TRAFFIC MANAGEMENT AT ROAD INTERSECTIONS ALONG OKENE- BENIN HIGHWAY AT AUCHI, EDO STATE

B. A Jimoh and C.C. Ogboi

Abstract
This paper is a write-up on an investigation of the ineffectiveness of traffic flows through the three intersections along the stretch of Okene-Benin highway running through the eastern outer fringes of Auchi, Edo State. Information contained in the research was obtained from both primary and secondary sources. Direct observation and hourly volumetric traffic count of vehicles were conducted. Affected vehicles include trucks, buses, cars, and motorcycles. Investigation reveals inadequacy of traffic management measures at the intersections. It also reveals a general high volume of traffic along the studied routes, with motorcycles being the most common means of transportation. The foregoing has caused occasional vehicular/pedestrian accident leading to loss of lives and property. Traffic congestion on the routes is resulting to atmospheric and noise pollution and increased consumption of fuel by vehicles at idling speed. It is concluded that this problematic situation should not be allowed to continue. In order to solve the traffic problem, it is suggested that in the interim, government should assign traffic officers to manage the traffic at the intersections. A permanent measure should be the construction of flyover bridges across the intersections to be provided with road signs and signals.

Introduction
Traffic flows constitute channels of organized interaction of activities on different land uses. Man has the propensity to desire the fastest, cheapest and most convenient interactions. In order to realize this, transport routes are designed such that the motorists, cyclists and pedestrians can all travel quickly, economically and most important of all, safely to their desired destinations. The remarkable increase in population, number of cars, motorcycles and other automobiles coupled with a mismatched of land uses have overstretched the capacity of roads to effectively function especially at intersections. The foregoing problematic traffic presentation is manifested at the three intersections on the stretch of Okene-Benin highway running through the eastern outer fringes of Auchi town. The management of traffic flows at these intersections currently suffers inadequate application of traffic management measures. Problems arising from this include traffic congestion, journey delays, increased cost of petrol resulting from idling vehicles, increased atmospheric and noise pollutions; and vehicular accidents leading to loss of lives and property.

The purpose of this study is to examine the problem of traffic management at intersection and to proffer useful measures for improvement by investigating traffic situation at the three intersections on the stretch of Okene-Benin highway which constitute the subject of this research. The intersections are created on the highway by three collectors originating from the town, namely; Jattu, Igbe and Auchi Polytechnic roads respectively.

Literature Review
Traffic is the movement or number of vehicles, pedestrians and so on along a street (Geddes and Grosset, 2007), which means pedestrians, livestock, motorcycles, vehicles and other automobiles that are on road at a particular time or their movement on a particular route. Traffic management is concerned with short-term measures to improve the efficient and safe movement of both pedestrian and vehicular traffic on the existing road network (O'Flaherty, 1983). The short-term measures include the rules and regulations enacted to control, regulate and improve the efficiency of traffic and users. Fundamentally, the objective of traffic management is to ensure the overall best use of the existing urban transport facilities, subject to the constraints of environmental preservation and public acceptability. The best use which may or may not be the maximum use or that generating the maximum benefits involves the imposition upon the travelers of rules and regulations governing the
use of transport facilities (Wells, 1975). Management of traffic at intersection is globally assuming a special challenge. An intersection is a complex part of a road which has been described as where two roads cross one another or where roads converge (Obateru, 2003).

Administration of Traffic Regulations

The practice of regulating and controlling traffic has evolved with the development of wheeled transport and social and commercial consequences of its use especially during the pre-nineteenth century (Hobbs, 1979). He added that traffic congestion was a regular characteristic of travel in Roman towns causing municipalities to plan for traffic and to enact regulations for its better use. In Nigeria the government enacted the Federal Road Safety Corps (FRSC) Act No. 45 of 1988 which provides, among others, that the organization shall execute the functions of enlightening the citizens on road usage, creation of laws guiding the use of road and their enforcement. In an attempt to manage traffic flows in Lagos State, the Vanguard (2005) reveals that “Lagos State moves to ban street parties.” The government sent a bill to the state House of Assembly which was passed into law banning the use of roads/streets in the state as rendezvous for parties and other social activities. However, the ban has not been effectively enforced. Abdul, (2009) in Business Day stated that the Federal Capital Territory Administration proposed to send to the National Assembly a bill to be passed into law stipulating payment of road tax by owners of vehicles plying all the roads. He added that the administration had constructed speed breakers at major intersections in the city.

Evolving Traffic Management Techniques at Intersections

The inherent problems of managing intersections have attracted researches geared towards improving upon the current methods of enabling traffic flow through intersections including overpasses and traffic light. Washington County, (2008) proposed the installation of cameras at Washington County’s busiest intersections to be monitored by engineers through video and adjust signal timing at congested locations, respond to emergencies and ensure an acceptable flow of traffic through an intersection. The proposal was implemented in the city of Vancouver through a programme called Intersection Safety Camera Program (City of Vancouver Engineering Services, 2010).

In his book, ‘Why You Act the Way You Do’ LaHaye, (1993) postulated that a person’s driving behaviour is determined by his temperament and writes thus:

“Sanguines are erratic drivers. Sometimes they speed, then for no apparent reason lose interest in driving fast and slow down. Cholerics are daring speed demons who dart in and out of traffic constantly. Melancholies are legalists by nature and they rarely speed. Phi Phlegmatic is the slowest driver of all. The last one to leave an intersection, he rarely changes lanes and is an indecisive danger when joining the flow of freeway traffic from an entrance ramp. He rarely has accidents, but he can be a road hazard”.

Evaluating a driver’s temperament therefore, throws up clue for collision avoidance.

Kurt and Peter (2005) conducted a research which is premised on the thinking that in future, artificial intelligence makes it possible for movement of vehicle by autonomous agents. In this system, individual cars are to be fitted with features of autonomy such as cruise control, GPS-based route planning and autonomous steering. Once individual cars become autonomous the possibility of autonomous interaction among multiple cars will be created. Traversing intersection is to be worked out through reservation-based system by which cars request and receive time slots from the intersection during which they pass. However, the inadequacies of this system stem from the fact that the driving agent must maintain constant velocity in the intersection and should not turn while in it. A further improvement on this arrangement will make acceleration and turnings in the intersection possible.

Congestion pricing has been applied in some cities as overall traffic reduction measure which is also beneficial to intersection as this measure reduces the number of vehicles reaching them. Larry (2008) reported in Environmental Defence that benefits of congestion pricing include a 45% traffic reduction, 10 miles per hour increased average speed, 25% fewer accidents, 176,000 fewer pounds of carbon dioxide emitted and 20% increase in public transit usage. These previous studies in this area
Traffic Management at Road Intersections along Okene-Benin Highway at Auchi, Edo State

have been undertaken to improve upon the existing measures of managing traffic flows at intersection in industrialized environment.

The Study Area and Methodology

The study was undertaken at Auchi, the administrative headquarters of Etsako West Local Government Area of Edo State, Nigeria. The Okene-Benin highway linking the Northern and Southern parts of the country runs through the eastern outer fringes of the town. Three collector roads radiating from the town centre, namely Jattu, Igbe and Auchi Polytechnic (now Tony Annenih Way) roads intersect the Okene-Benin highway at 4-way (cross), 3-way (T) and 4-way (cross) junctions respectively. Figure 1 below shows the location sketch.

Figure 1: Drawing showing the Okene-Benin highway and the affected three intersections.

Both primary and secondary sources of information were employed. A reconnaissance survey of the Okene-Benin highway at Auchi was carried out to determine suitable intersections for the study. The above-named three intersections were eventually selected. Appropriate locations along the routes were chosen for volumetric traffic count. A total of fourteen participants including the researchers were involved. Manual counting and recording were made from traffic observation to determine the means of transportation, volume of traffic, direction of flow and time of movement. It was an hourly-based investigation of traffic flow for three periods of the day of 7.00am to 8.00am; 1.00pm to 2.00pm and 4.00pm to 5.00pm and an average was projected. The study was carried out in March 2010. Texts on traffic management at intersection were also consulted.

Results

This section presents and summarizes the data collected on the field in tables and percentages. The means of transportation and volume of traffic on each route of the roads are adequately given. The situations at the intersections are given below.

A. The Jattu/Okene-Benin Roads Intersection

Below are the 12 routes on the roads at the above intersection (junction).

ROUTE 1 = Auchi-Benin
ROUTE 2 = Okene-Benin
ROUTE 3 = Jattu-Benin
ROUTE 4 = Benin-Jattu
ROUTE 5 = Auchi-Jattu
ROUTE 6 = Okene-Jattu
ROUTE 7 = Jattu-Okene
ROUTE 8 = Benin-Okene
ROUTE 9 = Auchi-Okene
ROUTE 10 = Okene-Auchi
ROUTE 11 = Jattu- Auchi
ROUTE 12 = Benin- Auchi

Table 1: Types of Vehicles and Volume of Traffic on each Route at Jattu/Okene-Benin Roads Intersection

<table>
<thead>
<tr>
<th>Vehicle</th>
<th>ROUTES</th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
<th>R4</th>
<th>R5</th>
<th>R6</th>
<th>R7</th>
<th>R8</th>
<th>R9</th>
<th>R10</th>
<th>R11</th>
<th>R12</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bicycle</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>10</td>
<td></td>
<td>0.3%</td>
</tr>
<tr>
<td>Motorcycle</td>
<td></td>
<td>240</td>
<td>114</td>
<td>198</td>
<td>221</td>
<td>392</td>
<td>99</td>
<td>73</td>
<td>108</td>
<td>117</td>
<td>96</td>
<td>348</td>
<td>120</td>
<td>2126</td>
<td>54.3%</td>
</tr>
<tr>
<td>Car</td>
<td></td>
<td>117</td>
<td>208</td>
<td>63</td>
<td>79</td>
<td>88</td>
<td>40</td>
<td>45</td>
<td>230</td>
<td>50</td>
<td>49</td>
<td>102</td>
<td>165</td>
<td>1236</td>
<td>31.5%</td>
</tr>
<tr>
<td>Bus</td>
<td></td>
<td>17</td>
<td>97</td>
<td>5</td>
<td>9</td>
<td>24</td>
<td>9</td>
<td>4</td>
<td>84</td>
<td>10</td>
<td>12</td>
<td>25</td>
<td>30</td>
<td>326</td>
<td>8.3%</td>
</tr>
<tr>
<td>Pick-up</td>
<td></td>
<td>4</td>
<td>6</td>
<td>3</td>
<td>8</td>
<td>10</td>
<td>4</td>
<td>3</td>
<td>12</td>
<td>6</td>
<td>4</td>
<td>14</td>
<td>4</td>
<td>78</td>
<td>1.9%</td>
</tr>
<tr>
<td>Lorries</td>
<td></td>
<td>2</td>
<td>41</td>
<td>7</td>
<td>3</td>
<td>27</td>
<td>2</td>
<td>1</td>
<td>38</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>149</td>
<td>3.8%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>381</td>
<td>466</td>
<td>276</td>
<td>320</td>
<td>541</td>
<td>154</td>
<td>129</td>
<td>472</td>
<td>187</td>
<td>164</td>
<td>513</td>
<td>322</td>
<td>3925</td>
<td>100%</td>
</tr>
</tbody>
</table>


Figure 2: Jattu/Okene-Benin roads intersection showing the twelve (12) routes and direction of traffic flow.

B. Igbe/Okene-Benin Roads Intersection (Angle 90)
Six (6) routes created by the roads at this intersection are as follows:
ROUTE 1 = Okene-Igbe
ROUTE 2 = Benin-Igbe
ROUTE 3 = Igbe-Benin
ROUTE 4 = Okene-Benin
ROUTE 5 = Benin-Okene
ROUTE 6 = Igbe-Okene
Table 2: Types of Vehicles and Volume of Traffic on Each Route at Igbe/Okene-Benin Roads Intersection (Angle 90)

<table>
<thead>
<tr>
<th>Vehicle</th>
<th>ROUTES</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>R1</td>
<td>R2</td>
</tr>
<tr>
<td>Bicycle</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Motorcycle</td>
<td>280</td>
<td>800</td>
</tr>
<tr>
<td>Car</td>
<td>66</td>
<td>160</td>
</tr>
<tr>
<td>Bus</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Pick-up</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>Lorry</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>360</td>
<td>984</td>
</tr>
</tbody>
</table>

Source: Field Survey, February, 2010

Figure 3: Igbe/Okene-Benin roads intersection (Angle 90) showing the six (6) routes and direction of traffic flow

C. Auchi Polytechnic/Okene-Benin Roads Intersection

Twelve (12) routes created by the roads at this intersection are as follows:

- ROUTE 1 = Okene-Auchi Polytechnic
- ROUTE 2 = South Ibie-Auchi Polytechnic
- ROUTE 3 = Benin-Auchi Polytechnic
- ROUTE 4 = Auchi Polytechnic-Benin
- ROUTE 5 = Okene-Benin
- ROUTE 6 = South Ibie-Benin
- ROUTE 7 = Benin-South Ibie
- ROUTE 8 = Auchi Polytechnic-South Ibie
- ROUTE 9 = Okene-South Ibie
- ROUTE 10 = South Ibie-Okene
- ROUTE 11 = Benin-Okene
- ROUTE 12 = Auchi Polytechnic-Okene
Table 3: Types of vehicles and volume of traffic on each route at Auchi Polytechnic/Okene-Benin roads intersection

<table>
<thead>
<tr>
<th>Vehicle</th>
<th>ROUTES</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>R1</td>
<td>R2</td>
<td>R3</td>
<td>R4</td>
<td>R5</td>
<td>R6</td>
<td>R7</td>
<td>R8</td>
<td>R9</td>
<td>R10</td>
<td>R11</td>
<td>R12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bicycle</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1064</td>
<td></td>
</tr>
<tr>
<td>Motorcycle</td>
<td>1064</td>
<td>1189</td>
<td>439</td>
<td>216</td>
<td>969</td>
<td>876</td>
<td>225</td>
<td>719</td>
<td>134</td>
<td>1182</td>
<td>267</td>
<td>1009</td>
<td>8289</td>
<td>80.9</td>
</tr>
<tr>
<td>Car</td>
<td>320</td>
<td>226</td>
<td>11</td>
<td>36</td>
<td>238</td>
<td>94</td>
<td>58</td>
<td>51</td>
<td>139</td>
<td>211</td>
<td>156</td>
<td>42</td>
<td>1682</td>
<td>16.4</td>
</tr>
<tr>
<td>Bus</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>86</td>
<td>5</td>
<td>3</td>
<td>-</td>
<td>3</td>
<td>4</td>
<td>79</td>
<td>2</td>
<td>191</td>
<td>1.9</td>
</tr>
<tr>
<td>Pick-up</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>8</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>6</td>
<td>4</td>
<td>7</td>
<td>4</td>
<td>34</td>
<td>0.3</td>
</tr>
<tr>
<td>Lorry</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>29</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>1</td>
<td>16</td>
<td>-</td>
<td>48</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1385</td>
<td>1417</td>
<td>554</td>
<td>254</td>
<td>1330</td>
<td>979</td>
<td>288</td>
<td>773</td>
<td>284</td>
<td>1405</td>
<td>522</td>
<td>1053</td>
<td>10244</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Field Survey, February 2010

Figure 4: Auchi Polytechnic/Okene-Benin roads intersection showing the twelve (12) routes and direction of traffic flow

Tables 1, 2, 3 and Figures 2, 3 and 4 show the types of vehicles, volume of traffic and directions of traffic flow on the routes through each of the three intersections under study. Motorcycle, among the six identified means of transportation, is mostly used along the roads, routes and through the three intersections. The percentages of motorcycle to other means of transportation passing through the intersections on Jattu, Igbe and Auchi Polytechnic roads are 54.2%, 69% and 80.9% respectively. The tables and figures also show the routes which generate the highest volume of traffic at each intersection. Routes 5 and 11 (Auchi-Jattu road and Jattu-Auchi road) at the intersection on Jattu road generate the highest volume of traffic of 541 and 513 vehicles per hour at peak periods. At Igbe road intersection (Angle 90), route 3 (Igbe-Benin road) and route 4 (Okene-Benin road) generate the highest volume of traffic which amount to 1128 and 1148 vehicles per hour at peak periods.
periods. At Auch Polytechnic road junction, routes 2 and 10 generate the highest volume of traffic. The routes involved are South Ibie-Auchi Polytechnic road and South Ibie-Okene road. The volumes of traffic on the routes are 1417 and 1405 respectively. The total volume of traffic generated at the Auchi Polytechnic road intersection in an hourly count is 10,244 vehicles per hour. An average of 6320 vehicles per hour was recorded on each intersection at the peak period of the day.

**Discussion**

Generally, there is a high volume of traffic along the studied routes, roads and intersections, climaxing during the peak hours. Motorcycles were noted to be the most commonly used means of transportation. Investigation also revealed that there were no adequate traffic control measures at the intersections except occasional services observed from members of the Federal Road Safety Corps (FRSC) and Save Accident Victim Association of Nigeria (SAVAN) at the Auchi Polytechnic and Jattu road intersections at peak hours.

The location of incompatible land uses along the routes, roads and intersections attracts and generates high volume of traffic thereby causing interruption to traffic flow. Such incompatible land uses include churches, motor parks and informal trading activities.

The academic and administrative activities at Auchi Polytechnic coupled with ancillary services such as consultancy and shopping attract high volume of traffic into the institution through the Polytechnic eastern gate on Okene-Benin highway.

The aforementioned high volume of traffic which is yet to be addressed with adequate traffic measures has led to congestion at the intersections, causing journey delays, and increased fuel by idling vehicles. Emission of large amount of fumes from exhaust pipes of vehicles causes environmental pollution which is hazardous to health. Also, there is loss of lives and vehicles and increased expenditure from repairs of accidented vehicles. Loss of lives stated above tantamounts to loss of manpower to the country at large. The enumerated losses have negative effects on the economy of the country.

**Conclusion**

Traffic situation on three intersections on Okene-Benin highway at the eastern outer fringes of Auchi was investigated to determine the adequacy of traffic management measures adopted. The volumetric traffic count revealed high volume of traffic at an average of 6320 vehicles per hour on each intersection. The means of transportation were bicycle, motorcycle, car, bus, pick-up van and lorry with motorcycle emerging as the most common means at 4910 vehicles per hour. There was absence of traffic control measures except occasional manual traffic services from members of the FRSC and SAVAN at the Auchi Polytechnic road intersection at peak periods of the day. Associated with high volume of traffic at intersections include traffic congestion, journey delays, pollution, high cost in fuelling vehicles and occasional vehicular/pedestrian collision. The ineffective management of traffic at the affected intersections should not be allowed to continue.

**Recommendations**

It is hereby recommended that the Federal and Edo State governments should provide regular and reliable traffic management measures at the intersections. Such measures should include effective services of road managers (FRSC and Traffic Wardens), provision of signs, markings and channelization with Pedestrian Island. Also, the administration of Auchi Polytechnic is advised to train its security officers to control and manage traffic at the eastern gate (Auchi Polytechnic Junction) especially at peak hours of the day for ensuring safety, convenience and time saving.

The permanent solution should be the construction of fly-over bridges across the Okene-Benin highway at Auchi, Igbe and Jattu road intersections for ease of accessibility to users of the collector roads. In constructing the fly-over bridges, allowance should be made for the future dualisation of the Okene-Benin highway and the affected collector roads at the intersections.
References


