateful to the Vice-Chancellor, Professor B. C. Ozumba, for giving me this opportunity to deliver the 97th Inaugural Lecture of the University of Nigeria, Nsukka. The first Inaugural Lecture in this University was delivered in 1976 but it was not as regular as it is today. Therefore, I am also grateful to other past vice-chancellors, Professor C. O. Nebo and Professor Bartho Okolo and for the incumbent, Professor B.C. Ozumba, for resuscitating and sustaining the culture of Inaugural Lectures in the University of Nigeria, Nsukka, and for making them more regular. It is highly commendable that they have not only sustained these lectures but have also made Inaugural Lectures in the University of Nigeria a regular monthly academic event.

This is the 2nd Inaugural Lecture from the Department of Geography, Faculty of the Social Sciences, University of Nigeria, Nsukka. The first Inaugural Lecture in the Department of Geography was delivered in Physical Geography (specifically, Geomorphology) by Professor G. E. K. Ofomata in 1982 (about 33 years ago). This Inaugural Lecture is in Human Geography, the other major branch of Geography.

I attended Girl's Secondary School, Ogidi in Anambra State and obtained the WASC in Grade I and then proceeded to Higher School at Queen's School, Enugu. I gained admission into the Department of Geography, University of Nigeria, Nsukka in 1966/67. The Nigeria/Biafra War started just as we completed the first year and the University was closed down because of the war. After the war, we came back to continue with our studies and I graduated in June 1972 as the Best Student in the Department of Geography with 2nd Class Upper Division. Immediately after graduation, I got employed as a Senior Geography Mistress at Asaba Girls Grammar School, Asaba in the then Mid-Western State (now Delta State), but I was recalled by the then Registrar, Mr A. E. Oradubanya, when the then Vice- Chancellor, Professor Kodilinye (of blessed memory) established the Junior Fellowship Scheme for staff development in this University. We were the very first set of academic staff that joined the University of Nigeria under the Junior Fellowship Scheme. I am very grateful to Mr Oradubanya for recalling me and my friend Professor G. O. Nnaemeka (nee Obidiegwu) from Asaba.

I joined the Department of Geography, University of Nigeria, Nsukka, as a Junior Fellow on the 5th of May, 1973. After serving for one year as a Junior Fellow, I gained admission in 1974 into the Department of Geography, University of Alberta, Canada, where I obtained my M.Sc. in Transportation Geography in 1976 and also my Ph. D Degree in Transportation Geography in 1979 under the supervision of Professor M. J. Hodgson. I came back to

the Department of Geography, University of Nigeria, Nsukka in 1981 as Lecturer and then rose from the ranks to become what I am today.

I became a Professor of Transportation Geography in 2000 (about 15 years ago), although it was announced in 2004. I am currently the **first and only female Professor of Transportation Geography in Nigeria.**

Mr Vice-Chancellor, my research interest has remained focussed on Transportation Geography although my research orientation and perspectives have widened to include other areas of interest such as Environmental Management, Gender Studies and Global Information System (GIS). Within Transportation Geography, my major area of emphasis is on the Role of Transportation in Economic Development and this has determined the choice of my topic for today's Inaugural Lecture titled **TRANSPORTATION DEVELOPMENT IN NIGERIA: THE JOURNEY SO FAR AND THE WAY FORWARD**

SUMMARY OF LECTURE

The lecture discussed how Nigeria's transportation development got to the present position, as that is, **The Journey so Far**, the implications of this position and what the Nigerian Transportation System should be aiming at in this era of globalization in the 21st Century, that is **The Way Forward**.

The Lecture starts with an Introduction which contains an exposition of the field of Geography, and this is followed by a presentation of the major stages in the evolution of transportation worldwide, especially the emergence of Transportation Geography as a sub-discipline of geography during the Fordist Era in the middle of the 20th Century. The scope of Transportation Geography is presented and the debate on the role of transportation in economic development is discussed. After this, the historical development of the four major modes of transportation, namely, waterways, railways, roads, and airways as well as the various problems and challenges facing these modes in their contributing to the economic development of Nigeria was presented and their comparative usage in the country analysed.

The **Journey so far** has indicated that there has not been a balanced development of the country's transportation system. Presently, with the marked increase in road construction and the simultaneous operational and organizational difficulties being experienced by the railway and inland waterways systems, the movement of people and all types of goods all over the country is dominated by road transport. In fact, roads are overused and misused in Nigeria while the waterways have a lot of capacity that is not being utilized. Railways and pipelines were heavily used in the past, but at present they are sparingly used while the airways are heavily used but still need a lot of improvement and expansion. The two major results and implications of this pattern of predominant use of road transportation over all the other modes of transportation in Nigeria are environmental problems of road transportation and high occurrence road traffic accidents which

were then discussed. The way forward on the reduction of road traffic accidents and how to reduce the adverse environmental impact of road construction and use were presented.

The way forward for the further development of the transportation modes in Nigeria so that they will be able to contribute effectively to the country's economic development of the country in the 21st Century were presented, based on the author's research contributions. Starting with the immediate restoration of refineries and the use of pipelines for the transportation of petroleum products, the author recommended that the strategic location of the country should be taken into consideration in the expansion and modification of all the modes of transportation in the country. In addition, it was recommended that the construction of an entirely new railway network should be a major priority. It was also recommended that Nigeria should plan and develop an integrated transportation system for the country in which the modes are used more efficiently. This should be done by using the regional specialization approach for identifying the roads to be constructed and developed in the rural areas of the country while the correct "mass transit" systems are developed for the urban centres. The need for research, transportation planning and adequate collection of data for these purposes were emphasized. Then, final section consists of the summary, recommendations, conclusion and acknowledgements.

THE INAUGURAL LECTURE

1.0 INTRODUCTION

Geography as a field of specialization in modern times can be said to be as old as man himself. From the account of creation in the Bible book of Genesis Chapters 1 and 2, Geography started when God, the Creator, after bringing the earth and elements into existence, gave the first man, Adam, the mandate “to tend and care for it” (Genesis 2 :15), and then Adam was asked to name the animals and plants he was surrounded with. In fact, Geography is called **“the mother of the sciences”**, since no science can claim a longer genealogy than Geography although it was only recognized in the 3rd Century BC when Eratosthenes coined the word Geography. The roots of the word “geography” are found in two Greek words, namely, *geo*, meaning Earth and *graphia*, meaning **description of the earth. Therefore the meaning and purpose of geography is to describe the planet Earth in various ways.** In fact, as soon as man recognized the surroundings in which he lived and was able to distinguish between locations where to live and unsafe areas to avoid, geography was already being practised. However, scientific geography as we know it today is the product of the 19th century, or more specifically, of the 150 years beginning from about 1750 to 1900. During this period, known as the Classical Period, the great formulators such as Kant, Humboldt, Ritter, Peschel and Ratzel among others defined the scope and method of the discipline and elaborated on the method of collecting, organizing and presenting geographical materials.

A philosophical foundation was secured for Geography within the framework of the philosophy of science by the great Prussian philosopher, Immanuel Kant (1724-1804) by separating all empirical knowledge into three organizational parts. The first part, which sorts out facts according to the kind of objects studied, is the realm of the “systematic sciences”; the second part, which studies facts according to time, is the realm of the “historical sciences”; and the third part which studies things as they are associated in space is the domain of the “geographical sciences”. This

philosophical construction of Kant gained for geography an honourable status among the sciences.

Modern geography is the study of the earth as the home of man. It is a science of synthesis which handles spatial relationships by focussing on the interaction between man and his environment, by using maps as the distinctive tool of geographers. The geographer studies any phenomenon or sets of phenomena, such as people, rocks, minerals, plants, animals and others because he sees them as part of an interrelated complex that give(s) character to space or a place. **It is the space or a place, whether in the form of region, country, state, town, city, village or any other form of place that the geographer wants to understand. No other science does this.**

In fact, modern geography is a very broad subject with several branches within its framework but for convenience it is usually subdivided into two major branches, **physical geography and human geography**, although other subdivisions are available. Ofomata (2008) discussed the interdisciplinary structure and functions of geography. **This implies that geography is related to many other academic disciplines and that what happens in these disciplines affects what happens in geography and vice versa.** Also over the years, many sub-disciplines, such as Transportation Geography, have evolved in geography.

1.1 THE RELEVANCE OF TRANSPORTATION IN GEOGRAPHY

The purpose of transportation is to move people, goods as well as information and services through space which is shaped by both cultural and physical constraints such as distance, time, political boundaries and topography. The basic necessities of life, namely, food, clothes and shelter are impossible to be achieved in any society without transportation; and without transport, life as it is today would be inconceivable. Transportation is particularly crucial for the existence of human settlements while the existence

of such settlements creates greater demand for transport. Transportation routes are constructed for distributing resources between places where they are abundant and places where they are scarce. It is an indispensable component of the social, political and economic life of every society because it has a major role to play in the spatial relationship between different locations, globally, nationally and regionally. The importance of transportation can therefore be seen in the daily rural, urban and regional human activities on the surface of the earth. **This explains why transportation is one of the most important human activities worldwide. In fact, there would be no transportation without geography and there would be no geography without transportation.**

1.2 HISTORICAL EVOLUTION OF TRANSPORTATION

Transportation, which is the movement of people, goods and information from one location to another, is said to be as old as man. Human beings have been known to have the desire to move from one place to another on the earth's surface carrying with them, food, property and culture depending on the technology available to them and what they can afford at the particular point in time. For many centuries of human existence, mankind has technologically developed various forms and modes of transportation.

At the most basic level, human beings move and thus interact with each other by walking, but transportation geography typically studies more complex and regional or global systems of transportation. Human beings do not walk at birth but by the age of one year most people start walking and this stage of human growth and development is still celebrated in many cultures and societies today. From this stage, human beings increase in their walking ability and also increase in the distances covered and goods carried until they are old and eventually die.

Transportation started with the primitive means of movement on foot or walking to the stage of making use of animals and then to the stage of using mechanical means of transporting goods and people from one geographical location to another. In fact, the historical evolution of transportation is related to the spatial evolution of economic systems worldwide. Using technological and economic developments all over the world, Rodrigue, Comtois & Slack (2006) summarized the historical evolution of transportation from the pre-industrial era to the early 21st century into five major stages, each linked with specific technological innovation in the transport sector.

1. Pre-industrial Era (pre – 1800)

No form of motorized transport existed. Transport technology was limited to walking and the use of animal labour for land transport and to wind for maritime transport. **Speed was slow and small quantities of goods were carried.** Waterways were the most efficient transport systems and so the first civilizations emerged along the river systems for agricultural and trading purposes (Tigris-Euphrates, Nile, Indus, Ganges, and Hwang-Ho). **The most extensive trade route by land used the Silk Road, opened around 138 BC, which was connected to the Arab sea routes in the ancient world and was used for many centuries. There is a recent ongoing attempt by China to resuscitate this route, the Silk Road, in order to connect China to Europe by land.**

2. Transportation during the Industrial Revolution (1800 – 1870)

During this period, **major improvements in transportation featured the development of the canal systems in Europe and later railways were developed when steam engines (which converted thermal energy into mechanical energy) were adapted to locomotives.** Railway transportation revolutionized and transformed inland transportation in the second half of the 19th century. Starting with national railway systems, trans-continental railways were constructed from New York to San

Francisco in U.S.A. in 1869, the Trans-Canadian railway in 1886 and the trans-Siberian railway in Russia in 1904. In addition, regular maritime routes linking harbours worldwide started over the North Atlantic between Europe and North America as shipbuilding technology improved. The major consequence of the Industrial Revolution was the establishment of large distribution networks of raw materials and energy as well as the specialization of transportation services.

3. Emergence of Modern Transportation Systems (1870 – 1920)
International transportation took a new growth phase with **improvements in engine propulsion and a gradual shift from coal to oil in the 1870's which increased the speed and capacity of maritime transportation.** Global maritime circulation was also dramatically improved when **infrastructures to reduce intercontinental distances, such as the Suez Canal in 1869 and the Panama Canal in 1914 were constructed.** With the Suez Canal, the far reaches of Asia and Australia became more accessible while the Panama Canal linking the American East and West coasts shortened maritime journeys by more than 13,000 kilometres and reduced the distances from various locations globally. Because of these developments, **ships also dramatically increased in size and port infrastructure had to expand in order to accommodate them. From the 1880's, regular intercontinental liner passenger transport services linked major ports of the world until the 1950's when air transportation took over.**

During this period, railway networks expanded and became the dominant mode for land transport for both passengers and goods. Significant growth of urban population led to the use of tramways (streetcars) in Western Europe and United States of America; and in some large metropolitan agglomerations, underground metro systems were constructed, for example, the construction of the London underground railway which started in 1863. Other significant developments include the fact that **by**

1895, every continent was linked by telegraphic lines, as a small beginning of the global information network that would emerge in the late 20th century.

4. Transportation Development during the Fordist Era (1920 – 1970)
The Fordist Era was **epitomized by the adoption of the assembly line as the dominant form of industrial production**, and this innovation benefited transportation development substantially. **The invention of the internal combustion engine** (a modified version of the diesel engine invented in 1885 and modified by Daimler in 1889) and the **invention of pneumatic tires by Dunlop also in 1885** permitted the production of **door-to-door transport vehicles/automobiles such as cars, buses and trucks**. **Mass producing these vehicles using the assembly line resulted in economies of scale which enabled bulk commodities such as minerals, crude oil and grain to move over long distances across the world.**

The era of air transportation was inaugurated by the **first propelled flight which was made in 1903 by the Wright brothers**. The 1920's and 1930's saw the expansion of regional and national air transport services in Europe and the United States of America. **The post – World War II period was, however, the turning point for air transportation** as the range, capacity and speed of aircrafts increased as well as the average income of the passengers which enabled increased number of people to afford the luxury, speed and convenience of air transportation. The first commercial jet plane, the Boeing 707, was put into service in 1958 and revolutionized the international movement of passengers, marking the end of passenger transoceanic ships.

Basic telecommunication infrastructures such as the telephone and the radio also mass marketed during the Fordist Era. In fact, the widespread diffusion of the automobile from the 1950's has so drastically changed lifestyles and the structure of cities, especially, in developed countries. It has encouraged suburbanization and enabled cities to expand to areas larger than 100 kilometres in

diameter and thus encouraged the development of millionaire cities and megalopolis.

Although traditionally, transportation has a major role to play in the location of economic activities, it was the growing mobility of passengers and increasing freight to be transported over the various regions of the world during the Fordist Era of the evolution of transportation that justified the emergence of Transportation Geography as a specialized field of investigation.

Mr. Vice-Chancellor, since Transportation Geography emerged as a sub-discipline of Economic Geography, it has been growing and expanding in its area of emphasis since the Post- Fordist Era of the 1970's till the present.

5. Post- Fordist Era of the 1970's till Present

Among the major changes in international transportation since 1970's and 1980's are the massive development in telecommunications, the globalization of trade, more efficient distribution systems and the considerable development of air transportation. At the international level, globalization processes have been supported by improvements in transport technology such as **the use of containers** which increased flexibility, reduced transshipment costs and delays and increased the quantity of freight moved at local, regional and international levels.

Also after the 1970's, telecommunications successfully merged with information technologies and the information highway became a reality (as fibre optic cables gradually replaced copper wires), and this increased the capacity to transmit information between computers. As the efficiency of the processing power of computers improved, wireless technology produced cellular networks which expanded and merged to cover whole cities, countries, regions and then continents. **Telecommunications have**

now reached the era of individual access, portability and global coverage.

In addition, air and rail transportation experienced remarkable improvements in the late 1960's and early 1970's as **high speed trains and aircrafts, like Boeing 747 and Concorde, were introduced (although the Concorde was finally retired in 2003).** Road transport has assumed dominance but it is responsible for the highest percentage of air pollution worldwide. Meanwhile, automobile manufacturing is no longer concentrated in specific countries like the US, Japan and Germany but in global industries like Ford, General Motors, Toyota, Mercedes Benz etc which have taken over the manufacturing of automobile in all parts of the world, using their subsidiaries.

There is also increased need for Integrated Transportation Networks and more use of Environmental Impact Assessment (EIA) methods for handling the adverse effects of pollution from transportation.

In the future, transportation will more likely involve the development of the maglev system which is the first fundamental innovation in railway transportation since the Industrial Revolution. The first commercial maglev system was introduced in Shanghai, China in 2003 and has an operational speed of 440 kilometres per hour. Other major new approaches are automated transport systems and the use of fuel cells.

1.3 THE SCOPE OF TRANSPORTATION GEOGRAPHY

The role of Transportation Geography is to understand and analyse the spatial relations that are produced by transport systems. In fact, it is a response to the ever-growing need of man for movement and the transportation of goods from their various origins to destinations all over the world. However,

because of the multidisciplinary nature of Transportation Geography it defies any rigid definitions.

In spite of this, a few scholars have tried to define it. These include Ullman (1954); Eliot-Hurst (1974); Robinson & Bamford (1978); The Great Soviet Encyclopaedia (1979); Taffee, Gauthier & O'Kelly (1996); Rodrigue, Comtois & Slack (2006) and Wikipedia (2014).

The geographer is not alone in the study of transportation because scholars in other disciplines such as **Economics, History, Sociology, Political Science, Engineering, Planning and many others** also study transportation.

Like Geography, Transportation Geography is influenced by several concepts and methods initially developed outside the discipline which have been adapted to its particular interests and concerns. The key concepts in transport geography are closely linked to economic, political, regional, historical and population geography, among others. Several other concepts such as **Regional Planning, Operations Research and Location Theory** are commonly used in Transport Geography notably as tools and methods for the spatial analysis of transportation. At a wider level, links exist with several major fields of science including natural sciences, mathematics and economics. Hagget (2001) discussed the major fields of Transportation Geography as well as how they are related to other academic disciplines and the interdisciplinary nature of the study of transportation.

The analysis of the major concepts of Transport Geography relies on methodologies often developed by other disciplines such as Economics, Mathematics and Demography. For instance, spatial structure of transportation networks can be analysed with Graph Theory, which was initially developed for Mathematics. In addition, many models developed for the analysis of transportation movements, such as the Gravity Model, were borrowed from

Physical Sciences. **Multidisciplinary approach is consequently an important attribute of Transport Geography as it is in Geography.**

The scope or issues of interest in the geographical study of transportation include the following areas:

1. **Inventory of Transportation Facilities.** This is done with specific reference to the fixed and mobile stocks of networks and equipment, especially, their distribution as related to income, population and the size of the areas they serve.
2. **Transportation Modes.** The major types or modes of transportation such as roads, railways, airways, waterways etc and the vehicles used for the movement play a different though overlapping role in the supply of transportation.
3. **Transportation Networks.** This refers to the structure or pattern of the transport routes using Graph-Theoretic indices.
4. **Traffic Flows.** The flows are studied by the application of transport flow models such as the Gravity Model and its many variations and other models of spatial interaction such as Linear Programming, using a temporal or regional framework.
5. **Interrelationships.** This identifies the impact of transportation on both the physical and the socio-economic environment especially within a broad regional or urban framework. It includes such interrelationships as the impact of transportation on economic development.
6. **Urban Transportation.** This examines the spatial implications of land use and traffic movements in the city using relevant behavioural data and distance, cost or time data zones in the urban centres. The types, volumes and periodicity of intra-urban movements are related to the socio-economic characteristics of

the population using Regression Analysis and other statistical techniques. The traffic flow may be projected to some future date in order to plan for it.

7. **Rural Transportation.** This examines rural transport demands, constraints and access to facilities as well as mobility and patterns of movement in rural areas.
8. **Transportation and the Environment.** This refers to the impact of transportation infrastructure and the use of transport vehicles on the environment, especially with regard to global warming, ozone layer depletion and other adverse side-effects of pollution from transportation facilities (such as cars, trains, ships and air planes) as well as traffic accidents. It also includes transportation and climate change issues.
9. **Transportation and ICT.** This examines the relationships between developments in ICT and the use of transport facilities.
10. **Miscellaneous.** There are other activities related to transportation and its use for human activities.

1.5 THE ROLE OF TRANSPORTATION IN ECONOMIC DEVELOPMENT

Transport development projects are capital intensive and also require long gestation periods before there are enough returns to justify the huge investments already made or to be made in the future. Because of the capital intensive nature of transportation infrastructures they are usually provided by the government as social services to the population and they vary from country to country. This explains why many governments all over the world continue to provide and subsidize the provision of transport infrastructure, whether they are viable or not.

There is no doubt that the functioning of an economy requires the use of transport, and that as economies develop, specialized production increases and relatively more transport is needed. Since people must utilize various forms of transportation to move around in the daily performance of their social and economic activities in the villages, towns and cities the evolution of transport has always been linked to economic development. **This pervasive role of transportation led to the idea that any human society is as developed as its transportation system.**

Issues related to the nature of the relationship between transport and economic development have been discussed extensively but the determination of the theoretically optimum amount of transportation investment and combination of modes for given countries has produced little agreement among scholars. The causal factors emphasize that the role of transportation in economic development can be a positive stimulus, neutral, permissive and negative stimulus. The first viewpoint of **positive stimulus** occurs when some new directly productive economic activities are the direct result of providing transportation facilities; **neutral or permissive role** when the provision of transportation may or may not result in subsequent increases in the level of economic growth; and **negative stimulus** when the provision of transportation effectively reduces the level of economic growth.

In this case, there is an absolute decline in the level of per capita income in a country after heavy investments in transportation. An example of this case is where a newly developing country's over ambitious and prestigious efforts to create a national airline may well divert investment from other areas where it could have led to economic growth such as was the case with Nigerian Airways before it was liquidated.

Other scholars have added the Temporal Factors and dimensions to three Causal Factors. Firstly, that the provision of transportation facilities predates economic growth (**PRE**). Secondly, that the provision of transportation is concomitant with economic growth

(CON). Thirdly, that the provision of transportation postdates economic growth **(POST)**. Eliot Hurst (1974) merged both the Temporal and Causal Factors to develop a possibility matrix of these factors and their roles in economic development as shown in Table 1.

TABLE 1: A POSSIBILITY MATRIX OF THE CAUSAL AND TEMPORAL FACTORS AND THEIR ROLES IN ECONOMIC DEVELOPMENT

Temporal Factors	Causal Factors			
		Positive (+)	Neutral (o)	Negative (-)
	PREcondition	X		
	CONcomitant		Y	
POSTdates			Z	

Source: Modified from Eliot-Hurst (1974, p 385).

The position **X** represents the traditional and generally accepted view that the provision of transport facilities is a precondition for economic development and that transportation gives positive stimulus to economic development. It simply assumes that improved transportation forms an essential early phase in any economic development scheme. This explains why in developing countries, like Nigeria, there is a widespread concern for transport in the context of the desire to promote rapid economic development.

The position **Y** is the neutral view that transport development is simultaneous or concomitant with economic development and that it is not a precondition or a prerequisite for economic development but goes hand in hand with development and may act as a catalyst to growth. This view suggests that transport development is not more or less important than any other factors or elements of economic growth.

The position **Z** refers to the view that transport development postdates economic growth and that it is the result rather than the

cause of economic development. It also implies that it could even have some negative effects.

Transportation geographers are interested in the role of transportation in economic development, especially the spatial implications of transport infrastructural developments and improvements as well as their impact on activities in a particular region. Provision of transport facilities leads to **increased specialization in production; acts as a control on factor mobility; is a critical investment sector and therefore a stimulus for economic growth and also increases accessibility of locations therefore it is one of the** major factors that explain the location of economic activities. Although in some cases, lack of adequate transport can be one of the greatest obstacles to economic progress and development it is not easy to determine how much investment is needed within the socio-economic context because **the demand for transportation is a “derived demand” because rather than being autonomous, transport is usually a means of serving other objectives.**

Generally, in developed countries, much attention was paid to the development of transportation during the early years of their industrial growth but these countries are now concerned with the modification or renewal of inherited transport systems. On the other hand, developing countries, like Nigeria, continue to improve their transportation systems in order to enable them to develop faster economically. Table 2 indicates the transport sector received a substantial part (ranging from 8.6% to 23.7%) of the planned public sector expenditure by the Nigeria government from 1962 to 1998.

Table 2: Percentage Share of Planned Public Sector Expenditure on Transport Sector 1962-1998

Plan	Plan Period	% Share of the Transport Sector
First National Development Plan	1962-1968	21.3
Second National Development Plan	1970-1974	23.7
Third National Development Plan	1975-1980	22.2
Fourth National Development Plan	1981-1985	15.2
First National Rolling Plan	1990-1993	11.6
Second National Rolling Plan	1994-1996	8.6
Third National Rolling Plan	1996-1998	10.1

Sources: Nigeria National Budget and Rolling Plans, (1962-1998)

There is no doubt that Nigeria is one of the African countries that have spent a considerable amount of their financial resources building, expanding and modernising her transportation infrastructure. This debate is not yet concluded and is still going on.

Mr. Vice-Chancellor, Sir, the major objective of this lecture is to demonstrate how and why Nigeria's investment in transportation has contributed or not contributed to the country's economic development and to suggest the sustainable ways of facing any challenges the Nigerian

transportation system may be facing in contributing to the country's economic development in the 21st Century.

2.0 HISTORICAL DEVELOPMENT OF TRANSPORTATION INFRASTRUCTURE IN NIGERIA - THE JOURNEY SO FAR

There is no doubt that at present, transportation constitutes one of the major features of the economic development of Nigeria. **Historically, the early 20th century saw the shift of traffic from the waterways to the railways and later on to road transportation mode or network while airways transportation was introduced after World War II. Each change had implications for the pattern of commodity flow, regional trade and economic development of Nigeria.**

The historical development of these modes are now discussed as **they are reflected in the research of the author**, emphasizing their developmental impact on the Nigerian economy and the prospect of their further development especially the challenges they are facing in their continued contribution to the economic development of Nigeria in the 21st century.

2.1 HISTORICAL DEVELOPMENT OF THE PORTS AND INLAND WATERWAYS INFRASTRUCTURE IN NIGERIA

The major inland waterways in Nigeria are the River Niger and River Benue which dissect the country into east, west and north sections. The two rivers meet at Lokoja in Kogi State. Both rivers rise outside the country but approximately 1440 kilometers of the River Niger and 960 kilometers of River Benue flow within Nigeria. In Northern Nigeria, River Sokoto and River Kaduna are some of the major tributaries of the River Niger while Gongola River and Katsina Ala River are some of the major tributaries of the River Benue. In north-eastern Nigeria, Hadeija River and others flow into the Lake Chad. Other major coastal rivers in South-western Nigeria include River Ogun, River Osse and Oshun

River, while the coastal rivers in South-eastern Nigeria include Cross River, Imo River, Aboine (Ebonyi) River and other tributaries of the River Niger such as Anambra and Mamu Rivers.

The role of the inland waterways and the seaports in the economic development of Nigeria was such that the numerous ports along the coasts and rivers of the country expanded, declined or completely disappeared as the pattern of trade within the country and with the outside world changed.

Initially, there were scattered small trade activities along the coastline such as Lagos, Gwato, Forcados, Koko, Burutu, Akasa, Brass and Calabar, among others, each with a very limited hinterland. However, as the penetration and subsequent control of the interior continued new trade routes were established and consequently, some ports such as Gwato, Brass, Koko, Forcados and others declined in importance or became extinct while other ports such as Lagos, Warri and Port-Harcourt became dominant.

The major seaports are Lagos port, Tin Can Island ports complex, Delta ports complex of Warri, Sapele, Koko and Burutu, Port-Harcourt port and Calabar port. Important river ports on the Rivers Niger, Benue and other rivers include Sapele, Aboh, Onitsha, Asaba, Idah, Baro, Ajaokuta and Makurdi.

Onokala (1994a) examined the pre-colonial stage of transportation in Nigeria and noted that before the contact with Europe, there were trade routes of tracts and waterways acting as important channels of communication by canoe during pre-historic times. Long before the railway and road transportation systems were introduced into various parts of Nigeria, the River Niger and its major tributary, the River Benue as well as other tributaries of Lower River Niger such as Mamu, Anambra River and Ulasi Rivers and some coastal rivers provided the only means of contact for commercial and other activities between the outside world and large parts of Nigeria and among the settlements on their banks. The major exceptions were smaller coastal rivers which were not

navigable because their courses were often blocked by snags of fallen trees.

The early European traders relied on water transport using the numerous creeks and rivers from where they communicated with specialist traders from the inland trading communities such as Arochukwu, Awka and Nkwere traders in the interior of south-eastern Nigeria until the later half of the 19th Century. In addition, some coastal and riverine communities such as the Efik, Opobo, Bonny and Calabar people traded directly with the European ships. Atubi & Onokala (2007) also noted that in Delta State, the waterways were used during the early history of trade between the Portuguese and the Ijaw, Itsekiri, Ukwuani, Bini and the Urhobo. Generally, palm oil and other agricultural products were transported to the ports by canoes while the slaves walked down to the coast and later the British merchants, who pushed the Portuguese, Dutch and other merchants away, as they penetrated and gained subsequent control of the interior, turned from slave trade to trade in vegetable oil.

Onokala (2002) noted that the period after World War I and II witnessed remarkable development in water transportation in Nigeria, mainly through such improvements such as introducing powered motor boats, government launches, motorized ferries in addition to engine boats and canoes for carrying goods and passengers along the River Niger and other major rivers and for transportation from one side of the river bank to another. Although the outboard engine boat (the Erico) was used on the River Niger between Onitsha and Asaba, River Niger remained a natural obstacle to road transportation until the first Niger Bridge, linking Asaba to Onitsha was constructed in 1965/66 and opened as a toll bridge but later the collection of tolls was abolished. Other major bridges across major rivers in Nigeria include, the Ajaokuta bridge near the confluence of the River Niger and River Benue at Lokoja as well as the Makurdi Bridge across the River Benue.

The development of modern seaports in Nigeria was linked to the establishment of the Nigerian Ports Authority (N.P.A) in 1954/55 and **since then Nigerian ports have played a dominant role in the country's international trade.** However, the ports system has been continually under stress and suffered from serious port congestion in the 1970's when other ports such as Tin Can Island port and Roll-on/Roll-off (RORO) port in Lagos were established. In spite of this, the Nigerian ports continued to suffer other unfavourable conditions such as use of old and dilapidated haulage facilities in handling cargoes as well as fixed tariffs and quotas by the government. **The reaction of port users to these unfavourable conditions was the use of alternative ports along the coast of West Africa such as the Port of Cotonou in the Republic of Benin, Lome Port in Republic of Togo, Accra Port in Ghana and Doula Port in Cameroon and others. Presently, much of the traffic that would have used Nigerian ports are diverted to other ports along the coast of West Africa in spite of the Port Reform in 2003 aimed at revitalizing the Nigerian ports since the ports infrastructure are long overdue for expansion and modernization.**

Over the years the volume of traffic handled by the inland waterways in Nigeria had fluctuated due to several reasons such as the Sahelian drought (1972-1974), construction of the Kainji Dam which reduced the water level and in some years the low output from the agricultural economy of the areas along the banks. Although such problems are not permanent, **the waterways and the ports in the country have never been properly developed for transportation.**

Onokala (2012) noted that presently, it is only the local communities along the creeks and rivers that use the waterways in Nigeria using wooden canoes, engine boats and various forms of modern vessels since the waterways transportation infrastructural facilities in Nigeria are not well developed. **Unfortunately, the huge capacity of ports and inland waterways for the cheap**

movement of goods and people, where they exist, has not been tapped to the advantage of Nigeria. Therefore, the huge potential of waterways mode of transportation, which is cheap for moving heavy and bulky goods and also has a lot of capacity for doing this, is presently underutilized in Nigeria.

2.2 DEVELOPMENT OF RAILWAY TRANSPORTATION INFRASTRUCTURE IN NIGERIA

Early reliance on the rivers and creeks as the major means of transportation in Nigeria shifted to the railways as soon as rail transport became available. **The railway network was constructed in Nigeria by the colonial administration in order to enable it to evacuate minerals and agricultural raw materials and forest resources from the interior parts of the country and also to enable the selling of imported manufactured goods in these interior locations. It was used for linking up the different regions of the country and thus for promoting inter-regional trade, and to increase economic and industrial development.**

Onokala (2002) noted that during the colonial phase of transport development in Nigeria, the penetration stage which was associated with the construction of the railway network from the ports of Lagos and Port-Harcourt inland as well as slight development of the inland waterways of the Rivers Niger and Benue during this period.

Most of the railway network of Nigeria was constructed between 1896 and 1964. The Nigerian railway network consists of 3,505 route kilometers of single line 1.067 meters gauge. The maximum permissible speed is only 64 kilometers an hour with a maximum axle load of 13.5 tonnes. In 1966, the Nigerian railways were dieselized and more efficient and economical diesel engines took over from the coal-powered engines.

After the initial construction of the railway network in Nigeria, there has not been any major modification or extensions of this backbone. The railway transport led to the general economic development of Nigeria by making possible the development of all parts of the country for agricultural exports, specifically cocoa in the west, groundnuts and cotton in the north and palm produce in the southeast. It facilitated the evacuation of minerals for export from the interior parts of the country (such as coal from Enugu and tin from Jos). It encouraged the development of long-distance inter-regional trade in various products within the country. It also led to the growth of existing towns and development of new towns along the railway routes.

From the middle of the 1970's, there was growing decline in the performance of the Nigerian railway system until it almost grinded to a halt for many obvious reasons. These include competition from road transport for goods and passengers, steady decline in the production of the traditional export commodities handled by the railway as well as the deterioration of the railway transport services which is slow, unreliable and grossly inadequate.

Due to many years of neglect, the Nigerian railway system has ceased to be economically viable. **It had deteriorated in all aspects and was caught up in a vicious circle of declining traffic, endemic deficits, decreasing capacity to serve its customers resulting in further loss of revenue over the past three or four decades. In addition, the existing railway network is no longer connected to the major population, resources and activity centres of the country.** Yet, railways are highly recommended for countries with large expanse of land, people and resources like Nigeria.

Onokala (2002) pointed out that the alignment of the national railway system has a major weakness of not having east-west railway connections. The prospects of a railway line to connect Port-Harcourt to Onitsha and from there to the west of the River

Niger has been mentioned but not yet been pursued vigorously. There were also plans for the expansion of the network by adding some east-west lines that will link the two existing north-south lines. The proposed lines are the Ajaokuta- Oturkpo and Warri-Ajaokuta- Itakpe lines (275 kilometers) for the proposed iron and steel complex which have not been actualized.

Presently, most of the railway infrastructure is old, obsolete, outdated and no longer adequate, poorly maintained and no longer functional. Therefore, there is need to modernize the entire Nigerian railway system because the railways are very important for transport coordination in Nigeria.

2.3 DEVELOPMENT OF AIR TRANSPORTATION INFRASTRUCTURE IN NIGERIA

The history of air transportation development in Nigeria started from the period after World War II in 1945 when flights were operated by the British Royal Air Force (RAF), West African Airways Corporation (WAAC), between Britain and her colonies in West Africa (Nigeria, Gold Coast, Sierra Lone and Gambia).

As soon as Nigeria became independent in 1960, the Federal government of Nigeria established the Nigerian Airways Limited as the national carrier, 100 per cent owned by the Nigerian government. Over the years government made huge capital investments in the development of air transportation in the country by introducing improved modern aircrafts (DC-3, F27, F28 and later Dc-8, Dc-10, Boeing 707, Boeing 737 and Boeing 474).

The Nigerian Airways operated international flights to East and West Africa, parts of Europe, North America and Asia. It also enjoyed the monopoly of providing domestic air services in the country until the 1980's when increase in demand for air transport and public complaints about the shortcomings of the Nigerian Airways forced the government to permit the participation of private airlines in domestic aviation. Onokala (2002) noted that

the civil aviation sector in Nigeria has shifted from a purely public sector of the 1970's and 1980's to a liberalized sector with private sector participation in airline business, in line with the global trend.

Since the establishment of air transport services in Nigeria, there has been tremendous increase in air traffic in the country and this has been very well documented (Filani, 1975, Bardi, 1987 and Akpoghme, 1995). **In fact, the last two decades in Nigeria has witnessed an enormous expansion in both domestic and international traffic but domestic traffic predominates and jumped from 5.2 million to 8.4 million between 2001 and 2007.** The situation in Nigeria is similar to what is reported at the global level where the International Air transport Association (IATA) reported world total domestic air passenger traffic of 1,249,000,000 in 2007 indicating 8 percent growth over the number for 2006 (IATA, 2008).

The National Civil Aviation Policy (NCAP) of 2001 formalized the deregulation and privatization of the aviation sector in Nigeria. **After this, the Nigerian Airways was formally liquidated in 2003 and private airlines have not only taken over both domestic and international air transportation but are also expanding their domestic and international services.**

The private airlines operating in Nigeria include Arik Airlines, Aero Contractors, Bellview Airlines, Associated Airlines, Capital Airlines, Overland Airlines and Chanchangi Airlines.

The international airports are at Abuja, Lagos, Port Harcourt and Kano. Kaduna, Ilorin, Sokoto and Enugu airports are of lower standards but are gradually being upgraded to international standards. In fact, most state capitals have airports.

The development of airways infrastructure, which started in the postcolonial phase of transport development in Nigeria, is still going on, with such projects for the modernization of airports as the upgrading of Enugu airport and others to the status of international airports as well as new airports construction. Over the years the number of airports in Nigeria, which are owned by the government, has steadily increased. Presently, Nigeria has 22 airports and many of them have been upgraded recently to international airports that can handle modern aircrafts. Due to its inherent advantage of speed in a situation where large spatial disparities occur in resource endowment and production as in Nigeria, the important and inevitable role of air transportation in the movement of people across the country has contributed a lot to the Nigeria's economic development.

Onokala (2012) noted that due to improved economic conditions, Nigerians are willing to travel and ship goods by air more than ever before. The air transportation mode is growing at an alarming rate and has huge potential for the development of tourism in Nigeria. Therefore, the airways transportation in Nigeria has a lot of room for expansion.

2.3 THE DEVELOPMENT OF ROAD TRANSPORTATION INFRASTRUCTURE IN NIGERIA

In Nigeria, although existing bush paths were widened to form a skeletal grid of road network, roads were not widely developed until the advent of motor vehicles in the 1920's and 1930's and extensive road development took place only after World War II. In 1926, the road system of Nigeria was classified into three major types as Federal Trunk A Roads, Regional/State Trunk B Roads and Provincial/Local Government Trunk C Roads. In this way, the Federal, regional/state and provincial/local governments were given separate responsibilities for the planning, construction and maintenance of roads in the country.

Although roads were primarily built to feed the railways and be complementary to them, roads eventually took over from the railways as the country's road network improved and captured more and more traffic from the railways, especially after independence in 1960. The new roads resulted in tremendous savings in travel time.

Since 1980, the Federal Government of Nigeria has expanded the Trunk a road network in the country substantially. **A major feature of the current stage of transport development in Nigeria is the development of high priority linkages, which is associated with a system of 4-lane expressways that were constructed in the country since 1980.** These include the expressways between Lagos and Ibadan, between Shagamu and Benin City, between Benin City and Onitsha, Onitsha and Enugu as well as between Enugu and Port-Harcourt via Aba and Umuahia in southern Nigeria. In northern Nigeria, another system of 4-lane expressway has also been constructed between Abuja and Kaduna, between Kaduna and Zaria as well as between Zaria and Kano, and currently the construction of an expressway between Abuja and Lokoja has just been completed.

The two-lane expressways reduced travel time and provided increased capacity for more vehicles to travel between the major cities, which they link together and therefore more intense interaction resulting in more economic development. For example, since the construction of the expressways more intense interaction is experienced between Lagos and Benin, Port-Harcourt and Enugu via Aba and Umuahia as well as between Abuja, Kaduna, Zaria and Kano.

Most parts of the country are linked by roads (especially during the dry seasons). The types of traffic that use the roads are also varied. In the 1950's, dual-purpose mammy wagons used for carrying both goods and passengers were predominant but these were gradually overtaken by 10 to 15 tonne trucks/lorries and 30

tonne trailers that carry containers for the transportation of goods while heavy tankers are used for the transportation of fuel and other petroleum products by road. Most passengers now travel in buses and minibuses, while some travel in taxis, private cars. Over the years, there has also been a tremendous increase in the number of vehicle registrations. In addition, travellers are becoming increasingly time conscious and there is need to take this into consideration.

There is no doubt that the Federal, state and local governments have been giving high priority to more road construction in their development plans and annual capital budgets in order to achieve more economic development and promote national unity, inter-regional trade and tourism. **Consequently, the contributions of road transportation to the socio-economic development in Nigeria are not only significant but also decisive since they opened up new lands for agricultural, industrial and residential development. Roads changed the orientation of the interior areas of the country from the waterways and the railways to the road network and opened up the interior parts of the country to modern means of transportation because they are flexible. They opened economic and settlement frontiers and provided increased accessibility to areas where export crops were cultivated. Roads integrated urban and rural settlements and encouraged long-distance trade. Interregional trade promotes internal unity, fulfils complimentary nutritional needs of Nigerians and also raises the economic standards of the traders engaged in the long-distance trade. Road encouraged the migration of population from the hinterlands to the new transport routes thus giving rise to a ribbon-like concentration of towns and villages along both sides of the new roads.**

Roads provide employment for drivers, mechanics, spare parts dealers, vulcanizers, petrol stations, car washers and other related activities and their numbers have increased in recent

times. The employment generating and other multiplier effects resulting from these forms of linkages have gone a long way towards the modernisation and rapid development of the Nigerian economy. Roads are also very important for successful tourism activities in the country.

The demand for road transportation in Nigeria has always exceeded supply. This is because road transport is regarded as a catalyst for regional/ national, urban and rural development.

3.0 COMPARATIVE USE OF AVAILABLE TRANSPORTATION INFRASTRUCTURE IN NIGERIA AND ITS CONSEQUENCIES

The examination of the historical development of the major modes of transportation, namely waterways, railways, roads, and airways, which have played, are playing and will continue to play very significant roles in the economic development of Nigeria as well as the various problems and challenges facing these modes presented above as **The Journey so Far has indicated that there has not been a balanced development of the country's transportation system.**

Although the road is good for short- and medium- distance goods and passenger transportation, it is presently almost solely responsible for carrying people and goods for long distances all over the country. Presently, roads account for 90 per cent of import traffic, 85 per cent of export traffic and about 90 per cent of the internal movement of people and goods in the country. Unless the use of the rivers, inland waterways and the railways and pipelines are revived this proportion is likely to rise even higher in the next few years.

Presently, with the marked increase in road construction and the simultaneous operational and organizational difficulties being experienced by the railway and inland waterways systems, the movement of people and all types of goods all over

the country is dominated by road transport. In fact, roads are over used and misused in Nigeria while the waterways have a lot of capacity that is not being utilized. Railways and pipelines were heavily used in the past but at present they are sparingly used while the airways are heavily used but still need a lot of improvement and expansion. Therefore, the roads are overused and also wrongly used.

Table 3: Proportional Allocation of Capital Expenditure to the Transport Sub-Sector 1962-2000

S/N	Transport Mode	Plan Period							Average
		1962-1968	1970-1974	1975-1980	1981-1985	1985-1989	1990-1994	1995-2000	
1	Highway (Road)	54	58.8	72.4	70	72.6	65	70.2	66.14
2	Railway	14	17	10.6	15	3.8	14.2	13	12.54
3	Port (sea)					5.9	7.5	4.6	10.57
4	Waterways	25	13	9	9	3.8	3.3	3	3.37
5	Air (Airports)	7	11	8	6	5.6	2.6	2.3	6.07
6	Others	N/A	N/A	N/A	N/A	8.4	7.4	6.9	7.57
	Total	100	100	100	100	100	100	100	

Sources: Nigeria National Budget and Rolling Plans, (1962 – 2000)

This situation is highly regrettable because as Table 3 indicates that roads (highway) received highest allocation of the budget to the transport sector from the Federal Government from 1981 to 2000. In fact, the government spent more on road transport than on all the other modes put together.

Therefore, the predominant use of the road is not only because of its inherent advantage of flexibility but also because transport development has favoured the road over all the other modes in Nigeria's development process. The overuse

and misuse of roads has serious negative implications for the continued economic development of the country.

The two major results of this pattern of predominant use of road transportation over all the other modes of transportation in Nigeria are **environmental problems of road transportation and high occurrence of road traffic accidents which are now discussed.**

3.1 ENVIRONMENTAL PROBLEMS OF ROAD TRANSPORT IN NIGERIA AND THE WAY FORWARD

3.1.1 Environmental Problems of Road Transportation in Nigeria

Environmentalists recognize that road construction projects and the utilization of road facilities carry with them the risks of irreversible to the environment as shown in the following ways.

1. The general effects of road construction on land resources such as earthworks, road cuttings and embankments and landslides as well as road failure and *severe erosion of the soils exposed during road construction.*

-The large land space taken up by the road infrastructure causes urban sprawl in urban areas as the destruction of valuable agricultural lands in the rural areas.

-Roads also *separate human settlements and communities on either side of the road and partitioning or destroying neighbourhoods, hamlets and separating villages from their farmlands.* For example, the people of Umumba Ndiuno along the Enugu-Onitsha expressway as well as people from Amaise-Ahaba along the Enugu-Port-Harcourt expressway are separated by these roads, which they have to cross in order to go to some of their farmlands, and occasionally villagers get involved in serious accidents as they cross the expressway to their farmland or social activities on the other side of the road.

- Destruction of forest resources and natural habitats which cause ecological disruption of wildlife habitats and ecosystems, and also destroys scenic beauty.

2. Environmental Problems of Road Maintenance in Nigeria include potholes, non-provision of drainage/culverts at the sides of the roads, irregular cutting of grasses on both sides of the roads and at the centre of the dual-carriage expressways, among others. The Federal Road Maintenance Agency (FERMA) was established in 2002 by the Federal Ministry of Works and Housing to handle this problem. This Agency is expected to monitor and constantly repair damage on the roads regularly. Unfortunately, the roads are not still well maintained in spite of the Federal Roads Maintenance Agency (FERMA).

3. Environmental Impact of the Normal Use of Roads include air pollution, noise pollution as well as generation of solid wastes from abandoned vehicles, roadside litter and other associated waste materials. Unfortunately, no acceptable noise and air pollution levels have been set or are being enforced on Nigerian roads.

In addition, too many vehicles on urban roads cause **traffic congestion** even in small towns like Nsukka. Onokala (2007) in discussing the effects of **traffic congestion in urban centres in Nigeria**, noted that in Nigerian urban centres the traffic congestion is complicated by other such dimensions as driver's impatience and indiscipline as well as parking problems. Congestion leads to the wastage of the valuable time of the urban dwellers and reduces manpower productive hours.

4. Environmental Problems of Overuse and Misuse of Roads in Nigeria

In many cases, roads are used while construction and/or rehabilitation are still going on. Even after the roads have been completed, most of the roads feature vehicles with high axle loads

in excess of the approved 9 tonne vehicle weight. In fact, trucks and trailers as heavy as 15 tonnes are common loads on Nigerian roads. **The use of excessive high axle loads and overloaded heavy vehicles, such as trucks and trailers, on both tarred and roads which are not tarred for long-distance trade within the country, leads to the fast deterioration and reduction of the life-span of the roads.** They result in premature damaging of the roads and also cause serious accidents and loss of human lives and property.

Roads are overused and misused since human beings, animals and various types of freight are carried together in the same vehicles in a very untidy manner on most Nigerian roads. The use of motorcycles (Okada) for the transportation of people and goods is also increasing. Some motorcycles carry up to five or six people whereas the maximum possible number is only two, made up of the driver and one passenger.

Roads are supposed to be used for the collection and disposal of wastes in urban areas. Transport serves as a means of disposing the large amount of wastes generated by the increasing urban population in order to reduce the risk of disease outbreak and enhance the quality of the environment. Unfortunately, in spite of the opportunity created by road transport for the removal of wastes, not much is being done in Nigeria. *Rather, all over the urban environments in the country roads are used as waste dumps by nearby residents.*

5. Contribution of Road Transportation to Climate Change in Nigeria

The link between transportation and climate change is as a result of greenhouse gas emissions by the various modes of transportation which contribute to global warming and climate change. The transportation sector (which is second to the power production sector) accounts for 30.3 percent of global CO₂ emission into the atmosphere. Out of the 30.3 percent of the

emissions from the various modes of transport road transport accounts for 22.9 percent leaving only 7.4 percent to other modes. According to IEA (2006) the global CO₂ emissions from the transportation sector are projected to increase by 140 percent from 2000 to 2050, with the biggest increase in developing countries such as Nigeria. In Nigeria, the transport sector contributes from 36 percent to 42.9 percent of the total carbon dioxide emissions caused by anthropogenic activities. With rapidly increasing urban growth and corresponding increases in vehicle ownership and transport use, urban centres in Nigeria will face increase in the negative environmental impact of transportation in the urban centres as well as the consequent effects of climate change. Yet, in Nigerian cities, most people still use obsolete technologies in fuel and vehicles such as leaded fuel and old and rickety vehicles in transportation activities in spite of available modern technologies due to financial constraints. This explains why the large cities in Nigeria like Lagos, Port-Harcourt, Ibadan and most other cities in Nigeria are some of the most polluted cities in the world. This may lead to serious health problems and after many years the cumulative effect would also be contributing to global pollution. Onokala and Ali (2010) examined the potential contribution of sustainable urban transportation in the reduction of Greenhouse Gas Emissions (GHG's) in Nigeria and they recommended the use of the methods of Sustainable Transport defined as all forms of transport which minimize fuel consumptions and emissions of carbon dioxide and pollutants. These methods can reduce traffic congestion, the volume of vehicles on the roads and the associated GHG gas emissions. **Unfortunately, the extent of the contribution of the vehicles to urban environmental pollution in Nigeria is not known because it is not measured.** Yet, it is imperative to embark on these sustainable transport practices in Nigeria so as to mitigate the effects of climate change.

Onokala and Phil-Eze (1996), Onokala (2001) as well as Onokala & Phil-Eze (2001) discussed environmental impact of road transport development projects in Nigeria using 103 kilometres

Enugu-Onitsha expressway with dual carriageway between Enugu State and Anambra State as a Case Study (13 years after the expressway was commissioned for public use in 1983).

The results of the analysis indicated that although the expressway increased accessibility between major centres it had serious negative environmental consequences on land, water and other resources in the environment. The overwhelming negative impact of the Enugu-Onitsha expressway on the physical environment is not surprising because no Environmental Impact Assessment (EIA) was undertaken before the road construction took place. This explains why the quality of most roads constructed in the country is rather poor by international standards, and that is why they get bad after a few years.

The negative environmental impacts of the expressway include the large number of land excavation for construction materials and evidence of major landfills around Enugu and the Milliken Hills and severe erosion, flooding and landslides which are also common. The effect of road construction and use on soil quality leads to the destruction of soil profile which accelerates the failure of the expressway under heavy traffic weight resulting in potholes, silting during the rainy season as can be observed at Oji, Ugwuoba, Nawfia and Nteje. The use of the road resulted in the destruction of the ecosystem, loss of biodiversity as well as the destruction of the soil profile which reduce the fertility of the soils for agricultural purposes.

The negative effects of the expressway on the physical environment was such that in those locations where no settlements existed before the construction of the expressway, the respondents did not observe or experience any negative physical impacts of the road construction activities on land and water resources. However, in such places as Abakpa Nike, Imezi Owa, Awkuzu and Nkwelle Ogidi and others where settlements existed before the construction of the expressway the respondents were bitter about their loss of

agricultural land as well as damage to their property, economic trees and houses which they experienced from the road construction activities. In fact, many communities in these locations had to resettle elsewhere or migrate to other places while those that remained had their access roads and footpaths destroyed. The study also identified four (4) water courses along the Enugu-Onitsha expressway, which were covered up during the construction process, instead of providing bridges across them. These are found at Oji, Ugwuoba, Amawbia and Abba. As a result, these four sections of the road are always waterlogged during the rainy season.

It was recommended that other expressways in Nigeria should also be studied.

3.1.2 WAY FORWARD ON ENVIRONMENTAL ISSUES AND PROBLEMS OF ROAD TRANSPORTATION IN NIGERIA

a) Creating Awareness on Adverse Impact of Transportation on the Environment and on Climate Change

-There is urgent need for increasing awareness of the public and policy makers to the dangers of the continued overuse and misuse of road transportation in Nigeria at the local government levels. This can be done through conferences, workshops and seminars. Video coverage of the adverse impact of road construction and use on the Nigerian environment should be compiled and widely advertised or publicized on television in order to create awareness. In addition, it is recommended that environmental and climate change issues should be introduced into the curriculum of relevant subjects like Geography and other Social Science disciplines at all levels of education to create awareness to as many people as possible in Nigeria.

b) Use of Environmental Impact Assessment (EIA) Methods/Procedures

Onokala (2002) recognized the negative impacts of road construction and use on the Nigerian environment, the social costs which the society pays for the construction of roads and the expressways, and for not undertaking Environmental Impact Assessment (EIA) before the construction took place and suggested the use of Environmental Impact Assessment (EIA) in Nigeria to make road construction and its use by vehicles and other road users to lead to sustainable development as is done in other developed countries. Nwafor (2006) outlined the major stages of the EIA procedures, namely screening, scoping and baseline studies during the pre-study stage, followed by the main EIA stage and finally the post-study auditing and environmental monitoring stage. Meanwhile, as a follow-up of the National Policy on Environment, the Federal Government of Nigeria enacted the EIA Act No 86 of 1992 as a demonstration of the country's commitment to sustainable development and FEPA has a National Guideline for Environmental Impact Assessment for all development projects in the country, including roads and highways, but unfortunately this is not being properly enforced and many aspects are often manipulated and compromised.

It is therefore suggested that FEPA and other existing institutions that are weak should be strengthened so that they can enforce the use of EIA procedures before the construction of every major transportation infrastructure such as new roads, railway line, and dredging of the River Niger. Subsequently, comprehensive programmes for monitoring the environmental and social impacts of road construction activities and the use of roads by motor vehicles and other road users, on a regular basis, as is done in other developed countries should be developed.

c) **Reducing the Impact of Transportation on Environmental Pollution by Using Non-motorized Modes of Transportation and other Methods**

Although there is *increasing awareness that the use of non-motorized transport* such as bicycles and walking help to reduce environmental problems in urban centres, especially in the Central Business Districts in developed countries, it is not the same in developing countries like Nigeria. Since *most roads in the urban centres in Nigeria were constructed without making any provisions for pedestrians and cyclists*, the current use of motorcycles, tricycles (Keke Napeb) and bicycles on urban roads in Nigeria is very chaotic and causes a lot of accidents with the result that the **concern for safety and other unfavourable conditions make non-motorized modes of cycling and walking unattractive modes of transportation in Nigeria**. Even an attempt by a former Minister of Transport, Chief Ojo Maduekwe, to introduce the use of bicycles in Nigerian urban centres in 2001 was not successful.

-Therefore, it is recommended that separate bicycle lanes which would enable the integration of the bicycles with other modes be provided (as in some developed countries like Netherlands, where the use of bicycles is predominant).

-Other methods include working out improved ways of road maintenance, in addition to FERMA and immediate stopping of **dumping of refuse on urban roads**.

-Also, in order to reduce the rate of greenhouse gas (GHG) emissions, it is suggested that *acceptable noise and pollution levels be set and enforced by FEPA, immediate stopping of gas flaring in the Niger Delta region and reducing oil spillage in the coastal oil-producing areas of Nigeria and the use of improved quality of fuel*. Nigerian traffic is characterized by poorly maintained and mostly old vehicles and since January 1995 when it was announced that used vehicles more than 8 years old will no

longer be imported into the country the number of such vehicles has increased instead of decreased.

-Therefore, it is recommended that FEPA should start highlighting the negative effects of air and noise pollution caused by transportation, as is done in the developed countries, using the *United Nations Environmental Programme (UNEP's) Handbook on Environmental Guidelines for the Motor Vehicle and its Use as a guide*.

3.2 HIGH OCCURENCE OF ROAD TRAFFIC ACCIDENTS IN NIGERIA

Accident means an unforeseen and often disastrous event that occurs by chance and which usually produces unexpected and unpleasant consequences. Road traffic accident was defined by Onokala (1995) as unexpected and unpleasant events that cause loss or injuries to passengers, vehicles and other mobile or immobile facilities along a route. They have serious implications for the lives of those involved as well as financial costs and also involve the risks of death. **High occurrence of road traffic accidents is another major consequence of overuse and misuse of road transportation in Nigeria.**

Road accidents are classified into **minor** when the injuries are minor, **serious** when the injuries caused involve hospitalization, and **fatal** when death is involved. They can also be categorized into four different ways, namely, *by degree of severity, by type of collision, by cause of accident and by phase of crash*. Road traffic injury is a major cause of death and disability in both developed and developing countries of the world. In almost all countries in Africa, Asia and Latin America road traffic accidents have become one of the leading causes of death of the youths as well as economically active adults. Unfortunately, little attention has been paid to road traffic accident prevention in most African countries, including Nigeria.

In the 1980's Nigeria had one of the highest rate of deaths from road traffic accidents in Africa leading 52 other nations in the number of deaths per 10,000-vehicle crashes. In fact, in comparison with the road traffic accidents in the more developed countries of the world the high accident and fatality rates in Nigeria were **so high that the situation was simply an embarrassing waste of human lives and resources for the country. Nigeria was followed by Ethiopia, Malawi and Ghana.** By 1987, Nigeria topped the list of 38 countries worldwide with the highest record of death by road traffic accidents with the chances of a vehicle killing someone on Nigerian roads being 47 times higher than in Britain. Statistics indicate that although by 1995, Nigeria had fewer than one million vehicles, our road accident fatalities are about 20 times that of the United States of America with 100 million vehicles. In fact, it was estimated that 2 out of 5 (40%) of deaths in the country were due to road traffic accidents.

WHO Global Status Report (2013) noted that although progress is being made to make the world's roads safer there is need to intensify and accelerate this critical work as over 1.24 million people were killed in road traffic accidents in 2010. Most of the accidents occurred in developing countries that are motorizing rapidly, such as Nigeria, where over one third of road traffic deaths involve pedestrians and cyclists. The Report emphasized that there is need to view road traffic accident as an issue that needs urgent attention aimed at reducing health, social and economic impacts all over the world. **This explains why in 2010 the United Nations General Assembly unanimously adopted a resolution calling for a Decade of Action for Road Safety from 2011 to 2020.**

In Nigeria, the Federal Road Safety Commission (FRSC) was established by Decree No. 45 of 1988, to help in solving the problem of road traffic accidents in the country and it complements the efforts of the Nigeria Police Force. One of its major functions is the regular patrol of the highways with the aim

of reducing reckless driving in order to enforce traffic rules and regulations. It has also taken over the function of enforcing some road traffic laws from the Nigeria Police, such as giving immediate attention to accident victims in order to reduce the effect of the injuries. The Road Safety Corps now enforce the speed limit of 100 kilometres per hour to reduce road traffic accidents. Although there has been some improvements made by the FRSC in conjunction with the Police Force but there are still lots of room for improvement. Presently, both of them do not have sufficient resources for checking speed violation, careless and dangerous driving and parking offences among others. **Unfortunately, such an important issue as reducing road traffic accidents in Nigeria has not yet received the adequate attention that it deserves.**

3.2.1 My Contributions to Research on Road Traffic Accidents in Nigeria

These studies were aimed at identifying the causes of road traffic accidents in Nigeria and how to reduce the high number of road traffic accidents. Onokala (1995) examined the *relationship between road traffic accidents and land use in order to explain the predominance of fatal accidents involving mostly pedestrians and bicycles in Benin City, Nigeria*. The results of the study indicated that there were 33 roads which comprise the Identified Accident Routes (IAR) in the city and that these routes generally follow the pattern of activities of the urban residents. Atubi and Onokala (2007) investigated the effect of climatic factors such as rainfall on road traffic accidents in the Niger Delta, with special emphasis on Benin City, Nigeria over a five-year period (1998-2002). The results of the analysis indicate that *human factors such as driver's fault or reckless driving, mechanical fault and the bad nature of the roads due to lack of maintenance were the major causes of accidents in Benin City*. It also indicated that although there was no statistically significant relationship between rainfall and road traffic accidents in the area of study and that

rainfall does not cause accidents in Benin City, it reduces visibility and makes the road slippery.

Atubi & Onokala (2003) used Correlation Analysis for the study of the *effect of road transport infrastructure and accident occurrence in Warri metropolis, Niger Delta*. The results of the Correlation Analysis indicate that because *majority of the roads are very narrow*, there was high positive relationships between accident occurrence and motor car transport ($r^2 = 0.90$) as well as between accident occurrence and motorcycle transport ($r^2 = 0.90$). Atubi & Onokala (2005b) also identified *the factors that contribute to the occurrence of traffic congestion and road accidents in Warri metropolis, Delta State, Nigeria*. The results of the analysis indicate that in Warri Metropolis, the commercial, residential and industrial land uses are generators of heavy traffic which cause traffic congestion. However, *there was no statistically significant relationship between traffic density in relation to land use pattern and road traffic accidents in Warri metropolis*. It was recommended that there should be a re-orientation of the land use pattern, improved network infrastructure and traffic facilities, such as traffic lights and traffic signals, in order to reduce the problems caused by traffic congestion and road accidents in Warri metropolis.

Atubi (2006) also analysed road traffic accident patterns in Lagos State from 1970 to 2000 while Atubi & Onokala (2009) used accident records from the Nigerian Police Force (NPF) and Federal Road Safety Commission (FRSC) for a thirty-two (32) year period (1970-2001) to investigate the spatial and temporal patterns of road traffic accidents in Nigeria in general and in the 20 local government areas of Lagos State in particular in order to suggest preventive and corrective measures for reducing road traffic accidents in the area of study. Lagos State is the smallest State in area in the country yet it had the highest average number of accidents and casualties nationwide. The State has over 5% of Nigeria's estimated total population of 170 million people with a

population growth rate of over 9 percent per annum. This population increase has been accompanied by a corresponding increase in motor vehicles and traffic accidents. Lagos is a major traffic centre and one of the most heavily motorized and fast-growing urban centres in the country. Until recently, Lagos was noted for its poor and chaotic road traffic conditions.

Both primary and secondary data were analysed and compared using Analysis of Variance (ANOVA), and Multiple Linear Regression Analysis was used to identify the factors that influence road traffic accidents in Lagos State. **The spatial and temporal pattern of distribution of road traffic accidents in the State** from ANOVA indicate that the annual number of accidents vary by local government area while the ten most accident prone LGA's in Lagos State are Lagos Island, Lagos Mainland, Ajeromi/Ifelodun, Ikeja, Mushin, Oshodi/Isolo, Apapa, Eti- Osa, Kosofe and Ojo. These areas are accident-prone because they are the most commercialized and motorized areas of Lagos State. **The results for the temporal pattern of road traffic accidents obtained indicated that for various reasons most of the accidents in Nigeria occur in the peak rainy months of June, July and September due to the bad condition of the roads as well as the months of October, November and December due to increased vehicular movement of people to celebrate Christmas and New Year holidays with their friends and families. Some days of the week such as Fridays and Saturdays generate more human movement and vehicular traffic than others because of their high concentration of socio-economic activities such as weddings, funerals and shopping trips. For example, church weddings to be held on Saturdays are usually preceded by traditional weddings/bachelor's eves on Fridays while burial ceremonies to be held on Saturdays are also preceded by funeral wake ceremonies on Fridays. In addition to these activities, the Moslems go to the mosques on Fridays while shopping trips take place on Saturdays and Church services are held on Sundays. Therefore, starting from Fridays**

till Sundays the roads are very busy with few traffic policemen while some motor drivers may be drunk after attending some of these activities. Other studies on road transport accidents patterns include Onokala (2002) on Enugu and Atubi and Onokala (2005d & 2009) on Warri metropolis and Lagos, respectively. Onokala & Atubi (2007d) regretted traffic congestion and road traffic accidents have continued to slow down socio-economic and sustainable development in many urban centres in Nigeria.

3.2.2 The Contributions of FRSC on the Recent Status of Road Traffic Accidents in Nigeria

Data from FRSC indicate that the number of traffic accidents and their intensity vary among the different States of Nigeria. Fig 1 highlighted the 5 top States according to Road Safety Records, namely, FCT, Nasarawa, Kaduna, Bauchi and Niger States.

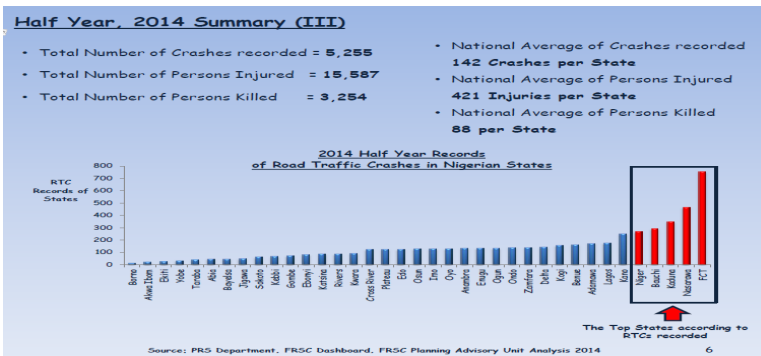


Fig 1: 2014 Half Year Records of Road Traffic Crashes in Nigeria States.

The FRSC records show that the road traffic crashes, the number of persons killed and the number of persons injured have increased steadily between 2012 and 2014.

The figure below shows Abaji-Gwagwalada route topping the list and is followed by Abuja-Kubwa expressroad while the 9th Mile – Onitsha road is ranked as No. 6.

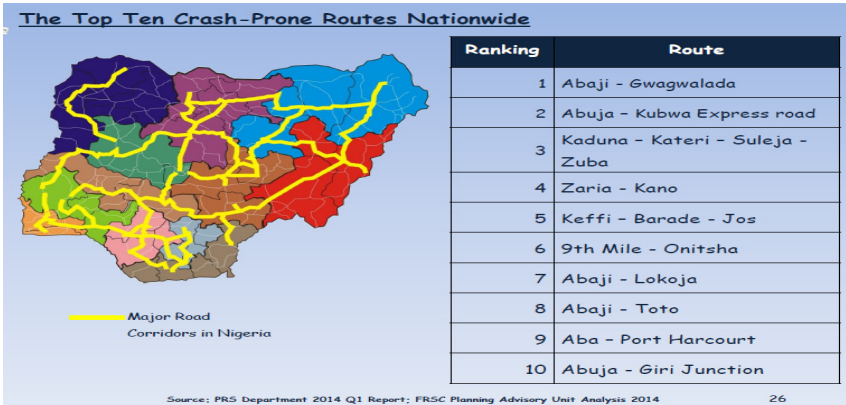


Fig.2: The top 10 Crash-Prone Roads Nationwide on a Map and on a Table.

From the above researches and investigations, it has been demonstrated that the major problems of road traffic accidents in Nigeria caused by the overuse and misuse of road transport facilities in the country can be classified as *driver-related (especially driving at high speeds), vehicle-related, road-related, environment/weather-related, and circumstances-related factors*. The driver factor includes inadequate training and testing of drivers, poor driving skills, low non-seat belt use, uncorrected eye sight, ignorance of traffic laws, improper parking, driving at high speed, impaired/bad driving due to alcohol and drug abuse, sleep deprivation, anxiety and impatience among others. The vehicle factor includes poor vehicle maintenance and attendant frequent vehicle breakdown. Road-related factors include insufficient road facilities due to poor design and poor traffic policing due to inadequate manpower, lack of equipment and corruption and inadequate road safety campaigns. In addition to increased number of vehicles and passengers, traffic accidents may also be caused by structural failures of old and worn out road facilities or from

vehicles using the roads. **Other factors include the large tankers and trailers the use the roads and cause the roads to deteriorate fast and cause accidents as well as tanker and trailer drivers who travel at high speed and cause serious accidents.**

Other reasons include *inadequate traffic signals, poor walkways for pedestrians and unavailable correct traffic signals*. These deficiencies in the operational and control aspects of the road systems are worsened by ineffective traffic law enforcement by corrupt officials. All these contribute to the country's high incidence of road accidents and fatalities.

It is not surprising that the human factor is the most potent contributor to motor vehicle accidents in Nigeria because of *individual and collective apathy to the safety of mechanized transportation as well as ignorance and lack of respect for other road users*. These are further compounded by *the low level of development and integration of the country's transport system resulting in Nigeria's over-reliance on road transportation*.

3.2.3 The Way Forward on Reducing Road Traffic Accidents in Nigeria

a) Coordinated Approach. There should be a coordinated approach by all stakeholders such as NigeriaPolice, the Federal Road Safety Commission (FRSC), Vehicle Inspection Officers (VIO), teachers, parents, planners, doctors and the general public.

b) Research on causes of road traffic accidents in the country, especially their spatial and temporal patterns on a regular basis is recommended.

c) It is suggested that information instruments such as public awareness campaigns, workshops and seminars as well as the radio, television, eco-driving and training education should be

used to improve driver education and all the aspects of sustainable transport development in the country.

d) There is an urgent need to embark on mass traffic education of road users in all segments of society in Nigeria so that they can imbibe the culture of safe driving in order to reduce accidents.

e) In Nigeria, road traffic accidents prevention interventions were sporadic, uncoordinated and ineffective before the establishment of the FRSC in 1988. The FRSC now enforces the speed limit of 100 kilometres an hour by using check-points at some locations along the highways, but this also often causes accidents too. It is therefore suggested that the Commission should be adequately funded as to employ more efficient and modern methods of checking speed violation, careless and dangerous driving as well as parking offences in order to reduce road traffic accidents.

f) There is need to learn from other countries with better traffic management systems (such as Great Britain and U.S.A.) that have demonstrated that increased population and vehicular traffic growth do not necessarily have to lead to increase in traffic accidents, deaths and permanent injuries as is the case in Nigeria. **If they achieved this through proper planning, adequate traffic accident control and injury prevention, Nigeria can also do the same.**

g) **It is important for Nigeria to follow the recommendations from WHO Global Report on the Decade of Road Safety (2010-2020). There are 5 pillars guiding the plans and activities during this Decade and the specific targets are reducing speed, reducing drinking and driving, increasing the wearing of helmet by motorcyclists, increasing the wearing of seat belts, and increasing the use of child restraints in vehicles.**

4.0 THE WAY FORWARD FOR THE DEVELOPMENT OF TRANSPORTATION AND ECONOMIC DEVELOPMENT IN NIGERIA IN THE 21ST CENTURY

4.1 THE GEOSTRATEGIC LOCATION OF NIGERIA

An integrated transportation system for Nigeria must take into consideration the geostrategic location of Nigeria in order to sustain Nigeria's social and economic growth that will enable her to compete favourably in international markets in the 21st century.

The size and location: Nigeria is a comparatively large country, with an area of 923,768.64 square kilometres. It is located between longitude 3⁰E to 6⁰E and latitude 4⁰N to 14⁰N. By its location, Nigeria has Cameroon Republic to its east and Benin Republic to its west and to the north, it has two landlocked countries of Chad and Niger.

Vast Natural Resources and Growth of Nigerian Economy: Nigeria is endowed with abundant mineral resources and agricultural resources which vary according to the three predominant ecological zones. The Nigerian economy has also been growing relative to that of many other countries in the sub region.

Growth of Population: The present population of Nigeria is about 167 million out of a total world population of 7 billion. The population is increasing at a very fast rate in both the rural and urban areas of the country. Consequently, **the demand for transport is high and growing and generally exceeds supply.** This trend is likely to continue with improved economic development.

These favourable strategic conditions should make the **transportation system in Nigeria to be internationally oriented and not only connecting the country internally but also**

connecting her to her neighbouring countries and the rest of the world.

4.2 RESTORATION OF REFINERIES AND PIPELINE TRANSPORTATION IN NIGERIA

The pipelines were constructed to link the 2 (two) refineries at Port-Harcourt as well as the refinery in Warri and the refinery at Kaduna with the oilfields in the Niger Delta. They are also connected for the transportation of petroleum products from the refineries to the NNPC pumping stations and depots across Nigeria. After many years of lack of maintenance, all the refineries in the country were abandoned and petrol tankers used for transporting all became non-were are no longer being operated and if they function at all types of fuel by road to all parts of the country. This practise is not only unsafe but also expensive.

It is therefore suggested that the existing pipelines should be put back into use so that the tankers are no longer used for long distance transportation of petroleum products in the country. The existing refineries should also be repaired and put back into use. The pipelines may even be expanded to other neighbouring countries so that Nigeria can supply petroleum products to them and earn some foreign exchange. The restoration of the refineries and the pipelines will enable the development of a transport system in which each mode of transportation has the opportunity of fulfilling its unique role in transport system of the country.

4.3 EXPANSION AND MODIFICATION OF THE NETWORKS FOR THE DIFFERENT MODES OF TRANSPORTATION IN NIGERIA

4.3.1 The Way Forward for the Infrastructural Development of the Ports Rivers and the Inland Waterways in Nigeria

There is urgent need for revamping the Nigerian ports, rivers and inland waterways for future competitive market demands globally. Atubi and Onokala (2005b) had emphasized the importance of

ports as gateways to the agricultural and industrial hinterlands of Nigeria. The country has an extensive coastline of 825 kilometres and major ports on this coastline should provide the opportunity of providing adequate port services not only to Nigeria but also to landlocked countries in West Africa, particularly Chad and Niger Republic as well as serve as a hub for transshipment to the West and Central African sub-region.

The Port Reform of 2003 and the establishment of Export Processing Zone at Calabar port were aimed at revitalising Nigerian ports but their effects are yet to recapture goods destined for Nigeria which are still captured by ports in neighbouring countries (such as Cotonou Port in Benin Republic, Lome Port in Togo, Accra Port in Ghana and Doula Port in Cameroon). **As a way forward, other such reforms for more seaports for development should be identified.** In addition, the existing inadequate port infrastructure should also be improved upon and constant repairs should take place within the ports in order to cause further development in these ports. Presently, only Lagos Port and Port-Harcourt Port are linked to the railway network. Other major ports should be linked to the railway network in order to develop an integrated transportation network.

The current plans for dredging of the River Niger, after Environmental Impact Assessment (EIA) has been applied, will help to reactivate the Lower Niger for River transportation and also revamp old river ports of Sapele, Onitsha, Idah, Baro, Ajaokuta and Makurdi for the transportation of agricultural commodities as well as boost the tourism industry in Nigeria. The construction of the N117 billion Second Niger Bridge was commissioned in March, 2014 and will be completed in 4 years. The project will be executed under Public Private Partnership (PPP) arrangement for a period of 25 years. **There are still more bridges needed across many other rivers in the country.**

Inland waterways constitute a major natural resource of Nigeria as they traverse 20 out of the 36 states of the country. The areas adjacent to the major rivers represent Nigeria's important agricultural wetlands. **In fact, agricultural products from the Middle Belt of Nigeria, particularly those from Makurdi and Lafia can be transported to Onitsha and Port-Harcourt through the waterways.** The Ajaokuta Steel Complex will benefit from using the waterways for importing scrap metal and other raw materials through Warri port. Onitsha, a major commercial and industrial town located on the River Niger will benefit from import and export cargo movement using the Inland waterways.

It is suggested that major coastal rivers in the country should be surveyed so that infrastructural constraints along their courses can be removed. In addition, navigation aids could be provided in the navigable sections which can be identified and developed for transportation for the riverine communities so that such rivers can function efficiently as waterways for transportation in the country. The National Inland Waterway Authority (NIWA) was established by Decree No. 13 of 1997 as a parastatal under the Federal Ministry of Transport with the corporate headquarters in Lokoja, Kogi State, in order to deal with the problem of ports and inland waterways in Nigeria. It replaced the defunct Central Water Transportation Company (CWTC) which handled all the traffic by modern vessels on the River Niger in the 1970's and 1980's. Many reforms have been introduced and NIWA is in charge of the regulatory activities while the private sector takes charge of the operational activities. The ultimate goal is to revive the waterways transport system so that it can make more positive contribution to the national transport development objective of the Federal government (Atubi and Onokala, 2007b).

4.3.2 The Way Forward for Railway Transportation Infrastructural Development in Nigeria

In order to correct the present imbalances in the use of the various modes of transportation in Nigeria and for the continued economic development of Nigeria, the Nigerian railway system must be resuscitated so that the railway can perform its proper role in the transportation system of the country. Already, the existing network is being rehabilitated and put back into use in some parts of the country but this is not a permanent or long lasting solution to the problem.

Therefore, it is recommended that the construction of a new standard guage rail line that will use the maglev system be undertaken in order to eliminate the sharp curves and steep gradients which reduce speed and cause frequent derailment and excessive wear and tear of the wheels on the present system. The new railway line should include East-West railway lines that link major resource centres and economic activity locations in the country which the existing railway no longer link together. The recent attempt to get China to revitalize the Nigerian railway system with high speed trains is a step in the right direction. Due to the high capital demand, the expansion and modification of the railway system can be done in stages.

The railways should also be properly integrated with the waterways and road transportation network of the country. This will enable the railway to play its proper role in inter regional trade within the integrated transport system of the country. The use of long vehicles and trailers for carrying containers on the Nigerian roads, which is a serious misuse and overuse of roads in the country, will stop since the containers and other heavy and bulky goods are better transported by railway, and this will also make the roads safer. In addition, railways should also be used for proper development of “mass transit” in Nigerian urban centres.

Nigeria should also be prepared to take its place as a regional hub and develop a railway with international connections between Nigeria and neighbouring countries. Stanford Research Institute Study (1961) had recommended that the Nigerian Railway Corporation should develop an aggressive and public relations and commercial policy so that the railway can attract traffic from Niger and Chad republics but this was not done. It is now time for the Nigerian Railway System to take the strategic location of the country into consideration and plan for extending its railway network to the Republic of Benin through Ilaro, Republic of Niger through Kaura Namoda, Chad Republic through Maiduguri and Cameroun through Yola, while taking the present security situation into consideration.

4.3.3 The Way Forward for Air Transport Infrastructural Development in Nigeria

Air transport is the most efficient and most reliable modern means of moving people, goods, services and information in the world today. Its major advantage is speed but it is very expensive. The unprecedented general economic boom which the country has experienced in the past few decades has enhanced the standard of living of many Nigerians who are increasingly becoming aware of the advantages of travelling by air. This awareness manifests itself in the increasing number of Nigerian businessmen and women, professionals and others who travel by air not only to different parts of Nigeria but also to various parts of the world.

The bad conditions of Nigerian roads, especially the roads that link the major cities and other production centres, have forced top government officials, business executives and other personalities to abandon road transport in favour of air transport. Therefore, geographical, economic and socio-cultural factors as well as the poor condition of Nigerian roads have also stimulated air transport development in Nigeria.

Therefore, there is need for airport expansion. In fact, in addition to existing airport, there are newer airports in Owerri, Uyo, Warri, Minna, Bauchi, Gombe, and Asaba which are either under construction or have been recently completed. Suggestions have also been made for more airports to be constructed in other parts of the country such as in Oba, near Onitsha and the University town of Nsukka. There are also many public and private landing strips located at places approved by the government in various parts of the country. Airways expansion should also take the strategic location of the country into consideration by planning the expansion in a way that it will accommodate airway connections to neighbouring countries. Aviation has important role to play in the development of tourism in the country. This can only be achieved in a properly integrated transportation system where air transport is properly integrated with waterway, roads, and railway transportation.

It is also important to ensure that, in spite of the increased demand for air transportation, the quality of domestic air transportation services should not be compromised. Schedules must be strictly kept, boarding must be orderly and loss of luggage and other problems should be reduced to the barest minimum. Recent improvements in the airline industry include the use of ICT and e-booking of flights, use of standard aircrafts and improved management. In addition, air transportation safety standard needs to be improved upon and sustained.

4.3.4 The Way Forward for National/Regional Road Transportation Infrastructural Development in Nigeria

The national system of allocation of responsibilities in the road transport sector as Trunk A for Federal Roads, Trunk B for Regional/State Roads and Trunk C for Provincial/Local Government Roads which started in 1926 is not equitable because the Federal Government which is more affluent has the least responsibility. Yet this pattern of allocation has remained basically

the same since then even after a slight review in 1937 and some modifications in 1974. Therefore, the generally poor standards of construction and maintenance of most roads in the country is attributed to this imbalance in the road transport sub-sector. In addition, it is not always clear to which category some of the roads belong to. **Therefore, there is need to revisit this national system of allocation of responsibilities in the road transport sub-sector so as to streamline responsibilities in a more equitable manner.**

Present road development should be aimed at modernising the existing road transport system, widening culverts and bridges as well as broadening, straightening and removing sharp bends. **More urban centres in the country also need to be linked by expressways.**

In addition to upgrading existing roads, new strategic roads should be planned in order to open up undeveloped areas and resources taking the strategic location of the country into consideration. The Nigerian road network system has important role to play at the international level which has not been fully addressed. There is no doubt that major roads in Nigeria which cross national boundaries will promote trade and transport between Nigeria and her neighbouring countries. For example, Lagos - Cotonou highway contributes a lot to the trade between Nigeria and the Republics of Benin, Togo and Ghana. Similarly, the extension of Lagos – Badagry expressway for 33 kilometers to Semi Pogi in Benin Republic with a bridge over the lagoon at Badagry has further strengthened these ties. In the same way, it is envisaged that at least two Trunk A Roads should be developed as part of the Mombassa - Dakar Pan African Highway. These are the Kaduna – Daura Kongolam Niger border Road as well as the Lagos – Shagamu – Benin City – Asaba – Enugu – Abakaliki – Ikom-Cameroun border roads.

In order to enable road transport to play increasing role in the development of tourism in Nigeria, new roads should be constructed where necessary so as to provide accessibility to places of tourist attraction.

4.3.5 Problems of Rural Road Transportation Infrastructure in Nigeria and the Way Forward

Although many rural settlements in Nigeria lack basic infrastructure such as electricity, pipe-borne water and other modern facilities, inadequate transport provision constitutes one of the greatest challenges to rural dwellers because many rural settlements are still linked by footpaths rather than roads, using walking, bicycles and motorcycles as the major modes of transportation. Yet, a good rural road network is vital and fundamental to rural development because without roads, the provision of other infrastructure becomes extremely difficult, if not impossible.

Over the years, provincial/local government councils in Nigeria have made very little success in constructing and /or rehabilitating rural roads. In most parts of south-eastern Nigeria, most road construction activities were usually mainly the result of local and community efforts by villagers who widened existing bush paths into roads through community efforts and later the government widened and tarred them.

However, since the 1970's and 1980's, the Federal Government has embarked upon a number of road construction programmes and other measures in order to transform the rural areas of the country. In spite of the laudable objectives of these programmes most rural areas of the country remain poor and inaccessible for various reasons such as their short period of operation, lack of continuity, inconsistencies in government policies as well as poor financial management of the programmes. For example, Directorate for Food Growth and Rural Infrastructure (DFRRI)

was established in 1986 in order to accelerate the development of rural areas of Nigeria. Onokala (1991) discussed the effect of DFFRI roads in the improvement of accessibility in the rural areas of the 23 local government areas of Anambra State during the First Phase of the programme (1986 – 1988). (The study was sponsored by the Social Science Research Council of Nigeria from the research grant received from Ford Foundation). The study indicated that DFRRRI constructed/rehabilitated 1,091.7 kilometres of roads in Anambra State and that more roads were constructed in the LGAs where more roads already existed. Field observations of the DFRRRI roads in some selected local government areas of Anambra State indicated that most of the DFRRRI roads were existing roads which were graded and/or tarred and that very little construction of new roads was undertaken in order to solve the pressing needs of the people at the grassroots. Onokala (1996) also examined the relationship between Better Life Projects and increased accessibility from DFRRRI roads in Enugu State, Nigeria from 1986-1990. The Better Life Programme, also initiated in 1986, was aimed at creating awareness and mobilizing women in the rural areas of Nigeria for more productive activities. The aim of the study was to compare the spatial pattern of the distribution of the type and number of Better Life projects and the amount of road construction/ rehabilitation undertaken by DFRRRI during Phase I (1986-1988) and Phase II (1989-1990) in 15 local government areas of Enugu State, Nigeria.

Ideally, the Better Life Projects located in the rural areas of Enugu State should have benefited from the increased accessibility from DFRRRI roads in the State but they did not. **These two programmes were complimentary but were not properly coordinated in a manner that they would have enhanced the accelerated rural development of the country.** Since there were no strict guidelines in the selection of road projects as well as in the selection of Better Life Projects to be handled in each local government area, **human and political factors were highly emphasized. These mistakes are still made in the subsequent**

programmes for development such as SEEDS, NEEDS, LEEDS and others, subsequent interventions or programmes while the poverty of the rural areas continues.

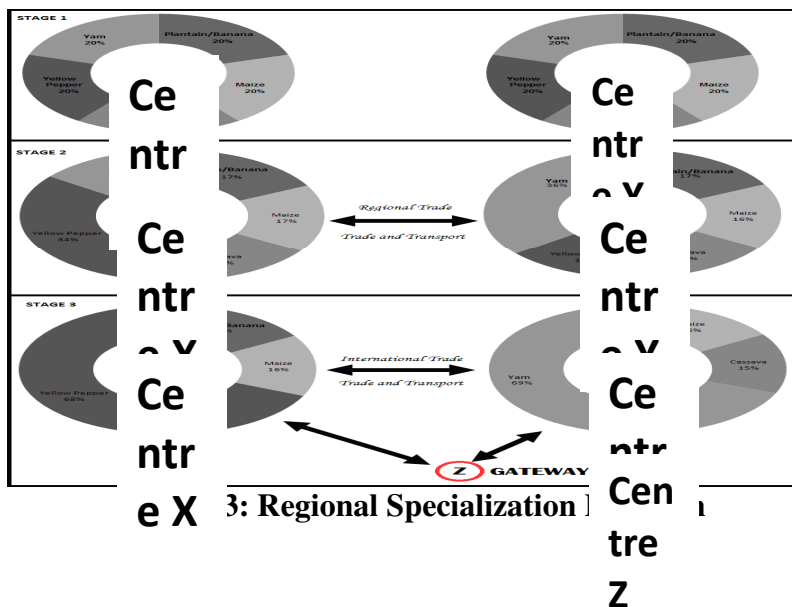
Ali & Onokala (2008) examined the implications of lack of or inadequate access to health care facilities in the 17 local government areas of Enugu State, Nigeria. The results of the study indicate that most rural dwellers in Enugu State are disadvantaged more than their urban counterparts in terms of distance, time and cost involved in getting access to the services of all the category of hospitals in the State. Also, Onokala, Phil-Eze and Madu (2003) had emphasized that without adequate road facilities, lack of transportation in the rural areas of Nigeria will continue to contribute a lot to the poverty of the rural areas and that poverty will remain a major challenge to sustainable rural and environmental development in Nigeria.

Although more roads need to be constructed and maintained in the rural areas in order to integrate the rural settlements into the national economy the rate very slow, there is therefore an urgent need for developing some objective criteria for selecting the specific transport network construction and expansion projects to be handled in the rural areas of Nigeria. This can be done by applying the regional specialization approach.

Fig.3 is a Regional specialization diagram. It is a simplified view of the way in which transportation changes affect regional specialization. In Stage 1 or the initial stages of little or no transportation, Location X and Location Y are virtually isolated from each other and from all other locations. As shown in the diagram, a wide range of subsistence agricultural crops are grown in each of them. The first signs of regional specialization appear as transportation improves and the two locations are connected. In Stage 2, the locations start to become interdependent and their production patterns are now complementary. Location X expands

its production of yellow pepper while Location Y expands its production of Plantain/Banana production as both locations concentrate on those crops for which they have **comparative advantages**. In Stage 3, where both locations are not only connected to each other but also to a third Location Z, which is a port connecting both X and Y to locations in other parts of the world, the two cities specialize further and expand their production of the crops they have comparative advantage for and this leads to more economic development.

It is suggested that this approach be applied to the selection of which transportation links should be constructed and improved upon in the rural areas of Nigeria. It illustrates the role of efficient transportation in making regions to specialize in the production of commodities for which they have comparative advantage and therefore economic development. This will enable rural areas to be linked to international markets. For example, the Nsukka yellow pepper can be sold in international markets, if Nsukka is properly connected to major areas of demand in other parts of the world and if the transportation facilities needed are available and efficient.



4.3.6 Urban Transportation Problems and Urban Transport Infrastructure in Nigeria and the Way Forward

As in other countries of the world, the pressure on the road system of Nigeria is continually increasing, especially in the urban centres all over the country. Yet, urban residents require efficient transport systems in order to survive in the urban environments. Onokala (2001) noted that increasing number of urban centres in Nigeria resulting from rural-urban migration as well as creation of States, creation of local government areas as well as other administrative, commercial and industrial activities in the country have resulted in a large and increasing urban population which involve large volumes of intra-urban and inter-urban journeys.

By 2008, Nigeria had 24 cities with a population of over 500,000 out of which 8 of them have population of over 1 million people. These millionaire cities are Lagos, Kano, Ibadan, Kaduna, Port Harcourt, Benin City, Maiduguri and Zaria (*Nigeria in Wikipedia, the free Encyclopedia. Also available at en.wikipedia.org as at 6th April, 2008*). In addition to these, many urban centres in Nigeria such as Abuja, Enugu, Onitsha, Aba, Abakaliki, Calabar and many others have increased in population in recent years. The increasing rate of urbanization and motorization in Nigeria exerts increasing pressure on the already inadequate public transport facilities. Therefore, urban transportation problems such as traffic congestion, accidents, inadequate public transport, difficulties for pedestrians, and pollution have increased in most cities in Nigeria and the situation is likely to worsen in the future.

Meanwhile, government agencies as well as corporate bodies and private individuals continue to be involved in the provision of public passenger transport services to meet the ever-growing demand for mobility in urban centres of the country. In fact, the private entrepreneurs continue to dominate the urban road transport industry as several attempts to replace them with government operated systems and models managed by the state

governments collapsed after a few years of operation and so were not sustainable.

Consequently, many parts of the urban centres are not easily accessible by available transport facilities. Ali (1997) studied accessibility of major centres to bus transportation services in Enugu while Atubi(1998) studied accessibility of major centres to the road network in Lagos Local Government Area of Lagos State Nigeria. Atubi & Onokala (2004a) examined the effect of road network characteristics on traffic flow in Lagos Mainland Local Government Area, which has a unique pattern of physical location of land uses using the Gravity Model. **They identified a lot of bottlenecks at various locations at three major employment centres and businesses in Lagos Mainland Local Government Area in Ebutte Metta, Oyingbo and Yaba.** Atubi & Onokala (2004b) examined the relationship between accessibility to transport networks and the provision of six central facilities (medical, educational, market, postal services, banking and administrative) in Lagos Island Local Government Area, Nigeria for three time periods, 1976, 1986 and 1997 using Graph Theoretic indices and simple regression analysis. They recommended the relocation of some of the central facilities in Lagos Island Local Government, of Lagos State, Nigeria. Ali and Onokala (2009) examined the level of accessibility of major centres in the city of Enugu, Enugu State, Nigeria to the intra-urban bus transit network using the Graph Theory approach and by using the shortest bus route distance for 31 centres and 39 links. Using the Graph Theory approach and by successive powering of the nxn matrix and using Boolean rules (i.e. $X + Y = \text{Min}(X.Y)$) **they identified a hierarchy of major centres with decreasing relative accessibility to the network from the city centre towards its peripheral areas, such as Aria Layout, Onoh Quarters/Abakiliki Lane, Idaw River Layout and others.**

Some improvements recommended for the accessibility in Nigerian urban centres include additional bus routes, improvement

of bus stop facilities, fixing and enforcement of bus fares, relocating some facilities. However, the **provision of high-capacity urban buses is imperative for an integrated transportation system.**

Onokala (2000) discussed the implications of the adoption of small buses, carrying 18 passengers then but now carrying 14 passengers, as “mass transit” in Nigeria. Ameigbebhor (2007) examined vehicular traffic congestion in Port-Harcourt metropolis and he noted that Nigerian cities are dominated by small 14-18 passenger buses, shared fare taxis, motor cycles (Okada) which provide main, collector and feeder services between different parts of the city.

In spite of increasing car ownership in many Nigerian cities, majority of urban dwellers continue to depend upon motorized trips by bus since **most of them are “captive bus riders” who must travel by bus because they do not have access to cars.** In fact, given its level of development, the bus system is the choice of most developing countries like Nigeria. This is because the bus is the only means of mobility that can be afforded by the poor in developing countries and generally most of them combine it with walking and other modes of transport.

Also, as a result of the increasing demand for transportation motorcycle transport, commonly called “okada” and tricycle, popularly called “Keke Napeb” were increasingly accepted as means of urban transportation while the scarcity of taxis and buses encourage the use of private car taxi commonly called “Kabukabu” to service the needs of the urban dwellers. All these means of transportation contribute further in the overuse and misuses of roads in Nigerian urban centres.

Recognizing this crisis situation, the Federal Government established the Federal Urban Mass Transit Agency (FUMTA) in 1988 to implement a national policy of urban mass transit. Over

the years, FUMTA acquired buses parts and established standard workshops for the operation and maintenance of mass transit buses. The FUMTA Programme now faces many problems when the buses meant for intra-urban transportation were changed to inter-urban transportation and the programme is now facing problems of new dimensions, which are still increasing. **In fact, the major achievement of FUMTA is that of increasing the number of “transit choice riders” who now use the bus system in Nigeria.** These are people who have cars but leave the car at home and travel by public transport.

5.0 RECOMMENDATIONS ON THE WAY FORWARD FOR THE CONTRIBUTION OF TRANSPORTATION TO THE ECONOMIC DEVELOPMENT OF NIGERIA

5.1 INTEGRATED TRANSPORTATION SYSTEM FOR NIGERIA

It is unfortunate that despite the goals and objectives of the National Transport Policy and the favourable geo-strategic conditions of the country, the Nigerian transport sector remains problematic. This is partly because the unique roles which the various transport modes have to play in the transport sector are not being enforced in the transportation system of the country.

There are various forms of integrated transport systems which combine the various modes of transportation within an area in the most efficient manner to provide “mass transit” systems and they use the high-capacity urban buses. The various alternatives widely used for supplying fast movement within urban areas or along individual corridors in specific regions as Rapid Rail Transit (RRT), Light Rail Transit (LRT), Bus Rapid Transit (BRT), Commuter Rail Road (CRR) and Automated Guide-way Transit (AGT) and others. The choice of any of these alternatives is influenced by the size of the city or the region as well as its land use pattern. The modal split shares the total number of trips to the different modes of transport available goes a long way to reduce

urban transportation problems, as well traffic congestion and other negative effects of road transportation.

Although it is recognized that the transportation of a large number of people is best undertaken by the rail system, the bus remains the choice of the Nigerian government for supplying “mass transit” services within urban centres and along individual corridors within the country. **Mass Transit is a form of public transport which connotes the act or means of moving many people “en mass” along principal corridors as opposed to movement in individual vehicles, carrying a few people at a time. Yet, in Nigeria small buses are called mass transit systems.**

When big buses carrying over 50 passengers on the roads are integrated with the railway, waterways and airways modes the Light Rail Transit (LRT) which has the capacity to move more than 50,000 passengers an hour during the peak period of traffic congestion is the result and this correctly called is “mass transit”. Generally, buses used in this manner for integrated and intermodal transport systems provide the most efficient means of moving large number of people, especially in densely populated urban centres and urban environments dominated by both land and water surfaces such as Lagos and Port- Harcourt.

After struggling with many ways of handling the urban transportation problems of Lagos without making any progress, Lagos State Government introduced the use of big buses for the Bus Rapid Transport (BRT) System in Lagos, Nigeria. BRT Lite, which is simply the creation of “dedicated lane” for high-capacity buses, was launched on 17th March, 2008 and it was well received by the public. **Public Private Partnership (PPP), in which the government provided the major infrastructure while the private sector provided the buses, was used for the implementation of BRT Lite.** Segregation barriers were used to demarcate the bus lanes along 60% of the corridor. It started with 220 blue buses and later 400 red buses were added. BRT Lite has 4

minutes headway, an average waiting time of 15 minutes and an average speed of 45 km/hour. The boarding is orderly, using level boarding and alighting facilities, in spite of the daily ridership which exceeds 3,000 passengers.

Seven major routes were identified for the BRT Scheme but only one of them, the Mile 2/Moshalashi – CMS route was selected for implementation. It is 22 kilometres long and a main distributor of commuters to Lagos Island and has 4 lanes between Mile 2 and Jibowu. BRT Lite is highly patronized and serves as a catalyst to urban development since it is characterized by large commuter demand. The advantages include decreased cost for commuters, decreased travel time between locations inside the city. Other parts of Lagos want the other 6 routes to be implemented so that the services of BRT Lite can be extended to them. Recently, the Lagos Branch of the Nigerian Union of Road Transport Workers (NURTW) has injected 100 buses to Lagos BRT.

Table 4 shows that BRT Lite of Lagos, Nigeria is performing relatively well compared with other such systems in various parts of the world. Meanwhile, the construction a Light Railway network is going on in Badagry and it will be connected to the BRT Lite and both of them be connected to ferry/waterway transportation to Lagos Island. When this is done, it will be possible for a commuter who intends to go from Sango to Lagos Island, for example, to take a bus to Oshodi, take a train from Oshodi to Apapa, then take a ferry from Apapa to C.M.S., and then take a bus from C.M.S. to Lagos Island. This will be the first correct “mass transit” system in Nigeria using an integrated transportation network.

Table 4: Selected Brt Systems in the World

NAME	CITY	COUNTRY	LENGT H (KM)	POPULATI ON (MILLION)	PEAK HOUR ONE WAY	DAILY TWO WAY
Trans milenio	Bogota	Columbia	84	7	45,000	1,300,000
Assis Brazil Bus way	Porto- Algre	Brazil	4.9	3.7	28,000	240,000
Metro bus El Trole	Quito	Ecuador	16.1	1.8	7,000	240,000
Qde- Julho bus way	Sao Paulo	Brazil	7	10	3,000	196,000
BRT life	Lagos	Nigeria	22	15.7	10,000	195,000
SUI bus way	Curitib a	Brazil	10.1	2.7	13,600	156,000
2 blok mkota	Jakarta	Indonesia	12.9	9.8	6,500	100,000
SE bus way	Brisban e	Australia	17	1.7	18,000	150,000
Mega bus	Pereira	Columbia	16.7	0.7		45,000
Adelai de	Adelai de	Australia	3	1.1	41,000	30,000

Source: EMBARQ NEWSLETTER (2013) World Resources Institute in “BRT in 166 Cities” available at www.WRI.org Accessed on 7/11/2013.

BRT Lite is a short- and medium-term Term transport solution. Nigeria must aim at developing an integrated transportation system as in other parts of the world as a long-term solution to transportation problems in major cities and principal corridors of the country. Most megacities all over the world have Rapid Rail Transit (RRT) systems. For example, London, England has an underground railway system well connected to the road network. Other cities have surface systems while others combine both surface and underground systems such as Seoul in North Korea, Moscow in Russia, New York in U.S.A. and Beijing in China. Fortunately, the technology for such construction of such facilities

and infrastructure has remarkably improved, but because of logistics problems, the surface systems which are easier to maintain, are recommended for Nigeria while underground systems should be avoided at present.

5.2 THE NEED FOR RESEARCH ON TRANSPORTATION ISSUES IN NIGERIA

There is need for intensive research on all modes and aspects of transportation in Nigeria as well as proper dissemination of research results and promoting collaboration between researchers and policy makers. In addition to the Nigerian Institute of Transport Technology (NITT), Zaria there are many other universities, institutes and higher institutions all over the country that are competent to undertake research on many areas of transportation in Nigeria. They can also carry out environmental and social research on transport development projects in the country. Such centres/institutes should be able to implement and manage research results already carried out in both developed and developing countries which are relevant to transport and sustainable development in Nigeria.

Some of them are Redeemer University (Transport and Logistics), Olabisi Onabanjo (Centre for Transport Studies), Federal University of Akure (Transport Technology Management), Lagos State University (School of Transport), The Polytechnic, Ibadan and Ladoke Akintola University, Ogbomosho (Transport Technology Management), Federal University of Technology, Minna, Modibo Adamawa University of Technology, Federal University of Technology, Yola Federal University of Technology, Owerri (FUTO) and many others. They should be encouraged to do research that will enable us to develop our own solutions to our own problems.

Research is needed for identifying all aspects of accident occurrence, traffic education and accident prevention; and the

results of these researches should be used by the relevant authorities as is done in other countries.

Research on how ICT and the use of GSM affect travel patterns in order to find out how to use tele-banking, tele-shopping, and computerized hotel booking and other transport services that do not involve physical contacts to reduce traffic congestion in urban centres in the country. The results of the research will enhance policy and planning in the Nigerian transportation system.

5.4 THE OPTION OF TRANSPORTATION PLANNING

Planning is a method or an arrangement for doing something in advance. Therefore, all the methods and processes of moving the transportation system of Nigeria forward which have been recommended can only be achieved by proper planning.

Transport planning studies have been conducted in many countries all over the world. The fundamental premise which underlies most planning studies is that some future horizon-year equilibrium condition of an area is a meaningful state to attempt to predict and evaluate. In a typical study, the most probable pattern of land use development is predicted for the horizon-year (usually some 20 to 50 or even more years) ahead. This planning process implies that there will be an orderly and easily identifiable sequence of public investments which will yield the horizon-year plan selected. The plans are usually published and subsequently updated and made available to the public so that researchers can utilize them for independent research.

Unfortunately, over the years, planners of Nigerian transport systems have not taken advantage of available transportation planning models to develop methods that will help to solve the transportation problems of the country in general and those of specific Nigerian cities as is done in developed countries and in a few developing countries. It is therefore recommended that Master Plan of the transportation system of Nigeria and for all the states

and all the major population centres in the country be produced and be strictly enforced.

The plan to integrate the various modes of transportation, namely waterways, railways, airways, roads and pipelines should be developed. In addition, there is need for planning to improve accessibility of rural areas by using the Regional Specialization Approach for choosing the roads to be constructed. Land use planning measures must be put in place to reduce traffic congestion and accidents in urban centres and for accommodating the use of non-motorized transportation in urban centres of Nigeria. There should be continuous efforts in traffic management and in-land use and transportation planning to reduce the adverse impact of road construction and use in all the urban and rural areas of Nigeria.

There is need to ensure that there is enough political commitment to deal with the long-term issues involved in the plans, such as providing enough financial resources to continue with the plans, in spite of extreme budgetary constraints.

5.5 THE NEED FOR ADEQUATE DATA FOR RESEARCH AND PLANNING

The Nigerian Government needs to spend money in generating data for research and for planning the transportation system of the country. The Federal Bureau of Statistics (formerly Federal Office of Statistics) was established in order to develop data bank on various aspects of Nigeria's physical, social and economic resources. Since its inception, the Bureau has tried to publish data but there are still relevant data available and widely dispersed in several files in government departments and ministries throughout the country. Most of these data have not been collated, synthesized and published in the form in which they can be used for detailed research and planning purposes.

Some of the data on traffic flows which presently exist were the results of widely scattered and often not-well-co-ordinated, “ad hoc” projects many of which were carried out on the spur of the moment to meet certain immediate needs. A more comprehensive approach to data collection is preferable to the present approach in order to plan adequately for the future development of transportation in the economy of Nigeria. This requires a large scale traffic plan at the national basis and the coverage of the whole country on a systematic basis instead of the present sporadic approach to traffic counts. Nigeria is still struggling to evolve a comprehensive Origin-Destination Survey of passenger and goods movement. Attempts should be made to develop facilities for the detailed measurement of the essential properties of other relevant transportation variables for planning purposes. The existing system of generating statistical data and the simple direct gathering of factual data on relevant variables are not comprehensive.

The data needed for employing transport-related land use models in transportation planning must be aggregated into various types of geographic sub-areas called traffic zones. There are no such units in any Nigerian city for this purpose, yet such standard statistical areas must be established in order to serve as a basis for future studies. **Failure to do this gives rise to results of the studies varying from one study to another and therefore may lead to conclusions which are not comparable.** Onokala (1980) pointed out that the relevant data needed for planning studies by applying the major stages of the Urban Transportation Planning Process, namely Trip Generation, Modal Split, Trip Distribution and Traffic Assignment Stages as well as the models and methods needed at each stage are well documented. Unfortunately, most of these data are not available, and this therefore causes difficulties for research and planning. Major cities should be divided into traffic zones to be used for collecting data on a regular basis while traffic census should be taken at regular intervals as in other developed countries.

There are also many technologies that will aid transportation agencies in reducing the effects of transportation hazards. Improved weather instruments and Global Position System (GPS) for more accurate data on accident analysis can help to improve the amount and quality of information available to transportation users and planners. Remote Sensing can be used to detect and monitor road traffic accidents and many other hazards. Geographic Information System (GIS) is a powerful computing tool for managing large amount of heterogeneous data. It can be effectively used to identify accident black spots on roads. Accurate and reliable traffic injury data can help to inform decision-makers, stakeholders and the general public about the magnitude of the problem as well as intervention options that have high proven effectiveness. With regard to road traffic accidents, efforts to combat the problem of injuries have been hampered by the scarcity of funds and lack of relevant data such as data on the spatial and temporal pattern of distribution of road traffic accidents in the country. Research can reduce this problem and also improve the effectiveness of the patrols for reducing road traffic accidents.

6.1 MY CONTRIBUTIONS TO THE DEBATE ON THE ROLE OF TRANSPORTATION IN ECONOMIC DEVELOPMENT

6.2 CANADIAN PUBLICATIONS

Mr Vice-Chancellor, my contributions to research in transportation and economic development geography started in the Department of Geography, University of Alberta, Edmonton, Canada, where I did my postgraduate studies and consequently studied problems of the Canadian transportation system.

The first study was on the spatial pattern of development of the regional highway network in Alberta Province, Canada from 1934 to 1974. Monanu and Hodgson (1975) examined the structural characteristics of the regional highway network in the Province of Alberta, Canada at five points in time, 1934, 1948, 1954, 1964 and

1974 using Graph-Theoretic indices and it indicated that the indices increased as the network became more complex and the Province of Alberta became more economically developed. However, these indices must be regarded as simple structural assessors used analysing extremely complex systems.

This second study, Monanu (1976), titled **Journey to Work Patterns in Edmonton, Canada, 1971** utilized data obtained from an Origin-Destination Survey by the Transportation Planning Department of City of Edmonton, Canada to investigate the spatial pattern of urban transportation and the major factors that explain the pattern of work-trip attraction to major employment centres in the city. The data employed was a 234 by 234 matrix of socio-economic variables on work trips between 234 traffic zones into which the city of Edmonton was divided in 1971. In addition, some traffic data were collected for these zones on a regular basis while traffic census was taken every 10 years.

The results of the Multiple Linear Regression Analysis indicated that the spatial pattern of work trip attraction to the Central Business District was highly representative of the pattern of residential location of workers in Edmonton, and that distance was not a deterrent factor to work trip making to the District, which is well connected to public transport system in the city.

The study recommended similar studies for other urban centres in Canada in order to find out if the results obtained are peculiar to Edmonton or are representative of the behaviour of urban dwellers in Canadian cities in general.

After these Canadian publications, my subsequent researches in Transportation Geography were mainly on the problems of transportation in Nigeria.

6.3 RESEARCH CONTRIBUTIONS TO THE ROLE OF TRANSPORTATION IN ECONOMIC DEVELOPMENT IN NIGERIA

As a transportation geographer from a developing country, like Nigeria, my Ph. D. research was on the **Optimal Patterns for the Transportation of Export Commodities in Nigeria**. Monanu (1979) employed the transportation Model of Linear Programming to examine the transportation of cocoa and palm kernels from the producing areas within Nigeria to the processing industries within the country or to the ports for export to overseas countries by the Commodity Boards in 1976/77. At that time, these agricultural export commodities were the mainstay of the Nigerian economy and it involved an extensive and expensive fieldwork in Nigeria in 1977.

The study added another practical example to the **empirical literature on the Transportation Problem of Linear Programming in which there are two or more modes of transportation as well as the option for transshipment between the modes for more than one commodity involving export commodities used for the economic development of Nigeria**.

Onokala (1981) applied the Transportation Problem of Linear Programming for investigating the evacuation of palm kernels to the ports and the processing industries within the country in order to assess the overall efficiency of the shipments by the Palm Produce Board in 1978/79. Onokala (1982) also applied the Transportation Problem of Linear Programming to investigate the optimal pattern of the evacuation of cocoa, to the ports for export and the Cocoa Industries Limited, Ikeja, the only processing industry within the country under the existing freight rate structure by road, rail and waterways in 1977/78.

The results of the study revealed that the sub-optimal shipments of cocoa and palm kernel using the Licensed Buying Agents made it possible to evacuate produce that would otherwise have been wasted, but it was an inefficient and expensive system. It also

indicated that the Cocoa Board was making sub-optimal shipments of cocoa and incurring higher transportation costs by transporting cocoa by road because both railways and waterways were having many infrastructural and operational problems which did not allow them to undertake the transportation of people and goods efficiently.

Other research contributions on the role of transportation in the economic development of Nigeria include Onokala (1994a) which discussed the role of road transportation in inter-regional trade during the pre-historic period in South-eastern Nigeria. In contributing to the explanation of the possible source(s) of the archaeological artefacts discovered in Igbo-Ukwu, the paper noted that in addition to Trans-Saharan trade in luxury items, all the markets in the region were well connected to the Onitsha Market and other towns in the region, since Igbo-Ukwu is only 25 kilometres south east of Onitsha. In fact, as far back as 1854, Onitsha Market was drawing people from 25-30 kilometres away and beyond to its market sessions, using the early traditional trade routes consisting of mainly footpaths and bush trails which followed boundary lines between friendly towns and villages. They travelled in groups for security reasons and the means of transportation used was human head portage. These footpaths and trails were later used as slave routes and a few of them later developed into major roads.

Onokala (1999) also discussed transportation and transport systems in pre-colonial Nigeria, where it was noted that the emphasis was on water transportation along the navigable sections of the rivers in Nigeria as well as land transportation in the southern forests along the bush trails and footpaths. Land transportation in the northern Savana region made use of animals (such as donkeys, horses, oxen and camels) in addition to footpaths and bush trails. It concluded that, unfortunately, these traditional modes of transportation are still predominant in some

rural areas of northern Nigeria due to lack of good roads, especially during the rainy season.

Onokala (1997) examined the effect of Enugu-Onitsha expressway on the economic development as well as its socio-economic impact on its immediate environment 13 years after the 103 kilometres road was constructed in 1980 and officially commissioned in 1983. The expressway starts from Abakpa Junction in Enugu through 9th Mile Corner and Awka to Borommo Hospital in Onitsha. As one of the busiest roads in the densely populated area of South-eastern Nigeria, the study examined the impact of the construction and the utilization of the expressway by vehicles and other road users on the immediate environment defined in this study as 200 meters on either side of the expressway.

Baseline survey of the area of study revealed that Environmental Impact Assessment (EIA) was not carried out before the construction of the expressway and that it did not pass through existing settlements except at Abakpa Nike, 9th Mile Corner, Imezi Owa, Obelagu Umana and very small parts of Awkuzu and Nteje.

From the results of the analysis, it was clear that most respondents found the socio-economic impact of road construction and the use of the road on land and water resources as either having negative impact or impact which could not be determined (i.e. Factor I), **thus indicating the low level of environmental awareness of the Nigerian public.** On the other hand, most respondents were highly convinced of the obvious advantages of both the accessibility provided by the expressway as well as the facilities attracted to it (i.e. Factor II). Both factors explain 64.6 % of the variation of the impact of road construction and use on the environment among the respondents.

The results of the analysis also indicated that both the accessibility which the road provided and the facilities attracted to the road was responsible for 64.5% of the positive impacts of the road

construction on the socio-economic environment in the area of study. The Enugu-Onitsha expressway caused a dramatic improvement in accessibility in the entire region by making rural areas through which the road passed and urban centres like Enugu, Awka and Onitsha more accessible by reducing travel time, cost and distances between locations. For example, it provided access to communities like Imezi Owa, Obeleagu Umana, Abba, Awkuzu, Umunya, Ogbunike and others which were not previously located on the old Enugu-Onitsha road. Parts of this old road are now resurfaced and better maintained and currently used by settlements along them. The expressway also made other local markets which were not previously accessible to become accessible such as Nkwo Eziagu Market in Obinofia, Ori Market at Umumba Ndiuno while new cattle markets at Amansee and Ugwuoba, timber market at Enugu Agidi and new parts market at Nkpor were attracted to their present locations because of the access provided by the expressway. Starting from Awkuzu to Umunya, Ogbunike, Nkpor and to Onitsha, a lot of facilities like markets, industries and petrol filling stations also were attracted by the expressway. In fact, some educational facilities like primary and secondary schools and Nnamdi Azikiwe University, Awka as well as the Government Residential Quarters at Awka were attracted to their present locations because of the expressway.

It was recommended that other expressways in Nigeria should be studied in a similar way.

Atubi & Onokala (2003) examined the effect of road transportation on economic development of urban centres in Nigeria using Warri in Niger Delta. The study concluded that road transportation created an enabling environment for both industrial and commercial activities, provided efficient means of mobility of the populace and thereby contributed tremendously to the socio-economic development of Warri in the Niger Delta region of Nigeria.

These findings may equally apply to many other towns and cities in Nigeria.

6.4 Extension of Development Issues

As an extension of development issues, I have researched on issues related to women and development, especially education of women, the role of women in environmental degradation and in water harvesting in Nigeria.

On education of women, we received two Research Grants Competition Awards on Higher Education in Africa from the Association of African Universities (AAU) in 1996/97 and in 1997/98 to conduct research on **“Women in Academic Positions in the Universities in Nigeria”** and on **“Gender Equity in Student’s Enrolment in the Universities in Nigeria”**, respectively. I am very grateful to the Association of African Universities and the then President of the Association, Professor Akaligpa Sawyer of the University of Ghana for the opportunity these grants enabled us to have in interacting with other African researchers and for networking with them.

Onokala and Onah (1998) examined the effect of institutional culture on the recruitment, promotion and appointment of women to academic and administrative positions in Nigerian universities using a sample of 4 out of the 16 Federal universities then in existence in Nigeria from 1988/89 to 1991/92.

The study noted that most universities in the country still lacked qualified academic staff and that as the number of academic staff increased the percentage that were females also increased. Onokala (1999) also discussed the gender composition of academic staff and the development of social sciences in Nigerian universities. The study demonstrated that the most outstanding feature of academic staff profile in the universities in the country was the preponderance of males in all the disciplines and in all the ranks.

In fact, most departments had very few female academic staff while some had none at all.

Onokala and Onwurah (2001) examined the gender composition of both undergraduate and postgraduate students' enrolment in the Federal universities in Nigeria according to discipline or type of courses offered from 1988/89 to 1999/2000 using a sample of 4 out of 16 Federal universities in the country at that time. The study revealed that there was no gender equity in the students' enrolment into the various faculties in Nigerian universities with males dominating in technical courses like engineering and females dominating in courses like administration, teaching and nursing.

The results of these gender studies indicated that there was need to educate the Nigerian society at large and the university system in particular about the dangers of gender inequity so that social changes that will stop stereotyping roles according to gender can be encouraged.

Onokala (1999) discussed gender issues and challenges of sustainable development of the Nigerian environment by examining the role of women and girls in facing both the challenges of development and also those of environmental protection. **It was shown that due to their position within the social structure, the role of women and children should be taken into consideration in all attempts to reduce environmental degradation** in order to achieve sustainable economic development of Nigeria.

Onokala & Ezemonye (1997) also examined and recommended appropriate water harvesting methods for Obollo Afor Community, in Enugu State, Nigeria and noted that **women and children are more involved in water harvesting in the community than the males since they are responsible for using the water in domestic activities.** It was recommended that the

government should provide pipe borne water to assist Obollo Afor and other villages in Enugu State, Nigeria.

7.0 SUMMARY AND CONCLUSION

We have examined the historical development of the major modes of transportation, namely waterways, railways, roads, and airways which have played, are playing and will continue to play very significant roles in the social, political and economic development of Nigeria as well as the various problems and challenges facing these modes. **The results of our examination, which is The Journey so far, indicate that there has not been a balanced development of the country's transportation system as people and goods are not transported efficiently on existing transportation facilities.**

Presently, with the marked increase in road construction and the simultaneous operational and organizational difficulties being experienced by the railway and inland waterways systems, the movement of people and all types of goods all over the country is dominated by road transport. On the other hand, waterways have a lot of unutilized capacities most of which have not even been developed while the old and dilapidated railway network is being revamped in several sections of the country and the demand for air transportation, which has a major role to play in the development of the tourism industry of Nigeria, continues to increase. In fact, roads are over-used and misused in Nigeria while the waterways have a lot of capacity that is not being utilized. Railways and pipelines were heavily used in the past but at present they are sparingly used while the airways are heavily used but still need a lot of improvement and expansion. Therefore, the roads are overused and also wrongly used.

The two major results and implications of this pattern of predominant use of road transportation over all the other modes of transportation in Nigeria are environmental problems of road transportation and high occurrence road traffic accidents were

identified. The way forward on the reduction of road traffic accidents as well as how to reduce the adverse environmental impact of road construction and use were presented.

It has been demonstrated that in spite of their contributions to the economic development of Nigeria, all the modes face various problems and challenges and require conscious policies, heavy capital investments and regular maintenance in order to satisfy the transport needs of Nigerians and contribute effectively to the economic development of Nigeria in the 21st century. Starting with the immediate restoration of refineries and the use of pipelines for the transportation of petroleum products, the author recommended that the strategic location of the country should be taken into consideration in the expansion and modification of all the modes of transportation in the country. In addition, it was recommended that the construction of an entirely new railway network should be a major priority. It was also recommended that Nigeria should plan and develop an integrated transportation system for the country in which the modes are used more efficiently. This should be done by using the regional specialization approach for identifying the roads to be constructed and developed in the rural areas of the country while the correct “mass transit” systems are developed for the urban centres. The need for research, transportation planning and adequate collection of data for these purposes were emphasized.

So far, BRT Lite is working in Lagos but needs to cover the whole of Lagos and also to be connected to the waterway and railway networks, and then from Lagos spread to other urban centres in Nigeria. Other cities in Nigeria where big buses have been introduced include El Rufai Buses in Abuja, Sullivan Buses in Enugu, Port-Harcourt, and in other megacities in the country and state capitals. This is not enough, and therefore it is recommended that the construction of the Light Rail Mass Transit (LRT) System not only in Lagos but also in other major urban centres in Nigeria such as Port Harcourt, Abuja, Enugu, Ibadan and others be pursued

with vigour in order to provide for more efficient mobility of commuters in the country. Airways, waterways and railways transport should also be integrated into the road/highway mode, where they are available in order to obtain an integrated transportation system. A standard gauge railway network that will cover the whole country with adequate North-South and East-West links to connect major population, resource and economic centres of the country is strongly recommended. Also, the waterways need to be more efficiently utilized and also connected to both railways and roads. All the modes need to be expanded or modified while taking the strategic location of the country as well as the special characteristics of each mode into consideration. In fact, all the modes need conscious policies, regular maintenance and **heavy capital investments in order to satisfy the present and future transport needs of Nigerians in the 21st Century**. In fact, more positive impact on the socio economic growth and development of the country will be made if all transport modes are well integrated, planned and managed.

These efforts will not only ensure continued economic development for the country but also ensure national integration and security, open up inaccessible areas and also serve the overall well being of Nigerians. In addition, the development of an integrated and inter-modal transportation system for Nigeria will not only promote a balanced development of the country's transportation system but also enable her to meet the challenges of the social and economic development of the country in the 21st century and beyond.

The Way Forward must take into consideration the fact that many improvement projects in transportation undertaken in recent years were undertaken by using Public-Private Partnership (PPP). This is because the Federal Government National Transport Policy for Nigeria (Draft Document No. 4) of 2004 recommended that an efficient transport system should be developed within the context of a progressive and competitive market economy. The

introduction of the market economy into the transport sector is supposed to attract private initiative and investment and also help in transferring responsibilities of the functioning of the transport system from the government to the private sector.

The policy of deregulation and privatization of transport services in the management of transport infrastructure is being adopted in many countries of the world, including Nigeria in recent years. This is now used as a way of assisting the Government in many countries in the development of modern transportation services.

The Nigerian Airways has been deregulated and privatized while efforts are going on to privatize the operation of waterways. The construction of the N117 billion Second Niger Bridge was commissioned in March, 2014 and will be completed in 4 years. The project will be executed under Public-Private Partnership (PPP) arrangement for a period of 25 years. In order to restore the use of waterways, many reforms have been introduced and NIWA is in charge of the regulatory activities while the private sector takes charge of the operational activities. There are also plans to extend privatization in the construction of railways and roads so that these modes can face the numerous challenges and problems facing them. Public-Private Partnership (PPP), in which the Government provided the major infrastructure while the private sector provided the buses, was used for the implementation of BRT Lite in Lagos, Lagos State.

While supporting the use of deregulation and privatization in the transport sector, it is recommended that social service nature of transport provision in the country should still be taken into consideration in developing an integrated and sustainable transport system in Nigeria as a social service.

Mr Vice Chancellor, I conclude by emphasizing that there should be immediate restoration of refineries in the country as well as the

use of pipelines for the transportation of petroleum products so that tankers and trailers can be removed completely from our roads and we shall have a transport system in which road traffic accidents are reduced to the barest minimum all year round. We can have a transportation system in which Environmental Impact Assessment is undertaken before all major construction of transport infrastructure while the use of transport facilities are monitored so that any serious environmental problems are handled before they reach crisis dimensions. This will enable the country to obey the Biblical injunction of “tending and caring” for the planet earth. We should have an entirely new railway line that will have the standard gauge and also be run on the maglev system. This railway line will be used for developing “mass transit” in major urban centres and also be connected to the roads, airways and waterway modes to obtain an integrated transportation system. We can have a transportation system in which the roads constructed in the rural areas are selected using the Regional Specialization Approach. In this way, the yellow pepper harvested from farms in Nsukka can be sold in the streets of London and New York the following morning just as South African fruits, vegetables and flowers harvested from farms in South Africa in the evening are sold on the streets of London the following morning. This can be done if our road, railway airways and waterways are properly integrated.

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