Transport Geography Papers of Polish Geographical Society

2021, 24(1), 31-43

DOI 10.4467/2543859XPKG.21.002.14945

Received: 9.11.2020
Received in revised form: 15.04.2021
Accepted: 16.04.2021
Published: 30.06.2021

PERFORMANCE ASSESSMENT OF THE STATE OF ROAD INFRASTRUCTURE IN SELECTED URBAN CENTERS IN KOGI STATE IN NIGERIA

Ocena eksploatacyjna stanu infrastruktury drogowej w wybranych ośrodkach miejskich w stanie Kogi w Nigerii

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Citation:
Olorunfemi S., 2021, Performance assessment of the state of road infrastructure in selected urban centers in Kogi State in Nigeria, *Prace Komisji Geografii Komunikacji PTG*, 24(1), 31-43.

Abstract: Road infrastructure has been identified as a major factor in the development of a nation and where is lacking or inadequate usually creates a memorable hardship for road users. To this end, this study assessed the state of road infrastructure in selected urban centres in Kogi State, Nigeria. Structured questionnaire cum field observation were deployed to collect the required data for the study. The structure questionnaire were administered to one thousand, two hundred and fifteen (1,215) household heads in the selected urban centres to elicit information on the perception of the urban dwellers with the state of road infrastructure. More importantly, Z-Score technique was utilized to show variation in the distribution of road infrastructure in the selected urban centres in Kogi State. Findings revealed that disparity exists in the provision of road infrastructure across the selected urban centres in the study area with the highest Z-Score value of 3.85 in Lokoja and a least Z-Score value of -0.28 in Mopa-Amuro. Findings also indicated that that the respondents (urban dwellers) were dissatisfied with the condition of road network and fairly satisfied with the state of bridge and drainage system, lay-by and walk way, street light, traffic/road sign and parking spaces available in the study area. Having revealed the level of satisfaction of respondents with the physical state of existing road infrastructures and their serviceability, the study recommends that Kogi State government should made concerted efforts to develop and implement standard road infrastructure capacity framework for road construction, rehabilitation and maintenance across the urban centres in Kogi State.

Key Words: road infrastructure, urban centre, Kogi State, Nigeria.

1. Introduction

Urban centers encounter different challenges, emanating from poor coordination of the existing urban systems or growth. Transport, as one of the components of the urban system, which is responsible for bridging the gap between areas of production and consumption, as well as creating a medium for spatial interaction, continues to be in deplorable state as a result of inappropriate infrastructural design and coordination (Kassahun, 2007). Throughout the world, cities in developing countries are struggling to cope with astronomical population growth that threatens to eclipse infrastructure capacities and cripple economic sustainability. These trends, however, are not confined to poorer countries, but are also being felt in Europe, Japan, and the United States (Yikang, 2013). Among the most severe problems resulting from this growth are congestion, smoke, air pollution and parking (Kennedy et al., 2006).

It has been argued that transportation performs a vital function in human society with its overall contribution to the process of social and economic interaction. To a large extent, the economic and social development of nations is pivoted on transportation system (Emmanuel et al., 2013). The realization of global trade objectives is also hinged on transportation and the linkage between transportation and economic development promotes global economic prosperity (Randall Eberts, 2011). Any form of breakdown in the smooth operation of transportation usually creates a memorable hardship in human life especially where there is under investment in transportation infrastructure which is capable of posing negative consequences on the socio-economic development of a nation (Harriet et al., 2013; Emmanuel et al., 2013, Okoko, 2018). Oyesiku (2000) posits that man, regions, nations and the world would be strictly limited in development without transportation, which is a key factor for physical and economic growth. The mobility of people and goods is highly dependent on the efficient use of available traffic infrastructure; the modernization and expansion of mobility infrastructure to meet the future demand for efficient transport services need to be considered for sustainable spatial interaction. This claim is highly essential to road transport, due to the fact that it accounts for more than 90% of all passengers transport and more than 80% of all freight transport in most countries of the world in terms of passengers and tonnes carried. Road transport infrastructure consists of the fixed installations used by the road transport service providers (i.e. road network) (Kendrick et al., 2004).

Abdulkareem and Adeoti (2004) and Mayaki (2014) also viewed road infrastructure as structural facilities that aid the movement of people, goods and services through the various means of transport on road. This according to the authors include the carriage way, pedestrian facilities (such as walk way, bus stop), drainage system, culverts (box or ring types), bridges and flyovers, street light installations, traffic signs, layby, traffic light, speed breaker among others. Road infrastructure as a major traffic corridor constitutes an important element providing accessibility to different land uses in the urban areas and proper functioning of human settlements to the extent that human settlements and urban development generally are incapable of proper functioning without it (Oni, 2007). In relation to the above, road infrastructure plays a significant role in the growth and development of settlements. It aids movement of people, goods and services from one area to another and where it is adequately developed; it opens opportunities for innovation of new ideas and technology.

Underinvestment in road transport infrastructure could have terrible consequences on passengers' mobility, logistic system and the entire social and economic activities (Chopra, Meindle, 2007). People move within cities to satisfy a purpose such as employment, education, leisure or access to goods and services. That is to say that each time a travel need is to be satisfied, a trip is generated. Unfortunately commuters or passengers, in most developing nations, go through challenges such as discomfort, commuting related stress and delays resulting from the challenges of poor road infrastructure. The stress that passengers go through may be addressed through adequate investment in road transport infrastructure which ensures effective, efficient and reliable transportation system (Rodrigue et al., 2009; Munuzuri et al., 2005).

Water and the road modes constitute the major means of transportation in Kogi State. Areas that are linked by river Niger and Benue navigate through locally fabricated canoe to the hinter land. Currently, the construction of dams on the two rivers has hindered the efficiency of water transportation in the state which has left the bulk of people in the state to rely on road for their movement. The roads across the state is grossly inadequate, as most of them are characterized by potholes coupled with inadequate sub-infrastructure such as drainage system, bus stop, parking facility, bridge, street light among others and poor quality of transport services which hindered effective passenger mobility. Coupled with the above is the frequent attack by armed robbers, kidnappers and other ills across the roads in Kogi State. It is against the above that the study seeks to assess the state of road infrastructure in the selected urban centres in Kogi State, Nigeria.

2. Literature review

It is common knowledge that adequate road networks are very essential aspects of economic activities (Atser, 2012). The Organization for Economic Co-operation and Development (OECD) (2004) defined road as a line of communication (travelled way) using a stabilized base other than rails or air strips open to public traffic, primarily for the use of motor vehicles running on their own wheels, which includes bridges, tunnels, supporting structures, junctions, crossings, parking, bus stop shelter among others. In urban areas, roads may diverge through a city or village and be named as streets, serving a dual function as urban space easement and route. Modern roads are normally smoothed, paved, or otherwise prepared to allow easy travel. According to Adetola (2014), road can be described as an identifiable thoroughfare, route or way between two places, which typically has been improved to allow travel by some conveyance, including a horse, cart or motorized vehicle. The author further noted that traditional roads were simply recognizable routes/paths without any formal construction or maintenance while modern roads are normally smoothed, paved, or otherwise prepared to allow easy travel on land via carriageway. Roads are the primary right-of-way which accommodate and ensure the safety of all modes – bus transit, automobile, walking and cycling. Nigeria has become increasingly dependent on the road system to meet virtually all its inland transport needs as the rail, pipeline and inland waterway systems have deteriorated (Ezeocha, 2011). Road transport in Nigeria accounts for more than 90% of the sub-sector. Road transport activities involve the conveyance of passengers' en-masse or in small numbers, the transportation of animals, farm produce and merchandise and the rendering of mobile services. Nigeria has the largest road network in West Africa and the second largest south of the Sahara. The national network is currently estimated to be 194,200 km of which 34,120 km (17.6%) are federal roads, 30,500 km (15.7%) state roads and 129,580 km (66.7%) local and rural roads. However, the federal roads network carries 70% of freight in the country (Obi-Igbokwe, 2009).

As provided for in the Constitution, the different tiers of government have independent responsibilities for the planning, financing and maintenance of their roads (Federal Government of Nigeria, 2010). The extent to which a nation's land mass is covered by road network is an index of the degree of mobility of people, goods and services within the country, and the quality of the network measures the ease and cost of that mobility. In addition, it is evident that transportation plays a crucial role in shaping the destiny of many nations because modern industry and commercial activities rest on proper, well-developed and efficient transport system. Huge sums of money have been sunk into road development in Nigeria (Central Bank of Nigeria, 2003). Since 1975 and through the 3rd and 4th Development plans and rolling plans till date, the Federal Government used road construction as instrument to expand political delineations so that their structures are better appreciated aesthetically and spatially. The reason behind this is to foster internal trade between areas of the country, that were not accessible by any other mode of transport, and the development of natural resources of the remote areas of the country (Ogunbodede, 2008).

Infrastructure refers to structures, systems, and facilities serving a country, city, or area for its economy to function (O'Sullivan, Steven, 2003). It typically characterizes technical structures such as roads, bridges, tunnels, water supply, sewers, electrical grids, telecommunications among others which are physical components of interrelated systems, providing commodities and services essential to enhance societal living conditions (Fulmer, 2009). Ogwude (2011) quoting Juma (2006) stated that the term infrastructure may be used to mean facilities, structures, associated equipment, services, institutional arrangements that facilitate the flow of goods and services between individuals, firms and governments.

Transport infrastructure consists of fixed installation equipment necessary for conveying people, goods and services. This include the roads, railways, airways, waterways, canals and pipelines, terminals such as airports, railway stations, bus stations, warehouses, trucking terminals, refueling depots (including fueling docks and fuel stations), and seaports (Oni, Okanlawon, 2003; Mayaki, 2014). Road transport infrastructure consists of the fixed installations used by the road transport service providers (i.e. road network). Road transport has trip origin and destination through terminals where passengers can embark, or where goods and services can be loaded or off-loaded in urban areas (Kendrick et al., 2004).

Carole et al. (2008) observed that developing road infrastructure is a cornerstone for accelerating Africa's regional integration, which can in turn attract private sector engagement across economic sectors by increasing market size, improve productivity, foster economies of scale for potential investors and facilitate passenger movement. Road infrastructure is central to the activities of households by providing smooth access to housing, work, recreation centre, market, hospital, school and aids mobility from one point to another and as well enhances economic production (Olorunfemi, Basorun, 2013). This reality becomes hampered when natural disaster or civil disturbances destroy roads, culverts, bridges, electricity

lines, traffic light and signage sign. In such situations, communities' quality of life and productivity become drastically reduced (Atser, 2012). The paramount issues affecting road infrastructure development in Nigeria is related to procurement process and funding (Oyegoke, 2005; Oforeh, 2006; Opawole et al., 2013). A research on infrastructure development quoted by Opawole et al. (2013) revealed that before 1999, Nigeria was losing an average of $265 million annually through several means of manipulation of the procurement procedure in award and execution of public contracts. These manipulations were in the form of inflation of contract costs, use of contract system to divert public funds to private pockets, award of contracts for non-existent projects, use of inexperienced contractors, over-invoicing, influence peddling, award of contracts to friends, relations and family members, and award of contacts without adequate planning and budgetary provisions. In agreement with the above Babalola et al. (2010), identified these abuses as major causes of abandonment of public projects and by implication a major threat to sustainable road infrastructure development in Nigeria. Another problem of road infrastructure sustainability in Nigeria could be traced to poor budget implementation. Budget implementation in Nigeria is identified as low, exemplified by huge budget deficits and poor physical performance (Olufidipe, 2003). According to Opawole et al. (2013) quite a number of projects contained in the annual budgets of government at all levels in Nigeria is either partly implemented or not implemented at all, thus resulting in wide divergence and persistent disparity between the actual and projected budget figure. Besides, sensitive stages, especially, identification, definition, planning, and budgeting, for infrastructure sector at macro-level have also been criticized to be dominated by the executive arm of the government with minimum or no input of the construction professionals (Mogbo, 2001; Opawole et al., 2013). The policy makers who plan for infrastructure development in both the national and state budgets lack adequate knowledge of the complex technological processes of construction and the cost characteristics of infrastructure constructions. These factors brought about poor road infrastructure in Nigeria (Oforeh, 2006). The consequences of these in urban area are traffic congestion due to poor parking system, pothole or bad road condition and accident. In rural areas, it leads to high cost of transportation in moving people and agricultural produce from the rural areas to the urban centre and in most cases hindering them (rural people) from access to good health care services; leaving majority of them to rely on trado-medical care (Gbadamosi, Olorunfemi, 2016).

Several authors have studies road infrastructure with respect to economic development, growth, national development, employment among others. For instance, Viggo (2012), carried out a study on a proposed construction of a new road infrastructure in Helgeland, used a cost benefit analysis by which costs like construction expense, relocating of people and so on were weighed against benefits of reduced time on the road, reduced maintenance costs and increased traffic on the road. The author found out a positive ratio between the variable which implying that the project was feasible. However, the author failed to provide information on the state of the proposed road and proposed sub road infrastructure considered. Adedotun et al. (2016) carried out a study on the assessment of road infrastructure in Osogbo, Nigeria. The authors relied on personal observation and direct measurement of the available road infrastructure to capture the data used for the study. The study found out that out of the 101 km of roads surveyed 77% of the roads are characterized with potholes and about 88% of the roads are without walkways which does not make it safe for pedestrians and about 92% of the roads are without road signs. Meanwhile, the authors failed to provide information on the state of roads.

Bougheas et al. (1999) in their analysis of a symmetric two-country model examines the effects of road infrastructure on specialization and the volume of trade. In their analysis, they convey the message that upgrading of transport and communications networks, which reduces transport costs and facilitates trade of goods both within and across national borders. Any investment in infrastructure by the domestic economy is likely to benefit not only domestic but also foreign producers and consumers. The symmetric nature of their model used, does not allow the authors to address coordination issues, such as the question of how countries might share the costs and benefits of infrastructure provision, which give rise to the possibility of either overinvestment or underinvestment. Nwakaze and Mulikat (2010) assessed the contribution of transportation investments, congestion and traffic related accidents to economic growth in Nigeria from 1975-2006. The authors used the extended Cobb Douglas production function model, they found that transport investment positively contribute to economic growth while traffic contribute negatively. The estimated model used by the authors was the error correction mechanism with the real gross domestic product as dependent variable while the explanatory variables used include total road network, automobile density, physical capital, labour force, and accidents. Although, the authors failed give detail information of the mode of transportation investment considered.

Hite (2006) carried out a study in Germany and measured inefficiency in government spending on road infrastructure, and further provided insight on regional variation in political corruption across Germany using ratio index. The index was calculated as the ratio of physical quantities of public roads over the normalized cumulative capital stock spent on roads. Findings revealed that a greater prevalence of political corruption is believed to exist in regions where the ratio of the physical infrastructure to spending is low. UNEP (2010) looks at the investment in walking and cycling road infrastructure in Nairobi using survey method and find out that investment into walking and cycling road infrastructure in Nairobi is low compare to the level of demand arises over time. Meanwhile, the author did not reveal the pattern of road infrastructure available for such infrastructure in the study area. Empirical study by OECD according to Egert et al. (2009) shows the contribution of road infrastructure to the long-run productivity and income growth is more significant compared to investment on other capital. A study by Fan et al. (2007) demonstrated that rapid development of express way and quality standard roads contributed to poverty reduction and economic growth in China. The study showed how investment on roads increased agricultural productivity and non-farm employment. Ajiboye and Afolayan (2009) also found that improved transportation encouraged farmers to work harder and be more productive, add value to products, reduce spoilage and wastages, empower farmers, have positive impact on productivity, income, employment and reduce poverty level in the rural areas. The gaps identified in the reviewed literature above stands as the gap this study intends to fill.

3. Study area

Kogi State is located between latitudes 7°30¹N – 7°52¹N and longitudes 6°38¹E – 6°42¹E (Fig. 1). Agriculture and fishing are the mainstay of the economy, and the state also has mineral resources such as limestone, coal, marble, and iron ore among others. There are three main ethnic groups and languages in Kogi; these are Igala, Ebira, and Okun (A Yoruba Group) with others such as Bassa-Nge, a people of Nupe extraction in Lokoja and Bassa Local Government Area, Bassa-Komo of Bassa Local Government Area, Gwari, Kakanda, Oworo people (A Yoruba Group), Ogori, Magongo, and the Eggan community under Lokoja Local Government. Kogi State consists of twenty-one (21) local government areas and these are Adavi, Ajaokuta, Ankpa, Bassa, Dekina, Ibaji, Idah, Igalamela-Odolu, Ijumu, Kabba/Bunu, Koton-Karfe, Lokoja, Mopa-Muro, Ofu, Ogori/Magongo, Okehi, Okene, Olamaboro, Omala, Yagba East and Yagba West (Fig. 2).

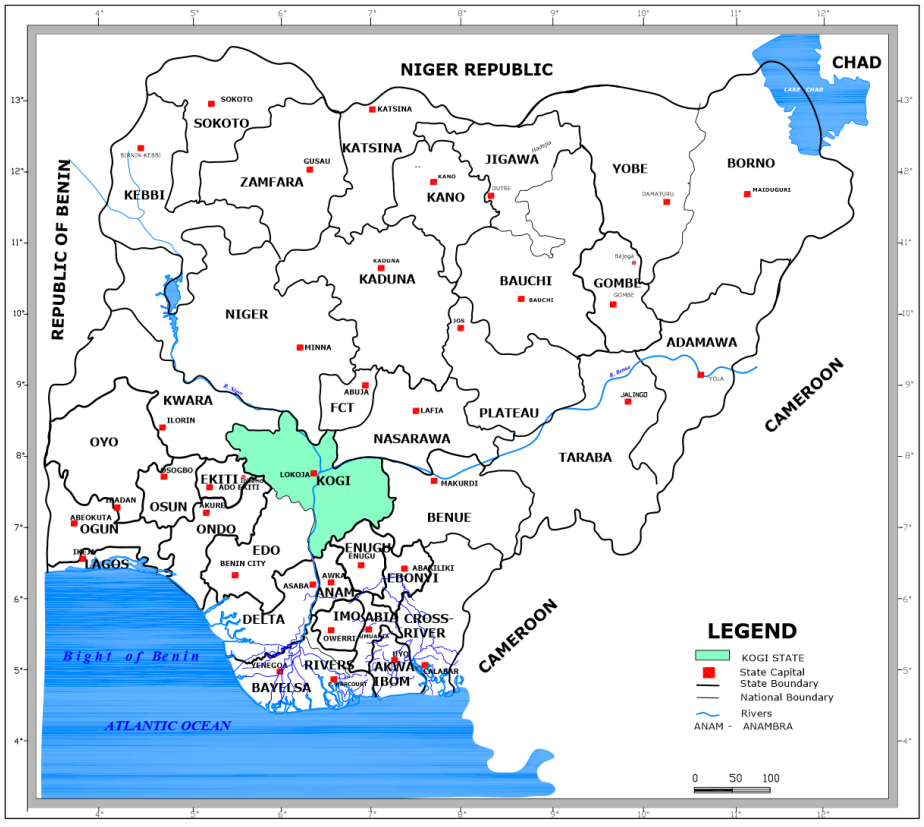

Fig. 1. Map of Nigeria showing Kogi State.

Source: Kogi State Ministry of Works and Urban Development, Lokoja (2018).

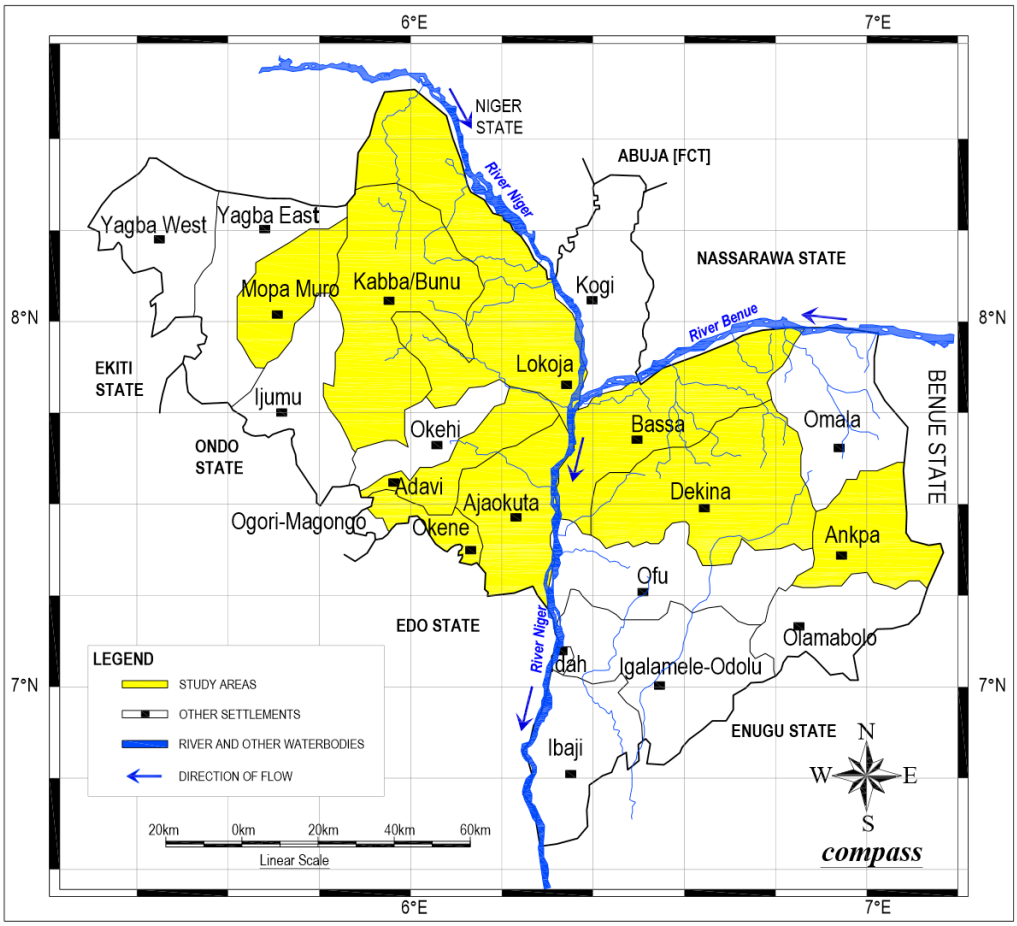

Fig. 2. Map of Kogi state showing selected urban centers for the study.

Source: Kogi State Ministry of Works and Urban Development, Lokoja (2018).

The modes of transportation in the state include road and water transportation. Kogi State connects the Federal Capital Territory with south west and South East States. Being in close proximity to the Federal Capital Territory, Abuja International Airport serves as the national and international gateway for air travelers from and to the state. The notable farm produce in the study area are coffee, cocoa, palm oil, cashews, groundnuts, maize, cassava, yam, rice and melon. The state is home to the largest iron and steel industry in Nigeria known as Ajaokuta Steel Company Limited located in Ajaokuta and the largest cement factory in Africa located in Obajana, Lokoja Local Government Area.

4. Methodology

Both primary and secondary sources of data were used for this research. Personal observation and structured questionnaire were the primary sources of data utilized. The population census figure of Kogi State sourced from the National Population Commission in Lokoja was used as the secondary data. To determine the sample size for the research, the population census results of 2006 of the selected urban centers in the study area was sourced and summed up to be 1,717,087. This was projected to 2017 at growth rate of 2.8%; this amount to 2,321,140 from which 1,658 of the household heads were sampled with the aid of structured questionnaires using systematic sampling method. From the sampled household heads, 1215 questionnaires were retrieved, analyzed and used for this study (Tab. 1).

The data for assessing the satisfaction level of the urban dwellers (respondents) with the condition of the available road infrastructure in the urban centres studied were presented using descriptive statistics. The variables were measured on 5-point Likert scale and weighted mean was also used as a decision rule to justify urban dwellers' satisfaction level with the state of road infrastructure. The weighted mean values used for the parameters by the study was adopted from the study of Olorunfemi (2013); Fadare and Adeniran (2018) where the level of satisfaction of respondents ranked is between intervals and reflected as 4.20 – 5.00 = (highly satisfied); 3.40 – 4.19 = (satisfied); 2.60 – 3.39

Tab. 1. Projected population of selected urban centers in Kogi State from 2006-2017.

S/N	Name of settlements	X1 2006 Population figure	X2 2017 Projected population figure	X4 Household heads to be sampled	X6 0.005% of Household heads (sample size)	X7 Number of questionnaire received
1	Adavi	217,219	294,332	10,512	210	150
2.	Okenne	325,623	434707	15,525	311	205
3	Ankpa	266,176	360,668	12,881	258	200
4	Dekinna	260968	353,612	12,629	253	195
5	Mopa-Amuro	43,760	59,295	2,117	42	35
6	Kabba/Bunu	144,579	195,905	6,997	140	80
7	Lokoja	196,643	266,451	9,516	190	150
8	Ajaokuta	122,432	165,895	5,925	119	100
9	Bassa	139,687	189,276	6,761	135	100
	Total	1,717,087	2,321,140	82,863	1,658	1, 215

Source: X1 – National Population Commission 2006; X2, X3, X4 and X5 – Author's Computation, 2018.

= (averagely satisfied); 1.80 – 2.59 = (fairly satisfied); and 1.00 – 1.79 = (dissatisfied). More importantly, the road infrastructure identified in each of the selected urban centres were subjected into Z-score analysis and this was used to show variation and depict pattern of infrastructural distribution in the study area. The Z – Score formula is stated below

$$Zi = \frac{X-\bar{X}}{SD} \quad \text{..... equation 1}$$

Where Zi = Z-score for observation i
X = the original value in the cell
X = the mean for the variable,
SD = the standard deviation of the X values, and

$$SD = \sqrt{\frac{\sum(X-\bar{X}^2}{N-1}} \quad \text{..... equation 2}$$

Where
N = Total number of observation.

The standardized score model was adopted because it is suitable for measuring variation or disparity in the distribution of a facility over space (Emuophe, 2016). The Z-score had also made it possible to clearly identify the values of each element of road infrastructure after the composite scores were standardized so that the mean became Zero and the standard deviation became unit of measurement (Aderamo, Aina, 2011). The technique is popular for its simplicity, elegance and gives opportunity to rank the unit areas according to their performance in infrastructural distribution (Hamsa, 2016).

5. Result and discussion

5.1. Pattern of road infrastructure development in the study area

Road infrastructure are the structural facilities that aid the functionality of road system. These exist to compliment the movement of road users through their movement involving goods and services in space. The complimentary road infrastructure includes the following: carriageway, pedestrian facilities, drainage system, culverts bridges and flyovers, street light installations, traffic signs, layby, traffic light, among others. The examination of the pattern of road infrastructure in the selected urban centers in Kogi state was carried out to reveal their distribution pattern with the aid of Z-score analysis. Road infrastructure elements such as road network, bridge, and drainage system, lay-by and walkway, street light, traffic/road signs and parking space/facility were counted in each of the selected urban centres and subjected into Z-score analysis as revealed in equation 1 and 2 respectively. The Z-score result of the spatial pattern of road infrastructure in the selected urban centres is shown in Tab. 1. The table revealed that disparity exists in the provision of road infrastructure across locations in the study area. For instance, Lokoja urban centre had the highest Z-score value of 3.93. This indicated that Lokoja is most privileged urban centre in the provision of road infrastructure compared to other urban centres in the study area. This may be attributed to the fact that Lokoja is the capital city of Kogi State and also the intervening city that linked the Federal Capital Territory, Abuja, Western and Eastern part of the country

together. The Z-score value of road infrastructure of other urban centres in descending order in the study area were Okenne (2.85), Ankpa (1.81), Dekinna (0.83) and Ajaokuta (0.77). Mopa-Amuro with a Z-score value of -0.28 is the most disadvantaged urban centre regarding the provision of road infrastructure. Closely followed by Bassa-Oguma (-0.27), Kabba-Bunu (-0.82) and Adavi (-0.81). Detailed presentation of the above can be seen in Tab. 2 while Fig. 3 shows urban centres that are advantage and disadvantage in the provision of road infrastructure in the study area.

In term of ranking of the selected urban centres in Kogi State with their pattern of road infrastructure distribution and availability, Lokoja urban centre ranked first, Okenne ranked second, Ankpa ranked third, Dekinna ranked fourth, Ajaokuta ranked fifth, Bassa-Oguma ranked sixth, Mopa-Amuro seventh, Adavi ranked eight and the least ranked was Kabba-Bunu which ranked nine.

It is also pertinent to note that there is a relationship between the Z-score results of the road infrastructure distribution and the distance in kilometers from the capital city (Tab. 1). This indicate that the closer the urban centres to the capital city (seat of government), the better the level of road infrastructure provision. This development clearly played out in the study area with the capital city (Lokoja) having the greatest concentration of road infrastructures. The road infrastructures decreases as one move away from the city centre. This is in consonance with the study of Basosun (2004) that revealed that the higher order towns usually influences the lower order towns surrounding them in terms of infrastructure provision.

5.2. Urban dweller satisfaction with the state road infrastructure

Road transport infrastructure is an essential element in development of an urban centre. Investigation in to the perception of the urban dwellers with the state of the available road infrastructure in the selected urban centres in Kogi State as indicated in Tab. 2 shows that 74.4% of the respondents (Urban Dwellers) were dissatisfied with the state of road network in the study area, 16.4% were fairly satisfied, 5.5% were averagely satisfied and 3.7% were satisfied. From the analysis, it is observed that the urban dwellers felt dissatisfied with the state of road network in the study area with a mean value of 1.3852. The different types of road network in the study area as revealed by the field survey are truck A, trunk B and truck C roads. The trunk A roads are the Federal road in the state, truck B roads are owned and managed by the state government and truck C roads are the roads that is under the control of Local Government. It is quite worrisome that majority of these roads network types are in deplorable condition. This may be why majority of the urban dwellers were dissatisfied with the state

Tab. 2. Z-score Analysis of the pattern of road infrastructure distribution and availability in the selected urban centres.

Urban Centres	Street Light	Road/Traffic Signs/Traffic Light	Parking Spaces	Road Network	Bridge and Drainage Facilities	Lay-by and Walkway	Z-Score Result	Rank	Distance from Capital City in Kilometres	Remark
Mopa-Amuro	✓	✓	✓	✓	✓	*	-0.28	7	125.8	Disadvantage
Kabba-Bunu	✓	✓	✓	✓	✓	✓	-0.82	9	87.8	Disadvantage
Okenne	✓	✓	✓	✓	✓	✓	2.85	2	77.1	Advantage
Adavi	✓	✓	✓	✓	✓		-0.81	8	48.1	Disadvantage
Lokoja	✓	✓	✓	✓	✓	✓	3.85	1	0	Advantage
Ajaokuta	✓	✓	✓	✓	✓	✓	0.77	5	40.2	Advantage
Bassa-Oguma	✓	✓	✓	✓	✓	*	-0.27	6	57.9	Disadvantage
Dekinna	✓	✓	✓	✓	✓	*	0.83	4	52.1	Advantage
Ankpa	✓	✓	✓	✓	✓	✓	1.83	3	170.6	Advantage

Note: √ available and * not Available
Source: Author's field work, 2019.

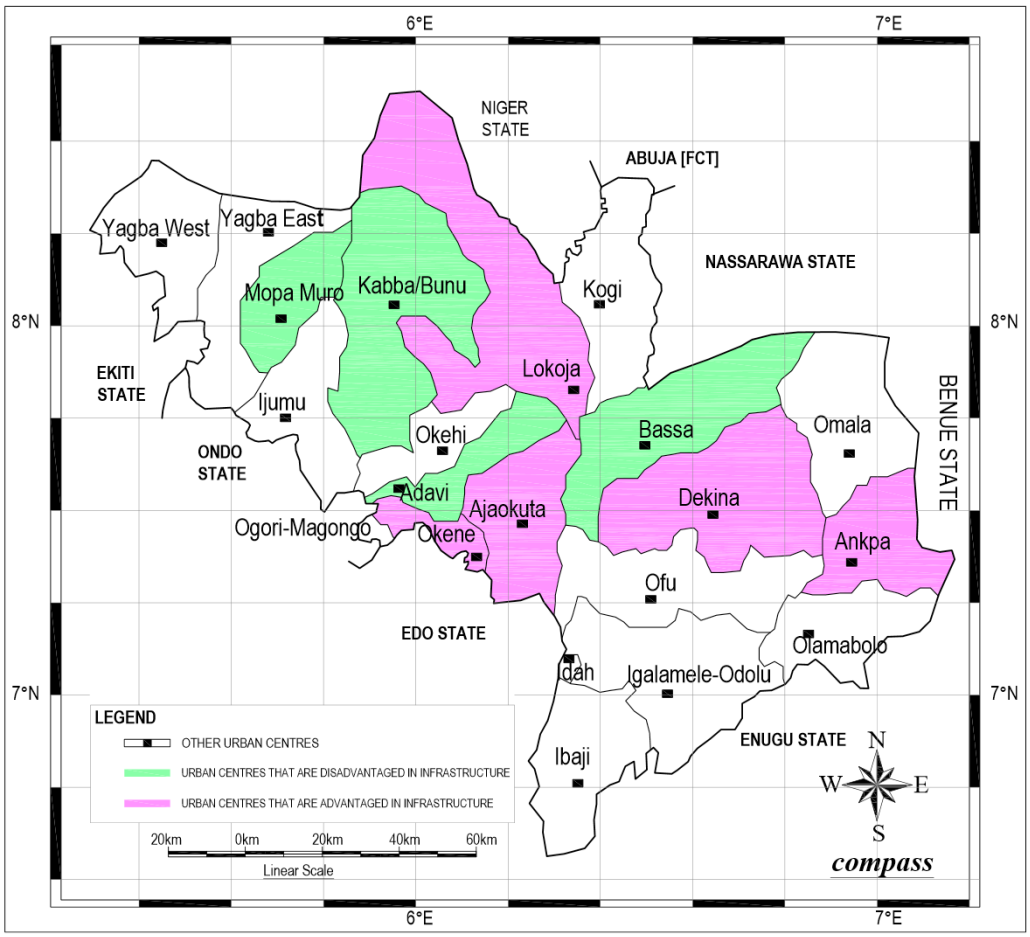

Fig. 3. Disadvantaged and advantaged urban centres in road infrastructure in the study area.

Source: Author's field work, 2019.

of road network in the study area. Buttressing the above, Olorunfemi (2013) identified problems facing road transport system in Kogi state to include poor road design/ construction and maintenance culture. These problems have turned many roads in the area into accident trap that has claimed many life and destroyed several properties.

The analysis of urban dwellers satisfaction with bridge and drainage system indicates that 43.7% were dissatisfied with the condition and functionality of bridge and drainage system in the area, 31.9% were fairly satisfied, 10.9% were averagely satisfied, 8.7% were satisfied and 5.2% were highly satisfied. The mean value revealed that considerable proportion of the sampled respondents sampled were fairly satisfied with the state of bridges and drainage system in the study area. Some of the extant pedestrian bridges in the area were under-utilize simple because government and her agencies does not enforce substantial compliance to their usage. As such, most of the pedestrian bridges in the area have been converted to where traders advertise their goods and in some cases, they have become an abode for mentally derange people. Evidently, majority of the roads in the study area lack proper drainage facility that should prevent soil erosion, flooding and control inflow of water along the road corridors. Where it is available, it has been blocked and filled up by sand and debris, thereby making the roads unsafe for users particularly during the raining season. Giving the benefit of drainage system, Morakinyo et al. (2012) opined that provision of drainage system will help to remove surface or subsurface water from a given area by natural or artificial means. The essential principle of any type of land drainage is to provide an open and readily accessible channel through which the surface or subsoil water can flow. Absence of drainage system in most of our roads has given rise to excessive potholes and delay in movement most especially during the raining season.

The examination of lay-by and walk ways available for the urban dwellers (respondents) shows that 21.5% of the respondents were dissatisfied with the lay-by and walkway available, 44.5% were fairly satisfied, 17.9% were averagely satisfied, 10.5% were satisfied and 5.5% were highly satisfied. The above revealed that majority of the urban dwellers sampled were

fairly satisfied with the state of lay-by and walk way in the study area with a mean value of 2.3399. The field survey revealed that lay-by and walk way were concentrated in strategic places such as city centres and area where higher institutions are situated.

Urban dwellers satisfaction with the state of street light was investigated, 11.2% were dissatisfied, 53.3% were fairly satisfied, 29.1% were averagely satisfied and 6.4% were satisfied. This indicated that urban dwellers in the study area were fairly satisfied with state of street light with the mean value of 2.3078. Although majority of street light identified in the study area are solar powered street light and reasonable number of it are still in good shape/functioning. Nevertheless, effort should be made to improve and sustain its functionality so as to continuously aid movement of road users and prevent crime and other social vices detrimental to life and prosperity at night. This is consistent with the assertion of Fadamiro (1998) and Okoko (2006) that street light play an important roles in the urban centres, in such a way that it help to reduce the incidence of road accident at night and also help to illuminate traffic signs and assist in reducing the incidence of crime especially at night. More importantly, provision of street light will further enhance mobility at night for both passengers and drivers.

The traffic/road signs and traffic light have been identified to be one of the significant tools for sustainable road safety. Traffic/road signs are meant to guide road users when plying the roads and it is usually situated in strategic places where it can be boldly seen by road users for the purpose of ensuring smooth and safe traffic flow. From the analysis, it is noted that 63.9% of the urban dwellers were dissatisfied with the state of traffic/road signs/ traffic light in the study area, 18.7% were fairly satisfied, 8.1% were averagely satisfied, 5.3% were satisfied and 4.0% were highly satisfied. The mean value for the traffic/ road signs and traffic light was given as 1.6700. This implies that road users were fairly satisfied with the state of traffic/road signs and traffic light in the study locations. From the study, most of the devices were moribund; although some are still working but need to be upgraded for maximum operations. Kadiyali (2002) affirmed that there is a significance correlation between traffic signal light and traffic/road signs as both complement each other by providing timely warning of hazardous situations when they are not self-evident, regulating traffic by impacting message to the drivers about the need to stop, gives way and limit their speeds as well as given information about the highway routes, directions and points of interest.

Parking facility/space is an essential element of road infrastructure and one of the major components of transportation needs of the people to ensure safety and easy flow of traffic. As indicated in Tab. 2, 53.3% were dissatisfied with the state of parking facility/space available in the study, 34.2% were fairly satisfied, 8.7% were averagely satisfied and 3.6% were satisfied. The mean value for the state of parking facility/spaces in the study area revealed that the urban dwellers were fairly satisfied with the state of parking facilities/spaces. The field survey revealed that adequate spaces were not made available for off street parking and this propels many people both private and commercial drivers to park their cars along the road. The few spaces made available for off-street parking were not properly design and grossly inadequate to accommodate the

Tab. 2. Satisfaction level of urban dwellers with the state road infrastructure in the study area.

Road infrastructure	Dissatisfied	Fairly satisfied	Averagely satisfied	Satisfied	Highly satisfied	Weighted mean	Remark
Road network	904 (74.4%)	199 (16.4%)	67 (5.5%)	45(3.7%)	0	1.3852	D
Bridge and Drainage System	531 (43.7%)	388 (31.9%)	127 (10.9%)	106(8.7%)	63 (5.2%)	1.9975	FS
Lay-by and Walk way	261 (21.5%)	546 (44.5%)	217(17.9%)	128(10.5%)	67 (5.5%)	2.3399	FS
Street Light	136 (11.2%)	647 (53.3%)	354(29.1%)	78 (6.4%)	0	2.3078	FS
Traffic/Road sign and Traffic Light	776 (63.9%)	227 (18.7%	98 (8.1%)	65 (5.3%	49(4.0%)	1.6700	FS
Parking facility	650 (53.5%)	415 (34.2%)	106(8.7%)	44(3.6%)	0	1.9893	FS

Note *1.00-1.79= D (Dissatisfied); 1.80-2.59=FS (Fairly Satisfied); 2.60-3.39= AS (Averagely Satisfied); 3.40-4.19 = S (Satisfied); and 4.20-5.0= HS (Highly Satisfied)

Source: Author's fieldwWork, 2020.

volume of vehicles plying the road corridor. Confirming the above, Olorunfemi (2013) noted that one of main problem of road network in Lokoja and the entire urban centres in Kogi state is parking. In a related study, Sivasubramanian & Malarvizhi (2007) opined that in most cities of developing countries, the planning of road networks lacks the provision of the entire basic infrastructure (parking facility inclusive) that should provide safe and orderly movement of the vehicles. This has worsened the problems of traffic congestion, traffic delay and accident in most cases.

6. Conclusion and recommendations

The study assessed the state and functionality of road infrastructure in the selected urban centres in Kogi State, Nigeria. Using Z-score values, it was clearly revealed that disparity exists in the provision of road infrastructure across the selected urban centres in the study area. From the study, the respondents (urban dwellers) were dissatisfied with the condition of road network in the study and fairly satisfied with the state of bridge and drainage system, lay-by and walk way, street light, traffic/road sign and parking spaces available in the study area.

Nevertheless, efforts should be made by Kogi State government to review and upgrade where necessary the existing road infrastructure in the urban centres so as to enhance road users' safety and productivity. This become necessary as the study area is an intervening State that absorb traffic nearly from all parts of the country, housed the largest cement company in Africa and other big companies that relied on heavy duty vehicle for the transportation of their finished goods. The review will reveal the physical state and serviceability of the road infrastructure through which the issue of disparity in the provision of road infrastructure across the selected urban space can be addressed. Also, standard road capacity framework for road construction, rehabilitation and maintenance across the urban centres in Kogi Staten should be developed and implemented.

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