THE POTENTIALS OF URBAN RAIL TRANSPORT DEVELOPMENT IN IBADAN, NIGERIA

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ABSTRACT

The goal of efficient transportation in cities requires that all modes should function at their optimal capacities to provide adequate choices for commuters. However, the neglect of the rail transport has been a contributory factor to the persistent mobility crisis prevalent in Nigerian cities. Ibadan once enjoyed intra-urban rail transport services (passenger and freight) until it became moribund. Given the current rate of urban expansion and increased commuting distances within the city, this study investigated the potentials of urban rail transport development as a solution for the urban mobility crisis in Ibadan.

The Spatial Interaction Theory and the Public-Private Partnership model provided the conceptual framework. Using a cross-sectional research survey, data were collected from both primary and secondary sources. The Bureau of Public Enterprises provided information on the concessioning procedure for rail transportation in Nigeria. The city was stratified into five major traffic corridors on which a seven-day traffic count was conducted to collect data on commuter threshold capacity. Salter's corridor sampling technique was employed in the administration of questionnaire to 642 household heads based on income groups, along the stratified traffic corridors. Data on trip pattern, trip purpose, modal choice, rail potentials, train ride and the desire for the return of intra-urban rail transport; traffic congestion reduction, commuter's savings from the use of rail and employment creation were collected. Analysis of variance, multinomial logit and multiple regression models were used in data analysis at $p \leq 0.05$.

Only 45.5 percent of residents had previously used train as mode of transportation. The threshold capacity for urban rail commuting along the traffic corridors of Podo/Akobo (2135), Lagos Road Toll/Moniya (1610), Bere/Akanran (1542) and Mokola/Ife Road Toll (1214) exceeded the required 1200 threshold capacity. Commuting distance varied from below 5 kilometres (53%) to 35 kilometres (4.8%) within the metropolis. Trips undertaken were mainly to work places (55.6%), shops/markets (26.8%), schools (6.7%), social/multipurpose trips (12.9%). There were significant differences in trips undertaken by the high, medium and low income groups (F= 38.503). Modal choice was significantly affected by auto-ownership, trip by bus, and respondents' income (r=0.24). The potential use of the rail transport was a function of occupation, estimated income and trip distance of commuters (R^2=0.84). Eighty-four percent of the respondents desired the return of intra-urban rail transport. Perceived potentials of rail transport included reduction in traffic congestion (84.2%), per capita traffic crash rates (76.8%), increased modal choice (68.2%), enhanced commuter savings (57.5%) and employment creation (52.7%). The traffic congestion reduction potential of the rail was high (R^2=0.59). Vertical integration approach of Bureau of Public Enterprises in rail concessioning was found to attract prospective private partnership.

Intra urban rail transport in Ibadan has very high potentials. There is the need to revitalise intra urban rail transport in the city through public-private partnership.

Keywords: Urban rail transport, Commuter threshold, Rail concessioning.

Word count: 458

CERTIFICATION

I certify that this work was carried out by Mr. O.J. OMIRIN in the Department of Urban and Regional Planning, University of Ibadan, Ibadan.

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DEDICATION

This thesis is dedicated to my Late Mother Chief Mrs Felicia Adenike Omirin for her inspiring, motivating and motherly roles in my life. Her death did not allow her to witness this blissful moment of her dream becoming a reality. May her gentle soul rest in perfect peace- Amen.

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Omirin, Olayide Josiah

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LIST OF ACRONYMS AND ABBREVIATIONS

ACOMORAN	–	Association of Commercial Motorcycle Riders Association of Nigeria
AGV	–	Automatic Guided Vehicle
ANOVA	–	Analysis of Variance
BOOT	–	Build – Own – Operate – Transfer
BOT	–	Build – Operate – Transfer
BPE	–	Bureau of Public Enterprises
BROT	–	Build – Rent – Operate – Transfer
BTO	–	Build – Transfer – Operate
CBD	–	Central Business District
DBFO	–	Design – Build – Finance – Operate
DBOM	–	Design – Build – Operate – Maintain
FGD	–	Focus Group Discussion
FOS	–	Federal Office of Statistics
FUMTP	–	Federal Urban Mass Transit Programme
GDP	–	Gross Domestic Product
HPUVS	–	Human Powered Utility Vehicle Service
HST	–	High Speed Train
ICD	–	Inland Container Depot
IPT	–	Intermediate Public Transport
MRT	–	Mass Rapid Transit
NPC	–	National Population Commission
NRC	–	Nigerian Railway Corporation
NURTW	–	National Union of Road Transport Workers
PPP	–	Public Private Partnership
PRT	–	Personal Rapid Transit
ROT	–	Refurbish – Operate – Transfer
RTEAN	–	Road Transport Employers Association of Nigeria

SAP –	Structural Adjustment Programme
SPSS –	Statistical Package for Social Sciences
TOD –	Transit Oriented Development
a –	Intercept
b –	Slope Coefficient
et. al –	And Others
r2 –	Coefficient of Determination
X –	Independent Variable
Y –	Dependent Variable

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Owen (1987) once suggested that if the global transport system does grind to a halt, it will be in the cities. Ironically, cities account for only 0.5 percent of world's land area in spatial terms while more than 50 per cent of the world's population is expected to reside in cities by 2015 (UNPD, 2000; Brockerhoff, 2000) In the last two decades, many Nigerian towns and cities have doubled their spatial sizes and population. Various population projections for the major urban centres in the country tend to suggest that there is not going to be an abatement in the rapidity of their growth soon. By implication, more than 70 million of the projected 150 million population of Nigeria by 2009 reside in urban centers with two of the most important cities, Lagos and Ibadan, accommodating between them, more than 18 million inhabitants by projection in the year 2008 (HABITAT, 2008).

Several reasons have been put forward for the unprecedented urbanization process (Egunjobi, 1997; Agbola, 2005). The most disturbing aspect of this rapid population growth and accelerating urbanization lies in the lack of requisite city economy to produce the public and private resources necessary for transport and city development at the scales required. The rapid urbanization trend means that more people will be making more trips in urban areas. More importantly, the movement access to education, work places, recreational, business and other land-uses is paramount to the continued existence of the city (Kenworthy and Newman, 1999; Litman, 2002). Indeed, several studies have been carried out by notable scholars in the area of urban public transportation systems in developing countries like Nigeria (Adeniji, 1985, 1987; Adesanya, 1998, 2002;. Oni, 2002). These studies have

propounded innovative and dynamic strategies towards combating the multifarious urban mobility challenges and have also clearly shown the close relationship between the city structure, density and land-use with transportation, the type that makes the transport demand and travel intensity to increase with the size of a city. With increasing economic, political and social activities especially in the developing countries, an efficient urban transport system and comprehensive mass transportation system becomes a necessity. Such a system would move people and freight in large numbers within a given network within a relatively short time.

The railway transport which developed during the steam and locomotive era to automation stage has significant characteristics of having the capacity for bulk movement of goods over long distances more cheaply than any other form of land transport. Itemizing the role of rail transport in cities, Adesanya, (2002) noted the contribution of rail transport to the creation of employment opportunities, promotion of trade and commerce, distribution of freight, the movement of passengers as well as the facilitation of urban development.

Until now, public transportation in urban centers have largely been dominated by para-transit and intermediate modes in the absence of formal public transport technologies such as light rail transit, trams, underground metros, elevated rail transit, sub-urban rail among others as obtained in advanced cities of the world. Adeniji (1987) noted that the absence of a well-organized transportation system in the cities does incalculable damage to the city's economy. He itemized three major damages that emanate from the inadequacy of existing transport infrastructural facilities in our cities which favours the road transport sub-sector and invariably a car-oriented urban transport landscape. Firstly, there is a restriction on the mobility of vast majority of urban dwellers who do not have access to or own a car. Secondly, there is an inordinate energy consumption and unmitigated environmental pollution which could be abated when people move in groups rather than individually in cars. Thirdly, the unavailability of adequate space within the core areas of large cities to accommodate all travels by car at an acceptable cost to the general public. Meanwhile, the problems induced by the proliferation of cars and mini-buses as the sole means of public transportation becomes worse by the day as over-crowding mounts in the cities. The various transport infrastructure and furniture becomes over-stretched and buckle under intense pressure as more people are thus rendered immobile.

Against the background of urban mobility crisis, emerging facts have shown that city functions and activities are spatially dispersed. Accordingly, city governments have built additional roads but these roads, rather than reducing traffic bottlenecks, have worsened them. Governments have also purchased more fleet of buses and cars for city transport, yet, all these have clogged the city roads, generating more demand for parking facilities. From the foregoing, this research sets out to examine the potentials of intra-urban rail transport development for Ibadan city and recommending such as a viable and befitting mass transit option.

1.2 STATEMENT OF RESEARCH PROBLEM

The symptoms of a malfunctioning urban traffic system are manifested by the urban traffic congestion, parking problems, traffic delays, crowded terminals among others. These symptoms are attributable to some basic and underlying factors which include route inadequacy, human misuse of traffic infrastructure, poor traffic management, absence of traffic and transportational planning as well as the upsurge in urban travel demand.

Nigeria's urban population has been growing very rapidly. In 1963, urban population was about 11million. It rose to 30 million in 1985, 40 million in 1990 and 70 million in 2010. The urban population growth rate in Nigeria, which was put at 8 percent, by far exceeds the national growth rate of 3.2 percent per annum (UN-HABITAT, 2008). This rapid growth is largely responsible for the unmet demand in urban transport supply. Associated with the rapid growth in urban population is an urban morphology that keeps changing from concentric to sectoral and multi-nuclei structure. For instance, Oni (2002), observed that the growth of the peak urban commune distance of Lagos from 20km in 1980 to over 40km in 2000 and concluded that city sprawl, which has been known to foster a spatial mismatch between places of work and residences of the poor will continue and intra-urban trips within the Lagos city region will remain high.

This situation in Lagos sets the pace for most of the large cities in Nigeria. Urbanization and its effect have long been neglected in policy statements and central planning as well as in practical decision making. The neglect has put unprecedented pressures on Governments to provide services and infrastructure. Regardless of income or social status, the conditions under which commuters travel within cities have

become more difficult and intolerable, including serious deterioration of health. Urban traffic congestion and air pollution have become the price people pay for economic development in the cities and travel speeds have in every peak period been reduced to the level of horse-trots (Oni, 2002).

UNCHS (1998) estimated that traffic congestion increases public transport operating costs by as much as 16 per cent in the developing countries and with Lagos in Nigeria was cited as one of those cities where an average one-way commune time can last for as much as one and half hours or more. Every non-business time lost to congestion, though not reflected in GDP statistics, is efficiency reducing. The World Bank estimated that the economic damage of air pollution is up to 10 per cent of GDP in polluted cities and have cost equivalence of vehicle emissions totaling 60 per cent of the import cost of diesel (Hughes et al, 1999). Moving from one point to another in our cities have thus become an endurance test so much so that the time we spend transporting ourselves is longer, the costs are higher and the air we breathe gets dirtier.

Apart from the induced low level productivity as a result of inaccessibility of employment opportunities by city dwellers, industrialization is seriously hampered and retarded. Over the years, the transport sector's real contribution to GDP has continued on a steady decline. The Federal Office of Statistics (2003), has shown that the sector's real contribution to GDP nose-dived from 6 per cent in 1981 to 3.12 per cent in 1991 and 3.10 per cent in 1998. The road sub-sector declined from 2.90 per cent in 1995 to 2.84 per cent in 1997 while the rail made less than 0.1 per cent impact between 1994 and 1998. Analysts and observers of the sector's performance attributed the free-fall in its performance to the effect of the Structural Adjustment Programme (SAP) of the late 1980's that finally snuffed life out of the sectors ebbing performance.

Rail transport services contribution, for instance, fluctuated between 1981 and 1985 before sliding continuously downwards from 0.17 per cent in 1981 to 0.15 per cent in 1984 and 0.06 per cent in 1998. Currently, the rail has less than 0.01 per cent impact on GDP (FOS, 2003). The state of public transport in Nigerian cities is very poor. While the goal of efficient transportation in cities requires that all the modes should function at their optimal capacities to provide adequate choices for commuters, most cities are largely dominated by para-transit or intermediate modes which consist of the mini-buses, taxis, (kabukabu) and motorcycles.

Bolade (1989) observed that except for licensing, there are no negotiations guiding the operations of these vehicles in every city. Operators enter and exit the business at will. Vehicles are not assigned to routes. Rather, operators respond to current demand, plying whatever route they deem profitable at any particular time. The large numbers of para- transit vehicles, combined with the bad driving habit of their operators, contribute significantly to the urban mobility crisis of Nigerian cities.

It has been established that urban transport infrastructure should form the bedrock of urban transport system. It is worthy of note that the only urban transport infrastructure in Nigeria is road. Invariably, most of the urban roads are narrow and poorly maintained. The nature of these urban roads as contained in the Ibadan Traffic Report of 1989 noted that;

> "*The forty-five seater bus and above have failed in Ibadan. The roads leading to many thickly populated areas are critically narrow thereby restricting the maneuverability of long buses. Even though these buses have the advantage of carrying more passengers, they are relatively slower than medium buses" (Ogunsanya, 2004:17)*

Ogunsanya (2004) also noted that the inadequate capacity of secondary streets often force vehicles to concentrate on the primary roads thereby causing congestion problems. Whereas the most important tool for combating road capacity problem are traffic management and traffic law enforcement, neither of which have proved effective in Nigerian urban centres especially, Ibadan. Essentially, the urban transport infrastructure are characterized by a planning and design oriented towards the private car, poor physical condition, poor management, poor interconnectivity, high incidence of misuse and low productivity.

Oni (2002) posited that urban transport is both an element and catalyst in economic and social activities. It provides the means by which people and goods are moved in space and time. Improvement in urban transport as guaranteed by the introduction of intra-urban rail services has been acknowledged as a prime mover and facilitator of economic growth and improved social interaction. Based on the foregoing and having noted the inadequacy of the existing transportation systems and the continuous stress which commuters are subjected to in our cities, this study is set to examine the means of integrating an intra – urban rail mass transit into the public transportation system of Ibadan city.

1.3 AIM AND OBJECTIVES OF THE STUDY

This study examined the potentials of intra-urban rail modernization and services in Ibadan metropolis. To achieve this aim, the objectives are to.

1. Examine the mobility patterns of residents in terms of frequency of movements, direction of journeys and distance travelled in Ibadan.
2. Identify the perception of the residents about the use of rail transport system.
3. Determine and evaluate the factors that may influence the potential patronage of intra-urban rail transport system in the city.
4. Identify the challenges and opportunities available for public-private sector partnership in the operation of intra-urban rail transport services.
5. Determine prospective intra urban rail route (s) for the city.

1.4 RESEARCH HYPOTHESES

The following hypotheses were tested in order to achieve the set objectives.

(i) There are no significant differences between trips undertaken by the low, middle and high income residents.

(ii) The use of the Rail Mass Transit is not a function of the socio-economic characteristics of the potential users.

(iii) The Rail Mass Transit will not significantly affect the modal choice of commuters within the study area.

(iv) The availability of Rail Mass transit would not significantly reduce traffic congestion in the city.

1.5 JUSTIFICATION OF THE STUDY

Mobility crisis in the country has lingered for decades. It involves the increasingly rapid movements of people and goods from one point to the other which is accompanied by traffic jams (collective movement of vehicles or persons between places or crises within a certain area) at most times. However, potentials of rail transport remain largely untapped as it carries less than one percent of overall traffic in Nigeria.

Hoyle (1994) and Hillings (1996) are of the view that only few cities in developing countries experience the development of 'tracked transport' to the point of

making it a solution to their urban transport problems. These authors explained further that since most urban centers in Third World Countries are heavily dependent on the combination of buses, Intermediate Public Transport (IPT) and Human Powered Utility Vehicles (HPUVS) operating in largely unplanned, uncoordinated and inadequately regulated environment, intractable mobility crisis would continue to be a regular urban experience. The breaking point of these crises ironically according to them is, when transport planners are called in to solve the problem. The immediate technological 'big-push' that comes readily in focus is the rail-based transit option.

Of the various mass transit options for Nigeria's large cities, the rail-based transit system appears to be of tremendous mass appeal and universal patronage, that could complement the road based systems to ensure an efficient, effective and sustainable public transportation in the cities. Available studies have shown that the capital and operational costs of these different rail systems vary greatly and are influenced by local conditions by which the system is managed (Adeniji 1987; Filani, 1988; Adesanya, 2002).

Having carefully assessed the Nigerian situation, Adeniji (1987) classified cities with 1- 5million inhabitants to be qualified for a surface rail or light rapid rail transit with feeder municipal buses. Ibadan, along-side some other Nigerian cities was indeed ripe for this recommendation. It is believed by many transport analysts that an effective, fast and efficient mass transportation system is necessary for any meaningful development in the country. This view was corroborated by Krucker (2007), a German railway expert, who hinted that, "no nation had ever developed without a modern and efficient railway system". He expressed the view that a fast moving modern railway system would help Nigeria immensely to respond to the challenges of development as they arose, particularly those large cities where the economy of the nation are concentrated. Thus, the expansion of the rail network with new technology could usher in mono-rails, automated guided trains, light railways etc. These systems would be more energy efficient and environment friendly than the rickety mini-buses, cars, tri-cycles, motor-cycles that pass for urban transit in most cities in Nigeria.

Also, Okanlawon (2010), commenting on the 'tragedy of neglect of the railways in Nigeria" opined that a virile railway system will play a significant role in the development and overall growth of the economy, open up the regions, hinterlands and the rural areas by facilitating agricultural development as well as the growth of

cottage/large scale industries. In addition to all these, residential, commercial, educational and recreational settlements and development can also be attracted around its corridor (The Punch, 2010 p. 11).

With an envisaged recovery in the Nigerian economy and a rapid networking in the distribution of goods and services in the urban centres, rail transport appears inevitable as a catalyst for socio-economic growth and development. Also, with an efficient and modernized rail transport system in Ibadan, the extremely disturbing traffic snarls often experienced on the city roads during peak periods would be considerably reduced and the full advantage of transport intermodalism realized. However, in order to achieve the expected benefits of the rail system, two major conditions have to be fulfilled according to Allport (1991). First, they should be confined to arterial corridors on which peak traffic flow approaches the 12,000 persons per hour threshold. Secondly, it should target where movements have marked linear patterns. It is in the light of these expectations that this study, focuses on the present state of inactivity of the intra-urban rail transport in the largest indigenous city, south of the Sahara and how this can be modernized to provide the needed services as obtained in other large cities of the world.

1.6. THE STUDY AREA

Ibadan city is located on latitudes $7^{0}20^{1}$ to $7^{0}50^{1}$ North and longitudes 2^{0} 50^{1} to $3^{0}20^{1}$ East. The city occupies the southeastern part of Oyo State of Nigeria. It is about 145 kilometres north-east of Lagos and 645 kilometres southwest of Abuja, the Federal Capital Territory (FCT). The continuous built-up area of Ibadan covers five local government areas while the metropolitan area of the city spreads to six other outlying local government areas where the city serving and other non-basic activities of the city are based. The whole of the metropolitan area has a land expanse of 3,123 square kilometers while the city itself has 463.33 square kilometers.

1.6.1 Historical Growth of Ibadan City (1829 to date)

Udo (1996), traced the origin of the sustained growth of Ibadan over the years to its emergence as the largest urban centre in Nigeria in 1860 through 1963, when its population was estimated at 627,780. This figure rose to 1.2 million in 1991 and 2.55 million in 2006 (NPC, 2006). See Figure 1.1 for the important phases in the growth of

Ibadan. Also, Table 1.1 is the population growth of the eleven local governments of Ibadan between 1991 and 2006. Corroborating the narration of Udo and Fouchard (2003), recalled the creation of Ibadan in 1829 as a war camp on a forest site with several ranges of hills and valleys which offered strategic defensive opportunities. Its location at the fringe of forest and savannah regions culminated in its emergence as a market center for goods from both the grassland and forest regions. The economy of Ibadan as at this period primarily rested on agricultural products such as yam, maize, vegetables, palm oil, kolanuts and the manufacture of weaponry through smithery because of its military environment. Most of the trading activities at this time centered around Oja-Oba market which really marked the city limits to the north (Mabogunje, 1962; Falola, 1984).

By 1896, when the British colonialist established their presence in the city, expansion of the initial city core began with the Agodi hills residency and the connection of the core with road networks. After an initial boom, in rubber production between 1901 and 1913, cocoa became the main produce of the region which attracted the European and foreign interest. The influx of the European traders led to the construction of rail services in 1901 to facilitate evacuation of cocoa products and the emergence of Gbagi market in 1903.

The colonial period witnessed phenomenal development of the city and reinforced the position of the city in the Yoruba urban network. Ibadan was looked up to as the center of activities and political development. The proximity of the city to Lagos facilitated its link by road and rail and eventually when the Western Region Secretariat was established in 1946,the emergence of the city as the centre of the Yoruba nation became irreversibly acknowledged. This development was followed by the establishment of the University College which later transformed into the University of Ibadan in 1948 with its teaching hospital. Also established were the first television station in Africa in 1959 and some government reservation areas for residential industrial and agricultural purposes.

The post-colonial era witnessed further growth and development of the city. The construction of Ijebu-ode bye-pass in 1963 opened further the southern part of the city and extended the residential quarters of Oke-ado and Molete. The location of the railway headquarters at Dugbe facilitated the emergence of Gbagi as a commercial zone, so also was the establishment of the Yemetu residential quarters to cater for the civil servants at the Secretariat (Mabogunje,1968).

The objectives of the first to the third National Development Plans of 1960 to 1980 were the acceleration of industrialization but incidentally the level of industrialization remained low in Ibadan city as small scale activities dominated the industrial landscape. Mabogunje (1968) and Oketoki (1998) observed that there were over 2,000 small-scale industries employing fewer than ten people while few big companies were established and located in the new industrial estates. This perhaps was why the informal sector dominated the economic landscape of the city to date (Akerele, 1997; Amuwo et al.2001).

By 1973, the Ibadan-Lagos expressway generated the greatest urban sprawl east and north of the city. This was followed by the Eleiyele expressway on the west, spiraling the city- spread further into the outlying local government areas of Egbeda, Ona-Ara, Akinyele and Ido respectively. (Figures 1.1 and 1.5 present graphic illustrations of the important phases in the growth and development of Ibadan.

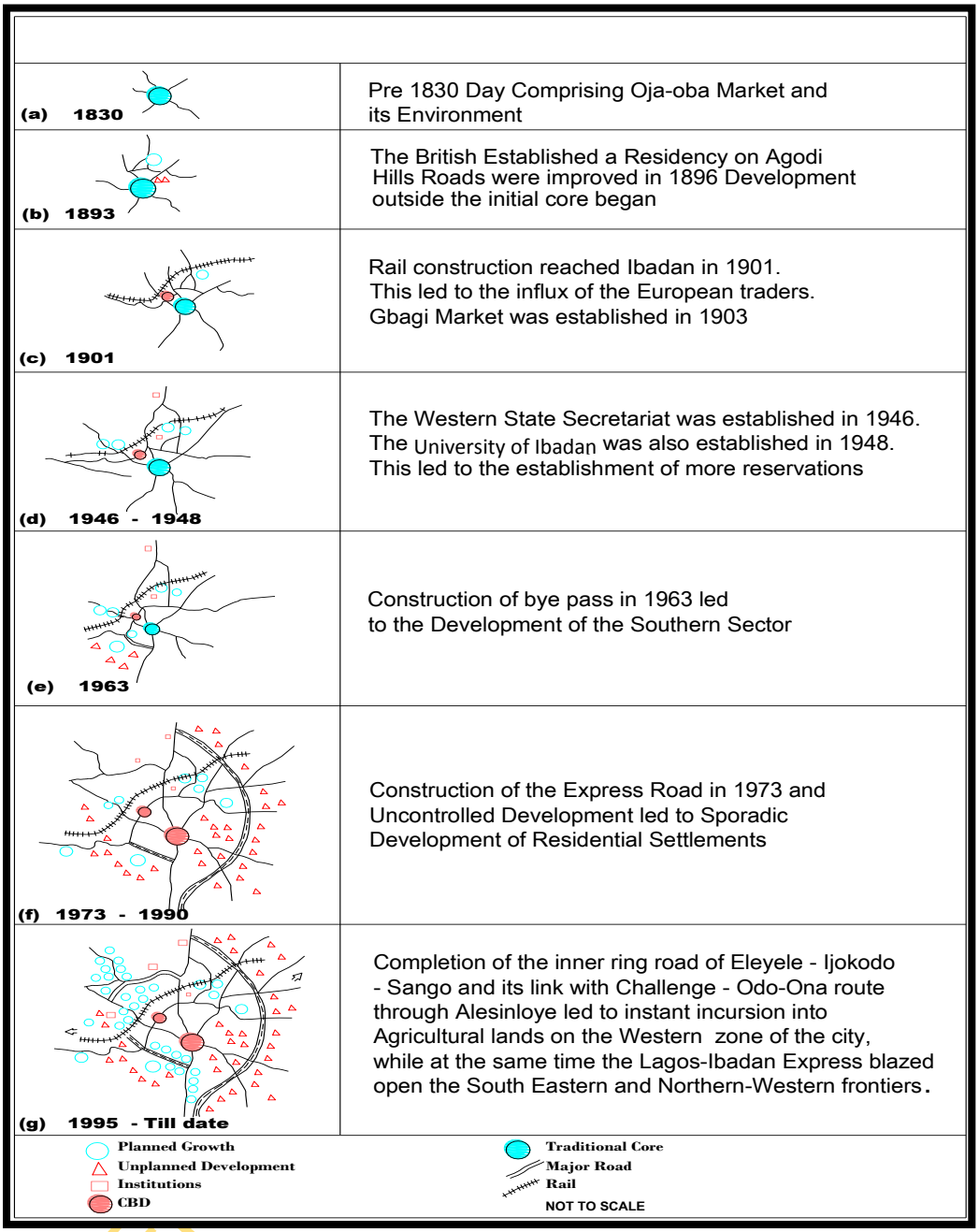

Figure: 1.1: Phases in the Growth of Ibadan

Source: Modified after Olatubara, (1995)

Table 1.1: Population Growth of Ibadan Metropolis, 1991-2006

S/N	Local Governments Ibadan Less City	Population 1991	Population 2006	Percentage Increase (%)	Rate of Growth (%)
1	Akinyele	140,118	211,359	50.84	2.78
2	Egbeda	129,461	281,573	117.50	5.32
3	Ido	53,582	103,261	92.72	4.47
4	Lagelu	68,901	147,957	114.74	5.23
5	Ona-Ara	123,048	202,725	121.49	5.25
6	Oluyole	91,527	265,059	115.41	5.25
	Total	**606,637**	**1,211,934**	**99.78%**	**4.7%**
	Ibadan Urban				
7	Ibadan North	302,271	306,795	1.50	0.17
8	Ibadan North East	275,627	330,399	19.87	1.22
9	Ibadan North West	147,918	152,834	3.32	0.22
10	Ibadan South East	225,800	266,046	17.82	1.10
11	Ibadan South West	227,047	282,585	2.00	0.13
		1,228,633	**1,338,654**	**15.43**	**0.57**

Source: Survey Department, Ministry of Lands, Housing and Survey, Ibadan (2007)

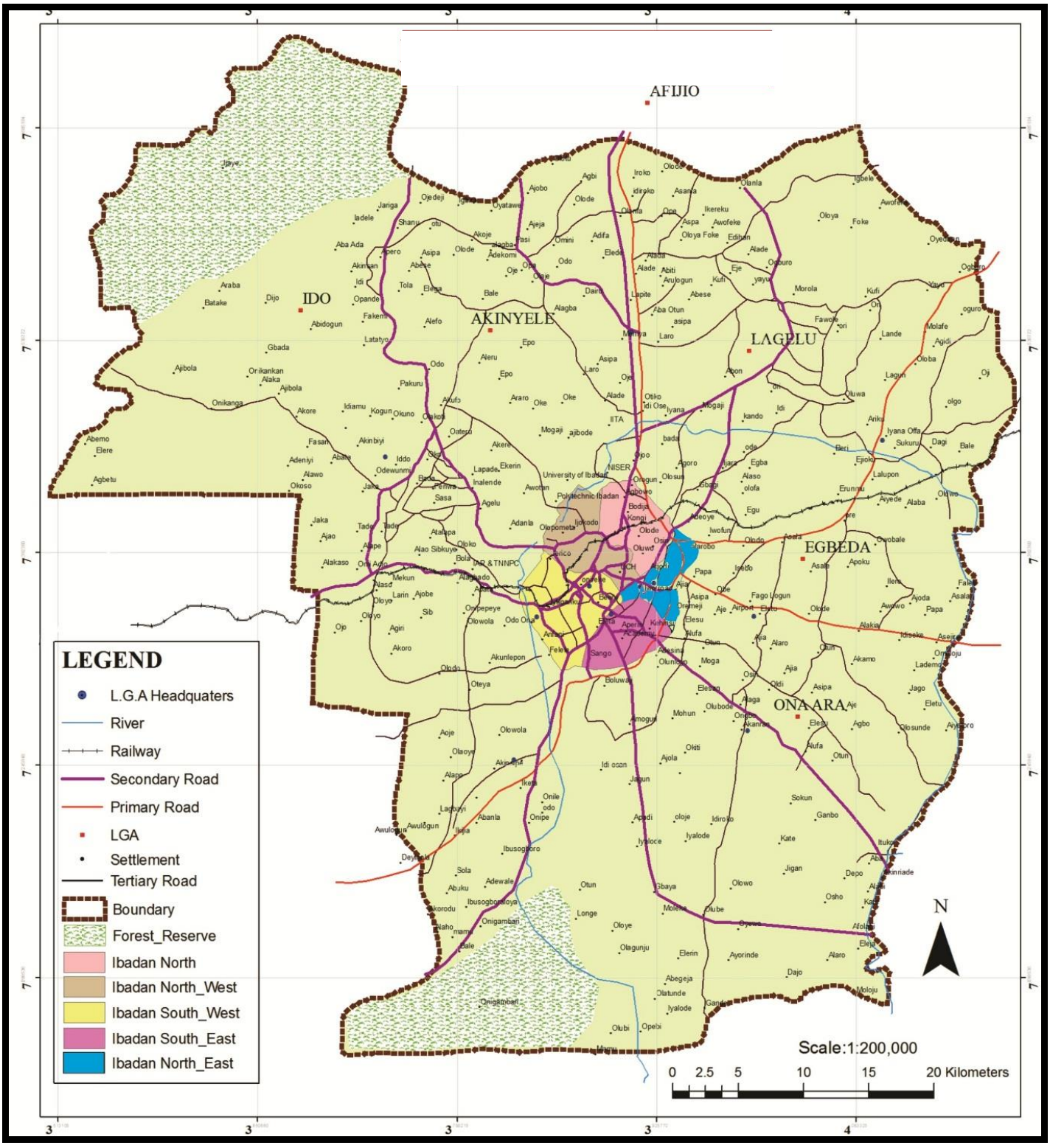

Figure 1.2: Ibadan Region

Source: Ministry of Lands and Survey, Oyo State, 2009

1.6.2 Land Use Classification and Location of Activities.

The growth of Ibadan was not structured by the use of any sophisticated master plan, hence the visible haphazard nature of its land use (Olatubara, 1995). Development has, therefore, sprung up indiscriminately in all directions with little regard to accessibility and other basic environmental considerations. Taking the elements of land use in the city in their perspective reveal that a large proportion of the urban land area, about 60.9 per cent is occupied by residential land use and interestingly, a sizeable area of the residential districts, especially the core area of the city falls within the high density zone where vehicular access is low, infrastructural facilities are poorly supplied and the structural quality of the residential buildings generally poor (Awoniyi, 1989; Olatubara, 1995).

The low density residential areas can be located around the housing estates of Bodija, Agodi, Jericho, Link Reservations, Oluyole, Akobo. Other low density residential areas include areas bordering Bodija and Agodi through Basorun to the expressway and the precincts of New Airport and areas around Challenge. The medium class residential areas occupy just about 12.69 per cent of the residential land use. These are found in such areas as Ring road, Apata, Sango, Eleyele, Oke-Ado, Oke-Bola, Monatan, Ojoo. However, most of the medium density residential zones are rapidly transiting into the high density zone because of the uncontrolled land-uses. The unplanned suburbs which make up about 35.59 percent of total landuse use of the city can be found around the traditional core areas and the extension away from the Lagos – Ibadan expressway to the east.

Ranking next to residential land-use is the huge chunk of accretion into the sub-urban land area of about 13.30 percent. These areas are constituted by the new and most recent directional pattern of settlement towards the western, South eastern and North eastern zones outside the city limits. The tag, 'rural use' given to this zone depicts the large number of uncompleted residential buildings and other activity developments.

Industrial land-use has been restricted to areas like Oluyole, Olomi, Owode and Lagelu estates and pockets of others at Podo along Lagos road and Iyana church along Iwo road. Commercial land use poses a lot of problem in terms of its measurement. Commercial facilities have been very significant in the growth and expansion of Ibadan. Apart from the several large markets such as New Gbagi, Dugbe,

Bodija, Oje, Alesinloye, Sango, Ojoo and Olomi, which have regional catchments and others such as Gege, Ayeye, Bode, Oke-Ado, Oja-Oba, Oranyan that serves local needs, almost every major highway within the city exhibits very high commercial attributes. Table 1.2 and Fig 1.3 reflect the land use analysis of Ibadan Metropolitan Area.

Table 1.2: Land use Analysis of Ibadan Metropolitan Area

Type of Use	Area in Hectares	Percentage of Landuse
High Density Residential	12,969.75	35.59
Medium Density Residential	2,815.50	7.73
Low Density Residential	6,406.25	17.58
Government Acquired	3,750.00	10.29
Industrial	1,500.00	4.11
Commercial	150.25	0.42
Institutional	1,562.50	4.28
Airport	562.50	1.541.
Open space	625.50	1.72
Rural Use	4,843.75	13.30
Agricultural	1,250.00	3.43
Total	**36,436.00**	**100**

Source: Oyo State Urban Planning Board, (2008)

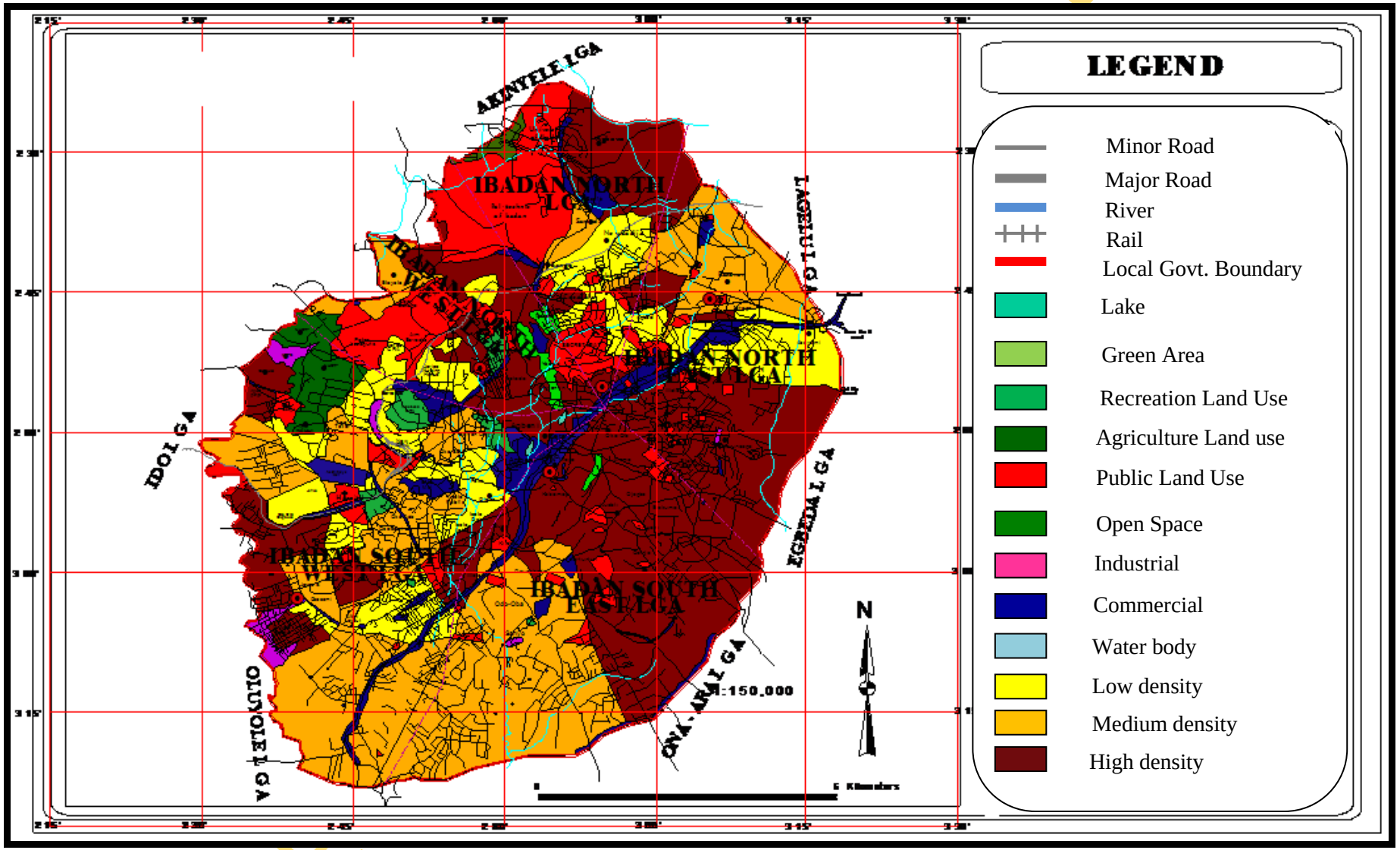

Figure 1.3: Land Use in Ibadan

Source: Author,s Compilation (2011)

1.6.3 Intra-Urban Mobility Pattern in Ibadan

Transportation system in Ibadan has been greatly influenced by the continuous sprawl of the city. The commuting distance from the traditional city core has continued to increase in an almost radial pattern as new activity centres are currently located outside the city limits thus promoting longer journeys by residents between homes and new activity modes. Osunade and Salami (1990), Olatubara (1995), all noted that the area of agricultural lands encroached upon by urban development rose from 0.38sq.km in 1935, 3.13sq.km in 1955, 6.26sq.km in 1977, 13.68sq.km in 1988 to its present figure of about 48.43sq.km in 2008. The expansion is direction – specific and continuous over time as clearly illustrated in Figures 1.1 and 1.5.

Movements within the urban centre involve trekking, and the use of private automobiles, motorcycles, tri-cycles, taxis and mini-buses. Adeniji (1983) noted that between 1964 and 1976, Ibadan city had a skeletal intra-urban bus system (publicly owned) originally plying 12 routes. The bus system eventually collapsed due to inadequate mass transport planning and regulation; lack of inter-governmental cooperation; poor maintenance, inadequate financial subsidy; dearth of qualified personnel and operational devices, among others. Also, the city benefitted from the financially assisted Oyo State Mass Transit Programme of 1978 which later transformed into the Trans-City Transport Company (TCTC) whose activity went down to its present non-performance level. The intra-urban rail mass transit earlier noted in the study also went this same way thereby putting the city at the whims and caprices of para-transit operators.

However, in a study of mobility patterns within the city, Fadare (1989) noted that the most important trips in Ibadan are essentially trips to work places and schools in the low, medium and high density residential areas. These trips, according to the study, accounted for 50 percent of all trips in the medium density areas and 64 per cent in the low density areas. Discretionary trips, including social, shopping etc were known to have accounted for 29 per cent, 42 per cent and 23 per cent in high, medium and low density residential areas respectively. The study concluded that trips for personal businesses accounted for the balance which is dominated by a large portion of petty – traders who are mostly women. Deviations from this mobility pattern can only be brought out by this research as the city keeps expanding. Figures 1.1 and 1.5 refer to the phases and growth direction of Ibadan.

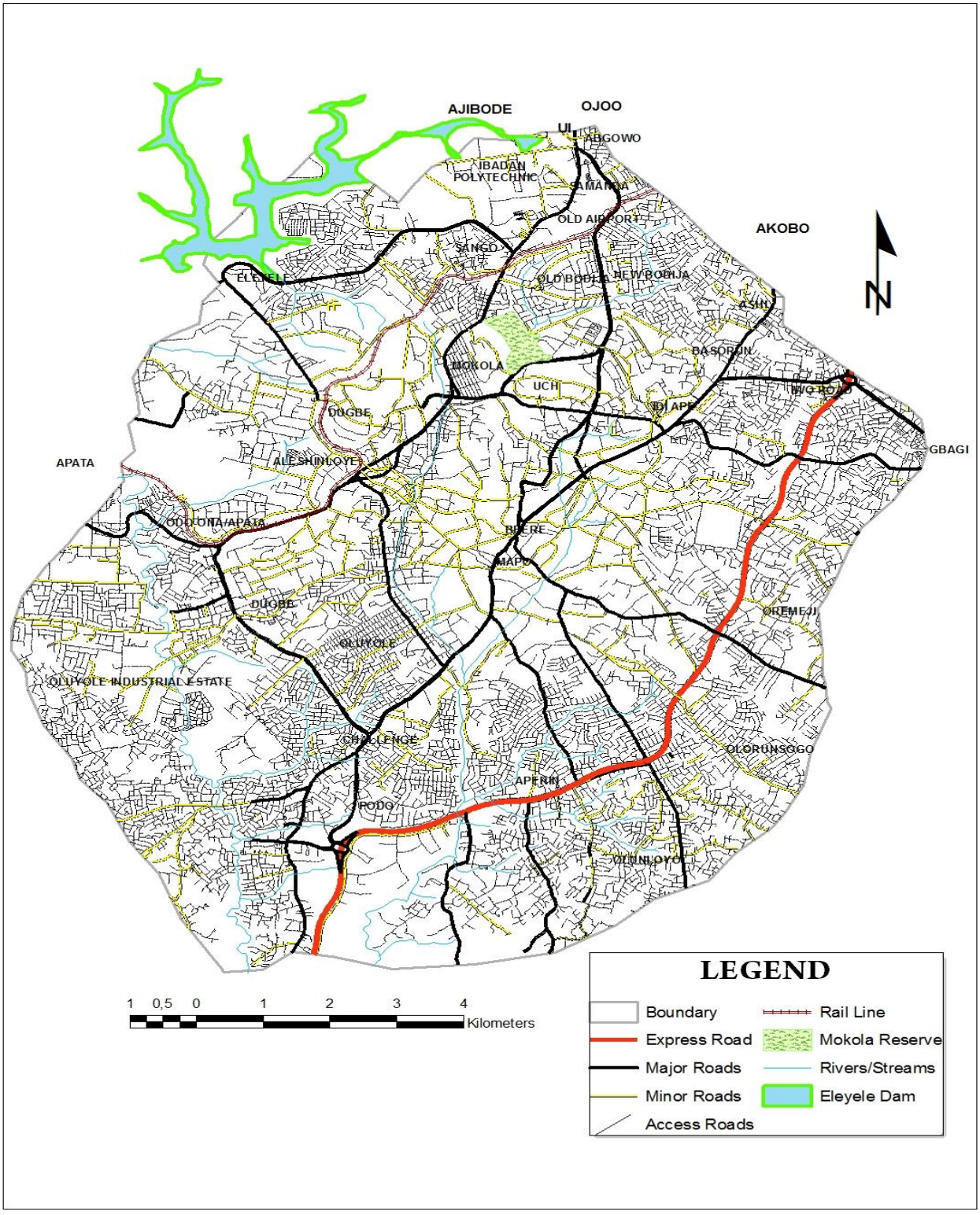

Figure 1.4: Road Network in Ibadan

Source: Ministry of Lands and Survey, Oyo State, 2009

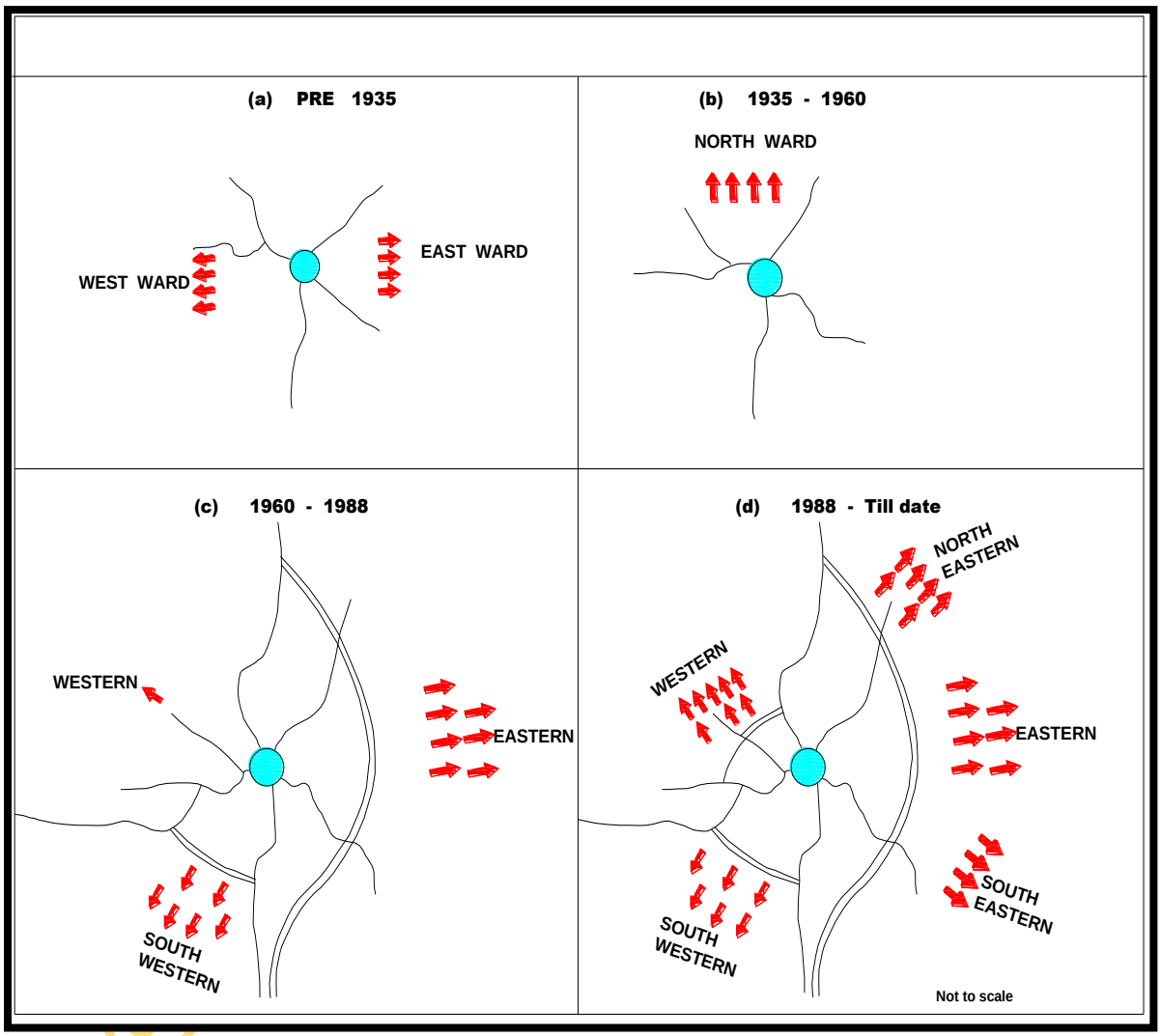

Figure 1.5: Direction of Physical Growth of Ibadan
Source: Modified after Olatubara, (1995)

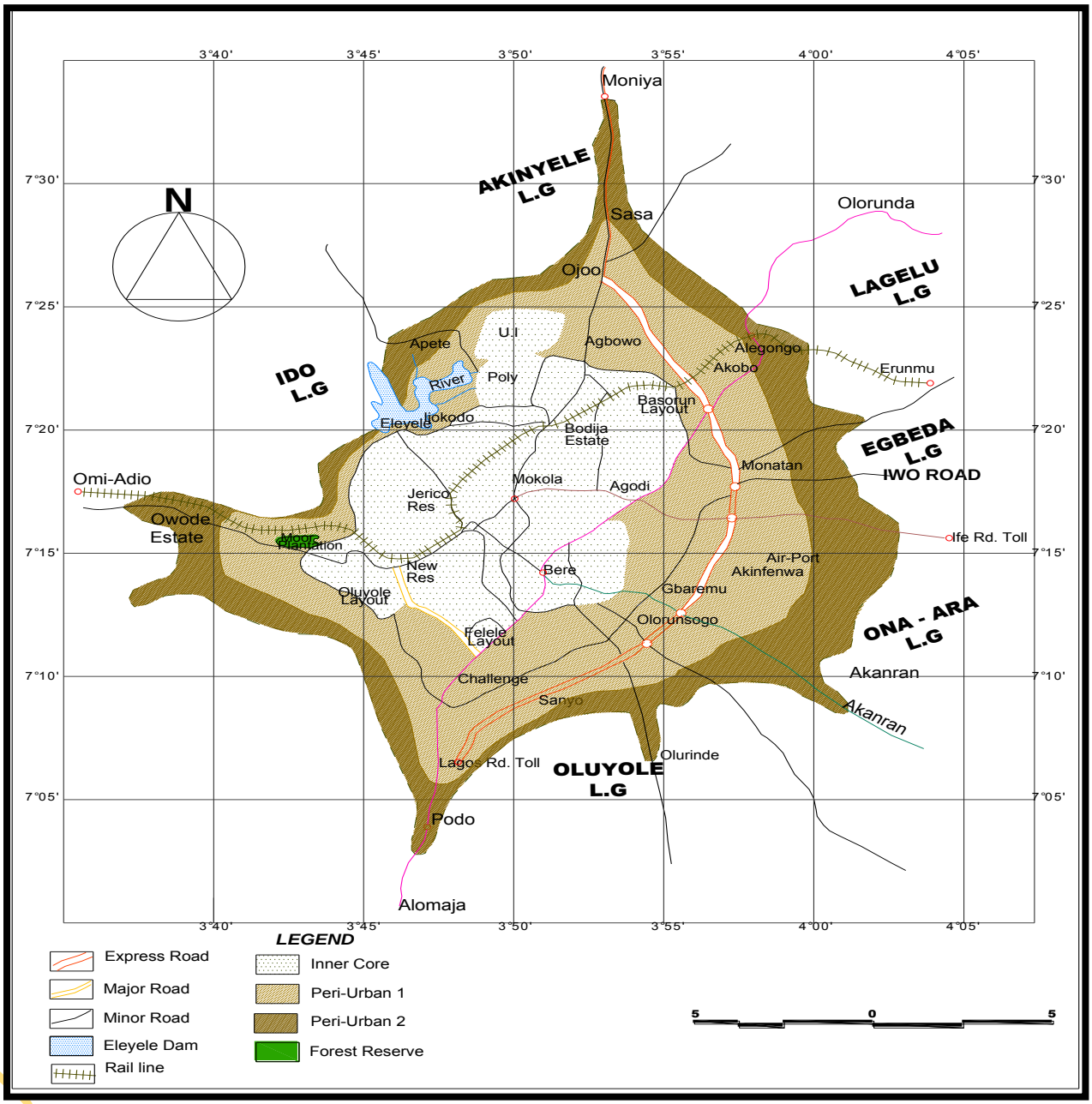

Figure 1.6: Ibadan and the Expansion of the Inner Core
Source: Modified after Adeagbo, (1995)

1.6.4 Challenges of Urban Travels in Ibadan

Journeys within the city and its environs just like many cities in Nigeria are concentrated on the roads. The land locked nature of the city does not lend it to water travels and the proximity factor of the city to Lagos did not allow for the buoyancy of air travels. The city dwellers therefore depend solely on road movements. This is one major reason why the major roads in the city are in poor state. All the existing major roads are overwhelmed by heavy vehicular distribution. Apart from the inter-state roads that traversed the city, most of the city roads are narrow single-carriage way. This factor highlights why the means of public transport is restricted to the use of mini-buses. The mini-buses find it more convenient to maneuvre through the roads, than the big buses.

As the city continued to expand, it became more obvious that most of the new areas can only be accessed by motorcycles rather than by vehicles because of the bad nature of the existing roads. The short spate of the urban mass transit programme of the late 1980's when the state owned Trans City Transport Corporation (TCTC) came on board with the big buses, gave the city dwellers a new impetus in terms of travel options and convenience. This combined with the rail mass transit operations along Omi-Adio- Bodija route which ferried both passengers and luggage around the zone of operations. A resident commented:

> *"we could not comprehend why the rail shuttle between Omi Adio and Bodija was discontinued. We have just begun to enjoy the services when it ended abruptly. They could have provided the much needed transportation option for the masses."*

The mass transit programme was however short lived and the task of public transportation in the city was totally surrendered to the National Union of Road Transport Workers (NURTW) and its Road Transport Employers Association of Nigeria (RTEAN) counterpart. It was glaring that the city has not really experienced an enduring mass transit system, in spite of the growing population and city expansion. Commuters suffer from limited options in making their trips within the city. The options which range between mini-buses (Danfo) to commercial taxis, private cars (kabu kabu) to motorcycles and of recent tri-cycles, left in their wake, a gory tale of transportation inefficiencies. Each of the modes have limited passenger carrying

capacity and can at best play a supportive role at the instance of a viable public transport system.

Another major transportation challenge faced by commuters in Ibadan lies in the location of the bus-terminals, most of which operate directly at road intersections thus incapacitating and creating more traffic chaos at such points. The terminals offers no comfort whatsoever for commuters who have to struggle to board vehicles to their various destinations. A commuter narrated her ordeal at one of such terminals:

> *"I am always filled with exasperation each time I want to board a vehicle at the terminals because of the incessant large crowd, most of whom are not just going anywhere but ready to pick your pockets at the slightest opportunity. Not only this, you also stand the risk of being knocked by moving vehicle entering the parking lots with impunity from the wrong lanes."*

Commuters are often stranded at various bus-stops especially at peak traffic periods. So also are the traffic snarls that are very incessant on all the major roads because of the heavy auto car invasion of such roads. All these summarized the challenges commuters pass through within the city.

Presently, the sub-urban commune distance of Ibadan city has shifted to several kilometres since the early 1990's when the urban rail mass transit was introduced. The same intra-rail route, for instance, extended beyond Bodija to Erunmu town, a distance of approximately 40 kilometres. Other arterial corridors have also emerged within the sprawling metropolis, all of which this research has identified. This study has also noted the peculiar nature of the terrain of this study, the transport culture of the people and the challenges which this type of pivotal research work could present in a city that is yet to have a master-plan for its physical development and whose activity-areas are located haphazardly within its sprawling suburbs. Perhaps more critically, Ibadan is a city whose public transport systems are largely dictated and run by transport unions rather than by government participation and directives.

Curbing the sprawl of the city over the years has proved to be a herculean task to which the city managers are yet to find answers. The sprawl that has threatened to take the city beyond the frontiers of effective management, still continued unabated as the built-up parts of the city are gradually eating up into the outlying six local government areas that makes up the city region.(Figure 1.6) All through the 1960's to the late 1970's when the Lagos-Ibadan express-way was constructed and

commissioned, all road traffic from Lagos to the northern parts of the country converged in Ibadan before proceeding to their destinations. Then, the railways as Udo (1996) recalled, also passes through the city which was a major break of bulk point for trade goods from the South West to the North. Ibadan also served as cargo station for the eastern bound traffic.

This view was corroborated by Filani (1996) who described the dramatic effect of the railway in the transformation of the city into a strategic collection and distribution centre. In Ibadan, where this research focuses, intra-urban rail mass transit service, which was introduced in early 1990, covered Omi-Adio-Bodija route, a distance of about 24 kilometres, served by 7 stations with an average distance of about 4 kilometres between the stations. Of the fifteen trains that operated only on work days, a poor ridership averaging 1,900 passengers per day was recorded. This was, however attributed to several reasons. First, that the line does not directly serve highly populated residential districts nor major employment areas. Second, it was the same line that served the inter-urban rail services that was adapted for intra-urban services. Third, the existing rail line and the newly created stations were unsuitable for sub-urban services (World Bank Report, 1991). This research has taken cognizance of these shortfalls in an effort to effect necessary corrections that can impact on the city's transportation landscape.

The city presently experiences poor traffic management and control, as its urban transport provision is in a state of flux, such that motor-cycles now evolved not only as complementary, but as a dominant mode of transport. The problems of providing an efficient public transportation system in Ibadan city are three-fold. First, the city has no visible urban transportation plan. What has happened is that road-networks are laid out in specific areas as they become incorporated into the built-up areas of the city. In many instances, land reserved for road networks are usually inadequate with the resultant in-accessibility of many houses by vehicular means. Secondly, government at all levels does not operate any public transport of its own in the city. The third, regarded as an institutional problem, typifies a general lack of cooperation and coordination among the various tiers of government that are responsible for the transport network within the city.

Traffic flow problems in Ibadan have become acute especially at peak hours. These, however, have been attributed to the rate of urban sprawl rather than economic

and industrial development. There is also a functional mix of both intra and inter-city movement that often create unexpected vicious snarls along the major roads in the city. The designation of Erunmu town as one of the six national dry ports for the Inland Container Depot (ICD) to decongest the Apapa Port in Lagos, marks another turning point in the transportation planning for the city as the fall-out of the siting of the dry-port is bound to exacerbate the freight-haulage capacity of the already congested roads in the absence of a functional rail transport. The city is surely ripe for a modern and viable intra-urban rail transit system so as to compete favourably with other urban agglomerations of its kind in the world.

1.7 THE PLAN OF THE THESIS

This thesis is divided into seven chapters. Chapter One outlines the background to the study, the statement of research problem, the justification for the study, the aim and objectives, the research hypotheses and the study area. Chapter Two presents the conceptual framework and literature review. The methodology employed in the research as well as the methods of data analysis are presented in Chapter Three. Chapter Four discusses the contextual development and institutional response to urban rail transport development in Nigeria. Chapter Five focuses on the household survey patterns of commuters in Ibadan, including the responses from the Focused Group Discussion, (FGD), the mobility pattern, of residents, their perception of rail transportation and the factors of rail patronage. Chapter Six evaluates the proposed rail corridors and their features while Chapter Seven summarises the major findings, concludes and proffers policy and practical recommendations.

CHAPTER TWO

2.0 THEORETICAL FRAMEWORK AND LITERATURE REVIEW

Urban transportation is an issue of daily concern. It is a catalyst to a country's social and economic development. It is also a dynamic urban infrastructure which will continue to attract constant review so as to elicit greater understanding of the problem it poses. Perspectives on urban transportation in Nigeria posit a collection of dispersed literature from scholars and professionals as to what can provide a sound theoretical and conceptual anchor for this type of research. Human movement in cities are known to be linked to specific urban activities and their land uses. Every particular type of land use involves the generation and attraction of an array of movements. These movements are either obligatory or voluntary (Rodrigue, 2008). Consequently, urban travels have evoked several theories, concepts and scholarly observations in the processes underlying it. This chapter presents the relevant conceptual framework and literature review.

2.1 THEORETICAL FRAMEWORK

Some of the theories and concepts considered in this study include the Spatial Interaction Theory, the model of urban activity pattern, the mass transit concept, the concept of deregulation and privatization, public-private-partnership concept in transport delivery. Others are: the eternal triangle model and the theory of rail transport and contestable market. These frameworks are critically examined with a view to specifying their theoretical support for this research.

2.1.1 The Spatial Interaction Theory.

The Spatial Interaction theory is an adaptation from the Newtonian concept of gravity in 1686, to explain the magnetic force operating within and between the

galaxies (Meyer and Miller, 2001). The adaptation of this model to transportation studies as explained by Vaughan (1987), states that "the amount of traffic between two zones is proportional to the product of the population or attraction of the zones multiplied by the deterrence factor for travel between the zones". This deterrence factor is based on the travel time, cost or distance between the zones.

Many alternative forms of this theory have been developed over the years (Meyer and Miller, 2001). From the series of mutations, the one that is widely used for transportation planning purposes takes the following form:

$$Tij = \frac{Pi\ Aj\ f(dij)\ kij}{\sum_{j=1}^{n} Ajf(dij)\ kij}$$

where Tij = number of trips generated in zone i and attracted to zone j

Pi = total trips generated in zone i

Aj = total number of trips attracted by zone j

f (dij) = an expression of spatial separation between zones i and j

kij = an adjustment factor for any special zonal characteristics of zones i and j.

In essence, what the spatial interaction model means is that the percentage of trips produced by zone i allocated to destination zone j is dependent upon both the attractiveness of and travel time to that zone relative to the features of all other attracting zones (Dickey, 1975). It tends to account for the factors that govern commuter's choice of movement. Researchers however have identified at least four of these factors which include; travel time, travel costs, comfort and levels of service (volume/capacity). Ortuzar and Williamson (1990), however broke these factors down further as journey time, distance, monetary cost such as (fuel and others), congestion queues, class of road on which such journeys are made, the scenery, signposts and other behavioural habits associated with the journey.

To explain the fit of the model into this research, there is the need to revisit the three basic concepts underlying the basis of movement and distribution of goods and services as advanced by Ullman (1956). Ullman, advanced three basic principles to explain the interaction involving transportation. These are the complementarity of places, intervening opportunities and the transferability of these goods and services.

The principle of complementarity implies that interaction between two or more places is a function of specific interdependence. Thus, for two or more places to interact there must be an interchangeable factor of supply and demand. Smith (1994), made a similar study of the flow of agricultural commodities by rail to the six New England States using a gravity-model regression.

Intervening opportunity explains the emergence of new alternative sources of supply which in essence can substitute the initial area of supply and subsequently remove or reduce the friction of transportation. (Ayeni, 1979; Oyesiku 1990). The principle of intervening opportunity and complementarity, to a great extent explains why interaction takes place between two spatially separated points. The concept of transferability focuses on the friction of distance as measured by time, cost and discomfort. The longer the distance, the higher the cost. In economic parlance, there is the tendency for people not to make contact with far distant locations. Essentially, this theory offers explanation on the issue of spatial interaction in urban centres. The day to day movements of people which involve activities like trip-making to and from places of work, markets, shopping centres, recreation and educational facilities are important in the spatial form of cities.

Travel behaviour of urban residents is the consequence of spatial separation of points of origin and destinations as well as the characteristics of the travelers (Barber, 1995; Oyesiku, 2003; Solanke 2005). However, this latter aspect, which refers to the effect of the travellers characteristics on trip frequency is not inclusive in the theory. It nevertheless, provides some explanations on why interaction takes place in space. In essence, the theory is largely theoretical than empirical and having implicit rather than explicit explanations to urban travel patterns. This is why transport planners always attempt to provide means of improving transport systems between areas by upgrading existing modes and networks, rather than relying on the underlying process of observed travel patterns.

2.1.2 Model of Urban Activity Pattern

Intra-urban travel pattern is determined by the number of trip characteristics including measures of frequency, timing and purpose of travel as well as distance travelled to reach such destinations, the amount of time spent at different activities and the means of travel used (Hanson, 1977, Olatubara, 1995). The model of Urban

Activity pattern presupposes that all intra urban movements are predicated on an *"action space"* which refers to the collection of all urban locations about which the individual has information and the subjective utility or preference associated with these locations. Horton and Reynolds (1971), have shown that every individual tends to carve out an *activity space* defined as a subset of all locations or areas that an individual has ever visited or had direct contact with as a result of day to day activities. Olatubara (1995), asserted that activity space is the most structured by individuals because it comprises of locations which have actually been visited. A location will change from being part of the activity space once a trip has been made. The pattern thus displayed by individual as they carry out their activities is the *activity pattern* of individuals.

Chapin (1974) also noted that activity pattern is determined by individual's propensity and opportunity to engage in particular activities. Also, travel behaviour of each individual are based on personal characteristics and the activity areas peculiar to each individual. The study however noted the importance of workplace, markets/shops, schools and other social locations in the life of residents within the study area. Constraints on this model are however imposed by culture, income, social status, old age, auto availability and employment.

2.1.3 Mass Transit Concept.

The mass transit system can be described as an efficient means of moving large numbers of people within a given network with relatively short term headways and reasonable turn-around time in dense urban areas (World Bank, 2002). This is made possible by various modes of transportation such as the buses, ferries, rails, trams and metros. Etitah (1989) was of the view that each of these options has its peculiar technical and operational characteristics as well as investment implications. The author deposed that any of the options or a combination of any of them can be adopted to suit individual urban centers or inter urban network. The choice of system could be influenced by population size and area extent of the city or regional area, the nature of transport demand, characteristics of land-use pattern and the level of technology.

The concept emphasized that not all forms of public transport are qualified to be called mass transit systems. For instance, mini-buses, taxis, rick-shaws and other para-transit modes are not mass transit systems. The carrying capacity, the

effectiveness and the efficiency of the system to relieve congestion in urban traffic situation makes the difference. From available statistics, the rail options have often provided a viable alternative to the buses in congested cities in terms of efficiency, convenience and mass appeal. The urban masses are no longer content to be moved conveniently in large numbers but also in a fast and appreciable time to their various destinations which only the mass rapid transit system can guarantee.

The integration of the MRT within the urban fabric however makes some important demands on the planning system. Rights-of-way must be established and protected. Space must be created for stations, platforms and terminals. One of the weak points of MRT system is their structuring effect on central business districts of cities which are likely to be increasingly congested. In another sense the MRT have been known to exhibit a less polluting factor that benefits the environment when compared with the private road traffic. Innovative bus-propulsion systems, including natural gas, clean diesel, hybrid diesel and electric, and fuel cells, all combine with the electric traction of the rail systems to make the environment cleaner and saf er.
The choice of MRT technology as dictated by costs and performance may vary from location to location. For instance, the conversion of existing roadway (including vehicles) cost averagely between 1 million and 8 million US dollars per route kilometer, where the carrying capacity can be up to 20,000 passengers per hour in the peak direction (pphpd) at an average speed of 17 to 20 km./hr.

Light Rapid Transit costs are typically between 10 and 30 million US dollars, while full heavy rail metros cost between 30 and 100 million US dollars per route kilometer, being fully automatic, fully underground systems. The capacity is up to 80,000 (pphpd) at an average speed of 40 to 50 km/h where the station spacings are fairly distant (Rebelo and Machado 2000). However, a more wide ranging multi-criteria analysis which include an integrated land-use urban transport strategies may be the most suitable way of ensuring that the unmeasured effects of MRT are taken into consideration. Table 2.1 shows the performance and cost of some typical mass rapid transit systems. In Order of magnitude, at-grade bus-way system formed by conversion of existing roadway (including vehicles) cost between 1 million and 5.2 million dollars per route kilometer (Porto Alegre and Bogota). Tunis, with its light-rail transit cost about 13.3 million dollars per route kilometre while Mexico City with full metro cost 40.92 million dollars per route kilometer.

Table 2.1. Performances and Cost of Some Typical Mass Transit Systems.

Example	Caracas (line4)	Mexico city (line B)	Kuala Lumpur (PUTRA)	Tunis (SMLT)	Recife (Linha sul)	Bogota (Trans-Milenio, phase 1)	Porto Alegre Busways
Category	Rail metro	Rail metro	Light rail	Light rail	Suburban rail conversion	Bus way	Bus way
Technology	Electric, steel rail	Electric, rubber tire	Electric, driverless	Electric, steel rail	Electric, steel rail	Articulated diesel buses	Diesel buses
Length (kilometers)	12.3	23.7	29	29.7km	14.3	41	25
Vertical segregation	100% tunnel	20% elevated 55% at grade 25% tunnel	100% elevated	At grade	95% at grade 5% elevated	At grade, mainly segregated	At grade, no signal priority
Stop spacing (kilometers)	1.5	1.1	1.3	0.9	1.2	0.7	0.4
Capital cost (millions of dollars)	1,110	970	1,450	435	166	213 (Inf. only)	25
Infrastructure/TA/equipment(millions of dollars	833	560	_	268	149	322	25
Vehicles (millions of dollars)	277	410	_	167	18	Not included (private operation)	Not included private operation
Initial (ultimate vehicles or trains/hour/direction	20(30)	13(26)	30	_	8	160	_
Initial maximum passenger capacity	21,600	19,500	10,000	12,000	9,600	_	20,000
Maximum passenger capacity	32,400	39,300	30,000	12,000	36,000	35,000	20,000
Average operating speed (km/h)	50	45	50	13/20	39	20	20
Capital cost/route km ($m)	90.25	40.92	50.0	13.3	11.6	5.2	1.0
Ownership	Public	Public	Private (BOT)	Public	Public	Public infras. Priv. vehicles	Public infras. Priv. vehicles
Year completed	2004	2000	1998	1998	2002	2000	1990's

Source: Pattison 1999 and BB&J Consult 2000

2.1.4 The Concept of Deregulation and Privatization.

The concept of deregulation generally means the abolishment of certain rules in the economic structure of a society which enables the respective companies to act with more freedom, according to their entrepreneurial spirit. It simply implies the liberalization of the market structures especially in the management of infrastructure sectors such as electricity supply, water supply, waste management and more importantly, the railways and other sectors still perceived as natural monopolies. Deregulation concept seeks to answer how to efficiently run these monopolist structures (Kessides, 1993; Francheys, 2000)

The general economic idea behind deregulation is the neo-liberal viewpoint that only in fully deregulated markets, real competition is possible. Real competition is seen by the proponents of the liberal economics as the best option to provide efficient services and reduce government control. More freedom of competition is seen to deliver better results while any restriction to free market is supposed to deliver inferior results. Kasperk (1997), focuses on the so called 'old-style' economic regulation which intends to determine, using parameters and influence decisions like market entry, prices and product quality. Privatization on the other hand can be one form for a deregulation process when the public authorities withdraw from services they have performed and private companies take over these services for various reasons. The main objective for deregulation however revolves around the need to increase the overall efficiency in the needed sector, which implies the use of expertise to reduce shortcomings in technical, managerial and operational fields. Other objectives include improved customer service, increases in capital investment and reduced political interference in the daily operation of enterprises.

With deregulation, there is a direct change in the market structure and the market outcome. Deregulation in infrastructure sectors can take various forms such as:

i. Outsourcing of tasks/services previously undertaken by the public-sector for a certain period of time.
ii. Full sale of public-enterprises to the private sector
iii. Enabling inset appointments, third party access to the network for other suppliers and free customer choice.

The achievement of deregulation processes as summarized by the World Bank (1997) is as shown in the Table 2.2

Table 2.2: Achievement of the Objectives Using Various forms of Deregulation.

Option	Deregulation Objectives					
	Expertise	**Managerial Expertise**	**Operating Efficiency**	**Investment Distribution System.**	**Insulation From Political Intervention**	**Improved Customer Orientation**
Service Contract	Partial	No	No	No	No	No
Management Contract	Yes	Partial	Yes	No	Partial	Partial
Lease	Yes	Yes	Yes	No	Yes	Yes
Concession	Yes	Yes	Yes	Yes	Yes	Yes
BOT	Yes	Yes	Yes	No	Partial	No
Divestiture	Yes	Yes	Yes	Yes	Yes	Yes
Enable TPA	Yes	Yes	Yes	No	Yes	Yes

Source: Adapted from the World Bank (1997)

2.1.5 The Public-Private Partnership Concept in Transport Delivery.

Public- private partnership (PPP) concept has been a useful tool in the area of transport infrastructural financing and delivery. At the core of this concept, a private investor renders public utility service on the grounds of a contract with a public agency or institution which is responsible for these services. The concept provides an opportunity to implement large investment projects which otherwise would be impossible due to limited financial resources.

In their overview of the (PPP) concept concerning transport delivery, Estache and Gines de Rus (2001), captured the overbearing influence of government intervention in the area of transport provisions and the futility of satisfying the yearnings aspirations and demands of tax payers. They observed that the tight hold of the public sector on transport has often resulted in excessive costs that are not usually matched by prices or quality of dividends. They noted further that transport deficits are becoming increasingly difficult to finance through government resources, a situation that has often triggered service-rationing in spite of growing demand and willingness to pay for more and better services by users.

Mabogunje (1998), observed that there are few available avenues in most African countries for raising sufficient revenue to fund urban infrastructure. In his view, they are restricted by their national governments to a narrow range of revenue. This has been the true state of railway funding in Nigeria since 1898. Rail transport has been funded by government only. It has never encouraged "partnership" where by multi-national corporations and other indigenous firms could participate and invest in the development of the rail-transport system. The logic of Mabogunje assertion lies in the encouragement of private companies with strong financial base to invest and participate in Nigeria's rail transport business alongside the Nigeria Rail-way Corporation (NRC). In order to create a conducive environment for such business to take place, he advocated a comprehensive revision of the 1955 Act that vested in the (NRC), the sole corporate operator.

The Abidjan-Ouagadougou rail-concession is a typical example of where public-private participation in rail-ways has functioned well in Africa. A World Bank report stated that in the first full year of operation between (October 1 1995 to September 30 1996) freight traffic almost doubled in comparison to the previous year

(230 million tonne/km to 428 million tonne/km). Also, quality of service to customers improved substantially. The variety of the options available between the public and private operators is presented in a conceptual frame work thus:

i. Programs/Performance Contracts: These contracts refer to an agreement between an autonomous public enterprise and the ministry or agency with which it is affiliated. Time allocation for these type of contracts tend to be short ranging from about two to five years and renewable. Private investment in this type of activity anchors on improved services, cost cuts, and meeting with set targets. Payment for services rendered is made by the appropriate Ministry or Agency through subsidies. The lack of popularity with this system in most developing countries lies in the factor of political interference

ii. Management Contracts: These, like the programs/performance option, is a transitional solution and not really attractive to the government. Finance on all investments and their attendant risks are borne by government or its agencies while the private operator supplies managerial skills or any associated innovations while the contractual agreement lasted. The private operator is paid on an agreed fee depending on the revenue of the business.

iii. Concessions/ Licences/Franchise: Under this agreement, assets continue to be public and are 'rented' out to the private operator for use during the contract period. However, operators are also free to bring its own assets. The concessionaire takes on operations and investment as well as commercial risk within the limits set in the contract for a period that ranges between 10 to 30years. Subsidies can however be part of the concessionary agreement if commercial risk is very high or as a result of heavy service obligations.

iv. Service Contracts: This is concerned with the need to deliver a specific transport services by government through private enterprises. Government provides the needed assets while the private agency provides services: it is these services that the government pays for rather than allow the operator to collect revenue directly. The major disadvantage of this system is that the private agency may not be interested in the demand of the sector since it has the guarantee of public payment:

However, service contracts are now through competitive bidding and it is usually smaller in scope and duration than concessions. The frame work captured in the foregoing discussion can be operated in the forms listed herewith.

a) Full Privatization: This method transfer all assets and liabilities to the private sector.

b) Build/Rehabilitate-Operate-Transfer (BOT): This is another form of Transport infrastructure privatization concept which is rapidly gaining popularity. This form of concession allows a consortium to finance, build and operate an infrastructure system for a fixed period, during which the government has a regulatory and oversight role.(Israel, 1992; Wei and Chung,2002). BOT projects, after generating sufficient revenue to cover investment and operating costs are transferred back to the government after a specified period of time, usually in 15 to 30 years. Other variants of BOT include build-own-operate (BOO), build-own-operate-transfer (BOOT), build-transfer-operate (BTO), build-rent-operate-transfer (BROT), develop-build-operate (DBO), design-build-finance-operate (DBFO), design-build-operate-maintain (DBOM), refurbish-operate-transfer (ROT) and so on (Kerf and Smith,1996) Altogether, the allocation of risks, seems to be the chief ingredient of BOT scheme's attractiveness to concessionaires.

c) The major shortcoming of BOT however lies in the fact that the model cannot precisely predict its earnings and payments, thus making banks to be reluctant in lending money to concession firms.

d) Joint Ventures: This is the combination of two or more firms joining forces with common interest and emerging as a single front. It is also possible for public authorities to collaborate with private firms to produce a joint venture. The only visible problem here is the fact that the Port authority plays a dual role of the regulator and the regulated.

e) Leasing: This involves renting public assets to private operators for a fixed period to obtain income from contract fees.

With respect to the dimension of private participation in the industry, Galenson and Thompson (1993) itemized the following.

i. Government full control of infrastructures and finances in which the railroad is subordinated to its interests.

ii. Public enterprise in which the railway is characterized by a higher managerial autonomy but still requires government approval for many decisions.

iii. Mixed forms of cooperation between private and public capital which include leasing, concession and other management contracts.

From global studies of rail service concession William and Thompson (1996) revealed that average duration of rail concession of 5 to 10 years, increasing up to 30years when network investment and development are included. Trends in the global rail industry has shown that the organization of the industry is adapted to each country's needs and characteristics and thus should be moderated by principles that foster competition and market mechanism that promotes stable legal and institutional framework for economic activity.

2.1.6 The Eternal Triangle Model

As a follow-up to the expositions on the Public- Private-Partnership concept in transport delivery, the Eternal Triangle Model is also be considered as a viable model that explains the key fundamental elements of public transportation. The model states that, given a set of eternal circumstances, there is a relationship between the level of service provided, the cost of operations and revenue accrued. According to Adeniji (1983), the model outlines the complex relationship among the three variables of cost, revenue and service in transport operations (Figure 2.1).

The Eternal Triangle Model is relevant because, the variables of cost, service and revenue are critical to public private participation in urban rail mass-transport operations. The aim of private investors is to make and maximize profit at minimum operating costs while the corporation or concerned agency provides the enabling environment. The illustration shows that the level of service comprises of three main elements which are: the density of route network, the frequency of service and the period of operation, all of which are critical to the reliance of the commuting public on a particular transport system.

Costs as a component of the triangle can also be classified into capital costs, which specifies the financial outlay in terms of equipment, trains, rolling stock, tracking, stations and terminal buildings and so on. The other aspect of cost relates to the operating costs which incorporates staff wages, ground rents, energy consumption among other things. The third aspect of the triangle which is the revenue to be

generated, refers to the transport fares charged for the services rendered. The fare level is dependent on the policy adopted. It may be economic or commercial level. Fare scales may be categorized as graduated by distance, zonal fares or time-based fares. Any fare structure adopted must provide the revenue to meet the financial target set, also universal to the users, flexible and fraud free.

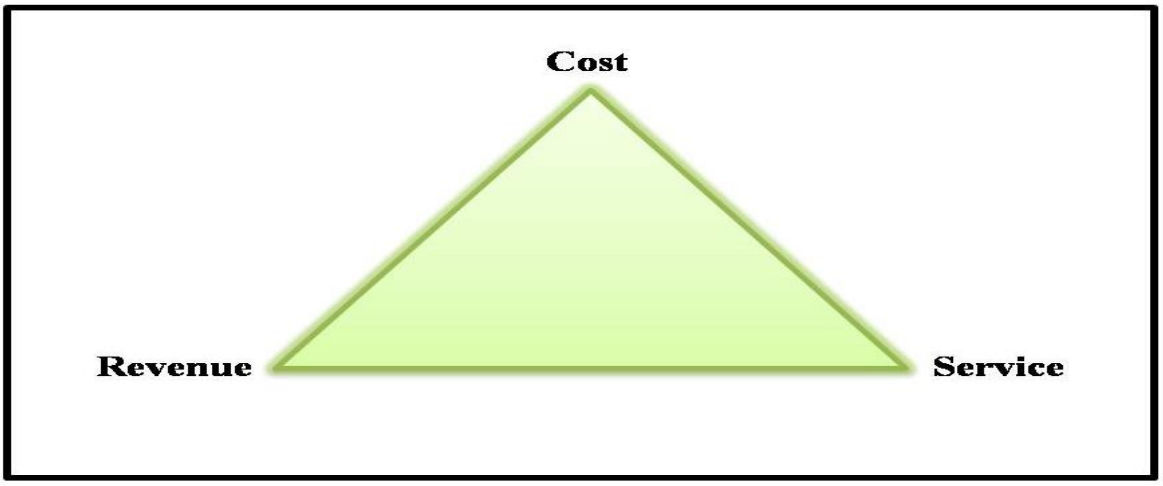

Figure. 2.1 The Eternal Triangle Model
Source: Addenbrooke et .al (1981)

2.1.7 Rail Transport and the Theory of Contestable Market.

The concept of rail transportation as social service, irrespective of profitability is a defining element that has determined the industry's organization and performance around the world. With the rail industry operating as a natural monopoly, in spite of the multi-product nature of the activity, the infrastructural provisions and the existence of indivisibilities in inputs and outputs, this theory has come to challenge the monopoly control over prices. The theory held that a monopolist would be prevented from changing monopoly prices if there was a threat that other firms could enter the industry. The threat of entry would be sufficient to discourage the monopolist from abusing his market position. The theory is in contention with the freezing of entry levels as obtained in many regulated industries whereby the regulators restricted entry into the industry's market. The growing trends of operational deficits recorded in the rail industry especially in the 1970's and 80's is an affirmation that this new theory has become very relevant to the rail industry as it seeks to explore every available avenue of concession and privatization for the survival of the industry. In this wise, Campos and Camtos (2000), advocated the separation of infrastructure from operational services in the rail industry as an important phenomenon in conditioning the concession process. With respect to the dimension of various ownership patterns in the industry, Galenson and Thompson (1993) itemized the following:

i. Government full control of infrastructure and finances in which the railroad is subordinate to its interests.
ii. Public enterprise in which the railway is characterized by a higher managerial autonomy but still requires Government approval for many decisions.
iii. Mixed forms of co-operation between private and public capital which include leasing, concession and other management contracts.

The application of this theory, in the context of the study will depend on the review of the 1955 law which gave full monopoly of operations and authority to the Nigerian Railway Corporation. Trends in the global rail industry has shown that the industry should be moderated by principles that foster competition and market mechanism that promotes stable, legal and institutional frame-work for economic activity.

2.1.8 Limitations of the Theoretical Framework on study

The spatial Interaction theory on which this study was largely anchored is well known to offer very good explanation on the origin and destination of journeys undertaken by commuters in a given space. For the theory to work efficiently, this space must be critically analyzed and well demarcated to offer explanations on the components of demand and supply. Interactions between demarcated zones can only be possible if alternative sources of supply are not present in both zones, otherwise interaction may be unnecessary. The limitation of the theory lies in its lack of forecast on the travel behaviour of some residents who may wish to move freely in an urban area on sight-seeing or tourism with no specific destination. The theory fails to capture the underlying processes of observed travel patterns. In essence, the theory is largely theoretical than empirical and having implicit rather than explicit explanations to urban travel patterns. This is why transport planners always attempt to provide means of improving transport systems between areas by upgrading existing modes and networks rather than relying on the underlying process of observed travel patterns.

The adoption of the Mass Transit Concept by this study was based on its efficiency factor in moving large numbers of people within given network using transportation modes such as the buses, trains, ferries among other means of mass transit. The concept however have been known to thrive only where commuter threshold capacity on a given network can be ascertained, otherwise it may fail. In compact nucleated cities where activities are located within trekkable distances, the concept may give way to the para-transit modes. In essence the adoption of the concept relies solely on the nature of transport demand, areal extent of the city and the characteristics of land use pattern.

The consideration of the concept of Deregulation and privatization reviewed in this study, whose main goal is targeted towards the increase in overall efficiency of the transport sector, has its limitations in the arrangement and set-up of the various partnership schemes. For instance, the full sale of public enterprises environment where the investment distribution system is heavily politicized and where the end-users of such investments are not well aligned.

The theory of contestable Market in the rail industry which is economic in nature cannot operate in an environment of natural monopoly where market prices are controlled by government. Private entrepreneurs have serious limitations in their entry of such markets.

2.2 LITERATURE REVIEW

2.2.1 Introduction

In this section, a number of critical issues that are related to the research are reviewed. These range from issues connected with transportation coordination in Nigeria, to the potentials of rail transport in the reordering of the transportational space within cities and the context of sustainable urban mobility, as highlighted by the public-private partnership schemes. The section also covers the varieties of rail transit options, their technical features and mode of spatial re-organization.

2.2.2. Issues of Transport Coordination in Nigeria

Transport Coordination means the fit of each form of transport into its proper place in the total system. Kolsen (1998) describes it as the assignment of each facility by whatever means to those transport tasks it can perform better than other facilities under conditions which ensures its fullest development in the place so found. Technically defined, co-ordination focuses on the apparent technical capabilities of each from of transport. The superiority of each medium is measured by the costs per unit performance. Performance is measured by the size and type of goods consigned, time in transit and accessibility to ancillary facilities at both ends of the journey.

Writing on the issue of transport co-ordination in Nigeria, Ekong (1977), believes that all transport modes possess technical and economic advantages peculiar to each particular mode. He asserted that where competition among these modes becomes unbridled, wasteful use of existing facilities result and the economy becomes the eventual loser. He stated that the marked imbalance in the development of the different modes in Nigeria has serious implications on the overall development of the nation. The analytical belief that unhealthy competition and overlapping functions in transport services are wasteful as well harmful is a truism in as much as they mean that two sets of the capital are trying to get remunerated where there is scope for only one. Costs are thereby increased and efficient services cannot be rendered. Under a

condition of unbridled competition, the better paying route tends to be over-provided with transport facilities at the expense of the less-paying routes, thus resulting in economic waste.

Scholars and professional alike in the field of transportation have argued on the necessity for and against some measures of regulation to achieve co-ordination at both the institutional and inter-modal levels. Basically, some of the notable advanced economies who have once passed through this stage realized the need to provide an impartial operational regulation for all the modes which according to Locklin (1966) will be "to recognize and preserve the inherent advantage of each mode, to promote safe, adequate, economical and efficient service to the end of developing, coordinating and preserving a national transportation system which is adequate enough to meet the needs of commerce, goods and other services". Presently, there seems to be no clear incentives to attract private investments to the Inland water transport, rail transport and even the aviation sector enough to strengthen inter-modal integration. Ekong (1977) summarized the problems of transport coordination in Nigeria as:

i. Absence of central institution capable of effectively coordinating all transport modes and their operations.
ii. Weak institutional base for policy formulation and enforcement of the transport systems.
iii. Government dependence on experts who address transport issues on spasmodic manner.
iv. Defective and incoherent management and operational principles on the part of major transport corporations and companies.
v. Weak infrastructural base for effective inter-modal linkages.

2.2.3 Rail Transport and Spatial Reorganization.

Rail transport has managed to generate avid enthusiasm across a wide spectrum of people over time. This fact may be due to the colossal engineering achievement which their construction represents or the vast scale of some rail-road schemes. For instance, Jefferson (1928) remarked that the railway had a civilizing role. The mobility it provides transformed and enabled people and had a profound impact on wider aspects of economic development and the evolution of economic and social landscapes.

Rostow (1960) see railways as historically the most powerful single initiator of economic take-off; a main force in the widening of markets and a prerequisite to the expansion of the transport sector. A couple of years after Rostow's remark, Meinig (1962), also agreed that railways remain a decisive instrument in the creation of the many significant patterns ever seen in human geography. The integrative social, economic and political roles played by railways across the globe and their accompanying development impact are well documented. Schivebusch (1986), argued that very few development planners and analysts would doubt that railways have had a significant role in organizing space. Just as Hillings (1996), also attested that railways could actually be both the cause and result of economic growth, in addition to their importance in settlement growth.

As observed by Jefferson, the sphere of influence of the rails and its re organization of space can be seen in the 32-kilometre band, 16-kilometre on either side of the track where the direct influence of the railway was concentrated. Kolars and Malin (1970), however extended this zone of influence to about 40-km band on either side of the rail-line in their study of Turkish railways. Also, in its commentary, the British Broadcasting Corporation in 1993 acknowledged that the rapid economic growth in the 19th century was certainly associated with the expansion of the supply of the transport sector which was largely due provided by the railway network development. The rail was appraised from the point of increasing efficiency and reducing transport cost particularly for bulk goods in large quantities.

2.2.4. Rail Transport and Economic Transformation of Cities.

The development of rail transport in developed countries with respect to the movement of passengers and goods followed the pattern of industrial and urban expansions of the 19th century. In Europe for instance, the early industries facilitated rail traffic generation while in America, it was the railways and agriculture that provided the starting point for industrial production (Hillings, 1996). In essence, the profound impact of rail transport in the development of trade and commercial economy, agricultural and mineral resources sector, settlement expansion facilitation and the enhancement of internal cohesion is indeed of immeasurable significance.

Adesanya (2002) citing Mabogunje(1980) traced the economic prosperity of cocoa belt of Ghana in 1903 to the provision of rail-lines . The subsequent incursion of

the rail from the coast of Sekondi to the gold mining areas of Tarkwa also resulted in a drastic fall in land transport cost per tonne of imported goods from the mines from 25.35 pounds sterling to about 3.00 pounds. In Nigeria it was also observed that within 18 months of reaching Kano, the rail enhanced the production of groundnut to the extent that every available piece of land was devoted to groundnut production. This situation raised the exportation of the commodity from about 10,000 tons in 1912 to an average of 40,000 tons per annum for the next decade.

Filani (1988) also attributed the political and economic emergence of some towns in Nigeria to the rail connection as the colonial administration at that time deliberately linked only centres of production in Nigeria. Towns like Enugu, Jos and Kafanchan emerged as 'new towns' while older towns like Kano, Kaduna, Ibadan, Port-Harcourt and Lagos were rejuvenated by the rails. The coming of the rails to Ibadan for instance, was largely responsible for the prominence of the Old Gbagi-Lebanon street commercial axis and the city expansion that was witnessed along Apata- Odo-Ona and Dugbe sector of the city.

2.2.5 Rail Transport and Intermodalism

The principle of intermodalism according to Syliowicz (2003); Filani (2005) refers to the development of mobility solutions that utilize each transport modes commercial and technical advantages in such a way that minimizes the negative impacts and at the same time enhances productivity of the local, regional, national and international transportation system. The existing system of un- integrated and uncoordinated modes has failed to meet the growing demands for greater personal mobility together with the movement of ever-large amounts of freight to a very great extent. It has also imposed heavy social and environmental costs upon populations in every society. What is needed is a system replete with efficient connectivity, and coordination among modes, provision of adequate choices for passengers and sustainable mobility enhancement.

Sherry (2006) defined intermodalism as the seamless interconnection of two or more modes of transportation to create an efficient, safe, secure, sustainable and ethical system of transportation. Intermodalism in the context of sustainable development presupposes the analysis of the strength and weaknesses of each mode

and eliminating the perceived weaknesses of each of the modes by allowing them to perform only in areas of their comparative advantages.

In this wise, the rail no doubt, is the major mode for promoting such sustainable economic development if perceived through the principle of intermodalism as defined. The importance of railway as a mode of transport has spanned over two centuries and for various development purpose in different part of the world including Africa. In a brief historical account, Filani (2005) noted that major railways development were built by the colonial powers to exploit the mineral resources and facilitate their evacuation to metropolitan countries as well as promote effective administrative control of the countries. He highlighted the traditional function of the rail as the economic carriage by land of bulky commodities and the relatively rapid movement of large numbers of people as well goods. Rail contemporary advantage today, revolves around the provision of intra as well as inters – urban passenger travel and freight movement. With the advancement of technology rail travel can now substitute air travel in terms of speed and distance covered. Private cars and other automobile congestion as recounted by Filani (2005), becomes more self- defeating as city sizes increase and the heart of these cities becomes in- accessible by auto – cars, railways has always being called to the rescue. This is made possible by its inherent characteristics which allow large volumes of passengers to be carried over short distances within the city. In cities like London, Liverpool, Paris, Moscow and Tokyo, underground rail systems serve this need. The future prospect according to him shows that rail travel will eventually become more widely used for intra – urban travel even in smaller cities than those mentioned above.

In this same narrative, the advent of 'containerization' has also advanced the course of the railways. Intermodal systems have developed trans – shipment terminals whereby railways are responsible for the deposit of freight, cargoes, trucks and other road transport modes converge and radiates for the collection and delivery of such cargoes or containers, The creation of six inland container depots in Nigeria is definitely bound to justify and foster the principle of intermodalism with the rail transport taking the leading role.

2.2.6. Rail Transport and Sustainable Urban Mobility

For sustainable development to become effective, Daly (1990) as cited by Filani (2005) agreed that policies on this should be based on three general principles namely: renewable resources should not be used faster than their generation rates; non - renewable resources should not be used faster than their substitutes become available and pollution emission should not exceed the assimilative capacity of the environment

The World Bank (1996) as cited by Filani (2005) asserted that the environmental effects of transport differ significantly among the different modes of transport. Motor vehicles according to him are the dominant sources of the emissions that have local and continental effects such as the formation of acid rain which accounts for more than 75 per cent of the transport sector's contribution to global pollution –Aviation he noted, causes local air and noise pollution at the ground level and gaseous emission in the troposphere to deplete the ozone layer and exacerbate global warming. In the case of maritime transport, shipping accounts for 25 per cent of the oil in the maritime environment. In all these instances, a virile railway system according to him has a significant role to play due to its inherent characteristics and the continued expansion of its operational capabilities afforded by continuous advancement in technology. Apart from the localized impacts of rail-generated noise, the railway has a decided advantage over all other modes of transport in the area of environmental friendliness. The last quarter of the 20th century witnessed the electrification of the rail system and a rapid spread of metro (urban) systems in the developing and developed countries. Surface tramway and the use of trams otherwise known as Light Rail Vehicle (LRV) was seen as an economical and efficient alternative when compared to the high cost of building a traditional sub-urban rail or underground metro. The Light Rail can carry 100 or more passengers and run up to 100 km/hr where the environment allows.

The advancement in technology has allowed rail transport to be developed from the Japanese Bullet Trains of the Mid-1960's to the French TGV (Train Grande Vitesses) or High-Speed Trains capable of running at 270km/hr in 1983 and now, the first fully automated passenger railway with crewless trains was inaugurated in Lille, northern France in 1989. The introduction of automatic signaling has also eliminated human errors and promoted greater safety on routes. All told, the rail concept is not only virile, dynamic and efficient in terms of mass movement of people and goods at

affordable rates, but also capable of utilizing resources that will meet the socio-economic development needs of the present generation of people without compromising the ability of future generations to meet their own needs.

2.2.7. Rail Transit Options in the Context of Urban Mass Transit System.

There are a number of rail mass transit forms that offers better service quality and faster operational speed when urban mass transit systems are considered. These are in form of heavy rail transit, which operates as underground metro or elevated rail transit and the rail light transit (LRT) which also incorporates the Trams and Personal Rapid Transit (PRT). Although these mass rapid transit alternatives combine to complement the bus rapid transit and have been known for long in developed countries. The concept has much short history in Asian countries and almost none in Africa.

2.2.7.1 Heavy Rail Transit (Metro): according to ITDP (2007), is described as a heavy rail system that operates on grade separated tracks that are located principally underground. It is superior than other mass transit alternatives because of its high passenger capacity and high operational speed. It is equally one of the capital intensive rail investments whose cost varies between 45-350 million US dollars per kilometer. It is also known to have the capacity for 80,000 pphpd. (World Bank, 2002) Cities that can boast of this infrastructure include, London, Madrid, Shanghai, Caracas, Bangkok, Hong Kong and Beijing.

2.2.7.2. Heavy Rail Transit (Elevated): is another form of heavy rail transit system operating on grade separated tracks that are located principally on an aerial structure. It can also be considered as a form of metro whose infrastructure is also capital intensive. The cost range from 40 –100 million dollars per route kilometer. Similarly, like the metro, it combines the advantage of speed and capacity. This concept is being adopted in most Asia mega-cities including India's Delhi, Mumbai, Kolkata among others.

2.2.7.3. Light Rail Transit: Button and Pitsfield (1986) described this as an urban electric railway system that operates either on its own right of way, at ground level, elevated or underground infrastructure or mixed with other traffic on streets typically

called ‘tram ways’. The Light Rail Transit as defined by ITDP (2007) is the electric rail based technology, operating either as a single rail car or as a short tram of cars, typically on exclusive right of way lanes at the surface level with overhead electrical connectors. This concept can be in vagaries such as at grade, elevated and tunnel.

Light rail transit can carry between 8000 and 25,000 passengers per hour per direction, although the system capacity can drop to a range of just 1,000 to 14,000 passengers per hour per direction when mixed with other traffic. The cost of providing a light rail transit which is between 10 – 30 million dollars put the choice away for many developing countries cities, except for the relatively wealthy ones like Tunis and Cairo in Africa. Currently, Singapore, Manila, Hong Kong and more than ten cities in Japan including Tokyo have light rail transit.

This form of public transport typologies in provision is expanding rapidly in the industrialized economics. (World Bank, 2002) The benefits of light rail transit over that of bus way is that they have a less local air pollution impact, offer a more long lasting commitment to public transport and have an image that triggers support for complementary measures which buses may find difficult to achieve (World Bank, 2002).

2.2.7.4. Personal Rapid Transit (PRT): This is another form of light rail transit although not with a mass transit appeal but which also operates on exclusive right-of-way lanes which may be at grade separated. PRT is a relatively new option for lower density developed cities. It makes use of Automatic Guided Vehicles (AGV), which makes it driverless with a carrying capacity of about six passengers. The concept is to combine the flexibility of taxi services with the automation of fixed track systems (ITDP, 2007)

The Capacity of rail systems is a function of two principal determinants which are the number of train paths and the maximum size of train as dictated by track geometry and technology. Nash (1985) suggest that for a single track there may not be more than two trains each way per hour and for a suitably signaled double track, 20 to 30 is possible. Sophisticated signaling systems can allow headways of as little as 90 seconds for trains moving at over 150 K ph. The technical characteristics of the rail system are highlighted in the Table 2.3

2.2.7.5 Trams: This can be regarded as a form of rail system that is older in form and usage. It operates with two or four car formation on tracks that are lighter in construction than both the rapid and the light transit systems. The capacity of Trams are lower, usually about 250 passengers per train and are capable of moving up to 15,000 passengers per hour at an average speed of 20 kilometres per hour depending on the corridor and station spacing. Nearly all German cities, even those that have invested heavily in new underground or light rail systems have kept and modernized their old Tram systems. However, cities in Nigeria are yet to witness these wonderful transitions because of the static nature of their rail development. This is why the present study intends to explore the potentials inherent in all these rail systems globally available and to see how they can be adapted to suite the Nigerian urban transportation landscape.

Table 2.3 Technical Characteristics of Rail Systems:

Technical Features	Trams	Light Rail	Rapid Rail
Right of way	Shared	Mainly not shared	Not shared
Average Speed km/hr	10-20	20-30	30-60
Highest possible speed km/hr	50-70	60-80	80-200
Security system	Visual observation: some signal support	As in Trams but stronger signal support	Automated signal system
Passengers per train	250	500	750-1,500
Efficiency: passengers per hour	15,000	20,000	30,000-60,000
Length of Train (m)	70	70-100	130-200
Width of Train (m)	2.20-2.40	2.40-2.65	2.65-3.00
Headway (seconds)	60	90	90
Platform height (m)	-0.40	-0.95	0.90-1.10

Source: Hall and Carmen Hoss-Klav (1986) p.7

2.2.8. Rail Transport Problems in Developing Countries.

Adesanya (2002) observed that in spite of the integrative social, economic and political roles played by railways across the globe, many railways systems, especially in developing countries, are suffering from rapidly declining productivity and unimpressive operating and financial performance. Galenson and Thompson (1994) also attributed the inefficient rail operations and chronically inadequate earnings recorded in the developing countries by rail transport to serious deficiencies in basic rail infrastructure provision and maintenance. This situation becomes even more aggravated by the macroeconomic crises which many of the countries are going through.

Although it will be recalled that many of the rail lines constructed in Africa were essentially to provide inland penetration and as a by-product of the need to demonstrate the effective political control required to justify colonial claims to territory. The railways established in the early colonial period according to Hillings (1996) were for reasons of parsimony, often built to low design standard and at least cost and in many cases have proved incapable of satisfactorily accommodating the traffic of expanding economies. The railways of Nigeria and Ghana which Hillings cited as good examples of initial considerable impact, but which are presently networks, on which even the traditional traffic is handled with great difficulty and where the possibility of rail induced economic development has to be regenerated.

Many of the railway systems of the developing world are of very low density, low connectivity and limited accessibility. Most of them are also struggling from stiff competition from road haulage and declining traffic. Other itemized problems associated with their low performance and productivity include that of state ownership and control, undue government interference in the area of staffing with its inducement of bureaucratic norms, unrealistic rates and tariffs as well as slow consideration and response to institutional reforms.

2.2.9. Rail Transport Reforms and Restructuring in Developed Economies.

Most advanced countries have also had the need to put their rail systems on a sound footing, so that it can function more efficiently and effectively. The major challenge for rail transportation came from the trucking industry which was placed on

a better pedestal for quality performance by massive highway construction programme embarked upon by various governments.

Thompson (1993) recalled that in the United States alone, three notable responses were made between early 1970's and 1980's to shore up the rapidly declining rail transport performance. When it was noticed that the inter-city freight dropped from 74 percent in 1988 and the passenger services could not survive the threat from the automobiles, the American government created the National Railroad Passenger Corporation (AMTRAK) in 1971 to improve the inter-city rail passenger service. Also, the big six railroads which included Norfolk Southern, Burlington Northern, Union Pacific, CSX, Sante Fe and Con-Rail. These six were reorganized with the Chicago North Western to form the bedrock of the freight forwarding network in the United States. The effort did a lot to remove drastically the series of un-economic operations and the stress which many of the private rail companies were undergoing.

The third response which was the famous Stagger's Act of 1980 restored the sanity and capability of the rail industry to hold its own in the competitive transportation landscape. The post-Staggers era witnessed a relatively stable rail traffic, increased customer service including dramatic profitability levels (Coyle et al, 1990; Thompson, 1993; Adesanya, 2002)

The British experience of rail restructuring was equally significant. By 1921, about 120 rail companies merged into four regional companies namely, the London Mid-land, Scottish, the Great Western and the London North Eastern/ Southern. In 1948, after World War II, all of these were nationalized in the name of British Rail. The immediate effect of this was the heavy toll on government finance through subsidies which prompted instant deregulation and reorganization of the British Rail into five distinct segments. The segments include freight, intercity passenger services, provincial services London/ South East commuter services and other ancillary services (Galenson and Thompson, 1994). By mid – 1992, British Rail became fully privatized.

In Japan, the Japanese National Railways (JNR) which was the dominant nationwide operator went through intense surgical operations to make it overcome the numerous challenges it faced. In 1985 alone, the JNR incurred a huge annual deficit of about 18 billion US dollars and an accumulated deficit of 286 billion dollars. In addition, JNR's passenger transport also dropped from 55 per cent in 1955 to 23 per

cent in 1985. The situation was made worse with a corresponding decline in freight traffic. (Fakui, 1992). Haunted by five restructuring failures in the past, and looking critically at what would become the fate of as much as 400,000 employees in its fold in the midst of the huge strain on the Japanese economy. The JNR resorted to privatization in April 1987 and was subsequently broken down into series of companies. (Adesanya, 2002).

The restructuring took the following form; each of the company that emanated from the division of the JNR was assigned a specific market on which its survival depended. The companies include six regionally based passenger railways, one freight railway for the entire country, the Shinkasen Holding Corporation and the JNR Settlement Corporation assigned with the role of all un-apportioned and unfunded obligations of the old JNR. After this effort, the JNR became transformed, revitalized and profit oriented.

The story was the same for Swedish Railways in 1986, when Swedish rail infrastructure and rail operations were split into two and the infrastructural aspect was handled by the government while rail operations was assigned to private companies. (Janson and Wallin (1997). The functional separation strategy was also adopted by the German Rails Baum (1993) noted that the Germans divided the rail functions into three independent undertakings which were, passenger transport, freight transport and infrastructure.

This reforms and restructuring by the developing economies is however very instructive to this study, in view of the various stages of development each of them had passed through. The Nigerian experience did not contain any of the afore mentioned developmental facets and perhaps this is why more than 70 million people currently residing in our cities would virtually depend on road transport system alone, at the expense of a well coordinated and integrated transport multi-modality in which rail system transport could play a leading role.

2.2.10. The Potentials and Benefits of Urban Rail Transport

The symptoms of a malfunctioning urban traffic system are manifested by traffic congestion, parking problem, traffic delays and crowded terminals among others. All these are attributable to absence of an effective transportation planning that

can meet with the upsurge in urban travel demand Ogunsanya (2004), painted a graphic picture of the urban transport problem (see Fig 2.2.).

Ogunsanya (2004) observed that in Nigeria, very few cities have designated bus stops and lay-bys and there are no lanes reserved for buses and para-transit vehicles. The organization of existing bus stops is poor and this is a major cause of urban traffic congestion problems. He further noted that different public transport vehicles park at will, competing to pick and drop passengers while the major roads are partly occupied by roadside traders and across roads are used for domestic waste disposal. Most urban roads are indeed in very deplorable conditions.

Traffic congestions according to Hoyle and Knowles (1998), occurs when urban transport network are no longer capable of accommodating the volume of movements that use them, thus leading to delays in journey time. They identified these delays as, fixed and operational in nature. Fixed delays occur mainly at road intersections. Together with traffic control at road junctions, both account for 40.12 percent of the total delay time. Operational delays are accounted for by parking problems, road factor, human factor, traffic mix and accidents totaling 50.8percent. The cost of traffic congestion according to Ogunsanya (1981) may be looked at, from its economic and psychological effects on the urban dwellers. It also leads to wastage of valuable time and reduces manpower productive hours of the residents.

Winston and Langer (2004), averred that, both motorist and truck congestion cost, decline in a city as rail transit mileage expands. Also, Garret and Castelazo (2004), found that traffic congestion growth rates declined in several U.S cities after light rails services was established. Baum-Snow and Kahn (2005), found significantly lower average commute travel times in areas near rail transit than in otherwise comparable locations that lack rail.

Complementing the foregoing studies Litman (2004), shows that per capita congestion delay is significantly lower in cities with high quality rail transit systems than in otherwise comparable cities with no rail services. He discovered that rail transit service reduces congestion costs in three ways. First, the comfort provided by the rail with passengers having a seat with clear vehicles and stations is capable of reducing travel time costs to people who shift modes. Second, grade-separated transit, common with the rail reduces delays on parallel roadways as various studies have indeed shown that travel times taken by door-to-door modes equates with those of grade separated

transit (Mogridge, 1999, Lewis and Williams, 1999; Vuchic, 1999). Third, rail transit has been known to stimulate transit oriented development (TOD) where people drive less because they have mobility options such as the 'park and ride'. Podobnik (2000), observed that households have significantly reduce their vehicle travel each time they move to transit-oriented locations. Market surveys conducted in the US indicated that transit-oriented development will increase in the future thereby making rail transit provide significant future benefits (Reconnecting America, 2004).

In a more comprehensive analysis, the potentials of the rail is again brought to the fore in a cost effective manner in the areas of energy conservation and pollution emission reduction. Road transport has been known to contribute more than 60 percent of the carbon emissions produced by the poorly maintained and sometimes unserviceable, Filani (2000) also noted that transport is one of the worst defilers of environment, its effect on health of the people, community values and environmental ecology is unimaginably deplorable. Ameyan (2002) gave reasons why Nigeria is more polluted than the industrialized countries simply as:

> *"The fact that many vehicles are in poor conditions following the economic downturn of the 1980s, a barrage of vehicles which are unable to meet the emission standards in Europe and elsewhere have flooded the country."*

Rail transit tends to reduce per capita vehicle ownership and use thus removing drastically the amount of lead concentrations which motorized transport infuses into the bloodstream of urban dwellers. Table 2.4 gives a more comprehensive detail of the rail transit potentials.

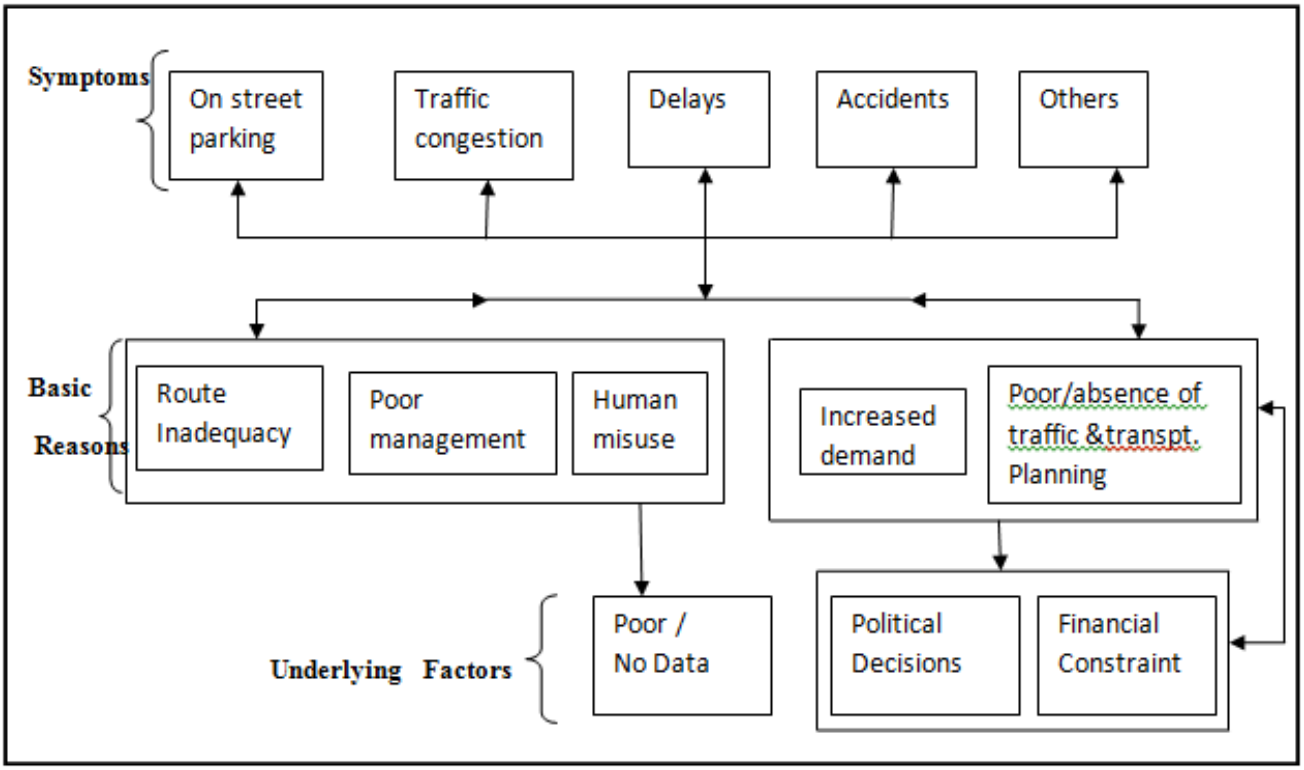

Figure 2.2 The Urban Transport Problem
Source: Ogunsanya, 2004

Table 2.4 – Rail Transit Potentials

S/N	Potentials	Description
1	Congestion Reduction	Reduced traffic congestion
2	Facility cost savings	Reduced road and parking facility costs
3	Consumer savings	Reduced consumer transportation costs
4	Transport diversity	Improved transportation options, particularly for non-drivers
5	Road safety	Reduced per capita traffic crash rates
6	Environmental quality	Reduced pollution emissions and habitat degradation
7	Efficient land use	More compact development, reduced sprawl
8	Economic development	Efficiencies of Agglomerations, increase productivity & wealth
9	Community cohesion	Positive interactions among people in a community.
10	Public health	Induce more physical activity (walking) for fitness and health

Source: Litman (2003, 2004).

In a comparison of US cities according to their rail transit service quality, Litman (2004), noted that cities with rail transit system when compared with cities with no rail transit have the following benefits going for them:

i. 400 percent higher per capita transit ridership
ii. 21 percent lower per capita motor vehicle mileage
iii. 887 percent higher transit commute mode split
iv. 36 percent lower per capita traffic fatalities
v. 14 percent lower per capita consumer transportation expenditures
vi. 19 percent smaller portion of household budgets devoted to transportation
vii. 33 percent lower transit operating costs per passenger mile
viii. 58 percent higher transit service cost recovery

Assessing further from a household's perspective, rail transit provides a positive economic returns on investment, for instance, while rail transit requires an average of 100 US dollars annually in direct consumer transport cost savings (Litman, 2004). In addition rail transit tends to increase regional development, business activity, improve mobility, public health, promotes community liability and productivity.

Quinet (2004), Litman (2005); and VTPI (2006), found out that respondents typically spend between 3000 and 5000 US dollars per vehicle on ownership and operating expenses annually while analysis by the Texas Transportation Institute (2005), indicated that the annual US congestion costs total approximately 100 billion US dollars or about 350 dollars per capita Typical average costs of running a car as put together by Victoria Transport Policy Institute (2006), is highlighted in Fig 2.3

In a car-oriented traffic system which is the predominant mode in this study area, a one-way commute by the rail is capable of taking more than 100 auto-cars off the roads, at the same time thereby increasing the lifespan of the roads as well as lowering their maintenance costs. Vuchic (2005), also noted that light rail service has lower operating costs compared to buses with as few as 1200 peak period passenger on a corridor. Rail tends to be more effective at attracting riders and more cost effective overall since it offers a more comfortable ride for commuters.

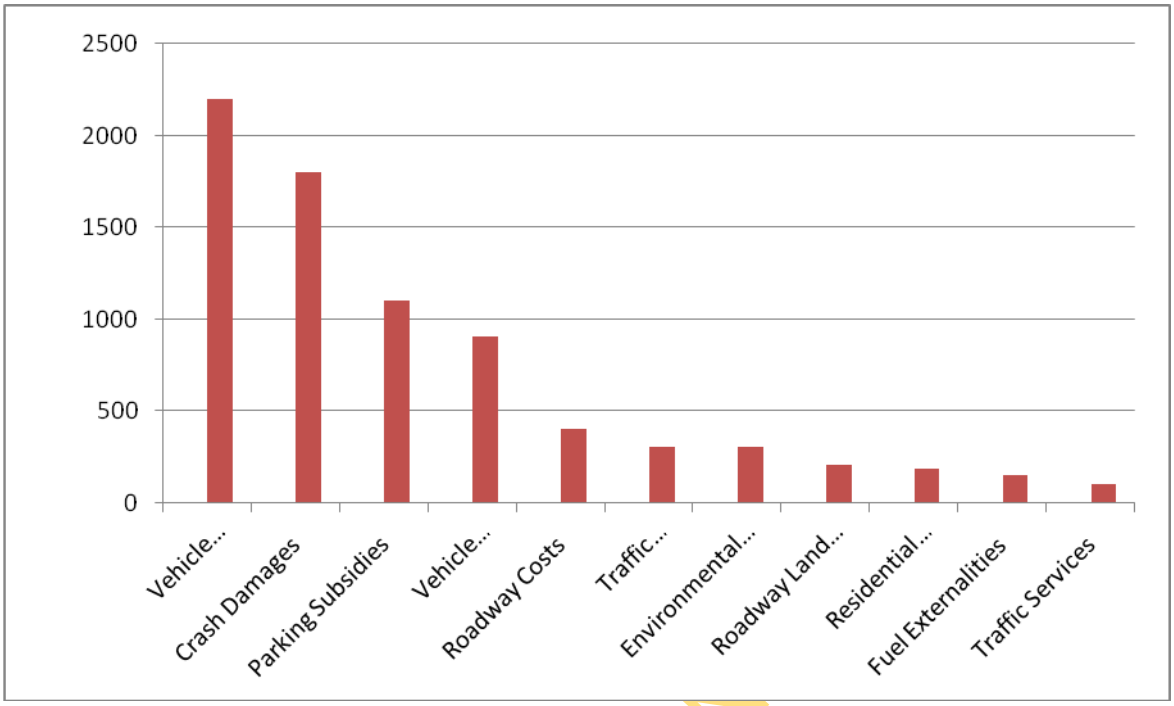

Figure 2.3 Average Car Costs in US Dollars

Source: VTPI, 2006.

2.2.11 The Relevance of Literature Review to the Study

The Review of Literature in this study traversed the contributions of many scholarly publications in the area of public transportation in the city, so as to be able to explain the fit of intra urban rail transportation as a mass transit mode. In spite of the fact that all transport modes possess one unique technical advantage over each other, the unhealthy and overlapping functions of the modes tend to have serious implications on transport development.

The review of literature in this study, revealed the numerous shortfalls in the area of transport Coordination in Nigeria where National Transport policies have failed to provide a central institution capable of controlling and coordinating the modes, to achieve transport multi-modality. Apart from this issue of transport coordination, the role of rail transport in the spatial reorganization of cities of the developed world were extensively reviewed to bring up the gap in the area of economic transformation of the urban landscape and the promotion of a sustainable urban mobility.

The various forms rail technology were explored in literature to bring up their technical characteristics and features, that can satisfy the urban transport demand. The review also brought up the various rail reforms put together by some developed countries to address the decline in rail performance in the face of economic depressions. In reference was the famous Stagger's Act of 1980 in the United States, the British rail reforms of 1921, 1948 and 1992 respectively and the privatization schemes of the Japanese National Railways (JNR). All of these, were to reinforce the fact that rail transport operations can be turned around to yield the desired results and be made profit-oriented if properly organized.

The malfunctioning urban transport system as revealed in literature also brought up the gaps that should be filled by an efficient public transport system like the rail in a city like Ibadan. The itemization of the rail transit potentials in both its economic, transport safety, transport diversity and environmental ramifications, has strengthened the central themes of this research and brought to focus, the need to stimulate such transit oriented development where people are provided with mobility options.

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter provides a detail description of methods and procedure used in collecting, analyzing and interpreting the relevant data obtained from the field. The essence of this aspect of the research is to choose appropriate methods and statistical tools for processing information sourced in accordance with the research goals and objectives.

3.1 DATA SOURCES AND DATA COLLECTION

The data for this research were obtained from both primary and secondary sources and they are both quantitative and qualitative in nature. However, an integrative approach involving diverse methods was adopted in the collection of data.

3.1.1 Primary Data Collection

In most transport researches, household survey is often used where comprehensive or innovative land use transport surveys are carried out. As Burton (1985) noted, household survey is concerned with the collection of basic facts relating to present-day movements within an urban area defined by the external cordon. It provides data on travel patterns and demands and these data could then be used in conjunction with data from land use characteristics and socio-economic attributes of respondents to project future travel patterns.

In order to collect relevant primary data through the use of non-contextual methodology from potential commuters who are the respondents in this instance, the first set of questionnaire was served on household heads (home owners or tenants) located within the limits of the external cordon (Burton 1985). The household questionnaire, (Appendix I) was designed to collect relevant baseline information on

the socio-economic attributes of the respondents such as age, gender, household size, education, income auto-ownership, travel patterns as well as their desirability of intra-urban rail transportation.

The institutional questionnaire involved the Nigerian Railway Corporation (NRC) where information on its current organization and administrative structure, infrastructural inventory, human and material resources to cope with intra-urban rail system in Ibadan were obtained. Specific questions addressed by the Corporation include its goals and objectives in this era of dwindling performance, institutional sustainability in the light of the 25-year strategic vision proposed by the Bureau of Public Enterprises (BPE), forms of concessionary approach to accommodate new investors and ways by which the best practices in urban rail technology could be attracted to solve mobility crises in our cities. (Appendix II)

In addition, the Focus Group Discussion (FGD) and Key Informant Interviews were conducted to complement information collected through questionnaire survey. The FGD was adopted to elicit information from identified stakeholders and to allow for exploratory and explanatory in-depth of analysis. The interactive session was drawn largely from institutions and groups whose views are very critical to the overall success of this study.

The FGD was conducted at the Nigerian Railway Corporation Headquarters, Ibadan where one official was selected from the Operations Department, Oyo State Ministry of Urban Development and Planning and the State Ministry of Urban Development and planning and the State Ministry of Works and Transport both of which had one member each. Others were the five Ibadan City local government areas, National Union of Road Transport Workers (NURTW), Road Transport Employers Association of Nigeria (RTEAN), Amalgamated Commercial Motorcycle Riders Association of Nigeria (ACOMORAN) and the commuting Public with three and one representatives respectively (see Table 3.1 for details).

Some of the critical issues that were discussed during the FGD session were also covered in the two questionnaires. In specific terms, the following issues were raised for discussion. An overview of the uncontrolled growth of Ibadan over the years and the implication of the perceived urban sprawl on infrastructure and land use development of the city; an introspection into intra-urban movements by the various modes the problems encountered by urban travellers in their day to day commuting;

The challenges and expectation for the viability of a rail mass transit in the city and the cost/benefits evaluation of such plans; issues of intermodality and sustainable transport for the city.

In order to complement data obtained through direct survey from the field, a host of existing information was also collected from some relevant institutions and agencies through Key Informant Interviews (KII). Information obtained from these sources were, however, used to validate formalized data from field survey.

Table 3.1: Selected Groups for the F.G.D

S/N	Institution/Group	No Selected for FGD	Percentage
1.	Nig. Railway Corp. Hq. Ibadan	1	8.3
2.	Oyo State Urban Devt. Planning Board.	1	8.3
3.	State Ministry of Works and Transport	1	8.3
4.	Ibadan City L.G. Areas (one rep/LGA)	5	41.8
5.	NURTW/ RTEAN/ACCOMORAN (one rep/Association)	3	25.0
6.	Commuting Public	1	8.3
	Total	**12**	**100**

Source: Field Survey, 2011.

3.1.2 Secondary Data Collection

The secondary data for this study include intensive review of literature, professional journal, published information in annual reports, national newspapers as well as various bulletins from government agencies and parastatals. Other secondary sources include technical reports, seminar/conference papers, theses/dissertations that are relevant to this study. In addition to the afore-mentioned, the following institutions and agencies were consulted.

Policy guidelines on the scrapped Federal Urban Mass Transit Programme (FUMTP) of 1988 were obtained from the Federal Ministry of Transport. Also, information on the concessioning procedure and the public-private partnership arrangement on public transportation were obtained from the Bureau of Public Enterprises (BPE) for prospective investors. At the State level, the Oyo State Ministry of Physical Planning and Urban Development provided information on the futuristic land use activities of Ibadan city while the Oyo State Ministry of Works and Transport gave insight on transport coordination and traffic integration among the various agencies connected with public transportation. Each of the city's five Local Government headquarters were also consulted on the land use proposals with regards to the proposed rail routes and issues concerning the stakeholders meeting on the project.

3.2 SAMPLING DESIGN AND SAMPLE SIZE

The whole of the metropolitan area of Ibadan was considered using the existing transportation corridors and their viability in conforming to the design of urban rail transport development. The sample design and sample size determination hinged on two types of survey. First, is the corridor determination and second, the corridor- cordon for the household survey. Critical to this transport corridor survey is the Allport Model (1991) which specified two major conditions that should be satisfied for a potential rail transit in any a given city. These are;

i. Corridors with marked linear patterns, and
ii. Arterial corridors with peak traffic population threshold of 12,000 – 15,000 persons per hour.

3.2.1 Corridor Commuter Survey

The traditional outlay of the city did not offer much in terms of arterial corridors but the linear patterns offered by the existing traffic corridors are prominent. The commuter population threshold of at least 12,000 per hour during the peak hour then became the determining factor of each potential corridor.

A seven-day peak hour commuter count was then undertaken on the identified corridors within the specified hours of 7 - 10am and 4 – 7pm from Monday through to Sunday. In carrying out the corridor commuter enumeration, counting was restricted to the three principal modes of movement which are mini- buses, taxis (*kabukabu*) and motorcycles. Two enumerators were stationed on either side of the principal bus stops to capture the flow (to and fro movement) and record the number of passengers alighting from the vehicles as they get to the bus – stops. Of the three hours designated for each of morning and evening sessions, the highest figures became the peak hour count. Details of the corridor commuter count are contained in Appendix V. Figures extracted are presented in Table 3.2.

Table 3.2: Traffic Corridor Commuter Count

Location	Morning Peak Hours			Evening Peak Hours		
	7– 8 am	8 – 9 am	9– 10am	4 -5 pm	5 – 6pm	6 -7pm
Corridor 1						
Omi-Adio-Erunmu	1340	*1803	1710	1805	*1891	1858
Corridor 2						
Podo/Challenge - Akobo	2234	*2274	1764	1858	* 1996	1360
Corridor 3						
Lagos Rd.Toll – Moniya	1515	*1684	1344	1412	*1536	1258
Corridor 4						
Mokola – Ife Rd Toll	1040	*1286	926	*1142	1018	946
Corridor 5						
Bere – Olorunsogo – Akanran	1518	1604	*1698	1390	*1486	1252

*Peak count

Source: Field Survey, 2011.

3.2.2 Household Survey

The establishment of the traffic corridors strewn across the metropolis in different directions provided a very strong basis for the household traffic survey for this study, since surveys of this type requires only a representative sample of the commuting public. To achieve this, a 100-metre cordon was established on either side of the corridors where a substantial number of households reside. The cordon demarcation however presupposed the adoption of a purposive sampling technique on the residents located along all the proposed rail routes in Ibadan. There is the salient need to draw on the experience and expectations of these potential respondents if by any chance a rail corridor is to be established near their habitation

The first corridor which was precluded from the traffic corridor count earlier conducted is a 40 –kilometer stretch of rail line from Omi Adio through Apata/Odo-ona, Dugbe/Jericho, Sango/Bodija, Ashi/Powerhouse, Akobo/Olodo and Erunmu. These are clustered but discontinuous communities both urban and suburban in composition with an estimated 18,000 households. The second corridor is a 22-kilometre highway stretch traversing the city from Podo/Challenge area through Molete, Bere/Oje, Idi-Ape /Bashorun terminating at Akobo/Oju-Irin where the highway crosses the rail line. This stretch contains an estimated 25,000 households. The third traffic corridor starts from the former Lagos-end toll plaza through Iwo road intersection to Ojoo on the expressway and terminates at Moniya on the old Oyo road; a distance of 26 kilometres with an estimated 6,950 households. The fourth, is a 15-kilometre traffic corridor that takes off from Mokola through Agodi/Gate and passes through the old Ife road and terminates at the former Toll plaza on Ife road. It contains an estimated 1,670 households

The last of the identified corridors takes off from Beere through the mid-section of the city to Elekuro, Aperin, Olorunsogo, Amuloko, a sub-urban locality and terminates at Akanran, a distance of 16 kilometres and an estimated 15,920 households. To determine the sample size, Salter (1983) advocated that the population of an area remains a critical factor in its determination. He went further to propose a corridor sampling technique (Traffic Appraisal Manual London ,1981) which has the best fit in this sample size selection thus:

$$\text{Sample} \quad n = \frac{P(1-p)N^3}{E\left[\frac{2}{1.96}\right](N-1)+P(1-P)N2}$$

Where, N = Total no of household within the study area.

E = The required accuracy expressed as a number of household.

P = The proportion of households with the attribute of interest.

From the foregoing, Salter's determination of the sample size from the household distribution showed that the first corridor has 171 households as its sample size, the second corridor has 238 households, also the third has 66 households while the fourth and fifth has 16 and 151 households respectively where a questionnaire each was administered. In essence, a total of 642 questionnaires were administered as a cross-sectional representation of the commuting public within the study area. Table 3.3 shows the details of the sample size distribution for all the selected localities. The questionnaire was administered using the random sampling technique in each of the study corridors.

Table 3.3: Details of Sample Size Distribution for the Selected Localities.

Corridor 1

S/N	Selected Localities	Local Government Area	Household Size Distribution	Sample Size	Percentage (%)
1	Omi-Adio	Ido	2,000	19	11.1
2	Apata/Odo-ona	Ibadan S/West	4,000	38	22.2
3	Dugbe/Jericho	Ibadan North	2,100	20	11.7
4	Sango/Bodija	Ibadan North	2,400	23	13.5
5	Ashi/Powerhouse	Akinyele	3,200	30	17.5
6	Akobo/Olodo	Lagelu	2,700	26	15.2
7	Erunmu	Egbeda	1,600	15	8.8
	Sub-total		**18,000**	**171**	**100**
Corridor 2					
1	Podo/Challenge	Oluyole/S.W	800	8	3.4
2	Challenge/Molete	Ibadan S.W/S.E	2,200	21	8.8
3	Molete/Bere	Ibadan South East	6,200	59	24.8
4	Bere/Oje	Ibadan North/N.E	5,860	56	23.5
5	Oje/Gate	Ibadan North/N.E	5,140	49	20.6
6	Idi-Ape/Basorun	Ibadan North/N.E	2,550	24	10.1
7	Akobo/Oju-Irin	Lagelu	2,250	21	8.8
	Sub-total		**25,000**	**238**	**100**
Corridor 3					
S/N	**Selected Localities**	**Local Government Area**	**Household Size Distribution**	**Sample Size**	**Percentage (%)**
1	Toll Gate/Olorunsogo	Ibadan SE/Ona Ara	800	8	12.1
2	Olorunsogo/Ife Rd Intersection	Ibadan N.E/Egbeda	3400	32	48.5
3	Ife Rd. Intersection/ Basorun Bridge	Ibadan North East/ Lagelu	360	3	4.5
4	Basorun Bridge/Ojo	Ibadan North/ Akinyele	820	8	12.1
5	Ojoo/Sasa/Akingbile	Akinyele	450	4	6.1
6	Moniya	Akinyele	1120	11	16.7
	Sub-total		**6,950**	**66**	**100.0**

Source: Computed based on the records obtained from the National Population Commission (NPC) Oyo State, 2011

Table 3.3: Details of Sample Size Distribution for the Selected Localities (Contd.)

S/N	Selected Localities	Local Government Area	Household Size Distribution	Sample Size	Percentage (%)
Corridor 4					
1	Mokola/Agodi-Gate	Ibadan North	25	2	12.5
2	Agodi-Gate/Sawmill (Bridge)	N.E./Egbeda	45	4	25.0
3	Sawmill/Adegbayi	Egbeda	1600	10	62.5
4	Adegbayi/Toll Plaza	Egbeda	-	-	-
	Sub-total		**1670**	**16**	**100.0**
Corridor 5					
1	Beere – elekuro	SE/NE	4850	46	30.5
2	Elekuro – Aperin	SE/NE	4200	40	26.5
3	Aperin – Olorunsogo	Ona-Ara	2400	23	15.2
4	Olorunsogo – Ogbere	Ona-Ara	2800	26	17.3
5	Ogbere – Amuloko	Ona – Ara	1250	12	7.9
6	Akanran	Ona – Ara	420	4	2.6
	Sub-total		**15,920**	**151**	**100.0**

Source: Computed based on the records obtained from the National Population Commission (NPC) Oyo State, 2011

3.3 Basis for the Choice of Variables

The selection of variables to be used in data analysis is an important attribute of research design. Scholarly consensus however identified a number of theoretical basis or consideration that should guide the selection of such variables to suit particular objectives. Wingo (1973), Knox (1978) and Adegoke (2006) all agreed that the foremost considerations should be that the selected variable should reflect the major attributes of the observed or hypothetical factors that may have profound effect on issues under investigation. In this regard, the variables to be selected must not only have potentials that is related to existing theories, it must also be related to theories in view. In essence, it must be related to the hypothesis to be tested.

In transportation studies, variables that are related to social, economic and demographic attributes of respondents are identified, so also are variables related to trip patterns such as trip origins, destinations and trip modal preferences (Wright and Ashford, 1989). For instance, in this study, the Proposed Rail Mass Transit is taken as a determination of types and characteristics of a large scale movement patterns in which the response of commuters was tested on the introduction of a transport innovation.

The hypothesis which states that the rail mass transit would reduce traffic congestion was analysed using multiple regression model. The model is expressed as follows.

$Y = a_0 + b_1 X_1 + b_2 X_2 + \ldots\ldots b_n X_n + e$

Where Y = availability of rail mass transit as the dependent variable

$X_1 - X_n$ = the independent variables of (bad driving habit, accident, bad road design, parking problems traffic control and traffic mix,)

$b_1 - b_n$ = the regression coefficients

a_0 = intercept

e = stochastic error.

The hypothesis which states that there are no significant differences between trip patterns of the low, medium and high income residents was analyzed using the analysis of variance (ANOVA). The application of this statistical tool drew samples from the respondent's activity area i.e. trips to work places, schools, markets, recreation etc. and analysed the differences between and within these variables as undertaken by the various income groups.

The test of the hypothesis, which states that the use of the Rail Mass Transit is not a function of the socio-economic characteristics of the potential users was analysed using the dichotomous logit model involving dummy variables. The model is expressed as thus:

$$\log 1/1\text{-}p = \beta o+\beta 1X1+\beta 2X2+\beta 3X3\ldots\ldots\ldots..\beta nXn$$

where log 1/1-p(Y) = response/dependent variable which is dichotomous in nature.

where Y= the use of rail mass transit.

1– if respondent signifies his or her intention to use.

0 – if otherwise.

βo = constant term

β1 (X1) - βn (Xn) = independent variables of socio-economic characteristics of respondents

x1 =gender (if male = 1; if female = 0)

x2 = marital status (if married = 1; not married = 0)

x3 = income (non – poor = 1; poor = 0)

x4 = residential location.(city core = 1; peri –urban = 0)

The hypothesis which states that the Rail Mass Transit would significantly influence the modal choice of Commuters within the study area was analysed using the trip-makers behavior in respect of the selection of travel mode. Fertal, (1970) and Ogunsanya, (1986) categorized the choice of a particular mode to be dependent on such factors as trip purpose, trip type, level of service, cost associated with available modes and characteristics of the trip maker, for example (income, age, auto-ownership, trip distance, modal availability and comfort). With the availability of all these variables, the model is expressed thus:

$$Y = a_0 + b_1 X_1 + b_2 X_2 + \ldots\ldots\ldots b_n X_n + e$$

where Y = the proposed rail transit as the dependent variable

$X_1 – X_n$ = the independent variables of (income, age, auto-ownership, trip distance, modal availability, cost, trip purpose and comfort.)

$b_1 – b_n$ = the regression coefficients

a_0 = intercept

e = stochastic error.

3.4 DATA ANALYSIS

Both qualitative and quantitative methods of data analysis were used in analyzing collected data. It involved an interactive process of preparing simple descriptive statistics such as frequencies and percentages. The Analysis of Variance (ANOVA) and the logit model, in its dictomous and multinomial form involving dummy variables were used in testing the hypothesis. Relevant maps including geostatic imageries of the proposed rail corridors as well as other graphic illustrations were used in data presentation. Information emanating from the Focus Group Discussion (FGD) was analyzed using the following:

i. Transcription of every aspect of recorded discussion;
ii. Coding of Transcripts;
iii. Tallying responses according to the topic of interest; and
iv. Analyzing the data generated from the responses.

The details of the analytical techniques are given in the relevant section.

CHAPTER FOUR

CONTEXTUAL DEVELOPMENT AND INSTITUTIONAL RESPONSE TO URBAN RAIL TRANSPORT DEVELOPMENT IN NIGERIA

4.1 INTRODUCTION

The cities of Nigeria are centers of administration, industrial, commercial, educational, social and recreational activities. They generate and attract very large number of trips daily and because of their multi-various functions, these urban centres are complex in the pattern of their interaction and traffic (Ikya, 1993; Oni, 2004).

Of the four major modes, road, rail, water and air, road has been the most utilized in Nigeria's urban transportation system. Presently, the road assets is estimated to be suffering an annual loss of about 80billion Naira due to lack of maintenance while road users also suffer an additional vehicle operating costs of 53 billion Naira due to poor conditions of the roads (Oni, 2004). The nature of the unguided urbanization makes the city's growth and their hierarchical ordering, difficult to sustain in spite of their important contribution to the national economy. The World Bank Report (2002), reveals the poor, unreliable and insecure quality of travel by public transport in Nigeria cities, the magnitude of which has reached unmanageable proportions as the city's roads have become choked with a vehicular volume never initially envisaged in an urban centre. The search for an effective means of turning around the continuous investment losses, incurred on the overconcentration of movement on the urban roads system, lend credence to this study, so that governments at the various levels, would be able to diversify transport investments into a more reliable, more efficient and more environmentally friendly means of moving urban masses around in a city like Ibadan.

This chapter highlights the Nigerian rail transportation experience for almost ten decades of its existence and also discusses the privatization and deregulation prospects of the system.. It also incorporates the institutional response to urban rail transport development by examining the organizational structure of the Nigerian Railway Corporation, Western District with the headquarters at Ibadan and the assessment of available rail infrastructures.

4.2. THE NIGERIAN RAIL TRANSPORTATION EXPERIENCE

Nigeria's Rail transport system has been in an increasingly backward state of disrepair for most of the 100 years of its existence. It is the oldest public utility in Nigeria wholly owned by the Federal Government of Nigeria. Its structures were put in place by the colonial masters ostensibly to help in the exploitation of mineral deposits and agricultural produce. But with the dwindling fortunes of solid mineral deposits and the neglect of agricultural sector, after the discovery of oil, the original design of the rail transport which was commodity-based, was jettisoned to a means of conveying passengers but its effectiveness has come to almost zero as a result of visible decay of existing infrastructure and nearly all the trains in the fleet of the corporation. The corporation itself was established in 1912 by the amalgamation of the Lagos Government rail-way and the Baro-Kano rail-way which subsequently became an autonomous public corporation by a Federal Act of 1955 as amended in the laws of the Federal Republic of Nigeria 1990. Its sole objective was to offer optimal services for the carriage of persons and goods to the population. Section 29 of the 1955 NRC Act states;

> "*it shall be unlawful for any person without the consent of the Corporation to construct or operate a railway for the public carriage of passengers or goods in Nigeria".*

This has been an albatross hanging on the neck of the corporation and the sought-after life-line from private-sector participation.

In 1990, the Nigerian rail system consisted of 3,500km of narrow gauge (1.067 meter) track. The system's basic elements were two main lines running in-land from the coast; one, in the West from Lagos to Kano opened in 1912, and the other in the East from Port-Harcourt to a junction with the western line at Kaduna, opened in 1926. Three major extensions, one was a branch line from Zaria to Kaura-Namoda

which was completed in 1929. The second, another branch from Kano to Nguru, completed in 1930. The third, a 645km branch from the eastern line to Maiduguri was completed in 1964. A loop to the mining area at Jos and two other short branches from Lagos and Kaduna completes the whole system.

For over three decades now, the Nigeria Railway Corporation has been an ailing public utility and several attempts have been made to revamp it. Adeniji (2000), recalled that in 1978, Rail-India (RITES) were brought in by the Federal Government on a three-year turn-around stint of the ailing corporation, having been convinced of the success story of the Indian Rail system. Apparently, the discontinuity in government policy stalled the expected progress. In 1995, another SINO-Nigeria bilateral pact worth several millions of dollars was sealed with the China Civil Engineering and Construction Corporation (CCEC). The contract was on a turn-key basis which involved the construction and extension of routes to cover the Iron and Steel industries at Ajaokuta and Aladja including Warri Port at a total cost of 16.75billion Naira. No sooner did work commence on the contract than it was halted for administrative bottlenecks and NRC's internal management problems that has been haunting the Corporation for a long time.

As at May, 2002, the NRC had only 67 functional locomotives, 218 coaches and 1,313 wagons viewed against local demand for higher volume of freight and passenger services. The deterioration of the rail-ways in Nigeria has been traced to many factors which include poor and inadequate infrastructure, technical constraints due to poor track alignment, distressed bridges all of which have substantially reduced the operational capacity of the corporation.

Another major and most distinct problem that have been identified over the years is that up till now, the Nigeria Railway Corporation a government parastatal, has managed and operated the railways as a public monopoly. Since the 1960's, the rail-ways has continuously lost its share of the transport market because of the ruinous competition from the road transport and the general inability to respond effectively to changing customer requirement. Filani and Botha (2006), observed that as at 2004, the rail-way accounted for only 1.5% of total transport performance in the country.

4.3 PRIVATIZATION/DEREGULATION PROSPECTS OF THE NIGERIAN RAILWAY SYSTEM.

While government seems committed to the revamping and modernization of the rail transport system, it is becoming increasingly difficult for government to provide all the finances required to fully rehabilitate the enterprise. In a country where averagely 70 kobo in every naira of the federal grant is absorbed by the urban bureaucracy that is meant to deliver it, the implementation of the policy of privatization and de-regulation is of paramount necessity for the rail sector. In view of its urgency and strategic importance to the economic development of the nation, a detailed study of the different options often adopted by the developed countries has been undertaken by the Bureau of Public Enterprise (BPE).This is the agency saddled with the responsibility of working out the modalities of concession of the Nigerian Railways. In its report forwarded to the Federal Government in 2004, the agency recommended the Vertical Integration Method for the Corporation.

In the Vertical Integration approach, the private sector operator will be granted the rights to use the assets of the railways which at present, is owned and operated by the NRC for a period of time in return for a fee. In addition, the concessionaire will be responsible for financing certain specified investments such as maintenance, renewal, extensions, rolling stock and other commercial risks (Akinawo, 2005), Also, a 25-year strategic vision for Rail Transport System in Nigeria was proposed by the BPE whereby a reconstituted Rail-way Development Authority will remain the regulatory body for safety and environmental issues.It will also evolve and execute policies and plans for the development of the railways. Three concessions were proposed by the BPE and these are:

i. Central railway line which is a standard gauge from Itakpe to Ajaokuta to Warri
ii. Western Rail Line which runs from Lagos to Kano
iii. The Eastern Rail Line which runs from Port-Harcourt to Maiduguri

In line with the BPE recommendations, the Federal Government on November 28, 2006 awarded the Western Rail Line worth 8.3 billion dollars to the China Civil Engineering Construction Corporation (CCECC). It involves the expansion of the existing narrow gauge to standard gauge double track. This is the first phase of the railway development programme with a completion period of 48months. Meanwhile,

an effective framework for the privatization and deregulation has been put forward which include the following tasks for the government.

i. Repeal of the Rail-way Act of 1955 and an enactment of a new legal and regulatory framework to allow private sector participation in the operations of the railways and the funding of new lines.
ii. Carrying out a comprehensive inventory of the existing railway assets.
iii. Carving-out the non-core assets of the railways.
iv. Creating a conducive atmosphere for economic regulation through the establishment of National Transport Commission in the Transport Sector.
v. Formulating policies and plans for railway development.
vi. Awarding the concessions.
vii. Determining the liabilities and paying the terminal benefits and salaries of staff.
viii. Continuing to fill in the capital investment gap left by the private sector.

4.4 INSTITUTIONAL RESPONSE TO URBAN RAIL TRANSPORT DEVELOPMENT

The Nigerian Railway Corporation was established by an Act of Parliament in 1955, although rail transport had existed in the country since 1898, when the first railway track was laid. Rail services between Lagos and Ibadan commenced in 1901. It is noteworthy that the Western District of the establishment has its Headquarters in Ibadan. Four other districts of the corporation also existed namely Lagos, Northern, Eastern and North-eastern areas of the country and each of these districts are headed by a Railway District Manager (RDM). For the purpose of this study, the structure of the Corporation at National and District level are shown in Figures 4.1 and 4.2 respectively.

The Ibadan District office of the Corporation is currently undergoing a massive rehabilitation in response to the current revitalization programme. Most of the personnel have been laid off, due to the current state of inactivity of the Corporation. However, some key officials on skeletal duties are on ground, but could not respond to most of the information sought appropriately. Figure 4.1 highlights the different departments of the Nigerian Railway Corporation involved in the Rail Mass Transit programme as follows:

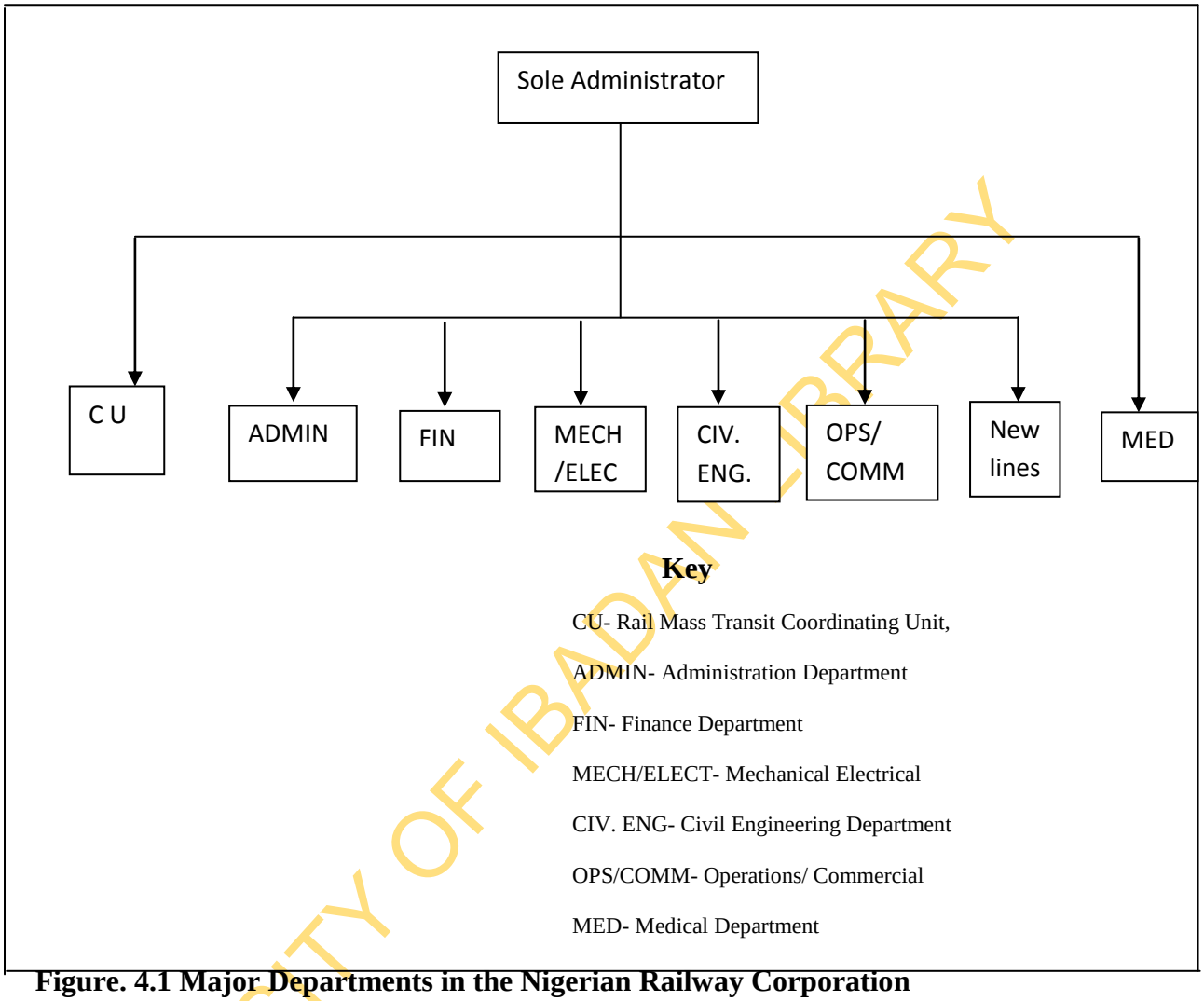

Figure. 4.1 Major Departments in the Nigerian Railway Corporation

Source: Nigerian Railway Corporation, 2011

4.4.1 The Rail Mass Transit Coordinating Unit

This is the special unit carved out of the corporation, to take care of the rail mass transit programme in the various urban centres where there are mass transit services. This unit coordinates and monitors the passenger unit in conjunction with the inter-state coach service unit. A district coordinator for this unit reports to the Sole Administrator of the corporation regularly on the day-to-day activities of the mass transit services.

4.4.2 Administrative Department

This department is responsible for the overall administrative matters and manpower/training of corporation staff nationwide. It controls the Research/Planning, Operations/Commercial and the Stores of the Corporation. In the area of staffing, staff strength continued to decline in accordance with the fortunes of the corporation. The height of this staff reduction exercise was in 1988 when the nationwide mass retrenchment exercise was carried out by the corporation, to control its expenditure on redundant labour among other pricing issues. As a government parastatal, the corporation has the autonomy to promote and deploy its staff to any part of the country as it deemed fit. Presently, the staff strength of the corporation is at its lowest ebb at the national and district headquarters due to the declining productivity.

4.4.3 Finance Department

This department is responsible for the accounting services in the area of the corporation's funding and revenue generation. The corporation is funded through government subvention on an annual fiscal basis for its capital and recurrent expenditure, which include staff salaries and emoluments, contractual obligations and infrastructure maintenance. Another source of funding is through the revenue generated from its operations (Appendix IV). The Corporation, also derive funds from rents on landed properties nationwide. An insight into the extent of the vastness of the land properties lies in the 100 metres setback provisions for the corporation along its entire 3,305 route kilometers.

4.4.4 Civil Engineering Department

This department is responsible for all civil works, involving the laying of tracks, realignment, ballasting, platforms and building construction. It also oversees the maintenance of the tracks, construction of the rail-bridges and culverts, staff quarters and other ancillary civil works.

4.4.5 Mechanical/Electrical Engineering Department

The department is saddled with the maintenance of the locomotives and rolling stock (all movement on tracks such as wagons, coaches, signal and communication facilities) It is also responsible for all technical matters relating to engineering service and operations**.**

4.4.6 Operations and Commercial Department

This department is affiliated to the Finance Department. It is responsible for coordinating ticket sales, goods and passenger services and the upkeep of the railway stations. The department also has an oversight function on rail infrastructure.

4.4.7 New Lines Department

This department is responsible for the drafting of plans for new rail tracks, doubling of tracks and the eventual construction of new lines. The department incorporates the Engineering and Planning Units to accomplish its task.

4.4.8 Medical Department

This department attends to the primary health care of the staffers and their immediate families.

4.4.9 Organizational Structure of Nigerian Railway Corporation at District Level

For any district of the Nigerian Railway Corporation to be functional and efficient, certain basic services are required. These include:

i. The Operation and Commercial Services.
ii. Signal and Communication Services
iii. Terminal Services.
iv. Maintenance Services
v. Medical Services.

However, all these are in a dysfunctional state presently at the Western district headquarters Ibadan, but are being gradually resuscitated in the new wave of nationwide rail-rehabilitation by the Federal Government. Currently, the Corporation is functioning like a full-fledged parastatal of the Federal Ministry of Transport being funded to start some skeletal services with the newly acquired locomotives. With the full rehabilitation of the rail tracks from Lagos to Ilorin en- route Kano and the rate of staff depletion, passenger and goods services on the route could only but be skeletal and irregular.

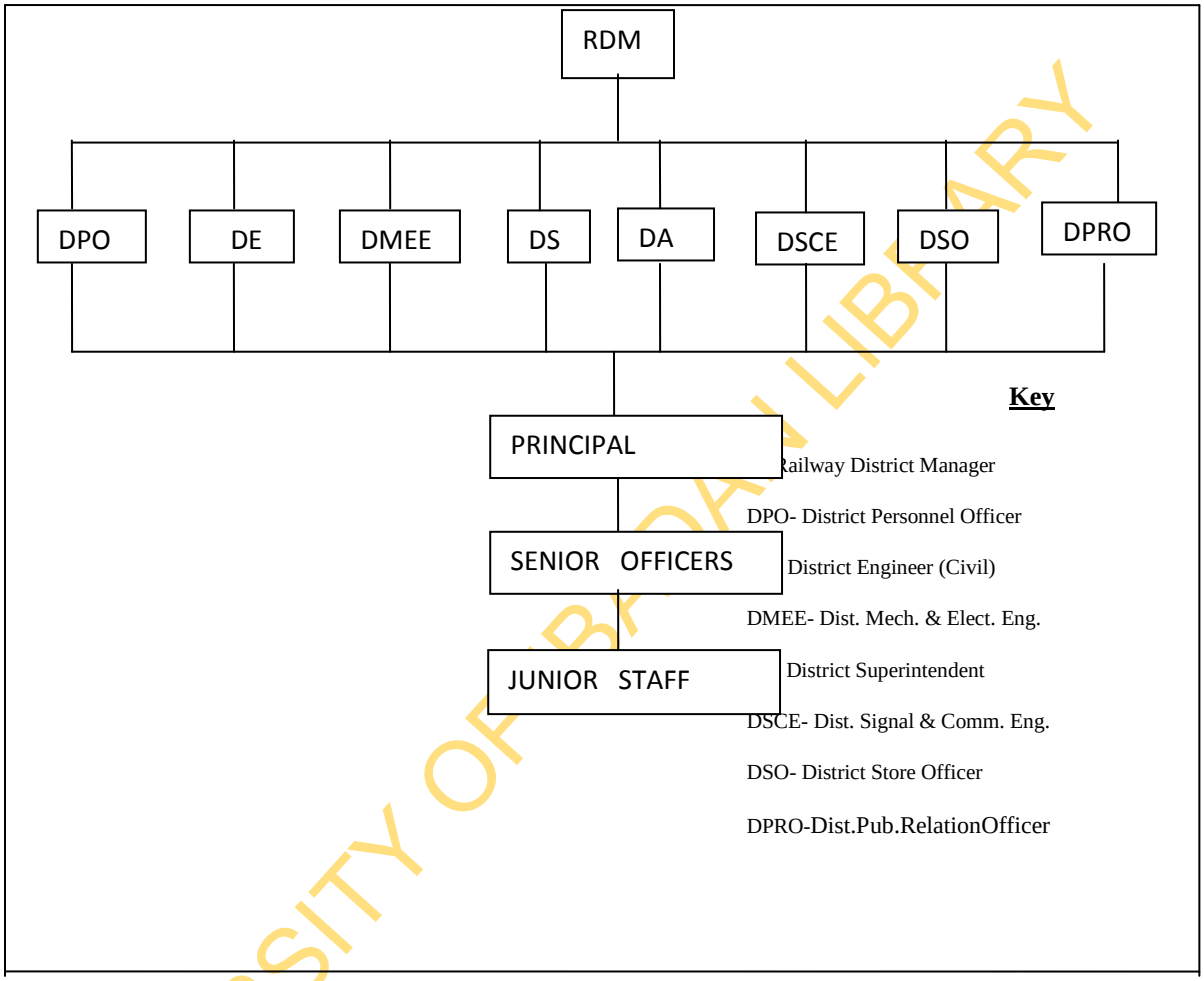

Figure. 4.2: Organisational Structure of Nigerian Railway Corporation at District Level

Source: Nigeria Railway Corporation, Ibadan, 2011

4.5. PUBLIC- PRIVATE PARTNERSHIP IN RAIL SERVICES

Given the level of rail infrastructure decay and obsolescence in Nigeria and the colossal investment that would be needed to modernize and rejuvenate the railways, it would be an arduous and an almost impossible task for the Federal Government alone to turn the fortunes of the Nigerian Railway Corporation around (Adesanya, et al, 2005). More analytic details of this observation is contained in section 2.2 of this thesis. Accordingly, the call for public-private partnership in rail transport services cut across the spheres of funding, running and maintenance. In this instance, there is the need for preliminary institutional legal reforms to be carried out before the implementation of rail infrastructure development. These will involve appropriate legislation, policy re-ordering and institutional reorganization.

In the rail transport sector of most countries, the ownership and management of rail infrastructure was retained in the public sector. These include tracks, signals, stations, yards and workshops. In the observation of Campos and Cantos, (2000), rail concessioning has been preferred to full privatization so as to attract private investors. Similarly, in the vertical unbundling of the rail transport sector, areas of infrastructure management could also be made viable for the private sector participation. Rail services such as ticket sales, cargo handling, catering and personnel in certain sectors of rail management could involve the private sector in form of contract services.

Examples from neighbouring countries of Cote d'Ivoire and Burkina Faso show a concession arrangement whereby rail infrastructural assets continue to be in the public domain and these are rented out to the private operator for use during the contract period. Within the contract period, the concessionaire brings in his equipment, takes on operators, invests and undertakes commercial risks. Concession period ranges between 10 and 25 years. In the case of Abidjan-Ouagadougou rail-line, SITARAIL, a private company was concessioned in 1994 on an initial 15year programme to handle freight and passenger services while (SIPF) from Cote D'Ivoire and (SOPAFER B) from Burkina Faso retained the land lordship for the maintenance of rail infrastructure. This arrangement which was the first rail concession arrangement in Sub-Sahara Africa was adjudged to have functioned perfectly from the reports of the turn-over (Mitchel and Budin, 1999). Although many of the respondents did not understand the intricacies of the processes involved in the Public-Private sector partnership, private

participation in the rail transport sector in Nigeria has been totally hindered by the controversial Federal Act of 1955 which vested sole authority of rail construction and its operational services in the Nigeria Railway Corporation (NRC).

4.5.1 Current Rail Modernization Programme

The critical area of rail transport infrastructure financing attracted a lot comments, as suggestions went into the area of seeking foreign financial interventions and investment just as experienced by Lagos State in the provision of Bus Rapid Transit System (BRT). Other form of Public Private Partnership in Rail Transport for the city was also advocated, even with due regards to the existing law which gave the Nigerian Railway Corporation the monopoly and control of rail transportation in Nigeria. It was widely believed that all obnoxious laws militating against the new development would eventually be expunged to create an enabling environment. The ongoing track rehabilitation however, did not meet with the expectation of the public, as they wanted the doubling of the tracks as well as track standardization to conform to what obtains in the developed countries. A discussant remarked that:

> *"what the Federal Government is currently doing with the rail tracks rehabilitation is totally disappointing. We expected them to construct new rail tracks with the standard gauge instead of replicating the old tracks. They have succeeded in sending us back to the rail technologies of the 1960's whose rolling stock is by now totally extinct."*

The potentials of rail transportation in the area of job provisions for teeming Nigerians formally and informally were also highlighted by the discussants.

Although many of the respondents did not understand the intricacies of the processes involved in the Public-Private sector Partnership, Public-Private Participation in the Rail Transport Sector in Nigeria has been totally hindered by the controversial Federal Act of 1955 which vested sole authority of rail construction and its operation services in the Nigeria Railway Corporation (NRC).

4.5.2 Current Partnership Schemes

From the information gathered at the Ibadan headquarters of the Corporation, the official position on the 1955 law that incorporated the establishment has shifted to the demand for a review with the sole aim of creating access for private partnership. Presently, some States of the Federation, namely Kaduna, Kwara, Lagos, Oyo, Ogun,

Rivers and Akwa – Ibom have signified their intention to run an intra – urban rail services within their various States in partnership with the Nigerian Railway Corporation.

Under the partnership scheme, the State Governments are mandated to provide a sum of N100million for the refurbishment and repairs of locomotive and coaches and a token amount of N500,000 per month for the training of State Government staff who are expected to run the services under the supervision of the Corporation's personnel. The current action of the Corporation was accommodated in the 25 year Strategic Vision Proposal released in 2005 by the Bureau of Public Enterprise (BPE). By this, State Governments are encouraged to also invest in rail transportation because of the capital intensive nature of the mode.

The Nigerian Railway Corporation also viewed the Vertical Integration method in rail concession as a welcome development which is bound to yield positive dividends in attracting private investors who will finance and use certain specified sectors of rail transport system for a period of time. All these operations may come after a lot of rail infrastructure has been put in place. In the mean time, it is the various State Governments that are warming up to take the challenge of rail investments.

4.6. RAIL INFRASTRUCTURE ASSESSMENT

Assessment of rail infrastructure for this study is limited to what obtains at the Western District Headquarters of the Nigerian Railway Corporation at Ibadan which invariably would be the controlling body in the event of an urban rail mass transit provision for Ibadan City. Although from what is on ground, the corporation appears to be unprepared for an immediate mass transit activity but the officials indicated their readiness to undertake a contingency plan that could take off such programme if the National Headquarters gives the directive. The current state of inactivity of the corporation revealed that most of the equipment in stock is obsolete and rusty because of the long period of disuse. However, the assessment of the facilities available at the district headquarters revealed the following.

4.6.1 Rail Tracks

The railway tracks within the metropolis covers the route from Omi-Adio in Ido local government to Erunmu in Egbeda local government area of Ibadan

Metropolis, a distance of about 40 kilometres. This is a single track route of 1,067mm gauge, generally considered narrow when compared to the 1,435mm broad gauge. In consonance with the 25year strategic vision for rail development in Nigeria, the corporation enlisted the services of the Chinese Civil Engineering Construction Company (CCECC) to rehabilitate the Lagos-Kano rail tracks in 2008. The portion within the metropolis has benefitted immensely from this exercise, the tracks are now wearing a new look with all the worn-out plank bedding fully replaced and now, fitted with concrete beddings and rail alignment adjusted accordingly with the rail bridges and culverts fully repaired. Plate 4.1 refers to a section of the repair works on the old rail tracks.

It should be noted however, that this route is an inter-state traffic route which can also function for intra-city mass transit with appropriate traffic scheduling. What this study suggests, is the doubling of the tracks within the metropolitan area to enhance intra-urban transit scheme on a full scale. This study has also suggested other routes that can fit into the planning prospective of the corporation.

Plate 4.1: On-going Repair Works on the Old Rail Tracks
Source: Field Survey, 2011

4.6.2 Rail Platforms

Provisions of platforms for each of the designated stations serving an urban rail programme is an important rail furniture that helps passengers in embarking and dis-embarking at each of the rail stations. Of the seven stations along the Omi-Adio/Dugbe/Bodija route, only Dugbe station was fitted with a platform. For most transit modes in the advanced nations, the safety and comfort of commuters are the key factors to the successes recorded in the provision of their services. Failure of the provision of rail platforms in the Nigerian context has been attributed to lack of funds to run mass transit programmes efficiently. Obviously from this survey, a rail mass transit scheme will require more stations and incidentally more rail platforms.

4.6.3 Rail Stations

During the Federal Urban Mass Transit Programme of the late 1980's, the Nigerian Railway Corporation Western District located seven stations along the Omi-Adio/Bodija route. The stations are averagely 4 kilometres apart with Omi-Adio and Bodija serving as end terminals. These terminals were created to enhance commuter ride, especially at the Bodija market end for those who have transactions at the market. The turn-around time at the terminals is 15minutes while the stop-over time in each of the station is 2 minutes. In the advent of rail mass transit for the metropolis, more stations would be created between Bodija and Erunmu to provide the necessary catchment points for the commuters. Apart from the Dugbe terminus, all the existing stations fall below the expected standard in the provision of shelter, security and parking facilities. The response of the Western District of the Nigerian Railway Corporation to the observed shortcoming was linked to the unpreparedness of the corporation for the initial take-off of the transit programme and the skeletal nature of services due to low patronage. Plate 4.2. is a typical old rail station.

Plate 4.2: Typical Old Rail-Station.

Source: Field Survey, 2010.

4.6.4 Signals and Communication

In these days of modern communication technology, the form of signals and communication equipment at the disposal of the Corporation are extremely obsolete and outmoded. They consist of the following for its operations.

i. Inter communication system that provides the link to the National headquarters and the various District headquarters.
ii. Control Phone link connecting all the stations.
iii. Walkie- talkie which work within a radius of 10 – 20 kilometres.
iv. Public address systems at each station for passing information to commuters from time to time.

A modern signaling system is now being gradually introduced in conformity with the current best practices in the advanced countries. But still, conspicuously displayed by the corporation are the:

i. Double wire-operated interlocking
ii. Single wire-operated interlocking
iii. Block instruments operated by key tokens

Based on the findings, it was confirmed that there was no direct communication link between trains in transit with the stations. Rather, all information directed to trains can only be received at the next station or terminal through the control phone systems. (Plate 4.3 for the Signal Control point at Erunmu Station of the Corporation)

Plate 4.3: Signal Control Point at Erunmu Station, Ibadan.

Source: Field Survey, 2011

4.6.5 Inventory of Facilities

Table 4.1 presents a summary of the facilities available at the Ibadan Headquarters of the Nigerian Railway Corporation. Of the facilities listed, only the locomotives are recently purchased as part of the first batch of 25 locomotives to kick start the Railway Modernization programme nationwide. The remaining facilities are being gradually refurbished in spite of the fact that most of them are outdated having existed for more than 25 – 30 years of life span. There is obviously the need for modern commuter train coaches. As it is now, the Corporation cannot go to the open market to purchase its rolling stock because of the outdated track still in use.

At the inception of the Mass Transit Programme in 1989, Table 4.1 also presents a typical crew composition for train movement. The day to day running of the train is handled by the crew in terms of inspection to detect mechanical or electrical faults and to see to the welfare of commuters.

Table 4.1 Inventory of Facilities and Crew Composition for Mass Transit Train

S/N	Facilities	No in Stock
1	Locomotives	2
2	Rail Station/Terminals	7
3	Coaches	14
4	Parking list	1
5	Signals	5
6	Guard Van	2
	Crew	**Number per Train**
1	Drivers	1
2	Assistant Drivers	1
3	Inspectors	2
4	Ticket Collectors	6 (1 per coach)

Source: Field Survey, 2011

4.7 CONCLUSION

The chapter examined the contextual issues that are related to rail transport development and the preparedness of the Nigerian Railway Corporation Western District, to undertake the new role of intra-urban rail transport development in Ibadan. Findings from the rail infrastructure assessment indicates, the state of slow but steady preparation towards resuscitation of services on the same old inter-city route currently undergoing a massive rehabilitation. The Nigerian Railway Corporation is currently seeking prospective corporate partnership in some States of the Federation, who wish to establish rail presence and services in their States. Presently, the activities of the Corporation depend on the annual subvention by the Federal Government.

CHAPTER FIVE

HOUSEHOLD TRAVEL SURVEYS OF COMMUTERS IN IBADAN

5.1 INTRODUCTION

Household travel surveys, according to Burton (1985), involve the collection of basic facts relating to the movement of commuters on a typical day within a specially cordoned area of study. Data collected on travel patterns and demands are combined with the land use and socio-economic attributes of respondents to project future travel patterns. The chapter therefore examines the locality, socio-economic characteristics, including mobility patterns of residents as well as their perception of rail transport. It also discusses the factors involved in rail transport patronage and the public-private partnership in rail services.

The views of some participants at the Focus Group Discussion (FGD) were also synthesized on the challenges and expectations for the viability of rail transportation in the city, and concluded with the detailed analysis of the prospective urban rail routes in the study area.

5.2 SOCIO-ECONOMIC CHARACTERISTICS OF RESPONDENTS

5.2.1 Locality Distribution of Respondents

A total of 642 households were interviewed across the five specified traffic corridors with the heads of households responding to the questionnaires. Of these households, only 582 respondents representing 90.65 percent of the total distribution were retrieved and analyzed. The locality of the respondents is presented in Table 5.1. The location of the corridors is also presented in Figure 5.1.

The distribution of respondents is a reflection of the clustering of the households and the length of each of the corridors, from which the figures are derived.

Omi Adio/Erunmu covers a distance of 40 kilometres along the stretch of the old rail line from where 147 or 25.3 percent of the respondents were drawn. The Podo/Akobo corridor which is a 22 kilometre stretch, is mainly urban with the largest number of households, out of which 258 or 44.3 percent of the respondents were drawn. However, in sharp contrast to the Podo/Akobo route, is the Lagos Express Toll/Moniya corridor which is a 26kilometre stretch but with discontinuous clusters of residential communities, where only 57 or 9.8 percent of respondents could be drawn. Similarly, the Mokola/Ife Road Toll has only 18 or 3.1 percent of the respondents.

The fifth corridor is that of Bere/Akanran which traverses through a combination of urban and sub-urban households where 102 or 17.5 percent of respondents were drawn. The locality of the respondents is presented in Table 5.1.

Table 5.1 Locality Distribution of Respondents.

S/N	Locality	Respondents	Percentage
1	Omi-Adio/Erunmu	147	25,3
2	Podo/Akobo	258	44.3
3	Lagos Express Toll/Moniya	57	9.8
4	Mokola/ Ife Road Toll	18	3.1
5	Beere/Akanran	102	17.5
	Total	**582**	**100.00**

Source: Field Survey 2011

5.2.2. Socio-Demographic Characteristics of Respondents

Table 5.2 is a reflection of the socio-demographic profile of the respondents. The age of respondents varied from 16-72 years 542 or 93.1 percent of the respondents fall between the range of 16 and 60 years which the study considers as active ages for movement and travels while the respondents between the ages of 61 and 72 years may be classified as less active respondents due to their more advanced years and lower tendencies to move about.

Of these respondents, 360 (61.9%) were male while 213 (36.6%) were female. This is a typical reflection of the traditional setting in Yorubaland where the male usually constitute the majority of household heads (Fadayomi, 1988; Akinola, 1997). Most of the female household heads are incidentally widows divorcees and those whose husbands were not around at the period of interview. However, 492 (84.5%) of the respondents were married while 72 or 12.4 percent were single. Widows/widower and the divorced, were only 18 or 3.1 percent .The distribution of respondents by household size shows that households with5-6 members constitute the highest percentage at 219 (37.6%) households with 7-8 and 3-4 members followed with 129 or 22.2 percent each, while households with 9-10 and 1-2 members followed with 36(6.2%) and 24(4.1%) respectively. This fact corroborates the view that the bulk of household heads belong to the married group. Household size is a very strong determinant of trip making as revealed in the studies conducted by Olayemi (1997) Fadare, (1989) Okoko and Fasakin (2003).

The educational status of respondents can be considered as average because, a significant proportion of the respondents 222(38.1%) have only secondary school education. Those with tertiary education are 144(19.6%) while those without any formal education constitute 54(9.3%). This distribution is not considered unusual as the survey traversed mostly the high density and indigenous areas of the city where the masses reside. The level of literacy however has significant implications on the ability of the respondents to comprehend issues related to intra-urban rail transport development in Ibadan.

Table 5.2: Socio-Demographic Profile of the Respondents

S/N	Variables	Characteristics	Frequency (N=582)	Percentage
1.	Age of Respondents (yrs)	Below 25years	37	6.4
		25-35years	165	28.3
		36-45years	185	31.8
		46-55years	134	23.1
		56-60years	21	3.6
		Above 60years	40	6.8
2.	Gender	Male	360	61.9
		Female	213	36.6
		No Response	9	1.5
3.	Marital Status	Married	492	84.5
		Single	72	12.4
		Divorced	12	2.1
		Widow	6	1.0
4.	Household Size	1-2 members	24	4.1
		3-4members	129	22.2
		5-6members	219	37.6
		7-8members	129	22.2
		9-10members	36	6.2
		Above 10	12	2.0
		No Response	33	5.7
5	Educational Status	No Formal Educ.	54	9.3
		Primary School	144	19.7
		Secondary School	222	38.1
		NCE/OND	147	25.3
		Tertiary	42	7.2
		No Response	3	0.5

Source: Field Survey, 2011

5.2.3 Socio-Demographic Characteristics of Respondents Contd.

Table 5.3 shows the dominant occupation of residents is Trading as form of self employment where 195 (33.5%) are engaged. It was discovered that apart from those who have their shops in distant locations from their residence , most of the houses along the major streets perform a dual function of residential cum commercial, to satisfy the occupation needs of some of the households. Next to these group are the Artisans and Craftsmen such as mechanics, vulcanizers, panel-beaters, bricklayers, painters and welders who are equally self-employed and constitute 180 (30.9%) of the respondents. Others are, Civil Servants with 99 (17%), Retirees, 39 (6.7%) Farmers, 15(2.6%) and Students, 36 (6.2%) Apprentices/Applicants made up 12 or 12.1 percent. Each of these groups, however, constitutes a highly mobile number of commuters, who will normally go to their workplaces everyday within the city.

The monthly calculation of the income of respondents is a reflection of the mode of occupation. About 450 or 77.3 percent are self employed and are basically not salary earners whose monthly income fall below N50,000 monthly. In this study, respondents were classified by their income levels into high, medium and low respectively. Those earning above N20,000 monthly, 201 or 34.5 percent are classified as low income earners. Level of income has been adjudged as another potent factor that determines trip generation (Okoko, 2003 Guliano and Narayan, 2003). It could also be seen that the level of income is a true reflection of the educational attainment of the respondent discussed earlier.

Auto – ownership is another strong factor of trip-making by households (Fadare, 1989; Ogunjumo, 1989). From the available literature, auto-ownership has been known to increase the propensity for trip making. Automobile ownership includes households that possess vehicles ranging from motor cars, buses, pick-up vans to motor cycles. Some households in the study area were known to possess more than one of these such that, when the head of household moves with one, the other members of the family still have another vehicle for use.

In the study area, 309 (53.1%) were auto-owners while about 259 (44.8%) commute within the city in public transport and other informal means. Some of the respondents 14(2.3%), did not disclose if they were auto-owners or not as they would not like to consider motor-cycle ownership in the same class with car-owners.

The twin phenomenon of Residential and Tenure status of respondents are two separate issues. One addressing the status of respondents as house owners, tenants or squatters while the other is about the length of stay and residential mobility within the city. It addresses the issue of familiarity with the urban space with a view to ascertaining the respondent's knowledge of the city in terms of work places, residential locations, the traffic culture, transportational modes and transit patterns. The factor of familiarity or knowledge of the urban space, may not be totally dependent on how long a respondent has stayed in a particular location in the city. There are other contributory factors such as education, job security among other. However, length of stay can be considered as a useful factor. Table 5.3(5) shows the length of respondents stay in their residences and location.

Table: 5.3 Socio-Demographic Profile of the Respondents

S/N	Variables	Characteristics	Frequency N=(582)	Percentage
1.	Occupation	Trader	195	33.5
		Artisans	180	30.9
		Farming	15	2.6
		Student	36	6.2
		Applicant/Apprentice	12	2.1
		Civil Servant	99	17.0
		Retiree	39	6.7
		No Response	6	1.0
2.	Monthly Income	Below N20,000 (Low Income)	201	34.5
		N20,000- N50,000 (Middle Income)	249	58.8
		Above N50,000 (High Income)	93	16.0
		No Response	39	6.7
3.	Residential Status	Tenants/Renters	300	51.5
		House owners	237	40.7
		Squatters	45	7.8
4.	Auto-Ownership	Motor-cars	104	17.8
		Buses	55	9.4
		Pick-up Vans	30	5.1
		M/Cycles/Tricycles	120	20.6
		None	273	47.1
5.	Tenure Status	1-10 years	396	68.0
		11-20 years	111	19.0
		21-30 years	39	6.8
		Above 30 years	36	6.2

Field Survey, 2011.

5.3: MOBILITY PATTERN OF RESIDENTS IN IBADAN

The mobility pattern of residents in Ibadan discussed here, is about the frequency of movements, the distance commuted within the city, the time spent on such trips and the purpose of such journeys.

The phenomenal expansion of the city according to Osunade and Salami (1990), Olatubara (1995) is largely attributed to the status of the city as an administrative centre with the attendant infrastructural development resulting in increased number of commercial and industrial activities which are regarded as pull factors. However, the current population of 1.3 million for Ibadan city (NPC 2006) notwithstanding, most of the 3,123 sq kilometres of the metropolitan land area is rapidly being annexed by the city in one of the most aggressive accretion ever witnessed in modern times.

Earlier, Mabogunje (1968) analyzed that the growth of Ibadan has been by a twin phenomenon of 'fission' and 'fusion'. The growth by fission results from the breaking up of single but large compounds into smaller individual units, while growth by fusion is largely explained by the outward shift in city boundary through the annexation of surrounding villages, in order to accommodate more people. The ease of boundary shift has been largely attributed to the absence of a city master-plan. Thus, the commuting distance from the city centre outwards is increasing on a daily basis. Although the city exhibits a multiple-nuclei structure, new activity areas in the absence of a city master-plan, are located haphazardly thereby exacerbating all the extenuating factors of mobility for residents in the city.

5.3.1 Ibadan City Growth and Land Use Perspectives

The Geography and Demography of Ibadan as the third largest city in Nigeria after Lagos and Kano has been overwhelmingly acknowledged (Mabogunje, 1998). The main city is made up of five Local Government areas and a population of 1.3 million while the metropolitan area comprising eleven Local Government areas in all, has 2.55 million inhabitants on a land expanse of 3,123 sq kilometers. The city land-use is almost expended and saturated such that, new development in the inner core is almost impossible. There is a gradual accretion of land-use into the rural lands thus eroding the city-serving and agrarian propensity of the peri-urban hinterlands. While

the metropolitan areas have fixed boundaries, the urban area kept expanding to keep pace with the ever growing urban population.

A vivid illustration of the phenomenon can be seen in the seemingly static nature of population growth of Ibadan North Local Government with a population increase of just 4,524 or 1.4 per cent growth between 1991 and 2006 census count and another outlying Local Government like Ona-Ara which recorded about 115.4 per cent growth increase within the same corresponding period. Commenting on this development, a Local Government official remarked:

> *"land use within the inner core of the city have been mopped up mainly by residential and commercial developments at the expense of industrial and other developments. Government acquisition and reservation areas have not been spared of the ugly trend. People have been forced to look for land in the peri-urban areas for further developments. This factor contributed to the lopsided population growth figures of the urban and peri-urban areas."*

In essence there is an over saturation of land-use within the inner core of the city and an absorbent nature of growth elasticity of the peri-urban and rural areas of Ibadan. This is a situation that is very inimical to the healthy existence of the city, both now and in the foreseeable future.

Another interesting feature is the hap-hazard and uncontrolled growth of the city. This was attributed to the absence of a city master plan which should have set the limits of city-growth, specify infrastructural and industrial growth points and order the pattern of development. The implication of the shortcoming is manifested in the continuous urban sprawl whereby the distance from the city-center becomes unbearably increased and thus, increase in urban travels becomes inevitable. In the absence of an efficient public transport, the roads get clogged with all kinds of auto-cars. Unavailability of land in the inner spaces of the city for new industrial and commercial development pushes activities beyond city boundaries thus exacerbating the agonies of commuters who are connected with these activity areas.

The phenomenon of city growth by 'fusion and by fission' Mabogunje (1968) has impacted negatively on transportation networking and flow, extension of provisional facilities into new areas in view of the capital outlay and its subsequent maintenance. There is a profound evidence of the alarming rate of incursion of the city on the erstwhile agricultural lands. Accessibility problems are thus experienced in the

new areas, infrastructural deficiency and the prominence of motorcycles as the most visible means of public transportation in the new areas becomes also inevitable.

5.3.2: Frequency of Trips Made by Respondents

While it is true that the majority of respondents 435 (74.7%) commute on a daily basis as against those who undertake weekly trips 54 (9.3%) and occasional trip makers 36 (6.2%) respectively, it is the actual number of trips made by respondents on a daily basis that tells the story of the ease or comfort enjoyed by each respondent during each trip. Most of the daily trips made here reflect a one-shot trip mostly to work places. Table 5.4 is the summary of frequency of trips made by respondents.

5.3.3: Purpose of Journeys

In this survey, the purpose of journeys is defined to reflect trips whose points of origin are directly from the respondent's residence. These include trips to work, school, social and to shop/market. The cross-sectional nature of the survey, traversing the various residential densities of households, makes it very difficult to comment on the nature and importance of the categories of trips. Trips to work and trips to school can hardly be separated as school can also be workplace for teachers. In the analysis shown in Fig 5.1, trips to work take the highest number and percentage 312 (53.2%) because most of them are still in active workforce. This is followed by trips to shopping and market with 156 (26.8%). Others trips are those to school, multi-purpose trips which recorded 6.7 per cent 5.7 per cent respectively. Social trips account for 42 (7.2%) made by respondents.

Table 5.4: Frequency of Trips by Respondents

Trip Period	Frequency	Percentage
Daily	435	74.7
Weekly	54	9.3
Monthly	6	1.0
Occasionally	36	6.2
No Response	51	8.8
Total	**582**	**100.0**

Source: Field Survey, 2011.

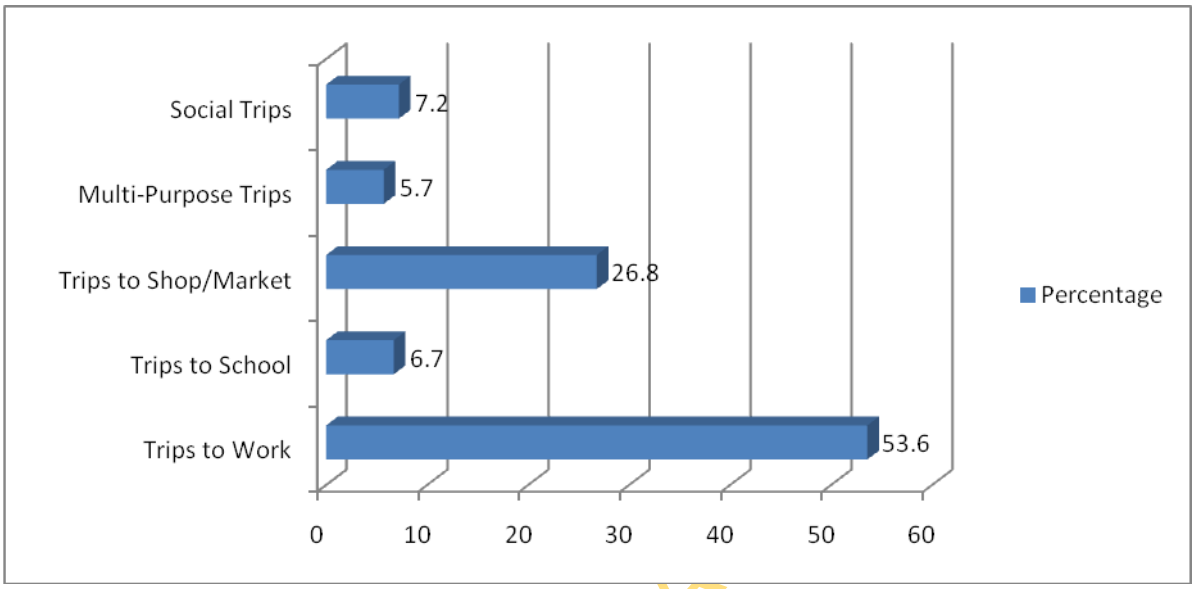

Figure 5.1: Usual Identified Purpose of Trips

Source: Field Survey, 2011.

5.3.4 Trip Purpose and Income of Residents.

Table 5.5 is a reflection of the nature of trips undertaken by the various income groups in which trips undertaken vary in context but cut moderately across all the income groups. However, trips to workplace took the lion share with 115 (19.8%), 102 (17.5%) and 95 (16.3%) respectively among the low, medium and high income groups. Trips to shop/market was next in rank with low income group having 38 (6.5%), medium income 65 (11.1%) and high income, 53 (9.1%) respectively. Multipurpose and social trips were not frequently undertaken by the high income group.

Table 5.5: Usual Purpose of Trips by Estimated Income of Residents.

Usual Purpose of Trips	Estimated Income		
	Low Income	**Middle Income**	**High Income**
Social Trips	29	11	02
Multipurpose Trips	13	20	-
Shops/Market	38	65	53
Trips to School	06	12	21
Workplace	115	102	95
Total	**201**	**210**	**171**
Mean	**40.2**	**42.0**	**42.75**

Source: Field Survey, 2011

Table 5.6: Analysis of Variance: Trips undertaken by Low, Medium and High Income Residents.

Source of Variation	Sum of Squares	Df	Mean Square	F	Variables	N	Mean	Std. Dev
Between Groups	17.137	3	2.379	38.503	Low Income	201	1.0000	0.00000
					Medium Income	249	1.9518	0.91894
Within Groups	7.683	578	0.186		High Income	132	3.5682	0.49722
Total	24.820	581						

Source: Computed from Table 5.5

5.3.5 Trips undertaken by Low, Medium and High Income Residents

In analyzing the hypothesis on the significant differences between trips undertaken by low, medium and high income residents, analysis of variance (ANOVA) statistical technique was adopted and the result is presented in Table 5.6 below. This technique analyses the variations within and between the income groups by comparing their means. These differences are represented by *F- ratio or F-Statistic.*

Table 5.6 which shows the analysis of variance between trips undertaken by the low, medium and high income residents indicate that there were significant differences in the usual purpose of trips undertaken by the potential users of proposed rail mass transit (F=38.503 (3.00); df=3/578; P < .05). In the same vein, the result was further subjected to descriptive analysis which shows variation in the mean and standard deviation of the computed result. However, the mean values ranging from 1.0 – 3.5 recorded 1.0 for low income residents' users, 1.9 for medium income residents' users and 3.5 for high income residents' users, hence, those high income ($\bar{X}$=3.56) residents recorded lower propensity to use rail than those with low income($\bar{X}$=1.00) residents. Also, the standard deviation values recorded a low variation of 0.00 to 0.91 respectively. Thus, the overall result confirmed the alternative hypothesis which says that there were significant differences between trips undertaken between the low, medium and high income residents and rejected the null hypothesis. This test is similar to the analysis computed on the measurement of spatial interaction pattern of commuters in Akure township by (Okoko 2002).

5.3.6: Distance between Workplace and Residence of Respondent

The distance commuted to workplace by some respondents from their residence has extended over the years correlatively with the continuous urban expansion. Many residential locations are in the peri-urban areas of the city where land is still affordable thus increasing the trip-distance to work places located in the city center. In this survey, the commute distance of about 18km recorded by Olatubara (1995) has shifted to more than 35km thus implying that more intra urban journeys has to be made by workers. Table 5.13 shows the distance of workplace to residence of

households. The bulk of household heads 423 (72.6%) are located within 10km of their workplace.

5.3.7: Respondents Usual Mode of Transport.

In this survey, as shown in Table 5.8, the mode usually employed by respondents as the various trip purposes are considered, most especially, the daily trips to workplaces, shopping, markets and to school. While 104 household heads admitted to having motor cars, only 63 (10.8%) use their cars on their daily trips. It is however most probable that the others use these cars for city shuttles and other commercial purposes. Most of the respondents, 390 (67%) per cent make their trips by public buses. Those who travel on motorcycles make up 57 (9.8%) while those who split their modes are 67 (11.5%).

Table 5.7: Distance of workplace to residence and usual mode of transport of respondents

Distance (km)	**Frequency**	**Percentage**
0.00 – 5.00	309	53.0
5.01 - 10.00	114	19.6
10.01- 15.00	51	8.8
15.01- 20.00	9	1.5
20.01- 25.00	24	4.2
25.01- 30.00	12	2.1
30.01- 35.00	15	2.6
Above 35.00	28	4.8
No Response	20	3.4
Total	**582**	**100.0**
Transport Mode	**Respondents**	**Percentage**
Motor Cars	63	10.8
Danfo Buses	390	67.0
Motor Cycles	57	9.8
Mixed	67	11.5
No Response	5	0.9
Total	**582**	**100.0**

Source: Field Survey, 2011

5.4: RESIDENTS PERCEPTION OF RAIL TRANSPORT

Intra urban rail services began in Ibadan early in 1990. The service developed by the Nigerian Railway Corporation (NRC) was in consonance with the provisions of the Federal Urban Mass Transit Programme (FUMTP). The programme refurbished the existing locomotives and coaches and made some spirited efforts to improve rail infrastructure within the city. In Ibadan, 15 trains were operated on working days on the Adio/Bodija route (24km) serving 7 stations. The commercial speed of the trains was about 28 kilometers per hour while the fare regime was based on a zonal fare system.

The data collected specified that the average patronage was about 130 passengers per train. Omi/Adio to Bodija operated a two-zonal system; Omi/Dugbe (15km) and Dubge/Bodija (9km). A number of factors were attributed to the discontinuance of the services a couple of years after its inception.

During the short period of the intra-urban rail usage in Ibadan, some of the respondents have patronized the services while some others relive their experience of rail transport in some other cities outside Ibadan. The perception of residents about rail usage is measured in this study by their experience of ever boarding a train. When and where? The problems envisaged from rail transport externalities and their preference of train travel to other modes.

5.4.1 Challenges of Urban Rail Services in Ibadan

Ibadan city had a very short experience of rail transit as a result of the Federal Urban Mass Transit Programme. The experience lasted between 1989 and 1992 with about 15 locomotives plying the route between Omi-Adio and Bodija, a distance of 24 kilometers. While the programme lasted, only a handful of the city's population benefitted due to the lopsided location of the route. The account of this rail transit experience also confirmed that the Nigerian Railway Corporation operated the programme at a loss, due to low patronage. For instance each train had 6 (six) attached coaches and 2 (two) guard vans and a seating capacity of 550 and a crush capacity of 700 passengers. Fares for the trip were based on the zonal system at the rate of 50 kobo per zone. From Omi-Adio- Dugbe (first zone) and Dugbe- Bodija (second zone). Average ridership per day is about 1,970 and average patronage per train was about 130 passengers. This statistics projected a dismal coverage of about 22 percent of

operating costs and even a much lesser value of the opportunity cost of the services. A Nigerian Railway official remarked:

> *"we could not have sustained that programme for long, we were actually running the services at a loss until we came to terms with the fact that we were supposed to be a commercial oriented Corporation."*

Presently, the geography of the city has changed considerably and city growth has gone in all directions unlike what it used to be in the past. With the extension of the route to Erunmu and with consideration of new route(s) development within the city, ridership quality is surely bound to improve. Obviously, one of the greatest challenges of the rail mass transit in Ibadan is that of the public orientation towards its patronage and the amount of cooperation this must receive from existing public transportation system. The culture of waiting at boarding stations and obtaining a boarding pass must be built in the public. More routes should also be considered for development in a rail network within the metropolis. More rail corridors within the built environment of the city, means more disturbance of the existing physical order in terms of demolition of shops and residential structures and eventual displacement of inhabitants. Of special mention is the huge financial burden of building new rail corridors and acquiring the necessary equipment and personnel.

5.4.2: Respondents Experience of Train Usage

Table 5.8 is the summary of the experience of respondents about train journeys. The survey reveals that about 264 (45.4%) admitted having ever boarded a train while the remaining 318 (54.6%) has never travelled in a train before. Of these numbers, 165 (28.4%) had their experience during the Federal Urban Train Mass Transit Programme of the 1990's in Ibadan while 99 (17%) had their experience in cities outside Ibadan.

Table 5.8: Respondents experience of train usage

Experience of Usage	Location		Total	Percentage
	In Ibadan	Outside Ibadan		
Boarded a train	165 (28.4%)	99 (17.0%)	264	45.4
Have not boarded a train	318 (54.6%)	00 (0.0)	318	54.6

Source: Field Survey, 2011.

Table 5.9: Resident's perception of rail traffic externalities

Response	Noise Pollution	%	Vibration	%	Displacement Fear	%
Yes	111	19.1	252	43.3	132	22.7
No	471	80.9	330	56.7	450	77.3
Total	**582**	**100.0**	**582**	**100.0**	**582**	**100.0**

Source: Field Survey, 2011.

5.4.3: Residents Perception of Rail Traffic Externalities.

This study incorporated resident's perception of anticipated noise pollution, vibration or displacement through demolition in the process of new rail-line construction within the city. Rail transportation has been known to induce some noise while in transit. Only 111 (19.1%) of the respondents believed that such noise could be disturbing while others 471 (80.9%) indicated that such noise is permissible for the magnitude of anticipated service. Also, 252 (43.3%) of the respondents noted the effect of vibration that may be experienced by people living close to the rail lines. The fear of being displaced when new rail routes are determined across the length and breadth of the city, were expressed by 132 (22.7%) of the respondents. All these are reflected in Table 5.9.

5.4.4: Public Perception of Rail Transport Modernization

At a time when most of the major roads are congested especially at peak periods, absence of a workable intra urban mass transit coupled with the prevalent scheme within the city, a greater percentage of the respondents 494 (85.0%) wanted the resuscitation of Rail Transport services in the city while only 42 (7.0%) saw no need for rail transportation. Also, 46 (8%) of the respondents were undecided about rail transport revitalization as reflected in Figure 5.2. Plate 5.1 presents revitalisation work in progress.

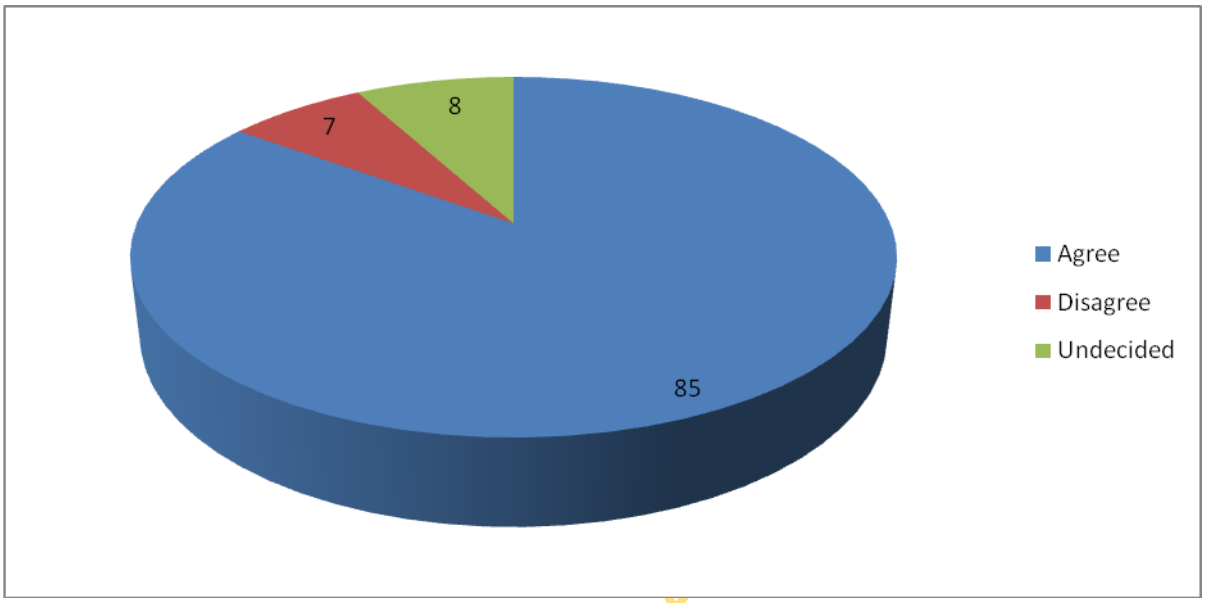

Figure 5.2: Revitalization of Intra – Rail Services in Ibadan
Source: Field Survey, 2011.

Plate 5. 1: Rail revitalization work in progress along the old rail route in Ibadan.

Source: Field Survey, 2011.

5.4.5: Usage when Revived and Modernised

Table 5.10 indicates the opinion of the respondents on whether they will patronize the intra-urban rail transit if rehabilitated and brought back to operation. The major fears of respondents are about the maintenance of rail services in terms of equipment and personnel when put in place. From this survey, 490 (84.0%) consented to its use while 58 (10.0%) saw no need for its patronage. 38 (6.0%) were undecided.

Table 5.10: Rail services usage if revived.

Response	Respondents	Percentage
Agree	490	84.0
Disagree	58	10.0
Undecided	38	6.0
Total	**582**	**100.0**

Source: Field Survey, 2011

5.4.6. Hypothesis Testing Rail Mass Transit as a Function of the Socio-economic Characteristics of Users

The hypothesis which states that the use of Rail Mass Transit is a function of the socio-economic characteristics of the potential users was tested by using the multinomial or polychotomous logit model which seeks to determine the proportion of trips that will select a specific mode. This model is invariably transformed into a linear logit model following Wrigley (1980). The equation is thus transformed into this expression - $Y = \beta o + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_n X_n + e$

where Y = Dependent variable

βo = constant

$\beta_1 - \beta_n$ = the regression co-efficient

$X_1 - X_n$ = Independent variables of (income, age, vehicle ownership, trip length)

e - = error term

Table 5.11 of the logit model shows that there is a significant combined effect of all the independent variables (socio – economic characteristics of potential users) on the use of the Rail Mass Transit. ($F = 38.970$ (2.60), d/f = 3/578; $R = .918$, $R^2 = .843$, Adj. $R = .842$; $p < .05$). Approximately 92% of the variation was accounted for by the independent variables while the remaining 8% was due to the unused factors. Thus, the relative effects of each independent variable showed that occupation status ($\beta = .050$; $p < .05$), estimated Income ($\beta = .074$; $p < .05$), and trip distance ($\beta = .187$; $p < .05$) all of these variables were found significant on the potential users of the rail mass transit. Thus, the hypothesis, is therefore, confirmed. This analysis conforms to the modal split model expressed by Hutchinson (1974) and Kanafani (1983) which states that the choice of a particular mode depends on factors associated with the nature of work undertaken by various individuals, the distance of trip undertaken and the level of income of users.

Table 5:11: The use of the rail mass transit as a function of the socio–economic characteristics of the potential users.

Variables	F –Ratio	Multiple R	R^2	Adjusted R^2	β	T	P. values
Occupation					0.050	-5.517	0.001*
Estimated Income	38.970	0.918	0.843	0.842	0.074	3.820	0.001*
Trip Distance					0.187	8.713	0.001*

*Significant, $p < 0.05$

5.4.7 Urban Rail Transport and Intermodality

The intermodal issues brought a lot of apprehension and misunderstanding initially when the discussion came up. It was misconceived that the introduction of rail transport will take away the jobs of the Road Transport Employers Association of Nigeria (RTEAN) and the National Union of Road Transport Workers (NURTW) members in the city and there was a lot of protest from their members present at the discussion. A member from the NURTW queried:

> *"do you want to send us into the labour market? The rail will take away our passengers and daily source of livelihood."*

This later gave way to a detailed explanation and education on how the system will bring them more work and more patronage as each mode will concentrate on its area of relative strength and advantages for the benefit of the masses.

5.5 FACTORS IN RAIL TRANSPORT PATRONAGE

The intra-urban rail services in Ibadan metropolis had a very short life span such that the potentials of the service in mitigating urban mobility problems could not be fully evaluated. However, during the period of operation, the areas covered by the rail-route according to Salami (1994), had a lot of relief in terms of road congestion and vehicular access to the city center. It was able to break the monopoly of the mini-bus operators and the taxi-cabs in addition to moving large number of commuters and freight haulage along its corridor.

5.5.1: Public Perception of Rail's Commuting Time and Cost

Of the various transport modes for intra urban trips, the rail has been noted for promoting inter modal transport because of its inability to accomplish door to door travels like the road modes. Ordinarily, it would have been expected that respondents would return a time-wasting verdict on rail travels because of the boarding and stop-over times at designated stations along its commuting routes. Yet, 453 (77.8%) of the respondents, believed in the promptness and time scheduling nature of rail travels as a strong asset. In terms of transport fares, 564 (96.9%) are of the opinion that rail modes has often attracted lower transport fares than other modes comparatively. See Table 5.12 for details.

5.5.2: Intra-Urban Travel Safety and Comfort

One of the major revelations of this survey was the struggles commuters sometimes engage in at boarding points of taxis and buses especially at peak periods and the rickety nature of some of the vehicles some of which are adjudged as not road-worthy. Many of the complaints include bruises inflicted by the vehicles wet clothes from leaky vehicle roofs and insecure windshields during the rainy seasons. Other aspects considered include the accident-prone nature of all the modes and their organization in getting commuters to their destinations. Table 5.12 presents public perception of rail commuting time and lower fares, while Table 5.13 is a reflection of the respondent's opinion and preference in terms of intra-urban travel safety and security. 419 (72%) of the respondents acquiesced to rail's travel safety and comfort when fully revitalized for intra-urban services.

Table 5.12: Public perception of rail's commuting time and cost.

Response	Time Wasting	%	Lower Cost	%
Agree	129	22.2	564	96.9
Disagree	453	77.8	18	3.1
Total	**582**	**100.0**	**582**	**100.0**

Source: Field Survey, 2011.

Table 5.13: Rail transport safety and comfort

Variables	Respondents	Percentage
Strongly Agree	302	52.0
Agree	116	20.0
Not Sure	134	23.0
Disagree	30	5.0
Total	**582**	**100.0**

Source: Field Survey, 2011.

5.5.4: Modal Comparative Ratings for Safety and Comfort

Mass Transit modes are not available in Ibadan at present, the city dwellers move about in mini-buses (danfo), taxis and other intermediate public transport modes that are largely informal. More prevalent now are also the tri-cycles and motor cycles. Preference ratings of the respondents are stated in Fig 5.3. The table presented the rail as the most preferred with 294 (50.5%) of the respondents, distantly followed by the taxis 20.6 per cent and the Danfo buses 15.9 per cent respectively. It would however be noted that both the mini-buses and the taxis has been totally aculturized into the transit system of the city for several years now, even while both are not regarded as mass-transit modes.

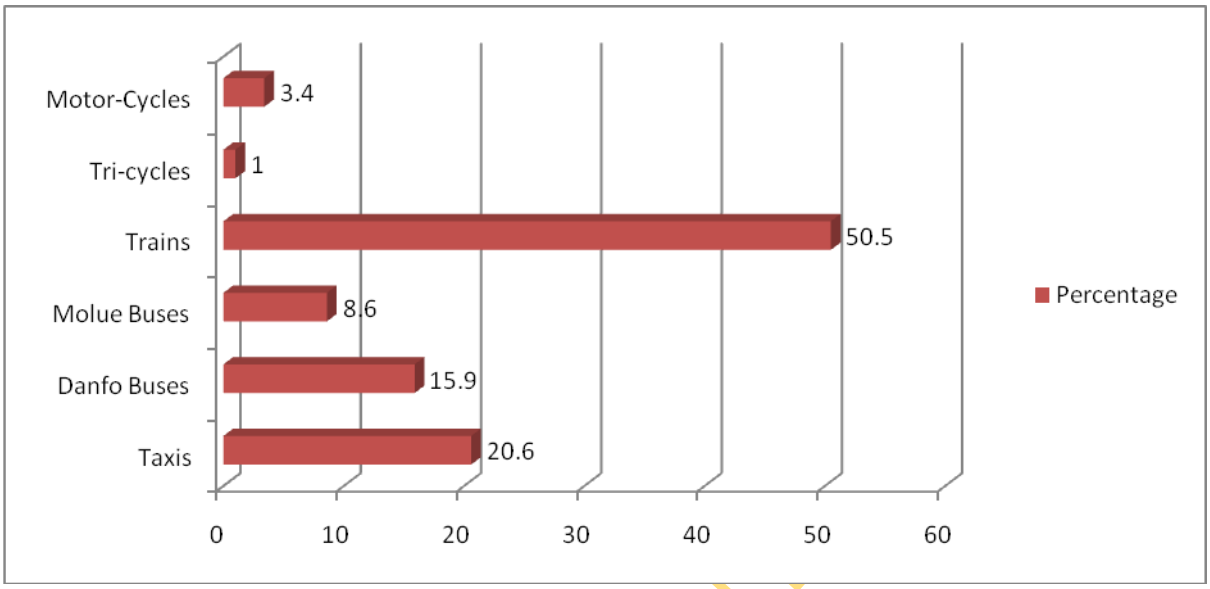

Figure 5.3: Modal Comparative Ratings for Safety and Comfort

Source: Field Survey, 2011

5.5.5. Hypothesis Testing if Rail Mass Transit would Significantly affect the Modal Choice of Commuters

The hypothesis which states that the Rail Mass Transit would significantly affect the modal choice of commuters in the study area, was tested using multinomial logit model and the result is presented in Table 5.14. The Table presents the variables that would affect the modal choice of commuters in Ibadan on the availability of the Rail Mass Transit. Inferences from the table shows that variables like income, vehicle ownership, trip modes by public transport (bus), were all significant in this regard. The modal choice of commuters has a strong association with the available modes and the characteristics of the trip maker which are likely to influence his behavior. In this instance, the commuter's level of income is highly significant (0.000; P < .05) and strongly associated with the choice of mode for journeys within the city. The higher the income, the more propensity for embarking on trips. The same is applicable to the category of people who were auto – car owners who equally were found significant at (0.011; P <.05) and (0.001; P < .05) those who undertake their journeys by public transport/bus respectively.

The result of this hypothesis corroborate the findings of Fertal (1970) and Ogunsanya (1986) who both analysed the factors that can influence the modal choice of commuters as income, auto ownership, trip distance, modal availability, cost and comfort among others. In this hypothesis however, variables like income, vehicle ownership and trip mode by public transport were significant. Most of the respondents (84%) as earlier discussed in Table 5.10 showed their enthusiasm of rail usage in the city if revived. Also, in the modal comparative ratings of Fig 5.4 about 50.5% of the respondents picked rail as their most preferred mode for making trips within the city.

Table 5.14: Variables likely to affect the modal choice of commuters in Ibadan.

Variable	B	Wald	P – Value (sig)
Age	-0.002	0.036	0.850
Income	0.000	21.873	0.001*
Vehicle ownership	-0.851	6.428	0.011*
Trip Distance	0.020	1.495	0.221
Trip Mode(foot)	-0.149	0.194	0.659
Trip Mode(M/Cycle)	-0.014	0.002	0.969
Trip Mode (Car)	-0.252	0.260	0.610
Trip	-1.060	10.962	0.001*
Mode(Bus/P.Transport)	1.216	3.340	0.068
Constant value			

*Significant $p \leq 0.05$.

5.5.6: Rail Mass Transit, Trip Generation Propensity and Perceived Potentials of Rail in Ibadan.

When respondents were asked if the introduction of Urban Rail Mass Transit will encourage them to make more trips within the city, 501 (86.1%) answered in the affirmative to show their long drawn enthusiasm while only 21 (3.6%) did not agree and about 60 (10.3%) were undecided. See Table 5.15.

Of the listed rail transit potentials, transport diversity, road facility preservation and maintenance, efficient land-use and consumer savings were seen as very strong factors that are capable of transforming intra-urban travels in Ibadan. In the first instance, the city is in dire need of a befitting mass transit system which the intra-urban rail can rightly fulfill so as to improve the transportation options for the residents. The rail by its features have also been found to move people in large numbers, thus capable of decongesting the roads and also extending their life span. Although the amount of residents transportation cost's savings in Ibadan was not ascertained, average car costs incurred by car- owners in the United States cities as conducted by notable researchers is very instructive. Transportation studies conducted by Litman (2004), revealed that a car owner spends between 3000 to 5000 US dollars per vehicle annually.

From Table 5.15, 490 respondents, representing 84.20 percent of the total population acknowledged the traffic reduction potential of the rail while 447 or 76.80 percent agreed that the availability of intra-urban rail services will reduce traffic crash rate within the city. The transport diversity factor which is explained by increased transportation options for commuters, was supported by 397 (68.20%) of the respondents. Also, the enhanced consumer savings which is a net reduction cost on commuting within the city especially for long distances is supported by 335 (57.50%) of the respondents while 306 (52.70%) are of the opinion that the rail will create more job opportunities for the teeming masses. See table 5.15 for details.

Table 5.15: Rail mass transit, trip generation and perceived potentials of intra-urban rail transport in Ibadan

Response	**Respondents**	**Percentage**
Agreed	501	86.1
Disagreed	21	3.6
Can't say	60	10.3
Total	**582**	**100.0**
Potentials	**Response (N= 582)**	**Percentage (%)**
Traffic Congestion Reduction	490	84.20
Reduction in per-capita crash rate	447	76.80
Increased Modal Choice	397	68.20
Enhanced Consumer Savings	335	57.50
Employment Creation	306	52.70

Source: Field Survey, 2011

Table 5.16: Traffic congestion factors and willingness to use rail mass transit

Traffic Congestion	Willingness to Use Rail Mass Transit					
	Agree	**%**	**Disagree**	**%**	**Undecided**	**%**
Bad Road Design	190	32.6	11	1.9	-	-
Drivers Bad Habit	120	20.6	20	3.5	03	0.5
Parking Problems	69	11.8	10	1.8	20	3.5
Traffic Control at Junctions	52	8.9	08	1.4	05	0.9
Accident	33	5.6	06	1.0	06	1.0
Traffic Mix	26	4.5	03	0.5	-	-
Total	**490**	**84.2**	**58**	**10.0**	**34**	**5.8**

Source: Field Survey, 2011

5.5.7 Rail Transport and Urban Traffic Congestion Reduction.

Table 5.16 present the factors that constitute traffic congestion in cities and the willingness of commuters to use rail mass transit as an option. All the listed factors were considered very potent by 490 (84.20%) of the respondents while only 92 or 15.8 per cent disagreed with this view. This confirms the notion that commuters would prefer a stress free and convenient trip.

5.5.8 Multiple Regression Analysis on Rail Transport and Traffic Reduction

Table 5.17 revealed that there is a significant combined effect of all the independent variables (urban traffic congestion) on availability of rail transport ($F= 9.054$; $d/f = 6/575$; $R = 0.770$; $R^2 = 0.592$; Adjusted $R = 0.591$; $p \leq 0.05$). Approximately 23%bof the variation was accounted for, by the independent variables while the remaining 77% was due to the unused factors. Thus, the relative effect of each independent variable showed that bad road design ($\beta = .073$; $p \leq 0.05$), drivers bad driving habit ($\beta = .051$; $p \leq 0.05$), parking problems ($\beta = .039$; $p \leq 0.05$), traffic control at junctions ($\beta = .036$; $p \leq 0.05$), accidents ($\beta = .035$; $p \leq 0.05$) and traffic mix ($\beta = .027$; $p \leq 0.05$) all of these variables were found significant on the availability of the rail mass transit. Thus, the hypothesis which states that the availability of rail transport would reduce urban traffic congestion was confirmed. This result corroborated the views of Winston and Langer (2004); and Litman, (2004), that the advent of rail transport brought about the decline in traffic congestion growth rates in several cities of the United States.

Table 5.17 Analysis on rail transport and urban traffic congestion reduction

Variables	F – Ratio	Multiple R	R^2	Adjusted R^2	β	T	P. values
Bad Road Design					0.073	-	0.001*
Drivers Bad Driving Habit	9.054	0.770	0.592	0.591	0.051	4.559	0.001*
Parking Problems					0.039	1	0.001*
Traffic Control at Junctions					0.036	.000	0.001*
Accidents					0.035	1.000	0.001*
Traffic Mix					0.027	1.000	0.001*

*Significant, $p \leq 0.05$

Source: Author's Analysis (2011).

CHAPTER SIX

EVALUATION OF THE PROSPECTIVE INTRA-URBAN RAIL ROUTES IN IBADAN

6.1 INTRODUCTION

As specified in this study, five traffic corridors have been charted for consideration as prospective intra-urban rail-routes. Four of the routes were determined using the Allport (1991) model which specified two major criteria that should be satisfied. First, a peak traffic-flow threshold of 12,000 to 15,000 potential passenger per peak hour and the second criteria which is a marked linear pattern of movement along the routes.

The first of the charted routes is an existing rail corridor which starts from Omi-Adio, along the Ibadan-Abeokuta highway, through Dugbe, Bodija to Erunmu on the Ibadan-Iwo highway. The second corridor is the Podo through Molete, Bere Agodi to Akobo route while the third corridor starts from the Lagos road Toll Gate along the Lagos-Ibadan Expressway through Ojoo interchange to Moniya along Ibadan-Oyo highway. The fourth corridor starts from Mokola in the heart of the city through Agodi, Alakia to Ife road Toll. The fifth corridor starts from Bere through Olorunsogo to Akanran.

6.2 CORRIDOR 1-OMI-ADIO-DUGBE-BODIJA-ERUNMU ROUTE

This first route is an existing rail corridor which served the inter-urban rail-route from Lagos to Kano. This same corridor worked perfectly for the Federal Urban Mass Transit Programme of 1990, ferrying passengers and freight from Omi-Adio to Bodija a distance of 24 kilometres. Currently, this corridor is undergoing a massive rehabilitation with the Federal Government sponsored Rail Modernization Programme from Lagos to Kano. Although most of the rail-tracks are being re-aligned and its plank beddings replaced with concrete sleepers. The rail service stations are in a state

of disrepair and the signal control points dysfunctional. All that is required to put this corridor into use for the intra-urban services is to build new stations, repair the tracks, refurbish the rail-yard its equipment and purchase of new locomotives Figure 6.1 shows the corridor in the context of the city's limits, covering a distance of about 40 kilo metres.

6.2.1 Corridor 1 Omi-Adio-Dugbe-Bodija-Erunmu Features

As shown in Figure 6.1. the corridor covered a total distance of 40 kilometres along the old rail-line and it is divided into six main sections for the purpose of this study. These sections are outlined in Table 6.1

From Table 6.1 the percentage distribution per peak hour averaged 1,847 which is more than the expected range of 1200-1,500 commuters per peak hour for intra-urban rail transport. The property distribution within the 100 metre cordon along the corridor is about 1,342 structures which ranges from residential buildings to fuel stations and commercial properties. Figures 6.2 to 6.7 presents the geo-spatial imagery of Corridor1 with all the structures trapped within the 100metre cordon of the survey. Plate 6.1 shows the new-look concrete rail tracking within the corridor.

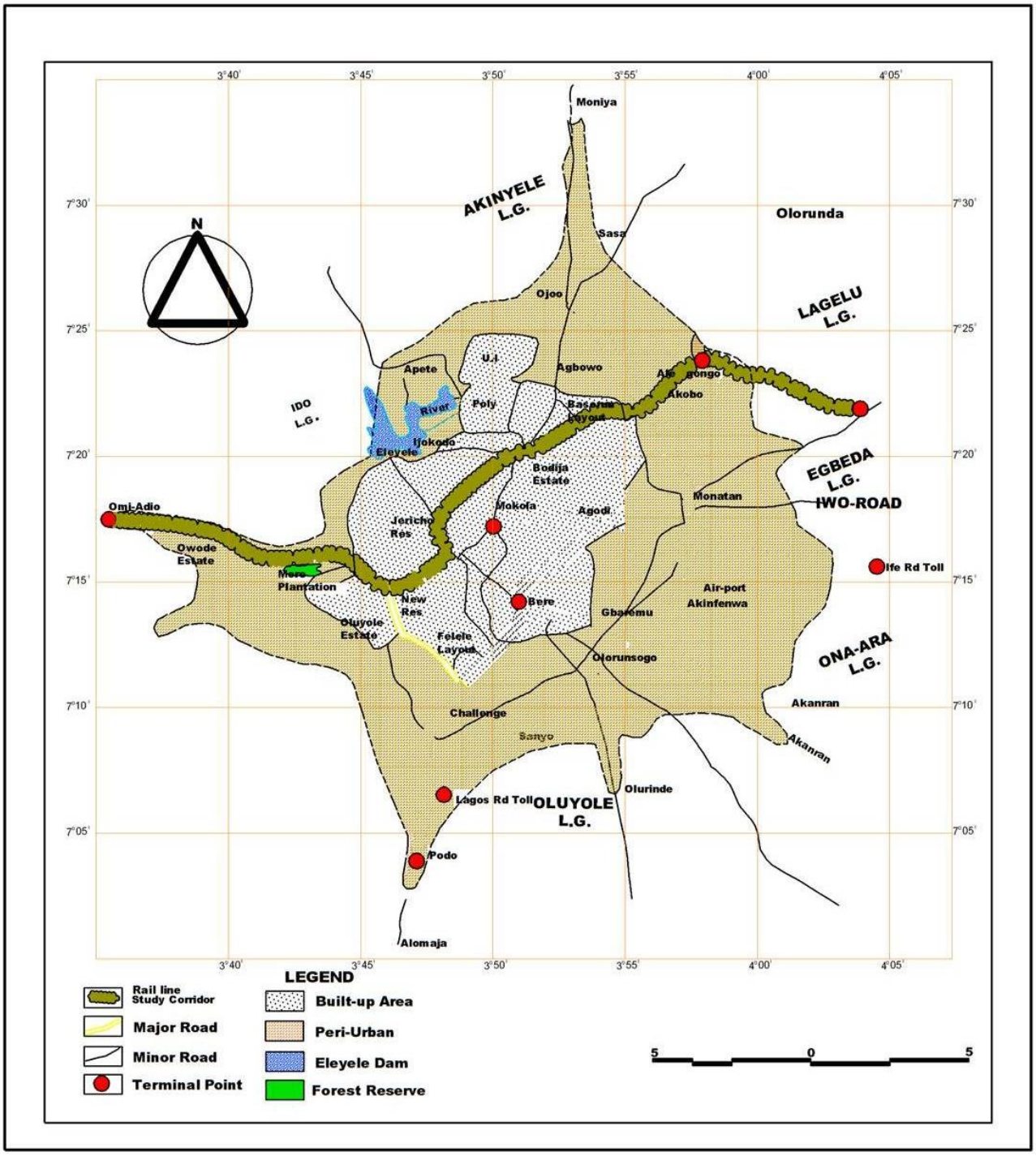

Figure 6.1 Proposed corridor 1-Omi-Adio-Dugbe-Bodija-Erunmu
Source: Field survey, 2011

Table 6.1 Features along Corridor 1-Omi-Adio-Erunmu

Locality	Distance km	Household Distribution	Passenger Threshold	Property Distribution
Omi-Adio-	8	2,000	373	150
Apata	4	4,000	350	320
Apata-Dugbe	12	4,500	320	480
Dugbe-Bodija	6	5,600	304	392
Bodija-Akobo	5	2,700	310	84
Akobo-Olodo	5	1,600	240	16
Olodo-Erunmu				
Total	**40**	**18,000**	**1847**	**1,342**

Source: Authors Fieldwork (2011)

Plate 6.1: The New-Look Concrete Rail-Tracking in Ibadan.

Source: Field Survey , 2011.

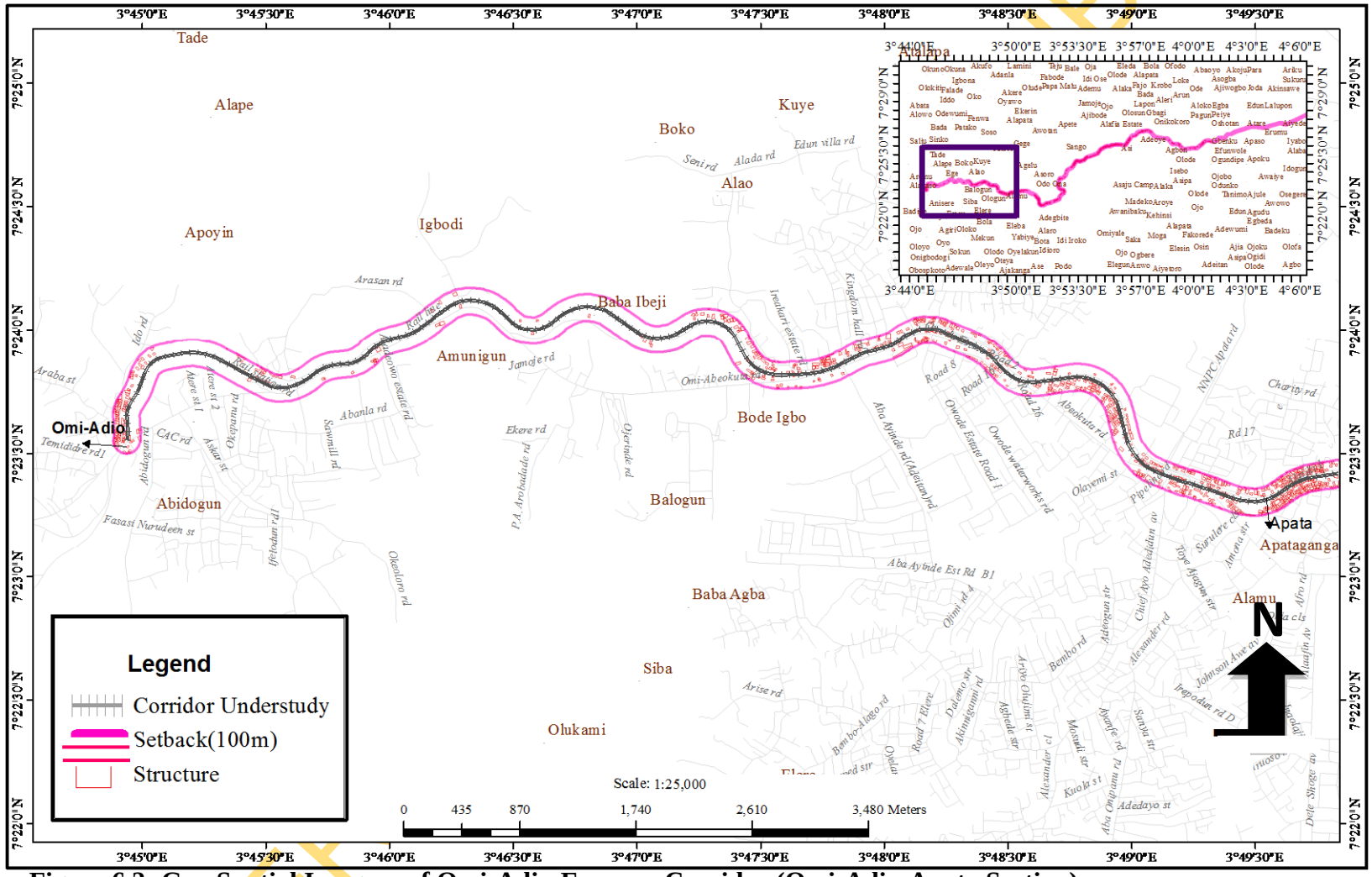

Figure 6.2: Geo-Spatial Imagery of Omi-Adio-Erunmu Corridor (Omi-Adio-Apata Section)

Source: Author's Compilation, (2011)

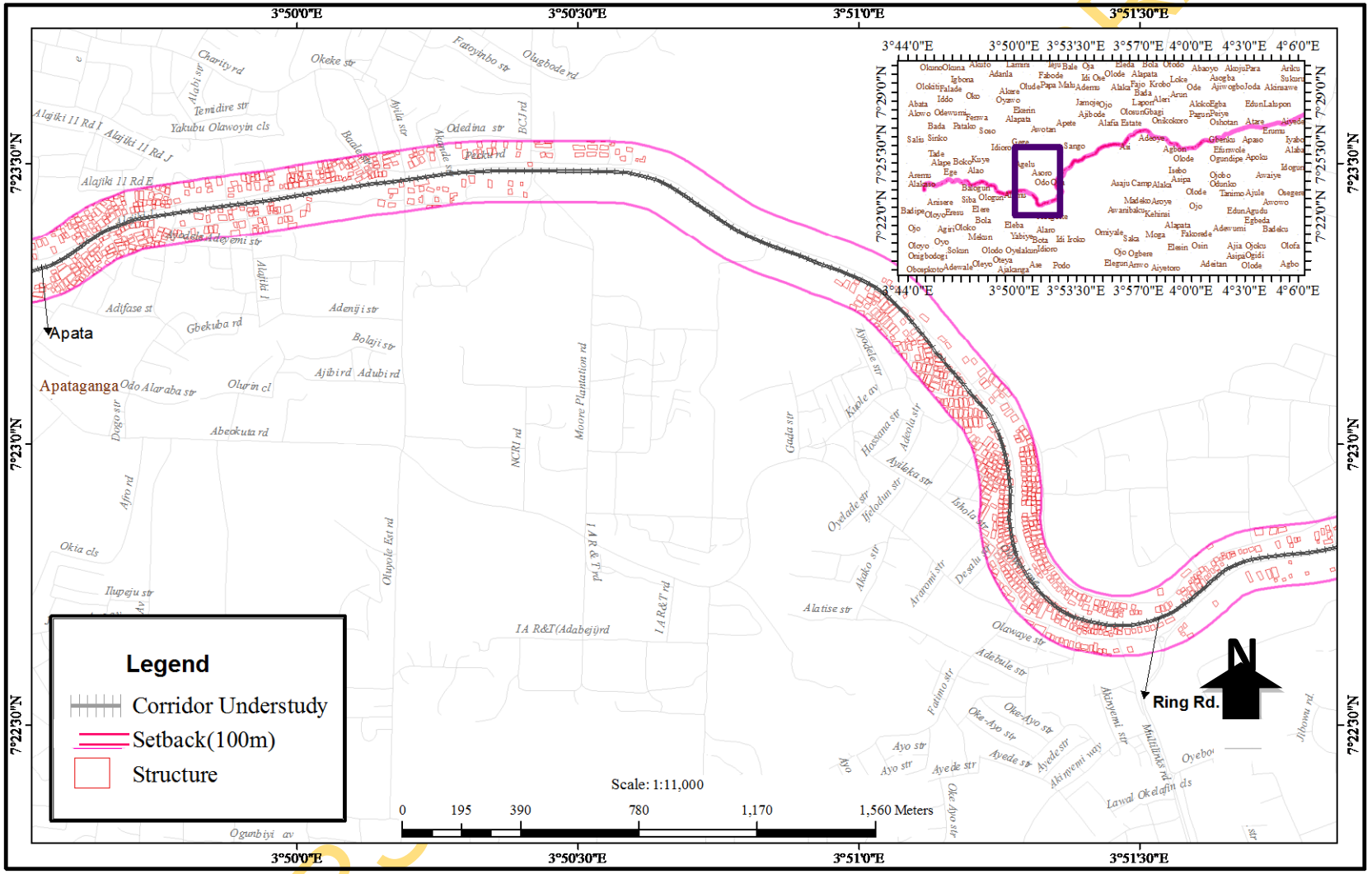

Figure 6.3: Geo-Spatial Imagery of Omi-Adio-Erunmu Corridor (Apata-Ring Road Section)

Source: Author's Compilation, (2011)

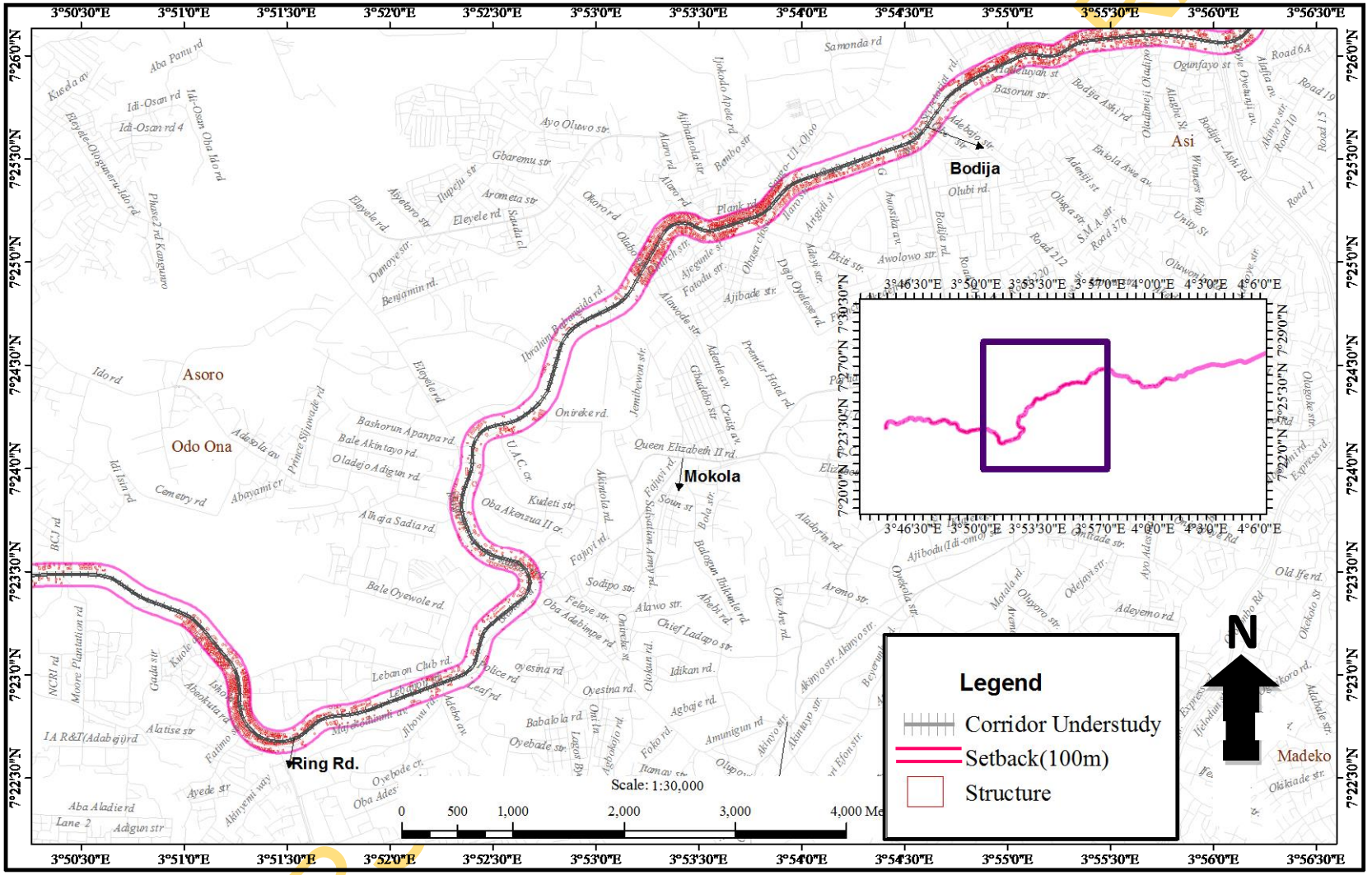

Figure 6.4: Geo-Spatial Imagery of Omi-Adio-Erunmu Corridor (Ring Road-Bodija Section)

Source: Author's Compilation, (2011)

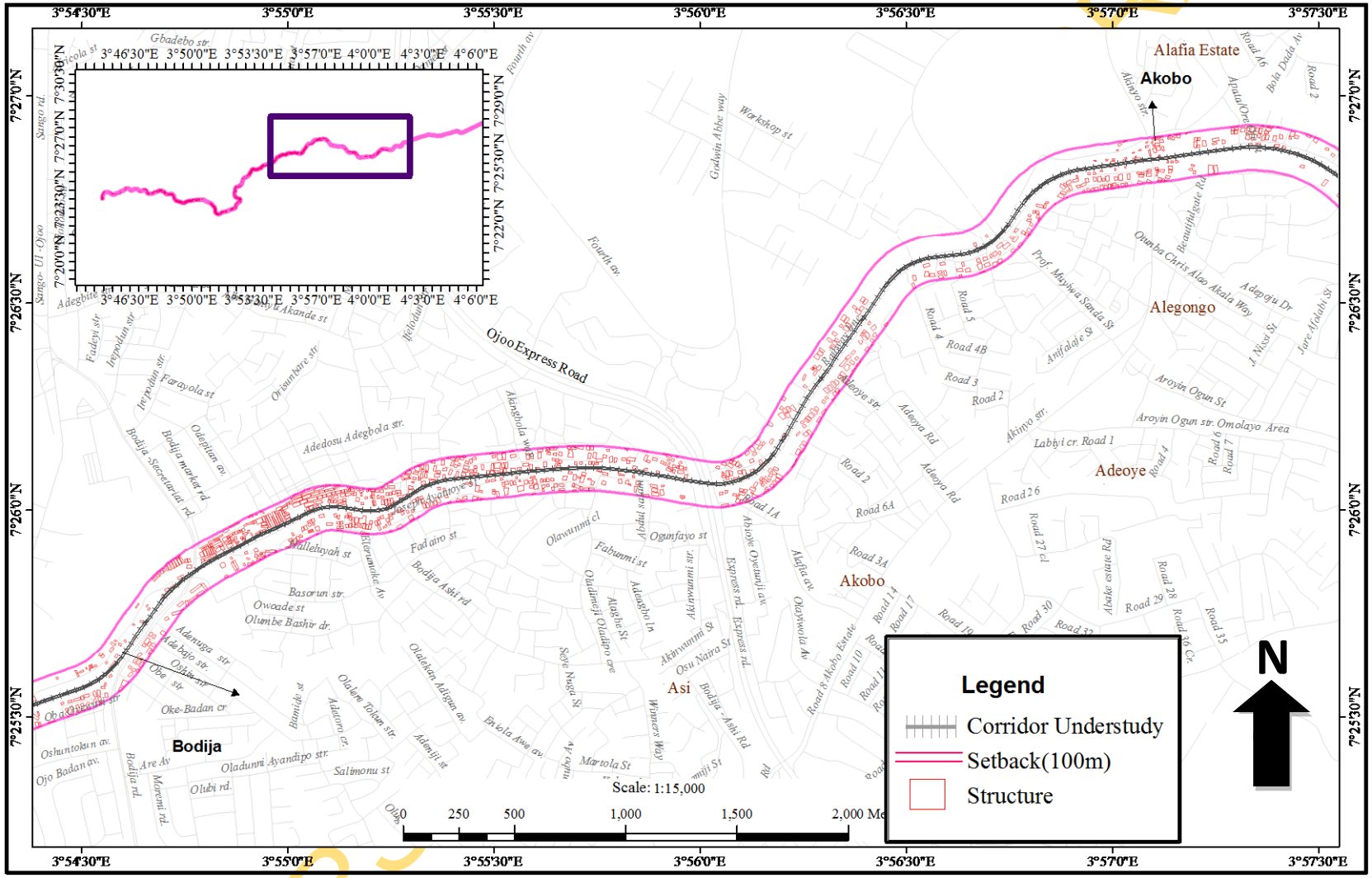

Figure 6.5: Geo-Spatial Imagery of Omi-Adio-Erunmu Corridor (Bodija-Akobo Road Section)

Source: Author's Compilation, (2011)

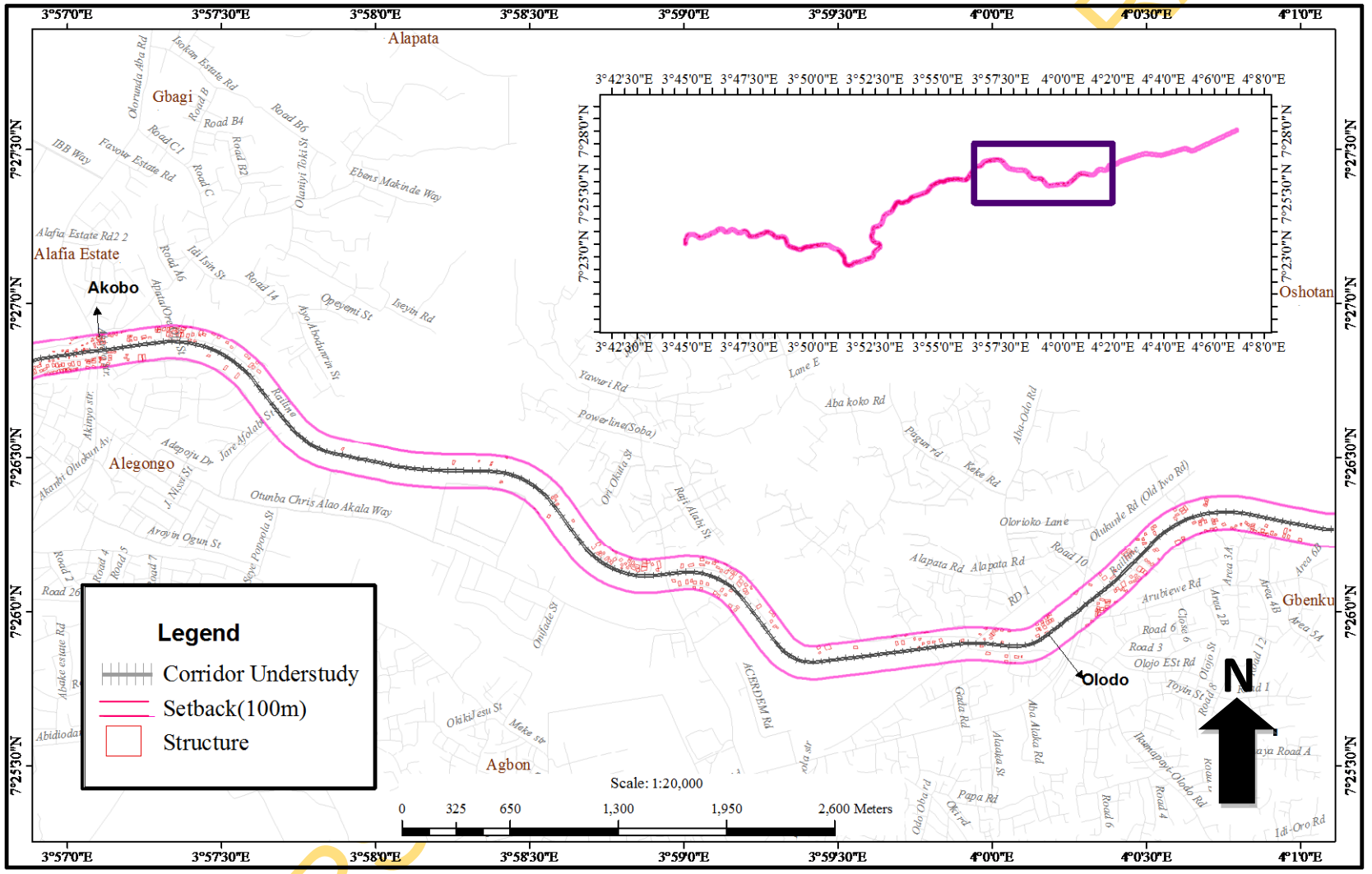

Figure 6.6: Geo-Spatial Imagery of Omi-Adio-Erunmu Corridor (Akobo-Olodo Section)

Source: Author's Compilation, (2011)

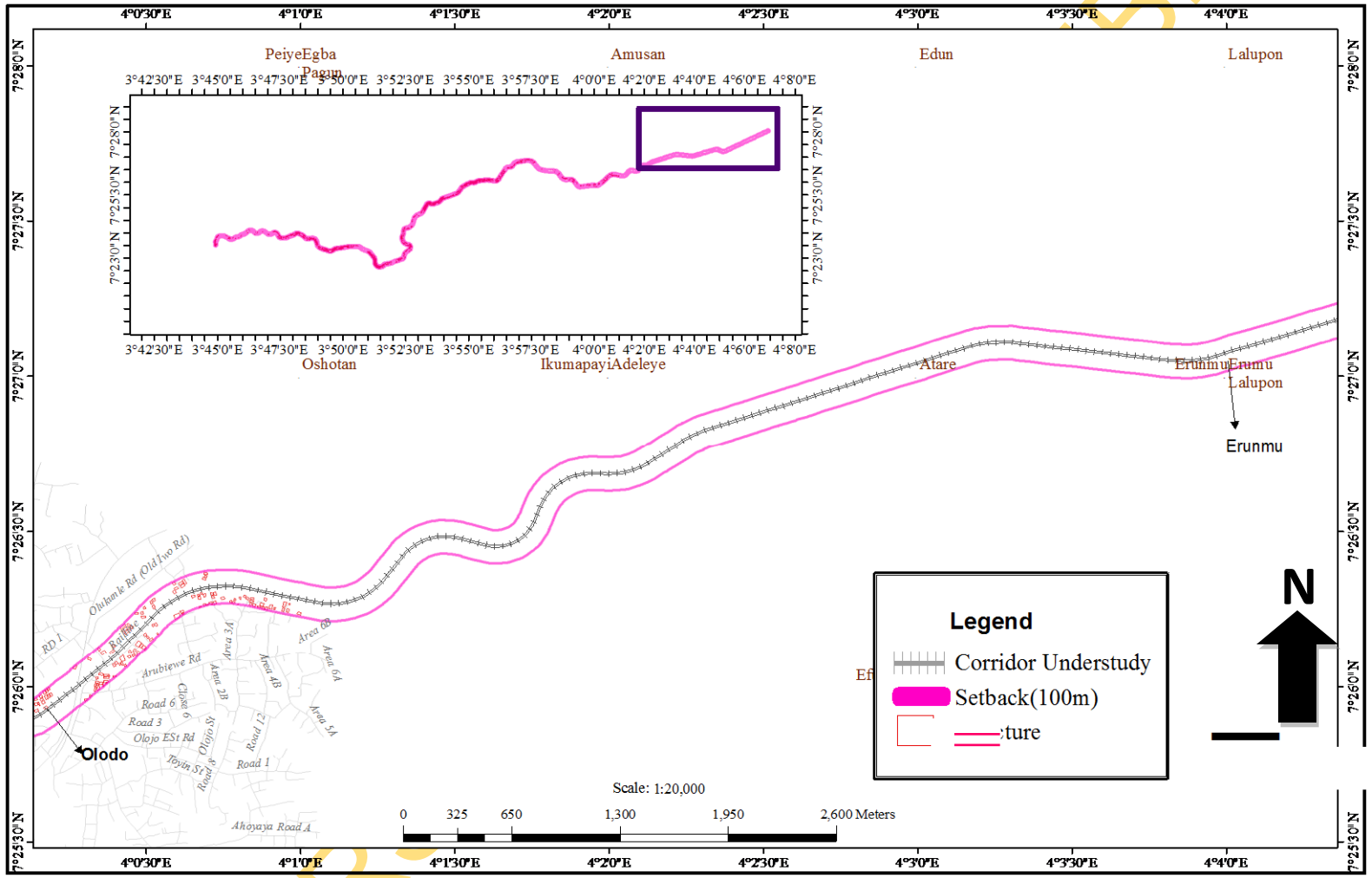

Figure 6.7: Geo-Spatial Imagery of Omi-Adio-Erunmu Corridor (Olodo-Erunmu Section)

Source: Author's Compilation, (2011)

6.3. CORRIDOR 2 – PODO-BERE-AKOBO ROUTE

The second proposed corridor runs from Podo area of Ibadan through Challenge, Molete, Beere, Agodi, Idi Ape, Basorun to the rail – junction at Akobo area. This corridor is about 22 kilometres in length and traversed a densely populated section of the city. The Podo end is within the Lagelu Industrial estate where many light industrial concerns are located. A rail link with this area would be very desirable for the movement of goods and services but the determination and design of a rail route here would be expected to fall within the 100 metre cordon of the survey. This is expected to displace some commercial and residential structures. Figure 6.8 shows Podo-Bere- Akobo route in the context of Ibadan while Table 6.2 gives a detailed and comprehensive account of structures that will be affected within the corridor including other features of the corridor.

From Table 6.2, the viability of the corridor in accommodating a rail route would involve a massive displacement and relocation of 25,000 households and the demolition of 1345 residential structures, the cost implication of which has not been determined by this study. Most of the residential structures also harbour commercial shops that are located beyond the road setback limits. The strong point of this route lies in its longitudinal traverse of the city core and inner recesses, where the bulk of the indigenous inhabitants reside. The route is anticipated to produce the greatest traffic threshold of rail commuters because of its population density. Figure 6.8. shows the corridor in the context of the city while figures 6.9 to 6.12 represent the geo-spatial imagery of the proposed route with the properties within the 100 metre cordon of the study.

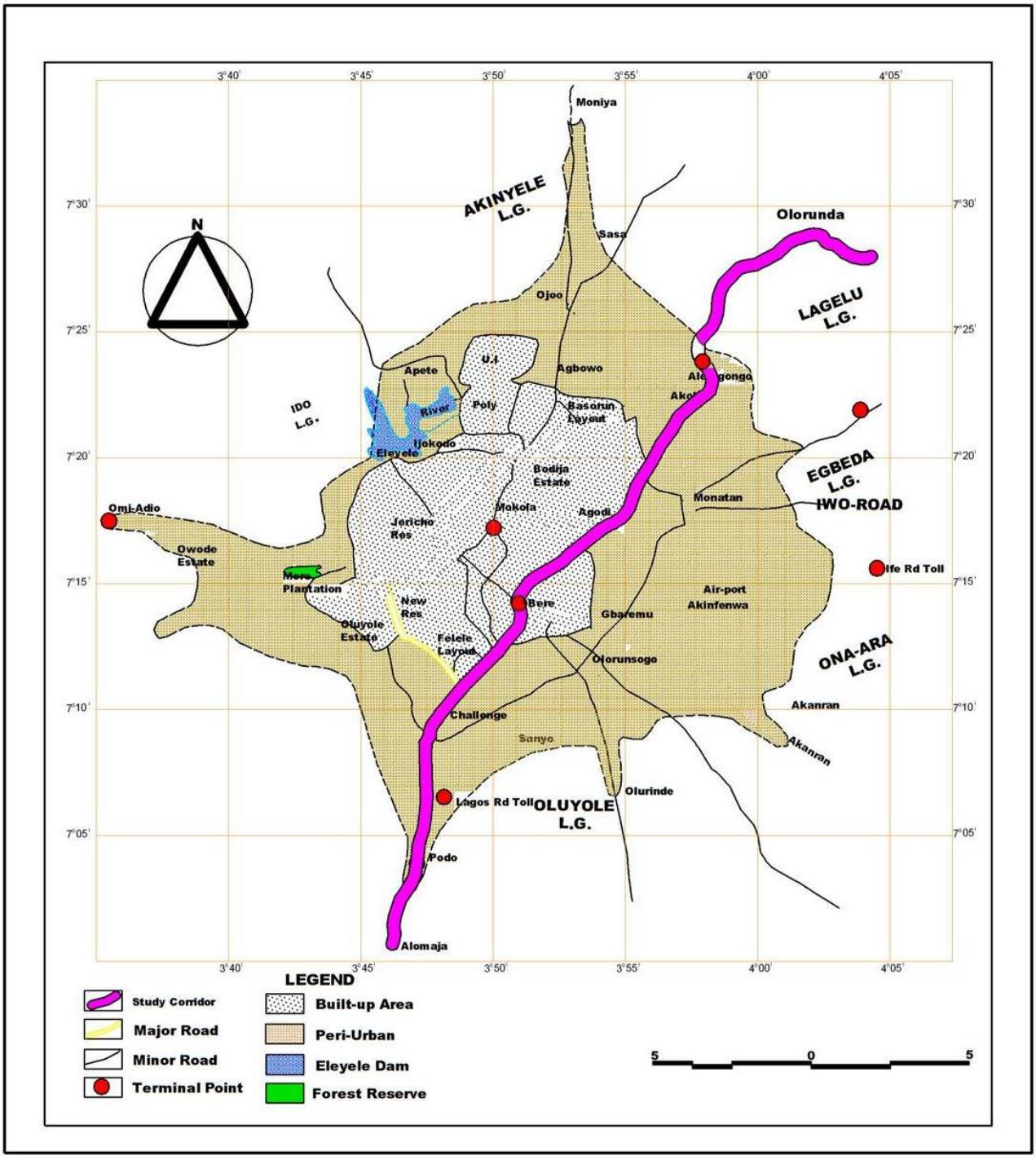

Figure 6.8 Ibadan showing corridor 2 Podo-Bere-Akobo route

Source: Field survey, 2011

Table 6.2: Features along Corridor 2 Podo – Bere -Akobo Route

Locality	Distance (Km)	Household Size Distribution	Passenger	Residential Structures
Podo/Challenge	2.8	800	N/A	87
Challenge/Molete	3.2	2,200	-	102
Molete/ Bere	3.0	6,200	-	344
Bere/Oje	2.2	5,860	-	360
Oje/Gate	3.2	5,140	-	262
Gate/Idi Ape	1.6	-	-	-
Idi Ape/Basorun	2.8	2,550	-	104
Akobo – Oju-Irin	3.2	2,250	-	86
Total	**22**	**25,000**	**2135**	**1,345**

Source: Field Survey, 2011.

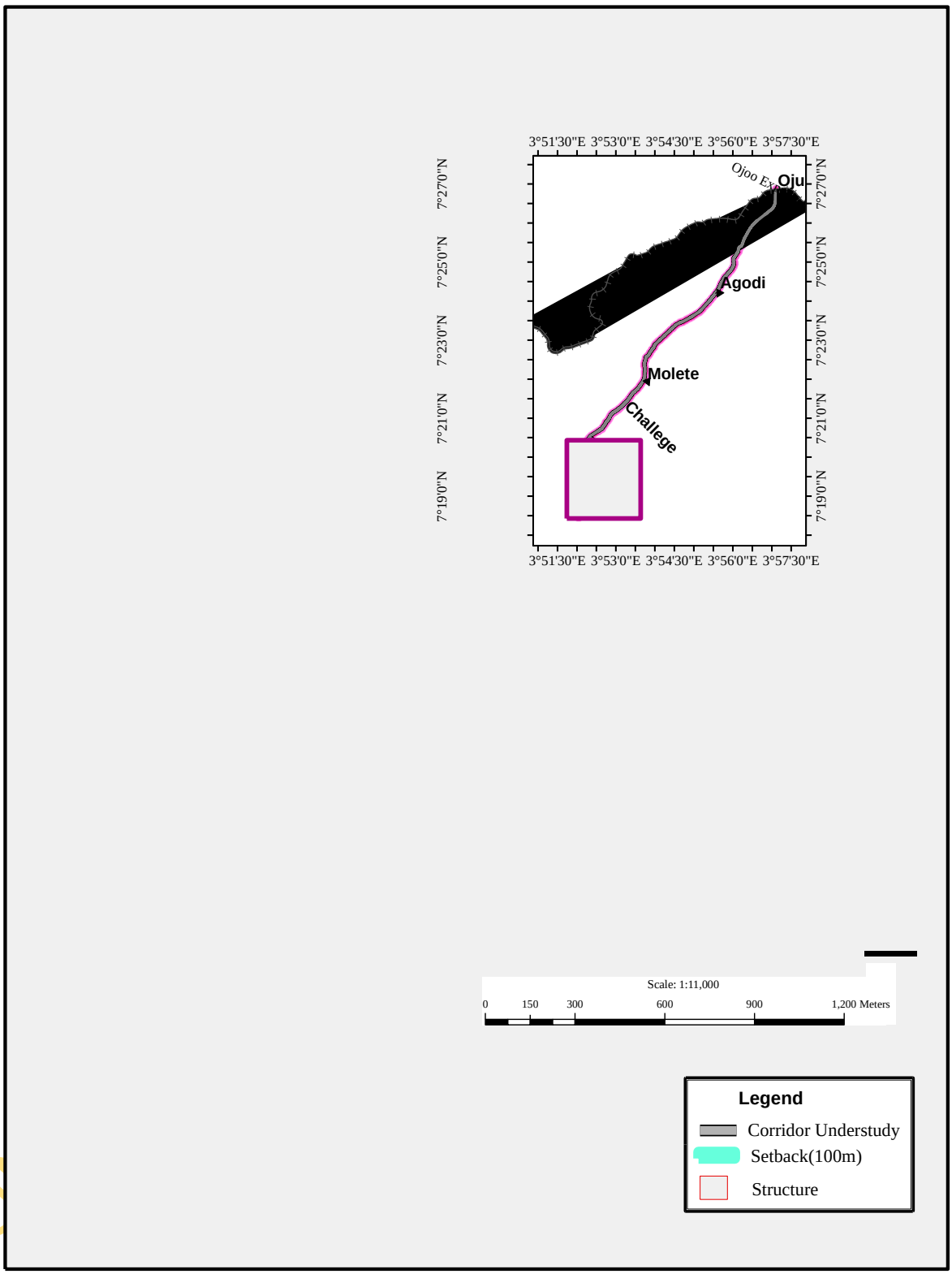

Figure 6.9: Geo-Spatial Imagery of Podo-Bere-Akobo Corridor (Podo-Challenge Section)

Source: Author's Compilation, (2011)

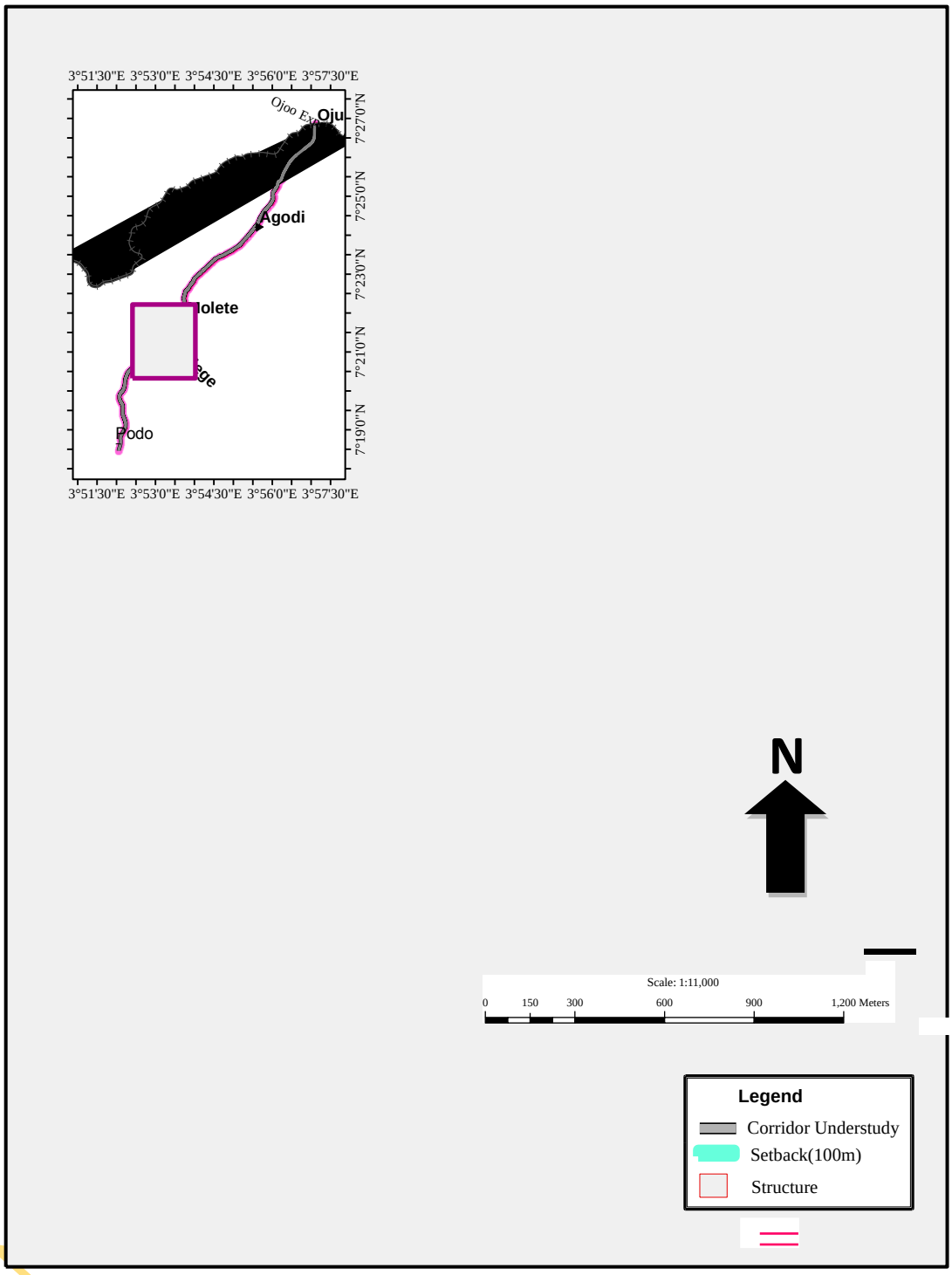

Figure 6.10: Geo-Spatial Imagery of Podo-Bere-Akobo Corridor (Challenge-Molete Section)

Source: Author's Compilation, (2011)

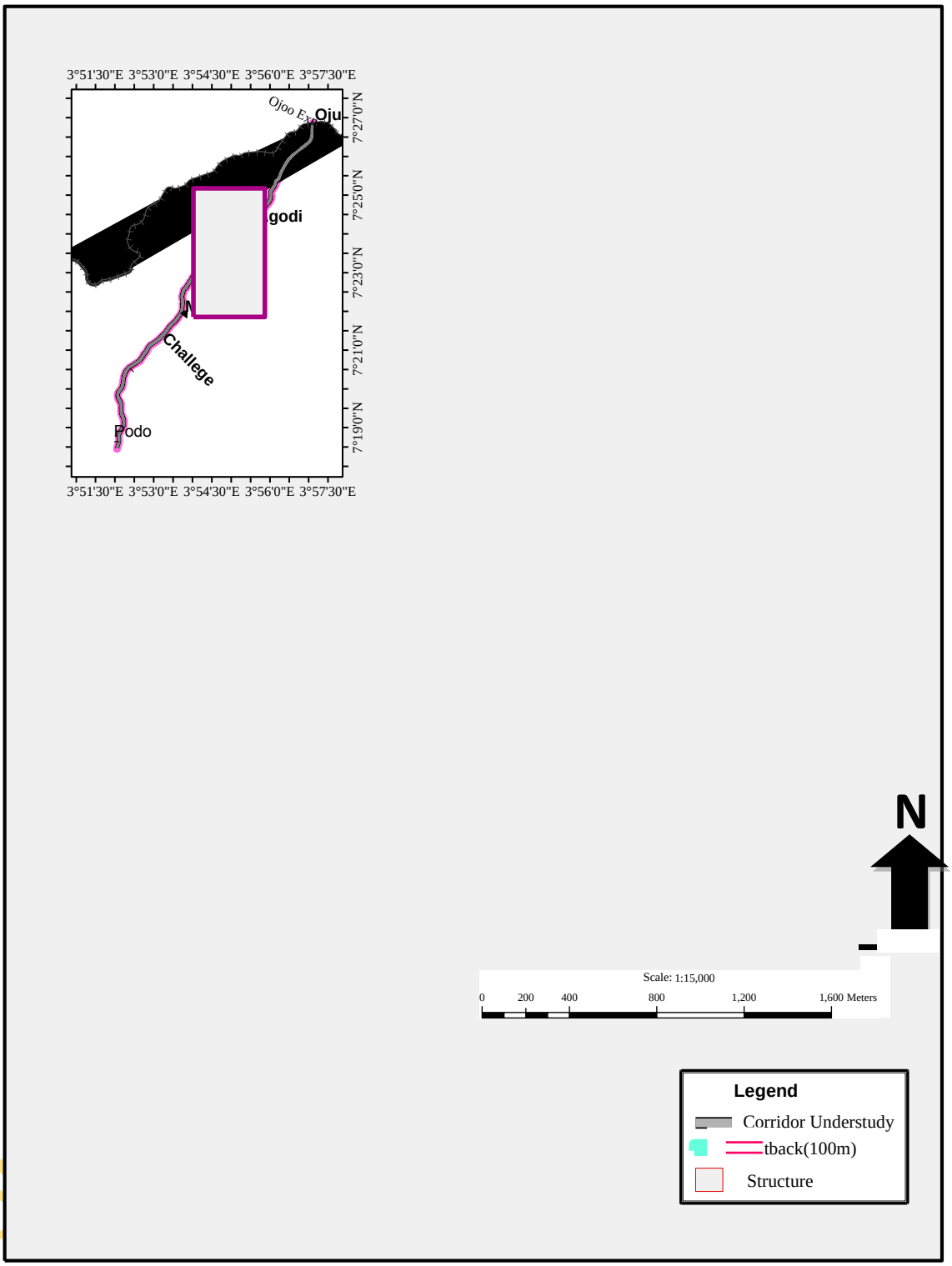

Figure 6.11: Geo-Spatial Imagery of Podo-Bere-Akobo Corridor (Molete-Agodi Section)

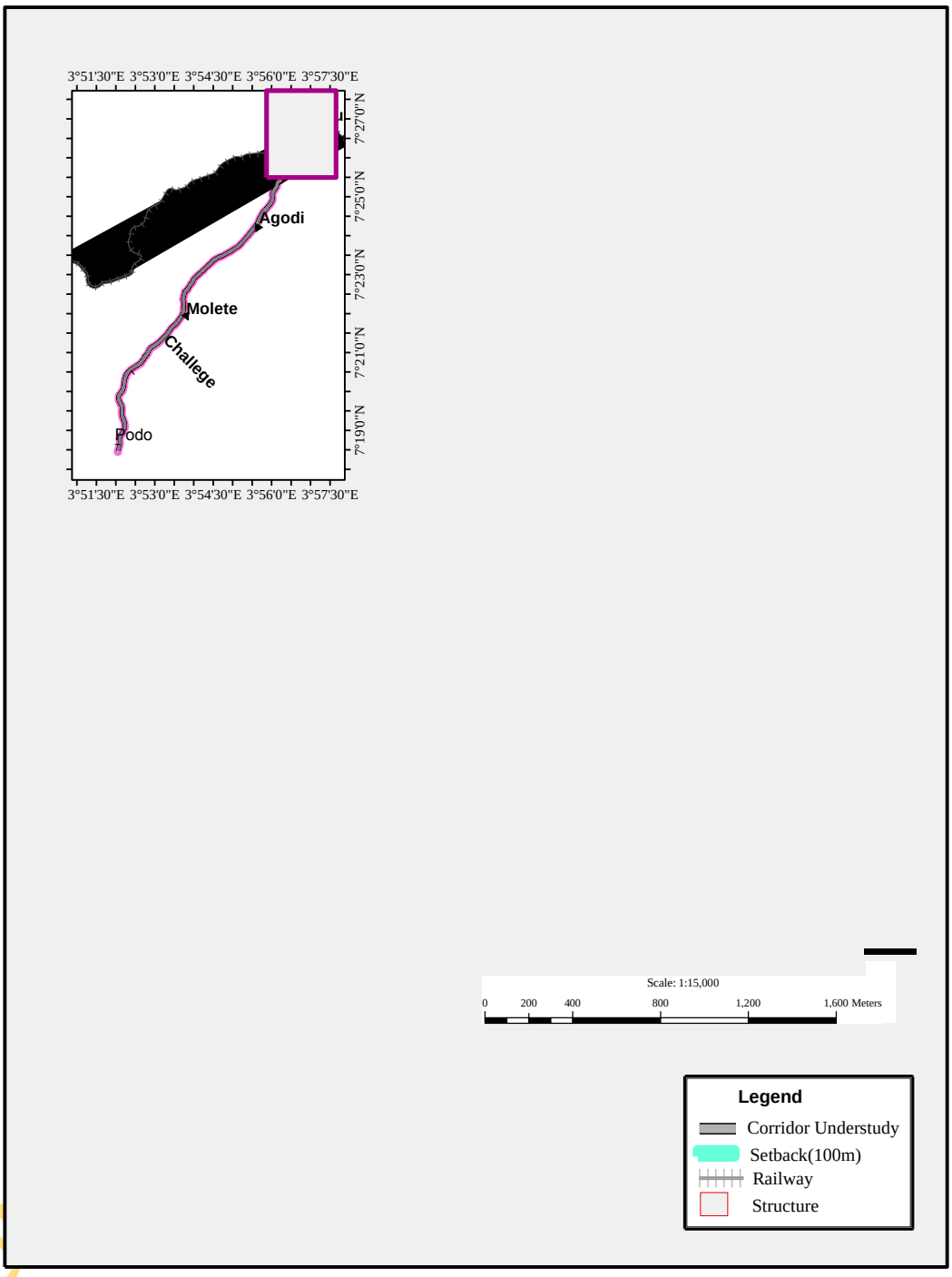

Figure 6.12 Geo-spatial imagery of Podo-Bere-Akobo Corridor (Agodi-Ojurin Akobo Section)

Source: Field survey, 2011

6.4: CORRIDOR 3: LAGOS ROAD TOLL-OJOO-MONIYA ROUTE

This corridor is expected to run within the space offered by the expressway median from the Lagos road Toll Gate end to Ojoo and then to Moniya a distance of 26 kilometres. Being an expressway, it has an extensive setback of more than 50 metres on either side to the service lanes that runs parallel to the route. This sets the highway free of obstruction in its right of way. Most of the structures found within the right of way are strictly removable encroachments. The whole stretch from Lagos road Toll gate to Ojoo can be said to be free except for the encroachments of the numerous filling stations that lined the route. The corridor is adjudged to be the most viable after the existing rail – route, simply because of its potentials to generate traffic for urban rail transport. The totality of the 6,950 households found within the 100 metre cordon are scattered and discontinuous with the Olorunsogo to Ife Road intersection and the Moniya end providing the greatest points of intrusion and encroachment along the route. Demolition of structures along the route is almost nil except for a massive clearance of mechanic sheds and illegal trucks and trailer parks. The Moniya end of the route is expected to provide a perfect terminus for the peri – urban commuters Figure 6.13 is a graphical representation of the Corridor while Table 6.3 contain some of the features along the route.

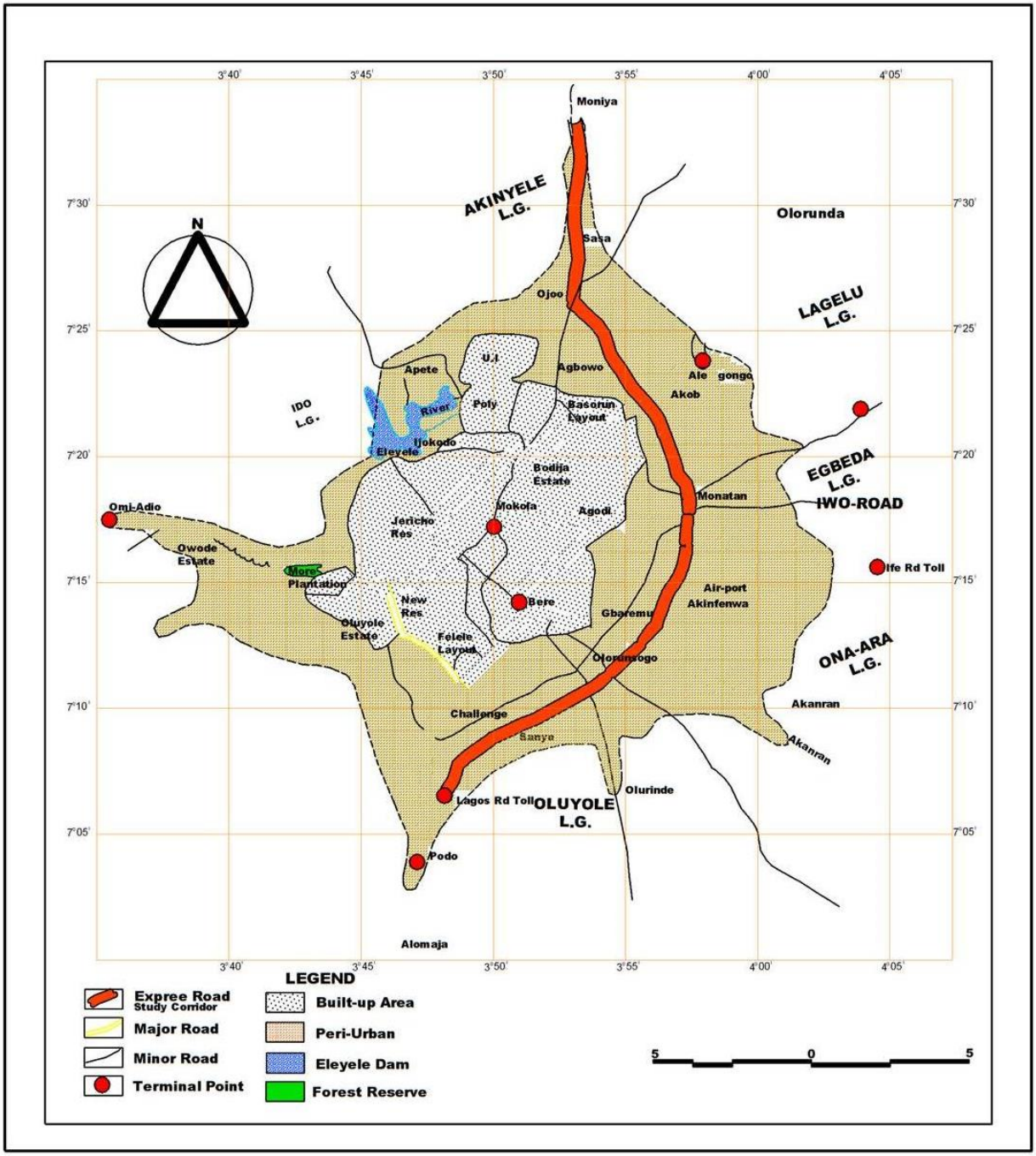

Figure 6.13: Lagos Road Toll-Ojoo-Moniya Corridor in the context of Ibadan

Source: Author's Compilation, (2011)

Table 6.3: Corridor 3 Lagos Road Toll-Ojoo-Moniya Route

Locality	Distance (Km)	Household Size	Passenger Threshold
Toll/Olorunsogo	4	750	285
Olorunsogo/Iwo Rd interchange	5	2200	410
Iwo Rd/Ojoo	8	2675	510
Ojoo/Moniya	9	1325	405
Total	26	**6,950**	**1610**

Source: Field Survey, 2011.

6.5: CORRIDOR 4: MOKOLA-AGODI-ALAKIA-IFE ROAD TOLL

This corridor stretches for about 15 kilometres from the Mokola intersection through Queen Elizabeth road to Agodi, Old – Ife road, Alakia and the Ife road Toll point. The bulk of the route passes through the built-up areas of the city up to the Alakia junction. From this point up to the Ife Road Toll, there were relatively very few obstructions as properties were located within the 100 metres mandatory setback. Found within the 100metre cordon along the corridor are 285 building structures, 8 filling stations, 3 motor parks and 1,670 residential households all of which are likely to be displaced in the advent of this corridor being used as rail route. Figure 6.14 shows the corridor in the context of the city. Table 6.4 contains details of the Corridor while Figures 6.15 to 6.20 represents the spatial imagery of the route within the 100 metre cordon.

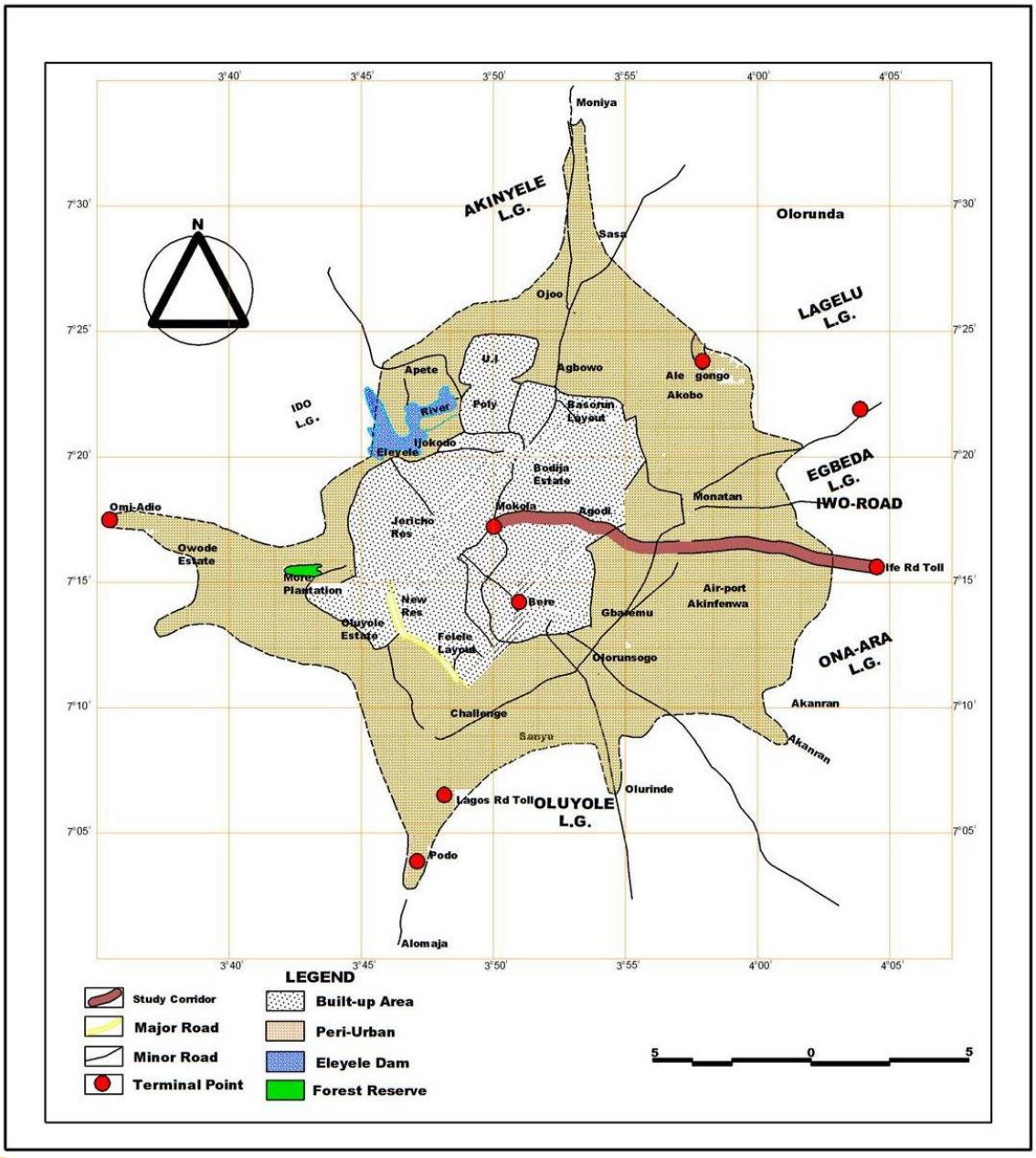

Figure 6.14 Corridor 4 Mokola-Agodi-Alakia-Ife Road Toll Route

Source: Field survey, 2014

Table 6.4: Features along Corridor 4 Mokola-Agodi-Ife Road Toll Route

Locality	Distance (Km)	Household Size Distribution	Passenger	Residential Structures
Mokola/Agodi	4.3	25	284	27
Agodi/Sawmill	4.7	45	396	68
Sawmill/Adegbayi	3.2	1230	392	124
Adegbayi/Ife Road	2.8	370	142	76
Total	**15**	**1670**	**1214**	**285**

Source: Field Survey, 2011.

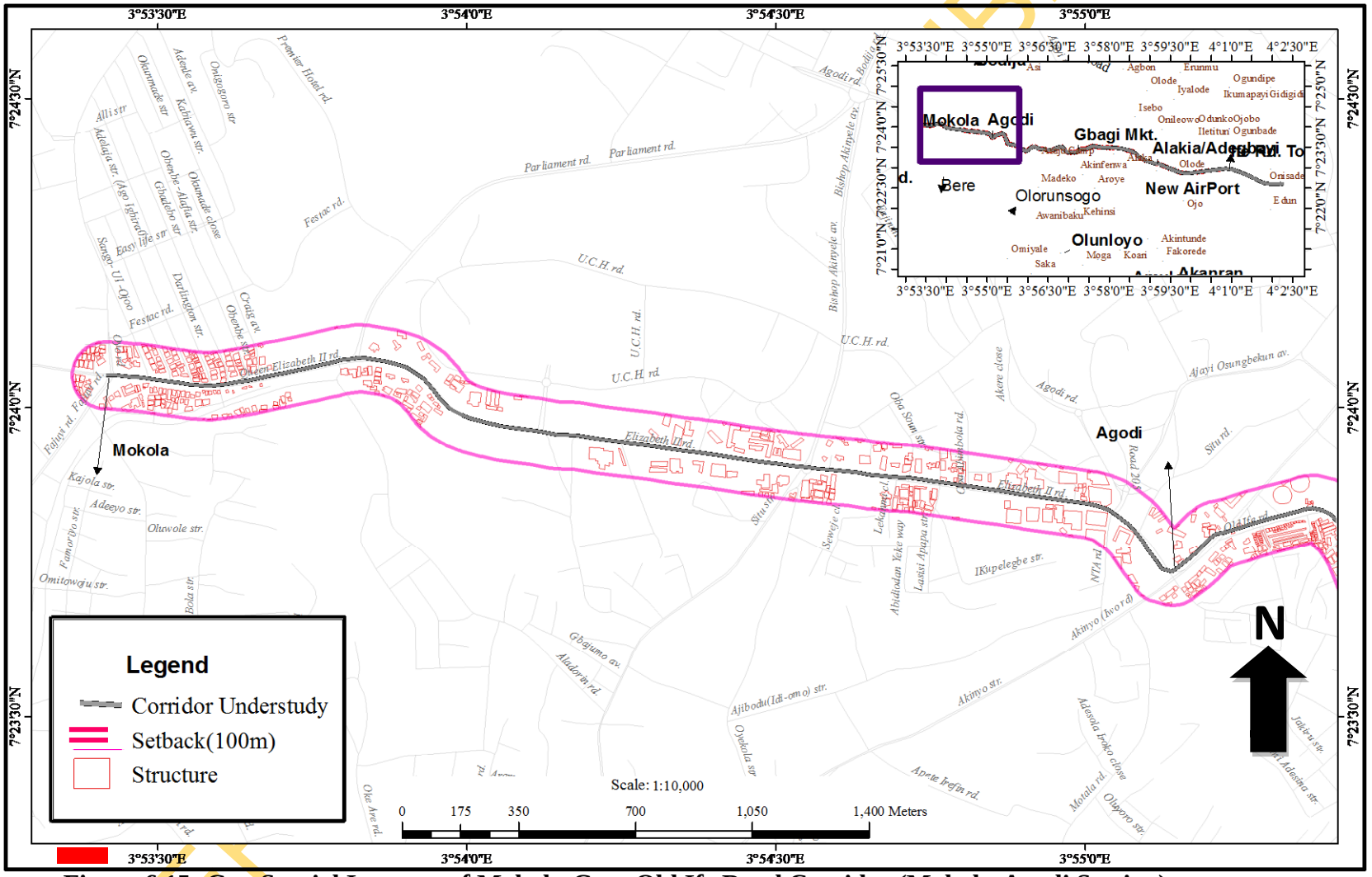

Figure 6.15: Geo-Spatial Imagery of Mokola-Gate-Old Ife Road Corridor (Mokola-Agodi Section)

Source: Author's Compilation, (2011)

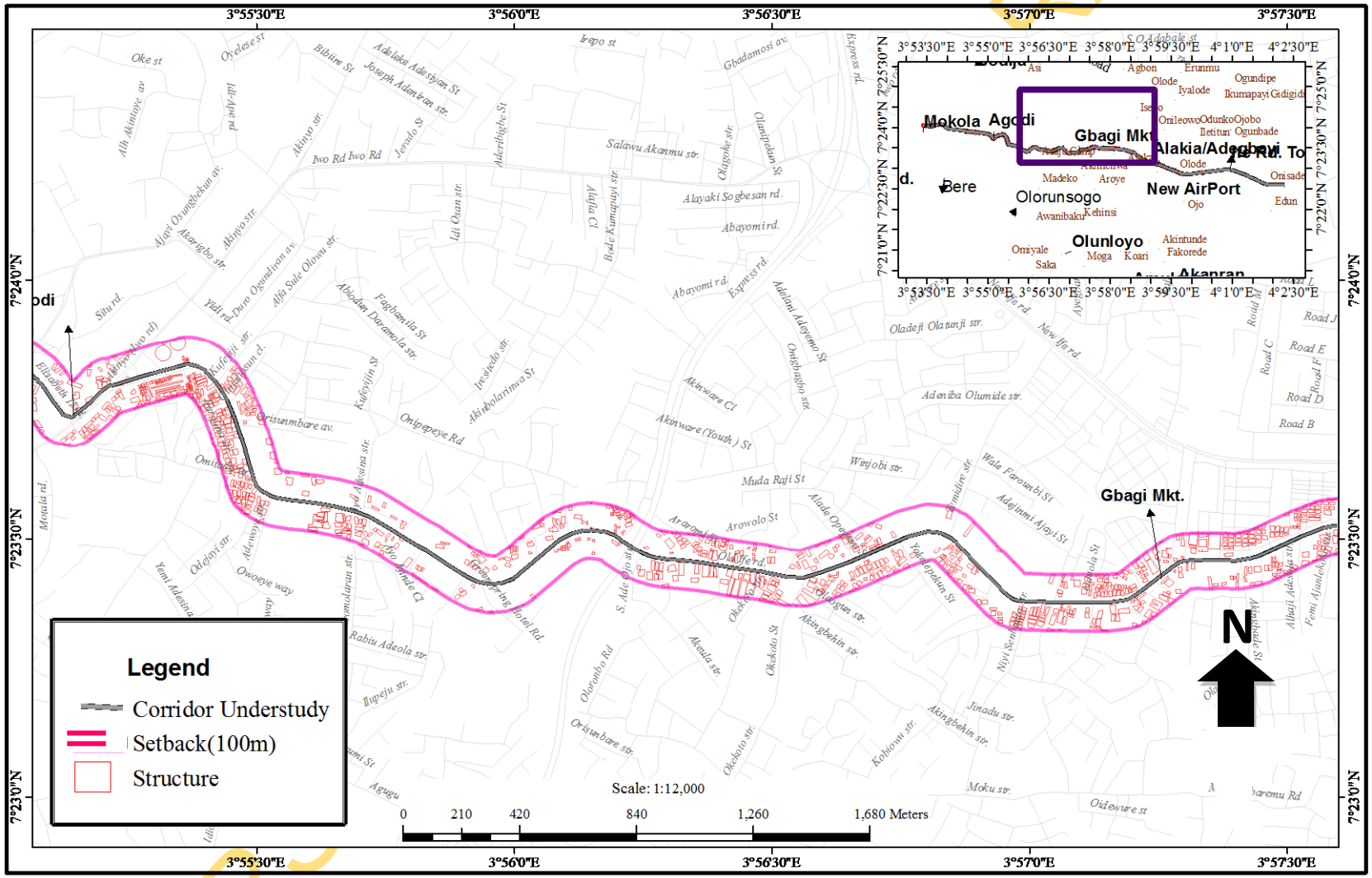

Figure 6.16: Geo-Spatial Imagery of Mokola-Gate-Old Ife Road Corridor (Agodi-Gbagi Market Section)

Source: Author's Compilation, (2011)

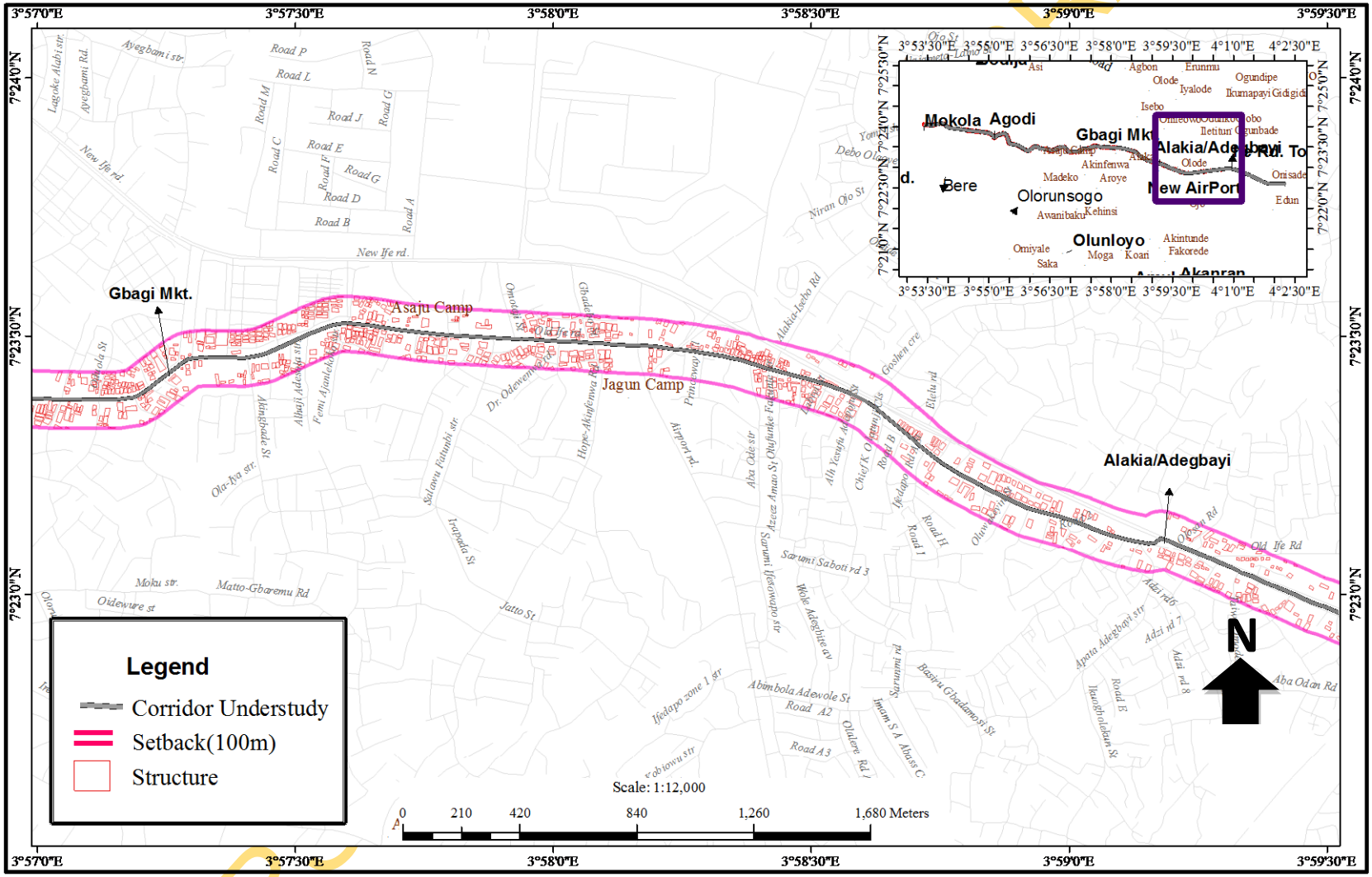

Figure 6.17: Geo-Spatial Imagery of Mokola-Gate-Old Ife Road Corridor (Gbagi Market-Alakia/Adegbayi Section)

Source: Author's Compilation, (2011)

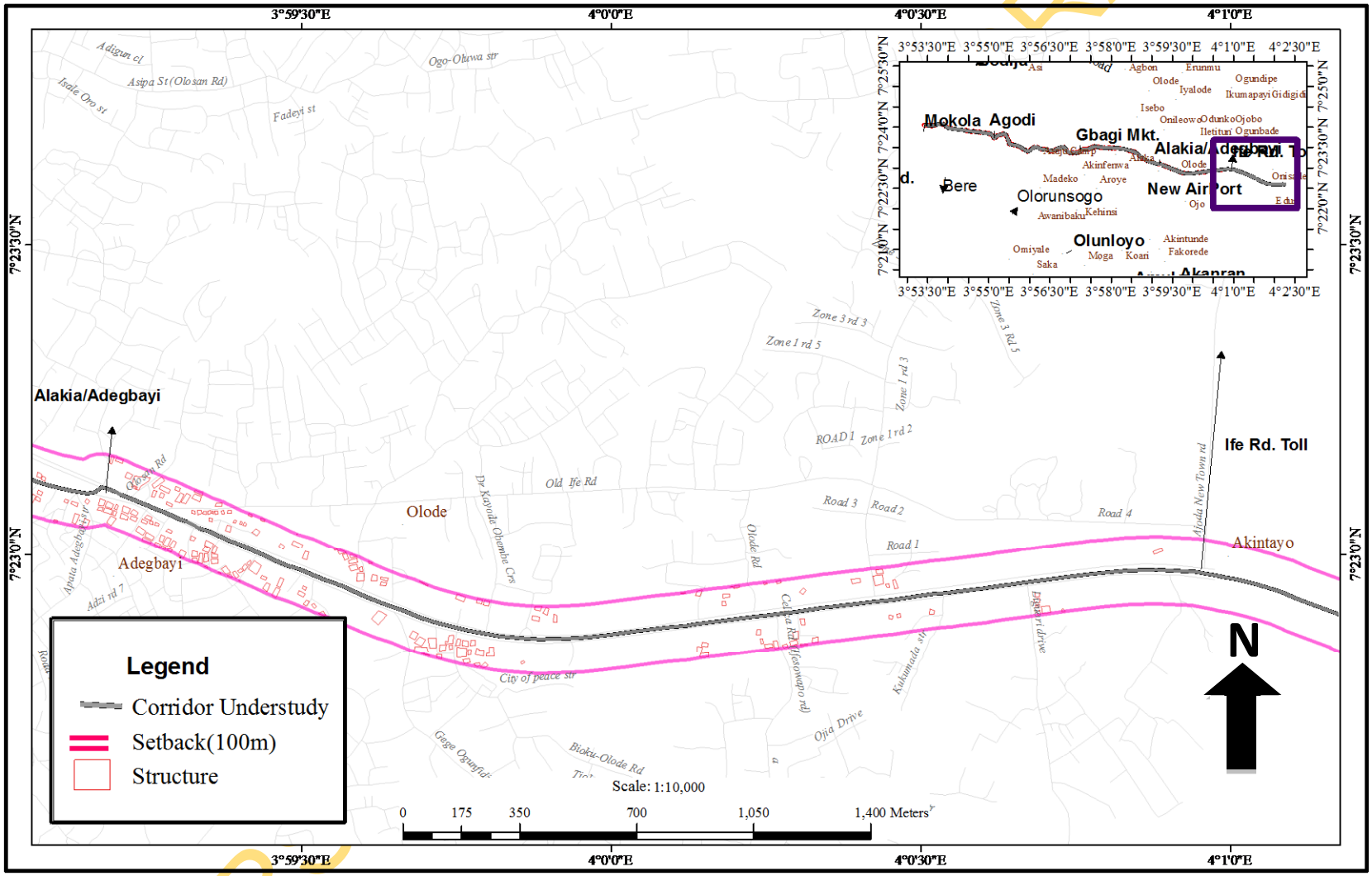

Figure 6.18: Geo-Spatial Imagery of Mokola-Gate-Old Ife Road Corridor (Alakia/Adegbayi-Akintayo Section)

Source: Author's Compilation, (2011)

6.6: CORRIDOR 5: BEERE-OLORUNSOGO-AKANRAN ROUTE

The fifth proposed corridor takes off from Bere in the heart of the city to Aperin to link the Lagos – Ibadan expressway at Olorunsogo and then to Akanran, a distance of 16 kilometres. On this route, the peri – urban link with the city is seriously manifested in the clustered but discontinuous stretches of sub – urban communities that lined the corridor. The route is one of the new growth directions of the city, where most indigenes displaced from the city core resides. Population density along the route is high and this factor makes the route viable for intra - rail transportation. This is also the route where motorcycles thrived as the sole means of public transportation. From Table 6.5, household distribution within the set cordon totaled 15,920 and 879 residential structures may likely be affected in the event of its establishment as an intra – urban rail route. Fig 6.19 shows the route extent while Figures 6.20 to 6.22 presents the graphic imagery of the route.

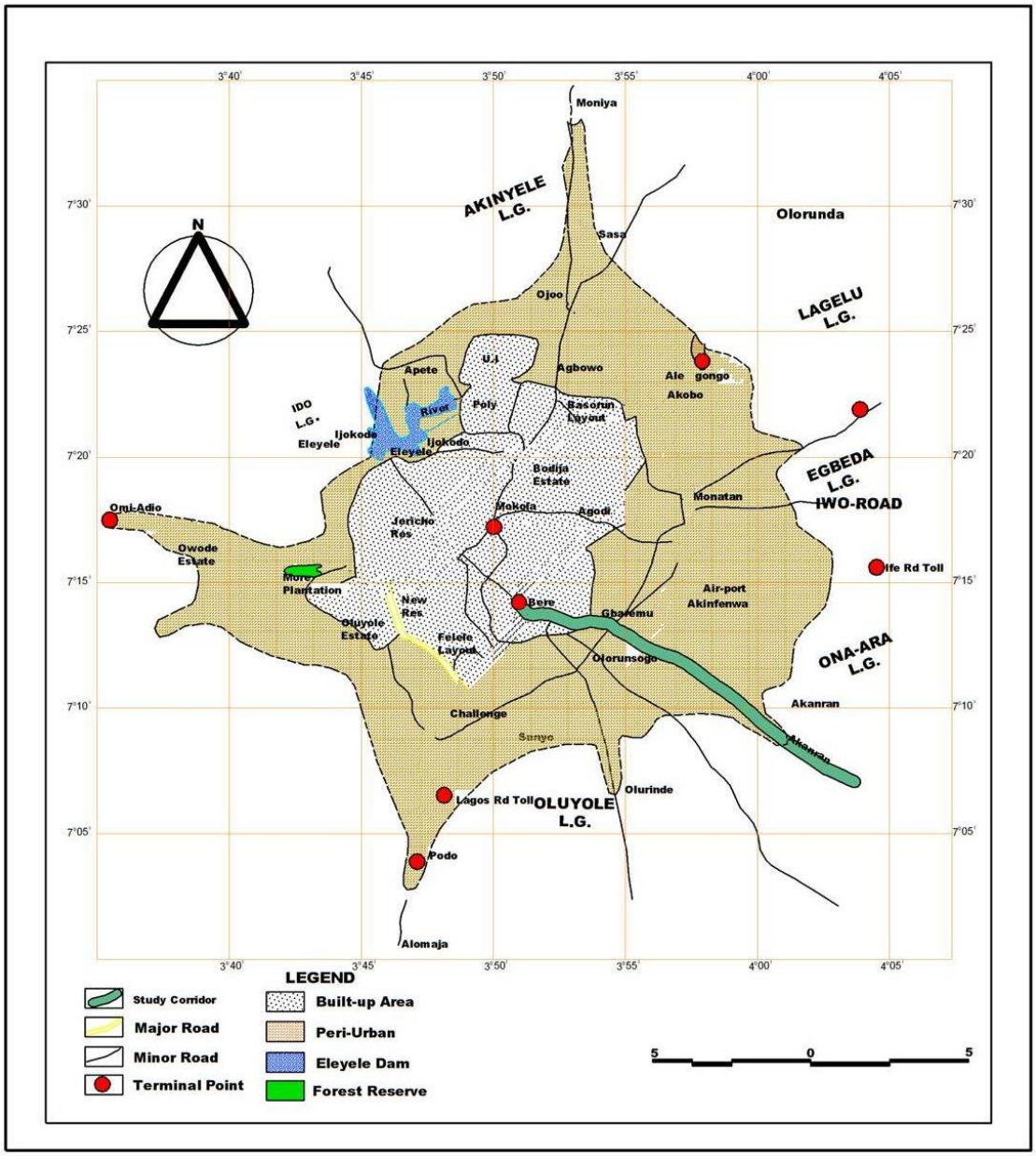

Figure 6.19: Bere-Akanran Corridor in the Context of Ibadan

Source: Field survey, 2011

Table 6.5: Features along Corridor 5: Beere-Olorunsogo-Akanran Route

Locality	Distance (Km)	Household Size Distribution	Passenger Threshold	Residential Structures
Beere-Elekuro	2.2	4850	315	266
Elekuro-Aperin	2.8	4200	322	248
Aperin-Olorunsogo	3.1	2400	305	124
Olorunsogo-Amuloko	4.2	4050	410	203
Amuloko-Akanran	3.7	420	190	38
Total	**16**	**15920**	**1542**	**879**

Source: Field Survey, 2011.

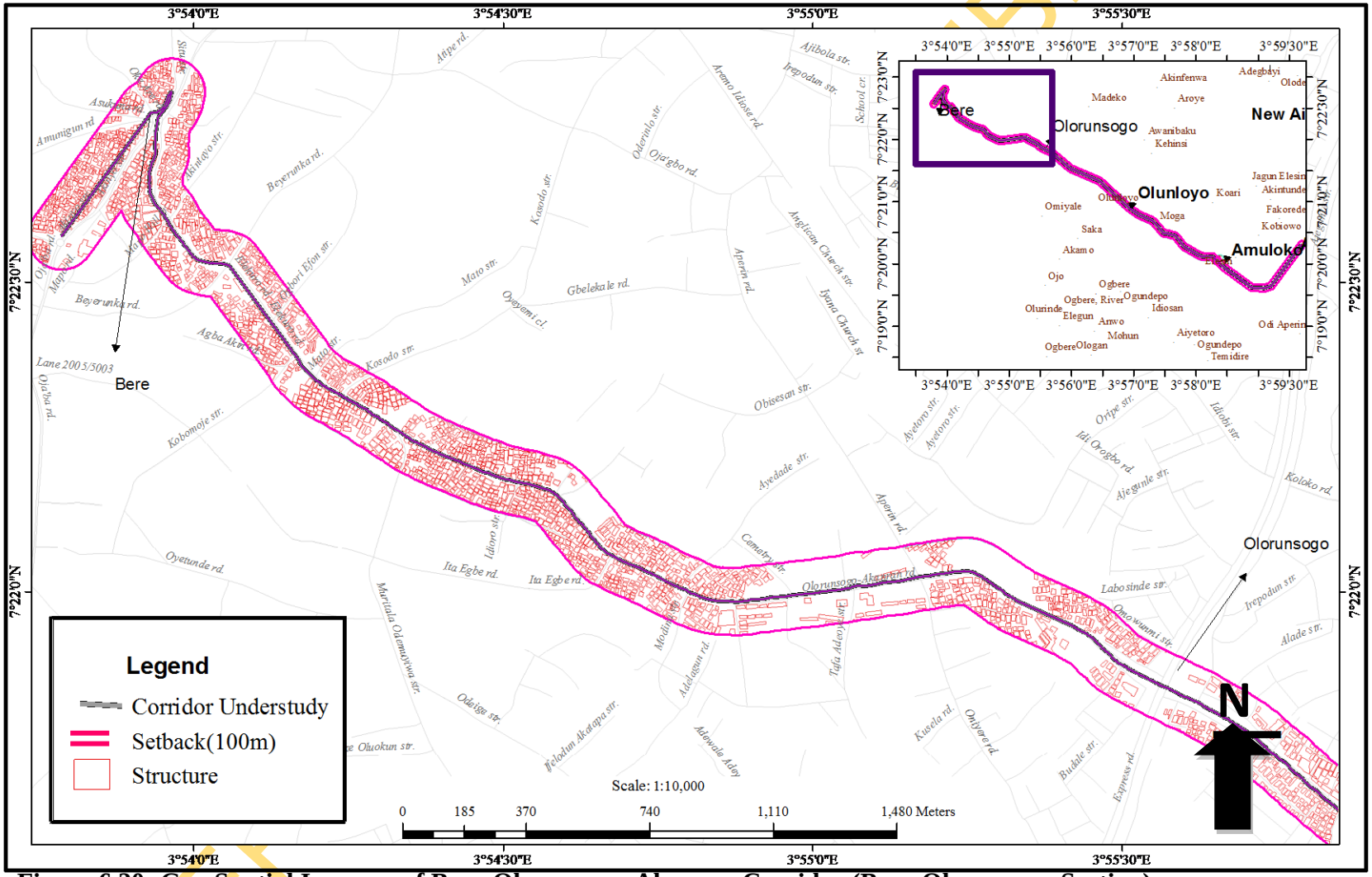

Figure 6.20: Geo-Spatial Imagery of Bere-Olorunsogo-Akanran Corridor (Bere-Olorunsogo Section)

Source: Author's Compilation, 2011

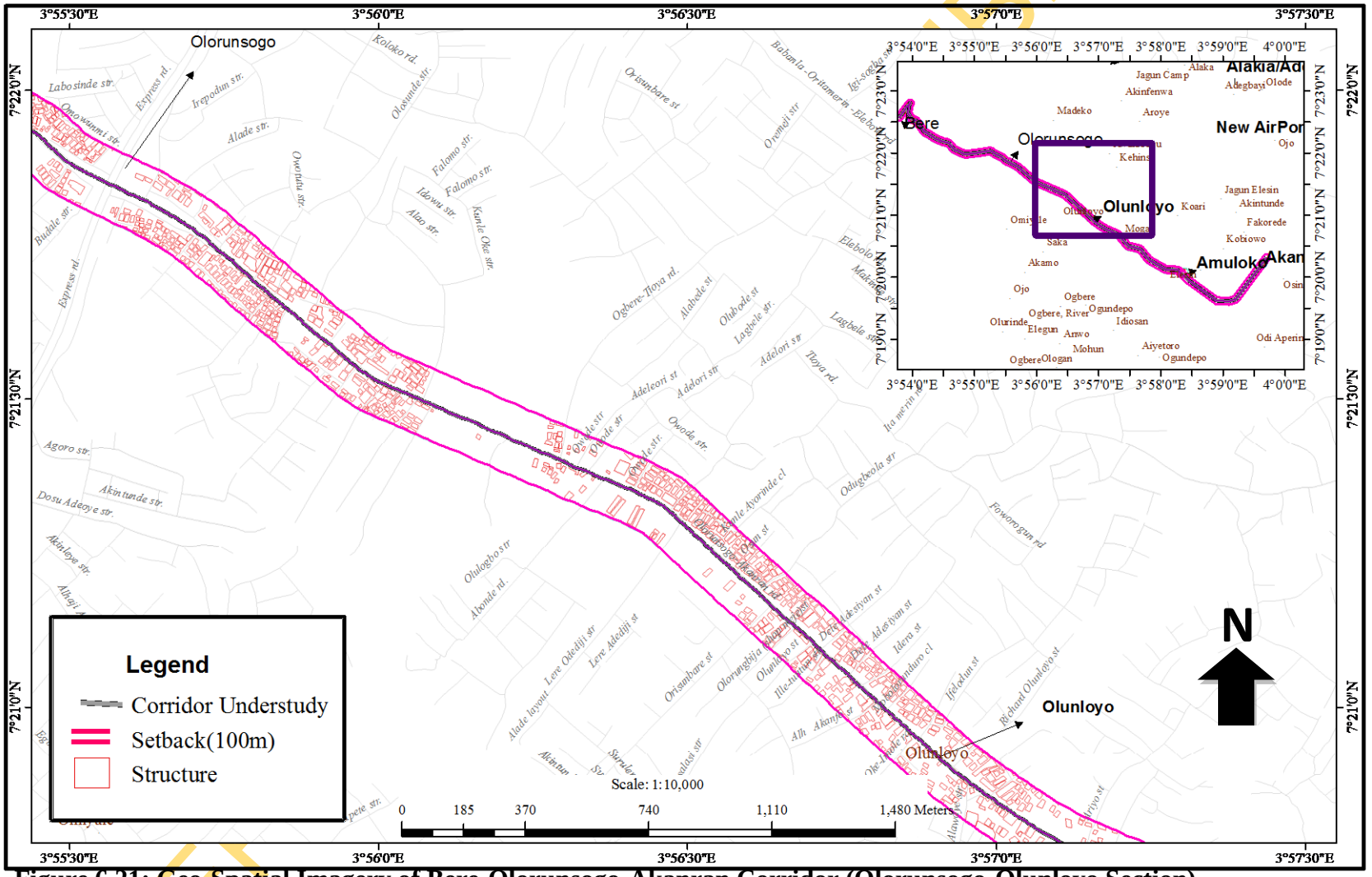

Figure 6.21: Geo-Spatial Imagery of Bere-Olorunsogo-Akanran Corridor (Olorunsogo-Olunloyo Section)

Source: Author's Compilation, 2011

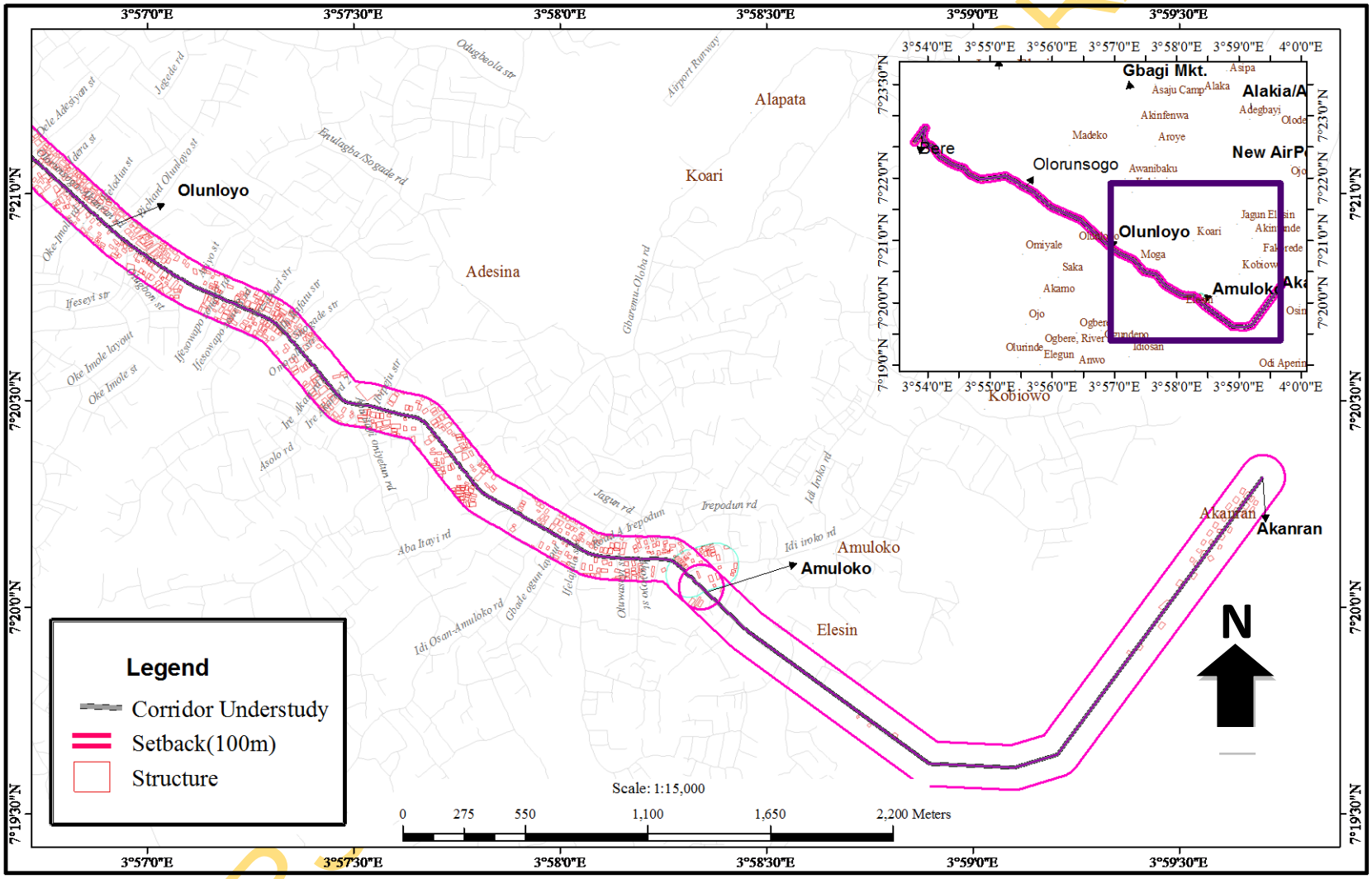

Figure 6.22: Geo-Spatial Imagery of Bere-Olorunsogo-Akanran Corridor (Olunloyo-Akanran Section)
Source: Author's Compilation, 2011

6.7 RESPONDENTS' EVALUATION OF THE PROPOSED RAIL ROUTE

The evaluation was based on the Focus Group Discussion and the respondents' views on the proposed routes. Five rail routes were earmarked for the city with each of the corridor offering viable ridership potentials. Each of the corridors has been thoroughly scrutinized to ascertain the feasibility of their implementation. The first corridor is expected to provide a dual function for the inter-city rail network and the intra- urban services and appears to be the most preferred by the discussants at the Focus Group Discussion (FGD), because it required only a rehabilitation of existing rail bed cum sleepers, the stations and signaling equipment. The existing right of way (ROW) is also adequate enough for space utility. The second preferred option by the discussants advocated the use of the central median for rail tracks between Lagos road toll – gate right through to Ojoo and further to Moniya with its stations connected at the road kerbs by boarding overhead bridges. According to an official of the Nigerian Railway Corporation:

> *"all these suggested rail routes are viable mainly because of the commuter catchment advantage inherent in them. The capital outlay of such projects could be very massive, but can be accomplished with time and government's political will."*

The third corridor which was considered as a long term project was the Bere – Aperin – Olorunsogo – Amuloko – Akanran route. The fact that the settlement growth direction was moving along the route was considered together with lesser strain of physical structure demolition. The two other proposed routes which were the Podo-Bere-Akobo and the Mokola-Agodi-Ife Road Toll respectively were considered to involve heavy demolition of structures and thus discarded by the discussants on the basis of cost considerations. However, it was noted that the opinion of the discussants corroborated the result of the field work interview of respondents across the study area.

The household survey conducted by the research also revealed the respondents' views of the five proposed rail routes. The survey reveals that 262 (45.0%) signified their preference for the existing rail route where the public activities may not be affected too much in the process of rehabilitation and revitalization works. Second on the preference log is the route which involves the existing Lagos to Ibadan expressway terminating at Moniya, where 160 (27.5%) of the respondents expressed their preference due to what they described as space availability for rail development.

6.7.1 Respondents Route Preference and Policy Direction

Urban transport policy is the framework for urban transport regulation and control. It implies a rule setting function on the part of the government with the aim of providing a rational, efficient, comfortable, safe and cost effective transportation system (Oyesiku,2004) Transportation Policy also form the basis of planning and the direction of growth of the transportation system and the extent to which the planning and provision of transport provide appropriate solution.

The route preference ratings by the respondents offer a clear cut planning options for executing the plan. For every transport project to be of real value, it must incorporate both the social and economic considerations within its policy framework. So also are the planning imperatives that must accommodate the wishes of the populace, as a guide to policy decision. In this regard, the existing rail route from Omi-Adio through Dugbe to Erunmu was highly favoured with 262 (45%) of the respondents preferring it. This may be due to some obvious assumptions of previous route usage, availability of rail transport furniture its obsolescence notwithstanding, all of which may likely require lesser funds to operate for urban rail transport. Policy decision in this instance would be in the direction of rail rehabilitation or modernization instead of full route construction. Priority attention should be given to rehabilitating the existing rail tracks, rail stations, signal and equipment personnel and partnership schemes that could guarantee smooth operations. When these are in place, urban rail transport awareness and patronage can be stimulated as other proposed routes come in to join the rail traffic network.

The second route preferred on the log, is the Lagos road Toll through Ojoo Expressway to Moniya with Moniya with 160 (27.6%) of the respondents favouring it. Adopting a light rail construction model whereby, the available space of the central median could be utilized for the rail tracks throughout the entire length of the route, with flexible and dynamic designs at major intersections along the route. An alternative design could utilize the vast setback space on each side of the expressway for the construction of rail tracks and rail stations.

Creating the space for the Bere-Olorunsogo-Akanran route, which is the third on the log with 85 (14.6%) preference by the respondents would remove 879 residential and commercial structures and displace almost 16,000 households. This will entail a comprehensive cost/benefit assessment of resettlement schemes to be

provided over time along the route. This procedure should be adopted for the Podo/Akobo and the Mokola/ Ife Road Toll routes. In essence, policy direction should embrace project phasing for each of the routes, so as to accommodate all the intricate details of engineering designs and at the same time, promoting the goals of transport efficiency, safety, comfort, adaptability and dynamism.(Table 6.6 is the summary of the details of each of the proposed routes). Figure 6.22 also represents the composite arrangement of the proposed rail routes for the city.

Table 6.6 Comparative Details of the Proposed Routes

S/N	Routes	Distance (km)	Household	Residential Structures	Preference
1.	Omi-Adio-Erunmu	40	18,000	N/A	262(45.0%)
2.	Podo-Bere-Akobo	22	25,000	1,345	85 (14.6%)
3.	Lagos Rd. Toll-Ojoo-Moniya	26	6,950	N/A	160 (27.5%)
4.	Beere-Olorunsogo- Akanran	16	15,920	879	85 (14.6%)
5.	Mokola-Agodi- Adegbayi-Ife Toll Gate	15	18,000	119	16 (2.7%)

N/A-Not Available
Source: Field Survey, 2011.

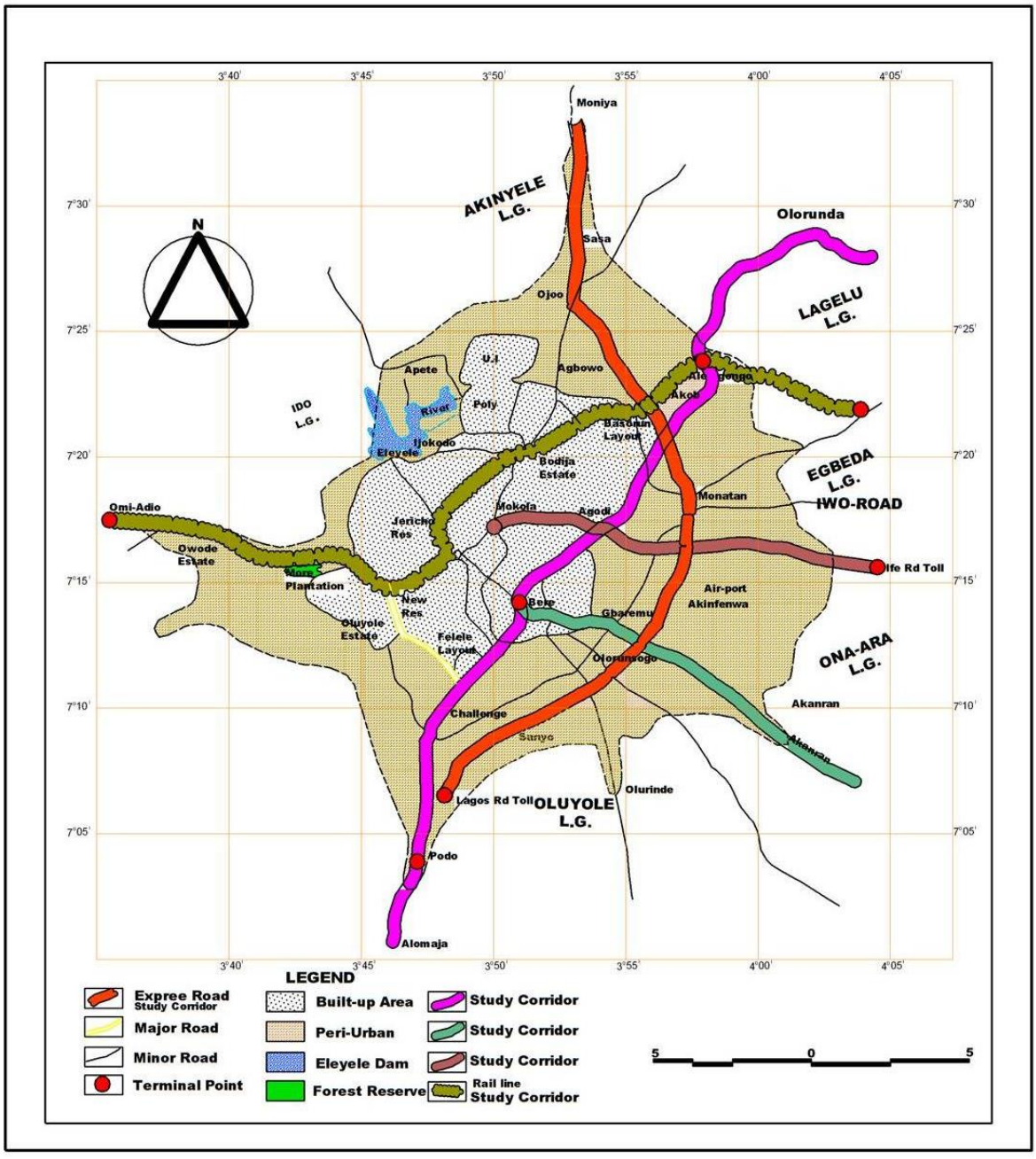

Figure 6.23 Proposed Rail Corridors in Ibadan
Source: Ministry of Lands Housing and Physical Planning Ibadan 2009: Author's Compilation 2011

CHAPTER SEVEN

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

7.1: INTRODUCTION

The study examined the potentials of intra-urban rail transport provision and services in Ibadan metropolis and listed five main objectives to achieve this aim. Four hypotheses were listed and tested while the sample size determination for the study enlisted the corridor determination and household survey designs, all of which were used to determine the pattern of movement by residents. The potentials and benefits of Urban Rail Transport were considered against the backdrop of the urban transport problems. Other issues examined were the public and institutional responses to urban rail transport development meant to ascertain the viability of the development. This chapter presents summary of major findings, the implication of the findings and offered some recommendations.

7.2 SUMMARY OF MAJOR FINDINGS

The transport problems of Ibadan was viewed from the perspectives of the ever increasing commuting distance within the city, the purpose of journeys and the time expended on such journeys by the city dwellers. Although the city exhibits a multiple – nuclei structure, the commuting distance from the old city centre is increasing daily in almost a perfect radial form as city expansion is advancing in every direction. For instance, the commuting distance of 18 kilometres recorded by Olatubara (1995) has shifted to more than 35 kilometres thus implying that more intra – urban journeys would be made by residents if the rate of city sprawl is not curtailed.

In the analysis of trip purpose, it was also found out that most of the trips made by respondents are mainly to work places (55.6%) shops and markets (26.8%)

respectively. All these time – based trips are found to be the chief causes of peak – hour traffic congestions experienced in the city. The most dominant means of movement in the city is still the 'danfo buses' which accounted for 67 per cent of respondents while 'mixed' use of immediate transport was next with 11.5 per cent. The result of the multiple regression model used in testing the first hypothesis revealed that the overall level of explanation by the six explanatory variables, which were found significant at 0.05 confidence level, is 77.0 percent ($R^2 = 0.592$). From the result of the multiple regression model, bad road design, with a beta coefficient of 0.073 is the most crucial variable, contributing mainly to traffic congestion. The introduction of a Rail Mass Transit as evident in this thesis will solve these traffic congestion problems in the city.

Also, the usual purpose of journeys undertaken by the residents was found to be social-class biased. Available data on the trips undertaken for social (7.2%), shop/market (26.8%), workplaces(53.6%), schools (6.7%) and multipurpose trips (5.7%) by residents, confirmed the hypothesis that there were significant differences in the usual purpose of trips undertaken by the low, medium and high income residents. The result of the ANOVA shows that the F- value of 38.503 is significant at 0.05 confidence level. The mean value of the high income class at 3.56, medium at 1.95 and low at 1.00 respectively is a reflection that the higher income group has a lower propensity to use the rail mass transit when provided.

On the resident's perception of rail transportation, the study employed some indices to measure this perception simply because the short stint of about 15 months offered by the Federal Urban Mass Transit Programme was not enough to let people make up their minds about how intra–urban rail transit works especially when a large section of the city was not covered by the services. The measurement of the respondents perception was, therefore based on the respondents experience of train usage not necessarily in Ibadan. Perceptions were based on rail traffic externalities and that of rail transport revitalization.

The study further revealed that only 264 (45.5%) of the respondents had experience of rail usage while 318 (54.6%) had no experience of train ride. In the measurement of rail traffic externalities, 111(19.1%) agreed that there will be noise pollution, 252 (43.3%) agreed that the vibration induced by rail movement could be disturbing, although this is largely because a lot of the respondents have actually

encroached on the space earmarked as the Right – of – Way (ROW). These people also formed the bulk of the 132 (22.7%) who expressed their fear of being displaced. Table 5.19 is very explicit on this analysis. The findings also revealed that 494 (85%) of the respondents yearn for the return of intra – urban rail transport in Ibadan but they equally expressed their fears of the non – starter' posture of the Corporation and agencies in charge.

On whether the use of the rail mass transit would depend on the socio-economic characteristics of the potential users, the result of the logit model shows a significant combined effect of the three explanatory variables of occupation, income and trip distance which were found significant at 0.05 confidence level, is 92.0 per cent (R^2 = 0.843). From the result, the estimated income of the potential users with a beta coefficient of 0.074 is very crucial as a socio-economic factor in the use of rail mass transit.

The analysis of public perception of rail transport also contained those factors of adherence of users to certain expectations from the mode such as the commuting time, cost, convenience, safety and comfort. In respect of the commuting time and cost, 453 (77.8%) of the respondents believed in the promptness and time scheduling nature of rail travels as strong asset. Lower transportation fares as the findings revealed made the rail the masses choice among other modes. In the aspect of transport safety and comfort, 302 (52%) of the respondents attested that the rail is ahead of other modes. This fact was further confirmed when 294(50.5%) of the respondents picked the rail as the most preferred among other modes. The taxis followed with 120 (20.6%), 'danfo buses' 92 (15.9%) respectively. The result of the multinomial logit model revealed that the modal choice of commuters are influenced by variables associated with the level of income of commuters, vehicle ownership and the availability of public transport, all of which were found significant at 95 per cent confidence level. Other variables such as age and trip distance have very weak association in determining commuter's modal choice. Commuters are bound to look for modes that would ensure their comfort, safety and convenience as provided by the rail mass transit. In addition to this foregoing, most of the respondents 501 (86.1%) showed that they are willing to make more trips within the city with the coming of rail mass transit.

The study further found out that the level of infrastructure decay and obsolescence of the rail transport sector is so much high that the Federal Government which is currently the sole financier and the Nigerian Railway Corporation itself can not undertake the burden alone. All the efforts undertaken by the Bureau of Public Enterprise (BPE) in putting together a 25 year strategic vision for the rail sector was designed to strengthen and re-constitute the legal framework that has insulated the Nigerian Railway Corporation from other forms of partnership.

Also, the study revealed the negative public perception of the 1955 law which established the Nigerian Railway Corporation in which 540 (92.8%) of respondents called for its revision. Ironically, even the NRC itself wanted a review of the law so that it can accommodate most of the prospective partners. The Refurbish – Operate and Transfer (ROT) form of concession was recommended by the Corporation as some of the State Governments are pushing for some kind of partnership with the Corporation.

The study examined the prospects and potentials of five proposed corridors each of which was well charted to conform to the Allport 1991, model for intra urban rail transport. In the analysis of the respondents ratings of the routes, 262 (45%) favoured the existing rail route from Omi–Adio to Erunmu, a distance of about 40km because of its existing facilities which is currently undergoing rehabilitation. This route was followed by the Lagos road toll – Moniya, a distance of 26 kilometres which was also favoured by 160 (27.6%) of the respondents. The Bere – Akanran route which ranked next attracted 85 (14.6%) of the respondents. However, to carve out space along the route will require the demolition or removal of 879 residentials cum commercial structures and the displacement of occupants. Podo – Bere – Akobo route ranked fourth on the log with only 47 (8.0%) of the respondents attracted by the route while Mokola – Agodi – Ife road had only 16 (2.7%) of the respondents supporting it. From the institutional standpoint, all the five routes were adjudged to be viable for future considerations.

7.3: THEORETICAL IMPLICATIONS OF THE RESEARCH

Most transportation studies have often relied on the spatial interaction theory to explain the basis of movement. It programmes every journey using the origin and destination factors and tries to account for the factors that govern the commuters

choice of movement. The interpretation of the model offered by Vaughan (1987), Dickey (1983) and Ortuzar and Willumsen (1990) tried to offer alternative forms and adaptation of the model to suit many transport studies.

One major finding of this study, however, revealed that the spatial interaction theory tend to offer a good description of spatial interactions but fails to explain such. Thus, it does not look at what is happening but at the result of what has happened. Lee (1974) also confirmed this observation. In studies that involve a critical analysis of the travel behavior of a large group of people as obtained in this study, it was discovered that the model failed to explain the differences in the socio economic characteristics of the commuters and their trip purpose, whereas travel behaviour is known to vary with trip purpose. This study found out that the propensity to travel to work place is different from the propensity to travel for recreation or social visits. This is contrary to the belief that the model provides the basis for all movements. This study also found that the use of the spatial interaction theory required that the area under study be divided into zones or sectors for easy analysis. In this wise, data collection, distance measurement and other analysis might be difficult where there are no zoning.

Another major observation of this study, is in the theory of contestable market as it affects the rail industry. In the developing countries, this theory could be very difficult to actualize since most of these countries run rail transportation as a natural monopoly, in spite of its multi – products nature of its inputs and outputs. For instance, in Nigeria, the 1955 rail law projected the Nigerian Railway as a monopolistic entity offering a social service when the theory in promoting efficiency and profitability in the rail industry opted for the deregulation of services. This, indeed, is very confusing. Should rail services run as a social or commercial enterprise? The views of Campos and Camtos (2000) in cutting the middle of the road across by separating infrastructure provisions from operation services appeared justifiable. Both authors advocated that the infrastructural aspect be handled by the public while private outfits handled the services aspect. Thus, countries of the developing world whose rail services have been institutionalized came into terms with practical trends in the global rail industry.

This study has also been able to bring out that the much touted Public – Private Partnership concept which has proved to be a useful tool in the area of transport infrastructural financing and delivery may not work for the rail transport sector in Nigeria unless the 1955 rail law is revisited and repealed. This study agrees

perfectly with the views of Estache and Gines de Rus (2001) in its criticism of the overbearing influence of government intervention in the area of transport provisions which has often resulted in excessive cost and low quality service delivery.

The Eternal Triangle Model of Addenbrooke (1981) and Adeniji (1983) offered a very perfect arrangement for private participation in public transportation. The variables of investment costs, service rendered and revenue derived are capable of promoting a sustainable rail mass transit system where private investors could make and maximize profit at minimum operating cost. Contrary to this perfect projection, the model may also not work in a heavily regulated rail transport environment as obtained in Nigeria.

7.4 CONCLUSION

Rail-transport, in spite of its high take-off costs, has long-term prospects in the development of cities. Apart from its potentials to relieve urban roads of their congestion by moving people in large numbers, no other form of transport can be more economically efficient in the use of urban land space. Almost all the important cities of the developed world are connected with an efficient rail-transport network that facilitates the ease of movement in a sustainable manner. Since Nigeria is aspiring to join the league of most developed economy by the year 2020, it is now more imperative to have an effective Urban Transportation Policy that is infrastructural-driven rather than by ordinary documentation, so that all the essential modes that are critical to the development of our cities are captured and integrated. The integration of the transport system according to Robins (1977), is the best investment to improve the personal mobility and the quality of life of the people.

This study cannot come at a more auspicious time when hundreds of thousands of city dwellers depend virtually on road transport alone. Ibadan city is currently witnessing a lull in the area of public transportation as there is no single mass transit system being operated in the city. The current rate of urban sprawl gives room for so much concern as it kept traffic congestion beyond tolerable limits. Intra – urban rail system must surely come to the rescue. This research is intended as a pilot-study which, when effectively utilized, will serve as a model for some other cities in Nigeria where rail assets are currently idling away.

7.5 POLICY AND PRACTICAL RECOMMENDATIONS

The haphazard growth of the city over the years is attributable to the absence of guidelines to the growth and development of the city. The type of sprawl witnessed in Ibadan today are as a result of the lack of judicious distribution of land uses such as residential, industrial, commercial or recreational activities over the urban space. Land use factors such as density, mix, connectivity and accessibility have been found to have an overbearing effect on how people travel in a community. According to Wegener and Furst (1999), the distribution of human activities in any urban space requires spatial interaction through the transport system to overcome the friction of distance between the locations of activities. The provision of a master plan would therefore define the city limits and confine all activities within this limit. When the city expands uncontrollably, the city centre becomes unbearably distant and almost inaccessible to people living at city edges. All these have implications for transport planning.

As part of the grand city masterplan, a transportation plan is equally recommended for the city. The focus of this study is on public transport especially mass transit systems and the vital role it plays in the prosperity and productivity of cities. It is therefore imperative to harness all the available transportational space within the city and re- organize these spaces so that the increasing city affluence as observed by World Bank, (2002) would not have the effect of reducing the quality of travel at least for the city poor.

The Ibadan City Transport masterplan will provide the policy framework for the operation of each of the modes and as well foster the principles of intermodality for the overall goals of city sustainability. The present situation whereby the public transportation within the city is left in the hands of Transport Unions and without a single mass transit system for the teeming population is a misnomer. Government should now seize the initiative in conjunction with private partnership to evolve a public transport system that will be masses oriented.

This assurance may not just be enough, the deplorable state of the existing railway infrastructure and the degree of technological obsolescence makes direct privatization or commercialization almost an impossible task. The moribund state of the Nigerian Railway Corporation properties may not attract prospective investors. In this wise, it is imperative to revisit the global trend in railway funding which is by

concessionaire agreement with consortium of foreign and local investors. The various forms of concession have been made exhaustively discussed in section 2.1.5 of this study.

The current rehabilitation effort of the Federal government in rail track repairs may not just be enough until all the existing tracks are made to conform to the standard gauge so that the advantage of global economies of scale in modern rail technologies can be benefitted from. The proposal will no doubt require several billion dollars which can be sourced through franchising some aspects of the project, through Build – Own – Operate (BOO) or Build, Operate and Transfer (BOT). This has been the case with the channel Tunnel between United Kingdom and France among others in Europe as observed by (Odeleye, 2004).

This study also advocated the establishment of a Transport Development Bank whereby multinational outfits operating in the country, parastatals, government agencies, individual and corporate tax payers particularly civil servants, could be made to contribute a minimum of two per cent of their income towards the operation of the transport bank. The bank would be expected to fund transportation infrastructure provisions, offer loans to corporate establishments and transportation outfits in the area of transport development. Capital intensive projects are expected to be broken down into phases for the ease of execution. For instance intra urban rail projects could start with the procurement of city rail master plan and other policy documentations. Policy execution could then involve the enlistment of Concessionaires, public enlightenment, route identification and surveys. The next phase could then accommodate physical construction, equipment procurement, personnel recruitment and training. Other phases could follow in that sequence.

The bus mode which appears to be easier to handle and manage, presents a short term measure to a long term urban transport problem. As the cities continue to grow, the bus system becomes eventually inadequate. A long term solution lies in effecting appropriate mass transit option using all existing railway corridors in all the cities where the rail exists. As Ogunsanya (2004) also observed, a pragmatic urban transit policy has the potentials of effecting the required positive change in our urban centres. Investment in urban transportation in Nigeria is also an investment in the country's future since these cities are the centres of industrial, commercial, educational, recreational, social and political activities.

Of the various mass transit options, the urban rail transit is of tremendous mass appeal. Apart from its exhibiting an unrivalled city centre to city centre connection, it is particularly cost effective for long distance and heavy freight. The World Summit on Sustainable Development (WSSD) held in Johannesburg, South Africa in 2002 commended the environmental friendliness of rail transport in mass movement of commuters in cities as well as the minimization of urban transportation externalities like air and noise pollution, energy consumption, accidents and road traffic congestion problems.

The summit report also emphasized the problems of global warming and ozone layer depletion in which the transport sector alone is responsible for about 25 per cent of the world wide carbon dioxide emission. The share of the rail in this emission is almost neglible compared to the dominant proportion of 80 – 90 per cent exuded by private cars and haulage trucks alone. Modern and efficient rail system properly integrated into the urban system is no doubt required for a city like Ibadan in the attainment of an even socio – economic growth (Odeleye, 2004).

By patronizing the rail, the density of traffic would have been taken off the roads, thus reducing the cost of road infrastructural repairs on a perennial basis. The movement of people in groups rather than individually in auto- cars is altogether more transport efficient and cost saving. Connecting urban rail in Ibadan to such an important location like the Dry Port site at Erunmu is bound to affect the trade and commercial environment from a local outlook to a regional pre-eminence and importance

In the delineation of the designated routes for rail development in Ibadan, there is no doubt that the problem of property or land acquisition for urban rail expansion will rear its ugly head. High land prices in the city centre or the cost of demolition of residential properties to pave way for rail development could be very daunting (Hirooka, 2002). For this reason, the five corridors have been carefully weighed and ranked in their order of priority taking into cognizance the enormity of the initial cost of development. Since planning is futuristic in nature and it involved taking decisions for the course of future actions, visiting each of the routes for space utility stands out the existing rail route as the priority route, followed by the Lagos Express to Moniya route where the central median measuring about 19 metres averagely could be made to contain a rail – route with its service stations located along

the service roads. Alternative option to space saving would require the construction of deviated lines or underground urban railways which like every other rail development has an initial funding problem but which can be overcome by sheer political will of the government.

7.6 CONTRIBUTION TO KNOWLEDGE

This study examined the potentials of intra-urban rail transport development in Ibadan against the set objectives of this study. As part of the objectives, the mobility pattern of residents were examined and the study was able to look into the city growth and the landuse perspectives in which there has been gradual accretion of landuse into the peri-urban and rural lands. By implication, this has extended the commuting distance within the city. The frequency and purpose of journeys were largely dominated by trips to shops /market and work respectively.

The study also found out that the perception of the residents about the use of rail transport was very low (45.4%) such that it requires a lot of orientation for the residents to imbibe intra-urban rail as a public transport mode. In the evaluation of the factors that may influence the potential patronage of rail transport, the respondents expressed their expectation in the areas of improvement to intra-urban travel safety, comfort and the traffic congestion reduction potentials of the rail. The study also identified the 1955 rail law in Nigeria as a disturbing factor that can work against public-private partnership and therefore advocated for its review.

Highlighting the experiences from the advanced countries, the study have shown that rail transport cannot be successfully run as a national or State monopoly hence, the variety of partnership schemes brought up for consideration and possible adoption to enhance rail transport delivery. On account of this development, this study have clearly presented the potentials offered by intra-urban rail transport services as efficient, reliable and functional alternative for a large-sized urban centre like Ibadan. Public perceptions of the services have been sought and a general overview of the intrinsic values associated with intra-urban rail services has been considered. Most importantly, the study has succeeded in charting potential rail corridors that would form the bedrock of future rail transport network for the city.

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APPENDIX 1

DEPARTMENT OF URBAN AND REGIONAL PLANNING
UNIVERSITY OF IBADAN, IBADAN

Dear Sir/Ma.

RE: "POTENTIALS OF URBAN RAIL TRANSPORT DEVELOPMENT IN IBADAN, NIGERIA."

This questionnaire seeks information on "Potentials of Urban Rail Transport Development in Ibadan". Your response(s) will be used strictly for academic purposes and shall be treated with utmost confidentiality.

Thank you.

QUESTIONAIRE A: (Household Travel Surveys)

Background Information:

1. Name of locality……..
2. Name of Street…….
3. Gender (i) Male [ ] (ii) Female [ ]
4. Age (yrs) ……
5. Marital Status
   (i) Married [ ]
   (ii) Single [ ]
   (iii) Separated [ ]
   (iv) Divorced [ ]
   (v) Widow [ ]
6. Educational Status
   (i) No formal education [ ]
   (ii) Primary education [ ]
   (iii) Secondary [ ]
   (iv) NCE/OND [ ]
   (v) HND/ Degree [ ]
7. Occupation
   (i) Artisan [ ]
   (ii) Trading [ ]
   (iii) Farming [ ]
   (iv) Student [ ]
   (v) Applicant/Apprentice [ ]
   (vi) Civil servant [ ]
   (vii) Professional [ ]
   (viii) Retiree [ ]
8. Estimated Income (per month) # ……
9. Residential Status (i) House/Property Owner [ ] (ii) Tenant [ ] (iii) Squatter [ ]
10. Length of stay in Residence……
11. Household Size ……
12. Place of Work (Location) ……
13. Distance of workplace to residence (approx. km) ……

14. What means of transport do you usually use? (i) Car [ ]
(ii) Bus [ ]
(iii) M/cycle [ ]
(iv) Bicycle [ ]
(v) Others [ ]

15. Do you own any of these means? (i) Yes [ ] (ii) No [ ]

16. Distance of the nearest Bus/Stop to your residence. (i) Less than 50m [ ]
(ii) 51 to 100m [ ]
(iii) 101 to 200m [ ]
(iv) More than 200m[ ]

17. What is the name of the Bus-Stop?. .....

B. Information about Trips:

18. Point of origin of regular daily trips? ……

19. Destination of trip? ……

20. Usual Purpose of trip? (i) Journey to work [ ]
(ii) Journey to school [ ]
(iii) Journey to shop/market [ ]
(iv) Multi-purpose trip [ ]
(v) Others (specify) [ ]

21. Trip mode (i) By foot [ ] (ii) Bicycle [ ] (iii) Motorcycle [ ] (iv) Car [ ]
(v) Bus/Public Transport [ ] (vi) Others (specify)……

22. Frequency of trip (i) Daily [ ] (ii) Weekly [ ] (iii) Monthly [ ]
(iv) Once in a while [ ]

23. Problems encountered on your trip……
……
……
……

24. How long do you wait at the bus-stop before getting a vehicle? .....

25. Have you ever boarded a train before? (i) Yes [ ] (ii) No [ ]

26. If yes, where? (i)…… (ii) when? ……

27. If you were to make your journey within the city by public transport, which of these modes will you prefer ? (tick as many as possible). (i) Bus [ ]
(ii) Train Mass Transit [ ] (iii) Taxi [ ] (iv) Motorcycle [ ]
(v) Keke NAPEP [ ].

28. Will the introduction of Urban Rail Mass Transit encourage you to make more trips within the city? (i) Yes [ ] (ii) No [ ] (iii) Can't Say.

29. If your response to question (28) is No, State your reasons……
……
……

30. The underlisted corridors have been identified for intra rail transport
Which of these corridors would you support for rail transportation within the city? State your preference.

(i) Omi-Adio-Bodija-Olodo-Erunmu ……
(ii) Podo-Challenge-Molete-Beere-Agodi/Gate-Idi-Ape-Akobo. ……
(iii) Mokola-Gate/Agodi-Iwo Rd.-Ife Road Toll Gate……
(iv) Lagos-end Express Road Toll Gate - Iwo road -Ojoo -Moniya……
(v) Agodi/Gate-Aperin-Olorunsogo- Amuloko- Akanran road……

31. Would you patronize this service when put in place?(i) Yes [ ] (ii) No [ ]
(iii) Not sure [ ].

32. Apart from the listed routes, what other routes can you suggest for rail services within Ibadan……..
……33.

What type of service would you like the train to provide?

(i) Passenger Services Only. [ ]
(ii) Freight Services Only. [ ]
(iii) Both Freight and Passenger Services. [ ]
(iv) Others (specify)……

34. What type of problem do you think rail mass transit can pose to the public ?
(tick as many as possible). (i) Noise Pollution [ ] (ii) Vibration. [ ]
(iii) Displacement through construction [ ]
(iv) More time wasting on trips [ ]
(v) High cost of commuting [ ] (vi) Security risk [ ]

35. Do you think that commuting by rail in the city will reduce your travelling cost ? (i) Yes [ ] (ii) No [ ] (iii) Can't Say [ ].

36. What is your suggestion for an improved rail transport performance in Nigeria?……
……
……

APPENDIX II

DEPARTMENT OF URBAN AND REGIONAL PLANNING
UNIVERSITY OF IBADAN, IBADAN

Dear Sir/Ma.

RE: "POTENTIALS OF URBAN RAIL TRANSPORT DEVELOPMENT IN IBADAN NIGERIA."

This questionnaire seeks information on potentials of Urban Rail Transport Development in Ibadan. Your response(s) will be used strictly for academic purposes and shall be treated with utmost confidentiality.

Thank you.

QUESTIONAIRE B (Rail-Inventory Surveys) ADMINISTRATION

1. Name and Location of Establishment ……
2. Year established ……
3. What service does your establishment render presently? …….

……

……

4. How is your Corporation funded?.....

……

5. What are the sources of revenue generation for the Corporation?.....

……

6. What is your view about the 1955 law that incorporated the Nigeria Railway Corporation?……

……

……

7. In 2005, the Bureau of Private Enterprises (BPE) recommended a Vertical Integration Method in Rail Concession in Nigeria. What is your view about this recommendation……

……

……

8. What is your view of the 25-year Strategic Vision proposed by the Bureau of Public Enterprise (BPE) for your establishment? ……

……

……

9. In the advent of Rail Concession, who in your opinion should fill the capital investment gap that may be left by the private investor? ……

……

……

……

10. What form of Concession would you advocate for this establishment to make Intra City Rail Transportation to succeed? ……

……

11. In the advent of a modernized intra-rail service in Ibadan, what fare structure will you recommend? (i) Flat Rate [ ]

(ii) Distance Graduated [ ]

(iii) Zonal fares [ ]
(iv) Time based [ ]
(v) Others (specify) ……

12. What are the core assets of this establishment?
(Please list or tabulate using the format below).

S/N	Facilities	Number	Date Installed	Current Condition

13. What are the non-core assets of this establishment?

S/N	Facilities	Number	Date installed	Current condition

14. Can you suggest the best way of re-tracking the rails to standard gauge ……
…..……
…..……

15. What is the current state of your workshop?
(i) Adequate [ ] (ii) Inadequate [ ] (iii) Can't say [ ]

16. What administrative problem(s) do you envisage for this establishment in the event of a successful concession? ……
……
……
……

17. The under-listed corridors have been identified for intra-rail transport within Ibadan City. Which of these corridors would you support for rail-transportation within the city?
(i) Omi-Adio- Dugbe-Bodija-Olodo-Erunmu ……
(ii) Podo-Challenge-Molete-Beere-Agodi/Gate-Idi-Ape-Akobo…….
(iii) Mokola-Gate/Agodi-Iwo Rd.-Ife Road Toll Gate……
(iv) Lagos-end Express Road Toll Gate - Iwo road –Ojoo-Moniya ……
(v) Beere-Aperin-Olorunsogo- Amuloko- Akanran road……

18. Apart from the listed corridors, what other viable corridor(s) can you suggest for intra-urban rail transit in Ibadan?. ……
……

Thank You.

APPENDIX III

15TH MARCH 2010

……
……
……

Dear Sir/Ma,

Invitation to an Expert Opinion Focus Group Discussion on The Potentials of Urban Rail Transport Development in Ibadan

The sub-urban commune distance of Ibadan city has shifted for several kilometers since the early 1990's when the urban rail mass transit was introduced. The same intra-rail route for instance can be extended beyond Bodija to Erunmu town, a distance of approximately 40km.

The expansion of the city continues unabated thus creating more problems for commuters whose fate has been condemned in most instances to various informal means of transportation including M/Cycles. Traffic situation within the city has been extremely disturbing with the incessant snarls often experienced at peak periods. It is in the light of these developments that this study intends to explore the potentials of a viable rail transport for the city, so that the benefits of multi-modality can be enjoyed by the inhabitants of the city. A focus group discussion on this subject matter has therefore been scheduled to take place in which your participation will be highly appreciated. The Date, Time and Venue is as scheduled below.

Date ……
Time ……
Venue ……

Yours Faithfully

,……
Omirin O.J
Researcher

PROCEEDINGS OF THE FOCUS GROUP DISCUSSION ON THE POTENTIALS OF INTRA-URBAN RAIL TRANSPORT IN IBADAN.

The F.G.D in this instance was employed to elicit more information and particularly to clarify, corroborate and validate data collected through questionnaire administration. To eliminate the possibility of data and facts duplication, only one group discussion was organized as envisaged. The number of discussants however witnessed a slight alteration from the envisaged 12 to 14 members including the researcher, who eventually moderated the discussion session. The Procedure adopted for the discussion is as stated below.

(a) Opening prayers
(b) Welcome and introduction of participants
(c) Presentation of discussion profile
(i) An overview of the uncontrolled growth of Ibadan over the years
(ii) The implication of the perceived urban sprawl for infrastructure and land-use development of the city.
(iii) Urban travels: Past, present and future- an introspection into intra-urban movements by the various modes
(iv) Challenges of urban travels and improvement to the public transportation culture of the city to Ibadan
(v) The return of mass transit rail system: the myth and reality
(vi) Challenges and expectations for the viability of rail transportation in the city.
(vii) Rail Potentials: Cost/Benefit Evaluation of Rail Transport plan for the city
(viii) Inter-modal issues- challenges and prospects
(ix) Issues of transport sustainability for the city
(x) General Comments/ Conclusion of discussion
(xi) Appreciation and closing prayer

APPENDIX IV

Volume of passengers and freight carried by NRC (1970-2004)

Year	Passenger carried	Revenue N	Freight Tonnage	Revenue N	Total Revenue (Passenger + Freight)
1970	8942.00	4676.00	1311000	18436000	2314000
1971	6151000	6296000	1311000	15680000	21976000
1972	5819000	7447000	1519000	17095000	24642000
1973	5131000	6906000	2129000	18025000	24931000
1974	4342000	6067000	1098000	12205000	18272000
1975	6755000	11003000	1612000	14724000	25727000
1976	7491000	10004000	1452000	16772000	26726000
1977	6747000	10822000	2374000	17172000	27994000
1978	6750000	12982000	1592000	16251000	29233000
1979	6771000	18716000	1543000	21861000	40577000
1980	4917000	17290000	1153000	23313000	40603000
1981	9638000	26623000	1932000	4509000	71713000
1982	11612000	28288000	2185000	49021000	77309000
1983	3142000	29877000	1619000	36499000	66376000
1984	15553000	33147000	1458000	33335000	66482000
1985	11324000	36205000	1182000	34247000	70452000
1986	9878000	38059000	852000	26335000	65394000
1987	7383000	35750000	353000	15632000	51382000
1988	4196000	25117000	326000	1326000	38323000
1989	6520000	24318000	202000	18155000	42473000
1990	6345000	3143000	198000	35911000	67314000
1991	3443000	19300000	237000	64400000	83700000
1992	1747000	17013000	204000	49732000	66745000
1993	1502000	14627000	106000	25841000	40468000
1994	784491	36809884	106000	12911902	158712786
1995	2889977	56144354	107878	133911942	190026256
1996	2626026	12907824	137661	161348796	274258624
1997	2946940	176456928	535000	219175125	435632053
1998	1070424	74457194	1513077	438779607	513236801
1999	1788171	1882085	7372394	404346982	493229067
2000	2610435	142920540	116837	155865908	298786448
2001	1284022	110456518	132813	165256201	275712711
2002	942594	62977167	98192	132907397	195884564
2003	1508447	103853378	56178	101088080	206606083
2004	1751159	206772909	62575	12480539	319253448

Source: Nigeria Railway Corporation (NRC), 2008.

APPENDIX V

CORRIDOR PASSENGER COUNT

Corridor 1- Omi-Adio-Bodija-Erunmu

	7-8am				8-9am				9-10am				4-5pm				5-6pm				6-7pm			
	T	B	C	M	T	B	C	M	T	B	C	M	T	B	C	M	T	B	C	M	T	B	C	M
Omi Adio-Apata	36	80	62	33	58	112	71	42	52	120	90	60	56	130	88	61	60	142	90	70	58	136	94	66
Apata-Dugbe	28	68	74	28	38	160	86	48	43	170	94	43	48	173	9o	45	51	180	93	54	53	148	90	52
Dugbe-Bodija	72	140	160	54	84	152	210	158	69	139	92	48	72	152	130	46	81	160	140	55	82	148	142	45
Bodija-Akobo	42	52	71	60	45	47	85	63	39	110	112	67	32	118	113	72	38	125	122	86	31	120	117	74
Akobo-Olodo	21	30	60	43	26	49	74	52	36	55	86	56	41	60	92	54	50	63	94	52	47	60	95	56
Olodo-Erunmu	20	18	24	36	22	24	35	42	18	28	51	44	20	23	48	48	24	30	45	56	21	27	42	54
	219	**388**	**451**	**252**	**273**	**564**	**561**	**405**	**257**	**612**	**525**	**316**	**269**	**656**	**553**	**327**	**244**	**700**	**584**	**363**	**272**	**639**	**580**	**347**
	1340				**1803**				**1710**				**1805**				**1891**				**1858**			

*Note that Figures tallied for each hour represents the to and fro movements and mean count for 7days

Source: Fieldwork, 2011

APPENDIX V
CORRIDOR PASSENGER COUNT

Corridor 2. – Podo/ Challenge – Bere - Agodi – Basorun – Akobo

Location	7 - 8am			8 - 9am				9 - 10am			4 - 5pm			5 - 6pm			6 - 7pm		
	B	T	M	B	T	M		B	T	M	B	T	M	B	T	M	B	T	M
Podo –Challenge	120	88	26	132	76	18		82	66	24	110	80	24	136	82	30	80	68	32
Challenge-Molete	160	92	30	170	84	26		96	80	30	130	94	26	142	78	34	76	70	36
Molete - Oja'ba	280	136	24	286	140	40		164	130	32	156	120	22	184	130	26	82	66	34
Oja'ba – Oje	220	120	22	200	134	38		190	100	32	140	110	20	160	124	22	100	80	30
Oje – Agodi	114	86	16	128	82	24		88	90	28	132	102	24	140	100	36	106	88	20
Agodi –Basorun	260	140	36	248	152	30		160	124	30	164	140	22	180	130	24	88	100	32
Basorun –Akobo	88	120	66	82	140	44		76	110	32	80	126	30	82	118	38	80	92	40
	1242	**782**	**210**	**1246**	**808**	**220**		**856**	**700**	**208**	**912**	**772**	**174**	**1024**	**762**	**210**	**612**	**544**	**204**
		2234			**2274**				**1764**			**1858**			**1996**			**1360**	

*Note that Figures tailed for each hour represents the to and fro movements and mean count for 7 days

Source: Fieldwork, 2011

Corridor 3. Toll – Gate – Iwo Road – Ojoo – Moniya

Location	B	T	M	B	T	M	B	T	M	B	T	M	B	T	M	B	T	M
Toll Gate - Academy	140	60	22	178	70	24	120	56	20	130	80	30	120	72	28	92	64	40
Academy - Olorunsogo	168	52	32	160	64	30	136	50	30	120	60	40	134	66	30	86	56	42
Olorunsogo- Oremeji	54	40	36	66	52	28	40	34	24	50	44	30	62	52	40	52	40	28
Oremeji - Iwo Road	186	80	34	216	92	26		76	32	140	82	36	164	70	42	96	74	40
Iwo road - Bashorun	12	16	14	18	24	18	16	10	18	16	18	20	20	28	12	18	20	10
Bashorun - Agbowo	88	76	20	74	80	24	64	62	14	80	64	14	86	68	30	98	60	18
Agbowo – Ojoo	60	36	28	70	44	30	56	40	26	52	30	22	56	32	28	50	34	14
Ojoo – Sasa	28	32	12	34	40	22	22	30	10	30	40	18	36	42	22	32	36	18
Sasa- Akingbile	18	14	10	26	12	20	14	20	16	16	14	20	18	10	24	18	22	26
Akingbile – Moniya	112	32	16	88	60	14	90	38	20	76	30	10	68	40	18	40	42	12
	866	**425**	**224**	**910**	**536**	**236**	**718**	**416**	**210**	**710**	**462**	**240**	**764**	**500**	**272**	**562**	**448**	**248**
	1515			**1684**			**1344**			**1412**			**1536**			**1258**		

*Note that Figures tailed for each hour represents the to and fro movements and mean count for 7 days

Source: Fieldwork, 2011

Corridor 4 – Mokola – Agodi – Adegbayi – Ife Road Toll

Location	B	T	M	B	T	M	B	T	M	B	T	M	B	T	M	B	T	M
Mokola - Agodi/Gate	130	96	78	154	102	62	140	110	76	140	124	130	128	116	94	108	116	82
Gate – Sawmill	88	82	60	206	208	44	76	84	68	90	110	62	112	114	50	110	94	74
Sawmill - Adegbite	124	120	82	114	102	50	88	72	60	130	142	76	124	100	60	122	106	80
Adegbayi - Ife Road	40	88	54	56	64	62	48	58	46	28	18	12	32	48	40	18	24	12
	382	**384**	**274**	**530**	**476**	**218**	**352**	**324**	**250**	**388**	**394**	**280**	**396**	**378**	**244**	**358**	**340**	**248**
	1040			**1214**			**926**			**1062**			**1018**			**946**		

*Note that Figures tailed for each hour represents the to and fro movements and mean count for 7 days

Source: Fieldwork, 2011

Corridor 5- Bere – Olorunsogo – Amuloko – Akaran

Location	B	T	M	B	T	M	B	T	M	B	T	M	B	T	M	B	T	M
Bere – Elekuro	114	82	60	122	80	62	128	80	62	120	70	54	126	82	50	110	88	56
Elekuro – Aperin	108	100	42	112	106	60	116	112	50	100	78	50	114	80	52	106	70	44
Aperin - Olorunsogo	124	86	56	130	88	58	140	90	60	90	80	52	102	94	68	74	84	72
Olornsogo - Ogbere	140	76	62	160	120	64	162	126	58	124	70	60	132	86	62	80	62	70
Ogbere - Amuloko	126	78	68	118	74	62	180	86	60	106	72	66	118	80	66	84	60	60
Amuloko - Akaran	88	62	46	72	60	56	76	64	48	70	48	50	72	40	62	52	36	44
	700	**484**	**334**	**714**	**528**	**362**	**802**	**558**	**338**	**610**	**448**	**332**	**664**	**462**	**360**	**506**	**400**	**346**
		1518			**1604**			**1698**			**1390**			**1486**			**1252**	

*Note that Figures tallied for each hour represents the to and fro movements and mean count for 7 days

Source :Fieldwork, 2010.

APPENDIX VI

Regression

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.918[a]	.843	.842	.15567

a. Predictors: (Constant), Trip Distance (km), Estimated Income, Occupation Status

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	75.203	3	25.068	1034.418	.000[a]
	Residual	14.007	578	.024		
	Total	89.210	581			

a. Predictors: (Constant), Trip Distance (km), Estimated Income, Occupation Status

b. Dependent Variable: Willingness to use Rail

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.746	.022		34.344	.000
	Occupation Status	-.050	.009	-.277	-5.517	.000
	Estimated Income	.074	.019	.142	3.820	.000
	Trip Distance (km)	.187	.007	1.049	28.713	.000

a. Dependent Variable: Willingness to use Rail

Descriptives

Trip Purpose

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Low Income Residents	201	1.0000	.00000	.00000	1.0000	1.0000	1.00	1.00
Medium Income Residents	249	1.9518	.91894	.05824	1.8371	2.0665	1.00	3.00
High Income Residents	132	3.5682	.49722	.04328	3.4826	3.6538	3.00	4.00
Total	582	1.9897	1.14967	.04766	1.8961	2.0833	1.00	4.00

ANOVA

Trip Purpose

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	526.130	2	263.065	629.899	.000
Within Groups	241.808	579	.418		
Total	767.938	581			

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	369.808[a]	.163	.240

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Classification Table[a]

			Predicted		
			Prefered mode by bus		Percentage Correct
	Observed		tick	unticked	
Step 1	Prefered mode by bus	tick	33	66	33.3
		unticked	18	267	93.7
	Overall Percentage				78.1

a. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	a4	-.002	.011	.036	1	.850	.998	.976	1.020
	a8	.000	.000	21.873	1	.000	1.000	1.000	1.000
	a15(1)	-.851	.336	6.428	1	.011	.427	.221	.824
	a13	.020	.016	1.495	1	.221	1.020	.988	1.053
	b21i(1)	-.149	.338	.194	1	.659	.862	.444	1.671
	b21ii(1)	-1.666	.668	6.226	1	.013	.189	.051	.700
	b21iii(1)	-.014	.349	.002	1	.969	.986	.498	1.955
	b21iv(1)	-.252	.495	.260	1	.610	.777	.295	2.048
	b21v(1)	-1.060	.320	10.962	1	.001	.346	.185	.649
	Constant	1.216	.665	3.340	1	.068	3.372		

a. Variable(s) entered on step 1: a4, a8, a15, a13, b21i, b21ii, b21iii, b21iv, b21v.