Traffic Management Problems in Lagos: A Focus on Alaba International Market Road, Ojo, Lagos State Nigeria

Olaogbebikan Jimoh Eniola[*] I kpechukwu Njoku,   Akinsulire Esther Seun and Enosko Okoko
Transport Management Technology Department, Federal University of Technology, Akure, Nigeria
[*]E-mail of the corresponding author: eniolajimoh2@yahoo.com

Abstract
This study examines the traffic management problems resulting from traffic congestion in the study area. It also evaluates the opinion of the stakeholders in the transport sector such as the commuters, transport operators and private car owners on the traffic situations and management problems in the study area. The study depended upon the survey research technique to gather relevant data on the respondents, using the questionnaire as the research instrument. The research identified *inter alia* the traffic congestion causative factors as; over dependency on small occupancy vehicles, narrow road, indiscriminate parking, loading and off-loading of goods and passengers on the road, on-street trading, inability of the traffic management agencies to evacuate crashed or breakdown vehicles on time and ineffective traffic control measure. The study recommends the expansion of the narrow road capacity to double lanes, provision of adequate parking facilities, increasing the number of the few bus terminal along the road, provision of adequate park and ride space, prohibition of on-street parking, effective traffic management techniques, pedestrians priority scheme, provision of mass transit buses, provision of more road furniture like traffic light, lane marking, frequent road assessment and maintenance in the study area.
Keywords: transport, congestion, furniture, traffic, terminal, vehicles, technique, pedestrians.

1. Introduction

The movement of people and goods in a city, referred to as traffic flow, is the joint consequence of land activity. There is a direct interaction between the type and intensity of land use and transportation facilities provided. Land use is one of the prime determinants of movement and activity i.e. trip generation which needs streets and transport systems for movement, and if this movement is not effectively managed it could lead to traffic congestion. Traffic congestion may be defined as the situation that arises when road networks are no longer capable of accommodating the volume of traffic on them (Bayliss 1977). The situation is usually caused by rapid growth in motorization with less than corresponding improvement in the road network and related facilities, the poor structural pattern of roads especially in the traditional area of cities and the unplanned growth and haphazard land-use distribution (Kombs 1988).

In urban areas of less developed countries, car ownership rate has been on the increase. Lagos has continued to experience traffic congestion because many car owners finds it more convenient to travel to work by car rather than public transport in congested conditions (Ubogu 1980). Traffic management can be described as the general process of adjusting the use of existing road system to improve traffic operations without resorting to major new construction; the term "traffic management" comprises a variety of techniques for dealing with highway and traffic – related issues. As a concept, it is a process for planning and operating a system of urban highway and street network (Adebisi 2004).

Alaba international market which is one of the major markets in Ojo local government area in Lagos has been a major attractor of traffic due to the commercial activities that take place there. The massive movement of people has put considerable pressure on the transportation infrastructure in the study area. The result is evident in the massive daily traffic congestion in two peak periods, great loss of precious man hours and stranded commuters seen endlessly   waiting for buses that are inadequate (Asenime   2009).

The major traffic problems that affect mobility in the area include: encroachment of market into the road e.g. on-street trading thereby reducing the width/carriage capacity of the road, which consequently impedes traffic flow; inadequate road infrastructure such as lay bys, bus terminal, parking lots have led to on-street loading and discharging of cargo and passengers, parking difficulty and on-street parking. Vehicles especially long trucks make u-turn at illegal places, broken down vehicles are left unattended to, the operation of motorcyclists is chaotic and makes it difficult for even pedestrian to move freely and safely. The land use plan in the area does not encourage free flow of traffic; the market structures are not organized. And even the capacity of the road network is not adequate enough to accommodate the traffic the area attracts. The traffic in the area had not been adequately managed. Government uses traffic control wardens to manage the traffic along the road. This measure has not been effective because during peak periods, traffic on the road increase beyond the control of the traffic wardens (Asenime 2009). The objective of this paper is to examine the cause of traffic congestion in the study area, examine the time of the day and day of the week in which congestion is very heavy, appraise the

measures adopted by government to manage traffic flow in the study area and the effectiveness of such measures and to make recommendations based on the findings.
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2. Traffic System Management

The Traffic System Management (TSM) is concerned with making the existing transport system as efficient as possible and provision for an area short range transportation needs. It is a key element in the transportation improvement program of an urban area. In combination with the long range transportation plan, a suitable package of programs and policy for orderly development and operations of an urban areas' transportation system is generated (Adebisi 2004).The term 'Traffic Management' comprises a variety of techniques for dealing with highway and traffic related issues. As a concept, it is a process for planning and operating a system of urban highway and street network. It arises from the need to maximize the capacity of existing highway networks with a minimum of new construction. More recently, the emphasis of the process has spanned beyond simple capacity improvement to accident reduction, demand restraint, public transport priority, environmental improvement and restoring the ability to move around safely and freely on foot and by pedal cycle. Thus traffic management may be considered as a means of optimizing the available highway network in account with specified objectives as dictated by the prevailing local issues (Adebisi 2004).

Traffic management according to Adebisi (2004) involves a package of actions designed to optimize the available highway network in a well focused manner. The package of action comprises a variety of techniques for dealing with traffic and highway related issues. In general terms, the main feature of traffic management measures may be summarized as: Be relatively inexpensive and be amenable to early implementation, improved the usefulness of existing facilities while duly accommodating the different requirements of the different categories of road users, improve safety or, and a minimum, maintain the existing level of safety, protect the environment, improving it where possible. Among the relatively inexpensive techniques available for developing comprehensive traffic management proposals are Road capacity, traffic sign (i.e. pavement markings, road sign, etc.)., Guard rails, cross marking etc traffic calming, vehicle parking regulations and controls, pedestrianisation measures, accident reduction programs, Bus priority measures and application of Intelligent Traffic System (ITS). So for effective traffic management in the study area, the aforementioned traffic management techniques can be applied, this will enable them make efficient use of the available traffic infrastructure in the area.

2.1 Review of Congestion Ameliorative / Traffic Management Strategy

Aworemi et al (2009) suggested the following congestion reduction strategy:

(a) **Enhanced transport coordination:** the various modes of public transport including intermediate public transport have to work in tandem. They should complement rather than involve themselves in cutthroat competition. Therefore, there is an urgent need for a transportation system that is seamlessly integrated across all modes in Lagos State. Since the ultimate objective is to provide an adequate and efficient transport system, there is a need to have a coordinating authority with the assigned role of coordinating the operations of various modes. This coordinating authority may be appointed by the state or federal government and may have representatives from various stakeholders such as private taxi operators, bus operators, railways and the government. The key objective should be to attain the integration of different modes of transport to improve the efficiency of service delivery and comfort for commuters, which in turn can dissuade the private car owners from using their vehicles and thereby reducing the number of cars on the roads that eventually lead to congestion reduction.

(b) **Road Capacity Expansion:** road widening is often advocated as ways to reduce traffic congestion. However, it tends to be expensive and may provide only modest congestion reduction benefits at the long run, since a significant portion of added capacity is often filled with induced peak period vehicle traffic. A large amount of additional capacity would be needed to reduce urban traffic congestion. Roadway capacity expansion provides only slight reductions in urban traffic congestion.

(c) **Transport system management**

Transportation system management (TSM) is a term used to describe a wide range of measures and techniques that attempt to both maximize the capacity of the street system and reduce the demand on it. Some traffic management techniques that can be used to combat traffic congestion are listed below:

    i. Junction improvement

    ii. Grade separation using bridges (or tunnels) freeing movements from having to stop for other crossing movement.

iii. Reversible lanes, where certain sections of highway operate in the opposite direction on different times of the day or days of the week, to match asymmetric demand. This may be controlled by variable message signs or by movable physical separation.

iv. Preferential treatment for High Occupancy Vehicle (HOV), i.e. Bus lanes e.g. Bus Rapid Transit (BRT)

v. Separate lanes for specific user groups (usually with the goal of higher people throughput with fewer vehicles).

vi. Traffic calming measures such as traffic bumps etc.

vii. Improved traffic signs/lane marking, etc.

(d) Supply and demand: congestion can be reduced by either increasing road capacity (supply) or by reducing traffic (demand). Capacity can be increased in a number of ways, but needs to take account of latent demand otherwise it may be used more strongly than anticipated. Increased supply can include, adding more capacity over the whole of a route or at bottlenecks, creating new routes, and traffic management improvements. Reduction of demand can include, parking restriction, park and ride, reduction of road capacity, congestion pricing, road space rationing, and incentives to use public transport, telecommuting, and online shopping.

In addition, the engineering design of the road should also take into consideration pedestrian walkways, zebra crossing, pelican crossing and pedestrian crossing as well as appropriate parking design standard.

3. Methodology

3.1 The Study Area

Ojo Local Government Area has a total population of about 598,071 comprising 310,100 males and 287,971 females (NPC. 2006) and land area of 375 sq. km. It occupies the south western part of the Lagos metropolis. It is located between latitude 6^0 22$'$N and 6^0 32$'$N and on longitude 3^0 4$'$E and 3^0 20$'$E. The local Government Area is bounded by six other local government areas and is among the seven Local Government Areas occupying the coastal plain of Lagos metropolis. The predominant land uses in this area are residential and commercial land use. Commercial land use includes financial institution and market. The major markets in Ojo Local Government Area are Iyana-Iba market, Okokomaiko market, Vesper market and the largest market which is Alaba international market with a land area of 2km by 1km on Ojo-Igbede Road. It is located between longitude 3^0 11$'$ 9.6$''$ E to 30 12$'$ 1.44$''$E and latitude 6^0 27$'$ 43.2$''$ N to 6^0 27$'$ 17.28$''$ N of the Greenwich meridian. The market can be accessed from Badagry on the Badagry-Oshodi-Apapa express way through Iyana-Iba or Volks. The market is not well structured and the stalls are small.

Figure 1.   Map of Lagos showing Ojo Local Government

3.2 Sources of data and Sampling Technique

Primary and secondary data were collected for the study. The primary data were obtained through structured questionnaires and were administered on three categories of respondents namely the Commuters, Commercial operators and Car owners. The variable considered in the questionnaires are; road condition, road infrastructure, car ownership rate, travel characteristics (travel time, travel cost, travel distance, travel purpose,

passengers' waiting time and travel frequency), operators, traders and passengers challenges (unexpected breakdown, accidents, long journey time, long waits, frequent stops) traffic management techniques (e.g. parking restrictions, park and ride, preferential treatment for High Occupancy Vehicles,Traffic sign such as pavement, markings, road sign, etc.) and on street trading. One hundred and fifty-six (156) questionnaires were administered to the respondents. Secondary data obtained from review of related literatures of past related studies from Physical Planning Department Lagos State Secretariat Alausa Ikeja, Local Government Traffic Unit, the internet, transport journals; traffic journals, text books etc.

The research employed the use of descriptive statistics in analysis of data. The formula used to determine the sample size is Taro Yamane's Formula which is designated as follows:

Where**:** n = Sample size

N = Population

e = Level of precision in % = level of precision or sampling error at 0.08

$$n = \frac{N}{1+N(e)^2} = \frac{59807}{1+598071(0.08)^2} = 156.21 \dots\dots\dots\dots\dots(1)$$

The 156 questionnaires were divided equally among the three groups – the commuter, the commercial operators and the private car owners at 52 questionnaires each. Systematic sampling technique was used; every 10th commuter, car owner and bus operators were interviewed in line with Hussey (1977) who opined that a sample error of less than 10% and a confident level of more than 90% are acceptable.

4. Results and Discussion

4.1 Categories of Operators, Types of Vehicles Used and Carrying Capacity

Considering the type of operators in the study area, the survey shows that 52% are National Union of Road Transport Workers (NURTW) while 48% are other non-classified private operators. Therefore, registered and well known commercial operators dominate transport operation in the area.

The analysis of the type of vehicle used for transport services show that 19% of the operators use cars, 33% of the operators use tricycles, 21% operates with mini buses, 4% uses trailer while 23% of the operators uses motorbikes for their operations. This means that passenger carriage is the most prominent transport service within the area (Table 1.)

Table 1. Type of Vehicle Used By Operators

Type of vehicle	Frequency	Percentage
Car	30	19
Tricycle	51	33
Buses	33	21
Trailer	6	4
Motorbike	36	23
Total	156	100

Source: Field Work, 2012

Furthermore, the examination of the type of service rendered by the operators in the study area reveals that 79% of the operators renders passengers service, 15% of the operators renders goods only service while only 6% renders car hire service. This implies the high demand for transportation in the area which, of course, if not effectively managed can result to a number of bottlenecks.

The major road in the study area is the one that linked the study area with Badagry and Oshodi; this is a narrow road which needs to be enlarged. The road that spans the market itself is narrow and hardly permits the movements of vehicles is worsen by the encroachment into the road by the traders who displayed their wares.

Table 2. Type of Service Rendered by Operator in the Area

Service type	Frequency	Percentage
passengers service	123	79
goods only	24	15
car hire	9	6
Total	156	100

Source: Field Work, 2012

4.2 Occurrence of congestion in the study area

The survey revealed that 73.7% of the respondents often experience traffic congestion daily, 18% of them experience traffic congestion at interval of 2-3 days per week, 5.1% experience congestion once a week while only 3.2% were indifferent. This is an indication of a high degree of traffic congestion in the area.

Table 3. Traffic congestion occurrence in the area

	Frequency	Percentage
Everyday	115	73.7
2-3days in a Week	28	18.0
Once a Week	8	5.1
No Response	5	3.2
Total	156	100

Source: Field Work, 2012

More so, the analysis of time delay in traffic hold up revealed that 58% of the respondents usually spend 30 mins- 1hour   in traffic jam,   15% usually spend 1 hour - 1 hour 30mins, 17.3% spend   1 hour 30mins – 2hours, 5.8% spend 2hrs – 2hrs 30mins   in traffic hold up. This means that there is high level of traffic hold up in the area (Table 4.).

Table 4. Time spent in traffic congestion

Time Frequency		Percentage
30mins - 1hr	90	58.0
1hr - 1hr 30mins	24	15.0
1hr 30mins - 2hrs	27	17.3
2hrs - 2hrs 30mins	9	5.8
No response	6	3.9
Total	156	100

Source: Field Work, 2012

4.3 Frequent travel purpose

Further analysis as shown in figure 1 revealed that 59.6% of commuters in the area travel to work daily while 26.9% goes for shopping. 5.8% commute to catch fun while 7.7% commutes for religious purpose. This implies that majority of the trips generated in the area are for working purposes and congestion may be evident during the morning rush hour (people commuting to work) and also during the evening period when they close from work.   The implication of this for policy formulation is that there is the need to divert some of the public transport vehicles to the area during the peak period as to reduce congestion at the period. Flex time working period can be adopted whereby workers are free to choose a convenient working period, this being the case many of the traffic at the two periods (morning and evening) will be redistributed thereby solving congestion problem at the two peak periods. Also BRT lane and services should be extended to the study area so that the traffic generated during the peak periods will be cleared.
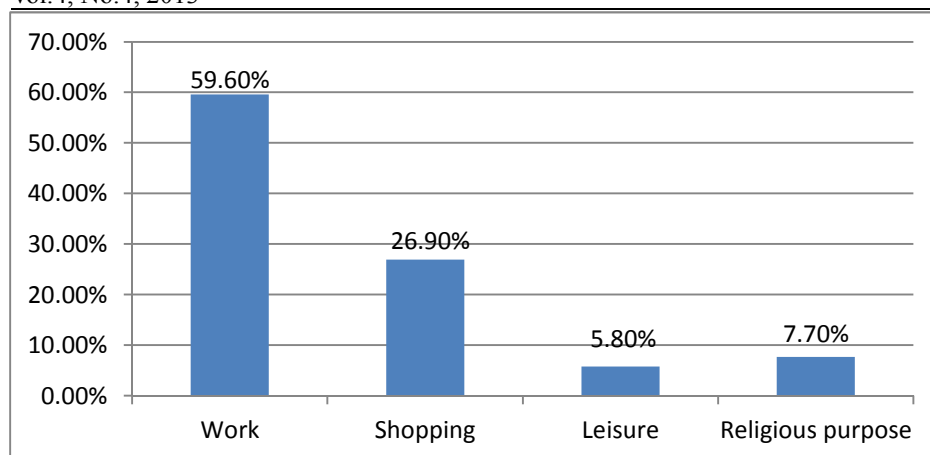
Figure 2. Frequent travel purpose

4.4 Travel frequency

This survey revealed that 37.2 % of commuters journeys to the study area everyday, 25% 1 – 2 times a week, and 19.2% 3-4 times a week while 14.7% journeys to the area 5 – 6 times a week. (See table 5). The implication of this is that more people commute to the area every day, this may be one of the contributing factors to congestion in the area as demand exceeds supply.

Table 5. Travel frequency of commuters

Duration	Frequency	Percentage
Everyday	58	37.2
1 - 2 times a week	39	25.0
3 - 4 times a week	30	19.2
5 - 6 times a week	23	14.7
No response	6	3.9
Total	156	100

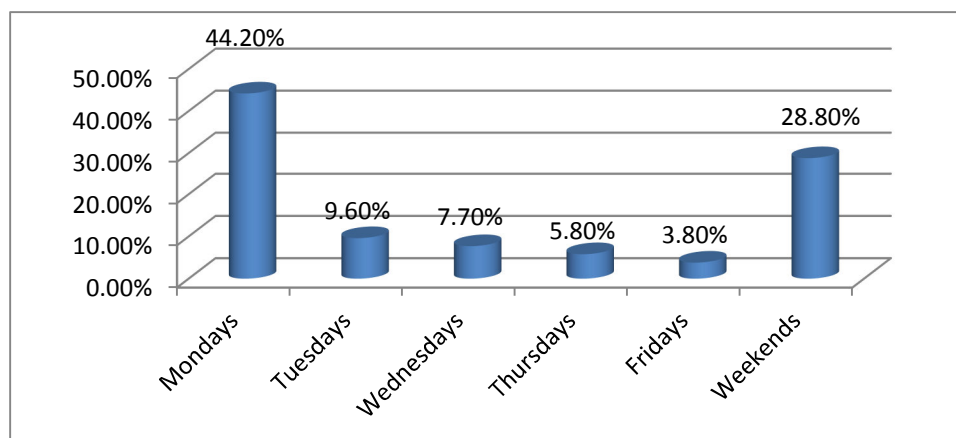Source: Field Work, 2012

Figure 3.   Days of the week in which congestion is most prominent

4.5 Waiting Time at the Bus Stop

The survey showed that 28.8% of the respondents spend 1-20minutes before getting a vehicle, 42.3% of the respondents spend 21-40minutes at the bus stop before getting a vehicle,   23.1% of the respondents spend 41-1hour, 3.9 % spends 1hour 1minute - 1 hours 20minutes and 1.9% spends 1hour 21minutes and above at the bus stop before getting a vehicle. This implies that majority spend much time at the bus stop before getting a vehicle which is an indication that there is a traffic delay on the Alaba international market road (Table 6).

Table 6. Waiting Time at the Bus Stop

	Frequency	Percentage
1 – 20 minutes	45	28.8
21 minutes - 40minutes	66	42.3
41minutes – 1hour	36	23.1
1hour 1minutes – 1 hour 20minutes	6	3.9
1hour 21 minutes and above	3	1.9
Total	156	100

Source: Field Work, 2012

4.6 Time of the Day in which Congestion is more Prominent

The survey revealed that congestion occurs mostly from 8am – 10am (46.2%) and 4pm – 6pm (34.6%). This indicates the morning peak period and evening peak period of the area. This is as a result of commuters travelling to work in the morning and coming back from work in the evening (Table 7)

Table 7. Time of the Day which Congestion is More Prominent

Time	Frequency	Percentage
6am - 8am	15	9.6
8am- 10am	72	46.2
10 am - 12 pm	3	1.9
12 pm - 2 pm	9	5.8
2 pm - 4 pm	3	1.9
4 pm - 6 pm	54	34.6
Total	156	100

Source: Field Work, 2012

The question that readily comes to mind is how can these congestion problems at peak period be resolved? As practiced in the advanced countries, demand management can be adopted whereby flex time work schedule with employers to reduce congestion at peak times, work place travels plan, adopting car pooling for workers, road space allocation in which some road space are allocated to public transport vehicle like BRT, aiming to rebalance provision between private cars which often predominates due to high spatial allocation to roadside parking and for sustainable mode, government and public establishment should provide transport facilities for their workers.

4.7 Day of the week in which traffic congestion is most eminent

The survey reveals that congestion is most prominent on Monday (44.20%) and also on weekends (28.80%) see figure 2. This is due to the activities taking place in the area which is commercial activities (Market) there is high demand for transportation on Mondays because it is the first day of the new week and also on weekends because people come for shopping mostly on weekends.

4.8 Causes of Traffic Congestion in the Area

From the study, about 26.9% of the respondents believes that too narrow road is responsible for traffic congestion on the road, 7.7% believes that congestion on the road is due to vehicle breakdown, 34.6% says congestion is due to loading and unloading of passengers and cargo on the road, 7.7% were of the view that indiscriminate parking contributes to the traffic situation in the area, 7.7% equally believes that on-street trading is the cause of traffic jam whereas 12.8% opined that lack of bus terminal a factor that contributes to the traffic jam in the area.

Table 8. Causes of Traffic Congestion in the Study Area

Causes of Traffic Congestion	Frequency	Percentage
Too Narrow Road	42	26.9
Vehicle Breakdown	12	7.7
Loading and off-loading of goods and passengers on the road	54	34.6
Indiscriminate Parking	12	7.7
On-Street Trading	12	7.7
Lack of Bus Terminal	20	12.8
No Response	4	2.6
Total	156	100

Source: Field Work, 2012

4.9 Traffic control measure used in the area and its effectiveness

The survey reveals that the traffic control measure used in the study area is the use of traffic control officers also known as traffic wardens, traffic light, lane marking and parking restriction.

Table 9. Traffic control measure used in the area

Traffic control measures	Frequency	Percentage
Use of traffic warden	93	59.6
Traffic light	25	16.0
Lane marking	34	21.8
Parking restriction	4	2.6
Total	156	100

Source: Field Work, 2012

However, the survey also revealed that the measure is not effective (Table 10). Many of the traffic wardens could not help when the traffic situation become chaotic. The traffic wardens were seen many at times playing truancy during traffic gridlock. Many of the intersection in the study area were not provided with traffic light. These factors were responsible for ineffectiveness of the traffic control measure in the study area.

Table 10. Effectiveness of Traffic Control Measure in the Area

Response	Frequency	Percentage
Yes	44	28.2
No	112	71.8
Total	156	100

Source: Field Work, 2012

4.10 Availability of Traffic Law Enforcement Agents along the Road and their Effectiveness

Considering the degree of availability of the traffic law enforcement agents, 62% of the respondents agreed that there are traffic law enforcement agents along the road, 36% objected to this while 2% did not respond to the question (figure 3). However when their effectiveness is been examined, it reveals that the agents are not performing their duty effectively due to some certain factors which is also been presented below in figure 4.8, this factor should be adequately examined in order to increase the effectiveness of the traffic law enforcement agents and thereby consequently improving the traffic condition in the area.
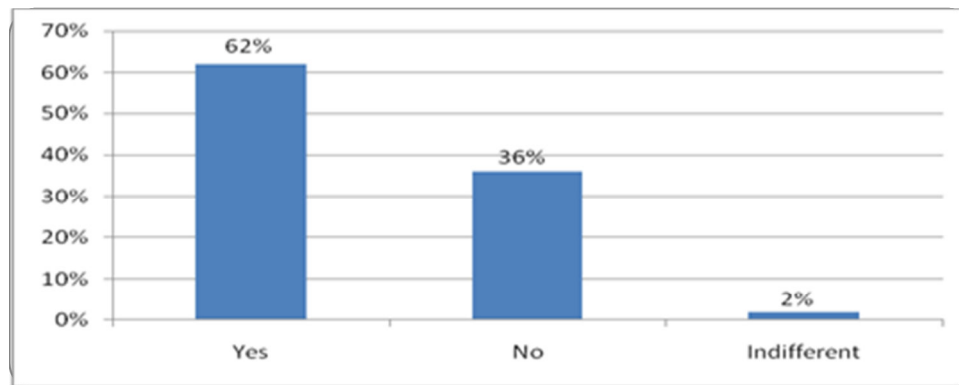
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Figure 4. **Availability of traffic law enforcement agents along the road**
4.11 Reason for Ineffectiveness of the Traffic Law Enforcement Agency
It was observed from the study that the reason for ineffectiveness of the traffic law enforcement agency include corruption whereby some of them do extort money from the traffic offenders hence this encourage them more to flout traffic regulations. The traffic law enforcement agent's courage and boldness has been eroded so they could not courageously confront the traffic offenders and apprehend them. Another reason for ineffectiveness of traffic law enforcement agents is inadequate facilities needed to effect smooth traffic control some of the junctions in the study area were not provided with traffic light; at such junction traffic gridlocks are normally experienced coupled with the fact that there are few traffic warders to control traffic at such junction. The skill of the traffic agents does not commensurate with the task so there is the need for training and retraining of traffic warders. There is the need for proper design of the road by incorporating proper road marking and traffic signs, ramp metering, traffic calming and street space management etc.

5. Summary of Findings
The study reveals that the traffic congestion experienced in the area is attributed to the over dependency on small occupancy vehicles such as mini buses, tricycles and motorcycles and that a good number of car owners in the area commute with their cars on a daily basis and this consequently result to high number of cars plying the road, exacting high pressure on the limited road capacity. Other traffic congestion causative factors as mentioned by the commuters are; narrow road (26.9%), indiscriminate parking (7.7%), loading and off-loading of goods and passengers on the road (34.6%), on-street trading (7.7%), lack of bus terminal (12.8) and vehicle breakdown (7.7). Also, the operators signified that at times when they experience traffic breakdown, they do not receive assistance from the traffic control officers on time. They also testify that the traffic control measure in the area has not been effective, and suggested road expansion, effective traffic management techniques, provision of parking space, and provision of bus terminals amongst others.

5.1 Policy Recommendations
There is need to expand the road network capacity to at least two lanes in order to accommodate the ever increasing volume of traffic in the area. Parking facilities should be put in place on the road; there should be restrictions and enforcement of parking rules and regulations to stop operators from on street parking. Bus-terminals should be located at strategic locations along the road. On-street trading should be discouraged in the study area through enforcement. Also more traffic control officers should be employed and retrained on modern traffic control techniques. There is need to put in place some traffic infrastructures such as: traffic light, lane marking, pedestrian walkways etc. A park and ride space should be provided outside the market region where car owners can park their cars and join a high occupancy vehicle (HOV) to the market center. This would reduce the rate of congestion in the region. Adequate mass transit buses should be made available to lift large numbers of commuters at once rather than having the small occupancy vehicles flooding the road without making much impact on traffic demand. Frequent road assessment should be carried out by maintenance agencies to free the road of pot holes and bumps in order to improve the flow of traffic in the area.

5.2 Conclusion
Traffic congestion is defined as the situation that arises when road networks are no longer capable of accommodating the volume of traffic on them (Bayliss 1977). This is caused by rapid growth in motorization with less than corresponding improvement in the road network and related facilities, the poor structural pattern of

roads especially in the traditional area of cities and the unplanned growth and haphazard land-use distribution (Kombs 1988). Then again, traffic management may be considered as a means of optimizing the available highway network in account with specified objectives as dictated by the prevailing local issues (Adebisi 2004). The challenges of traffic management in the study area have been examined and recommendations made. The emphasis should now be on apportioning priorities to all the proposed recommendations and the need for strict enforcement to achieve the desired result. Effective traffic management cannot work when there is inadequate road capacity to hold more traffic in the area. In addition, the poor parking facilities and total disregard for traffic regulations by road users altogether play a major role in the daily traffic congestion in the area. Moreover, the method of manual traffic control system used has not fared well as this has been described as ineffective. This is mainly due to the traffic agents who compromise with operators that violate the traffic rule and also due to lack of adequate personnel to control the ever increasing traffic in the area. It has therefore become imperative that new techniques of electronic traffic control be adopted; the intelligent transportation system (ITS) could be used to efficiently move large volume of traffic with common destination through a series of traffic signals by detecting the large volume of traffic and appropriately adjusting the traffic signal time.

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