ECONOMIC IMPLICATIONS OF TRANSPORT INFRASTRUCTURE ON THE NIGERIAN ECONOMY: A STUDY OF ROAD TRANSPORT CHOICE AND COST OF DOING BUSINESS

By

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ABSTRACT

Transportation infrastructure is vital for growth of economies worldwide, and for developing-country catch-up drive. The objective of this study is to examine the current state of road transport infrastructure with emphasis to travel choice and its impacts on the cost of doing business. Data was sourced from some locations in the Northeast Nigeria. Two main theories formed the springboard of this study: public finance theory, and infrastructure theories. Multinomial logit and ordinary least square (OLS) are the main tools of analysis. The results of multinomial logit (marginal effects) show that worsening conditions in the terrain affects transport choice, preference of individuals and cost of doing business. This has implications of price of transportation, agricultural productivity, and cost of transactions. OLS results for public investment and maintenance estimated showed low investment expenditure on roads due to fiscal problems.This has generally effected cost of doing business manifested in high transport prices, prices of goods and services. These results are supported by findings of World Bank, Sub-Saharan Africa Transport Policy and others agencies. Nigeria's infrastructure deficit remains one of the binding constraints to growth in the economy. The overall marginal change in network access showed increased access due to new highways. However these gains have not been sustained due crisis in the locations. Participation of the private sector is road building is still very low to compliment public expenditure. The study recommends higher prioritization for roads in the budget space; this supports the goals of the national transport policy of 2010, that 90 percent of all movement of goods and people is by road transportation.

Keywords: road conditions, cost of doing business, infrastructure, transport choice

ABSTRAK

Infrastruktur pengangkutan adalah penting bagi pertumbuhan ekonomi di seluruh dunia dan merupakan pemangkin kepada negara membangun. Objektif kajian ini adalah untuk mengkaji keadaan semasa infrastruktur pengangkutan jalan dengan memberi penekanan kepada pilihan perjalanan dan kesan ke atas kos bagi menjalankan perniagaan. Data telah diperoleh daripada beberapa lokasi di Timur Laut Nigeria. Dua teori utama yang digunakan dalam kajian ini adalah Teori Kewangan Awam dan Teori Infrastruktur. Logit Multinomial (MNL) dan kaedah Kuasa Dua Terkecil Biasa atau *Ordinary Least Square* (OLS) merupakan kaedah utama dalam analisis kajian ini. Keputusan logit multinomial (kesan marginal) menunjukkan bahawa keadaan yang teruk di sesuatu kawasan akan memberi kesan kepada pilihan pengangkutan, keutamaan individu dan kos untuk menjalankan perniagaan. Hal ini memberi implikasi kepada harga pengangkutan, pengeluaran pertanian, dan kos urus niaga. Keputusan OLS bagi pelaburan awam dan penyelenggaraan anggaran menunjukkan perbelanjaan pelaburan awam terhadap jalan raya adalah rendah disebabkan oleh masalah fiskal. Secara umumnya, kos untuk menjalankan perniagaan dimanifestasikan dalam harga pengangkutan, harga barangan dan perkhidmatan yang tinggi. Dapatan ini disokong oleh hasil kajian Bank Dunia, Dasar Pengangkutan Sub-Sahara Afrika dan agensi-agensi lain. Kekurangan infrastruktur di Nigeria masih menjadi salah satu kekangan kepada pertumbuhan ekonomi. Perubahan marginal dalam keseluruhan akses rangkaian sudah bertambah baik dengan adanya lebuh raya yang baharu, tetapi ianya masih tidak berubah disebabkan oleh krisis yang berlaku. Penyertaan sektor swasta dalam pembinaan jalan raya masih rendah bagi menampung perbelanjaan sektor awam. Kajian ini mencadangkan bahawa infrastruktur jalan raya perlu diberi keutamaan dalam ruangan bajet: ini adalah untuk menyokong matlamat Dasar Pengangkutan Negara tahun 2010, yang mana 90 peratus daripada semua pergerakan barangan dan orang awam adalah dengan menggunakan kemudahan pengangkutan jalan raya.

Kata kunci: keadaan jalan raya, kos menjalankan perniagaan, infrastuktur, pilihan pengangkutan

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LIST OF ABBREVIATIONS

AASHTO	American Association of State Highways and Transportation Official
AGIS	Abuja Geographic Information System
AGOA	African Growth Opportunity Act
AICD	Africa Infrastructure Country Diagnostic
AU	African Union
CFA	Communaute Financiere Africaine
CPI	Consumer Price Index
DCM	Discrete Choice Model
ECOWAS	Economic Community of West African States
EU	European Union
FERMA	Federal Road Maintenance Agency
FGN	Federal Government of Nigeria
FMW	Federal Ministry of Works
FRSC	Federal Road Safety Corp
ICRC	Infrastructure Concession Regulatory Commission
IMF	International Monetary Fund
IRF	International Road Federation
IRIN	Integrated Regional Information Network
KBE	Knowledge-Based Economy
LGA	Local Government Area
LNC	Lagos-Niger Corridor

MDGs	Millennium Development Goals
ME	Marginal effect
MNC	Multinational Corporation
MNL	Multinomial Logit
MTEF	Mid-Term Expenditure Framework
NBBRI	Nigerian Bureau for Road Research Institute
NCFRP	National Cooperative Freight Research Program
NEEDs	National Economic Empowerment Development Strategy
NEPAD	New Partnership for African Development
NERFUND	National Economic Reconstruction Fund
NTP	National Transport Policy
NZIER	New Zealand Institute for Economic Research
OAU	Organization of African Union
PCA	Principal Component Analysis
PPP	Public-Private Partnership
R&D	Research and Development
RONET	Road Network Evaluation Tools
RUM	Random Utility Model
SMEDAN	Small Medium Enterprises Development Agency
SMEs	Small Medium Enterprises
SSA	Sub-Saharan Africa

SSATP	Sub-Saharan Africa Transportation Policy
USAID	United States Aid Agency for international Development
VMT	Value of Miles Travel

CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

Transport economics is concerned with various aspects of the transportation system. It covers choice of roads and users, various goods (types of modes), induced demand for transport types, cost minimization of types of routes and modes. The transportation system follows demand and supply theories. Increase in population and growth of new cities, costs of congestions (urban sprawl), logistics management, generalized cost of travel, complications in networks and others aspects, all results in changes. These had introduced sophistication in theory and measurements used in transportation models. Transport economists are interested in the economic problems of moving goods and people (Button, 2010). Transport has long been recognized as an important determinant of the location of economic activity, and therefore, the policy instrument for economic development (Lane, 2014). Greene and Hensher (2013), on the other hand, examined various aspects of demand for transport, especially the dimensions of heterogeneity of individuals in the demand for transport for various levels of activity.

The working of the transportation system depends on the characteristics and peculiarities of the economy. In Nigeria, the working of the transportation system is best described in the background study of the economy – given available stock of roads, pricing, fiscal issues related to investments and maintenance of road networks and other factors. The population of Nigeria is about 175 million people (see Appendix III).

Nigeria has 36 states and 774 local Government areas (LGAs), (See Figure 1.1). There also six geopolitical zones. Geopolitical zones are politico-administrative demarcations in the country set out along diverse ethnic groupings and historical backgrounds (religious affiliations, ethnicity, language spoken, etc.) for administrative and other demographic considerations as the case may be.

Nigeria has borders with Cameroon, Niger, Chad, and the Republic of Benin both in the northern and southern regions of Nigeria. (See typical porous border post in Figure 1.2). Nigeria have common important international corridors with these countries, apart from its regional groupings like the African Union (AU), which was established 1963 (OAU) and 2001 (AU), Economic Community of West African States (ECOWAS) 1975, New Partnership for Africa's Development (NEPAD) in 2001 to promote sustainable growth and development, and the empowerment of its community. The African Growth and Opportunity Act (AGOA) is also another initiative launched in 2000 and signed into law 2001 by the US congress to increase exports and growth of the economies of Africa.

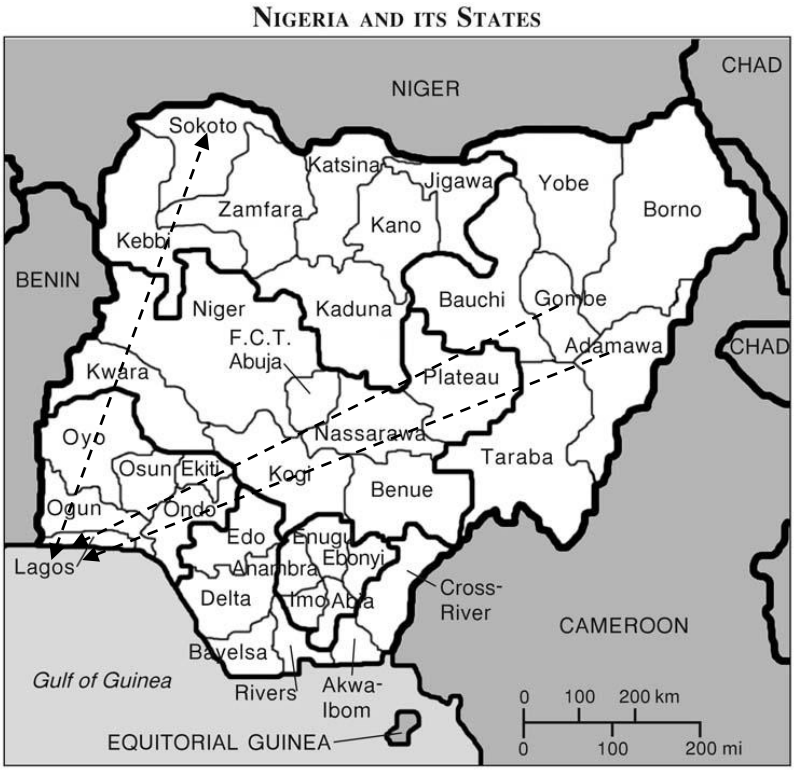


Figure 1.1
States and common borders in Nigeria
(Legal and illegal routes along borders (1487)
Source: http://www.puching.com/newsimmigration

Figure 1.2
Typical Nigeria-Niger border post at Birnin Kuka, Katsina State
Source: Zainab Usman (2012), Nigeria's porous borders in pictures. Retrieved from Nigeriastak.org/2012/03/25/Nigeria-porous-borders in pictures.

These organizations have introduced and enhanced cooperation amongst countries, especially the transportation of goods across their common borders whether legal or illegal, alongside a highly developed underground economy in the region. Several routes encouraged smuggling activities due to porous borders in locations.There are road networks in varying conditions in different locations. Most of the rural roads are the links to these borders (Figure 1.3); devise transport corridors (local and international) which are gateways to countries that are engaged in border trade with some countries – Niger, Chad, Cameroon, the Republic of Benin and others.

Figure 1.3
Road conditions at some Nigerian borders and major roads
Source: author's photos.

There are locations (roads) that go through the mountains in some border countries (Figure 1.3a,b). Some of the locations in Adamawa are in Madagali (Dirif); others are in Borno state to Chad and Niger. These routes are linked from Lagos on trunk A. Main currencies used in these locations are the CFA and US Dollar (also the Nigerian Naira currency).

These countries have different geographic characteristics. The common features of these countries are Landlocked, and among the poorest in the world. In addition, out of 30 of the world's landlocked third World countries, 16 can be tagged as the least developed (Jean-Francois Arvis, 2012). Countries bordering Nigeria form part of the economic and transport corridors for Nigeria, and most of these countries have illegal trade routes and connections around the north-eastern geopolitical zone. Some of the areas are riverine (Cameroon), while other countries are bordered with mountainous and or have characteristics of Sahara Desert especially in the northern region (Niger and Chad). A journey by air from Yola to Lagos takes two (2) hours, approximately 1047 kilometers (km). By road, it takes close to 24 hours or a little more. From the location on a Nigerian map, Lagos to Sokoto in the far North (see positions marked, Figure 1.1), is about 951 km (in a straight journey) is a long journey (Victor & Hope, 2011). Most industrial goods – machines, car spares and other goods come from Lagos port, Porthacourt ports through these routes. Second hand cars are imported into Nigeria from the Cotonou (Republic of Benin) through this route. Trade and other aspects of cooperation of the countries in the region (sub-Saharan) are facilitated by road transport.

The standard for road infrastructure is security management. This is important in the realization of the goals of access to different economic activities. Transport by Road remains the main cause of death among all EU citizens. (Hermans, Brijs, Wets, & Vanhoof, 2009). Road transport is the principal means for moving people and goods; it must have the highest security measures. According to the ranking for road accidents, the ranking of Nigeria is: 191 out of 192 in the world with un-safe roads, 162 deaths for 100,000 populations from road traffic accidents. The World Health Organization (WHO) reports that more than 1.3 million commuters are fatally involved in road related

accidents, while over 50 million people sustain different degrees of injuries from such crashes annually (Britain, 2011). This has implications on productivity of the Nigerian economy. Since roads are vital in accessing economic activity and important determinant of cost, this will be addressed in three ways; firstly, to assess road transport in the context of security and cost on highways because it determines the rate of the transaction cost and productivity. Secondly, poor road infrastructure (in terms of maintenance) has implications for travel time and higher cost of storage of goods in transit towards a given destination, poor road networks encourage crime. Over time bad portions of some roads had facilitated setting roads block by armed robbers. This is a common occurrence in Nigeria. Some road agencies in Nigeria have most times shown such roads conditions, for instance, Nigeria (Federal Road Maintenance Agencies - (FERMA) and a traffic management agency, and the Federal Rood Safety Commission (FRSC). The Federal Road Safety Commission (FRSC) is charged with the task of policy making, organization and administration of road safety in Nigeria in relation to road security and, thirdly, in terms of the productivity of road infrastructures, in Nigeria. This is essential because both the MDGs and Vision 2020 affirms that 90% of all goods are moved by road in Nigeria, but the budgetary allocation and development priority to this sector remains low as shown in Table 1.1.

Table 1.1
Gross Domestic Product at Current Basic Prices (=N=Million), 2011

Activity Sector	Q1	Q2	Q3
Total for all sectors	7,402,481.25	8,983,832.24	10,205,085.18
Road Transport	**105,732.99 (1.43 %)**	**147,026.57 (1.64%)**	**131,174.38 (1.29%)**
Rail and Pipelines	1.55 (0.00%)	3.48 (0.00%)	2.44 (0.00)
Water Transport	275.21 (0.00%)	415.64 (0.00%)	476.81 (0.00%)
Air Transport	1,444.74 (0.2%)	1,590.45 (0.002%)	1,833.55 (0.02%)

Sources: NBS, CBN. (**N**ational **B**ureau of **S**tatistics and **C**entral **B**ank of **N**igeria), 2011.

1.1.1 Features of the Study Area (Road stock and accessibility issues)

The study area, Adamawa and Gombe are strategically important to other geopolitical zones in Nigeria in many ways and have roads in varying degrees. The region has many borders as shown in Figure 1.1 above, and shows the urgent need for achieving the objectives of trade integration in a regional body like the Economic Community of West African States (ECOWAS), given the conditions of roads and fiscal requirements for road building and accessibility in the sub region.

Gombe is an agricultural state and strategic for agricultural production of grains (various corn species) for cities in Kano, Maiduguri and border towns. Dadinkowa Dam is located in Gombe state. Federal College of agricultural is also located in Gombe, which is important in enhancing grain production in the area and benefits most cities in the north (Mohammed, 2012). Gombe has an oil refinery, which serves surrounding states like Adamawa, Borno (Maiduguri) and Bauchi states. There are two major roads (highways connecting Adamawa and Borno states). Adamawa state, on the other hand, has a long history of routes that connect countries within its borders like Cameroon and

Chad; strategically from the ancient trans-Saharan trade routes and common agricultural activities – fishing in the Lake Chad. Adamawa has paved and unpaved roads that facilitate access to Cameroon and Chad on the border. This background is important in evaluating whether road infrastructures contribute to the cost of doing business in most parts of Nigeria, especially in Adamawa and Gombe states. Most roads towards the border towns are unpaved but experience heavy traffic and trading activities

The stock of roads is an essential element of the transport infrastructures. The transport infrastructures are services that are provided by the physical transport networks. It includes roads (and bridges), railway tracks and modal interchange facilities, dock facilities, airport runways and terminals, navigation and traffic control assets for air and maritime management. Transport infrastructure (which includes roads) is an important facilitator of growth for developing economies like Nigeria. Increase stock of these facilities has been responsible for growth disparities in economies worldwide. The urgent reasons for innovation in the stock of roads, (which may include innovations in the tracks of roads) results from the facts of the growth in communities, increase productive industries and human settlements that use these facilities. The growing needs for these facilities thus gives rise to induced demand theory. Essentially the induced demand theory of transport addresses growing use of roads that results from increased traffic and building new roads or road capacity to absorb increased traffic. The need for the growth in the stock of roads and associated problems introduces the need for efficient transport. These steps address the main issues of a nation's performance. Better roads provide the only access to markets, education, health and social development for many Africans (IRF, 2008). Strong correlation between the

performance of the economy and infrastructure is usually required according to the World Bank's report 1994 and other such reports (Canning & Bennathan, 2000).

Accessibility defines coverage in terms of availability of roads, price and efficiency of roads. Efficiency, on the other hand, defines the optimum working of the infrastructure - also defined as the quality of infrastructure in performance. Both aspects of infrastructure are important for increasing firm competitiveness (Iimi, 2008). Over the years, questions about accessibility of Africa's infrastructure have affected both the social and business environment. Social aspects occur when such transport systems exclude segments (class) in the group based on income levels - leading to lack of effective demand for the commodity or service (purchasing power of individuals). The business environment results in high transaction cost, affecting manufacturing firms (Bigsten & Söderbom, 2006). These have manifested into cost differentials in different African regions.

Factors affecting the current availability in Africa's infrastructure usually range from fiscal policy matters, which dictates government expenditure spending, priorities in the development agenda, and the dictates of the global economy. Levels of infrastructure spending and maintenance of existing infrastructures have had major impediments in the low economic performance of Africa, especially sub-Saharan region. Addressing these shortfalls and the funding gap for infrastructure are critical to Africa's economic future (Xu, 2011).

Infrastructure is vital for achieving economic growth and development; which is the desired goal of all economies. Infrastructures are the springboard for attaining growth in all sectors of the economy. The level of availability of these facilities may differ from one economy to the other. The parameter for measuring the levels of

availability had been argued based on the classification of economies – developing and developed. This can be argued in a broader perspective that all economies (whether developed or developing) are exploring new ways of production and distribution, for example, which are the core elements of the e-economy.

The importance of infrastructure has been recognized early in economic literature. Infrastructure was seen as means for production of goods and services - capital endowment or productive inputs (Todaro and Smith, 2000). Hirschman defined infrastructure as "capital that provides public service" (Hirschman, 1988). This really is the value of infrastructure in growth; where Aschauer (Aschauer, 1989; Warner, 2014) measures the productivity of public investment over time as required for productivity of both private and public enterprises.

It is uncommon to find an acceptable definition of infrastructure (even though specialized infrastructures in information technology and other fields may evolve into some form of definition). This is because such definitions seem to follow the ideas of a derived demand: that the demand of a particular product or service depends on the demand for what it helps to produce. But generally infrastructure is usually understood as basic public infrastructure: an umbrella term for many activities which forms the foundation for socioeconomic activities. This is the traditional functions of government in public finance, that government is the provider of such services. This definition (connoting public services) has long been overtaken by many evolutions in the provision of both public and private investments (PPP) in most economies worldwide; however, this definition still holds to a certain extent in developing countries where government still plays an active role in vital infrastructure provision and market failure. This was

relevant in 2007-2008 economic crisis where government interventions (stimulus packages) played the 'publicness' role.

In the developing economies, government provides capital for public services. Private investment in infrastructures like roads is still insignificant, because public sector (Government) still provides the bulk of such finances invested in infrastructure. Some of the constraints to lack of participation of the private sector in the provision of infrastructure may be due to initial blue print that defined and encouraged their existence, high inflationary tendencies that affect total revenue and other constraints. For instance, World Bank assessment defines the easiness of business setting, government regulatory processes to be harsh for setting businesses in Nigeria. This may be a constraint.

Generally infrastructure sector is divided into hard and soft infrastructure. The hard infrastructure includes roads and bridges, ports, airlines, railway, power, telecom while the soft infrastructure includes education, health, tourism and highly sophisticated applications. The nature of soft infrastructure is the delivery of services to people and organizations. Unlike much of the service area of the economy, the delivery of those services depends on highly developed systems and large facilities or organizations that share many of the features of hard infrastructure.

Road transport infrastructure (example of hard infrastructure, tangible asset) has two major types, composing the land transport system, roads and railways. With a growing population and other demographic characteristics, there are needs to design and redesign road networks especially for expanding transport system's needs. Modern roads tend to follow the structure and to respond to the growth of cities, product locations and other considerations. In the modern economy, roads have become an essential

infrastructure for the growing urban cities and community. Due to these growths, especially the used of these facilities, travel time and cost became a concern for policy makers. The need to make for a lighter traffic and to decongest the roads has been the preference for modern roads. The development of transportation networks reduces transaction cost; it also allows for gains such as economies of scale in productivity, also that other economic activity can be carried out (Limao & Venables, 2001).

Dynamism in the growing economies and demography, productivity of goods and services, and provisions for necessary socioeconomic needs of the various economies had introduced various concepts of infrastructures. For example, an increase in information technology concerning security and defense (Cyber related crimes and general defence secrets as in Pentagon's USA 9/11), new payment systems and fraud related crimes presented in the financial sector of the economy, tracking environmental changes and the need for early warning systems (tsunamis for instance), including the need for quick-yielding crops due to small amount of rainfall in sub-Saharan countries, are some of the innovations in infrastructure.

The growth and expansion in economies introduced the need to provide infrastructure, especially roads and other sophistication in infrastructures. Apart from investment in infrastructure to provide sufficient and efficient services to a growing community, there are problems of maintenance and environmental aspects of road building. In developing countries like Nigeria, there are problems associated with the provision and maintenance of infrastructures. Political structure plays a vital role in the provisions of necessary infrastructure, especially in developing countries like Nigeria. The growth of the political systems also exhibits societal ills – for example the

provision of efficient infrastructure is slow due to bureaucracy and corruption (Yehoue, Hammami, & Ruhashyankiko, 2006).

Issues relating to private partnership in road building in Nigeria are factors that encourage entrepreneurship and participation in transport infrastructure, is beneficial to private sector revenue from their businesses. This also depends on the provisions of necessary infrastructure – electricity and roads. This again is the problem of cost-savings which are essential in the profitability of the business (Bougheas, Demetriades, & Mamuneas, 2003). Private participation in infrastructure provision, especially in road building, has been low (or non-existence in some aspects) due to two important factors. Firstly, political machinery – PPPs are widespread in a politically stable country with a responsible government and secondly, the market and macroeconomic factor – PPP tend to be more common in larger markets places where the demand and purchasing power are greater. Alongside this factor (the market), PPP is more prevalent in a country with credible, predictable and stable macroeconomic conditions, particularly, a country with lower inflation and stable exchange rates. (Yehoue, et al., 2006). The relationship between infrastructure and economic growth result from the fact that infrastructure is needed for what it can help to produce. For instance, technology (Software building, new equipment, new road construction techniques and results of R & D) issues in the development, instructions used for mixing together inputs (raw materials, labour and capital inputs) lies at the heart of economic growth (Romer, 1991)

Thus, improvement in productivity leads to increase in commerce. As a result, increase in output capable of stimulating demand. This lead to innovations at the firm level, which led to several theories, related to endogenous and exogenous development thoughts in development theories. The heart of these theories is linked to the fact that

some of the changes are capable of introducing improvements that accelerate economic growth. The arguments, however, is that many innovations may take place are endogenous according to Romer, 1991. That internal processes and investment capital spur growth. The main thrust of the arguments is that the existence of a conducive environment is "of eminent importance for carrying out innovations and for enhancing rivalry" (Carree & Thurik, 2005) and the drive for investment in infrastructure which, speeds the rate of growth, because infrastructure is an important denominator of growth.

Nigeria has significant infrastructure challenges. These challenges range from the growing gap in fiscal budgets, which is a constraint to infrastructure investment. There are widespread budget shortfalls, inefficient management of large infrastructure and lack of good political 'conscience' to undertake important infrastructure projects (in terms of the technical engineering work). (A. Campbell, 2009; Okojie, 2012). Poor state of road infrastructure has had implications on the cost of operating vehicles according to FERMA[1].

Nigeria's infrastructure investment (in roads) is low, considering the needs of the states, growing community to hit above 175 million, with oil resources/revenue higher, is capable of investing in an efficient transport sector (Figure 1.4). Low level of investment in roads means most communities, especially the rural population cannot access basic essential health and educational facilities due to lack of access. In Nigeria, good health facilities are located in semi-urban and urban locations far from rural locations.

[1] Federal Road maintenance Agency (an agency in Nigeria in charge of road maintenance).

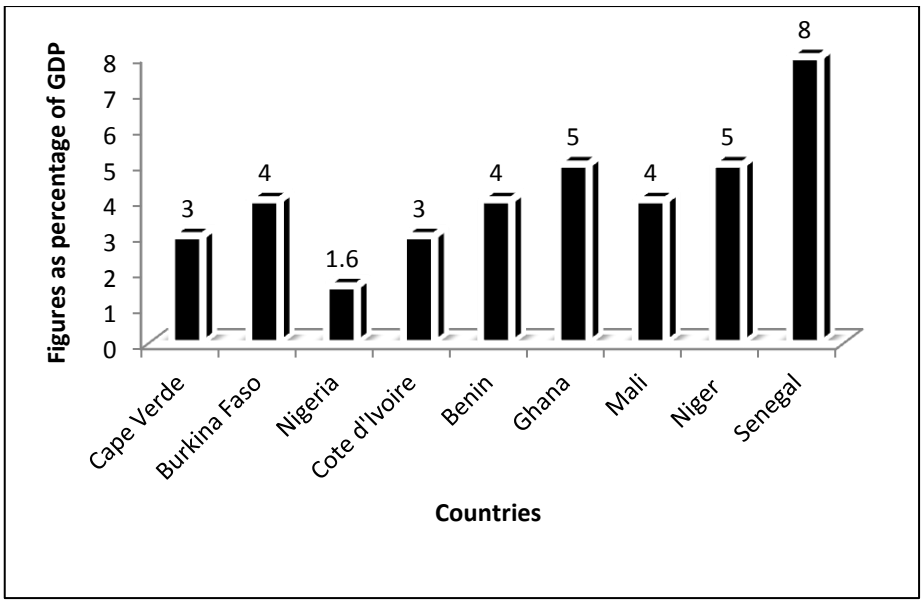


Figure 1.4
Nigeria's Infrastructure spending on infrastructure
Sources: Foster and Bricenrio-Germendia, 2009

The importance of infrastructure has been highlighted by the World Bank stating "the adequacy of infrastructure helps determine one country's success and another's failure..." (World Bank, 1994). Many economies have gone beyond 'basic' infrastructures to well-functioning infrastructures that facilitate e-commerce and governance. For instance road pricing (toll) that use smart cards for transactions, and connections that allow customers make electronic payment for some logistics or payment of storage and warnings in cases of road hazards. As noted in most literatures, the level of infrastructure that is inefficient adds to the cost of doing business – bad roads, potholes, electricity failures that make for an ineffective e-banking in Nigeria, for example. In measuring road performance for low-income economies, 1.6 (road density in terms of population kilometers per 1000 people), the benchmark for low-income countries is 3.0 (Estache & Goicoechea, 2005) is used often times. Nigeria's infrastructure lags behind the low-income group (Omojimite, 2010), even though Nigeria is ranked in the low, middle-income group

(Word Bank, 2010). The staggering question is: what is the critical infrastructure for Nigeria? To upgrade the state of the roads is a springboard for growth of the economy. These are problems plaguing a developing country like Nigeria that is balancing the use of funds for priority sectors of their economies. For example, from 1970-1999, $231 billion oil revenue was generated (Ross, 2003). Another report stated that, from 1971-2005, $390 billion accrued to Nigeria (Budina & van Wijnbergen, 2008) during this same period Nigeria was categorized as undeveloped with negative growth between 1960-2003 (Perkins, Radelet, & Lindauer, 2006). These developments have raised questions as to what are the growth goals of the national economy and how these goals can be attained.

Infrastructure gaps exist in Nigeria; that is the present stock of roads and what is needed for the growth of the economy. According to Oloniruha, (2013), Nigerian road infrastructure needs to increase from 200,000 km to about 300,000 km in the next five years. Presently, 200,000 km roads existing, only 39,000 roads are paved (about 19.5%). Infrastructure can be a growth-lifting strategy (Saidi, Scacciavillani, Prasad, & Roi, 2011) because both economic and transport corridors support economic activities of the area, resulting in greater regional economic performance. The growth agenda for Nigeria developed from the Vision 2020 states that, "Roads are important in the Nigerian economy, thus Nigeria has become increasingly dependent on the road system to meet virtually all its inland transport needs, road transport accounts for 90% of the internal movement of goods and people in Nigeria." (Nigeria, 2012). The argument is relevant that the ownership of key infrastructure facilities is commonly the public, at least still relevant in the developing world. Nigeria goals for developments in the next century depended on increased stock of roads. According to the World Bank report (Foster &

Pushak, 2011) and Africa infrastructure country diagnostic (Foster & Briceño-Garmendia, 2008) both positions paint gloomy picture of Nigeria.

Infrastructure challenges have been manifested in rising prices of food and other services in Nigeria as a result of high transportation cost. In Nigeria, the bulk of food needed to feed the 175 million comes from rural Nigeria, thus high cost of transport affects cost of goods and low business profits/entrepreneurship in Nigeria are also determined by the political class, which has many sides in Nigeria. Apart from the point of maintaining our political structure, in terms of cost and corruption, some of the many woes include non adherence to strict budgeting procedures and fiscal indiscipline, endemic corruption that affects management of resources. This stresses the questions on the cost of democracy and the social welfare function which is a function that ranks social state. The cost of democracy has had many implications for the state, especially investment in projects that are beneficial for growth. The social system could be defined as the constituency, political geography that defines catchment areas. It has been the platform for weighing the impacts of most road projects. A social network is defined by constituencies, 36 states and 774 local governments in Nigeria. Lack of public infrastructures in some locations is able to bring about dissension and explosions in communities – the many crises that have contributed to growth drawbacks of the Nigerian economy (Oriakhi & Osemwengie, 2012). For instance the Niger-Delta insurgence affects oil sales. The Niger-Delta region is the oil producing region of Nigeria, sometimes crisis occur due to 'marginalization' and uncontrolled oil spillage that affects their farmlands.

The cardinal objective of this study is to examine the effects of roads on the cost of doing business in a particular region (Northeast geopolitical zone of Nigeria), because infrastructure is seen as the primary public investment which forms the foundation for society and growth goals (Peden et al., 2004). Infrastructure is critical and as a catalyst for industrial and overall economic growth. This forms the basis of National Economic Empowerment and Development Strategy (NEEDS) agenda and the basis for achieving the global development strategy, the MDGs. Infrastructures are the "lifeline system" that physically tie together sectors of the economy from the metropolitan areas, communities, and neighbourhoods, and promote the growth of local, regional, and national economies.

1.2 Statement of the Problem

Rising prices of food and other services in Nigeria have always been linked to high transportation cost.

Infrastructure gaps exist in Nigeria; that is the present stock of roads and what is needed to effectively move goods and people - especially meeting the goals of Millennium Development Goals (MDGs), expanding rural accessibility etc, cannot be attained.

There are challenges to poor design, materials, and supervision. Most literature on road transport has argued that road failure in Nigeria occurs due to: (i). Poor road designs and materials used have been a significant part of road accidents. This has resulted in high cost of transportation and security of goods in transit, (ii). Supervision of roads projects has another part. According the Cost of Business statistics,

contracts are not effectively supervised, and work done is not according to specifications.

The study area has the lowest road networks in Nigeria. This has made transportation in the study area inaccessible, and also, due to the current growth of insurgency and crisis in the Northeast. This study use discrete choice model(s) to evaluate transport choice and Multiple Regression to assess the cost of doing business.

The research gap of this study is the use of multinomial logit and Regression models jointly to address growing trends in cost of doing business in Nigeria. This study acknowledged the fact that transport choice is determine by utility considerations of individual (even though conditions in the study area restrict preferences of individuals), available modes and road conditions amongst others. To be able to adequately study high cost of transactions and cost differentials among the geopolitical region, two data type was sourced, discrete and continuous data. This allows the study to combined findings based on perceptions of respondents. Combining models and the perceptions of travel choice behaviour of respondents was important is determining cost of doing business in Nigeria.

Using discrete choice model to determine that travel behaviour, defined not only the choice behaviour of individuals but cost, also plays an important role in choice models. The regression tool on the other hand helps to explain that costs define road conditions (due to public expenditure on roads), also responsible in determining cost of doing business arising due to lack of access and other constraints.

Non availability of official statistics or data bank for transport choice and qualitative survey would have warranted the use of triangulation in this study. This may be important considerations for further studies.

1.3 Research Questions

(i). What are the determinants of the current state of road infrastructure in Nigeria, in terms of travel time and efficiency of road transportation?

(ii). Does the state of roads determine upward trends in the prices of goods and services in Nigeria?

(iii). What determines specific features of road transport in the selected states and its impacts on these economies, in terms of travel risks, conflicts, growth of black markets across the borders?

(iv). How does accessibility considerations determine road transport choice and cost of doing business?

1.4 Objectives of study

The general purpose of the study is to evaluate current state of Nigerian road transport in terms of travel choice, how it affects travel behaviour of individuals and why it ultimately affects cost of doing business in the selected locations.

Specific objectives are:

i. To evaluate the current state of road transport affects travel on time in Nigeria
ii. To examine the impact roads on the prices of goods and services in the selected locations.
iii. To examine specific aspects of road transport - travel risks, travel time, conflicts and the environment.
iv. To assess accessibility considerations and factors related to the geography of transport, travel choice, various travel constraints, and their impact on the cost of doing business.

1.5 The significance of the study

Most discrete choice models are based on various aspects of socioeconomic conditions of individuals in utility maximization for different activities – in travel choice, employment issues and other aspects of the demography, applied to any kind of dynamic conditions of the population. Some of these conditions affect various aspects of the household and the economy in general.

Corridor management is important especially for trade connections. Economic corridors connect economic agents along a defined geography. They provide important connections between economic hubs that are usually important links to cooperation in trade. Some of the problems raised in this study are linked to connectivity and access, defined by road transport, which has various dimensions. These conditions (road connectivity) have introduced drawbacks to trade development and or high cost of transaction as over time. The realization of flow of goods and services between countries in the sub region, the sub Sahara Africa (SSA) has been hampered. Individuals may choose gateways that maximize a choice option; either due to cost/freight charges, and other factors, for instance deciding which routes is accessible. The study of these conditions may assist policy making and an efficient transportation policy for the region, mainly to increase trade flows and the concepts of regional specialization.

The use of this model (Multinomial Logit) from various literatures has been applied to various socioeconomic conditions. In this study, it will be applied mainly to determine travel choice in difficult road conditions, with limited choices of both transport modes and routes (high unpaved roads, landlocked locations and crisis ridden environment) and its impacts on the cost of doing business. Based on the typology of the

area, we intend to use these models for policy making associated with cost benefits analysis.

Cost of doing business results from transport cost and other constraints. The study will focus on aspects of typical developing country characteristics – misplaced priorities of developments, culture that plays a major dictate in development agenda due to multiple ethnicity and religion in Nigeria, which seems to bring about complexities in priorities of developments to different communities The level(s) of importance of each option depends on the data in observing trends in either mode choice or the degree to which it affects the cost of doing business, this is important, because such issues may be beneficial to policy making options, especially in the development of a the so called 'silk road'. The development of the Corridor is important because it serves as a gateway for the region (Northeastern Region). The trans-Saharan trade routes have been important since the era of the ancient slave trade and trade routes (Figure 1.5).

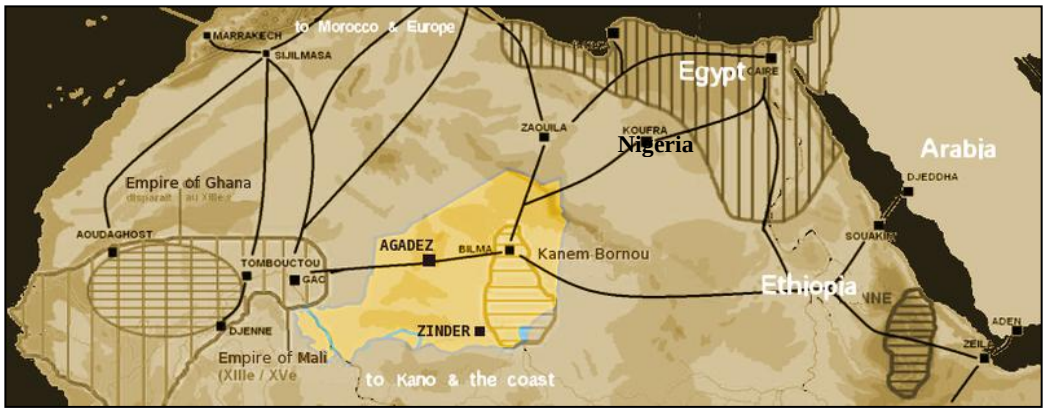


Figure 1.5
Trans-Saharan trade route
Sources: Map of Medieval Saharan Trade route, Boahen, 1964)

In relation to policy matters, it may assist the government in its cost-benefit analysis in project funding, especially for a project that assessed the accessibility that over the years have created inequality in most-developing economies. This is seen in most countries that better travel services are expensive and excludes bulk of the people. In Nigeria, for example, when crisis erupts in some regions, cost of transport is increased, or a choice of mode is limited. This situation is glaring in the health area where options are constrained.

It is also significant in enhancing the development of an international corridor. The International corridor is from Lagos (South-West)-Maiduguri (North-East) – N'Djamena (Chad) which is 1,816 kilometers. This gateway is important for both countries and sources of commerce for both countries. Fairly used cars from the Cotonou the (Republic of Benin) imported via this route to the Northern part of Nigeria. In the southern part of the country, linking the port of Calabar (in the South-South geopolitical zone) to the big northern town of Maiduguri (where Chadian trucks may load various cargoes) to Ndjamena. There is more direct route to the Ndjamena border, but the road is unpaved. Both roads run along the Eastern side of Nigeria, alongside the Cameroons mountainous border. Along here, you can cross into Cameroon. This is important in the development of international trade for Africa and gateways to Europe.

It is significant for future research in road building, from the experiences of building tunnels linking Europe and the other parts of the world. It could also important in modeling modern transporting, engineering and connectivity. The support of the private sector has been low (and some cases nonexistence). In this study, the argument is the improvement of the current infrastructure as a means for enabling

entrepreneurship in the economy.The argument is the fact that it affects the cost of doing business ultimately.

1.6 Scope of the study

Considering the role of infrastructure as drivers of economic growth, innovations that had resulted in increased living standards in advanced economies and important ingredients in globalization, e-commerce and e-government, the state of infrastructure has the potential of a growth-lifting strategy (Saidi, et al., 2011)

This study covers two states in Nigeria. The two states are located in the North-East geopolitical zone, Adamawa and Gombe states. Adamawa state, (bordering Cameroon republic and Niger in the Northern part) is a popular trade route between Nigeria and Cameroon. There are many studies on cross - border trade along this border (Nwanolue & Iwuoha, 2012) and along Borno state, Taraba state, Bauchi and Gombe. Adamawa state has a UNESCO World Heritage Site. Adamawa, Borno and Taraba have borders with Niger republic, Cameroon, Chad and Central African Republic. The ancient trade routes to most of North Africa and the famous trans-Saharan route trade in the $17^{th} – 19^{th}$ century, and extended to Mali; Libya still exists have relevance to these states. Taraba state is linked to the Middle belt and Southern parts of Nigeria with all the same vegetation and road linkage to Southern parts of Nigeria. Other states have features of the desert and tropical climate (Borno and Yobe)

The location of Lake Chad had created and increased border trade, conflicts within the region as a result of increased migration of Chadians and Cameroonians. The creation of over 30 villages founded by Nigerian migrants on Cameroon territory had increased the creation of trade routes mostly in Northeastern Nigerian, River states and surrounding states in southeastern Nigeria (Bakassi) had popularized these borders, (Metz, 2007). Entry point from the North-east region of Nigeria (Borno, Gombe, Adamawa and Taraba states) is visible on this Figure.

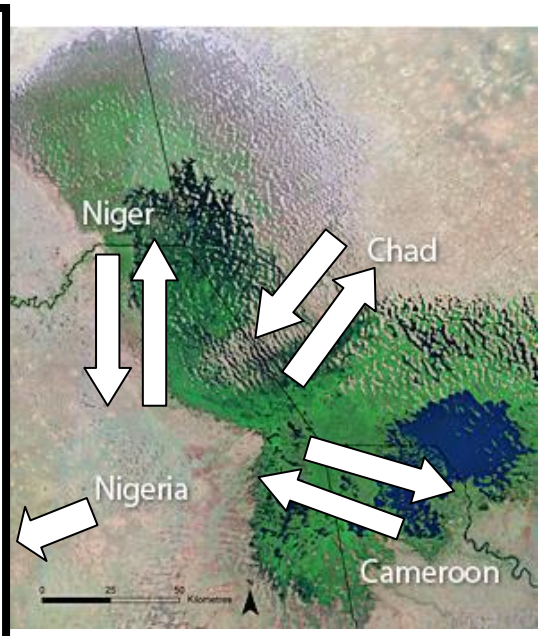


Figure 1.6
Movements around the Lake Chad
Source: Lake Chad 2007, Source: UNEP,
(Author: map reorganized for the purpose of this study)

An important feature of this region (Northeast region) is that there are road linkages connected from one of the states (Taraba) to the Southern part of Nigeria. There is also a road that links Southern part of Nigeria for all the three states. (Taraba, Adamawa and Borno and Yobe states) (see map, 1.6). This also explains the importance to the growth the Lake Chad prominence in both countries and the transportation across these countries. Adamawa and Gombe states form the biggest highway in the Northeastern geopolitical zone. It is a famous route for increased underground economics – the so called black market bordering Borno, Adamawa, and Taraba state in the study area.

1.7 Organization of the study

The study is organized into five chapters. Chapter one is the introduction. It captures the review of the study – infrastructures and its contributions to economic growth. Note that this section discusses economic development, which is a subset of economic growth. Chapter two is the literature reviews. Important literatures on infrastructures as springboard for growth, different forms of theories of growth linked to the evolution of the information economy - driven by sophisticated literatures on critical infrastructures which are be treated in a running commentary. Chapter three is the methodology. It will lay out a framework and building of constructs (variables) for study of the four points raised as the basis for assessing infrastructure and growth – public investments (funds needed to build roads), maintenance (repairs on existing infrastructures), and the environment is seen as facilitators to the growth of SMEs and other businesses that depended on it. Chapter four is the analysis. Data analysis will be sourced using various sources. In this study, primary data is used. Chapter five is the summary, conclusion and policy recommendations.

CHAPTER TWO
LITERATURE REVIEW

2. 1 Introduction

This chapter provides an overview of the literature for this study. It starts with the introduction, section 2.1 and definition of infrastructure in section 2.2. Thereafter, literature review is structured into two broad sections: Section 2.3, Theoretical Literature review, with sub-sections 2.3.1 – 2.3.14, surveys various aspects of the transportation infrastructure theories, the features of the Nigerian public finance, which shows the nature of government expenditure, the main theory of used in this study. It also examines amongst others, land use theories of the transport system, sustainable theories of the transport system – aligning subsectors of the transport system (environment and other conditions that affect the transport system), public policy theories, which essentially the role of governments in transportation policies. A survey of theories and models of infrastructure was also undertaken. Section 2.4 is empirical literature, includes study of the variables used in this study (both dependant and independent variables). It examines their impacts on the economy and growth, in formulating economic policies. These are divided into 2.4.1-2.4.7 subsections. The empirical framework includes a research framework, essentially an examination of empirical aspects that affects conditions of roads and cost of transaction - perceptions from SMEs and petty traders who daily experience cost of transport as a result of various travel decisions. Public investment is an important aspect of road building; this aspect provides bulk of the finances needed in a developing country like Nigeria. The sub-section also studied road maintenance, an essential aspect of sustaining an efficient transport system,

the environment, which defines various contemporary terrains that affects accessibility, travel time and availability of particular transport mode. Road connectivity, examines literature on road links or the ability to link from one type of roads to another, this also defines costs and travel time. Cost of Doing Business (dependent variable), examines various aspects of the transportation system that affects cost of business operations, and Transport choice (dependent variable), which examines various literature on probability and choice of individuals. Transport choice is discussed in some details in chapter 3 – components of choice, models of utility maximization, choice probability and discrete choice models used in transportation.

2.2 Definition of infrastructure

The term infrastructure has been used in different ways and, sometimes models have been evolved to explain why infrastructure is critical for achieving a desired goal or generally, for countries to achieve economic growth. The speed at which this is achieved depend on many factors. Infrastructure definition was used in different times for different things, but the nature and scope have since changed with the desire of economies to reach the potential of their production frontiers (function). The combination of available resources and planning process was important in defining the speed, effectiveness and efficiency of infrastructure – the so called convergence speed (also catch-up effect) in growth models (Reiss, 2000).

According to the World Bank's (1994) definition, infrastructure includes public utilities or public works (includes roads etc). Economic infrastructure is characterized by economics of scale and has a spill over effect from users and non-users. It is a

significant agent of economic growth, and it is an essential part of enhancing human development. It has also been seen as the main networks that support economic and social activity (Pcglobal, 2011). In some studies, peace monuments, community-based organizations campaigns also constitute infrastructure, because it is a reminder of the importance of peaceful resolution that enhances wellbeing, and an environment devoid of conflicts is a facilitator for thriving economic activities (Juma & Mengistu, 2002). This solidifies the social nature of infrastructure as important factor that creates an environment for commerce.

Other feature for examining the definition of infrastructure, is the nature of infrastructure defined by New Zealand Institute for Economic Research (NZIER, 2002), as a infrastructure system which supports the transportation network. The nature of this kind of infrastructure is mainly a supportive tool or driver of the working or functioning of the industrial sector of the economy. These are the sectors of the economy engaged in the production of output. If deficits or inefficiency exists, it is reflected in the output over time. This is the case with Africa, and specifically, the Sub-Saharan Africa region. Over time, infrastructure is defined as lifeline systems that supports communities, neighbourhoods, and facilitates the growth of local, regional and national economies. Some definitions portray the quality of transportation corridors - gateways to some regions of the world, modern economies connects countries by underground tunnels, subways and flights (airports), (Gourvish, 2006)) as important innovations in infrastructure. Others, however, examine infrastructure as the lifeline systems, which can be local corridors that connect communities and needed infrastructure as it exists in the Sub-Saharan regions, where water, electricity and connectivity is a matter of life and death. It accounts for mortalities and preventable deaths and the collapse of most

businesses. Omojimite, (2010), argued that the nature of infrastructure in Nigeria is such that only 20 percent can access electricity and even lack of drinking water, road access, has been factors that stand in the way of growth.

The 'publicness' definition of infrastructure follows the theory of public finance, the traditional functions of government in the provision of essential services for the sustenance of economic units. This is also related to a definition that exhibits the publicness of infrastructure, "*may also include schools, health facilities, jails, recreation facilities, electric power production, fire safety, solid waste disposal, and telecommunications*," (Moteff, Copeland, & Fischer, 2002) - this is the American congressional definition of infrastructure

The cost argument for investment in infrastructure agrees with the public finance definitions that failures or inadequacies results due to increasing government expenditure theory that tries to cooperate with private sector to reduce the burden of government. Cooperation (between public and private sectors) has been reasonably successful in developed countries than developing countries. In Nigeria, for example, the infrastructure concession and regulatory commission, ICRC (Act 2005) are such arrangements for public-private partnership support. It has not reasonable to contribute to the expenditure on major projects in the country. Probably, it may be hypothesized that PPPs are more prevalent in politically stable countries with accountability standards in government business. This agrees with some of the findings of the World Bank Cost of doing business, that most government activities in the economy exhibit weak controls in the implementation of projects (World Bank, 2012). Some of the reasons for public intervention in the provision of infrastructure range from the cost of investment, important characteristics of joint consumption and non excludability in the consumption

of the service or good amongst other things. Infrastructure is a public good that produces positive externalities in production. (Rodrigue, 2009). The importance of infrastructure as a growth enhancing factor cannot be overemphasised as in Figure 2.1.

Initial Investments		
Infrastructure Investment	**Economic Efficiency**	**Productivity**
New Roads	Access and transport Modality	• Increase entrepreneurship
	Low cost of doing business	• Increase goods in the market
Road Connectivity	Low prices of goods and services	• Increase in revenues for entrepreneurs
(Linking new communities and expanding economic activities)	Increase market access and new markets in different locations.	• New ecommerce installations/machines
Innovations in e-commerce Increase rural banking Policies	Increase use of different methods of payment – the cashless policy of CBN and acceptance by many markets in Nigeria.	• Increase/faster transactions, new ways/methods introduced in the production line/process
New payment systems	Financial distress check	• Introduce new bank facilities and other financial regulations

Figure 2.1
Infrastructure and the growth process
Sources: Author's idea of new infrastructure investment and benefits accrued

To research into the dynamic goals of economic development and growth (changing environment as a result effects of global warming, dwindling energy resources, and technological change relevant to developing nations), the infrastructure-led growth model proponents examines the effective and efficient performance of infrastructure as bringing about low cost information in a regular cost function of the firm – Q=f(l,k), a simple two-input production function. There may be degrees of such relationship between infrastructure and productivity when using empirical data from developed

economies. In Sub-Saharan Africa, however, the relationship paints a very low relationship because of the low capacity utilization of infrastructure and resulting output. Africa's infrastructure is by far the most inefficient and costly. (Infrastructure, et al, 2009). Productivity or output exhibit efficiency of infrastructure, thus the efficiency indicator of infrastructure is economic efficiency; exhibited by access to different types of available transport, low cost of doing business, increased access to markets and the opening up of new markets illustrated in figure 2.1.

It is essentially, therefore, to categorise (define) infrastructure into soft and hard infrastructure to prioritise public investment of the economy that are important for the functioning of both economic and social well being of the economic agents. It also includes software application capable of operating systems – computer software, traffic lights regulation and the functioning of essential airport or cyber related facilities. In developed countries, popularizing software infrastructure has been an integral of part in the development of e-commerce and e-government. Other features of infrastructure may be defined arising from induced demand concepts – infrastructures needed for what they help to produce.

2.3 Theoretical Literature Review

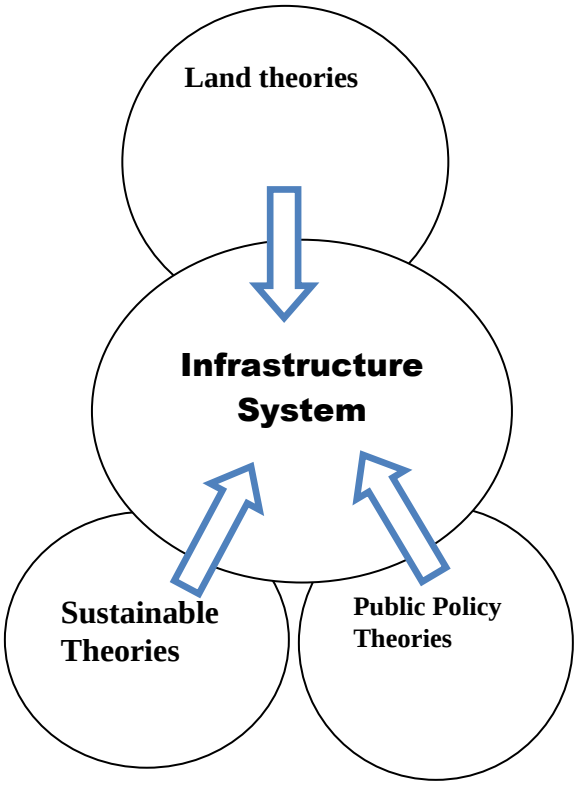
2.3.1 Infrastructure Theories

Infrastructure theories are interwoven to produce infrastructure as a system. Each of these theories has impacts on investments in infrastructure, cost and benefits of infrastructure, impacts on the environments (so called sustainability theories) and many models in explaining the performance of as a infrastructure system as shown in Figure 2.2

The main concern of infrastructure theories are issues surrounding the utility of individuals in making choices, thus models in literature pioneered by various authors - Ben Akiva and Lerman, and host of other literature abound. This has been used extensively in chapter three of this work. For instance Dell'orco and Kikuchi (2004) reported that, Prob ($U_{iq} > U_{jq}$); $i \neq j; i, j \in A_q$. The decision maker is faced with i and j alternatives, A_q is the set of alternatives; U_{iq} and U_{jq} are the utilities of alternatives: V_{iq} and V_{jq} , are the fixed terms; and the random terms. In most African settings with limited choices, all the same there exists some sort of choices. But most of the concerns in most developing countries are the gap between growing urban cities to the neglect of rural communities which create a wider gap in the choice set. The question is: How much infrastructure is needed, it depended on several factors. Public investments financed by public budgets are the leading factors. The questions of public funding have several aspects, and affect the infrastructure system as a whole.

2.3.2 Nigeria Public Finance

Issues of public finance in Nigeria operate within the various levels of the central and sub-national governments (federal government, 36 states and 774 local governments). The function of government is to support an efficient allocation of scarce resources to the federating units backed up by the constitution. Nigeria operates a federal system of government.



Public Policy theory

The cardinal theory that forms the theoretical underpinning is the Public Policy Theory. Public policy is guided by the growth goals of the government through various policy statements on sectors of the economy. In Nigeria public investment in infrastructure – all roads (whether local, state or federal government roads) accounting for 34,340.95 km in the 6 geopolitical zones in Nigeria are financed through public funds. (Alaba Adetola, 2011).

The public policy theory is made up:

1.Public policy instruments (fiscals/budgets)

2. Market failure introduced (PPP)

3. Public good theory (public finance concept).

Figure 2.2
Infrastructure system and theoretical underpinning
(Adapted from Rajabifard, A. (2011)

The functions of the federation are through performing its resource allocation, income distribution and economic stabilization, this is the main treatise of Musgrave, (1989), which outlined functions of government as fiscal burden of the state. Performing these functions to different to tiers of government is called fiscal federalism. It is a system of

taxation and public expenditure, where the powers to raise revenue and control expenditure are vested within the federating states. In Nigeria, public expenditure (building new roads and maintenance), is to a large extent, executed through public budgets. Partnering with the private sector in road building is still very low (SSATP, 2014), thus expenditure on infrastructure is solely done by government. Through its fiscal policy matters therefore, Nigeria expands the productive capacity of the real sector and the distribution of goods as the central objective of Nigeria's transportation policy. This enables the Nigerian state in achieving the desired level of the stock of roads. The level of relationship between various public expenditures connects directly with public policies in infrastructure planning. Efficient transport policies effects connectivity, accessibility and prices – ultimately effecting cost of doing business. Sub-national government in the Northeast geopolitical region has had travel constraints due to the rising crisis. This has affected their budgets in road building and maintenance for instance, because (i).The existing crisis in the area, coupled with high influx of other nationalities, (ii). Existence of a state of emergency in some states (Adamawa, Yobe, Borno and parts of Gombe and Bauchi states), and (iii). Part of their budgets is earmarked for maintenance of multinational force (Niger, Cameroon, and Chad) to maintain peace. Expenditure on roads in these locations is non-existence since 2009 to date (2015). This had resulted to worsening of the terrains, effects of the environment and maintenance of roads (which is non- existing), thus cost differentials between the region and other regions of Nigeria are glaring. It has ultimately affected the economic gains of the region because towns like Maiduguri (Borno state) was trading centre(s) for Sub-Saharan (SSA) border towns like Chad, Niger, Cameroon – to most of North Africa (Libya, Mauritania, etc).

2.3.3 Land-Use theories of the transport system

Land theories (Figure 2.2) are concerned with land administrations and land information. Although some literature argued that land administration is not recognized as infrastructure, it is linked to the geography of transport (Bennett, Tambuwala, Rajabifard, Wallace, & Williamson, 2013). Land use models are concerned with describing activities of land consuming units in the economy and their competition for land. Transportation policies, such as the construction of a new link or expansion of an existing one, eventually have impacts on land investment. One of the earlier models used in land related theories is gravity model. This model analysis travel issues within a location and other locations (called zones), and the transportation cost incurred between the various location, including travel time. This is important as transportation policy for expansions, like Malaysian merger projects, (Mass Rapid Transit) of transportation aimed at expanding the transportation horizon in Kuala Lumpur and other cities in Malaysia, land policies must be taken into considerations. Horowitz also formulated another model for trip-based forecasting to measure the travel behaviour between zones. Horowitz model captures behaviour of individuals in a typical living and workplace environment. It is more of a residential location to a workplace which exhibits stress for individuals that have to make different trips to their workplace. This model sets an important measure that could be used in this study area; there are locations with constraints to road travel due to several factors, including road conditions and crisis-ridden spots in the study area.

Some land-use models related transportation are summarised below:

Table 2.1
Selected models of land-use transportation infrastructure

Model	Reference	Features
ILUTE	Salvani and Miller (2005)	activity-travel model includes household member interactions
ILUMASS	Moeckel et al. (2003)	incorporates microscopic dynamic simulation
	Strauch et al. (2003)	model of traffic flows and goods movement model;
Ramblas	Veldhuisen et al. (2000)	designed to simulate very large populations
UrbanSim	Waddell et al. (2003)	demographic processes land use development; parcel-level land use representation
DELTA	Simmonds (1999	Micro simulation of demographic changes; treatment of quality in the market for space
PECAS	Hunt and Abraham (2005)	Regional econometric model with micro simulation of land development at the parcel level; ability to couple with an activity-based travel model and to apply at supra-regional level

Sources: Lacono, Levinson and El-Geneidy, (2008)

Land use theories are concerned with different human activities, the state of the environment and how these resources are used. It is relevance to transport in the areas of:

(i). the use of land activities and the interactions that generate the demand for transport, (Wagener M, 2014).

(ii). activities and interactions are to a greater or lesser extent influenced by the availability of transport over time, especially in an urban setting and,

(iii). the linkages between transport and other social activities may be important to the appraisal of public transport policies.

Various economic units demand transport for movements to economic units and other socioeconomic needs of the population. Therefore there is a connect between transport needs for the population (which depended on land available) and other needs of the

population for land related use – housing, firms, farms and other use of land as illustrated in the Figure 2.3

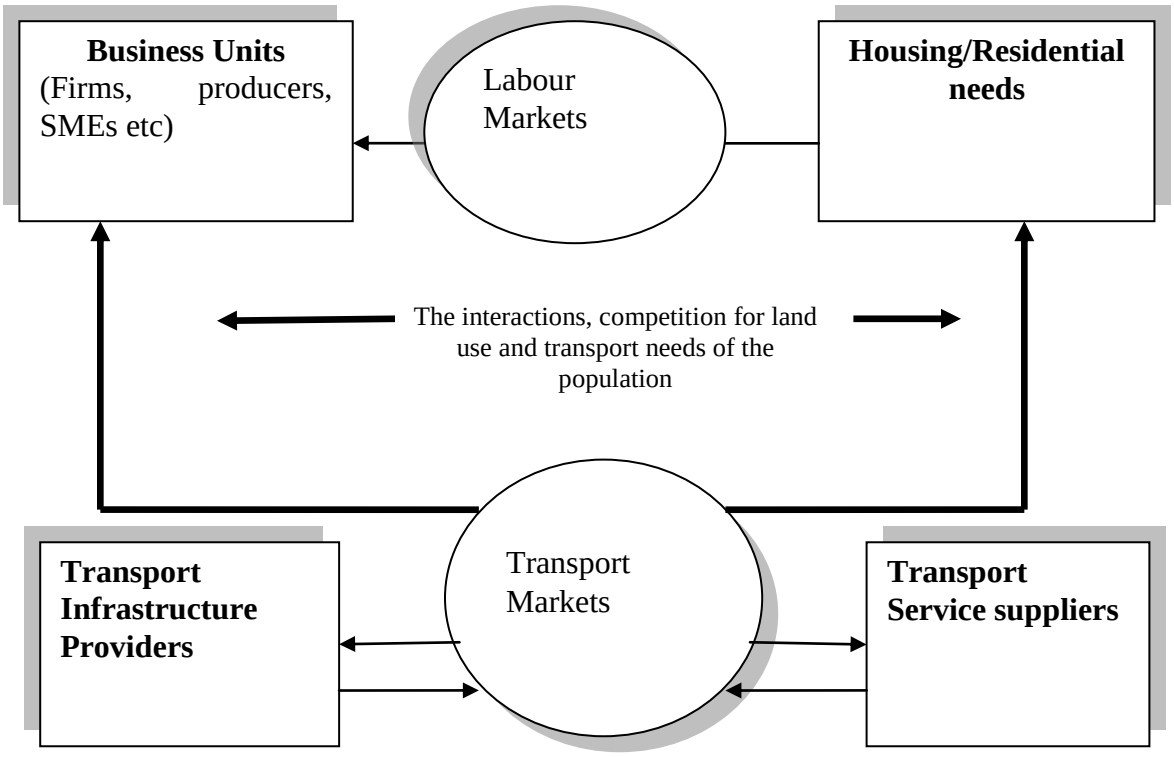


Figure 2.3
Actors and Markets in Land-Use/Transport Interaction Models
Source: (Adapted from Wagener M, 2014).

The interaction model of land use: the upper loop shows different needs/use of land, for residential needs and business unit. The lower loop shows the transport market, the demand for transport. The interactions that transport is essential both for travels needs of individuals, to build roads and business concerns, thus the rivalry for land uses. Transit-oriented development (TOD) is one of the most popular means of public intervention in the field of spatial planning, which aims at reducing land consumption caused by urban sprawl (Padeiro, M, 2014).

In Nigeria, (except for land use decrees), only in urban cities such considerations of land related issues on infrastructures exist for instance, the Abuja Geographic information Systems (AGIS) and other cities that have landmarked policies. This is due to increase in both the residential and need for roads. In rural Nigeria, land use policies are relaxed, except for the south-south and south west regions. There are, however, increased need for roads that may affect farms and traditional settlements in Nigeria. This has been source for communal clashes in most populated regions.

2.3.4 Sustainable theories of transport system

Sustainable transport theories are meant to be a springboard for finding practical ways and the importance between the existing and future connect of the transport system. Sustainable transpiration are developed to solve to an extent rising problems in transportation, rising income levels, increased pollution, road congestion and other transport problems. It also means that there should be a balance in the environmental, social, and economic qualities of transportation. Sustainable transportation is examined with respect to the transportation system itself, which is focusing on the positive and negative values or aspects of the traffic and the contemporary effects of transportation, and taking into cognizance the future of transportation in the economy.

Normally, theory-based conceptions and operationalization of sustainable transport indicators should be developed, first by defining sustainable transport, and thereafter by deriving significant performance indicators that enable both policy-makers and the community to measure sustainable transport (Hilmanen, Gosselin and Perrel, 2008). Performance indicators have been used based on current practices – in transport

related plans and public policies. These indicators have been based on-the-ground definition/assessments over time. Indicators are used as benchmarks to set sustainable transportation goals and to monitor if this transportation system is tending towards sustainability. Some of the problems experienced in transport, includes erosion on some roads, especially in the south-east and south-south regions in Nigeria (shown in Figure 2.4 below), have affected sustainability of the transport system in terms of the environmental balance, since issues relating to transport sustainability is concerned with the interaction of different sectors of the economy to the transport system. A typical model of transportation uses mappings of various zones – digitalizing the terrains, road network terrains, zoning systems, and socioeconomic data. It also includes policy scenarios. (Plümer, 2001; Schiewe, 2001).

Figure 2.4
Erosion experiences on Nigerian roads
Sources: www.google.ca, 2014

According to various literatures, transportation causes different external effects with respect to environmental functions. Such issues relate to the complex interactions between the transport system and its environment; thus public policy in the transportation should make policies towards sustainable transport system. Some authors related sustainability issue to three-dimensional interactions – public health, the economy and environment, (Yevdokimov, & Mao, 2002; Himanen and Perrels, 2005, Rossi and Gecchele, 2014). These issues are all related because the goal of the sustainability theory is to evolve an efficient transport policy that takes into consideration the three dimensional factors mentioned above that result from emissions and environmental changes. Some of the indicators for sustainability in the transport are health sector, social justice, freedom, safety, education and environmental quality. The constraints on Nigerian roads is to creates awareness that accidents may occur if an individual takes into consideration of sustainability issues – the blend of some factors that are necessary to cause road mishap. This ultimately affects the cost of doing business.

2.3.5 Public Policy theories of transport system

Public policy theories are linked to public policy tools (fiscal policy issues and the markets, situations that may result to business failures, economic and the environment). It is also linked to the need to support sectors of the economy, the private sector, for example, in the provisions of infrastructure and related policy, for example, 2005 Act in Nigeria. Levels of participations of the private sector in infrastructure provision in Nigeria has evolved into the creation of the Infrastructure Concession and Regulatory

Commission (ICRC) that regulates the provision of infrastructure has not been effective in bringing about changes in the infrastructure stock in terms of partnering with private sector for investments in the sector.

Public policies are general statements of principles or goals. It is concerned with specific state of actions on specific features, broadly known as "policy statements" by state. From various literatures, reports reveal that such government policy decisions have had effects on the transport system in Nigeria. The goals of Nigeria's transport policy of 2010, and the specific roles of the policy are that of providing guidelines and management of the transport sector. Some essential parts are:

(i). Identifying existing gaps and short comings and how to address them – this has been pointed out earlier in this study. Some of the gaps exist in the stock of roads, maintenance gaps and general fleet policy.

(ii). Actions in the different modes are linked the pursuit of common goals. Common goals are that of providing access and prices of transport.

(iii). providing the basis for monitoring and accountability – this is an aspect captured by cost of doing business report of World Bank, that project supervisions are loose. This may be due to the deep-seated corruption in Nigeria.

(iv). Ensuring consistency in the application of policy principles across all modes and pursuit of different objectives. Consistencies are sometimes lacking due to, amongst others, questions of funding and policy direction, especially to segments of the society, mostly the urban and rural population, other things being equal.

The goals of the Nigerian public policy in the transportation are:

(i). Safe transport system – safety standards, which now is carried out by road safety agencies in Nigeria – Federal maintenance agency (FERMA) and Federal road safety corps (FRSC).

(ii). Environmentally sound transport system – to check pollution and road conditions

(iii). Efficient transport system – based on resources and technology

(iv). Affordable transport system – prices are such that all classes can afford (equality issues)

(v). Integrated transport system – efficient connectivity.

The overall goal of public policy is to lay a standard for effective transportation, financial support and well-coordinated transportation system in different countries. There are many literatures that support this goal, the National Cooperative Freight Research Program (NCFRP) report 2011, MIT Transportation Systems Focus Area, (2009); The National Transport Policy (NTP), (2010); Igwe et al, (2013), and others have shown that issues related to transportation must be sustained and based on the national policy on transportation according to the socioeconomic and environmental characteristics.

Generally speaking, effective implementation of the requirements for a reliable and efficient transport system stems from the fiscal trends in Nigeria, especially issues with the fiscal collaboration between the federal and the sub-national governments theorem (Musgrave, 1959; Oates 1972; Rodden, Eskeland and Litvack 2003). Apart from the federal budget implementation, states argued for independence in their fiscal matters in order to take decisions on their revenue and expenditure, with little interference by the federal government. Sometimes however, the constitution gives the federal government powers (exclusive list) over such matters. This results into

disagreements between the tiers. This situation some results to disagreements in the levels of revenue and expenditure, especially funds meant for development projects. The ability of the population to influence budgetary decisions at the sub-national level is essential in the realization of the efficiency gains that justify the decentralization process itself (Bahl and Martinez-Vazquez 2006). Effective decentralization of the tiers in government, states and local government in Nigeria has affected the ability of these tiers to undertake projects that would benefit their various communities. Thus issues related to funding for maintenance and road building at the sub national government is not efficient. Generally, public policies are supported by the budgetary system towards its realization of the goals of an efficient transportation system.

2.3.6 Fiscal policies and infrastructure investment spending

It has been stated earlier in this study that public investment is an important driver of private sector productivity. There are many models developed over time, Barro (1990), for instance, included fiscal policy as an agent of growth, in many more models, it is used to observe the effect of fiscal policy on growth. Most models used is the production function, $Y = f(K, G) = AK^{1-\alpha}\, G^{\alpha}$, portraying that the G element is inputs provided by government, K is the private capital, where $0<\alpha < 1$. As noted by many authors, public expenditure is financed by a flat income tax rate. In countries like Nigeria, most government expenditure from late 1970s, oil has been the 'chief financier'. It forms most of the investment in the transportation sector, especially in road building (Foster & Pushak, 2011). Better roads provide the only scope for better access to markets, education, health care and social development for the majority of African (IRF, 2008). It

is important, therefore, for government to apply appropriate policies and investments. This is also the agenda of the National Economic Empowerment and Developments (NEEDs), Vision 2020 etc. The actualization of these programmes depended, to a large extent, to increase public spending in infrastructure, i.e, roads (which at the moment is difficult to achieve) and point to the need for sustainability, entrepreneurship growth and higher economic performance. Fiscal policy and public investment in infrastructure is built around the public finance theory that studies government's role in the provision of goods and services. This is essentially the theory used for this study. In most developing economies, public funds form the bulk of all investments in infrastructure, and thus investments in a stock of old and new roads is determined by government expenditure financed by different revenues through its fiscal policy programmes. It is important to examine the stand of various literature on either the productivity of public capital as discussed by Hirscherman, 1988; Aschauer, 1989; Banister et al, 2001, 2003; O'Fallon, 2004; Barro et al, 2004, or the constraints to capital productivity in WDR, 1994; Limao et al, 2001; Ulimwengu, 2009; Omojimite, 2010; Sunil, 2011; Xu, 2011. Productivity of capital is important for the growing industries as argued by Aschauer and Hirschaman. Most literatures discuss or examine the increasing government spending on varying determinants that affect trends in public expenditures. Even though many such literatures examine the effects of Wagner's law, this stand is relevant for economies like Nigeria that struggle to provide vital infrastructure in the face of competing needs. Wagner's Law states that, "as the economy develops over time, the activities and function of government increase". The developmental agenda of government in developing countries still depends to a large extent on public finance, thus follows Wagner's treatise. But, examined by researchers to the fact that it does not show a causal

relationship when an examination of growth of the productive sector (value added) is done, which really measures the figure of GDP, the growth of GDP is examined with public expenditure levels (Fernandes, 2009), meaning that Wagner's laws did not actually measure that growth occurs as a results public spending over time, rather, it merely recognizes a positive statistical association between those two variables, public expenditure and the GDP.

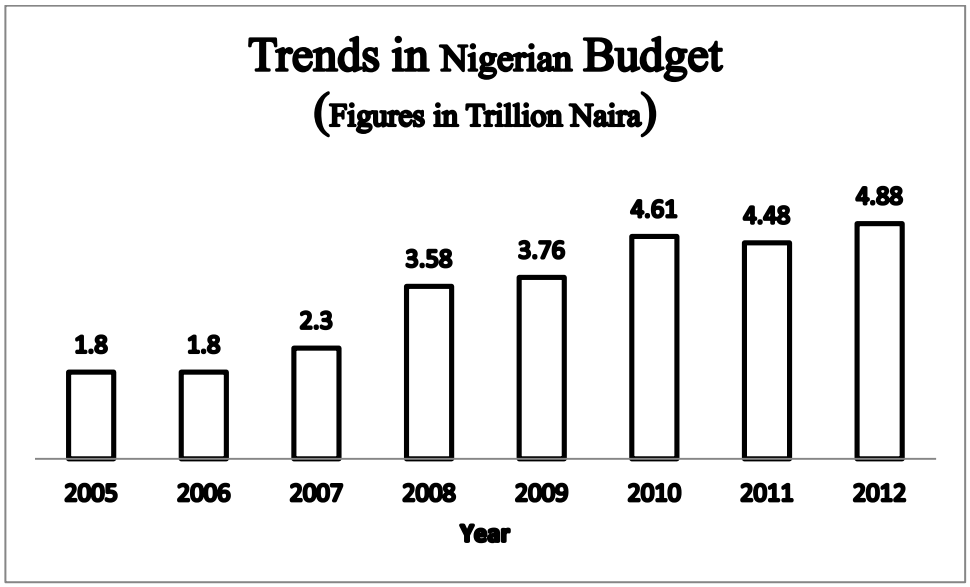


Figure 2.5
Increasing trends of budget revenues in Nigeria, 2005-2013
Sources: Various National Bureau Statistics (NBS), other sources & Documents, 2003-2015

With the increasing budget figures (as shown in the Figure, 2.5), it backs up public expenditure levels. Does the increase in budget's revenue affect growth in Infrastructure spending? The arguments are whether particular strategies for achieving growth agenda in Nigeria can be supported by a productive public sector investment. Findings by Barro (1990), Devarajan et al. (1996) and Bose et al. (2007) found that a positive relationship between government expenditure and growth exist. It raises questions or an inquiry into finding the determinants of government spending, especially

in a typical developing country. Socioeconomic factors cover many aspects and define various concerns like labour related issues, accessibility factors in transportation systems, education, agriculture and access for the community to economic points. Benefits of socioeconomics needs are important to economic units like the household in terms of incomes and other benefits created through government fiscal spending. In developing economies like Nigeria, government spending responded to different programmes aimed at empowering bulk of the rural population – NEEDs, Vision 2020 and achievements of the Millennium Development Goals (MDGs), which have been the bedrock for major growth potholes in Nigeria. As stressed by (Fan & Rao, 2003), productive government expenditures have contributed to the establishment of a positive linkage between government expenditure, production growth and poverty reduction, this is the cardinal point in our development agenda.

The inability of government to perform its traditional functions is related to fiscal issues. There are evidence that a government budget deficit (due to shortfalls in expected revenues), which has always been reflected in Nigeria's extra budgetary allocation, gives rise to increasing debts (Bose, et al, 2007) and this has been responsible in low investment in transport related infrastructure over years. This has been seen in the stock on roads in Nigeria, especially rural roads which provides the bulk of the people in rural Nigeria and has impacts on agricultural productivity and access to markets for agricultural goods (Fakayode, Omotesho, Tsoho, & Ajayi, 2008).

2.3.7 Infrastructure, Millennium Development Goals and Poverty Reduction

Infrastructure is necessary and an important part of the Millennium Development Goals (MDGs). Recently, most of the development agenda in Nigeria is tied to the MDGs. This global development strategy is evolved to raise the standard of living, empowering the most vulnerable and creating the basis for a takeoff, or the so called late comers in development, depending on the stock and quality of infrastructure in the development process. Some of these developmental problems result along the policy making due to periodical adjustments in the economy, for example, adjustments in petroleum prices which impacted on transport prices and prices of goods and service. Apart from increases triggered by petroleum price change, access, road connectivity to health centers (facilities), educational institutions and markets affect the attainment of the millennium Development goals (MDGs). Infrastructure is an important facilitator to achieving the Millennium Development Goals (MDGs) because the development of efficient transportation system makes accessibility possible; thus each of the eight goals is associated or powered by an efficient transportation system. Figure 2.6 and table 2.2 establishes a relational analysis of direct or indirect relationship between infrastructure and the MDGs. It is important because this is Africa's chance for attaining global pace of development by 2015 the terminal date.

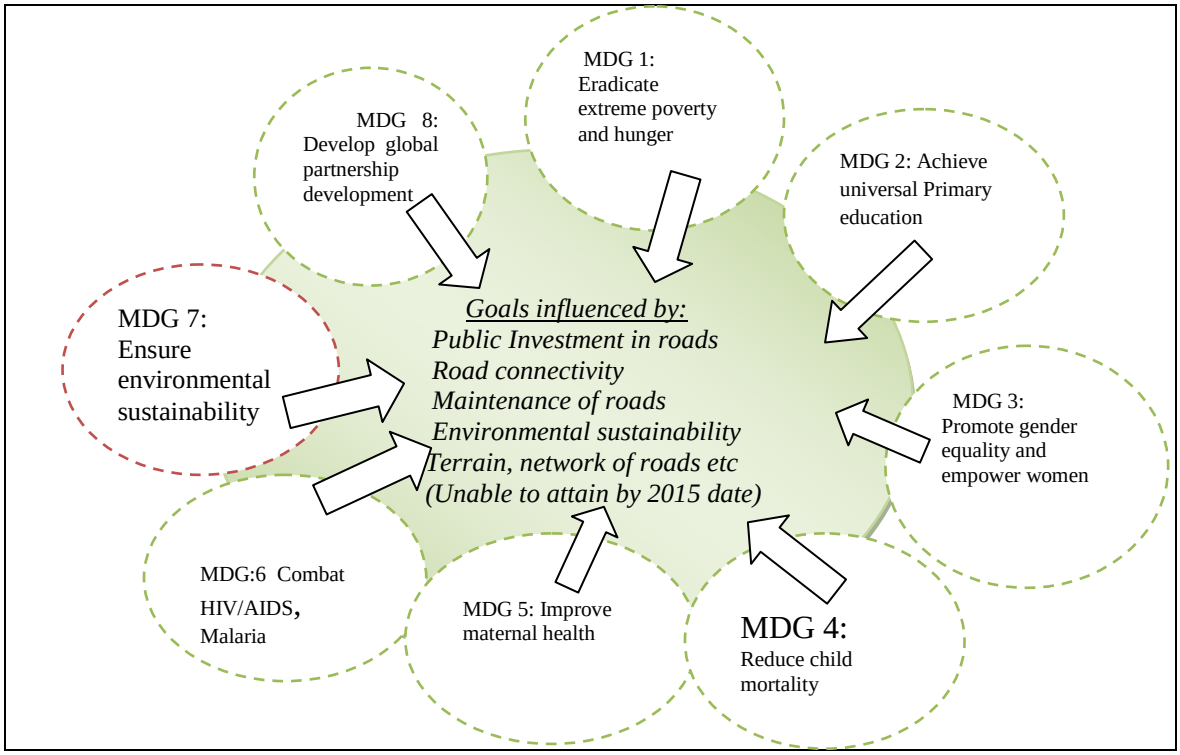


Figure 2.6
Infrastructure and Millennium Development Goals
Sources: Author's concept of MDGs.

There are studies that are linked to the fact that most deaths occurring in developing (the rural population) countries - especially for goal 4, goal 5 and goal 6 resulting from lack of access to medical facilities or the ability of victims to reach health centres in Africa. (Nwogu-Ikojo, Nweze, & Ezegwui, 2008), (Ouro-Bang'na, Kabore, Zoumenou, Gnassingbe, & Chobli, 2008). In Rural Nigeria, the prevalence of deaths, as a result, transport accessibility abound in Nigeria (Iliyasu, Abubakar, Galadanci, & Aliyu, 2010; Kawuwa, Mairiga, & Usman, 2007; Ouro-Bang'na, et al., 2008) These studies argue that the maternal mortality can be prevented if women access health facilities, but in most cases deaths occur for women and children who live 10 – 15 kilometers from the nearest maternities or health centers. These conditions warranted the Federal Government of Nigeria to float a program of distribution of midwives to

disadvantage locations in Nigeria like the Northeastern region of Nigeria and other disadvantaged locations. (Singh & Kumar, 2007; Abimbola, Okoli, Olubajo, Abdullahi, and Pate, 2012).

The greatest hindrance is accessibility in terms of transport and availability of health facilities especially in Northern Nigeria. Thus achieving the Millennium development Goals (MDGs) by the target year 2015 depended on firstly, building new health centres and secondly, access transport to these locations. It is necessary for efficient transportation transport system not only to reach these locations, but to move drugs from urban centers, availability of medical personnel who are not willing to accept employment in these area.

Table 2.2
Infrastructure and the Millennium Development Goals (MDGs)

MDG (Goals)	***Direct Links to infrastructure(s)***	***Indirect Link to Infrastructure***
l. Eradicate extreme poverty and hunger	Road to Economic activities, ie, markets and other economic activities	Educational institutions or schools
2. Achieve universal primary education	Transport accessibility to schools	Provide schools, other learning facilities.
3. Promote gender equality and empower women	To markets and other economic activities	Schools to have a voice and need for rights and better wages
4. Reduce child mortality	Transport to health facilities for children	Access free medical facilities
5. Improve maternal health	Transport to health facilities for mothers/women	Better educational facilities for improved living conditions
6. Combat HIV/AIDS, malaria and other diseases	Access to retroviral drugs and registration for subsidised medications and government facilities	Education for AIDS free society
7. Ensure environmental sustainability	Protection of the environment (green house emission), pollution from vehicles.	Protecting animals routes and animal crossing and habitat, agricultural lands, rivers etc.
8. Develop a global partnership for development	Relaxing structures for entrepreneurship and business entry for multinationals and other companies that may bring about innovations in modern transport system – trucks for big industries through free entry into the economy, landlocked areas for accessibility,	Access funding from companies for transport development, debt sustainability, market access.

Source: author's conception of MDGs and effects.

This is a drawback towards the target date of 2015. Already there are visible signs that Nigeria may not attain these goals by 2015 (Moti, 2010). Nigeria needed an increase in

the total road network from the current 193,000 km to over 300,000 km to meet MDGs (Mefor, 2013).

2.3.8 Geography of the transport systems

Production of goods and services organized by man is ultimately to reach the final consumer. This is essentially an analysis of various conditions of mobility based on the available infrastructure investment as a vehicle for attaining these objectives. It involves movements of these final products across space to reach the end users. According to Rodrigue, (2009), the possible set of immediate locations, a destination, is linked to geographical attributes, these are the main issues in the geography of the transport system. Movements across space have different geographical features– across different terrains, across water, land and air. These different locations with geography have varying impacts on movements in term of distances, access and typography, defines costs and modes of movements – water transport, various land transport, by air and other forms of movement/transports. Therefore the components of geography of transport define in general transportation and space, takes into consideration the following:

(i) Topography, the study of physical bottlenecks that have impact on the structure of networks, the cost structure and proper working of a transportation system – defined in sum as the physical barriers.

(ii) Hydrographic – related to water that most times necessitate huge public investments in building bridges, canals and etc, which may have impacts on land road transport. According to Achieves et al, (2007), it has been the main factors hindering accessibility in most of landlocked regions of Africa.

(iii) Climate – includes temperature which affects transportation modes. In Northern Nigeria, for example, the hot climate and harmattan around December to January of each year have had an impact on flight cancellations, harsh semi-desert lands affect vehicle's performance etc (influenced by the growing Sahara desert movements, affects the cost of transport in the area (Iliya, 1999). For example transportation of stock fish or ice fish from Lagos and other locations in the South and West of Nigeria has made the cost of these goods high for consumers in the northern parts of Nigeria due to climatic conditions or travel time.

(iv) Absolute Barriers – geographical structures that prevent smooth movement, these may be difficult barriers that are not possible to overcome. These features affect poor countries that are not able to build bridges or roads through mountains over important routes due to fiscal problems. Most towns in the Niger-Delta in Nigeria require these facilities - bridges and roads with difficult terrains despite the fact that Nigeria's oil is located in the area.

The fundamentals of the Nigeria's development strategy is aimed at achieving both economic and social activities, such as the availability of affordable transportation prices as the essential part of the development programme of Nigeria, the NEEDs and Vision 2020 (Okonjo-Iweala & Osafo-Kwaako, 2007; Kherallah, Delgado, Gabre-Madhin, Minot, & Johnson, 2000; Omojimite, 2010; Oni & Okalawon, 2006) . This, according to most literature has dictated the performance of the economy and the growth of the entrepreneurial environment in Nigeria.

2.3.9 Transportation Modes

The concept of transport modes is derived from the demand to access an economic activity. The idea is modeled from the derived demand - that the demand of any commodity or service is an essential input in the production of another commodity. Infrastructure is one of the inputs required to achieve a level of productivity in the production space.

There are three main categories of transport modes – land, includes roads, rail lines and pipelines. In Africa, natural means (on foot) are very important. A cattle's herdsman from the Masai tribe in Kenya travels hundreds of kilometers across borders from the South African plains to provide foods for their animals. In Nigeria herdsmen travel to Cameroon, Central Africa, Mali, Niger and Chad for instance in search of good grass land for their animals still exist in many paths of Africa, thus pathways are important Modes of land transportation in Africa. Other forms of transport are not fully functional and used in Africa. In Nigeria and most of Africa, road transport is popular. Air transport is not used for the majority of low-income population in Africa. For forms of water transport, raft and canoes are used for riverine communities, except for port cities where supplies/cargoes come into many countries. In Nigeria, there three major ports all located in the south/west part of Nigeria. There is however land port developed in the Northern parts (Kano). Mobility across the border towns is by road. There are varying degrees of roads in Nigeria. In Most of the border area, roads are unpaved and go through different terrains. The topography in the most borders towns is mountainous, across rivers and access are landlocked in some locations.

There other routes, bush routes used by smugglers (Roitman, 2006 ; Niger-Thomas, 2001; Metz, 2007) all reported that most of the smugglers worked around the Lake Chad (See Figure 1.6) where fishing and other agricultural activities takes place. This has also encouraged smuggling activities and source of conflicts on the border. Finally, transport by air is another mode. This form of transportation demands huge investments in building airport and the required logistics. This mode is not popular in Nigeria. Nigeria has a total of 21 airports and some additional 62 airstrips according the Vision 2020 document. According the to the Vision 2020 document, road transport is responsible for over 90 percent of all good moved on the mainland. It means water and air transport shares 10 percent (N. P. C. Nigeria, 2010). According to (Rodrigue, 2009), "..... road transport modes have limited abilities to achieve scale Economies". This is much more relevant in Nigeria, going by the statistics and plans of government. However, achieving this plan is still not feasible due to lack of public-private partnership participation in public road investment (even though the Chinese may have invested in the sector, this still farfetched).

Road transport in Nigeria has the following features:

i. High road accident due to increased bad segments of roads (OKIGBO, 2012; Bashir, 2012).

ii. Low investment in the sector and or loose contract enforcement (*Gwilliam et al., 2008*; *World Bank, 2012b)*

iii. There is widespread corruption in road building (Hanson, 2009; Smith, 2001)

iv. Many sectors of the road are bad (potholes, crack portions) and, not navigatable resulting to slower journey for shorter distances (Iweze, 2011), reports of experiences in a typical luxury bus for most of the travels from the North to South of Nigeria.

2.3.10 Road transport development in North-Eastern Nigeria

The Northeastern region of Nigeria is generally regarded as the least developed in the regions. The area has the highest percentage of unpaved roads (Alaba Adetola, 2011) and, have high conflict points due to open borders in the area. Cameroon has borders with Adamawa State from the south (which was formerly in Nigeria; Bawden & Tuley, 1967; David, 1998). On the extreme points on geopolitical region, Borno State has borders with Cameroon and Chad to Central African Republic extending on the ancient trans-Saharan route to Libya and most of North Africa (see map, Figure 2.7).

Study area and border countries that engaged in border trade and problems associated with various mixed in immigra-tion entry and exit at border points.

Figure 2.7
Map of Nigeria and Border roads
Sources: Urhobo Historical Society, 2010, (Minor adjustments for this study made)

Road transport is very significant in Nigeria with an area of 923,768.64 km^2 (F.G.N, 2010). The main transport hub in the Northeast defines the main route

(gateway). This road connects both the area in the Northeast to the Neighboring countries of Chad and Cameroon both from Yola – Maiduguri routes that is classified trunk A road; according to the classifications of the Federal Ministry of Works. The classification is as follows:

i. Trunk A road – major routes that connect important economic units and international links with state capitals and border towns.

ii. Trunks B road – Highways within the states which connects important towns and connects to federal highways.

iii. Trunk C road – roads that are located within the rural community, local administrative headquarters. These roads also connect major highways, connects to important modes like the railways, and other area.

Trunk C roads are local government roads with some international/federal/states funds in building such roads. These roads form the links to most smuggling activities in Nigeria.

Major roads in the six geopolitical zones are shown on the table 2.3, these are main links to economic sources for supply of important inputs – Bitumen from the Western parts for road construction, petroleum products from Southern Nigeria (News, 2012), rich agricultural states in Benue State, Plateau state, and other states that transport is vital and needed food supply to agriculturally disadvantaged states

Table 2.3
Federal Highway Network in the Six Geo-political Zones of Nigeria

Zone	States	Road Network (KM)
South-East	Anambra, Enugu, Imo, Ebonyi, Abia	3,121,70 km
South-West	Lagos, Oyo, Osun, Ondo, Ekiti, Ogun	4,161.06 km
South-South	Akwa Ibom, Delta, Cross River, Bayelsa, Rivers, Edo	4,150.89 km
North-East	Adamawa, Bauchi, Borno, Gombe, Taraba, Yobe	6, 787.90 km
North-West	Kaduna, Jigawa, Kano, Katsina, Kebbi, Sokoto, Zamfara	6,363.40 km
North-Central	Niger, Kwara, Plateau, Benue, Nasarawa, Kogi, Federal Capital Territory Abuja	9,756.00 km
Total	**All States**	**34,340.95 km**

Sources: Alaba Adetola, 2011 (Minor adjustments by current author, 2012)

mostly in the Northern part of Nigeria. These roads also connect ports locations in southwest. The Most important transport corridor connecting North-East geopolitical zone are road networks from Lagos originating from the Lagos Sea Port (connecting the railways from Lagos) to Onitsha to Yola – Maiduguri up to the borders (Chad). The construction of part of this road (not from Onitsha) started in 1964 (Johnson et al, 1990) to connect this zone to other parts of the country. The construction of this road is all important not only for the area but to countries bordering the North-East. However, the opening of the Maiduguri road (which was the capital of the Northeastern state before other state was created from this state) has had a much socioeconomic impact to the region. Some of the implications of this major corridor as follow:

i). Opening for border trade within the region – the North-East region has high traffic around the Borno-Adamawa state border to Neighboring countries. According to (Fadahunsi & Rosa, 2002; Haan, Quarles van Ufford, & Zaal, 1999; Yahya, Adebayo,

Jolayemi, Oyejola, & Sanni, 2008) , availability of unpaved roads (mostly created by smugglers) had increased the volume of border trade (see Figure 1, of common border routes around Adamawa State).

ii). It has also increased conflict and illegal entrants (migrants) into the region – the current conflicts in the North-East region (*Boko Haram* and the Last *Maitatsine* conflicts) were fueled by the porous borders in this region. According to (Adesoji, 2011; Hansen, 2011; Harbom & Wallensteen, 2010; Joseph, 2003; Shaka, 2011), the spread of such conflicts was as a result of the porous borders into Nigeria from the North-East border towns.

iii). Opening of agricultural activities and methods of farming - According to Metz, 2007, most of the conflicts is around the Lake Chad, both nationals engage in fishing at the Lake Chad; this has created some settlement and agricultural activities.

v). High prices of transportation cost and Food Prices in the region. High traffic and poor road network created by smugglers according most literature (Fadahunsi & Rosa, 2002; Mamman, 2005; Ogunbodede, Ilesanmi, & Olurankinse, 2010) created scarcity in some town in states, and contributed into higher prices of goods. The most common phenomenon in Nigeria is smuggling of petroleum products to border towns where they are sold for high prices.

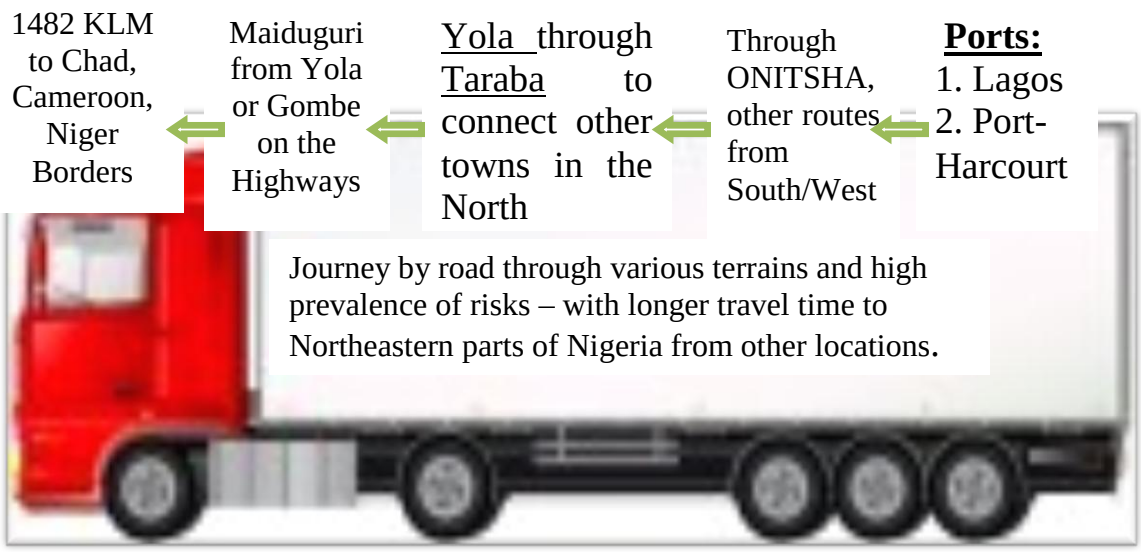


Figure 2.8
Lagos - Maiduguri - Chad road corridor (International corridor)
Source: author's concept of Northeast Transport Corridor

Due to the high level of unpaved roads in this region and the distance required for delivery essentials products – machineries for industries, petroleum products, and affects costs (see illustration on Figure 2.8). Cost of prices is usually high in this zone. The reason of this is the fact the main transport route located on two important types of corridors and determined by unsafe and poor network of roads. The International corridor: Lagos (South-West), Maiduguri (North-East), N'Djamena (Chad) is 1,816 kilometers. This gateway is important for both countries and sources of commerce. Fairly used cars from Cotonou come via this route also to the Northern part of Nigeria.

Road Corridor: Calabar (South-South), Gboko (North-Central), Jalingo (North-East) Maiduguri (North-East), N'djamena/Garoua (Chad/Cameroon) runs on the other side of the country, linking the port of Calabar (in the South-South geopolitical zone) to the big northern towns (where Chadian trucks may come to lift up flour and other cargo) to N'djamena. There is more direct route to the N'djamena border, but the road is

unpaved. Both roads run along the Eastern side of Nigeria, alongside the Cameroons mountainous border.

2.3.11 Transport cost and the cost of doing business

The transport sector is an important facilitator in the functioning of the economy. According to the literature, the relevance of this sector grows with the growth of the economies – with the need of different modes and elements needed to reduced travel time of vehicles (VMT). Literature on whether public investment into the sector is productive has taken the centre stage, with the view that the productivity of such investment must take into cognizance many factors ranging from fiscal considerations and other institutional factors. Aschauer (1989) argues on the grounds of neoclassical views that the expansion of public investment spending has larger stimulative impacts on private output. This has played out in the popular stimulus packages in the global economic crisis of 2007 – 2008, (Claessens, Dell'Ariccia; Igan, & Laeven, 2010) . In Africa, the picture has been grimmer; since the continent depended on aid, and even the oil rich African countries were affected by the slowdown in global businesses (fall in demand for oil) (Berg et al., 2009). The negative effects in Africa were felt first in emerging and frontier markets, mostly in the stock markets and other financial assets during the financial crisis.

Public investment in road building or other infrastructures seems not keep pace with the growth of the economies in the Sub-Saharan region. According to (Estache, Speciale, & Veredas, 2005), Financial crisis created infrastructure gap. Gaps resulted into high transport cost (for different transport needs), high costs of production, low-

quality output and other factors that impacted on the slow growth of the economy overtime (Sunil Sinha, 2011). Most large investments in infrastructure were made to reduce the high cost of transportation (accessing landlocked area, or barriers like a bridge). Thus the place of infrastructure according to the World Bank is important to growth (World Bank, 1994). An important concept in the transport system is the evaluation of important features of transport demand, the derived demand. It refers to the aspects that are directly the result of economic activities, without which they would not take place. Thus, transportation is directly the result or the functions of production and consumption. It is illustrated as follows on figure 2.9

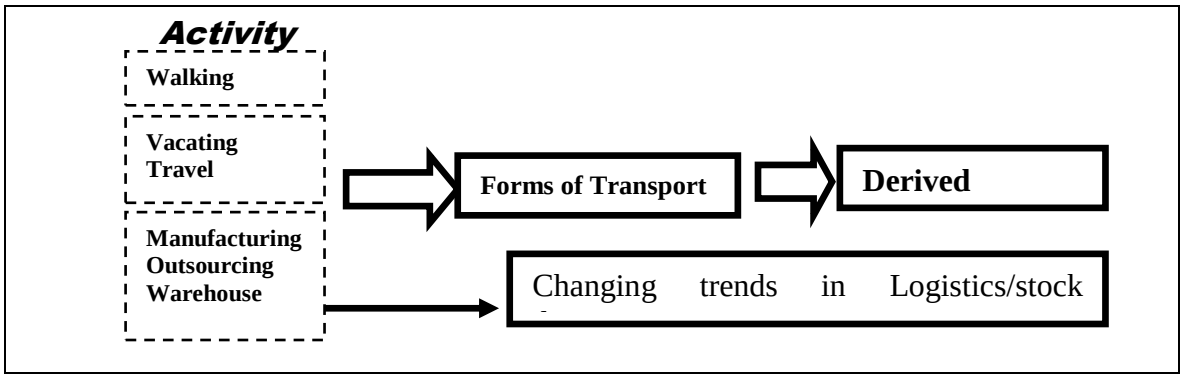


Figure 2.9
The idea of Derived demand
Source: author's idea of various definitions/forms of transport activity.

To access any of such economic activity, is defined as the sum of money outlay in undertaking such activity. This also is defined as the transport cost, or the ticket price for commuters, freight charges, warehouse cost and other charges for accessing a transport modal.

There are different features that define the components of the ideas of derived demand. Travel activities that warrant movement through space or the movements of

goods (freight) that have been contested if these can be grouped under derived demand. According to (Preston, 2001; Rodriguez, 2006), it has argued that recent developments in freight distribution have experienced new dynamic conditions in the global market place, for example, logistics have been more than the construction of distribution due the different inventory levels or to stabilize and, monitored the market levels over time. Thus such movements (freight) may be indirectly derived demand, because transportation cannot be completed instantly from the production line to the final consumer. Derived demand theory establishes a direct relationship – movements resulting from economic activity. (Mokhtarian & Salomon, 2001), on the other hand, contesting the theory of its inappropriateness in defining what constitute derived demand – "Modern transportation is assumed to involve a disutility for the sake of achieving a desired destination", travel itself may not be an action that is demanded, could be a leisure walk, any form that involves movements – racing, etc also defined movements. The idea of direct or undirected travel results in the production of economic value. Thus, transportation has induced when it represents a demand to the reduction of price of a good (Herold & Roberts, 2005). In developed economies increased growth of different modes of transportation unlike cases in Africa, where infrastructure is inefficient, the consequences are felt in every activity, especially in rural Africa, even though there is growth in economic activity (Economists, 2012).

Transport cost dictates cost of business because of the induced demand effects. The concept defines that a particular condition is indirectly caused by another condition. Lee, Klein, & Camus, 1999, defined "induced" as referring to a movement along a travel demand curve, in which the price dimension includes travel time and other user cost. Both these dimensions hinge on activity-based travel that defines cost. Hymel,

Small, & Dender, 2010, measures the induced demand effects in building of new roads and or increases in highway capacity that attracts traffic. Building new roads and or maintenance of existing roads has been the main hurdle for travel access. There are, however, few cases of congestions mainly in cities which is usual for cities all over the world. Recently, however, the agency responsible for maintenance of roads in Nigeria has argued for high cost of travel in Nigeria to the response of the growing population more than 175 million, and responsible for maintaining 34,120 km of federal roads in Nigeria. This is an uphill task due to fiscal constraints. Trends in road maintenance is sometimes it has been left to communities to make emergency repairs (Confidential, 2012) .

Most businesses depend on these roads for navigating long distances, for example, the transportation of petroleum related products from the South-South area, goods from the Nigerian ports located in the South-South and South West, which takes weeks to arrive their destinations in the Northern parts, and has resulted in high disparities in prices of goods in the regions. Depending on connectivity, most rural locations in Nigeria have to pay higher costs, sometimes about 150 percent increases in prices. What the factors that dictate costs of goods and services in Nigeria?

i. Transport costs attributed to lack of securities on the roads

ii. High bad roads segments that determine the arrival times

iii. Security operatives on the roads

The problem of road maintenance has been very acute on Nigerian roads. Most of the problem has to do with the cost of frequent, comprehensive inspection, and many jurisdictions that limit their surveys on major roads, especially highways connecting major business centres in Nigeria. Most road distress according to (Herold & Roberts,

2005), provide information on the distress types, their location, severity and extent. This has been the loopholes for Federal Road Maintenance Agency (FERMA), the body that oversee Nigerian roads. There has not been constant reporting on the management of all federal roads in the country and the funding problems. These have dictated prices overtime. Transport is an important input in the production, transport unit has determined the level of market share for businesses whose raw materials are located in other parts of Nigeria (Agénor, 2010). These may have contributed to the exit of manufacturers like Dunlop (Okafor, 2010; Okonjo-Iweala & Osafo-Kwaako, 2007), and many such businesses, even thought the supply of electricity and other infrastructure has affected the rate of production and movement of goods and services in Nigeria.

The Regulations of the business environment in different features have impacted on the business environment, apart from the problems associated with road infrastructure. These are mostly regulatory institutions – permits; contract regulations have had significant effects on the business environment. This is what the World Bank and IFC measure when they use the "doing business index" as shown on Table 2.4

Table 2.4
Average ranking on sets of Doing Business Indicators

Legal Environment of business	Region	Ranking
Weaker Legal institutions but less expensive regulatory processes	Middle East & North Africa	93
Weaker legal institutions and more expensive regulatory processes	Sub-Saharan Africa	137
	South Asia	117
Stronger legal institutions and less expensive regulatory processes	OECD	30
	Eastern Europe & Central Asia	77
Stronger legal institutions but more expensive regulatory processes	East Asia & Pacific	87
	Latin America & Caribbean	95

Source: Doing Business Database, 2012 (World Bank/IFC)

The Doing business document is a series of annual reports investigating regulations that affect the business environment generally. (World Bank, 2012a). Total of 185 countries were studied. The ranking is based on the number of countries. The higher the ranking based of the country, the weaker the aspect considered. For instance, Nigeria is ranked 137 (which higher on the scale of 1-185 countries), the weaker the legal environment for instance.

Table 2.5 (A)
Summary of Doing Business 2012

Nigeria:		**Sub-Sharan Africa**		**GNI per capital**	**1,180**
Ease of doing business	**133**	**Low middle Income**		**US($)**	**158.30**
				Population	
Starting a business (rank)	116	Registering property (rank)	180	Trading across borders (rank)	149
Procedures (number)	8	Procedures (number) 13	13	Documents to export (number)	10
Time (days)	34	Time (days)	82	Time to export (days)	24
Cost (% of income per capita)	90.6	Cost (% of property value)	20.8	Cost to export (US$ per container)	1,263
Minimum capital (% of income per capita)	0.0			Documents to import (number)	9
		Getting credit (rank) 78	78	Time to import (days)	39
Dealing with construction permits G108(rank)	84	Strength of legal rights index (0-10)	9	Cost to import (US$ per container)	1,440
Procedures (number)	15	Depth of credit information index (0-6)	0		
Time (days)	85	Public registry coverage (% of adults)	0	Enforcing contracts (rank)	97
Cost (% of income per capita)	504.8	Private bureau coverage (% of adults)	0.0	Procedures (number)	40
				Time (days)	457
Getting electricity (rank)	176	Protecting investors (rank)	65	Cost (% of claim)	32.0
Procedures (number)	8	Extent of disclosure index (0-10)	5		
Time (days)	260	Extent of director liability index (0-10)	7	Resolving insolvency (rank)	99
Cost (% of income per capita)	1,056.0	Ease of shareholder suits index (0-10)	5	Time (years)	2.0
		Strength of investor protection index (0-10)	5.7	Cost (% of estate)	22
				Recovery rate (cents on the dollar)	28.2
		Paying taxes (rank)	138		
		Payments (number per year)	35		
		Time (hours per year)	938		
		Total tax rate (% of profit)	32.7		

KEY: Domestic firms in 183 countries and are ranked according to either time in terms of hours or percentages as the case may be.
Source: Doing Business Database (World Bank, IFC).

From the table 2.4, the doing business indicators shows countries with different categorization in assessing strength and weakness of regulatory institutions and agencies. For a weak index (Middle East and North Africa, Latin America and Caribbean, East and South Asia, and Sub-Saharan Africa), thus improving bankruptcy regulations allows financially distressed yet viable firms improve their performance, and using the Index of Economic Freedom, deregulation, (Xu, 2011), have been important in many economies. Table 2.5(b) shows factors that affect doing business in nations.

Table 2.5(B)
Major factors that impact on cost of doing business

Domain	Impact in the economy
Starting business	Weak, procedures & legal requirements, it is difficult to start a business.
Permits	Weak, but could be obtained with high levels of corruption to officials.
Electricity supply	Low, according to statistics only 20% access electricity in Nigeria (Omojimite, 2010)
Getting credit	Weak, but could be access with difficulties.
Protecting investors	Fair, businesses pay multiple taxes, policing high crimes, risks in business.
Trading across the borders	Porous borders (more than 1400 entry points), increase conflicts in Nigeria in border trade zones, source of conflict**s** in Nigeria and the Sub-Saharan region.
Enforcing contracts	Weak, these are issues in high public corruption (Soyinka, 2012; Ribadu, 2012, Barro, 1994), leading to low quality of projects (collapsed bridges, erosion-prone roads), conditions of roads in typical developing economies like Nigeria.

Source: authors' review of table 2.4(a).

The extent these impacts on the cost of doing business in Nigeria has shown grim picture. According to the literature, most studies have assessed this impacts one entrepreneurial environment in Nigeria. Hezekiah (2011) opined that the Central Bank of Nigeria presentation of some policies that affects entrepreneurship in Nigeria, then a

wide range of policies ranging from the bank's assessment of small business holders, especially the working of some of the policies that do not favour entrepreneurship. Some of these policies have had no impact in the Nigerian business frontiers, for example, the National Economic Reconstruction Funds (NERFUND) which is clouded by corruption and policy delays affects the entrepreneurial environment which is the main reports of the Doing business index which surveys the business environment in the global economies.

2.3.12 Knowledge-Based Economy (KBE) and Road Transport Research

The knowledge–based economy creates an environment where policy is focused on the dynamics of the economy based on research and knowledge spill-overs, whether exogenous as in the traditional Solow's model. Figure 2.10 or change in the quality of the labour force or general factors of production.

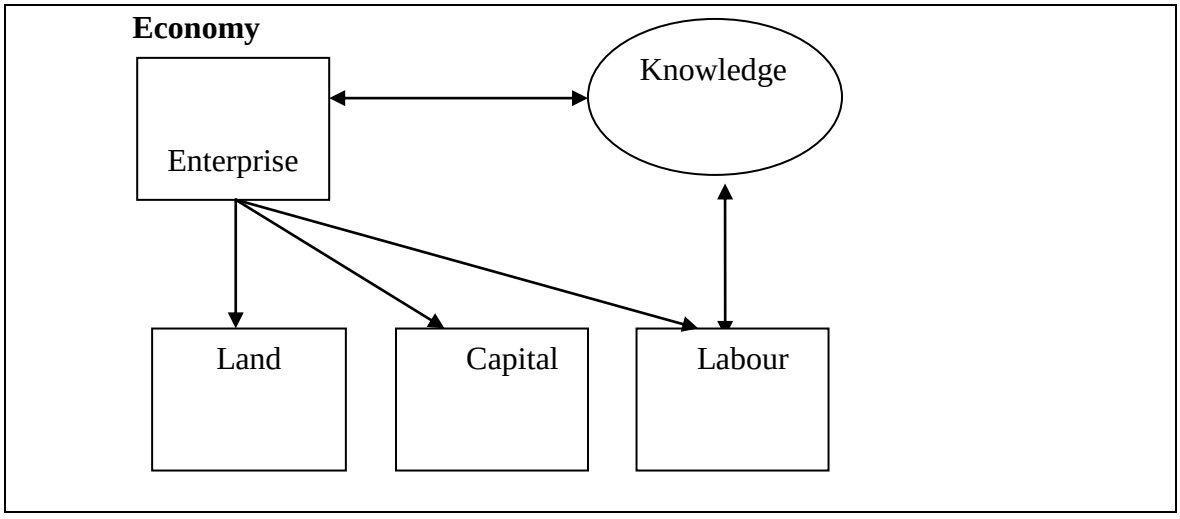


Figure 2.10
Knowledge-based Economy Model.
Sources: http://www.alphade.com, 2007 (Adapted)

Figure 2.10 shows factors of production within the economy – with entrepreneur as the organizer of these factors. Knowledge relates with factors of production. Knowledge exists as the fifth factor. Human factors use information from several sources to bring about a change to the value of other factors. Knowledge brings about innovation which is relevant in the industrial sector and policy making. According to Silberberg,(1994), knowledge is input in the production of other goods. Knowledge brings about change or an improvement. In the transport system, information leads to increase speed, accessibility and security. In a typical developing economy like Nigeria, a substantial use of body of research leads to a production–led economic growth (Lawrey, 2012). The value of this is an examination of historical review of road construction and its importance in the modern economy that the transportation has undergone several innovations to achieve speed in the travel time and safety (Porter, 2012). In Nigerian, increase in population, opening up of business outlets across the area and the increase attractions of China products in markets, and other 'intruders' has increased the need for access. Other important implications of this are the view of Oyelaran-Oyelaran & Sampath (2010) that a Nigerian case where the use of information is based on collaboration with some organizations. Empirical results based on 2005 survey shows that agriculture output have benefited and improved agriculture. But there has not been any research related to improvements in road related issues. Even though agencies like ICRC, FRSC, NBBRI and Federal ministry of works, have made some contributions to improved conditions in rural roads and connectivity, especially frequent crack, potholes on the roads, but the problem of bad segments of roads still persists.

The important features of innovations in road transport in Nigeria concerns increase types of transports to lessen longer waiting time as propounded by the theory of

Urban sprawl (Brueckner, 2000), roads networks, which at the moment can be seen in cities. But even in cities, the need for high speeds, Asphalt management and research, most importantly the substandard asphalts used, soil related problems research which cause regular cracks (Pais, 2002; Woolcock, 1998; World Bank, 2012b). Handling 7 Million vehicles operating on Nigerian roads – (Mbawike, 2012) and the increase traffics on Nigerian roads, seems to be difficult task for the public 'policing' of the roads.

Infrastructure, specifically the road transport infrastructure, is the current focused of African economies, and the 'catch up' in growth has inhibited growth of the economy. In Nigeria, road transport accounts for 90 per cent of all movements of goods and service, this benchmark been difficult to attained due to fiscal problems, research in new road building etc (Karlaftis, Easa, Jha, & Vlahogianni, 2012). Innovation in several types of transport-based policies (metro lines, improved water transport etc) had impacted on the cost of doing business in Nigeria. Also that research-based policy to improved road maintenance has been the shortcomings in policy making.

2.4 Empirical Literature Review

Literature, especially on previous research had been pivotal in shaping positively this study, and relating to the variables (DVs and IVs) in this study. In this subsection, the research framework (graphical) relating to all variables used is discussed to highlight the structure of the study (part of the study – the OLS analysis II).

A Large body of the empirical literature on the transport system, and especially on road infrastructure exist. The construction of literature used relates to public investment

needed in building new road and existing road projects, maintenance issues, connectivity of roads which defines access, issues relating to environmental concerns of roads. In Nigeria, road management issues are mainly executed through public funds. Political and institutional determinant plays a vital role in the economic agenda of government. A Large body of literature has always noted that the problems of inefficient infrastructure in the Sub-Saharan Africa exist due to fiscal constraints – increased debt burden, increasing community demographics which has introduced changes in the economy and poverty profiles, increased needs in different sectors of the economy – it could be related to the Arab uprisings, triggered by the structure of governance, equity and welfare considerations of the population. (Al-Rasheed, 2012)

The framework shown in Figure 2.11, discuss part of the empirical literature of this study.

2.4.1 Research framework

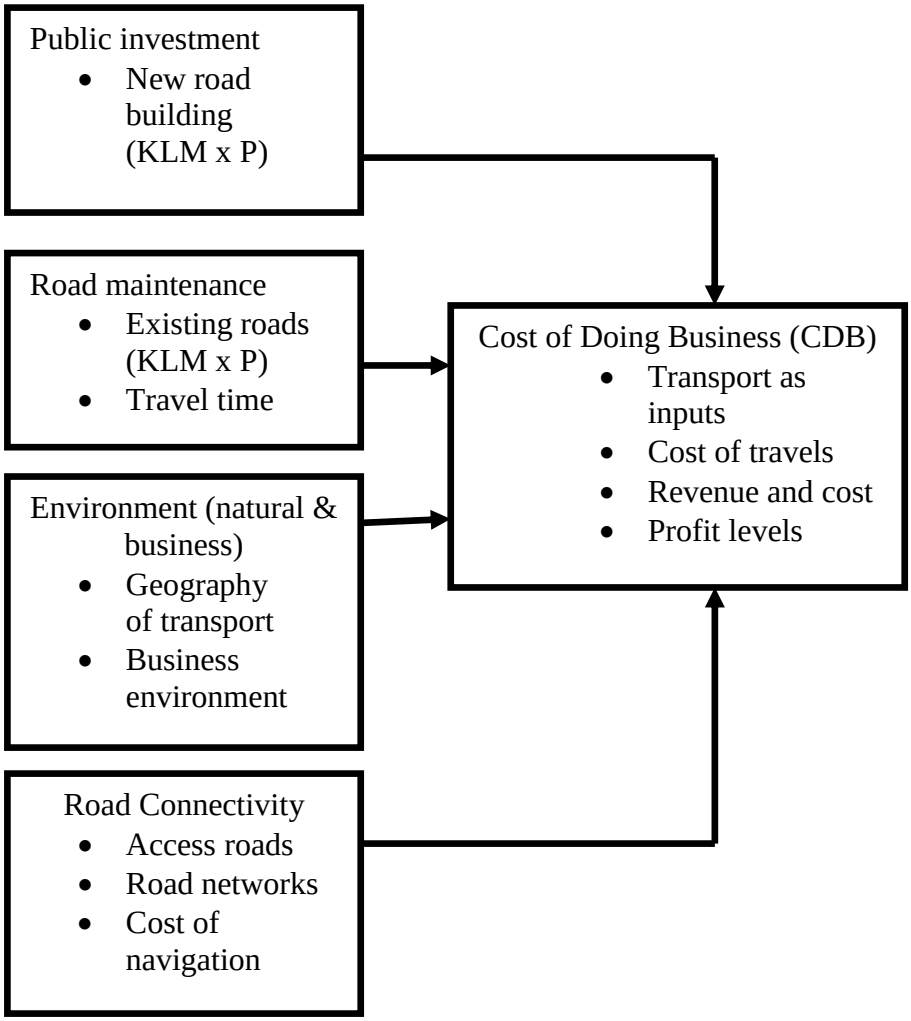


Figure 2.11
Research framework
Source: author's concept of IVs and DV (Cost of doing Business).

2.4.2 Public Investment

Public investment in infrastructure has drawn large literature in developing countries mainly as it concerns the growth of the economy. This was triggered amongst others by World Bank's report 1994 on the quality of infrastructure for development, which to a large extent, depend on public investment. The leading works of Aschauer, (1989), on

government spending and productivity in the private was a lead literature in this field. Later, other studies criticized his work. His works according this report "did not *demonstrate* causality but *presupposes* it." (Claudia 2011; Randolph, 1996; and Baro & Sala-i-Martin, 2003). Efficient transport infrastructures depend on myriad factors in realizing productive levels. In developed economies where laid down policies for research and project innovation exist, it has laid the foundation for efficiency and productivity based on research (Schilirò, 2010; Smith, 2001). Dividends of investments in transport depend to a large extent on innovations due to changing demographic factors (including population growth), and modernization propelled by growth of the real sector, global competitions and global market place responding to demand and supply trends.

Apart from the fact that public sector provides the bulk of amount required in the transport sector, attention has been drawn to the increasing rates of pollution from second-hand cars imported into the developing countries. Most of the population in the developing countries cannot afford new cars; public policy is required, amongst others, to regulate the inflow of these cars. This is done to reiterate public policy on sustainable transport policy and the reduce funds invested or to fund regulatory authorities, thereby reducing this subheads and investing in public transport or mass transit in Nigeria.

2.4.3 Road Maintenance

Road maintenance is required in achieving travel time in order to (i) preserve the road in its originally constructed condition, (ii) add important features – pedestrian crossing and animal crossing, (iii) protect adjacent resources and user safety, and (iv) provide efficiently, convenient travel along the route. Unfortunately, maintenance is often

neglected or improperly performed resulting in rapid deterioration of the road and eventual failure from both climatic and vehicle use impacts. This ultimately affects the productivity of roads. The structural design of a pavement relates to the experience of the road to carry the imposed loads without excessive maintenance or rehabilitation. Corrupt politicians choose investment projects, not on the basis of their fundamental economic worth (the productivity consideration or creating welfare to rural communities) but due to their gains. The deterioration of roads may be due to traffic loads, movements occurring in the pavement cracks depending on the position of the wheel load, (Pais, Pereira, Sousa, & Capitao Pais, 2002). In Nigeria, road maintenance has been a causative agent for higher prices of transport. Maintenance by agencies like the Federal Road Maintenance Agency (FERMA) does not do regular maintenance due to fiscal constraints and other factors. Travel behaviour is the relationship between timing and maintenance activities (Pendyala & Bhat, 2004) because it determines when people want to travel or to avoid such travel due to the stress on the roads. According to the World bank (2011), the establishment of maintenance and rehabilitation agencies is important. In Nigeria and developing countries, political and fiscal related issues are the determinants for effective road maintenance. Gwilliam et al (2008) noted that the reason for travel horror on the road is due partly to the fact that spending on roads in state and local governments in sub-Saharan Africa is low, and Nigeria with 34,000 national roads, it can be an uphill task to maintain such roads for efficient and safe transport.

One of the factors that had contributed to the deterioration of roads especially in the sub-Saharan Africa is the issues of corruption in government contracts, building and maintenance of roads. (Hansen 2009; Soyinka,2012; Smith,2001), It is opined that corruption in Nigeria follows the ruling class (chiefs and Emirs relations) and political

stakeholders. It is uncommon to supervise projects efficiently. These have contributed to highways failure and poor designs, (Okigbo (2012; Okojie, 2012). Thus the structural quality pavement rehabilitation, restoring and improving roads (Huang & Sadek, 2012) has not worked efficiently.

2.4.4 Environment

Issues of transport and the environment have many considerations and definitions, especially in the contemporary green revolution. The environment can be defined in accordance with the contemporary state of analysis. This is because there are various types – the natural environment, business and others. In this study, environment could be a terrains that creates constraints to transportation, the sahara desert in the North, wash off roads due to a water-locked locations or lack of accessibility due to the geography of a location. Stringent bureaucracies, difficult requirements for securing a loan facility for small business (requirements for difficult collaterals), high corruptions by officials also creates a difficult business environment. Highier transport cost creates social exclusions for some groups in the society or conditions of roads that makes dependance on mass transit buses due to lack of personal tranport creates difficulties for non-car owners. The blend of the environments calls for a sustainable policies to encorporate various types.

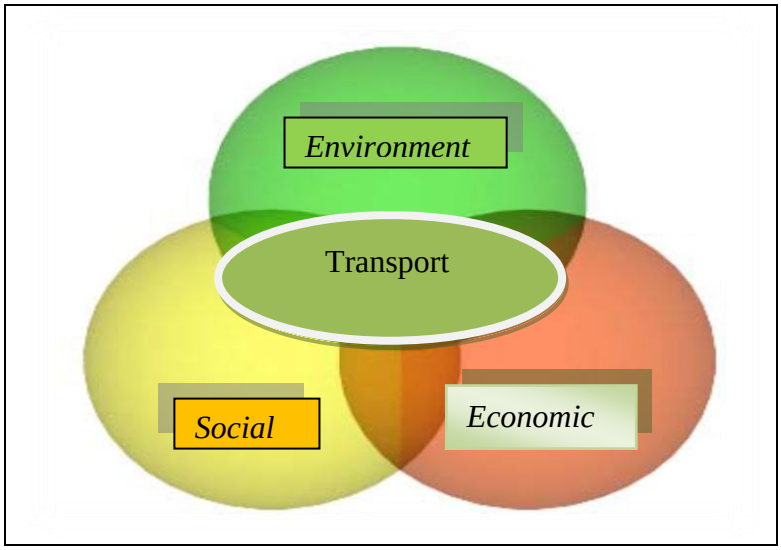


Figure 2.12
Environmental sustainability
Source: AASHTO, (2009) (format changed for this study)

The definitions of the environment in this study is twofold – the natural environment and the business environment (which may also incorporate the financial environment). The environments have interactions with both social (way of life) and the economy which is desirable in the dynamic balance between human and natural systems (Figure 2.12). The economy supports viable transport policy which is cost-efficient. In terms of costs, infrastructure must be within a society's ability and willingness to pay which have impacts on accessibility and connectivity, this also defines user costs, including private costs, need to affordability considerations of people and households. Roads in rainforest have seldom short life span due to amounts of rain in a year and the desire to conserve some species (forest conservation, lakes and animals routes etc) (Taiwo & Moyo, 2012). This condition has affected road construction in high erosions prone in the South-South and South West, Northeast of Nigeria; with different typologies and soil types that affects life span of roads. These types of environmental factors have been responsible for 30 of the world's landlocked developing countries, 16 are classified as the least

developed (World Bank, 2012). Due to different considerations that affect transport system, the geography of transport examines the effect to locomotion across different terrains. (Rodrigue, 2009).

The Environment creates and allows different economic units operates in the area and **c**reates solutions for each unit. The natural environment absorbs emissions and pollution from the transportation system, and reduces the material resources required to support transportation that is sustainable through efficient institutional workings. Also, the increase in the number of vehicles and fuel consumption affects the environment. Most cities in Nigeria have such heavy traffic and with little connectivity, available road options have created an increased load on the existing roads, Iimi, (2008).

2.4.5 Road connectivity

Road connectivity is important. It is the basis for some of the transportation models, the transit-oriented development (TOD) model, amongst others, which is aimed at higher densities, transport – friendly development, the so-called mixed land use aimed at coordinating the transport system (Nemeth & Wells, 2005). The increased availability and accessibility introduced by technology and transportation planning were important elements of this model. Connectivity refers to the density of connections in the path or road network and the directness of links (World Bank, 2005). In fact, common barriers to achieving the millennium development goals depend on the road connections (Willoughby, 2004). The means for identifying sustainable transportation programmes depend on connectivity. (Zietsman, Rilett, & Kim, 2006). Failure in meeting the 2015

date for MDGs in Africa and other developing countries starts with the conditions of roads.

Lack of connectivity has result to price differential in different regions in Africa. Taiwo M. & Initiative, B. (2012), stated that bad roads in Cameroon make an increase in prices with about 15 percent of the cost in most parts of the Cameroon due to road conditions. According to Rus & Socorroa, 2012; Dorosh, Wang, You, & Schmidt, 2012, most sub-Saharan countries, agricultural productivity depends on access (links) and the intermodal substitution. The impact of investment in roads connectivity in Africa according to (Dorosh, et al., 2012), also dictates the desire to invest in a location where raw materials exist.

In rural Africa, lack of road access has been a source of poverty increase. This is important because most African communities live in rural Africa and connectivity of roads creates lack of access for reaching basic economic activity like farming and markets. This has been one of the demographic factors that encouraged urban drift, crime, tribal wars in Africa. (Van de Walle, 2002). This is a pointer towards realizing the goals of Millennium development goals (MDGs), which argued that lack of access for preventable medical conditions, child and maternal mortality issues which form the bulk of the MDGs goals. Rodrigue, 2008, on the other hand, dealt with issues relating to the environment, which is also important for connectivity.

2.4.6 Cost of Doing Business

Cost of Doing Business data base provides objective measures for analyzing business regulations for local firms in 185 economies and selected cities at the sub national level

(World Bank, 2012). The main issues in this data base provided the basis for measuring the performance of countries. This forms the basis for evaluating the performance of the real sectors in the national economies. The Cost of doing Business data base measures a wide range of sectors of economies (see Table 2.5a). This is important because these actions usually translate to ease of doing business – covering the procurement of finance for starting a business, empowerment especially of gender related issues, and how institutional bureaucracies affect the cost of transport, resulting in higher prices, and impact on prices. Examine for instances two features: (i). Trading across the border which scores 147, meaning that trading across the border had encouraged smuggling and resulting to scarcity, which results into higher process. This action makes trade in border town attractive for practitioners. Higher prices in border towns in Nigeria have encouraged the underground economy (black markets) that flourish in these borders. The result of this is loss of revenue to the federal government, and encourages an influx which has many vices, conflicts (Metz, 2007), illegal immigrants, etc. (ii). Enforcing contracts ranked 97, meaning that weak supervision in contract enforcing had encouraged inflated contract amounts, high costs of projects to government. The result of this translates to lower quality projects including roads.

There are other features that affect the cost of doing business – cost associated with infrastructure efficiency that firms include in the production function as inputs. Transport forms part (input) in cost determination, high transaction cost exhibited in various forms – high cost of logistics, high transport cost, difficult terrain to reach the location of a raw materials and transporting finished goods to the consumer, meeting set standards by regulatory authorities, all adds to the cost of doing business.

Transportation policy and planning decision affects the cost of transport (Litman, 2004). Ecology affects accessibility (Achieves et al, 2010) – landlocked, desert features in most towns around the North-eastern geopolitical zone of Nigeria, added to the proximity of this locations to border roads affects cost of doing business. These different features in the transportation system dictate cost of doing business over time.

2.4.7 Transport choice

Modelling travel decisions is an integral part of demand analysis where an individual makes decision in choosing methods of access to the desired location. Transport choice arises as a result of attempting to measure consumer behaviour in different economic and non-economic activities. The modelling process involves desegregation of personal travel behaviour. It is important to measure individuals or household, because the choice or decision is individualistic aimed at utility maximization. In evaluating transport choice, different models are used, mainly the family of discrete choice models. This has been explained in the model used in this study.

Large volumes of literature on developing country infrastructures conclude that the sub-optimal performance of these economies has been limited by the efficiency of the infrastructure levels (Omojimite, 2010, Ogbo & Nwachukwu, 2012). This is seen in various sectors of the economy, especially low levels of productivity arising from the high cost of inputs, higher prices of goods and service, low level of business operations etc. For most rural businesses, the main problem is access to good roads and optimal use of resources in their domain - they need to travel to cities (markets), long distances for procurements (Oostende, von Broekhuizen, en Jan, & van der Ploeg, 2008). Trends in high cost may arise due to materials needed for road constructions are transported from

regions in the South-South and South-West. Transport from this locations (South-South, South-West parts of Nigeria) require long travel hours to a location in the Northern parts of Nigeria. This affects the duration of road projects, thus affecting transport of goods, and this affects stock of unfinished goods (Ojo, 2012). Thus the penalty for insufficient infrastructures affects productivity and slows the pace of the economy (Rioja, 2003). Another dimension to Transport choice identified by Saelens & Frank, 2003, involves the considerations of both neighbourhood environment and individual factors that determines travel decisions. Safety concerns influence NE – traffic, crime, animals, and community related factors like parks. In Northern Nigeria, animals are very important in transportation. Individual factors are: car ownership, income levels and age/gender issues. Some of the factors mentioned above also influence the transportation policy of government, which affects fiscal policies of government.

The connection between government spending and economic growth in Nigeria depends on the fiscal structure of government and the political preference for investing in infrastructure (Adesoye, 2010). Other bottlenecks peculiar to developing countries are the debt burden and the political structure of the country based on a geopolitical grouping, also affects road infrastructure. Thus, institutions, democracy and such policies affect the demand for infrastructure in some locations (Helpman, 2008). Transport failure associated with poor access is probably the most important factor limiting agricultural productivity in Nigeria (Porter, 2007) where more than 70 percent of rural industries are agro-allied. These issues determine economic performance of small medium enterprises (SMEs) and other businesses in Nigeria.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

The transport infrastructure, roads and other related features are characterized by its efficiency in the movement of good or service. In this chapter, we discuss methods and importance that enables trade between people, which in turn establishes civilizations and innovations. The output of road investments is assessed based on their efficiency in terms of accessibility, defining roadway condition, and capacity or the ability of such roads in terms of its carrying capacity. The standardized accessibility is defined such that it enables the researcher to estimate of travel time and cost, say one hour a day with an expenditure of 7%-9% spent on personal income.

Travel decisions explain the behaviour of households, and for the businesses, mostly determined by transport choice and costs amongst others. This decision can be analysed using the random utility models which are the most-general theoretical basis for discrete choice models. Random utility models (RUM) have been intensively used by researchers and practitioners in various fields of applications including econometrics and transportation demand analysis. So, in random utility models we presume that the utility U_{ij} given to individual *i* by product *j* is composed of a deterministic component v_{ij}, which can be computed based on observed characteristics, and a stochastic error component ε_{ij}, which is unobserved, so that: $U_{ij} = v_{ij} + \varepsilon_{ij}$ observable component for product *j*, error component ε_{ij}, which we do not have enough information to predict a particular individual's choice on a particular choice. These

decisions on the transportation system by individuals given an array of alternatives such as modes choice, mobility requirements and other factors defined their utility maximising behaviour. There are, however, constraints that are made as simplifying assumptions which limits the ability of the model to represent the actual structure of the alternative process.

Chapter three is structured into sections. Introduction of this chapter is in section 3.1. The theoretical framework is discussed in section 3.2, with subsection 3.2.1- 3.27. The theoretical framework discusses issues relating to utility-based measures and the choice process. Section 3.3 addressed population and sample determination of this study. Section 3.4 examines questionnaires and Section 3.5 is the justification for the population. Section 3.6 discusses the variables used in this study - Transport choice and classical linear regression models – both the dependent and independent variables. Sections 3.7 - 3.9, examine the two models used, the estimation of multination logit model and the Classical Linear Regression Model (CLRM). These models specify two main aspects, firstly, the related issues of transportation and choice, and secondly, the costs and constraints involved in the process of transport choice.

3.2 Theoretical framework

Infrastructure investment is commonly defined to exhibit ‘publicness’ which is derived from its traditional definition of the theory of public finance and depends on the fiscal policy features of the economy. The World Bank stated the importance of the quality of the provision of infrastructure through government expenditure as necessary for growth according to World Development Report, 1994 (WDR). The American congress also

exhibited the publicness of infrastructure investment to show that government expenditure forms the largest part (Moteff, J., Copeland, C., & Fischer, J. 2002;Bennert, Tambuwala, Wallance & Williamson, 2013; Akiva & Lerman, 1985; and thus defined it as a national infrastructure. The most cited reference on infrastructure is of work of David Aschauer, 1989; it defined infrastructure as public capital. In public finance theory, two distinct characteristics of public good, non-rivalry **(**many individuals can consume the same good without diminishing its value), and non-excludability - the notion that an individual cannot be prevented from consuming the good has been central in the development agenda of most developing nation, where poverty eradication have been the focal point of development programmes. Public capital (which is an aspect of public finance theory) is disaggregated into infrastructure, human resource development and military capital stocks. However, a large body of literature had focused on the productivity of public capital and the determinants of public capital spending in less-developed countries influenced by several factors ranging from the fiscal constraints, heavy debt burden and the rising population amongst others (Sala-i-Martin 1997; Sturm, 2001) found that the ratio to GDP of total investment is among the few variables that are robustly correlated with growth for a diverse group of countries. This raises the question why the investment ratios across countries vary so much. Secondly, the debt crises in the early 1980s have triggered interest in the `debt overhang' hypothesis (Dorosh, et al., 2012). In general, most of these studies have found support for the adverse effects of the debt service and debt overhang on private investment. Similar arguments can be made for public investment; however, on the determinants of publicly funded investment in less-developed countries, this depend to a large extend on priorities and management. Research in this aspect is small. This lack of analysis is especially surprising, as the

majority of countries throughout the world show that productive government services have declined as a percentage of GDP since the 1970s (Sturm, 2001)). In Nigeria, this has been seen with the decline in agricultural productivity (major export source) and the early parts of Nigeria's fortune in oil wealth. At the same time, productivity growth plummeted worldwide. Indeed, in many countries, politicians of different political thoughts and international institutes like the World Bank and IMF support such policies. This raises the question, however, as to why public capital spending has declined in so many countries.

Many developing countries have a long legacy of failed public projects. Besides negating the potential benefits that could have flowed from these projects, the poor record in undertaking public investments has bred scepticism about the ability of these countries to increase public investment. At the same time, developing countries are under pressure to invest more in infrastructure in order to accelerate and/or sustain growth. The effectiveness of public investment also depends on institutional factors, such as the quality of project selection, management and evaluation, and the regulatory and operational difficulties.

The 'legacy of failed public projects' is attributed to institutional factors and have consequences on the quality of the project, priorities of projects, management and evaluation of infrastructure have implications on the stock of roads in the developing countries. It again hinges on the role of public capital. These trends have affected the mobility and most importantly accessibility in both the urban and rural Nigeria. Failures in public projects affect travel decisions. Accessibility is important because it defined travel decision/behaviour of individuals for mobility. Accessibility is defined by Handy, (2005), as "easily approached or entered". In most cases, measures of accessibility

include both an impedance factor, reflecting the time or cost of reaching a destination, and an attractiveness factor, reflecting the qualities of the possible destinations. Accessibility refers to the ease of arrival to destinations. People who are in places that are highly accessible can reach many other activities or destinations quickly; people in inaccessible places can reach fewer places in the same amount of time.

Although accessibility-enhancing strategies expand the range of choice for individuals and increase the possibility of connectivity, they do not ensure that individuals will choose some modes or a road system due to many travel needs and costs (Hashim & Meagher, 1999), because accessibility has many components - connection, movement, cost, time, and comfort. Mobility is sometimes defined to have same meaning with accessibility. This is important because it guides an individual into making a choice.

3.2.1 Utility–based measures of accessibility

Utility-based measures are based on random utility theory, and consist of the denominator of the multinomial logit model. Utility theory is based on the assumption that individuals maximize their utility. This means that the individual assigns a value, in terms of level of utility drive from each mode. In microeconomics, utility maximization is where the marginal utility per Naira (Nigerian currency) spent is the same for each of the goods.

$$-\frac{MUx}{MUy} = -\frac{Px}{Py} => \frac{MUx}{Px} = \frac{MUy}{Py}$$

Given different transport types (modes), an individual or corporate individuals will maximize their utility where = $\frac{MU_{m1}}{P_{m1}} = \frac{MU_{m2}}{P_{m2}}$, where m_1= transport through trunk A

road and m_2= trunk B road, and MU is marginal Utility, while P is the transport price. It is important to note that trunk A roads are federal government roads and trunck B roads are state government roads, each can be used to access location. The utility function includes variables representing the features of each choice, reflecting the attractiveness of the destination, the travel impedance or the direction of traffic, and the socioeconomic characteristics of the individual or household. These measures occasionally resemble gravity-based measures, but with theoretical and empirical advantages (Handy and Niemeier, 1997). The advantage of utility measures is that they enable the testing of alternative formulations of the utility function in the search for one that best matches the actual travel behaviour. Measurement of these options determines the relative importance of various factors and need not be specified as in the case of gravity-type measures. “Gravity-based” measures, takes into consideration two types of accessibility: referred to as “active” and “passive” accessibility (Cascetta, 2009). The gravity-type measures accessibility measures as a central role in transport and urban planning. This measure is seen as essential in modern transportation for growth of economies, especially in sub-Saharan Africa. To achieve desired accessibility; it depends on the productivity of roads.

3.2.2 Productivity of road infrastructure and Accessibility in Africa

Productivity of public investment is important because it is a step in determining the efficiency of public capital, given the institutional and political and environmental factors. There are studies done to assess the availability of public good and to gauge the efficiency of public capital – the central purpose is to spur growth. The majority of the

studies used the production function to study the productivity of the stock of capital in a typical production of the form *Y=K, G, L.* 'G' as the stock of public capital. This study makes small deviations to deal with probability responses of individuals/corporate individuals in their decisions on the output of one of the outputs of public capital investment, transport infrastructure

In Nigeria, most literature had opined that there is insignificant growth in the public investment. Various factors affect such development. Some of the factors may be related to increase in the political and democratic needs, generally agreeing with the increasing public expenditure theory of Wagner's law. According an empirical study by (Omojimite, 2010), Nigeria does not rank with countries in the middle lower income group due to low level of investments in infrastructure.

Public investment, road maintenance, road connectivity, and environmental sustainability, which form the core features of this study (Independent variables) drawn mainly from public budgets/public expenditure for accessibility. Thus accessibility depends on increased/efficient use of funds for new road building (increase connectivity) and or maintenance (increase access), and the need for sustainability. Since the effectiveness of public investment is to provide road infrastructure, what are elements of choice and how individuals maximize his consumption of a public good (roads)?

3.2.3 Elements of the Choice process

A proper estimation of travel behavior will be examined in order to survey different processes involved – to explain methods for accessibility or various mode choices by individuals. The modeling process involves disaggregation of individual travel behavior,

because it involves the choice of individual consumer in the travel decisions. The discrete choice model (DCM) had been used as a tool in the analysis and prediction of travel decisions. A discrete choice model predicts a decision made by an individual (such as mode or route choice) as a function of any number of variables (Pavlyuk, 2010). The mathematical formalization of the model can be presented as:

$P(y = 1|x = X) = F(\boldsymbol{X^T\beta})$, (a model for predicting a preferred transportation mode).

where y – a discrete variable, which equals to 1 if a passenger accepts an option and 0 if he/she declines it (binary choice case).

X – a vector of explanatory variables;

β – a vector of unknown coefficients to be estimated;

F – Function, transforming a set of real numbers into [0, 1]

Note that $\boldsymbol{X}^T$ indicates the log odds of choice (logit transformation).

The critical decisions of choice depended on the general modelling of the decision process, and these are: (i). The individual involved in the decision making, (ii). Available alternatives, (iii). Attributes or dimension of each option in terms of its benefits and cost to the individual decision maker, and (iv). Decision rule examines the basic components needed by the decision maker if and when the decision is completed from the available options. A decision rule is a process that the researcher uses to decide whether to accept or reject the hypothesis in statistics decisions (whether to accept or reject the null hypothesis), depending on when the conditions for accepting or rejection is based on conditions that established each probability of success or failure as basis for measurement (i.e the log odds).

3.2.4 Decision maker

Discrete Choice models are also referred to as disaggregated models, meaning that the decision maker is assumed to be an individual and that this decision maker falls under a particular use. Consider a group situation for instance that a group of persons is the decision maker. Ignoring the heterogeneous characteristics of individuals, we consider only the decisions of the group. Thus in this study we may refer to 'decision maker' and person interchangeably. To take note of the differences among decision makers, a disaggregated model must note of several differences – socioeconomic variables of age, gender, education and income are important in decision-making process. These characteristics of the respondents apply because we are sampling small holders within a region.

3.2.5 Alternatives

In evaluating the decisions of individuals, it requires not only knowledge of what has been chosen, but also what has not been chosen (available option). This is important because assumptions must be made for available options or alternatives that an individual considers in the decision process. The set from which these alternatives exist is the called the choice set. A discrete choice set contains a finite number of alternatives that can be explicitly listed. Discrete choice models are statistical methods that model decisions made by people among a finite set of alternatives. The choice of travel mode is a typical example of a choice from a discrete set. The determination of the list of alternatives is a complex process usually referred to as choice set generation (Ben-Akiva & Bierlaire, 1999; 2011). The most widely used methods for choice set generation

use deterministic criteria of alternatives available. The universal choice set includes all possible alternatives in the application's context. The choice is a subset of the universal choice set considered by or available to, a particular individual. Alternatives in the universal choice that are not available to the individual are, therefore, not included in the choice set. In addition to availability, the decision–makers knowledge of the alternative could also affect the choice set. The behavioural aspects of knowledge introduce uncertainty in modelling in the choice set generation process and this motivates the use of probability of each attainable choice set within the universal set. For example, issues concerning access and choice of modes are a decision that affects the cost of doing business, thus the decision maker must consider the cost factors in the universal set.

3.2.6 Attributes

Alternatives in the choice set are characterized by a set of attributes. The important elements of attributes may have some features of the whole group (generic to all), and some may be alternative - specific. An attribute is not necessarily a direct, measurable quantity. It can also be any function of available data. This can be of travel time; travel access as an attribute of a type of transport (transport mode), or travel time may be used to describe its attributes. An alternative definition of attributes as functions of available data must usually be tested to identify its appropriateness. In a regular choice condition, attributes play an important role in individual's travel decision. In this study, the individual is the unit of study. Travel decisions are based on the options set and the option available at a given time. In some cases, the set of alternatives may influence their decision.

3.2.7 Decision Rule

The decision rule is the process used by the decision-maker to evaluate the attributes in the choice set and determine a decision. Most models used in travel behavior applications are based on utility theory, which assumes that the decision-makers preference for an option is captured by value, called utility, and the decision-maker sets the option in the choice set with the highest utility. This forms the concept employed in microeconomics used for consumer behavior in utility maximization – based on the heterogeneity of human decisions. Some models assume that the decision rule is intrinsically probabilistic, and even when an individual has complete knowledge of the problem, this will not change the degree of uncertainty. Others consider the individuals' decision rule as deterministic (without any room for random variation), and motivate the uncertainty from the limited capacity of the observer in capturing all the dimensions of the decision process. There are other specific models that can be derived based on assumptions about the source of uncertainty. Models with probabilistic decision rules, like the model used in McFadden (probabilistic choice among products) states that, when a person chooses among alternatives, very often their responses appear to be governed by probabilities that are conditioned on the choice set (McFadden, 1980). For example, when an individual is deciding to travel from home to another city, the choice may be by airplane (a), bus (b), or car (c). Let A, B, C denote the uncertain states of nature associated with each form of travel. No matter the choice, either to fly or take a bus etc, these options still exist, so there really is no universal event underlying the sources of uncertainty. In developing countries, not so many options exist, still an individual makes a choice or are 'forced' into a choice, and thus the options in A-C may

not exist, still based on either it is available (1) or not to travel (0). Observing Luce's choice axiom, Saari, (2011), observed that in determining the option from the choice set, an array of options exist like determining the likelihood of a ranking by starting with the ''best-first,'' or ''worst-first'' option. Individual decision making is an important element in Luce's Model; this was done by a settings that can be captured using probability measures. Lower case letters represent probabilities, for example, P(A) = a, The probability measure P_T satisfies the usual axioms for space T; supposed that T is a universal sample space, these are also defined in the original set R,S,T, representing different sample space where probabilities can be observed, thus for $S \subset T$; $0 \leq P_T(S) \leq 1$ etc, shows the probability in the set with a range between 1 - 0. Meaning that, for each of the set, there is a defined option based on its probability measures. This is typical in a setting where decisions must be tailored towards the fact that a decision must be arrived at in the choice set. Most times travel decisions take into consideration other factors in making the decisions. This is the reason why cost may not be the sole variable ceteris paribus; it also must take into consideration issues relating to the geography of transport for instance.

The 'elimination by aspects' approach proposed by Tversky, (1972), assumes a deterministic utility and a probabilistic decision process. Random Utility models are used in econometric and travel behaviour analysis. These are based on deterministic decision rules, where utilities are represented by random variables. The elimination by aspects approach is a state where decision makers during the process of sequential selection. All options have decisions that constitute cost and benefits (opportunity costs)

that helps an individual in deciding the preferable 'basket' by his preference and constraints. At each stage of decision, the individuals eliminate all the options not having an expected attribute, until only one option remains, which to him maximizes utility. To analyse the characteristics of the population, sampling methods are used to study the population using various statistical and other methods, given the features of the sample.

3.3 Population, sampling frame and data

Data for this study were sourced from primary sources - two states in the Northeast geopolitical zone were selected. The study focuses on SMEs in different locations (see table 3.4) connected by varying road conditions which fall under trunk A, B and C roads according to road classifications in Nigeria. (A is classified as a highway under the federal government maintenance; B is state government roads and C are local government roads.) The features of the two states have been described on Table 3.2.

The sampling frames used in this study are selected from the target population (SMEs and small holders) in some towns and villages in Adamawa and Gombe states. Both Locations (towns or villages) have different topography.

Table 3.1
*Population, Sample location and Road conditions **

Name Location of sample.	***State***	***Characteristics of location***	***Road Connectivity to A,B,C.***	***Remarks***
Borrong	Adamawa	(Village setting) Riverine community: means of transport changes by seasons	*Not connected to any major road, far from A,B,C, can't access trunks.*	*Steep terrain – while in raining season, the only access, is by water transport.*
Madagali	Adamawa	Semi-urban community: located about 350 km from state capital, surrounded by Mandara mountains - difficult access terrain/topography	*Along Maiduguri road Connected to A,B,C, border town to Cameroon republic.*	*Connect to Cameroon border through the Mandara mountains (unpaved bush paths)*
Ganye	Adamawa	Semi-urban community: located about 150 km from the state capital – access to borders of other countries.	*Connected to Jalingo (Taraba) on the trunk A road. Also connected to Road Corridor located at - Calabar – Gboko – Jalingo – Maiduguri – N'Djamena/Garoua – A,B,C*	*Connections to Cameroons through bush paths/mountains*
Gombe	Gombe	Urban centre: Capital city of the state.	*Connected to Trunk A road. Also has connection on an International Corridor from Yola. A,B,C*	*Connects most of Northern Nigeria towns*
Dadinkowa	Gombe	(Village setting) located about 50 km from the capital	*Connected to Trunk A,B,C road to Gombe.*	*Major agricultural activities due to the location of the Dam.*
Ashaka	Gombe	Semi-urban community: located about 100 km from the state capital	*Connected to trunk A road, A,B,C towards Maiduguri access road.*	*Important productive Centre – Cement company of Northern Nigeria location.*

Sources: Author: *Both Gombe and Adamawa were curved out of former North-East State of Nigeria.

The justification for selecting these locations was based on historical, locations with difficult accessibility, range of the choice set (of roads to highways) limited and other factors that stood as constraints to connectivity – even though some locations have good roads. Small holders are targeted because these groups are familiar with road

conditions because they use these roads for daily travel needs. Another justification is that these groups are most vulnerable due to their income levels and, some locations have high prevalence to travel risks because they have to go their supply source routinely.

3.4 Questionnaire

The source of data for this study is from the primary source. The rationale for using this source was as a result of limitations in obtaining relevant data from some agencies and government organs, especially data on travel choice. In Nigeria, such data could have been obtained from the Federal Ministry of Transport[2], and Small and Medium Enterprises Development Agency of Nigeria (SMEDAN), but these data was unavailable, sometimes also, due to some bottlenecks in government agencies, coupled with the growing insecurity problems in Nigeria (constant bombings in Nigeria's capital city, growing insurgents etc). Data specifically on road transport captures only number fleet on Trunk A,B,C roads, safety measures (including accidents) usually made by government parastatals. The Federal Road Safety Commission (FRSC), only measures the number of fleets on the roads and safety (including the requirements of vehicles). Another bottleneck or hurdles involve the syndrome of 'seemingly sensitive' documents that most agencies seem to protect. A body that computes periodic prices in Nigeria is

[2] Data from this source only show stock of roads in various locations (finished and work-in-progress), number of fleets, and other road features. It does not show transport costs and different topographies of locations. SMEDAN data: definition of SMEs, sources of finance and regulation. Data does not show elements that contribute to costs – transport cost and locations difficulties, thus it is difficult to get 'meaningful data' for this study except from primary source.

the National Bureau of Statistics (NBS). These factors, therefore, warranted the use of questionnaires. From the questionnaire administered, we are able to source four types of data and household characteristics to obtain the following: Note that, in some cases, it may be perceptions, but transport cost is known phenomenon in Nigeria as responsible for higher trends in prices.

i. Transport prices (in Naira)

ii Road access and connectivity by measuring road length in kilometers and value in Naira

iii. Cost and profit outlays from SMEs as a result of transport element in the cost of a product or commodity (affected by cost).

iv. Duration of travel (VMT) of goods transportation from different locations. In this study VMT is computed by KLM travel multiplied by price (transport cost) – this is because in Nigeria fuel changes and associated taxes are captured in the cost of transport. For example fuel is subsidized in Nigeria, when an element is removed (tax), it is immediately felt in transport price increase. No need to isolate the cost of fuel.

3.5 Respondents

Respondents for this study are chosen through stratified sampling. A stratum is defined as the population elements grouped into non-overlapping groups. There may be similarities within the group, in the sense that they form cooperative forum within which to solve the problems of transport to their suppliers, groups to secure loan and a common forum to government on tax matters. In Nigeria, there are unions of small holders (includes small-scale famers, petty traders etc). Differences between the stratums exist

because they sell difference types of products. Some may be agricultural products (which is common in Nigeria like fish sellers unions, vegetables, manufactured goods etc). For instance, in Northern Nigeria, 'Yan gwari' (means union of vegetable sellers) exist in a particular market location. The grouping or the stratum in this case is sourced from each market location. In the location, there are small and 'big' business. Small holders are the concern of this study. Apart from the fact that SMEs and small-scale famers are chosen, another criteria is the fact that these (small-scale) traders get there supplies by going to the suppliers; unlike big traders who received their supplies directly and often transported to the locations by suppliers because they buy wholesale (bigger quantities). The random sampling is applied within the group (the small traders (SMEs) and ensures that at least one observation is picked from each location (strata). However, since this study is to measure the effects of transport on SMEs in the selected areas, using this method will minimize errors (Metropolis, 1987*)* in the samples because questionnaire are distributed in a small location of the market and targeted. The characteristics of the population seem to be the same in both locations because the two states have similar features; this has been mentioned elsewhere in this study and in table 3.2.

Table 3.2

Characteristics of the population in Adamawa and Gombe states.

Location (State in bracket)	Ethnicity (Language)	Common Language spoken in all locations	Major Occupation	Main transport type(s)	Currency	Socioeconomic Factors
Borrong (Adamawa)	Mbulla (local tribe) Fulbe	English, Hausa	Fishing and Crop farming	Minibuses, motorcycles, Boats	Nigerian Naira	Farm, fishing related income
Madagali (Adamawa)	Margi/Higgi (local tribe), Fulbe, some tribes from Cameroon Republic	English, Hausa	Trading and crop farming	Minibuses and motorcycles	Nigerian Naira, CFA	Farm, trade related income
Ganye (Adamawa)	Chamba/Fulbe/tribes from Cameroon Republic	English Hausa	Farming and non-farm employment	Minibuses and motorcycles	Nigerian Naira	Agric and non-agricultural Incomes
Gombe (Gombe)	Multiple Languages of an urban setting	English Hausa	Civil servants, Traders and others	Variety of transport vehicles	Nigerian Naira	Variety of incomes
Dadinkowa (Gombe)	Fulbe, Hausa	English, Hausa	Agriculture and trading	Minibuses, motorcycles, Boats	Nigerian Naira	Mainly farm related income
Ashaka (Gombe)	Fulbe, Hausa	English, Hausa	Farming and non-farm employment	Minibuses and motorcycles	Nigerian Naira	Both farm and non-farm incomes.

Source: author, 2013

SMEs selection will be defined as small traders (both farm and non-farm activities). The justification for this has already been stated in this study that, in Nigeria, this (SMEs) category contributes 60 percent to GDP; their contribution to the economy is essential for growth. The selected of SMEs will be done with the thought that, in most towns, there are classified markets locations or parts of town/village where traders are mostly located. There are some traders, however, who use their premises for small trading; this will be ignored. The coding of the Questionnaires administered to respondents is shown in table 3.3.

Table 3.3
Identification of questionnaire coding.

Dependent Variables		**(Sources of information) Independent Variables**					
		(X_1)	(X_2)	(X_3)	(X_4)	(IVs T.Choice)	
Transport Choice (TC)	Cost of Doing Business (CBD)	PI	RM	EN	RC	CI	DI
(DV 1)	(DV 2)	PI -1	RM1	EN1	RC1	C2	D2
		PI -2	RM2	RN2	RC2	C3	D3
		PI -3	RM3	RN3	RC3	C4	D4
		PI -4	RM4	RN4	RC4	C5	D5
		PI -5	RM5	RN5	RC5	C7	D6
						C8	D7

Sources: survey

TC= transport choice, CD=Cost of doing business, (two dependent variables). PI=Public investment (both old and new roads in the location) X_1, RM=Road maintenance X_2, EN=Environment X_3 and RC=road connectivity X_4, (four independent variables), C1-C8 measures costs of transport (DV) and D1-D7, pricing of transport (IVs for transport choice).

3.5.1 Justification for population and sample size

Markets play an important role in Africa especially for smallholders, which are the main respondents of the study. It is also stated in this work that respondents will be contacted in a marked location. It will also be estimated that in town markets in a particular location there are 200 small traders/holders and 600 for the town market. This is in keeping with some literature that discusses the practice of market segmentation in most African agricultural markets (Tversky & Kahneman, 1973; UNIFEM, 2009; Fafchamps & Gabre-Madhin, 2006), and generally define as a subdivision of a market along some

commonality, similarity, and how market segmentation can determine a set target of customers in a locality. This is a common practice in rural markets in Africa. The population and sample are computed in table 3.4

Table 3.4
Population and sample size

State	***Selected locations***	***Town market****	***Village market****	***Population***	***Questionnaires to be administered***
Adamawa	Borrong		✓	500	150
Adamawa	Madagali	✓		1000	250
Adamawa	Ganye	✓		1000	250
Gombe	Gombe	✓		1000	250
Gombe	Dadinkowa		✓	500	150
Gombe	Ashaka		✓	500	150
Totals	➔			**4,500**	**1200**

Source: Author/Survey.
***The selected box indicates the characteristics (town or village) of the market.

In terms of the target population and the required sample, (Luce, 1963; Krajcie and Morgan, 1970), a population size of 4,500 requires a sample size of 354 respondents. Furthermore, as suggested by Neumann, that for small populations (under 1,000), the researcher needs a large sampling ratio (about 30 percent). For example, a sample size of about 300 is required for a high degree of accuracy (Neuman, 2007). The actual administration of questionnaires is shown in table 3.4. The analysis of distribution and questionnaires returned is shown below:

Questionnaires distributed	1200
Questionnaires returned	1000
Questionnaires fully completed	612

In Nigeria, the response rate is between 45 - 79.9% (Adomi, Ayo & Nakpodia, 2007). The total number used analysis is 612 questionnaires, about 83 percentage response rate achieved.

The Small medium enterprises (SMEs), are the backbone of the economy in high-income countries but are also important for less developed in low-income countries. In Sub-Saharan (SSA) Africa, SMEs account for 60 percent of the GDP and these enterprises account for almost 60% of private sector employment. (Adesanya, 2010; Bose, Haque, & Osborn, 2007; Osuji, 2013) The figure varies with each economy. Suppose a trader travels to the south west location from the northeast location. It takes about 2-days, including other factor of the road, the degree of uncertainty increases as a result of travel time, thus the process of identifying the alternative is cumbersome. If the 'elimination by aspects' method is chosen as the model, the individual trader will seek to eliminate all the options not having an expected given attribute, that is the appropriateness of the option with different attributes, until only one option remains, which to him maximizes utility. From the perspectives of discrete choice modelling, an individual makes a choice from a range of available discrete alternatives. Thus both SMEs (including smallholders in terms of agricultural and non-agricultural activity) choose a particular travel mode or motor vehicle from available alternatives, from a range of a discrete choice model (from multinomial logit model), which impose the criterion of the availability of potential option that allows access based on defined constraints:

i. Transport price

ii. The need to arrive based on a schedule set by an individual may not be met by road conditions and other factors

iii. Type of Mode used (land, air, or water)

iv. Risk factors on the roads–armed robbery, crisis along a road location, accidents etc

The sample for the study is 612, thus the rule of thumb for a discrete choice analysis is the advise against using a smaller sample; that is that smaller sample less than 500 observations (Long, (1999).

3.6 Dependent and Explanatory Variables

The dependent variables are the Transport choice (TC) and cost of doing business (CDB). Transport choice defines the decision process of individuals in utility maximization. It defined both by choice of mode, and treated as discrete variable because an individual transport choice depends either a choice of route A,B,C, and such option follows the independence from irrelevant alternatives (IIA) - whether A or B is better should not be changed by the availability of another option, say C. Long and Freese (2006), noted that IIA assumption often provides conflicting results. Dependent variable I is influenced by 1- 4 explanatory variables, which affects individual choices of routes or transport modes. Transport Choice has four alternatives j (j=1, 2, 3 and 4). Choice of trunk roads A, B and C, depended on the conditions of the roads.

Data for computing Cost of doing business is from monthly transport cost (measured in Nigerian currency). Cost of doing business is the second dependent variable. Since the choice set is made up trunk A, B, C, the choice is limited due to

location of the individual, either located within the highways, state or local roads. This influences their choice in terms of cost. Cost of doing business is the costs involved in the operation business, given the budget constraints**.** A budget constraint represents all the combinations of goods and services that a consumer may purchase given current prices within given income. In this study, the desire to access some location depends on the availability of a means to reach the given location by road type or transportation mode. The World Bank definition for cost of doing business in seen as 'ease of doing business'. All constraints, either in the bureaucratic bottlenecks in regulating business permits, supervisory agents for new projects, required fees for payments of permits, and inferior materials used for road construction that affects quality of road conditions are some of the issues defined by the World Bank Database that affects generally, the cost of transactions.

The explanatory variables are public investment *(x_1);* new roads for providing options to various locations, Road maintenance *(x_2)* defines and affects the travel time (speed), road connectivity *(x_3)* defines which option to link another road. In corridor designations, it is a gateway to other locations, especially to facilitate trade. Environment defines terrains (geography of transport) *(x_4);* it also defines policies that affect the ease of doing business.

In the discrete choice model, the analysis is not the same as in ordinary least analysis. Where y (dependent variable) - a discrete variable, which equals to 1 if the individual accepts an alternative and) if an individual declines (this is typically a binary choice), where, X – a set of explanatory variables; β the vector of unknown coefficient to be estimated; F, function, transforming a set real number into [0, 1]. However, in a

multinomial distribution we consider a random variable y_i that may take one of several discrete values, which we index 1; 2;....., j. In the example the response is travel modes or determining best connections to a location use and it takes discrete values and between a polytomous response variable and a set of regressor variables. The term multinomial logit model includes, in a broad sense, a variety of models.

3.7 Multinomial Logit Model (MNLM) (model I)

The demand for transport and its related features depended on the probabilistic response or dependent variable; which is typically discrete and it often has the structure of a binomial, or more generally, a multinomial variable. The log odds of the outcomes are modeled as a linear combination of the predictor variables. Generalized logit and conditional logit models are used to model consumer choices. The multinomial logit model is seen as relevant case of a generalized model for utility maximization. Multinomial logit models are used to model relationships between a polytomous (more than two distinct categories) response variable and a set of regressor variables. According to (Luce, 1958), probabilistic choice models, including the multinomial logit model, have roots in a macroeconomic model (consumer behaviour) in which the decision maker has to make some effort in order to implement any desired outcome. McFadden, 1974 showed that the probabilistic choice model is closely related to the multinomial logit model because it can be obtained from the concept of utility comparison, which is captured in many consumer choices, the revealed preference for instance, where individuals' utility are maximized from choosing alternatives. The Random Utility Theory postulate that utility is a latent construct that exists in the mind

of the consumer's mind and cannot be observed directly and usually shown thus, $\cup_{ij}=\times'_{ij}\beta+\in_{ij}$ and $\times_{ij}$ will only include attributes corresponding to the j^{th} options. The discrete choice, according to Long (1997), is based on the individual's choice of outcomes that maximizes the utility gained from the choice, such that:

Pr (y_i=1) =P ($\mu_{i1} > \mu_{i2}$), ultimately,

= Pr ($\mu_{i1} + \varepsilon_{i1} > \mu_{i2} + \varepsilon_{i2}$)

= Pr ($\epsilon_{i1} + \epsilon_{i2} > \mu_{i2} - \mu_{i1}$) defining where there are j choices and the probabilities of a choice, x_i (transport modes or types of roads) that defines both travel time and cost.

The multinomial logit (MNL) model is widely used in discrete choice models due to its closed-form choice probabilities and its consistency with the random utility maximization (RUM). The generalization to more than two alternatives is referred to as Multinomial Logit Model, shows each response probabilities, and the estimation of probabilities, $\times_{ij}$ of each observation based of the decisions of individuals. According to Ben-Akira (1999), the MNL is drived from the assumptions that the error terms of the utility functions are independent and identically Gumbel. In modeling the multinomial logit model we assume that the log-odds of each response follow a linear model – that what we need is only *j-1* equations to describe a variable with j response categories. It can also be written in terms of the original probabilities p_{ij}. This has been explained in many pages of this work, especially in sections for estimating the formulation of MNL. However, the MNL model suffers from restrictive independence from irrelevant alternatives (IIA) property, which states that the ratio of two choice probabilities is independent of the other alternatives in the model even when a new alternative is

introduced in the choice set. An individual is assumed to have preferences defined over a set of alternatives. The alternatives in this case relates to options related to choice of modes and travel time dictated by the length of the road by kilometres (j=1, 2,3,4).

The main reason for the choice of this model is the cost element that is involved in choice (transport) which effects SMEs's profitability and economic performance of the region. The uncertainty element has to do with possibilities of reaching destination due to several factors – risks, travel time and connectivity/accessibility (from trunk C roads to a trunk A, or B).

Assumptions of MNL formulation:

1. The first assumption is that the random components of the utilities of the different alternatives are independently and identically distributed (IID).
2. The second assumption of the MNL model is that it maintains the homogeneity in responsiveness to attributes of alternatives across individuals (*i.e.*, an assumption of response homogeneity).
3. The third assumption of the MNL model is that the error variance-covariance structure of the alternatives is identical across individuals (*i.e.*, an assumption of error variance-covariance homogeneity).

These assumptions define mutual exclusiveness of alternatives with same variance-covariance, and identical error covariance of alternatives across individuals may not be appropriate if the extent of substitutability among alternatives differs across individuals.

Individual traders and other travellers are affected by four factors $\times_{i,}$ [public investment, road maintenance, environment, connectivity]. The use of standard linear regression model such as:

$Y_i = \beta_0 + \beta_1 \boldsymbol{X_i} + \varepsilon_i$ which correlates the discrete choice y_i with the explanatory variables x_i does not lead to a satisfactory model because this model produces both undefined probabilities and negative variances (see Greene, 2008). The probabilities that an individual will choose an alternative j given by explanatory variable $\times_i$ is:

$$\Pr(y_i = j | x_i = \frac{\exp(\beta_{0,j} + \beta_{1.j}\mathbf{x_i})}{\sum_{j=1}^{4} \exp(\beta_{0,j} + \beta_{1,j}\boldsymbol{x_i})} \qquad (1)$$

Where x_i is a 1 x (k_x+1) matrix of explanatory variables including the elements 1 to model the intercept β_j is a (k+1) dimensional parameter vector, which is the multinomial logit model (MNLM). This study has four explanatory variables. To show the case of four explanatory variables (K_x=4) the equation is (1) can be written as:

$$Pr(y = j|x_i) = \frac{exp\left(\boldsymbol{\beta'}_j\ \boldsymbol{x_i}\right)}{\sum_{j=1}^{j} exp\left(\boldsymbol{\beta'}_j \boldsymbol{x_i}\right)}$$

$$= \frac{\mathrm{Exp}(\ \beta_{0,j} + \beta_{1,j}\ x_{i1} + \beta_{2,j}x_{i2} + \beta_{3,j}x_{i3} + \beta_{4,j}x_{i4}\ )}{\sum_{j=1}^{4} \exp\left(\beta 0_{,j} + \beta_{1,j}x_{i1} + \beta_{2,j}x_{i2}\beta_{3,j}x_{i2} + \beta_{3,j}x_{i3+\beta_{4,j}}x_{i4}\right)} \qquad (2)$$

X, $\beta = x_i$, vector of characteristics specific to the jth individual, and β_j is a vector of coefficients respectively.

The multinomial logit model shows each response probabilities showing the k=4 once we know the probabilities for j=1 ...j

Note that the choice of an individual is motivated by the cost elements (even though this is shown in many aspects – travel time, available and functional routes (roads), including transport modes).

3.7.1 Multinomial logit as a probability Model

In a typical discrete choice model, the probability that a person chooses a particular alternative, with the probability expressed as a function of observed variables that relate to both the alternatives and the person is central. Most times such alternatives may be few alternatives, say two (binary), but such alternatives may be more than two (polychromous); this is a multinomial choice models. In its general form, the probability that person *n* chooses alternative *i* is expressed as:

$$P_{ni} \equiv Prob(\text{Person n chooses alternative i}) = G\left(x_{ni,}x_{nj}\,\forall_j \neq i, s_{n.}\,\beta\right),$$

Where:

x_{ni} is a vector of attributes of alternative j faced by person *in*, [this can also occur or that it helps the individual in making choices because they choice is described by its attributes]

$x_{nj,}$ is a vector of attributes of the other alternatives (other than *i*) faced by person *n*, because an individual can choose from a choice set or options.

x_n, is a vector of characteristics of person *n*, and β is a set of parameters giving the effects of variables on probabilities, which are estimated statistically.

The choice probabilities are assumed to satisfy two requirements:

(i). Choice probabilities are nonnegative (constant) and sum to 1

(ii). Choice probabilities depend only on the measured characteristics of alternatives and individual characteristics.

To ensure that the probabilities are nonnegative, we take the exponential of $x^{\beta j}$; exp ($x^{\beta j}$) and the sum ($\sum$) as it applies. To examine constraints as a result of the non-zero definition (assuming that we set β=0 as normal distribution – which may be violated), β

is the measurement parameter of the variables, and adding the constraint (β=0), the probability equation is:

$$\Pr(y_i = j|x_i = \frac{\exp(\mathbf{x_i}\beta_j)}{\sum_{j=1}^{j}\exp(x_i\beta_j)}, \quad \text{we have already defined } \beta=0 \qquad (3)$$

Since exp ($\boldsymbol{x}_i\beta_j) = 1$, the model is commonly written as:

$$\Pr(y_i = j|x_i) = \frac{1}{1+\sum_{j=2}^{j}\exp(x_i\beta_i)} \qquad (4)$$

$$\Pr(y_i|x_i) = \frac{\exp(\boldsymbol{x_i\beta_j})}{1+\sum_{j=2}^{j}\exp(x_i\beta_j)} \qquad for\ J\ , 1, \ldots ,4 \qquad (5)$$

Equations 3-5 lay a theoretical foundation of the multinomial logit model and its probabilistic considerations. The logit model is simply a log ratio of the probability of choosing a mode to the probability of not choosing a mode.

To apply, given that there exist four (public investment, road maintenance, Road connectivity and the environment) the explanatory variables defined as:

i. The probability of investments in new roads that creates a high degree of access,

ii. Existing roads but there exists the need for road maintenance that affects travel time and cost,

iii. The good road linkage between trunk A, B, C that enables individuals to reach desired locations and to lessen the cost of connectivity (in terms of prices) and,

iv. Conditions where an individual can make decisions that are constrained by the terrain of the location.

The Equation 5 can be rewritten (noting that an individual is faced with four different options that affect the Transport choice as:

$$\Pr(y=j|x_i) = \sum_{j=i}^{j} \exp(\beta'_j x_i) = \frac{\exp(\beta_{0,i}+\beta_1 x_{i1}+\beta_{2,j}x_{i2}+\beta_{3,j}x_{i3}+\beta_{4,j}x_{i4}}{1+\sum_{j=1}^{4}\exp(\beta_{0,j}+\beta_{1,j}x_{i1}+\beta_{2,j}x_{i,2}+\beta_{3,j}x+\beta_{4,j}x_{i4}} \quad (6)$$

for j >1

3.8 Estimation of Multinomial logit model

Estimation of this model can be done through the Maximum Likelihood Estimation (MLE). The method provides estimates of the model's parameters. It estimates the product of the probabilities of the chosen alternative given the conditions of the binary independence (individual preferences) criterion : $\Pr(y_i = j|x_i) = \frac{\exp(x_i\beta_i)}{\sum_{j=1}^{j}\exp(x_i\ \beta_j)}$ – this defines both the individual preferences and the measurement parameters of the *βs* given the options defined by *js* (1-4), the MLE: The probability of observing y_i = j, given the x_i with the parameters β_i, *Pr* is the probability of a choice, and if the observations are independent, the likelihood equation is written as:

$$l(\theta) = (\beta_1 \dots\dots\dots\dots \beta_j) = \prod_{i=1}^{n} Pr \quad (7)$$

Where θ is model parameter, β measurement parameter to the jth option.

$$l(\theta) = \prod_{i=1}^{n}\prod_{j=1}^{4}\Pr(yi = j|xi) = \frac{\exp(xi\beta i)}{\sum_{j=1}^{j}\exp(xi\beta i)} \quad (8)$$

Where, θ summarizes the model parameters and individual preferences. The right side of this equation 8 introduces the Pr value in equation 7 – the probability equation. Generally, the maximum-likelihood estimation provides estimates for the model's parameters. To measure any change in the probability, it is dependent on observing the

probability equation Pr ($y_{i=}j|x_i$). The value of the marginal effects depends on the values of the predictors and the coefficient of each outcome (Long, (1997).

In the computation and interpretation of coefficients, some researchers use different methods apart from examining MLE. The goal of the model is to find values for the parameters (coefficients) that maximize value of the likelihood function in estimating the MNL parameters (βs). Apart from the results of the regression and multinomial computations, marginal effects are also considered to observe changes $\frac{dy}{dx} = \frac{\Delta y}{\Delta x}$ The importance of this is to examine changes in the predictors that affects the dependant variable. However must researchers, and infact, the nature of this study, is to transform to odds ratios or relative–risk ratios – to examine the relative risks of various locations using A,B,C as a point of navigation. The odds ratios or relative –risk ratio of choosing alternative j rather than alternative 1 which is given by:

$$\frac{\Pr(y_i=j)}{\Pr(y_i=1)} = \exp(\boldsymbol{x_i}'\boldsymbol{\beta_i}) \quad \text{..... (9)}$$

Thus $e\beta^{ir}$ (the proportionate change) – the relative risk of choosing alternative j rather than alternative 1, when the predictor (x_{ir})changes by one unit of measurement.

Road choice in the North-eastern region of Nigeria has been a crisis prone routes since the days of the Maitasine uprising that spread to most northern towns (Omede, A. J. 2012; Suleiman and Gabdo, 2013; Abdulraheem, 2013). The choice of transportation routes has been a concern for the population in various locations in the region. In this study, the computation of marginal effects will be applied to observe changes that occur, either as a result of crisis or cost of transportation, to measure what triggers such changes.

In the travel decisions, some choices may be associated with waiting time for each option, this defines travel time and cost. According to Long, 1997, the coefficients for a variable are the same for each outcome, but the values of the variables differ from each outcome – it is explained in the effect of time, but the amount of time may differ by the type of transport mode, for instance a private car and a commercial bus given that such roads are not maintenance, requiring higher travel time.

3.9 Estimating cost of doing business (Continuous Variable) II

Cost of doing business is the ease (or otherwise) in doing business on various aspects – legal requirements (setting of business required by regulatory bodies), financing the business, environment of business like aspects of security, and other factors that doesn't encourage entrepreneurship growth. This is also the difficulties that occur in doing business. In Nigeria for instance, factors of access to finance and security, gender issues etc, in doing business has been factors in the forefront that have impeded cost of doing business. Examining Table 2.4 and 2.5(a) of the ranking of regions of the world on doing business database by World Bank/IFC of this study had been stated that some of the contributing factors to high transaction cost is the weakness in the business environment by the regulatory authorities. On table 2.5(b), specific details of Nigerian data have been shown on this aspect. In this study, the four independent variables, public investments, road maintenance, road connectivity and environment (which define the geography of transport) are seen as factors influencing the cost structure of businesses in Nigeria. This has been explained in several segments of this work.

For a variable that can take on any of a range of value(s), cost of doing business, is assessed using the ordinary least square method. The main motivation is to examine the effects of the explanatory variables, which are cost of transport related and its impact on the cost of doing business in Nigeria. The General model is shown thus:

$y = \beta_1 + \beta_2 + \beta_2 x_2 + \beta_3 x_3 + \ldots\ldots\ldots\ldots + \beta_K x_k + \in$ (12)

y, is the dependent variable, in this case cost of doing business which is related to explanatory variables $x_2,\ x_3 \ldots \ldots x_k$ and the $\beta_2, \beta_3 \ldots \ldots \beta_k$ are the unknown coefficnets corresponding to the explainatory variables, with β_1 as the intercept. $\in$ is the random error term. This helps us to develop a model to be used in assessing the degree of effects of the explanatory variable on cost of doing business in Nigeria.

We formulate a simple equation model thus:

$y = \beta_0 + \beta_1 PI + \beta_2 RM + \beta_3 RC + \beta_4 EN + \in$ (13)

PI = public investment, RM=road maintenance, RC= road connectivity and EN= Environment.

The operations of Classical linear regression model (CLRM) results must satisfy critical assumptions. Since the application of classical linear regression analysis, to be totally valid, requires that so many assumptions are satisfied, it follows that the testing of these assumptions is a critical part of any such analysis. Some of these assumptions of the CLRM are:

(i) $E(\epsilon_i) = 0$. Errors have zero mean

(ii) Var (ϵ_i)= $\sigma^2 < \infty$. The variance of the error term is constant and finite over all value of x_i

(iii) $\text{Cov}(\epsilon_i, \epsilon_j) = 0$. The error term is statistically independent of one another.

(iv) $\text{Cov}(\epsilon_i, x_i) = 0$. There is no relationship between the error and the corresponding (x) and,

(v) $\in_{i\sim} N(0, \sigma^2)$. ϵ_i, is normally distributed.

In the event of a violation of these assumptions, the model results into any combination(s) of the three problems. (i). It could lead to a state where the coefficients estimates (β_s) are biased, meaning that the estimated coefficient of $\hat{\beta} \neq \beta$, (ii). the associated standard errors are biased. As a result the hypothesis test becomes invalid, and (iii). the distribution that were assumed for the test statistics are inappropriate. These violations are the reasons for the diagnostic tests in the regression model – heteroskedasticity, multicollinearity etc. Measurement error in the observation of the independent variables x_i, would lead to biased estimates of the regression coefficients if the classical regression model were used. The justification for using the OLS model is due to the nature of the data, which is continuous (monthly cost of transportation).

CHAPTER FOUR
RESULTS AND DISCUSSIONS

4.1 Introduction

The empirical analysis chapter of this study is focused on the use of multinomial logit (MNL) regression and the linear regression, the ordinary least square model (OLS). It follows the main concern of this study; to examine factors that affect individual travel behaviour, especially road/route choice, and cost of doing business in Nigeria. The data source for MNL is primary and shows trunk roads (A,B,C) types, and different terrains (in Kilometres). It is important because route choice depend on preferred locations where the frequency (see descriptive statistics) of use is low compared to the route used for day-to-day travels to different locations. The scope of locations includes roads in Adamawa and Gombe (and parts of Borno state) in the North-East Geopolitical zone of Nigeria. Data used for regression analysis include: types of business, product type, cost and profit margins, frequent expenditure: all determinants of cost of doing business in Nigeria.

Chapter four is structured into sections 4.1 – 4.10. Sections 4.1- 4.3 are the introduction, descriptive statistics and a survey of instruments used for this study. Section 4.4 is the model fit for transport choice (Model I). Subsection 4.4.1 is the IIA assumption. Section 4.5 – 4.6 examines multinomial logit model and the marginal effects (ME), while section 4.7 is the section for the analysis of control variables estimation (demographic variables, age, gender etc). Section 4.8 is devoted to the ordinary regression model (CLRM). Subsections 4.81 - 4.84 are mainly diagnostic statistics (model fit for regression model, multicollinearity and collinearity tests, and

heteroskedasticity). Section 4.7 and 4.8 are the computations and discussions of Cost of Doing Business (CDB). Subsections 4.9.1 – 4.9.5 is examining the independent variables (model II) in relations to cost of doing business, and finally section 4.10, the summary of chapter 4.

4.2 Descriptive and Diagnostic statistics

Table 4.1
Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Share of Category(ies) (Percentage)	Total (%)	Min	Max
Gender	612	1.57	0.49		100	1	2
Age	612	34.0	9.80	Age range:17-40=43% 41-68=57%	100	17	68
Location	612	1.50	0.50	Adamawa 51% Gombe 49%	100	1	2
Type of business	612	1.60	0.58	Agricbus 44% Petty trade 51.1% Proces/manu 4.9%	100	1	3
Years of experience	612	1.86	0.83	1-5yrs=42.4% 6-10=28.4% >10yrs=29.1%	100	1	3
Product type	612	1.79	0.85	Agric related 48.9% Clothes 23.4% Minimart 27.8%	100	1	3
Product location (KLM)	612	1.55	0.75	50-100 = 60.9% 101-300= 23.0% >400= 16%	100	1	3
Monthly profits (in Nigerian currency Naira)	612	2.26	1.12	3000-10000 = 31.5% 11000-15000=31% 16000-25000=15.4% >26000 =21.4%	100	1	4

Source: computation output

Variable	Obs.	Mean	Std. Dev.	Share of Category (ies) (Percentage)	Total (%)	Min	Max
Monthly Cost (exp) (Naira)	612	2.01	0.84	5000-10000=35% 100001-15000=31% 16000-25000=28.9% >16000 = 36.1%			
Frequent expenditure	612	1.47	0.68	Transport cost=63.6% Household expenses = 5.7% Others = 10.8%	100	1	3
Cost determination (Prices).	612	2.20	0.93	Petrol prices=30.1% Bad roads= 23.5% Petrol+ roads= 41.2% Others = 4.9%	100	1	4
Location choice (weather)	612	1.66	0.81	High prices= 55.1% Low prices = 23.2% No effects = 21.7%	100	1	3
Network of roads (ABC)	612	1.18	0.38	Use trunk roads= 81.5% Use other roads=18.5%	100	1	2
Terrain roads (klm ,VMT)	612	1.56	0.89	150-249= 64.5% 250-449=21.9% 450-500=6.5% >501=27.8	100	1	4
Seasonal price changes	612	1.07	0.26	Yes seasonal prices=93.5% No, seasonal prices = 7.5%	100	1	2
General price trends (transport cost)	612	1.06	0.24	Yes =93.8% No =6.2%	100	1	2
Road pricing (policies that affect prices)	612	3.81	1.82	Significant= 70.4 No = 29.6	100	1	2

Variable	Obs.	Mean	Std. Dev.	Share of Category(ies) (Percentage)	Total (%)	Min	Max
Rood maintenance	612	2.48	0.67	Mean value of likert scale(5)	100	1	5
Road connections	612	1.74	1.74	Mean value of likert scale(5)	100	1	5
Public Investments (roads)	612	3.73	1.32	Mean value of Likert scale (5)	100	1	5
Environmental factors	612	2.15	0.48	Mean value of Likert scale (5)	100	1	5
Average transport (daily)	612	4089.39	7925.81	Amounts ranging from N100 -N90,000	100	100	90,000
Monthly transport [3] (DV2) Cost	612	15679.15	25954.09	Amounts spent range from N3,000 – N360,000	100	300	360,000
Daily transport routes[4] (DV1)	612	(0.84)*		Highways= 10.9 % State roads= 29.6 % Local roads = 24.2 % Highways & local roads=35.3%	100	1	4
Preferred routes locations[5]	612	(1.03)*[6]		Highways = 40.85% State roads = 27.12% Local roads = 32.03	100	1	3

[3] Transport per month: monthly transport cost use in the regression analysis (model)

[4] Routes use for daily travel needs (MNL model)

[5] Preferred routes that an individual could have chosen because these routes are better maintained than other road in a location.

[6] Mean values in parenthesis for daily transport routes and preferred routes are for discrete variables which are not used, percentages in routes types show the preference of road choice as in daily and preferred routes.

Table 4.1 is essentially a descriptive statistics used to describe the basic features of the data and captures the two models used in this study – transport choice, discrete choice modelling using the MNL for analysis, also the cost of doing business, a continuous variable and values in Nigeria's local currency (Naira): the regression analysis will be used mainly to assess the cost of doing business to support the main objective of this study, to examine the current state of Nigerian road transport and the cost of doing business. As shown on the table (4.1), mean values are deliberately excluded and shown by (*) to indicate that these values are discrete (in category) and are used in transport choice. In both cases (daily routes and prefer routes), the measurements show that there are within 1 standard deviation of the measurement (with the distribution of percentages for highways, state roads and local roads. State and local roads are roads daily used by most Nigerian. These roads form the geatest percentage of daily used routes. However, local roads are neglected in terms of maintenance if one compare these roads to highways. Highways are mostly located far away from most rural dwellers. Urban settlers, big towns (in terms of population) and cities are familiar and use highways. There are however some Nigerians that are located close to highways and can use these roads, when compared to total percentages (100%), there are only 35 percentages for those who are located within the local government roads and can access highways. If we examine the percentage of state roads and the proximity to highways, this is highier (highway 10.9 and state roads 29.6 = 40.5) will mean that state roads have highier opportunities to access highways than for the local government roads.The argument is that most state roads cooperate with the federal govenment through the monthly remittance meetings (council of states and the federal executive council) to states for new projects

(including new roads). Also that states and the Federal governments have common powers in the constitution (the Concurent list in the constitution)[7]. The preference level of roads is shown below (Figure 4.1).

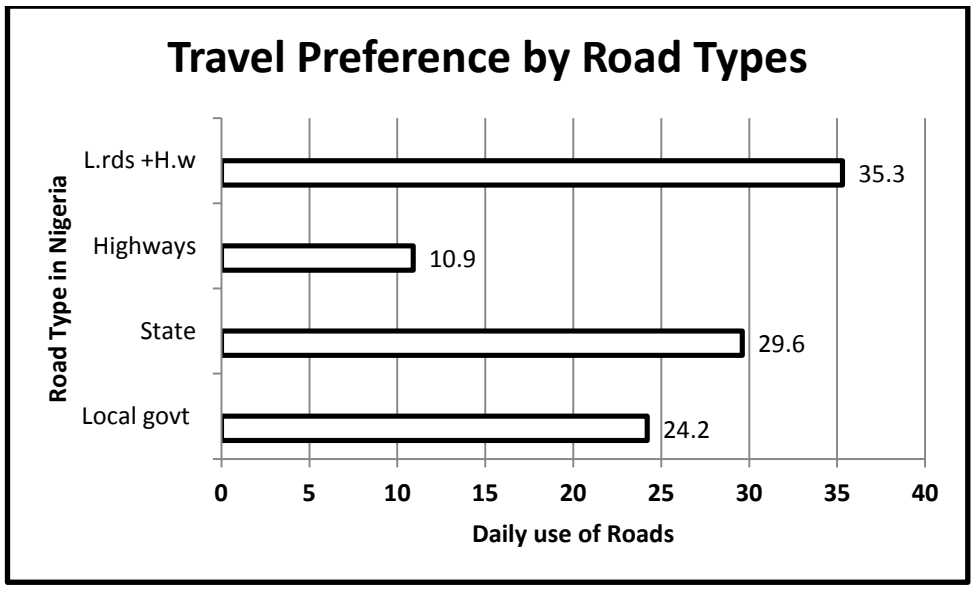


Figure 4.1
Route choice
Source: Author's survey

Note: Compared with table 4.2 a.b (daily, preferred transport)
L.rds + H.w = local roads and highways.

According to Akinola, S. R. (2003), 79% of farmers walk to their workplace using bad roads. This case is made most unpleasant when it includes the transportation of their farm products. Table 4.1 shows the daily roads used and preferred location, when compared; it shows that individuals preference for highways (40.85% but what they use for travel needs for highways is only 10.95%), meaning that in their location, individuals can access the use of highways up to

[7] Concurrent list in the constitutions = both the federal and state governments have powers concerning legislation on some fiscal matters (revenue and expenditure powers).

10.95 percent. If given the opportunity, individuals would choose to use highways (4.85). Their preference is due to the fact that highways are maintained periodically when compared to state roads. Most the data used fall within the range of 2-3, and a standard deviation within 05-1, which might be looked at as good, except for the cost of average and monthly transport costs which are continuous variables (measured in Nigerian currency). The dispersion does not show extreme values.

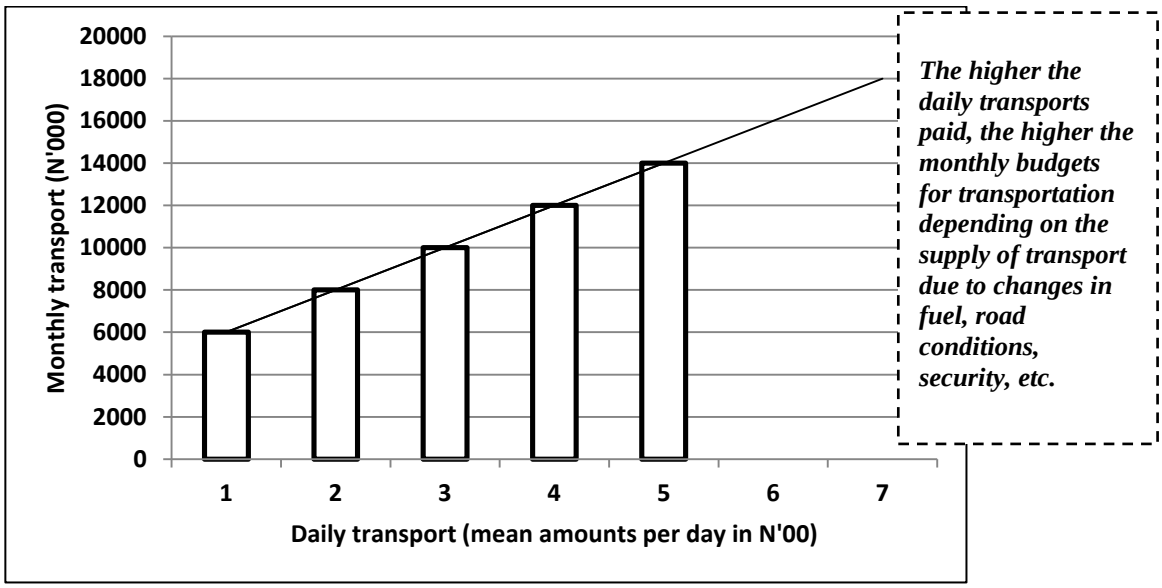


Figure 4.2
Cost of doing business data Adamawa & Gombe
Source: survey results
(Transport cost in sampled locations: Adamawa and Gombe states)

Figure 4.2 transport cost (the mean amount per day for a month due to variation in daily transport expenses) from the two locations (with same terrain); cost of doing business depend on the variation of daily transport cost. The fluctuation in daily transport cost may be due to various factors – petrol price increase, peculiarities of

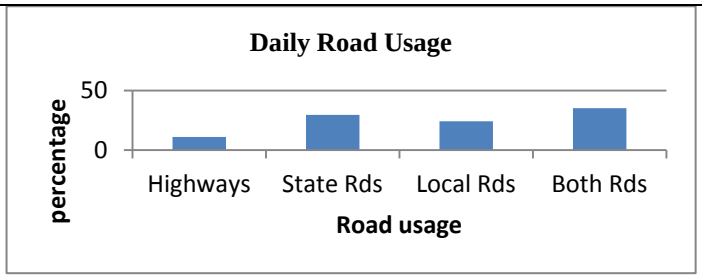
some roads and many other factors in Adamawa and Gombe in relation to the overall cost of doing business (CDB_T1). The higher the amounts paid daily for transport, the higher the amounts paid monthly as shown on the upward trend in the Figure 4.1. This is important because it shows again that, in both locations, there are similarities road in conditions. Average transport is measured in the Nigerian Naira. It is the average transport cost or expenditure spent on transport monthly. Thus we observe average transport is only used by small traders, to compute two types of costs – transport for bus fares and cost of transporting goods bought for resell. This is not used in the analysis.

In the first model of this study, the transport choice - the model of the discrete choice, it studies roads choice amongst the trunk roads A,B,C based on data collected in the two locations – Adamawa and Gombe states. It is shown in table 4.2A,B, and based on table 4.2AB, subsequent data is used to compute the multinomial logit model, given the that the dependent variable is transport choice with four predictors. The choice process is based on several factors, ranging from alternatives available, attributes and the budget constraint. Locat_choice (location choice) here is defined as the initial point for choosing transport mode. Location choice may arise due to increasing population and urban expansion that generates increased transportation congestion and residential location (due rising housing prices). These factors are responsible for choosing a location for individual travel needs and the proximity from the residential location. Netwk_rds (Network roads) is the choice based on road network that determine cost minimizing options for individuals. This factor has been responsible to travel constraints in Nigeria due to a

particular road condition. Terrain_rd (Terrain road) is the condition of a road based on the effects of weather on particular road. Trans_price (Transport price) is the cost of consuming transport services by individuals. These factors determine preference of individuals in road choice as shown in Tables (4.2A,B).

Table 4.2A
Questionnaire: Daily transport route (TC_2)
(What type of road do you use most times in your daily transport?)

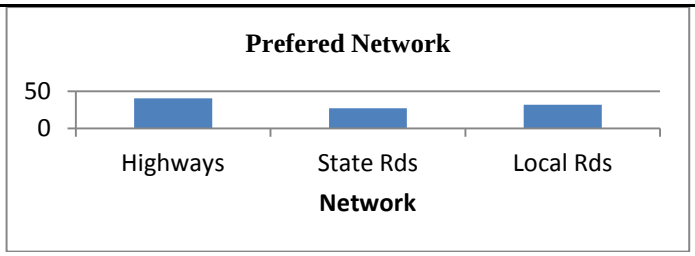
Trunk A,B,C	**Frequency**	**Percent**	**Cumulative Percent**
Highways	67	10.9	10.9
State roads	181	29.6	40.5
local government roads	148	24.2	64.7
Highways and local roads	216	35.3	
Total	612	100	



Sources: Survey data

Table 4.2B
Questionnaire: Preferred Routes (TC_1)
(Which type of road location do you prefer in your location?)

Trunk A,B,C	Frequency	Percent	Cumulative Percent
Highways 1-4 roads	250	40.8	40.8
State roads 5-8	166	27.1	68.8
Local government roads 9-12	196	32.1	100
Totals	612	100	



Sources: Survey data

Descriptive statistics captures the features of the data and the diagnostics is done to 'align' the data to eradicate data that is extreme that influence basic parameters of the model and in most cases makes the overall model redundant. According to Long (1997), when the model is 'null' or an 'empty' model, model with no predictors, especially for parameters of different variables measures including the F-statistics that measure the overall 'health' of the model – including other measures of fit statistics.

4.3 Overview of instruments of analysis

We have stated that this study will make use of two methods of analysis:

i The Multinomial logit model (MNL) and,

ii The Regression model (CLRM).

The need to use these models was due to the nature of data and analysis. The use of the multinomial logit model is done to evaluate the cost of transport arising from utility maximizing behavior of individuals in choosing from a choice set of alternative travel routes in Nigeria, especially in the location of the study area. The multinomial logit (MNL) is most commonly used to explain and to predict discrete options. The model is preferred because it uses utility theory, it is convenient and applicable. MNL expresses the probability that a particular option chosen is the exponent of the utility of the chosen option divided by the exponent of the sum of all alternatives chosen. When logistic regression is calculated, the regression coefficient β_1 is the estimated increase in the log odds of the outcome per unit increase in the value of the exposure (Szumilas, 2010). The larger the probability, the better the chances of its occurrence. According the elementary probability theory, the nearer an event is approaching 1, the greater the probability of its occurrence, and more, the use of log odds gives a wider range to maneuver outcomes such that Odds ratio (OR) =1 exposure does not affect odds of outcome, OR>1 exposure associated with higher odds of outcome and OR<1 exposure associated with lower odds of outcome.

4.4 Overall Model Fit for transport choice

The overall fit for this model is performed to ascertain the 'health' of the model for all categories – both the dependent (Transport choice) and predictors (Location choice, network roads, terrain and transport price ranging from a p-value at 5 percent to 10 percent as shown table 4.3a. Other Tests, including the Wald test, for combining dependent categories and comparing with the output of the multinomial

Table 4.3(A)
*Testing Categories of choices**

Categories Tested	**Chi^2**	**Df**	**P-value**
Highways	19.74	4	0.001
State Roads	15.15	4	0.004
Local government Roads	10.93	4	0.027
Both state roads and highways	14.42	4	0.006
Both local roads and highways	12.14	4	0.016

Number of observations = 612
*1 The basis for making the choice of type of routes
Sources: survey

logit which defines the iterations, the log likelihood of the "null" or empty model (no predictors), is also ascertained; it is the log likelihood of the fitted model.

Table 4.3(B)
Model fit information

Model	**Log likelihood**	**Chi-Square**	**Df**	**Significance**
Intercept only	646.855			
Final	646.855	33.44	4	0.001

Number of obs: 612

The LR Chi^2 (8) test (Table 4.3b) both the choices, which in this case are significant from the table. The likelihood ratio chi-square of 33.44 with a p-value < 0.0001 shows that the model as a whole model fits significantly.

4.4.1 IIA Assumption of Multinomial Logit model

The IIA assumption requires that if a new alternative becomes available, the probabilities for the prior choice must adjust in precisely the amount necessary to retain the original odds. Meaning that for IIA condition to be satisfied, odds ratio 1 divided by odds ratio 2 should equal one(1) that is $\left(\frac{1}{2} \div \frac{1}{2} = 1\right)$, and if IIA is not satisfied when $\left(\frac{1}{2} \div \frac{1}{4} \neq 1\right)$. So if the H_o probability is equal to 1 (for logit model) the IIA assumptions hold, but it is violated the probability for H_1 not equal to 1. Most times, the argument or the area of conflict is that: the ratio of any two alternatives is "entirely" unaffected by the systematic utilities of any other alternatives. This has introduced an unrealistic and restricted conditionality in choice. In Africa there are many conditions for individual's choices between transport modes that have implications for completing the trip alive. According to Leon and Miguel, (2011), such cases of choice cannot be applied to the IIA characterization because it deals with issues of life and death. For example, the case for transporting a woman in labour with the only available means of transport, a horse or donkey. This may look extreme, but it is a reality in most African rural and city slums. The problems of IIA have been always shown in the instance of the red and blue buses, the colour factor. Orme and Comb-Orme (2009) stated that this property is an appropriate model if the systematic component of utility accounts for heterogeneity across individuals. This is not obtainable in both the so called developed and underdeveloped economies, but more in developing countries with a glaring underdevelopment index and, in real life accounting for heterogeneity across

individual seems to be an uphill task or impossible. The most commonly used tests are the Hausman and MacFadden, and Small and Hsiao (Cheng and Long, (2007). The main difference in the tests is the difference in the approach in the use of likelihood ratio test – comparing the Log-likelihood equation from the so called restricted estimation obtained and the full model. Small and Hsiao test findings was that likelihood ratio test seems to be asymmetrically biased, thus the alternative ratio test – Small and Hsiao test to eliminate the biased toward accepting the null hypothesis. It can be demonstrated using the full model in MNL

$$P_r(y = m|x) = \frac{\mathbf{exp}\ (\times \boldsymbol{\beta_m})}{\sum_{j=1}^{j} \mathbf{exp}\ (\times \boldsymbol{\beta_j})} \text{ for m=1,.....,J}$$

where:

The vector β_m defines coefficient (βs) in the model to include the intercept β_{0m} And other measurement parameters used for estimation, $(\beta_{k\ldots\ldots\ldots}, \beta_K)'$. To identify the model we assume that $\beta_1 = 0$. Note that x= vector of K and m is an outcome for a given **x.** Since we have some alternatives measured from a choice set, the condition of the new alternative introduced depend on the outcome to determine the IIA. This is the IIA property. The Small and Hsiao's was modified from the MacFadden's. This is supported by Long and Freese, (2006), which argued that this (IIA) tests often provides conflicting results, "some tests rejected null while others do not".

Below is a typical test for Hausman's test for IIA assumption. Note that this is only generated output using stata software for the data used for this study. It is only a simple example output shown below:

Sample: Hausman test.(typical stata output for this data)

*** *Hausman tests for IIA assumption*

Ho: Odds (Outcome-J v's Outcome –K) are independent of other alternatives

In the case of the multinomial logit model, the IIA implies that adding another alternative or changing the characteristics of a third alternative must not affect the relative odds between the two alternatives considered. The IIA assumption is not violated in this case. However, given the conditions obtainable in the locations, the IIA appears restrictive due to sequence of choices available. They argued further that the MNL works best when the alternatives are dissimilar and not just substitutes for one another. MacFadden (1974) also, argued that the assumption would be violated if it involves the choice of transportation mode, the classical examples of buses that are distinguished by colour or generally for dissimilar alternatives.

Below are the significant tests, performed with the Wald's test for independent variables. It is also a pointer to the arguments of some rejection of the null and other acceptance.

Table 4.4 (A)
Wald tests for independent variables and test for IIA assumptions
(State Roads)

Predictor	**Chi^2**	**t-statistics**	**Df**	**p-value**
Location choice	2.620	-1.61	2	0.270
Network roads	11.456	-2.07	2	0.003
Terrain roads	11.127	-3.16	2	0.004
Transport price	2.080	1.11	2	0.353
Constant	5.353	2.15	2	0.069

Table 4.4 (B)
Local Government roads

Predictor	**Chi^2**	**t-statistics**	**Df**	**p-value**
Location choice	2.62	-0.82	2	0.270
Network roads	11.46	-0.19	2	0.003**
Terrain roads	11.13	-0.15	2	0.004**
Transport price	2.08	1.29	2	0.353
Constant	0.27	1.62	2	0.105

Source: Output of analysis

Wald tests for independent variables. Ho: All coefficient associated with given variable(s) are = 0.

Test Locat_choice = Netwk_rds

[Highways]Locat_choice - [highways]Netwk_rds = 0

chi2(1) = 1.10
Prob > chi2 = 0.2938

*(*Wald test is used to evaluate the statistical significance of each coefficient (β), model coefficients). *As noted by Long & Freese, 2006, the LR test and Wald tests are similar, difference on borderline cases. The Wald test works by testing that the parameters of interest are simultaneously equal to zero (Bruin J, 2006, 2011)*

Table 4.4A, B, shows the t-statistics and level of significance of predictors. Five of the independent variables, some are seen not to be significant (p-value). If a subset of decision alternatives is irrelevant, it can be omitted from the sample without changing the remaining parameters systematically (Hausman and McFadden, 1984). The decision of this study is not to omit any vital sample from the population, but to treat this property as not relevant. That the omission of any variables according to Hair et al (2010), depends on the importance of the variable in the model. This is also the decision of this study because the data is based on perceptions of individuals.

4.5 Multinomial Logit Estimation (Model I)

Estimating the model involves a whole range of considerations, it includes assumptions of the model - assumption that the log-odds of each response follow a linear model system of standard interpretation of the multinomial logit is that for a unit change in the predictor variable, the logit of outcome (*m)* relative to the referent group (highways) is expected to change by its respective parameter estimate given the variables in the model are held constant. The individual making the choice is more likely to choose alternative *j* than alternative 1 and vary with the base category in a pair wise manner (or the base group). For instance, a one unit increase in terrain leads to a (-0.424, Table 4.5(A) decrease in relative log odds (comparing access and travel time considerations) in the choice of a better route (highway) relative to state routes versus local roads. The interest however, in using the multinomial marginal effects for interpreting the findings is based on the facts that we are observing unit

change (the unit of measurement, say kilometers) not comparing the relatives between the roads. The change in the probability may eventually dictate choice behaviour. Also that the exponential beta coefficient represents the change in the odds (the ratio of an individual's choice) of the dependent variable being in a particular category in relation to the reference category, associated with a one unit change of the corresponding independent variable. In the marginal effect is to determine by how much probability of an event will change given the change in a conditional factor (explanatory variable).

Table 4.5(A)
Multinomial Logit Estimates of Transport Choice

Explanatory Variables	Highways (A) Y=1 (Base outcome)	P-Value	State Roads (B) Y=2	P-Value	Local Government Roads (C) Y=3	P-Value
	Coefficient		**Coefficient**		**Coefficient**	
Location Choice	.132	0.305	-.212	0.164	-.101	0.412
	(.129)		(.132)		(.124)	
Network Roads	**.171*** **	**0.006**	-.564	0.496	**-.881*** **	**0.001**
	(.062)		(.272)		**(.276)**	
Terrain Roads	**-.424** **	**0.048**	**-415*** **	**0.001**	-0514	0.881
	(.123)		**(.131)**		(.013)	
Transport Price	-.0262	0.720	.0618	0.269	0.068	0.197
	(.0731)		(.056)		(.053)	
Constant	.1480	0.700	**1005** **	**0.032**	.730	0.105
	(.3835)		(.468)		(.450)	

- Sources: Survey output
- Standard error in parentheses
- A,B,C trunk road definition in Nigeria (Federal Ministry of Works)
- *p<0.1, ** p<0.05, *** p<0.001

Our objective is to assess this change in terms of the probability that affects choice and travel behaviour in various locations, given the variables estimated. This is the justification for using marginal effects. We show the multinomial logit estimates for transport choice, table 4.5(A) as a basis for estimating our marginal effect, which determines the effects of the predictors on transport choice.

Highways are preferred because these roads are maintained by the federal budgets unlike state roads and local government roads. Since highways are the base category, interpreting choices are based on alternatives available (highways in relations to other roads). Therefore, individual preferences for state roads or local government roads are examined in relation to highways - the most preferred in terms of achieving the desired travel time, even though accessing preferred routes are relatively difficult with location of individual commuter.

4.6 Multinomial Marginal effects

A requirement of this study is to compute marginal effect. This is important to determine the effect of a unit change in the value of some attributes, transport price, terrain, etc. Several changes had occurred in Nigeria over the years, especially the familiar fuel subsidy that 'without warning' had affected the transport price. This affects the choice of mode or route to a desired location. Studies by various researchers on the trends in transport prices in Nigeria show how travel decisions are determined due to the percentage increase in transport related issues. In the 10 years of democratic government in Nigeria, the case of petroleum price changes in Nigeria had existed. Some of the problems associated with transport price fluctuations are in the policies on fuel prices and related matters. Marginal effects are used to show the probabilities of choice and rate of increase/decrease. It is thus important to examine or predict all outcomes, the marginal change in all outcomes. Using the predictors of $x_1, x_{2,} x_{3,} x_4$ (the predictors) and $P_r(y = 2): P_r(y = 1)$, $P_r(y = 3): (P_r(y = 1)$, always referring the base category, Y=1. This is essentially an examination of

change in each outcome (A, B, C), also seen as the various probability outcomes in relation to location choice, network, terrain and transport price. Marginal effects in Multinomial logit (MNL) analysis can be performed to measure firstly the effect of change as a result of a unit change: $\frac{\partial p_{ij}}{\partial x_i} = p_{ij}(\beta_j - \hat{\beta}_i)$, Where the estimated $\hat{\beta}_i = \sum_l p_{il}\,\beta_l$ is the probability of weighted average of β_l and the marginal effects vary with the point of computation of any one predictor because P_{ij} varies with the predictor (x_i), the marginal effect is positive if $\beta_j > \hat{\beta}_i$. Thus, β_j is the marginal change in log odds with respect to X_i. Also, due to the risks on some roads in the North-East geopolitical roads, from Yola to parts of Maiduguri (trunk A roads) to either roads from Yola to Gombe (trunk A roads) or from Gombe to Yola and vice versa on state roads, travels around these roads have high risk to travelers (the location of the kidnapped Nigerian girls in April, 2014), thus high preference is made due to the risks involve (see appendix for maps of roads in the region).

In Nigeria changes in travel decisions, are immediately noticed with a change in mode or as the results of fuel price change or some peculiarities in the road conditions. Marginal effects show the change in probability when the predictor or independent variable increases (decrease) by one unit. Nigeria has features of changes of travel plans as a result of some of the factors mentioned in the table above (4.5A). Choices can also be in relations to types of vehicles used or as a result of changes in road conditions. The discussion of results in Table 4.5B would be based on the changes in probabilities as a result of a unit increase (decrease) in estimated variables.

Table 4.5 (B)
Marginal effects of outcome probabilities for choice of road networks

Explanatory Variables	Highways (A) (Y=1) (Δy/Δx)	P-Value	State roads (B) Y=2 (Δy/Δx)	P-Value	Local government (C) Y=3 (Δy/Δx)	P-Value
Location Choice	.0367 (.0258)	0.155	-.0329 (.0236)	0.164	-0039 (.0246)	0.876
Network roads	**.1783*** (.539)**	**0.001**	-.0346 (.0508)	0.496	**.1438** (.5685)**	**0.011**
Terrain roads	**.0476 (.0229)**	**0.038****	**-.0800*** (.235)**	**0.001**	.0324 (.0211)	0.124
Transport price	-.0158 (.0110)	0.150	.0062 (.0100)	0.538	-0097 (.0107)	0.363

Source: Survey data output

- All variables are in category (categorical variables)
- Standard Error in parentheses
- A, B, C trunk road definition in Nigeria (Federal Ministry of Works).
- * p<0.1, ** p<0.05, *** p<0.001
- Note: demographic control variables on table 4.5B

(a). Network of roads show access to the different types of roads (A,B,C). A change could increase or decrease access. Units can be measured in kilometers or cost of fuel required. It is estimated that a one unit change in the probability of individuals to choose highways for instance may result. This means that individuals are able to access their preferred roads (as in table 4.2a). The significance of network of roads with an outcome (0.1783***) indicates that a one unit change in kilometers, an increases by 0.1783 results, meaning that the probability of an individual to access to

other networks than routes in their locations increased. Higher probability of access allows individuals to change their travel behaviour (plan) (due to unrestricted access) as a result. In terms of petrol required per kilometer, if 250 naira is required for instance, with the increased access, this can result to higher distance covered with less petrol required. We formulate an equation for cost required for every kilometer, $y = 0.539+0.1783(250) = 179.32$ Naira for instance. It means that higher access lessens the time required and cost is reduced from 250 Naira to 179.32 Naira, since only 179.32 naira is required to cover equivalent distance. We note that the change (increase) is statistically significant at 95 percentage chance to cause a change in travel behaviour over time. Some of the factors that may be responsible are:

(i). Opening up new feeder roads by the federal government that link some communities, resulting from increase in public investment in new roads or high routine maintenance for old roads executed by Federal road Maintenance Agency (FERMA). In rural Nigeria, motorcycles, mass transit buses (government low price transport), can bring about a change in the travel behaviour as a result of higher access.

(ii). Increased security on the roads may also be responsible for increased access on road networks. The issue of security on Nigeria roads has been some of the difficulties experienced; also a factor in determining prices of goods due to high premium charged by insurance companies and transportation related companies in transporting goods to some part of Nigeria, and for individuals, choosing alternative roads (without security constraints) to reach various economic activities and social needs.

(iii). Increased security personnel in some locations due to increased insurgency in Nigeria, especially in northern Nigeria, has increased security challenges. Recently due to an increased cooperation with African Union forces in Nigeria, commuters can now access some roads in Nigeria. According to Anyadike, issues of national security had affected the economic life of people in Nigeria (Anyadike, 2013).

Opening new roads and maintenance on existing roads has impact on individual's ability to travel with little constraints. This has affected cost of doing business, such that cost of doing falls. In some locations however, gains in higher access (increased networks), had been neutralized by increase crisis and insurgent (Boko Haram) activities.

(b). Terrain Roads: These are constraints in transportation as a result of weather or other road conditions resulting from seasonal changes, growing global warming that caused floods and effects roads. Terrain affects various aspects of transportation system – travel time, security on roads and value of some goods in transit (perishable items like agricultural goods, medications needed for urgent treatments in rural Nigeria with lack of access). The estimates on Table (4.5B) shows that a unit changes in the terrain, increases by 0.0476 the probability of travel time due to road conditions or risks as a result of longer travel time required at any time because it affects roads. Increase in the probability means that the likelihood or chances of accessing routes becomes lower with each increase. As flooding of roads increases, the ability of buses or other vehicles that used these roads becomes lower (traffic lower). These changes are significant (5 percent), it may be because vital road

connection (a bridge) that link a community collapsed due high rainfall, a supply route that goes a location that is crises-ridden or goes through insurgents location. This will significantly affect travel behaviour of individuals. For instance, a journey by roads from Numan (Yola) to Gombe is 275 kilometers (see map in appendix II) and takes 3 hours ceteris peribus. Sometimes due to heavy rainfall, the bridge over river Benue at Numan or erosions on roads along Numan - Gombe result in delays due to traffic and the heavy police check due to increasing risks on the roads. More time is required by this increase (.0476*3) which approximately increased by 15 minutes. The inconvenience of waiting time is sometimes dangerous because some locations may be far from human settlements (in the bush). As opined by NEPAD and FAO (2006), during rainy season roads are impassable in most locations in the North. Also, Aoav and Nwgay, 2013; Levinson and Kanchi, 2002, noted that most roads in the North east are violent roads. Thus travel speed affects the share of time an individual allocates to daily activities. Terrain roads answer the third objective of this study: to assess accessibility considerations and factors related to the geography of transport, travel choice and the cost of doing business.

Terrain roads estimated shows (-.0800***) for state roads. A one unit change in terrain (change in conditions of roads on the state roads), decreases by -.0880 the probability of using state roads than highways which are far from most local locations. The significance of this is the fact that most residents mostly use these roads for their daily travels; a slight change on these roads is immediately noticed. There are however federal government assisted-roads projects which are maintained in these locations that improve transport needs for populace. However, over the years

up to end of 2011- early 2012, Nigerians benefited from the subsidy of petroleum products, and according to various views, the subsidy issue was a ‘mirage’ because transport price seems to be kept low, but very erratic due to changes in government polices related to the transport sector. Coupled with these shortages that are artificial, Omisore, (2014), observed that marketers target prices in the border market because such prices are beneficial to most marketers. A study by Dorosh & Schmidt (2012), showed that travel time on Nigerian roads affects crop productivity (-0.020***), “longer travel time discourages the adoption of high-input/high yield crop production”. In the northern Nigeria, dry season farmers, the yield of inputs is very low in Dadinkowa, a place in Gombe where some questionnaires were administered. For smallholders (traders), travel time discourages farm work and the transportation of fresh farm produce to Gombe and parts of Adamawa due to longer travel time. The terrain is also a factor that determines the travel time and higher cost of transport. Terrain in this study defines seasonal changes due to extreme weather in a season. In the rainy season, the roads are damaged due to rains; in the dry season temperature can go up to 48^0 F in most northern towns, Yola, Kano, Sokoto, this affects vehicle cooling and condition of the vehicle. These conditions bring about a change in response to terrain related to road travel due to conditions of bridges and some features of the road which are made worse during the season (rainy) (see Figure 2.4). The vehicle travel time is made worst by the road terrain, especially state roads and local roads that have near-zero maintenance due to fiscal problems, if the conditions are made ‘unmotorable’ this will increase the probability of using routes on the highways (A) by 0.476 (5%) compared to the state and local

government road routes ceteris paribus. Road conditions, including the transport price are an important determinant of transport cost in the northeast geopolitical zone. We have already said that the conditions of Nigerian roads determine maintenance cost of vehicles, transport price and high volatility on the roads; this in turn dictates the travel behaviour of consumers of road services. The World Bank, reported by the Economist, 2014, graphically showed with a caption, "driving to an early grave" gives a grim picture that even though road users paid the high transport cost, the safety of an individual is grave. Figure 4.3 below shows that " Poor and middle-income ones will see crashes match HIV/AIDS as a cause of death by 2030" These conditions exist on our roads and have strengthened one of the problem statement of this study, that low investment in roads has been responsible for low stock of infrastructure (roads) in Nigeria. The positions of the World Health Organization (WHO) showed that industrialized countries and some emerging economies are investing in roads that are safer that may prevent deaths on our roads.

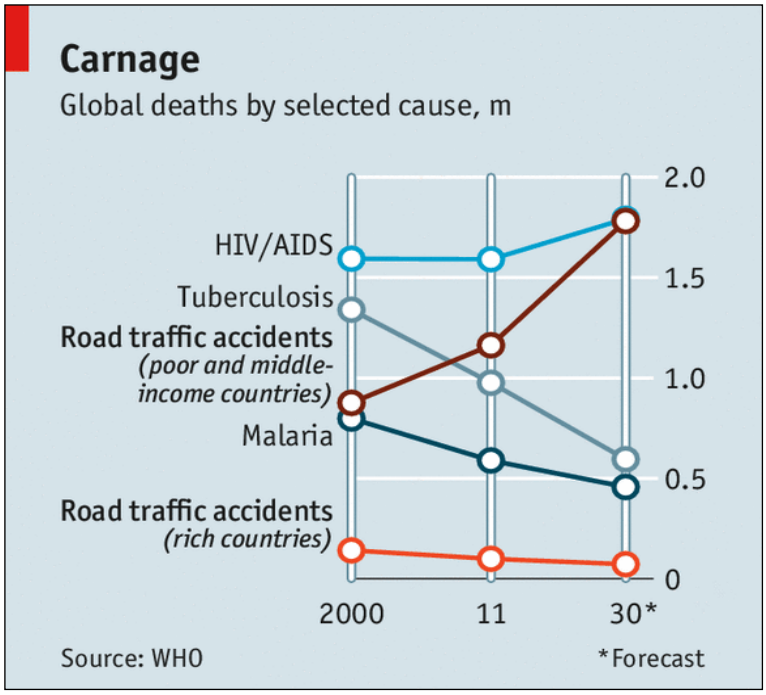


Figure 4.3
Driving to an early grave

Apart from the fact that congestions are experienced in most world cities, it affirms the theory of Urban sprawl, which results due to growing population and induced transport demand present in all countries.

4.7 Demographic Control variables and ME of transport choice

We set four dummy variables to observe discrete change for dummy variable (s) as controls. This action is to observe changes in the marginal effects. We show marginal effects results incorporating control variables in table 4.5C.

From the results on table 4.5C, there only minor changes in the results from Table 4.5B. The fall in transport price is not significant to warrant increase access to some locations.

Table 4.5 (C)
ME of outcome probabilities and Dummy (control variables)

Explanatory Variables	Highways (A) (Y=1) (Δy/Δx)	P-Value	State Roads (B) Y=2 (Δy/Δx)	P-Value	Local Government (C) Y=3 (Δy/Δx)	P-Value
Location Choice	.0367 (.0258)	0.155	-.0329 (.0236)	0.164	-0039 (.0246)	0.876
Network roads	**.1783*** (.539)**	**0.001**	-.0346 (.0508)	0.496	**.1438** (.5685)**	**0.011**
Terrain roads	**.0476** (.0229)**	**0.038**	**-.0800*** (.235)**	**0.001**	.0324 (.0211)	0.124
Transport price	-.0158 (.0110)	0.150	.0062 (.0100)	0.538	-0097 (.0107)	0.363
#Age	-.0028 (.0022)	0.201	.0005 (.0018)	0.766	.0022 (.0020)	0.266
#Gender	0.656 (.0425)	0.123	.0177 (.0374)	0.636	**-.0834** (.0411)**	**0.043**
#Location of Business	**-.1252*** (.0431)**	**0.004**	**.0966** (.0380)**	**0.011**	.0286 (.0402)	0.477
#Type of business#	.0096 (-.0444)	0.829	.3292 (.0390)	0.399	-.0233 (.0412)	0.572

Sources: Survey data
- Standard Error in parentheses
*p<0.1, ** p<0.05, *** p<0.001
Demographic (dummies) control variables

Basically, the results in Table 4.5(A) and Table 4.5 (C) are the same. However, lower half of table 4.5 (C) show some interesting features in gender and location of business. Gender defines sex of the respondent, abilities in managing their business and significance in a location (in terms of providing small services despite cost constraints and travel to where they can obtain supplies). It shows that in the local village locations, the role of gender in providing retail services is significant even though there are constraints in transportation generally. Location of business on the other hand, show advantages (in terms of proximity to the source of supply) accrued to small holders due to their location. Note that there are two locations (Gombe and Adamawa states) where respondents were surveyed. In terms of nearness (proximity) to commercial cities of Kano and Jos where to buy goods to resell, Gombe has advantages over Adamawa location in terms of kilometers to such commercial towns. It requires longer travel time for Adamawa than Gombe states. Cost of doing business – transport price, travel time and other logistics, plays an important role for small businesses in terms of the many constraints which adds to the costs of transaction and small profit margins.

4.8 The Regression (Model II)

The second model is to facilitate the computation of Cost of doing business for continuous variable. In the descriptive table (4.1), data used have been examined and described – refer to as monthly transport cost, measured in Naira. The CLRM is of this format:

$$Y = \beta_0 + \sum_{i=1}^{4} \beta_i x_i + u$$

$$= \beta_0 + \beta_1 + \beta_2 x_2 + \cdots + \beta_k x_k + u$$

Where:

Y is the dependent variable (Transport cost, CDB_T1), $x_{1,} x_2, x_3, x_4,$ $are\ k\ independant\ variables,$ β_0 and β_i are the regression coefficients, and this is the true model for all members of the population presenting the model of a specific population, u is the stochastic disturbance-term (error term).

4.8.1 The model fits for the regressed data

In this subsection, we present a model fit for the data used. The overall regression data is a good fit for data as shown in the table below:

Table 4.6
Model fit Information

Item	Present data fit
F (4, 607)	4.64
Prob > F	0.0011
Number of Observation	612
R^2	0.030 = 3%

Source: Survey

Information table 4.6 show that the independent variables statistically significant predict the dependant variable, F (4,607) = 4.64, P < .0011. The regression model is a good fit of the data – Cost of doing business (DV) and the four independent variables. The R^2, however, may be not be good for only 3 percent of the dependent variable was predicted. Cohen (1988) criteria, he defined the statistic power: 2.0 weak/small, 0.3 moderate and 0.35 substantial. It is explained that, for several reasons, this may be due to the data source. In a study of active transportation by Rosenberg et al (2012), suggested that it may be due to cross-sectional results in data collection. This may be due to the fact that this survey was based on the opinion(s) of people about infrastructure (roads) and cost of doing business over the survey period in 2013.

4.8.2 Multicollinearity and Colinearity in the data

Multicollinearity is a cause of concern for reliable estimates because variables highly correlated and basically measuring the same phenomenon. This has significance on the credibility of the model. The variance inflation factor (VIF) is used to measure the impact of collinearity among the variables in the regression. It is found that value of VIF is ≥1. The rule of thumb is when the value of VIF exceeds 10 (table 4.7a) is regarded as indicating severe multicollinearity. Correlation can also be used to detect high collaboration among the variables.

Table 4.7(A)
Testing for Multicollinearity (VIF), and Correlation of Cost of doing business. Multicollinearity check { ≥ 1, VIF ≤ 10}

Variable	**VIF**	$\frac{\mathbf{1}}{\mathbf{VIF}}$
CBD_T1	1.03	0.970246
PI_Invesment	1.23	0.815859
R_Maintenance	1.08	0.926951
RD_Connection	1.27	0.787096
ENV_Factors	1.25	0.797289
Mean VIF	1.17	

Source: Survey
*VIF=9 and Std Error is three times larger if the VIF=1, the coefficient is 3 times as large to be statistically significant (see http://www3.nd.edu/~rwilliam/stats2/11.pdf

Table 4.7(B)
*Correlation Check [1-R2]**

Variable	CBD_T1	PI_investment	R_maintainance	RD_connection	ENV_factors
CBD_T1	1,0000				
PI_Invesment	0.0031 (0.9383)	1,0000			
R_Maintenance	-0.0751* (0.0635)	0.0770* (0.0570)	1,0000		
RD_Connection	0.0888* (0.0280)	-0.3362* (0.0000)	0.1535* (0.0001)	1,0000	
ENV_Factors	0.08864* (0.0326)	-0.3195* (0.0000)	0.1701* (0.0000)	0.3554* (0.0000)	1,0000

Source: Survey
*range from -1 to 1, (-1= negative correlation, 1 +ve perfect correlation, 0 no association). Close to zero, multicollinearity may be a threat (perfect correlation).
- Significance in parentheses starts from ≤ 0.10 percentage and R^2=3.0

4.8.3 Test for Heteroskedasticity

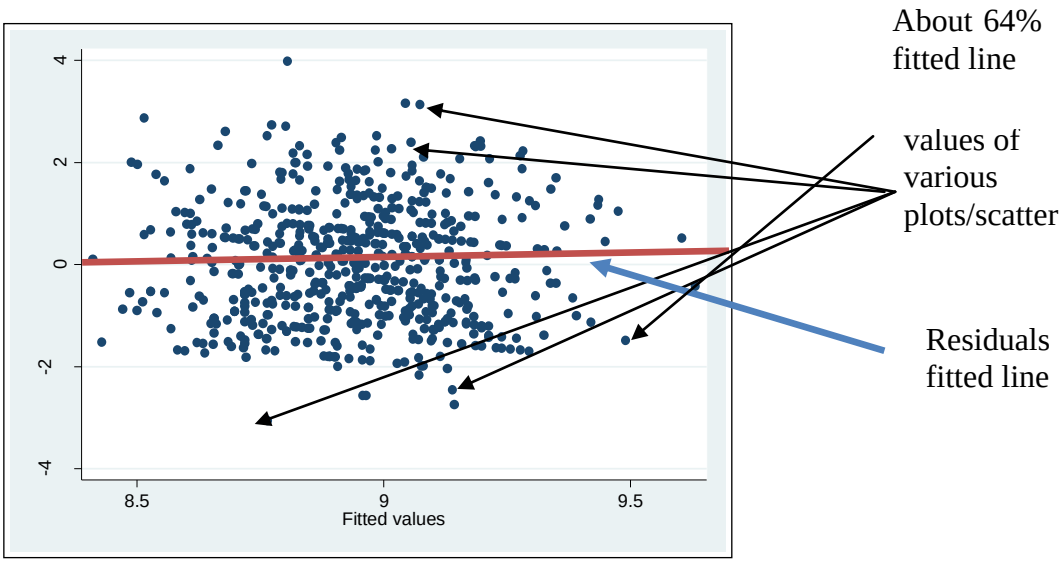


Figure 4.4
Test for Heteroskedasticity

Heteroskedasticity occurs to describe the behaviour of a sample variance and standard deviation. If it is present, then the variance and standard deviation of the variables are not constant over the entire graph of the sample data. The variance of e_i , (Var(ε_i) = σ_i^2) is not a constant and the variance of e_i is greater for some observations than for others. This occurs in violation of one of the assumptions of regression. White's and Breusch-Pagan / Cook-Weisberg test is used in measuring heteroskedasticity shown in table 4.8 (1 and 2). It does not affect consistency but it can lead to wrong inferences.

Table 4.8
White's Test for Heteroskedasticity

Source	Chi^2	df	p-value
Heterosdasticity	10.47	14	0.7271
Skewness	15.75	4	0.0034
Kurtosis	4.39	1	0.0362
Total	**30.67**	**19**	**0.0445**

The probability is not significant, thus it is homoscedastic

2. Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of CDB_T1 (DV model II)

Source	Chi^2	p-value
Heterosdasticity	0.00	0.9860 (not significant)

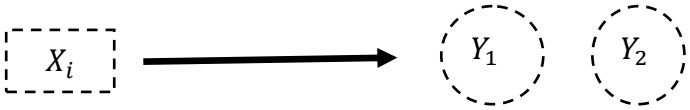
Sources: Survey data

Consider a regression line, $CDB = \beta_0 + \beta_1 + \beta tr + e$, where CDB is the cost of doing business and tr = transport price. Individual choice of mode to use motorcycle, for instance (popular in Nigeria for low income consumers), low scope for choosing type of vehicle, thus if the $Var(e_i)$ is low due income level, it affects choice of type of transportation. This group will always chose low income means of travel (despite risks). For wealthy individuals the choice to use air transport due to travel risk in Nigeria enlarges the choice set, especially locations in the Northeast region (and generally in Northern Nigeria), the $Var(e_i)$ is high. Meaning that class in society dictates the prevalence and definition of a zero choice constraints by income. Sometimes because of necessity (access food and water in distant locations), the IIA assumption may not hold due to zero alternative(s). According to most literature, if

there is no heteroskedasticity, the test statistic should be insignificant (White 1980; Totallis, 2008; Imdadullah, 2013).

4.8.4 Endogeneity/Exogeneity Test

Endogeneity may result due to three main causes: (i). omitted variables - failing to include important control variables when testing the predictive validity of variables (ii) measurement error , measurement error occurs when some constructs cannot be perfectly observed, thus these constructs includes some degree of measurement error and (iii). Simultaneity occurs when two variables simultaneously affect each other, (the so called backward causality). An example of simultaneity is the effects of road accidents and the police or road marshals, each affects each other - increase in accidents affects number of police (road marshals), more policemen (road marshals) affects the number of accidents. It is the main threat to consistency and causal claims. There are a number of methods used including Hausman test for endogeneity and various other methods.



IVs (exogenous) DVs (endogenous)

In a simple model Y=$X\beta + \varepsilon$, there must exist E(X'ε)=0 which shows exogeneity for unbiased estimates of β. The assumption however of E($X'\varepsilon$) = 0 does not hold due to measurement error in X, simultaneous equations , omitted variable in X and other conditions of for dictating endogeniety. The general term for E(X'ε) $\neq$ 0 is endogeneity of the error term ε. Examine a model commuter *n* choice for a choice

set j, $U_{nj} = V(y_{nj}, x_{nj}, \beta_n)$, where y_{nj} is the observed endogenous variable, x_{nj} vector of observed exogenous variables that affect utility from choice set j, β_n, parameter that represents the type of mode or routes (taste of a commuter *n*), and e_{nj} the unobserved utility. The test of endogeneity arises to solve the problem that ϵ_{nj} is not independent of y_{nj} according to standard estimation techniques (Shadish, Cook, and Campbell, 2002; Petrin, A., & Train, K. 2010).

In this section, we will establish relation amongst variables to observed independence in the variables. This important in establishing this is the fact that they able to measure the phenomenon which they are set to - choice behaviour and cost of doing business. We used the structural equation model (SEM) to see the effects of endogeneity by observing the effects of both the IVs and DVs on each other. Even though some elements of the model fit show an acceptable standard – the goodness of fit (GFI), and other fit indices.

Table 4.9
Fit Indices for Measurement Model

Fit Indexed	**This study**	**Recommended Values**	**Sources**
X2	1256.1 (df=34)	≤ 3.00	Bagozzi & yi (1998), Byne (2001)
GFI	.824	≥ 0.90	Chau & Hu (2001), Hair et al, (1998,2010)
AGFI	.804	≥ 0.80	Hau & Hu (2001)
TLI	.620	≥ 0.95	Hu & Bentler (1999).
CFI	.654	≥ 0.95	Bagozzi & yi (1998), Hu & Bentler (1998).
RMSEA	.066	≤ 0.08	Hu & Bentler (1998).

Sources: Survey data
Total observation 612

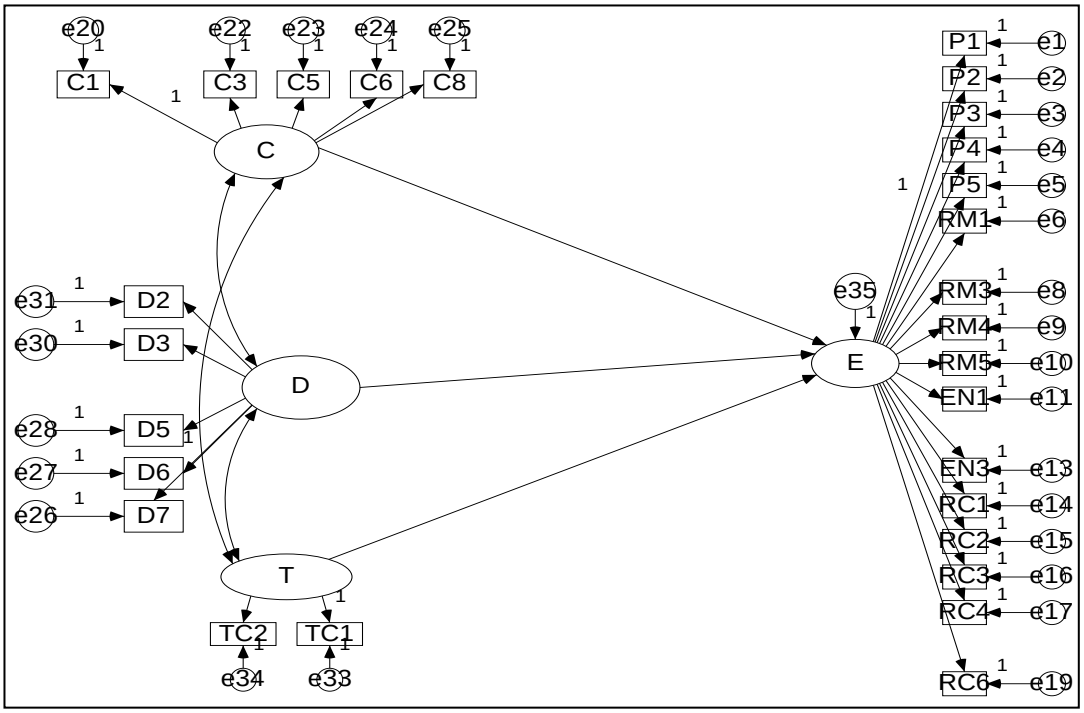


Figure 4.5
SEM for IVs and DVs
Sources: SEM output

The measurement model and the path diagram measure both the independent variables (IVs) and dependant variables (DVs) as shown on figure 4.4. Of interest is the relationship between DVs (2) and IVs. From table 4.10, it shows the relationships between the IVs (E) to DVs (C,D,T). C= cost of doing business, which is one of the DVs and T= transport choice. From this relationship, it shows that the relationship is not significant given the p-values. All relationships are not significant; this indicates that there is no relationship between these variables and are independent estimates.

Table 4.10
Regression Weights for Default Model (TC) and (CDB)

Group*			Estimate	S.E.	C.R.	P-Value
E	<---	**C**	-.001	.160	-.008	.993
E	<---	**D**	-.243	.592	-.410	.682
E	<---	**T**	.000	.001	.140	.888

Sources: Survey Data (612 Obs)
TC= Transport choice, CDB= Cost of doing business
* Exogenous variables (E), endogenous variables (C,D,T)

The objectives of this subsection of the study is to establish and observe lack of association between the endogenous - exogenous which results into endogeneity concerns. There are many studies that used direct methods, examining the structure of relationship of variables (Hicks, 2006), even though there many studies that criticized this method. (Holtz-Eakin, Douglas, Schwartz & Amy, 1994; Evans, Paul & Karras, 1996; Chandra, Amitabh & Thompson, 2000). The use of instrumental variables is another method that employs multiple equations. We found these important but decided for this study to explore relationships that are clearly distinct – two different dependent variables with different data sources and methods of collections, methods of analysis – discrete choice model (multinomial logit model) and OLS for continuous variables as data type. The case of Hausman test for endogeneity, (Espinozza, 2010) showed that education suffers from unobserved ability, that parents may be important in children education. The test showed (observing education as independent variable), that the F-test is significant in child education. This results show the presence of endogeneity. In this study we dictated

lack of significant relationships between both variables. This, to our understanding, may be important in showing absence of endogeneity.

Applying OLS to evaluate Cost of Doing Business is shown in tables 4.11.

Table 4.11
Regression results for Cost of doing business (CDB_T1).

Predictor	Monthly Transport (CBD_T1)	P-value
PI_Investment	0.0192 (0.0388)	0.621
R_Maintainance	-0.138** (0.0686)	0.045
RD_Connect	0.507*** (0.154)	0.001
ENV_factors	- 0.335*** (0.124)	0.007
Constant	8.964*** (0.376)	0.000
No. observations	612	
R^2	3.0	

Source: regression output
-Standard error in parentheses
-* p<0.05, ** p<0.01, *** p<0.001
- CDB_T1= cost of doing business (monthly transport cost)
- T-statistics not included, the values are: PI_1(0.49), R_M(-2.01), RD_C(3.29), ENV(23.86) for monthly transport cost.
- PI= Public investment, R_maintenance=road maintenance, RD_connect=road connectivity, ENV_factors=environmental factors.

4.9 Cost of Doing Business: Model II.

We have stated in different sections of this study that there are various parameters used in measuring of cost of doing business. World Bank data examine cost in terms of ease of doing business; bottlenecks that require time in completing necessary regulatory requirements, measures re quired in the establishment a conducive environment of business etc. The World Bank criteria assessed 185 countries, using different standards, parameters from the regulatory requirement to actual cost of doing business. In this section, however, cost of doing business will be measured using the monthly transport cost (OLS). Monthly transport cost is the total cost of transport price paid in a month. Objectives 1, 2, 4 are answered in this section.

4.9.1 Costs of Doing Business in Adamawa and Gombe States

Public finance theory includes taxation policies, revenue and expenditure of government. The importance of public finance is seen in various levels of development and growth; it defines both the provisions of public investment and in other dimensions. The interventionist arguments are that governments may influence private sector economic activity by subsidies or taxes, or they may exercise direct control over behaviour in the private sector through regulation, is tenable in all economies. For developing economies like Nigeria, these roles are vital in the provision of important infrastructure like roads and other growth-led infrastructure. The ability (inability) of achieving vision 2020 depended on efficient infrastructure and low cost of doing business, resulting from the quality road infrastructure.

Table 4.11 is used in discussing cost of doing business for this section.

4.9.2 Public Investment

Public investment is an important foundation of the economy worldwide; the financial crisis in 2007-2008 had dictated this with the massive interventions (fiscal stimulus) as a result of business failure. In the developing economy, the value of public investment is much more needful. Observing table 4.11, the estimated for public investment (especially roads), shows that, for every additional funds provided for in public investment (for new roads linking communities or markets), kilometer per gallon increases by 0.0192 (it is statistically insignificant), making transportation cost to rise. In another view, additional funds provided for new roads and opening up new roads for communities is not statically significant, meaning that for every 1000 new roads, only (0.0192) or about 2 percentage of the budget is spent (or the inference of individual respondents is that government expenditure is small on roads generally). Considering the number population and communities in Nigeria (774 local government), also the fact quality of new roads cannot be attained with low amount earmarked for this projects (because these projects are capital intensive), this is not enough to increase the stock of roads. Low investment in roads increases cost of doing business because commuters cannot access some locations. In table 1.1, it shows that in the first quarter (1.48%) to the third quarter (1.29%) of 2013 overall amounts earmarked for infrastructure in the budget is low. Considering the fact that Nigeria's transport policy states 90% of all goods are transported by road in Nigeria, this pace cannot be attained the desired low transaction cost resulting from transport

prices. This was also is raised in the problem statement of this study. As shown by the World Bank sponsored study by Foster & Bricenrio-Germandia, (2009); World Bank/Africa diagnostic country fiscal balance, (2008), both confirmed that Nigeria's investment in infrastructure falls short of the required standards to drive growth in the economy, and compare figures (Figure 1.3 and Figures 1.4) in the sub region (SSA). Nigeria fell short of its investments in infrastructure. Dorosh et al, 2011 argued that the level of infrastructure investment in roads in the sub-Saharan region, affects agricultural productivity; it showed that the share of high-input potential production for all crops to be affected by travel time. In Nigeria, this situation results into constraints, especially the lack of access to market by rural farmers who depended on rural roads; where roads are sometimes affected by the conditions (rainy seasons or parts of the Sahara desert in northern Nigeria). Even though there are large amounts of China investments (any other institution doing business in Nigeria), on average, such investments seem to target new urban settlements. There are efforts to open up rural settlements, but this is still on the 'drawing board'. The targeted population is rural Nigeria for many reasons; the bulk of agricultural production and a high percentage of the population lives in the rural Nigeria. Cost of doing business is still high in Nigeria, as a result.

4.9.3 Road Maintenance.

The World Bank reports observed that Africa needs $12 million spent on 'timely' road maintenance in the last decade (from 1994) could have saved $45 billion spent

on reconstruction. Even though this report could have been overtaken by new efforts, the year 1994 has been a classic in issues of infrastructure and development in the global economy and such maintenance disregard has been responsible for the present road conditions in Nigeria. The results of the estimates on table 4.11 shows that for every Naira spent on road maintenance, kilometers per hour decreases by -0.138 and it is statistically significant at 95% level. It may also be the case of maintenance disregard or neglected maintenance of a specific road, meaning that low maintenance cost affects travel time (increases). However, in terms of cost of fuel, it may not be directly linked to level of maintenance (the argument is, travel time depends on the condition of the road (well maintained road). However, cost of fuel determines the value of kilometers travel (VMT). Good roads saves fuel consumption in terms of kilometers covered. Put in another way, for every 100 kilometers covered, travel time decreases by 7-8 percentages due to maintenance may increase the cost of doing business. A study by Rioja, 2001, found that as more is spent on maintenance it reduces the depreciation rate of roads from 0.12 to 0.10 (in terms of the capital expenditure) – examining the change of public capital which he tagged as change in government expenditure. In Nigeria, the agency responsible for road maintenance is federal road maintenance (FERMA). A study by Oke et al (2013) found that, the inefficiency of roads was due to bad maintenance which is associated with the materials in road building. Studies also showed failed roads in Nigeria fail due to lack of maintenance. As opined by Ogwuche, Ibochi and Akinbileje, to achieve efficiency on our roads and to reduce the rate of accidents, it is depend on routine maintenance. The situation is that some communities are sometimes involved in

repair work to increase their access to some roads. Road maintenance has been responsible for various aspects that affect cost, including travel risk on Nigerian roads.

4.9.4 Transport Routes and Corridors Management in Nigeria

Road connectivity is the essence of outsourcing in marketing. It is balancing both economic, environmental, and the goals of the desired travel plan by individuals (Manaugh & Ahmed, 2011), access from one location to another is important in the business world. In corridor theory, it is the gateway to connecting economies and beneficial economic spots. In Northern Nigeria, (including the many countries bordering it), most business sources (sea ports and airports) are in the western and southern Nigeria; it is thus important that the cost does not inhibit business profit resulting from lack of logistics, in terms of road conditions, security and other road features in Nigeria. As depicted on table 4.11, estimates (road connectivity) show for every kilometer gained in accessing preferred location, the ability to access a location is increased by 0.507 of a kilometre. This is statistically significant, meaning that individuals are able to connect to both routes (A,B,C). It also means that (in terms of cost), every gallon of fuel used is decreased by 0.507 units (litres of fuel). This is seen in terms of kilometer access and fall in the cost of fuel per gallon. Ultimately, this affects cost of doing business, a fall for instance. Accessibility defines different characteristics of transport demand, but most of the factors that affect accessibility (apart from environmental factors) is cost. It depends on the actual budget of time and money (cost) that individuals are willing to spend. With

increased connectivity and lower costs of fuel, cost of doing business and other factors are affected. During the fuel subsidy policy of the Nigerian government (up to 2012), cost of transport were supposed to be lower, but during this era, it experienced increased black markets in petrol in every location in Nigeria, especially in the border towns. The profit motive of black marketers and the unstable (erratic) nature of government policy in fuel subsidy resulted in higher cost of doing business for most rural populace. However, most recently, costs have been defined in terms of travel restrictions in most of the northern states due to the crisis; this also has affected cost of doing business. Gains in connectivity are not real because most locations in the region experience crisis and insurgency, this has eroded the gains in connectivity.

4.9.5 The environmental and travel cost

The environmental conditions can be defined as any constraints that affect transportation. This may be physical or costs. Faye et al, (2004), noted that there are challenges facing developing countries, challenges of distances as a result of low stock of roads, such that alternative routes are non-available due to changes in the environment. The estimated coefficient of the environment shows that, for each change in kilometre as a result of the environmental factors, access is decreased by -0.335 units of a kilometre, meaning that a decrease by -0.335 unit of a kilometre results into a travel constraints. This may also mean that a regulatory requirement increasing waiting time to get a permit by -0.335 of a day (in terms of hours of waiting). Some environmental factors may be due to floods, desert conditions, the

rate of connectivity is expensive due to several links to get to a desired area, and it means also that higher transport price is involved. It may also mean that some bottlenecks introduce higher waiting time for regulatory authorities to return an application for business permit for instance. According to Zimring and Johnson, (2007), corruption is responsible for slow economic growth in Nigeria and most of Asia. Weather related constraints are most prevalent in northern Nigeria from desert conditions to crisis which affects transportation. In Yola, travelers using airport sometime around December to February of each year experience lack of visibility due to harmattan/fog, makes landing difficult, so passengers are asked to stop at the airport far away from Yola. Individuals will have to arrange for another transport to Yola. The cost of connectivity increases, as a result.

4.10 Summary

There are available evidences that infrastructure promotes growth of businesses, however, factors that relate to travel constraints in African infrastructure have affected competitiveness in the market place. Cost of doing business and other features have affected the pace of developments. Travel choice over the years has changed individual's travel behaviour in terms of a limited choice set of roads and transportation modes. These constraints (terrain, choice of roads types, and the lingering problem of transport prices amongst others) affected cost of transactions. Other factors that have dictated such choices are the increasing crisis locations in Nigeria, and particularly northeast geopolitical zone. Public investments in new roads and maintenance needed for such services cannot be sustained due to fiscal

problems. Studies show that the coefficients of the measures of travel time (as in Freddy and Doris, 2012), infrastructure stock (Luiz, 2010) and other research, including this study shows Public investment, road maintenance amongst other does not sustained the productivity of roads, thus increasing cost of doing business. Funds by donor agencies/countries like China and others have raised doubts as to the quality of projects due to official bottlenecks and corruptions. This trends does significantly affects cost of doing business overall.

Issues of corruption estimated to cost $148 billion annually represent 25% of Africa's GDP (Ayittey, 2005, p.325). Corruption raises the transaction cost and is responsible for increasing insecurity and uncertainty, and undermines government action (Luiz, 2010). Expenditure on roads have not been prioritize as the springboard to growth in various sectors of the economy and the fact that , development of the so called silk road that encourage trade and cooperation is not made an integral policy issues in the development agenda.

CHAPTER FIVE
CONCLUSION AND POLICY RECOMMENDATIONS

5.1 Introduction

The primary purpose of this study is to examine the current state of Nigerian road transport infrastructure, transportation mode choice and its impacts on the cost of doing business. It is also to evaluate the current state of road infrastructure with the aim of establishing whether or not these conditions affect the travel choice and the overall trends in rising prices in Nigeria. Public policy theories forms the basis of our arguments, and since the variable of interest is public investment (important part of public finance) amongst others, it has been argued why public investment plays a pivotal role in road infrastructure in Nigeria. Most of the reasons have been raised in various literatures. The determination of total government spending depend on fiscal conditions and political, cultural and economic factors (Fan, S., & Rao, N. 2003; Fan S., 2008). Fiscal conditions define the fiscal space for budgets priorities of various government programmes, (Fan, S., Yu, B., & Saurkar, A., 2008). Analysis focused on the role of government in public expenditure on road conditions determined by public expenditure, which affects upward trend in cost of doing business and the efficient policy of transportion, millennium development goals, etc,all aimed at reaching the noble objectives of vision 2020.

Findings amongst others showed that impacts of transport choice generally hinges on travel time, costs and the choice behaviour of individuals faced with limited choices in locations. This was one of the limitations of the IIA assumptions,

which is opined by (Ashenfelter, 2006; León and Miguel, 2013), that IIA is not relevant in a location where there is zero alternative or the alternative is a lesser evil. Related to cost, higher probability in the transportation cost especially in the transport of certain categories of goods and the services bound by time (terrain and environmental factors), have been connected to some variables. For instance, the need to meet up with medical emergencies could be delayed due to road conditions or for small business that need to transport fresh vegetables to a market. Costs are generally results due to difficulty or limited choices that affect supply and price. Cost differentials may arise due to the stock of roads, which is influenced public expenditure on roads. Public investment in the Nigeria is between 6-12 percent gross of the domestic product (GDP) annually on infrastructure (Bricerio-Garmendia et al, 2008; Fan, S, Yu B.; & Saurkar, A, 2008). These conclusions are based on the fact that variables estimated using our tool of analysis (MNL) are alternative specific, showing that factors that affect travel decisions are based on alternatives available. The attributes of these options and the decision rule amongst others, are based on utility of an individual to access a location.

Other important findings in this study is the measurements of road accessibility (networks, road connectivity, environment, etc.) which is responsible for most of Nigeria's low level of agriculture, health needs, especially the (Millennium Development Goals (MDGs), it is essential in measuring progress, and mostly responsible for increased cost of transactions in Nigeria.

5.2 Current state of road infrastructure in Nigeria

The state of road infrastructure in Nigeria has been captured by most literature on African infrastructure deficits. For example, the World Bank report by her agency, Africa Infrastructure Country Diagnostic (AICD), using the Road Network Evaluation Tools (RONET), an organ of sub-Saharan Africa transport policy (SSATP), showed that low investment in infrastructure and fiscal problems (associated with maintenance and new roads), was responsible for the current state of Nigerian roads. Public investment showed that government investment estimated is not sufficient to increase stock of roads especially in the northeast geopolitical zone. This has resulted higher cost of transaction. The situation has been made worse by the low level of maintenance as depicted on Figure 5.1 (see appendix IV). That most of the funds expended for maintenance goes into nonproductive expenses – wages, overheads, and more, so that high level of expenditure indicates that operational inefficiencies are diverting resources away from investments on roads. This result also agrees with Cost of doing business report of the World Bank (see table 2.5A) 2013, 2014, that the supervisory agencies in Nigeria are weak, such that a lower trend on maintenance expenditure requirement as per Road network evaluation tool (RONET) engineering parameters for Nigeria showed this effects. The implications of these are has been made in this study earlier that most of the problems of Nigerian roads is the poor materials used in Nigerian road constructions. As noted by Rioja, (2001), lack of maintenance leads to road deterioration and affects productivity in the agriculture sector and general price rises.

An issue relating to engineering aspects of roads is not the scope of this study, but various literatures have attributed road failure in Nigeria to the materials use. These materials have been responsible for a critical failure of roads in Nigeria - (see report RONET, 2007)[8], road failure is common in Nigeria, except of course for city/urban roads which are routinely maintained.

Findings this study also showed that the current state of road infrastructure is experiencing downward trend because of the level of investment. The estimated funds for public investment shows that, for every increase in public investment, (new roads), such increase is not significant to affects cost of doing business, also that, earmarked amounts for infrastructure in the yearly budget for 2013, indicated that for the first quarter 1.48% to the third quarter if the same period, 1.29% for roads (see table 1.1) is not significant to reverse the current trends. The implications of this state of affairs in Nigerian roads are: (a). Affects connectivity of roads for facilitating the movement of people and goods up to 90 percent by road as proposed in Nigeria's transportation policy, (b).Many communities cannot access network of roads and the achievement of Millennium Development Goals (MDGs) by 2015 is unattainable since most goals cannot be achieved without efficient roads infrastructure (school attendance, accessing medical facilities etc), and the desired goals of vision 2020, which amongst other, the growth of trade, which depended on efficient corridor management, and efficient transportation system in general.

[8] See report RONET, 2008: Sub-Saharan Africa Transport Policy Program, SSATP Working Paper No. 85-A, Road Network Evaluation Tools (RONET), 2008.

5.3 Road infrastructure and its effects on Prices of goods and services

The transport sector is an important facilitator in the functioning of the economy. According to the literature, the relevance of this sector grows with the growth of the economies – with the need of different modes and elements needed to reduce travel time of vehicles (VMT). Increasing low investments in infrastructure in Nigeria, given results of this study and other research suggests that the accessibility to locations in rural Nigeria, and the general travel demand and needs is affected by:-

(i). Low stock of efficient roads is responsible for higher transport cost for most travel needs.

(ii). Road conditions – bad segments affects safety and travel time. This is responsible for increase health conditions and deaths to locations that take long hours to reach health facilities. Examine for example, road conditions from the axis in the northeast geopolitical zone (study era). An examination some road terrains in the location, as per estimated coefficient of terrain shows that increased adverse conditions of terrain has affected travel time, due either to flooding of roads and communities cut-up, or broken bridge has affected transportation. One of the travel terrains (constraint) in the northeast location is the flash point of insurgency in many locations. It showed that a marginal increase in terrain 0.0476 units in the kilometers resulted to low travel time, increased inaccessibility as a result of the worsening effects and constraint in accessibility (see Table 5.2B). Travel time is also affected by increase bad section of roads. (iii). The conditions of roads affect cost of doing business considering travel time required for goods in transit from other part of Nigeria and the cost of transportation affected by conditions of roads.

Ultimately, the transaction costs of most businesses are high, affects profitability and the entrepreneurial environment in Nigeria. This is remotely related to the increasing socioeconomic problems in Nigeria. The ability of individuals to reach market locations has been one of the most important activities for most Nigerians in the drive of building entrepreneurship, because they need to sell their products – hand craft, agricultural goods, small food vendors and services that could be provided by small traders. The ability to gain the benefits from markets depended on the cost of transport, cost of supplies, and logistics.

Cost of transport and Road conditions, on the other hand, affects the noble goals of the Millennium Development Goals (MDGs). The achievements of these goals depended on infrastructure (roads) and efficiency conditions of these roads. Most recently, these goals are use as parameters for achieving a global development strategy especially for developing countries, who lack most basic needs of the population including goods and health facilities.

Cost of doing business has been a major concern in the real sector of Nigeria. Changing trends in logistics and stock dynamics has introduced the need for efficient transportation system to facilitate goods in stock. Considering the location of the study area, given the estimates of results in road maintenance (-0.138) and environment (-0.335), it indicates that lack of maintenance and the environmental conditions of the roads affects cost of doing business. This is also advance by the level of investment of 1.6 percent of the GDP of Nigeria as presented by Feri G (2011). A study undertaken by an independent body undertaken by Ibukun Edu,

2013[9], from May 7 to May 9, with 1,002 randomly picked Nigerians of legal age (≥ 18), across the six geopolitical zones, shows that 71 percent of Nigerians believe that our roads are unsafe. Lack of safety on roads has prevented transporters worldwide to increase insurance premium and cost of transportation (see IRIN report, 2004, http://www.irinnews.org).

5.4 Road infrastructure in the Northeast Geopolitical zone.

North-East geopolitical zone has a high level of unpaved roads, where the study area is located. Increased insecurity on roads in the region, coupled with the adverse geography of the area (terrain roads, cost of transactions are high compared to other regions in Nigeria). The existence of the state of emergency[10] from 2009 in the northeast area by the president of Nigeria had resulted in withholding some parts of the statutory allocation to states in this region. Due to the security alerts, most roads remain unmaintained from 2009-2014. This also means that minor repairs of some roads cannot be done as a result of shortfalls in revenues from the federation accounts and internally generated revenue. Sub national governments are not capable and can be regarded as failed governments at the regional level. The results on the terrain (Marginal effects), maintenance and environment (OLS results) showed that the conditions of roads had depicted these trends (low fiscal remittance to states and increased insurgency) and affected transportation in the locations.

Travel time and high prevalence of risk determine to a large extent the choice of routes by individual travellers on roads in the Northeast geopolitical. Problems

[9] Ibukun Edu (2013) – Http:// telegraphing.com
[10] http://www.foxnews.com/world/2013/05/14/state-emergency-declared-in-nigeria.

associated with road decision by individuals is the fact that small changes immediately trigger higher transport cost, especially for road conditions, conflicts in a place and other factors for instance, the problem of petroleum products that phenomenally caused increase in prices of transport over the years. Changes in route choice, as a result, of deterioration of roads also exist. Most recently, increased risks on roads located in the study area, connected to the widespread news about the missing Nigerian girls in the same location, had increased choice on roads; this had increased arms trafficking and armed robbery in the region in various locations. Risks and longer travel time in the region have been due to roads in the locations with critically failed sections. These conditions have created price differentials with the rest of Nigerian. Transaction cost is high in the region because most access is constrained due to the geography and crisis in the zone.

5.5 Road infrastructure and accessibility

Accessibility in transportation is achieved by the ability of an individual to use particular type of transport. Constraints or challenges occur if an individual cannot access such services due to one reason or another. Most constraints in Nigeria are either the geography of the location or cost (price of transport). The terrain and the environment estimated showed these effects.

Policies of transportation in Nigeria are mostly aimed at providing access to all, but factors that inhibit accessibility are low public investments in roads, which is found in this study (to be low) coupled with various literatures already cited in various chapters of this work. The predictors of transport choice have shown mixed

effects in cost of doing business (terrain, network roads, location and transport price). For instance terrain is has an influence on choice of routes, much more, there are other conditions, which may influence such accessibility – the current crisis in the region. Network road on the other hand, estimates that the probability of an individual to access to other networks than routes in their locations increased (0.1783) due to this change. This may be connected to some new roads built by donors to secure access to some vital mineral exploitation and location of raw materials.

In all, constraints occur either in road choice, available networks (due to crisis), terrains and transport price, building new roads to link communities and other factors. These are the current challenges in contemporary Nigeria, especially in rural Nigeria.

5.6 Implications of transport infrastructure to public finance in Nigeria

Public spending in Nigeria is an important policy instrument for the government, and from research, these instruments are expected to result into an expected large effects on economic growth over time, to raise productivity in the real sector of the economy. Romer (1986) and Barro (1990) both constructed several models that allow for an endogenous positive and long run effects on economic growth. Barro had specifically examined public sector spending that increases the marginal productivity. Barro's results, however, represent a necessary condition of conducting a consistent study of state policies, examining positive effects on long run economic growth. Such framework of policies is laid in Nigeria's NEED's, vision 2020,

several economic transformation agenda and the achievements of the Millennium Development Goals (MDGs), which have been the bedrock for major development potholes prior to the 1986 structural adjust program (SAP). This forms the bulk of government spending. Government drive to meet up the infrastructure spending is captured in the plan by the National Planning Commission as depicted in the Figure 5.2, (Appendix IV). To achieve the required infrastructure need depended on government strong will to make appropriate investments in infrastructure. This also depends on the multidimensional issues of Nigeria – the corruption index and political will to implement this plan, driven by the economic transformation polices enshrined in transport policy and sustainable development agenda of Nigeria. Could these levels of growth be affected by some policies of the government along factors that could change the priorities of government investments in some public goods production, in roads and other vital sectors that may be responsible for desired growth in the private sector, as a result for example? The seminal work of Aschauer, (1989) illustrates the significant relationship between aggregate productivity and stock and flow of government spending variable that; it is expected that public investments in roads and other necessary infrastructure is argued to induce an increase in the rate of returns of private capital, but research and empirical data showed that there exist funding gaps as shown in Figure 5.3 (Appendix IV) for many sub-Saharan countries. The implications of these funding gaps translates to low stock of roads (public investment – PI increase is not significant to affect stock of roads) for new communities and provision for communities that have peculiar barriers/terrain (landlocked locations) that ‘shut out’ many communities in fulfilling

even their civic responsibilities: elections, due to difficult tertian to reach this locations.

Generally, though, the stock 'good' roads (given the infrastructure gap in figure 5.4) - 1.6 % of GDP devoted to infrastructure in Nigeria compared with research carried out by World Bank/Eutache and Goicoechea, (2005) argued that accessibility in terms of the density (road density, the ratio of the length of country's total roads to the country's land area = road-km/1000 people) of roads is low (1.6) if we compare the benchmark of (3.0) (low income countries), (3.3) for sub-Saharan countries, and World average of (5.7) [11]. Travel decisions are constraint given the low density of roads, especially with the 2.5-3 percent growth of the people annually and the desire for Nigeria to join the ranks of industrialized nations by 2020, this is 'tall' task, taking into consideration fiscal problems, increased socioeconomic disorder (increased oil theft, crisis in the oil producing blocs and crisis in many regions of Nigeria, affects budget expectations, social disorder, economic activity, etc). This, in the long run, has implications on the cost of doing business.

5.7 Policy Recommendations and trends of infrastructure in Nigeria

Policy implementation has been the loopholes of Nigeria over the years, coupled with the low fiscal space experienced by Nigeria. Low fiscal space is a concept developed by the operators of medium term expenditure framework (MTEF)[12]. It

[11] World bank/Eutache and Goicoechea, 2005, Bogetic and Fedderke, 2005.(the current estimates for 2013 is slightly upwards due to increase of roads, but Nigeria still needs higher investments in roads up to N600 Bn to meet up vision 2020 according to minister, Federal Min. of Works (Mike Onolememen).

[12] Medium Term Expenditure Framework for Implementing Poverty Reduction Strategies experimented in Nigeria.

was specially developed for implementation of National Economic Empowerment and Development strategy (NEEDS) programme in Nigeria by the World Bank. Fiscal space has to do with the basic economic consideration for budget constraint and the need for preferences in the budget. Thus prioritizing indicates the importance of developmental projects in the fiscal space.

Based on the study's conclusions, we recommend the following:

(i). Project prioritization should be done according to its economic importance rather than political 'point scoring.' Lack of priorities has most times been responsible for defining if the fiscal space that can accommodate a necessary project like roads, which Vision 2020 noted that mobility, logistic and goods movements; road use is 90 percent. Prioritization of needed roads projects is capable of affecting transport price and cost of doing business over time.

(ii). Investment in road infrastructure project should be undertaken based on the location of economic activity, population density and the considerations based on value of statistical life (VSL) which is used in measuring deaths in road related accidents in some locations of roads rather than other considerations like political affiliation and regionalism/geopolitical area.

(iii). Funds provided for road projects (from agencies/countries like China and the donor agencies) should target rural Nigeria, where bulk of agricultural output is provided rather than urban centres as the case in Nigeria.

(iv). The growth of crisis in different locations has been responsible for economic disparities between the North and the south, and a decrease in the economic potentials of the northeast geopolitical zone, for instance oil exploration stopped in

Baga - Chad border, also fishing activities in the Lake Chad reduced coupled with numerous border entry and exits. This trend had resulted into shortage in fish supply and other raw materials. These trends have affected cost of supply of goods across the border to Nigeria, Cameroon, Niger and most countries in North Africa. Cost of doing between business and growing cost/price differentials in various locations in Nigeria. There should be community dialogue to resolve such trouble spots in Nigeria despite the presence of multinational force (Chad, Cameroon, Niger and Nigeria) to bring peace into this sub-region.

(v). The increasing government expenditures in various sectors of the economy increases the need for public-private participation in road projects, which at the moments is between the federal government and states in Nigeria. Private participation is highly a necessity to increase the need for maintenance, a new road project which has been responsible for high transport costs and security concerns in Nigeria.

The modest contribution of this study is the estimation of the contemporary road conditions in Nigeria and its impacts on travel behaviours. Travel behaviour is determined by the probability of choices of individual, either for mode choice or roads as the deciding factors of cost exist. The empirical assessment of road conditions using questionnaires administered in some locations in the North-eastern Nigeria provided data for analysis and findings. The classification of choice and data using the various criteria in transportation literature, defined instruments and assumptions of a particular model applied in estimation. The IIA assumptions, type of conditions of choice are some of the consideration noted in this study. For

instance, this study used the multinomial logit due to number of choices involved. Thus the use of IIA assumption was relevant for this case. However, the assumptions according to literature have a number of constraints. The working of this assumption states that a person's choice between two outcomes is unaffected by what other choices are available, is not applicable in a typical Nigerian rural location where choices are limited and zero alternatives in some cases. Available road stock, the application of Value of statistical life (VSL), which requires that public investment in roads should be based on fatality statistics, is non-existent. The VSL has been used in transportation literature as a basis for providing desire roads in transportation related issues.

The study measured transport choice and cost of doing business using two models. These models were used jointly, first to conclude that constraints exist in transport choice exist, secondly low stock of roads due to various factors that affect public investment, all contributed to transport constraint and high cost of transactions in Nigeria, according to literature and empirical studies showed a number of constraints.

We are aware of the fact that shortfalls in Nigeria's infrastructure remain one of the binding constraints to growth of the economy. The strategy for prioritizing infrastructure investments in the National budgets which remain low over the years should be prioritized. To leverage additional external funding for infrastructure investments in the country is an important avenue for the economy to get desired funding in the midst of competing needs and increased cost of democracy, growing population and the needs of growing new communities in Nigeria.

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