ANALYSIS OF VEHICULAR TRAFFIC ON THE THREE MAJOR ROUTES OF THE FEDERAL CAPITAL CITY OF ABUJA

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Abstract:
The study investigated vehicular traffic on the three major routes leading in and out of the federal capital city of Abuja with focus on urban mass transit (high capacity) buses. Data were sourced through primary sources using questionnaires for Commuters, interview for Urban Mass Transit Bus (UMTB) Operators and Regulator and observation for vehicular traffic count. Data were analyzed using tables, percentages and charts while Hypotheses were analyzed using ANOVA. From the findings, 84.0% of respondents indicated that Urban Mass Transit Bus functionality was highly inadequate. This makes Commuters to rely on illegally operating Passenger Service Vehicles (PSV). Traffic volume and vehicular composition were dominated by Cars/Jeeps/Space Buses giving 443,718 (93.71%) while public Urban Mass Transit Bus was 329 (0.07%) on a six-hour traffic count. Hypothesis testing showed that there was a statistically significant difference in the volume of Commuters that board private cars and those that board Urban Mass Transit Bus because the F ratio of 3.100 at p=0.05 was 0.046. The study recommended proper enforcement by the Transport Secretariat against illegal Passenger Service Vehicles, provision of Light Rail, Provision of subsidy for Urban Mass Transit Bus Operators, adequate Bus Terminals, Bus stops and Bus Rapid Transit lanes.

Key words:
Transportation, Vehicle, Traffic, Federal Capital City

INTRODUCTION

Mobility is inherent to human existence, rudimentary to economic, human and social development. Every movement starts from an origin and ends at a destination. Between these two points are a potential set of intermediate locations linked with geographical attributes. Transportation systems are made up of infrastructures, modes and terminals which are enshrined and integrated in the daily socio-economic life of individuals, institutions and corporations of all kinds [12]. Transportation involves moving people, freight and services from a geographical locality to another locality to enhance utility. Public transportation is a system of moving passengers or freight with private or public carriers for a financial reward

[13]. Bus, rail, light rail, tramways, monorails, and water transportation make up a Public transport system. Passengers' preference of one or more of the modes of public transport depends on area characteristics. One of the main characteristics of high occupancy bus transport system is that it is one of the cheapest and affordable transport systems. The urban mass transit bus scheme is a public transport arrangement involving mainly high occupancy buses with larger passenger space, operating on defined road with predetermined timetable or adjustably routed [7].

[6] affirmed that a Public Transport for a developing nation is a transportation system for the mass movement of passengers ranging from fifty (50) and above while for a developed nation, it is a transportation system for the mass movement of passengers ranging from eighty (80) and above. The year 2006 census has an official population of 1.4 million for Abuja. But, the daily population is very much higher because of commuters from other neighbouring states like Nassarawa, Niger and Kogi. Most trips are done using private cars, taxis, informal buses and in the outer extremities of the city by motorcycles. There are estimated nine (9) million passenger trips per week and over 1.3 million vehicles per week. Most of the influx is travel between homes and places of work, business activities and school attendance. Urban transportation is highly dominated by private car use which accounts for about 70% of all vehicular traffic. 46.1% of all households in Abuja own at least one car. Public transport accounts for approximately 59% of transport demand in the Federal Capital Territory. Concessions to carry 25% of commuters have been granted by Federal Capital Territory Administration to private companies for high capacity bus operations [3].

Despite all, this goal is yet to be fully achieved. High Capacity Bus services are dwindling while Private car ownership and usage is on the increase there by leading to high vehicular traffic in the transport routes [7]. Public transport on the three main corridors leading in and out of the federal capital city has experienced heavy gridlock due to high vehicular traffic. These corridors serve as the main transport entry and exit routes into the city. Since these routes are the main transport corridors in the capital city of the most populous black nation in the world, an evaluation of the vehicular traffic in these corridors is a step in the right direction. In spite of the advantages of mass transit system the use of private cars remains the most patronized mode in Nigeria for movement of people. The consequence of the dominant use of road mode of transport especially private cars in moving people will reflect when the road and private car usage fail to contribute positively to the efficient mass movement of people across numerous towns in Nigeria. In view of this, the study intends to examine the vehicular traffic on the three major routes leading in and out of the federal capital city of Abuja.

1   LITERATURE REVIEW

There have been several publications by different authors on issues relating to vehicular traffic and public transportation in Nigeria. [4], examined the effects of congestion and travel time variability along Abuja-Keffi Corridor in Nigeria. Study aimed at identifying the causes of congestion and determining journey time variability along the route. Study findings showed that for travellers, commuting time to work was unpredictable; inadequate bus stops and excessive motorization contribute to congestion on the corridor. [10], examined the traffic management challenges caused by traffic congestion in the Alaba International Market Road, Lagos State. The study identified causes of traffic gridlock to include; private cars, road, haphazard parking, loading plus off-loading of passengers and goods, on-street trading, poor incident management and inefficient traffic control mechanism. [9], evaluated traffic

congestion in developing countries like Nigeria. The study revealed that road traffic congestion due to high vehicular volume, poorly planned road network and traffic/management still exists in cities like Lagos and Abuja and has caused huge hold-up, prolonged trips, high energy expenditure, monetary and man-hour loss. [11], studied traffic congestion problems in Central Business District (CBD) Ikeja, Lagos Metropolis, Nigeria. The focus was to explore problems of traffic gridlock plus management problems in the CBD of Ikeja. Result of findings showed a chaotic land use model, resulting into prolonged trips, congestion and dwindled output. [14], assessed traffic delay problems and characteristics at urban road intersections using Ilorin as a Case Study. Study findings showed variations in the traffic pattern of intersections studied. In addition, traffic delays were revealed to be connected with the traffic volumes at the different intersections and eventually caused gridlock. Besides, parking problems and traffic wardens also contributed to the gridlock at the junctions. [5], investigated traffic congestion in major cities of Nigeria. The result of findings showed that lack of parking facilities, poor road network, inadequate road capacity and poor driving habits immensely contribute to traffic congestion in Abuja, Lagos and Port Harcourt. It can be stated that issues relating to vehicular traffic and urban public transportation are yet to be covered by researchers. Therefore, the objective of this study is hinged on vehicular traffic volume in order to determine the ratio of urban mass transit buses to other vehicles within a traffic period in Abuja.

1.1 Hypothesis
H_0: There is no statistically significant difference in the vehicular traffic on the three major routes that lead to the Federal Capital City.
H_1: There is statistically significant difference in the vehicular traffic on the three major routes that lead to the Federal Capital City.

2. MATERIALS AND METHODS

2.1 Study Area
        The FCT Abuja was created by decree No. 6 of February 4th, 1976 in response to the problems of managing capital cities and the experience from Lagos as national capital [1]. Abuja is centrally situated in Nigeria as its capital with an 8,000 square Kilometres of land coverage. Geographically, it is situated on latitude $8^o 25''$ and $9^o 25''$ North of the Equator and Longitude $6^o 45''$ and $7^o 45''$ East of the Greenwich. Transportation in Abuja is better than many cities in Nigeria due to better infrastructure [8]. The FCT has three main entrances namely; Musa Yar'dua Expressway (popularly known as Airport road), The Murtala Muhammed Expressway (popularly known as Kubwa expressway) and the Abuja-Keffi expressway (popularly known as Nyanya expressway) [2].
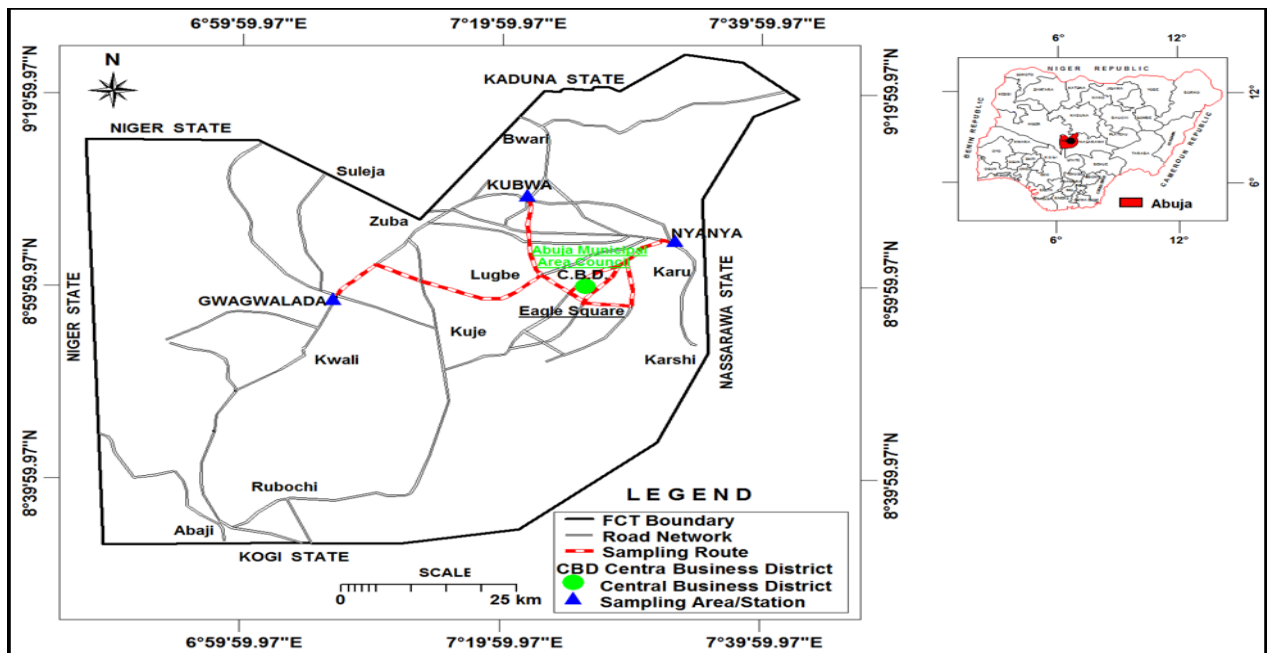
Fig. 1*: Map of Federal Capital Territory, Abuja*
Source: Administrative Map of Federal Capital Territory, Abuja (2015)

2.2 Presentation of Data

The study made use of primary data collected by observation of vehicular traffic on Yar'adua expressway (Airport road), Murtala Mohammed Expressway (Kubwa expressway) and Abuja-Keffi (Nyanya) expressway in Abuja using traffic count survey. The objective was to determine the vehicular traffic volume and category on each of the corridor as well as the volume of urban mass transit buses (high capacity buses) in the traffic volume during the peak periods.

The choice of the route is because the expressway serves as the three major corridors that connects traffic in and out of the federal capital city of Abuja.

The study collected data on the vehicular volume and category using observation schedule (checklist) by conducting a manual vehicular traffic count (using Tally Sheet/traffic count schedule as the check list) on the three corridors on a Wednesday from 6am to 9am and 3pm to 6pm. Survey stations were chosen as follows; Kubwa expressway (Tipper Garage by Ministers' hill), Airport road (City gate) and Nyanya expressway (Mogadishu cantonment pedestrian bridge). In Tally count, I=1 vehicles; II= 2 vehicles and so on. The Traffic count schedule had categories of vehicles which include: Category 1: Cars, Jeep & Space bus; Category 2: Taxis; Category 3: Mini Buses 7, 10, 14 & 18 Passenger capacities; Category 4: Motorcycle; Category 5: Tricycle; Category 6: Mid Buses 28-35 Capacity (Coaster Bus); Category 7: Big Buses (Public UMTB); Category 8: Big Buses (Private); Category 9: Pick-Ups; Category 10: Trailers & Tankers and Category 11: Lorry & Trucks. Data for the study was collected using observation schedule (checklist) and analysed using descriptive statistics (percentages and tables). Hypothesis was analysed using inferential statistics (one way ANOVA).

Tab. 1 *A 6 hour Inflow/Outflow Summary of Traffic Volume Survey for Kubwa Express Way - CBD from 6:00am-9:00am & 3:00pm-6:00pm*

VEHICLE TYPE	6-7am	7-8am	8-9am	9-10am	3-4pm	4-5pm	5-6pm	TOTAL
CARS, JEEP &SPACE BUS	18,764	25,835	32,651	23,640	22,666	27,450	31,112	182,118
TAXIS	520	640	703	660	724	891	872	5010
MOTOR CYCLE	292	102	183	124	67	49	129	946
MINI BUSES 7, 10, 14 & 18 Passenger Capacity	168	142	107	125	45	139	170	896
MID BUSES 28-35 Capacity (Coaster Bus)	72	64	59	25	45	69	77	411
BIG BUSES (Public High Capacity Bus/UMTB)	21	10	9	5	6	10	19	80
BIG BUSES (Private High Capacity Bus)	2	1	-	-	3	1	2	9
PICK-UPS	88	97	83	74	79	87	119	627
TRAILER & TANKERS	29	35	10	15	9	5	8	111
LORRY & TRUCKS	26	40	37	41	23	18	45	230
TRICYCLE	7	-	-	2	-	4	6	19
TOTALS	19,989	26,966	33,842	24,711	23,667	28,723	32,559	190,457

Source: Researcher's Field survey, 2017

Table 1 showed the distribution for the traffic count on Kubwa Traffic route between 6am and 9am and between 3pm and 6pm on Wednesday 22/03/2017. It revealed that Cars, Jeep and Space Bus recorded a total of 182,118 vehicles having the highest number; Taxis 5010; Motor Cycle 946; Mini buses (low capacity) recorded 896 vehicles; Mid Buses (coaster bus) recorded 411vehicles; Big Buses (Public High capacity Buses/UMTB) had a total count of 80 vehicles; Big Buses (Private High Capacity Buses) recorded 9 vehicles; Pick-ups 627; Trailers and Tankers 111; Lorry and Trucks 230 and Tricycle 19.

Tab. 2 *A 6 hour Inflow/Outflow Summary of Traffic Volume Survey for Yar'adua Express Way (Airport road) - CBD from 6:00am-9:00am & 3:00pm-6:00pm*

VEHICLE TYPE	6-7am	7-8am	8-9am	9-10am	3-4pm	4-5pm	5-6pm	TOTAL
CARS, JEEP & SPACE BUS	16,764	17,835	19,651	11,640	7,666	18,450	21,112	113,118
TAXIS	600	1,102	896	940	783	880	1,121	6,322
MOTOR CYCLE	121	90	83	68	63	58	112	595
MINI BUSES7, 10, 14 & 18 Passenger Capacity	140	163	99	125	60	107	115	809
MID BUSES 28-35 Capacity (Coaster Bus)	33	70	48	12	15	55	68	301
BIG BUSES (Public High Capacity Bus/UMTB)	26	9	13	2	4	8	19	81
BIG BUSES (Private High Capacity Bus)	3	-	3	-	2	1	1	10
PICK-UPS	121	89	110	120	88	94	133	755
TRAILER & TANKERS	55	42	33	8	12	10	45	205
LORRY & TRUCKS	77	53	45	110	93	86	74	538
TRICYCLE	3	-	-	-	-	-	1	4
TOTALS	17,943	19,453	20,981	13,025	8,786	19,749	22,801	122,738

Source: Researcher's Field survey, 2017

Table 2 showed the distribution for the traffic counts along Airport road between the same time periods. It revealed that Cars, Jeep and Space Bus recorded a total of 113,118 vehicles having the highest number; Taxis 6322; Motor Cycle 595; Mini buses (low capacity) recorded 809 vehicles; Mid Buses (coaster bus) recorded 301 vehicles; Big Buses (Public High capacity Buses/UMTB) had a total count of 81 vehicles; Big Buses (Private High Capacity Buses) recorded 10 vehicles; Pick-ups 755; Trailers and Tankers 205; Lorry and Trucks 538 and Tricycle 4.

***Tab. 3** A 6 hour Inflow/Outflow Summary of Traffic Volume Survey for Nyanya Express - CBD Way from 6:00am-9:00am & 3:00pm-6:00pm*

VEHICLE TYPE	6-7am	7-8am	8-9am	9-10am	3-4pm	4-5pm	5-6pm	TOTAL
CARS, JEEP & SPACE BUS	21,034	22,665	24,773	21,983	15,443	22,094	20,490	148,482
TAXIS	990	1,223	1,200	1,100	945	1,300	1,150	7,908
MOTOR CYCLE	150	110	74	94	60	101	134	723
MINI BUSES 7, 10, 14 & 18 Passenger Capacity	205	182	103	133	96	196	213	1,128
MID BUSES 28-35 Capacity (Coaster Bus)	45	66	84	68	34	77	84	458
BIG BUSES (Public High Capacity Bus/UMTB)	32	28	34	23	13	15	23	168
BIG BUSES (Private High Capacity Bus)	2	2	-	-	1	2	2	9
PICK-UPS	132	110	129	122	74	136	129	832
TRAILER & TANKERS	24	15	13	10	6	2	1	71
LORRY & TRUCKS	82	36	41	116	96	74	82	527
TRICYCLE	5	1	2	-	-	3	5	16
TOTALS	22,701	24,438	26,453	23,649	16,768	24,000	22,313	160,322

Source: Researcher's Field survey, 2017

Table 3 also showed the distribution for the traffic counts along Nyanya road between the same time periods. The results also showed that Cars, Jeep and Space Bus recorded a total of 148,482 vehicles having the highest number; Taxis 7,908; Motor Cycle 723; Mini buses (low capacity) recorded 1,128 vehicles; Mid Buses (coaster bus) recorded 458vehicles; Big Buses (Public High capacity Buses/UMTB) had a total count of 168 vehicles; Big Buses (Private High Capacity Buses) recorded 9 vehicles; Pick-ups 832; Trailers and Tankers 71; Lorry and Trucks 527 and Tricycle 16.

***Tab. 4** A 6 hour (6:00am-9:00am & 3:00pm-6:00pm) Routes Traffic Volume Survey Summary*

ROUTE NAME	CARS, JEEP &SPACE BUS	TAXI	MOTOR CYCLE	MINI BUSES 7, 10, 14 & 18 Passenger Capacity	MID BUSES 28-35 Capacity (Coaster Bus)	BIG BUSES (Public High Capacity Bus)	BIG BUSES (Private High Capacity Bus)	PICK-UPS	TRAILLERS &TANKERS	LORRY &TRUCKS	TRICYCLE	TOTAL
Kubwa Express Way	182,118	5,010	946	896	411	80	9	627	111	230	19	190,457
Yarádua Express Way (Airport road)	113,118	6,322	595	809	301	81	10	755	205	538	4	122,738
Nyanya Express	148,482	7,908	723	1,128	458	168	9	832	71	527	16	160,322

TOTAL	443,718	19,240	2,264	2,833	1,170	329	28	2,214	387	1,295	39	473,517
PERCENTAGE (%)	93.71	4.06	0.48	0.59	0.25	0.07	0.01	0.47	0.08	0.27	0.01	100

Source: Researcher's Field survey, 2017

Table 4 showed the Routes Traffic Survey of the three major routes that lead to Central Business District CBD. The routes are: Kubwa expressway, Airport road and Nyanya expressway. The study revealed that Kubwa expressway had the highest number of vehicular traffic 190,457; followed by Nyanya expressway 160,322 and Airport road 122,738 giving a total of 473,517 transport vehicles. In summary of the routes survey, Cars, Jeep and Space Bus recorded the highest number of 443,718 vehicles; Taxis 19,240; Motor Cycle 2,264; Mini buses (low capacity) recorded 2,833 vehicles; Mid Buses (coaster bus) recorded 1,170vehicles; Big Buses (Public High capacity Buses UMTB) had a total count of 329 vehicles; Big Buses (Private High Capacity Buses) recorded 28 vehicles; Pick-ups 2,214; Trailers and Tankers 387; Lorry and Trucks 1,295 and Tricycle 39.

Hypothesis Testing:

H_0: There is no statistically significant difference in the vehicular traffic on the three major routes that lead to CBD.

H_1: There is statistically significant difference in the vehicular traffic on the three major routes that lead to CBD.

Tab. 5 *One way ANOVA computed for the Hypothesis*

	Sum of Squares	Df	Mean Square	F ratio	Significance at p=0.05
Between Groups	209289037.636	2	104644518.818	0.051	0.950
Within Groups	61140719504.364	30	2038023983.479		
Total	61350008542.000	32			

Source: Researcher's Analysis, 2017

The information on Table 4 on Vehicular Traffic on the three major routes to Federal Capital City (FCC) was used for this analysis. The One way ANOVA was used to test the stated hypothesis. The result of the test was indicated on Table 5 above. The distribution showed that the F ratio of 0.051 at p=0.05 was 0.950. However, since the level of significance of 0.950 was higher than the p value of 0.05, thus we accept the null hypothesis (H_0) which states that there is no statistically significant difference in the vehicular traffic on the three major routes that leads to Federal Capital City.

2.3 Discussion

The study discovered the number of Cars, Jeeps, and Space Buses (which are sometimes used for private commercial purposes on these routes) accounted for about 93.71% of the entire traffic. In other words, more private vehicles ply the sampled roads in the study area. The study observed that Cars, Jeeps (SUV), and Space Buses accounted for 93.71%, taxis 4.06%, Motorcycle 0.48%, Mini Buses 0.59%, Big Buses (public UMTB) 0.7%, Big Buses (private) 0.1%, Pick-ups 0.47%, Trailers and Tankers 0.08%, Lorry and Trucks 0.27% and Tricycle 0.01%. The study further revealed that public UMTB represented only 0.7% compared to the dominance of Cars, Jeeps (SUV), and Space Buses 93.71% in the traffic survey summary. Comparison between public UMTB 0.7% and Cars, Jeeps (SUV), and Space Buses 93.71%, makes the UMTB system highly insignificant in the study area. In the Hypothesis testing, the

distribution showed that the F ratio of 0.051 at p=0.05 was 0.950. Since the level of significance of 0.950 was higher than the p value of 0.05, the null hypothesis (H_0) was accepted which states that there is no statistically significant difference in the vehicular traffic on the three major routes that leads to Federal Capital City.

3 CONCLUSIONS

Findings revealed that Urban Mass Transit Buses (High Capacity Buses) (UMTB) system in the study area was very inadequate as measured from the number of other vehicles in the traffic survey. UMTB (0.07%) was highly insignificant when compared to Cars, Jeeps (SUV), and Space Buses (93.71%). The volume of traffic on sampled roads was the same as more Cars, Jeeps (SUV), and Space Buses (93.71%) ply the routes more than the Taxis, Mini Buses, Big Buses (public and private), Pick-ups, Trailers and Tankers, Lorry and Trucks and Tricycle. The UMTB system is an important tool for promoting socio-economic development of a society. Thus, the UMTB Operators in the study area are therefore challenged to remain relevant to urban mobility through improved service delivery frameworks while the Regulator are also urged to ensure adequate financing and availability of subsidy for adequate public transport system in Abuja. The study recommended proper enforcement by the Transport Secretariat against illegal Passenger Service Vehicles, provision of Light Rail, Provision of subsidy for Urban Mass Transit Bus Operators, adequate Bus Terminals, Bus stops and Bus Rapid Transit lanes.

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