ASSESSMENT OF TRAFFIC VOLUME IN SOME SELECTED STATES IN NIGERIA USING ELECTRONIC METRO COUNTER

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ABSTRACT

The ability to estimate traffic flow is the primary measure that comes with traffic planning and management at the outset of transport planning. In this regard, a tried effort has been put up to study the volume of traffic along some important roads of states like Kogi, Oyo, Niger, Nasarawa, Ondo, Lagos, Abuja, Jos, Cross River, Delta, Kaduna, and Taraba to know the present state of the traffic flow conditions in the states. The encounter of traffic flow as such is strongly related to traffic composition, which is the most significant element of transportation security and effectiveness complexity, bringing together people, passengers, and goods. The following factors in traffic flow must be considered: speed, volume, and capacity. It poses the challenge of fronting and relating to such terms as traffic volume, which is the number of automobiles passing a certain stretch of road or lane in time, to the traffic of such a huge diversity of vehicles that are not similar by dynamic and static characteristics. Purposely, traffic volume studies are needed as they allow planners to devise sound traffic plans and traffic management. They are used in anticipation of when roadworks will be needed. However, the most notable problem occurs during peak passenger flow when roads experience overcrowding. The number of vehicles that encountered the location was measured using an electronic road counter machine.

INTRODUCTION

Motivation

Vehicle count at one place is a major part of the traffic volume measure because it tells the number of cars that are travelling through that place. Volume is nothing but a ramp that the traffic goes through one day at a time. The most accurate way of estimating the traffic load is based on the number of cars considered in the calculation, which reflects the number of vehicles that utilize a certain part of the road within a specified period. Heterogeneous traffic is addressed by shifting the vehicle across a piece of road into the category of passenger cars with volumes measured in passenger car units per hour (Raj et al., 2018). The vehicles are the units of equivalent PCU, which is a rating of traffic volumes in use during a certain period. The other characteristic is volume after the speed. It makes the other factor illustrating the condition of the whole road network. The simulated traffic data operating on a different time scale will provide the basis for several traffic-related services. A typical set of aims for the use of traffic volume data, for example, is the generation of transportation plans and maintenance purposes for operations such as incident response and traffic light control optimization.

This data can also be of great value for the efficiency assessment of the network that affects road construction planning, and it voices the environmental impact because of traffic like noise, emissions, and the natural world. The instant and time-diversified application of traffic information to particular sections of a road is crucially important whether it is either real-time or long-term solutions such as Annual Average Daily Traffic (AADT) that plan road infrastructure. Traffic volume is a quantity traditionally determined through space occupancy employing stationary arc detectors. Placing such en route infrastructure gives a fairly accurate volume, but it still requires purchasing and maintenance costs that may not be that easy to pay.

Due to the shortage of sites that enable this technology, the coverage being offered is limited to very few points in the network of the traditional road system, leaving the majority of the traffic features outside the network. An alternative option is to switch from using the stationary detectors to using the whole network's data of private car probes for the network traffic estimation. Because there is a higher chance of Probe Vehicle (PV) data getting in fewer PV units, that is, the PV cost is lower and covers almost every part of the network. However, the barcode capture system can only come from a subset of the vehicle population. To get the flow and number of probes identical, we take into account the probe vehicle penetration rate, also known as sample rate, through its mechanism. The penetration rate is a parameter that allows for the calculation of the number of vehicle probes/target vehicle dataset size as a ratio of vehicle population. Data from the vehicles with the inclusion of penetration factor can be used as a source of realistic forecasting of the free network.

Axles	Groups	Description	Class		Parameters	Dominant Vehicle	Aggregate
2	1 or 2	Very Short - Bicycle or Motorcycle	MC	1	d(1)<1.7m & axles=2		1 (Light)
2	1 or 2	Short - Sedan, Wagon, 4WD, Utility, Light Van	SV	2	d(1)>=1.7m, d(1)<=3.2m & axles=2		
3, 4 or 5	3	Short Towing - Trailer, Caravan, Boat, etc.	SVT	3	groups=3, d(1)>=2.1m, d(1)<=3.2m, d(2)>=2.1m & axles=3,4,5		
2	2	Two axle truck or Bus	TB2	4	d(1)>3.2m & axles=2		2 (Medium)
3	2	Three axle truck or Bus	TB3	5	axles=3 & groups=2		
>3	2	Four axle truck	T4	6	axles>3 & groups=2		
3	3	Three axle articulated vehicle or Rigid vehicle and trailer	ART3	7	d(1)>3.2m, axles=3 & groups=3		3 (Heavy)
4	>2	Four axle articulated vehicle or Rigid vehicle and trailer	ART4	8	d(2)<2.1m or d(1)<2.1m or d(1)>3.2m axles = 4 & groups>2		
5	>2	Five axle articulated vehicle or Rigid vehicle and trailer	ART5	9	d(2)<2.1m or d(1)<2.1m or d(1)>3.2m axles=5 & groups>2		
>=6	>2	Six (or more) axle articulated vehicle or Rigid vehicle and trailer	ART6	10	axles=6 & groups>2 or axles>6 & groups=3		
>6	4	B-Double or Heavy truck and trailer	BD	11	groups=4 & axles>6		
>6	>=5	Double or triple road train or Heavy truck and two (or more) trailers	DRT	12	groups>=5 & axles>6		

Table 1: Vehicle classification (UK Classification of Traffic)

Notation:

AADT (Annual Average Daily Traffic

AADW (Annual Average Day of Week

AAWDT (Annual Average Weekday Traffic

AAWET (Annual Average Weekend Traffic)

LITERATURE REVIEW

Flow is the conditioning factor that varies depending on the volume, density and speed, as per Sireesha and Durga (2021). Likewise, planning is also required by conducting these studies to accomplish aims such as improving traffic management and finding out whether roads need to be widened. The number of "motor vehicles" present at or passing through a particular section of the road or the traffic lane assigned to a certain timeframe is called, traffic volume. A traffic volume study is of the figures, categories, and schedules of the cars and motor vehicles in a specific area, which is helpful in determining whether the traffic volume is high during peak or off-peak hours (Prachi and Somkuwar, 2020). However, per the United Nations Centre for Human Settlements (1998), the travel speed in developing states is reducing, and the trailing patterns are degrading for walkers and other people-powered vehicles (UNHCS, 1998).

Taking five of sixteen developing cities that are part of the UNCHS's global urban indicators database with more than 4 million populations as of 1998. Among these are Bucharest, Jakarta, Kinshasa, Lagos, and Manila; the average one-step commute duration is approximately one and a quarter of an hour. A residence, workplace, and public service near the modes of transportation are the underlying factors in understanding urban transport, as stated by Odelye (2008). It connects people's houses with numerous services such as schools, health facilities, shops and markets, and places of worship like churches or mosques.

Transportation is a means to an aim. First of all, here there is a very special situation where there are two targets - access and communication. Traffic will start the congestion process soon when the flow rate reaches its predetermined maximum capacity, causing autos to meet heavy congestion. The HCM describes the capacity as the maximum hourly traffic in members or vehicles per lane and per hour that can be comfortably carried by a uniform section of a freeway or a roadway, considering road traffic and the traffic control conditions prevailing at that instance (HCM). Raval and Birya (2016) found out that the general concept of traffic flow is inseparable from the roads' planning, design, and operations.

Firstly, the funding is used to upgrade road infrastructure, especially old and new roads, to improve the safer and quicker movement of cars on the roads. The authors looked into the relationship between the number of car accidents within an hour and the traffic to capacity on rural roads, as postulated by Hall and Pendleton (1990). They realized that as traffic volume increased, the speed of traffic crashes increased. Authors refer to traffic volumes as a variable that inevitably leads to fatalities along with motor vehicle crashes. Nevertheless, the exact link between the two is a mystery.

The market being in the lives of people plays a key role. It plays a key role of ensuring that the world’s goods flow via the exchange of economic transactions. As per Osoja (2019), markets are the economic bodies that should be taken in charge of facilitating the transfer of goods and services. However, the urban flush has impacted the services, resulting in management issues, which is the concern that is highlighted in Osoja (2019). It is obvious that if some of these issues are not urgently tackled, open spaces will become one of the problems, and other environmental issues such as improper waste disposal, insufficient water supply, housing, traffic jams, and water

pollution will follow. This article examined the traffic volume of selected roads in Lagos, Ondo, Taraba, Niger, Abuja, Jos across River Delta, and Kaduna states.

Concept of Traffic Volume and Classification

The traffic link survey is designed in such a way that the number of vehicles passing at a certain intersection and its link are counted over a particular period, and the data regarding the vehicle types are also collected. The counting is done by the use of a set number of data collection equipment, after which the survey is done to collect data such as the number of vehicles and their types. It includes the number of vehicles (cars and pedestrians), vehicle types, speed, weight and factors such as trip length, trip mission, and frequent usage rate. To give the data on the volume of people using the room, occupancy is considered. Nonetheless, traffic is calculated as several traffic flows. The measures usually consist of vehicles per hour (veh/h), vehicles with the whole day rate (veh/day), and the traffic assessment in the whole year is on average daily traffic (ADT) or annual average daily traffic (AADT).

Manual counting is the best way to measure the performance of the automated counter, the vehicle classification, and the vehicle occupancy by looking at the car's tracking. Automatic traffic data measurement is a common practice and normally applied to links; this tool is designed for long-term data collection and analysis of seasonal, daily, and hourly changes. The most complicated measurements usually designed to yield the desired level of air pollution estimates combine automated and manual counts. This lesson involves the usual counts that are obtained during the week in the morning rush hour and the Friday evening rush hour, which normally produce high volumes that are hard to determine in the transportation analysis. Therefore, there is a concept that much more traffic counts will be obtained on Tuesday, Wednesday, and Thursday, which would provide the real traffic scenario.

Automatic Count Method

The automatic count method is a mechanized way to collect vast traffic data on a 24-hour basis with intervals of 60 minutes. This observation period could go from a week or month to a year. Automatic counting is very similar to manual counting, which is a procedure employing the technology of these devices. The example of the pneumatic tube is also a tool used for automatic counting machines but as a manual counter. A Permanent Counter is an automatic device that shall be used for the tallying of long-term counts, which will almost invariably take more than 24 hours. In another way, the cause of the remaining ones may be done for a day or year. The permanent counters are normally unfeasible in terms of economy, even though the data collected here are very accurate; this means that the counters could, in turn, be applied in monitoring and estimating the trend of traffic over a long period. Videotape makes used of video recorder and camcorder, for video recording at the site of collection. The digital clock, being a part of the video image, then would show the viewers how that particular time was passing. Similar to PC, videotaping is not an economical option.

Data

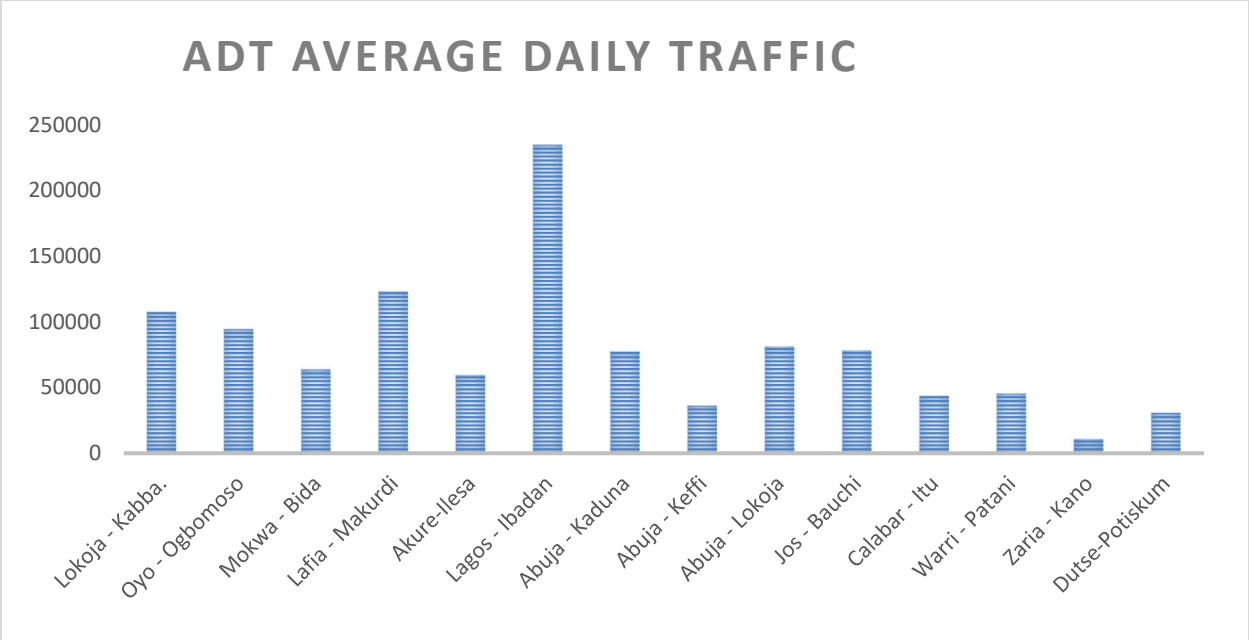
In this study, vehicular traffic information from the surveyed states of Nigeria for the 27 roadway network measurements of Nigeria is used. The data have been collected from Dec 23rd – Jan 4th, 2023, which is 13 days.

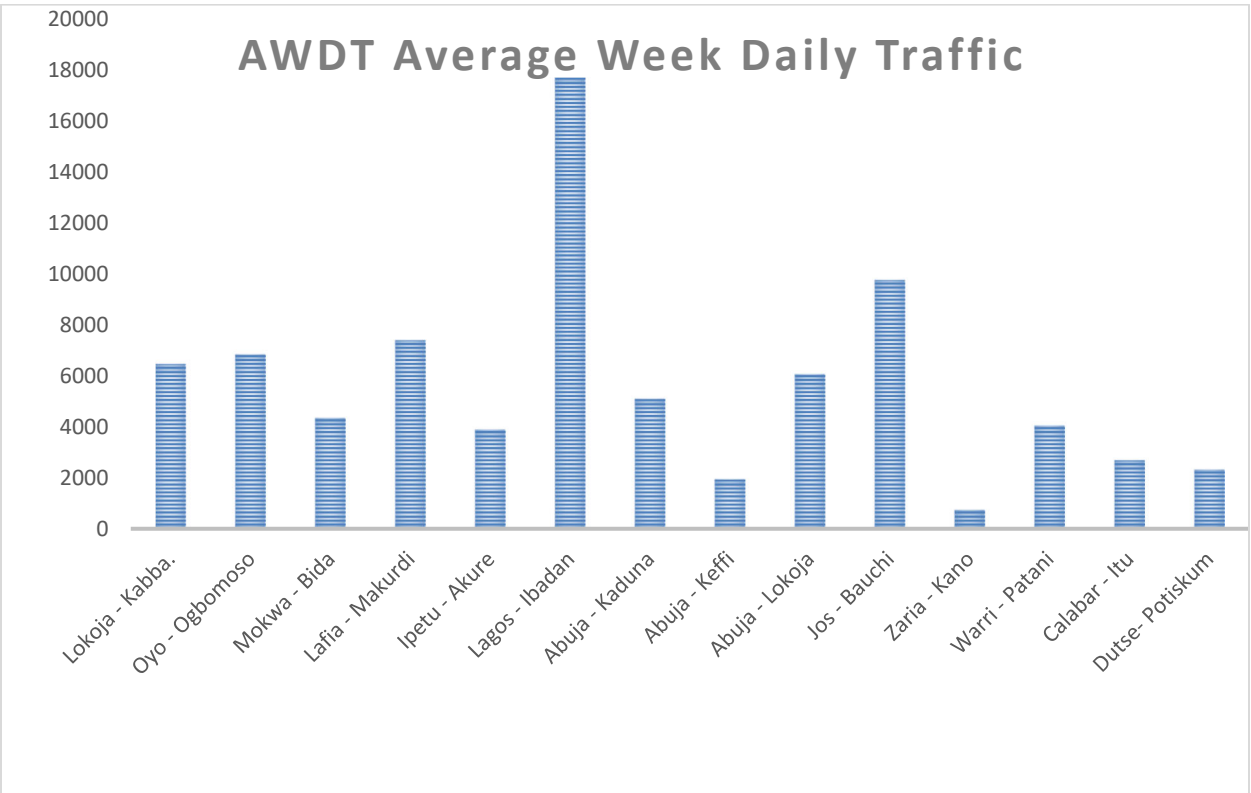
Traffic data

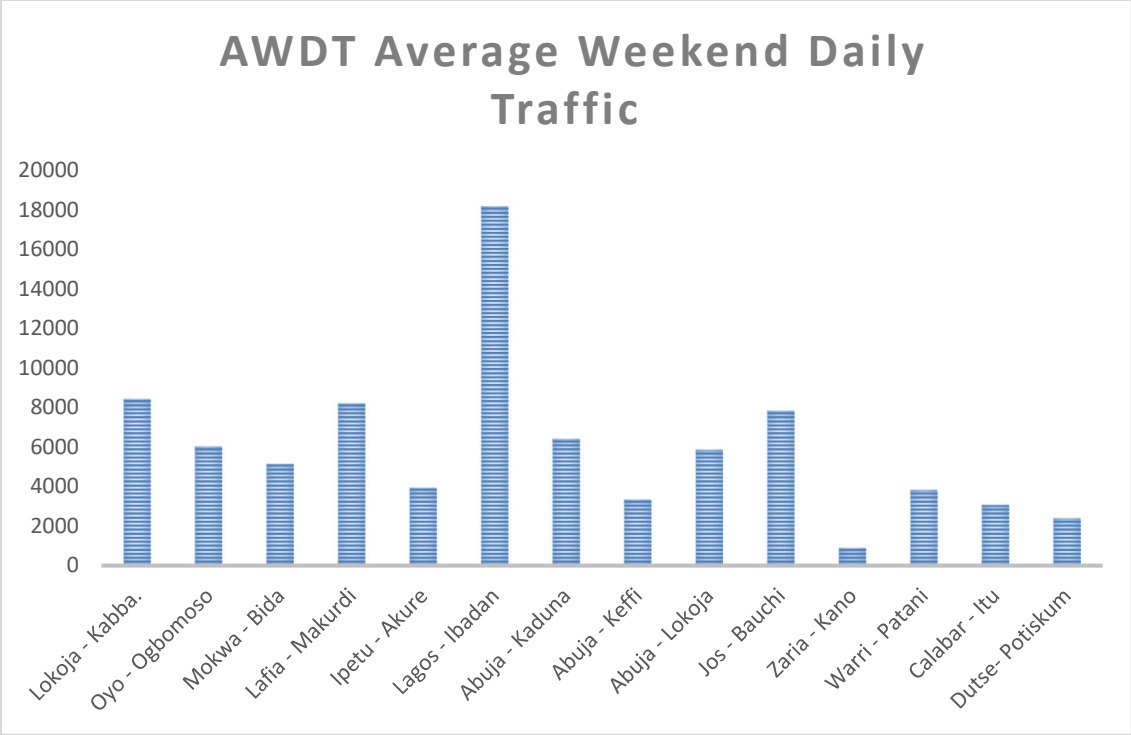
The number of automobiles that pass through any highway or targeted section of a highway per unit of time is known as traffic volume.

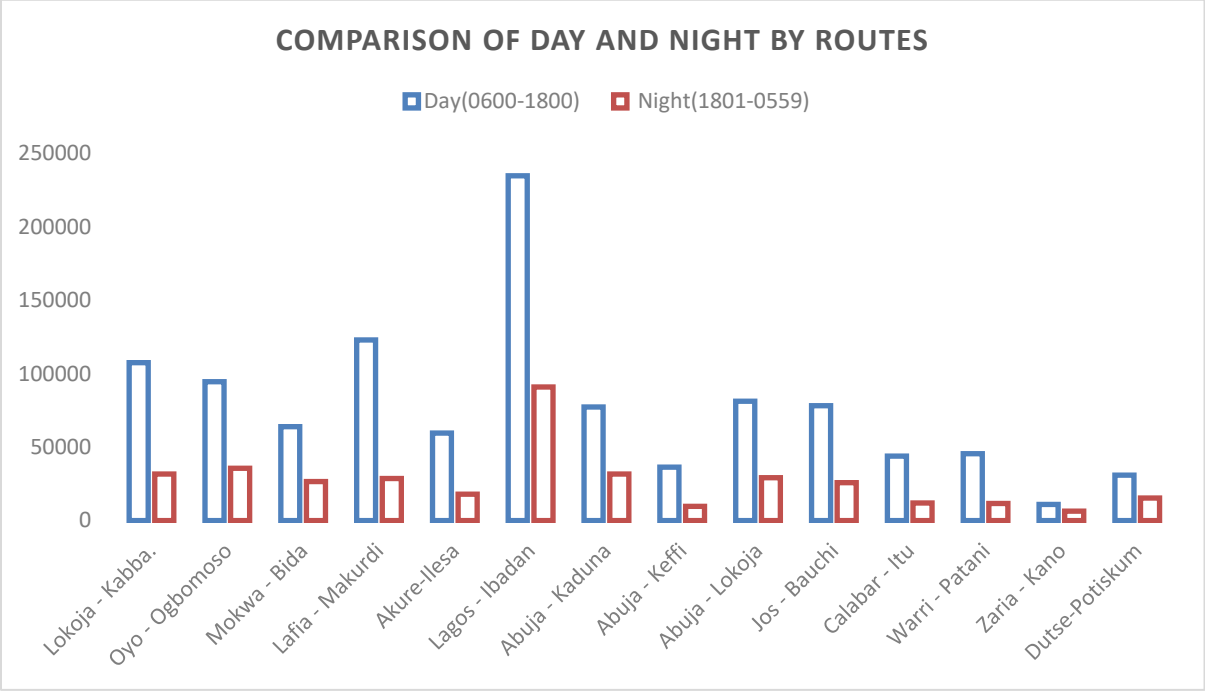
S/No.	ROUTE	COUNTING POINT	Volume of vehicles		
			Day (0600-1800)	**Night (1801-0559)**	**Total**
1	Lokoja - Kabba.	Kabba	107479	31642	139121
2	Oyo - Ogbomoso	Ogbomoso	94447	35552	129999
3	Mokwa - Bida	Kutigi	63882	26609	90491
4	Lafia - Makurdi	Lafia	122912	28623	151535
5	Akure-Ilesa	Ipetu	59501	17978	77479
6	Lagos - Ibadan	Mowe	234626	90935	325561
7	Abuja - Kaduna	Tasha-Yari	77337	31708	109045
8	Abuja - Keffi	Keffi	36355	9708	46063
9	Abuja - Lokoja	Yangoji	81170	29174	110344
10	Jos - Bauchi	Bauchi	78141	25802	103943
11	Calabar - Itu	Odukpani	43843	11948	55791
13	Warri - Patani		45533	11630	57163
14	Zaria - Kano	Chiromawa	10969	6469	17438
15	Dutse-Potiskum	Shuwarin	30891	15361	46252
Total			**1087086**	**373139**	**1460225**

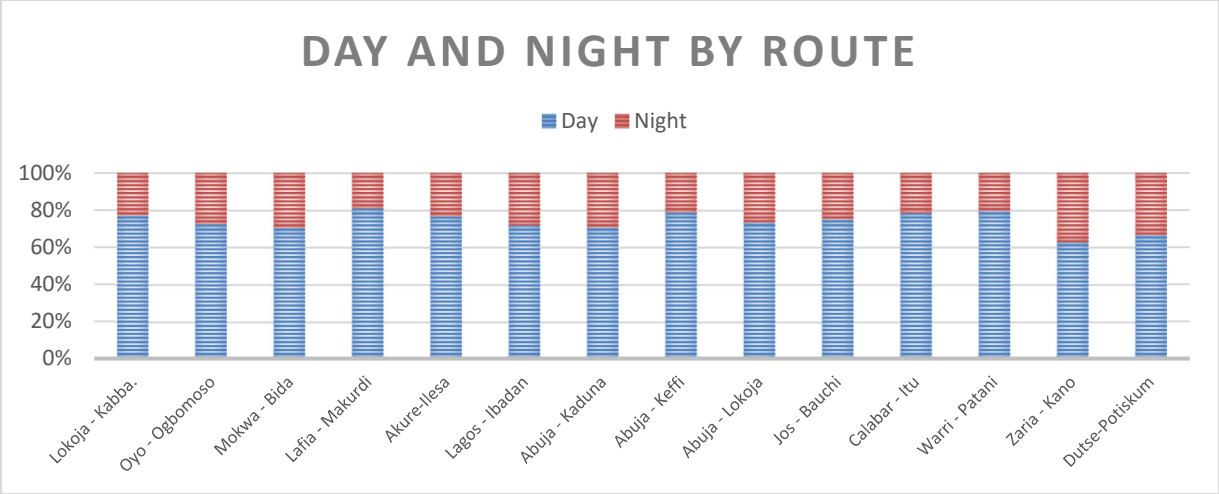
Table 2: summary data for all routes between 23rd December 2022 – 4th January 2023


ADT AVERAGE DAILY TRAFFIC
250000
200000
150000
100000
50000
0
Lokoja - Kabba.
Oyo - Ogbomoso
Mokwa - Bida
Lafia - Makurdi
Akure-Ilesa
Lagos - Ibadan
Abuja - Kaduna
Abuja - Keffi
Abuja - Lokoja
Jos - Bauchi
Calabar - Itu
Warri - Patani
Zaria - Kano
Dutse-Potiskum


AWDT Average Week Daily Traffic
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
Lokoja - Kabba.
Oyo - Ogbomoso
Mokwa - Bida
Lafia - Makurdi
Ipetu - Akure
Lagos - Ibadan
Abuja - Kaduna
Abuja - Keffi
Abuja - Lokoja
Jos - Bauchi
Zaria - Kano
Warri - Patani
Calabar - Itu
Dutse- Potiskum


AWDT Average Weekend Daily Traffic
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
Lokoja - Kabba.
Oyo - Ogbomoso
Mokwa - Bida
Lafia - Makurdi
Ipetu - Akure
Lagos - Ibadan
Abuja - Kaduna
Abuja - Keffi
Abuja - Lokoja
Jos - Bauchi
Zaria - Kano
Warri - Patani
Calabar - Itu
Dutse- Potiskum

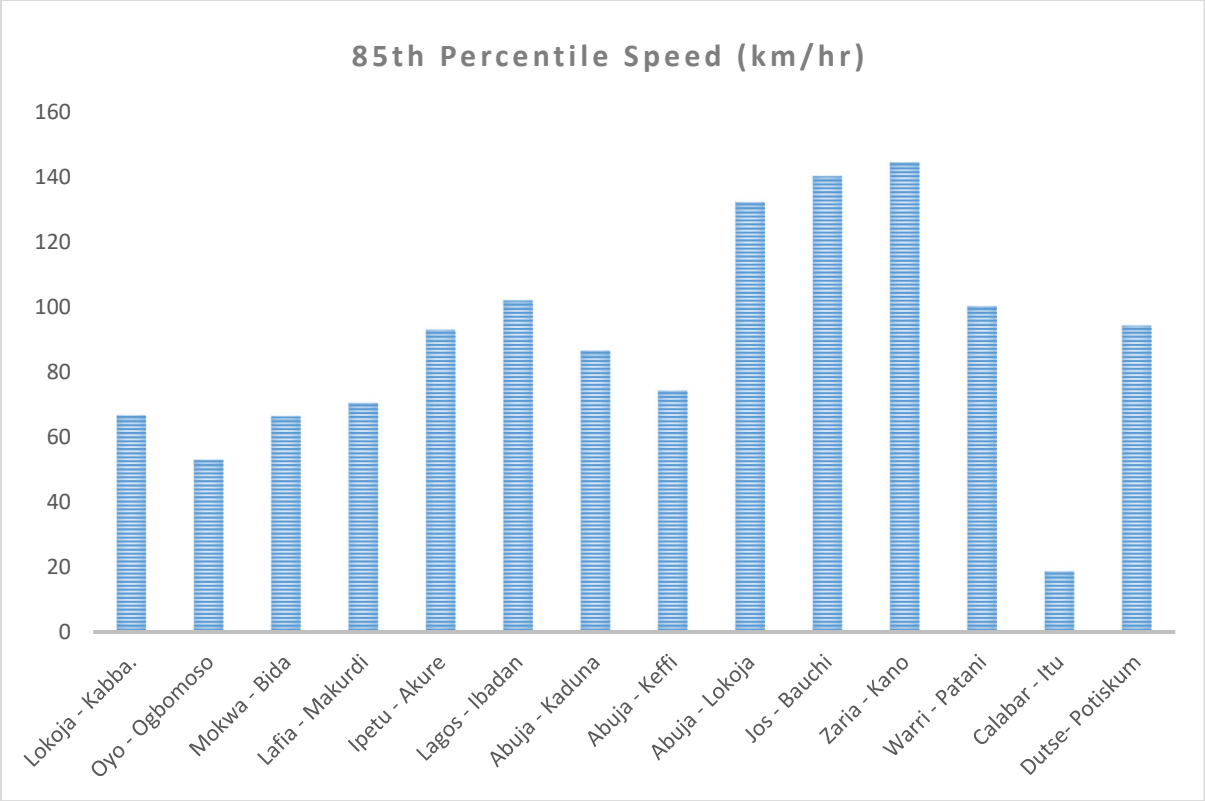

COMPARISON OF DAY AND NIGHT BY ROUTES
Day(0600-1800)
Night(1801-0559)
250000
200000
150000
100000
50000
0
Lokoja - Kabba.
Oyo - Ogbomoso
Mokwa - Bida
Lafia - Makurdi
Akure-Ilesa
Lagos - Ibadan
Abuja - Kaduna
Abuja - Keffi
Abuja - Lokoja
Jos - Bauchi
Calabar - Itu
Warri - Patani
Zaria - Kano
Dutse-Potiskum



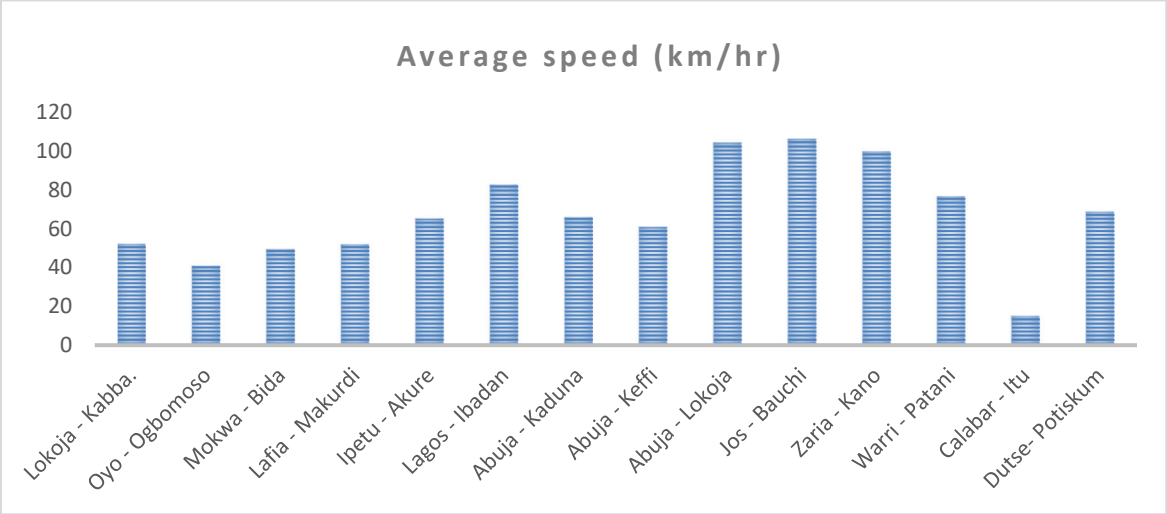
Speed Data

Speed is the most important performance gauge for the safety and cost-effectiveness of the major roads of the country. Speed means a quotient of distance moved by a vehicle and time. A widely used unit of speed, such as kilometres per hour (kph) or miles per hour (mph). There are two types of speed: space-mean speed and time-mean speed. Space mean speed happens when you divide the length of a road's portion by the average travel time of a car separately through this certain section. The time-mean speed or spot speed is the average spot speed of different vehicles, each of which has been measured at the same location in a given time.

Drivers along these roads take Abuja to Lokoja, Kano to Zaria, Lagos to Ibadan, and Jos to Bauchi with an 85% average speed received more than 100km/hr. limit. Accordingly, the leading factor behind this high number of deaths reported during the holidays is over-speeding. Therefore, technology and more manpower should be deployed along the slopes during such periods for effective policing to reduce losses of life. Besides this, many motorists along Sahala-Lokoja, Kabba, Ipetu-Akure, Unborn-Asaba, Abuja-Lokoja, Jos-Bauchi and Lagos-Ibadan speeds above the 160 km/hr. limit, which makes these routes high risk during the festive period.



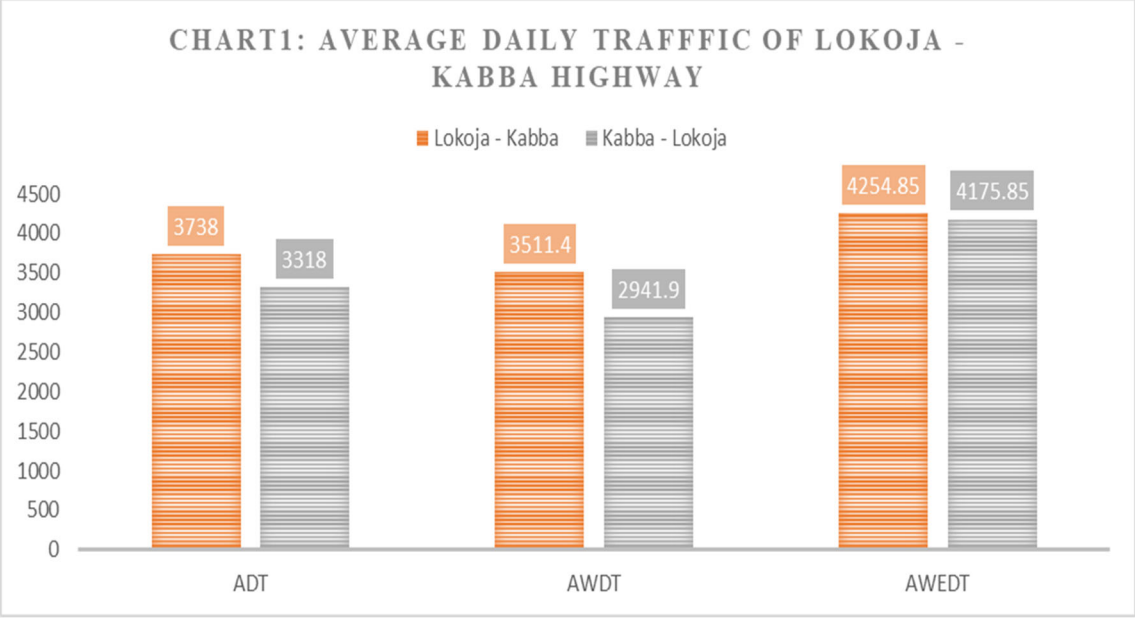
Source: field survey,2023



Summary Data PSL = Posted speed limit = 50km/hr											
Route	ADT	AWDT	AWEDT	85th	Avg	SD.	95th	Var.	Min.	Max	% >PSL
				km/hr							
Lokoja - Kabba	3738	3511.4	4254.85	69.84	53.8	15.89	83.16	252.4	10.1	151.9	55.8
Kabba - Lokoja	3318	2941.9	4175.85	63.36	50.2	13.13	73.8	172.48	10.1	159.5	46.7
Both Directions	7056	6453	8431	66.60	52.10	14.77	79.20	218.06	10.10	159.50	51.5

Table 3: Summarizes Data for Lokoja-Kabba Highway A3.

Source: Field Survey 2023



Category	Class	Bins	Both Direction		Lokoja - Kabba		Kabba - Lokoja	
			No. Veh.	percentages	No. Veh.	percentages	No. Veh.	percentages
L	Class		60550	43.50%	34224	46.40%	26326	40.20%
	Class		65606	47.20%	32144	43.60%	33462	51.10%
	Class		938	0.70%	491	0.70%	447	0.70%
M	Class		6310	4.50%	4098	5.60%	2212	3.40%
	Class		570	0.40%	234	0.30%	336	0.50%
	Class		2176	1.60%	1069	1.50%	1107	1.70%
H	Class		18	0.00%	13	0.00%	5	0.00%
	Class		815	0.60%	398	0.50%	417	0.60%
	Class		328	0.20%	161	0.20%	167	0.30%
	Class	10	1479	1.10%	702	1.00%	777	1.20%
	Class	11	193	0.10%	95	0.10%	98	0.10%
	Class	12	138	0.10%	67	0.10%	71	0.10%

Table 4: summary percentages of traffic volume and number of vehicles data by class

Field Survey 2023

Speed Summary									
	Lokoja - Kabba			Kabba - Lokoja			Both Directions		
	Weekday	Weekend	All Week	Weekday	Weekend	All Week	Weekday	Weekend	All Week
85th (Km/Hr)	69.84	69.66	69.84	64.62	61.02	63.36	67.32	65.52	66.60
Avg (Km/Hr)	53.8	53.7	53.8	50.9	49	50.2	52.5	51.4	52.1

Table 5: Summary Speed Data

CHART 11: 85TH PERCENTILE SPEED ALONG LOKOJA - KABBA (BOTH DIRECTIONS) HIGHWAY

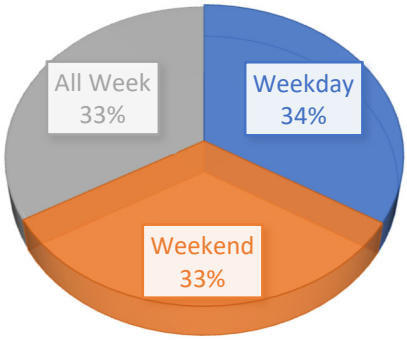
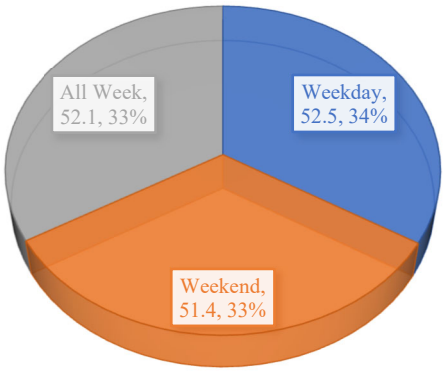


CHART 12: AVERAGE SPEED ALONG LOKOJA - KABBA HIGHWAY



Speed Summary									
	Lokoja - Kabba			Kabba - Lokoja					Both Directions
	Weekday	Weekend	All Week	Weekday	Weekend	All Week	Weekday	Weekend	All Week
10 - 20 km/h	0.73%	6.23%	0.85%	2.21%	0.52%	0.56%	0.66%	0.80%	0.71%
20 - 30 km/h	3.41%	23.57%	3.60%	6.59%	4.79%	4.17%	3.59%	4.37%	3.87%
30 - 40 km/h	13.14%	33.87%	13.08%	26.15%	17.32%	15.96%	14.04%	15.12%	14.43%
40 - 50 km/h	27.15%	20.63%	26.66%	38.26%	35.00%	32.59%	28.94%	30.33%	29.45%
50 - 60 km/h	25.90%	10.34%	26.09%	17.37%	25.84%	26.35%	26.25%	26.14%	26.21%
60 - 70 km/h	14.86%	3.80%	14.98%	6.69%	10.38%	12.55%	14.42%	12.81%	13.84%
70 - 80 km/h	8.12%	1.22%	8.04%	2.03%	4.28%	5.59%	7.33%	6.10%	6.89%
80 - 90 km/h	4.12%	0.24%	4.13%	0.51%	1.39%	1.81%	3.18%	2.78%	3.04%

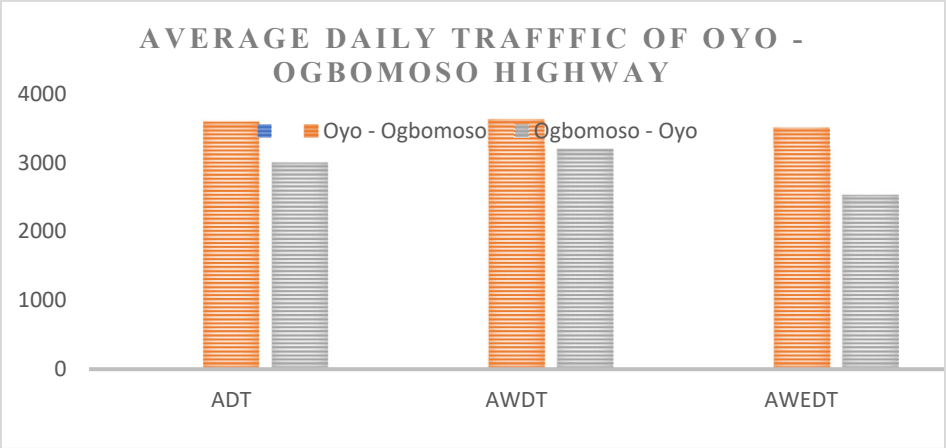
90 - 100 km/h	1.72%	0.06%	1.73%	0.13%	0.31%	0.31%	1.07%	1.04%	1.06%
100 - 110 km/h	0.66%	0.01%	0.61%	0.04%	0.07%	0.06%	0.39%	0.29%	0.35%
110 - 120 km/h	0.17%	0.01%	0.19%	0.01%	0.03%	0.02%	0.10%	0.13%	0.11%
120 - 130 km/h	0.02%	0.01%	0.03%	0.02%	0.02%	0.01%	0.01%	0.03%	0.02%
130 - 140km/h	0.00%	0.01%	0.02%	0.00%	0.02%	0.01%	0.00%	0.03%	0.01%
140 - 150 km/h	0.00%	0.00%	0.01%	0.00%	0.02%	0.01%	0.01%	0.02%	0.01%
150 - 160 km/h	0.00%	0.00%	0.00%	0.00%	0.03%	0.01%	0.00%	0.02%	0.01%

Table 6: Summary Percentages of Vehicle by Speed Class Data

Field Survey 2023

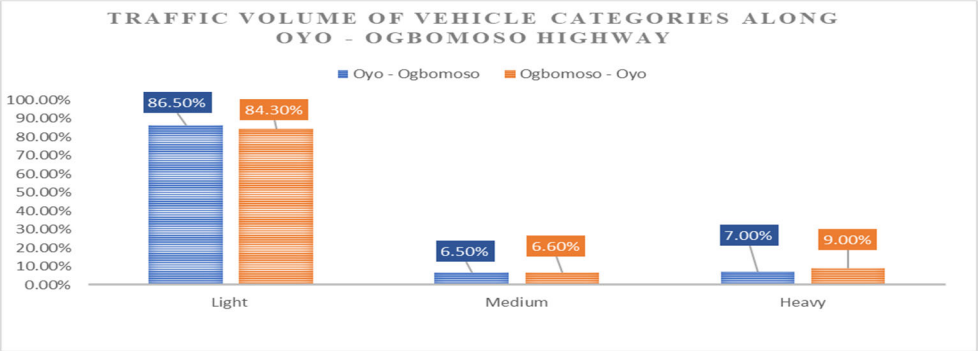
Summary Data PSL = Posted speed limit = 50km/hr											
Route	ADT	AWDT	AWEDT	85th	Avg	SD.	95th	Var.	Min.	Max	% >PSL
				km/hr							
Oyo - Ogbomoso	3591	3630.6	3501.2	50.22	37.9	12.56	60.12	157.67	10	156	16.5
Ogbomoso - Oyo	2996	3198.4	2528.35	55.44	44.2	11.87	65.52	141	10.1	138.5	28.0
Both Directions	6587	6829	6030	52.92	40.80	12.65	63.00	159.94	10.00	156.00	21.6

Table 7: Summarizes Data for Oyo - Ogbomoso Highway



Classification					
Route	Light	Medium	Heavy	Unclassifiable	Total
Oyo - Ogbomoso	86.50%	6.50%	7.00%	0.00%	100%
Ogbomoso - Oyo	84.30%	6.60%	9.00%	0.10%	100%
Both Directions	85.40%	6.60%	7.90%	0.10%	100%

Table 8: summarizes percentages of vehicle by class data.



Category	Class	Bins	Both Direction		Oyo - Ogbomoso		Ogbomoso - Oyo	
			No. Veh.	percentages	No. Veh.	percentages	No. Veh.	percentages
L	Class	1	26433	20.30%	12944	18.30%	13489	22.80%
	Class	2	82930	63.80%	47261	66.70%	35669	60.30%
	Class	3	1741	1.30%	1036	1.50%	705	1.20%
M	Class	4	5506	4.20%	2907	4.10%	2599	4.40%
	Class	5	1131	0.90%	654	0.90%	477	0.80%
	Class	6	1926	1.50%	1090	1.50%	836	1.40%
H	Class	7	44	0.00%	42	0.10%	2	0.00%
	Class	8	4092	3.10%	1875	2.60%	2217	3.70%
	Class	9	1791	1.40%	839	1.20%	952	1.60%
	Class	10	3180	2.40%	1568	2.20%	1612	2.70%
	Class	11	615	0.50%	332	0.50%	283	0.50%
	Class	12	610	0.50%	326	0.50%	284	0.50%

Table 9: Summary percentage of vehicles and number of vehicles by class

Speed Summary									
	Oyo - Ogbomoso			Ogbomoso - Oyo			Both Directions		
	Weekday	Weekend	All Week	Weekday	Weekend	All Week	Weekday	Weekend	All Week
85th (Km/Hr)	68.22	66.06	67.50	65.52	64.26	65.16	66.96	65.34	66.42
Avg (Km/Hr)	50.8	48.9	50.1	48.9	48	48.6	49.9	48.5	49.4

Table 10: Summary of Speed Data

CONCLUSION AND RECOMMENDATIONS

The research aims to determine the significance and the urge to redress the big traffic survey of highway volume in Nigeria; three high-value roads were selected for the study, connecting the Nigerian states of high importance in transportation and national connection. According to the study's findings, the major highway flow of motor vehicles comprised the main longitudinal traffic load on the chosen roadways. This, however, means more road lanes for more cars/SUVs, which is the result of ineffective public investment by both government and private transport sector initiatives that have been adopted into a conventional public transport system. This also includes the poor policy and poor intermodal system.

Apart from this, it reveals that there is no direct link between inbound traffic and outbound traffic flow, and it sets the poor road conditions and the traffic jams as the reasons people prefer indirect routes over direct paths. Nevertheless, it does not mean that roads cannot be improved. Unfortunately, the scope of road design and infrastructure maintenance in Nigeria is among the persistent bottlenecks that cause traffic and road transportation management to be one of the problems in the country.

This is mainly contributed by the neglect of the traffic volume survey and the decline in provision and maintenance of basic infrastructural facilities such as traffic management devices being the focus of this study, traffic control and monitoring, road lighting, night visibility mechanism, road layout and geometry, road signals and signs. Based on the research results, it is recommended that the traffic volume survey and road planning along the road corridors need to be restructured; digital traffic count devices be installed, including the permanent count devices and videotaping devices along the major traffic corridors; the road maintenance to be done periodically with quality roads, installations of modern (auto and manual) traffic management devices on the road corridors; as well as road in terms of this, research units are a must to have for an efficient, safe and a quality road transport in Nigeria and many other developing states encountering the same traffic problems.

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The author, who is presenting as another researcher, can also contribute to creating and planning the paper: Study conception and design, data collection, mentation, and draft manuscript preparation; the author reviewed the results and approved the final version—Wasiu Adenekan; Analysis and interpretation of results: Kia Eyo Essien, I.

REFERENCES

Abdurrahman, U. N. and Nasiru, S. (2022). Influence of Roadside Friction on the Traffic Flow in Core Northwestern States. Direct Research Journal of Engineering and Information Technology. Vol. 9 (4), Pp. 201-207. https://directresearchpublisher.org/drjeit/files/2022/05/PublicationDRJEIT19829781.pdf

Badejo, B.A. (2011). Transportation Removing the Clogs to Nigeria's Development. Lagos: Anchorage Press and Publishers

European Commission JRC (2008). Road traffic data: Collection methods and applications. European Commission

Ministry of Works and Transport (2004). Traffic data collection and analysis: Road department, Gaborone, Botswana. Botswana: MWT Publication.

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Padshala, A. (2014). Traffic studies of urban mid-block section: A case study of Pragatinagar to Akhbarnagar and Akhbarnagar to Ranip crossroad. International Journal of Research in Engineering and Technology 3(6), 383-385