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EFFECT OF LAND USE ON ROAD TRAFFIC ACCIDENTS IN URBAN ZARIA AREA, NIGERIA

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ABSTRACT

This study examines and explains the effect of land use on road traffic accidents in Zaria urban area. Primary method was used to collect data for this study. In the primary method designed selected major roads were used in urban area. Whereas, the Kaduna state urban development provided information on land use. Also the Federal Road safety Command Zaria Unit provides record of accidents along the six selected roads, which were called as identified accidents routes, (IAR). The accessibility index together with crude capacity and potential generation rate of vehicular traffic was used to analyze the data obtained. The result showed the highly and moderately utilized roads in urban Zaria area while the product moment correlation revealed that there is a strong relationship between traffic flow and road traffic accident. It also found out, the six major roads referred to as identified accident routes" (IAR) produce large number of trips and have high accidents rates due to the intensive and complex sitting of land use. It was found out those other factors like increase traffic flow, refusal to obey traffic rules and mechanical fault are also contributors to occurrence road traffic accidents in urban Zaria area. Even though the rate of occurrence of accident is very high on the identified roads, it is generally moderate in urban Zaria area when compared to major towns like Kano, Kaduna, Benin and Port Harcourt. It was recommended that the authorities concerned should ensure land use is developed according to plan. The leap frog growth pattern of land uses should be discouraged.

KEYWORDS: Accessibility Index, Accident Route, Land Use, Road Traffic Accident, and Urban Zaria

INTRODUCTION

The interrelationship between transportation and land use been known for quite a long time, especially with references to the fundamental concept that traffic is the joint product of land use activity levels and transport capability. This was why Rimmer (1986), complained that the relationship between transport and land use was little explored because transportation geographers got themselves bogged down with network analysis.

In recent years, there has been growing concerned in studying the relationship between growth of land use and transportation in town, metropolis, cities and in urban areas (Onakala, 1995; Sule 1981; Vivian, 1983; Duru, Olayemi 1976 and Filani, *et al.,* 1976). These studies revealed that the physical development and shape of urban areas are dependent on the available network and transportation facilities. Also, that transportation facility exists in order to make it possible for people to carry on their different activities on land use at different locations. They also agreed that trips originating from or are attracted to a particular land use influence the volume of traffic attracted to it, which is also believed to be associated with the occurrence of road traffic accidents.

The spatial location of urban communities and the existence of land use in them is a reflection of socio economic and ecological forces (Main, 1985b). In Urban Zaria area, the growth of Urban Communities is facilitated by increase in populations and accompanied by the growth of different land use. These have lead to the arrangement of people's activities, building and commercial points indifferent locations along the transport routes, which produces different trips on a daily

basis. The conflict between the potential for population increase, growth of land use results in to the increase of daily trips which produces road traffic accident in urban Zaria area. This is well supported by some studies in which, Fonseca, (1976) and Banjo (1984) reported on that, relationship between transportation and land use in Nigeria in complicated by the bazaar of tradition of mixed land use, intensification as well as the diversity of life style. Duru (1981) and Sule (1984) have reviewed as problematic cities, they reported that higher order of residential land use are often found next door to major commercial and industrial land use even though their functions may be incompatible.

In urban Zaria area the effect of land use in road traffic accident is better appreciated as problem of growth and rigidity in the distribution of complex land use and the crisis crossing trips to and from various land use for variety of reasons. The trips generated tend to be high in one place and moderate to low in some places. And the continuous movement of people on two and four wheel vehicles creates accidents. This study examines and provides explanation on how land use generates road traffic flow and subsequently creates accidents in urban Zaria area, Nigeria.

METHODOLOGY

The primary and secondary methods of data collection were used to obtain information for this study. The six major roads, PZ, bank road Zaria, Gaskiya/Poly road, Ahmed Makarfi dual road, Lagos street/Aminu road, Sokoto/Samaru road and Shehu Idris road Zaria city referred to as identified accident routes (I.A.R.), by the federal road safety command in Zaria were used as main study areas. One hundred and twenty designed questionnaires were purposively administered to respondents to elicit information on the relationship between land use and transportation as it relates to the occurrence of road traffic accidents in urban Zaria area, Nigeria. The secondary information which has to do with road pattern and developed land uses were obtained from the Kaduna state Urban development board. While the accident data was collected from the Federal Road Safety commission, Zaria command.

The accessibility index was calculated to show the high and moderate roads as it relates the occurrence of road accidents in Urban Zaria area.

- Accessibility Index = $\frac{crude\ capacity}{potential\ generation} \chi \frac{100}{1}$

  Where;

- Crude capacity

  The measured road width

- Potential generation

  Short period count that is achieved by using formula

  Where Eiji = actual ‘E’ Factor at site: and day j

  E = mean ‘E’ factor overall sites and all days

  Fij: short period flow at site i on day j

- 100 = constant

To be able to achieve potential generation rate, the short period traffic flow count was conducted at established points on the six identified accidents routes in urban Zaria area. The continuous counting of traffic vehicles on selected

sites was done by trained research assistants for a period of six hours in 5 days (excluding Saturday and Sunday, which were considered as public holidays).

This method is statistically independent and current, it was used in estimating daily traffic flows as its relates to the occurrence of accidents by Gwarwy and Philip, 1980; Evans and Philips, 1978 and Bellamy, 1978 in related studies of traffic flows in different areas in United Kingdom, in Nairobi and in South Africa. The product moment correlation was performed to produce the relationship between traffic flow and road traffic accident in urban Zaria area.

RESULTS AND DISCUSSIONS

Attempt is made in this study to examine and explain the relationship between the continuous growth and development of various land use and occurrence of road traffic accident in urban Zaria area, Nigeria. The result showed that land use generates different kinds of movements which are done using different modes of transport to various activity centres. The disagreement between traffic flow and land use produces road accident in urban Zaria area, which occur when the interaction between vehicles, road user and the roads becomes defective.

Table 1 present information of the short period count of traffic vehicles on identified accident routes in urban Zaria area, Nigeria.

Table 1 Average Daily Vehicles Traffic Census on Selected Roads in Urban Zaria Area

Identified Major Accidents Route	Total Daily Traffic (6hrs Census for Five Days)	Average Daily Traffic Census for Five Days	Width of Roads
Samaru/Sokoto Road	9.889	1,977.8	18.2 meters
P.Z Junction/Bank Road	16.105	3,341.0	16.4 meters
Tutunwada: Ahmed Makarfi Duel Carraigo Road	7,551	1,510.2.2	18.2 meters
Gaskiya/Polytechnic Road	8,250	1,650.0	9.1 meters
Sabon Gari: Aminu Road/Lagos Street	11,289	2257.8	9.0 meters
Zaria City: Shehu Idris Road	8,569	1713.8	IS.Ometers
Total	**61653**	**26042.6**	**-**

Source: Field Work 2008

This result of the traffic census was recorded for six hours for five days and it produced the average daily vehicular traffic (A.D.V.T) for each of the identified major accident routes (IAR) is presented on table 1. The results showed that P.Z junction, Bank road and Lagos street/Aminu Road in Sabon Gari have the highest volumes of traffic flow daily, followed by Samaru/Sokoto road.

The main reasons for high traffic flow include the patronage of commercial, Educational and administrative land use which attract many people in need of their services. Also important is the thorough traffic movements to other types of land use along the road or are located in different urban communities.

The accident data used in this study was obtained from Federal Road Safety Commission, Zaria command for the year 2007. The summary for each of the six identified accident routes in Urban Zaria area, Nigeria is presented on the following tables. They show types of accidents (fatal, minor and serious). Type of vehicles involved, average number of death and causes of the accidents.

Table 2: Road Traffic Accident on Samaru (Sokoto Road)

S/No	Type of Vehicle	Types of Accidents			Average No of Deaths	No of Accident	Type of Road	Cause of Accident	Time of Day
		Fatal	Minor	Serious					
1	Peugeot/Bus	-	-	07	-	01	Single carriage	Bad road	13.29hrs
2	Nissan Car/Van	09	-	05	09	01	Single carriage	Bad road	10.30hrs
3	Honda/Motorcycle	01	-	-	01	01	Single carriage	Obstruction on road	ll.50hrs

Table 2: Contd.,

4	Toyota/Bus	-	-	01	-	01	Single carriage	Dangerous driving and over speeding	6.45hrs 25/08/07
5	Nissan Bus/M/Bens/Tipper	-	-	01	-	01	Single carriage	Dangerous driving over speeding	9.30hrs 23-12-07
	Total	**10**	**-**	**14**	**10**	**05**			

Source: FRSC, 2007

Table 3: Road Traffic Accident on PZ (Bank Road)

S/No	Type of Vehicle	Types of Accidents			Average No of Deaths	No of Accident	Type of Road	Cause of Accident	Time of Day
		Fatal	Minor	Serious					
1	Nissan Bus/Honda	-	-	02	-	01	Single carriage	Brake failure	18.409hrs
2	Peugeot (504)	-	-	02	-	01	Single carriage	Brake failure	31/03/07
3	Opel/Motor Cycle	-	-	01	-	01	Single carriage	Driving dangerous	9.00hrs
4	Bus/Meredes Benz		01			01	Single carriage	Mechanical fault	11.30hrs 25/08/07
5	Motorcycle/Motorcycle			02		01	Single carriage	Drivers dangerous	16.30hrs •
6	Wheel Chair Motorcycle/Bus	-	1	-	-		Double carriage	Brake failure	02/11/07
7	Honda accord/motorcycle	-	-	01	-		Double carriage	Dangerous driving	8:15hrs 4/11/07
8	Truck/saloon	-	1	-	-		Round about	Dangerous driving	21:5hrs 9/11/07
9	Motorcycle/Vespa motorcycle	-	-	02	-		Round about	Dangerous driving	17:30hrs 15/11/07
	Total	**-**	**03**	**10**	**-**	**09**			

Source: FRSC, 2007

Table 4: Road Traffic Accident on Tudun Wada (Ahmed Makarfi Road)

S/No	Type of Vehicle	Types of Accidents			Average No of Deaths	No of Accident	Type of Road	Cause of Accident	Time of Day
		Fatal	Minor	Serious					
1.	Bus/Motorcycle	-	-	01	-	01	Single carriage	Brake failure	14.20hrs 12/04/07
2.	Honda Accord/Nissan	-	01	-	-	01	Single carriage	Over speeding	10:34hrs 4/6/07
3.	Honda Civic/Bus	-	-	02	-	01	Single carriage	Dangerous driving	11.30hrs 13/08/07
4.	Truck/Bus	02	-	-	01	01	Single carriage	Break failure	12:40hrs 20/09/07
	Total	**02**	**01**	**03**	**01**	**04**			

Source: FRSC, 2007

Table 5: Road Traffic Accident on Tudun Jukun Gaskiya/Polytechnic Road

S/No	Type of Vehicle	Types of Accidents			Average No of Deaths	No of Accident	Type of Road	Cause of Accident	Time of Day
		Fatal	Minor	Serious					
1	Trailer/DAF	-	-	01	-	01	Single carriage	Tyre Burst	07:00hrs 20/2/07
2	Honda Civic	01	-	02	01	01	Single carriage	Tyre Burst	ll:00hrs 28/4/07
3	911	-	-	02	-	01	Single carriage	Robbery	5:00hrs 01/6/07hrs
4	Toyota Car/Bus	-	-	01	-	01	Single carriage	Dangerous driving	12:00hrs 01/6/07
5	Toyota car Saloon	-	-	01	-	-	Single carriage	Lost control	232:00hrs 4/7/07
6	Toyota/Bus/ Motorcycle	-	-	04	-	-	Single carriage	Over speeding	16:30hrs 29/10/07hrs
7	Motorcycle	-	-	02	-	-	Single carriage	Over speeding	7:59hrs 13:11/07
	Total	**1**	**-**	**14**	**1**	**7**			

Source: FRSC, 2007

Table 6: Road Traffic Accident on Sabon Gari (Lagos Street/Aminu Road)

S/No	Type of Vehicle	Types of Accidents			Average No of Deaths	No of Accident	Type of Road	Cause of Accident	Time of Day
		Fatal	Minor	Serious					
1	Peugeot	-	-	01	-	01	Single carriage		2:30hrs 12/01/07
2	Honda Civic/Motorcycle	01	-	-	-	01	Single carriage	Over speeding	3:00hrs 3/03/07
3	Bus/Toyota Saloon	-	02	-	-	01	Single carriage		4:00hrs 4/03/07hrs
4	Toyota Bus/Bus			02		01	Single carriage	Obstruction on road	12:00hrs 12:05/07
5	Nissan/Bus/M/Benz	-	01	—	01	01	Single carriage	Dangerous driving	5:00hrs 24/07/07
6	Bus/Motorcycle	-	—	01	-	01	Single carriage	Brake failure	23:00hrs 4/10/07
7	Toyota Bus/Toyota Bus	01	-	-	-	01	Single carriage	Dangerous driving	2:10hrs 27/11/07
8	Nissan Bus/Honda	-	-	01	01	01	Single carriage	Dangerous driving	2:40hrs 10/12/07
	Total	**01**	**-**	**05**	**01**	**7**			

Source: FRSC, 2007

In this study the road on which a total of 38 traffic accident were reported to have occurred in 2007 are refereed to as identified accident routes (IAR) the names and location of the roads was presented on able 1. The result on table 3 revealed that the P.Z junction/bank road had the highest number of accidents with nine cases. This is due to the existence of complex land use, such as commercial, educational, residential and transport attracting high trips which inadvertently lead to traffic accidents 4 Table 2, 4 and 6 showed a total of 5 and 7 accidents cases for the year 2007 on Sokoto road in Samaru and on Shehu Idris road in Zaria City. These roads have educational and residential land use sited along them, providing jobs to people there by attracting large daily movements. Where as in Tudun Wada along Ahmed Makarfi dual carriage road generate moderate trip and low accident rate because of the existence of few economic activities. Again, table 7 showed 8 different accidents for the year 2007 on Aminu road and Lagos Street is high because of the thorough passing of vehicles and the patronage of major services in a daily market in Sabon Gari.

The Table 8 present a summary of the types and characteristics of land use along the identified accident routes. They include commercial, all Educational and Residential Land use, all producing complex services which are attracting large crisis crossing movements along bank road, park road located in the central business district area, and along Animu road by Lagos Street. These movements create high thorough traffic, wrong and parallel parking of vehicles, major traffic hold up points and the growth of unplanned land use along the route which creates road traffics accidents.

Table 7: Characteristics Land Uses a long Identified Accident Routes in Urban Zaria

Identified Accidents Route	Land Uses Through Which Road Passed	No of Accidents	Road Width (in Meters)	Accessibility Index	Over/ Under Utilized IAR
Samaru (Sokoto Road)	Semi-public/Residential/Commercial Land uses	5	18.2	8.4	+
P.Z. (Bank Road)	Commercial/Transportation, Residential and Public and uses	9	16.4	14.3	+
Zaria City Shehu Idris Road)	Residential/commercial land uses	5	16.4	5.6	-
Tudun Wada (Ahmed Makarfi Raod)	Residential/commercial land uses	4	9.1	7.1	+
Gaskiya (Polytechnic Road	Residential/Educational and Administrative land use	7	9.1	7.7	+
Sabon Gari Lagos Street/Aminu Road	Commercial/Residential /Transportation land uses	8	9.1	12.8	+
	Total	**38**			**-**

+ = Highly utilized IAR and - moderately utilized IAR

Source: Filed Survey, 2008

Table 8 showed that P.Z junction park road and bank road with 14.3 as index accessibility is the most accessible and highly utilized. While Aminu road and Lagos Street is not well connected but are highly used. Gaskiya/Polytechnic road and Aminu Road/Lagos Street in Sabon Gari identified accident routes have more unplanned land uses with complex characteristics attracting different movements and as such have high potential for occurrence of road accidents than the others, The implication of these findings showed that land use is not the only determinant of road traffic accident, others like increase traffic flow, dangerous driving, lack of concentration, refusal to obey traffic rules and mechanical fault are also major causes of road traffic accidents in urban Zaria area Nigeria. The result of the accessibility index showed that P.Z Junction/Bank road, Animu Road/Lagos Street and Gaskiya/polytechnic roads are highly utilized and they recorded the high number of accidents, contributing 63% of the total road traffic accident cases in urban Zaria area Nigeria. This is attributed to the fact that they experience heavy vehicle traffic flow, most of which are attracted by land use located in them or as a result of through traffic flow.

The result of the product mention correlation came up with a cotrreltaion of 0.62 meaning that therer is a relationship between traffic flow and the occurrence of road accidents in urban Zaria area.

CONCLUSIONS

This study examines how land use generate crisis - crossing trips using different modes of transport to conveying people and provided explanation on how the relationship between land use and traffic flow creates road traffic accident in urban Zaria area Nigeria. It found out that location pattern of the various land use in urban Zaria area is a reflection of socio-economic and ecological factors. It was also found out that the residential areas are the trip or traffic generating areas, while attracting areas are the activity or work places. The movements of vehicles carrying people and goods between these areas result in the crisis-crossing of traffic flows which inadvertently come up with road accidents along the identified accident route on urban Zaria area. This study revealed that the rate of road traffic occurrence of accident varies on the identified roads, but it is generally moderate in urban Zaria area Nigeria. It was recommended that building of activity places should be done based on plan and that a committee responsible for the removal of unplanned building, other obstruction by the road side should be put in place.

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