European Journal of Engineering & Environmental Sciences

RESEARCH ARTICLE

Evaluation of Traffic Problems in Enugu Metropolis, Enugu State, Nigeria

Agwu, Jacob Parkins[1*], Ibeneme, Afor Patience[2] and Ikeokwu, Ihechimere Ursula[3]

[123]Department of Geography, Alex Ekwueme Federal University, Ndufu Alike Ikwo (AEFUNAI), Nigeria

Corresponding Author

ABSTRACT

With the rising influx of people into cities, conveying both people and goods from one place to another poses a daunting challenge to city authorities. In order to move people and goods, these activities generate and attract traffic, which of course has implications on mobility. Therefore, the aim of this study sought to evaluate the traffic problems in Enugu Metropolis, Enugu State, Nigeria. Study objectives pursued included ascertaining the causes of vehicular traffic composition of selected roads in Enugu metropolis and to evaluating the traffic problems prevalent in the study area. The study adopted the cross-sectional survey design which aimed at arriving at veritable findings and conclusions. Purposive and simple random sampling techniques were adopted where a total number of 400 respondents were selected for the study. Well-structured questionnaires, interview and personal observation facilitated data collection. Collected data were presented and analyzed using tables, percentages and means. Findings from the study revealed that the causes of traffic congestion included bad roads, breakdown of vehicles; traffic checks; roadside trading; on-street parking; increased car ownership; irregular bus stops; cultural and religious activities; accidents; flooding. Further study findings showed that delays in travel time, pollution (noise and air); deaths from road accidents; fuel wastage and increase maintenance; dilapidation of road, bus shed, street lights; parking problems; loss of productive time; unwanted urban sprawl constituted the intra-urban traffic problems prevalent in Enugu Metropolis. The major recommendation of this study highlights that the government should formulate policies that encourage public transportation policy (reduction in transport fares, adherence to vehicle carrying capacity and provision of more coal city buses). This will go a long way in reducing the volume of vehicles plying roads in Enugu metropolis and ultimately the menacing problems of Intra-urban traffic problems both in the study area and Nigeria at large.

Keywords: *Congestion; Enugu Metropolis; Traffic*

Introduction

With the rising influx of people into cities, conveying both people and goods from one place to another poses a daunting challenge to city authorities. The United Nations prediction that cities with one million people will increase to over 300 by the year 2000 in the developing world gives credence to this fact. This trend is likely to continue due to rapid urbanization, assisted by improvements in health care and the multifarious functions performed by cities which form a major attractive force. This situation has its impacts on the movement of people most especially in the developing world. Thus, these activities make them generators and attractors of traffic, which of course has implications on mobility (Ogunbodede, 2021).

Traffic congestion regarded as a global phenomenon is associated with urban environment across the globe; this is due to the fact that people need to move from one place to the other, especially when trekking becomes inefficient. A forecast by Global Traffic Volume (GTV) reveals that traffic congestion would double between 1990 and 2020 and again by 2050 (Engwitch, 2024). Another forecast by International Road Index (INRIX) (2021) Global Traffic Scorecard on congestion and mobility trends for over 200 cities across 38 countries reveal that over half of these cities registered over 100 hours lost in congestion per driver per year. A recent survey by Holmes (2022) revealed that average commuting time is more than I hour each week day per workers in 41 out of 52 countries. This assertion as envisaged by the end of year 2020 and 2050 is an indication of what the future congestion portends for people living in urban environment (Ogunbodede, 2021).

In Nigeria, traffic congestion in major cities has remained a part of the operating transportation system especially during the mornings, afternoon and evening peak periods. As noted by Ogunsanya (2020), the problems of traffic congestion is no longer limited to traditional cities like Lagos, Ibadan, Benin City, Portharcourt, Abuja, Kano and

Citation: Agwu, J. P., Ibeneme, A. P. & Ikeokwu, I. U. (2025). Evaluation of Traffic Problems in Enugu Metropolis, Enugu State, Nigeria. *European Journal of Engineering and Environmental Sciences, 9(1), 1-8. DOI: https://doi.org/10.5281/zenodo.15676565*

Kaduna (Papoola, Abiola & Adeniji, 2021). In Lagos, the unpredictability of transit time negatively impacts businesses and other socio-economic activities (Odeleye, 2022). Oni (2023) opined that traffic problems in Lagos are multi-dimensional and bewildering. The countless man-hours lost in traffic congestion and the wastefulness of human energy and motor fuel are factors that have the most serious impacts on the economic efficiency and social performance of the areas. Consequently, Mobereola (2021) disclosed that commuters in Lagos spend on average of 40% of their income on transportation. The case of Kaduna is no different. The problem of traffic congestion in Kaduna metropolis has persisted despite administrative efforts to tackle it. For example, the Kawo flyover was constructed in 2006 in order to decongest traffic along Kawo-Zaria route, while the construction of the fourth bridge along Yakowa road was also to alleviate the problem of motorists in spending hours to commute from the southern part of the metropolis to the northern part where many of the government offices are located.

In Enugu State, traffic problems have manifested in increased travel time from point of origin to destination, rising heat levels, gridlocks, frustrations, noise and air pollution (Nnaemeka-Okeke, 2022). Traffic congestion is mostly experienced along Agbani road to Holy Ghost, Liberty to Abakpa Nike where commuters and motorists are forced to spend hours on transit for journeys that would have taken minutes. It is therefore believed that proper identification of traffic characteristics is the first step in tackling traffic challenges being faced by most metropolises. This is necessary as it provides an essential guidance for selecting appropriate measures (Rao & Rao, 2024). Therefore, the aim of this research is to evaluate the traffic problems in Enugu metropolis, Enugu State, Nigeria with a view to proffering cost effective measures to curb this daunting urban menace. Specific objectives of the study include ascertain the causes of vehicular traffic composition of selected roads in Enugu metropolis and evaluate the intra urban traffic problems prevalent in the study area.

Theoretical Considerations

The Down's Law of Traffic Congestion

The road traffic congestion law, according to Downs (1999) states that "efforts to relieve automobile congestion through highway and other infrastructure expansion will simply be undone by continuous growth in the demand for travel; thus, fulfilling the now well-known and documented "law of Congestion". This is now widely known as generated or incurred demand.

Despite the recognition of Down's Law, few transport policies ultimately reflect this, and planners, politicians and citizens alike all hope that the next road expansion will bring the elusive solution to congestion woes (Zegras, 2021). Downs (1999) warns that "ring road and bypasses may not provide a solution to peak-hour traffic loads; the most important thing to understand about peak-hour traffic congestion is that once it has appeared in a region, it cannot be eliminated or even substantially reduced". Therefore, building or improving highways to relieve congestion might be short-lived in areas where population is projected to grow substantially.

Traffic Equilibrium Theory

The traffic equilibrium theory as postulated by Florian (1999) stems from activities embarked upon by city officials to curb traffic related problems, most notably is the construction and expansion of new and existing road networks. Florian (1999) stated that though it is likely reasonable for commuters and motorists to avoid certain routes (A) due to heavy traffic congestion and choose an alternative route (B) that is free from congestion. Florian (1999) opined that with time and continued usage of such route by motorists from route (A), route (B) becomes congested as travel speed reduces. He further stated that as congestion becomes heavy on the alternative route (B), it becomes equally profitable to use route (A). Florian (1999) added that two principles formalize the notion of equilibrium. First was that journey times in all routes actually used are equal and less than those which would be experienced by a single vehicle on any unused route. Also, under certain assumptions, he opined that the routes actually being used are the shortest in time (or cost) under the prevailing traffic conditions and their perceptions by the travelers. Secondly is the principle which states that users have the right to choose routes that are best suitable to them. This principle is referred to as "user optimal flow". A case in point in Enugu metropolis is the Gariki/Agbani road route to Holy Ghost/Okpara Avenue, a situation where most commercial vehicles and private car owners often prefer to divert to New Layout so as to avoid the bottleneck points around mayor and One Day. This is regarded as a strategy of saving cost related to fuel wastage and vehicle maintenance. The above theories in relation to the menace of the problem of road traffic in an urban setting necessitates a better understanding of the phenomenon as conceptualized in literature.

Empirical Review

Different researchers and authors have lent their voice on traffic problems on urban road networks. On the causes of intra-urban traffic problems in urban transport systems, Aderamo (2022), examined traffic congestion problems and their causes at selected road intersections, in Ilorin, Nigeria. Traffic volume and delay were estimated and the causes of delay were identified. The result revealed that space and time variations exist in traffic flow and delays at the intersections. Traffic wardens and parking problems were found to be the greatest cause of delays. The study recommended that the road intersections be signalized and vehicle parking be strictly prohibited to reduce congestion and delays.

Ukpata & Etika, (2021) investigated traffic congestion which has become a common sight in most urban centres of Nigeria. A survey was conducted during the Annual National Conference of the Nigerian Society of Engineers (NSE) which held in December 2011 at the Calabar Tinapa Business and Leisure Resort. Three hundred (300) copies of questionnaires were distributed among participants and 196 returns were made and these were analyzed. The results showed that poor driving habits, poor road network, inadequate road capacity, and lack of parking facilities constitute the greatest causes of traffic congestion in Nigeria. Also, Lagos, Port Harcourt and Abuja were identified as cities most affected by traffic congestion.

Bashiru & Waziri (2023) studied the problems of intra-urban traffic in Lagos Nigeria and found that 57% of commuters and motorists spend between 30 to 60 minutes on the road due to traffic congestion. Their results also showed that the worst traffic congestion occurs on Mondays. They listed traffic congestion in Lagos to include, presence of pot holes/bad road, trading activities, on-street parking, loading and discharging of passengers, illegal bus stops, flooding/poor drainage, vehicle breakdown, narrow road sections, religious activities, high volume of traffic, lack of parking space and lack of traffic light at some road intersections.

Thwala et al, (2021), examined the effects and causes of traffic congestion in Ibadan city, Nigeria. The study was carried out in three neighborhoods (Agbowo, Bodija and Agodi Gate) in Ibadan North Local Government Area. Survey approach through questionnaire was used for data collection. Fifty (50) respondents were sampled in each of the three neighborhoods making a total of 150. Descriptive statistics such as means, simple percentages and graphics were employed in analyzing the data collected. Results showed that 51.3% of the respondents spend between 21 minutes and above on congestion daily while 20.7% spend between 5-15 minutes and1.3% less 5 minutes. It was equally observed that residents in the city spend almost twice the time they would use on their trip from home to office due to traffic congestion. On the temporal and spatial pattern of traffic congestion in the three neighborhoods, the results revealed that Agbowo (65.3%) recorded the highest traffic congestion in the evening and morning period followed by Bodija (48 %) and Agodi Gate (31. 4%). On ranking of some major routes in the study area on traffic congestion by respondents, Agodi –Iwo Road route ranked highest with a mean value of 1.45 followed by University of Ibadan (U.I)–Bodija-Agodi Gate route with mean value of 1.27 and Sango-Iwo Road 1.03. The authors recommended the banning of street trading and provision of functional mass transit buses.

Ibrahim & Salisu (2020) studied the effects of road development on travel time and cost in Kaduna state, Nigeria. The research determined the travel time as it relates to road connectivity and accessibility among some selected major settlements. Questionnaire administration was carried out in major motor parks in the selected settlements. The results of the study showed that there was significant decrease in travel time between different locations in Kaduna State which can be attributed to the huge investments in road development in the State. The reduction in travel time has brought about greater spatial integration in the State. It also revealed road development translated to improved accessibility and connectivity and decrease in travel time.

Though studies had investigated the various aspects of intra-urban traffic problems, much of it is concerned with traffic problems as it relates to congestion, travel time and also the causes and effects of traffic problems on urban environment. Only a small number of papers focused on an in-depth understanding of the problems of intra-urban traffic as it affects both the residents and the urban environment at large. Aderamo (2022), Thwala et al. (2021), Ukpata & Etika (2021), Bashiru and Waziri (2023) and Ibrahim and Salisu (2020) focused on the causes and effects of traffic congestion in selected cities of Nigeria namely: Illorin, Calabar, Lagos, Mowe-Ibafo, Ibadan and Kaduna respectively. There seems to be a dearth of literatures that focused on the problems of intra-urban traffic in cities of developing countries like Enugu metropolis. The study therefore sought to fill this gap in literature. The study performed an in-depth study of the causes and problems of intra-urban traffic in the study area with a view to proffering lasting and cost-effective solutions. This will ensure that major routes in Enugu metropolis are free from

traffic gridlocks with results in daunting problems for the residents. This will make travel enjoyable and living in the city worthwhile.

Materials and Methods

The Study Area

Enugu metropolis lies approximately between latitude $6^0$21' N and $6^0$30'N and between longitude $7^0$26' E and $7^0$37'E of the Greenwich Meridan. The total area coverage is approximately 72.8 square kilometers. Enugu Metropolis comprises three council areas Enugu North, Enugu East and Enugu South Local Government Areas. It is bounded in the East by Nkanu LGA, in the West by Udi LGA, in the North by Igbo-Etiti and Isiuzor and in the South byNkanu West LGA.

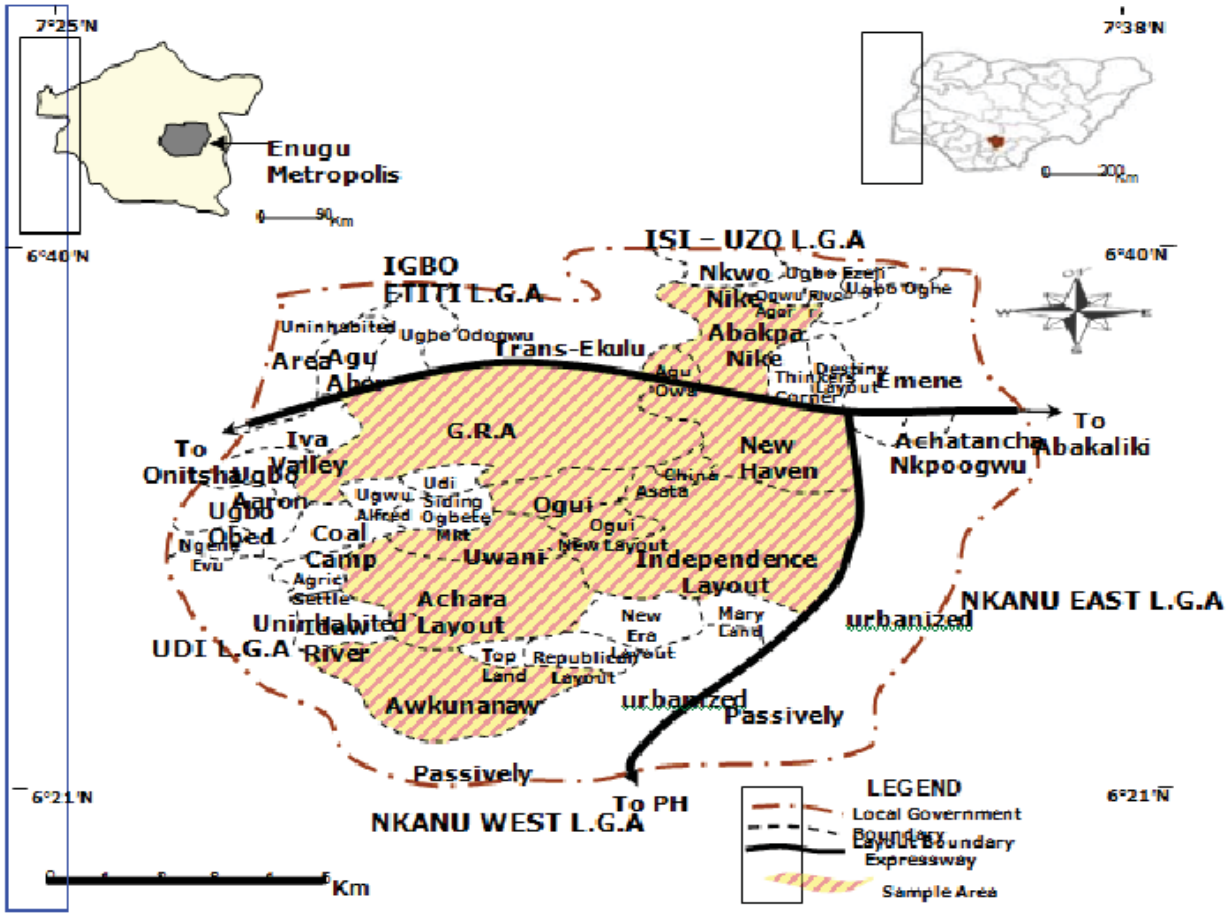

Figure 1: Map of Enugu Metropolis
Source: Enugu State Geology and Survey, 2025

Geology

In terms of geology, the town lies in the eastern Nigeria sedimentary basin, underlain by Enugu shales, lower coal measure (Mamu formation) and false bedded sandstone (Ajalli formation) (Egboka, 2021). Its topographical features are classified into two; the escarpment zone, the plains and lowlands of Cross River Basin. Average maximum temperature is usually a little above 27˚C all over the year although it sometimes exhibits peaks of up to 36˚C in March, which is usually the hottest month of any year. Average annual rainfall is about 1800mm but over 70% of the amounts fall in four months, between June and September. The metropolis sources its water supply mainly from Ekulu and Asata rivers boreholes including Ngwo as well as shallow wells around Abakpa-Nike, Emene, New Haven and parts of Independence Layout where the geological formation permits.

Population

The metropolis comprises three local government areas (Figure 1); namely, Enugu North, Enugu South and Enugu East. The population of Enugu as given by the 2006 census data from the National population commission is put at 722,665 persons with 348,902 males and 373763 females.

Methods

The study employed a cross-sectional survey design aimed at evaluating the intra-urban traffic problems in Enugu metropolis, Enugu State, Nigeria. Information were obtained from residents of the selected areas, various transportation management agencies in the areas, transport Company Unions, Town planners and other professionals in the built environment as domiciled in Enugu Metropolis particularly in Agbani road, Ogbete/Holy Ghost and Abakpa Nike. Questionnaire, interviews and personal observation facilitated the gathering of information. The utilized questionnaire was well-structured, open-ended and worded in simple English language for easy understanding by the respondents. The respondents were to choose from a list of options their desired answers while in some cases, they were meant to indicate multiple answers. The causes of traffic in the areas and problems emanating from these situations were gotten through the questionnaire. Purposive and simple random sampling techniques were employed for the study. Purposive sampling entails that only areas with high population concentration coupled with high vehicular and pedestrian movement within Enugu Metropolis were selected. These include Abakpa, Ogbete, Achara layout and Awkunanaw. Simple random sampling technique requires that respondents are chosen randomly for questionnaire administration thereby given no room for bias. This technique ensured that for every 1056 residents in the area, one was chosen. On this basis, 400 questionnaires were administered in the selected areas of Enugu metropolis. Collected data were presented and analyzed using frequencies, percentages and means.

Findings

Causes of Vehicular Traffic of selected Roads in Enugu Metropolis

Figure 1 shows the causes of traffic in Enugu Metropolis. From the table, it was revealed that all identified causes were responsible for traffic in the study area. The result showed that 79% of respondents indicated bad road/pot holes; 73% indicated breakdown of vehicles; 72% indicated traffic checks/wardens; 88% indicated roadside trading/hawking; 93% indicated on-street parking; 65% indicated increased car ownership; 70% indicated irregular bus stops; 53% indicated cultural/religious activities; 73% indicated accidents; 60% indicated flooding; 80% indicated absence of traffic lights; 77% indicated construction activities; 63% indicated improper land use; 50% indicated VIP movements; 52% indicated poor travel information and 66% indicated traffic law violation. The result therefore implies that causes of traffic in Enugu Metropolis are multi-faceted and therefore requires holistic approach in its remedy. The result is in conformity with the findings of Ukpata and Etika (2021) and Bashiru and Waziri (2023) who stated that bad roads/pot holes, on-street trading/hawking, religious activities, absence of street lights, flooding were among the major causes of road traffic in major cities of Nigeria.

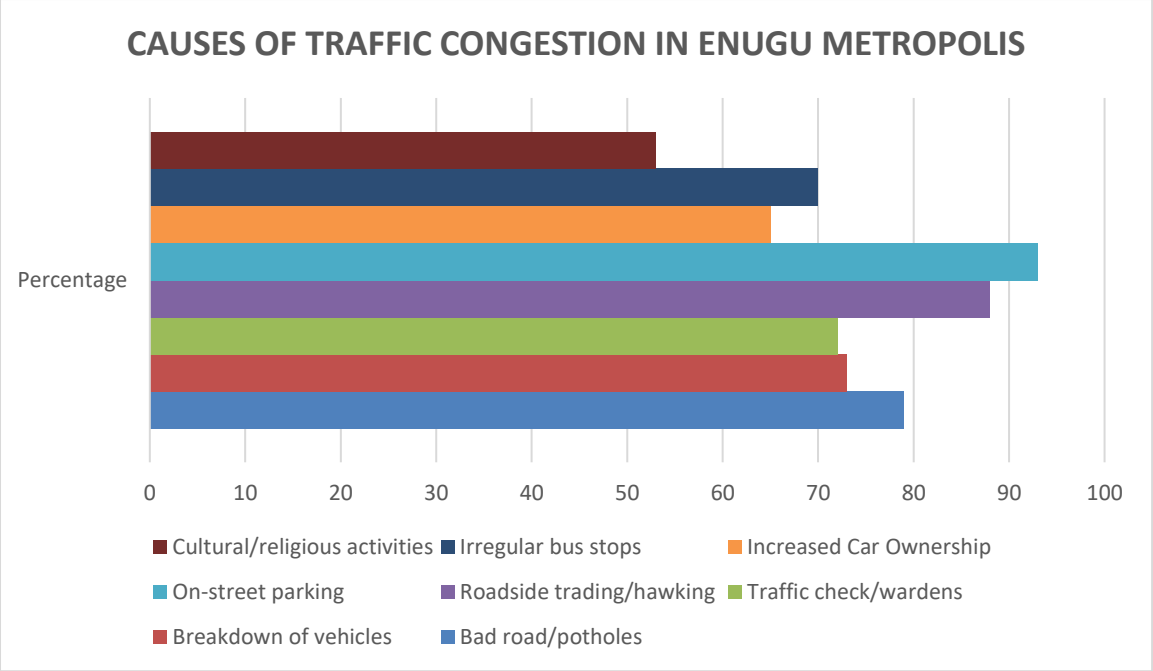

Figure 1: Causes of traffic in Enugu Metropolis

Source: Researcher's Survey, 2025

Traffic Problems Prevalent in Enugu Metropolis

Table 1: Traffic problems prevalent in Enugu Metropolis

S/N	*Situations*	*Sig 3*	*Mod. Sig 2*	*Not Sig 1*	*Mean X*	*Rmk*
1	Traffic congestion	213	123	38	2.5	Sig.
2	Delays in travel time	302	52	20	2.8	Sig.
3	Delays related to scarcity of buses, cabs, taxis etc	205	142	27	2.5	Sig.
4	Rise in heat levels	198	102	74	2.3	Sig.
5	Pollution (Noise and Air)	293	65	16	2.7	Sig.
6	Reduction in road width	236	98	40	2.5	Sig.
7	Road accidents	218	122	34	2.5	Sig.
8	Dilapidation of roads, bus shed, street lights	254	82	38	2.6	Sig.
9	Deaths from road accidents	285	65	24	2.7	Sig.
10	High cost of fares	247	68	59	2.5	Sig.
11	Fuel wastage/increase maintenance	302	45	27	2.7	Sig.
12	Headaches, swollen eyes etc	256	57	61	2.5	Sig.
13	Anger/frustration	210	85	79	2.4	Sig.
14	Reduced accessibility to commercial centres	214	57	103	2.3	Sig.
15	Parking problems	274	69	31	2.6	Sig.
16	Loss of productive time	258	89	27	2.6	Sig.
17	Unwanted urban sprawl	259	56	59	2.5	Sig.

Source: Researcher's Survey, 2025

Table 1 showed the intra-urban traffic problems prevalent in Enugu Metropolis. From the result, all identified problems were significant in the study area as they all recorded mean scores above 1.5. These traffic problems include delays in travel time (m=2.8); pollution (noise and air) (m=2.7); deaths from road accidents (m=2.7); fuel wastage/increase maintenance (m=2.6); dilapidation of road, bus shed, street lights (m=2.6); parking problems (m=2.6); loss of productive time (m=2.6); unwanted urban sprawl (m=2.5); headaches, swollen eyes etc (m=2.5); high cost of fares (m=2.5), road accidents (m=2.5); reduction in road width (m=2.5); delays related to scarcity of buses, cabs, taxis etc (m=2.5); traffic congestion (m=2.5); rise in heat levels (m=2.3); anger and frustration (m=2.4) and reduced accessibility to commercial centres (m=2.3). This result is in tandem with the findings of Osoba (2021)

who averred that despite the contributory role of transportation to urban growth; it also brings some negative effects with it. The result also corroborates with the findings of Echendu et al (2020) who opined that most commuters underwent stress during trips in most cities of Nigeria with special emphasis on Enugu Metropolis.

Conclusion

It is an established fact that consequent upon rapid population growth and horizontal motion of cities, so widespread are the dimensions of transport problems in urban areas; although each city/town has its own specific transport problems. Several measures had been attempted to improve urban transport challenges in the country. These solutions had not been able to relief the cities of their overwhelming challenges due to complexity of the factors and seemingly ad-hoc nature of attempted solutions. Lasting solutions to intra-urban transport problems requires a combined efforts and understandings of academia, transport practitioners and policy makers at various tier of government. The recent efforts to address intra-urban transport problems have shown that successful urban transport planning and administration requires sizeable capital investments and should be on long-term basis.

Towards improving intra-urban transport problems, there is also the need to ensure result-oriented integration of transport modes in the metropolis, state and the country at large. An integrated transport system implies the development of a seamless chain of connected and complementary transport means linking different modes of transport in such a way that every mode has the opportunity of fulfilling its distinct potentials in a partnering manner. A pragmatic transportation development plan, designed to ensure sustainable result, will only be intelligent if based on the principle of integrated and inter-modal transport connectivity. It is what the enormity of the intra-urban transport problems facing urban centres of Nigeria demand, and to which critical examination should be directed.

Recommendations

From the above findings, the study makes the following recommendations:

1. The government should formulate policies that encourage public transportation policy (reduction in transport fares, adherence to vehicle carrying capacity, provision of more coal city buses etc). This will go a long way in reducing the volume of vehicles plying roads in Enugu metropolis.
2. The government through its agency (Ministry of Transport (MOT) in collaboration with Federal Road Safety Corps (FRSC) should ensure effective and efficient intermodal coordination. This will help to remove traffic bottlenecks and reduce traffic congestion at major nodal points in Enugu Metropolis. This will also ensure easy accessibility to major areas within Enugu Metropolis.
3. The government through its agencies, FRSC with advice from Town Planners should educate and enlighten the general public on the need to use non-motorized transport and embrace telecommunications channels in disseminating information. This will help to reduce the volume of vehicles plying the road and the need to travel thereby ensuring efficient movement of people and goods from one place to the other within and around Enugu Metropolis.
4. The government through its agencies, FRSC, Ministry of Works with advice from Town Planners should embark on prompt maintenance, reconstruction and construction of old and new transport infrastructure and facilities in Enugu Metropolis. This will go a long way in ensuring easy flow of traffic within and around the metropolis.
5. The government through its agencies with advice from Town Planners should formulate policies banning the use of unworthy road vehicles, under age driving, high carbon emitting vehicles, over-speeding, on-street trading/hawking/parking and strict adherence to traffic rules, regulations and codes. This will help in ameliorating the causes and intra-urban traffic problems being experienced in Enugu Metropolis and major cities in Nigeria.
6. Town Planners should ensure strict adherence to planning rules, standards and regulations like setbacks, adequate development control implementations, discourage the collection of bribes and wavers. This will help curb unwanted urban sprawl and encroachments as they have been identified as major road bottlenecks in Enugu Metropolis.

References

Aderamo, J. A., (2022). Traffic Congestion at Road Intersections in Ilorin, Nigeria. *Mediterranean Journal of Social Sciences* 3(2). Doi:10.5901mjss.2022.v3n2.20

Bashiru, K. B. and Waziri, S. (2023). Traffic Demands and Delays on Lagos -Ikorodu Road in Nigeria. *Journal of Environmental Issues and Agriculture in Developing Countries*, 3(4): 723-731

Down, E. (1999). Impact of urbanization and land use change on climate. Nature.

Egboka, B. C, E. (2021). Water Resources Problems in the Enugu Area of Anambra State, Nigeria. *Water Resources and Environmental Pollution Unit (WREPU), Department of Geological Anambra State University of Technology: 95, 97.*

Engwitch, D. (2024), Towards an Eco-City; Calming the Traffic. Envirobook, Publishers. Environmental Systems Research Institute Inc. Data and Maps, Major Roads of the US. Redlands, ca.

Florian, M. (1999). Untangling Traffic Congestion. OR/MS Today. *Journal of the Institute for Transportation Research and the Management Sciences, USA*

Holmes, A. (2022). The countries with the longest and shortest commutes. Dalia. Retrieved from https://daliaresearch.com/the-countries-with-the-longest-and-shortest-commutes/ [accessed 23/04/2025]

Ibrahim, O. O. and Salisu, D. (2020). Gender Perspectives in Travel Behaviour of Motorcycle Passengers in Nigerian Intermediate Cities. Netherlands: CODATU X Conference on Urban Mobilty for All, Zeitlinger,

International Road Index (INRIX) (2021). Global traffic scorecard. Retrieved from http://inrix.com/scorecard/ [accessed 21/05/2025]

Mobereola, D. (2021). Cited in The dairy grind of Commuting in Africa's economic hubs by Robyn Curnow and Teo Kermeliotis, CNN. Edition.cnn.com.

Nnaemeka-Okeke R.C (2022). Urban Sprawl and Sustainable City Development in Nigeria. *Journal of Ecological Engineering.* http://dx.doi.org/ 10.12911/22998993/62277

Odeleye, J.A (2022). A Study of Road Traffic Congestion in Selected Corridors of Metropolitan Lagos. A Published Thesis Submitted to the School of Post Graduate Studies of the University of Lagos in Partial Fulfillment of the Requirements for the Award of the Degree of Doctor of Philosophy in the Department of Geography, School of Post Graduate Studies, University of Lagos, Akoko, Lagos, Nigeria

Ogunbodede, E.F. (2021). Application of GIS to the Management of Traffic Congestion in Akure, Ondo state, Nigeria. PGD Project submitted to RECTAS, Obafemi Awolowo University, Ile-Ife, Nigeria

Ogunsanya, A.A. (2020). Makers and Breakers of Cities. The fifty-ninth Inaugural Lecture Delivered at the University of Ilorin on Thursday June 27.

Oni, A. O. (2023). Graph-Theoretic Analysis of Intra-Community Road Network: Case Study of Covenant University, Nigeria. Paper Presented at the College Seminar/Workshop held at College of Science & Technology Conference Room, Covenant University, Ota, Nigeria on 1st August 2023

Osoba, S. B. (2021). A geographical analysis of intra-urban traffic congestion in some selected local Government Areas of Lagos metropolis. *Journal of Geography and Regional Planning*. Available online at http://www.academicjournals.org/JGRP. retrieved April, 2025

Popoola, M.O., Abiola S. O.and Adeniji W.A. R. (2021). Traffic Congestion on Highways in Nigeria Causes, Effects and Remedies. *International Journal of Civil, Architectural Science and Engineering*. Retrieved from waste.org/publications/17391 [accessed 20/04/2025]

Rao, K.R. and Rao, A.M. (2024). Measuring Urban Traffic Congestion: A Review. *International Journal of Traffic and Transport Engineering*. Doi: http//dxdoi.org/10.7708/ijtte20122(4).01 [accessed 22/04/2025]

Thwala, D. W., Eluwa, E. S., Ajagbe, A.M., Ojo, A.K., Duncan, E.E., Gafar, O.Y., and Abdullah, A. (2021). Traffic Congestion, Causes and Effect on Residents of Urban Cities in Nigeria. In: The Asian Conference on the Social Sciences 2014, Official Conference Proceeding.

Ukpata, O. J. and Etika, A. A. (2021). Traffic Congestion in Major Cities of Nigeria. *International Journal of Engineering and Technology*, 3(1): 23-33

Zegras, C. (2021). Cleaning the Sky in Santiago. (Habitat), *UNCHS Journal, 4 (2)*