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RESEARCH ARTICLE

GEOSPATIAL ANALYSIS OF ROAD TRANSPORT SYSTEM IN PERI- URBAN AREAS OF IBADAN, NIGERIA

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ABSTRACT

Most countries of the developing world are characterized by inadequate and poorly maintained road transport infrastructure. The condition of peri-urban areas of Nigeria is more pathetic since they are highly deprived of infrastructural facilities. This paper therefore, examines existing road transportation facilities in the six local governments that constitute peri-urban areas of Ibadan using geo-spatial techniques. This techniques which consist of Global Positioning System (GPS) and Remotely Sensed Images were used to analyze different types of roads in peri- urban areas of Ibadan. The study reveals highly congested federal and state roads. Many of the existing roads were without drainage system, a situation which has serious implication for effective road transport system and quality of life. The results also show that motor parks and bus stops are not evenly distributed in the study area. Car free cities, car-light cities, eco-cities designed, and park and ride system, among others are suggested for effective road transport system in the study area.

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INTRODUCTION

Transport is important for the survival of modern society. Without it there would be no life in the city (Okoko, 2006). As an essential service in urban centers, transport enables people, firms and other organizations to carry out their activities at sites selected for these purpose in separate location in the cities. Transport provides a key to the understanding and operation of many other systems at many different scales and is an epitome of the complex relationships between social and political activities and the level of economic development (Filani, 2002). During the past two decades, the populations of many cities in Africa and indeed Nigeria have doubled. This huge population growth has been accompanied by a substantial expansion of city boundaries and much higher levels of industrial and commercial activities (World Bank, 1996). These changes have placed new and heavy demands on urban transport system. This has made many cities in developing countries, particularly Nigeria, not to meet transport demand of their residents in Nigeria. Many people have seen their personal fortunes and wellbeing declined so fast that they are unable to make ends meet. Further, transport infrastructures and services that are required to turn around individual,

regional and national socio- economic fortunes are grossly inadequate and unaffordable (Oyesiku, 2002a). Consequently, an effective transport system helps to maximize the economic progress. In addition, over burdened transport systems have made traffic accidents a principal's cause of death and injury in developing countries. Today, transport problems have arisen despite large annual expenditures on urban transport system. (Adeniji, 1993). In Nigeria, about 15 to 25 percents of the annual expenditures is devoted to transport systems and sometimes much more, example of this is the operation of 500 roads embarked upon by the federal Ministry of works. All these capital intensive projects however, have not always been cost effective (Ogunsanya, 2002). However, many transportation problems are prevalent in developing countries of the world and they vary in degree from one area to another because of socio- economic and topographical conditions vary from city to city. Along the problem experienced in peri-urban areas of Ibadan are poor condition of road network, on street parking, vehicular traffic conflict, street trading, lack of kerbs, violation of traffic rule and regulations and lack of pedestrian walkways among others. Peri-urban transportation involves movement both within and outside. Transportation itself has little meaning. It is a means to fulfill certain needs such as employment, education, health, social relation, entertainment, administrative services, legal services, banking and financial services, political activity, marketing of local produces, getting inputs for local production and consumption system, energy, water, waste disposal from industry and household, warehousing, construction materials. Peri-urban transportation

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is the backbone of the development of a village economy and the development of its transport assumes special importance from the point of view of economic integration of the rural areas with the administrative, marketing and servicing centers (Singh, 2001). Geospatial analysis is an approach to applying statistical analysis and other informational techniques to data which has a geographical or geospatial aspect. Such analysis would typically employ software capable of geospatial representation and processing, and apply analytical methods to terrestrial or geographic datasets, including the use of geographic information systems and geomatics (Cheng and Robert, 2014). These spatially referenced data are usually displayed for solving complex environmental problems. When roads and bridges are down and the infrastructure is collapsing around people, maps can help make the difference between life and death. The use of geo-spatial techniques to examine road transport condition enhances quality of description of the road system. This study was conceived owing to the concern to appreciate the spatial distribution of road transportation facilities in the six local governments that constitute peri-urban areas of Ibadan with a view to suggesting framework for effective road management without holding down the development. This paper therefore, examines existing road transportation facilities in the peri-urban areas of Ibadan using geo-spatial techniques.

Literature Review

The meaning and Characteristics of Peri-urban Areas

According to Organization for Economic Co-operation and Development (OECD) (2007) the term 'peri-urban' came into public domain and use during the 1980s in Europe. The OECD described peri-urban as a name given to the 'grey area' which is neither entirely urban nor rural in the traditional sense. It is neither fully urbanized nor completely rural, but often seen as a 'middle band' of land with atypical characteristics (Buxton, 2007). It comprises an unbalanced mixture of urban and rural functions. Peri-urban area serves as the zone where urban-rural interaction is at its peak (Johnson, 1974). At this zone, rural activities and modes of life are in rapid retreat, with extensive urban land use intrusion (that is urban area physically and functionally expands into the rural area). Peri-urban areas exhibit peculiar characteristics that make them distinct from urban and rural areas, and these include accelerated development of urban residential and urban commercial uses, and decrease in rural primary activities (Hewitt, 1989), rapid but unplanned growth with inadequate service infrastructure (Government of Swaziland, 1997), middle and low income residents (Johnson, 1974), and serve as receptacles for the growing rental market (Buxton, 2007). Generally, peri-urban areas can be classified into four interrelated categories. These include village periurban, diffused peri-urban, in-place peri-urban and absorbed peri-urban (Drescher & Jaquinta, 2000). The categorization is derived from the underlying socio-demographic processes, especially migration. The defining features connected the elements of the typology in the form of a continuum.

Peri-Urban and Transportation

Transportation network, be it road, rail, air or water, acts as the lifeline of a country and the de facto barometer of overall

economic and industrial growth (Hyderabad, 1996). An effective and efficient transportation network providing accessibility to villages through development of road communication facilities is important for enabling all other facets of rural development. This would also help integrate the communities in the periurban with the mainstream society. However even after over 50 years of independence, about 40 per cent of the villages still lack connection with the nearest road or railway station. Peri-urban transportation involves movement both within and outside the periurban interface. Transportation per se has little meaning. It is a means to fulfill certain needs such as employment, education, health, social relation, entertainment, administrative services, legal services, banking and financial services, political activity, marketing of local produces, getting inputs for local production and consumption system, energy, water, waste disposal from industry and household, warehousing, construction materials. The principal means of peri-urban transport are due to:

- Human and animal energy (walk, bicycle, rickshaw, boat, head load, animal backload, animal cart)
- Combustion engine (private) (car, tractor, two-wheeler)
- Combustion engine (public) (bus, van, auto, taxi, train, ferry)

Role of Geospatial Technology in Environmental Sustainability

Geospatial technology offers a wide range of innovative and cost effective solutions for environmental sustainability; hence, many countries now appreciate the relevance of geospatial technology in the sustenance of our environment. The relevance of environmental information is based on the degree of its availability to the end users and to what extent such information can be shared effectively with external organizations largely over the internet and other available global information infrastructure (SDI) platform. In this regard, the emphasis should be on accessibility and distribution of available information over wide range of networks and environmental information market-place (Matambanadzo, 1999). The use of Geospatial technology in mitigating environmental problems and challenges is thus on the increase the use information driven tools such as GIS, Earth imaging systems/Satellites, Global Positioning System (GPS) and Remote sensing techniques to mitigate environmental problems has find global application and acceptance.

MATERIALS AND METHODS

Geo-spatial techniques which consist of Global Positioning System (GPS) and Remotely Sensed Images were used to analyze different types of roads in peri-urban areas of Ibadan. Base maps were used as the field tools to characterize roads. The data processing techniques adopted include, data evaluation, georeferencing and mosaicking, data sub-setting, feature extraction, terrain modeling, road maps update from satellites images and integration.

Study Area

Ibadan, one of the fastest growing cities in Nigeria is located in Oyo State in the south-west geo-political zone of Nigeria.

MAP OF NIGERIA SHOWING OYO STATE

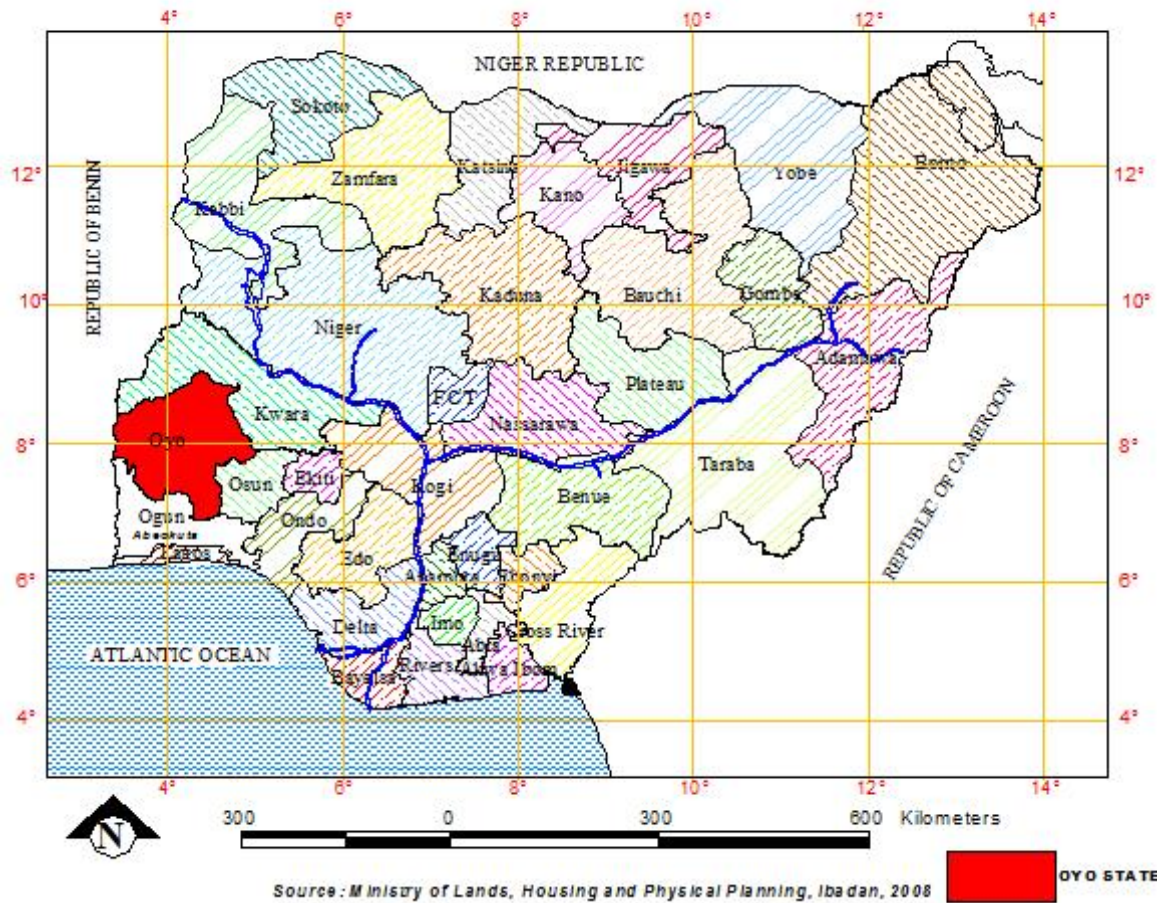


Figure 1. Oyo State in the context of Nigeria

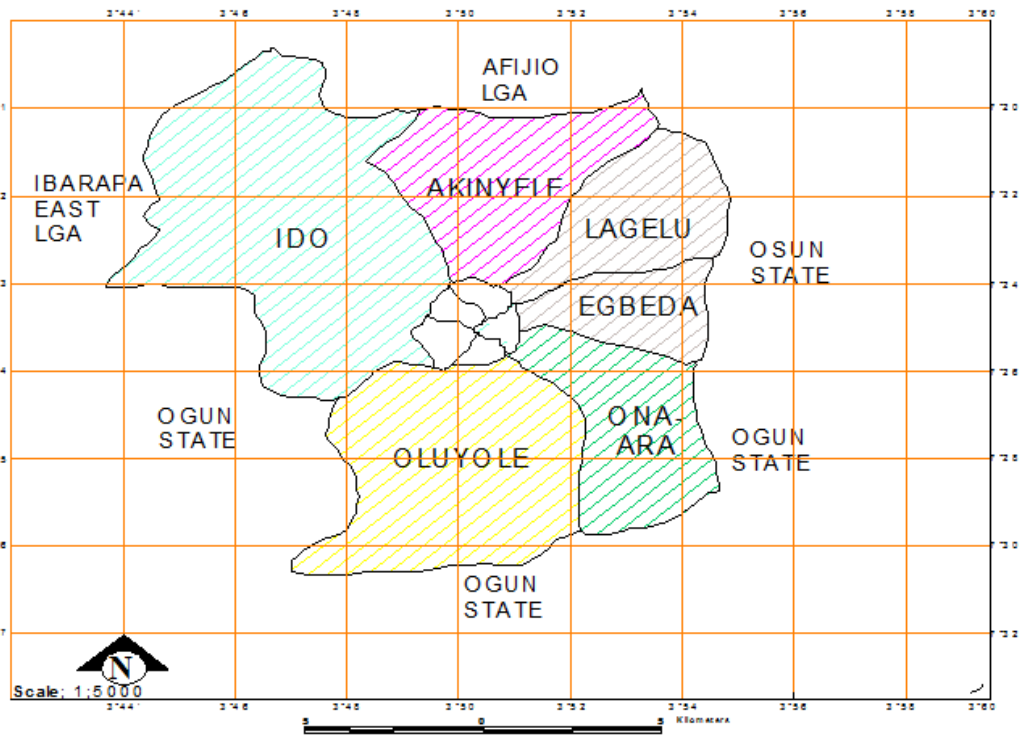


Figure 2. Peri-Urban Areas of Ibadan

The State is bounded on the North by Kwara State, on the south by Ogun State, on the west by the sister state of Osun, and on the West by the neighboring Republic of Benin. The city of Ibadan is located approximately on longitude 3°51 East of the Greenwich Meridian and latitude 7°231 North of the Equator at a distance some 145kilometres worth east of Lagos. Ibadan is directly connected to many towns in Nigeria, as its rural hinterland by a system of roads, railways and air routes. The physical setting of the city consists of ridges of hills that run approximately in northwest – southeast direction. The largest of these ridges lies in the central part of the city and contains such peaks as Mapo, Mokola and Aremo. These hills range in elevation from 160 to 275 metres above sea level and thus afford the visitor a panoramic view of the city. The average temperature of Ibadan is 27°C, with a range of 4°C; the mean annual rainfall is above 1,505mm while the relative humidity is between 60% and 80%. The vegetation, of Ibadan is rainforest. It has tall trees exist in different heights; they form canopies i.e. lower, middle and upper layers; it has numerous heterogeneous species of trees like Iroko, Obeche and Mahogany. The focus of this study is on the Peri-Urban areas of Ibadan. The Local government that fall within this category is: Akinyele, Egbeda, Lagelu, Oluyole, OnaAra and Ido.

Results

The major results of the study include the production of Map, to show characterization of roads and its infrastructures in the study area. Others include the spatial analysis (Query and Buffering) results of the present road conditions and the Identification of some possible strategies for a robust road transport networks in the study area.

RESULTS AND DISCUSSION

Figure 3 shows the spatial analysis of Federal Roads in the Peri-Urban areas of Ibadan. The roads were observed to have characterized with high volume of traffic. The high traffic congestion is a feature of daily occurrence in these areas. The reason for this might not be unconnected with the fact that, these roads carries traffic to and from the city of Ibadan. The situation in Ibadan-Oyo road, Ibadan-Iwo road, Lagos-Ibadan road, and Ibadan-Ijebu Ode road is a good example of what this paper is emphasizing. Similar to the above analysis is the Oyo state roads which were also found out to have generated high volume of traffic and thereby causing traffic congestion. These roads as contained in figure 4 are also wreaking a lot of havoc to the road users in the peri-urban areas of the city.

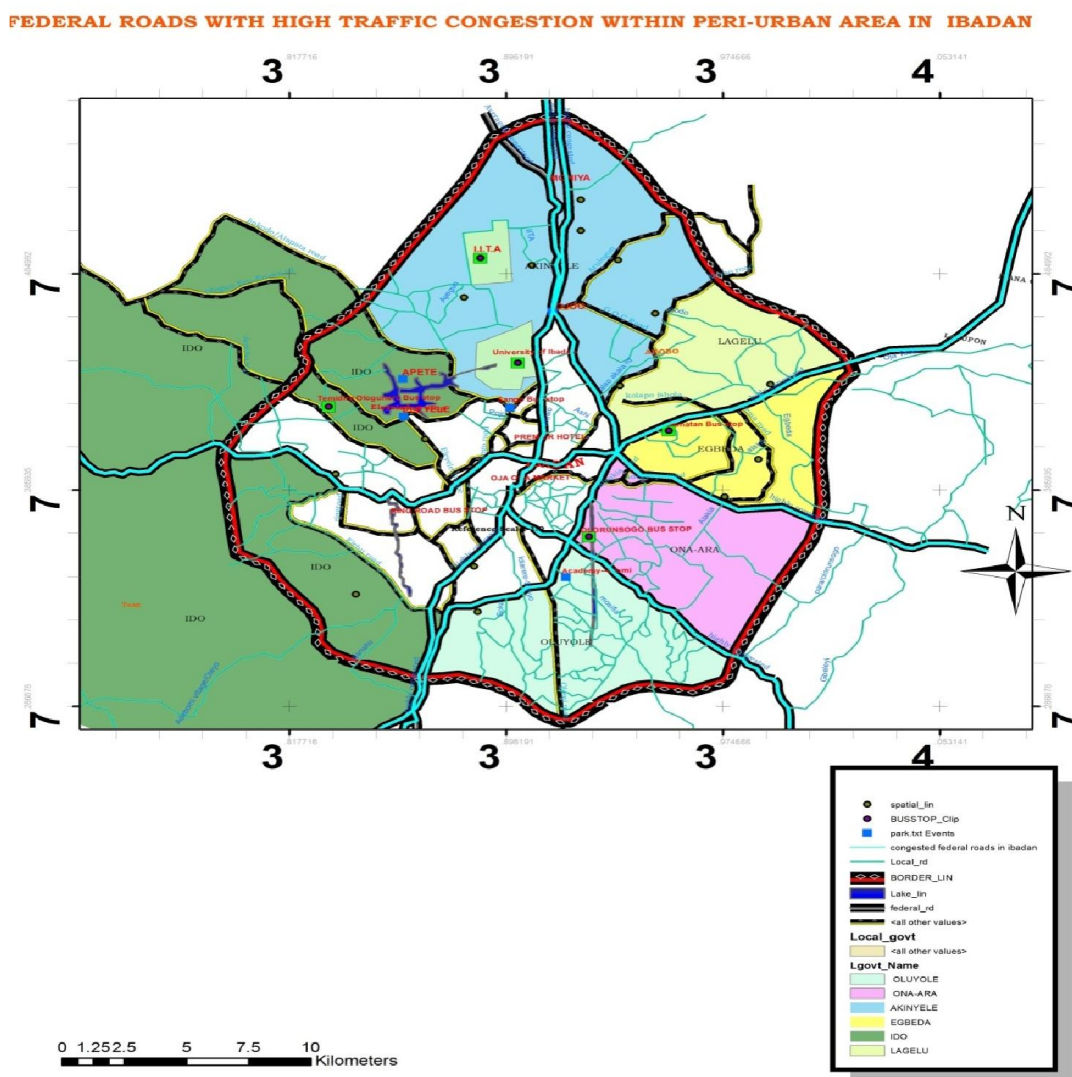


Figure 3. Federal Road with high Traffic Congestion within Peri-Urban areas in Ibadan

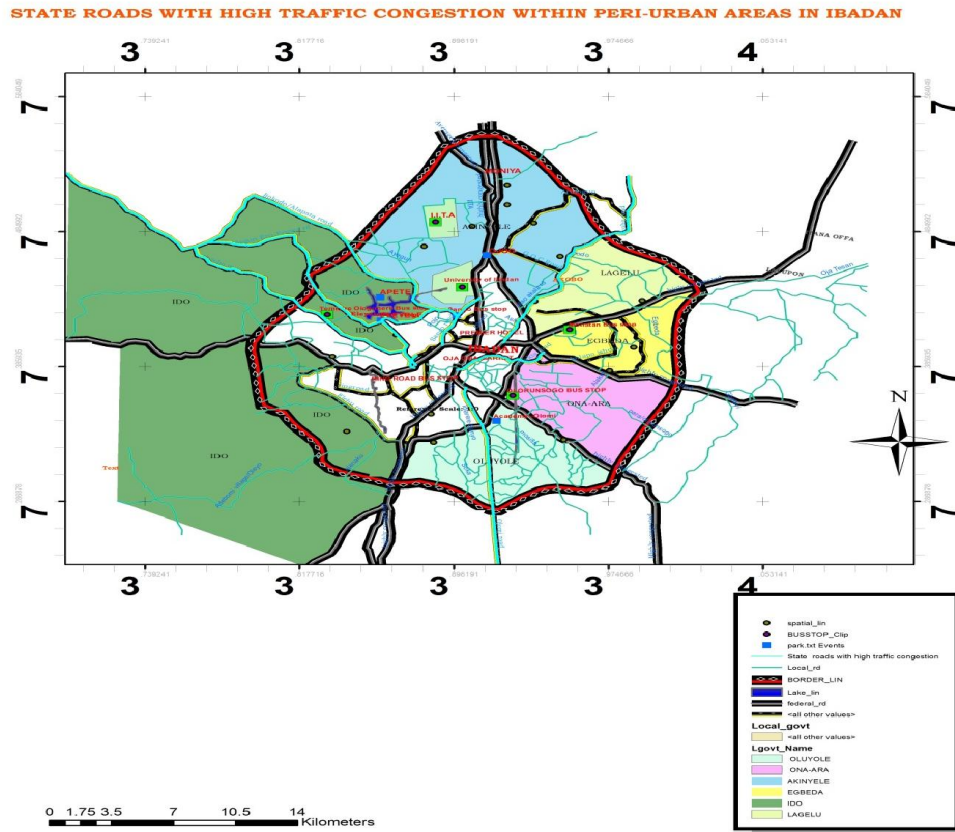


Figure 4. State Road with high Traffic Congestion within Peri-Urban areas in Ibadan

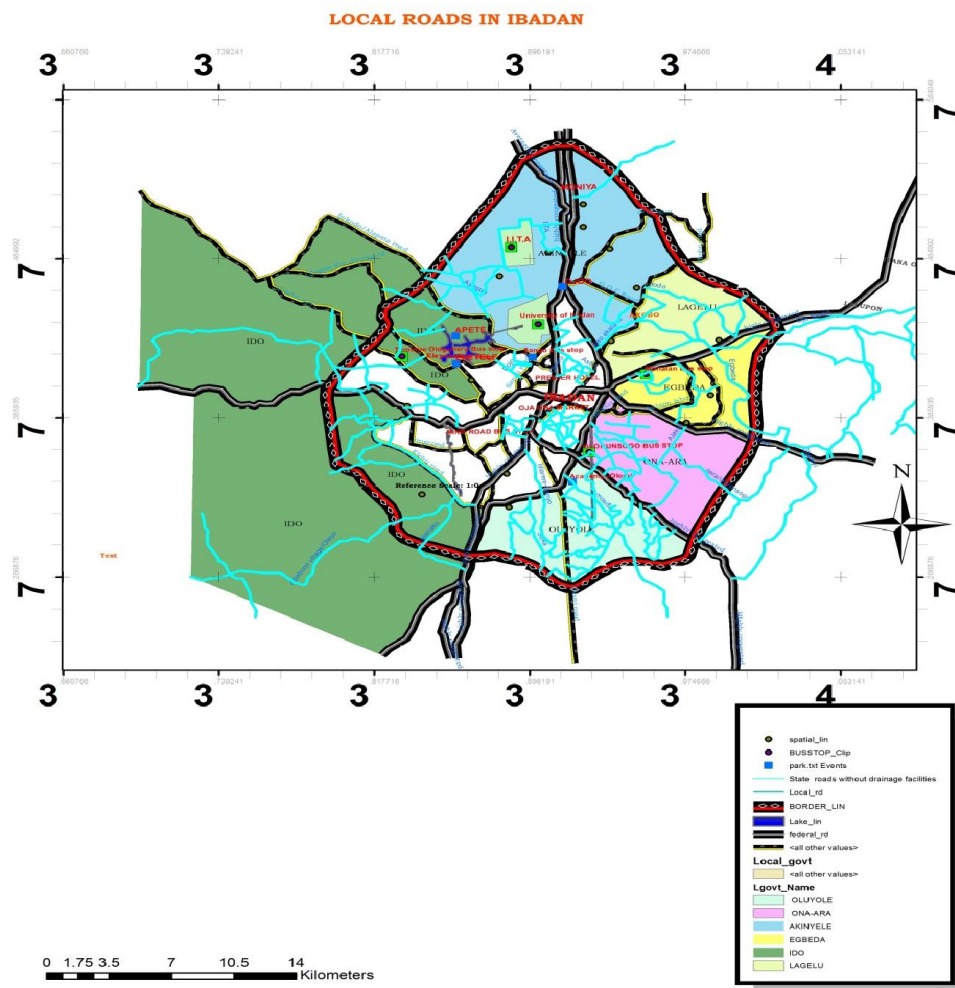


Figure 5. Local Roads in the Peri-Urban areas of Ibadan

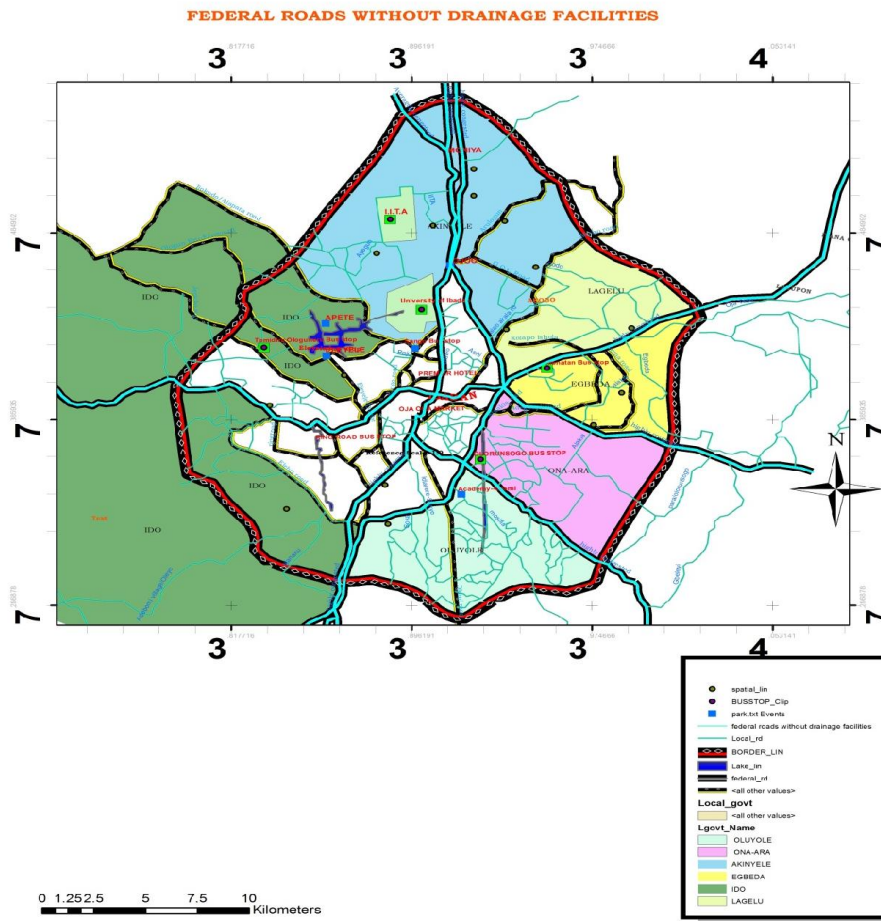


Figure 6. Federal Roads without Drainage in the Peri-Urban areas of Ibadan

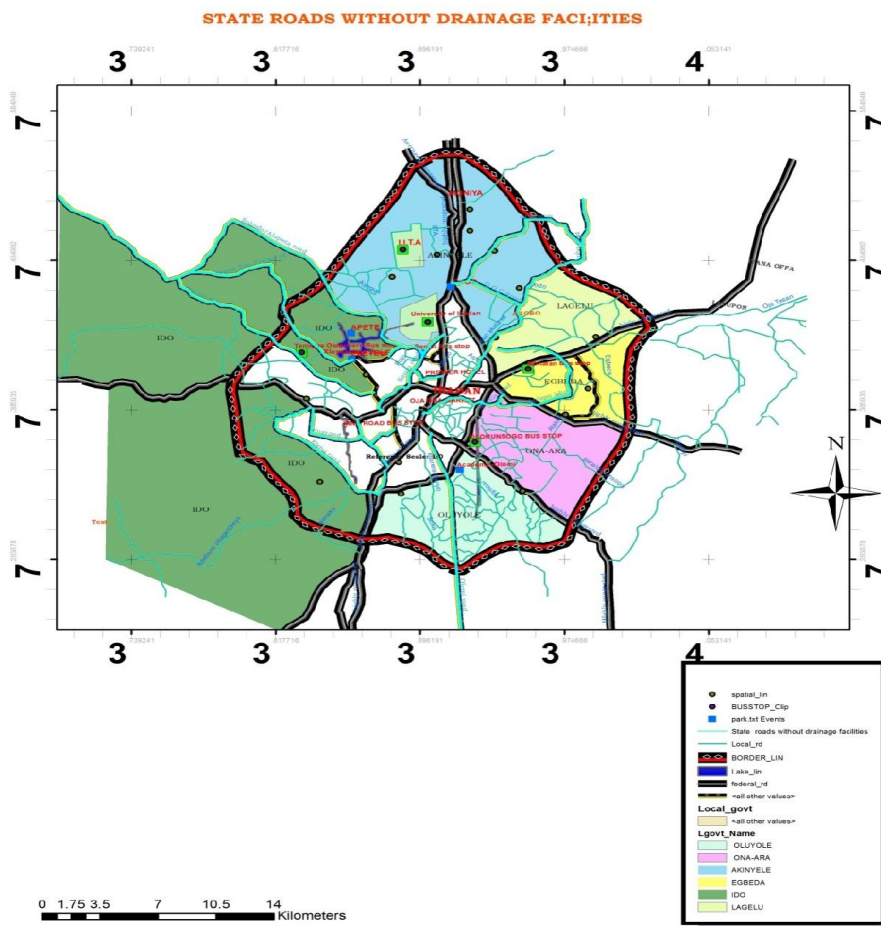


Figure 7. State Roads without Drainage facilities

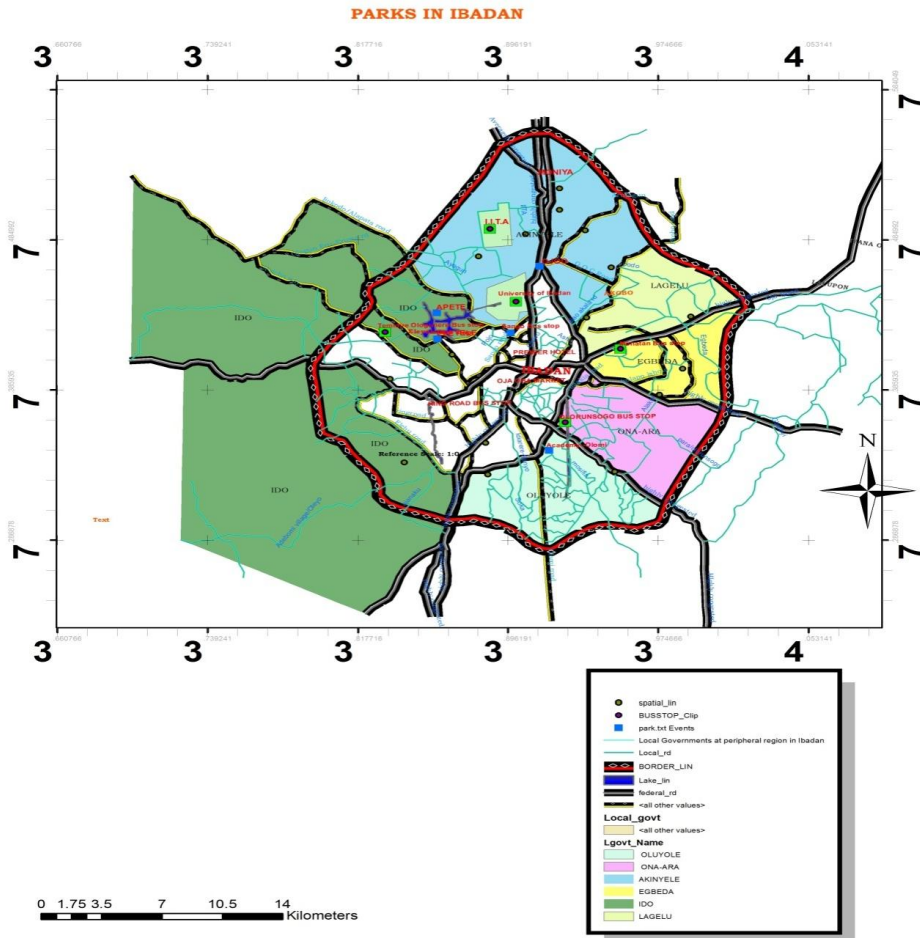


Figure 8. Location of Motor Parks in the Peri-Urban areas of Ibadan

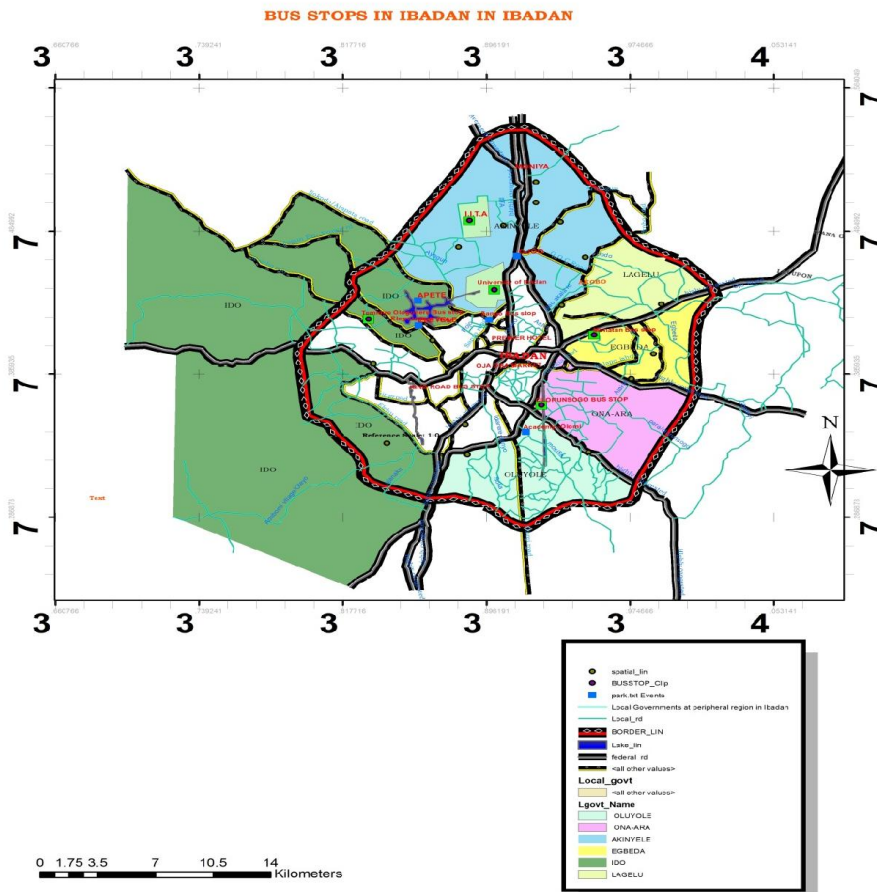


Figure 9. Location of Bus Stops in the Peri-Urban areas of Ibadan

However, figure 5 also gives accounts of the networks of local roads in the study area. It is disheartening to find Federal Roads in the peri-urban areas without drainage system. Likewise State roads, many of them were existing without drainage system. Figure 6 and figure 7 indicated the information. The road that is characterized with poor drainage system has serious implication for effective road transport system and quality of life. It is pathetic that access roads are in deplorable condition. Figure 8 and 9 describes spatial location of motor parks and bus stops in the Peri-urban areas of Ibadan. According to the figures, motor parks are not evenly distributed in the study area. Effective parking system is what urban planners and policy makers can use to address problems related to travel demand and traffic congestion in the city. Parking constantly demands valuable space in the city and its distribution is not properly planned, and thereby constituting negative impacts on the traffic flow and order of the city.

Conclusion

In this study, geospatial techniques were integrated for the mapping and analysis of road transport system in the peri-urban areas of Ibadan. The study successively characterized road system and described road transport infrastructure. Ibadan which is fast growing as a major city in Nigeria needs to put up the appearance that befits status among its counterparts and having a clutter free and appealing landscape is one of the ways to achieve this, hence it is necessary that appropriate planning strategies should be put in place for the improvement of existing road transport facilities in the sub-urb.

Recommendation

1. Drainage should be well dug and constructed with concrete and all covered on the top so that it can serve as a pedestrian walk way. The state government should make sure that all the open drains are covered to prevent quick or accelerated blockage by garbage's and sand.
2. Government should enforce every industry and other land users to make provision for adequate parking spaces, loading and unloading of their goods and for their consumers. This would control illegal parking by individuals or commuters.
3. Government should introduce park and ride for residents which should not be far from road and place of work to encourage people. This would control problem of street parking and also reduce volume of vehicles in the area.
4. Car free cities, car-light cities, and eco-cities designed are needed to eliminate the need to travel by car for most inhabitants.
5. Transit-oriented development at residential and commercial areas should be designed to maximize access to public transport.
6. Community development associations should embark on the rehabilitation of roads provided with adequate facilities to support government.

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