APPLICATION OF SHORT PERIOD TRAFFIC COUNT TO ESTIMATE DAILY TRAFFIC FLOW IN AHMADU BELLO UNIVERSITY ZARIA, NIGERIA

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ABSTRACT

Traffic flow poses serious traffic management problems in many Nigerian urban centres and tertiary educational institutions in such cities may not be exempted. This is not quite different from the experience in Ahmadu Bello University, Zaria (ABUZ). This paper attempts to estimate the traffic flow in ABUZ by: determining the number of vehicles   in-bound traffic flow into Ahmadu Bello University, Zaria; explaining the factors responsible for variation in vehicular inflow per gates. The short period traffic counts method was employed to estimate vehicles; daily average vehicles density per/hour/day through the major gates was also determined through Mean while Chi- square was used to determine the total volume of traffic in- bound flow per gates, the highest entry gate and reasons for variation per gate. The results of daily counts revealed that in-bound flow through North gate is consistently higher. It was recommended that more traffic facilities; parking space, road shoulder, traffic signs should be put in place. It is also advised that the use of bicycles and trekking within campus should be encouraged, as these reduce traffic management problems and improve health of staff and students.

Keywords: Short period Traffic, Daily, Flow, Ahmadu Bello University Gates, Zaria

INTRODUCTION

Ahmadu Bello University, Zaria (ABUZ) came into being in 1962 as a premier northern Nigerian university to provide tertiary education and to promote academic excellence in Nigeria (Vision and Mission Statement of ABU, 1962). It started with four faculties and eight departments and between 1962 to 2012 (50 years), the University witnessed the establishment of other compatible and incompatible land-uses, which are acting as pulling factors through the provision of admission, employment and the provision of other complementary services like residential, commerce, health and transportation. Currently, the ABUZ is witnessing physical growth, as there are structural infilling and location of more land-uses that are providing different programmes and desired services. In some quarters ABUZ is acclaimed as the largest university in Nigeria in terms of physical size.   Examples of units that contribute to the gigantic size of ABUZ include the Institute of Development Research (IDR), ABU Community Bank, ABU Community Market and the school Social Centre. Ahmadu Bello University Consultant Unit (ABUCONS), Disaster and Risk Management Centre, the up-coming Centre of Excellence and state of the art ICT Centre are other illustrations. It should be mentioned that all these land-uses are meant to serve ABU, Zaria and its environs and other institutions as well. These created and provided employment and other service points that attracted very high volume of human and vehicular traffic movement into ABU Zaria. Before now, the journey to work

pattern in ABUZ is mostly between residential areas (Areas A, B, BZ, C, E and F) to work places all sited within or very close to the main campus. This is in agreement with the model of Vance (1960), Wolforth (1965) and Wheeler (1967), where they in related but different studies proposed a case where all residence and work places are in same location or proximate boundary. This is the picture of journey to work place in ABU, Zaria. Even though work places within ABU exhibit linear pattern of arrangement   (after O'Connor and Meyer, 1979), the residential areas are scattered and located in different neighborhoods. This means that about 93% of the main and adjunct staff and other residents on ABUZ commute using different modes of transportation, either privately owned or commercially operated with consequent problems.

As a result of this, there is an increase in the number of vehicle and human movements coming into ABU Zaria daily, which is further fueled by increase in car ownership made possible by the increase in worker's salary and through bank loans. Thus as the daily inward vehicular movement increases so are the transport problems mounting. The basic issue is that this uneasy traffic management situation is very similar to large urban areas in general. The question then, as asked by Shoup (2006) is how much more would this apply to the university environment in particular which is a bounded space and often a small portion of a great metropolis area?. The need for parking spaces within the University environment would be much higher because of the increase in the volume of vehicles that flow into A.B.U. No doubt parking problem constitutes a special case and which probably explains why this particular issue has escaped much of the recent literature of parking problems within campuses (Shoup, 2006; Roth, 2004; Cathrop, 2002-2003).   Historically, parking did not become an administrative problem until the post-war boom in college enrollments (Grove and Slades, 1995). These problems will also include issues of space utilization and management, emergence of multiple points' traffic hold-ups, discerned parallel point parking and spontaneous un-designed authorized parking space, cause of delay and accident (Kinne, 1961).It therefore becomes a research problem to empirically examine the pattern of traffic movement into the main campus of ABUZ because not only that there is no previous study on this issue, the findings will be of transport policy significance for the present and the distant future in Nigerian tertiary educational institutions. The objectives are to: determine the number of vehicles (cars pickups, trucks and motorcycles) in-bound traffic flow in to the main campus of Ahmadu Bello University, Zaria and explain the factors responsible for variation in vehicular inflow per gates.

MATERIALS AND METHODS

The study area for this research is the Main Campus of the Ahmadu Bello University Samaru, Zaria. One of the premier universities of Nigeria located in Zaria, Kaduna State. Materials used in this research include; the field conducted data collection (short period traffic count) at the Main, North, NUGA and IAR gates of the ABU main campus. The daily traffic count was conducted during the peak period between 7:30am to 8:30am in the morning for five days running between Monday and Friday. The data was organized and processed into different pictorial graphs and tables for easy understanding. Chi square is the selected statistical technique used to determine the gate that has highest in-bound traffic flow (or is most utilized entry gate) into main campus, Ahmadu Bello University, Zaria.

RESULTS AND DISCUSSION

Tables 1-3 present the results of the short time traffic count of in-bound flow of vehicles (cars, pickups trucks and motor cycles) into ABU main campus through the major gates (Main,

North, NUGA and IAR gates) at the peak hour period (7:30am-8:30am) from Monday to Friday in 2011. Table 1 shows the details of counts for the gates, thus provided general picture of the in-bound traffic flow situation. This has assisted in determining the total number of vehicles coming through authorized gates into Ahmadu Bello University, Zaria.

Table 1: Cumulative Percentage Total of In- Bound Traffic flow Monday- Friday (7:30am-8:30am)

	Main		North		NUGA		I.A.R		Total
	Traffic	%	Traffic	%	Traffic	%	Traffic	%	Traffic
Monday	1094	21.63	1342	20.92	459	21.15	293	23.86	3188
Tuesday	983	19.42	1280	19.95	437	20.14	233	18.97	2932
Wednesday	1058	20.92	1211	18.89	433	19.95	242	19.71	2944
Thursday	917	18.12	1347	20.99	455	20.97	232	18.89	2951
Friday	1007	19.91	1235	19.25	386	17.79	228	18.57	2856
Total	5058	100	6415	100	2170	100	1228	100	14871

Source*: Authors' Field Work 2011

This section presents the summaries of the Mean and Chi-square calculation of in-bound traffic flow daily average vehicles (cars and motorcycles) density per/hour/day through the gates.

Average Daily Inflow of Vehicles:

$$\frac{\text{Summation of Vehicles for the total of five days}}{\text{Numbers of Days}}$$

$$= \frac{3188 + 2932 + 2944 + 2951 + 2856}{5}$$

The average vehicle inflow = 2, 974 vehicles/peak hour period/day

Average Car Density:

$$= \frac{\text{Total Car Inflow for Five Days at Peak Periods}}{\text{Number of Days}}$$

$$= \frac{127+1125+1140+1194+1695}{5}$$

$$= \frac{5896}{5}$$

Average Car Density= 1179 cars/peak hour/day

Average Motorcycle Density:

$$= \frac{\text{Total Motorcycle Inflow for Five Days at Peak Periods}}{\text{Number of Days}}$$

$$= \frac{1912+1807+1804+1757+1695}{5}$$

$$= \frac{8975}{5}$$

Average Motorcycle Density = 1795 Motorcycles/peak hour/day.

The result of daily counts summaries on the tables, presented in pictorial forms indicate the volume of in-bound traffic flow of vehicles coming into ABU Main Campus through gates

from Monday to Friday. It revealed that in-bound flow through North gate is consistently higher because it serves workers residing in Samaru, Shika and Bomo sub-settlement and from Samaru New Extension, as well as Areas C, E, G and H. It also provides good entrance to Demonstration Staff   School,   Public   Library,   Sick   Bay   and   Community   Market. These land-uses along that axis provide important services and therefore, attract a lot of traffic daily. Added to these, the North gate provides easy access to large faculties and departments like Pharmacy, Veterinary Medicine. Engineering, Medicine, Environmental Design and ABU Press. On daily basis, 2974 vehicles flow into the campus at selected peak periods meaning that 14871 vehicles come into ABU Main Campus through the gates weekly excluding Saturdays and Sundays (see table 2). The result of analysis also revealed a density of 1179 cars and 1795 motorcycles per day in undersigned major parks within the Campus. Figures 1 and 2 provide daily vehicle movement in-bound flow to ABU Main Campus from Monday to Friday during the selected peak period. It aided the explanation which revealed that the highest traffic inflow was recorded on Monday while the least was on Friday.   Chi   Square   analysis   was performed to compare the number of vehicles coming through the gates and determine which gate has the highest rate. The results obtained are expected to provide the records of in-bound flow and insight into traffic problems in ABU. Table 2 presents the traffic count data that was analyzed using the formula.

$$= \frac{CT \times RT}{GT}$$

$Where\ CT = Column\ Total\ ; RT = Row\ Total;\ GT = Grand\ Total\ ; Fe = Expected\ Frequency$

Table 2:Daily Traffic In-Bound flow into ABU Main Campus from Monday Friday(7:30am-8:30am)

Gates	Monday	Tuesday	Wednesday	Thursday	Friday	Week Total
Main	1094	983	1058	917	1007	5058
North	1342	1280	1211	1347	1235	6415
NUGA	459	437	433	455	386	2170
I.A.R	293	233	242	232	228	1228
Total	3188	2932	2944	2951	2856	14871

Source: Authors' Field Work, 2011

Table 3: Summarized result of Chi-square analysis.

F_o	F_e	F_o-F_e	$(F_o-F_e)^2$	$\frac{(F_o-F_e)^e}{F_e}$
1094	1084.32	968	93.70	93.70/1084.32=0.09
982	997.25	-15.25	232.56	232.56/997.25=0.23
1058	1001.33	56.67	3211.49	3211.49/1001.33=0.0009
917	1003.71	-86.71	7518.62	7518.62/1003.71=7.49
1007	971.40	35.6	12267.36	1267.36/971.40=1.30
1342	1375.23	-33.23	1104.23	1104.23/1375.23=0.80
1280	1264.80	-15.20	231.04	231.04/1264.80=0.18
1211	1269.97	-58.97	3477.46	3477.49/1269.97=2.74
1347	1272.99	74.01	5477.48	5477.48/1272.99=4.30
1235	1232.01	2.99	8.94	8.94/1232.01=0.007
459	465.20	-6.20	38.44	38.44/465.20=0.08
437	427.84	7.41	54.91	54.91/427.84=0.13

433	429.59	3.41	11.63	11.63/429.59=0.03
455	430.61	24.39	594.81	594.81/430.61=1.38
386	416.75	-30.75	945.87	945.87/416.75=2.27
293	263.25	29.75	885.06	885.06/263.25=3.36
233	242.12	-9.12	83.17	83.17/242.12=0.34
242	243.11	-1.11	1.23	123/243.11 = 0.005
232	243.68	-11.68	136.42	136.42/243.68 = 0.59
228	235.84	-7.84	61.47	61.47/235.84 = 0.26
				Calculated Value 25.55 (X^2)

$X^2 = 25.55$

Significance Level $\quad = \quad 0.05$

Degree of Freedom $\quad = \quad$ (C-1) (R-1)

$\qquad\qquad\qquad\qquad = (4-1)(5-1)$

$\qquad\qquad\qquad\qquad = 3 \times 4 = 12$

Table 3 presents the result of the calculated value of chi Square 25.55 is found to be greater than the critical value 5.23 at 0.05 level of significance, which can be interpreted to mean that there is significant different in the in- bound flow volume of vehicles coming into Ahmadu Bello University Main Campus gates daily.

However, going by the daily records of vehicles coming into the Main Campus followed by Thursday with a record of 2951 Wednesday with a record of 2944.The least turned up to be Friday with a record of 2856. The North gate turned up to be the highest with a record of 6415 vehicles (see table 2). It is followed by the main gate with a record of 5058 vehicles. In this category, the gate with the least volume of vehicle turned up to be the I.A.R gate which has a record of 1228 vehicles for the entire week.

RECOMMENDATIONS AND CONCLUSION

Ahmadu Bello University, Zaria is currently one the largest employers of labour in Zaria and its immediate environs. It has more than one hundred and twenty departments, plus institutes and other activity centres. These facilities provide employment /jobs to people who come into work on daily basis using different types in of vehicles. The findings confirmed that there is very high in-bound traffic flow and the North gate has highest flow in to the main campus daily. It was advised that the use of bicycles and trekking should be encouraged as it reduces traffic management problems and improve health of staff.

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