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My Academic Colleagues, the Congregation, and other Staff of our University,

Special Guests, Friends and Well Wishers,

Gentlemen of the Press,

Great AAUA Students,

Distinguished Ladies and Gentlemen.

Preamble

I give glory to God Almighty for sparing my life to witness this day as well as the grace and privilege to present this Inaugural Lecture. To Him also be the Glory and Honour for helping me to reach the pinnacle of my academic career. I thank God Almighty for His immeasurable grace which I enjoyed since I started teaching

at the various levels of educational institutions. Looking back, I say like Apostle Paul in 1 Corinthians, Chapter 15 verse 10: But by the Grace of God I am what I am, and His Grace is not in vain. Left to me, a first degree would have been enough for me to continue with life. But the thought and plans of God were quite different for me because I made it up to the Ph.D. level. I, therefore, appreciate the Almighty God for those whom He used to enable me to get to the peak of my chosen career. As revealed, also, from the Book of Zechariah, Chapter 4: verse 6: It is not by power or might but only by the spirit and grace of God. Thus, I hereby use this opportunity to return all gratitude, glory and adoration to God Almighty for the marvelous things He has done in my life.

Mr. Vice Chancellor, sir, distinguished colleagues, ladies and gentlemen, the desire to expose the contemporary relevance of Geography both as an academic discipline and as a tool for solving social, economic, political and environmental problems prompted me to present this Inaugural Lecture.

I have decided to focus on my significant contributions to knowledge and society in the context of developments in my chosen sub-discipline of Human Geography. I stand here today to present the first Inaugural Lecture in the Department of Geography and Planning Sciences in this University, the first in the specialized and narrow area of Transport Geography, the second in the Faculty of Social and Management Sciences and the tenth in the Inaugural Lecture Series of Adekunle Ajasin University, Akungba-Akoko. Hence, I have decided to follow this tradition of Inaugural Lectures by engaging this audience on the topic, "Trading Space for a Cost and Seeking Transport as a Solution: A Transport Geographer's View".

My Journey in the World of Geography

I fell in love with Geography while I was in the Primary School, even though, I did not understand what Geography then entailed. In those days I travelled often with my parents. I was always fascinated by the thick vegetation, rivers, rocks, hills, hamlets, villages and towns which we passed through. I was very fond of asking questions my worthy father took time to explain those fascinating, attractive and changing geographic features during such journeys to me with keen interest. When I gained admission to the Secondary School, my immediate and

distant environments became subjects of intense interest to me. Drawings of maps and features in Human and Physical Geography became objects of fascination and indeed past-time during my leisure hours then; and I was able to, very well visualize objects in reality.

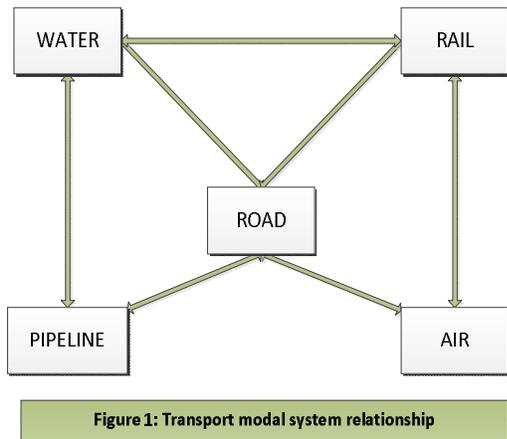
Before my admission to the university, I worked briefly with the Ondo State Government Licensing Office where I was involved in licensing different types of vehicles. My experience in this office eventually assisted me in terms of vehicle data-gathering; and, very much, later in life,

At both the undergraduate and at the Ph.D. level, I was mentored by a renowned Professor of Transport Geography – the late Prof A. A. Ogunsanya, who laid for me the solid foundation on which I subsequently built upon till today.

Transport Studies: An Important Arm of Economic Geography

Mobility is fundamental to economic, political and social activities of any nation. Without mobility, nothing, in terms of development, can be realized. This is because people need to move from residences to places of work and other major land uses as found in a typical urban environment as well as in rural environment to effect productive activities. This is why the economist perceives the demand for transportation as a 'derived demand' since transport does not really produce a tangible product like machines in a factory. The word 'demand,' in this case, indicates that transport will not be required if it does not have to satisfy other needs. Transport systems, through which these movements are realizable, are composed of service, infrastructures, modes, means and terminals. The adequacy and the efficiency of these infrastructural facilities and services in any city are, therefore, important ingredients for a well-planned environment.

Transportation involves movement, using different modes of transport, such as air, rail, water, pipeline and road. The relationship in logistics is simply depicted as shown in Figure 1. Geography, as the study of man in his environment, seeks to understand, among other things, how mobility of freight, people and information is conducted in cities as well as determine spatial constraints between the points of origin and destination.



These mobility constraints are at a cost to any geographical space. Therefore, the extent to which mobility in the study of geography as a discipline has traded space with a cost is my focus in this Inaugural Lecture because of its immense usefulness to urban managers and planners. The study of transport i.e. Transport Geography, as an important arm of Economic Geography grew tremendously with the paradigm-shift that pervaded the discipline - Geography shortly after the Second World War. It is, therefore, important at this point in time, to make some conceptual clarifications and the varying positions of Transport Geography, as distinct from other disciplines that are also concerned with the study of Transport.

What is 'Transport'?

The movement of people, goods and information has always been an important and fundamental component of human endeavours since creation; and, it has continued to be more complex as the population increases. According to Jean-Paul Rodrigue, Claude Comtois and Brian Slack (2006),

Transportation is concerned with mobility, particularly with how the mobility takes place in the context of a wide variety of conditions. A driving force of the global economy resides in the capacity of transport systems to ship large quantities of freight and to accommodate vast numbers of passengers

From the statement above, transportation can be seen as an economic activity that trades space with time. This is because with transportation, one can overcome the barrier of space which comes up in the forms of human and physical constraints while trading this opportunity with the vast land which it occupies (Ogunbodede, 1998b). Such transportation constraints manifest in the forms of distance, time, and topography. The multifarious nature of constraints as experienced today makes the study of transportation to cut across many disciplines all over the world. For these reasons, the study of transportation is not limited to any single discipline.

Economists, therefore, study the cost characteristics of different modes of transport; engineers study the operating characteristics of the transport modes; political scientists study regulatory policies of each transport mode, while lawyers study the laws governing the operation of the different modes of transportation. Geographers, however, look at the arrangements of spatial structures of different land uses and attempt to understand the processes that have created them. Transport Geographers, nonetheless, are not only concerned with the modes and means of transportation, but with the relationship between them in the movement of goods and services. Transport Geographers are, therefore, interested in what flows, volume of what flows, time of the flows, direction of flows and constraints to what flows. In other words, the Transport Geographer's view is well equipped with the following tools in the discharge of his/her research undertakings: **Analytical and Descriptive tools**

The 'quantitative revolution', in Transport Geography, follows closely the historical development of the discipline itself. Before 1960, transport geographers were satisfied with the cataloguing of features of movements, in terms of modes and their description. At that particular point in time, the basic geographer's questions, was "**what**" is **where**. Later on, in the early 1960s transport geographers were no longer contented with mere identification of phenomena and description of events in space. Questions about "**what**" those things were and "**how**" those things became located and "**where**" they were located became prominent in geographic enquiry (Onokerhoraye, 1984)

Transport geographers in the 1970s were also no longer concerned about where routes are to be found or in the classification of routes in terms of commodities or passengers moved. Rather, questions on “**why**” people moved and the efficiency attached to such movement(s) were raised. Thus, transport geographers started probing the movement of goods, passengers and information as well as their patterns in space. In other words, Transport Geography moved from a descriptive to an explanatory stage. The movement to the explanatory stage, however brought about an increasing dependence on mathematical tools and multi-variate techniques for studying and solving the complex system of transport. The 'revolutionary' effect of this paradigm shift on the spatial organization of society has added much value to Transport Geography as an important arm of Human Geography.

Foremost, among the techniques, is the Interaction Model, exemplified by the Gravity Techniques in Physics with its derivatives; then, the Linear Programming Techniques, Graph Theoretical Techniques, Factor Analysis, Multiple Regression Analysis, Logit Model and Canonical Correlation Analysis. Advances in computer technology, as well as its application in Geography, generally made simulation possible in the area of Transportation Geography.

Today, more and more transport geographers continue to depend on using mathematical tools in dealing with transport problems. It should, however, be noted that the use of mathematical tools in this field of study to solve transportation problems is a means to an end but not an end in itself (Ogunbodede, 2004; Ogunbodede and Ale, 2015). The starting point is the descriptive aspect, but, it could end well with robust analytical techniques that can highlight planning implications if well-conceived and applied.

Mr. Vice Chancellor, sir, I feel proud to reveal and inform you that in my academic career, which spans over twenty-nine years, I have deployed most of these tools to explain my research findings in several attempts to address the problems confronting urban transportation in Nigeria. Before I start the full discussion of my academic contribution, I wish to make further clarification on the relationship that exists between urban environment and transport systems.

Urban Environment and Transport System

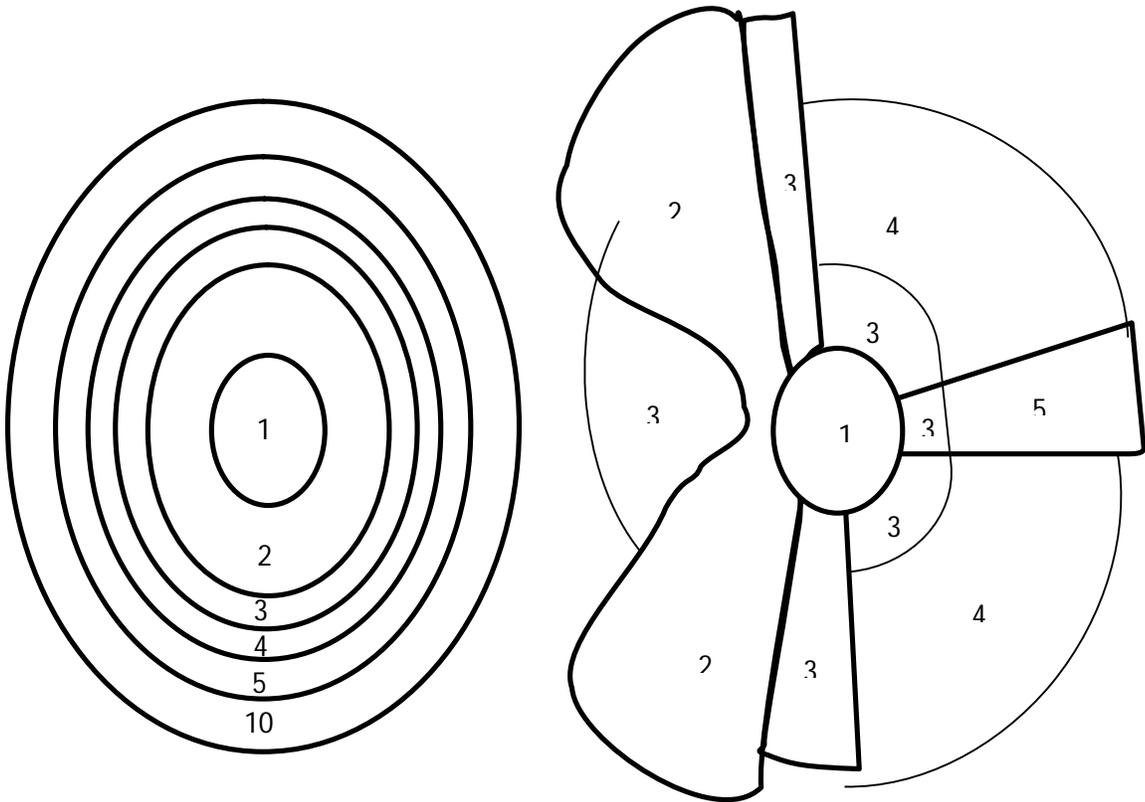
The Industrial Revolution of the 19th Century and the rapid development of the automobile in the 20th Century accelerated the process of urbanization throughout the world. Since then, population grew, land use became dispersed, socio-political and economic scenes have changed. The effect of industrialization on urbanization is, therefore, observable in the new role played by villages and small towns as they acquire new roles which transformed many of them into urban centres.

The recent trend in urbanization, in Nigeria, has resulted in the continuous influx of people into the major cities. The rapid growth of cities, no doubt, created some urban transportation challenges which manifest in the forms of movement delays, accidents on roads, traffic congestion and environmental pollution.

Urban space in Nigeria is made up of different types of land use and these different types are linked together by different transport systems. It may be difficult to say that a particular land use occupies an area as the development that took place in our city centres pre-date planning. What is, therefore, common is mixed land use in most cities; hence, classification becomes difficult. This is, however, resolved, using the most prominent land use as a criterion for the purpose of classification (Ogunbodede, 1997). However, there are some planned environments that maintain distinct land use classification as exemplified by Government and Private Housing Estates in some of the urban environment in the country.

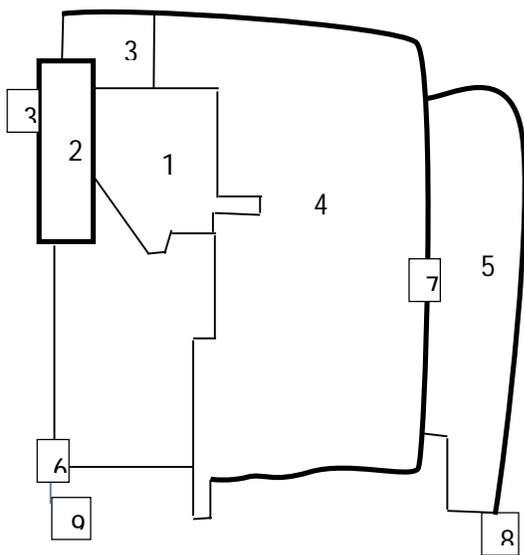
As urban land use continues to become more dispersed, the cost of operating public transportation systems increases. Thus, one of the characteristics of an automobile dependent city is in its alliance with dispersed residential patterns. This is why, in many cities additional investments in public transit movement may not necessarily translate to a significant additional ridership opportunity because unplanned and uncoordinated land development continues to call for more expansion of the urban periphery.

Three conceptual issues help to explain the structure of urban space in relation to its transport system (see Fig 2). Summarily, they follow the three classical ecological theories of urban morphology as articulated by Berry (1965)



(a) Concentric Theory

(b) Sector Theory



(c) Multinuclei Theory

KEY	
1.	Central business district
2.	Whole sole light manufacturing
3.	Low Class residential
4.	Medium class residential
5.	High class residential
6.	Heavy manufacturing
7.	Outlying business district
8.	Residential suburb
9.	Industrial suburb

Figure 2: Models of the internal structure of cities. Source: Hudson, 1980

The models, however, remain valuable tools for analyzing the modern city structure and providing the necessary basic tools for urban land use or transport comparison. Therefore, the structure of cities as exemplified in this study has a lot of influence on the movement pattern we find in our cities today as well as transport infrastructure that had sprang up in them.

Movement in Cities

Many people move to cities because of the numerous opportunities which the urban areas offer. Cities are noted to provide opportunities for social, economic and political interaction and because of these varying opportunities; they attract population which also needs space. The migration into cities could be through **rural-urban or urban-urban type**. Whatever the type of migration that may be involved, the patterns always induce pressure on urban transport infrastructure, thereby creating problems for the people living at the destination point. This is because adequate and efficient transportation systems are needed to make urban life more pleasurable. According to Ogunbodede (2005 a & b), the activities and functions which cities perform are spatially dispersed and because of this, they create varying demand for mobility.

Most cities in Nigeria, except Abuja, pre-date planning policies; hence, there is a myriad of transportation challenges affecting the cities center today. Even Abuja, which was created through a well-conceived plan, experienced violations when development commenced. Mallam El-Rufai, Minister of Federal Capital Territory (FCT), at a point in time in Nigeria, tried his best through his demolition exercise to implement the Master Plan for the FCT. The urban renewal efforts of both the Federal and State Governments at the core of the cities' growth have not been able to mitigate some of the problems created by rapid development during the pre-planning periods, hence, traffic congestion has always been the order of the day in most cities.

Many urban centres in Nigeria have inadequate transport facilities/infrastructure that could ensure smooth urban movement.

It is important to note that transport plays an important role in the life of cities; hence what is being experienced in modern day urban centres of Nigeria should be expected.

Mr. Vice Chancellor sir, from the discussion so far, one can assume that a correlation exists between urban growth and transport development. The correlation can be positive, neutral or negatively skewed depending on its impact on mobility. Where the correlation is negatively skewed, transport 'breaks' the city and where there is a positive correlation, transports 'makes' the city. The extent to which these judgments are realized in our urban system has a lot of implications on how we have traded space for a cost and the extent to which we have also gone to use transport as a solution.

Fundamentally, we have traded space for a cost in the urban environment through our activities by using transport to overcome the barrier of distance. While transport is continuously being used, we invest in infrastructures which occupy space. For example, we construct roads (single, double and multiple lanes), motor parks, bus-stops, railway terminals, railway lines, airports and sea-ports. The land in urban environment is inelastic, while transport land use is elastic like any other form of land use. However, transport land use is more dynamic as more land use is needed for its infrastructures. Transport land use in the city of Lagos is enormous like any other mega-city and can better be imagined when we determine the percentage share to the total land use devoted to other usages.

During peak periods, there are always traffic jams which delay travelling. Thus, travelling hours in an urban environment or space in the morning, afternoon and evening peak periods elongate travelling hours and sometimes, affect productive and working hours of workers in the cities negatively. During the peak periods too, a lot of conflicts on the corridor of movements result in accidents, which may claim lives and properties, worth millions of Naira. Lives and properties that are lost in such accidents form part of the cost of using the urban space. Similarly, delays, resulting from traffic jam are part of the cost of using urban space during peak periods travels.

There is no escape from transport if we want to work in any urban environment. However, adequate and efficient transport systems are required by urban commuters to make life livable in cities. Therefore, at this juncture, it is important to examine transport infrastructures and the extent to which they conform to urban spatial order.

Transport Infrastructure and Spatial Order

Urban transport infrastructure forms the foundation of the urban transport system. This implies that a poorly-developed transport infrastructure can create problems for urban transport management/system while a well-developed infrastructure may pose little or no problems.

A cursory look at roads in Nigerian cities shows that the main roads are narrow and poorly maintained because such roads development predates planning.

This shows that mass transit may not record the desired result in a city that is not provided, with at least, double-lane roads, even when the threshold population condition to support its use is present or satisfied.

Another important problem, facing urban transportation management, is that of feeder routes. It is equally observed that only a few cities have designated bus stops and lay-bys. In some cities, where bus stops and lay-bys are provided, they are not well managed. Some of these infrastructures have been taken over by the destitute that turned them into a place of abode. In other cases, they have been turned to warehouse by retailers for their goods (Ogunbodede and Ogundare, 2014a and 2014b). This situation has led different public transport vehicles e.g buses, taxis and motor cycles to park at will while competing to pick or drop passengers without minding their actions.

It has also been observed that priority lanes, reserved for buses and Para-transit vehicles, are either absent or have not been instituted as part of traffic management technique in most of the urban environment in Nigeria, except in Lagos State. This makes the movement on the roads chaotic as all the vehicles, irrespective of their capacities and sizes ply the same lanes. In most cities of the country, interchange points, bus stops, terminals, parking facilities, among others,

are either absent, inadequate or ineffectively located. These anomalies have increased traffic congestion challenges in Nigerian cities thereby inflicting a lot of inconveniences on commuters and creating dis-order.

Urban Transport Challenges

Urban transportation problems are multifarious in nature and are best understood when we examine them through the following:

- a. Urban traffic problems and their symptoms
- b. Reasons for transport challenges and
- c. Underlying factors for such transport challenges

Mr. Vice Chancellor, sir, let us imagine the urban land use that is devoted to intra-urban transportation in the Lagos Metropolis and/or in Abuja, FCT. Such imagination should cover areas of land allotted to airport operations, sea-ports, traffic corridors, motor parks, railway terminals and the tracks. It is indisputable that a large chunk of urban land use is devoted to transport; yet, this sector seems not to be satisfied because planners and non-planners are daily asking for expansion, reconstruction, rehabilitation and elongation of road networks within cities. The question that should, therefore, agitate our minds is: "At what cost are we trading space and at what cost are Transport Planners advancing solution?" Similarly, when shall professional planners stop to ask for improvement in road network expansion, elongation and reconstruction?

Urban transport problems such as traffic congestion, parking problems, traffic delays, accidents etc are symptoms of a malfunctioning urban transport system (see Figure 3). The basic reason for these urban traffic problems is inherent in trading with space and it manifests in the form of route inadequacy, human misuse of transport infrastructure, poor traffic management, absence of transport complimentary infrastructures and upsurge in urban travel demand without adequate measures to balance demand and supply. The underlying factors for urban transport problems, therefore, include financial constraints, inappropriate political decisions and absence of transport planning data. According to

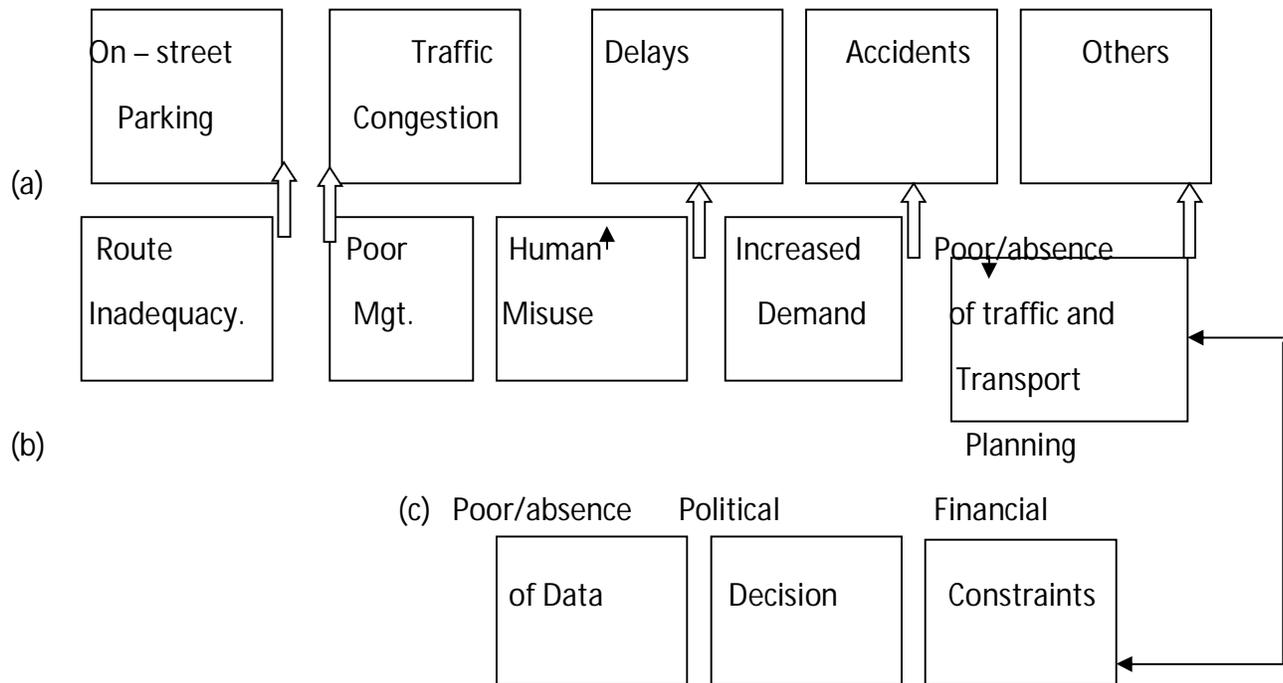
Ogunbodede (2007) and Ogunsanya (2004), unless these basic issues and underlying factors in urban traffic problems are adequately addressed, the symptoms of malfunctioning transportation system may not abate.

Parking is a major problem associated with traffic congestion in urban environment. The city's Central Business District (CBD) often lacks enough parking facilities. By design, the CBD has a higher tendency to attract vehicles more than any other known land use in any urban area. The absence of parking facilities, which is a common feature in Nigerian cities, therefore, results in the conversion of part of the available road space provided for free movement of people and vehicles, to parking purposes (Ogunbodede, 2004).

Traffic congestion occurs when the urban transport network is no longer capable of accommodating the volume of movements that use them efficiently, thus, leading to delays in journey time.

Accident is one of the unavoidable negative consequences of transport in Nigeria's urban environment. Ogunbodede (2004), Ogunbodede (2007), Ogunbodede (2008), and Odedokun (1991) have identified the various negative consequences of high accident rates on urban environments. These include loss of present and future manpower resources, inability to fulfill social obligations, existence of widows and orphans, among others.

Figure 3: Urban Transport Challenges



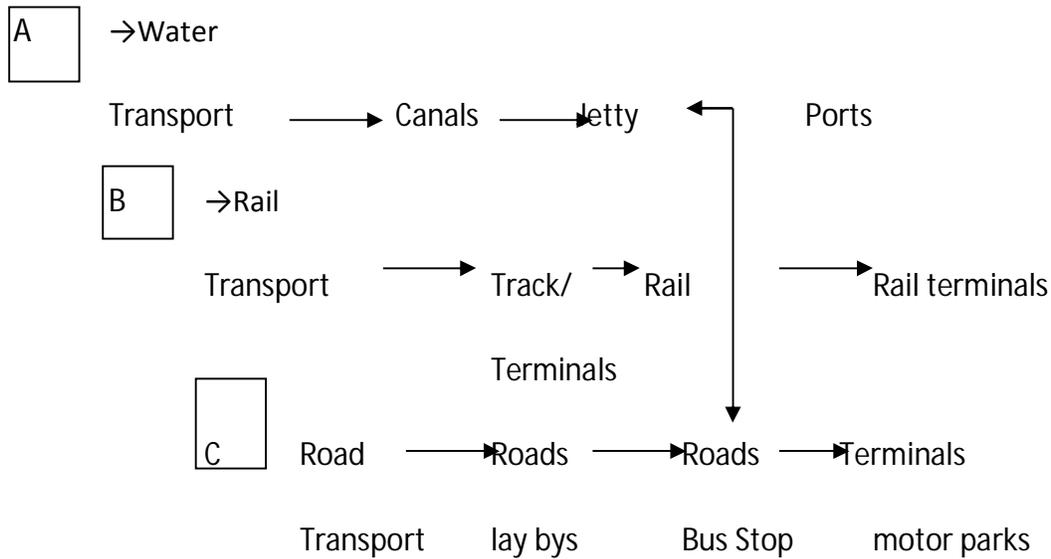
- a= Symptom of urban traffic problems
- b= Basic reasons for urban transport problems
- c= Underlying factors for urban transport problems

Source : Adapted from Ogunsanya, 2004

Provision of Urban Transport Infrastructure

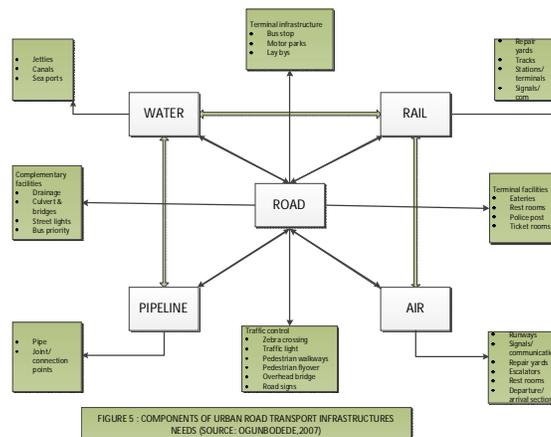
Cities are made up of different morphologies and, as such, are different from one another. Because of this, cities are themselves in the best position to influence the right mix of transport infrastructure to create sustainable mobility. It is when the right mix is missing that transport problems are experienced. However, where the terrain within the city has a mix of water route, then water transportation has to be considered in transport infrastructure integration.

Figure 4: Integration of Transport Infrastructure in Urban environment



Source: Ogunbodede and Olurankinse, 2008

In Nigeria, traffic restraints using odd and even numbers, were introduced to control traffic inflow to Lagos Island as well as park and ride system during the Festival of Arts and Culture (FESTAC) in 1977. These traffic management techniques were, however, ad hoc in nature and as such, never stood the test of time as vehicle owners devised other means to circumvent the traffic regulation at that time (Ogunbodede, 1997 and Ogunbodede, 2004).



Bus stops and terminals are transport's complimentary facilities that can be used to reduce delays and congestions in cities'. In Nigeria, most cities' roads are not provided with bus stops. This has made public passenger transport to stop at will to load and off-load. Such uncontrolled stoppage often adds to the delay experienced mostly in cities.

Traffic lights are provided in some cities, in Nigeria, while a larger proportion does not have this facility. Apart from this, the Nigeria epileptic power supply renders the 'beauty' of using traffic lights as a means of effectively controlling traffic flow useless. The provision of this facility is however dependent on the threshold population of vehicles that can make its use relevant. This is important because, if the population of vehicles does not justify its use, then it can result in unnecessary delays. Similarly, street lights are meant to illuminate a city; but, not all cities are provided with this facility in Nigeria. In a nutshell, Fig. 5 provides the component of urban road transport infrastructure needs of an ideal urban environment.

Effectiveness of Urban Transport Infrastructure

As pointed out earlier, there are some urban environment with poor land use control and absence of bus stops. This has made structures to spring up, not minding the consequences they attract for traffic generation and, where they are located. The CBD, often houses 'houses' the Oba or the Emir's Palace, the central mosque, central market, shopping malls, etc., in the same area. All these land uses have high tendencies to attract traffic to the core of the city and by extension, lead to multiple congestion (Ogunbodede, 1997, Ogunbodede, 1998 and Ogunbodede, 2004).

Transport infrastructures such as street light in most cities, only work for a few months after installation. Inadequate maintenance of the street lights defeat the aims of installing them.

In most cities, the circular and ring roads are absent. This has made traffic that is not meant for the CBD to pass through such zone since there are no alternate routes for them. Except for cities like Benin and Ibadan, most of the cities in

Nigeria have linear pattern type of routes which often makes the CBD to be congested during and even after peak periods.

Pot holes and partly damaged roads are common features on the roads in Nigerian cities. Unfortunately, the maintenance culture, expected of the governments (Federal, State and Local) is often not available. The implication of these anomalies on urban residents is much as it affects travelling time, hold ups, accidents etc.

Trading Space for a Cost and Seeking Transport as a Solution

The term 'space' reveals a close relationship between Geography and Transportation. According to Rodrigue et al (2006), the ideal transport mode should be instantaneous, free, have an unlimited capacity and always be available. But it can render space obsolete. This is obviously not the case. Space has been noted to be a constraint for the construction of transport infrastructures. Transportation, therefore, appears to be an economic activity, different from the others. It trades space with time and thus, money. Space endows a place with a particular uniqueness. If everything had occurred in the same place over time there would have been no need for movement. It is this regional differentiation that produces trade or exchange or movement in space which in turn, is dependent upon transport to facilitate.

One of the most significant explanations of the factors influencing movement in any space is the one given by Ullman (1956) which has been cited in many research works. The theory outlined three (3) conditions that affect transport development. The three conditions are: Complementarity, Intervening opportunity and Transferability.

Mr Vice Chancellor sir, if human beings are the objects of our curiosity as geographers, then, the quality of their lives in any space of influence is of paramount interest. I have discovered during my numerous research efforts in the field of Transport Geography that movement in space has a lot of social, cultural and economic constraints that are worth mentioning. Some of the constraints manifest in the form of congestion, accidents, intersection challenges, parking

challenges, mismatch between demand and supply, pollution and other environmental challenges. I will like to mention and discuss these constraints since my major contributions to research in the field of Urban Transportation dealt with how road users have traded space for a cost and how transport had been used as a solution in order to make our urban space useable as well as make our urban environment livable. The following discussions are therefore are therefore targeted at how transport has provided the needed solution to conflicts arising from mismatch in the use of space for some landuses.

a) Land use and pattern of transport system

While investigating the movement pattern of commuters in Akure and its implications for transportation planning, Ogunbodede (2006) observed four basic types of trips associated with an urban space. These are;

- i. trips originating from the city and destined for outside the city;
- ii. trips originating from outside the city and destined for the city;
- iii. transit trips and
- iv. intra-urban trips.

The fourth type which is the intra-city movement has received less attention. I worked vigorously in this area by examining the nature of interaction patterns of commuters and the way trips are structured in a hierarchy form within space. Using land use zones as a measure of functional linkages, I applied factor analytical technique to this study. Origin-Destination (O-D) traffic data was collected in Akure for a period of one week (see Table 2) and the data was subjected to factor analysis. With this data, traffic flow from various land uses were determined. Figure 6 shows the non-routed flow pattern of people within the land use zone in Akure when the routes are not followed but the data on O-D were used to determine the flow of people. I was able to determine the origin and destination points for effective traffic analysis. The results of the research efforts in Akure's urban space showed four (4) trips sub-region in which groups of traffic exhibited high degree of similarity. The most dominant zone (1st order) is

the commercial land use zone with central attracting pattern. The public/semi-public land use zone emerged as the next dominant zone (2nd Order) with NW-SE attracting pattern. The satellite zone (3rd Order) includes industrial, transport/communication, military/police, medium residential, low residential and recreational land uses zones with NW-SW attracting pattern. Educational land use zone however, emerged as an independent zone with NW-SE attracting pattern as the 4th Order (Ogunbodede, 2006).

Mr. Vice Chancellor sir, this study, which, I have just described, shows that there exists in the city space, a pattern of dominant flow of commuter traffic on the basis of which the land uses are structured.

Table 2: O-D Matrix of Intra-Urban Commuter Movement in Akure

O-D	1	2	3	4	5	6	7	8	9	10
1*	<u>229</u>	89	91	150	146	82	89	95	131	115
2	83	195	173	119	121	<u>197</u>	86	103	89	93
3	119	87	194	95	101	<u>255</u>	91	157	195	163
4	171	81	94	99	97	151	129	139	111	<u>187</u>
5	161	90	101	81	104	134	154	94	97	<u>210</u>
6*	89	95	121	<u>209</u>	98	138	88	128	110	80
7	87	81	86	90	89	78	88	87	106	<u>109</u>
8	78	86	<u>124</u>	95	66	88	58	58	78	67
9	88	86	108	78	67	<u>138</u>	99	76	116	76
10	<u>155</u>	61	63	65	81	119	112	90	90	68
Total	1266	951	1155	1090	970	1380	994	1027	1118	1168
Rank	2	10	4	6	9	1	8	7	5	3

- *Largest flow from these land use was to a 'smaller' land use where size was determine by column total
- The largest flow is underlined. it was determined by the volume of outgoing movement flow.

Key:

- | | |
|----------------------------------|---------------------------------|
| 1. Educational Land use | 6. Commercial land use |
| 2. Industrial land use | 7. Recreational land use |
| 3. Residential (High) land use | 8. Transport/communication |
| 4. Residential (Medium) land use | 9. Military/Police land use |
| 5. Residential (low) land use | 10. Public/Semi Public land use |

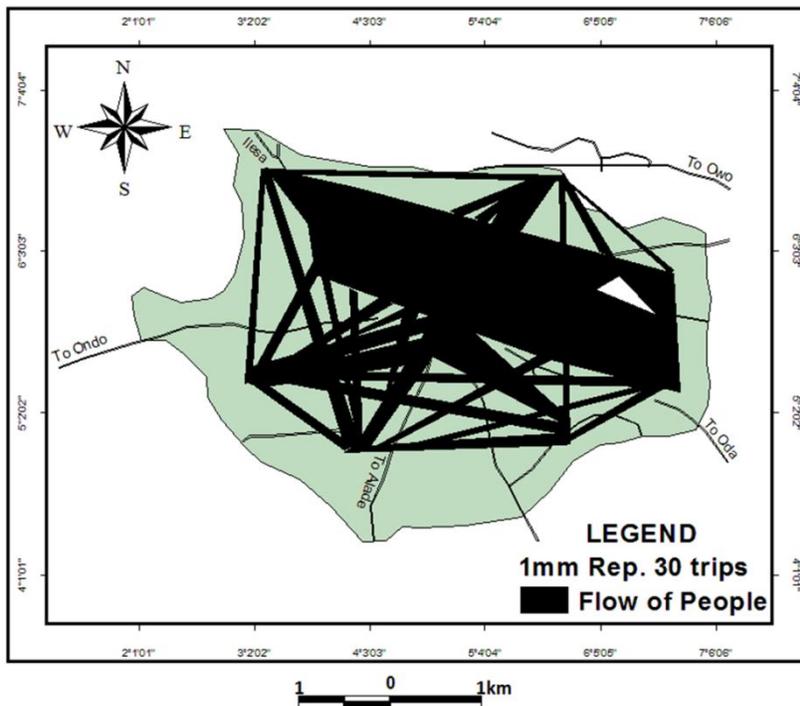


Figure 6: Non-routed Flow Pattern of People within the Land Use Zone in Akure Source: Ogunbodede, 2006

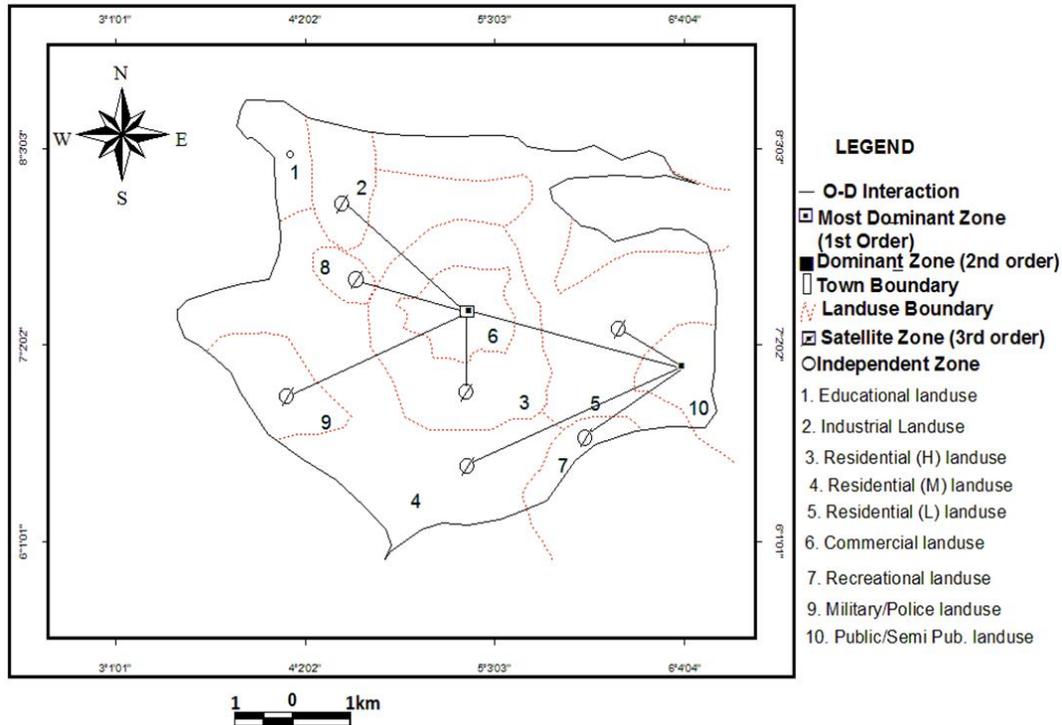


Fig. 7: Hierarchy of Traffic Flows in Various Land Use Zones in Akure Source: Ogunbodede, 2006

a) Mobility Barriers in Urban Areas

While looking for ways by which mobility barriers could be reduced, Ogunbodede (2008) examined the predictions of the United Nations (2006) on population growth and their negative implications on urban traffic. Ogunbodede (2008) noted that mobility challenges varied from one urban centre to another. In some, they manifested in the form of traffic jam, accidents, robbery black spots, pot holes, floods and right-of-way problems.

Plate 1: Traffic Congestion in the Central Business District of an Urban Space



While addressing mobility barriers in urban environment, Ogunbodede (2004) provided the following options for sustainable transport development – promoting bicycling in the CBDs, the use of Mass-transit for urban movement, encouraging planning policies that would create traffic reduction in the city centre, encouraging inter-modal coordination, promoting traffic restraint methods, providing public parking spaces, providing traffic information system and use of GSM and data sharing on traffic information. Something drastic has to be done to address the traffic situations in Nigeria's rapidly developing cities. This is because transportation problems in Nigeria seem to be worse than those in the developed countries with more vehicle population. It is necessary therefore, to minimize these by borrowing experience from the cities of the developed world which have succeeded in curtailing their urban traffic management problems.

My researches which were targeted at re-examining traffic management techniques in urban environment in the past and why such technique failed also revealed a lot. Findings showed that the way space is used was instrumental to traffic volume generation and dispersal. Studies of the traffic situation in Akure, show that various land uses had different potentials to generate and attract traffic (Ogunbodede and Aribigbola, 2003; Ogunbodede, 2006 and Ogunbodede,

2009). The existing road network and the quality of individual streets in Akure revealed that a lot of improvements need to be undertaken if the future traffic is to be properly managed. The studies, therefore, suggested the construction of a circular road of 15 kilometer radius from the city centre in Akure. If this is done, the traffic that is not destined for the city centre can be effectively channeled and diverted from certain roads where they would have constituted traffic jams. The work, also, recommended a new institutional arrangement and procedure for the development and management of road traffic, in Akure, as the uncoordinated and disjointed framework for traffic management was found to be the bane of traffic jams.

The use and rise of commercial motorcycles in Nigeria urban space arose with the changes in the socio-economic structure of the country when the conventional vehicular means of movement could not meet the astronomical rise in demand for transport services (Ogunbodede, E. F; Ale, S.A; Akinnawo, E. O; Ocheho, T and Adegbayi A, 2017). Ever since it started, the proliferation of its use had been on the increase not only in the rural areas where it started but also in the cities where it is largely used to satisfy mobility demand. Nigeria has witnessed increased road mishaps with the advent of the use of commercial motorcycle in its urban environment and cases of orthopedic patients in our hospitals were therefore on the increase and at alarming rate more than before.

It has been noted that though commercial motor cyclists contribute significantly to our transportation services, their presence in our major cities also constitute a serious environmental hazard. This is because road traffic accidents among commercial motorcyclists were very frequent in cities. This is in addition to constituting part of traffic congestion in cities. This is well noted in operational delays caused by commercial motorcyclists when they maneuver in traffic as well as when they park indiscriminately

Drug abuse in its various forms and quantity has impact on travel behavior of motorists. The major consequences have been exhibited through sleepiness and drowsiness.

Information gathered from drivers and road users revealed that fatigue actually had significant effects on driving and as such is an important predictor of road accidents in the study area. Taking drugs to remain agile by these commercial motorcyclists therefore are common in these two LGAs of Lagos State.

The study recommends that Commercial motor-cyclists should be discouraged from taking alcohols in whatever forms and smoking before embarking on riding. All these will help to reduce factors which can trigger off occurrence of fatigue to motor-cyclists while riding and by implication reduce accidents on our roads. This paper therefore recommends Psycho-education (focus on drug issues) for commercial motor cyclists. Discourage sales of drugs in parks and other public places

a) Application of Geographic Information System (GIS) to the Management of Traffic in Cities

The occurrence of traffic congestion at any spot or area may be accounted for by the characteristics of travel demand and supply. The reason is that demand for travel varies over time while the supply of vehicles to meet this demand is relatively fixed over a long period of time. Systemic daily and weekly variations in travel demand are, often, informed by work and school schedules as well as operating hours of business, shopping, social and entertainment establishments. Unfortunately, the vehicles to satisfy these movements are, relatively, fixed, hence, the traffic congestion. While attempting to find solutions to these urban traffic challenges, Ogunbodede (2006) designed and constructed a GIS tool, called "Traffic Information System (TIS)". This tool was used to assess traffic congestion in Akure.

This model shows the importance of points, lines and area features in a GIS environment in determining the model for traffic congestions in a typical urban environment, Ogunbodede (2006).

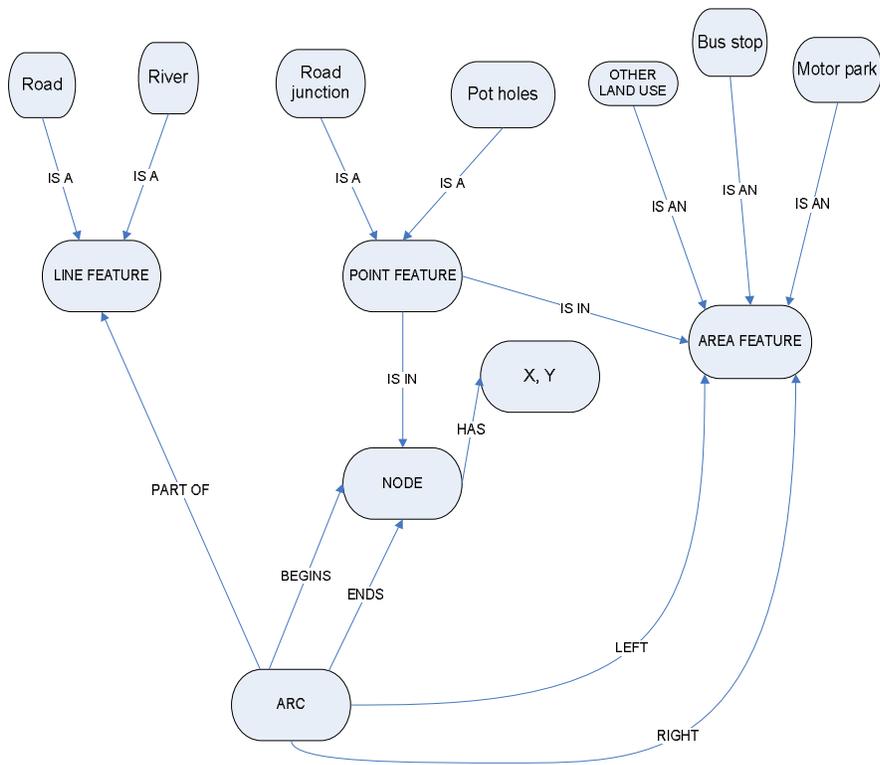


Figure 8: Modeling Traffic Congestions in Cities. Source: Ogunbodede, 2006

The summary of my finding was that traffic information is absent in most of Nigerian cities. Hence, there is need to understand 'entity relationship" that influence traffic congestion occurrence

Without this, the relationship between reality and factors influencing traffic congestion would have been difficult to connect in a GIS environment, Ogunbodede (2006)

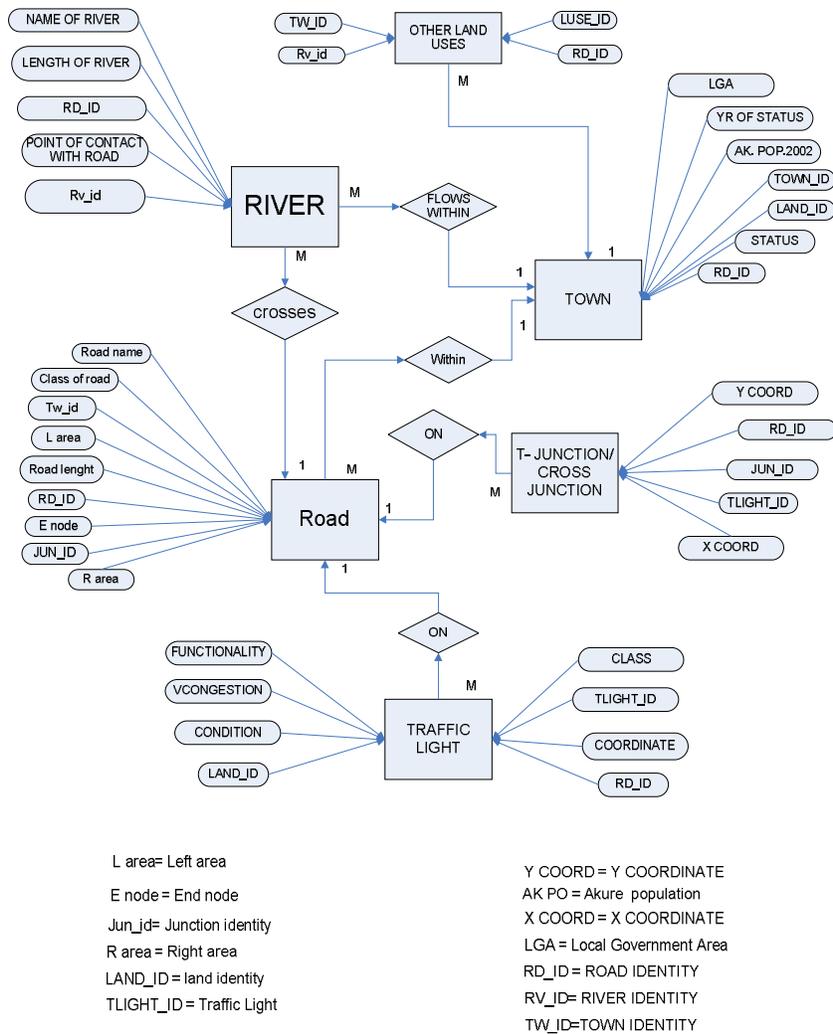


Figure 9: Entity relationship diagram for traffic congestion Ogunbodede, 2006

Inadequate traffic information has been found to be a major cause of traffic congestion in Akure. The findings, however, provided two major ways by which GIS could provide solutions to traffic congestion: the first is the provision of traffic information that enables commuters and motorists to take rational decision as to which routes to take during peak hour travel. The second is the ability of the tool to provide appropriate graphical responses to queries which could be used to manage traffic congestions (see Fig. 11).

The study further recommends incorporating a Traffic Information System (TIS) into the existing traffic management system as a necessary means of managing traffic in cities, provided it is built on a well-designed database. The database

must however be updated from time to time (Ogunbodede, 2006, 2007e, 2007f and 2009a).

Figure 11 also shows the pictorial and attribute query on one of the roads at a particular point in time.

Figure 10: Classified Landsat TM Data of the Study Area as at 2006. Source: Ogunbodede, 2006

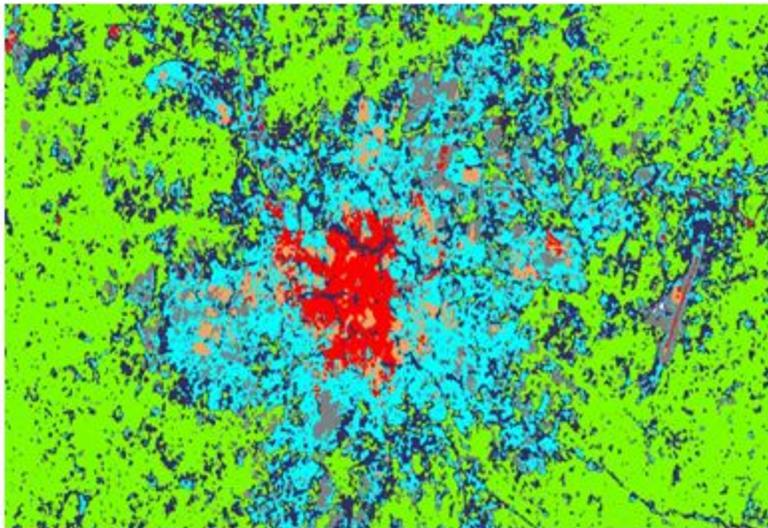


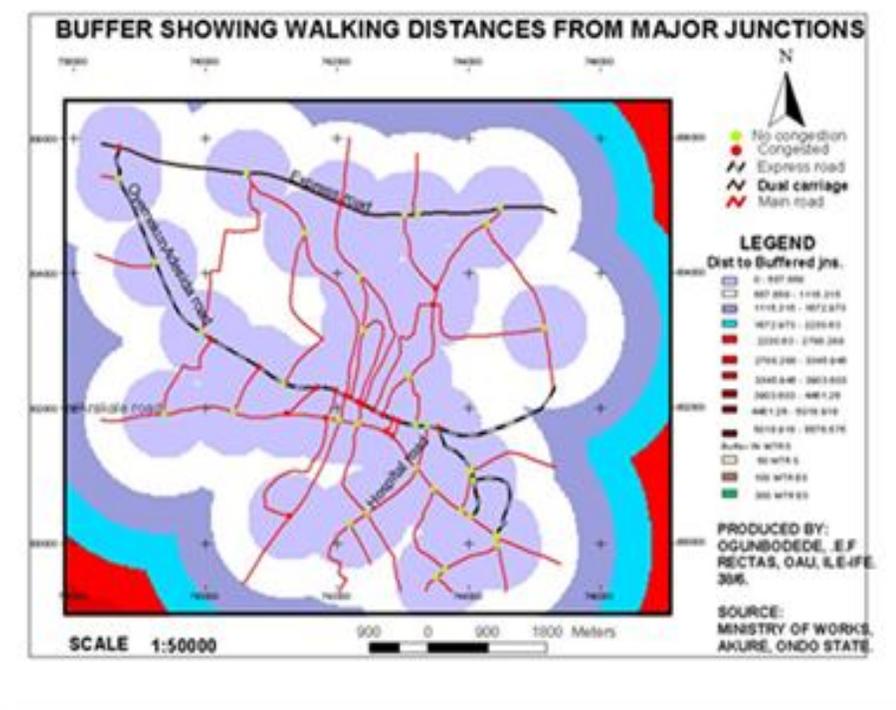
Figure 11: Pictorial and attribute query on one of the roads. Source: Ogunbodede, 2006

Figure 11: Hierarchy of Traffic Flow in Various Land use Zones in Akure as at year 2006
Source: Ogunbodede, 2006



Figure 12: Buffer Zones Showing Walking Distances from the Major Juctions. Source: Ogunbodede, 2006

Figure 12: Buffer Zones Showing Walking Distances from the Major Junctions
source: Ogunbodede, 2006



b) Impact of Global System of Mobile Communications (GSM) on Traffic Volume in Urban Environment

Mr. Vice Chancellor, sir, you will also agree with me that for a very long time, physical contact, using private and public transport, dominated the mode of travelling in Nigeria. The introduction of the cell-phone in Nigeria, however, has changed this pattern as more and more people become users of this modern means of communication (Ogunbodede, 2005 and Ogunbodede, 2010).

It was revealed that the use of GSM has a number of advantages over the use of physical contacts by automobiles. Some of the identified advantages are relative reduction in travel time, reduction in traffic hold-up, employment

opportunities, making business easier for people and more use of emergency calls during distressed periods.

To reduce the current level of automobile dependence (Ogunbodede,2005) suggested that more private organisations should be encouraged to act as service providers in order to promote competition in the provision of efficient and effective GSM that is affordable to the majority of the people. Similarly, government should adopt supervisory roles capable of driving down the overall cost of telecommunication services so as to make the use of handsets accessible to the majority of Nigerians.

c) Curriculum Development on Safety Awareness

In developing a curriculum for safety awareness on Nigerian roads, I discovered that road accidents in Nigeria constitute significantly to heavy losses of human lives and the destruction of economic resources. A close study of the causes of this high rate of accidents indicates careless road development and bad driving habits. This lack of 'safe road culture' is so alarming that the Nigerian Highway Code was revised in 1989 for proper enlightenment or understanding (Ogunbodede, 1998).

Ogunbodede (1998a) defined road users as children at pre-school ages, primary and secondary school levels as well as drivers' license applicants, motor traffic offenders and students in higher institutions school who are yet to own personal vehicles. The reason for selecting this category of road users was because, majority of them are not accessible to highway codes and worse still, some of them used illegal means to obtain drivers licenses. The curriculum on Highway Code was meant to be included in the Social Studies Curriculum for students at both Junior and Senior Secondary Schools. Ogunbodede (1998a) highlighted the themes, units, objectives and contents of what to teach. At the end of the day, the students would have been exposed to some important themes/topics in the nation's revised Highway Codes in their school curriculum that are capable of reducing accidents on Nigerian roads. The study however noted that Social Studies was only taught at the JSS Level; and, it has never been part of the subjects being examined at the SSS Level. It, therefore, advocated a case for

making Social Studies a core subject to be examined at the SSS final examinations such that, the majority of the students would have had the opportunity of imbibing the 'safe road culture' through the subject.

Ogunbodede, Ilesanmi and Olurankinse (2010) study on luxurious buses as a means of night journey in Nigeria revealed that armed robbers often disguised as commuters and in some cases, some motor transport companies' staff connived with armed robbers to rob unsuspecting passengers at some specific places within a geographical space. The study, also, revealed that night journeys were more vulnerable to robbery attacks with lots of casualties than day time journeys. The study, then suggested the use of highly sophisticated metal screening equipment at the point of embarkation and the use of e-banking by travellers. Passengers are also advised to keep their travelling plans secret as much as possible to forestall armed robbery attacks (Ogunbodede, et al 2010).

d) Premium Motor Spirit (PMS) Pricing Crisis and the Nigerian Public Passenger Transportation System

Nigeria is among the World's leading oil and gas producing countries. Incidentally, the country is caught up in a bizarre paradox that makes it 'an energy rich country, yet, most often, wracked by both fuel and power shortages that have prevented much infrastructural development and stifled economic growth'. Nigeria is one of the countries where the price of its domestic oil has been on the increase since the 1970s. This is, in spite, of the fact that Nigeria, in addition to having three major oil refineries also imports refined products to satisfy its domestic consumption (Ogunbodede, et al, 2010). Table 3 below shows the price fluctuations of PMS from 1977-2009 and the type of government in power (Ogunbodede et al, 2010).

Table 3: HISTORY OF FUEL PRICE FLUCTUATIONS IN NIGERIA

S/N	GOVERNMENT	YEAR	PRICE	INCREASE/DECREASE	PERCENTAGE
1	Gen Yakubu Gowon	1973	6K	8.45K	40.83 **
2	Gen M Mohammed	1976	8.45K	9K	0.59 **

3	Gen Obasanjo	Oct. 1, 1978	9 K	15.3K	70 **
4	President Shagari	April 20 1982	15.3K	20K	30.71 **
5	Gen Babangida	March 31, 1986	20K	39.5K	97.5 **
6	Gen Babangida	April 10,1988	39.5K	42K	6.33 **
7	Gen Babangida	Jan 1, 1989	40K	60K	**
8	Gen Babangida	Dec 19, 1989	uniform price of 60k	60K	42.86
9	Gen Babangida	March 6, 1991	69K	70K	16.67 **
10	Shonekan	Nov 8, 1993	70k	₦ 5	614 **
11	Gen Abacha	Nov 22,1993	Petrol price drops from N5 to	₦ 3.25K	35% *
12	Gen Abacha	Oct 2, 1994	₦ 3.25	₦ 15	361.54 **
13	Gen Abacha	Oct 4, 1994	Petrol drops from ₦ 15	₦ 11	26.67 *
14	Gen Abubakar	Dec 20, 1998	₦ 11	N25	127.27 **
15	Gen Abubakar	Jan 6, 1999	₦ 25	N20	-20 *
16	President Obasanjo	June 1, 2000	₦ 20	₦ 30	50 **
17	President Obasanjo	June 8, 2000	₦ 30 Price drops to	₦ 22	-10 *
18	President Obasanjo	Jan 2002	₦ 22	₦ 26	18.18 **
19	President Obasanjo	Jun – Oct, 2003	₦ 26	₦ 42	23.08 **
20	President Obasanjo	May 29, 2004	₦ 42	₦ 50	19.05 **
21	President Obasanjo	May 25, 2004	₦ 50	₦ 65	30 **
22	President Obasanjo	May 27,2007	₦ 65	₦ 75	15.38 **
23	President Yar'Adua	June 2007	₦ 75 drops to	₦ 65	-15.38 *
24	President Jonathan	Jan 1, 2012	N65	₦ 141	116.92 **
25	President Jonathan	Jan 17, 2012	₦ 141	₦ 97	-31.21 *
26	President Buhari	May 29, 2015	₦ 97	₦ 86.50	-10.83 *

27	President Buhari	May 11, 2016	₦ 86.50	₦145	67.63 **
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Key: ** increase in PMS Price *decrease in PMS Price

Source: Ogunbodede, et al 2010 (updated in 2016)

One of the major aftermaths of recurring fuel scarcity in Nigeria is the myriads of hardship that it created for the nation. Buyers of the products spend many long hours to get the products though depending on the level of scarcity and when the scarcity starts. The FGN is, therefore, advised to get all the four (4) refineries efficiently and effectively working. The Government should encourage the establishment of more private owned refineries by the major marketers and other companies involved in oil exploration, production and distribution in order to reduce or eliminate both the exportation of crude oil for refining abroad and monitor the downstream sector more effectively than hitherto done. (Ogunbodede et al, 2010). More importantly, the Niger-Delta militants' need be strongly discouraged from vandalizing the oil pipelines in their localities. This is because, every time a crude oil flow station is destroyed, the environment including land, sea and air as well as the communities are subjected to serious environmental hardships (Ogunbodede et al, 2010).

a) Urban Transport and the Environment

Over the past three or four decades, environmentalists had complained about the contribution of transport to the deteriorating effects of the urban space. Ogunsanya (1985), while examining the reasons behind journey delays in Ilorin and Lagos, it was observed that delays attributed to road intersection were the greatest while Ogunbodede (2005), Ogunbodede (2009) and Ogunbodede and Ogundare (2014) noted that fixed delays and other categories such as road factor, accidents and parking problems made journey time to be prolonged unnecessarily. Transport is a major contributor to pollution in the urban environment.

Undoubtedly, transport is a major user of space in the urban environment. A major chunk of urban land use is used therefore for the provision of transport

infrastructure such as port facilities, rail and road terminals, pipelines and pumping depots and air ports. Thus, urban landscapes, which would have been available for the provision of other important comforts for urban residents, are lost to vehicles (Ogunbodede, 2004). It is not out of point, therefore, to conclude that transport is a 'two-edged sword' infrastructure. This is because as transport has contributed positively to the growth of the urban environment; so also, it has brought many negative effects. Be that as it may therefore, transport can be viewed as a necessary evil that cannot be avoided in any urban environment.

Mr. Vice Chancellor, sir, the exposition so far shows that transport is a powerful instrument in the making and breaking down of the urban system. However, a major objective of an urban transport analyst is how to devise the best approach for reducing its negative impacts. A number of approaches had been suggested and even adopted in the past to mitigate the negative external effects of transport in the urban environment. Such approaches included the use of mass transit, traffic management and control, traffic restraint methods, car/bus pool system, increased use of telecommunication, increased patronage of non-motorised transport system and traffic education.

Flood during the raining seasons, often renders some urban spaces inaccessible and impassable. According to Ogunbodede (2016) and Ogunbodede and Sunmola (2013b and 2013d), in order to extend areas usable in cities, migrants to cities, often reshape the natural landscapes in various forms. In some cases, they reduce hills, reclaim beach regions, fill valleys and wetlands, and, sometimes, encroach on river valleys, not minding the consequences on the environment. These cultural ways of increasing usable lands have some negative impacts on the urban physical environment. The major negative impact is change in the micro-climate of the urban environment, which manifests in various forms, including flooding. Ogunbodede (2016), in the study, shows that a positive correlation exists between flash flood and traffic congestions in cities. Similarly, accident rates are found to increase during heavy downpour in many of the flood prone spots as many vehicles struggle for right of way. Flash flood on traffic corridor was noted to have influenced increase in the volume of stranded vehicles in many pools of water. In order to have passable roads during the rainy seasons,

Ogunbodede (2016) recommended regular clearance of drainages at the on-set of rainy seasons especially in areas prone to flooding. He also advocate the creation of environmental awareness through both formal and informal forms of education on how to dispose solid wastes as the hallmark of managing traffic in flooded environment.

Plate 3: Roads littered with solid waste after rain fall. Source: Ogunbodede & Sunmola, 2013



Plate 4: Traffic hold-up caused by flash flood on a traffic corridor. Source: Ogunbodede & Sunmola, 2013



a) Road Quality Assessment and Performing Screening Indices for Routes

Mr Vice Chancellor sir, in 1997, I conducted a research to examine the changing pattern of land use in Akure between 1966 and 1996; and to justify the use of some transport management techniques that could be used to ameliorate the transport challenges that emerged then in Akure. Using roadway quality assessment and performance screening indices to measure the quality of routes and performances of transport services respectively, two out of ten routes considered in Akure, which were the study-routes, could be regarded as the best. Ogunbodede (1997) and Ogunbodede (1998), also, noted that the type of traffic management proffered is not without its cost-benefit analysis. The cost to those who have physical structures in the city centre may be affected by the demolition exercise but the benefits to the generality of the people living in the city are definitely much more.

The relationship between transport and urban growth has been a subject of considerable interest to physical planners in Nigeria and the world over. Though

controversies exist, the consensus of planners is that transport is a component of development which can aid or have adverse effect on urban growth (Ogunbodede, 1998). The study on the intra-urban transport development in Akure shows that transport development within an urban area can be viewed from two major angles. The first is the infrastructural development which is basically the prerogative of Government to construct, reconstruct and rehabilitate. The second is the passenger and freight transport services which are largely controlled by private individuals. The study, therefore, asserts that successive Governments, over the years, have only concentrated on road development at the expense of other transport complimentary facilities; hence, the scarcity of public-parking spaces, few pedestrian walkways, few laybys, very few bus-stops, inadequate traffic lights and absence of ring or circular roads.

Mr. Vice Chancellor, sir, in my quest to develop a model for travel demand in an urban environment, I applied the regression model to a study of trip generation in Akure (Ogunbodede, 2004c & Ogunbodede and Ale, 2015).

Two approaches were adopted in the regression model to determine trip generation from the city. The first was at the level of purpose of trips – the disaggregate level and the second was at the aggregate of all trips – the aggregate level.

The usefulness and reliability of this model to trip generation was therefore, confirmed at both aggregate and disaggregate levels (Ogunbodede, 2004 and Ogunbodede and Ale, 2015).

b) Parking Capacities and Parking Demands

A study conducted in Akure on parking situation by Ogunbodede and Ogundare (2014a, 2014b and 2014c) revealed that, in spite of the substantial land allocated to parking by the immediate past administration, the core area of the city, which is basically for commercial land use, attracts heavy traffic not minding the provision of a double-lane network as well as the corresponding parking lots. The study recommended that both state and local governments should work together

to identify vacant lands for further car park development in addition to adopting sophisticated traffic management techniques to address traffic challenges.

Submission on how to improve transport infrastructures and Services in urban centres of Nigeria.

Mr. Vice Chancellor, sir, my various research in the area of urban transportation show that various land-uses have different potential to generate and attract traffic. The potential of any land use to generate or attract traffic, however, depends on its location, characteristics and areal extent. The trend, as revealed by these studies, shows that there is a continuous growth in importance in the way commercial and public land uses are utilized while some land uses, such as cultural land use, are on the decline.

The studies also reveal that the stage of development of a city plays an important role in the choice of the transport or mode and the infrastructures provided (Ogunbodede, 2009b). The identification of the volume of traffic generated or attracted by these land uses suggest the need for a para-transit or Bus Rapid Transit (BRT) on some routes, especially the ones that link up both commercial and public land uses to residential zones of the city. This kind of measure will go a long way to reduce congestion in some routes and also reduce waiting time at bus stops to such zones.

Some of the findings show that the core area (CBD) of the city in most cases may not be the focus of traffic convergence. In some cases, it acts as a transit zone for the traffic that is not destined for the city centre. In the light of this finding, some of the studies suggest a ring road or a circular road depending on the magnitude of the traffic jam occasioned in such an area.

Public parking spaces are conspicuously absent in almost all the land uses except public/semi-public land use. The commercial land use zone, in particular, deserves special attention in this case. City planners should make the necessary provisions for a public parking space in the core area of the city with appropriate transport complimentary facilities to encourage the free flow of traffic.

The existing urban road transport infrastructure like roads and complimentary facilities like street lights, traffic lights, drainages, zebra-crossings and bus stops should be properly maintained and put to effective use. An arm of the State Ministry of Transport should be saddled with the responsibilities to constantly monitor the decay of these infrastructures and immediate action be taken to repair or replace such decayed facilities.

Consideration should also be given to the reconstruction of major roads, provision of more motor parks, fly-overs, over-head bridges and traffic lights at intersections as the city assumes a new settlement status. Motor vehicles parking charges should be instituted and, sustained, while the funds realized should be used to maintain such parking lots and other transport infrastructure facilities.

A method that would allow integrated coordination of different modes of transport in bigger cities should be introduced especially where there are opportunities for water and rail transportation. The use of Transport Information System (TIS) to monitor traffic, control congestion and arrest traffic offenders should be instituted in our urban centres.

Public and private sectors should be involved in the provision of both services and infrastructures. For example, institutions like Banks, Hotels and big Eateries with functioning generators should supplement electricity-supply that can service both the streets and traffic lights in their areas of operation as part of their Corporate Social Responsibility (CSR) to the communities where they are located.

6.0 RECOMMENDATIONS

Mr. Vice Chancellor, sir, in order to create a lively atmosphere in the urban environment, we need to trade the constraints imposed by limited land in urban space by adopting transport solutions in the right dimension and proportions to address the issue of inefficient transport services and inadequate transport infrastructures among others, in our urban space. The following are recommended:

- i. Government should encourage the construction of circular roads in cities with over two million populations. This will aid efficient distribution of traffic within the urban centres.
- ii. Movements of traffic that are not destined for the city centre should be diverted to circular roads or bye-passes that would assist to distribute traffic, not meant for the city centre (CBD) to the periphery.
- iii. Bus priority routes should be made an integral part of the road transport infrastructure in Nigerian cities with over 2 million people.
- iv. Road transport infrastructures and complimentary facilities' development should be phased out and made to coincide with vehicular growth and spatial growth of settlements.
- v. The three tiers of government should promote the use of non-motorized mobility in the urban centres that now qualify as metropolis and megalopolis (Ogunbodede, 2010).
- vi. Light rail system should be encouraged from the city centre to the outskirts of the urban environment. This will greatly discourage and reduce the congestion experienced in the CBD.
- vii. A supplementary power supply arrangement from major eateries, banks and hotels that often put on their generators each time there is power failure, should be worked out to supply power to streets and traffic control points.
- viii. A Traffic Information System (TIS) should be incorporated into the existing traffic management system of cities. This TIS must be built on a well-designed database. The database must however be updated from time to time to meet the exigencies of traffic dynamics.
- ix. Traffic Information System (TIS) should be fully deployed to create effective monitoring platform for traffic situation to road users and curb traffic offences should be curbed.

x. Curriculum on safety awareness education should be developed for motor traffic offenders, drivers' license applicants and all other roads users. This exposure will open all road users to the revised highway codes that are capable of reducing accidents on Nigerian roads.

Acknowledgments

Mr. Vice-Chancellor, sir, ladies and gentlemen, words are not enough to thank the Almighty God for making me what I am today. I have enjoyed His tremendous Grace since I was born and the grace is still sufficient for me as I grow older every day.

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Finally, I thank you all for listening.

Mr. Vice Chancellor, sir, permit me to close this Inaugural Lecture by singing this song:

"Olorun to da awon oke-igbani,

Iwo ni mo fi ope mi fun (2ce)

Tani ni n o tun gbe ga o bi ko

se baba loke

Tani n o tun fi gbogbo ope mi fun

Olorun to da awon oke-igbani

Iwo ni mo fi gbogbo ope mi fun"

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